HARMONY GROVE VILLAGE SOUTH

APPENDIX I

GEOTECHNICAL REPORT

to the

DRAFT ENVIRONMENTAL IMPACT REPORT

PDS2015-GPA-15-002; PDS2015-SP-15-002
PDS2015-TM-5600; PDS2015-REZ-15-003
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APRIL 2017

Prepared for:
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UPDATE
GEOTECHNICAL REPORT

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

RCS-HARMONY PARTNERS, LLC
MANHATTAN BEACH, CALIFORNIA

FEBRUARY 3, 2015
PROJECT NO. 07465-32-03

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07465-32-03
February 3, 2015

RCS-Harmony Partners, LLC
321 12th Street, Suite 200
Manhattan Beach, California 90266

Attention: Ms. Kathryn Murrel

Subject: UPDATE GEOTECHNICAL REPORT
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

Dear Ms. Murrel:

In accordance with your request, we have prepared this update geotechnical report specific to the revised vesting tentative map (VTM) for the subject project. The accompanying report presents the findings of our study, and conclusions and recommendations pertaining to the geotechnical aspects of project development. Based on the results of this study, it is our opinion that the subject project can be developed as planned provided that the recommendations of this report are followed.

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Emilio Alvarado
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(2) Addressee
(3) Project Design Consultants
Attention: Ms. Camille Passon

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UPDATE GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents updated information for the Harmony Grove Village South project located in the west central area of San Diego County, California (see Vicinity Map, Figure 1). The purpose of this report is to evaluate soil and geologic conditions within the limits of proposed improvement and provide geotechnical recommendations pertaining to development of the property as proposed.

The scope of this update included a review of:

1. *Geotechnical Investigation, Harmony Grove Property, San Diego County, California,* prepared by Geocon Incorporated dated May 2, 2005 (Project No. 07465-32-01).

2. *Vesting Tentative Map, Harmony Grove Village South, San Diego County, California,* prepared by Project Design Consultants, electronic copy dated January 16, 2015.

We also performed a site reconnaissance in August 2014 to check that the property was essentially the same as described in our geotechnical report referenced above.

The recommendations presented herein are based on analysis of the data and observations obtained during the previous investigation, and our experience with similar soil and geologic conditions. Additional references reviewed to prepare this report are provided in the *List of References*.

2. PREVIOUS GEOTECHNICAL STUDY

As discussed in Reference No. 1, we performed a field investigation on the subject property in March and April of 2005 that consisted of a site reconnaissance, geologic mapping, excavating 35 exploratory trenches, drilling six small-diameter borings, and performing 16 air-track borings. We also performed laboratory testing on selected soil samples collected during the field investigation to evaluate pertinent physical properties of the soil types encountered. The approximate locations of the subsurface information collected during the previous study for the site are shown on the Geologic Map (Figures 2 and 3, map pocket). Cross-Sections A-A′ through C-C′ (Figure 4, map pocket) represent our interpretation of the geologic conditions in select locations of the site. Exploratory trench, boring and air-track logs and laboratory test results from our 2005 study is presented in Appendices A and B, respectfully.

3. SITE AND PROJECT DESCRIPTION

The property consists of approximately 112-acres of essentially undeveloped land located south of Harmony Grove Road and east of Country Club Drive. Topographically, the site is characterized by a

broad relatively gentle valley bottom to moderately steep hillside terrain. Surface drainage across the site is primarily to the north where it flows into Escondido Creek. The elevations within the proposed development consist of a topographic high of 804 feet Mean Sea Level (MSL) along the south margin of proposed development and a low of approximately 570 feet MSL along the northern property boundary.

Vegetation consists of natural low-lying grasses and chaparral. Man-made features include two structures that have been destroyed by fire located in the central western portion of the site. Several paved and unpaved roads traverse the property and provide access to existing residences located east of the property. Overhead power lines also cross the property from east to west in the central portion of the site.

We understand that the property will be developed to create an approximately 453 single-family residential subdivision with parks, associated roadways and infrastructure improvements. Grading will consist of maximum cut and fill depths on the order of 70 prior to remedial grading. Cut and fill slopes with maximum heights of approximately 90 and 75 feet, respectively, are planned and generally designed at an inclination of 2:1 (horizontal:vertical) or flatter. Cut slopes located along the northeast and south margins of planned development are designed at a 1.5:1 ratio. Fill slopes 1.5:1 are proposed along private Drive K and the adjacent 3 pads. Offsite grading is also planned and consists of widening Country Club Drive and constructing a bridge across Escondido Creek.

The revised VTM plan (Figures 2 and 3) shows a larger development footprint proposed for the property than the subdivision configuration presented on Figure 2 of our 2005 geotechnical report. We recommend that an update geotechnical investigation be performed in areas of planned development not covered by our 2005 geotechnical investigation report. This work can be performed after the subdivision configuration is finalized. The field work should consist of performing exploratory trenching and a rippability study (i.e., seismic refraction lines and/or air-track borings) to evaluate subsurface soil conditions and rippability characteristic of the granitic rock in areas not previously investigated. Performing an investigation along the west margin of Country Club Drive Stations 22 through 35 and at the location of the planned bridge along the creek will also be necessary to evaluate the existing soil conditions.

The locations and descriptions of the site and proposed development above are based on our previous field study and review of the project VTM plan. If development plans differ significantly from those described herein, Geocon Incorporated should be contacted for review and possible revisions to this report.

4. SOIL AND GEOLOGIC CONDITIONS

Four surficial soil types and one geologic formation were encountered during the previous field investigation. The surficial deposits consist of undocumented fill, topsoil, alluvium, and colluvium. The formational unit includes the Cretaceous-age granitic rocks commonly referred to as Escondido Creek Granodiorite. Each of the surficial soil types and geologic unit encountered is described in order of increasing age. The approximate extent of the surficial deposits and granitic rock, excluding topsoil, is shown on the Geologic Map, Figures 2 and 3. Geologic cross-sections are provided on Figure 4.

4.1 Undocumented Fill (Qudf)

Three relatively small undocumented fill embankments have been mapped on the property. The deposit mapped along the southwest boundary appears to have been constructed by the adjacent homeowner to accommodate several horse corals. We were unable to evaluate the condition and thickness of this deposit due to the corals being occupied by horses. The embankment mapped in the eastern portion of site appears to be an old dam that has since been breached and was most likely associated with former farming activities. This embankment is estimated to be approximately 7 to 8 feet thick. The remaining deposit mapped along the northern portion of the property was previously located beyond the limits of proposed improvement and thus not trenched to check the condition and thickness of the fill. The undocumented fill is unsuitable for support of additional fill or structural loading in its present condition and will require complete removal and compaction within areas of planned development.

4.2 Topsoil (Unmapped)

Topsoils blanket the majority of the site and vary from approximately ½ to 1 foot thick. The topsoils are characterized as loose, damp, brown, silty sands. The topsoil is compressible and will require complete removal and compaction during grading.

4.3 Alluvium (Qal)

Alluvial deposits were found over a relatively large portion of the property within the drainage and tributary channels throughout the site. These deposits generally consist of relatively loose to medium dense, silty sands with varying amounts of gravel and cobble. We encountered wet to saturated conditions within the alluvium deposit in several trenches (see Trenches T-4 and T-10). In some exploratory trenches and borings, dense to very dense alluvium was encountered at depth; however, in general, the material is potentially compressible and will require removal and compaction where encountered in areas of planned development.

4.4 Colluvium (Qc)

Colluvial deposits were encountered along the hillsides above the alluvial drainages overlying the granitic rock. These deposits generally possess low to high expansion potential, are loose to very dense. In limited areas, we encountered cemented colluvium at grade and at depth in exploratory trenches T-14, T-18, T-19 and T-23, and borings B-4 and B-5 along the southeast portion of planned development. We also encountered wet conditions within this deposit (see trench T-16). The majority of the colluvium is compressible and will require removal and compaction. Additionally, the presence of thick colluvium may necessitate the construction of stability fills if exposed in planned cut slopes.

4.5 Escondido Creek Granodiorite (Ke)

Cretaceous-age Escondido Creek Granodiorite (granitic rock) underlies the surficial deposits. Based on observations made during the field exploration, site reconnaissance, and rock rippability study, the granitic rock exhibits a variable weathering pattern ranging from highly weathered, decomposed rock to outcrops of slightly weathered, extremely strong rock that may require blasting to excavate. The granitic unit generally exhibits adequate bearing and slope stability characteristics. Cut slopes excavated within the granitic rock should be stable to the proposed heights if free of adversely oriented joints or fractures.

The soils derived from excavations within the decomposed granitic rock are anticipated to consist of low-expansive, silty, medium- to coarse-grained sands and should provide suitable foundation support in either a natural or properly compacted condition. It should be anticipated that excavations within the granitic rock will generate boulders and oversize materials (rocks greater than 12 inches in nominal dimension) that will require special handling and placement as recommended hereinafter.

5. RIPPABILITY AND ROCK CONSIDERATIONS

The subsurface exploration program that we previously performed consisted of drilling 16 air-track borings in proposed cut areas based on the 2005 VTM plan to evaluate the rippability characteristics of the rock. The locations of the air-track borings generally coincide with cut areas shown on the revised VTM plan (see Figures 2 and 3). Air-track borings utilizing an Ingersoll Rand 590 with a 3½-inch bit were advanced in selected cut areas. Drill penetration rates were used to evaluate rock rippability and to estimate the depth at which difficult excavation will occur. Rock rippability is a function of natural weathering processes that can vary vertically and horizontally over short distances depending on jointing, fracturing, and/or mineralogic discontinuities within the bedrock.

A frequently used guideline to equate rock rippability to drill penetration rate is that a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material, 20 to 30 spf indicates marginally to non-rippable material, and greater than 30 spf indicates non-rippable rock. These general guidelines are typically based on drill rates using a rotary percussion drill rig similar to an Ingersoll Rand ECM 360 with a 3½-inch drill bit. The penetration rates (recorded in seconds per foot) for each air track boring are presented in Appendix A, Figures A-42 through A-57.

The estimated thickness of rippable material for each air track boring using 20 spf as the boundary between rippable and marginal to non-rippable rock is presented on the Figures 2 and 3. The estimate is derived from a literal interpretation of the penetration rate from each boring log, based on the first occurrence where the penetration rate reaches 20 spf. Perspective contractors should use their own judgment to identify the penetration rate boundary between productive and non-productive ripping and, rippable and non-rippable rock.

Based on an air track penetration rate of 20 spf, it is expected that most of the proposed cuts in the areas studied will encounter rippable granitic rock. The air-track borings indicate that, where fresh rock is not exposed near the surface (e.g., boulders), the granitic rock is characterized by a rippable weathered mantle varying from approximately 29 to 60 feet thick. Excavations greater than these depths may encounter difficult ripping conditions requiring blasting techniques and can be expected to generate oversized rock (rocks greater than 12 inches in dimension), which will necessitate typical hard rock handling and placement procedures during grading operations. Proposed cuts in the weathered mantle may also generate oversized fragments.

Estimates of the anticipated volume of hard rock materials generated from proposed excavations should be evaluated based on the information from each boring and drill penetration rate criteria acceptable to the contractor. Roadway/utility corridors and lot undercutting criteria should also be considered when calculating the volume of hard rock.

Earthwork construction should be carefully planned to efficiently utilize available rock placement areas. Oversize materials should be placed in accordance with rock placement procedures presented in Appendix C of this report and governing jurisdictions.

6. GROUNDWATER/SEEPAGE

Groundwater or seepage was encountered in exploratory trenches T-4, T-10 and T-16 at the time we performed the field work in March and April of 2005. The groundwater water in trench T-4 was approximately at the same elevation of the Escondido Creek. The subsurface water encountered in trenches T-10 and T-16, was likely associated with the heavy rains that had occurred prior to our field work and continued migrating through the permeable soils. Groundwater levels in drainage

areas can be expected to fluctuate seasonally and may affect grading. In this regard, grading may encounter wet to saturated soils conditions causing excavation and compaction difficulty, particularly if construction is planned during the rainy season. Remedial grading of surficial deposits, at or near Escondido Creek most likely will encounter wet to saturated soils requiring specialized excavation equipment, dewatering and drying of the material to facilitate proper compaction.

Subdrain systems will be necessary for the proposed development to intercept and convey seepage migrating along impervious strata. Subdrains should be planned for the main drainages and possibly where impervious layers daylight near the ultimate graded surface. The location of proposed underground improvements may result in modifications to the recommended subdrains shown on Figures 2 and 3.

7. GEOLOGIC HAZARDS

7.1 Faulting and Seismicity

Based on our review of geologic literature, previous geotechnical study and observations during mass grading in adjacent areas, the site is not located on any known active, potentially active, or inactive fault traces as defined by the California Geological Survey (CGS).

According to the results of the computer program *EZ-FRISK* (Version 7.62), nine known active faults are located within a search radius of 50 miles from the property. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA in our analysis. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault Zone, located approximately 13 miles west of the site and are the dominant sources of potential ground motion. Table 7.1.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for faults in relationship to the site location.

TABLE 7.1.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood	13	7.5	0.24	0.19	0.24
Rose Canyon	13	6.9	0.21	0.17	0.18
Elsinore	18	7.85	0.23	0.16	0.21
Coronado Bank	28	7.4	0.16	0.10	0.12
Palos Verde Connected	28	7.7	0.17	0.12	0.14
Earthquake Valley	32	6.8	0.11	0.08	0.07
San Jacinto	43	7.88	0.14	0.09	0.11
San Joaquin Hills	47	7.1	0.09	0.08	0.07
Palos Verdes	47	7.3	0.10	0.07	0.07

It is our opinion that the property could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed in Table 7.1.1 or other faults in the Southern California/Northern Baja California region. However, we do not consider the site to possess any greater seismic risk than that of the surrounding developments.

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the fault slip rate. The program accounts for earthquake magnitude as a function of fault rupture length. Site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) in the analysis. Table 7.1.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 7.1.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.49	0.38	0.45
5% in a 50 Year Period	0.38	0.30	0.33
10% in a 50 Year Period	0.30	0.24	0.26

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the California Building Code (CBC) or San Diego County guidelines.

7.2 Liquefaction

Soil liquefaction during a strong earthquake is limited to those soils that are in a relatively loose, unconsolidated condition and located below the groundwater table. Due to the relatively high density of the granitic rock at the site, remedial grading recommended within the proposed developed areas, and implementation of the recommendations contained herein, the risk associated with seismically induced soil liquefaction hazard is low.

7.3 Tsunamis and Seiches

The risk associated with tsunamis and seiches hazard at the project is low due to the site elevation and the absence of an upstream body of water.

7.4 Landslides

No landslides were encountered within the site or mapped within the immediate areas influencing the project development. In our opinion, the risk associated with landslide hazard is low.

7.5 Consolidation

The cemented portions of the colluvium encountered at the site during the field investigation generally consisted of dense to very dense, damp to moist, silty to clayey sands with gravel. We performed laboratory testing on the cemented colluvium to check consolidation potential of the soil. Based on the laboratory test results, the cemented colluvium is suitable for support of compacted fill and structural loading. Laboratory test results are presented in Appendix B.

7.6 Flooding

The northern approximately 80 feet of the property is located within a Federal Emergency Management Agency (FEMA) designated flood plain. A review of the VTM plan indicates that proposed grades along the northern margin of site will be raised approximately 10 feet. The risk associated with inundation by flooding is considered low due to the proposed grading.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

8.1.1 No soil or geologic conditions were encountered during this study that would preclude development of the property as presently proposed provided the recommendations of this report are followed.

8.1.2 We recommend that an update geotechnical investigation be performed in areas of planned development not covered by our 2005 investigation report. This work can be performed after the subdivision configuration is finalized. The fieldwork should consist of performing exploratory trenching and a rippability study to evaluate subsurface soil conditions and rippability characteristics of the granitic rock in areas not previously investigated. Performing excavations along the west margin of Country Club Drive Stations 22 through 35 and at the location of the proposed bridge along the creek will also be necessary to evaluate the existing soil conditions.

8.1.3 Remedial grading along the western margin of Country Club Drive Stations 22 through 35 may be impacted due to property line constraints. Figure 5 presents our recommended remedial configuration in this area. A future study along this margin will evaluate the alluvial conditions and provide geotechnical recommendations for this area.

8.1.4 Fill slopes inclined at 1.5:1 are proposed along private Drive K and the adjacent 3 pads. These slopes will require reinforcement (e.g. geogrid, soil cement, etc.) to achieve acceptable slope stability.

8.1.5 Undocumented fill, topsoil, alluvium, and majority of the colluvium are not suitable for the support of fill or structural loading in their present condition and, will require removal and compaction in areas of planned development.

8.1.6 We encountered cemented colluvium at grade and at depth in exploratory trenches T-14, T-18, T-19 and T-23, and borings B-4 and B-5 along the southeast margin of planned improvement. Laboratory analysis indicates the material has adequate strength parameters to receive fill soils or structural loads. However, where this condition occurs at grade, a minimum 3-foot undercut is recommended to facilitate future shallow excavations. An engineering geologist should be present during grading to identify the colluvial areas that may not require remedial grading.

8.1.7 We encountered wet to saturated soils and groundwater/perched water conditions in exploratory trenches T-4, T-10 and T-16. Dependent upon seasonal conditions at the time of grading, remedial grading of surficial deposits along the natural drainages may encounter wet to saturated materials and groundwater resulting in possible excavation and fill placement difficulties. Saturated soil conditions and groundwater should be anticipated for proposed off-site grading along the Escondido Creek. Dewatering and/or use of specialized equipment may be required to excavate the surficial deposits. Overly wet soils may require spreading and drying and/or mixing with drier materials to reduce the moisture content so that compaction can be achieved.

8.1.8 The potential of hard rock within proposed cut areas will require special consideration during site development. Excavations within the granitic rock that extend below the weathered mantle or where fresh core stones are exposed at grade may require blasting to facilitate excavations. We anticipate that excavations performed during grading operations will generate oversize materials (rock fragments >12 inches) that will require special handling and fill placement procedures. Oversize materials should be placed in accordance with grading recommendations presented in Appendix C.

8.1.9 An earthwork analysis should be performed to determine if there is an adequate volume of fill area available to accommodate the anticipated volume of blasted/oversize materials. This study should consider the proposed grading, rippability information contained in this report, rock placement requirements and include proposed undercutting.

8.1.10 Cut slopes should be observed during grading by an engineering geologist to check that the soil and geologic conditions do not differ significantly from those anticipated. Scaling of loose rock fragments from proposed cut slopes may also be necessary.

8.1.11 Subsurface conditions observed may be extrapolated to reflect general soil/geologic conditions; however, some variations in subsurface conditions between boring and trench locations should be anticipated.

8.2 Soil and Excavation Characteristics

8.2.1 Based on observations and laboratory expansion testing performed on selected soil samples, the soils tested have an Expansion Index (EI) less than 20 and are considered very low expansive in accordance with the 2013 California Building Code (CBC). Laboratory test results are presented in Appendix B, Table III. Based on our observations, the clay portions of the alluvium and colluvium are potentially high expansive. The table below presents soil classifications based on the EI per ASTM D 4829.

TABLE 8.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification
0 – 20	Very Low
21 – 50	Low
51 – 90	Medium
91 – 130	High
Greater Than 130	Very High

8.2.2 Excavation of the surficial deposits (undocumented fill, topsoil, alluvium and the loose to dense portions of the colluvium) should generally require light to moderate effort using conventional heavy-duty grading equipment.

8.2.3 Excavating within the granitic rock, and to a lesser extent the cemented colluvium, will generally vary in difficulty with the depth of excavation depending on the degree of weathering. It is anticipated that the majority of the proposed excavations will encounter moderate to heavy ripping with conventional heavy-duty equipment. Blasting may be required where excavations extended beyond the weathered granitic rock mantle and where unweathered boulders or "core" stones are encountered in proposed granitic rock cut areas. Oversize rock (material >12 inches) should be placed in accordance with *Recommended Grading Specifications* (Appendix C) and the requirements of the governing agency. Oversize rock may require breakage to acceptable sizes or exportation from the property. Placement of oversize rock within the area of proposed underground utilities should not be permitted.

8.3 Corrosion

8.3.1 Laboratory testing on soil samples should be performed to evaluate water soluble sulfate-content, chloride and, potential for hydrogen (pH) and resistivity testing to generally evaluate the corrosion potential to structures in contact with soil. This testing should be performed during future field studies.

8.3.2 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, if improvements that could be susceptible to corrosion are planned, it is recommended that further evaluation by a corrosion engineer be performed.

8.4 Grading

8.4.1 All grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of Appendix C conflict with this report, the recommendations of this report should take precedence.

8.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

8.4.3 Grading should be performed in conjunction with the observation and compaction testing services of Geocon Incorporated.

8.4.4 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

8.4.5 All potentially compressible surficial soils (undocumented fill, topsoils, alluvium, and most of the colluvium) within areas of planned grading should be removed to firm natural ground and properly compacted prior to placing additional fill and/or structural loads. Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required where the thickness of potentially compressible surficial deposits exceeds 3 feet. Where not restricted by property lines, protected open space or exiting improvements, removal of compressible surficial soils should extend beyond the toe of fill slopes a horizontal distance equal to the depth of the remedial removal (see Figure 5 for general information). The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist.

8.4.6 We expect groundwater/perched water conditions will be encountered in removal areas performed at or near the Escondido creek. Wet to saturated soil and perched water may also be encountered in the surficial deposits located in the natural drainages if grading is performed during the rainy season. Remedial grading of surficial deposits in these areas will likely result in possible excavation and fill placement difficulties. Dewatering and/or use of specialized equipment will likely be required to excavate the alluvium and/or colluvium. Overly wet materials will require spreading and drying and/or mixing with drier materials to reduce the moisture content so that compaction can be achieved.

8.4.7 If complete removal of compressible material cannot be performed at or near the creek due to groundwater conditions, alternative measures such as dewatering and surcharge loading with settlement monitoring may be required. Geocon Incorporated will provide alternate recommendations, if needed, based on conditions encountered during grading.

8.4.8 After removal of unsuitable material as recommended above, the base of excavations to receive fill should be scarified approximately 12 inches, moisture conditioned, and compacted.

8.4.9 The site should then be brought to final subgrade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of laboratory maximum dry density at or above optimum moisture content, as determined in accordance with ASTM D1557. Fill within 150 feet of the bridge abutments should be compacted to at least 95 percent relative compaction. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.

8.4.10 Oversize material (material >12 inches) will be generated during grading operations and especially in excavations performed in the granitic rock. Grading operations should be scheduled to permit the placement of oversize material in the deeper fill areas.

8.4.11 Rocks, cemented concretions or any irreducible material greater than six inches in maximum dimension should not be placed within three feet of finish grade in graded areas. Rocks greater than 12 inches in maximum dimension should not be placed within the upper 10 feet of finish grade and three feet below the deepest utility. Placement of the oversize rock should be performed in accordance with the recommendations in Appendix C.

8.4.12 Grading should be conducted so that high expansive soils (EI >90) are placed in the deeper fill areas at least three feet below proposed finish grade elevations and at least 15 feet from the face of fill slopes. Where practical, the upper three feet of graded areas (cut or fill) should consist of properly compacted very low to low (EI $\leq$50) expansive granular soils.

8.4.13 Based on the grading plan, grading could result in fill to formation transitions across building pads. A transition condition is defined where formation is located within three feet of finish pad grade. To reduce the potential for differential settlement, the formation

portion of the transition should be over-excavated (undercut) at least three feet below proposed finish grade or at least one foot below the lowest foundation element, whichever is deeper, and replaced with properly compacted very low to low expansive fill soils. Over-excavations should be cut at a gradient of one percent toward the street or the deepest fill area to provide drainage for moisture migration along the contact between the native soil and compacted fill.

8.4.14 Cut pads exposing granitic rock or cemented colluvium should be undercut at least three feet and replaced with properly compacted very low to low expansive soil to facilitate excavation of foundations and shallow utilities.

8.4.15 Undercutting of street areas should be considered to facilitate the excavation of underground utilities where the streets are located in cut areas composed of marginally to non-rippable hard rock. If subsurface improvements or landscape zones are planned outside these areas, consideration should be given to undercutting these areas as well. This can be evaluated during grading operations.

8.4.16 In order to maintain safety and the stability of adjacent improvements, it is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with the applicable OSHA rules and regulations.

8.4.17 Imported materials (if required), should consist of granular very low to low expansive soils (EI $\leq$50). Prior to importing the material, samples from proposed borrow areas should be obtained and subjected to laboratory testing to determine if the material conforms to the recommended criteria. The grading contractor should allow at least four days for completion of the laboratory testing and schedule grading accordingly. The import soil should be free of oversize rock (greater than 6 inches) and construction debris.

8.5 Earthwork Grading Factors

8.5.1 Estimates of embankment shrink-swell factors presented on Table 8.5 are based on comparing laboratory compaction tests with the density of the material in its natural state and experience with similar soil types. It should be emphasized that variations in natural soil density, as well as in compacted fill, render shrinkage value estimates very approximate. As an example, the contractor can compact fills to any relative compaction of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Based on the work performed to date and considering the above discussion, the following earthwork factors may be used as

a basis for estimating how much the on-site soils may shrink or swell when removed from their natural state and placed in compacted fills.

TABLE 8.5

Soils Unit	Shrink-Swell Factors
Undocumented fill, Topsoils, Compressible Colluvium and Alluvium,	0 to 10 Percent Shrinkage
Escondido Creek Granodiorite	15 to 20 Percent Bulk

8.6 Subdrains

8.6.1 Subdrains should be installed in the tributary drainages that will be filled. Typical subdrain installation details are presented on Figure 6. The subdrains should extend up the canyons to approximately 15 feet below proposed ultimate finish grade elevations and at least two feet below any proposed utilities. The approximate locations of proposed subdrains are shown on Figures 2 and 3.

8.6.2 The final 20-foot segment of a subdrain should consist of non-perforated drainpipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction in accordance with Figure 7. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure in accordance with Figure 8.

8.6.3 Final grading plans should show the location of the proposed subdrains. Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map depicting the existing conditions.

8.6.4 The final outlet and connection locations should be determined during grading. The grading contractor should consider videotaping the subdrains shortly after burial to check proper installation and to check that the pipe has not been crushed. The contractor is responsible for the performance of the drains.

8.7 Slope Stability

8.7.1 Slope stability analyses, utilizing average drained direct shear strength parameters based on laboratory tests presented in Appendix B indicate proposed fill slopes constructed with on-site granular materials should have calculated factors of safety of at least 1.5 under

static conditions with respect to both deep-seated and surficial instability for the slope heights proposed. Results of the analyses are presented on Figures 9 and 10.

8.7.2 Cut slopes in rock materials (granitic rock) do not lend themselves to conventional slope stability analyses. Based on experience with similar rock conditions, 1.5:1 cut slopes to the planned heights of up to 90 feet should possess a factor of safety of at least 1.5 with respect to slope instability, if free of adversely oriented joints or fractures.

8.7.3 Although rare, the most common mode of instability for rock slopes are shallow wedge failures from intersecting fault planes or clay filled joints/fractures dipping out of slope. We recommended that cut slopes be observed during grading by an engineering geologist to check that geologic conditions do not differ significantly from those anticipated. In the event that adverse conditions are observed, stabilization recommendations (i.e., buttresses, stability fills) can be provided.

8.7.4 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular soil fill to reduce the potential for surficial sloughing. In general, soil with an EI $\leq$50 and soil strength used in our slope stability analysis should be used within the outer slope zone.

8.7.5 Fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed four feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope. Alternatively, the fill slope may be over-built at least three feet and cut back to yield a properly compacted slope face.

8.7.6 Slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. Slopes should also be properly maintained to reduce erosion.

8.8 Seismic Design Criteria

8.8.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 8.8.1 summarizes site-specific design criteria obtained from the 2013 California Building Code (CBC; Based on the 2012 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 8.8.1 are for the risk-targeted maximum considered earthquake (MCE_R). Based on soil conditions and planned grading, the lots with a fill thickness of 10 feet or less across the pad portion of the lot are

considered Site Class C. Lots with a fill thickness of greater than 10 feet across the pad are considered a Site Class D. Site class will be assigned to each lot subsequent to completion of grading in an as-graded report.

TABLE 8.8.1
2013 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	Value	2013 CBC Reference
Site Class	C	D	Section 1613.3.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.989g	0.989g	Figure 1613.3.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.386g	0.386g	Figure 1613.3.1(2)
Site Coefficient, F_A	1.004	1.104	Table 1613.3.3(1)
Site Coefficient, F_V	1.414	1.628	Table 1613.3.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.993	1.092g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE_R Spectral Response Acceleration (1 sec), S_{M1}	0.546	0.628g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.662g	0.728g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.364	0.419g	Section 1613.3.4 (Eqn 16-40)

8.8.2 Table 8.8.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 8.8.2
2013 CBC SITE ACCELERATION PARAMETERS

Parameter	Value, Site Class C	Value, Site Class D	ASCE 7-10 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.369g	0.369g	Figure 22-7
Site Coefficient, F_{PGA}	1.031	1.131	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.380	0.417g	Section 11.8.3 (Eqn 11.8-1)

8.8.3 Conformance to the criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur in the event of a maximum level earthquake. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

8.9 Foundation and Concrete Slabs-On-Grade Recommendations

8.9.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories dependent on the thickness and geometry of the underlying fill soils as well as the expansion index of the prevailing subgrade soils of a particular building pad (or lot). The foundation category criteria are presented in Table 8.9.1. Foundation categories for each building or lot will be provided after completion of grading (finish pad grades have been achieved) and laboratory expansion testing of the finish grade soils is complete.

TABLE 8.9.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	T <20	--	EI ≤50
II	20≤ T <50	10≤ D <20	50< EI ≤90
III	T ≥50	D ≥20	90< EI ≤130

8.9.2 Table 8.9.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 8.9.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

8.9.3 The embedment depths presented in Table 8.9.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A wall/column footing dimension detail is presented on Figure 11.

8.9.4 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

8.9.5 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements in a manner that prevents puncture. The project architect or developer should specify the type of vapor retarder used based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

8.9.6 The project foundation engineer, architect, and/or developer should determine the thickness of bedding sand below the slab. In general, 3 to 4 inches of sand bedding is typically used. Geocon should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

8.9.7 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plan. It is critical that the foundation contractor understands and follows the specifications presented on the foundation plan.

8.9.8 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2013 California Building Code (CBC Section 1808.6). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical

parameters presented on Table 8.9.3 for the particular Foundation Category designated. The parameters presented in Table 8.9.3 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 8.9.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

8.9.9 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

8.9.10 If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 8.9.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

8.9.11 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The placement of the reinforcing tendons in the top of the slab and the resulting eccentricity after tensioning could reduce the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

8.9.12 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

8.9.13 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

8.9.14 The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1 inch and 1/2-inch, respectively. Differential settlement is estimated to occur over a span of 40 feet.

8.9.15 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

8.9.16 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

8.9.17 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

8.9.18 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

8.9.19 The exterior flatwork recommendations provided herein assumes that grading is performed as recommended above and that the near surface soils are very low to low expansive (EI $\leq$50). Exterior slabs not subjected to vehicular traffic should be a minimum of four inches thick and reinforced with 6 x 6-6/6 welded wire mesh. The mesh should be placed in the middle of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement. Prior to construction of slabs, the upper 12 inches of subgrade soils should be moisture conditioned one to three percent above optimum moisture content and compacted to at least 90 percent of the laboratory maximum dry density per ASTM 1557.

8.9.20 To control the location and spread of concrete shrinkage and/or expansion cracks, it is recommended that crack-control joints be included in the design of concrete slabs. Crack-control joint spacing should not exceed, in feet, twice the recommended slab thickness in inches (e.g., 10 feet by 10 feet for a 5-inch-thick slab). Crack-control joints should be created while the concrete is still fresh using a grooving tool or shortly thereafter using

saw cuts. The structural engineer should take criteria of the American Concrete Institute into consideration when establishing crack-control spacing patterns.

8.9.21 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

8.9.22 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

8.10 Retaining Walls and Lateral Loads

8.10.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2013 CBC. The seismic load is dependent on the retained height, where H is the retained height of the soil behind the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the soil. A seismic load of 20H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.417g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

8.10.2 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf, respectively, is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index $\leq$50.

8.10.3 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the active soil pressure where the wall possesses a height of 8 feet or less and

12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to two feet of fill soil should be added.

8.10.4 Soil to be used as backfill should be stockpiled and samples obtained for laboratory testing to evaluate its suitability for use as wall backfill. Modified lateral earth pressures will be required if backfill soils do not meet the required expansion index. County or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. On-site soils might not meet the design values used for County or regional standard wall design. Geocon Incorporated should be consulted if County or regional standard wall designs will be used to assess the suitability of on-site soil for use as wall backfill.

8.10.5 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

8.10.6 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI $\leq$50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. Figure 12 presents a typical retaining wall drainage detail.

8.10.7 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index $\leq$90.

8.10.8 Footings that must be placed within seven feet of the top of slopes should be extended in depth such that the outer bottom edge of the footing is at least seven feet horizontally inside the face of the slope.

8.10.9 For resistance to lateral loads, a passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed formation materials. The passive pressure assumes a

horizontal surface extending away from the base of the wall at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

8.10.10 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 10 feet or other types of walls (i.e., soil nail, MSE walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

8.11 Detention Basin and Bioswale Recommendations

8.11.1 At the completion of grading the site will be underlain by compacted fill or dense granitic bedrock. Infiltrating into compacted fill generally results in settlement and distress to improvements placed over the compacted fill. It is our opinion the compacted fill is unsuitable for infiltration of storm water runoff due to the potential for adverse settlement. The granitic bedrock is also sufficiently dense that infiltration water would be expected to perch on granitic rock.

8.11.2 Any detention basins, bioswales and bio-remediation areas should be designed by the project civil engineer and reviewed by Geocon Incorporated. Typically, bioswales consist of a surface layer of vegetation underlain by clean sand. A subdrain should be provided beneath the sand layer. Prior to discharging into the storm drain pipe, a seepage cutoff wall should be constructed at the interface between the subdrain and storm drain pipe. The concrete cut-off wall should extend at least 6 inches beyond the perimeter of the gravel-packed subdrain system.

8.11.3 Distress may be caused to planned improvements and properties located hydrologically downstream or adjacent to these devices. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. Downstream and adjacent properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration. Due to site soil and geologic conditions, permanent bioswales and bio-remediation areas should be lined with an impermeable barrier, such as a thick visqueen, to prevent water infiltration in to the underlying compacted fill. Temporary detention basins in areas where improvements have not been constructed do not need to be lined.

8.11.4 The landscape architect should be consulted to provide the appropriate plant recommendations. If drought resistant plants are not used, irrigation may be required.

8.12 Site Drainage and Moisture Protection

8.12.1 Adequate drainage is critical to reduce the potential for differential soil movement, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings or pavement. The site should be graded and maintained such that surface drainage is directed away from structures and the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed improvements.

8.12.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

8.12.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

8.12.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that subdrains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material

8.13 Grading and Foundation Plan Review

8.13.1 Geocon Incorporated should review the grading, foundation, and wall plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

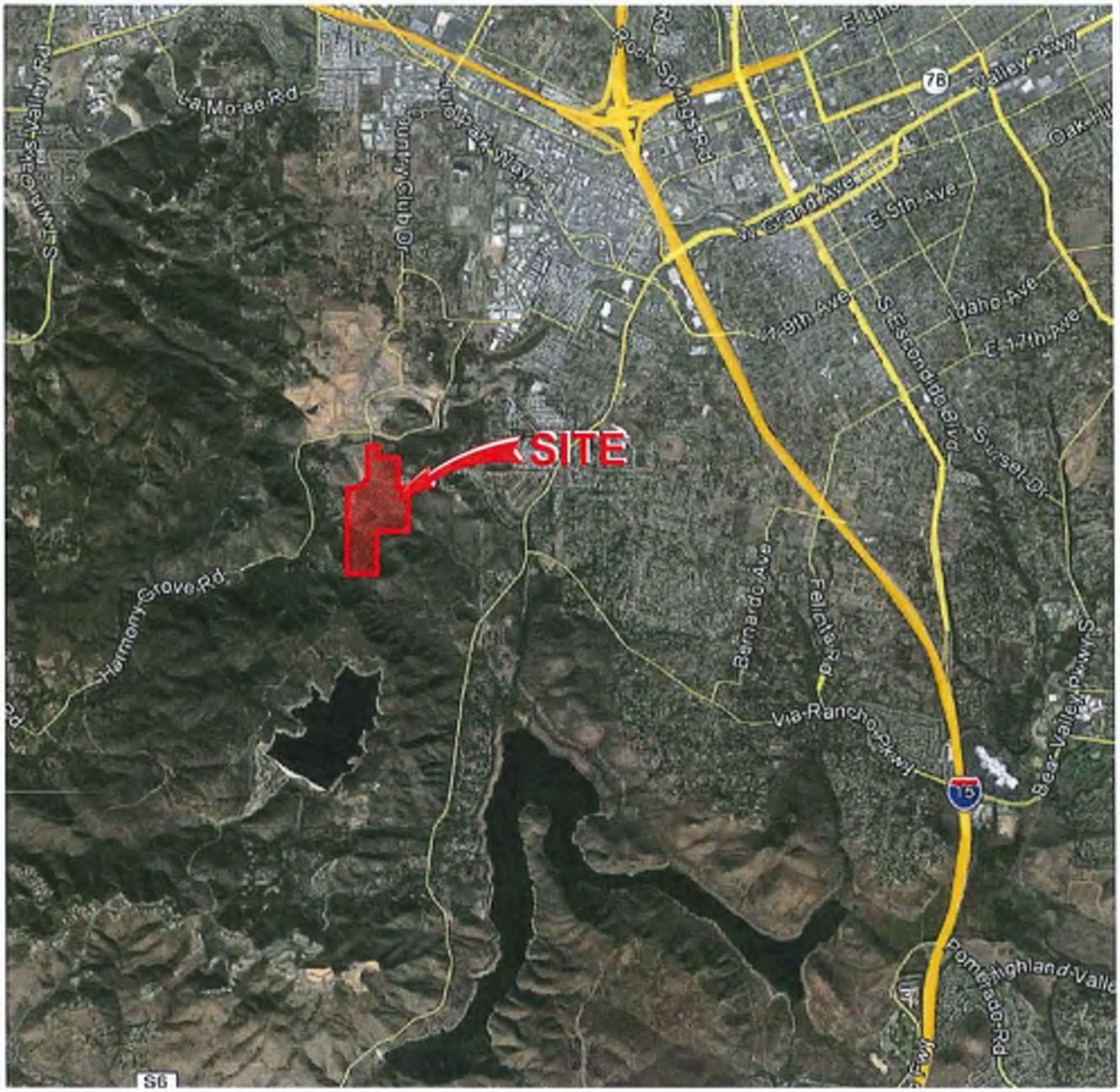
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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NO SCALE

VICINITY MAP

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
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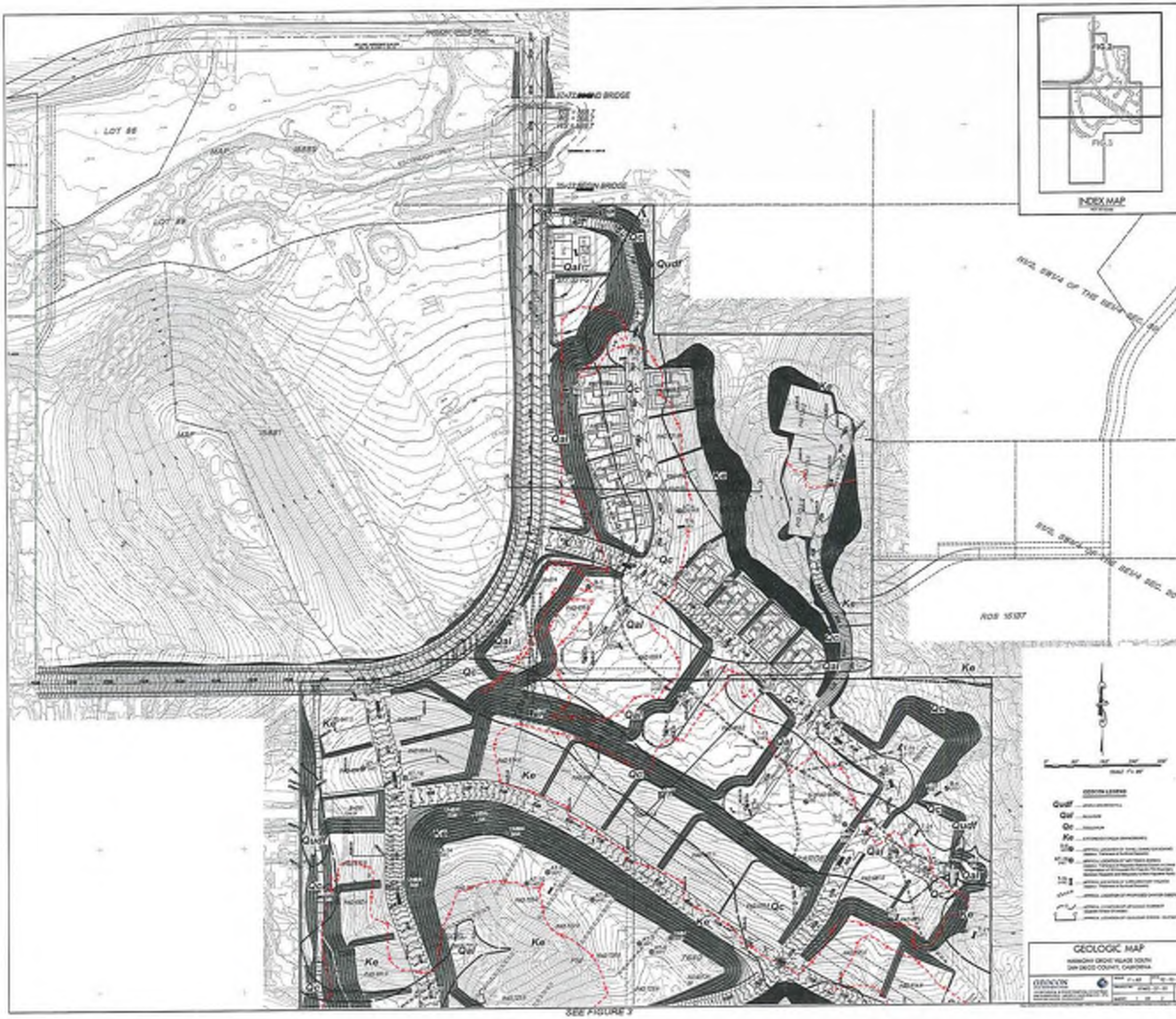
PHONE 858 558-6900 - FAX 858 558-6159

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

EA / RA		DSK/GTYPD

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 1

Plotted:02/02/2015 8:46AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\07465-32-03 Vicinity Map.dwg


INDEX MAP
FIG.2
FIG.3
LOT 88
LOT 89
BRIDGE
BRIDGE
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SEE FIGURE 3
Qudf
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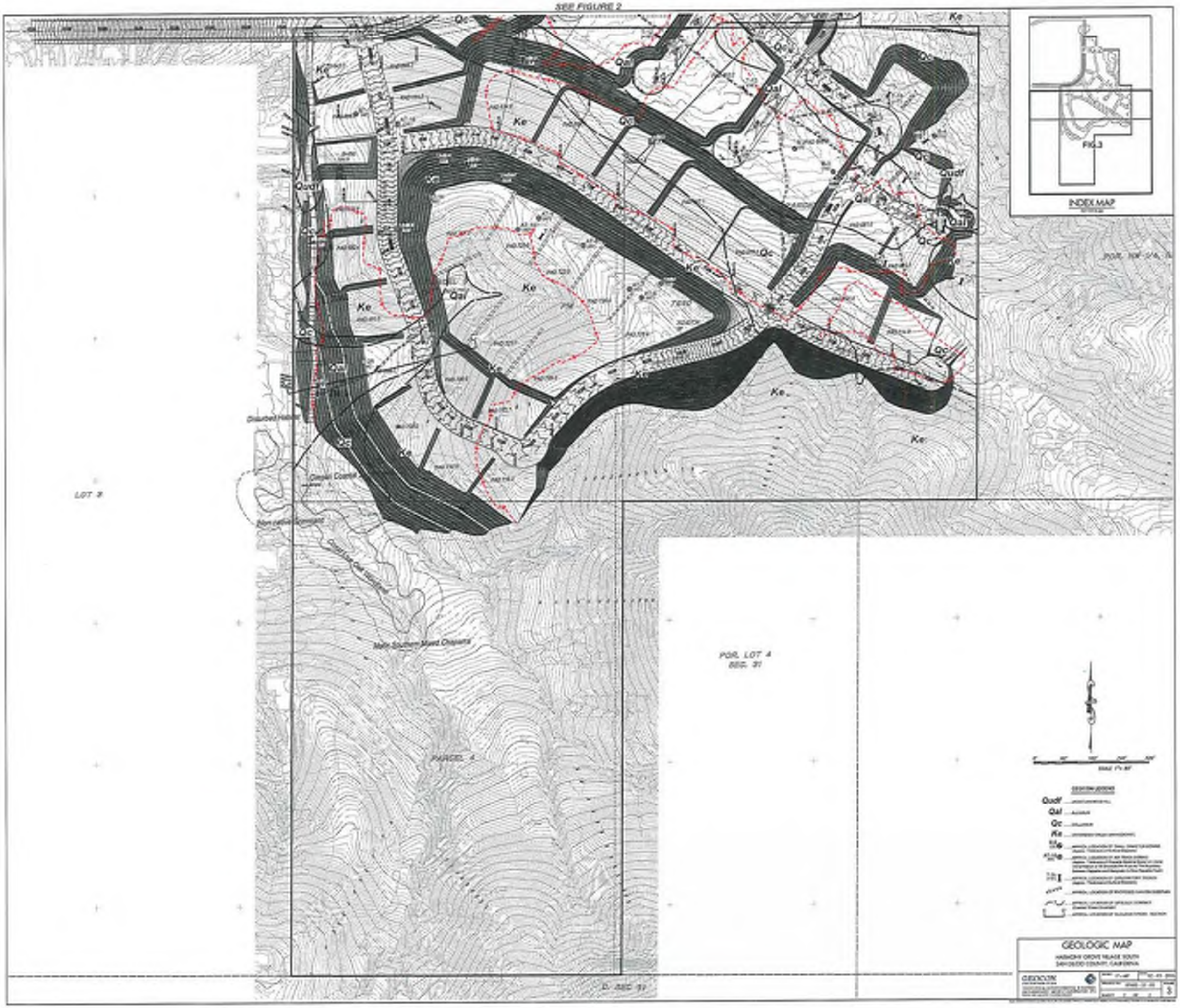
GEOLOGIC MAP
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA
GEOCON
2



SEE FIGURE 2
INDEX MAP
FIG.3
LOT 3
PARCEL 4
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Qudf
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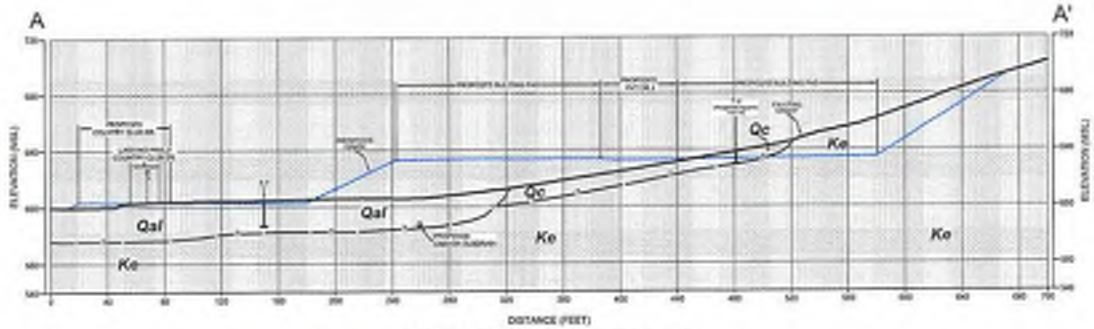
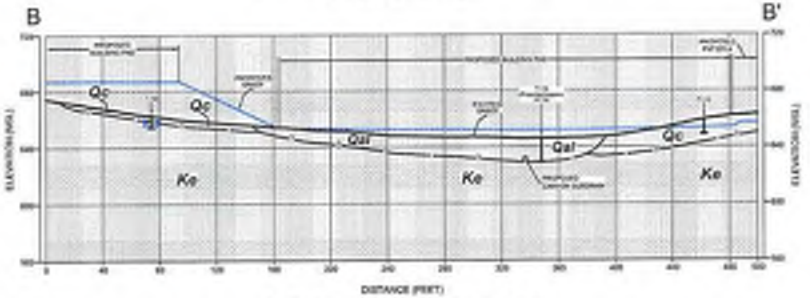
GEOLOGIC MAP
GEOCON
3



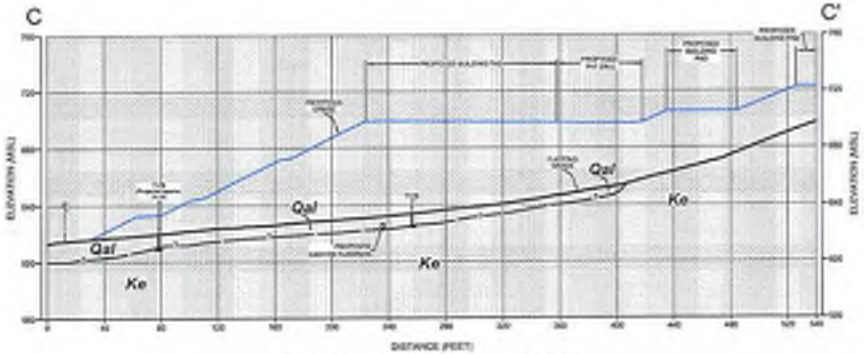
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION B-B'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

Qal — ALLUVIUM

Qc — COLLUVIUM

Ke — CRETACEOUS-AGE GRANODIORITE

APPROX. LOCATION OF EXPLORATORY TRENCH

APPROX. ELEVATION OF GROUNDWATER AND/OR SEEPAGE CONDITION

APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS - SECTIONS

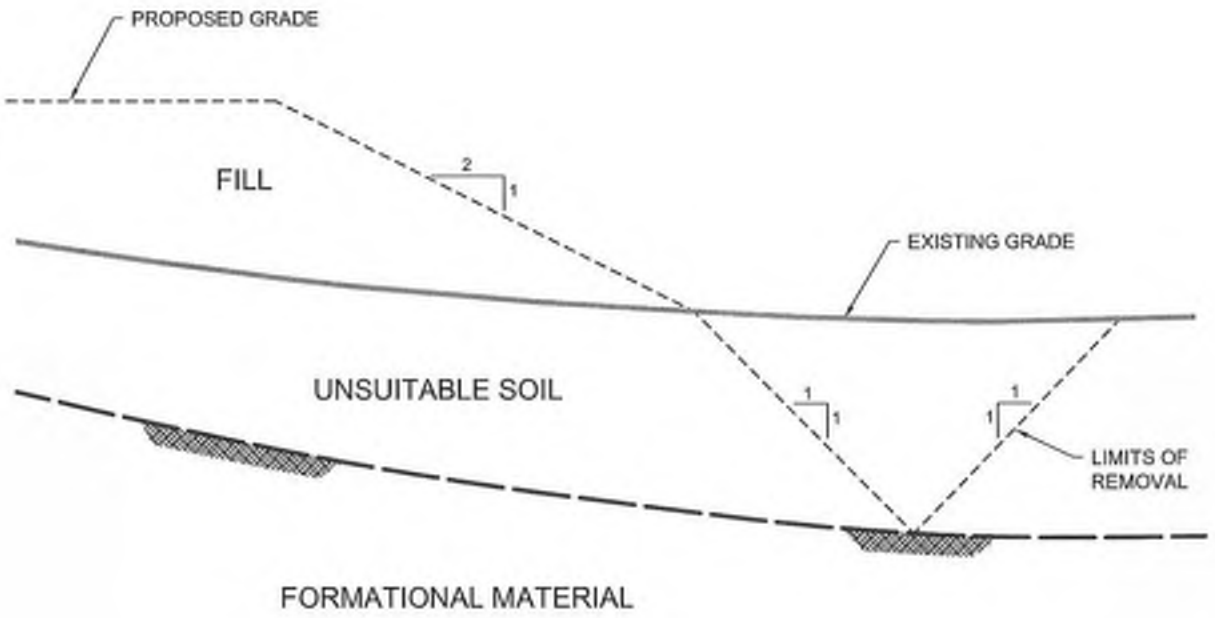
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

GEOCON INCORPORATED

SCALE: 1" = 40' | DATE: 02-03-2016

PROJECT NO. G7455-32-03 | FIGURE 4

SHEET 1 OF 1



NOTE:

SLOPE OF BACKCUT MAY BE STEEPENED WITH THE APPROVAL OF THE SOILS ENGINEER WHERE BOUNDARY CONSTRAINTS LIMIT EXTENT OF REMOVALS

NO SCALE

CONSTRUCTION DETAIL FOR LATERAL EXTENT OF REMOVAL

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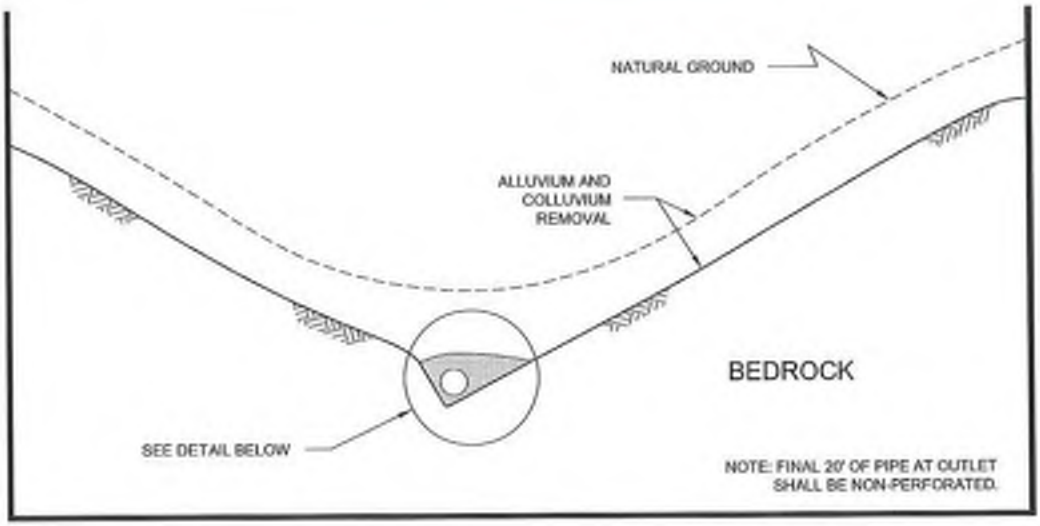
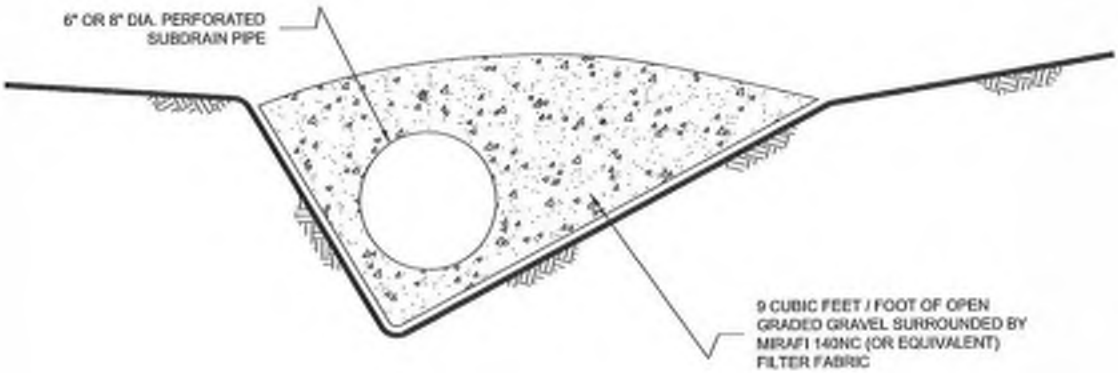
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

EA / RA		DSK/GTYPD

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 5

Plotted:02/02/2015 9:02AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\CDFLER.dwg





NOTES:

1. SUBDRAIN PIPE SHOULD BE 6-INCH MINIMUM DIAMETER, PERFORATED, THICK WALLED SCHEDULED 40 PVC, SLOPED TO DRAIN AT 1 PERCENT MINIMUM AND CONNECTED TO STORM DRAIN SYSTEM OR APPROVED OUTLET.

2. WHERE SUBDRAIN PIPE EXCEEDS 1,000 FEET IN LENGTH, THE DOWNSTREAM (LOWEST PORTION) 1,000 FEET SHOULD BE INCREASED TO 8 INCHES DIAMETER SCHEDULE 40 PVC PIPE.

NO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

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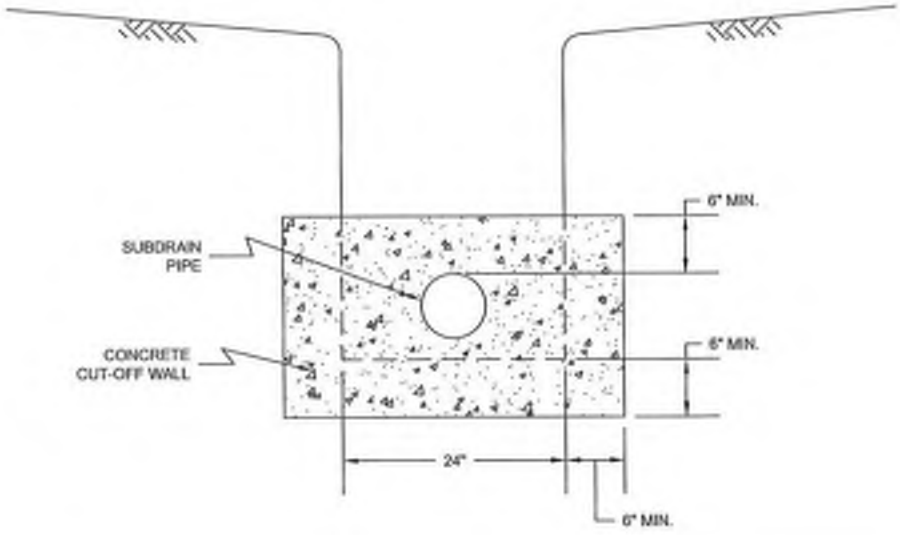
EA / RA		DSK/GTYPD

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 6

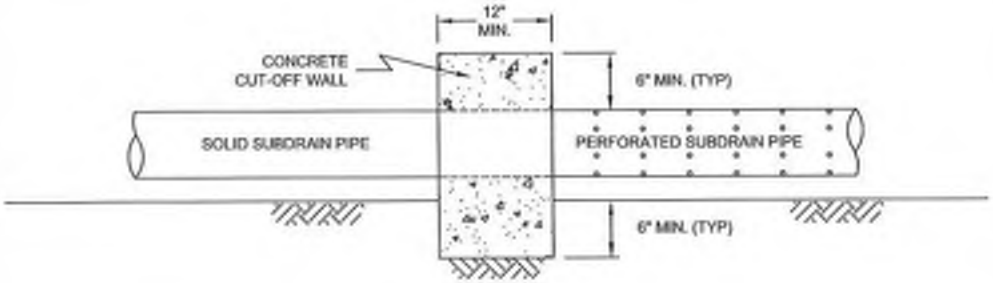
Plotted:02/02/2015 9:06AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Canyon Drain Detail (TCSD2).dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL DETAIL

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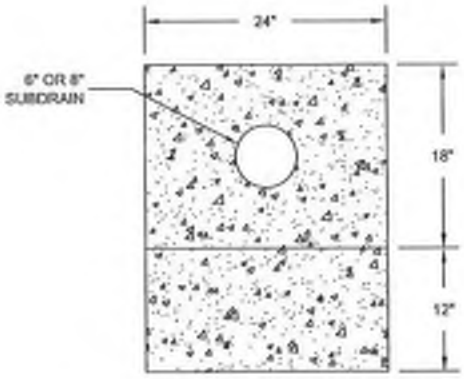
EA / RA		DSK/GTYPD

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 7

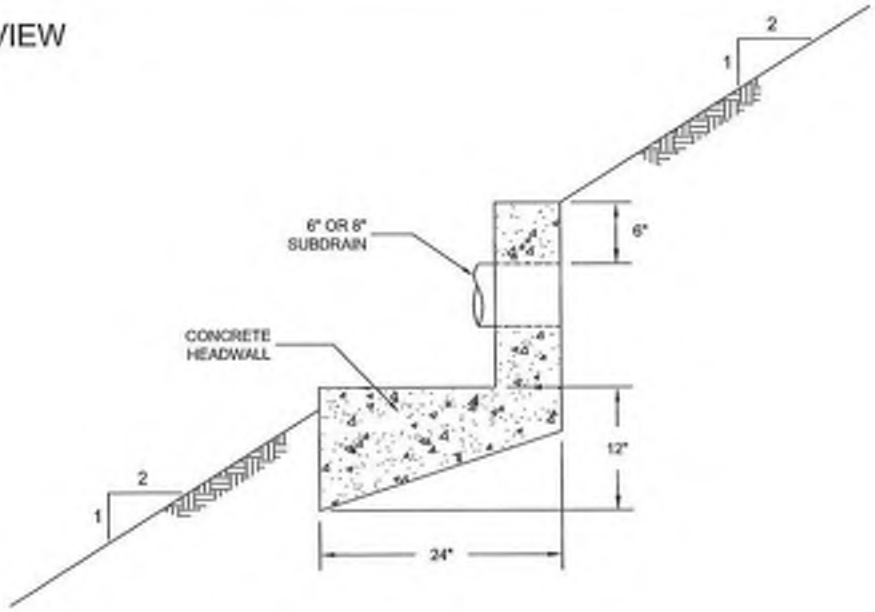
Plotted:02/02/2015 9:07AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Recommended Subdrain Cut-Off Wall Detail (RSCOW).dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

SUBDRAIN OUTLET HEADWALL DETAIL

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EA / RA		DSK/GTYPD

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 8

Plotted:02/02/2015 9:08AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Subdrain Headwall Detail (SOHD).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	75 feet
SLOPE INCLINATION	2 : 1 (Horizontal : Vertical)		
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	400 pounds per square foot
NO SEEPAGE FORCES			

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{N_{cf} C}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\lambda_{c\phi}$	=	14.1	CALCULATED USING EQ. (3-3)
N_{cf}	=	40	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.6	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1.....Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2.....Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS - FILL SLOPES

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HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 9

Plotted:02/02/2015 9:09AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Slope Stability Analyses-Fill (SSAF).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	= Infinite
DEPTH OF SATURATION	Z	= 3 feet
SLOPE INCLINATION		2 : 1 (Horizontal : Vertical)
SLOPE ANGLE	i	= 26.6 degrees
UNIT WEIGHT OF WATER	γ_w	= 62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	= 130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	= 30 degrees
APPARENT COHESION	C	= 400 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 3.2$$

REFERENCES :

1.....Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPES

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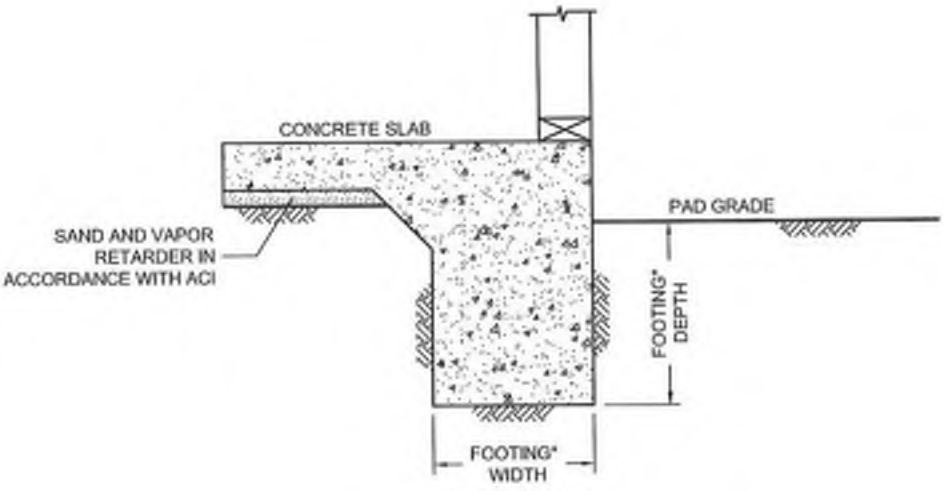
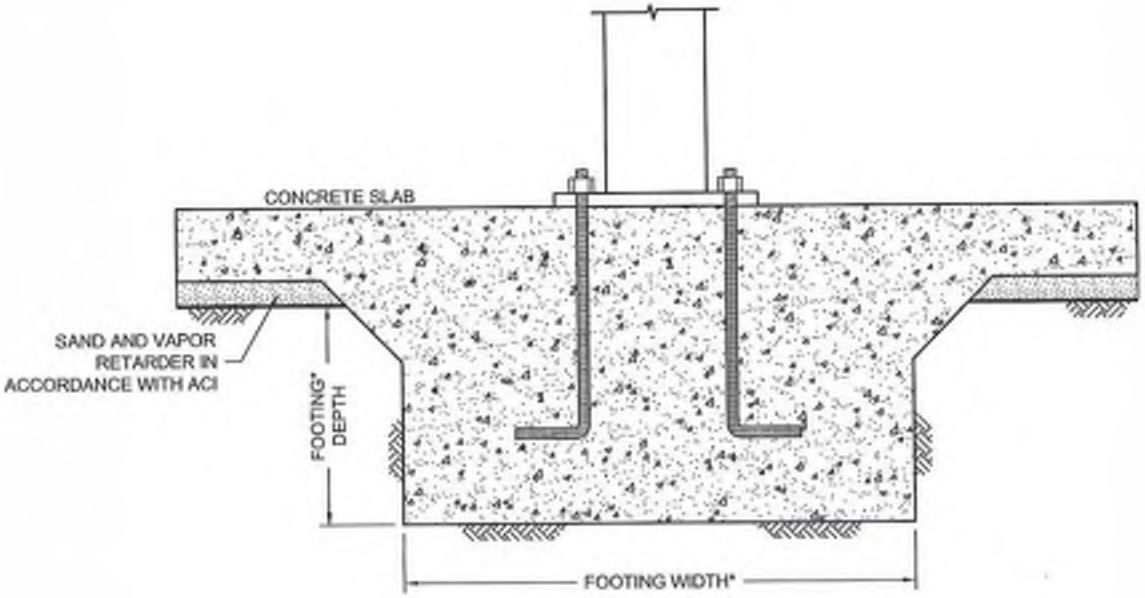
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 10

Plotted:02/02/2015 9:12AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Slope Stability Analyses-Surficial (SFSSA).dwg





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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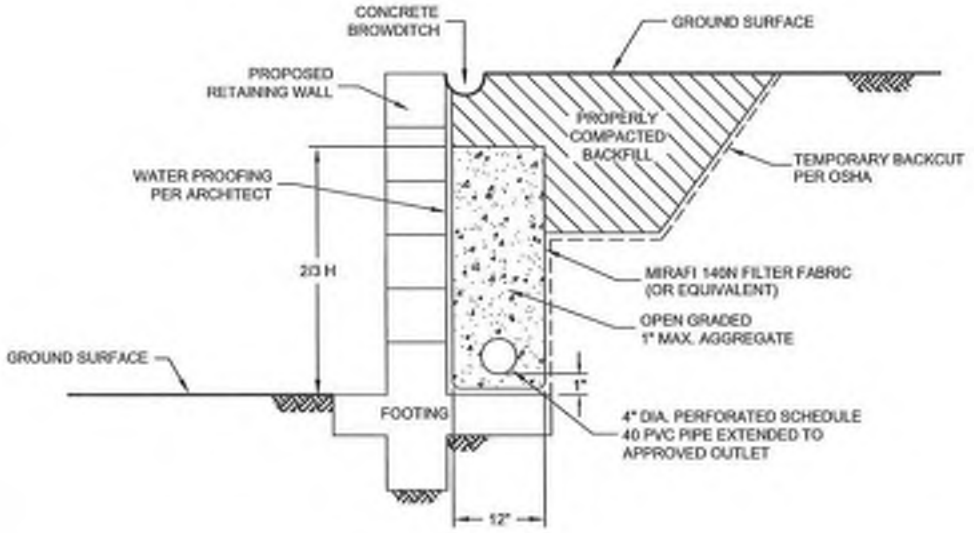
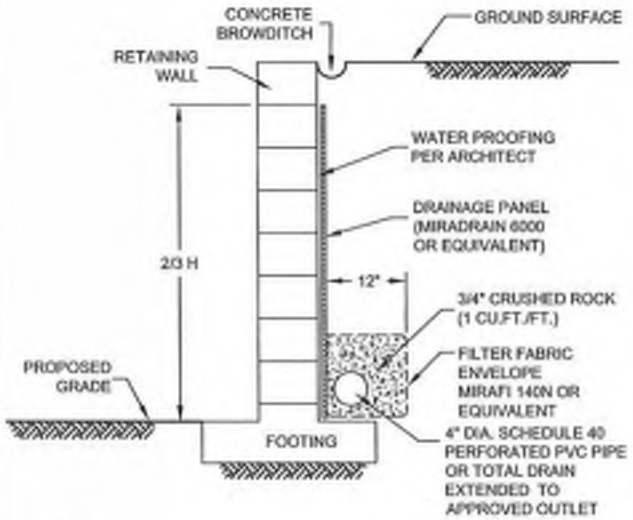
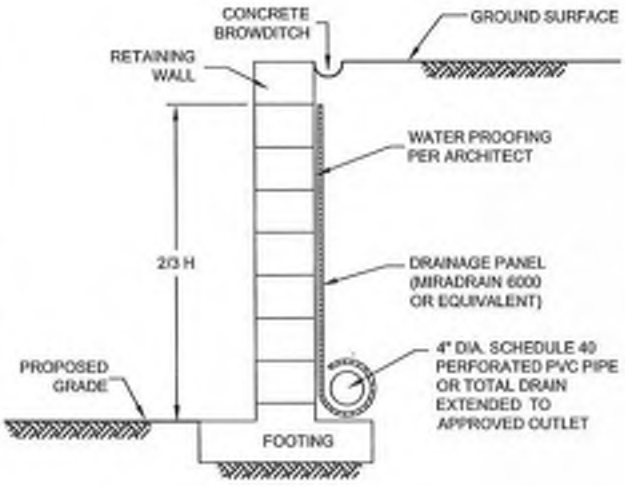
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 11

Plotted:02/02/2015 9:13AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

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EA / RA		DSK/GTYPD

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

DATE 02 - 03 - 2015	PROJECT NO. 07465 - 32 - 03	FIG. 12

Plotted:02/03/2015 9:14AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\07465-32-03 (Harmony Grove Property)\DETAILS\Typical Retaining Wall Drainage Detail (RWD07A).dwg

APPENDIX A

APPENDIX A

LOGS OF EXPLORATORY TRENCHES, SMALL-DIAMETER BORINGS AND AIR-TRACK BORINGS PERFORMED BY GEOCON INCORPORATED (2005)

FOR

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 07465-32-03

PROJECT NO. 07465-32-01

TRENCH T 1

ELEV. (MSL.) 570' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
2					Loose, moist, dark brown, fine to medium SAND, with some clay			
4								
6				SM				
8								
10	T1-1							
12					-Becomes brown at 12 feet			
					GRANITIC ROCK			
					Fresh, dark gray, very strong GRANITIC ROCK			
					REFUSAL AT 13 FEET			

07465-32-01.GPJ

Figure A-1,
Log of Trench T 1, Page 1 of 1

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 2

ELEV. (MSL.) 570' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, dark brown, Silty, fine to medium SAND, with clay			
2								
4								
6				SM				
8								
10					-Becomes brown at 10 feet			
		+ +			**GRANITIC ROCK** Fresh, dark gray, strong GRANITIC ROCK			
12		+			REFUSAL AT 12 FEET			

07465-32-01.GPJ

Figure A-2,
Log of Trench T 2, Page 1 of 1

SAMPLE SYMBOLS

- ☐ .. SAMPLING UNSUCCESSFUL
- ◧ .. STANDARD PENETRATION TEST
- ■ .. DRIVE SAMPLE (UNDISTURBED)
- ▨ .. DISTURBED OR BAG SAMPLE
- ◪ .. CHUNK SAMPLE
- ▼ .. WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 3

ELEV. (MSL.) 574' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2	T3-1			CL	Firm to stiff, moist, brown, Silty/Sandy CLAY			
4								
6				SM	Medium dense, damp to moist, reddish brown, Silty SAND, with some clay			
8	T3-2				-Becomes dense and damp below 8 feet -Weathered granitic rock present in matrix (very difficult to trench)			
10					**GRANITIC ROCK** Fresh, gray, very strong GRANITIC ROCK REFUSAL AT 10 FEET			

07465-32-01.GPJ

Figure A-3,
Log of Trench T 3, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 4

ELEV. (MSL.) 572' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
2				SM	Loose, moist, dark brown, Silty, fine to medium SAND			
4					Stiff to very stiff, moist, reddish brown, Silty/Sandy CLAY, with trace angular gravel			
6				CL				
8					Medium dense to dense, moist, reddish brown, Silty, fine to medium SAND, with some clay			
10	T4-1						112.4	17.9
12				SM				
14								
16			▼		-Moderate seepage at 16 feet -Saturated below 16 feet -Refusal on rock, possible granitic contact at 17.5 feet			
					REFUSAL AT 17.5 FEET			

07465-32-01.GPJ

Figure A-4,
Log of Trench T 4, Page 1 of 1

SAMPLE SYMBOLS

☐ .. SAMPLING UNSUCCESSFUL ▮ .. STANDARD PENETRATION TEST ■ .. DRIVE SAMPLE (UNDISTURBED)

▩ .. DISTURBED OR BAG SAMPLE ◣ .. CHUNK SAMPLE ▼ .. WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 5

ELEV. (MSL.) 590' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND, with some clay			
2								
4				SM				
6					-Becomes brown below 7 feet			
8								
10	T5-1			SM	Medium dense, moist, brown, Silty, fine to coarse SAND, with some gravel -Becomes grayish-brown below 11 feet			
12					**GRANITIC ROCK** Highly weathered, gray-brown, weak GRANITIC ROCK			
14	T5-2				-Becomes moderately weak below 14 feet			
					TRENCH TERMINATED AT 14.5 FEET			

Figure A-5,
Log of Trench T 5, Page 1 of 1

07465-32-01.GPJ

SAMPLE SYMBOLS

- ☐ .. SAMPLING UNSUCCESSFUL
- ◧ .. STANDARD PENETRATION TEST
- ■ .. DRIVE SAMPLE (UNDISTURBED)
- ▨ .. DISTURBED OR BAG SAMPLE
- ◪ .. CHUNK SAMPLE
- ▼ .. WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 6

ELEV. (MSL.) 607' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
					Loose, moist, dark brown, Silty SAND			
2				SM				
4					Stiff, moist, reddish brown, Sandy CLAY			
				CL				
6					**GRANITIC ROCK**			
					Highly weathered, gray, weak to moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 7 FEET			

07465-32-01.GPJ

Figure A-6,
Log of Trench T 6, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 7

ELEV. (MSL.) 604' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND, with trace clay			
2								
4								
6								
8				SM				
10								
12								
14					-Becomes medium dense and brown below 15 feet			
16					-Scratched fresh granitic rock with teeth at 17.5 feet (probable contact?)			
					TRENCH TERMINATED AT 17.5 FEET (Limit of backhoe)			

07465-32-01.GPJ

Figure A-7,
Log of Trench T 7, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▥ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8 ELEV. (MSL.) 614' DATE COMPLETED 03-17-2005 EQUIPMENT JD 555 TRACK HOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND, with trace clay			
2								
4	T8-1							
6								
8								
10				SM	-Becomes mottled gray and brown with increase in clay content below 11 feet			
12								
14					-Some 4-inch angular gravel present below 15.5 feet			
16								
18					TRENCH TERMINATED AT 18 FEET			

07465-32-01.GPJ

Figure A-8,
Log of Trench T 8, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 9 ELEV. (MSL.) 641' DATE COMPLETED 03-17-2005 EQUIPMENT JD 555 TRACK HOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Loose, moist, reddish brown, Silty/Clayey SAND			
2								
4				SM/SC	-Becomes medium dense to dense below 4 feet			
6					-Becomes dense and damp below 6 feet -Difficult trenching below 7 feet			
8		+ +			**GRANITIC ROCK** Highly weathered, gray, moderately weak GRANITIC ROCK TRENCH TERMINATED AT 8.5 FEET			

07465-32-01.GPJ

Figure A-9,
Log of Trench T 9, Page 1 of 1

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 10

ELEV. (MSL.) 618' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist to wet, dark brown, Silty SAND, with some clay			
2								
4			▼		-Minor seepage at 4 feet			
6				SM	-Becomes medium dense, mottled brown and gray below 6 feet			
8	T10-1						110.0	12.9
10					-Becomes dense at 11 feet			
12		+ + +			**GRANITIC ROCK** Highly weathered, gray, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 13 FEET			

Figure A-10,
Log of Trench T 10, Page 1 of 1

07465-32-01.GPJ

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▥ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 11

ELEV. (MSL.) 631' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
2					Loose, moist, dark brown, Silty SAND, with trace clay			
4								
6				SM				
8					-Becomes medium dense and mottled brown and gray below 8 feet			
10								
12					**GRANITIC ROCK**			
14					Highly weathered, gray, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 14 FEET			

07465-32-01.GPJ

Figure A-11,
Log of Trench T 11, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12 ELEV. (MSL.) 638' DATE COMPLETED 03-17-2005 EQUIPMENT JD 555 TRACK HOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND, with some clay			
2								
4								
6								
8				SM				
10								
12					-Becomes medium dense and mottled brown and gray below 12 feet			
14								
16					TRENCH TERMINATED AT 16 FEET			

07465-32-01.GPJ

Figure A-12,
Log of Trench T 12, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 13	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) 649' DATE COMPLETED 03-17-2005 EQUIPMENT JD 555 TRACK HOE			
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND			
2								
4								
6								
8				SM				
10								
12								
14					-Becomes mottled brown and gray below 15 feet			
16					**GRANITIC ROCK** Moderately to slightly weathered, gray, very strong GRANITIC ROCK TRENCH TERMINATED AT 16.5 FEET			

07465-32-01.GPJ

Figure A-13,
Log of Trench T 13, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◹ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 14

ELEV. (MSL.) 662' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SM/SC	**COLLUVIUM** Loose, moist, dark brown, Silty/Clayey SAND			
4								
6								
8	T14-1				-Becomes dense and brown below 7 feet		125.6	9.1
10					-Very difficult trenching below 9 feet			
					PRACTICAL REFUSAL AT 10 FEET			

07465-32-01.GPJ

Figure A-14,
Log of Trench T 14, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 15

ELEV. (MSL.) 658' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, dark brown, Silty SAND			
2				SM				
4								
6								
8					**GRANITIC ROCK** Highly weathered, brown, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 9 FEET			

07465-32-01.GPJ

Figure A-15,
Log of Trench T 15, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 16

ELEV. (MSL.) 663' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2				SC	**COLLUVIUM** Loose, moist to wet, reddish brown, Clayey SAND			
4	T16-1				**GRANITIC ROCK** Highly weathered, tan, moderately weak to moderately strong GRANITIC ROCK			
6					-Slight seepage at 6 feet			
8					TRENCH TERMINATED AT 8 FEET			

07465-32-01.GPJ

Figure A-16,
Log of Trench T 16, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◺ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 17

ELEV. (MSL.) 689' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Very loose, damp, brown, Silty SAND			
2				SP	-Minor caving below 2 feet			
4					**GRANITIC ROCK** Highly weathered, tan, weak GRANITIC ROCK			
6					TRENCH TERMINATED AT 6 FEET			

07465-32-01.GPJ

Figure A-17,
Log of Trench T 17, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 18

ELEV. (MSL.) 698' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
	T18-1			SC	**COLLUVIUM** Dense, moist, mottled brown and gray, Clayey SAND, with trace gravel			
2					-Very dense below 3 feet			
					PRACTICAL REFUSAL AT 3.5 FEET			

07465-32-01.GPJ

Figure A-18,
Log of Trench T 18, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 19 ELEV. (MSL.) 691' DATE COMPLETED 03-17-2005 EQUIPMENT JD 555 TRACK HOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**COLLUVIUM** Dense to very dense, damp, mottled gray and brown, Silty SAND, with some gravel			
2					-Very difficult trenching at 2 feet			
					PRACTICAL REFUSAL AT 2.5 FEET			

07465-32-01.GPJ

Figure A-19,
Log of Trench T 19, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 20

ELEV. (MSL.) 667' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, reddish brown, Silty SAND, with some clay			
2								
4								
6								
8				SM				
10					-Ocassional 6-inch rock present below 11 feet			
12								
14								
16					TRENCH TERMINATED AT 16 FEET			

07465-32-01.GPJ

Figure A-20,
Log of Trench T 20, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 21

ELEV. (MSL.) 725' DATE COMPLETED 03-17-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, damp, brown, Silty SAND			
2					**GRANITIC ROCK** Highly weathered, gray, moderately weak GRANITIC ROCK			
4					-Becomes moderately strong below 5 feet			
6					TRENCH TERMINATED AT 6 FEET			

07465-32-01.GPJ

Figure A-21,
Log of Trench T 21, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▥ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 22

ELEV. (MSL.) 656' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, moist, reddish brown, Silty, fine to medium SAND, with trace clay			
2								
4				SM				
6					-Occasional 4-inch angular gravel present below 6 feet -Becomes medium dense below 7 feet			
8					-36-inch fresh, gray, granitic rock present at 8 feet (appears to be within matrix)			
					REFUSAL AT 8.5 FEET			

07465-32-01.GPJ

Figure A-22,
Log of Trench T 22, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▮ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◣ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 23

ELEV. (MSL.) 669' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, moist, brown, Silty SAND, with trace gravel and clay			
2								
4								
6	T23-1			SM				
8								
10								
12					-Becomes dense, damp with 3 to 4-inch angular gravel at 12 feet			
14	T23-2				-Very difficult trenching PRACTICAL REFUSAL AT 14 FEET		122.9	9.2

07465-32-01.GPJ

Figure A-23,
Log of Trench T 23, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 24

ELEV. (MSL.) 682' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, dark brown, Silty/Clayey SAND			
2				SM/SC				
4								
6					Loose to medium dense, moist, reddish brown, Silty, fine to medium SAND, with clay			
8								
10				SM				
12								
14					-Becomes damp and light brown at 15 feet			
16					**GRANITIC ROCK** Highly weathered, tan, weak GRANITIC ROCK TRENCH TERMINATED AT 16.5 FEET			

07465-32-01.GPJ

Figure A-24,
Log of Trench T 24, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▮ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 25

ELEV. (MSL.) 688' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**COLLUVIUM** Loose, moist, dark brown, Silty SAND, with some clay			
2					**GRANITIC ROCK** Highly weathered to moderately weathered, tan, weak to moderately weak GRANITIC ROCK			
4					TRENCH TERMINATED AT 4 FEET			

07465-32-01.GPJ

Figure A-25,
Log of Trench T 25, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 26 ELEV. (MSL.) 682' DATE COMPLETED 03-18-2005 EQUIPMENT JD 555 TRACK HOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Loose, moist, dark brown, Silty SAND			
2				SM	-Abundant 3 to 4 inch angular gravel present above contact			
4					**GRANITIC ROCK** Highly weathered to moderately weathered, brown, moderately weak to moderately strong GRANITIC ROCK			
					TRENCH TERMINATED AT 5 FEET			

Figure A-26,
Log of Trench T 26, Page 1 of 1

07465-32-01.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 27

ELEV. (MSL.) 660' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, moist, reddish brown, Silty SAND, with trace clay			
2								
4								
6				SM	-Becomes medium dense to dense and damp with 1 to 2-inch gravel			
8	T27-1						116.4	12.5
10					-Difficult trenching			
12					**GRANITIC ROCK** Highly weathered, gray, moderately weak GRANITIC ROCK PRACTICAL REFUSAL AT 12 FEET			

07465-32-01.GPJ

Figure A-27,
Log of Trench T 27, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◹ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 28

ELEV. (MSL.) 620' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	T28-1			SM/SC	**ALLUVIUM** Loose, damp to moist, very dark brown, Silty/Clayey SAND			
2								
4								
6					-Becomes moist, brown, Clayey SAND, with trace gravel at 6 feet			
8								
10					**GRANITIC ROCK** Highly weathered, gray, weak to moderately weak GRANITIC ROCK TRENCH TERMINATED AT 10 FEET			

07465-32-01.GPJ

Figure A-28,
Log of Trench T 28, Page 1 of 1

SAMPLE SYMBOLS

- ☐ .. SAMPLING UNSUCCESSFUL
- ◧ .. STANDARD PENETRATION TEST
- ■ .. DRIVE SAMPLE (UNDISTURBED)
- ▨ .. DISTURBED OR BAG SAMPLE
- ◥ .. CHUNK SAMPLE
- ▼ .. WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 29

ELEV. (MSL.) 634' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose, damp to moist, very dark brown, Silty/Clayey SAND			
2								
4				SM/SC				
6								
8		+ +			**GRANITIC ROCK** Highly weathered, gray, weak to moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 9 FEET			

07465-32-01.GPJ

Figure A-29,
Log of Trench T 29, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 30

ELEV. (MSL.) 649' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM/SC	**ALLUVIUM** Loose, moist, dark brown, Silty/Clayey SAND			
2								
4								
6					**GRANITIC ROCK** Highly weathered, gray, weak to moderately weak GRANITIC ROCK			
8					TRENCH TERMINATED AT 8 FEET			

07465-32-01.GPJ

Figure A-30,
Log of Trench T 30, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

▩ ... DISTURBED OR BAG SAMPLE ◥ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 31

ELEV. (MSL.) 652' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, damp, dark brown, Silty/Clayey SAND			
2				SM/SC				
4								
6		+ + + + + +			**GRANITIC ROCK** Highly weathered, gray, weak GRANITIC ROCK			
					TRENCH TERMINATED AT 7 FEET			

07465-32-01.GPJ

Figure A-31,
Log of Trench T 31, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 32

ELEV. (MSL.) 660' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Loose, damp, brown, Silty SAND, with gravel			
					GRANITIC ROCK Moderately weathered, gray, moderately weak GRANITIC ROCK			
2								
					-Becomes moderately strong below 3.5 feet			
4					REFUSAL AT 4 FEET			

07465-32-01.GPJ

Figure A-32,
Log of Trench T 32, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◺ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 33

ELEV. (MSL.) 726' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**GRANITIC ROCK** Moderately weathered, gray, moderately strong GRANITIC ROCK			
2					REFUSAL AT 2.5 FEET			

07465-32-01.GPJ

Figure A-33,
Log of Trench T 33, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 34

ELEV. (MSL.) 727' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Loose, damp, brown, Silty SAND			
2					**GRANITIC ROCK** Moderately to highly weathered, gray, moderately weak GRANITIC ROCK			
4	T34-1				-Becomes moderately weathered to moderately strong below 3 feet			
6								
8					REFUSAL AT 8 FEET			

07465-32-01.GPJ

Figure A-34,
Log of Trench T 34, Page 1 of 1

SAMPLE SYMBOLS

- ☐ .. SAMPLING UNSUCCESSFUL
- ◧ .. STANDARD PENETRATION TEST
- ■ .. DRIVE SAMPLE (UNDISTURBED)
- ▨ .. DISTURBED OR BAG SAMPLE
- ◥ .. CHUNK SAMPLE
- ▼ .. WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

TRENCH T 35

ELEV. (MSL.) 646' DATE COMPLETED 03-18-2005

EQUIPMENT JD 555 TRACK HOE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, damp, brown, Silty SAND			
2				SM				
4					**GRANITIC ROCK** Highly weathered, grayish-brown, moderately weak GRANITIC ROCK			
6					-Becomes moderately weathered and moderately strong below 6 feet			
8					REFUSAL AT 8 FEET			

07465-32-01.GPJ

Figure A-35,
Log of Trench T 35, Page 1 of 1

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ▒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 1

ELEV. (MSL.) 620' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2	B1-1			SM	**ALLUVIUM** Loose to medium dense, moist, dark brown, Silty SAND, with trace clay -No recovery in sample	10		
4								
6								
8								
10	B1-2				-No recovery in sample	32		
12								
14		+ + +			**GRANITIC ROCK** Highly weathered, dark gray, moderately weak GRANITIC ROCK			
	B1-3				BORING TERMINATED AT 15 FEET	58/9"		

07465-32-01.GPJ

Figure A-36,
Log of Boring B 1, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 2

ELEV. (MSL.) 660' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
					Loose to medium dense, moist, reddish brown, Silty SAND, with trace clay			
2								
4								
	B2-1			SM	-Gravel present	32	125.2	13.2
6								
8								
					GRANITIC ROCK			
10					Completely weathered, dark gray, moderately weak GRANITIC ROCK			
	B2-2				BORING TERMINATED AT 10 FEET	73/10"		

07465-32-01.GPJ

Figure A-37,
Log of Boring B 2, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ▨ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◹ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 3

ELEV. (MSL.) 665' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Loose to medium dense, moist, reddish brown, Silty SAND, with trace clay			
2								
4								
6	B3-1				-Gravel present below	36	117.3	15.4
8								
10				SM				
12	B3-2				-Becomes dense with more clay	56	107.7	21.3
14								
16	B3-3				-Becomes very dense	68	124.9	13.9
18								
	B3-4	+ +			**GRANITIC ROCK** Moderately weathered, dark gray, moderately strong GRANITIC ROCK BORING TERMINATED AT 19 FEET	50/5"		

Figure A-38,
Log of Boring B 3, Page 1 of 1

07465-32-01.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 4

ELEV. (MSL.) 702' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
2					**COLLUVIUM** Very dense, damp, gray, Silty, fine to coarse SAND, with gravel			
4								
6	B4-1			SM		50/4"	N/A	10.3
8	B4-2							
10	B4-3					50/5"	N/A	4.1
12								
14								
16	B4-4				**GRANITIC ROCK** Highly weathered, dark brown, moderately weak GRANITIC ROCK	50/4"		
					BORING TERMINATED AT 17 FEET			

07465-32-01.GPJ

Figure A-39,
Log of Boring B 4, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▩ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 5

ELEV. (MSL.) 680' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Very dense, damp, brownish gray, Silty, fine to coarse SAND, with gravel			
2								
4								
6	B5-1					50/5"	117.3	12.1
8								
10	B5-2			SM		83/10.5"	121.4	8.0
12					-Becomes brown			
14								
16	B5-3					82/11"	130.6	8.8
18								
20	B5-4				-Becomes dense	51	107.8	6.6
	B5-5				-Becomes medium dense	24		
22	B5-6	+ +			**GRANITIC ROCK** Moderately weathered, gray, moderately strong GRANITIC ROCK	31/6"		
					BORING TERMINATED AT 22 FEET			

07465-32-01.GPJ

Figure A-40,
Log of Boring B 5, Page 1 of 1

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465-32-01

BORING B 6

ELEV. (MSL.) 640' DATE COMPLETED 04-08-2005

EQUIPMENT SMALL DIAMETER (CME)

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM**			
2					Very loose to medium dense, moist, dark brown, Silty SAND, with trace clay			
4								
	B6-1					4		
6				SM				
8								
10	B6-2				-Becomes mottled reddish brown and gray	20		
12								
		+ +			**GRANITIC ROCK**			
14		+ +			Highly weathered, gray-green, moderately weak GRANITIC ROCK			
		+ +						
	B6-3				BORING TERMINATED AT 15 FEET	50/6"		

07465-32-01.GPJ

Figure A-41,
Log of Boring B 6, Page 1 of 1

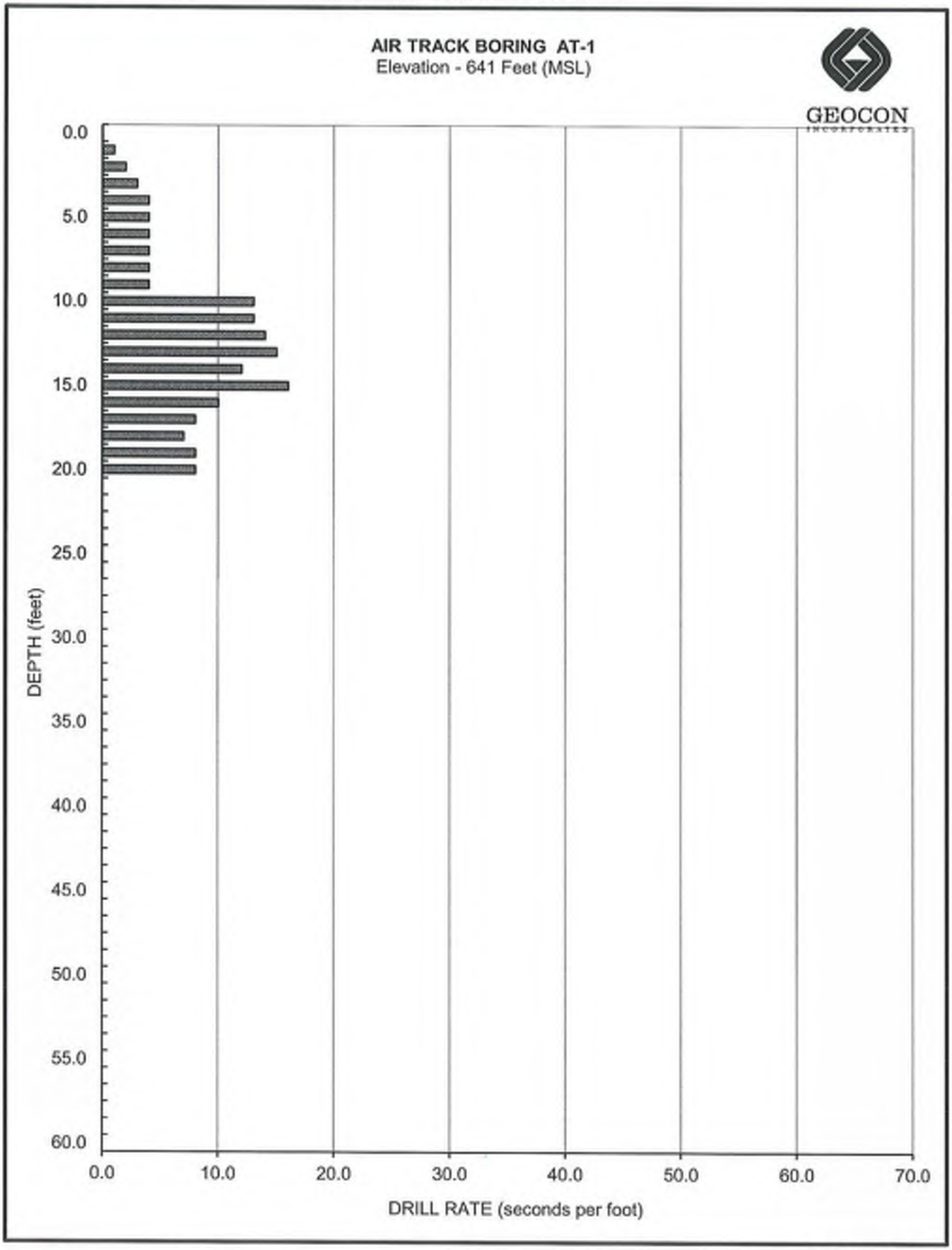
SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT001.xls

FIGURE A-42

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

AIR TRACK BORING AT-2

Elevation - 650 Feet (MSL)

GEOCON INCORPORATED

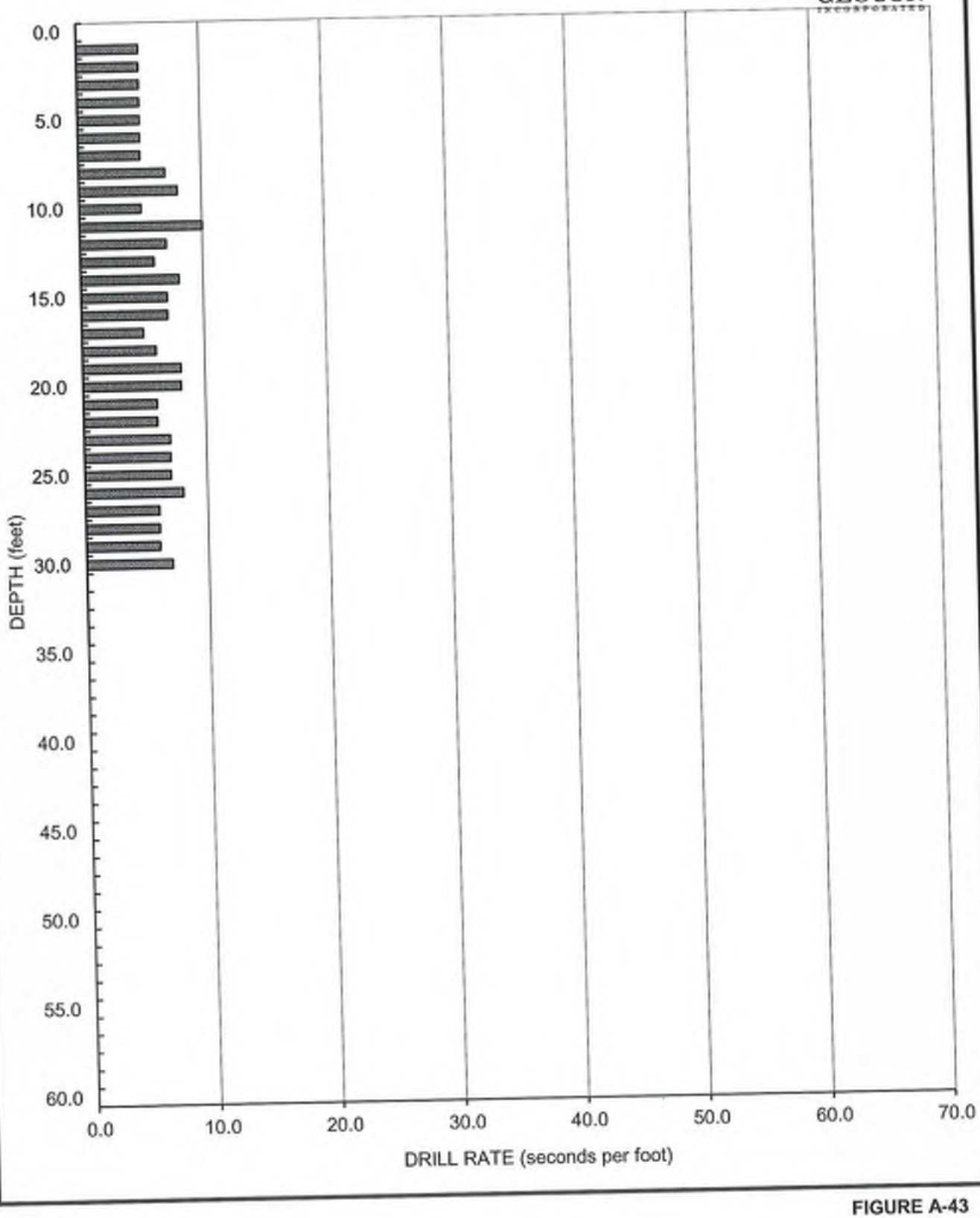
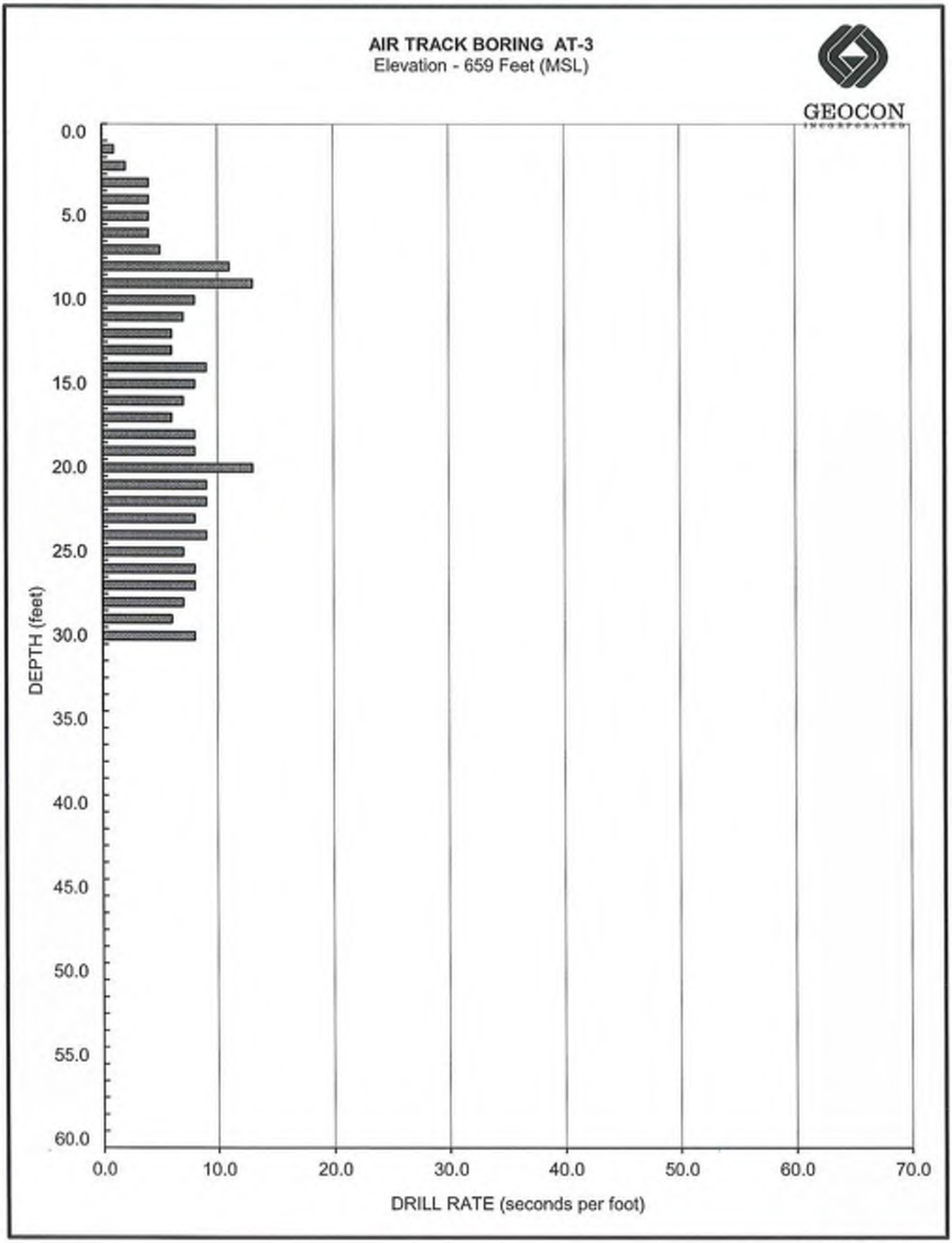


FIGURE A-43

AT032.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT003.xls

FIGURE A-44

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

AIR TRACK BORING AT-4

Elevation - 638 Feet (MSL)

GEOCON INCORPORATED

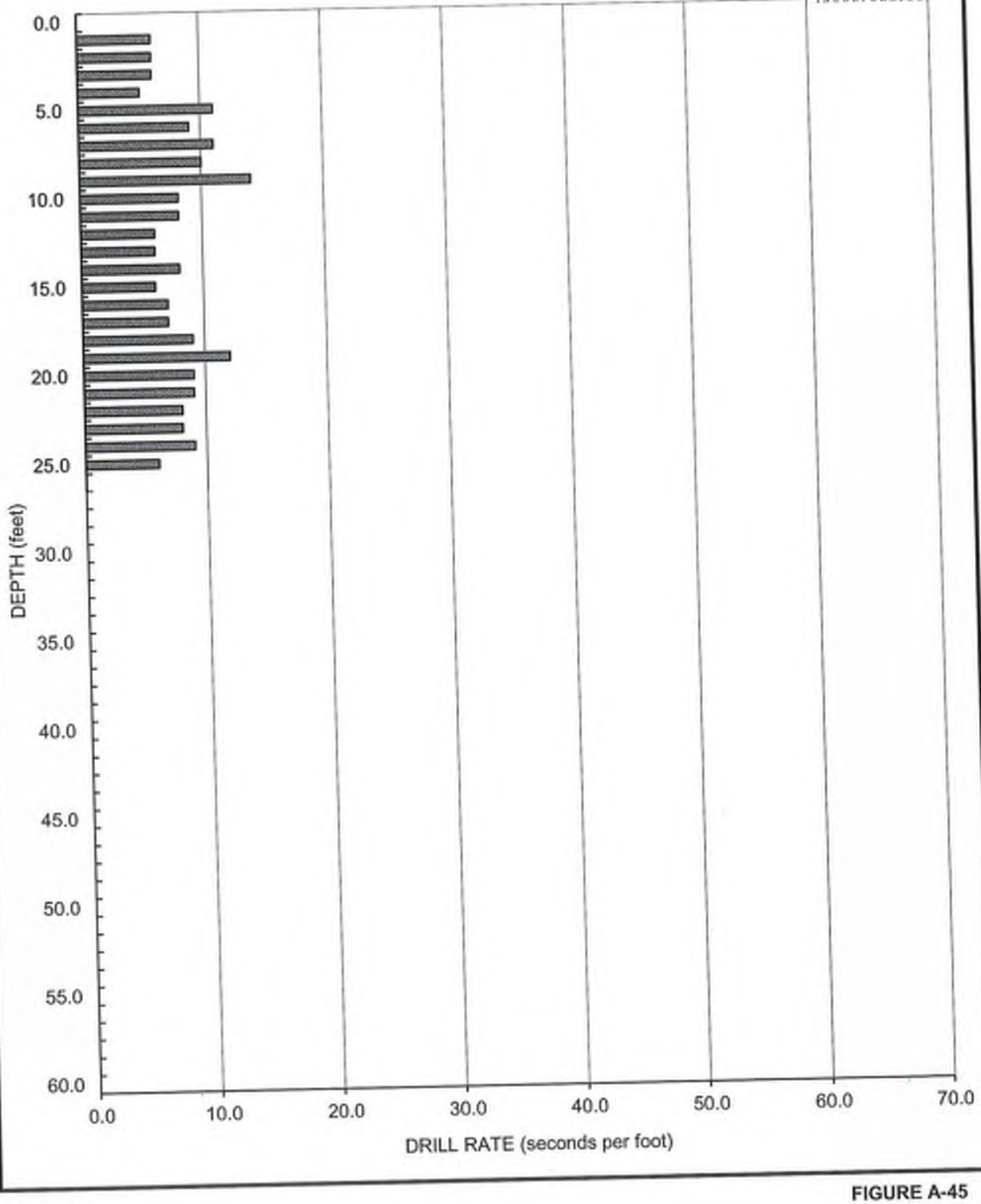
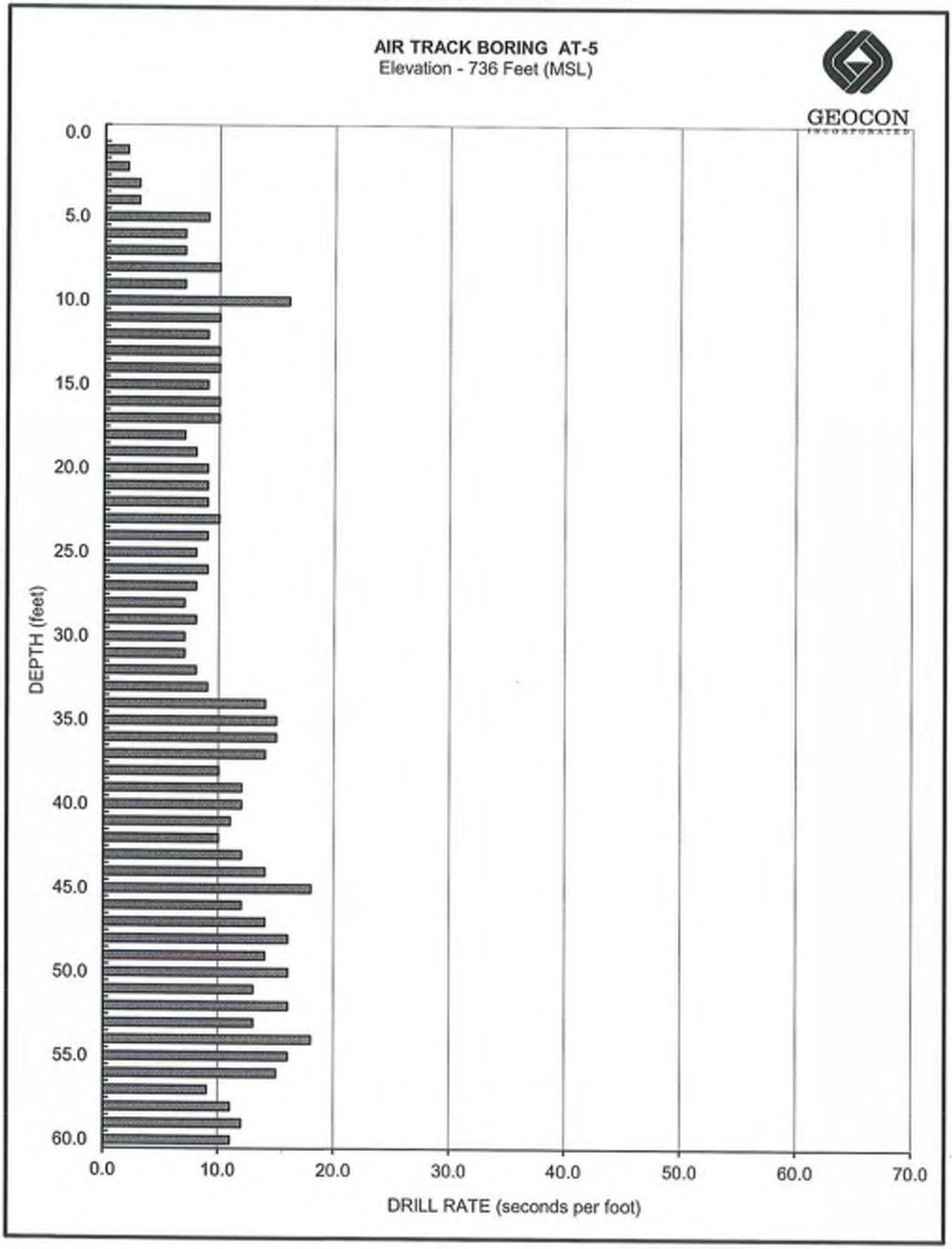


FIGURE A-45

A7034.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT005.xls

FIGURE A-46

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

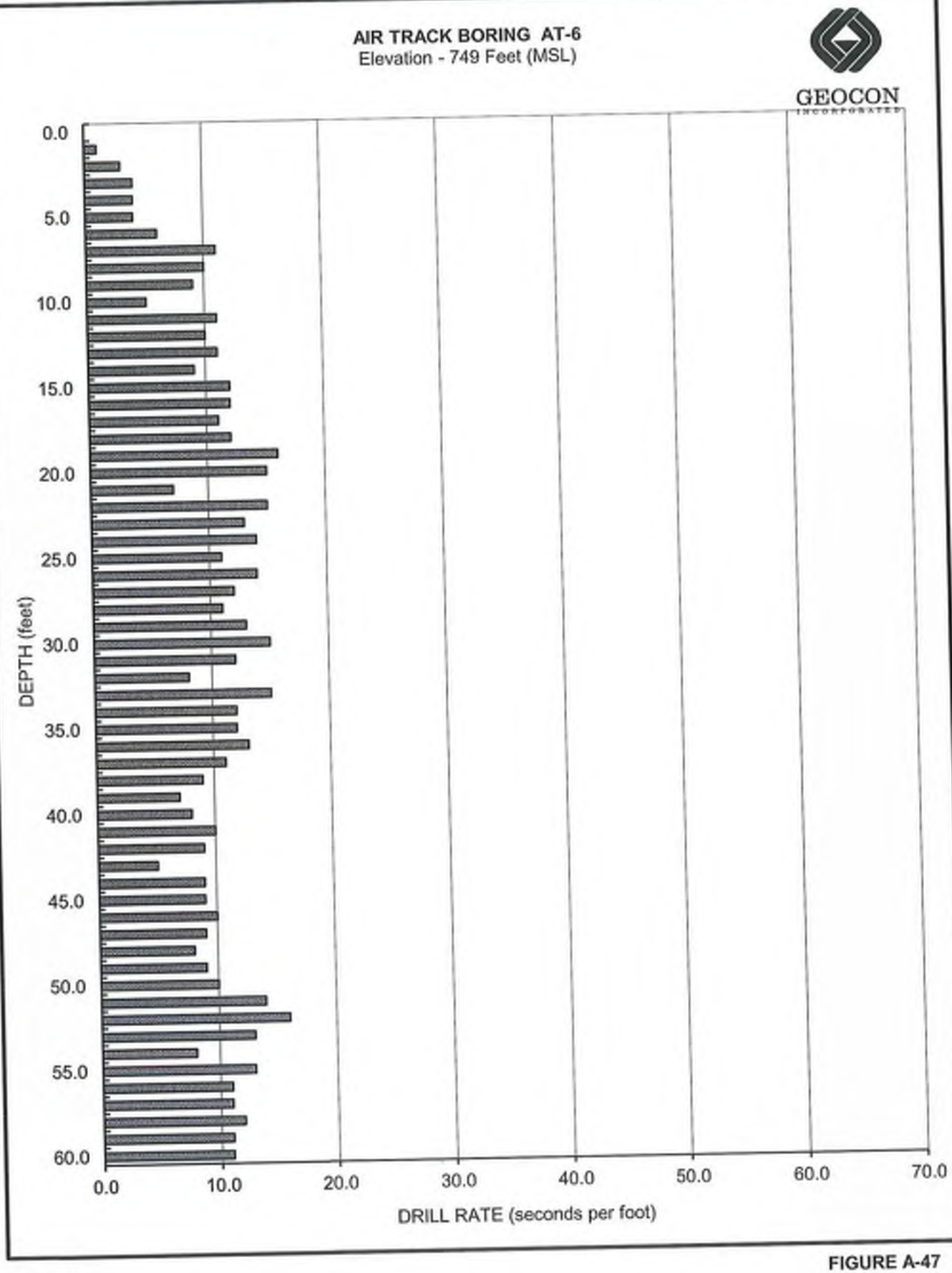
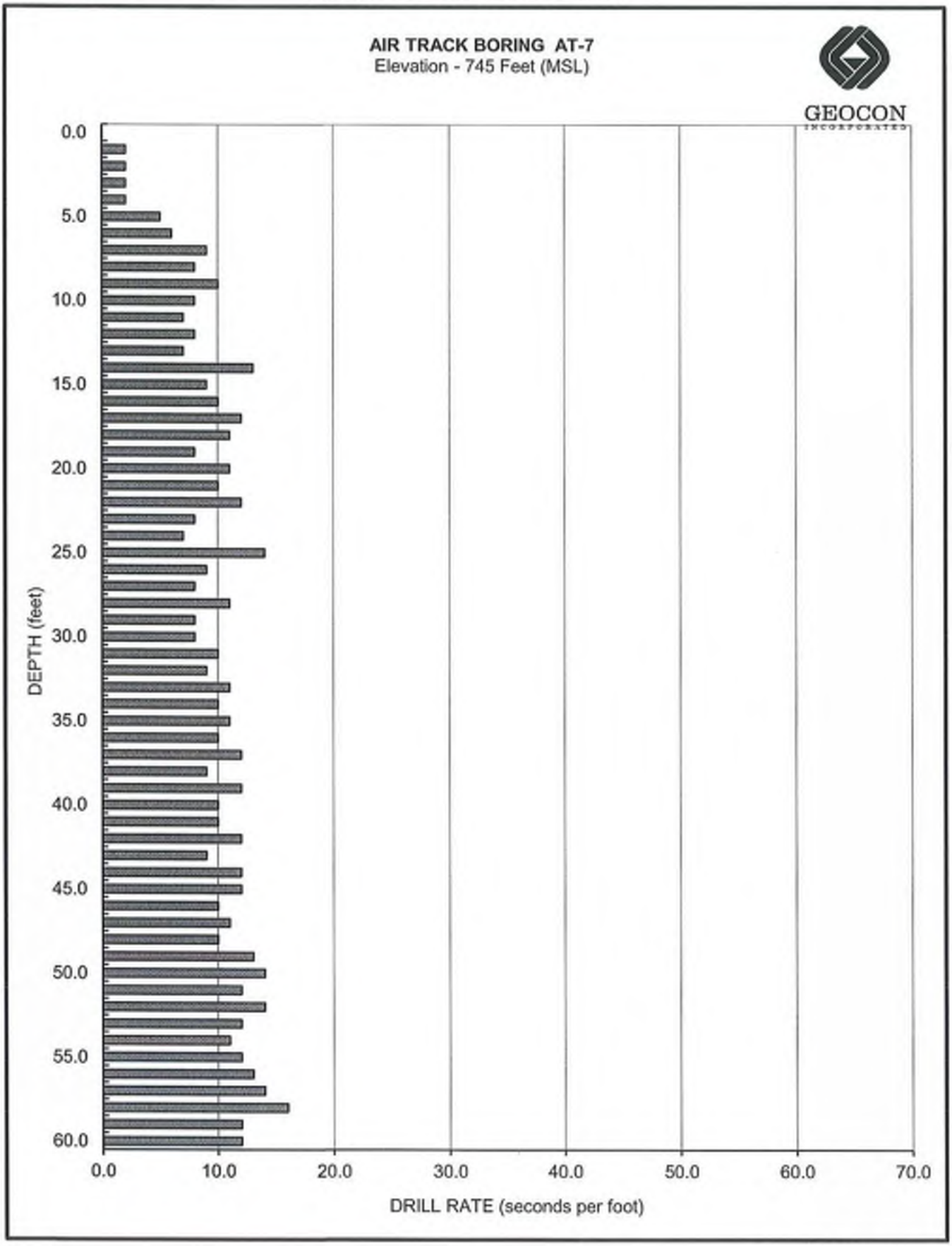


FIGURE A-47

AT06C.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT07.xls

FIGURE A-48

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

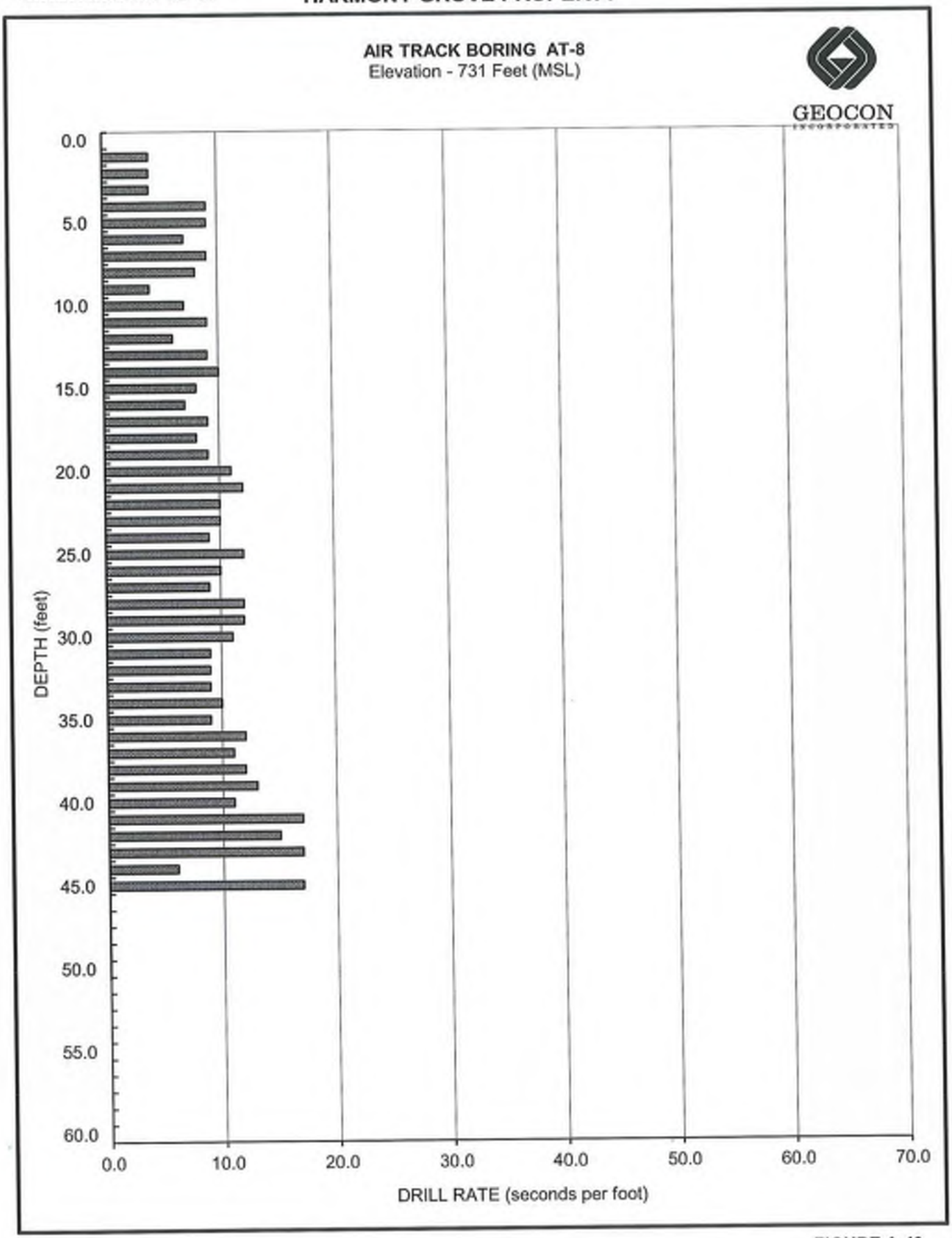
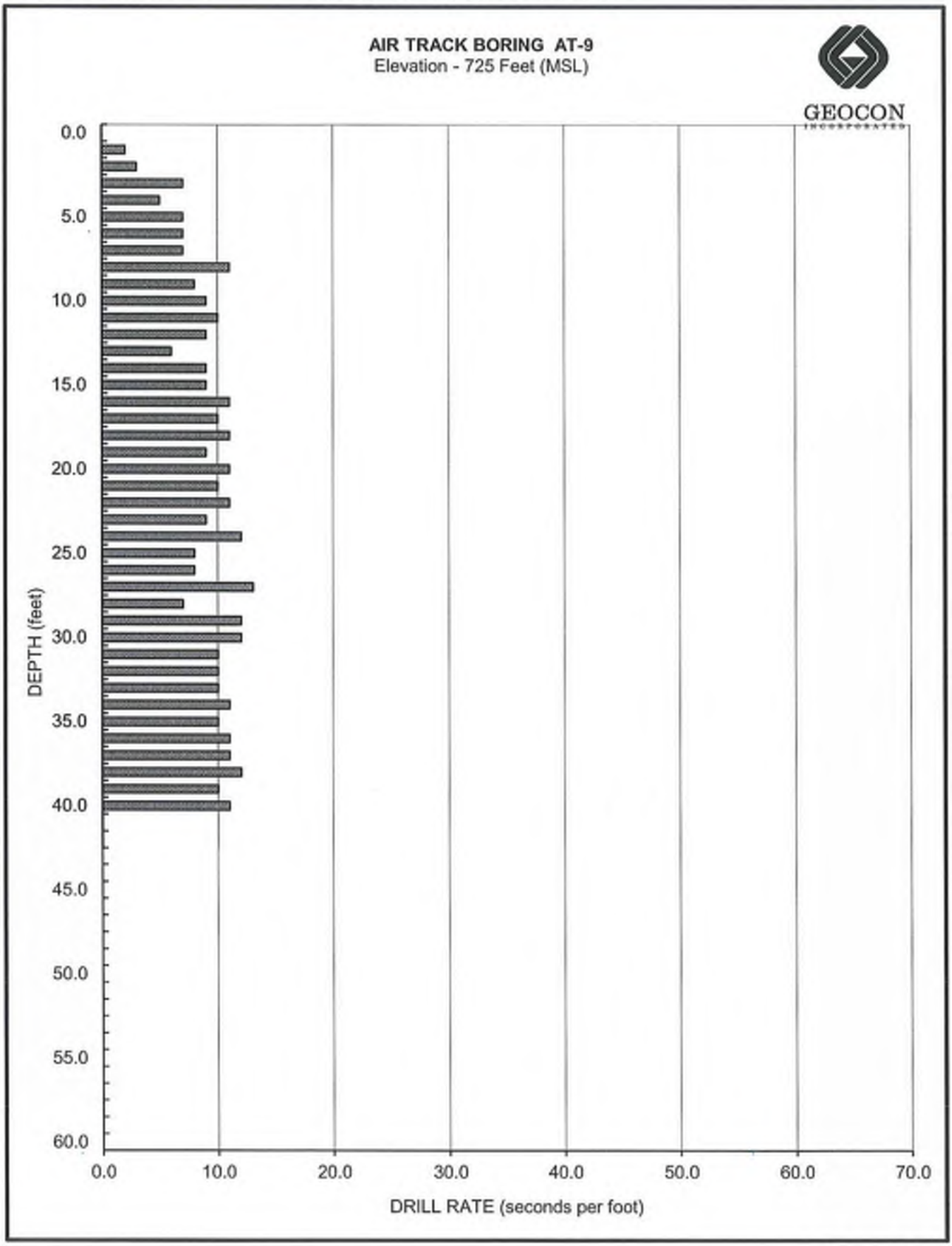


FIGURE A-49

AT08.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT039.xls

FIGURE A-50

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

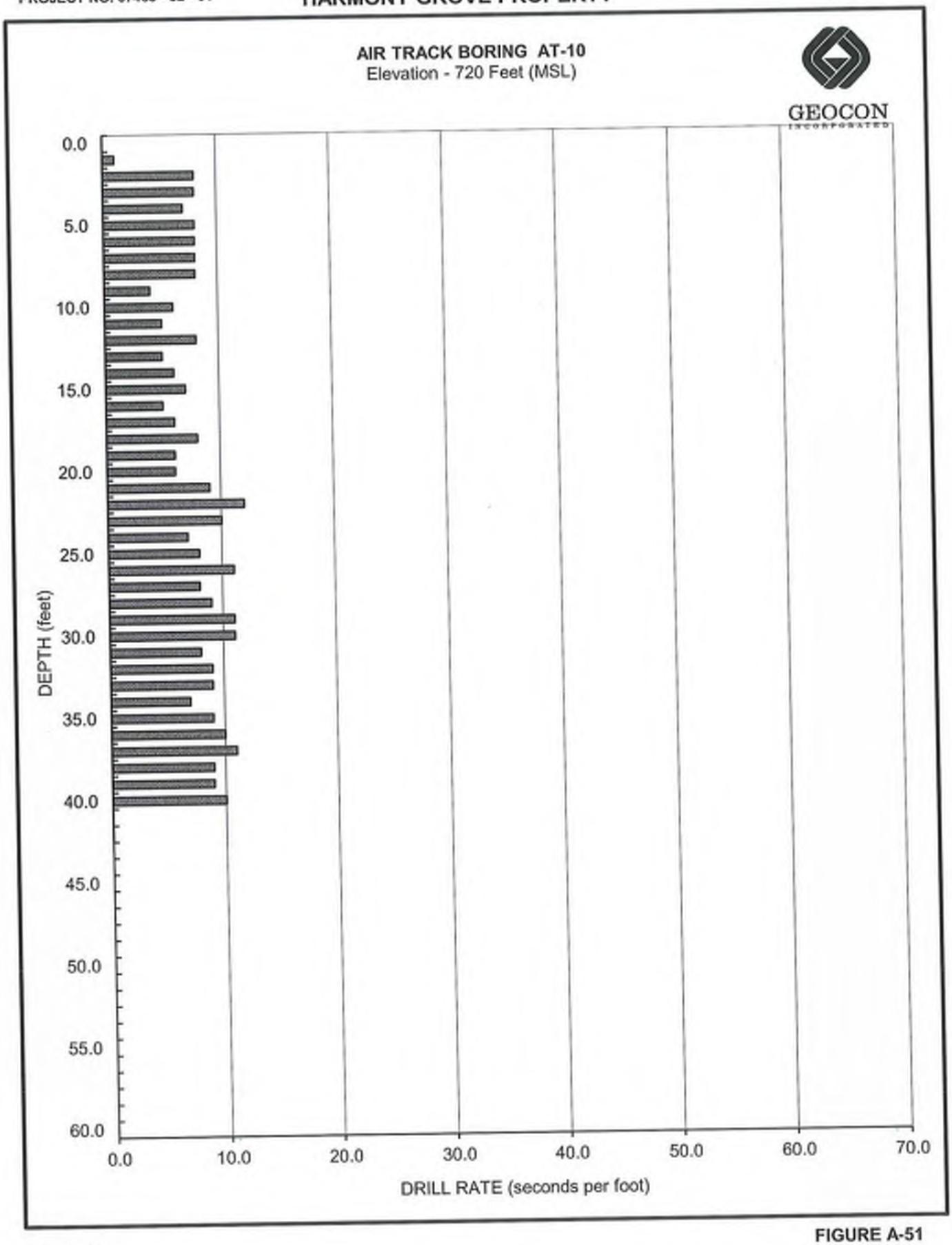
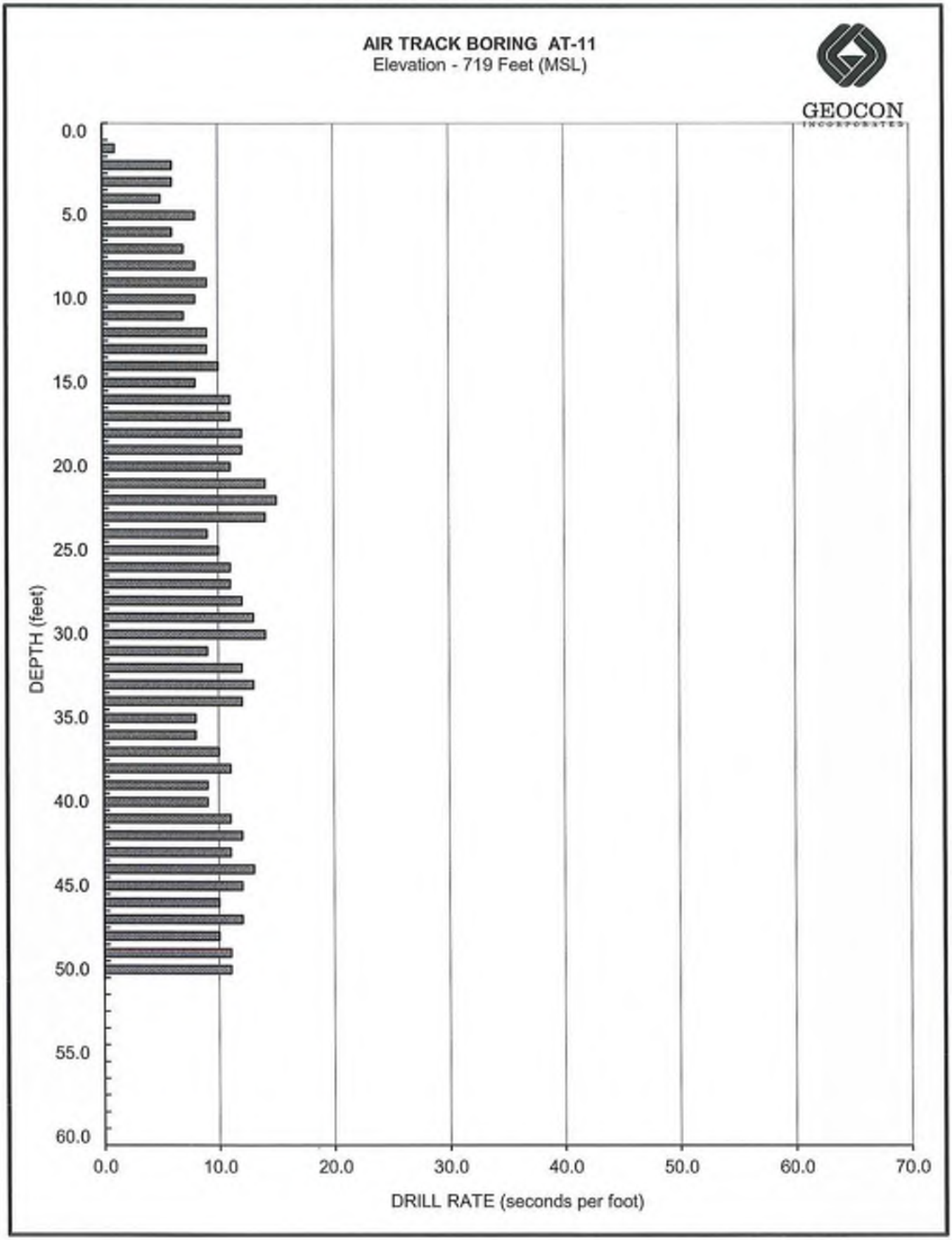


FIGURE A-51

AT0510.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT0011.xls

FIGURE A-52

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

AIR TRACK BORING AT-12
Elevation - 726 Feet (MSL)

GEOCON
INCORPORATED

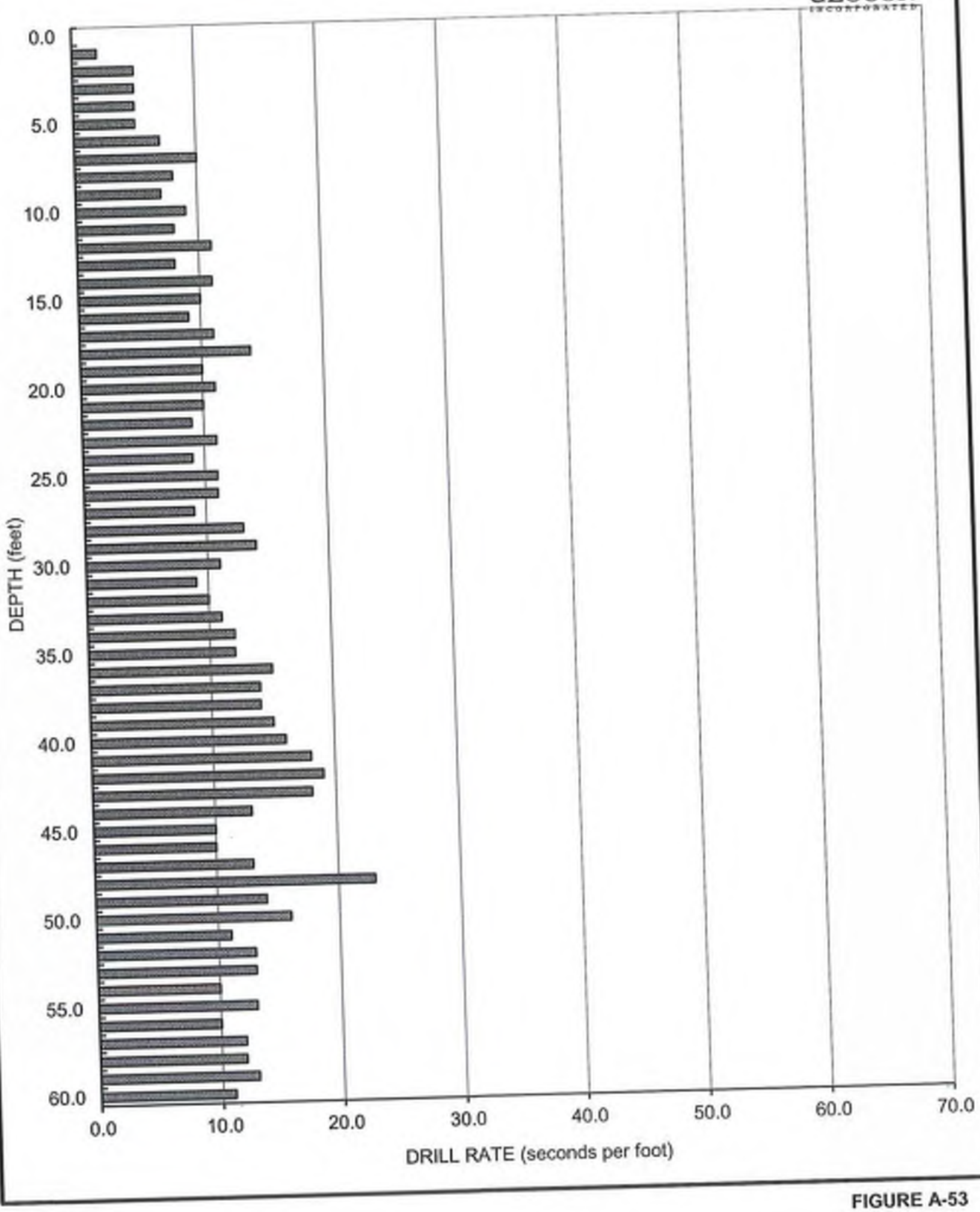


FIGURE A-53

AT0912.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

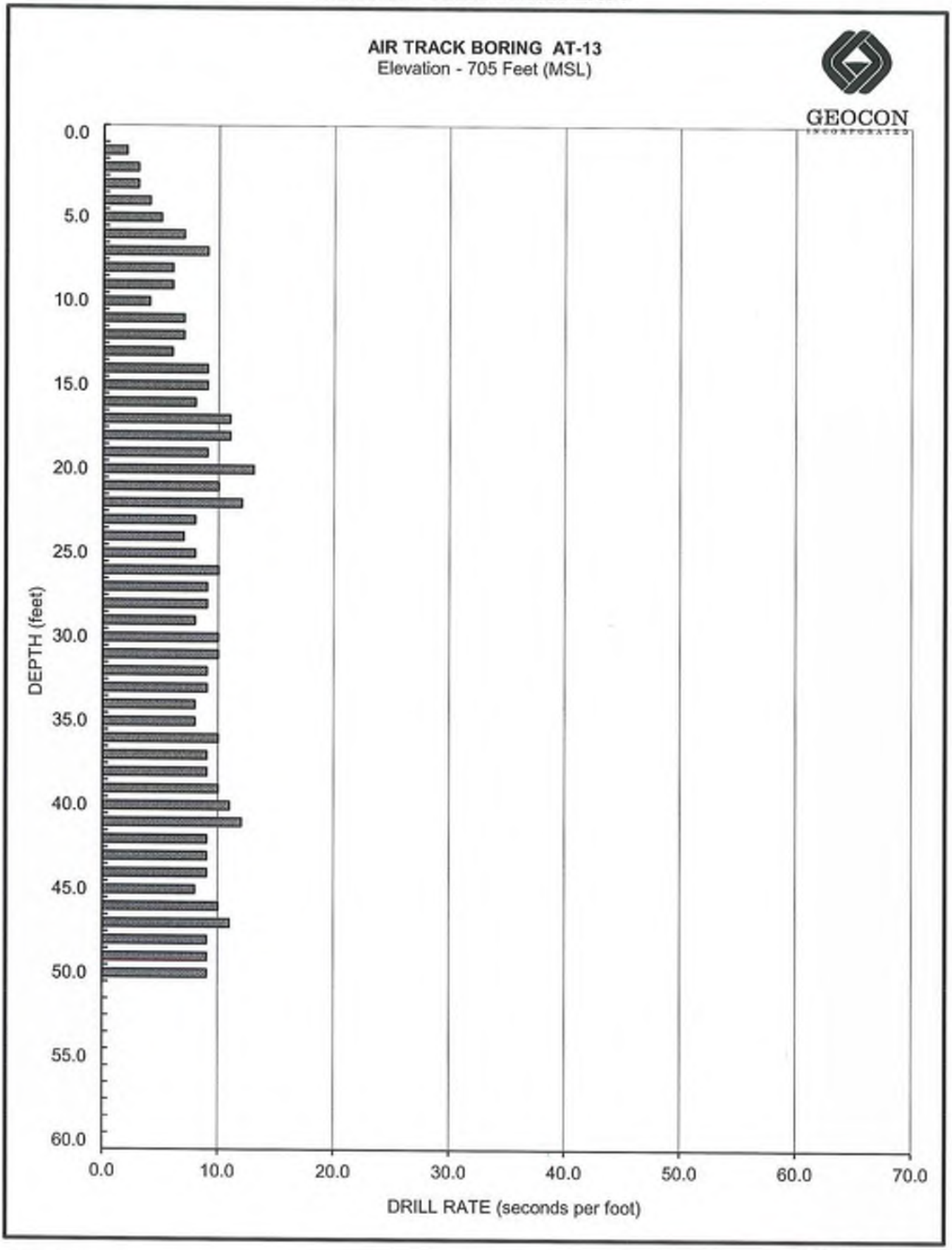


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FIGURE A-54

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

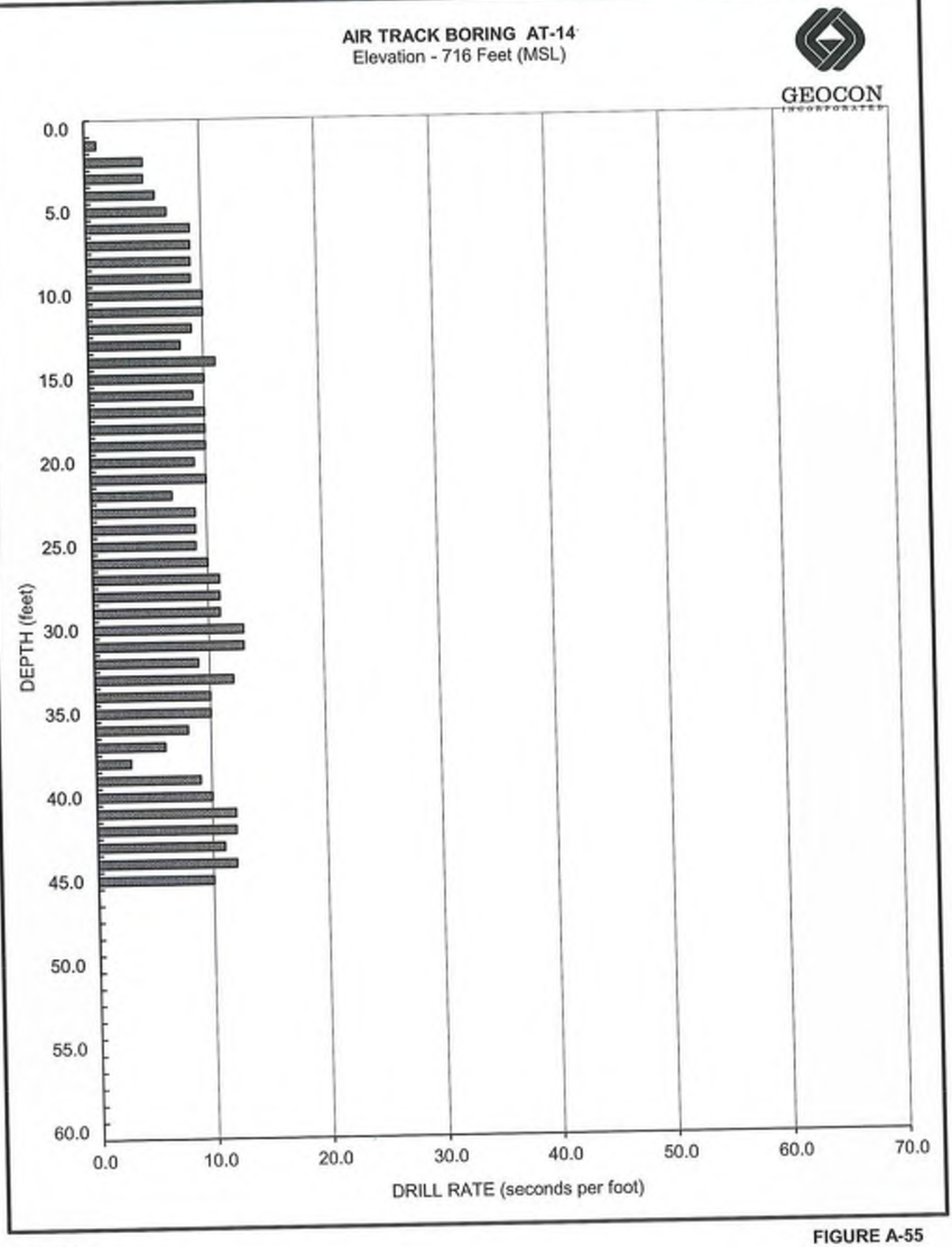
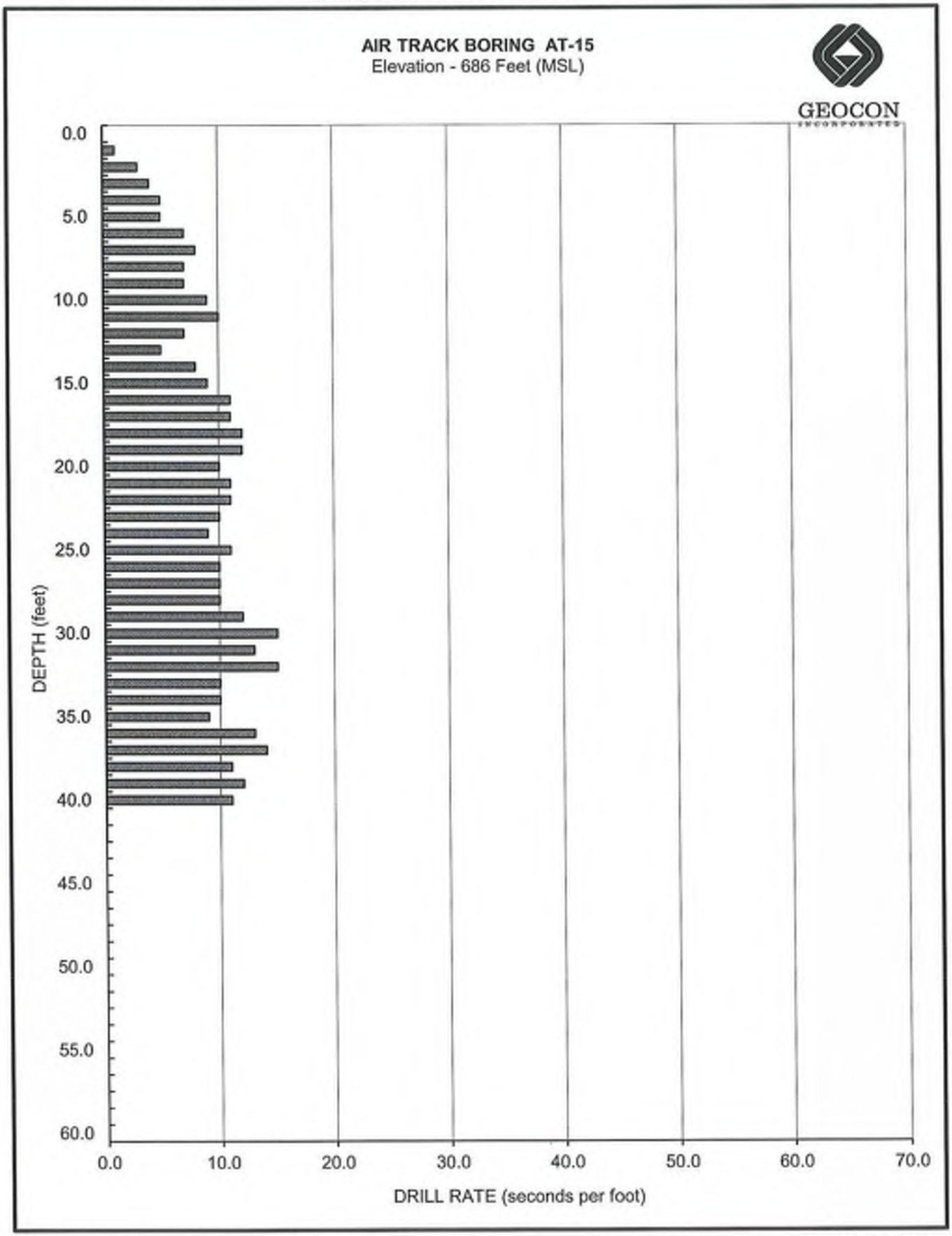


FIGURE A-55

AT0014.xls

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY



AT0315.xls

FIGURE A-56

PROJECT NO. 07465 - 32 - 01

HARMONY GROVE PROPERTY

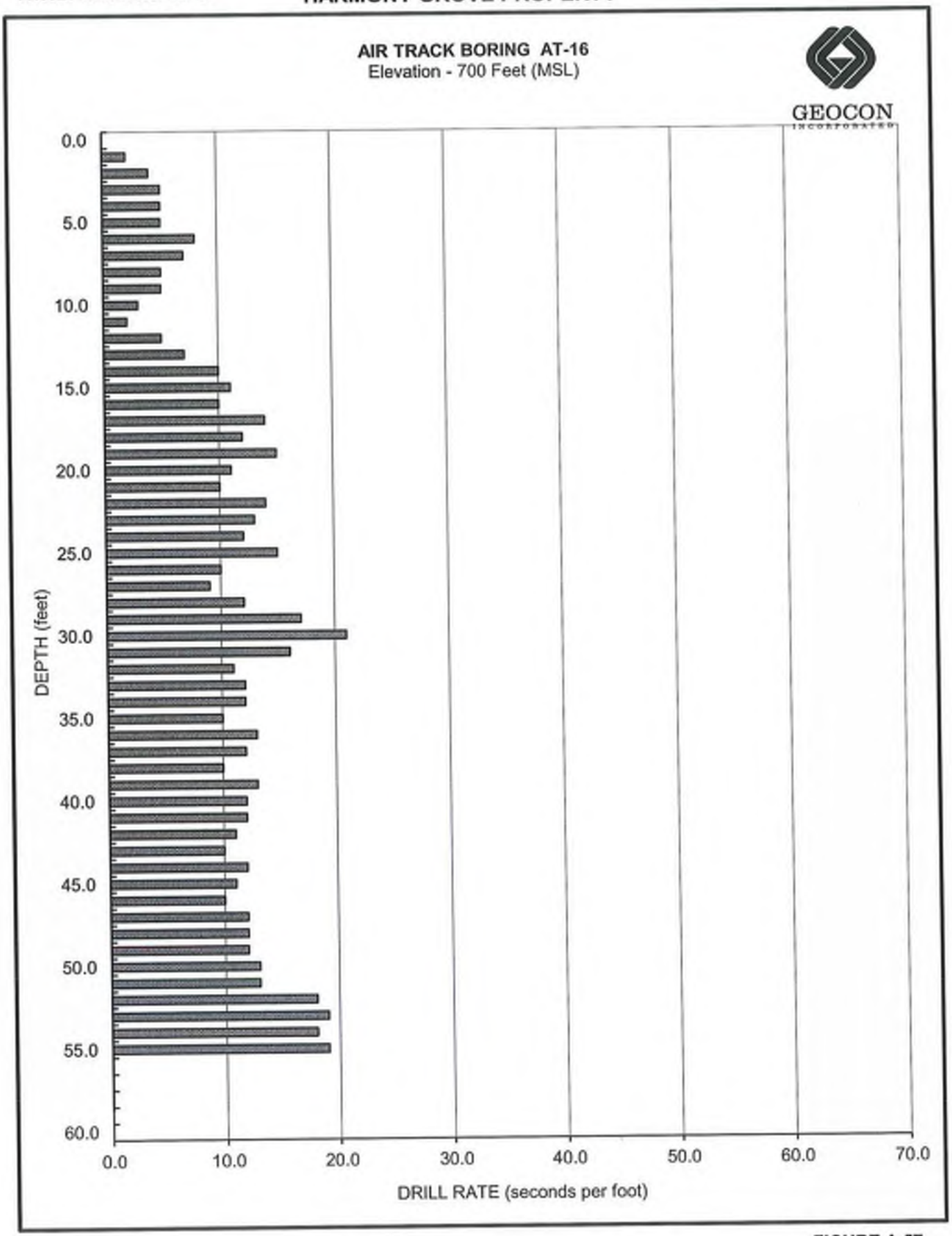


FIGURE A-57

AT0016.xls

APPENDIX B

APPENDIX B

LABORATORY TESTING
PERFORMED BY GEOCON INCORPORATED (2005)

FOR

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 07465-32-03

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures.

Selected disturbed bulk samples and relatively undisturbed chunk and ring samples were tested for in-place dry density, moisture content, expansion potential and shear strength characteristics. The maximum dry density and optimum moisture content of selected disturbed bulk samples were determined in accordance with ASTM D 1557-78. Portions of the bulk samples were also subjected to remolded direct shear tests.

The results of our laboratory tests are presented in tabular and graphical forms hereinafter. The in-place density and moisture characteristics are presented on the logs of the exploratory borings and trenches.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-91

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T8-1	Dark brown, Silty, fine to medium SAND	137.8	8.4
T16-1	Yellowish brown, Silty, fine to coarse SAND	122.8	12.8

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T8-1	8.5	18.5	117.8	8
T23-1	11.2	22.5	105.9	2

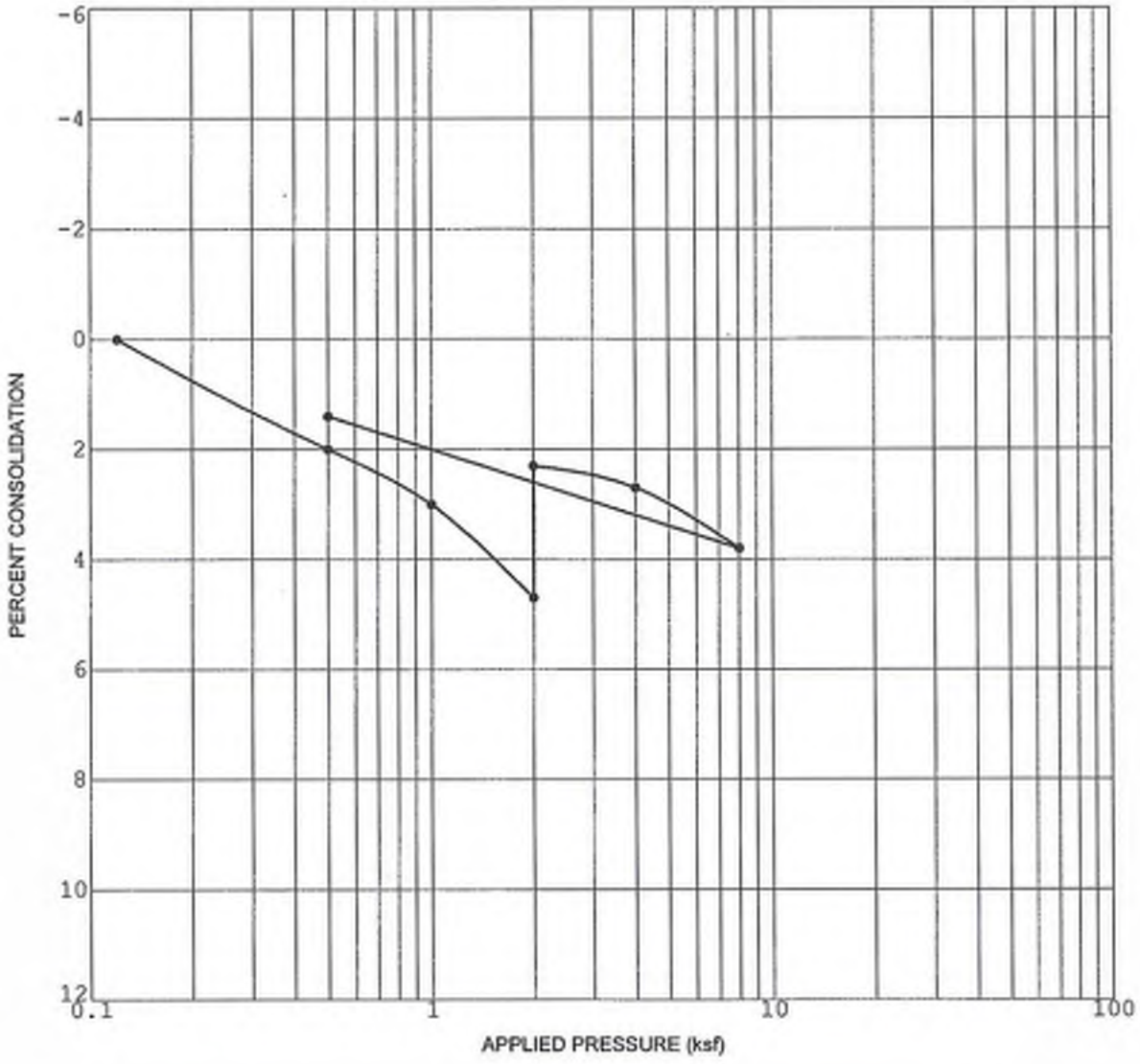
TABLE B-III
SUMMARY OF DIRECT SHEAR TEST RESULTS

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T8-1	124.4	8.0	425	33
T16-1	110.1	12.2	235	35

*Samples remolded to approximately 90 percent of maximum dry density at near optimum moisture content.

PROJECT NO. 07465-32-01

SAMPLE NO. B3-2



Initial Dry Density (pcf)	107.7
Initial Water Content (%)	21.3

Initial Saturation (%)	100
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

HARMONY GROVE PROPERTY

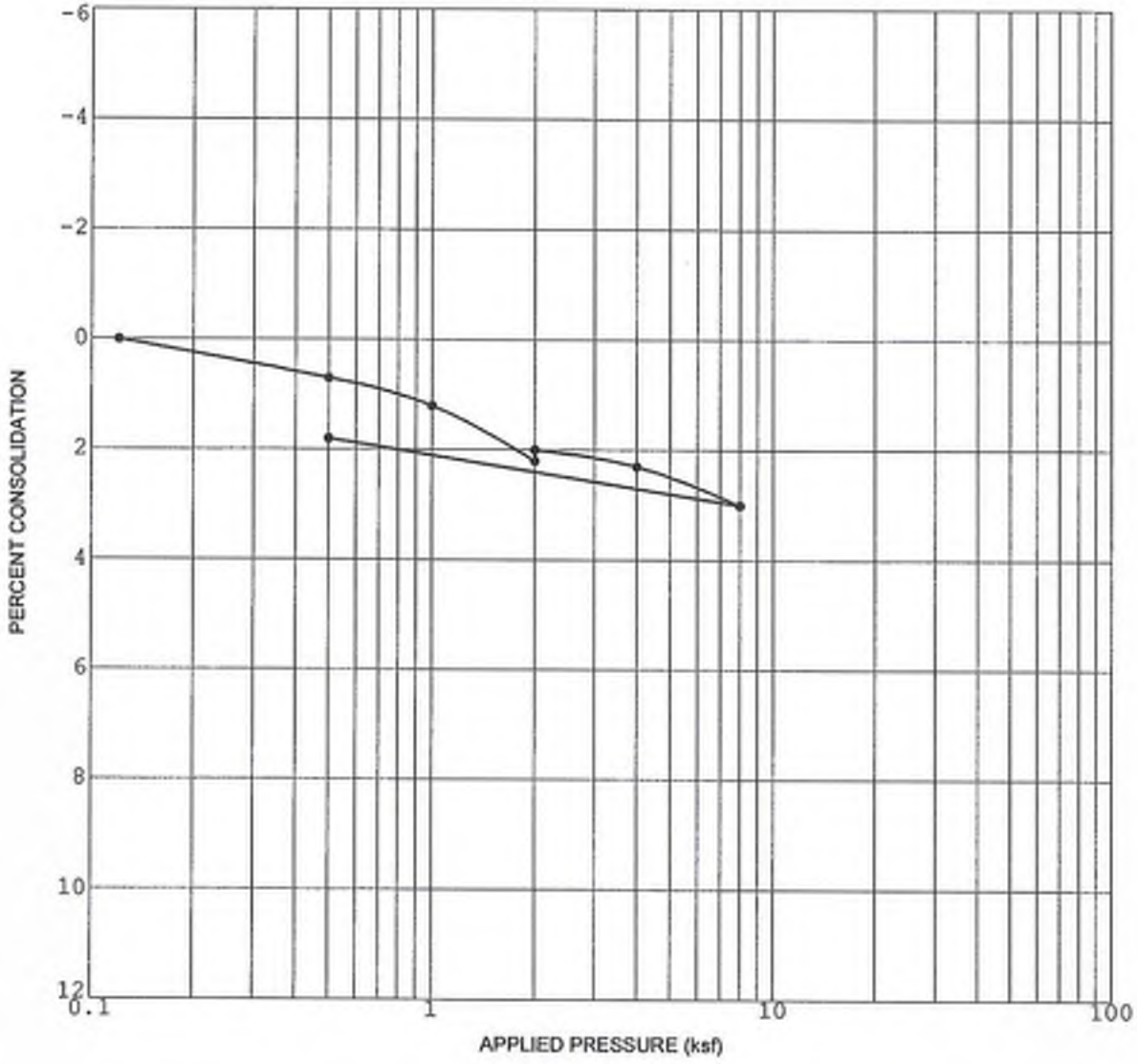
SAN DIEGO COUNTY, CALIFORNIA

07465-32-01.GPJ

Figure B-1

PROJECT NO. 07465-32-01

SAMPLE NO. B3-3



Initial Dry Density (pcf)	124.9	Initial Saturation (%)	100
Initial Water Content (%)	13.9	Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

HARMONY GROVE PROPERTY

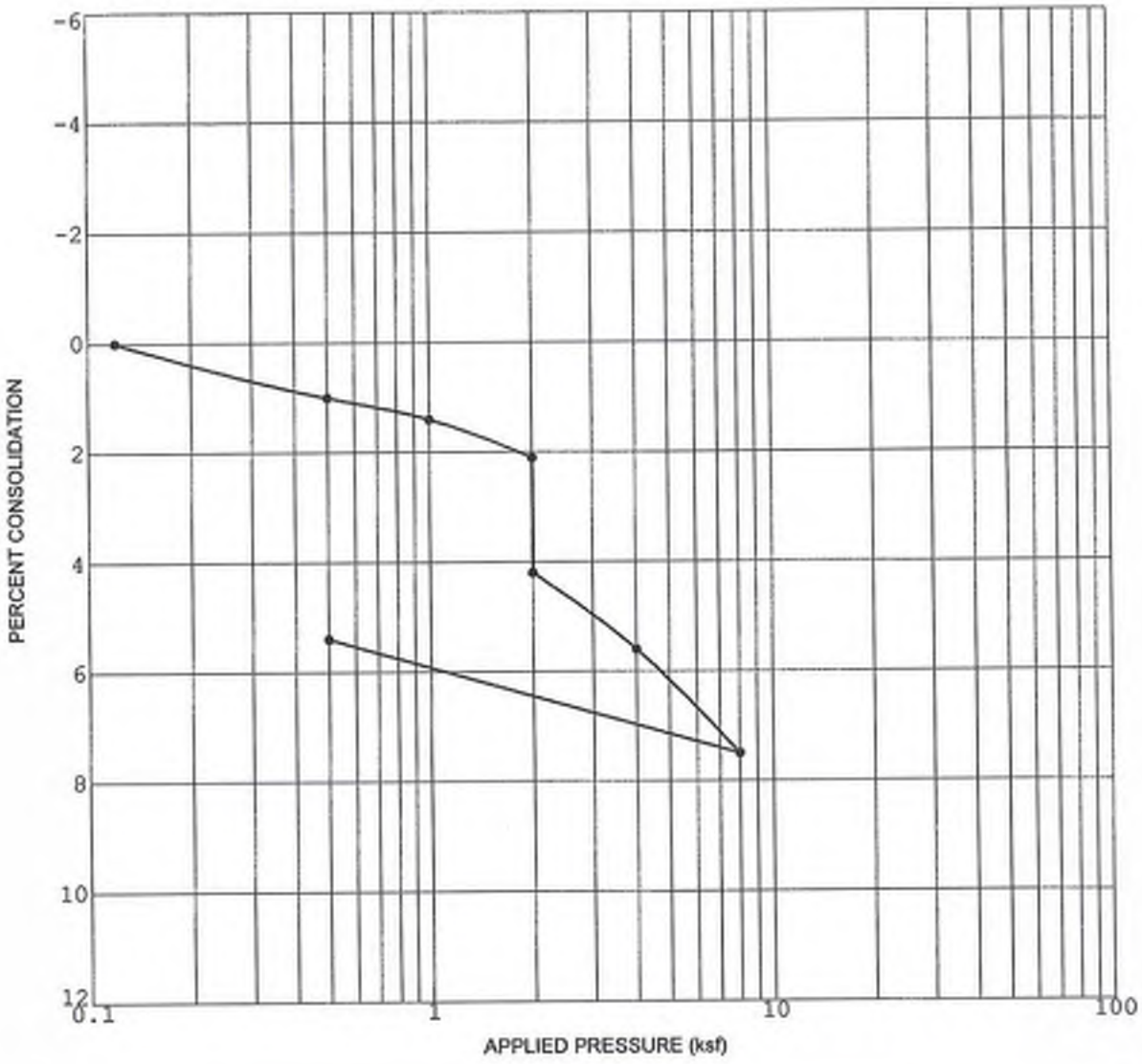
SAN DIEGO COUNTY, CALIFORNIA

07465-32-01.GPJ

Figure B-2

PROJECT NO. 07465-32-01

SAMPLE NO. B5-1



Initial Dry Density (pcf)	117.3	Initial Saturation (%)	77.8
Initial Water Content (%)	12.1	Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

HARMONY GROVE PROPERTY

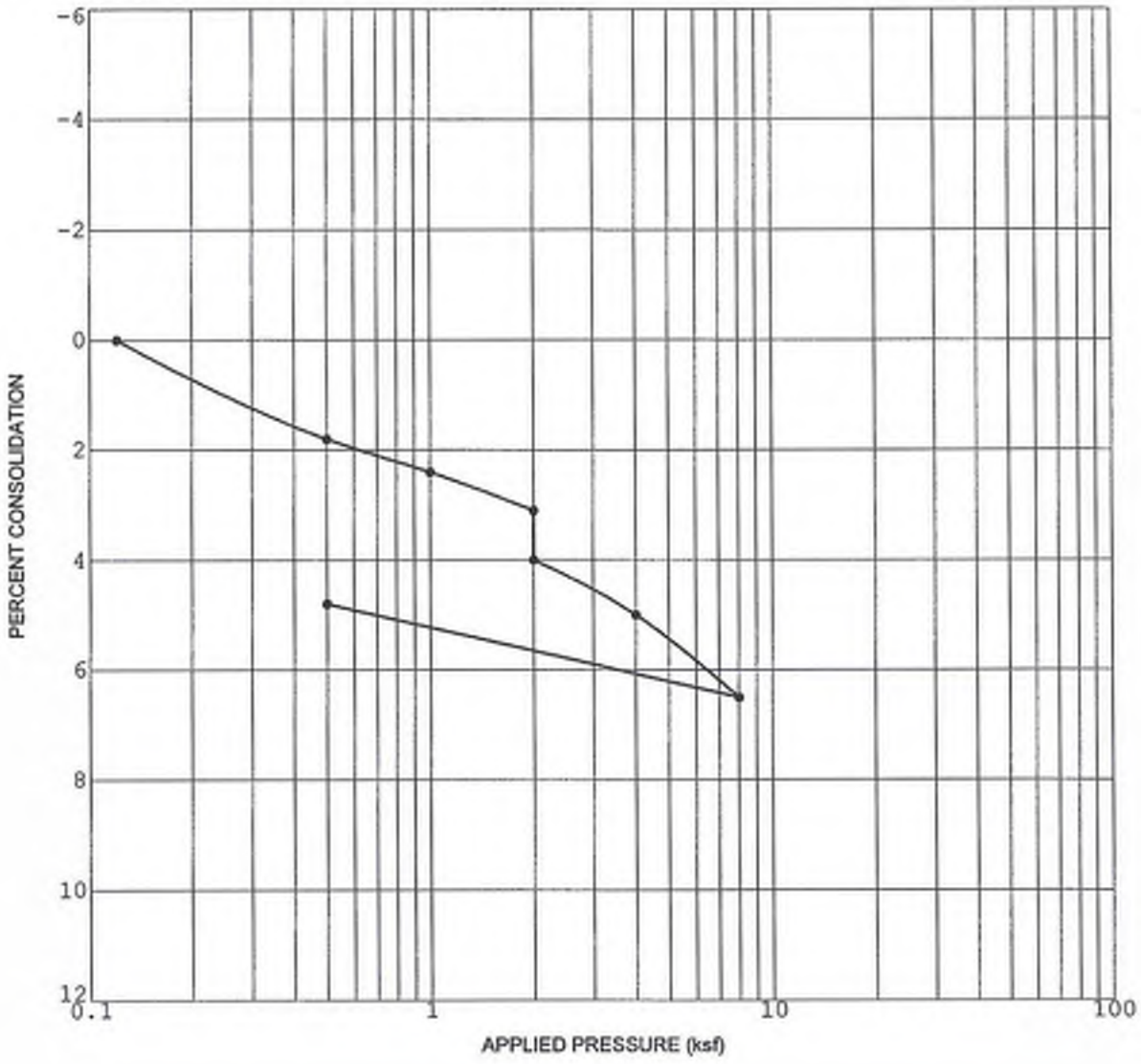
SAN DIEGO COUNTY, CALIFORNIA

07465-32-01.GPJ

Figure B-3

PROJECT NO. 07465-32-01

SAMPLE NO. B5-2



Initial Dry Density (pcf)	121.4	Initial Saturation (%)	58.1
Initial Water Content (%)	8.0	Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

HARMONY GROVE PROPERTY

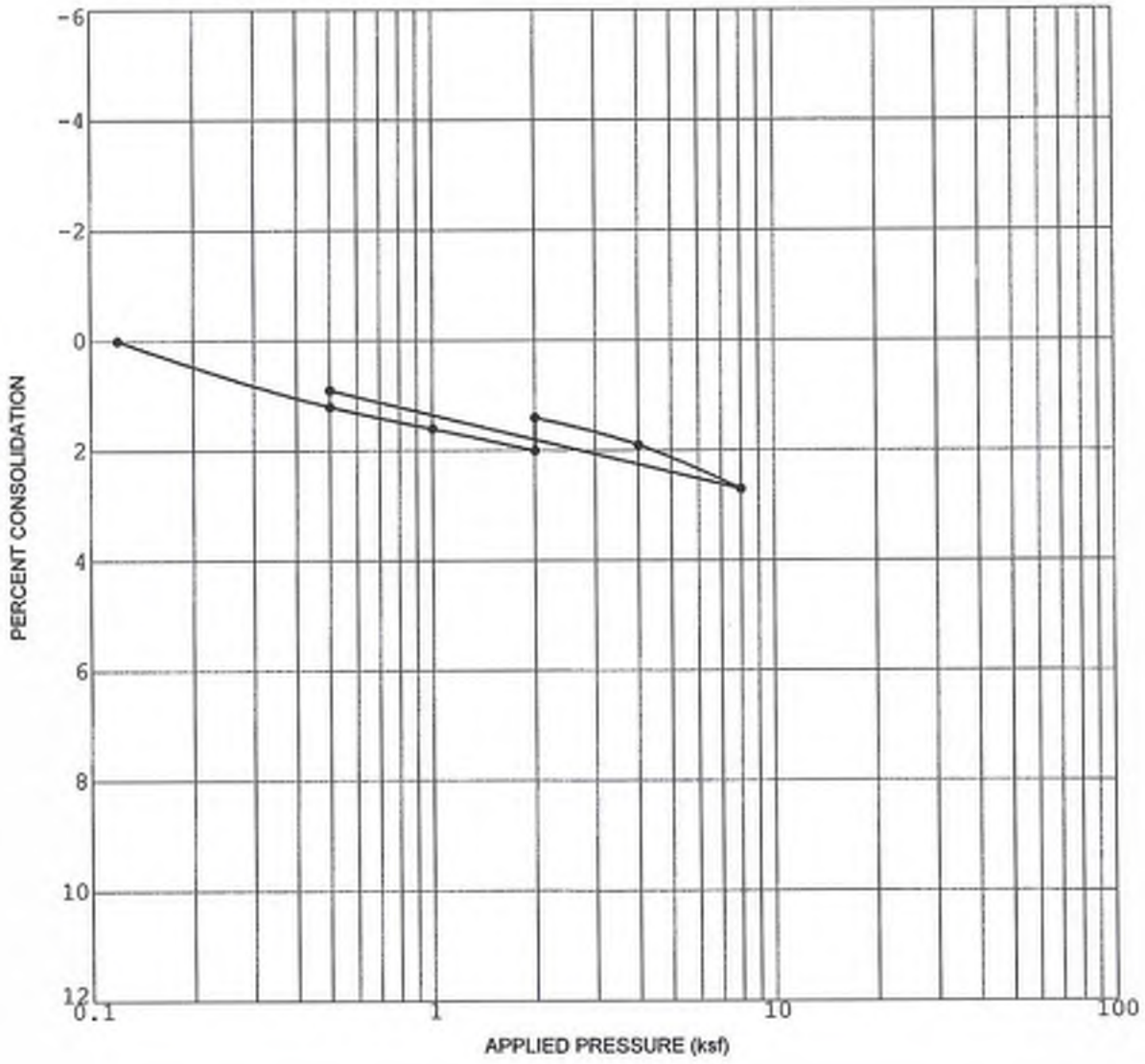
SAN DIEGO COUNTY, CALIFORNIA

07465-32-01.GPJ

Figure B-4

PROJECT NO. 07465-32-01

SAMPLE NO. B5-3



Initial Dry Density (pcf)	130.6
Initial Water Content (%)	8.8

Initial Saturation (%)	86.4
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

HARMONY GROVE PROPERTY

SAN DIEGO COUNTY, CALIFORNIA

07465-32-01.GPJ

Figure B-5

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 07465-32-03

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

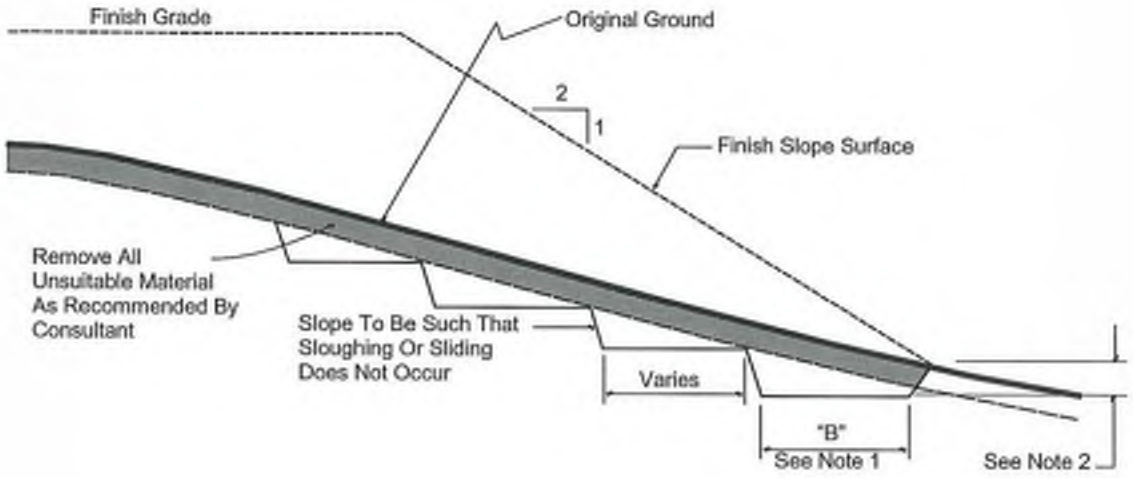
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-09.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557-09. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the

required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196-09, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. OBSERVATION AND TESTING

7.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 Soil and Soil-Rock Fills:

7.6.1.1 Field Density Test, ASTM D 1556-07, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D 1557-09, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

7.6.1.4. Expansion Index Test, ASTM D 4829-08A, *Expansion Index Test.*

7.6.2 Rock Fills

7.6.2.1 Field Plate Bearing Test, ASTM D 1196-09 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. U.S. Geological Survey, 1968, Escondido, California, *7.5 Minute Quadrangle Map,* photorevised 1975.

2. U.S. Geological Survey, 1968, Rancho Santa Fe, California, *7.5 Minute Quadrangle Map,* photorevised 1983.

3. *Landslide Hazards In The Northern Part of the San Diego Metropolitan Area, San Diego County, California,* California Division Of Mines And Geology, Open File Report 95-04 (1995), 1953 stereoscopic aerial photographs of the site and surrounding areas.

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5. Anderson, J. G., *Synthesis of Seismicity and Geologic Data in California,* U. S. Geologic Survey Open-File Report 84-424, 1984, pp. 1-186.

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12. Risk Engineering, *EZ-FRISK*, 2011.

13. Unpublished reports and maps on file with Geocon Incorporated.

14. USGS computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra.*

15. FEMA National Flood Hazard Layer (NFHL), version 3.0-Flood Zone

GEOCON
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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07465-32-03
October 23, 2015

RCS-Harmony Partners, LLC
321 12th Street, Suite 200
Manhattan Beach, California 90266

Attention: Ms. Kathryn Murrel

Subject: RESPONSE TO COUNTY OF SAN DIEGO REVIEW COMMENTS
HARMONY GROVE VILLAGE SOUTH
SAN DIEGO COUNTY, CALIFORNIA

References:
1. *County of San Diego Review Comments, Harmony Grove Village South, Project No. PDS2015-SP-15-002*, dated July 6, 2015.
2. *Update Geotechnical Report, Harmony Grove Village South, San Diego County, California,* prepared by Geocon Incorporated, dated February 3, 2015 (Project No. 07465-32-03).
3. *Vesting Tentative Map, Harmony Grove Village South, San Diego County, California,* prepared by Project Design Consultants, electronic copy dated January 16, 2015.

Dear Ms. Murrel:

In accordance with your request, we have prepared this letter to respond to a County of San Diego Review comment (Reference 1) for the project. The review comment pertaining to geotechnical issues followed by our response is provided below.

Item No. 11-1: *Subject Area - Geologic Hazards: An update geotechnical investigation is required in areas of planned development not covered by the 2005 geotechnical investigation work by GEOCON. The scope of work is outlined within Section 8 of the Update Geotechnical Report, Harmony Grove Village South, San Diego County, California, dated February 3, 2015. It is recommended to complete the update geotechnical investigation work once development plans are finalized.*

Response: It is our opinion that the update geotechnical investigation discussed in Reference No. 2, Section 8.1.2 is not needed at the current stage of project planning. Based on previous fieldwork performed at the subject site, we anticipate that areas of planned development not encompassed by our 2005 investigation report will consist of similar geologic materials and that no conditions will be present that would preclude the development as presently proposed. In this regard, the fieldwork and update report can be performed at a later date.

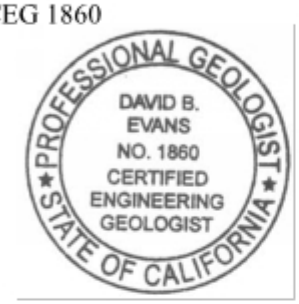
Should you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Emilio Alvarado
RCE 66915

David B. Evans
CEG 1860



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(2) Addressee