



UPDATE GEOTECHNICAL REPORT

MELROSE AND DIAMOND PROJECT SAN MARCOS, CALIFORNIA

APRIL 9, 2026
PROJECT NO. G2520-32-03A

PREPARED FOR:

LENNAR
SAN DIEGO, CALIFORNIA



Project No. G2520-32-03A

April 9, 2026

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13520 Evening Creek Drive North, Suite 600
San Diego, California 92128

Attention: Mr. Brendan Smith

Subject: UPDATE GEOTECHNICAL REPORT
MELROSE AND DIAMOND PROJECT
SAN MARCOS, CALIFORNIA

Dear Mr. Smith:

In accordance with your request and our change order dated April 2, 2026, we prepared this update geotechnical report for a proposed residential development located in San Marcos, California.

The accompanying report presents our previous subsurface information, laboratory test results, and our conclusions and recommendations pertaining to the geotechnical aspects of project development. The results of our study indicate that the site can be developed as planned, provided the recommendations of this report are followed.

If there are 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

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UPDATE GEOTECHNICAL REPORT

1. PURPOSE AND SCOPE

This report presents an update geotechnical report for a proposed residential development located in San Marcos, California (see *Vicinity Map*, [Figure 1](#)). This report addresses the current site plan titled *Ascend Condominium at the City of San Marcos* prepared by Excel Engineering, received on March 26, 2026, and supersedes our previous geotechnical report titled *Geotechnical Investigation, Melrose Industrial Site, San Marcos, California*, dated June 24, 2020 (Project No. G2520-42-01).

Our scope of services included preparation of this report and review of the referenced geotechnical investigation. This report summarizes the previous subsurface exploration and laboratory testing, along with our updated conclusions and geotechnical recommendations based on the current site plan for the proposed residential development.

2. PREVIOUS GEOTECHNICAL STUDIES

Several geotechnical studies were conducted on the subject site in 1979, 1986, and 2001 in support of a proposed industrial development, as listed below.

- *Martin Business Park, City of San Marcos T.S.M. 292, San Marcos, California*, prepared by Geocon Inc., dated December 17, 2001 (Project No. 06827-32-01).
- *Supplemental Soil and Geologic Investigation, San Marcos T. S. M. 292, Lots 16 Through 30, San Marcos, California*, prepared by Geocon Inc., dated October 3, 1986, revised January 22, 1987 (Project No. D-2059-J02).
- *Soil and Geologic Investigation, San Marcos Tract 207, San Marcos, California*, prepared by Geocon Incorporated, dated December 4, 1979 (Project No. D-2059-J01).

Subsurface information from these studies included exploratory trenches and borings, air-track borings, and seismic refraction traverses conducted in 1979, 1986, and 2001. Logs, seismic traverse data, and laboratory testing results from these investigations are provided in [Appendix A](#). The approximate locations of the previous subsurface explorations, along with the mapped extent of geologic units (excluding topsoil), are shown on the *Geologic Map* ([Figure 2](#)). Some exploratory trenches and borings are not shown, as they were performed west of the site, off the subject property.

3. SITE AND PROJECT DESCRIPTION

The proposed Melrose and Diamond project is located east of the intersection of Melrose Drive and Diamond Street in San Marcos, California. The property is bounded by open space to the north and east, a residential subdivision to the northwest, Melrose Drive to the west, and an abandoned rock quarry to the south. Site topography is characterized by moderate- to steep-sloping hillside terrain, with a canyon drainage area along the southern portion of the property.

It is our understanding that the 22.89-acre property is being rezoned from industrial to residential use to support the development of 147 dwelling units, recreational areas, several retaining walls, water quality basins, and associated parking and infrastructure improvements.

According to grading volume estimates provided by Fuscoe Engineering, the project will consist of approximately 143,073 cubic yards of cut and 217,649 cubic yards of fill, resulting in a need for 74,576 cubic yards of import to balance the site. However, these estimates do not account for remedial grading or adjustments due to material bulking and shrinking. The slopes are designed at a ratio of 2:1 (horizontal to vertical) or flatter, with a maximum slope height of approximately 60 feet.

The descriptions contained herein are based upon the grading plan and our understanding of the project. If project details vary significantly from those outlined herein, Geocon Incorporated should be notified for review and possible revisions to this report prior to final design submittal.

4. SOIL AND GEOLOGIC CONDITIONS

Four surficial soil types and one geologic formation were encountered during our previous studies. The surficial deposits consist of undocumented fill, topsoil, alluvium and colluvium. The formational unit consists of the Cretaceous-age granitic rock. Each of the units are described below in order of increasing age and their mapped extent is shown on the *Geologic Map*, except for topsoil.

4.1 Undocumented Fill (Qudf)

Undocumented fill deposits were encountered in several of the subsurface excavations across the site. These materials generally consist of poorly consolidated, dry to damp, clayey to silty sands with varying amounts of gravel, cobble, and boulder-sized rock fragments up to approximately 2 feet, with occasional boulders as large as 3 feet. Based on our review of previous studies, these embankments appear to have been placed during adjacent grading and former rock quarry operations, circa 1990.

4.2 Topsoil (Unmapped)

Topsoil was encountered across the site in several of the subsurface excavations and varied in thickness from 1 to 2 feet. The topsoil is characterized primarily as silty, fine to coarse sands.

4.3 Alluvium and Colluvium (Qal/Qcol)

Alluvium and colluvium (undifferentiated) were identified in the lower lying areas across the site, both at the surface and underlying the undocumented fill in the southern portion of the site. Where encountered, these deposits had a maximum thickness of approximately 11 feet in Trench No. T-9. In general, these deposits consist primarily of silty to clayey sands with varying percentages of gravel and cobble size rock fragments.

4.4 Granitic Rock (Kgr)

Cretaceous-age granitic rock was encountered beneath the surficial deposits across the site. In general, the granitic rock exhibited a variable weathering pattern ranging from completely weathered to fresh and consists of weak to extremely strong rock material.

The rippability characteristics of the granitic rock are discussed in the *Rippability and Rock Considerations* section of this report. Granitic units generally exhibit adequate bearing and slope stability characteristics and cut slopes excavated at an inclination of 2:1 (horizontal:vertical) should be stable to the proposed heights if free of adversely oriented joints or fractures.

5. RIPPABILITY AND ROCK CONSIDERATIONS

To aid in evaluating the rippability characteristics of rock across the project site, previous subsurface exploration consisting of air-track borings and seismic refraction traverses was performed. The associated logs and reports are included in [Appendix A](#). However, these explorations were completed as part of a previous development plan and do not fully encompass several of the primary cut areas identified in the current grading plan. **A supplemental study should be considered to better define the extent of hard rock in the primary excavation areas based on the revised grading plan.**

A commonly used guideline for assessing rock rippability based on drill penetration rates of the air-track borings is as follows: a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material; 20 to 30 spf indicates marginally rippable to non-rippable material; and greater than 30 spf indicates non-rippable rock. These guidelines are typically based on drill rates using

a rotary percussion drill rig, such as an Ingersoll Rand ECM 360 with a 3½-inch bit. The estimated thickness of rippable material at each air-track boring location, using 20 spf as the boundary between rippable and marginal to non-rippable rock, is presented on the *Geologic Map*. This estimate was derived from a literal interpretation of the penetration rates, based on the first occurrence of 20 spf from each boring.

Based on the subsurface information, we estimate that conventional heavy-duty grading equipment will experience very difficult ripping and will likely require blasting as excavations are extended beyond the rippable weathered mantle. Blasting techniques 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.

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. Therefore, prospective contractors should use their own judgment and interpretation of the data presented in [Appendix A](#) to evaluate rippability and excavation production rates. Consideration should also be given to performing test pits and/or trial ripping to assist in determining the appropriate excavation methods, equipment and costs associated with excavating the materials on site.

Earthwork should be carefully planned to efficiently utilize available rock placement areas based on the rock restriction criteria provided herein. Roadway/utility corridors and lot undercutting criteria should also be considered when calculating the volume of hard rock. Oversized materials should be placed in accordance with rock placement procedures presented in [Appendix B](#) of this report and the City of San Marcos Grading Requirements.

6. GROUNDWATER

Minor seepage was observed in a few of the subsurface excavations, particularly within the lower drainage area along the southern boundary. Since the existing groundwater levels, especially in the low-lying alluvial areas, are expected to fluctuate seasonally, remedial grading may encounter wet soils and experience excavation and compaction difficulties due to wet and/or saturated soil conditions.

Due to the geologic conditions, a canyon subdrain will be necessary to intercept and convey groundwater migrating within the southern portion of the site. The proposed canyon subdrain location is shown on the *Geologic Map*.

7. GEOLOGIC HAZARDS

7.1 Ground Rupture

USGS (2016) shows that no mapped Quaternary faults cross or trend toward the property. In addition, the site is not located within the currently established Alquist-Priolo Earthquake Fault Zone. The nearest known active faults are the Rose Canyon/Newport-Inglewood Fault Zone, located approximately 10 miles west of the site.

7.2 Seismicity

The San Diego County and Southern California region is seismically active. Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be performed in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency. The risk associated with strong ground shaking due to earthquakes at the site is no greater than that for the region.

7.3 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If all four criteria are met, a seismic event could result in a rapid increase in pore water pressure from the earthquake-generated ground accelerations. The potential for liquefaction at the site is considered low due to removal of compressible deposits that will occur during grading, the lack of permanent, near-surface groundwater and the dense nature of the underlying granitic bedrock.

7.4 Landslides

No evidence of ancient landslide deposits was encountered at the site during our previous studies.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

- 8.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the development of the property as proposed, provided the recommendations of this update report are followed.
- 8.1.2 The site is underlain by surficial deposits, including undocumented fill, topsoil, alluvium, colluvium, as well as granitic rock. The surficial deposits are unsuitable in their current condition and will require remedial grading that includes removal and compaction, in areas where improvements are planned.
- 8.1.3 The presence of hard rock within proposed cut areas will require special consideration during site development. Excavations are anticipated to encounter difficult ripping conditions using conventional heavy-duty equipment. Where fresh granitic rock is present, blasting is expected and will likely generate oversize materials and corestones that will require special handling and specific fill placement procedures, as discussed further herein. **A supplemental study should be considered to better define the extent of hard rock in the primary excavation areas based on the revised grading plan.**
- 8.1.4 Cut slopes should be observed during grading by an engineering geologist to verify that soil and geologic conditions are consistent with those anticipated. Additionally, scaling of loose rock fragments from cut slope faces may also be necessary to ensure slope stability.
- 8.1.5 The proposed structures can be supported by conventional continuous and isolated spread foundations supported entirely in compacted fill.
- 8.1.6 The proposed structures can be supported by conventional continuous and isolated spread foundations supported entirely in compacted fill.
- 8.1.7 For projects that require select grading, the **contractor should carefully evaluate** the various soil and rock materials and potential placement zones on-site to ensure compliance with the geotechnical recommendations specified in this report (e.g. burial of oversized rock, expansive soil, etc.). Special handling and/or stockpiling of “select materials” may be necessary to meet the project specifications for slope zones, wall backfill (masonry block and MSE), capping,

buttress and/or stability fill construction, or other specific needs. It is the contractor's responsibility to review the report, plan their grading logistics, and determine whether the quantity of on-site "select materials" is sufficient to satisfy the project recommendations. If the volume of available "select materials" and/or placement zones are insufficient, Geocon should be notified for further evaluation and possible modification of our recommendations.

8.2 Canyon Subdrains

- 8.2.1 The geologic units encountered on the site have permeability characteristics and fracture systems that could be susceptible to groundwater transmission. Therefore, a canyon subdrain is recommended to collect subsurface water in areas of planned development where the maximum fill thickness is 10 feet or greater and there are no potential conflicts with future utilities. The recommended canyon subdrain location is presented on [Figure 2](#); however, the need for additional subdrains and their locations may be modified depending on the conditions encountered in the field. Recommendations for canyon subdrains are detailed in Section 7 of [Appendix B](#).
- 8.2.2 Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain location and prepare an "as-built" map depicting its location and elevation.

8.3 Excavation and Soil Characteristics

- 8.3.1 Excavation of the topsoil, alluvium, and colluvium should be possible with light to moderate effort using conventional heavy-duty equipment. Excavations extending into the undocumented fill will likely encounter very difficult excavation conditions due to the presence of oversize materials, which may require additional handling and secondary breaking. In addition, the surficial deposits may be very moist to saturated during the winter or early spring depending on preceding precipitation. Overly wet soils will require drying or mixing with drier material prior to their use as compacted fill.
- 8.3.2 Excavating within the rock units will generally vary in difficulty with the depth of excavation and degree of weathering. It is anticipated that the proposed excavations will encounter heavy ripping conditions with conventional heavy-duty equipment. Blasting will be required where excavations extend beyond the weathered rock mantle and where unweathered boulders or "core" stones are encountered in proposed cut areas. Oversize rock (material >12 inches) should be placed in accordance with [Appendix B](#) 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.

- 8.3.3 The soils encountered in the field investigation are considered to be both “non-expansive” (expansion index [EI] less than 20) and “expansive” (expansion index [EI] of 20 or more) as defined by 2025 California Building Code (CBC) Section 1803.5.3. The table below presents soil classifications based on the expansion index. We expect a majority of the soil encountered possesses a “very low” to “low” expansion potential (expansion index of 50 or less).

EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM 4829 Expansion Classification	2025 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

- 8.3.4 Previous laboratory test results indicate that the near-surface on-site materials at the locations tested possess *Not Applicable* sulfate severity to concrete structures as defined by 2025 CBC Section 1904 and ACI 318-19 Chapter 19. The table below presents a summary of concrete requirements set forth by 2025 CBC Section 1904 and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO ₄) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight ¹	Minimum Compressive Strength (psi)
S0	SO ₄ <0.10	No Type Restriction	n/a	2,500
S1	0.10≤SO ₄ <0.20	II	0.50	4,000
S2	0.20≤SO ₄ ≤2.00	V	0.45	4,500
S3	SO ₄ >2.00	V+Pozzolan or Slag	0.45	4,500
		V	0.40	5,000

¹ Maximum water to cement ratio limits do not apply to lightweight concrete

- 8.3.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, we recommend that further evaluation by a corrosion engineer be performed.

8.4 Grading Recommendations

- 8.4.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* contained in [Appendix B](#). Where the recommendations of this section conflict with [Appendix B](#), the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.
- 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 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 are relatively free of organic matter and construction debris. Material generated during stripping and/or site demolition should be exported from the site.
- 8.4.4 The surficial deposits should be removed to expose granitic rock, moisture conditioned, and properly compacted to provide uniform foundation conditions. The actual extent of unsuitable soil removal will be determined in the field by the geotechnical engineer and/or engineering geologist.
- 8.4.5 After removal of unsuitable materials is performed, 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 maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.
- 8.4.6 Prior to placing fill, the ground surface should be scarified to a depth of 12 inches (except in unweathered rock areas), moisture conditioned and compacted to a dry density of at least

90 percent of the laboratory maximum dry density near to slightly above optimum moisture content, as determined by ASTM Test Method D 1557.

- 8.4.7 Where practical, the upper 3 feet of the building pads should be comprised of soil with a “very low” to “low” expansion potential (i.e., Expansion Index of 50 or less). The more highly expansive fill soils should be placed in the deeper fill areas, if present.
- 8.4.8 Oversize material (defined as material greater than 12 inches in nominal dimension) will likely be generated during remedial grading and/or excavations performed within the rock units. Placement of oversize material within fills should be conducted in accordance with the recommendations in [Appendix B](#). Grading operations on the site should be managed to allow for oversize materials to be placed in designated rock placement areas and/or deeper fills.
- 8.4.9 Recommendations for the handling and placement of oversized rock in fill areas are presented on [Figure 3](#) and [Appendix B](#) of this report. In general, structural fill placed and compacted at the site should be placed as follows:
- Zone A:* Material placed within 3 feet from building pad grade and, parkways and street grade should consist of soil fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent of the soil passing the $\frac{3}{4}$ -inch sieve and should have at least 20 percent of the soil passing the No. 4 sieve.
- Zone B:* Soil fill with rock up to 1 foot in maximum dimension. Zone B should extend to at least 2 feet below the deepest utility in roadway and utility areas. See [Figure 3](#) for minimum thickness within this zone.
- Zone C:* Rock fill or soil-rock fill generally consisting of 2-foot minus rock material with occasional rock up to 4 foot in maximum dimension. Alternatively, rock 2 to 4 feet in maximum dimension can be placed in windrows spaced a minimum of 12 feet apart. The voids around and beneath the rock should be filled with soil possessing a sand equivalent of at least 30.
- Zone D:* Fill slopes should contain soil fill with rock up to 1 foot in maximum dimension. See [Figure 3](#) for minimum thickness of zone.
- 8.4.10 To reduce the potential for differential settlement and to facilitate foundation and shallow utility excavations, it is recommended that all cut pads and cut/fill transition building pads be undercut at least 3 feet and sloped towards the front of the lots. Where the thickness of the fill below the building pad exceeds 15 feet, the depth of the undercut should be

increased to one-fifth of the maximum fill thickness. In addition, roadway and utility areas where rock is present, should be undercut to a depth of at least 2 feet below the lowest utility.

- 8.4.11 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations in order to maintain safety and maintain the stability of adjacent existing improvements.
- 8.4.12 Import fill should consist of granular materials with a “very low” to “low” expansion potential (EI of 50 or less) free of deleterious material or stones larger than 3 inches and should be compacted as recommended above. Geocon Incorporated should be notified of the import soil source and should perform laboratory testing of import soil prior to its arrival at the site to determine its suitability as fill material.

8.5 Seismic Design Criteria

- 8.5.1 The seismic provisions of the 2025 California Building Code (CBC) are based on the American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI) publication: ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-22). For seismic design purposes, sites are classified based on the average shear wave velocity, $\bar{v}_s$, from the ground surface to a depth of 100 feet. The following table presents the Site Classifications based on ASCE 7-22.

SITE CLASSIFICATION

Site Class	Average Shear Wave Velocity, $\bar{v}_s$ (Feet/Second)
A– Hard Rock	5,000+
B– Medium Hard Rock	3,000 to 5,000
BC– Soft Rock	2,100 to 3,000
C– Very Dense Sand or Hard Clay	1,450 to 2,100
CD– Dense Sand or Very Stiff Clay	1,000 to 1,450
D– Medium Dense Sand or Stiff Clay	700 to 1,000
DE– Loose Sand or Medium Stiff Clay	500 to 700
E– Very Loose Sand or Soft Clay	Less Than 500
F– Soils Requiring Site Response Analysis	n/a

- 8.5.2 Where shear wave velocity is not directly measured at the project site, appropriate generalized correlations between shear wave velocity and standard penetration test (SPT)

blow counts, Cone Penetration Test (CPT) data, shear strength, or other geotechnical parameters can be used to estimate the shear wave velocity profile. These correlations can be applied where the data extends at least 50 feet deep and where we expect the geology/soil conditions do not possess soft layers below the maximum exploration depth.

- 8.5.3 For this project, site exploration was performed to a maximum depth of approximately 29 feet. Therefore, the seismic design parameters shall be based on the “default” condition, which is the most critical spectral response acceleration at each period of Site Classes C, CD, and D.
- 8.5.4 We used the online ASCE Hazard Tool (<https://ascehazardtool.org>) to evaluate the code-based seismic design parameters in accordance with ASCE 7-22. The results are summarized in the following table.

SEISMIC DESIGN PARAMETERS

Parameter		Value	ASCE 7-22 Reference
Site Class		Default	Table 20.1-1
S_s	MCE _R 5% Damped Spectral Response Acceleration at a Period of 0.2 Seconds for Site Class BC	1.04	USGS Seismic Design Geodatabase
S_1	MCE _R 5% Damped Spectral Response Acceleration at a Period of 1 Second for Site Class BC	0.33	
S_{MS}	MCE _R 5% Damped Spectral Response Acceleration at Short Periods Adjusted for Site Class	1.34	
S_{M1}	MCE _R 5% Damped Spectral Response Acceleration at a Period of 1 Second Adjusted for Site Class	0.86	
S_{DS}	Design, 5% Damped Spectral Response Acceleration at Short Periods	0.89	Equation 11.4-1
S_{D1}	Design, 5% Damped Spectral Response Acceleration at a Period of 1 Second	0.58	Equation 11.4-2
PGA_M	Maximum Considered Earthquake Geometric Mean (MCE _G) Peak Ground Acceleration	0.50	USGS Seismic Design Geodatabase

- 8.5.5 The multi-period MCE_R response spectra provided in the ASCE Hazard Tool report is presented as [Figure 4](#). The two-period MCE_R response spectra may be constructed based on ASCE 7-22 Section 11.4.5.2 using the values in the table above.
- 8.5.6 Conformance to the criteria in this section for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in

the event of a large earthquake. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

- 8.5.7 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D. The table below presents a summary of the risk categories in accordance with ASCE 7-22.

ASCE 7-22 RISK CATEGORIES

Risk Category	Building Use	Examples
I	Low risk to Human Life at Failure	Barn, Storage Shelter
II	Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV)	Residential, Commercial and Industrial Buildings
III	Substantial Risk to Human Life at Failure	Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins
IV	Essential Facilities	Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage

8.6 Foundation and Concrete Slabs-On-Grade Recommendations

- 8.6.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in the following table.

FOUNDATION CATEGORY CRITERIA

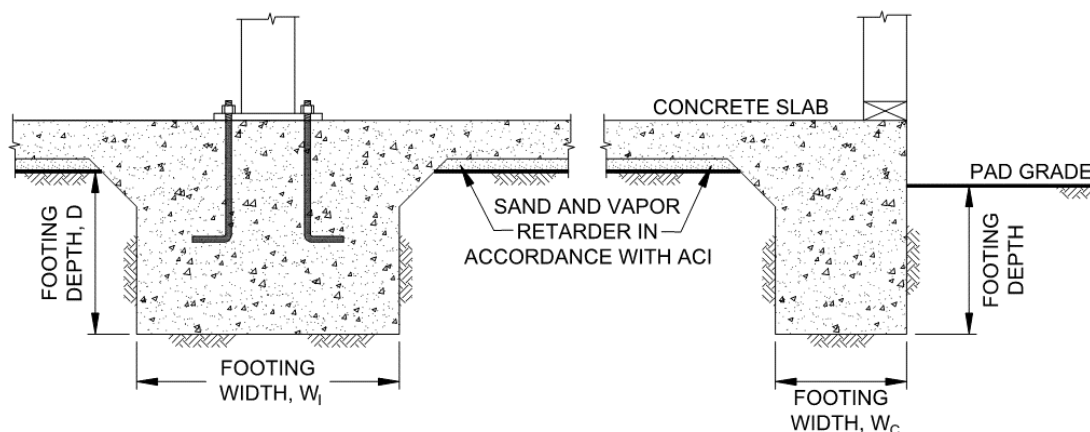
Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	$T < 20$	--	$EI \leq 50$
II	$20 \leq T < 50$	$10 \leq D < 20$	$50 < EI \leq 90$
III	$T \geq 50$	$D \geq 20$	$90 < EI \leq 130$

- 8.6.2 We will provide final foundation categories for each building or lot after finish pad grades have been achieved, the underlying fill-bedrock geometry is evaluated and we perform laboratory testing of the subgrade soil.
- 8.6.3 The following table presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth, D (inches)	Minimum Continuous Footing Reinforcement	Minimum Footing Width (Inches)
I	12	Two No. 4 bars, one top and one bottom	12 – Continuous, W_c 24 – Isolated, W_i
II	18	Four No. 4 bars, two top and two bottom	
III	24	Four No. 5 bars, two top and two bottom	

- 8.6.4 The foundations should be embedded in accordance with the recommendations herein and the Wall/Column Footing Dimension Detail. The embedment depths should be measured from the lowest adjacent pad grade for both interior and exterior footings. 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 (unless designed with a post-tensioned foundation system as discussed herein).



Wall/Column Footing Dimension Detail

- 8.6.5 The proposed structures can be supported on a shallow foundation system founded in the compacted fill. The following table provides a summary of the foundation design recommendations.

SUMMARY OF FOUNDATION RECOMMENDATIONS

Parameter	Value
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Total Static Settlement*	1 Inch
Estimated Differential Static Settlement*	½ Inch in 40 Feet

- 8.6.6 The bearing capacity values presented herein are for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.
- 8.6.7 The concrete slab-on-grades should be designed in accordance with the following table.

CONVENTIONAL SLAB-ON-GRADE RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Concrete Slab Thickness (inches)	Interior Slab Reinforcement	Typical Slab Underlayment
I	4	6 x 6 - 10/10 welded wire mesh at slab mid-point	3 to 4 Inches of Sand/Gravel/Base
II	4	No. 3 bars at 24 inches on center, both directions	
III	5	No. 3 bars at 18 inches on center, both directions	

- 8.6.8 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. 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). The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

- 8.6.9 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. It is common to see 3 inches and 4 inches of sand below the concrete slab-on-grade for 5-inch and 4-inch thick slabs, respectively, in the southern California area. 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 plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.
- 8.6.10 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 (foundation dimensions and embedment depths, slab thickness and steel placement) should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2025 California Building Code (CBC Section 1808.6.2). 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 in the following table for the particular Foundation Category designated. The parameters presented in the following table are based on the guidelines presented in the PTI DC 10.5 design manual.

POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) DC10.5 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

- 8.6.11 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.
- 8.6.12 If the structural engineer proposes a post-tensioned foundation design method other than PTI, DC 10.5:
- The deflection criteria presented in the previous table 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.
- 8.6.13 Foundation systems for the lots that possess a foundation Category I and a “very low” expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2025 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI, DC 10.5) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.
- 8.6.14 If an alternate design method is contemplated, Geocon Incorporated should be contacted to evaluate if additional expansion index testing should be performed to identify the lots that possess a “very low” expansion potential (expansion index of 20 or less).
- 8.6.15 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift from tensioning, 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 structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.
- 8.6.16 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 unless designed by the structural engineer.

- 8.6.17 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 in both directions. 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.
- 8.6.18 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.
- 8.6.19 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.
- 8.6.20 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation 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, 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. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. 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.

- 8.6.21 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill 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 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.
- 8.6.22 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.
- 8.6.23 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.
- 8.6.24 We should observe the foundation excavations prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have

been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

8.7 Exterior Concrete Flatwork

- 8.7.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations presented in the following table. The recommended steel reinforcement would help reduce the potential for cracking.

MINIMUM CONCRETE FLATWORK RECOMMENDATIONS

Expansion Index, EI	Minimum Steel Reinforcement* Options	Minimum Thickness
EI ≤ 50	6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh	4 Inches
	No. 3 Bars 18 inches on center, Both Directions	

*In excess of 8 feet square.

- 8.7.2 The subgrade soil should be properly moisturized and compacted prior to the placement of steel and concrete. The subgrade soil should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557.
- 8.7.3 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The steel reinforcement should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.
- 8.7.4 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete.

- 8.7.5 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.
- 8.7.6 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

8.8 Conventional Retaining Walls

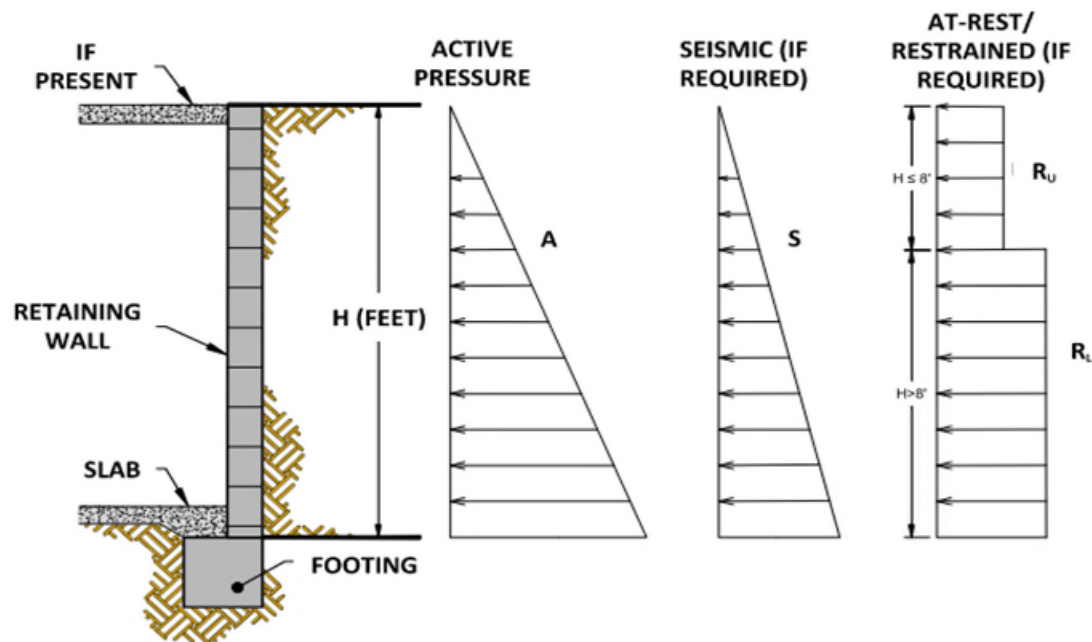
- 8.8.1 Retaining walls should be designed using the values presented in the following table. Soil with an expansion index (EI) of greater than 50 should not be used as backfill material behind retaining walls.

RETAINING WALL DESIGN RECOMMENDATIONS

Parameter	Value
Active Soil Pressure, A (Fluid Density, Level Backfill)	35 pcf
Active Soil Pressure, A (Fluid Density, 2:1 Sloping Backfill)	50 pcf
Seismic Pressure, S	17H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_u (0 to 8 Feet High)	8H psf
At-Rest/Restrained Walls Additional Uniform Pressure, R_L (8+ Feet High)	12H psf
Expected Expansion Index for the Subject Property	$EI \leq 50$

H equals the height of the retaining portion of the wall

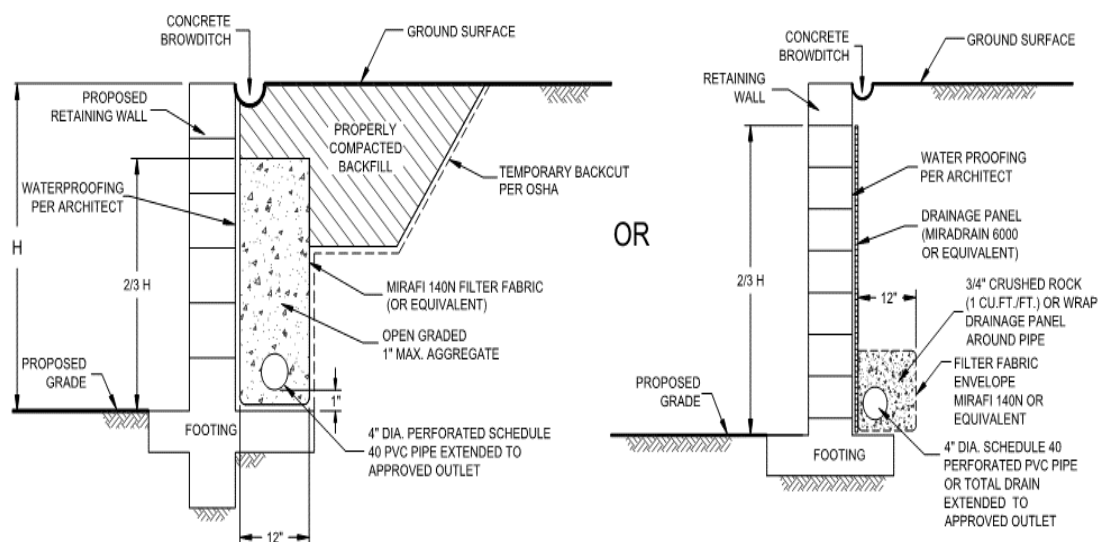
- 8.8.2 The project retaining walls should be designed as shown in the Retaining Wall Loading Diagram.



Retaining Wall Loading Diagram

- 8.8.3 Unrestrained walls are those that are allowed to rotate more than $0.001H$ (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top (at-rest condition), an additional uniform pressure should be applied to the wall. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.
- 8.8.4 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2025 CBC or Section 11.6 of ASCE 7-16. For structures assigned to 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 2025 CBC. The seismic load is dependent on the retained height where H is the height of 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 wall.
- 8.8.5 Retaining walls should be designed to ensure stability against overturning sliding, and excessive foundation pressure. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

- 8.8.6 Drainage openings through the base of the wall (weep holes) should not be used where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted granular (EI of 50 or less) free draining backfill material with no hydrostatic forces or imposed surcharge load. The retaining wall should be properly drained as shown in the Typical Retaining Wall Drainage Detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.



Typical Retaining Wall Drainage Detail

- 8.8.7 The retaining walls may be designed using either the active and restrained (at-rest) loading condition or the active and seismic loading condition as suggested by the structural engineer. Typically, it appears the design of the restrained condition for retaining wall loading may be adequate for the seismic design of the retaining walls. However, the active earth pressure combined with the seismic design load should be reviewed and also considered in the design of the retaining walls.
- 8.8.8 In general, wall foundations should be designed in accordance with the following table. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, retaining wall foundations should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

SUMMARY OF RETAINING WALL FOUNDATION RECOMMENDATIONS

Parameter	Value
Minimum Retaining Wall Foundation Width	12 inches
Minimum Retaining Wall Foundation Depth	12 Inches
Minimum Steel Reinforcement	Per Structural Engineer
Allowable Bearing Capacity	2,000 psf
Bearing Capacity Increase	500 psf per Foot of Depth
	300 psf per Foot of Width
Maximum Allowable Bearing Capacity	4,000 psf
Estimated Total Static Settlement*	1 Inch
Estimated Differential Static Settlement*	½ Inch in 40 Feet

- 8.8.9 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls. In the event that other types of walls (such as mechanically stabilized earth [MSE] walls) are planned, Geocon Incorporated should be consulted for additional recommendations.
- 8.8.10 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 retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.
- 8.8.11 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time, Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

8.9 Mechanically Stabilized Earth Retaining Walls

- 8.9.1 Mechanized stabilized earth (MSE) retaining walls can be utilized for the project. The soil parameters provided below are based on our experience and laboratory testing of selected

onsite materials collected during previous studies. These parameters may be used for preliminary design and should be verified prior to placement.

- 8.9.2 It is anticipated that imported and/or onsite soil will be used in the three zones comprising a typical MSE wall system (see table below). Once the proposed materials have been selected and/or stockpiled, sufficient laboratory testing should be conducted on representative samples to verify compliance with the design parameters. If test results differ from the assumed values, the designer may need to modify the original design (e.g., increase reinforcement embedment lengths).
- 8.9.3 A peak ground acceleration adjusted for Site Class effects, PGA_M , of 0.50g was calculated from ASCE 7-22 Section 11.8.3.

GEOTECHNICAL PARAMETERS FOR MSE WALLS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	30 degrees	30 degrees	30 degrees
Cohesion	0 psf	0 psf	0 psf
Wet Unit Density	125 pcf	125 pcf	125 pcf

- 8.9.4 The designer should verify that temporary backcuts and installation of grids can be accomplished considering property boundaries and other constraints. Additionally, the designer should verify that proposed improvements, such as building foundations and underground utilities, do not interfere with the wall system.
- 8.9.5 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density at or slightly above optimum moisture content in accordance with ASTM D 1557. Heavy compaction equipment is generally excluded from within 3 feet of the wall face; instead, smaller equipment (e.g., walk-behind or self-driven compactors, hand whackers) should be used to prevent wall deformation. If compactive effort cannot be performed along the wall face, the designer should take this into consideration for their design.
- 8.9.6 The wall should be designed with a drainage system sufficient to prevent hydrostatic pressures behind the wall.

- 8.9.7 Geosynthetic reinforcement must elongate to develop full tensile resistance, which typically results in movement at the top of the wall. The extent of this movement depends on the height of the wall (e.g., taller walls experience greater rotation) and the type of reinforcing grid used. Additionally, over time, the reinforcement grid may exhibit creep, leading to further movement. Given these factors, the owner should be aware that structures, pavement and other improvements placed within the reinforced and retained zones of the wall may experience movement.
- 8.9.8 Geocon Incorporated should review the wall plans prior to final design submittal to verify that the geotechnical design parameters provided herein have been incorporated into the design and to evaluate whether additional analyses and/or recommendations are required.

8.10 Lateral Loading

- 8.10.1 The following table should be used to help design the proposed structures and improvements to resist lateral loads for the design of footings or shear keys. The allowable passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

SUMMARY OF LATERAL LOAD DESIGN RECOMMENDATIONS

Parameter	Value
Passive Pressure Fluid Density	350 pcf
Coefficient of Friction (Concrete and Soil)	0.35
Coefficient of Friction (Along Vapor Barrier)	0.2 to 0.25*

*Per manufacturer's recommendations.

- 8.10.2 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

8.11 Preliminary Pavement Recommendations

- 8.11.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for parking stalls, driveways, medium

truck traffic areas, and heavy truck traffic areas, respectively. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections for the proposed roads and parking lots should be based on the R-Value of the subgrade soil encountered at final subgrade elevation. We have assumed an R-Value of 10 for the subgrade soil and 78 for the base material for the purposes of this preliminary analysis. The following table presents the preliminary flexible pavement sections.

PRELIMINARY FLEXIBLE PAVEMENT SECTION

Location	Assumed Traffic Index	Assumed Subgrade R-Value	Asphalt Concrete (Inches)	Class 2 Aggregate Base (Inches)
Parking Stalls for Automobiles and Light-Duty Vehicles	5.0	10	3	9
Light Truck Traffic Areas	5.5	10	3	11
Medium Truck Traffic Areas	6.0	10	3	13
Heavy Truck Traffic Areas	7.0	10	4	15

- 8.11.2 Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned as necessary, and recompact to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. Similarly, the base material should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.
- 8.11.3 Base materials should conform to Section 26-1.02B of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with a $\frac{3}{4}$ -inch maximum size aggregate. Asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook)*.
- 8.11.4 A rigid Portland cement concrete (PCC) pavement section should be placed in roadway aprons and cross gutters. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330-21 *Commercial Concrete Parking Lots and Site Paving Design and Construction – Guide*. We used

the following traffic categories and design parameters used for the calculations for 20-year design life.

TRAFFIC CATEGORIES

Traffic Category	Description	Reliability (%)	Slabs Cracked at End of Design Life (%)
A	Car Parking Areas and Access Lanes	60	15
B	Entrance and Truck Service Lanes	60	15
C	School or City Buses (Excluding Large Articulated Buses)	75	15
D	Heavy Duty Trucks (80-Kip Gross Weight)	75	15
E	Garbage or Fire Truck Lane	75	15

- 8.11.5 We used the parameters presented in the following table to calculate the PCC pavement sections.

RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	Design Value
Modulus of Subgrade Reaction, k	50 pci
Modulus of Rupture for Concrete, M_R	500 psi
Concrete Compressive Strength	3,000 psi
Concrete Modulus of Elasticity, E	3,150,000 psi

- 8.11.6 Based on the criteria presented herein, the PCC pavement sections should have the following minimum thicknesses for the applicable traffic category.

RIGID VEHICULAR PAVEMENT RECOMMENDATIONS

Traffic Category	Trucks Per Day	Portland Cement Concrete, T (Inches)
A = Car Parking Areas and Access Lanes	10	6
B = Entrance and Truck Service Lanes	10	6.5
C = School or City Buses	50	10.5
D = Heavy Duty Trucks	50	7
E = Garbage or Fire Truck Lanes	5	7.5

- 8.11.7 The PCC vehicular pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above

optimum moisture content. The garbage truck pad should be large enough such that all wheels are on the concrete pad during the loading operations.

- 8.11.8 Adequate joint spacing should be incorporated into the design and construction of the rigid pavement in accordance with the following table.

MAXIMUM JOINT SPACING

Pavement Thickness, T (Inches)	Maximum Joint Spacing (Feet)
$4 < T < 5$	10
$5 \leq T < 6$	12.5
$6 \leq T$	15

- 8.11.9 The rigid pavement should also be designed and constructed incorporating the following parameters.

ADDITIONAL RIGID PAVEMENT RECOMMENDATIONS

Subject	Value
Thickened Edge	1.2 Times Slab Thickness Adjacent to Structures
	1.5 Times Slab Thickness Adjacent to Soil
	Minimum Increase of 2 Inches
	4 Feet Wide
Crack Control Joint Depth	Early Entry Sawn = $T/6$ to $T/5$, 1.25 Inch Minimum
	Conventional (Tooled or Conventional Sawing) = $T/4$ to $T/3$
Crack Control Joint Width	$\frac{1}{4}$ -Inch for Sealed Joints and Per Sealer Manufacturer's Recommendations
	$\frac{1}{16}$ - to $\frac{1}{4}$ -Inch is Common for Unsealed Joints

- 8.11.10 Reinforcing steel will not be necessary within the concrete for geotechnical purposes.
- 8.11.11 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be in accordance with the referenced ACI guide.

- 8.11.12 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab.
- 8.11.13 Concrete curb/gutter should be placed on soil subgrade compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Cross-gutters that receive vehicular traffic should be placed on subgrade soil compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Base materials should not be placed below the curb/gutter, or cross-gutters so water is not able to migrate from the adjacent parkways to the pavement sections. Where flatwork is located directly adjacent to the curb/gutter, the concrete flatwork should be structurally connected to the curbs to help reduce the potential for offsets between the curbs and the flatwork.

8.12.0 Storm Water Management

- 8.12.1 If low-impact development (LID) best management practices (BMP's) are being considered, Geocon should review the design and provide specific geotechnical recommendations to reduce the potential adverse impacts to both on and off-site properties.
- 8.12.2 If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeology study at the site. Down-gradient 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.
- 8.12.3 Based on the City of San Marcos storm water standards manual, full or partial infiltration is considered infeasible and the site exhibits a "no infiltration" and "restricted" condition due to the proposed compacted fill, expected infiltration rates of the underlying very dense formational materials, slope stability, daylight water seepage, proximity to existing utilities, and potential for lateral water migration to adversely impact nearby public and private improvements.

- 8.12.4 Due to site soil and geologic conditions, liners and subdrains should be incorporated into the design and construction of any planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 4 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. The penetration of the liners at the subdrains should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

8.13. Site Drainage and Moisture Protection

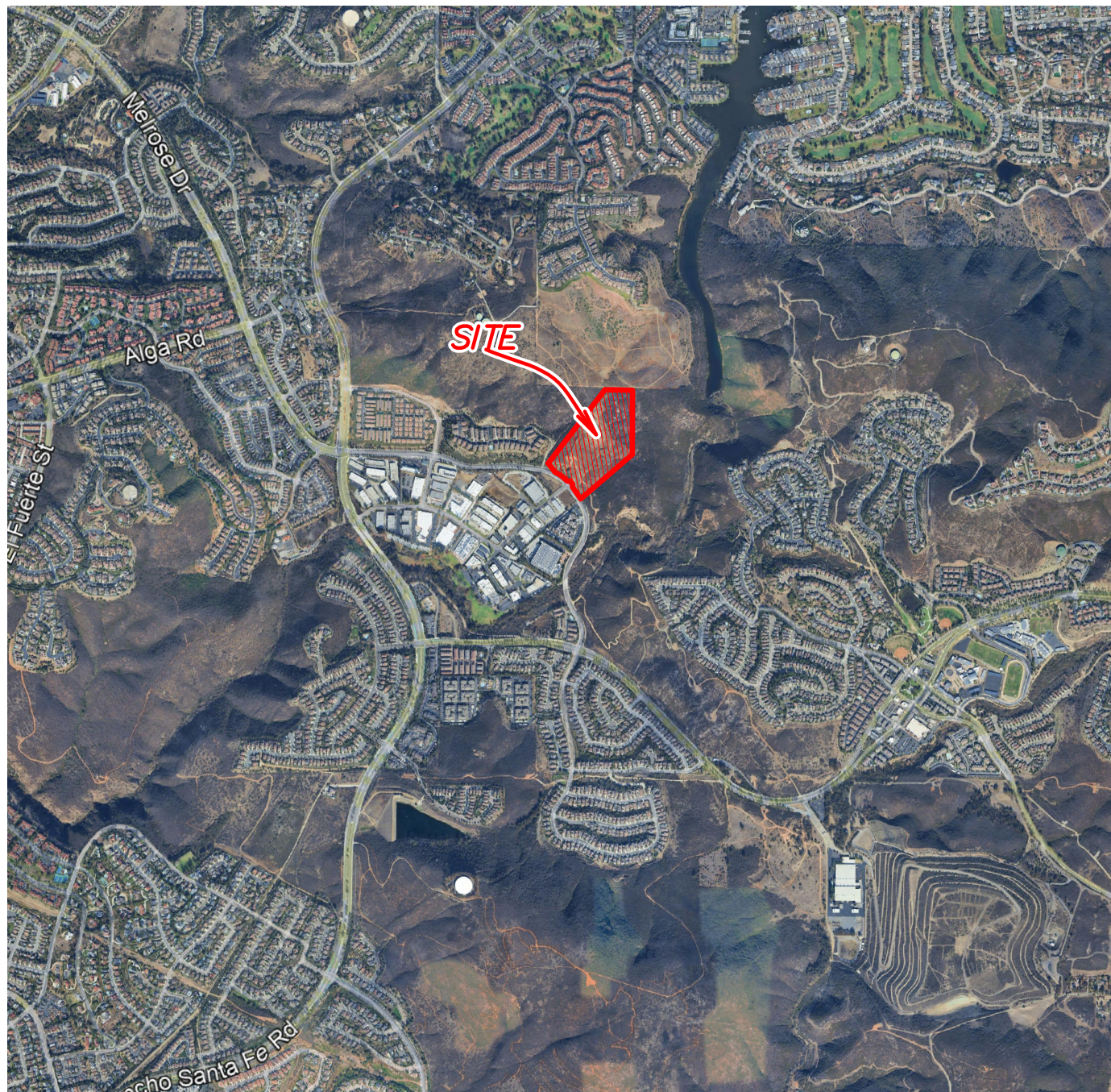
- 8.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2025 CBC 1804.3 or other applicable standards. In addition, surface drainage should be directed away from 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 structure.
- 8.13.2 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.

8.14. Grading and Foundation Plan Review

- 8.14.1 Geocon Incorporated should review the grading and foundation 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

GEOCON
INCORPORATED



GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

MELROSE AND DIAMOND PROJECT SAN MARCOS, CALIFORNIA

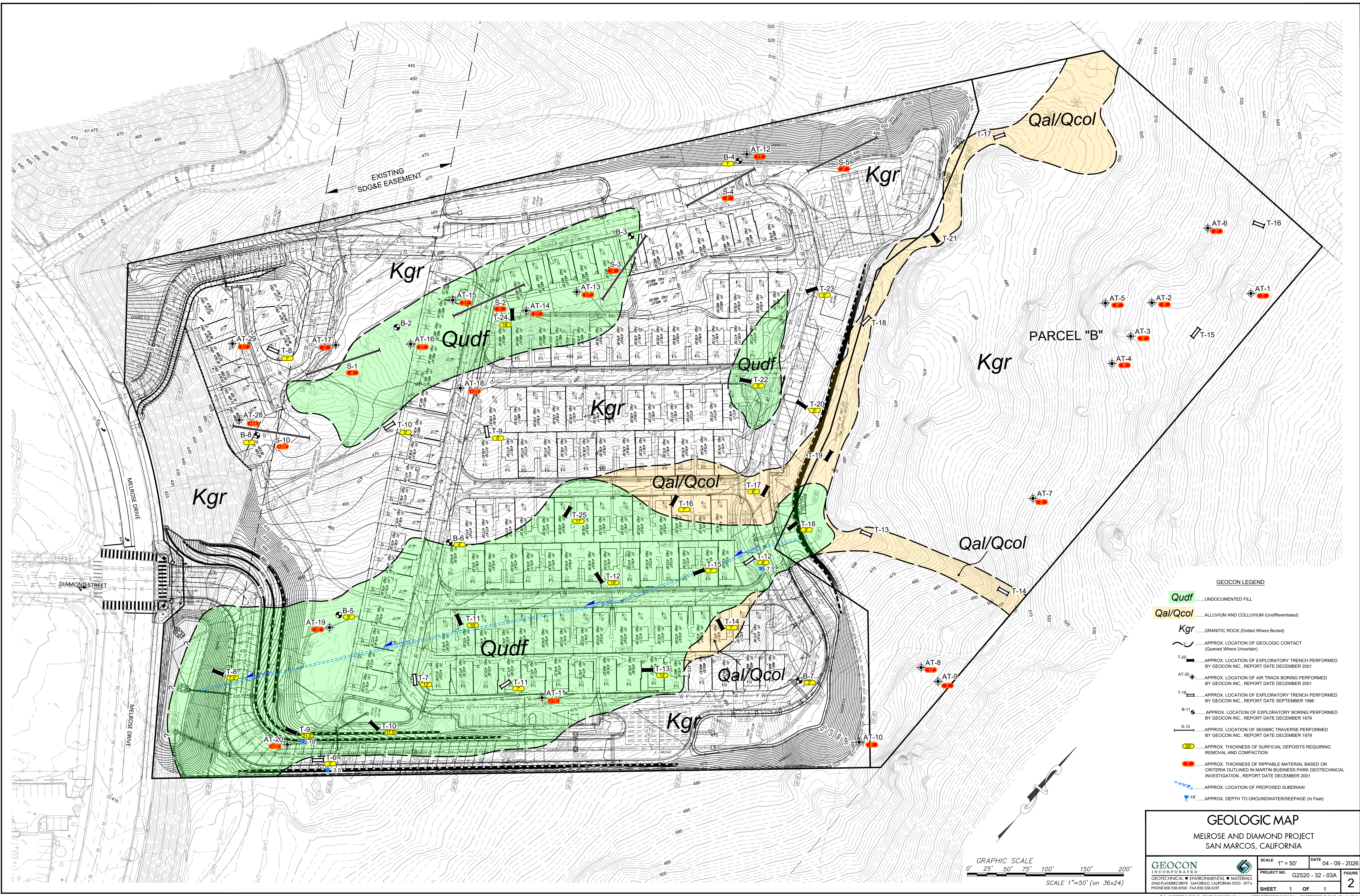
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DSK/GTYPD

DATE 04 - 09 - 2026

PROJECT NO. G2520 - 32 - 03A

FIG. 1



- GEOCON LEGEND**
- Qudf** UNDOCUMENTED FILL
 - Qal/Qcol** ALLUVIUM AND COLLUVIUM (Undifferentiated)
 - Kgr** GRANITIC ROCK (Dotted Where Buried)
 - APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
 - T-25 APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY GEOCON INC., REPORT DATE DECEMBER 2001
 - AT-30 APPROX. LOCATION OF AIR TRACK BORING PERFORMED BY GEOCON INC., REPORT DATE DECEMBER 2001
 - T-18 APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED BY GEOCON INC., REPORT DATE SEPTEMBER 1986
 - B-11 APPROX. LOCATION OF EXPLORATORY BORINGS PERFORMED BY GEOCON INC., REPORT DATE DECEMBER 1979
 - S-12 APPROX. LOCATION OF SEISMIC TRAVERSE PERFORMED BY GEOCON INC., REPORT DATE DECEMBER 1979
 - 20' APPROX. THICKNESS OF SURFICIAL DEPOSITS REQUIRING REMOVAL AND COMPACTION
 - 10' APPROX. THICKNESS OF RIPPLE MATERIAL BASED ON CRITERIA OUTLINED IN MARTIN BUSINESS PARK GEOTECHNICAL INVESTIGATION, REPORT DATE DECEMBER 2001
 - APPROX. LOCATION OF PROPOSED SUBDRAIN
 - 19' APPROX. DEPTH TO GROUNDWATER/SEEPAGE (in Feet)

GEOLOGIC MAP

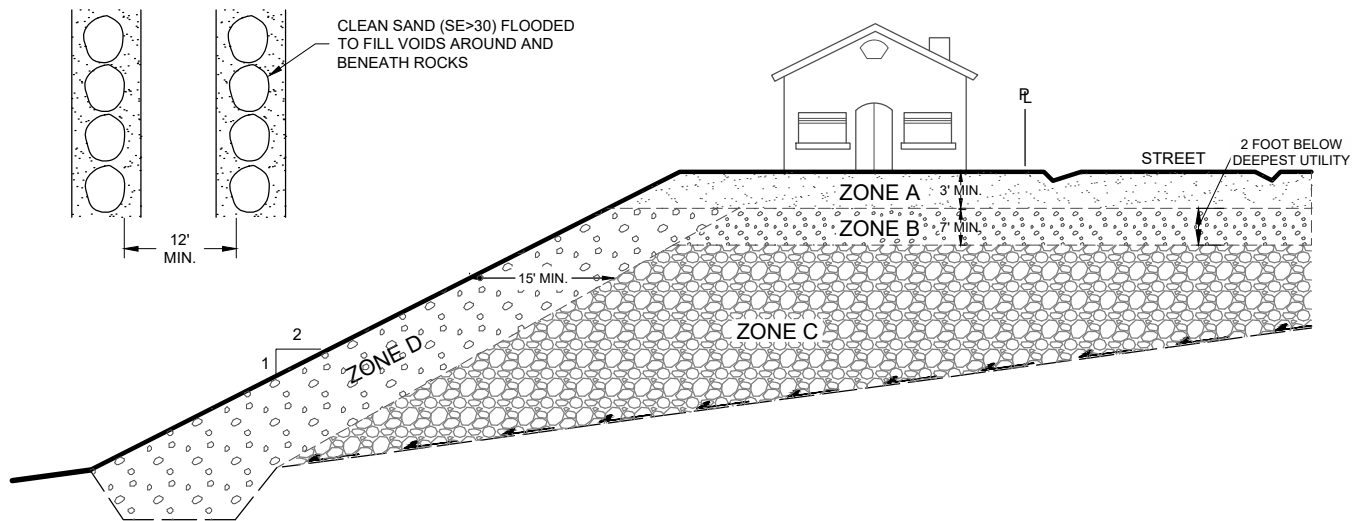
MELROSE AND DIAMOND PROJECT
SAN MARCOS, CALIFORNIA

GEOCON INCORPORATED GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974 PHONE 858 558-6900 - FAX 858 558-6159		SCALE 1" = 50'	DATE 04 - 09 - 2026
		PROJECT NO. G2520 - 32 - 03A	FIGURE 2
		SHEET 1 OF 1	

Printed 04/07/2026 8:15AM | By JONATHAN WILKINS | File Location: Y:\PROJECTS\G2520-32-03A Melrose\GHEET\G2520-32-03A GeoMap_Inv 01.dwg

ZONE B

WINDROWS DETAIL
(PLAN VIEW)



NO SCALE

LEGEND

ZONE A: COMPACTED SOIL FILL. NO ROCK FRAGMENTS OVER 6 INCHES IN DIMENSION.

ZONE B: ROCKS UP TO 1 FOOT IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL.

ZONE C: ROCK OR SOIL-ROCK FILL GENERALLY CONSISTING OF 2 FOOT MINUS MATERIAL WITH OCCASIONAL INDIVIDUAL FRAGMENTS UP TO 4 FEET MAXIMUM DIMENSION. ZONE C SHOULD TERMINATE AT LEAST 2 FEET BELOW LOWES UTILITY. ALTERNATE: ROCKS 2 TO 4 FEET IN MAXIMUM DIMENSION CAN BE PLACED IN WINDROWS IN COMPACTED SOIL FILL AND BACKFILLED WITH SOIL POSSESSING A SAND EQUIVALENT OF AT LEAST 30.

ZONE D: ROCKS UP TO 1 FOOT IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL.

NOTES

1. COMPACTED SOIL FILL IN UPPER 3 FEET SHALL CONTAIN AT LEAST 40 PERCENT SOIL PASSING THE 3/4 - INCH SIEVE (BY WEIGHT) AND AT LEAST 20% SOIL PASSING THE NO. 4 SIEVE (BY WEIGHT)
2. CONTINUOUS OBSERVATION REQUIRED BY GEOCON DURING ROCK PLACEMENT.

ROCK PLACEMENT DETAIL

GEOCON
INCORPORATED



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6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

MELROSE AND DIAMOND PROJECT
SAN MARCOS, CALIFORNIA

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DATE 04 - 09 - 2026

PROJECT NO. G2520 - 32 - 03A

FIG. 3

Period	Site Class C	Site Class CD	Site Class D	Controlling
0.00	0.51	0.56	0.57	0.57
0.01	0.51	0.56	0.57	0.57
0.02	0.52	0.56	0.57	0.57
0.03	0.56	0.59	0.59	0.59
0.05	0.70	0.71	0.67	0.71
0.08	0.91	0.90	0.85	0.91
0.10	1.06	1.07	1.02	1.07
0.15	1.22	1.27	1.25	1.27
0.20	1.25	1.37	1.38	1.38
0.25	1.21	1.39	1.45	1.45
0.30	1.13	1.37	1.49	1.49
0.40	0.98	1.26	1.44	1.44
0.50	0.86	1.15	1.36	1.36
0.75	0.63	0.87	1.07	1.07
1.00	0.48	0.68	0.86	0.86
1.50	0.31	0.45	0.60	0.60
2.00	0.23	0.33	0.45	0.45
3.00	0.14	0.21	0.29	0.29
4.00	0.10	0.15	0.20	0.20
5.00	0.08	0.11	0.15	0.15
7.50	0.06	0.07	0.10	0.10
10.00	0.04	0.05	0.07	0.07

Values are from <https://seismicmaps.org>



MULTI-PERIOD MCER SPECTRUM

Project No.: G2520-32-03A

Melrose and Diamond Project
San Marcos, CA

Apr 26

Figure 4

APPENDIX

A

APPENDIX A

**PREVIOUSLY REPORTED SUBSURFACE LOGS, SEISMIC REFRACTION
INFORMATION AND LABORATORY TESTING**

FOR

**MELROSE AND DIAMOND PROJECT
SAN MARCOS, CALIFORNIA**

PROJECT NO. G2520-32-03A

**TABLE A-I
SEISMIC TRAVERSES (GEOCON 1979)**

Seismic Traverse No.	Average Velocity (ft./sec.)			Average Depth (ft.)		Length of Traverse (ft.)	Approximate Maximum Depth Explored (ft.)
	V ₁	V ₂	V ₃	D ₁	D ₂		
S-1	1240	6640	---	4	---	100	30
S-2	1075	6460	---	3	---	100	30
S-3	1370	8580	---	4	---	100	30
S-4	1250	8025	---	4	---	100	30
S-5	1280	10,270	---	3	---	100	30
S-6	1370	8500	---	5	---	100	30
S-7	1370	8830	---	4	---	100	30
S-9	1370	6665	---	3	---	100	30
S-10	1250	4765	9000	3	20	100	30
S-12	1390	8040	---	3	---	100	30

V₁ = Velocity in feet per second of first layer of materials

V₂ = Second layer velocities

V₃ = Third layer velocities

D₁ = Depth in feet to base of first layer

D₂ = Depth to base of second layer

Note:

For mass grading, materials with velocities of less than 4500 fps are generally rippable with a D9 Caterpillar Tractor equipped with a single shank hydraulic ripper. Velocities of 4500 to 5500 fps indicate marginal ripping and blasting. Velocities greater than 5500 fps generally require pre-blasting. For trenching, materials with velocities less than 3800 fps are generally rippable depending upon the degree of fracturing and the presence or absence of boulders. Velocities between 3800 and 4300 fps generally indicate marginal ripping, and velocities greater than 4300 fps generally indicate non-rippable conditions. The above velocities are based on a Kohring 505.

The reported velocities represent average velocities over the length of each traverse, and should not generally be used for subsurface interpretation greater than 100 feet from a traverse.

**TABLE A-II
APPROXIMATE THICKNESS OF RIPPABLE ROCK (GEOCON 1979)**

Traverse No.	Approximate Thickness (ft.)*
S-1	4
S-2	3
S-3	4
S-4	4
S-5	3
S-6	5
S-7	4
S-9	3
S-10	Marginally rippable from 3 to 20 feet
S-12	3

*Assumes D9 Caterpillar tractor.

PROJECT NO. 06827-32-01

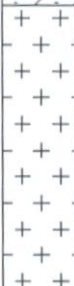
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 1		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					414	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				CL/SC	UNDOCUMENTED FILL Soft, damp, dark reddish-brown, fine to coarse Sandy CLAY/Clayey, fine to coarse SAND -Numerous 1 foot subangular rock fragments -Abundant stockpiles containing gravel and 2-3 foot boulders at surface				
2									
4					GRANITIC ROCK Moderately weathered, yellowish-brown, weak, GRANITIC ROCK -Becomes slightly weathered and highly fractured with moderate weathering along fractures at 4 feet -Excavates to fine to coarse, Silty SAND with 3 inch to 1 foot angular rock fragments -Numerous 2 foot fragments below 6 feet				
6									
8									
					TRENCH TERMINATED AT 8.5 FEET				

Figure A-1, Log of Trench T 1

MARBP

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. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 2		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					421	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0					UNDOCUMENTED FILL Medium dense, damp, yellowish-brown, Silty, fine to very coarse SAND with little clay and abundant subangular gravel -Becomes reddish-brown at 2.5 feet -Boulder stockpiles with boulders up to 2 feet at surface -Concrete debris at surface				
2				SM					
4									
6									
8					GRANITIC ROCK Moderately weathered, reddish-brown to yellowish-brown, moderately strong, GRANITIC ROCK -Excavates to Silty, fine to very coarse SAND with 1 to 4 inch angular rock fragments				
					TRENCH TERMINATED AT 8 FEET				

Figure A-2, Log of Trench T 2

MARBP

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. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 3		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					430	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				SM	ALLUVIUM/COLLUVIUM Loose, damp, reddish-brown to yellowish-brown, Silty, fine to coarse SAND with abundant gravel				
2					GRANITIC ROCK Slightly weathered, bluish-gray with some pink, strong to very strong, highly fractured GRANITIC ROCK				
4									
6									
8					-Minor seepage along fractures -Excavates to Silty, fine to very coarse SAND and 1 inch to 1 foot angular rock fragments -Occasional fragments up to 2 feet				
10					TRENCH TERMINATED AT 10 FEET				

Figure A-3, Log of Trench T 3

MARBP

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. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 4		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>448</u>	DATE COMPLETED <u>11/26/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0		+			GRANITIC ROCK(BLAST AFFECTED) Slightly weathered, grayish-brown to yellowish-brown, moderately strong to strong, highly fractured GRANITIC ROCK -Excavates to Silty, fine to very coarse SAND and 1-6 inch subangular rock fragments with occasional 1 foot fragments -Becomes bluish-gray, slightly weathered to fresh at 4 feet. Continuous to be highly fractured -Caving of trench walls from 0 to 10 feet -Easy to dig due to degree of fractured rock -Blasting wires observed in upper 5 feet				
		+							
		+							
2		+							
		+							
		+							
4		+							
		+							
		+							
6		+							
		+							
		+							
8		+							
		+							
		+							
10		+							
		+							
		+							
					TRENCH TERMINATED AT 11 FEET				

Figure A-4, Log of Trench T 4

MARBP

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. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 5		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>428</u>	DATE COMPLETED <u>11/26/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0		++			GRANITIC ROCK Highly weathered, reddish-brown, weak GRANITIC ROCK -Becomes slightly weathered and very strong at 1 foot -Excavates to Silty, fine to very coarse SAND with 1 inch to 6 inch angular fragments -Moderately fractured				
2		++							
					PRACTICAL REFUSAL AT 3 FEET				

Figure A-5, Log of Trench T 5

MARBP

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 6		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					478	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0		+			GRANITIC ROCK(BLAST AFFECTED) Slightly weathered, light yellowish-brown with some gray and pink, strong, highly fractured, GRANITIC ROCK -Fracturing both horizontal and vertical with up to 2 inches of separation. Some fractures infilled with loose, damp, reddish-brown to yellowish-brown, silty, fine to very coarse sand -Blasting wires observed in upper 5 feet -Excavates to 1 inch to 2 foot subangular rock fragments with abundant fines -Becomes slightly weathered to fresh and very strong at 2 feet -Continues to be highly fractured the depth of trench -Caving of trench walls from 0 to 10 feet				
2		+							
		+							
		+							
4		+							
		+							
		+							
6		+							
		+							
		+							
8		+							
		+							
		+							
10		+							
		+							
		+							
12		+							
		+							
					TRENCH TERMINATED AT 13 FEET				

Figure A-6, Log of Trench T 6

MARBP

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. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 7		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>457</u>	DATE COMPLETED <u>11/26/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0		+			GRANITIC ROCK				
		+			Highly to moderately weathered, reddish-brown to				
		+			yellowish-brown, weak, GRANITIC ROCK				
2		+			-Becomes moderately weathered and strong and				
		+			moderately fractured at 1 foot				
		+							
4		+							
		+							
		+							
6		+			-Excavates to Silty, fine to very coarse SAND and				
		+			1 inch to 6 inch subangular rock fragments with				
		+			occasional 1 foot fragments				
		+			-Becomes moderately to slightly weathered at 6				
8		+			feet				
		+			Continues to be moderately fractured				
		+							
10		+			-Fractures infilled with decomposed granite				
		+							
		+			-Numerous 2 foot boulders at 10 feet				
12		+							
		+							
		+							
14		+							
					TRENCH TERMINATED AT 14 FEET				

Figure A-7, Log of Trench T 7

MARBP

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 8		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					430	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0					UNDOCUMENTED FILL* Loose to damp, dark yellowish-brown, Silty, fine to very coarse SAND with little clay and some gravel -Abundant subangular rock fragments from 6 inches to 1.5 feet in size from 0 to 6 feet -2 foot boulders visible at top of stockpile -Fill becomes dry at 2 feet				
2									
4									
6									
6				SM	ALLUVIUM/COLLUVIUM Dense, damp, dark brown, Silty, fine to coarse SAND with little clay -Abundant voids visible in matrix				
8									
					GRANITIC ROCK Moderately to slightly weathered, reddish-brown to yellowish-brown, strong to very strong, GRANITIC ROCK				
					REFUSAL AT 8 FEET				
					*NOTE: Deposits described herein are overlain by approximately 8 feet of Undocumented Fill immediately adjacent the trench to the North.				

Figure A-8, Log of Trench T 8

MARBP

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 9		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					439	11/26/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				SC	UNDOCUMENTED FILL Loose, damp, dark brown, Clayey, fine to medium SAND				
2				SM	Loose, dry, light orange-brown, Silty, fine to very coarse SAND with abundant 1 inch to 1.5 foot angular to subangular rock fragments				
4					-Numerous 2 foot rock fragments below 3 feet -Becomes medium dense at 4 feet				
6									
8					-Moderate caving of trench walls from 0 to 8 feet -Difficult digging due to oversize rock				
10					-Occasional 3 foot rock fragments -Becomes damp with dense matrix at 6 feet				
12	T9-1			SC	ALLUVIUM/COLLUVIUM Dense, damp, dark bluish-gray to black, Clayey, fine to coarse SAND with abundant organics				
14									
16				ML	Stiff, damp to moist, dark brown, fine to medium Sandy SILT -No oversize rock past 15 feet				
18									
20					-Heavy seepage at 19 feet				
22									
					GRANITIC ROCK Moderately weathered, yellowish-brown to reddish-brown, moderately strong, GRANITIC ROCK				
					TRENCH TERMINATED AT 22 FEET				

Figure A-9, Log of Trench T 9

MARBP

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 10	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) 445 DATE COMPLETED 11/27/01 EQUIPMENT JOHN DEERE 710D			
MATERIAL DESCRIPTION								
0				SM	UNDOCUMENTED FILL Loose, damp, yellowish-brown to reddish-brown, Silty, fine to coarse SAND with abundant gravel size to boulder size rock fragments -Becomes medium dense to dense at 1.5 feet -Rock fragments from 2 inches to 2 feet in size and matrix supported -Limited zones of loose, dry matrix below 2 feet -Difficult trenching due to amount of oversize rock -Excavates to Silty, fine to coarse SAND matrix with abundant angular to subangular rock fragments up to 2 feet			
2								
4								
6								
8								
10								
12								
14								
16								
18								
				SM	ALLUVIUM/COLLUVIUM Dense, damp, dark brown, Silty, fine to coarse SAND -Numerous pinhole voids GRANITIC ROCK Moderately weathered, yellowish-brown, moderately strong, GRANITIC ROCK TRENCH TERMINATED AT 18 FEET			

Figure A-10, Log of Trench T 10

MARBP

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 11		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					444	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0	T11-1			SC	UNDOCUMENTED FILL Loose, damp, brown to reddish-brown, Clayey, fine to coarse SAND with gravel -Becomes dark brown at 2 feet				
2									
4					Medium dense to dense, damp, yellowish-brown to reddish-brown, Silty, fine to very coarse SAND with abundant subangular rock and little clay -Matrix supported with rock size from 3 inches to 2 feet -Observed blasting wire at 6 feet				
6									
8				SM/SC	-Difficult to dig due to oversize rock -3 foot boulder which could not be excavated at 5 feet -Becomes brown to reddish-brown with more clay at 7 feet -Minor caving at 7 feet -Limited zones of point on point rock contact below 7 feet				
10									
12									
14									
16				SM	ALLUVIUM/COLLUVIUM Medium dense, damp to moist, very dark brown to black, Silty, fine to medium SAND with abundant organics -Becomes olive-gray with abundant gravel and less organics at 15.5 feet -Becomes dense to very dense at 16 feet with no organics				
18									
					GRANITIC ROCK Moderately weathered to slightly weathered, grayish-brown to yellowish-brown, strong to very strong, GRANITIC ROCK TRENCH TERMINATED AT 19.5 FEET				

Figure A-11, Log of Trench T 11

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	□ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	▣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 12		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>453</u>	DATE COMPLETED <u>11/27/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0				SM	UNDOCUMENTED FILL Loose, damp, light olive, Silty, fine to medium SAND				
2				SM	Medium dense, dry, dark brown, Silty, fine to coarse SAND with little clay and occasional 6 inch rock fragments				
4				ML	Medium stiff, dry, dark reddish-brown, fine to medium Sandy SILT with gravel				
6				SM	Medium dense, dry, brown, Silty, fine to coarse SAND with numerous 6 inch rock fragments and some clay -Occasional asphalt chunks at 6 feet				
8									
10	T12-1				-Numerous 2 foot subangular rock at 9 feet -Becomes damp with abundant 6-inch matrix supported fragments at 6 feet				
12									
14				SM	ALLUVIUM/COLLUVIUM Medium dense, damp to moist, very dark brown to black, Silty, fine to medium SAND with some gravel and abundant organics -Becomes olive-gray with abundant gravel and no organics at 14 feet				
				CL	Stiff, moist, olive-blue-gray, fine to coarse Sandy CLAY				
					REFUSAL ON GRANITIC ROCK AT 15 FEET				

Figure A-12, Log of Trench T 12

MARBP

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

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PROJECT NO. 06827-32-01

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.) <u>453</u>	DATE COMPLETED <u>11/27/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0				SM	UNDOCUMENTED FILL ASPHALT stockpile at surface				
2				SC	Loose, damp, dark brown, Silty, fine to medium SAND				
4					Medium dense, damp, grayish-brown to reddish-brown, Clayey, fine to coarse SAND with abundant gravel and 6 inch to 1 foot subangular rock fragments				
6					-Rock fragments are matrix supported				
8					-Excavates to Clayey, fine to coarse SAND with gravel and rock				
10					-Difficult digging below 5 feet due to rock fragments				
12				SM	ALLUVIUM/COLLUVIUM Medium dense to dense, damp to moist, very dark brown to black, Silty, fine to coarse SAND with some gravel				
					REFUSAL ON GRANITIC ROCK AT 13 FEET				

Figure A-13, Log of Trench T 13

MARBP

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

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PROJECT NO. 06827-32-01

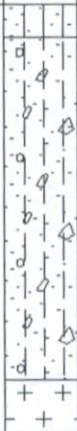
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 14		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) 447	DATE COMPLETED 11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				ML	ALLUVIUM/COLLUVIUM Loose, damp, very dark brown, fine Sandy SILT				
2				SM	Loose, dry, brown, Silty, fine to coarse SAND with abundant 6 inch and 1 foot angular rock fragments -Becomes medium dense and damp at 2 feet				
4									
6									
8					GRANITIC ROCK Slightly weathered, yellowish-brown, very strong, highly fractured, GRANITIC ROCK PRACTICAL REFUSAL AT 8 FEET				

Figure A-14, Log of Trench T 14

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◼ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 15		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>450</u>	DATE COMPLETED <u>11/27/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>				
					MATERIAL DESCRIPTION				
0				SM	UNDOCUMENTED FILL Loose, damp, yellowish-brown, Silty, fine to very coarse SAND with abundant 3-inch to 1 foot subangular rock fragments and occasional 2 foot fragments -Mostly matrix supported with some point on point contact of rock -Becomes dry and medium dense at 2 feet				
2									
4									
6									
					REFUSAL ON GRANITIC ROCK AT 7 FEET				

Figure A-15, Log of Trench T 15

MARBP

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

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 16		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					450	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0									
2	T16-1			CL	ALLUVIUM/COLLUVIUM Medium stiff, moist, dark reddish-brown, fine to medium Sandy CLAY				
4	T16-2				-Abundant gravel from 2 to 4 feet				
6	T16-3			SC	Very dense, damp, reddish-brown, moderately cemented Clayey SAND with some gravel				
8					GRANITIC ROCK Moderately weathered, reddish-brown, moderately strong, GRANITIC ROCK				
					TRENCH TERMINATED AT 8 FEET				

Figure A-16, Log of Trench T 16

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◼ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 17		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					455	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				SM	ALLUVIUM/COLLUVIUM Loose, dry, Silty, fine to medium SAND with some gravel				
2				SC/GC					
4					Dense to very dense, damp, reddish-brown, moderately cemented, Clayey, fine to coarse SAND with abundant gravel				
6									
					GRANITIC ROCK Highly to moderately weathered, reddish-brown to yellowish-brown, strong, GRANITIC ROCK PRACTICAL REFUSAL AT 6.5 FEET				

Figure A-17, Log of Trench T 17

MARBP

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

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DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 18		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					448	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0					UNDOCUMENTED FILL Loose, damp, brown to dark brown, Clayey, fine to coarse SAND with abundant 4 inch to 2 foot subangular rock fragments -Becomes medium dense at 2 feet -Predominantly matrix supported with some point on point contact of fragments -Occasional 3 foot boulders				
2									
4				SC					
6									
8									
		++			GRANITIC ROCK Moderately weathered, reddish-brown to yellowish-brown, strong, GRANITIC ROCK TRENCH TERMINATED AT 8.5 FEET				

Figure A-18, Log of Trench T 18

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	▤ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 19		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					450	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0									
2				SM	ALLUVIUM/COLLUVIUM Dry, loose, dark brown to dark reddish-brown, Silty, fine to medium SAND -Becomes medium dense and damp at 2 feet				
4					-Gravel layer at 4 feet				
6					-Moderate seepage at 5 feet				
					GRANITIC ROCK Moderately weathered, yellowish-brown, moderately strong, GRANITIC ROCK TRENCH TERMINATED AT 6.5 FEET				

Figure A-19, Log of Trench T 19

MARBP

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

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 20	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) <u>465</u> DATE COMPLETED <u>11/27/01</u>			
					EQUIPMENT <u>JOHN DEERE 710D</u>			
0		+			MATERIAL DESCRIPTION			
		+						
		+			GRANITIC ROCK			
		+			Moderately weathered, reddish-brown, moderately			
2		+			strong to strong, GRANITIC ROCK			
					TRENCH TERMINATED AT 2 FEET			

Figure A-20, Log of Trench T 20

MARBP

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

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 21		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					471	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0									
2				SM	ALLUVIUM/COLLUVIUM Medium dense, wet, dark brown, Silty, fine to coarse SAND with gravel -Moderate seepage at 2.5 feet				
					GRANITIC ROCK Slightly weathered, light yellowish-brown to pink, very strong, GRANITIC ROCK REFUSAL AT 3.5 FEET				

Figure A-21, Log of Trench T 21

MARBP

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

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 22		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					472	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0					UNDOCUMENTED FILL Loose, dry, dark brown, Silty, fine to medium SAND with abundant 4 inch to 1 foot subangular rock fragments -Minor caving from 0 to 5 feet				
2				SM					
4									
		+	+		GRANITIC ROCK Moderately weathered, reddish to yellowish-brown, strong, GRANITIC ROCK TRENCH TERMINATED AT 5.5 FEET				

Figure A-22, Log of Trench T 22

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	▤ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 23		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.)	DATE COMPLETED			
					473	11/27/01			
					EQUIPMENT JOHN DEERE 710D				
0		+ +			MATERIAL DESCRIPTION				
		+ +			GRANITIC ROCK Slightly weathered, grayish-brown with pink, very strong, GRANITIC ROCK				
					REFUSAL AT 1 FOOT				

Figure A-23, Log of Trench T 23

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	▤ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 06827-32-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 24		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) 508	DATE COMPLETED 11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0	T24-1			SM	UNDOCUMENTED FILL Loose, dry, reddish-brown to yellowish-brown, Silty, fine to coarse SAND with some clay -Becomes medium dense to dense and damp at 3 feet -Becomes dense at 5 feet -Occasional 1 foot subangular rock fragments below 6 feet -Limited zones of 1 to 3 inch gravel				
2									
4									
6									
8									
10									
12									
14									
16									

Figure A-24, Log of Trench T 24

MARBP

SAMPLE SYMBOLS	□ ... SAMPLING UNSUCCESSFUL	▣ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	▤ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

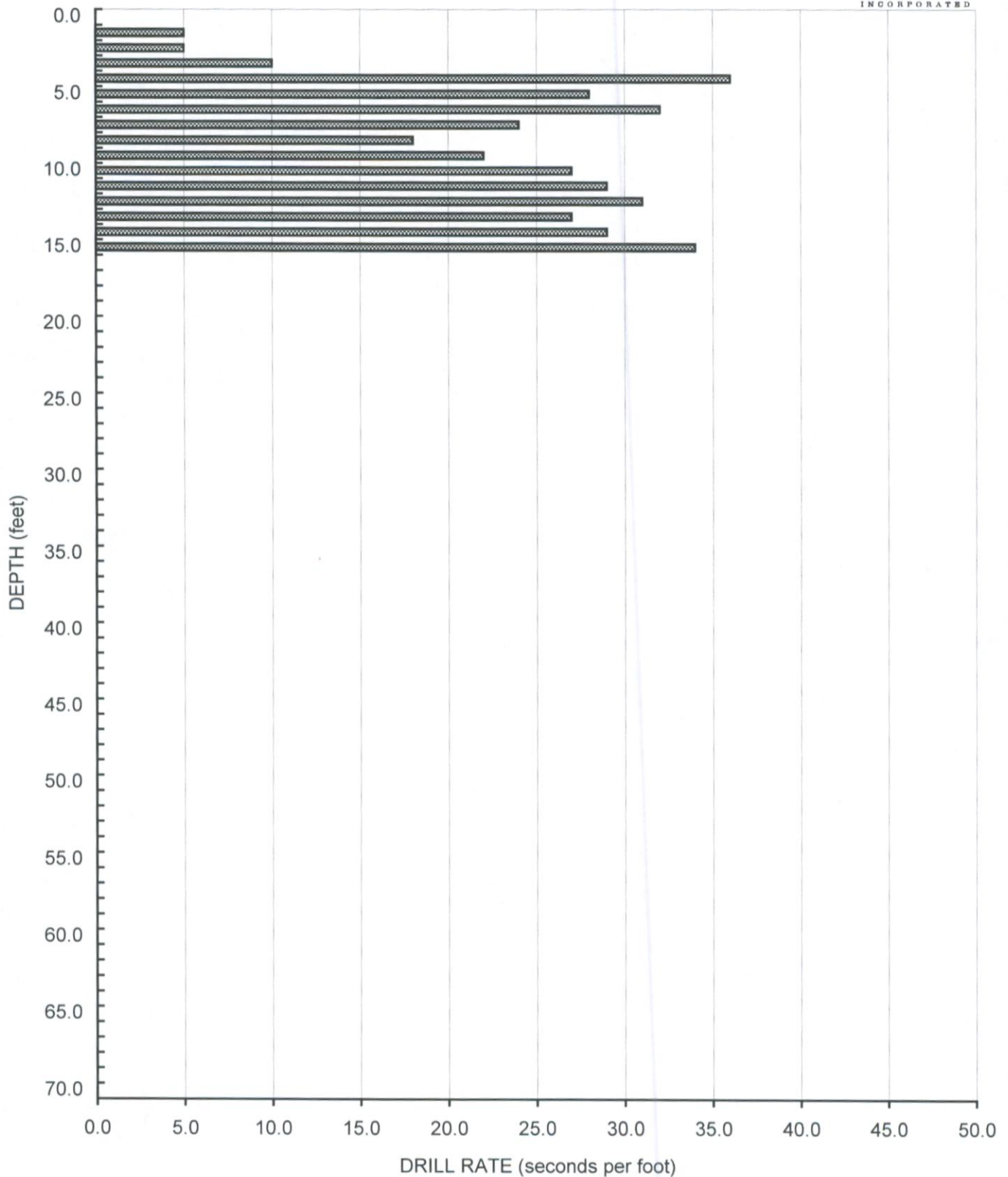
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 25		PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) 449	DATE COMPLETED 11/27/01			
					EQUIPMENT JOHN DEERE 710D				
					MATERIAL DESCRIPTION				
0				CL/SC	UNDOCUMENTED FILL Stiff/dense, damp, dark brown, fine to coarse Sandy CLAY/Clayey, fine to coarse SAND				
2									
4									
6				SM	ALLUVIUM/COLLUVIUM Loose to medium dense, dry, very dark brown, Silty, fine to medium SAND				
8									
10									
					GRANITIC ROCK Moderately weathered, reddish-brown to yellowish-brown, strong, GRANITIC ROCK TRENCH TERMINATED AT 11.5 FEET				

MARBP

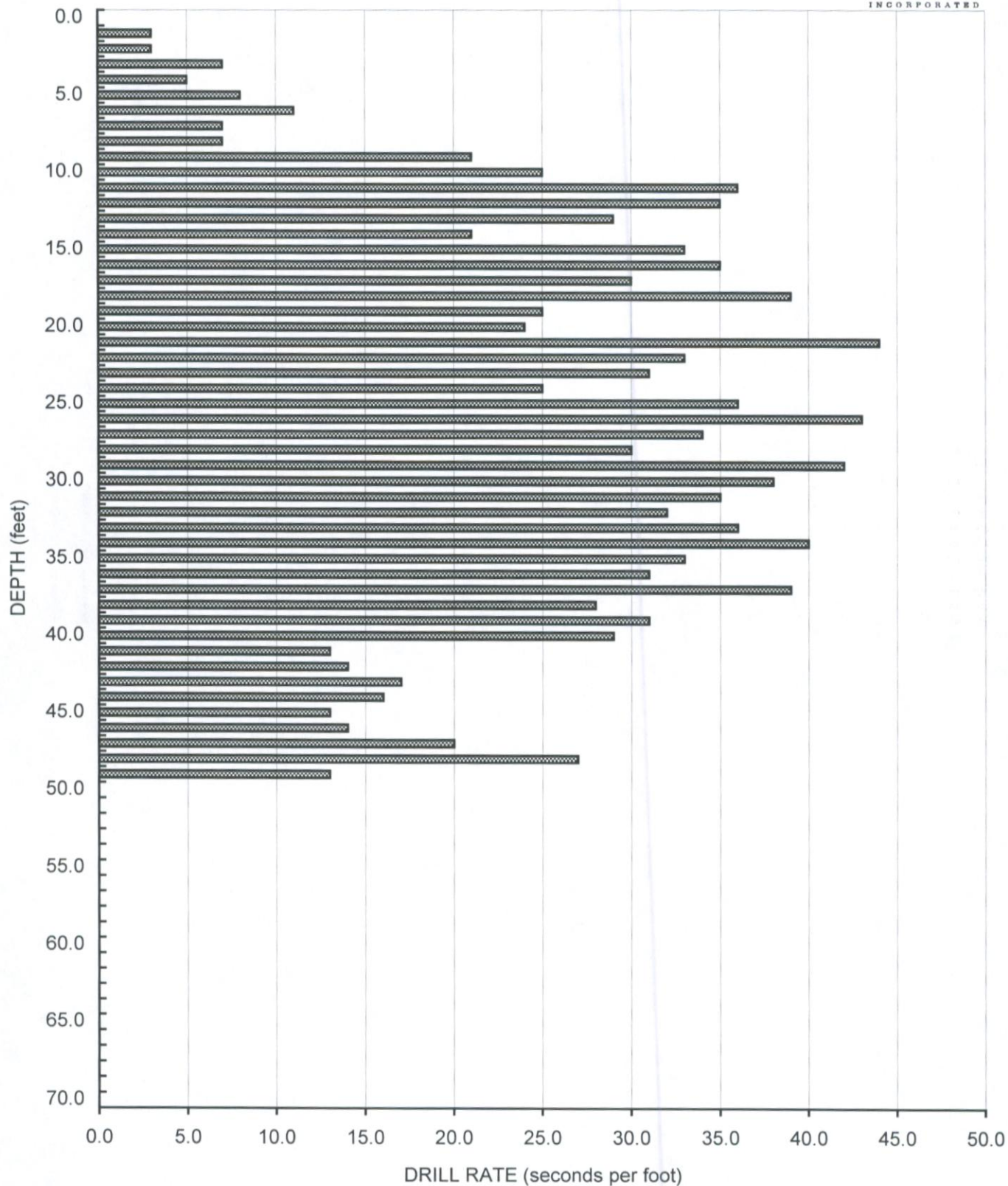
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☒ ... DISTURBED OR BAG SAMPLE ☒ ... CHUNK SAMPLE ☒ ... WATER TABLE OR SEEPAGE

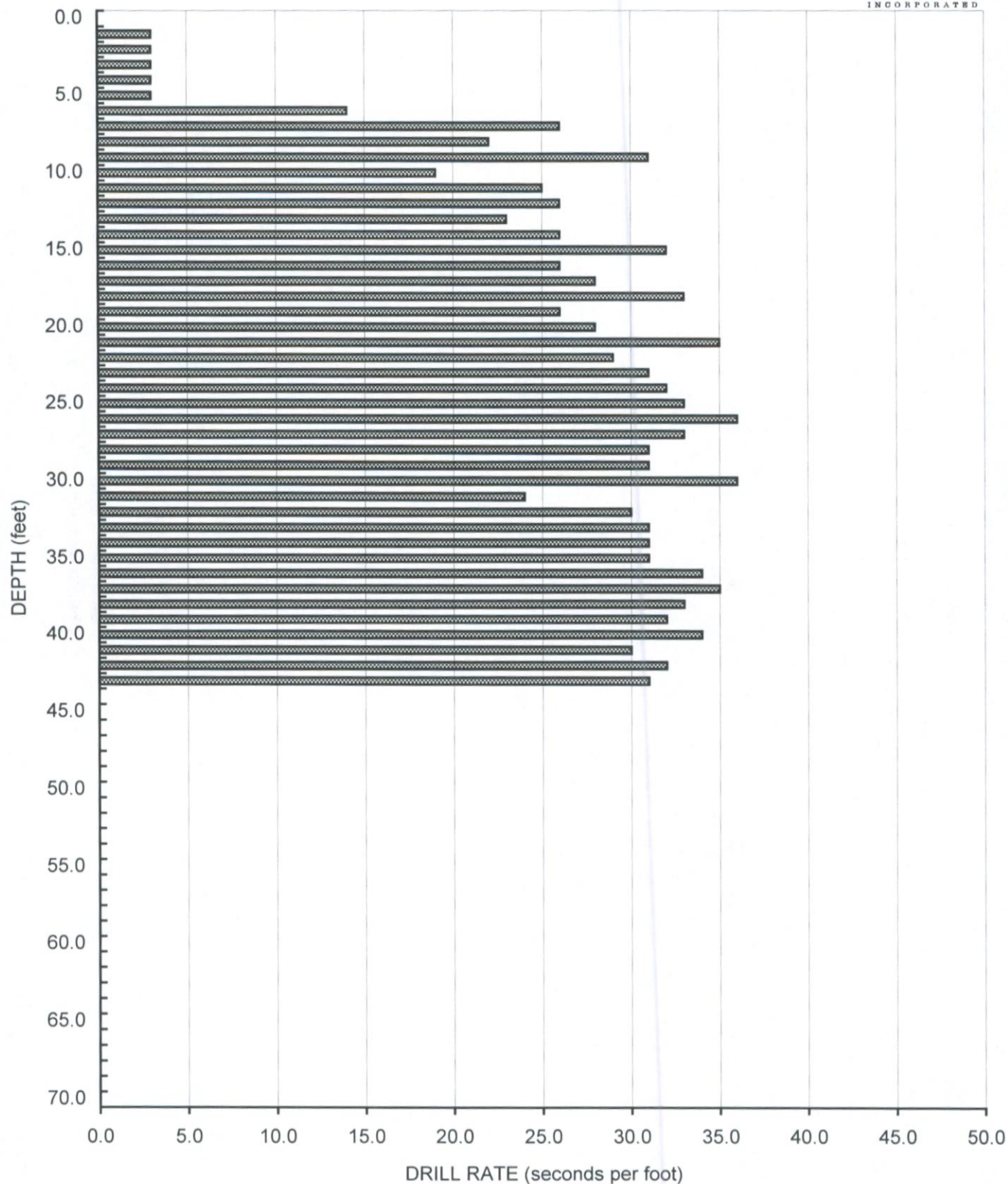
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

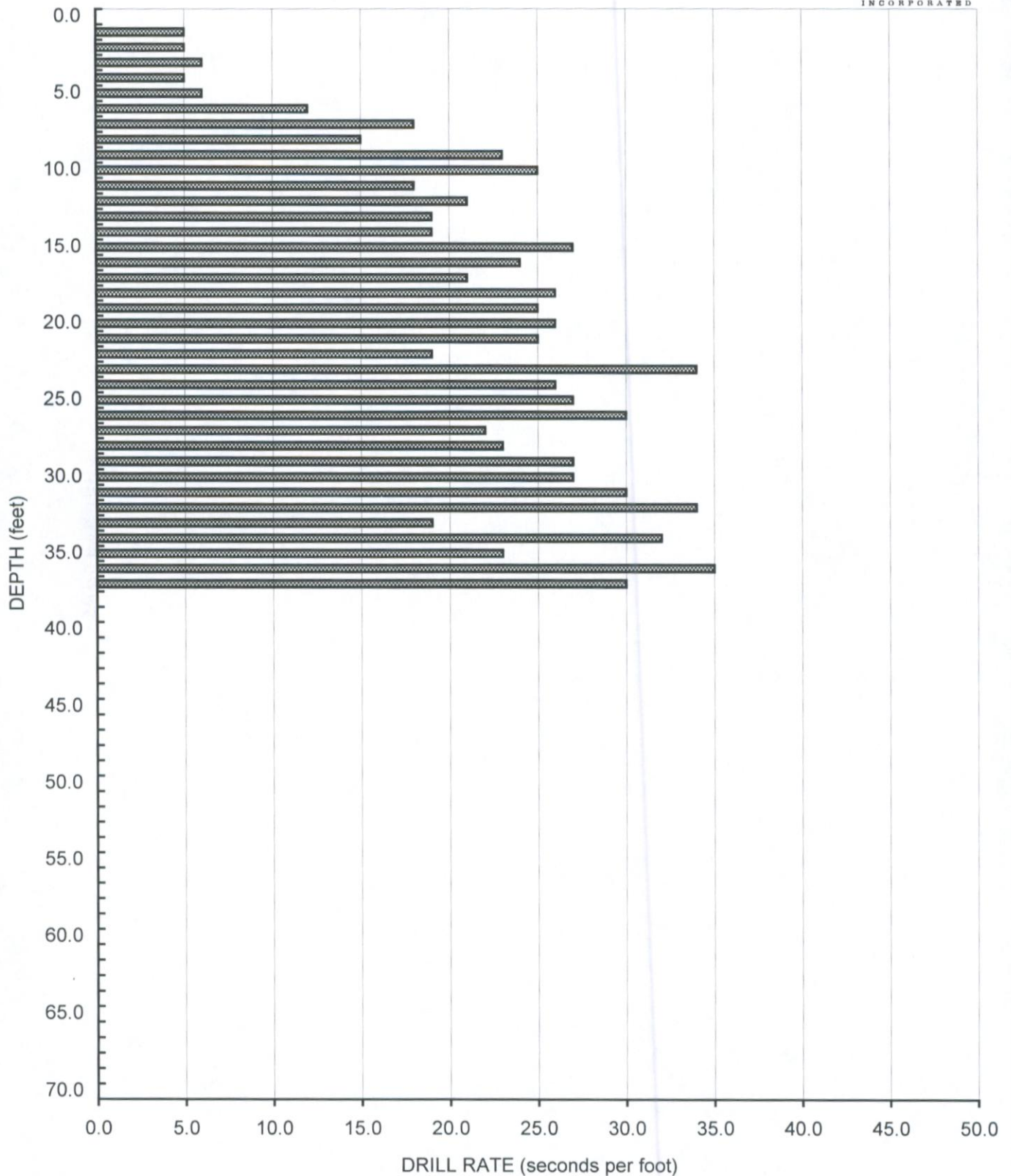
AIR TRACK BORING AT-1
Elevation - 555 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-2

Elevation - 538 Feet (MSL)

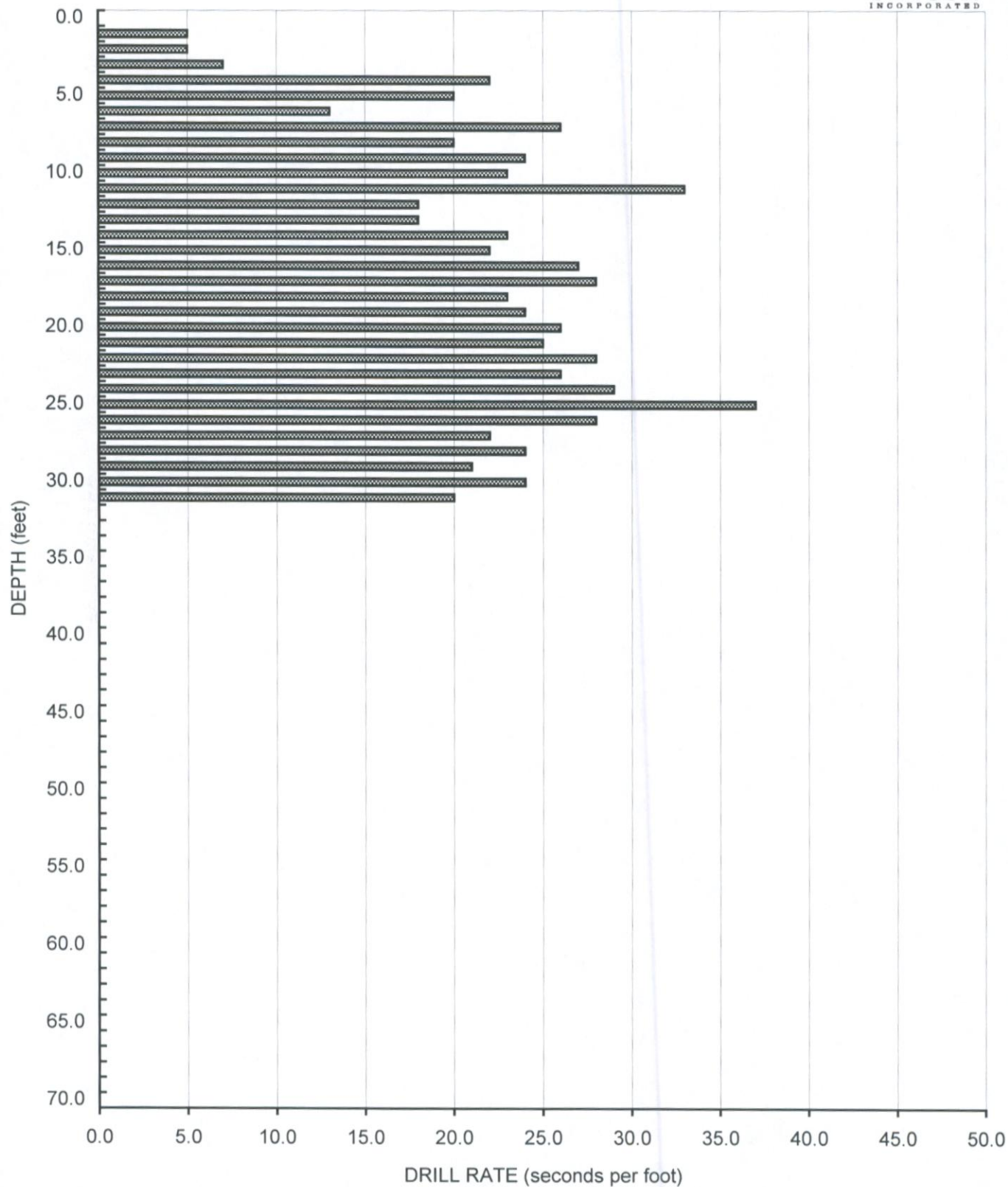
GEOCON
INCORPORATED

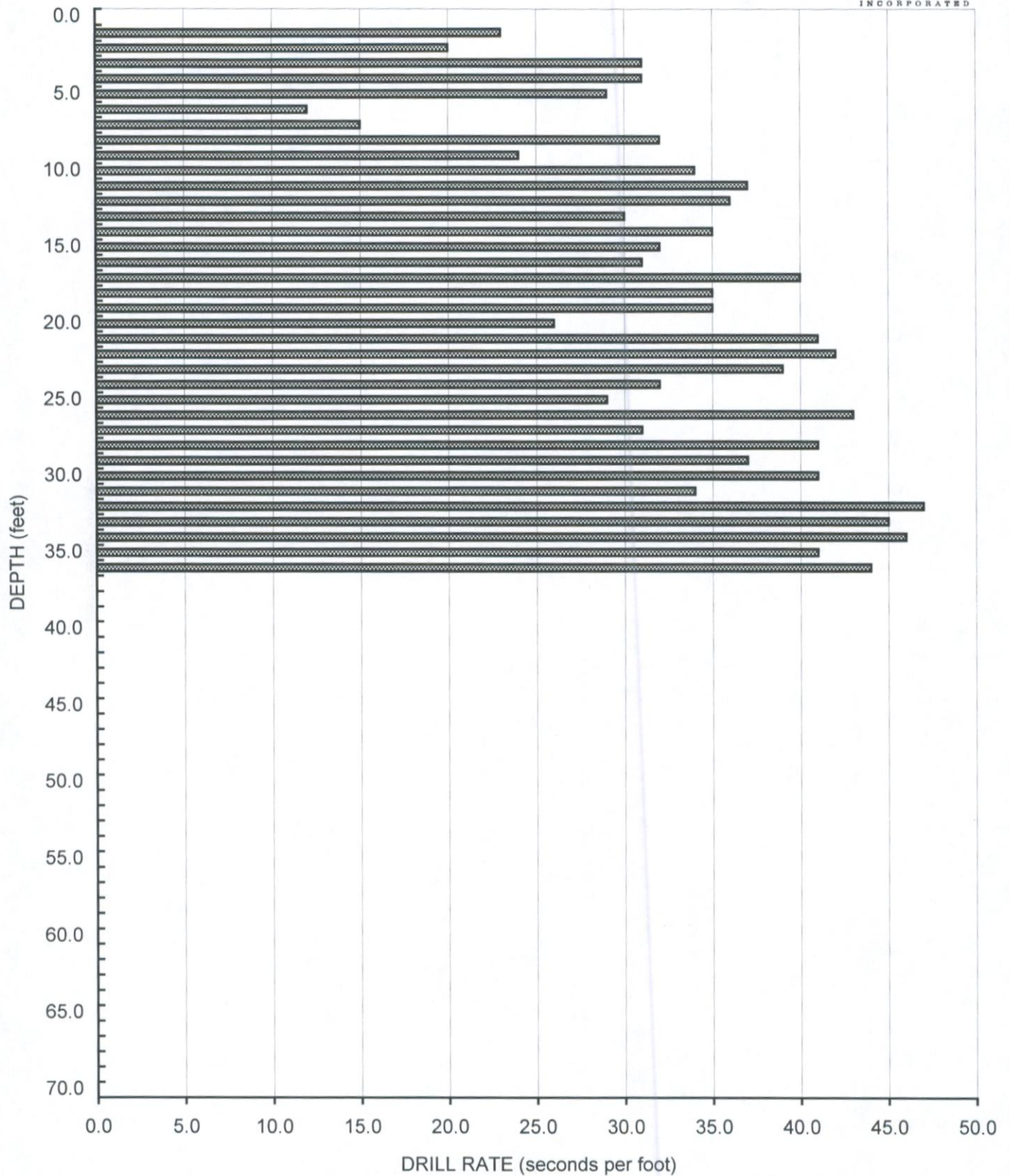
AIR TRACK BORING AT-3
Elevation - 532 Feet (MSL)GEOCON
INCORPORATED

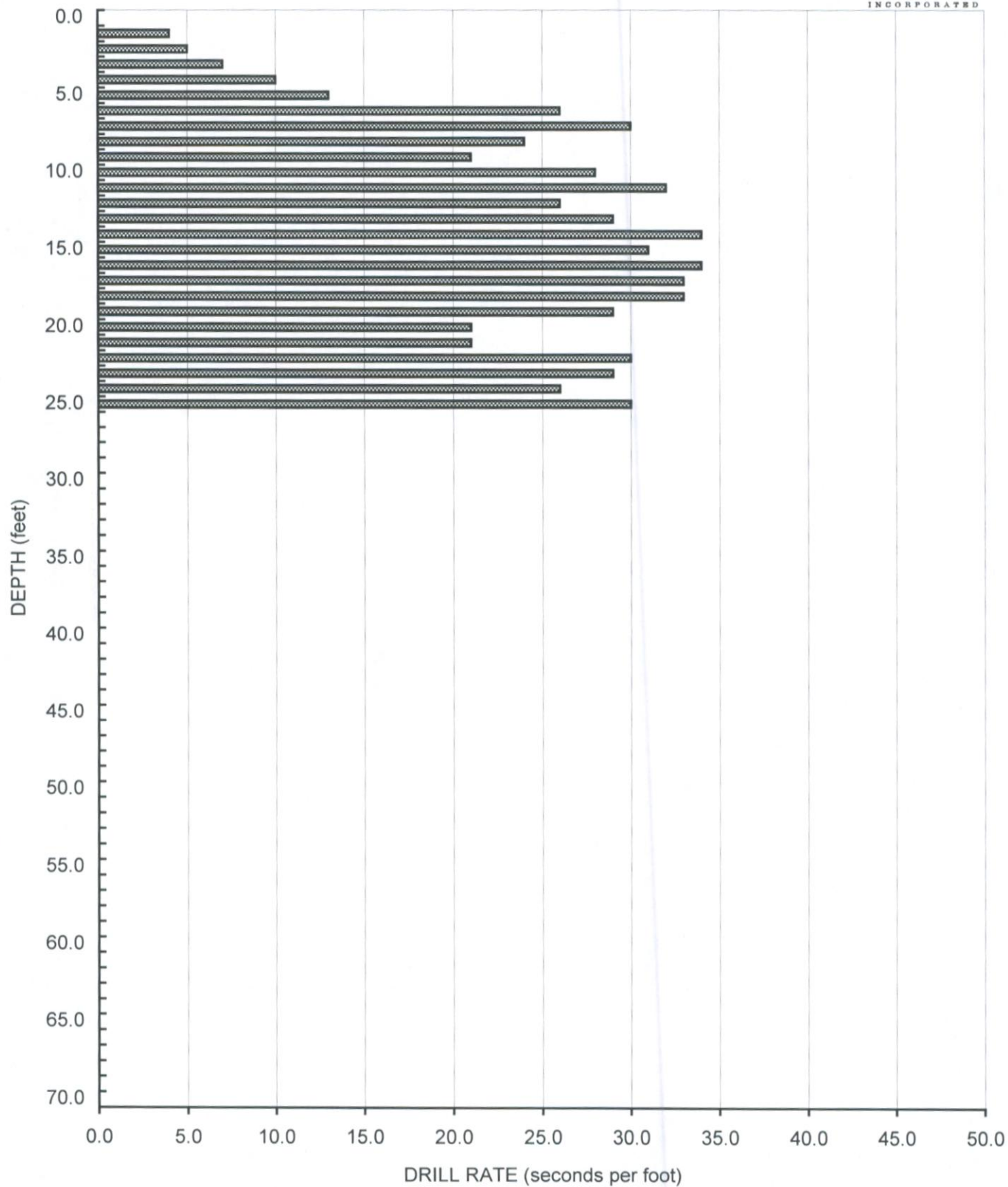
AIR TRACK BORING AT-4
Elevation - 525 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-5

Elevation - 525 Feet (MSL)

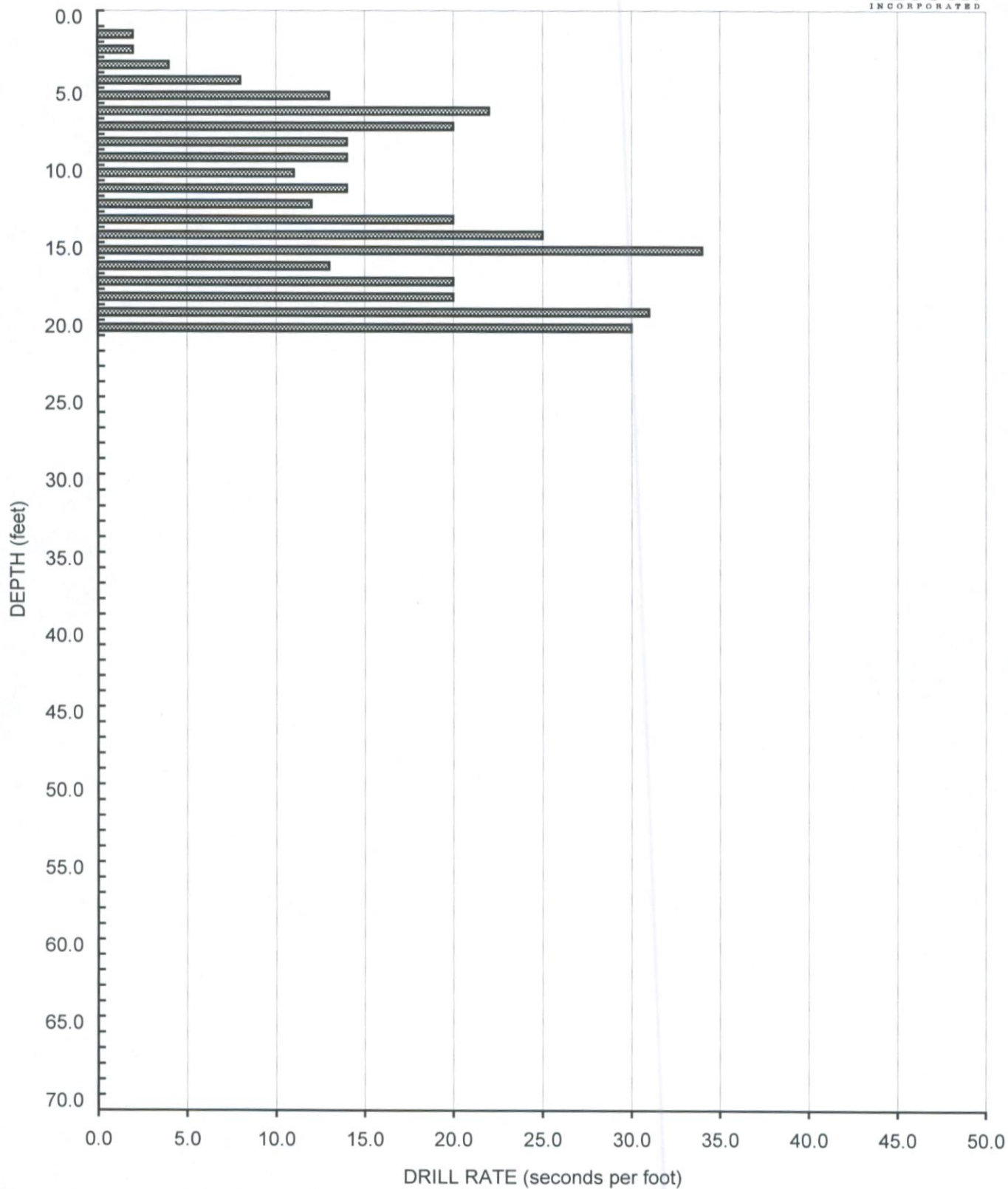
GEOCON
INCORPORATED

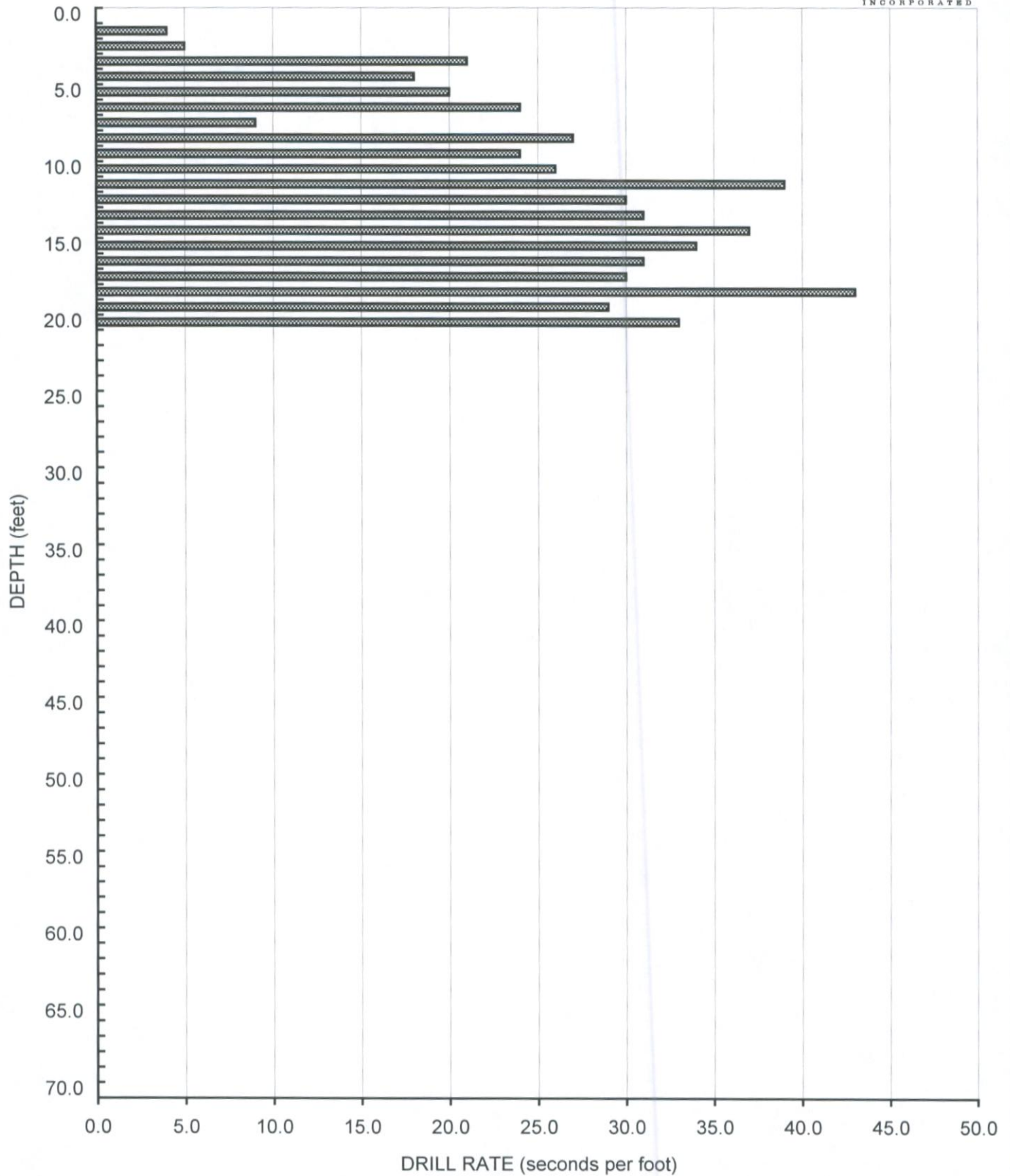
AIR TRACK BORING AT-6
Elevation - 530 Feet (MSL)GEOCON
INCORPORATED

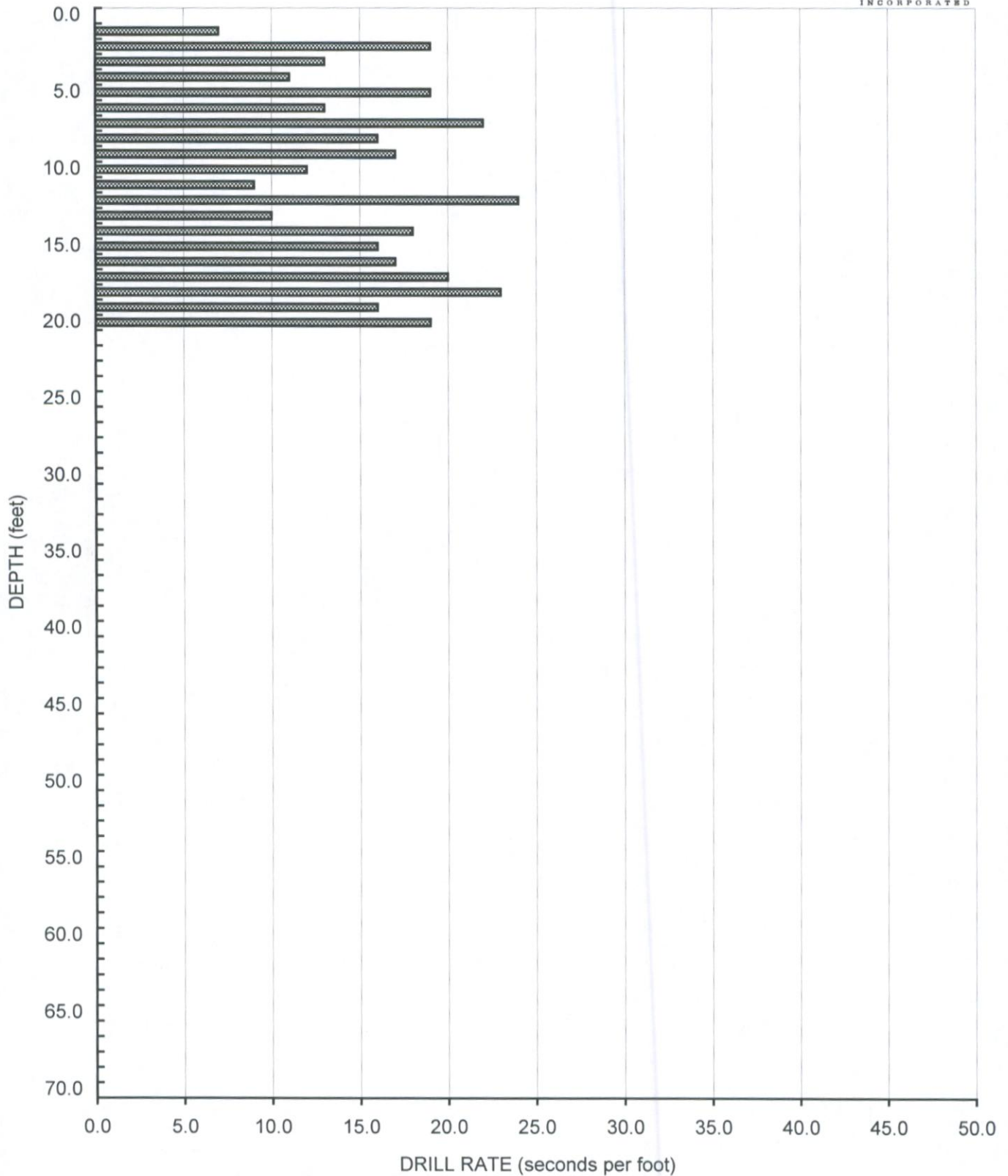
AIR TRACK BORING AT-7
Elevation - 510 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-8

Elevation - 500 Feet (MSL)

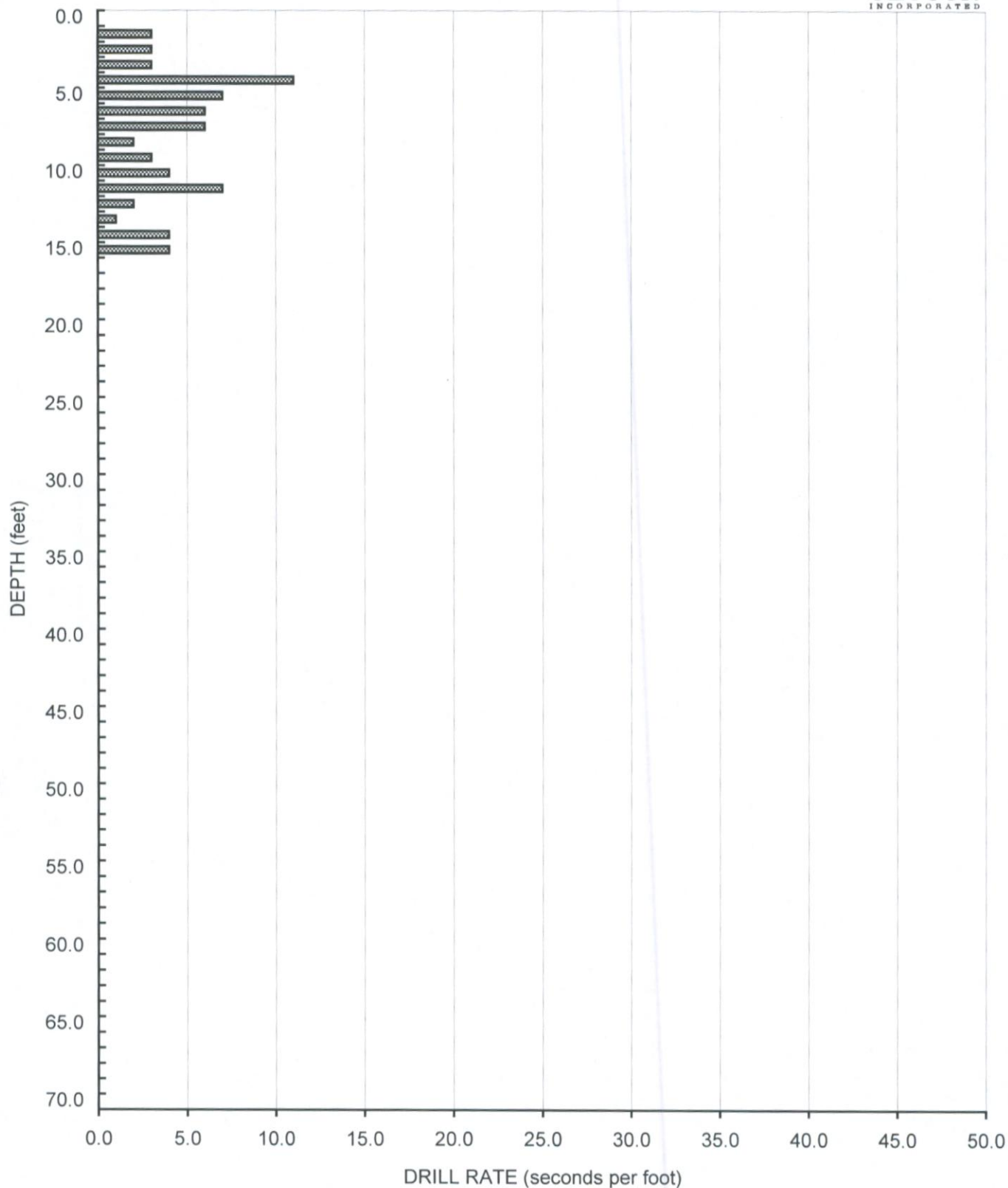
GEOCON
INCORPORATED

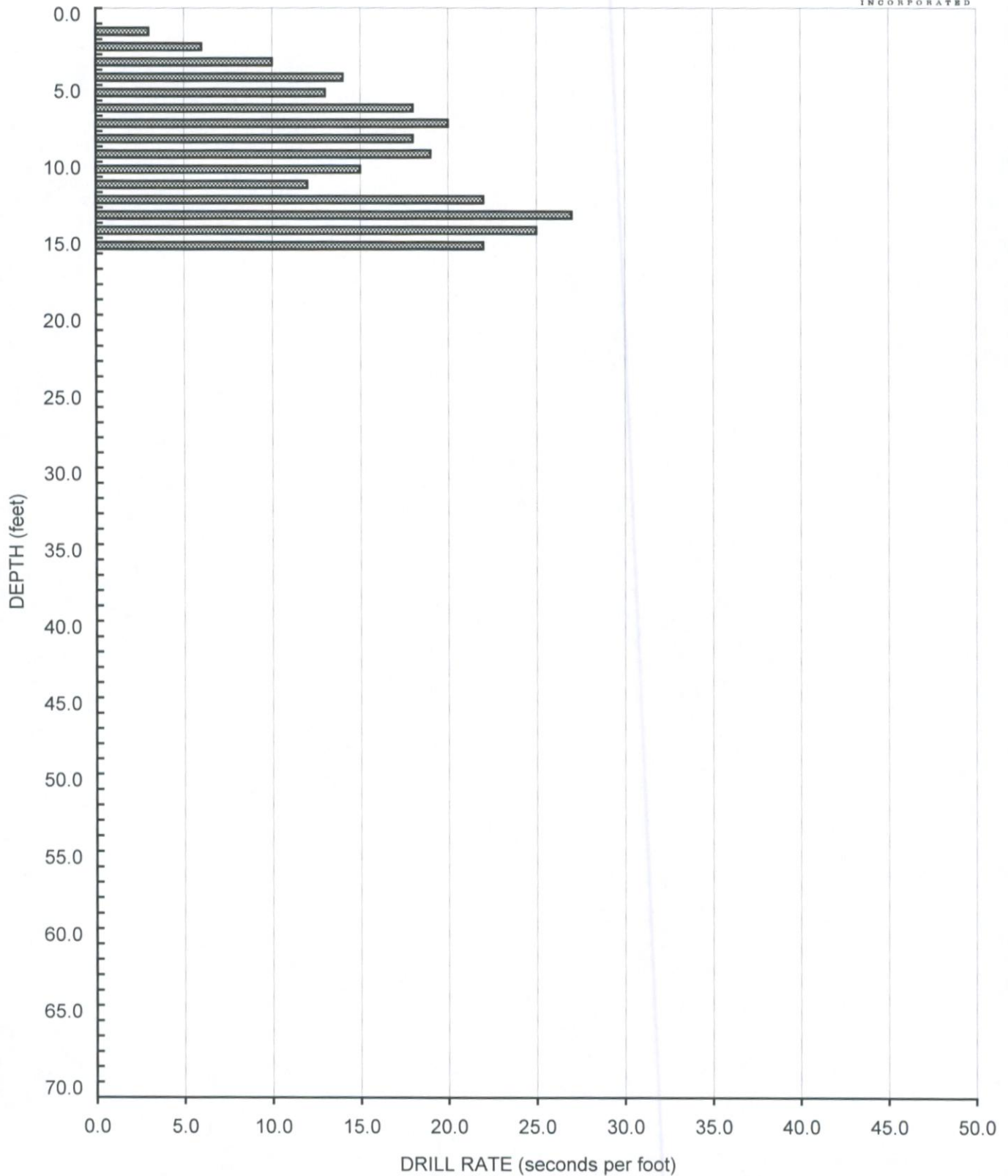
AIR TRACK BORING AT-9
Elevation - 504 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-10
Elevation - 491 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-11

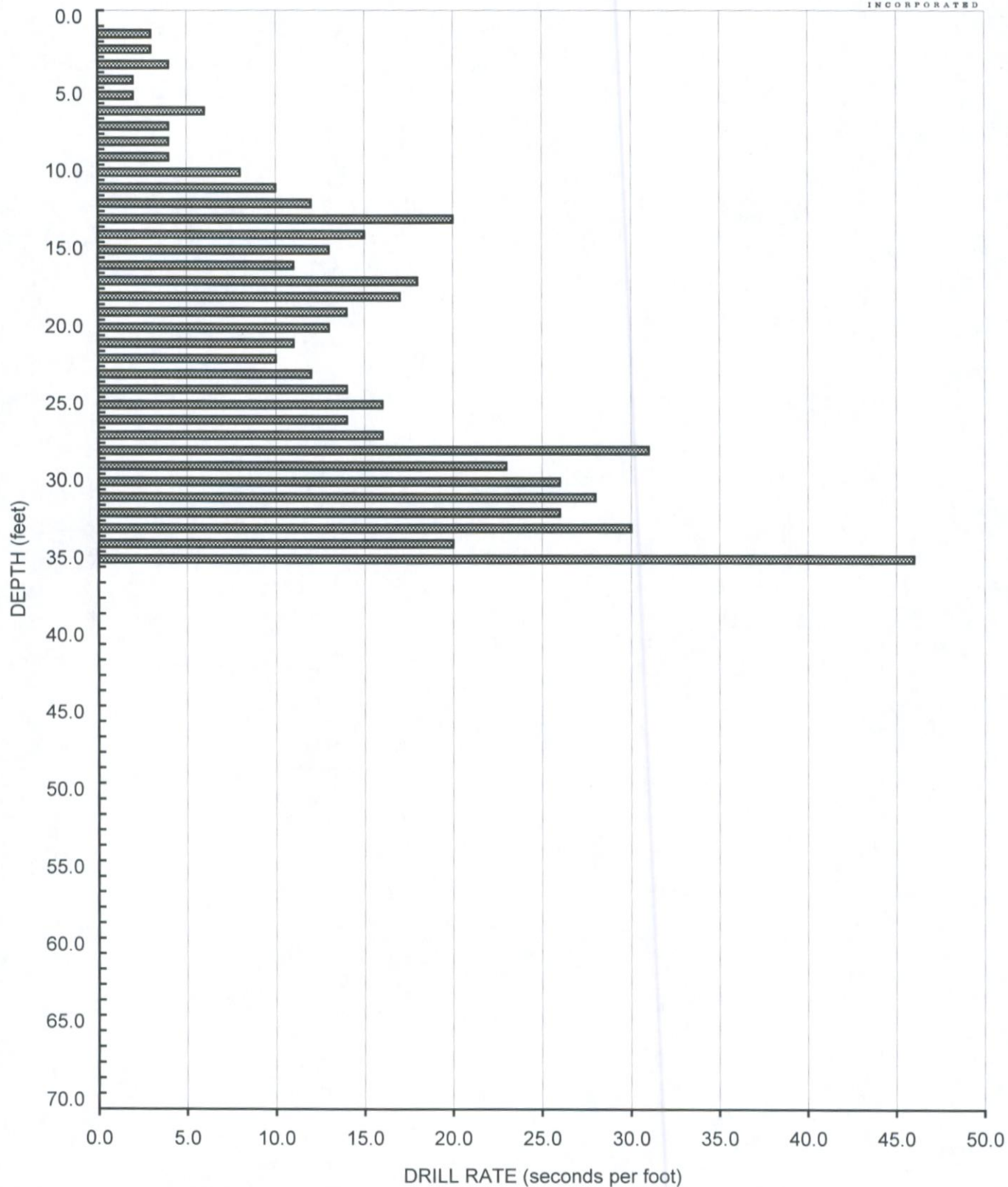
Elevation - 452 Feet (MSL)

GEOCON
INCORPORATED

AIR TRACK BORING AT-12
Elevation - 499 Feet (MSL)GEOCON
INCORPORATED

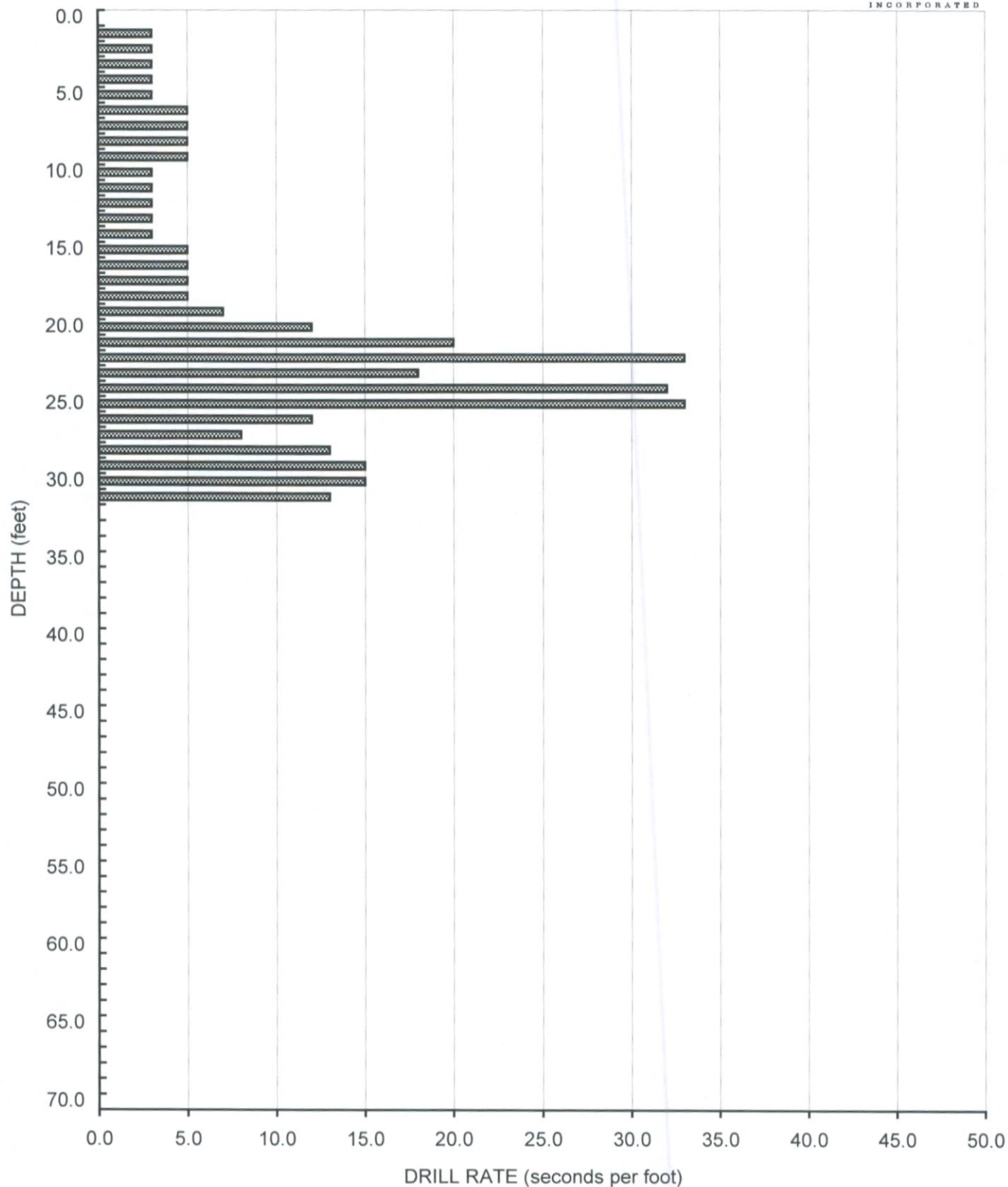
AIR TRACK BORING AT-13

Elevation - 504 Feet (MSL)

GEOCON
INCORPORATED

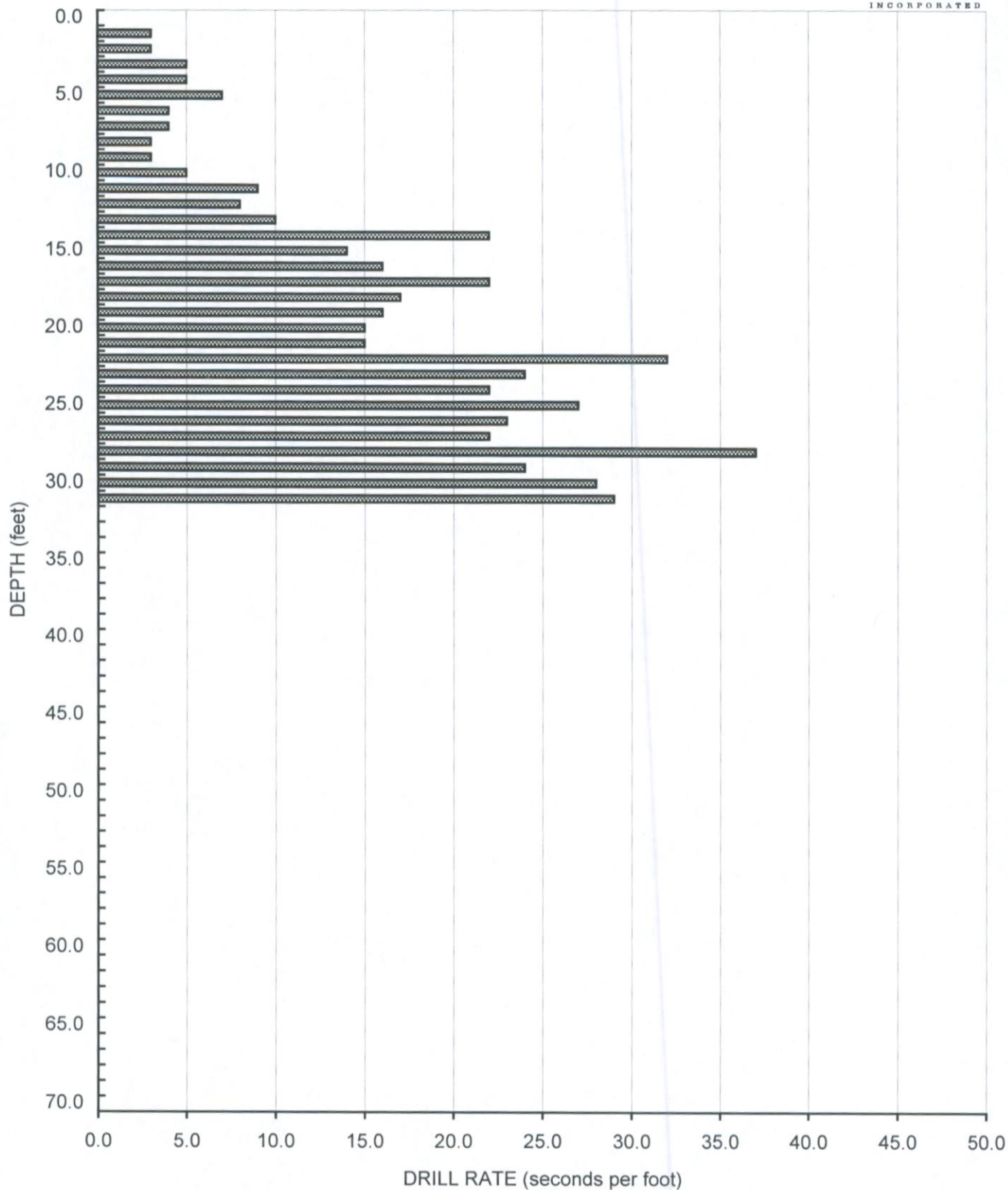
AIR TRACK BORING AT-14

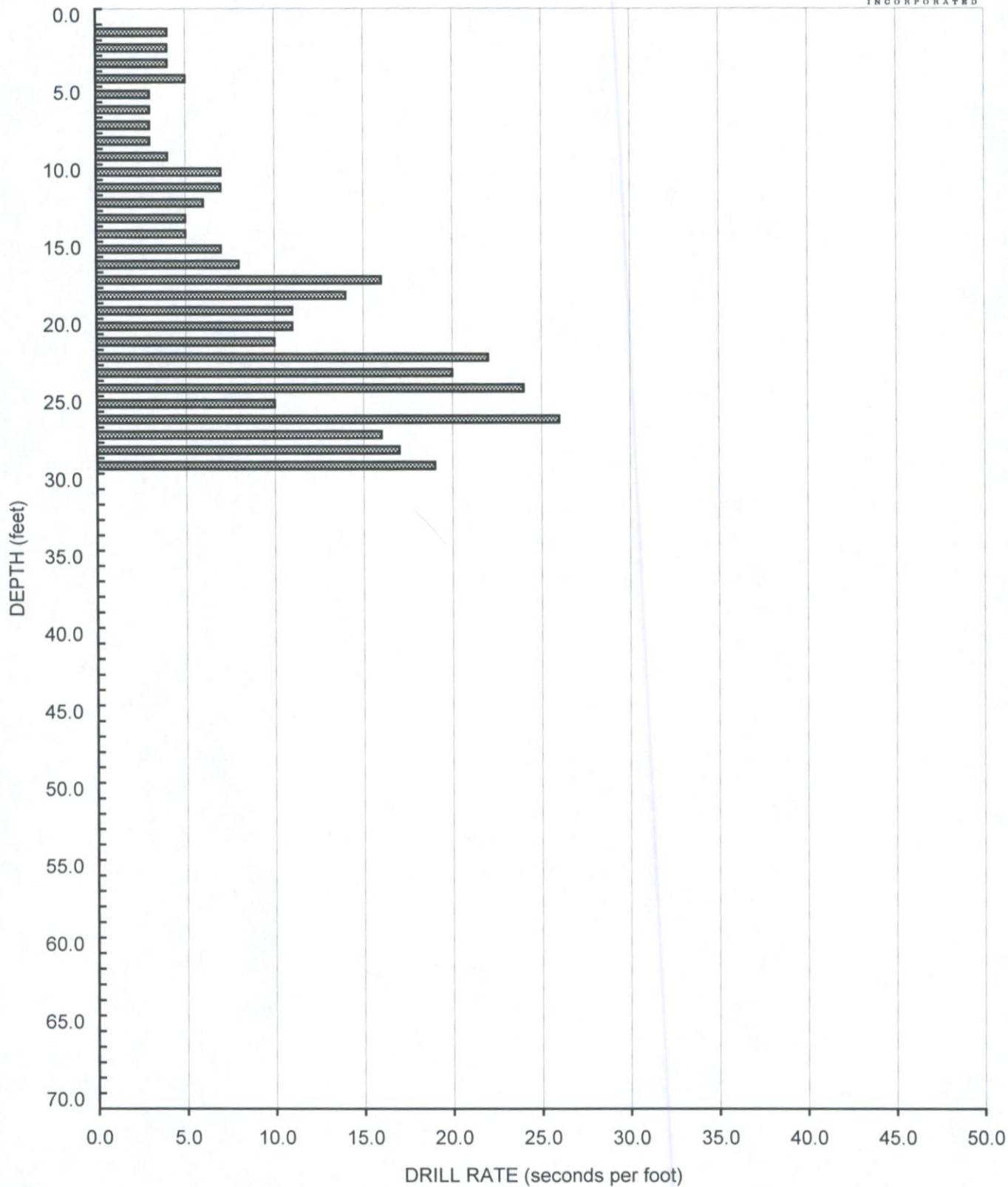
Elevation - 508 Feet (MSL)

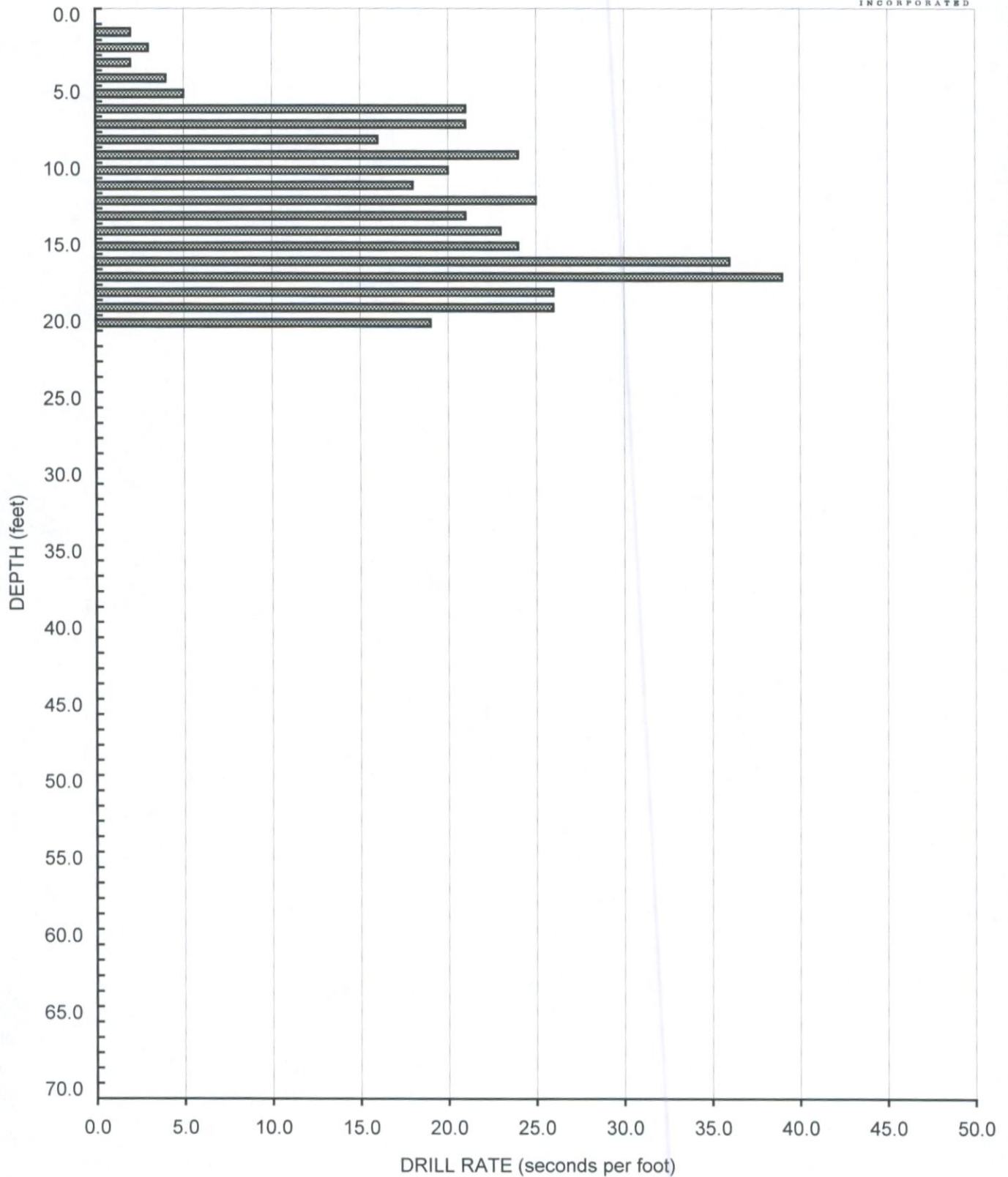
GEOCON
INCORPORATED

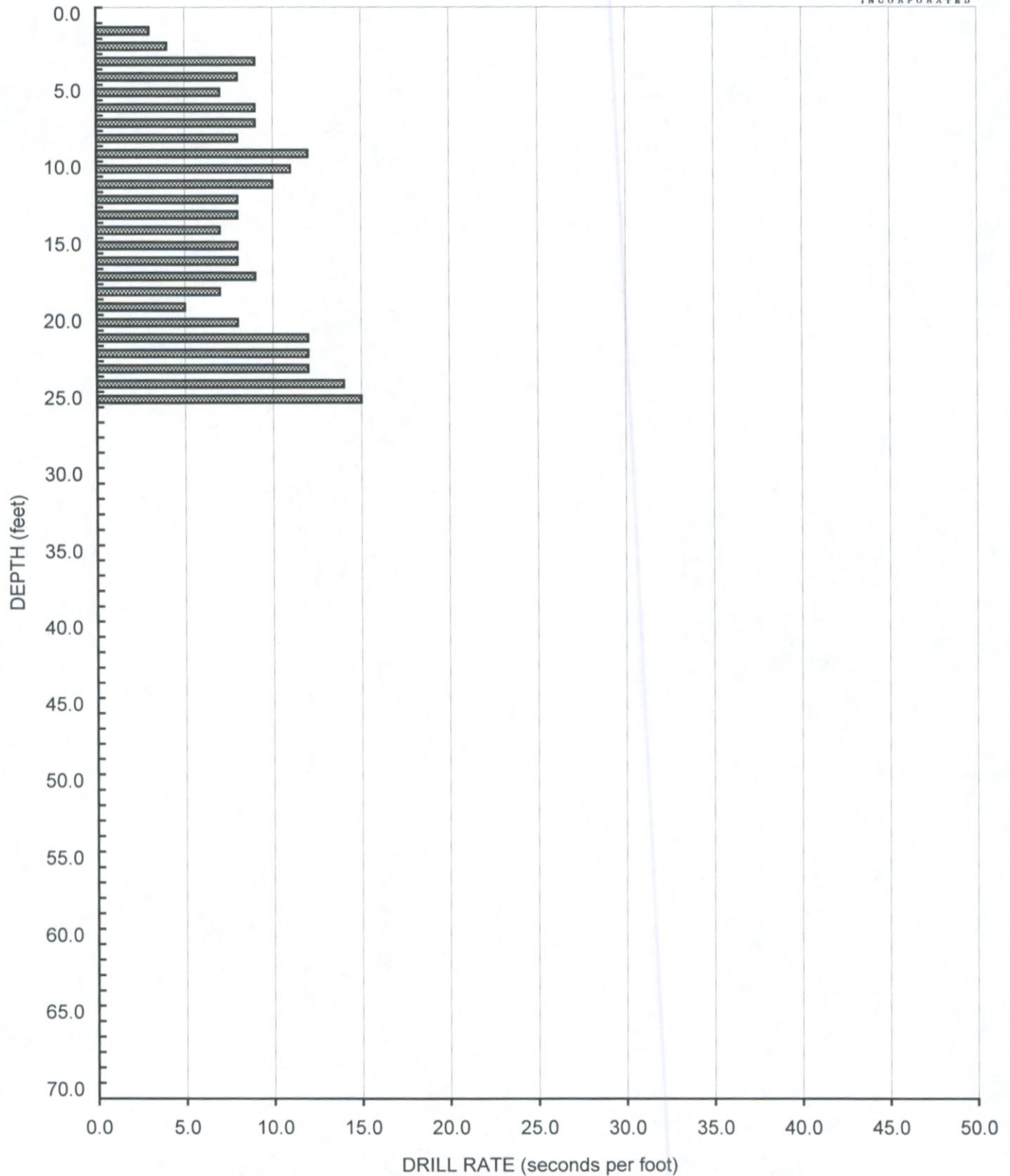
AIR TRACK BORING AT-15

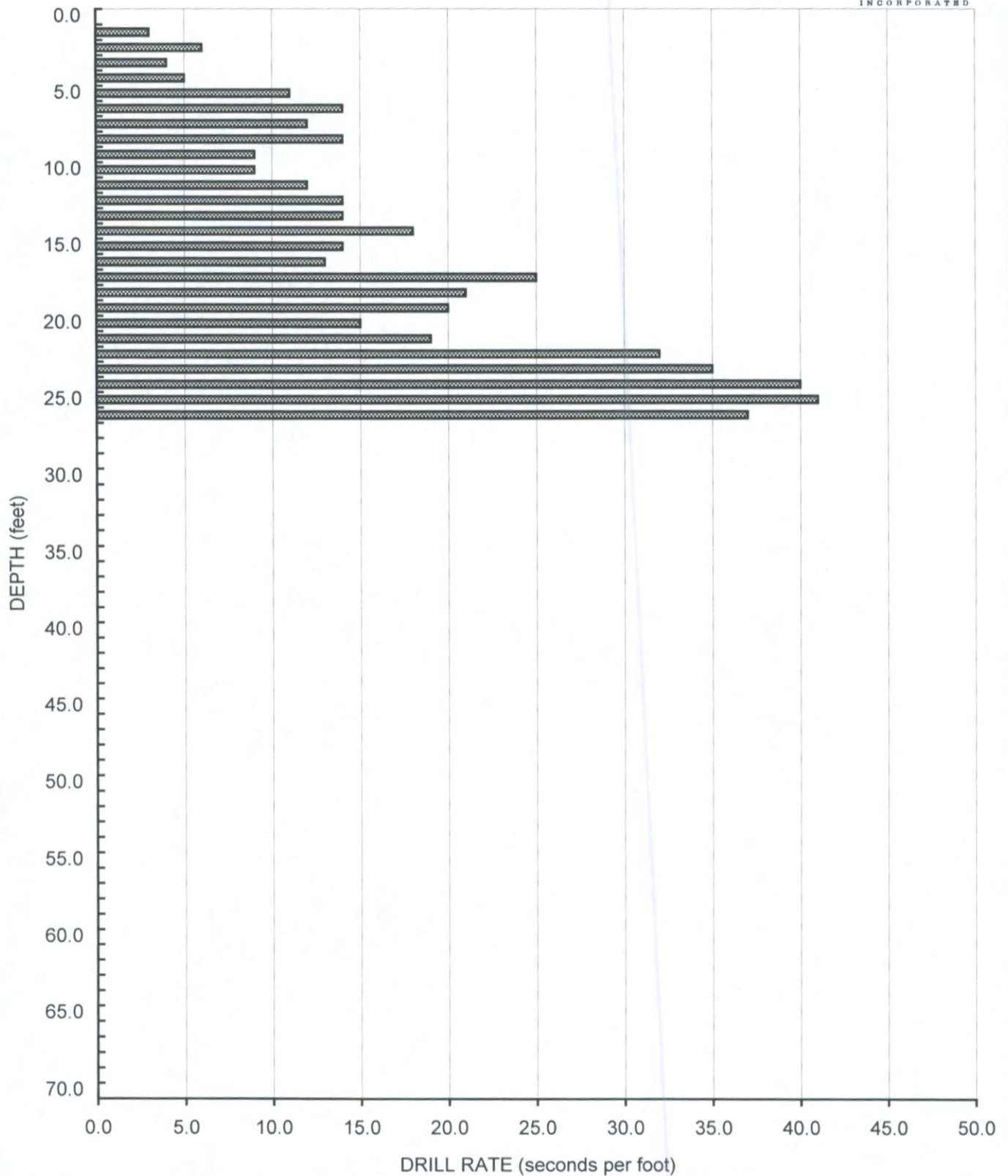
Elevation - 504 Feet (MSL)

GEOCON
INCORPORATED

AIR TRACK BORING AT-16
Elevation - 503 Feet (MSL)GEOCON
INCORPORATED

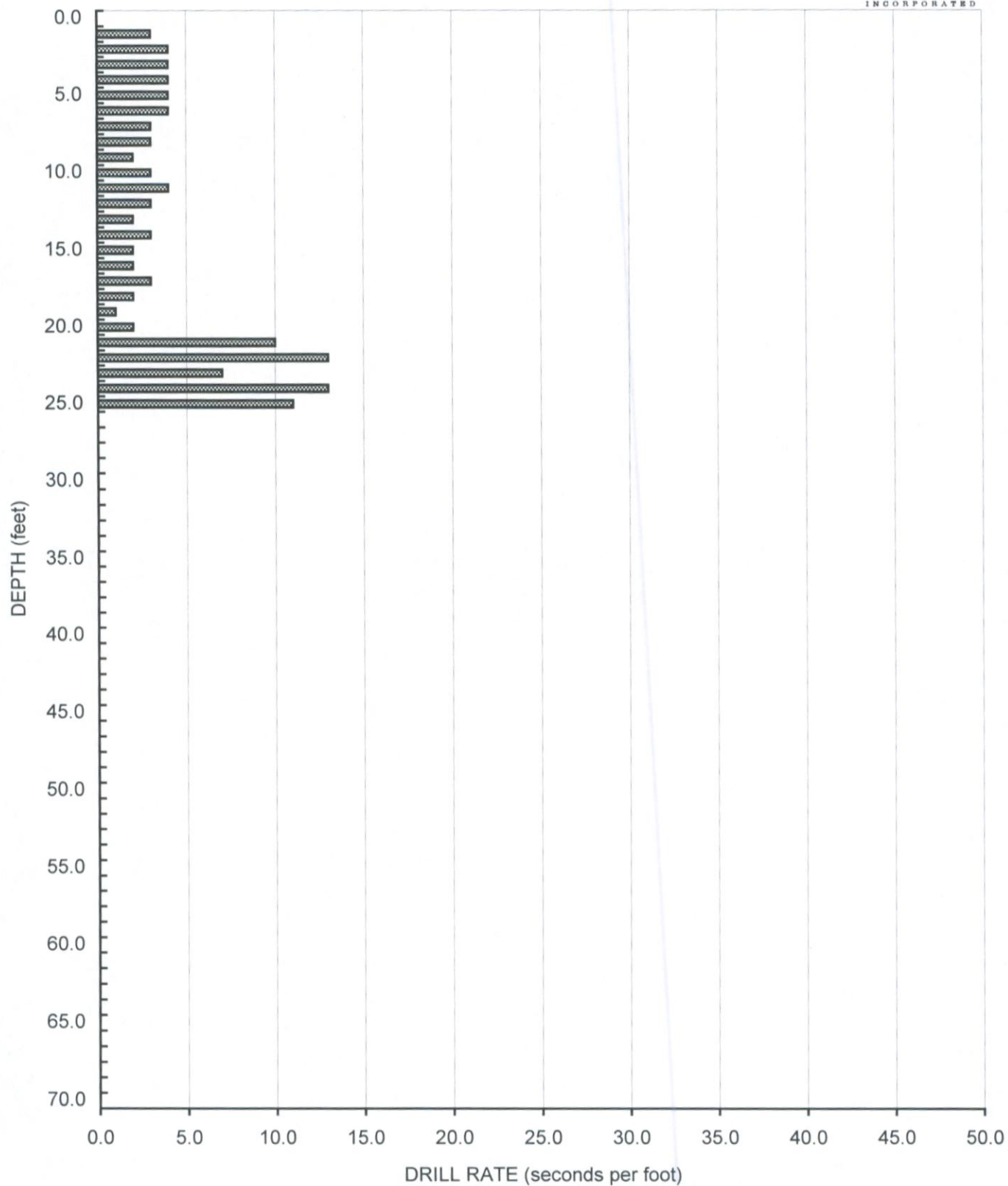
AIR TRACK BORING AT-17
Elevation - 497 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-18
Elevation - 484 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-19
Elevation - 439 Feet (MSL)GEOCON
INCORPORATED

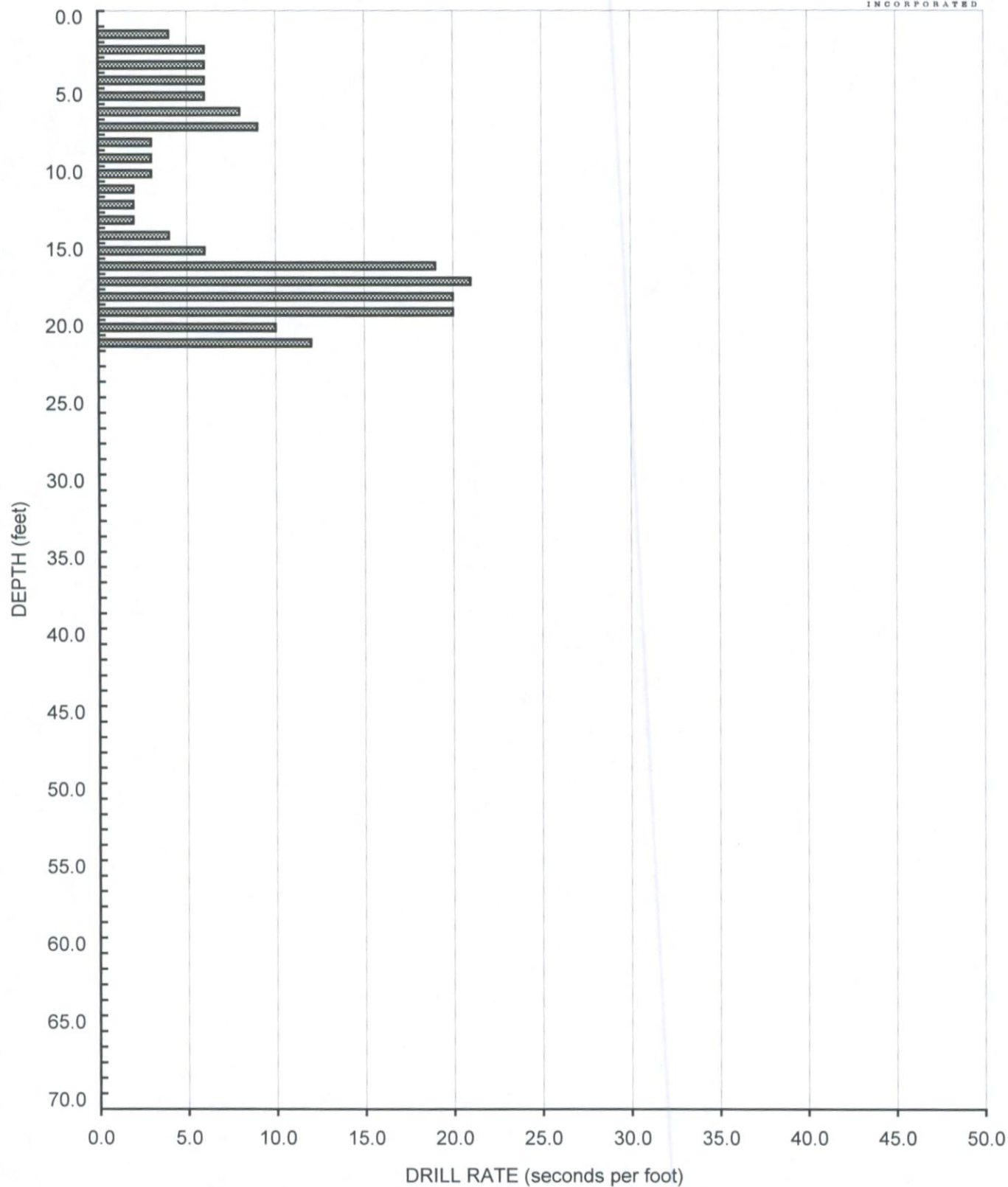
AIR TRACK BORING AT-20

Elevation - 438 Feet (MSL)

GEOCON
INCORPORATED

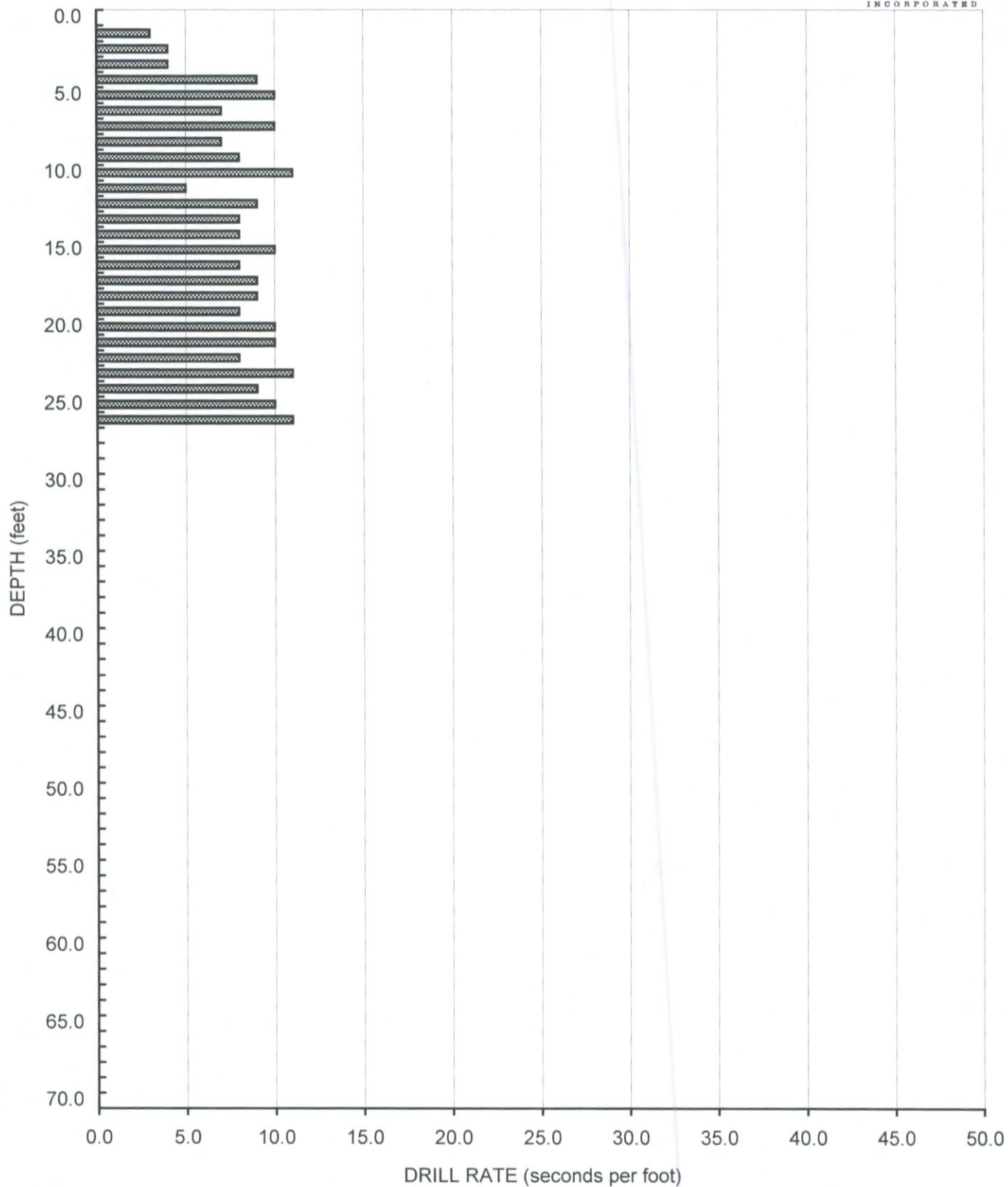
AIR TRACK BORING AT-21

Elevation - 419 Feet (MSL)

GEOCON
INCORPORATED

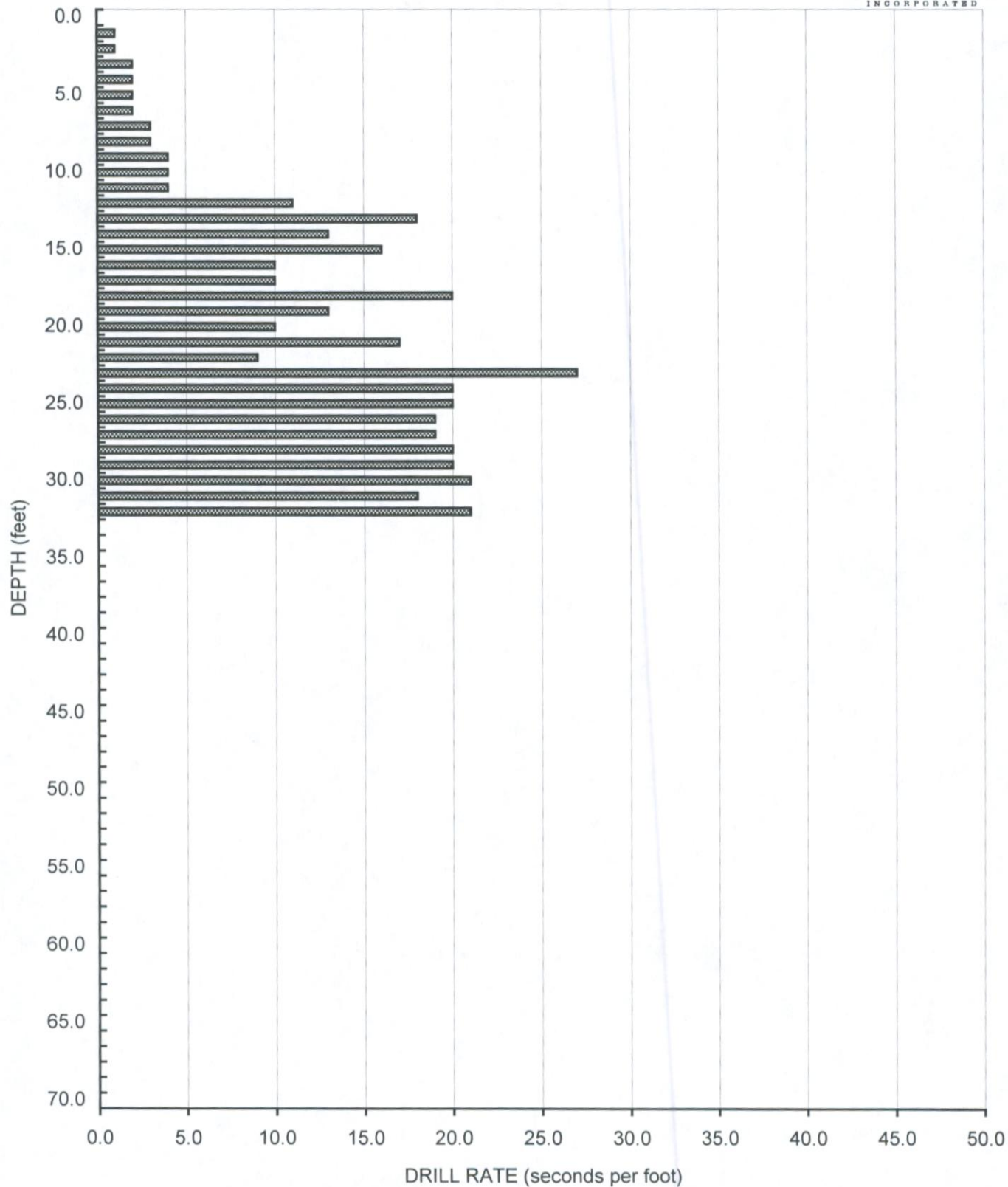
AIR TRACK BORING AT-22

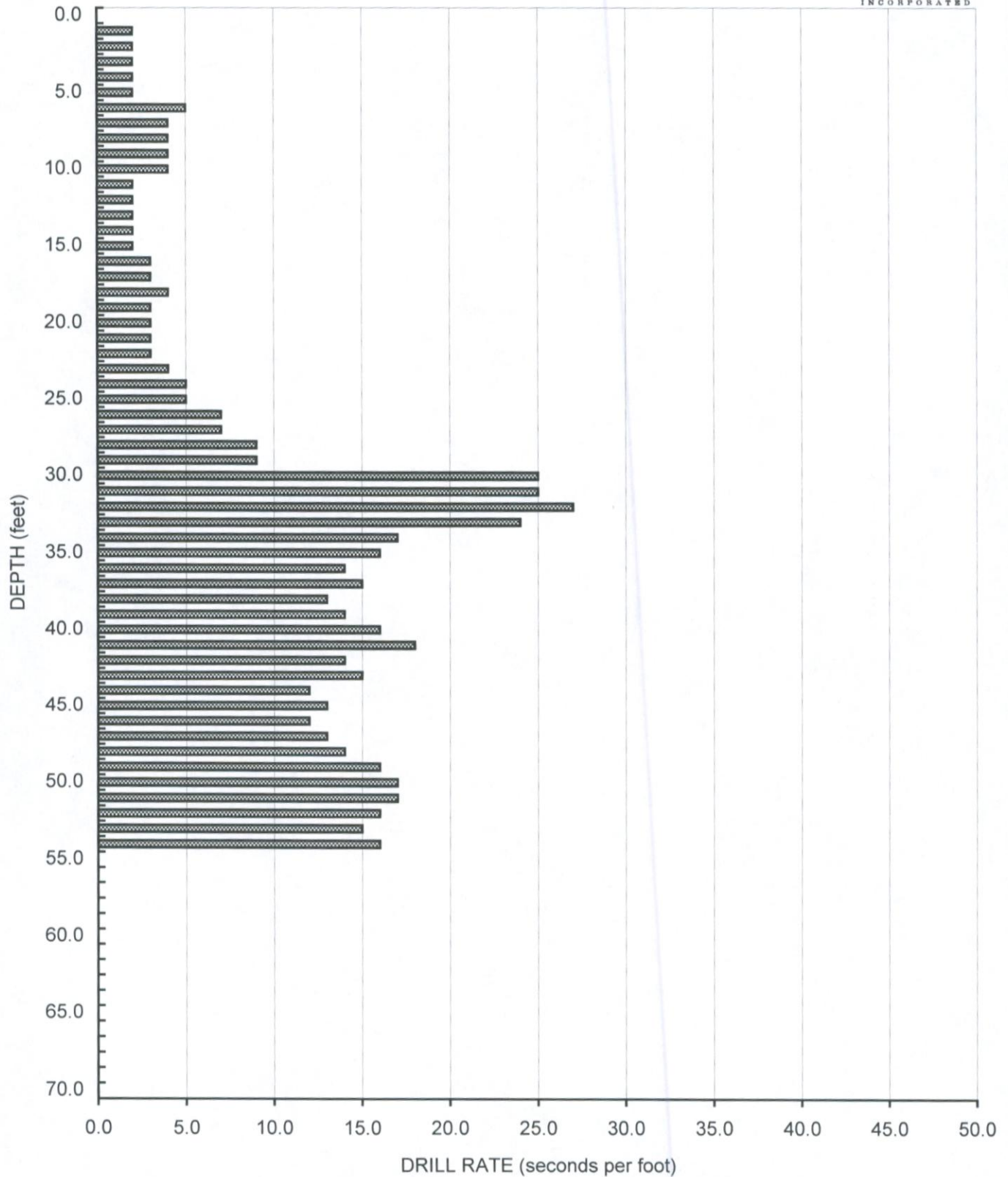
Elevation - 427 Feet (MSL)

GEOCON
INCORPORATED

AIR TRACK BORING AT-23

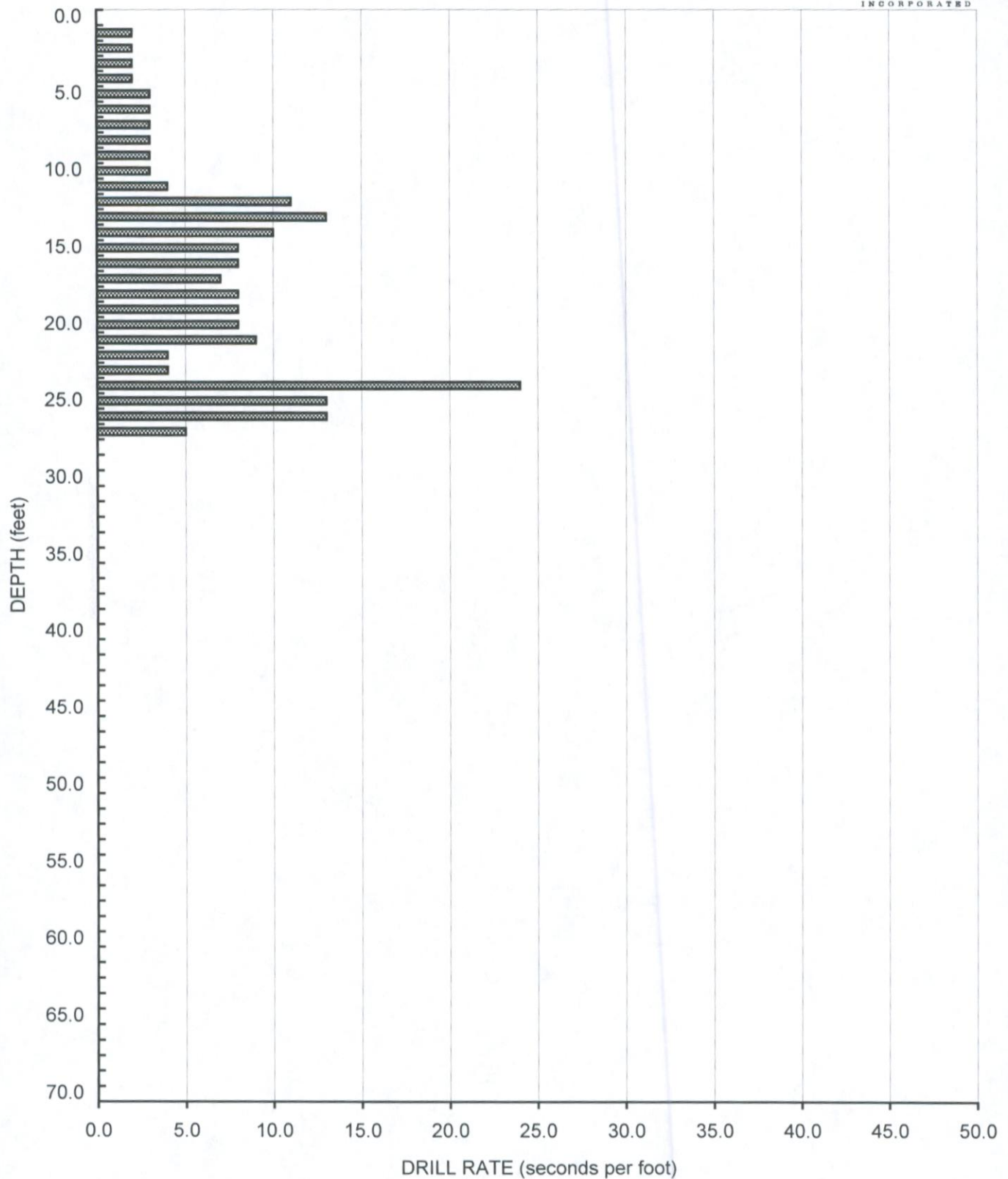
Elevation - 437 Feet (MSL)

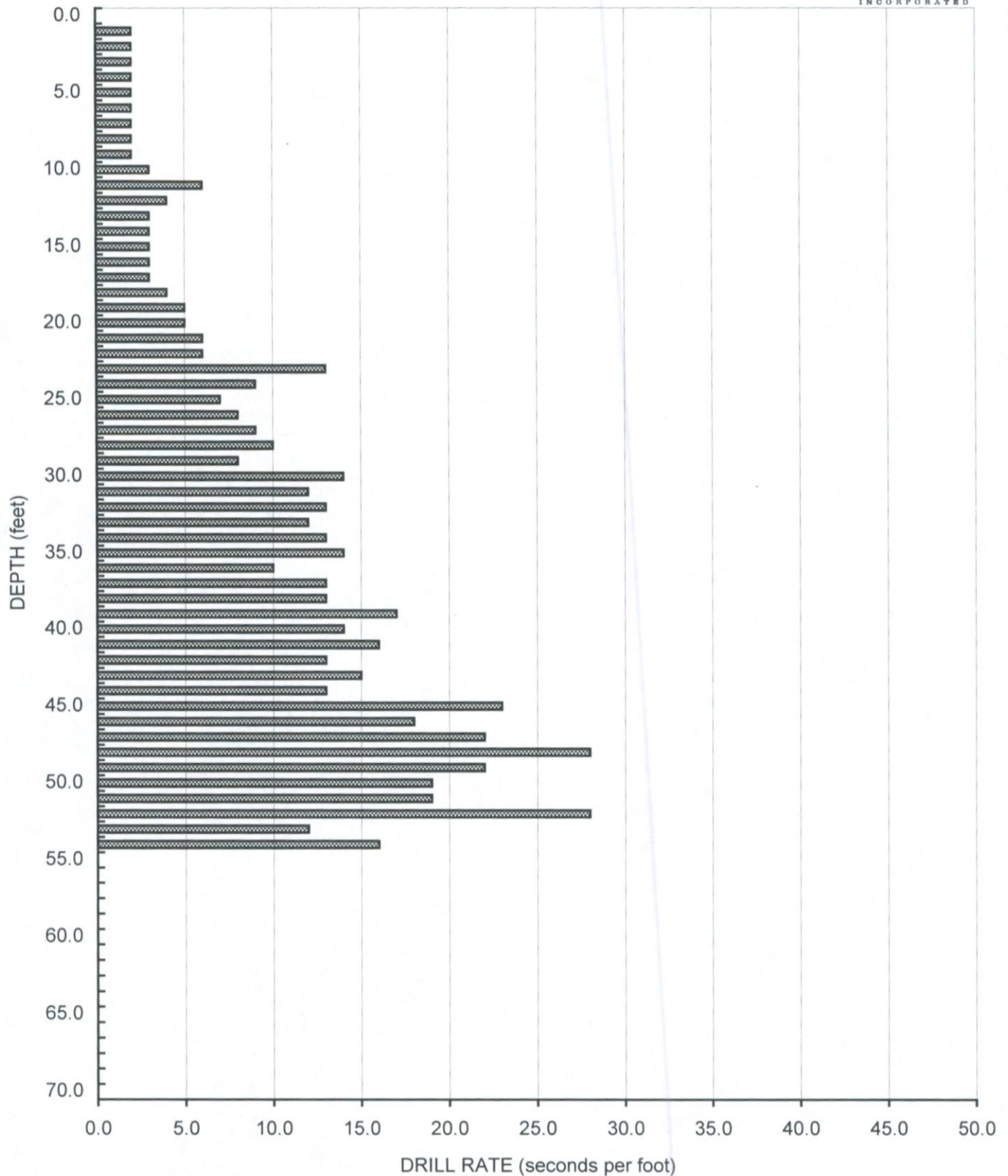
GEOCON
INCORPORATED

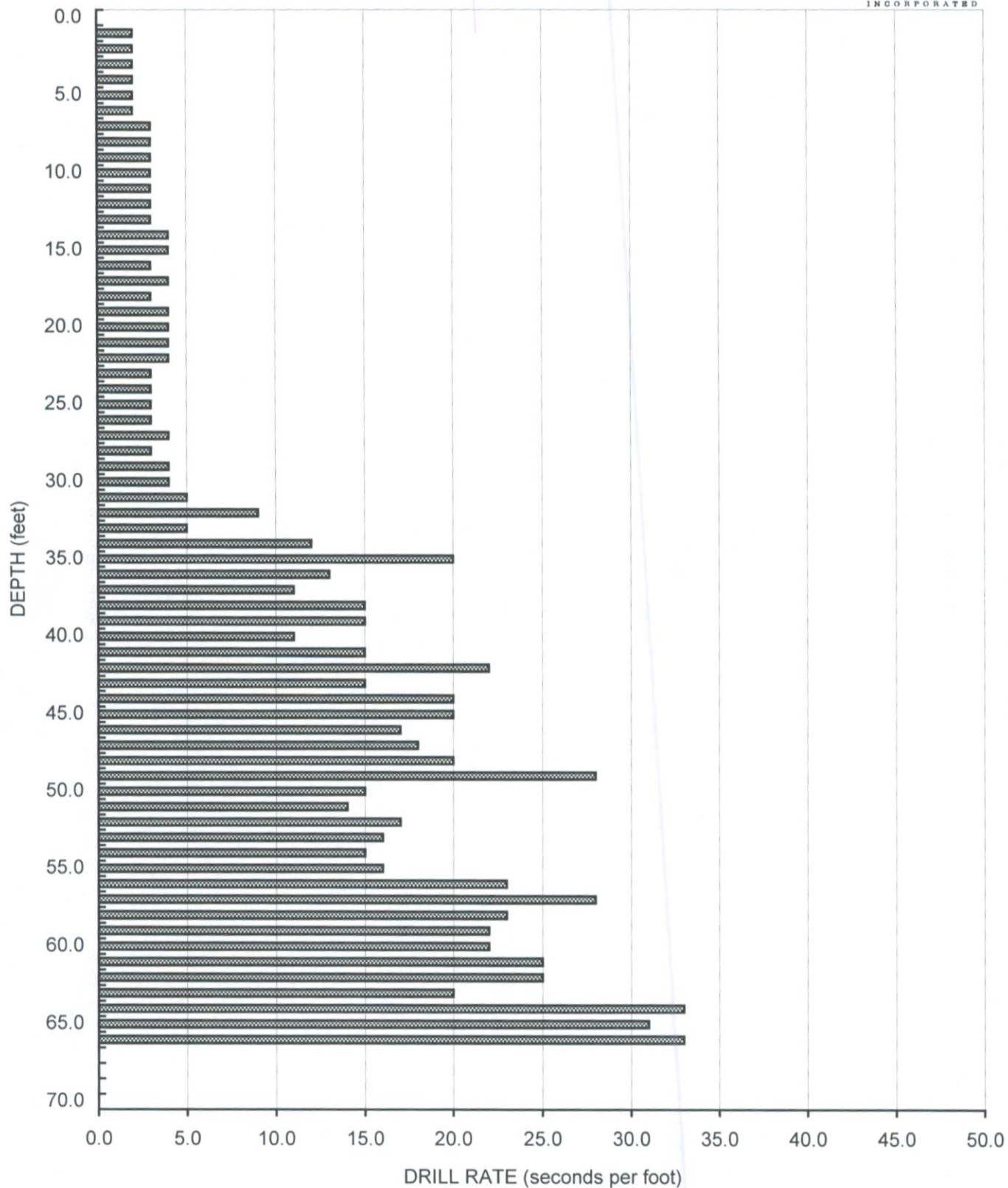
AIR TRACK BORING AT-24
Elevation - 464 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-25

Elevation - 467 Feet (MSL)

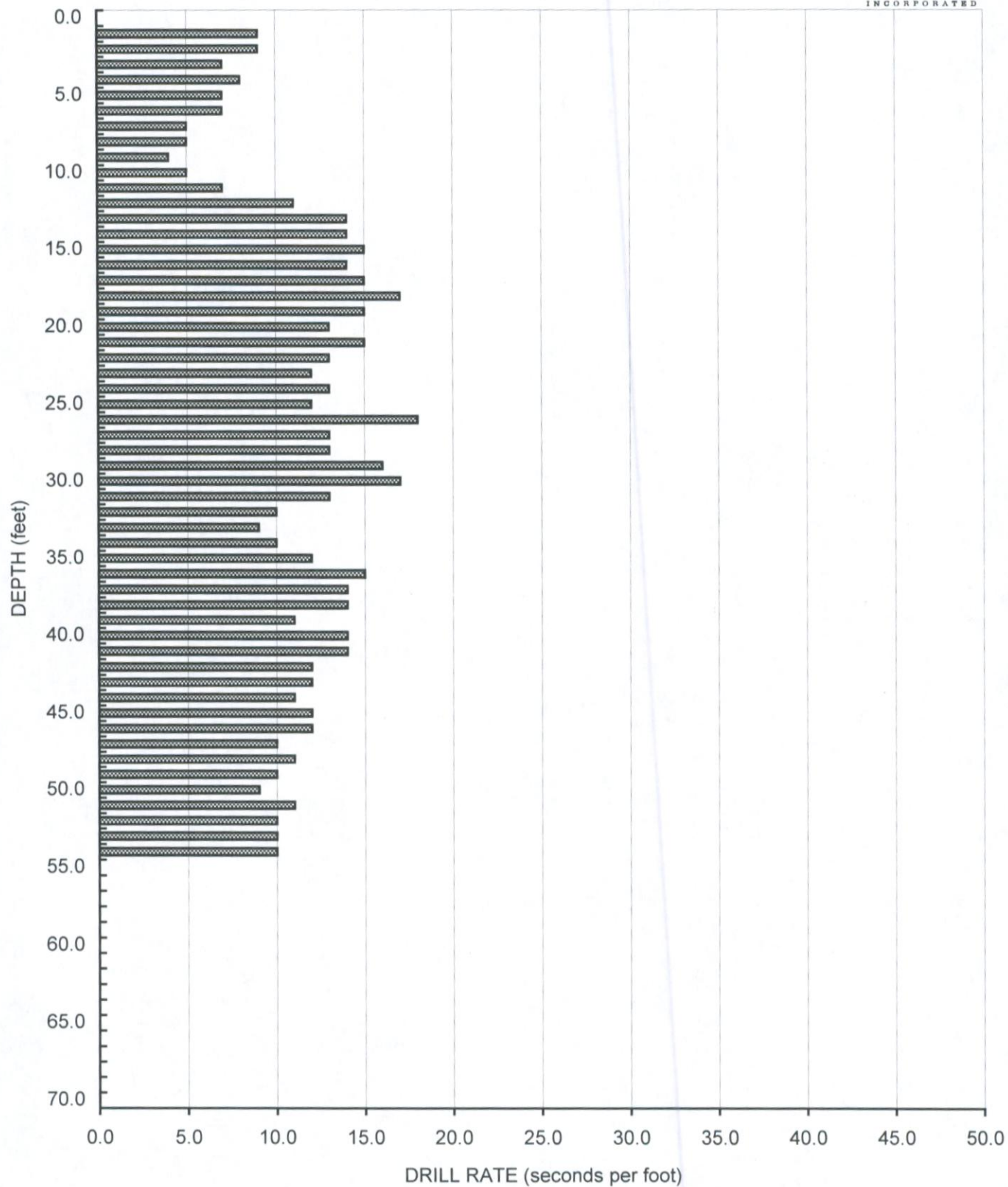
GEOCON
INCORPORATED

AIR TRACK BORING AT-26
Elevation - 467 Feet (MSL)GEOCON
INCORPORATED

AIR TRACK BORING AT-27
Elevation - 478 Feet (MSL)GEOCON
INCORPORATED

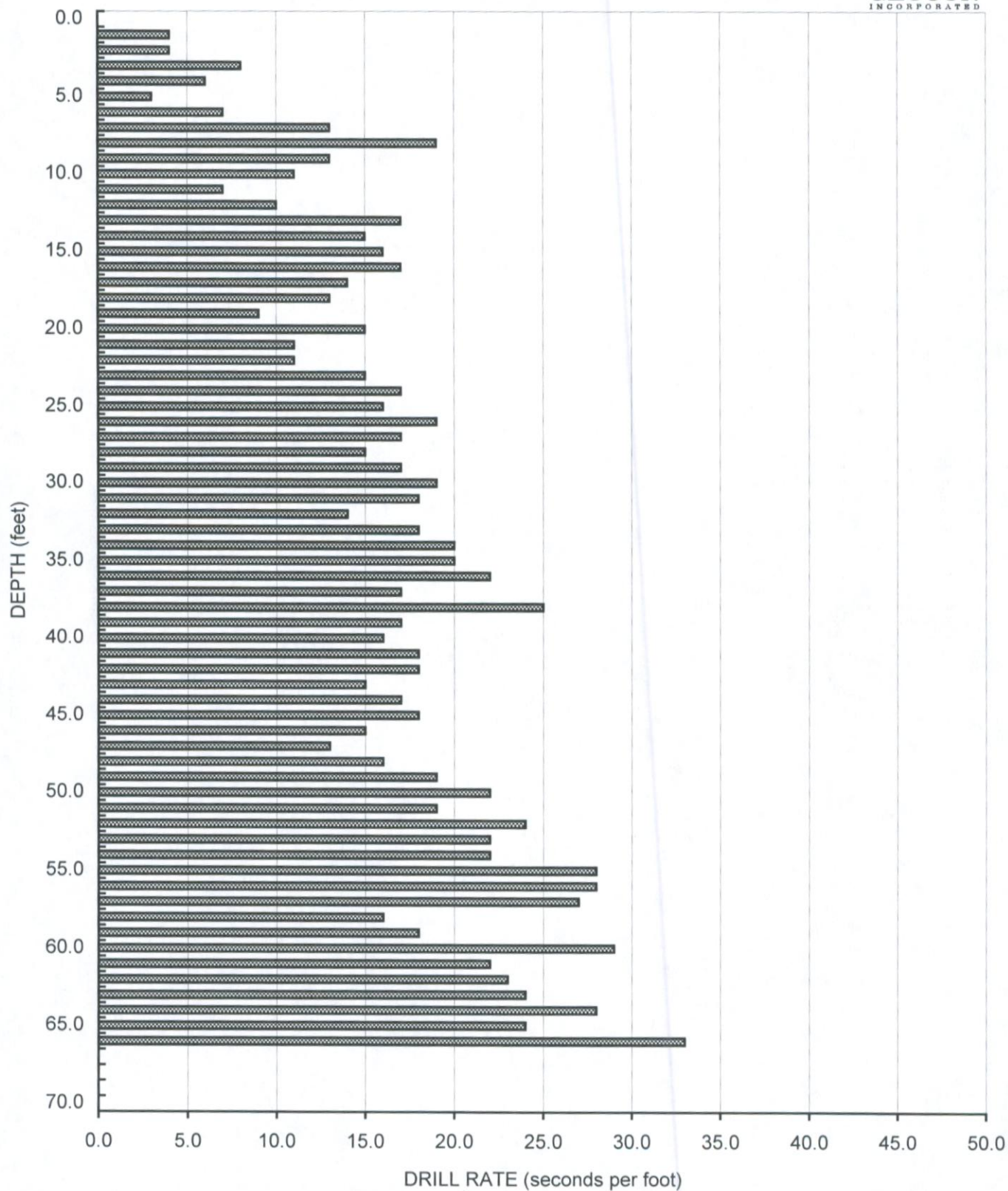
AIR TRACK BORING AT-28

Elevation - 481 Feet (MSL)

GEOCON
INCORPORATED

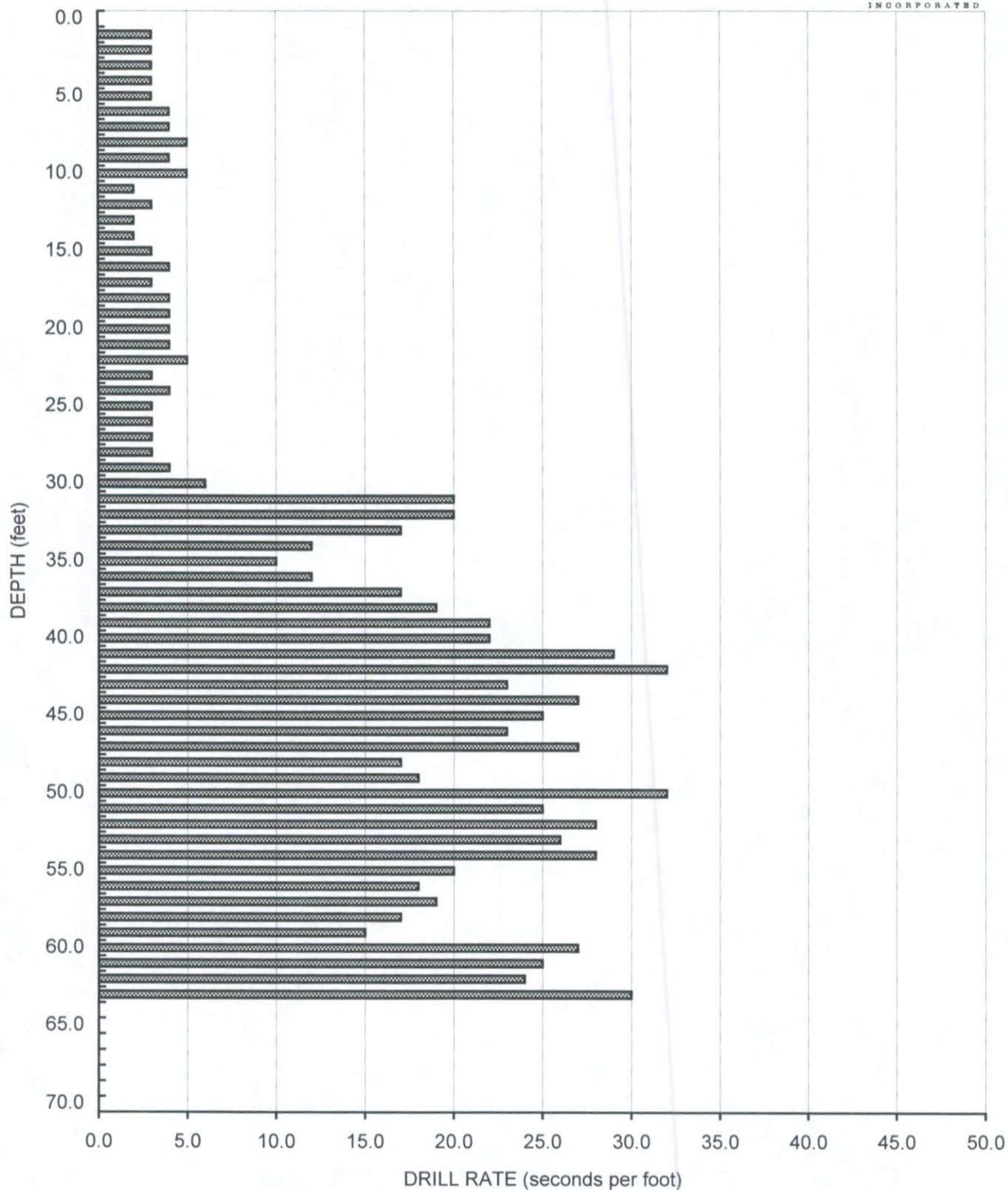
AIR TRACK BORING AT-29

Elevation - 480 Feet (MSL)

GEOCON
INCORPORATED

AIR TRACK BORING AT-30

Elevation - 478 Feet (MSL)

GEOCON
INCORPORATED

File No. D-2059-J01
December 5, 1979

TABLE I
Summary of In-Place Moisture-Density and Direct Shear Test Results

<u>Sample No.</u>	<u>Depth ft.</u>	<u>Dry Density pcf</u>	<u>Moisture Content %</u>	<u>Unit Cohesion psf</u>	<u>Angle of Shear Resistance Degrees</u>
1-3	6-8	116.2	9.8	230	32
3-1	1-4	118.5	8.5	110	41
5-1	2-8	113.5	11.9	180	39

TABLE II
Summary of Laboratory Compaction Test Results
A.S.T.M. D1557-70

<u>Sample No.</u>	<u>Depth ft.</u>	<u>Description</u>	<u>Max. Dry Density pcf</u>	<u>Optimum Moisture % dry wt.</u>
1-3	6-8	Tan, Sandy CLAY	129.2	10.0
3-1	1-4	Tan, Silty, fine to coarse SAND	131.0	9.1
5-1	2-8	Brown, gravelly, fine to coarse SAND	125.9	11.3

TABLE III
Summary of Laboratory Expansion Test Results

<u>Sample No.</u>	<u>Description</u>	<u>Depth ft.</u>	<u>Moisture Content Before Test %</u>	<u>Moisture Content After Test %</u>	<u>Dry Density pcf</u>	<u>Expansion (+) or Settlement (-) %</u>	<u>Surcharge psf</u>
1-3	Tan, Sandy CLAY	6-8	9.1	17.6	117.0	(+)4.5	150

File No. D-2059-J02
October 3, 1986

TABLE I

Summary of In-Place Moisture-Density and Direct Shear Test Results

Sample No.	Dry Density pcf	Moisture Content %	Unit Cohesion psf	Angle of Shear Resistance Degrees
1-1	124.8	2.7		
*1-2	118.4	8.4	327	39
1-3	121.0	8.7		
*1-4	108.3	11.1	380	31
2-1	108.5	12.1		
5-2	109.2	2.2		
7-2		15.1		
*11-1	114.1	9.9	320	38
12-1	121.6	14.6		
13-2	107.0	1.0		
14-1	104.3	0.2		
15-1	104.0	3.4		
15-2	132.3	5.4		
16-1	107.5	7.6		

*Remolded to 90% of maximum density and near optimum moisture content.

File No. D-2059-J02
October 3, 1986

TABLE II

Summary of Laboratory Compaction Test Results

ASTM D1557-78

Sample No.	Description	Maximum Dry Density pcf	Optimum Moisture % Dry Wt.
1-2	Orange-brown Silty, fine to coarse SAND	131.2	8.7
1-4	Light gray-green, Silty, fine to medium SAND	119.9	11.4
11-1	Black-brown, Clayey, fine to SAND	126.4	10.2
13-1	Brown, Clayey, fine to medium SAND	115.5	13.3

TABLE III

Summary of Laboratory Expansion Test Results

FHA Method

Sample No.	<u>Moisture Content</u>			Dry Density pcf	Expansion (+) or Settlement(-) Surcharge	
	Before Test %	Air Dry %	After Test %		%	psf
1-2	8.1	0.6	13.3	118.7	+0.3	150
1-4	12.0	3.5	22.0	07.5	+3.7	150
11-1	9.8	0.8	14.2	114.0	+0.3	150

SAMPLE		T2-3	T11-1				
DEPTH (ft.)							
GRADATION (% FINER BY WEIGHT)	U.S. STANDARD SIEVES	1 1/2"	69.0	95.1			
		1"	41.3	88.7			
		3/4"	31.7	84.9			
		1/2"	21.8	80.2			
		3/8"	16.9	76.6			
		#4	10.6	67.2			
		#8	7.1	58.0			
		#16	5.0	46.4			
		#30	3.8	35.0			
		#50	2.8	25.5			
		#80	--	--			
		#100	2.1	18.7			
		#200	1.5	14.4			
	HYDROMETRY	.05mm					
		.005mm					
		.001mm					

LIQUID LIMIT						
PLASTIC LIMIT						
PLASTICITY INDEX						

GRAIN SIZE ANALYSIS AND ATTERBERG LIMITS

SAN MARCOS TRACT 218
SAN MARCOS, CALIFORNIA

Figure B-1

File No. D-2059-J01
December 5, 1979

DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE	
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt
0				BORING NO. 1		
2	1-1		50 3"	TOPSOIL Loose, slightly damp, brown, Silty fine SAND	NO SAMPLE	
4	1-2			ALLUVIUM Dense, slightly damp, tan, Clayey, Gravelly, Silty, fine SAND	BULK SAMPLE	
6				becomes Sandy CLAY		
8	1-3				BULK SAMPLE	
10						
12						
14				becomes moist to wet		
16						
18				METAVOLCANIC Dense, moist, white, gravelly, Sandy CLAY		
20						
22				becomes tan		
24						
26						
28						
30				REFUSAL AT 29.0 FEET		

Figure 4, Log of Test Boring 1

File No. D-2059-J01
December 5, 1979

DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE	
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt
BORING NO. 2						
0				TOPSOIL		
2				Medium dense, dry, bronw, Silty, fine SAND		
4				DECOMPOSED GRANITE		
				Dense, dry, tan, Silty, fine to coarse SAND		
6				— becomes very dense		
				REFUSAL AT 5.0 FEET		
BORING NO. 3						
0				TOPSOIL		
2				Loose, dry, brown, Silty, fine SAND		
4	3-1			DECOMPOSED GRANITE	BULK SAMPLE	
				Dense, dry, tan, Silty, fine to very coarse SAND		
6				REFUSAL AT 4.0 FEET		
BORING NO. 4						
0				TOPSOIL		
2				Loose, dry, brown, Silty, fine SAND		
4				DECOMPOSED GRANITE		
				Dense, dry, tan, Silty, fine to coarse SAND		
6				Dense, dry, tan, Silty, Sandy GRAVEL		

Figure 5, Log of Test Borings 2, 3, and 4

File No. D-2059-J01
December 5, 1979

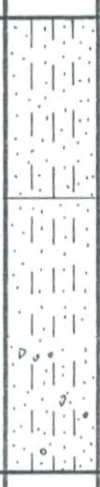
DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE	
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt
0				BORING NO. 5		
2				ALLUVIUM Loose, slightly damp, brown, Gravelly, fine to coarse SAND	BULK SAMPLE	
4				Loose, slightly damp, brown, slightly Silty, fine to coarse SAND		
6	5-1			becomes gravelly, dark brown		
8				DECOMPOSED GRANITE Very dense, slightly damp, tan, Silty, fine to very coarse SAND		
10				BORING TERMINATED AT 10.0 FEET		
0				BORING NO. 6		
2				TOPOSIL Loose, damp, dark brown, Silty, fine SAND		
4				DECOMPOSED GRANITE Dense, damp, tan, Silty, fine to coarse SAND		
6				becomes yellow, moderately gravelly		
8						
10				BORING TERMINATED AT 10.0 FEET		

Figure 6, Log of Test Borings 5 & 6

File No. D-2059-J01
December 5, 1979

DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE		
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt	
BORING NO. 7							
0				TOPSOIL Loose, dry, brown, Silty fine SAND			
2				DECOMPOSED GRANITE Dense, dry, tan, Silty, fine to coarse SAND			
4				Dense, dry, tan, gravel			
6							
8				BORING TERMINATED AT 6.5 FEET			
BORING NO. 8							
0				TOPSOIL Loose, dry, light brown, Silty, fine SAND			
2				DECOMPOSED GRANITE Dense, dry, tan, Silty, fine to coarse SAND			
4							
6							
8							
10							
12				becomes damp			
14							
16				becomes very dense			
18							

Figure 7, Log of Test Borings 7 & 8

File No. D-2059-J01
December 5, 1979

DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE	
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt
BORING NO. 9						
0				TOPSOIL		
2				Loose, dry, brown, Silty, fine SAND		
4				DECOMPOSED GRANITE		
6				Dense, dry, tan, Silty, fine to very coarse SAND		
8				Becomes gravel		
10				Becomes Silty, fine to very coarse SAND		
12				Becomes Sandy GRAVEL		
REFUSAL AT 12.0 FEET						
BORING NO. 10						
0				TOPSOIL		
2				Loose, dry, brown, Silty, fine SAND		
4				DECOMPOSED GRANITIC		
6				Dense, dry, tan, Silty, fine to very coarse SAND		
8						
10				REFUSAL AT 8.5 FEET		

Figure 8, Log of Test Borings 9 & 10

File No. D-2059-J01
December 5, 1979

DEPTH IN FEET	SAMPLE NUMBER	LOG & LOCATION OF SAMPLE	Penetration Resistance Blows/ft	DESCRIPTION	IN-PLACE	
					DRY DENSITY p.c.f	MOISTURE CONTENT % dry wt
				BORING NO. 11		
0				TOPSOIL		
2				Loose, dry, red-brown, Silty, fine SAND		
4				Stiff, dry, red-brown, Sandy CLAY		
6				ALLUVIUM		
8				Dense, slightly damp, red-brown, Clayey, Gravelly, fine SAND becomes tan		
10				METAVOLCANIC		
12				Dense, white, to light green, Sandy CLAY becomes gravelly		
14				becomes moist		
16				BORING TERMINATED AT 15.0 FEET		

Figure 9, Log of Test Boring No. 11

DEPTH FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 1 ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D. 555 Trackhoe with Extendahoe</u>	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
0					MATERIAL DESCRIPTION			
2	T1-1 T1-2				FILL Medium dense to dense, slightly moist, orange-brown Silty fine to coarse SAND with some gravel and boulders boulders > 1 foot	BULK	124.8	2.7
6	T1-3 T1-4				GRANITIC ROCK Weathered: very dense, slightly moist, light gray-green, Silty fine to medium SAND, clay along joints N67W27S N70E85N	BULK	121.0	8.7
8					TRENCH TERMINATED AT 6.5 FEET			
0					TRENCH 2			
2	T2-1 T2-2				TOPSOIL Dense, slightly moist to moist, orange Clayey fine to coarse SAND rocks contact in places is gradational	BULK	108.5	12.1
5	T2-3				GRANITIC ROCKS/SANTIAGO PEAK VOLCANICS Highly fractured, pink and tan, medium- grained transition rock, B-C,C,D,D, joints approximately 2 inches apart, joint surfaces moist and with clay N10W85S N75E70S	BULK		
6					TRENCH TERMINATED AT 6.0 FEET (REFUSAL)			
8								

Figure A-1, Log of Test Trenches 1 and 2

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 3	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D. 555 Trackhoe with Extendahoe</u>			
0					MATERIAL DESCRIPTION			
2					GRANITIC ROCK Gray and tan medium grained granite, extensively fractured, jointed, B-C,B,D,D joints approximately 1 foot apart			
4								
6					N10W80N: joint			
8					evidence of blasting (voids)			
10					TRENCH TERMINATED AT 10 FEET			
0					TRENCH 4			
2					FILL Medium dense, slightly moist to moist, brown Clayey fine to coarse SAND becomes green and clayey			
4					COLLUVIUM Medium dense, slightly moist, dark brown Silty fine to coarse SAND with cobbles			
6					GRANITIC ROCKS/SANTIAGO PEAK VOLCANICS Weathered, medium-grained transition rock: dense, moist, reddish-brown Silty fine to coarse SAND with joint cracks up to 1/2 inch wide filled with clay			
					TRENCH TERMINATED AT 5.0 FEET			

Figure A-2, Log of Test Trenches 3 and 4

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 5	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D. 555 Trackhoe with Extendahoe</u>			
0					MATERIAL DESCRIPTION			
0	T5-1				FILL	BULK	SAMPLE	109.2 2.2
2	T5-2				Medium dense, slightly moist, tan, Silty fine to coarse SAND with boulders			
4					dark brown			
6					dark brown, clayey SAND with roots			
					COLLUVIUM			
					Dense, slightly moist, dark brown Silty fine to coarse SAND with cobbles			
					GRANITIC ROCK			
					Weathered: very dense, slightly moist, gray, Silty fine to medium SAND with gravel			
					TRENCH TERMINATED AT 5.5 FEET			
0					TRENCH 6			
0					COLLUVIUM			
2					Medium dense, moist, dark brown, Silty fine to coarse SAND with cobbles and roots			
4					GRANITIC ROCKS/SANTIAGO PEAK VOLCANICS			
6					Pink and gray, fine-grained transition rock: B-C,C,D-E,D highly jointed, much clay along joints, joints approximately 1 inch apart			
					TRENCH TERMINATED AT 4.5 FEET			

Figure A-3, Log of Test Trenches 5 and 6

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (U.S.C.S.)	TRENCH 7		PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY PCF.	MOISTURE CONTENT, %
					ELEVATION _____	DATE DRILLED 9/17/86			
					EQUIPMENT J.D. 555 Trackhoe with Extendahoe				
					MATERIAL DESCRIPTION				
0					FILL				
2					Loose, moist, tan Silty, fine to coarse SAND with some clay, boulders to 1 foot				
4									
6									
8	T7-1						BULK	SAMPLE	
10					more and larger boulders, approximately 4 feet in diameter				
12	T7-2				Medium dense, moist, black-brown Clayey, fine to coarse SAND		BULK	SAMPLE	
					GRANITIC ROCK/SANTIAGO PEAK VOLCANICS Pink and gray, fine-grained transition rock B,A,B,D				
					TRENCH TERMINATED AT 12 FEET (REFUSAL)				

Figure A-4, Log of Test Trench 7

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 8	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D. 555 Trackhoe with Extendahoe</u>			
0					MATERIAL DESCRIPTION			
2					TOPSOIL Dense, slightly moist, orange-brown, Clayey fine to coarse SAND (weathered Kgr/Jsp)			
					GRANITIC ROCK/SANTIAGO PEAK VOLCANICS Light gray, fine-grained granite C,B-C,D,D N45W82S			
					TRENCH TERMINATED AT 1.5 FEET (REFUSAL)			
0					TRENCH 9			
2					GRANITIC ROCK Light gray, fine to medium-grained granite, weathered, clayey in parts			
4					TRENCH TERMINATED AT 3.5 FEET (REFUSAL)			

Figure A-5, Log of Test Trenches 8 and 9

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 10	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D, 555 Trackhoe with Extendahoe</u>			
0					MATERIAL DESCRIPTION			
2					GRANITIC ROCK Medium-grained, orange and tan granite with euhedral feldspar crystal, C,C,D,D joints approximately 1 inch apart N5E70N N30E73N N27W30S			
					TRENCH TERMINATED AT 2.0 FEET (REFUSAL)			
0					TRENCH 11			
2					FILL Dense, slightly moist, tan, Silty, fine to coarse SAND with some boulders			
4	T11-1				Loose, moist, black-brown Clayey, fine to coarse SAND with boulders and roots)	BULK	SAMPLE	
6								
8					GRANITIC ROCK Weathered, medium-grained, gray and white granite			
					TRENCH TERMINATED AT 7.5 FEET (REFUSAL)			

Figure A-6, Log of Test Trenches 10 and 11

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.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 12	PENETRATION RESISTANCE BLOWS/FT.	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED <u>9/17/86</u> EQUIPMENT <u>J.D. 555 Trackhoe with Extendahoe</u>			
0					MATERIAL DESCRIPTION			
2					FILL Medium dense, slightly moist, tan Silty, fine to coarse SAND with some boulders			
4	T12-1				Loose to medium dense, moist, dark brown Clayey, fine to coarse SAND with some roots and boulders		121.6	14.6
6								
8					GRANITIC ROCK Medium-grained tan and gray granite, weathered			
					TRENCH TERMINATED AT 8.0 FEET			
0					TRENCH 13			
2	T13-1 T13-2				COLLUVIUM Medium dense, very slightly moist, brown Clayey, fine to medium SAND with few gravel	BULK	SAMPLE 107.0	1.0
4					Medium dense, slightly moist, brown, Clayey SAND			
					GRANITIC ROCK Orange and tan, medium-grained granite, joints approximately 2 inches apart N65W90-joint			
					TRENCH TERMINATED AT 4.0 FEET (REFUSAL)			

Figure A-7, Log of Test Trenches 12 and 13

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.

DEPTH IN FEET	SAMPLE NO	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 14	PENETRATION RESISTANCE BLOWS/FT	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED 9/18/86 EQUIPMENT JD 510 Backhoe with 24" Bucket			
0					MATERIAL DESCRIPTION			
2	T14-1				COLLUVIUM Loose to medium dense, slightly moist, brown, Clayey, fine to coarse SAND with roots, boulders		106.1	0.2
4					TRENCH TERMINATED AT 3.5 FEET			
0					TRENCH 15			
2	T15-1				COLLUVIUM Medium dense, slightly moist, brown, Silty, fine to coarse SAND with gravel		104.1	3.4
4	T15-2				GRANITIC ROCK/SANTIAGO PEAK VOLCANICS Dense, slightly moist, light orange, Silty, fine to coarse SAND with few round holes Pink and gray, medium-grained granite; C-D, C-D-E, D, clay along joints, joint spacing, approximately 2 inches apart N32E78N less weathered		132.3	5.4
					TRENCH TERMINATED AT 4.0 FEET (REFUSAL)			

Figure A-8, Log of Test Trenches 14 and 15

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.

DEPTH IN FEET	SAMPLE NO	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH 16	PENETRATION RESISTANCE BLOWS/FT	DRY DENSITY P.C.F.	MOISTURE CONTENT, %
					ELEVATION _____ DATE DRILLED 9/18/86 EQUIPMENT _____			
0					MATERIAL DESCRIPTION			
2	T16-1				COLLUVIUM Medium dense, slightly moist, brown, Silty, fine to coarse SAND with roots and cobbles		107.5	7.6
4					GRANITIC ROCK/SANTIAGO PEAK VOLCANICS Weathered topsoil: dense, slightly moist, <u>orange-red Clayey fine to coarse SAND</u> Pink and purple, medium-grained granite C,C-B,D,D TRENCH TERMINATED AT 2.5 FEET (REFUSAL)			
0					TRENCH 17			
2					FILL Loose, moist, tan, Silty, fine to coarse SAND black with organics			
4					ALLUVIUM Loose, saturated, brown, Clayey GRAVEL TRENCH TERMINATED AT 2.5 FEET (REFUSAL)			
0					TRENCH 18			
2	T18-1				FILL Loose, very moist, dark brown, Clayey, fine to coarse SAND black with organics		BULK SAMPLE	
4					ALLUVIUM Loose, saturated, brown, Clayey GRAVEL TRENCH TERMINATED AT 2.5 FEET (REFUSAL)			

Figure A-9, Log of Test Trenches 16, 17 and 18

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.

APPENDIX

B

APPENDIX B

RECOMMENDED GRADING SPECIFICATIONS

FOR

MELROSE AND DIAMOND PROJECT
SAN MARCOS, CALIFORNIA

PROJECT NO. G2520-32-03A

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. 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 herein in the event 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 Geotechnical Report recommendations and these specifications. The Consultant shall provide sufficient testing and observation services to assess whether, in their opinion, the work has been performed in substantial conformance with these specifications and the recommendations contained in the Geotechnical Report. It shall be the responsibility of the Contractor to keep the Consultant apprised of their work schedule and any changes, including planned placement of fill material, so that personnel may be scheduled accordingly. Fill placed in the absence of the geotechnical consultant is subject to removal.
- 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, the Geotechnical Report recommendations and the approved plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, improper moisture content, inadequate compaction, or adverse weather result in work not in conformance with these specifications and the Geotechnical Report recommendations, the Consultant will be empowered to reject the work and recommend to the Owner that grading be suspended 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 providing qualified representatives to be present on-site, as necessary, 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

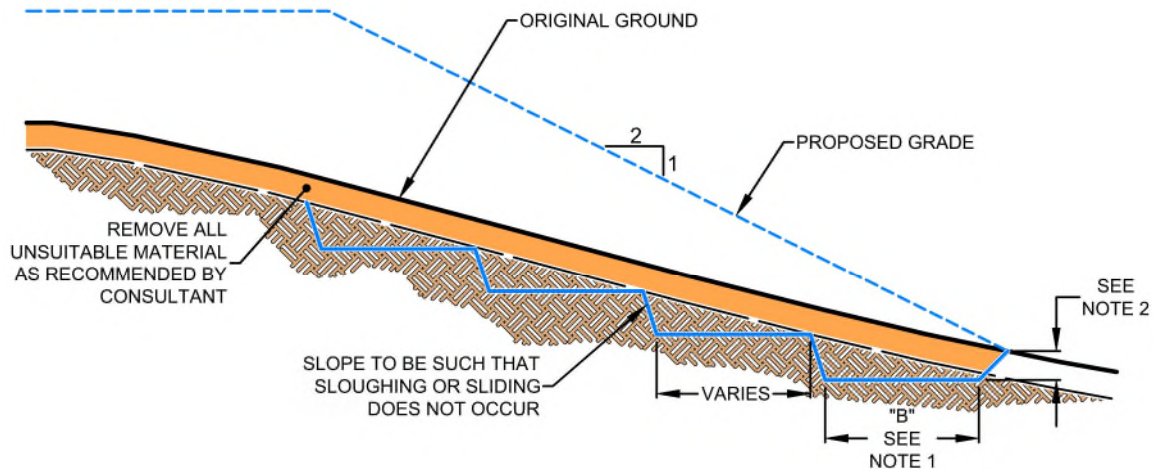
- 3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined 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 $\frac{3}{4}$ 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 (less than 20 percent). Fines are defined as material smaller than ¾ inch in maximum dimension.
- 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 Health and Safety Code Section 25501, and any other applicable local, state or federal laws. The Consultant is not 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 the termination of grading operations within the affected area until the Owner can be notified of the conditions. Prior to resuming grading operations, the Owner shall provide written documentation to the Consultant confirming that the suspected materials are not hazardous under applicable laws and regulations.

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 of trees, stumps, brush, vegetation, 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.
- 4.2 Concrete fragments 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 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



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 TOWARDS THE NATURAL SLOPE.
- 2.....THE OUTSIDE OF THE KEY SHOULD BE BELOW THE UNSUITABLE SURFICIAL MATERIAL AND EXPOSE DENSE OR HARD FORMATIONAL MATERIAL. WHERE 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*.

5. COMPACTION EQUIPMENT

- 5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepfoot 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 *Section 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 should generally not exceed 8 inches when compacted. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of materials and moisture content in each layer. The entire fill shall be placed 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.

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 (i.e., 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. Compaction shall be continuous over the fill 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. These soils should generally be moisture-conditioned to at or above optimum moisture content, or as otherwise approved by the Consultant.

6.1.7 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. To achieve proper compaction, fill slopes should be over-built by at least 3 feet and then cut to the design grade where possible.

- 6.1.8 As an alternative to over-building, fill slopes can be back-rolled with either a heavy-duty loaded sheepsfoot or track-walked with a D-8 dozer or larger equipment at vertical intervals every 4 feet during slope construction. Upon completion, the entire slope face should be track-walked promptly using a D-8 dozer or larger equipment to ensure uniform compaction of at least 90 percent relative compaction at or above optimum moisture content. If the fill slope cannot be constructed all at once, the finished portions of the slope should be compacted as described above.
- 6.1.9 Where fill slopes and fill-over-cut slopes are planned, a 15-foot-wide keyway should be constructed prior to placing compacted fill. The keyway should expose competent formational material all the way to the slope face and be inclined towards the inside portion of the slope. A subdrain may be recommended along the base of the keyway depending on the conditions encountered.

6.2 *Soil-rock* fill, as defined in *Section 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 positioned 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 and properly compacted. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, provided this method is 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 should 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 should 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 compaction methods 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 should be placed on a sloping surface (minimum slope of 2 percent). The surface should slope toward suitable subdrainage outlet facilities. The *rock* fills should be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains should be permanently connected to controlled drainage facilities to control post-construction infiltration of water. Modifications to these recommendations are at the discretion of the Consultant.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing the previous lifts and dumping at the front edge of the current lift. Spreading of the *rock* fill shall be by a dozer with sufficient water support to facilitate *seating* of the rock. Water support shall generally consist of water trucks traversing in front of the embankment and continuously spraying during rock placement. Spreading of the rock fill shall not occur without adequate water support.

6.3.3 Compaction shall be achieved using equipment that provides compactive energy equivalent to, or greater than, a 20-ton steel vibratory roller, a loaded rock truck, or other equipment approved by the Consultant capable of providing sufficient energy to meet the required compaction. Each *rock* fill lift shall be uniformly compacted, ensuring that the entire lift—including edges and ends—receives a

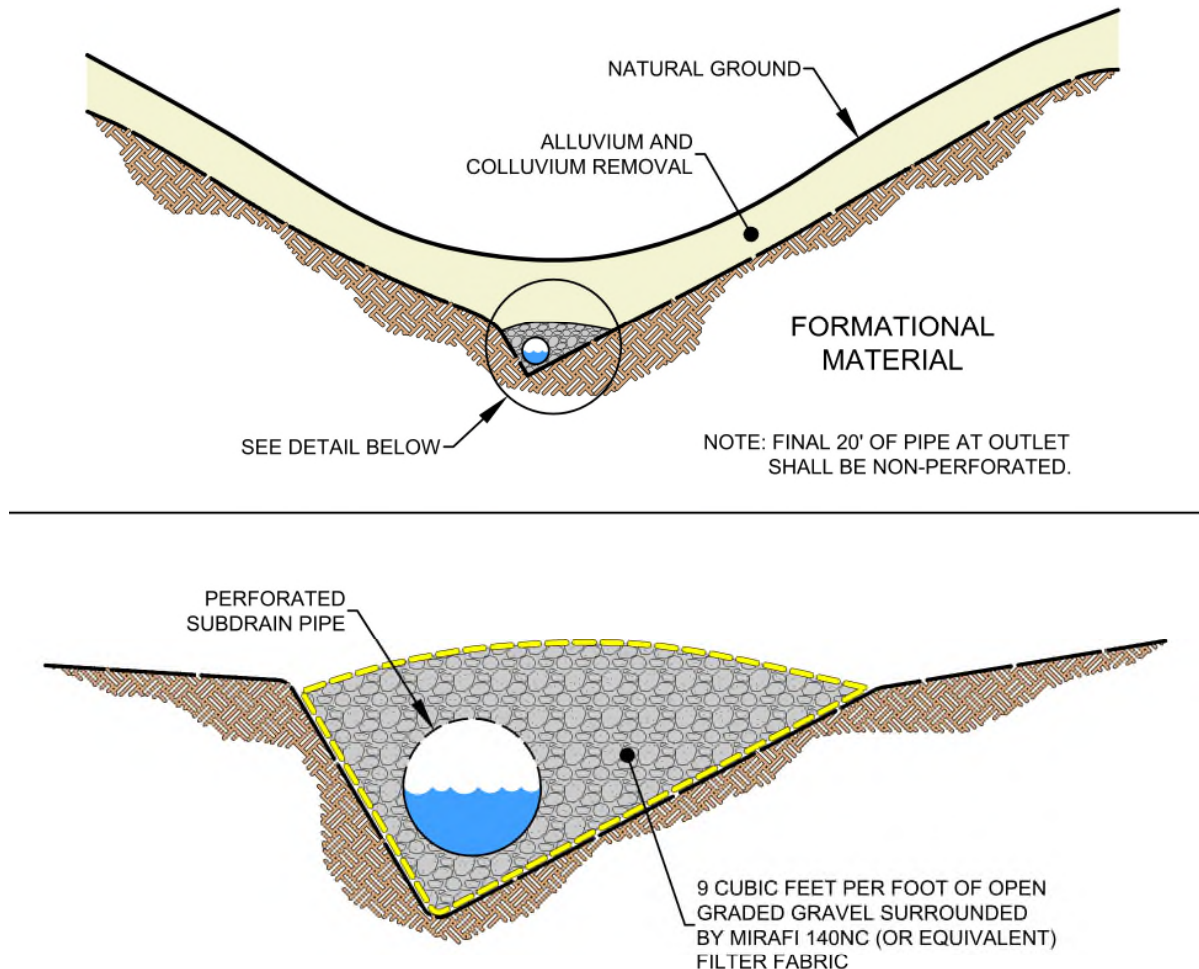
minimum of two passes with the compaction equipment before the next lift is placed. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts shall be permitted.

- 6.3.4 A representative of the Consultant should be present continuously during *rock* fill operations to observe and confirm that the necessary methods for compactive effort have been provided, that water is being properly applied and that the specified procedures are being followed. The appropriate number of rock truck passes during compaction will be determined by the Consultant during grading.
- 6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can observe the condition of the fill and state that, in their opinion, the rock has been properly placed. 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 the overlying *soil* fill, a minimum 2-foot-thick layer of graded rock material shall be placed above the uppermost lift of *rock* fill. The gradation of this material and overall lift thickness will be determined by the Consultant.

7. SUBDRAINS

- 7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. The lower portion of canyon subdrains exceeding 500 feet in length, or extensions of existing offsite subdrains, shall use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch diameter pipes.

TYPICAL CANYON DRAIN DETAIL



NOTES:

- 1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.
- 2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NOT TO SCALE

- ### TYPICAL CUT OFF WALL DETAIL

Diagram illustrating a detail of a concrete cut-off wall. The wall is shown in cross-section, with a subdrain pipe (indicated by a dashed line) embedded within the concrete. The wall is labeled "CONCRETE CUT-OFF-WALL". The subdrain pipe is labeled "SUBDRAIN PIPE". The diagram shows the wall extending 24" horizontally and 6" vertically, with a minimum clearance of 6" MIN. indicated on the right side.

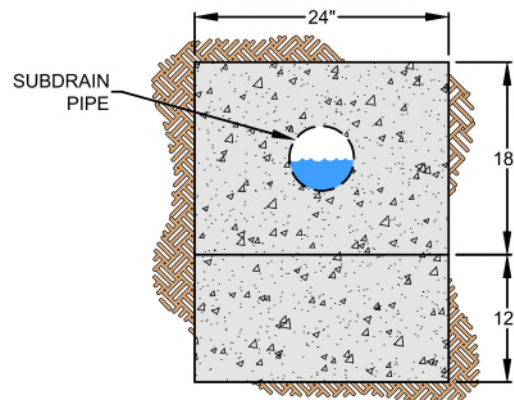
A cross-sectional diagram of a concrete cut-off wall and subdrain pipe assembly. The wall is shown as a vertical rectangular section with a stippled texture. A horizontal line represents the ground surface. Below the ground surface, a solid subdrain pipe is shown, transitioning into a perforated subdrain pipe. The concrete wall is 12" MIN. thick. The perforated subdrain pipe has a diameter of 6" MIN. (TYP). The solid subdrain pipe is labeled "SOLID SUBDRAIN PIPE" and the perforated subdrain pipe is labeled "PERFORATED SUBDRAIN PIPE". The concrete wall is labeled "CONCRETE CUT-OFF-WALL".

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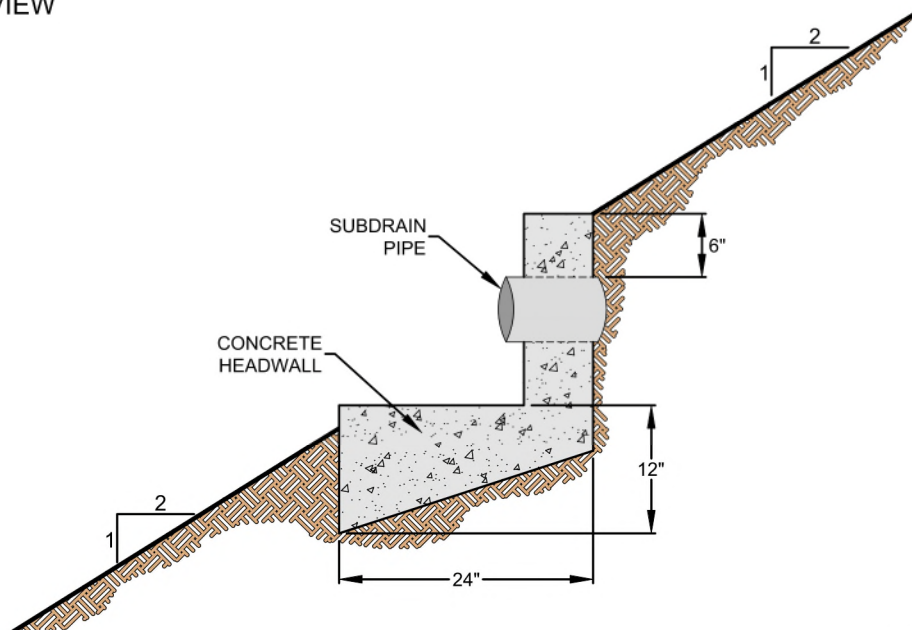
- 7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure per the detail below.

TYPICAL HEADWALL DETAIL

FRONT VIEW



SIDE VIEW



NOT TO SCALE

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

- 7.7 The 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 showing the drain locations and connection points. The final outlet and connection locations should be

determined during grading operations. A vertical riser should be installed at the end of any subdrain that is planned for future extension into adjacent areas. The grading contractor should consider video inspection of the subdrains shortly after burial to verify proper installation and functionality. The contractor is responsible for the proper construction and performance of all drains.

8. OBSERVATION AND TESTING

- 8.1 The Consultant shall be the Owner's representative to observe and perform in-place density 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 general, 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.
- 8.2 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. 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.
- 8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes over the fill have been performed. The Contractor shall excavate observation pits, as requested by the Consultant, within the *rock* fill 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.
- 8.4 A settlement monitoring program designed by the Consultant may be required in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Geotechnical Report or in the final report of testing and observation services performed during grading.
- 8.5 The Consultant should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

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

9. PROTECTION OF WORK

- 9.1 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 remediated prior to placing additional fill or structures.
- 9.2 It is the responsibility of the Contractor and their designated competent person to ensure that all excavations, temporary slopes and trenches are properly constructed and maintained in accordance with applicable OSHA regulations to maintain safety and the stability of adjacent existing improvements. Temporary backcuts for buttresses, shear keys, stability fills or any other remedial excavations shall be promptly backfilled with properly compacted fill to prevent raveling, sloughing or slope failure.
- 9.3 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.

10. CERTIFICATIONS AND FINAL REPORTS

- 10.1 Upon completion of the work, a certification by the Project Civil Engineer shall be prepared stating that the graded surfaces have been constructed 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 each subdrain section, the Project Civil Engineer should survey its location and prepare an “as-built” plan showing the subdrain location. The Project Civil Engineer should also verify the proper outlet, and the Contractor should ensure that the drain system is free of obstructions.
- 10.2 The Owner is responsible for furnishing a final as-graded soil and/or geologic report satisfactory to the appropriate governing or accepting agencies. The 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 Geotechnical Report, which includes these Recommended Grading Specifications.

LIST OF REFERENCES

1. 2025 California Building Code, California Code of Regulations, Title 24, Part 2, based on the 2024 International Building Code, prepared by California Building Standards Commission, adopted January 2026.
2. American Concrete Institute ACI 330-08, Guide for the Design and Construction of Concrete Parking Lots, prepared by the American Concrete Institute, dated June, 2008.
3. American Concrete Institute, ACI 318-11, Building Code Requirements for Structural Concrete and Commentary, dated August, 2011.
4. American Society of Civil Engineers (ASCE), ASCE 7-22, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
5. Anderson, J. G., T. K. Rockwell, and D. C. Agnew, *Past and Possible Future Earthquakes of Significance to the San Diego Region: Earthquake Spectra*, v. 5, no. 2, p. 299-333, 1989.
6. California Department of Conservation, Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California*, Open File Report 96-08, 1996.
7. California Geological Survey, *Seismic Shaking Hazards in California*, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003). 10% probability of being exceeded in 50 years.
<http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html>
8. <http://www.water.ca.gov>.
9. <http://earthquake.usgs.gov/designmaps/us/application.php>.
10. Kennedy, M. P. and S. S. Tan, *Geologic Map of the Oceanside 30'x60' Quadrangle, California*, USGS Regional Map Series, Scale 1:100,000, 2005.
11. Unpublished reports and maps on file with Geocon Incorporated.
12. USGS computer program, *Seismic Hazard Curves and Uniform Hazard Response Spectra*.