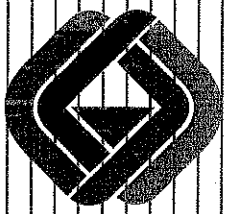
GEOTECHNICAL INVESTIGATION

LOS COCHES I
BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA



GEOCON
INCORPORATED

GEOTECHNICAL
CONSULTANTS

PREPARED FOR

CENTEX HOMES
SAN DIEGO, CALIFORNIA

OCTOBER 11, 2005
PROJECT NO. 07091-32-03

GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS

Project No. 07091-32-03
October 11, 2005

Centex Homes
1815 Aston Avenue, Suite 101
San Diego, California 92008

Attention: Mr. Ryan Martin

Subject: LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA
GEOTECHNICAL INVESTIGATION

Gentlemen:

In accordance with your request and our Proposal No. LG-05116, dated March 15, 2005, we have performed a geotechnical investigation of the subject project. The accompanying report presents the results of our study and our conclusions and recommendations regarding the geotechnical aspects of developing the property as proposed.

In our opinion, the site may be developed as planned provided the recommendations of this report are followed. The presence of thick colluvial deposits and hard rock in areas of proposed excavation will require special consideration during site grading.

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

Very truly yours,

GEOCON INCORPORATED

Trevor E. Myers
RCE 63773

REGISTERED PROFESSIONAL ENGINEER
TREVOR E. MYERS
No. C63773
Exp. 09/30/06
CIVIL
STATE OF CALIFORNIA

David B. Evans
CEG 1860

PROFESSIONAL GEOLOGIST
DAVID B. EVANS
No. 1860
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

TEM:DBE:anh

(6/del) Addressee

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed 72-lot residential subdivision planned within the community of Lakeside, San Diego County, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate soil and geologic conditions at the site and, based on the conditions encountered, provide recommendations pertaining to the geotechnical aspects of developing the property as proposed. As part of this study, the following reports and plans were reviewed:

1. *Soil and Geologic Reconnaissance, Los Coches, County of San Diego County, California,* prepared by Geocon Incorporated, dated June 13, 2003 (Project No. 07091-32-01).

2. *Tentative Map For: County of San Diego Tract No. 5306RPL2, "Los Coches,"* prepared by REC Consultants, Inc., Sheets 1 of 3, undated.

3. *Grading Plan For: Brightwater Ranch, County of San Diego, California,* prepared by Project Design Consultants, undated.

The field investigation was conducted in various phases from September 2003 to August 2005 and consisted of a site reconnaissance by an engineering geologist, excavating 28 exploratory trenches and 23 exploratory borings, and performing 13 air-track borings. The trenches and borings were performed to determine the general extent of surficial deposits (i.e., topsoil, colluvium, and alluvium) and to further investigate the geologic conditions where development is planned. The air-track borings were conducted to examine the rippability characteristics of the granitic rock. Details of the field investigation as well as trench, boring, and air-track boring logs are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained from the trenches and borings to determine their pertinent physical properties for engineering analyses. A discussion of the laboratory testing and test results are presented in Appendix B.

The recommendations presented herein are based on an analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed for this report are provided in the *List of References* section of this report.

The base map used to depict the soil and geologic conditions consisted of a reproducible copy of the referenced grading plan prepared by Project Design Consultants (see Geologic Map, Figure 2, map pocket). The geologic map depicts the configuration of the property, proposed development, existing topography, mapped geologic contacts, and the approximate locations of the exploratory trench and boring excavations and air-track borings.

2. SITE AND PROJECT DESCRIPTION

The site consists of approximately 78 acres of undeveloped land located northwest of the intersection of Interstate 8 and Los Coches Road in eastern San Diego County. Topographically, the proposed development area is characterized by gentle north and east sloping ground surfaces located at the base of steeper hillsides. The gently sloping surfaces are dissected by several shallow to deeply incised drainage channels. The central portion of the property is designated open space (Lot A) and is occupied by a promontory that divides the two development areas.

Elevations on the property vary from approximately 766 feet Mean Sea Level (MSL) at the top of the central ridge to approximately 600 feet MSL in the vicinity of the proposed drainage easement located in the northwestern portion of the property. Vegetation consisting of native chaparral covers the majority of the site.

Review of the referenced grading plan, prepared by REC Consultants, Inc., indicates that proposed site development consists of grading the property to construct a 72-lot residential subdivision with associated roadways. Cuts and fills on the order of 40 to 45 feet, respectively, are proposed. Cut and fill slopes, inclined at 1.5:1 (horizontal:vertical) and 2:1, respectively, having maximum heights of 60 feet and 35 feet are also proposed. Access to the site will be provided via the extension of Wellington Hill Drive into the eastern side of the development.

The locations and descriptions of the site and proposed development are based upon a site reconnaissance, a review of the available plans, and our understanding of proposed development. If project details vary significantly from those described above, Geocon Incorporated should be consulted to provide additional recommendations and/or analysis.

3. SOIL AND GEOLOGIC CONDITIONS

Four surficial soil types and one geologic formation were encountered during our field investigation. The surficial deposits consists of undocumented fill, topsoil (unmapped), alluvium, and colluvium. The formational unit includes Cretaceous-age granitic rock. The materials and geologic unit are discussed below in order of increasing age. Their estimated areal extent, as determined by field mapping, is depicted on Figure 2.

3.1 Undocumented Fill (Qudf)

Undocumented fill deposits have been mapped based upon topographic expression along the southern property line and at the southern end of Wellington Hill Drive. These deposits appear to be associated with past grading activities for the adjacent residential developments. Although the fill deposits

appear relatively minor, they will likely be exposed in proposed 1.5:1 cut slopes and will need to be evaluated during grading. In this regard, geogrid-reinforced stability fills may be necessary. The undocumented fill at the south end of existing Wellington Hill Drive will require removal and compaction during site grading.

3.2 Topsoil (unmapped)

Topsoil typically blankets the site and primarily consists of silty sand. Topsoil is estimated to be on the order of 1½ to 3 feet thick, but localized areas with greater thicknesses may exist. The topsoil is considered unsuitable in its present condition and will require removal and compaction.

3.3 Alluvium (Qal)

Alluvial soils have been mapped within the active drainage channels throughout the site. These deposits generally consist of relatively loose to medium dense, silty sands with varying amounts of gravel and cobble derived from the bedrock units. Due to the relatively unconsolidated nature of the alluvial deposits, removal and compaction will be necessary in areas to receive structural fill or structures. The estimated extent of the alluvial deposits located within the development boundary is shown on Figure 2.

3.4 Colluvium (Qcol)

Colluvial deposits were encountered throughout the site overlying the granitic rock with a maximum thickness of 50 feet (Boring B-6). These deposits consist of silty to clayey sands and generally posses a low to medium expansion potential. The results of laboratory tests indicate that the majority of the colluvium is compressible when subjected to loads, hence, remedial grading will be required in areas of planned development. However, portions of the colluvium demonstrated adequate strength characteristics to receive fill soils or structural loads. The estimated removal depth has been indicated on the Geologic Map. An engineering geologist should be present during grading to verify the colluvial areas that will not require remedial grading.

3.5 Granitic Rock (Kgr)

Cretaceous-age granitic rock was encountered throughout the project. The rock materials exhibited a variable weathering pattern ranging from completely weathered, decomposed granite to outcrops of fresh, extremely strong, hard rock that may require blasting to excavate. The majority of the air-track borings revealed rippable conditions based on generally accepted drill penetration rate criteria. Granitic units generally exhibit adequate bearing and slope stability characteristics and cut slopes

excavated at an inclination of 1.5:1 (horizontal:vertical) should be stable to the proposed heights if free of adversely oriented joints or fractures.

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

4. GROUNDWATER

Groundwater was not encountered at the time of this investigation and is not expected to significantly affect construction as proposed. However, it is not uncommon for groundwater or seepage conditions to develop in fills and formational units where none previously existed, especially in irrigated areas or after seasonal rainfall. Proper surface drainage of irrigation water and rain will be critical to future performance of the project.

5. GEOLOGIC HAZARDS

5.1 Faulting and Seismicity

Based on our field investigation and a review of geologic maps, reports and aerial photos, the site is not located on any known "active" fault trace as defined by the California Geological Survey (CGS).

The Rose Canyon Fault zone, located approximately 16 miles west of the site, is the closest known active fault. The CGS considers a fault seismically active when evidence suggests seismic activity within roughly the last 11,000 years. The CGS has included portions of the Rose Canyon Fault zone within an Alquist-Priolo Earthquake Fault Zone. Based upon a review of available geologic data and published reports, the site is not located within a State of California Alquist-Priolo Earthquake Fault Zone.

Earthquakes that might occur on the Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. In order to determine the distance of known faults to the property, the computer program *EQFAULT* (Blake, 2000) was utilized. Principal references used within *EQFAULT* in selecting faults to be included are Jennings (1975), Anderson (1984), and Wesnousky (1986). In addition to fault location, *EQFAULT* was used to estimate ground accelerations at the site for the maximum anticipated seismic event.

Thirteen known active faults were identified within a search radius of 62 miles (100 kilometers) from the property. The results of the deterministic analyses indicate that the Rose Canyon Fault Zone is the dominant source of potential ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 7.2 and 0.18g, respectively. The following table lists the estimated maximum earthquake magnitude and peak ground acceleration for the 13 faults. Peak ground acceleration was estimated using the attenuation relationships of Sadigh (1997).

TABLE 5.1
DETERMINISTIC SITE PARAMETERS FOR SELECTED ACTIVE FAULTS

Fault Name	Approximate Distance From Site (mi)	Estimated Maximum Magnitude Earthquake	Estimated Maximum Magnitude Site Acceleration (g)
Rose Canyon Fault Zone	17	7.2	0.18
Elsinore-Julian	27	7.1	0.11
Coronado Bank	30	7.6	0.13
Earthquake Valley	31	6.5	0.06
Elsinore-Coyote Mtn	33	6.8	0.07
Newport-Inglewood (offshore)	37	7.1	0.07
Elsinore-Temecula	38	6.8	0.06
San Jacinto-Coyote Creek	47	6.6	0.04
San Jacinto-Borrego	49	6.6	0.04
San Jacinto-Anza	49	7.2	0.06
Superstition Mtn.	59	6.6	0.03
Laguna Salada	60	7.0	0.04
Elsinore-Glen Ivy	62	6.8	0.03

*From *EQFAULT* Computer Program (Blake, 2000).

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. We recommend seismic design of the structures be performed in accordance with *California Building Code* guidelines or other applicable guidelines.

The site could be subjected to moderate to severe ground shaking in the event of a major earthquake on any of the faults referenced above or other faults in Southern California. With respect to seismic shaking, the site is considered comparable to the surrounding developed area.

5.2 Soil Liquefaction

Soil liquefaction occurs within relatively loose, cohesionless sands located below the water table that are subjected to ground accelerations from earthquakes. Due to the likely absence of permanent groundwater, the dense nature of the soil beneath the site, and the proposed compaction of compressible soils, the potential for liquefaction occurring at the site is considered very low.

5.3 Landslides

No landslides were mapped or observed on the property. Landslides are not considered a geologic hazard to this project.

5.4 Rock Rippability

A rippability study was performed and consisted of drilling hydraulic rotary percussion borings (generically referenced herein as air-track borings) in the areas where significant excavations are proposed. The borings were advanced using an Ingersoll Rand 590 drill rig equipped with a 4.5-inch drill bit. A total of 13 borings were drilled on August 26, 2005. The air-track borings, in general, were advanced to approximately 10 feet below proposed finish grade, or to a maximum depth of 50 feet. The approximate locations of the air-track borings are shown on the Geologic Map.

Drill penetration rates were used to evaluate rock rippability and to estimate the depth at which difficult excavation will occur. A frequently used guideline to equate rock rippability to drill penetration rate is that a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material, 20 to 30 spf indicates marginally to non-rippable material, and greater than 30 spf indicates non-rippable rock. These general guidelines are typically based on drill rates using a rotary percussion drill rig similar to an Ingersoll Rand ECM 360 with a 3½-inch drill bit.

The penetration rates (recorded in seconds per foot) for each air track boring are presented in Appendix A, Figures A-49 through A-61. The estimated thickness of rippable material for several borings in the granitic rock using 20 seconds per foot as the boundary between rippable and marginal to non-rippable rock is presented on Figure 2. The estimate is derived from a literal interpretation of the penetration rate from each boring. Perspective contractors should use their own judgment to identify the penetration rate boundary between productive and non-productive ripping, and rippable and non-rippable rock.

Based on this study, it is expected that the majority of the significant excavations within the development will encounter generally rippable granitic rock materials. However, based on drill penetration rates obtained in Borings AT-1, AT-3 and AT-11, marginal to non-rippable rock may be

encountered at depths ranging from 15 to 37 feet below existing grades. Corestones should also be anticipated.

Proposed excavations within the granitic rock will likely require very difficult ripping and possible blasting as excavations are extended beyond the rippable mantle. Estimates of the anticipated volume of hard rock materials generated from proposed excavations should be evaluated based on the information from each boring and drill penetration rate criteria acceptable to the contractor. Roadway/utility corridor and lot undercutting criteria should also be considered when calculating the volume of hard rock. Proposed cuts in hard rock areas can be expected to generate oversized fragments (rocks greater than 12 inches in dimension) which will necessitate typical hard rock handling and placement procedures during grading operations.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

6.1.1 The project may be developed as proposed provided the recommendations of this report are incorporated into project design and construction. The presence of thick colluvial deposits and possible hard rock in areas of proposed excavations will require special consideration during site grading.

6.1.2 Remedial grading to remove and compact the potentially compressible surficial soils will be required during grading. The depth of remedial grading will vary and the anticipated deepest removals are on the order of 40 feet below the ground surface. In general, the colluvial soils encountered in the vicinity of Lots 60 through 72 will require the maximum removal of 40 feet or until granitic rock is exposed, whichever occurs first. The colluvium in the vicinity of Lots 34 though 59 will require remedial grading on the order of 10 feet below existing grade, or until granitic rock is exposed, whichever occurs first. Deeper colluvial/alluvial pockets may be encountered, depending on the natural condition of the deposit. The colluvium exposed at the base of remedial excavations should be evaluated for suitability by a representative of our firm. The anticipated removal depths are shown on Figure 2. The presence of perched groundwater/seepage should be considered when planning remedial grading procedures during the winter months.

6.1.3 Based on the rippability study, the majority of the proposed excavations can be accomplished by applying moderate to heavy ripping with conventional heavy-duty equipment. Heavy ripping may generate oversize materials and corestones that will require special handling and fill placement procedures. Oversize materials should be placed in accordance with Appendix C of this report.

6.1.4 Geogrid reinforced stability fills may be necessary where undocumented fills are exposed in proposed 1.5:1 slope excavations. This condition may occur along the slope east of Lots 6 through 8, and to a lesser extent Lots 9 through 18. The necessity to construct the fills should be evaluated once the proposed slope excavations commence. Typical stabilization measures may consist of placing a reinforcing grid every approximately two vertical feet within the fill portion of the slope. Grid lengths are typically 10 feet. Recommendations will be provided once the actual conditions are observed and evaluated.

6.2 Subdrains

6.2.1 The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to groundwater seepage. The use

of canyon subdrains will be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Figure 3 depicts a typical canyon subdrain detail.

6.2.2 Prior to outletting, the final segment of subdrain should consist of non-perforated drain-pipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction in accordance with Figure 4. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent head wall structure in accordance with Figure 5. Based on the proposed configuration, it is anticipated that the subdrains would outlet adjacent to the eastern portions of the site or connected to the storm drain system.

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

6.3 Seismic Design Criteria

6.3.1 The following table summarizes the site-specific design criteria obtained from the 1997 Uniform Building Code (UBC). The values listed in Table 6.3 are for the Rose Canyon Fault, which is identified as a Type B fault, and the Elsinore-Julian Fault, which is a Type A fault. Two sets of values are provided depending on the final building locations and the thickness of colluvium and fill beneath the buildings. If more than 10 feet of fill or colluvium will be present beneath the lot, S_D should be used. If less than 10 feet of fill or colluvium will be present, S_C can be used. S_D should be used for Lots 1, 2, 10 through 23, 30 through 38, 41 through 59, and 60 through 72. S_C should be used for Lots 3 through 9, 24 through 29, 39, and 40.

TABLE 6.3
SITE DESIGN CRITERIA

Parameter	Value	Value	UBC Reference
Seismic Zone Factor	0.40	0.40	Table 16-I
Soil Profile	S_C	S_D	Table 16-J
Seismic Coefficient, C_a	0.40	0.44	Table 16-Q
Seismic Coefficient, C_v	0.56	0.64	Table 16-R
Near-Source Factor, Na	1.0	1.0	Table 16-S
Near-Source Factor, N_v	1.0	1.0	Table 16-T
Seismic Source	A/B	A/B	Table 16-U

6.4 Grading—General

6.4.1 Grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of Appendix C conflict with this section, the recommendations of this section take precedence.

6.4.2 Grading should begin with the removal and exportation of vegetation or deleterious material from areas to be graded.

6.4.3 Compressible soils (undocumented fill, topsoil, colluvium and alluvium) should be removed to expose competent colluvium or granitic rock, as discussed above. Fill soil may then be placed and compacted to minimum 90 percent relative compaction at or slightly above optimum moisture content. On-site soils are generally considered suitable for use as fill provided they are free of deleterious materials. Soils with an Expansion Index less than 50 should be placed in the upper 3 feet of building pads.

6.4.4 To reduce the potential for differential settlement, it is recommended that the cut portion of cut-fill transition pads should be undercut a minimum of three feet and replaced with properly compacted "very low" to "low" expansive soil fill.

6.4.5 Imported soil, if required, should be tested and approved by Geocon Incorporated prior to importation. At least 3 working days should be allowed for laboratory testing of the soil prior to its importation. The import soil should be predominantly granular and have an Expansion Index less than 50.

6.4.6 Fill soil, including wall and trench backfill, should be compacted in lifts no thicker than will allow for proper compaction. Fill soil should be compacted to a minimum relative compaction of 90 percent at or above optimum moisture content as determined by ASTM Test D 1557-91. Materials placed below optimum moisture content may be considered unacceptable.

6.4.7 Excavations into granitic rock may require special rock breaking equipment and may produce oversize boulders not suitable for use as fill soil underlying the building pad or in utility trenches. Where granitic rock is exposed at finish grade on cut lots, it is recommended that the lot be undercut at least three feet and replaced with properly compacted soil fill to facilitate construction of foundations, landscaping, and shallow improvements. Consideration should also be given to undercutting utility trench alignments in hard rock areas to facilitate utility trench excavation operations. This can be evaluated during grading operations.

6.4.8 Due to remedial grading operations and property line restrictions, a zone of special construction consideration may be necessary at the rear of Lots 19 through 21, 29 through 33, and 34 through 38. This zone would be established considering a 1:1 (H:V) projection extending from the removal bottom into the subject lots. Foundations and hardscape improvements located within this zone will require additional design recommendations and possible setbacks. Off-site grading at the rear of these lots, if possible, would eliminate this zone.

6.5 Bulking and Shrinkage

6.5.1 Estimates of embankment bulking and shrinkage factors are typically based on comparing laboratory compaction tests with the density of the material in its natural state as encountered in the exploratory borings and trenches. It should be emphasized that variations in existing soil density, as well as in compacted fill densities, render shrinkage value estimates very approximate. As an example, the contractor can compact the fill soils to any relative compaction of 90 percent or higher of the maximum laboratory density. Thus, the contractor has approximately a 10 percent range of control over the fill volume. Based on the results of laboratory testing and our experience with similar materials, in our opinion the following shrinkage factors can be used as a basis for estimating how much the on-site soils may shrink or swell (bulk) when excavated from their existing state and placed as compacted fills.

TABLE 6.5
SHRINKAGE AND BULK FACTORS

Soil Unit	Shrink/Bulk Factor
Colluvium and Alluvium	5 to 15 percent shrink
Granitic Rock	15 to 20 percent bulk

6.6 Slope Stability

6.6.1 Slope stability analyses utilizing average drained direct shear strength parameters from the laboratory test results indicate that the proposed 2:1 fill slopes, constructed of on-site materials, should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions to heights of at least 40 feet. Slope stability calculations for both deep-seated and surficial slope stability are presented on Figures 8 and 10, respectively.

6.6.2 Based on experience with similar rock conditions, 1.5:1 cut slopes to the planned heights should possess a factor of safety of at least 1.5 with respect to slope instability if free of

adversely oriented joints or fractures. It is recommended that all cut slope excavations be observed during grading by an engineering geologist to verify that soil and geologic conditions do not differ significantly from those anticipated. In the event that undocumented fill or colluvial deposits are exposed in the upper portions of planned cut slopes, minor removals and/or slope flattening may be required. Otherwise, stabilization measures using geogrid reinforcement may be necessary.

6.6.3 Fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped. Alternatively, the fill slope may be over-built and cut back to yield a properly compacted slope face.

6.6.4 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

6.7 Foundations

6.7.1 The foundation recommendations that follow are for two- or three-story residential structures and are separated into categories dependent on the thickness and geometry of the underlying fill soils as well as the Expansion Index of the prevailing subgrade soils of a particular building pad (or lot). The recommended minimum foundation and interior concrete slab design criteria for each category is presented in Table 6.7.1. Final foundation category determination will be made following grading, once fill geometry and expansion characteristics of finish-grade soils are known.

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

6.7.3 The use of isolated footings that are located beyond the perimeter of the building and support structural elements connected to the building is 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.

6.7.4 For Foundation Category III, the structural slab designer should consider using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In

addition, consideration should be given to connecting patio slabs that exceed 5 feet in width to the building foundation to reduce the potential for future separation to occur.

6.7.5 No special subgrade presaturation is deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soils should be sprinkled, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

TABLE 6.7.1
FOUNDATION RECOMMENDATIONS BY CATEGORY

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

CATEGORY CRITERIA

Category I: Maximum fill thickness is less than 20 feet and Expansion Index is less than or equal to 50.

Category II: Maximum fill thickness is less than 50 feet and Expansion Index is less than or equal to 90, or variation in fill thickness is between 10 feet and 20 feet.

Category III: Fill thickness exceeds 50 feet, variation in fill thickness exceeds 20 feet, or Expansion Index exceeds 90 but is less than 130.

Notes:

1. All footings should have a minimum width of 12 inches.
2. Footing depth is measured from lowest adjacent subgrade (Figure 6).
3. All interior living area concrete slabs should be at least 4 inches thick for Categories I and II, and 5 inches thick for Category III.
4. All interior concrete slabs should be underlain by at least 4 inches (3 inches for a 5-inch slab) of clean sand or crushed rock.
5. All slabs expected to receive moisture-sensitive floor coverings or used to store moisture-sensitive materials should be underlain by a vapor barrier covered with at least 2 inches of the clean sand recommended in No. 4 above.

6.7.6 Where foundations are planned near the top of a slope steeper than 3:1 (horizontal:vertical), the 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. Although other improvements that 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 that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

6.7.7 As an alternative to the foundation recommendations for each category, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and the design criteria of the Post-Tensioning Institute (UBC Chapter 18, Div. III, §1816). Although this procedure was developed for expansive soils, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned designer should incorporate the geotechnical parameters presented on Table 6.7.2 for the particular foundation category designated. Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions, unless reinforcing steel is placed at the bottom of the perimeter footings and the interior stiffener beams. Current PTI design procedures primarily address the potential center lift of slabs; however, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning may reduce the ability of the system to mitigate edge lift. The foundation system should be designed to reduce the potential for edge lift to occur.

TABLE 6.7.2
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Design Parameters	Foundation Category		
	I	II	III
1. Thornthwaite Index	-20	-20	-20
2. Clay Type–Montmorillonite	Yes	Yes	Yes
3. Clay Portion (Maximum)	30%	50%	70%
4. Depth to Constant Soil Suction	7.0 ft.	7.0 ft.	7.0 ft.
5. Soil Suction	3.6 ft.	3.6 ft.	3.6 ft.
6. Moisture Velocity	0.7 in./mo.	0.7 in./mo.	0.7 in./mo.
7. Edge Lift Moisture Variation Distance	2.6 ft.	2.6 ft.	2.6 ft.
8. Edge Lift	0.41 in.	0.78 in.	1.15 in.
9. Center Lift Moisture Variation Distance	5.3 ft.	5.3 ft.	5.3 ft.
10. Center Lift	2.12 in.	3.21 in.	4.74 in.

6.7.8 UBC Chapter 18, Div. III, §1816 uses interior stiffener beams in its structural design procedures. If the structural engineer proposes a post-tensioned foundation design method **other than UBC Chapter 18, Div. III, §1816**, the following recommendations apply:

- The deflection criteria presented in Table 6.7.2 are still applicable.
- Interior stiffener beams be used for Foundation Categories II and III.
- The depth of the perimeter foundation should be at least 12 inches for Foundation Category I, 18 inches for Foundation Category II, and 24 inches for Foundation Category III.

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

6.7.9 During the construction of the post-tensioned 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.

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

6.8 Lateral Loading

6.8.1 To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 300 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat against properly compacted granular fill soils. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in the design for passive resistance.

6.8.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for the design.

6.9 Retaining Walls

6.9.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining wall portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pcf. Where the backfill will be inclined at 2:1 or 1.5:1 (horizontal: vertical), an active soil pressure of 50 pcf and 55 pcf, respectively, is recommended. Soil placed for retaining wall backfill should have an Expansion Index no greater than 50.

6.9.2 Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure, where H is the height of 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 (250 psf) should be added.

6.9.3 Retaining wall footings should be at least 12 inches wide and 12 inches below lowest adjacent grade. An allowable bearing capacity for retaining wall footings can be taken as 4,000 psf.

6.9.4 Retaining walls should be provided with a drainage system (Figure 7) adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI less than 50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are anticipated, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

6.9.5 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 20 feet. In the event that walls higher than approximately 20 feet or other types of walls are planned, Geocon Incorporated should be consulted for additional recommendations.

6.10 Site Drainage

6.10.1 Establishing proper drainage is imperative to reduce the potential for differential soil movement, erosion, and subsurface seepage. Positive measures should be taken to properly finish grade the building pads after structures and other improvements are in place, so that water draining from the building pads and adjacent properties is directed to streets and

away from foundations and tops of slopes. Experience has shown that even with these provisions, a shallow groundwater or subsurface condition can and may develop in areas where no such condition existed prior to site development. This is particularly true where a substantial increase in surface water infiltration results from an increase in landscape irrigation.

6.11 Slope Maintenance

6.11.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions which are both difficult to prevent and predict, be susceptible to near surface (surficial) slope instability. The instability is typically limited to the outer three feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is, therefore, recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. It should be noted that although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility, and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

6.12 Foundation and Grading Plan Review

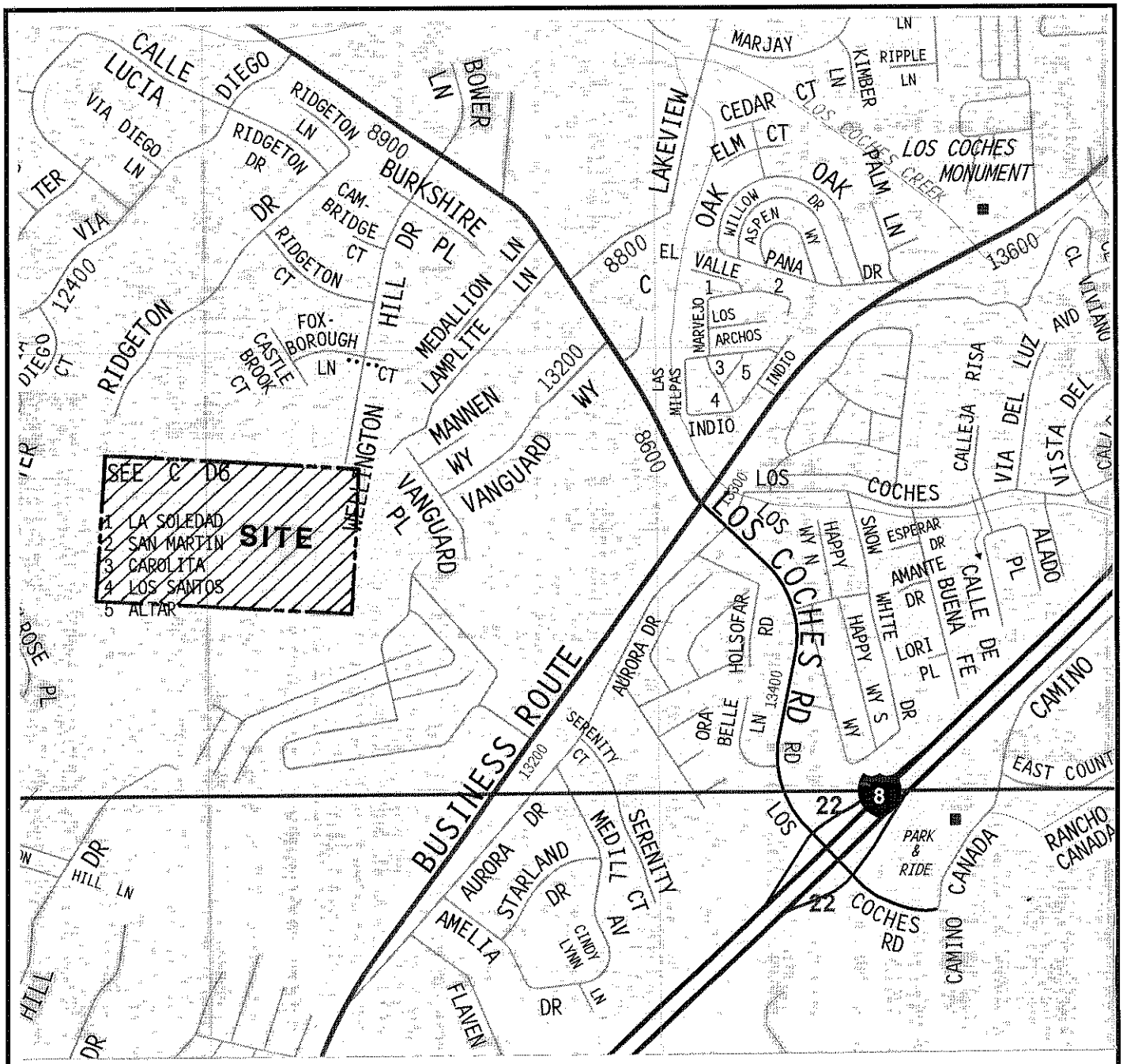
6.12.1 Geocon Incorporated should review the grading plans and foundation plans for the project prior to final design submittal to determine whether additional analysis and/or recommendations are required.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. 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.

2. 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.

3. 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 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.



SOURCE : 2005 THOMAS BROTHERS MAP
SAN DIEGO COUNTY, CALIFORNIA

N

NO SCALE

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

TEM / RSS		DSK / D000D

VICINITY MAP

LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

DATE 10-11-2005	PROJECT NO. 07091 - 32 - 03	FIG. 1

1GVICMAP

LEGEND

- *Qudf* .....UNDOCUMENTED FILL
- *Qal* .....ALLUVIUM
- *Qcol* .....COLLUVIUM
- *Kgr* .....GRANITIC ROCK (Dotted Where Buried)
- ~2~ .....APPROX. LOCATION OF GEOLOGIC CONTACT (Querried Where Uncertain)
- T-28 .....APPROX. LOCATION OF EXPLORATORY TRENCH
- T-8 (40) .....APPROX. LOCATION OF EXPLORATORY TRENCH PERFORMED FOR LOS COCHES II - SETLERS POINT (Showing Approximate Depth of Removal)
- B-20 .....APPROX. LOCATION OF EXPLORATORY SOIL BORING
- AT-13 .....APPROX. LOCATION OF EXPLORATORY AIR TRACK BORING
- (27) .....ESTIMATED DEPTH TO MARGINALLY TO NON-RIPPABLE ROCK BASED ON A LITERAL INTERPRETATION OF PENETRATION RATE AND 20 SECONDS / FT GUIDELINE
- (40) .....ESTIMATED REMOVAL DEPTH FROM EXISTING GRADE

GEOLOGIC MAP

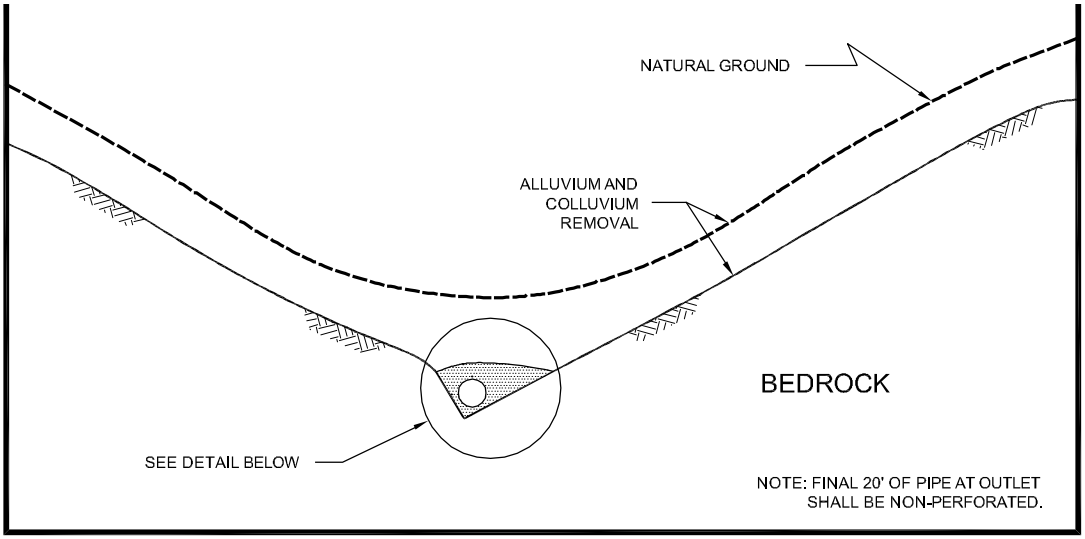
LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

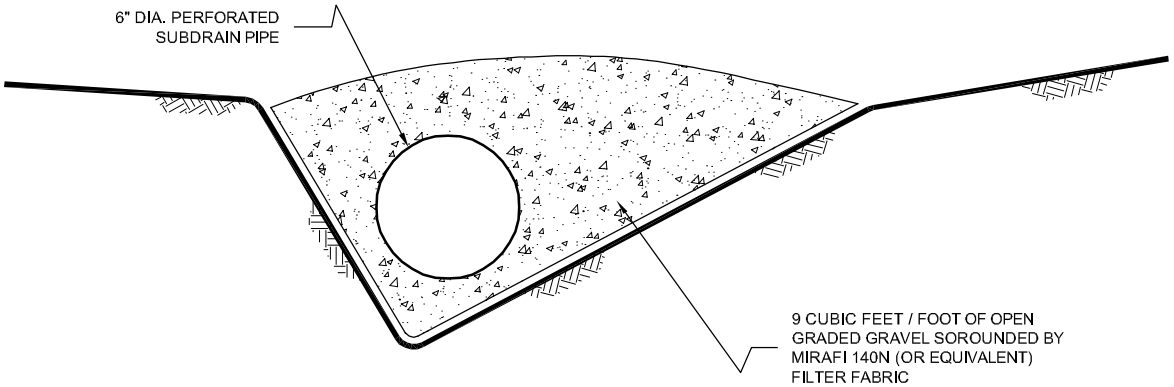
GEOCON INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 80'
DATE	10 - 07 - 2005
PROJECT NO.	07091 - 32 - 03
FIGURE	2
SHEET	1 OF 1

E:\2005\7091_TM1.DWG/aml

C:\Documents_2005\GEOTECH\7091\32-03\7091_TM1.dwg, 10/12/2005 9:13:46 AM, DWG To PDF.pc3





NOTES:

1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH.

NO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

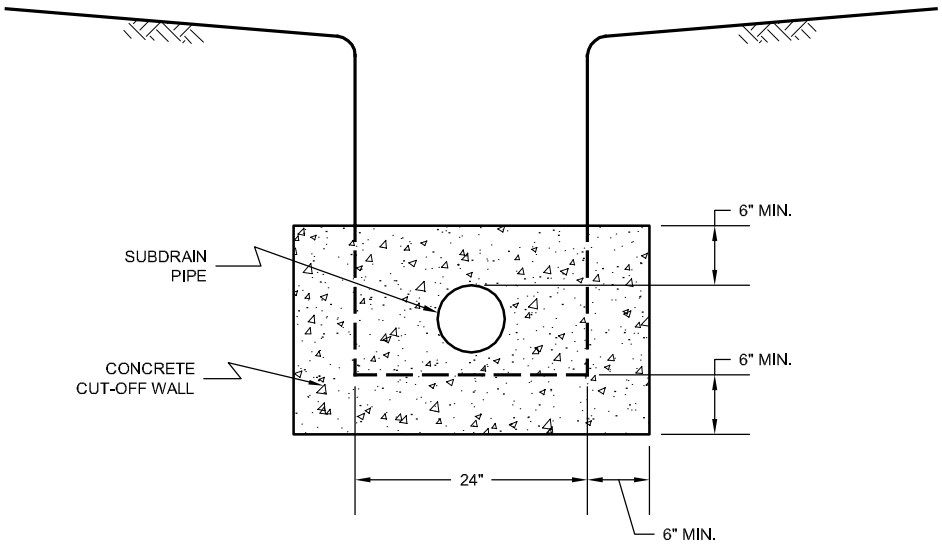
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

TM/AML		DSK/E0000

LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

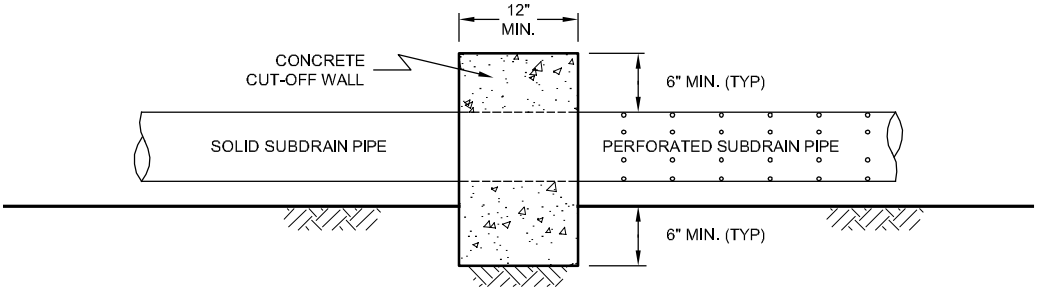
DATE	PROJECT NO. 07091 - 32 - 03	FIG. 3

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

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

TM/AML		DSK/E0000

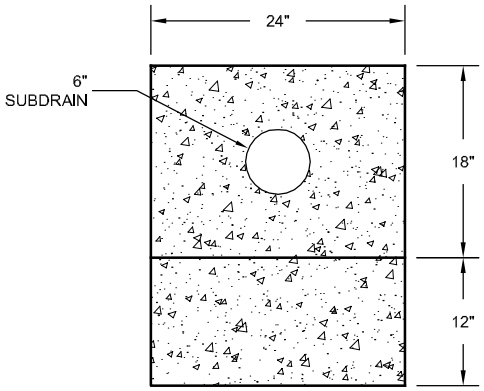
LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

DATE	PROJECT NO. 07091 - 32 - 03	FIG. 4

RSCOW.DWG/aml

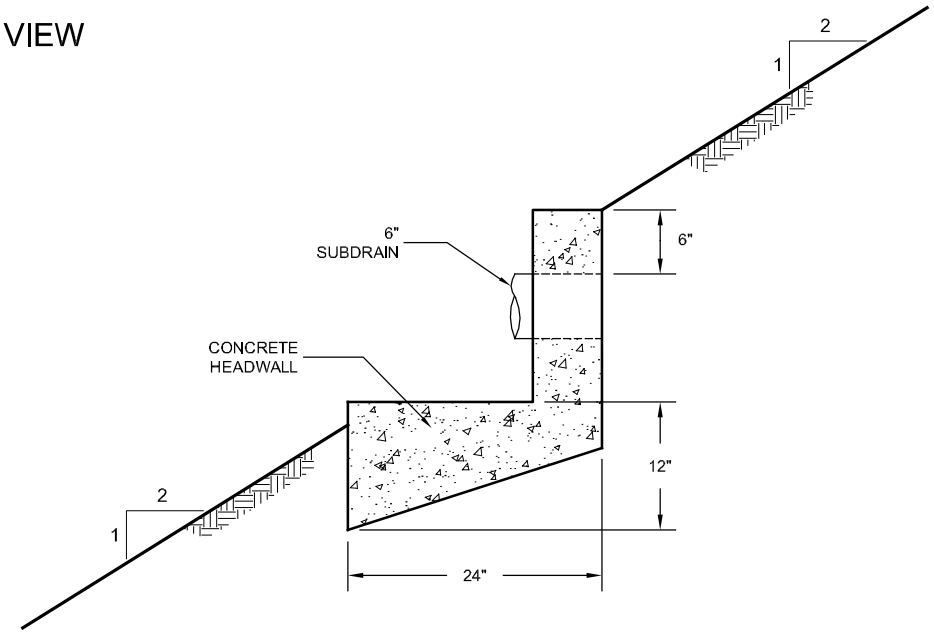
C:\GEOCON\GEO_2005\GEOTECH\7091-32-03\GEOCON\RSCOW.dwg, 10/12/2005 9:09:02 AM, Drafting3

FRONT VIEW



NO SCALE

SIDE VIEW



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

NO SCALE

SUBDRAIN OUTLET HEADWALL DETAIL

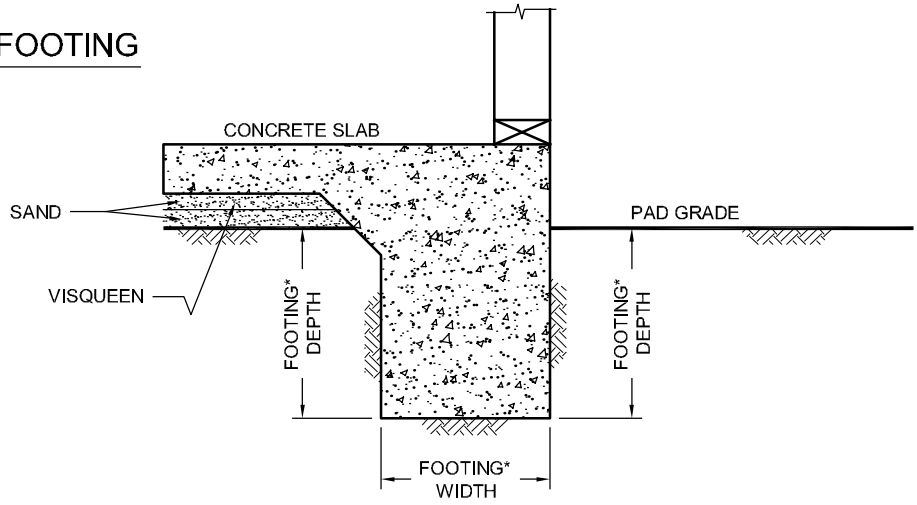
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

TM/AML		DSK/E0000

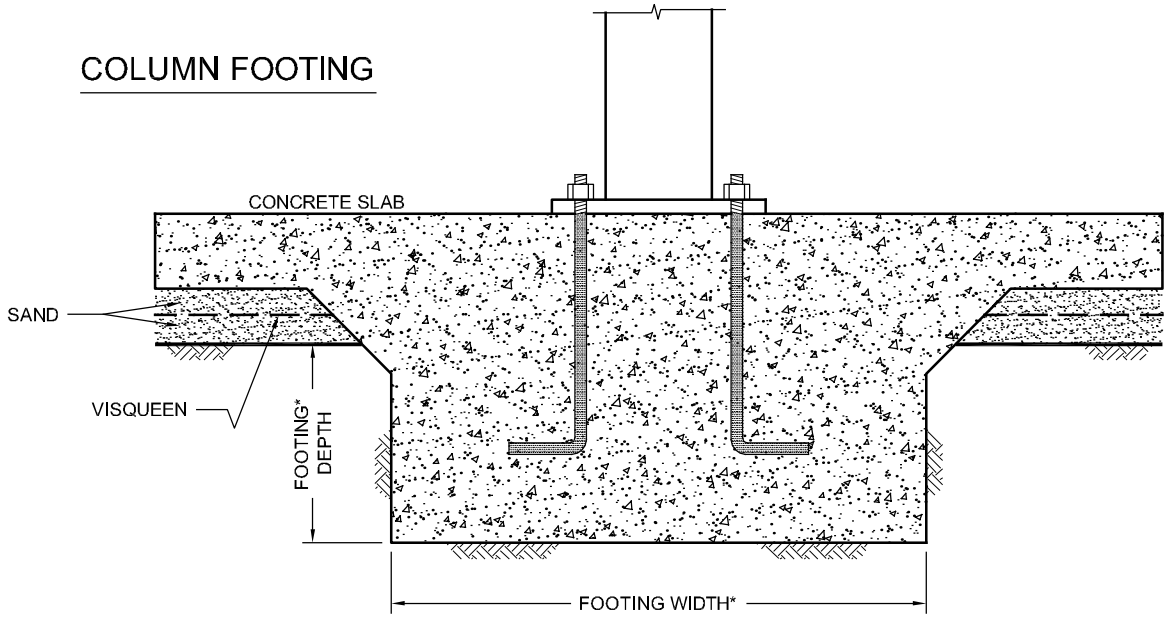
LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

DATE	PROJECT NO. 07091 - 32 - 03	FIG. 5

WALL FOOTING



COLUMN FOOTING



NO SCALE

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

WALL / COLUMN FOOTING DIMENSION DETAIL

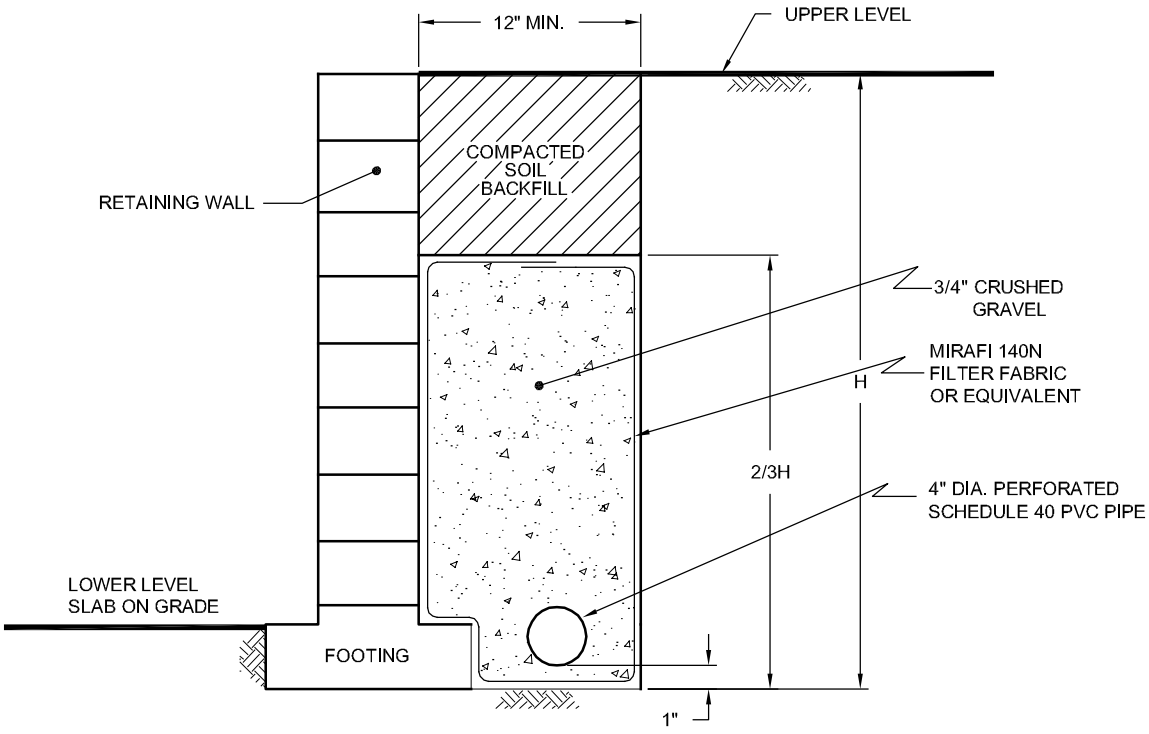
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

TM/AML		DSK/E0000

LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

DATE	PROJECT NO. 07091 - 32 - 03	FIG. 6

COLFOOT2.DWG/aml



NOTES:

1.....PVC PIPE TO DRAIN AT A MINIMUM GRADIENT OF 1% AND CONNECT TO A SUITABLE OUTLET.

2.....WALL DRAINAGE PANELS SUCH AS MIRADRAIN OR EQUIVALENT MAY BE USED IN LIEU OF EXTENDING GRAVEL TO TWO-THIRDS THE WALL HEIGHT.

NO SCALE

RETAINING WALL DRAINAGE DETAIL

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

TM/AML		DSK/E0000

LOS COCHES I - BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

DATE	PROJECT NO. 07091 - 32 - 03	FIG. 7

RETWALL5.DWG/aml

PROJECT NO. 07091-32-03

ASSUMED CONDITIONS:

Slope Height	H	= 35	feet
Slope Inclination	2:1 (Horizontal :Vertical)		
Total Unit Weight of Soil	γ_t	= 130	pounds per cubic foot
Angle of Internal Friction	ϕ	= 32	degrees
Apparent Cohesion	C	= 200	pounds per square foot
No Seepage Forces			

ANALYSIS:

$\gamma_{c\phi} = \frac{\gamma H \tan\phi}{C}$ Equation (3-3), Reference 1

$FS = \frac{N_{cf} C}{\gamma H}$ Equation (3-2), Reference 1

$\gamma_{c\phi}$ = 14.2 Calculated Using Eq. (3-3)

N_{cf} = 40 Determined Using Figure 10, Reference 2

FS = 1.8 Factor of Safety Calculated Using Eq. (3-2)

REFERENCES:

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

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

FILL SLOPE STABILITY ANALYSIS

LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

FIGURE 8

ASSUMED CONDITIONS:

Slope Height	H =	60	feet
Slope Inclination	1.5:1	(Horizontal :Vertical)	
Total Unit Weight of Soil	γ_t =	130	pounds per cubic foot
Angle of Internal Friction	ϕ =	35	degrees
Apparent Cohesion	C =	500	pounds per square foot
No Seepage Forces			

ANALYSIS:

$\gamma_{c\phi} = \frac{\gamma H \tan\phi}{C}$ Equation (3-3), Reference 1

$FS = \frac{N_{cf} C}{\gamma H}$ Equation (3-2), Reference 1

$\gamma_{c\phi}$ = 11 Calculated Using Eq. (3-3)

N_{cf} = 28 Determined Using Figure 10, Reference 2

FS = 1.8 Factor of Safety Calculated Using Eq. (3-2)

REFERENCES:

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

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

CUT SLOPE STABILITY ANALYSIS

LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

FIGURE 9

ASSUMED CONDITIONS:

Slope Height	H	= Infinite	
Depth of Saturation	Z	= 4	feet
Slope Inclination	2:1	(Horizontal:Vertical)	
Slope Angle	i	= 26.6	degrees
Unit Weight of Water	γ_w	= 62.4	pounds per cubic foot
Total Unit Weight of Soil	γ_t	= 130	pounds per cubic foot
Angle of Internal Friction	ϕ	= 32	degrees
Apparent Cohesion	C	= 200	pounds per square foot

Slope saturated to vertical depth Z below slope face.
Seepage forces parallel to slope face

ANALYSIS:

$$FS = \frac{C + (\gamma_t - \gamma_w) Z \cos^2 i \tan \phi}{\gamma_t Z \sin i \cos i} = 1.6$$

REFERENCES:

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

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

SURFICIAL FILL SLOPE STABILITY ANALYSIS

LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

FIGURE 10

ASSUMED CONDITIONS:

Slope Height	H	=	Infinite	
Depth of Saturation	Z	=	4	feet
Slope Inclination	1.5:1 (Horizontal:Vertical)			
Slope Angle	i	=	33.7	degrees
Unit Weight of Water	γ_w	=	62.4	pounds per cubic foot
Total Unit Weight of Soil	γ_t	=	120	pounds per cubic foot
Angle of Internal Friction	ϕ	=	35	degrees
Apparent Cohesion	C	=	500	pounds per square foot

Slope saturated to vertical depth Z below slope face.
Seepage forces parallel to slope face

ANALYSIS:

$$FS = \frac{C + (\gamma_t - \gamma_w) Z \cos^2 i \tan \phi}{\gamma_t Z \sin i \cos i} = 2.6$$

REFERENCES:

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

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

SURFICIAL CUT SLOPE STABILITY ANALYSIS

LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

FIGURE 11

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The initial field investigation was performed on September 16 through 19, 2003 and consisted of excavating 3 exploratory borings at the locations indicated on the Geologic Map, Figure 2. On March 21, 2005, the field investigation continued and consisted of excavating 4 exploratory trenches. Due to biological restrictions, the field investigation was delayed until after August 15, 2005. The current field investigation was performed on August 17 through August 26, 2005 and consisted of excavating 24 exploratory trenches, drilling 20 hollow-stem auger soil borings and 13 air-track borings at the locations shown on the *Geologic Map*, Figure 2.

Backhoe trenches were advanced to depths between 3 and 18 feet using a John Deere 555 track-mounted backhoe equipped with a 24-inch-wide bucket. Relatively undisturbed chunk samples as well as bulk samples were obtained from selected depths in the trenches.

The hollow-stem auger soil borings were drilled to a maximum depth of approximately 50 feet below existing grade using a CME 55 truck-mounted drill rig equipped with 8-inch-diameter hollow-stem augers. Relatively undisturbed samples were obtained with the drill rig by driving a 3-inch O. D., split-tube sampler 12 inches into the undisturbed soil mass with blows from a 140-pound hammer falling 30 inches. The split-tube sampler was equipped with 1-inch-high by 2⅜-inch-diameter brass sampler rings to facilitate sample removal and testing.

The air-track borings were advanced to a maximum depth of approximately 50 feet below existing grade using an IR 590 track-mounted drill rig with 4.5 inch drill bit.

The soil materials encountered in the trenches and soil borings were visually examined, classified, and logged in general conformance with the American Society for Testing and Materials (ASTM) *Practice for Description and Identification of Soils* (Visual-Manual Procedure D 2488). The logs of the exploratory Trenches T-1 through T-28 are presented on Figures A-1 through A-28. The logs of soil Borings B-1 through B-20 are presented on Figures A-29 through A-48. The logs depict the various soil types encountered and indicate the depths at which samples were obtained.

PROJECT NO. 07091-32-03

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.) **618'** DATE COMPLETED **03-21-2005** EQUIPMENT **JD 555 TRACKHOE**			
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Loose, damp, brown, Silty, fine to medium SAND			
2								
4	T1-1			SM	-With a trace of clayey at 4 feet			
6					-Becomes dense, damp, and gray brown below 7 feet -Very difficult trenching below 8 feet			
8	T1-2							
10								
					PRACTICAL REFUSAL AT 10.5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 2

ELEV. (MSL.) **632'** DATE COMPLETED **03-21-2005**

EQUIPMENT **JD 555 TRACKHOE**

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

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

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.) **615'** DATE COMPLETED **03-21-2005** EQUIPMENT **JD 555 TRACKHOE**			
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Loose, moist, reddish brown, Silty, fine to medium SAND, with trace gravel			
2								
4								
6				SM				
					-Becomes tan and fine to coarse below 6.5 feet			
8								
	T3-1				-Becomes medium dense to dense and dark brown			
10								
					PRACTICAL REFUSAL AT 10.5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 4

ELEV. (MSL.) **613'** DATE COMPLETED **03-21-2005**

EQUIPMENT **JD 555 TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
					COLLUVIUM Loose, moist, dark brown, Silty, fine to medium SAND			
2								
4				SM				
6					-Becomes dense, damp and gray-brown below 6 feet			
	T4-1							
8								
					PRACTICAL REFUSAL AT 8.5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 5

ELEV. (MSL.) **630'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, dry, reddish brown, Silty, fine to medium SAND, with trace clay			
2				SM				
4					-Becomes brown at 3 feet			
6					**GRANITIC ROCK** Moderately weathered, gray, moderately strong to strong GRANITIC ROCK			
					TRENCH TERMINATED AT 6 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 6

ELEV. (MSL.) **632'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, dry to damp, reddish brown, Silty, fine to medium SAND, with trace clay			
2				SM				
4								
6					**GRANITIC ROCK** Moderately weathered, brown gray, moderately weak to moderately strong GRANITIC ROCK			
8					TRENCH TERMINATED AT 8 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

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.) **630'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE**			
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Medium dense, dry to damp, brown, Silty, fine to coarse SAND			
2	T7-1							
4				SM				
6					-Becomes dense, moist, dark brown with clay below 5 feet			
8	T7-2							
	T7-3							
10					**GRANITIC ROCK** Moderately weathered, gray brown gray, moderately weak GRANITIC ROCK PRACTICAL REFUSAL AT 10 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 8

ELEV. (MSL.) **670'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, dry, brown, Silty, fine to medium SAND			
2								
4								
6					-Becomes damp at 5 feet			
8								
10				SM				
12								
14					-Becomes medium dense, mottled gray and brown with orange and red staining below 14 feet			
16	T8-1							
18					-Possible contact with granitic rock with teeth at 18 feet			
					TRENCH TERMINATED AT 18 FEET (Limit of Trackhoe)			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 9

ELEV. (MSL.) **697'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

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

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 10

ELEV. (MSL.) **691'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Loose, dry, brown, Silty, fine to medium SAND			
2				SM				
4					**GRANITIC ROCK** Moderately weathered, reddish brown, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 11

ELEV. (MSL.) **672'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, damp, brown, Silty, fine to medium SAND, with trace clay			
2					-Becomes medium dense below 2.5 feet			
4								
6								
8				SM	-Becomes mottled gray and brown			
10								
12								
14								
16					**GRANITIC ROCK** Moderately weathered, gray, moderately weak GRANITIC ROCK TRENCH TERMINATED AT 16 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 12

ELEV. (MSL.) **692'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Loose, dry, brown, Silty, fine to medium SAND			
2				SM				
4					**GRANITIC ROCK** Moderately weathered, reddish brown, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 5.5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 13** ELEV. (MSL.) **685'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4				SM	-Becomes dark reddish brown with some clay at 4 feet			
6								
8					**GRANITIC ROCK** Moderately weathered, gray, moderately weak to moderately strong GRANITIC ROCK			
					TRENCH TERMINATED AT 8.5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 14 ELEV. (MSL.) 637' DATE COMPLETED 08-17-2005 EQUIPMENT JD 450-C TRACKHOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4								
6				SM				
8					-Becomes dense below 8 feet			
10	T14-1							
					PRACTICAL REFUSAL AT 11 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 15

ELEV. (MSL.) **654'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, reddish brown, Silty, fine to medium SAND			
2				SM				
4								
6					**GRANITIC ROCK** Moderately weathered, gray, moderately weak GRANITIC ROCK			
					TRENCH TERMINATED AT 7 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 16

ELEV. (MSL.) **619'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense to dense, damp, brown, Silty, fine to coarse SAND			
2					-Becomes dense and dark brown with trace clay below 3 feet			
4				SM				
6	T16-1							
					TRENCH TERMINATED AT 7 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 17** ELEV. (MSL.) **654'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE** MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4								
6				SM	-Becomes dense, damp to moist, dark brown with clay below 5 feet			
8								
10					PRACTICAL REFUSAL AT 10 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 18

ELEV. (MSL.) **676'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Loose, dry to damp, brown, Silty, fine to medium SAND			
2				SM				
					GRANITIC ROCK Moderately weathered, reddish brown, moderately weak GRANITIC ROCK			
4					TRENCH TERMINATED AT 4 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 19** ELEV. (MSL.) **688'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**COLLUVIUM** Loose to medium dense, dry to damp, brown, Silty, fine to medium SAND			
2								
4					**GRANITIC ROCK** Moderately weathered, reddish brown, moderately weak GRANITIC ROCK			
6					TRENCH TERMINATED AT 6 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 20

ELEV. (MSL.) **702'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, dry to damp, brown, Silty, fine to medium SAND			
2								
					-Becomes moist and dark brown below 3 feet			
4								
6								
8				SM				
10								
					-Becomes brown gray with trace clay below 11 feet			
12								
14					-Becomes gray below 14.5 feet (possible granitic rock contact ?)			
					TRENCH TERMINATED AT 15 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 21

ELEV. (MSL.) **712'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2				SM				
4					**GRANITIC ROCK** Moderately weathered, reddish brown, weak GRANITIC ROCK			
6					TRENCH TERMINATED AT 6 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 22

ELEV. (MSL.) **720'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				SM	**TOPSOIL** Loose to medium dense, damp, dark brown, Silty, fine to medium SAND			
2								
4					**GRANITIC ROCK** Moderately weathered, tan, moderately strong GRANITIC ROCK			
					TRENCH TERMINATED AT 5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 23

ELEV. (MSL.) **725'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

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

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

TRENCH T 24

ELEV. (MSL.) **716'** DATE COMPLETED **08-17-2005**

EQUIPMENT **JD 450-C TRACKHOE**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, dry to damp, brown, Silty, fine to medium SAND			
2				SM				
4					**GRANITIC ROCK** Moderately weathered, tan, moderately strong GRANITIC ROCK			
					TRENCH TERMINATED AT 5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 25** ELEV. (MSL.) **708'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Loose, dry to damp, brown, Silty, fine to medium SAND			
2								
4				SM				
6					-Becomes dense, damp, gray and fine to coarse with trace gravel below 6 feet			
					GRANITIC ROCK Highly weathered, gray, moderately weak GRANITIC ROCK			
8					TRENCH TERMINATED AT 8 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TRENCH T 26** ELEV. (MSL.) **696'** DATE COMPLETED **08-17-2005** EQUIPMENT **JD 450-C TRACKHOE**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SM	**TOPSOIL** Medium dense, damp, dark brown, Silty, fine to coarse SAND			
2					**GRANITIC ROCK** Moderately weathered, tan, moderately strong GRANITIC ROCK			
					TRENCH TERMINATED AT 3 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 27 ELEV. (MSL.) 675' DATE COMPLETED 08-17-2005 EQUIPMENT JD 450-C TRACKHOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Medium dense, dry to damp, Silty, fine to coarse SAND			
2				SM	-Becomes dense below 2 feet			
	T27-1							
4								
					PRACTICAL REFUSAL AT 5 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	TRENCH T 28 ELEV. (MSL.) 646' DATE COMPLETED 08-17-2005 EQUIPMENT JD 450-C TRACKHOE	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2					-Becomes dense, dark brown with trace clay below 2 feet			
4				SM				
6	T28-1				PRACTICAL REFUSAL AT 6 FEET			

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

07091-32-03.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 1

ELEV. (MSL.) **673** DATE COMPLETED **09-16-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Very dense, damp, light brown, Silty, fine to medium SAND; difficult drilling from 0 to 6 feet			
2								
4								
6	B 1-1					50/5"	102.1	4.6
8					- Becomes medium dense at 7 feet			
10	B 1-2					20	113.2	5.0
12								
14				SM	- Becomes dense, mottled light brown and gray with trace pinhole voids at 13 feet			
16	B 1-3					45	119.0	5.1
18					- Becomes very dense, brown, and micaceous at 18 feet			
20	B 1-4					50/5"	102.0	4.9
22								
24								
26	B 1-5					50/5"	107.0	4.1
28								
30	B 1-6				- Becomes moist at 30 feet	80/10"	115.6	6.4
32								

Figure A-29,
Log of Boring B 1, Page 1 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 1

ELEV. (MSL.) **673** DATE COMPLETED **09-16-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
34								
36	B 1-7			SM		80/10"	114.6	7.1
38								
40	B 1-8				- Becomes clayey at 40 feet (SC)	80	124.6	10.8
42								
44								
46	B 1-9					50/1"		
					GRANITIC ROCK - no recovery			

REFUSAL AT 46 FEET

Boring backfilled with 4 bags bentonite chips, 1/2 bag every 6 feet
Bentonite added at 46, 41, 34, 30, 24, 19, 13 and 6.5 feet. Total of 2.2 cubic feet used
No groundwater encountered

Figure A-29,
Log of Boring B 1, Page 2 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 2

ELEV. (MSL.) **644** DATE COMPLETED **09-17-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Very dense, damp, brown, Silty, fine to medium SAND; lens of clayey sand from 1 to 2 feet (SC), difficult drilling from 0 to 4 feet			
4				SM				
6	B 2-1					50/4"	102.4	5.4
8					-Becomes slightly micaceous with trace clay below 8 feet			
10	B 2-2					50/4"	116.8	6.8
14								
16	B 2-3					50/3"	117.1	5.6
18				SM				
20	B 2-4				- Trace pinhole voids at 20 feet	50/6"	120.6	6.7
22					- Easy to drill from 20 to 25 feet			
24								
26	B 2-5					81/10"	117.1	5.6
28								
30	B 2-6					50/6"	109.0	6.1
32				SM	-Becomes moist with mica and clay absent below 33 feet			

Figure A-30,
Log of Boring B 2, Page 1 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 2

ELEV. (MSL.) **644** DATE COMPLETED **09-17-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
34								
36	B 2-7			SM	- Easy drilling from 35 to 40 feet	75	112.8	13.6
38				SM	-Becomes mottled gray and brown with mica below 38 feet			
40	B 2-8				- Contact in sampler shoe	82/10"	108.1	13.1
42	B 2-9				**GRANITIC ROCK** Highly weathered - No recovery at 42 feet	50/0"		
					REFUSAL AT 42 FEET Boring backfilled with 8.5 bags bentonite chips, from 5 to 20 feet and 29 to 42 feet Total of 4.7 cubic feet used No groundwater encountered			

Figure A-30,
Log of Boring B 2, Page 2 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 3

ELEV. (MSL.) **695** DATE COMPLETED **09-18-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2					Medium dense, dry, brown, Silty, fine to medium SAND			
4				SM				
6	B 3-1					30	112.4	2.3
8					-Becomes dense, tan to brown, with pinhole voids and mica below 8 feet			
10	B 3-2					48	108.3	2.3
12								
14								
16	B 3-3			SM		63	109.6	2.5
18								
20	B 3-4				- Becomes very dense, tan, with trace coarse sand at 20 feet	80	113.2	1.8
22								
24					- Thin gravel lens at 23 feet			
26	B 3-5					68/11"	111.3	2.5
28				SM	-Becomes brown and fine to coarse below 28 feet			
30	B 3-6					46	110.2	2.7
32								

Figure A-31,
Log of Boring B 3, Page 1 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 3

ELEV. (MSL.) **695** DATE COMPLETED **09-18-2003**

EQUIPMENT **LIMITED ACCESS BEAVER RIG**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
34								
	B 3-7			SM	- Becomes moist at 35 feet	80	113.7	7.7
36								
					- Gravel lens from 37 to 38 feet			
38								
					- Gravel lense from 39 to 40 feet			
40					- Very difficult drilling below 40 feet			
	B 3-8					50/6"	109.4	4.5
	B 3-9				**GRANITIC ROCK**	56/3"		
					No recovery at 41.5 feet			
					REFUSAL AT 41.8 FEET			
					Boring backfilled with 10 bags bentonite chips, from 41.5 to 6.5 feet			
					Total of 5.5 cubic feet used			
					No groundwater encountered			

Figure A-31,
Log of Boring B 3, Page 2 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 4

ELEV. (MSL.) **654'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
					Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4				SM	-Becomes dense, dark brown to slightly moist with clay			
	B4-1					50/5-½"		
6								
8								
10	B4-2					50/6"		
					GRANITIC ROCK			
12					Yellowish and orangish brown, GRANITIC ROCK			
14								
	B4-3				-Becomes white, black and orange below 15 feet	50/3"		
					BORING TERMINATED AT 15.5 FEET			

Figure A-32,
Log of Boring B 4, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 5

ELEV. (MSL.) **664'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
					Medium dense, damp, reddish brown, Silty, fine to medium SAND			
2				SM				
4								
6	B5-1				-Becomes light reddish brown and fine to coarse below 6 feet	33	104.0	4.2
8					**GRANITIC ROCK**			
					Black, white and orange GRANITIC ROCK			
10	B5-2					N/A		
					BORING TERMINATED AT 10.5 FEET			

Figure A-33,
Log of Boring B 5, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 6

ELEV. (MSL.) **684'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2					Medium dense, damp, brown, Silty, fine to medium SAND			
4								
6	B6-1				-Becomes dense below 5 feet	38	105.8	2.5
8								
10	B6-2					39	102.8	5.5
12								
14								
16	B6-3			SM	-Becomes very dense and fine to coarse below 15 feet	85	114.2	5.5
18								
20	B6-4					69	110.5	2.7
22								
24								
26	B6-5					93/11"	106.8	3.0
28								
30	B6-6					82	107.6	2.6
32								

Figure A-34,
Log of Boring B 6, Page 1 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 6

ELEV. (MSL.) **684'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
34								
36	B6-7			SM	-Grain size increases to very coarse below 37 feet	50	104.3	5.9
38								
40	B6-8				-Becomes moist and fine to coarse below 40 feet	42	116.8	13.1
42								
44								
46	B6-9			SC	Very dense, moist to very moist, grayish brown, Clayey, fine to coarse SAND	50/5-½"	121.1	5.8
48								
50		+ +			**GRANITIC ROCK**	50/½"		
					Gray, black, white and orange GRANITIC ROCK			
					BORING TERMINATED AT 51 FEET			

Figure A-34,
Log of Boring B 6, Page 2 of 2

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 7

ELEV. (MSL.) **690'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2				SM	Medium dense, damp, brown, Silty, fine to medium SAND			
4								
6	B7-1			SC	Dense, moist, grayish brown, Clayey, fine to medium SAND	50	106.5	14.7
8								
10	B7-2					79	121.0	10.8
					GRANITIC ROCK			
					Black and orange GRANITIC ROCK			
					BORING TERMINATED AT 11 FEET			

Figure A-35,
Log of Boring B 7, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 8

ELEV. (MSL.) **710'** DATE COMPLETED **08-22-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2					Medium dense, damp, brown, Silty, fine to medium SAND			
4								
6	B8-1			SM		31	95.3	3.4
8								
10	B8-2					31	103.6	5.5
12								
14								
16	B8-3				-Becomes dense and fine to coarse below 15 feet	55	104.6	4.0
18								
20	B8-4				-Becomes moist below 20 feet	40	114.1	9.8
22								
24								
26	B8-5					N/A	100.0	8.2
					GRANITIC ROCK			
					Black, white and orange GRANITIC ROCK			
					BORING TERMINATED AT 26 FEET			

Figure A-36,
Log of Boring B 8, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 9

ELEV. (MSL.) **704'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
					Medium dense, damp, brown, Silty, fine to medium SAND			
2				SM				
4								
	B9-1					81		
6					Very dense, damp to moist, Clayey, fine to medium SAND			
				SC				
8								
10					**GRANITIC ROCK**			
					White, black and orange GRANITIC ROCK			
					BORING TERMINATED AT 10 .5 FEET			

Figure A-37,
Log of Boring B 9, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 10

ELEV. (MSL.) **688'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Loose, damp, reddish-brown, Silty, fine to medium SAND, with rootlets			
2								
4								
6	B10-1			SM		12		
8								
10					-Becomes dense below 10 feet			
12								
14								
16	B10-2				**GRANITIC ROCK** Black and white GRANITIC ROCK BORING TERMINATED AT 16 FEET	74/10"		

Figure A-38,
Log of Boring B 10, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 11

ELEV. (MSL.) **674'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4								
6	B11-1			SM	-Becomes dense below 5 feet	67		
8								
10	B11-2				Medium dense, damp to moist, dark olive brown, Clayey, fine to medium SAND	34		
12				SC				
14								
16	B11-3					93/8"		
					GRANITIC ROCK Black, white and greenish-brown GRANITIC ROCK BORING TERMINATED AT 16 FEET			

Figure A-39,
Log of Boring B 11, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 12

ELEV. (MSL.) **663'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, orangish-brown, Silty, fine to medium SAND			
2								
4								
6	B12-1			SM	-Becomes dense and dark brown with some rootlets below 5 feet	45	124.9	5.9
8								
10	B12-2				Very dense, damp to moist, dark brown, Clayey, fine to medium SAND	66	124.0	6.3
12				SC				
14								
16	B12-3					83/11"	123.1	6.7
					GRANITIC ROCK Black, white and greenish-brown GRANITIC ROCK BORING TERMINATED AT 16 FEET			

Figure A-40,
Log of Boring B 12, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 13

ELEV. (MSL.) **645'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2				ML	Medium dense, damp, yellowish-brown, fine to medium, Sandy SILT			
4					Very dense, damp, dark brown, Silty, fine to medium SAND			
6	B13-1					96/9"	117.3	9.2
8								
10	B13-2			SM	-Becomes damp to moist, olive brown and fine to coarse below 10 feet	82/10"	127.7	8.2
12								
14								
16	B13-3					74	113.9	5.9
					GRANITIC ROCK			
					Reddish-brown GRANITIC ROCK			
					BORING TERMINATED AT 16 FEET			

Figure A-41,
Log of Boring B 13, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 14

ELEV. (MSL.) **676'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2					Loose, damp, brown, Silty, fine to medium SAND			
4								
6	B14-1			SM		16	112.3	4.1
8								
10	B14-2				Medium dense, damp, Clayey, fine to coarse SAND	28	109.6	6.2
12				SC				
14								
16	B14-3				Dense, damp, Silty, fine to coarse SAND	45	106.3	4.6
18				SM				
20					**GRANITIC ROCK**	50/6"		
					Black, white and orange GRANITIC ROCK			
					BORING TERMINATED AT 20.5 FEET			

Figure A-42,
Log of Boring B 14, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 15

ELEV. (MSL.) **675'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2				SM	Medium dense, damp, brown, Silty, fine to medium SAND			
4								
6	B15-1			SC	Dense, moist, reddish-brown, Clayey, fine to medium SAND	43	112.5	16.9
8								
10	B15-2					74/10"	132.8	9.8
					GRANITIC ROCK			
					Gray, orange and black GRANITIC ROCK			
					BORING TERMINATED AT 11 FEET			

Figure A-43,
Log of Boring B 15, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 16

ELEV. (MSL.) **643'** DATE COMPLETED **08-23-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4				SM				
6	B16-1				-Becomes dense below 5 feet	44	112.5	5.2
8								
10	B16-2			SC	Very dense, damp, reddish-brown, Clayey, fine to coarse SAND	75	139.9	9.6
					GRANITIC ROCK Black, white and orange GRANITIC ROCK			
					BORING TERMINATED AT 11 FEET			

Figure A-44,
Log of Boring B 16, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 17

ELEV. (MSL.) **620'** DATE COMPLETED **08-24-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4				SM				
6	B17-1				-Becomes very dense and olive-brown with little clay below 5 feet	52	120.0	9.8
8	B17-2							
10	B17-3				Very dense, damp, Clayey, fine to medium SAND, with little silt	75	123.6	6.5
12								
14				SC				
16	B17-4"					82/9"	129.6	6.4
18								
20	B17-5				Very dense, damp, brown, Silty, fine to medium SAND	90/9"	130.8	6.8
22								
24				SM				
26	B17-6				-Becomes olive-brown and fine to coarse below 25 feet	77/11-½"	111.1	5.7
28								
30	B17-7					94/9"	132.0	7.6
					GRANITIC ROCK Black and white GRANITIC ROCK			
					BORING TERMINATED AT 31 FEET			

Figure A-45,
Log of Boring B 17, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 18

ELEV. (MSL.) **615'** DATE COMPLETED **08-24-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4				SM				
6	B18-1				-Becomes dense, moist, dark brown with little clay below 5 feet	40	126.1	11.0
8								
10	B18-2				Dense, moist, dark brown, Clayey, fine to coarse SAND	47	127.9	9.8
12								
14								
16	B18-3			SC		46	121.4	8.9
18								
20	B18-4				-Becomes very dense below 20 feet	74/11-½"	125.2	8.9
22								
24								
26	B18-5					83/11-½"	125.5	9.8
28								
30						50/2"		
					GRANITIC ROCK Black and greenish-brown GRANITIC ROCK BORING TERMINATED AT 31 FEET			

Figure A-46,
Log of Boring B 18, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 19

ELEV. (MSL.) **616** DATE COMPLETED **08-24-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM**			
2					Medium dense, damp, reddish-brown, Silty, fine to medium SAND			
4								
6	B19-1			SM	-Becomes very dense below 5 feet	79	118.2	5.5
8								
10	B19-2				-Becomes moist with little clay below 10 feet	92/10"	115.2	11.6
12								
14								
16	B19-3				Very dense, moist, brown, Clayey, fine to medium SAND, with little silt	75/11"	117.0	12.6
18								
20	B19-4			SC		83	120.1	12.6
22								
24								
26	B19-5					73	117.2	14.3
28								
30	B19-6	+ +			**GRANITIC ROCK**	50/1"		
					Orange, white and black GRANITIC ROCK			
					BORING TERMINATED AT 30.5 FEET			

Figure A-47,
Log of Boring B 19, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

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

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

PROJECT NO. 07091-32-03

BORING B 20

ELEV. (MSL.) **619'** DATE COMPLETED **08-24-2005**

EQUIPMENT **CME 55**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**COLLUVIUM** Medium dense, damp, brown, Silty, fine to medium SAND			
2								
4								
6	B20-1			SM	-Becomes very dense below 5 feet	60		
8								
10	B20-2				-Becomes tan to reddish brown below 10 feet	71	113.6	10.4
12								
14								
16	B20-3				-Becomes grayish brown to reddish brown below 15 feet	75	113.6	6.8
18								
20	B20-4					83/11-½"	117.2	7.2
22								
24								
26	B20-5				-Becomes gray brown to brown below 25 feet	50/6"	119.5	5.4
28								
30	B20-6				-Becomes brown below 30 feet	87/11-½"		
					GRANITIC ROCK Orange, white and black GRANITIC ROCK			
					BORING TERMINATED AT 31 FEET			

Figure A-48,
Log of Boring B 20, Page 1 of 1

07091-32-03_OLD BORING B1-B3.GPJ

SAMPLE SYMBOLS

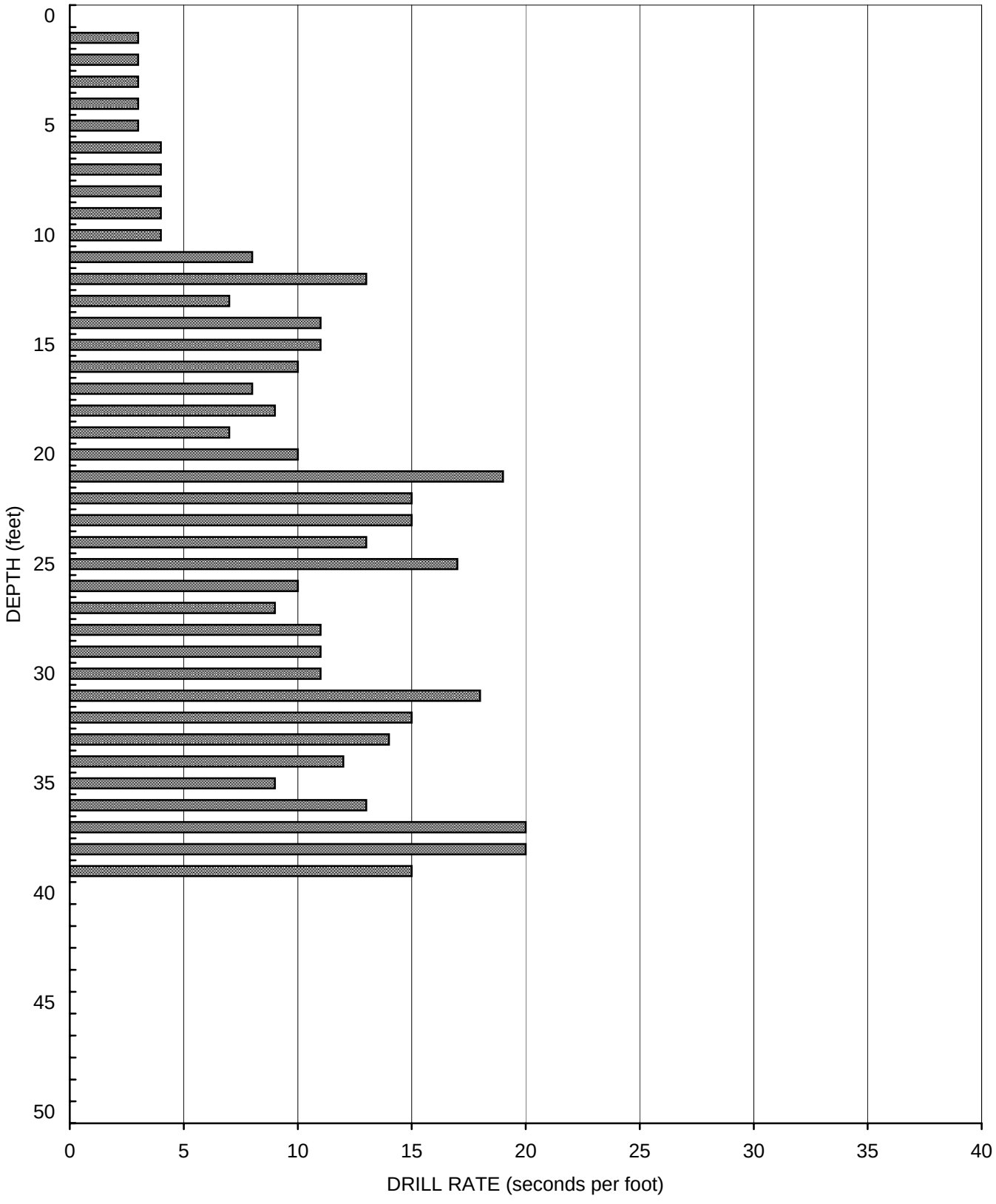
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◥ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

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

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-1
Elevation - 690 Feet (MSL)

GEOCON
INCORPORATED



AT001.xls

FIGURE A-49

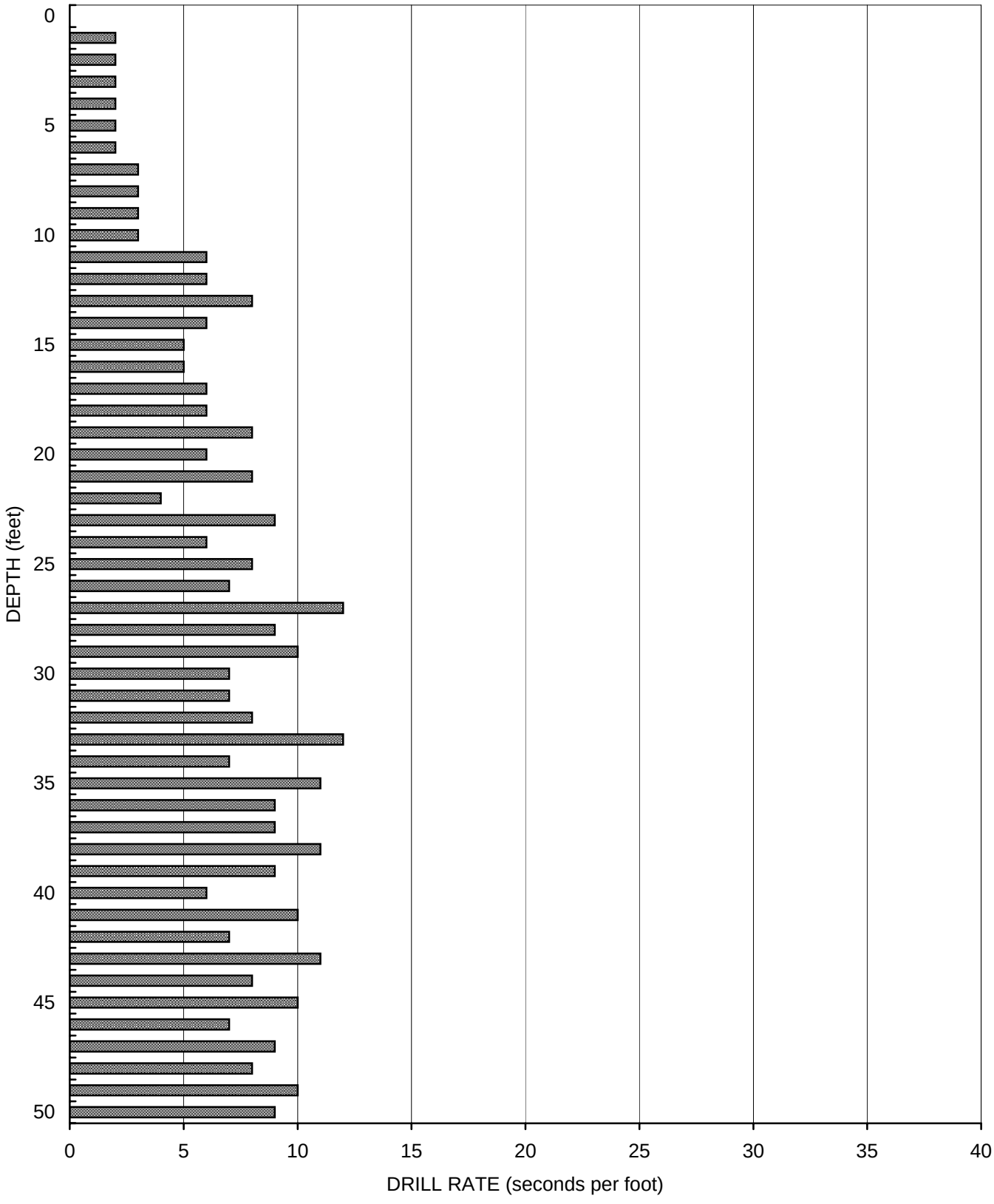
PROJECT NO. 07091 - 32 - 03

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-2

Elevation - 706 Feet (MSL)

GEOCON INCORPORATED



AT002.xls

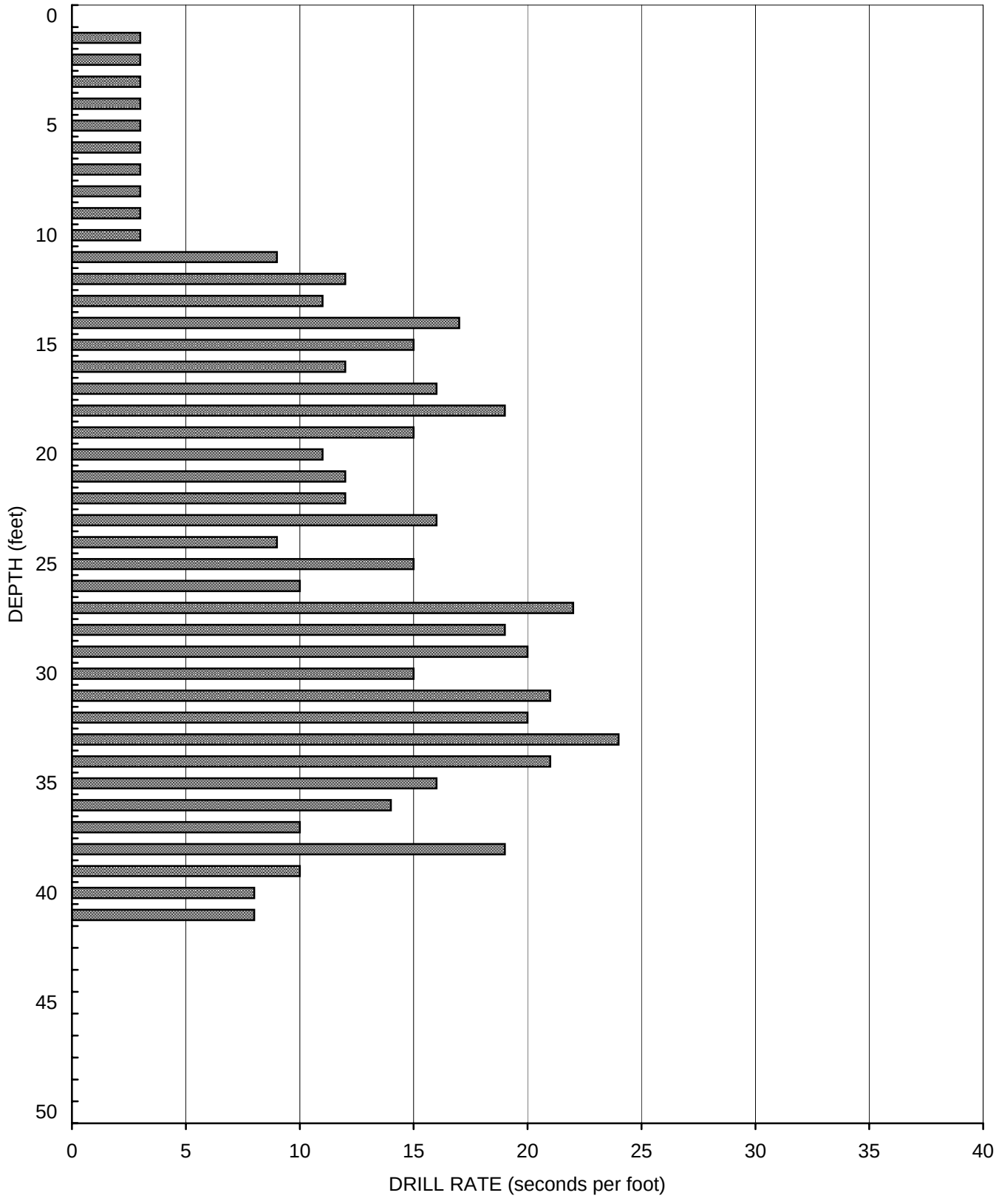
FIGURE A-50

PROJECT NO. 07091 - 32 - 03

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-3
Elevation - 714 Feet (MSL)

GEOCON
INCORPORATED



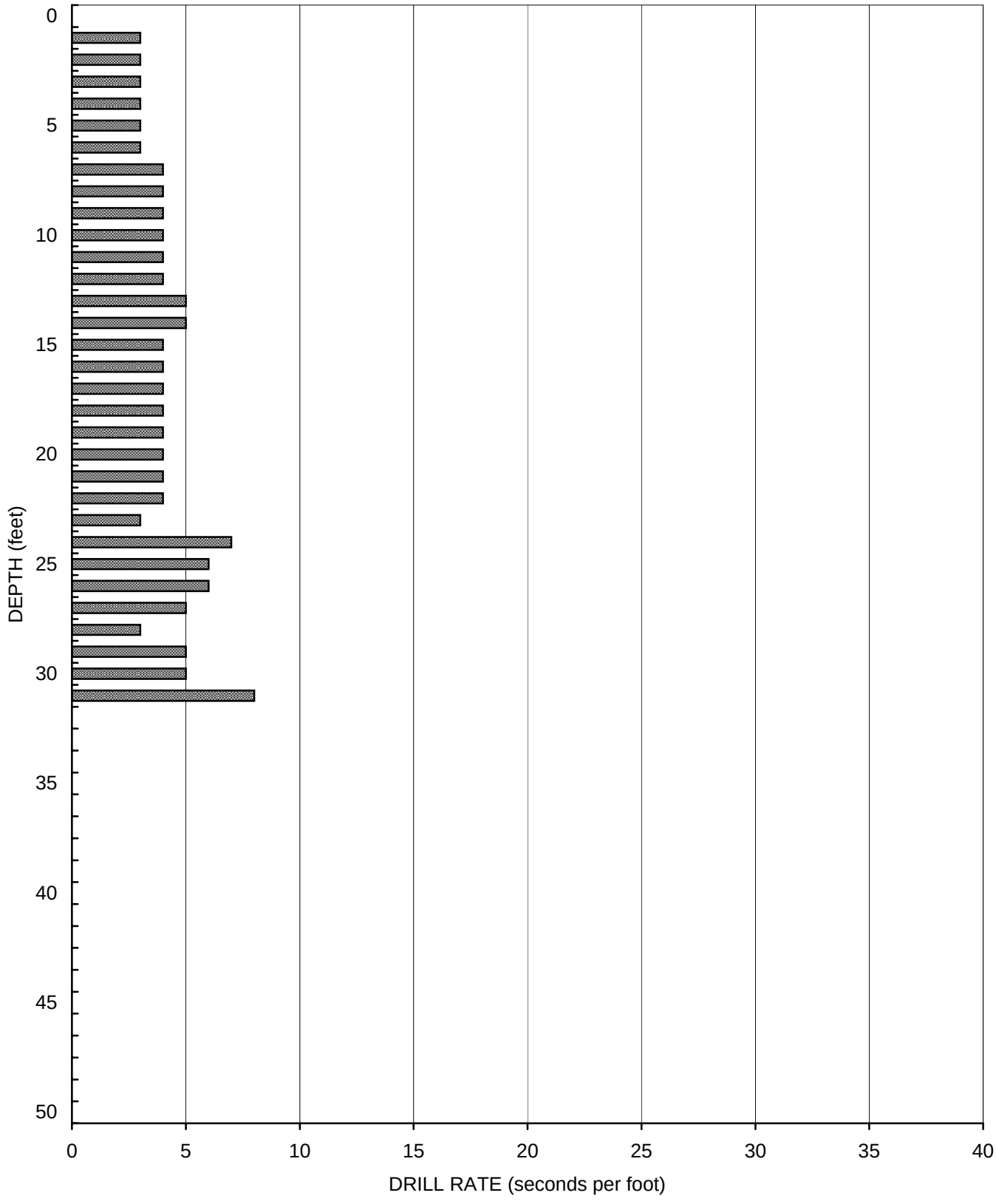
AT003.xls

FIGURE A-51

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-4
Elevation - 734 Feet (MSL)

GEOCON
INCORPORATED



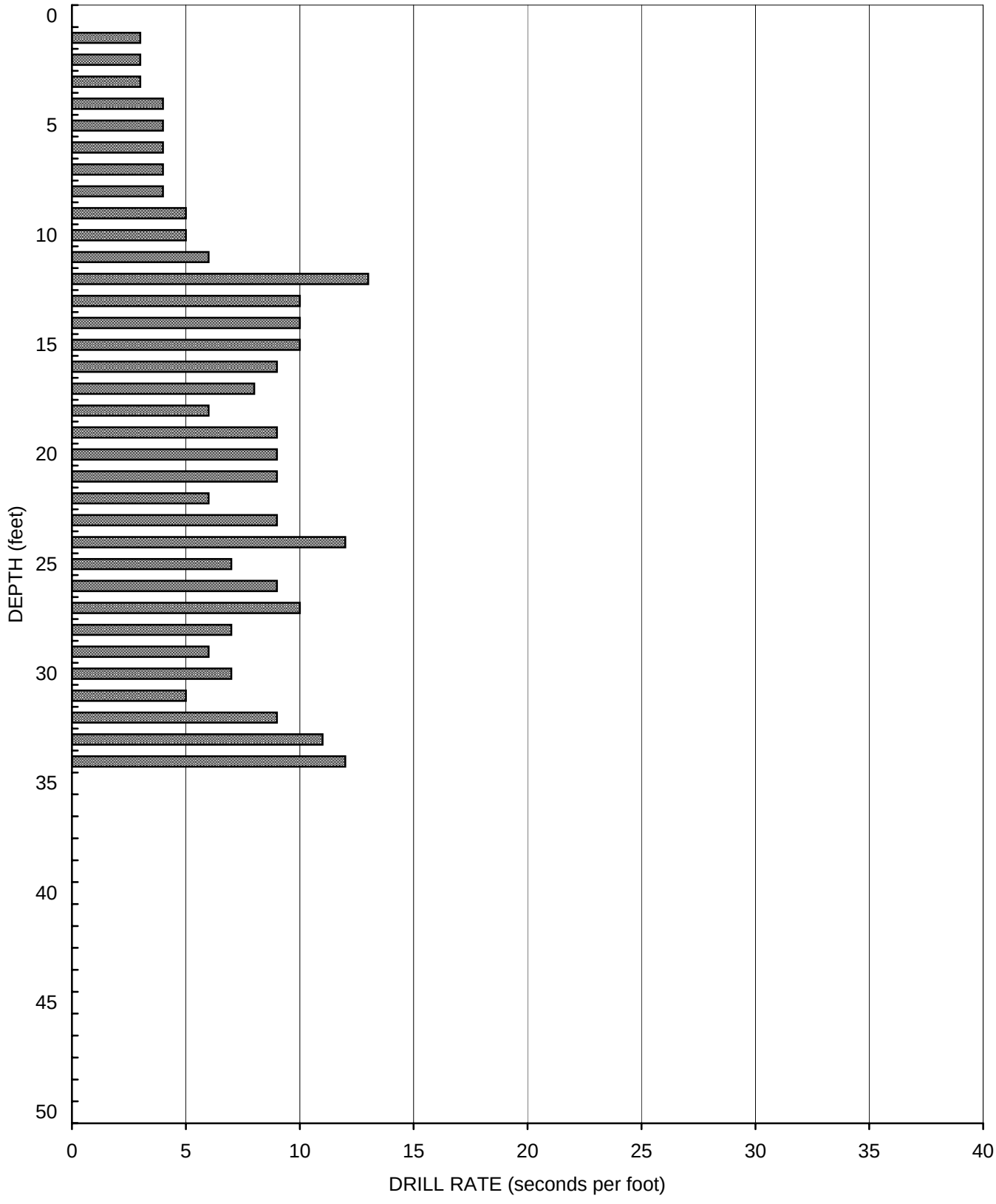
AT004.xls

FIGURE A-52

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-5
Elevation - 735 Feet (MSL)

GEOCON
INCORPORATED



AT005.xls

FIGURE A-53

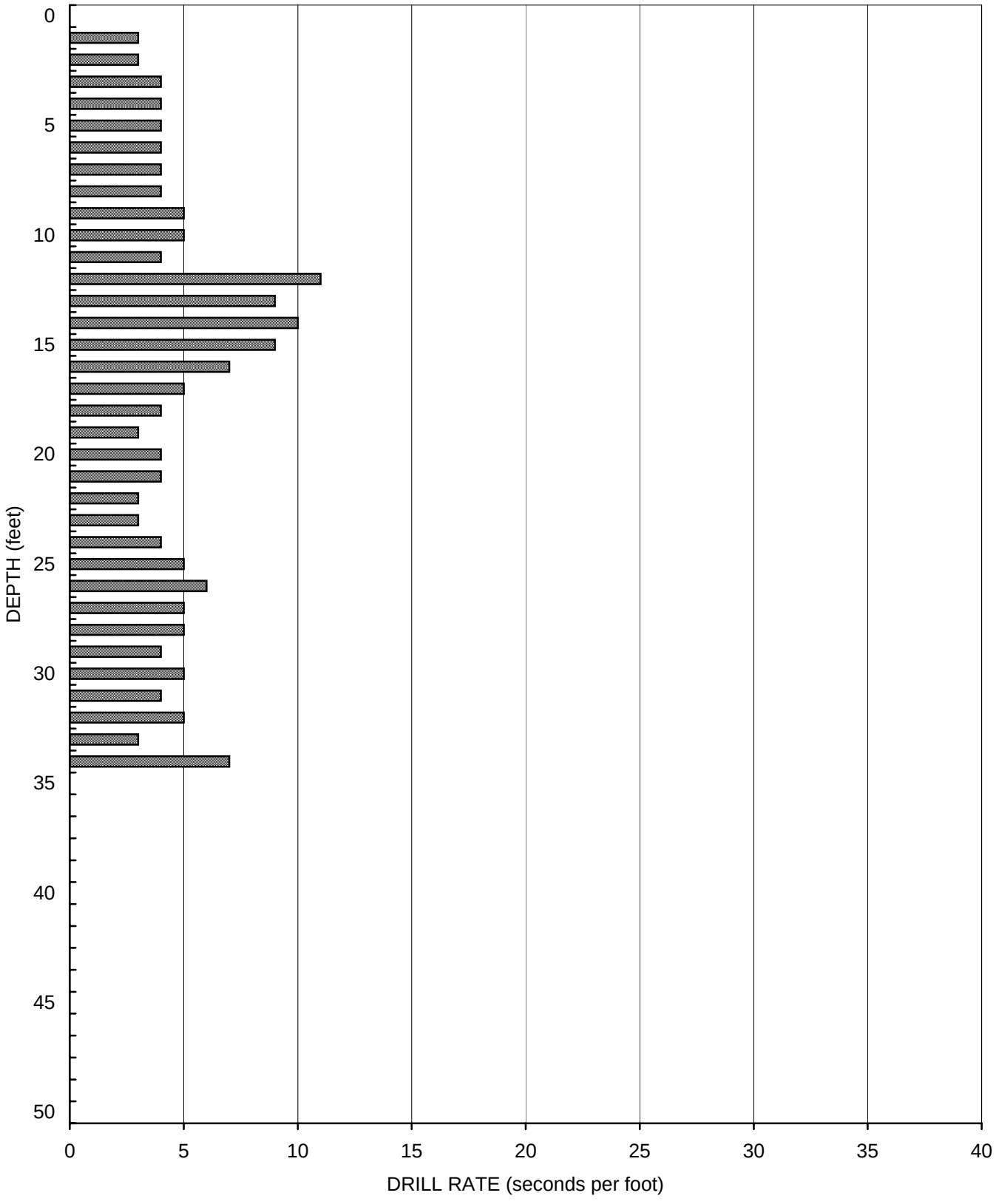
PROJECT NO. 07091 - 32 - 03

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-6

Elevation - 708 Feet (MSL)

GEOCON
INCORPORATED



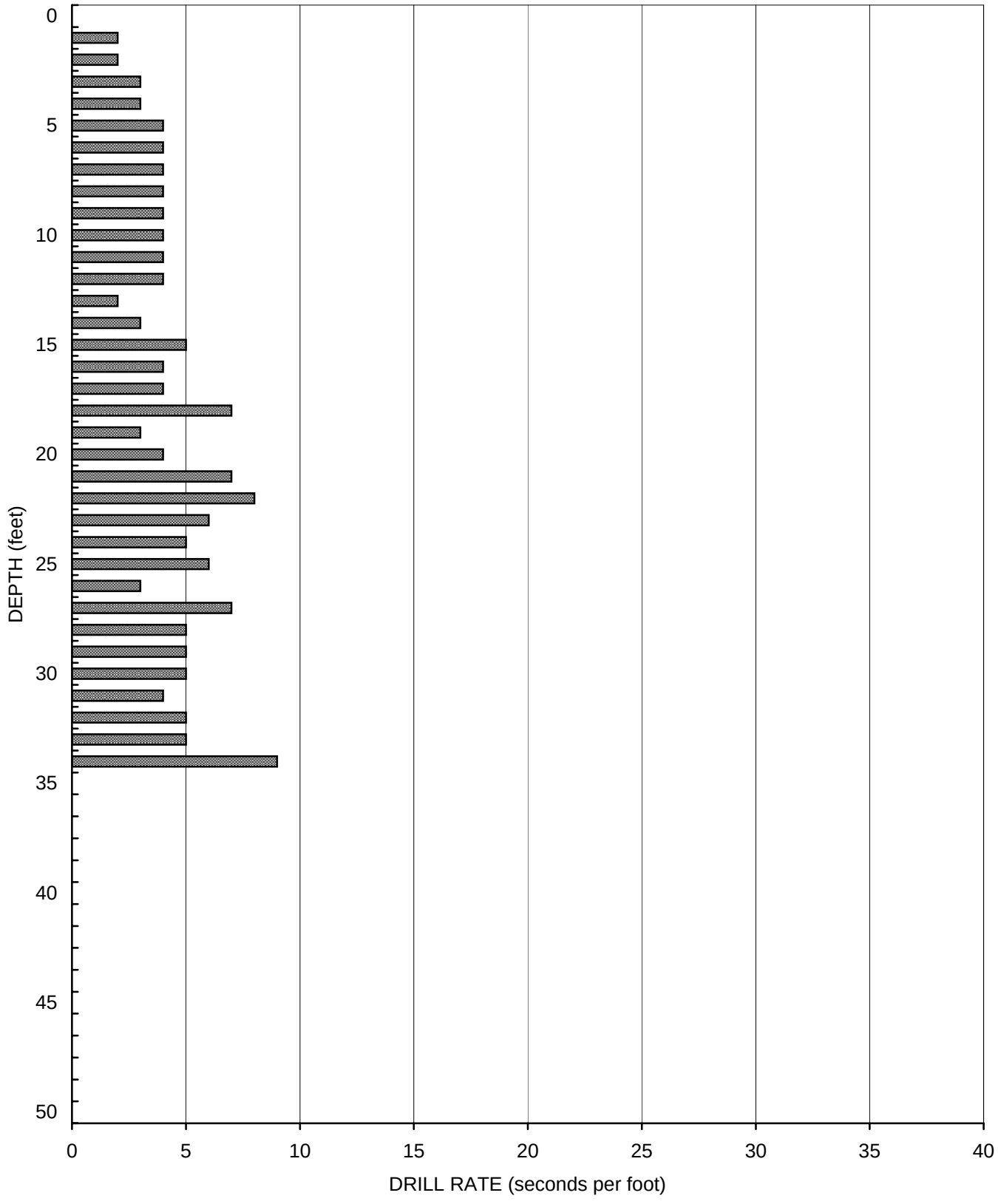
AT006.xls

FIGURE A-54

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-7
Elevation - 700 Feet (MSL)

GEOCON
INCORPORATED



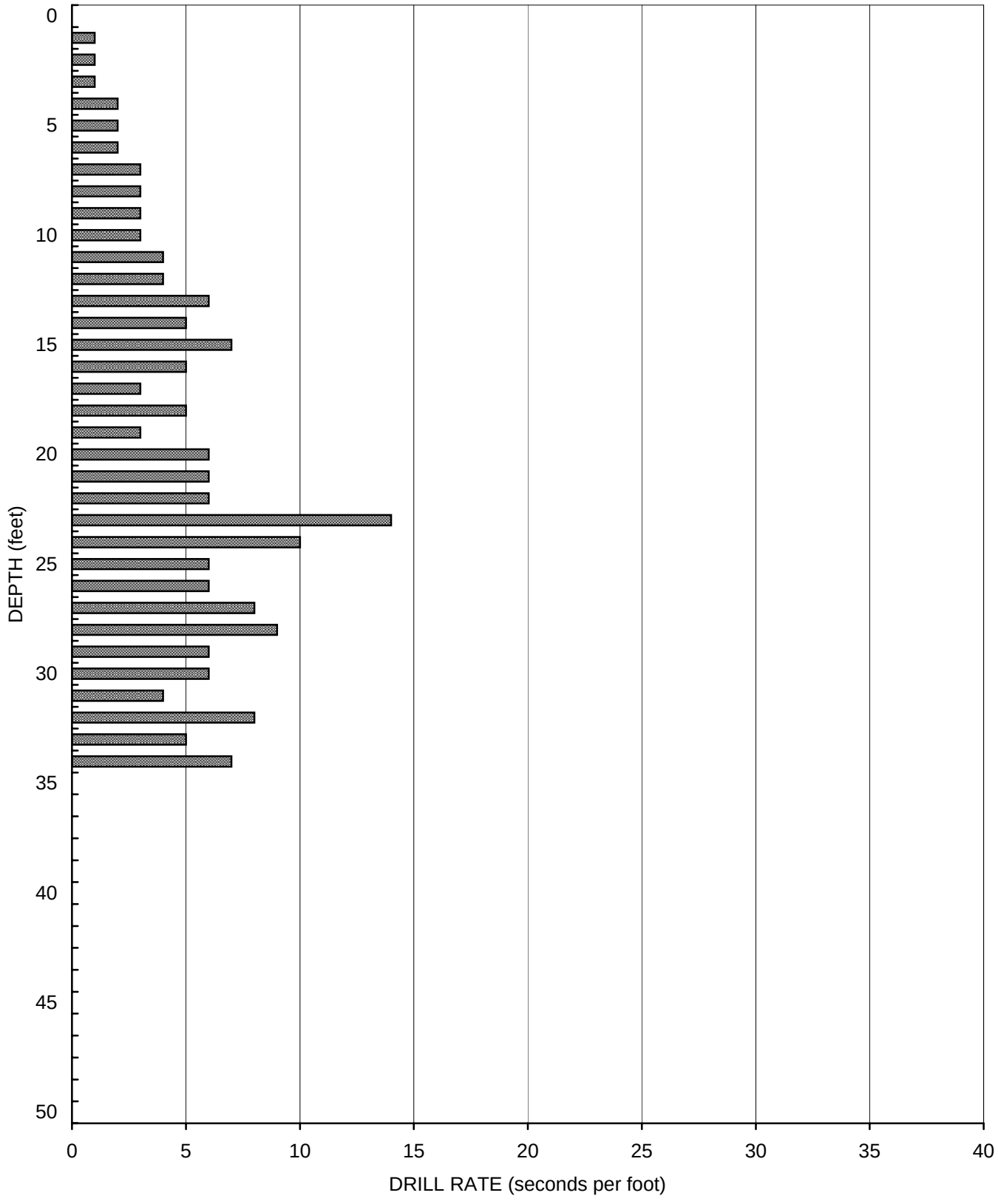
AT007.xls

FIGURE A-55

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-8
Elevation - 690 Feet (MSL)

GEOCON
INCORPORATED



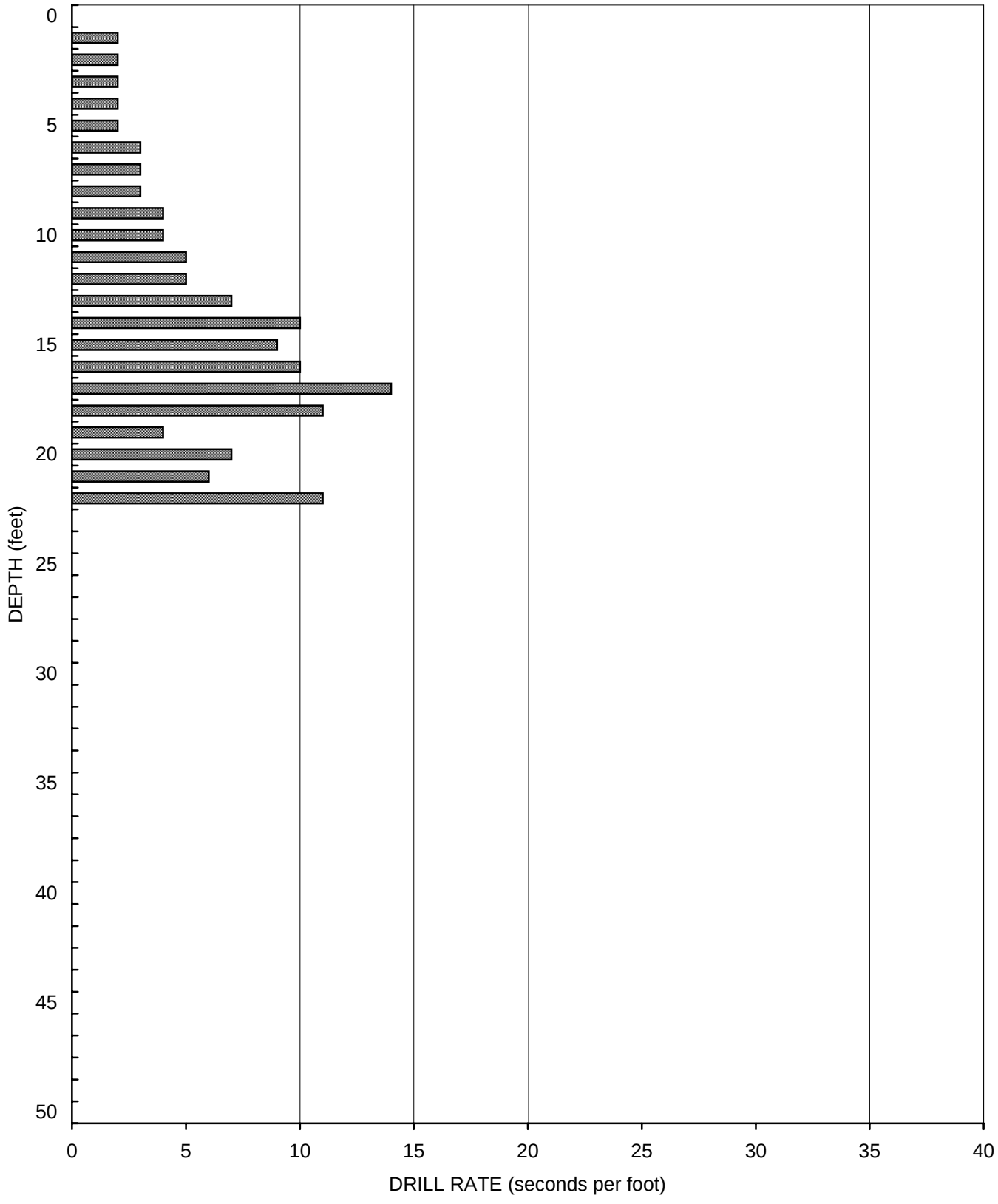
AT008.xls

FIGURE A-56

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-9
Elevation - 650 Feet (MSL)

GEOCON
INCORPORATED



AT009.xls

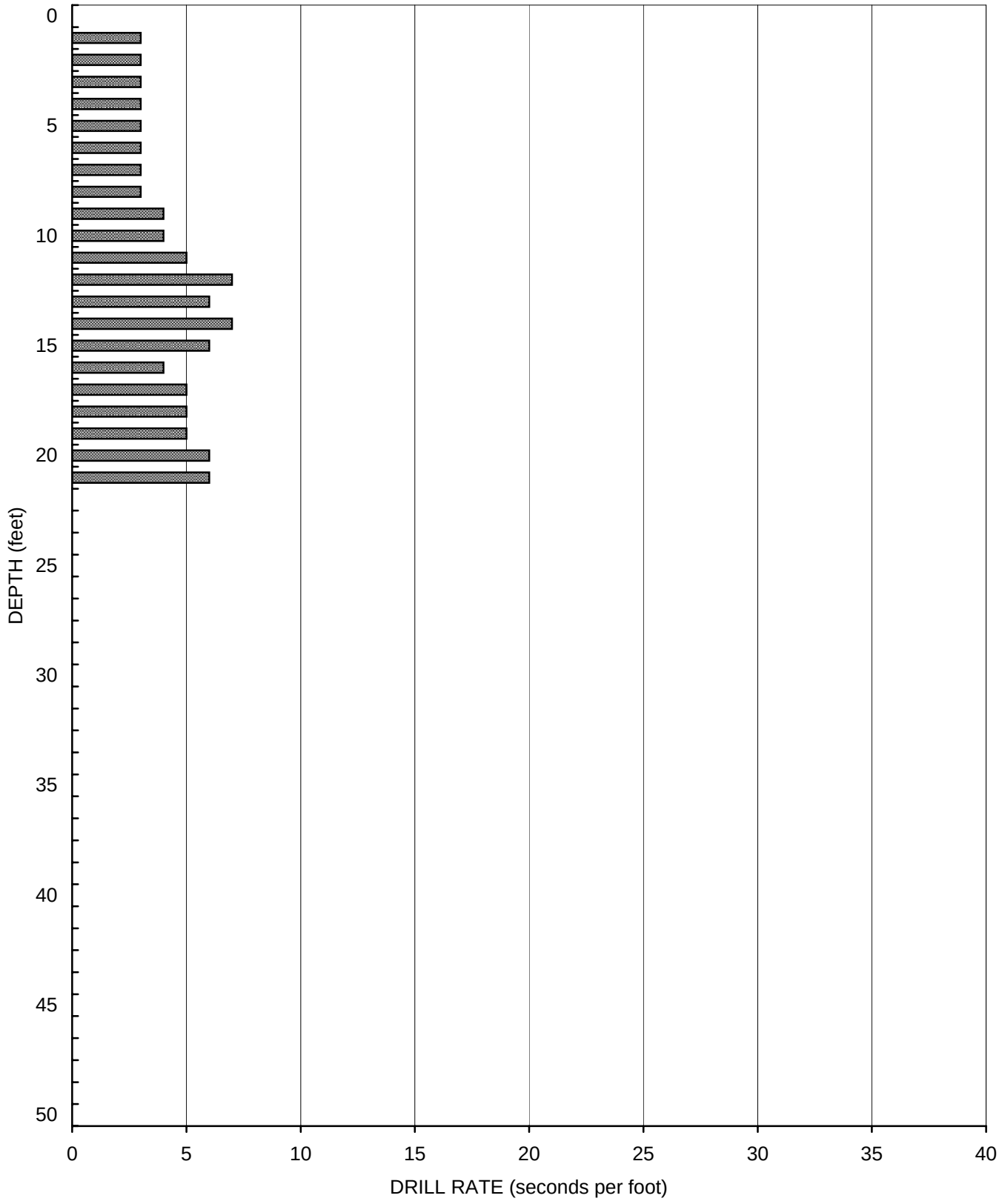
FIGURE A-57

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-10

Elevation - 656 Feet (MSL)

GEOCON
INCORPORATED



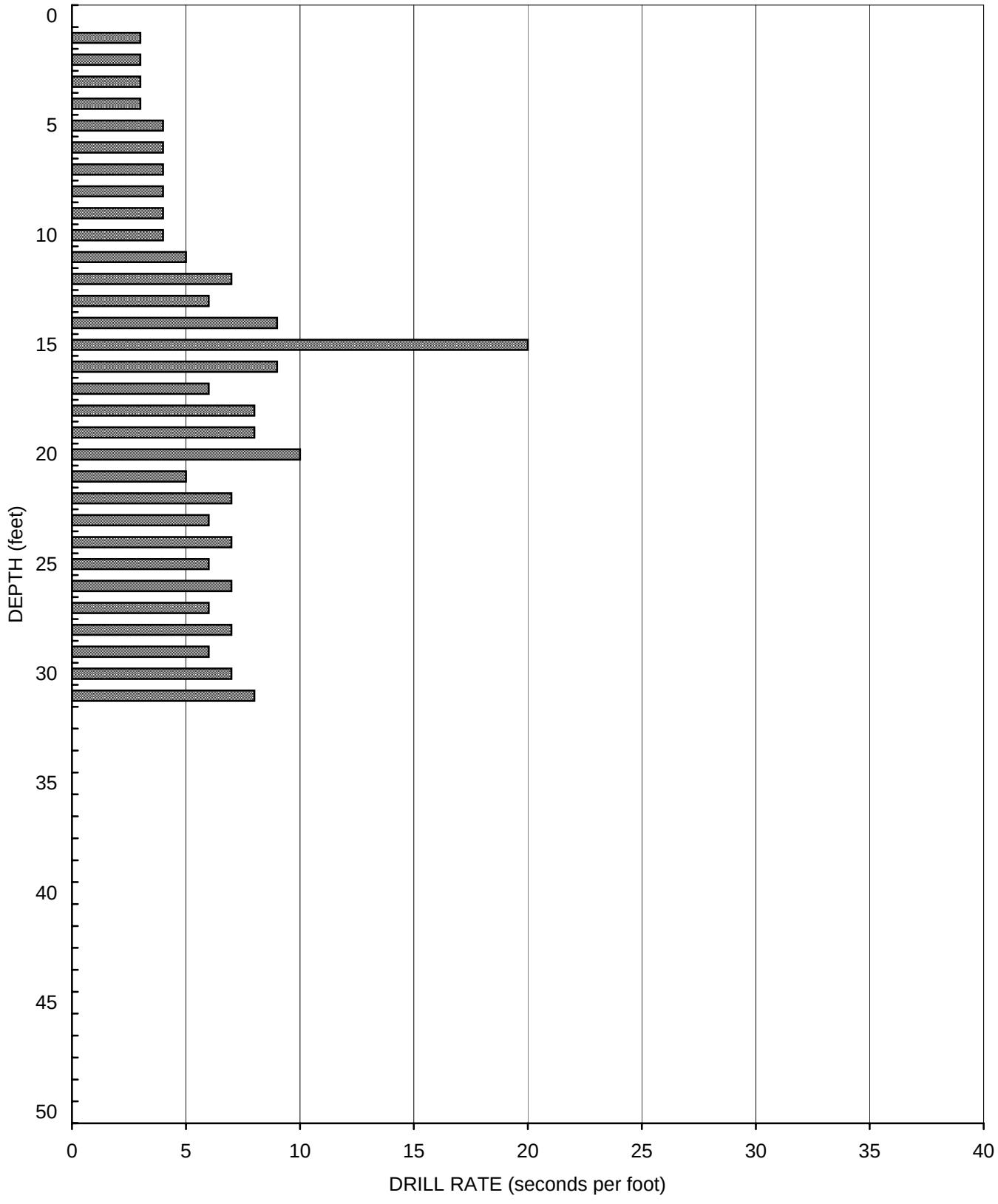
AT010.xls

FIGURE A-58

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-11
Elevation - 652 Feet (MSL)

GEOCON
INCORPORATED



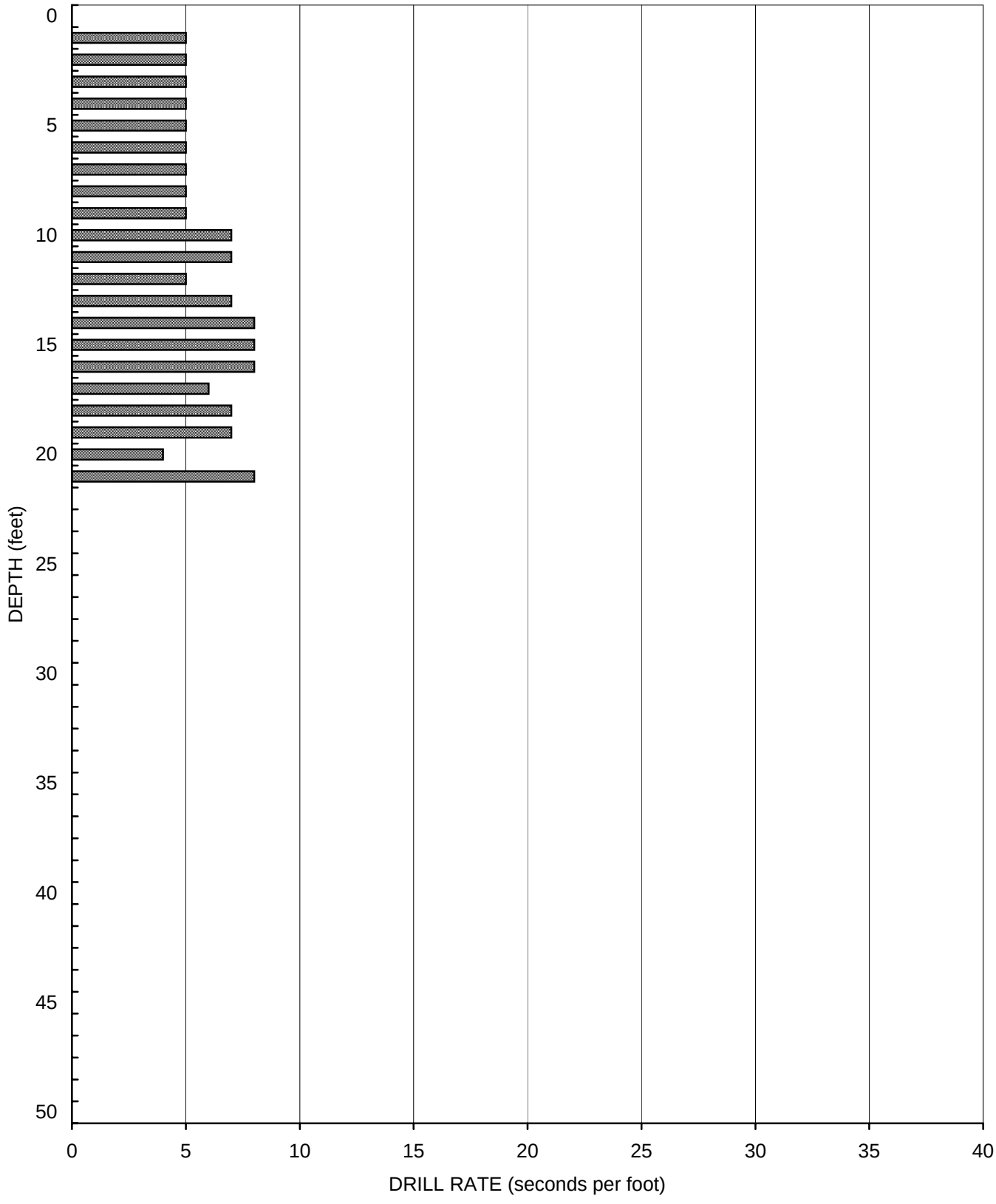
AT011.xls

FIGURE A-59

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-12
Elevation - 708 Feet (MSL)

GEOCON
INCORPORATED



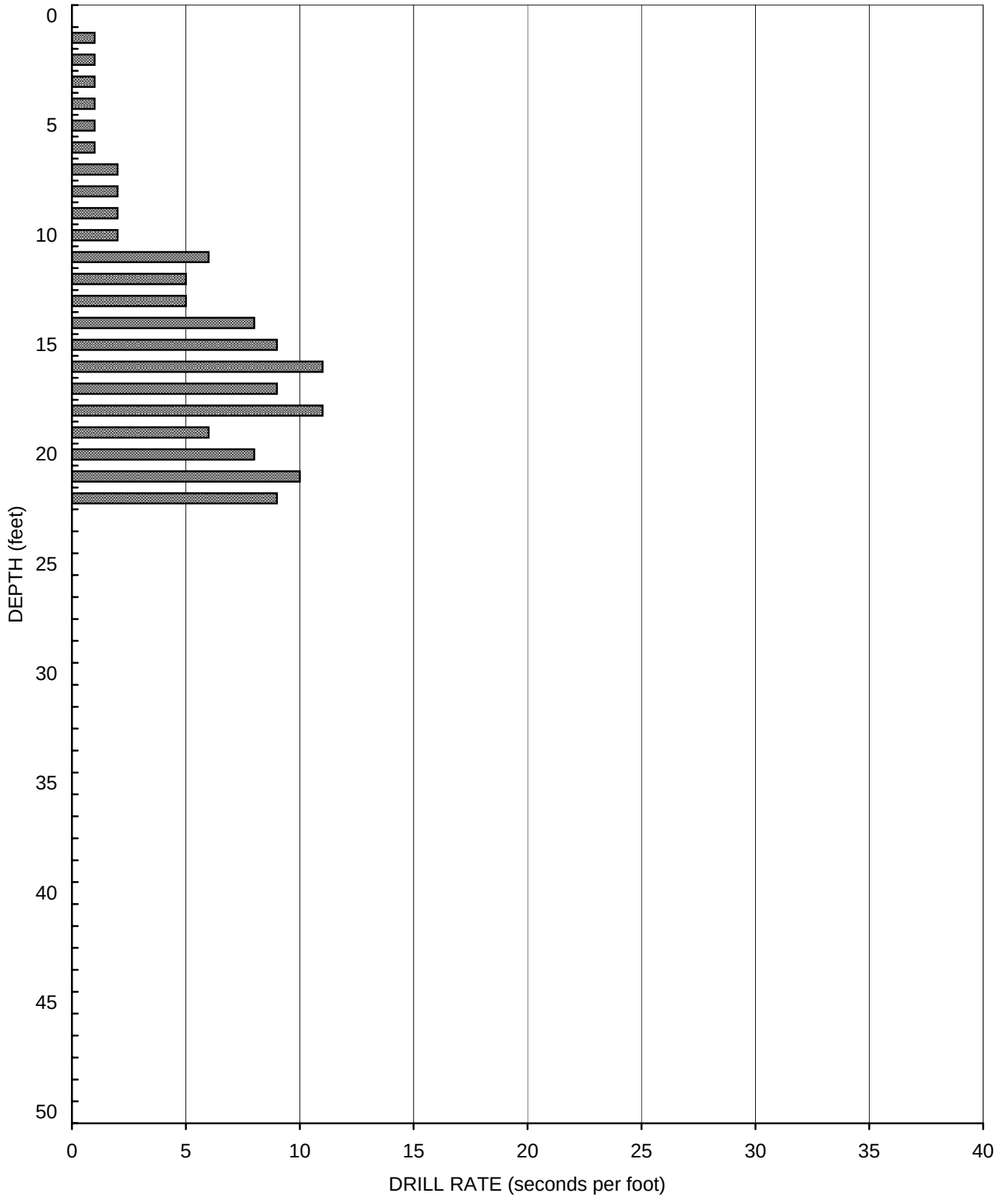
AT012.xls

FIGURE A-60

LOS COCHES I - BRIGHTWATER RANCH

AIR TRACK BORING AT-13
Elevation - 708 Feet (MSL)

GEOCON
INCORPORATED



AT013.xls

FIGURE A-61

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in general accordance with the test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected relatively undisturbed chunk and ring samples were tested for their in-place dry density and moisture content, shear strength and consolidation characteristics. Selected bulk samples were tested for their maximum dry density and optimum moisture content, water-soluble sulfate, and expansion characteristics. Portions of the bulk samples were remolded to selected densities and subjected to drained direct shear testing.

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

TABLE B-I
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
B5-2	97.4	3.4	0	45
T1-1	115.7	10.4	290	30
T26-1*	121.9	7.8	240	38

*Soil sample remolded to approximately 90 percent of the maximum dry density at near-optimum moisture content.

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

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Brown, Silty, fine to medium SAND with trace gravel	129.9	9.6
T7-1	Dark brown, Clayey, fine to medium SAND with trace gravel	127.0	10.6
T26-1	Light brown, Silty, fine to coarse SAND with trace gravel (Granitic Rock)	135.3	8.1

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

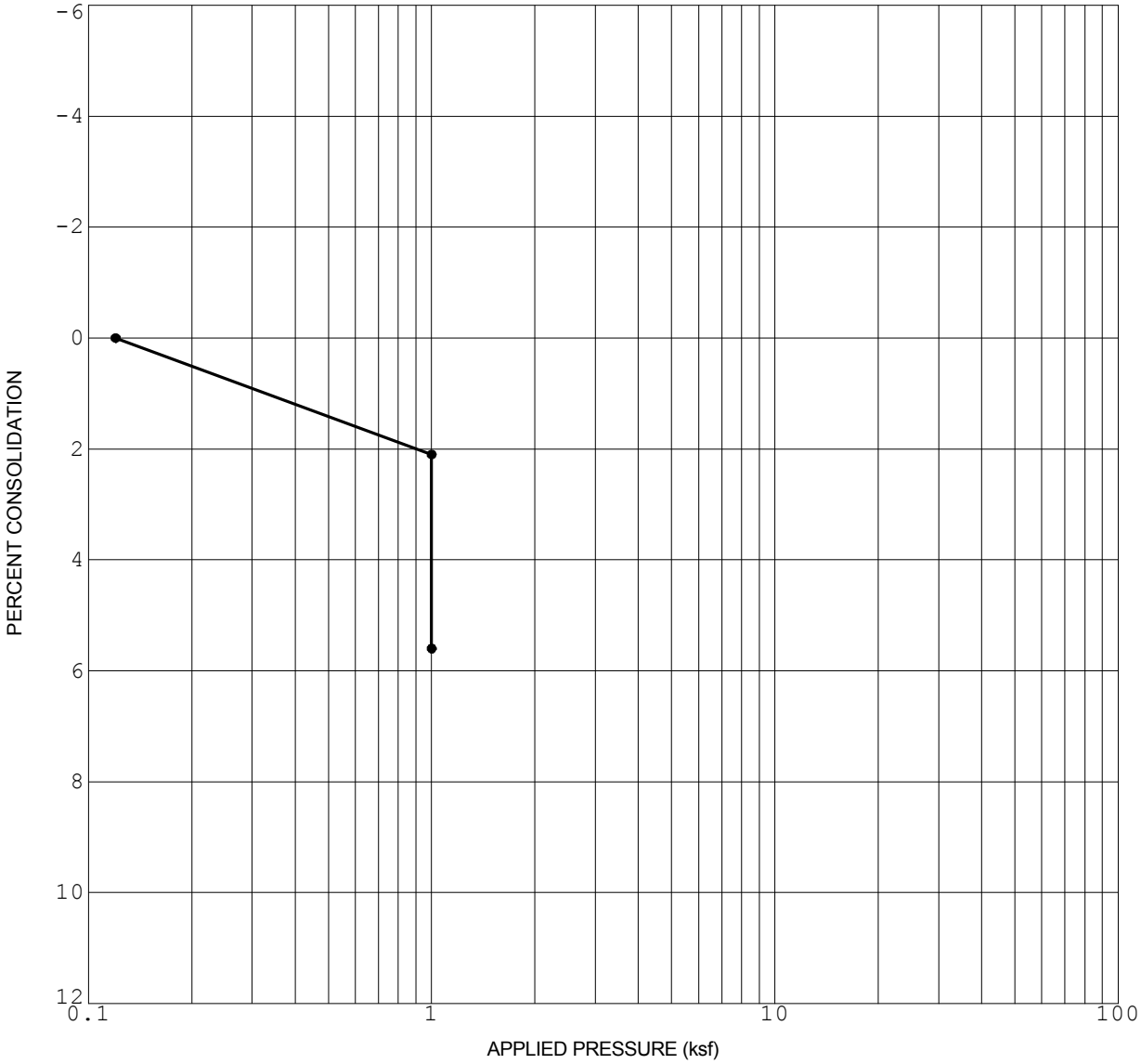
Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index
	Before Test (%)	After Test (%)		
T7-1	8.9	19.5	112.8	50
T28-1	8.4	16.6	114.5	24

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST METHOD NO. 417

Sample No.	Water-Soluble Sulfate Content (%)	Exposure
T7-1	0.038	Negligible
T28-1	0.014	Negligible

PROJECT NO. 07091-32-03

SAMPLE NO. B1-1



Initial Dry Density (pcf)	102.1	**Initial Saturation (%)**	19.7
Initial Water Content (%)	4.6	**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

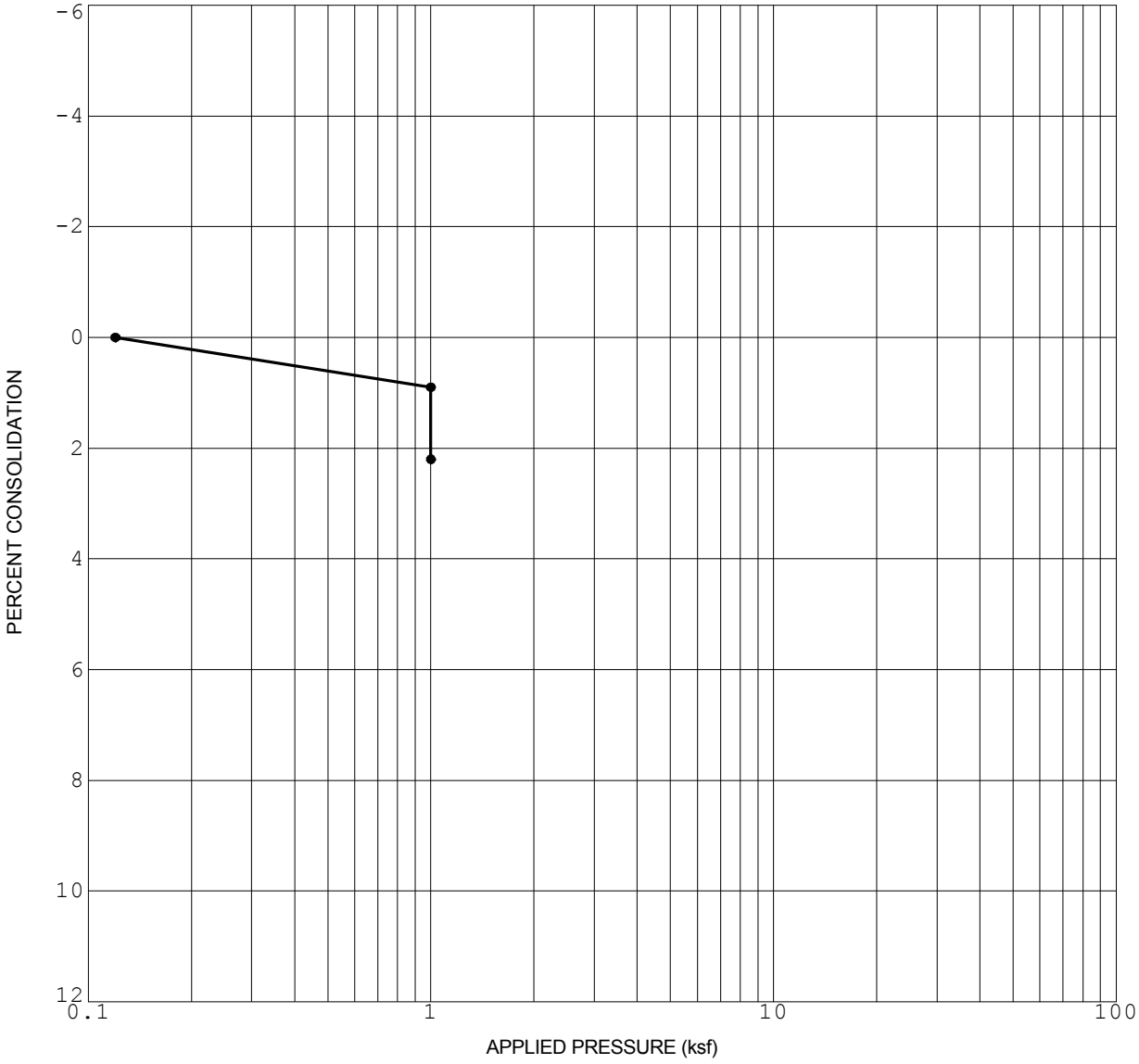
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-1

PROJECT NO. 07091-32-03

SAMPLE NO. B1-2



Initial Dry Density (pcf)	113.2	**Initial Saturation (%)**	28.7
Initial Water Content (%)	5.0	**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

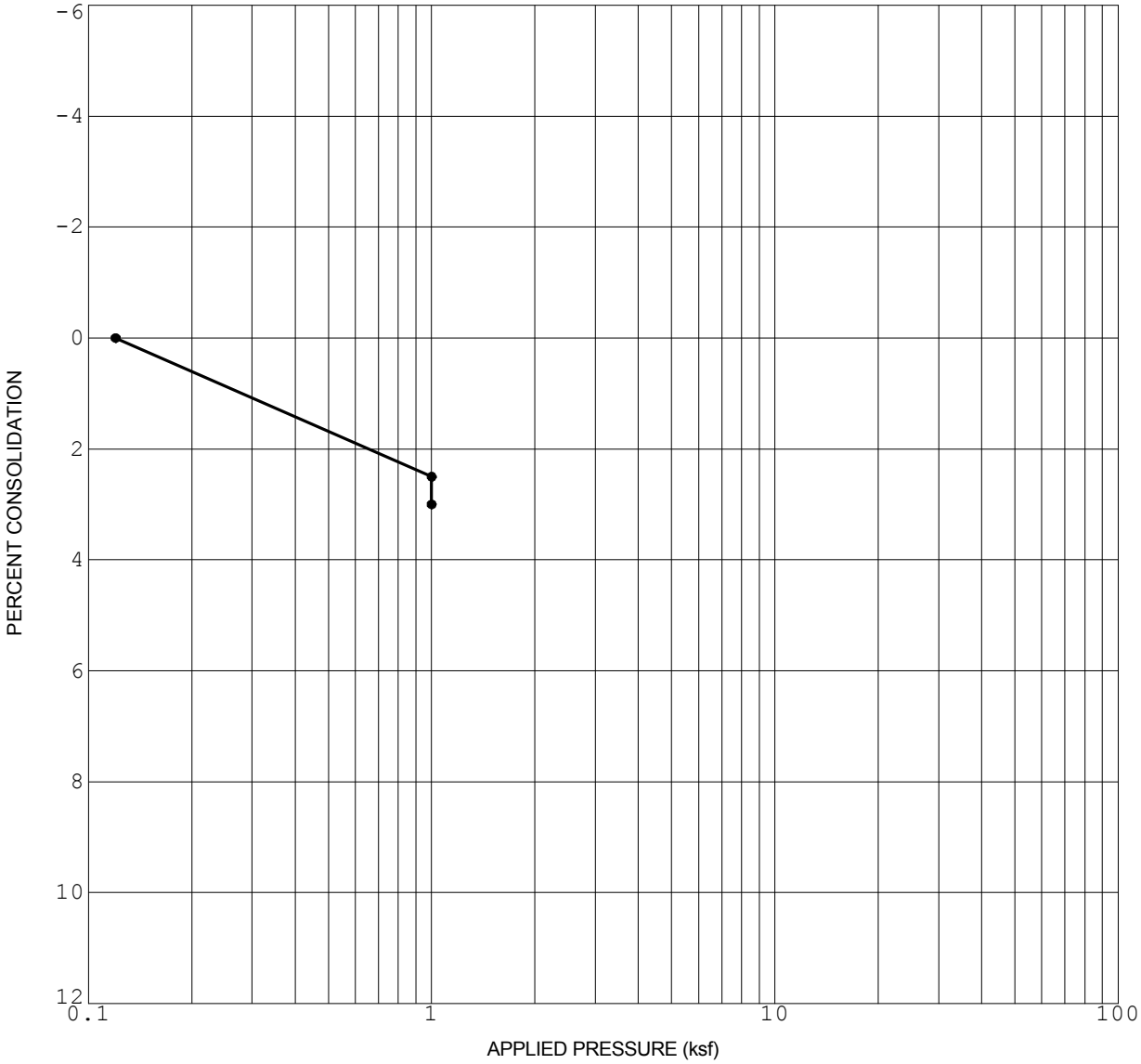
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-2

PROJECT NO. 07091-32-03

SAMPLE NO. B1-3



Initial Dry Density (pcf)	119.0	**Initial Saturation (%)**	34.2
Initial Water Content (%)	5.1	**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

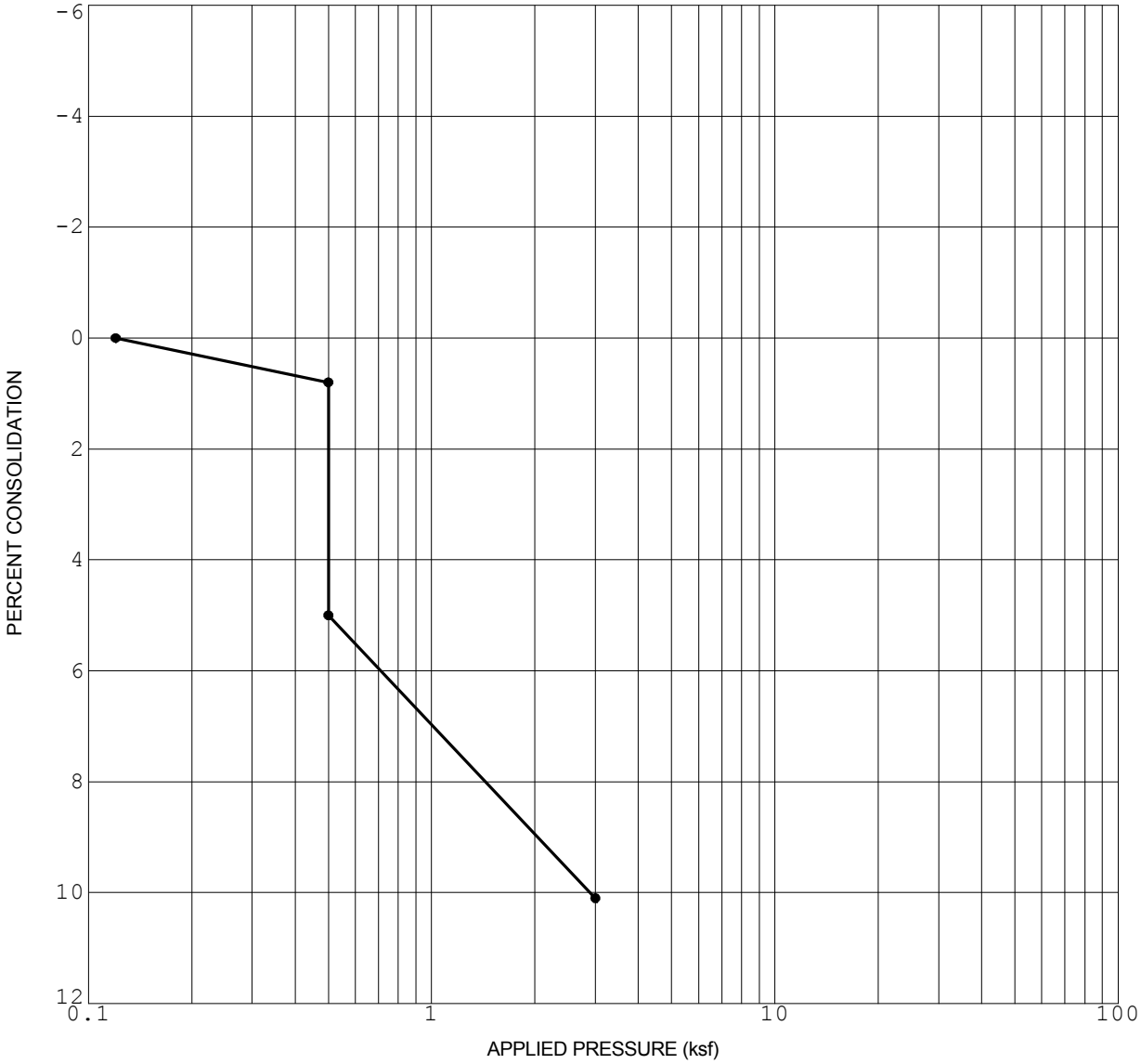
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-3

PROJECT NO. 07091-32-03

SAMPLE NO. B1-4



Initial Dry Density (pcf)	102.0	**Initial Saturation (%)**	20.8
Initial Water Content (%)	4.9	**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

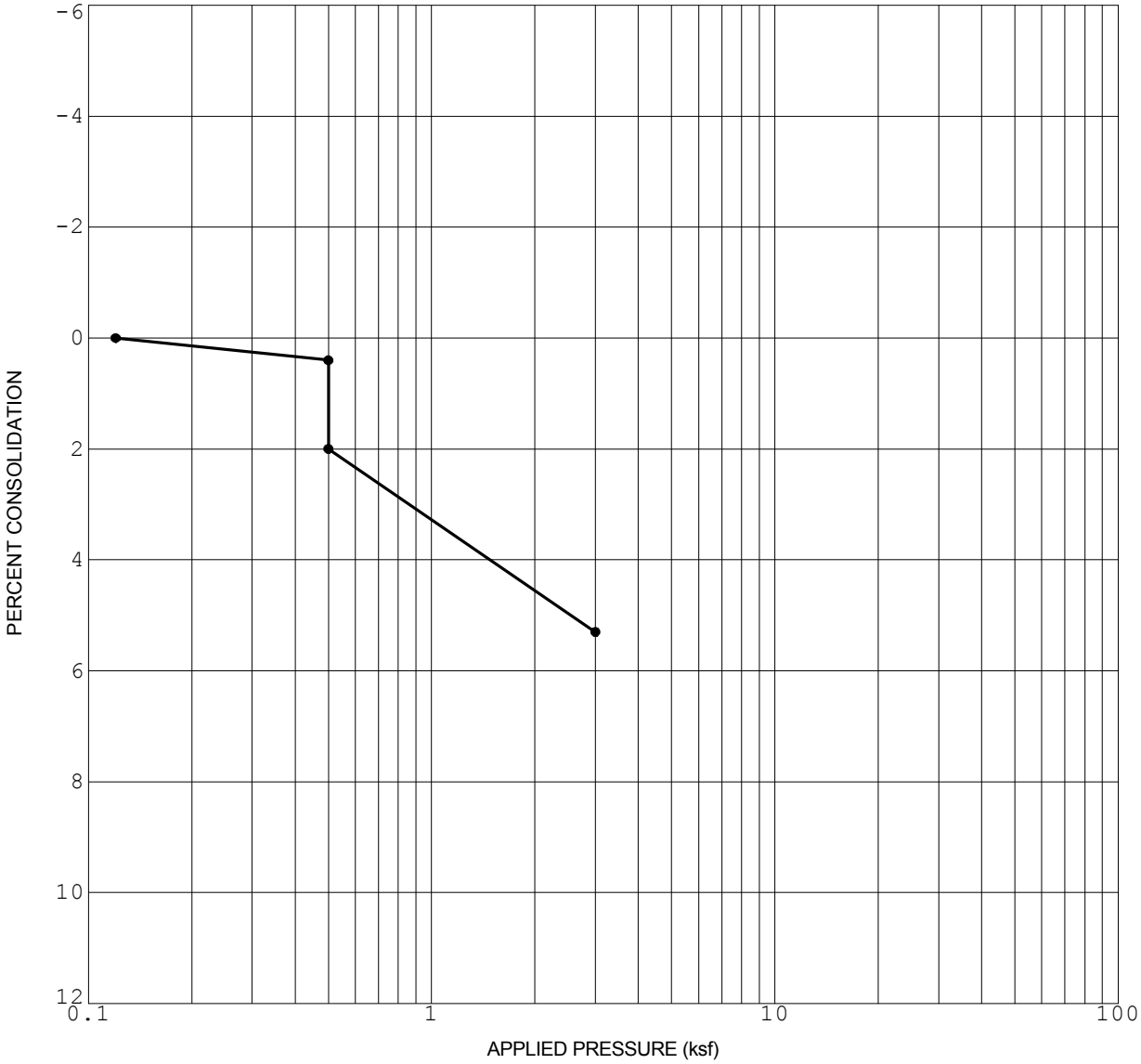
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-4

PROJECT NO. 07091-32-03

SAMPLE NO. B1-5



Initial Dry Density (pcf)	107.0	**Initial Saturation (%)**	19.8
Initial Water Content (%)	4.1	**Sample Saturated at (ksf)**	.5

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

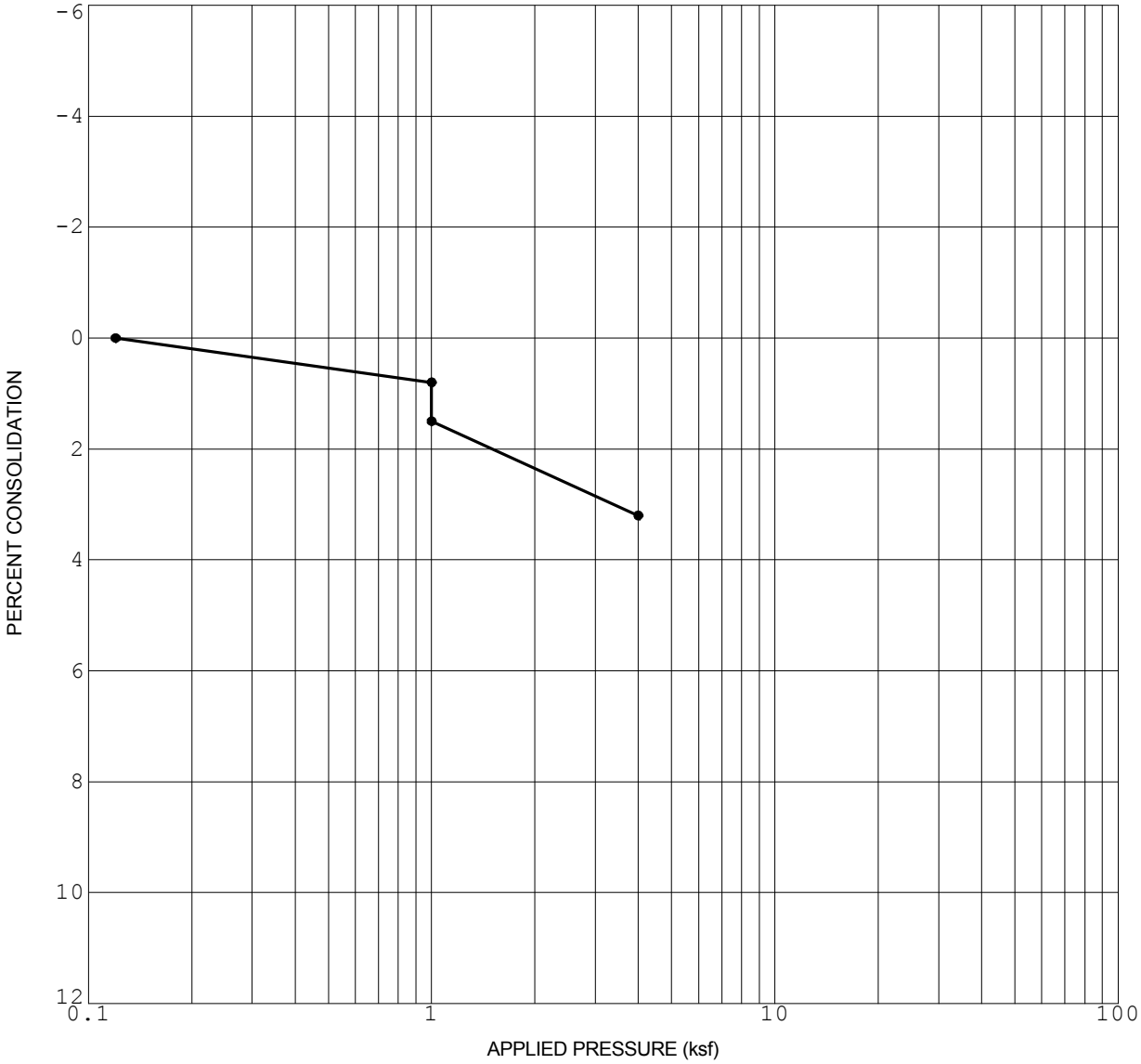
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-5

PROJECT NO. 07091-32-03

SAMPLE NO. B1-6



Initial Dry Density (pcf)	115.6	**Initial Saturation (%)**	39.2
Initial Water Content (%)	6.4	**Sample Saturated at (ksf)**	1.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

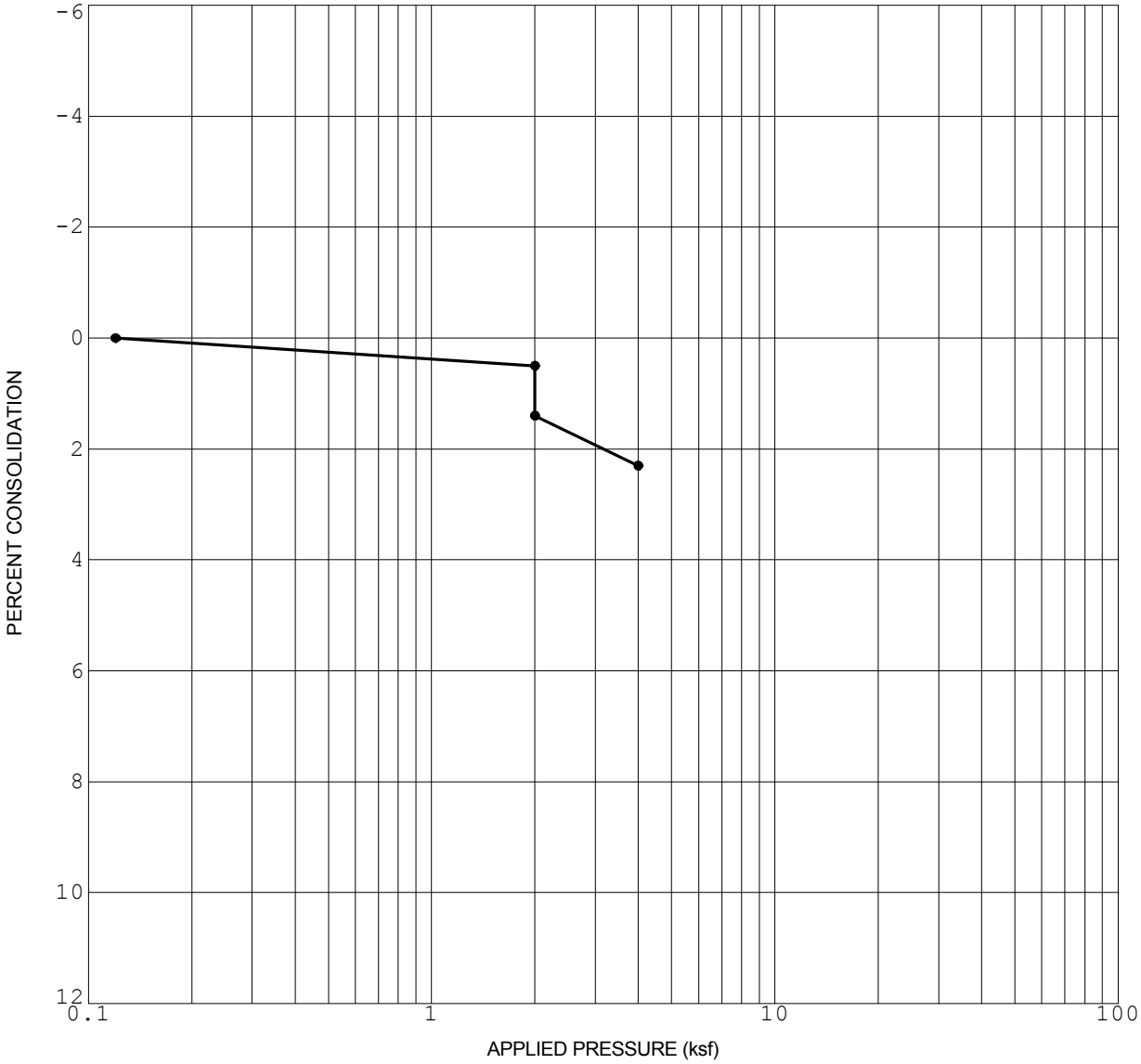
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-6

PROJECT NO. 07091-32-03

SAMPLE NO. B1-7



Initial Dry Density (pcf)	114.6	**Initial Saturation (%)**	41.9
Initial Water Content (%)	7.1	**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

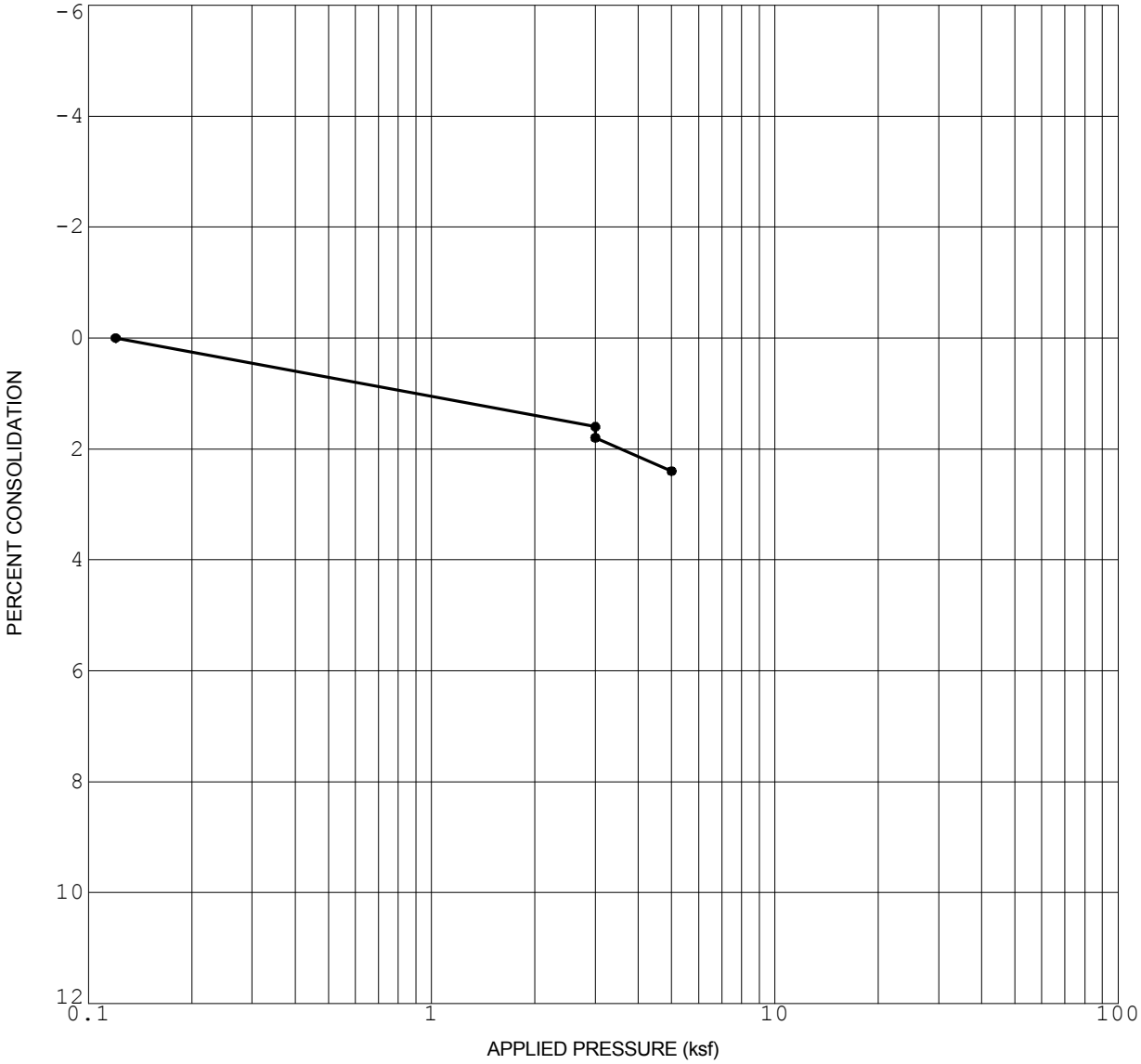
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-7

PROJECT NO. 07091-32-03

SAMPLE NO. B1-8



Initial Dry Density (pcf)	124.6	**Initial Saturation (%)**	86.5
Initial Water Content (%)	10.8	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

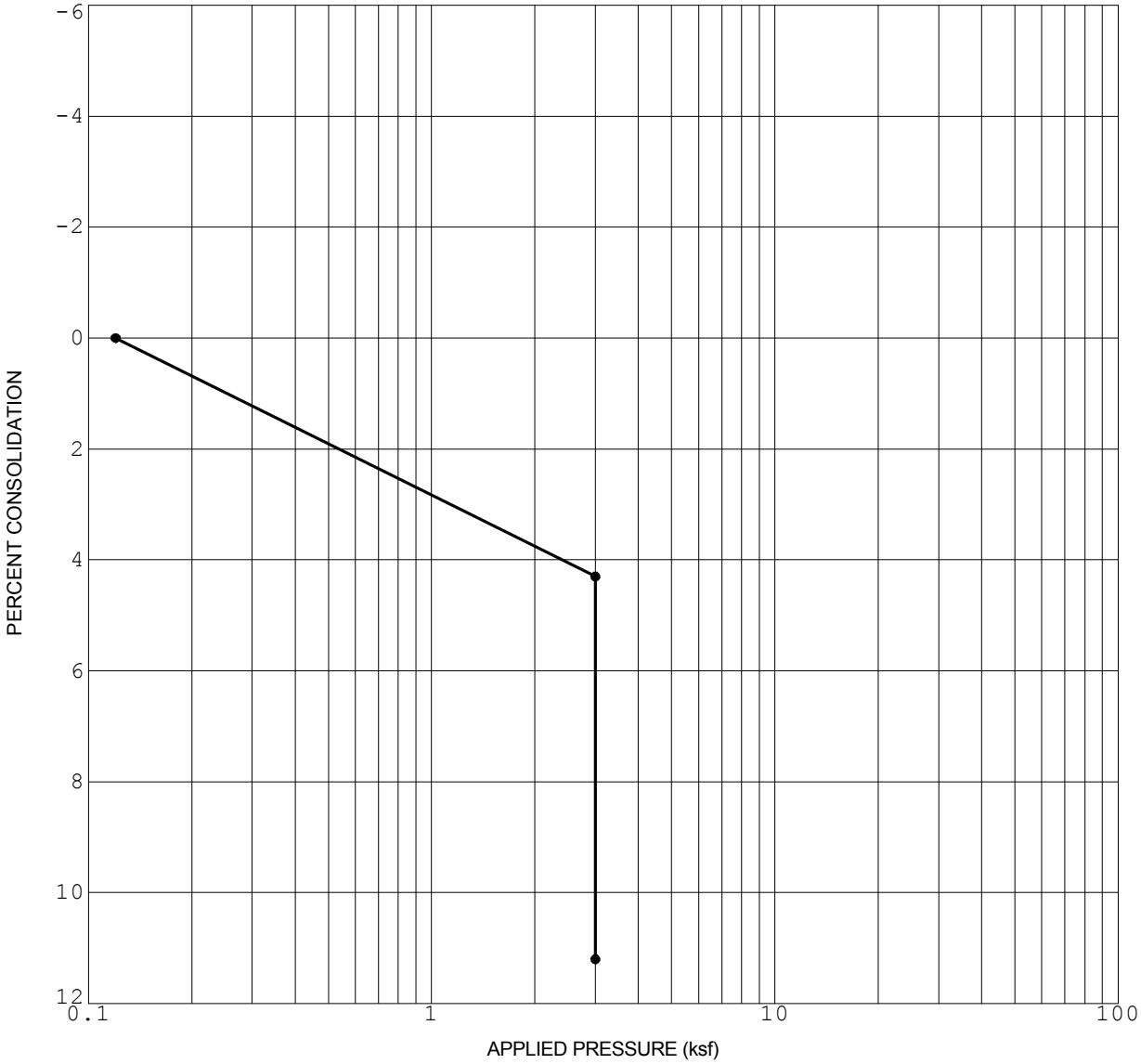
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-8

PROJECT NO. 07091-32-03

SAMPLE NO. B2-1



Initial Dry Density (pcf)	102.4	**Initial Saturation (%)**	23.1
Initial Water Content (%)	5.4	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

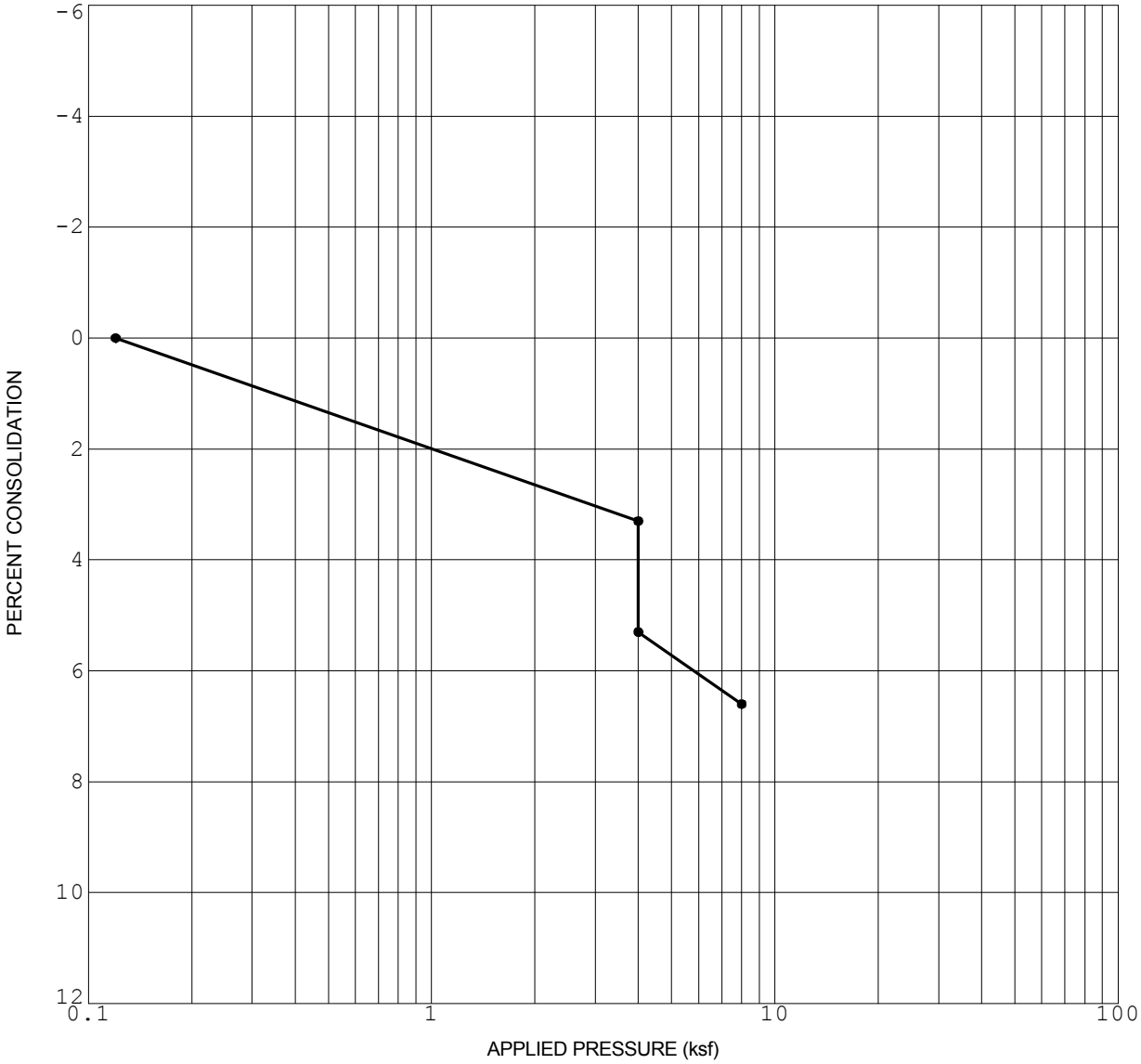
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-9

PROJECT NO. 07091-32-03

SAMPLE NO. B2-2



Initial Dry Density (pcf)	116.8	**Initial Saturation (%)**	47.0
Initial Water Content (%)	6.8	**Sample Saturated at (ksf)**	0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

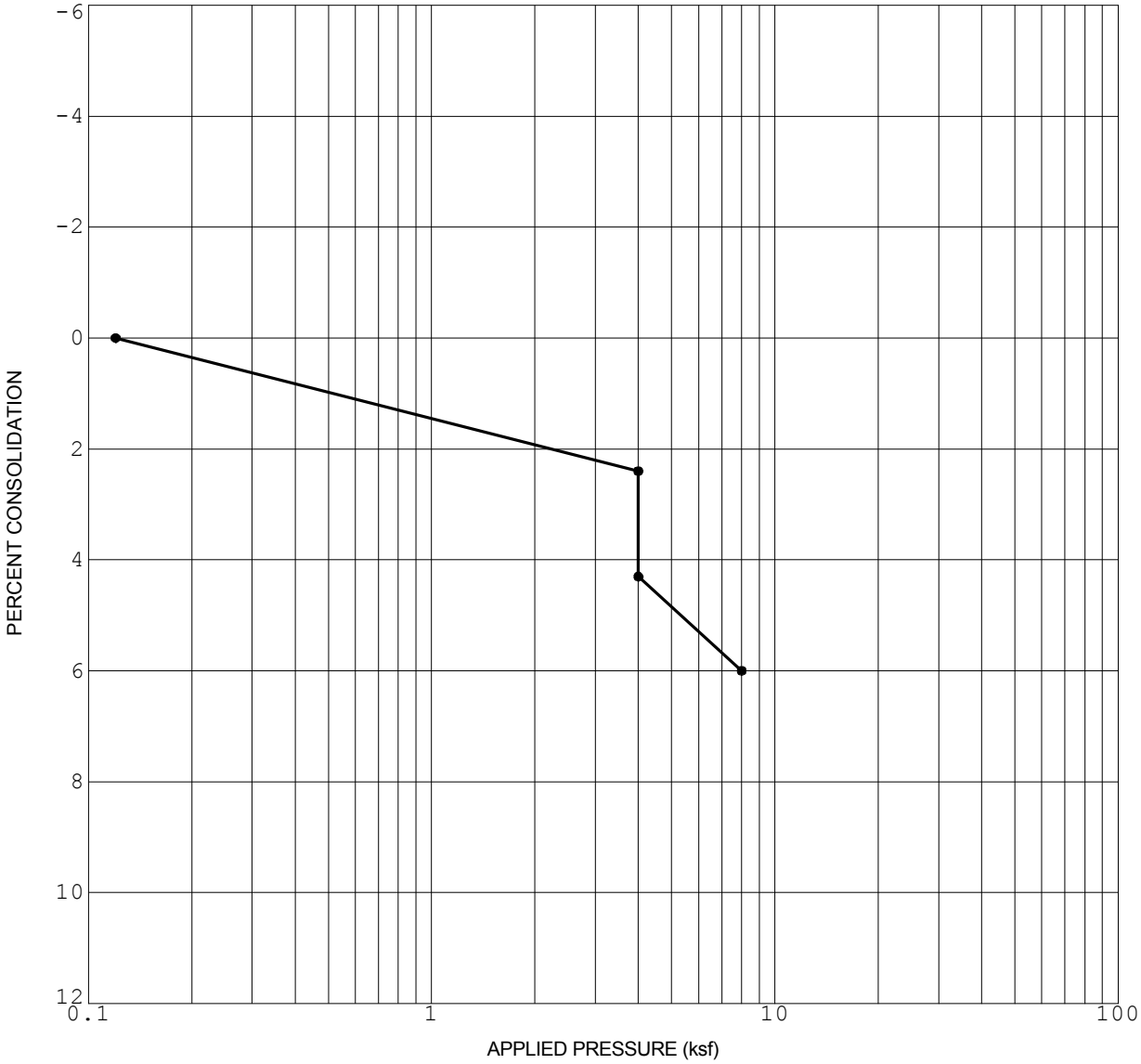
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-10

PROJECT NO. 07091-32-03

SAMPLE NO. B2-3



Initial Dry Density (pcf)	117.1	**Initial Saturation (%)**	35.6
Initial Water Content (%)	5.6	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

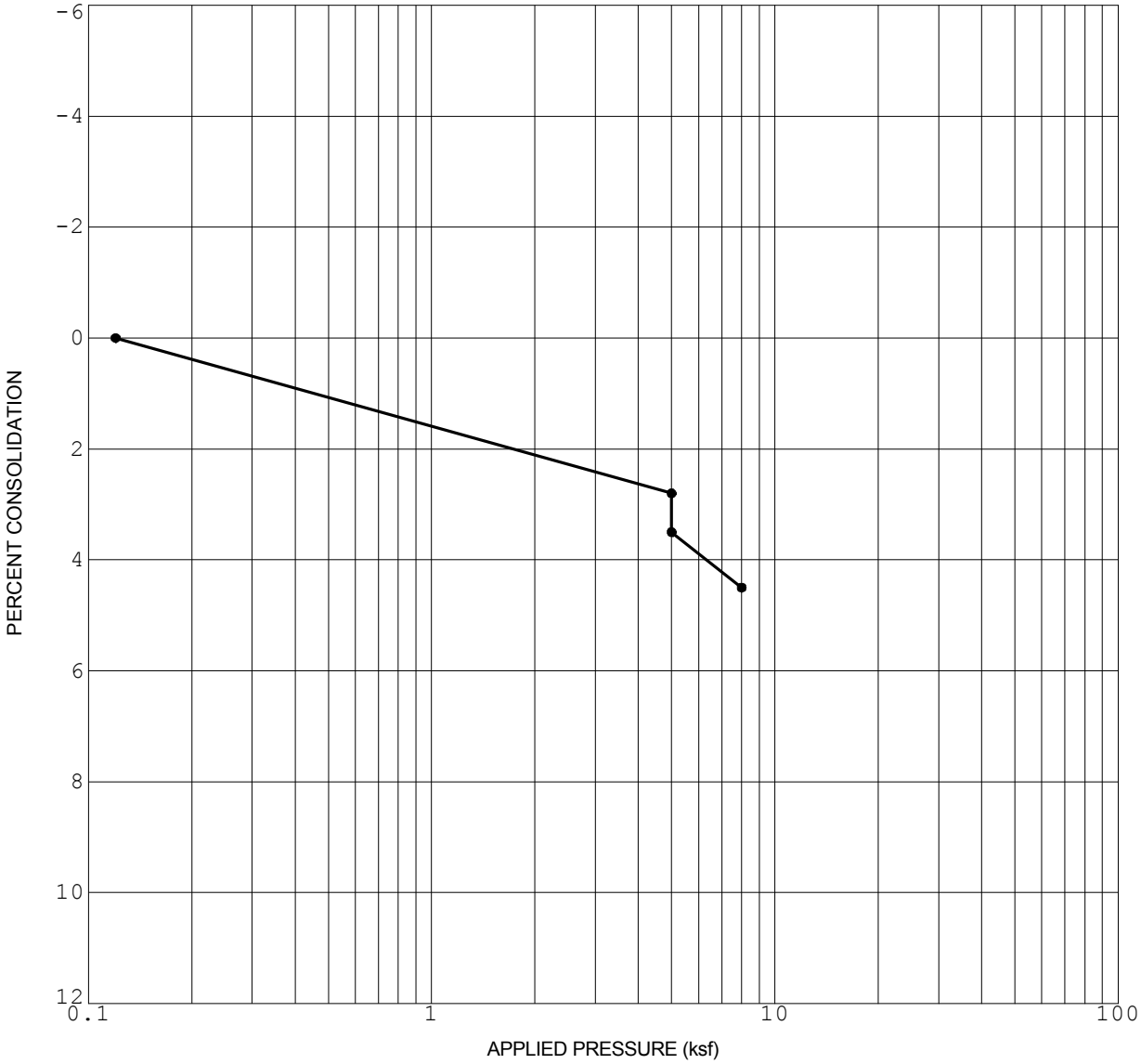
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-11

PROJECT NO. 07091-32-03

SAMPLE NO. B2-4



Initial Dry Density (pcf)	120.6	**Initial Saturation (%)**	47.5
Initial Water Content (%)	6.7	**Sample Saturated at (ksf)**	5.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

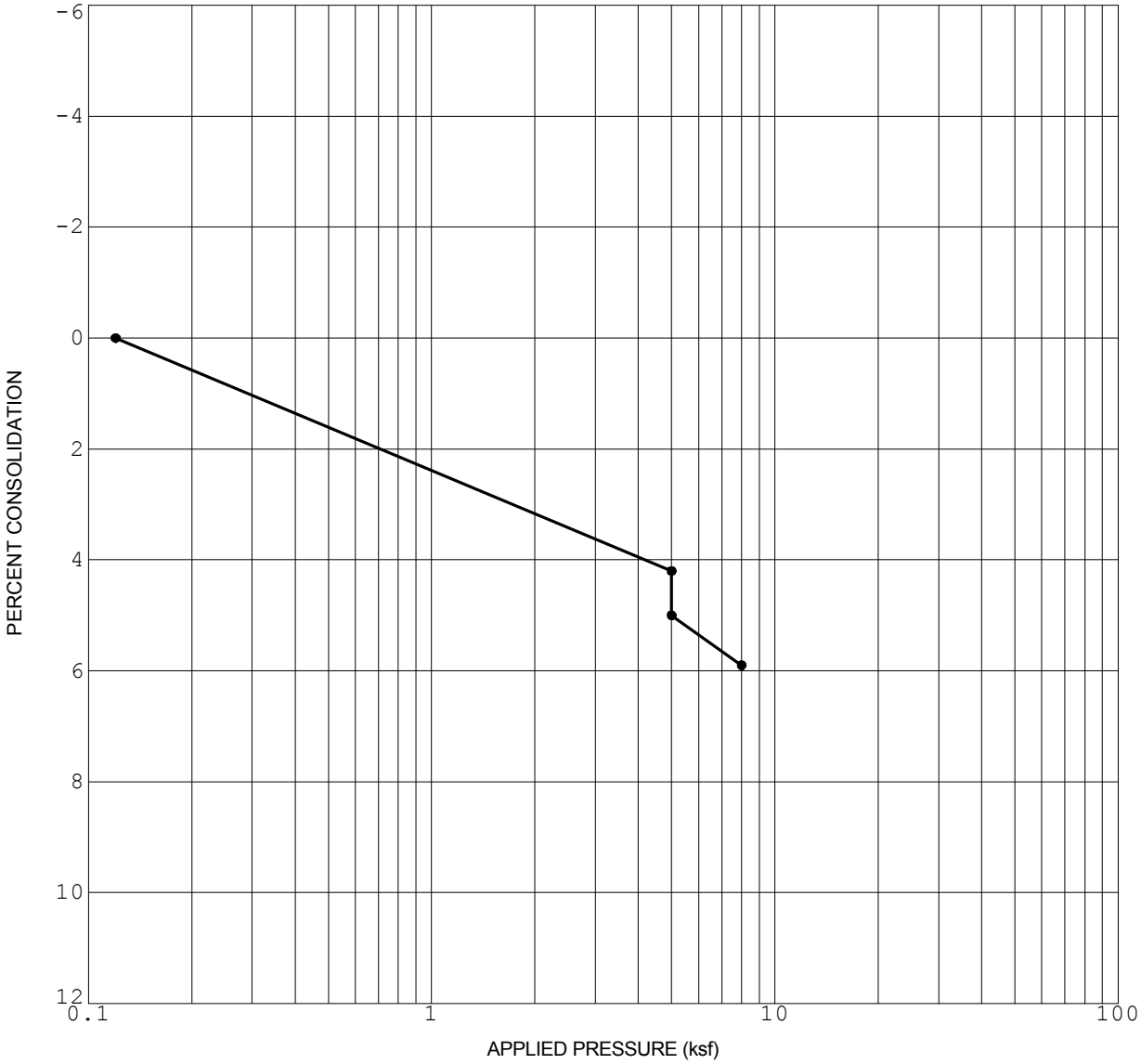
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-12

PROJECT NO. 07091-32-03

SAMPLE NO. B2-5



Initial Dry Density (pcf)	117.1	**Initial Saturation (%)**	35.6
Initial Water Content (%)	5.6	**Sample Saturated at (ksf)**	5.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

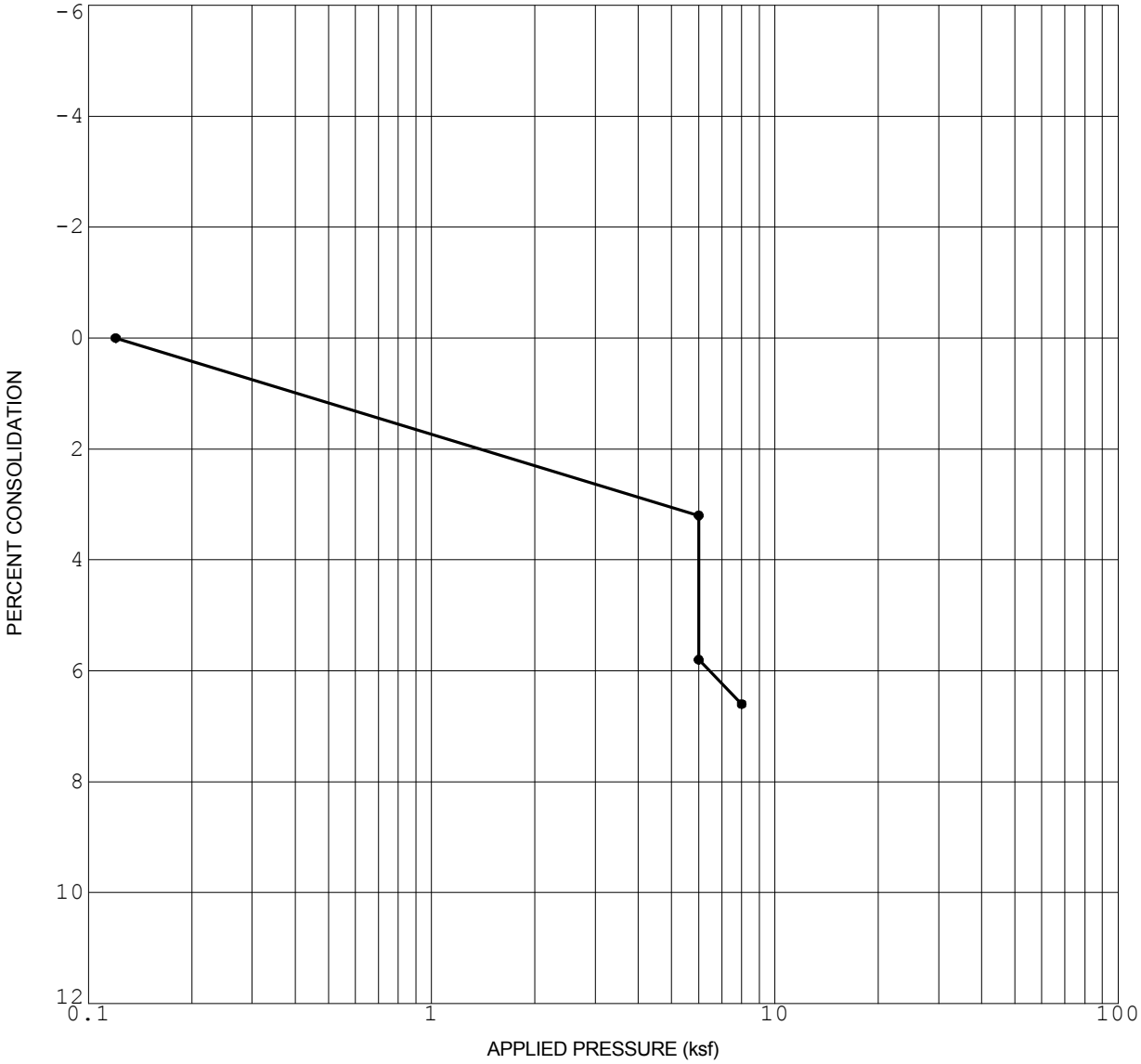
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-13

PROJECT NO. 07091-32-03

SAMPLE NO. B2-6



Initial Dry Density (pcf)	109.0	**Initial Saturation (%)**	31.0
Initial Water Content (%)	6.1	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

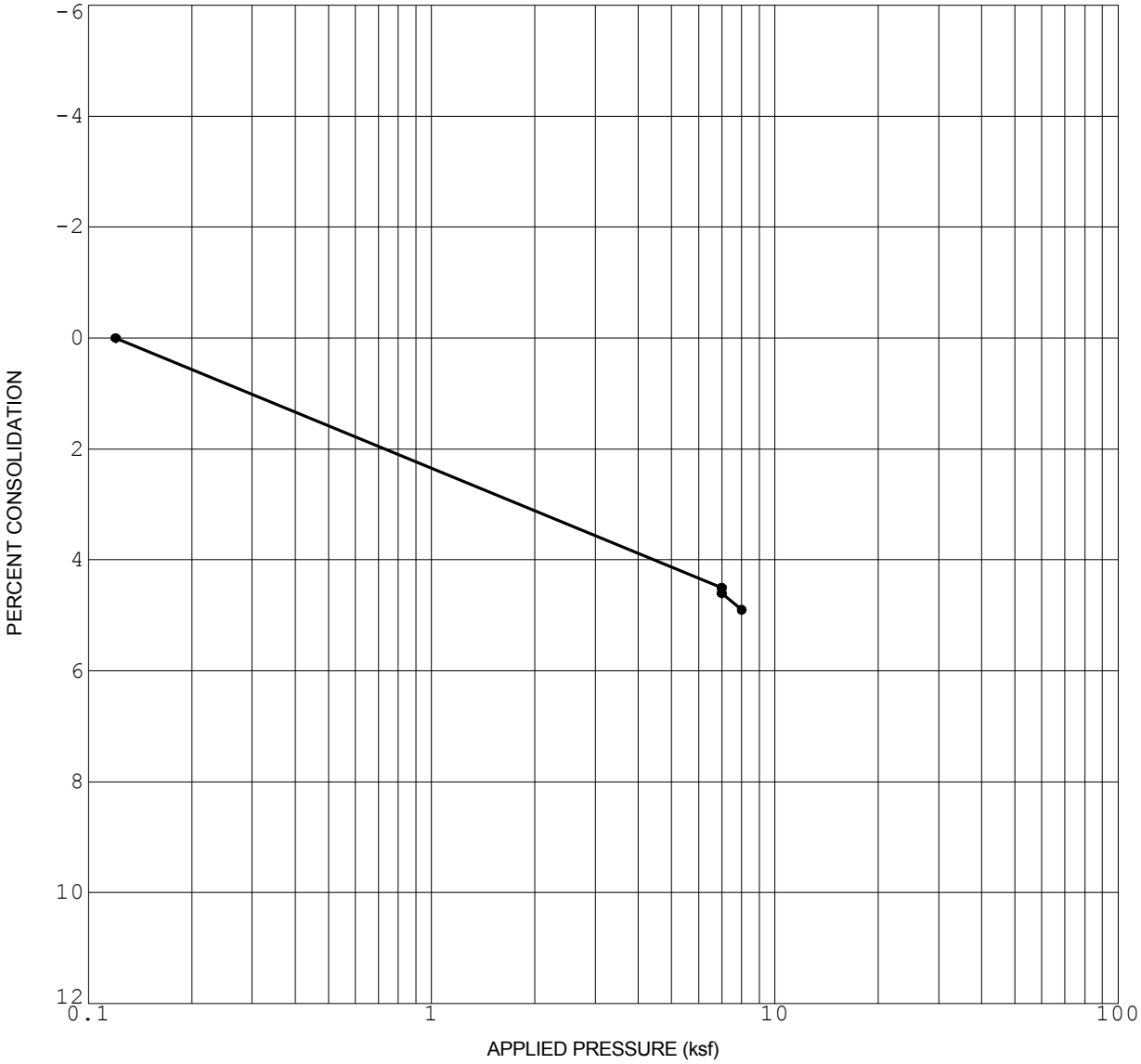
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-14

PROJECT NO. 07091-32-03

SAMPLE NO. B2-7



Initial Dry Density (pcf)	112.8	**Initial Saturation (%)**	76.8
Initial Water Content (%)	13.6	**Sample Saturated at (ksf)**	7.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

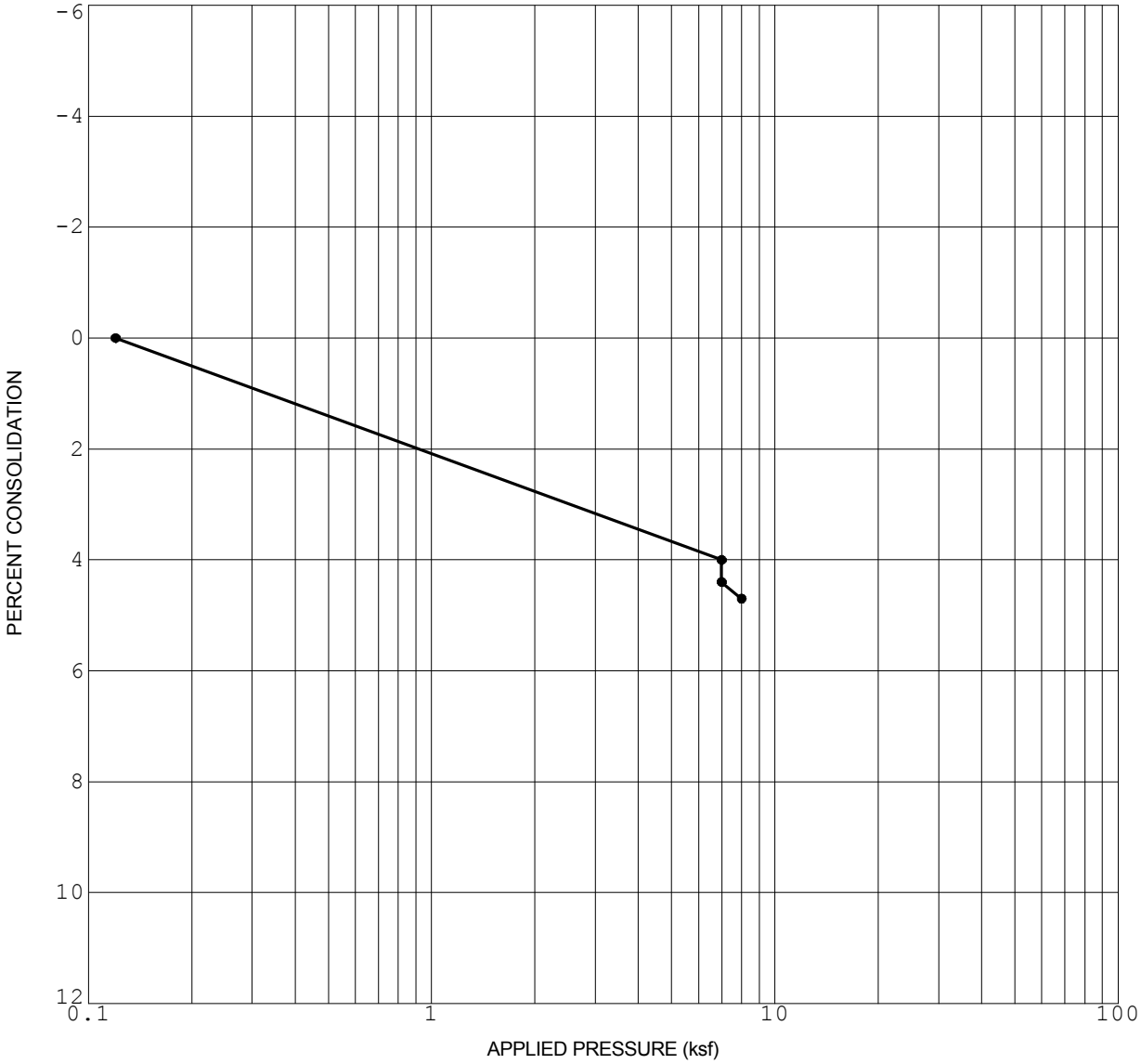
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-15

PROJECT NO. 07091-32-03

SAMPLE NO. B2-8



Initial Dry Density (pcf)	108.1	**Initial Saturation (%)**	65.0
Initial Water Content (%)	13.1	**Sample Saturated at (ksf)**	7.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

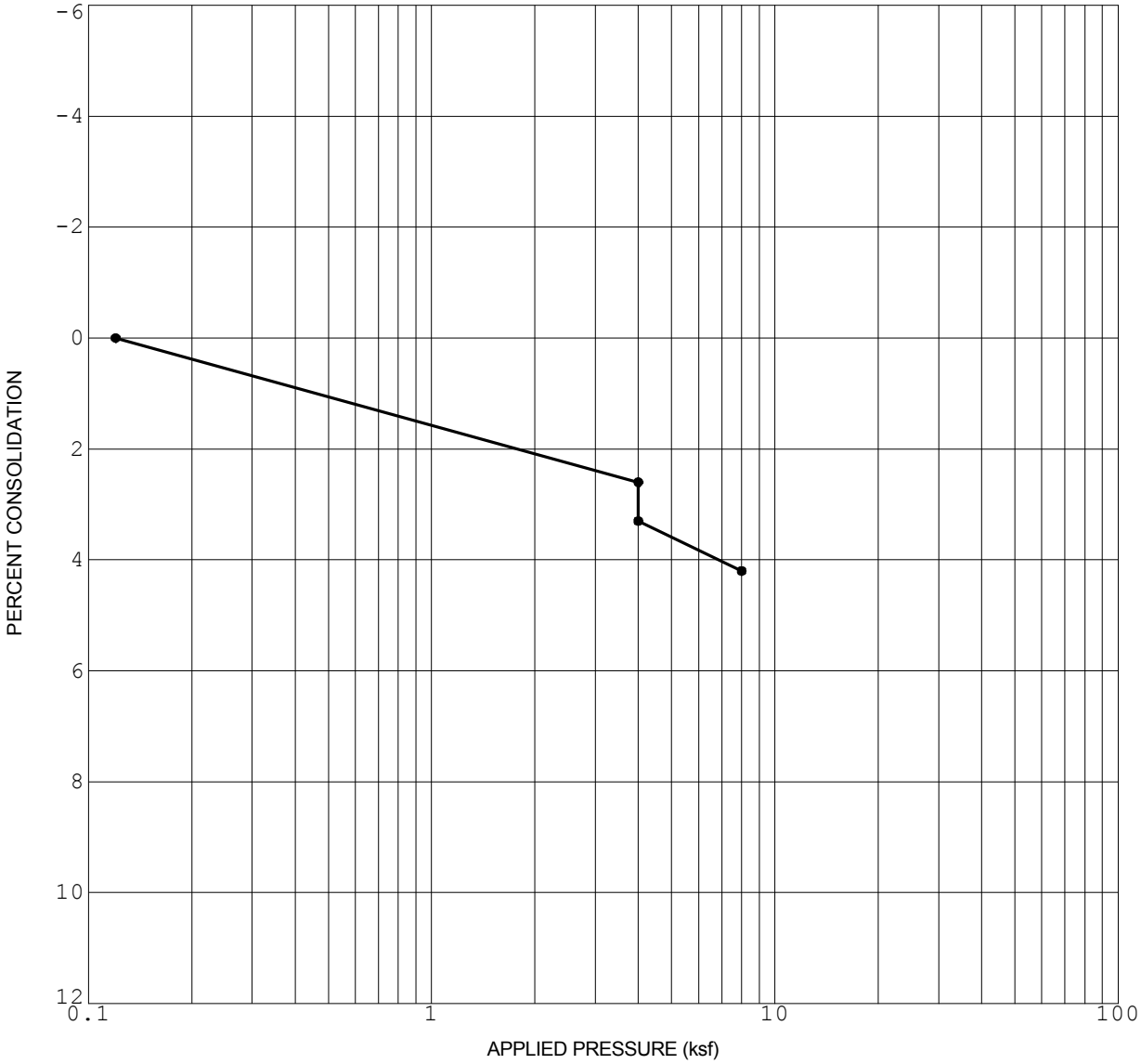
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-16

PROJECT NO. 07091-32-03

SAMPLE NO. B3-1



Initial Dry Density (pcf)	112.4	**Initial Saturation (%)**	12.8
Initial Water Content (%)	2.3	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

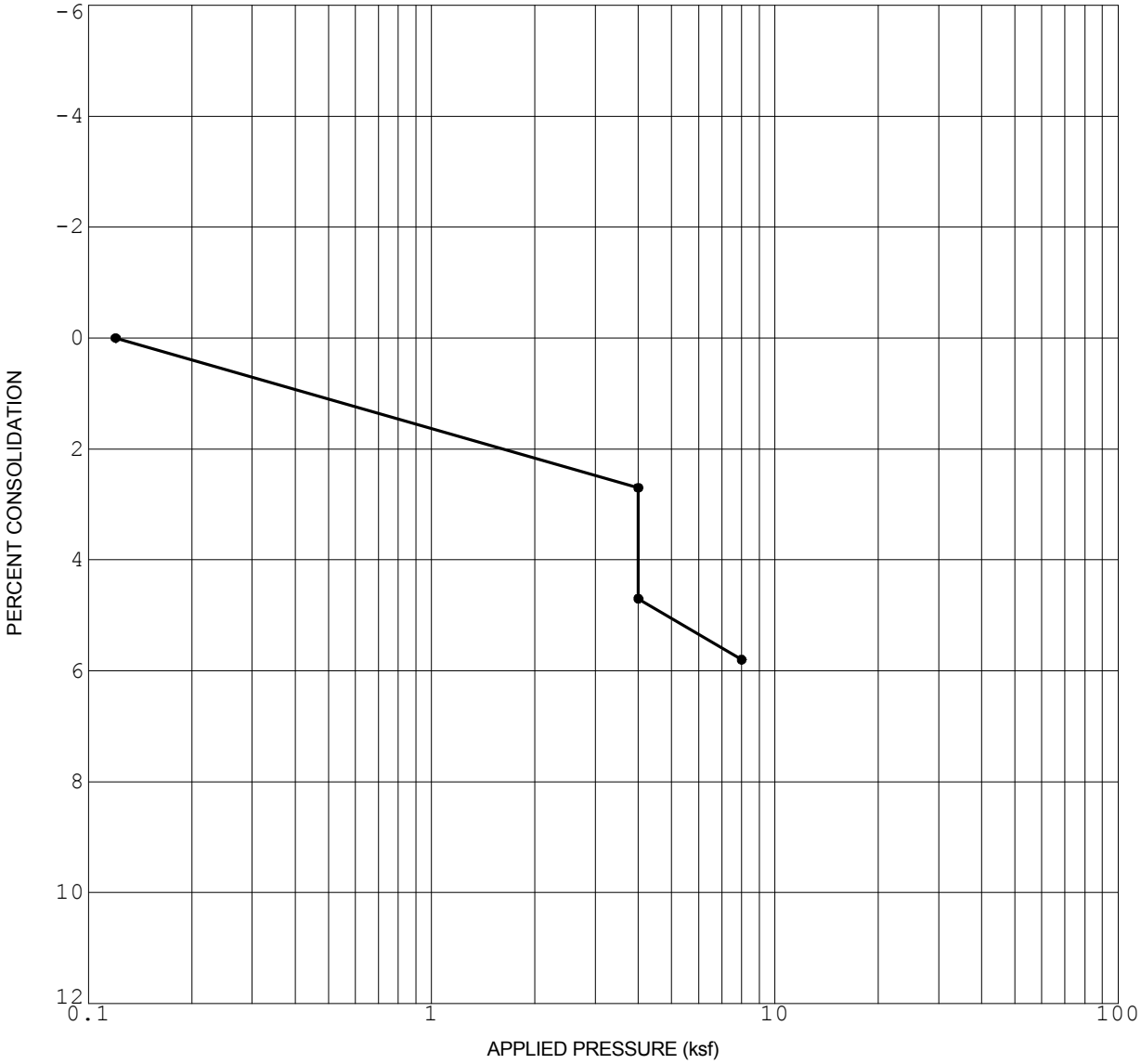
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-17

PROJECT NO. 07091-32-03

SAMPLE NO. B3-2



Initial Dry Density (pcf)	108.3	**Initial Saturation (%)**	11.5
Initial Water Content (%)	2.3	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

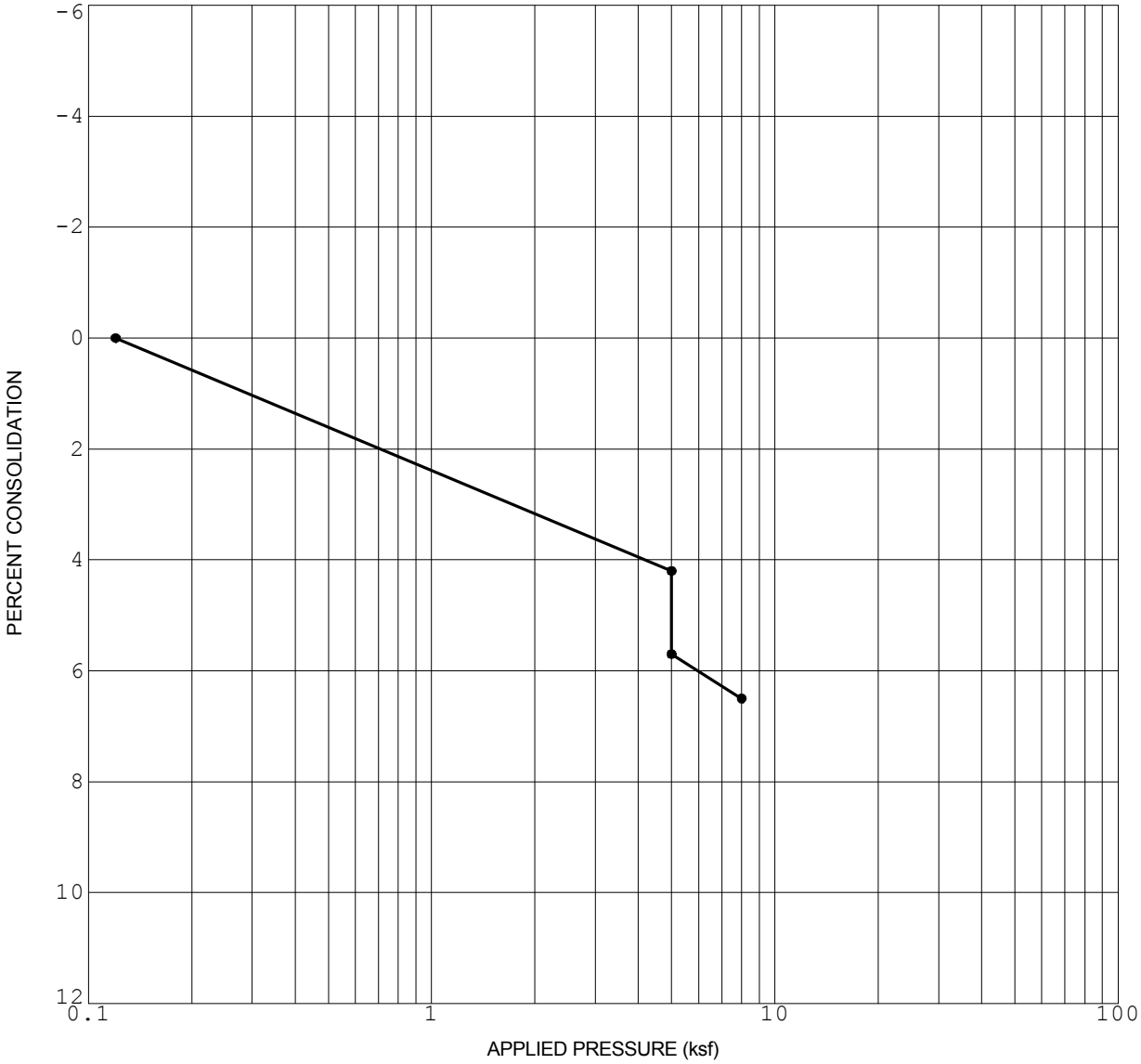
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-18

PROJECT NO. 07091-32-03

SAMPLE NO. B3-3



Initial Dry Density (pcf)	109.6	**Initial Saturation (%)**	13.0
Initial Water Content (%)	2.5	**Sample Saturated at (ksf)**	5.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

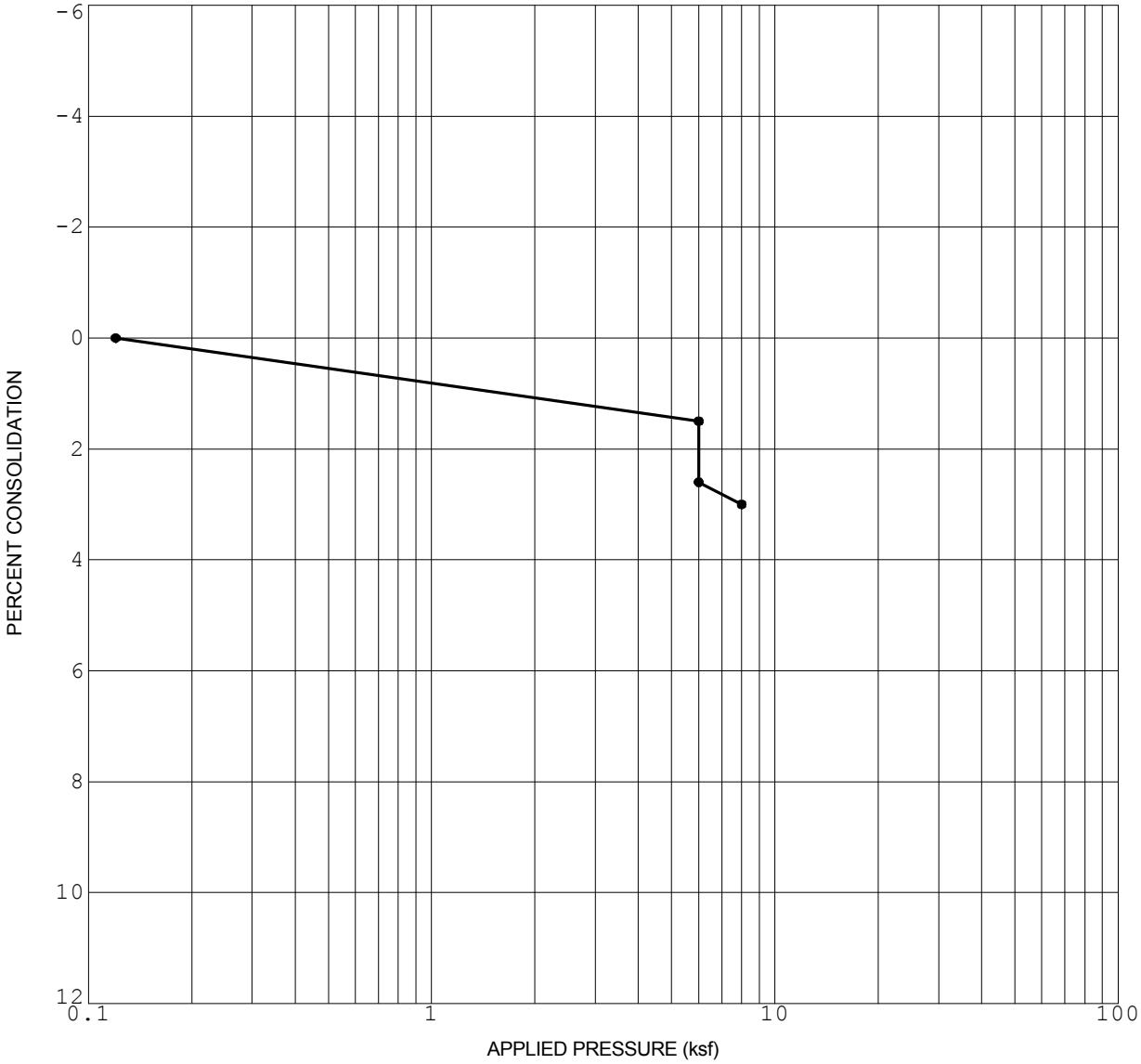
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-19

PROJECT NO. 07091-32-03

SAMPLE NO. B3-4



Initial Dry Density (pcf)	113.2	**Initial Saturation (%)**	10.0
Initial Water Content (%)	1.8	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

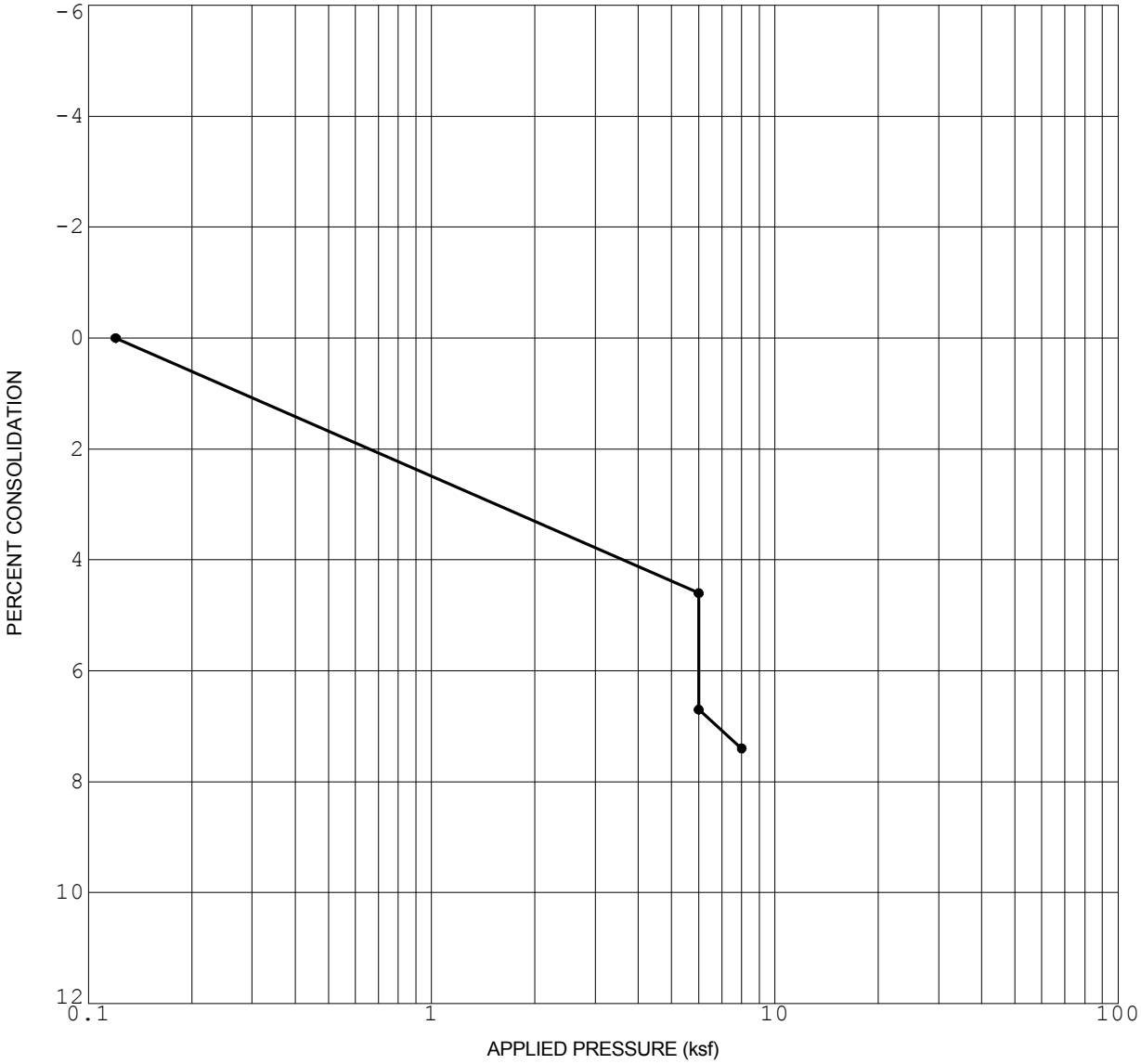
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-20

PROJECT NO. 07091-32-03

SAMPLE NO. B3-5



Initial Dry Density (pcf)	111.3	**Initial Saturation (%)**	13.4
Initial Water Content (%)	2.5	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

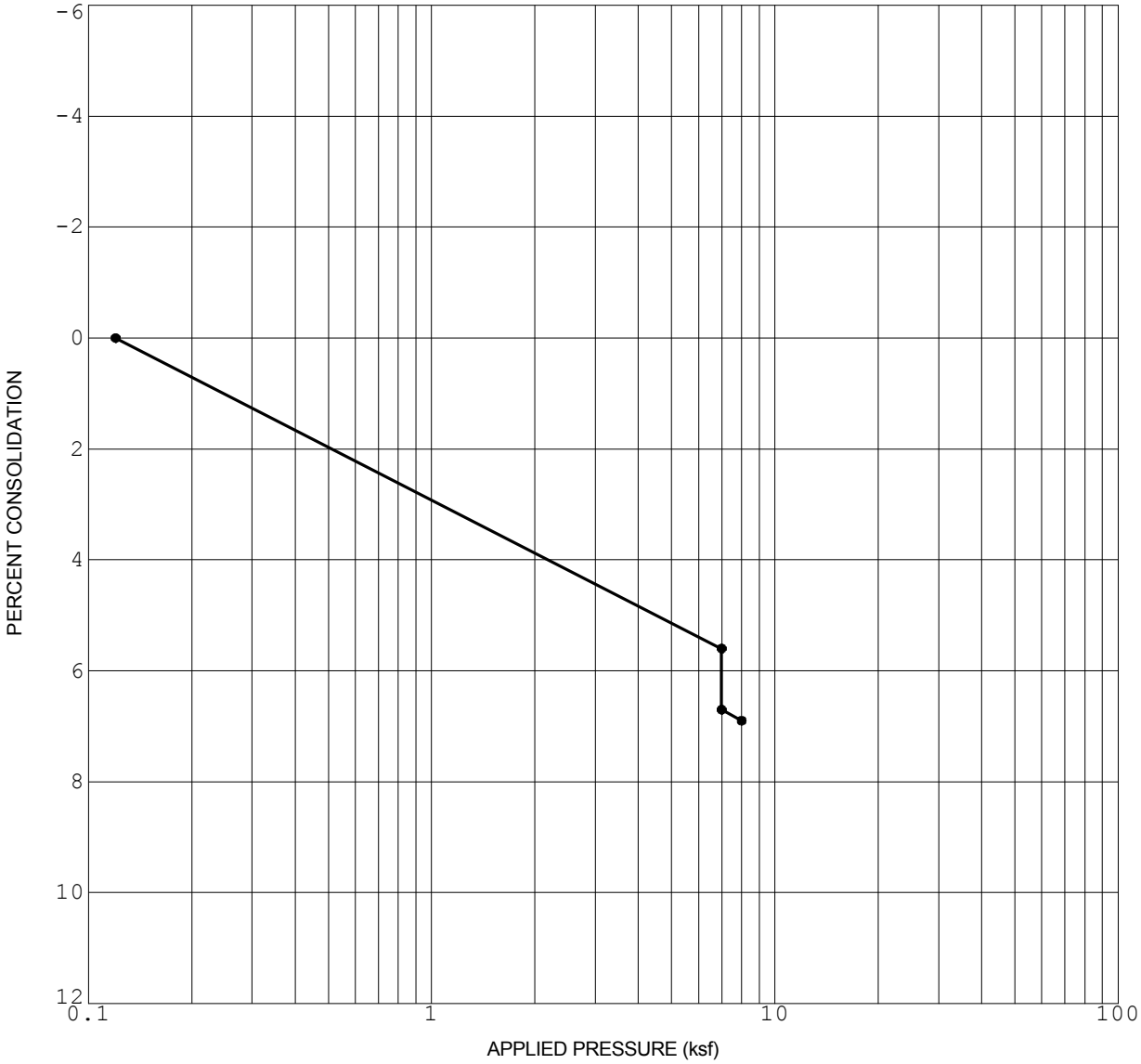
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-21

PROJECT NO. 07091-32-03

SAMPLE NO. B3-6



Initial Dry Density (pcf)	110.2	**Initial Saturation (%)**	14.0
Initial Water Content (%)	2.7	**Sample Saturated at (ksf)**	7.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

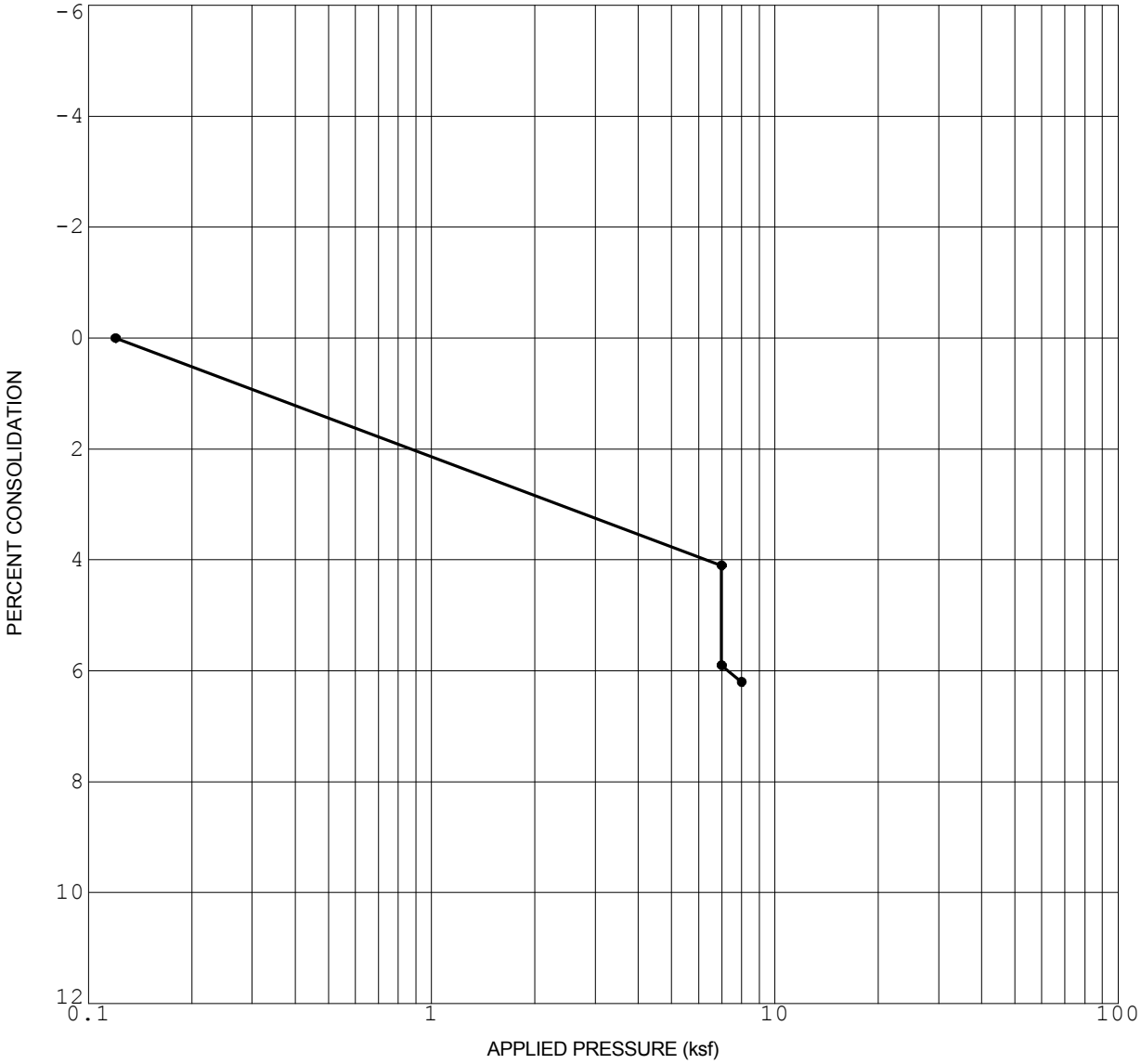
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-22

PROJECT NO. 07091-32-03

SAMPLE NO. B3-7



Initial Dry Density (pcf)	113.7	**Initial Saturation (%)**	44.8
Initial Water Content (%)	7.7	**Sample Saturated at (ksf)**	7.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

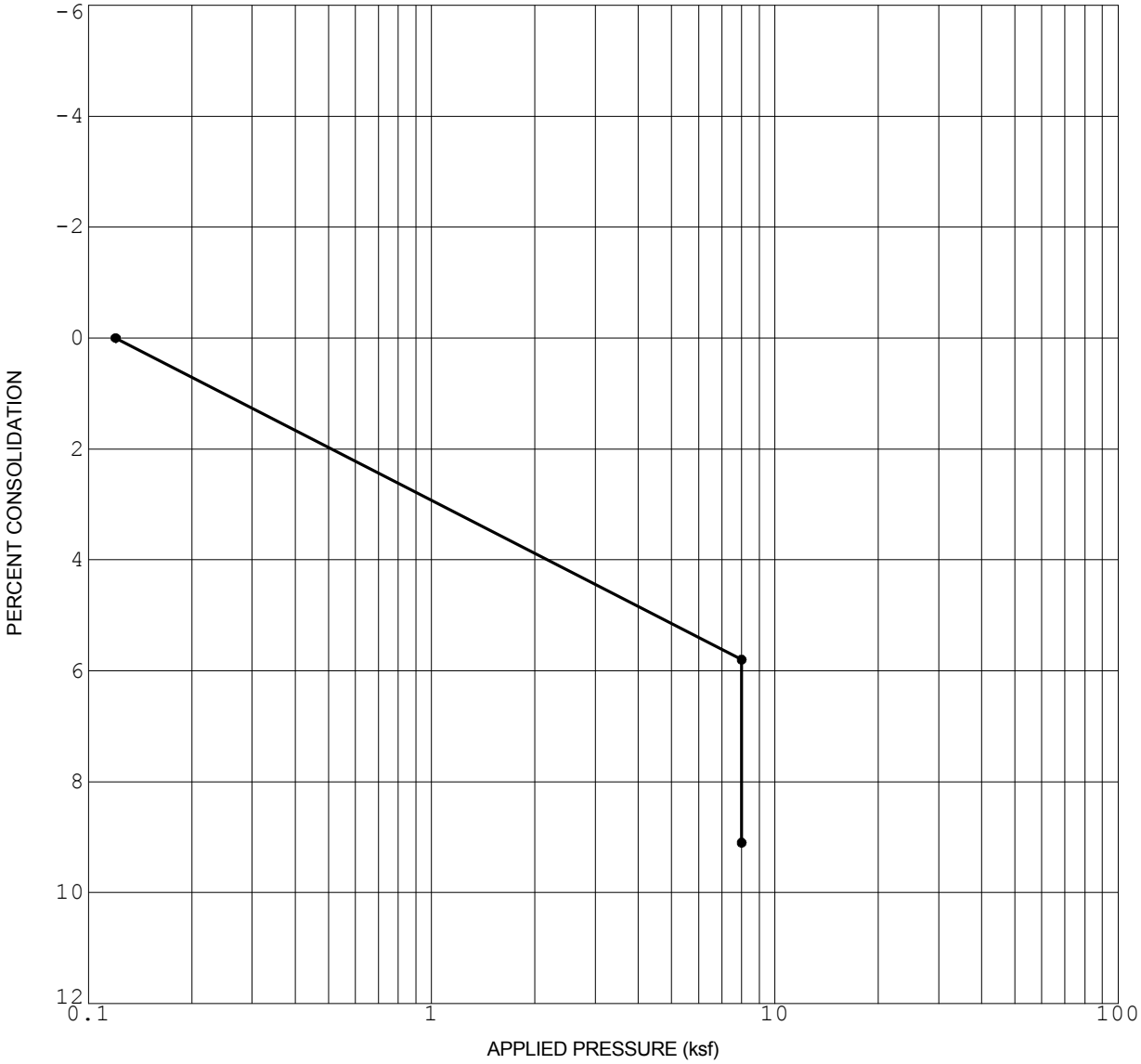
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-23

PROJECT NO. 07091-32-03

SAMPLE NO. B3-8



Initial Dry Density (pcf)	109.4	**Initial Saturation (%)**	23.1
Initial Water Content (%)	4.5	**Sample Saturated at (ksf)**	8.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

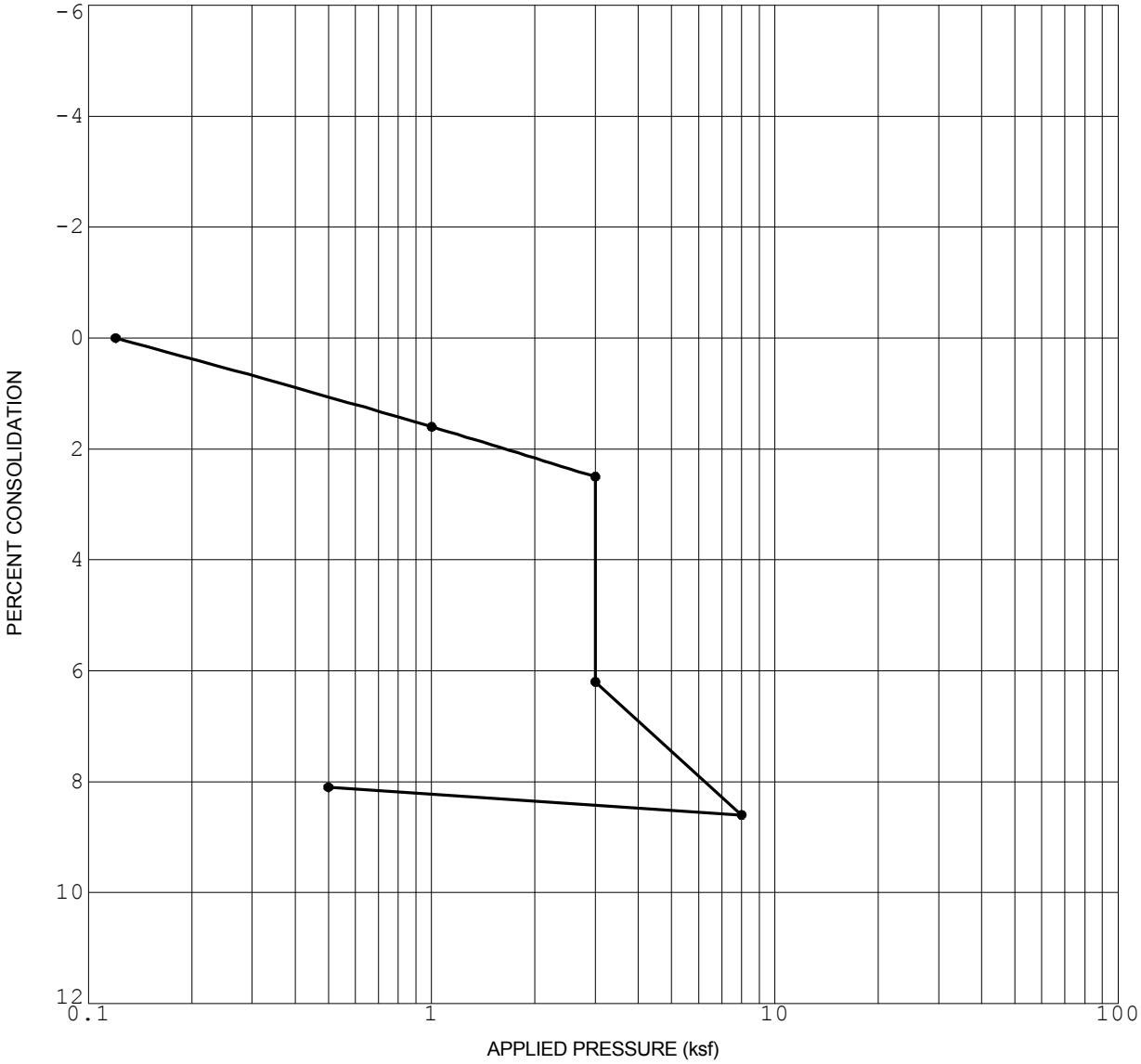
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-24

PROJECT NO. 07091-32-03

SAMPLE NO. B6-1



Initial Dry Density (pcf)	105.8
Initial Water Content (%)	2.5

Initial Saturation (%)	11.8
Sample Saturated at (ksf)	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

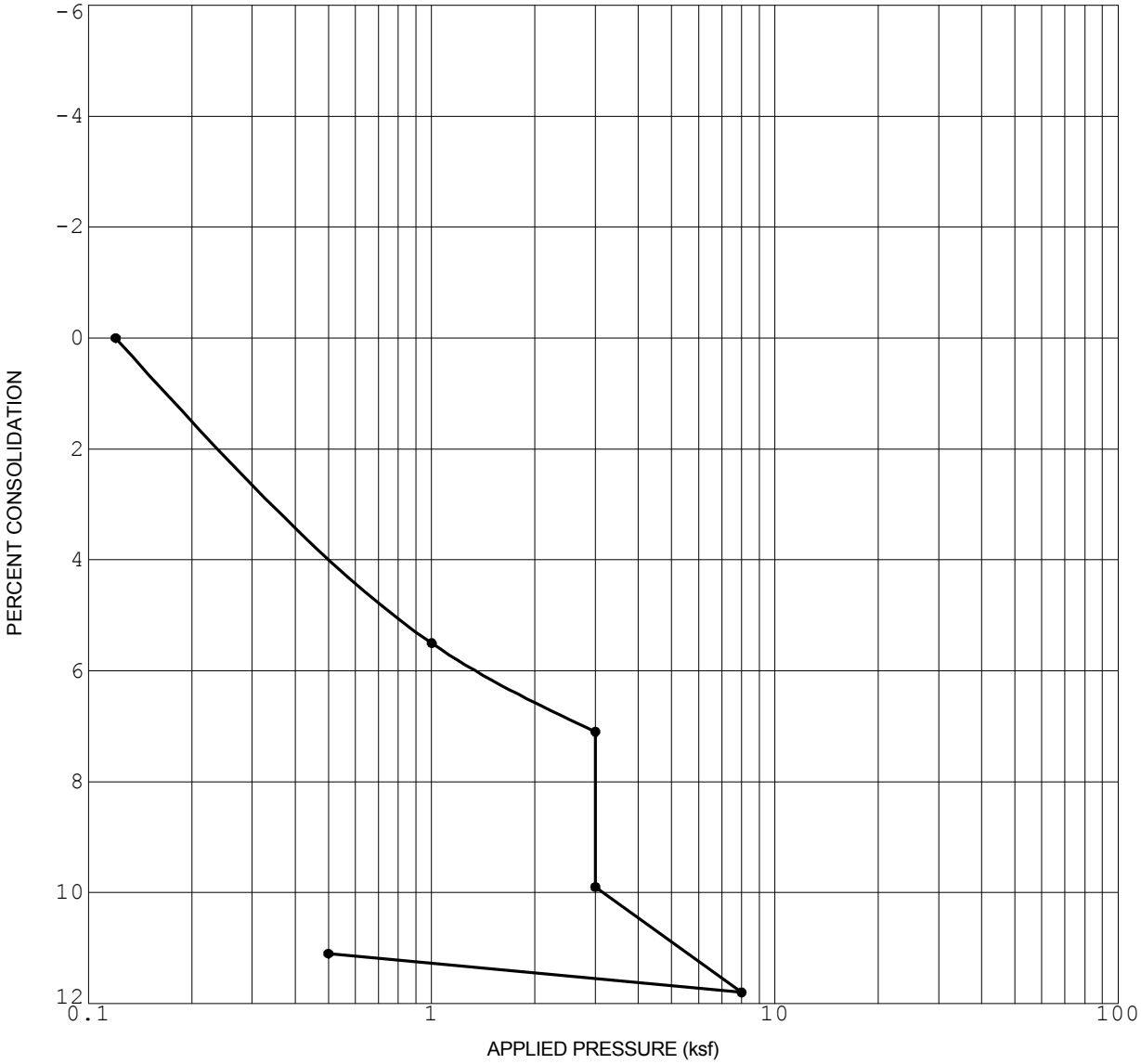
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-25

PROJECT NO. 07091-32-03

SAMPLE NO. B6-2



Initial Dry Density (pcf)	102.8
Initial Water Content (%)	5.5

Initial Saturation (%)	23.6
Sample Saturated at (ksf)	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

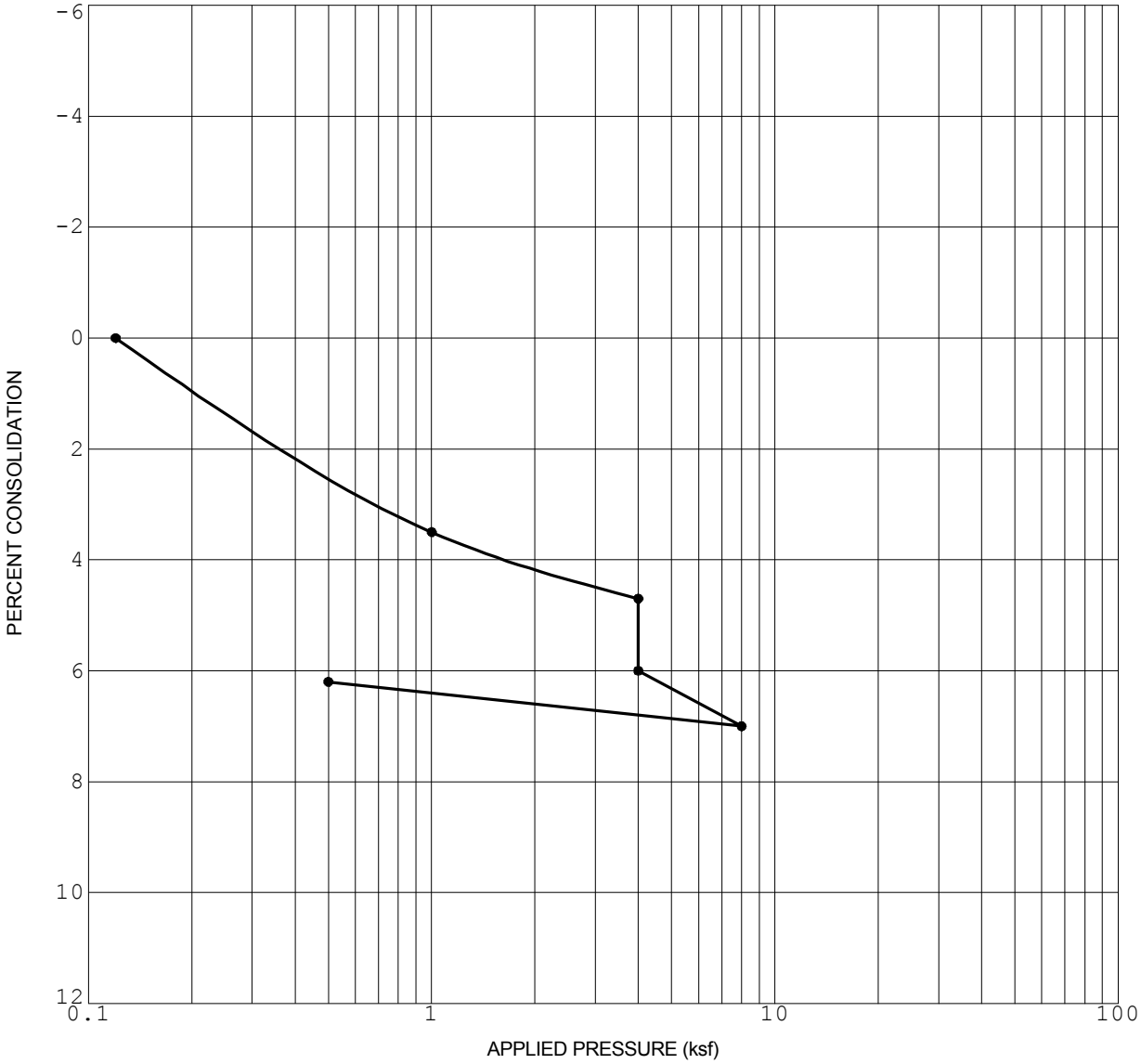
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-26

PROJECT NO. 07091-32-03

SAMPLE NO. B6-3



Initial Dry Density (pcf)	114.2	**Initial Saturation (%)**	20.8
Initial Water Content (%)	3.5	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

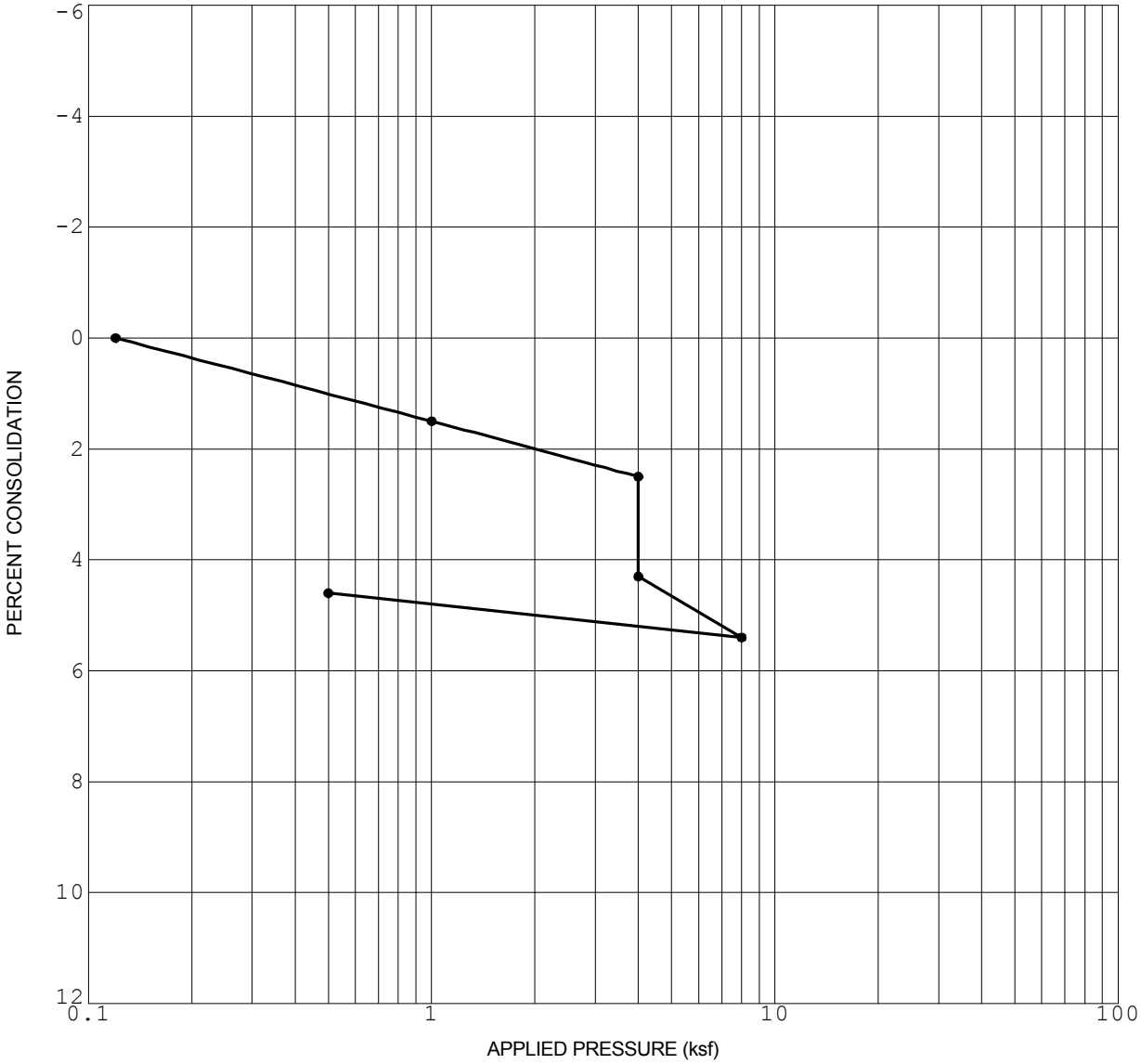
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-27

PROJECT NO. 07091-32-03

SAMPLE NO. B6-4



Initial Dry Density (pcf)	110.5	**Initial Saturation (%)**	14.1
Initial Water Content (%)	2.7	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

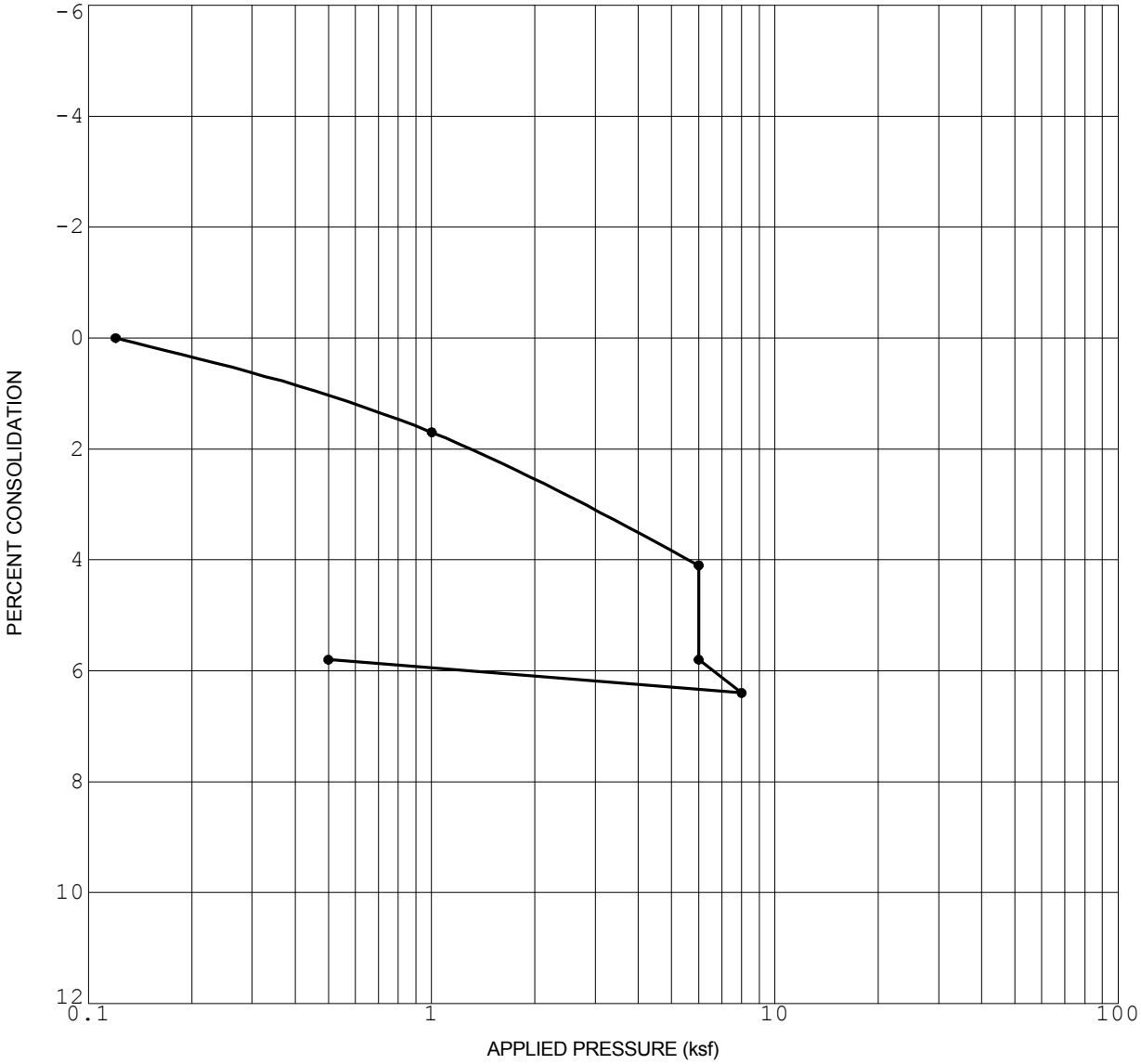
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-28

PROJECT NO. 07091-32-03

SAMPLE NO. B6-5



Initial Dry Density (pcf)	106.8	**Initial Saturation (%)**	14.3
Initial Water Content (%)	3.0	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

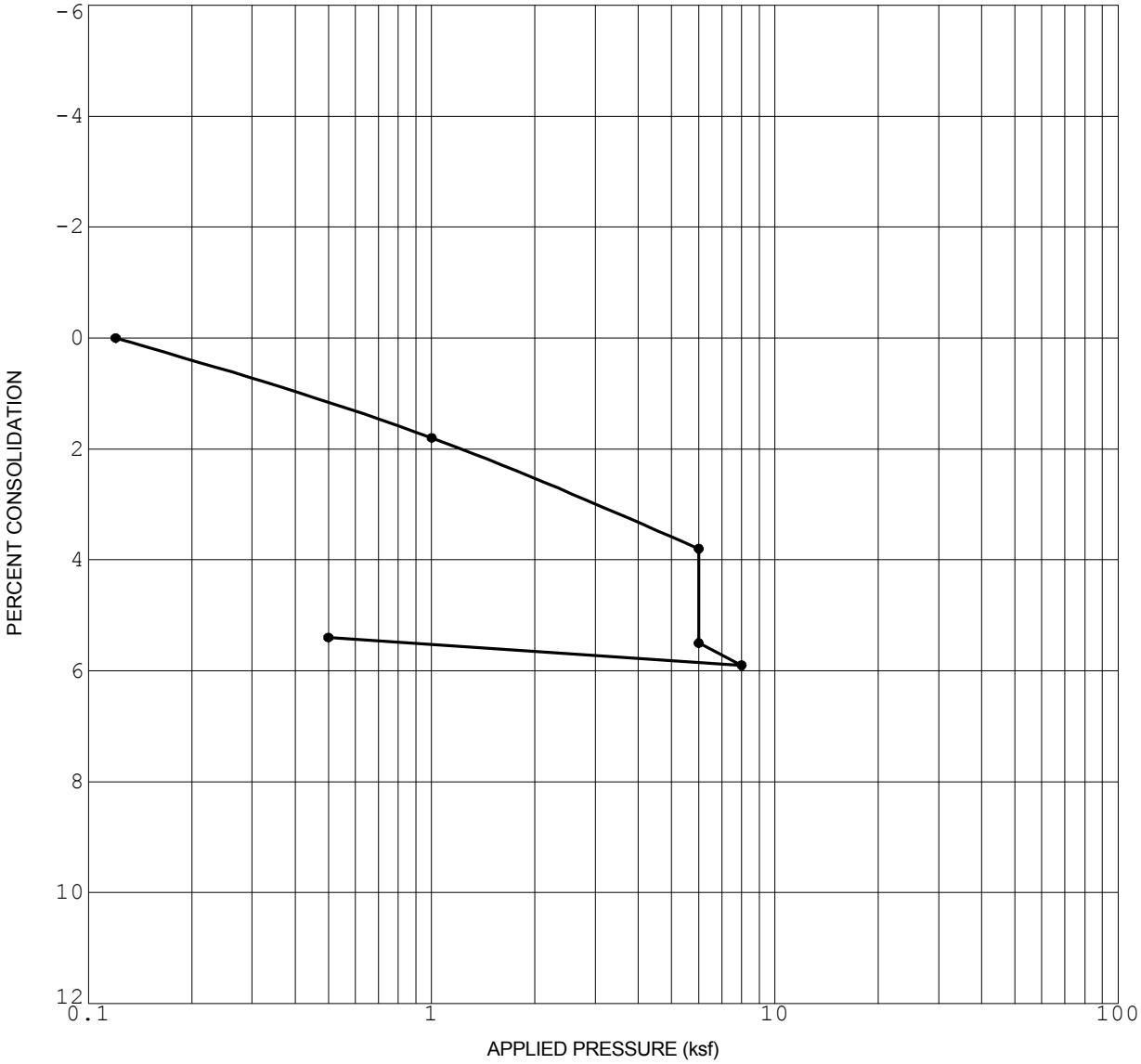
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-29

PROJECT NO. 07091-32-03

SAMPLE NO. B6-6



Initial Dry Density (pcf)	107.6
Initial Water Content (%)	2.6

Initial Saturation (%)	12.6
Sample Saturated at (ksf)	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

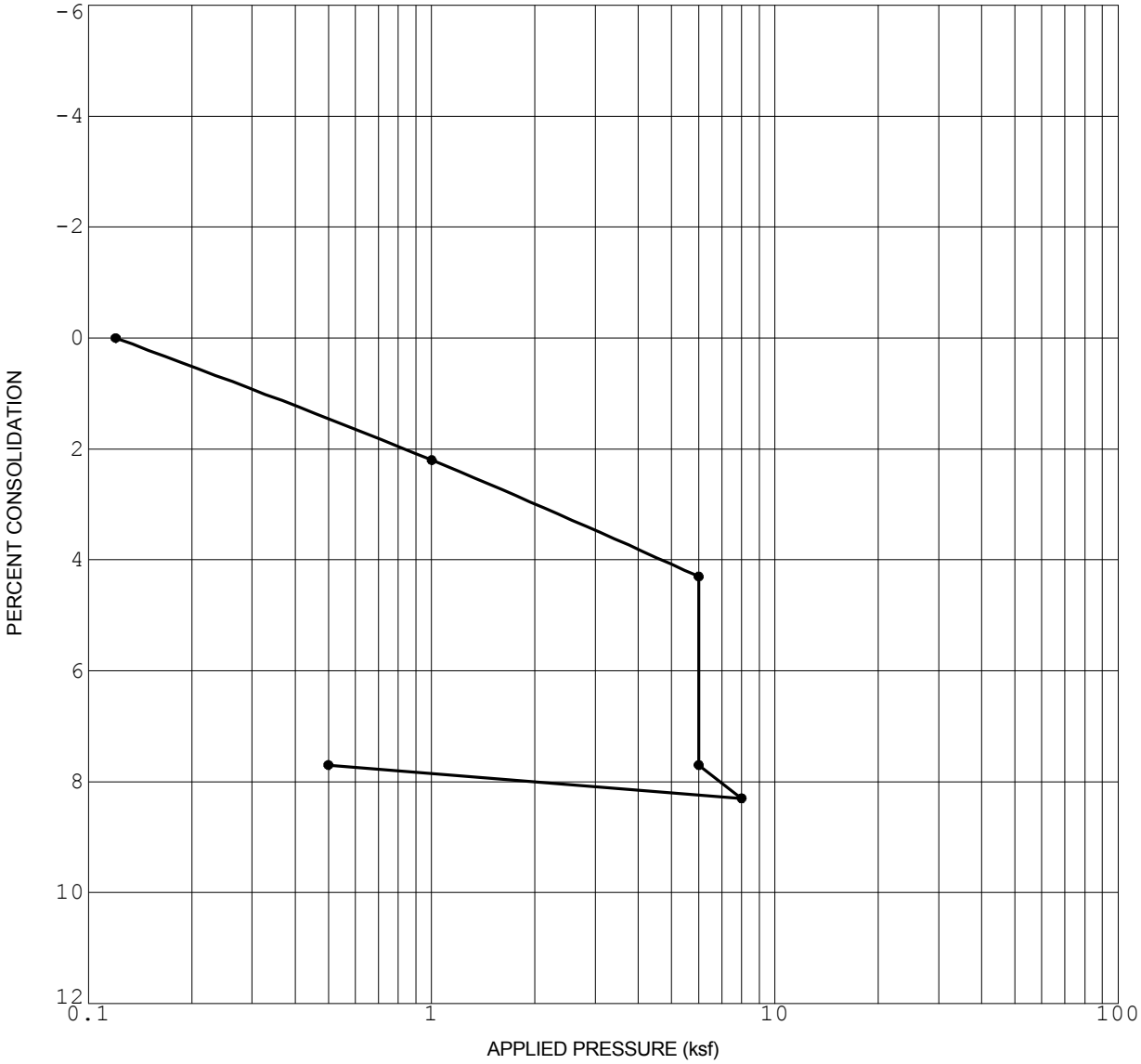
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-30

PROJECT NO. 07091-32-03

SAMPLE NO. B6-7



Initial Dry Density (pcf)	104.3	**Initial Saturation (%)**	26.4
Initial Water Content (%)	5.9	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

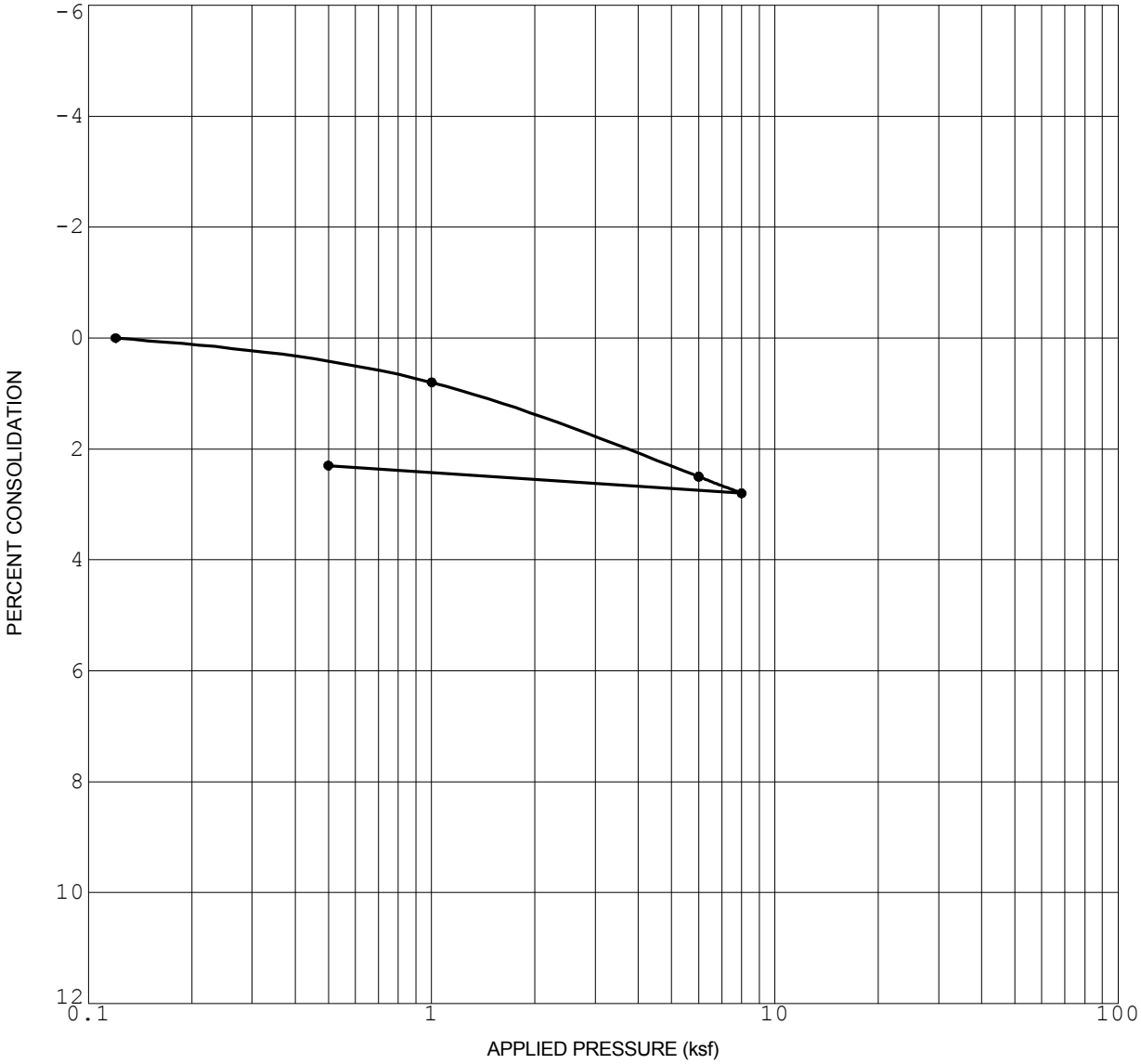
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-31

PROJECT NO. 07091-32-03

SAMPLE NO. B6-8



Initial Dry Density (pcf)	116.8	**Initial Saturation (%)**	83.0
Initial Water Content (%)	13.1	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

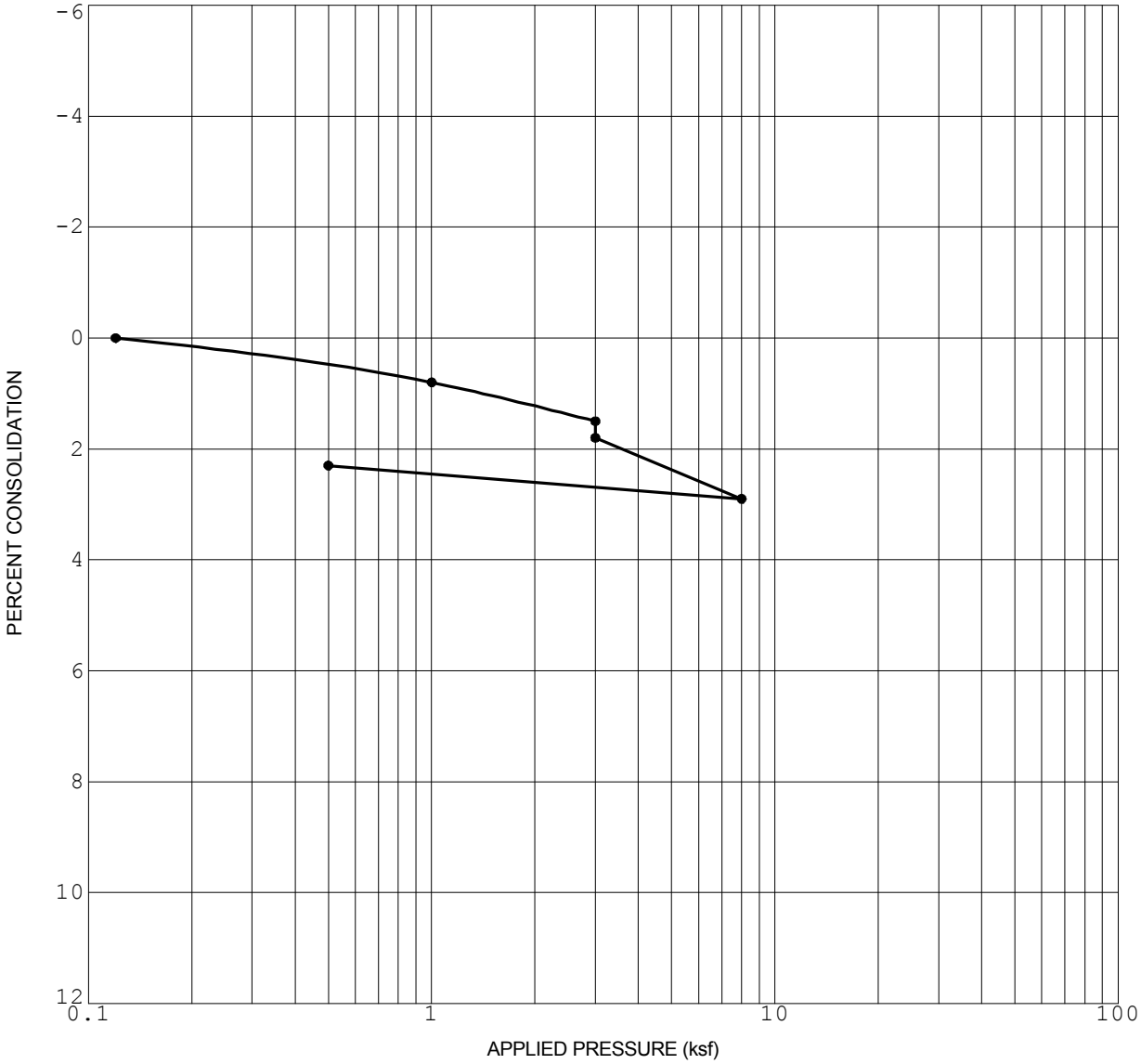
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-32

PROJECT NO. 07091-32-03

SAMPLE NO. B13-1



Initial Dry Density (pcf)	117.3	**Initial Saturation (%)**	58.9
Initial Water Content (%)	9.2	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

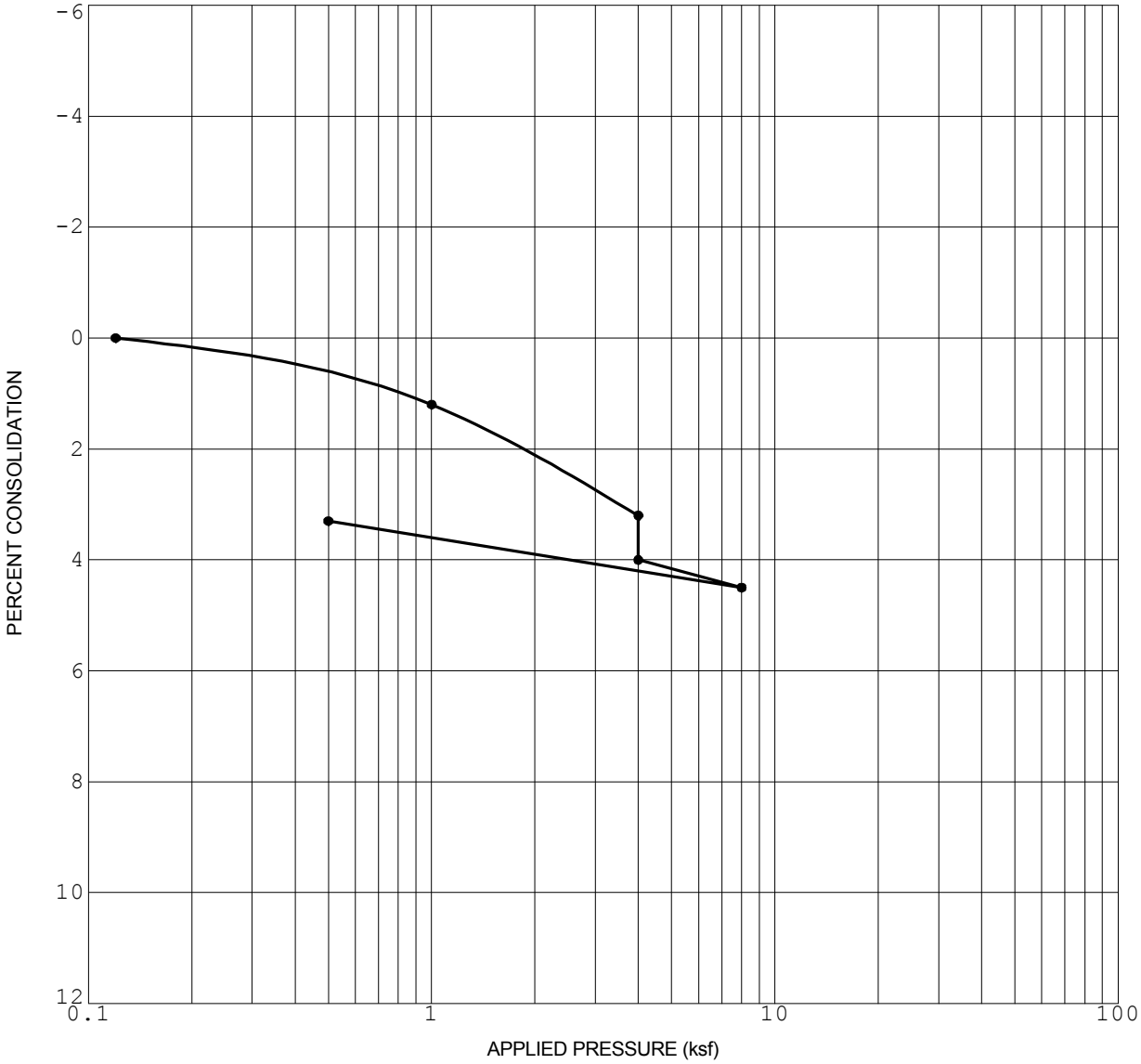
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-33

PROJECT NO. 07091-32-03

SAMPLE NO. B13-2



Initial Dry Density (pcf)	127.7	**Initial Saturation (%)**	73.1
Initial Water Content (%)	8.2	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

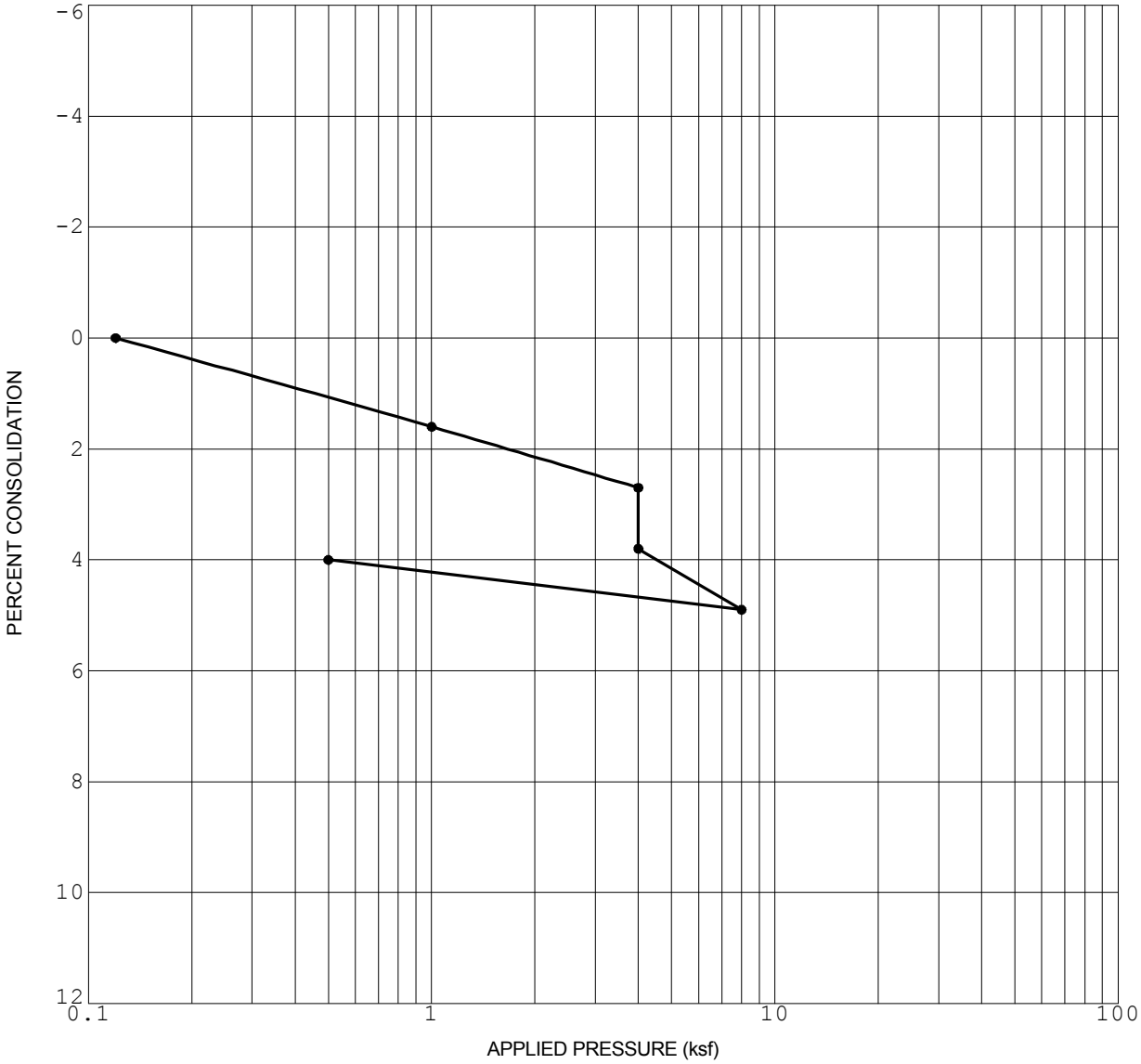
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-34

PROJECT NO. 07091-32-03

SAMPLE NO. B13-3



Initial Dry Density (pcf)	113.9	**Initial Saturation (%)**	34.3
Initial Water Content (%)	5.9	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

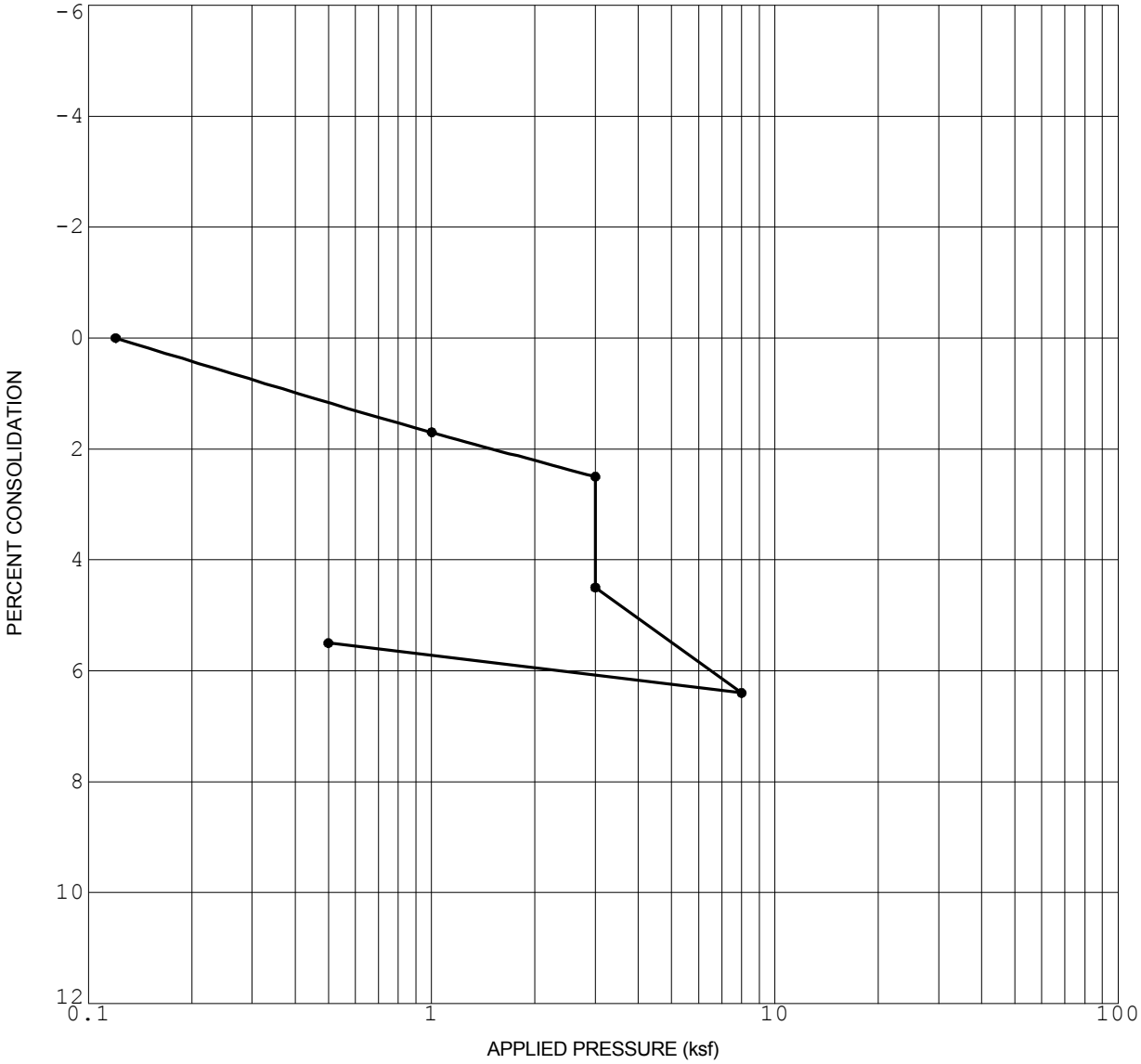
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-35

PROJECT NO. 07091-32-03

SAMPLE NO. B14-2



Initial Dry Density (pcf)	109.0	**Initial Saturation (%)**	31.8
Initial Water Content (%)	6.2	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

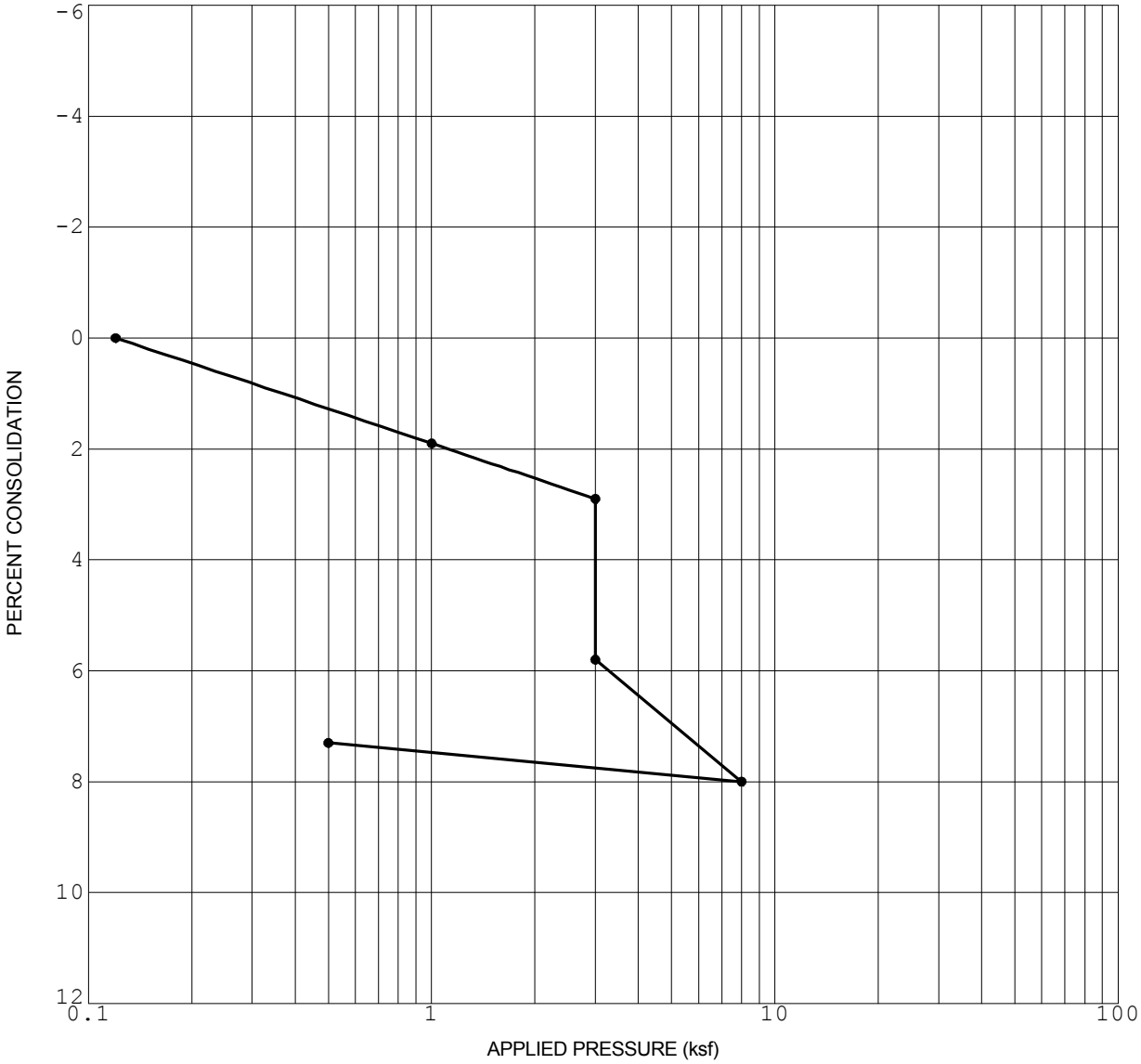
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-36

PROJECT NO. 07091-32-03

SAMPLE NO. B14-3



Initial Dry Density (pcf)	106.3	**Initial Saturation (%)**	21.9
Initial Water Content (%)	4.6	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

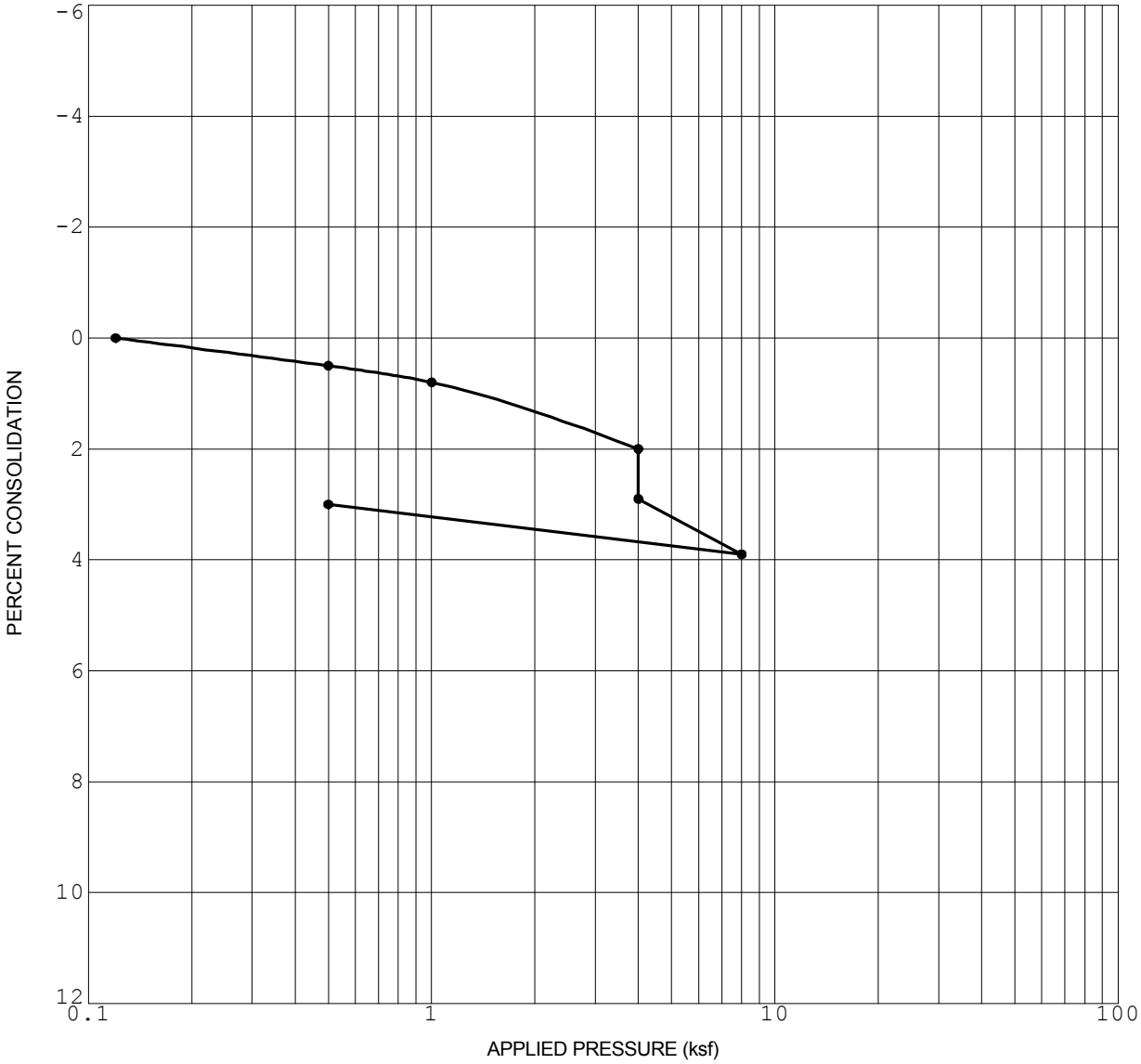
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-37

PROJECT NO. 07091-32-03

SAMPLE NO. B17-1



Initial Dry Density (pcf)	120.0	**Initial Saturation (%)**	67.9
Initial Water Content (%)	9.8	**Sample Saturated at (ksf)**	4.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

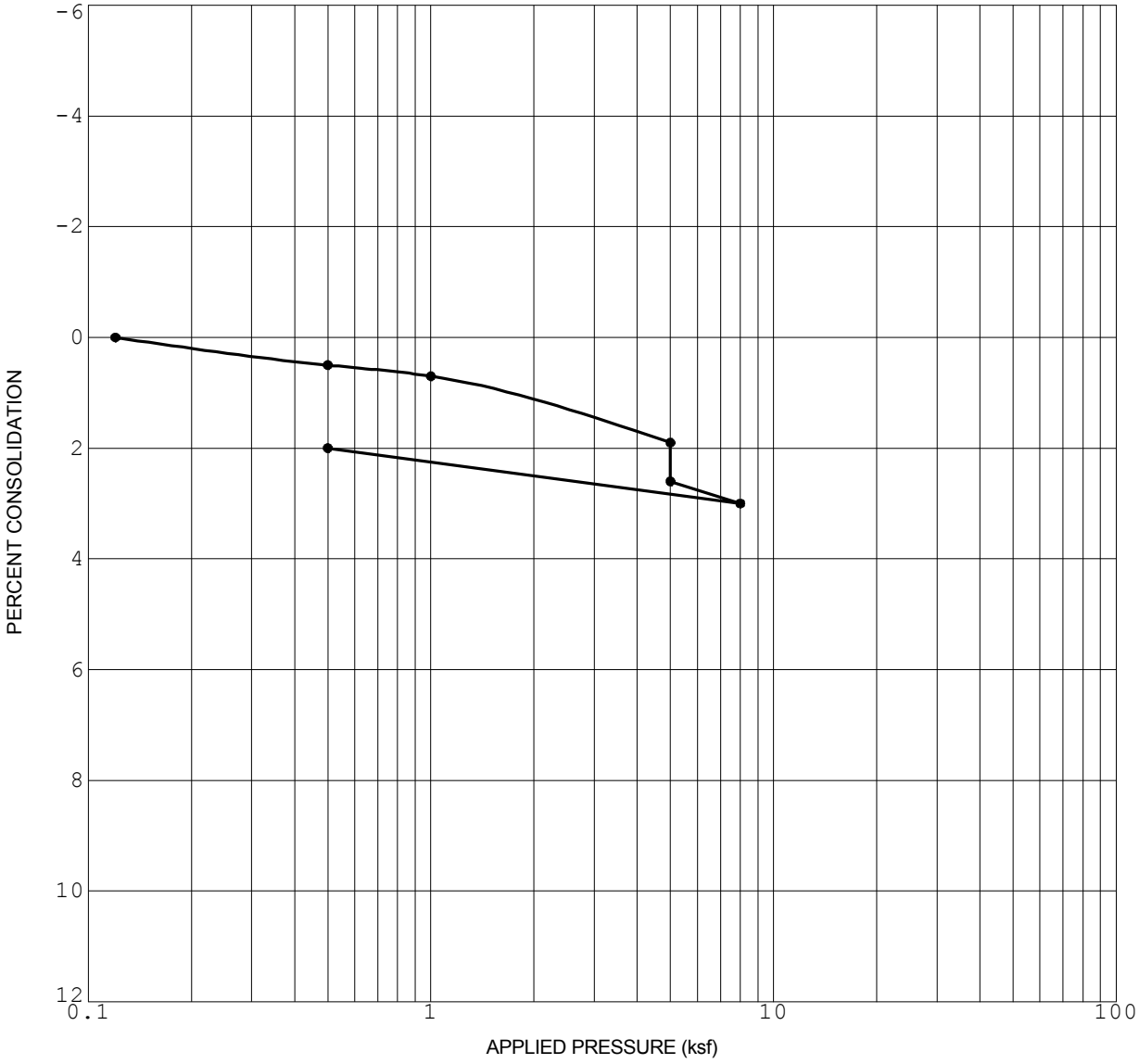
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-38

PROJECT NO. 07091-32-03

SAMPLE NO. B17-3



Initial Dry Density (pcf)	123.6	**Initial Saturation (%)**	50.4
Initial Water Content (%)	6.5	**Sample Saturated at (ksf)**	5.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

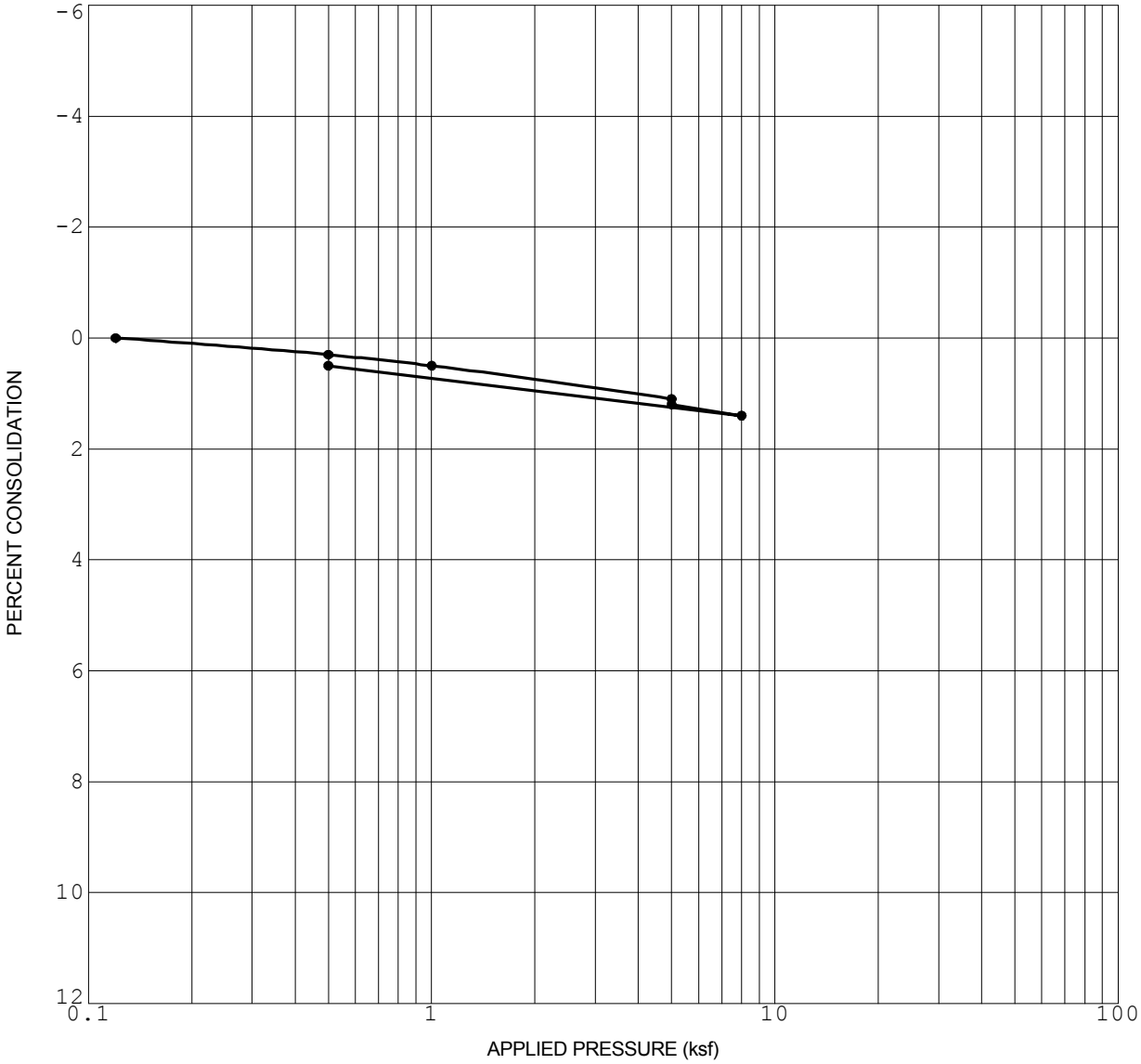
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-39

PROJECT NO. 07091-32-03

SAMPLE NO. B17-4



Initial Dry Density (pcf)	129.6	**Initial Saturation (%)**	60.7
Initial Water Content (%)	6.4	**Sample Saturated at (ksf)**	5.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

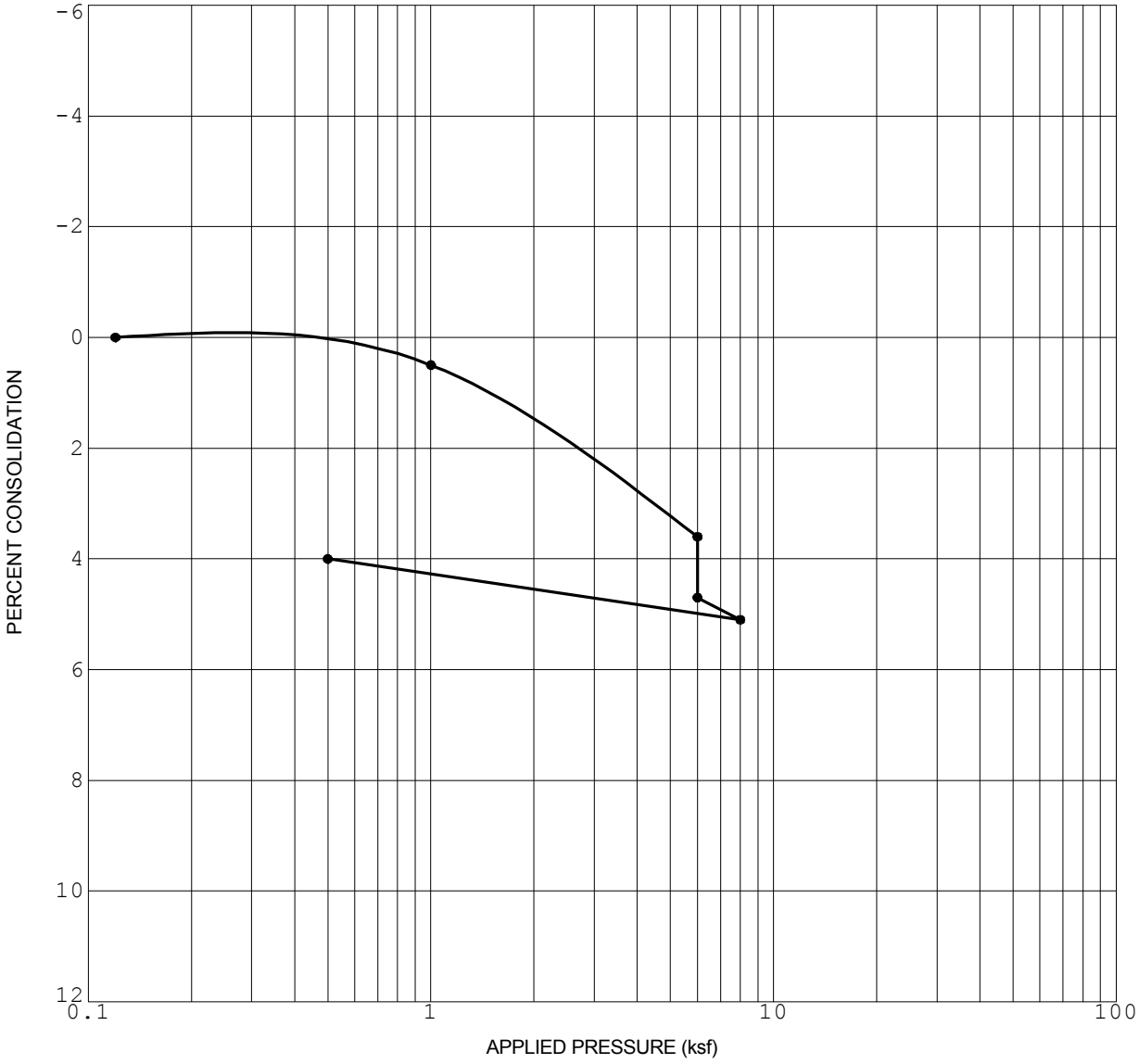
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-40

PROJECT NO. 07091-32-03

SAMPLE NO. B17-5



Initial Dry Density (pcf)	130.8	**Initial Saturation (%)**	67.2
Initial Water Content (%)	6.8	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

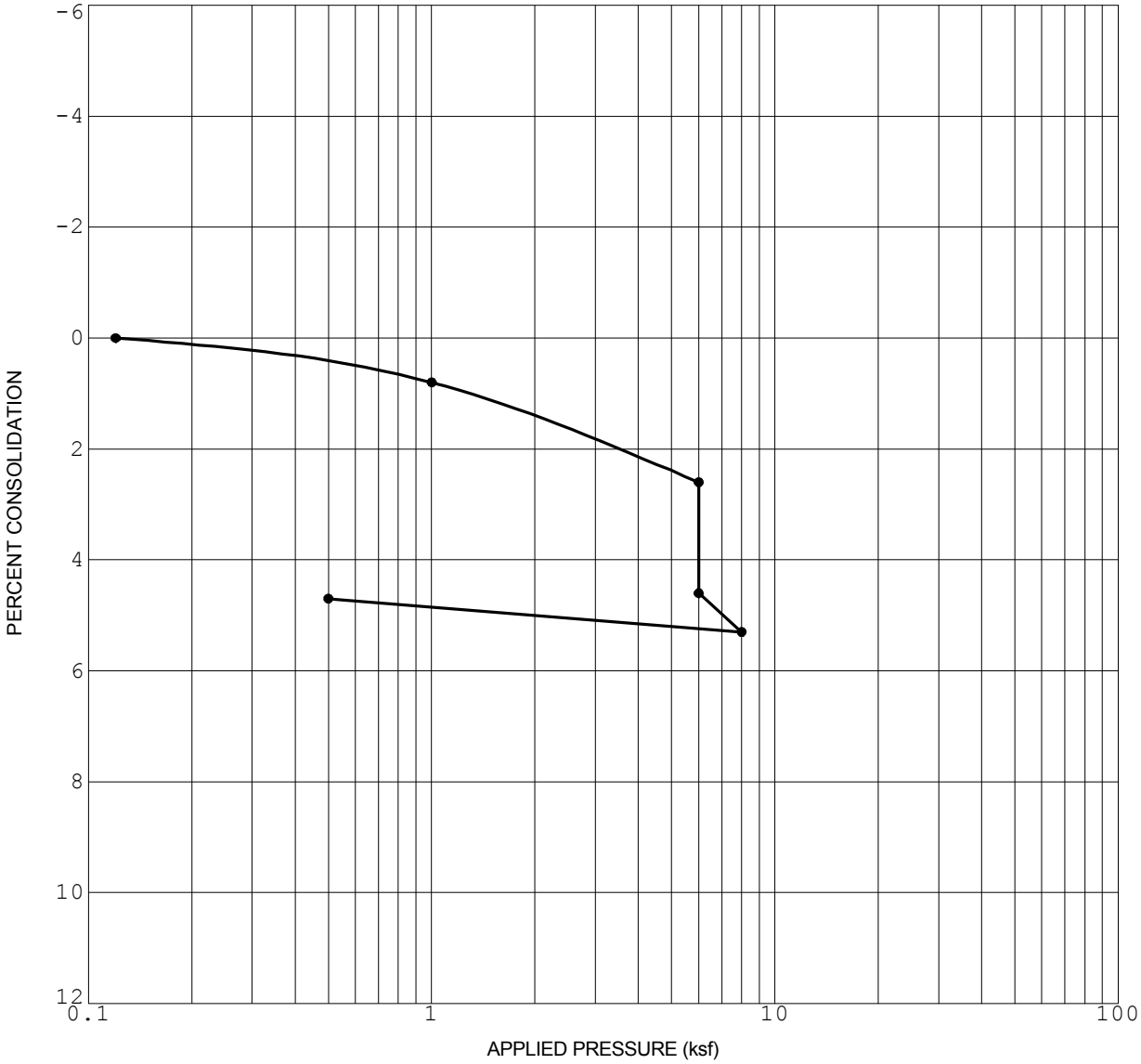
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-41

PROJECT NO. 07091-32-03

SAMPLE NO. B17-6



Initial Dry Density (pcf)	111.1	**Initial Saturation (%)**	30.5
Initial Water Content (%)	5.7	**Sample Saturated at (ksf)**	6.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

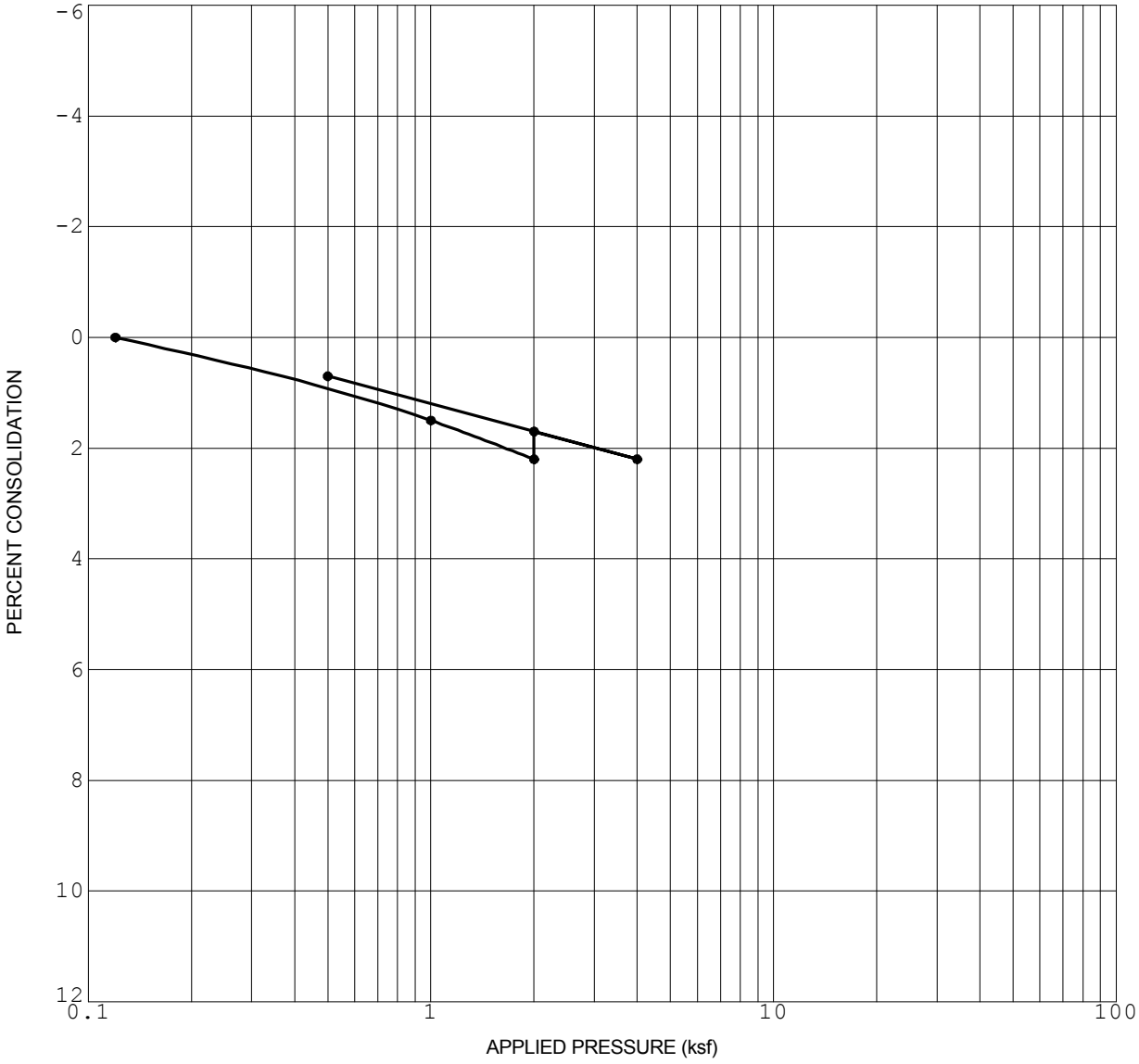
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-42

PROJECT NO. 07091-32-03

SAMPLE NO. B20-2



Initial Dry Density (pcf)	113.6	**Initial Saturation (%)**	60.0
Initial Water Content (%)	10.4	**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

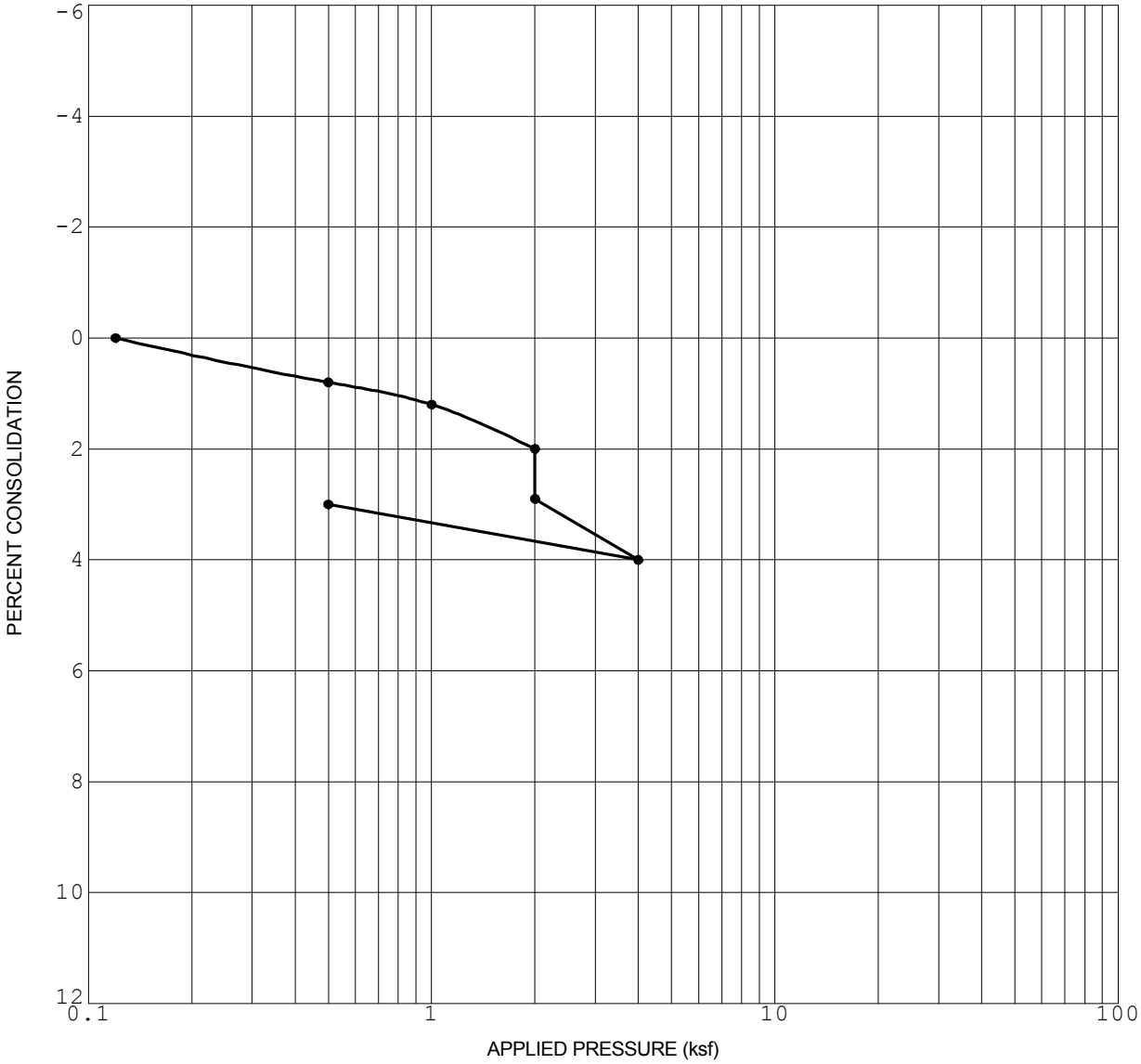
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-43

PROJECT NO. 07091-32-03

SAMPLE NO. B20-3



Initial Dry Density (pcf)	113.6
Initial Water Content (%)	6.8

Initial Saturation (%)	39.4
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

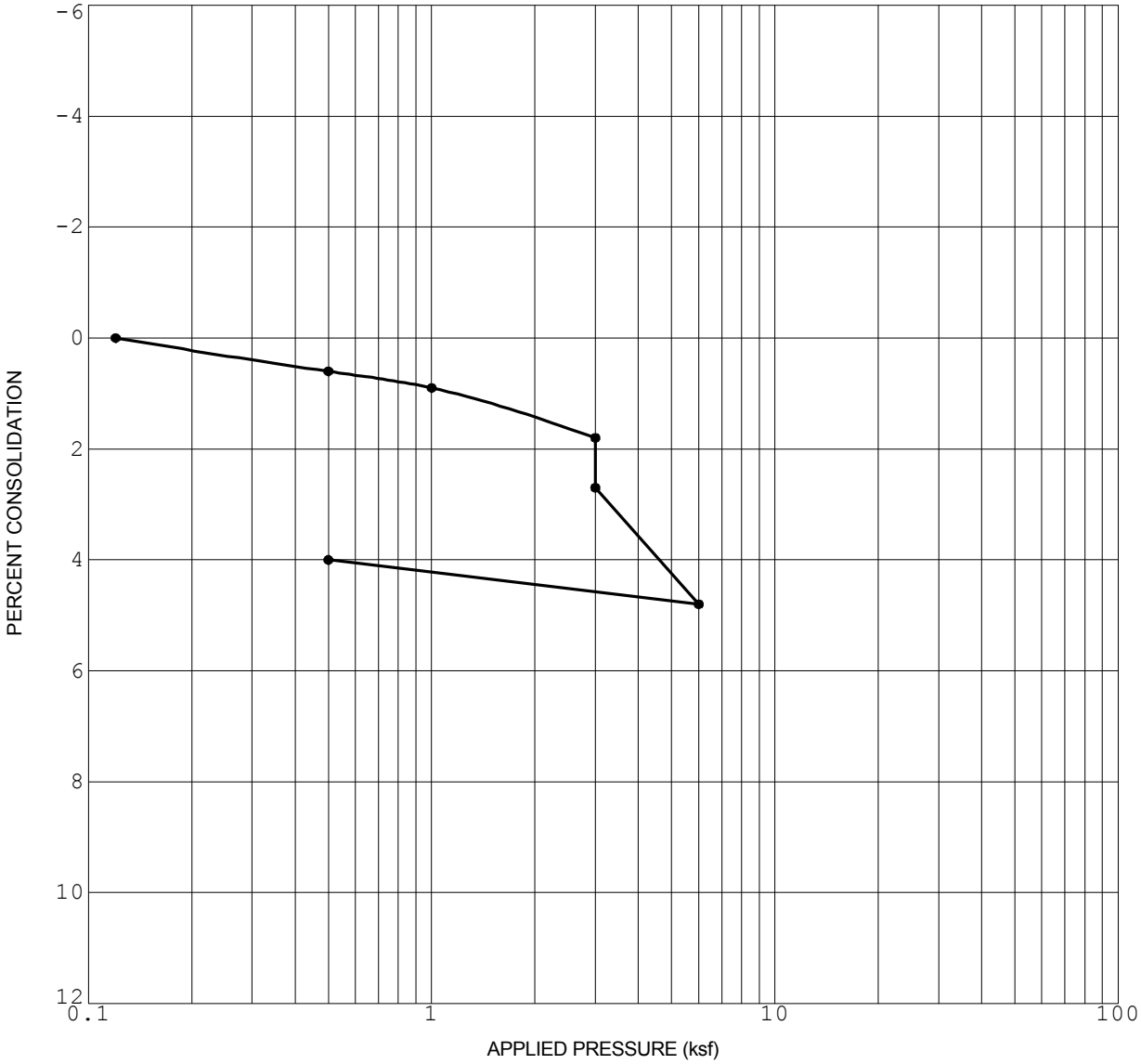
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-44

PROJECT NO. 07091-32-03

SAMPLE NO. B20-4



Initial Dry Density (pcf)	117.2	**Initial Saturation (%)**	46.1
Initial Water Content (%)	7.2	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

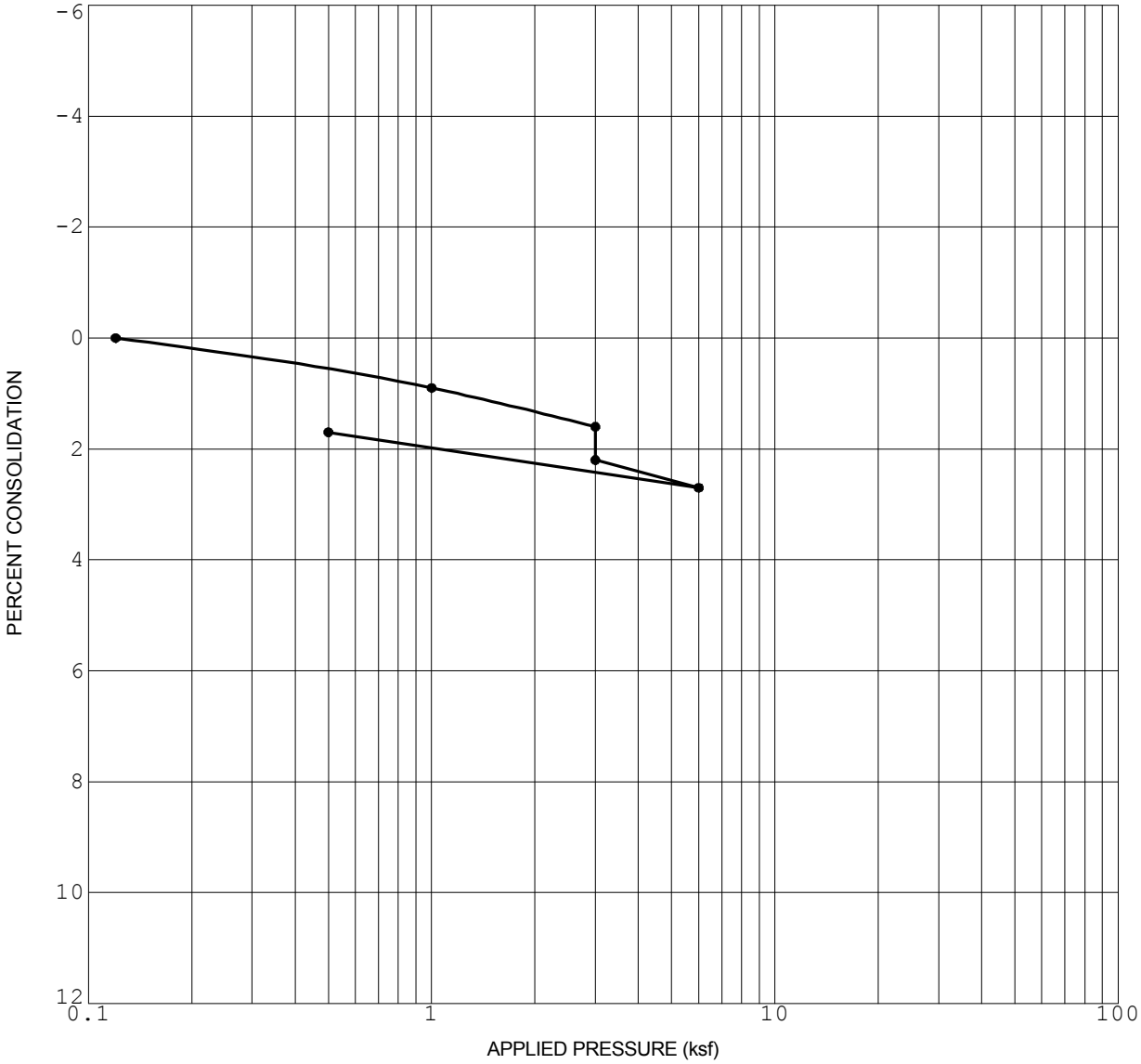
SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-45

PROJECT NO. 07091-32-03

SAMPLE NO. B20-5



Initial Dry Density (pcf)	119.5	**Initial Saturation (%)**	37.0
Initial Water Content (%)	5.4	**Sample Saturated at (ksf)**	3.0

CONSOLIDATION CURVE

LOS COCHES I - BRIGHTWATER RANCH

SAN DIEGO COUNTY, CALIFORNIA

07091-32-03_OLD BORING B1-B3.GPJ

Figure B-46

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

LOS COCHES I – BRIGHTWATER RANCH
SAN DIEGO COUNTY, CALIFORNIA

PROJECT NO. 07091-32-03

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

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

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

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

2. DEFINITIONS

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

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

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

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

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

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

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

3. MATERIALS

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

3.1.1. **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than 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. Fines are defined as material smaller than 3/4 inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

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

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

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

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

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

4. CLEARING AND PREPARING AREAS TO BE FILLED

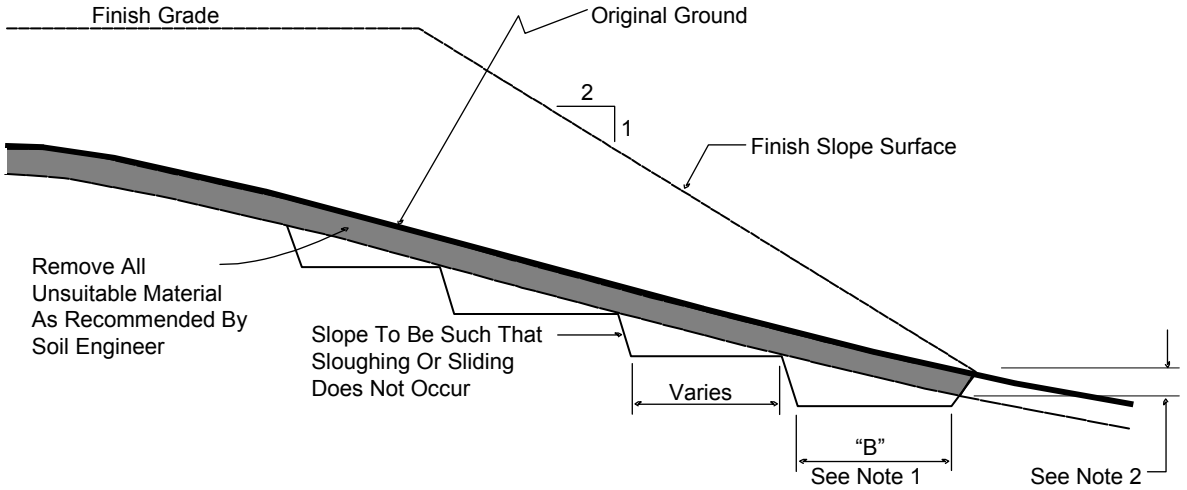
4.1. Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1-1/2 inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

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

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

4.4. Where the slope ratio of the original ground is steeper than 6:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES:

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

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

4.5. After areas to receive fill have been cleared, plowed or scarified, the surface should be disced or bladed by the Contractor until it is uniform and free from large clods. The area should then be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6.0 of these specifications.

5. COMPACTION EQUIPMENT

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

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

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

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

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

6.1.2. In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D1557-00.

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

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

6.1.5. After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D1557-00. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6. Soils having an Expansion Index of greater than 50 may be used in fills if placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

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

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

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

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

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

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

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

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

6.2.6. All rock placement, fill placement and flooding of approved granular soil in the windrows must be continuously observed by the Consultant or his representative.

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

6.3.1. The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent, maximum slope of 5 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post--construction infiltration of water.

6.3.2. *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be

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

6.3.3. Plate bearing tests, in accordance with ASTM D1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the number of passes of the compaction equipment to be performed. If performed, a minimum of three plate bearing tests shall be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4. A representative of the Consultant shall be present during *rock* fill operations to verify that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading. In general, at least one test should be performed for each approximately 5,000 to 10,000 cubic yards of *rock* fill placed.

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

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

6.3.7. All *rock* fill placement shall be continuously observed during placement by representatives of the Consultant.

7. OBSERVATION AND TESTING

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

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

7.3. During placement of *rock* fill, the Consultant shall verify that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant shall request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. If performed, plate bearing tests will be performed randomly on the surface of the most-recently placed lift. Plate bearing tests will be performed to provide a basis for expressing an opinion as to whether the *rock* fill is adequately seated. The maximum deflection in the *rock* fill determined in Section 6.3.3 shall be less than the maximum deflection of the properly compacted *soil* fill. When any of the above criteria indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

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

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

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

7.6.1. Soil and Soil-Rock Fills:

7.6.1.1. Field Density Test, ASTM D1556-00, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2. Field Density Test, Nuclear Method, ASTM D2922-96, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3. Laboratory Compaction Test, ASTM D1557-00, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

7.6.1.4. Expansion Index Test, ASTM D4829-95, *Expansion Index Test*.

7.6.2. Rock Fills

7.6.2.1. Field Plate Bearing Test, ASTM D1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

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

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

9. CERTIFICATIONS AND FINAL REPORTS

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

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

LIST OF REFERENCES

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

2. Blake, T. F., *EQFAULT, A Computer Program for the Deterministic Prediction of Peak Horizontal Acceleration from Digitized Faults*, User's Manual, 1989a, pp. 79 (updated, 1997).

3. ------, *EQFAULT, A Computer Program for the Estimation of Peak Horizontal Acceleration from Southern California Historical Earthquake Catalogs*, User's Manual, 1989b, pp. 94 (updated, 1997).

4. California Department of Conservation, California Geological Survey, formerly California Division of Mines and Geology, *Probabilistic Seismic Hazard Assessment for the State of California,* Open File Report 96-08, 1996.

5. *Fault Activity Map of California and Adjacent Areas,* California Geological Survey, formerly California Division of Mines and Geology, 1992, complied by C. W. Jennings, 1994.

6. *San Diego-El Centro Sheet*, California Geological Survey, formerly California Division of Mines and Geology, 1962.

7. Wesnousky, S. G., *Earthquakes, Quaternary Faults, and Seismic Hazard in California*, Journal of Geophysical Research, Vol. 91, No. B12, 1986, pp. 12, 587, 631.

8. Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

9. *Landslide Hazards in the Southern Part of the San Diego Metropolitan Area, San Diego County, California,* California Geological Survey, formerly California Division of Mines and Geology, Open File Report 95-03, 1995.

10. *Mines and Mineral Resources of San Diego County, California, County Report 3,* California Geological Survey, formerly California Division of Mines and Geology, 1958-1959.

11. *Soil* and Geologic Investigation for Wellington Hills Subdivision, San Diego County, California, prepared by Geocon Incorporated, October 1978, Project No. D-1206-T02.

12. United States Department of Agriculture, 1953, Stereoscopic Aerial Photographs, Flight AXN-9M, Photo Nos. 41 and 42.

13. United States Geological Survey, 7.5 Minute Quadrangle Series, El Cajon Quadrangle, 1955, 1967, photorevised 1975.