REPORT
PRELIMINARY –SOIL INVESTIGATION
PLANNED 3 ACRES PARCEL SUBDIVISION
ASSESSOR'S PARCEL NO. 152-01-0004
PASO NOGAL ROAD, CONTRA COSTA COUNTY
PLEASANT HILL, CALIFORNIA

JOB NO. 112402
MARCH 9, 2007

GEI Geotechnical Engineering Inc.

CONSULTANTS IN GEOLOGIC & SOIL ENGINEERING

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March 9, 2007
Job No: 112402

Mr. Majad Azad
1380 Rudgear Road
Walnut Creek, CA 94596

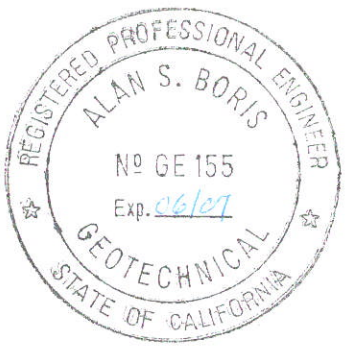
Dear Mr.Azad:

One copy of "Report, Preliminary Soil Investigation," Planned 3 Acres Parcel Subdivision Assessor's Parcel No. 152-01-0004, Paso Nogal Road, Contra Costa County, Pleasant Hill, California" are herewith submitted. The work was authorized on February 15, 2007.

Because of the sloping site and variable depth of overburden soils to bedrock, the planned retaining walls should be supported on properly designed and constructed pier and grade beam foundations, as detailed in the text of this report. The preliminary recommendations contained herein should be used for familiarity with subsurface conditions, site grading and planning purposes only. A final report should be prepared following preparations of final subdivision map and once the locations of the planned buildings are finalized. **Provided that the preliminary recommendations contained herein for site preparation, compaction, foundations, retaining walls, drainage (surface and subdrain), slab on grade, paving and inspection are properly implemented under the supervision of GEI and continually maintained the grading should perform satisfactorily.**

It has been a pleasure to serve you on this project. Should you have any questions or require additional information, please do not hesitate to call us.

Very truly yours,
Geotechnical Engineering, Inc.



Taghi Manbeian, Ph.D., P.E.
President

Alan S. Boris, GE 155, CE 15796
Geotechnical Engineer

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PLANNED 3 ACRES PARCEL SUBDIVISION
ASSESSOR'S PARCEL NO. 152-01-0004
PASO NOGAL RD., CONTRA COSTA COUNTY
PLEASANT HILL, CALIFORNIA

INTRODUCTION

General

In this report, we present the results of the preliminary soil investigation at the subject site. The work was authorized by you on February 15, 2007, in accordance with the scope of the Geotechnical Engineering, Inc. (GEI) proposal dated February 13, 2007.

Geotechnical Background

The sloping site is located east of Paso Nogal Road and north of Pillon Real in Pleasant Hill. The locations of the site together with the GEI exploratory borings are presented on **plate 1.**

According to California geologic maps, the site is located outside of an earthquake Special Studies Zones for the active Calaveras and Concord faults.

Planned Construction

We understand that a 3 acres parcel residential subdivision is planned. The new houses will be of wood frame construction.

Purpose and Scope

As was outlined in our proposal dated February 13, 2007, the purposes of the preliminary investigation were to:

(1) Explore and evaluate the surface and general subsurface conditions at the residential site.

(2) Obtain continuous samples for subsequent testing.

(3) Perform laboratory testing and geotechnical engineering analyses.

(4) Provide preliminary evaluation of the site with recommendations for excavating, site preparation, drainage, preliminary foundations, retaining walls and slabs for use by your structural engineer.

(5) Summarize the results of the investigation together with appropriate recommendations in a preliminary soil report.

Other engineering services such as preliminary environmental site assessment, geologic studies, etc. were not within the scope of this study. **These preliminary recommendations should be used for familiarity with subsurface conditions, site grading and planning purposes only. A final report should be prepared following preparation of final subdivision map and once the locations of the planned buildings are finalized.**

In order to evaluate the general subsurface conditions, a program of field explorations was undertaken including **5 borings** with continuous sampling. Laboratory testing was carried out on representative samples to provide the basis for engineering analyses. The results of the investigation together with our recommendations are presented as follows.

FIELD EXPLORATIONS & LABORATORY TESTING

Field Explorations

The surface and general subsurface conditions in the area of the general area of the parcel were explored on February 22, 2007 by drilling and sampling a total of **5 borings** at the approximate locations shown on **plate 1**. Due to sloping ground surface, the test borings were drilled using portable drilling equipment to depths of **from 4.5 to 8 feet** below existing grade. The GEI boring logs are presented on **plates 2 through 6**. All borings were terminated due to "slow drilling" in very hard underlying claystone. The overburden soils are classified according to the Unified Soil Classification System.

The field program was directed by our geotechnical engineer, who maintained logs of the materials encountered, obtained continuous samples and recorded other data.

Laboratory Testing

A series of laboratory tests were performed to evaluate the pertinent physical properties of the materials encountered. The laboratory testing program included **moisture content, Atterberg limits, and compaction tests.**

The moisture content results and Atterberg limits (Liquid Limit=LL, Plastic Limit=PL, Plasticity Index=PI) are presented on **plates 2 through 6.** The compaction test data are summarized on **plate 7.**

The laboratory testing was performed in accordance with the procedures of the American Society for Testing and Materials.

SITE CONDITIONS

Surface Conditions

As was previously stated, the sloping site which is located east of Paso Nogal Road and north of Pillon Real in Pleasant Hill, is presently vacant. The approximate ground surface elevation is about 200 feet. At the time of the field explorations, the existing vegetation generally consisted of weeds, a few bushes and numerous trees. Some trees growing on the slope are **visibly tilted or deformed,** suggesting creep movements of the trees.

Subsurface Conditions

Based upon our review of the test boring logs, examination of the samples, laboratory test data and experience in the vicinity, the subsurface conditions appear to be relatively uniform. **Beneath top soils and local shallow fill, stiff to very stiff silty clay is underlain by weathered but hard claystone.**

Below top soils, **about 1.7 feet of local upper fill soils** were encountered in borings 1, 4 & 5. The fill classification is based upon easy drilling; debris were not encountered.

Beneath top soils and local upper fill, generally stiff silty clay with gravel stratum was **encountered in all borings**. The silty clay which is highly plastic **(measured Plasticity Index of 25)**, would be very expansive, swelling with increasing moisture contents. The gravel encountered in the silty clay stratum is "angular" – indicating colluvium.

Below from 4 to 7 feet, weathered but hard claystone was encountered in all test boring logs; the borings were terminated due to "slow drilling" in very hard underlying claystone.

Detailed descriptions of the materials encountered are presented on the test boring logs, **plates 2 through 6**.

Free ground water was not encountered in the borings. The maximum depth explored was about **8 feet** below the existing ground surface.

Seismic Design Criteria

In accordance with the Walnut Creek quadrangle revised Official Map dated 1982, the property is located **outside** a State of California Special Studies Zone **active Calaveras and Concord faults.** Because of the proximity of the site to the **active Concord fault**, located about 3.1 miles northeast of the property, and other active Bay Area faults, depending upon the intensity and magnitude of earthquakes, the new residences will probably experience **"very strong"** shaking during the project life. Therefore, it is recommended that the residences be **appropriately reinforced by a structural engineer and at least in accordance with the applicable Seismic Code to resist earthquakes.** This however, does not guarantee or insure that the residences will not sustain structural damage in the event of future earthquakes. Some residences constructed under the provisions of recent building codes suffered significant damage during the October, 1989 earthquake on the San Andreas fault.

Soil Profile Type	Description	Near Source Factor Na	Near Source Factor Nv
Sc	Soft Rock	1.0	1.2

PRELIMINARY RECOMMENDATIONS

General

Based upon the results of field explorations, laboratory testing, professional experience and engineering analyses, following are our professional opinions:

- It is the professional opinion of GEI that the site will be **suitable** for construction of the planned subdivision.
- Because of the presence of **generally highly expansive clay and variable depths to bedrock, pier and grade beam foundations should be extended sufficiently into underlying competent claystone.**
- **Due to sloping site and evidence of areas of soil creep, GEI recommends construction of a keyway located adjacent to Paso Nogal Road in order to stabilize garden landscaping and other front yard improvements**
-

Recommendations for site preparation, compaction, excavation, slabs, retaining walls, foundations, retaining walls and paving are presented herein.

SITE PREPARATION

Stripping

All existing vegetation. should be removed from the area of the planned improvements, prior to construction. At the time of our field explorations, we estimated that a stripping depth of approximately **6 inches** would be appropriate. The actual stripping depth should be determined in the field by the soil engineer at the time of construction.

Note of Caution

Prior to any excavations, any existing nearby utility lines and any other buried structures should be clearly marked for safety and in order to avoid any mishap.

Excavations

Any **temporary** excavations (less than 4 feet deep), which are constructed **during the dry season**, may be constructed using vertical slopes. Vertical cuts or any excavation deeper than four feet should be sloped back at 0.5 (horizontal) : 1 (vertical) or be properly **shored** for safety. **The grading and underground contractors should be alerted to possibly of encountering hard rock and difficult digging so that they could plan appropriate continuances.**

All permanent cut and fill slopes should be relatively gentle. Provided the drainage and grading recommendations presented herein are carefully implemented, we recommend using a slope ratio of 2 (horizontal): 1 (vertical) for all permanent cuts and properly **keyed in and compacted fill** slopes.

All excavations for future utility trenches should be properly backfilled in accordance with the compaction criteria of this report.

Fill Materials

Because the upper on site soils are highly plastic, they should not be used for engineered fill in any structural and paving areas. Any required imported fill materials used in backfilling should consist of non-expansive soils with a Plasticity Index of less than 15 percent. The project soil engineer prior to placing fill should approve the suitability of any imported fill materials.

Keyway Construction

After stripping, the exposed subgrade in fill areas should be **benched** so that any fill can be placed and **compacted in horizontal lifts**, properly keyed at least **4 feet** into the underlying competent claystone (adjacent to and parallel to Paso Nogal Road), sloping about one percent into the hillside (northwest), and properly compacted. **A subdrain consisting**

of 4-inch perforated pipe wrapped in ¾-inch drain rock and filter fabric should be installed in the key way.

Subgrade Preparation Beneath Paving & Slabs - After stripping the exposed subgrade beneath any slabs and paved areas should be scarified at least 12 inches deep, moisture conditioned to about 2 percent above optimum moisture, backfilled using on site soils, and properly compacted to at least 90 percent, as recommended below.

All grading, compaction and drainage should be performed under the supervision of GEI to ensure proper construction.

Drainage

We recommend that final grades be selected so that a gentle slope is provided to divert all surface water away from the planned improvements. The surface water runoff including all downspouts should be securely connected to closed pipes leading to nearby storm drains / splash blocks. At no time should water be allowed to pond adjacent to foundations, slabs and paving.

PRELIMINARY FOUNDATIONS

Drilled Piers

The planned residences and any retaining walls should be supported on properly designed and constructed drilled concrete pier and grade beam foundations. The piers, which should be properly designed and reinforced by your structural engineer should be carried at least 6 feet into underlying competent claystone (at least 13 feet below existing grade). The drilling contractor should be alerted to the possibility of encountering hard rock and difficult drilling so that he could plan appropriate contingencies. The piers which should be at least 12 inches in diameter, should be carried to appropriate depths depending upon structural loads, spacing, and pier diameter as can be

determined by your **structural engineer**. The structural engineer is also responsible for determining the amount, size and location of the reinforcing.

Concrete piers may be designed using an allowable friction or adhesion value of up to **700 pounds per square foot** for underlying competent bedrock. **The friction of existing clay soils should be ignored.** The recommended unit friction may be increased by one-third for resistance to wind and earthquake loads. **An allowable friction of 300 pounds per square foot should be used to resist uplift.**

Because of the proximity of the site to the nearby active Concord fault, all **piers should be tied together with grade beams and/or properly designed and constructed tie beams to act as a unit in resisting lateral loads (UBC 1997, Section 1807.2). The steel should be bent into the grade beams to achieve transfer of moment stresses.**

At least 2 inches of card board void forms should be placed beneath all grade beams. To this end, the grade beams should be designed to span unsupported between piers.

Group Action

We anticipate that pier spacing will exceed three pier diameters. Because of the relatively wide pier spacing, there will be no reduction in pier capacity due to group action. In the event that pier spacing less than recommended herein is considered, we should be contacted in order to provide appropriate reduction in pier capacity.

Settlements

The estimated total settlements of foundations designed as recommended herein are expected to be relatively medium. We anticipate that the maximum total and differential settlements of the houses designed and constructed according to the recommendations presented herein will be on the order of 0.75 and 0.375 inch, respectively.

Lateral Loads

Lateral forces resulting from wind, seismic and active earth pressures may be resisted by passive earth pressure and by friction between foundation concrete and the supporting subgrade. An allowable coefficient of friction of **0.3** may be used between the concrete and subgrade. For design purposes, the passive pressure of competent bedrock may be taken as equal to pressure developed by a fluid having a density of **350** pounds per cubic foot. **The passive pressure of existing clay soils should be ignored.** The passive pressure may be **doubled** for use with a pole formula. A combination of both friction and passive pressure may be used provided that one of the values is reduced by 50 percent.

Walls Below Grade

Depending upon the slope of the backfill materials, the criteria for design of walls below grade should include the following to resist active earth pressures.

Slope of Backfill Materials	Active Earth Pressure (Drained Backfill)
Level Backfill (up to 5:1 slope)	35
Level Backfill (up to 3:1 slope)	45
Level Backfill (up to 2:1 slope)	60

Where surcharge loads may act above walls below grade, an **additional pressure equal to one-third to one-half of the maximum anticipated surcharge load should be applied to the surface behind unrestrained walls and restrained walls, respectively.** All walls below grade should be properly waterproofed and provisions for positive drainage (weep holes, subdrain, Miradrain, Amerdrain, etc.) should be provided, as appropriate.

In the **subdrain** trench, which should be at least one foot wide, a continuous minimum 4 inch diameter perforated plastic pipe "bedded" on a minimum of 6 inches of drain rock wrapped in filter fabric or a Hydraway Drain 2000 water collection system should be placed at the bottom of the trench.

The balance of the trench should be backfilled using 3/4inch drain rock up to within approximately 12 inches of final grade.

Paving

The subgrade beneath paving areas should be properly scarified and recompacted at least 12 inches deep. Based upon the soil classification and using an appropriate R-value of 5, a traffic index of 6.0 and using Cal Trans procedure 301, the recommended paving design section for the planned paved areas properly compacted for use by light (pick up) traffic would be as tabulated below:

Asphalt Paving Design
(Light Traffic)

Asphaltic Concrete (Inches)	Good Quality Class II* Aggregate Base (Inches)	Total Paving Thickness (Inches)
3	11	14

* Not recycled materials

Slabs

Because of the sloping site, GEI recommends using structurally supported wood floor in all future living areas to avoid wet carpet and other damages.

We recommend that any **new garage slabs on grade** should be properly reinforced by **No. 4 rebar 12 inches on center**, running both ways by your structural engineer and be underlain by a layer of granular base. The base materials should consist of clean, **free draining** crushed rock or drain rock. After the subgrade has been prepared in accordance with the site preparation recommendations of this report, at least **8 inches** of drain rock or properly compacted crushed rock should be placed beneath **any slabs.** The sand and

gravel should be covered with **Vapor Block 10 membrane (Raven 800-635-3456), Moistop Under Slab (800-773-4777) or Stego Wrap (949-493-5460)** to act as a vapor barrier in order to prevent condensation beneath interior slabs. The membrane should be covered, in turn, with at least **2 inches of sand** for protection during construction.

Any future garage slabs should not be connected to grade beams and should be allowed to float.

Inspection

Grading and foundation plans and any other geotechnically related plans should be reviewed and approved in writing by GEI to ensure conformance to the recommendations of this preliminary report prior to issuance of grading permit.

A final report should be prepared following preparation of subdivision map and once the locations of the planned houses have been determined to be used final design of foundations.

All earthwork, subgrade preparation, foundation construction, compaction in structural areas and drainage should be observed, controlled and approved by GEI in writing to enable proper construction. It is the responsibility of the owner and/or his agents to implement the recommendations in this report. GEI cannot be held responsible for compliance with design recommendations for grading, foundations and drainage (surface and subdrains) controlled and approved by others.

Limitations

The preliminary recommendations made in this report are based on the assumption that the soil conditions do not deviate appreciably from those disclosed in the borings. This report does not reflect any variations that may occur between these borings. The nature and extent of variations between

the borings may not become evident until the course of construction. If during construction subsurface conditions different from those encountered in the borings are observed or appear to be present, we should be advised at once so that we can review these conditions and make appropriate changes to our recommendations. To this end, some contingency fund is recommended to accommodate these required additional expenditures to attain a properly constructed project. This report is therefore not to be construed as a guarantee or warranty, nor is it intended for the purpose of establishing a value, nor as an opinion as to the advisability of construction. No reliance on this report shall be made by anyone other than the client's name, which appears on the cover letter to this report.

The conclusions and opinions presented herein were prepared in accordance with generally accepted engineering principles and practices at the time of the investigation. This warranty is in lieu of all other warranties either expressed or implied. In the event that recommendations are made by others, these are not the responsibility of GEI unless we have been given the opportunity to review and concur in writing.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man, on this and adjacent properties. In addition, changes in applicable or appropriate standards 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. This report should therefore be reviewed after a period of one year in the light of changes on the site, future planned construction, and the then current applicable codes.

This report has been prepared in order to assist in the project design. In the event of changes in the proposed new residences and/or planned

locations, the conclusions and recommendations shall not be considered valid unless we have been given an opportunity to review and approve or modify this report in writing.

Very truly yours,
Geotechnical Engineering, Inc.

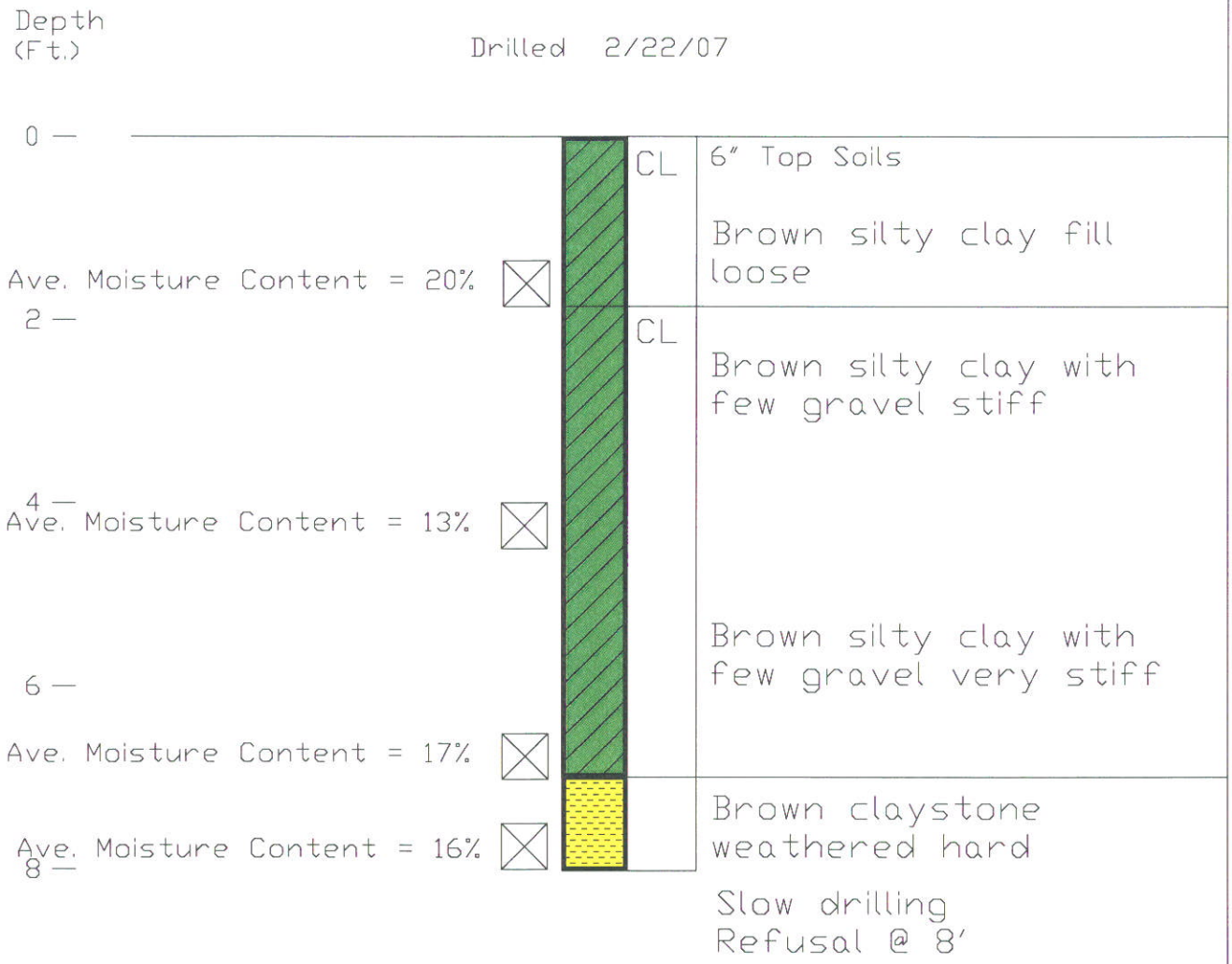
Taghi Manbeian, Ph.D., P.E.
President

Alan S. Boris, GE 155, CE 15796
Geotechnical Engineer

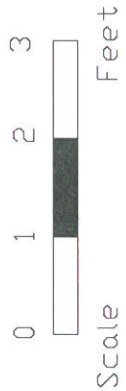
BORING 1

1" Diameter Percussion Hole

Drilled 2/22/07



Note: Free Ground Water Not Encountered



LOG OF BORING

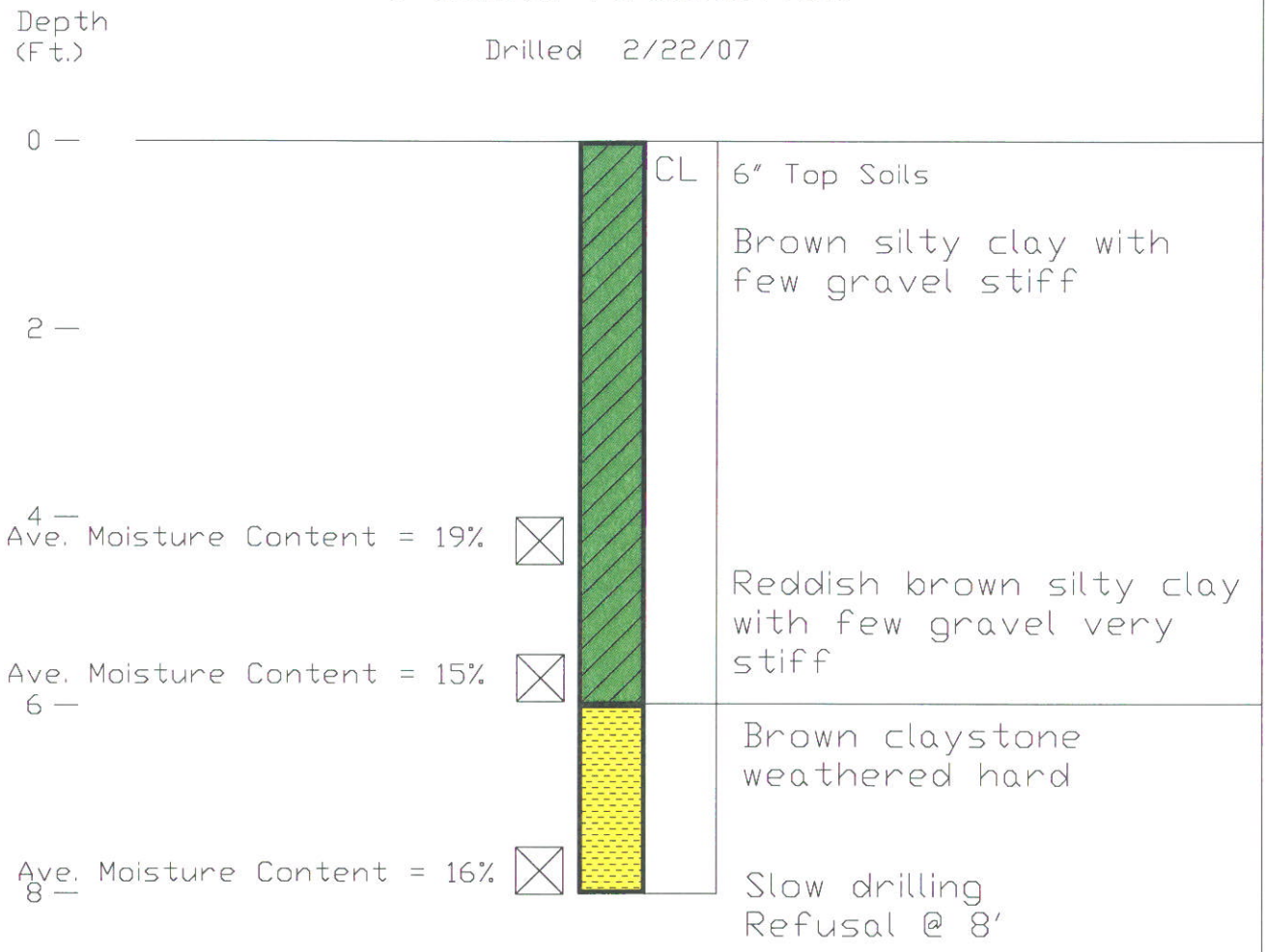
GEOTECHNICAL ENGINEERING, INC.

PLATE 2

BORING 2

1" Diameter Percussion Hole

Drilled 2/22/07



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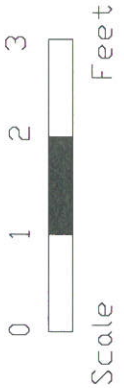


LOG OF BORING

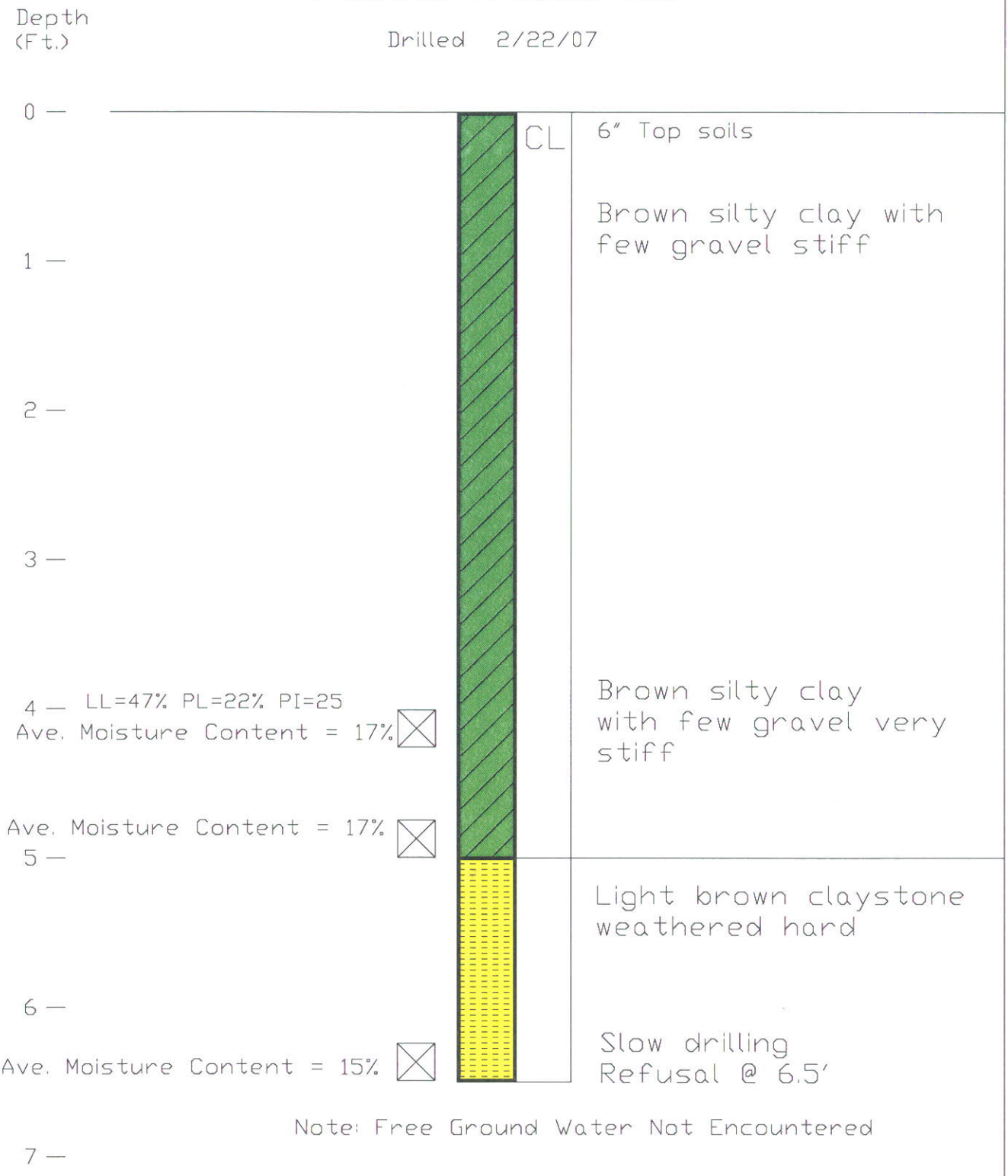
GEOTECHNICAL ENGINEERING, INC.

PLATE 3

BORING 3

1" Diameter Percussion Hole

Drilled 2/22/07



Note: Free Ground Water Not Encountered

LOG OF BORING

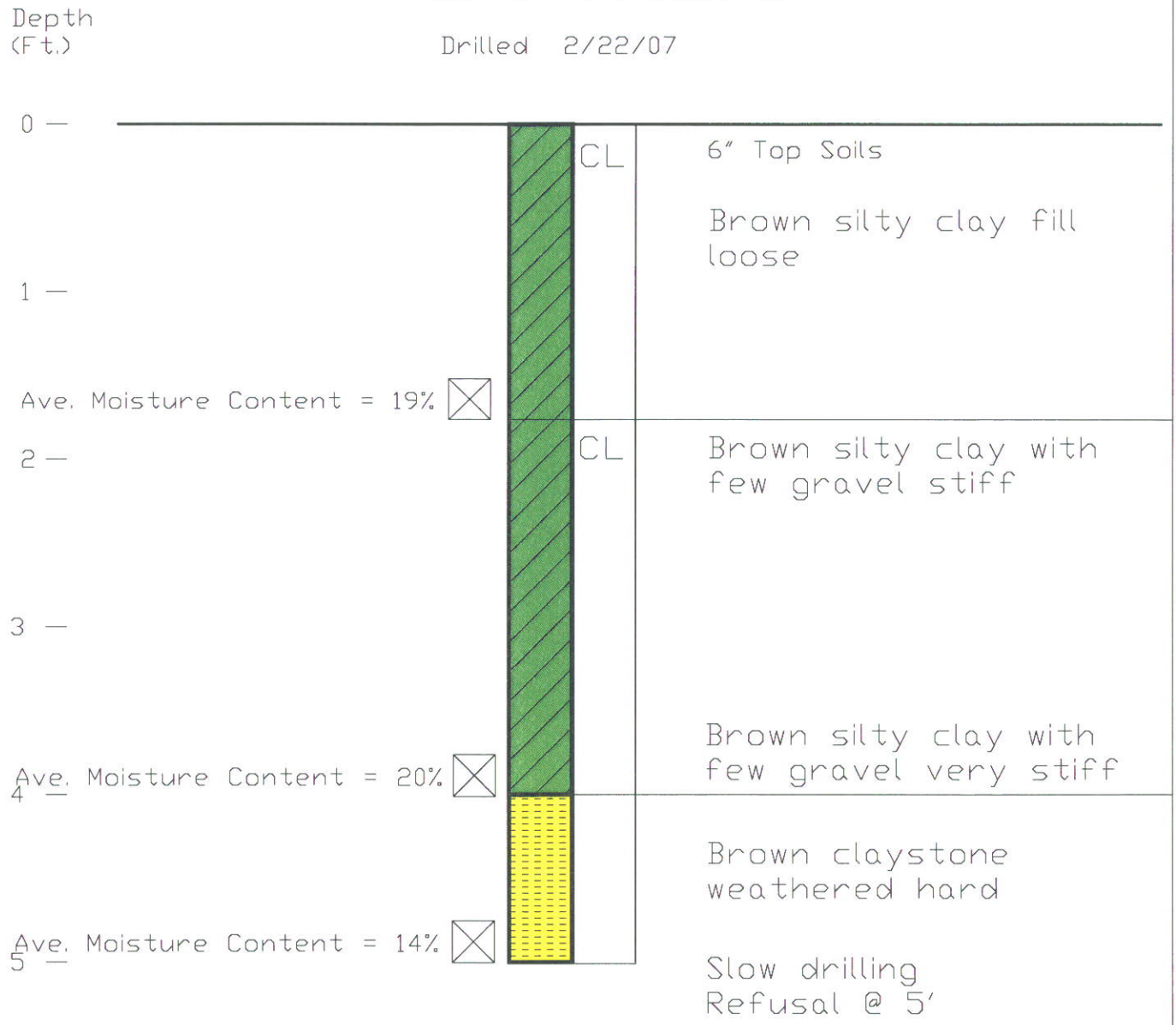
GEOTECHNICAL ENGINEERING, INC.

PLATE 4

BORING 4

1" Diameter Percussion Hole

Drilled 2/22/07



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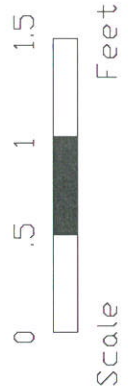


LOG OF BORING

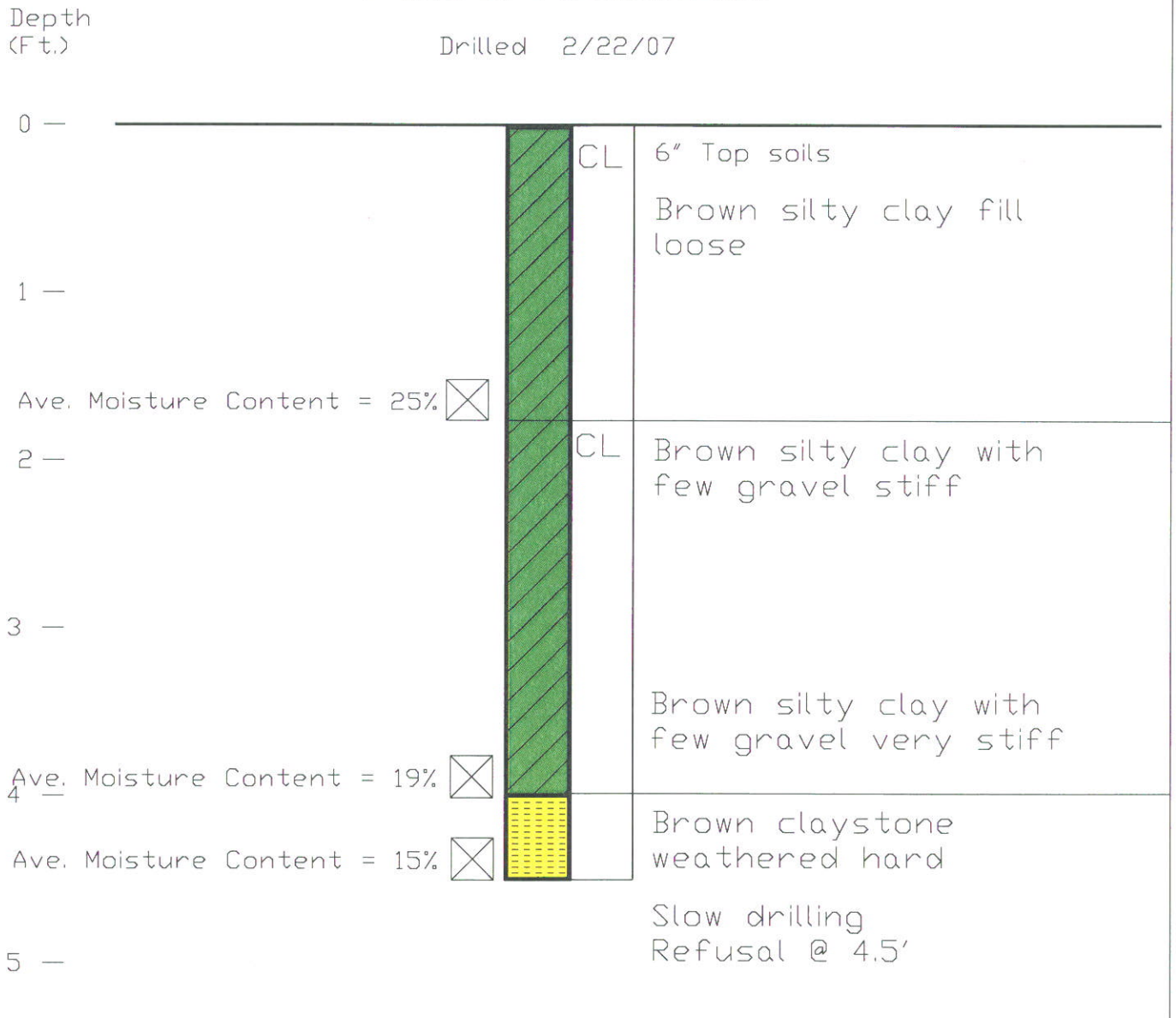
GEOTECHNICAL ENGINEERING, INC.

PLATE 5

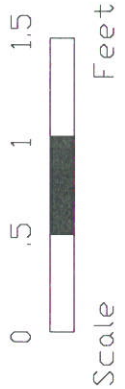
BORING 5

1" Diameter Percussion Hole

Drilled 2/22/07



Note: Free Ground Water Not Encountered



LOG OF BORING

GEOTECHNICAL ENGINEERING, INC.

PLATE 6

BORING 5

SAMPLE 1

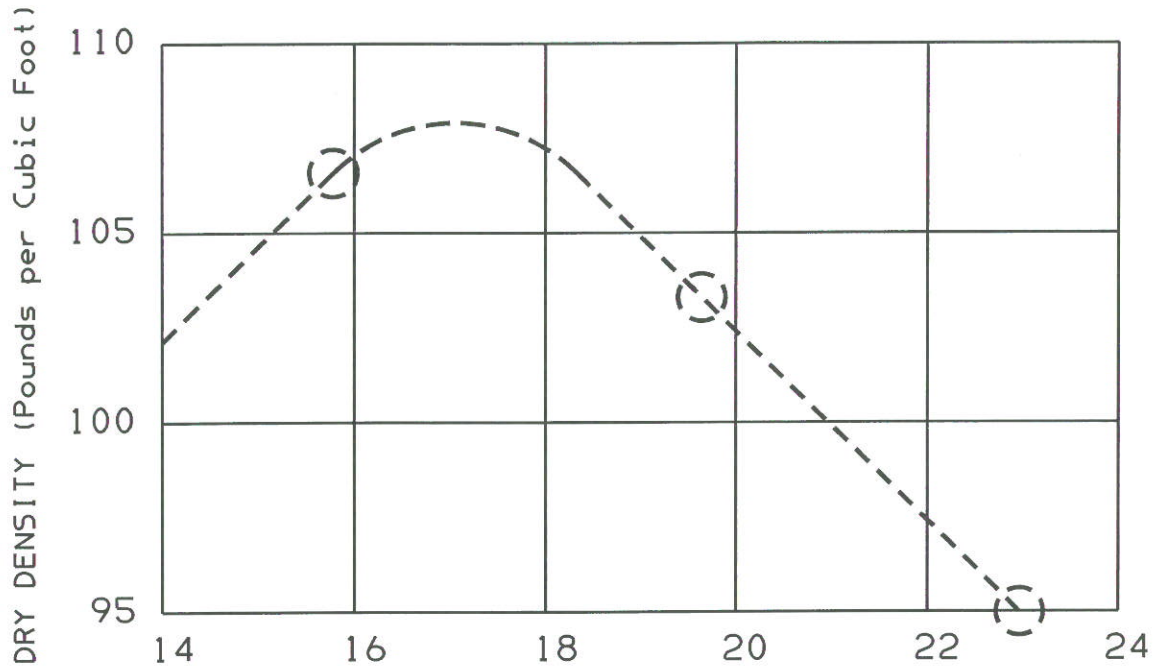
DEPTH .7'

MAXIMUM DRY DENSITY = 108 Pounds Per Cubic Foot

OPTIMUM MOISTURE CONTENT = 17 percent

AMERICAN SOCIETY FOR TESTING & MATERIALS DESIGNATION: D:1557-78

(Modified Proctor Compaction Method)



COMPACTION TEST DATA

GEOTECHNICAL ENGINEERING, INC.

PLATE 7