Subsurface Conditions Data Report
Phase 5 Fill and Subgrade Improvement
Third Runway Embankment
Sea-Tac International Airport
SeaTac, Washington

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Prepared for
HNTB

September 21, 2001
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Prepared by
Hart Crowser, Inc.

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SUBSURFACE CONDITIONS DATA REPORT
PHASE 5 FILL AND SUBGRADE IMPROVEMENT
THIRD RUNWAY EMBANKMENT
SEA-TAC INTERNATIONAL AIRPORT
SEATAC, WASHINGTON

INTRODUCTION

This data report compiles information on subsurface conditions, to support the Phase 5 construction for the Third Runway Embankment Project at the Sea-Tac International Airport. A list of documents, which include original presentation of the geotechnical and hydrogeologic field and laboratory testing data, is provided in the References section.

The site is located at the Sea-Tac International Airport (STIA), in SeaTac, Washington. A vicinity map presented on Figure 1 shows the general area; Figures 2 and 3, Site and Exploration Plan - Phase 5 Work Area West and Work Areas South, show the proposed work areas and existing exploration locations.

We have organized this report into several sections.

- The main text begins with a summary of the geologic units followed by a more detailed discussion of subsurface conditions.
- This is followed by a discussion of the groundwater conditions and available hydrogeologic information.
- Appendices A and B follow the main text and present results of Hart Crowser's subsurface explorations and laboratory testing, respectively.
- Appendix C presents exploration and test results reported by others.
- Appendix D provides specific information on peat soils in the area.

Purpose and Scope of this Report

This report provides information on subsurface soil and groundwater conditions for the planned Phase 5 construction for the Third Runway. We anticipate Phase 5 construction will include placement of compacted embankment fill and subgrade improvement (overexcavation and replacement with compacted fill, in the area west of the airfield between areas between South 154th and South 188th Street. Sources of the fill include on-site stockpiles and some excavation on the airfield. Soils in Borrow Area 4, located south of the airfield, are described in a separate report (Hart Crowser 2001). Additional fill sources off site may also be used in accordance with the contract documents. The information presented herein provides the basis for geotechnical engineering aspects of design and should be made available to prospective bidders prior to construction.

Information presented herein was obtained in general accordance with Tasks 1.03, 1.13, and 1.3.5 in Modification No. 8 to Hart Crowser's contract with HNTB dated May 1, 1998.

GENERALIZED GEOLOGIC DESCRIPTION AND SUBSURFACE SOIL CONDITIONS

This section provides a description of the geologic and subsurface soil conditions within the Phase 5 Fill areas, shown on Figures 2 and 3, based on explorations at the site by Hart Crowser and others.

Generalized Geologic Conditions

Various existing reports (AGI 1998 and Hart Crowser 1999a, 1999b, 2000a, 2000b, 2000c, 2000d, and 2000e) describe the generalized geologic conditions for areas along the proposed runway, including parts of the areas covered by this report. In summary, the following geologic units have been identified at the Third Runway project site:

- Fill (loose to medium dense, locally dense, variably graded silt, sand, and gravel);
- Alluvium (primarily soft to stiff, peat, clay, and silt; and very loose to medium dense, fine to medium non-silty to silty sand);
- Recessional Outwash (primarily medium dense to dense, silty sand and gravel, and/or soft to medium stiff, sandy silt and/or sandy clay);
- Glacial Till (dense to very dense, silty sand and gravel); and
- Advance Outwash (dense to very dense, non-silty to silty sand and gravel and very stiff to hard silt and clay).

Subsurface Conditions

Subsurface soil conditions interpreted from materials encountered in explorations at the site and soil properties inferred from laboratory tests formed the basis for the information contained in this report. Variations between explorations occur due to the variability in gradation, moisture content, and density/consistency of soils at the site. The nature and extent of these variations may not become evident until construction. If variations become evident, it will be necessary to re-evaluate our interpretation of the soil conditions at the site, as well as any recommendations based on those interpretations.

This report discusses the subsurface conditions in three main work areas: Work Area West, Work Area South 1, and Work Area South 2 as shown on the 60 percent draft Phase 5 Construction Plans and the enclosed Figures 2 and 3. Subsurface conditions in these three areas are addressed separately.

Subsurface conditions are also described in the vicinity of stormwater detention ponds D and G, which may be modified as part of Phase 5 construction.

In this report, "pre-construction fill" refers to fills placed prior to about 1997 for which no information is available other than indicated by exploration and test results presented herein. Fill placed since 1997 were constructed as part of the Third Runway project by the Port of Seattle.

Work Area West

This is the largest of the five Phase 5 Fill work areas. Work in this area will include:

- Cuts and fill placement;
- Embankment construction; and
- Overexcavation and replacement of subgrade soils.

The following soils were encountered in Work Area West:

Topsoil. This soil was not consistently encountered in our explorations. Typically, this soil consists of a loose mixture of silt and sand with roots and other organic material. Topsoil is generally 1/2 to 1 foot thick where encountered.

Pre-Construction Fill, consisting of loose to medium dense, variable mixture of silt or clay, sand, and gravel. Fill soils encountered in Work Area West are typically associated with prior site use including paved streets and residential housing. Buried utilities and other features such as possible abandoned wells or underground storage tanks could be encountered. Fill is generally absent in the low-lying portions of the site, adjacent to wetlands. Most of the fill is less than 1 foot thick. The density and granular nature of the fill materials resembles the recessional outwash deposits and the fill is sometimes difficult to distinguish from the outwash.

Other fill in the area was placed as compacted embankment or stockpiled fill soils placed by STIA contractors since 1997. Typically the embankment and stockpiled fill consists of dense, non-silty to silty, sand and gravel with cobbles.

Alluvial deposits consisting of interlayered silt, clay, sand, and peat. These soils occur mainly in the low-lying areas to depths of up to about 15 feet.

The consistencies of the clay and silt deposits vary widely from soft to stiff. The clays and silts generally contain sand fractions ranging from slightly sandy to sandy. The existing alluvial sands are generally loose to medium dense.

Peat was encountered in the wetlands in the west central part of Work Area West, around Runway Station 180+00. Both surficial and shallow buried peat deposits were encountered in this area. Buried deposits tend to be medium stiff to stiff, whereas the surficial peat exhibited consistencies in the very soft to soft range. Buried peat deposits were encountered at depths ranging from 3.5 to 9.5 feet and varied in thickness between 1.5 and 5.5 feet. Peat deposits near the ground surface varied in thickness between a few inches and about 2 feet. A detailed discussion of the extent and characteristics of the peat deposits in Work Area West (and in the North Safety Area, which is not part of Phase 5) is included in Appendix D.

Colluvium and Recessional Outwash consisting of medium dense to dense, slightly silty to silty, slightly gravelly to gravelly sand. Recessional outwash overlies the glacial till, or advance outwash where the glacial till has been eroded. Thickness of the colluvium and recessional deposits varies over the site, but is generally less than 20 feet. These deposits are generally intermittent or may be absent where alluvial materials are located and dense to very dense glacial till or advance outwash sand and gravel underlies the alluvium.

Glacial Till consisting of dense to very dense, slightly gravelly to gravelly, silty to very silty sand. In general, Glacial Till differs from the overlying recessional soils by having a higher silt content and much higher density. The top of the glacial soils is generally within 10 to 20 feet of the ground surface.

Glacial till is generally encountered near the surface of the west facing slope on the east side of Work Area West. The till is absent, downslope to the west, where the advance outwash soils are exposed. Springs and seeps occur along the western edge of the till due to both perched water and interflow above the till horizon as well as seepage through the underlying advance sands.

Figure 4 presents an elevation contour map of the highest measured groundwater levels in this area. Groundwater conditions are discussed later in this report.

Advance Outwash consisting of dense to very dense, slightly silty, slightly gravelly to gravelly sand. In general, the advance outwash can typically be distinguished from the glacial till by lower silt content. However, observations at the site suggest that some areas of advance outwash are silty.

Portions of the advance outwash include hard silt and clay soils. Below a depth of about 30 feet these soils have been reported to be part of the Lawton Silt and Clay or "Pre-Vashon Deposition." These hard soils may be laminated or contain planes of separation (partings). Furthermore, these deposits are typically reported to be relatively plastic and are often slickensided (i.e., showing evidence of previous failure planes).

Work Area South 1

The majority of the work in this area will consist of excavating an existing fill stockpile and cutting to proposed ground elevations. Figures 5 and 6 show the location of subsurface explorations in Work Area South as well as initial estimates of the depth of excavation (refer to contract documents for specifics). Available information on soils to be excavated in Work Areas South 1 and 2 is summarized in Tables 4 and 5. The subsurface conditions in this area are generally as follows:

Topsoil. Typically, topsoil up to about 1 to 1.5 feet thick was reported in some previous explorations in this area, but was typically not described in the logs.

Pre-construction fill consisting of very loose to very dense, silty sand with asphalt, and occasional gravel and organics. Pre-construction fill consisting of silty sand with gravel and some asphalt concrete and organic debris was encountered in only two borings. Boring AT97-B14 was drilled 5 feet away from boring AT97-B13 after the initial boring was abandoned due to the presence of debris. The borings are located at the very north end of this work area, adjacent to an access road. The fill depth at this location was 22 feet.

No other information is available on the pre-construction fill in this area.

Recessional Outwash consisting of medium dense, slightly silty sand. An approximately 3-foot-thick layer of Recessional Outwash was encountered in test pit AT94b-TP5. This was the only exploration within this work area that encountered Recessional Outwash.

Glacial Till consisting of very dense, silty sand with occasional gravel. This soil unit generally was encountered at very shallow depths in the majority of the explorations within this work area. However, borings AT97-B8 and AT97-B33 encountered Advance Outwash without encountering Till. Some borings contained up to 13 feet of very dense Weathered Till overlying very dense unweathered Till.

Advance Outwash consisting of dense to very dense sand with minor amounts of gravel and silt. This soil unit typically underlies the Glacial Till.

Work Area South 2

Construction in Work Area South 2 is anticipated to consist of removing existing stockpiled fill for use in the embankment and excavation of existing native soils to grade. Location of the stockpiles, available explorations and anticipated cut depths are shown on Figure 3.

The following soil units were encountered during explorations performed by AGI Technologies in 1994 and 1997. The recent fill stockpiles were placed after AGI's field exploration in this area and were therefore not encountered in their explorations.

Pre-construction fill consisting of very loose to very dense, non-silty to silty sand. This layer was encountered in all of the explorations in this work area. The fill thickness ranges from about 10 to 48 feet (some explorations were not advanced deep enough to encounter natural soil deposits). The fill material appears to be predominantly glacial till type soils, likely obtained during grading of portions of the airfield in 1961 or 1962 (AGI 1999). Occasional organics, and wood and concrete debris were also encountered.

Glacial Till consisting of dense to very dense, silty sand with some gravel and occasional cobbles. This layer was generally encountered in the borings that were advanced deep enough to encounter natural soils. In some areas, the

Glacial Till layer might be thin or non-existent. In boring AT97-B15 for example, no glacial till was encountered below the recent fill, which was underlain by Advance Outwash.

Advance Outwash consisting of dense to very dense, non-silty to slightly silty sand. Advance Outwash was encountered in borings AT94b-B2 and AT97-B15. This soil unit is generally overlain by Glacial Till except where the Glacial Till was removed, e.g., by erosion.

Stockpiles 1 and 2

Eight test pits were completed to assess soils in Stockpile Nos. 1 and 2 located within Work Area South 2. Table 6 presents a summary of soils observed. Conversations with the field inspector who observed stockpile construction for the Port of Seattle indicates that Stockpile No. 1 consists mostly of non-silty gravely sand, with a separate area of silty sand and gravel (Till fill), while Stockpile No. 2 consists of a mixture of silty sand and gravel (Till fill). Visual classification of the test pit soils and soil gradation test results concur with this description. Gradation tests for the non-silty portion of Stockpile No. 1 indicate this material would be suitable for use within the embankment underdrain.

Pond D

Subsurface conditions in this area appear to be variable Alluvial and Colluvial soils over Advance Outwash soils. The following soil units have been identified:

- Loose to dense, non-silty to very silty, non-gravelly to very gravelly sand with interbedded occasional hard silt layers.
- Hard SILT in HC00-TP138 (from the ground surface to the bottom of the test pit at 13 feet) and in HC00-B147 (below 23 feet).
- Very dense, silty, gravelly sand.

Pond F

Subsurface conditions generally consist of sandy pre-construction fill overlying Glacial Till or Advance Outwash soils. Test pit HC00-TP318 encountered a layer of stiff, very sandy silt between depths of 6 and 12.5 feet.

- Loose to medium dense, silty, gravelly sand fill with various amounts of organic material and concrete (1 to 5 feet thick).

- Medium dense to dense, slightly silty to silty, slightly gravelly to gravelly sand (2 to 9 feet thick).

- Dense to very dense, silty, slightly gravelly to gravelly sand.

GENERALIZED HYDROGEOLOGIC CONDITIONS IN WORK AREAS

Groundwater is encountered in discontinuous zones perched on the Glacial Till and the Advance Outwash soils. The Advance Outwash, also known as the Shallow Regional Aquifer, discharges to Miller and Des Moines Creeks, and via underflow to Puget Sound and the Green River valley (AGI 1996).

The following sections summarize water level data and hydraulic conductivity data collected in the three Phase 5 Work Areas and at Ponds D and F. Water levels observed in open borings at the time of drilling (ATD) and seepage observed in test pits are shown on the exploration logs (Appendices A and F). Water levels observed in monitoring wells are presented in Tables 1 and 2.

Work Area West

Table 1 presents water level measurements in 24 wells in Work Area West. Elevation contours for the highest measured groundwater levels are shown on Figure 4.

Typically up to about 3 feet of seasonal fluctuation has been observed in wells close to Miller Creek, with less groundwater fluctuation in wells located in upland areas east of the creek.

Dewatering will be required during excavation of unsuitable subgrade soils, to enable removal of all soft or loose soils within the designated area, and backfill with compacted fill. Magnitude and rate of flow will vary locally due to changes in gradation and density of the soils.

Seepage and wet soils are typically observed at the surface in wetlands in some areas where fill placement or subgrade improvement (overexcavation and replacement) is anticipated. East of this area (east of the former 12th Avenue South) artesian conditions were observed in two wells (AT94A-B3 and AT96-B4). Artesian pressures are likely sustained by recharge occurring in higher elevation areas of the existing airport area to the east.

Hydraulic Conductivity Testing

Slug testing was performed in four wells (HC99-B37 through HC99-B40) within or adjacent to Work Area West. The mean hydraulic conductivity was 1.1 x 10^{-4} cm/sec. Hydraulic conductivity values are presented in Table 2, along with soil material type observed within the screened interval.

Work Area South 1

Water level data from wells AT97-B8 and AT97-B14 are presented in Table 3. AGI and Hart Crowser advanced several other explorations (borings and test pits) in this area to depths ranging from 8 to 19.5 feet. Only a few of these explorations encountered groundwater. At the time of drilling/excavation, groundwater was encountered at elevations ranging from 356 to 367.5 feet, generally at least 8 feet below the final proposed ground surface. Bottom elevations of the explorations that did not encounter groundwater were generally at least 7 feet below the final proposed ground surface.

Based on available data, cuts within most of Work Area South 1 will likely not encounter groundwater. However, groundwater might be encountered near the wetland area near boring/well AT97-B8, where high water levels measured in this well are near the final proposed ground surface elevation.

Note that water levels vary with time and may rise above elevations reported herein.

Work Area South 2

There are no monitoring wells located in Work Area South 2. Therefore, no long-term water level readings are available for this area.

Several borings in this area were advanced to depths ranging from 14.5 to 34.5 feet. Only the deepest boring (AT97-B18) encountered groundwater at the time of drilling at elevation 329 feet. Bottom of boring elevations range from 301 to 359.5 feet and are generally below proposed final ground surface elevations. Water level observations at the time of drilling may not accurately represent water table conditions, and may vary over time.

Test pit AT94b-TP16 encountered water at elevation 363 feet, approximately 3 feet above the proposed final ground surface elevation at this location. Based on observation in the other explorations in this area, this seepage probably represents a local perched water zone of limited extent.

Pond D

There are no monitoring wells in this area. Some seepage was observed during excavation of some of the test pits between about 341 and 350 feet in elevation. These likely represent local perched water zones of limited extent. No water was encountered during drilling of boring HC00-B147, which was advanced to a depth of 39 feet.

One infiltration test in a test pit at Pond D indicated good infiltration or seepage potential, but no infiltration was observed in other tests attempted at Pond D (Hart Crowser 2000f).

Pond F

No groundwater was encountered during drilling and excavation of the explorations. Borings HC01-B401, HC01-B402, and HC01-B403 were advanced to depths of 24.3, 24.4, and 28.5 feet, respectively. Some seepage was observed in test pit HC00-TP202. We believe that the seepage was caused by perched water in this area. No monitoring wells are located in this area.

USE OF THIS REPORT

This report has been prepared for the exclusive use of HNTB Corporation and the Port of Seattle for the site and project described herein. Hart Crowser's work has been accomplished and report prepared, in accordance with generally accepted geotechnical engineering practices for the nature and conditions of the work completed in the same or similar localities at the time the work was completed. No other warranty, express or implied, is made.

Hart Crowser appreciates the opportunity to provide this information. Please call if you have any questions.

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Table 1 - Water Level Data - Work Area West

Sheet 1 of 4

	AT94A-B3		AT96-B4		AT97-B69		HC99-B37		HC99-B38		HC99-B39		HC99-B40	
	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet
Measuring Point	0.00	*273.4*	0.00	*279.7*	0.00	*337.2*	0.00	237.65	0.00	230.88	0.00	230.80	0.00	250.63
Ground Level*	1.4	*272*	*-0.3*	*280*	3.2	*334*	3.1	234.6	3.3	227.6	-0.3	231.1	2.0	248.6
Top of Screen*	23.4	*250.0*	36.7	*243.0*	*27.7*	*310*	9.1	228.6	12.3	218.6	4.7	226.1	14.0	236.6
Bottom of Screen*	33.4	*240.0*	46.7	*233.0*	*29.7*	*308*	19.1	218.6	22.3	208.6	14.7	216.1	24.0	226.6
Date: 3/8/1999					--	--	3.52	234.13	4.40	226.48	0.69	230.11	4.88	245.75
3/10/1999					6.18	331.0								
4/5/1999					6.59	330.6	3.58	234.07	4.41	226.47	0.74	230.06	5.26	245.37
5/4/1999					7.43	329.8	3.82	233.83	4.60	226.28	0.86	229.94	5.75	244.88
5/15/1999					--	--								
6/14/1999					8.08	329.1	5.12	232.53	5.90	224.98	1.68	229.12	6.89	243.74
7/13/1999					8.41	328.8	4.72	232.93	5.93	224.95	2.05	228.75	7.18	243.45
8/13/1999					8.83	328.4	5.70	231.95	6.08	224.80	2.18	228.62	7.13	243.50
9/14/1999					9.16	328.0	6.47	231.18	6.48	224.40	2.51	228.29	7.67	242.96
10/13/1999					9.12	328.1	4.50	233.15	5.98	224.90	2.09	228.71	7.32	243.31
11/11/1999					8.13	329.1	3.22	234.43	4.25	226.63	2.90	227.90	5.80	244.83
12/9/1999					6.80	330.4	3.27	234.38	4.38	226.50	0.27	230.53	5.00	245.63
1/13/2000					6.48	330.7	3.20	234.45	4.35	226.53	0.54	230.26	4.86	245.77
2/14/2000					6.54	330.7	3.12	234.53	4.33	226.55	0.59	230.21	4.49	246.14
3/9/2000	Flowing	>272	Flowing	>280	6.82	330.4	3.17	234.48	4.43	226.45	0.61	230.19	5.57	245.06
4/11/2000	Flowing	>272	Flowing	>280	7.45	329.8	3.35	234.30	4.60	226.28	0.88	229.92	5.08	245.55
5/10/2000	Flowing	>272	Flowing	>280	7.78	329.4	3.19	234.46	4.32	226.56	0.88	229.92	5.14	245.49
6/19/2000	-7.15	280.6	Flowing	>280	8.40	328.8	3.76	233.89	4.91	225.97	1.15	229.65	6.01	244.62
7/10/2000	-6.00	279.4	-1.73	281.4	8.84	328.4	3.96	233.69	5.72	225.16	1.61	229.19	6.50	244.13
10/10/2000	-1.38	274.8	-0.81	280.5	9.90	327.3	3.84	233.81	5.99	224.89	2.17	228.63	8.39	242.24
1/22/2001	-8.30	281.7	-2.35	282.1	7.82	329.4	3.30	234.35	4.42	226.46	0.79	230.01	5.25	245.38
5/4/2001	-8.54	281.9	1.04	278.7	8.93	328.3	3.31	234.34	4.58	226.30	1.05	229.75	5.44	245.19

Italics = Estimated
Depth* All depths are below measuring point (NOT below the ground surface)
-- Indicates data not available.

Hart Crowser
497828\Tables1&2&3WaterLevels&slugtesting.xls - Table 1-Work Area West

Table 1 - Water Level Data - Work Area West

	HC00-B106		HC00-B111		HC00-B118		HC00-B120		HC00-B121		HC00-B123		HC00-B125	
	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet
Measuring Point	0.00	315.81	0.00	286.06	0.00	298.61	0.00	236.93	0.00	231.78	0.00	237.64	0.00	257.8
Ground Level*	1.7	314.1	0.8	285.3	1.0	297.7	2.9	234.0	2.1	229.7	2.9	234.7	-0.4	258.2
Top of Screen*	11.7	304.1	9.8	276.3	7.0	291.7	17.6	219.3	6.8	225.0	14.0	223.7	3.6	254.2
Bottom of Screen*	21.7	294.1	19.8	266.3	12.0	286.7	22.6	214.3	16.8	215.0	24.0	213.7	8.6	249.2
Date: 3/8/1999														
3/10/1999														
4/5/1999														
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8/13/1999														
9/14/1999														
10/13/1999														
11/11/1999														
12/9/1999														
1/13/2000														
2/14/2000	5.49	310.32	6.80	279.26	6.63	291.98								
3/9/2000	5.50	310.31	6.94	279.12	6.71	291.90								
4/11/2000	6.21	309.60	8.34	277.72	7.84	290.77	5.1	231.83	0.80	230.98	2.06	235.58	3.74	254.06
5/10/2000	6.38	309.43	8.59	277.47	7.64	290.97	4.92	232.01	0.62	231.16	1.90	235.74	3.89	253.91
6/19/2000	7.04	308.77	9.17	276.89	8.52	290.09	5.52	231.41	1.09	230.69	2.25	235.39	4.79	253.01
7/10/2000	7.47	308.34	9.95	276.11	9.12	289.49	6.1	230.83	1.53	230.25	2.61	235.03	6.39	251.41
10/10/2000	8.52	307.29	10.83	275.23	9.85	288.76	6.23	230.70	1.53	230.25	2.59	235.05	6.83	250.97
1/22/2001	7.02	308.79	6.57	279.49	6.37	292.24	4.87	232.06	0.52	231.26	1.90	235.74	5.66	252.14
5/4/2001	7.69	308.12	7.77	278.29	7.75	290.86	4.97	231.96	0.56	231.22	2.00	235.64	5.07	252.73

Italics = Estimated
Depth* All depths are below measuring point (NOT below the ground surface)
-- Indicates data not available.

Table 1 - Water Level Data - Work Area West

	HC00-B126		HC00-B129		HC00-B130		HC00-B132		HC00-B133		HC00-B137		HC00-B141	
	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet
Measuring Point	0.00	251.56	0.00	245.83	0.00	225.46	0.00	229.96	0.00	243.47	0.00	267.21	0.00	258.64
Ground Level*	1.4	250.2	2.6	243.2	2.3	223.1	2.6	227.4	2.4	241.1	2.8	264.5	0.9	257.8
Top of Screen*	8.4	243.2	9.6	236.2	7.3	218.1	13.6	216.4	7.4	236.1	9.8	257.5	12.9	245.8
Bottom of Screen*	13.4	238.2	14.6	231.2	11.4	214.1	18.6	211.4	12.4	231.1	17.8	249.5	22.9	235.8
Date: 3/8/1999														
3/10/1999														
4/5/1999														
5/4/1999														
5/15/1999														
6/14/1999														
7/13/1999														
8/13/1999														
9/14/1999														
10/13/1999														
11/11/1999														
12/9/1999														
1/13/2000														
2/14/2000	2.02	249.54	3.07	242.76					2.51	240.96			7.94	250.70
3/9/2000	1.82	249.74	3.15	242.68					2.44	241.03			8.91	249.73
4/11/2000	1.97	249.59	3.59	242.24	1.73	223.73	2.65	227.31	2.53	240.94			10.21	248.43
5/10/2000	2.07	249.49	3.6	242.23	1.67	223.79	2.55	227.41	2.61	240.86			10.75	247.89
6/19/2000	2.54	249.02	4.56	241.27	1.92	223.54	2.91	227.05	3.97	239.50	2.54	264.67	11.50	247.14
7/10/2000	2.68	248.88	5.01	240.82	2.14	223.32	3.24	226.72	5.01	238.46	4.12	263.09	11.88	246.76
10/10/2000	5.15	246.41	6.6	239.23	1.88	223.58	3.29	226.67	5.94	237.53			12.99	245.65
1/22/2001	2.40	249.16	4.75	241.08	1.47	223.99	2.58	227.38	2.71	240.76			9.43	249.21
5/4/2001	2.19	249.37	3.94	241.89	1.56	223.90	2.63	227.33	2.76	240.71			10.32	248.32

Italics = Estimated

Depth* All depths are below measuring point (NOT below the ground surface)

-- Indicates data not available.

Table 1 - Water Level Data - Work Area West

	HC00-B142		HC00-B143		HC00-B144		HC00-B145		HC00-B146	
	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet
Measuring Point	0.00	272.72	0.00	242.27	0.00	248.99	0.00	265.11	0.00	263.55
Ground Level*	2.7	270.1	3.2	239.1	2.4	246.6	2.3	262.8	2.9	260.7
Top of Screen*	17.2	255.6	7.2	235.1	8.9	240.1	12.3	252.8	11.9	251.7
Bottom of Screen*	22.2	250.6	12.2	230.1	13.9	235.1	17.3	247.8	16.9	246.7
Date: 3/8/1999										
3/10/1999										
4/5/1999										
5/4/1999										
5/15/1999										
6/14/1999										
7/13/1999										
8/13/1999										
9/14/1999										
10/13/1999										
11/11/1999										
12/9/1999										
1/13/2000										
2/14/2000							2.94	262.17		
3/9/2000	3.27	269.45			2.98	246.01	3.14	261.97	3.81	259.74
4/11/2000	3.53	269.19			3.17	245.82	3.51	261.60	4.02	259.53
5/10/2000	3.58	269.14			3.00	245.99	3.18	261.93	3.79	259.76
6/19/2000	4.57	268.15	4.23	238.04	4.11	244.88	3.95	261.16	4.56	258.99
7/10/2000	5.17	267.55	5.96	236.31	5.76	243.23	4.59	260.52	5.92	257.63
10/10/2000	6.19	266.53			7.07	241.92	5.84	259.27	6.26	257.29
1/22/2001	3.85	268.87	3.61	238.66	3.11	245.88	3.38	261.73	3.63	259.92
5/4/2001	3.94	268.78	3.64	238.63	3.35	245.64	3.59	261.52	3.94	259.61

Italics = Estimated
Depth* All depths are below measuring point (NOT below the ground surface)
-- Indicates data not available.

Table 2 - Hydraulic Conductivity - West Wall Area

Location	Soil Types in Screen Interval	Hydraulic Conductivity in cm/sec
Work Area West		
HC99-B37	Dense, very silty, fine to medium SAND and sandy, silty PEAT	9.5×10^{-5}
HC99-B38	Soft, slightly sandy SILT and very dense, slightly gravelly to gravelly, silty SAND	7.0×10^{-5}
HC99-B39	Medium dense to very dense, slightly gravelly, silty, fine SAND	1.5×10^{-4}
HC99-B40	Medium dense to very dense, slightly gravelly, silty SAND	1.3×10^{-4}
	Mean:	1.1×10^{-4}

Hart Crowser
497828\Tables1&2&3WaterLevels&slugtesting.xls - Table 2-Slug Test Data

Table 3 - Work Area South Water Level Data

	AT97-B8		AT97-B14	
	Depth* in Feet	Elevation in Feet	Depth* in Feet	Elevation in Feet
Measuring Point	0.00	*379.2*		
Ground Level*	2.2	*377*	N/A	*386*
Top of Screen*	15.2	364.0		
Bottom of Screen*	20.2	359.0		
<u>Date:</u> 3/10/2000	4.65	374.6		
4/11/2000	5.50	373.7		
5/10/2000	5.83	373.4		
6/20/2000	7.02	372.2		
7/10/2000	7.88	371.3		
10/10/2000	10.39	368.8		
1/22/2001			19.97	
1/23/2001	6.26	372.9		
5/3/2001	5.72	373.5		
5/10/2001			16.97	

Italics = Estimated

Depth* All depths are below measuring point (NOT below the ground surface).

-- Indicates data not available.

Table 4 - Soil Conditions by Area (500 ft x 500 ft Squares) - Work Area South 1

New Area I.D.	Grid Coordinates	Cut Depth in Feet	Borings and Test Pits	Cut Depth at Exploration Location in Feet	Comments / Soil Description	Estimated Fines Content Range in Percent Based on Description	Moisture Sensitivity (low, med., high)	Moisture Content (MC) of Representative Samples in Percent	Observed Optimum Moisture Content (OMC) Range for Prev Filling and Similar Fines Content Range in Percent	Generalized Comparison of Average OMC and MC
	N15000, E 11000		HC00-TP223*	(1)	Wet, (med dense), slightly gravelly, silty SAND	12 to 50	med to high	21	3 to 13	Above OMC
17	N14500, E 11000	0 to 4			*Located outside Phase 5 Area					
	N15000, E 11500				Very little cut in this area; mostly fill					
	N14500, E 11500									
	N15000 , E11500									
18	N14500 , E11500	2 to 7	AT97-B27*	(4)	Moist, dense SAND (Adv. Outwash), occasional gravel	0 to 5	low	9.6	2 to 7	Above OMC
	N15000 , E12000				*Located outside Phase 5 work area					
	N14500 , E12000									
	N15500 , E11000		AT97-B10	Fill area	12" of topsoil + dry, very dense, silty SAND (Weathered Till)	12 to 50	med to high	-	3 to 13	-
19	N15000 , E11000	0 to 4	AT97-B11	Fill area	12" of topsoil + dry, very dense, silty SAND (Weathered Till)	12 to 50	med to high	8.9	3 to 13	Near avg. OMC
	N15500 , E11500				* Located in fill area; not in cut.					
	N15000 , E11500				Stock pile located along east edge of Area 19					
	N15500 , E11500									
20	N15000 , E11500	1 to 5	AT97-B9	1	Moist, very dense, silty SAND, some gravel (Weathered Till)	12 to 50	med to high	7.5	3 to 13	Near avg. OMC
	N15500 , E12000									
	N15000 , E12000									
	N16000 , E11000		AT94B-TP5*	-	Moist to wet, med. dense SAND with some silt (Rec. Outwash)					
21	N15500 , E11000	0 to 14	AT97-B5	3	Moist, very dense, silty SAND (Weathered Till)	12 to 50	med to high	5.8	3 to 13	Below avg. OMC
	N16000 , E11500				*16 feet of new fill was placed here; cut depth is only 6 feet.					
	N15500 , E11500				Stockpile located along east edge of Area 21					
	N16000 , E11500		AT97-B8*	(7)	1' of topsoil + Moist, dense SAND (Adv Outwash)	0 to 5	low	14	2 to 7	Above OMC
22	N15500 , E11500	6 to 26			boring terminated at 19.5' below ground surface					
	N16000 , E12000				* Located outside of Phase 5 work area					
	N15500 , E12000				Large portions of Area 22 are occupied by stockpile.					
	N16500 , E11000		AT97-B4*	Fill area	Silty sand FILL + SAND (Rec. Outwash) + silty SAND	0 to 50	med to high	19.9	2 to 13	Above OMC
23	N16000 , E11000	0 to 13			* Located in fill area; not in cut.					
	N16500 , E11500									
	N16000 , E11500									
	N16500 , E11500		AT97-B13/-B14*	7	Moist, med. dense, silty SAND FILL, some gravel, asphalt, organics	12 to 50	med to high	9.2	3 to 13	Slightly above avg. OMC
24	N16000 , E11500	7 to 22								
	N16500 , E12000				* Located just north of Phase 5 work area.					
	N16000 , E12000				Large portion of Area 24 occupied by stockpile					
	N16500 , E12000									
25	N16000 , E12000	0 to 16	none		Only west edge of Area 25 part of Phase 5					
	N16500 , E12500									
	N16000 , E12500									

Table 5 - Soil Conditions by Area (500 ft x 500 ft Squares) - Work Area South 2

New Area I.D.	Grid Coordinates	Cut Depth in Feet	Borings and Test Pits	Cut Depth at Exploration Location in Feet	Comments / Soil Description	Estimated Fines Content Range in Percent Based on Description	Moisture Sensitvity (low, med., high)	Moisture Content of Representative Samples in Percent	Observed OMC Range for Prev Filling and Similar Fines Content Range in Percent	Generalized Comparison of Average OMC and MC
1	N11500 , E10500	14 to 17								
	N12000 , E10500		AT97-B36*	16	Moist, med. dense to dense, silty SAND FILL with gravel and organics	12 to 50	med to high	14.4 and 18.2	3 to 13	Above OMC
	N11500 , E11000				Only easternmost part of Area 1 is in Phase 5.					
	N12000 , E11000				* Located west of Phase 5 Area					
2	N11500 , E11000	11 to 28	AT97-B18	11 5	Dry, medium dense, silty SAND FILL, some coarse gravel	12 to 50	med to high	8.5 to 9.4	3 to 13	Near avg. OMC
	N12000 , E11000		AT97-B19	12	Moist, dense to very dense, silty SAND FILL	12 to 50	med to high	8.1	3 to 13	Near avg. OMC
	N11500 , E11500		AT97-B20*	14	Moist, medium dense to dense, silty SAND FILL	12 to 50	med to high	6.6 to 13.2	3 to 13	Below and above avg. OMC
					* Located outside of Phase 5 work area					
	N12000 , E11500				Stockpile of recent fill at NE corner - nature of fill soils unknown					
3	N11500 , E11500	16								
	N12000 , E11500		none		Only northeast corner of Area 3 is in Phase 5 work area					
	N11500 , E12000									
	N12000 , E12000									
4	N12500, E10500	10 to 14			Only west edge of Area 4 is in Phase 5 work area					
	N12000, E10500		AT94B-B2	12	Moist, medium dense, silty SAND FILL	12 to 50	med to high	8.4 to 9.7	3 to 13	Near or slightly above avg. OMC
	N12500, E11000									
	N12000, E11000									
5	N12000 , E11000	6 to 46								
	N12500 , E11000		AT94B-B2	12	Moist, medium dense, silty SAND FILL	12 to 50	med to high	8.4 to 9 7	3 to 13	Near or slightly above avg. OMC
	N12000 , E11500				Stockpile of recent fill - nature of fill soils unknown					
	N12500 , E11500									
6	N12500 , E11500	4 to 47	AT97-B29*	(6')	Moist, medium dense, silty SAND FILL	12 to 50	med to high	7.5	3 to 13	Slightly below avg. OMC
	N12000 , E11500		AT97-B30**	(6) + 21' of new fill	Moist, medium dense, silty SAND FILL.	12 to 50	med to high	7.6	3 to 13	Slightly below avg. OMC
	N12000 , E12000				* Located just outside Phase 5 work area					
	N12500 , E12000				** Located within stockpile boundary					
7	N12500 , E12000	6								
	N12000 , E12000		none		Only northwest corner of Area 7 is in Phase 5 work area					
	N12500 , E12500									
	N12000 , E12500									
8	N13000 , E11000	5 to 35	AT94B-B2	12	Moist, medium dense, silty SAND FILL	12 to 50	med to high	8.4 to 9.7	3 to 13	Near or slightly above avg. OMC
	N12500 , E11000		AT97-B31	7	Moist, medium dense, silty SAND FILL	12 to 50	med to high	5.9	3 to 13	Below avg. OMC
	N13000 , E11500									
	N12500 , E11500				Stockpile of recent fill at SE corner - nature of fill soils unknown					
9	N13000 , E11500	6 to 45								
	N12500 , E11500		none							
	N13000 , E12000				Stockpile of recent fill covers most of this area - nature of fill					
	N12500 , E12000				soils unknown					
10	N13000 , E12000	3 to 20			Only west edge of Area 10 is in Phase 5 work area					
	N12500 , E12000		none							
	N13000 , E12500				Stockpile slope is located along west edge of Area 10					
	N12500 , E12500									
11	N13500 , E11000	2 to 11								
	N13000 , E11000		AT97-B15	2	12" of topsoil + moist, medium dense, silty SAND FILL some gravel	12 to 50	med to high	11 8	3 to 13	Above avg. OMC
	N13500 , E11500									
	N13000 , E11500				Stockpile along east edge of Area 11					
12	N13500 , E11500	7 to 17	AT97-B16	10	Moist, loose to medium dense, silty SAND FILL, some gravel	12 to 50	med to high	9.7	3 to 13	Above avg. OMC
	N13000 , E11500		AT94B-TP16*	(9') +9' of new fill	Moist to wet, slightly silty to silty SAND FILL, trace organics	5 to 50	med to high	17 1	2 to 13	Above OMC
	N13500 , E12000				* located within stockpile boundary					
	N13000 , E12000									
13	N13500 , E12000	4 to 8	AT97-B23*	(3')	12" of topsoil + moist, medium dense, silty SAND FILL/some gravel	12 to 50	med to high	9 6	3 to 13	Above avg. OMC
	N13000 , E12000									
	N13500 , E12500				*Located outside Phase 5 work area					
	N13000 , E12500				Only southwest corner of Area 13 in Phase 5 work area					
14	N14000 , E11000	9 to 13								
	N13500 , E11000		AT97-B37*	(3')	Moist, medium dense, silty SAND FILL with gravel & organics	13 (test results)	med	18 3	3 to 13	Above OMC
	N14000 , E11500				*Located outside Phase 5 work area					
	N13500 , E11500									
15	N14000 , E11500	6 to 32	AT97-B17*	13	Moist, loose, silty SAND FILL some gravel, trace organics	12 to 50	med to high	7 3 and 15 9	3 to 13	Below and above avg. OMC
	N13500 , E11500									
	N14000 , E12000				* Located within stockpile boundary					
	N13500 , E12000				Stockpile of recent fill covers parts of this area - nature of fill					
16	N14000 , E12000	5 to 8	AT97-B22*		Moist, med dense, silty SAND FILL, trace gravel	12 to 50	med to high	5 7	3 to 13	Below avg. OMC
	N13500 , E12000									
	N14000 , E12500				*Located outside Phase 5 Area					
	N13500 , E12500				Only west edge of Area 16 in Phase 5					

Table 6 - Test Pit Summary for Stockpile Nos. 1 and 2 - Work Area South 2

Sheet 1 of 2

HC01-TP1

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 2	S1	2	GS	(Medium dense), damp, gray-brown, sandy GRAVEL.
2 to 5.5	S2	N/A	None	(Medium dense to dense), damp to moist, brown, gravelly, medium SAND with scattered cobbles

HC01-TP2

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 5.5	S1	3	GS	(Medium dense to dense), damp, brown, very gravelly SAND with scattered cobbles.

HC01-TP3

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 5.5	S1	7	GS	(Medium dense), moist, brown, slightly gravelly, silty, medium to fine SAND.

HC01-TP4

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 7	S1	10	GS	(Medium dense), moist, brown, slightly gravelly, silty SAND with concrete and wood debris, and scattered cobbles. - Gravelly sand layers throughout test pit.

HC01-TP5

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 10	S1	N/A	None	(Medium dense), damp, brown, slightly silty to silty, slightly gravelly to gravelly SAND with scattered cobbles up to 10-inch diameter. - Wood debris at 3.5-foot depth. - Wood debris with creosote odor at 8-foot depth.

Table 6 - Test Pit Summary for Stockpile Nos. 1 and 2 - Work Area South 2 Sheet 2 of 2

HC01-TP6

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 2	S1	N/A	None	(Medium dense), damp, brown, gravelly, very silty SAND.
2 to 10	S2	N/A	None	(Loose to medium dense), moist, gray, gravelly, slightly silty to silty SAND.

HC01-TP7

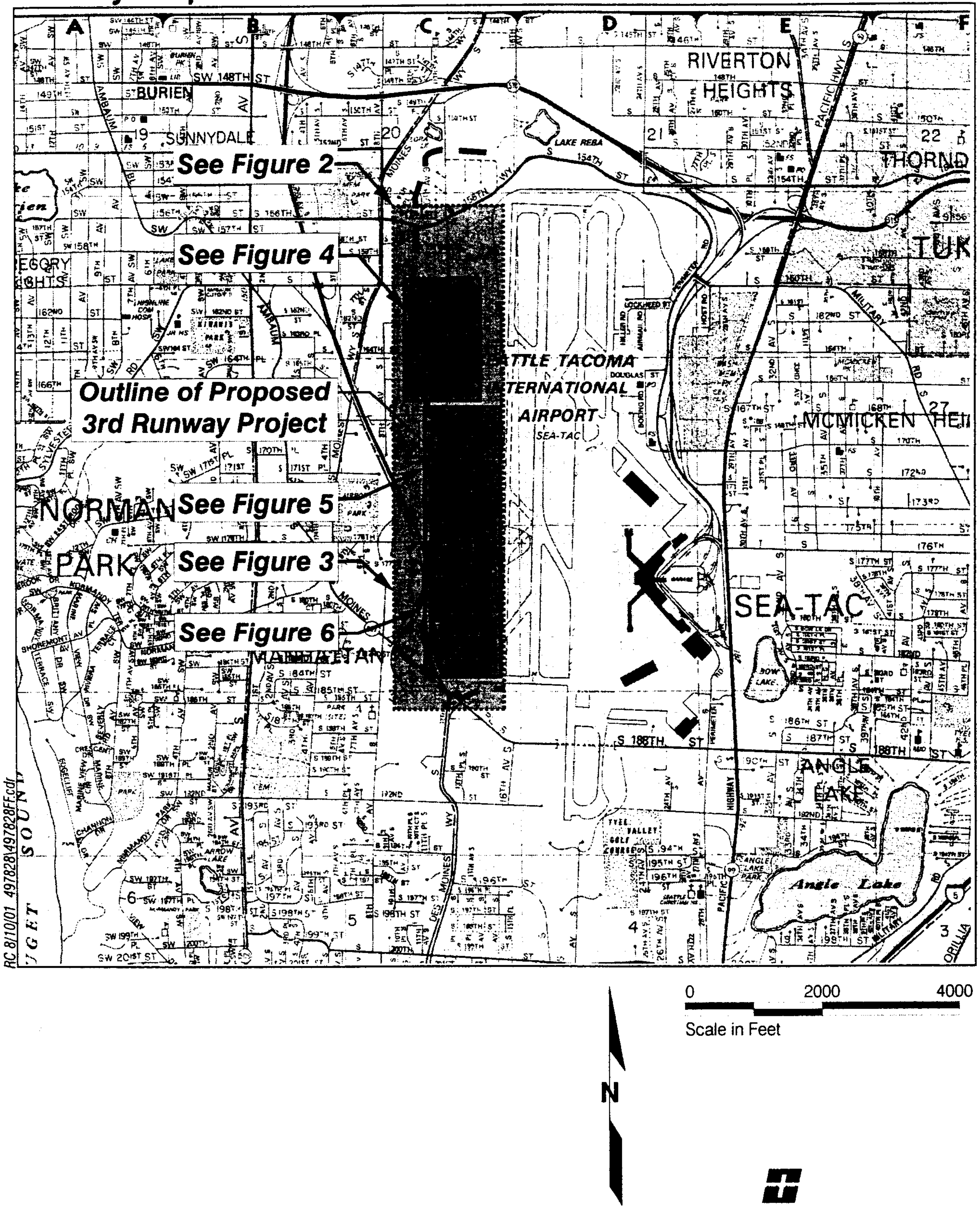
Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 9.5	S1	N/A	None	(Medium dense to dense), moist, gray-brown, gravelly, silty SAND with large concrete debris. - Wood debris at 8-foot depth.

HC01-TP8

Depth in Feet	Sample No.	Water Content in Percent	Lab Tests	Description
0 to 6	S1	3	GS	(Medium dense), damp to moist, brown, very sandy GRAVEL.

F:\docs\jobs\497828\Phase5Data Stockpile test pit logs.doc

Vicinity Map



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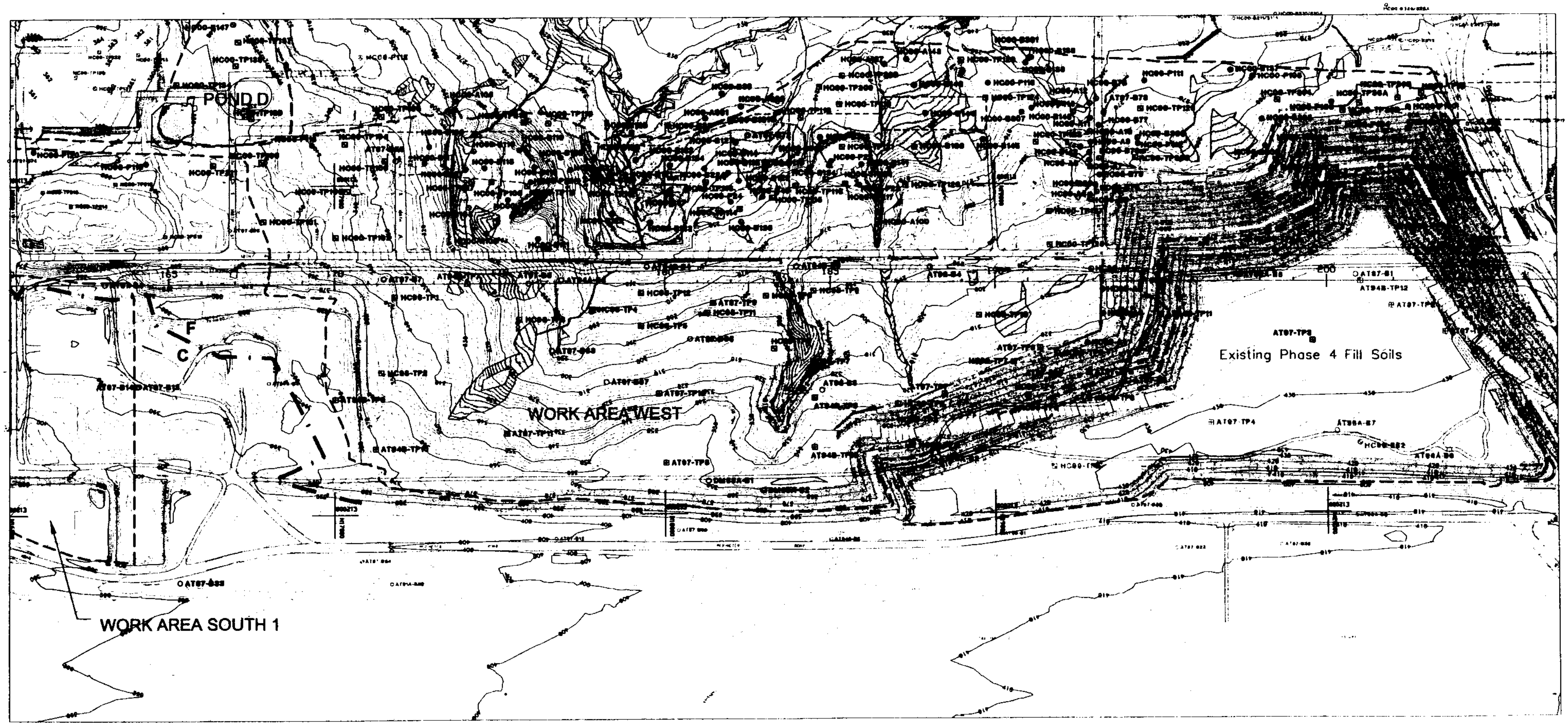
J-4978-28 8/01

Figure 1

Site and Exploration Plan
Phase 5 - Work Area West



Notes:
1) Base map prepared from drawing provided by HNTB. Wetlands delineations prepared from drawing provided by Parametrix.

2) Phase 5 Fill limits based on drawing provided by HNTB, June 2001.

F
C
Limit of On-Site Cut and Fill

HC00-TP5 Exploration Location and Designation

Anticipated Work Area Limit

Limit of Subgrade Improvement

Wetland

N

0 300 600
Scale in Feet

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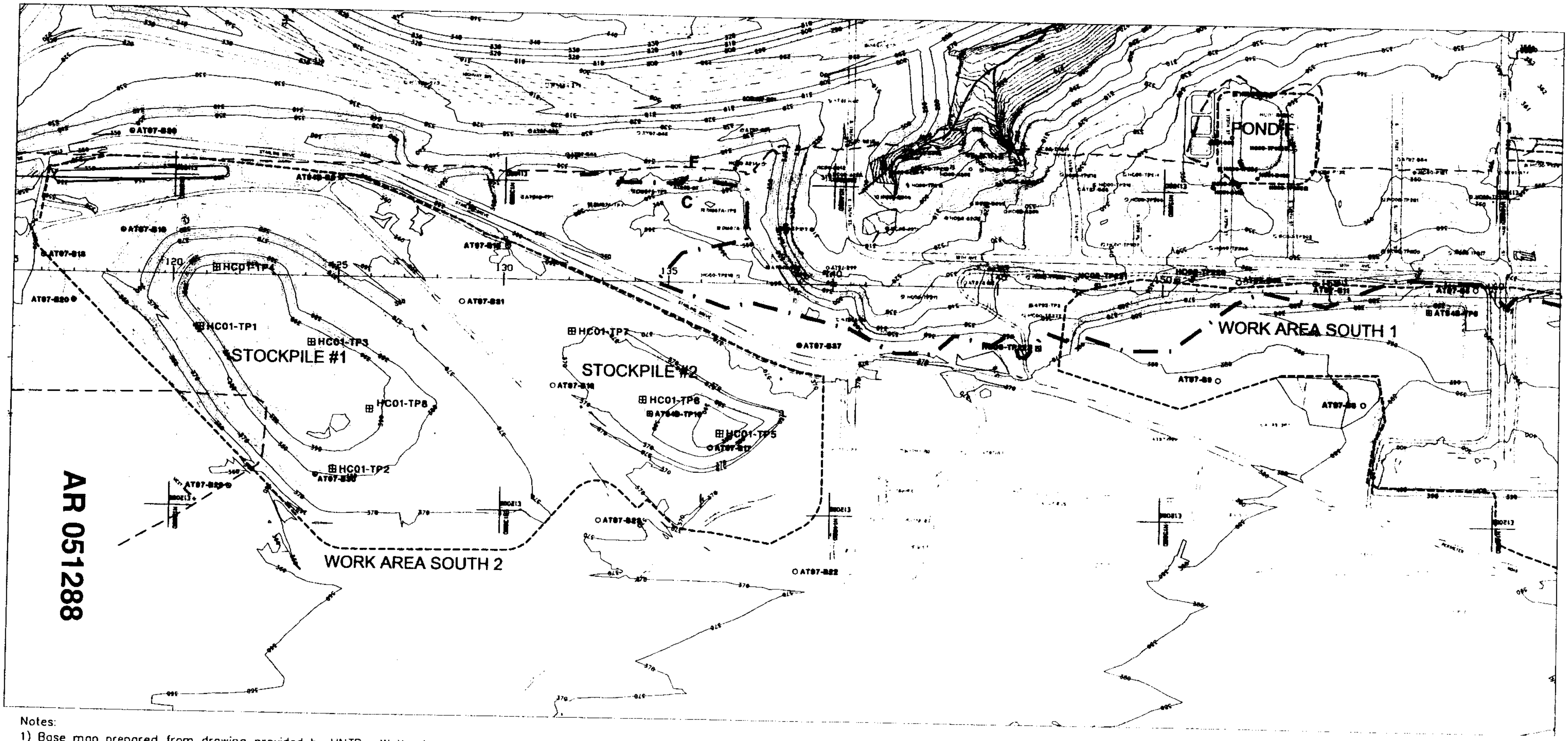
J-4978-28 8/01
Figure 2

DJH 8/14/01 1=300 (xref)see drawing file/charlie.pc2
49782828

Site and Exploration Plan

Phase 5 - Work Areas South 1 and South 2



Notes:

1) Base map prepared from drawing provided by HNTB. Wetlands delineations prepared from drawing provided by Parametrix.

2) Phase 5 Fill limits based on drawing provided by HNTB, June 2001.

F / C Limit of On-Site Cut and Fill

HC99-TP8 Exploration Location and Designation

Anticipated Work Area Limit

Wetland

Z

0 300 600

Scale in Feet

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J-4978-28 9/01

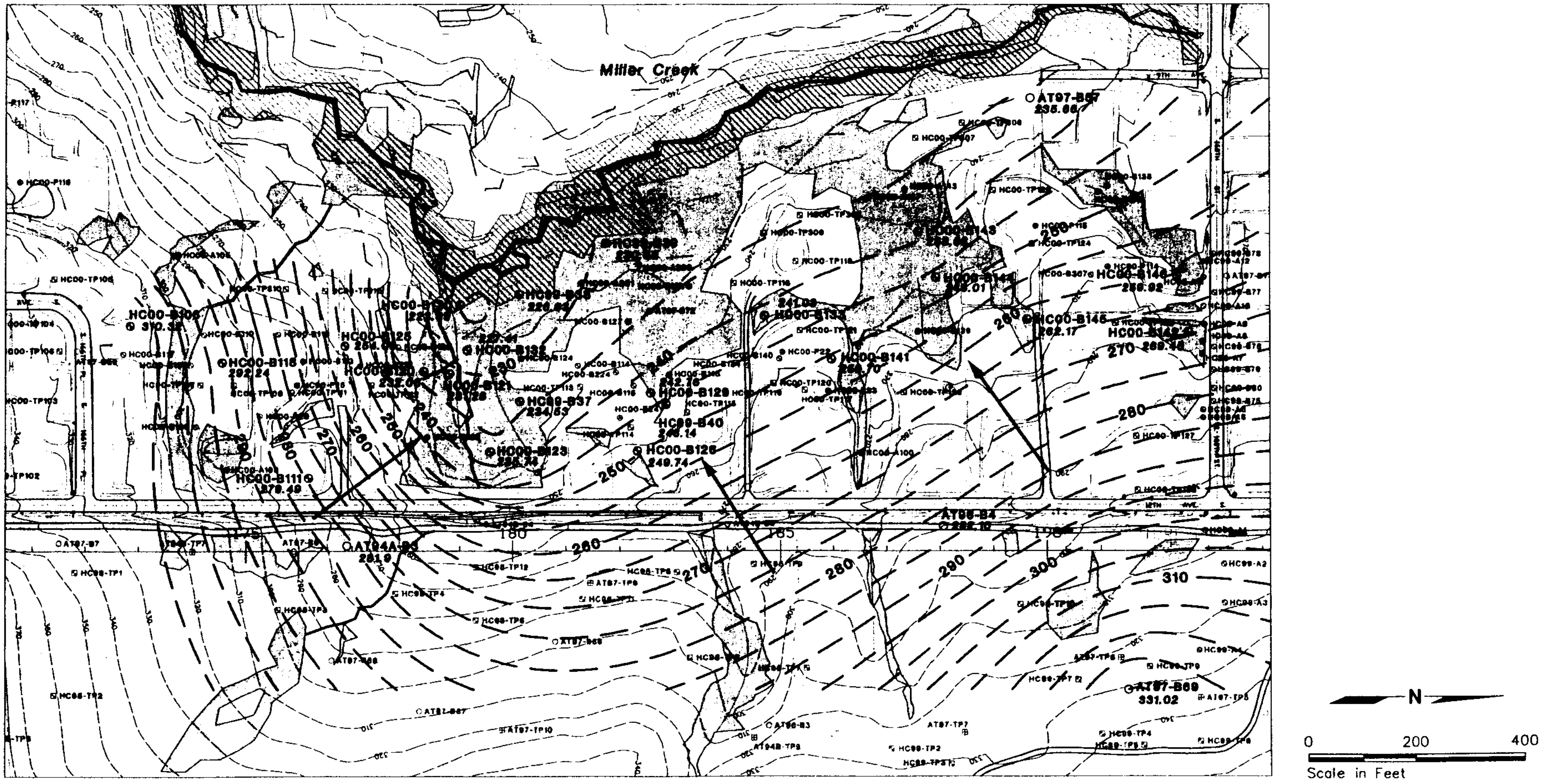
Figure 3

9/21/01 1=300 (xref)see drawing file

49782829

Groundwater Elevation Contour Map

Work Area West



Notes:
1) Base map prepared from drawing provided by HNTB entitled, "SthBase.dwg", dated August, 1998. Wetland locations based on drawing provided by Parametrix entitled, "w_022201.dwg," dated February 22, 2001.

2) Groundwater elevation contours generated using Surfer 6.02 Surface Modelling Program based on highest water levels measured in monitoring wells.

— — 250 — —	Groundwater Elevation Contour in Feet
— — — 410 — — —	Existing Elevation Contour in Feet
⊕HC99-B36	Monitoring Well Location and Number
281.9	Groundwater Elevation in Feet
▫ HC99-TP13	Other Exploration Location and Number
←	Inferred Groundwater Flow Direction
175	Runway Stationing
○	Wetland Location

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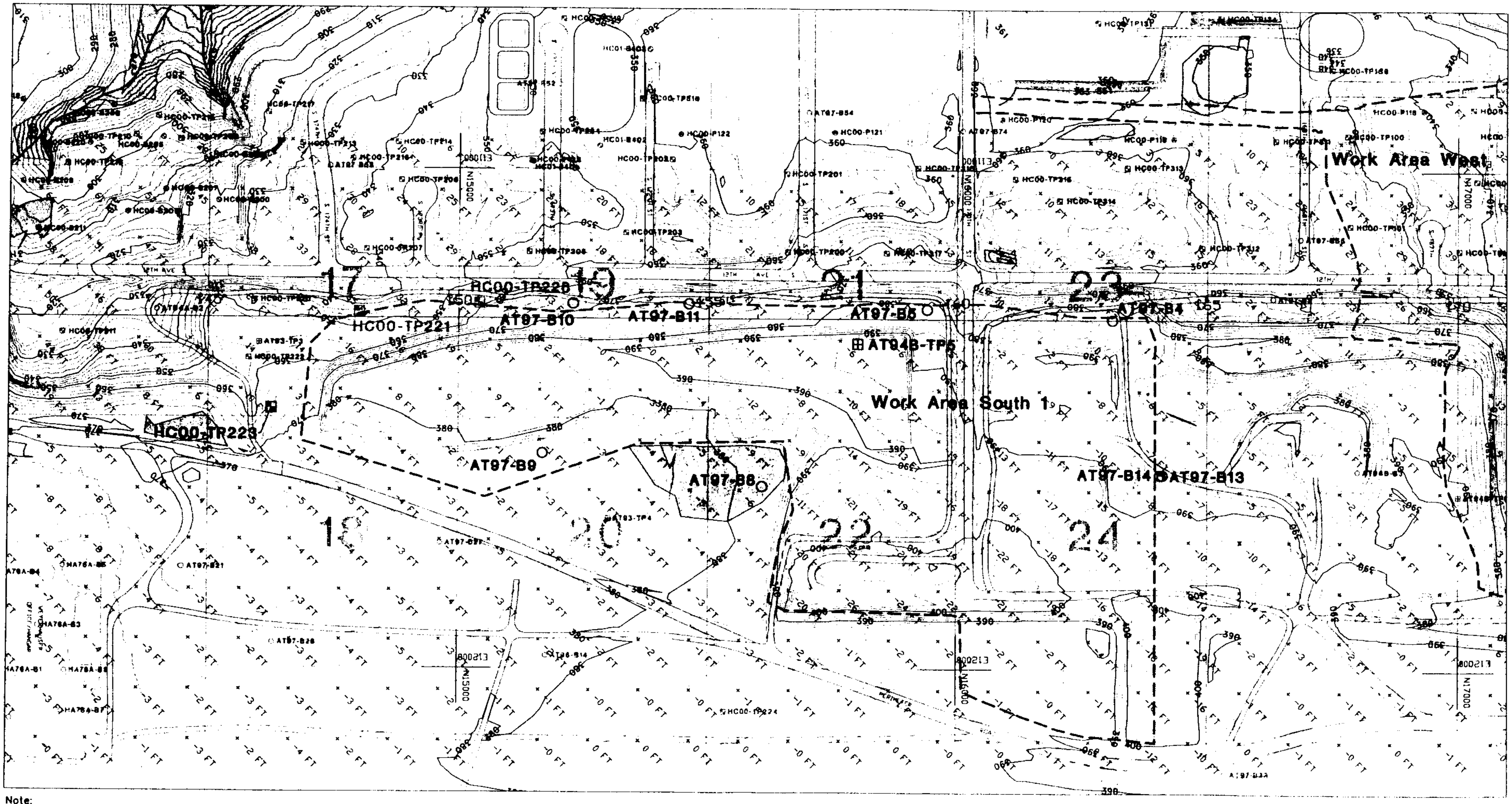
J-4978-28 8/01
Figure 4

RC 8/10/01 1=1 (xref)see drawing file/charlie.pc2
4978826

Anticipated Excavation Plan

Work Area South 1



Note:
1) Base map prepared from drawing provided by HNTB entitled "X_Topo.dwg", dated April, 2001.
2) Negative number at node within work area limits indicates approximate depth of cut and positive number indicates approximate height of fill.

HC99-B80⊕ Exploration Location and Designation

See reference list for explorations not included in this report.

– – – – – Anticipitated Work Area Limits

N

0 200 400
Scale in Feet

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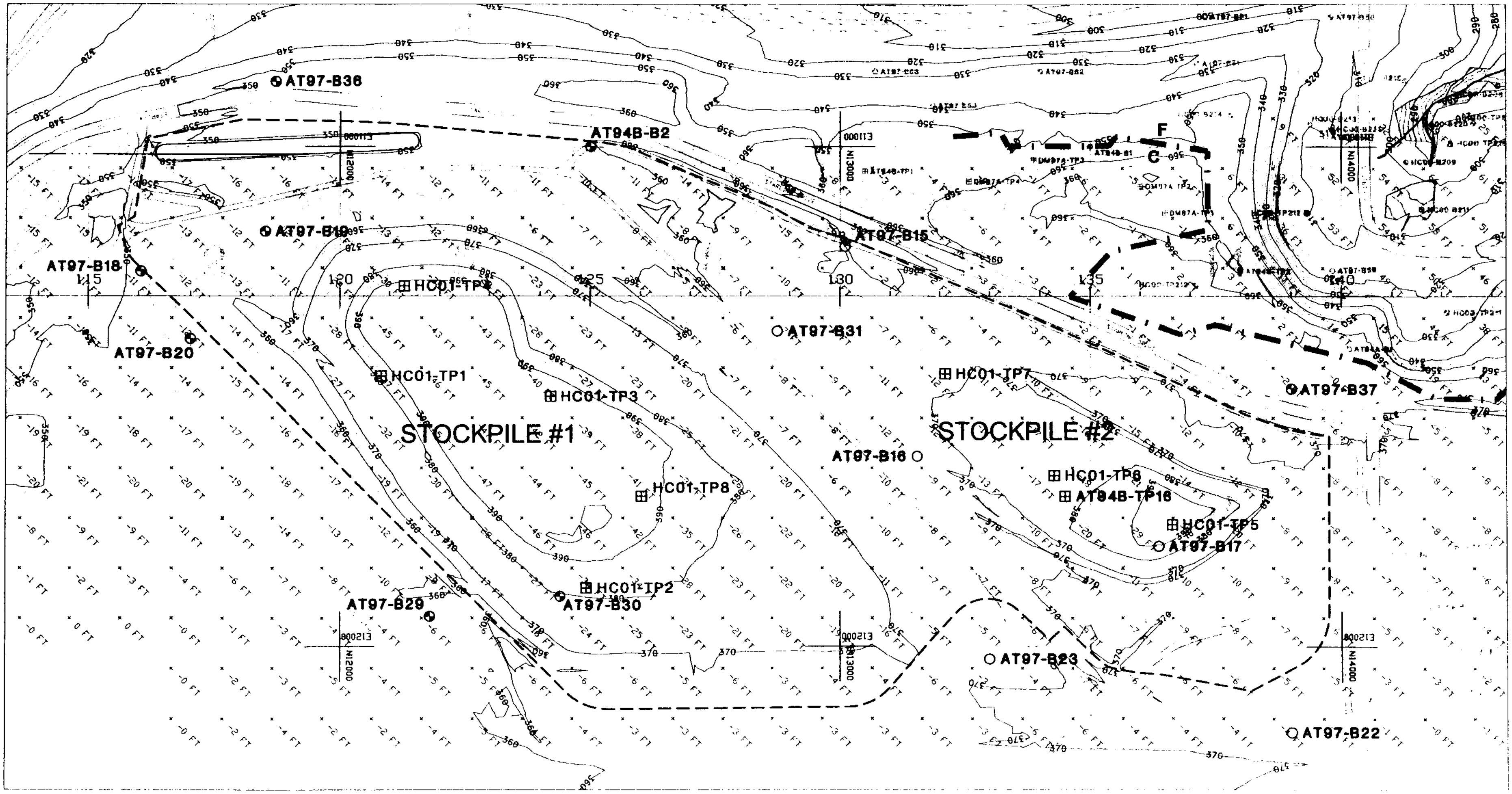
J-4978-28 8/01
Figure 5

RC 8/10/01 1=1 (xref) see dwg file/charlie.pc2
4978283O

Anticipated Excavation Plan

Work Area South 2



Note:
1) Base map prepared from drawing provided by HNTB entitled "X_Topo.dwg", dated April, 2001.
2) Negative number at node within work area limits indicates approximate depth of cut and positive number indicates approximate height of fill.

See reference list for explorations not included in this report.

F/C Limit of On-Site Cut and Fill

HC99-B80 Exploration Location and Designation

Anticipated Work Area Limit

N

0 200 400
Scale in Feet

HARTCROWSER
J-4978-28 9/01
Figure 6

DTN 9/21/01 1=1 (xref) see dwg file/charlie.pc2
4978283I

APPENDIX A
FIELD EXPLORATIONS METHODS AND ANALYSIS

APPENDIX A
FIELD EXPLORATIONS METHODS AND ANALYSIS

This appendix documents the processes Hart Crowser used in determining the nature of the soils underlying the project site addressed by this report. The discussion includes information on the following subjects:

- Explorations and Their Location;
- The Use of Auger Borings;
- Standard Penetration Test (SPT) Procedures;
- Use of Shelby Tubes;
- Drilling of Hand-Auger Holes;
- Excavation of Test Pits;
- The Use of Cone Penetrometer Probes;
- Hydraulic Conductivity Testing (Slug Test); and
- Water Level Measurement.

Subsequent to the field work described in this appendix, Hart Crowser obtained additional undisturbed (shelby tube) samples of clay, silt, and peat soils, and accomplished field vane shear tests in peat. Typically the shelby tube samples were obtained by drilling near previous boring locations and the new samples were labeled by appending a letter (such as "A" or "B") to the exploration number. In cases such as this a new exploration log was not produced for the report. Results of the field vane shear tests on peat are presented in Appendix D.

Explorations and Their Location

This appendix presents exploration data collected by Hart Crowser. Exploration logs generated by Applied Geotechnology, Inc. (AGI) and Dames & Moore are presented in Appendix C. This appendix includes the following subsurface explorations:

- Borings

HC99-B37 through HC99-B40, HC99-B75 through HC99-B80, HC00-B106 through HC00-B108, HC00-B110, HC00-B111, HC00-B113 through HC00-B134, HC00-B137 through HC00-B147, HC00-B221, HC00-B224, HC00-B300, HC00-B303, HC00-B305 through HC00-B307, HC01-B401 through HC01-B403.

- Hand Auger Explorations

  HC00-A100, HC00-A105, HC00-A109, HC00-A137, HC00-A143, HC00-A300, HC00-A301.

- Test Pits

  HC98-TP1 through HC98-TP12, HC99-TP1 through HC99-TP5, HC99-TP7, HC99-TP9, HC99-TP34, HC99-TP36, HC99-TP36A through HC99-TP36D, HC99-TP44, HC00-TP100 through HC00-TP108, HC00-TP110 through HC00-TP121, HC00-TP123 through HC00-TP129, HC00-TP133, HC00-TP134, HC00-TP137 through HC00-TP139, HC00-TP202, HC00-TP204, HC00-TP221, HC00-TP223, HC00-TP226, HC00-TP301 through HC00-TP305, HC00-TP308 through HC00-TP311, HC00-TP318, HC00-TP319.

- Cone Penetrometer Test Probes

  HC00-P22A, HC00-P22B, HC00-P23 through HC00-P26, HC00-P100, HC00-P104 through HC00-P108, HC00-P111 through HC00-P112, HC00-P114, HC00-P115, HC00-P118 through HC00-P120, HC00-P122, HC00-P123.

The exploration logs within Appendix A show our interpretation of the material encountered based on drilling (or excavation), sampling, and testing data. They indicate the depth where the soils change. Note that the change may be gradual. In the field, we classified the samples taken from the explorations according to the methods presented on Figure A-1 - Key to Exploration Logs. This figure also provides a legend explaining the symbols and abbreviations used in the logs.

Location of Explorations. Figures 2 and 3 show the location of explorations in Work Area West and Work Area South, respectively.

Locations for borings and test pits designated J-4978-06 were originally located by hand taping or pacing from existing physical features. The ground surface elevations at these locations were interpreted from the aerial survey topography provided by HNTB.

Locations for borings and test pits designated J-4978-16 were located using GPS survey by Hart Crowser on October 1, 1999. Port of Seattle surveyors performed x, y, z survey for all wells on October 13, 1999, which replaced the GPS locations. GPS coordinates were used for the test pits. The ground surface elevations of the test pits can be interpreted from the aerial survey topography.

Locations for borings and test pits designated J-4978-18, J-4978-21, J-4978-23, J-4978-26, J-4978-27, and J-4978-31 were located using a global positioning system (GPS) survey by Hart Crowser. Port of Seattle surveyors performed an x, y, z survey for the top of the casing elevations of the wells and ground surface elevations for piezocones, test pits, and some borings completed without wells. Where available, the Port's survey supersedes the GPS locations. Where Port survey data are not available, ground surface elevations were interpreted from aerial survey topography provided by HNTB.

The method used in the determination of their locations determines the accuracy of the location and elevation of the explorations.

The Use of Auger Borings

Hart Crowser performed 59 borings that are included in this report. The borings used a 3-3/8-inch inside diameter hollow-stem auger and were advanced with a truck-mounted drill rig subcontracted by Hart Crowser. The drilling was continuously observed by an engineering geologist from Hart Crowser. Detailed field logs were prepared of each boring. Using the Standard Penetration Test (SPT), we obtained samples at 2-1/2- to 5-foot-depth intervals.

Groundwater levels in the borings were noted at the time of drilling (ATD) and following installation and development of observation wells where noted on the boring logs and shown in Tables 1 and 3.

The borings logs are presented on Figures A-3 through A-61 at the end of this appendix.

Standard Penetration Test (SPT) Procedures

This test is an approximate measure of soil density and consistency. To be useful, the results must be used with engineering judgment in conjunction with other tests. The SPT (as described in ASTM D 1586) was used to obtain disturbed samples. This test employs a standard 2-inch outside diameter split-spoon sampler. Using a 140-pound hammer, free falling 30 inches, the sampler is driven into the soil for 18 inches. The number of blows (N value) required to drive the sampler the last 12 inches only is the Standard Penetration Resistance. This resistance, or blow count, measures the relative density of granular soils and the consistency of cohesive soils. The blow counts are plotted on the boring logs at their respective sample depths.

Soil samples are recovered from the split-barrel sampler, field classified, and placed into watertight jars. They are then taken to Hart Crowser's laboratory for further testing.

In the Event of Hard Driving

Occasionally, very dense materials or the presence of gravel and/or cobbles prevented driving the total 18-inch sample. When this happens, the penetration resistance is entered on logs as follows:

Penetration less than six inches. The log indicates the total number of blows over the number of inches of penetration.

Penetration greater than six inches. The blow count noted on the log is the sum of the total number of blows completed after the first 6 inches of penetration. This sum is expressed over the number of inches driven that exceed the first 6 inches. The number of blows needed to drive the first 6 inches is not reported. For example, a blow count series of 12 blows for 6 inches, 30 blows for 6 inches, and 50 (the maximum number of blows counted within a 6-inch increment for SPT) for 3 inches would be recorded as 80/9.

Use of Shelby Tubes

To obtain a relatively undisturbed sample for classification and testing in fine-grain soils, a 3-inch-diameter thin-walled steel (Shelby) tube sampler was pushed hydraulically below the auger in select borings. The tubes were sealed in the field and taken to our laboratory for extrusion and classification.

Drilling of Hand-Auger Holes

Hart Crowser engineering geologists drilled seven hand-auger borings using portable equipment. The geologists observed the soil in the hand-augered holes and reported the findings on a field log. Our geologists took representative samples of soil types for testing at Hart Crowser's laboratory. Groundwater levels during excavation of the holes were noted on the logs. The density/consistency of the soils (as presented parenthetically on the test pit logs to indicate their having been estimated) is based on visual observation only as disturbed soils cannot be measured for in-place density in the laboratory.

The hand-auger logs are presented on Figures A-62 through A-65.

Excavation of Test Pits

Seventy-five test pits were excavated across the site with a tractor-mounted backhoe. The sides of these excavated pits offer direct observation of the subgrade soils. The test pits were located by and excavated under the direction of an engineering geologist from Hart Crowser. The geologist observed the soil exposed in the test pits and reported the findings on a field log. Our geologist took representative samples of soil types for testing at Hart Crowser's laboratory. Groundwater levels or seepage during excavation were noted on the logs. The density/ consistency of the soils (as presented parenthetically on the test pit logs to indicate their having been estimated) is based on visual observation only, as disturbed soils cannot be measured for in-place density.

The test pit logs are presented on Figures A-66 through A-111.

Cone Penetration Test Procedures

The electric piezocone penetrometer test procedure involves hydraulically pushing a series of cylindrical rods into the soil at a constant rate of two centimeters per second and subsequently monitoring soil and pore fluid response near the conical tip. The cylindrical rod at the bottom of the drill string houses the pressure transducer and load cells which, during probing, measure the parameters indicated above. The results are often used with engineering judgment in conjunction with other tests, preferably the SPT procedure, which allows soil sample collection for direct comparison purposes. Tests were performed in general accordance with procedures outlined in ASTM D 3441, Standard Method for Deep, Quasi-Static, Cone and Friction-Cone Penetration Tests of Soil.

The cone system is mounted on a truck or bulldozer to provide the necessary reaction for the applied loads. The cone tip has a surface area of about 10 square centimeters (cm^2) and an angle of 30 degrees from the axis. The friction sleeve has a surface area of about 150 cm^2. Prior to testing, a plastic filter element, which has been saturated under vacuum in glycerin, is placed behind the cone tip. This filter element transmits pore pressures to the transducer. Load cells measure end resistance on the tip and frictional resistance on the friction sleeve. As the cone penetrates the soil, measurements are continuously recorded on a portable computer at depth increments of about 5 centimeters.

The classification method used to develop an interpreted soil profile is based on normalized parameters provided by the piezocone, as there are no soil samples collected with a penetrometer system of this type.

The relationship between the cone tip resistance and friction ratio, which has been normalized for soil overburden stresses, can be established to predict soil behavior (Jeffries and Davies 1991 and 1993). This relationship has been applied to the soil classification chart developed by Robertson as reported in Lunne et al. 1997 (refer to Figure A-2) according to the following equation:

$$I_C = \sqrt{\{3 - \log[Q \cdot (1 - B_q)]\}^2 + [1.5 + 1.3 \cdot \log(F)]^2}$$

Where,

Ic = Soil behavior index

Q = Normalized cone tip resistance

$$Q = \frac{q_T - \sigma_{vo}}{\sigma'_{vo}}$$

q_T = Corrected cone tip resistance

σ_{VO} = Total overburden stress

σ'_{VO} = Effective overburdens stress

B_q = Normalized pore pressure

$$B_q = \frac{\Delta u}{q_T - \sigma_{vo}}$$

F = Normalized friction ratio

$$R_f = \frac{f_s}{q_T - \sigma_{vo}} \cdot 100\%$$

f_s = Sleeve friction

Hydraulic Conductivity Testing (Slug Testing)

Hydraulic conductivity testing was performed using the slug test method. In this method the water level (hydraulic head) in the well is rapidly raised or lowered, and the rate at which it returns to its initial state is used to calculate hydraulic conductivity for the formation surrounding the wellscreen. Data were collected using an Aquistar data logger in conjunction with a Instrumentation Northwest PSI9000 pressure transducer. Tests were conducted as follows:

- A transducer was set in the well and allowed to equilibrate with ambient conditions, and background water level data were collected.
- One or two slug rods (solid PVC rods) were rapidly introduced into the well (causing a near-instantaneous rise in water level), to initiate a falling head test. Water level data were collected in logarithmically increasing time increments using the data logger and transducer. For wells where depth to water was small, a falling head test was not attempted.
- Water level in the well was allowed to re-equilibrate.
- The slug rod or rods were rapidly pulled from the well (causing a near-instantaneous drop in water level) to initiate a rising head test. Water level data were collected in logarithmically increasing time increments using the data logger and transducer.
- Most of the wells responded reasonably quickly, and therefore multiple slug tests were performed for most wells.

Data were pre-processed as described in Butler (1998), and hydraulic conductivity values were estimated using the method of Bouwer and Rice (1976) for unconfined aquifers. The estimated values are summarized in Table 2.

Water Level Measurement

Water levels were measured using a Solinst water level probe, graduated in 0.01-foot increments. Depth to water was measured below the top of casing, and recorded to the nearest hundredth of a foot. Depth to water was converted to groundwater elevation using survey information for the top of casing in the wells. Depth to water data and groundwater elevations are summarized in Table 1 and 2.

References for Appendix A

Bouwer, H., and R.C. Rice 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, Vol. 12, No. 3, pp. 423-428.

Butler, J.J. 1998. The design performance and analysis of slug tests. Publisher: Lewis, Boca Raton, Florida.

Jeffries, Michael G., and Michael P. Davies 1991. Soil classification by the cone penetrometer test: Discussion, Can. Geotech. J. 28, 173-176.

Jeffries, Michael G., and Michael P. Davies 1993. Use of CPTu to Estimate Equivalent SPT N_{60}. Geotechnical Testing Journal. GTJODJ, Vol. 16, No. 4, 458-468.

Lunne, T. P.K. Robertson, and J.J.M. Powell 1997. Cone Penetration Testing in Geotechnical Practice, Blackie Academic and Professional, London.

F:\docs\jobs\497828\Phase5Data(rpt).doc

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

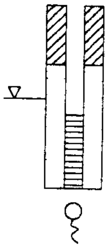
BORING SAMPLES

☒	Split Spoon
⧅	Shelby Tube
▥	Cuttings
◫	Core Run
*	No Sample Recovery
P	Tube Pushed, Not Driven

TEST PIT SAMPLES

☒	Grab (Jar)
⧄	Bag
⧅	Shelby Tube

Groundwater Observations



Surface Seal

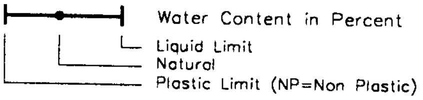
Groundwater Level on Date
(ATD) At Time of Drilling

Observation Well Tip or Slotted Section

Groundwater Seepage
(Test Pits)

Test Symbols

GS	Grain Size Classification
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits



PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	*In Situ* Density Test

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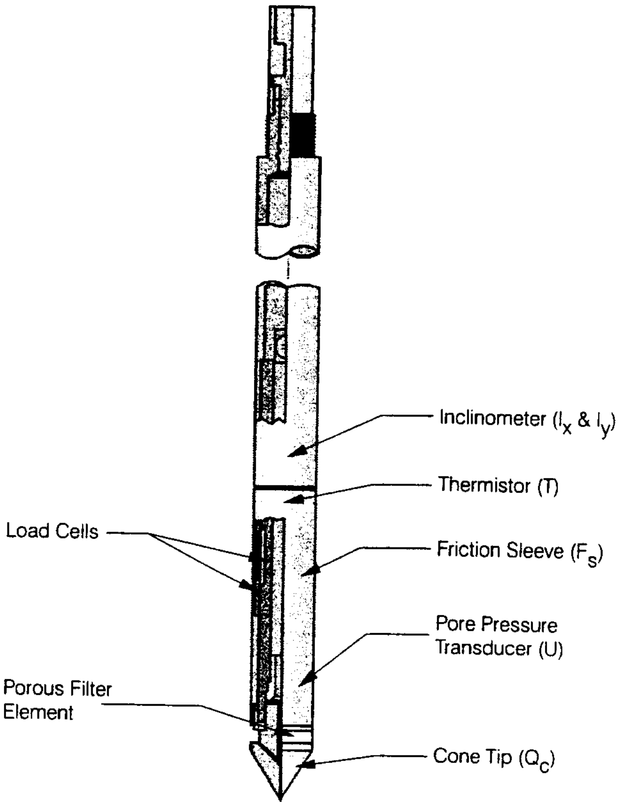
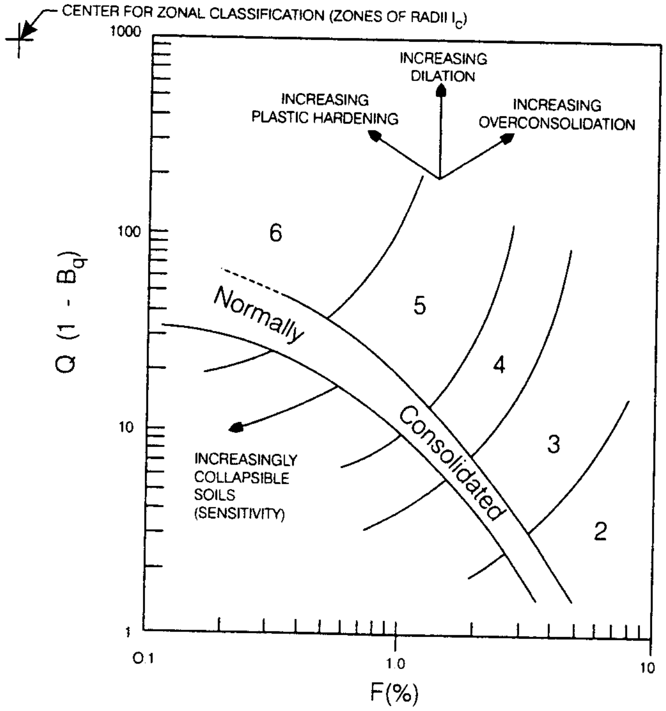
Figure A-1

Electric (Piezocone) Cone Penetrometer

Schematic of Electric Piezocone (Typical)



Simplified Classification Chart (Jefferies and Davies, 1993 after Lunne et al., 1990)



Zone	Soil Behavior Type
1	sensitive fine grained
2	organic soils - peats
3	clays - clay to silty clay
4	silt mixtures - clayey silt to silty clay
5	sand mixtures - silty sand to sandy silt
6	sands - clean sand to silty sand

$$Q = \frac{q_T - F_{VO}}{F'_{VO}}$$

$$B_q = \frac{u - u_o}{q_T - F_{VO}}$$

$$F = \frac{f_s'}{q_T - F_{VO}} X\ 100\%$$

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J-4978-28 *8/01*

Figure A-2

Boring Log HC99-B37

N 18,014, E 11,020

Soil Descriptions

Ground Surface Elevation in Feet: 234.55

(Loose) to medium dense, wet, dark brown, slightly gravelly, very silty SAND.

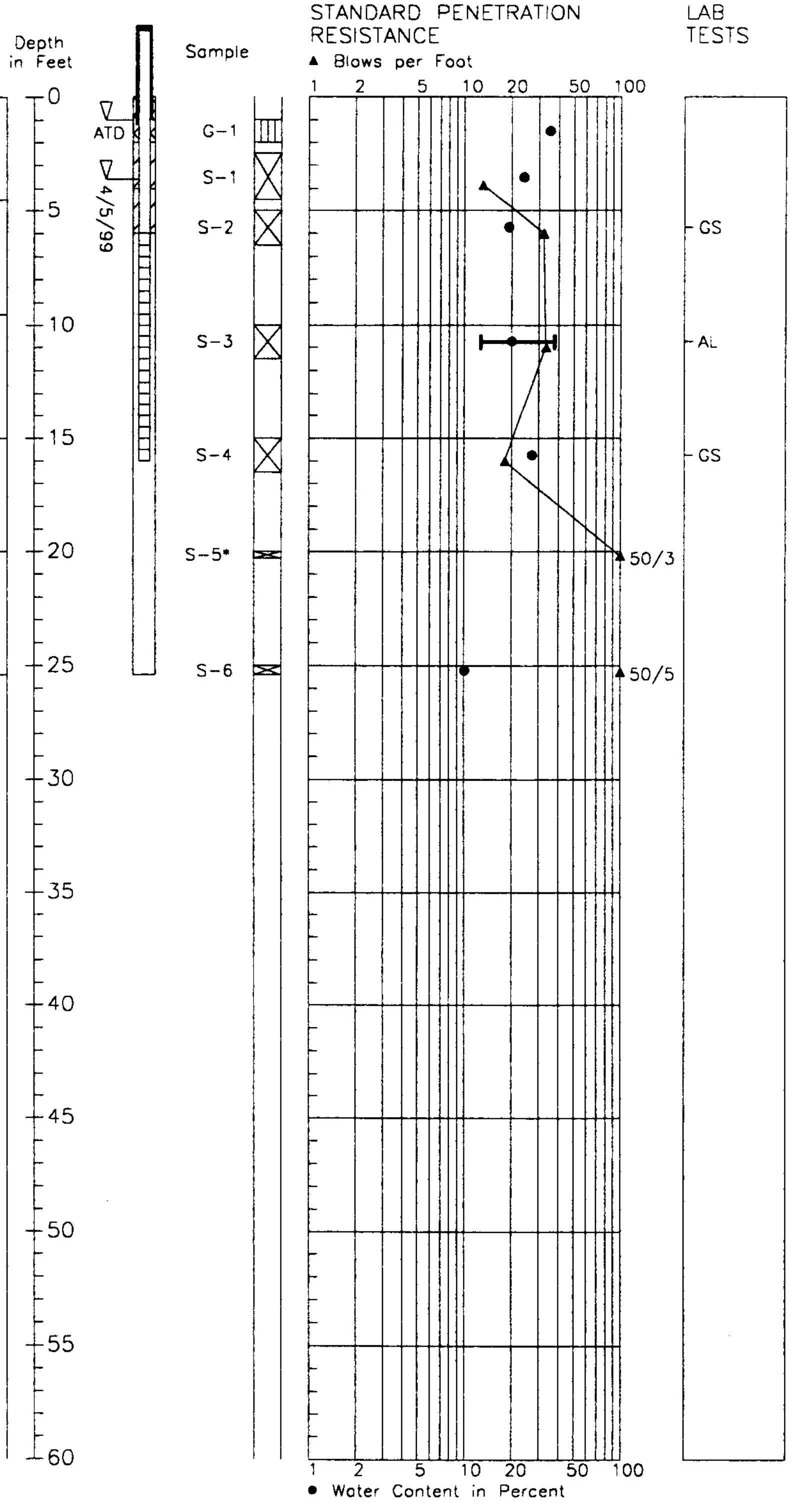
Dense, wet, gray, silty, fine to medium SAND.

Very stiff, moist, dark brown to gray, sandy, clayey PEAT.

Very stiff, moist, gray, slightly gravelly, very sandy SILT.

Very dense, moist, gray, slightly gravelly, very silty SAND.

Bottom of Boring at 25.4 Feet.
Completed 2/22/99.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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4978\LOGS\99 BORINGS

HARTCROWSER

J-4978-06 2/99
Figure A-3

Boring Log HC99-B38

N 18,012, E 10,819

Soil Descriptions

Ground Surface Elevation in Feet: 227.58

(Loose), moist, brown, silty SAND.

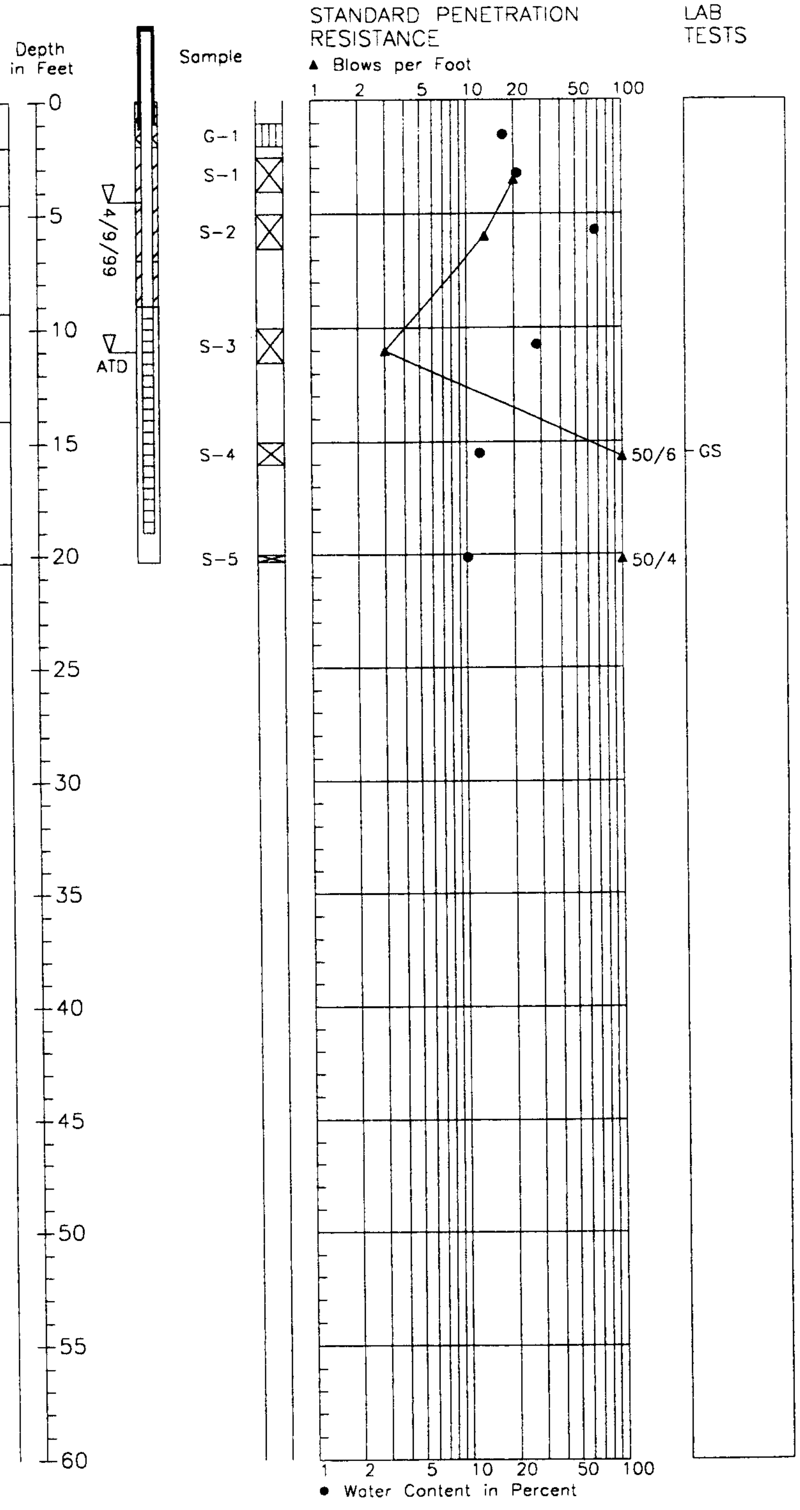
Medium dense, moist, gray, very silty SAND.

Stiff, moist, dark brown, sandy PEAT with occasional wood debris.

Soft, moist, gray, slightly sandy SILT with occasional wood debris.

Very dense, moist to wet, gray, slightly gravelly, silty SAND.

Bottom of Boring at 20.3 Feet.
Completed 2/22/99.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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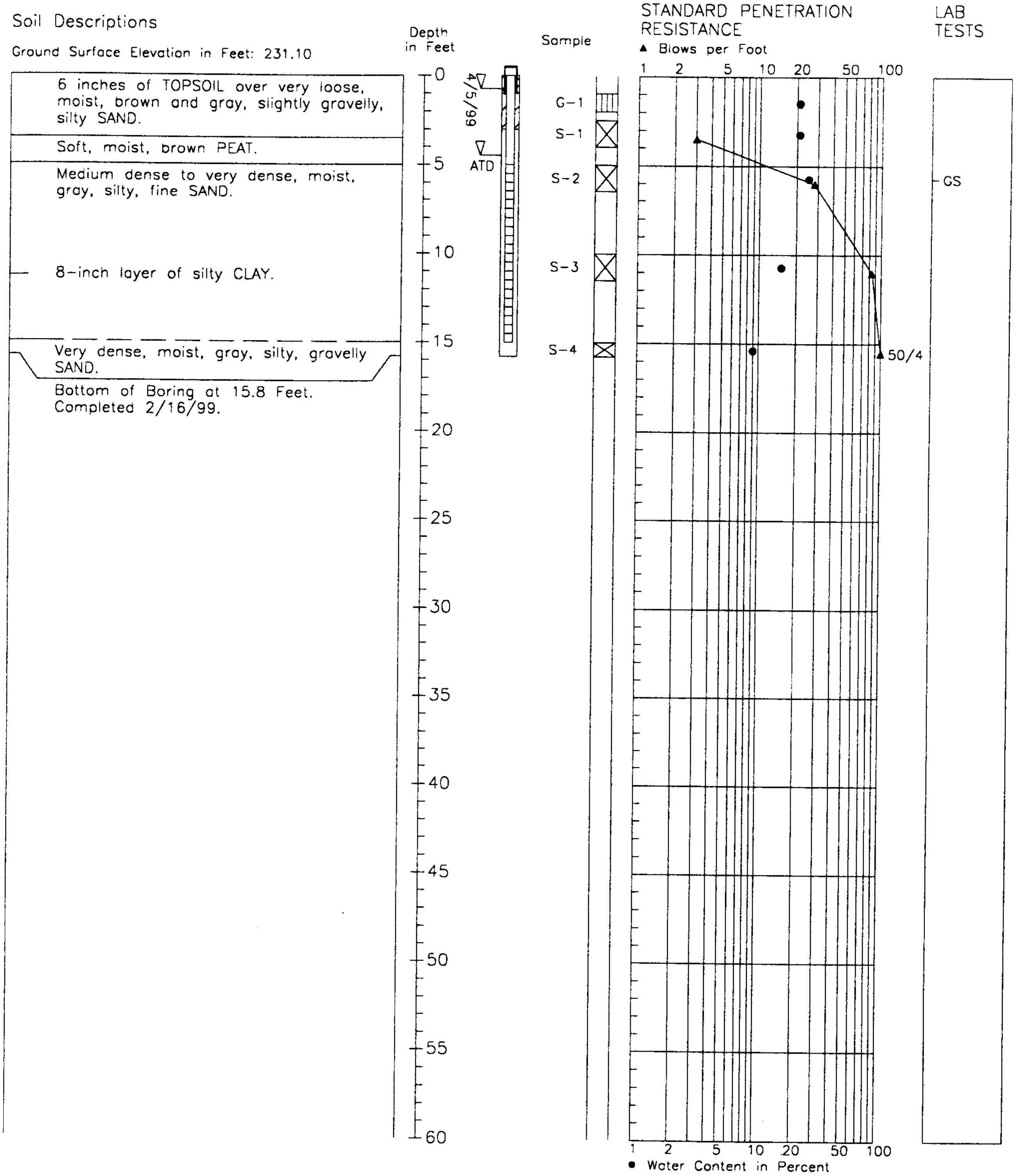
J-4978-06 **6/01**

Figure A-4

Boring Log HC99-B39

N 18,174, E 10,722



Soil Descriptions

Ground Surface Elevation in Feet: 231.10

6 inches of TOPSOIL over very loose, moist, brown and gray, slightly gravelly, silty SAND.

Soft, moist, brown PEAT.

Medium dense to very dense, moist, gray, silty, fine SAND.

8-inch layer of silty CLAY.

Very dense, moist, gray, silty, gravelly SAND.

Bottom of Boring at 15.8 Feet.
Completed 2/16/99.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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4978\LOGS\99 BORINGS

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J-4978-06 6/01

Figure A-5

Boring Log HC99-B40

N 18,285 E 11,026

Soil Descriptions

Ground Surface Elevation in Feet: 248.63

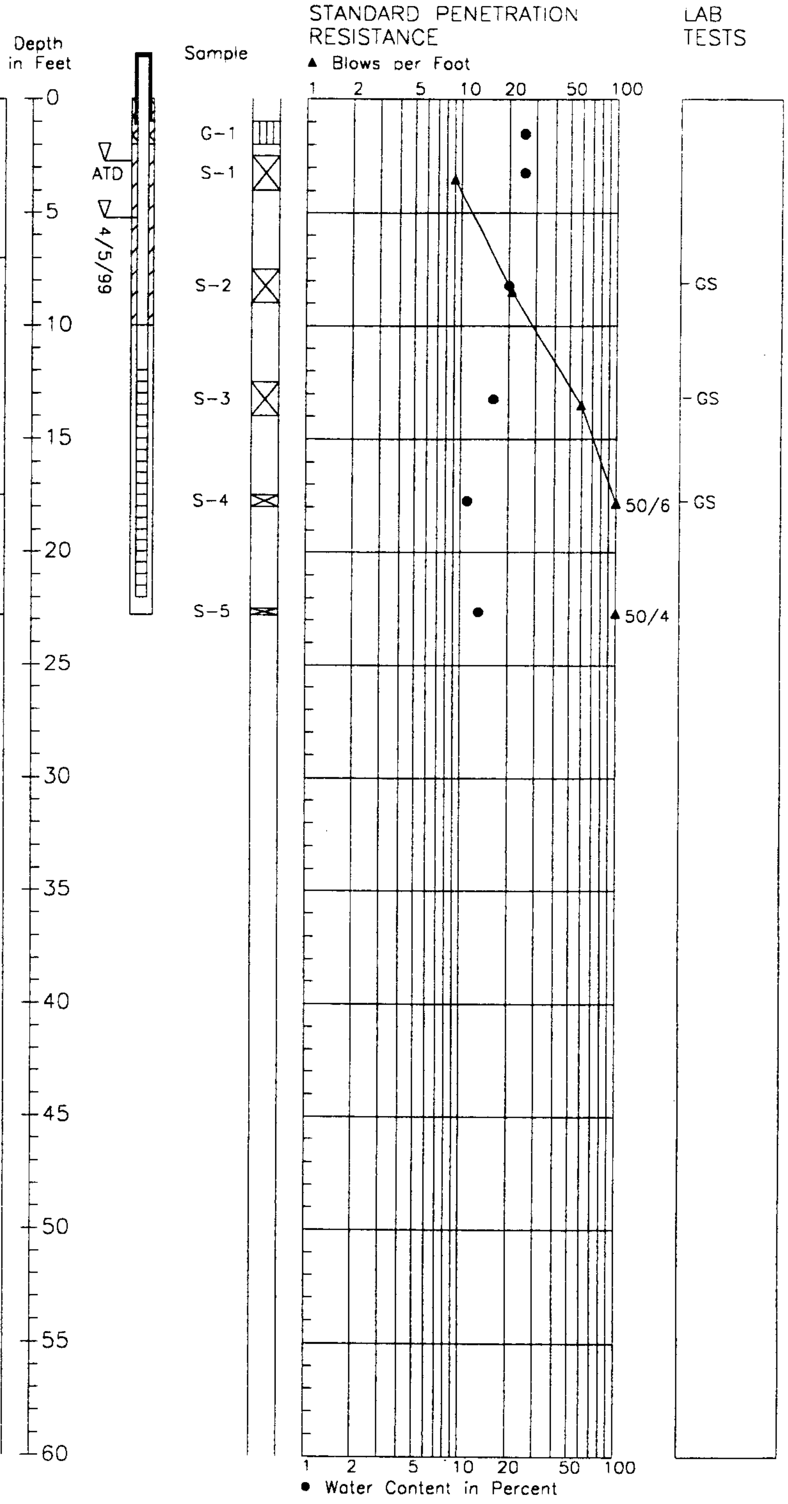
Loose, wet, dark brown, slightly gravelly, silty SAND.

Medium dense to very dense, wet, gray, slightly gravelly, silty SAND.

Cobbly drill action.

Very dense, moist, gray, very silty, fine SAND.

Bottom of Boring at 22.8 Feet.
Completed 2/9/99.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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J-4978-06 **2/99**

Figure A-6

Boring Log HC99-B75

N 19310 E 11020

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 284

3 inches of Asphalt over loose, wet, gray to brown, slightly gravelly SAND.

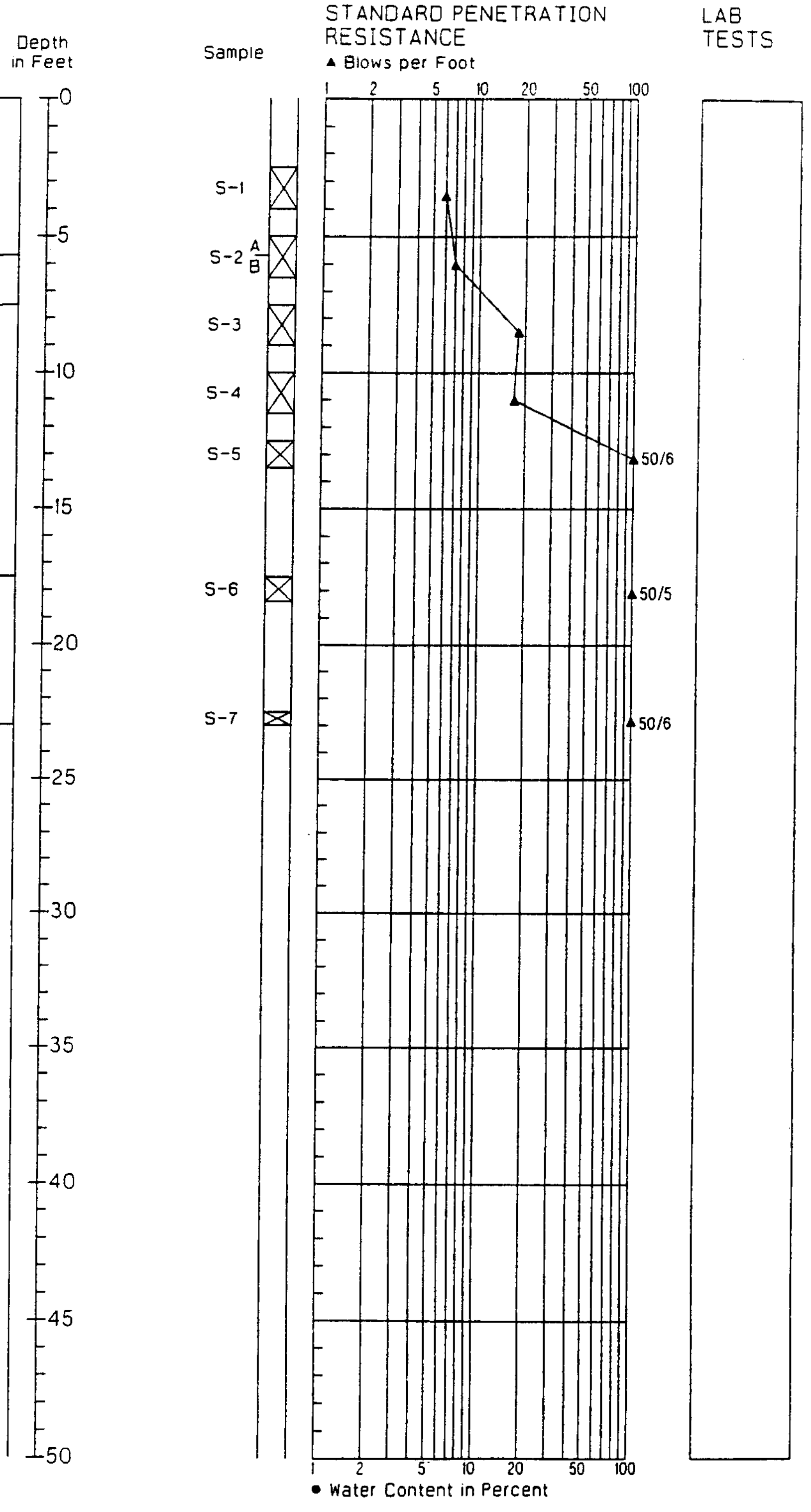
Petroleum-like odor.

Medium stiff, moist, gray to green, sandy SILT.

Medium dense to dense, wet, brown to gray, slightly silty, gravelly SAND.

Very dense, moist, gray, silty, fine SAND with trace gravel.

Bottom of Boring at 23.0 Feet.
Completed 6/4/99.



1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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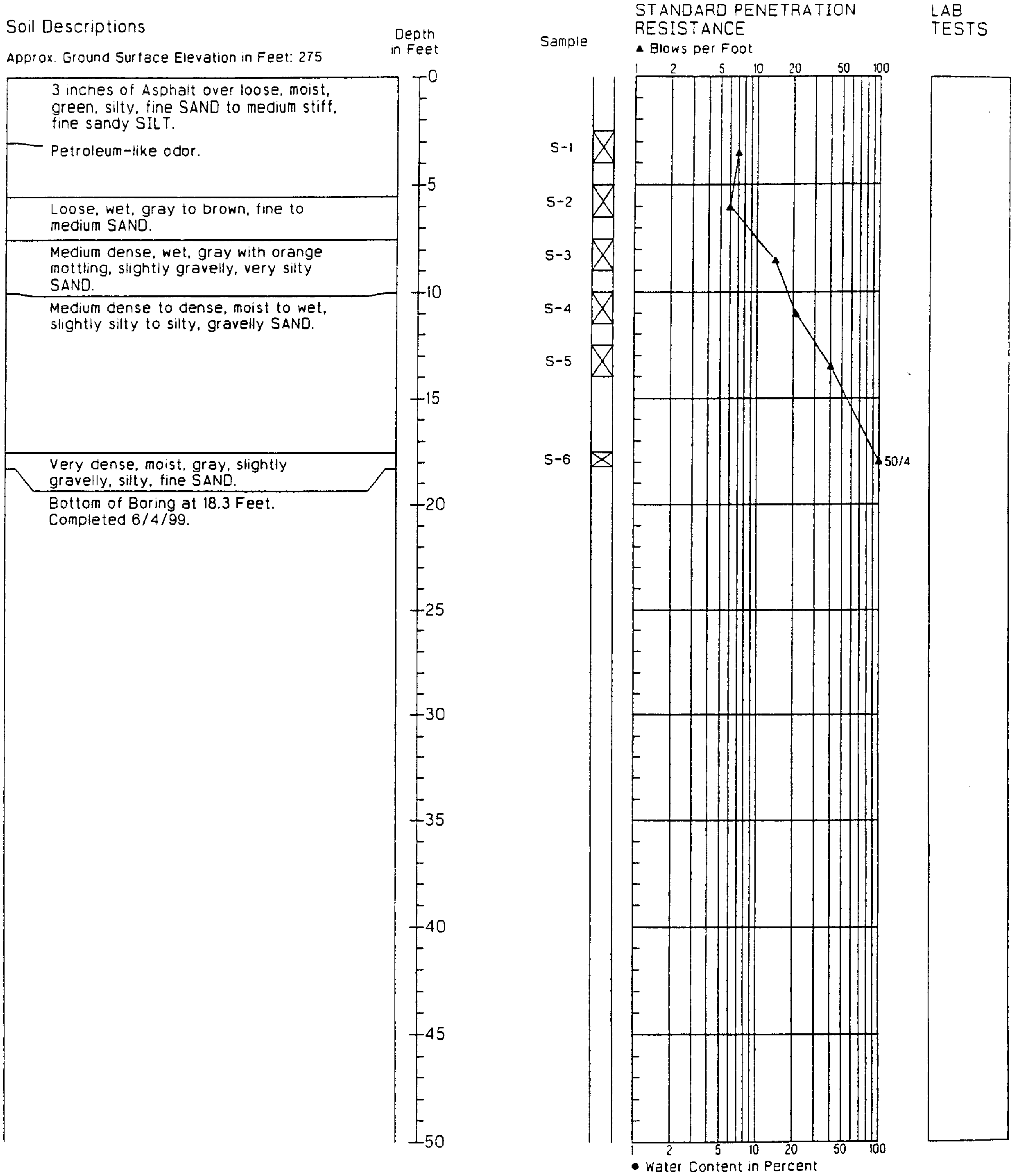
J-4978-07 6/99

Figure A-7

Boring Log HC99-B76

N 19311 E 10918



Soil Descriptions

Approx. Ground Surface Elevation in Feet: 275

3 inches of Asphalt over loose, moist, green, silty, fine SAND to medium stiff, fine sandy SILT.

Petroleum-like odor.

Loose, wet, gray to brown, fine to medium SAND.

Medium dense, wet, gray with orange mottling, slightly gravelly, very silty SAND.

Medium dense to dense, moist to wet, slightly silty to silty, gravelly SAND.

Very dense, moist, gray, slightly gravelly, silty, fine SAND.

Bottom of Boring at 18.3 Feet.
Completed 6/4/99.

1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-07 6/99

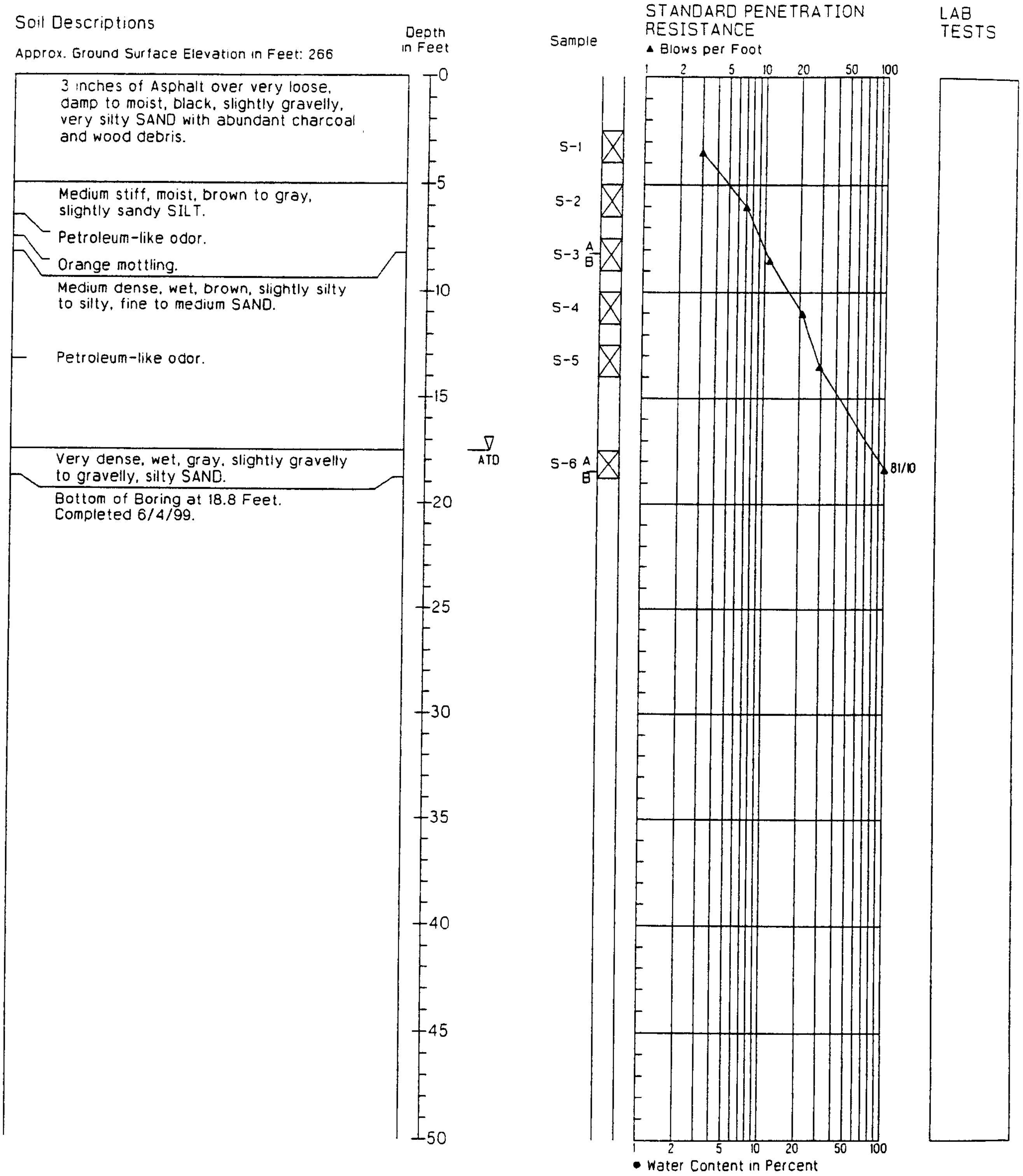
Figure A-8

Boring Log HC99-B77

N 19312 E 10816

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 266



3 inches of Asphalt over very loose, damp to moist, black, slightly gravelly, very silty SAND with abundant charcoal and wood debris.

Medium stiff, moist, brown to gray, slightly sandy SILT.

Petroleum-like odor.

Orange mottling.

Medium dense, wet, brown, slightly silty to silty, fine to medium SAND.

Petroleum-like odor.

Very dense, wet, gray, slightly gravelly to gravelly, silty SAND.

Bottom of Boring at 18.8 Feet.
Completed 6/4/99.

1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-07 **6/99**

Figure A-9

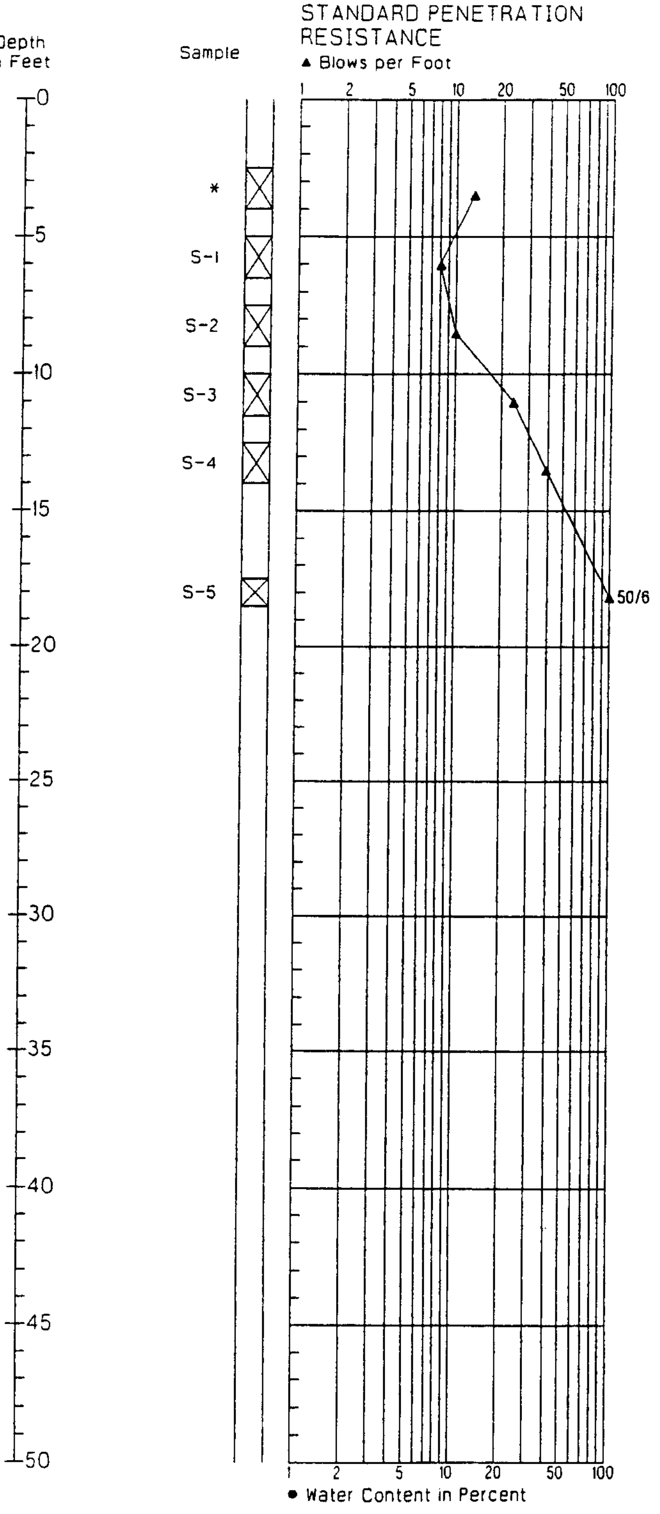
Boring Log HC99-B78

N 19311 E 10743

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 262

	Depth in Feet
3 inches of Asphalt over loose to medium dense, moist, black, silty SAND to medium stiff, sandy SILT with scattered wood and organics.	0
Stiff, moist, blue to green SILT with scattered wood fragments.	
Medium dense to dense, wet, blue-gray, silty to very silty, medium to coarse SAND with scattered organics.	10
Very dense, moist, gray, slightly gravelly, silty, fine SAND.	
Bottom of Boring at 18.5 Feet. Completed 6/4/99.	20



LAB TESTS

1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-07 **6/99**

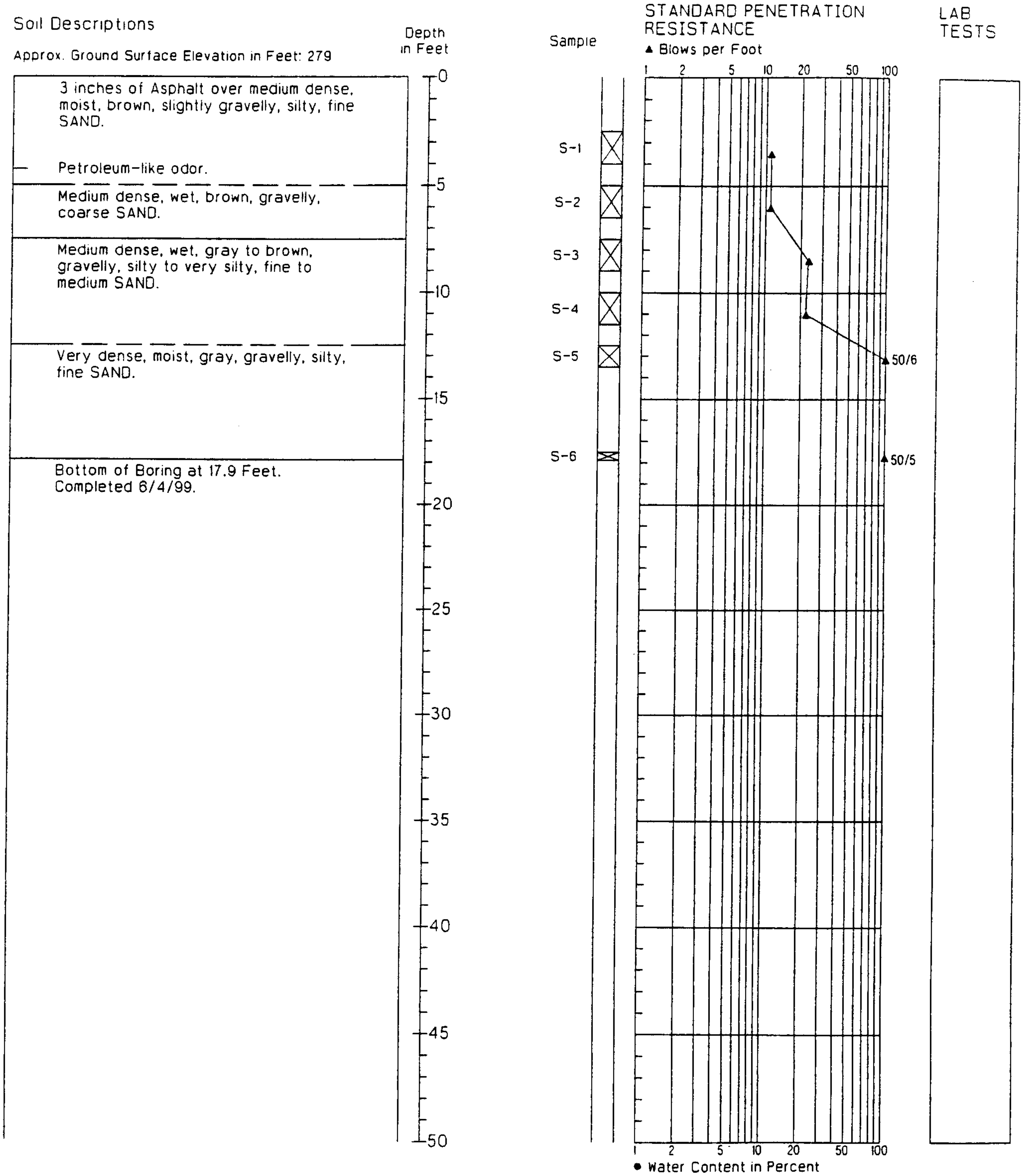
Figure A-10

Boring Log HC99-B79

N 19309 E 10961

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 279



3 inches of Asphalt over medium dense, moist, brown, slightly gravelly, silty, fine SAND.

Petroleum-like odor.

Medium dense, wet, brown, gravelly, coarse SAND.

Medium dense, wet, gray to brown, gravelly, silty to very silty, fine to medium SAND.

Very dense, moist, gray, gravelly, silty, fine SAND.

Bottom of Boring at 17.9 Feet.
Completed 6/4/99.

1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-4978-07 6/99
Figure A-11

Boring Log HC99-B80

N 19311 E 10996

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 282

3 inches of Asphalt over very loose to loose, wet, black, slightly gravelly, silty SAND with scattered charcoal and wood fragments.

Petroleum-like odor.

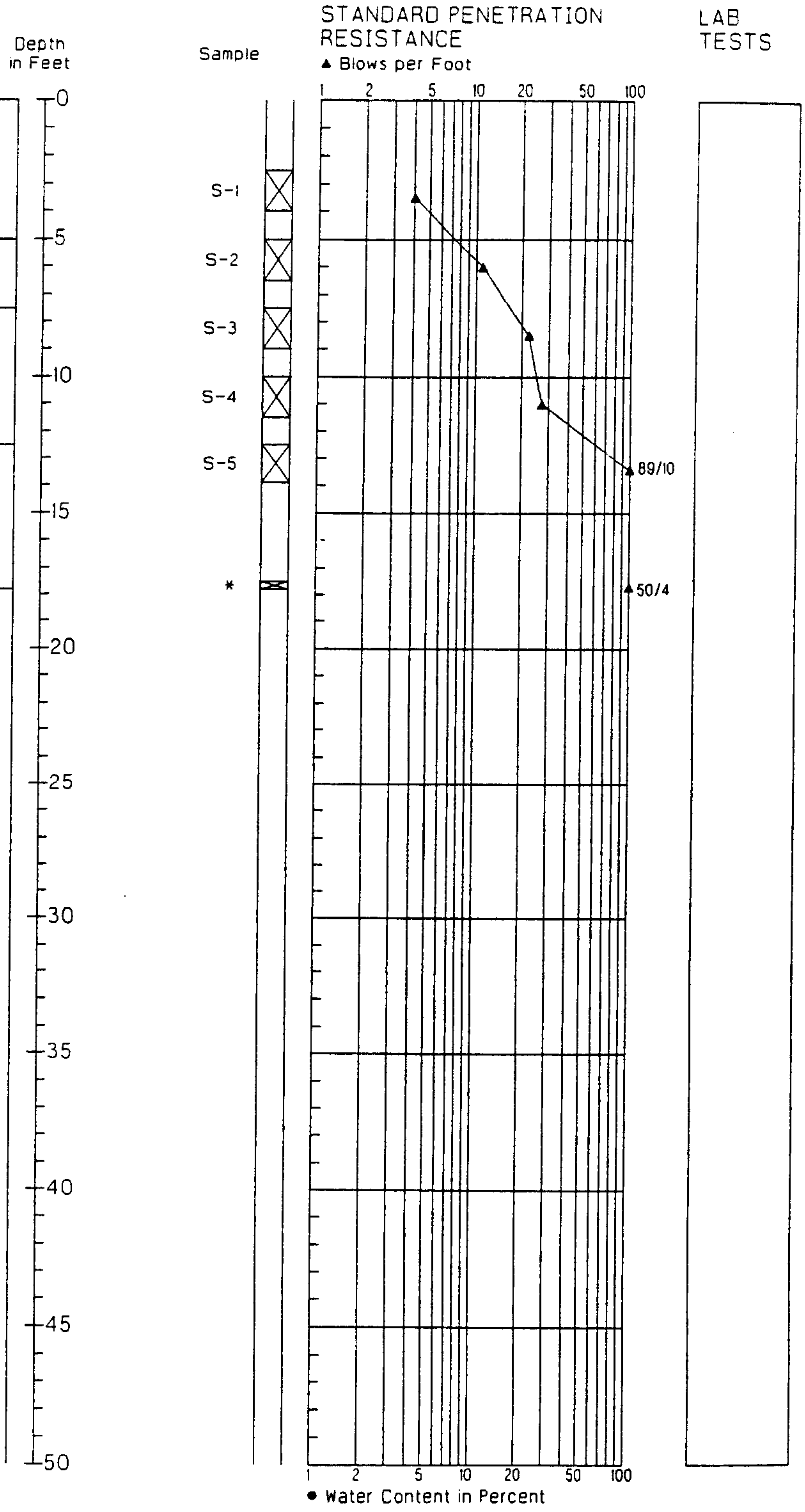
Stiff, moist, gray with brown mottling, slightly gravelly, sandy SILT with scattered organics and trace wood.

Medium dense, wet, brown to gray, slightly gravelly to gravelly, silty to very silty SAND.

Petroleum-like odor in S-3 and S-4.

Very dense, moist to wet, gray, slightly gravelly to gravelly, silty SAND.

Bottom of Boring at 17.8 Feet.
Completed 6/4/99.



1. Refer to Figure A-1A for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-4978-07 **6/99**
Figure A-12

Boring Log HC00-B106

N 17284

E 10878

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 314
Top of Casing Elevation in Feet: 315.81

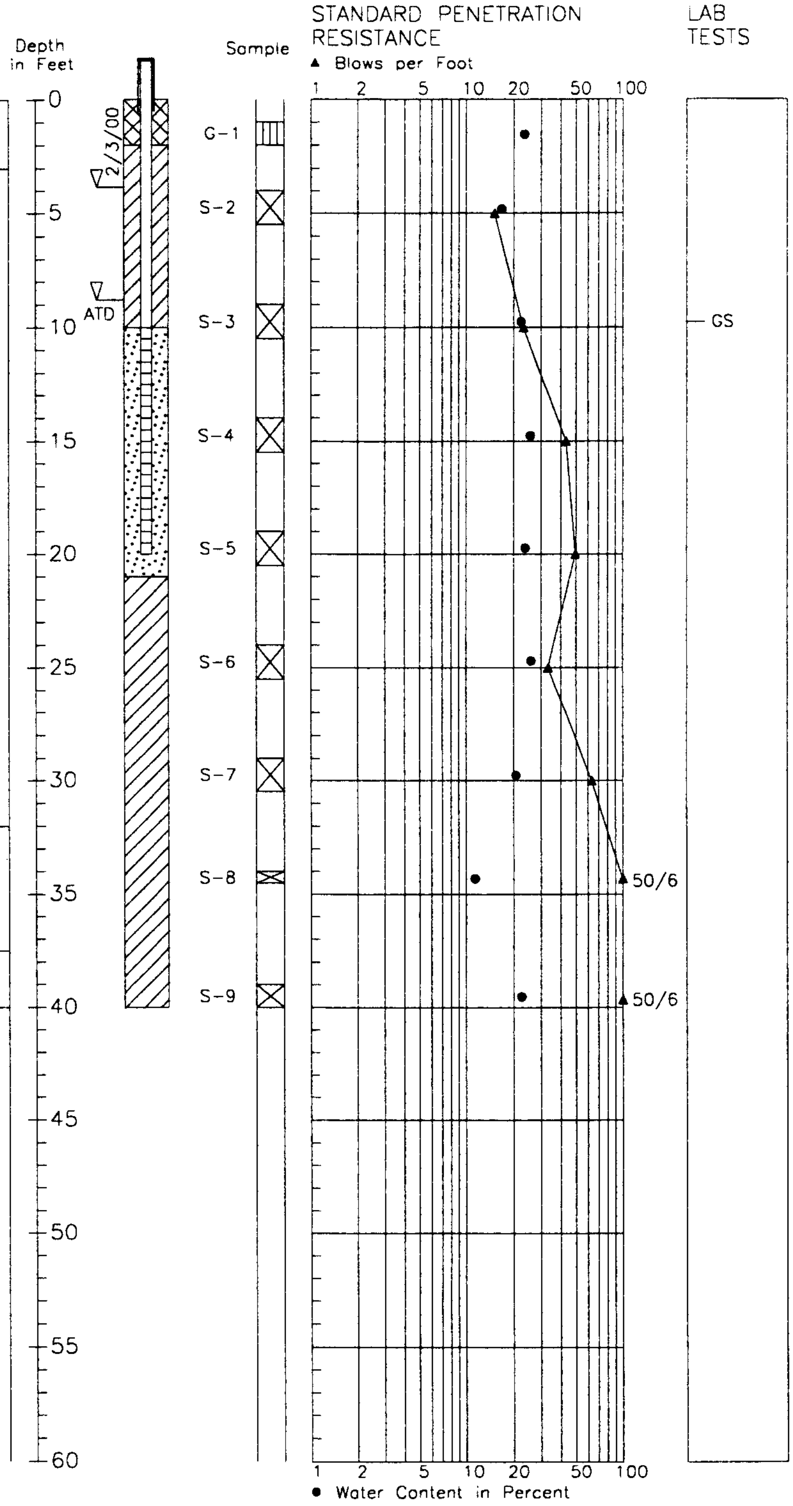
Loose, wet, brown, silty SAND with trace organic material.

Medium dense to very dense, wet, brown gray, non-silty to silty SAND.

Very dense, wet, gray, slightly gravelly, very silty SAND.

Hard, moist, gray SILT.

Bottom of Boring at 40.0 Feet.
Completed 2/3/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

rel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-13

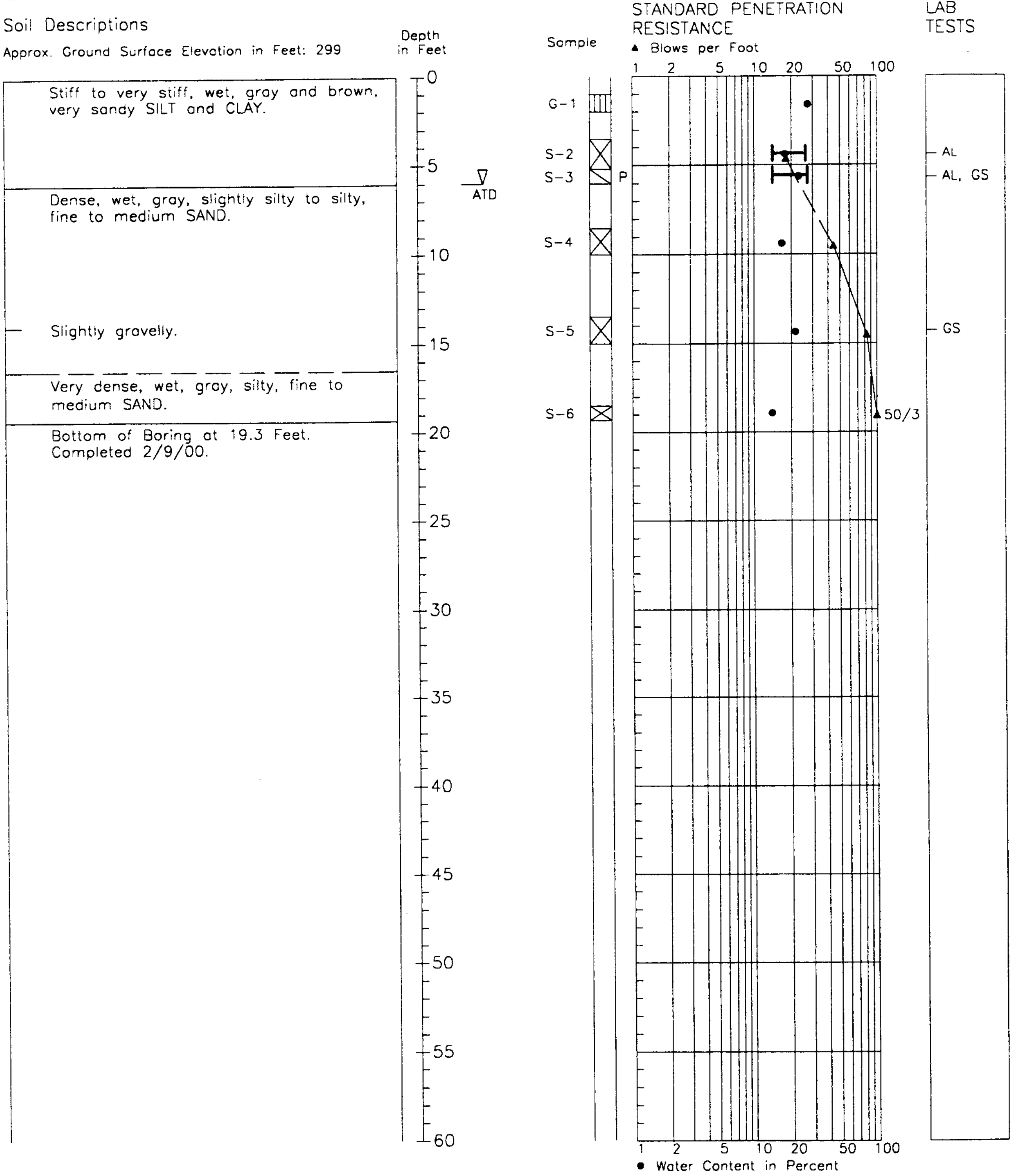
Boring Log HC00-B107

N 17398

E 10953

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 299



Stiff to very stiff, wet, gray and brown, very sandy SILT and CLAY.

Dense, wet, gray, slightly silty to silty, fine to medium SAND.

Slightly gravelly.

Very dense, wet, gray, silty, fine to medium SAND.

Bottom of Boring at 19.3 Feet.
Completed 2/9/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-14

Boring Log HC00-B108

N 17407

E 11067

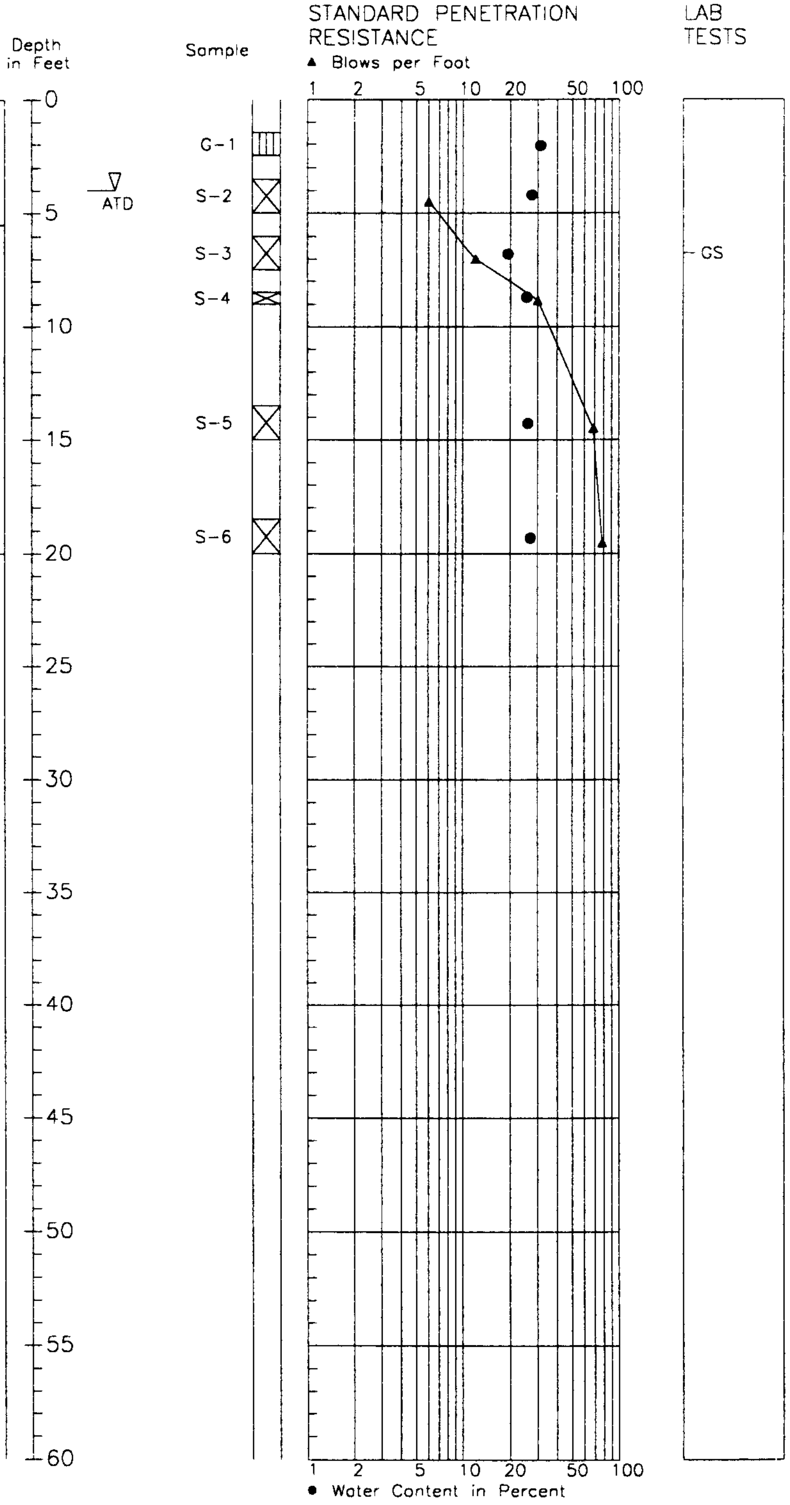
Soil Descriptions

Approx. Ground Surface Elevation in Feet: 295

Loose, wet, dark brown to brown, silty SAND with wood and organic material.

Medium dense to very dense, wet, gray, slightly silty, gravelly SAND, and slightly silty SAND.

Bottom of Boring at 20.0 Feet.
Completed 2/9/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

nel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-15

Boring Log HC00-B110

N 17422

E 10895

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 298

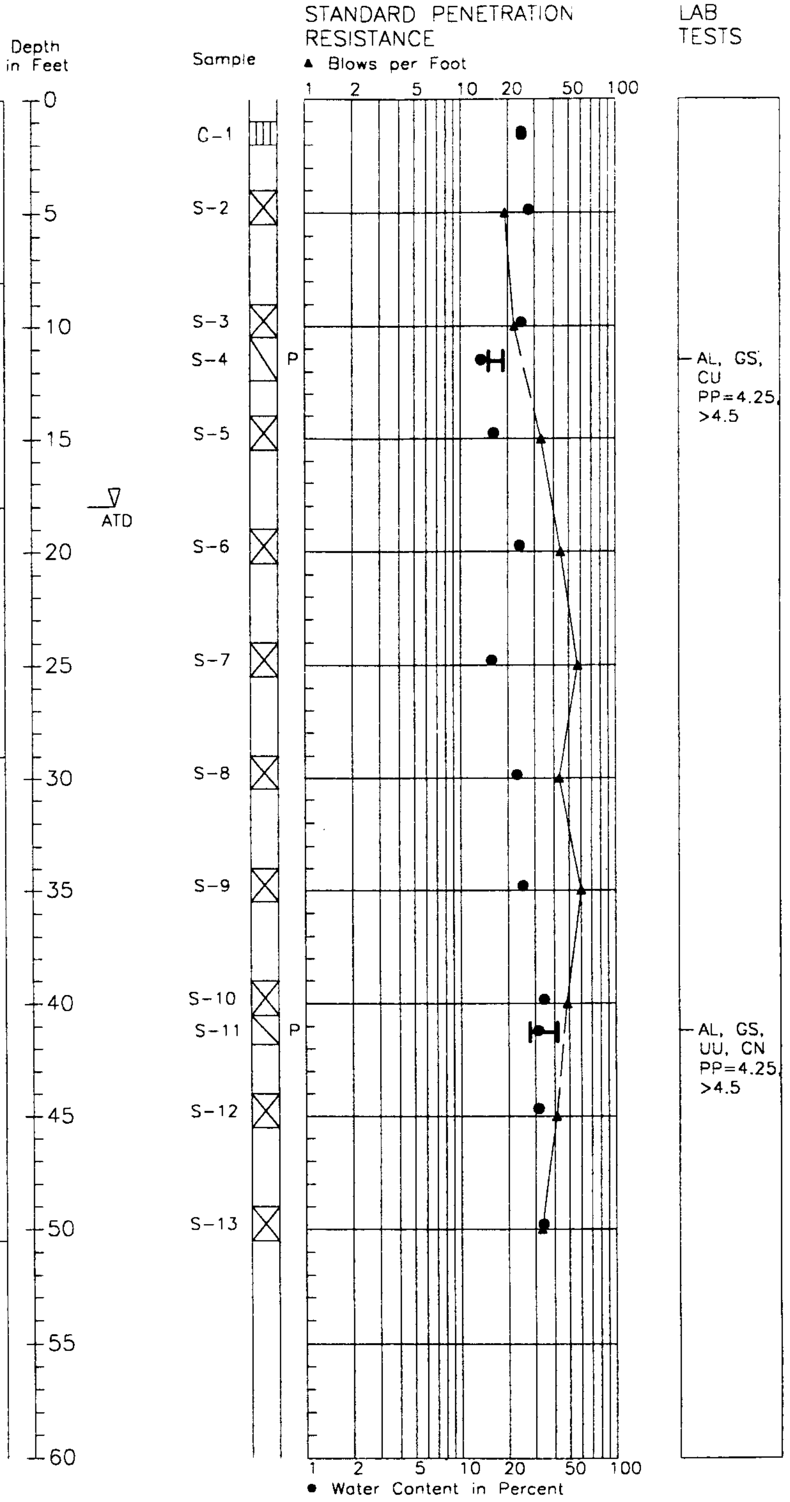
Loose to medium dense, moist to wet, brown to gray and brown mottled, silty SAND with silt layers.

Very stiff to hard, moist to wet, gray, slightly gravelly, slightly sandy to sandy SILT and CLAY.

Dense to very dense, wet, gray, slightly gravelly, non-silty to silty SAND.

Hard, moist to wet, gray, very clayey SILT, layered with occasional shear zones.

Bottom of Boring at 50.5 Feet. Completed 2/9/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-16

Boring Log HC00-B111

N 17617

E 11163

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 285
Top of Casing Elevation in Feet: 286.06

Loose, wet, brown, silty SAND.

Stiff, wet, brown and gray mottled, slightly sandy, clayey SILT.

Medium dense, wet, gray, slightly gravelly, silty SAND.

Medium dense, wet, gray, slightly clayey, gravelly, very silty SAND.

Hard, moist to wet, gray, very clayey SILT with layered sand and silt zones.

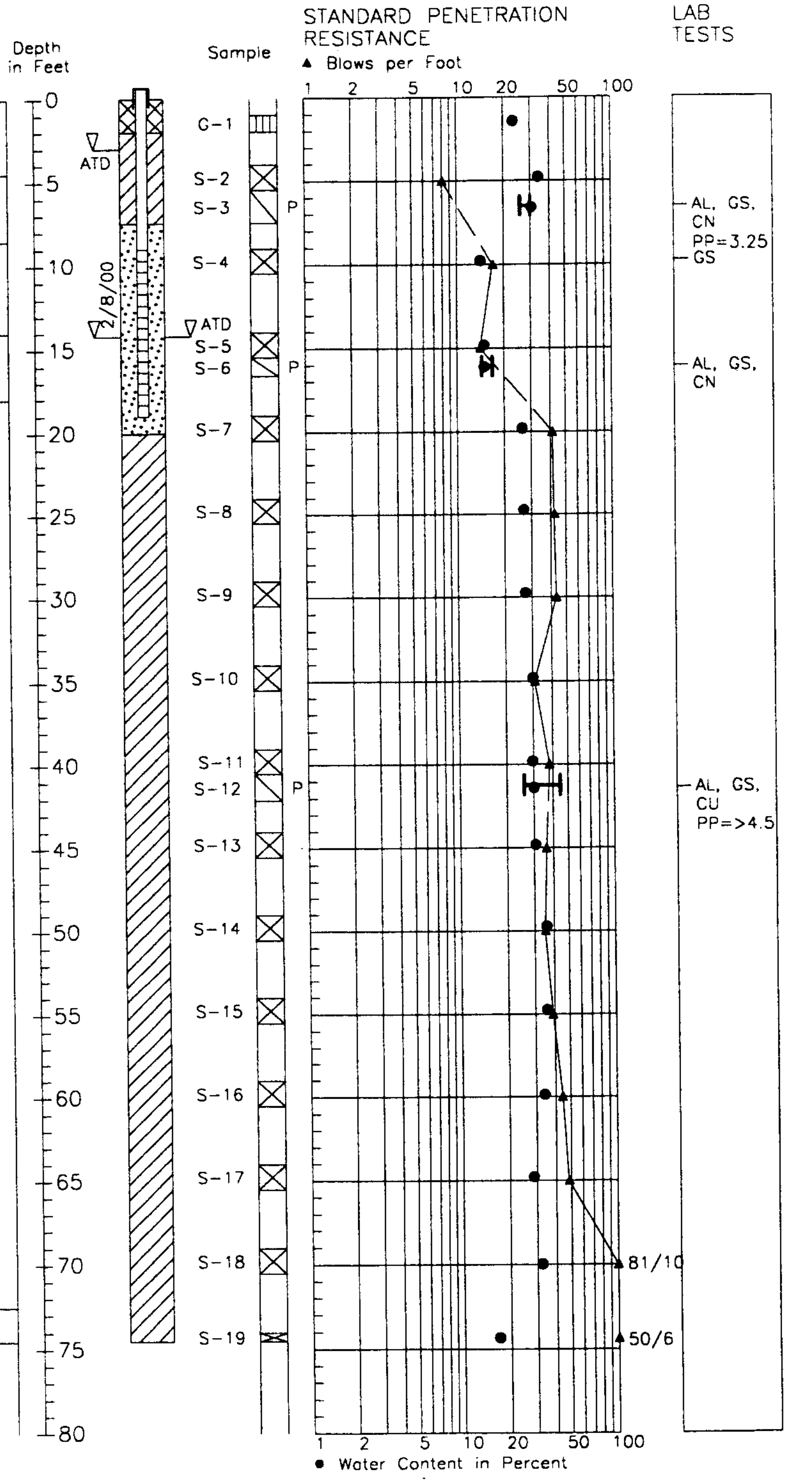
— Shear zone noted.

— Shear zone noted.

— Shear sone noted.

Very dense, wet, gray, silty SAND.

Bottom of Boring at 74.5 Feet.
Completed 2/1/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

497821 LOGS hel 7/30/01 1=1

HARTCROWSER
J-4978-21 2/00
Figure A-17

Boring Log HC00-B113

N 17607

E 10945

Soil Descriptions

Ground Surface Elevation in Feet: 285

(Loose), moist, brown, slightly gravelly, fine to medium SAND.

Very stiff, wet, brown and gray, sandy SILT.

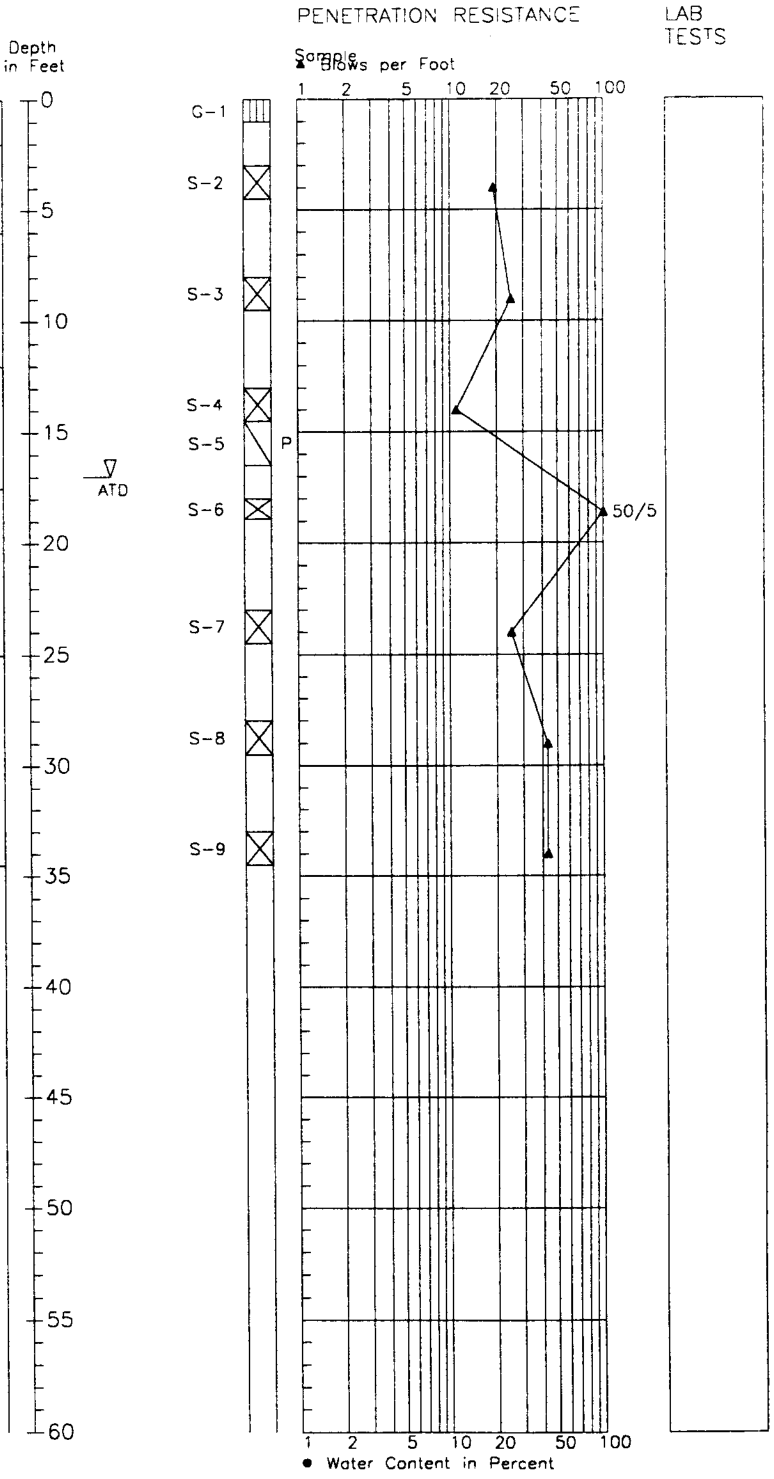
Medium dense, wet, brown, silty, fine to medium SAND with slightly silty SAND and sandy SILT layers.

Stiff, wet, brown with orange mottling SILT.

Medium dense to very dense, moist, gray-brown, silty to very silty SAND. (TILL)

Hard, moist, gray SILT layered with fissured CLAY.

Bottom of Boring at 34.5 Feet. Completed 3/23/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-18

Boring Log HC00-B114

N 18122

E 10953

Soil Descriptions

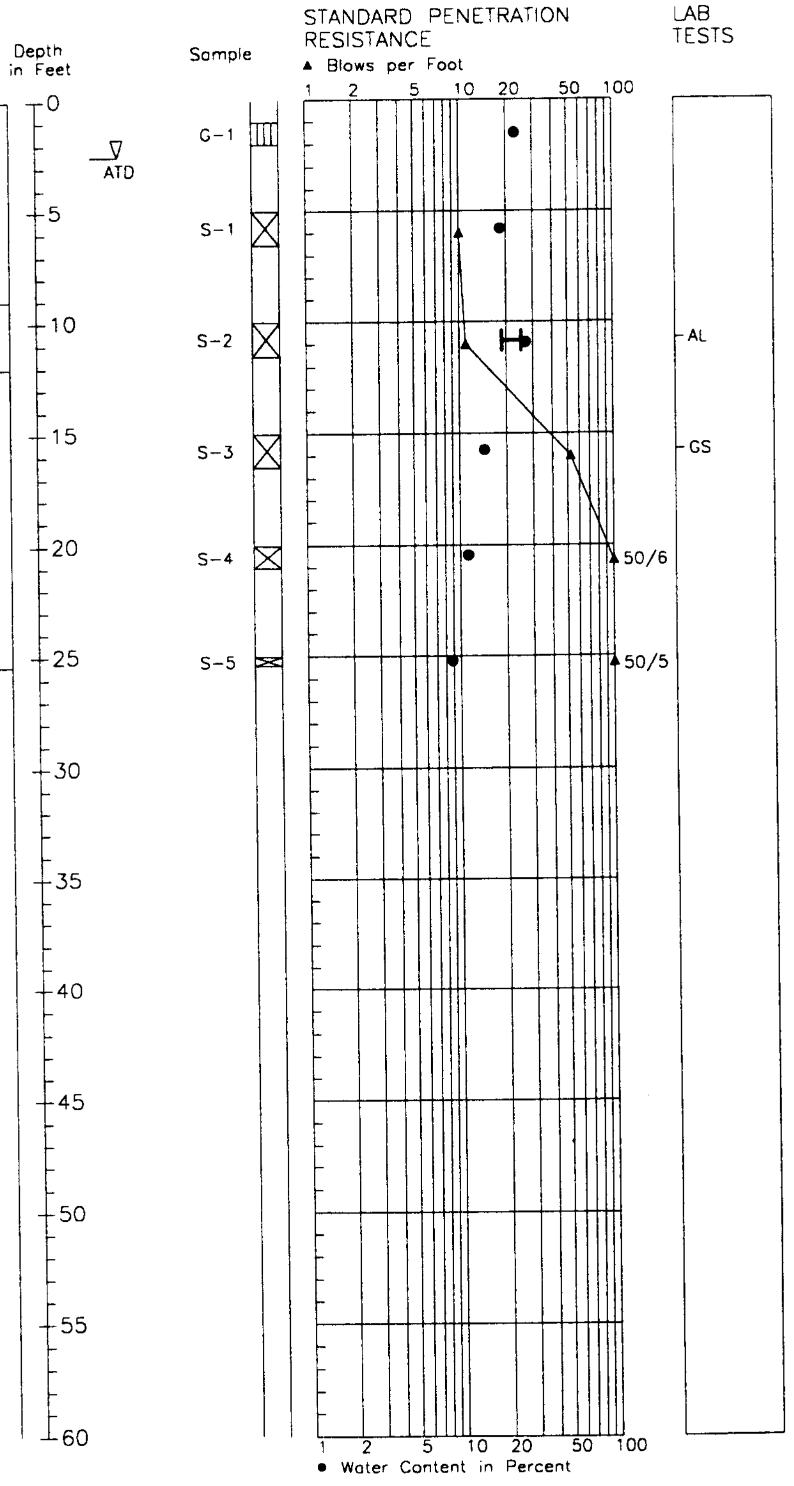
Approx. Ground Surface Elevation in Feet: 237

Loose, moist to wet, brown and gray, slightly gravelly, silty to very silty SAND.

Stiff, moist to wet, gray, clayey, sandy SILT.

Very dense, moist to wet, gray, slightly gravelly, silty SAND.

Bottom of Boring at 25.4 Feet.
Completed 2/1/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-19

Boring Log HC00-B115

N 18225
E 10990

Soil Descriptions
Approx. Ground Surface Elevation in Feet: 242

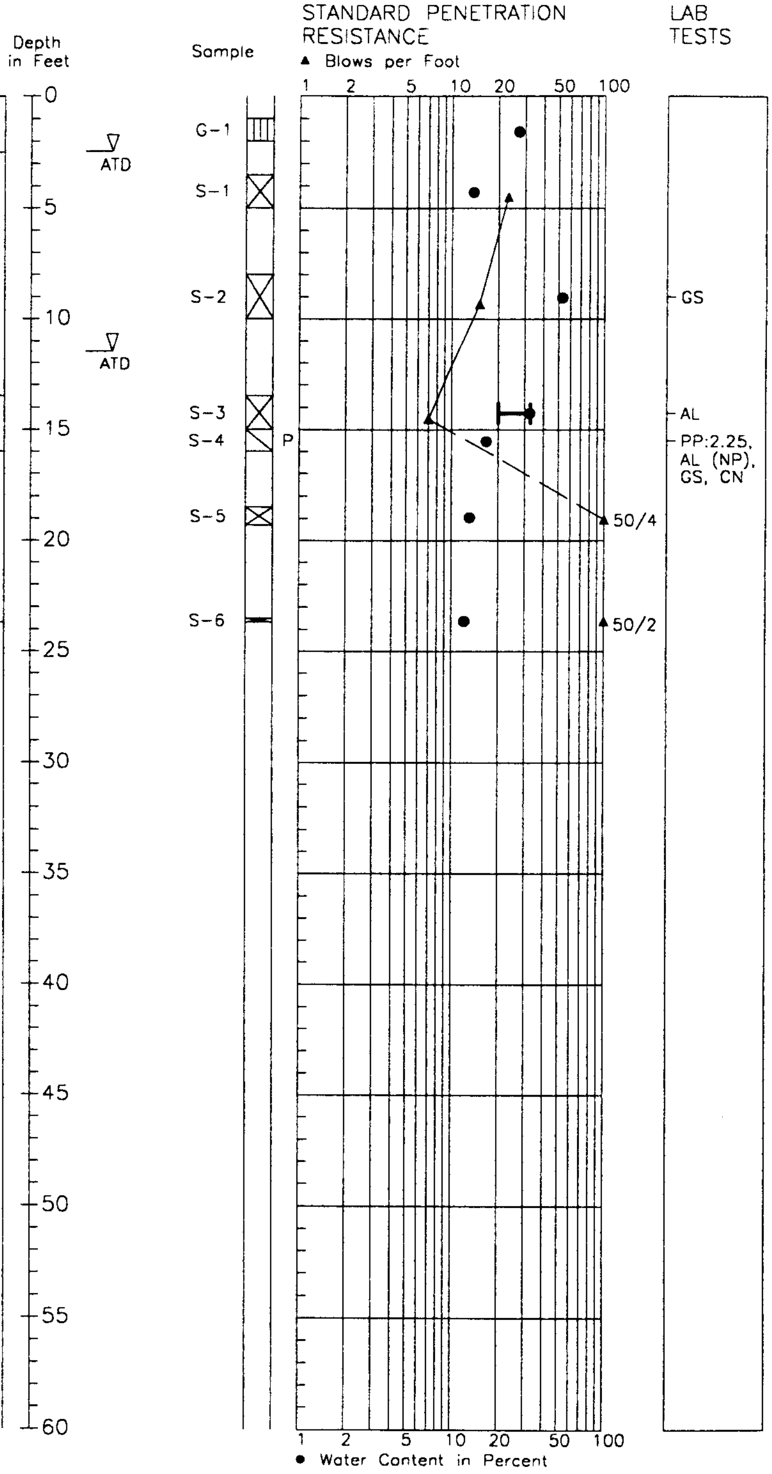
(Loose), moist to wet, gray and black, silty SAND.

Medium dense, moist to wet, brown and gray, slightly gravelly, silty SAND with organic material.

Medium stiff, moist, gray, very sandy CLAY and SILT.

Very dense, moist to wet, gray, slightly gravelly, silty SAND.

Bottom of Boring at 23.7 Feet.
Completed 1/28/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

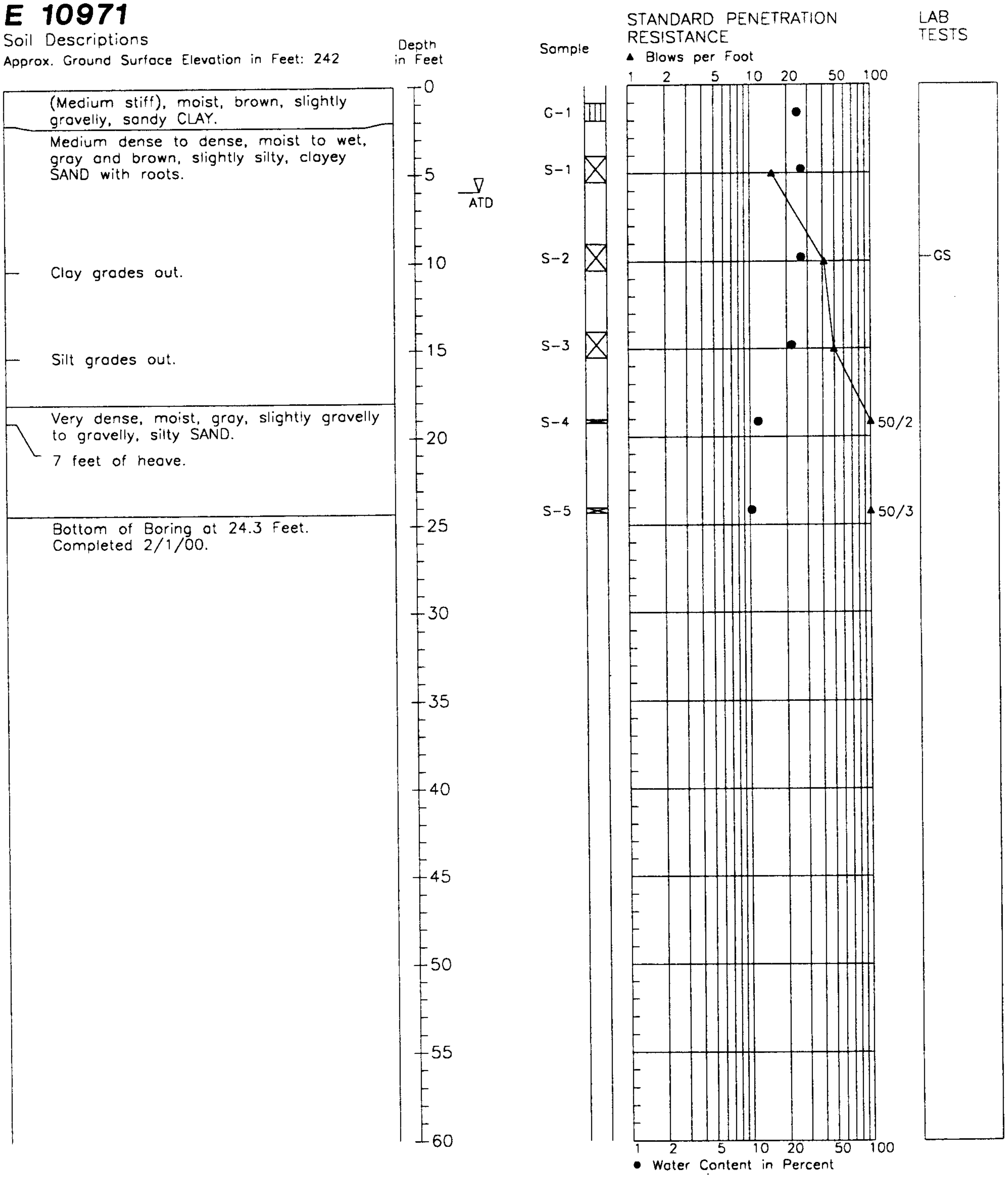
hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-20

Boring Log HC00-B116

N 18291

E 10971



(Medium stiff), moist, brown, slightly gravelly, sandy CLAY.

Medium dense to dense, moist to wet, gray and brown, slightly silty, clayey SAND with roots.

Clay grades out.

Silt grades out.

Very dense, moist, gray, slightly gravelly to gravelly, silty SAND.

7 feet of heave.

Bottom of Boring at 24.3 Feet.
Completed 2/1/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-21 2/00

Figure A-21

Boring Log HC00-B117

N 17271

E 10931

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 315

(Medium stiff), moist, brown, slightly sandy CLAY.

Medium dense to very dense, moist to wet, brown, slightly gravelly, slightly silty, medium to fine SAND.

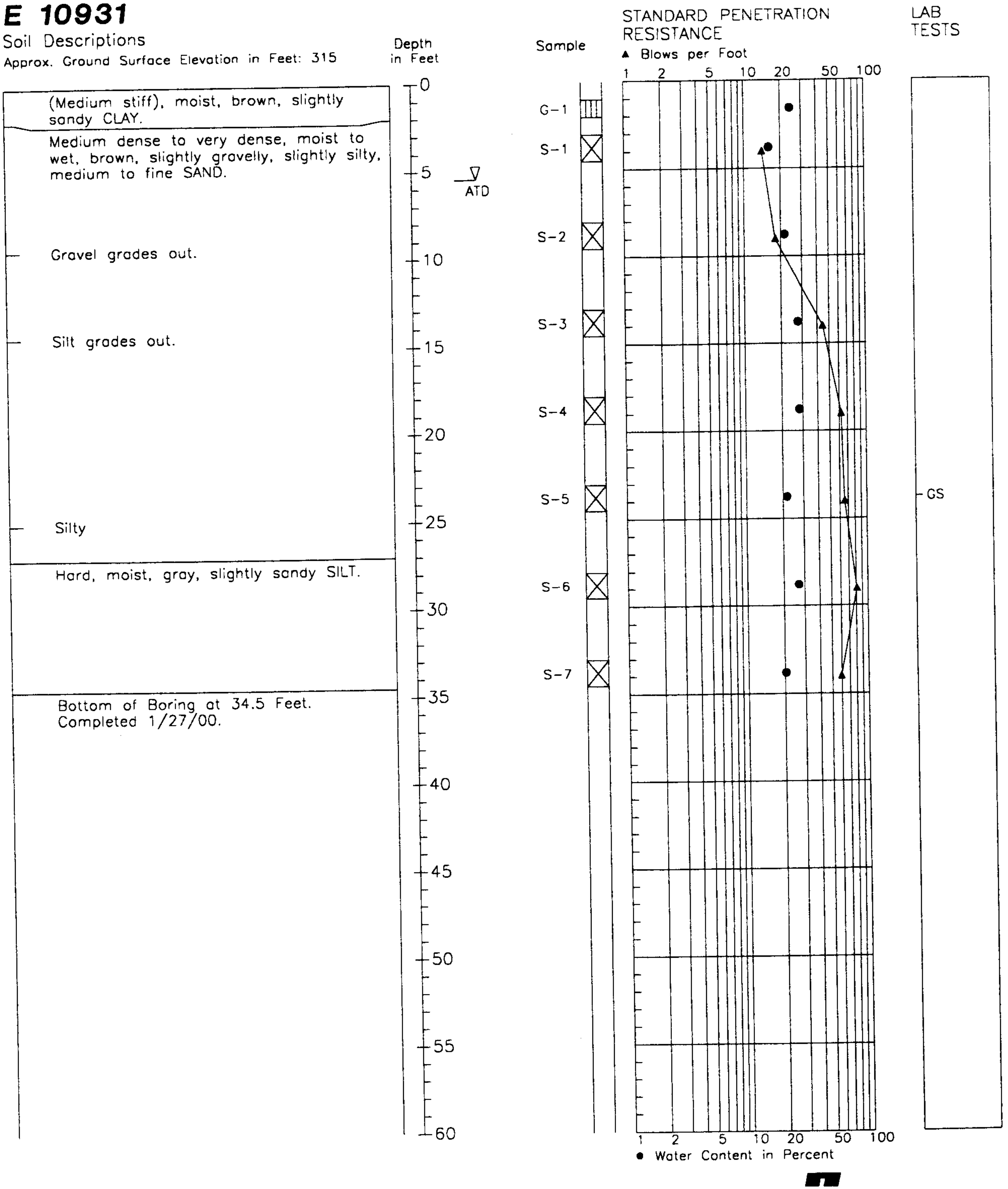
Gravel grades out.

Silt grades out.

Silty

Hard, moist, gray, slightly sandy SILT.

Bottom of Boring at 34.5 Feet.
Completed 1/27/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 1/00

Figure A-22

Boring Log HC00-B118

N 17456

E 10947

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 298
Top of Casing Elevation in Feet: 298.61

(Loose), moist, dark brown, slightly silty SAND.

Medium stiff, tan and orange mottled, slightly sandy, clayey SILT with organic material.

(Medium dense), wet, brown, slightly gravelly SAND.

(Very stiff), moist, gray, slightly sandy, slightly gravelly CLAY.

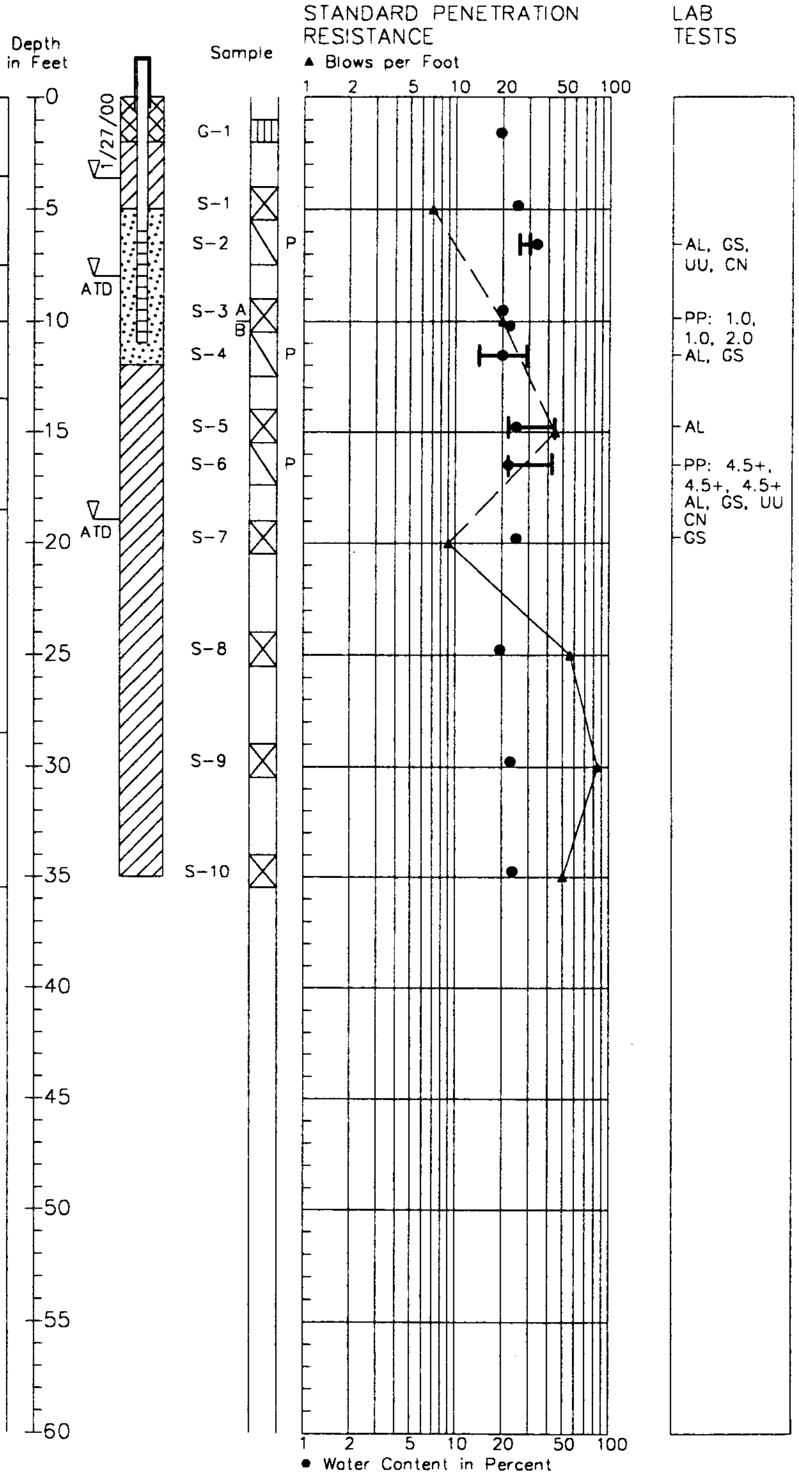
Hard, moist, gray, sandy CLAY to very clayey SILT.

(Loose to) very dense, wet, gray SAND.

Note: S-7 N-value apparently not representative of in situ density, due to disturbance by groundwater.

Hard, moist, gray, clayey SILT.

Bottom of Boring at 35.5 Feet.
Completed 1/27/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-23

Boring Log HC00-B119

N 17560

E 10894

Soil Descriptions

Ground Surface Elevation in Feet: 285

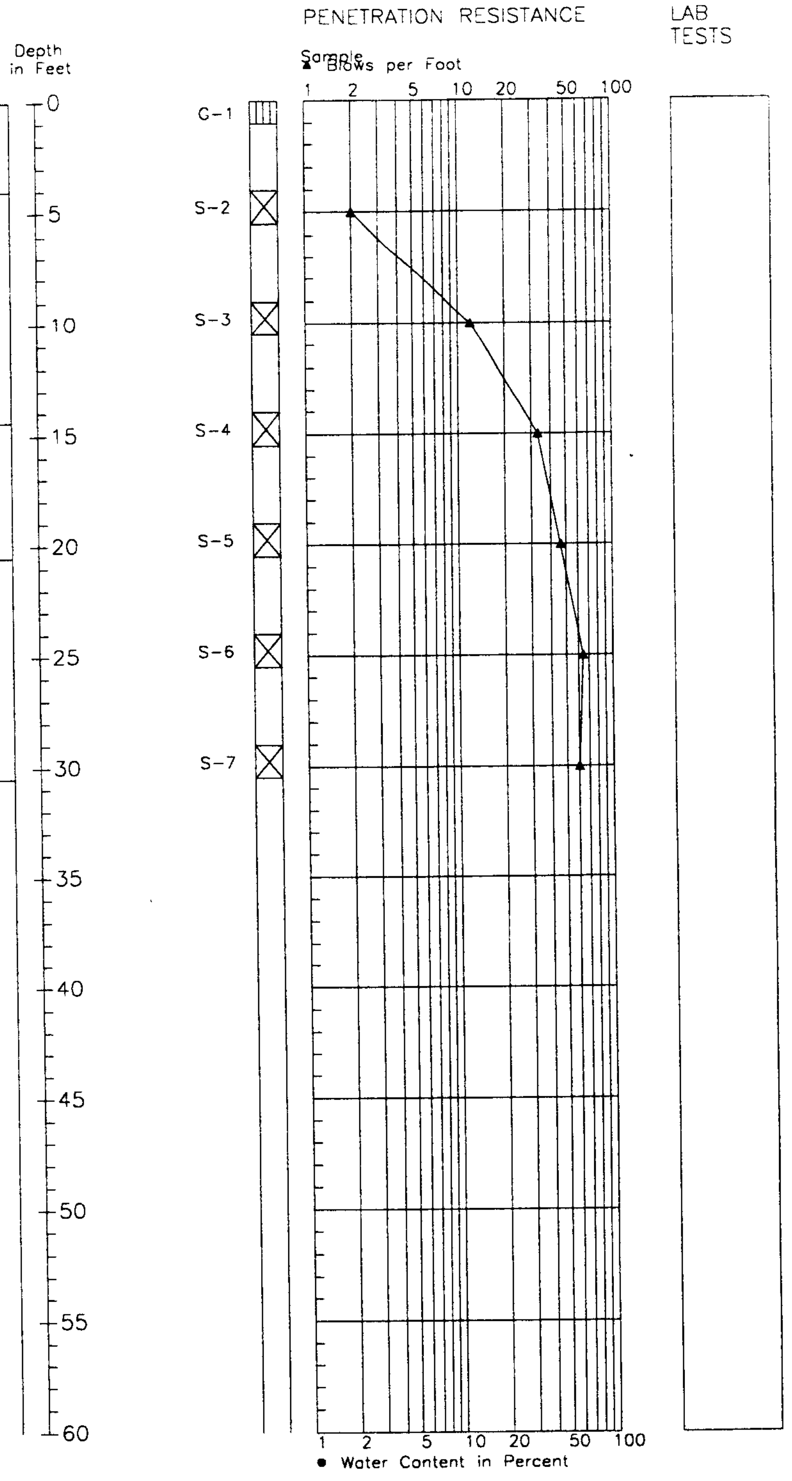
(Loose), moist, brown, slightly gravelly SAND.

Soft to stiff, wet, brown to gray and orange mottled, sandy SILT.

Dense, moist, brown to gray, silty, gravelly SAND. (TILL)

Hard, moist, gray, slightly gravelly to gravelly, sandy SILT.

Bottom of Boring at 30.5 Feet. Completed 3/23/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-24

Boring Log HC00-B120

N 17834

E 10964

Soil Descriptions

Ground Surface Elevation in Feet: 234

(Very loose), wet, brown, slightly gravelly, silty, fine to medium SAND with organic material.

Medium stiff, wet, gray with orange mottling, sandy SILT with silty SAND layers.

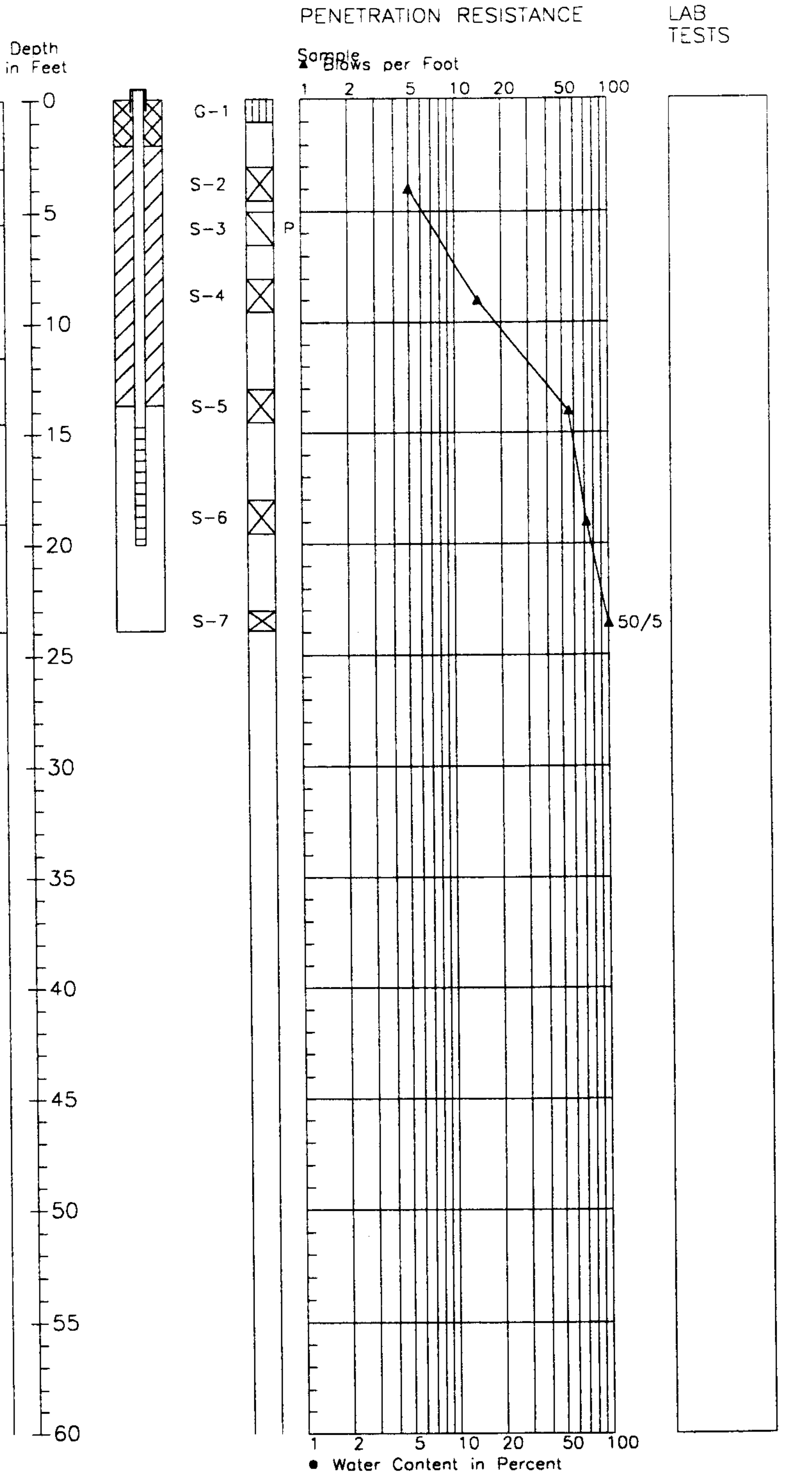
Medium dense, wet, gray, gravelly, very silty, fine SAND.

Stiff, wet, gray, sandy SILT.

Very dense, wet, gray, slightly, gravelly SAND.

Very dense, wet, gray, slightly gravelly, silty, fine to medium SAND. (TILL)

Bottom of Boring at 23.9 Feet.
Completed 3/16/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-25

Boring Log HC00-B121

N 17881

E 10968

Soil Descriptions

Ground Surface Elevation in Feet: 229.7

(Very soft), wet, dark brown SILT with Sand and Peat intermixed.

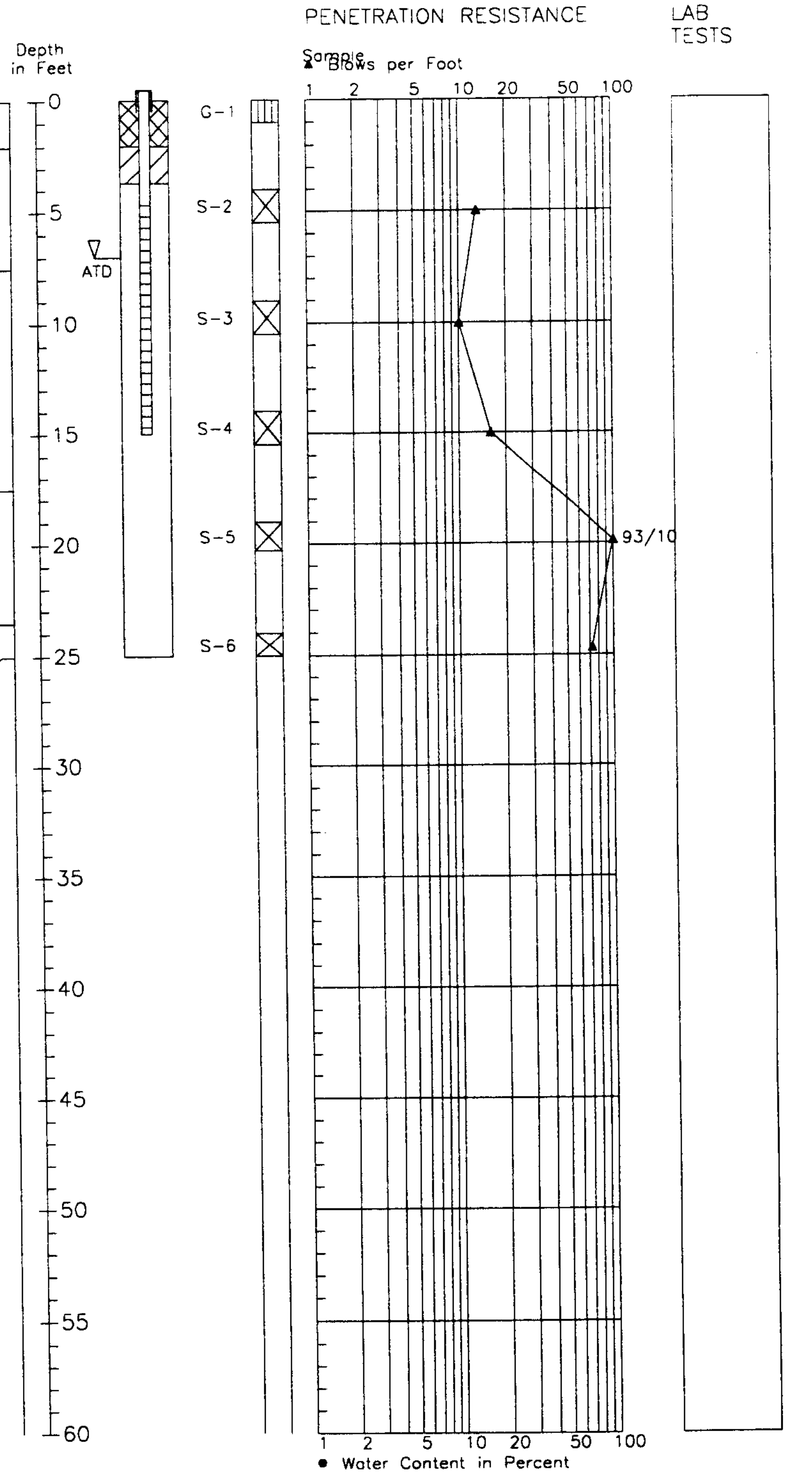
Medium dense, wet, gray, slightly silty to silty SAND with trace organic material.

Medium dense, wet, gray with orange mottling to gray, slightly silty to silty SAND and sandy SILT.

Very dense, wet, gray, silty to very silty SAND and hard, sandy SILT (layered).

Very dense, wet, gray, silty, gravelly, fine to medium SAND.

Bottom of Boring at 25.0 Feet.
Completed 3/16/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 3/00
Figure A-26

Boring Log HC00-B122

N 17840

E 11087

Soil Descriptions

Ground Surface Elevation in Feet: 239

Very loose, wet, dark brown, silty SAND and PEAT.

Stiff, wet, gray-brown, sandy SILT.

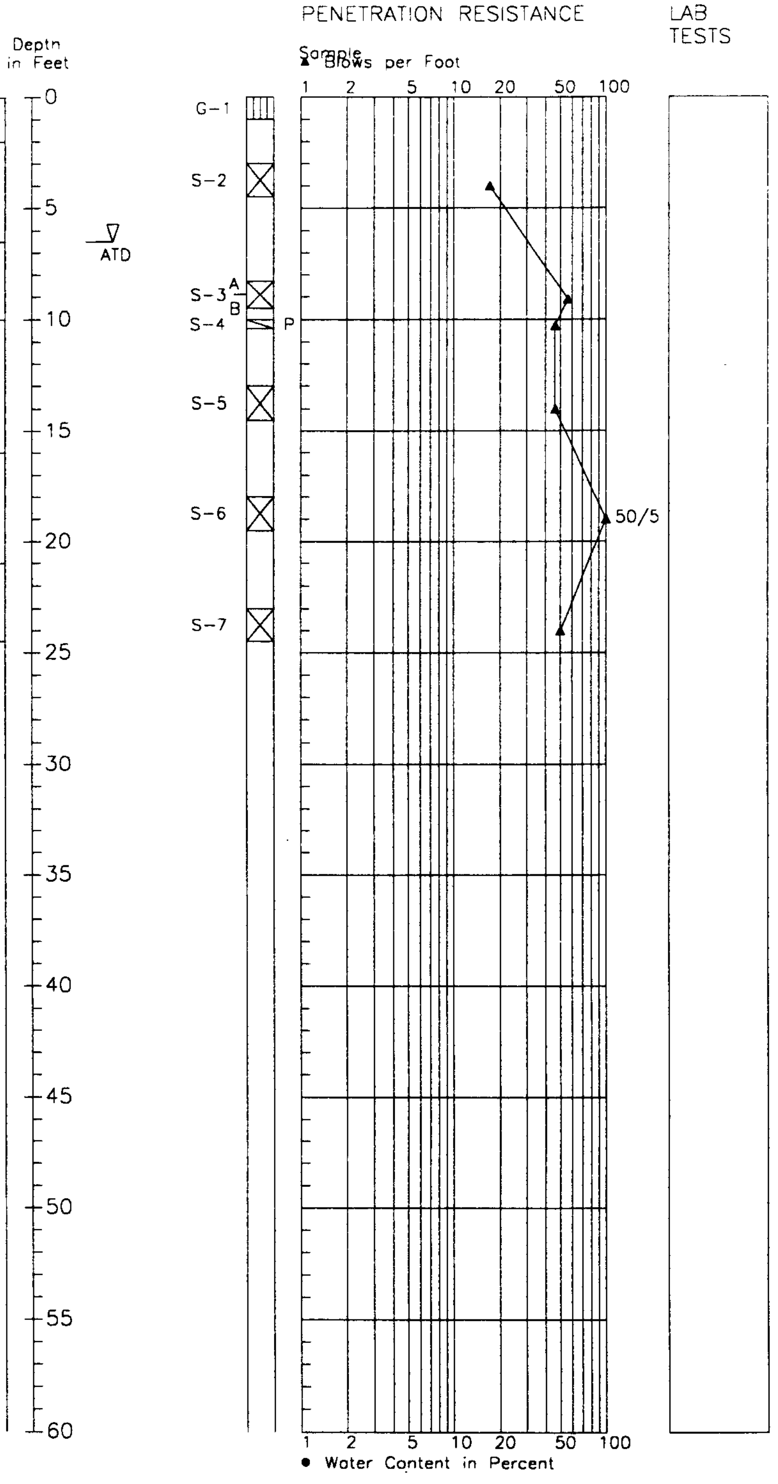
Hard, wet, gray-brown, sandy SILT with a slightly gravelly, silty, fine to medium SAND lens.

Dense, wet, gray-brown, slightly silty to silty, gravelly SAND.

Very dense, wet, gray, silty, gravelly SAND. (TILL)

Hard, moist, gray SILT (layered).

Bottom of Boring at 24.5 Feet.
Completed 3/15/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 3/00
Figure A-27

Boring Log HC00-B123

N 17958

E 11114

Soil Descriptions

Ground Surface Elevation in Feet: 234.7

(Soft). wet, dark brown, sandy SILT (PEAT).

Loose, wet, brown, very silty, fine to medium SAND with sandy SILT layers.

Soft to medium stiff, wet, brown to gray, sandy SILT with interbedded layers of peat, sand and silty sand.

MEdium stiff, wet, gray and brown, slightly sandy PEAT with very silty SAND layers.

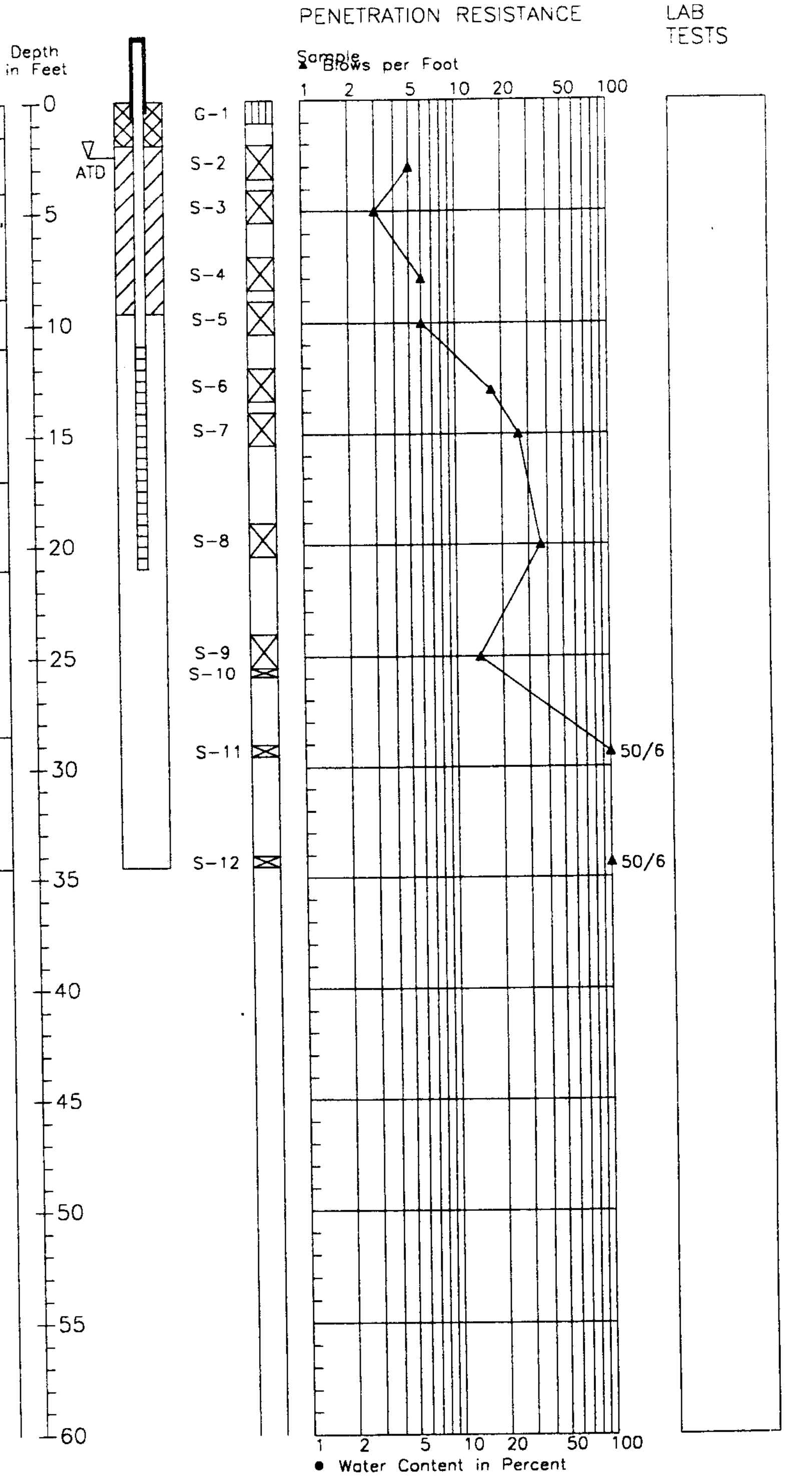
Medium dense, wet, gray, silty, gravelly SAND with sandy SILT layers.

Dense, wet, gray, slightly gravelly, very silty SAND.

Stiff, wet, gray, sandy CLAY.

Very dense, moist, gray, slightly silty to silty, gravelly SAND.

Bottom of Boring at 34.5 Feet.
Completed 3/22/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 3/00
Figure A-28

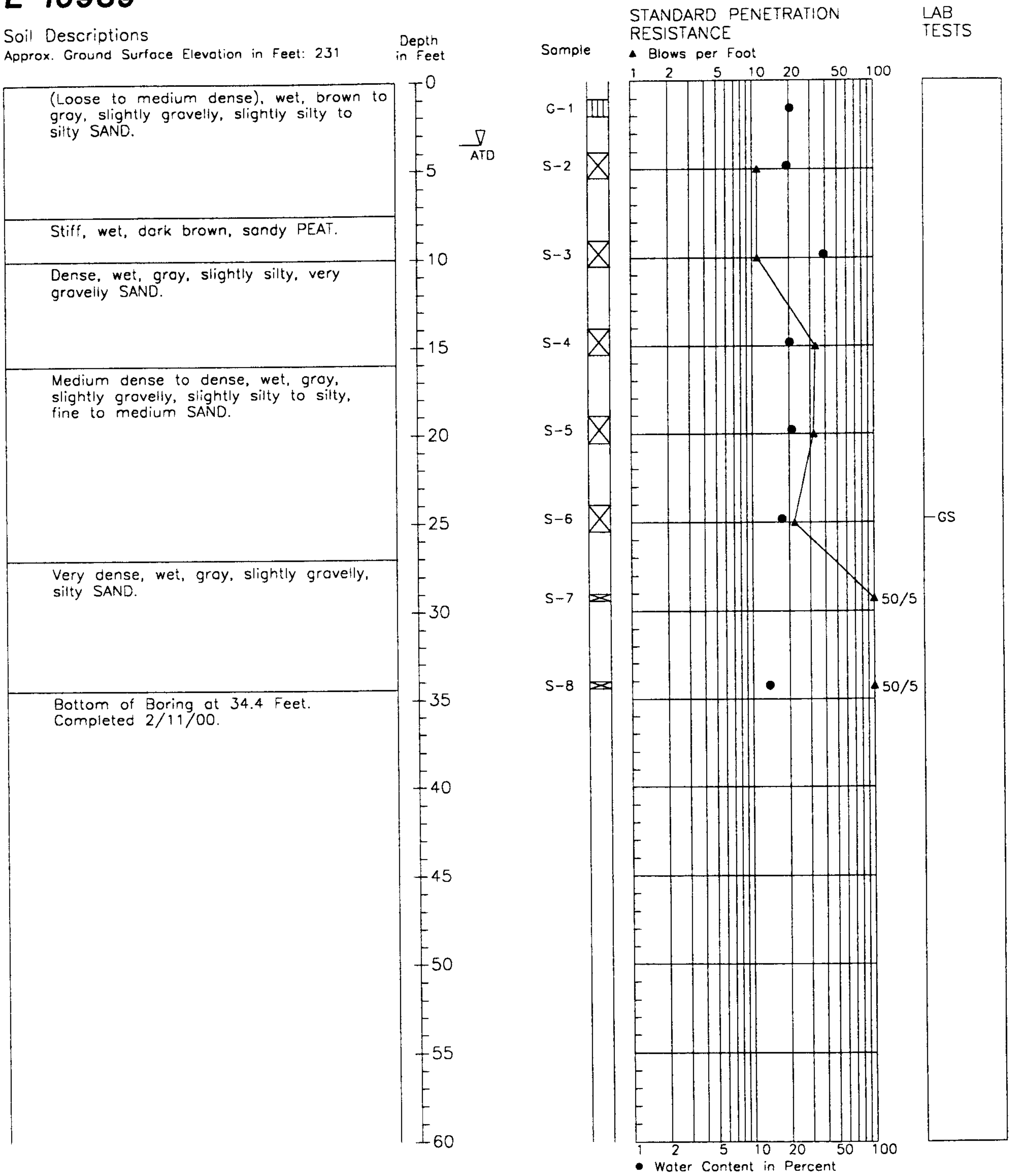
Boring Log HC00-B124

N 18016

E 10939

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 231



(Loose to medium dense), wet, brown to gray, slightly gravelly, slightly silty to silty SAND.

Stiff, wet, dark brown, sandy PEAT.

Dense, wet, gray, slightly silty, very gravelly SAND.

Medium dense to dense, wet, gray, slightly gravelly, slightly silty to silty, fine to medium SAND.

Very dense, wet, gray, slightly gravelly, silty SAND.

Bottom of Boring at 34.4 Feet. Completed 2/11/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hei 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-29

Boring Log HC00-B125

N 17686

E 10916

Soil Descriptions

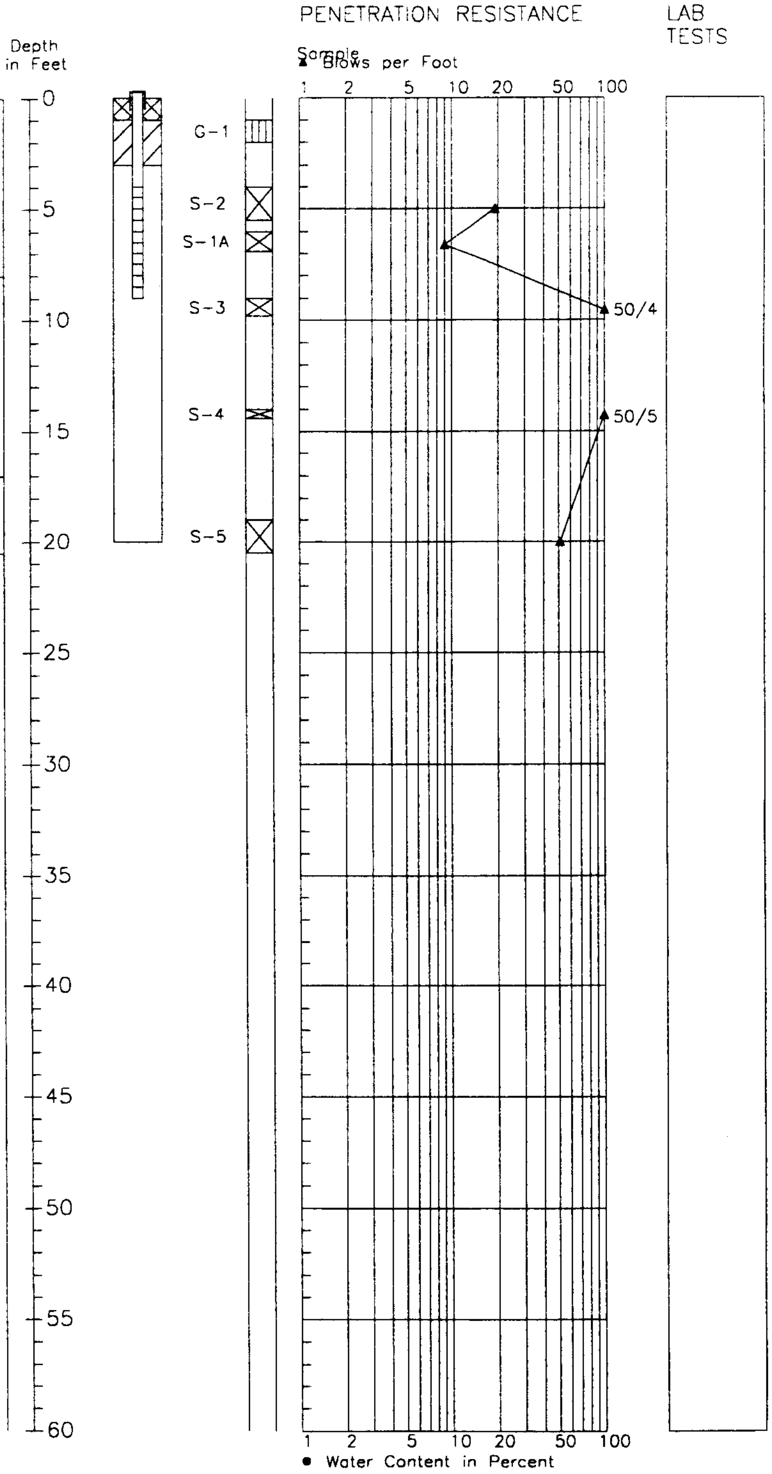
Ground Surface Elevation in Feet: 258.2

(Medium dense), wet, brown to gray with orange mottling, slightly gravelly, silty, fine to medium SAND with sandy SILT layers.

Very dense, wet, gray with orange mottling to gray-brown, silty, gravelly SAND. (TILL)

Hard, moist, gray SILT (layered).

Bottom of Boring at 20.5 Feet.
Completed 3/20/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-30

Boring Log HC00-B126

N 18232

E 11112

Soil Descriptions

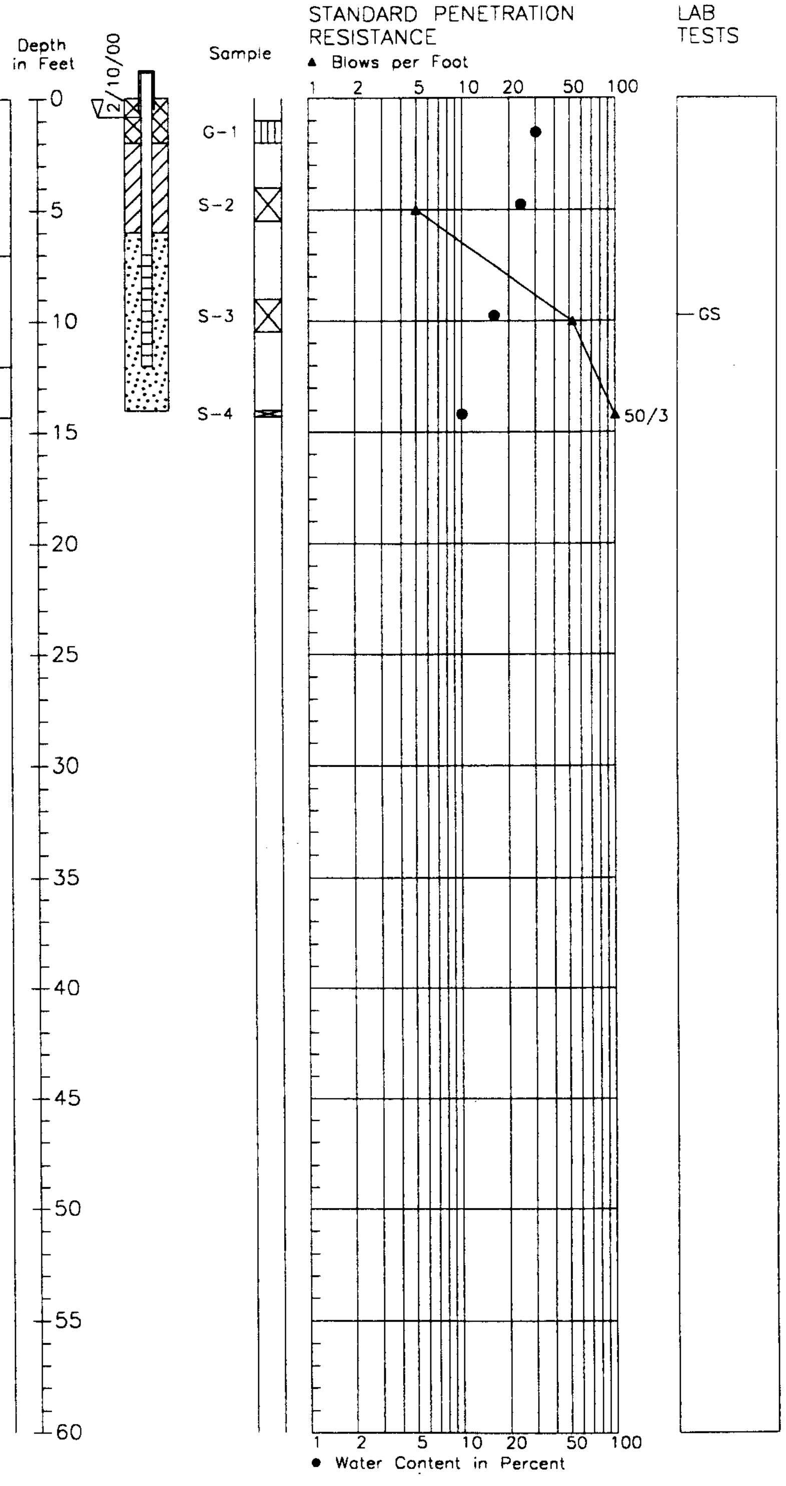
Approx. Ground Surface Elevation in Feet: 250
Top of Casing Elevation in Feet: 251.56

Loose, wet, brown to gray, slightly gravelly, non-silty to silty SAND.

Very dense, wet, gray, gravelly SAND.

Very dense, wet, gray, slightly gravelly, silty SAND.

Bottom of Boring at 14.3 Feet.
Completed 2/10/00.



hel 7/30/01 1=1
497821 LOGS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-4978-21 2/00
Figure A-31

Boring Log HC00-B127
N 18215
E 10869

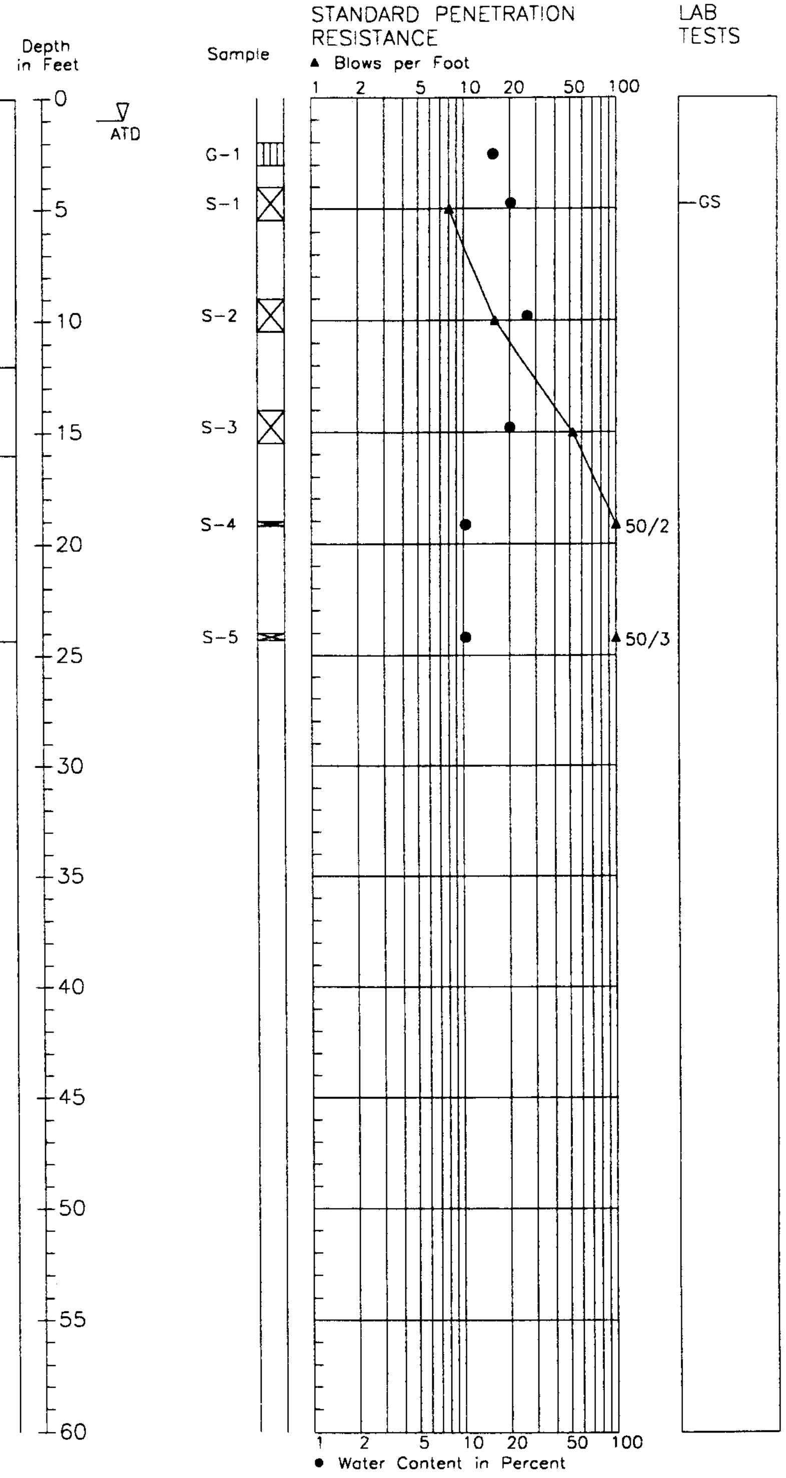
Soil Descriptions
Approx. Ground Surface Elevation in Feet: 234

Loose to medium dense, wet, brown to gray with brown mottling, slightly gravelly, slightly silty to silty SAND with silt layers.

Very dense, wet, gray, gravelly SAND.

Very dense, moist, gray, slightly gravelly, silty SAND.

Bottom of Boring at 24.3 Feet.
Completed 1/31/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-32

Boring Log HC00-B128

N 17786
E 10918

Soil Descriptions

Ground Surface Elevation in Feet: 238

(Loose), wet, dark brown, slightly gravelly, silty SAND.

Medium dense, wet, brown, slightly gravelly, silty, fine to medium SAND.

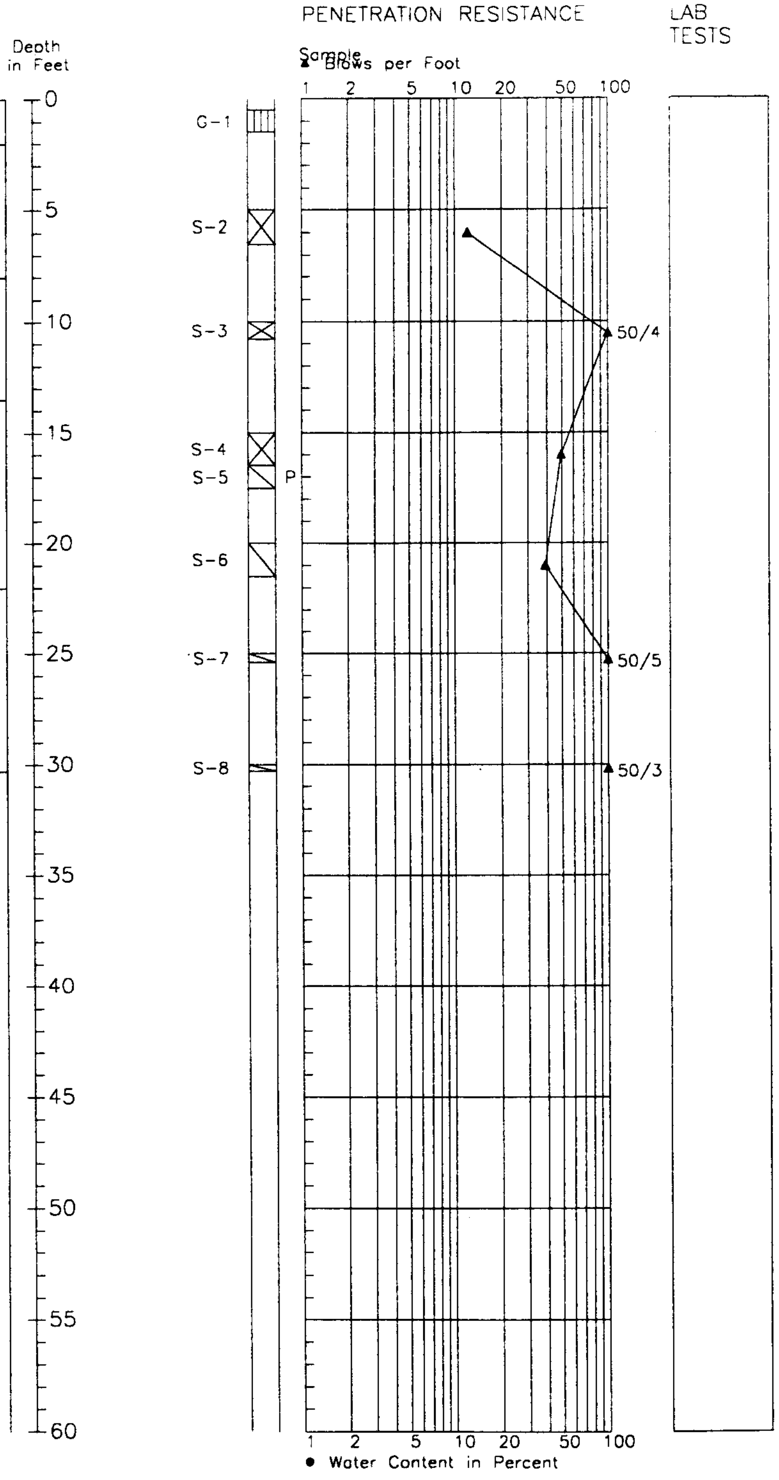
Very dense, moist, gray, silty, gravelly SAND. (TILL)

Hard, moist, gray SILT, laminated with Silt and Clay lenses.

Very dense, moist, gray, silty to very silry, fine to medium SAND.

Grades to gravelly.

Bottom of Boring at 30.3 Feet. Completed 3/16/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-33

Boring Log HC00-B129

N 18256
E 11004

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 243
Top of Casing Elevation in Feet: 245.83

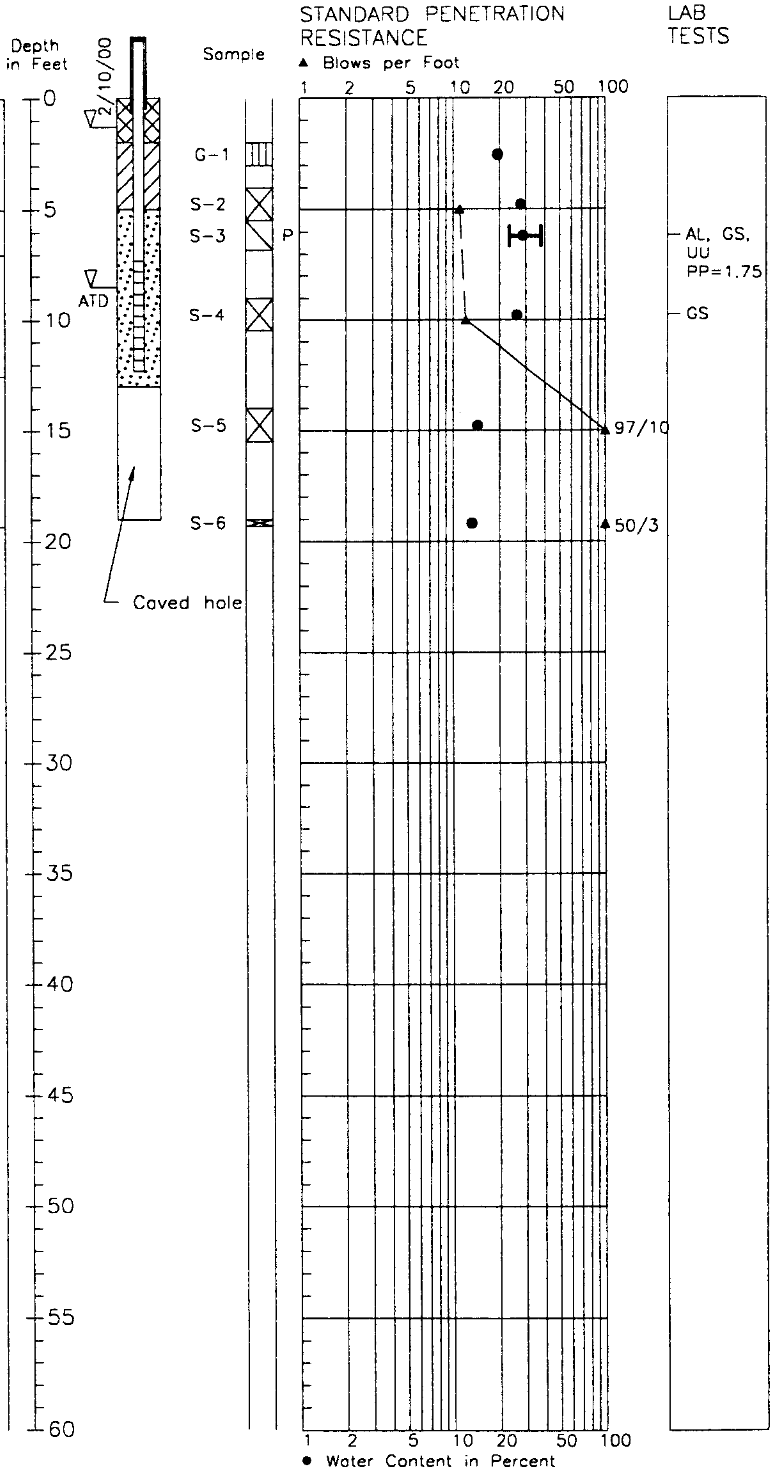
Medium dense, wet, brown to gray medium to fine SAND.

(Stiff), wet, gray, slightly sandy CLAY.

Medium dense, wet, brown, slightly silty, medium to fine SAND.

Very dense, wet, gray, silty, slightly gravelly to gravelly SAND.

Bottom of Boring at 19.3 Feet.
Completed 2/10/00.



hel 7/30/01 1=1
497821 LOCS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-4978-21 2/00
Figure A-34

Boring Log HC00-B130

N 17901

E 10839

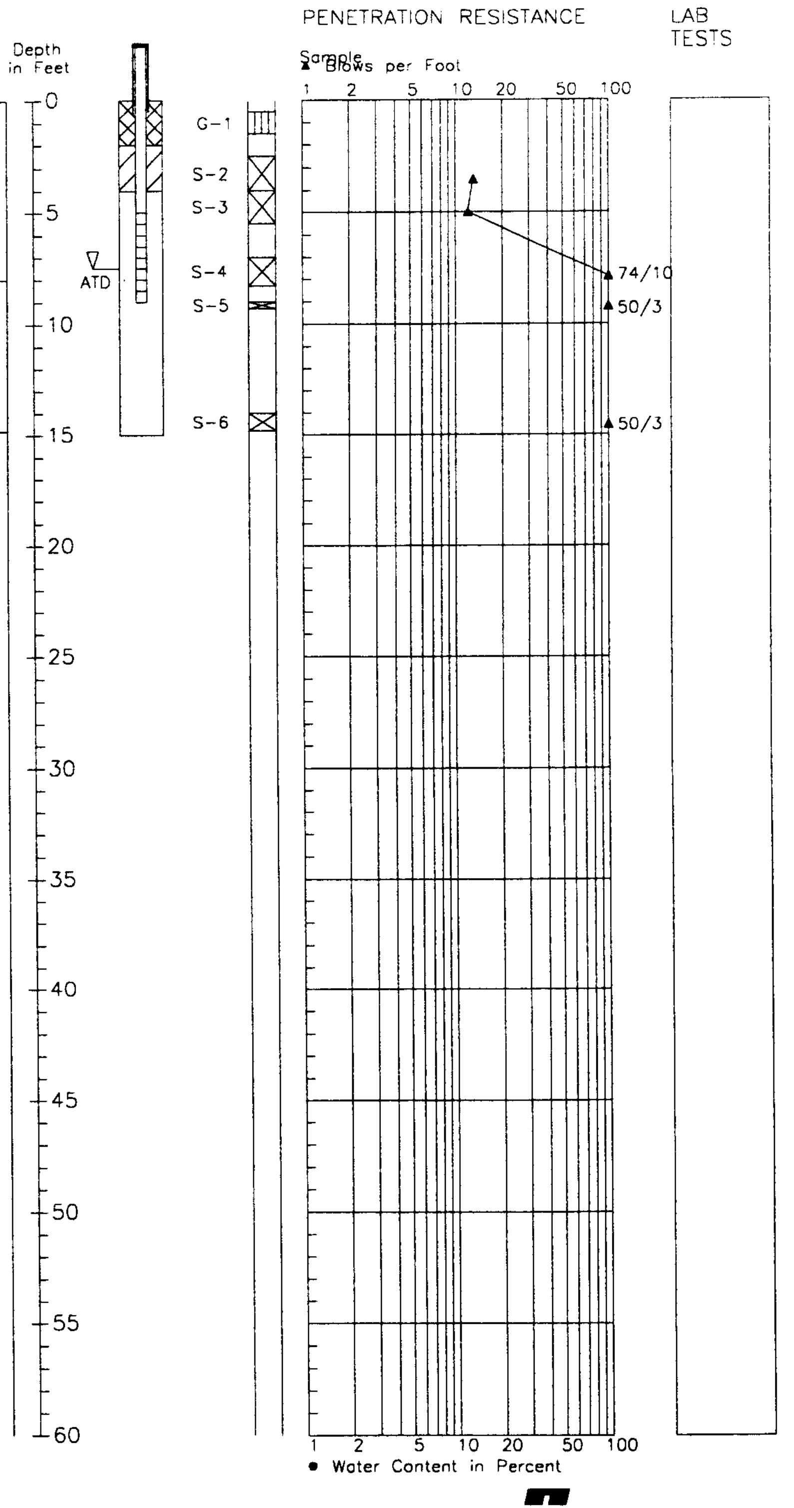
Soil Descriptions

Ground Surface Elevation in Feet: 223.1

(Medium dense), wet, gray and brown to gray, silty to very silty, fine to medium SAND with sandy SILT and SAND layers.

Very dense, moist to wet, gray, silty, gravelly SAND. (TILL)

Bottom of Boring at 14.8 Feet. Completed 3/21/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 3/00

Figure A-35

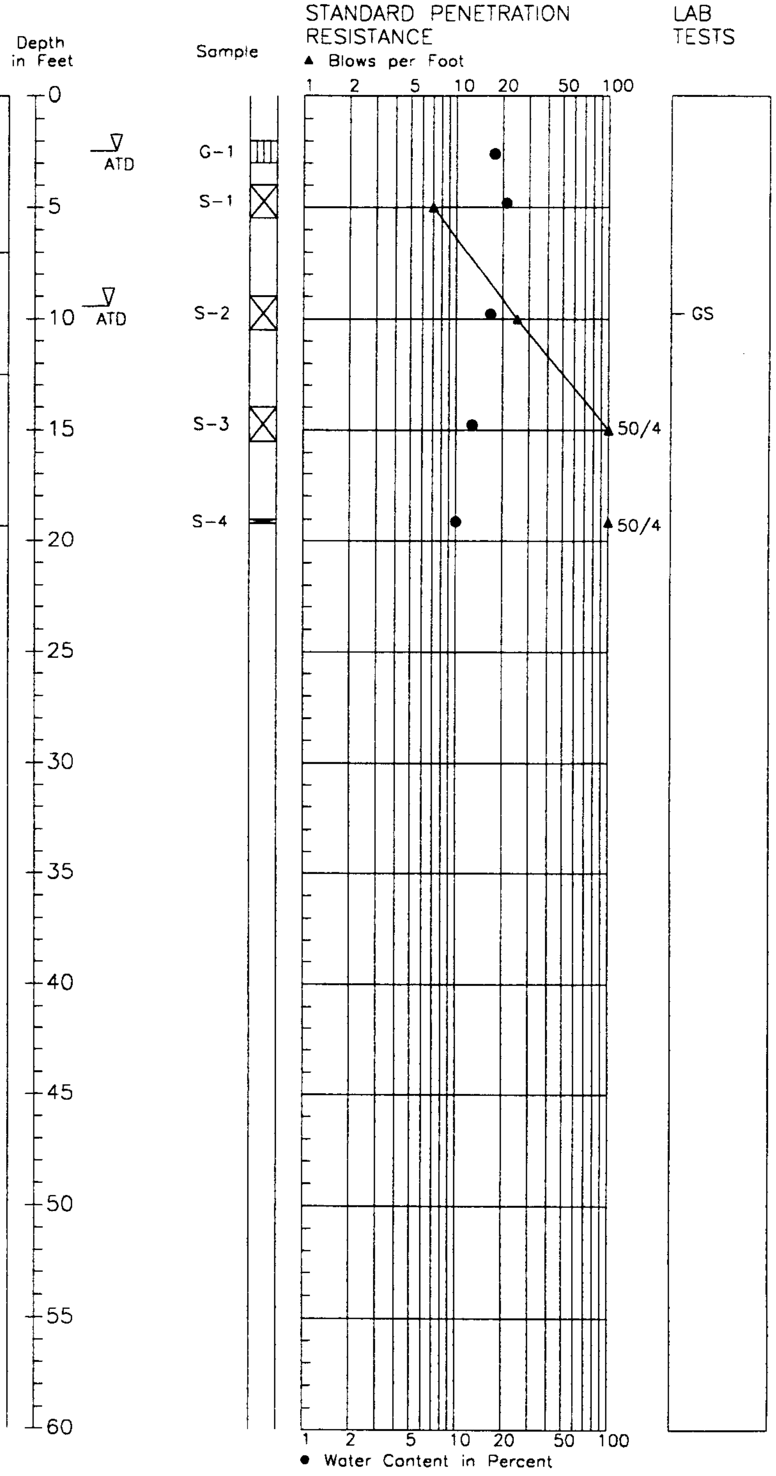
Boring Log HC00-B131

N 18329

E 10804

Soil Descriptions
Approx. Ground Surface Elevation in Feet: 231

0	Loose, wet, gray, silty SAND with trace organic material.
7	Medium dense, wet, gray, gravelly, very silty SAND and SILT.
12.5	Very dense, moist, gray, slightly gravelly, silty SAND.
19.3	Bottom of Boring at 19.3 Feet. Completed 1/31/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

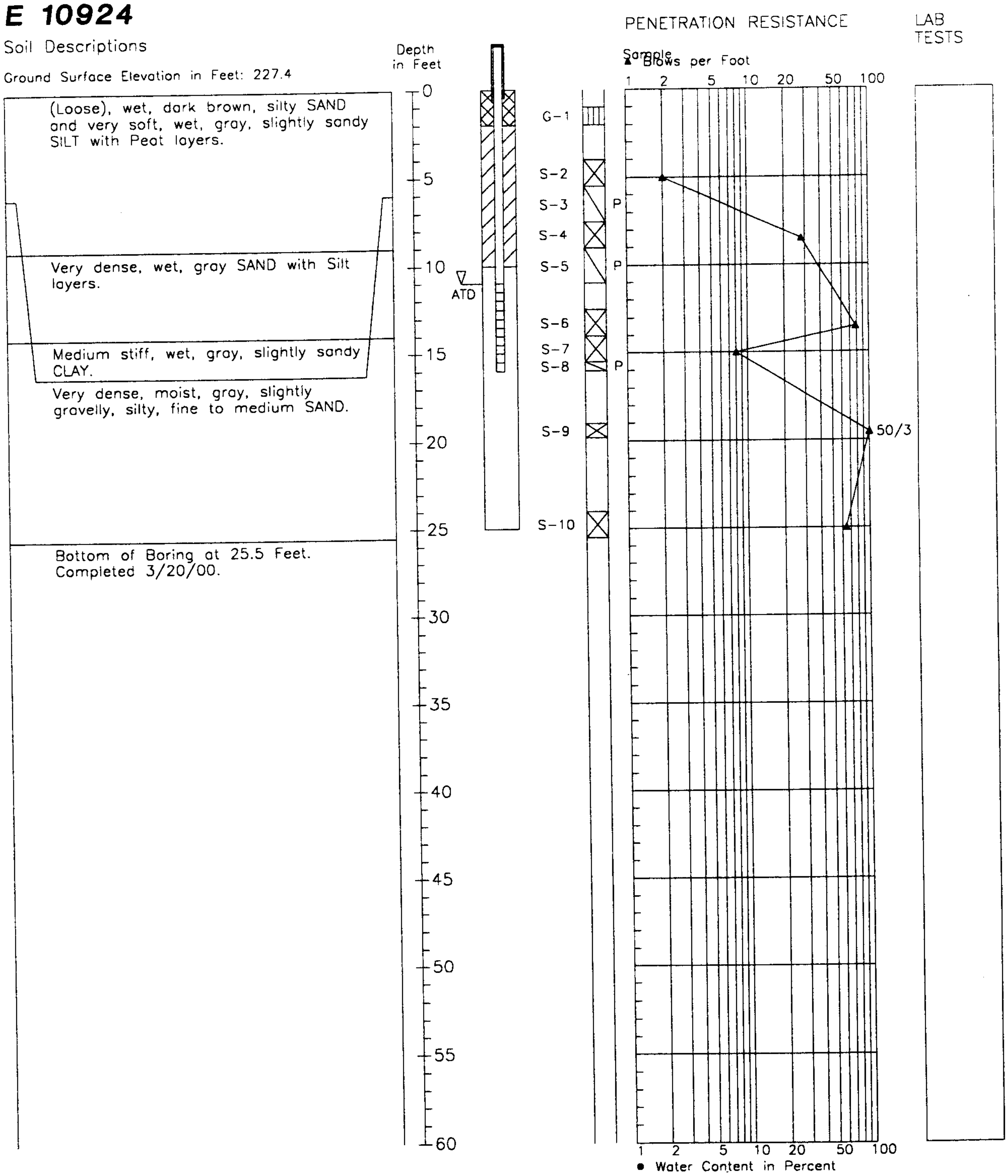
hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-36

Boring Log HC00-B132

N 17904

E 10924



Soil Descriptions

Ground Surface Elevation in Feet: 227.4

(Loose), wet, dark brown, silty SAND and very soft, wet, gray, slightly sandy SILT with Peat layers.

Very dense, wet, gray SAND with Silt layers.

Medium stiff, wet, gray, slightly sandy CLAY.

Very dense, moist, gray, slightly gravelly, silty, fine to medium SAND.

Bottom of Boring at 25.5 Feet. Completed 3/20/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 **3/00**

Figure A-37

Boring Log HC00-B133

N 18471
E 10859

Soil Descriptions

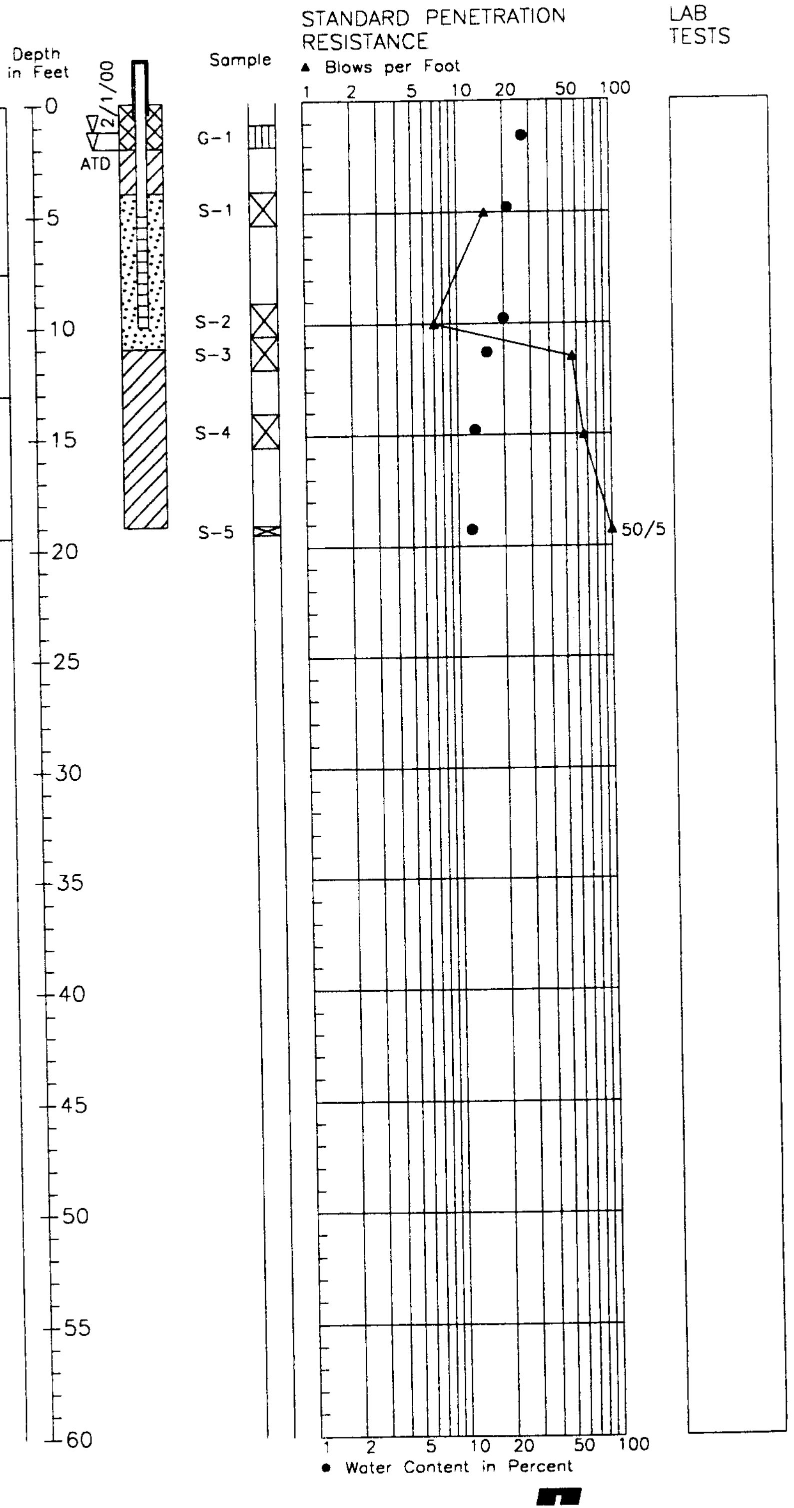
Approx. Ground Surface Elevation in Feet: 241
Top of Casing Elevation in Feet: 243.47

(Loose to medium dense), wet, brown to gray, slightly silty to silty SAND.

Loose to very dense, wet, gray, silty, gravelly SAND with CLAY layers.

Very dense, wet, gray, slightly gravelly to gravelly, silty SAND.

Bottom of Boring at 19.4 Feet.
Completed 2/1/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 2/00
Figure A-38

Boring Log HC00-B134

N 18438

E 10953

Soil Descriptions
Approx. Ground Surface Elevation in Feet: 250

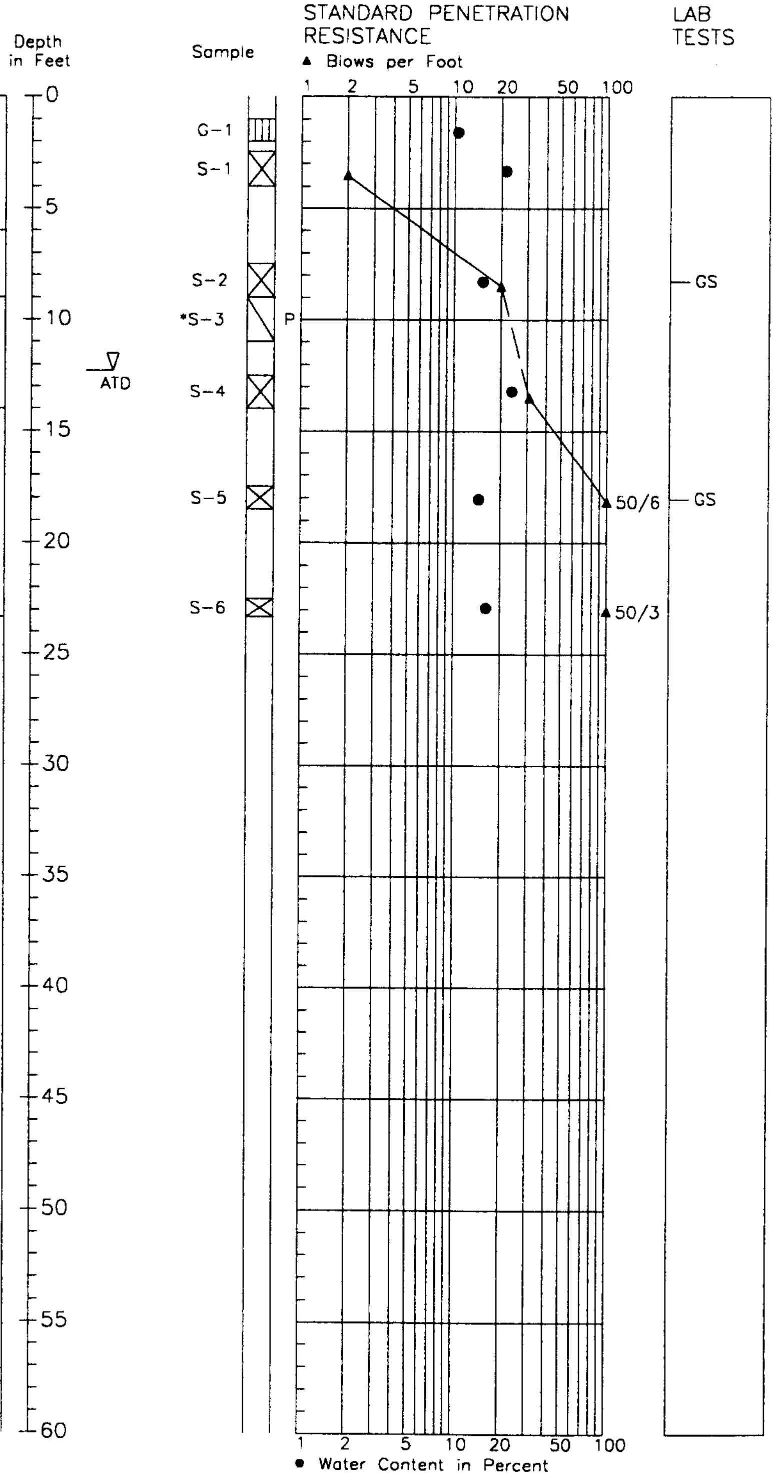
Very loose (to medium dense), moist, brown, slightly gravelly, slightly silty to silty SAND. (FILL)

Very stiff, moist, gray and orange mottled, gravelly, sandy SILT.

Dense, wet, brown SAND.

Very dense, moist to wet, gray, slightly silty to very silty SAND.

Bottom of Boring at 23.3 Feet.
Completed 1/28/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 1/00

Figure A-39

Boring Log HC00-B137

N 19714

E 10657

Soil Descriptions

Top of casing elevation in Feet: 267.21

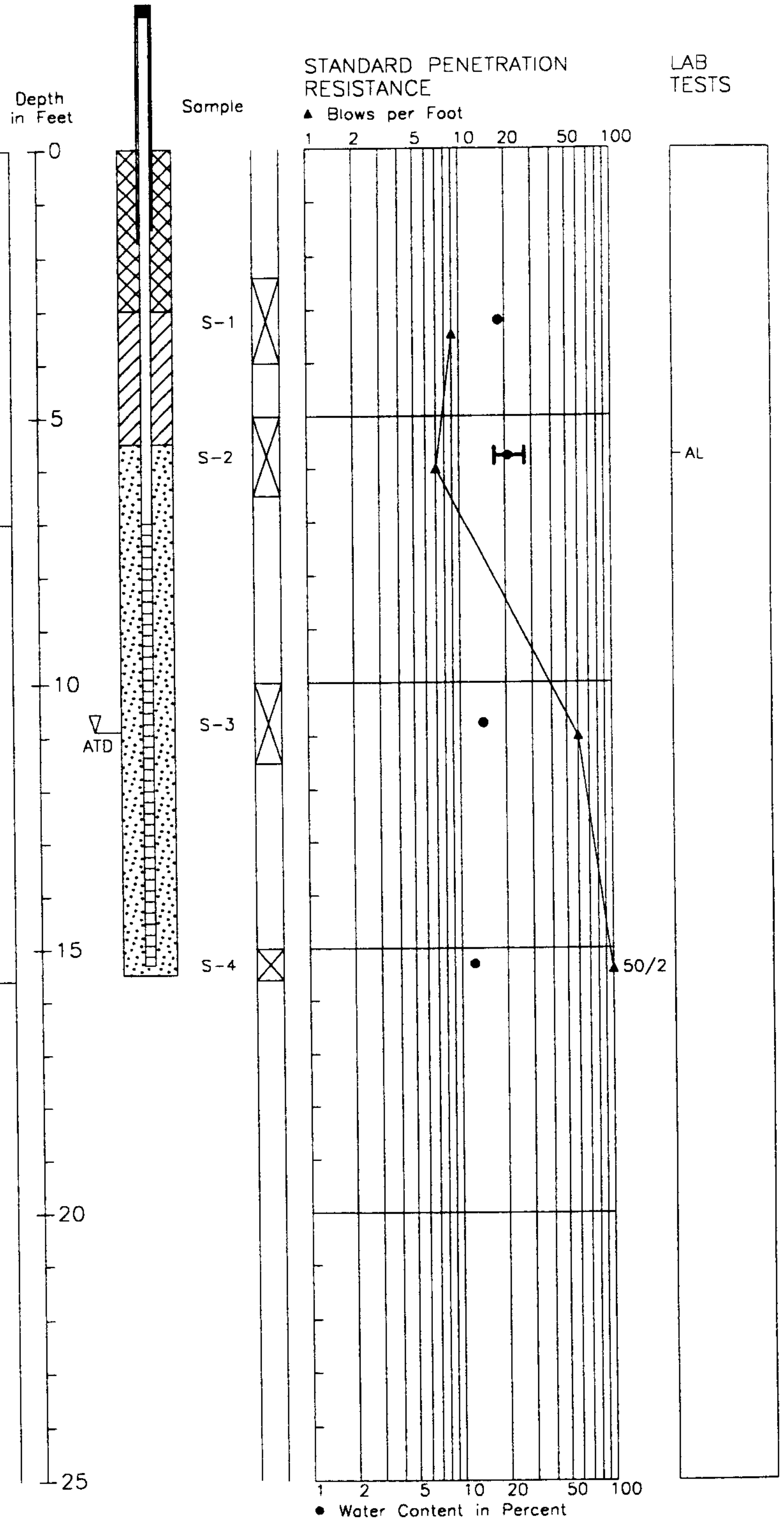
Approx. Ground Surface Elevation in Feet: 264

Medium stiff, to stiff, moist, gray, slightly sandy, silty CLAY with roots and organic material.

Very dense, moist to wet, gray, slightly gravelly, slightly silty to silty SAND with trace organic material.

Gravelly zone

Bottom of Boring at 15.6 Feet. Completed 5/23/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hei 7/30/01 1=1
BORINGS

HARTCROWSER

J-4978-26 5/00

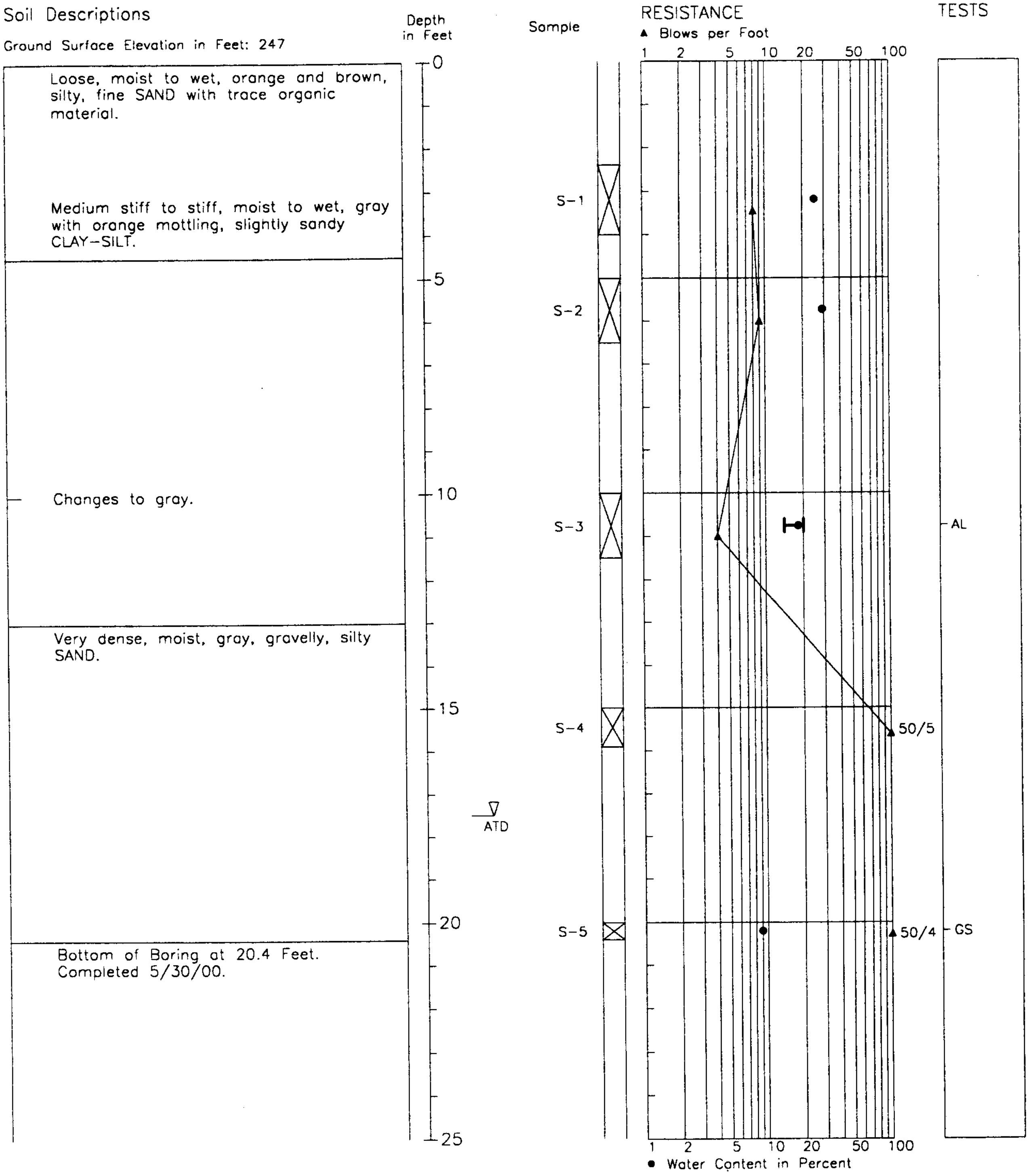
Figure A-40

Boring Log HC00-B138

N 19096
E 10627

Soil Descriptions

Ground Surface Elevation in Feet: 247



Loose, moist to wet, orange and brown, silty, fine SAND with trace organic material.

Medium stiff to stiff, moist to wet, gray with orange mottling, slightly sandy CLAY-SILT.

Changes to gray.

Very dense, moist, gray, gravelly, silty SAND.

Bottom of Boring at 20.4 Feet. Completed 5/30/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
BORINGS

HARTCROWSER
J-4978-26 5/00
Figure A-41

Boring Log HC00-B139

N 18759

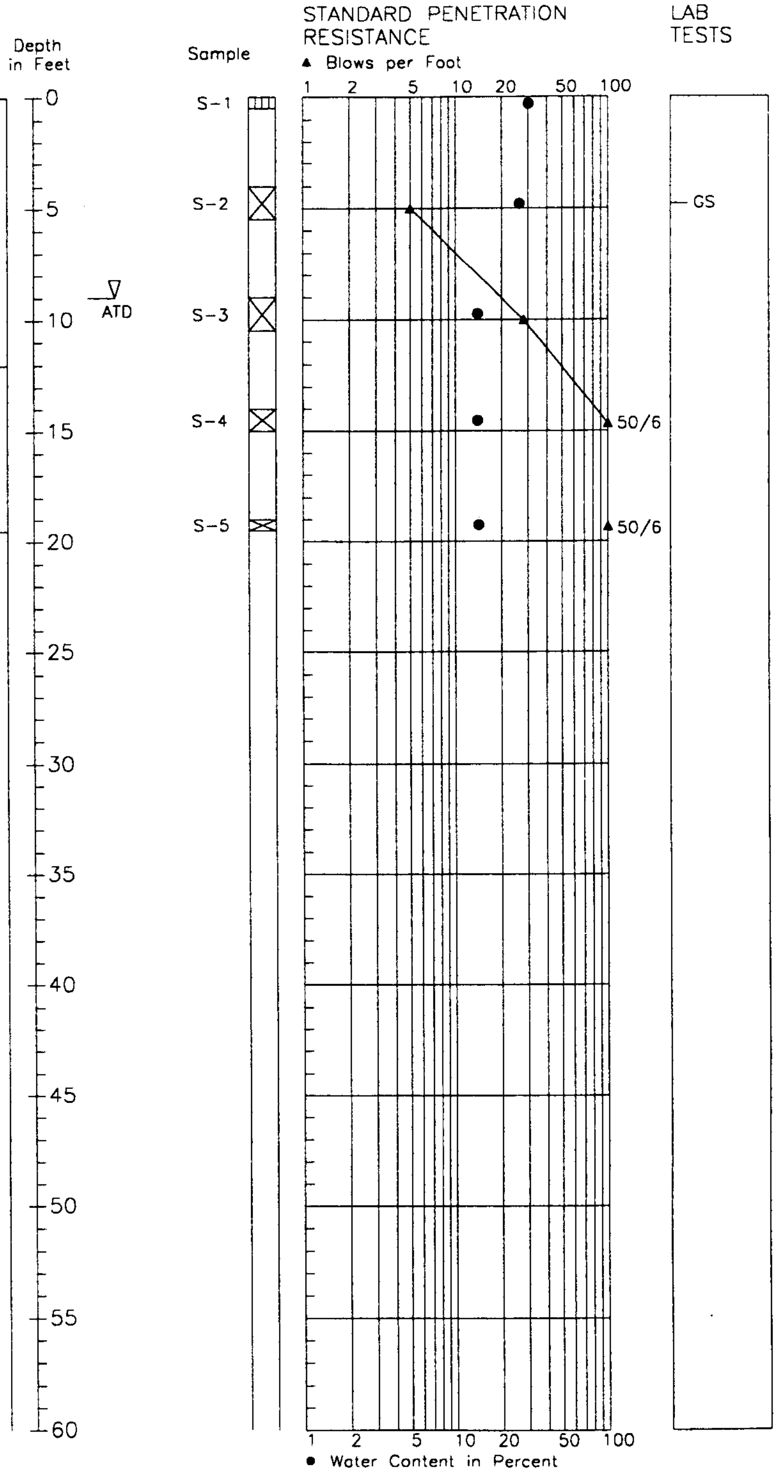
E 10889

Soil Descriptions
Approx. Ground Surface Elevation in Feet: 255

Loose, to medium dense, wet, brown to gray, slightly gravelly, silty to very silty fine to medium SAND.

Very dense, wet, gray, slightly gravelly to gravelly, silty SAND.

Bottom of Boring at 19.5 Feet.
Completed 2/15/00.



hel 7/30/01 1=1
497821 LOGS

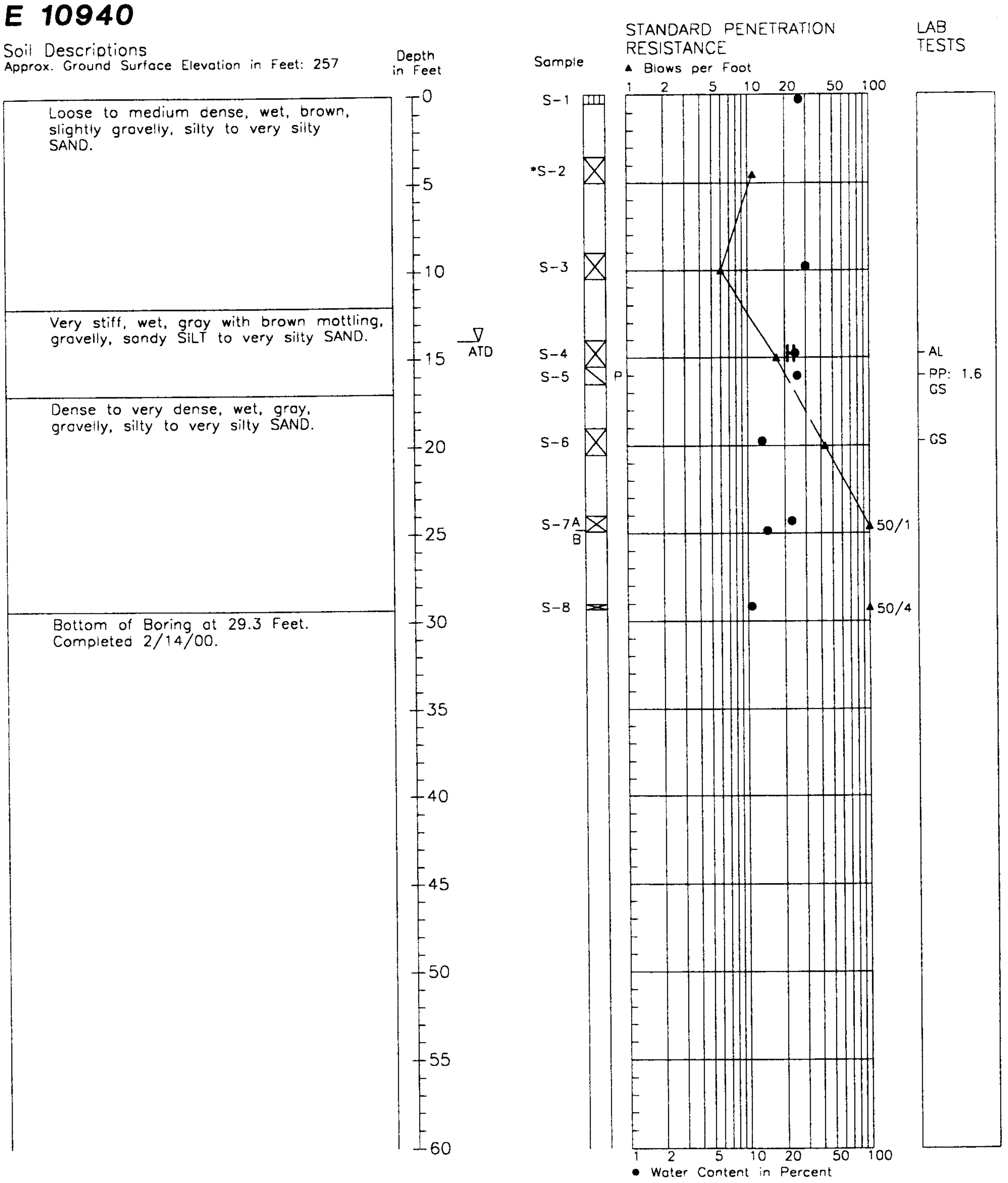
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-42

Boring Log HC00-B140

N 18498

E 10940



Soil Descriptions
Approx. Ground Surface Elevation in Feet: 257

Loose to medium dense, wet, brown, slightly gravelly, silty to very silty SAND.

Very stiff, wet, gray with brown mottling, gravelly, sandy SILT to very silty SAND.

Dense to very dense, wet, gray, gravelly, silty to very silty SAND.

Bottom of Boring at 29.3 Feet. Completed 2/14/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-43

Boring Log HC00-B141

N 18597

E 10941

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 258

Top of Casing Elevation in Feet: 258.64

Loose (to dense), wet, brown to gray, silty, gravelly SAND with concrete debris. (FILL)

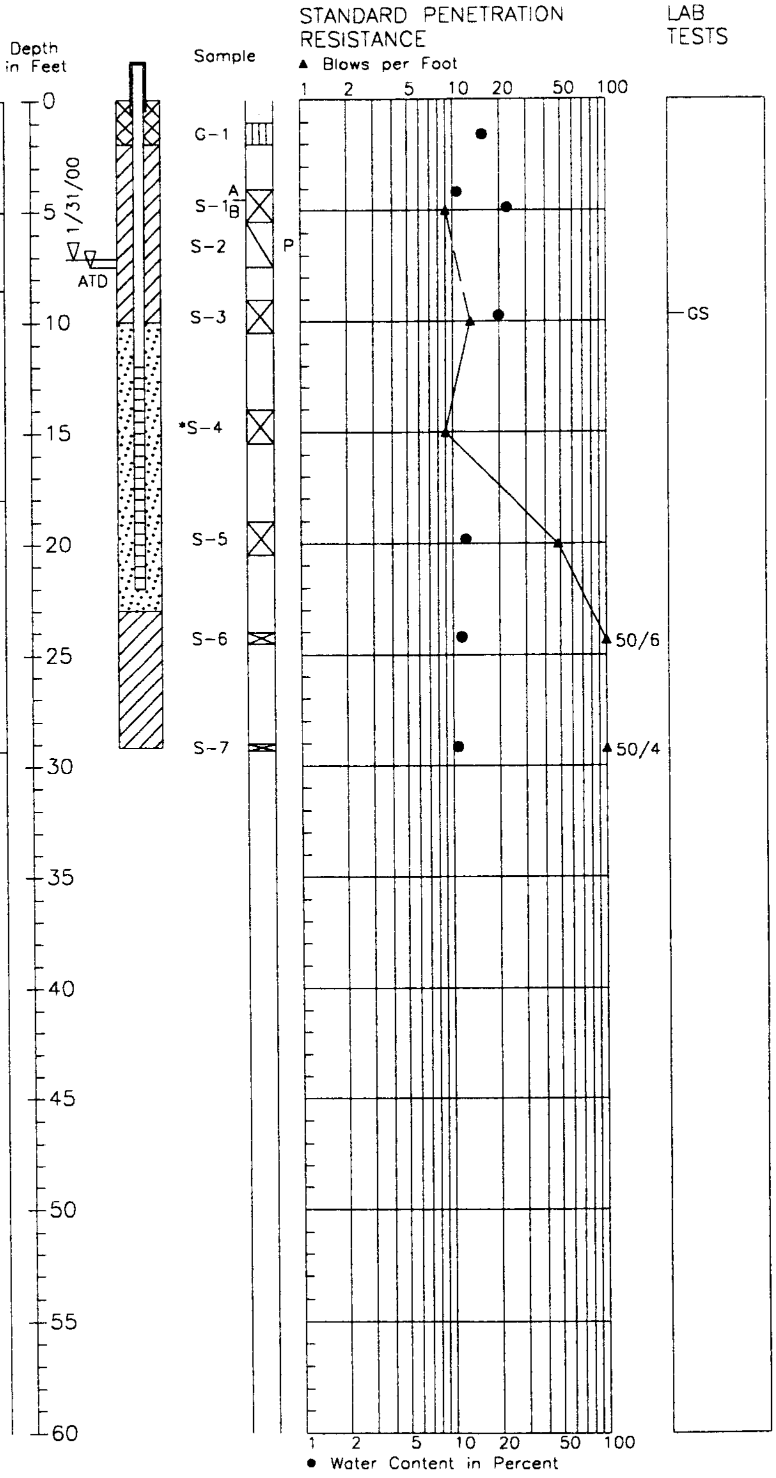
Stiff, wet, gray, slightly gravelly, sandy SILT with organic material.

Loose to medium dense, wet, gray with orange mottling, slightly gravelly, very silty SAND with trace organic material.

Very soft drilling noted.

Dense to very dense, wet to moist, gray, slightly gravelly, silty SAND.

Bottom of Boring at 29.3 Feet. Completed 1/28/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1

497821 LOGS

HARTCROWSER

J-4978-21 **1/00**

Figure A-44

Boring Log HC00-B142

N 19263

E 10890

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 270
Top of Casing Elevation in Feet: 272.72

(Loose) to medium dense, wet, brown to dark brown, silty, gravelly fine to medium SAND.

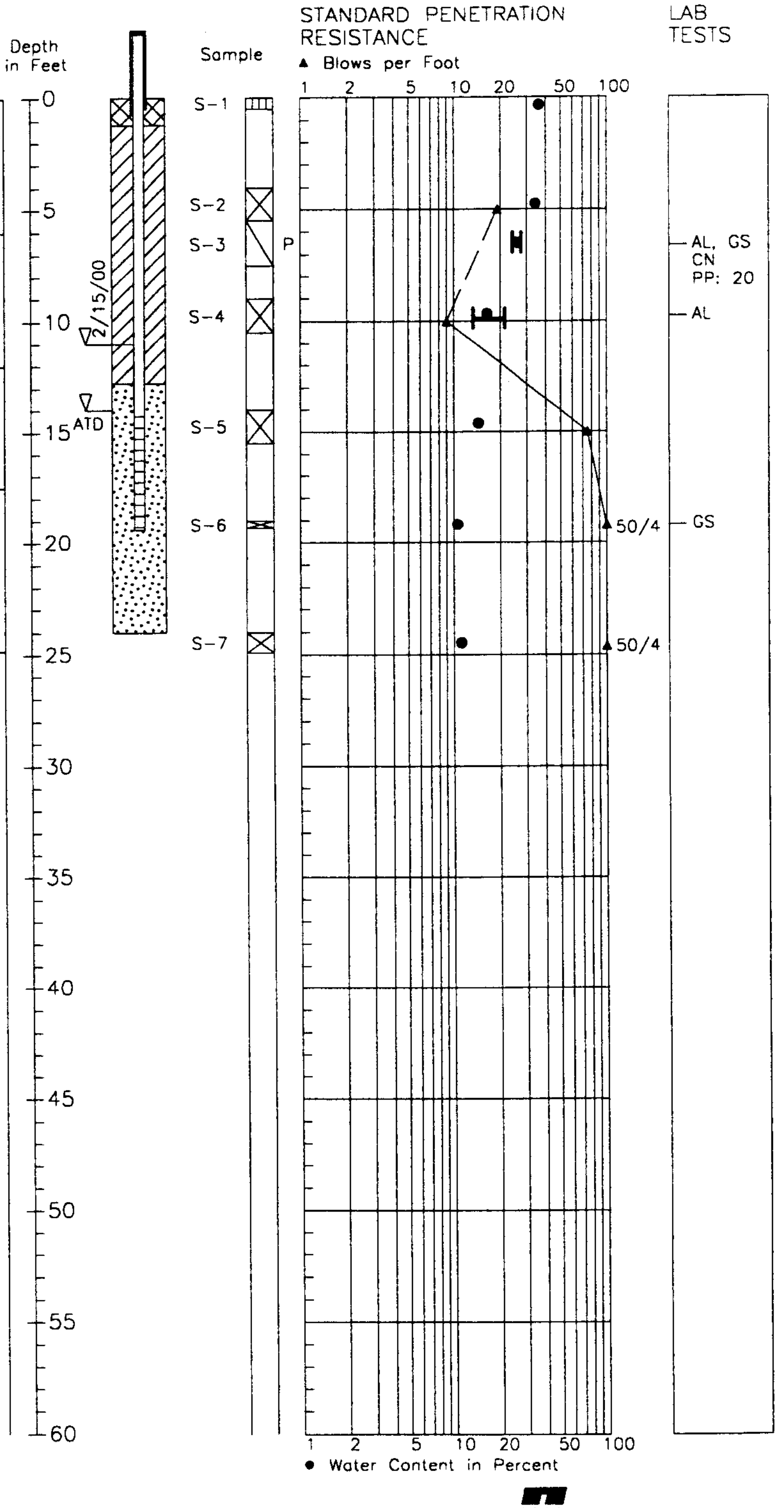
Peat noted.

Stiff, wet, gray, gravelly, sandy SILT.

Medium dense, wet, gray, silty, gravelly SAND.

Very dense, wet, gray, slightly gravelly, very silty SAND.

Bottom of Boring at 24.8 Feet.
Completed 2/15/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER
J-4978-21 1/00
Figure A-45

Boring Log HC00-B143

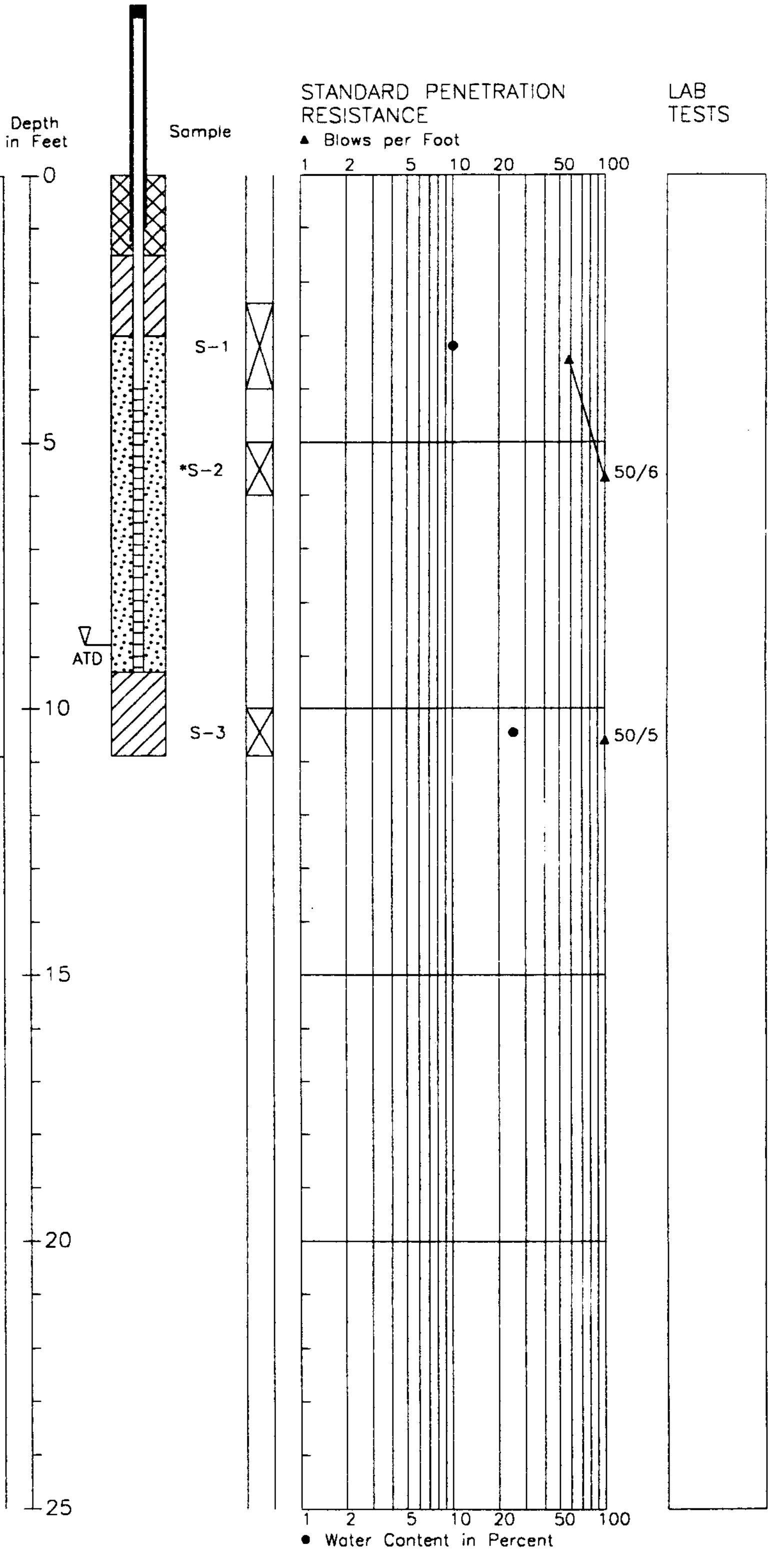
N 18759
E 10701

Soil Descriptions
Top of casing elevation in Feet: 242.27
Approx. Ground Surface Elevation in Feet: 239

Very dense, moist, gray with brown mottling, gravelly, silty SAND.

— Grades to very silty.

Bottom of Boring at 10.9 Feet.
Completed 5/26/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497826 BORINGS

HARTCROWSER
J-4978-26 5/00
Figure A-46

Boring Log HC00-B144

N 18792

E 10787

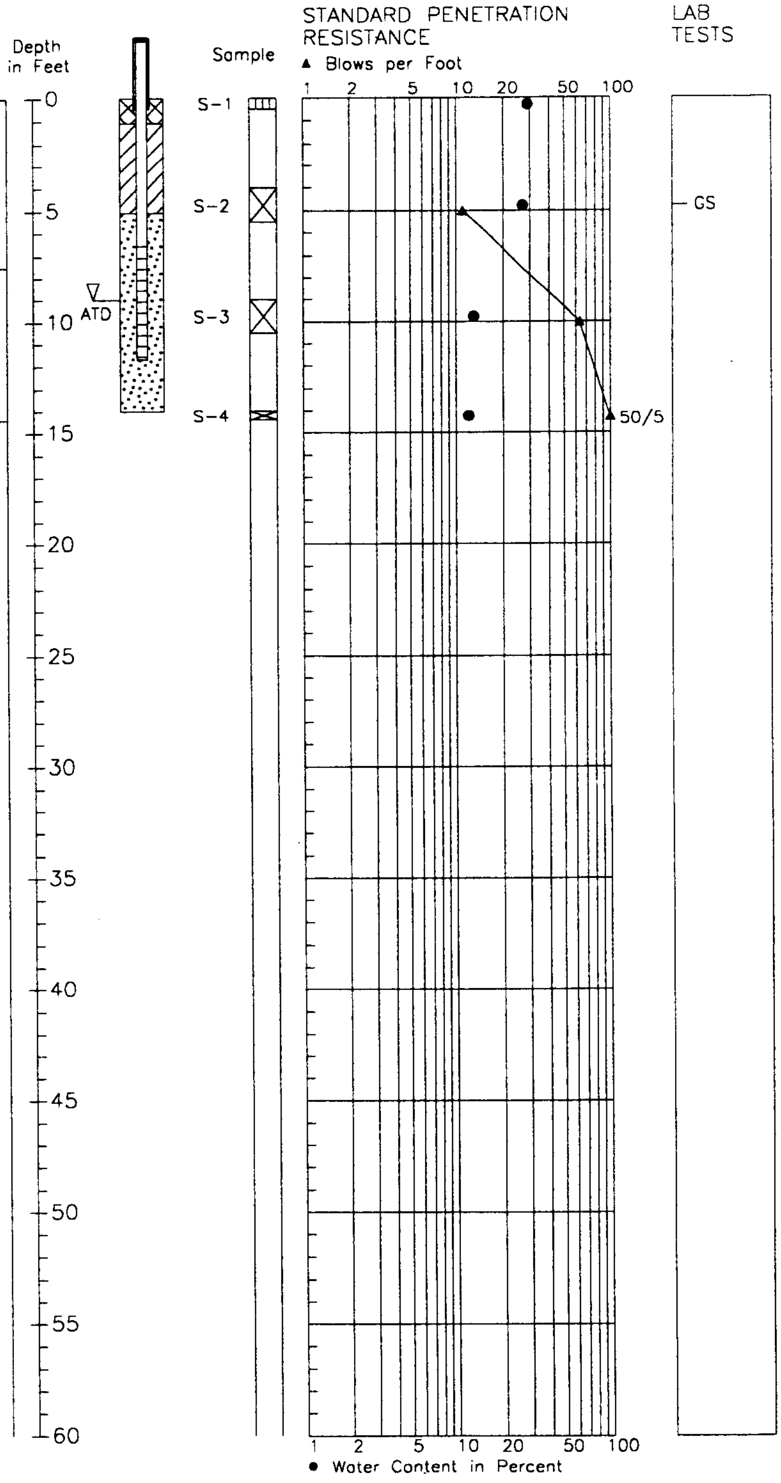
Soil Descriptions

Approx. Ground Surface Elevation in Feet: 247
Top of Casing Elevation in Feet: 248.99

Loose to medium dense, dark brown to gray, slightly gravelly, non-silty to silty SAND with trace organic material.

Very dense, wet, gray, silty, slightly gravelly to very gravelly SAND.

Bottom of Boring at 14.4 Feet.
Completed 2/15/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOCS

HARTCROWSER

J-4978-21 1/00

Figure A-47

Boring Log HC00-B145

N 18964
E 10866

Soil Descriptions

Approx. Ground Surface Elevation in Feet: 263

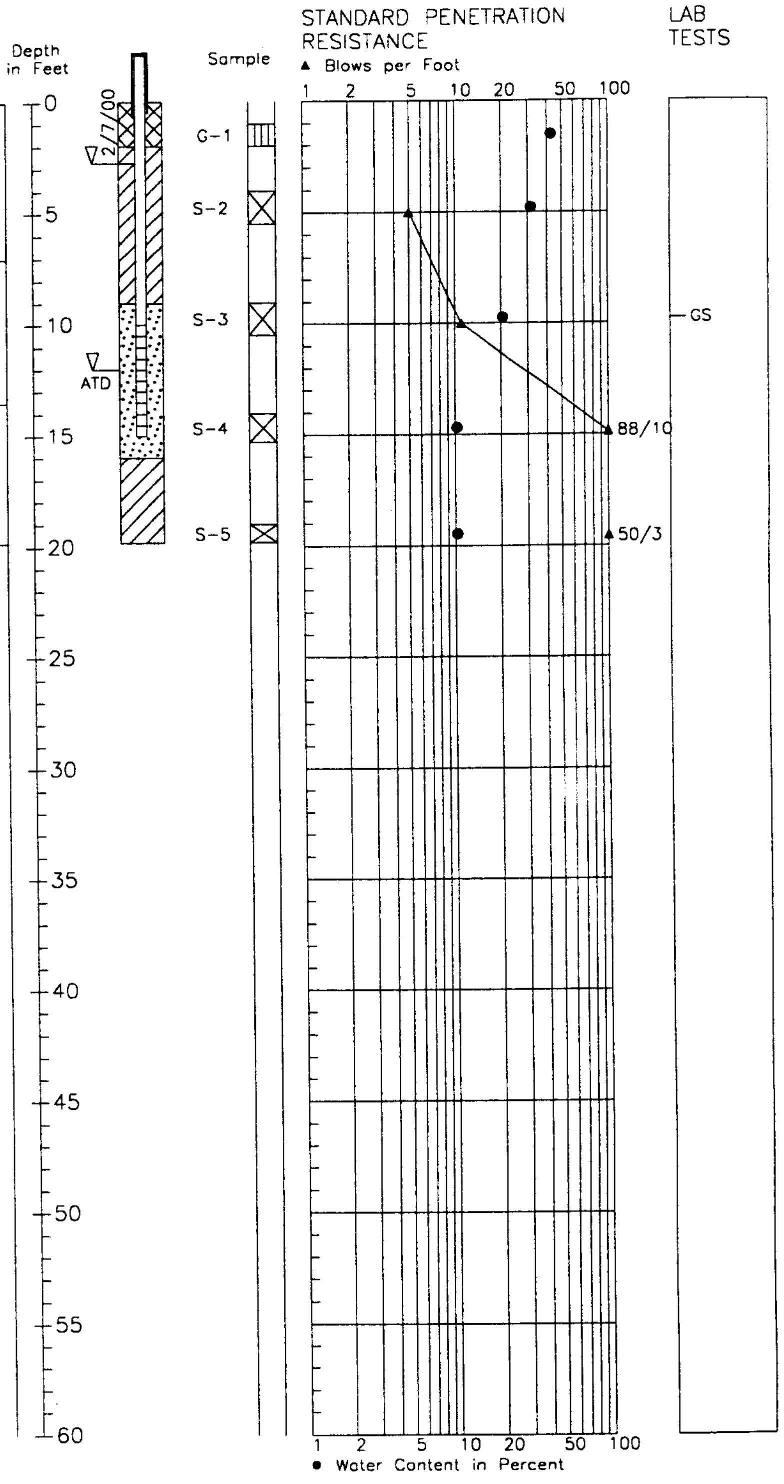
Top of Casing Elevationin Feet: 265.11

Loose, wet, dark brown to gray and brown, slightly gravelly, silty SAND with trace organic material.

Medium dense, wet, tan, slightly gravelly, silty SAND.

Very dense, moist, gray, slightly gravelly, silty SAND.

Bottom of Boring at 19.8 Feet. Completed 2/7/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-48

Boring Log HC00-B146

N 19242

E 10784

Soil Descriptions

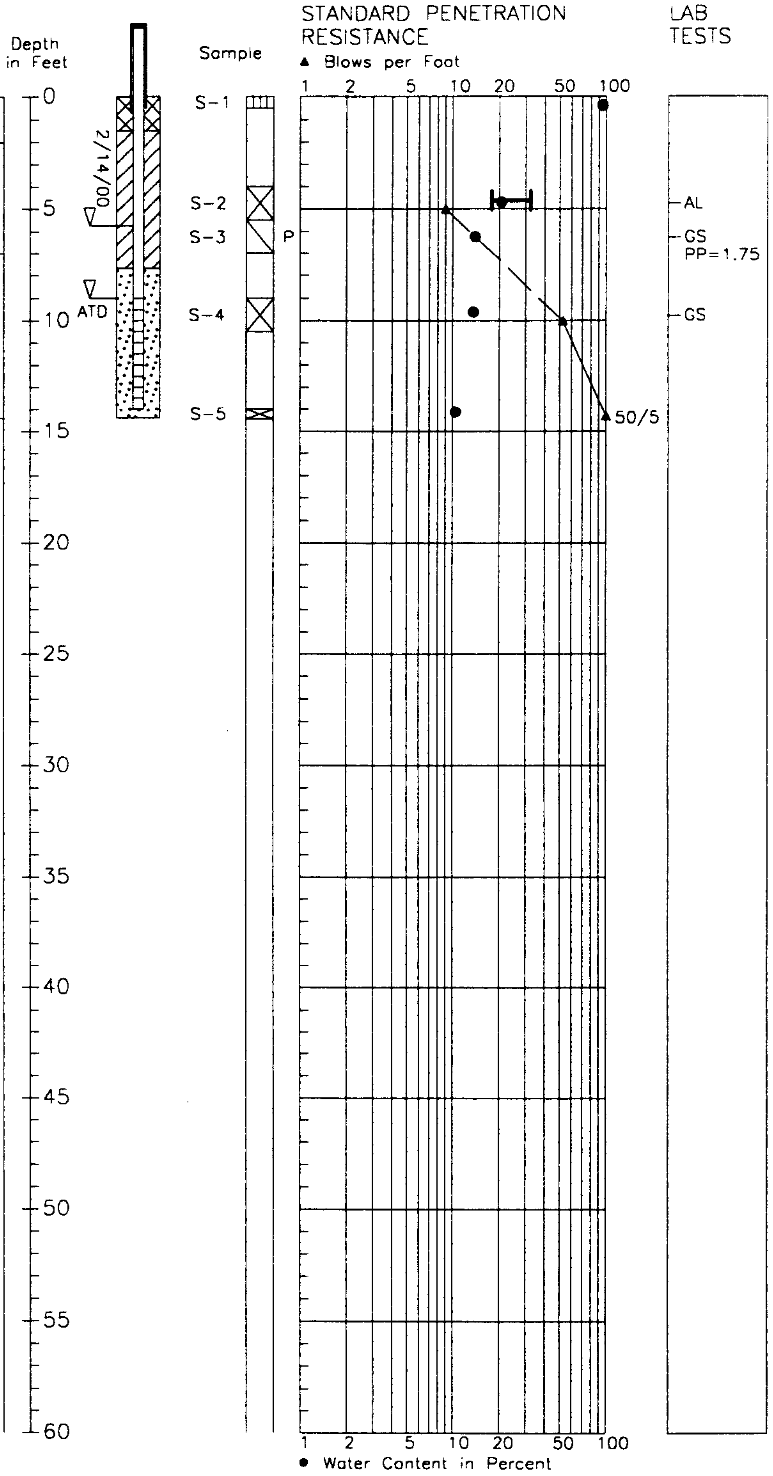
Approx. Ground Surface Elevation in Feet: 261
Top of Casing Elevation in Feet: 263.55

Soft, wet, dark brown, sandy PEAT.

Stiff, wet, gray, gravelly, very sandy SILT and CLAY with trace organic material.

Very dense, wet, gray, slightly gravelly, very silty SAND.

Bottom of Boring at 14.4 Feet. Completed 2/14/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497821 LOGS

HARTCROWSER

J-4978-21 2/00

Figure A-49

Boring Log HC00-B147

N 16694
E 10507

Soil Descriptions

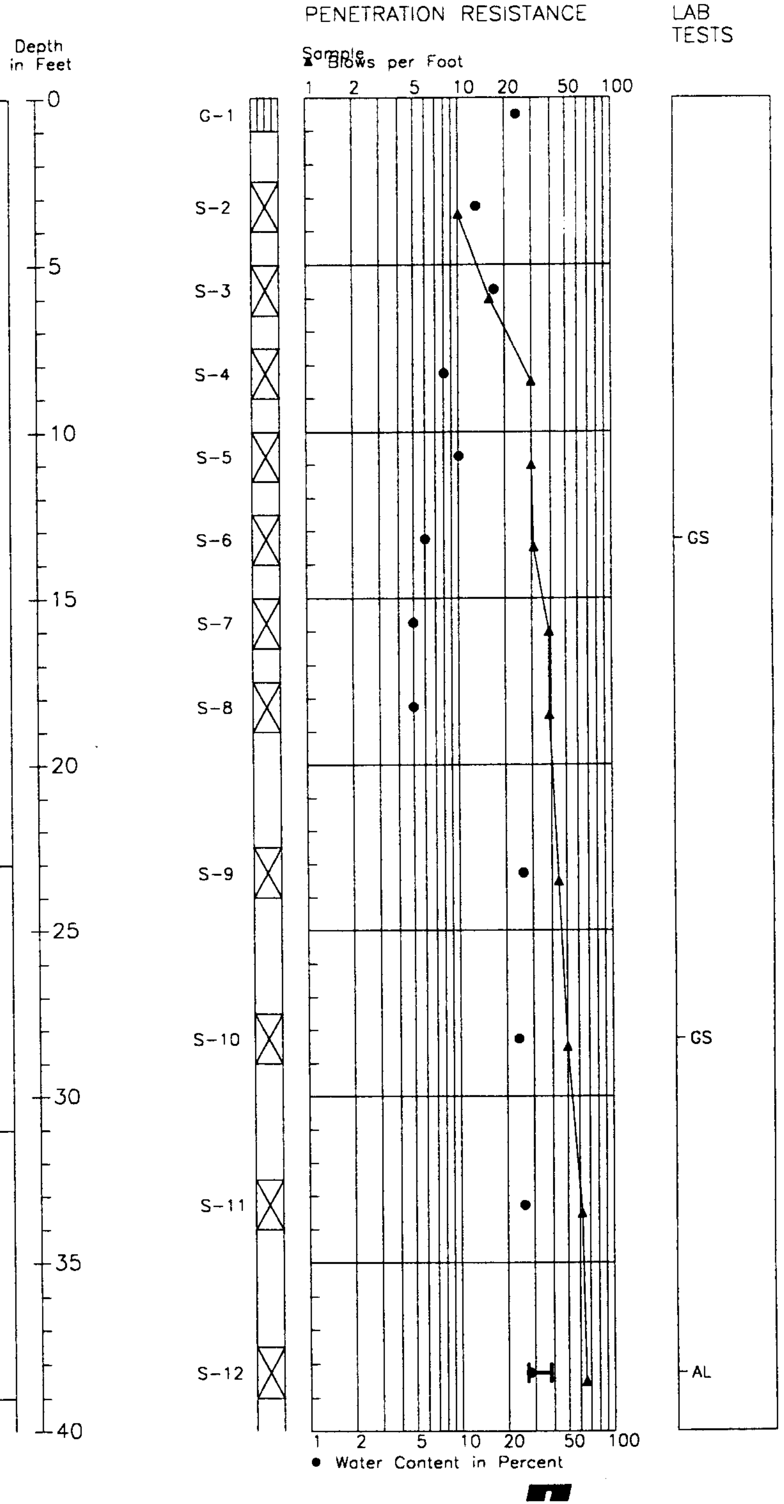
Ground Surface Elevation in Feet: 347

Medium dense to dense, moist, brown, slightly silty, medium to fine SAND to SAND.

Hard, moist, brown and orange mottled, very sandy SILT.

Hard, moist, gray, slightly sandy, very silty CLAY to clayey SILT.

Bottom of Boring at 39.0 Feet.
Completed 2/3/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 497822 Logs 7/30/01

HARTCROWSER
J-4978-22 2/00
Figure A-50

Boring Log HC00-B221

N 17715

E 10953

Soil Descriptions

Approximate Ground Surface Elevation in Feet: 256

Loose, wet, gray and brown mottled, silty, gravelly, fine to medium SAND. (WEATHERED)

— Pressuremeter test.

— Pressuremeter test.

Very dense, wet, gray-brown, silty, gravelly, fine to medium SAND.

— Drilled through 8-inch cobble.

— Pressuremeter test.

— Pressuremeter test.

Very stiff to hard, moist, gray, clayey SILT and silty CLAY.

— Pressuremeter test.

— Pressuremeter test.

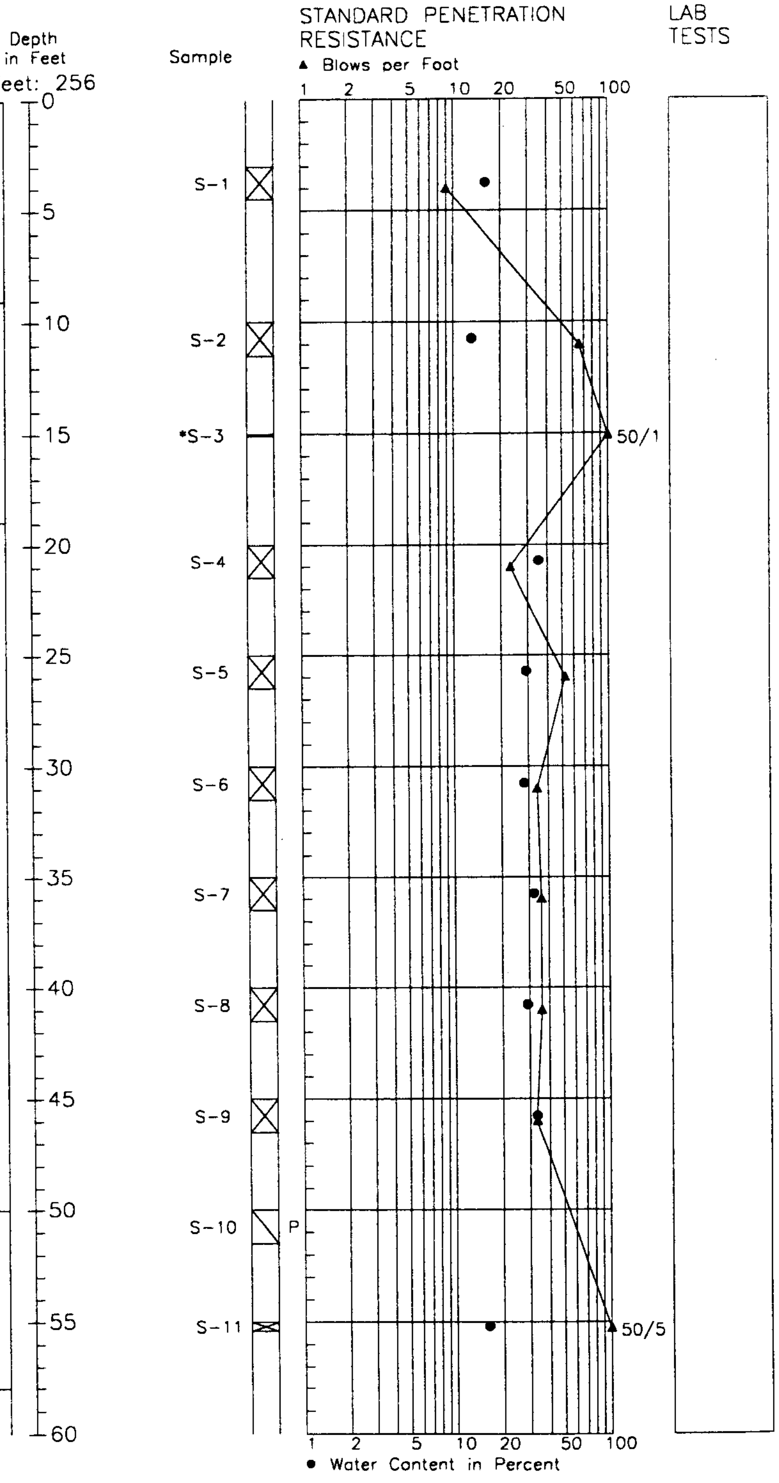
— Becomes laminated and layered.

— Pressuremeter test.

— Some slickensides.

Hard, moist, gray, sandy SILT.

Very dense, wet, gray, slightly silty SAND.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

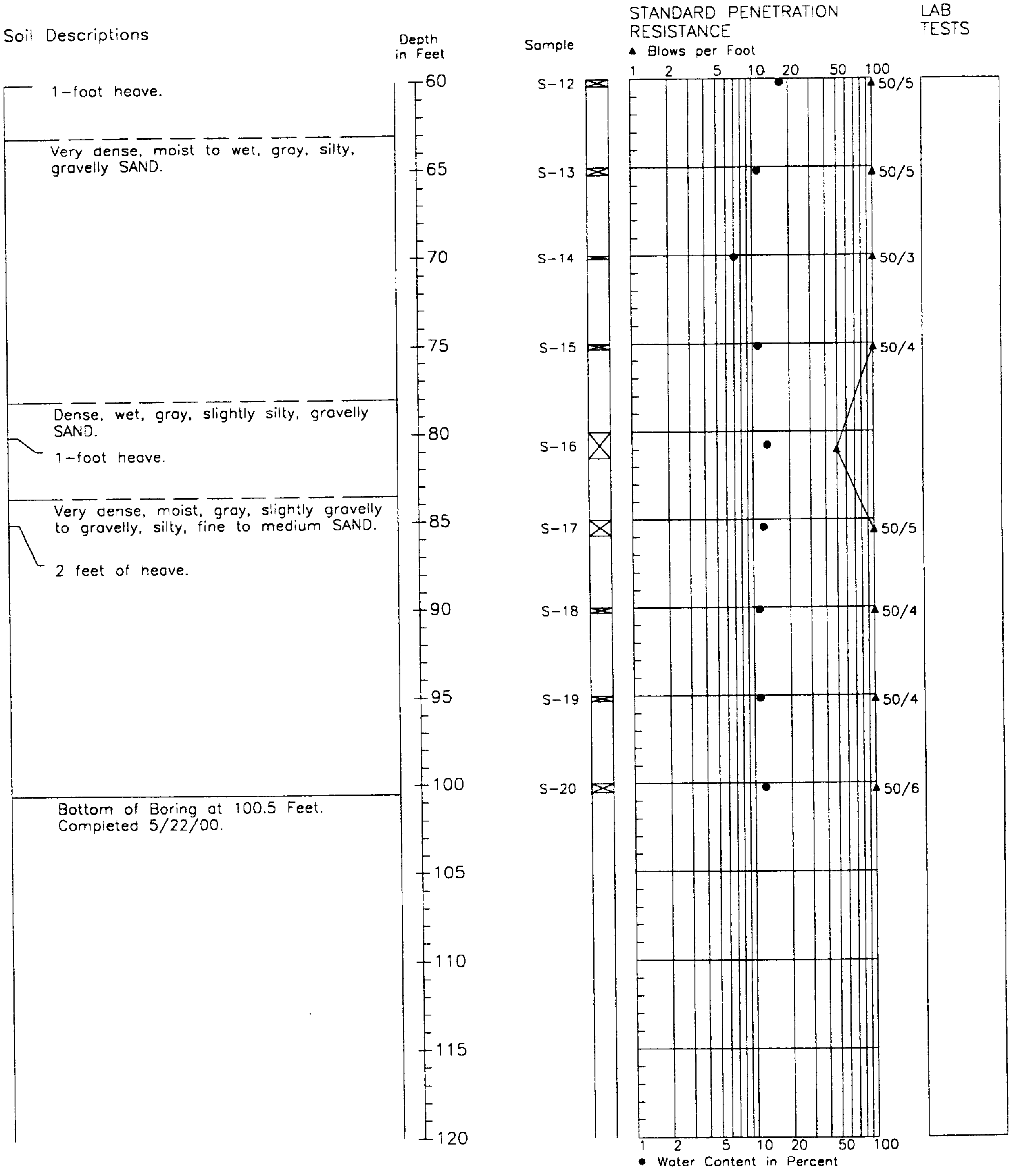
hei 7/30/01 1=1
497827\LOGS.dwg

HARTCROWSER

J-4978-27 5/00

Figure A-51 1/2

Boring Log HC00-B221



1-foot heave.

Very dense, moist to wet, gray, silty, gravelly SAND.

Dense, wet, gray, slightly silty, gravelly SAND.

1-foot heave.

Very dense, moist, gray, slightly gravelly to gravelly, silty, fine to medium SAND.

2 feet of heave.

Bottom of Boring at 100.5 Feet.
Completed 5/22/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497827\LOGS.dwg

HARTCROWSER
J-4978-27 5/00
Figure A-51 2/2

Boring Log HC00-B224

N 18193

E 10965

Soil Descriptions

Approximate Ground Surface Elevation in Feet: 240

Drill action indicates gravel.

Very dense, wet, gray, slightly silty, fine SAND.

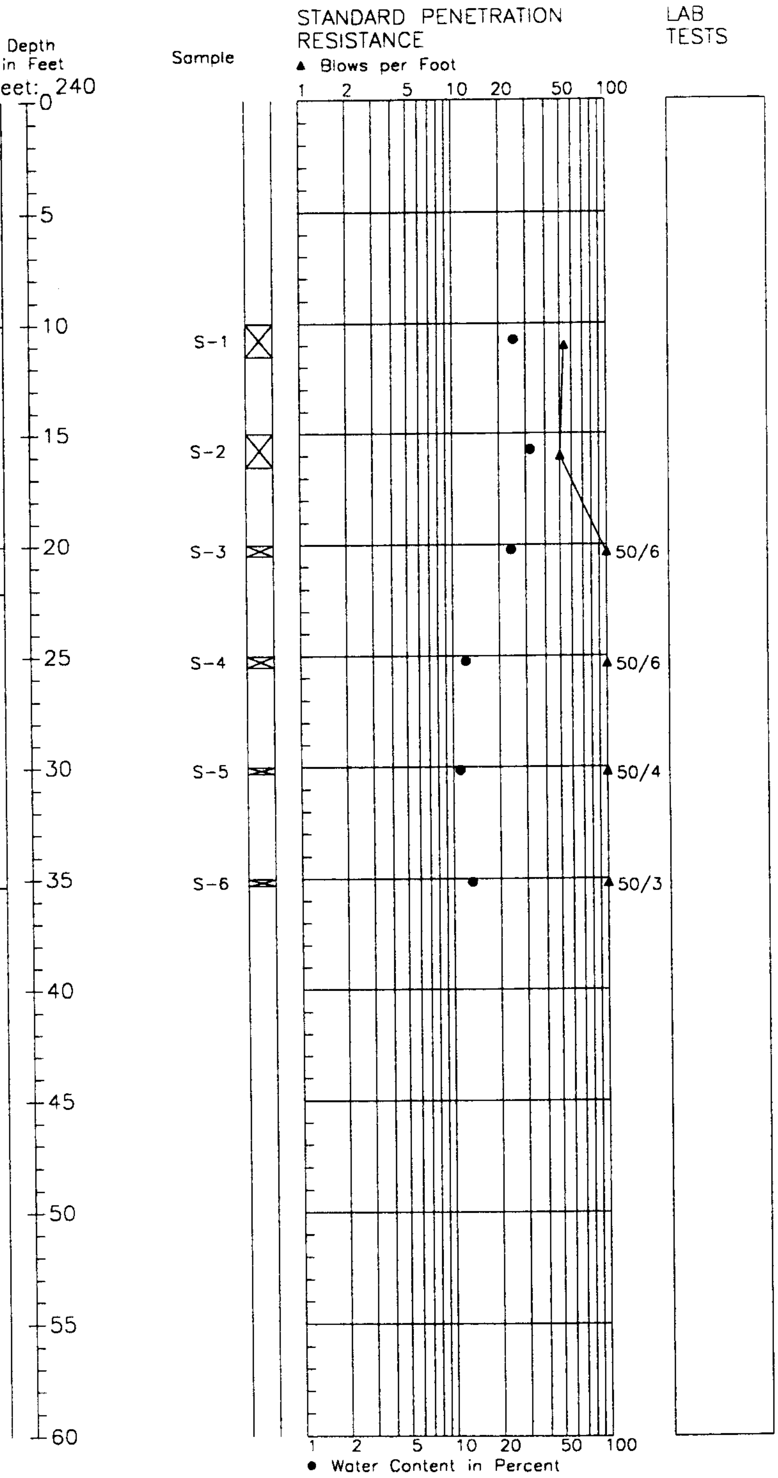
Very dense, wet, gray, silty, gravelly SAND.

Pressuremeter test.

Very dense, moist, gray, gravelly, silty SAND.

Pressuremeter test.

Bottom of Boring at 35.3 Feet.
Completed 5/22/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
49782\LOGS.dwg

HARTCROWSER

J-4978-27 5/00

Figure A-52

Boring Log HC00-B300

N 19818

E 10889

Soil Descriptions

Ground Surface Elevation in Feet: 291

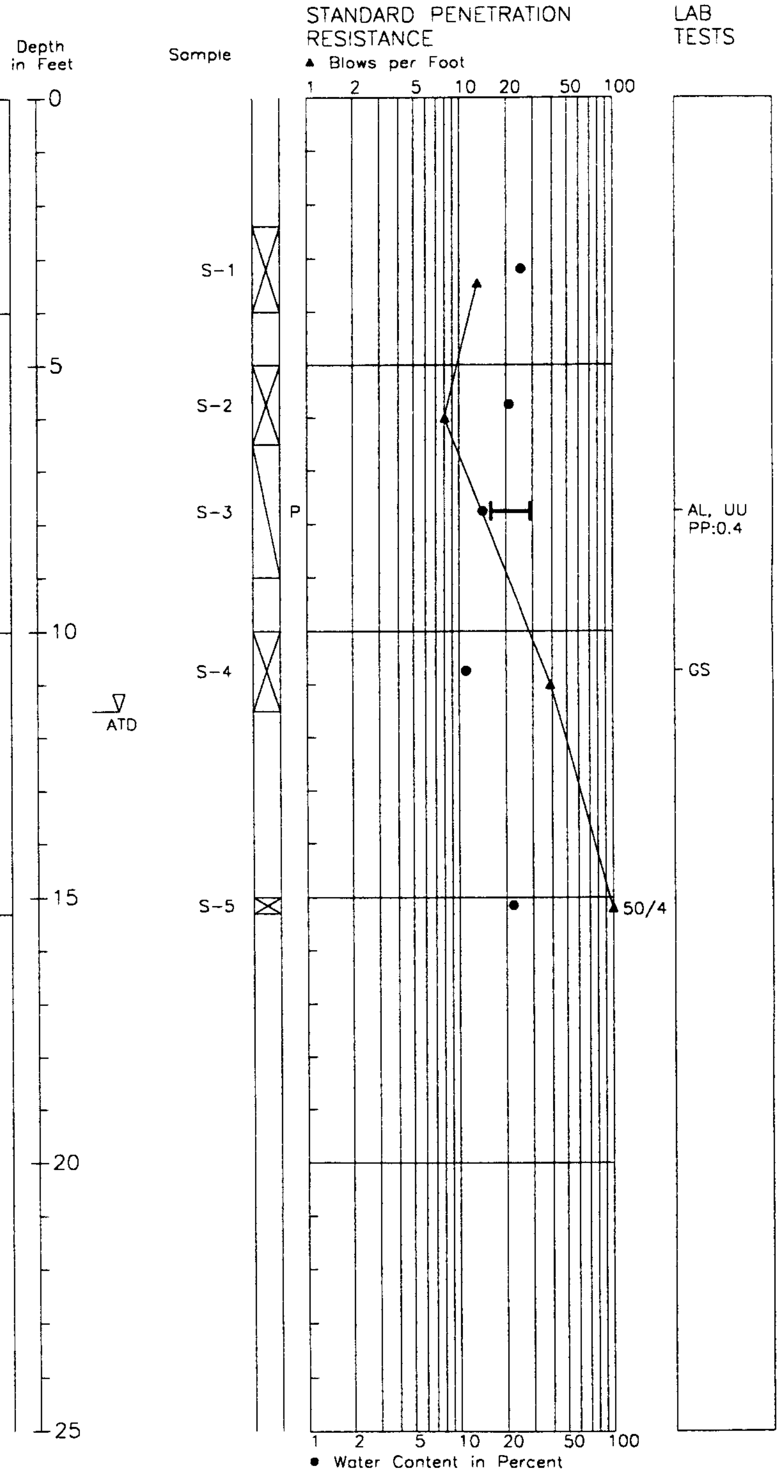
Medium dense, wet, brown, slightly silty SAND.

Medium stiff, moist, greenish gray with mottling, slightly sandy, slightly silty CLAY.

Dense to very dense, moist to wet, brown, slightly gravelly, very silty SAND.

Changes to gray, becomes silty.

Bottom of Boring at 15.3 Feet.
Completed 5/25/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Ground water level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

hel 7/30/01 1=1
497826 BORINGS

HARTCROWSER

J-4978-26 5/00

Figure A-53

Monitoring Well Log HC00-B301

Northing (ft): 21476
Easting (ft): 10560

Soil Descriptions
Ground Surface Elevation in Feet: 264.65

(Stiff), damp, brown, sandy SILT with trace organics.

Medium dense, moist, brown and gray, silty SAND with some peat over (soft) moist, brown PEAT.

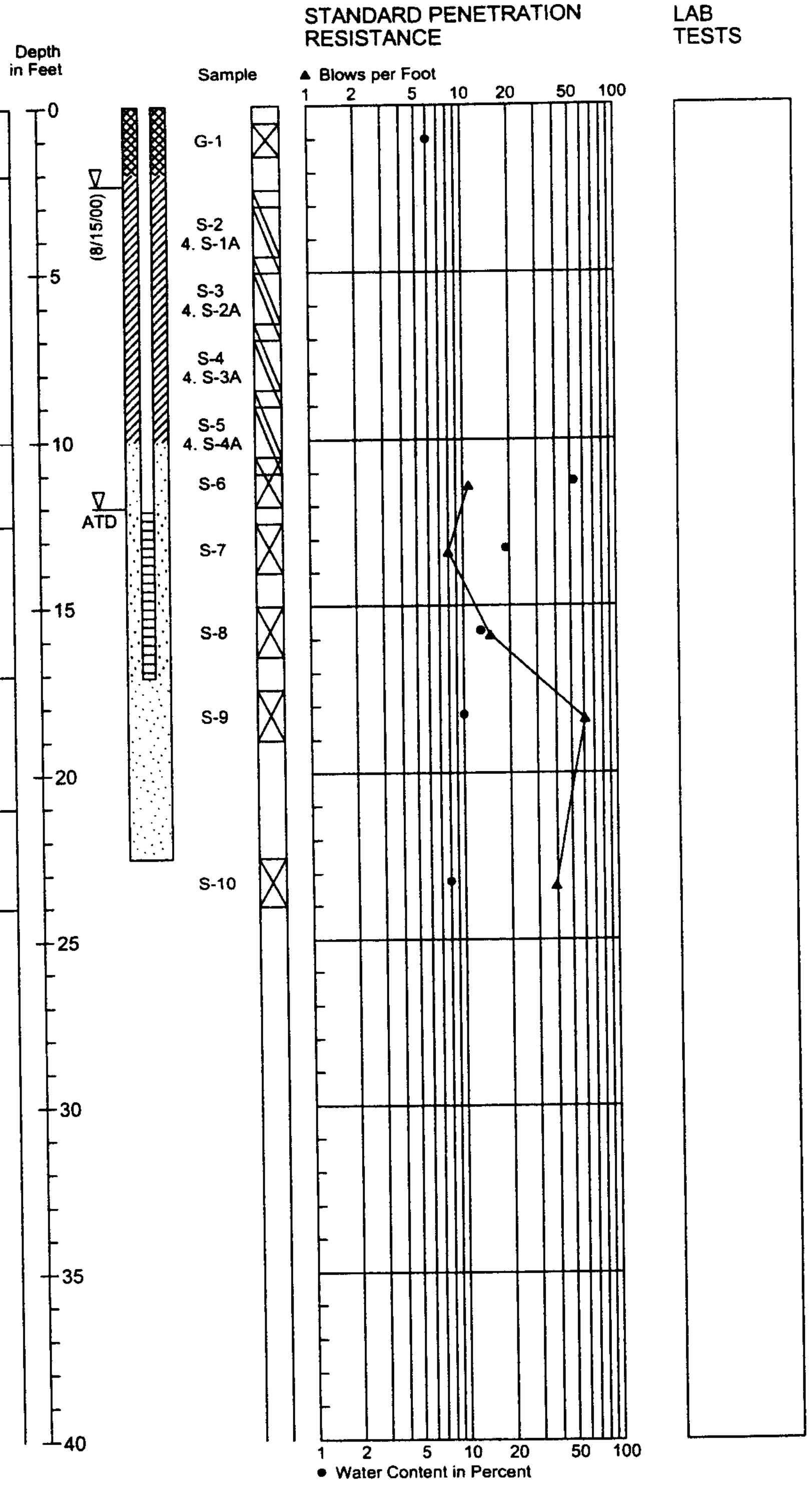
Stiff, moist, gray to brown SILT with some PEAT and trace organics.

Loose to medium dense, wet, brown to gray, fine to coarse SAND.

Hard, moist, gray, slightly gravelly, sandy SILT.

Dense, moist to wet, gray, slightly gravelly, slightly silty, fine to coarse SAND.

Bottom of Boring at 24.0 Feet.
Completed 08/11/00.



BORING LOG 497831A.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

4978-31 **08/00**

Figure A-54

Boring Log HC00-B303

Northing (ft): 20224
Easting (ft): 10971

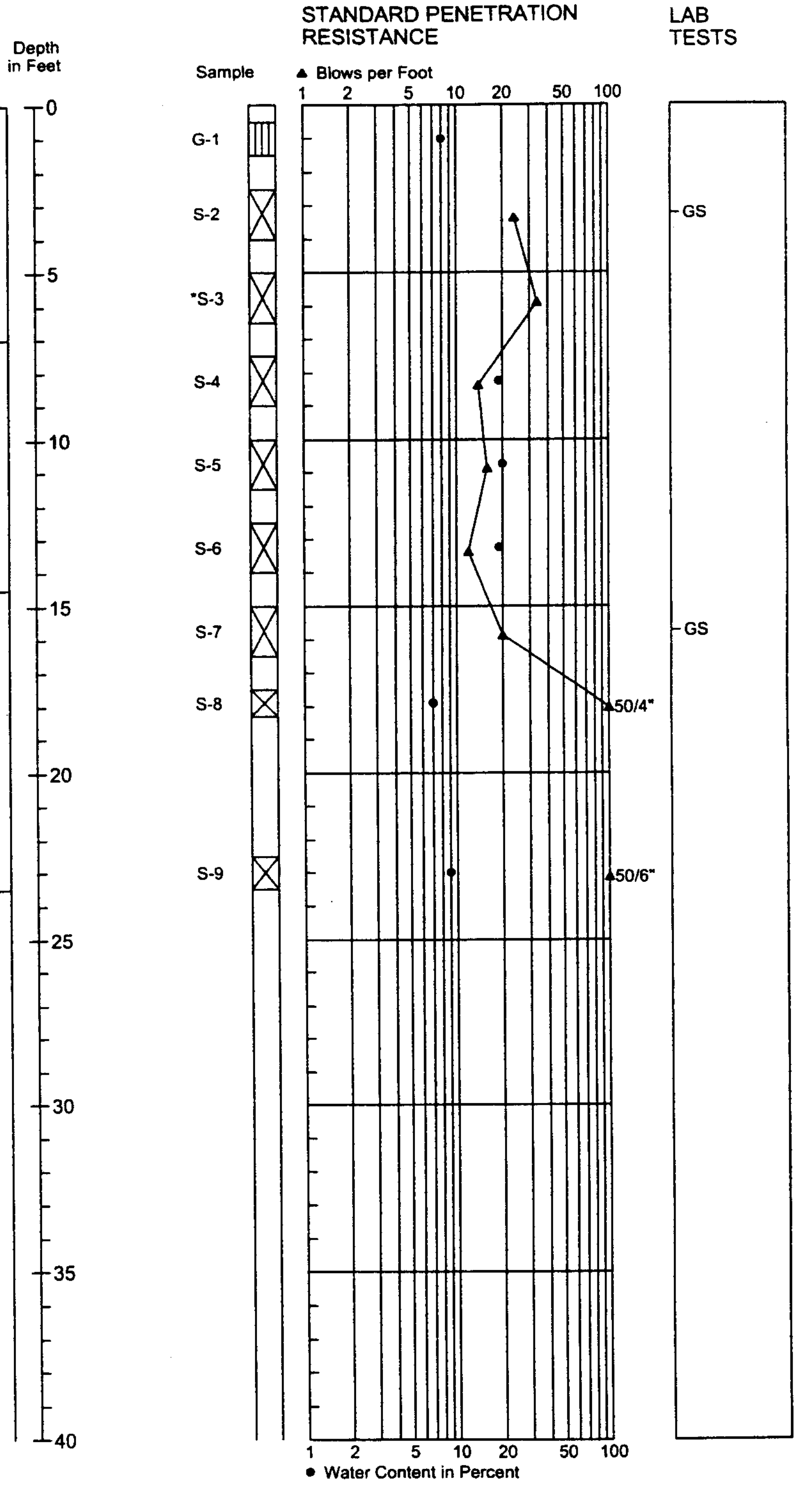
Soil Descriptions
Ground Surface Elevation in Feet: 304

Medium dense to dense, moist to damp, brown, silty, fine to medium SAND.

Stiff to very stiff, moist, brown with orange mottling, slightly sandy to sandy CLAY.

Medium dense to very dense, moist, brown, slightly gravelly, silty, fine to medium SAND.

Bottom of Boring at 23.5 Feet.
Completed 08/10/00.



BORING LOG 497831A.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

4978-31 *08/00*

Figure A-55

Monitoring Well Log HC00-B305

Northing (ft): 19808
Easting (ft): 10808

Soil Descriptions
Ground Surface Elevation in Feet: 284

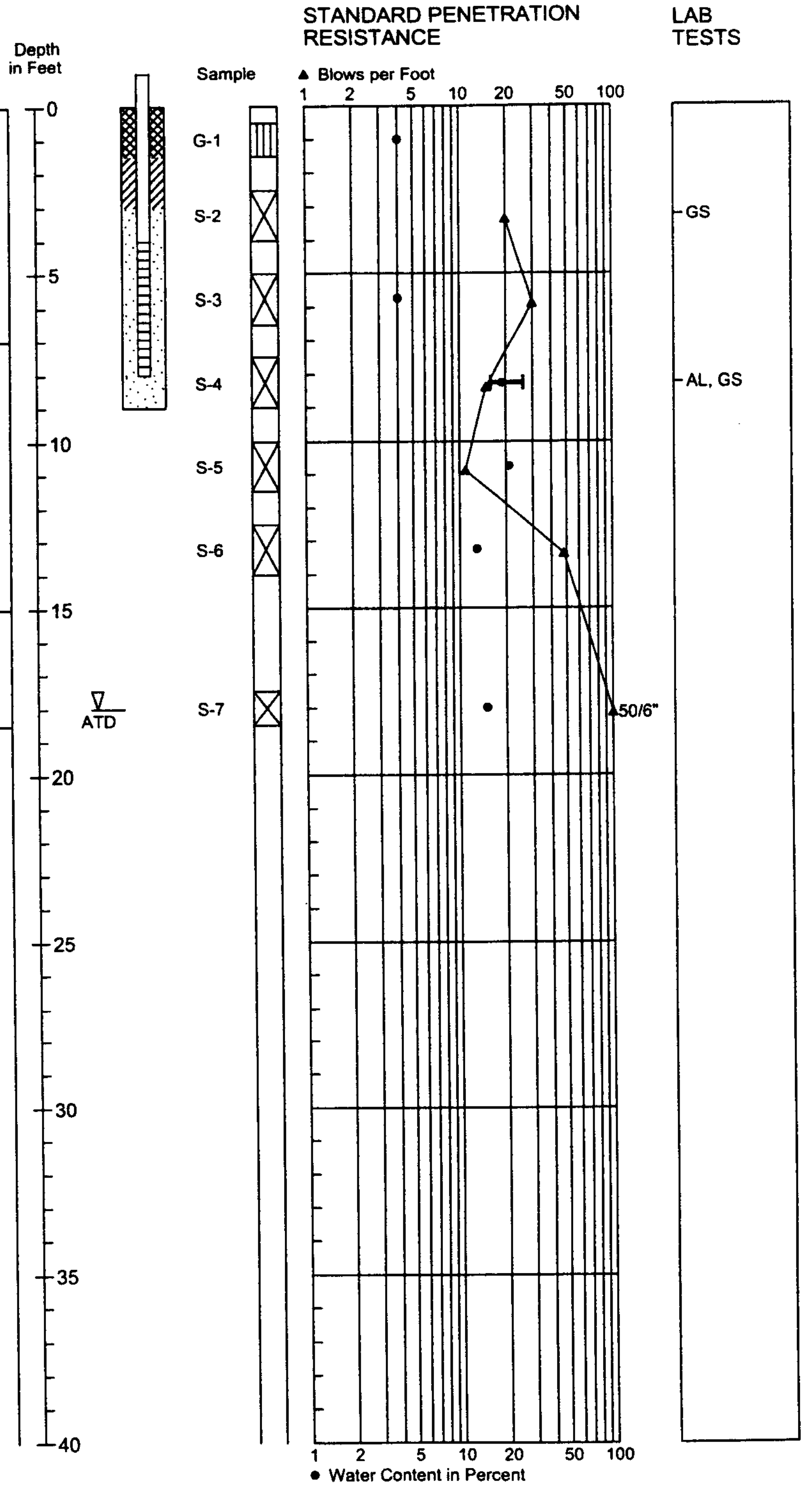
Medium dense to dense, damp to moist, slightly silty, very gravelly SAND.

Stiff to hard, moist, brownish gray and orange mottled, sandy CLAY.

Sand and gravel noted at bottom 2 inches of sample.

Very dense, moist to wet, gray and brown, slightly gravelly, silty SAND.

Bottom of Boring at 18.5 Feet.
Completed 08/10/00.



BORING LOG 497831A.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

4978-31 **08/00**

Figure A-56

Monitoring Well Log HC00-B306

Northing (ft): 19434
Easting (ft): 10866

Soil Descriptions
Ground Surface Elevation in Feet: 278.65

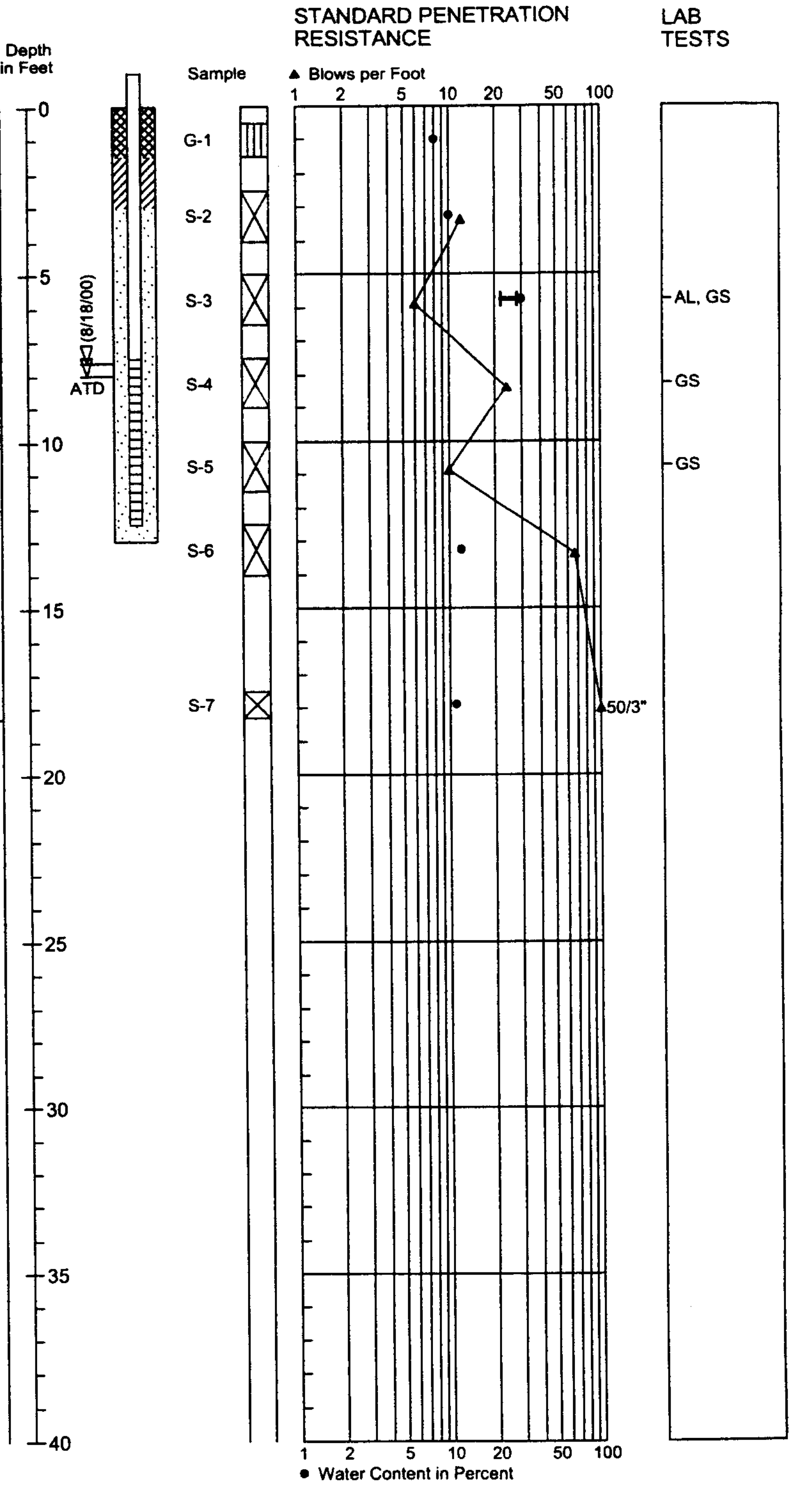
Medium dense, moist to damp, brown with orange mottling, slightly silty SAND.

Medium stiff, moist, gray and orange mottled, sandy, very silty CLAY.

Loose to medium dense, moist to wet, gray with orange mottling, slightly gravelly, very silty, fine to medium SAND.

Very dense, damp to moist, brownish gray, slightly gravelly, silty SAND.

Bottom of Boring at 18.3 Feet.
Completed 08/10/00.



BORING LOG 497831A.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

4978-31 *08/00*

Figure A-57

Boring Log HC00-B307

Northing (ft): 19082
Easting (ft): 10783

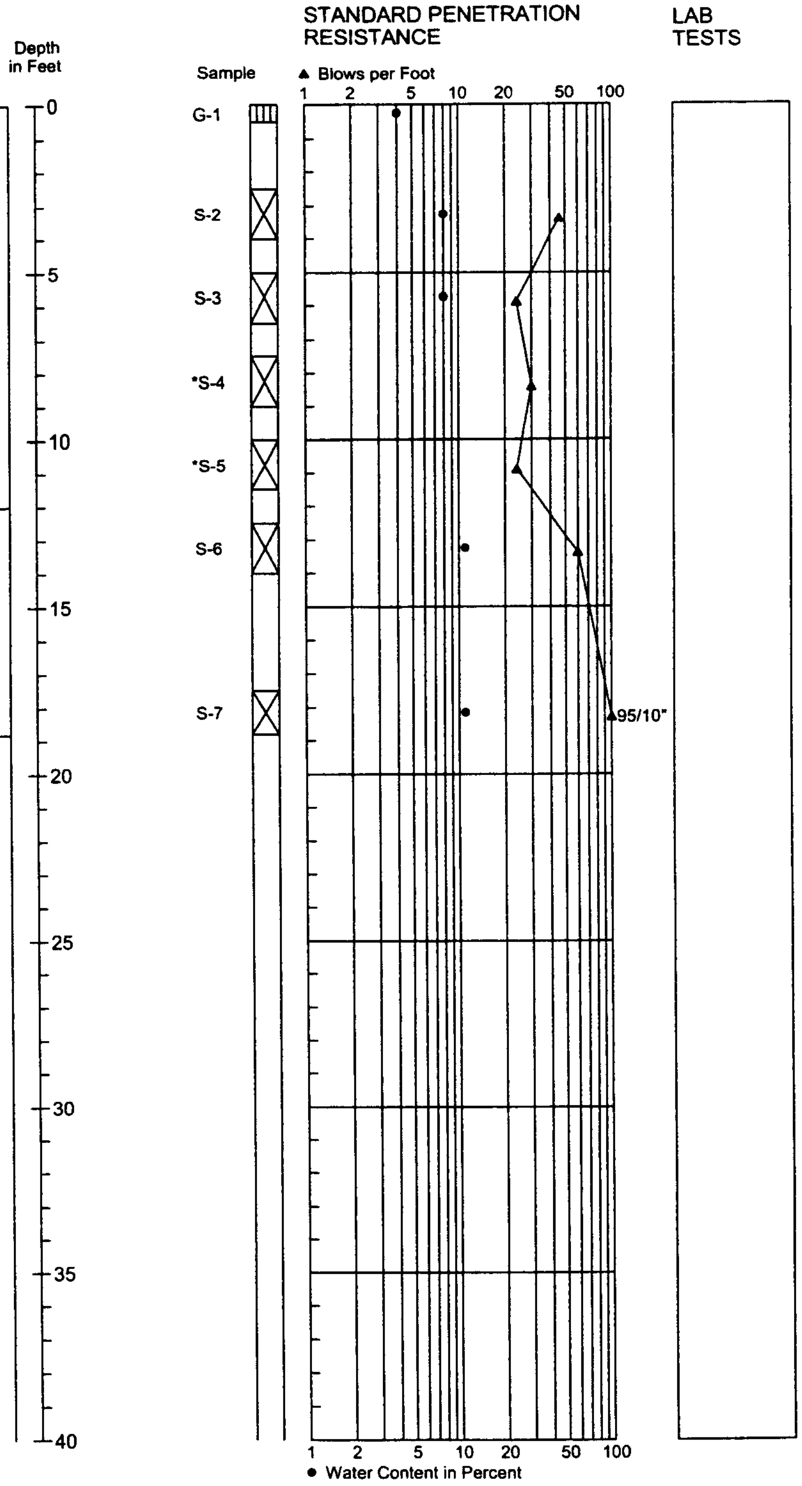
Soil Descriptions
Ground Surface Elevation in Feet: 267

Medium dense to dense, moist to damp, brown and gray, gravelly, silty SAND.

Noted gravels in run.

Very dense, moist to wet, brownish gray to gray, slightly gravelly, slightly silty to silty SAND.

Bottom of Boring at 18.8 Feet.
Completed 08/09/00.



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

4978-31 *08/00*

Figure A-58

Boring Log HC01-B401

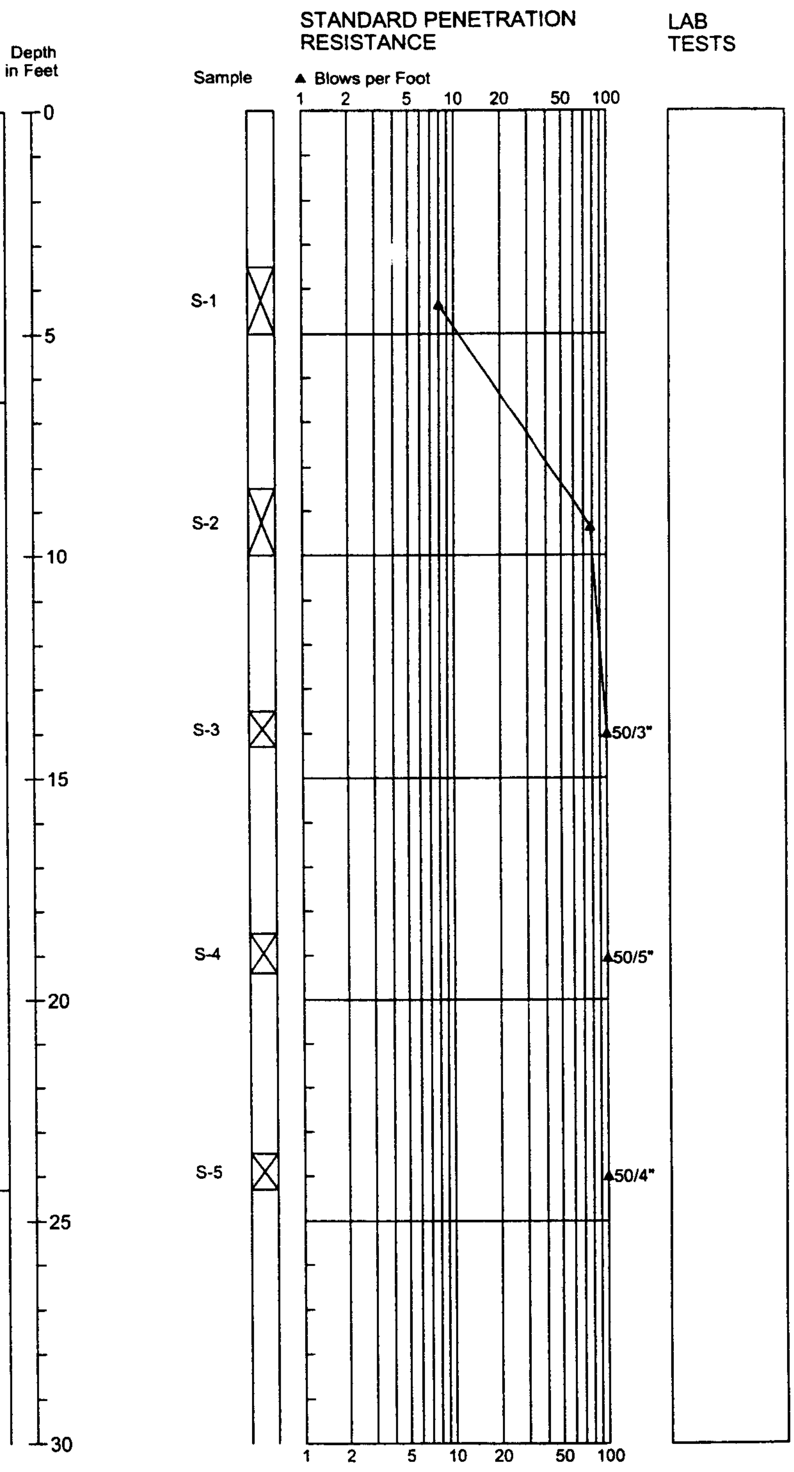
Northing (ft): 15148
Easting (ft): 10985

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 349.6

Loose, moist to wet, gray and red-brown, mottled, gravelly, silty SAND. (WEATHERED TILL)

Very dense, moist, gray, gravelly, silty SAND with slightly silty zone near top. (TILL)

Bottom of Boring at 24.3 Feet.
Completed 04/25/01.



BORING LOG 497806B.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-06 *04/01*
Figure A-59

Boring Log HC01-B402

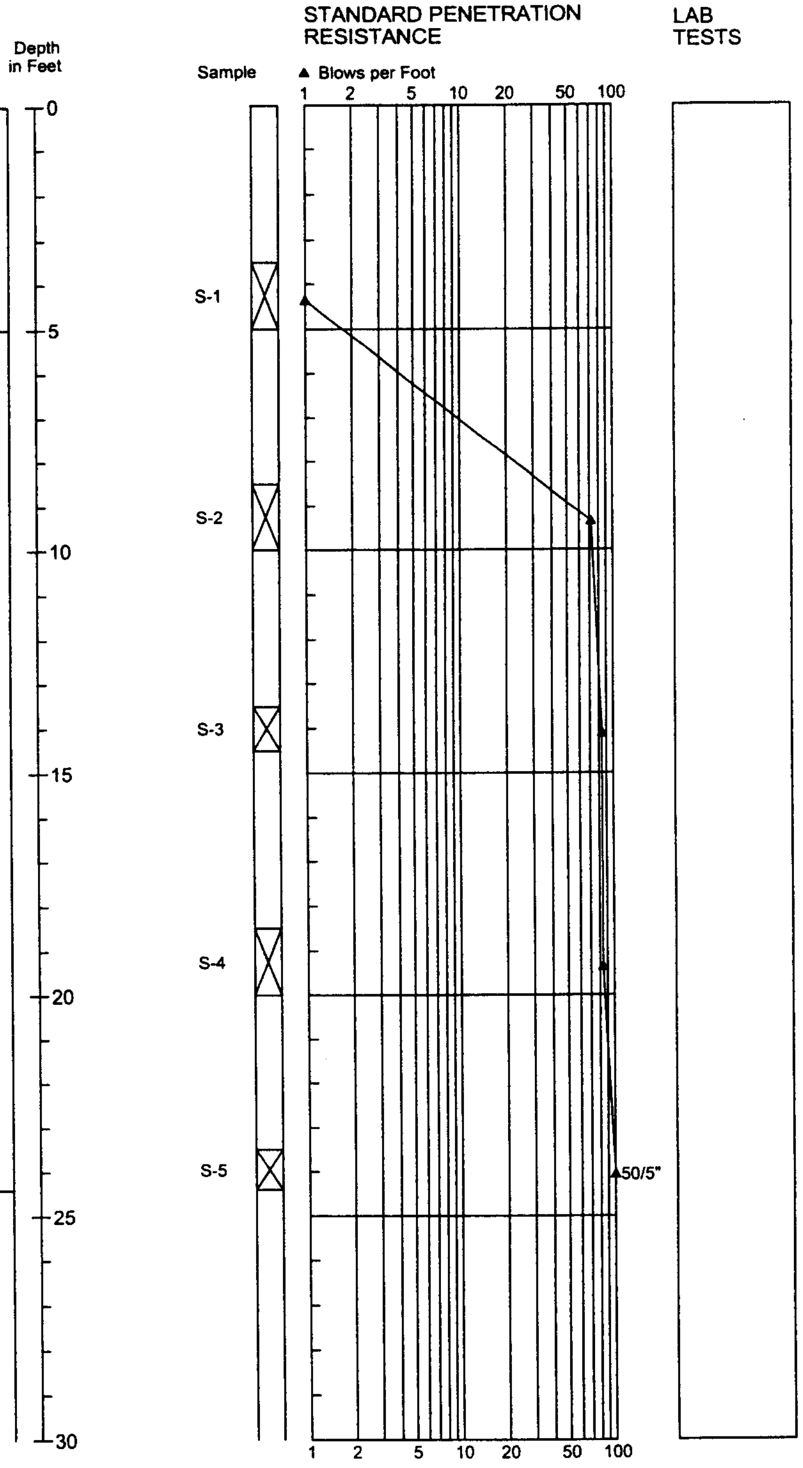
Northing (ft): 15279
Easting (ft): 10953

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 355.7

Fill with scattered concrete.

Very dense, moist, gray, gravelly, silty SAND. (TILL)

Bottom of Boring at 24.4 Feet.
Completed 04/25/01.



BORING LOG 497806B.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

J-4978-06 *04/01*
Figure A-60

Boring Log HC01-B403

Northing (ft): 15378
Easting (ft): 10759

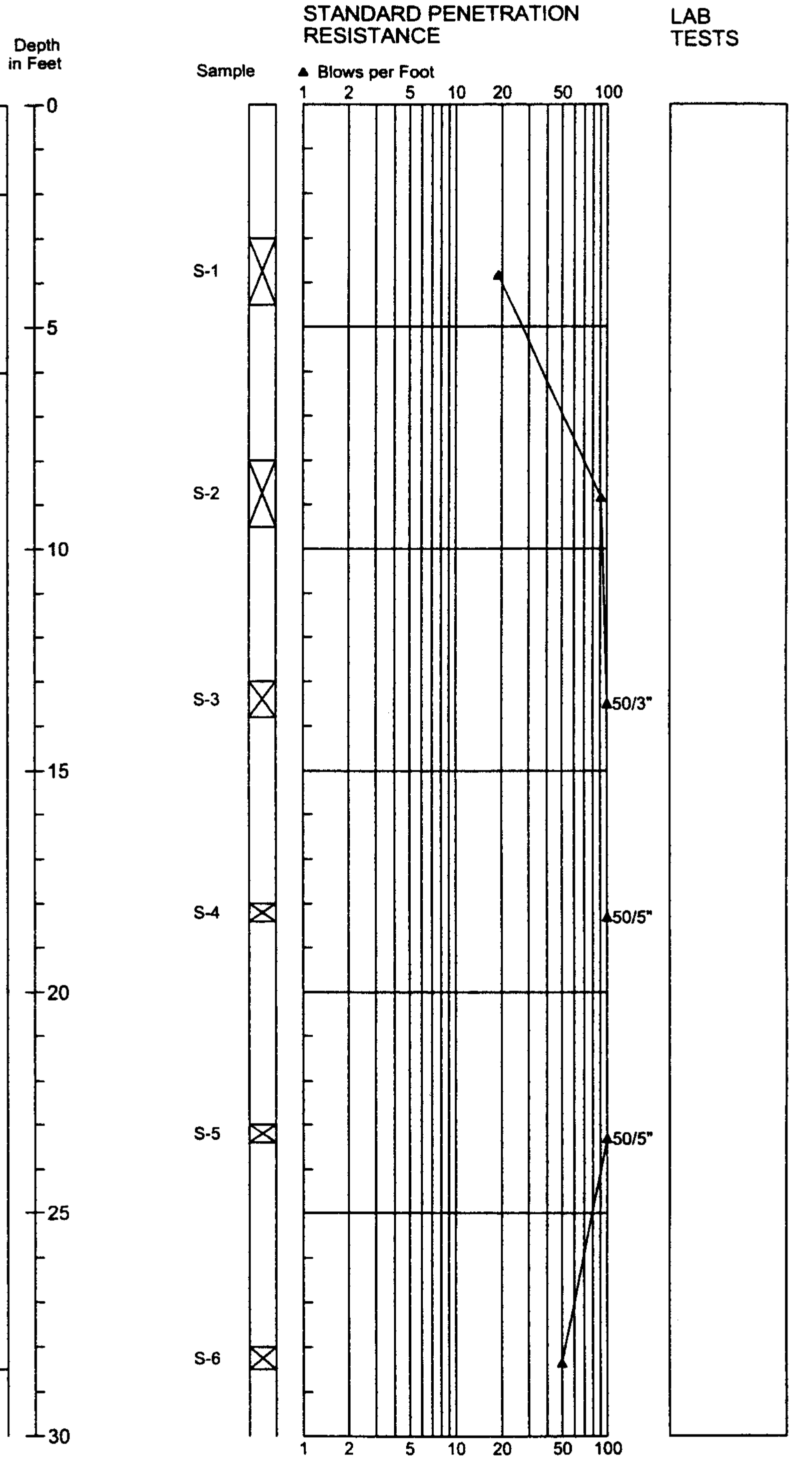
Soil Descriptions
Approximate Ground Surface Elevation in Feet: 361.7

Fill and gravelly roadbase.

Medium dense, moist, gray and brown mottled, slightly gravelly, silty SAND. (WEATHERED TILL)

Very dense, moist, gray, gravelly, silty SAND. (TILL)

Bottom of Boring at 28.5 Feet.
Completed 04/25/01.



BORING LOG 497806B.GPJ HC_CORP.GDT 7/30/01

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

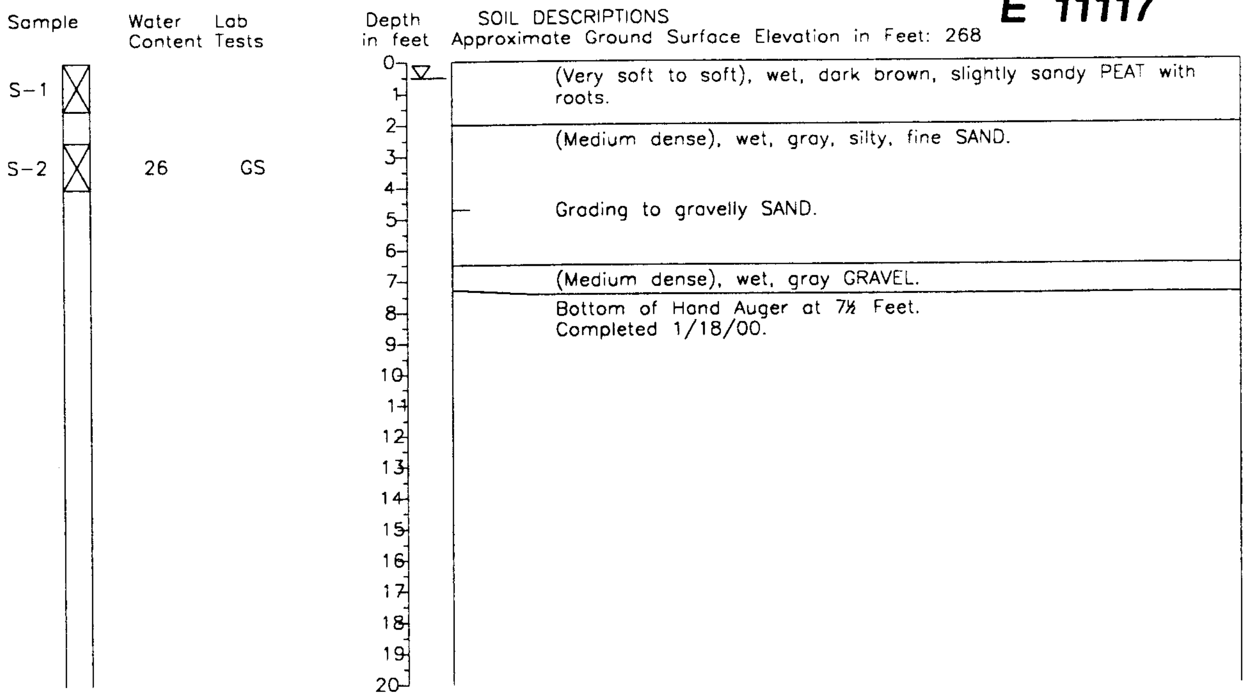
HARTCROWSER

J-4978-06 *04/01*

Figure A-61

Hand-Auger Boring Log HC00-A100

N 18652
E 11117



Sample	Water Content	Lab Tests
S-1		
S-2	26	GS

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 268

(Very soft to soft), wet, dark brown, slightly sandy PEAT with roots.

(Medium dense), wet, gray, silty, fine SAND.

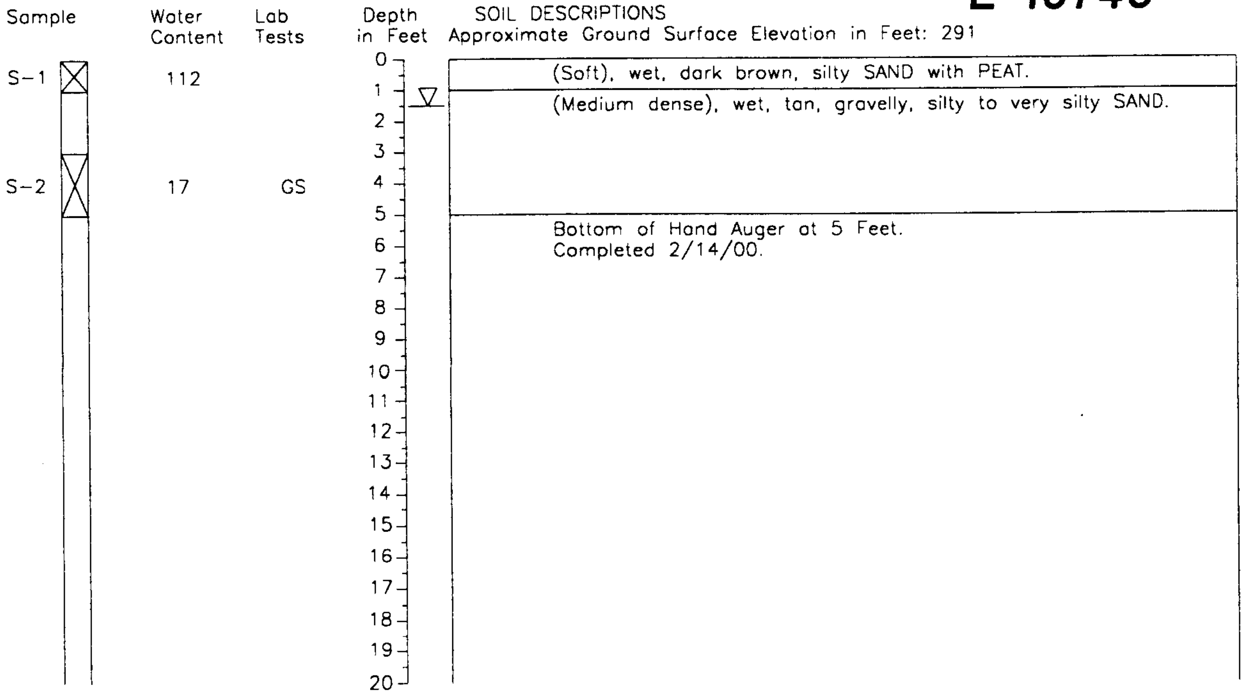
Grading to gravelly SAND.

(Medium dense), wet, gray GRAVEL.

Bottom of Hand Auger at 7½ Feet.
Completed 1/18/00.

Hand-Auger Boring Log HC00-A105

N 17373
E 10745



Sample	Water Content	Lab Tests
S-1	112	
S-2	17	GS

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 291

(Soft), wet, dark brown, silty SAND with PEAT.

(Medium dense), wet, tan, gravelly, silty to very silty SAND.

Bottom of Hand Auger at 5 Feet.
Completed 2/14/00.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

hel 7/30/01 1=1 497821 H_augers.dwg

HARTCROWSER
J-4978-21 3/00
Figure A-62

Hand-Auger Boring Log HC00-A109

N 17464
E 11147

Sample	Water Content	Lab Tests
S-1	34	
S-2	24	
S-3	30	
S-4	31	GS

Depth in Feet 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 291

(Soft), wet, dark brown, sandy SILT with organic material.

(Medium dense), wet, brown, silty SAND with trace organic material.

(Medium dense), wet, gray, slightly silty to silty fine SAND with trace organic material.

(Medium dense), wet, gray, slightly silty fine SAND.

Bottom of Hand Auger at 8 Feet.
Completed 2/14/00.

Note: no seepage noted.

Hand-Auger Boring Log HC00-A137

N 18666
E 10636

Sample	Water Content	Lab Tests
S-1	94	
S-2	33	
S-3	29	GS
S-4	30	
S-5	27	AL

Depth in Feet 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 235

(Loose), wet, brown, silty SAND with PEAT.

(Loose), wet, brown, very silty SAND.

(Medium dense), wet, gray SAND.

(Stiff), wet, gray, gravelly, sandy SILT and CLAY.

Bottom of Hand Auger at 8 Feet.
Completed 2/14/00.

hel 7/30/01 1=1 497821 H_augers.dwg

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 2/00
Figure A-63

Hand-Auger Boring Log HC00-A143

N 18733
E 10621

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 237

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS
			0	(Loose), wet, brown, slightly gravelly, very silty SAND with trace organic material.
S-1	23		1 ▽	
			2	(Very soft), wet, brown, sandy, organic SILT with organic material.
S-2	47		3	
			4	(Loose), wet, brown, very silty SAND with zones of sandy silt with organic material.
S-3	39	GS	5	
			6	
			7	
			8	(Medium dense), wet, gray SAND.
S-4	30		9	
			10	
			11	Bottom of Hand Auger at 11 Feet. Completed 2/14/00.
			12	
			13	
			14	
			15	
			16	
			17	
			18	
			19	
			20	

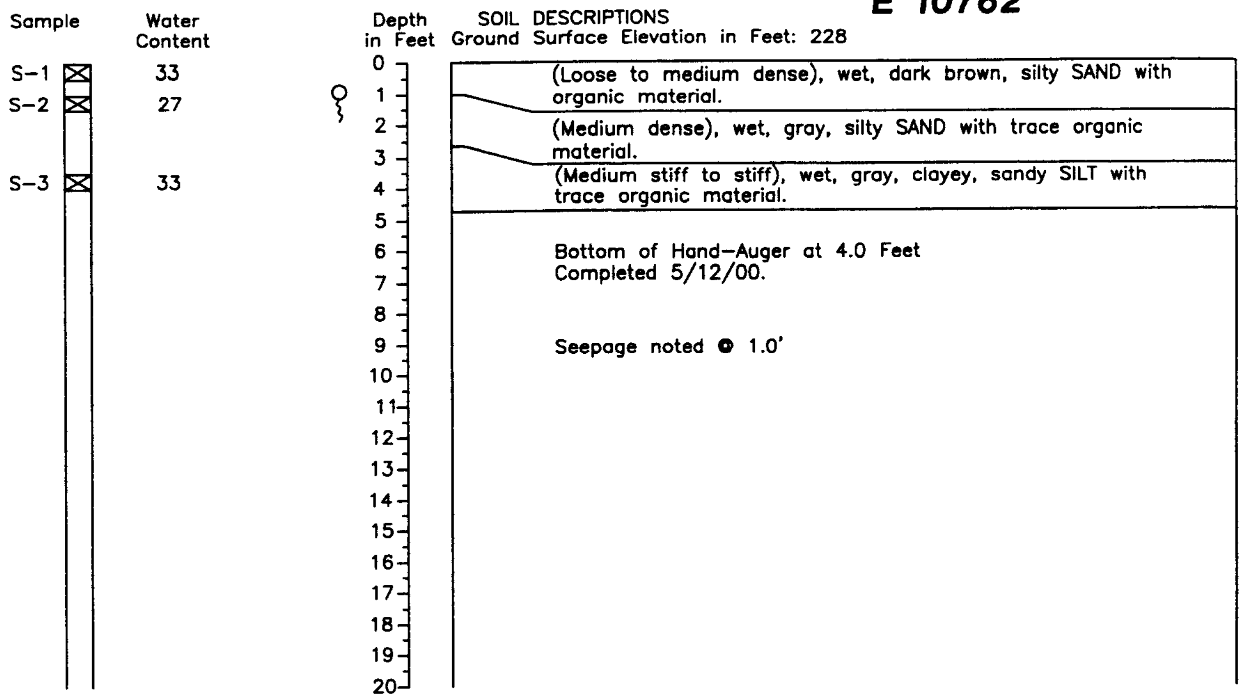
hel 7/30/01 1=1 497821 H_augers.dwg

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 2/00
Figure A-64

Hand-Auger Log HC00-A300

N 18235
E 10762



Sample	Water Content
S-1 ☒	33
S-2 ☒	27
S-3 ☒	33

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 228

(Loose to medium dense), wet, dark brown, silty SAND with organic material.

(Medium dense), wet, gray, silty SAND with trace organic material.

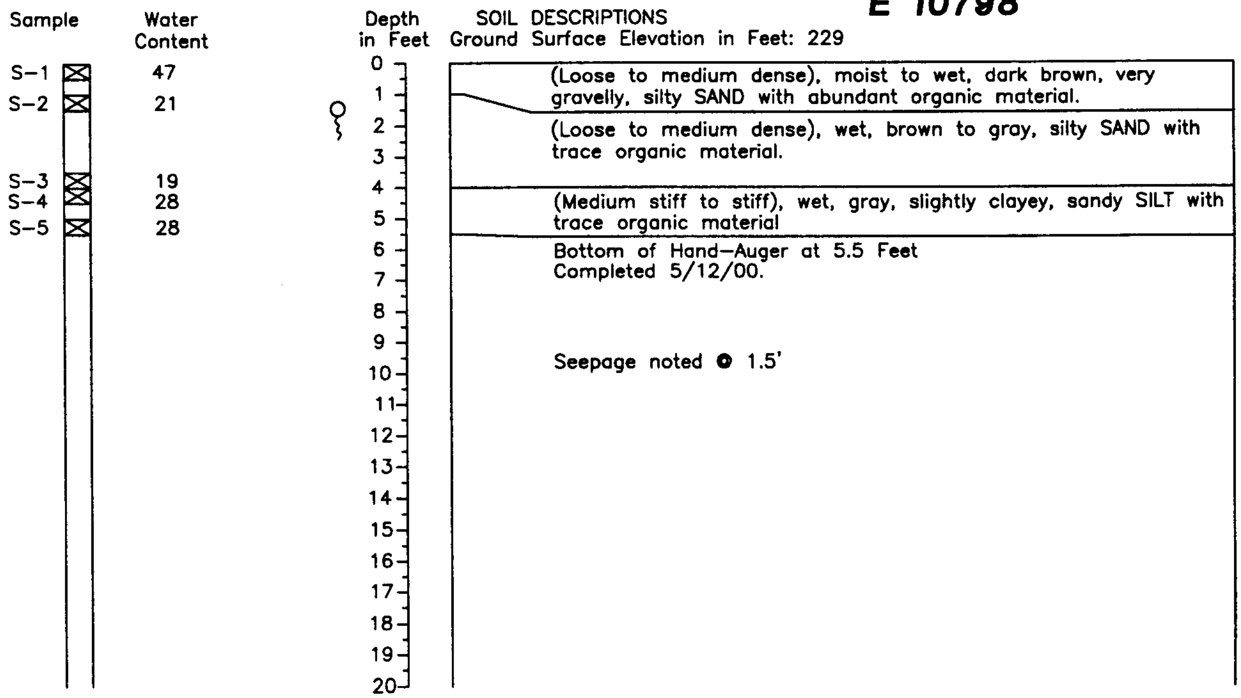
(Medium stiff to stiff), wet, gray, clayey, sandy SILT with trace organic material.

Bottom of Hand-Auger at 4.0 Feet
Completed 5/12/00.

Seepage noted @ 1.0'

Hand-Auger Log HC00-A301

N 18127
E 10798



Sample	Water Content
S-1 ☒	47
S-2 ☒	21
S-3 ☒	19
S-4 ☒	28
S-5 ☒	28

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 229

(Loose to medium dense), moist to wet, dark brown, very gravelly, silty SAND with abundant organic material.

(Loose to medium dense), wet, brown to gray, silty SAND with trace organic material.

(Medium stiff to stiff), wet, gray, slightly clayey, sandy SILT with trace organic material

Bottom of Hand-Auger at 5.5 Feet
Completed 5/12/00.

Seepage noted @ 1.5'

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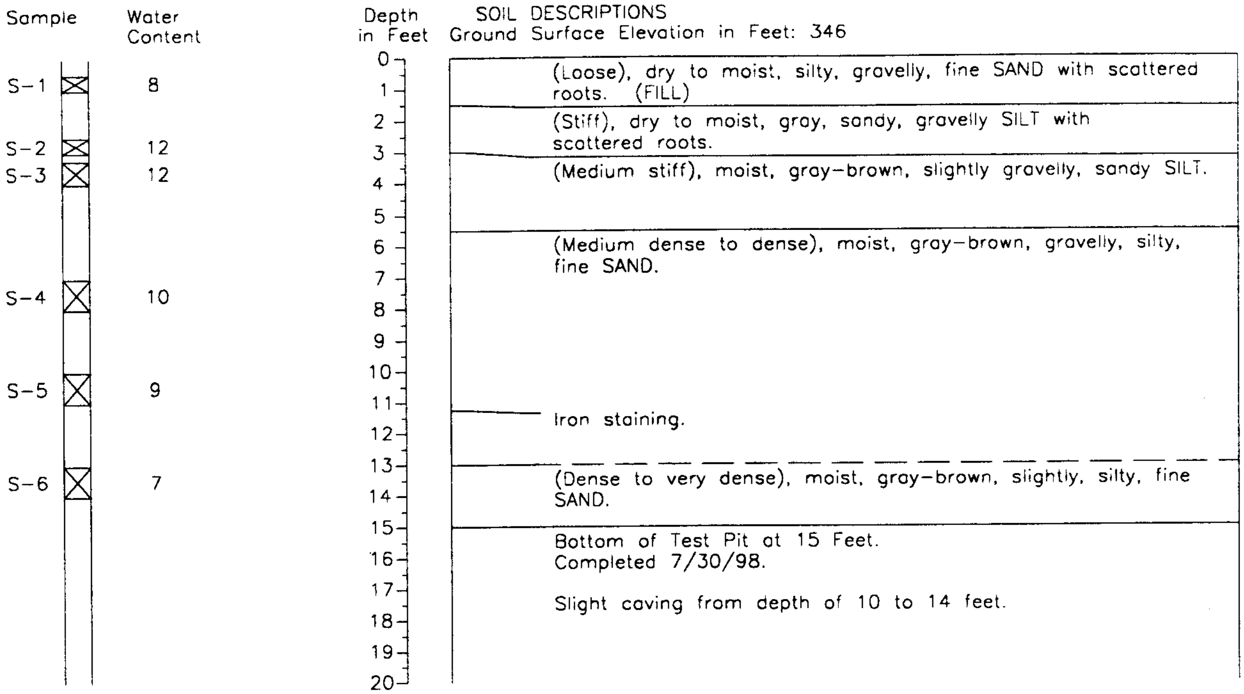
497826 HANDAUGERS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-26 5/00
Figure A-65

Test Pit Log HC98-TP1

N 17,180 E 11,340



Sample	Water Content
S-1	8
S-2	12
S-3	12
S-4	10
S-5	9
S-6	7

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 346

(Loose), dry to moist, silty, gravelly, fine SAND with scattered roots. (FILL)

(Stiff), dry to moist, gray, sandy, gravelly SILT with scattered roots.

(Medium stiff), moist, gray-brown, slightly gravelly, sandy SILT.

(Medium dense to dense), moist, gray-brown, gravelly, silty, fine SAND.

Iron staining.

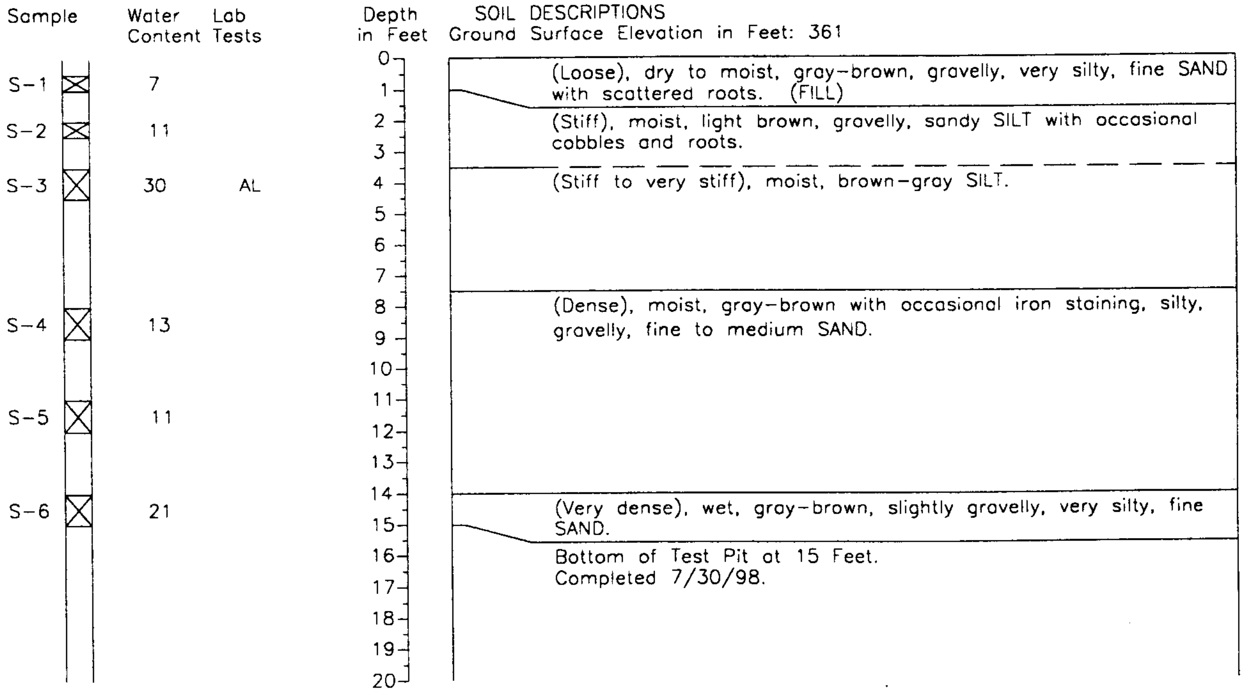
(Dense to very dense), moist, gray-brown, slightly, silty, fine SAND.

Bottom of Test Pit at 15 Feet.
Completed 7/30/98.

Slight caving from depth of 10 to 14 feet.

Test Pit Log HC98-TP2

N 17140 E 11570



Sample	Water Content	Lab Tests
S-1	7	
S-2	11	
S-3	30	AL
S-4	13	
S-5	11	
S-6	21	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 361

(Loose), dry to moist, gray-brown, gravelly, very silty, fine SAND with scattered roots. (FILL)

(Stiff), moist, light brown, gravelly, sandy SILT with occasional cobbles and roots.

(Stiff to very stiff), moist, brown-gray SILT.

(Dense), moist, gray-brown with occasional iron staining, silty, gravelly, fine to medium SAND.

(Very dense), wet, gray-brown, slightly gravelly, very silty, fine SAND.

Bottom of Test Pit at 15 Feet.
Completed 7/30/98.

CVD 5/3/99 1=1 WDSTK-8.PC2
4978\LOGS\98 TEST PITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

J-4978-06 7/98
Figure A-66

Test Pit Log HC98-TP3

N 17560 E 11410

Ground Surface Elevation in Feet: 299

Sample	Water Content	Depth in Feet	SOIL DESCRIPTIONS
S-1 ☒ S-2 ☒	8 10	0 1 2 3	(Loose to medium dense), moist, gray, slightly gravelly, silty, fine to medium SAND. (FILL)
S-3 ☒ S-4 ☒	21 16	4	(Very stiff), moist, gray-brown mottled, fine sandy SILT.
		5 6	(Dense), moist, gray, silty, fine SAND.
S-5 ☒ S-6 ☒	14 3	7 8 9	(Very dense), moist, gray, silty, gravelly, fine SAND to gravelly SAND.
S-7 ☒	27	10 11 12 13 14	(Stiff), moist, gray, clayey SILT with slickensides and fractures.
		15 16 17 18 19 20	Bottom of Test Pit at 15 Feet. Completed 7/30/98.

Test Pit Log HC98-TP4

N 17780 E 11380

Ground Surface Elevation in Feet: 274

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS
S-1 ☒	9		0 1 2 3 4	(Medium dense), moist, brown-gray, silty, gravelly SAND. (FILL)
S-2 ☒ S-3 ☒	10 9		5 6 7 8 9 10	(Dense), moist, gray-brown mottled, slightly gravelly, silty, fine to medium SAND to gravelly, fine to medium SAND.
S-4 ☒	16	GS	11 12 ♀ 13 14	(Dense), wet, gray, silty, fine to medium SAND.
S-5 ☒	17		15 ♀	(Dense), wet, mottled gray and red-brown, slightly silty, gravelly SAND.
			16 17 18 19 20	Bottom of Test Pit at 15 Feet. Completed 7/30/98. Groundwater seepage observed at a depth of 12 and 14½ feet. Slight caving observed from depth of 14 to 15 feet.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

hel 7/30/01 1=1
4978\LOGS\98 TEST PITS

HARTCROWSER

J-4978-06 7/98

Figure A-67

Test Pit Log HC98-TP5

N 17930 E 11430

Sample	Water Content
S-1 ☒	19
S-2 ☒	14
S-3 ☒	27
S-4 ☒	10

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 283

(Loose), moist, brown, silty, fine to medium SAND with abundant roots. (FILL?)

(Medium stiff), moist, mottled gray and brown, fine sandy SILT.

Becomes clayey.

(Dense), moist, gray, slightly gravelly to gravelly, silty, fine to medium SAND.

Bottom of Test Pit at 15 Feet.
Completed 7/30/98.

Test Pit Log HC98-TP6

N 18330 E 11500

Sample	Water Content	Lab Tests
S-1 ☒	7	
S-2 ☒	4	
S-3 ☒	22	
S-4 ☒	9	
S-5 ☒	10	
S-6 ☒	15	GS

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 300

(Loose), moist, brown, slightly silty, gravelly SAND with abundant roots. (FILL)

(Medium dense), moist, gray to brown, silty, gravelly SAND.

(Medium dense), moist, gray to brown, silty, fine SAND.

(Dense), wet, gray to brown, gravelly SAND.

Becomes silty.

Slight seepage.

(Dense to very dense), wet, gray and brown, slightly gravelly, silty SAND.

Slight to moderate seepage.

Bottom of Test Pit at 20 Feet.
Completed 7/30/98.

Groundwater seepage observed at a depths of 12, 14, and 18 feet.

Moderate caving below 7 feet.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

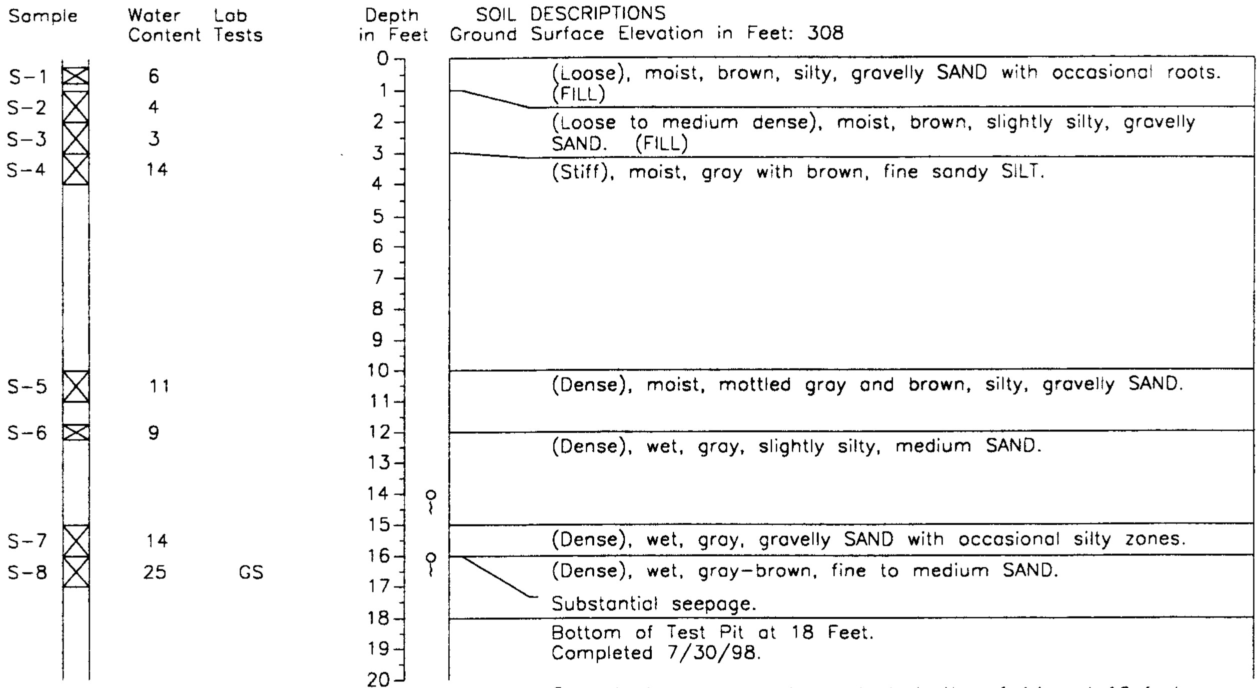
hel 7/30/01 1=1
4978\LOGS\98 TEST PITS

HARTCROWSER

J-4978-06 7/98
Figure A-68

Test Pit Log HC98-TP7

N 18550 E 11520



Ground Surface Elevation in Feet: 308

Sample	Water Content	Lab Tests
S-1	6	
S-2	4	
S-3	3	
S-4	14	
S-5	11	
S-6	9	
S-7	14	
S-8	25	GS

SOIL DESCRIPTIONS

(Loose), moist, brown, silty, gravelly SAND with occasional roots. (FILL)

(Loose to medium dense), moist, brown, slightly silty, gravelly SAND. (FILL)

(Stiff), moist, gray with brown, fine sandy SILT.

(Dense), moist, mottled gray and brown, silty, gravelly SAND.

(Dense), wet, gray, slightly silty, medium SAND.

(Dense), wet, gray, gravelly SAND with occasional silty zones.

(Dense), wet, gray-brown, fine to medium SAND.

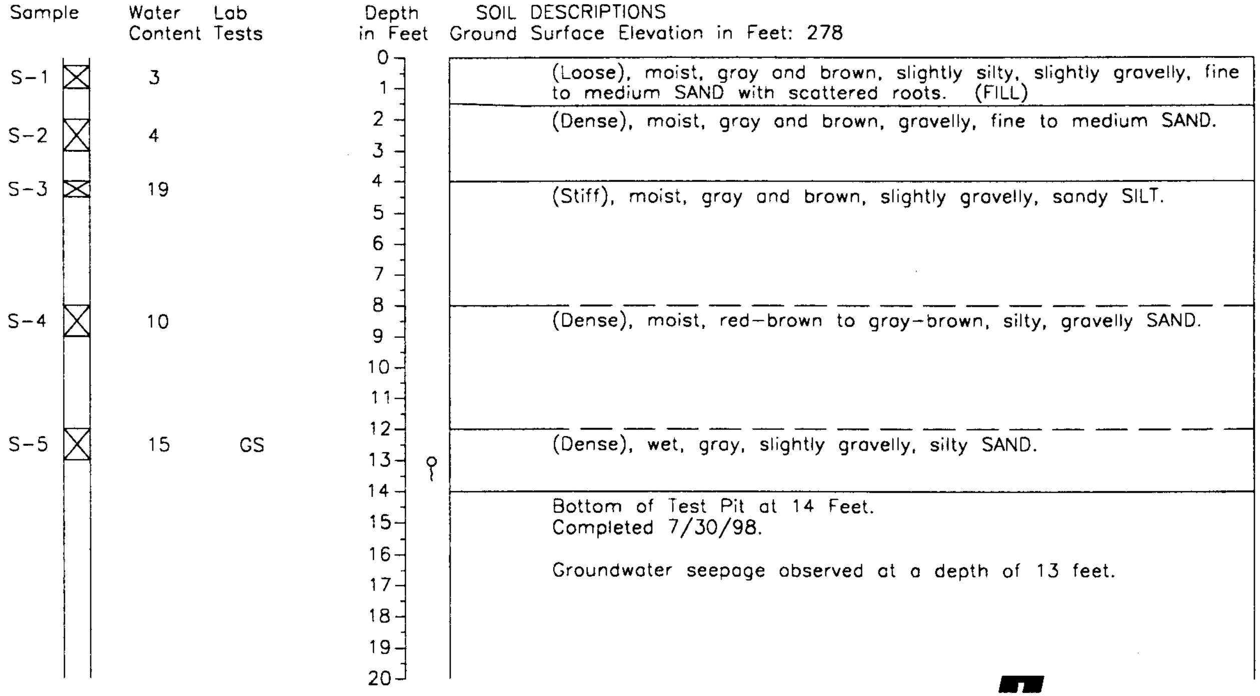
Substantial seepage.

Bottom of Test Pit at 18 Feet.
Completed 7/30/98.

Groundwater seepage observed at depths of 14 and 16 feet.
Moderate caving below 10 feet.

Test Pit Log HC98-TP8

N 18306 E 11340



Ground Surface Elevation in Feet: 278

Sample	Water Content	Lab Tests
S-1	3	
S-2	4	
S-3	19	
S-4	10	
S-5	15	GS

SOIL DESCRIPTIONS

(Loose), moist, gray and brown, slightly silty, slightly gravelly, fine to medium SAND with scattered roots. (FILL)

(Dense), moist, gray and brown, gravelly, fine to medium SAND.

(Stiff), moist, gray and brown, slightly gravelly, sandy SILT.

(Dense), moist, red-brown to gray-brown, silty, gravelly SAND.

(Dense), wet, gray, slightly gravelly, silty SAND.

Bottom of Test Pit at 14 Feet.
Completed 7/30/98.

Groundwater seepage observed at a depth of 13 feet.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

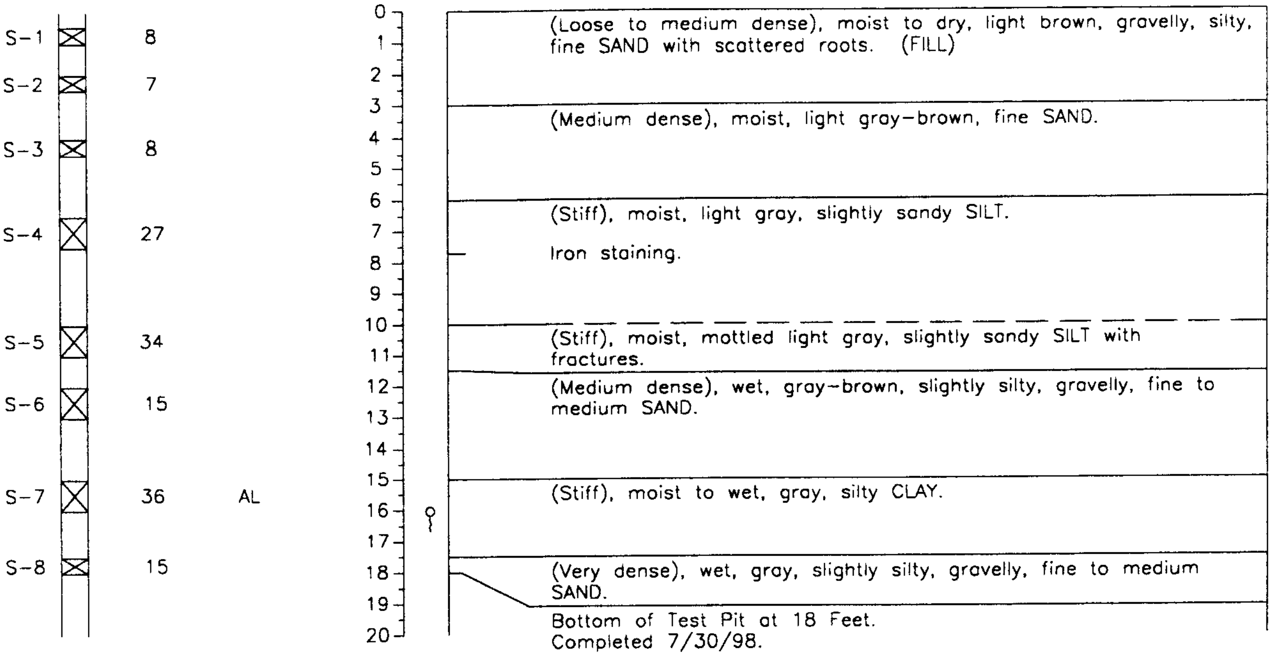
CVD 5/3/99 1=1 WDSTK-8.PC2
4978\LOGS\98 TEST PITS

HARTCROWSER

J-4978-06 7/98
Figure A-69

Test Pit Log HC98-TP9

N 18450 E 11325



Sample	Water Content	Lab Tests
S-1	8	
S-2	7	
S-3	8	
S-4	27	
S-5	34	
S-6	15	
S-7	36	AL
S-8	15	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 286

(Loose to medium dense), moist to dry, light brown, gravelly, silty, fine SAND with scattered roots. (FILL)

(Medium dense), moist, light gray-brown, fine SAND.

(Stiff), moist, light gray, slightly sandy SILT.

Iron staining.

(Stiff), moist, mottled light gray, slightly sandy SILT with fractures.

(Medium dense), wet, gray-brown, slightly silty, gravelly, fine to medium SAND.

(Stiff), moist to wet, gray, silty CLAY.

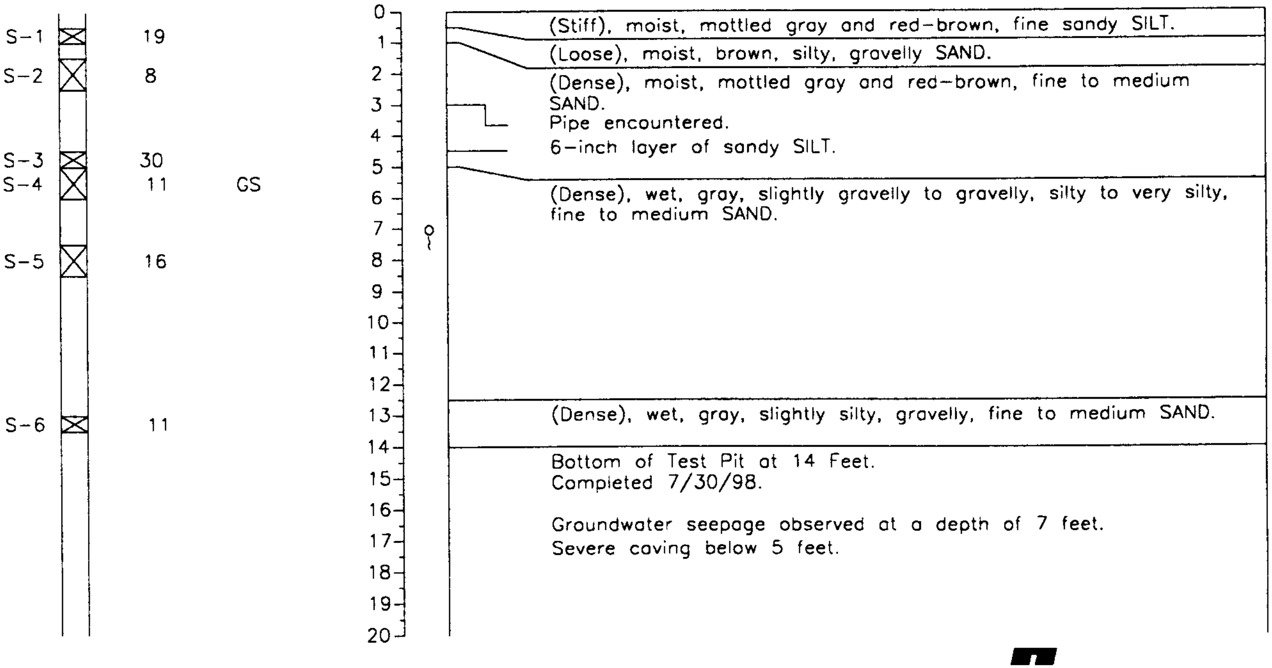
(Very dense), wet, gray, slightly silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 18 Feet.
Completed 7/30/98.

Groundwater seepage observed at a depth of 16 feet.
Moderate caving from depth of 10 to 14 feet.

Test Pit Log HC98-TP10

N 18950 E 11400



Sample	Water Content	Lab Tests
S-1	19	
S-2	8	
S-3	30	
S-4	11	GS
S-5	16	
S-6	11	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 306

(Stiff), moist, mottled gray and red-brown, fine sandy SILT.

(Loose), moist, brown, silty, gravelly SAND.

(Dense), moist, mottled gray and red-brown, fine to medium SAND.

Pipe encountered.

6-inch layer of sandy SILT.

(Dense), wet, gray, slightly gravelly to gravelly, silty to very silty, fine to medium SAND.

(Dense), wet, gray, slightly silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 14 Feet.
Completed 7/30/98.

Groundwater seepage observed at a depth of 7 feet.
Severe caving below 5 feet.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

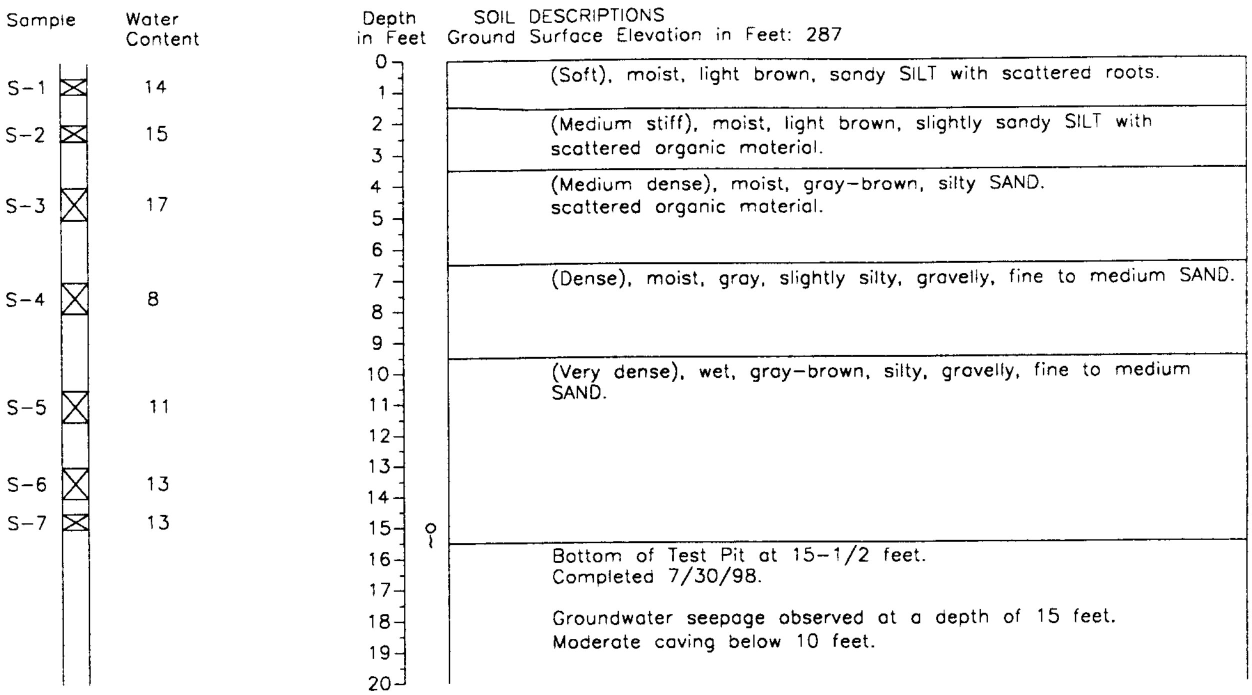
hel 7/30/01 1=1
4978\LOGS\98 TEST PITS

HARTCROWSER

J-4978-06 7/98
Figure A-70

Test Pit Log HC98-TP11

N 18130 E 11390



Sample	Water Content
S-1	14
S-2	15
S-3	17
S-4	8
S-5	11
S-6	13
S-7	13

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 287

(Soft), moist, light brown, sandy SILT with scattered roots.

(Medium stiff), moist, light brown, slightly sandy SILT with scattered organic material.

(Medium dense), moist, gray-brown, silty SAND. scattered organic material.

(Dense), moist, gray, slightly silty, gravelly, fine to medium SAND.

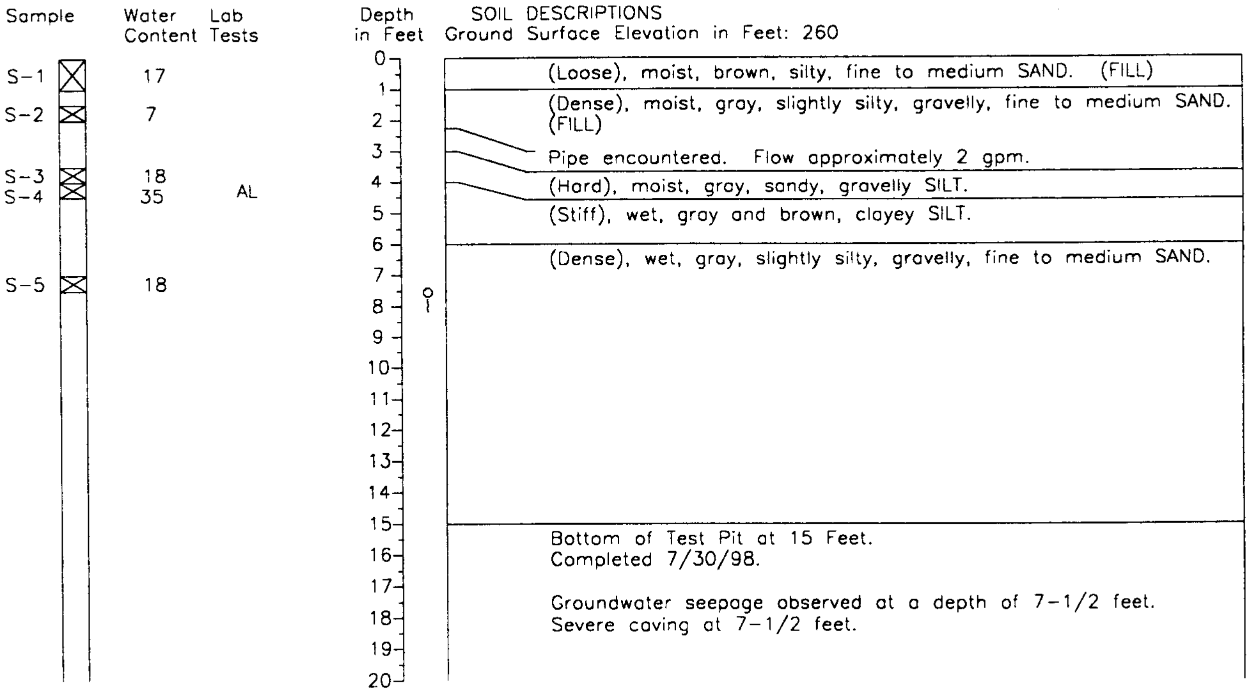
(Very dense), wet, gray-brown, silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 15-1/2 feet.
Completed 7/30/98.

Groundwater seepage observed at a depth of 15 feet.
Moderate caving below 10 feet.

Test Pit Log HC98-TP12

N 17930 E 11330



Sample	Water Content	Lab Tests
S-1	17	
S-2	7	
S-3	18	
S-4	35	AL
S-5	18	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 260

(Loose), moist, brown, silty, fine to medium SAND. (FILL)

(Dense), moist, gray, slightly silty, gravelly, fine to medium SAND. (FILL)

Pipe encountered. Flow approximately 2 gpm.

(Hard), moist, gray, sandy, gravelly SILT.

(Stiff), wet, gray and brown, clayey SILT.

(Dense), wet, gray, slightly silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 15 Feet.
Completed 7/30/98.

Groundwater seepage observed at a depth of 7-1/2 feet.
Severe caving at 7-1/2 feet.

CVD 5/3/99 1=1 WDSTK-8.PC2
4978\LOGS\98 TEST PITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

J-4978-06 7/98
Figure A-71

Test Pit Log HC99-TP1

N 18749 E 11795

Sample	Water Content	Lab Tests
S-1 ☒	32	
S-2 ☒	19	GS
S-3 ☒	16	GS
S-4 ☒	13	
S-5 ☒	18	

Depth in Feet: 0–20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 342

(Loose), moist, brown, silty, very gravelly SAND. (FILL) over (loose to medium dense), moist, gray, very silty, fine SAND to very sandy SILT.

(Medium stiff), moist, gray, slightly sandy SILT.

Bottom of Test Pit at 8½ Feet.
Completed 2/16/99.

Test Pit Log HC99-TP2

N 18708 E 11670

Sample	Water Content
S-1 ☒	10
S-2 ☒	24
S-3 ☒	17
S-4 ☒	19
S-5 ☒	14

Depth in Feet: 0–20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 324

(Loose to medium dense), wet, gray, silty, very gravelly SAND. (FILL)

(Soft to medium stiff), moist, brown, sandy SILT.

(Medium dense), moist to wet, gray, silty, gravelly SAND.

(Medium stiff to stiff), moist, gray mottled brown, sandy SILT with occasional thin layers of Clay.

Grades to (stiff), moist, tan, sandy SILT.

Severe caving.

Bottom of Test Pit at 15 Feet.
Completed 2/16/99.

Groundwater seepage observed at a depth of ½, 5, and 10½ feet.

hel 7/30/01
4978\LOGS\TP01-02

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

Test Pit Log HC99-TP3

N 18820 E 11698

Sample	Water Content	Lab Tests
S-1 ☒	22	
S-2 ☒	13	
S-3 ☒	28	
S-4 ☒	32	AL
S-5 ☒	19	
S-7 ☒	28	

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 331

(Loose to dense), moist, brown, silty, gravelly SAND to sandy SILT. (FILL)

(Soft), moist, brown, slightly sandy SILT.

(Stiff to hard), moist, gray mottled with brown, slightly sandy, silty CLAY.

(Dense to very dense), moist to wet, gray, silty, fine SAND.

Grades to fine to medium SAND.

Bottom of Test Pit at 17½ Feet.
Completed 2/16/99.

Groundwater seepage at 15 feet; groundwater table encountered at a depth of 17½ feet.

Test Pit Log HC99-TP4

N 19100 E 11643

Sample	Water Content
S-1 ☒	19
S-2 ☒	7
S-3 ☒	14
S-4 ☒	15

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 339

(Soft), moist, brown, sandy SILT.

(Loose to medium dense), moist, brown, silty, very gravelly SAND with scattered concrete and asphalt blocks. (FILL)

2-foot-diameter concrete pipe.

(Medium dense), moist, gray, slightly gravelly, silty SAND to sandy SILT.

Grades to (medium dense), gravelly, very silty SAND to very sandy SILT.

Becomes saturated.

Bottom of Test Pit at 9 Feet.
Completed 2/16/99.

Groundwater seepage encountered at a depth of 7½ Feet.

DTN 11/13/00 1=1 WDSIK-8.PC2
4978\LOGS\99 TESTPIT\TP03-04

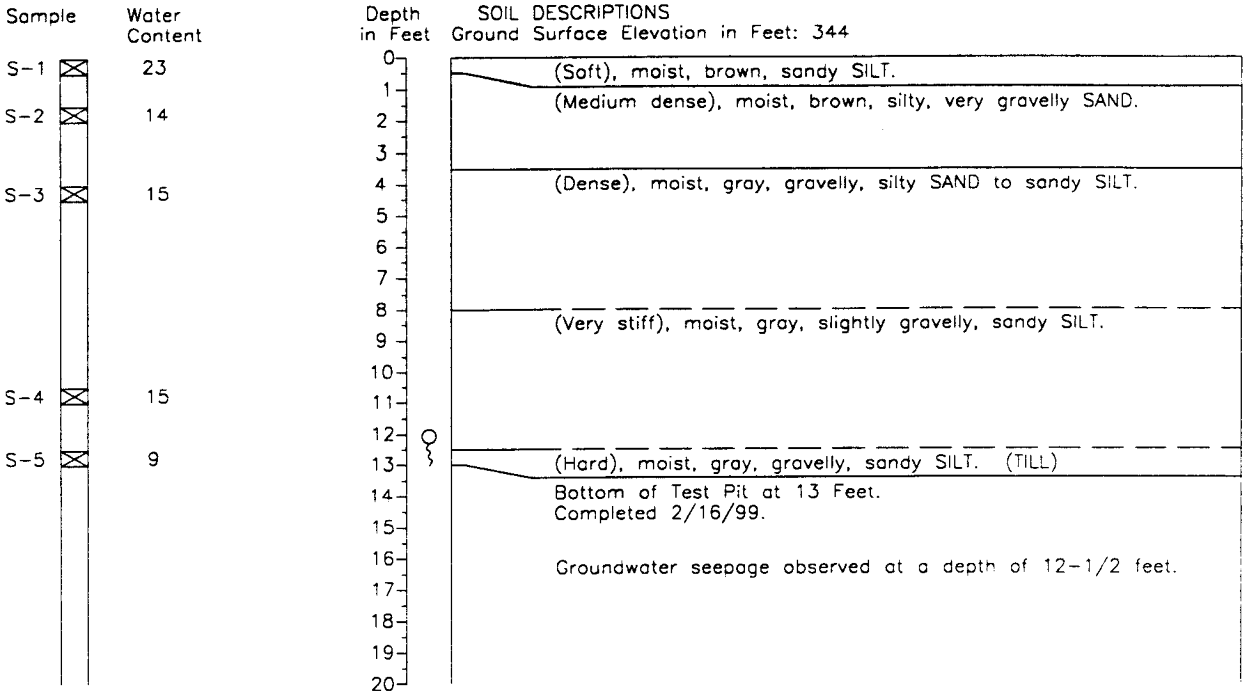
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

J-4978-06 2/99
Figure A-73

Test Pit Log HC99-TP5

N 19179 E 11664



Sample	Water Content
S-1 ☒	23
S-2 ☒	14
S-3 ☒	15
S-4 ☒	15
S-5 ☒	9

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 344

(Soft), moist, brown, sandy SILT.

(Medium dense), moist, brown, silty, very gravelly SAND.

(Dense), moist, gray, gravelly, silty SAND to sandy SILT.

(Very stiff), moist, gray, slightly gravelly, sandy SILT.

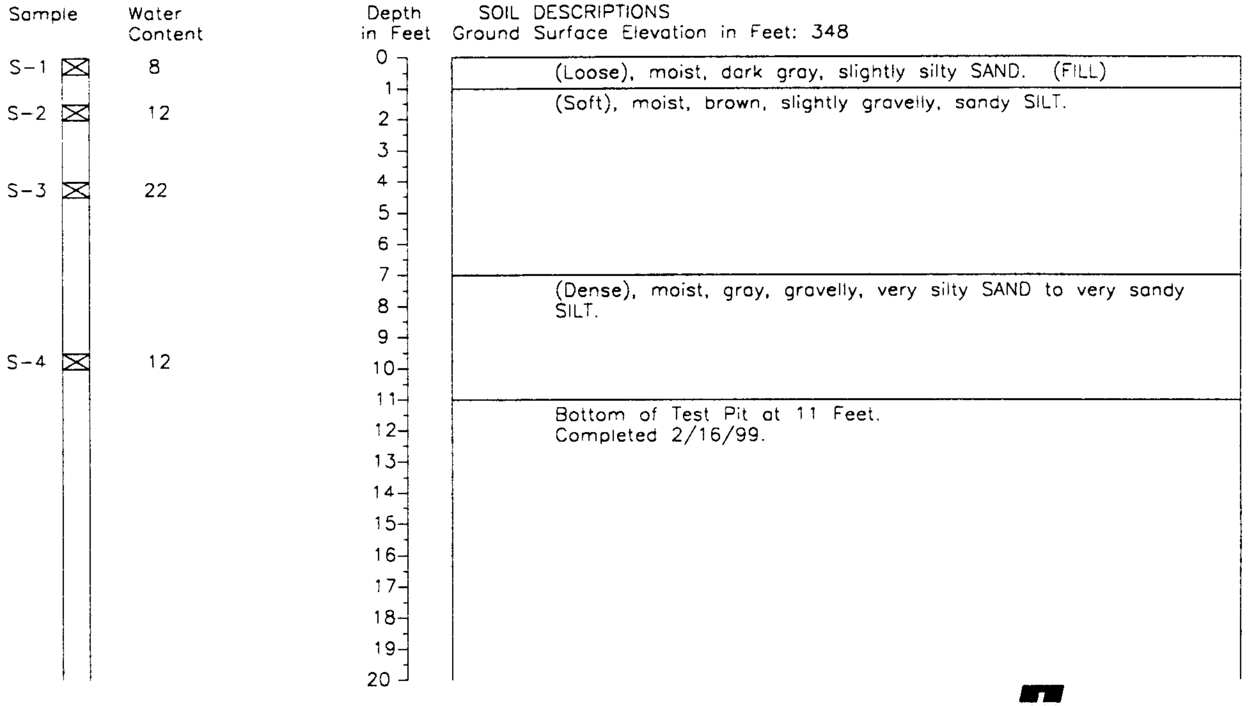
(Hard), moist, gray, gravelly, sandy SILT. (TILL)

Bottom of Test Pit at 13 Feet.
Completed 2/16/99.

Groundwater seepage observed at a depth of 12-1/2 feet.

Test Pit Log HC99-TP6

N 19284 E 11656



Sample	Water Content
S-1 ☒	8
S-2 ☒	12
S-3 ☒	22
S-4 ☒	12

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 348

(Loose), moist, dark gray, slightly silty SAND. (FILL)

(Soft), moist, brown, slightly gravelly, sandy SILT.

(Dense), moist, gray, gravelly, very silty SAND to very sandy SILT.

Bottom of Test Pit at 11 Feet.
Completed 2/16/99.

DTN 11/13/00 1=1 WDSTK-8.PC2
4978\LOGS\99 TEST PITS\TP05-06

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

J-4978-06 2/99
Figure A-74

Test Pit Log HC99-TP7

N 19056 E 11542

Sample	Water Content	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 322
S-1	40	0	(Soft), moist, dark brown, sandy SILT.
		1	(Soft), moist, brown, slightly gravelly, sandy SILT.
S-2	30	2	
		3	
S-3	17	4	(Loose to medium dense), wet, gray, gravelly, very silty SAND.
		5	
		6	Running ground due to groundwater flow from 5 to 7 feet.
		7	(Medium stiff to stiff), moist, gray, slightly gravelly, sandy SILT.
		8	
		9	
		10	
		11	
S-4	11	12	Grades to (hard), moist, gray, slightly gravelly, sandy SILT.
S-5	11	13	
		14	Bottom of Test Pit at 13.5 Feet. Completed 2/16/99.
		15	
		16	Groundwater seepage observed at depths of 5 and 6 Feet.
		17	
		18	
		19	
		20	

Test Pit Log HC99-TP8

N 19180 E 11860

Sample	Water Content	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 364
S-1	34	0	(Soft), moist, dark brown, sandy SILT. (TOPSOIL)
S-2	14	1	(Soft to medium stiff), moist, gray, sandy SILT.
		2	
S-3	21	3	(Medium stiff), moist, brown, slightly gravelly, sandy SILT.
S-4	18	4	(Medium dense), moist, gray, very silty SAND to very sandy SILT.
		5	Red stains observed.
		6	
		7	
		8	
		9	
S-5	15	10	(Dense), moist, gray, very silty SAND.
		11	Moderate caving from 10 to 14 feet depths.
		12	
		13	
S-6	14	14	
		15	(Hard), moist, gray, slightly sandy, gravelly SILT.
		16	Bottom of Test Pit at 15 Feet. Completed 2/16/99.
		17	
		18	Groundwater seepage observed at a depth of 5 and 14 Feet.
		19	
		20	

CVD 1=1 WDSTK-8.PC2
4978\LOGS\TP07-08

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

J-4978-06 2/99

Figure A-75

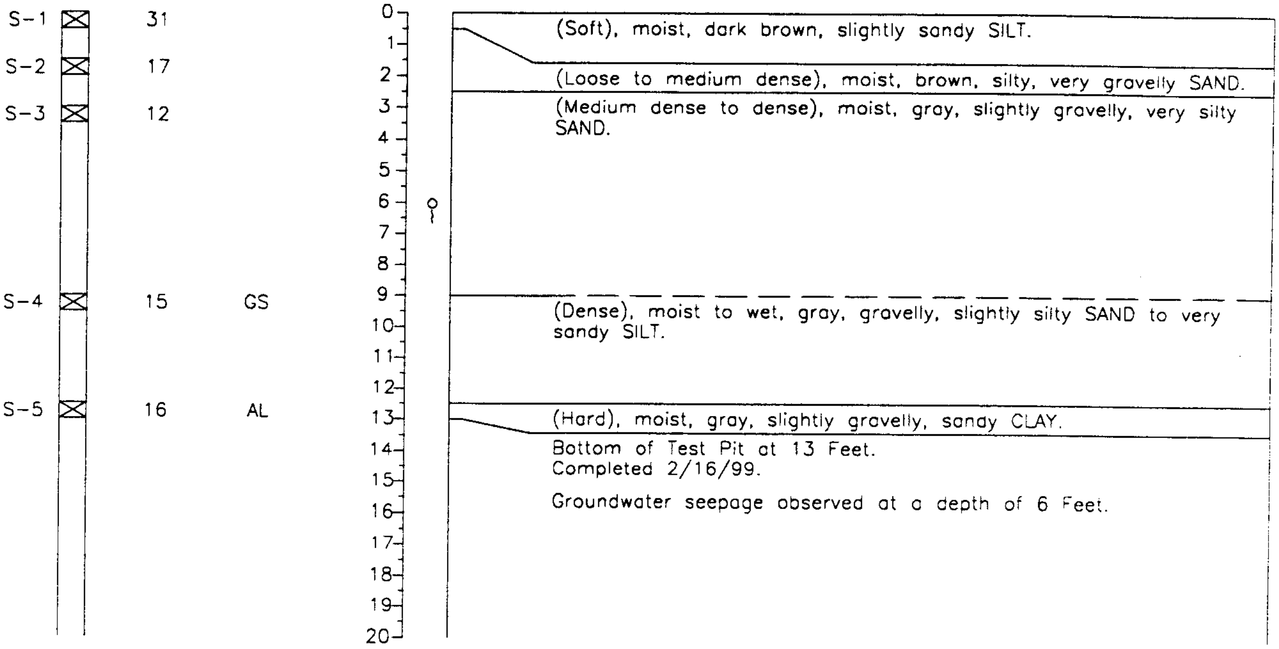
Test Pit Log HC99-TP9

N 19190 E 11517

Sample	Water Content	
S-1	31	
S-2	17	
S-3	12	
S-4	15	GS
S-5	16	AL

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 326



(Soft), moist, dark brown, slightly sandy SILT.

(Loose to medium dense), moist, brown, silty, very gravelly SAND.

(Medium dense to dense), moist, gray, slightly gravelly, very silty SAND.

(Dense), moist to wet, gray, gravelly, slightly silty SAND to very sandy SILT.

(Hard), moist, gray, slightly gravelly, sandy CLAY.

Bottom of Test Pit at 13 Feet.
Completed 2/16/99.

Groundwater seepage observed at a depth of 6 Feet.

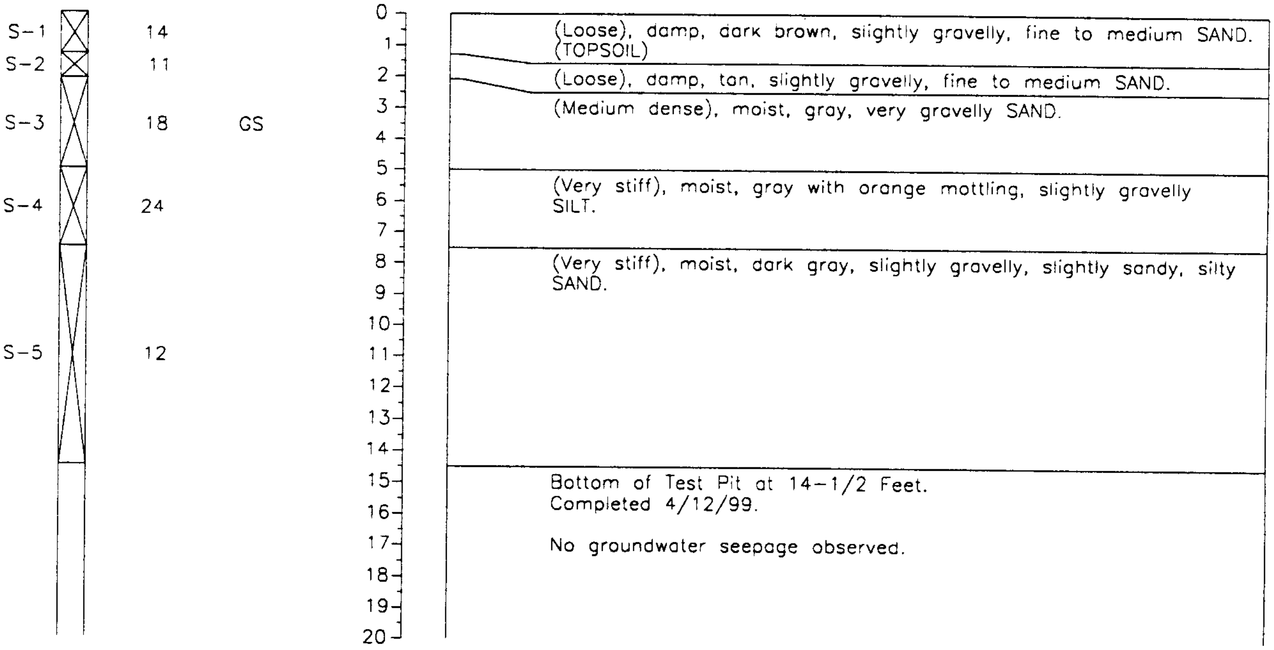
Test Pit Log HC99-TP10

N 21672 E 11059

Sample	Water Content	Lab Tests
S-1	14	
S-2	11	
S-3	18	GS
S-4	24	
S-5	12	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 278



(Loose), damp, dark brown, slightly gravelly, fine to medium SAND. (TOPSOIL)

(Loose), damp, tan, slightly gravelly, fine to medium SAND.

(Medium dense), moist, gray, very gravelly SAND.

(Very stiff), moist, gray with orange mottling, slightly gravelly SILT.

(Very stiff), moist, dark gray, slightly gravelly, slightly sandy, silty SAND.

Bottom of Test Pit at 14-1/2 Feet.
Completed 4/12/99.

No groundwater seepage observed.

DTN 11/13/00 1=1 WDSTK-8.PC2
4978\LOGS\99 TEST PITS\TP09-10

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER

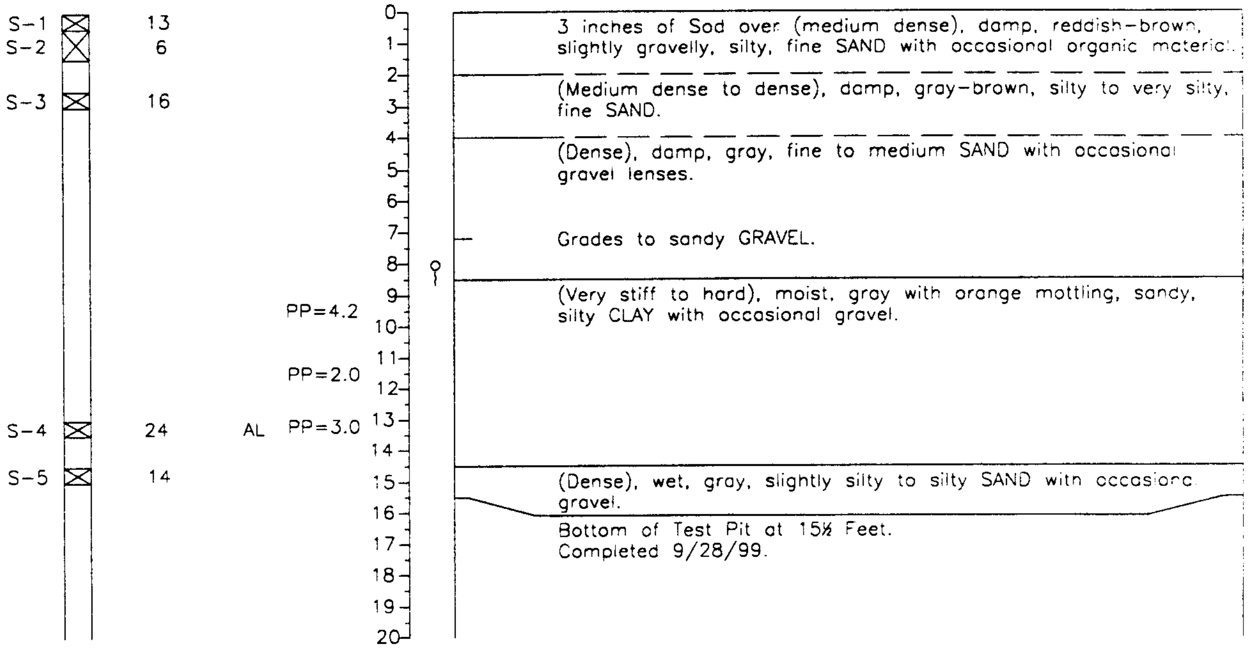
J-4978-06 2/99

Figure A-76

Test Pit Log HC99-TP34

N 20,164
E 10,952

Ground Surface Elevation in Feet: 303



Sample	Water Content	Lab Tests	Field Test
S-1	13		
S-2	6		
S-3	16		
			PP=4.2
			PP=2.0
S-4	24	AL	PP=3.0
S-5	14		

SOIL DESCRIPTIONS

3 inches of Sod over (medium dense), damp, reddish-brown, slightly gravelly, silty, fine SAND with occasional organic material.

(Medium dense to dense), damp, gray-brown, silty to very silty, fine SAND.

(Dense), damp, gray, fine to medium SAND with occasional gravel lenses.

Grades to sandy GRAVEL.

(Very stiff to hard), moist, gray with orange mottling, sandy, silty CLAY with occasional gravel.

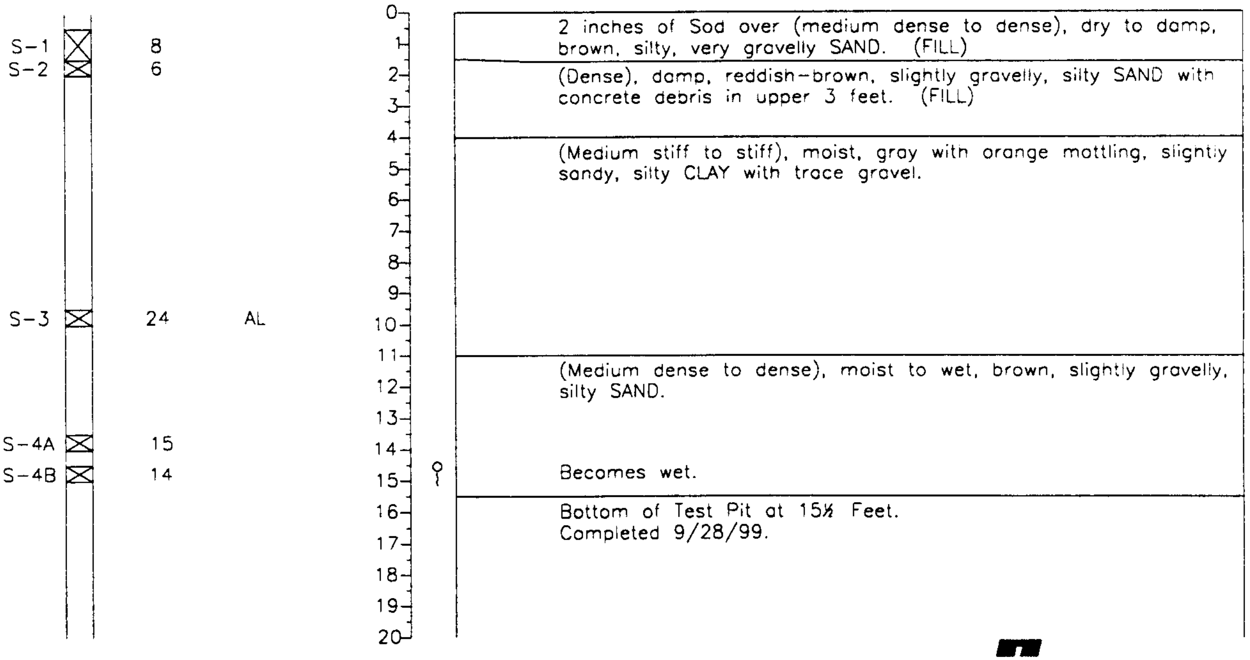
(Dense), wet, gray, slightly silty to silty SAND with occasional gravel.

Bottom of Test Pit at 15½ Feet.
Completed 9/28/99.

Test Pit Log HC99-TP35

N 20,374
E 10,976

Ground Surface Elevation in Feet: 305



Sample	Water Content	Lab Tests
S-1	8	
S-2	6	
S-3	24	AL
S-4A	15	
S-4B	14	

SOIL DESCRIPTIONS

2 inches of Sod over (medium dense to dense), dry to damp, brown, silty, very gravelly SAND. (FILL)

(Dense), damp, reddish-brown, slightly gravelly, silty SAND with concrete debris in upper 3 feet. (FILL)

(Medium stiff to stiff), moist, gray with orange mottling, slightly sandy, silty CLAY with trace gravel.

(Medium dense to dense), moist to wet, brown, slightly gravelly, silty SAND.

Becomes wet.

Bottom of Test Pit at 15½ Feet.
Completed 9/28/99.

nel 7/30/01 1=1
49/816 TEST PITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-16 9/99
Figure A-77

Test Pit Log HC99-TP36

N 20,287
E 10,730

Ground Surface Elevation in Feet: 290

Sample	Water Content	Lab Tests	Field Test
S-1	15		
S-2	8		
			PP=3.0
S-3	20		
S-4	30	AL	PP=1.0
S-5	14		

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS

(Medium dense), moist, brown, slightly gravelly, slightly silty to silty, fine to medium SAND with burnt debris. (FILL)

(Medium dense), moist, brown and gray, gravelly, fine to medium SAND.

(Hard), moist, gray with orange mottling, slightly gravelly, slightly sandy, silty CLAY.

(Very stiff), moist, gray, silty CLAY.

(Dense), moist, gray, slightly gravelly, very silty SAND.

Bottom of Test Pit at 15 Feet.
Completed 9/28/99.

Test Pit Log HC99-TP36A

N 20,102
E 10,759

Ground Surface Elevation in Feet: 287.5

Sample	Water Content
S-1	12
S-2	21
S-3	17
S-4	20

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS

(Dense), moist, brown, silty SAND with decreasing organic material down to approximately 3 feet.

(Stiff), moist to damp, gray with orange-brown mottling, slightly gravelly SILT.

(Medium dense), moist to damp, brown, slightly gravelly SAND.

(Hard), moist, gray, slightly gravelly, slightly sandy, silty CLAY.

Bottom of Test Pit at 15 Feet.
Completed 9/29/99.

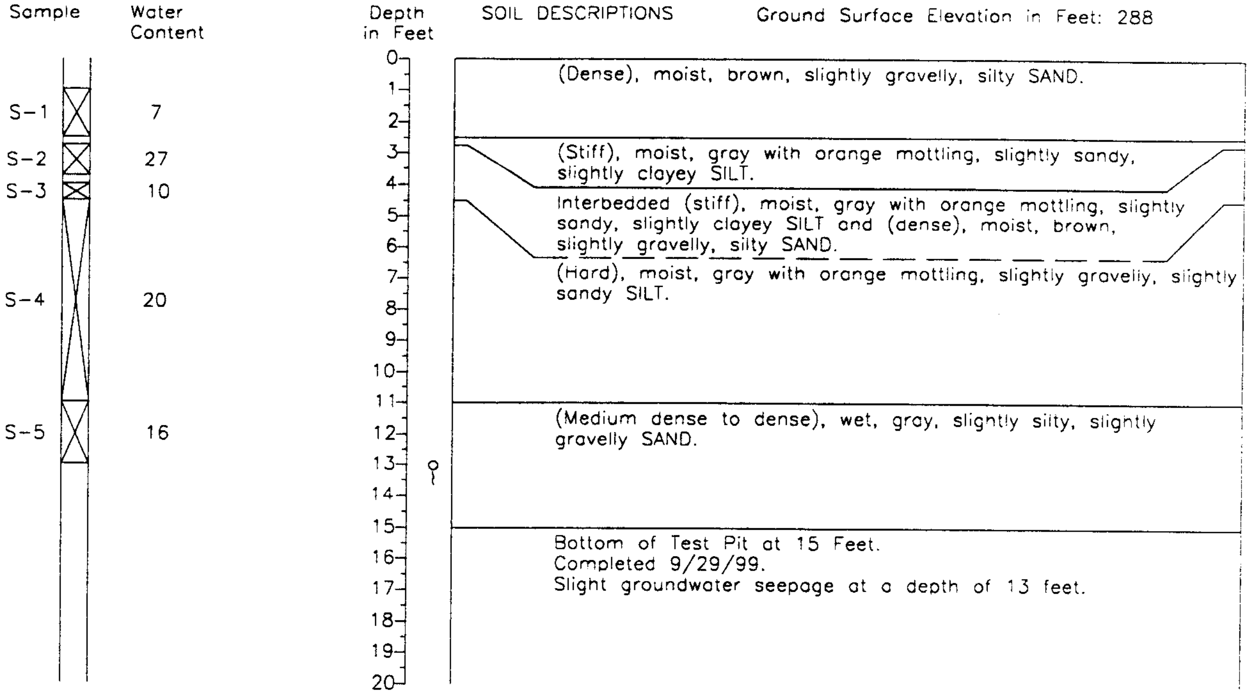
hel 7/30/01 1=1
497816 TEST PITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-16 9/99
Figure A-78

Test Pit Log HC99-TP36B

N 20,215
E 10,744



Ground Surface Elevation in Feet: 288

Sample	Water Content
S-1	7
S-2	27
S-3	10
S-4	20
S-5	16

SOIL DESCRIPTIONS

(Dense), moist, brown, slightly gravelly, silty SAND.

(Stiff), moist, gray with orange mottling, slightly sandy, slightly clayey SILT.

Interbedded (stiff), moist, gray with orange mottling, slightly sandy, slightly clayey SILT and (dense), moist, brown, slightly gravelly, silty SAND.

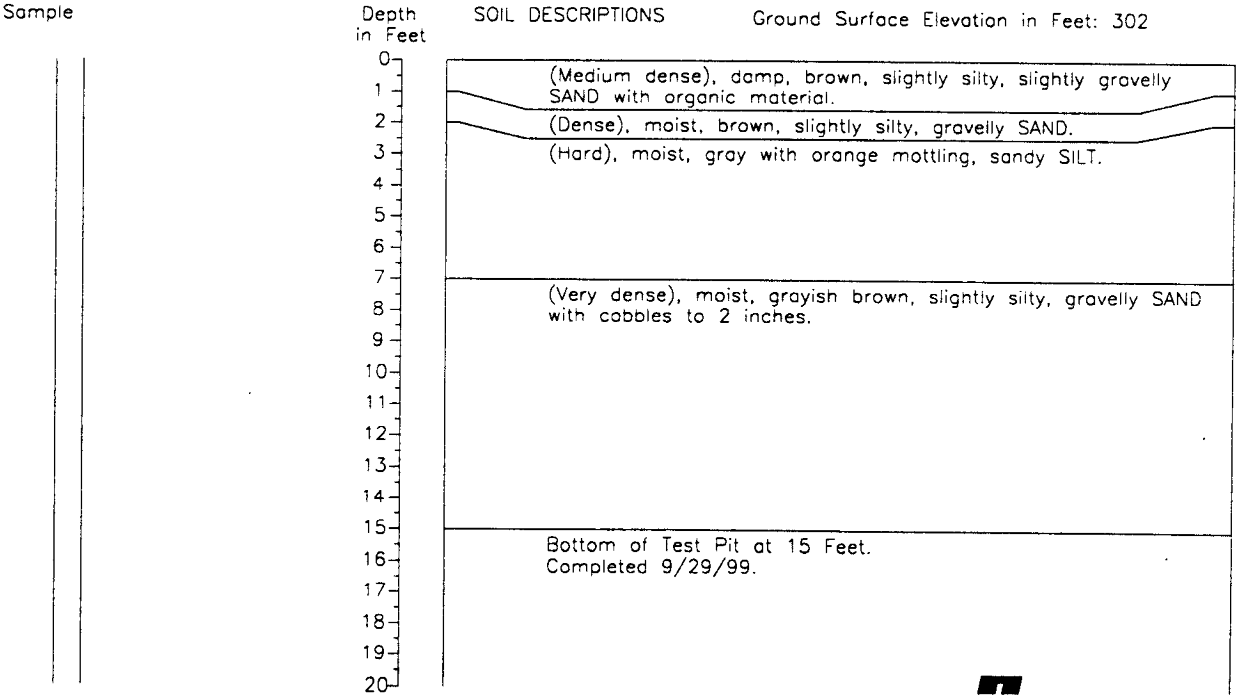
(Hard), moist, gray with orange mottling, slightly gravelly, slightly sandy SILT.

(Medium dense to dense), wet, gray, slightly silty, slightly gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 9/29/99.
Slight groundwater seepage at a depth of 13 feet.

Test Pit Log HC99-TP36C

N 20,030
E 10,956



Ground Surface Elevation in Feet: 302

SOIL DESCRIPTIONS

(Medium dense), damp, brown, slightly silty, slightly gravelly SAND with organic material.

(Dense), moist, brown, slightly silty, gravelly SAND.

(Hard), moist, gray with orange mottling, sandy SILT.

(Very dense), moist, grayish brown, slightly silty, gravelly SAND with cobbles to 2 inches.

Bottom of Test Pit at 15 Feet.
Completed 9/29/99.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

hel 7/30/01 1=1
497816 TEST PITS

HARTCROWSER

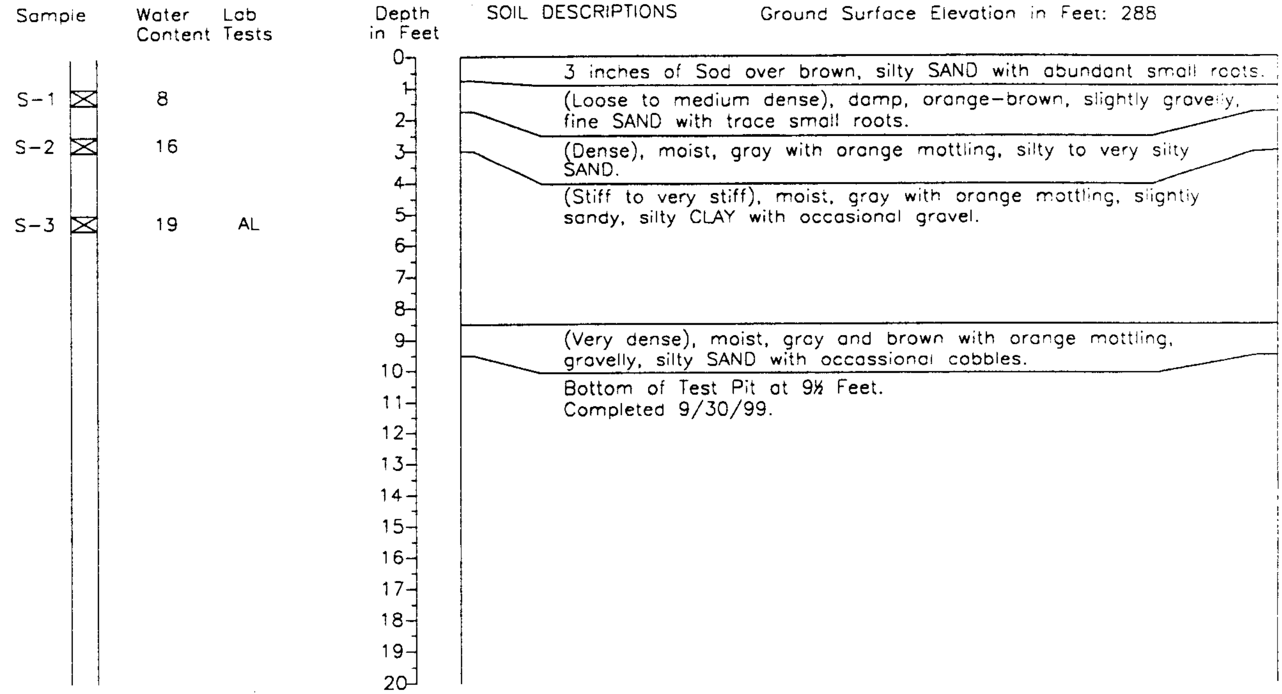
J-4978-16 9/99

Figure A-79

Test Pit Log HC99-TP36D

N 20,051
E 10,781

Sample	Water Content	Lab Tests
S-1	8	
S-2	16	
S-3	19	AL



SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 288

3 inches of Sod over brown, silty SAND with abundant small roots.

(Loose to medium dense), damp, orange-brown, slightly gravelly, fine SAND with trace small roots.

(Dense), moist, gray with orange mottling, silty to very silty SAND.

(Stiff to very stiff), moist, gray with orange mottling, slightly sandy, silty CLAY with occasional gravel.

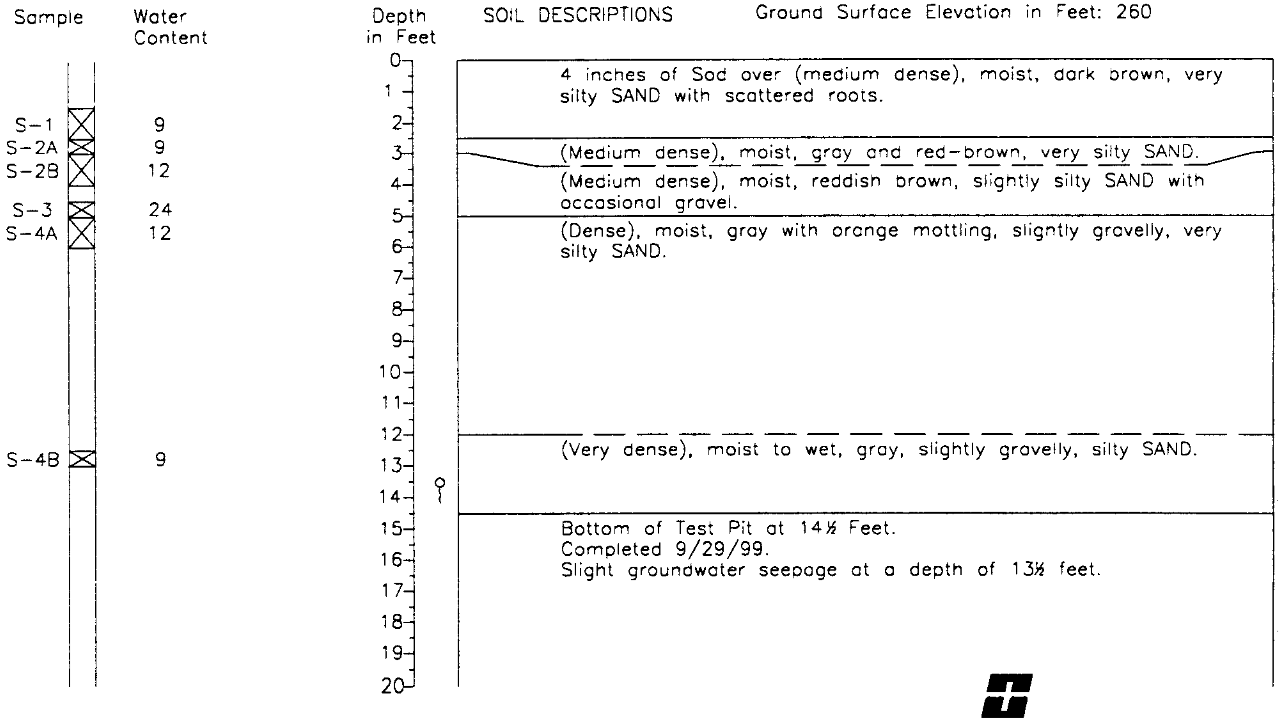
(Very dense), moist, gray and brown with orange mottling, gravelly, silty SAND with occassional cobbles.

Bottom of Test Pit at 9½ Feet.
Completed 9/30/99.

Test Pit Log HC99-TP37

N 19,575
E 10,328

Sample	Water Content
S-1	9
S-2A	9
S-2B	12
S-3	24
S-4A	12
S-4B	9



SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 260

4 inches of Sod over (medium dense), moist, dark brown, very silty SAND with scattered roots.

(Medium dense), moist, gray and red-brown, very silty SAND.

(Medium dense), moist, reddish brown, slightly silty SAND with occasional gravel.

(Dense), moist, gray with orange mottling, slightly gravelly, very silty SAND.

(Very dense), moist to wet, gray, slightly gravelly, silty SAND.

Bottom of Test Pit at 14½ Feet.
Completed 9/29/99.
Slight groundwater seepage at a depth of 13½ feet.

hal 7/30/01 1=1
497816 TEST PITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-16 9/99
Figure A-80

Test Pit Log HC99-TP40

N 21,533
E 12,134

Ground Surface Elevation in Feet: 32

Sample	Water Content	Lab Tests	Field Test	Depth in Feet	SOIL DESCRIPTIONS
				0	(Dense), brown, silty, gravelly SAND.
S-1	12			1	
				2	
				3	
				4	
				5	
S-2	21	$P_{200}=78\%$		6	(Stiff), moist, gray with orange mottling, sandy SILT.
				7	(Medium dense to dense), moist, brown, slightly silty, slightly gravelly SAND.
				8	
				9	
S-3	11			10	
				11	Cobbles and boulders encountered.
				12	
				13	
				14	
				15	Bottom of Test Pit at 14½ Feet. Completed 10/1/99.
				16	
				17	
				18	
				19	
				20	

Test Pit Log HC99-TP44

N 19,768
E 11,173

Ground Surface Elevation in Feet: 308

Sample	Water Content	Depth in Feet	SOIL DESCRIPTIONS
		0	(Medium dense), damp, light to dark brown, slightly silty, gravelly SAND with roots.
		1	
S-1	6	2	
		3	
S-2	4	4	(Medium dense), damp to moist, light brown, fine SAND.
		5	
		6	
		7	(Stiff), moist, gray with orange mottling, slightly sandy, slightly gravelly SILT.
		8	
S-3	20	9	
		10	
		11	(Dense), moist to wet, gray, slightly silty to silty, gravelly SAND.
		12	
S-4	12	13	
		14	
		15	Bottom of Test Pit at 14½ Feet. Completed 9/30/99. Heavy groundwater seepage at a depth of 13½ feet.
		16	
		17	
		18	
		19	
		20	

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

DIN 11/13/00 1=1 woodstock-8.pc2
497816 TEST PITS

HARTCROWSER

J-4978-16 9/99

Figure A-81

Test Pit Log HC00-TP100

N 16778
E 10927

Sample	Water Content	Lab Tests
S-1	20	
S-2	13	GS
S-3	11	AL

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 350

(Loose), moist, brown, slightly gravelly silty SAND with roots. (TOPSOIL)

(Medium dense to dense), moist, red-brown, slightly gravelly, silty SAND.

(Very dense), moist, gray, clayey, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/25/00.
Note: Slight seepage noted at a depth of 10½ feet.

Test Pit Log HC00-TP101

N 16784
E 11109

Sample	Water Content	Lab Tests
S-1	19	
S-2	70	
S-3	25	
S-4	9	

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 356

(Loose), moist, brown, silty, gravelly SAND with roots. (FILL)

(Very loose), wet, black, silty, gravelly SAND with PEAT.

(Medium dense), wet, gray and orange mottled, slightly gravelly, very silty SAND.

(Dense to very dense), moist, gray, silty, gravelly SAND.

Note: Seepage from abandoned septic drain field encountered below 3 feet.

Bottom of Test Pit at 15 Feet.
Completed 1/25/00.

HEM 3/15/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-82

Test Pit Log HC00-TP102

N 17003
E 11158

Sample	Water Content	Lab Tests
S-1 ☒	19	
S-2 ☒	18	
S-3 ☒	12	GS
S-4 ☒	13	

Depth in Feet 0–20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 344

(Loose), moist, gray and brown, silty, gravelly SAND with trace organic material.

(Loose to medium dense), moist, brown, silty, gravelly SAND.

(Very dense), moist, gray with brown mottling, gravelly, very silty SAND.

(Dense), moist, gray, slightly gravelly, slightly silty to silty SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/25/00.

Note: No seepage noted.

Test Pit Log HC00-TP103

N 17037
E 11018

Sample	Water Content	Lab Tests
S-1 ☒	15	GS
S-2 ☒	25	
S-3 ☒	15	
S-4 ☒	13	

Depth in Feet 0–20

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 339

(Loose), moist, brown, gravelly, silty SAND. (FILL)

(Loose), moist, dark brown, silty, gravelly SAND. (TOPSOIL)

(Medium dense), moist, brown, silty, gravelly SAND.

(Very dense), moist, gray with brown mottling to gray, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/25/00.
Note: Slight groundwater seepage noted at a depth of 10½ feet.

Septic drainfield encountered 2 to 3 feet deep.

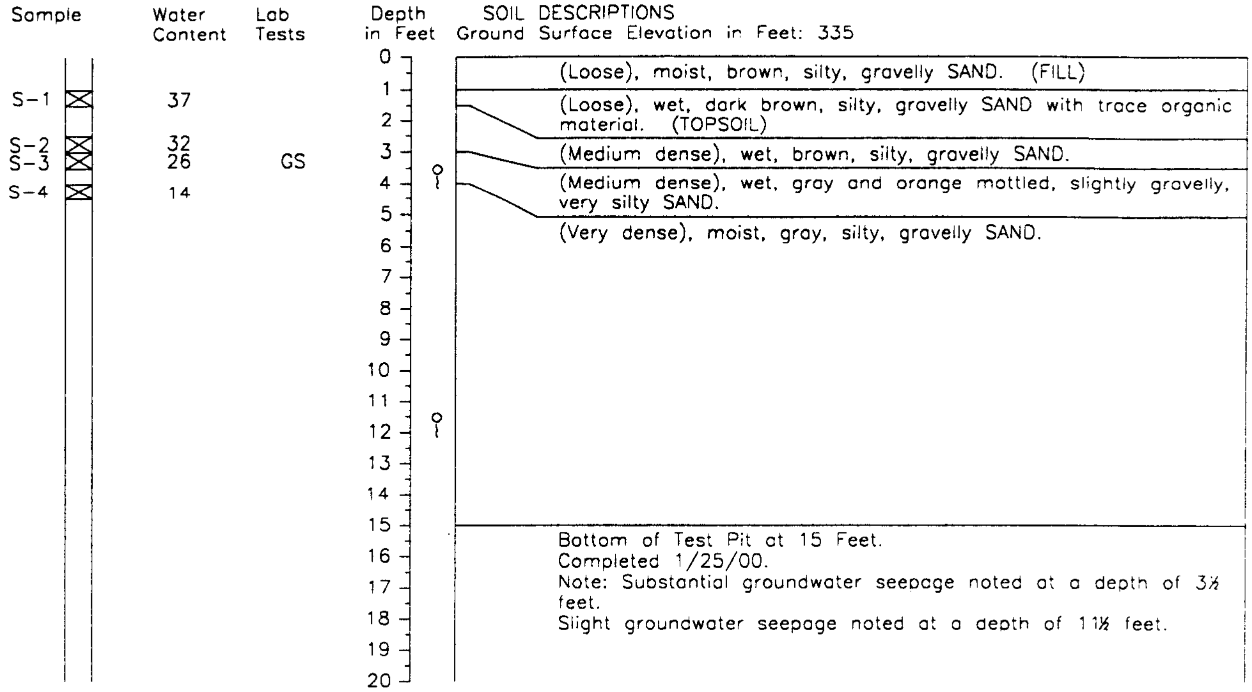
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HEM 3/15/00 1=1 497821 testpits woodstck pc2

HARTCROWSER
J-4978-21 1/00
Figure A-83

Test Pit Log HC00-TP104

N 17030
E 10874



Sample	Water Content	Lab Tests
S-1	37	
S-2	32	
S-3	26	GS
S-4	14	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 335

(Loose), moist, brown, silty, gravelly SAND. (FILL)

(Loose), wet, dark brown, silty, gravelly SAND with trace organic material. (TOPSOIL)

(Medium dense), wet, brown, silty, gravelly SAND.

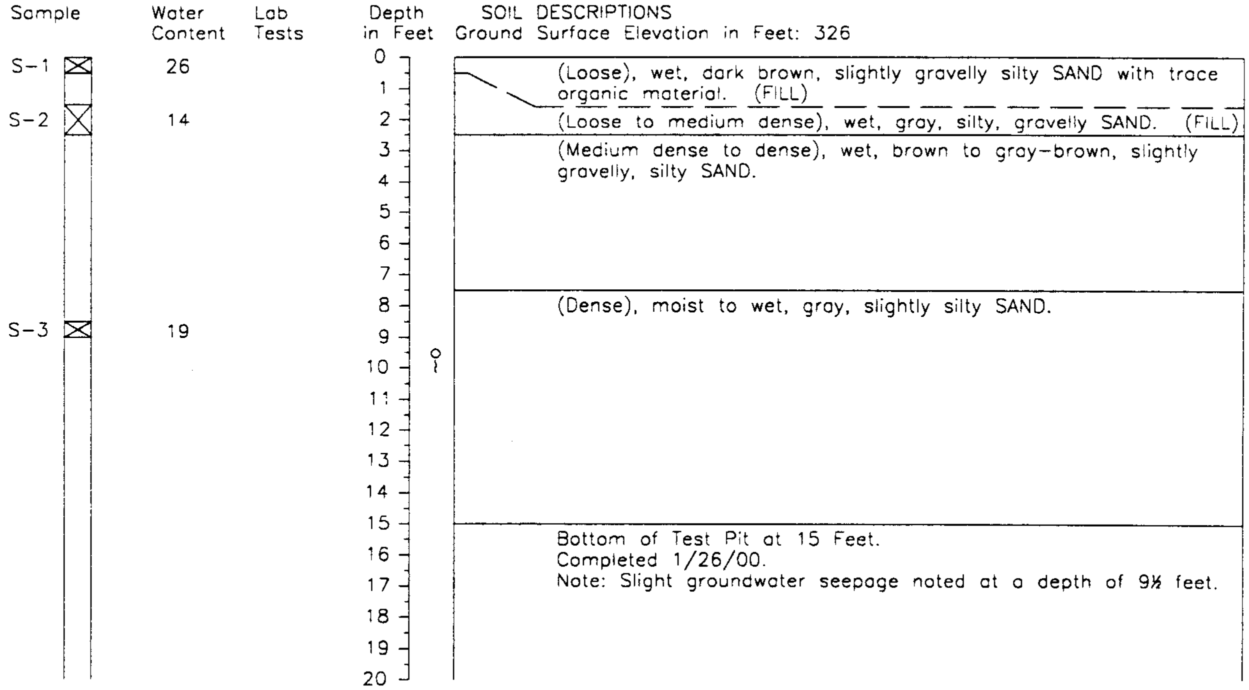
(Medium dense), wet, gray and orange mottled, slightly gravelly, very silty SAND.

(Very dense), moist, gray, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/25/00.
Note: Substantial groundwater seepage noted at a depth of 3½ feet.
Slight groundwater seepage noted at a depth of 11½ feet.

Test Pit Log HC00-TP105

N 17141
E 10790



Sample	Water Content	Lab Tests
S-1	26	
S-2	14	
S-3	19	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 326

(Loose), wet, dark brown, slightly gravelly silty SAND with trace organic material. (FILL)

(Loose to medium dense), wet, gray, silty, gravelly SAND. (FILL)

(Medium dense to dense), wet, brown to gray-brown, slightly gravelly, silty SAND.

(Dense), moist to wet, gray, slightly silty SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/26/00.
Note: Slight groundwater seepage noted at a depth of 9½ feet.

HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-84

Test Pit Log HC00-TP106

N 17151
E 10925

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 328
S-1 ☒	26		0	(Loose), moist, dark brown, slightly gravelly, silty SAND. (TOPSOIL)
			1	
S-2 ☒	16		2	(Loose), red-brown, moist, silty, gravelly SAND.
			3	(Medium dense), moist, gray-brown, silty, gravelly SAND.
S-3 ☒	13		4	(Dense to very dense), moist, gray, silty, gravelly SAND.
			5	
			6	
			7	
S-4 ☒	20	GS	8	(Dense), wet, gray, slightly gravelly SAND with silty Sand layers.
			9	
			10	
			11	
			12	
			13	
			14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: No seepage noted.
			16	
			17	
			18	
			19	
			20	

Test Pit Log HC00-TP107

N 17415
E 10989

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 298
S-1 ☒	26		0	(Loose), wet, dark brown, silty, gravelly SAND with trace organic material and roots.
S-2 ☒	38	AL	1	
			2	(Soft to medium stiff), wet, gray and brown mottled CLAY.
S-3 ☒	19		3	(Medium dense), wet, gray, slightly gravelly to gravelly SAND.
			4	
			5	
			6	
S-4 ☒	13		7	(Very dense), moist, gray, silty, gravelly SAND.
			8	
S-5 ☒	23		9	(Very stiff), moist, gray SILT with some sandy silt zones.
			10	
			11	
S-6 ☒	23		12	(Dense), wet, gray SAND.
			13	
			14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Seepage from standing water at surface. Slight groundwater seepage noted at depths of 4 feet and 8½ feet.
			16	
			17	
			18	
			19	
			20	

HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-85

Test Pit Log HC00-TP108

N 17477
E 10990

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 294
			0	(Loose), moist, red-brown to tan, silty, slightly gravelly to gravelly SAND.
S-1	14		1	
			2	
			3	
			4	
			5	(Medium stiff), wet, gray with brown mottling, fine sandy SILT.
S-2	32	AL	6	
			7	
			8	(Dense), wet, gray, gravelly SAND.
S-3	21		9	
			10	
			11	(Dense), wet, gray, silty, gravelly SAND.
			12	
			13	(Dense), wet, gray, slightly silty SAND.
S-4	27	GS	14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Significant groundwater seepage noted at depth of 9 feet.
			16	
			17	
			18	
			19	
			20	

Test Pit Log HC00-TP113

N 18126
E 10993

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 239
			0	(Loose), wet, dark brown, slightly gravelly, silty SAND with PEAT.
S-1	30		1	
			2	(Loose), wet, gray with brown mottling, silty, gravelly SAND.
S-2	21		3	
			4	
			5	
			6	(Loose to medium dense), wet, gray, very silty, gravelly SAND with trace organic material.
S-3	24		7	
			8	
			9	
			10	
			11	
			12	
			13	
			14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Slight groundwater seepage noted at depth of 10½ feet.
			16	
			17	
			18	
			19	
			20	

HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-86

Test Pit Log HC00-TP110

N 17647
E 10813

Sample	Water Content	Lab Tests
S-1	43	
S-2	40	
S-3	32	GS
S-4	12	
S-5	32	AL

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 256

(Loose), wet, dark brown, slightly gravelly, silty SAND with organic material. (TOPSOIL)

(Loose), wet, brown, slightly silty, gravelly, silty SAND.

(Loose), wet, light brown, fine to medium SAND.

(Medium dense), wet, gray with brown mottling, silty, gravelly SAND.

Grades to very dense.

(Hard), moist, gray CLAY with silt partings.

Bottom of Test Pit at 14 Feet.
Completed 3/15/00.

Note: Groundwater seepage noted at depth of 3 feet.
Sand from 3 to 5 feet highly transmissive and loose, free-face flows as a sand slurry.

Test Pit Log HC00-TP111

N 17585
E 11003

Sample	Water Content	Lab Tests
S-1	21	
S-2	26	
S-3	26	AL
S-4	.18	

Depth in Feet

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 285

(Loose), moist to wet, dark brown, slightly silty, slightly gravelly, fine to medium SAND with roots and trace organic material.

Roots grade out.

(Medium stiff), wet, gray-brown, sandy SILT.

(Medium stiff), wet, gray with brown mottling, non-sandy to, slightly sandy CLAY.

(Loose), wet, gray, gravelly, fine to medium SAND.

Grades to medium dense.

Bottom of Test Pit at 15 Feet.
Completed 3/15/00.

Note: Slight groundwater seepage noted at depth of 6½ feet.

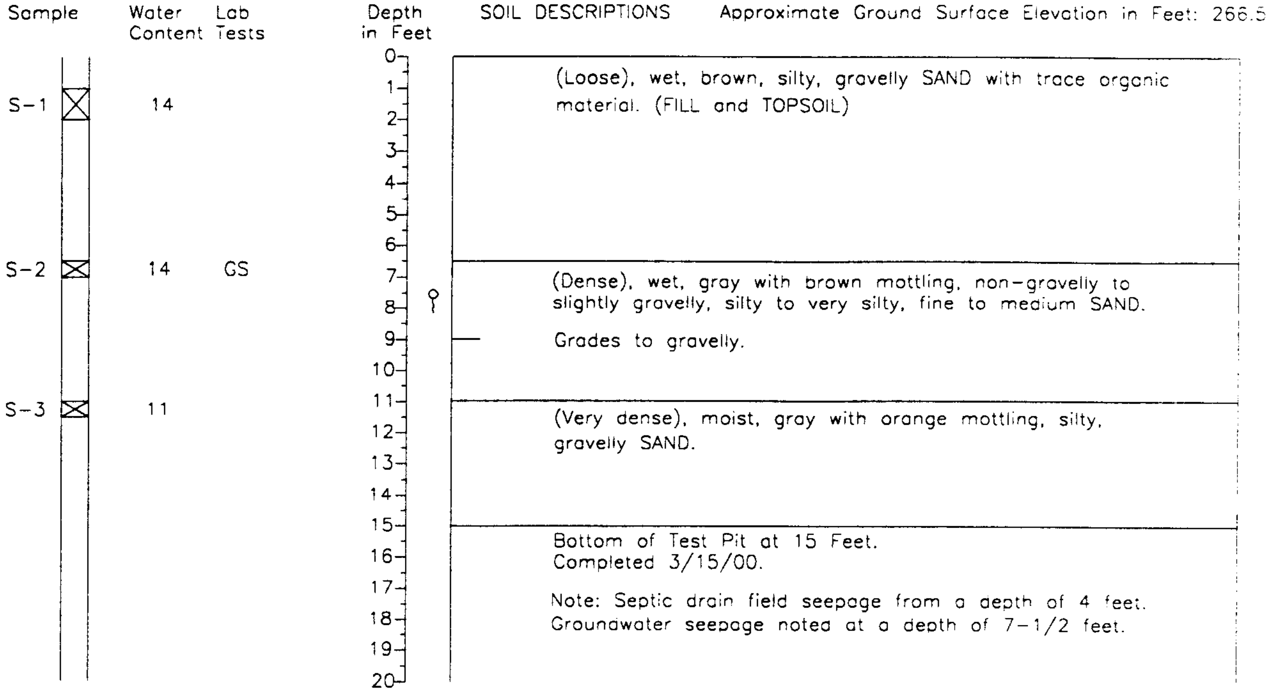
CVD 6/15/00 1=1 CHARLIE-8.PC2
APPX-C-LOGS

1. Refer to Figure C-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 3/00
Figure A-87

Test Pit Log HC00-TP112

N 17736
E 10990



Sample	Water Content	Lab Tests
S-1	14	
S-2	14	GS
S-3	11	

SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 266.5

(Loose), wet, brown, silty, gravelly SAND with trace organic material. (FILL and TOPSOIL)

(Dense), wet, gray with brown mottling, non-gravelly to slightly gravelly, silty to very silty, fine to medium SAND.

Grades to gravelly.

(Very dense), moist, gray with orange mottling, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 3/15/00.

Note: Septic drain field seepage from a depth of 4 feet.
Groundwater seepage noted at a depth of 7-1/2 feet.

CVD 6/15/00 1=1 CHARLIE-B.PC2
APPX-C-LOGS

1. Refer to Figure C-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 3/00
Figure A-88

Test Pit Log HC00-TP108

N 17477
E 10990

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 294
			0	
S-1	14		1	(Loose), moist, red-brown to tan, silty, slightly gravelly to gravelly SAND.
			2	
			3	
			4	
			5	
S-2	32	AL	6	(Medium stiff), wet, gray with brown mottling, fine sandy SILT.
			7	
S-3	21		8	(Dense), wet, gray, gravelly SAND.
			9	
			10	
			11	
			12	(Dense), wet, gray, silty, gravelly SAND.
			13	
S-4	27	GS	14	(Dense), wet, gray, slightly silty SAND.
			15	
			16	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Significant groundwater seepage noted at depth of 9 feet.
			17	
			18	
			19	
			20	

Test Pit Log HC00-TP113

N 18126
E 10993

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 239
			0	
S-1	30		1	(Loose), wet, dark brown, slightly gravelly, silty SAND with PEAT.
			2	
S-2	21		3	(Loose), wet, gray with brown mottling, silty, gravelly SAND.
			4	
			5	
S-3	24		6	
			7	(Loose to medium dense), wet, gray, very silty, gravelly SAND with trace organic material.
			8	
			9	
			10	
			11	
			12	
			13	
			14	
			15	
			16	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Slight groundwater seepage noted at depth of 10½ feet.
			17	
			18	
			19	
			20	

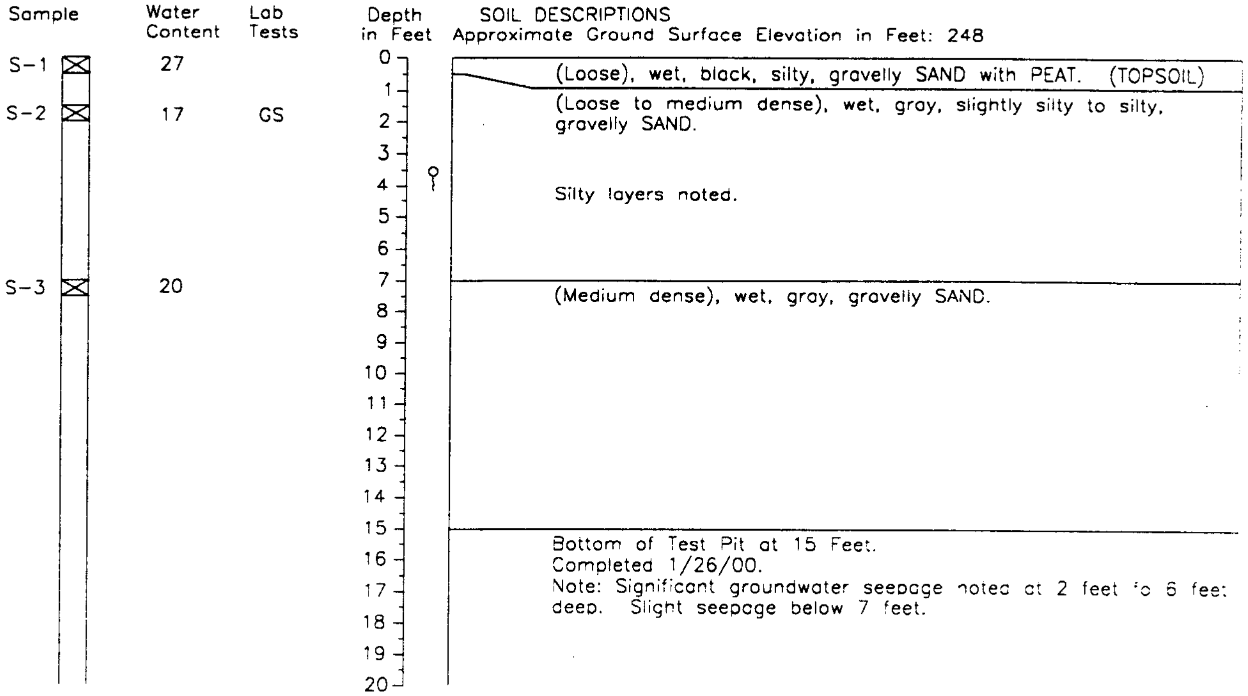
HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-89

Test Pit Log HC00-TP114

N 18220
E 11068



Sample	Water Content	Lab Tests
S-1	27	
S-2	17	GS
S-3	20	

Depth in Feet

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 248

(Loose), wet, black, silty, gravelly SAND with PEAT. (TOPSOIL)

(Loose to medium dense), wet, gray, slightly silty to silty, gravelly SAND.

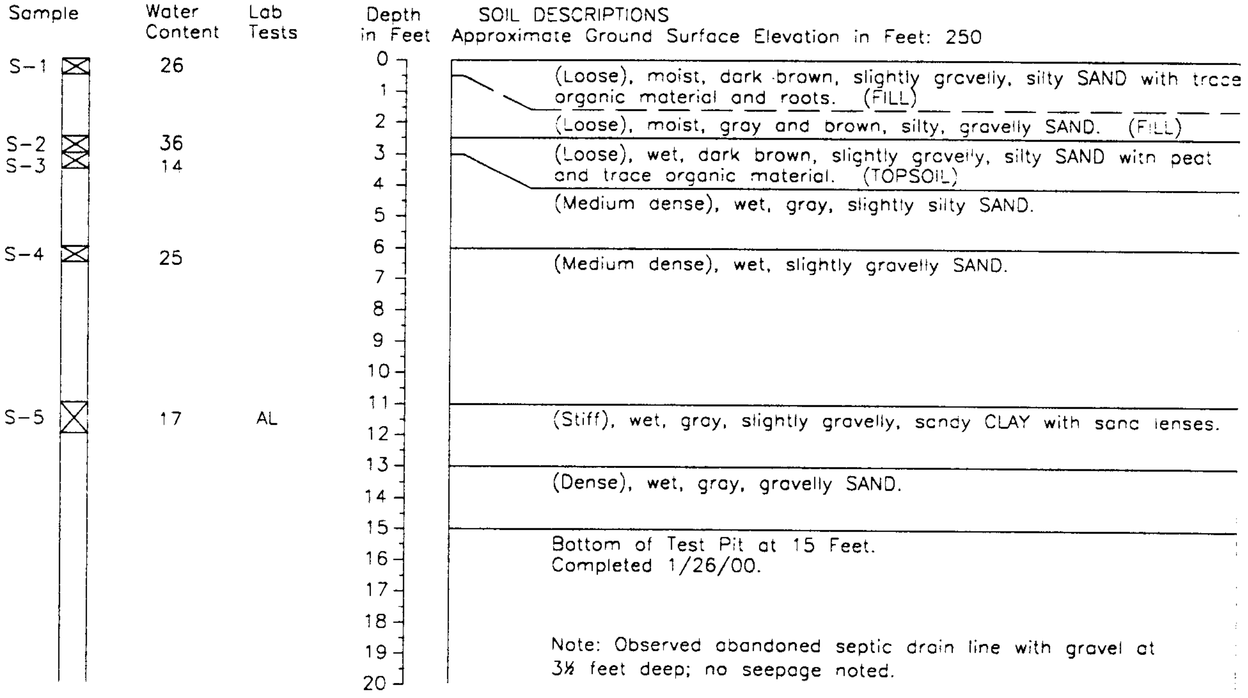
Silty layers noted.

(Medium dense), wet, gray, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/26/00.
Note: Significant groundwater seepage noted at 2 feet to 6 feet deep. Slight seepage below 7 feet.

Test Pit Log HC00-TP115

N 18325
E 11041



Sample	Water Content	Lab Tests
S-1	26	
S-2	36	
S-3	14	
S-4	25	
S-5	17	AL

Depth in Feet

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 250

(Loose), moist, dark brown, slightly gravelly, silty SAND with trace organic material and roots. (FILL)

(Loose), moist, gray and brown, silty, gravelly SAND. (FILL)

(Loose), wet, dark brown, slightly gravelly, silty SAND with peat and trace organic material. (TOPSOIL)

(Medium dense), wet, gray, slightly silty SAND.

(Medium dense), wet, slightly gravelly SAND.

(Stiff), wet, gray, slightly gravelly, sandy CLAY with sand lenses.

(Dense), wet, gray, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/26/00.

Note: Observed abandoned septic drain line with gravel at 3½ feet deep; no seepage noted.

HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-90

Test Pit Log HC00-TP116

N 18396
E 11005

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 257
			0	(Loose to medium dense), moist, gray and brown mottled, non-silty to silty SAND.
S-1	14		1	
			2	(Medium dense), moist, gray, SAND with slightly silty zones.
S-2	6	GS	3	
			4	(Dense), moist, gray, fine to medium SAND.
			5	
			6	
			7	
			8	
			9	
			10	
			11	(Dense) wet, gray, slightly gravelly SAND.
			12	
			13	Becomes gravelly.
S-3	19		14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Slight groundwater seepage noted at a depth of 11½ feet.
			16	
			17	
			18	
			19	
			20	

Test Pit Log HC00-TP117

N 18547
E 10999

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 261
			0	(Loose), moist, silty SAND. (FILL)
S-1	8		1	Concrete slab.
			2	(Medium dense), moist, gray-brown, slightly silty SAND.
			3	
S-2	18		4	(Dense), moist, gray and orange mottled, gravelly, very silty SAND.
			5	
			6	
			7	
S-3	12		8	(Dense), wet, gray, slightly silty, very gravelly SAND.
			9	
			10	
			11	
			12	Grades to sandy GRAVEL.
			13	
S-4	18		14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/26/00.
			16	
			17	
			18	
			19	Note: No seepage noted.
			20	

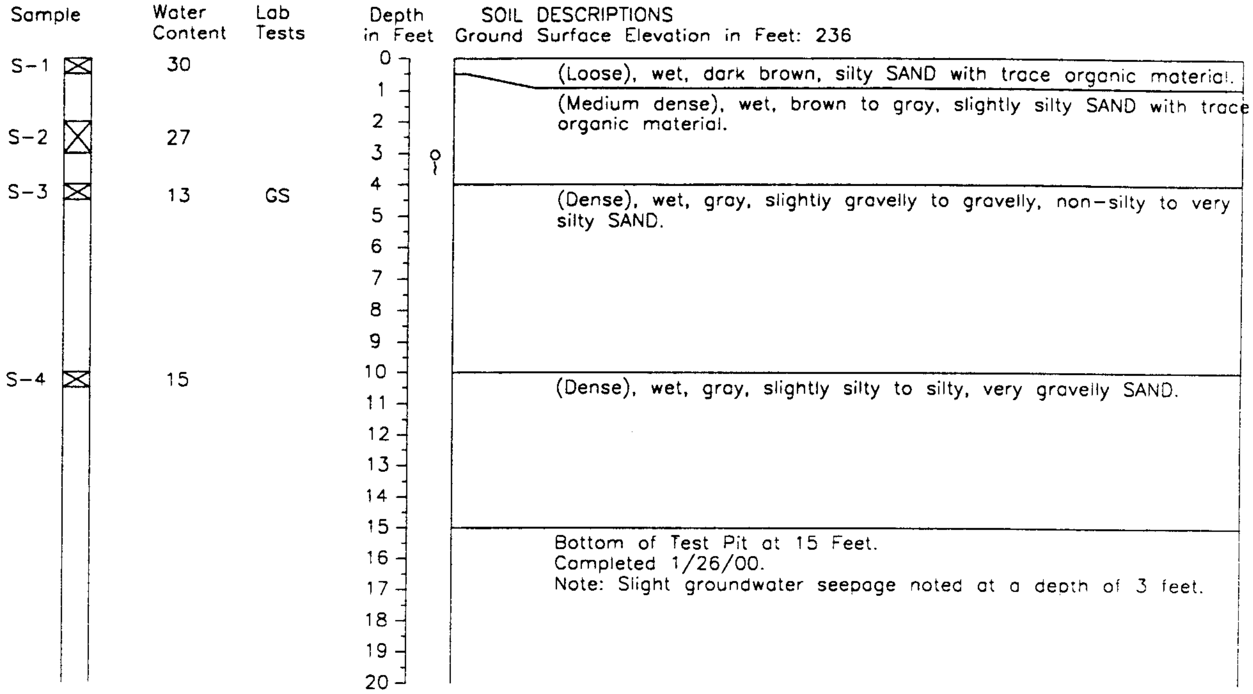
HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-91

Test Pit Log HC00-TP118

N 18412
E 10798



(Loose), wet, dark brown, silty SAND with trace organic material.

(Medium dense), wet, brown to gray, slightly silty SAND with trace organic material.

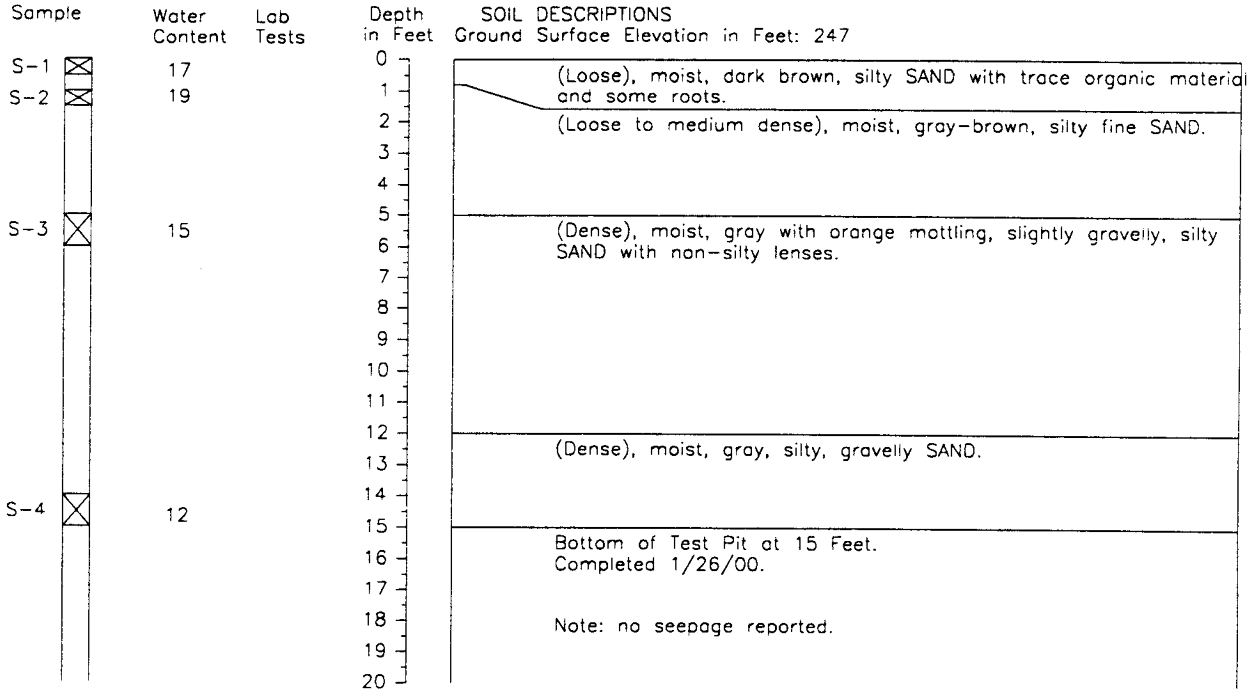
(Dense), wet, gray, slightly gravelly to gravelly, non-silty to very silty SAND.

(Dense), wet, gray, slightly silty to silty, very gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/26/00.
Note: Slight groundwater seepage noted at a depth of 3 feet.

Test Pit Log HC00-TP119

N 18529
E 10757



(Loose), moist, dark brown, silty SAND with trace organic material and some roots.

(Loose to medium dense), moist, gray-brown, silty fine SAND.

(Dense), moist, gray with orange mottling, slightly gravelly, silty SAND with non-silty lenses.

(Dense), moist, gray, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/26/00.

Note: no seepage reported.

HEM 3/9/00 1=1 497821 testpits woodstick pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-92

Test Pit Log HC00-TP120

N 18487
E 10986

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 260
			0	
S-1	13	GS	1	ASPHALT
			2	(Medium dense), moist, brown, silty SAND.
			3	(Dense), moist, brown, silty, gravelly SAND.
			4	
			5	
S-2	6		6	(Dense), moist, gray, gravelly SAND with slightly silty zones.
			7	
			8	
			9	
			10	
			11	
			12	
			13	
			14	(Dense), moist, gray, very gravelly SAND.
			15	
			16	Bottom of Test Pit at 15 Feet. Completed 1/26/00.
			17	
			18	Note: no seepage noted.
			19	
			20	

Test Pit Log HC00-TP121

N 18537
E 10886

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 254
			0	
			1	(Loose to medium dense), moist, brown, slightly silty, gravelly SAND with 50 to 70 percent concrete debris, scattered wood and metal debris. (FILL)
			2	
S-1	18		3	
			4	
			5	
			6	
			7	
			8	
			9	
			10	
			11	
S-2	31		12	(Loose), wet, black, silty SAND with PEAT.
			13	
			14	(Medium dense), wet, gray, silty SAND stiff sandy SILT layers with a trace of organic material.
S-3	24		15	
			16	Bottom of Test Pit at 15 Feet. Completed 1/26/00. Note: Significant groundwater seepage noted at a depth of 10½ feet.
			17	
			18	
			19	
			20	

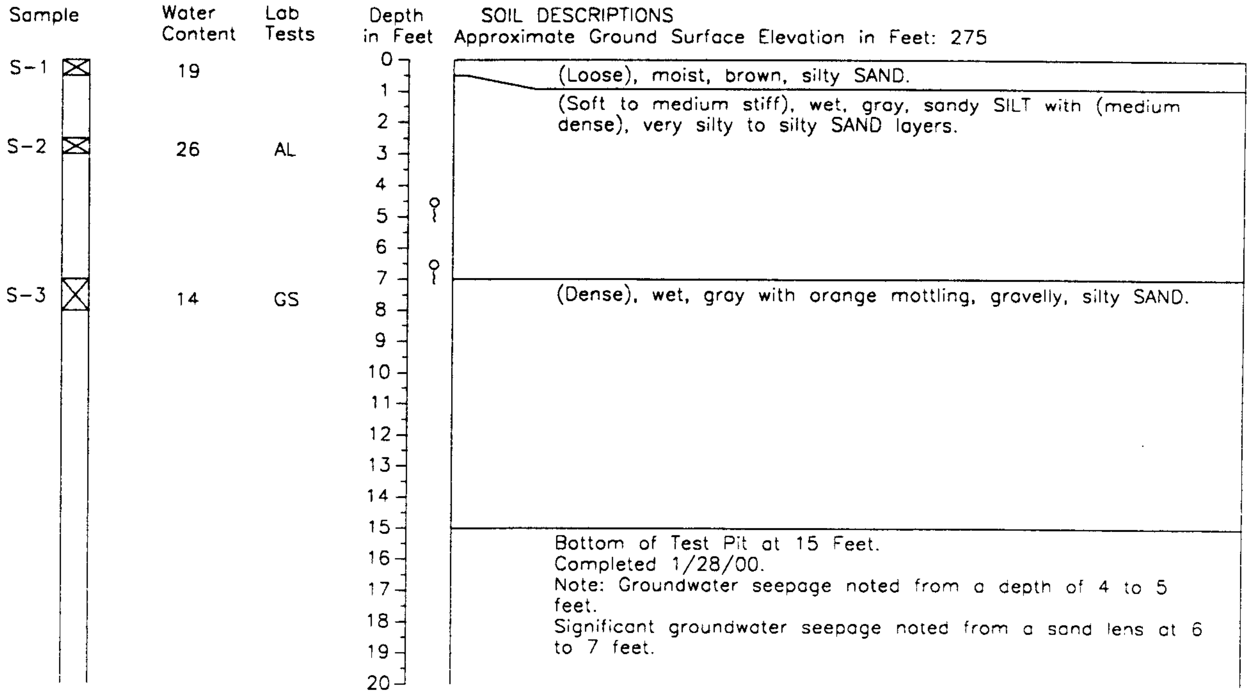
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HEM 3/9/00 1=1 497821 testpits woodstck pc2

HARTCROWSER
J-4978-21 1/00
Figure A-93

Test Pit Log HC00-TP123

N 19126
E 10873



Sample	Water Content	Lab Tests
S-1	19	
S-2	26	AL
S-3	14	GS

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 275

(Loose), moist, brown, silty SAND.

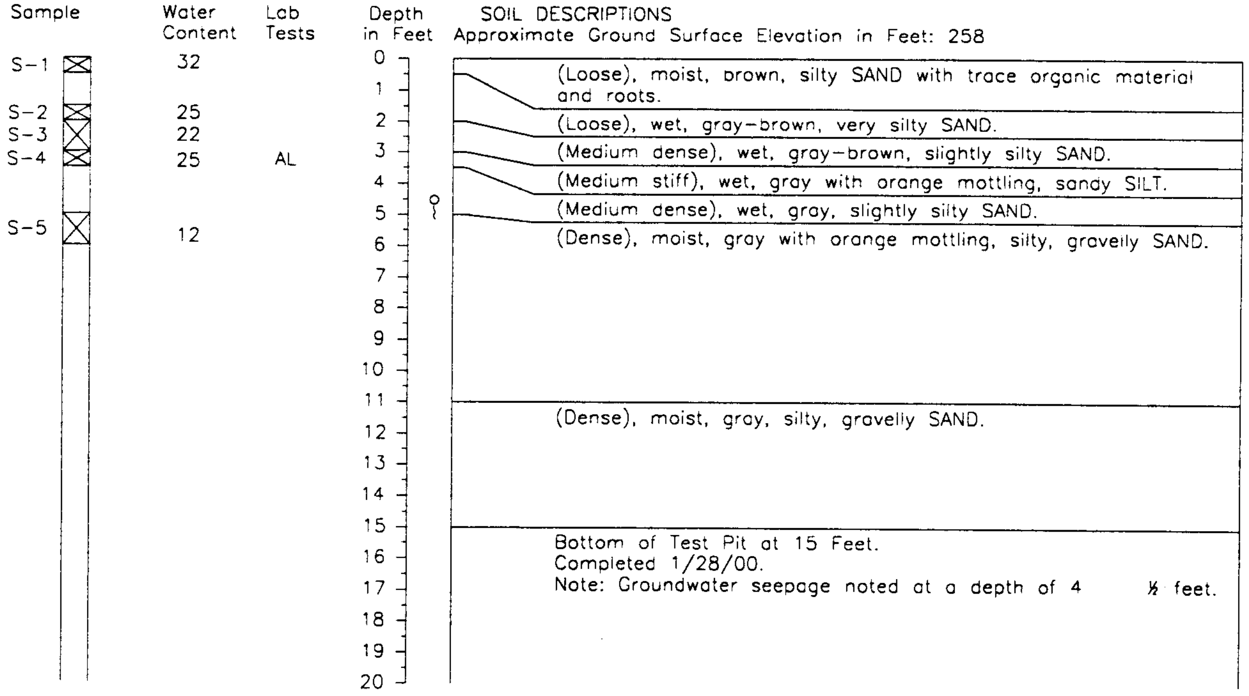
(Soft to medium stiff), wet, gray, sandy SILT with (medium dense), very silty to silty SAND layers.

(Dense), wet, gray with orange mottling, gravelly, silty SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/28/00.
Note: Groundwater seepage noted from a depth of 4 to 5 feet.
Significant groundwater seepage noted from a sand lens at 6 to 7 feet.

Test Pit Log HC00-TP124

N 18973
E 10724



Sample	Water Content	Lab Tests
S-1	32	
S-2	25	
S-3	22	
S-4	25	AL
S-5	12	

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 258

(Loose), moist, brown, silty SAND with trace organic material and roots.

(Loose), wet, gray-brown, very silty SAND.

(Medium dense), wet, gray-brown, slightly silty SAND.

(Medium stiff), wet, gray with orange mottling, sandy SILT.

(Medium dense), wet, gray, slightly silty SAND.

(Dense), moist, gray with orange mottling, silty, gravelly SAND.

(Dense), moist, gray, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/28/00.
Note: Groundwater seepage noted at a depth of 4 ½ feet.

HEM 3/9/00 1=1 497821 testpits woodstck pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-94

Test Pit Log HC00-TP125

N 19168
E 11187

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 299
S-1 ☒	24		0	(Loose), moist, brown, silty SAND with trace organic material and roots.
S-2 ☒	24		1	
S-3 ☒	10	GS	2	(Soft to medium stiff), moist, gray and orange mottled, sandy SILT.
			3	(Medium dense to dense), moist, gray with orange mottling, very gravelly, silty SAND with some non-sandy zones.
			4	
			5	(Dense), gray, non-silty to silty, gravelly SAND. (TILL)
			6	
			7	
			8	
			9	
			10	
			11	
			12	
S-4 ☒	10		13	
			14	
			15	Bottom of Test Pit at 15 Feet. Completed 1/28/00.
			16	
			17	
			18	Note: no seepage noted.
			19	
			20	

Test Pit Log HC00-TP126

N 19443
E 10773

Sample	Water Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 272
S-1 ☒	26		0	(Loose), wet, brown, silty SAND with some roots and trace organic material.
			1	
S-2 ☒	20		2	(Medium dense), wet, gray with orange mottling, silty, gravelly SAND.
			3	
			4	
			5	
			6	
			7	
S-3 ☒	8		8	(Very dense), moist, gray, silty, gravelly SAND.
			9	
			10	
			11	Bottom of Test Pit at 11 Feet. Completed 1/28/00.
			12	
			13	
			14	
			15	Note: Septic drainfield encountered at 3 feet.
			16	
			17	
			18	
			19	
			20	

DTN 11/13/00 1=1 497821 testpits woodstock pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-95

Test Pit Log HC00-TP127

N 19166
E 11086

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 292

Sample	Water Content	Lab Tests
S-1	11	
S-2	6	
S-3	13	GS

Depth in Feet: 0 – 20

(Loose), moist, gray,silty, gravelly SAND. (FILL)

(Loose), moist, brown, slightly silty SAND.

(Loose to medium dense), moist, gray, slightly gravelly SAND.

(Dense), moist, gray with orange mottling, gravelly, very silty SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/28/00.

Note: no seepage noted.

Test Pit Log HC00-TP128

N 18732
E 11003

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 273

Sample	Water Content	Lab Tests
S-1	18	
S-2	8	
S-3	11	
S-4	11	

Depth in Feet: 0 – 20

(Loose), moist, brown, silty SAND with some roots.

(Medium dense), moist, gray-brown SAND.

(Medium dense), wet, gray with orange mottling, silty, gravelly SAND with some non-silty zones.

Bottom of Test Pit at 15 Feet.
Completed 1/28/00.

Note: no seepage noted.

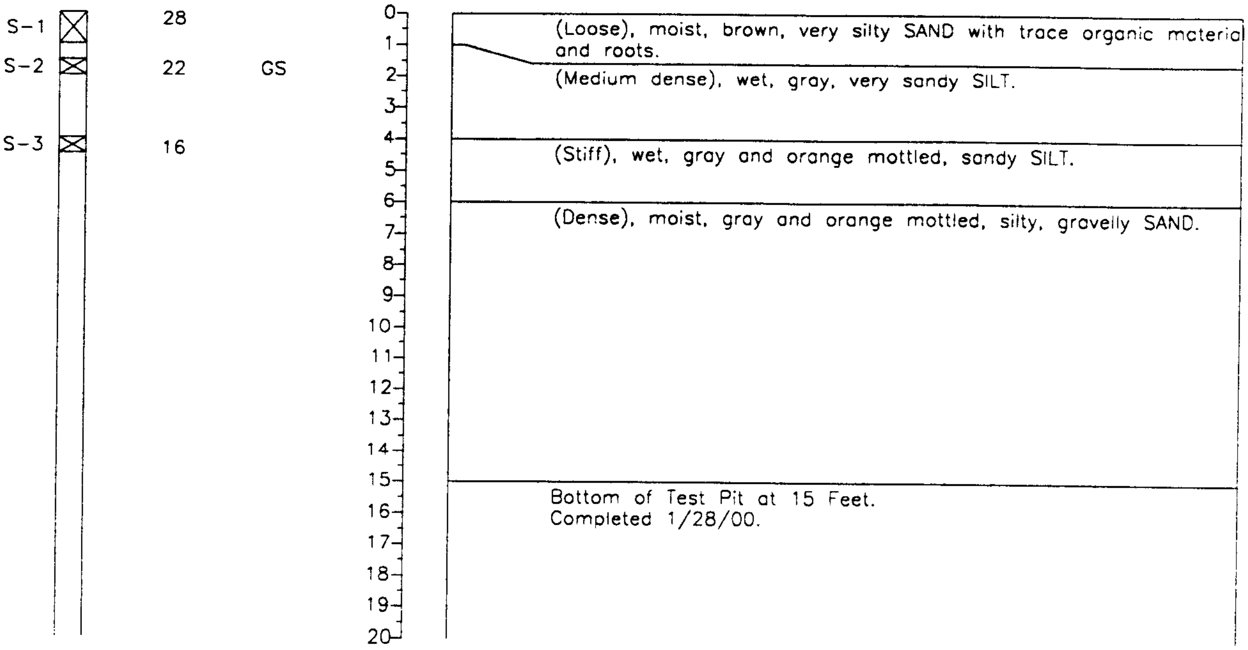
DTN 11/13/00 1=1 497821 testpits woodsick pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-96

Test Pit Log HC00-TP129

N 18899
E 10623



Sample	Water Content	Lab Tests
S-1 ☒	28	
S-2 ☒	22	GS
S-3 ☒	16	

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 250

(Loose), moist, brown, very silty SAND with trace organic material and roots.

(Medium dense), wet, gray, very sandy SILT.

(Stiff), wet, gray and orange mottled, sandy SILT.

(Dense), moist, gray and orange mottled, silty, gravelly SAND.

Bottom of Test Pit at 15 Feet.
Completed 1/28/00.

HEM 3/9/00 1=1 497821 testpits woodstick pc2

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-21 1/00
Figure A-97

Test Pit Log HC00-TP132

N 16290
E 10592

Sample	Moisture Content	Lab Tests
S-1	10	
S-2	16	
S-3	14	

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 367

(Medium dense to dense), moist, brown, slightly silty, slightly gravelly SAND with organic material.

(Very dense), moist, gray and orange mottled, very silty SAND. (WEATHERED TILL?)

Bottom of Test Pit at 8 Feet.
Completed 1/10/00.
Slight groundwater seepage noted at a depth of 5 feet.

Test Pit Log HC00-TP133

N 16408
E 10600

Sample	Moisture Content	Lab Tests
S-1	7	GS
S-2	13	
S-3	12	

Depth in Feet: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 362

(Medium dense), moist, brown, silty, gravelly SAND with organic material.

(Loose), moist to wet, tan and orange mottled, slightly gravelly, very silty SAND with scattered organic material.

(Very dense), moist, gray and orange mottled, gravelly, silty SAND increasing in density with depth.

Varying silt and sand content and/or lenses noted.

Bottom of Test Pit at 10 Feet.
Completed 1/10/00.
No groundwater encountered.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HEM 3/17/00 1=1 497822 testpits

HARTCROWSER
J-4978-22 1/00
Figure A-98

Test Pit Log HC00-TP134

N 16525
E 10692

Sample	Moisture Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 352
S-1 ☒	16		1	(Dense), moist, dark brown, slightly silty, slightly gravelly SAND.
S-2 ☒	9		2	(Medium dense), moist to wet, brown and orange, very gravelly SAND.
S-3 ☒	10		3	(Very dense), moist, gray, slightly gravelly, very silty SAND.
			5	Bottom of Test Pit at 5 Feet. Completed 1/10/00. Very slight groundwater seepage noted at a depth of 2 feet.

Test Pit Log HC00-TP137

N 16708
E 10562

Sample	Moisture Content	Lab or Field Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 355
S-1 ☒	30	PP: 4.75, 4.5, 4.25	1	(Hard), moist, greenish gray with orange mottling, clayey SILT.
S-2 ☒	16		2	(Medium dense), moist, brown SAND.
		PP: 4.5	3	(Hard), moist, brown SILT.
S-3 ☒	19	GS	4	(Medium dense), moist, brown, silty, medium to fine SAND increasing in density and decreasing in silt content with depth.
			15	Bottom of Test Pit at 15 Feet. Completed 1/19/00. Double Ring Infiltration Test conducted in bottom of test pit.

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HEM 3/17/00 1=1 497822 testpits

HARTCROWSER
J-4978-22 1/00
Figure A-99

Test Pit Log HC00-TP138

N 16702
E 10635

Sample	Moisture Content	Field Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 354
S-1	22	PP: 3.5, 4.25, 4.5	1	(Hard), moist, brown, slightly gravelly, slightly clayey, sandy SILT with roots.
			2	(Hard), damp, greenish gray with some orange mottling, slightly sandy, clayey SILT.
S-2	32		3	
			13	Bottom of Test Pit at 13 Feet. Completed 1/19/00. Slight groundwater seepage noted at a depth of 12½ feet.

Test Pit Log HC00-TP139

N 16747
E 10796

Sample	Moisture Content	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS Approximate Ground Surface Elevation in Feet: 351
S-1	14		1	(Dense), moist, gray with orange mottling, gravelly, silty SAND with roots.
S-2	14		2	(Very dense), moist, gray with orange mottling, gravelly, silty SAND.
			6	Bottom of Test Pit at 6 Feet. Completed 1/19/00.

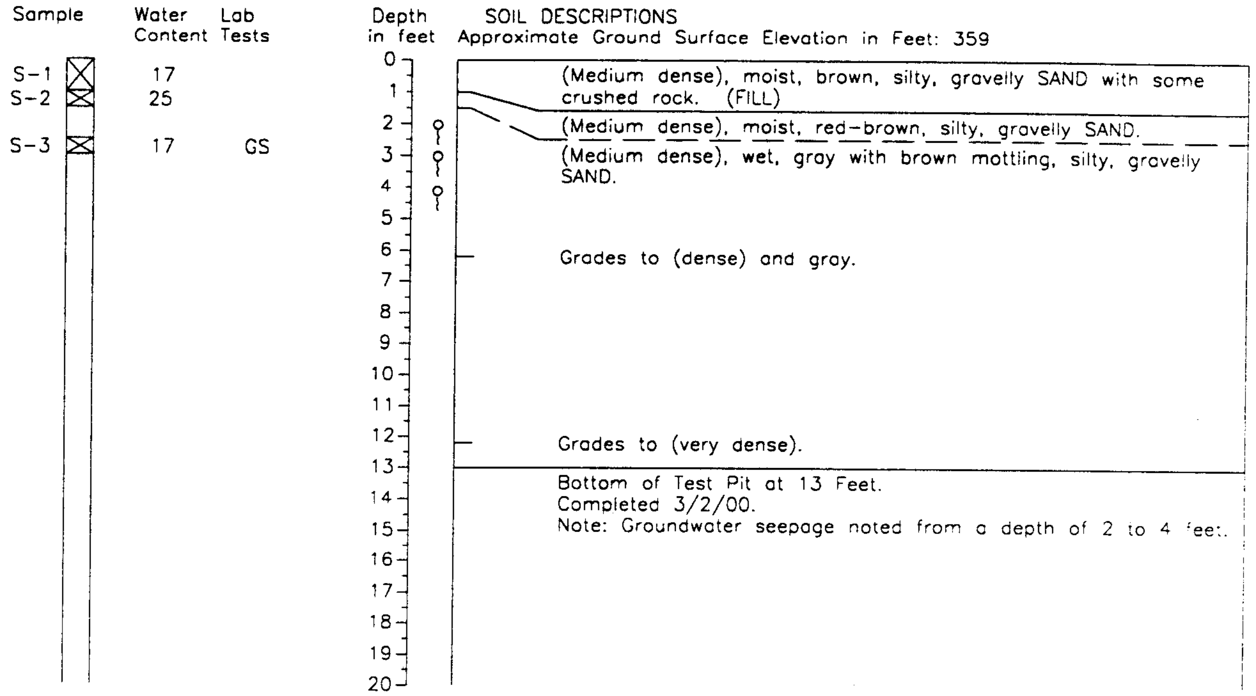
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HEM 3/17/00 1=1 497822 testpits

HARTCROWSER
J-4978-22 1/00
Figure A-100

Test Pit Log HC00-TP202

N 15424
E 10963



Sample	Water Content	Lab Tests
S-1	17	
S-2	25	
S-3	17	GS

Depth in feet

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 359

(Medium dense), moist, brown, silty, gravelly SAND with some crushed rock. (FILL)

(Medium dense), moist, red−brown, silty, gravelly SAND.

(Medium dense), wet, gray with brown mottling, silty, gravelly SAND.

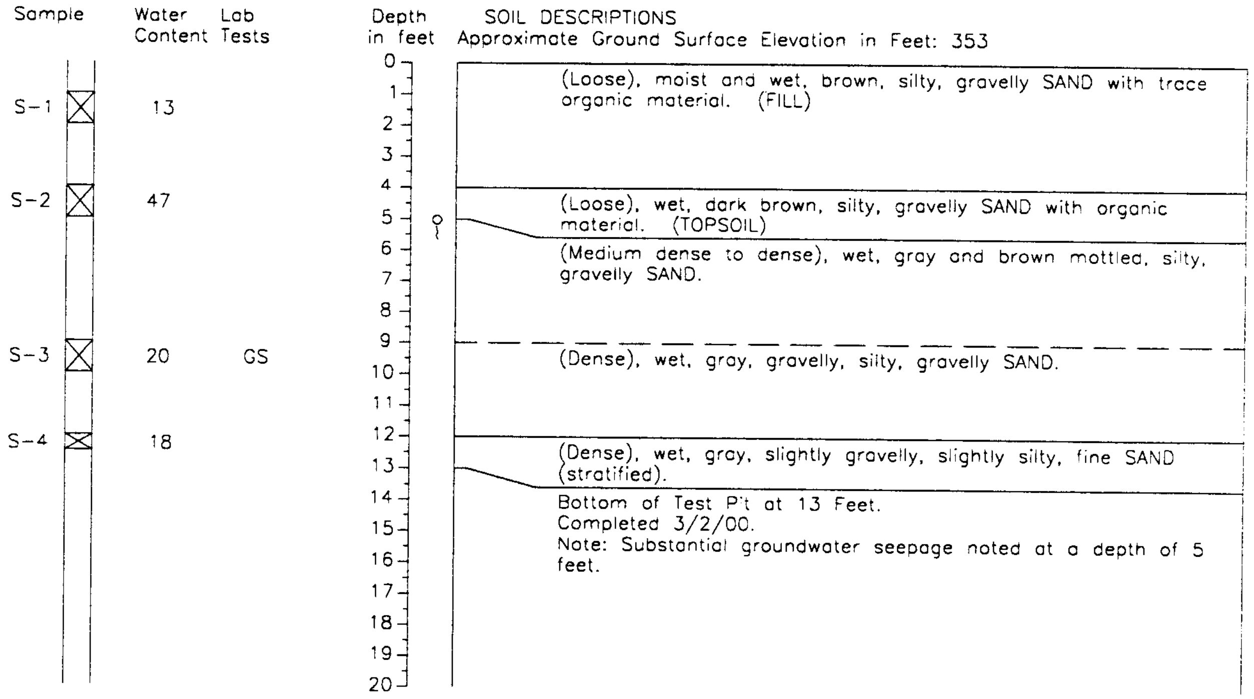
Grades to (dense) and gray.

Grades to (very dense).

Bottom of Test Pit at 13 Feet.
Completed 3/2/00.
Note: Groundwater seepage noted from a depth of 2 to 4 feet.

Test Pit Log HC00-TP203

N 15411
E 11101



Sample	Water Content	Lab Tests
S-1	13	
S-2	47	
S-3	20	GS
S-4	18	

Depth in feet

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 353

(Loose), moist and wet, brown, silty, gravelly SAND with trace organic material. (FILL)

(Loose), wet, dark brown, silty, gravelly SAND with organic material. (TOPSOIL)

(Medium dense to dense), wet, gray and brown mottled, silty, gravelly SAND.

(Dense), wet, gray, gravelly, silty, gravelly SAND.

(Dense), wet, gray, slightly gravelly, slightly silty, fine SAND (stratified).

Bottom of Test Pit at 13 Feet.
Completed 3/2/00.
Note: Substantial groundwater seepage noted at a depth of 5 feet.

HEM 497823 Pits 3/24/00

1. Refer to Figure A−1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-23 3/00
Figure A-101

Test Pit Log HC00-TP204

N 15161
E 10951

Sample	Water Content	Lab Tests
S-1 ☒	20	
S-2 ☒	13	GS
S-3 ☒	14	

Depth in feet 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 351

(Loose), moist, brown, silty, gravelly SAND with trace organic material.

(Medium dense), wet, gray, slightly silty, gravelly, medium to fine SAND.

Grades to (dense).

(Dense to very dense), moist, gray, slightly gravelly, silty, fine SAND.

Grades to gravelly.

Bottom of Test Pit at 11 Feet.
Completed 3/2/00.

Note: No seepage observed.

Test Pit Log HC00-TP205

N 15157
E 11181

Sample	Water Content
S-1 ☒	17
S-2 ☒	13
S-3 ☒	11

Depth in feet 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 356

(Loose), moist, red-brown, silty, gravelly SAND.

(Medium dense to dense), moist to wet, gray with brown mottling, silty, gravelly SAND.

(Dense), moist, gray, silty, gravelly, fine to medium SAND. (TILL)

Bottom of Test Pit at 9 Feet.
Completed 3/2/00.

Note: Groundwater seepage noted at a depth of 3½ feet.
Very hard digging at 9 feet.

HEM 497823 Pits 3/24/00

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-23 3/00
Figure A-102

Test Pit Log HC00-TP220

N 14590
E 11265

Approximate Ground Surface Elevation in Feet: 346

Sample	Water Content	Depth in feet	SOIL DESCRIPTIONS
		0	
S-1 ☒	23	1	(Loose to medium dense), moist to wet, brown, slightly gravelly, silty SAND.
		2	
S-2 ☒	8	3	(Very dense), moist, gray, silty, gravelly, fine to medium SAND.
		4	
		5	
		6	
		7	
		8	
		9	Bottom of Test Pit at 9.0 Feet. Completed 3/16/00.
		10	
		11	
		12	
		13	
		14	
		15	
		16	
		17	
		18	
		19	
		20	

Test Pit Log HC00-TP221

N 14801
E 11287

Approximate Ground Surface Elevation in Feet: 344

Sample	Water Content	Lab Tests	Depth in feet	SOIL DESCRIPTIONS
			0	
S-1 ☒	16		1	(Medium dense to dense), moist, brown, silty, gravelly SAND with cobbles, and organic material and roots. (FILL)
			2	
			3	
S-2 ☒	22	GS	4	(Medium dense), moist, brown, gravelly, very silty SAND with organic material.
			5	
			6	Roots grades out.
S-3 ☒	8		7	(Very dense), moist, gray, silty, gravelly SAND.
			8	
			9	
			10	Bottom of Test Pit at 10.0 Feet. Completed 3/16/00.
			11	
			12	
			13	
			14	
			15	
			16	
			17	
			18	
			19	
			20	

RC 497823 Pits 6/7/00

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-23 3/00
Figure A-103

Test Pit Log HC00-TP222

N 14579
E 11381

Sample	Water Content
S-1	18
S-2	15
S-3	11

Depth in feet: 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 357

6 inches of Topsoil over (medium dense), wet, brown, silty, gravelly SAND with roots.

(Medium dense to dense), wet, gray, slightly silty, very gravelly SAND.

(Dense to very dense), moist, gray, silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 13.0 Feet.
Completed 3/16/00.

Test Pit Log HC00-TP223

N 14625
E 11481

Sample	Water Content
S-1	21
S-2	24
S-3	11

Depth in feet: 0–20

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 365

(Medium dense), wet, brown to dark brown, slightly gravelly, silty SAND with roots.

(Loose), wet, brown, silty, gravelly SAND.

(Dense to very dense), moist, gray, silty, gravelly SAND.

Bottom of Test Pit at 13.0 Feet.
Completed 3/16/00.

RC 497823 Pits 6/7/00

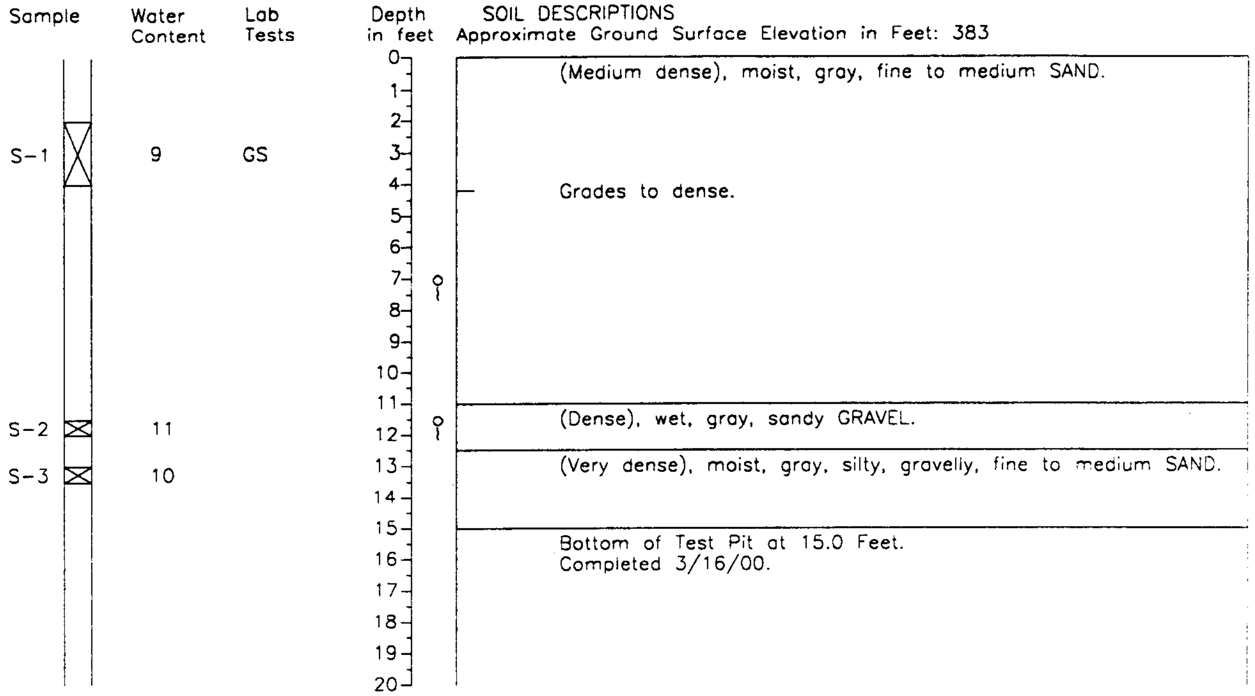
1. Refer to Figure A 1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-23 3/00
Figure A-104

Test Pit Log HC00-TP224

N 15532
E 12085

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 383



(Medium dense), moist, gray, fine to medium SAND.

Grades to dense.

(Dense), wet, gray, sandy GRAVEL.

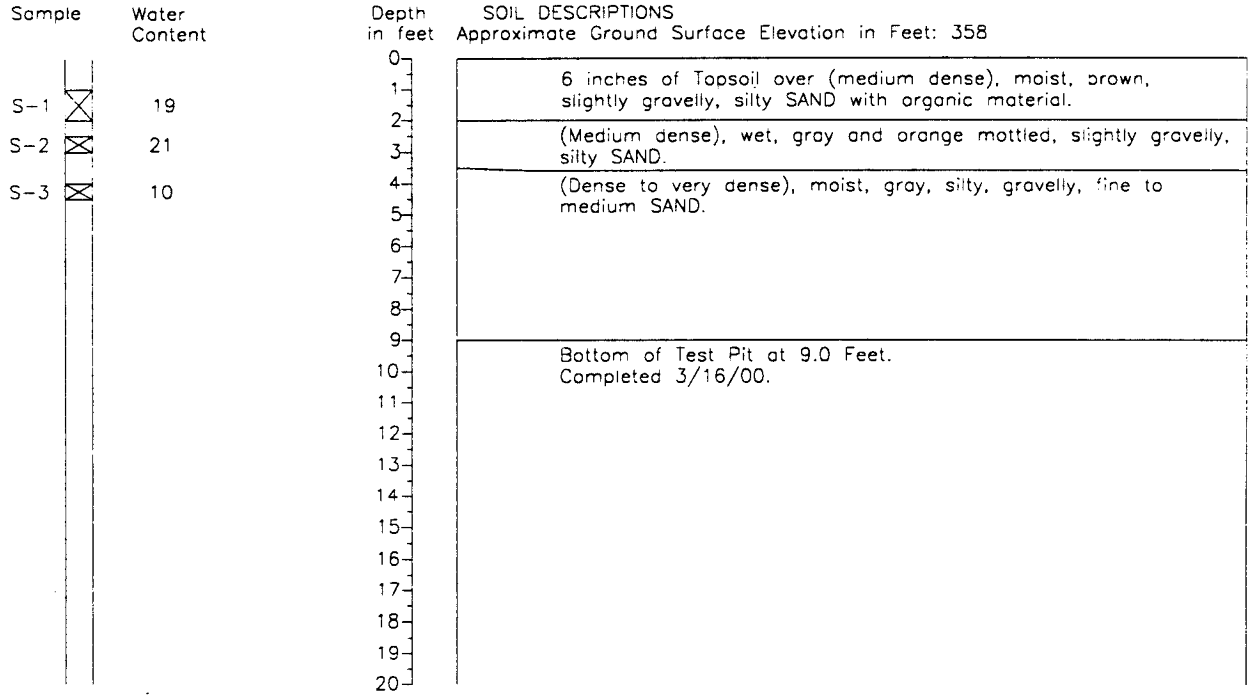
(Very dense), moist, gray, silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 15.0 Feet.
Completed 3/16/00.

Test Pit Log HC00-TP226

N 15042
E 11269

SOIL DESCRIPTIONS
Approximate Ground Surface Elevation in Feet: 358



6 inches of Topsoil over (medium dense), moist, brown, slightly gravelly, silty SAND with organic material.

(Medium dense), wet, gray and orange mottled, slightly gravelly, silty SAND.

(Dense to very dense), moist, gray, silty, gravelly, fine to medium SAND.

Bottom of Test Pit at 9.0 Feet.
Completed 3/16/00.

RC 497823 Pits 6/7/00

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-23 3/00
Figure A-105

Test Pit Log HC00-TP300

N 20404
E 10845

Ground Surface Elevation in Feet: 299

Sample	Water Content	Depth in Feet	SOIL DESCRIPTIONS
		0	
S-1	14	1	(Medium dense), moist, dark brown, slightly silty SAND with organic material. (TOPSOIL)
		2	(Medium dense), moist, brown, slightly silty, fine SAND with trace organic material.
S-2	10	3	
		4	
S-3	20	5	(Stiff), moist, orange to gray, very sandy, very clayey SILT.
		6	
		7	(Stiff), moist, gray to orange, slightly gravelly, sandy SILT. (Weathered)
S-4	20	8	
		9	
		10	(Stiff), moist, gray, sandy SILT.
S-5	18	11	
		12	
		13	
		14	
		15	
		16	Bottom of Test Pit at 15 Feet. Completed 5/2/00. No groundwater seepage observed.
		17	
		18	
		19	
		20	

Test Pit Log HC00-TP301

N 20247
E 10838

Ground Surface Elevation in Feet: 295

Sample	Water Content		Depth in Feet	SOIL DESCRIPTIONS
			0	
S-1	23		1	(Medium dense), moist, brown, silty SAND with organic mater'c. (TOPSOIL)
			2	(Medium dense), moist, brown SAND with trace roots.
S-2	20		3	
S-3	22	AL	4	(Stiff), moist, gray and orange CLAY.
			5	
			6	(Stiff), moist, gray and orange, slightly gravelly, sandy SILT. (Weathered)
S-4	21		7	
			8	
			9	
			10	
			11	
			12	
			13	(Very dense), moist, gray, gravelly, silty SAND.
S-5	9		14	
			15	
			16	Bottom of Test Pit at 15 Feet. Completed 5/2/00. Groundwater seepage observed at a depth of 12½ feet.
			17	
			18	
			19	
			20	

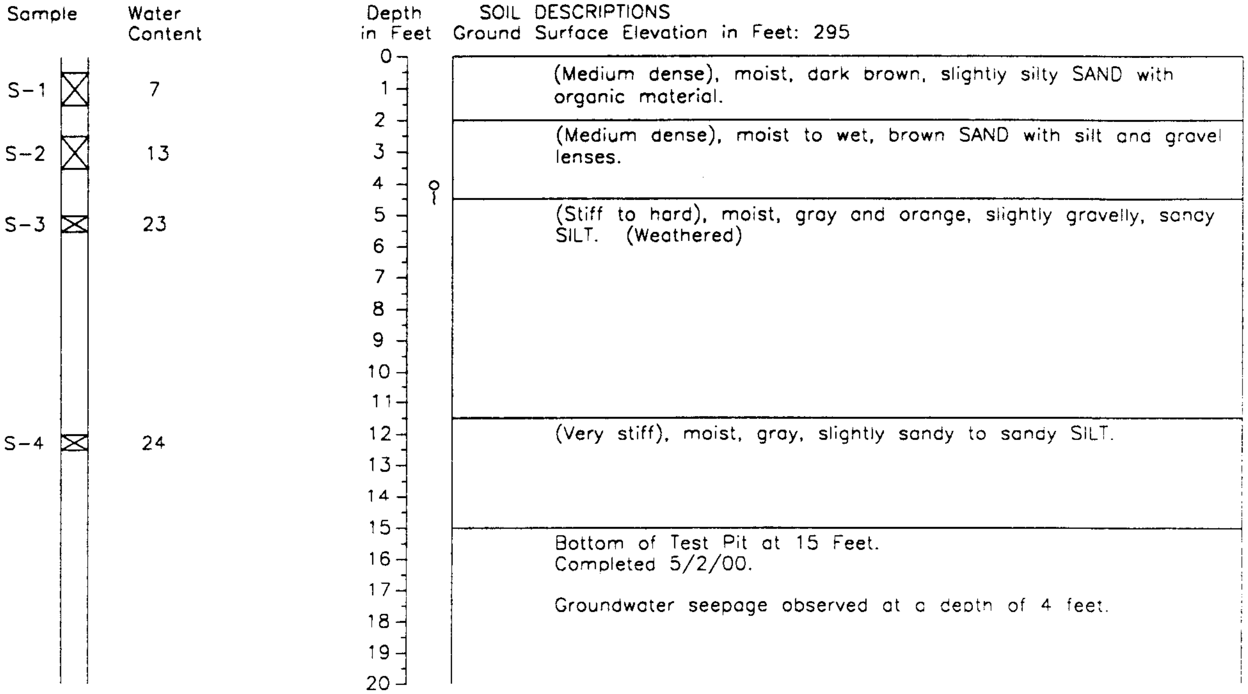
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

DTN 11/13/00 1=1 CHARLI-8.PC2
TESTPITS

HARTCROWSER
J-4978-26 5/00
Figure A-106

Test Pit Log HC00-TP302

N 20083
E 10860



Sample	Water Content
S-1	7
S-2	13
S-3	23
S-4	24

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 295

(Medium dense), moist, dark brown, slightly silty SAND with organic material.

(Medium dense), moist to wet, brown SAND with silt and gravel lenses.

(Stiff to hard), moist, gray and orange, slightly gravelly, sandy SILT. (Weathered)

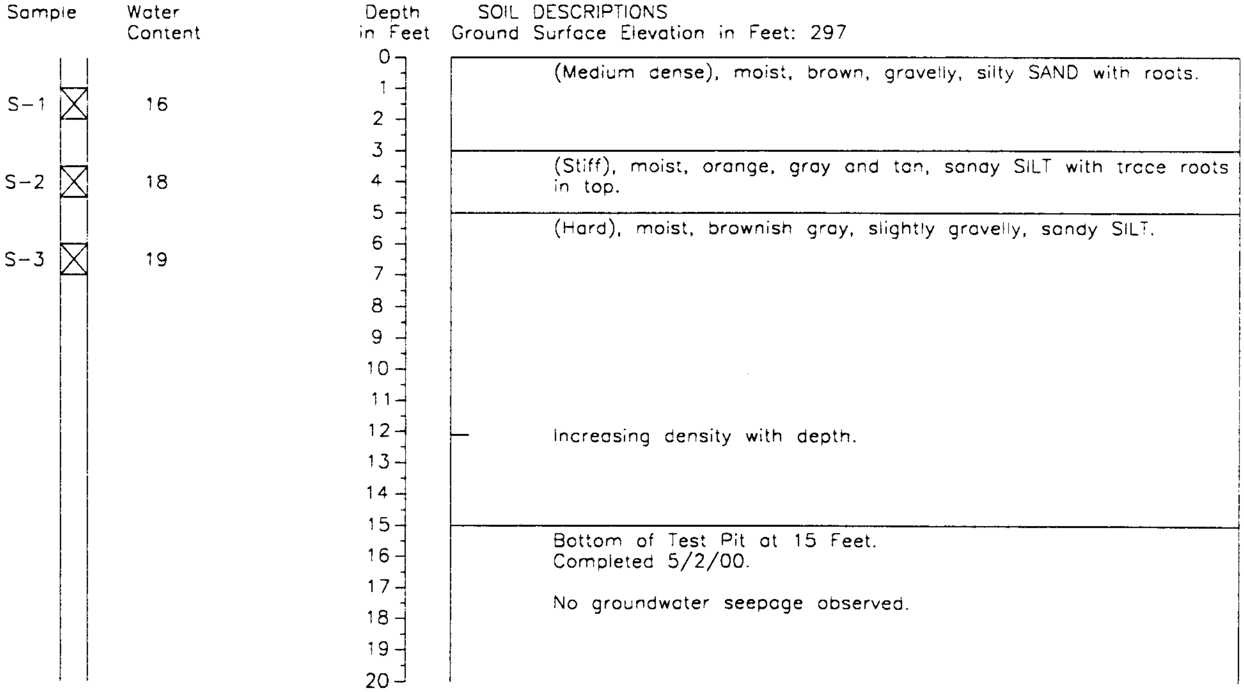
(Very stiff), moist, gray, slightly sandy to sandy SILT.

Bottom of Test Pit at 15 Feet.
Completed 5/2/00.

Groundwater seepage observed at a depth of 4 feet.

Test Pit Log HC00-TP303

N 19940
E 10887



Sample	Water Content
S-1	16
S-2	18
S-3	19

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 297

(Medium dense), moist, brown, gravelly, silty SAND with roots.

(Stiff), moist, orange, gray and tan, sandy SILT with trace roots in top.

(Hard), moist, brownish gray, slightly gravelly, sandy SILT.

Increasing density with depth.

Bottom of Test Pit at 15 Feet.
Completed 5/2/00.

No groundwater seepage observed.

DIN 11/13/00 1=1 CHARLI-8.PC2
TESTPITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-26 5/00
Figure A-107

Test Pit Log HC00-TP304

N 19855
E 10748

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 284

Sample	Water Content
S-1	10
S-2	17
S-3	13
S-4	13

Depth in Feet	SOIL DESCRIPTIONS
0	(Medium dense), moist, brown, slightly gravelly SAND with roots.
3.5	(Stiff to hard), moist, gray, tan, and orange, slightly gravelly, sandy SILT.
7	Increasing sand and decreasing silt, gravel sizes up to 6 inches.
9.5	Wet, gray, slightly silty, gravelly SAND.
11	(Very dense), moist, gray, slightly gravelly, silty SAND.
15	Bottom of Test Pit at 15 Feet. Completed 5/2/00. Groundwater seepage observed at a depth of 10½ feet.

Test Pit Log HC00-TP305

N 19427
E 10922

SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 279

Sample	Water Content
S-1	7
S-2	13

Depth in Feet	SOIL DESCRIPTIONS
0	3 inches of roots over (medium dense), moist, brown, fine to medium SAND.
1.5	(Dense), moist, gray and orange, gravelly, silty SAND.
4.5	Grading to very dense, gray-brown.
11	Bottom of Test Pit at 11 Feet. Completed 5/2/00. Refusal at 11 feet. No groundwater seepage observed.

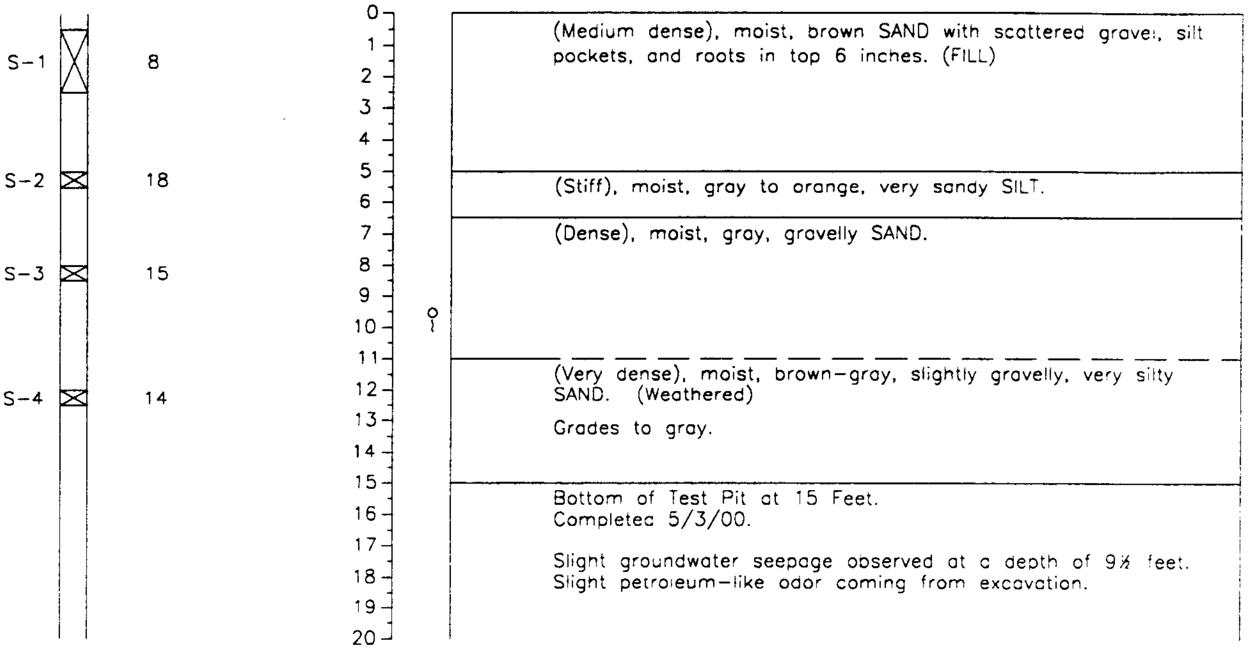
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

DTN 11/13/00 1=1 CHART-8.PC2
TESTPITS

Test Pit Log HC00-TP308

N 18537
E 10671

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 240



Sample	Water Content
S-1	8
S-2	18
S-3	15
S-4	14

(Medium dense), moist, brown SAND with scattered gravel, silt pockets, and roots in top 6 inches. (FILL)

(Stiff), moist, gray to orange, very sandy SILT.

(Dense), moist, gray, gravelly SAND.

(Very dense), moist, brown-gray, slightly gravelly, very silty SAND. (Weathered)

Grades to gray.

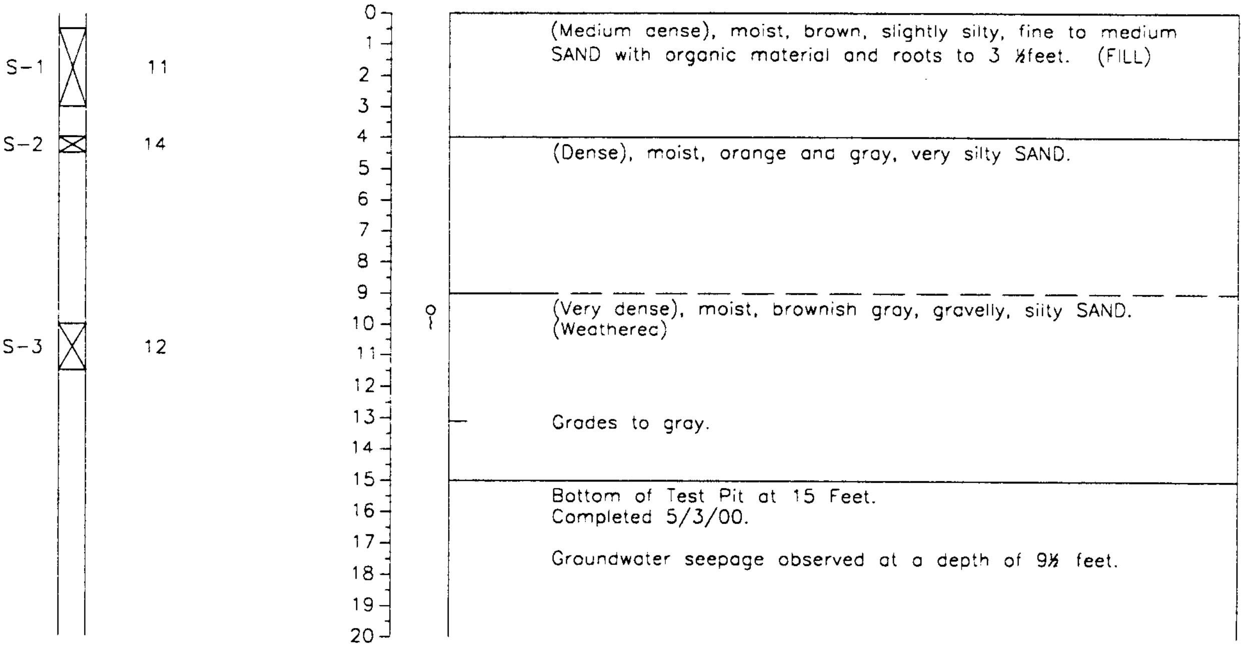
Bottom of Test Pit at 15 Feet.
Completed 5/3/00.

Slight groundwater seepage observed at a depth of 9½ feet.
Slight petroleum-like odor coming from excavation.

Test Pit Log HC00-TP309

N 18468
E 10704

Depth in Feet — SOIL DESCRIPTIONS
Ground Surface Elevation in Feet: 240



Sample	Water Content
S-1	11
S-2	14
S-3	12

(Medium dense), moist, brown, slightly silty, fine to medium SAND with organic material and roots to 3 ½feet. (FILL)

(Dense), moist, orange and gray, very silty SAND.

(Very dense), moist, brownish gray, gravelly, silty SAND. (Weathered)

Grades to gray.

Bottom of Test Pit at 15 Feet.
Completed 5/3/00.

Groundwater seepage observed at a depth of 9½ feet.

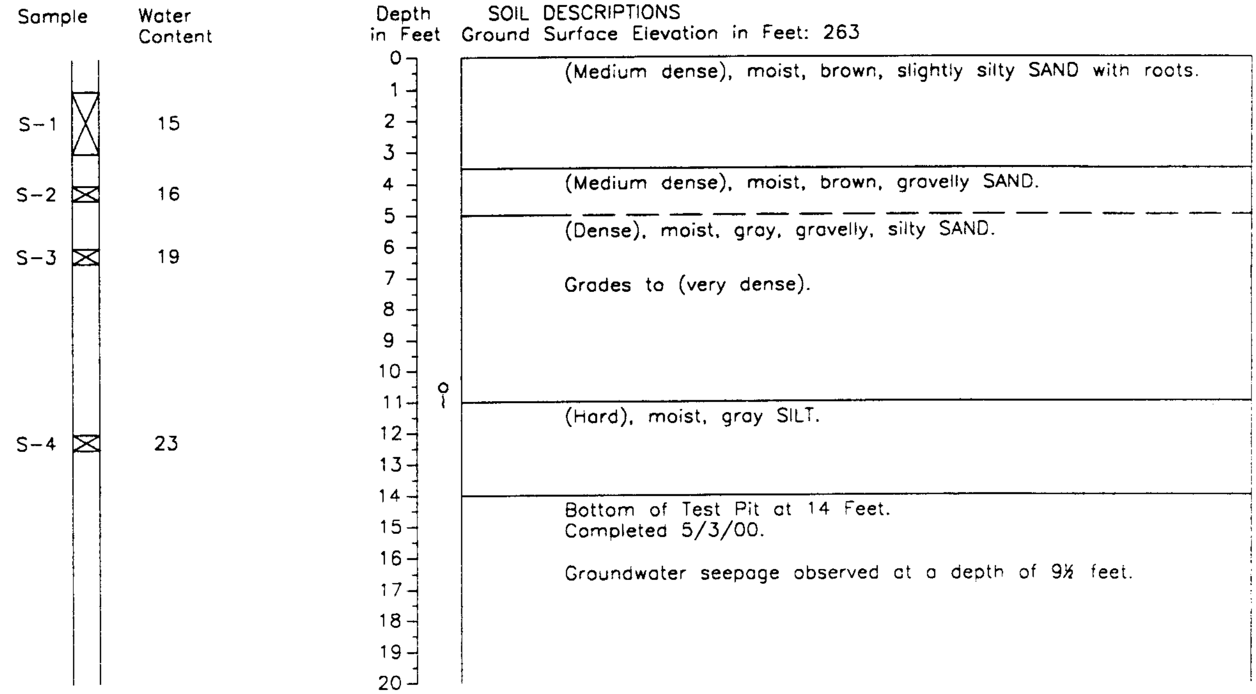
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

DTN 8/30/00 1=1 CHARLI-8.PC2
TESTPITS

HARTCROWSER
J-4978-26 5/00
Figure A-109

Test Pit Log HC00-TP310

N 17575
E 10809



Ground Surface Elevation in Feet: 263

Sample	Water Content
S-1	15
S-2	16
S-3	19
S-4	23

(Medium dense), moist, brown, slightly silty SAND with roots.

(Medium dense), moist, brown, gravelly SAND.

(Dense), moist, gray, gravelly, silty SAND.

Grades to (very dense).

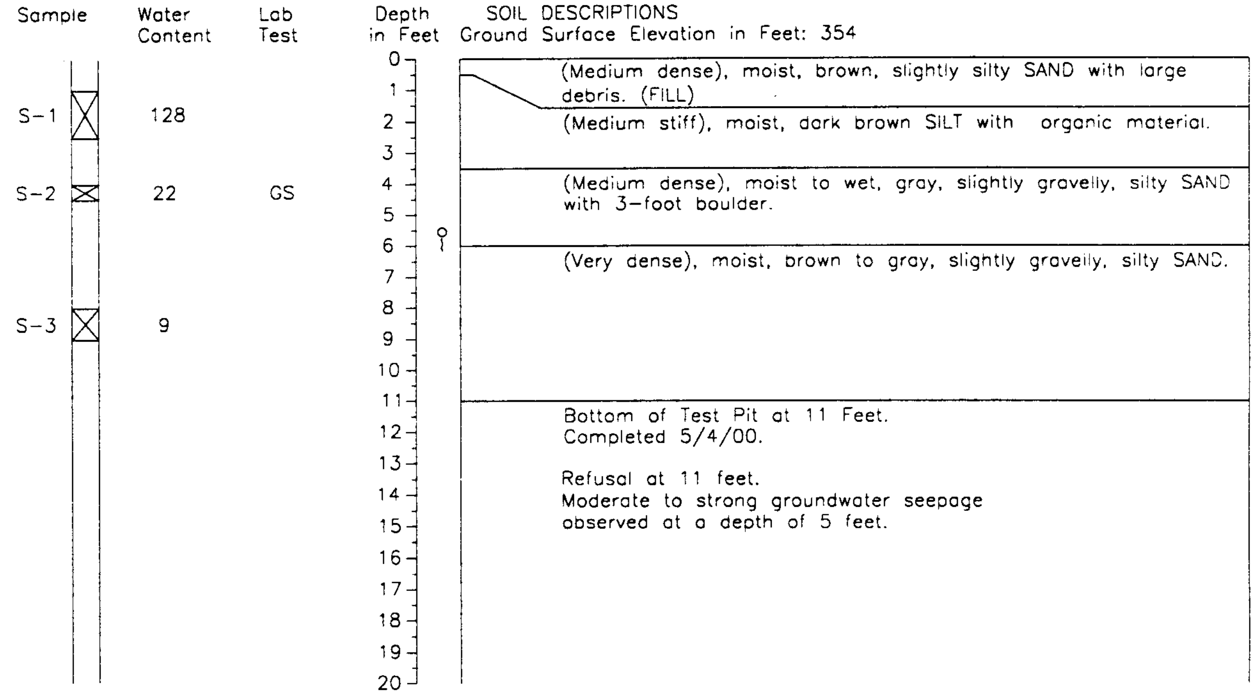
(Hard), moist, gray SILT.

Bottom of Test Pit at 14 Feet.
Completed 5/3/00.

Groundwater seepage observed at a depth of 9½ feet.

Test Pit Log HC00-TP311

N 16634
E 10938



Ground Surface Elevation in Feet: 354

Sample	Water Content	Lab Test
S-1	128	
S-2	22	GS
S-3	9	

(Medium dense), moist, brown, slightly silty SAND with large debris. (FILL)

(Medium stiff), moist, dark brown SILT with organic material.

(Medium dense), moist to wet, gray, slightly gravelly, silty SAND with 3-foot boulder.

(Very dense), moist, brown to gray, slightly gravelly, silty SAND.

Bottom of Test Pit at 11 Feet.
Completed 5/4/00.

Refusal at 11 feet.
Moderate to strong groundwater seepage observed at a depth of 5 feet.

CHARLI-8.PC2
DTN 8/30/00 1=1
TESTPITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-26 5/00
Figure A-110

Test Pit Log HC00-TP318

N 15364
E 10859

Sample	Water Content	Lab Test	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 360
			0	(Medium dense), damp to moist, light brown, gravelly, slightly silty to silty SAND with organic material and roots to 3 feet. (FILL)
			1	
S-1	10		2	
			3	Large roots.
			4	(Medium dense to dense), damp to moist, gray, slightly gravelly, slightly silty SAND.
S-2	10		5	
			6	(Stiff), moist, gray and red alternating bedding, very sandy SILT.
			7	
			8	
S-3	16	GS	9	
			10	
			11	
			12	
S-4	10		13	(Very dense), damp, gray, gravelly, silty SAND.
			14	Bottom of Test Pit at 14 Feet. Completed 5/5/00.
			15	
			16	No groundwater seepage observed.
			17	
			18	
			19	
			20	

Test Pit Log HC00-TP319

N 15206
E 10698

Sample	Water Content	Lab Test	Depth in Feet	SOIL DESCRIPTIONS Ground Surface Elevation in Feet: 351
			0	(Loose to medium dense), damp to moist, brown, gravelly, silty SAND with roots and organic material.
S-1	14		1	
S-2	15		2	(Medium dense), moist, light brown and tan alternating bedding, gravelly, silty SAND.
			3	
			4	Roots.
			5	(Medium dense to dense), damp, gray with red-brown bedding, slightly gravelly, very silty SAND.
S-3	13	GS	6	
			7	
			8	(Dense to very dense), damp, gray, gravelly, silty, fine to medium SAND.
S-4	10		9	
			10	Bottom of Test Pit at 9 Feet. Completed 5/5/00.
			11	
			12	No groundwater seepage observed.
			13	
			14	
			15	
			16	
			17	
			18	
			19	
			20	

DIN 8/30/00 1=1 CHARLI-8PC2
TESTPITS

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are the time of excavation. Conditions may vary with time.

HARTCROWSER
J-4978-26 5/00
Figure A-111

Cone Penetration Probe Log HC00-P22A

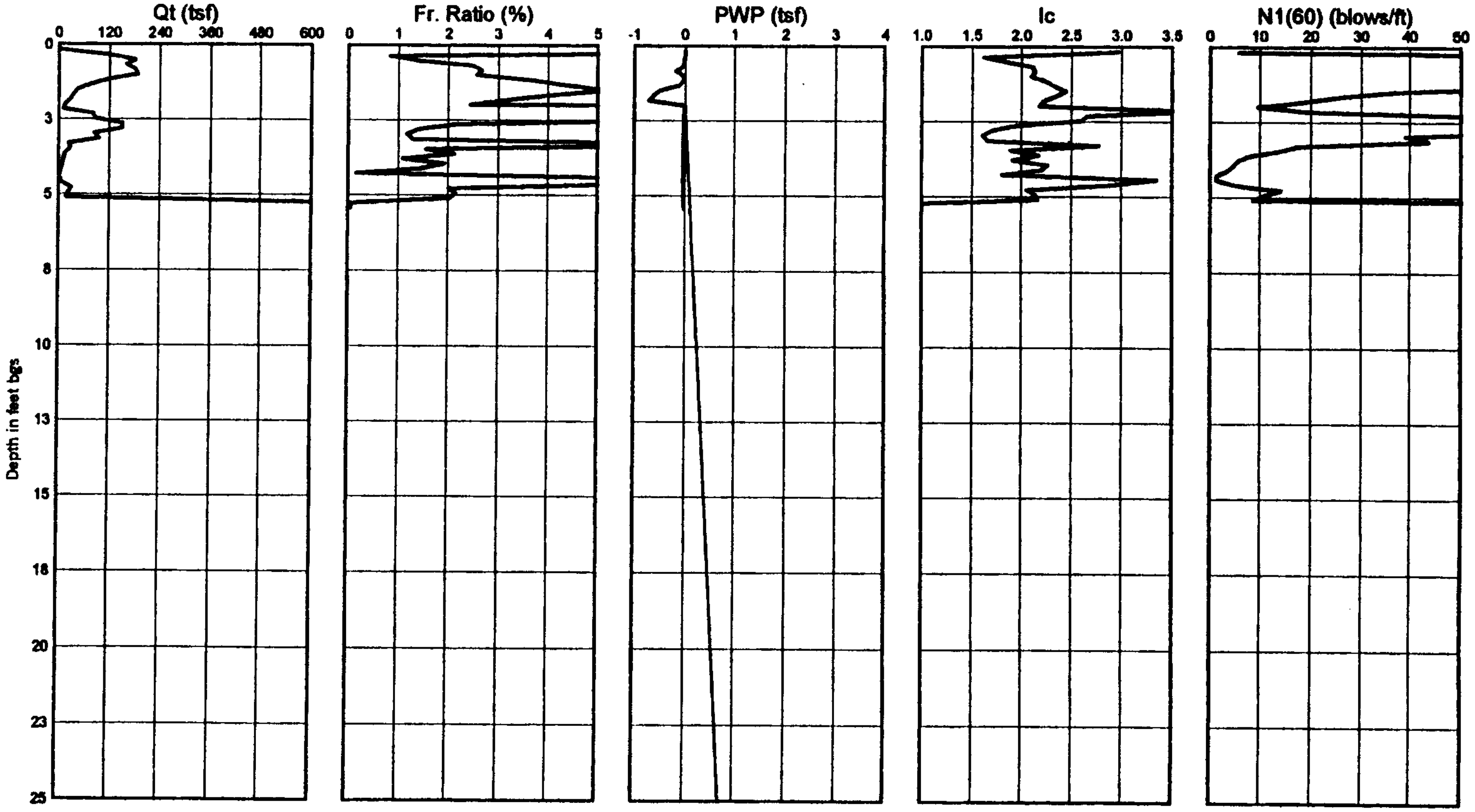
N 18507 E 10928

Test Date : May 18, 2000
Location : Third Runway Embankment

Refused at 5 feet depth.

Operator : Northwest Cone Exploration

Ground Surf. E 253 0.00
Water Table Depth : 2.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27 DATE: May 24, 2000 DRAWN BY: Keith Brown

Hart Crowser

CVD 6/16/00 4978270.cdr

HARTCROWSER

J-4978-27 8/01

Figure A-112

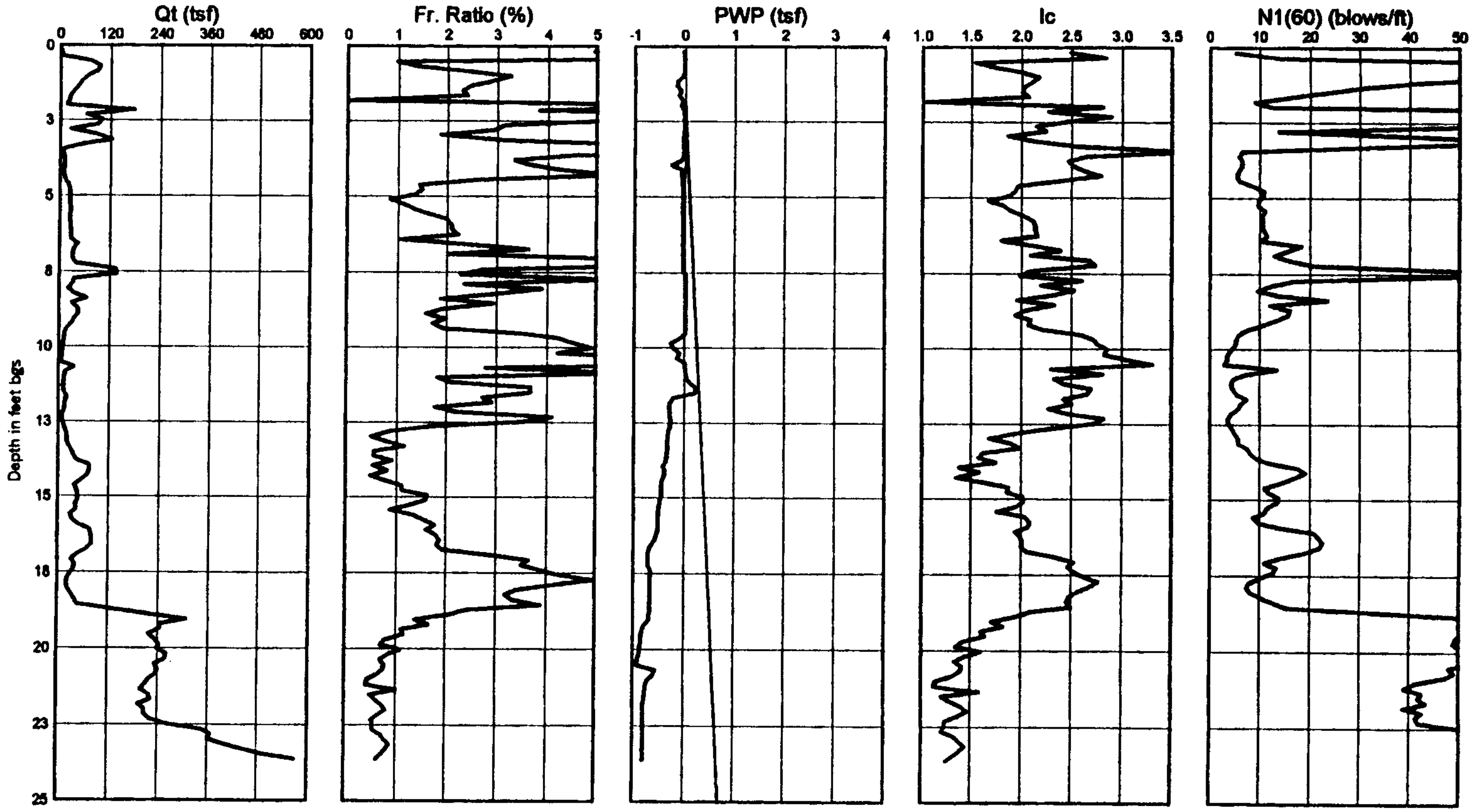
Cone Penetration Probe Log HC00-P22B

N 18504   E 10917

Test Date : May 18, 2000
Location : Third Runway Embankment   Repeat of 22A.

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 256
Water Table Depth : 2.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27   DATE: May 24, 2000   DRAWN BY: Keith Brown

Hart Crowser

DTN 8/30/00 497827P.cdr

HARTCROWSER
J-4978-26   8/01
Figure A-113

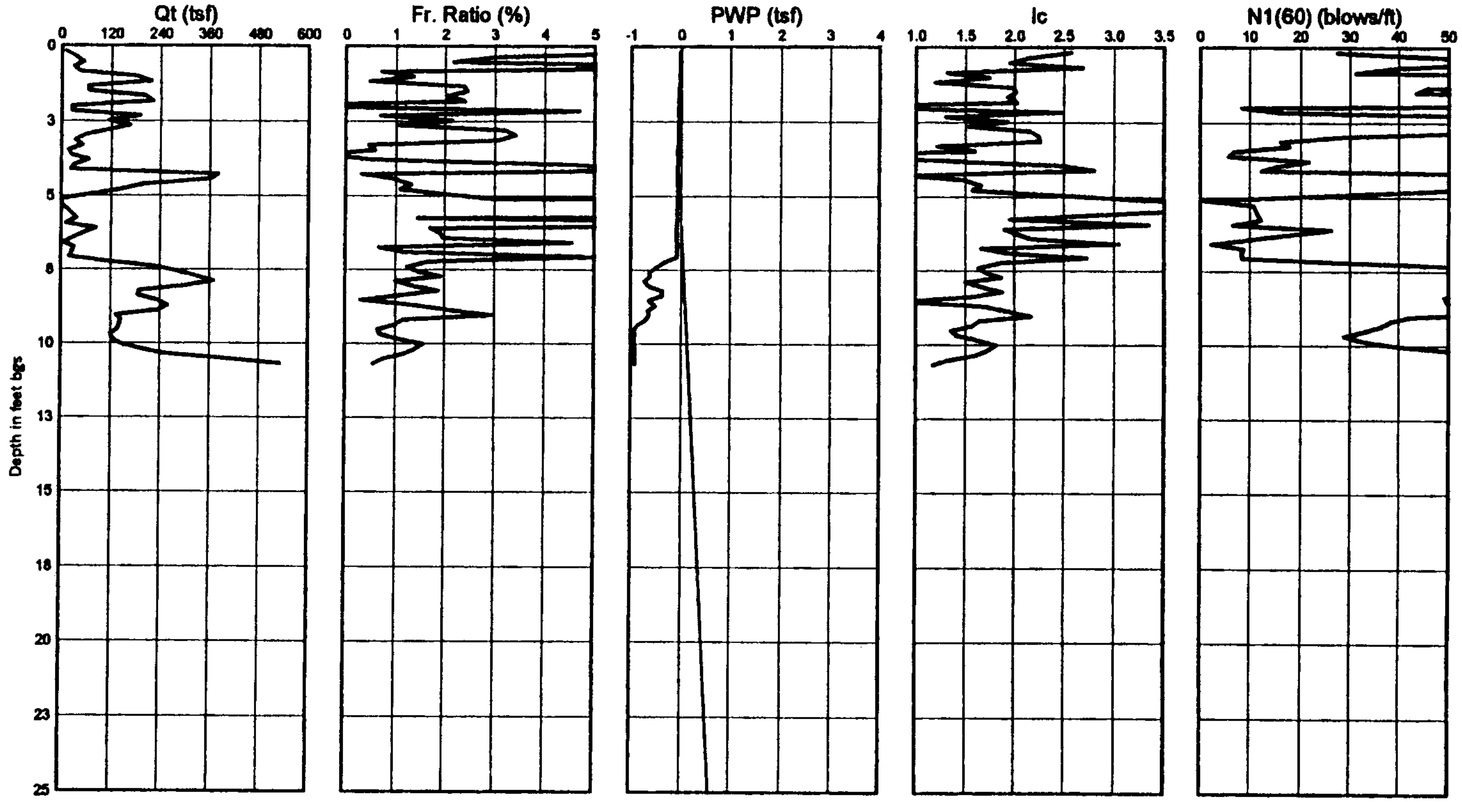
Cone Penetration Probe Log HC00-P23

N 18590 E 11000

Test Date : May 18, 2000
Location : Third Runway Embankment

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 261' Apprx.
Water Table Depth : 6.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27 DATE: May 24, 2000 DRAWN BY: Keith Brown

Hart Crowser

CVD 6/16/00 497827C.cdr

HARTCROWSER
J-4978-27 8/01
Figure A-114

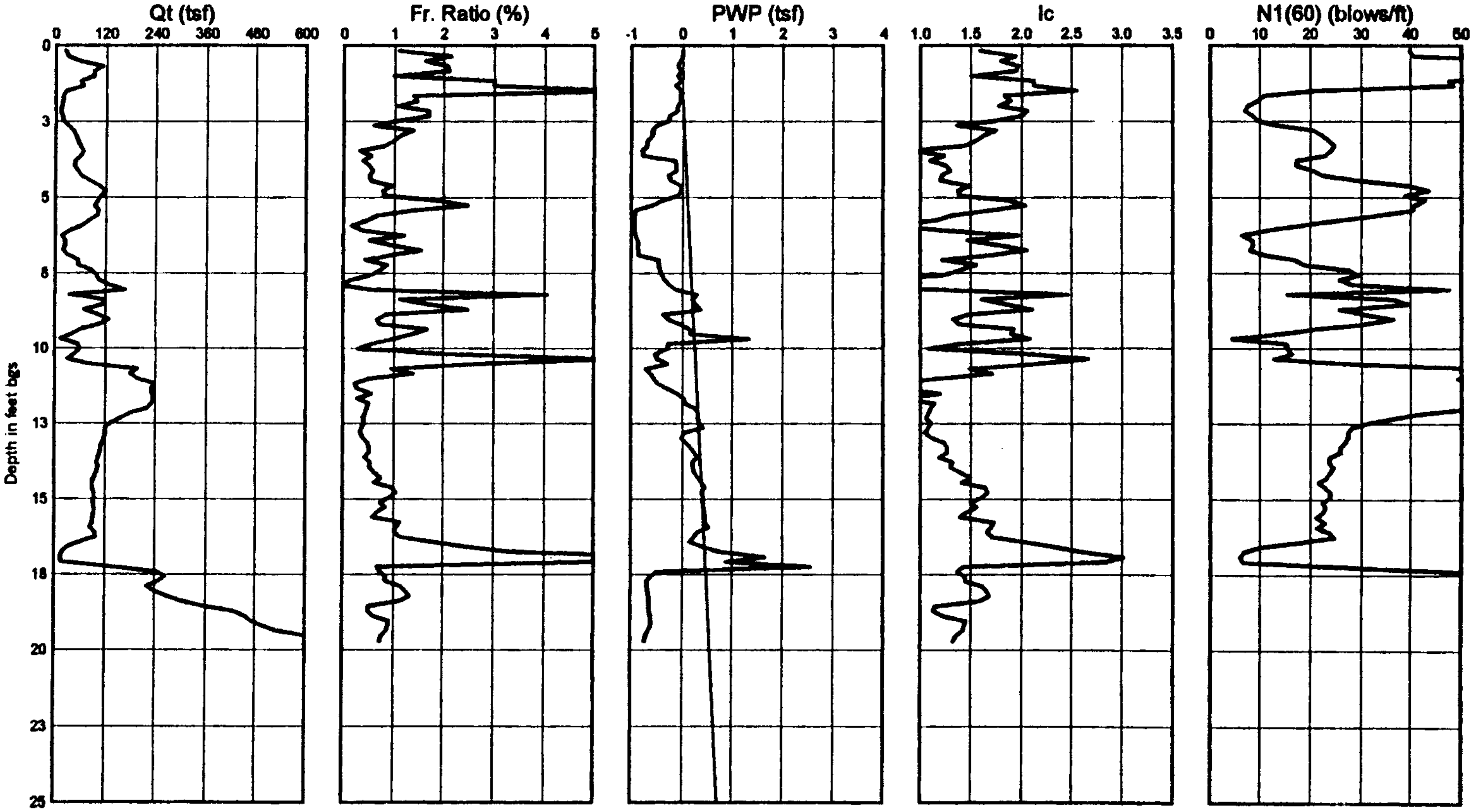
Cone Penetration Probe Log HC00-P24

N 18199 E 11050

Test Date : May 18, 2000
Location : Third Runway Embankment

Operator : Northwest Cone Exploration

Ground Surf. Elev. 246' Apprx.
Water Table Depth : 2.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27 DATE: May 24, 2000 DRAWN BY: Keith Brown

Hart Crowser

DTN 8/30/00 497826D.cdr

HARTCROWSER

J-4978-27 8/01
Figure A-115

Cone Penetration Probe Log HC00-P25

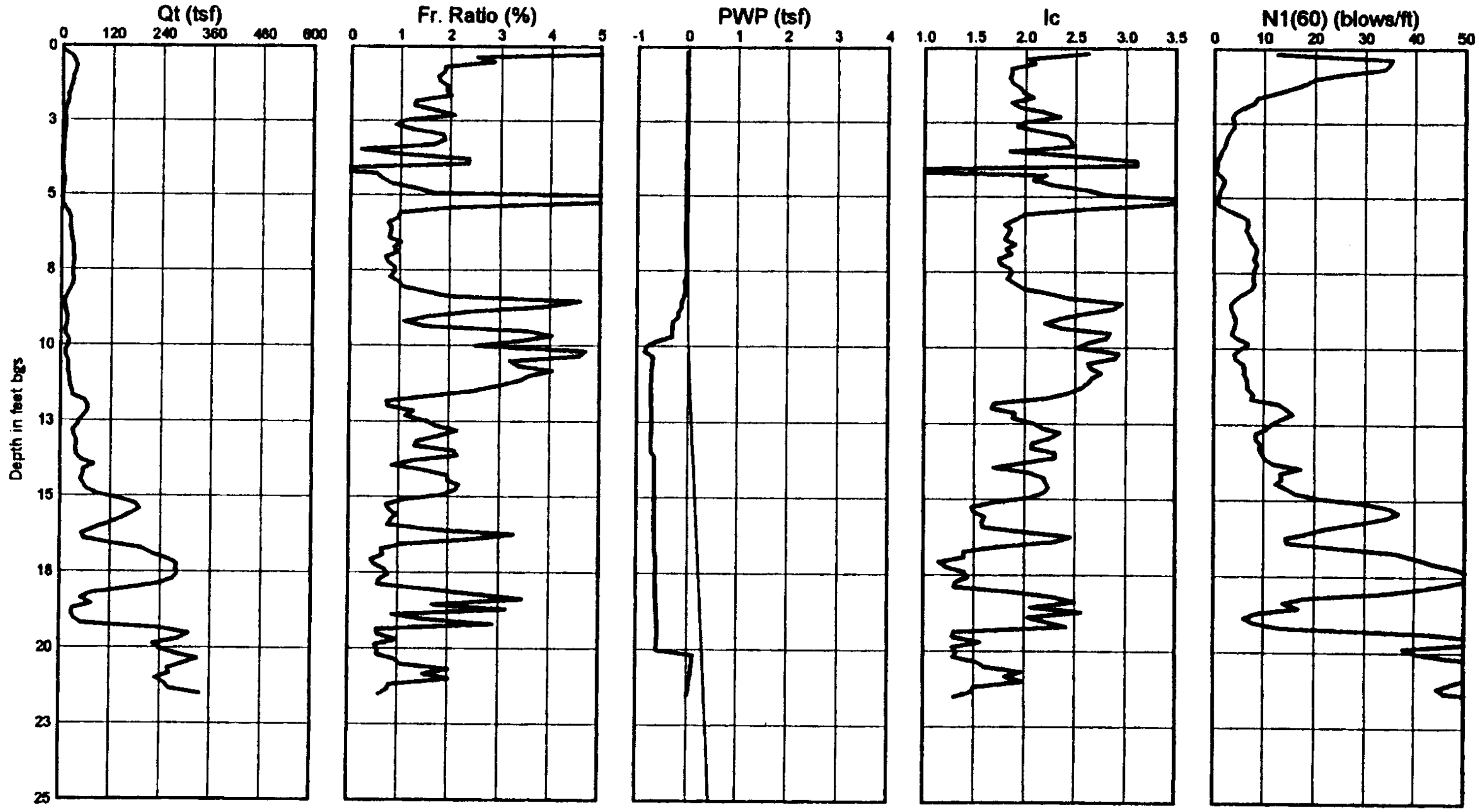
N 17595 E 10989

Test Date : May 19, 2000
Location : Third Runway Embankment

Test near edge of existing fill embankment.

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 283
Water Table Depth : 10.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27 DATE: May 24, 2000 DRAWN BY: Keith Brown

Hart Crowser

CVD 6/16/00 497827Q.cdr

HARTCROWSER

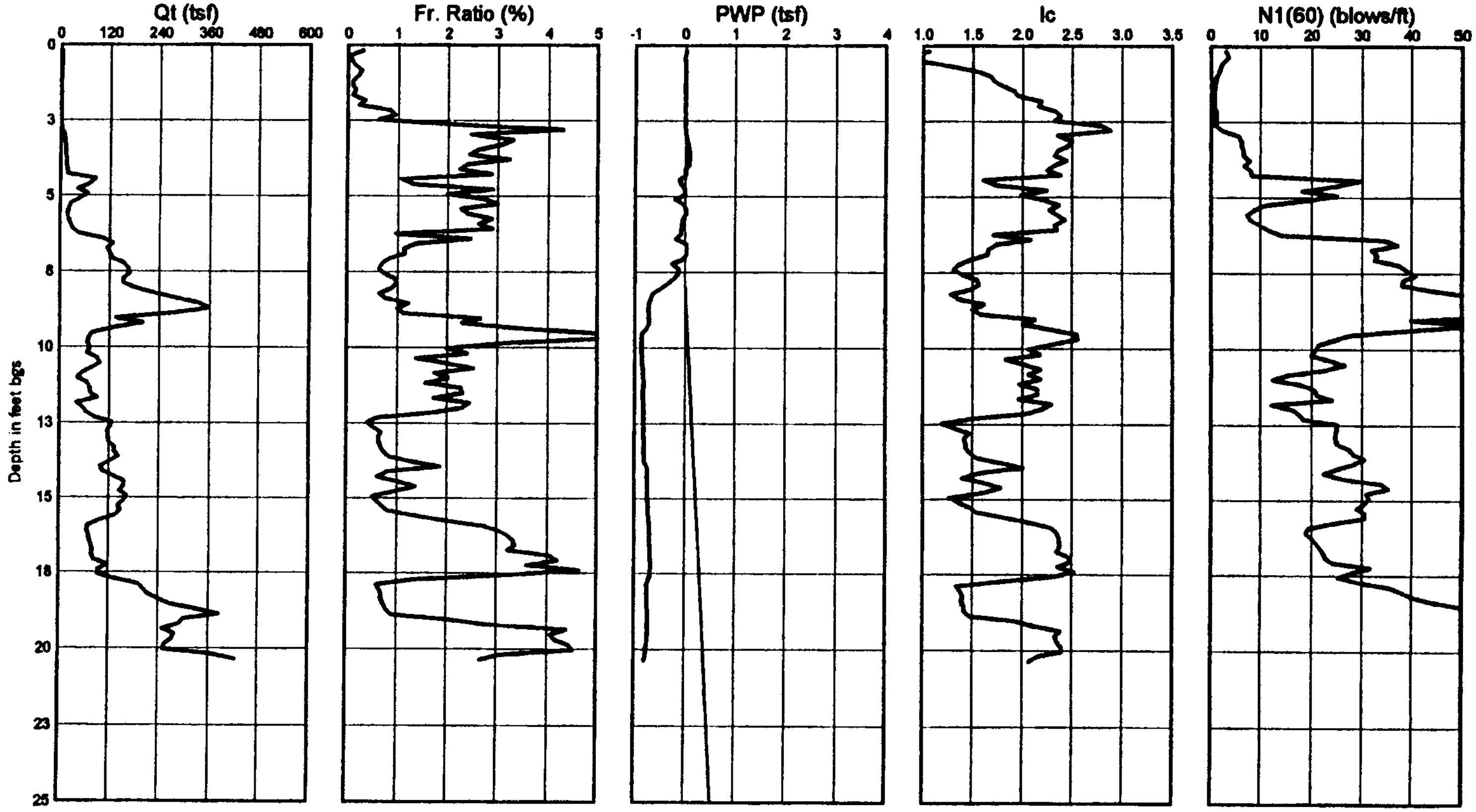
J-4978-27 8/01
Figure A-116

Cone Penetration Probe Log HC00-P26

Test Date : May 19, 2000
Location : Third Runway Embankment

Operator : Northwest Cone Exploration
Test in driveway of residence. Hand auger to 36 inch depth.

Ground Surf. Elev. : 0.00
Water Table Depth : 8.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 115.2 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. J-4978-27 DATE: May 24, 2000 DRAWN BY: Keith Brown

Hart Crowser

DTN 8/30/00 497827R.cdr

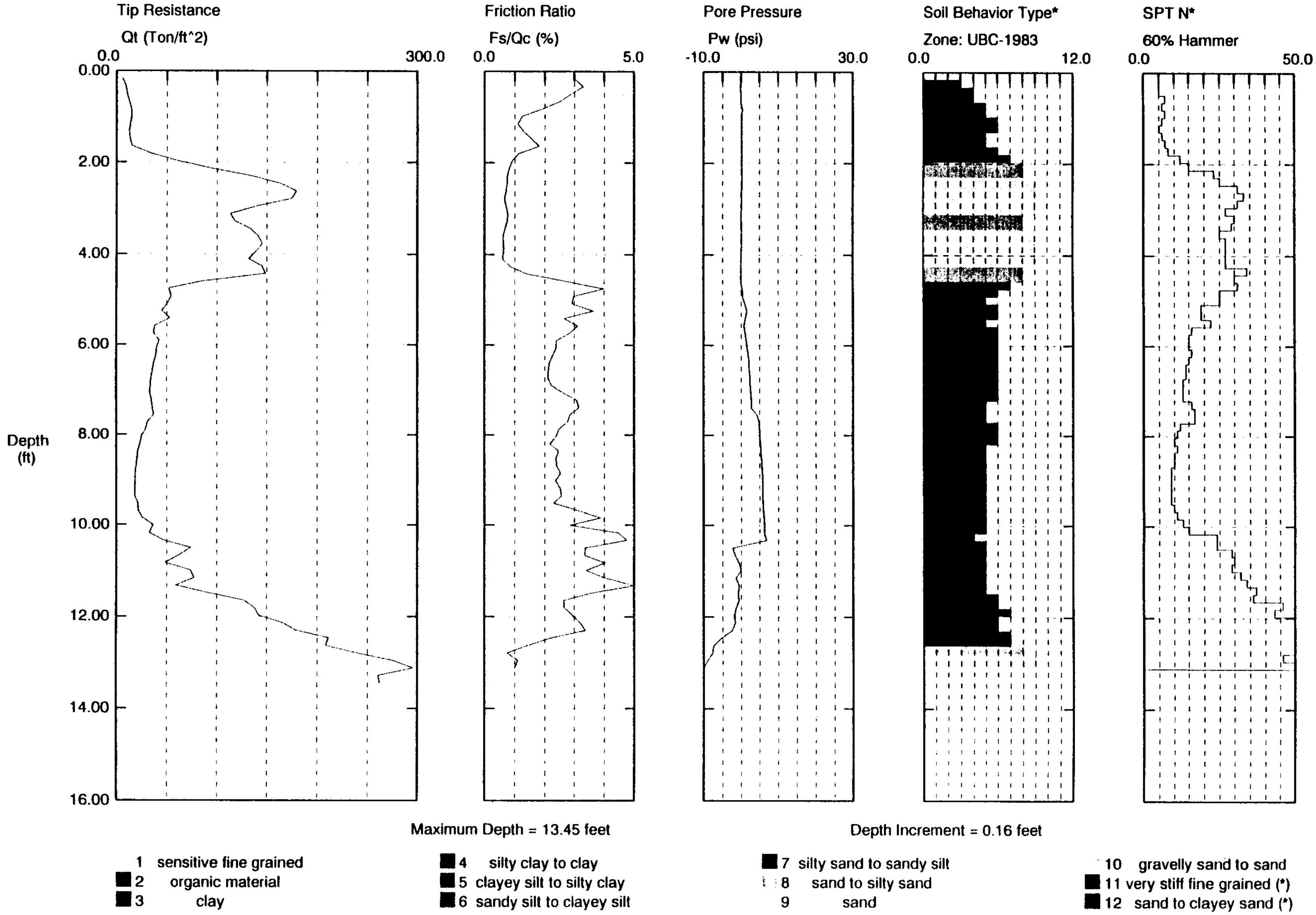
HARTCROWSER
J-4978-27 8/01
Figure A-117

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P100
Cone Used: 708

CPT Date/Time: 12-01-00 15:49
Location: N 20247, E 10769
Job Number: 4978-28



Maximum Depth = 13.45 feet

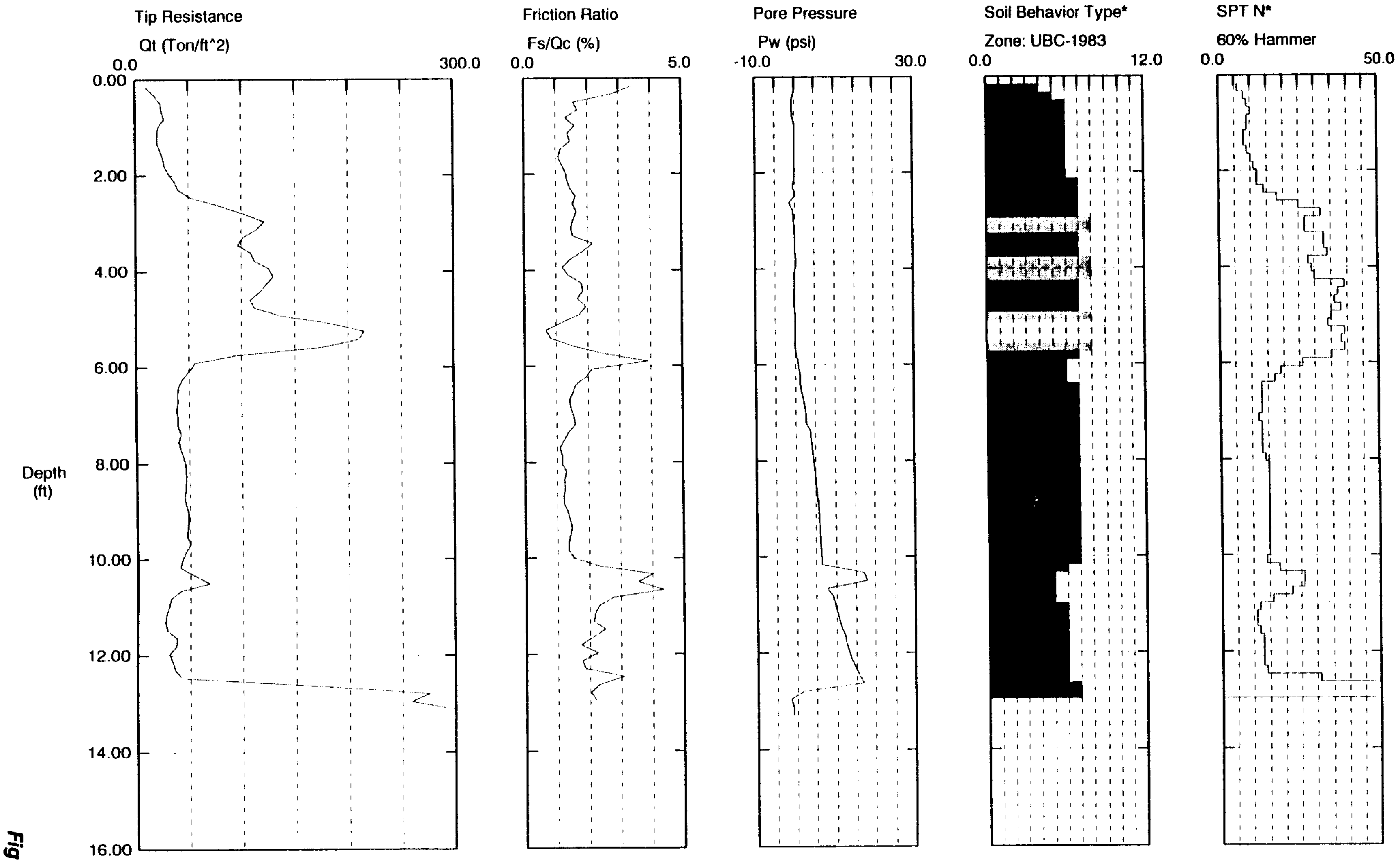
Depth Increment = 0.16 feet

Figure A-118

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P104
Cone Used: 708

CPT Date/Time: 12-01-00 16:20
Location: N 20178, E 10843
Job Number: 4978-28



Maximum Depth = 13.29 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
▨ 8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

Figure A-119

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P105
Cone Used: 708

CPT Date/Time: 12-01-00 16:43
Location: N 20225, E 10977
Job Number: 4978-28

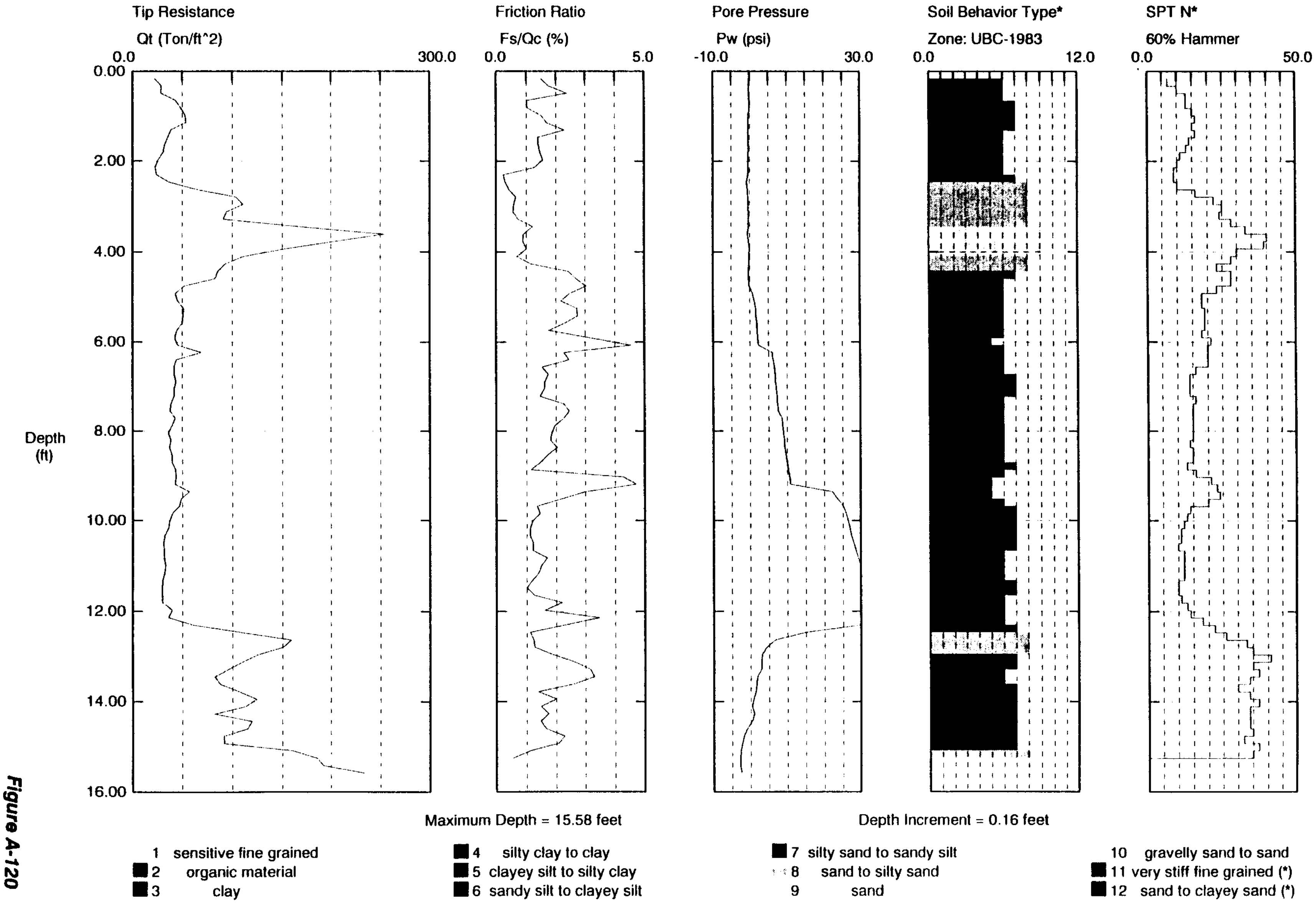


Figure A-120

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P106
Cone Used: 708

CPT Date/Time: 12-01-00 14:50
Location: N 20017, E 10753
Job Number: 4978-28

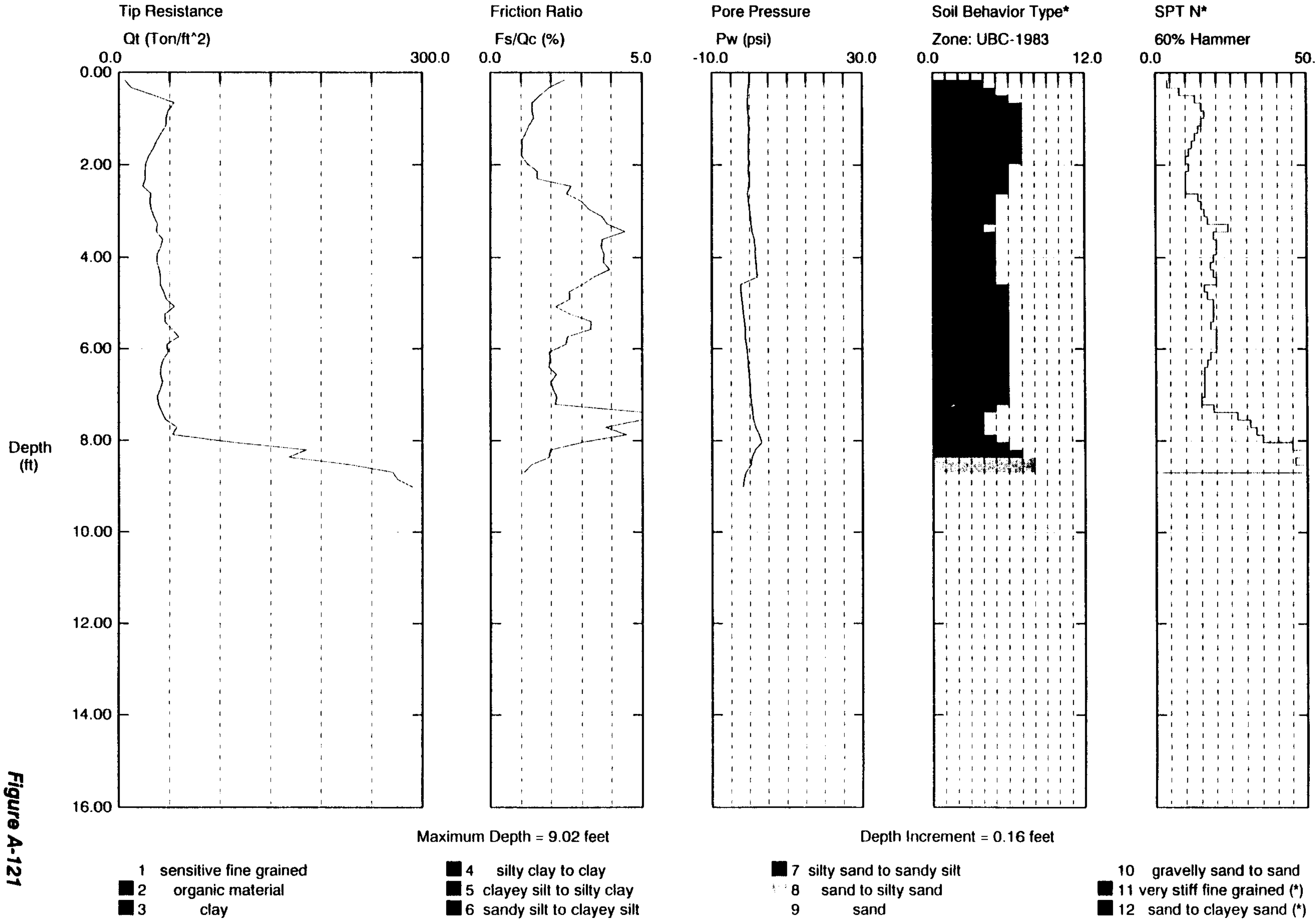


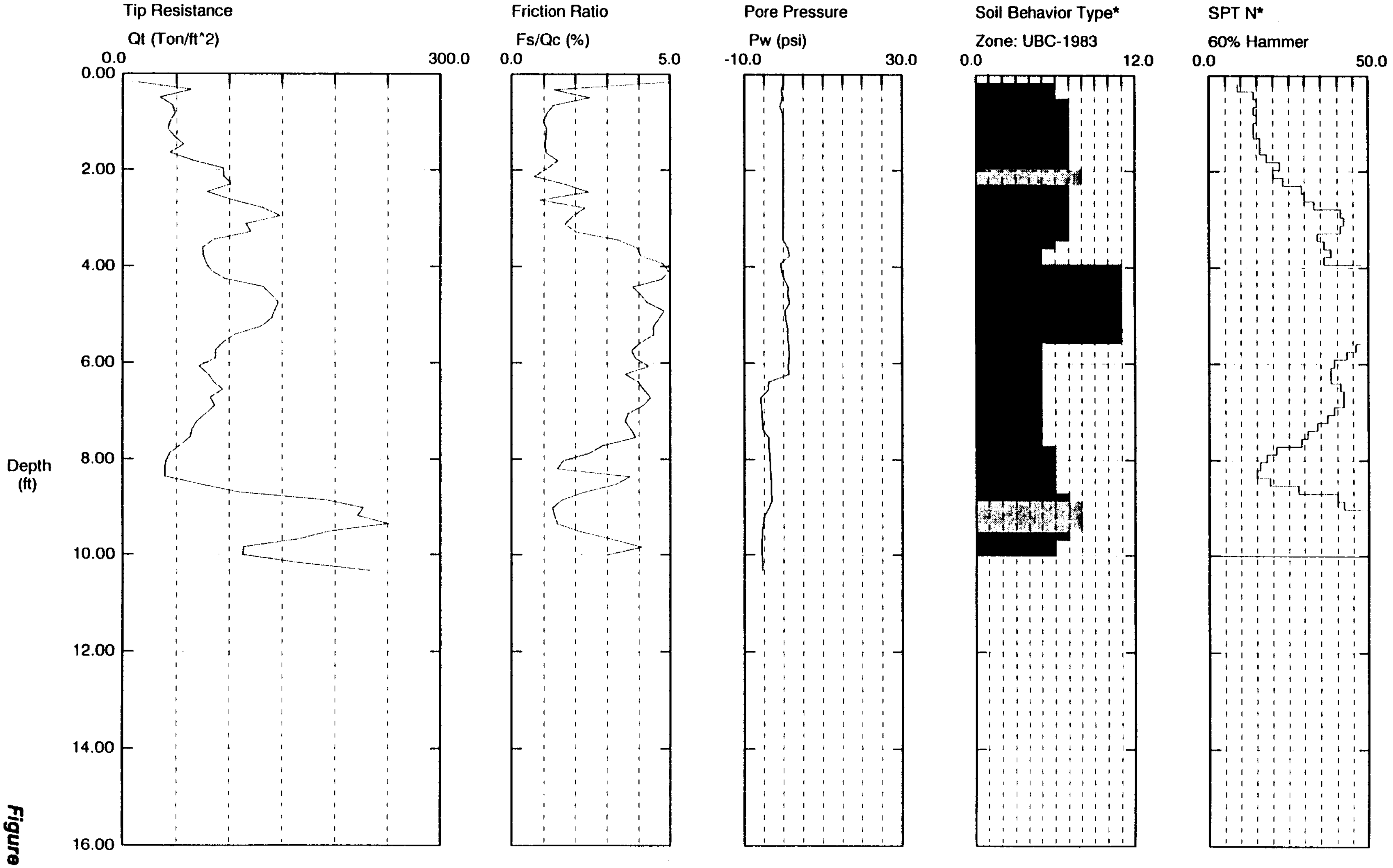
Figure A-121

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P107
Cone Used: 708

CPT Date/Time: 12-01-00 14:30
Location: N 19984, E 10885
Job Number: 4978-28



Maximum Depth = 10.33 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

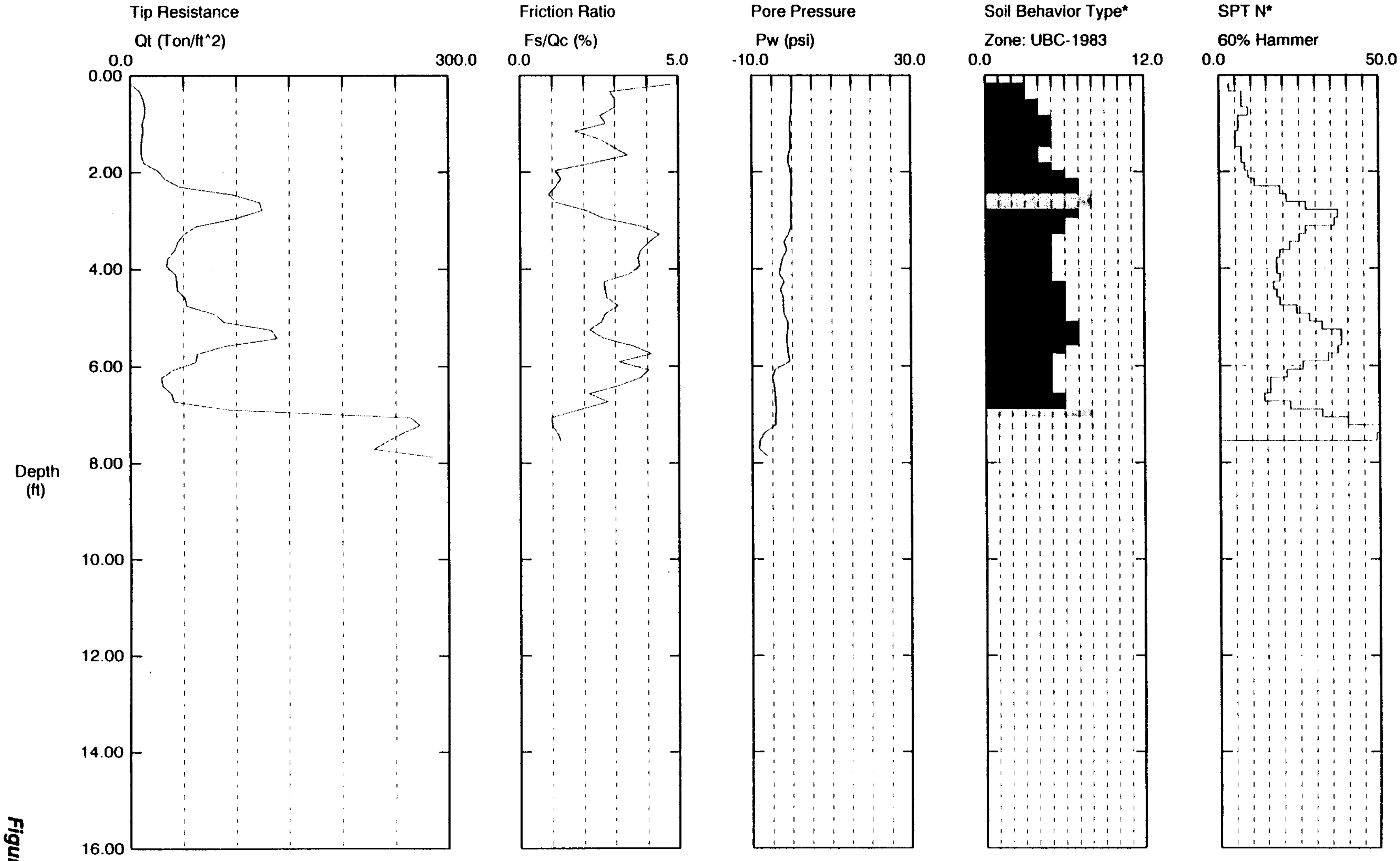
Figure A-122

*S havior d SP d on c m UB

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P108
Cone Used: 708

CPT Date/Time: 12-04-00 17:33
Location: N 19780, E 10674
Job Number: 4978-28



Maximum Depth = 7.87 feet

Depth Increment = 0.16 feet

	1	sensitive fine grained	■	4	silty clay to clay	■	7	silty sand to sandy silt		10	gravelly sand to sand
■	2	organic material	■	5	clayey silt to silty clay	▨	8	sand to silty sand	■	11	very stiff fine grained (*)
■	3	clay	■	6	sandy silt to clayey silt		9	sand	■	12	sand to clayey sand (*)

Figure A-123

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P111
Cone Used: 708

CPT Date/Time: 12-04-00 12:02
Location: N 19455, E 10686
Job Number: 4978-28

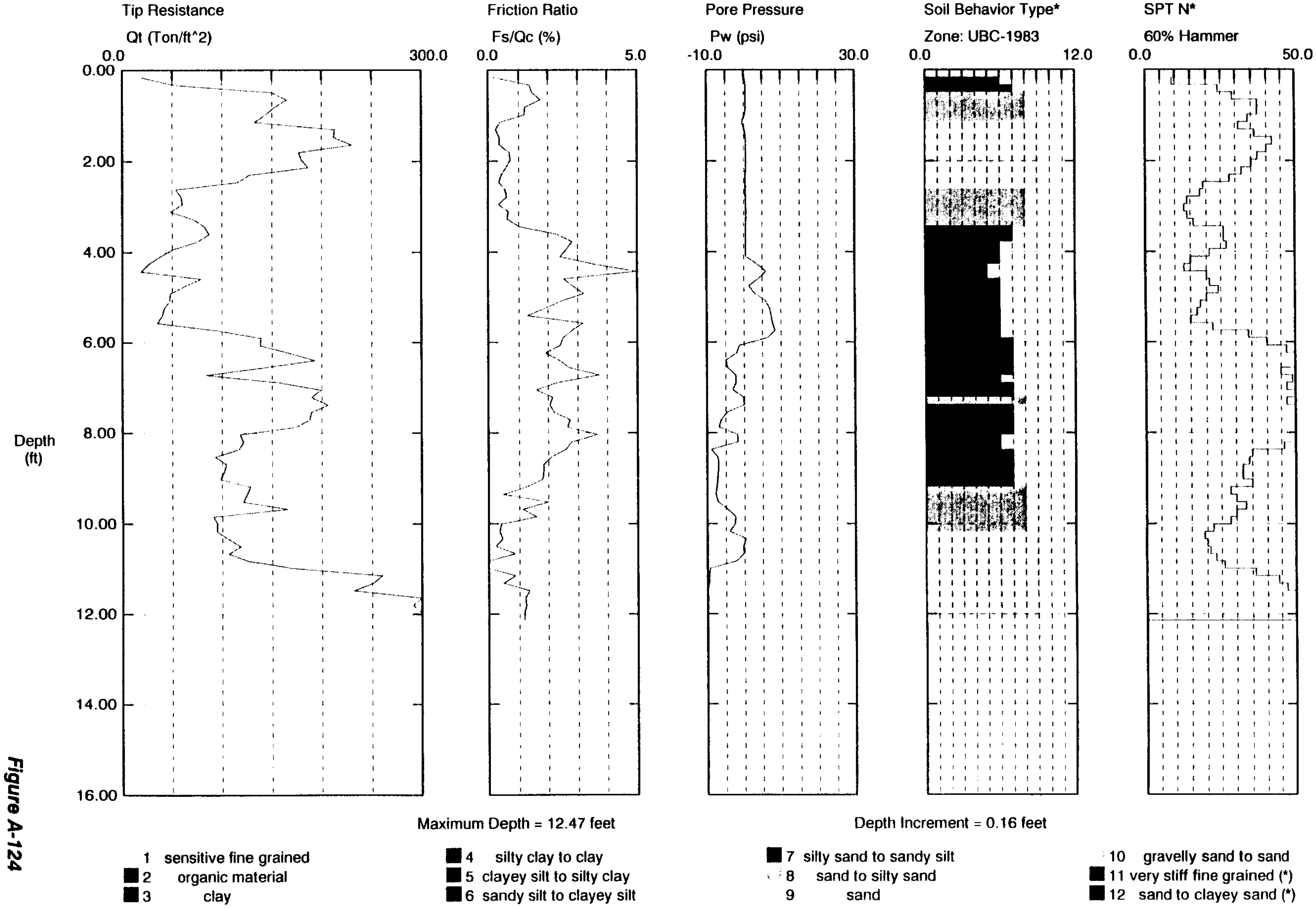


Figure A-124

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P112
Cone Used: 708

CPT Date/Time: 12-01-00 17:29
Location: N 19435, E 10877
Job Number: 4978-28

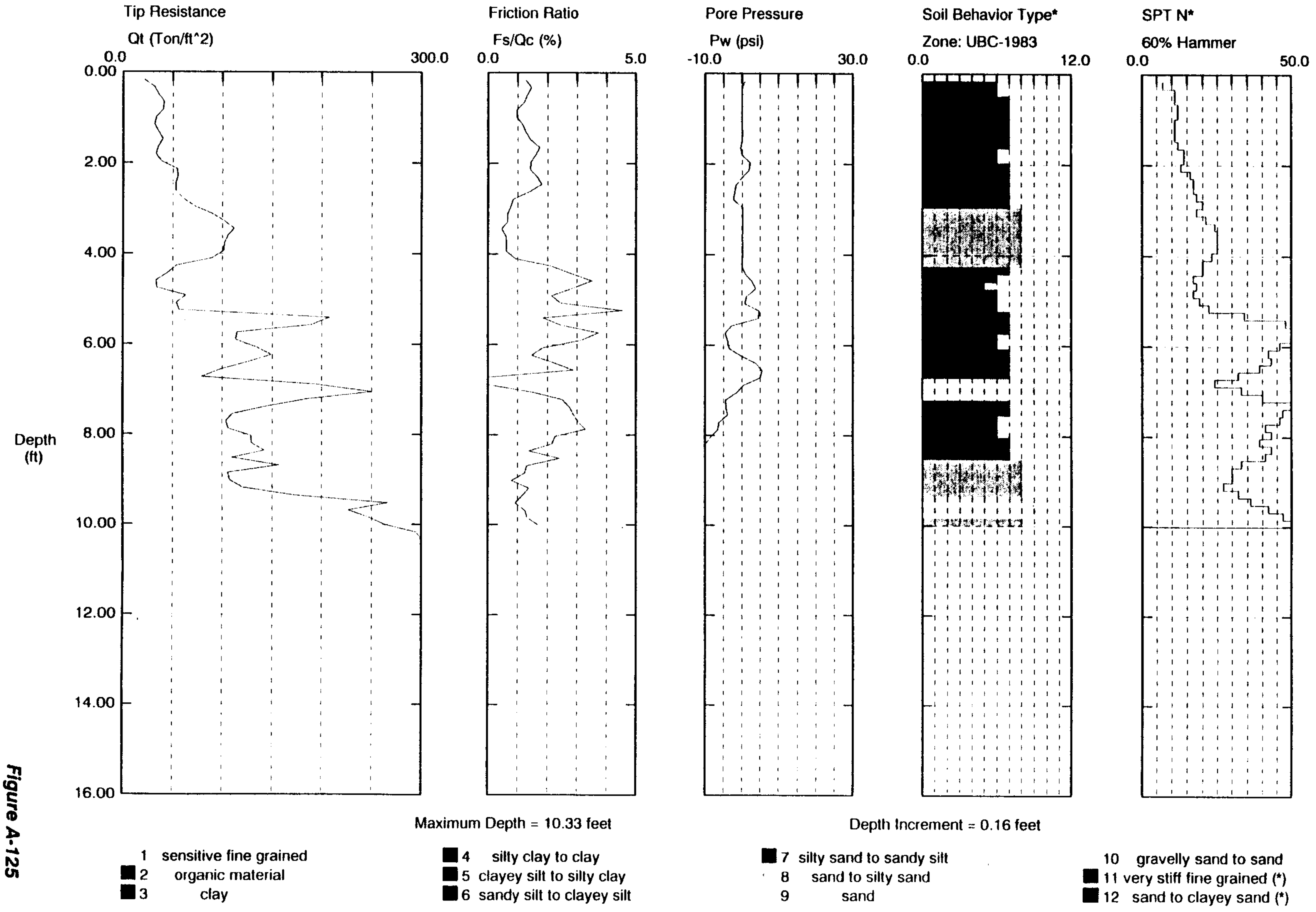


Figure A-125

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB	CPT Date/Time: 12-04-00 12:57
Sounding: HC00-P114	Location: N 19113, E 10768
Cone Used: 708	Job Number: 4978-28

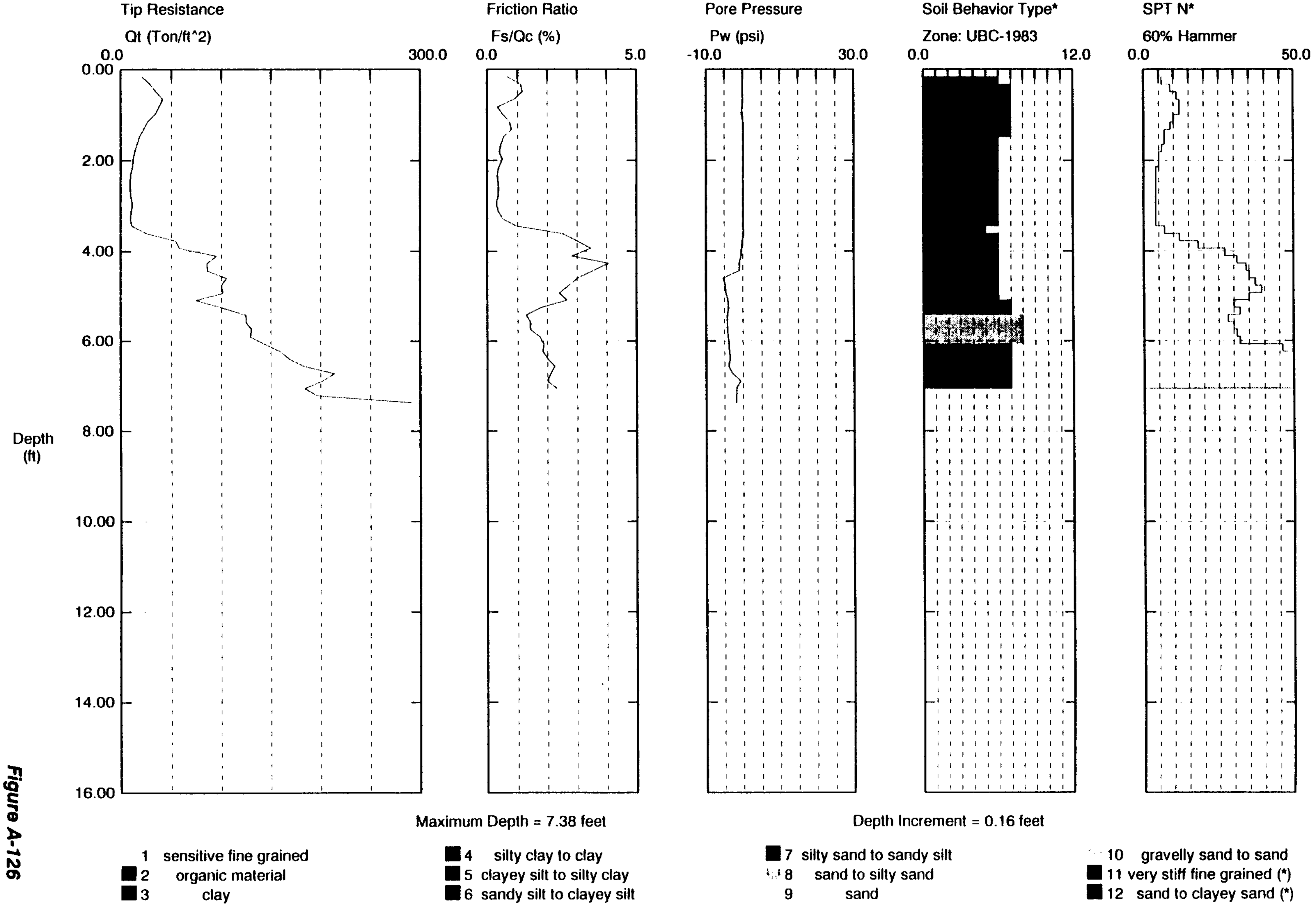


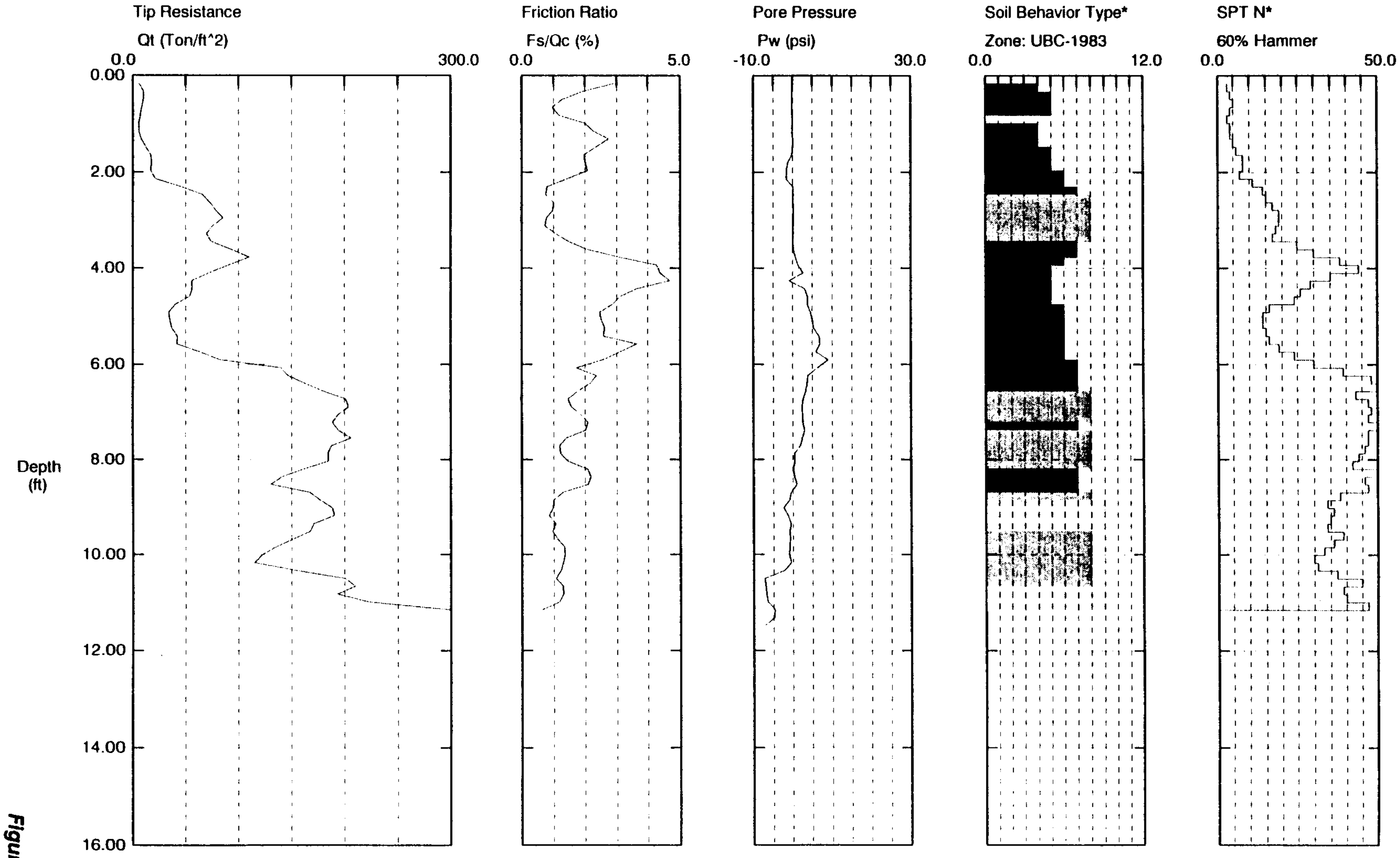
Figure A-126

havio nd SF ıd on ›m UE 3

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P115
Cone Used: 708

CPT Date/Time: 12-04-00 13:25
Location: N 18980, E 10691
Job Number: 4978-28



Maximum Depth = 11.48 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

Figure A-127

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P118
Cone Used: 708

CPT Date/Time: 12-04-00 13:54
Location: N 16930, E 10877
Job Number: 4978-28

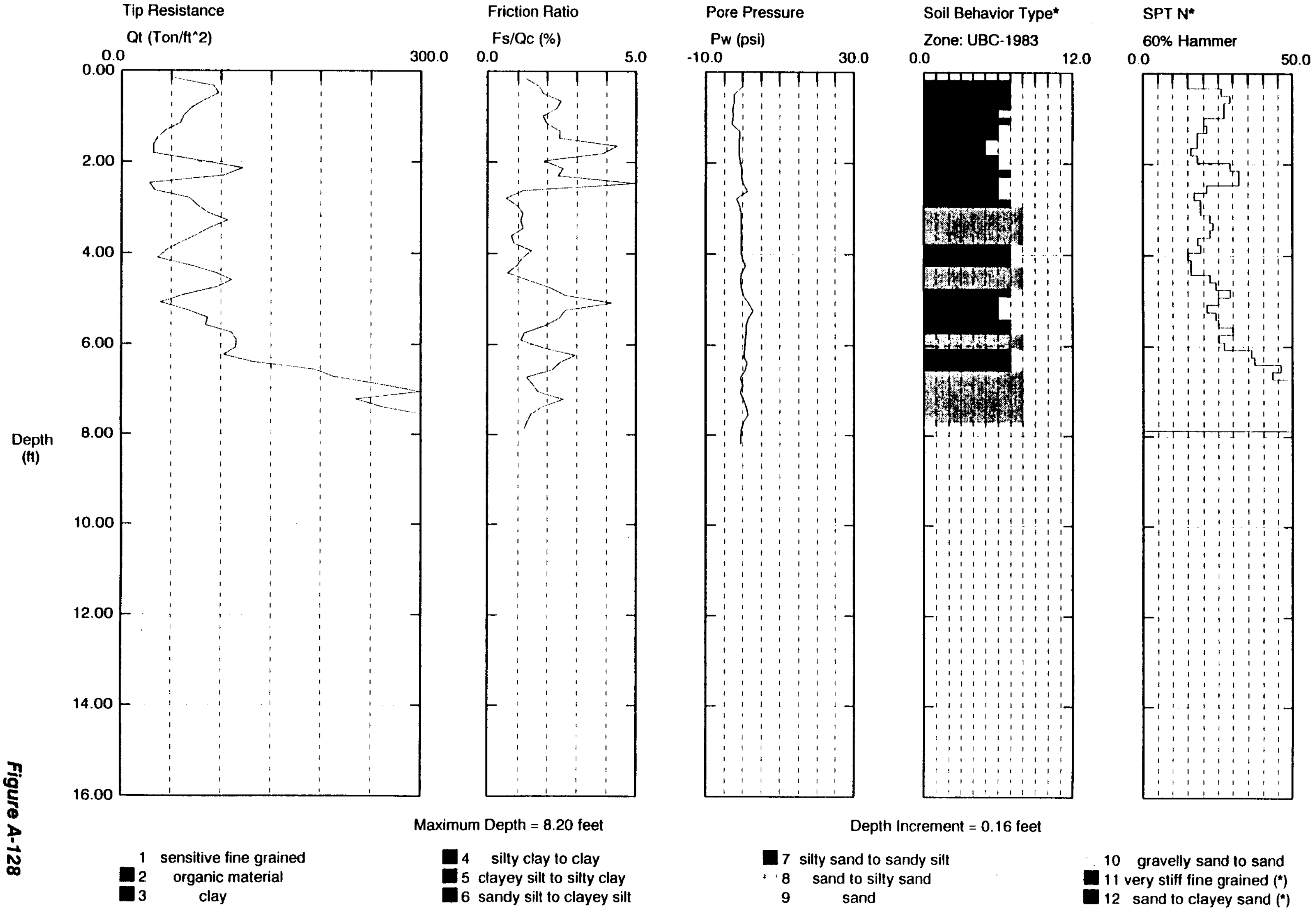


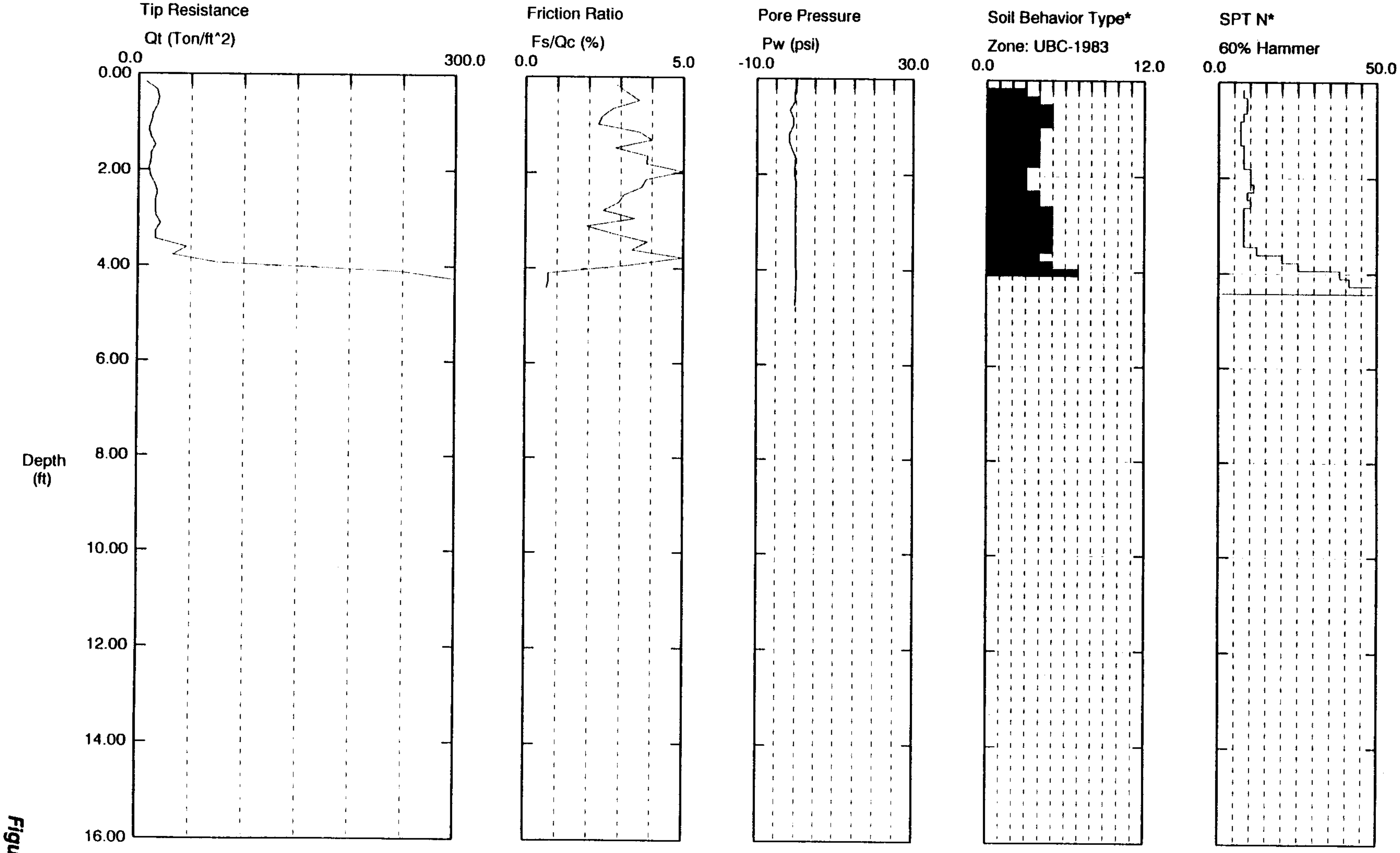
Figure A-128

*(iavior id SP d on c m UB

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P119
Cone Used: 708

CPT Date/Time: 12-04-00 17:11
Location: N 16432, E 10935
Job Number: 4978-28



Maximum Depth = 4.76 feet

Depth Increment = 0.16 feet

	1	sensitive fine grained
■	2	organic material
■	3	clay
■	4	silty clay to clay
■	5	clayey silt to silty clay
■	6	sandy silt to clayey silt
■	7	silty sand to sandy silt
▨	8	sand to silty sand
	9	sand
▨	10	gravelly sand to sand
■	11	very stiff fine grained (*)
■	12	sand to clayey sand (*)

Figure A-129

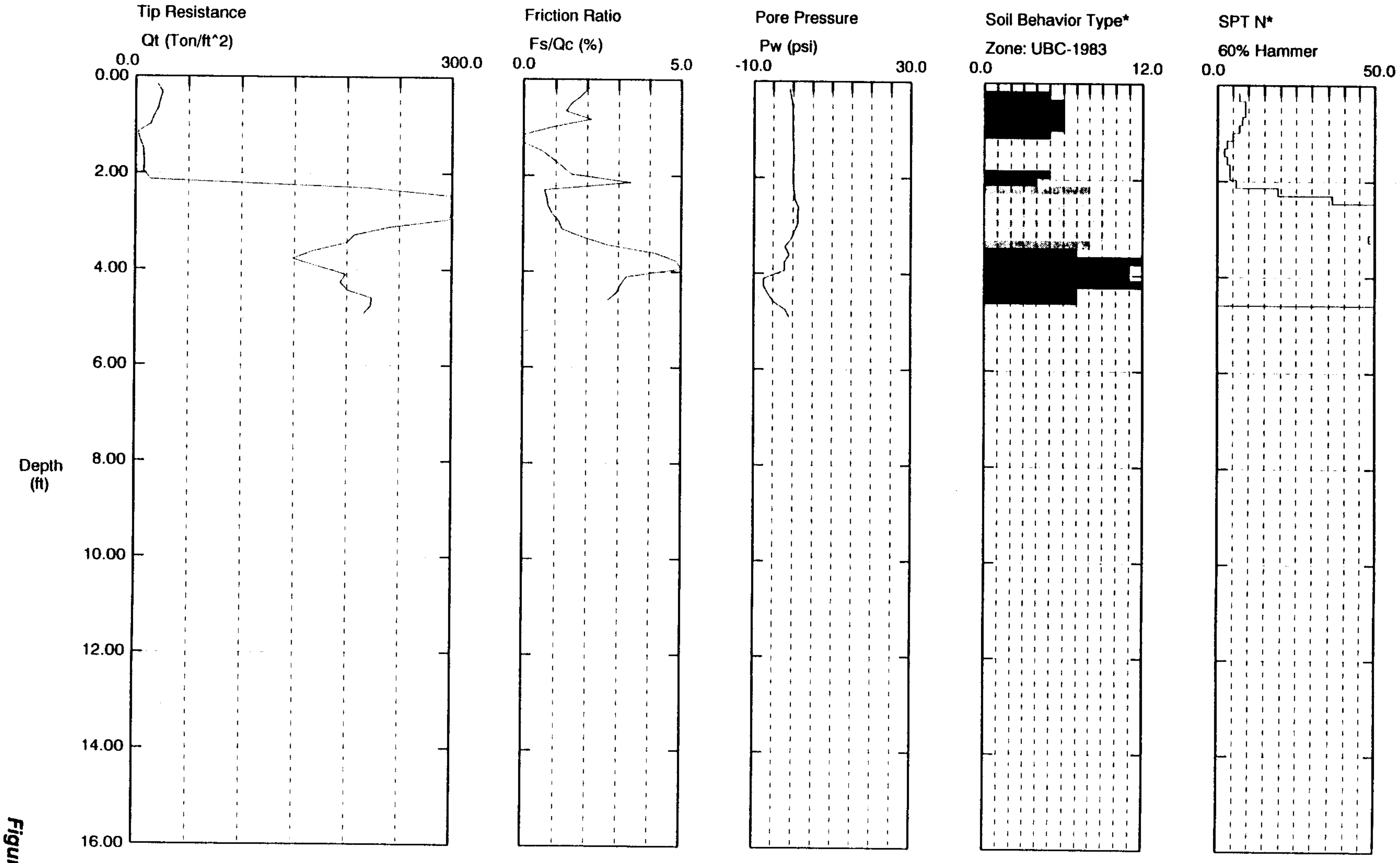
AR 051430

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P120
Cone Used: 708

CPT Date/Time: 12-04-00 15:53
Location: N 16086, E 10897
Job Number: 4978-28



Maximum Depth = 4.92 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

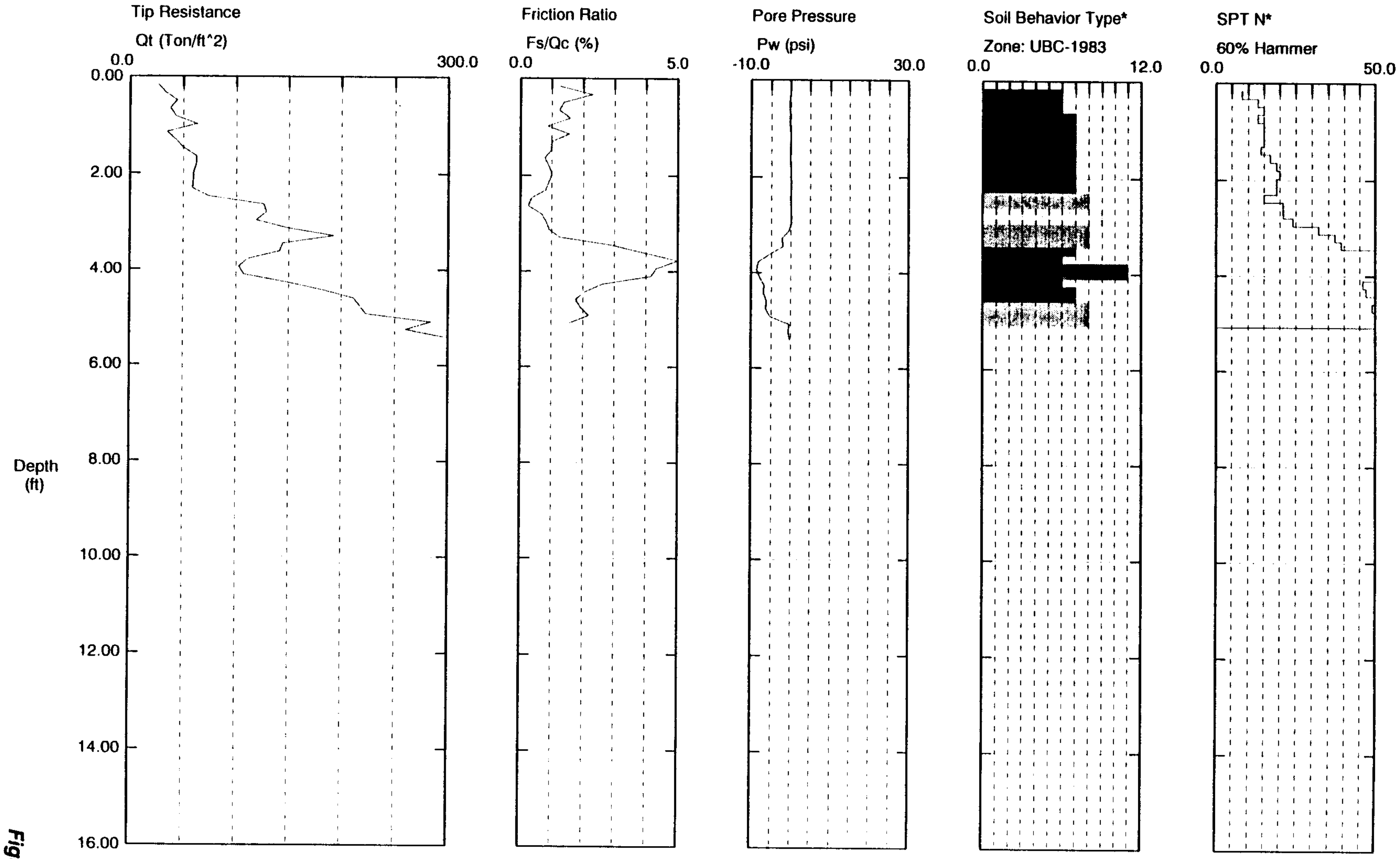
Figure A-130

ehavic [illegible] and SPT [illegible]ed on [illegible] om UBC 1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P122
Cone Used: 708

CPT Date/Time: 12-04-00 16:41
Location: N 15441, E 10929
Job Number: 4978-28



Maximum Depth = 5.41 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

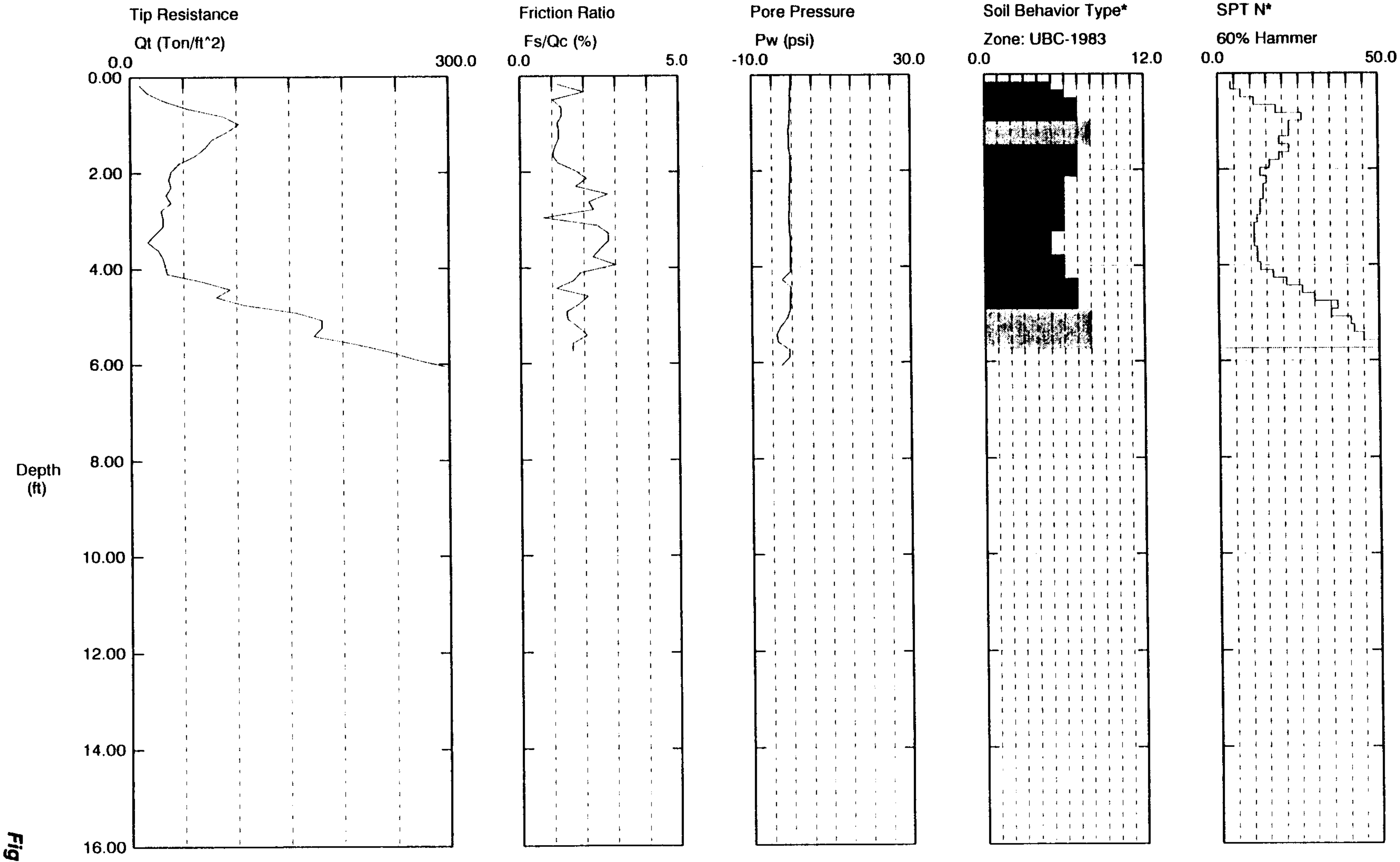
Figure A-131

*Soil behavior type and SPT based on data from UBC-1983

Hart Crowser, Inc.

Operator: KRB
Sounding: HC00-P123
Cone Used: 708

CPT Date/Time: 12-04-00 16:53
Location: N 15143, E 10983
Job Number: 4978-28



Maximum Depth = 6.07 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
■ 2 organic material
■ 3 clay
■ 4 silty clay to clay
■ 5 clayey silt to silty clay
■ 6 sandy silt to clayey silt
■ 7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
■ 11 very stiff fine grained (*)
■ 12 sand to clayey sand (*)

Figure A-132

APPENDIX B
LABORATORY TESTING PROGRAM

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LABORATORY TESTING PROGRAM

Laboratory testing was accomplished by Hart Crowser to evaluate the basic index and geotechnical engineering properties of the site soils. Both disturbed and relatively undisturbed samples were tested. The tests performed and the procedures followed are outlined below.

Additional laboratory results obtained by Applied Geotechnology, Inc. (AGI) are presented at the end of Appendix C.

Appendix D presents results of additional classification and strength tests on peat and Appendix E presents results of triaxial strength tests on clay and silt soils.

NOTE: Laboratory test results presented in this report were compiled from earlier reports. These reports should be consulted in the interpretation of the laboratory test data.

Soil Classification

Field Observation and Laboratory Analysis. Soil samples from the explorations were visually classified in the field and then taken to our laboratory where the classifications were verified in a relatively controlled laboratory environment. Field and laboratory observations include density/consistency, moisture condition, and grain size and plasticity estimates.

The classifications of selected samples were checked by laboratory tests such as Atterberg limits determinations and grain size analyses. Classifications were made in general accordance with the Unified Soil Classification (USC) System, ASTM D 2487, as presented on Figure B-1.

Water Content Determinations

Water contents were determined for most samples recovered in the explorations in general accordance with ASTM D 2216, as soon as possible following their arrival in our laboratory. Water contents were not determined for very small samples nor samples where large gravel contents would result in values considered unrepresentative. The results of these tests are plotted at the respective sample depth on the exploration logs. In addition, water contents are routinely determined for samples subjected to other testing. These are also presented on the exploration logs.

Grain Size Analysis (GS)

Grain size distribution was analyzed on representative samples in general accordance with ASTM D 422. Wet sieve analysis was used to determine the size distribution greater than the U.S. No. 200 mesh sieve. The size distribution for particles smaller than the No. 200 mesh sieve was determined by the hydrometer method for a selected number of samples. The results of the tests are presented as curves on Figures B-2 through B-44 plotting percent finer by weight versus grain size.

Atterberg Limits (AL)

We determined Atterberg limits for selected fine-grained soil samples. The liquid limit and plastic limit were determined in general accordance with ASTM D 4318. The results of the Atterberg limits analyses and the plasticity characteristics are summarized in the Liquid and Plastic Limits Test Report, Figures B-45 through B-63. This relates the plasticity index (liquid limit minus the plastic limit) to the liquid limit. The results of the Atterberg limits tests are shown graphically on the boring logs as well as where applicable on figures presenting various other test results.

Pocket Penetrometer (PP) and Torvane (TV)

The pocket penetrometer and torvane procedures provide quick approximate tests of the consistency (undrained shear strength) of a cohesive soil sample. The pocket penetrometer device consists of a calibrated spring mechanism which measures penetration resistance of a 1/4-inch-diameter steel tip over a given distance. The penetration resistance is correlated to the unconfined compressive strength of the soil, which is typically twice the undrained shear strength of a saturated, cohesive soil.

The torvane device consists of a 1-inch-diameter plate with eight equally spaced and radially arranged 1/4-inch vanes. The vanes are pressed into the soil and the device is rotated. The vanes force a shear failure to take place over the area of plate face. The resistance at failure, as measured by a calibrated spring, correlates to the undrained shear strength of the sample tested. The exploration logs show the results of the pocket penetrometer and torvane tests in tsf (tons per square foot).

Consolidation Test (CN)

The one-dimensional consolidation test provides data for estimating settlement and preconsolidation pressure. The test was performed in general accordance with ASTM D 2435. A relatively undisturbed, fine-grained sample was carefully trimmed and fit into a rigid ring with porous stones placed on the top and bottom of the sample to allow drainage. Vertical loads were then applied incrementally to the sample in such a way that the sample was allowed to consolidate under each load increment. Measurements were made of the compression of the sample (with time) under each load increment. Rebound was measured during the unloading phase. In general, each load was left in place until the completion of 100 percent primary consolidation, as computed using Taylor's square root of time method. The next load increment was applied soon after attaining 100 percent primary consolidation. The test results plotted in terms of axial strain and coefficient of consolidation versus applied load (stress) are presented on Figures B-64 through B-71.

Triaxial Unconsolidated Undrained Compression Test (TUU)

The triaxial unconsolidated undrained compression test estimates the undrained shear strength of the soil. A relatively undisturbed fine-grained sample was trimmed to a length of about 6 inches, encased in a rubber membrane, and placed in the triaxial cell. An all-around confining pressure was applied hydraulically, but the sample was not allowed to consolidate, and no back pressure was applied. An axial load was then applied at a constant strain rate to the sample without allowing drainage from the specimen. The stress-strain behavior was recorded until failure occurred.

The failure stress was generally taken as the maximum load on the sample or the load recorded at 20 percent strain, whichever was greater. The test results plotted in terms of axial strain versus deviator stress are presented on Figure B-72 through B-76. The shear strength is considered to be one-half the maximum stress difference based on the $\phi = 0$ concept and a total stress analysis.

Consolidated Undrained Triaxial Compression Test (CU)

The consolidated undrained triaxial compression test with pore pressure measurement is used to determine effective strength of soil at various stress levels. We performed this test in general accordance with ASTM D 4767. A relatively undisturbed fine-grained soil sample was extruded from a shelby tube and trimmed to a length of about 6 inches, encased in a rubber membrane, and placed in the triaxial cell. The triaxial cell was then filled with de-aired water and a back pressure was applied to saturate the sample and force any remaining air bubbles into solution. The back pressure was applied to both, the sample and cell simultaneously to avoid consolidating the sample. After saturation was achieved, the cell pressure was raised to the desired confining pressure while keeping the back pressure constant and the sample was allowed to consolidate to the all-around equal confining pressure. During the consolidation phase, drainage occurred through porous stones and filter paper strips placed around the sample. Once consolidation was completed, the drainage lines were closed and the sample was loaded to failure under undrained conditions by application of increasing axial load at a constant strain rate.

During loading, we recorded the magnitude of excess pore water pressure developed. To obtain shear strength data, three soil samples were tested for each set of CU tests.

The CU test data are presented on Figures B-77 through B-84. These figures include Mohr envelopes and Mohr circles for effective stresses and for total stresses at failure, stress-strain plots (deviator stress vs. axial strain), and stress path plots.

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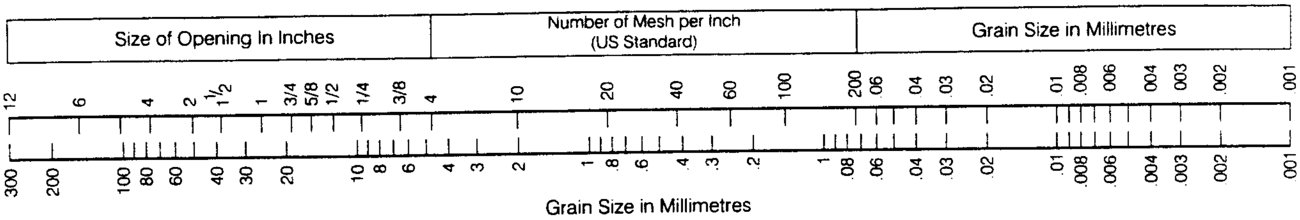
Unified Soil Classification (USC) System

Soil Grain Size



COBBLES	GRAVEL	SAND	SILT and CLAY
Coarse-Grained Soils			Fine-Grained Soils

Coarse-Grained Soils

G W	**G P**	**G M**	**G C**	**S W**	**S P**	**S M**	**S C**
Clean GRAVEL <5% fines		* GRAVEL with >12% fines		Clean SAND <5% fines		* SAND with >12% fines	
GRAVEL >50% coarse fraction larger than No. 4				SAND >50% coarse fraction smaller than No. 4			
Coarse-Grained Soils >50% larger than No. 200 sieve							

G W and S W $\left(\frac{D_{60}}{D_{10}}\right) \begin{matrix} >4 \text{ for G W} \\ >6 \text{ for S W} \end{matrix}$ & $1 \leq \left(\frac{(D_{30})^2}{D_{10} \text{ X } D_{60}}\right) \leq 3$

G P and S P Clean GRAVEL or SAND not meeting requirements for G W and S W

G M and S M Atterberg limits below A line with PI <4

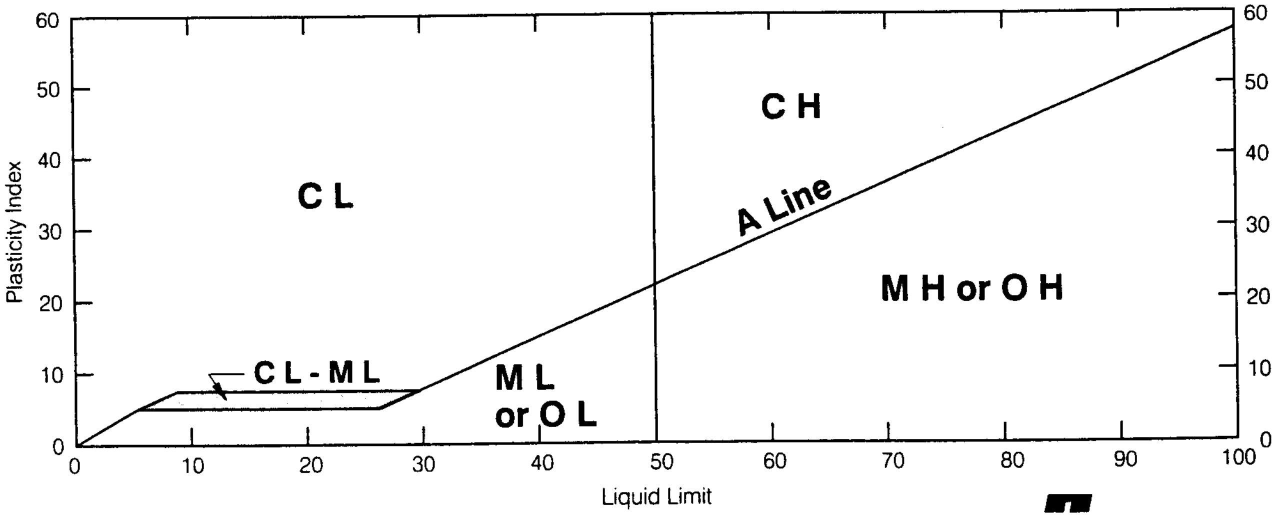
G C and S C Atterberg limits above A Line with PI >7

* Coarse-grained soils with percentage of fines between 5 and 12 are considered borderline cases required use of dual symbols.

D_{10}, D_{30}, and D_{60} are the particles diameter of which 10, 30, and 60 percent, respectively, of the soil weight are finer.

Fine-Grained Soils

M L	**C L**	**O L**	**M H**	**C H**	**O H**	**Pt**
SILT	CLAY	Organic	SILT	CLAY	Organic	Highly Organic Soils
Soils with Liquid Limit <50%			Soils with Liquid Limit >50%			
Fine-Grained Soils >50% smaller than No. 200 sieve						



HC Standards\Report Figures\Grain Size (B-1)

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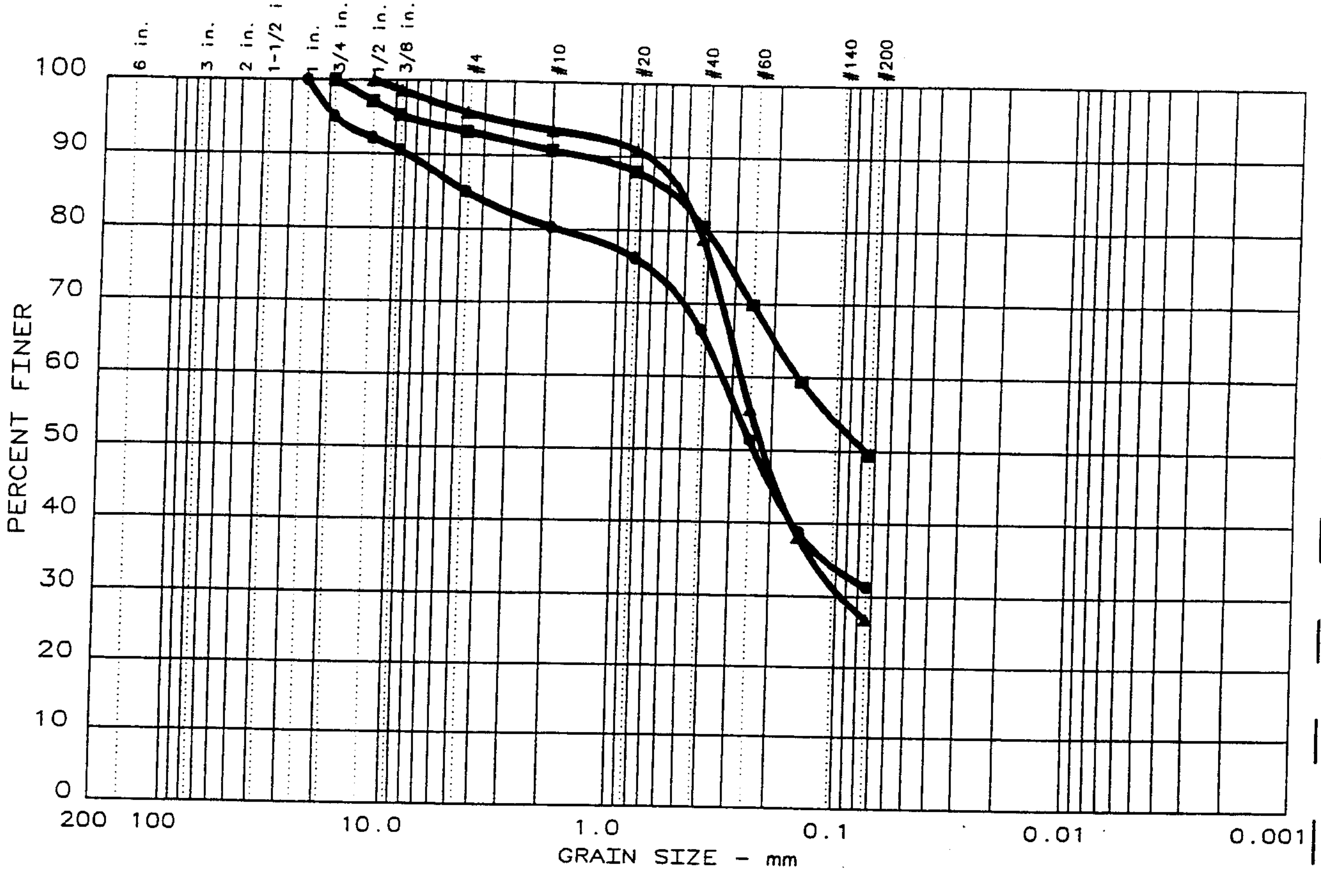
J-4978-28 **7/01**

Figure B-1

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	15.0	53.7	31.3	
▲	0.0	4.3	69.0	26.7	
■	0.0	6.8	43.7	49.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			4.73	0.33	0.24					
▲			0.52	0.28	0.22	0.095				
■			0.58	0.15	0.08					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Gravelly, very silty SAND	SM	
▲ Silty SAND	SM	19%
■ Slightly gravelly, very sandy SILT	ML	27%

Remarks:

Project: 3rd Runway
● Location: HC99-B36, S-2
▲ Location: HC99-B37, S-2
■ Location: HC99-B37, S-4

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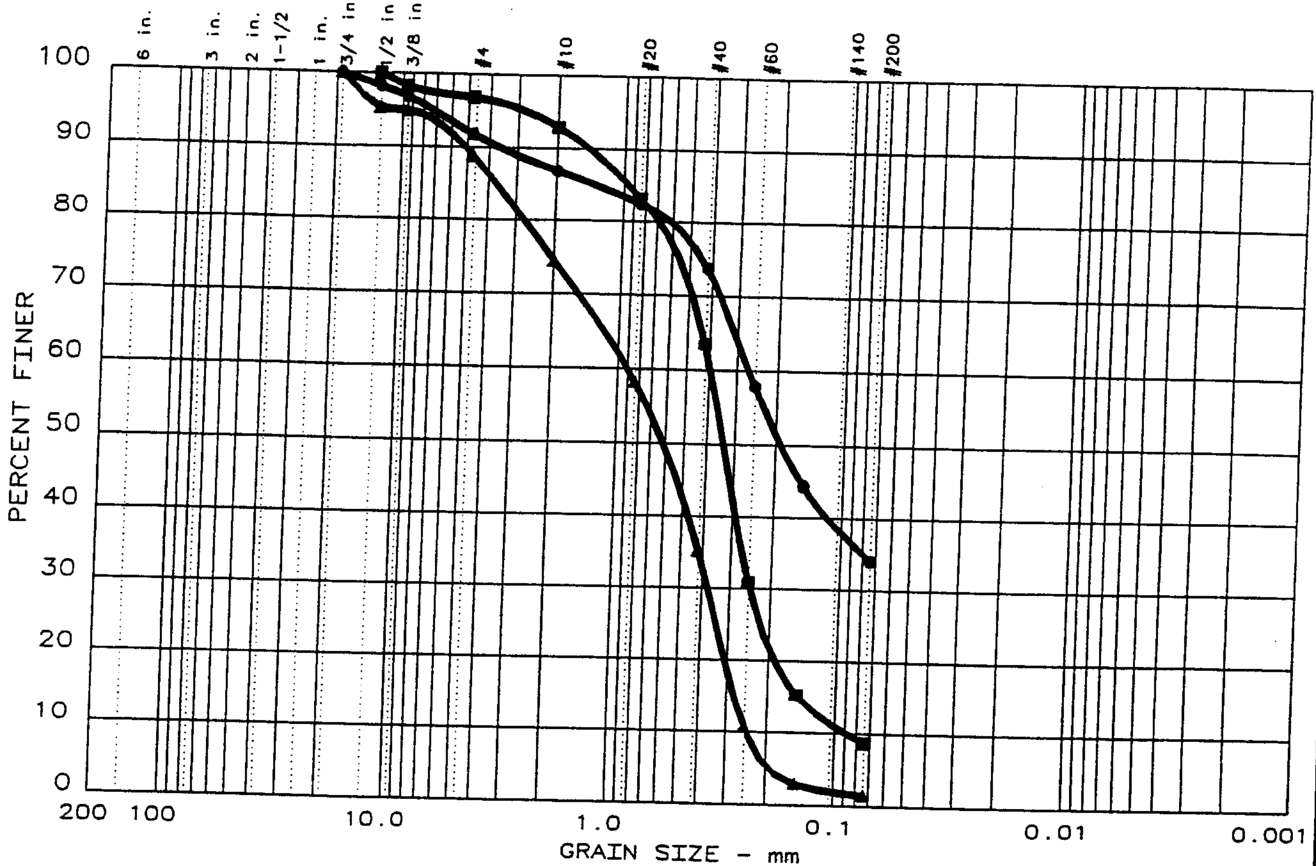
Figure B-2

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	8.2	57.7	34.1	
▲	0.0	11.0	87.5	1.5	
■	0.0	3.2	88.0	8.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			1.33	0.27	0.19					
▲			3.67	0.90	0.62	0.378	0.2786	0.2443	0.65	3.7
■			0.94	0.39	0.34	0.245	0.1442	0.0889	1.71	4.4

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly gravelly, silty SAND	SM	12%
▲ Slightly gravelly SAND	SP	17%
■ Slightly silty SAND	SP-SM	20%

Remarks:

Project: 3rd Runway

● Location: HC99-B38, S-4

▲ Location: HC99-B31, S-4

■ Location: HC99-B31, S-5

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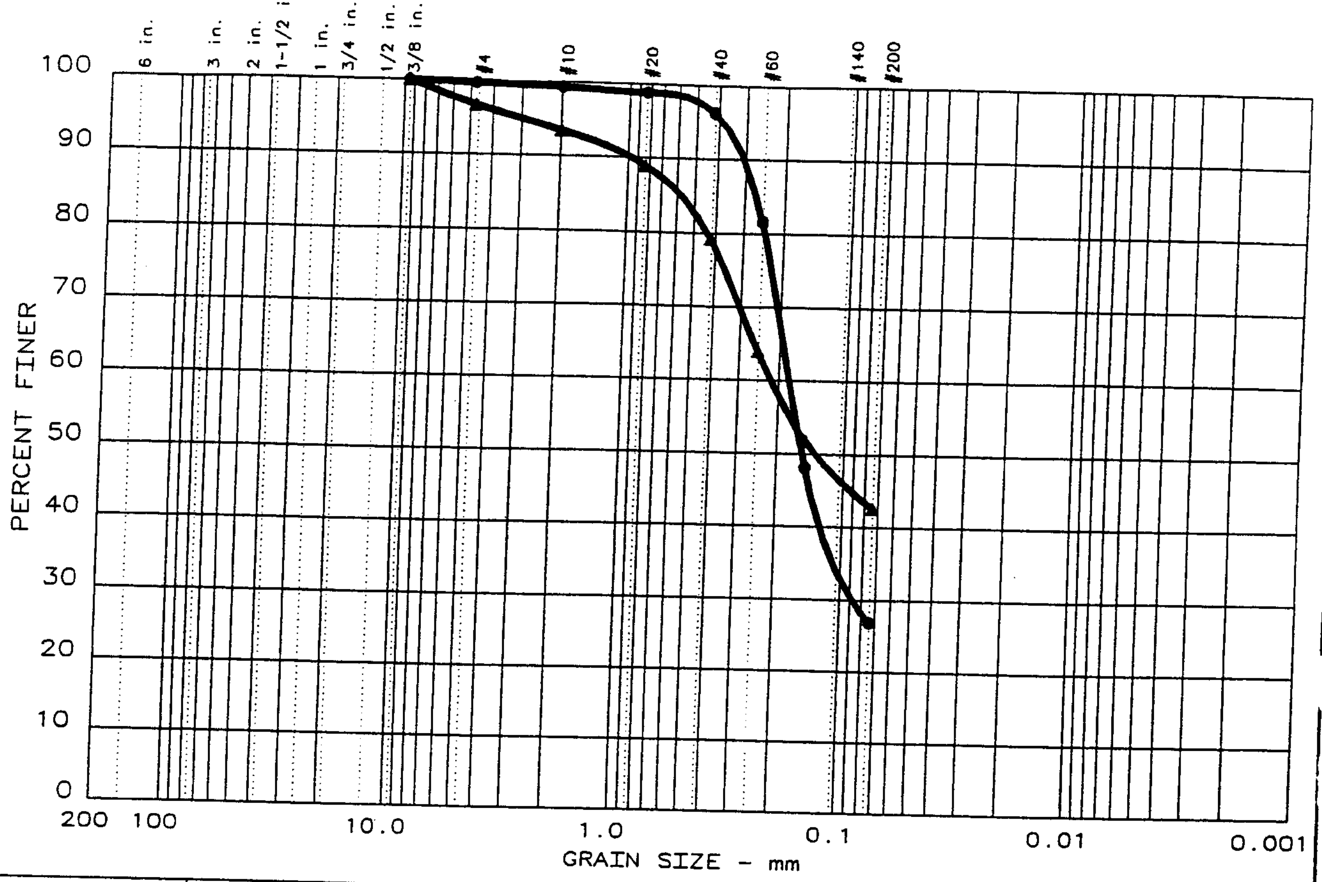
Figure **B-3**

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.3	72.8	26.9	
▲	0.0	3.3	54.2	42.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.27	0.18	0.15	0.087				
▲			0.57	0.22	0.13					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Silty SAND	SM	25%
▲ Very silty SAND	SM	11%

Remarks:

Project: 3rd Runway

● Location: HC99-B39, S-2

▲ Location: HC99-B40, S-4

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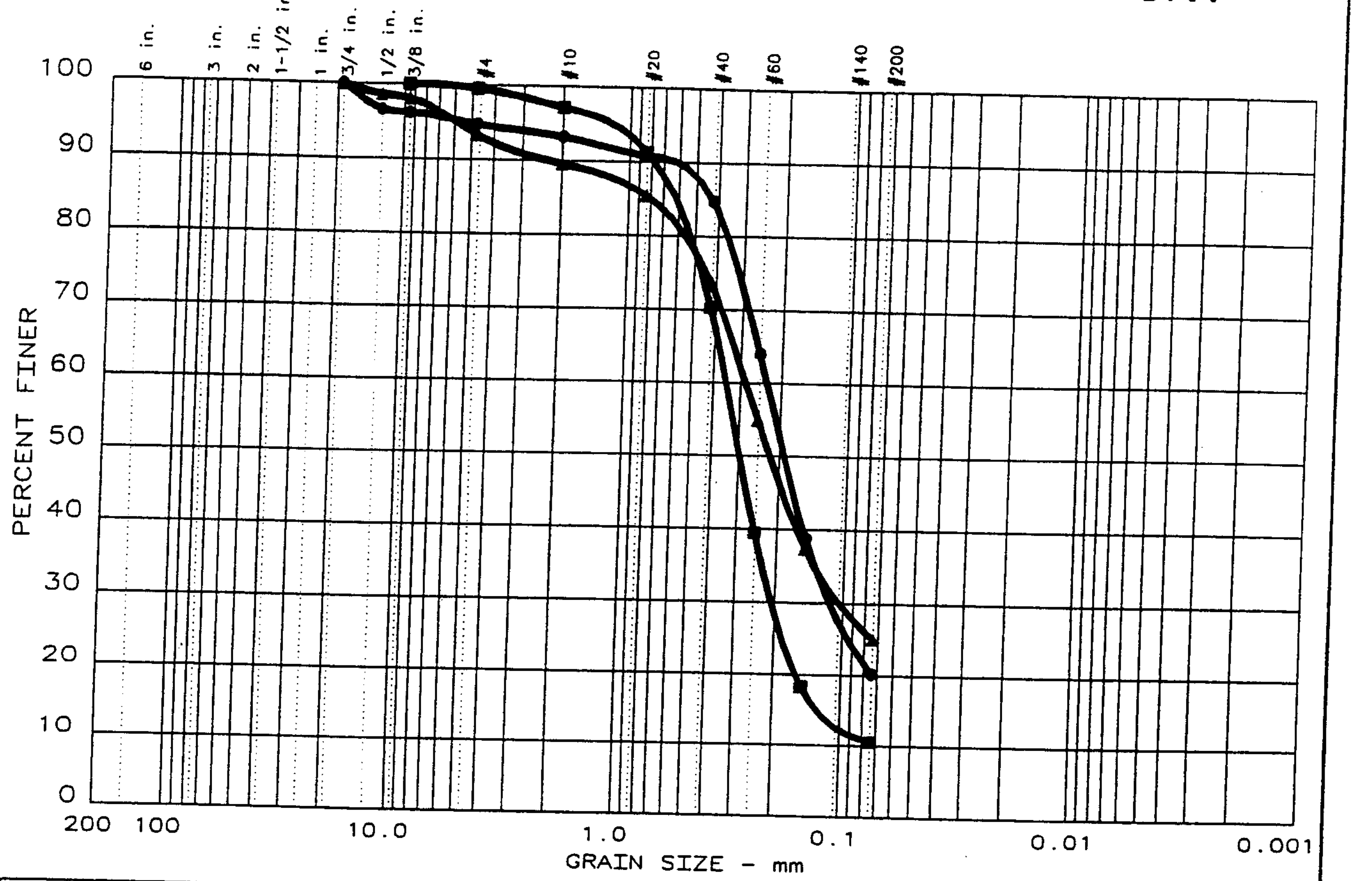
Figure **B-4**

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	5.3	74.5	20.2	
▲	0.0	6.8	68.0	25.2	
■	0.0	0.5	88.9	10.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.43	0.23	0.19	0.114				
▲			0.80	0.29	0.22	0.104				
■			0.62	0.35	0.30	0.207	0.1263			

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly gravelly, silty SAND	SM	20%
▲ Slightly gravelly, silty SAND	SM	16%
■ Slightly silty SAND	SP-SM	22%

Remarks:

Project: Third Runway
● Location: HC99-B40, S-2
▲ Location: HC99-B40, S-3
■ Location: HC99-B41, S-7

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Figure **B-5**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.8	1.9	6.6	72.8	17.9	
□	0.0	7.9	15.7	6.8	9.4	49.3	10.9	
△	0.0	6.6	4.1	3.0	11.2	52.1	23.0	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.366	0.222	0.189	0.128				
□			9.64	0.420	0.292	0.185	0.115			
△			1.38	0.306	0.252	0.144				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, medium to fine SAND	SM	22%
□ Slightly silty, gravelly SAND	SP-SM	19%
△ Slightly gravelly, silty, medium to fine SAND	SM	15%

Remarks:

○

□

△

Project: Third Runway West Wall

Client: HNTB

○	**Source:** HC00-B106	**Sample No.:** S-3
□	**Source:** HC00-B108	**Sample No.:** S-3
△	**Source:** HC00-B111	**Sample No.:** S-4

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Figure No. **B-6**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	2.3	1.8	6.9	35.8	36.9	16.3
□	0.0	0.0	0.5	0.2	1.8	7.8	44.5	45.2
△	0.0	0.0	0.0	0.1	0.1	1.4	56.8	41.6

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	27	12	0.357	0.145	0.0666	0.0349	0.0043	0.0023	3.61	62.21
□	19	4	0.0398	0.0077	0.0058	0.0020				
△	41	13	0.0104	0.0067	0.0058	0.0037	0.0015			

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Very sandy, lean CLAY	CL	23%
□ Slightly sandy CLAY-SILT	CL-ML	14%
△ Very clayey SILT	ML	31%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B107 **Sample No.:** S-3

□ **Source:** HC00-B110 **Sample No.:** S-4

△ **Source:** HC00-B110 **Sample No.:** S-11

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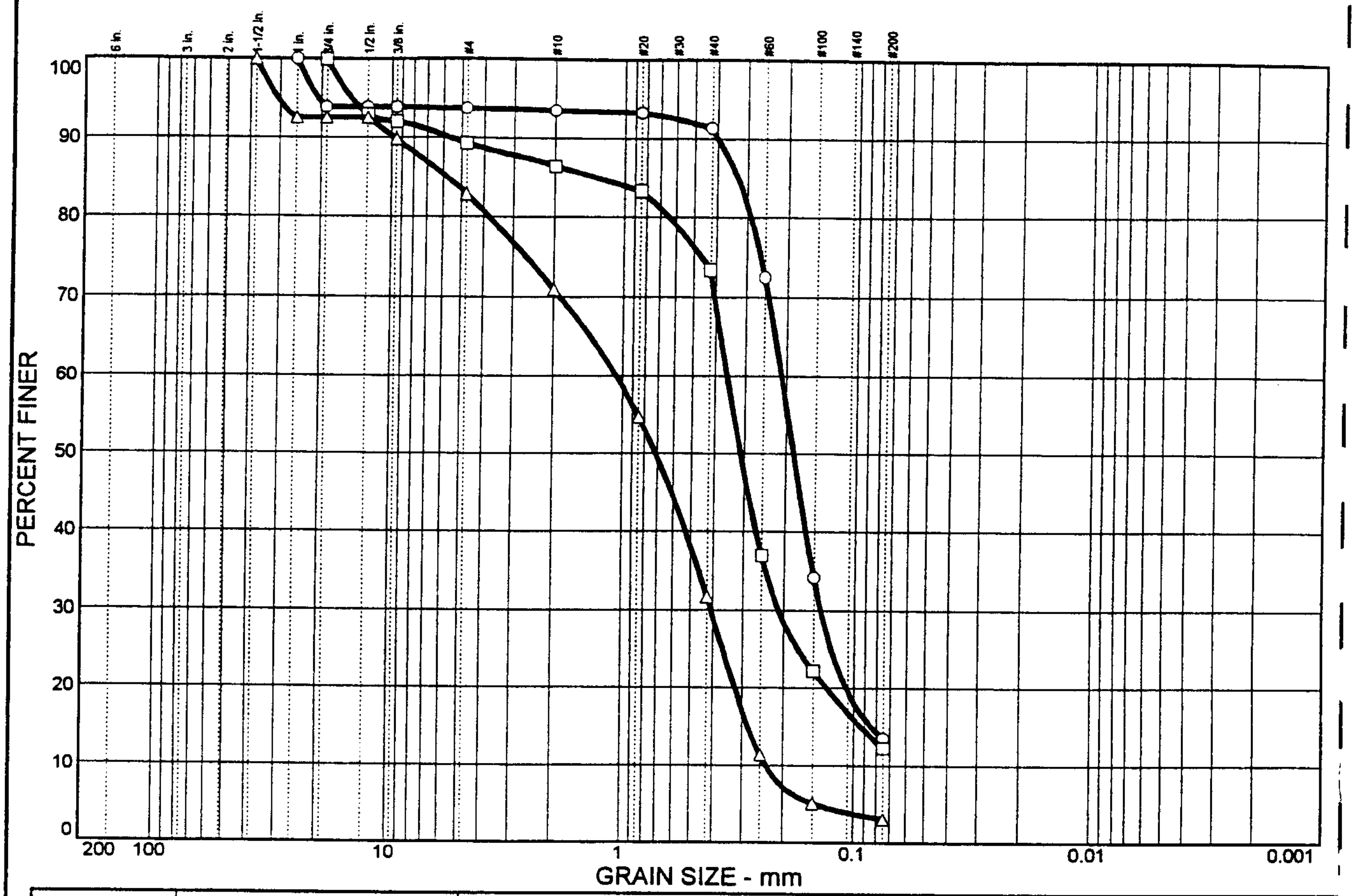
Figure No. **B-7**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	6.1	0.2	0.2	2.2	77.7	13.6	
□	0.0	0.0	10.7	2.9	13.1	61.0	12.3	
△	0.0	7.5	9.7	11.9	39.2	28.5	3.2	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.331	0.210	0.186	0.140	0.0833			
□			1.36	0.357	0.311	0.211	0.0922			
△			5.80	1.06	0.714	0.408	0.281	0.236	0.66	4.51

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, silty, fine SAND	SM	21%
□ Slightly gravelly, silty, medium to fine SAND	SM	18%
△ Gravelly SAND	SP	17%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B107 **Sample No.:** S-5

□ **Source:** HC00-B124 **Sample No.:** S-6

△ **Source:** HC00-B126 **Sample No.:** S-3

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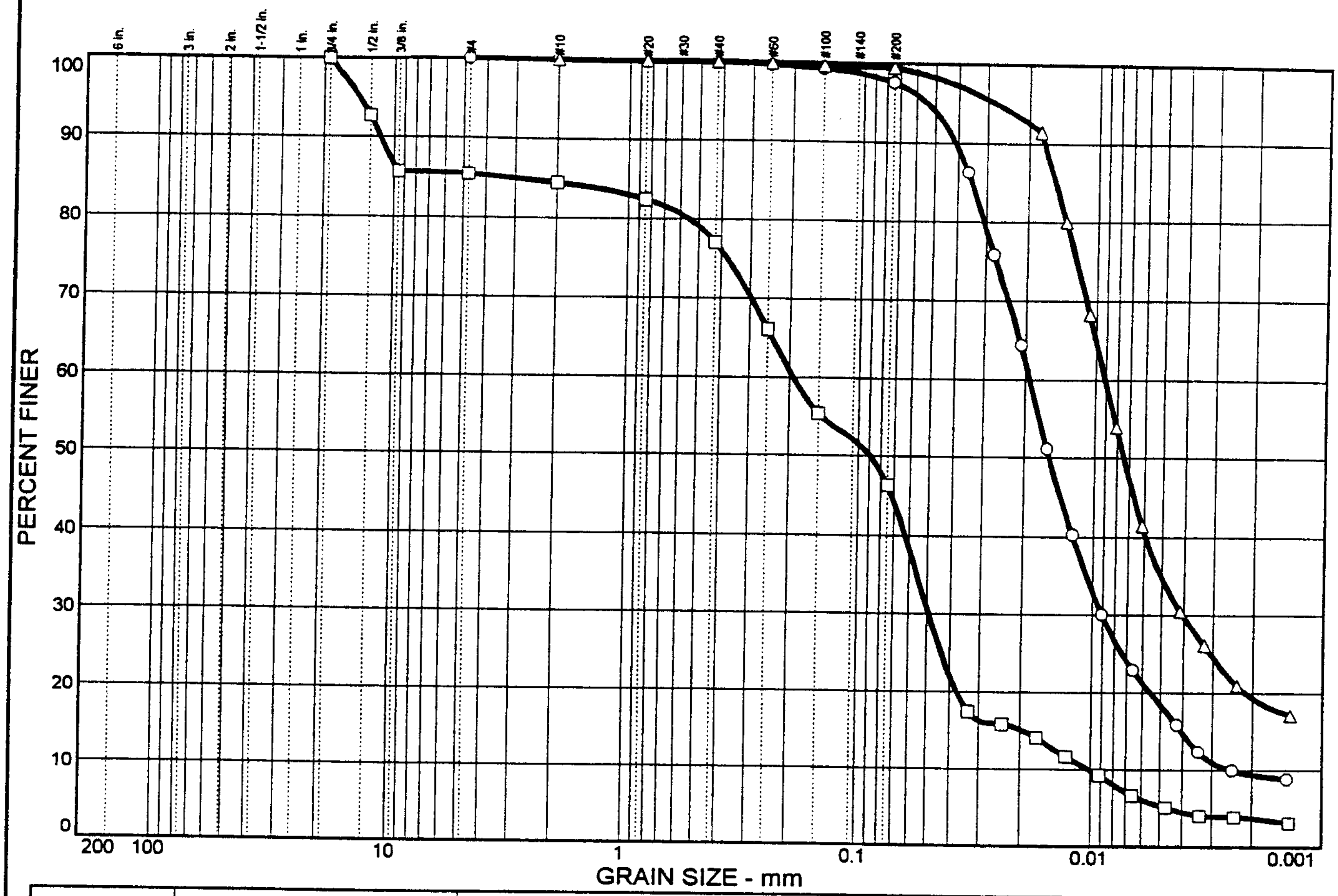
Figure No. B-8

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.2	2.2	79.2	18.4
□	0.0	0.0	14.5	1.1	7.4	30.7	40.9	5.4
△	0.0	0.0	0.0	0.0	0.1	0.4	64.8	34.7

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	30	4	0.0349	0.0191	0.0156	0.0091	0.0041	0.0024	1.76	7.81
□	18	3	3.14	0.192	0.0891	0.0492	0.0191	0.0101	1.24	19.04
△	43	17	0.0152	0.0091	0.0074	0.0041				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Clayey SILT	ML	31%
□ Slightly clayey, gravelly, very silty, medium to fine SAND	SM	15%
△ Very clayey SILT	CL	30%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B111 **Sample No.:** S-3

□ **Source:** HC00-B111 **Sample No.:** S-6

△ **Source:** HC00-B111 **Sample No.:** S-12

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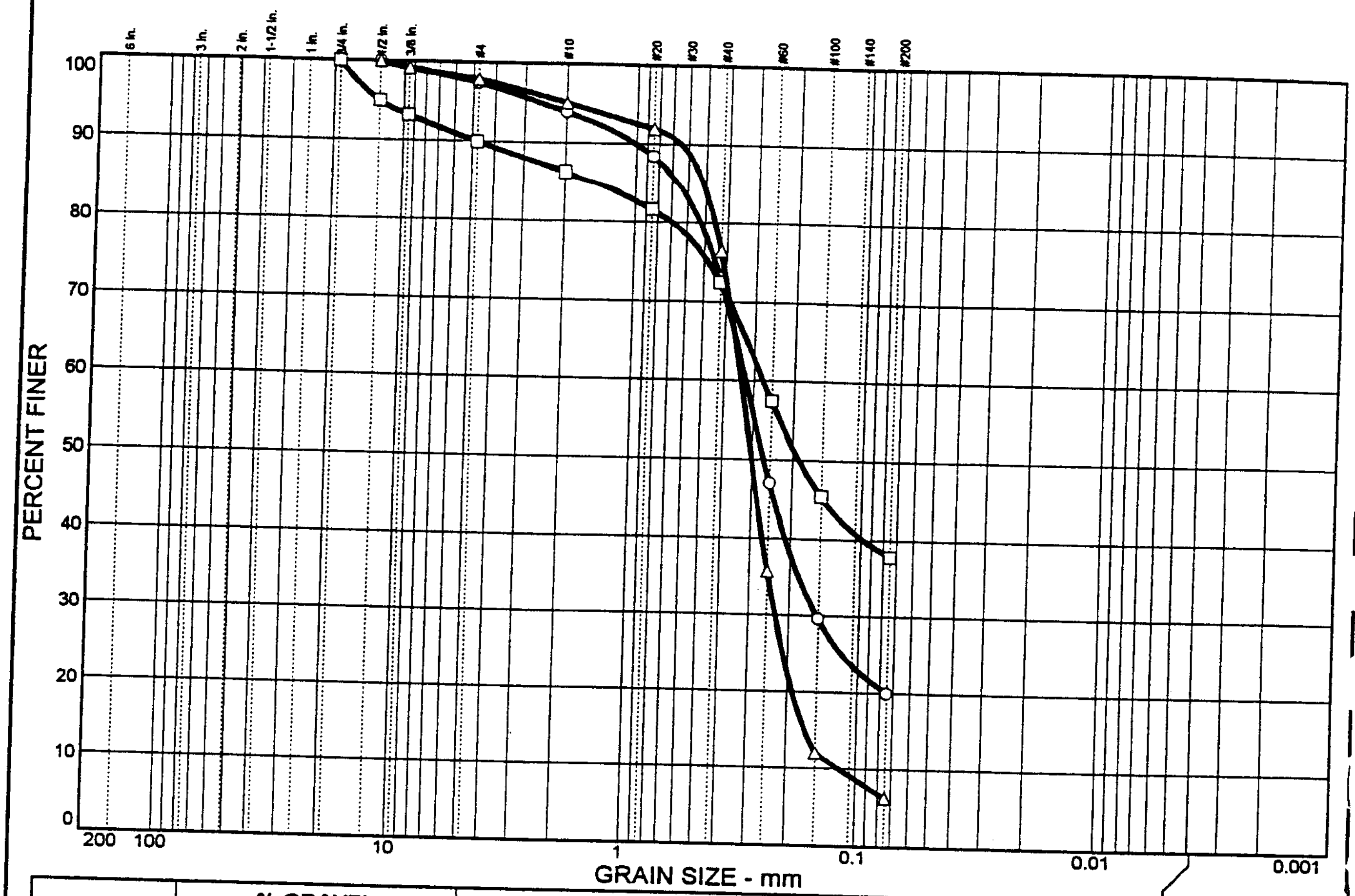
Figure No. B-9

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	2.5	3.6	20.9	53.0	20.0	
□	0.0	0.0	10.0	3.7	13.8	34.7	37.8	
△	0.0	0.0	2.1	2.8	18.6	70.2	6.3	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.658	0.324	0.266	0.153				
□			1.50	0.273	0.188					
△			0.513	0.338	0.300	0.230	0.167	0.118	1.32	2.88

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, medium to fine SAND	SM	17%
□ Slightly gravelly, very silty, medium to fine SAND	SM	10%
△ Slightly silty, medium to fine SAND	SP-SM	25%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B113 **Sample No.:** G-1

□ **Source:** HC00-B119 **Sample No.:** S-5

△ **Source:** HC00-B119 **Sample No.:** S-7

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Figure No. *B-10*

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	10.4	4.6	13.0	43.1	28.9	
□	0.0	6.3	1.5	2.6	16.1	49.5	24.0	
△	0.0	0.0	2.1	0.8	17.2	67.3	12.6	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.00	0.298	0.226	0.0839				
□			0.748	0.314	0.255	0.125				
△			0.482	0.310	0.270	0.196	0.0973			

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, silty, medium to fine SAND	SM	15%
□ Slightly gravelly, silty, medium to fine SAND	SM	51%
△ Silty, medium to fine SAND	SM	27%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B114 **Sample No.:** S-3

□ **Source:** HC00-B115 **Sample No.:** S-2

△ **Source:** HC00-B116 **Sample No.:** S-2

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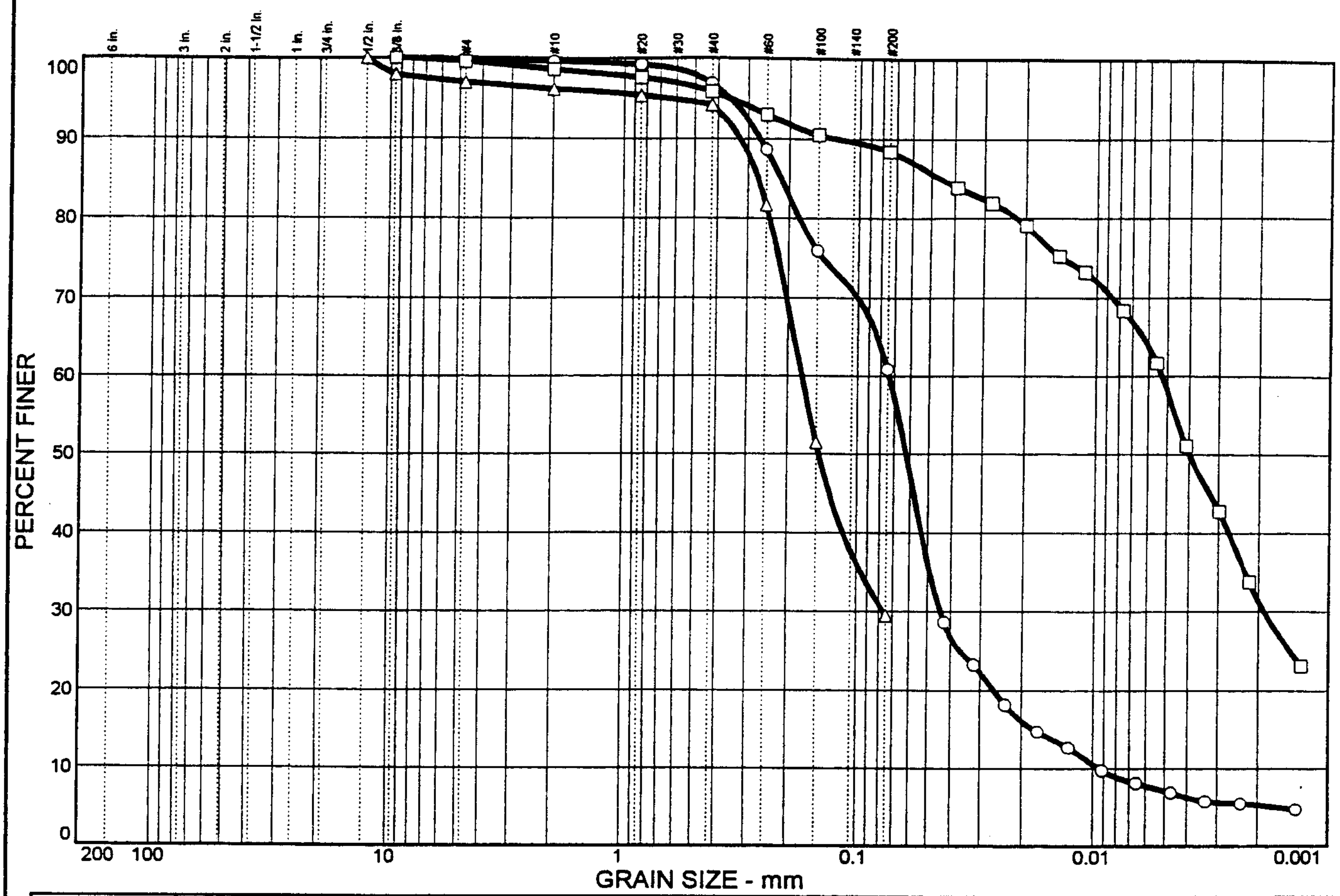
Figure No. **B-11**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.2	0.2	2.8	35.9	53.7	7.2
□	0.0	0.0	0.5	0.9	2.8	7.4	30.3	58.1
△	0.0	0.0	3.1	0.8	1.9	64.7	29.5	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.217	0.0736	0.0622	0.0443	0.0175	0.0094	2.83	7.84
□	38	15	0.0464	0.0053	0.0040	0.0019				
△			0.271	0.173	0.146	0.0768				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Very sandy SILT	ML	18%
□ Slightly sandy, lean CLAY	CL	29%
△ Silty, fine SAND	SM	25%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B115 **Sample No.:** S-4

□ **Source:** HC00-B129 **Sample No.:** S-3

△ **Source:** HC00-B140 **Sample No.:** S-5

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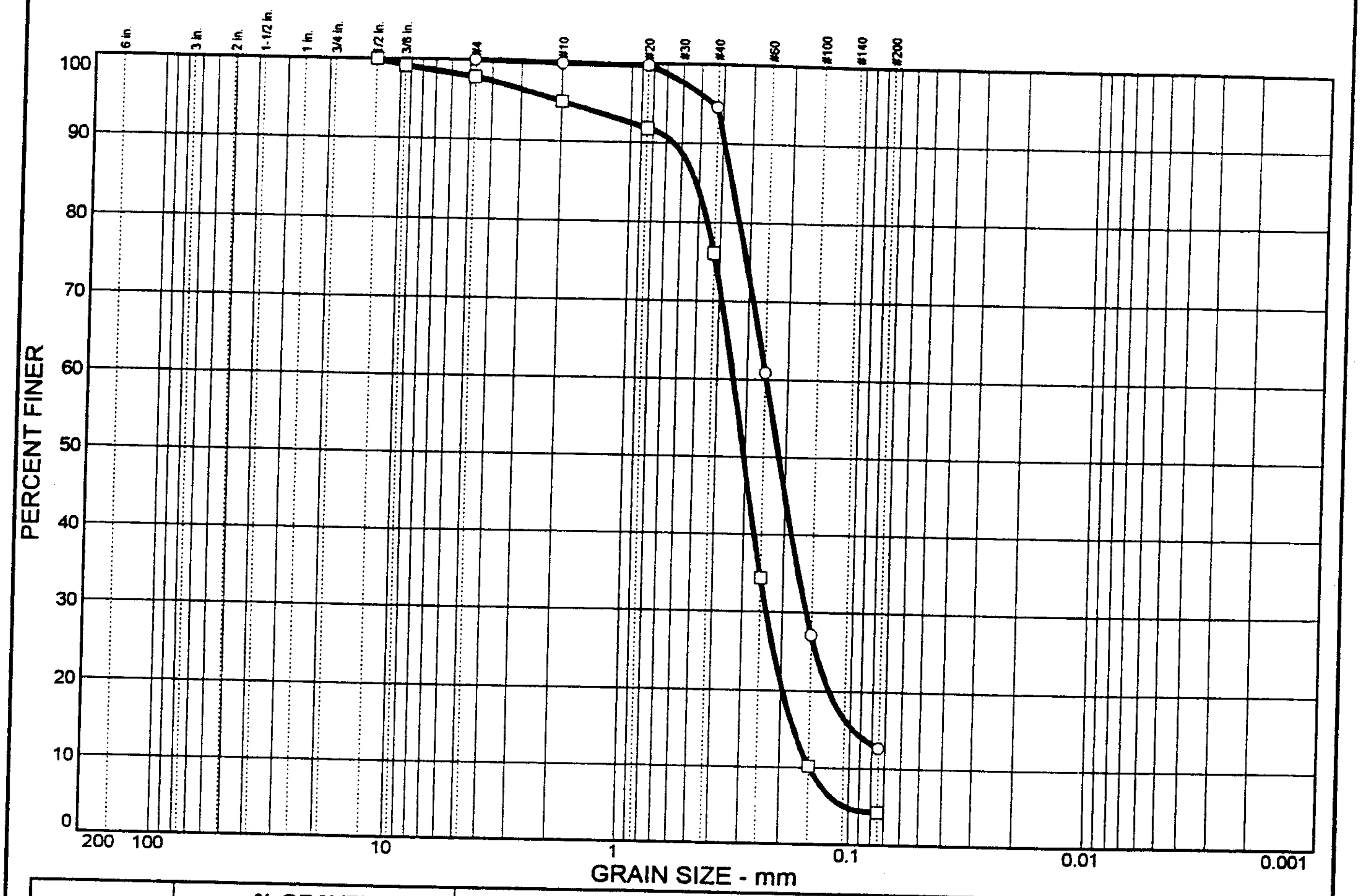
Figure No. *B-12*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.1	5.4	81.8	12.7	
□	0.0	0.0	2.1	2.9	18.9	71.7	4.4	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.362	0.247	0.215	0.158	0.0969			
□			0.516	0.342	0.303	0.235	0.175	0.148	1.09	2.30

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, medium to fine SAND	SM	21%
□ Medium to fine SAND	SP	25%

Remarks:

○

□

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B117 **Sample No.:** S-5

□ **Source:** HC00-B118 **Sample No.:** S-7

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Figure No. **B-13**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	1.3	5.1	72.4	21.2
□	0.0	0.0	4.3	4.4	8.3	22.2	33.3	27.5
△	0.0	0.0	0.8	0.6	4.1	12.2	43.0	39.3

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	30	4	0.0483	0.0215	0.0152	0.0083	0.0033	0.0015	2.20	14.80
□	29	14	0.531	0.0666	0.0216	0.0059				
△	41	16	0.169	0.0102	0.0073	0.0036	0.0016			

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly sandy, clayey SILT	ML	32%
□ Very sandy, lean CLAY	CL	20%
△ Very clayey SILT	CL	25%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B118	**Sample No.:** S-2
□ **Source:** HC00-B118	**Sample No.:** S-4
△ **Source:** HC00-B118	**Sample No.:** S-6

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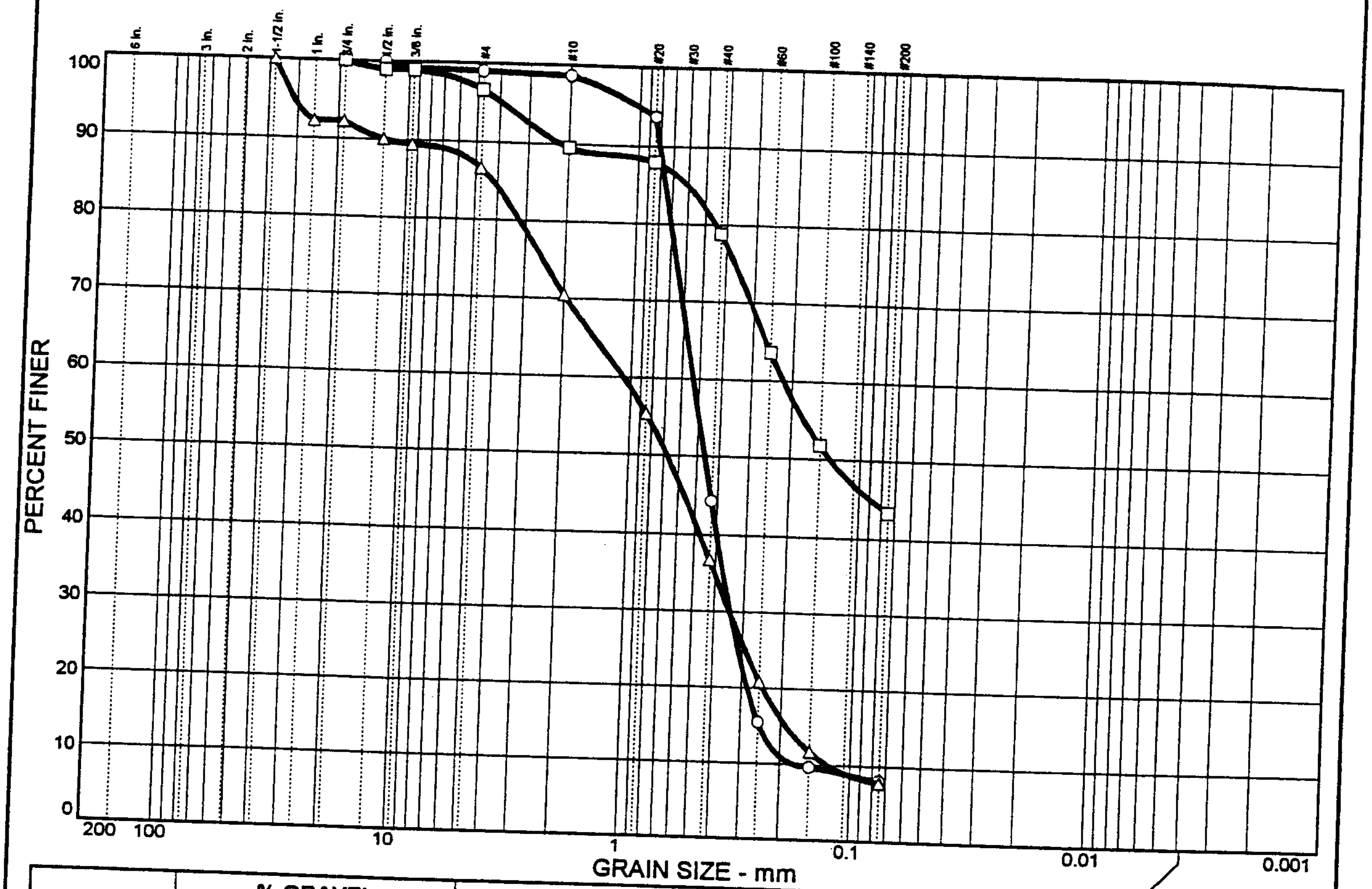
Figure No. *B-14*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.0	0.3	54.4	36.2	8.1	
□	0.0	0.0	3.3	7.1	10.8	35.5	43.3	
△	0.0	7.7	5.6	16.2	33.8	28.9	7.8	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.753	0.532	0.462	0.340	0.246	0.172	1.27	3.10
□			0.598	0.218	0.135					
△			4.18	1.07	0.674	0.343	0.189	0.125	0.88	8.60

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly silty, fine to medium SAND	SP-SM	32%
□ Very silty SAND	SM	14%
△ Slightly silty, gravelly SAND	SP-SM	14%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-TP110 **Sample No.:** S-3

□ **Source:** HC00-TP112 **Sample No.:** S-2

△ **Source:** HC00-B120 **Sample No.:** S-6

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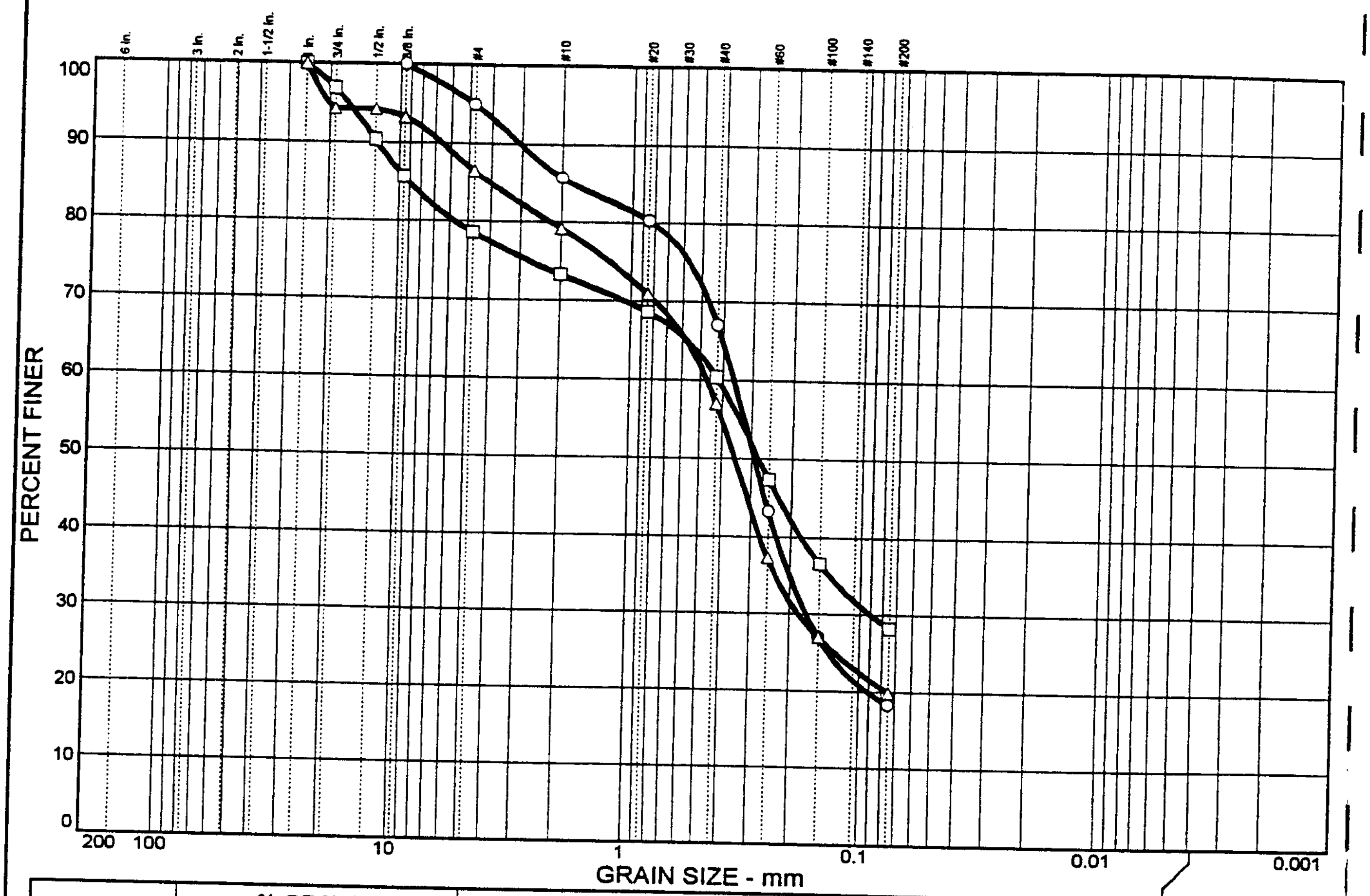
Figure No. *B-15*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	5.0	9.3	18.7	48.7	18.3	
□	0.0	3.0	18.4	5.3	12.9	32.2	28.2	
△	0.0	5.7	7.8	7.3	22.1	37.2	19.9	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.83	0.359	0.290	0.170				
□			9.06	0.417	0.278	0.0901				
△			4.08	0.467	0.351	0.184				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, silty SAND	SM	19%
□ Gravelly, silty SAND	SM	11%
△ Gravelly, silty SAND	SM	17%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B121	**Sample No.:** S-2
□ **Source:** HC00-B122	**Sample No.:** S-5
△ **Source:** HC00-B128	**Sample No.:** S-2

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Figure No. **B-16**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	5.9	4.8	14.1	32.5	42.7	
□	0.0	0.0	4.9	1.3	9.3	58.8	25.7	
△	0.0	0.0	2.1	1.6	8.2	40.8	47.3	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.940	0.250	0.158					
□			0.434	0.211	0.152	0.0845				
△			0.371	0.168	0.0984					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	16%
□ Silty, medium to fine SAND	SM	21%
△ Very silty, medium to fine SAND	SM	23%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B123 **Sample No.:** S-8

□ **Source:** HC00-B125 **Sample No.:** S-2

△ **Source:** HC00-B130 **Sample No.:** G-1

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Figure No. **B-17**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	9.0	4.7	19.6	48.9	17.8	
☐	0.0	0.0	12.8	3.8	8.5	38.3	36.6	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.44	0.366	0.301	0.185				
☐			3.12	0.229	0.164					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, silty, medium to fine SAND	SM	20%
☐ Gravelly, very silty, medium to fine SAND	SM	17%

Remarks:

○

☐

Project: Third Runway West Wall

Client: HNTB

○ **Source:** HC00-B127 **Sample No.:** S-1

☐ **Source:** HC00-B131 **Sample No.:** S-2

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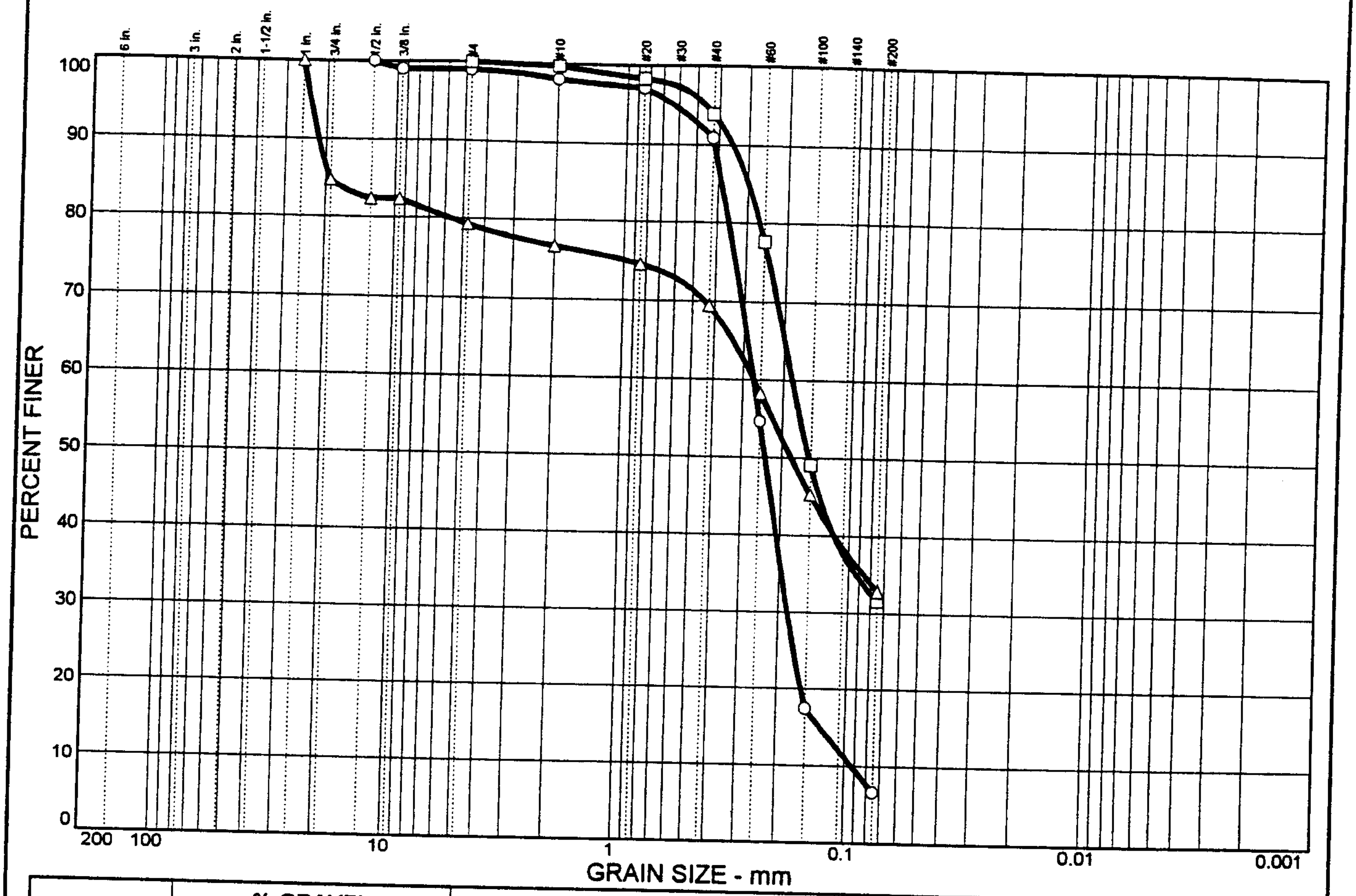
Figure No. **B-18**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.0	1.0	7.1	84.2	6.7	
□	0.0	0.0	0.0	0.3	5.8	62.3	31.6	
△	0.0	15.3	5.4	2.6	7.3	36.6	32.8	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.387	0.268	0.236	0.183	0.128	0.0927	1.34	2.89
□			0.297	0.183	0.153					
△			19.2	0.267	0.182					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly silty, medium to fine SAND	SP-SM	27%
□ Very silty, medium to fine SAND	SM	26%
△ Gravelly, very silty, medium to fine SAND	SM	13%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B129	**Sample No.:** S-4
□ **Source:** HC00-B139	**Sample No.:** S-2
△ **Source:** HC00-B140	**Sample No.:** S-6

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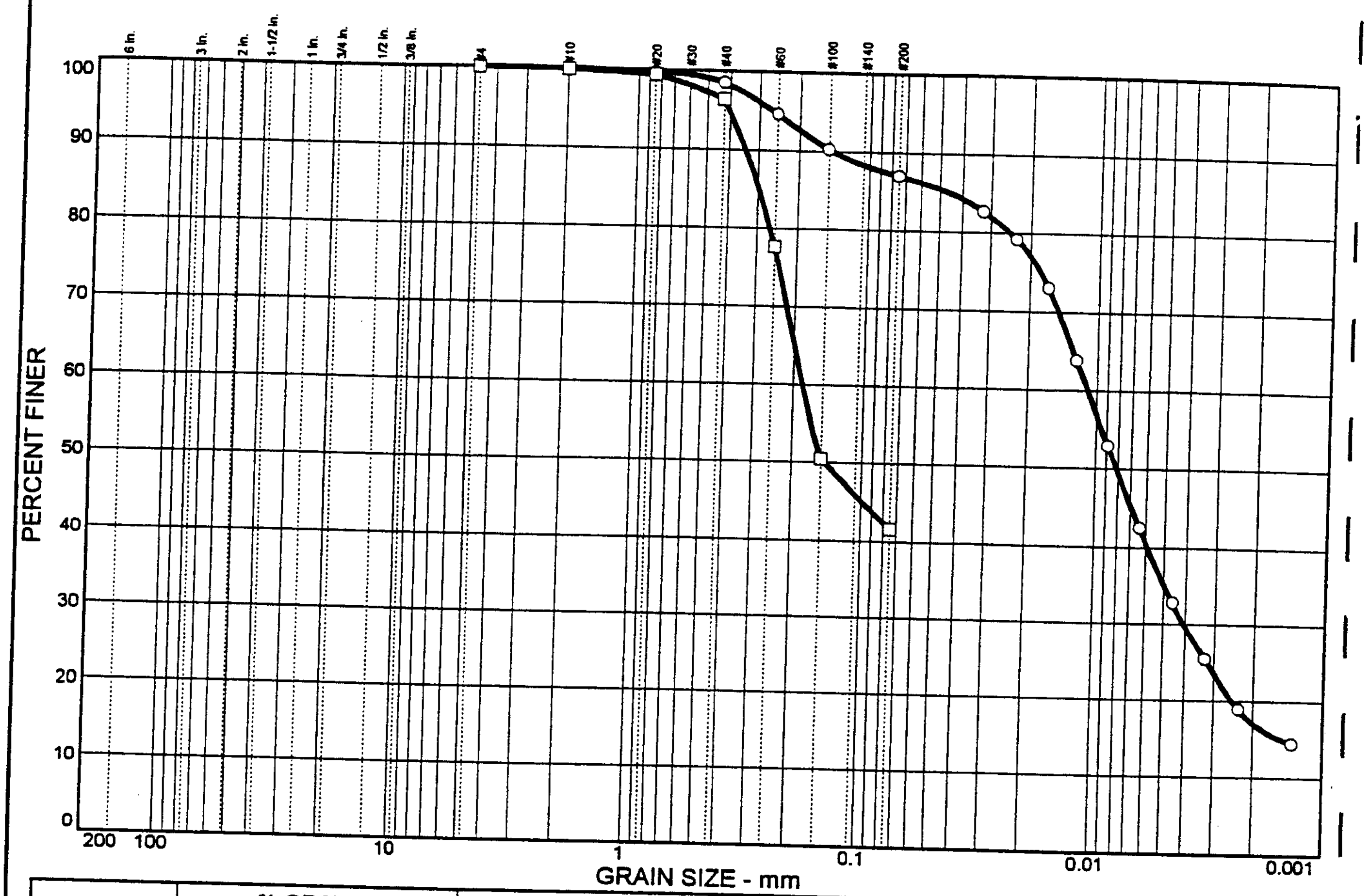
Figure No. **B-19**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	1.5	11.5	51.9	35.1
□	0.0	0.0	0.0	0.1	3.5	54.8	41.6	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	37	15	0.0455	0.0109	0.0081	0.0041	0.0015			
□			0.296	0.182	0.144					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Sandy CLAY	CL	33%
□ Very silty, fine SAND	SM	17%

Remarks:

○

□

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B132 **Sample No.:** S-5

□ **Source:** HC00-B132 **Sample No.:** S-10

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Figure No. **B-20**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	7.5	9.0	2.8	7.4	18.5	54.8	
□	0.0	0.0	4.6	5.1	13.2	43.5	33.6	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.74	0.151						
□			0.742	0.249	0.184					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Gravelly, sandy SILT	ML	15%
□ Very silty SAND	SM	14%

Remarks:

○

□

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B134 **Sample No.:** S-2

□ **Source:** HC00-B134 **Sample No.:** S-5

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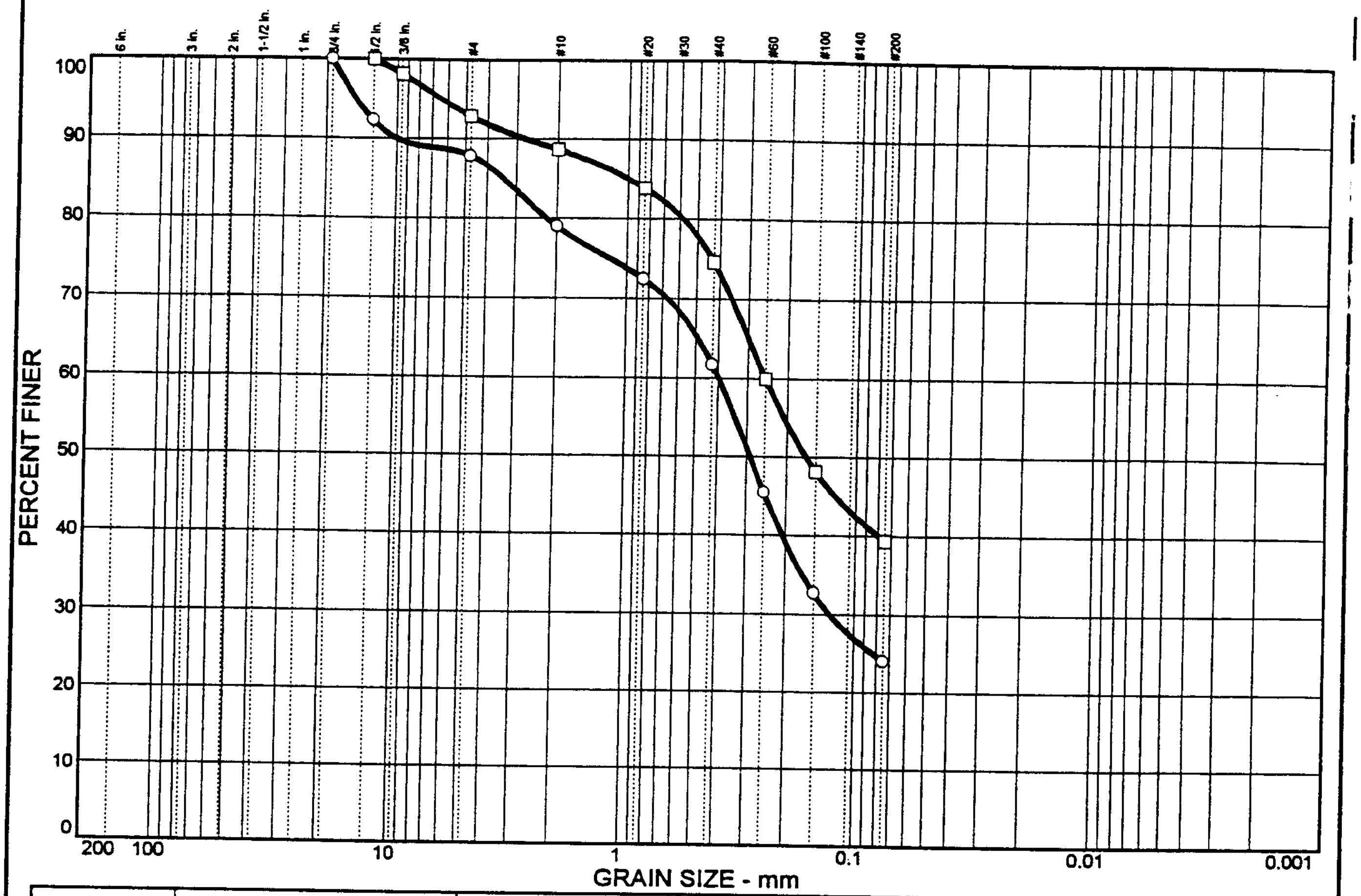
Figure No. **B-21**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	12.1	8.9	17.2	37.7	24.1	
□	0.0	0.0	7.2	4.1	14.1	35.3	39.3	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.39	0.397	0.288	0.128				
□			0.989	0.250	0.165					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Gravelly, silty SAND	SM	9%
□ Slightly gravelly, very silty,medium to coarse SAND	SM	14%

Remarks:
○
□

Project: Third Runway

Client: HNTB
○ **Source:** HC00-B138 **Sample No.:** S-5
□ **Source:** HC00-B300 **Sample No.:** S-4

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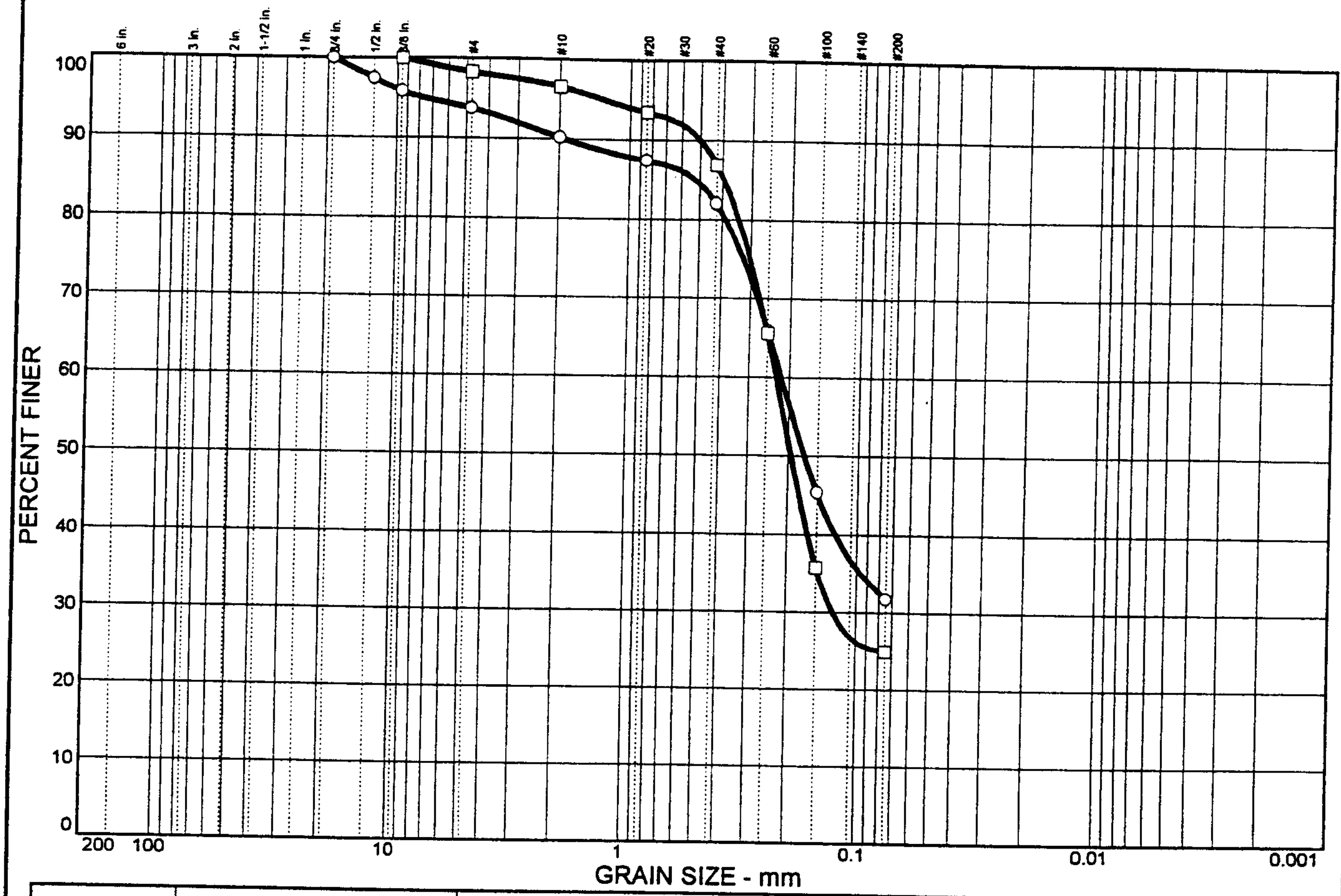
Figure No. B-22

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	6.2	3.6	8.2	50.3	31.7	
□	0.0	0.0	1.7	1.7	9.7	62.0	24.9	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.524	0.217	0.171					
□			0.395	0.228	0.194	0.126				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	20%
□ Silty, medium to fine SAND	SM	21%

Remarks:
○
□

Project: Third Runway West Wall

Client: HNTB
○ **Source:** HC00-B141 **Sample No.:** S-3
□ **Source:** HC00-B145 **Sample No.:** S-3

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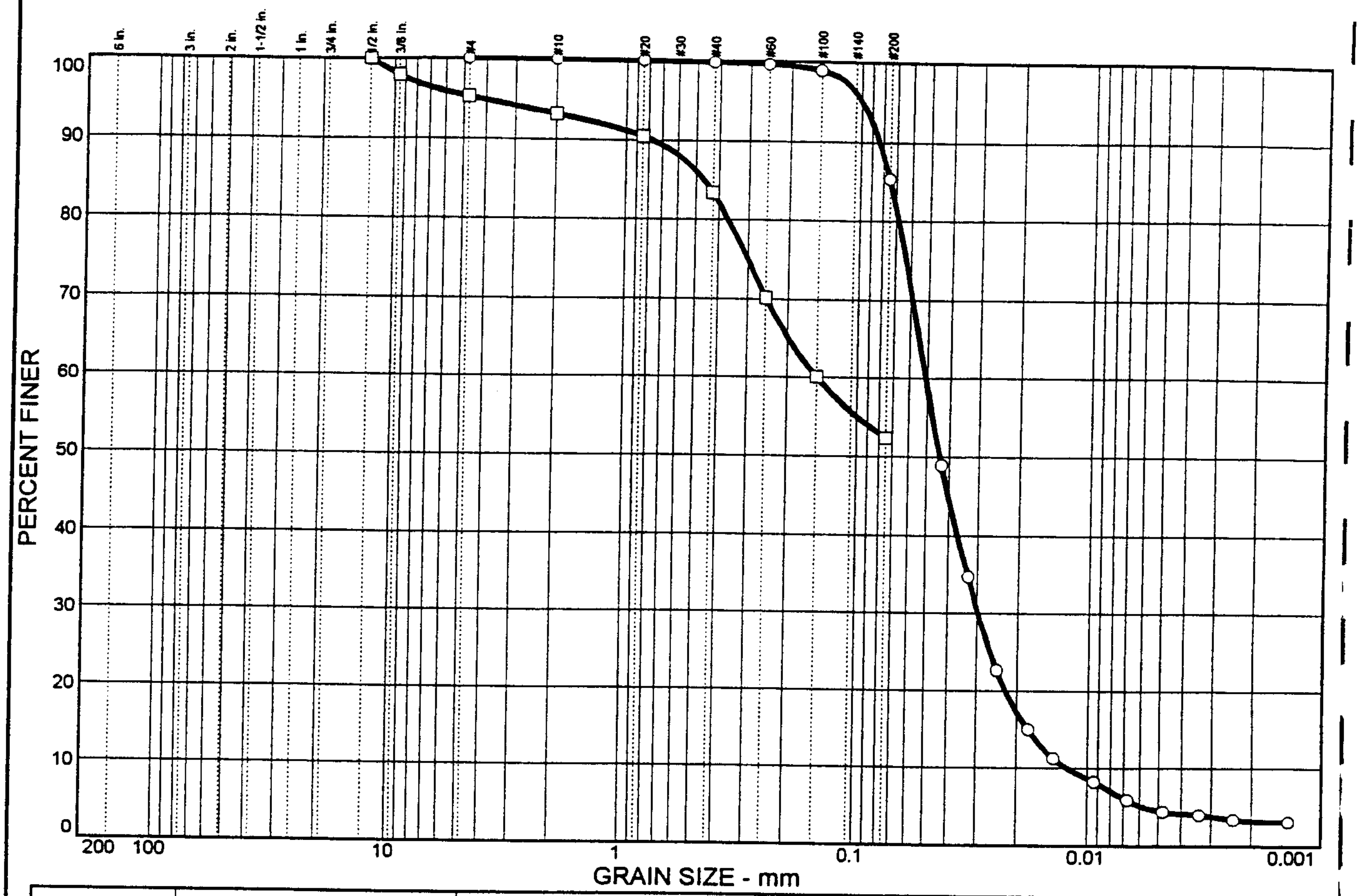
J4978-21 3/10/2000
Figure No. **B-23**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.0	0.2	14.5	80.7	4.6
□	0.0	0.0	4.7	2.1	9.8	30.9	52.5	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	25	NP	0.0746	0.0509	0.0439	0.0296	0.0178	0.0121	1.42	4.19
□			0.464	0.149						

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Sandy SILT	ML	26%
□ Very sandy SILT-CLAY	ML	14%

Remarks:

○

□

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B142 **Sample No.:** S-3

□ **Source:** HC00-B146 **Sample No.:** S-3

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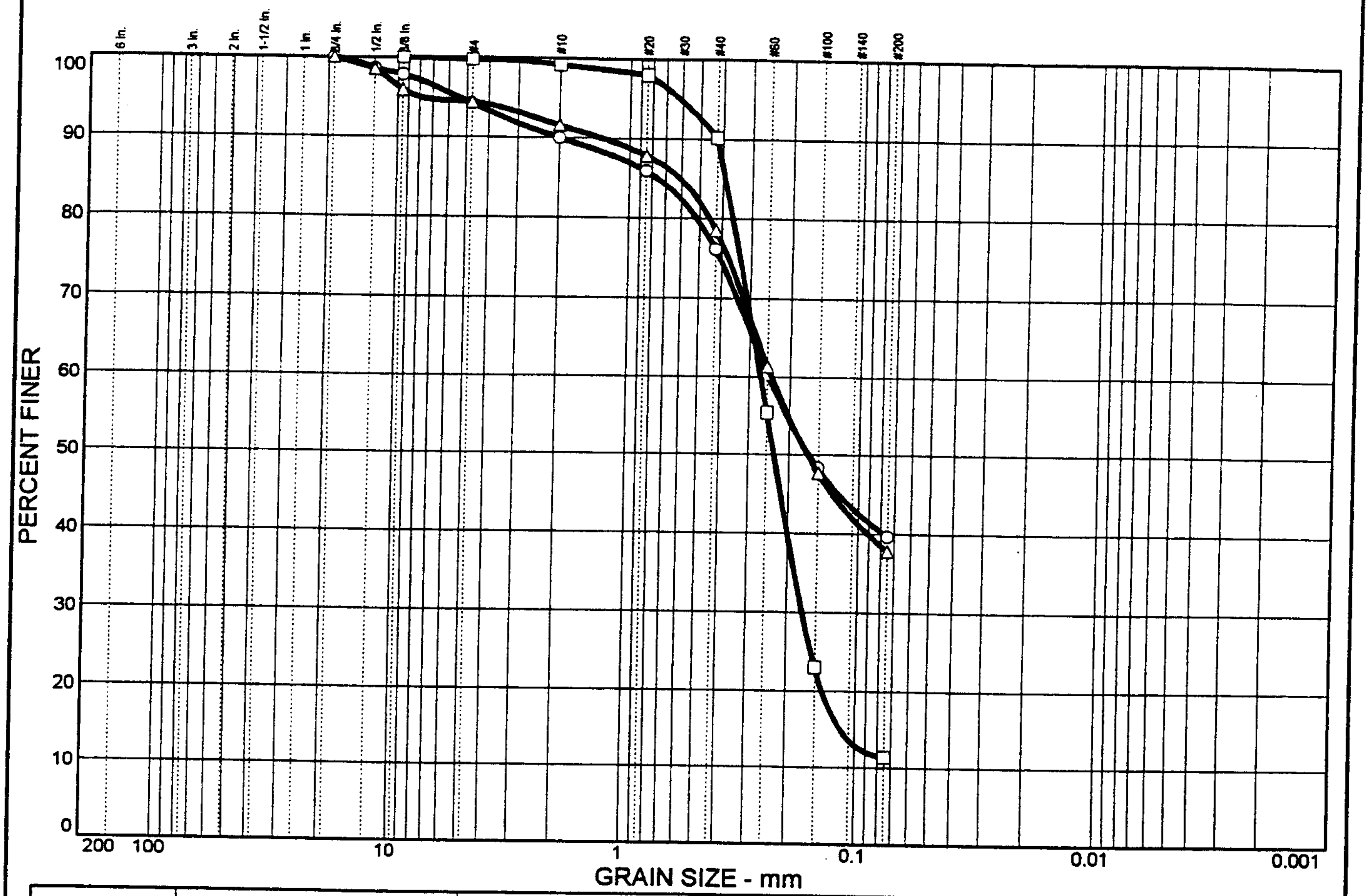
Figure No. *B-24*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	5.7	4.3	14.0	36.4	39.6	
□	0.0	0.0	0.3	0.6	8.9	78.8	11.4	
△	0.0	0.0	5.5	2.9	13.1	40.7	37.8	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.760	0.247	0.164					
□			0.391	0.267	0.232	0.172	0.116			
△			0.607	0.239	0.167					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	11%
□ Slightly silty, medium to fine SAND	SP-SM	26%
△ Slightly gravelly, very silty, medium to fine SAND	SM	13%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-B142 **Sample No.:** S-6

□ **Source:** HC00-B144 **Sample No.:** S-2

△ **Source:** HC00-B146 **Sample No.:** S-4

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Figure No. **B-25**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○							38.1	13.1
□	0.0	0.0	0.0	0.1	5.9	81.8	12.2	
△	0.0	0.0	5.3	3.0	17.5	46.5	27.7	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○					0.0674	0.0160	0.0060	0.0038		
□			0.307	0.209	0.186	0.142	0.0909			
△			0.695	0.297	0.231	0.0935				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○		15%
□ Silty, medium to fine SAND	SM	6%
△ Slightly gravelly, silty, medium to fine SAND	SM	15%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B302 **Sample No.:** S-5

□ **Source:** HC00-B303 **Sample No.:** S-2

△ **Source:** HC00-B303 **Sample No.:** S-7

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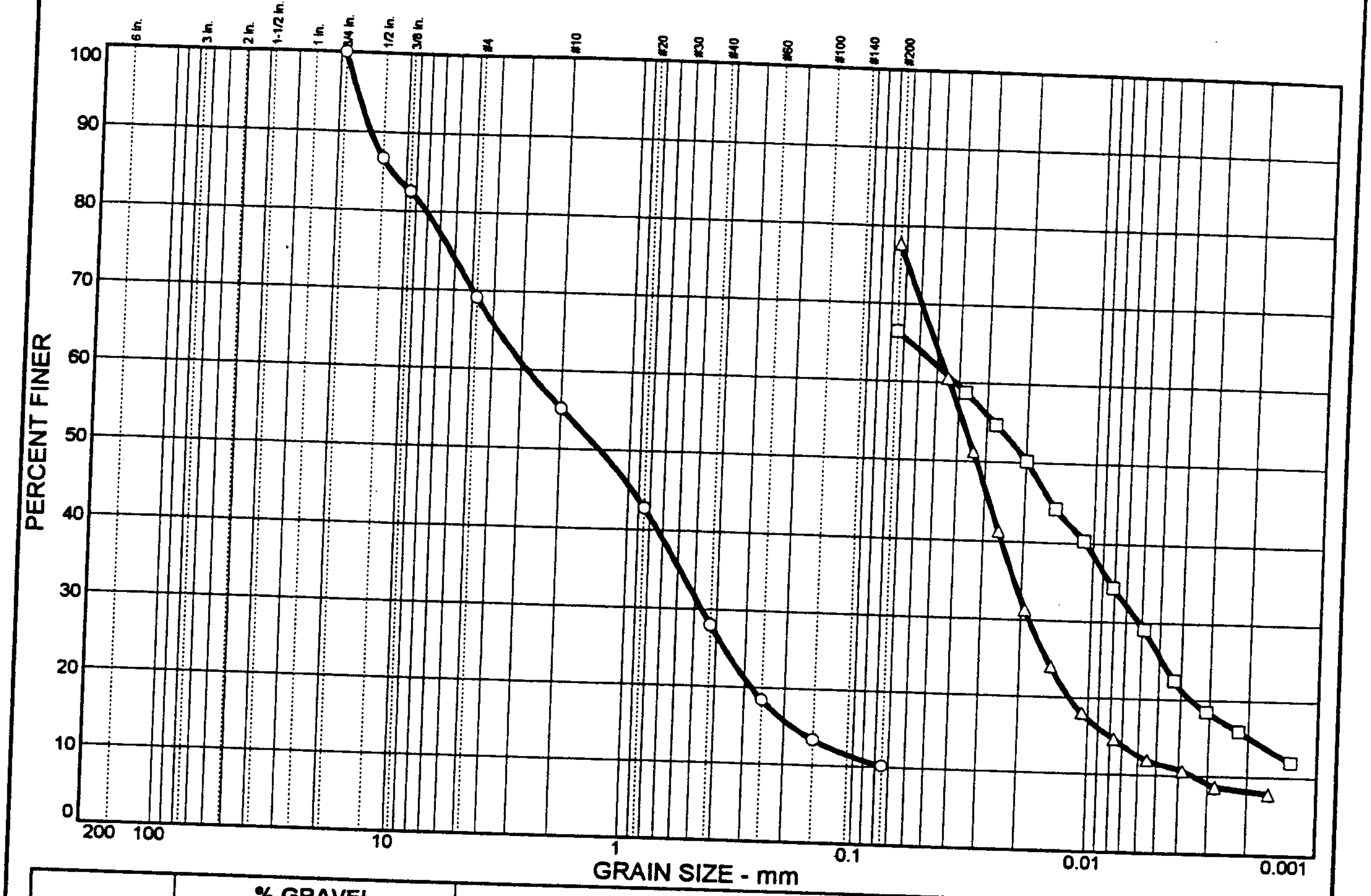
Figure No. B-26

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	30.9	13.9	27.2	17.8		
□							10.2	
△							40.8	25.6
							66.2	11.6

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			11.6	2.82	1.34	0.466	0.185			
□	26	10		0.0415	0.0198	0.0062	0.0019			
△	28	6		0.0441	0.0328	0.0185	0.0079	0.0034	2.26	12.84

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly silty, very gravelly SAND	SP-SM	3%
□	CL	19%
△	CL-ML	30%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B305 **Sample No.:** S-2

□ **Source:** HC00-B305 **Sample No.:** S-4

△ **Source:** HC00-B306 **Sample No.:** S-3

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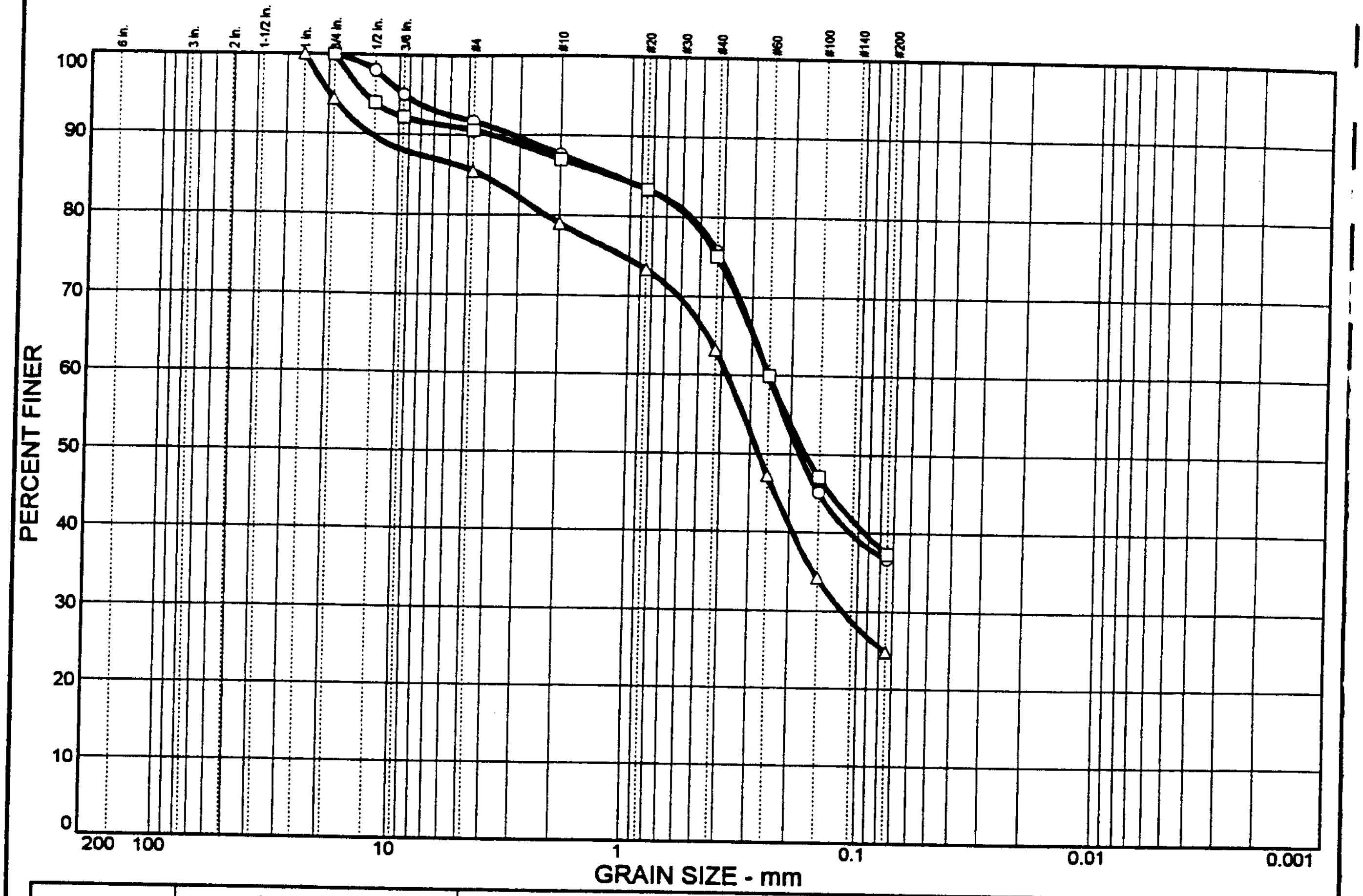
Figure No. B-27

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	8.3	4.1	11.9	39.0	36.7	
□	0.0	0.0	9.4	3.6	11.9	37.7	37.4	
△	0.0	5.5	9.0	6.5	15.8	38.4	24.8	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.17	0.251	0.182					
□			1.19	0.250	0.172					
△			4.35	0.377	0.273	0.116				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	16%
□ Slightly gravelly, very silty, medium to fine SAND	SM	15%
△ Gravelly, silty SAND	SM	8%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-B306 **Sample No.:** S-4

□ **Source:** HC00-B306 **Sample No.:** S-5

△ **Source:** HC00-B307 **Sample No.:** S-3

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Figure No. *B-28*

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.1	0.2	6.5	73.4	19.8	
□	0.0	7.8	14.2	5.2	13.6	32.8	26.4	
△	0.0	0.0	0.0	0.1	1.5	88.3	10.1	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.353	0.227	0.197	0.139				
□			13.9	0.441	0.301	0.114				
△			0.267	0.196	0.177	0.138	0.0959			

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, medium to fine SAND	SM	26
□ Gravelly, silty SAND	SM	17%
△ Slightly silty, fine SAND	SP-SM	31%

Remarks:
○
□
△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-A100	**Sample No.:** S-2
□ **Source:** HC00-A105	**Sample No.:** S-2
△ **Source:** HC00-A109	**Sample No.:** S-4

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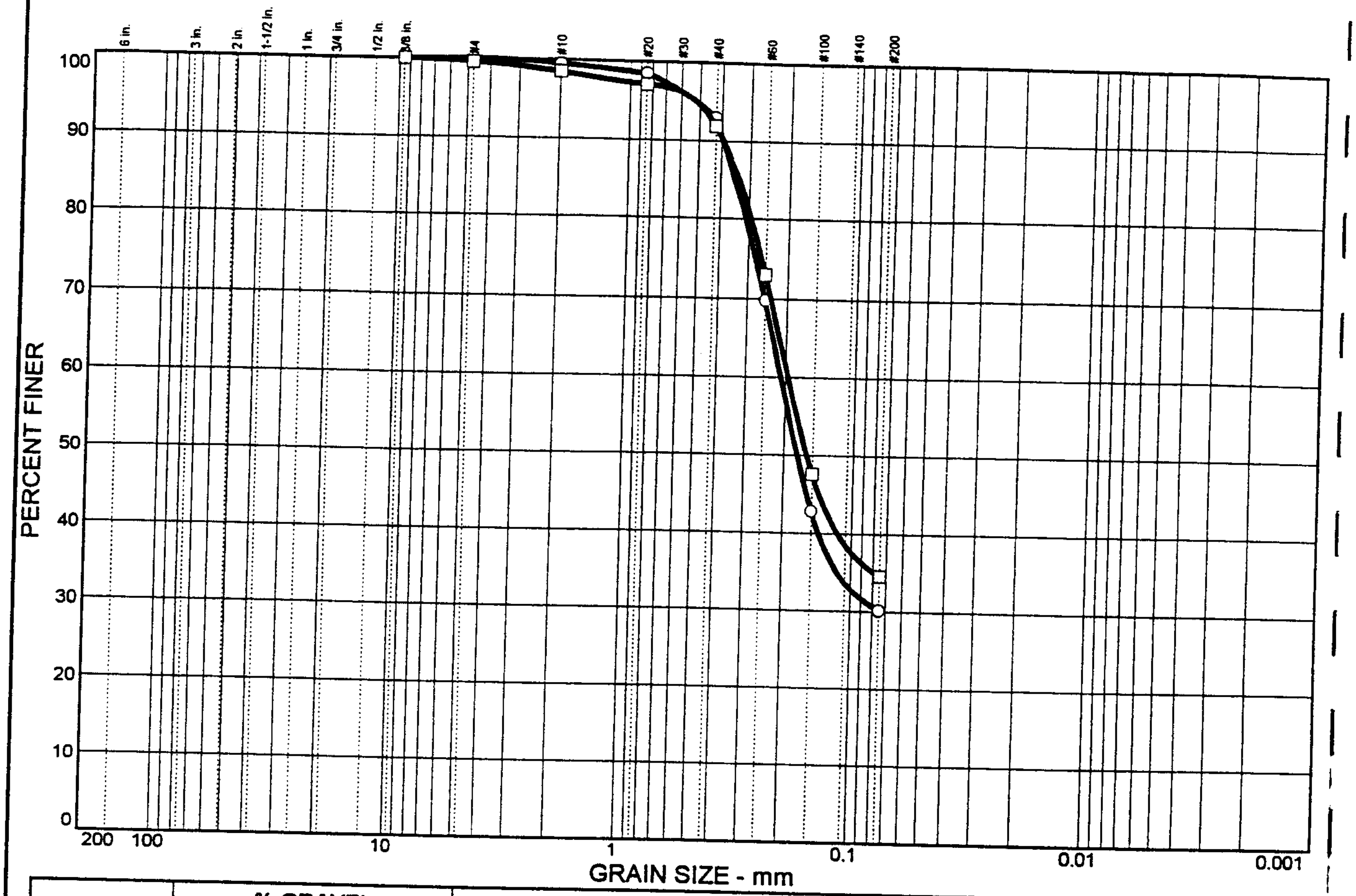
Figure No. *B-29*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.5	6.5	62.9	30.1	
☐	0.0	0.0	0.4	1.1	6.6	57.4	34.5	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.347	0.210	0.175					
☐			0.332	0.195	0.159					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Very silty, medium to fine SAND	SM	29%
☐ Very silty, medium to fine SAND	SM	39%

Remarks:

○

☐

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-A137 **Sample No.:** S-3

☐ **Source:** HC00-A143 **Sample No.:** S-3

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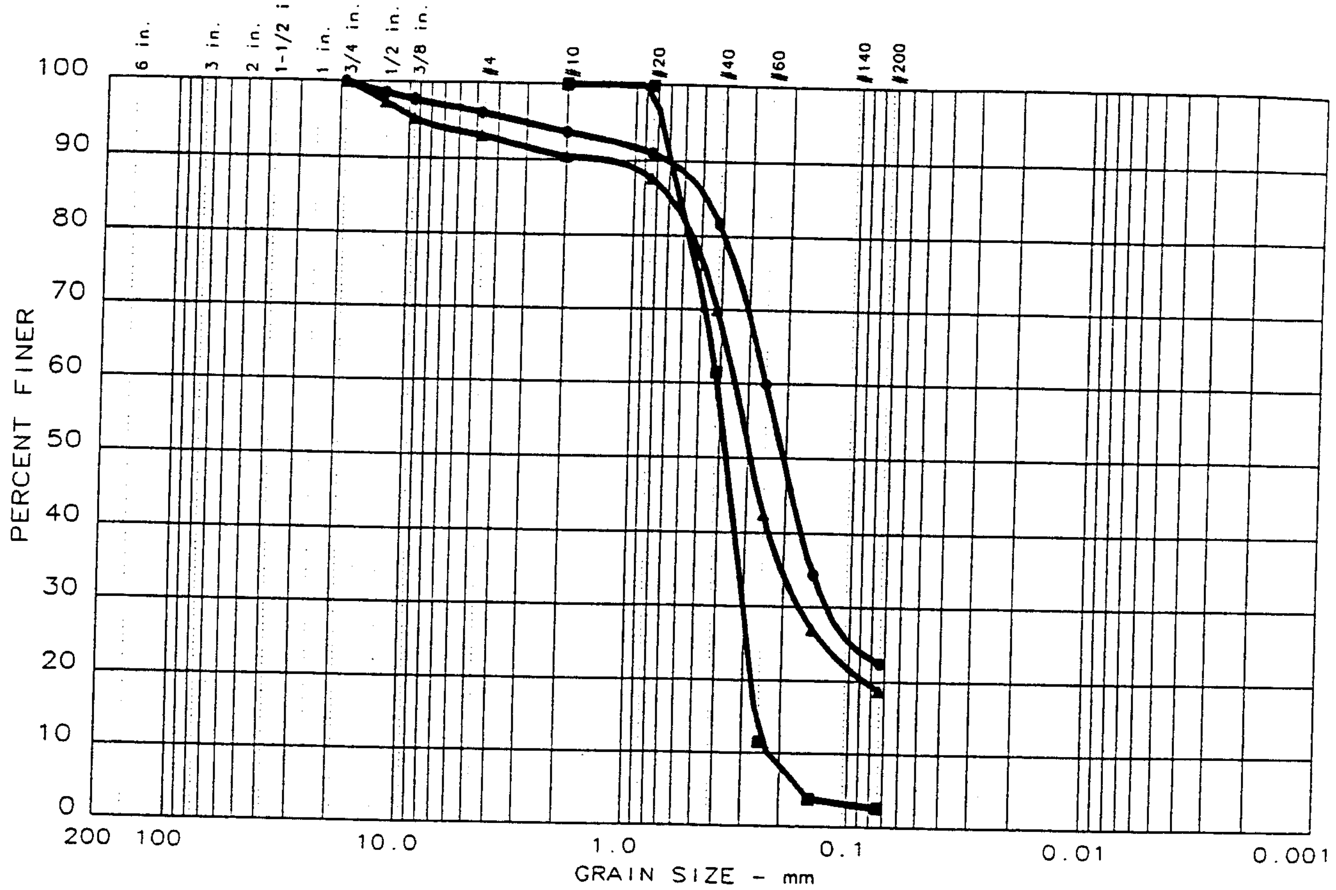
Figure No. *B-30*

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	3.8	73.7	22.5	
▲	0.0	6.9	74.4	18.7	
■	0.0	0.0	97.4	2.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.48	0.25	0.21	0.129				
▲			0.68	0.35	0.29	0.172				
■			0.63	0.41	0.37	0.303	0.2591	0.2257	0.98	1.8

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Silty SAND	SM	16%
▲ Slightly gravelly, silty SAND	SM	15%
■ SAND	SP	25%

Remarks:

Project: 3rd Runway Phase II

● Location: HC98-TP4, S-4

▲ Location: HC98-TP6, S-6

■ Location: HC98-TP7, S-8

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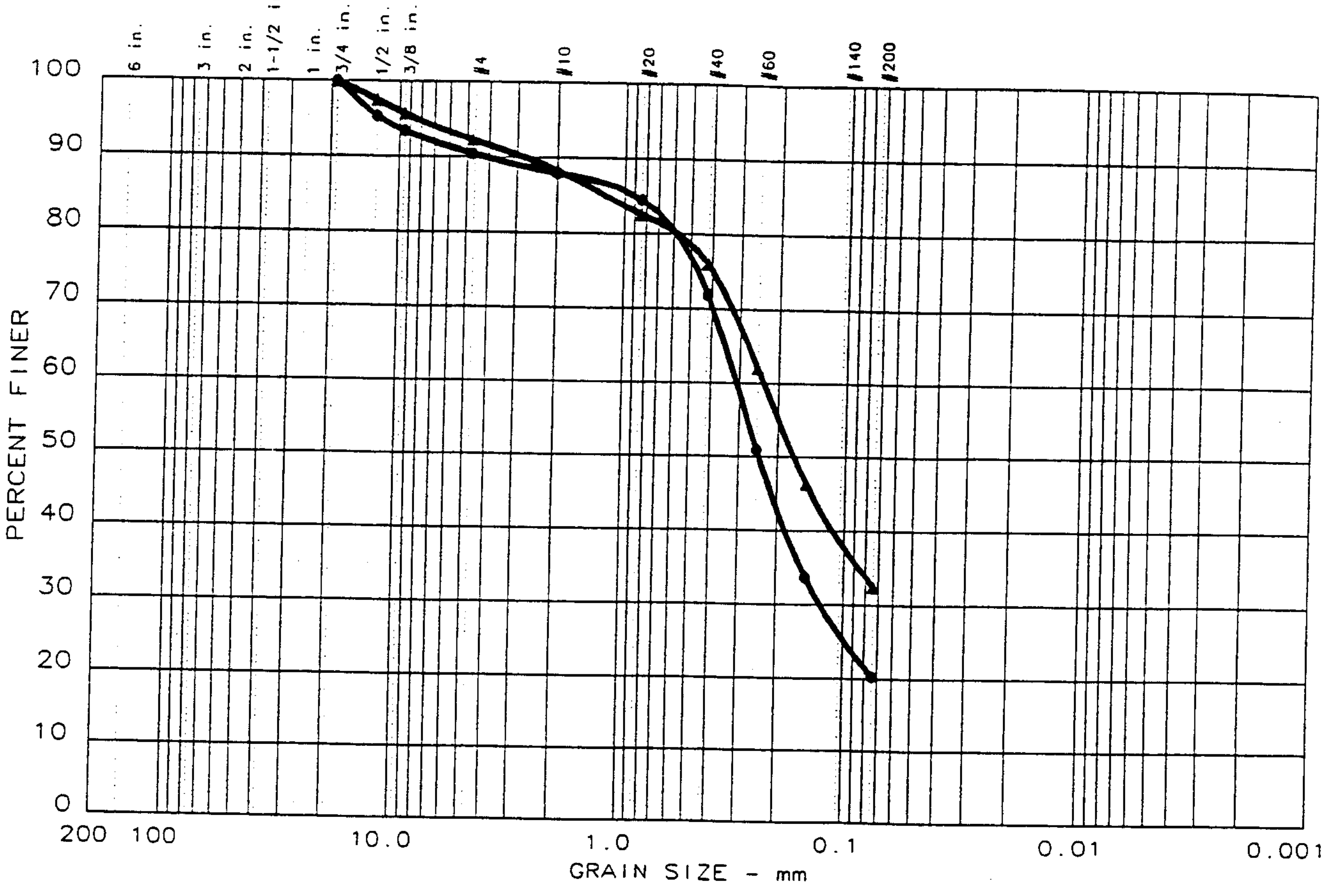
J-4978-06 8/4/98

Figure **B-31**

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	9.5	70.2	20.3	
▲	0.0	7.7	59.8	32.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.89	0.31	0.24	0.126				
▲			1.22	0.23	0.17					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Slightly gravelly, silty SAND	SM	15%
▲ Slightly gravelly, very silty SAND	SM	11%

Remarks:

Project: 3rd Runway Phase II

● Location: HC98-TP8, S-5

▲ Location: HC98-TP10, S-4

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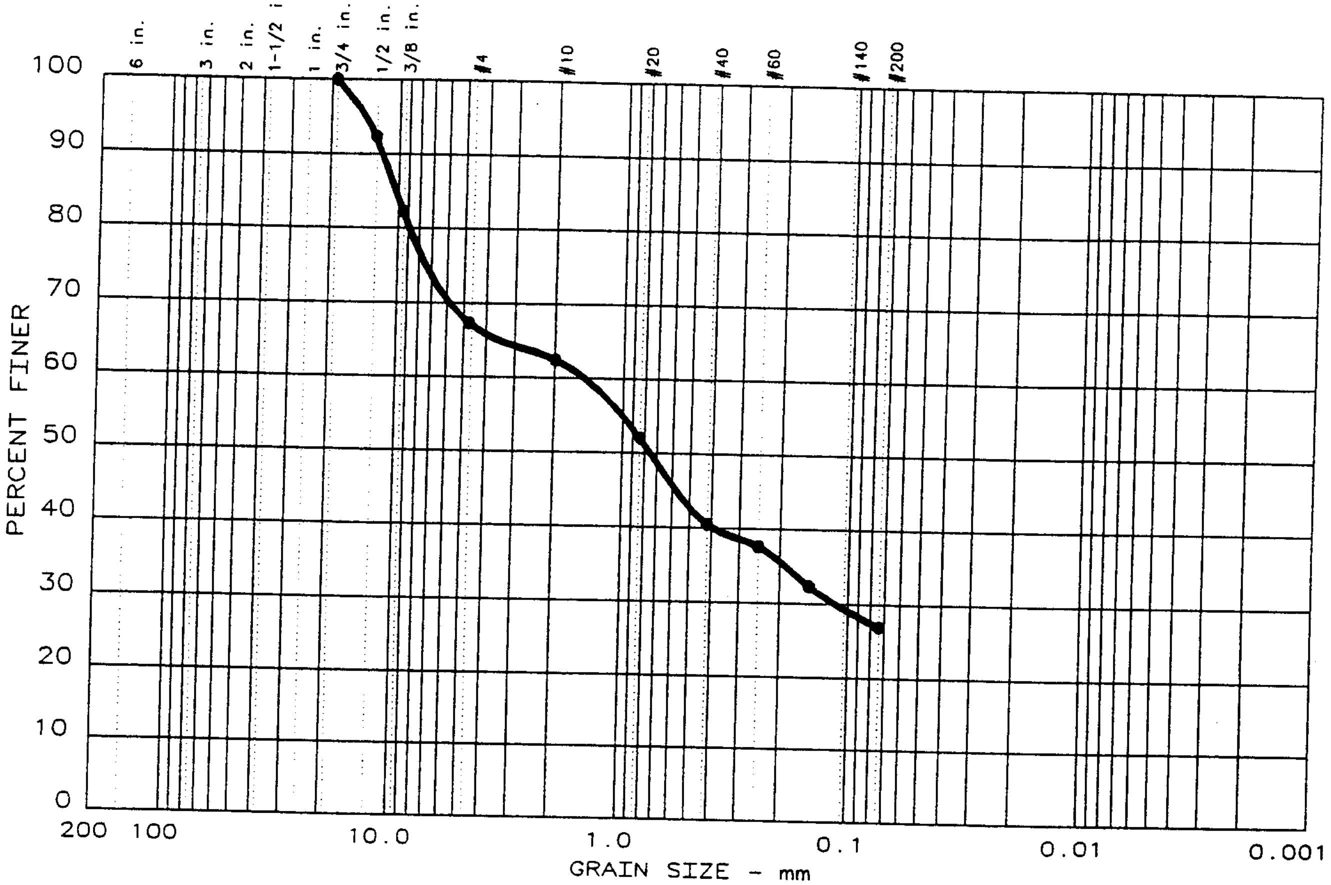
Figure **B-32**

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	32.7	40.3	27.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			10.23	1.48	0.75	0.114				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Silty, very gravelly SAND	SM	19%

Remarks:

Project: 3rd Runway

● Location: HC99-TP1, S-2

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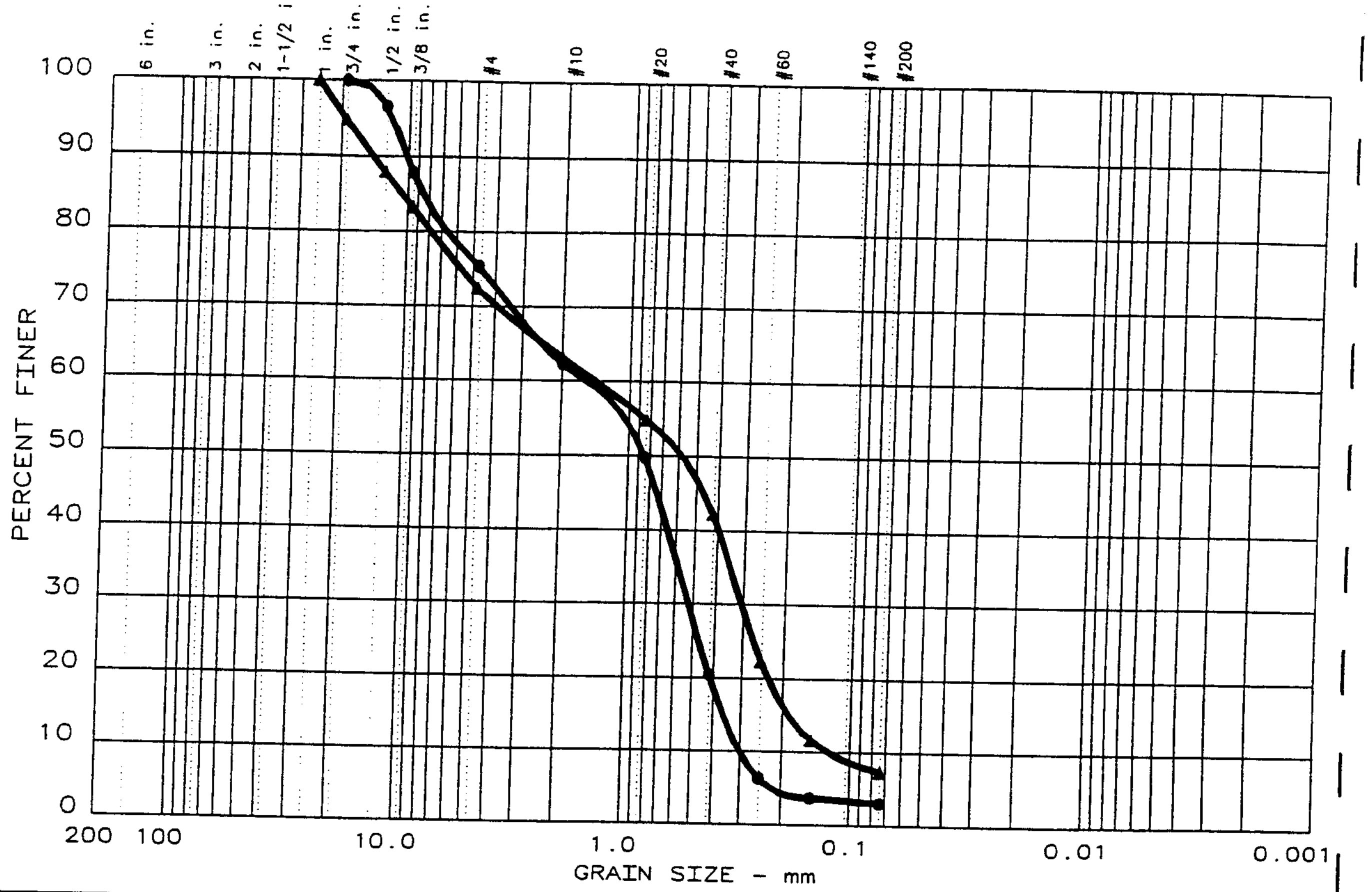
Figure **B-33**

GRAIN SIZE DISTRIBUTION TEST REPORT



	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	24.7	72.3	3.0	
▲	0.0	27.5	65.1	7.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			8.51	1.55	0.85	0.523	0.3610	0.3027	0.58	5.1
▲			10.47	1.41	0.58	0.305	0.1862	0.1245	0.53	11.4

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● Gravelly SAND	SP	18%
▲ Slightly silty, gravelly SAND	SP-SM	15%

Remarks:

Project: 3R 99 Fill
● Location: HC99 -TP1, S-3
▲ Location: HC99 -TP9, S-4

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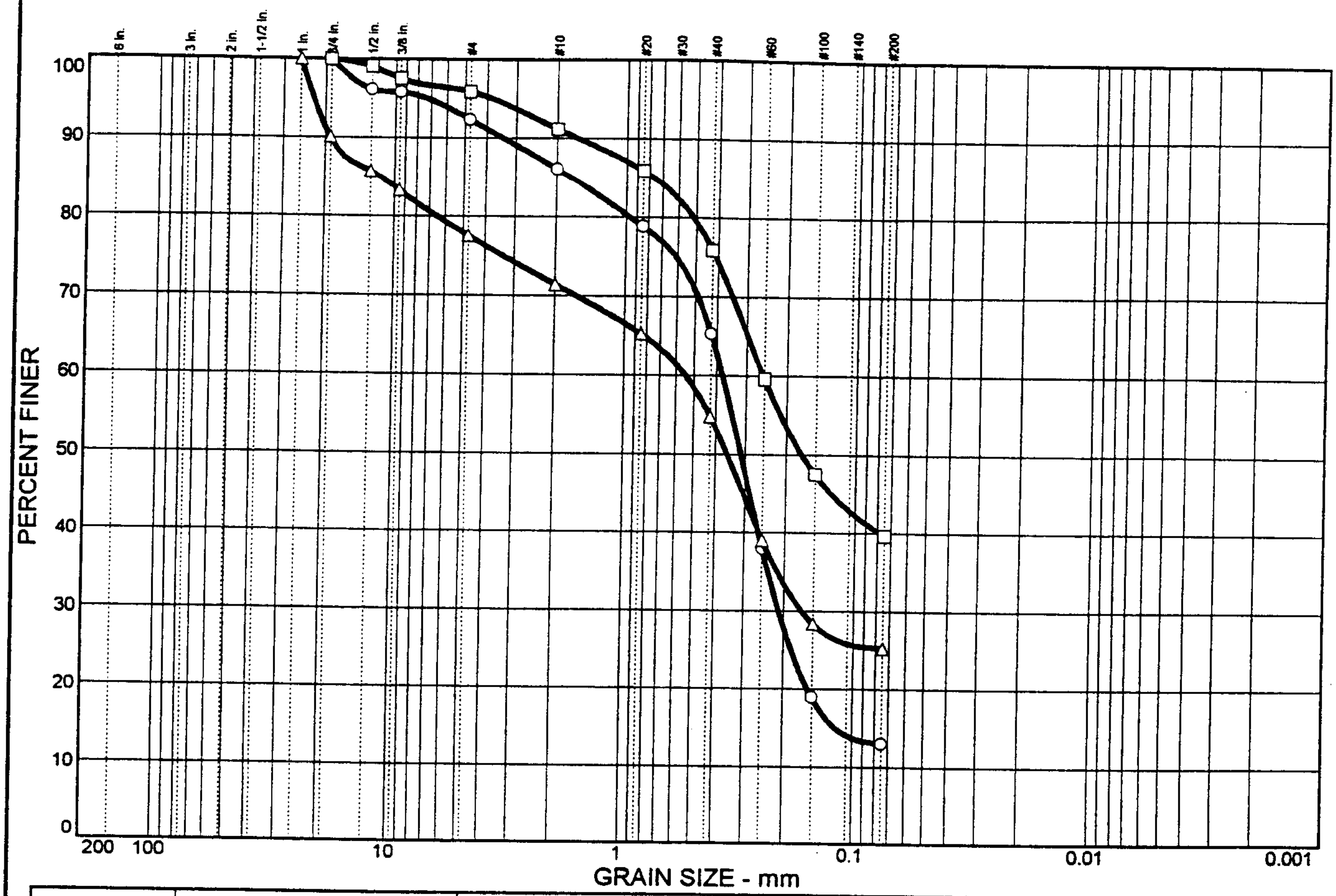
Figure *B-34*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	7.6	6.3	20.8	52.2	13.1	
□	0.0	0.0	4.0	4.8	15.3	36.3	39.6	
△	0.0	9.9	12.5	6.2	16.5	29.7	25.2	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.74	0.378	0.312	0.211	0.118			
□			0.762	0.253	0.171					
△			11.4	0.545	0.357	0.168				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slighlty gravelly, silty SAND	SM	13%
□ Very silty, medium to fine SAND	SM	12%
△ Gravelly, silty SAND	SM	15%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-TP100	**Sample No.:** S-2
□ **Source:** HC00-TP102	**Sample No.:** S-3
△ **Source:** HC00-TP103	**Sample No.:** S-1

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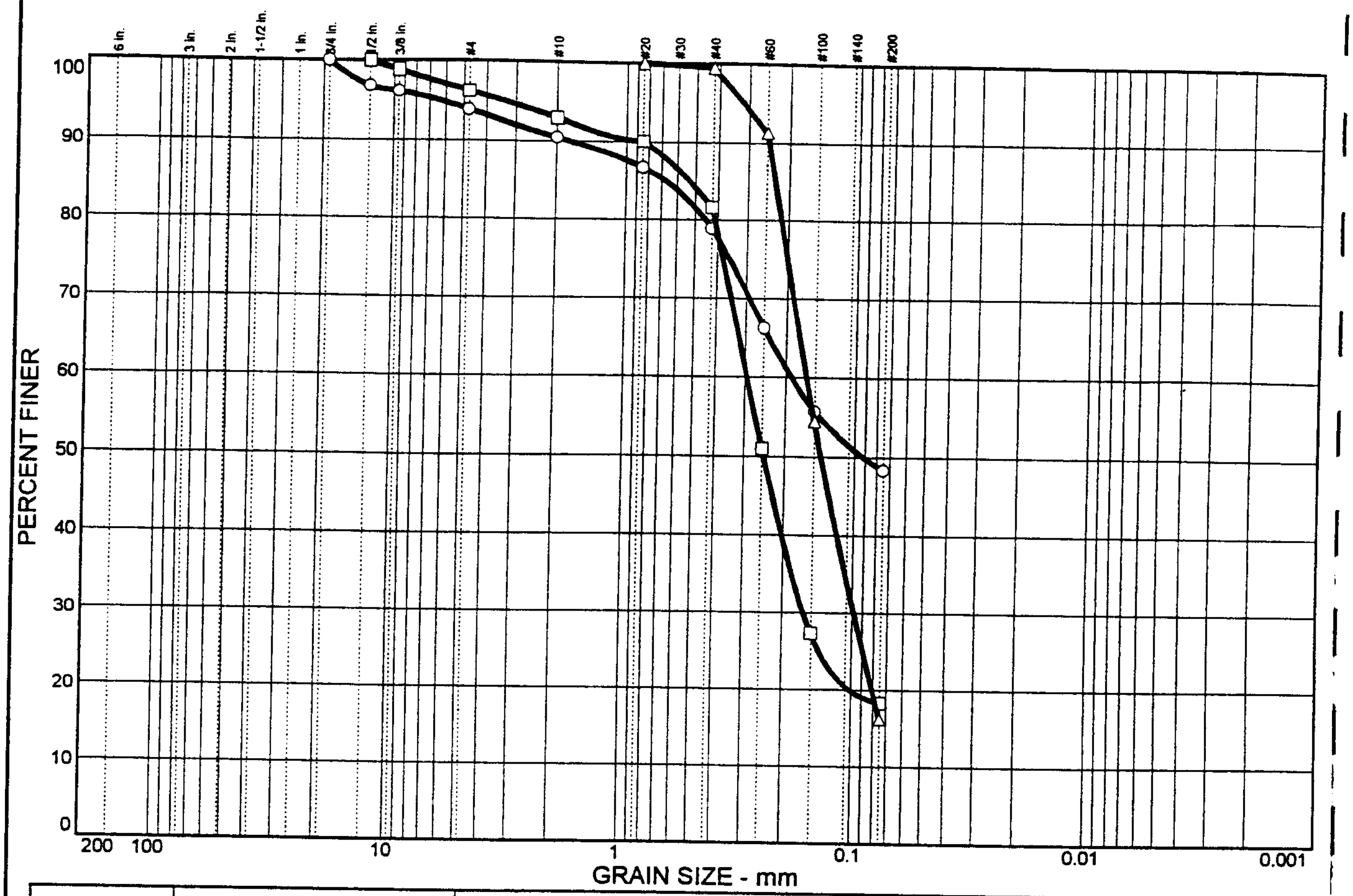
Figure No. *B-35*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	6.1	3.4	11.6	30.6	48.3	
□	0.0	0.0	3.7	3.3	11.3	63.4	18.3	
△	0.0	0.0	0.0	0.0	0.5	83.3	16.2	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.672	0.189	0.0916					
□			0.531	0.293	0.246	0.162				
△			0.230	0.163	0.140	0.0982				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	26%
□ Silty, medium to fine SAND	SM	20%
△ Silty, fine SAND	SM	27%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-TP104 **Sample No.:** S-3

□ **Source:** HC00-TP106 **Sample No.:** S-4

△ **Source:** HC00-TP108 **Sample No.:** S-4

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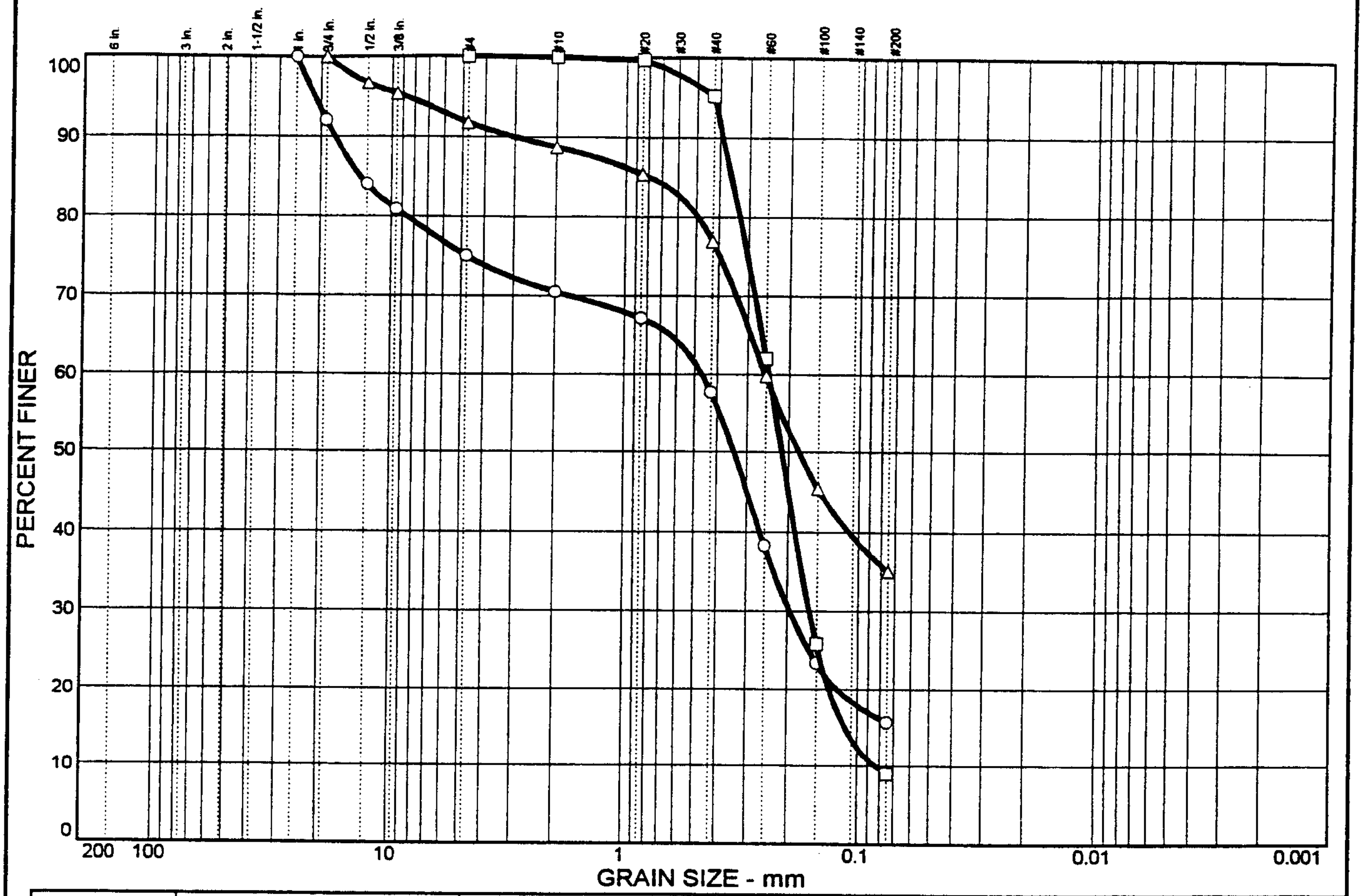
Figure No. **B-36**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	7.9	17.0	4.6	12.8	42.1	15.6	
□	0.0	0.0	0.0	0.0	4.8	86.2	9.0	
△	0.0	0.0	8.2	3.0	11.8	41.9	35.1	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			13.5	0.465	0.338	0.195				
□			0.356	0.243	0.213	0.161	0.113	0.0831	1.29	2.92
△			0.776	0.251	0.181					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, gravelly, medium to fine SAND	SM	17%
□ Slightly silty, fine SAND	SP-SM	6%
△ Slightly gravelly, very silty, medium to fine SAND	SM	13%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-TP114 **Sample No.:** S-2
□ **Source:** HC00-TP116 **Sample No.:** S-2
△ **Source:** HC00-TP118 **Sample No.:** S-3

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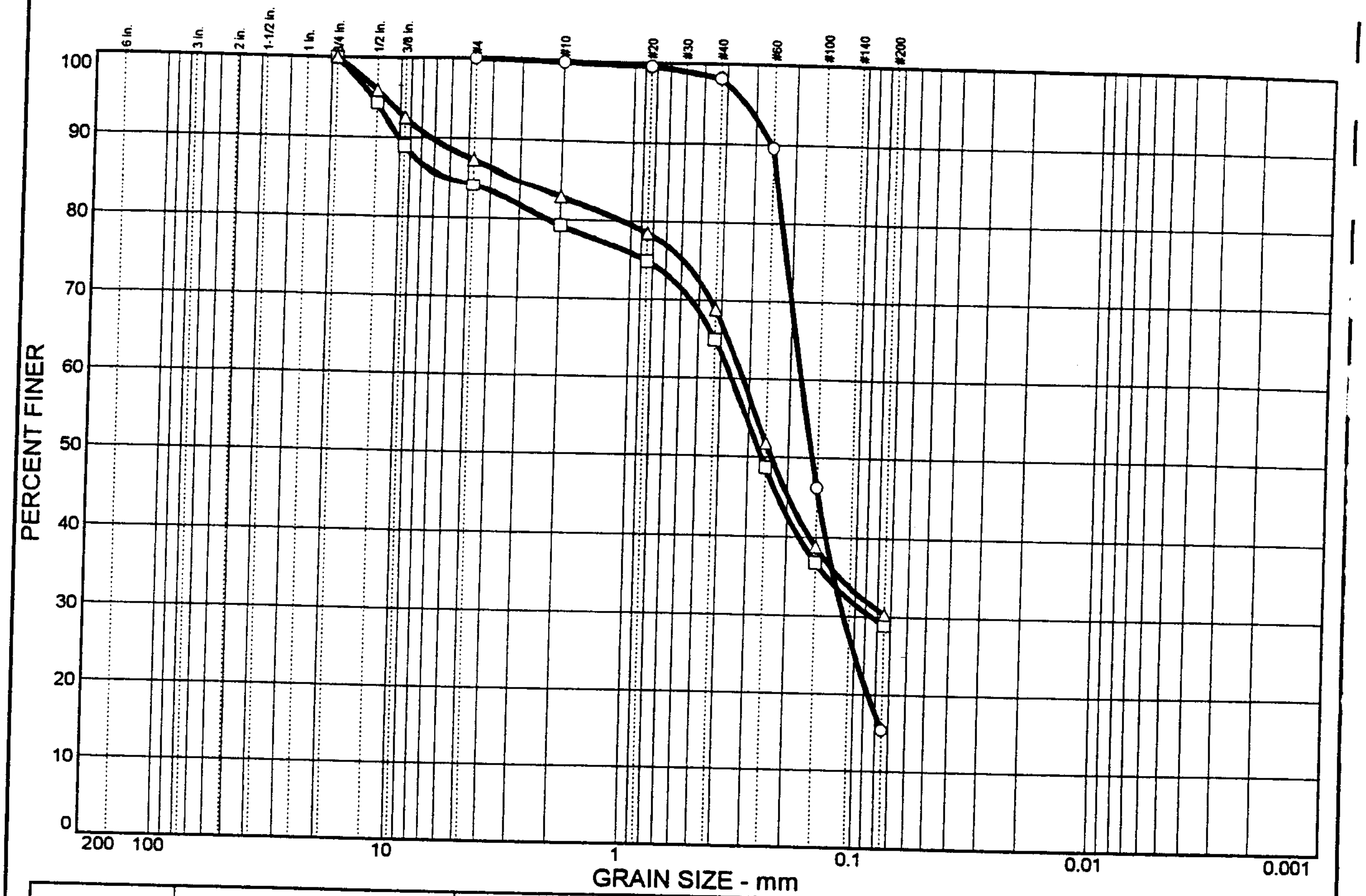
Figure No. *B-37*

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	0.0	0.2	1.6	82.8	15.4	
□	0.0	0.0	15.7	5.0	14.3	36.1	28.9	
△	0.0	0.0	12.6	4.5	14.1	38.5	30.3	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.238	0.179	0.158	0.112				
□			5.80	0.357	0.261	0.0851				
△			3.04	0.319	0.236					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Silty, fine SAND	SM	13%
□ Gravelly, silty SAND	SM	14%
△ Gravelly, very silty, medium to fine SAND	SM	10%

Remarks:

○

□

△

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-TP120 **Sample No.:** S-1

□ **Source:** HC00-TP123 **Sample No.:** S-3

△ **Source:** HC00-TP125 **Sample No.:** S-3

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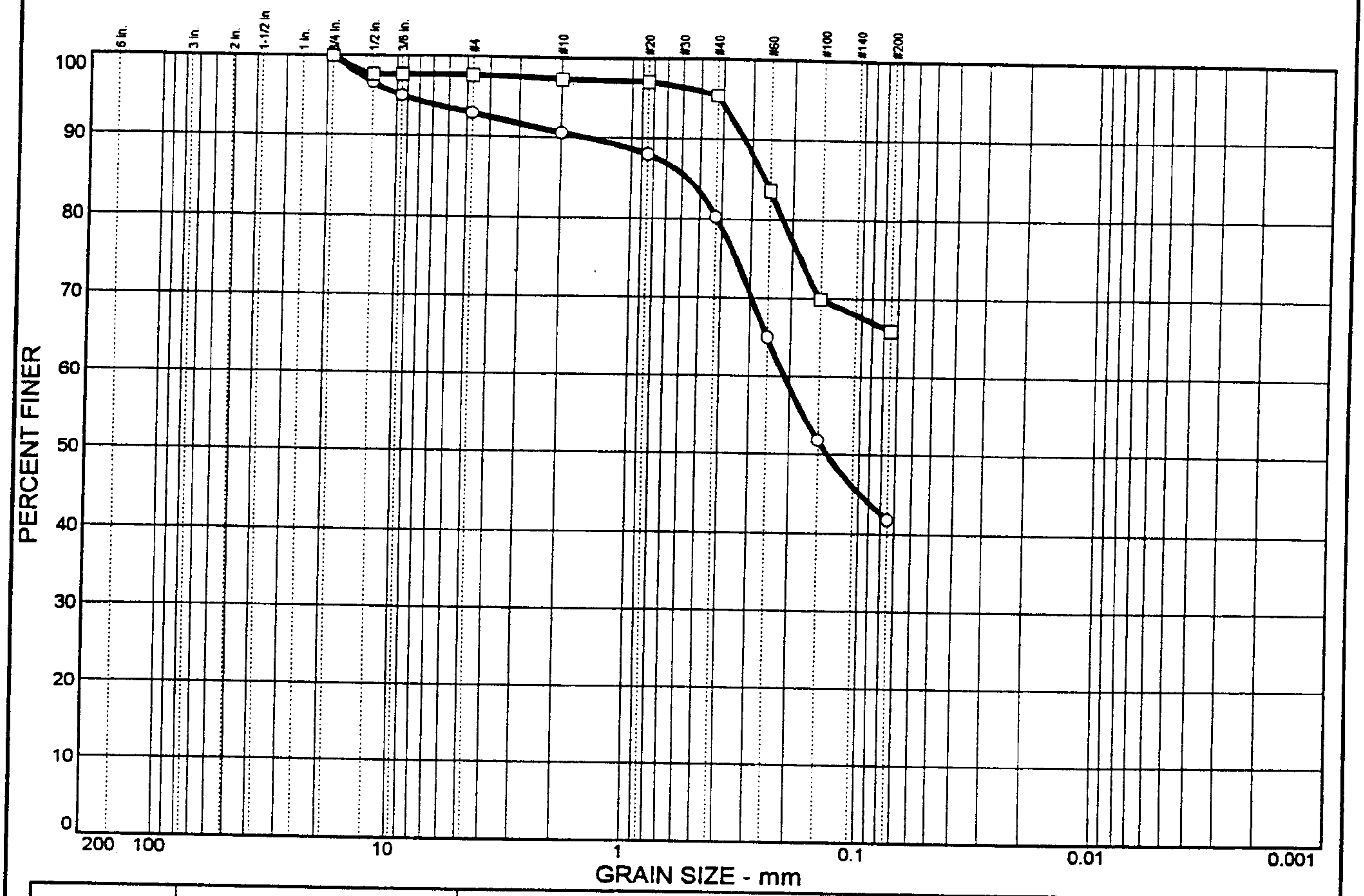
Figure No. B-38

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	7.1	2.3	10.3	38.6	41.7	
□	0.0	0.0	2.3	0.3	1.9	29.7	65.8	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.564	0.211	0.137					
□			0.263							

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Slightly gravelly, very silty, medium to fine SAND	SM	13%
□ Very sandy SILT	ML	22%

Remarks:

○

□

Project: Third Runway Westside

Client: HNTB

○ **Source:** HC00-TP127 **Sample No.:** S-3

□ **Source:** HC00-TP129 **Sample No.:** S-2

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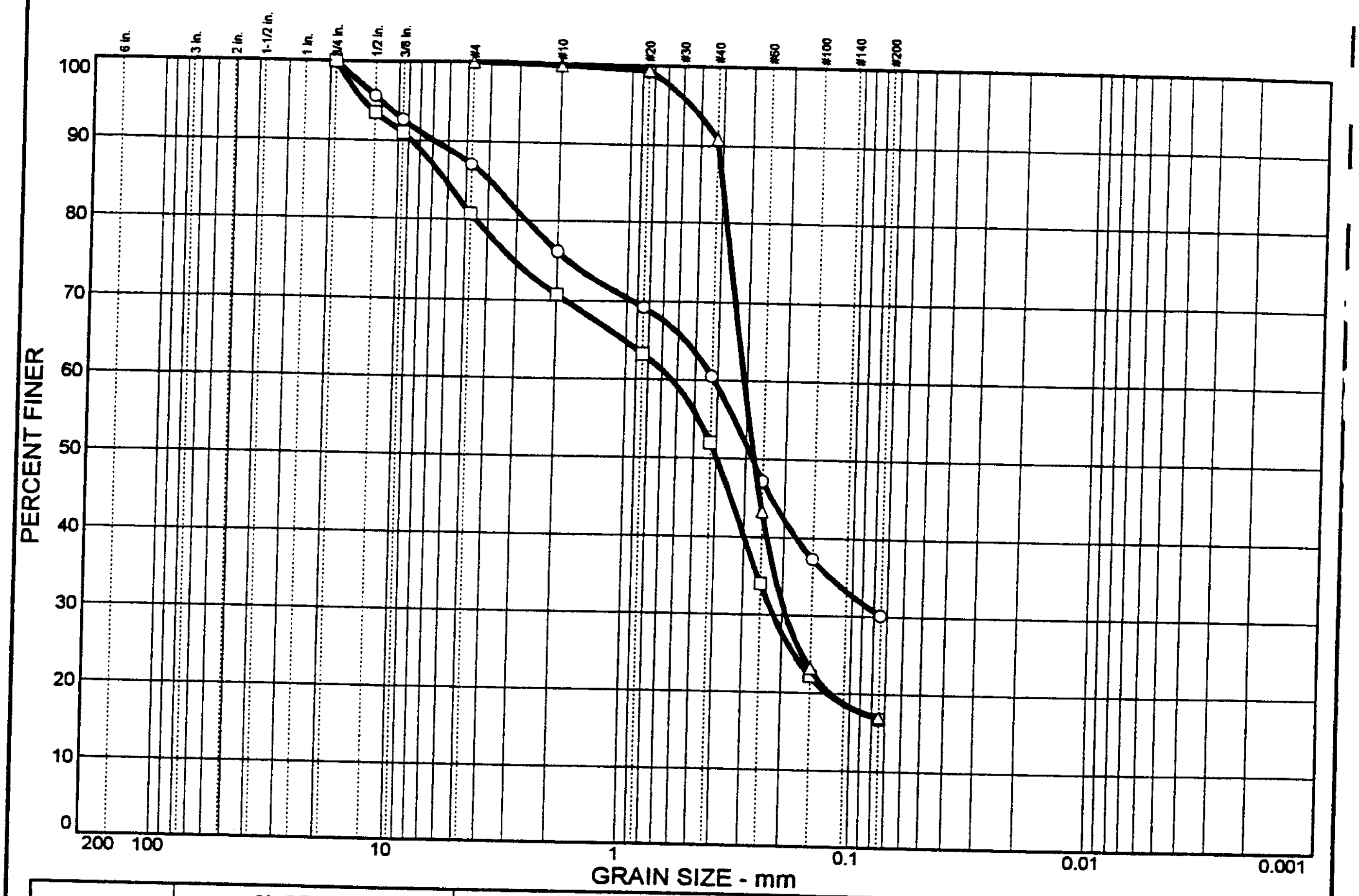
Figure No. **B-39**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	13.0	10.8	15.7	30.4	30.1	
□	0.0	0.0	19.2	10.0	18.8	35.3	16.7	
△	0.0	0.0	0.0	0.2	8.9	74.0	16.9	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.97	0.415	0.279					
□			6.17	0.632	0.397	0.218				
△			0.401	0.309	0.274	0.192				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Gravelly, very silty SAND	SM	27%
□ Silty, gravelly SAND	SM	11%
△ Silty, medium to fine SAND	SM	19%

Remarks:

○

□

△

Project: Third Runway

Client: HNTB

○ **Source:** HC00-TP130	**Sample No.:** S-1
□ **Source:** HC00-TP133	**Sample No.:** S-1
△ **Source:** HC00-TP137	**Sample No.:** S-3

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Figure No. **B-40**

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	9.1	5.4	5.2	16.2	38.6	25.5	
□	0.0	4.2	11.2	5.0	14.3	42.1	23.2	
△	0.0	13.7	4.6	2.4	10.8	47.6	20.9	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			4.27	0.366	0.266	0.112				
□			5.13	0.354	0.264	0.123				
△			13.1	0.327	0.253	0.137				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Gravelly, silty SAND	SM	17%
□ Gravelly, silty SAND	SM	20%
△ Gravelly, silty, medium to fine SAND	SM	13%

Remarks:

○

□

△

Project: Third Runway South End

Client: HNTB

○ **Source:** HC00-TP202 **Sample No.:** S-3

□ **Source:** HC00-TP203 **Sample No.:** S-3

△ **Source:** HC00-TP204 **Sample No.:** S-2

HARTCROWSER

J-4978-23 3/14/2000

Figure No. B-41

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	12.8	10.3	14.1	28.3	34.5	
□	0.0	0.0	0.0	0.0	17.4	80.6	2.0	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			4.13	0.323	0.200					
□			0.468	0.354	0.325	0.267	0.215	0.191	1.05	1.85

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Gravelly, very silty SAND	SM	22%
□ Medium to fine SAND	SP	9%

Remarks:

○

□

Project: Third Runway South End

Client: HNTB

○ **Source:** HC00-TP221 **Sample No.:** S-2

□ **Source:** HC00-TP224 **Sample No.:** S-1

HARTCROWSER

J-4978-23 6/15/2000

Figure No. B-42

PARTICLE SIZE DISTRIBUTION TEST REPORT

	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.7	0.4	7.6	56.9	33.4	
□	0.0	0.0	10.5	3.0	12.2	45.9	28.4	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.346	0.196	0.160					
□			1.39	0.278	0.216	0.0920				

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Very silty, medium to fine SAND	SM	30%
□ Slightly gravelly, silty, medium to fine SAND	SM	22%

Remarks:

○

□

Project: Third Runway

Client: HNTB

○ **Source:** *HC00-TP307* **Sample No.:** S-4

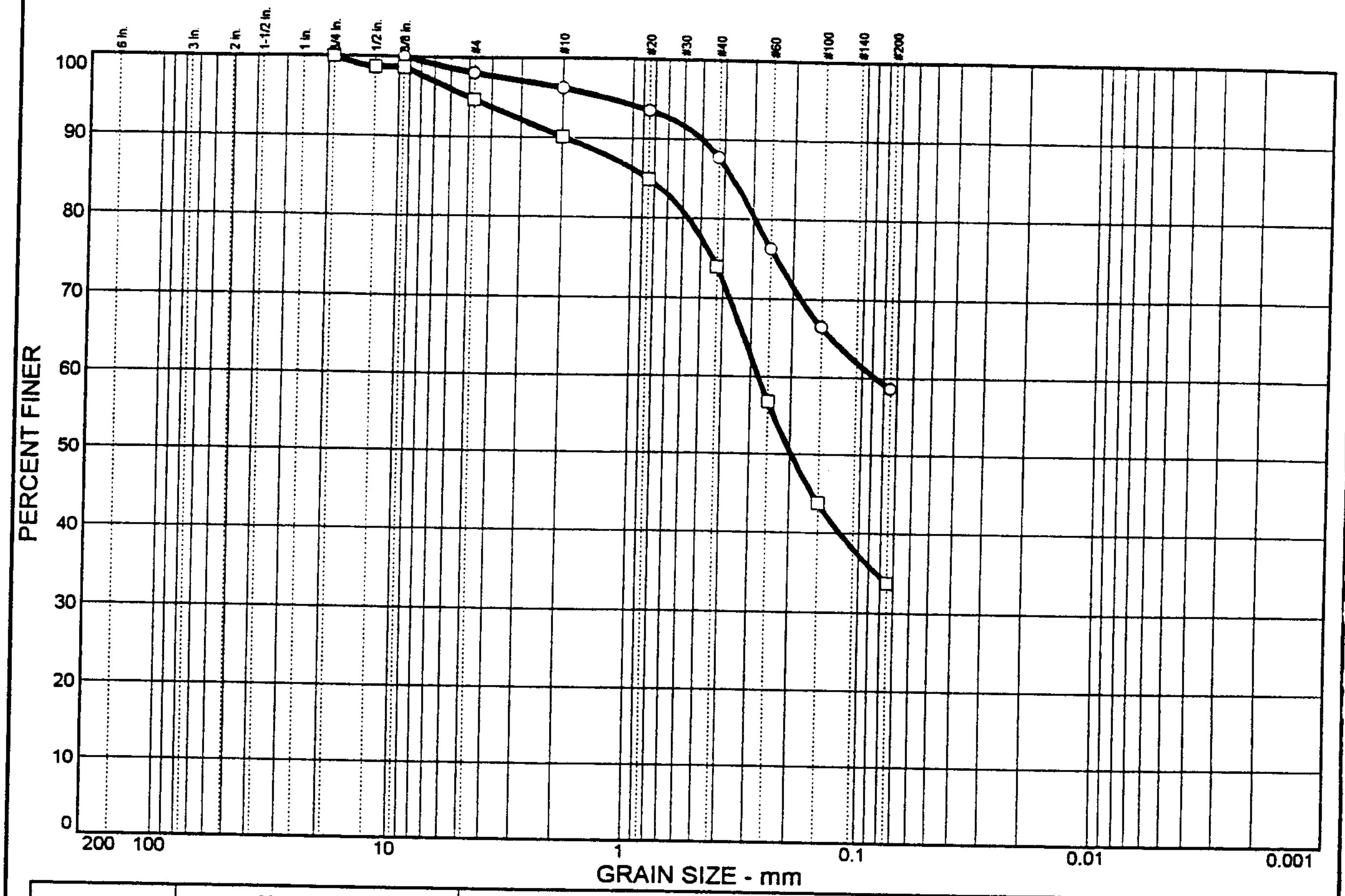
□ **Source:** *HC00-TP311* **Sample No.:** S-2

HARTCROWSER

J-4978-26 5/11/2000

Figure No. B-43

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% + 3"	% GRAVEL		% SAND			% FINES	
		CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
○	0.0	0.0	1.9	1.8	8.6	29.1	58.6	
□	0.0	0.0	5.2	4.7	16.2	40.2	33.7	

☒	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.368	0.0872						
□			0.860	0.276	0.197					

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
○ Very sandy SILT	ML	16%
□ Slightly gravelly, very silty, medium to fine SAND	SM	13%

Remarks:

○

□

Project: Third Runway

Client: HNTB

○ **Source:** *HC00-TP318* **Sample No.:** S-3

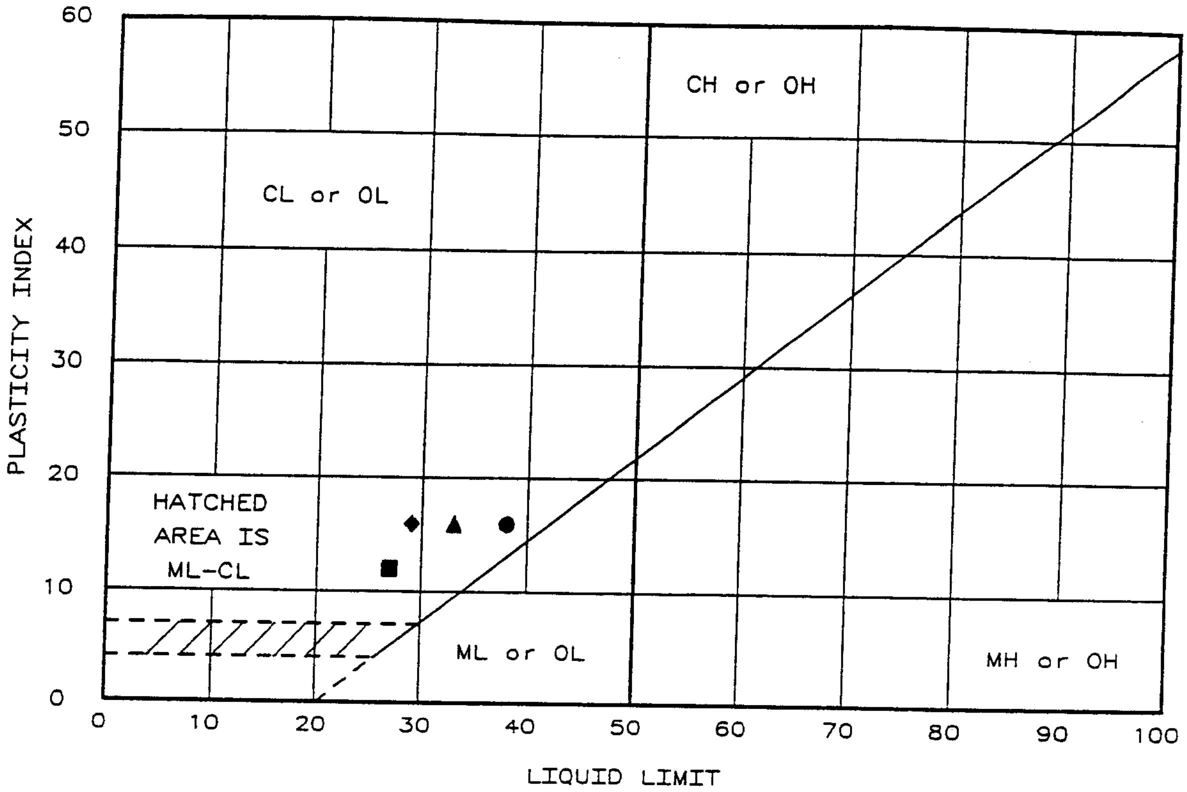
□ **Source:** *HC00-TP319* **Sample No.:** S-3

HARTCROWSER

J-4978-26 5/11/2000

Figure No. ***B-44***

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	ASTM D 2487-90
● HC99-B45, S-2	38	22	16		Slightly sandy CLAY
▲ HC99-B45, S-3	33	17	16		Slightly sandy CLAY
■ HC99-B45, S-4	27	15	12		Slightly sandy CLAY
◆ HC99-B37, S-3	29	13	16		Sandy, clayey PEAT

Remarks:

Project: 3rd Runway

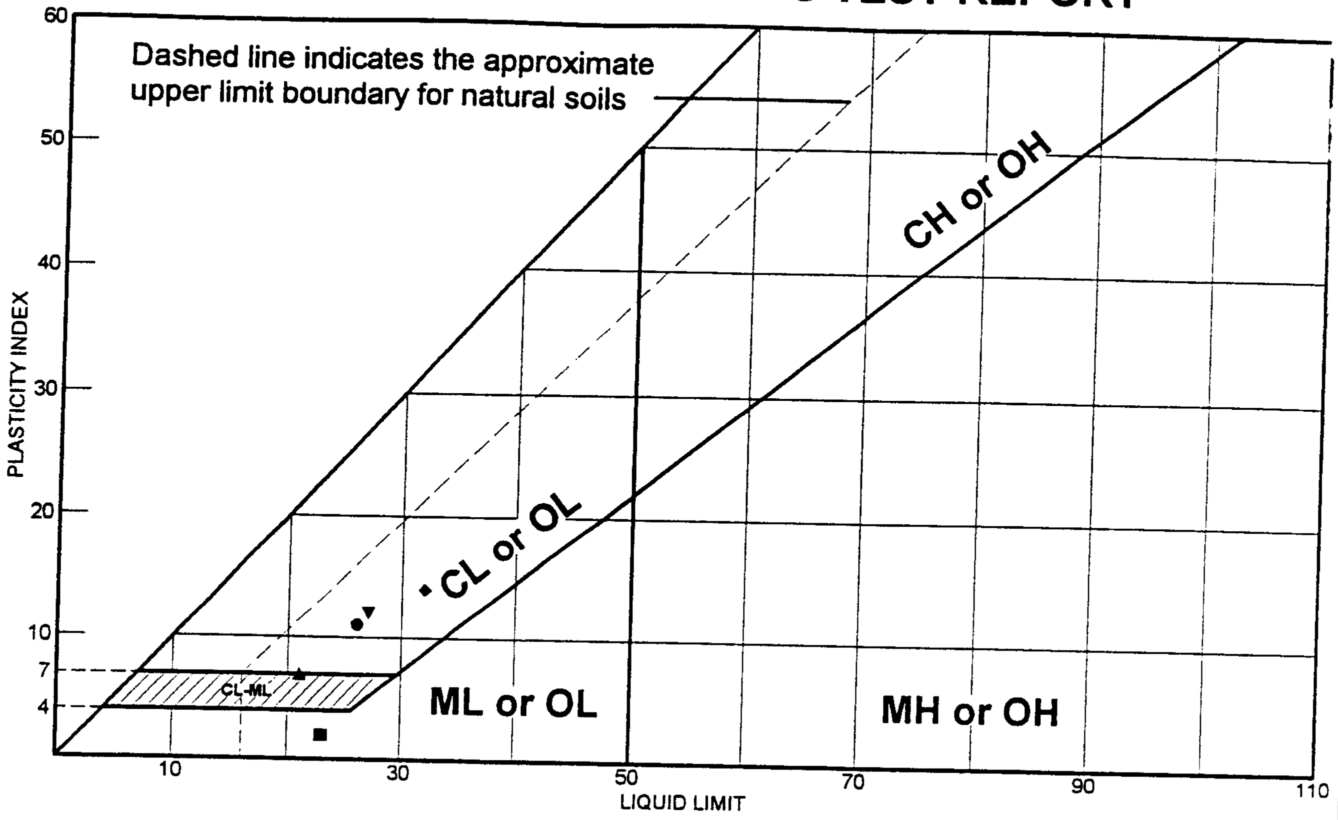
Client:

Location: SeatTac Airpot, Washington

HARTCROWSER

J-4978-06 5/6/99
Figure **B-45**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B107 Sample No.: S-2 Lean CLAY	26	15	11		CL
■ Source: HC00-B140 Sample No.: S-4 SILT	23	21	2		ML
▲ Source: HC00-B142 Sample No.: S-4 CLAY-SILT	21	14	7		CL-ML
◆ Source: HC00-B146 Sample No.: S-2 Lean CLAY	32	18	14		CL
▼ Source: HC00-A137 Sample No.: S-5 Lean CLAY	27	15	12		CL

Remarks:
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Project: Third Runway Westside

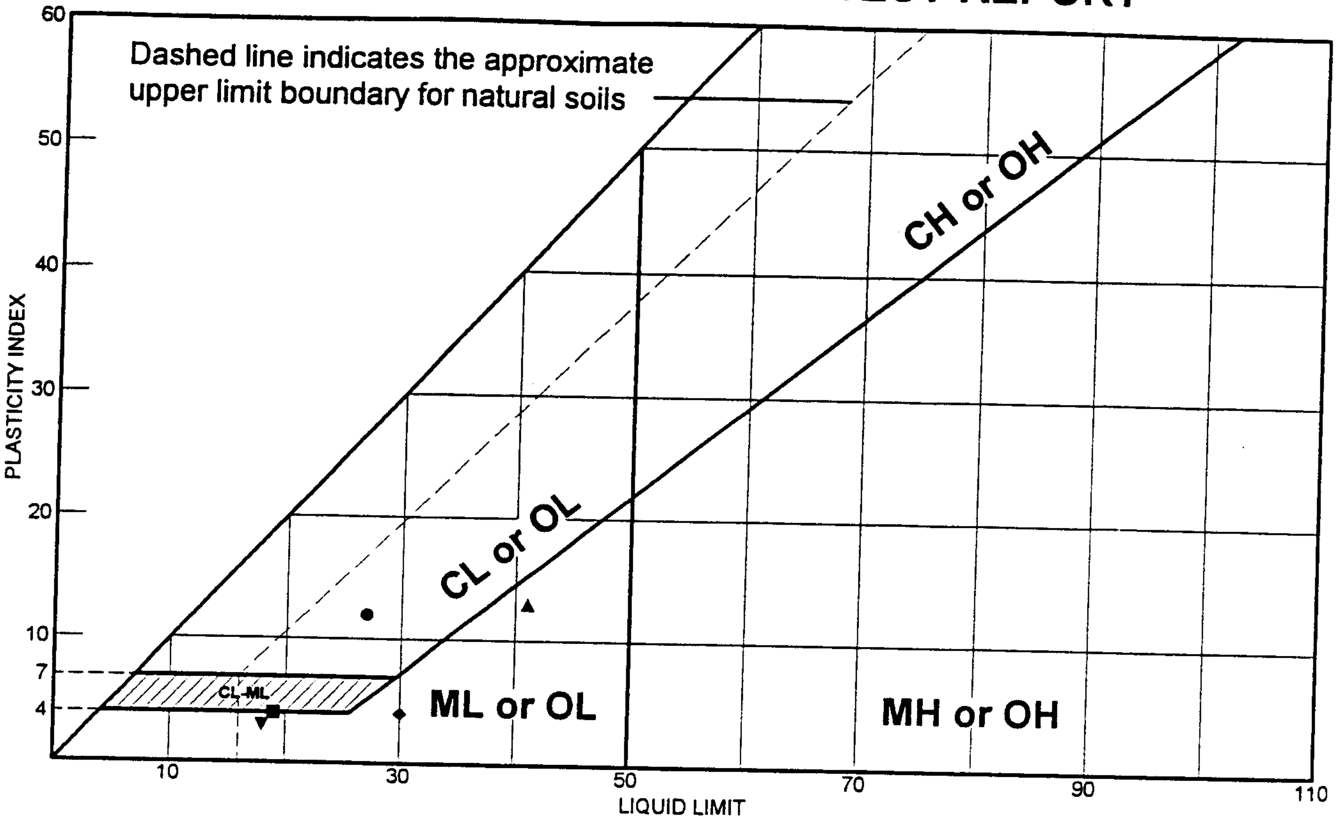
Client: HNTB

Location:

HARTCROWSER

J4978-21
3/10/2000
Figure No. B-46

LIQUID AND PLASTIC LIMITS TEST REPORT


Dashed line indicates the approximate upper limit boundary for natural soils

Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B107 Sample No.: S-3 Very sandy, lean CLAY	27	15	12	53.2	CL
■ Source: HC00-B110 Sample No.: S-4 Slightly sandy CLAY-SILT	19	15	4	89.7	CL-ML
▲ Source: HC00-B110 Sample No.: S-11 Very clayey SILT	41	28	13	98.4	ML
◆ Source: HC00-B111 Sample No.: S-3 Clayey SILT	30	26	4	97.6	ML
▼ Source: HC00-B111 Sample No.: S-6 Slightly clayey, gravelly, very silty, medium to fine SAND	18	15	3	46.3	SM

Remarks:

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Project: Third Runway Westside

Client: HNTB

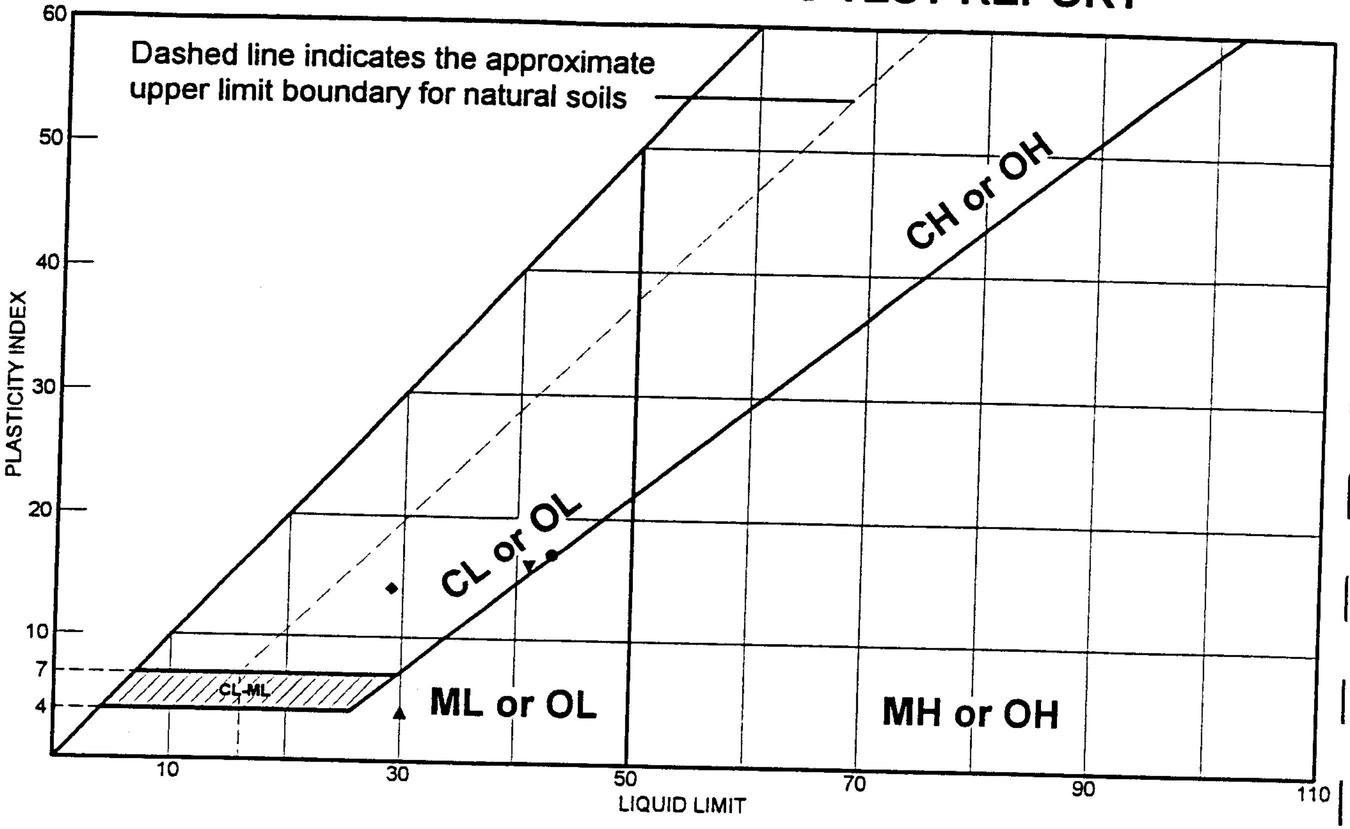
Location:

HARTCROWSER

J4978-21 3/10/2000

Figure No. B-47

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B111 Sample No.: S-12 Very clayey SILT	43	26	17	99.5	CL
■ Source: HC00-B115 Sample No.: S-4 Very sandy SILT	NV	NP	NP	60.9	ML
▲ Source: HC00-B118 Sample No.: S-2 Slightly sandy, clayey SILT	30	26	4	93.6	ML
◆ Source: HC00-B118 Sample No.: S-4 Very sandy, lean CLAY	29	15	14	60.8	CL
▼ Source: HC00-B118 Sample No.: S-6 Sandy, lean CLAY	41	25	16	82.3	CL

Remarks:

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- ▼

Project: Third Runway Westside

Client: HNTB

Location:

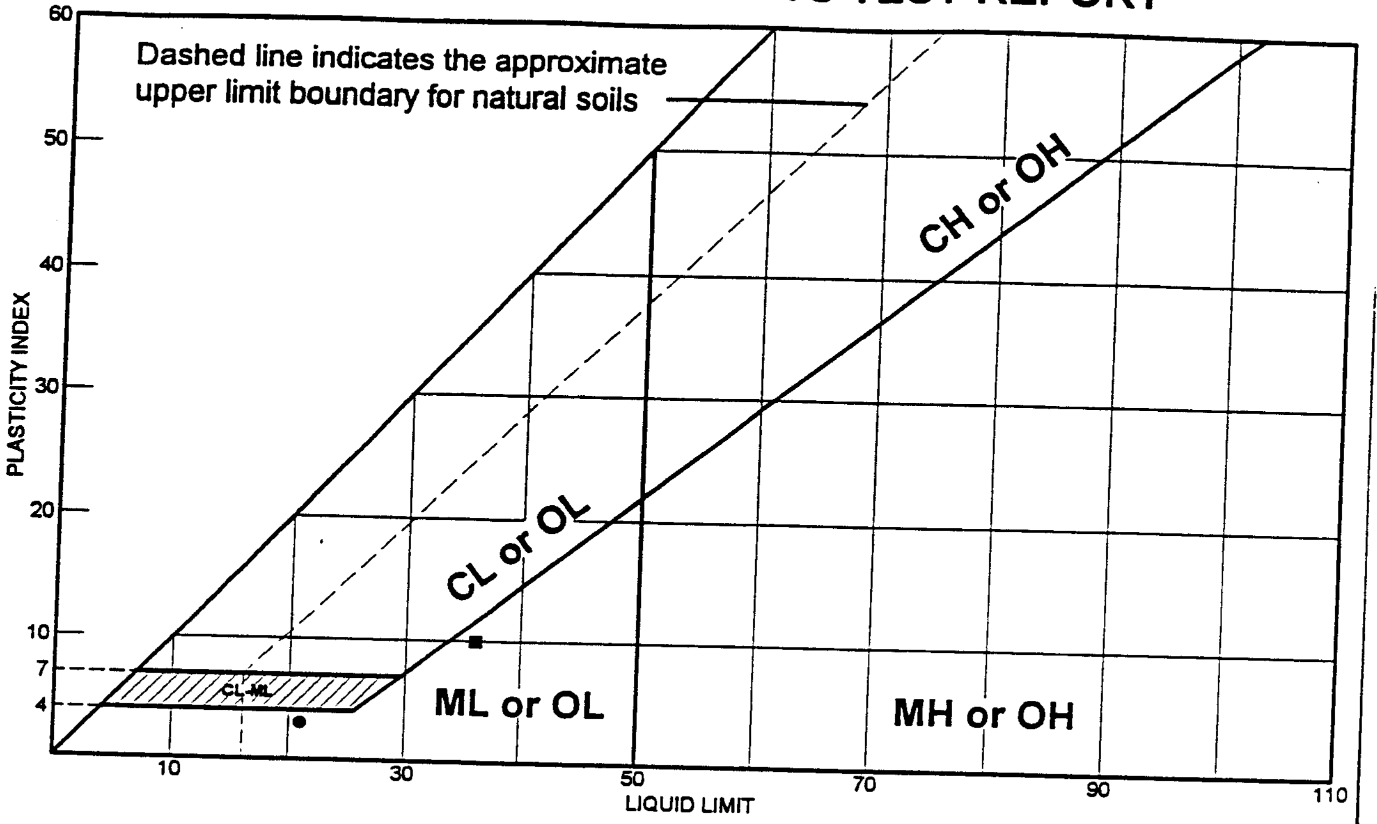
HARTCROWSER

J4978-21

Figure No. **B-48**

3/10/2000

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B113 Sample No.: S-2 SILT	21	18	3		ML
■ Source: HC00-B119 Sample No.: S-3 SILT	36	26	10		ML

Remarks:

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Project: Third Runway

Client: HNTB

Location:

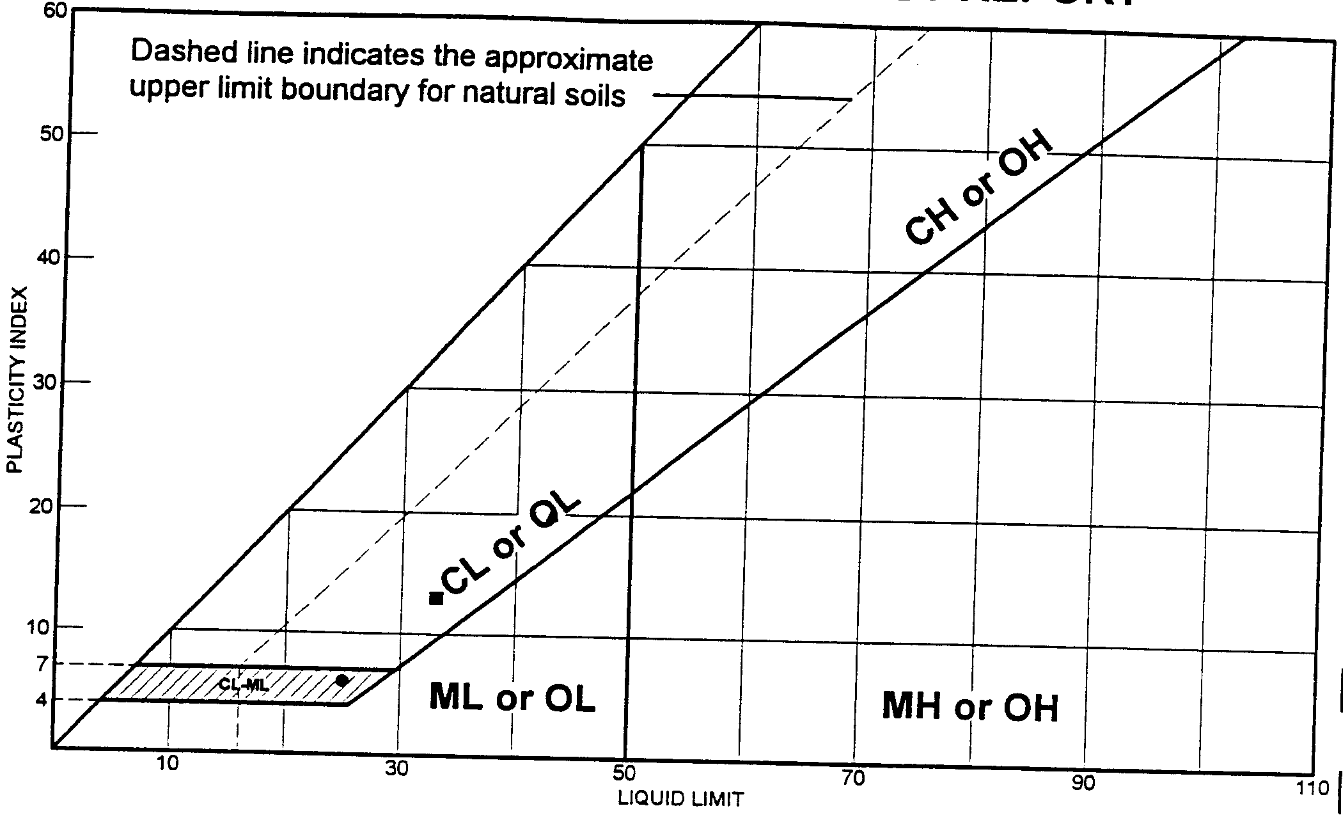
HARTCROWSER

J4978-21

3/31/2000

Figure No. B-49

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B114 Sample No.: S-2 CLAY-SILT	25	19	6		CL-ML
■ Source: HC00-B115 Sample No.: S-3 Lean CLAY	33	20	13		CL
▲ Source: HC00-B118 Sample No.: S-5 Lean CLAY	43	23	20		CL

Remarks:
●
■
▲

Project: Third Runway Westside

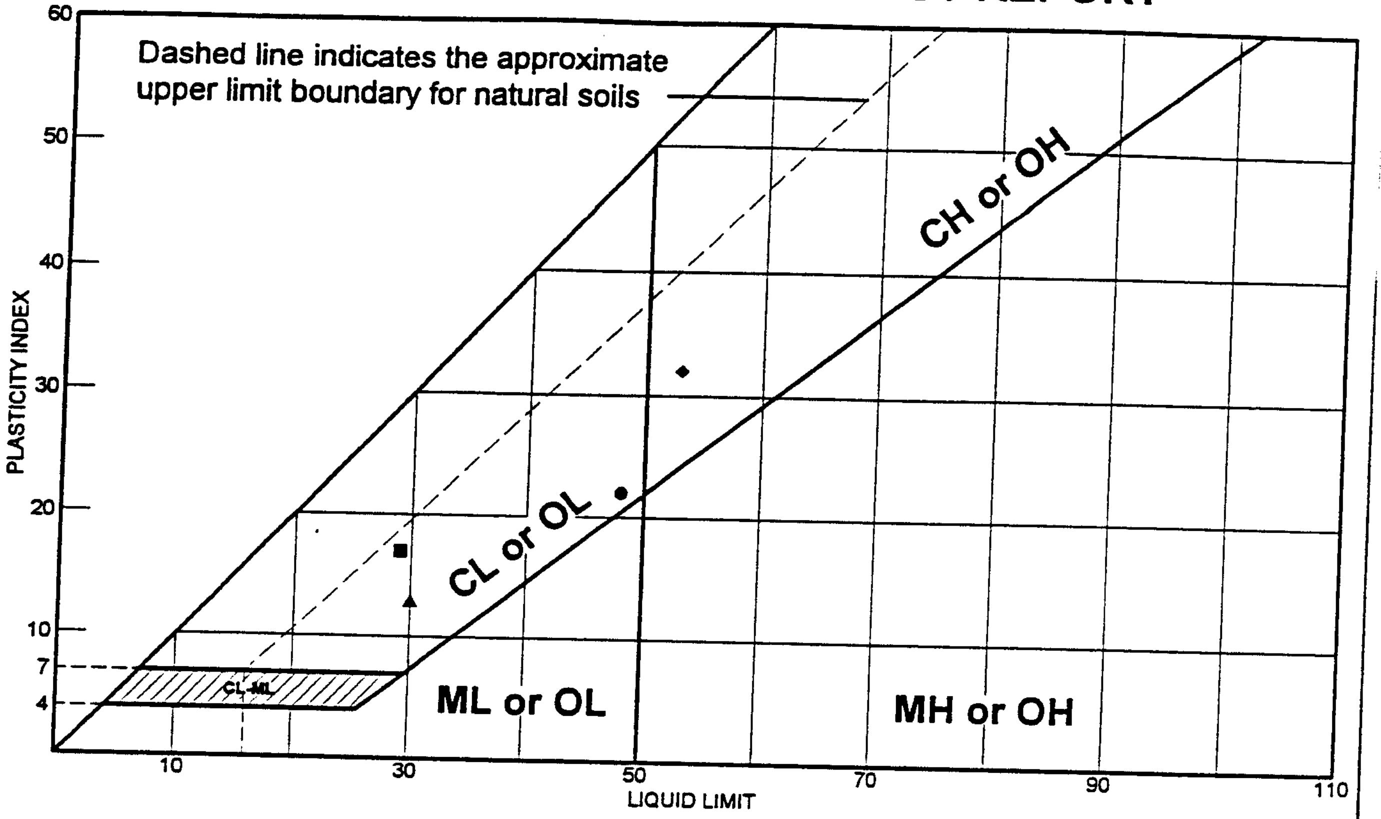
Client: HNTB

Location:

HARTCROWSER

J4978-21 3/10/2000
Figure No. **B-50**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-TP110 Sample No.: S-5 Lean CLAY	48	26	22		CL
■ Source: HC00-TP111 Sample No.: S-3 Lean CLAY	29	12	17		CL
▲ Source: HC00-B120 Sample No.: S-5 Lean CLAY	30	17	13		CL
◆ Source: HC00-B128 Sample No.: S-6 Fat CLAY	53	21	32		CH

Remarks:

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Project: Third Runway

Client: HNTB

Location:

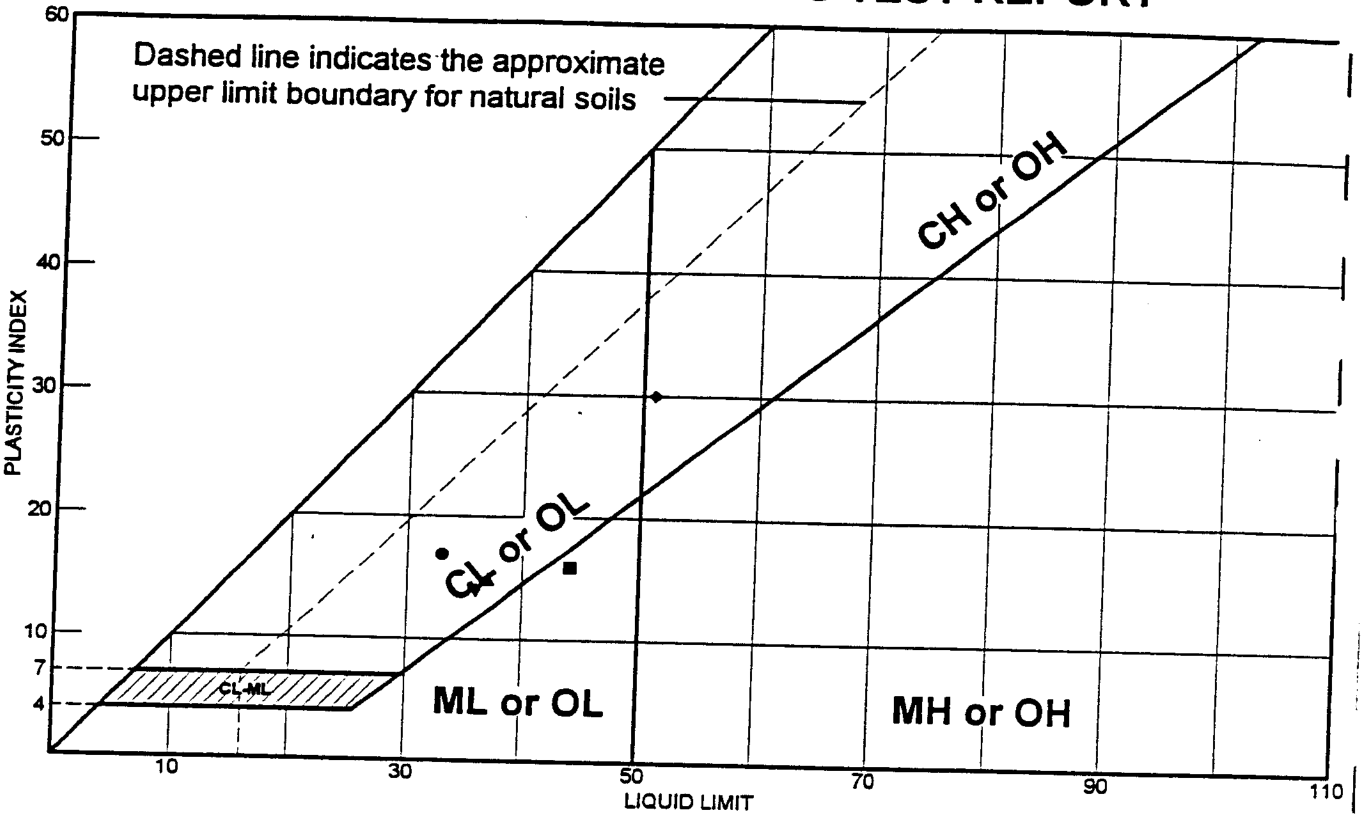
HARTCROWSER

J4978-21

3/29/2000

Figure No. **B-51**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description		LL	PL	PI	-200	USCS
● Source: HC00-B123 Lean CLAY	Sample No.: S-9	33	16	17		CL
■ Source: HC00-B125 SILT	Sample No.: S-5	44	28	16		ML
▲ Source: HC00-B132 Sandy CLAY	Sample No.: S-5	37	22	15	87.0	CL
◆ Source: HC00-B132 Fat CLAY	Sample No.: S-7	51	21	30		CH
▼ Source: HC00-B132A Lean CLAY	Sample No.: S-1	36	22	14		CL

Remarks:
- ●
- ■
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- ◆
- ▼

Project: Third Runway

Client: HNTB

Location:

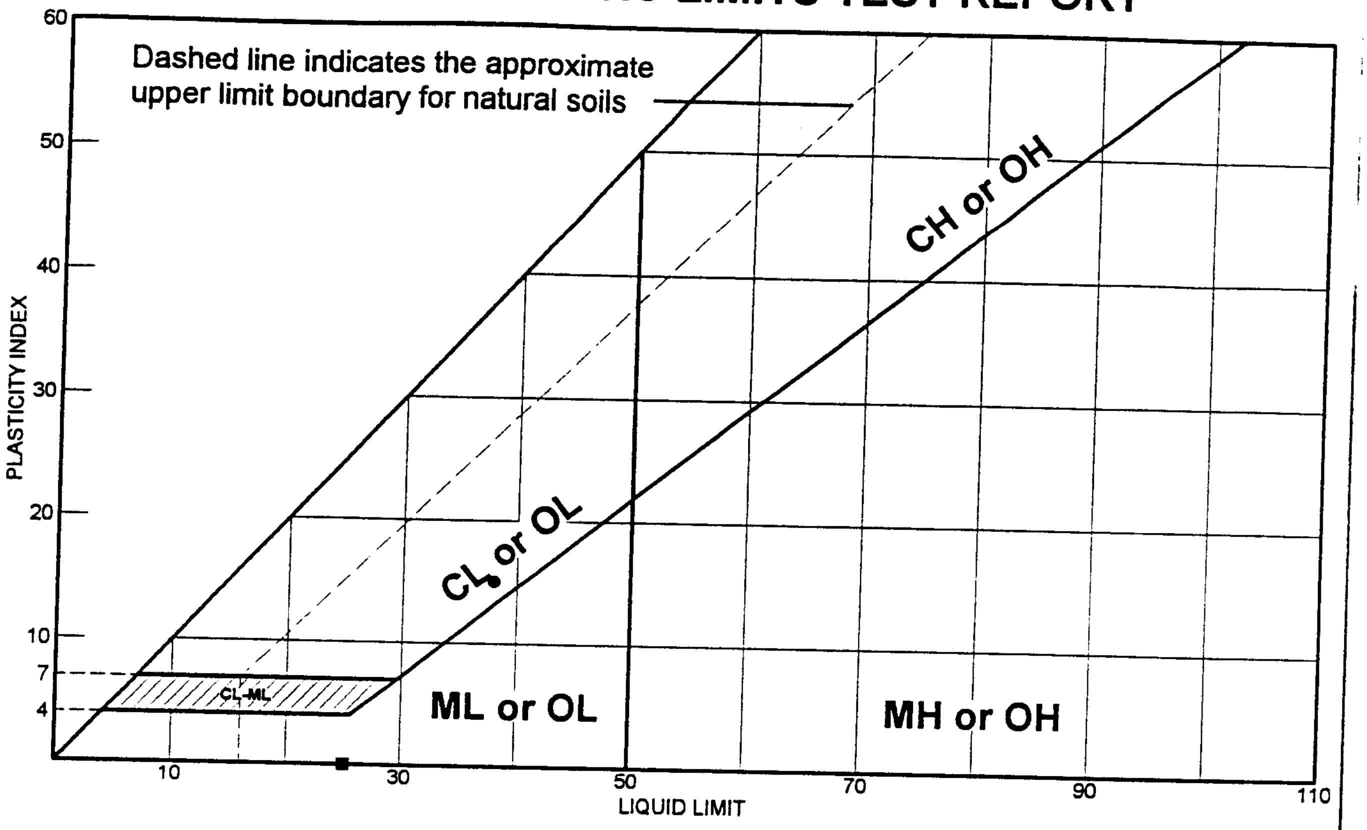
HARTCROWSER

J4978-21

Figure No. B-52

3/31/2000

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-B129 Sample No.: S-3 Slightly sandy, lean CLAY	38	23	15	88.4	CL
■ Source: HC00-B142 Sample No.: S-3 Sandy SILT	25	27	NP	85.3	ML

Remarks:
●
■

Project: Third Runway Westside

Client: HNTB

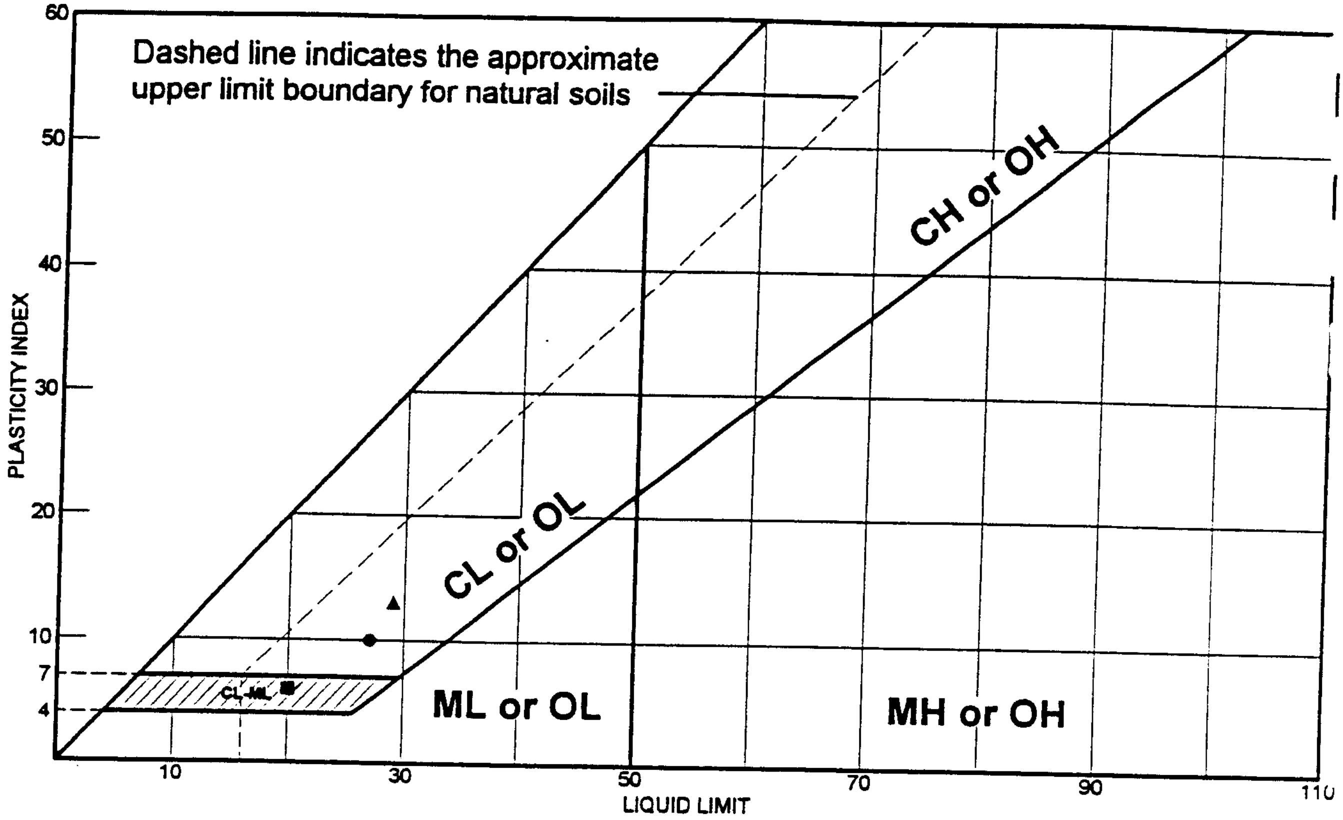
Location:

HARTCROWSER

J4978-21
Figure No. B-53

3/10/2000

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description		LL	PL	PI	-200	USCS
● Source: HC00-B137 Lean CLAY	Sample No.: S-2	27	17	10		CL
■ Source: HC00-B138 CLAY-SILT	Sample No.: S-3	20	14	6		CL-ML
▲ Source: HC00-B300 Lean CLAY	Sample No.: S-3	29	16	13		CL

Remarks:
●
■
▲

Project: Third Runway

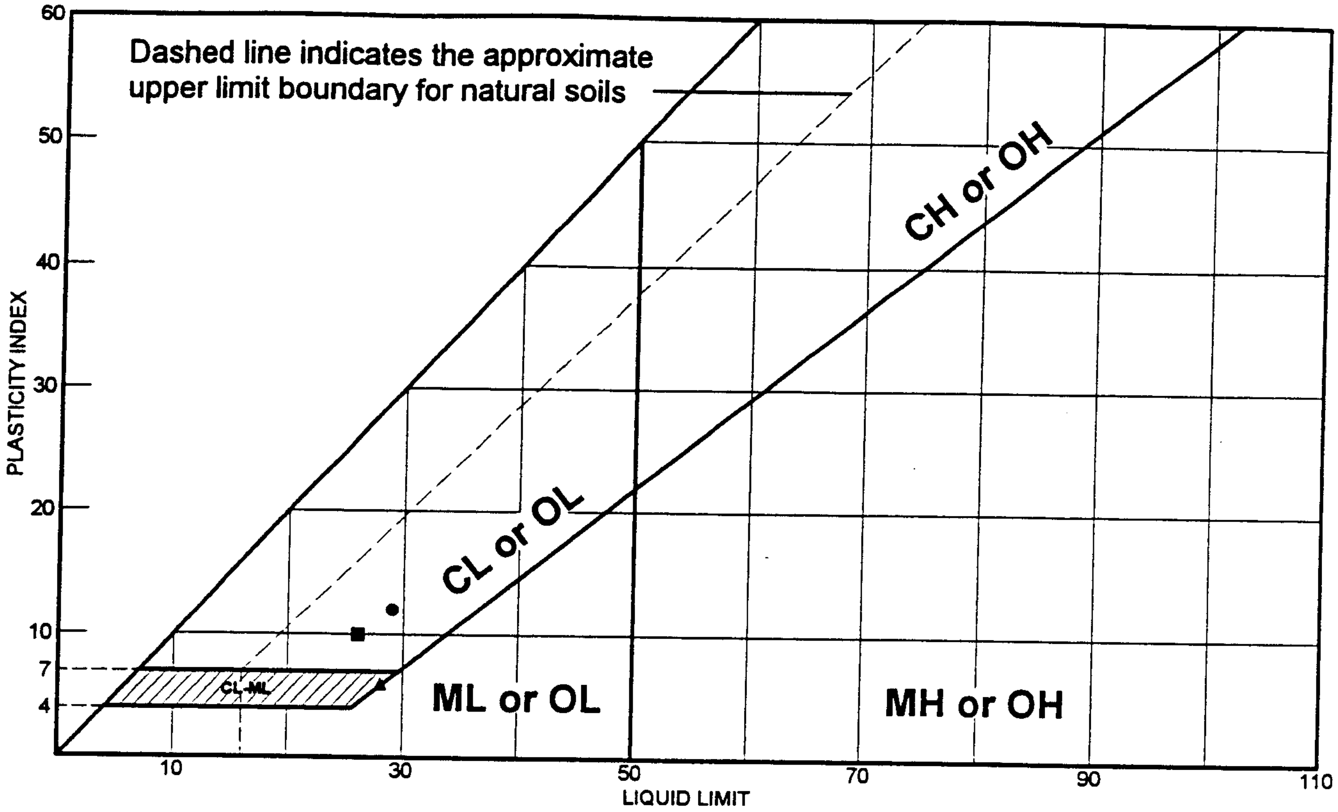
Client: HNTB

Location:

HARTCROWSER

J-4978-26
6/14/2000
Figure No. **B-54**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description		LL	PL	PI	-200	USCS
● Source: HC00-B302	Sample No.: S-4	29	17	12		
■ Source: HC00-B305	Sample No.: S-4	26	16	10	[illegible].4	CL
▲ Source: HC00-B306	Sample No.: S-3	28	22	6	77.7	CL-ML

Remarks:

●

■

▲

Project: Third Runway

Client: HNTB

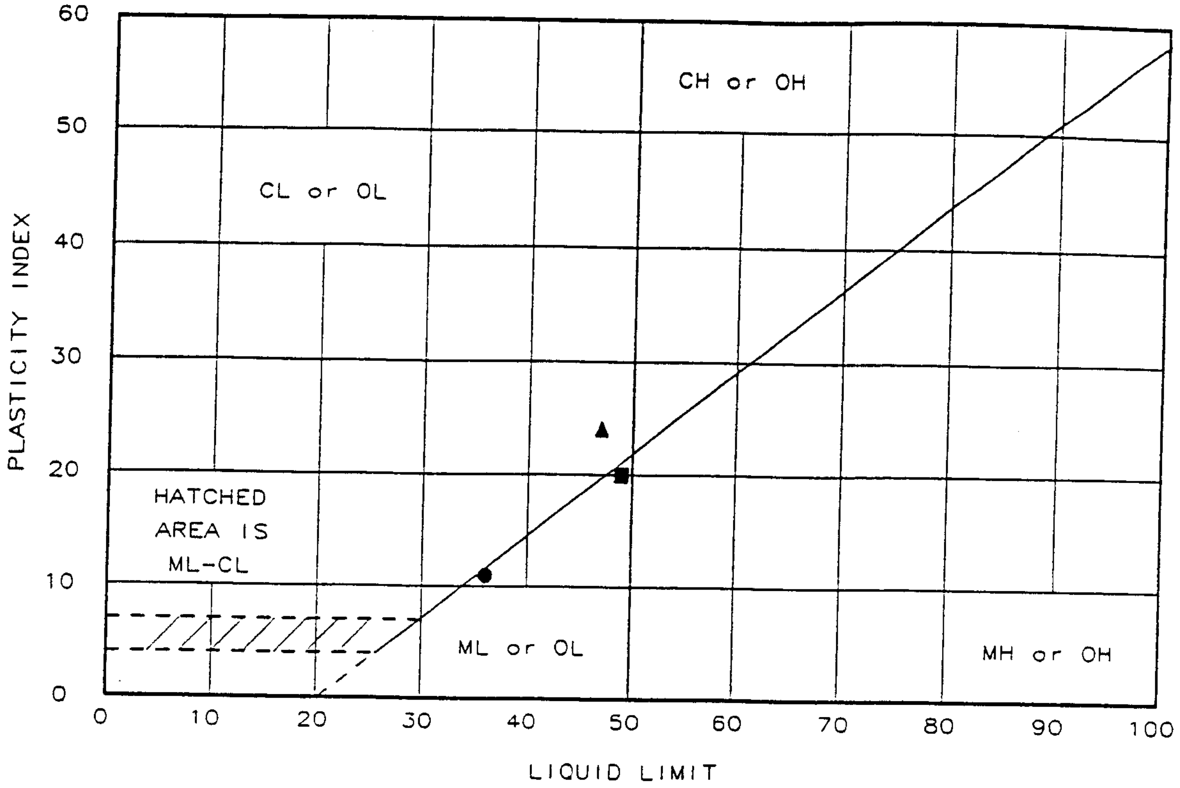
Location:

HARTCROWSER

J-4978-31 8/18/2000

Figure No. B-55

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	ASTM D 2487-90
● HC98-TP2, S-3, Depth 3.5 to 4.5 feet	36	25	11		SILT
▲ HC98-TP9, S-7, Depth 15 to 16 feet	47	23	24		Silty CLAY
■ HC98-TP12, S-4, Depth 4 to 4.5 feet	49	29	20		Clayey SILT

Remarks:

Project: 3rd Runway

Client:

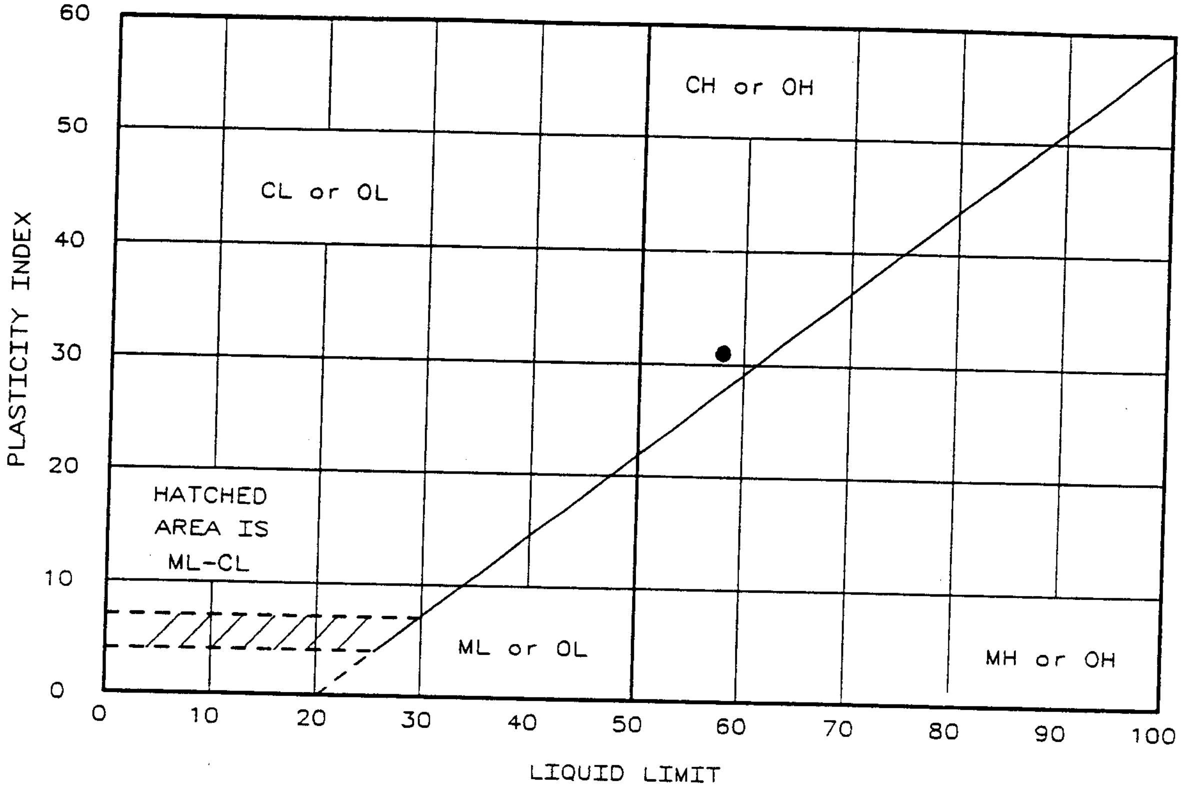
Location: Seattle, Washington

HARTCROWSER

J-4978-06 8/3/98

Figure **B-56**

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	HC-99/TP-3, S-4 Depth 10.5 to 11 feet	58	27	31		Slightly sandy, silty CLAY

Remarks:

Project: 3rd Runway

Client:

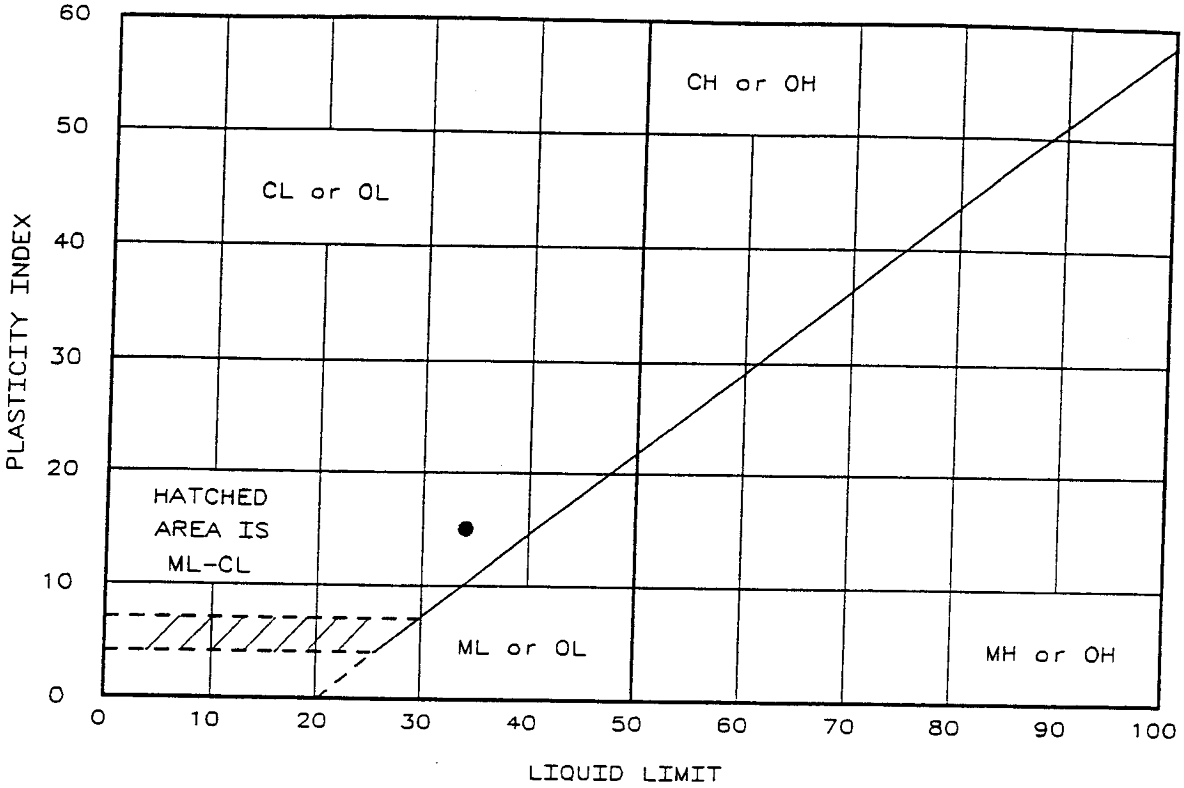
Location: SeaTac, Airport, Washington

HARTCROWSER

J-4978-06 3/9/99

Figure **B-57**

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	HC99 -TP9, S-5	34	19	15		CLAY

Remarks:

Project: 3R 99 Fill

Client:

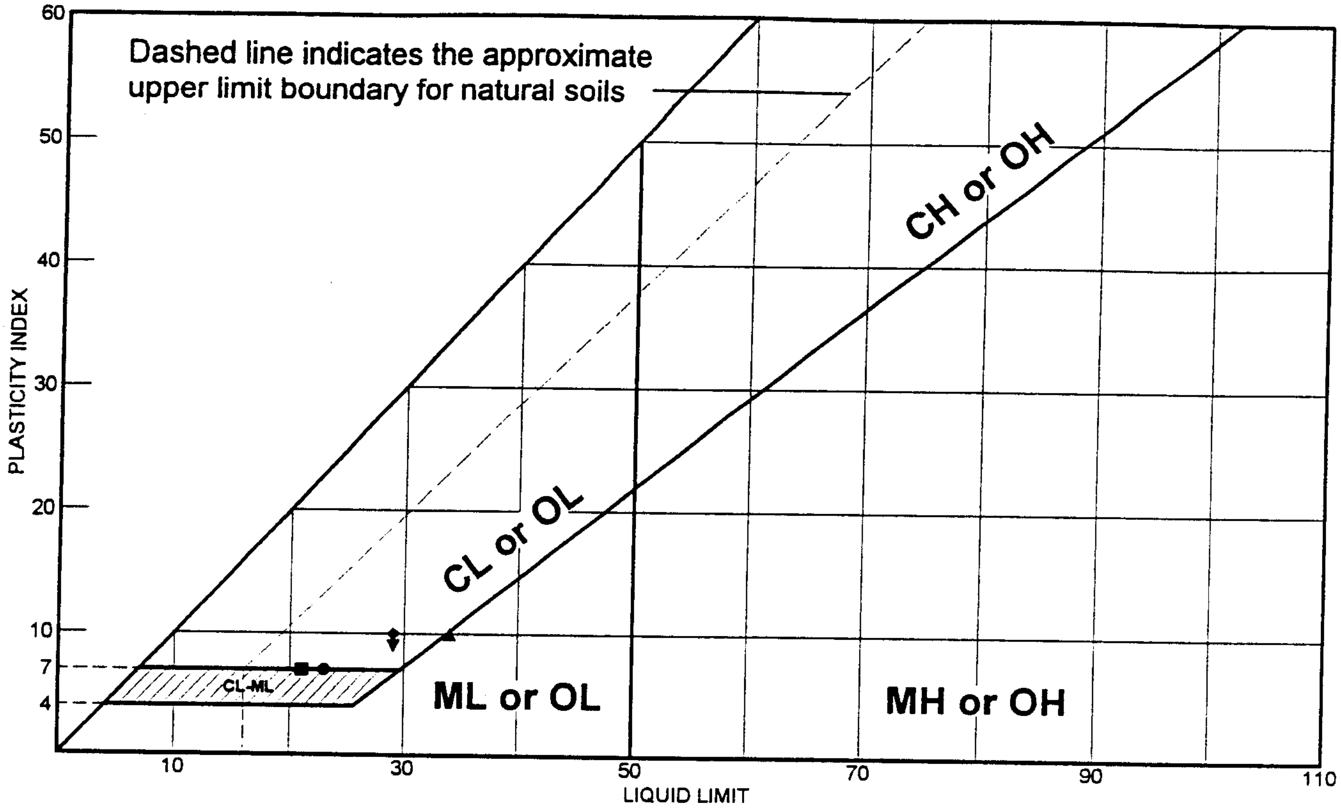
Location: SeaTac Airport, Washington

HARTCROWSER

J-4978-05 4/24/99

Figure **B-58**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description		LL	PL	PI	-200	USC
● Source: HC99-TP26 Slightly sandy, silty CLAY	Sample No.: S-3	23	16	7		CL-ML
■ Source: HC99-TP28 Slightly sandy, very silty CLAY	Sample No.: S-6	21	14	7		CL-ML
▲ Source: HC99-TP32 Sandy, clayey SILT	Sample No.: S-4	34	24	10		ML
◆ Source: HC99-TP34 Sandy, silty CLAY	Sample No.: S-4	29	19	10		CL
▼ Source: HC99-TP35 Slightly sandy, silty CLAY	Sample No.: S-3	29	20	9		CL

Remarks:
- ●
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- ◆
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Project: Third Runway Embankment

Client: The Port of Seattle

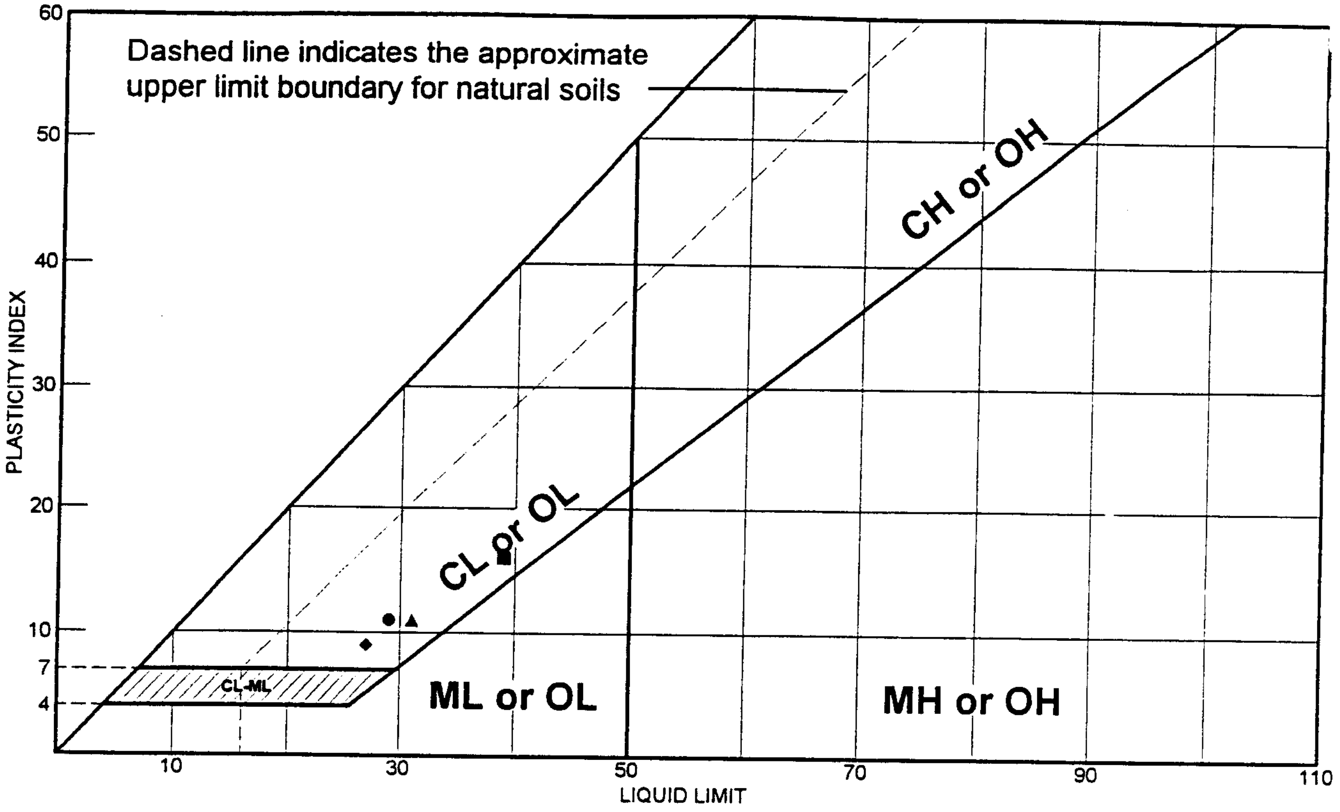
Location: Sea-Tac International Airport

HARTCROWSER

J-4978-16 11/3/99

Figure No. **B-59**

LIQUID AND PLASTIC LIMITS TEST REPORT



Dashed line indicates the approximate upper limit boundary for natural soils

Location + Description	LL	PL	PI	-200	USC
● Source: HC99-TP36 Sample No.: S-4 Silty CLAY	29	18	11		CL
■ Source: HC99-TP36D Sample No.: S-3 Slightly sandy, silty CLAY	39	23	16		CL
▲ Source: HC99-B61 Sample No.: S-3 Slightly sandy, silty CLAY	31	20	11		CL
◆ Source: HC99-B73 Sample No.: S-2 Slightly sandy, silty CLAY	27	18	9		CL

Remarks:

●

■

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Project: Third Runway Embankment

Client: The Port of Seattle

Location: Sea-Tac International Airport

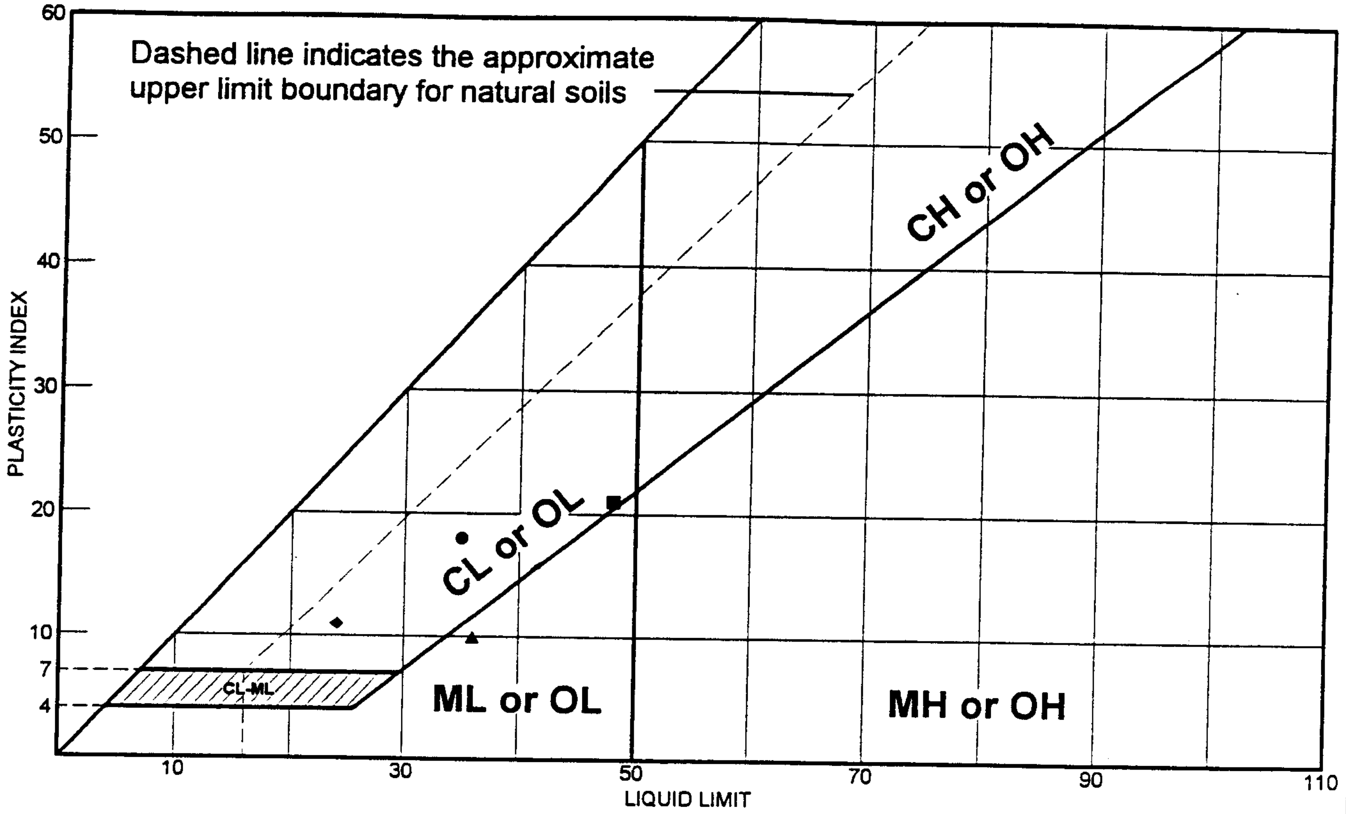
HARTCROWSER

J-4978-16

11/12/99

Figure No. **B-60**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-TP100 Sample No.: S-3 Lean CLAY	35	17	18		CL
■ Source: HC00-TP107 Sample No.: S-2 Lean CLAY	48	27	21		CL
▲ Source: HC00-TP108 Sample No.: S-2 SILT	36	26	10		ML
◆ Source: HC00-TP115 Sample No.: S-5 Lean CLAY	24	13	11		CL

Remarks:
- ●
- ■
- ▲
- ◆

Project: Third Runway Westside

Client: HNTB

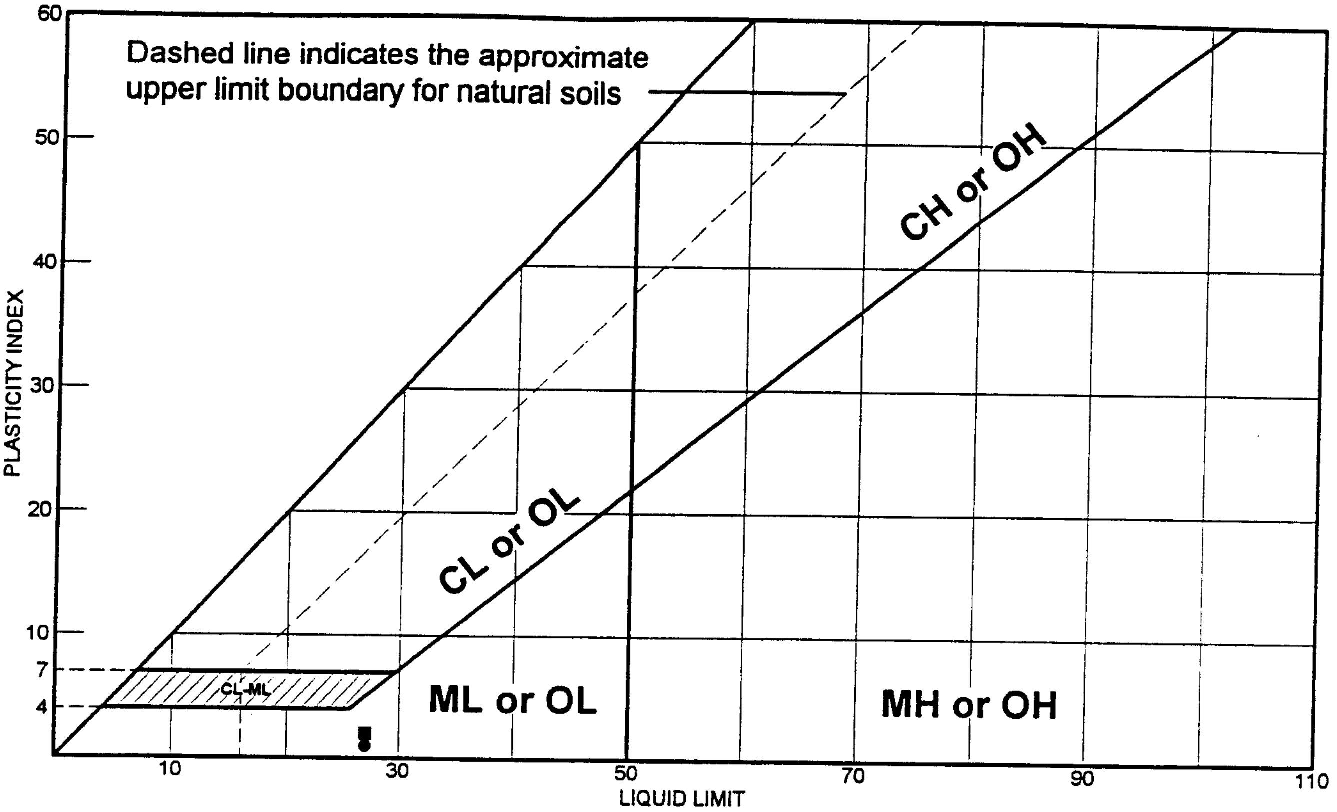
Location:

HARTCROWSER

J4978-21 3/10/2000

Figure No. **B-61**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: HC00-TP123 Sample No.: S-2 SILT	27	26	1		ML
■ Source: HC00-TP124 Sample No.: S-4 SILT	27	25	2		ML

Remarks:
●
■

Project: Third Runway Westside

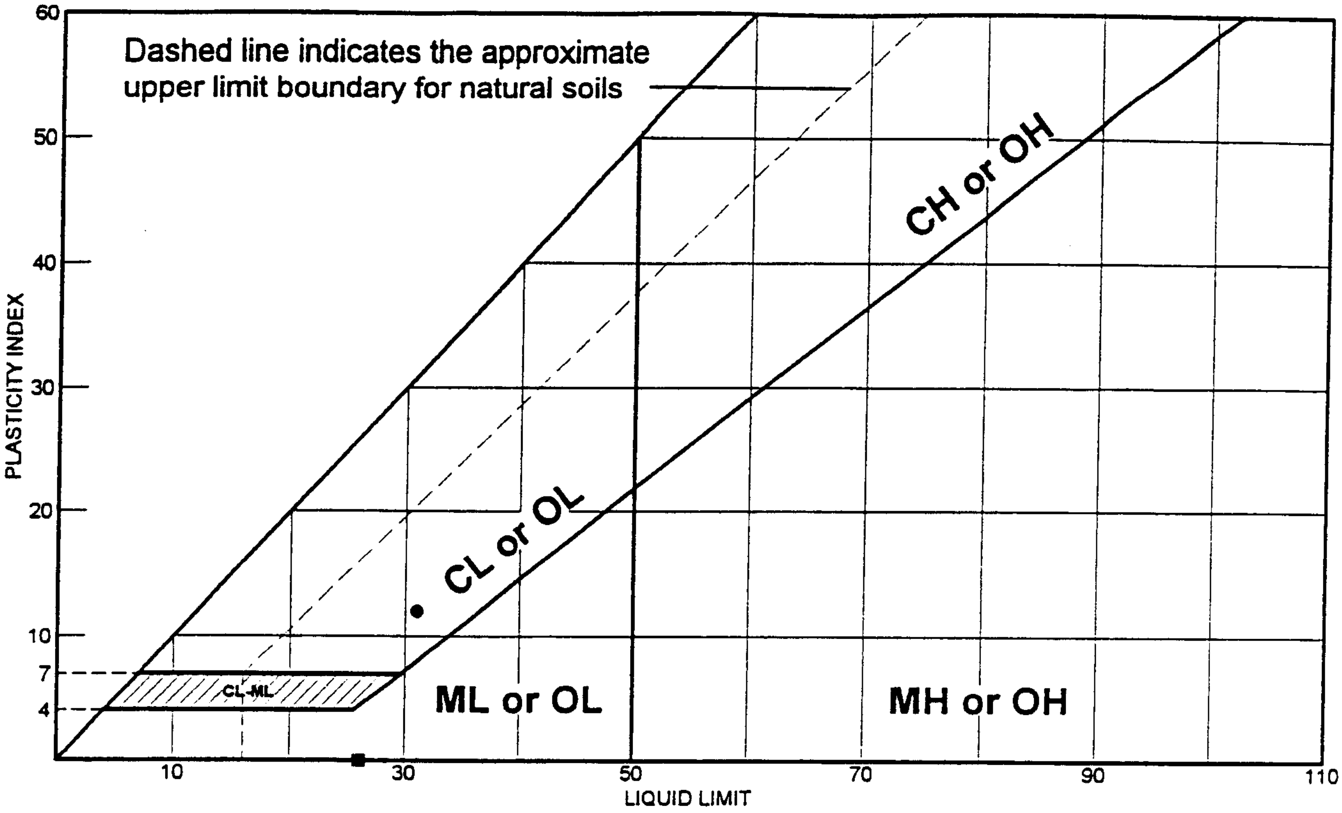
Client: HNTB

Location:

HARTCROWSER

J4978-21 3/10/2000
Figure No. **B-62**

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS
● Source: TP-301 Sample No.: S-3 Lean CLAY	31	19	12		CL
■ Source: TP-307 Sample No.: S-6 SILT	26	26	0		ML

Remarks:

●

■

Project: Third Runway

Client: HNTB

Location:

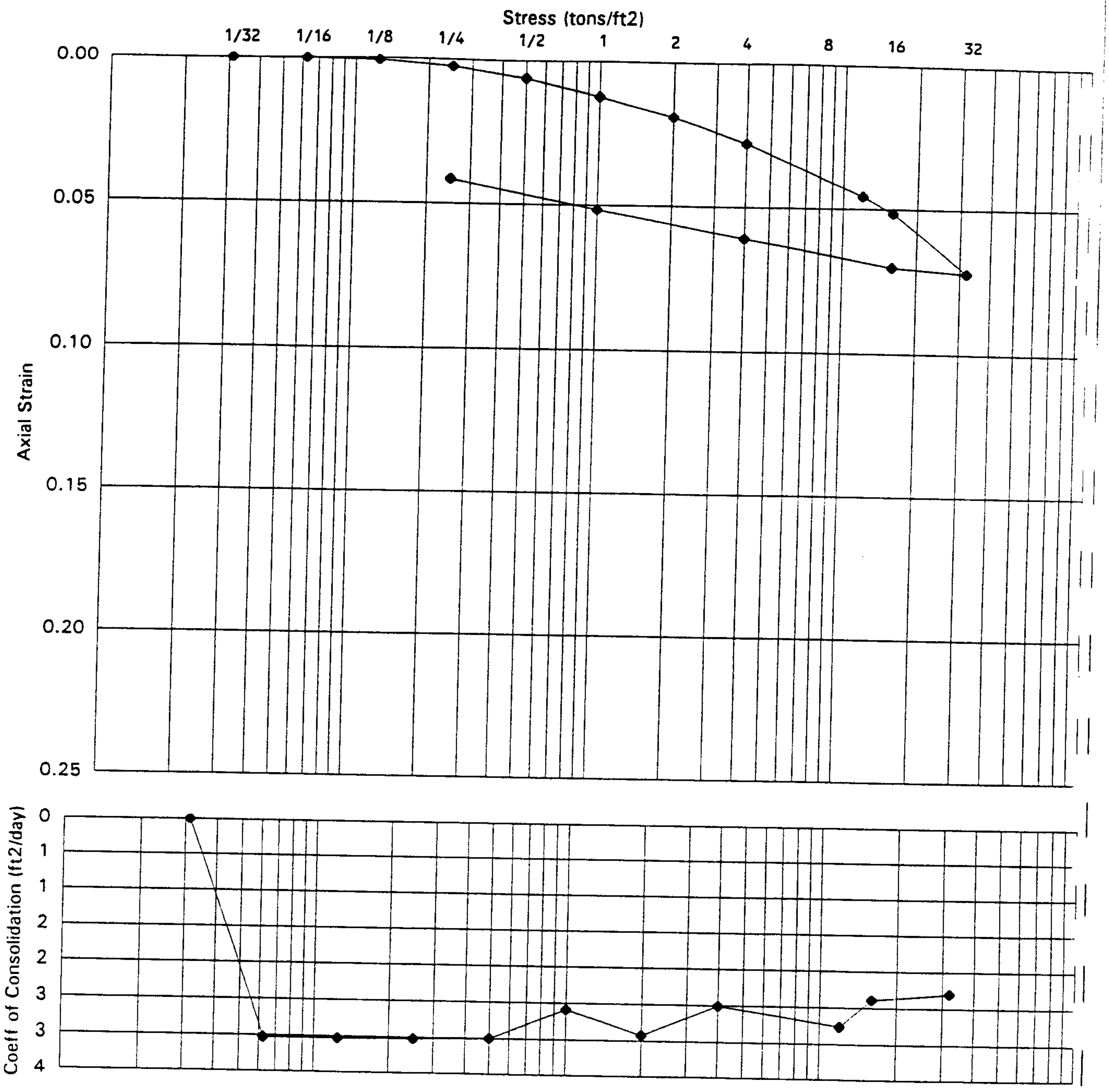
HARTCROWSER

J-4978-26

5/11/2000

Figure No. **B-63**

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B110	S-11	40.5'-41.8'	31%	31%	30	26	4	119 pcf	ML	Very clayey SILT

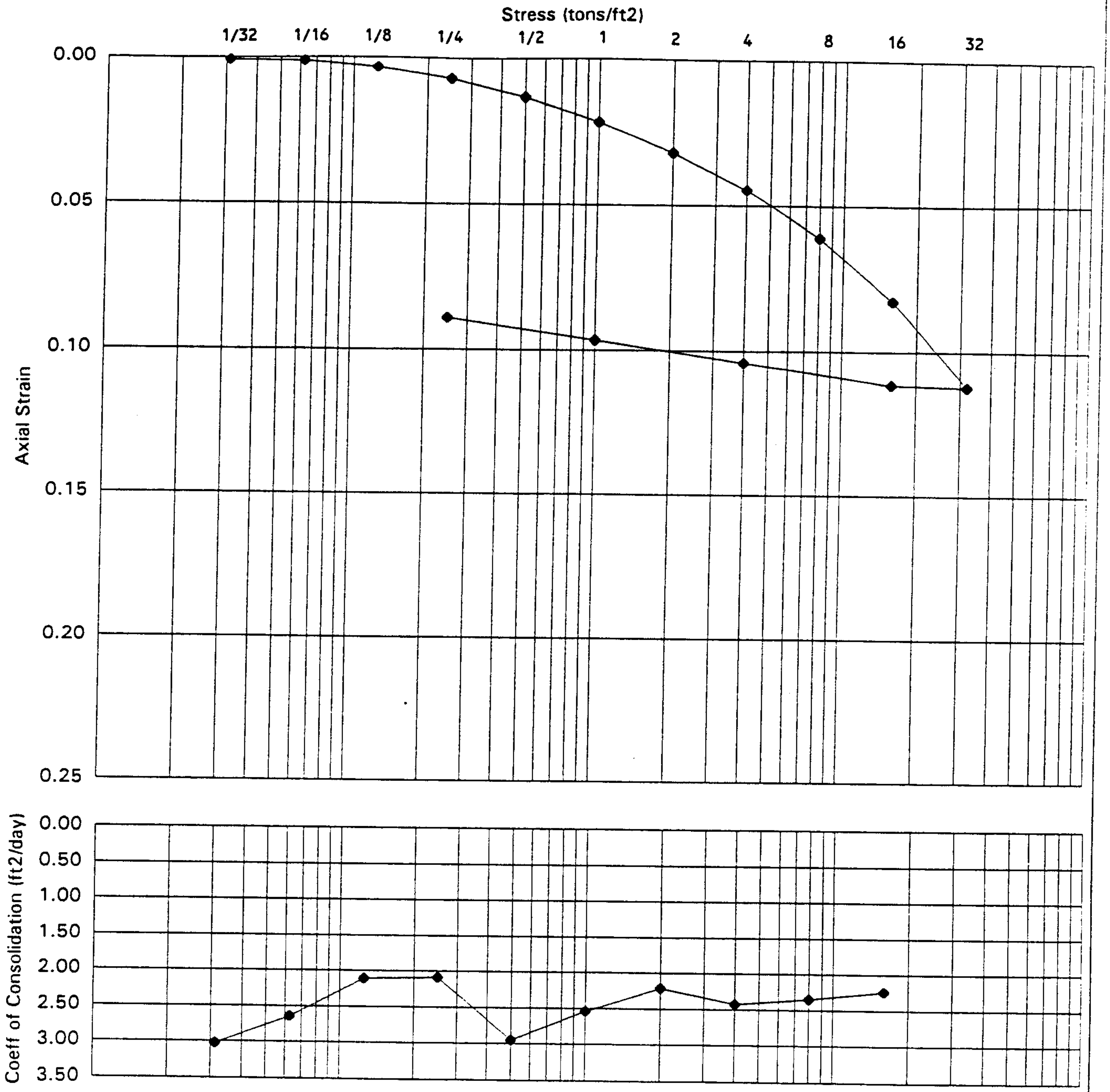
Remarks:

HARTCROWSER

J-4978-21 2/29/200

Figure **B-64**

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B111	S-3	5.5'-7.5'	31%	28%	30	26	4	118 pcf	ML	Clayey SILT

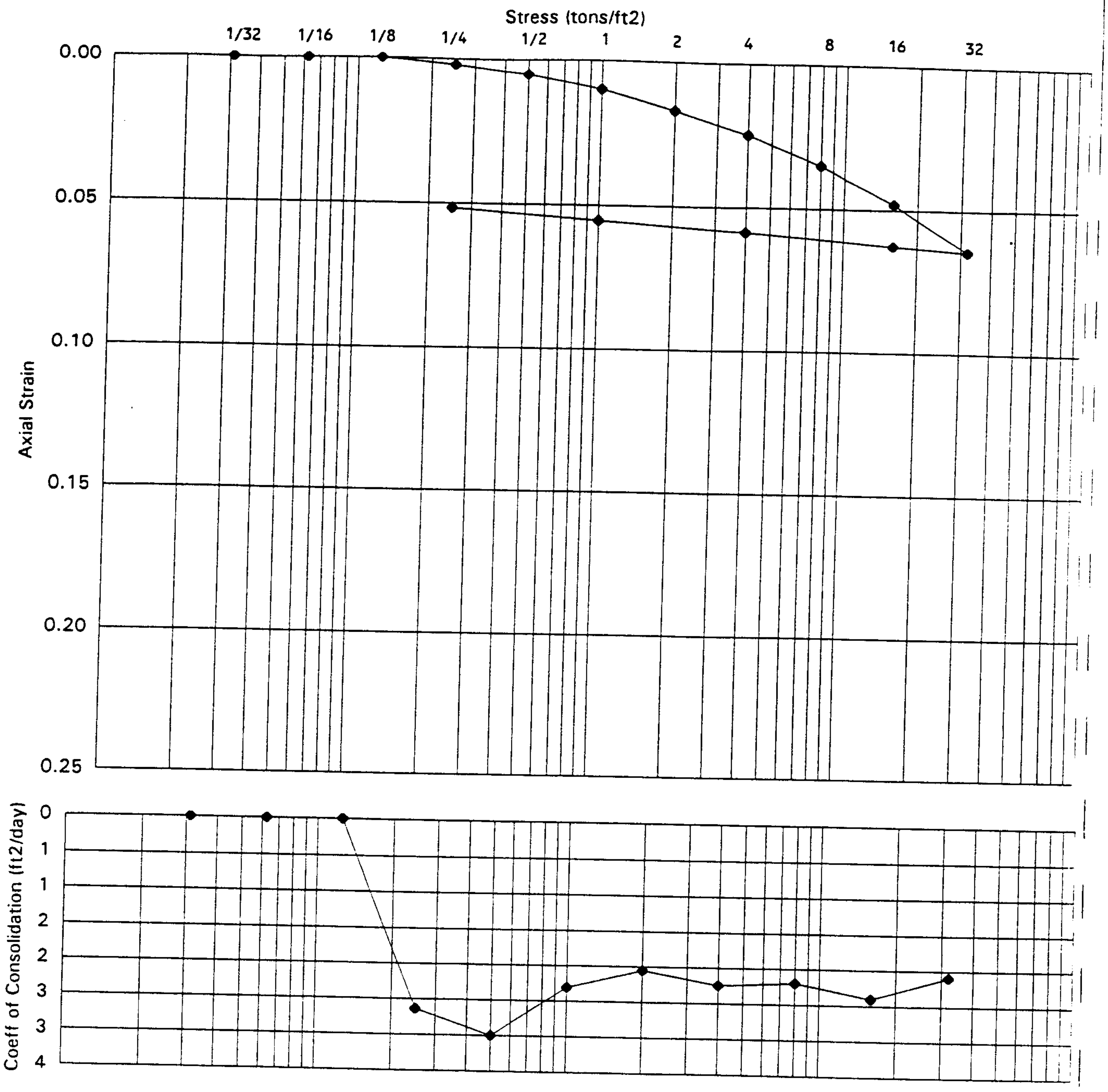
Remarks:

HARTCROWSER

J-4978-21 2/12/2000

Figure **B-65**

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B111	S-6	15.5'-16.6'	15%	14%	18	15	3	135 pcf	SM	Grav., v. silty SAND

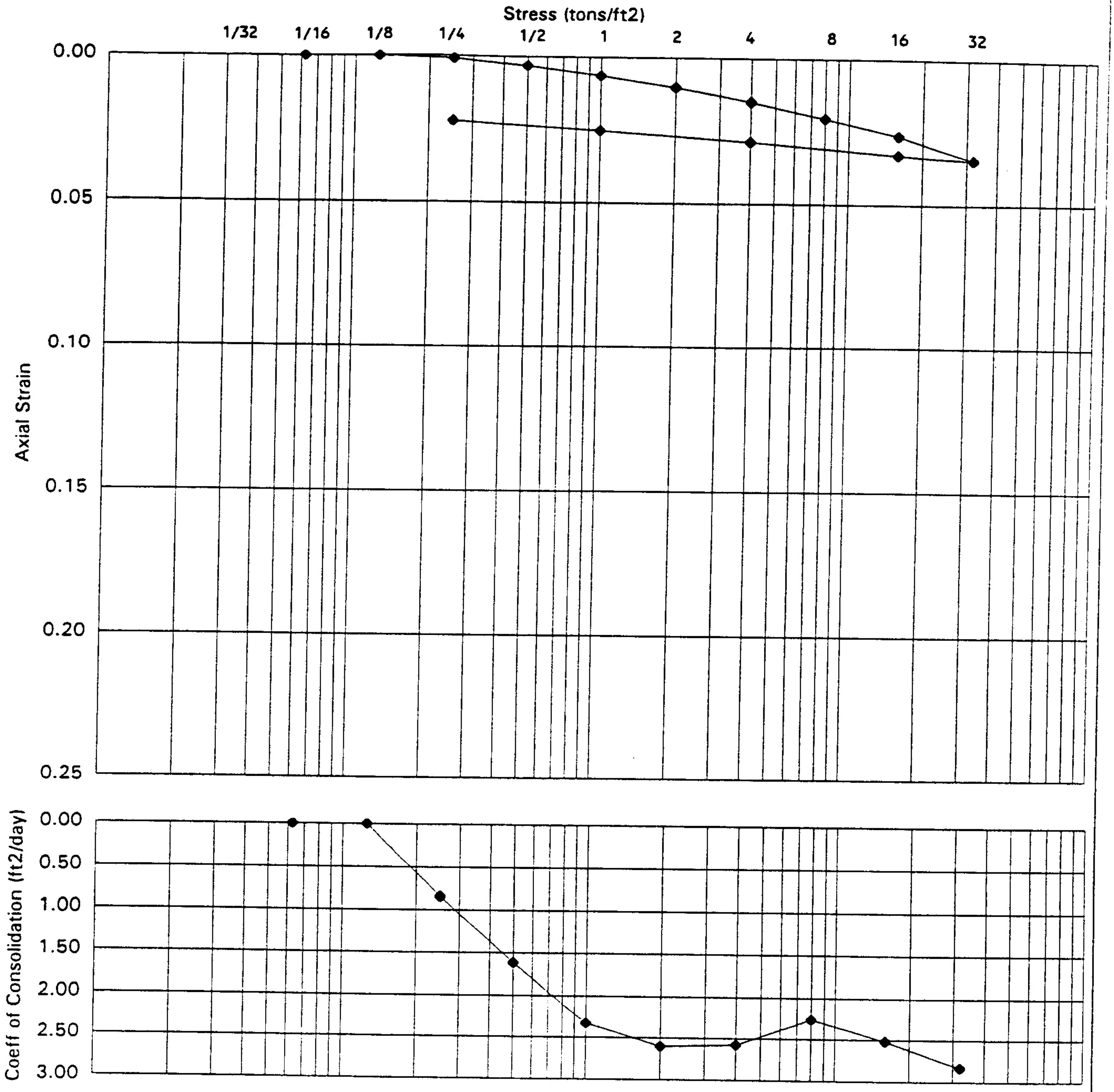
Remarks:

HARTCROWSER

J-4978-21 3/2/2000

Figure ***B-66***

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B115	S-4	10'-11'	18%	18%	NV	NP		131 pcf	ML	Very sandy SILT

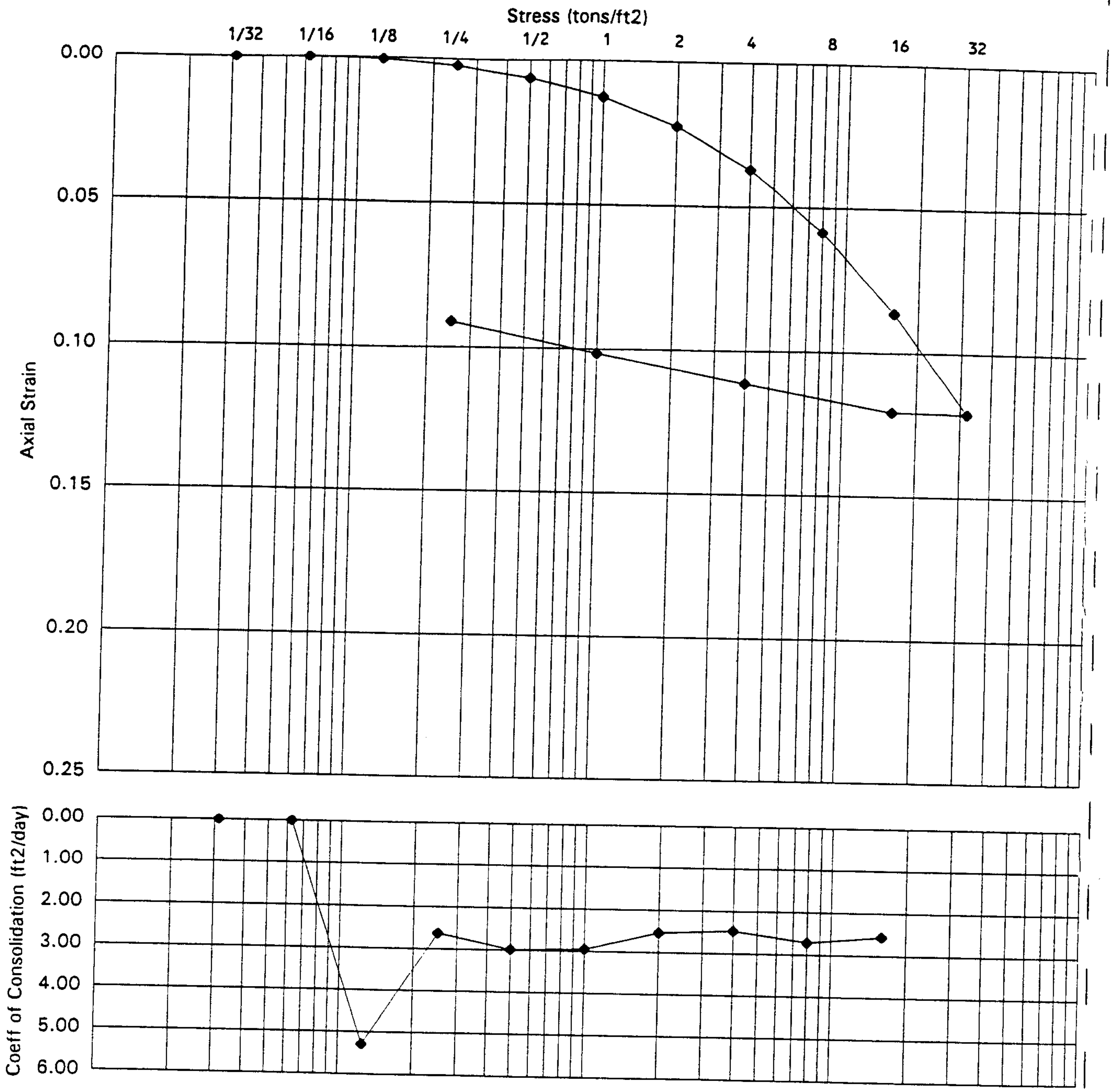
Remarks:

HARTCROWSER

J-4978-21 3/6/2000

Figure **B-67**

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B118	S-2	5.5'-6.5'	32%	28%	30	26	4	119 pcf	ML	Sl. sandy, clayey SILT

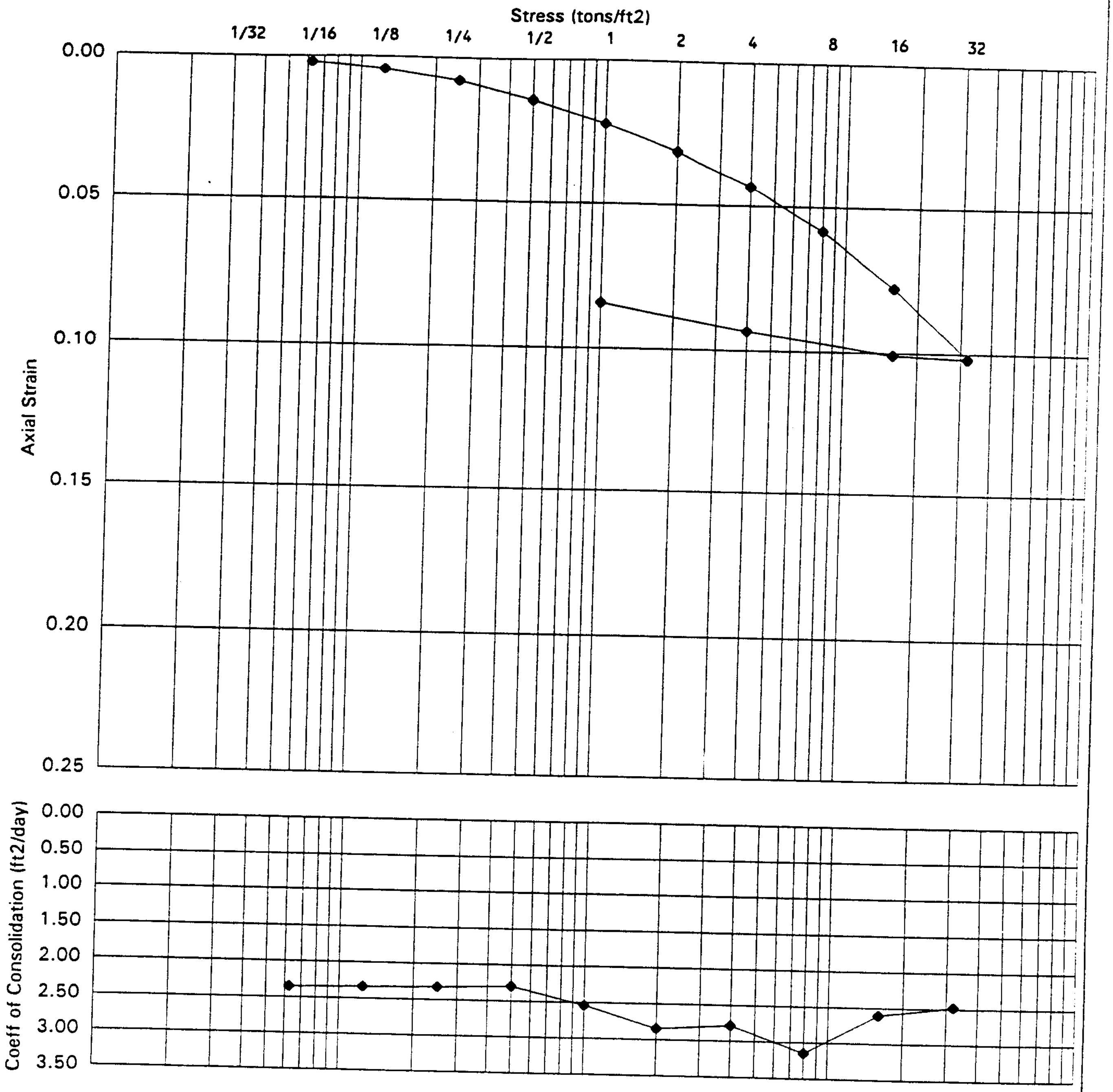
Remarks:

HARTCROWSER

J-4978-21 2/10/2000

Figure ***B-68***

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B118	S-6	15.5'-17.4'	25%	25%	41	25	16	123 pcf	CL	Sandy, lean CLAY

Remarks:

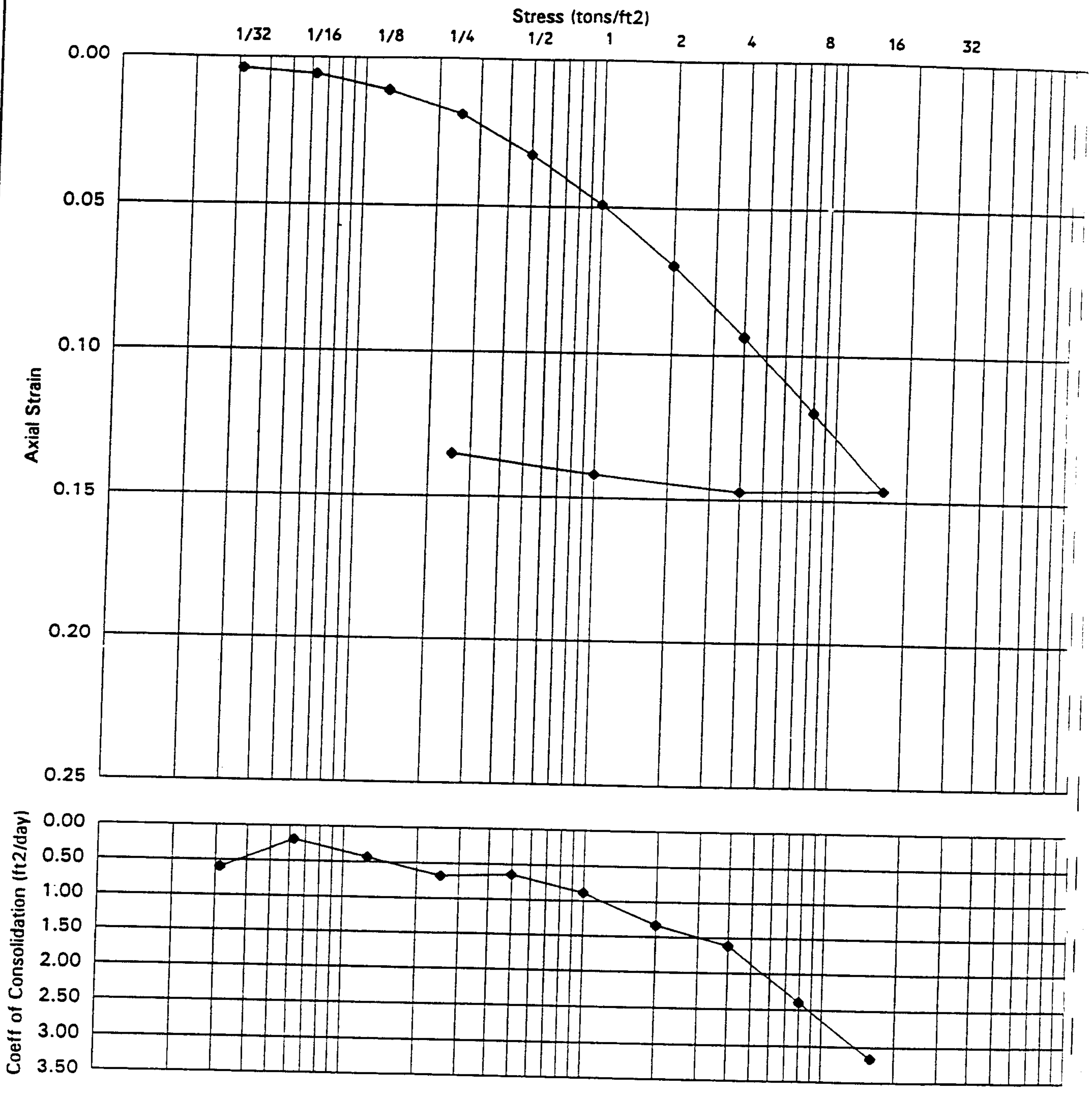
HARTCROWSER

J-4978-21

2/15/2000

Figure **B-69**

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B132A	S-1	8.5'-10.5'	32%	24%	36	22	14	120 pcf	CL	Lean CLAY

Remarks:

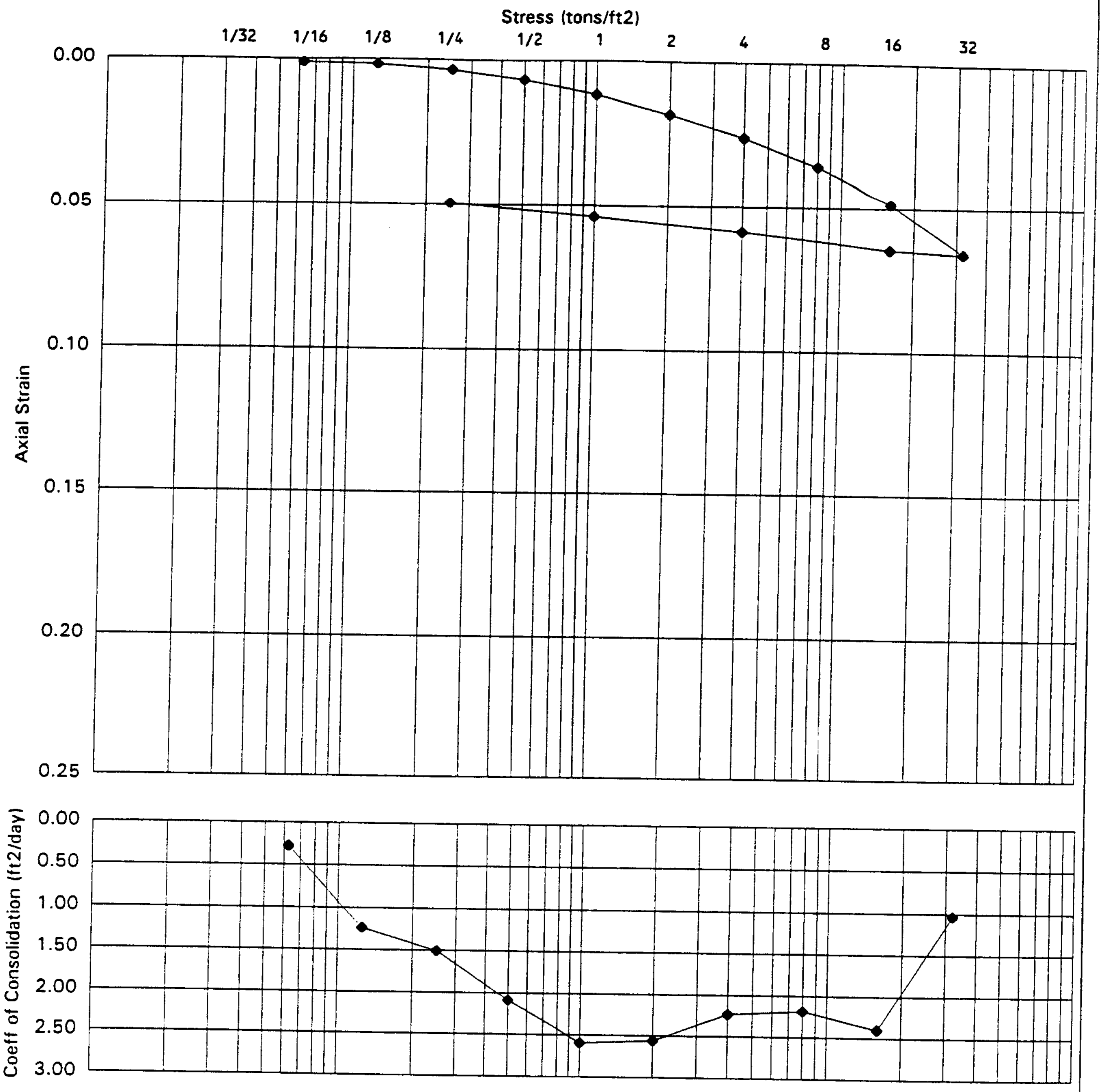
HARTCROWSER

J-4978-21

3/29/2000

Figure B-70

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
B142	S-3	5.5'-7.5'	26%	25%	25	27	NP	125 pcf	ML	Sandy SILT

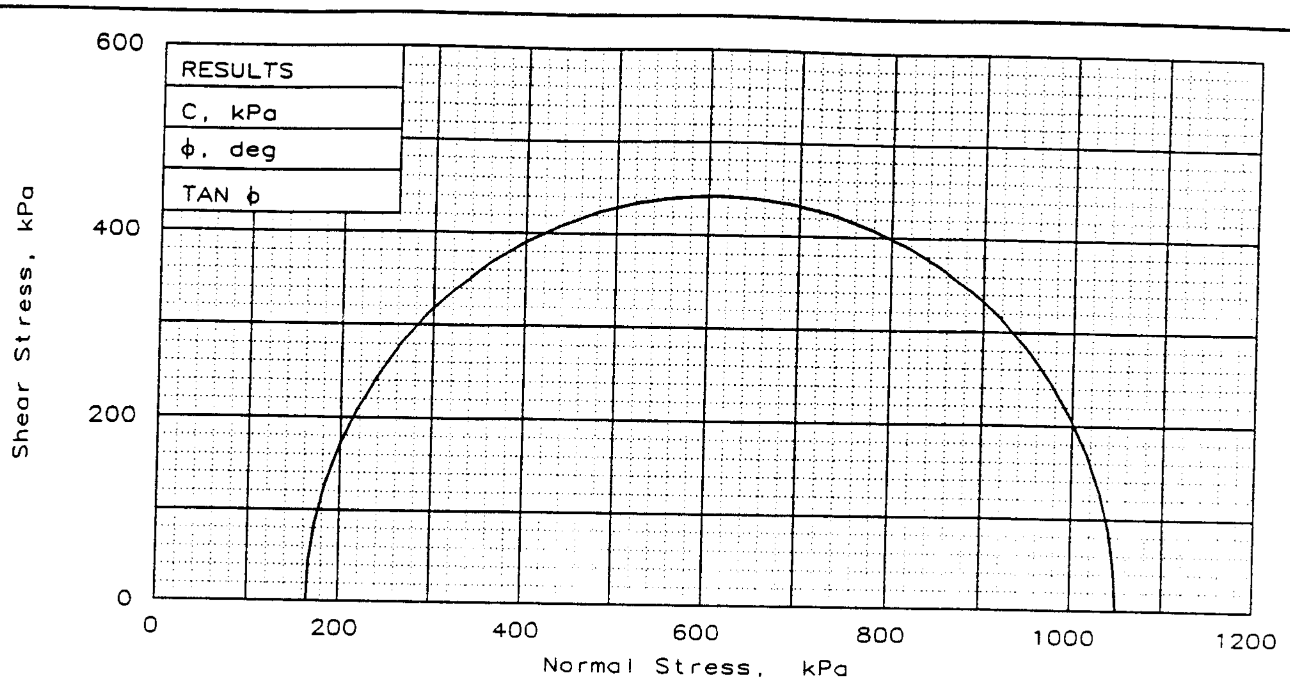
Remarks:

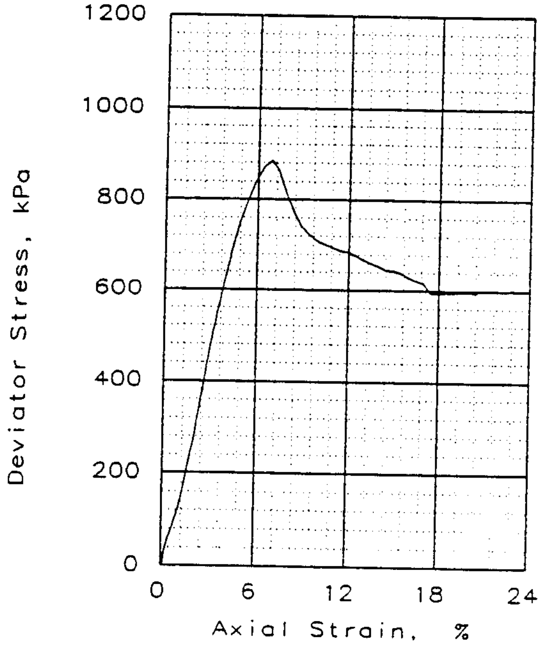
HARTCROWSER

J-4978-21

2/28/2000

Figure **B-71**





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	31.1
	DRY DENSITY, g/cc	1.5
	SATURATION, %	106.2
	VOID RATIO	0.777
	DIAMETER, cm	7.26
	HEIGHT, cm	15.41
AT TEST	WATER CONTENT, %	31.0
	DRY DENSITY, g/cc	1.5
	SATURATION, %	105.8
	VOID RATIO	0.777
	DIAMETER, cm	7.26
	HEIGHT, cm	15.41
BACK PRESSURE, kPa		0
CELL PRESSURE, kPa		165
FAILURE STRESS, kPa		885
PORE PRESSURE, kPa		
STRAIN RATE, %/min.		0.300
ULTIMATE STRESS, kPa		
PORE PRESSURE, kPa		
σ_1 FAILURE, kPa		1051
σ_3 FAILURE, kPa		165

TYPE OF TEST:
Unconsolidated undrained

SAMPLE TYPE: Shelby Tube

DESCRIPTION: Very clayey SILT

LL= 41 PL= 28 PI= 13.0

SPECIFIC GRAVITY= 2.65

REMARKS:

CLIENT: HNTB

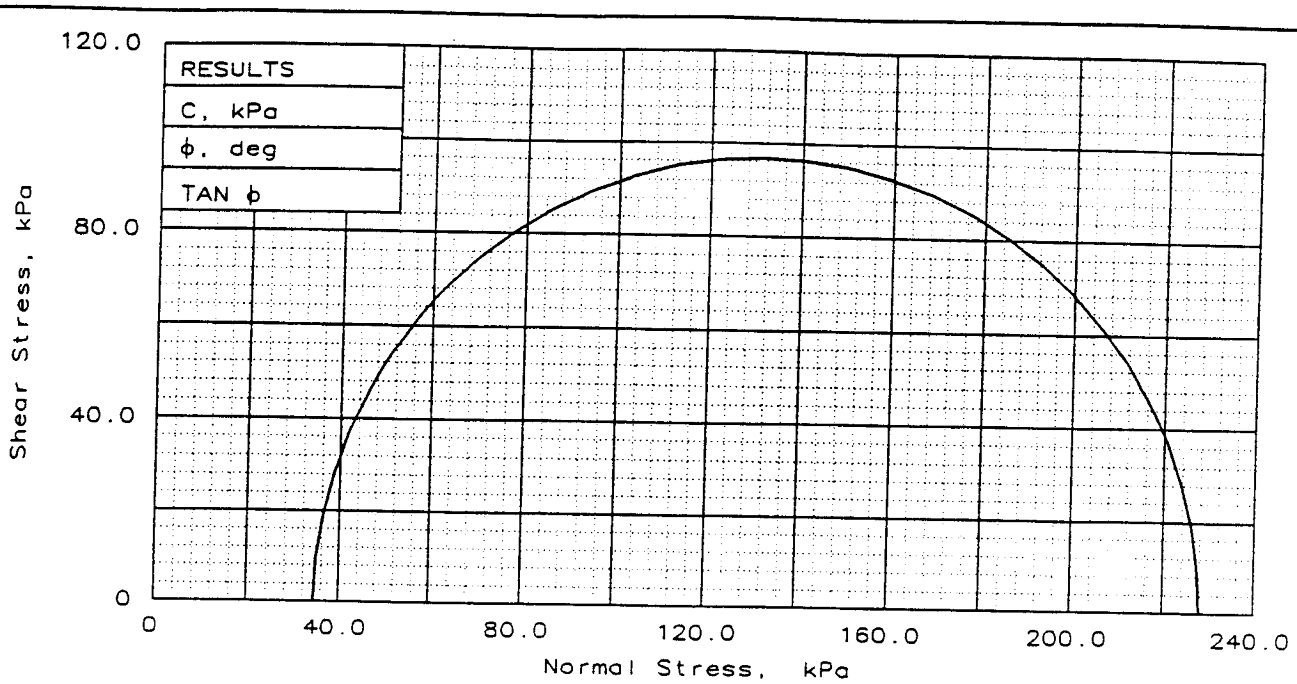
PROJECT: Third Runway West Side

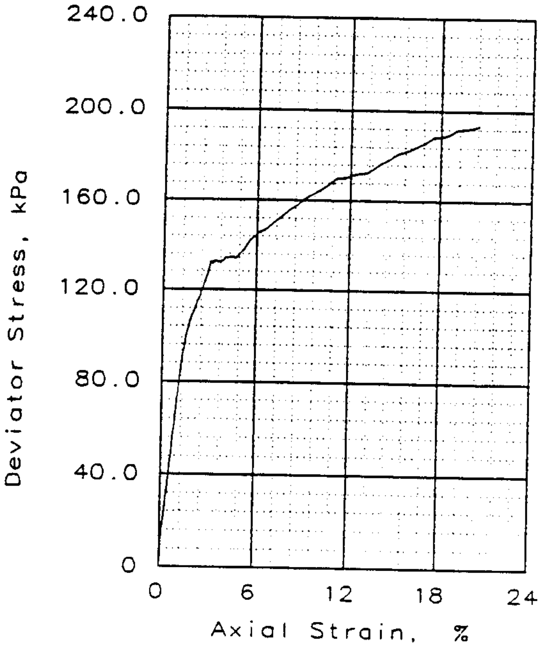
SAMPLE LOCATION: HC00-B110/S-11

HARTCROWSER

J4978-21 3/3/00

Figure **B-72**





	SAMPLE NO.	1
INITIAL	WATER CONTENT, %	31.7
	DRY DENSITY, g/cc	1.5
	SATURATION, %	104.5
	VOID RATIO	0.803
	DIAMETER, cm	7.24
	HEIGHT, cm	15.35
AT TEST	WATER CONTENT, %	31.6
	DRY DENSITY, g/cc	1.5
	SATURATION, %	104.4
	VOID RATIO	0.803
	DIAMETER, cm	7.24
	HEIGHT, cm	15.35
	BACK PRESSURE, kPa	0.0
	CELL PRESSURE, kPa	34.5
	FAILURE STRESS, kPa	193.6
	PORE PRESSURE, kPa	
	STRAIN RATE, %/min.	0.300
	ULTIMATE STRESS, kPa	
	PORE PRESSURE, kPa	
	σ_1 FAILURE, kPa	228.1
	σ_3 FAILURE, kPa	34.5

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Slightly sandy, clayey SILT
LL= 30 PL= 26 PI= 4.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

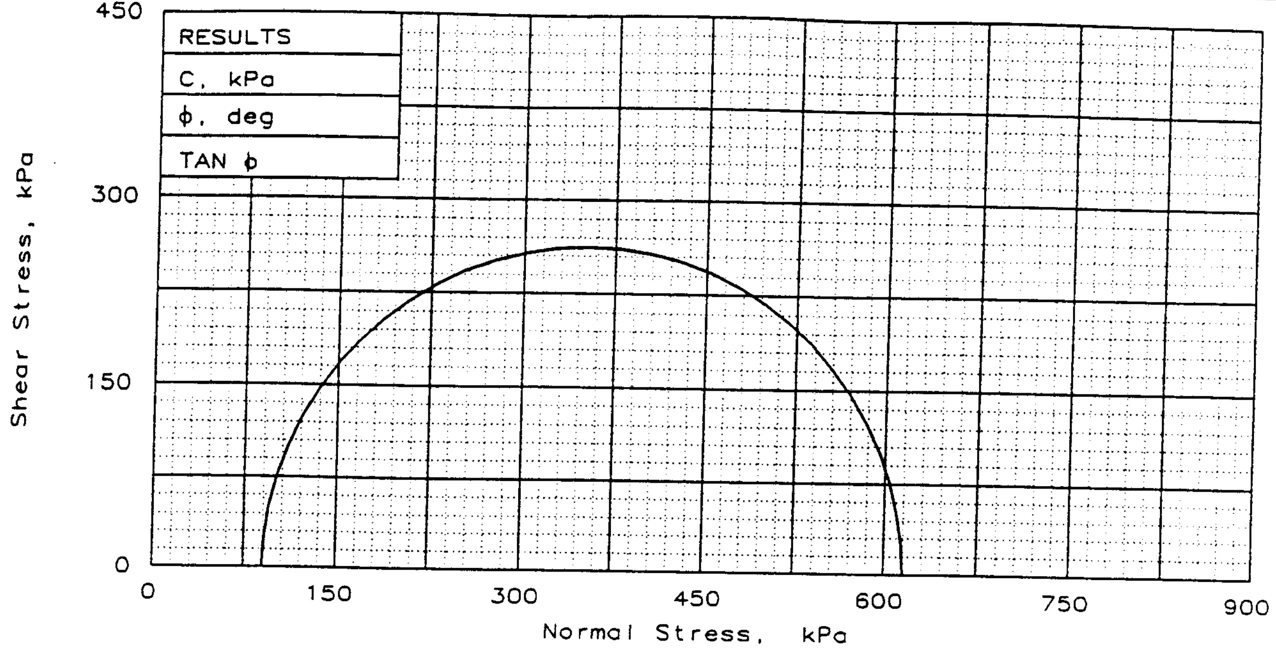
PROJECT: Third Runway West Side

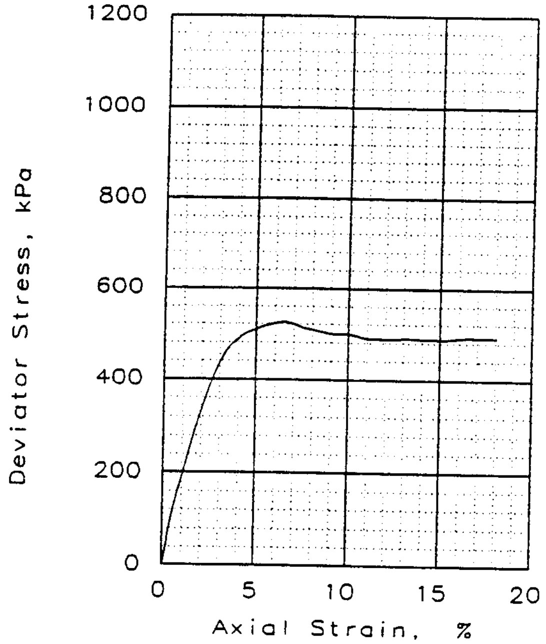
SAMPLE LOCATION: HC00-B118/S-2

HARTCROWSER

J4978-21 2/21/00

Figure **B-73**





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	25.0
	DRY DENSITY, g/cc	1.6
	SATURATION, %	104.5
	VOID RATIO	0.635
	DIAMETER, cm	7.27
	HEIGHT, cm	15.68
AT TEST	WATER CONTENT, %	25.0
	DRY DENSITY, g/cc	1.6
	SATURATION, %	104.3
	VOID RATIO	0.635
	DIAMETER, cm	7.27
	HEIGHT, cm	15.68
BACK PRESSURE, kPa		0
CELL PRESSURE, kPa		90
FAILURE STRESS, kPa		525
PORE PRESSURE, kPa		
STRAIN RATE, %/min.		0.300
ULTIMATE STRESS, kPa		
PORE PRESSURE, kPa		
σ_1 FAILURE, kPa		615
σ_3 FAILURE, kPa		90

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE:
DESCRIPTION: Sandy, very clayey SILT

LL= 41 PL= 25 PI= 16.0
SPECIFIC GRAVITY= 2.65
REMARKS:

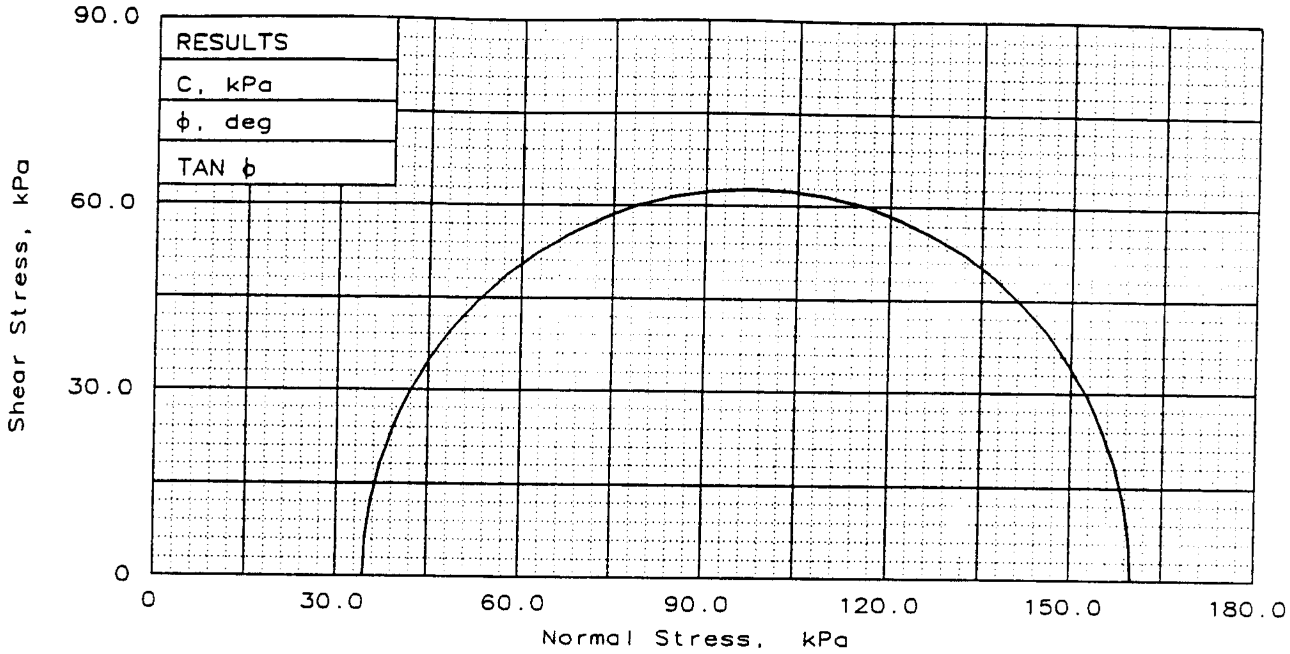
CLIENT: HNTB

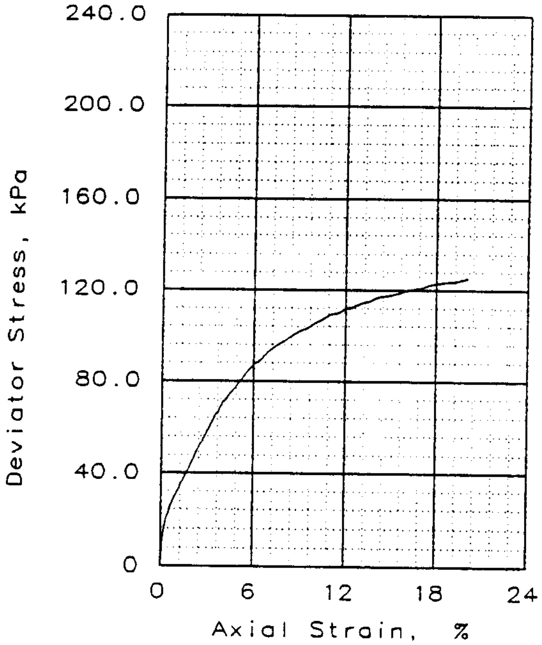
PROJECT: Third Runway West Side

SAMPLE LOCATION: HC00-B118/S-6

HARTCROWSER

J4978-21 2/19/00
Figure **B-74**





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	28.7
	DRY DENSITY, g/cc	1.6
	SATURATION, %	110.0
	VOID RATIO	0.691
	DIAMETER, cm	7.04
	HEIGHT, cm	14.37
AT TEST	WATER CONTENT, %	28.5
	DRY DENSITY, g/cc	1.6
	SATURATION, %	109.4
	VOID RATIO	0.691
	DIAMETER, cm	7.04
	HEIGHT, cm	14.37
BACK PRESSURE, kPa		0.0
CELL PRESSURE, kPa		34.5
FAILURE STRESS, kPa		125.6
PORE PRESSURE, kPa		
STRAIN RATE, %/min.		0.300
ULTIMATE STRESS, kPa		
PORE PRESSURE, kPa		
σ_1 FAILURE, kPa		160.1
σ_3 FAILURE, kPa		34.5

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Slightly sandy, lean CLAY
LL= 38 PL= 23 PI= 15.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

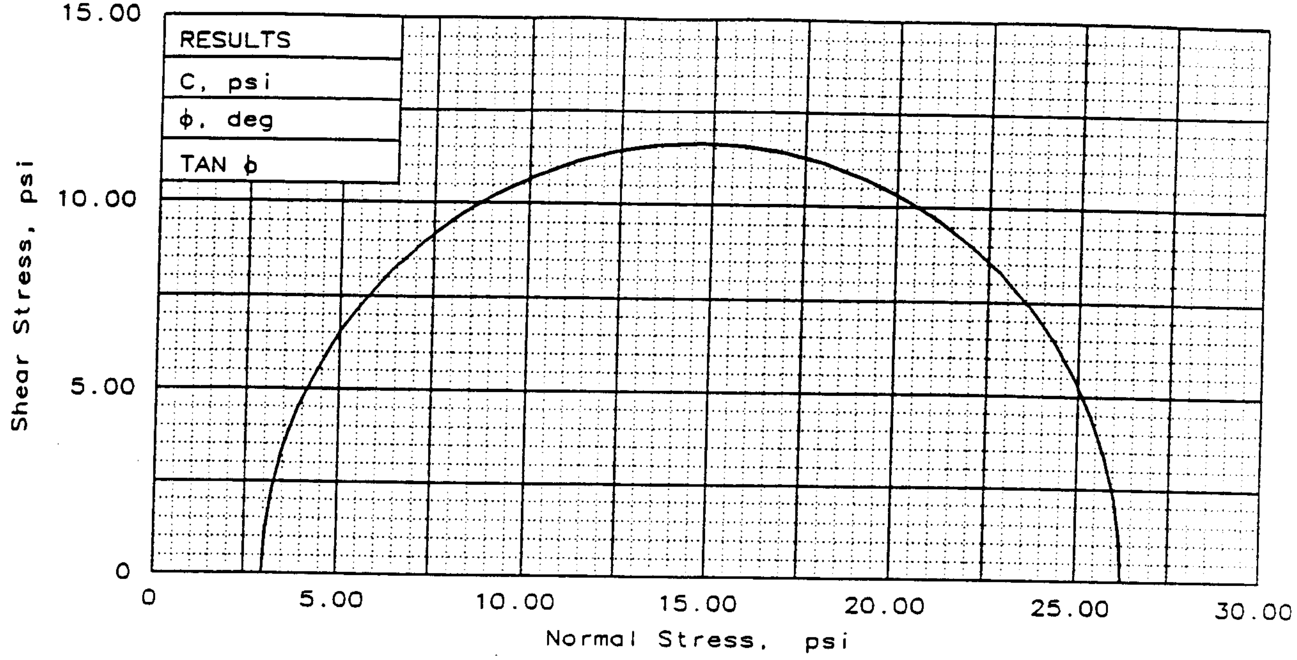
PROJECT: 3rd Runway West Side

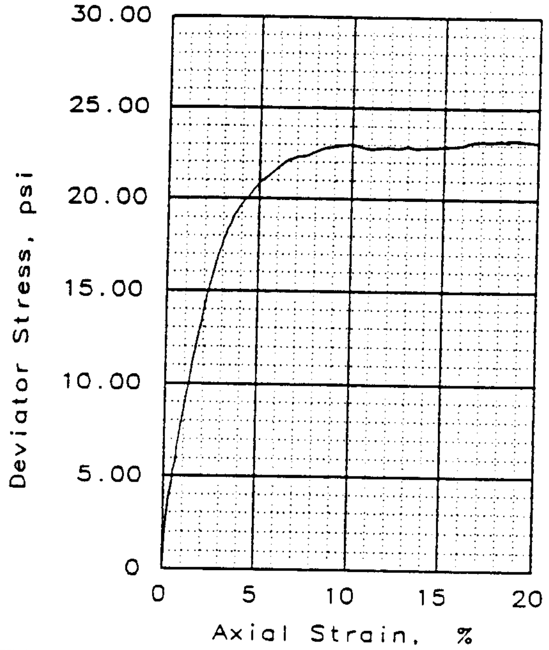
SAMPLE LOCATION: HC00-B129/S-3

HARTCROWSER

J4978-21 3/3/00

Figure **B-75**





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	22.4
	DRY DENSITY, pcf	106.9
	SATURATION, %	108.5
	VOID RATIO	0.547
	DIAMETER, cm	7.20
	HEIGHT, cm	15.59
AT TEST	WATER CONTENT, %	22.3
	DRY DENSITY, pcf	106.9
	SATURATION, %	108.1
	VOID RATIO	0.547
	DIAMETER, cm	7.20
	HEIGHT, cm	15.59
BACK PRESSURE, psi		0.00
CELL PRESSURE, psi		3.00
FAILURE STRESS, psi		23.27
PORE PRESSURE, psi		
STRAIN RATE, %/min.		0.300
ULTIMATE STRESS, psi		
PORE PRESSURE, psi		
σ_1 FAILURE, psi		26.27
σ_3 FAILURE, psi		3

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Lean CLAY

LL= 29 PL= 16 PI= 13.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

PROJECT: Third Runway Wetlands

SAMPLE LOCATION: HC00-B300

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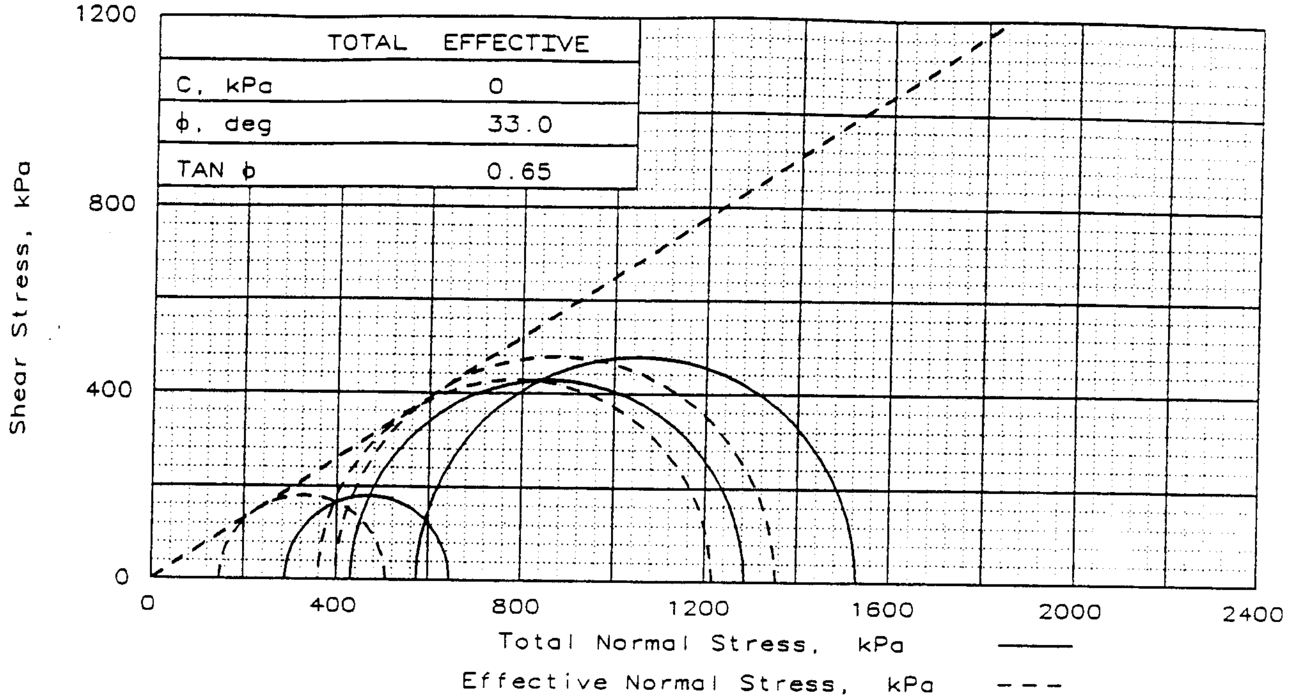
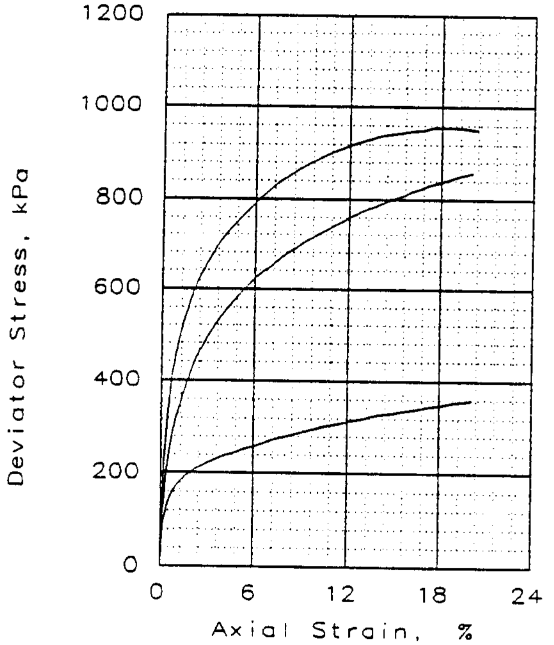
J4978-26 6/12/00

Figure B-76



	TOTAL	EFFECTIVE
C, kPa		0
ϕ, deg		33.0
TAN ϕ		0.65



SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	25.2	23.0	14.2
	DRY DENSITY, g/cc	1.6	1.7	1.9
	SATURATION, %	104.3	105.3	95.4
	VOID RATIO	0.640	0.578	0.394
	DIAMETER, cm	7.20	7.21	7.19
	HEIGHT, cm	15.54	15.27	14.63
AT TEST	WATER CONTENT, %	22.9	21.1	15.1
	DRY DENSITY, g/cc	1.7	1.8	2.0
	SATURATION, %	113.9	114.8	126.6
	VOID RATIO	0.534	0.486	0.317
	DIAMETER, cm	7.04	7.07	7.06
	HEIGHT, cm	15.20	14.98	14.35
BACK PRESSURE, kPa		138	138	138
CELL PRESSURE, kPa		425	569	712
FAILURE STRESS,' kPa		359	856	956
PORE PRESSURE, kPa		278	209	315
STRAIN RATE, %/min.		0.018	0.035	0.035
ULTIMATE STRESS, kPa				
PORE PRESSURE, kPa				
$\bar{\sigma}_1$ FAILURE, kPa		507	1216	1354
$\bar{\sigma}_3$ FAILURE, kPa		148	360	398

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Slightly sandy CLAY-SILT

LL= 19 PL= 15 PI= 4.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

PROJECT: Third Runway West Side

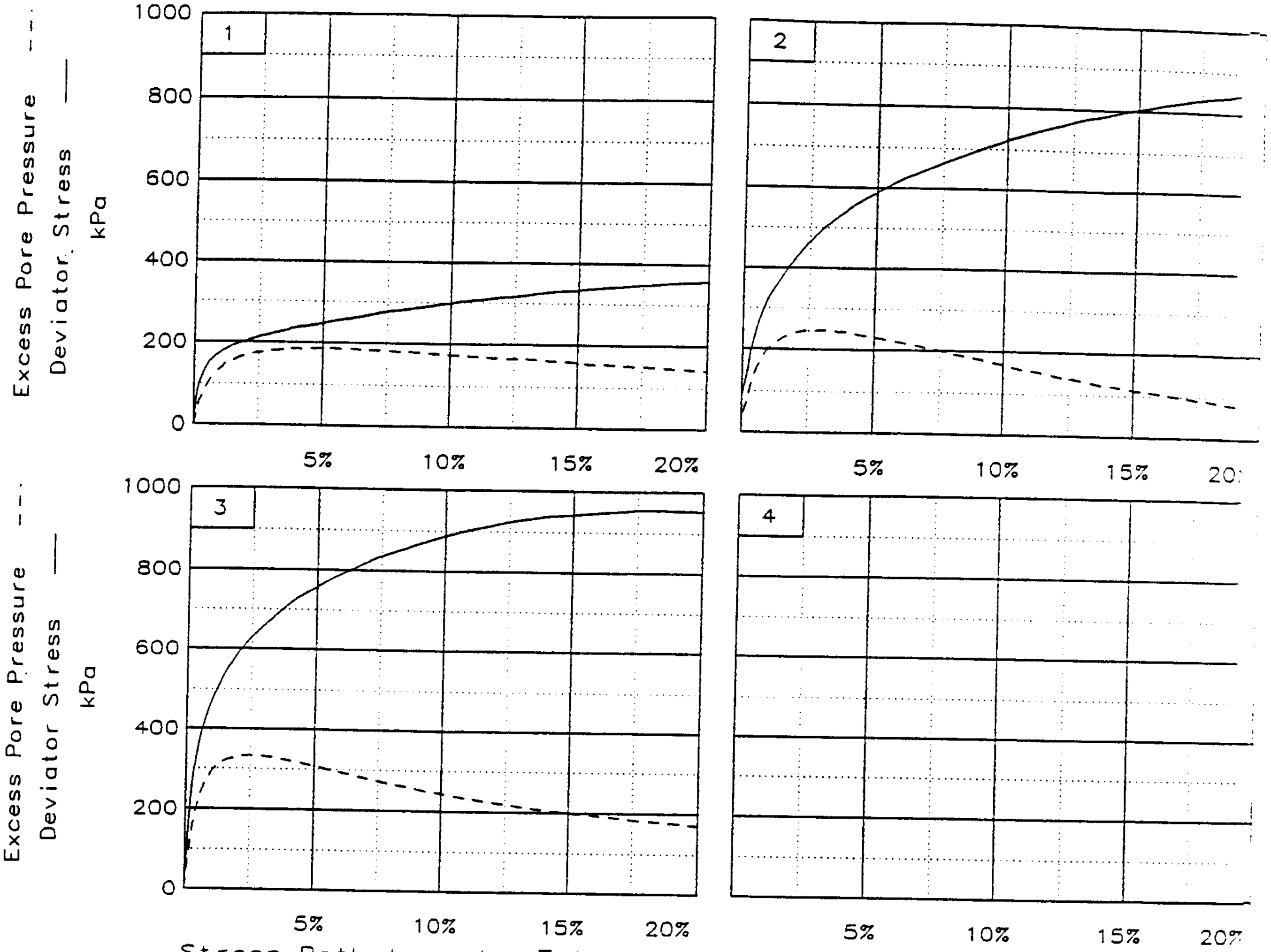
SAMPLE LOCATION: HC00-B110/S-4

HARTCROWSER

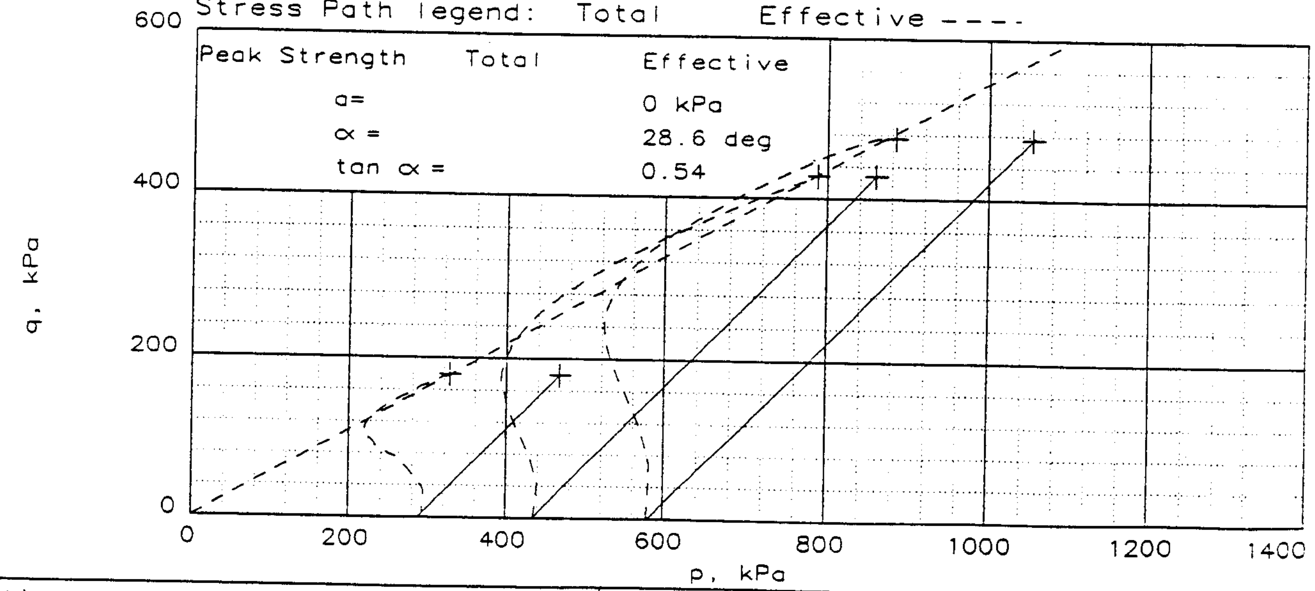
J4978-21 3/9/00

Figure B-77

STRESS-STRAIN AND STRESS PATHS REPORT



Stress Path legend: Total —— Effective - - - -



Peak Strength	Total	Effective
a=		0 kPa
∝ =		28.6 deg
tan ∝ =		0.54

Client: HNTB

Project: Third Runway West Side

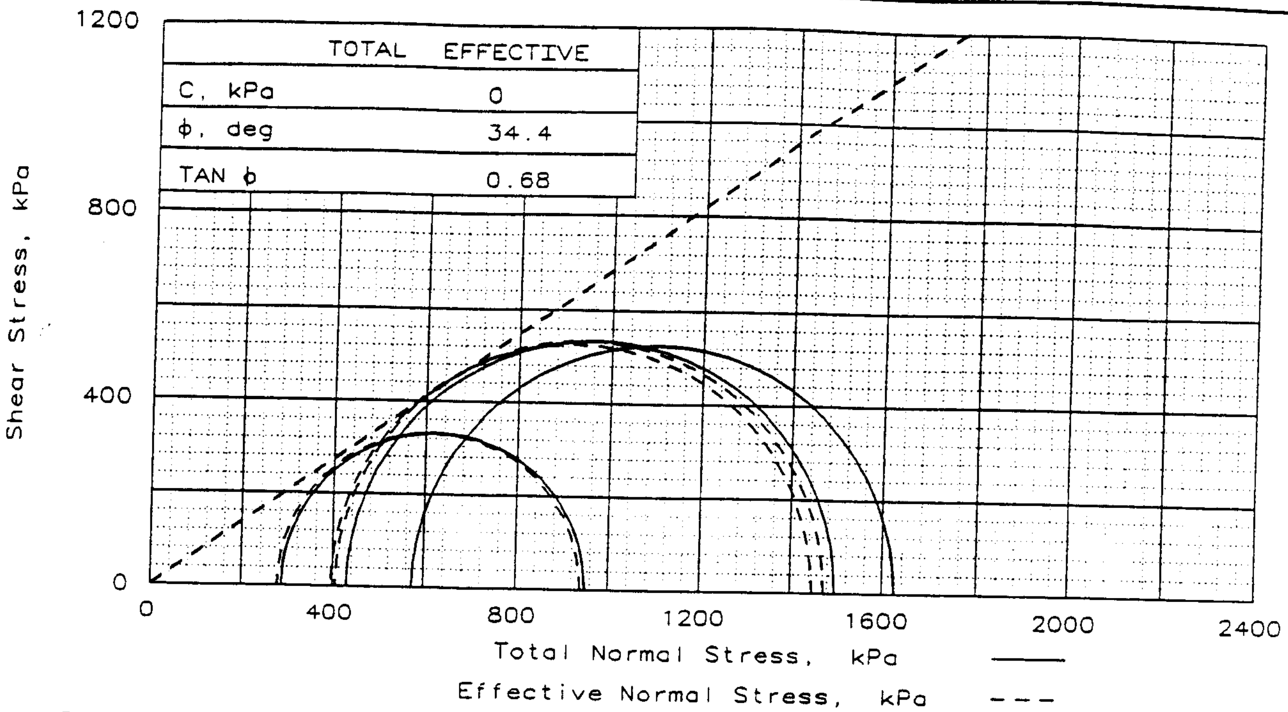
Location: HC00-B110/S-4

File: 3RWL

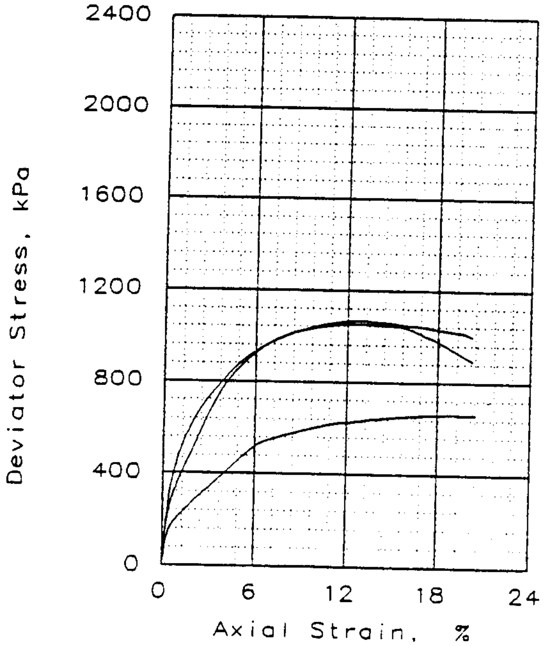
HART CROWSER

J4978-21 3/9/00

Figure **B-78**



	TOTAL	EFFECTIVE
C, kPa		0
ϕ, deg		34.4
TAN ϕ		0.68



	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	31.2	30.5	29.6
	DRY DENSITY, g/cc	1.5	1.5	1.5
	SATURATION, %	113.1	102.1	102.5
	VOID RATIO	0.730	0.793	0.767
	DIAMETER, cm	6.92	7.00	6.65
	HEIGHT, cm	14.12	13.80	13.98
AT TEST	WATER CONTENT, %	30.0	30.0	28.9
	DRY DENSITY, g/cc	1.6	1.5	1.5
	SATURATION, %	122.3	104.2	104.9
	VOID RATIO	0.650	0.764	0.730
	DIAMETER, cm	6.81	6.96	6.60
	HEIGHT, cm	13.90	13.73	13.88
	BACK PRESSURE, kPa	172	172	172
	CELL PRESSURE, kPa	747	603	460
	FAILURE STRESS, kPa	1051	1067	662
	PORE PRESSURE, kPa	351	197	183
	STRAIN RATE, %/min.	0.040	0.040	0.040
	ULTIMATE STRESS, kPa			
	PORE PRESSURE, kPa			
	$\bar{\sigma}_1$ FAILURE, kPa	1447	1473	940
	$\bar{\sigma}_3$ FAILURE, kPa	396	406	277

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Very clayey SILT

LL= 43 PL= 26 PI= 17.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

PROJECT: Third Runway West Side

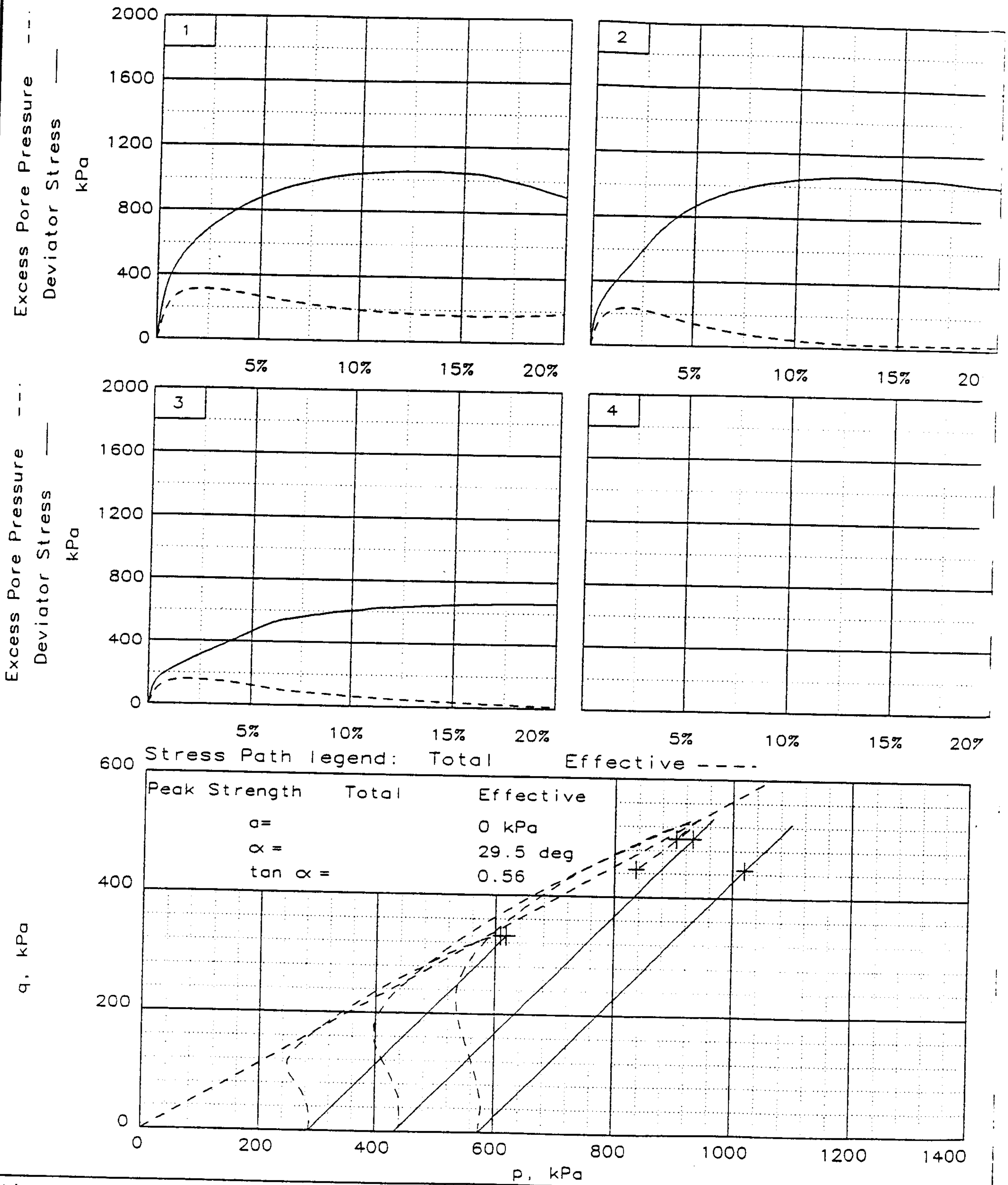
SAMPLE LOCATION: HC00-B111/S-12

HARTCROWSER

J4978-21 2/22/00

Figure **B-79**

STRESS-STRAIN AND STRESS PATHS REPORT



Peak Strength Total Effective

a= 0 kPa

∝ = 29.5 deg

tan ∝ = 0.56

Client: HNTB

Project: Third Runway West Side

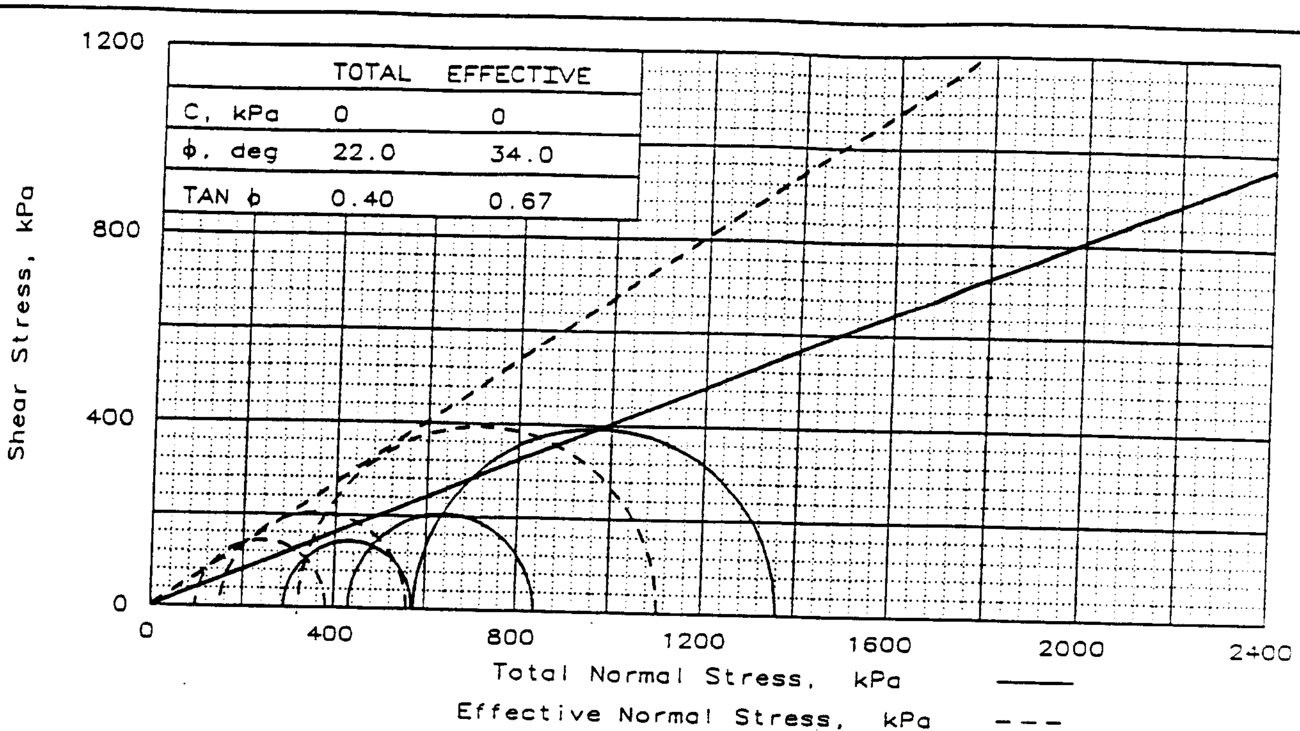
Location: HC00-B111/S-12

File: 3RWM

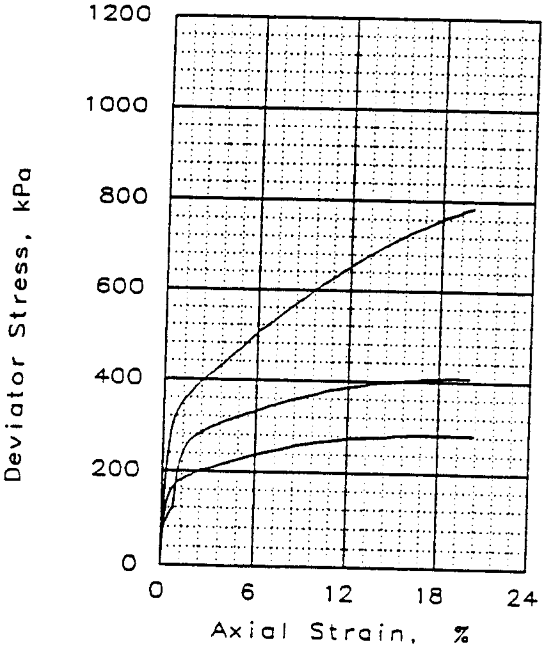
HART CROWSER

J4978-21 2/22/00

Figure **B-80**



	TOTAL	EFFECTIVE
C, kPa	0	0
ϕ, deg	22.0	34.0
TAN ϕ	0.40	0.67



SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	40.5	32.7	25.3
	DRY DENSITY, g/cc	1.3	1.5	1.6
	SATURATION, %	104.8	106.2	107.5
	VOID RATIO	1.024	0.816	0.624
	DIAMETER, cm	7.15	7.05	7.01
	HEIGHT, cm	14.95	14.67	14.23
AT TEST	WATER CONTENT, %	28.7	24.9	20.8
	DRY DENSITY, g/cc	1.5	1.6	1.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.761	0.659	0.551
	DIAMETER, cm	6.75	6.82	6.95
	HEIGHT, cm	14.59	14.29	13.83
BACK PRESSURE, kPa		138	138	138
CELL PRESSURE, kPa		425	569	714
FAILURE STRESS, kPa		285	408	786
PORE PRESSURE, kPa		329	418	393
STRAIN RATE, %/min.		0.011	0.018	0.036
ULTIMATE STRESS, kPa				
PORE PRESSURE, kPa				
$\bar{\sigma}_1$ FAILURE, kPa		381	559	1106
$\bar{\sigma}_3$ FAILURE, kPa		96	151	321

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: Sandy lean CLAY

LL= 37 PL= 22 PI= 15.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: HNTB

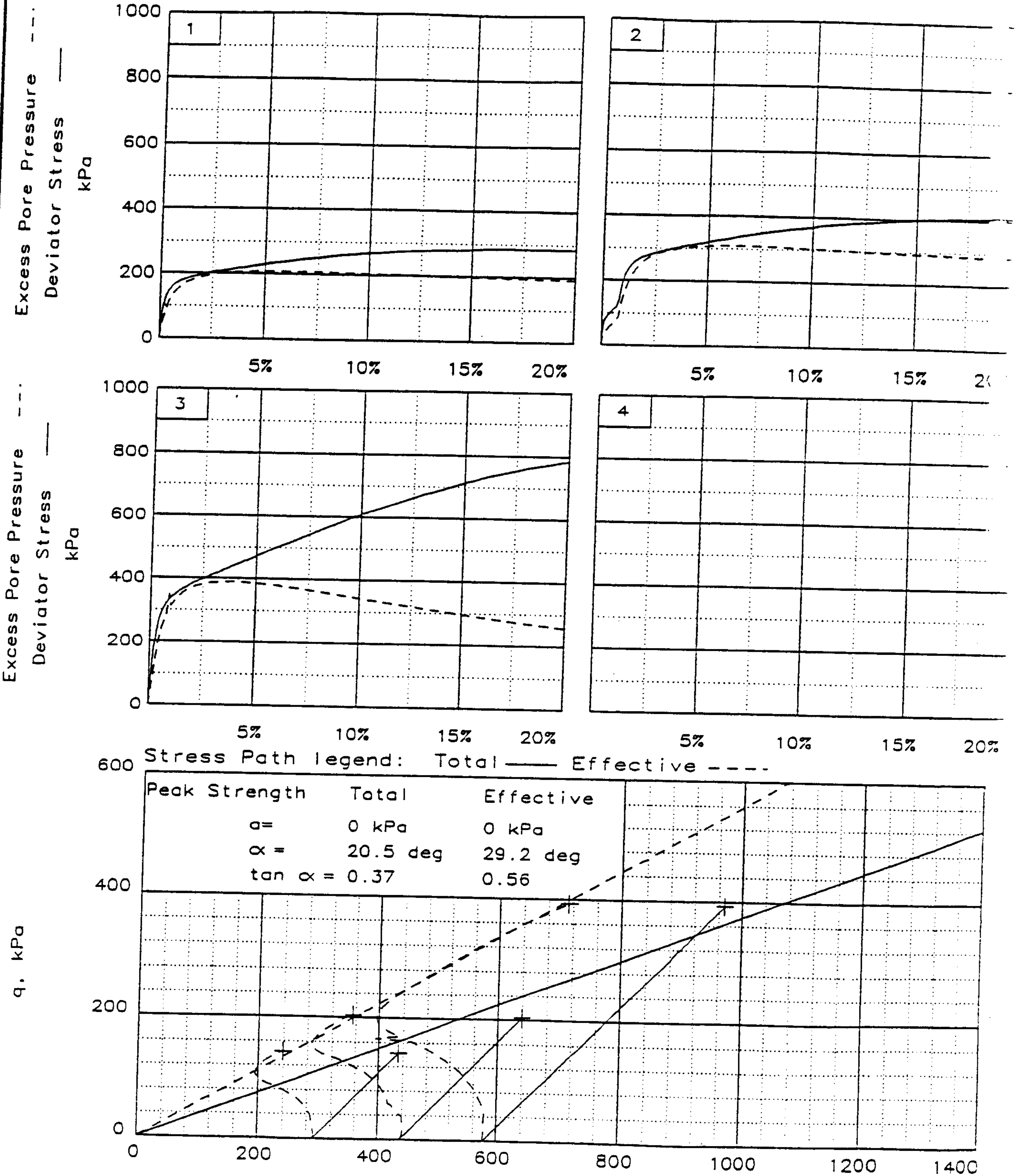
PROJECT: Third Runway

SAMPLE LOCATION: HC00-B132/S-5

HARTCROWSER

J4978-21 3/31/00
Figure **B-81**

STRESS-STRAIN AND STRESS PATHS REPORT



Stress Path legend: Total —— Effective - - - -

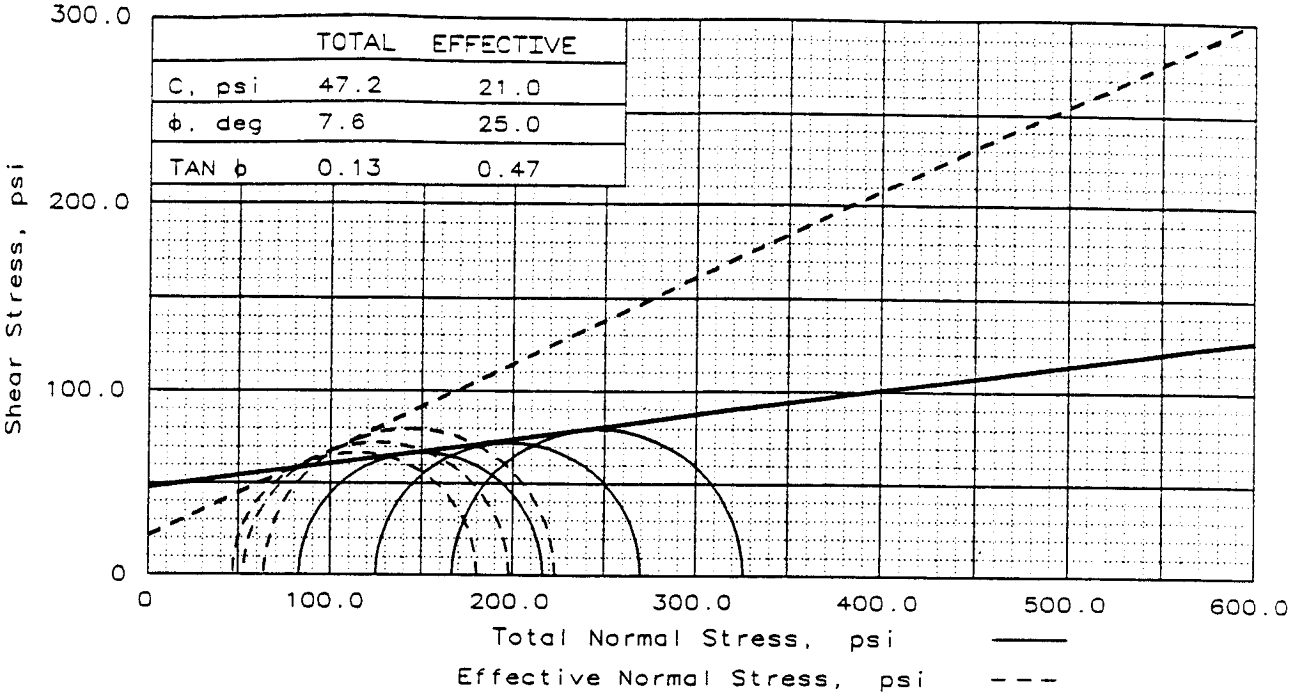
Peak Strength	Total	Effective
a=	0 kPa	0 kPa
∝ =	20.5 deg	29.2 deg
tan ∝ =	0.37	0.56

Client: HNTB
Project: Third Runway
Location: HC00-B132/S-5
File: 3RWR

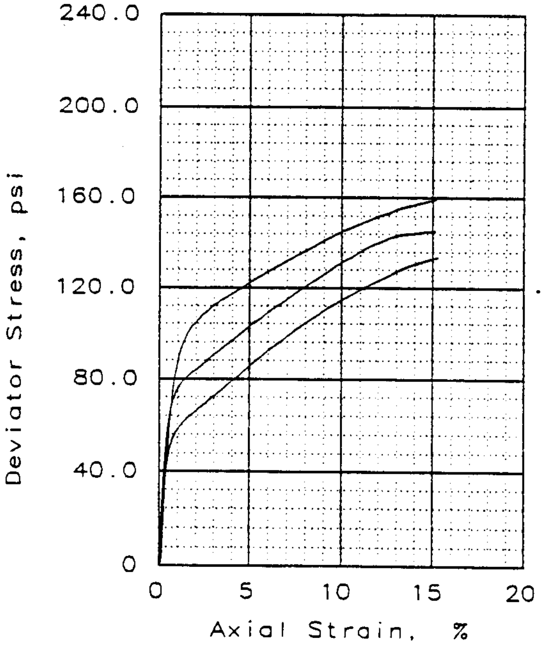
HART CROWSER

J4978-21 3/31/00

Figure **B-82**



	TOTAL	EFFECTIVE
C, psi	47.2	21.0
ϕ, deg	7.6	25.0
TAN ϕ	0.13	0.47



	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	33.8	34.2	36.0
	DRY DENSITY, pcf	85.2	93.0	89.3
	SATURATION, %	95.1	116.4	111.8
	VOID RATIO	0.943	0.779	0.853
	DIAMETER, in	2.90	2.78	2.80
	HEIGHT, in	5.93	5.95	5.80
AT TEST	WATER CONTENT, %	32.1	29.8	28.2
	DRY DENSITY, pcf	89.4	92.5	94.7
	SATURATION, %	100.0	100.0	100.0
	VOID RATIO	0.850	0.789	0.746
	DIAMETER, in	2.85	2.82	2.76
	HEIGHT, in	5.84	5.81	5.61
	BACK PRESSURE, psi	13.0	13.0	13.0
	CELL PRESSURE, psi	96.0	138.0	180.0
	FAILURE STRESS, psi	133.6	145.1	159.2
	PORE PRESSURE, psi	49.3	85.1	116.0
	STRAIN RATE, %/min.	0.100	0.100	0.100
	ULTIMATE STRESS, psi	133.6	145.1	159.2
	PORE PRESSURE, psi	49.3	85.1	116.0
	$\bar{\sigma}_1$ FAILURE, psi	180.4	198.0	223.2
	$\bar{\sigma}_3$ FAILURE, psi	46.7	52.9	64

TYPE OF TEST:
CU with pore pressures
SAMPLE TYPE: Shelby Tube
DESCRIPTION: SILT

LL= 38 PL= 30 PI= 8.0
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Port of Seattle

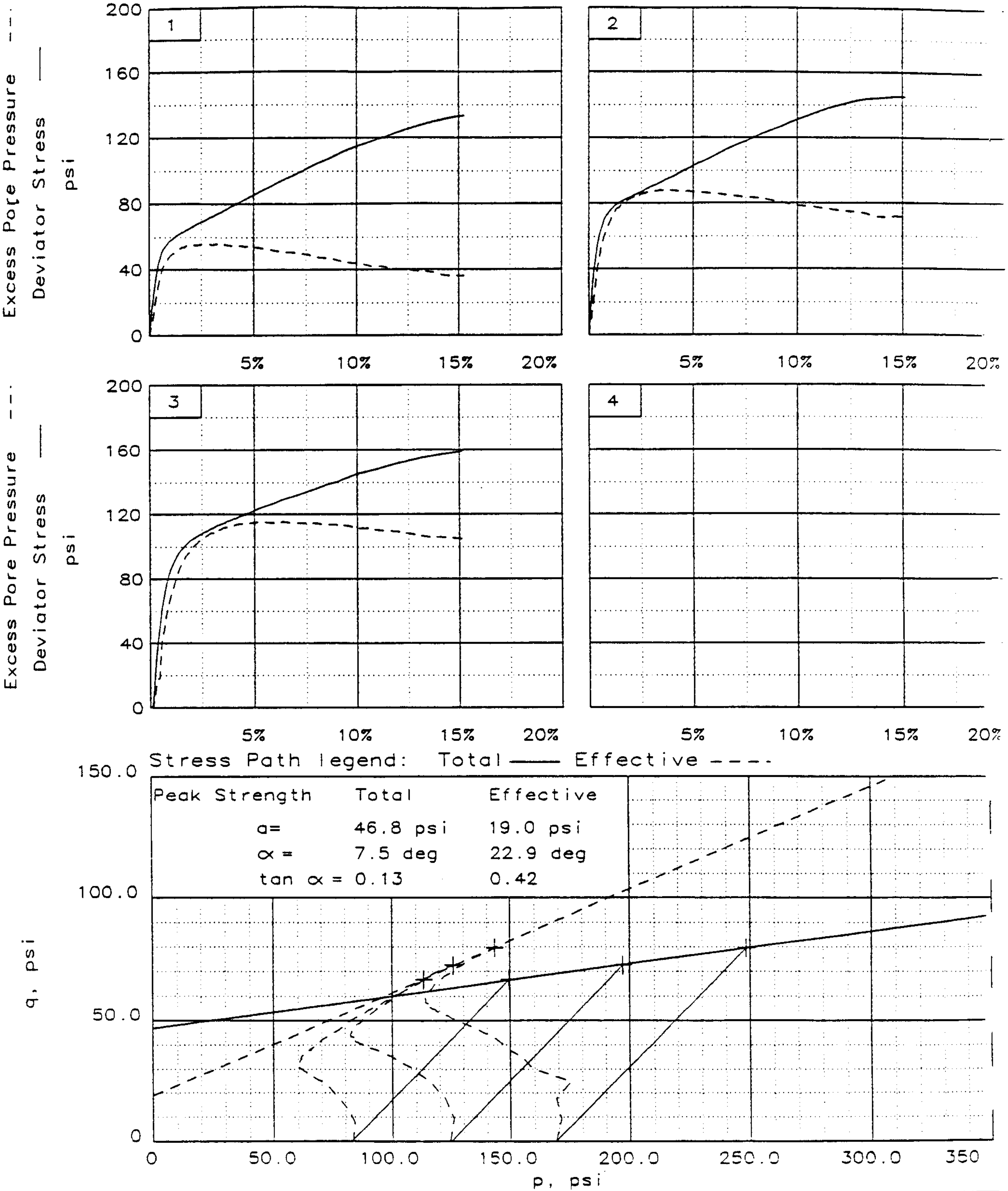
PROJECT: Third Runway

SAMPLE LOCATION: HC01-B119A S-4

HARTCROWSER

4978-42 5/9/01
Figure **B-83**

STRESS-STRAIN AND STRESS PATHS REPORT



Peak Strength	Total	Effective
a=	46.8 psi	19.0 psi
α =	7.5 deg	22.9 deg
tan α =	0.13	0.42

Client: Port of Seattle
Project: Third Runway
Location: HC01-B119A S-4
File: CU119A

HART CROWSER

4978-42 5/9/01

Figure **B-84**

APPENDIX C
FIELD EXPLORATIONS AND LAB TEST RESULTS BY OTHERS

APPENDIX C
FIELD EXPLORATIONS AND LAB TEST RESULTS BY OTHERS

This appendix presents data collected by Applied Geotechnology, Inc. (AGI) and Dames & Moore. Boring logs and test pit logs are presented on Figures C-3 through Figures C-49. Figure C-1 presents the soil classification system that was used by AGI and a legend to their exploration logs. An explanatory figure illustrating piezometer construction is provided on Figure C-2. Laboratory test data consisting of grain-size data and direct shear test results are presented on Figures C-50 through C-53. The exploration logs indicate that more laboratory tests were conducted than presented in this data report. We included the data that are available to us at this time and that are relevant to the Phase 5 work areas.

NOTE: Laboratory test results presented in this data report were compiled from earlier reports. These reports should be consulted in the interpretation of the laboratory test data.

This appendix includes the following subsurface explorations:

Explorations by AGI:

Borings:

AT94A-B3, AT94B-B2, AT94B-B6, AT96-B2 through AT96-B4, AT97-B2, AT97-B4 through AT97-B11, AT97-B13 through AT97-B20, AT97-B22, AT97-B23, AT97-B29 through AT97-B31, AT97-B33, AT97-B36, AT97-B37, AT97-B52, AT97-B56, AT97-B66 through AT97-B68, AT97-B72, AT97-B73.

Test Pits:

AT94B-TP5 through AT94B-TP7, AT94B-TP9, AT94B-TP10, AT94B-TP15, AT94B-TP16, AT97-TP5 through AT97-TP11.

Borings by Dames & Moore:

DM68A-B1 and DM68A-B2.

F:\docs\jobs\497828\Phase5Data(rpt).doc

UNIFIED SOIL CLASSIFICATIONS SYSTEM

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than half is larger than No. 200 Sieve	**GRAVELS** More than half coarse fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	**GW**	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		Gravels with over 12% fines	**GM**	Silty Gravels, poorly graded gravel-sand-silt mixtures
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
	SANDS More than half coarse fraction is larger than No. 4 sieve size	Clean sands with little or no fines	**SW**	Well graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		Sands with over 12% fines	**SM**	Silty sand, poorly graded sand-silt mixtures
			SC	Clayey sands, poorly graded sand-clay mixtures
FINE GRAINED SOILS More than half is smaller than No. 200 Sieve	**SILTS AND CLAYS** Liquid limit less than 50		**ML**	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic clays and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		**MH**	Inorganic silts, micaceous or diatomacious fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			**PT**	Peat and other highly organic soils

SAMPLE

■ "Undisturbed"

☒ Bulk/Grab

☐ Not Recovered

⊞ Recovered, Not Retained

CONTACT BETWEEN UNITS

———	Well Defined Change
／	Gradational Change
- - -	Obscure Change
▬	End of Exploration

BLOWS PER FOOT

Hammer is 300 pounds with 30-inch drop, unless otherwise noted

S - SPT Sampler (2.0-Inch O.D.)

T - Thin Wall Sampler (2.8-Inch Sample)

H - Split Barrel Sampler (2.4-Inch Sample)

MOISTURE DESCRIPTION

Dry - Considerably less than optimum for compaction

Moist - Near optimum moisture content

Wet - Over optimum moisture content

Saturated - Below water table, in capillary zone, or in perched groundwater

PHYSICAL PROPERTY TESTS

Consol	Consolidation
LL	Liquid Limit
PL	Plastic Limit
Gs	Specific Gravity
SA	Size Analysis
TxS	Triaxial Shear
TxP	Triaxial Permeability
Perm	Permeability
Po	Porosity
MD	Moisture/Density
DS	Direct Shear
VS	Vane Shear
Comp	Compaction
UU	Unconsolidated, Undrained
CU	Consolidated, Undrained
CD	Consolidated, Drained

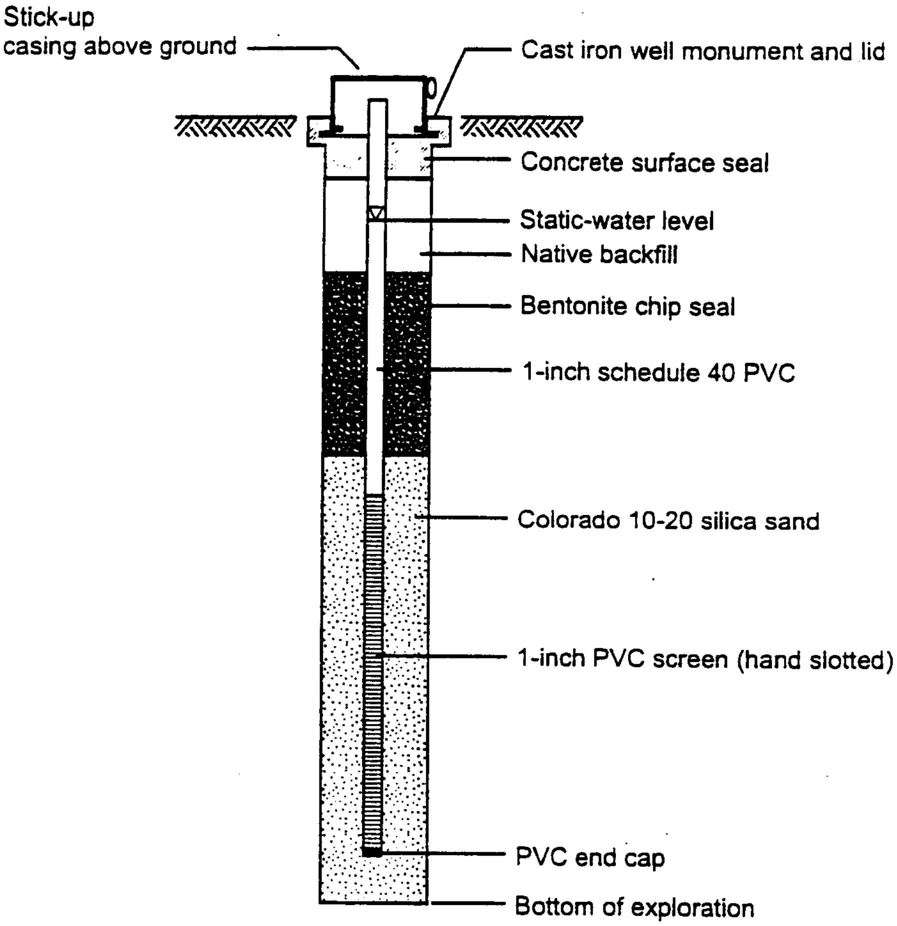
AGI
TECHNOLOGIES

Soil Classification/Legend

HNTB/SeaTac 1997 - Runway Investigation
SeaTac, Washington

Figure C-1

soilClas.cdr	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
	14,190.211	ECR	13 October 97			



AGI
TECHNOLOGIES

Piezometer Construction

HNTB/Runway Borrow Source Study
Seatac, Washington

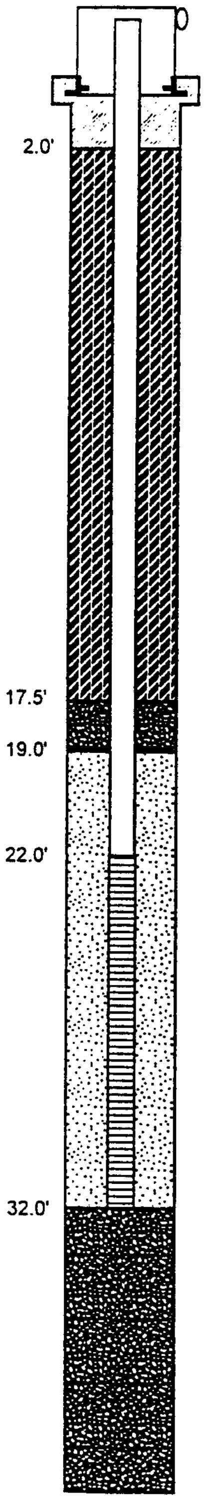
Figure C-2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
wel con.cdr	14,190.211	ECR	13 October 97			

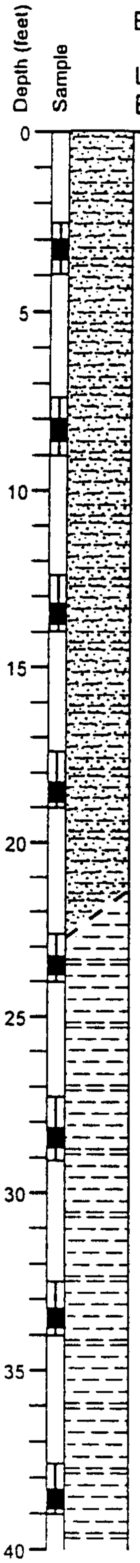
P.O.S. Coordinates: N 10,690 11,290 E

Equipment Mobile B-61

Land Surface Elevation 272 feet Date 12/14/94



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	15.7	115	18
MD,SA	17.3	117	9
MD	11.3	128	10
MD	8.8	134	53
MD,LL, PL	26.7	100	46
MD	28.9	97	26
MD	26.9	100	25
LL,PL	25.6		16



BROWN SILTY SAND (SM) medium dense, moist; fine to medium grained.

Becomes loose.

Becomes medium dense.

Becomes very dense.

GRAY SILT (MH) hard, moist. (Pre-Vashon Drift).

Becomes very stiff.

AGI TECHNOLOGIES

AT94A-B3 (0-40')

HNTB/Runway Borrow Source Study
SeaTac, Washington

***Figure* C-3** *1/2*

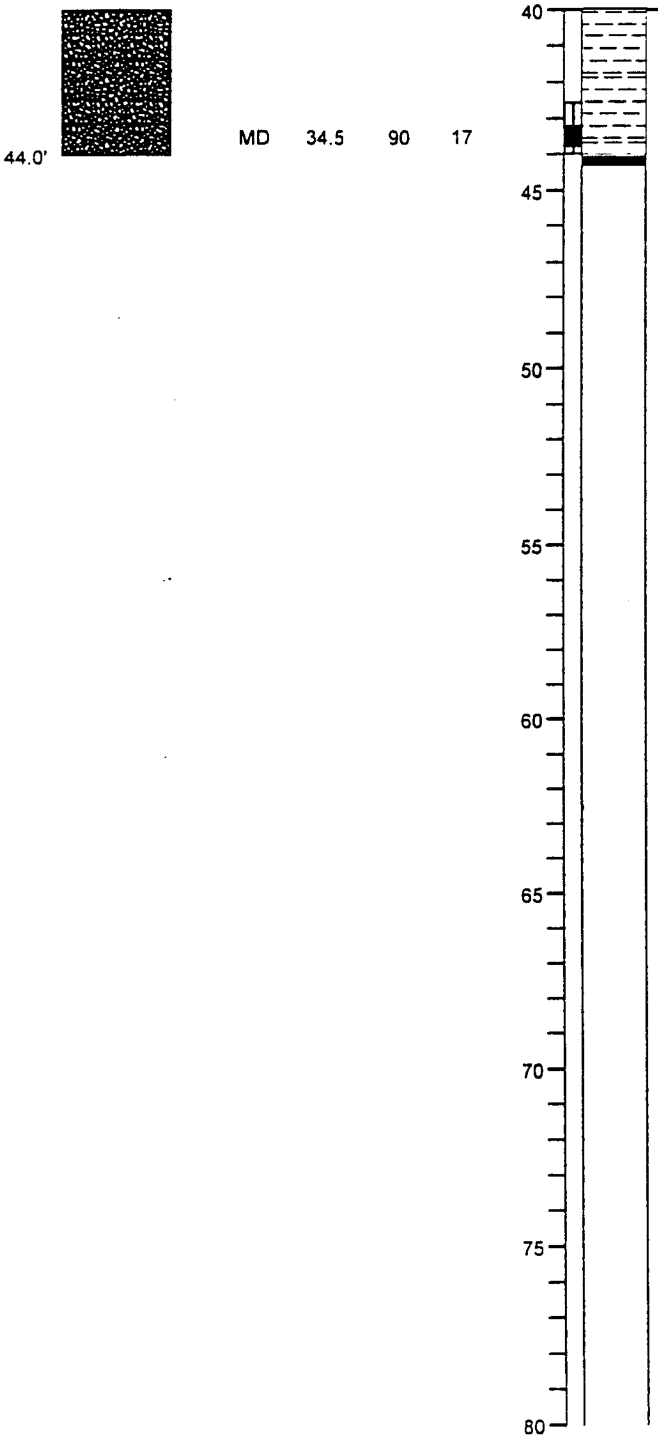
	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
B1w.cdr	14.190.208	ECR	6 December 94			

P.O.S. Coordinates: N 17,690 E 11,290

Equipment Mobile B-61

Land Surface Elevation 272 feet Date 12/14/94

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	34.5	90	17



Groundwater encountered at 26 feet during drilling.

Boring converted into piezometer on 12/14/94.

AGI TECHNOLOGIES

AT94A-B3 (40-44')

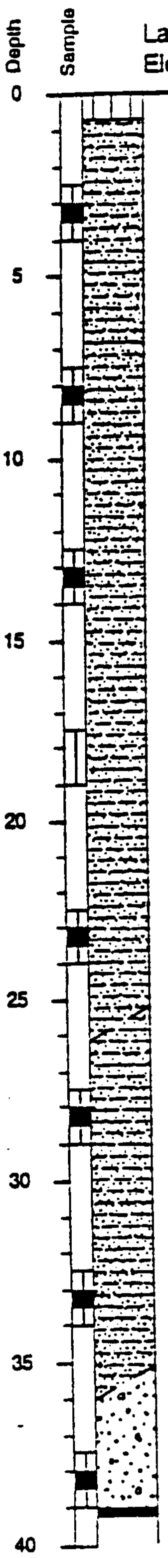
HNTB/Runway Borrow Source Study
SeaTac, Washington

Figure C-3 2/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
B1-40.cdr	14,190.208	ECR	6 December 94			

P.O.S. Coordinates: E 11000 N 12500
Equipment Canterra CT-450
Land Surface Elevation 359 feet* Date 12/28/93

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
SA	9.7	124	26
MD	8.4	125	24
MD	8.0	114	8
			7
MD	11.0	110	13
MD	8.0	124	70
MD	8.9	132	75/11"
MD	10.2	125	60



Pavement.
GRAY SILTY SAND (SM) medium dense, moist; fine to coarse grained, with gravel (Fill).

Becomes loose.

GRAY SILTY SAND (SM) very dense, moist; fine to coarse grained, with gravel (Glacial Till).

BROWN GRAY SAND (SW) very dense, moist; fine to coarse grained, with gravel and some silt (Advance Outwash).

Groundwater not encountered during drilling.

*Datum: Port of Seattle

Applied Geotechnology Inc.

AT94B-B2

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-4

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	KM		29 March 94		

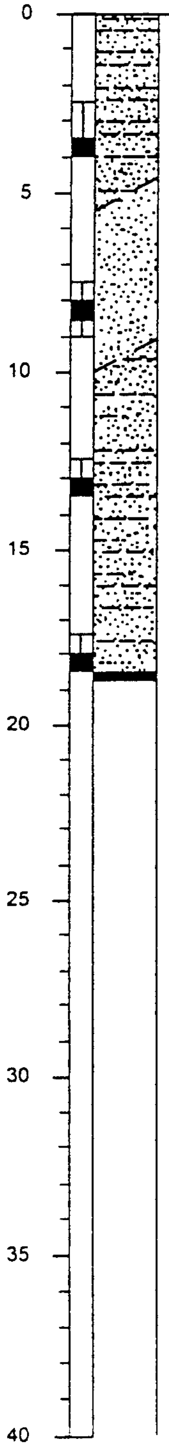
190203lg.pm5

P.O.S. Coordinates: E 11250 N 18400

Equipment Canterra CT-450

Land Surface Elevation 275 feet* Date 12/22/93

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
M	13.4		2
MD	11.7	116	16
MD	14.5	111	92/9"
MD	7.0	114	100/5"



BROWN SILTY SAND (SM) very loose, moist; fine grained, with a trace of organics (Recessional Outwash).

GRAY SAND (SP) medium dense, saturated; fine to coarse grained, with some silt and gravel (Recessional Outwash).

GRAY SILTY SAND (SM) very dense, moist; fine to medium grained, with gravel (Glacial Till).

Groundwater encountered at 7.5 feet during drilling.

*Datum: Port of Seattle

AGI
TECHNOLOGIES

Log of Boring AT94b-B6

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-5

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.211	KM		29 March 94		

190203lg.pm5

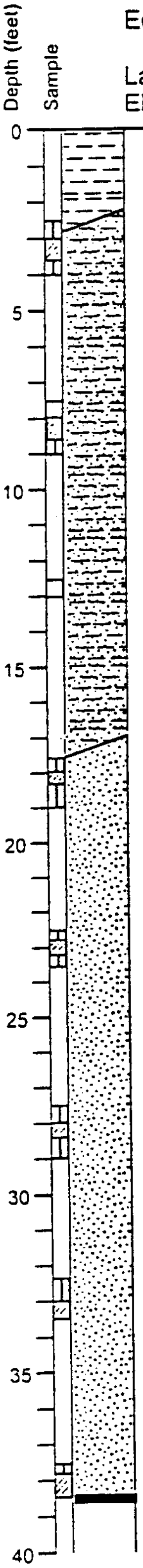
P.O.S. Coordinates: N 18.812 E 11.837

Equipment Mobile B59

Land Surface Elevation 345 feet

Completion Date 1/22/96

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	35.6	92.9	50/5"
MD MA DS	13.1	118.5	34
			50/4"
MD MA DS	8.9	109.4	50/5.5"
MD	5.2	102.0	50/5.5"
MD	20.6	102.8	60
MD	20.4	106.9	50/5"
MD MA DS	22.1	108.0	50/2"



RED BROWN SANDY SILT (ML) soft, moist to wet; with fine to coarse grained sand and organics (Fill).

BROWN GRAY SILTY SAND (SM) very dense, moist; fine to medium grained, with gravel (Till).

Becomes dense, with lenses of coarse sand.

GRAY SAND (SP) very dense, moist; fine grained.

Becomes fine to medium grained.

Becomes brown, wet to saturated.

Becomes gray, saturated.

Boring terminated on 1/22/96.
Boring backfilled with cuttings and bentonite.
Groundwater encountered at 32.5 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT96-B2

HNTB/P.O.S. Runway
SeaTac, Washington

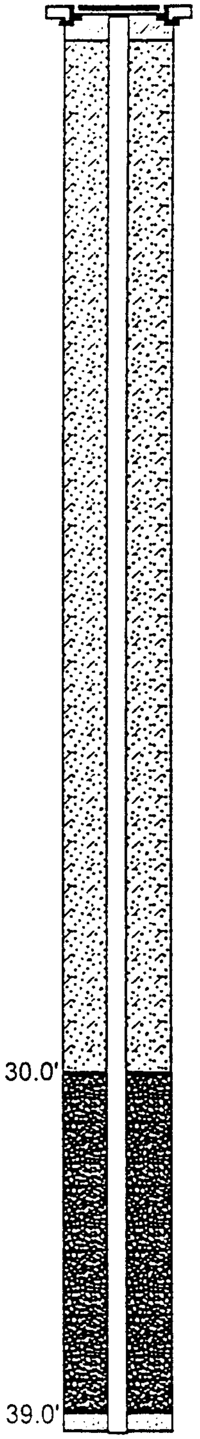
Figure C-6

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	25 Feb 96			

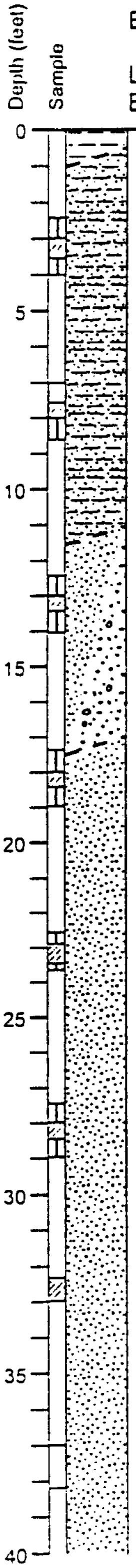
P.O.S. Coordinates: N 18,478 E 11,627

Equipment Mobile B59

Land Surface Elevation 325 feet Completion Date 1/23/96



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	13.5	118.5	28
MD	9.2	137.6	42
MD MA	7.3	134.7	68
MD	11.5	112.8	50/5"
MD MA DS	5.9	100.4	50/5"
MD	12.8	111.7	50/5.5"
MD			50/5.5"
			50/3"



BROWN SANDY SILT (ML) medium stiff, wet; with organics (Fill).

BROWN GRAY SILTY SAND (SM) medium dense, moist; mottled, with gravel, (Weathered Till).

Becomes dense with organic seam.

GRAY BROWN SAND (SP-SW) very dense, moist; fine to coarse grained, with some silt (Advance Outwash).

RED BROWN SAND (SP) very dense, moist; fine to medium grained, with some gravel.

Becomes brown, wet.

Becomes saturated.

AGI
TECHNOLOGIES

Log of Piezometer AT96-B3 (0-40')

HNTB/P.O.S. Runway
SeaTac, Washington

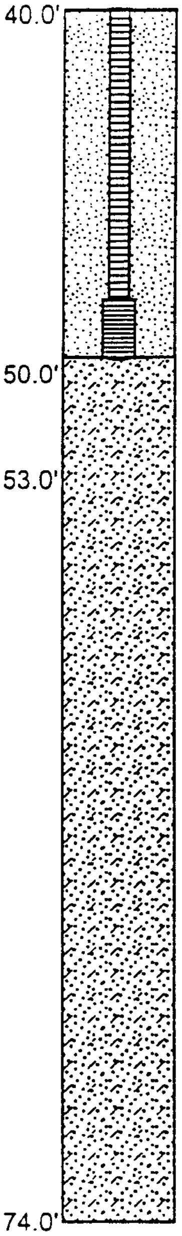
Figure C-7 1/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
B2.cdr	14,190.211	ECR	24 Feb 96			

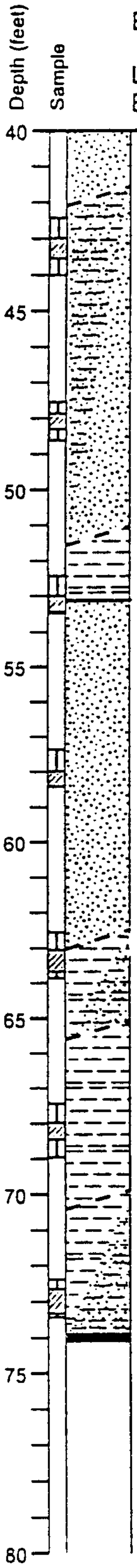
P.O.S. Coordinates: N 18,478 E 11,627

Equipment Mobile B59

Land Surface Elevation 325 feet Completion Date 1/23/96



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	25.4	102.4	50/5.5"
MD	31.6	92.5	50/6"
MD	33.5	95.1	50/4"
MD	22.3	109.9	50/4"
			50/4"
			63
MD	25.1	104.3	50/4"



GRAY SILTY SAND (SM-SP) very dense, saturated; fine grained.

GRAY SILT (ML) very hard, wet.

GRAY SAND (SP) very dense, saturated; fine grained, with some silt.

With interbedded silt seams.

GRAY SANDY SILT (ML-SM) very dense, wet to saturated; fine grained.

GRAY SILT (ML) very hard, wet to saturated; with a trace of fine sand.

GRAY SANDY SILT (ML-SM) very hard, saturated; fine grained.

Boring terminated at 74 feet bgs.
Groundwater encountered at 31.5 feet bgs during drilling.
Piezometer installed on 1/23/96.

AGI TECHNOLOGIES

Log of Piezometer AT96-B3 (40-74')

HNTB/P.O.S. Runway
SeaTac, Washington

Figure C-7 2/2

B2more.cdr

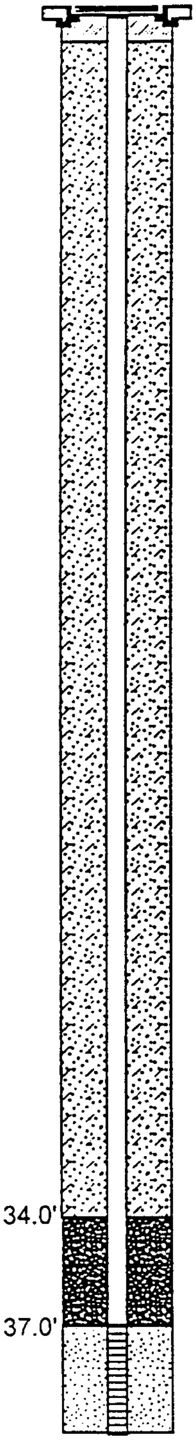
PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
14,190.211	ECR	24 Feb 96			

P.O.S. Coordinates: N 18.806 E 11.253

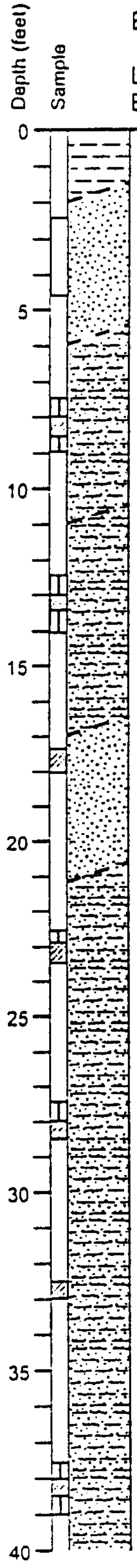
Equipment Mobile B59

Land Surface Elevation 280 feet

Completion Date 1/18/96



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			13
MD	19.9	114.4	58
MD DS -200	7.8	125.2	50/6"
MD	15.7	118.9	50/5"
MD	16.3	116.0	50/5"
MD	13.3	125.5	50/3"
MD DS -200	17.0	115.6	50/5"
MD	24.8	101.5	50/5.5"



BROWN SANDY SILTY (ML) medium stiff, saturated; with organics (Fill).

BROWN SAND (SP) medium dense, wet; fine to medium grained (Recessional).

BROWN SILTY SAND (SM) very dense, wet to saturated; with gravel.

GRAY SILTY SAND (SM) very dense, moist to wet; fine to medium grained, with gravel (Till).

GRAY SAND (SP) very dense, wet to saturated, fine to medium grained, with a trace of gravel and silt.

GRAY SILTY SAND (SM) very dense, wet to saturated; fine to medium grained.

Interbedded lenses of clean sand.

Becomes saturated, fine to coarse grained.

With cobbles at 36'.

Becomes fine grained.

AGI
TECHNOLOGIES

Log of Piezometer AT96-B4 (0-40')

HNTB/P.O.S. Runway
SeaTac, Washington

Figure C-8 *1/2*

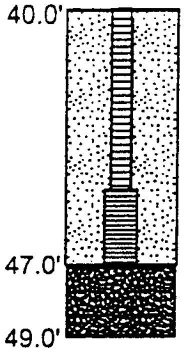
	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
B2.cdr	14.190.211	ECR	24 Feb 96			

P.O.S. Coordinates: N 18,806 E 11,253

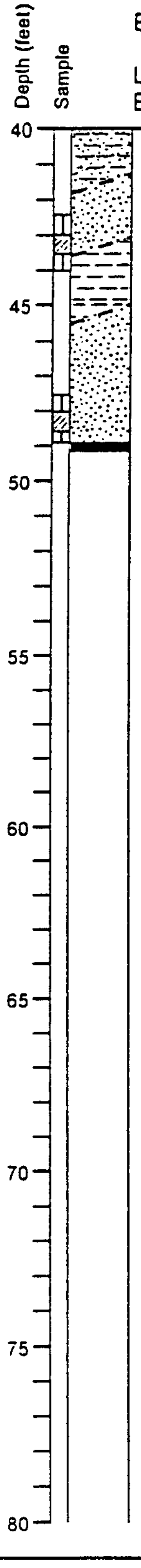
Equipment Mobile B59

Land Surface Elevation 280 feet

Completion Date 1/17/96



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	16.3	114.1	50/5.5"
MD	17.6	112.4	39



GRAY SAND (SP) very dense, saturated; fine to medium grained.

GRAY SILT (ML) very hard, wet; with trace sand.

GRAY SAND (SP) dense, saturated; fine grained, with silt.

Boring terminated at 49 feet bgs.
Groundwater encountered at 17.5 feet bgs during drilling.
Piezometer installed on 1/18/96.

AGI
TECHNOLOGIES

Log of Piezometer AT96-B4 (40-49')

HNTB/P.O.S. Runway
SeaTac, Washington

***Figure* C-8 2/2**

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
B2more.cdr	14,190.211	ECR	24 Feb 96			

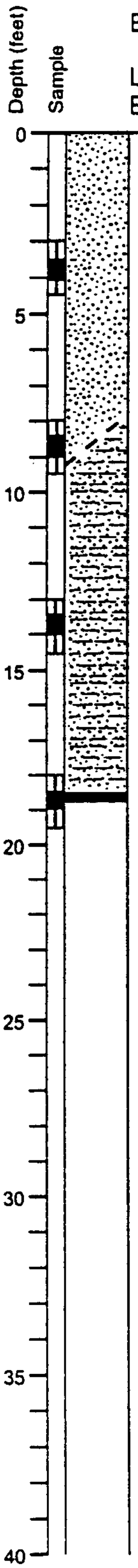
P.O.S. Coordinates: N 19,450 E 11,275

Equipment Mobile B59

Land Surface Elevation 312 feet

Completion Date 9/12/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	8.5	107	16
MD	11.8	121	21
MD	10.2	127	74
MD	11.1	113	50/5"



REDDISH BROWN SAND (SP-SM) medium dense, moist, fine grained with silt, trace gravel (Recessional Outwash).

GRAY SILTY SAND (SM) very dense, moist, fine to coarse sand, with fine gravel (Till).

Boring terminated at 18.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B2

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-9

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

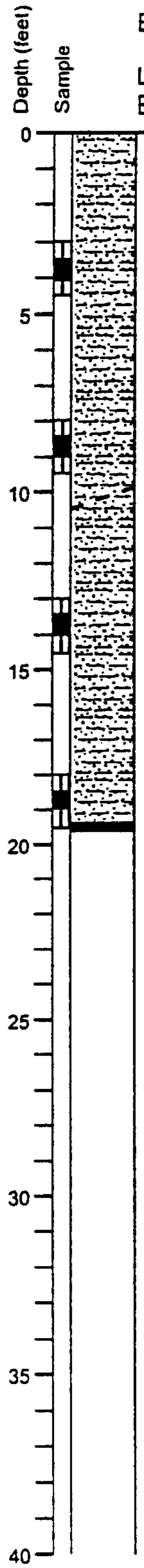
P.O.S. Coordinates: N 16,310 E 11,300

Equipment Mobile B59

Land Surface Elevation 378 feet

Completion Date 9/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	9.6	132	50/5"
MD	8.4	116	50/6"
MD	7.2	120	50/5"
			50/5.5"



REDDISH BROWN SILTY SAND (SM) very dense, moist, fine to medium grained with trace fine gravel (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained with trace gravel (Till).

Boring terminated at 19.4 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B4

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-10

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

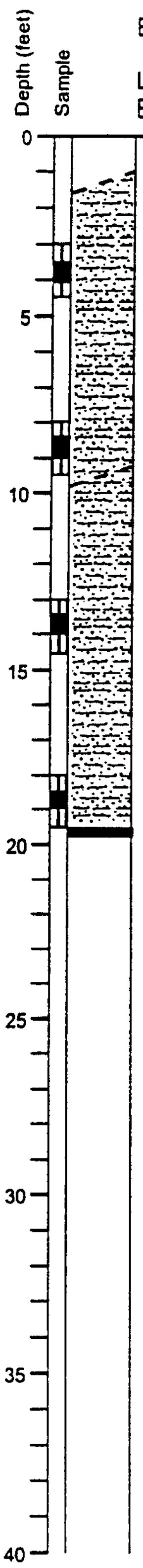
P.O.S. Coordinates: N 15,940 E 11,280

Equipment Mobile B59

Land Surface Elevation 377 feet

Completion Date 9/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	5.8	114	50/5.5"
			50/5.5"
MD	7.4	131	95
MD	9.8	129	84



Topsoil 16".

REDDISH BROWN SILTY SAND (SM) very dense, moist, fine to medium grained, trace gravel (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, with trace gravel (Till).

Boring terminated at 19.5 feet bgs.

No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B5

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-11

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

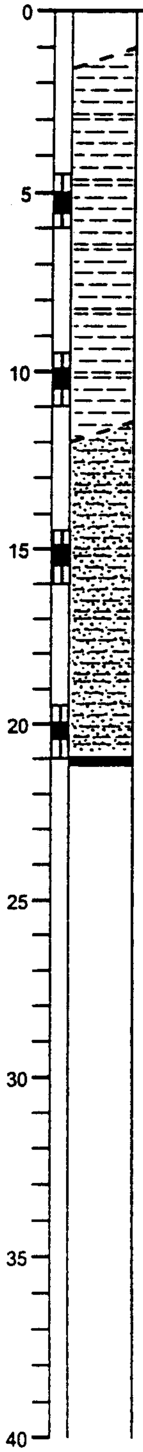
P.O.S. Coordinates: N 17,590 E 11,300

Equipment Mobile B59

Land Surface Elevation 292 feet

Completion Date 9/16/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)
PL			28	5
DS	28.7	96	25	10
MD	11.4	127	32	15
MD	10.8	127	38	20



Topsoil 18".

GRAY SILT (ML) very stiff, moist, with fine sand.

GRAY SILTY SAND (SM) dense, moist, fine to medium grained, some gravel (Pre Vashon Drift).

Boring terminated at 21.0 feet bgs.

No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B6

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-12

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

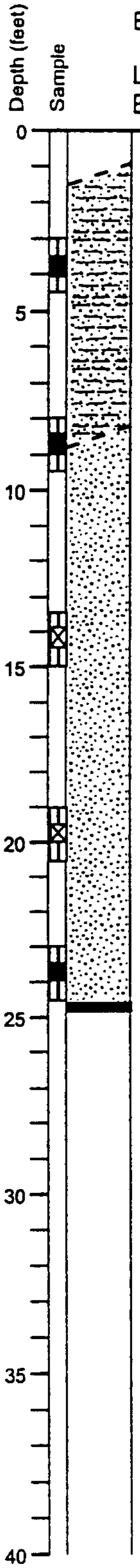
P.O.S. Coordinates: N 17,150 E 11,285

Equipment Mobile B59

Land Surface Elevation 340 feet

Completion Date 9/16/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	6.2	105	30
MD	14.4	111	30
			13
			16
DS	21.7	109	16



Topsoil 12".

LIGHT BROWN SILTY SAND (SM) medium dense to dense, dry, fine to medium grained, trace gravel (Fill).

BROWN SAND (SP-SM) medium dense, moist to wet, fine grained, (Advance Outwash).

Boring terminated at 24.5 feet bgs.

Groundwater encountered at 18 feet bgs during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B7

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

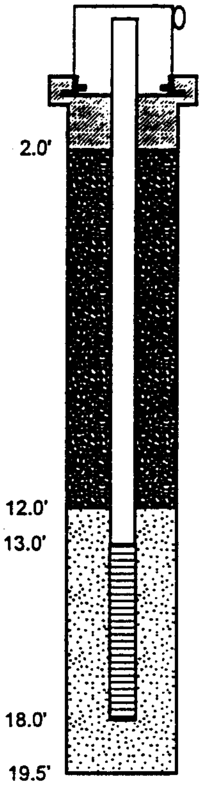
Figure C-13

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

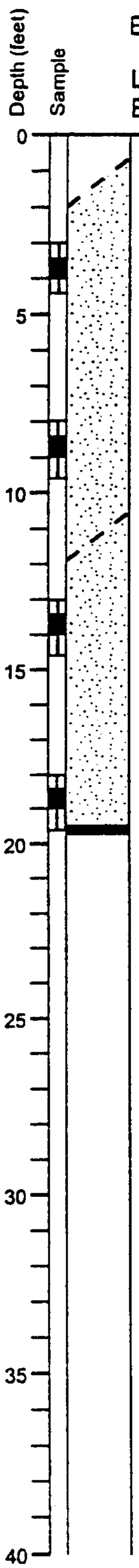
P.O.S. Coordinates: N 15,610 E 11,635

Equipment Mobile B59

Land Surface Elevation 377 feet Date 9/16/97



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	14.0	104	50
MD	14.8	114	68
MD	17.4	115	42
DS	21.0	109	86



Topsoil

BROWN SAND (SP-SM) dense, moist, fine to medium grained, trace gravel (Advance Outwash).

Becomes wet.

BROWN SAND (SP) dense, saturated, fine grained, (Advance Outwash).

Becomes very dense.

Boring terminated at 19.5 feet bgs .
Groundwater encountered at 18 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B8

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

Figure C-14

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Bwells.cdr	14,190.211	ECR	15 October 97			

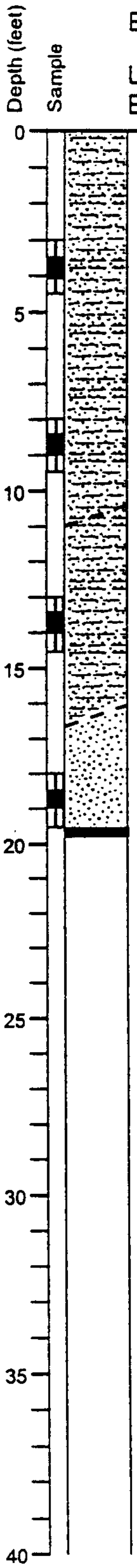
P.O.S. Coordinates: N 15,170 E 11,570

Equipment Mobile B59

Land Surface Elevation 374 feet

Completion Date 9/17/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	7.5	118	50/5"
MD	8.4	122	50/5.5"
MD	10.9	124	50/5"
MD	23.7	105	44



BROWN GRAY SILTY SAND (SM) very dense, moist, fine to coarse grained, with gravel, mottled (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to coarse grained, with gravel (Till).

BROWN SAND (SP) dense, saturated, fine grained (Advance Outwash).

Boring terminated at 19.5 feet bgs.
Groundwater encountered at 18 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B9

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-15

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

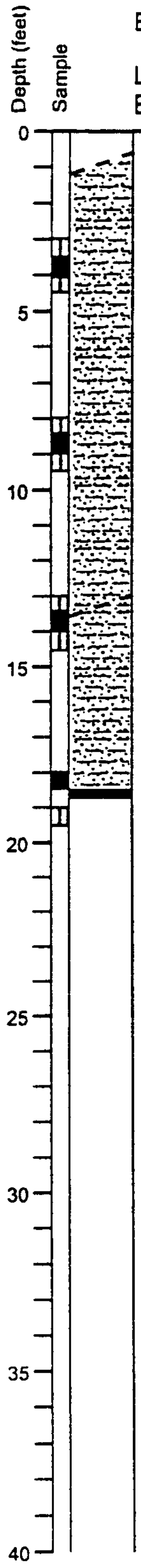
P.O.S. Coordinates: N 15.230 E 11.270

Equipment Mobile B59

Land Surface Elevation 3367 feet

Completion Date 9/17/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			67
MD	9.2	125	96
			50/4"
MD	10.0	112	50/5"



Topsoil 12".

BROWN GRAY SILTY SAND (SM) very dense, dry, fine to medium grained, with some gravel (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, some gravel (Till).

Boring terminated at 18.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B10

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-16

boring.cdr	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
	14,190.211	ECR	13 October 97			

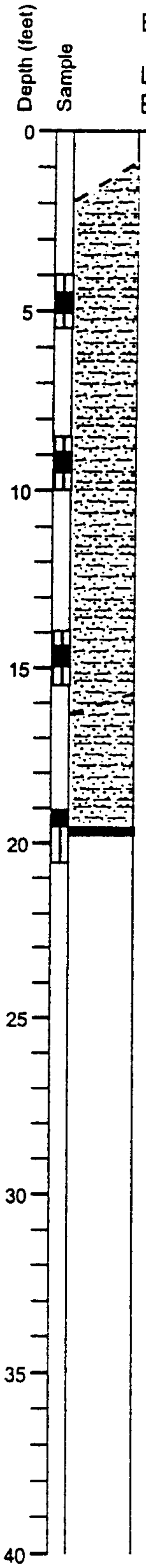
P.O.S. Coordinates: N 15,460 E 11,270

Equipment Mobile B59

Land Surface Elevation 370 feet

Completion Date 9/17/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	8.9	122	50/5.5"
DS			50/5.5"
MD	9.3	114	50/5.5"
MD	7.8	105	50/5.5"



Topsoil 12".

BROWN GRAY SILTY SAND (SM) very dense, dry, fine to medium grained, with some gravel (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, with some gravel (Till).

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B11

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-17

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
boring.cdr	14,190.211	ECR	13 October 97			

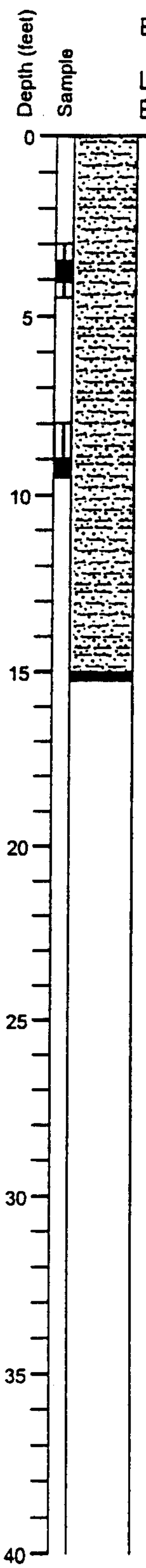
P.O.S. Coordinates: N 16,410 E 11,610

Equipment Mobile B59

Land Surface Elevation 386 feet

Completion Date 9/18/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	9.2	105	18
MD	9.4	110	20



BROWN SILTY SAND (SM) medium dense, moist, fine grained, with some gravel, asphalt, organics (Fill).

Boring abandoned at 15.0 feet bgs during drilling on fill debris.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B13

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

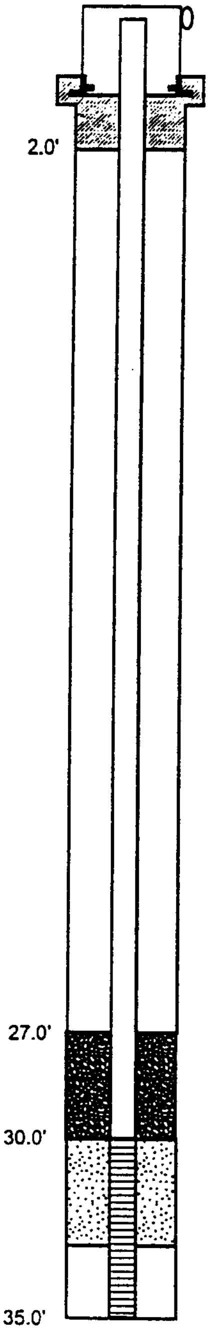
Figure
C-18

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

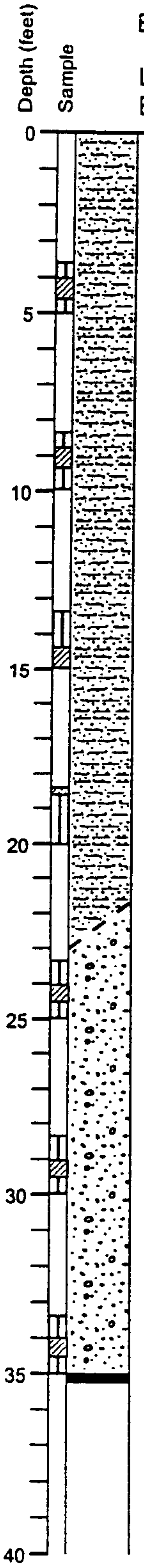
P.O.S. Coordinates: N 16,405 E 11,610

Equipment Mobile B59

Land Surface Elevation 386 feet Date 9/18/97



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			20
			51
			3
			50/3"
MD	8.7	133	50/5.5"
MD	10.7	134	84
			50/4"



BROWN SILTY SAND (SM) medium dense, moist, fine to medium grained, with gravel (Fill).

Becomes very loose.

Sampler driven on concrete debris.

BROWN SAND (SW) very dense, saturated, fine to coarse grained, some fine gravel and silt (Advance Outwash).

Boring terminated at 35.0 feet bgs.
Groundwater encountered at 18.5 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B14

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

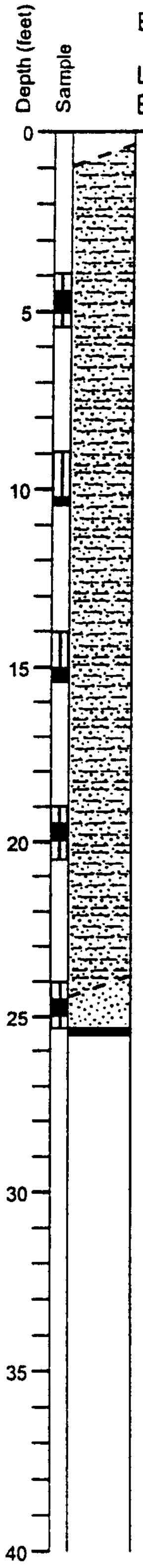
Figure C-19

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Bwells.cdr	14,190.211	ECR	15 October 97			

P.O.S. Coordinates: N 13,010 E 11,200

Equipment Mobile B59

Land Surface Elevation 359 feet Completion Date 9/18/97



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	
				Topsoil 12". BROWN SILTY SAND (SM) medium dense, moist, fine grained, with some gravel and asphalt (Fill).
MD	11.8	116	15	
			5	Becomes loose.
MD	11.4	120	3	Becomes very loose.
MD	13.9	105	4	
MD	8.2	112	34	BROWN SAND (SP) dense, moist, fine grained, with some silt (Advance Outwash).

Boring terminated at 25.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B15

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-20

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

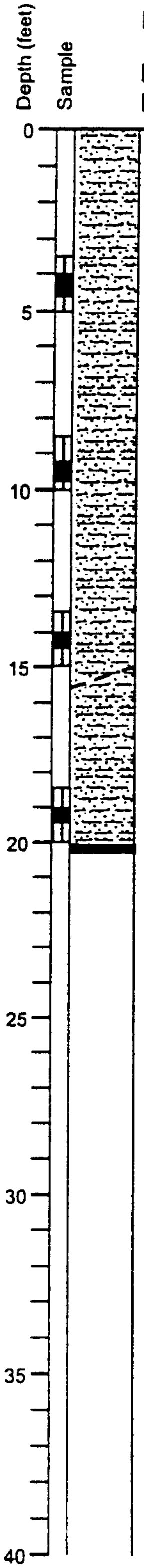
P.O.S. Coordinates: N 13,155 E 11,620

Equipment Mobile B59

Land Surface Elevation 367 feet

Completion Date 9/18/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	9.7	123	15
MD	9.7	93	7
MD	12.8	111	15
MD	10.9	130	57



GRAY AND BROWN SILTY SAND (SM) medium dense, moist, fine to coarse grained, with some gravel (Fill).

Becomes loose.

GRAY-BROWN SILTY SAND (SM) very dense, moist, fine to medium grained, with some gravel, mottled (Weathered Till).

Boring terminated at 20.0 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B16

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-21

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

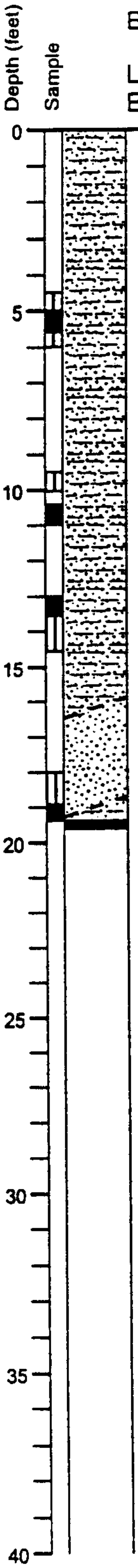
P.O.S. Coordinates: N 13,635 E 11,800

Equipment Mobile B59

Land Surface Elevation 372 feet

Completion Date 9/18/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	7.3	109	7
MD	15.9	115	4
			50/2"
MD	8.3	120	15



BROWN SILTY SAND (SM) loose, moist, fine grained, with some gravel, trace organics (Fill).

Sampler driven on debris.

GRAY SAND (SP) medium dense, moist, fine grained.

GRAY BROWN SILTY SAND (SM) medium dense, moist, fine grained, with some gravel, mottled.

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B17

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-22

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

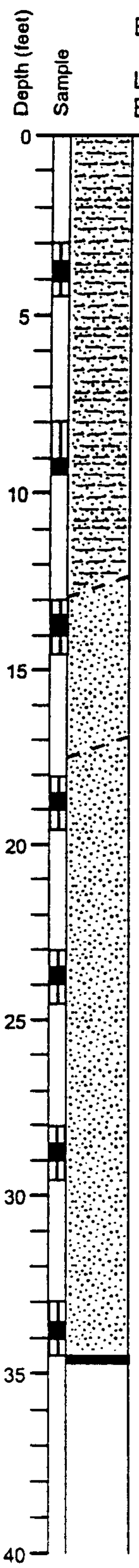
P.O.S. Coordinates: N 11,605 E 11,250

Equipment Mobile B59

Land Surface Elevation 350 feet

Completion Date 9/19/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	9.4	122	24
MD	8.5	122	31
MD	12.3	113	24
MD	9.0	121	31
MD	16.2	113	24
MD	12	120	24
MD	9.4	131	21



BROWN GRAY SILTY SAND (SM) medium dense, dry, fine to medium grained, some gravel (Fill).

With coarse gravel.

GRAY SAND (SP) medium dense, moist, fine grained.

GRAY AND BROWN SILTY SAND (SP) dense, moist, fine grained, trace gravel.

Boring terminated at 34.5 feet bgs.
Groundwater encountered at 23.0 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B18

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-23

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

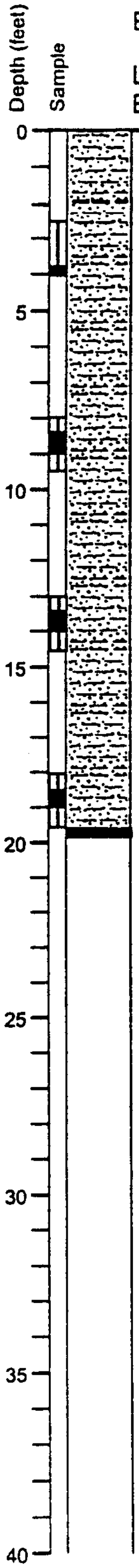
P.O.S. Coordinates: N 11,850 E 11,170

Equipment Mobile B59

Land Surface Elevation 351 feet

Completion Date 9/19/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			50/4"
MD	8.1	112	37
MD	7.9	116	41
MD	9.7	123	37



BROWN-GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, some gravel (Fill).

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B19

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-24

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

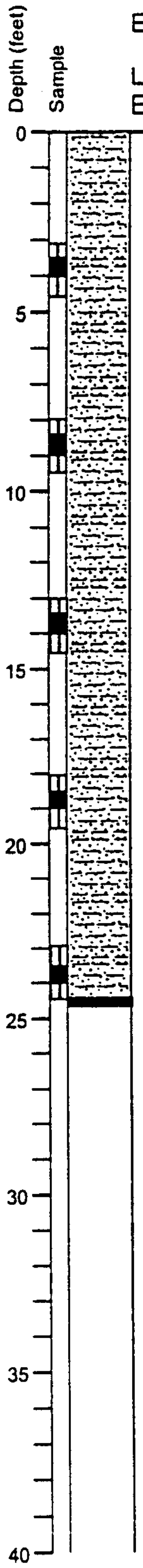
P.O.S. Coordinates: N 11,700 E 11,385

Equipment Mobile B59

Land Surface Elevation 352 feet

Completion Date 9/19/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	8.1	132	42
MD	6.6	130	11
MD	13.2	124	29
MD	12.6	123	24
MD	8.6	120	22



BROWN-GRAY SILTY SAND (SM) dense, moist, fine to medium grained, with gravel (Fill).

Boring terminated at 24.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B20

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-25

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

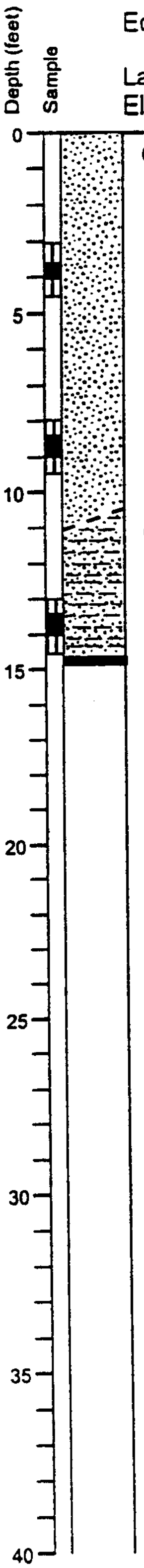
P.O.S. Coordinates: N 13,900 E 12,170

Equipment Mobile B59

Land Surface Elevation 374 feet

Completion Date 9/22/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	5.7	102	20
			22
MD	6.5	122	50/5.5"



GRAY -BROWN SILTY SAND (SP/SM) medium dense, moist, fine grained, trace gravel (Fill).

GRAY SILTY SAND (SM) very dense, moist, fine to coarse grained, with fine gravel (Weathered Till).

Boring terminated at 14.5 feet bgs.
No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B22

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-26

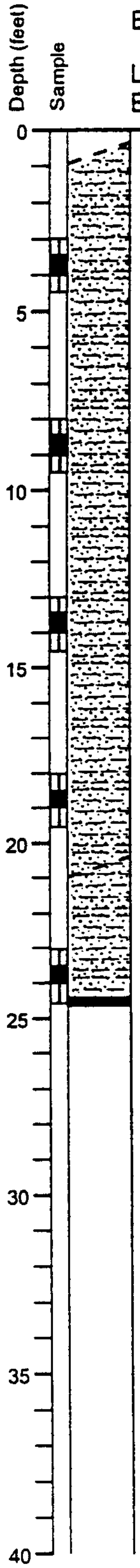
	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring2.cdr	14,190.211	ECR	13 October 97			

P.O.S. Coordinates: N 13,300 E 12,025

Equipment Mobile B59

Land Surface Elevation 367 feet Completion Date 9/22/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	9.6	127	20
MD	10.4	121	21
MD	7.2	122	37
MD	8.7	127	57
MD	7.8	131	50/5"



Topsoil 12".

BROWN-GRAY SILTY SAND (SM) medium dense, moist, fine to medium grained, with some gravel (Fill).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, some gravel (Till).

Boring terminated at 24.5 feet bgs.

No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B23

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-27

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring3.cdr	14,190.211	ECR	13 October 97			

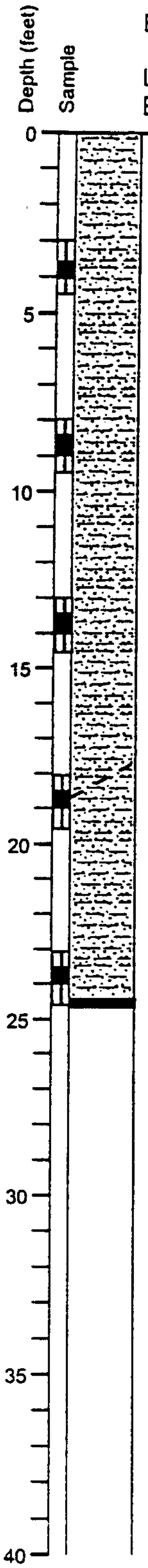
P.O.S. Coordinates: N 12,180 E 11,940

Equipment Mobile B59

Land Surface Elevation 358 feet

Completion Date 9/23/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	7.5	111	12
			18
MD	9.5	127	33
MD	10.1	127	97
MD	9.3	127	86



BROWN GRAY SILTY SAND (SM) medium dense, moist, fine to medium grained, with gravel (Fill).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, with gravel (Till).

Boring terminated at 24.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B29

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-28

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring3.cdr	14,190.211	ECR	13 October 97			

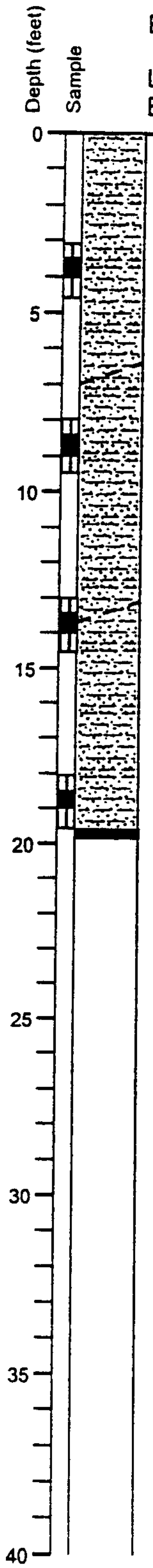
P.O.S. Coordinates: N 12,440 E 11,900

Equipment Mobile B59

Land Surface Elevation 359 feet

Completion Date 9/23/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	7.6	126	15
MA	9.2		24
MD	13.7	120	60
MD	9.9	123	70



BROWN GRAY SILTY SAND (SM) medium dense, moist, fine to medium grained, some gravel (Fill).

BROWN GRAY SILTY SAND (SM/SP) medium dense, moist, fine to medium grained, some gravel and sand.

Becomes wet.

BROWN GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, occasional gravel (Till).

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B30

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-29

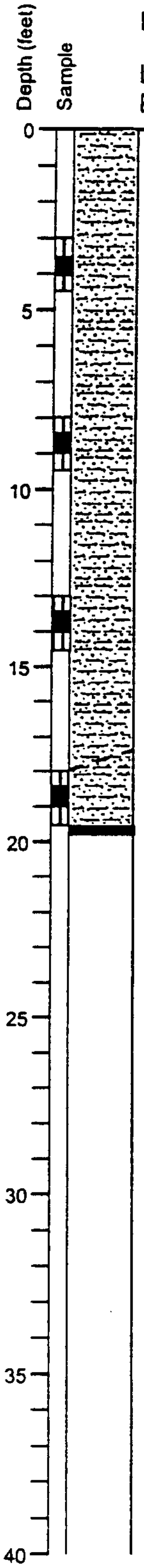
	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring3.cdr	14,190.211	ECR	13 October 97			

P.O.S. Coordinates: N 12,875 E 11,370

Equipment Mobile B59

Land Surface Elevation 362 feet Completion Date 9/23/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD,MA	5.9	115	24
MD	10.1	90	4
MD	25.2	91	5
MD	9.6	92	72



BROWN SILTY SAND (SM) medium dense, moist, fine to medium grained (Fill).

Contains organics and wood debris, becomes loose.

GRAY BROWN SILTY SAND (SM) very dense, moist, fine to medium grained, some gravel (Till).

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B31

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-30

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring3.cdr	14,190.211	ECR	13 October 97			

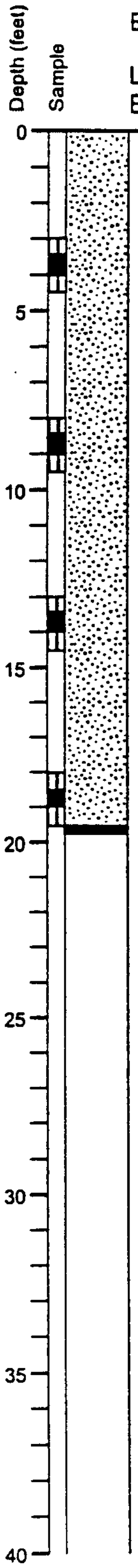
P.O.S. Coordinates: N 16,535 E 12,205

Equipment Mobile B59

Land Surface Elevation 391 feet

Completion Date 9/24/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	6.4	104	33
			37
			56
MD	12.3	112	57



BROWN SAND (SP) dense, moist, fine grained (Advance Outwash).

Boring terminated at 19.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B33

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-31

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring4.cdr	14,190.211	ECR	13 October 97	Ww		

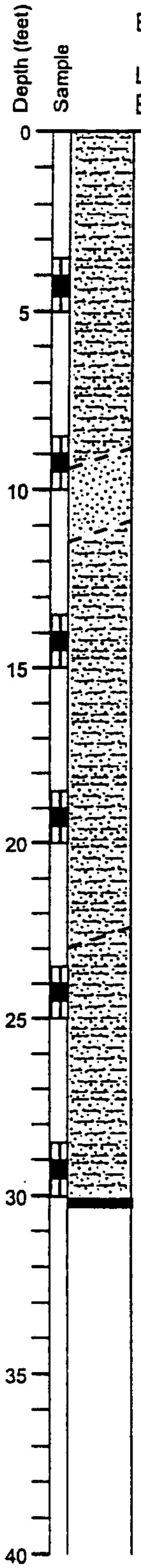
P.O.S. Coordinates: N 11,870 E 10,870

Equipment Mobile B59

Land Surface Elevation 350 feet

Completion Date 9/25/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			38
MD	14.4	122	31
MD	18.2	118	24
			13
MD,MA	8.4	122	57
MD	11.7	120	50/6"



BROWN GRAY SILTY SAND (SM) dense, moist, fine to medium grained, with gravel (Fill).

GRAY SAND (SP) dense,moist, with some silt (Fill).

DARK GRAY BROWN SILTY SAND (SM) medium dense, moist, fine to medium grained, with gravel and organics (Fill).

GRAY SILTY SAND (SM) very dense, moist, fine to coarse sand, some gravel (Till).

Boring terminated at 30.0 feet bgs.
No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B36

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-32

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring4.cdr	14,190.211	ECR	13 October 97			

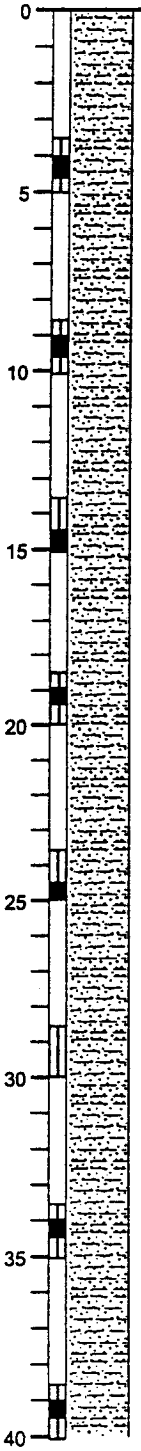
P.O.S. Coordinates: N 13,900 E 11,485

Equipment Mobile B59

Land Surface Elevation 356 feet

Completion Date 9/25/97

GRAY BROWN SILTY SAND (SM) medium dense, moist, fine to coarse grained, with gravel and organics (Fill).



Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	
MD,MA	18.3	118	26	
MD	16.7	114	17	
			29	
M	10.6		31	
			18	With concrete debris.
			50/1"	Sampler driven on debris.
DS	11.5	127	8	Becomes loose, wet.
MD	16.2	118	10	

AGI
TECHNOLOGIES

Log of Boring AT97-B37 (0-40')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure
C-33 1/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring4.cdr	14,190.211	ECR	13 October 97	Ctw		

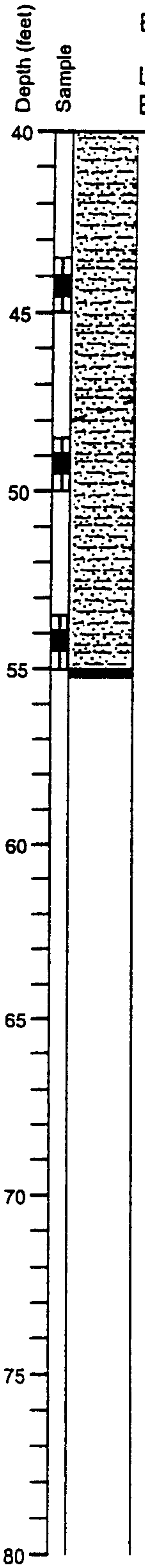
P.O.S. Coordinates: N 13,900 E 11,485

Equipment Mobile B59

Land Surface Elevation 356 feet

Completion Date 9/25/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	63.1	75	18
MD	10.6	120	43
MD,MA	10.1	128	44



GRAY BROWN SILTY SAND (SM) medium dense, moist, fine to coarse grained, with gravel and organics (Fill).

GRAY SILTY SAND (SM) dense, moist, fine to medium grained, with some gravel (Till).

Boring terminated at 55.0 feet bgs .
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B37 (40'-55')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-33 2/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Bor2-40.cdr	14,190.211	ECR	13 October 97			

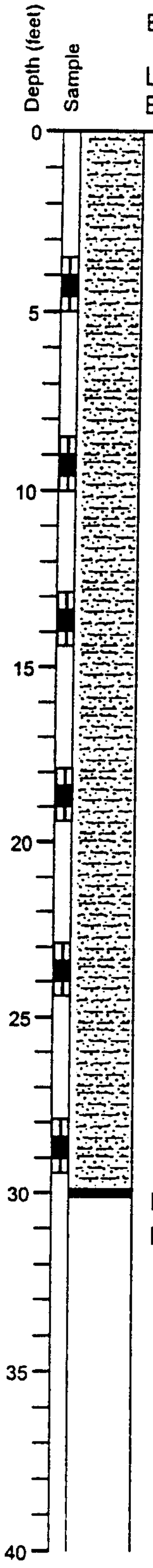
P.O.S. Coordinates: N 15,200 E 10,830

Equipment Mobile B59

Land Surface Elevation 353 feet

Completion Date 10/6/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			60
			60
			76
CU-TxS	9.8	129	50/5.5"
			50/5.5"
MD	5.7	125	50/5"



GRAY SILTY SAND (SM) very dense, moist, fine grained, trace fine gravel (Till).

With fine sand interbeds.

Boring terminated at 30.0 feet bgs.
No groundwater encountered during drilling.

AGI TECHNOLOGIES

Log of Boring AT97-B52

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-34

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring5.cdr	14,190.211	ECR	13 October 97			

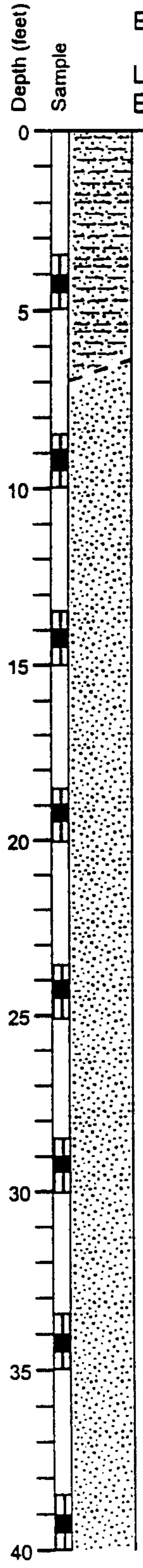
P.O.S. Coordinates: N 17,185 E 10,925

Equipment Mobile B59

Land Surface Elevation 322 feet

Completion Date 10/6/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
MD	13.9	119	10
			11
SA,DS	12.9		27
			36
			56
MD	23.0	104	46
			66
MD	20.7	107	55



GRAY SILTY SAND (SM) loose, moist, fine grained, with gravel.

BROWN SAND (SP) loose, moist, fine to medium grained, with some gravel (Advance Outwash).

Becomes medium dense.

Becomes dense, wet.

AGI TECHNOLOGIES

Log of Boring AT97-B56 (0-40')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-35 1/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring5.cdr	14,190.211	ECR	13 October 97			

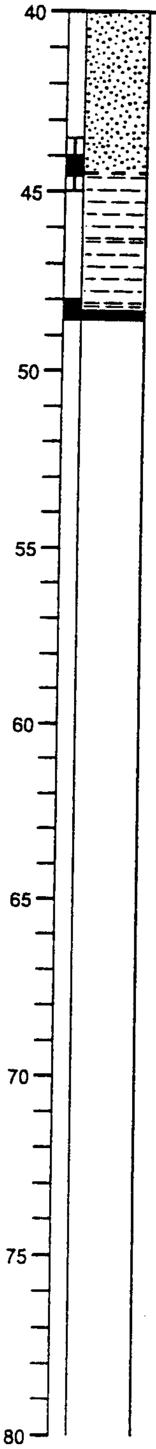
P.O.S. Coordinates: N 17,185 E 10,925

Equipment Mobile B59

Land Surface Elevation 322 feet

Completion Date 10/6/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
M	22.4		62
M	25.2		



BROWN SAND (SP) loose, moist, fine to medium grained, with some gravel (Advance Outwash).

GRAY SILT (ML) very stiff, wet, with trace sand (Pre Vashon Drift).

Boring terminated at 48.5 feet bgs.
Groundwater encountered at 23.5 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B56 (40'-48.5')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-35 2/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Bor2-40.cdr	14,190.211	ECR	13 October 97			

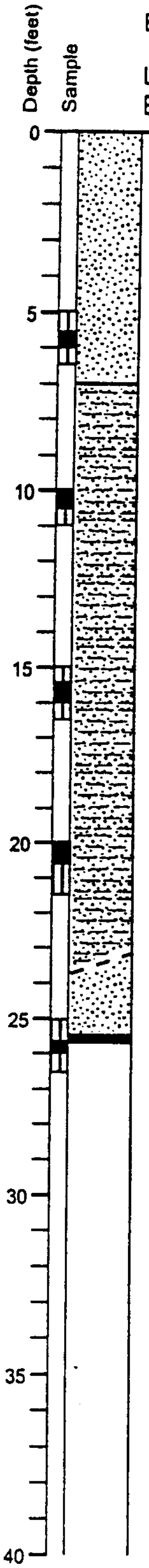
P.O.S. Coordinates: N 18,080 E 11,470

Equipment L10-T Track Rig

Land Surface Elevation 302 feet

Completion Date 10/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)
			9	5
MD	9.0	129	50/4"	10
M	6.6		50/5"	15
			50/3.5"	20
MD	12.7	121	50/3"	25



BROWN SAND (SP) loose, moist, fine to medium grained, with some silt and organics (Recessional Outwash).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, with gravel (Till).

GRAY SAND (SP) very dense, moist, fine to medium grained, trace gravel (Advance Outwash).

Boring terminated at 25.5 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B66

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-36

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring6.cdr	14,190.211	ECR	13 October 97	DAW		

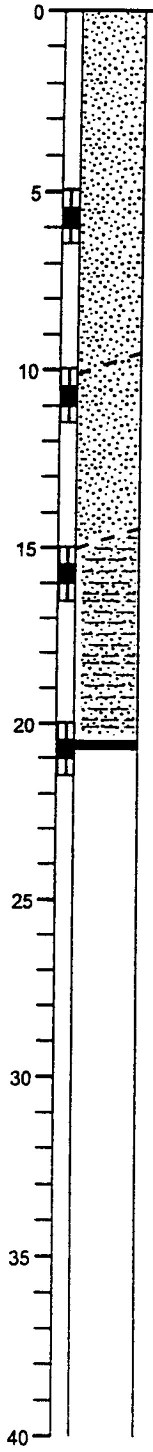
P.O.S. Coordinates: N 17,825 E 11,600

Equipment L10-T Track Rig

Land Surface Elevation 312 feet

Completion Date 10/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)
MD	7.5	105	35	5
			59	10
MD	8.0	126	50/4"	15
			50/5.5"	20



DARK BROWN AND BROWN SAND (SP) dense, moist, fine to medium grained, with some silt, with trace coarse gravel (Recessional Outwash).

BROWN SAND (SP) dense, moist, fine to coarse grained, with some gravel and silt (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to medium grained, with some coarse gravel (Till).

Boring terminated at 30.0 feet bgs.
No groundwater encountered during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B67

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-37

Boring6.cdr	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
	14,190.211	ECR	13 October 97			

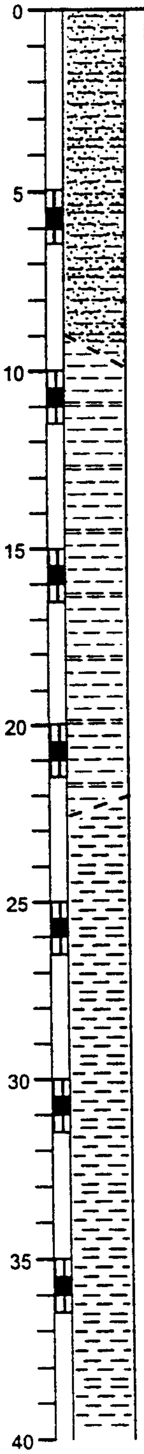
P.O.S. Coordinates: N 17,660 E 11,505

Equipment L10-T Track Rig

Land Surface Elevation 296 feet

Completion Date 10/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot	Depth (feet)
MD	13.5	120	47	5
MD	16.9	111	28	10
MD	17.8	111	44	15
			66	20
MD	27.1	95	54	25
			50/4"	30
CU-TxS	32.1	89	46	35



BROWN SILTY SAND (SM) dense, moist, fine to medium grained (Advance Outwash).

Becomes saturated.

GRAY SILT (ML) hard, moist, with some fine sand interbeds (Pre Vashon Drift).

GRAY CLAYEY SILT (MH) hard, moist, fractured, laminated.

AGI TECHNOLOGIES

Log of Boring AT97-B68 (0-40')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure
C-38 1/2

Boring6.cdr	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
	14,190.211	ECR	13 October 97			

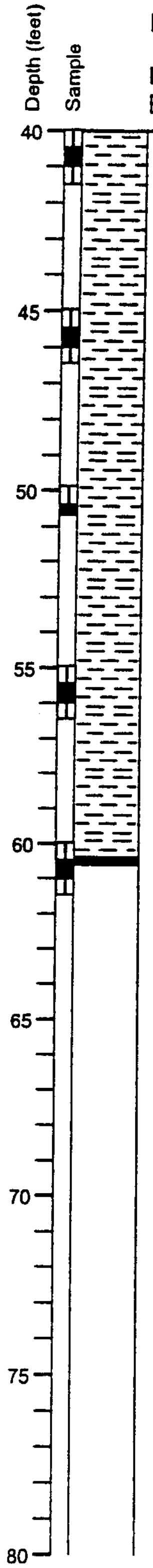
P.O.S. Coordinates: N 17,660 E 11,505

Equipment L10-T Track Rig

Land Surface Elevation 296 feet

Completion Date 10/15/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
CU-TxS	28.8	95	51
CU-TxS	30.8	96	54
MD	29.7	94	50/5.5"
MD	33.3	90	45
MD	29.0	93	50/5.5"



GRAY CLAYEY SILT (MH) hard, moist fractured, laminated

Boring terminated at 60.5 feet bgs.
Perched groundwater encountered at 8 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B68 (40'-60.5')

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure
C-38 2/2

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Bor2-40.cdr	14,190.211	ECR	13 October 97			

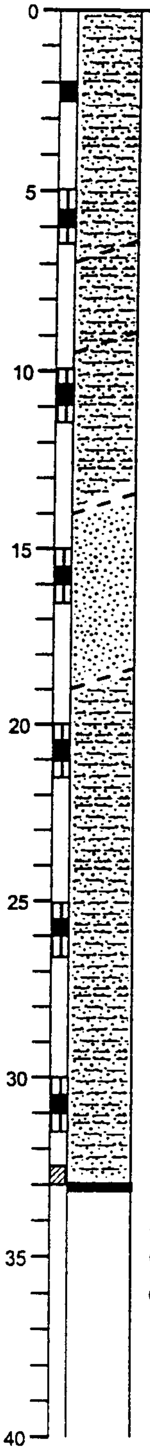
P.O.S. Coordinates: N 18,255 E 10,850

Equipment L10-T Track Rig

Land Surface Elevation 233 feet

Completion Date 10/17/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			35
MD	18.8	114	56
M	19.5		70/11"
			50/5"
M	11.3		50/2"
			130/6"
M	10.4		70/4"



LIGHT BROWN GRAY SILTY SAND (SM-SP) medium dense, moist, fine grained, trace gravel, mottled (Recessional Outwash).

Becomes wet.

With silt interbeds.

Becomes dense.

GRAY SAND (SP) very dense, wet, fine to medium grained, with trace gravel and silt.

GRAY SILTY SAND (SM) very dense, saturated, fine to coarse grained, with gravel (Till).

With sand interbeds.

Driller notes hard drilling.

Boring terminated at 33.0 feet bgs.
Groundwater encountered at 17 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B72

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

Figure C-39

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring6.cdr	14,190.211	ECR	13 October 97			

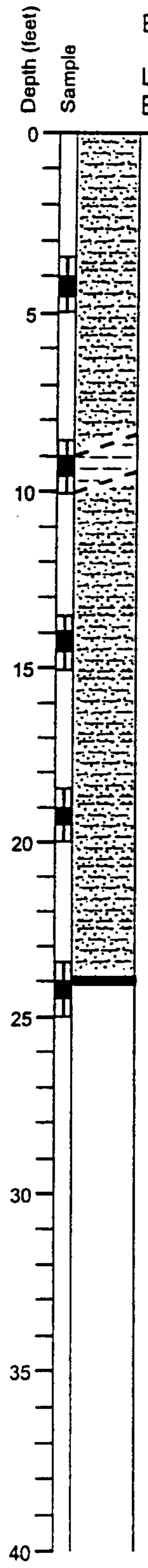
P.O.S. Coordinates: N 19,335 E 10,785

Equipment Mobile B59

Land Surface Elevation 267 feet

Completion Date 10/20/97

Laboratory Tests	Moisture Content (%)	Dry Density (pcf)	Blows per Foot
			3
MD	30.5	88.2	5
			50/5.5"
			50/4.5"
MD	10.7	128	50/5"



DARK BROWN SILTY SAND (SM) loose, moist, fine grained, with some gravel and organics (Fill).

GRAY SILT (ML) medium stiff, moist, with some organics.

GRAY SILTY SAND (SM) very dense, wet, fine to medium grained, with some gravel (Till).

Boring terminated at 24.0 feet bgs.
Groundwater encountered at 13.5 feet bgs during drilling.

AGI
TECHNOLOGIES

Log of Boring AT97-B73

HNTB/SeaTac 1997- Runway Investigation
SeaTac, Washington

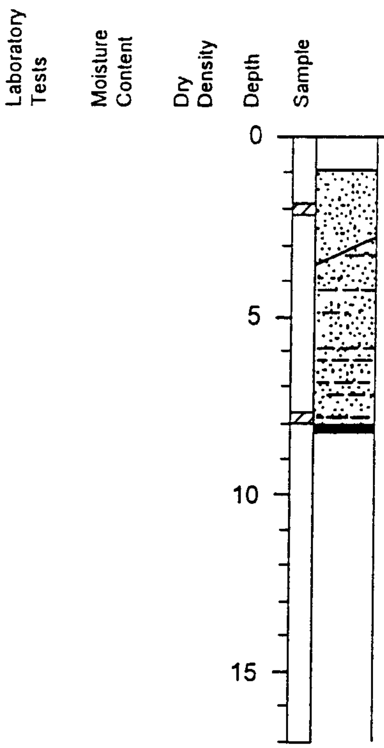
Figure C-40

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Boring6.cdr	14,190.211	ECR	13 October 97			

Test Pit Number 5

P.O.S. Coordinates
E 11350
N 15800

Date 12/10/93 Elevation 380 feet



Sod.

RED BROWN SAND (SP) medium dense, moist to wet; fine grained, with some silt (Recessional Outwash).

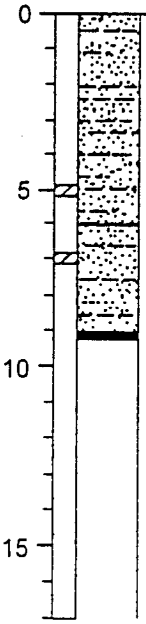
GRAY SILTY SAND (SM) very dense, moist; fine to coarse grained, with gravel and occasional cobbles (Glacial Till).

Groundwater not encountered.

Test Pit Number 6

P.O.S. Coordinates
E 11650
N 17000

Date 12/10/93 Elevation 380 feet



BROWN SILTY SAND (SM) dense to very dense, moist; fine to coarse grained, with gravel, and occasional cobbles, asphalt chunks (Fill).

GRAY SILTY SAND (SM) very dense, moist; fine to coarse grained, with gravel (Fill).

Groundwater not encountered.

AGI
TECHNOLOGIES

Log of Test Pits AT94b-TP5 and TP-6

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-41

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	KM	aRw	29 March 94		

190203TP.p65

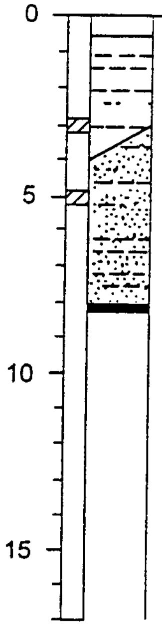
Laboratory Tests | Moisture Content | Dry Density | Depth | Sample

Test Pit Number 7

P.O.S. Coordinates
E 11300
N 17400

Date 12/13/93 Elevation 320 feet

PI 30.2



Sod.

BROWN SANDY SILT (ML) stiff, moist to wet; interbedded with brown silty sand (Colluvium).

GRAY SILTY SAND (SM) very dense, moist; fine to medium grained, with gravel (Glacial Till).

Groundwater not encountered.

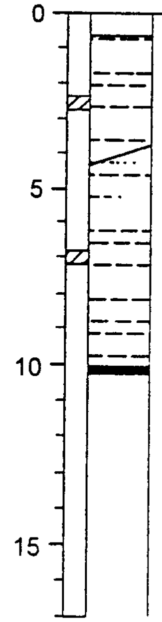
Test Pit Number 8

P.O.S. Coordinates
E 11400
N 21900

Date 12/14/93 Elevation 285 feet

PI 34.6

M 23.5



Sod.

BROWN SILT (ML) medium stiff, moist; with organics and rootlets and occasional sand layers.

BROWN GRAY SANDY SILT (ML) stiff, wet; mottled, with a trace of fine gravel.

Groundwater not encountered.

AGI TECHNOLOGIES

Log of Test Pits AT94b-TP7 and TP8

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-42

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	KM		29 March 94		

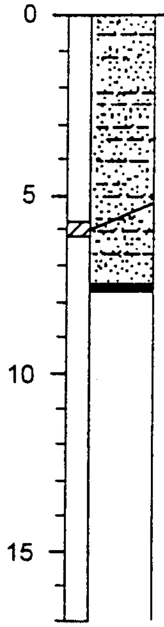
190203TP.p65

Laboratory Tests | Moisture Content | Dry Density | Depth | Sample

P.O.S. Coordinates
E 11650
N 18450

Test Pit Number 9

Date 12/10/93 Elevation 325 feet



GRAY BROWN SILTY SAND (SM) medium dense to dense, moist; fine to coarse grained, with gravel and occasional cobbles (Fill).

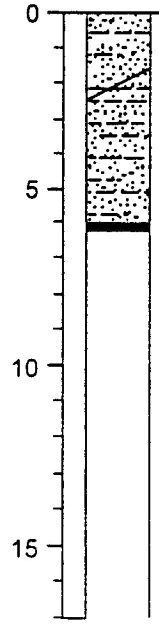
GRAY SILTY SAND (SM) very dense, moist; fine to coarse grained, with gravel (Glacial Till).

Groundwater not encountered.

P.O.S. Coordinates
E 11800
N 17120

Test Pit Number 10

Date 12/10/93 Elevation 370 feet



RED BROWN SILTY SAND (SM) medium dense to dense, moist; mottled, fine grained, with a trace of gravel (Fill).

LIGHT BROWN SILTY SAND (SM) very dense, moist; fine to medium grained, with gravel (Glacial Till).

Groundwater not encountered.

AGI
TECHNOLOGIES

Log of Test Pits AT94b-TP9 and TP10

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-43

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	KM		29 March 94		

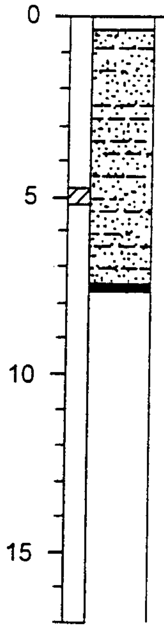
190203TP p65

Laboratory Tests | Moisture Content | Dry Density | Depth | Sample

Test Pit Number 15

P.O.S. Coordinates
E 11800
N 18450

Date 12/13/93
Elevation 345 feet



Sod.

GRAY SILTY SAND (SM) very dense, moist; fine to coarse grained, with gravel (Glacial Till).

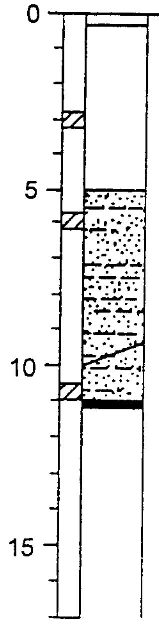
Groundwater not encountered.

Test Pit Number 16

P.O.S. Coordinates
E 11700
N 13450

Date 12/13/93
Elevation 368 feet

M 17.1



Sod.

GRAY BROWN SAND (SP-SM) medium dense, wet; fine grained, with silt and a trace of gravel (Fill).

GRAY SILTY SAND (SM) dense, moist; fine to medium grained, with gravel and a trace of organics (Fill).

GRAY BROWN SILTY SAND (SM) very dense, moist; fine to medium grained, with gravel (Glacial Till).

Groundwater seepage encountered at 5 and 10 feet.

AGI
TECHNOLOGIES

Log of Test Pits AT94b-TP15 and TP16

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-44

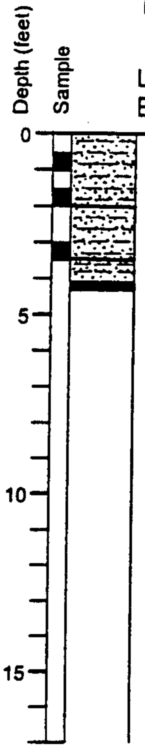
JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	KM		29 March 94		

190203TP.p65

Test Pit Number TP5-97

Land Surface Elevation 335 feet Date 11/21/97

Laboratory Tests	Moisture Content (%)
M	21.0
M	17.4



SILTY SAND (SM) loose, moist, fine to coarse grained, with asphalt, roots, organics (Fill).

SILTY SAND (SM) medium dense, saturated, fine to medium grained, with gravel, weathered (Weathered Till).

GRAY SILTY SAND (SM) very dense, wet, fine to coarse grained, with gravel (Till).

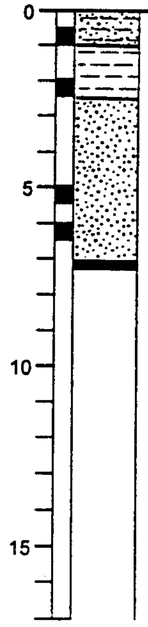
Groundwater seepage encountered at 2 feet bgs during excavation.

Test pit terminated at 4.0 feet bgs.

Test Pit Number TP6-97

Land Surface Elevation 331 feet Date 11/21/97

Laboratory Tests	Moisture Content (%)
M	27.1
M	23.6
M	9.1
M	10.2



BROWN SILTY SAND (SM) loose, moist, fine to medium grained, with roots, charcoal, organics, and gravel (Fill).

RED BROWN SANDY SILTY (ML) hard, moist, trace gravel, oxidized (Weathered Till).

RED BROWN SAND (SP) dense, moist, fine to medium grained, with gravel, oxidized (Advance Outwash).

Test pit terminated at 7.0 feet bgs.

No groundwater encountered during excavation.

AGI TECHNOLOGIES

Log of Test Pits AT97-TP5 and AT97-TP6

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

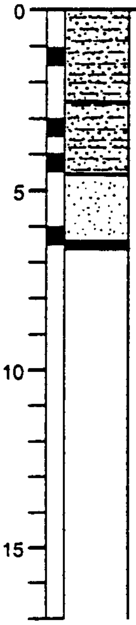
Figure C-45

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Testpit.cdr	14,190.211	ECR	19 December 97			

Test.Pit Number TP7-97

Land Surface Elevation 332 feet Date 11/24/97

Laboratory Tests	Moisture Content (%)
M	9.9
M	13.9
M	25.3
M	7.3



BROWN SILTY SAND (SM) medium dense, moist, fine to medium grained with gravel, organics (Fill).

GRAY BROWN SILTY SAND (SM) dense, moist, fine to medium grained, occasional pockets, mottled (Weathered Advance Outwash).

GRAY BROWN SAND (SP) dense, moist, fine grained, with some silt (Advance Outwash).

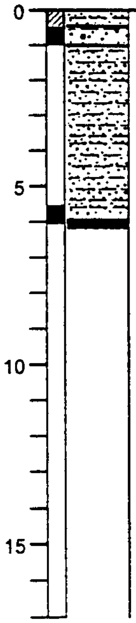
Test pit terminated at 6.5 feet bgs.

No groundwater encountered during excavation.

Test Pit Number TP8-97

Land Surface Elevation 354 feet Date 11/24/97

Laboratory Tests	Moisture Content (%)
M	18.2
MD	10.7



RED BROWN SILTY SAND (SM) loose, moist to wet, fine to medium grained, with some gravel, (Fill).

BROWN GRAVELLY SAND (SW) dense, moist, fine to coarse grained, with some silt.

GRAY BROWN SILTY SAND (SM) very dense, moist, fine to coarse grained, with gravel, cemented (Till).

Test pit terminated at 6.0 feet bgs.

No groundwater seepage encountered during excavation.

AGI TECHNOLOGIES

Log of Test Pits AT97-TP7 and AT97-TP8

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

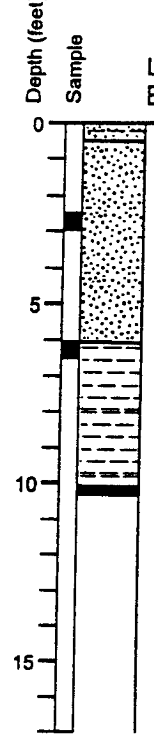
Figure C-46

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Testpit.cdr	14,190.211	ECR	19 December 97			

Test Pit Number TP9-97

Land Surface Elevation 277 feet Date 11/24/97

Laboratory Tests	Moisture Content (%)
M	14.8
M,PL,LL	31.6



DARK BROWN SILTY SAND (SM) loose, moist, fine to medium grained, with roots and organics (Topsoil)..

GRAY BROWN SAND (SP) dense, moist, fine to medium grained, with occasional gravel and silty pockets (Advance Outwash).

REDDISH GRAY BROWN SILT (ML) stiff, wet, with some fine sand, mottled.

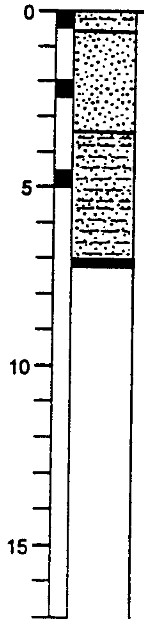
Test pit terminated at 10.0 feet bgs .

No groundwater seepage encountered during excavation.

Test Pit Number TP10-97

Land Surface Elevation 336 feet Date 11/24/97

Laboratory Tests	Moisture Content (%)
M	17.9
M	10.6



DARK BROWN SILTY SAND (SM) loose, moist, fine to medium grained, with roots and organics (Topsoil).

RED BROWN SAND (SP) dense, moist, fine to medium grained, with occasional gravel and trace silt (Recessional Outwash).

GRAY BROWN SILTY SAND (SM) very dense, moist, fine to coarse grained, with gravel, cemented (Till).

Test pit terminated at 7.0 feet bgs.

No groundwater seepage encountered during excavation.

AGI TECHNOLOGIES

Log of Test Pits AT97-TP9 and AT97-TP10

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

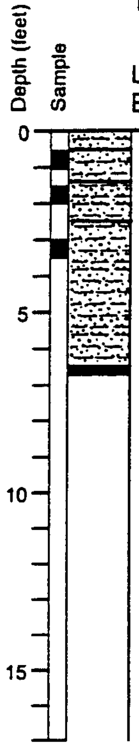
Figure C-47

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Testpit.cdr	14,190.211	ECR	19 December 97			

Test Pit Number TP11-97

Land Surface Elevation 342 feet Date 11/24/97

Laboratory Tests	Moisture Content (%)
M	19.9
M	20.1
M	12.4



DARK BROWN SILTY SAND (SM) loose, moist, fine to medium grained, with roots and organics (Topsoil).

RED BROWN SILTY SAND (SM) dense, moist, fine to medium grained, with occasional gravel (Recessional Outwash).

RED BROWN SANDY SILT (SM-ML) dense, moist, fine to coarse grained sand, with gravel, oxidized (Weathered Till).

GRAY SILTY SAND (SM) very dense, moist, fine to coarse grained, with gravel (Till).

Test pit terminated at 6.5 feet bgs.

No groundwater seepage encountered during excavation.

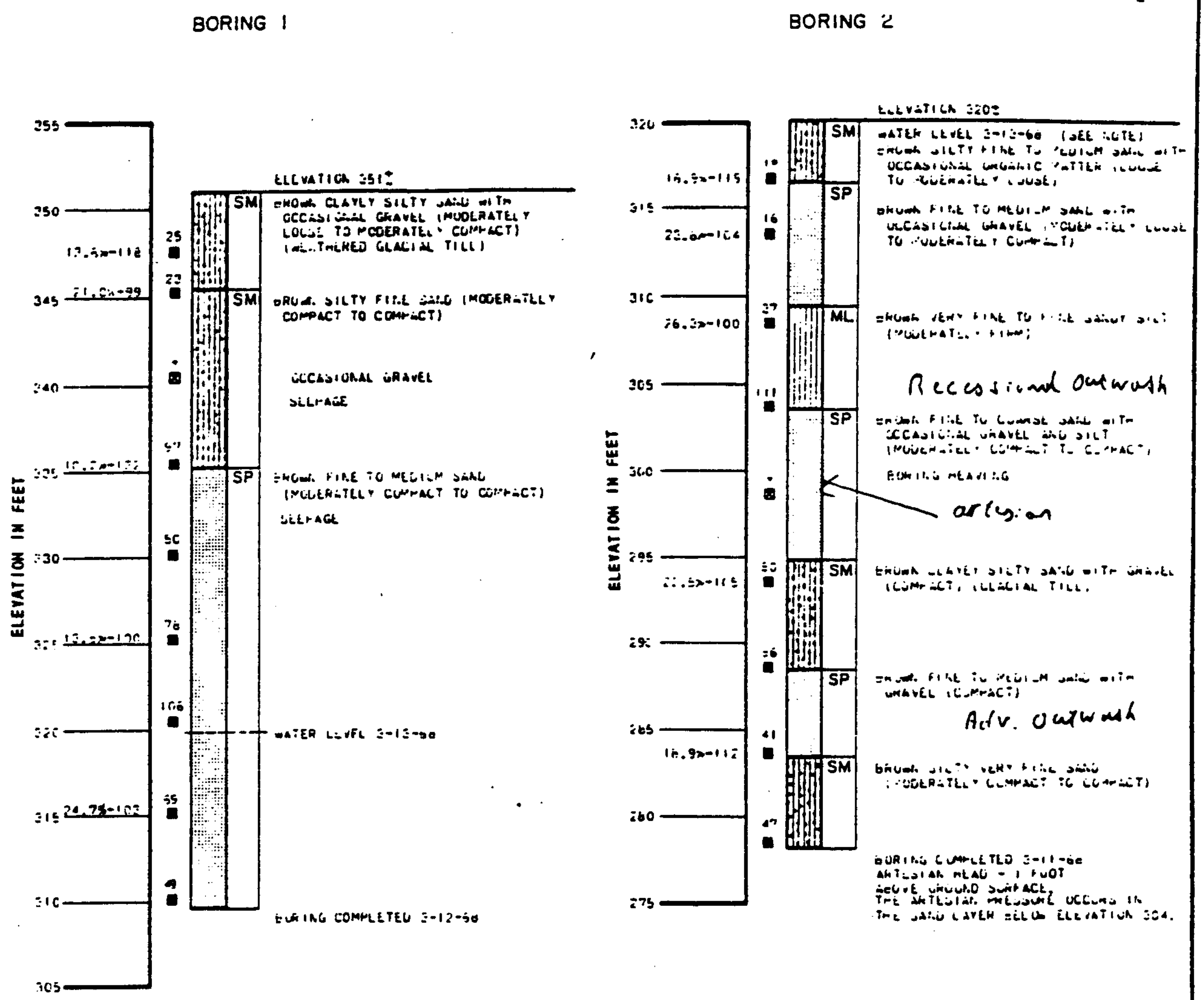
AGI
TECHNOLOGIES

Log of Test Pit AT97-TP11

HNTB/SeaTac 1997-Runway Investigation
SeaTac, Washington

Figure C-48

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
Testpit.cdr	14,190.211	ECR	19 December 97			



MOISTURE CONTENT
24.7%-103
DRY DENSITY IN PCF

BLOWS REQUIRED TO DRIVE SAMPLER ONE FOOT WEIGHT 350 LBS., STROKE 26 INCHES.

5
■ INDICATES DEPTH AT WHICH UNDISTURBED SAMPLE WAS EXTRACTED.

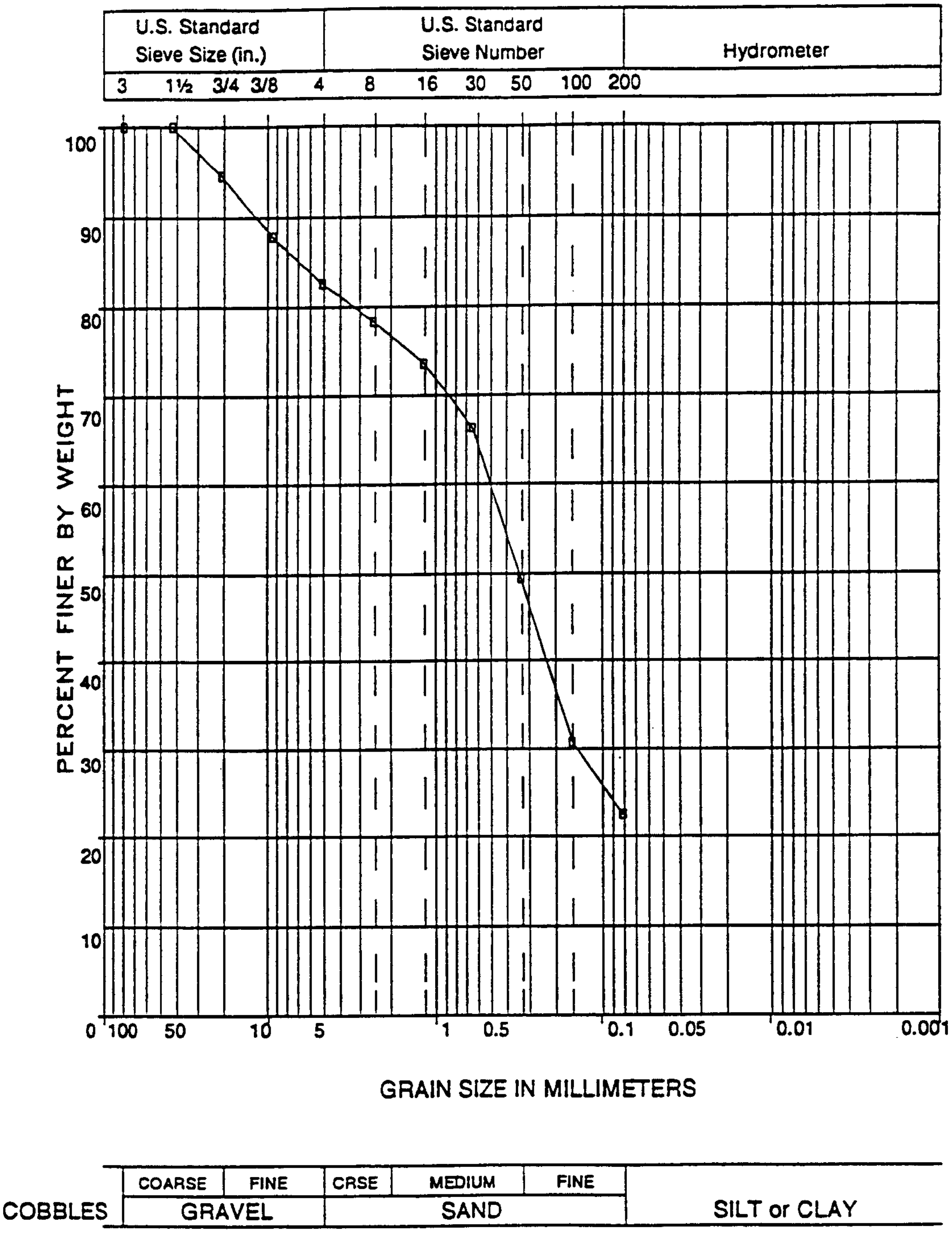
▨ INDICATES DEPTH AT WHICH DISTURBED SAMPLE WAS EXTRACTED.

* INDICATES BLOW COUNT NOT REPRESENTATIVE

NOTE: ELEVATIONS REFER TO U.S.C. AND G.S. DATUM.

LOG OF BORINGS

Figure C-49



Sample Source	Classification
AOA B2 @ 3.0 ft. AT94B-B2	SILTY SAND (SM) with gravel

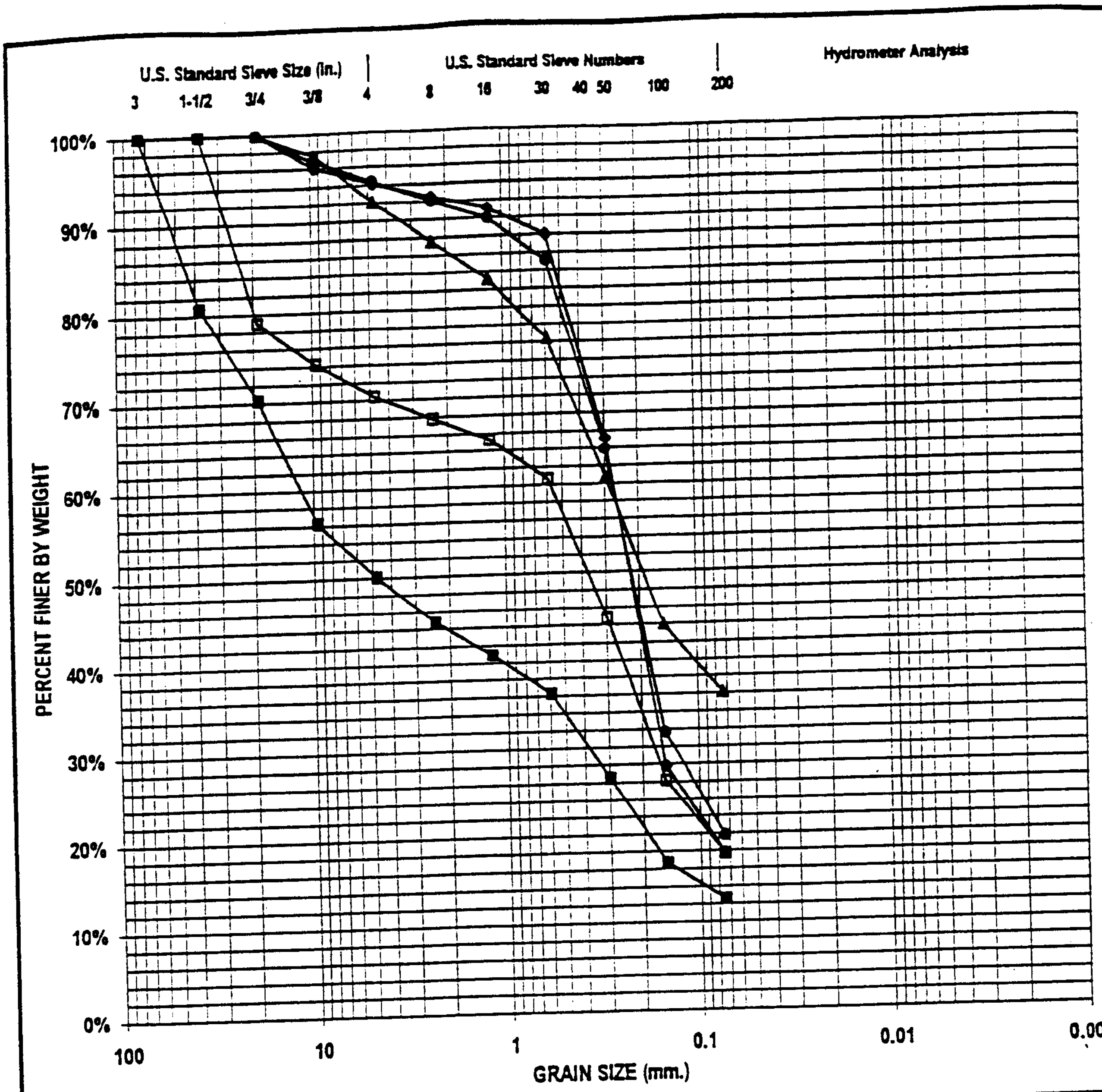
Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Particle Size Analysis

HNTB/Third Runway Preliminary Engineering Design
Sea-Tac, Washington

Figure C-50

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
14,190.203	JRS		01/10/94		



COBBLES	GRAVEL		SAND			SILT OR CLAY
	Coarse	Fine	Coarse	Medium	Fine	

SYMBOL	SOURCE	CLASSIFICATION
◆	B30-97; 9 ft	Brown Silty SAND (SM); Dense, moist
●	B31-97; 4 ft	Brown Silty SAND (SM) ; Dense, moist
▲	B35-97; 24 ft	Reddish Brown Silty SAND (SM); Dense, moist
☐	B36-97; 24 ft	Reddish Brown Silty SAND (SM); Dense, moist
■	B37-97; 4 ft	Gray Sandy Gravel (GW); Dense, moist

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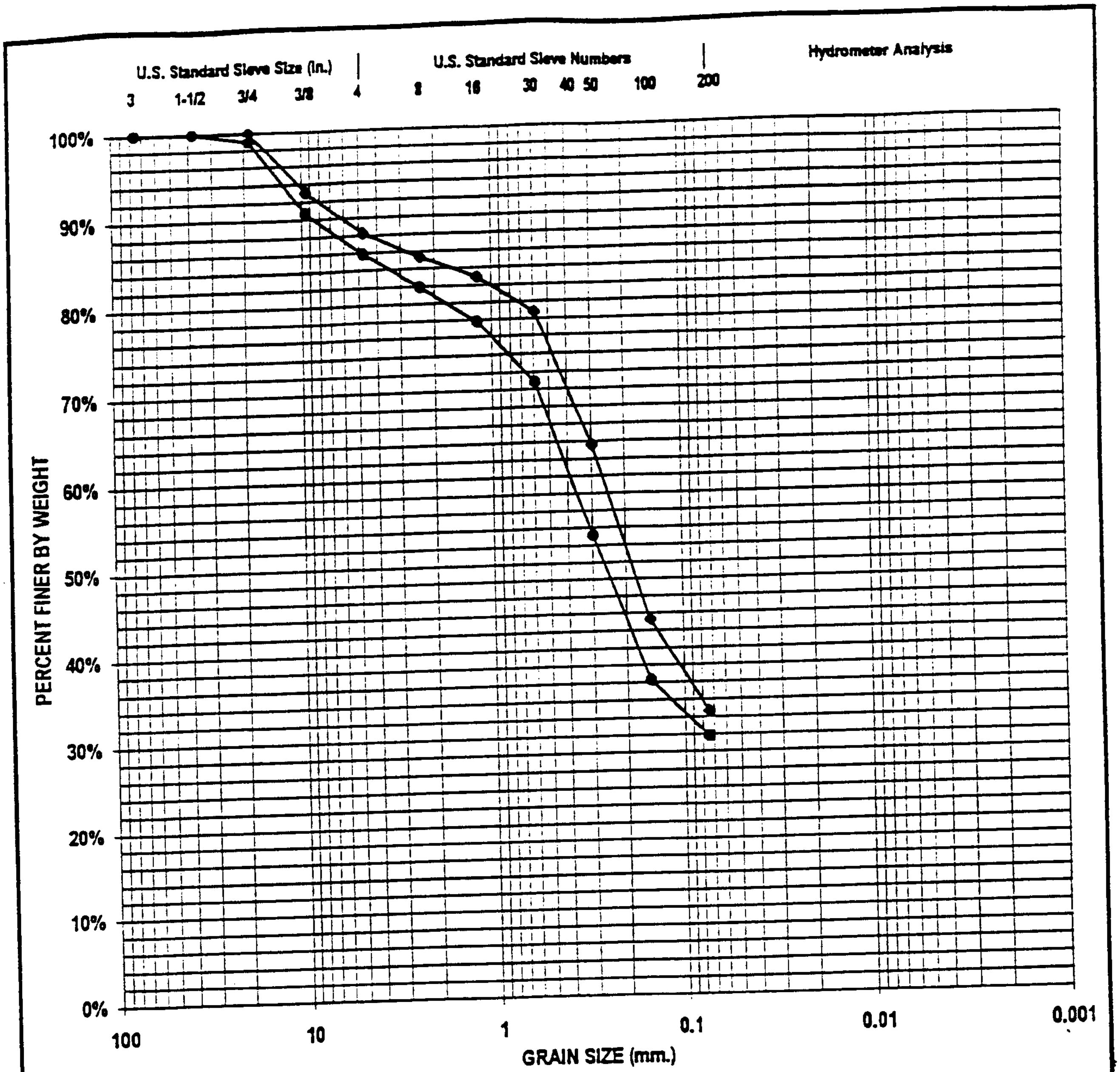
TECHNOLOGIES

Particle Size Analysis

HNTB / Seatac Third Runway
Seatac, Washington

Figure
C-51

	Project No.	Drawn	Date	Approved	Date	Revised	Date
hntbgsb31-37	14.190.211	JMM	12/04/97				



	Coarse	Fine	Coarse	Medium	Fine	
COBBLES	GRAVEL		SAND			SILT OR CLAY

SYMBOL	SOURCE	CLASSIFICATION
◆	B37-97; 54 ft	Dark Gray Silty SAND (SM); Dense, moist
●	B38-97; 24 ft	Brown Silty SAND (SM) ; Dense, moist

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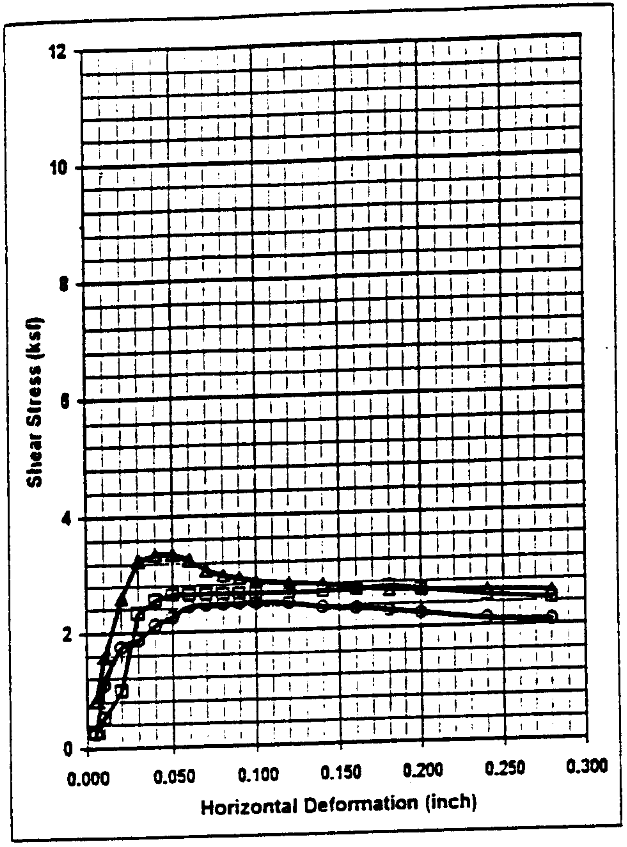
TECHNOLOGIES

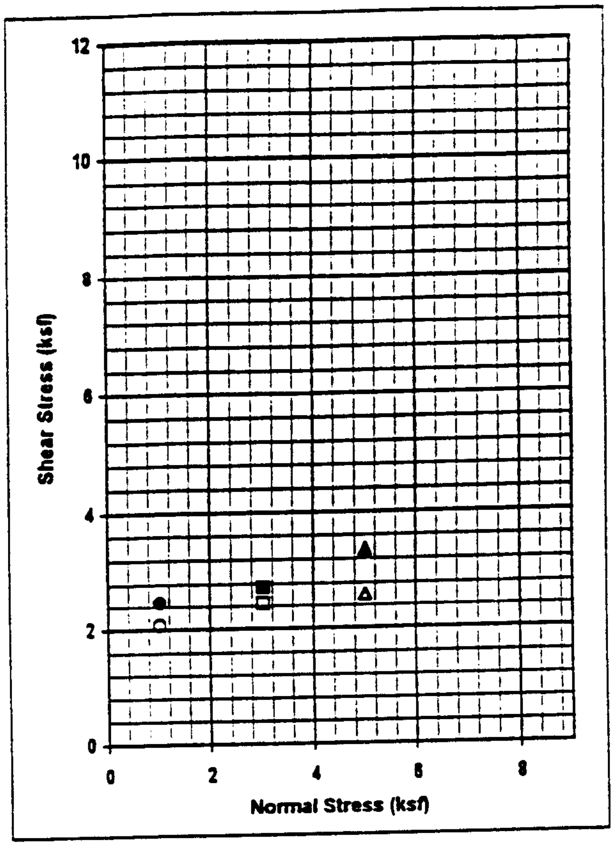
Particle Size Analysis

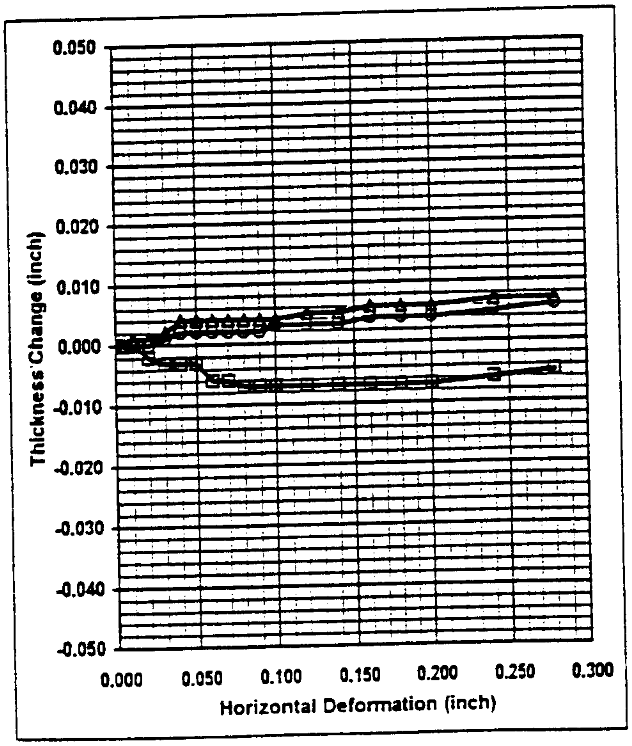
HNTB / Seatac Third Runway
Seatac, Washington

Figure C-52

	Project No.	Drawn	Date	Approved	Date	Revised	Date
hntbgsb31-37	14,190.211	JMM	12/04/97				







PHYSICAL CONDITIONS	A ●	B ■	C ▲
Initial			
Diameter (in.)	2.41	2.42	2.41
Height (in.)	1.00	1.00	1.00
Water Content (%)	27.1	28.7	26.9
Void Ratio	0.74	0.78	0.74
Saturation (%)	99.0	99.1	97.7
Dry Density (pcf)	97.0	94.6	96.7
Specific Gravity	2.70	2.70	2.70
Post Consolidation			
Dry Density (pcf)	99.2	100.0	102.3
Void Ratio	0.70	0.69	0.65
Post Failure			
Water Content (%)	27.0	28.3	26.3
Dry Density (pcf)	98.6	100.5	101.6
Void Ratio	0.71	0.68	0.66
Saturation (%)	102.9	112.7	107.7
Failure			
Normal Stress (ksf)	1.01	3.01	5.00
Maximum Shear Stress (ksf)	2.46	2.72	3.35
Residual Shear Stress (ksf)	2.07	2.44	2.59
Axial Strain at Failure (inch)	0.10	0.18	0.04
Time to Failure (min.)	1.96	3.53	0.78

Sample : SILT; B6-97 @ 10 feet; Gray SILT (ML)

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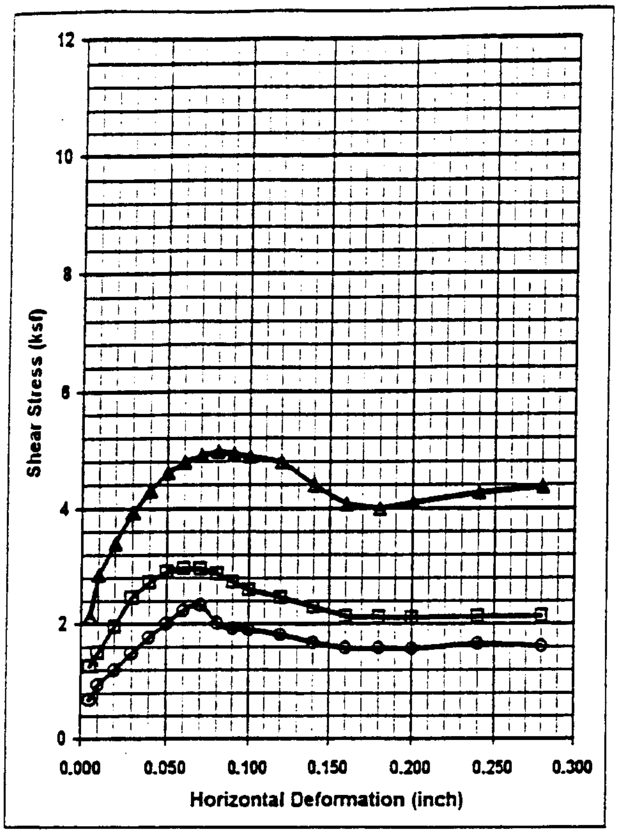
TECHNOLOGIES

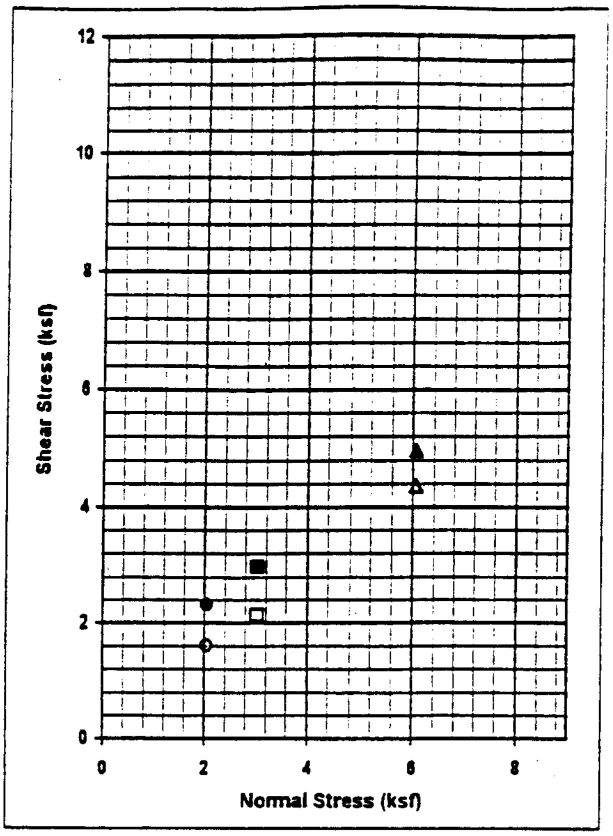
Direct Shear Test Results

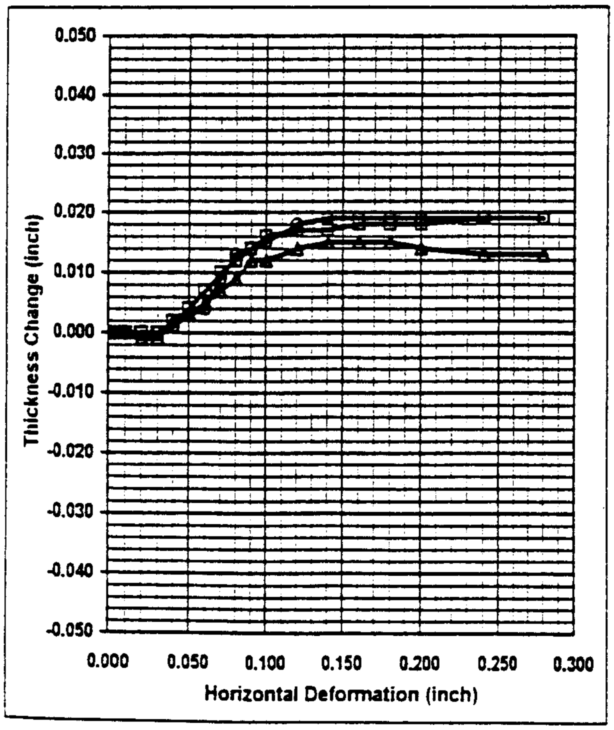
HNTB / Seatac Third Runway
Seatac, Washington

Figure
C-53

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
b697@10.xls	14,190.211	HHH	11/11/97			







PHYSICAL CONDITIONS	A ●	B ■	C ▲
Initial			
Diameter (in.)	2.40	2.40	2.40
Height (in.)	0.99	1.00	1.00
Water Content (%)	21.7	20.4	19.6
Void Ratio	0.55	0.56	0.53
Saturation (%)	106.7	99.1	101.3
Dry Density (pcf)	109.3	108.9	111.2
Specific Gravity	2.72	2.72	2.72
Post Consolidation			
Dry Density (pcf)	111.7	110.8	114.4
Void Ratio	0.52	0.53	0.48
Post Failure			
Water Content (%)	23.0	22.4	21.5
Dry Density (pcf)	109.5	108.7	112.9
Void Ratio	0.55	0.56	0.50
Saturation (%)	113.8	108.3	116.5
Failure			
Normal Stress (ksf)	2.03	3.01	6.06
Maximum Shear Stress (ksf)	2.32	2.97	4.96
Residual Shear Stress (ksf)	1.61	2.14	4.36
Axial Strain at Failure (inch)	0.07	0.06	0.08
Time to Failure (min.)	1.40	1.20	1.60

Sample : Brown SAND; B7-97@ 23.5 ft; (SP)

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Direct Shear Test Results

HNTB / Seatac Third Runway
Seatac, Washington

Figure C-54

b7@23.5ds.xls	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
	14,190.211	HHH	12/8/97			

APPENDIX D
EXTENT AND CHARACTERISTICS OF PEAT IN THE NORTH SAFETY AREA AND PHASE 5 WORK AREA

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MEMORANDUM

DATE: July 10, 2001

TO: Third Runway File

FROM: Michael Bailey, P.E., Carsten Becker, E.I.T., Hart Crowser, Inc.

RE: **Extent and Characteristics of Peat in the North Safety Area and Phase 5 Work Area (West Wall)**
4978-42

This memo summarizes information on peat soils that will be encountered during construction of the Third Runway embankment at Seattle-Tacoma International Airport. Exploration data from borings, test pits, hand-auger holes, and cone penetration tests have been used to identify and locate peat deposits along the proposed Third Runway MSE walls and embankments. Classification tests, field vane tests, direct shear, and consolidation tests were conducted to better characterize the peat in the Phase 5 Work Area (West Wall) and North Safety Areas.

EXTENT OF EXISTING PEAT

Peat soils observed range from relatively fibrous residue of more or less decomposed plant material intermixed with sand particles ranging from gravel and sand to clay in size, to predominantly silt (or clay) soils that have non-fibrous, highly decomposed residual organics. Classification testing along the West Wall and the North Safety Area revealed some differences in composition. In general, the peat samples obtained in the NSA have higher organic and fiber contents than the peat from the West Wall area. The buried West Wall peat appears to have a significant sand fraction ranging from sandy to very sandy, while the peats in the NSA are practically non-sandy.

Deposits of peat were encountered in explorations along the proposed West Wall and in the North Safety Area. The following paragraphs summarize the location and thickness of the peat deposits. In some areas, shallow peat deposits were encountered. In other areas, layer(s) of peat is interbedded with other soil layers. The locations of the peat and organic silt deposits in the North Safety Area and West Wall Area are shown on Figures D-1 and

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Chicago
Denver
Fairbanks
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Long Beach
Portland
Seattle

1910 Fairview Avenue East
Seattle, Washington 98102-3699
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Tel 206.324.9530

D-2, respectively. Data concerning peat deposits in these same areas are presented in Tables D-1 and D-2, respectively.

West Wall

Peat deposits along the West Wall ranged from soft to very stiff. Peat was generally observed around Station 180+00 where a depression in the topography coincides with the area designated as Wetland 37a. Runoff water from higher elevations to the east collects in a small unpaved drainage channel that runs along the bottom of the depression and is transported to Miller Creek downslope.

Buried Peat Deposits along the West Wall

Peat deposits buried underneath deposits of sands were encountered in explorations near Station 180+00 (west of the new runway). These deposits were encountered at depths ranging from 3.5 to 9.5 feet and varied in thickness between 1.5 and 5.5 feet. Based on observations in explorations in this area, it appears that buried peat deposits might be located in an area up to about 200 feet wide, between Stations 179+20 and 181+20.

SPT blow counts in the buried peat deposits near Station 180+00 typically indicate consistencies ranging from medium stiff to very stiff (N=10 to 30). To physically measure undrained shear strengths, Hart Crowser conducted *in situ* field vane tests. Undrained shear strengths of 1,044 and 1,607 psf were measured, which correlates with a consistency range of upper-bound medium stiff to stiff cohesive material.

In two borings (HC 00-B123 and HC00-B132) located below the proposed MSE wall near Station 179+00, consistency of the buried peat deviates from conditions encountered in adjacent borings. In these borings, the top 9 to 11 feet of soil consists of loose sand with interbedded layers of soft peat and silt.

Shallow Peat Deposits along the West Wall

The majority of peat deposits near the ground surface were encountered between Runway Stations 178+40 and 183+30 with deposit thickness typically varying between a few inches and about 2 feet. As mentioned in the previous section, in boring HC00-B132 soft peat layers were encountered to a depth of 9 feet.

While in most areas along the West Wall shallow peat deposits appear to be scattered and localized, there is an increased abundance of shallow peat in Wetland 37a near Station

179+00, just north and south of the unnamed drainage that carries water toward Miller Creek.

The shallow peat deposits in the wetland areas generally appear to be soft and highly compressible. Field vane tests were conducted in two locations in the wetlands near Station 179+00. The undrained shear strengths were determined to range from 167 to 459 psf.

Peat also was encountered in five explorations along the West Wall north of Station 183+30. No peat was encountered in explorations along the West Wall north of Station 192+80. The peat deposits scattered between Stations 183+30 and 192+80 generally appear to be isolated deposits. In these deposits, the thickness of the peat ranges from a few inches to about 3 feet.

North Safety Area

Peat deposits in the North Safety Area were encountered in the footprint of the proposed embankment and MSE Wall area, as well as to the west and north of the proposed fill in the area of the proposed Miller Creek floodplain improvements. These deposits were generally characterized as very soft to soft peat, based on SPT blow counts typically ranging from 1 to 2.

Peat Deposits in the Miller Creek Floodplain

In the North Safety Area, peat extending to depths greater than 9 feet was encountered to the west and north of the proposed embankment fill. In most of these areas, 1 to 4 feet of silty sands overlie the peat. The only structure that is proposed in this area is a sewer that will cross underneath Miller Creek. This work will require trenching in the peat

Hart Crowser conducted field vane tests to measure undrained shear strengths of the peat. The *in situ* undrained shear strength of the peat near the proposed sewer ranges from 626 psf at a depth of 3.5 feet to values of 313 and 375 psf at greater depths of up to about 8 feet. The undrained shear strength of the peat generally decreased with depth, possibly as a result of dessication and surface compaction associated with previous farming in this area.

Hong West also conducted field vane tests in the Miller Creek floodplain (Hong West 1998). However, their report does not clearly state what soil types the tests were performed on. Many of the adjacent explorations encountered organic silts at the depths the tests were performed. Field vane tests were performed at depths between 8 and 10 inches. Reported peak undrained shear strengths ranged from 426 to 576 psf. Residual undrained strengths varied between 108 and 150 psf.

Peat Deposits below the Proposed Embankment and MSE Wall

Peat deposits to depths of up to 10 feet below ground surface were encountered in borings in the area of the proposed embankment and MSE wall. The *in situ* undrained shear strength of the peat measured in this area ranged from 292 to 542 psf. A test conducted on a shallow organic silt deposit exhibited an undrained strength of 835 psf. The undrained shear strength of the peat generally decreased with depth.

PEAT CLASSIFICATION

Peat samples were visually classified using the Unified Soil Classification System for exploration log descriptions. Selected representative samples were also classified in general accordance with ASTM D 4427. We determined the following characteristics: Moisture content (ASTM D 2974), fiber content (ASTM D 1997), ash/organic content (ASTM D 2974), and acidity (ASTM D 2976); botanical composition and absorbency were not determined.

West Wall Area

Buried Peat Deposits along the West Wall

Peat samples obtained in the West Wall area at depths between 3.8 to 7 feet were visually classified as stiff, moist, dark brown, sandy peat (see Table D-4). Two of three samples were slightly gravelly.

Laboratory classification testing revealed moisture contents varying between 72 and 132 percent, fiber contents ranging from 4 to 12 percent, and organic contents between 9 and 18 percent. In general accordance with ASTM D 4427, the samples were classified as sapric, high ash, slightly to moderately acidic peat (see Table D-3).

Shallow Peat Deposits along the West Wall

Peat samples obtained near the ground surface at depths between 4 inches and 2.1 feet were significantly softer than the samples from the buried deposits. The shallow samples also contained less sand and gravel than the deeper deposits. The shallow samples were visually classified as very soft to soft, moist to wet, dark brown peat (see Table D-4).

In general accordance with ASTM D 4427, the samples were classified as sapric, high ash, slightly acidic peat with moisture contents of 132 to 168 percent, fiber contents of 11 percent, and organic contents ranging from 18 to 24 percent (see Table D-3).

North Safety Area

In this area, samples were obtained in the Miller Creek floodplain and beneath the proposed embankment. The peat deposits were visually classified as soft to medium stiff, moist to wet, dark brown, fibrous peat (see Table D-4). One medium stiff organic silt sample was also obtained at a depth of about 10 inches. Organic silt was encountered at shallow depth only.

Generally, the peat obtained in the North Safety Area is more fibrous and has significantly higher organic contents and moisture contents than the peat from the West Wall area. Fiber contents ranged from 22 to 52 percent. Organic contents varied between 54 and 90 percent. Moisture contents ranged from 561 to 981 percent. In general accordance with ASTM D 4427, the peat in this area obtained at depths between 4.0 and 7.8 feet may be described as sapric to hemic, medium to high ash, slightly to moderately acidic peat (see Table D-3). The peat appears to become softer with depth, which may be attributed to varying water levels and higher degrees of desiccation near the ground surface.

STRENGTH CHARACTERISTICS

Hart Crowser conducted field vane tests in the West Wall and North Safety Areas this year to obtain *in situ* undrained shear strength values. To obtain drained ϕ-angles of the existing peat, two sets of direct shear tests were performed on undisturbed samples from the North Safety Area.

Field Vane Testing

Test results of the field vane testing in the North Safety Area and along the West Wall are shown in Table D-4. Table D-4 shows field vane results and classification test results along with additional information. It appears that the peat deposits in the West Wall area generally have higher strengths than the peat in the NSA, which might be related to the relatively lower organic content or lower moisture contents in the West Wall area.

Direct Shear Testing

Two sets of direct shear tests were performed on samples from the North Safety Area at borings HC01-B33A/B and HC01-HB3A.

The direct shear tests were conducted on soft peat samples with fiber contents of 22 and 25 percent and organic contents of 54 and 61 percent. Both tests exhibited very similar drained ϕ-angles ranging from about 15 degrees at 2 percent strain to about 25 degrees at 8 percent strain (see Figures D-3 and D-4). Somewhat lower values (ϕ approximately 7 degrees) are observed in one sample at very low confining pressures.

Consolidation Testing

Consolidation test results for samples obtained in borings HC01-B33B and HC01-HB3A are shown on Figures D-5 and D-6, respectively. Results obtained from the data shown on the figures are summarized in the table below. The consolidation tests were conducted in accordance with ASTM D 2435 Test Method B.

Consolidation Properties

	Sample Depth in Feet	p_c' in psf	σ_{v0}' in psf	OCR	$C_{C\varepsilon}$	C_C
HC01-B33B	6.5	660	307	2.1	0.58	5.0
HC01-HB3A	7.2	480	396	1.2	0.51	5.8

Consolidation ratios (i.e., modified compression indexes) and compression indexes were determined in the upper portion of the virgin compression curves. A specific gravity of 1.6 was assumed to convert from consolidation ratios to compression indexes. At high strains, the virgin compression curves are no longer straight lines when plotted in the semi-log space. Consolidation ratios and compression indexes decrease at strains greater than about 50 to 60 percent.

Compression indexes for the samples from HC01-B33B and HC01-HB3A were estimated to be 5 and 5.8, respectively. The samples were estimated to be in the normally to slightly overconsolidated range with OCRs of 2.1 and 1.2

REFERENCES

Hong West 1998. Geotechnical and Dewatering Evaluation, Miller Creek Relocation, SeaTac Airport, Washington, June 8, 1998.

Civiltech 1997. Geotechnical Report, South 154th Street/156th Way Relocation, Sea-Tac International Airport, SeaTac, Washington, October 27, 1997.

Attachments:
Table D-1 - Peat and Organic Silt in the North Safety Area
Table D-2 - Peat and Organic Silt along the West Wall
Table D-3 - Peat Classification Summary
Table D-4 - Summary Table – Field Vane Results, Classification Testing Results, and SPT Blow Counts in Adjacent Borings
Figure D-1 - Peat and Organic Silt – North Safety Area
Figure D-2 - Peat and Organic Silt – West Wall Area
Figure D-3 - Direct Shear Test Results – HC01-B33A/B
Figure D-4 - Direct Shear Test Results – HC01-HB3A
Figure D-5 - Consolidation Test Results – HC01-B33B
Figure D-6 - Consolidation Test Results – HC01-HB3A

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Table D-1 - Peat and Organic Silt in North Safety Area

Exploration Number	Soil Description	N Value (consistency/density based on N values)	Depth of Top of Layer in Feet	Depth of Bottom of Layer in Feet	Layer Thickness in Feet	Ground Surface Elevation in Feet	Top of Layer Elevation in Feet	Bottom of Layer Elevation in Feet
NORTH SAFETY AREA - EXPLORATIONS IN MILLER CREEK FLOODPLAIN								
Shallow PEAT and Organic SILT								
HC99-B48	siSw/org (PEAT)	grab (loose)	0	3	3	268	268	265
HC99-B31	PEAT	1 v.soft	0	15	15	263.7	263.7	248.7
HW98-TP1	organic SILT	(soft)	0	2	2	346	346	344
HW98-TP2	organic SILT	(soft)	0	2	2	361	361	359
HW98-TP3	organic SILT	(v.soft-soft)	0	1.5	1.5	299	299	297.5
HW98-TP4	organic SILT	(soft)	0	1	1	274	274	273
HW98-TP5	organic SILT	(soft)	0	2.5	2.5	283	283	280.5
HW98-TP6	organic SILT	(soft)	0	2	2	300	300	298
HW98-TP7	organic SILT	(soft)	0	1	1	308	308	307
HW98-TP10	organic SILT	(soft)	0	1.5	1.5	306	306	304.5
P-B1	siS w/organics (topsoil)	no description	0	1.25	1.25	264	264	262.75
CT98-B4	organic SILT (PEAT)	1 soft	0	3.5	3.5	264	264	260.5
CT98-B5	organic SILT (PEAT)	0 v.soft	0	2	2	264	264	262
CT98-B6	organic SILT (PEAT)	0 v.soft	0	2.5	2.5	264	264	261.5
CT98-B8	organic SILT (PEAT)	2 v.soft	0	3.5	3.5	264	264	260.5
Buried PEAT and Organic SILT Deposits								
HC00-B301	siS & PEAT	push (m.dense & soft)	2	10	8	264.6	262.6	254.6
HC00-B301	SILT & PEAT	11 stiff	10	12.5	2.5	264.6	254.6	252.1
HW98-HB1	organic SILT	(soft)	3	4	1	263	260	259
HW98-HB1	PEAT	(v.soft-soft)	4	BOB	>8.5	263	259	(250.5)
HW98-HB2	PEAT	(v.soft-soft)	3	BOB	>8.5	262	259	(250.5)

Notes: BOB = Bottom of boring. Boring was not drilled through layer.
Layer is thicker than distance between BOB and top of layer.

Table D-1 - Peat and Organic Silt in North Safety Area

Exploration Number	Soil Description	N Value (consistency/density based on N values)	Depth of Top of Layer in Feet	Depth of Bottom of Layer in Feet	Layer Thickness in Feet	Ground Surface Elevation in Feet	Top of Layer Elevation in Feet	Bottom of Layer Elevation in Feet
Buried PEAT and Organic SILT Deposits								
HW98-HB3	PEAT	(v.soft-soft)	3.5	BOB	>9	263	259.5	(250.5)
HW98-HB4	organic SILT	(soft)	2	3	1	263	261	260
HW98-HB4	PEAT	(soft)	3	BOB	>7	263	260	(253)
HW98-HB5	organic SILT	(soft)	2	3.5	1.5	263	261	259.5
HW98-HB5	PEAT	(v.soft-soft)	3.5	BOB	>6.5	263	259.5	(253)
HW98-HB6	PEAT	(v.soft-soft)	3	BOB	>0.5	262	259	(255.5)
HW98-HB7	PEAT	(v.soft-soft)	3.5	BOB	>0.5	262	258.5	(258)
HW98-HB8	organic SILT	(soft)	1.5	3.5	2	262	260.5	258.5
HW98-HB8	PEAT	(v.soft-soft)	3.5	BOB	>0.5	262	258.5	(258)
HW98-HB9	organic SILT	(soft)	2	3.5	1.5	263	261	259.5
HW98-HB9	PEAT	(v.soft)	3.5	BOB	>0.5	263	259.5	(259)
HW98-TP1	PEAT	(v.soft)	2	8	6	263	261	255
HW98-TP2	PEAT	(v.soft)	2	8	6	266	264	258
HW98-TP3	PEAT	(v.soft)	1.5	5	3.5	267	265.5	262
HW98-TP4	PEAT	(v.soft)	1	BOB	>7	263	262	(255)
HW98-TP5	PEAT	(v.soft)	2.5	8	5.5	263	260.5	255
HW98-TP5	SILT w/PEAT	(soft)	8	10	2	263	255	253
HW98-TP5	PEAT	(soft)	10	BOB	>2	263	253	(251)
HW98-TP6	PEAT	(soft)	2	BOB	>10	263	261	(251)
HW98-TP7	PEAT	(soft)	1	BOB	>9	263	262	(253)
P-B1	PEAT	no description	1.25	BOB	>7.75	264	262.75	(255)
P-B2	PEAT	no description	2.75	7.25	4.5	264.5	261.75	257.25
P-B3	PEAT	no description	2.25	BOB	>7.55	262	259.75	(252.2)
P-SB1	PEAT	no description	3	BOB	>0.3	266	263	(262.7)

Notes: BOB = Bottom of boring. Boring was not drilled through layer.
Layer is thicker than distance between BOB and top of layer.

Table D-1 - Peat and Organic Silt in North Safety Area

Exploration Number	Soil Description	N Value (consistency/density based on N values)	Depth of Top of Layer in Feet	Depth of Bottom of Layer in Feet	Layer Thickness in Feet	Ground Surface Elevation in Feet	Top of Layer Elevation in Feet	Bottom of Layer Elevation in Feet
Buried PEAT and Organic SILT Deposits								
P-SB2	PEAT	no description	3.25	BOB	>5.75	264	260.75	(255)
P-SB3	PEAT	no description	2.25	5.25	3	265	262.75	259.75
CT97-B4A	SILT w/org (PEAT)	0 v.soft	2	8	6	264	262	256
CT98-B4	PEAT	0 & push v.soft	3.5	12.5	9	264	260.5	251.5
CT98-B5	PEAT	1 v.soft	2	9.5	7.5	264	262	254.5
CT98-B6	PEAT	0 v.soft	2.5	7.5	5	264	261.5	256.5
CT98-B8	PEAT	1 v.soft	3.5	9	5.5	264	260.5	255
NORTH SAFETY AREA - EXPLORATIONS IN PROPOSED EMBANKMENT / MSE WALL AREA								
Area of Proposed Overexcavation (10 Feet)								
HC99-B32	PEAT	v soft	0	9.5	9.5	263.2	263.2	253.7
HC99-B33	PEAT	1 v.soft	0	10	10	262.7	262.7	252.7
HC99-B34	SILT & PEAT interbedded	2 very soft	0	5.5	5.5	265.2	265.2	259.7
CT98-B7	organic SILT (PEAT)	(v.soft)	9	13	4	264	255	251
Area Outside of Proposed Overexcavation								
HC99-B42	organic CLAY	GRAB (soft)	0	2.5	2.5	263	263	260.5
HC99-B47	PEAT	grab (soft)	0	2.5	2.5	278.8	278.8	276.3
HC00-B167	SAND & PEAT	grab (loose)	0	4.5	4.5	276	276	271.5
HC00-B174	PEAT	grab (soft)	1	2.5	1.5	267	266	264.5
CT98-B3	organic SILT (PEAT)	4 to 13 soft	0	6.5	6.5	265	265	258.5
CT98-B9	organic SILT (PEAT)	2 v.soft	0	5.5	5.5	264	264	258.5
CT98-B10	organic SILT (PEAT)	2 v.soft	0	7.5	7.5	264	264	256.5

Notes: BOB = Bottom of boring. Boring was not drilled through layer.
Layer is thicker than distance between BOB and top of layer.

Table D-2 - Peat and Organic Silt along the West Wall

Exploration Number	Soil Description	N Value (consistency/density based on N values)	Depth of Top of Layer in Feet	Depth of Bottom of Layer in Feet	Layer Thickness in Feet	Ground Surface Elevation in Feet	Top of Layer Elevation in Feet	Bottom of Layer Elevation in Feet
WEST WALL - BURIED PEAT DEPOSITS AT STATION 180+00								
HC99-B37	scPEAT	30 v.stiff	9.5	15	5.5	234.6	225.1	219.6
HC99-B38	sPEAT	15 stiff	4.5	9.5	5	227.6	223.1	218.1
HC99-B39	PEAT	(3 soft - only part. in peat)	3.5	5	1.5	231.1	227.6	226.1
HC00-B124	sPEAT	10 stiff	7.5	10	2.5	231	223.5	221
WEST WALL - PEAT DEPOSITS NEAR STATION 180+00 RANGING FROM SHALLOW TO DEEP								
HC00-B123	sSILT w/PEAT & siS layers	3 to 6 soft-m.stiff	0	11	11	235	235	224
HC00-B132	siSAND w/sl.sSILT & PEAT layers	2 loose	0	9	9	227	227	218
WEST WALL - SHALLOW PEAT DEPOSITS BETWEEN STATIONS 178+40 AND 183+30								
HC00-B121	SILT w/S & PEAT interbedded	grab (v.soft)	0	2	2	230	230	228
HC00-B122	siSAND & PEAT	grab (v.loose)	0	2	2	240	240	238
HC00-TP113	sl.g,siSAND w/PEAT	(loose)	0	2	2	239	239	237
HC00-TP114	g,siSAND w/PEAT (topsoil)	(loose)	0	0.5	0.5	248	248	247.5
HC00-TP115	sl.g,siSAND w/PEAT (topsoil)	(loose)	2.5	3	0.5	250	247.5	247
WEST WALL - SCATTERED, LOCALIZED PEAT DEPOSITS NORTH OF STATION 183+30								
HC00-B146	sPEAT	grab (soft)	0	2	2	261	261	259
HC00-A100	sl.sPEAT w/roots	(v.soft-soft)	0	2	2	268	268	266
HC00-A105	siSAND w/PEAT	(soft)	0	1	1	291	291	290
HC00-A137	siSAND w/PEAT	(loose)	0	3	3	235	235	232
HC00-A143	organic SILT w/organics	(v.soft)	1.5	4	2.5	237	235.5	233
HC00-TP121	siSAND w/PEAT	(loose)	11	13	2	254	243	241

Table D-3 - Peat Classification Summary

New Exploration Number	Sample Depth in Feet	Previous Exploration	General Location	Moisture Content	Fiber Content	Organic Content	pH (Water)	pH (CaCl2)	Classification (ASTM D 4427) [1]
HC01-FV1	0.2 to 0.4	HC00-B121	West Wall	132%	11%	18%	5.9	5.4	Sapric, high ash, slightly acidic Peat
HC01-FV7B	1.8 to 2.1	HC00-B123	West Wall	168%	11%	24%	5.6	4.8	Sapric, high ash, slightly acidic Peat
HC01-FV4	3.8 to 4.3	HC99-B39	West Wall	132%	12%	18%	5.2	4.8	Sapric, high ash, moderately acidic Peat
HC01-FV8	6.8 to 7	HC99-B38	West Wall	72%	4%	9%	5.6	5.6	Sapric, high ash, slightly acidic Peat
HC-01-FV9	4.0 to 4.3	HC99-B33	NSA	981%	32%	79%	5.5	5.0	Sapric, high ash, moderately acidic Peat
HC01-FV6	4.3 to 4.5	HW98-HB3	NSA	783%	51%	90%	5.5	4.9	Hemic, medium ash, moderately acidic Peat
HC01-B33B	5.0 to 5.5	HC99-B33	NSA	561%	22%	54%	6.5	6.0	Sapric, high ash, slightly acidic Peat
HC01-HB3A	7.3 to 7.8	HW98-HB3	NSA	640%	25%	61%	6.0	5.7	Sapric, high ash, slightly acidic Peat

Notes: [1] Definitions as per ASTM D 4427:

Fiber Content:
Fibric - Peat with greater than 67% fibers.
Hemic - Peat with between 33 and 67% fibers.
Sapric - Peat with less than 33% fibers.

Ash Content:
Low Ash - Peat with less than 5% ash.
Medium Ash - Peat with between 5 and 15% ash.
High Ash - Peat with more than 15% ash.

Acidity:
Highly Acidic - Peat with a pH less than 4.5.
Moderately Acidic - Peat with a pH between 4.5 and 5.5.
Slightly Acidic - Peat with a pH greater than 5.5 and less than 7.
Basic - Peat with a pH equal or great than 7.

Table D-4 - Summary Table - Field Vane Results, Classification Testing Results, and SPT Blow Counts in Adjacent Borings

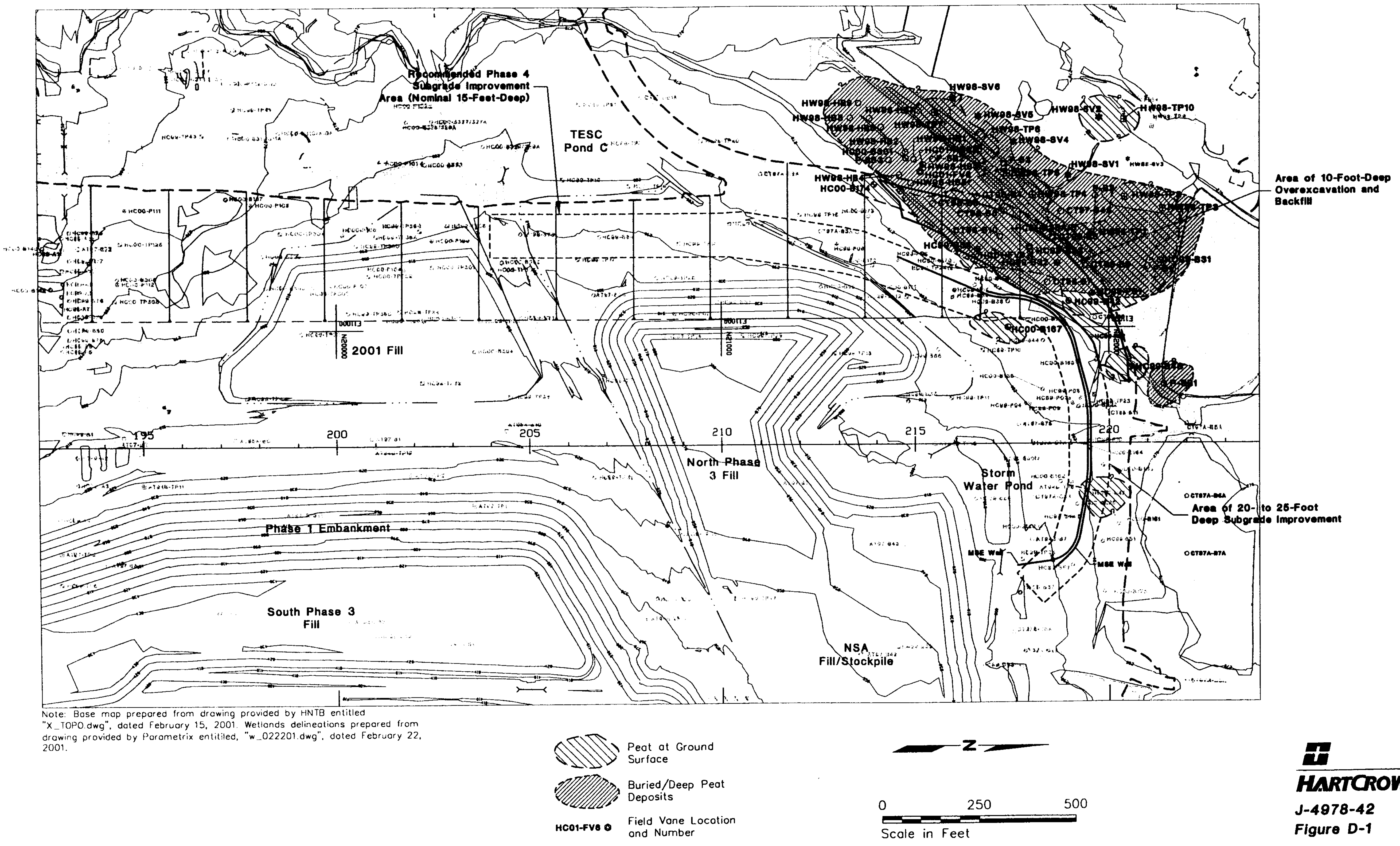
Field Vane Location	General Location	Test Depth in Feet	Undrained Strength in psf	Moisture Content in Percent	Fiber Content in Percent	Organic Content in Percent	USC Visual Classification (1)	Previous, Adjacent Boring	SPT Depth in Feet	SPT Blow Counts	Remarks
HC01-FV1	West Wall	0.33	167	132	11	18	Very soft, wet, dark brown Peat with fine roots	HC00-B121	-	-	No shallow SPT samples.
HC01-FV7A	West Wall	1.6	417	-	-	-	Soft, moist, dark brown Peat	HC00-B123	-	-	No shallow SPT samples.
HC01-FV7B	West Wall	2	459	168	11	24	Soft, moist, dark brown Peat	HC00-B123	-	-	No shallow SPT samples.
HC01-FV4	West Wall	4.2	1607	132	12	18	Stiff, moist, dark brown, sandy Peat	HC99-B39	3.5	3	Only bottom of sample in PEAT.
HC01-FV8	West Wall	6.4	1044	-	-	-	Stiff, moist, dark brown, slightly gravelly, sandy Peat	HC99-B38	6.0	13	
		7	1044	72	4	9	Stiff, moist, dark brown, slightly gravelly, sandy Peat				
HC01-FV6	NSA	3.5	626				Medium stiff, moist, dark brown, fibrous Peat	HW98-HB3	-	-	Hand auger - no blow counts avail.
		4.5	459	783	51	90	Soft, moist, dark brown, fibrous Peat				
		5.8	313				No sample (boring log indicates Peat)				
		6.8	375				No sample (boring log indicates Peat)				
		7.8	375				No sample (boring log indicates Peat)				
HC01-FV9	NSA	0.8	835				Medium stiff, moist to wet, dark brown, Organic Silt	HC99-B33	-	-	No shallow SPT samples.
		2.1	542				Medium stiff, wet, dark brown , fibrous Peat		3.5	2	
		4.2	292	981	32	79	Soft, wet, dark brown , fibrous Peat		5.0	2	

Note:

(1) West Wall peat samples typically classified as sapric, high ash, slightly acidic; per ASTM D 4427.
NSA peat samples typically classified as sapric, high ash, slightly to moderate acidic, per ASTM D 4427.

Peat and Organic Silt

North Safety Area



Note: Base map prepared from drawing provided by HNTB entitled "X_TOPO.dwg", dated February 15, 2001. Wetlands delineations prepared from drawing provided by Parametrix entitled, "w_022201.dwg", dated February 22, 2001.

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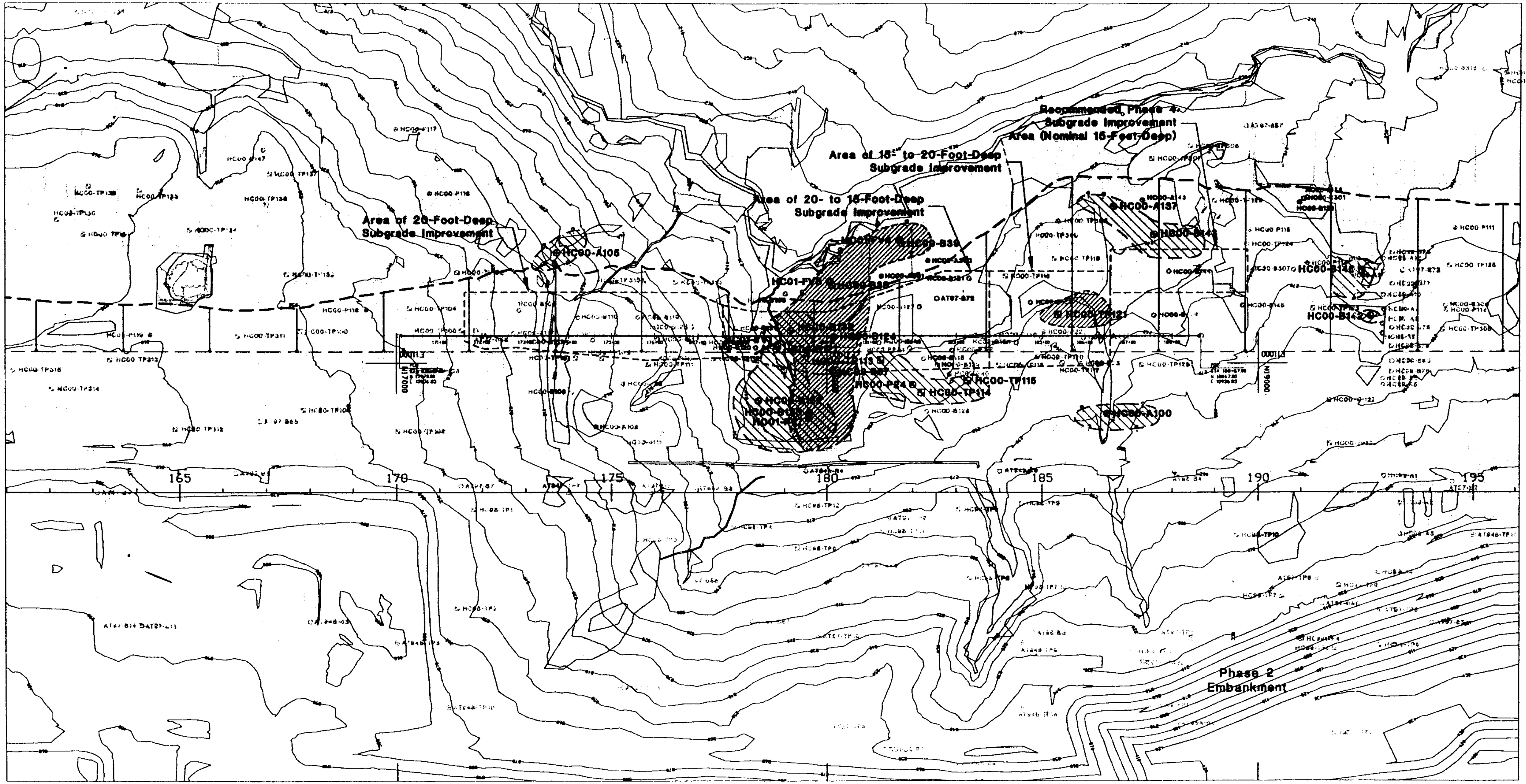
J-4978-42 8/01
Figure D-1

DJH 8/17/01 1=250 (xref) see dwg/charlie.pc2
49784001

Peat and Organic Silt

West Wall Area



Note: Base map prepared from drawing provided by HNTB entitled "X_TOPO.dwg", dated February 15, 2001. Wetlands delineations prepared from drawing provided by Parametrix entitled, "w_022201.dwg", dated February 22, 2001.

RC 8/15/01 1=250 (xref) see dwg/charlie.pc2
49784202

▧ Peat at Ground Surface

▨ Buried/Deep Peat Deposits

HC01-FV1 ⊙ Field Vane Location and Number

Z

0 250 500
Scale in Feet

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J-4978-42 8/01
Figure D-2

Direct Shear Test on sapric, high ash, slightly acidic Peat

(Boring HC01-B33A/B, 5.0 to 7.0 feet)

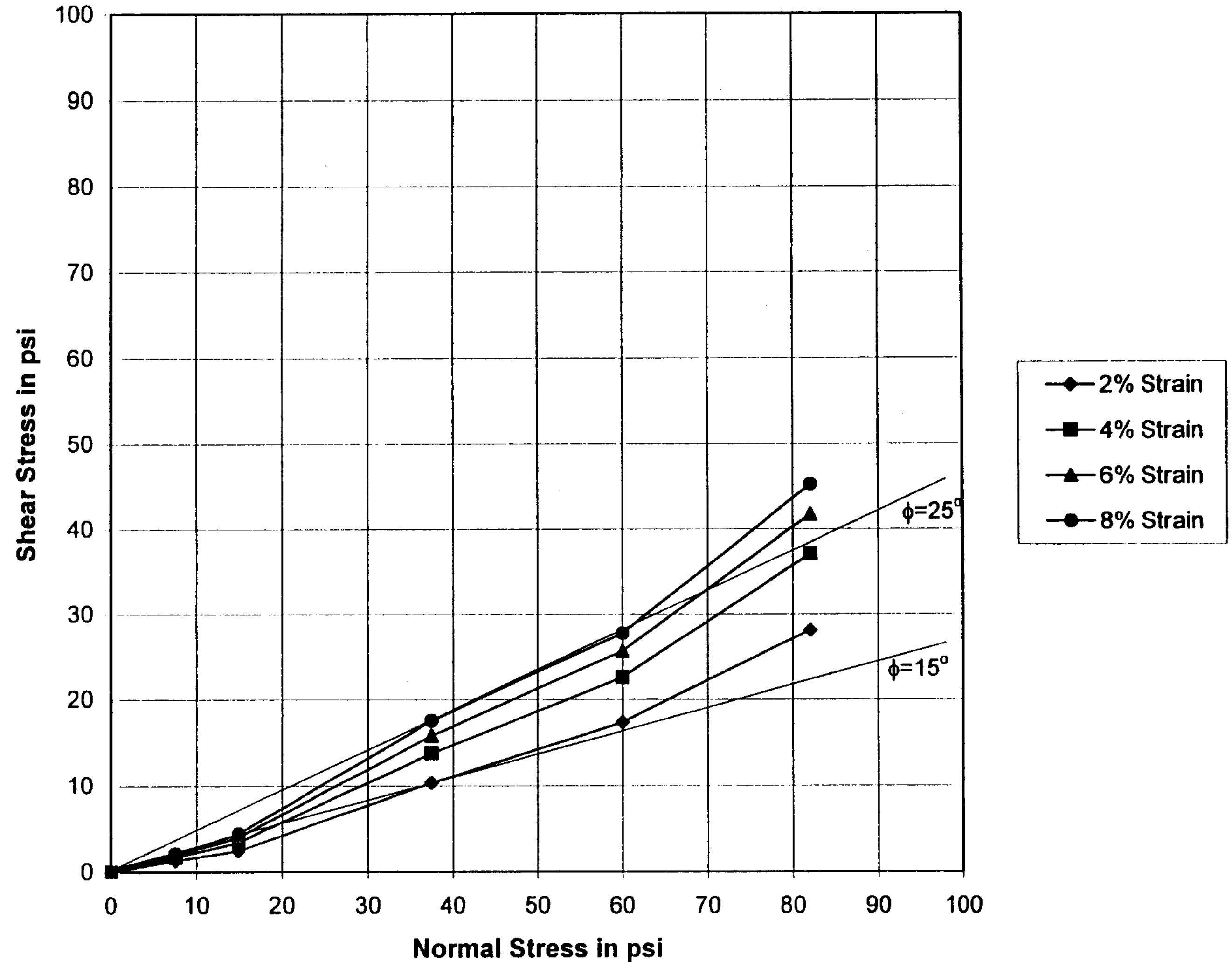

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Figure D-3

Direct Shear Test on sapric, high ash, slightly acidic Peat
(Boring HC01-HB3A, 6.3 to 7.6 feet)

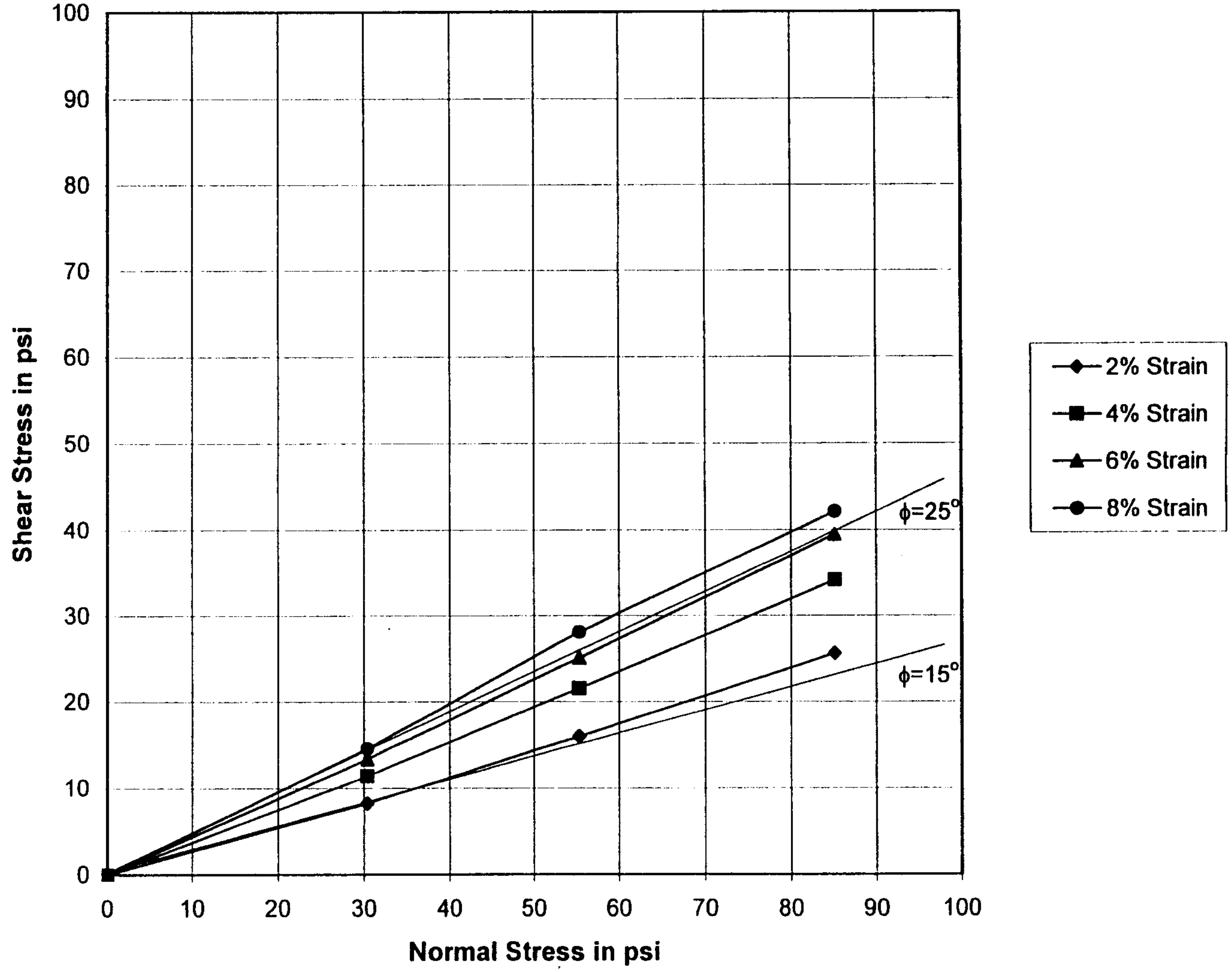

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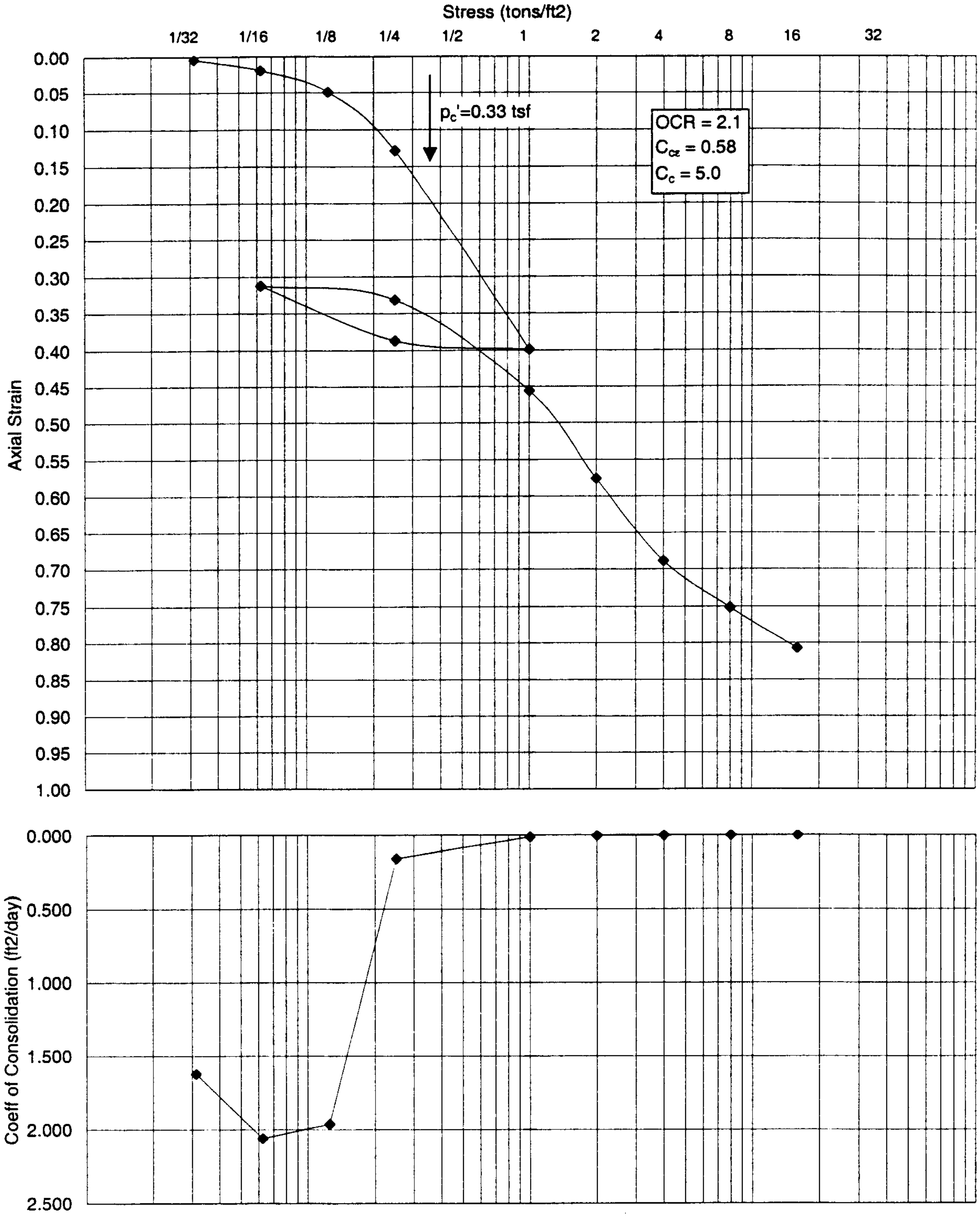
Figure D-4

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
HC01-B33B	S-2	5'-7'	479%	98%	*	*	*	65 pcf	PT	Sapric, high ash, PEAT

Remarks:

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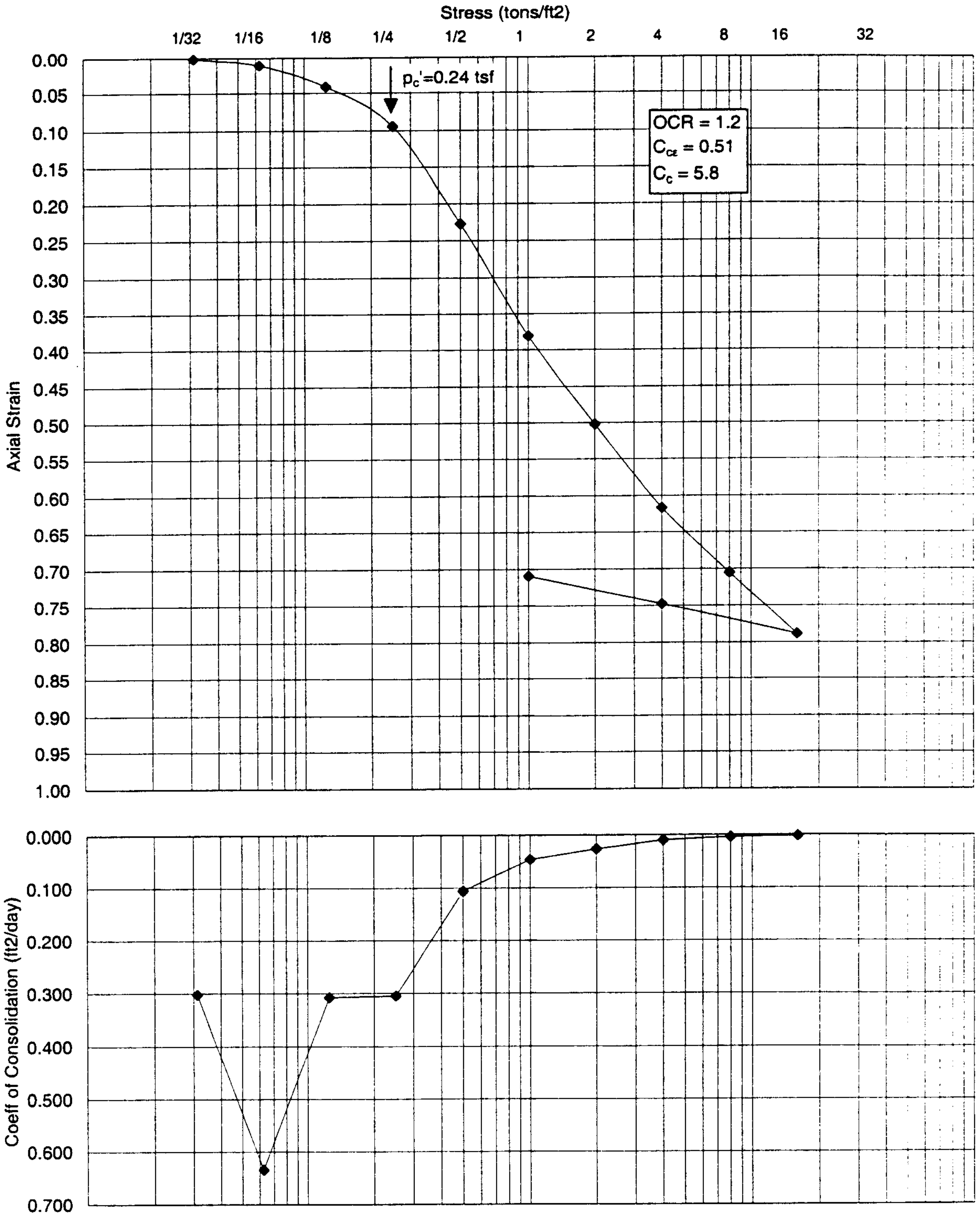
4978-42 5/24/2001

Figure D-5

CONSOLIDATION TEST RESULTS



Expl. No.	Sample No.	Depth (ft)	W.C. %		Atterberg Limit			Wet Wt (pcf)	USC	Description
			Before	After	LL	PL	PI			
HC01-HB3A	S-2	7.15'-7.3'	648%	163%	*	*	*	60 pcf	PT	Sapric, high ash, PEAT

Remarks:

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Figure D-6