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October 21, 2011

5264 DATA RPT

University of Oregon
Campus Planning and Real Estate
1276 Franklin Boulevard
Eugene, OR 97403-1276

DRAFT

Attention: Martina Bill

SUBJECT: Subsurface Data Report
Erb Memorial Union Expansion and Renovation
University of Oregon
Eugene, Oregon

At your request, GRI has completed subsurface explorations for the proposed Erb Memorial Union project on the University of Oregon campus in Eugene, Oregon. This report summarizes the results of the field explorations completed for this project.

FIELD EXPLORATIONS

Subsurface materials and conditions at the site were investigated on October 3 through October 5, 2011, with sever borings, designated B-1 through B-7, made at the approximate locations shown on the Site Plan, Figure 1. The borings were observed by an experienced engineer from GRI, who maintained a detailed log of the materials disclosed during the course of the work. The borings were advanced to depths of 10.1 to 20.2 ft., all of the borings were terminated in the underlying siltstone. The borings were advanced using mud rotary drilling techniques and a track-mounted drill rig provided and operated by Western States Soil Conservation of Hubbard, Oregon.

Disturbed and undisturbed soil samples were obtained from the borings at 2.5- to 5-ft intervals of depth. Disturbed soil samples were obtained using a standard split-spoon sampler. The Standard Penetration Test (SPT) was completed while obtaining disturbed soil samples. This test is performed by driving a split-spoon sampler into the soil a distance of 18 in. using the force of a 140-lb hammer dropped 30 in. The number of blows required to drive the sampler the last 12 in. is called the Standard Penetration Resistance, or N-value. The N-value provides a measure of the degree of compactness of granular soils, such as sand, and the degree of softness or stiffness of cohesive soils, such as silt. In addition, relatively undisturbed 3.0-in.-diameter Shelby tube samples of the silt soil were obtained. The samples were obtained by pushing a Shelby tube into the undisturbed soil a distance of approximately 24 in. using the hydraulic ram of the drill rig. The soil exposed in the ends of the Shelby tubes were examined and classified. After classification, the ends of the tubes were sealed with rubber caps and tape and returned to our laboratory for further classification and testing.

Logs of the borings are provided on Figures 1A through 7A. Each log presents a descriptive summary of the various types of material encountered in the boring and notes the depth where the materials and/or characteristics of the materials change. To the right of the descriptive summary, the numbers and types of samples that were taken during the drilling operation are indicated. Farther to the right, N-values and Torvane shear strength values are shown graphically. The terms used to describe the materials encountered in the borings are defined in Tables 1A and 2A.

SUBSURFACE CONDITIONS

General

Subsurface materials and conditions at the site were explored on October 3, 4, and 5, 2011, with seven borings, designated B-1 through B-7, at the locations shown on Figure 1. The borings were advanced to depths of 10.1 to 20.2 ft. The borings completed for this investigation indicate the site is mantled by up to 7.0 ft of medium stiff silt fill, which is likely associated with the landscaping. The silt fill is underlain by a layer of decomposed siltstone/sandstone, which typically has the consistency of stiff to very stiff or dense soil and is derived from the weathering of the underlying sedimentary rock. Below depths of about 8 to 14 ft, extremely soft (R0) siltstone/sandstone was encountered in all of the borings, all of the borings were terminated in the siltstone/sandstone at depths of 10.1 to 20.1 ft below the ground surface. The materials encountered in the borings for this investigation are similar to those encountered during our investigations of other nearby sites on campus.

For the purpose of discussion, the materials encountered in the borings have been grouped into the following categories.

For the purpose of discussion, the materials disclosed in the borings have been grouped into the following major units based on their physical characteristics and engineering properties.

1. **PAVEMENT**
2. **FILL**
3. **SILT (Decomposed Siltstone/Sandstone)**
4. **SILTSTONE/SANDSTONE (Eugene Formation)**

1. PAVEMENT. A 1.5 and 2.0-in.-thick section of AC pavement was encountered at the ground surface in borings B-1 and B-5, respectively. The AC in boring B-5 is underlain by a 28-in. thick layer of fine to coarse, rounded to subrounded gravel base course. No base course was encountered beneath the AC in boring B-1.

2. FILL. Fill consisting of brown silt was encountered at the ground surface in borings B-2 through B-4 and B-7. The thickness of the fill ranges from about 2.6 to 7.0 ft. The silt fill contains some fine-grained sand and scattered fragments of weathered siltstone. The relative consistency of the silt fill is typically medium stiff to stiff based on visual observation and N-values of 5 to 19 blows/ft.

3. SILT and SAND (Decomposed Siltstone/Sandstone). Silt and sand formed by the weathering of the underlying sedimentary rock was encountered beneath the silt fill and pavement section in borings B-1 through B-5 and B-7, and at the ground surface in boring B-6. The decomposed siltstone/sandstone extends to the top of rock at a depth of 8.2 to 14.2 ft. The silt is typically light brown to gray mottled rust in color, and has a variable clay and sand content. Fragments of weathered siltstone and sandstone are present throughout the unit. The sand is typically silty. The relative consistency of the silt is stiff to hard and the relative density of the sand is medium dense to dense.

4. SILTSTONE/SANDSTONE (Eugene Formation). Light brown to gray mottled rust siltstone and sandstone of the Eugene Formation was encountered beneath the residual silt, and all of the borings were terminated in the rock. The relative rock hardness of the siltstone and sandstone is estimated to be extremely soft (R0) to medium hard (R2 to R3), based on N-values of up to 50 blows for 1 in. of sampler penetration.

Groundwater

The borings were advanced using mud-rotary methods, which does not permit the observation of groundwater conditions during drilling. Groundwater monitoring wells installed on the campus in similar soil conditions indicate the groundwater level typically fluctuates in the range of 10 to 25 ft below the existing ground surface throughout the year, with levels generally the lowest in the late summer months. However, due to the presence of shallow, low-permeability subsurface materials, it should be anticipated that perched groundwater conditions could approach the ground surface during the wet, winter months and following periods of intense precipitation.

Excavations

We understand that below grade structures requiring excavations on the order of 10 to 15 ft deep below existing site grades maybe planned for the project. The borings disclosed the top of the soft to medium hard rock is at about 8 to 14 ft below existing site grades. The depth to rock at the boring locations is shown on Figure 1. Based on our experience on campus with similar conditions, it will be difficult to excavate below the top of rock without using a large hydraulic excavator equipped with a rock bucket with carbide teeth. It should be anticipated that progress will be relatively slow, and there will be obvious "wear and tear" on the excavation equipment. Therefore, it should be anticipated that excavations into the rock will require rock excavation techniques, such as percussion and chipping methods. In this regard, we feel that relatively hard and/or massive areas of rock encountered at this site could be effectively excavated using a hydro ram, which is commonly attached to a large track-mounted hydraulic excavator.

LIMITATIONS

This data report has been prepared to aid the design team in the design of this project. The scope is limited to the specific project location described herein. The findings submitted in this report are based on the data obtained from the borings made at the locations indicated on Figure 1 and from other sources of information discussed in this report. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is acknowledged that variations in soil conditions may exist between boring locations. This report does not reflect any variations that may occur between these explorations.

Please contact the undersigned if you have any questions regarding this report.

Submitted for GRI,

Michael W. Reed, PE, GE
Principal

This document has been submitted electronically.
The original sealed document is on file in this office.

Table 1

GUIDELINES FOR CLASSIFICATION OF SOIL

Description of Relative Density for Granular Soil

Relative Density	Standard Penetration Resistance (N-values) blows per foot
very loose	0 - 4
loose	4 - 10
medium dense	10 - 30
dense	30 - 50
very dense	Over 50

Description of Consistency for Fine-Grained (Cohesive) Soil

Consistency	Standard Penetration Resistance (N-values) blows per foot	Torvane Undrained Shear Strength, tsf
very soft	2	less than 0.125
soft	2 - 4	0.125 - 0.25
medium stiff	4 - 8	0.25 - 0.50
stiff	8 - 15	0.50 - 1.0
very stiff	15 - 30	1.0 - 2.0
hard	over 30	over 2.0

Sandy silt materials, which exhibit general properties of granular soils, are given relative density description.

Grain-Size Classification

Boulders
12 - 36 in.

Cobbles
3 - 12 in.

Gravel
$^{1}/_{4}$ - $^{3}/_{4}$ in. (fine)
$^{3}/_{4}$ - 3 in. (coarse)

Sand
No. 200 - No. 40 sieve (fine)
No. 40 - No. 10 sieve (medium)
No. 10 - No. 4 sieve (coarse)

Silt/Clay - pass No. 200 sieve

Modifier for Subclassification

Adjective	Percentage of Other Material In Total Sample
clean	0 - 2
trace	2 - 10
some	10 - 30
sandy, silty, clayey, etc.	30 - 50

Table 2A

GUIDELINES FOR CLASSIFICATION OF ROCK

RELATIVE ROCK WEATHERING SCALE:

Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 in. into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident. May be reduced to soil with hand pressure.

RELATIVE ROCK HARDNESS SCALE:

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	< 100 psi
Very Soft	R1	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocket knife and scratched with fingernail.	100 - 1,000 psi
Soft	R2	Can be peeled by a pocket knife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.	1,000 - 4,000 psi
Medium Hard	R3	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.	4,000 - 8,000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.	8,000 - 16,000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	> 16,000 psi

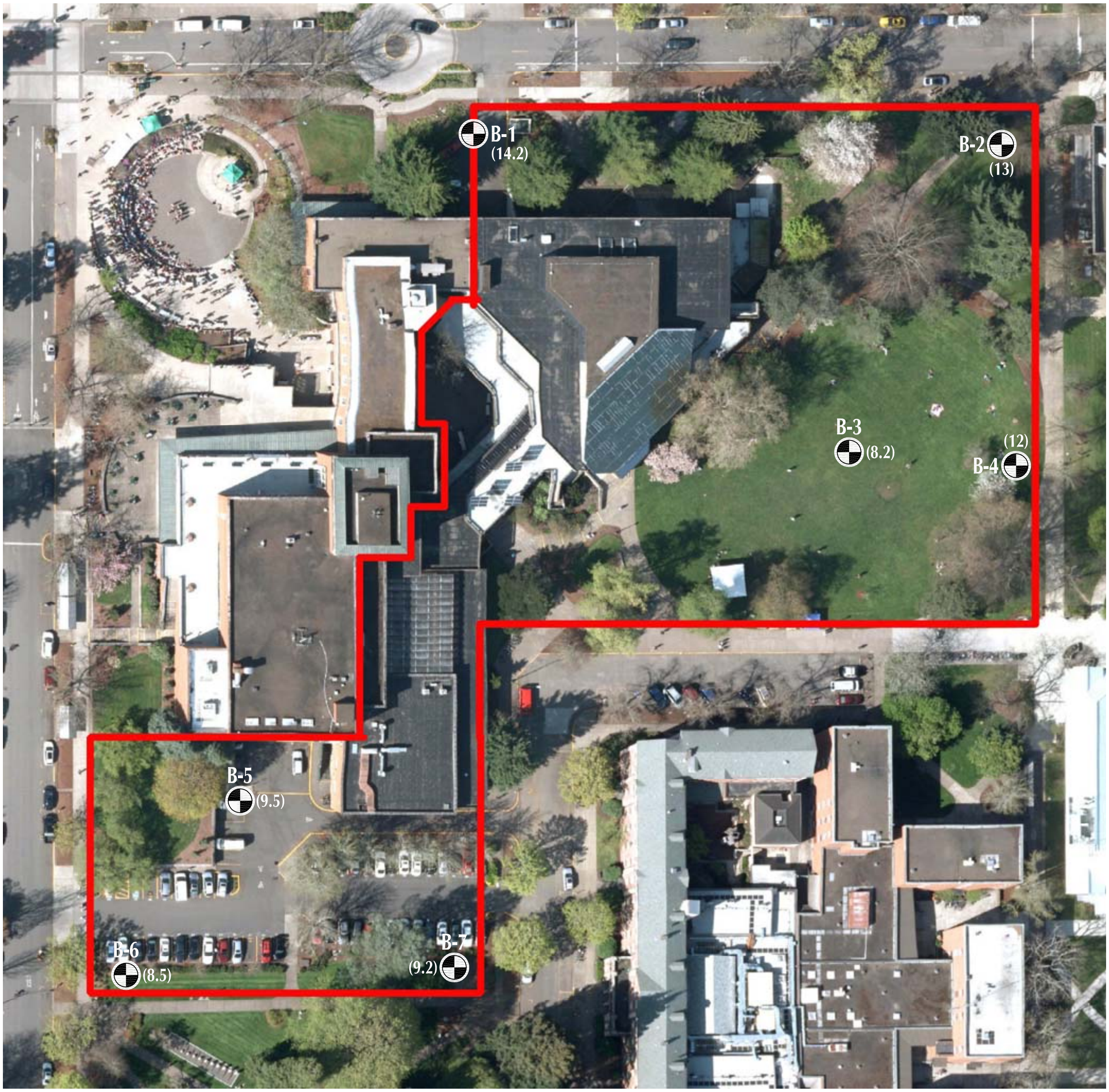
RQD AND ROCK QUALITY:

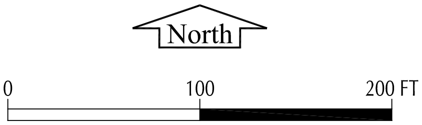
Relation of RQD and Rock Quality

RQD (Rock Quality Designation), %	Description of Rock Quality
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Terminology for Planar Surface

Bedding	Joints and Fractures	Spacing
Laminated	Very Close	< 2 in.
Thin	Close	2 in. – 12 in.
Medium	Moderately Close	12 in. – 36 in.
Thick	Wide	36 in. – 10 ft
Massive	Very Wide	> 10 ft





⊕ BORING MADE BY GRI
(OCTOBER 3 - 5, 2011)

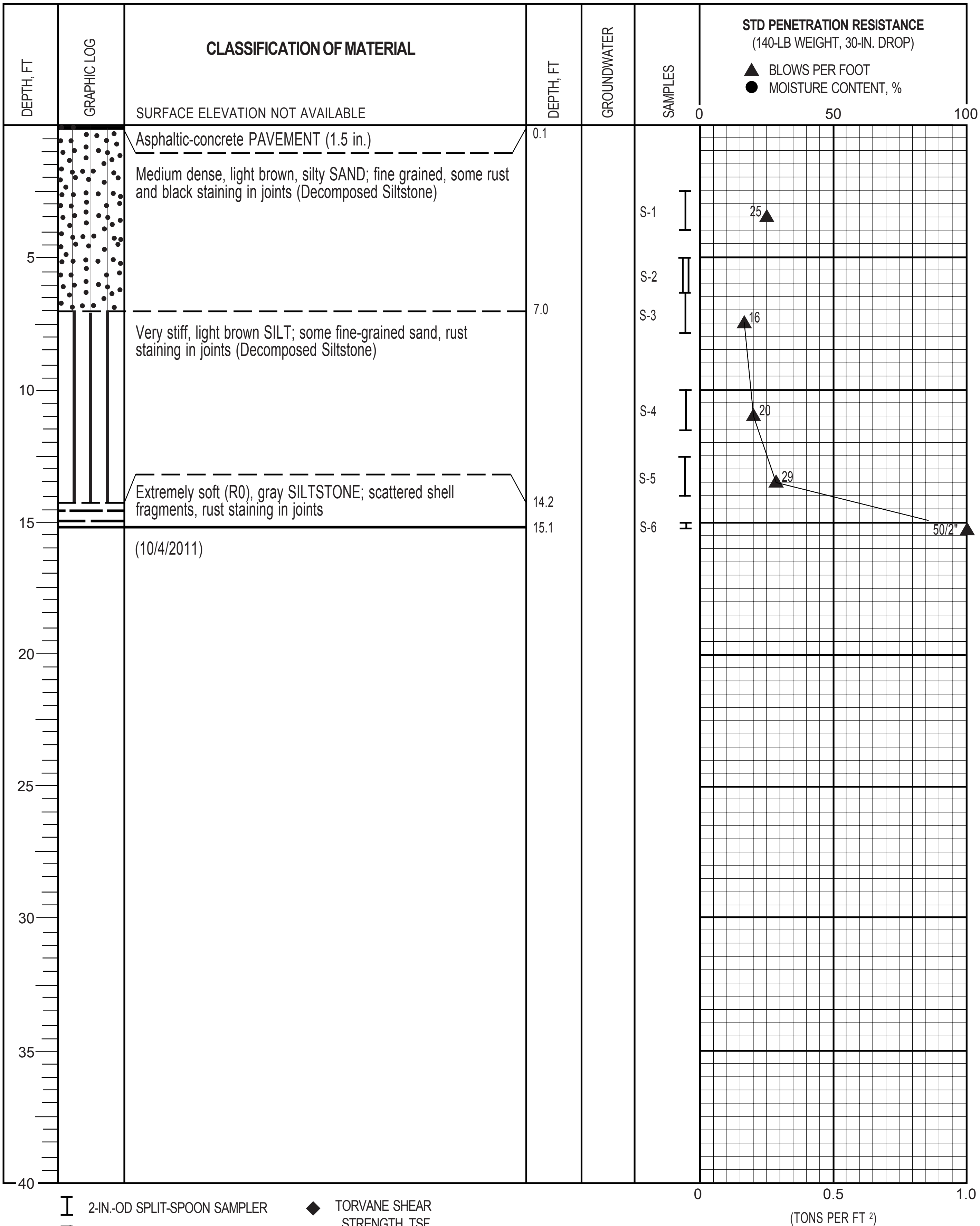
(**14.2**) DEPTH TO ROCK, FT

SITE PLAN FROM FILE BY UNIVERSITY OF OREGON, DATED APRIL 2011

GRI
UNIVERSITY OF OREGON
U OF O ERB MEMORIAL UNION

SITE PLAN

OCT. 2011 JOB NO. 5264 FIG. 1



CLASSIFICATION OF MATERIAL

SURFACE ELEVATION NOT AVAILABLE

CLASSIFICATION OF MATERIAL	DEPTH, FT
Asphaltic-concrete PAVEMENT (1.5 in.)	0.1
Medium dense, light brown, silty SAND; fine grained, some rust and black staining in joints (Decomposed Siltstone)	7.0
Very stiff, light brown SILT; some fine-grained sand, rust staining in joints (Decomposed Siltstone)	14.2
Extremely soft (R0), gray SILTSTONE; scattered shell fragments, rust staining in joints	15.1

(10/4/2011)

I	2-IN.-OD SPLIT-SPOON SAMPLER
Ⅱ	3-IN.-OD THIN-WALLED SAMPLER
G	GRAB SAMPLE OF DRILL CUTTINGS
▌	NX CORE RUN
├	SLOTTED PVC PIPE
▼	Water Level (date)
◆	TORVANE SHEAR STRENGTH, TSF
☐	PERCENT PASSING NO. 200 SIEVE (WASHED)
*	NO RECOVERY

Liquid Limit
Moisture Content
Plastic Limit

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BORING B-1

OCT. 2011

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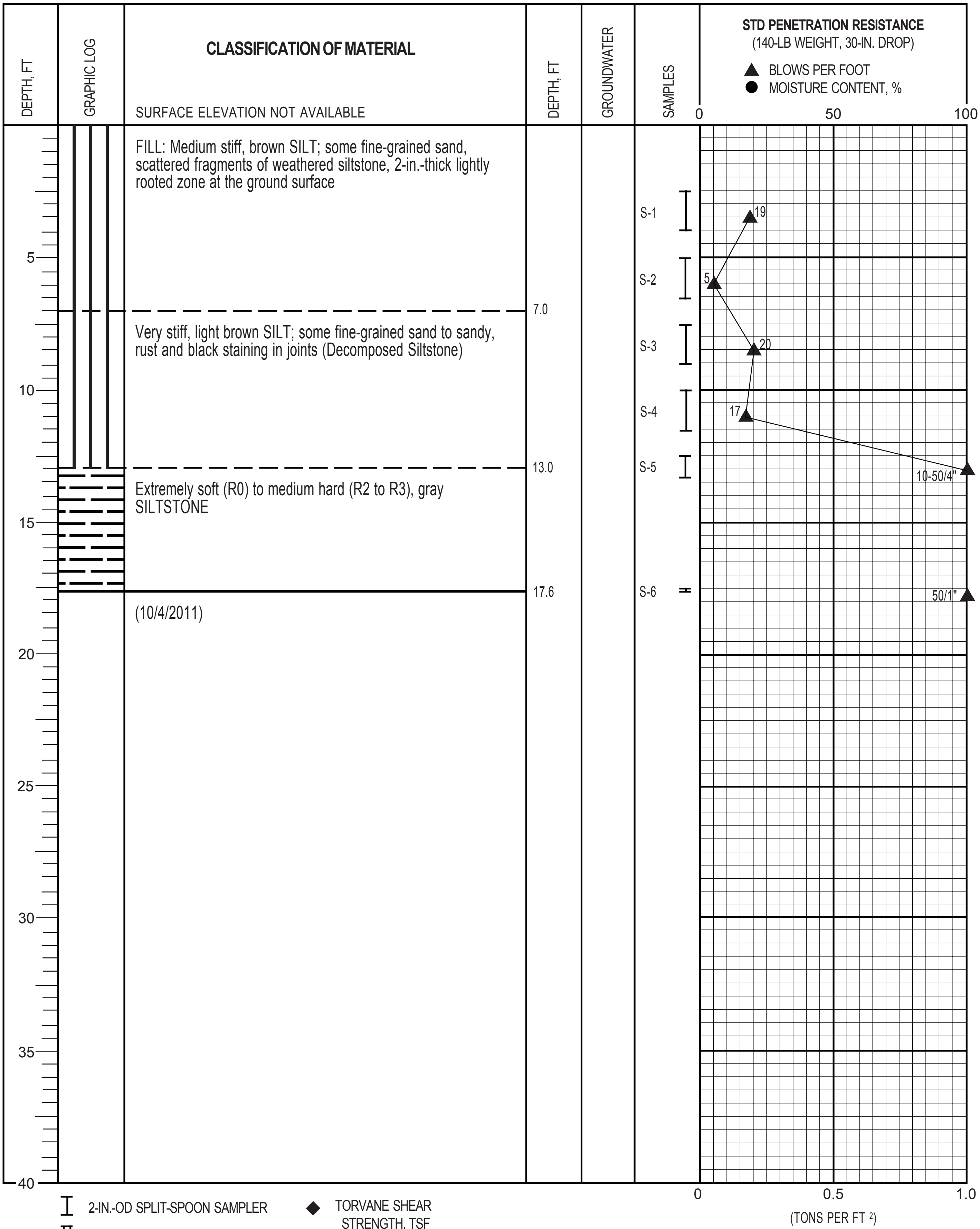
FIG. 1A



CLASSIFICATION OF MATERIAL

SURFACE ELEVATION NOT AVAILABLE

FILL: Medium stiff, brown SILT; some fine-grained sand, scattered fragments of weathered siltstone, 2-in.-thick lightly rooted zone at the ground surface

7.0

Very stiff, light brown SILT; some fine-grained sand to sandy, rust and black staining in joints (Decomposed Siltstone)

13.0

Extremely soft (R0) to medium hard (R2 to R3), gray SILTSTONE

17.6

(10/4/2011)

I 2-IN.-OD SPLIT-SPOON SAMPLER

II 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

▌ NX CORE RUN

|—SLOTTED PVC PIPE

▼ Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

☐ PERCENT PASSING NO. 200 SIEVE (WASHED)

* NO RECOVERY

Liquid Limit
Moisture Content
Plastic Limit

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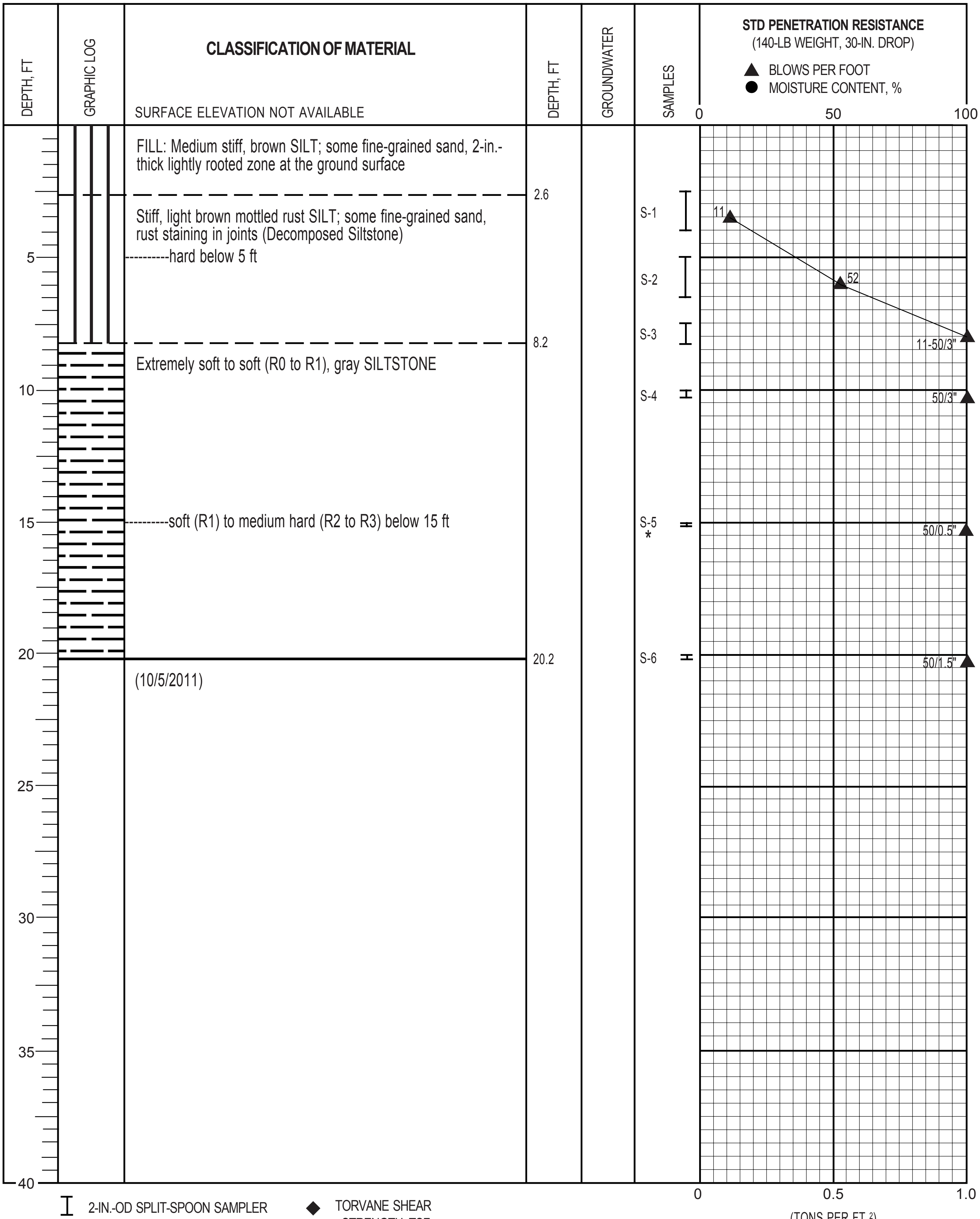
BORING B-2

OCT. 2011

JOB. NO. 5264

FIG. 2A



CLASSIFICATION OF MATERIAL

SURFACE ELEVATION NOT AVAILABLE

FILL: Medium stiff, brown SILT; some fine-grained sand, 2-in.-thick lightly rooted zone at the ground surface

2.6

Stiff, light brown mottled rust SILT; some fine-grained sand, rust staining in joints (Decomposed Siltstone)

----------hard below 5 ft

8.2

Extremely soft to soft (R0 to R1), gray SILTSTONE

----------soft (R1) to medium hard (R2 to R3) below 15 ft

20.2

(10/5/2011)

I 2-IN.-OD SPLIT-SPOON SAMPLER

Ⅱ 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

▌ NX CORE RUN

|—SLOTTED PVC PIPE

▼ Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

☐ PERCENT PASSING NO. 200 SIEVE (WASHED)

* NO RECOVERY

Liquid Limit

Moisture Content

Plastic Limit

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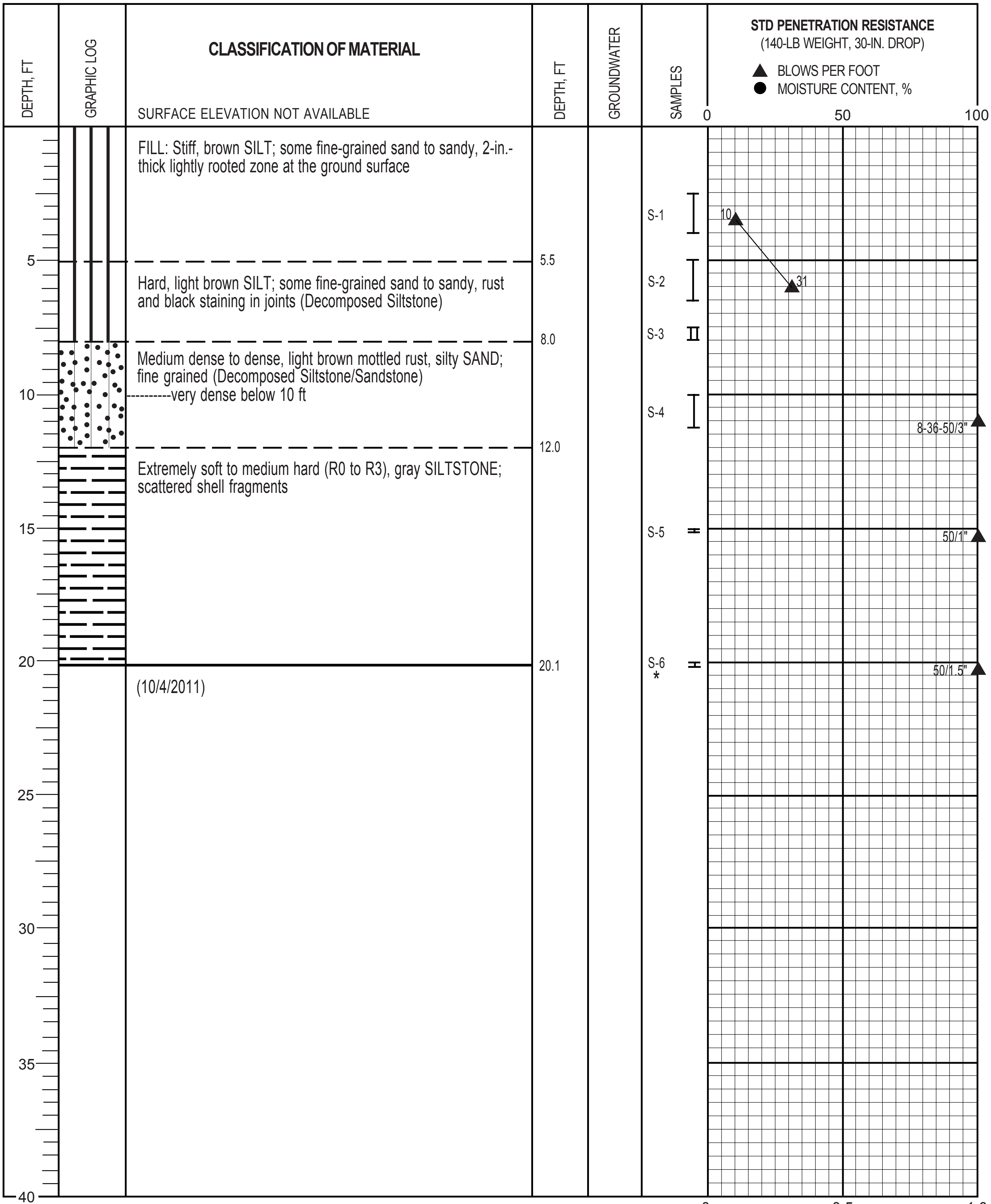
BORING B-3

OCT. 2011

JOB. NO. 5264

FIG. 3A



CLASSIFICATION OF MATERIAL

SURFACE ELEVATION NOT AVAILABLE

FILL: Stiff, brown SILT; some fine-grained sand to sandy, 2-in.-thick lightly rooted zone at the ground surface

5.5

Hard, light brown SILT; some fine-grained sand to sandy, rust and black staining in joints (Decomposed Siltstone)

8.0

Medium dense to dense, light brown mottled rust, silty SAND; fine grained (Decomposed Siltstone/Sandstone)
---------very dense below 10 ft

12.0

Extremely soft to medium hard (R0 to R3), gray SILTSTONE; scattered shell fragments

20.1

(10/4/2011)

I	2-IN.-OD SPLIT-SPOON SAMPLER
II	3-IN.-OD THIN-WALLED SAMPLER
G	GRAB SAMPLE OF DRILL CUTTINGS
▌	NX CORE RUN
⊢	SLOTTED PVC PIPE
▼	Water Level (date)
◆	TORVANE SHEAR STRENGTH, TSF
☐	PERCENT PASSING NO. 200 SIEVE (WASHED)
*	NO RECOVERY

Liquid Limit
Moisture Content
Plastic Limit

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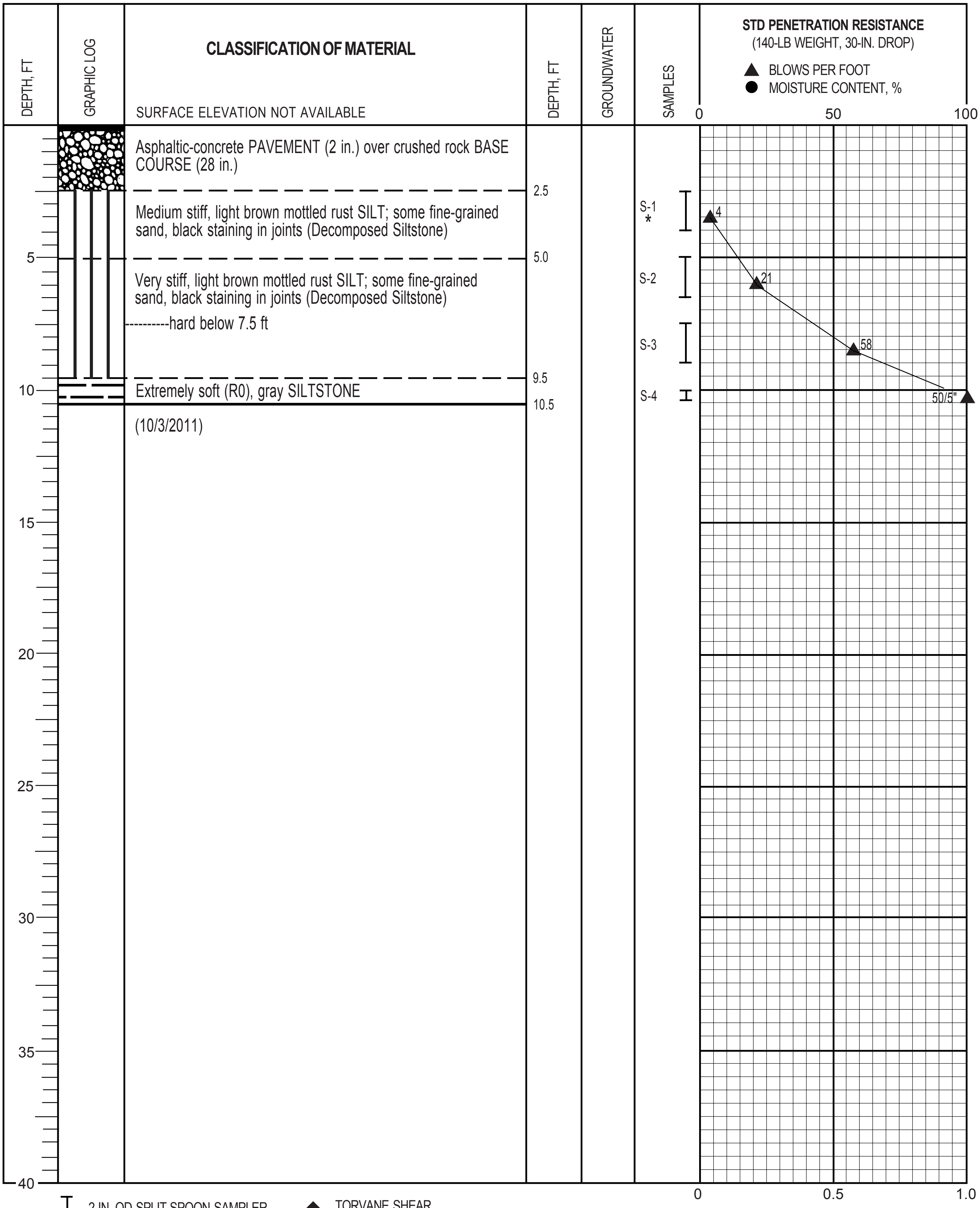
BORING B-4

OCT. 2011

JOB. NO. 5264

FIG. 4A



	Asphaltic-concrete PAVEMENT (2 in.) over crushed rock BASE COURSE (28 in.)
2.5	Medium stiff, light brown mottled rust SILT; some fine-grained sand, black staining in joints (Decomposed Siltstone)
5.0	Very stiff, light brown mottled rust SILT; some fine-grained sand, black staining in joints (Decomposed Siltstone) ----------hard below 7.5 ft
9.5	Extremely soft (R0), gray SILTSTONE
10.5	(10/3/2011)

I 2-IN.-OD SPLIT-SPOON SAMPLER

II 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

▌ NX CORE RUN

├ SLOTTED PVC PIPE

▼ Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

☐ PERCENT PASSING NO. 200 SIEVE (WASHED)

* NO RECOVERY

Liquid Limit

Moisture Content

Plastic Limit

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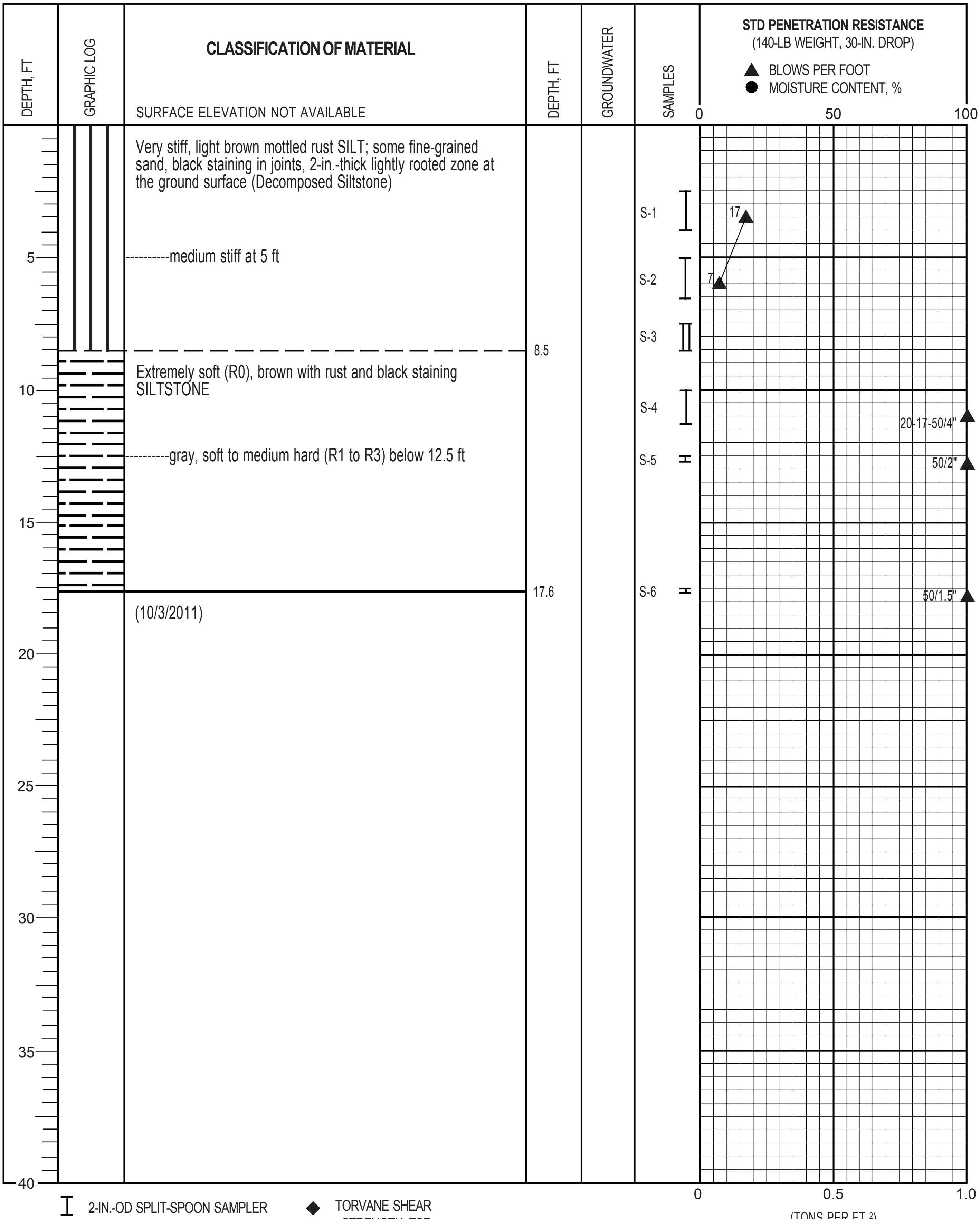
BORING B-5

OCT. 2011

JOB. NO. 5264

FIG. 5A



CLASSIFICATION OF MATERIAL

SURFACE ELEVATION NOT AVAILABLE

Very stiff, light brown mottled rust SILT; some fine-grained sand, black staining in joints, 2-in.-thick lightly rooted zone at the ground surface (Decomposed Siltstone)

----------medium stiff at 5 ft

Extremely soft (R0), brown with rust and black staining SILTSTONE

---------gray, soft to medium hard (R1 to R3) below 12.5 ft

(10/3/2011)

- I 2-IN.-OD SPLIT-SPOON SAMPLER
- II 3-IN.-OD THIN-WALLED SAMPLER
- G GRAB SAMPLE OF DRILL CUTTINGS
- ▌ NX CORE RUN
- |—SLOTTED PVC PIPE
- ▼ Water Level (date)
- ◆ TORVANE SHEAR STRENGTH, TSF
- ☐ PERCENT PASSING NO. 200 SIEVE (WASHED)
- * NO RECOVERY
- Liquid Limit / Moisture Content / Plastic Limit

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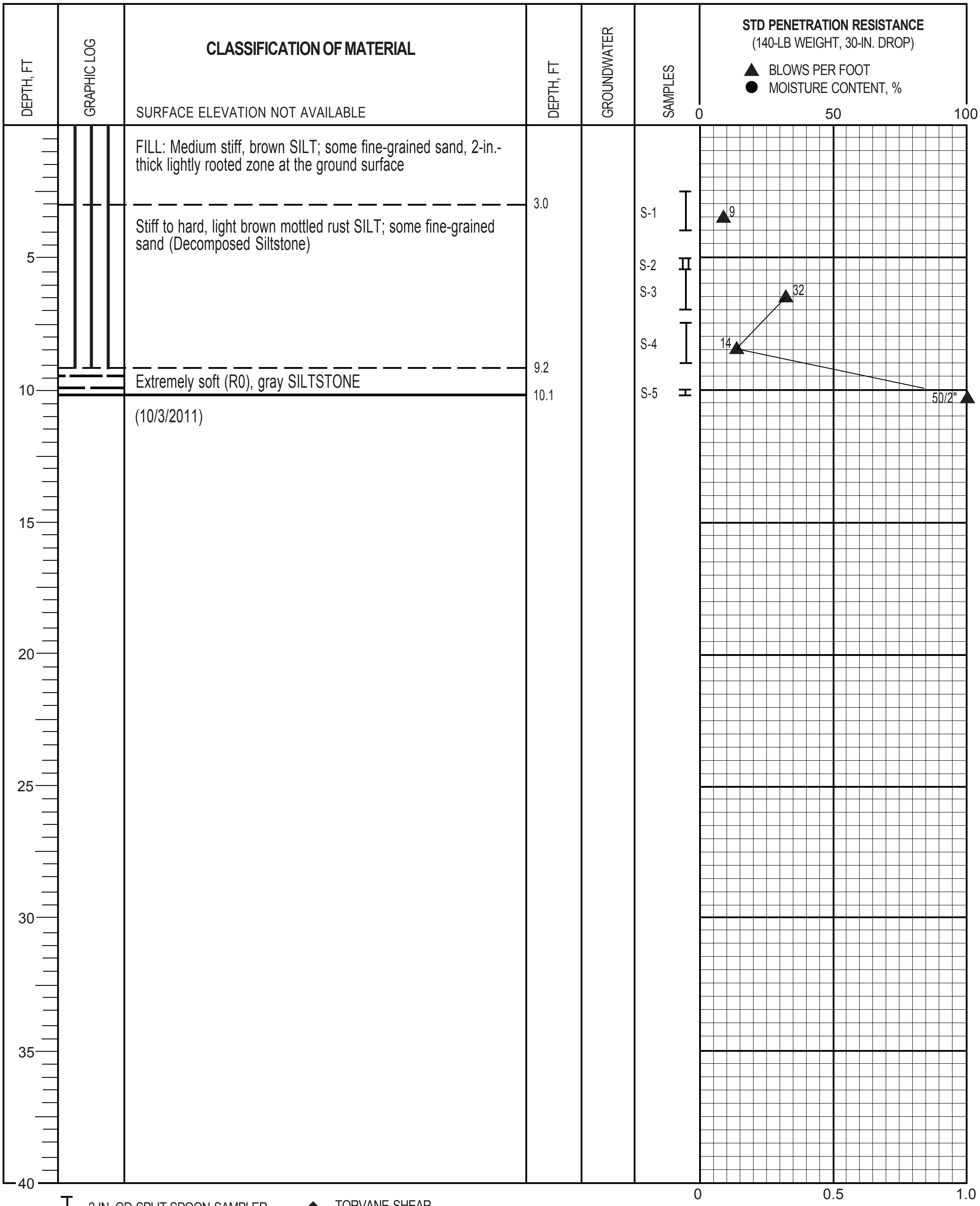
BORING B-6

OCT. 2011 JOB. NO. 5264 FIG. 6A



FILL: Medium stiff, brown SILT; some fine-grained sand, 2-in.-thick lightly rooted zone at the ground surface

Stiff to hard, light brown mottled rust SILT; some fine-grained sand (Decomposed Siltstone)

Extremely soft (R0), gray SILTSTONE

(10/3/2011)

I 2-IN.-OD SPLIT-SPOON SAMPLER

II 3-IN.-OD THIN-WALLED SAMPLER

G GRAB SAMPLE OF DRILL CUTTINGS

▌ NX CORE RUN

|—SLOTTED PVC PIPE

▼ Water Level (date)

◆ TORVANE SHEAR STRENGTH, TSF

☐ PERCENT PASSING NO. 200 SIEVE (WASHED)

* NO RECOVERY

Liquid Limit
Moisture Content
Plastic Limit

GRI

BORING B-7

OCT. 2011 JOB. NO. 5264 FIG. 7A