Final Site-Wide Soil Remedial Investigation Kaiser Trentwood Facility Spokane Valley, Washington

Volume II
Appendices

Prepared for
Kaiser Aluminum
Washington, LLC

May 2012
2644-114

HARTCROWSER

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INPUT PARAMETERS AND DERIVATION OF SATURATED AND UNSATURATED SOIL SCREENING LEVELS

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APPENDIX A
EXPLORATION LOGS

Table A-1 - Surface Soil Sample Data – Transformer Yard

Sample Number	Depth in Feet	Description
TY-SS-01	0.4 to 0.8	(Soft), moist, brown, clayey SILT to silty CLAY (Import FILL) under 0.4 foot of (1-inch minus, washed) GRAVEL.
TY-SS-02	0.3 to 0.8	(Soft), moist, brown, clayey SILT to silty CLAY (Import FILL) under removed 0.3 foot of (1-inch minus, washed) GRAVEL.
TY-SS-03	0.4 to 0.9	(Soft), moist, brown, silty CLAY to clayey SILT (Import FILL) over 0.1 foot of (Medium Dense), moist, dark brown, silty, sandy GRAVEL under 0.4 foot of (1-inch minus, washed) GRAVEL.
TY-SS-04	0.4 to 0.9	(Soft), moist, brown, silty CLAY to clayey SILT (Import FILL) under 0.4 foot of (1-inch minus, washed) GRAVEL.
TY-SS-05	0.4 to 0.9	(Soft), moist, brown, silty CLAY to clayey SILT (Import FILL) over 0.4 foot of (1-inch minus, washed) GRAVEL.
TY-SS-06	0.4 to 1.0	(Soft), moist, brown, silty CLAY to clayey SILT (Import FILL) over 0.4 foot of (1-inch minus, washed) GRAVEL.
TY-SS-07	0.4 to 0.8	(Soft), moist, brown, clayey SILT to silty CLAY (Import FILL) over 0.4 foot (1-inch minus, washed) GRAVEL.
TY-SS-08	0.4 to 1.0	(Soft), moist, brown, clayey SILT to silty CLAY (Import FILL) over 0.4 foot of (1-inch minus, washed) GRAVEL with scattered 2- to 4-inch gravel.
TY-SS-09	0.5 to 1.0	(Soft), moist, brown, silty CLAY to clayey SILT (Import FILL) over 0.5 foot of (1-inch minus, washed) GRAVEL.

Note: Each surface soil sample exploration terminated at the upper surface of (medium dense), moist, dark brown, silty, sandy GRAVEL. Soil sample TY-SS-03 contained 0.1 foot of the silty, sandy GRAVEL in the composite sample. Remaining soil samples did not include the silty, sandy GRAVEL in the composite sample.

Table A-2 - Surface Soil Sample Data - West Drainage Ravine

Sample Number	Depth in Feet	PID	Description
WDR-SS-1	0 to 1	0.5	Three- to four-inch-diameter dead tree limbs over one inch of compact Forest Duff over damp, brown, slightly silty, sandy GRAVEL with cobbles and scattered organic material and woody debris.
WDR-SS-2	0 to 1	5.6	Two inches of compact Forest Duff over dry to damp, brown, slightly silty, sandy GRAVEL with cobbles and scattered organic material.
WDR-SS-3	0 to 1	0.4	One inch of compact Forest Duff over dry, brown, slightly silty sandy GRAVEL with cobbles and organic material.
WDR-SS-4	0 to 1	0.2	One inch of compact Forest Duff over dry to damp, brown, slightly silty, sandy GRAVEL with cobbles and scattered organic material and woody debris.
WDR-SS-5	0 to 1	0.4	Three-fourths inch of compact Forest Duff over damp, dark brown, slightly silty, sandy GRAVEL with cobbles and scattered organic material and woody debris.
WDR-SS-6	0 to 1	0.2	One inch of compact Forest Duff over dry, light brown, slightly sandy GRAVEL with trace of silt and scattered organic material and woody debris.
WDR-SS-7	0 to 1	0.4	One and a half inches of compact Forest Duff over dry, brown, slightly silty, sandy GRAVEL with cobbles and scattered organic material and woody debris.
WDR-SS-8	0 to 1	0.2	One-half inch of compact Forest Duff over dry, light brown, silty, sandy GRAVEL with cobbles and minor organic material (rootlets).
WDR-SS-9	0 to 1	0.6	One inch of compact Forest Duff over damp, dark brown, silty, sandy GRAVEL with cobbles and abundant organic material (rootlets).
WDR-SS-10	0 to 1	0.3	One inch of compact Forest Duff over dry to damp, dark brown, slightly silty, sandy GRAVEL with cobbles and abundant organic material (rootlets). Organic-rich to 5-inch depth.
WDR-SS-11	0 to 1	0.4	One inch Moss over one-half inch of compact Forest Duff over dry to damp, dark brown, silty, sandy GRAVEL with cobbles and abundant organic material (rootlets). Organic-rich to 6-inch depth.
WDR-SS-12	0 to 1	0.5	One inch of Moss over one inch of compact Forest Duff over dry, brown, slightly silty, sandy GRAVEL with cobbles and abundant organic material (rootlets). Organic-rich to 8-inch depth.

Table A-2 - Surface Soil Sample Data - West Drainage Ravine

Sample Number	Depth in Feet	PID	Description
WDR-SS-13	0 to 1	0.2	Two inches of Moss over compact Forest Duff over damp, brown, slightly silty, sandy, very cobbly GRAVEL with abundant organic material. Organic-rich to 8-inch depth.
WDR-SS-14	0 to 1	0.1	One and one-half inches of Moss and Forest Duff over damp, brown, slightly silty, sandy, very cobbly GRAVEL with abundant wood fragments, stems, roots, and organic material. Organic-rich to 8-inch depth.
WDR-SS-15	0 to 1	0.3	One inch of Moss over damp, brown, slightly silty, slightly sandy GRAVEL with moderate organic material. Organic-rich to 8-inch depth.
WDR-SS-16	0 to 1	0.3	Trash (plywood and miscellaneous debris) over minimal Forest Duff over damp, brown, slightly silty to silty, sandy GRAVEL with scattered organic material. Organic-rich to 8-inch depth.
WDR-SS-17	0 to 1	0.8	One inch of Moss over damp, brown, slightly silty, sandy GRAVEL with trace of organic material.
WDR-SS-18	0 to 1	0.5	One-half inch of Moss over dry to damp, gray-brown, slightly sandy GRAVEL with trace of organic material.

Table A-3 - Surface Soil Sample Data - South Drainage Ravine

Sample Number	Depth in Feet	PID	Description
SDR-SS-1	0 to 1	4.7	Dry to damp, brown, slightly silty, sandy GRAVEL with cobbles and abundant organic material.
SDR-SS-2	0 to 1	6.7	Dry, brown, slightly silty, slightly sandy to sandy GRAVEL with cobbles and abundant rootlets and scattered wood fragments.
SDR-SS-3	0 to 1	9.7	Dry to damp, brown, sandy to very sandy GRAVEL with cobbles and abundant rootlets and organic material and trace of wood fragments.
SDR-SS-4	0 to 1	2.3	Dry to damp, brown, slightly silty, sandy to very sandy GRAVEL with cobbles and abundant rootlets and organic material.
SDR-SS-5	0 to 1	2.4	One inch of moist, dark brown, fibrous organic material (wood, leaves, and roots) over 2 inches of moist, light brown, medium to coarse sandy GRAVEL with scattered organic material over moist, dark brown, coarse sandy GRAVEL.
SDR-SS-6	0 to 1	3.6	Six inches of moist to wet, dark brown, woody organic material with gravel and scattered sand over moist, brown, slightly sandy to sandy GRAVEL.
SDR-SS-7	0 to 1	2.0	Three inches of moist, brown, slightly sandy GRAVEL with abundant organic material (pine needles and roots) over moist, gray-brown, sandy GRAVEL.
SDR-SS-8	0 to 1	3.1	Six inches of moist, brown, fibrous, woody organic material over moist, brown, sandy GRAVEL.
SDR-SS-9	0 to 1	2.4	One inch of (loose), moist FOREST DUFF and organic material (sticks and pine needles) over moist, medium to coarse very sandy GRAVEL.

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

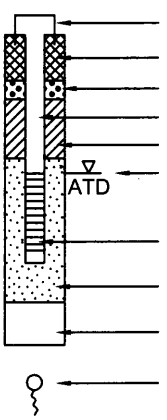
	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

Boring Samples		Test Pit Samples	
⊠	Split Spoon	⊠	Grab (Jar)
⧅	Shelby Tube	⧄	Bag
▥	Cuttings	⧅	Shelby Tube
◫	Core Run		
*	No Sample Recovery		
P	Tube Pushed, Not Driven		

Groundwater Observation Wells



Monument
Surface Seal
Gravel Backfill
Riser Pipe
Bentonite
Groundwater Level on Date or at Time of Drilling (ATD)
Well Screen
Sand Pack
Native Material
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
	Water Content in Percent Liquid Limit Natural Plastic Limit
PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	*In Situ* Density Test

12/05 (HC Standards\SRF\ A-1.dwg)

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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.

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Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

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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
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Minor Constituents

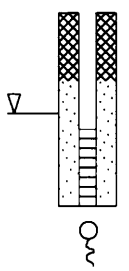
	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Sampling Test Symbols

BORING SAMPLES		TEST PIT SAMPLES	
☒	Split Spoon	☒	Grab (Jar)
▨	Shelby Tube	▨	Bag
▥	Cuttings	▨	Shelby Tube
▮	Core Run		
*	No Sample Recovery		
P	Tube Pushed, Not Driven		

Exploration and Completion Details



Surface Seal

Groundwater Level (ATD) At Time of Drilling

Observation Well Tip or Slotted Section

Groundwater Seepage (Test Pits)

Test Symbols

NS	No Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
TCD	Triaxial Consolidated Drained
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
	Water Content in Percent Liquid Limit Natural Plastic Limit
PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	*In Situ* Density Test

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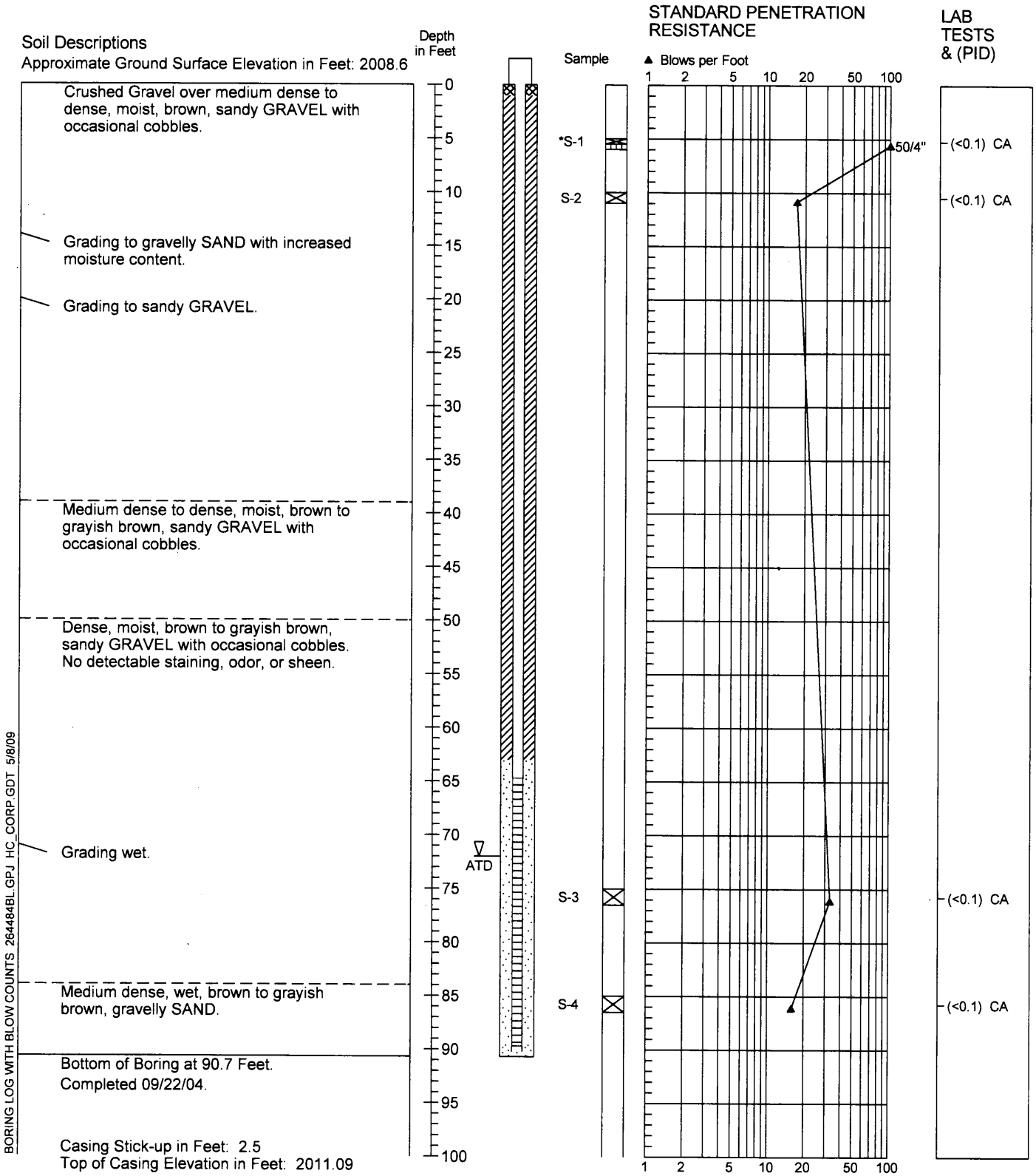
Boring Log & Construction Data for Monitoring Well CM-MW-1S



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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2644-84 **9/04**

Figure A-2

Boring Log & Construction Data for Monitoring Well CM-MW-2S

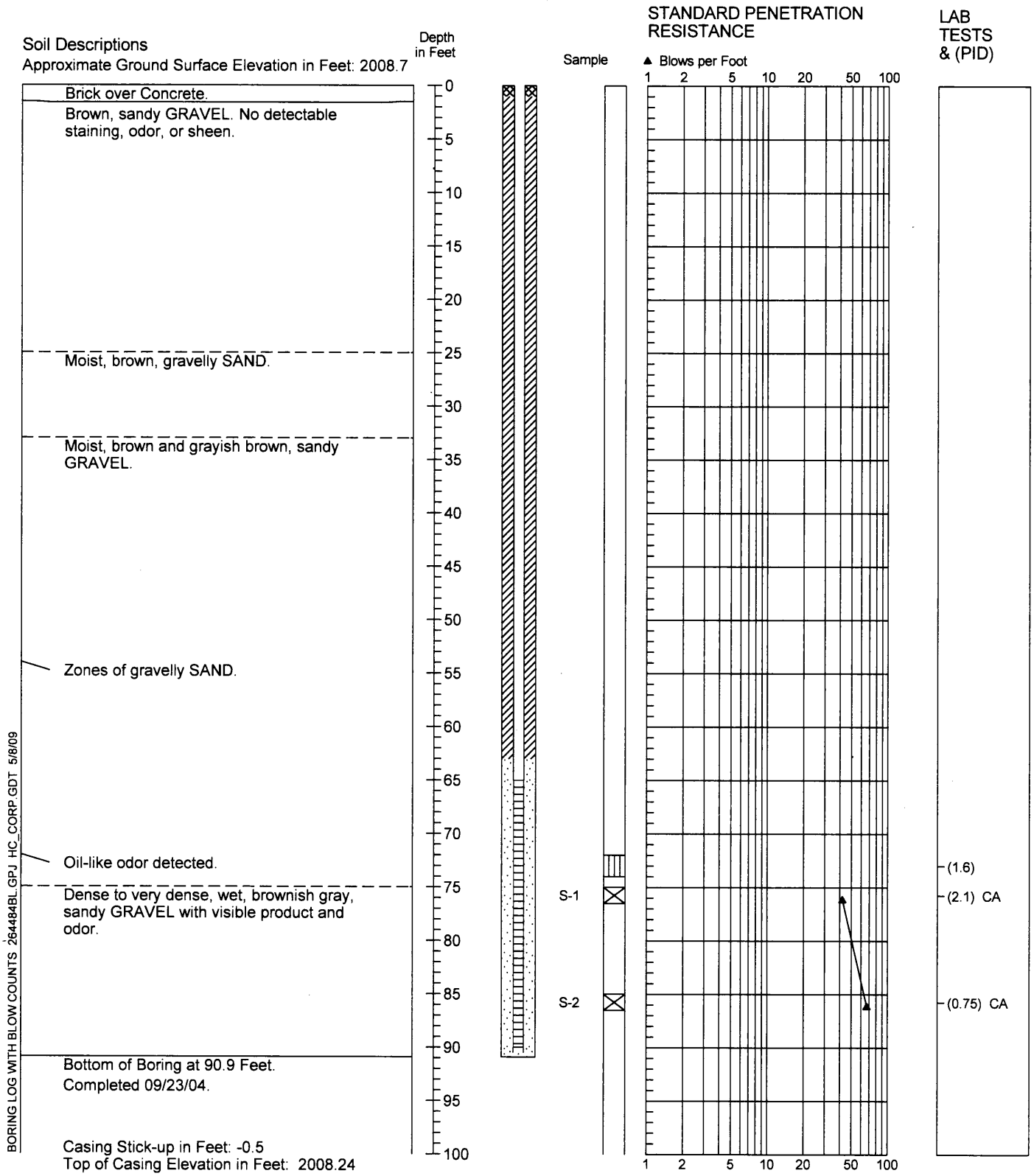

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Figure A-3

Boring Log & Construction Data for Monitoring Well CM-MW-3S

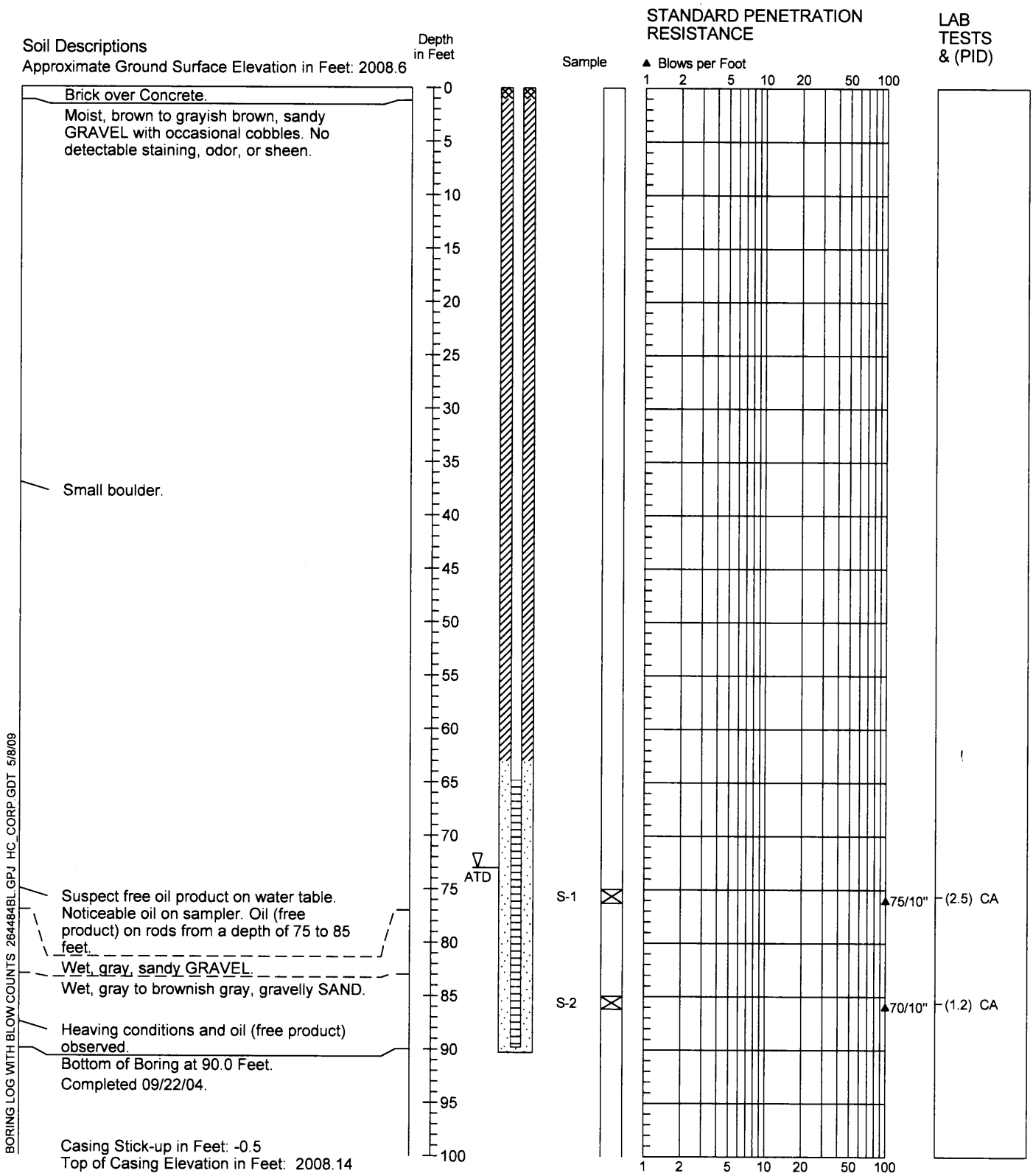

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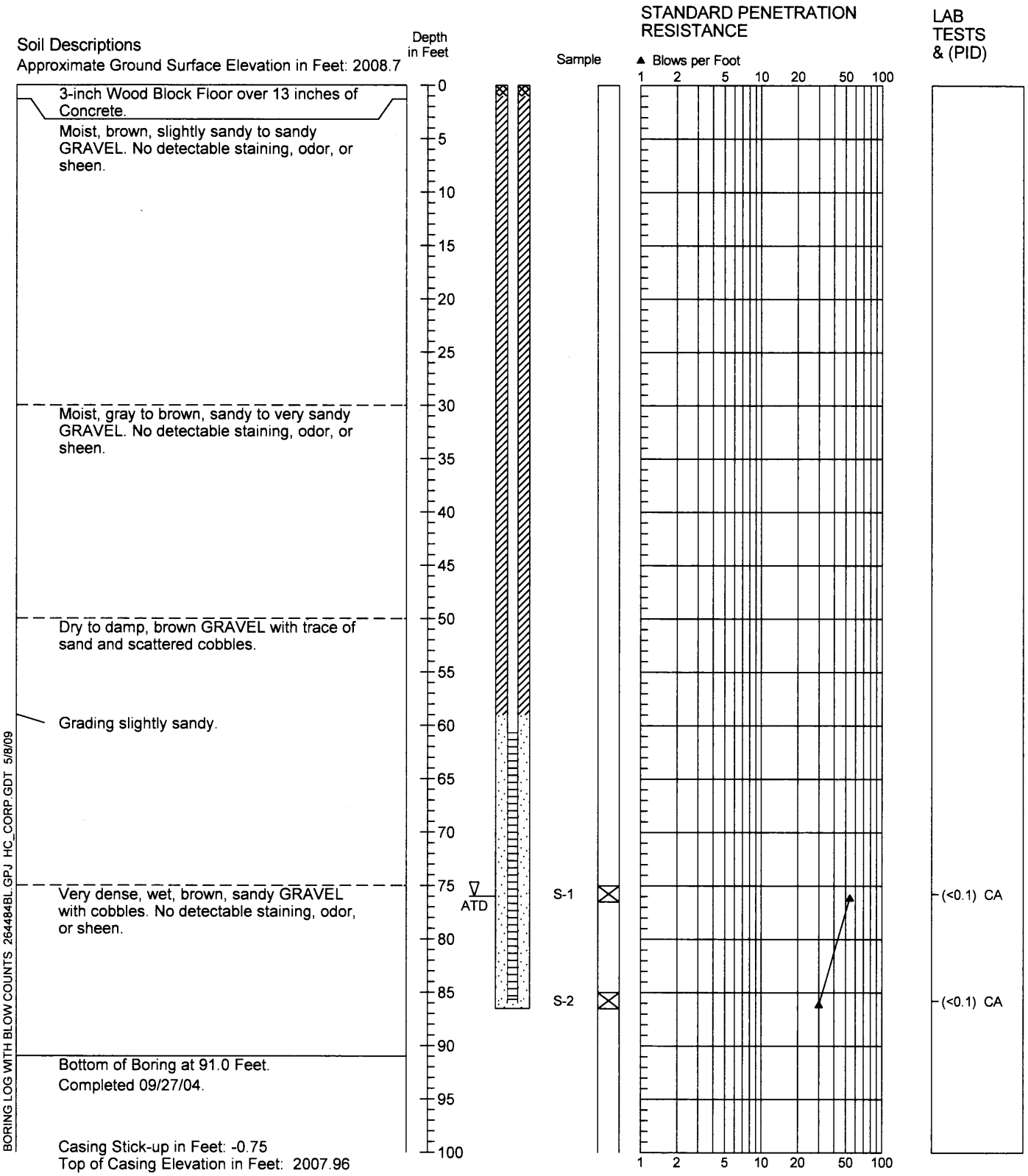
Figure A-4

Boring Log & Construction Data for Monitoring Well CM-MW-4S



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3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Figure A-5

Boring Log & Construction Data for Monitoring Well CM-MW-5S

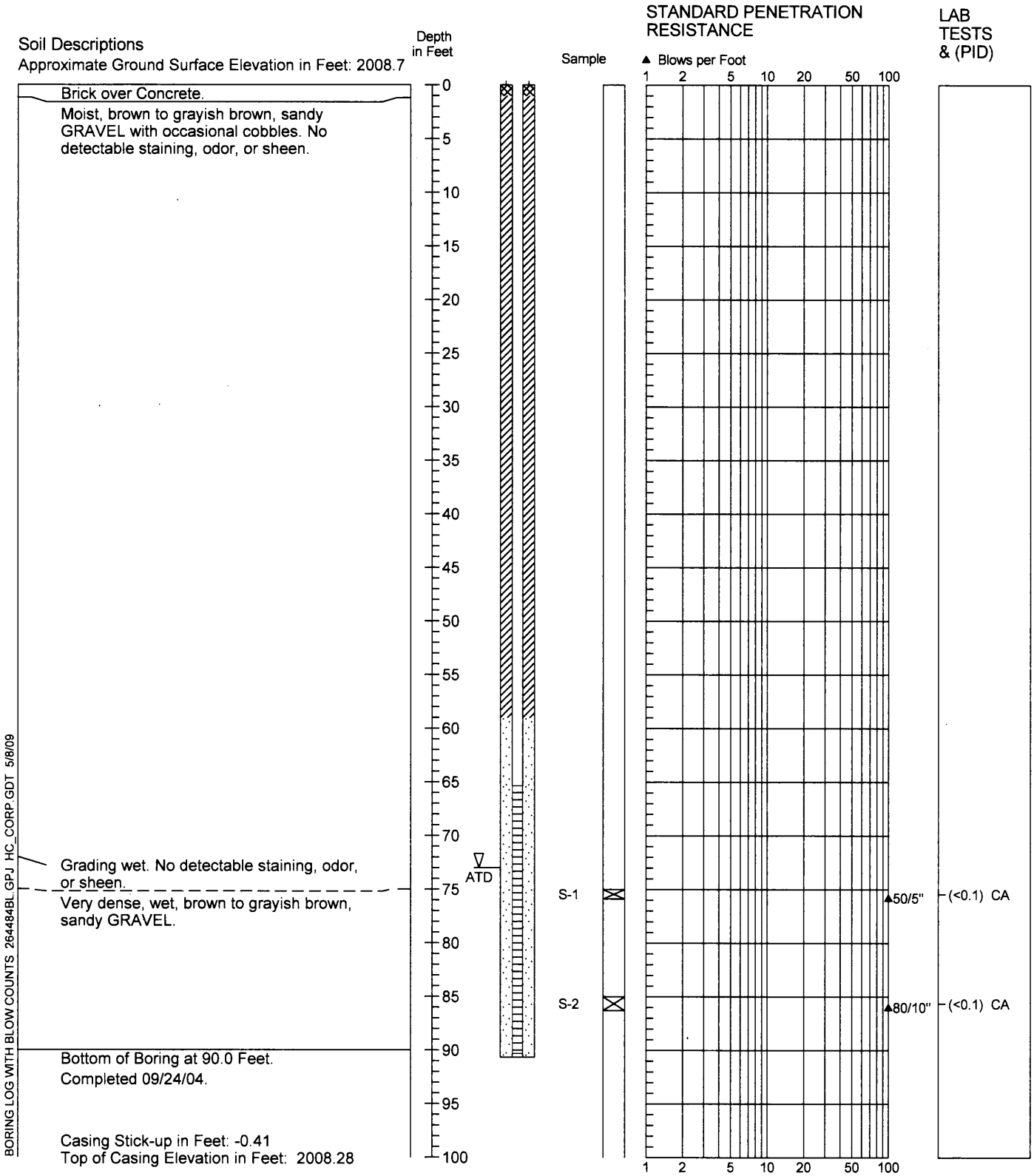

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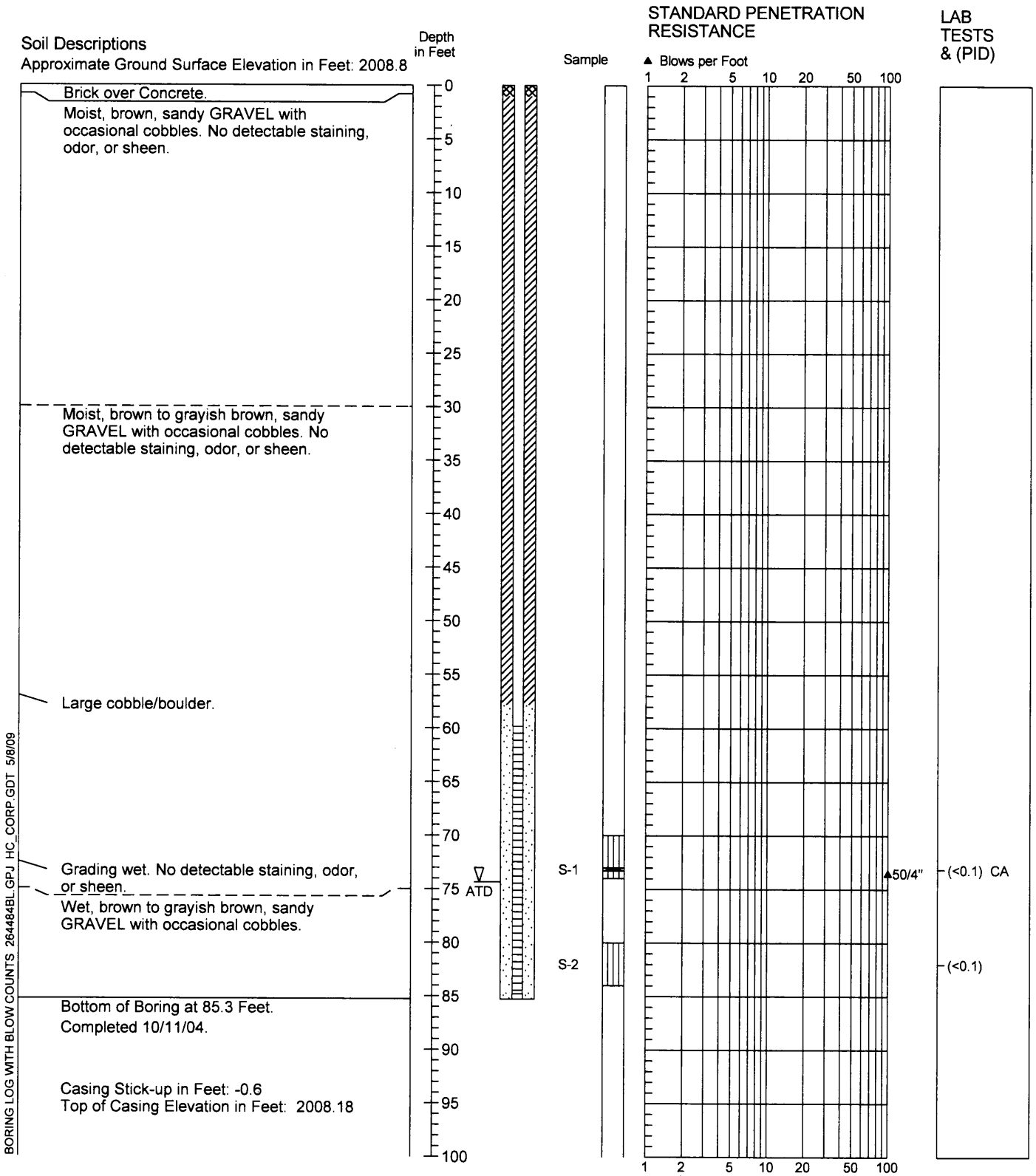
Figure A-6

Boring Log & Construction Data for Monitoring Well CM-MW-6S



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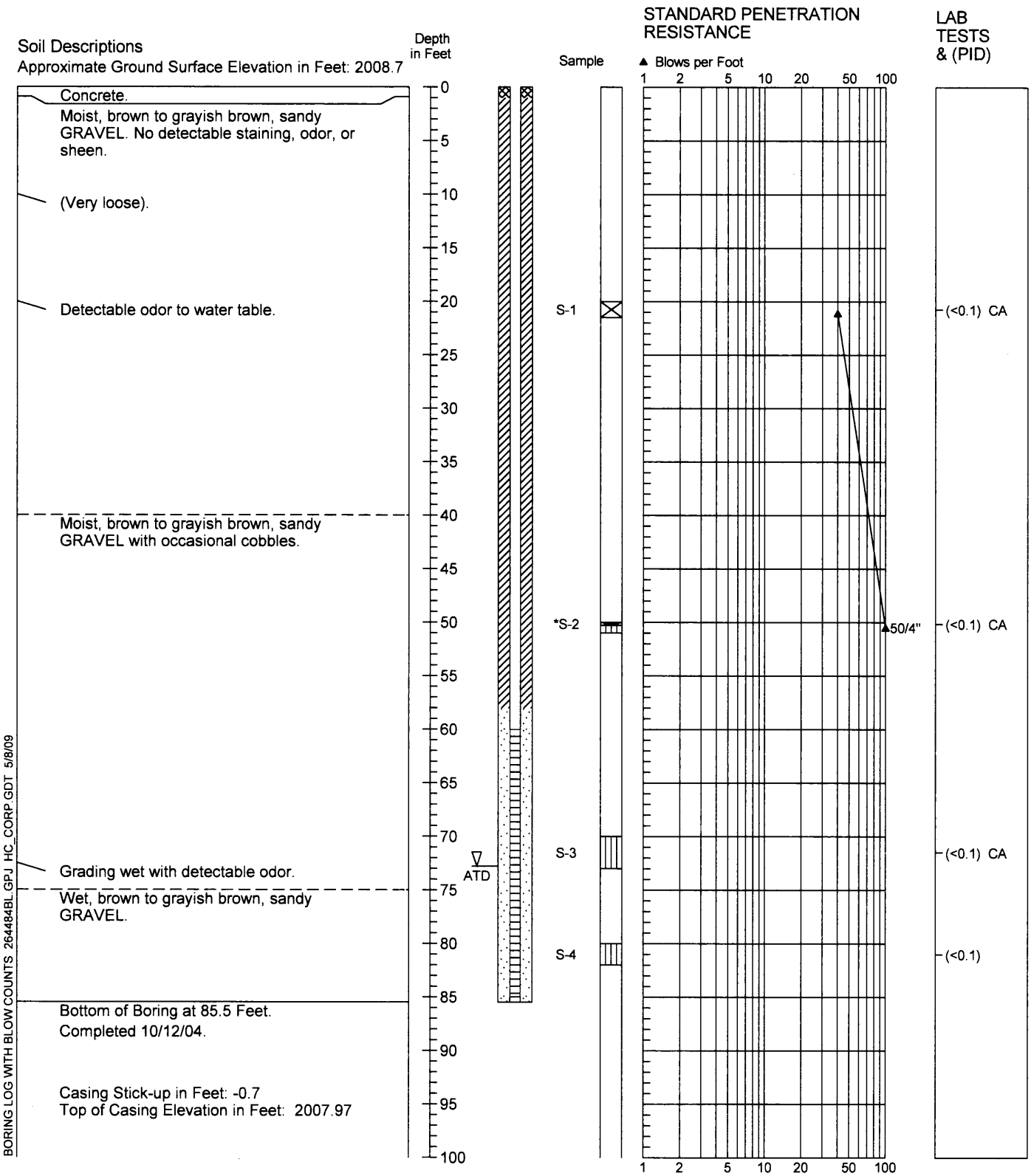
2644-84 **10/04**

Figure A-7

Boring Log & Construction Data for Monitoring Well CM-MW-7S



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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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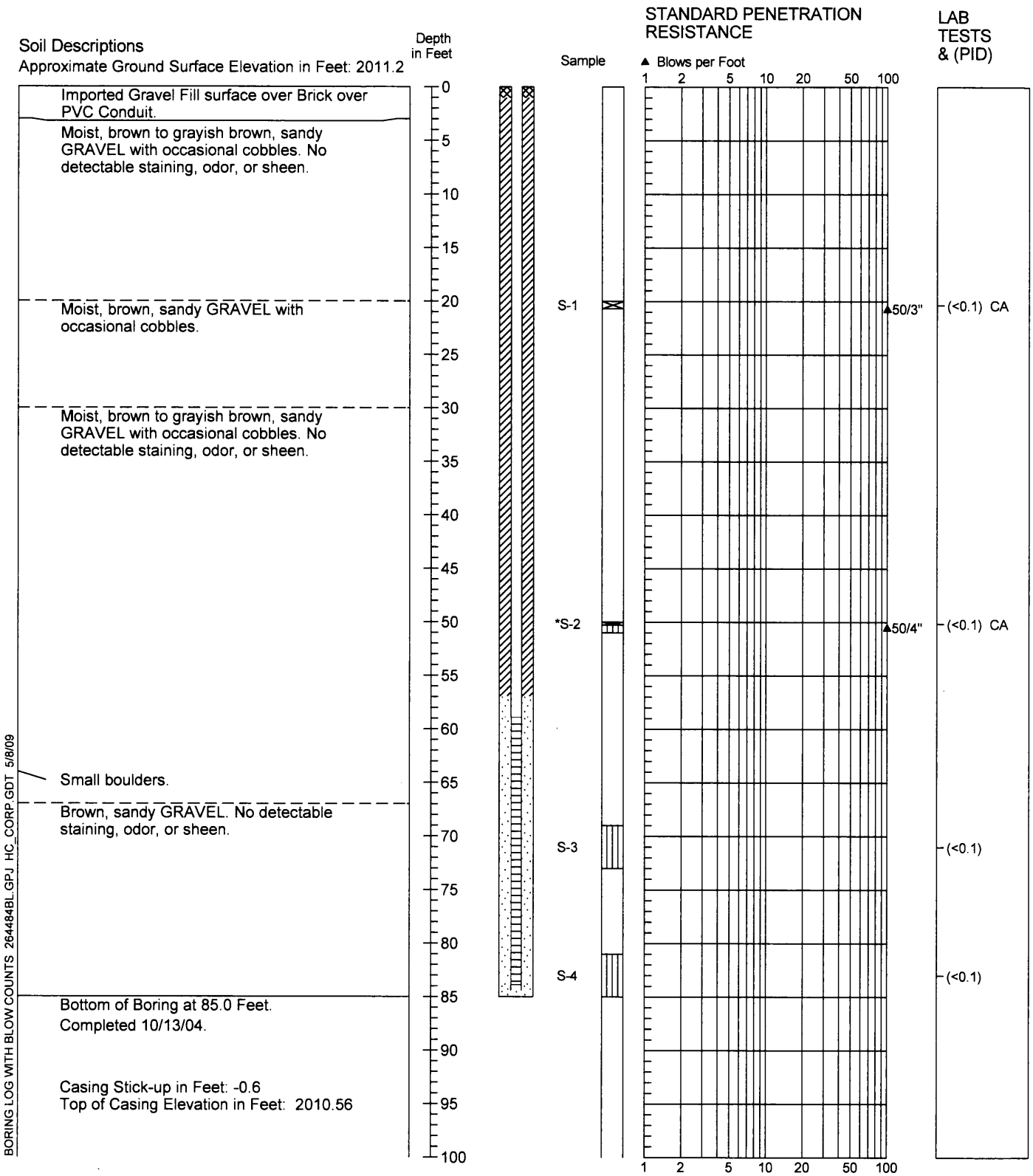
2644-84 **10/04**

Figure A-8

Boring Log & Construction Data for Monitoring Well CM-MW-8S



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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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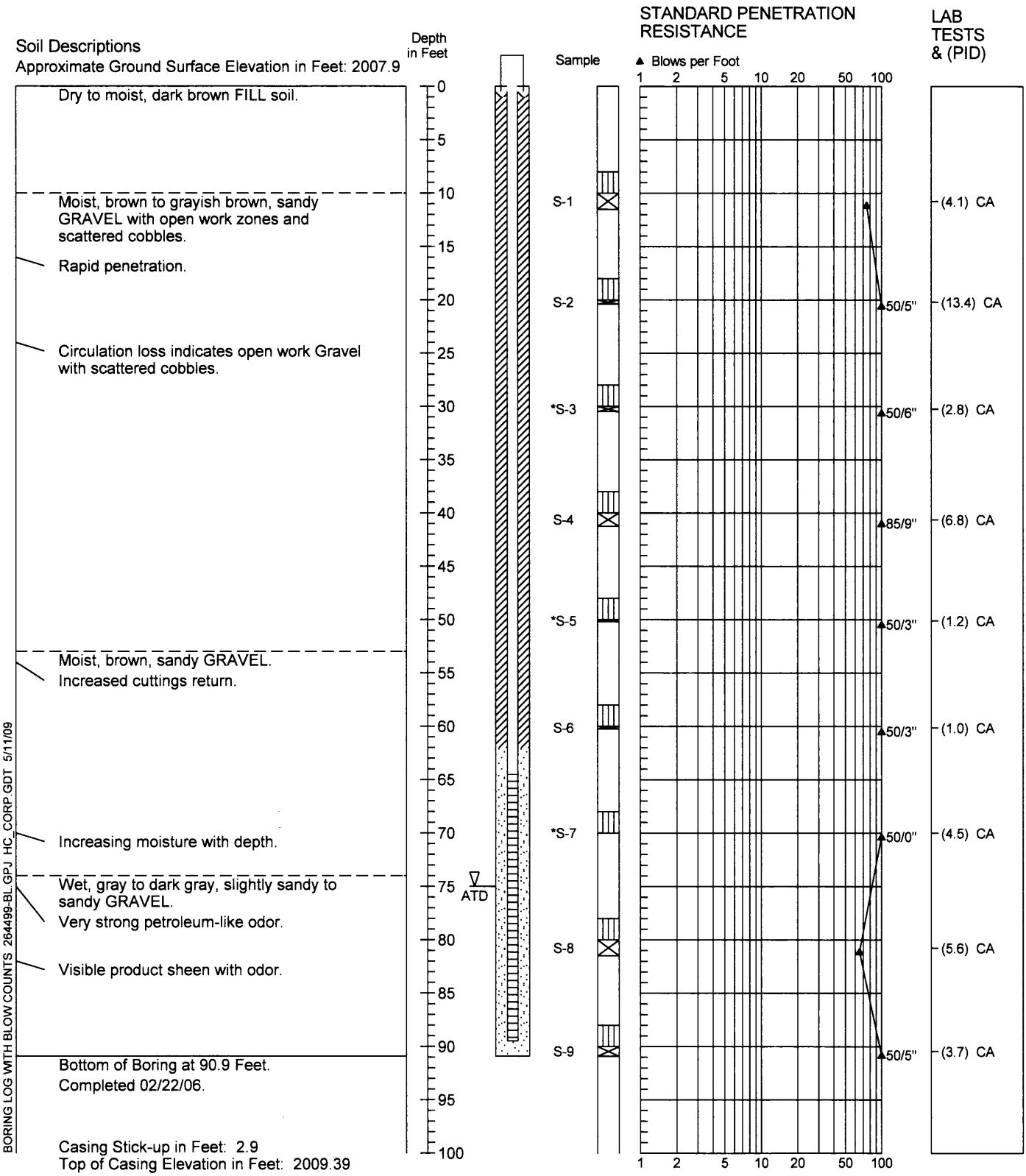
2644-84 **10/04**

Figure A-9

Boring Log/Construction Data for Monitoring Well FO-MW-1S



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3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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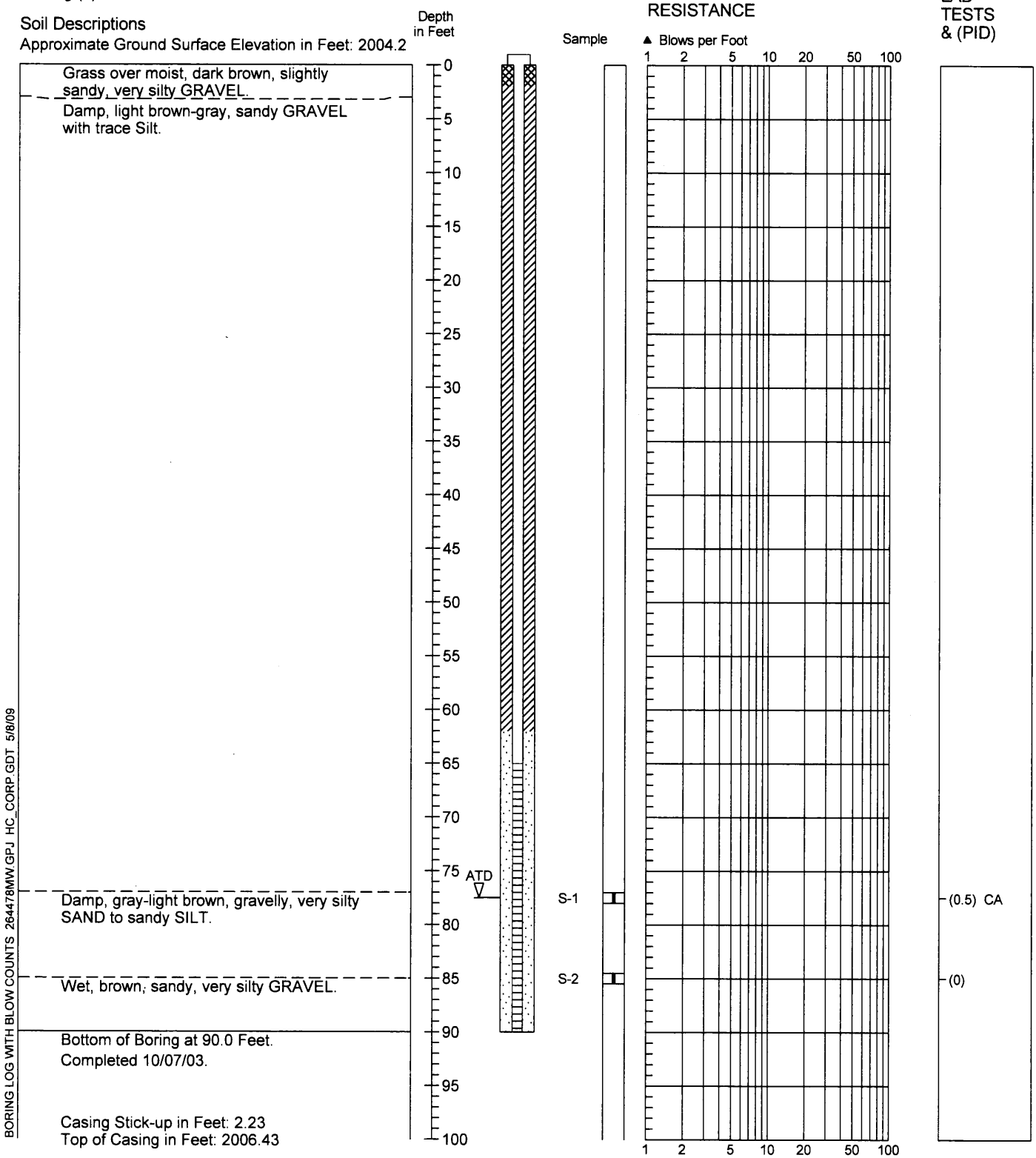
2644-99 *2/06*

Figure A-10

Monitoring Well Log HL-MW-12S

Northing (ft): 11199.4
Easting (ft): 10086.6

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.2



BORING LOG WITH BLOW COUNTS 26447BMW.GPJ HC_CORP.GDT 5/8/09

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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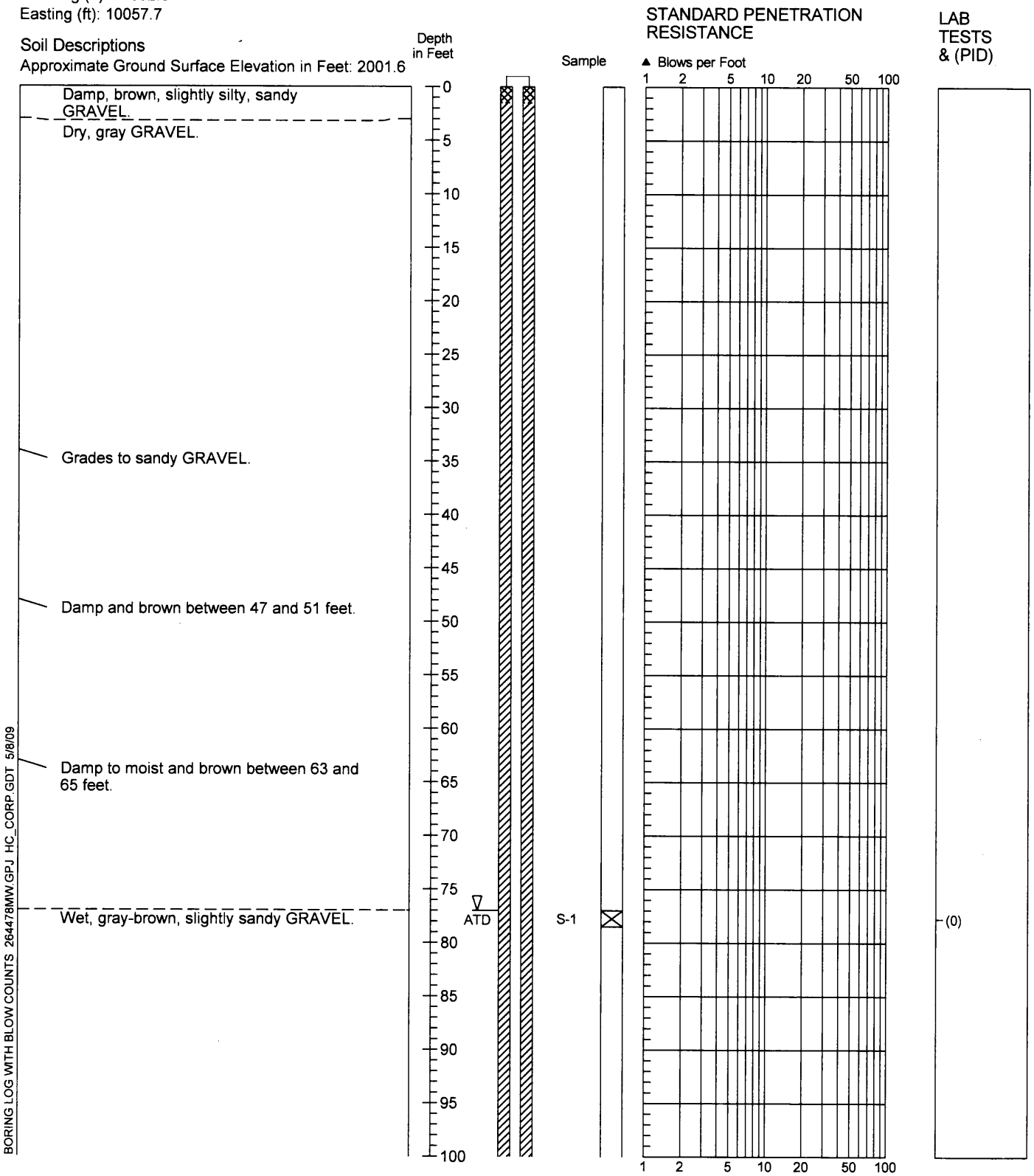
2644-78 *10/03*

Figure A-11

Monitoring Well Log HL-MW-13DD

Northing (ft): 11082.8
Easting (ft): 10057.7



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3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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Monitoring Well Log HL-MW-13DD

Northing (ft): 11082.8
Easting (ft): 10057.7

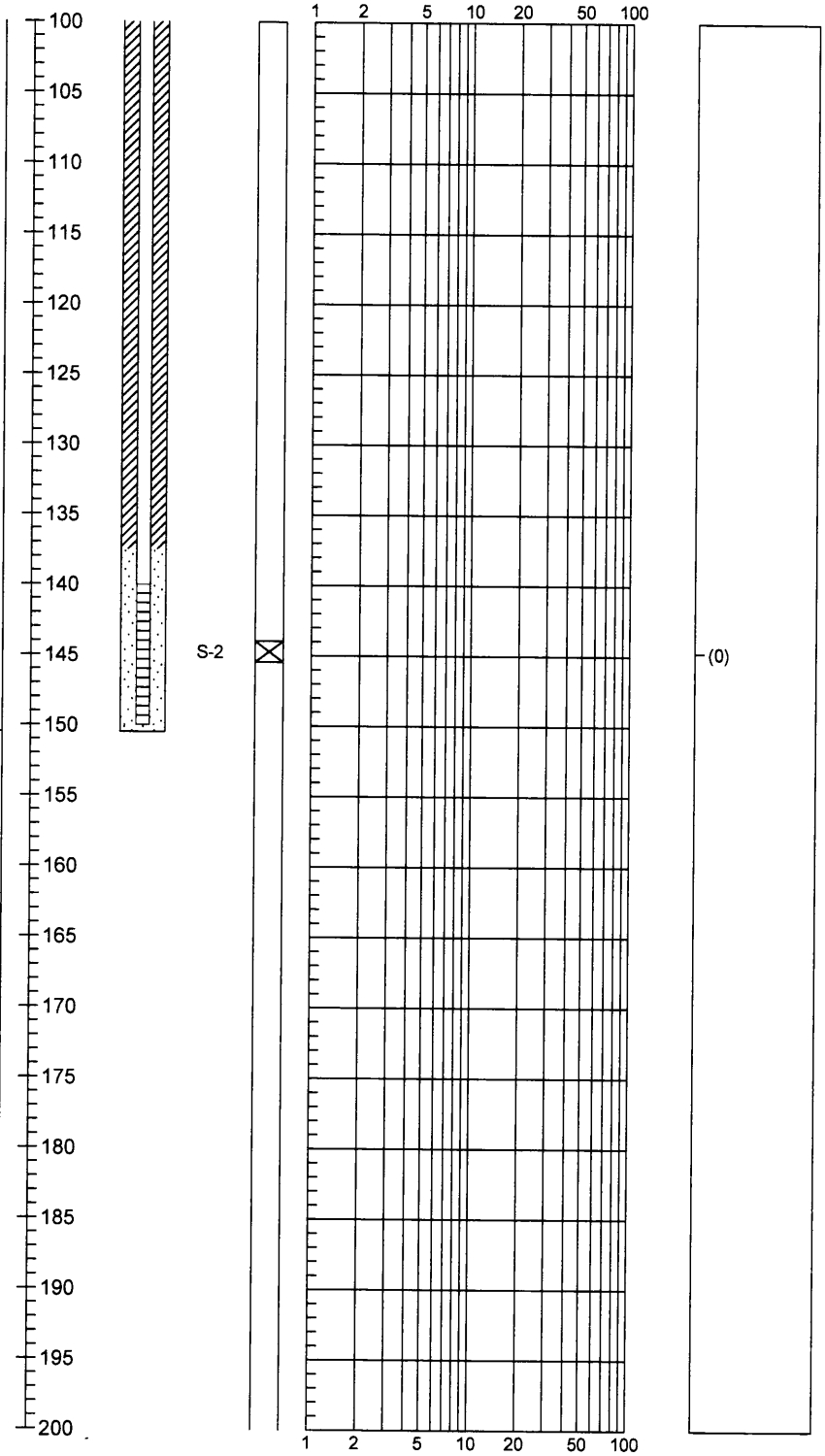
Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2001.6

Wet, gray-brown, slightly sandy GRAVEL.

Grades to brown, non-silty to slightly silty, sandy GRAVEL and gravelly SAND.

Bottom of Boring at 150.5 Feet.
Completed 09/28/03.

Casing Stick-up in Feet: 2.51
Top of Casing in Feet: 2004.11



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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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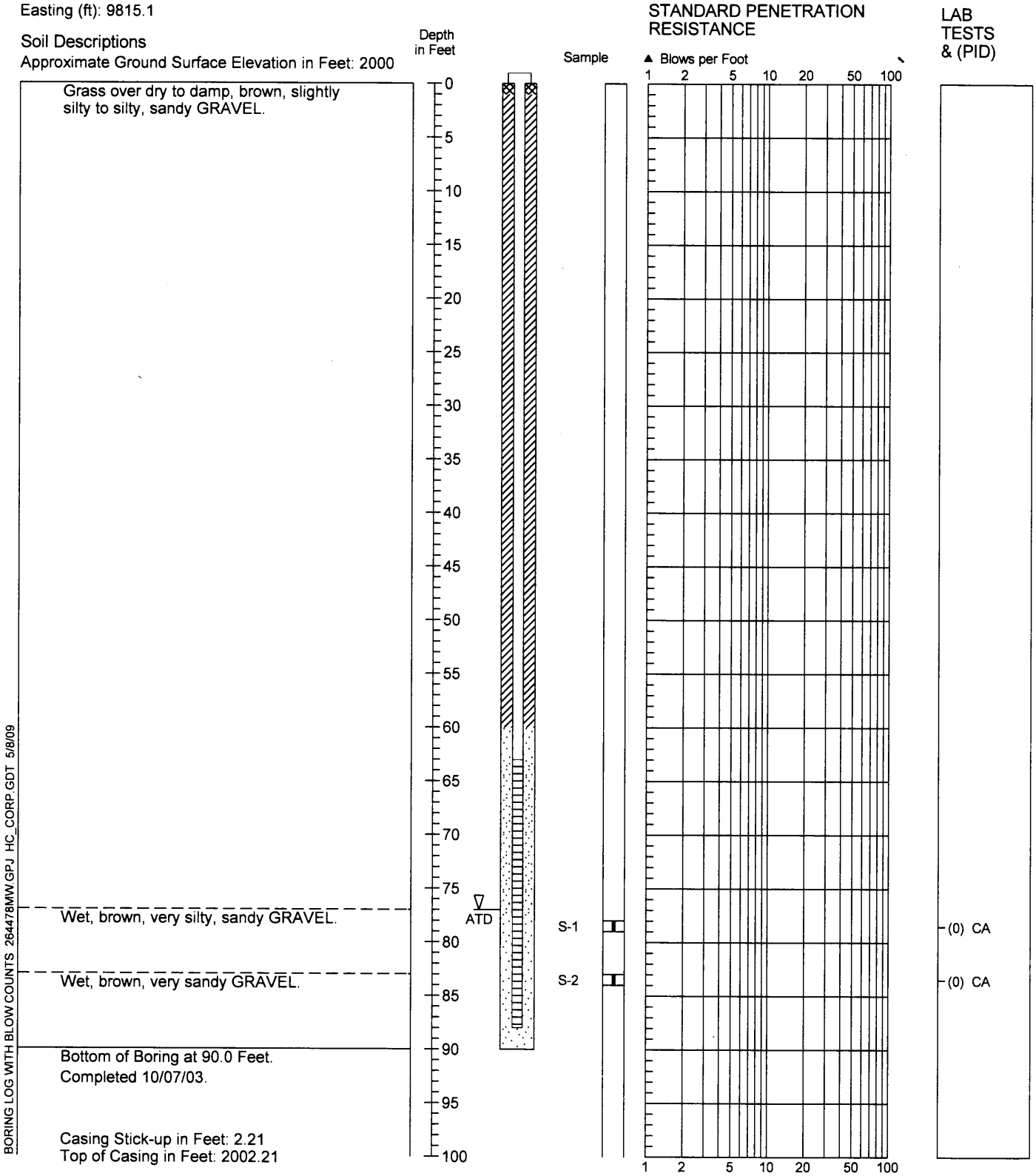
2644-78 *9/03*
Figure A-12 *2/2*

Monitoring Well Log HL-MW-14S

Northing (ft): 10868.4
Easting (ft): 9815.1



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2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
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2644-78 *10/03*

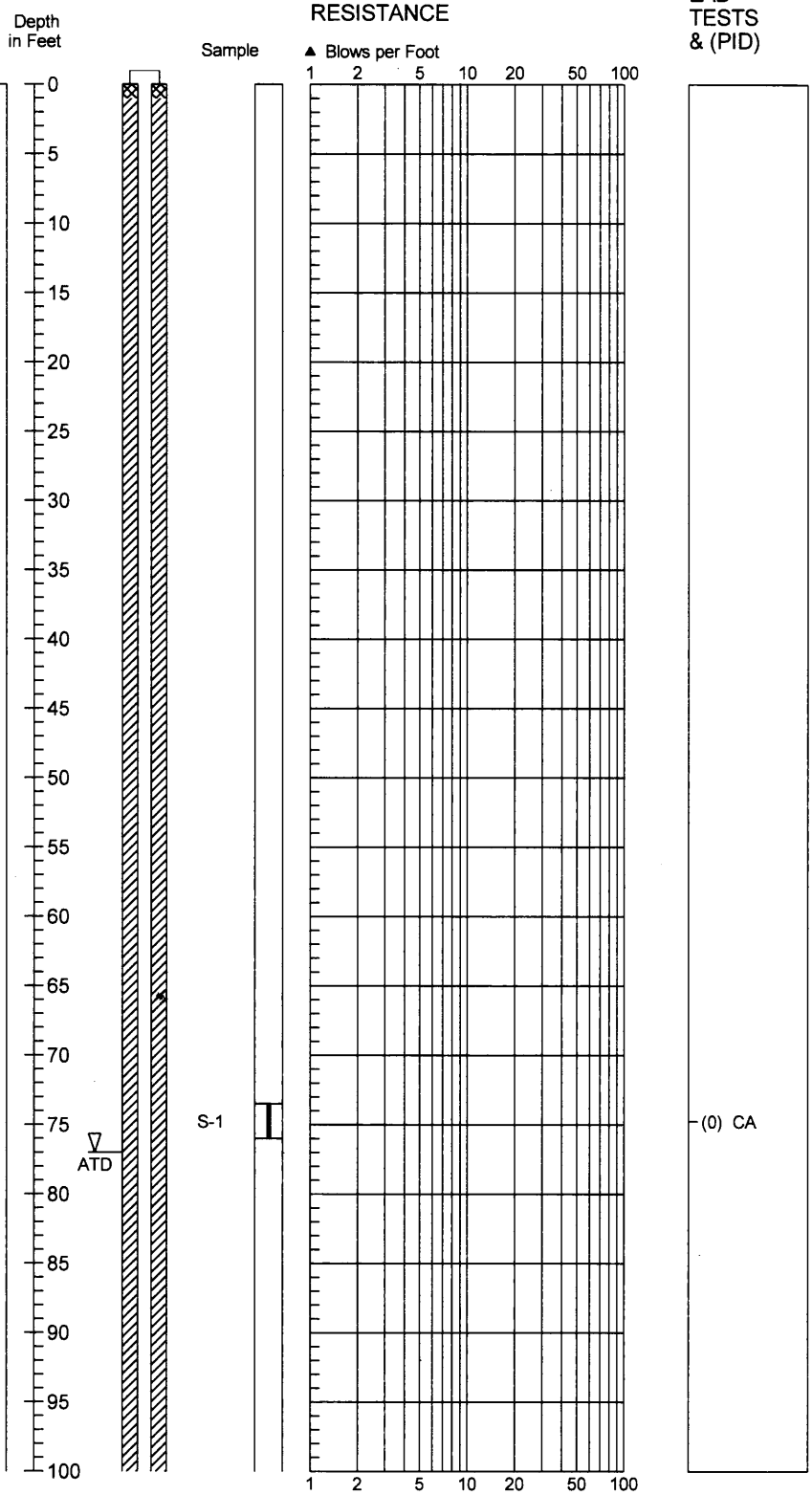
Figure A-13

Monitoring Well Log HL-MW-15DD

Northing (ft): 10990
Easting (ft): 10307.5

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.0

Brown to gray, sandy to very sandy GRAVEL.



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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2644-78 *10/03*
Figure A-14 *1/2*

Monitoring Well Log HL-MW-15DD

Northing (ft): 10990
Easting (ft): 10307.5

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.0

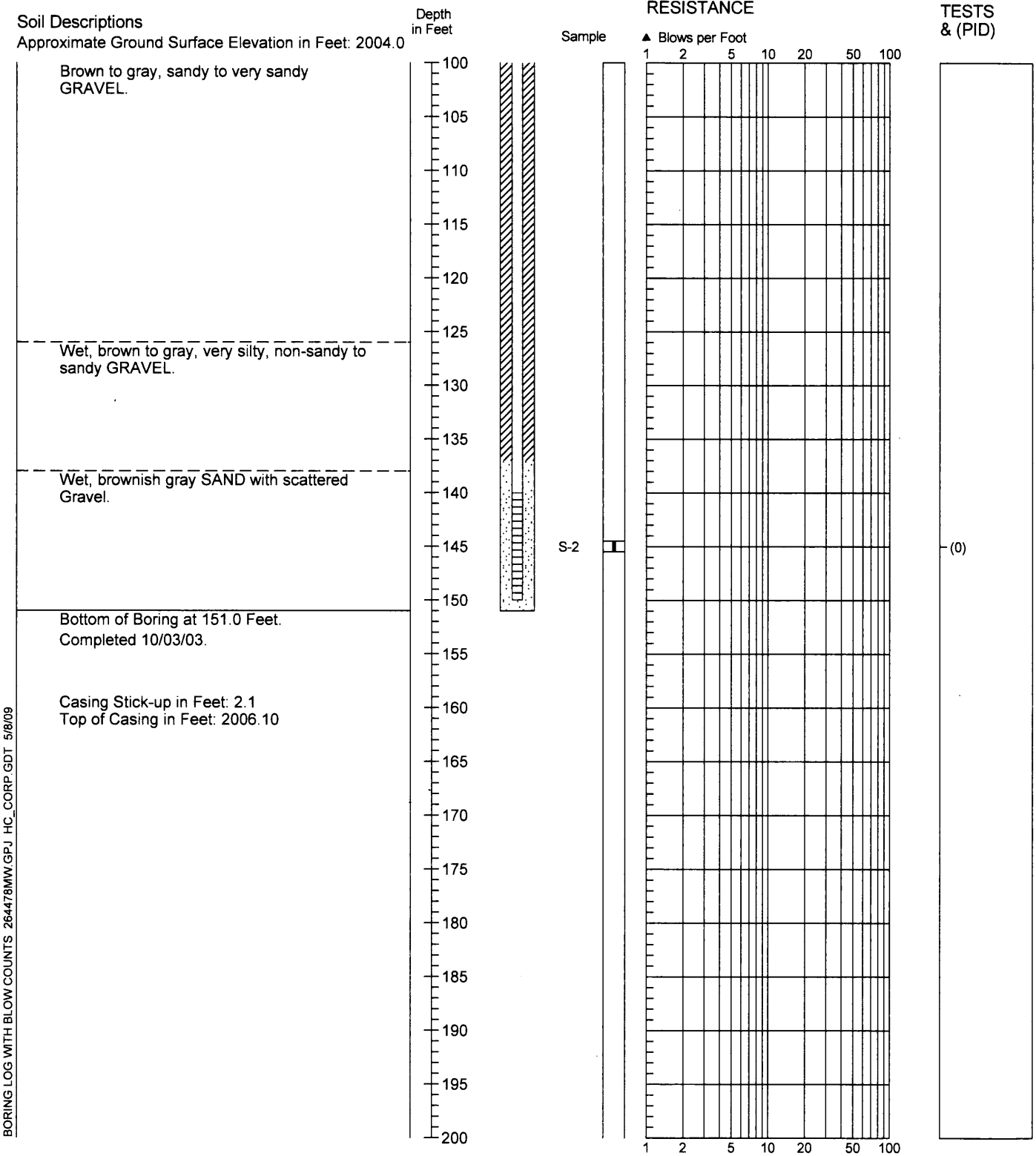
Brown to gray, sandy to very sandy GRAVEL.

Wet, brown to gray, very silty, non-sandy to sandy GRAVEL.

Wet, brownish gray SAND with scattered Gravel.

Bottom of Boring at 151.0 Feet.
Completed 10/03/03.

Casing Stick-up in Feet: 2.1
Top of Casing in Feet: 2006.10



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

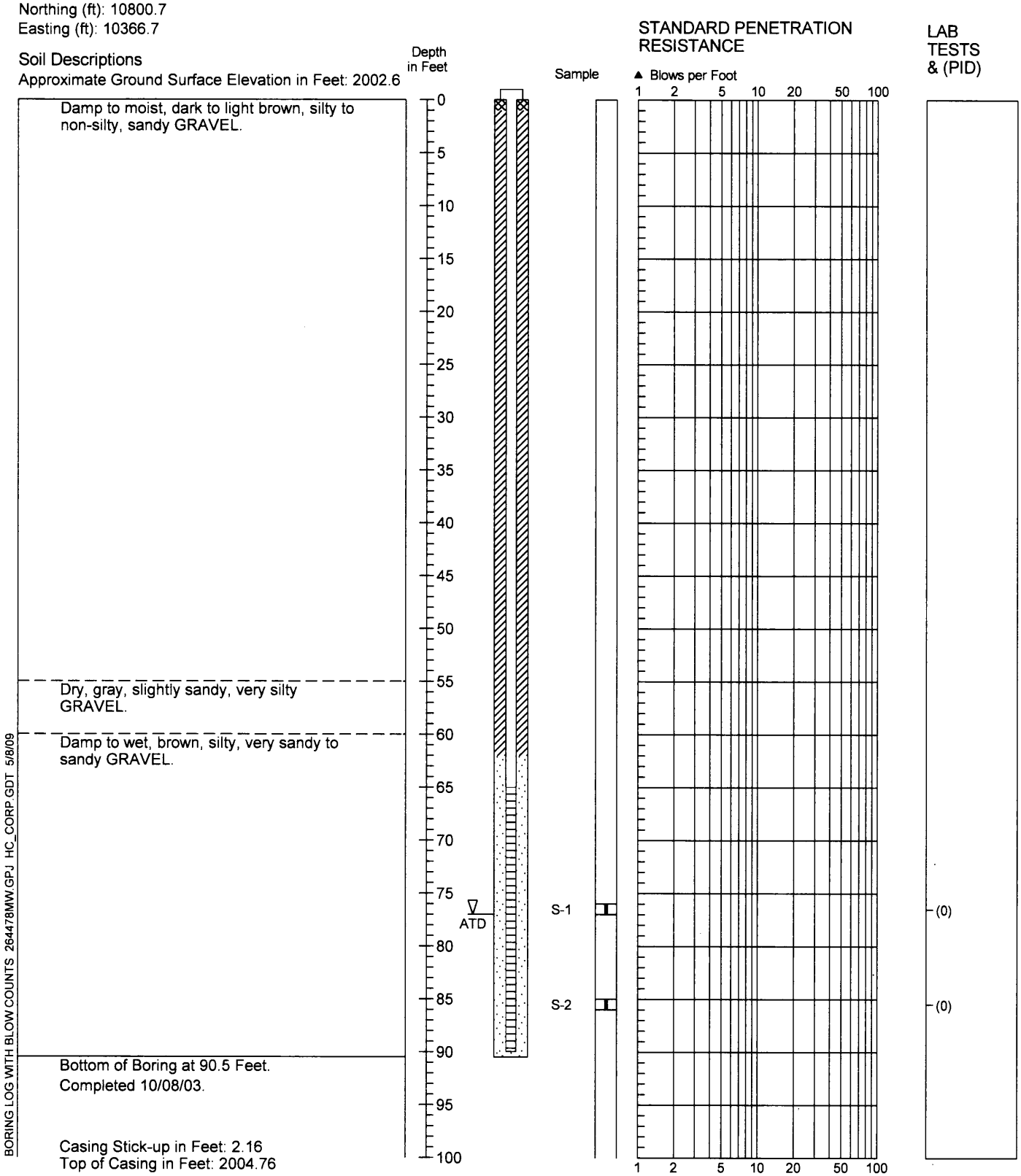
HARTCROWSER

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.

Monitoring Well Log HL-MW-16S

Northing (ft): 10800.7
Easting (ft): 10366.7

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2002.6



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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.

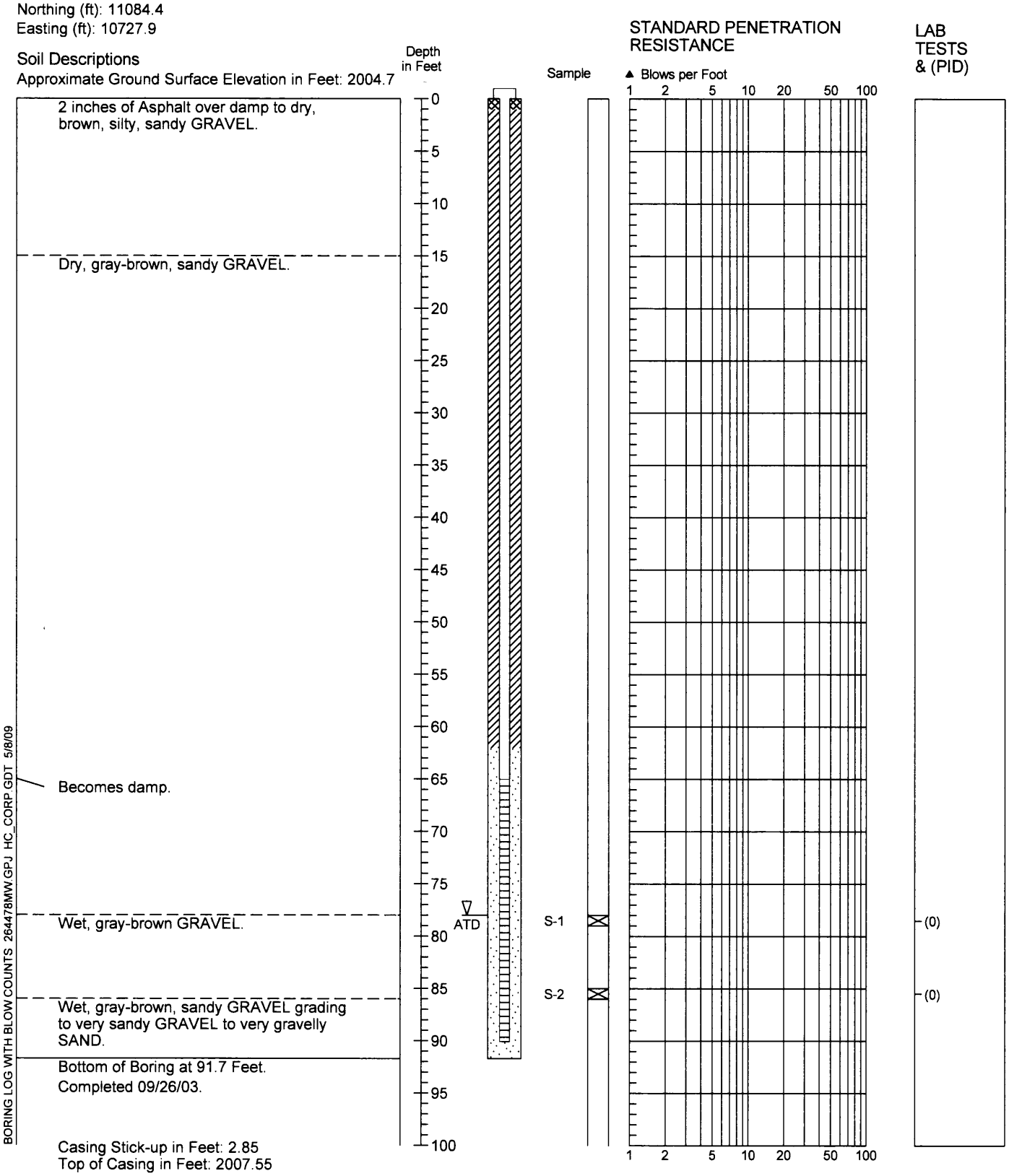
HARTCROWSER

2644-78 *10/03*

Figure A-15

Monitoring Well Log HL-MW-17S

Northing (ft): 11084.4
Easting (ft): 10727.9



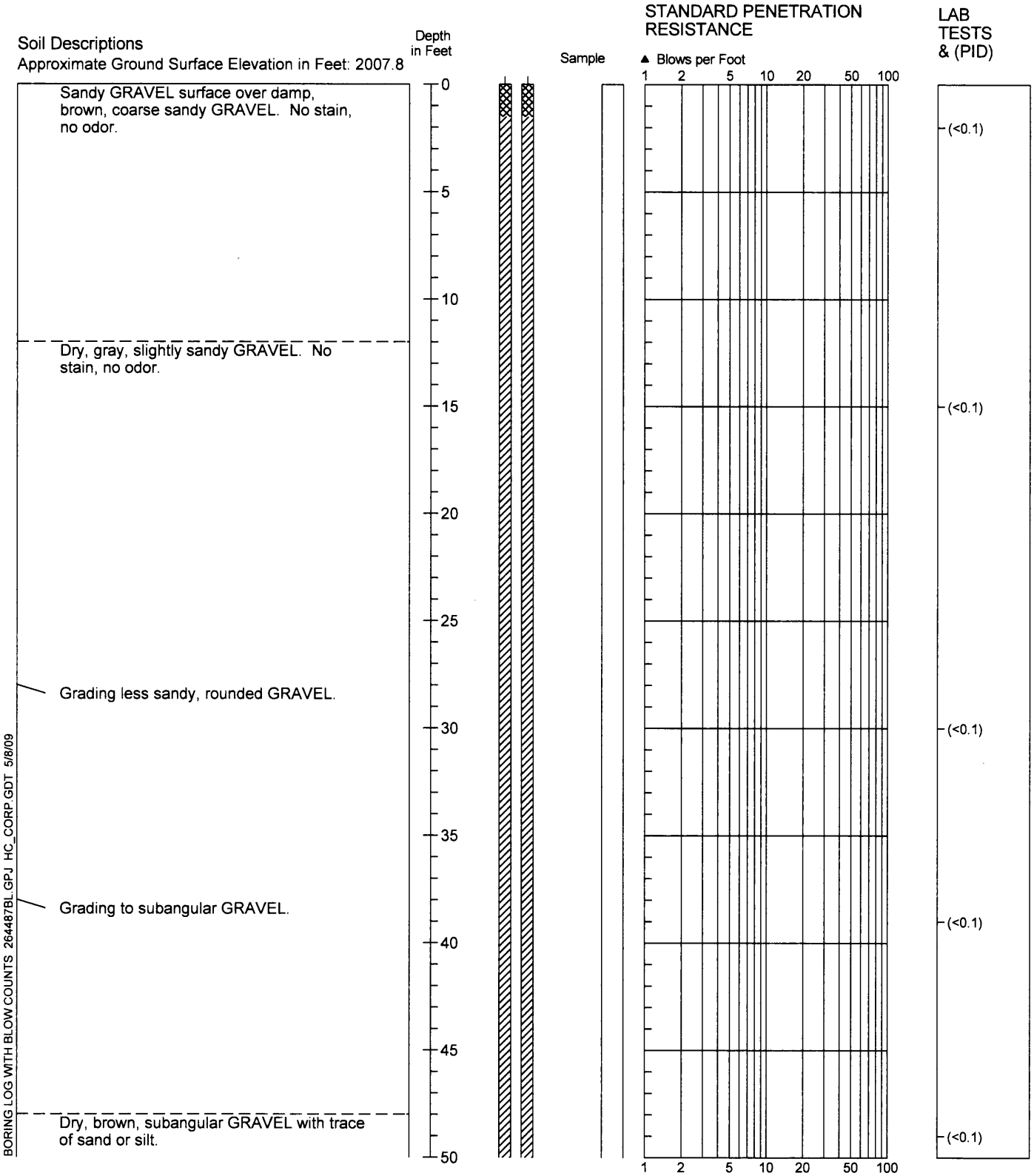
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-78 *9/03*

Figure A-16

Boring Log/Construction Data for Monitoring Well HL-MW-18S



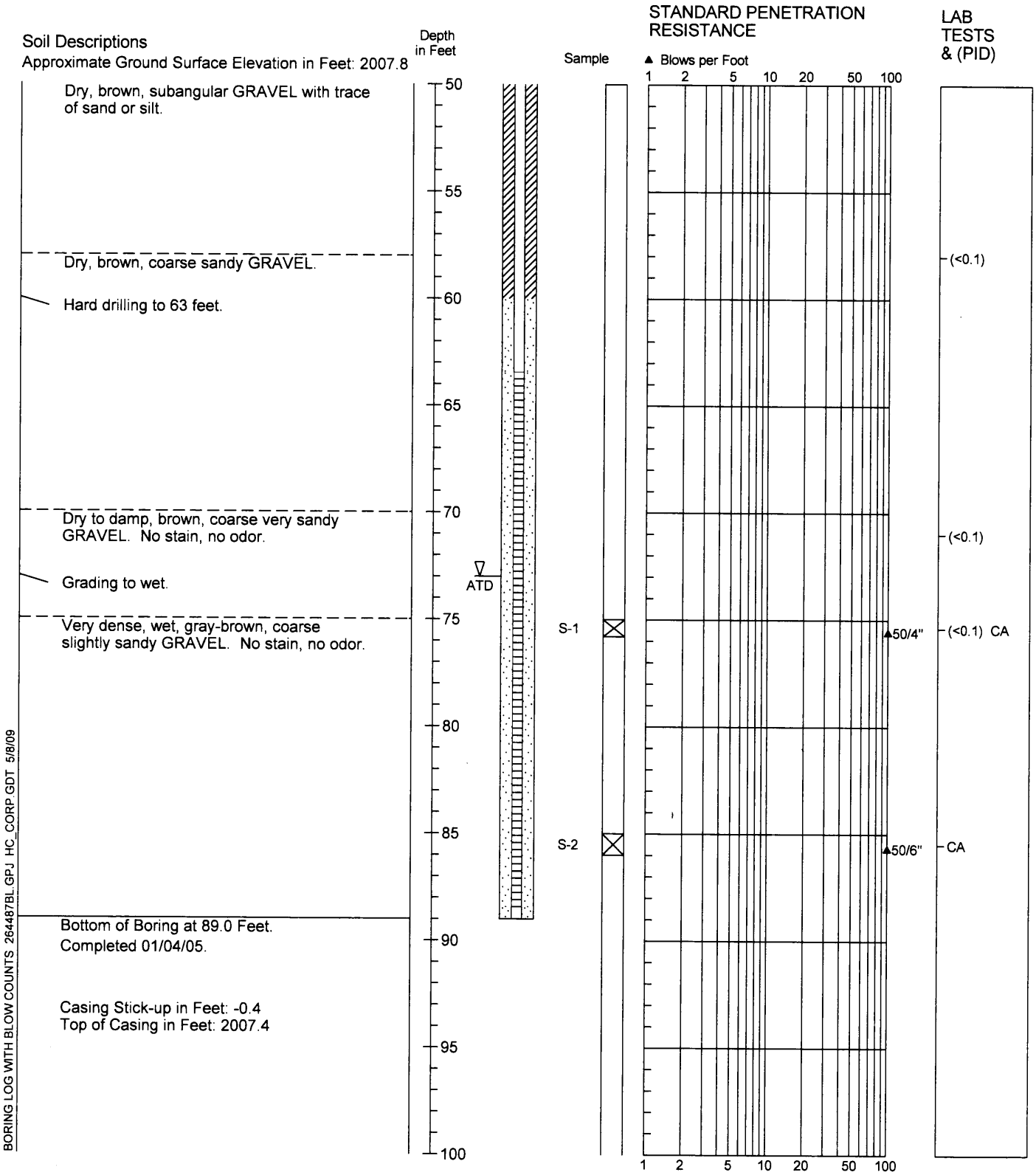
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-17 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-18S



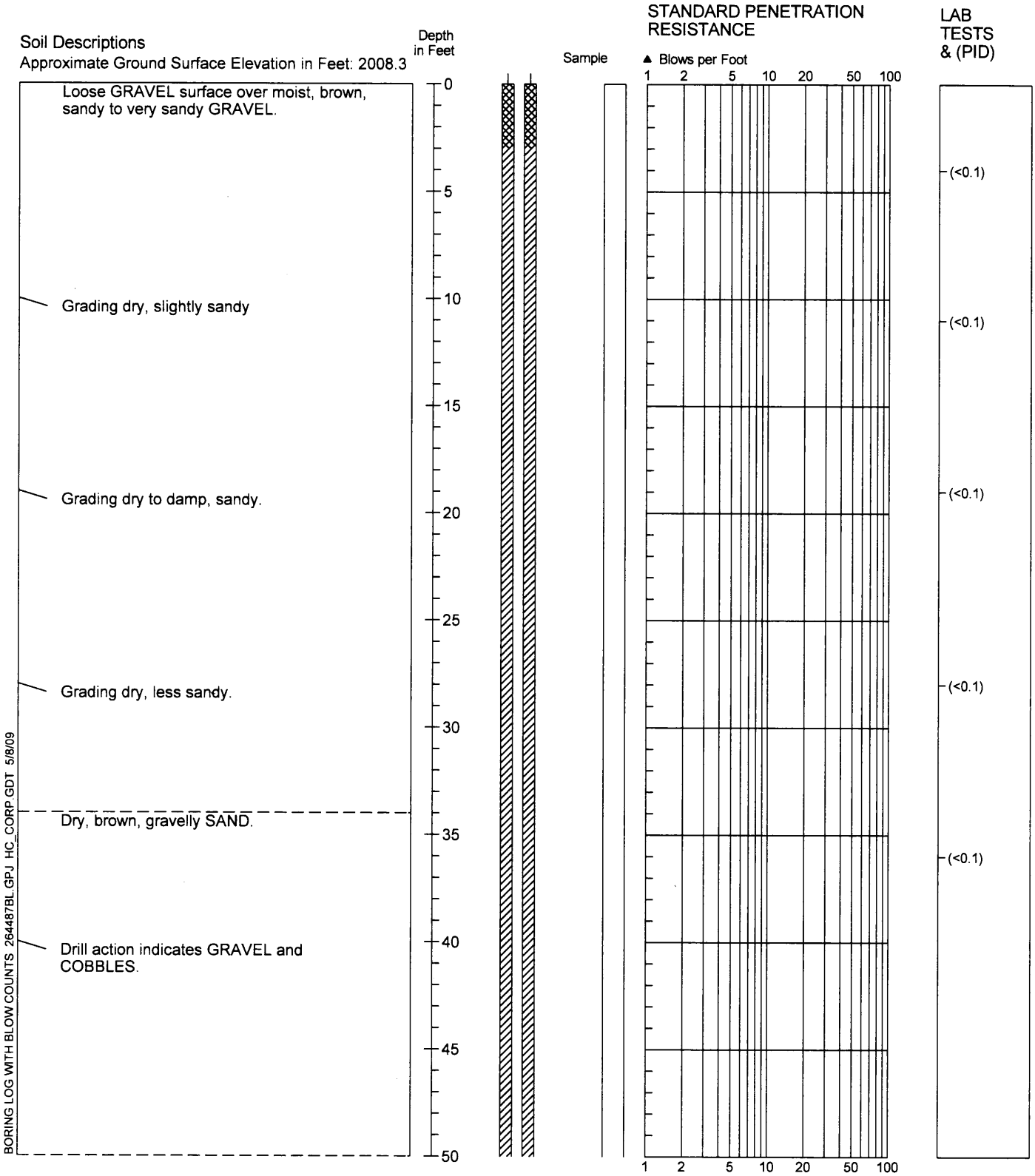
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-17 *2/2*

Boring Log/Construction Data for Monitoring Well HL-MW-19S



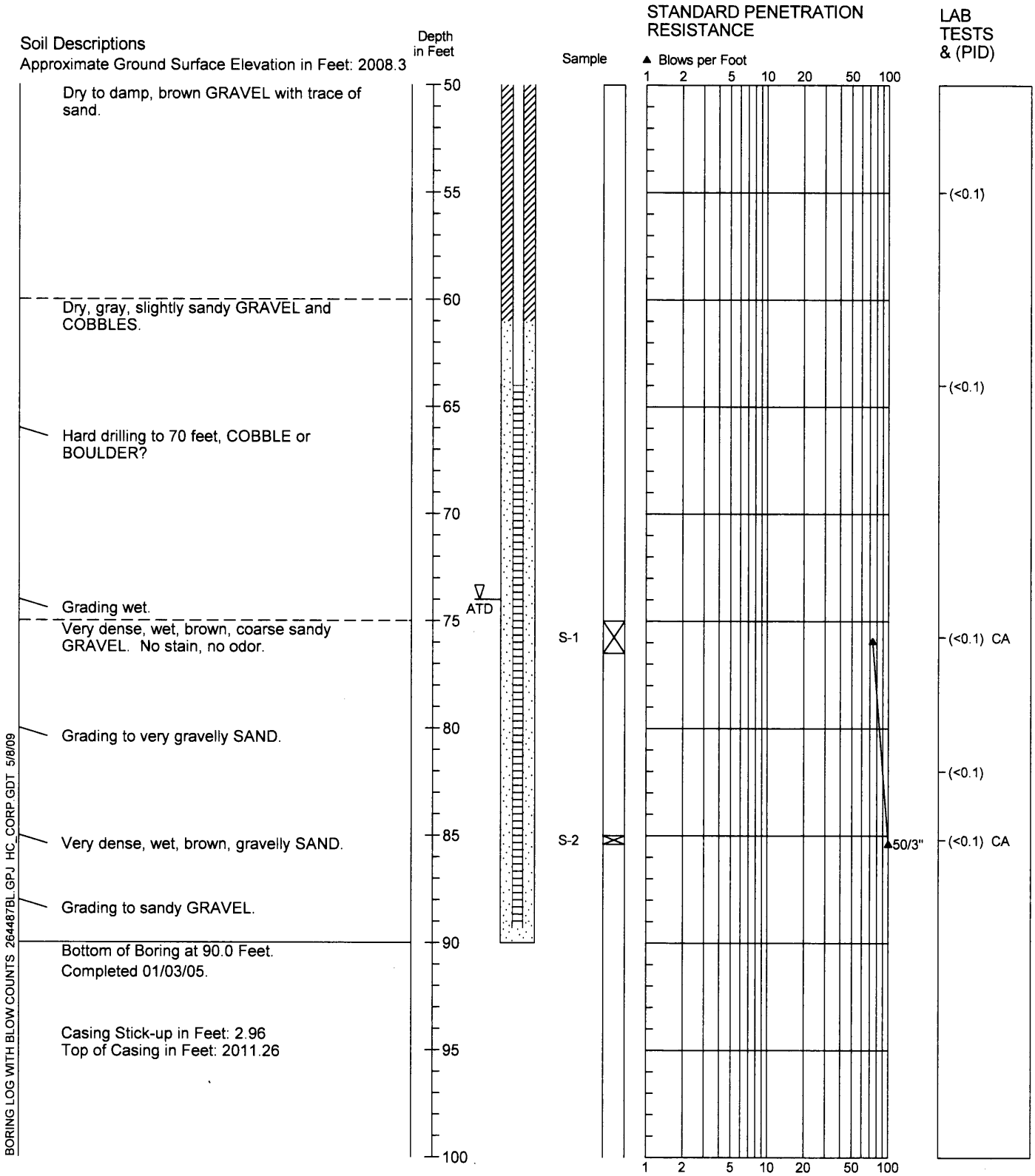
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-18 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-19S



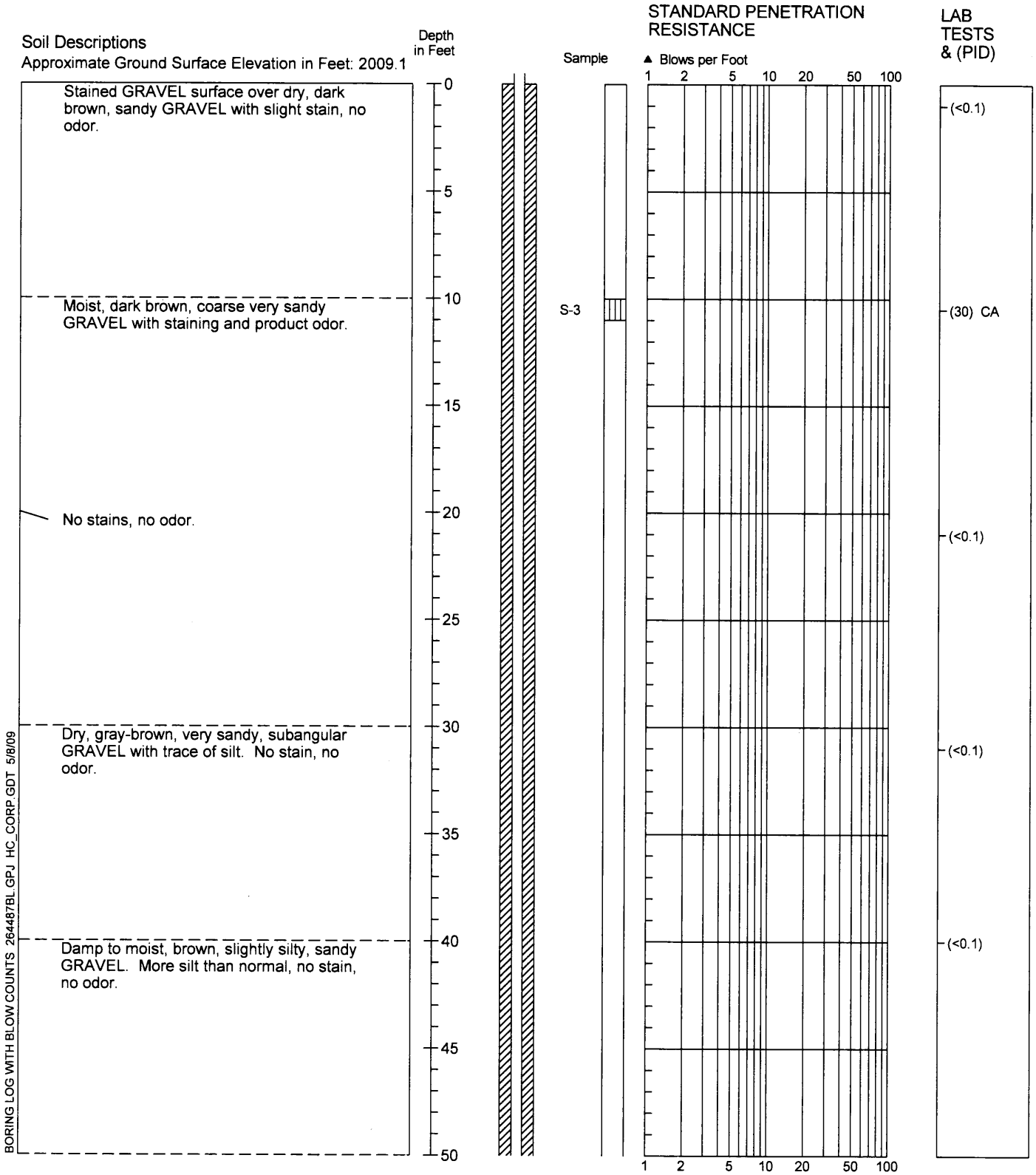
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-18 *2/2*

Boring Log/Construction Data for Monitoring Well HL-MW-20S



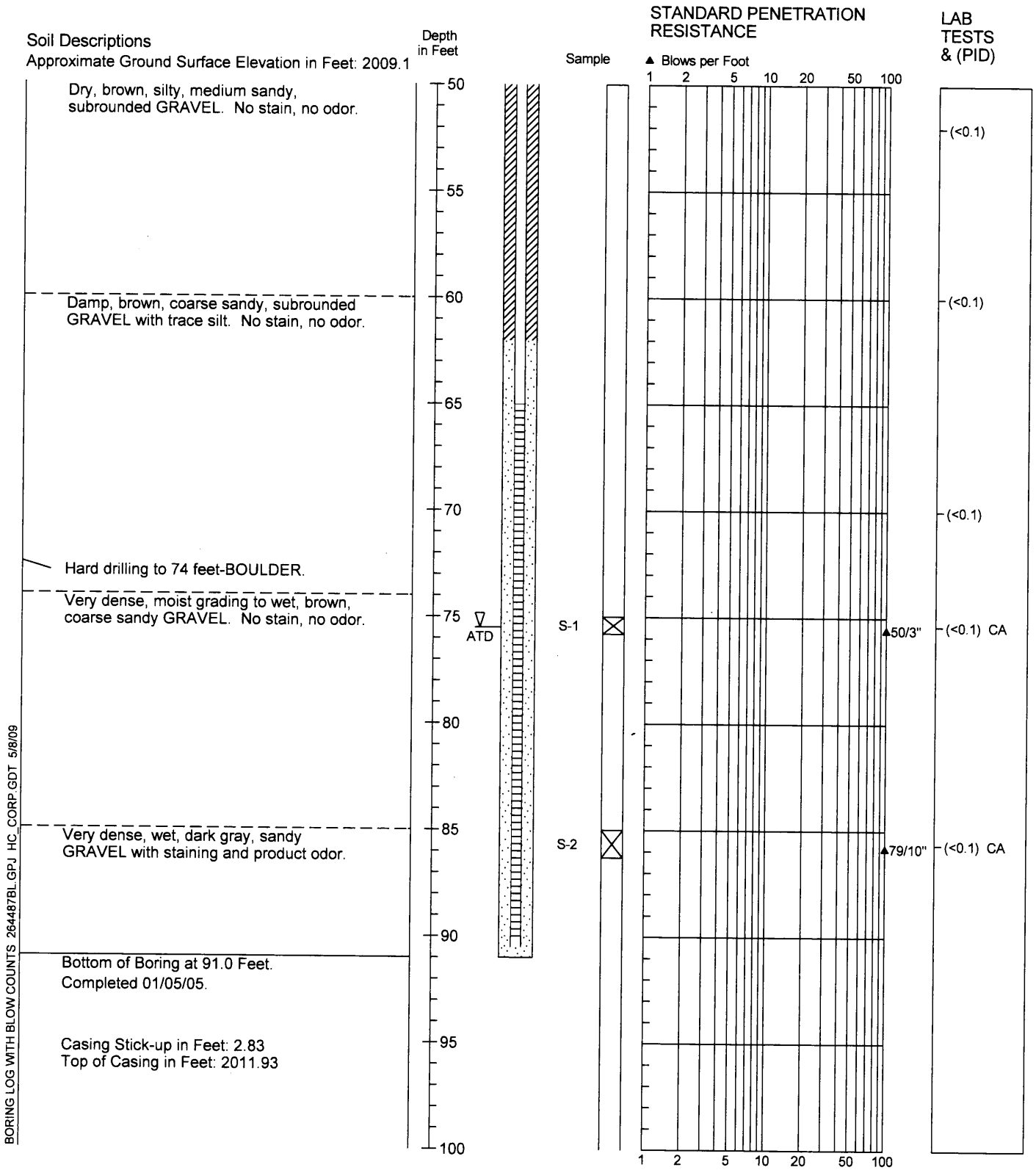
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 1/05

Figure A-19 1/2

Boring Log/Construction Data for Monitoring Well HL-MW-20S



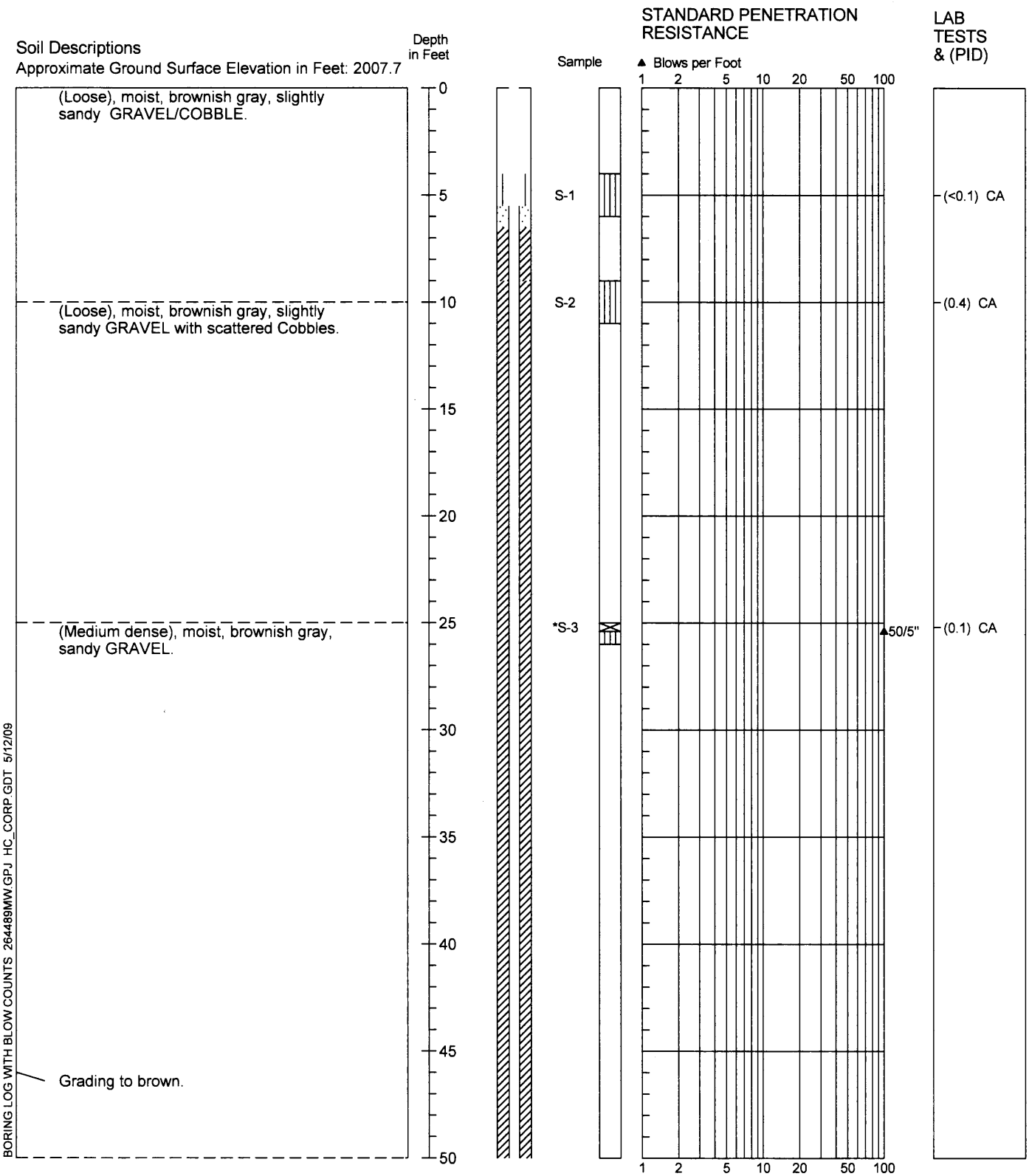
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 **1/05**

Figure A-19 **2/2**

Boring Log/Construction Data for Monitoring Well HL-MW-21S



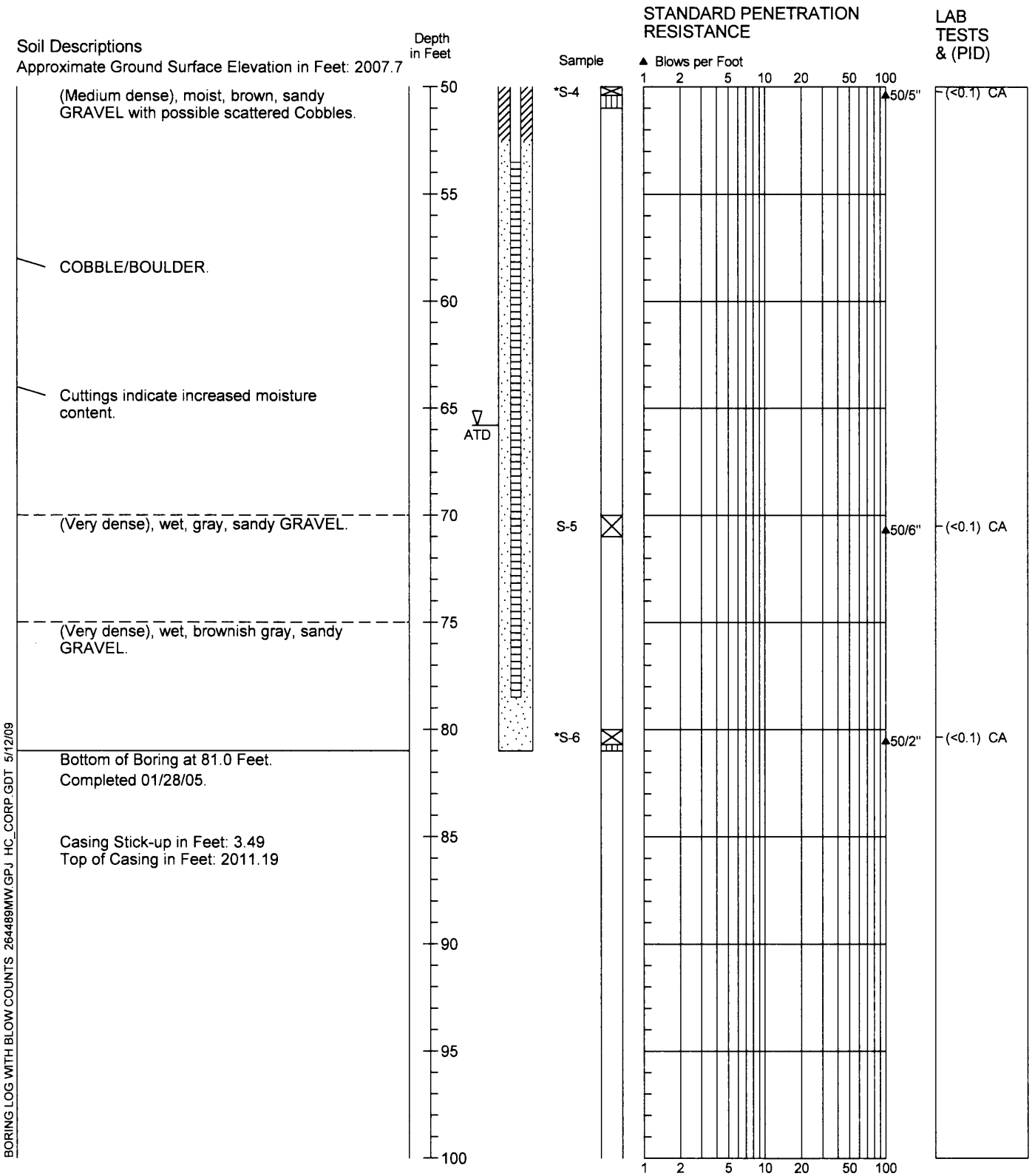
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-89 *1/05*

Figure A-20 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-21S



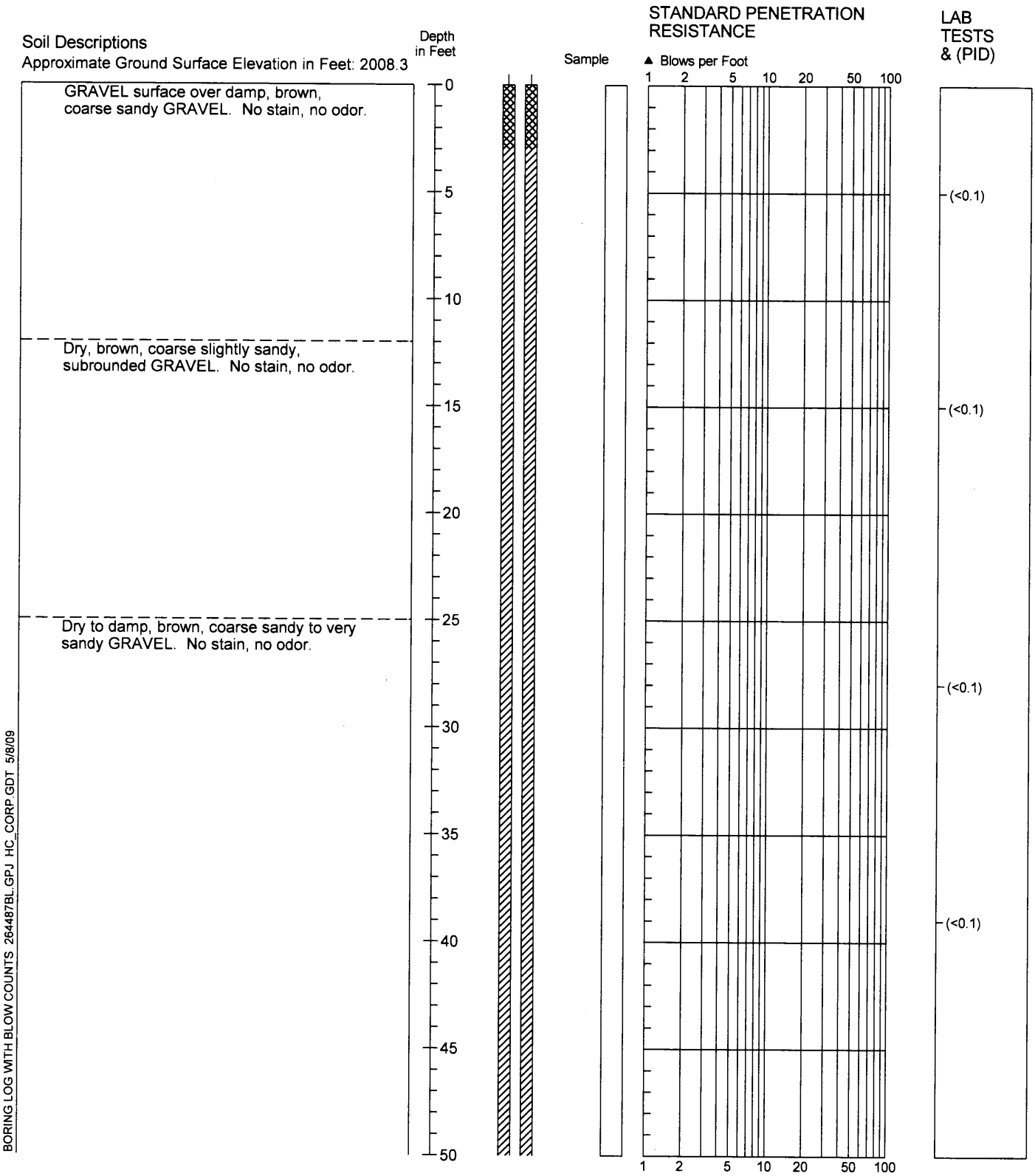
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-89 *1/05*

Figure A-20 *2/2*

Boring Log/Construction Data for Monitoring Well HL-MW-22S



BORING LOG WITH BLOW COUNTS 264487BL.GPJ HC_CORP.GDT 5/8/09

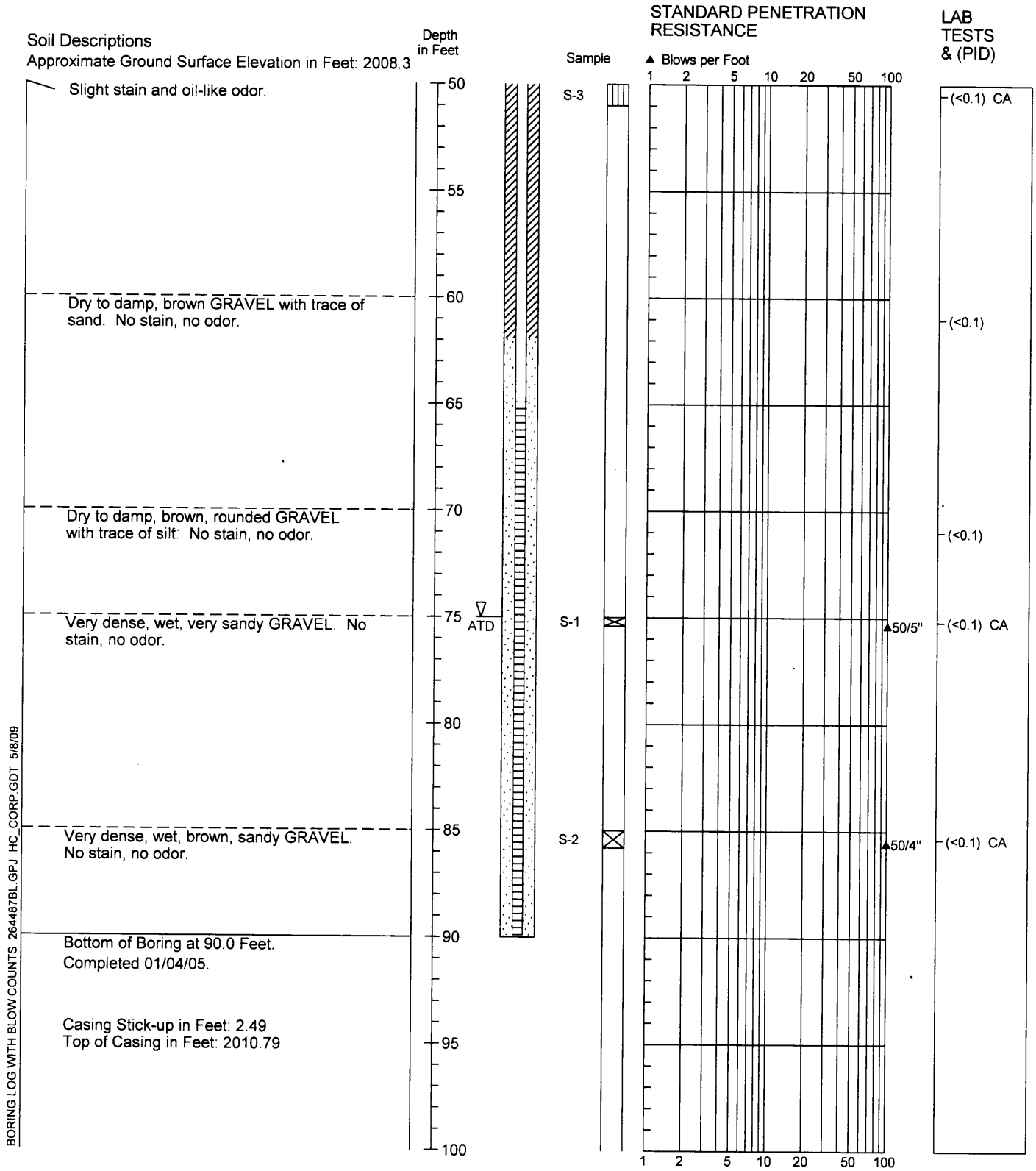
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-21 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-22S



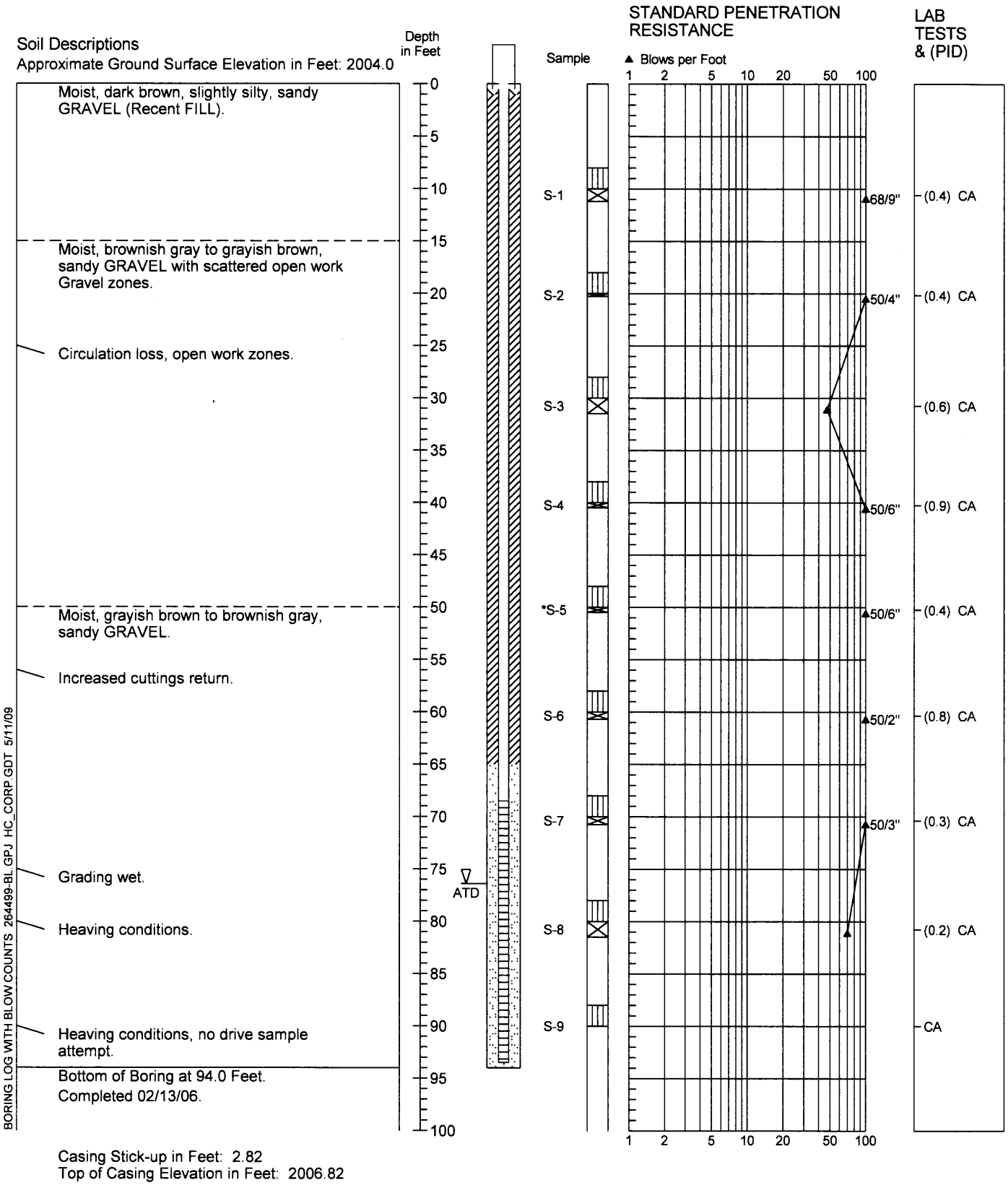
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-87 *1/05*

Figure A-21 *2/2*

Boring Log/Construction Data for Monitoring Well HL-MW-23S



Casing Stick-up in Feet: 2.82
Top of Casing Elevation in Feet: 2006.82

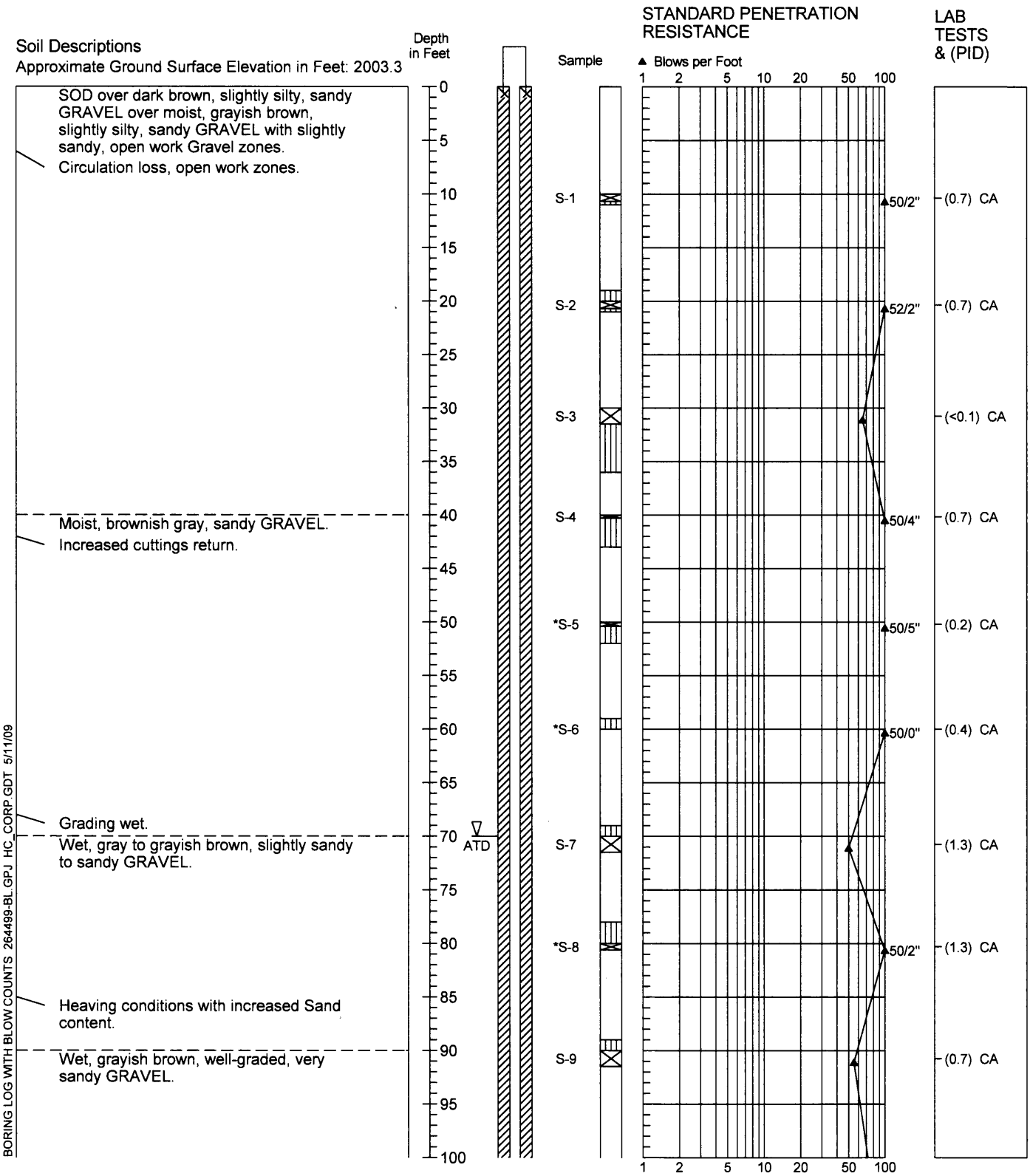
HARTCROWSER

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.

2644-99 ***2/06***

Figure A-22

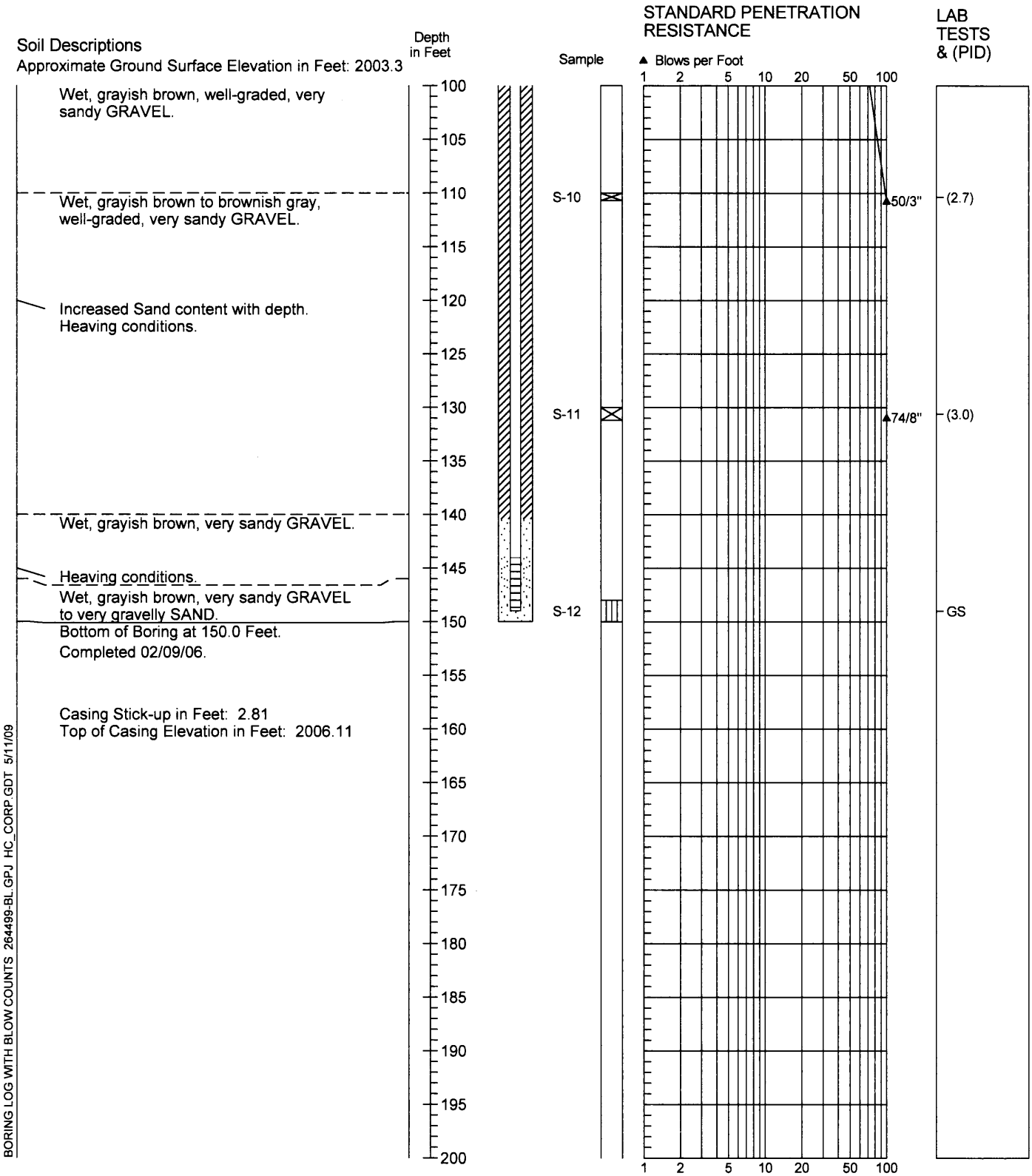
Boring Log/Construction Data for Monitoring Well HL-MW-24DD



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

Boring Log/Construction Data for Monitoring Well HL-MW-24DD

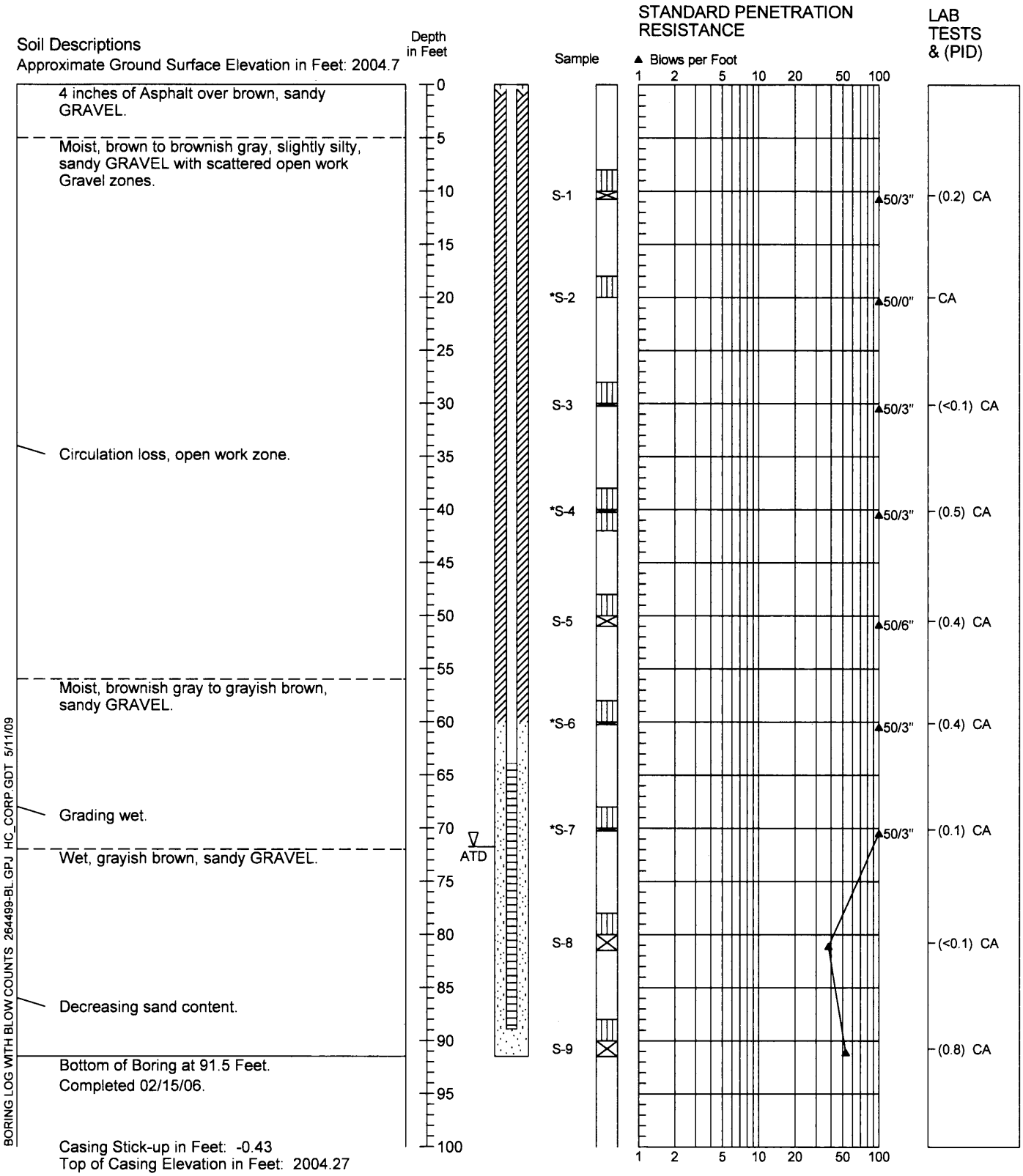


BORING LOG WITH BLOW COUNTS 264499-BL.GPJ HC_CORP.GDT 5/11/09

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

Boring Log/Construction Data for Monitoring Well HL-MW-25S



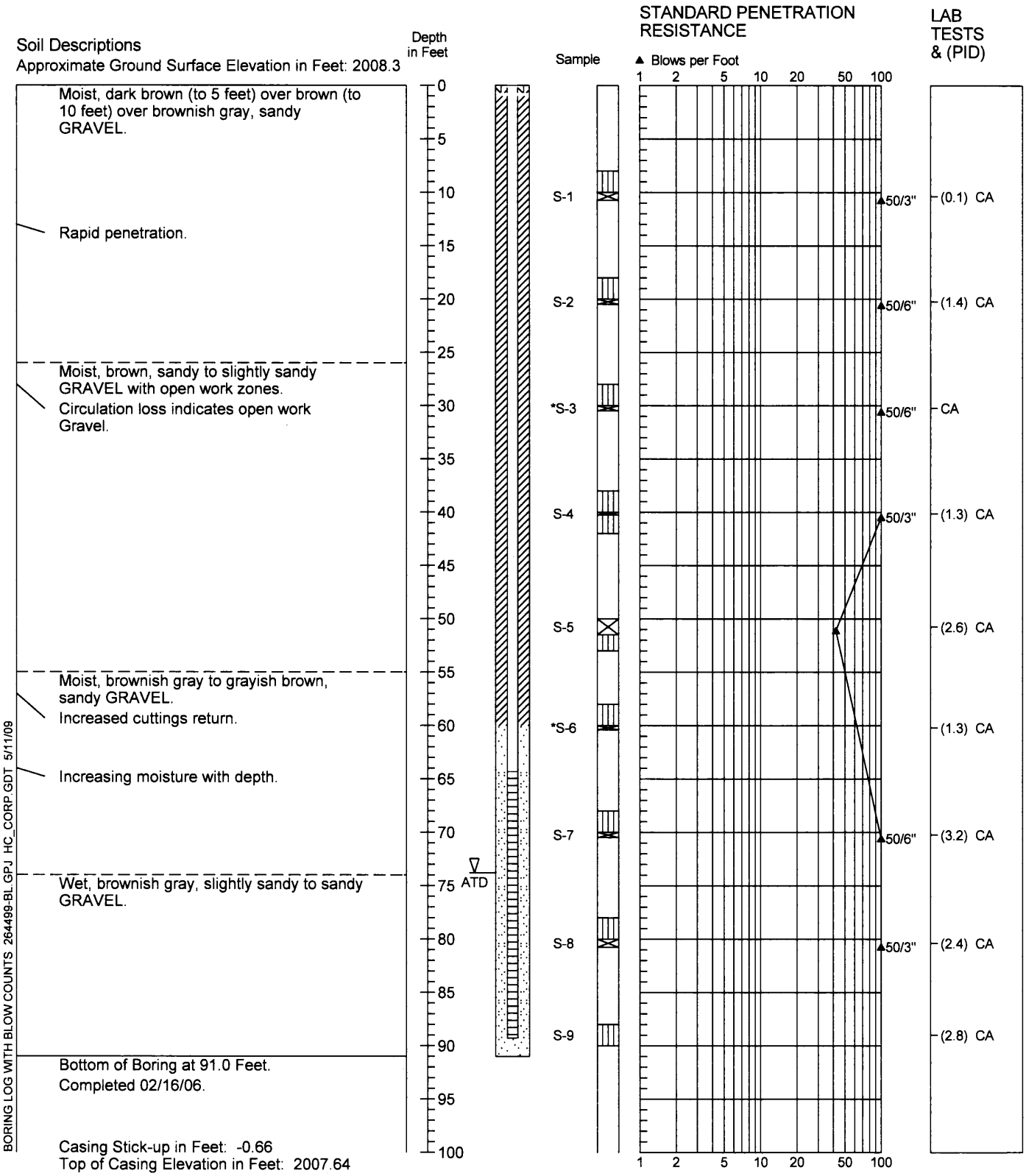
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 **2/06**

Figure A-24

Boring Log/Construction Data for Monitoring Well HL-MW-26S



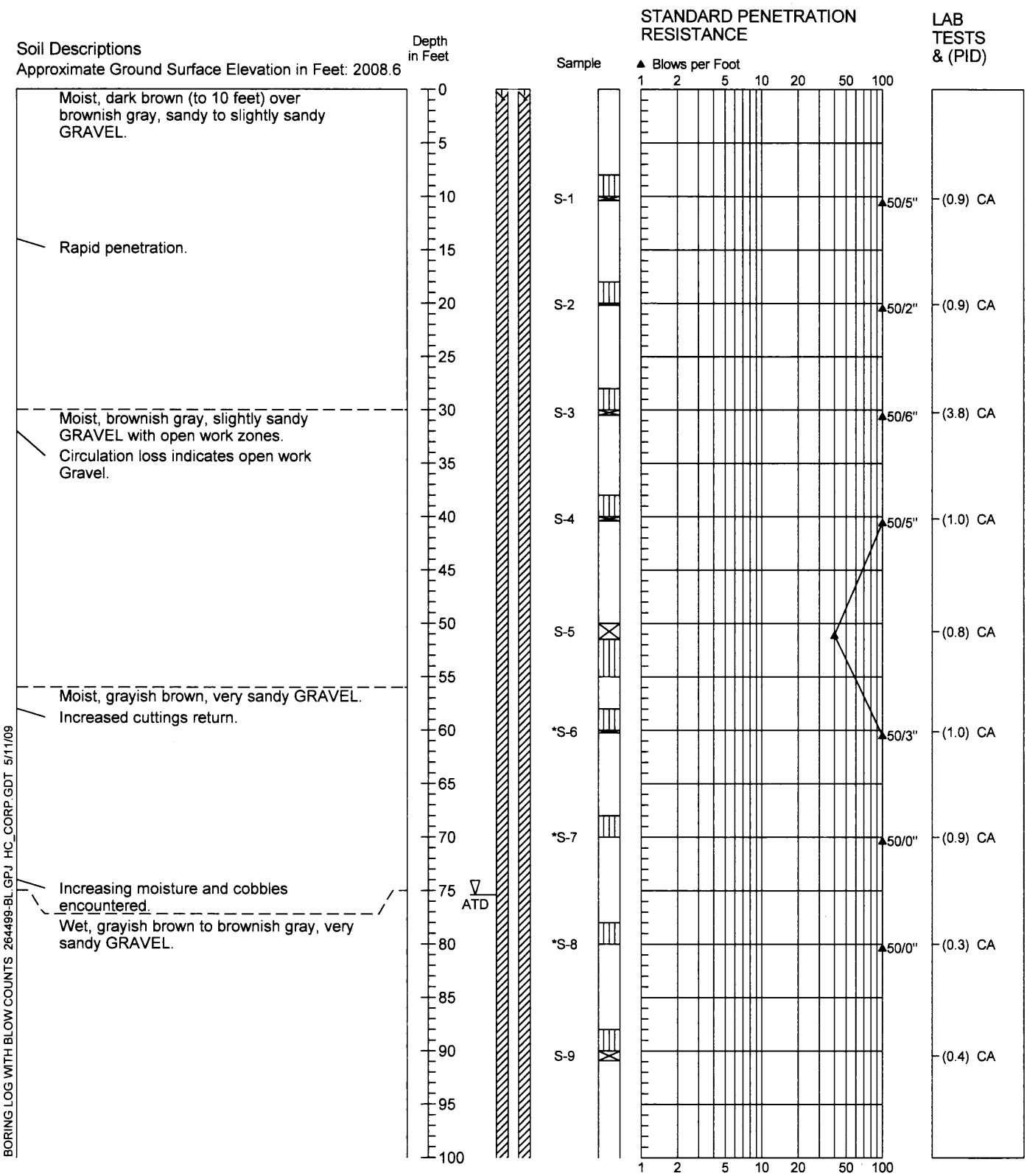
HARTCROWSER

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.

2644-99 ***2/06***

Figure A-25

Boring Log/Construction Data for Monitoring Well HL-MW-27D



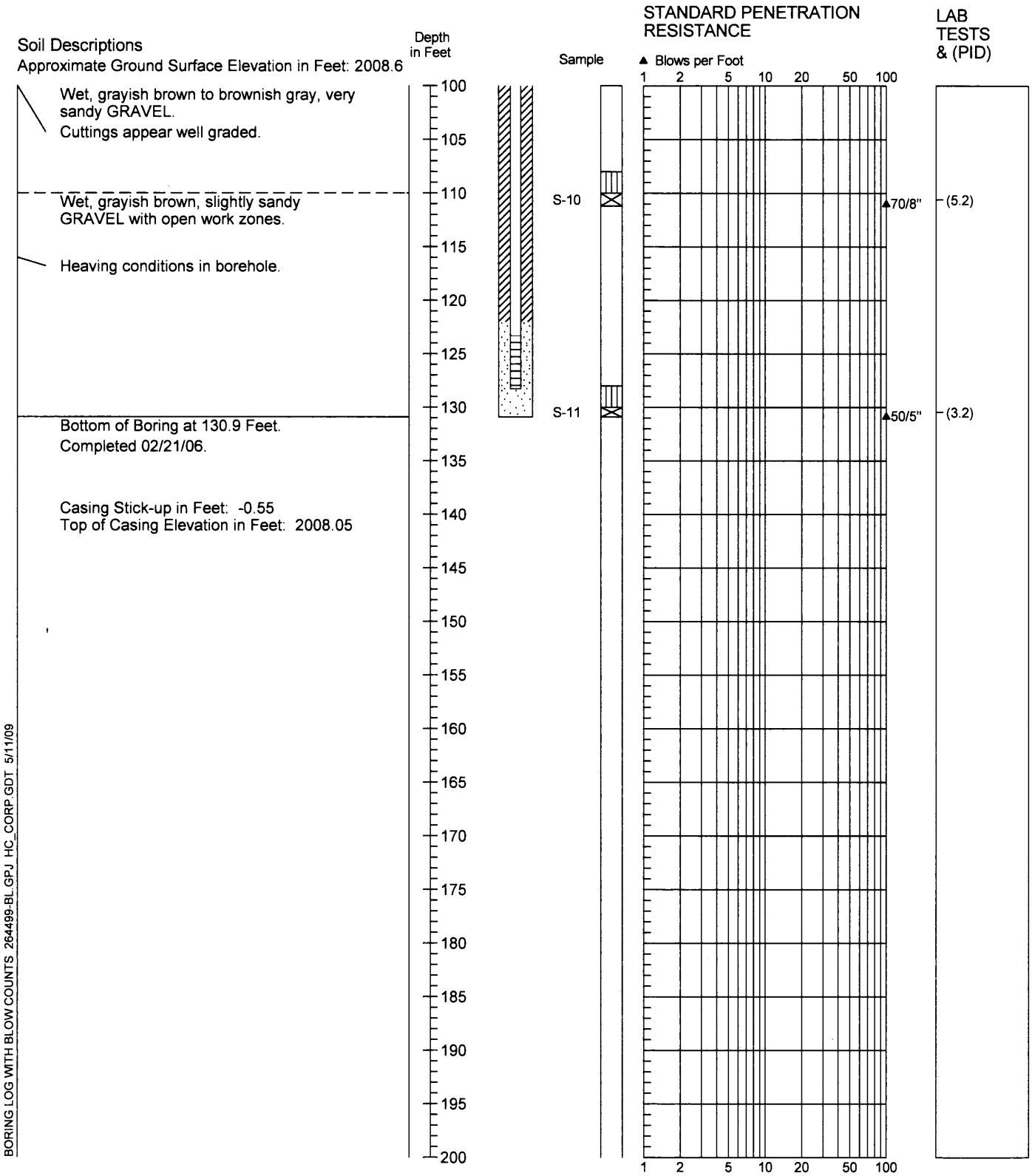
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 2/06

Figure A-26 1/2

Boring Log/Construction Data for Monitoring Well HL-MW-27D

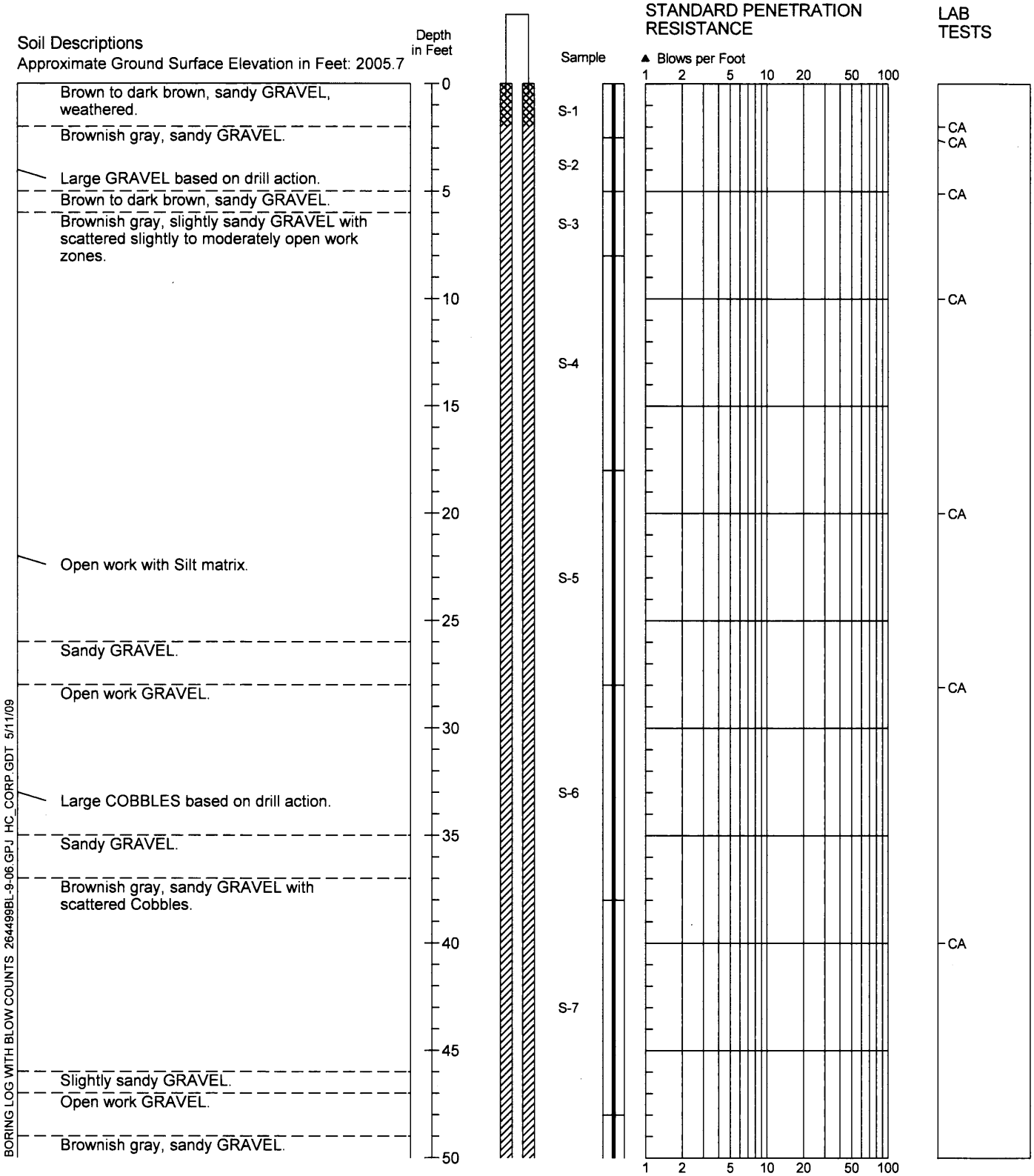


BORING LOG WITH BLOW COUNTS 264499-BL.GPJ HC_CORP.GDT 5/11/09

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

Boring Log/Construction Data for Monitoring Well HL-MW-28DD



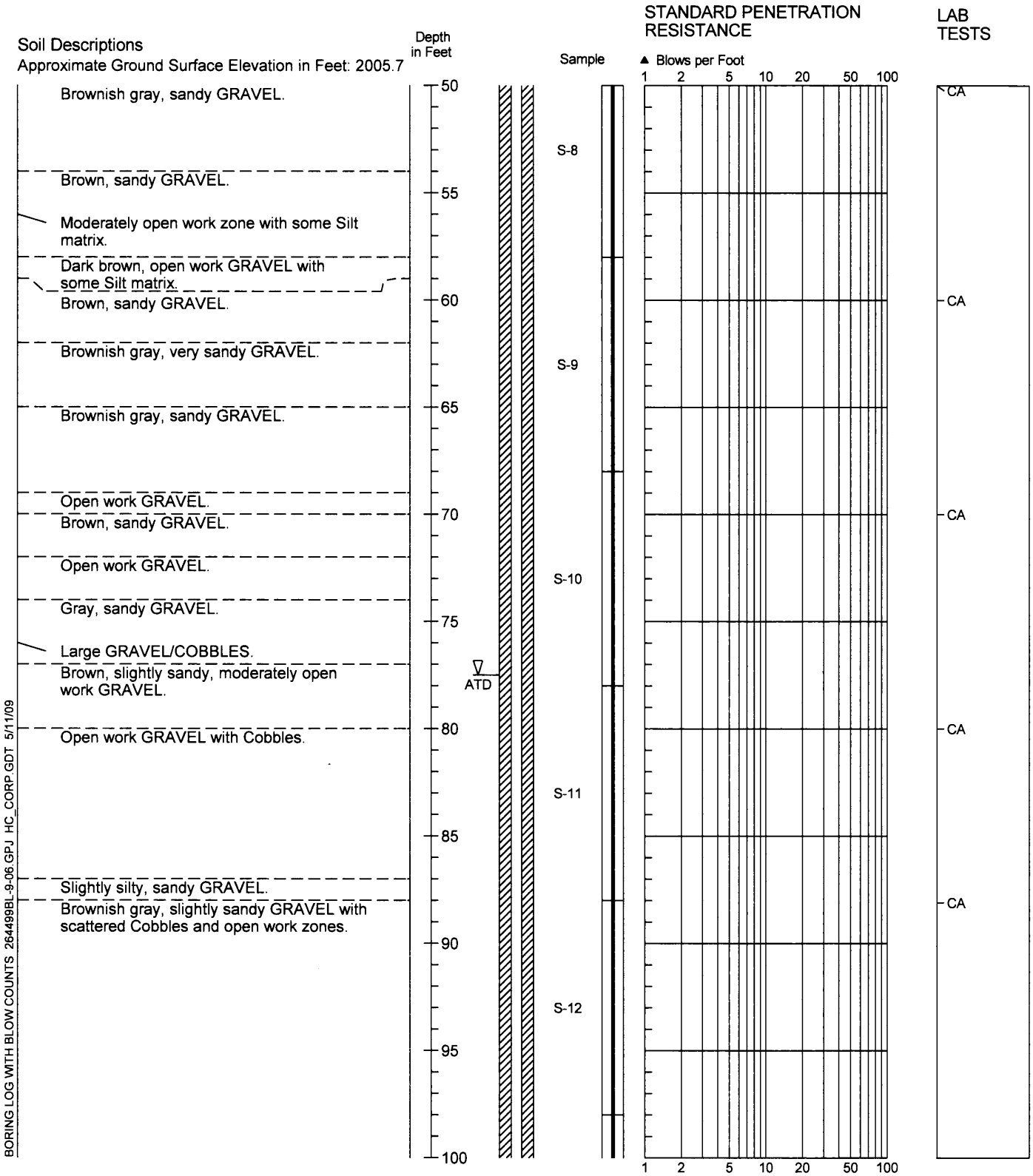
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Note: Boring by Sonic Rig.

HARTCROWSER

2644-99 *9/06*

Figure A-27 *1/3*

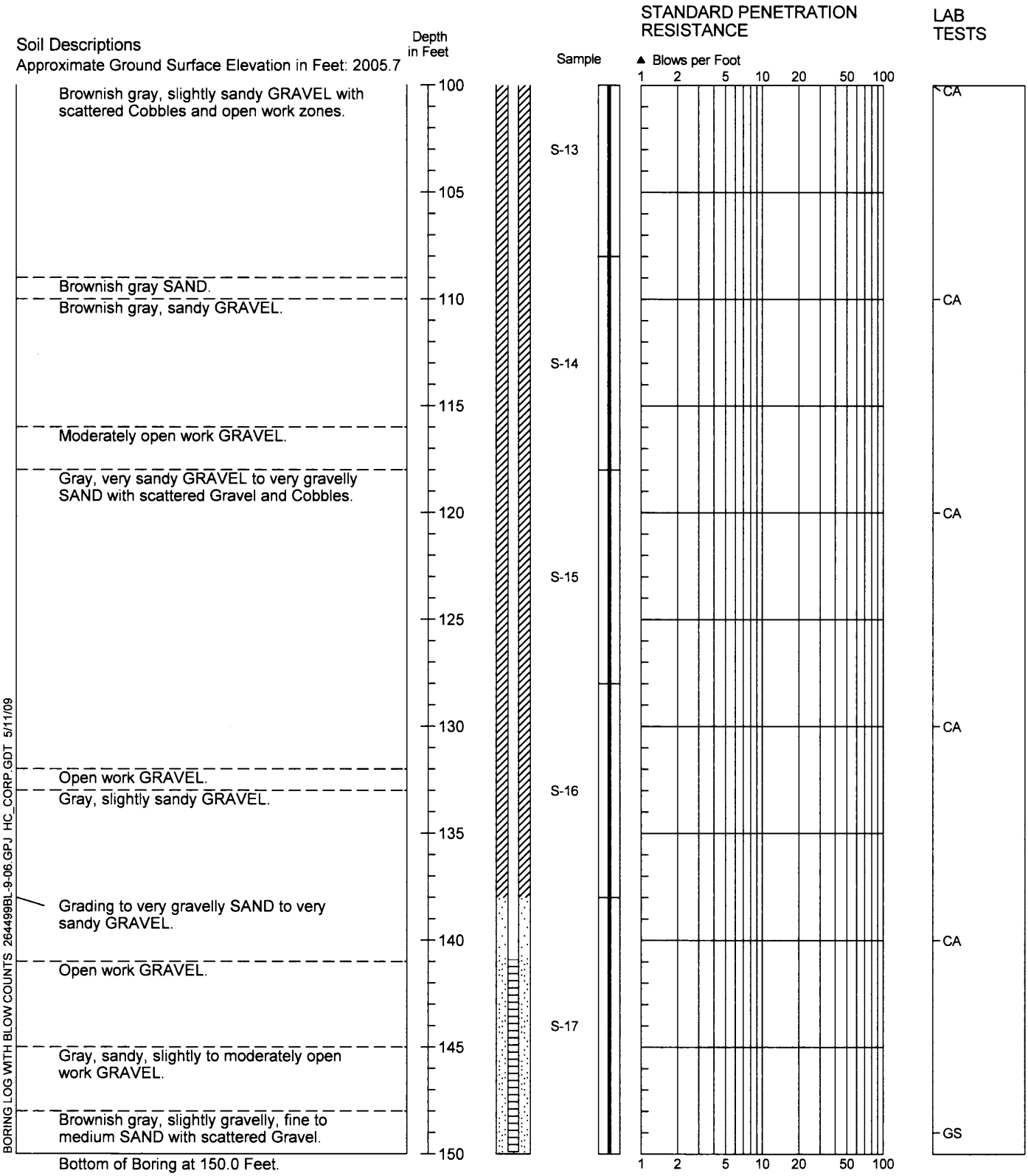
Boring Log/Construction Data for Monitoring Well HL-MW-28DD



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.
4. Note: Boring by Sonic Rig.

HARTCROWSER

Boring Log/Construction Data for Monitoring Well HL-MW-28DD



Casing Stick-up in Feet: 2.5
Top of Casing Elevation in Feet: 2008.22

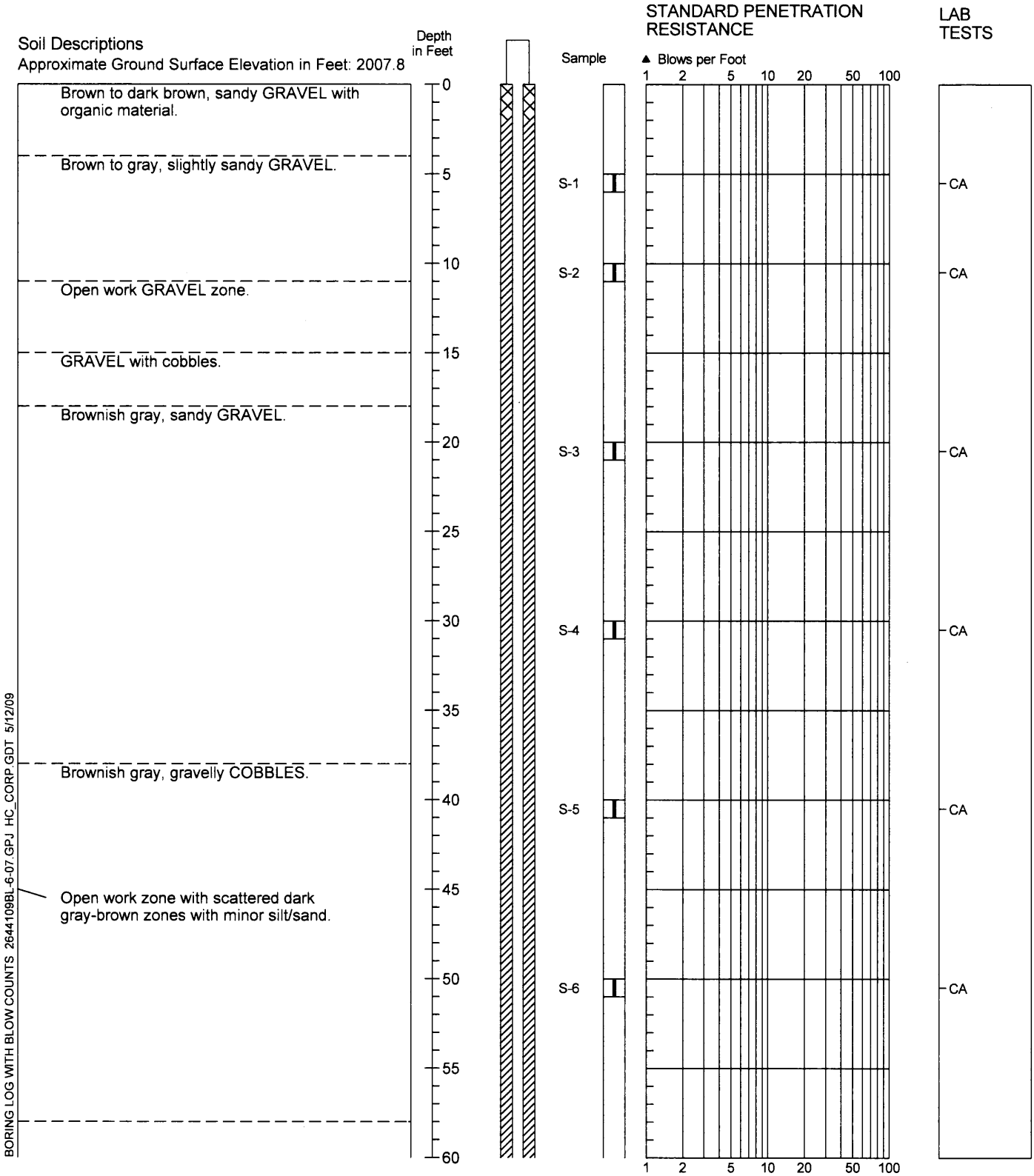
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Note: Boring by Sonic Rig.

HARTCROWSER

2644-99 *9/06*

Figure A-27 *3/3*

Boring Log/Construction Data for Monitoring Well HL-MW-29S



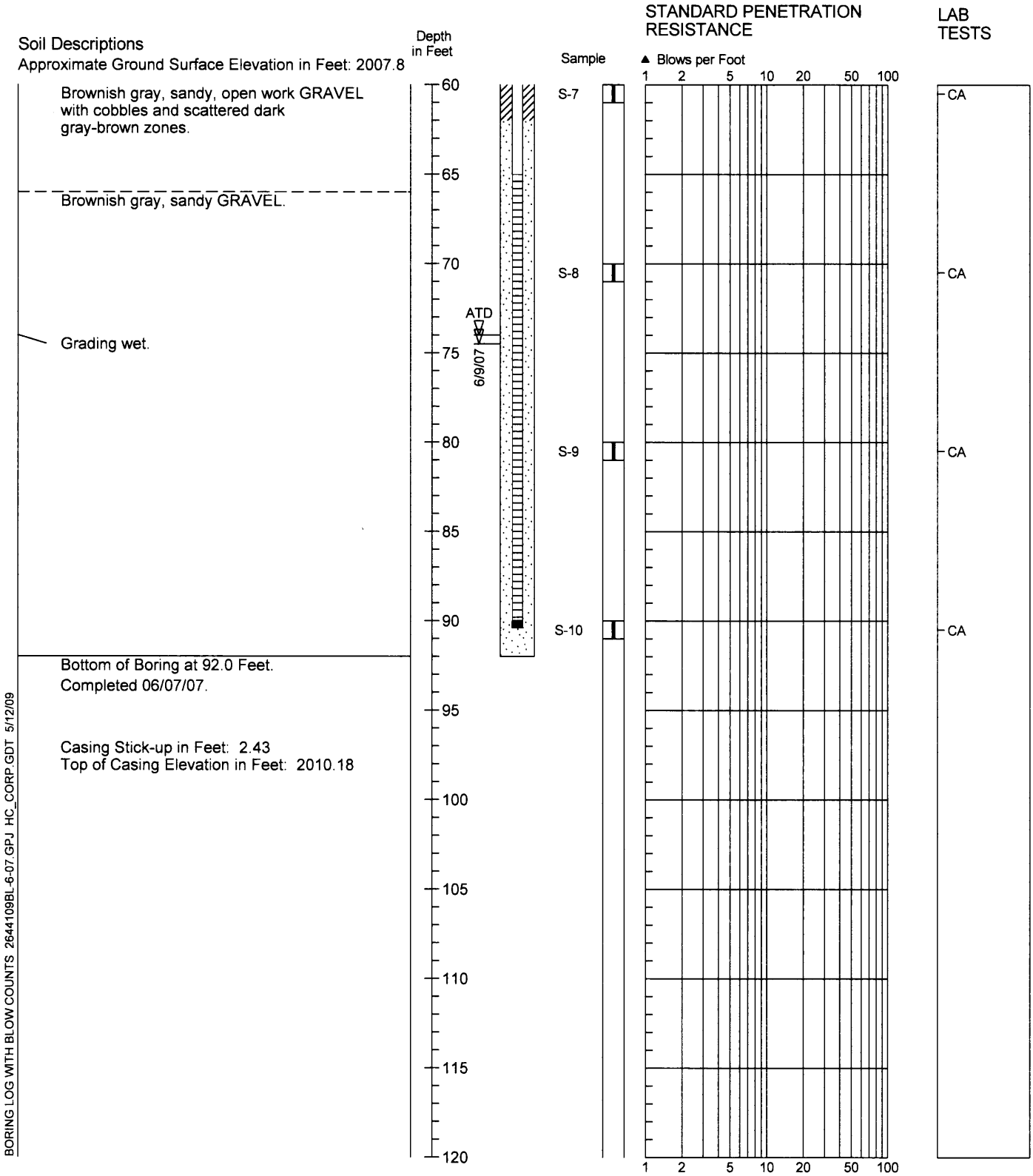
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Note: Boring continuously cored by Sonic Rig with composite samples collected as indicated.

HARTCROWSER

2644-109 *6/07*

Figure A-28 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-29S

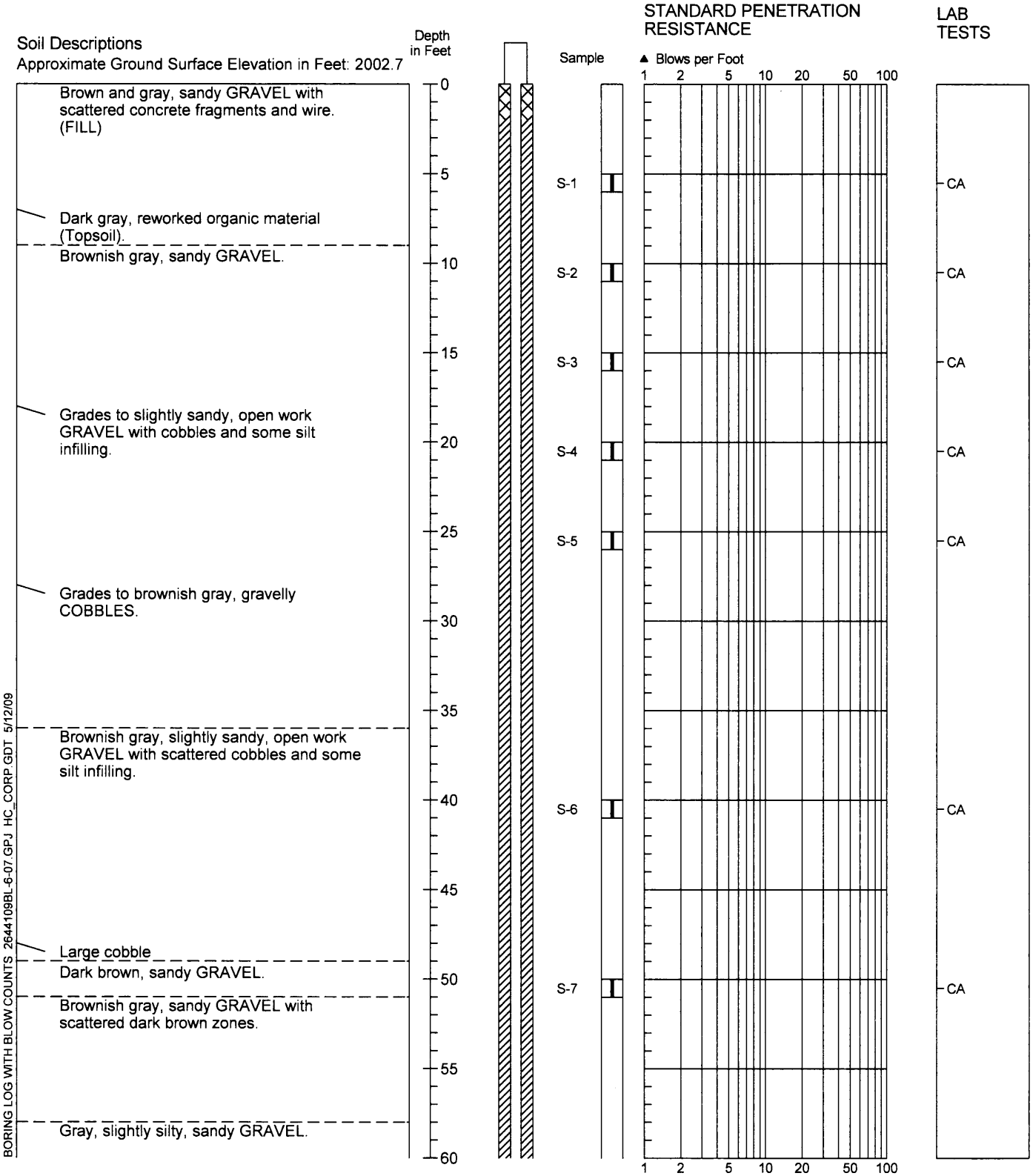


BORING LOG WITH BLOW COUNTS 2644109BL-6-07.GPJ HC_CORP.GDT 5/12/09

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.
4. Note: Boring continuously cored by Sonic Rig with composite samples collected as indicated.

HARTCROWSER

Boring Log/Construction Data for Monitoring Well HL-MW-30S



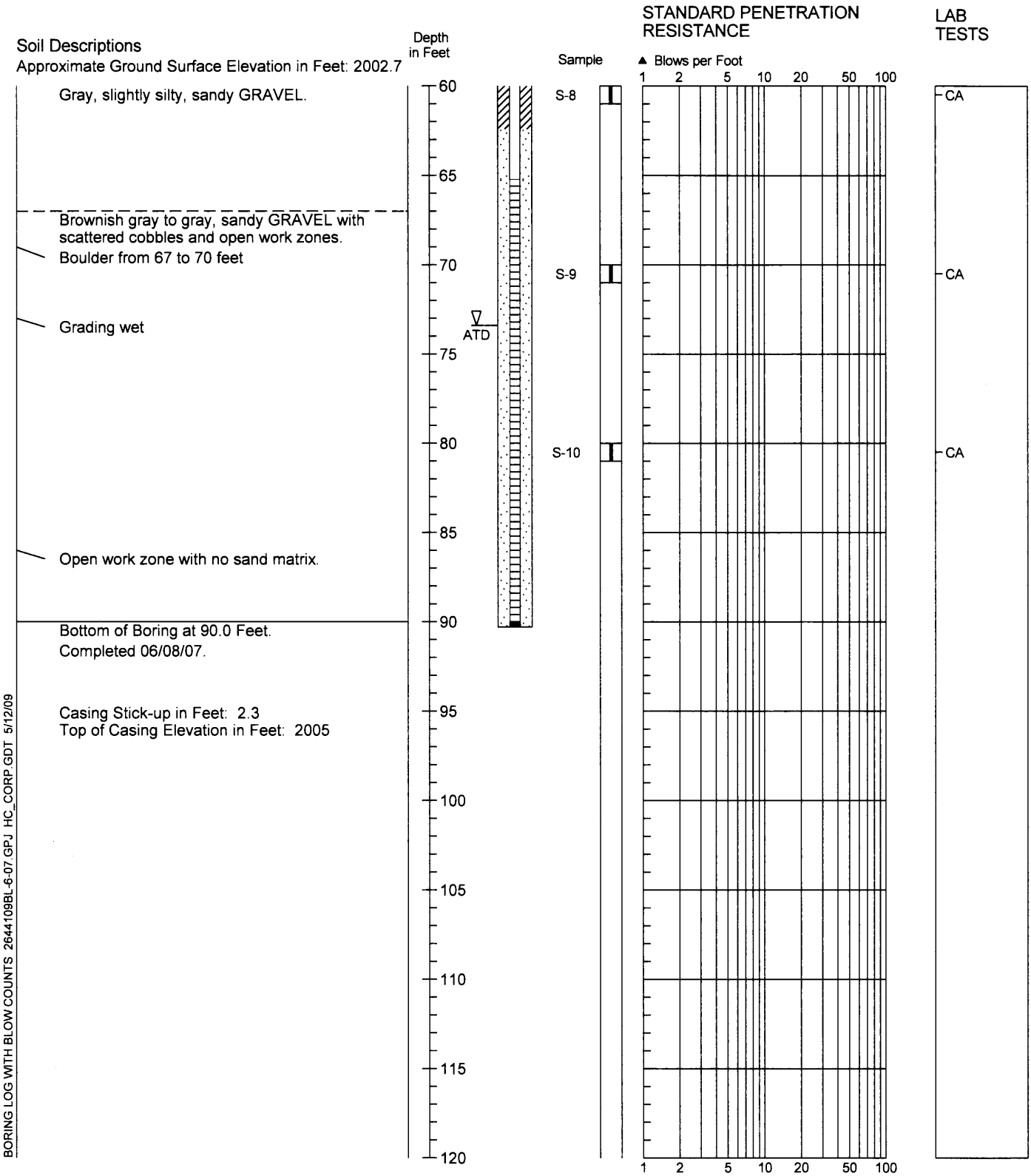
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Note: Boring continuously cored by Sonic Rig with composite samples collected as indicated.

HARTCROWSER

2644-109 *6/07*

Figure A-29 *1/2*

Boring Log/Construction Data for Monitoring Well HL-MW-30S



BORING LOG WITH BLOW COUNTS 2644109BL-6-07.GPJ HC_CORP.GDT 5/12/09

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.
4. Note: Boring continuously cored by Sonic Rig with composite samples collected as indicated.

HARTCROWSER

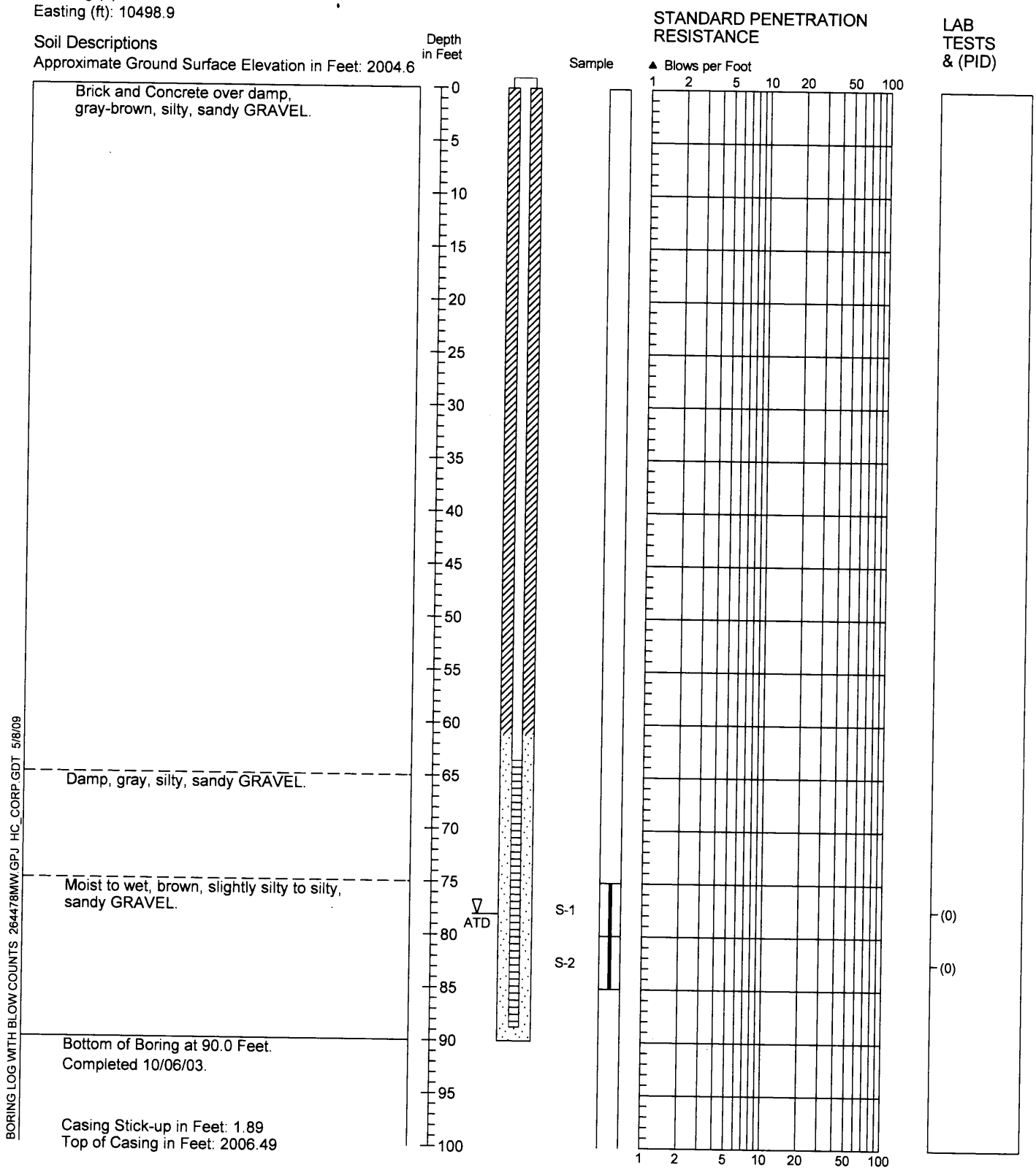
2644-109 *6/07*

Figure A-29 *2/2*

Monitoring Well Log RM-MW-1S

Northing (ft): 11216
Easting (ft): 10498.9

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.6



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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

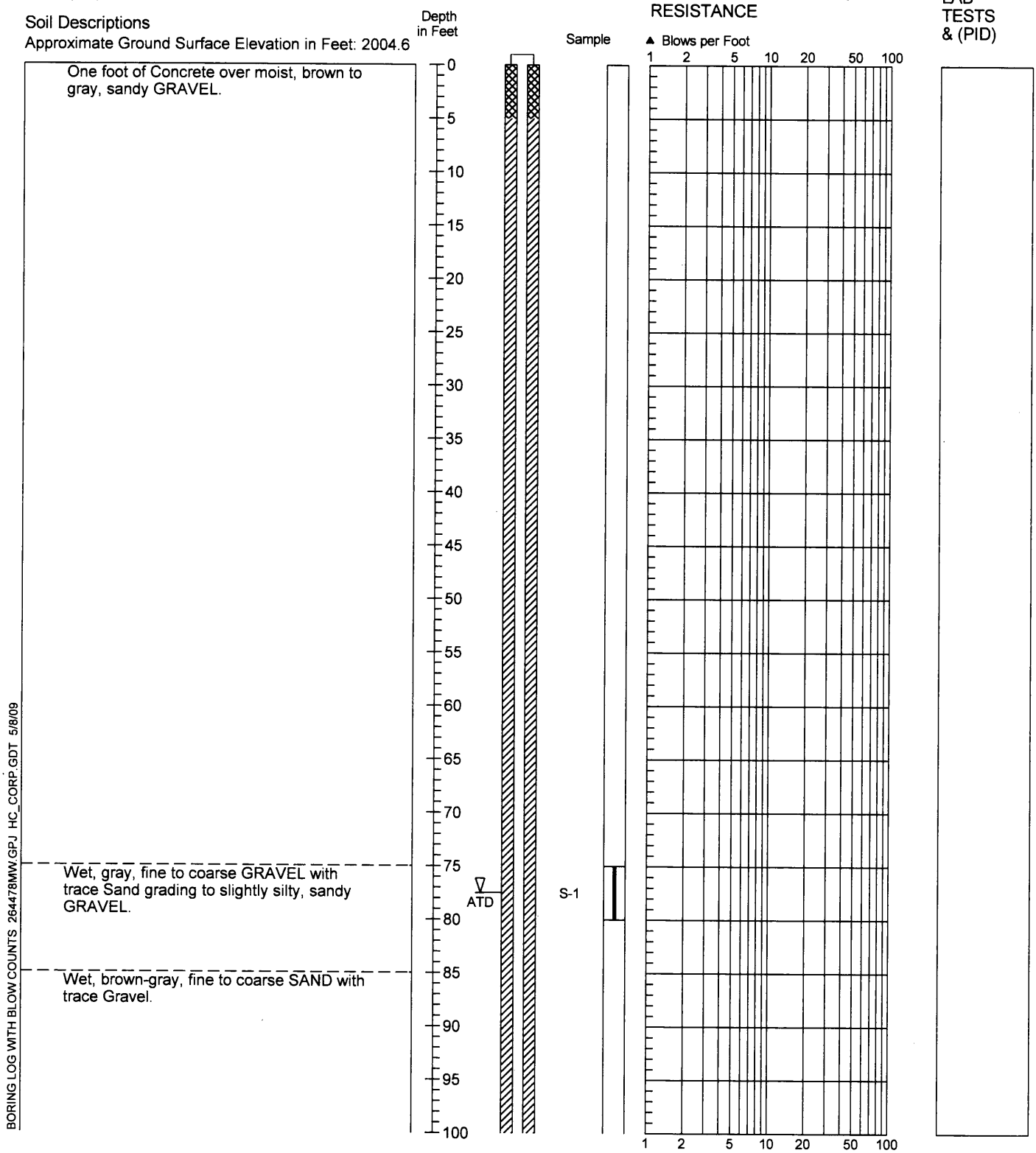
2644-78 *10/03*

Figure A-30

Monitoring Well Log RM-MW-2D

Northing (ft): 11228.8
Easting (ft): 10499.2

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.6



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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

2644-78 *10/03*
Figure A-31 *1/2*

Monitoring Well Log RM-MW-2D

Northing (ft): 11228.8
Easting (ft): 10499.2

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2004.6

Depth in Feet

Sample

STANDARD PENETRATION RESISTANCE
▲ Blows per Foot
1 2 5 10 20 50 100

LAB TESTS & (PID)

Wet, brown-gray, fine to coarse SAND with trace Gravel.

Wet, brown-gray, fine to coarse SAND with silty SAND lenses.

Bottom of Boring at 155.0 Feet.
Completed 10/04/03.

Casing Stick-up in Feet: 1.91
Top of Casing in Feet: 2006.51

100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200

S-2

(0)

1 2 5 10 20 50 100

BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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.

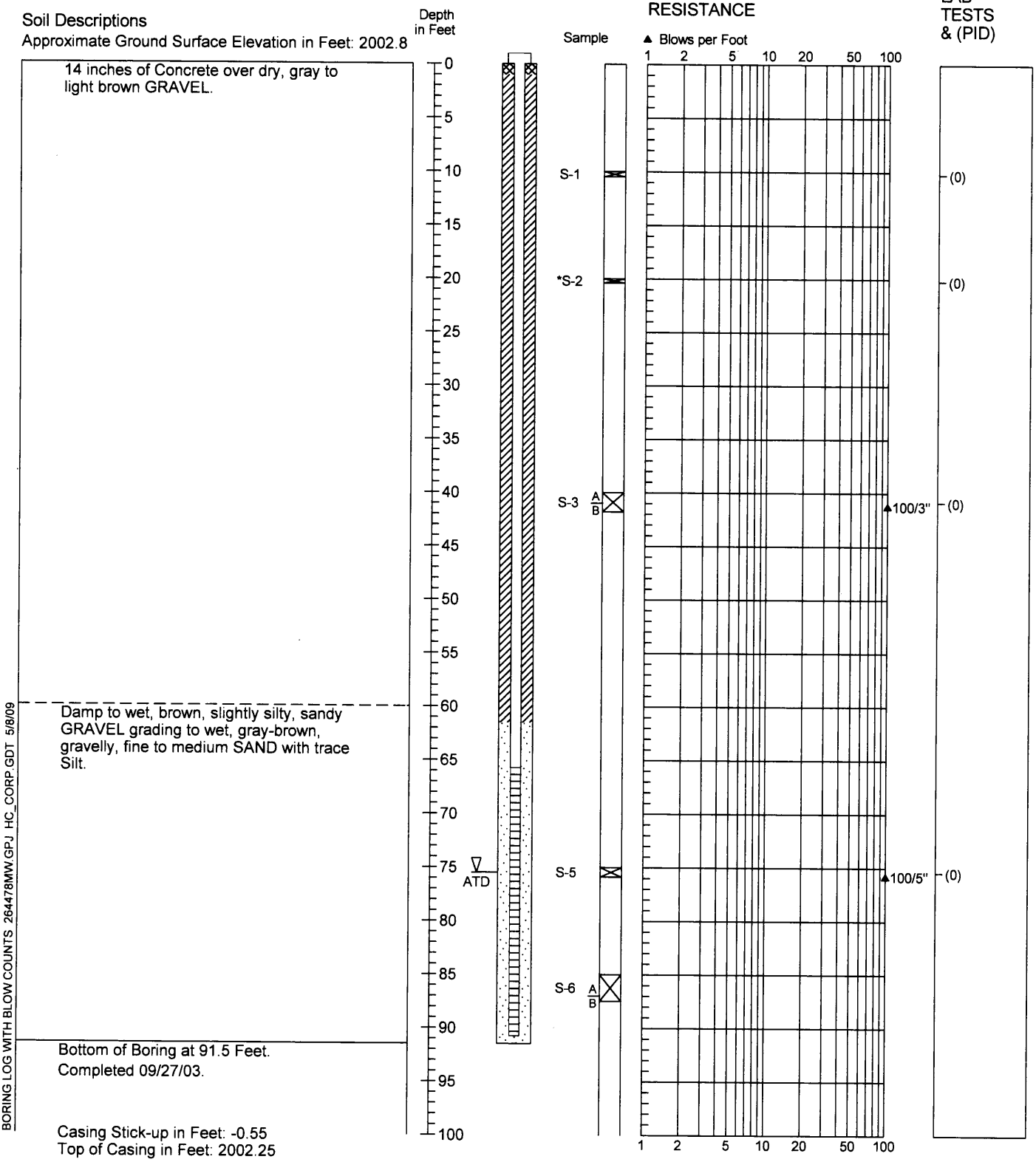
HARTCROWSER

2644-78 10/03
Figure A-31 2/2

Monitoring Well Log RM-MW-3S

Northing (ft): 11301.7
Easting (ft): 10924.4

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2002.8



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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

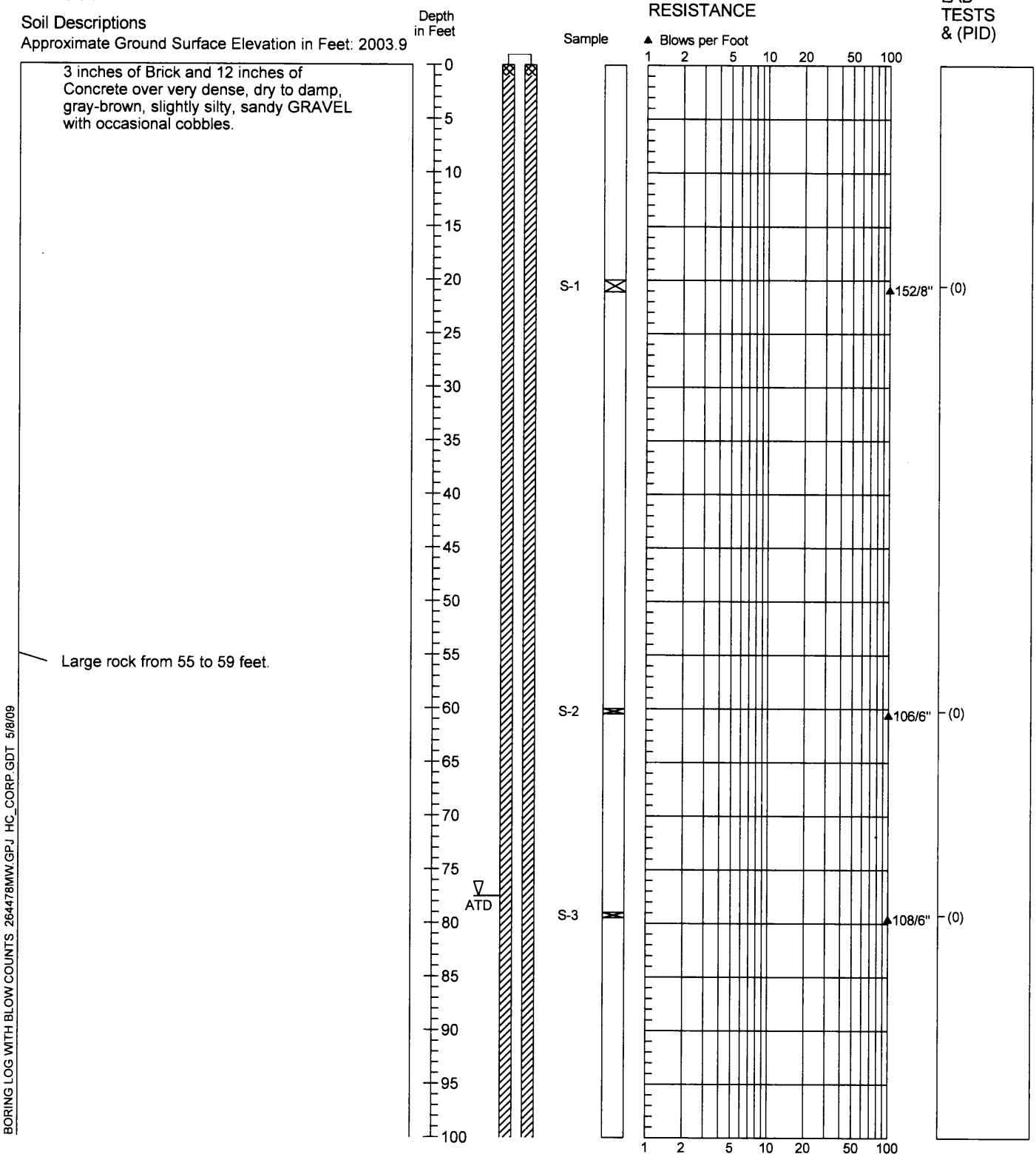
2644-78 9/03

Figure A-32

Monitoring Well Log RM-MW-4D

Northing (ft): 11290.6
Easting (ft): 10924.9

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2003.9



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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

2644-78 *10/03*
Figure A-33 *1/2*

Monitoring Well Log RM-MW-4D

Northing (ft): 11290.6
Easting (ft): 10924.9

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2003.9

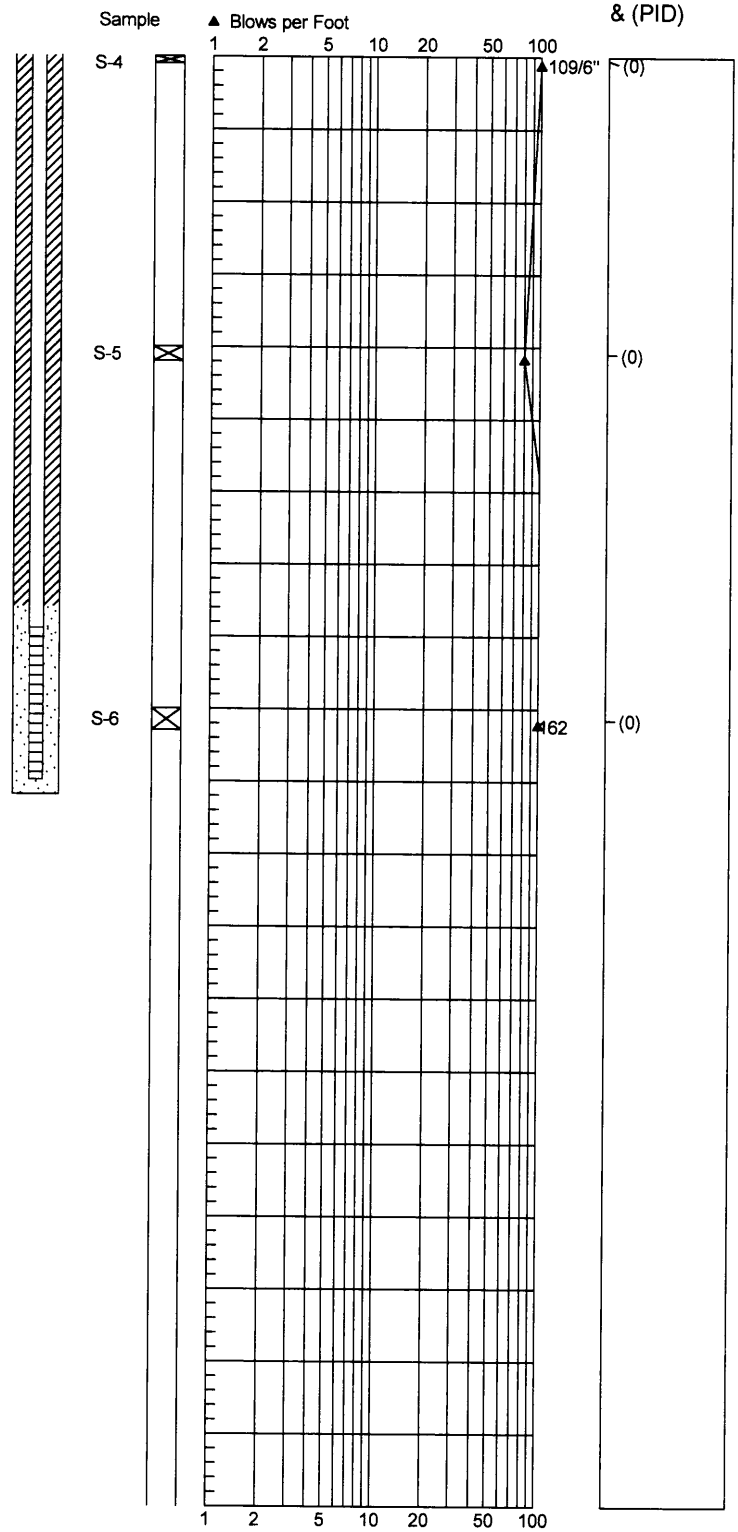
Depth in Feet

Very dense, wet, slightly gravelly, coarse SAND.

Very dense, wet, brown, sandy to non-sandy GRAVEL.

Bottom of Boring at 151.0 Feet.
Completed 10/04/03.

Casing Stick-up in Feet: -0.59
Top of Casing in Feet: 2003.31



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

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

2644-78 10/03
Figure A-33 2/2

Monitoring Well Log RM-MW-5S

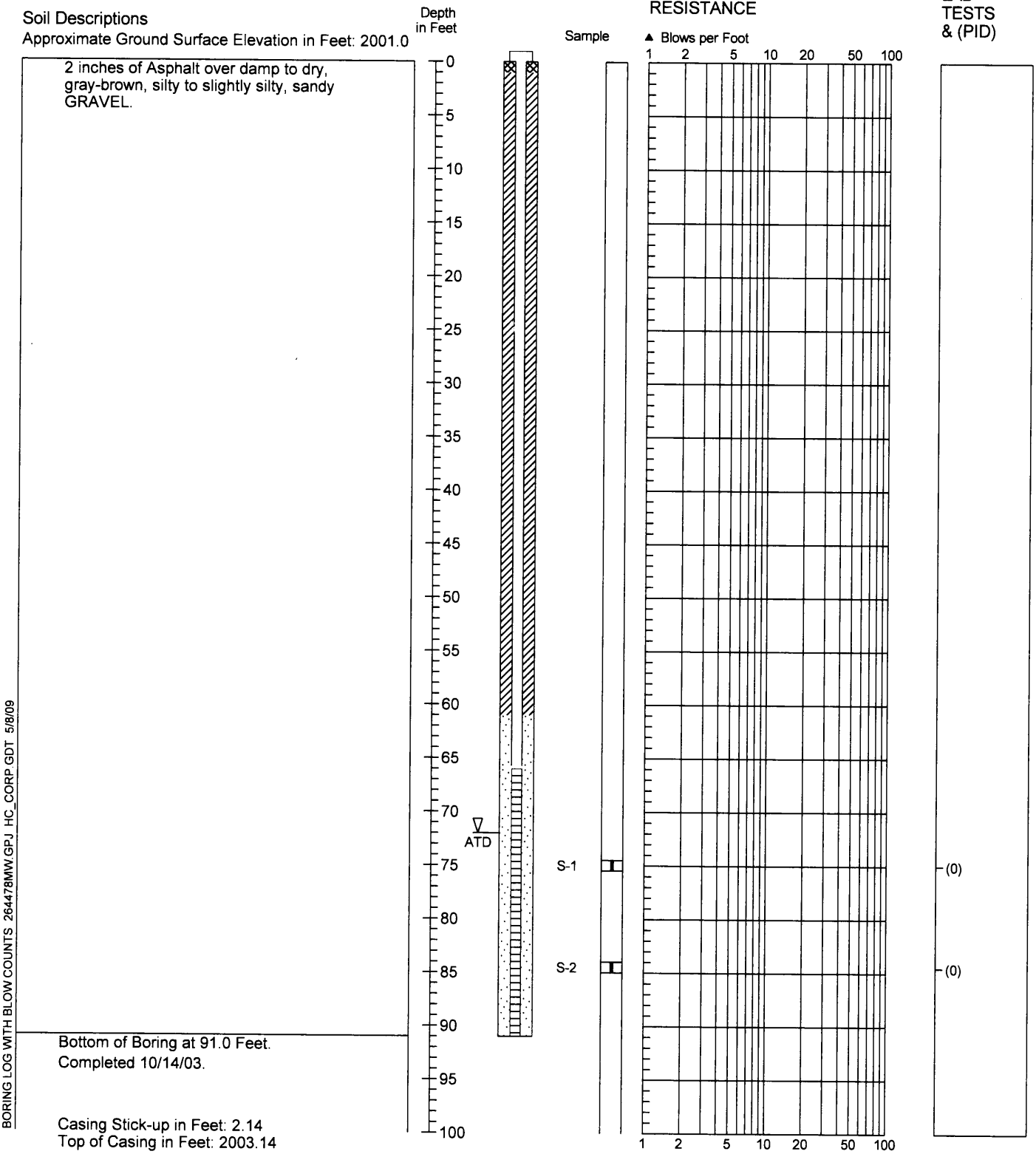
Northing (ft): 11414.8
Easting (ft): 11405.7

Soil Descriptions
Approximate Ground Surface Elevation in Feet: 2001.0

2 inches of Asphalt over damp to dry, gray-brown, silty to slightly silty, sandy GRAVEL.

Bottom of Boring at 91.0 Feet.
Completed 10/14/03.

Casing Stick-up in Feet: 2.14
Top of Casing in Feet: 2003.14



BORING LOG WITH BLOW COUNTS 264478MW.GPJ HC_CORP.GDT 5/8/09

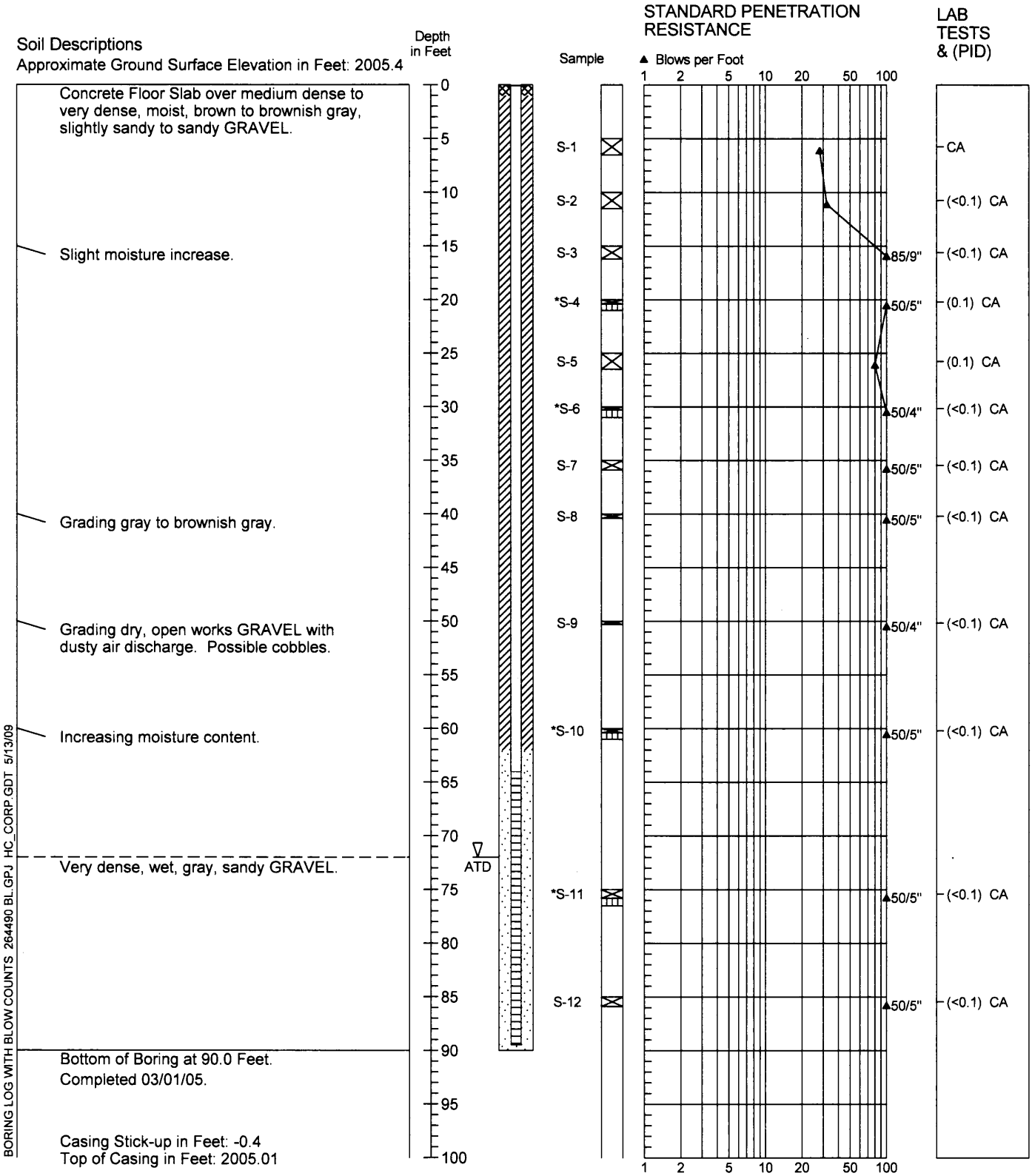
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-78 10/03

Figure A-34

Boring Log/Construction Data for Monitoring Well RM-MW-8S



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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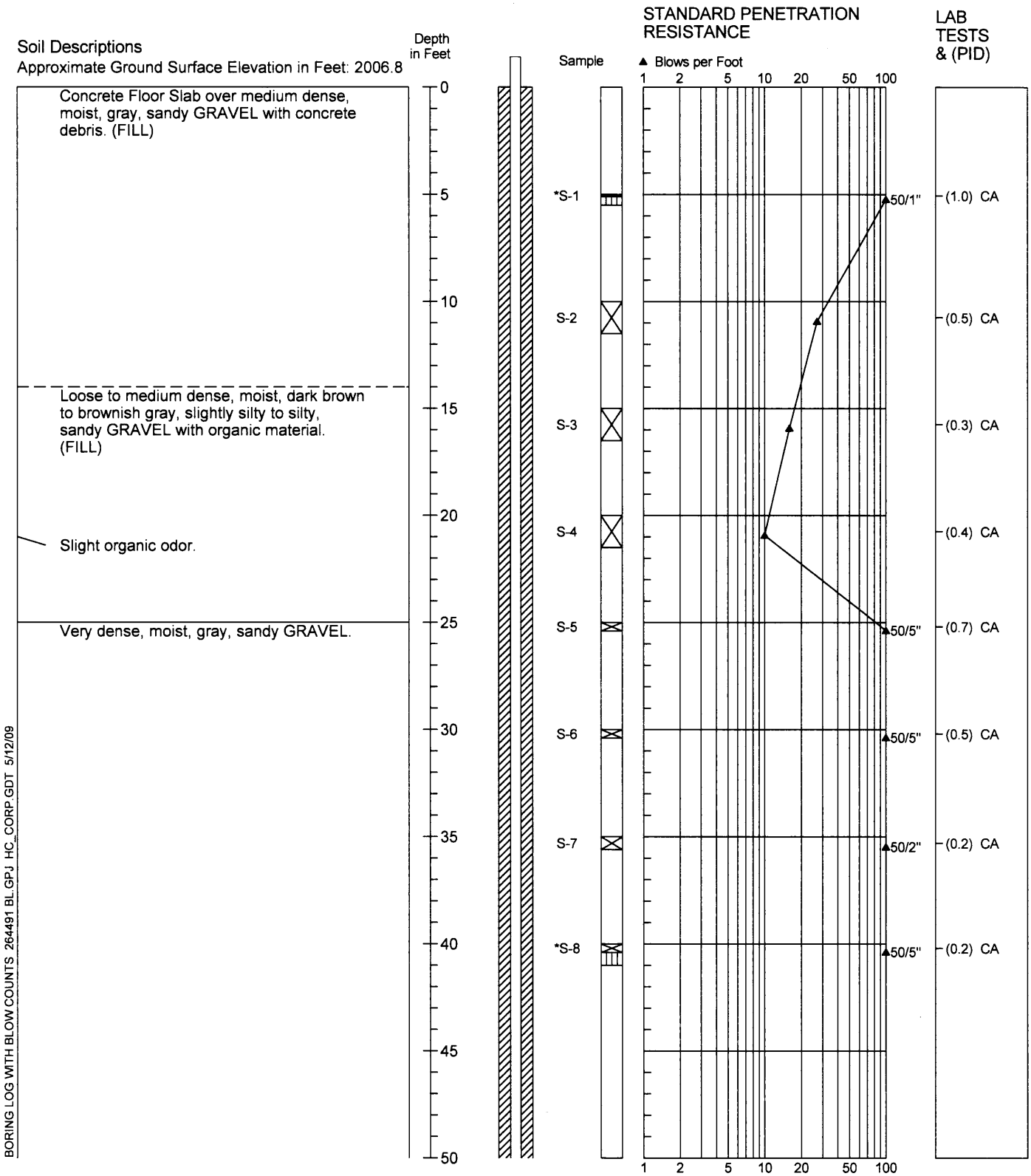
2644-90 *3/05*

Figure A-35

Boring Log/Construction Data for Monitoring Well RM-MW-9S

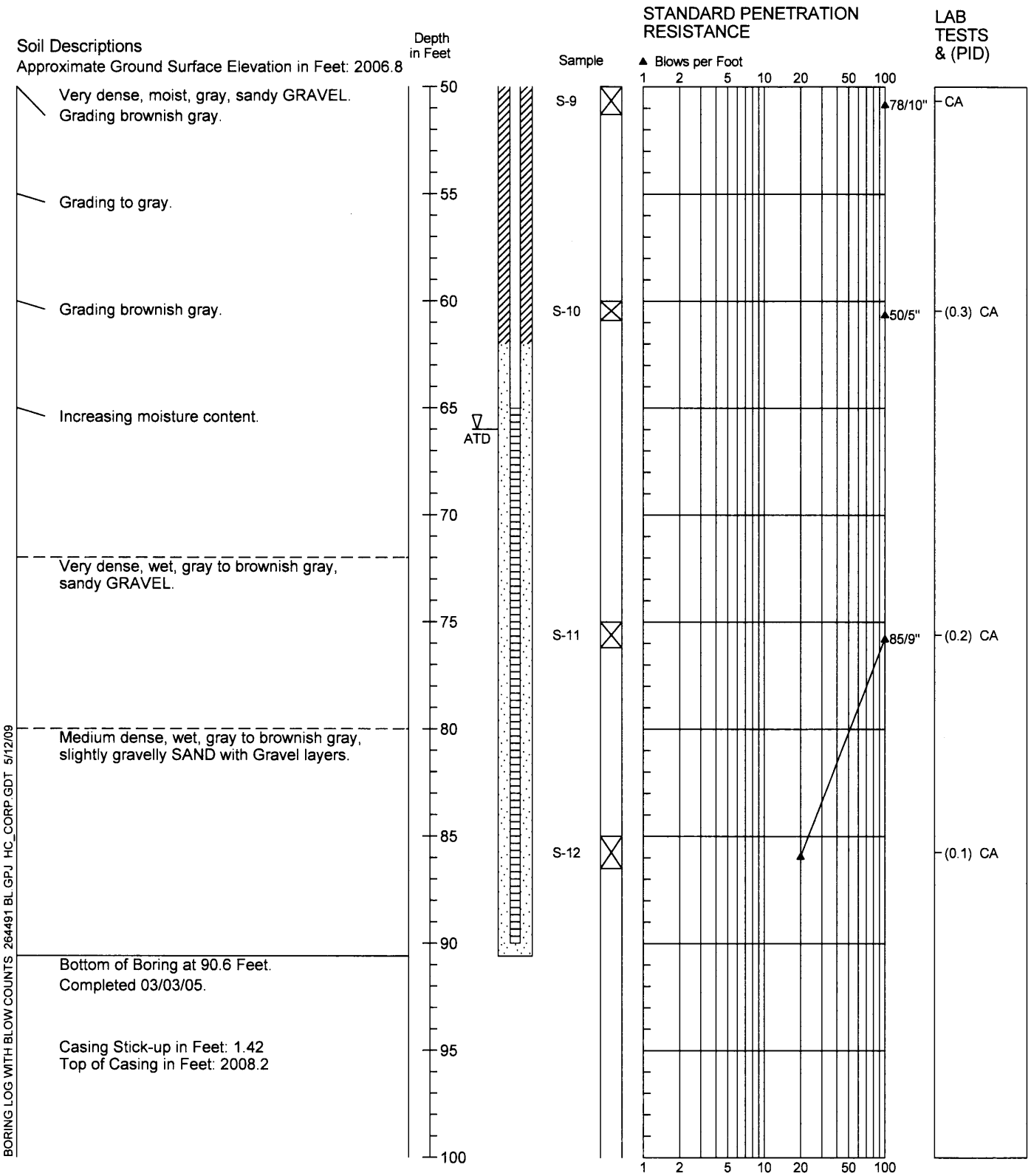


BORING LOG WITH BLOW COUNTS 264491 BL.GPJ HC_CORP.GDT 5/12/09

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

Boring Log/Construction Data for Monitoring Well RM-MW-9S



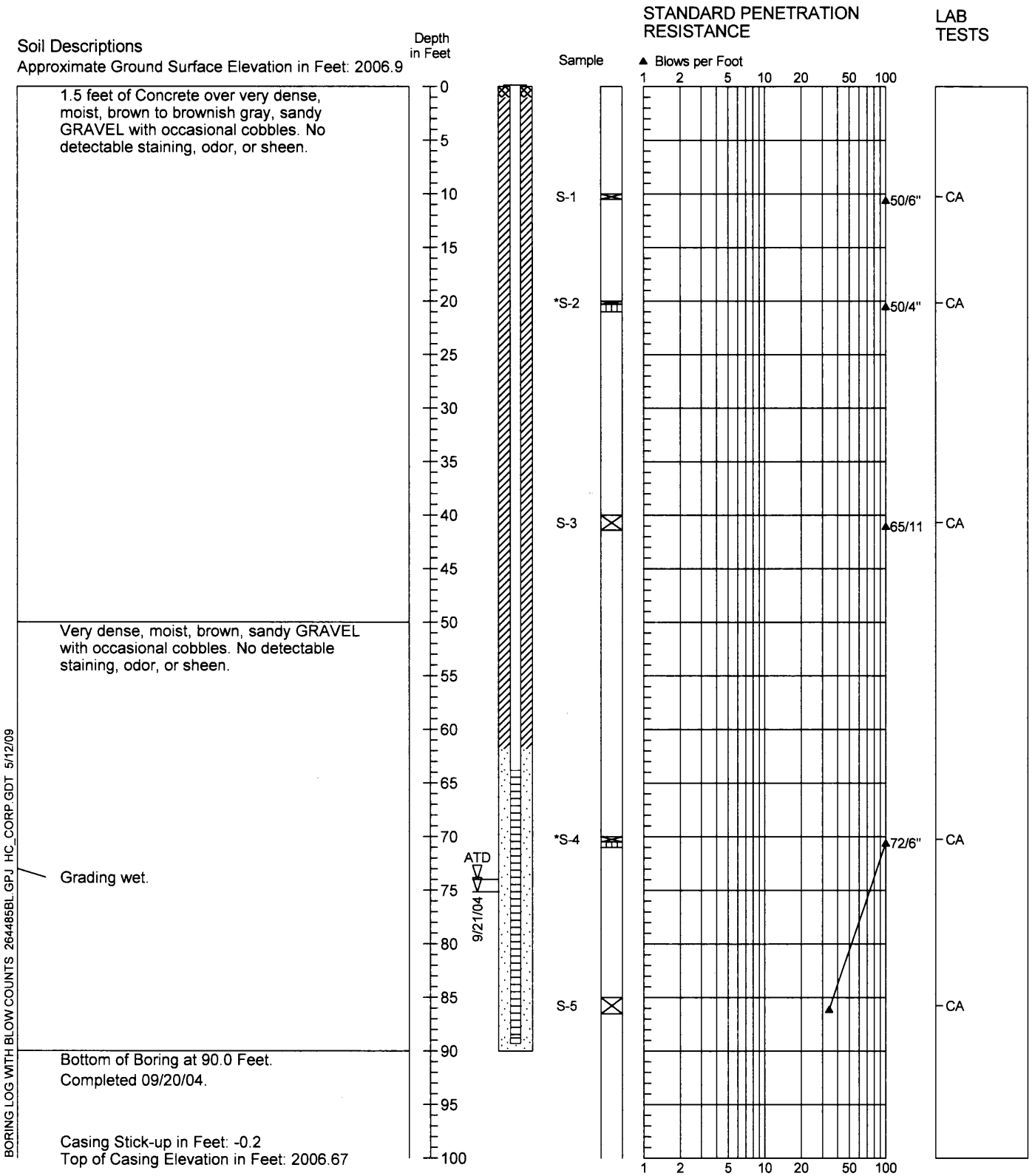
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-91 *3/05*

Figure A-36 *2/2*

Boring Log /Construction Data for Monitoring Well RM-MW-10S



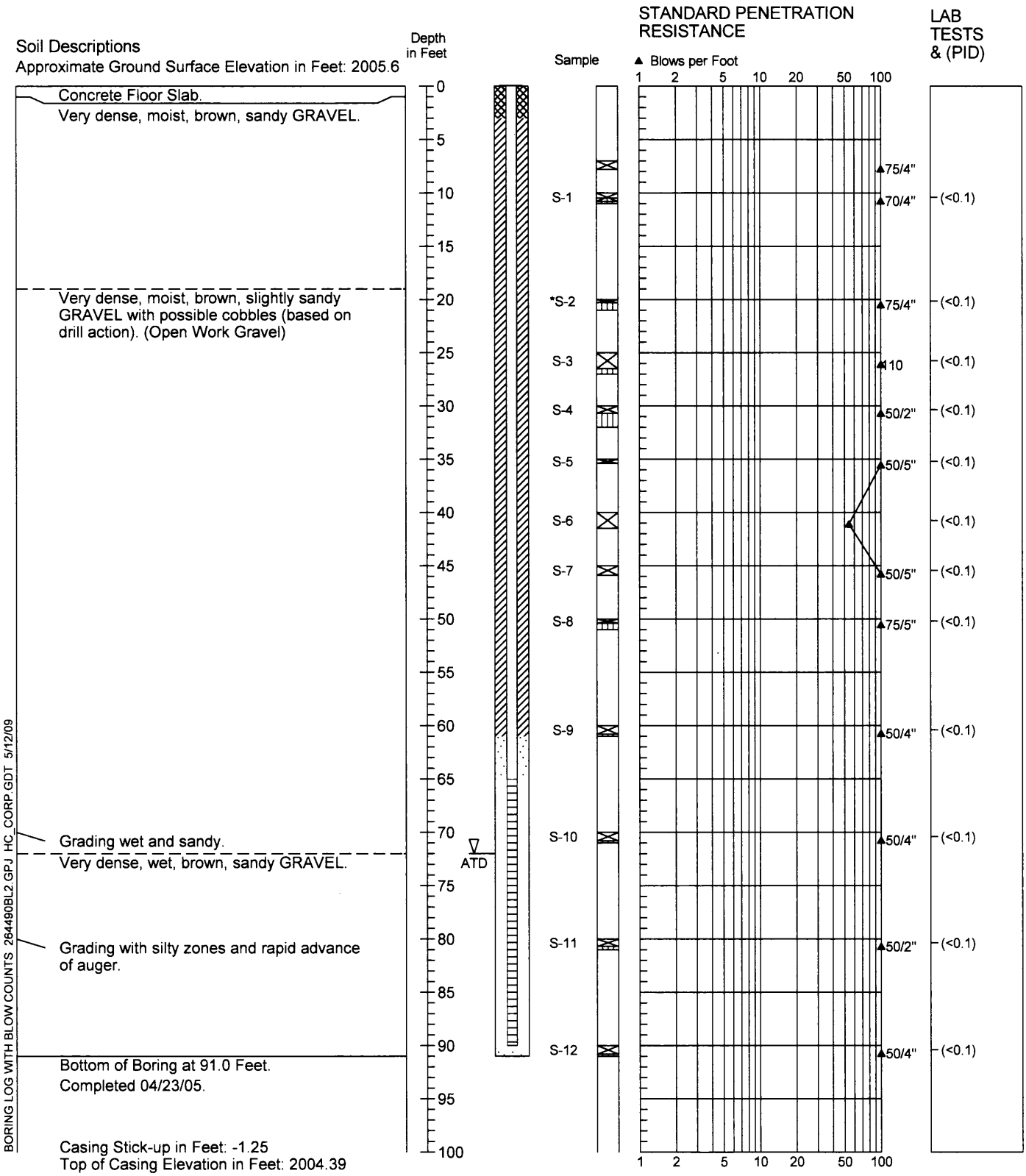
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-85 9/04

Figure A-37

Boring Log/Construction Data Monitoring Well RMSW-MW-11S



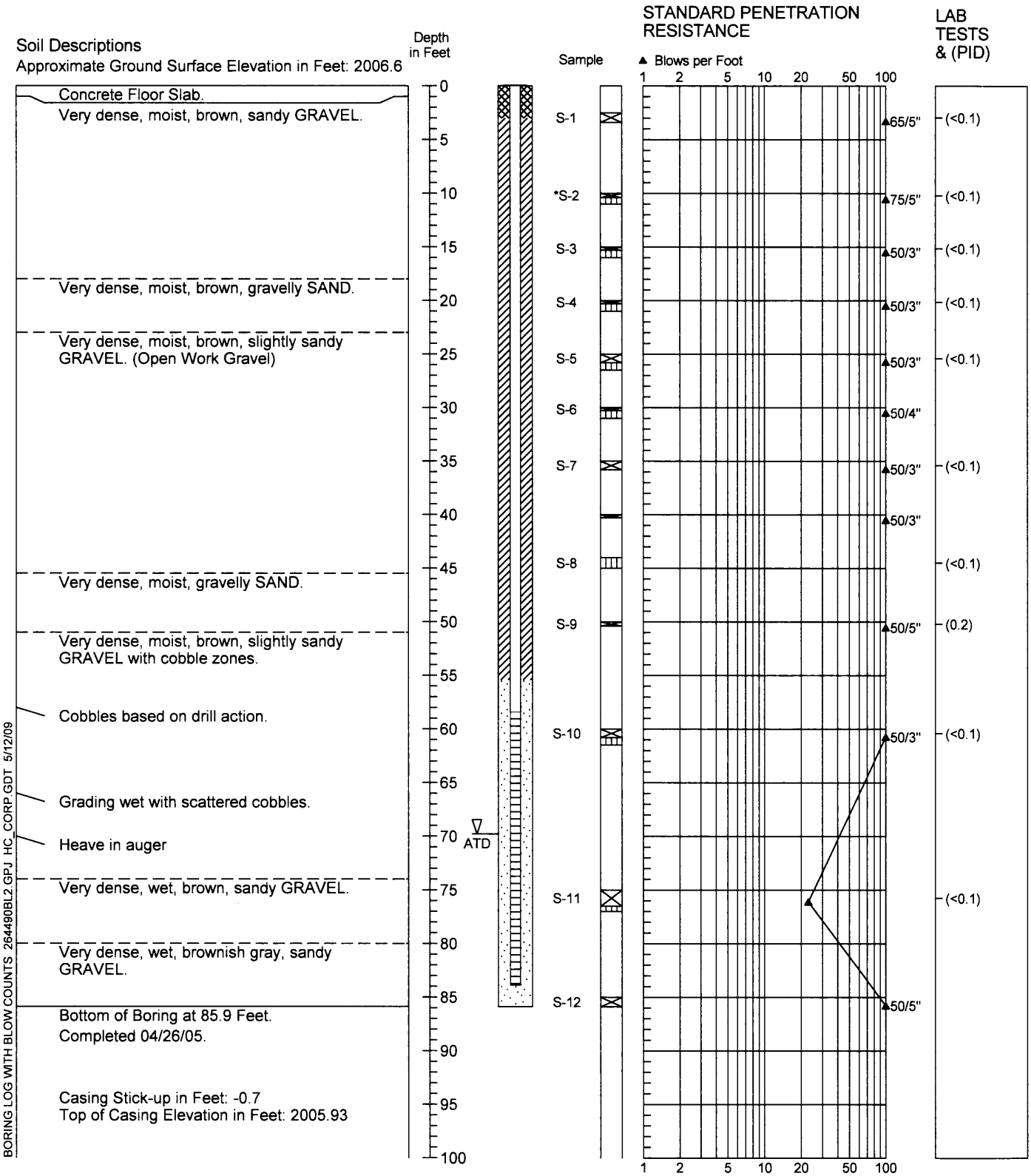
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Boring drilled on 73° slant relative to horizontal. Depths indicated are dimensions along slope, not vertical depths. Prepacked well screen installed and casing withdrawn allowing native material to collapse around screen below depth of 65 feet.

HARTCROWSER

2644-90 *4/05*

Figure A-38

Boring Log/Construction Data for Monitoring Well RM-MW-12S



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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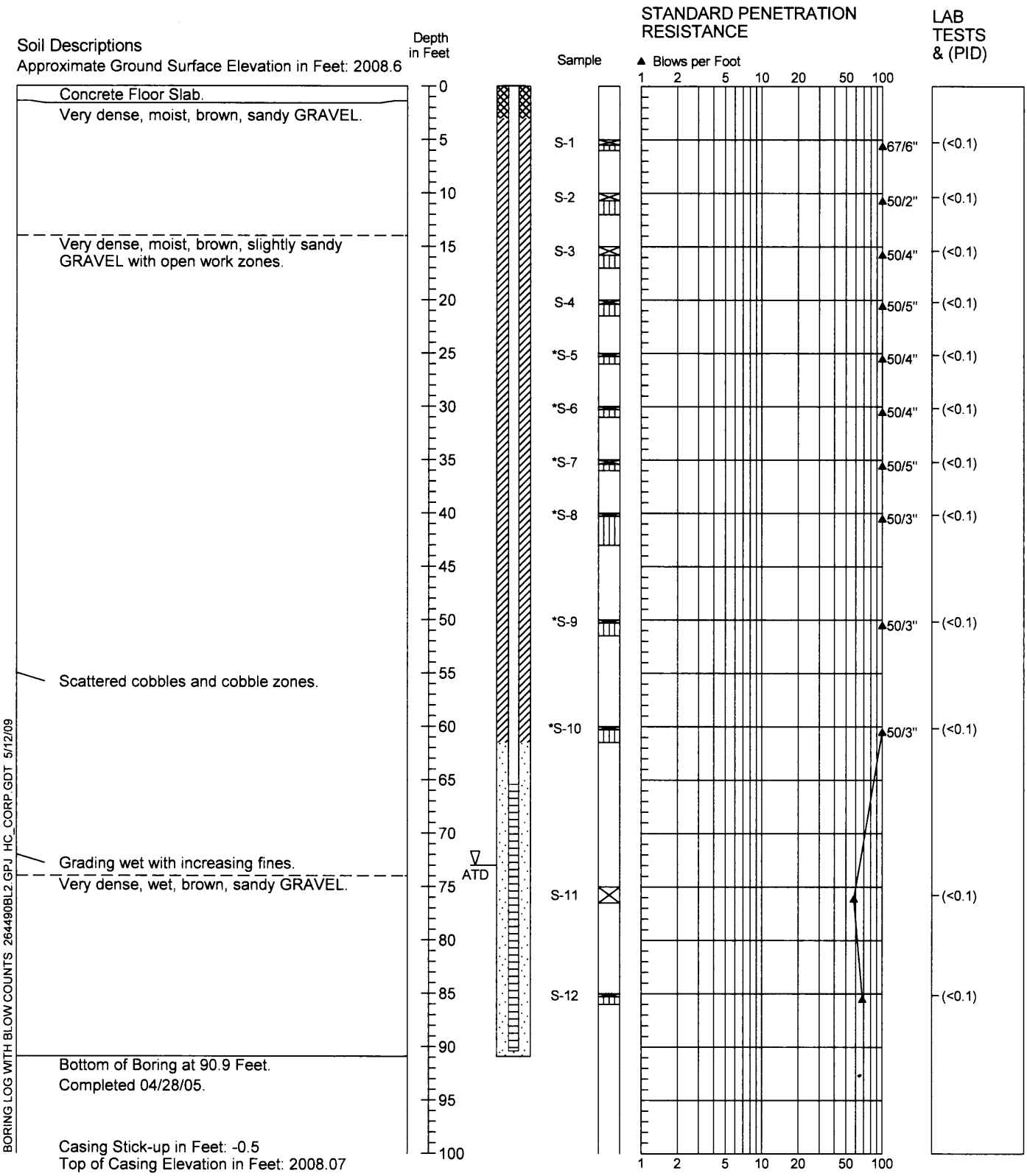
2644-90 **4/05**

Figure A-39

Boring Log/Construction Data for Monitoring Well RM-MW-13S



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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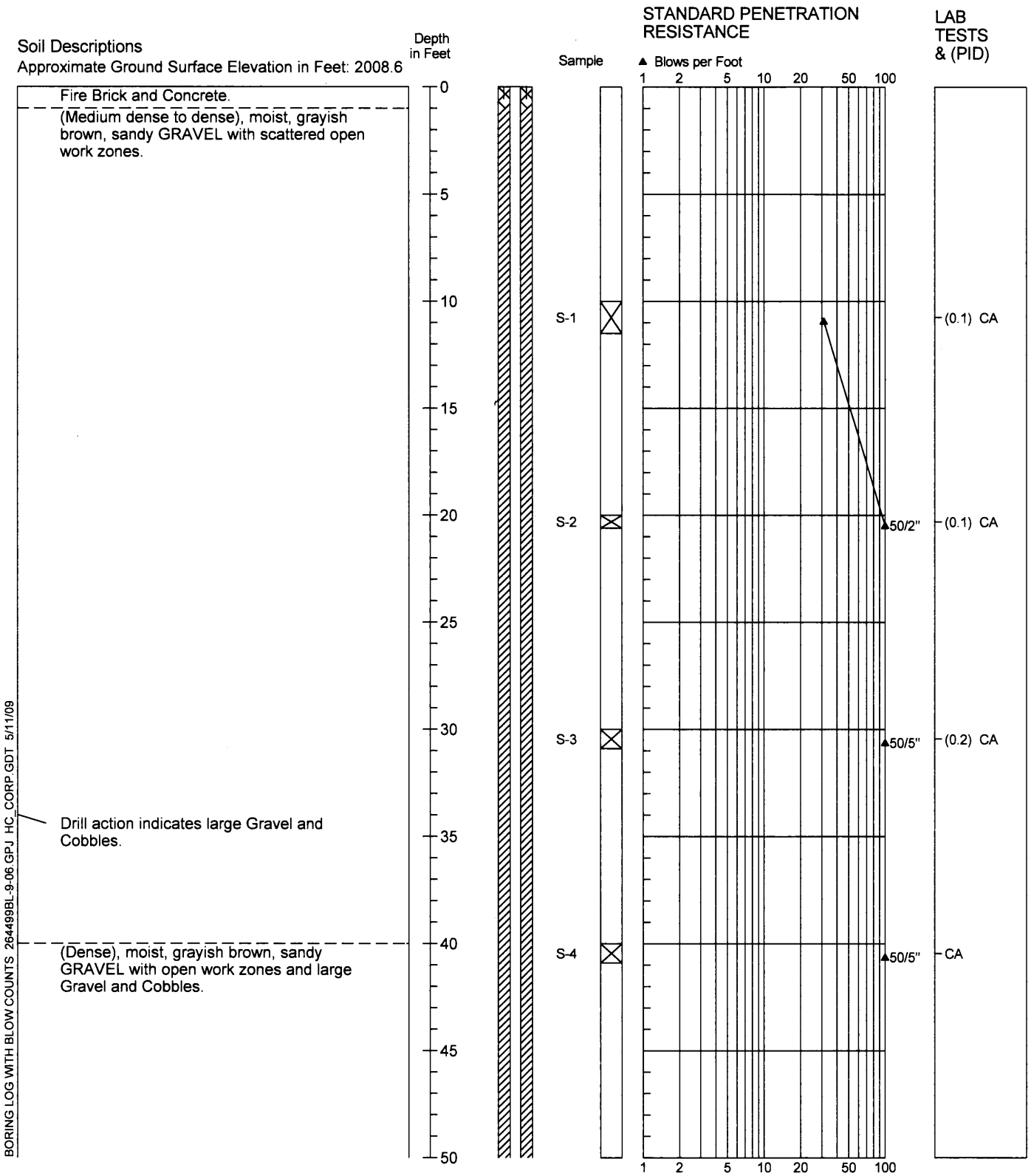
2644-90 4/05

Figure A-40

Boring Log/Construction Data for Monitoring Well RM-MW-14S



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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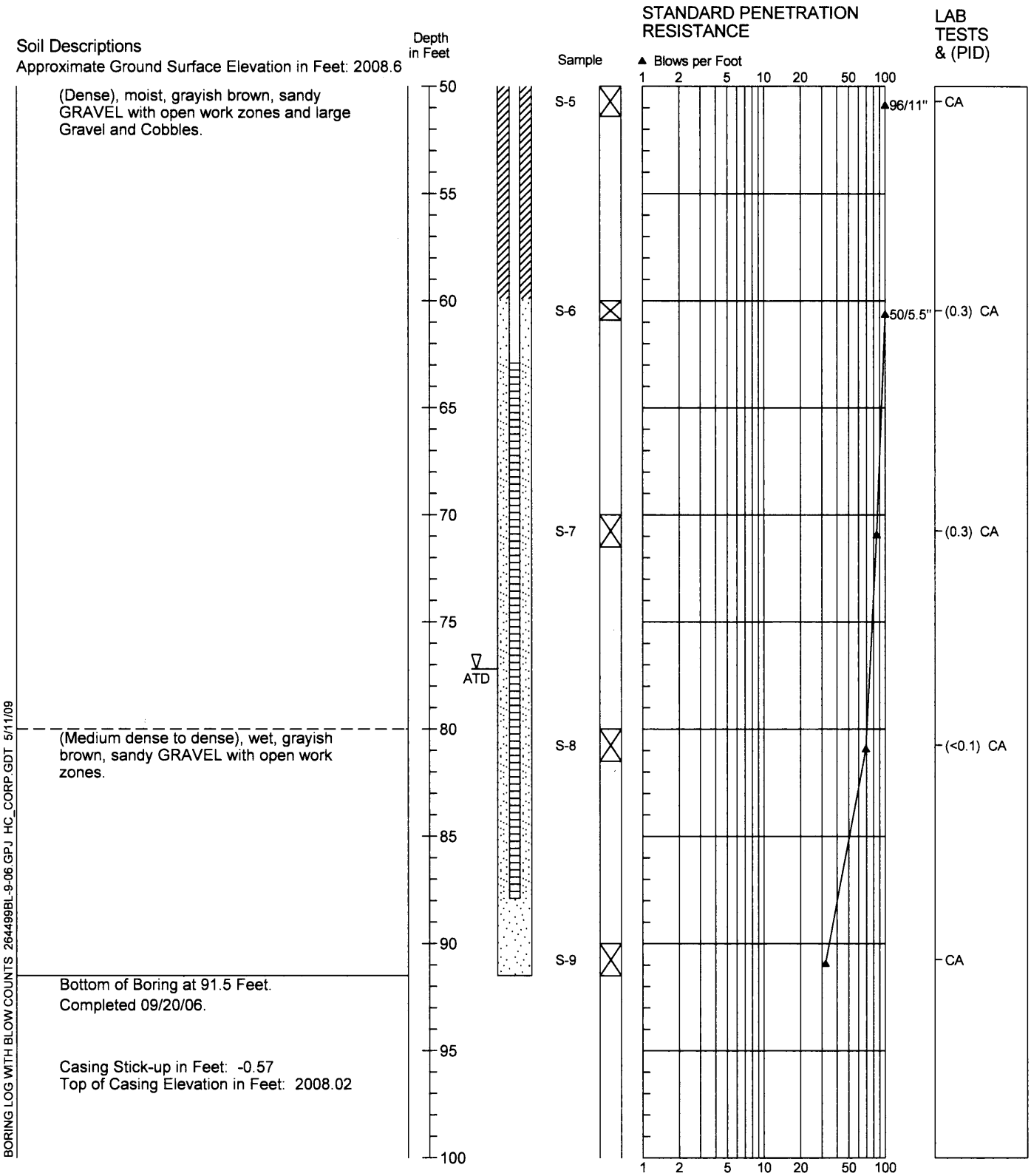
2644-99 *9/06*

Figure A-41 *1/2*

Boring Log/Construction Data for Monitoring Well RM-MW-14S



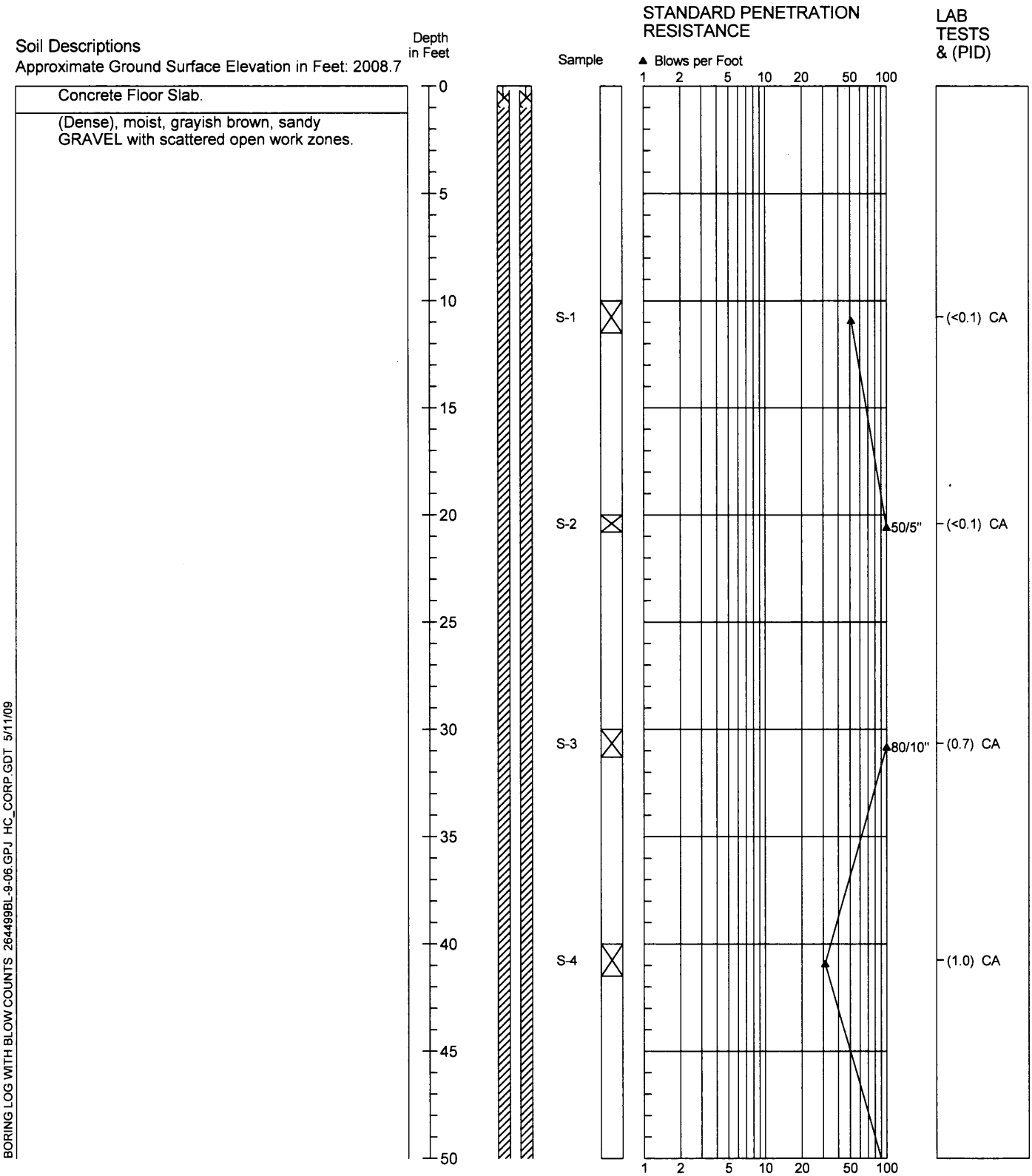
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 *9/06*

Figure A-41 *2/2*

Boring Log/Construction Data for Monitoring Well RM-MW-15S

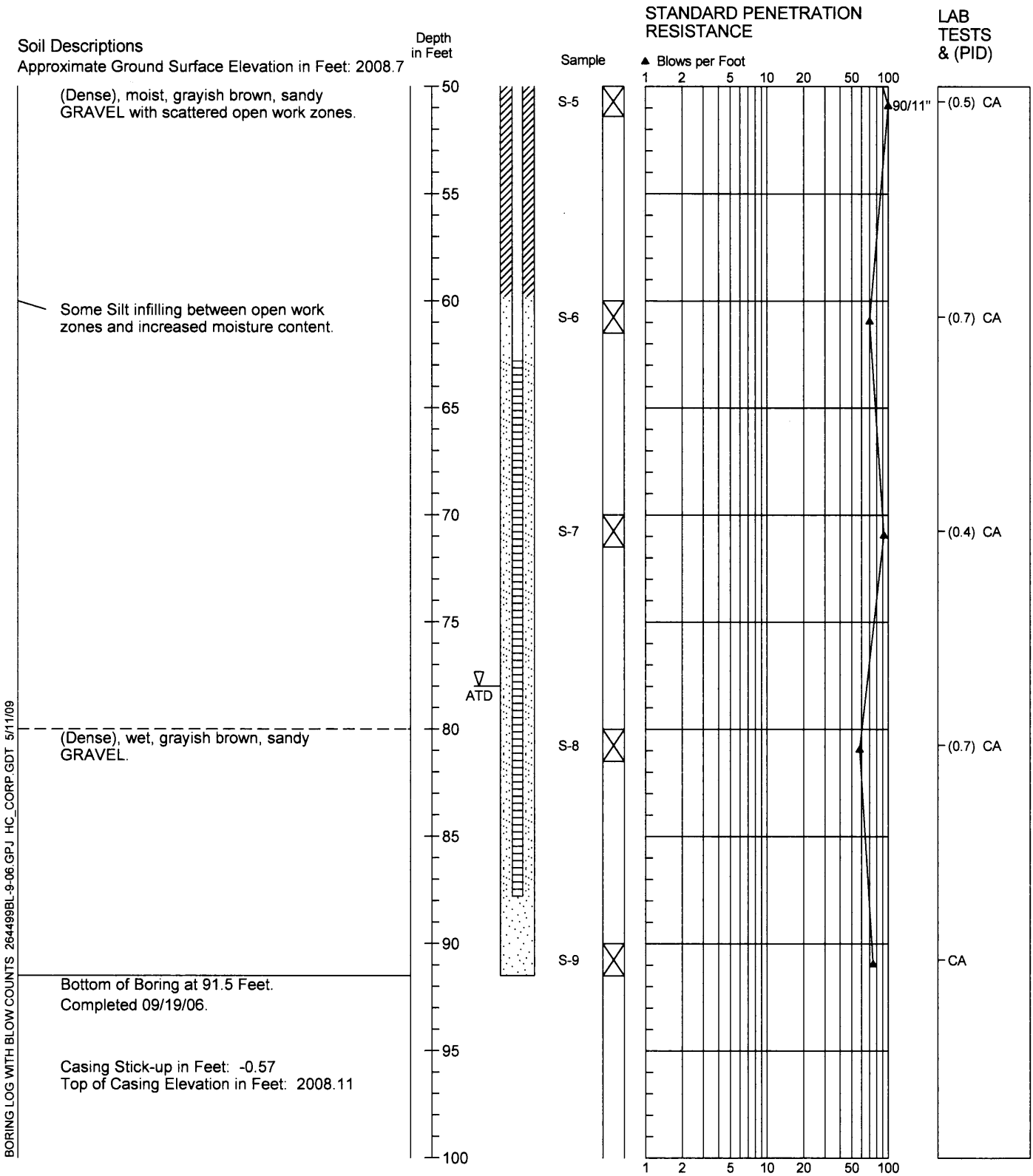


BORING LOG WITH BLOW COUNTS 264499BL-9-06.GPJ HC_CORP.GDT 5/11/09

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

Boring Log/Construction Data for Monitoring Well RM-MW-15S

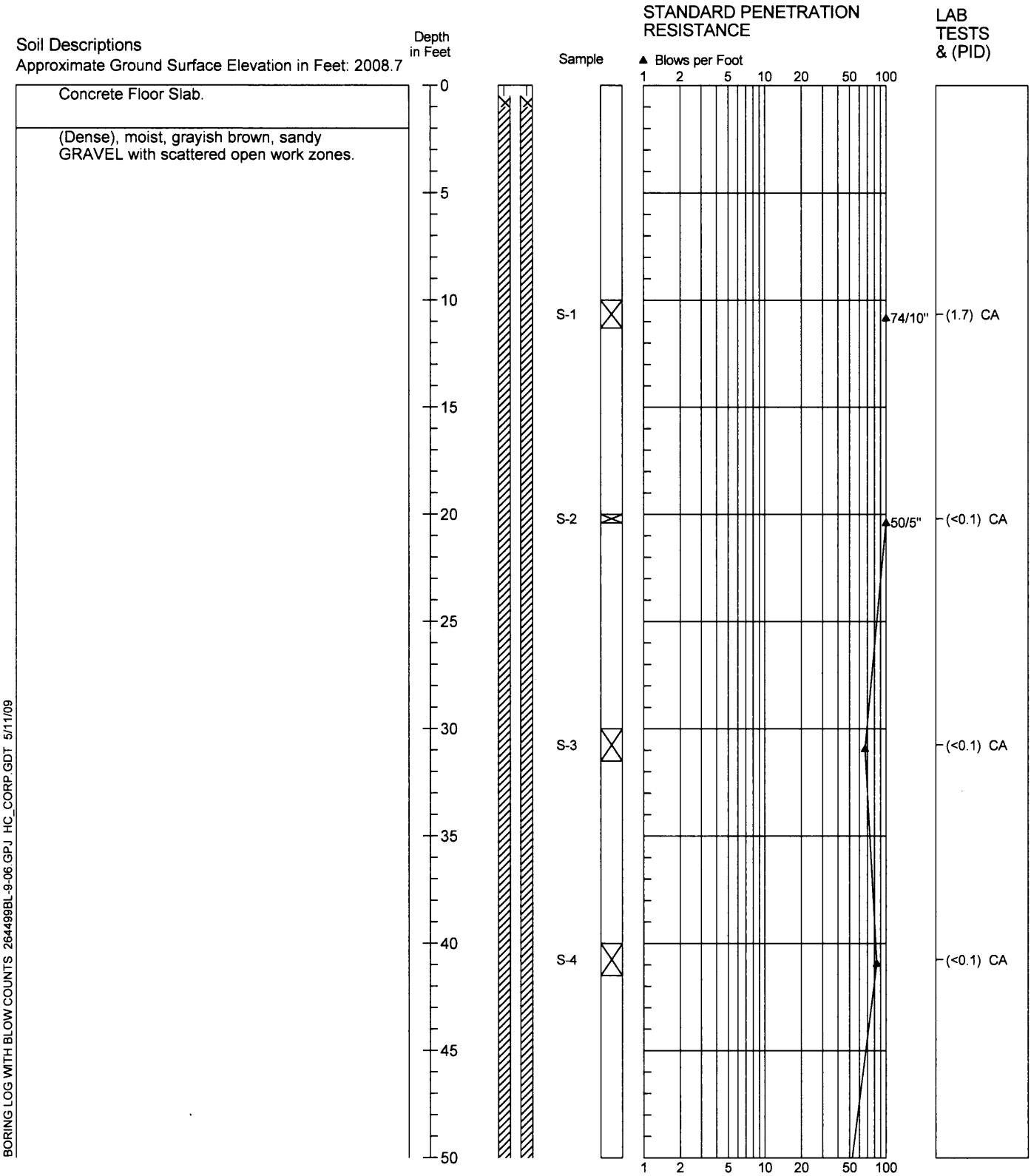


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99	*9/06*
Figure A-42	*2/2*

Boring Log/Construction Data for Monitoring Well RM-MW-16S



BORING LOG WITH BLOW COUNTS 264499BL-9-06.GPJ HC_CORP.GDT 5/11/09

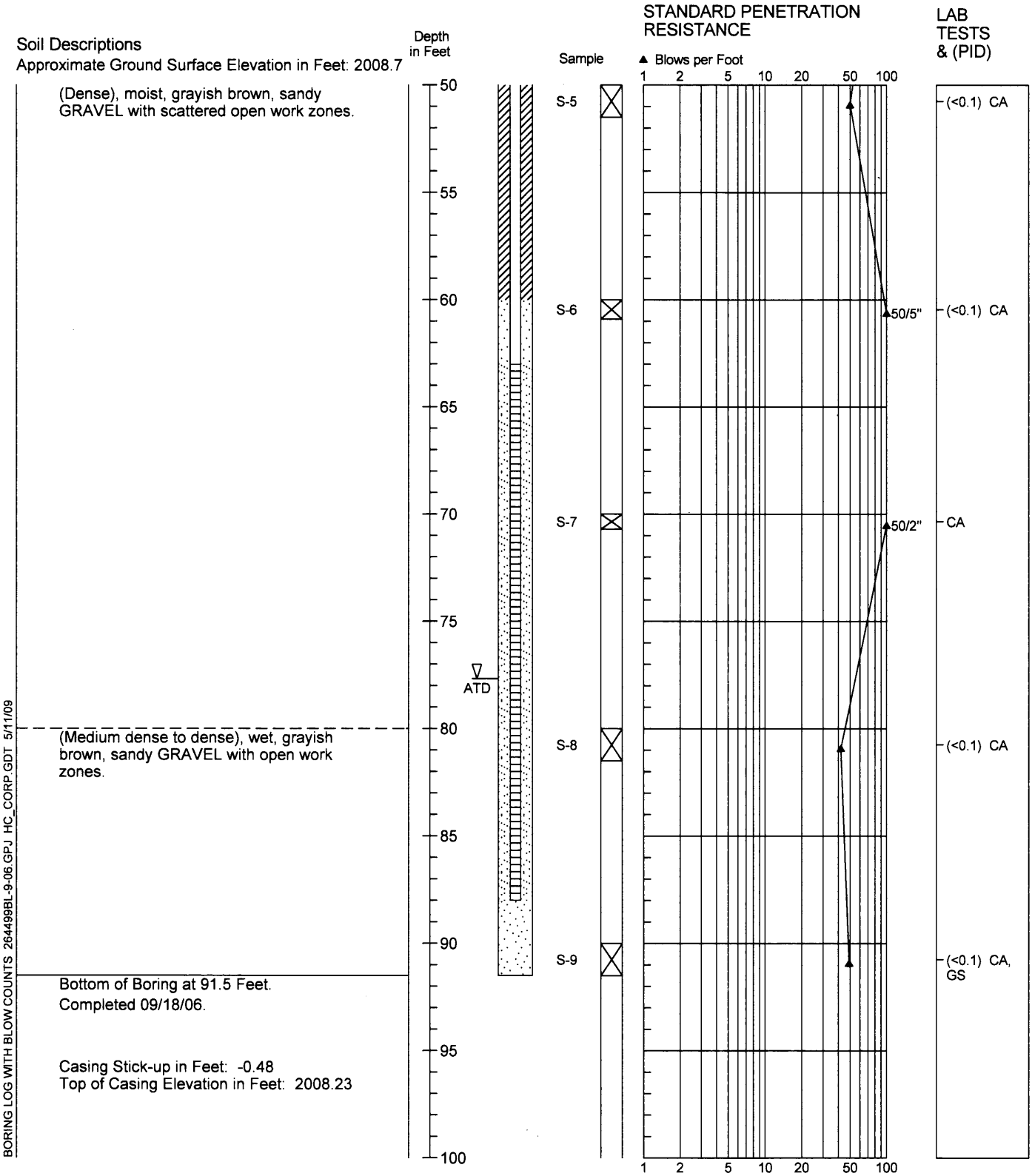
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 *9/06*

Figure A-43 *1/2*

Boring Log/Construction Data for Monitoring Well RM-MW-16S



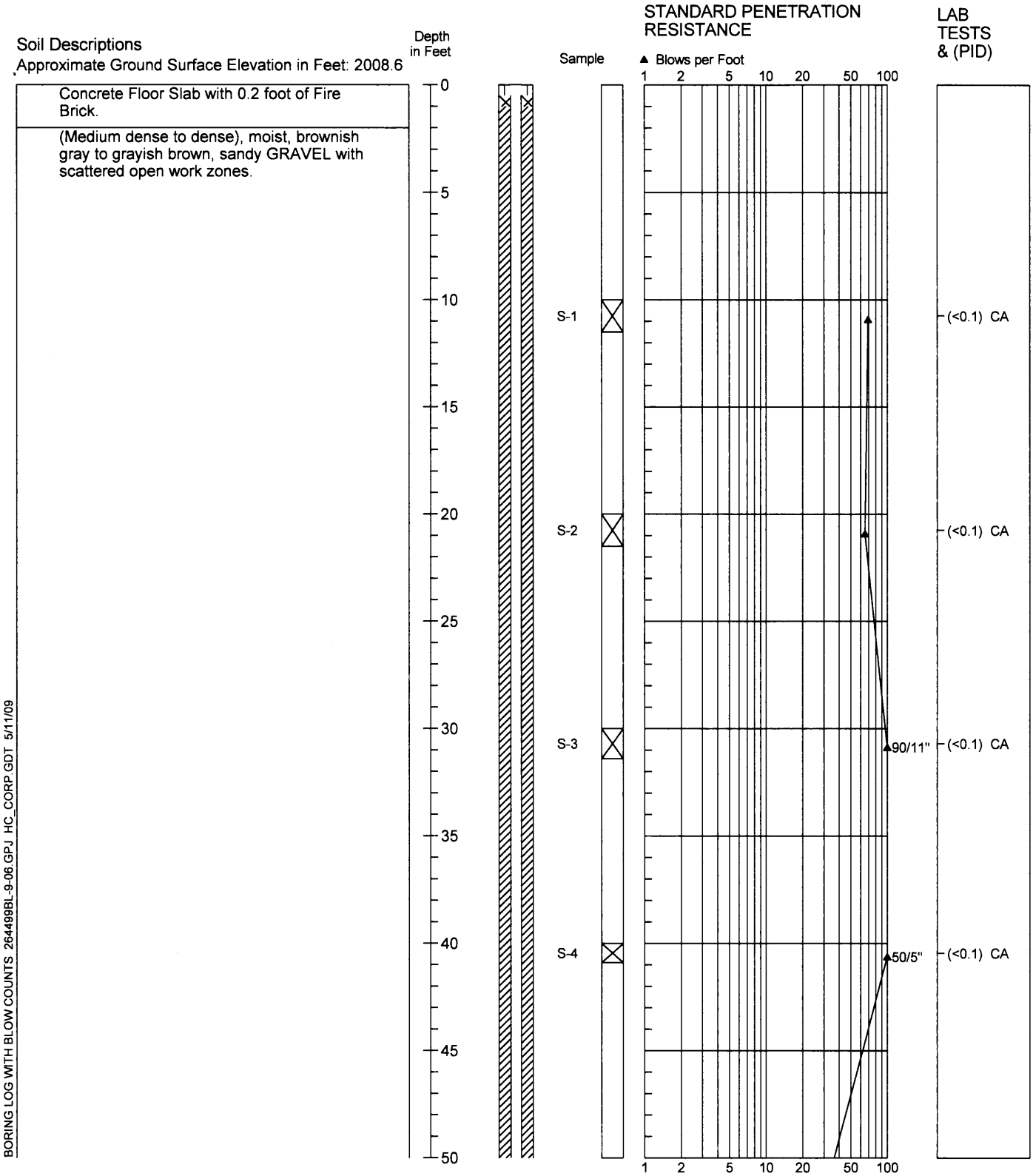
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 *9/06*

Figure A-43 *2/2*

Boring Log/Construction Data for Monitoring Well RM-MW-17S



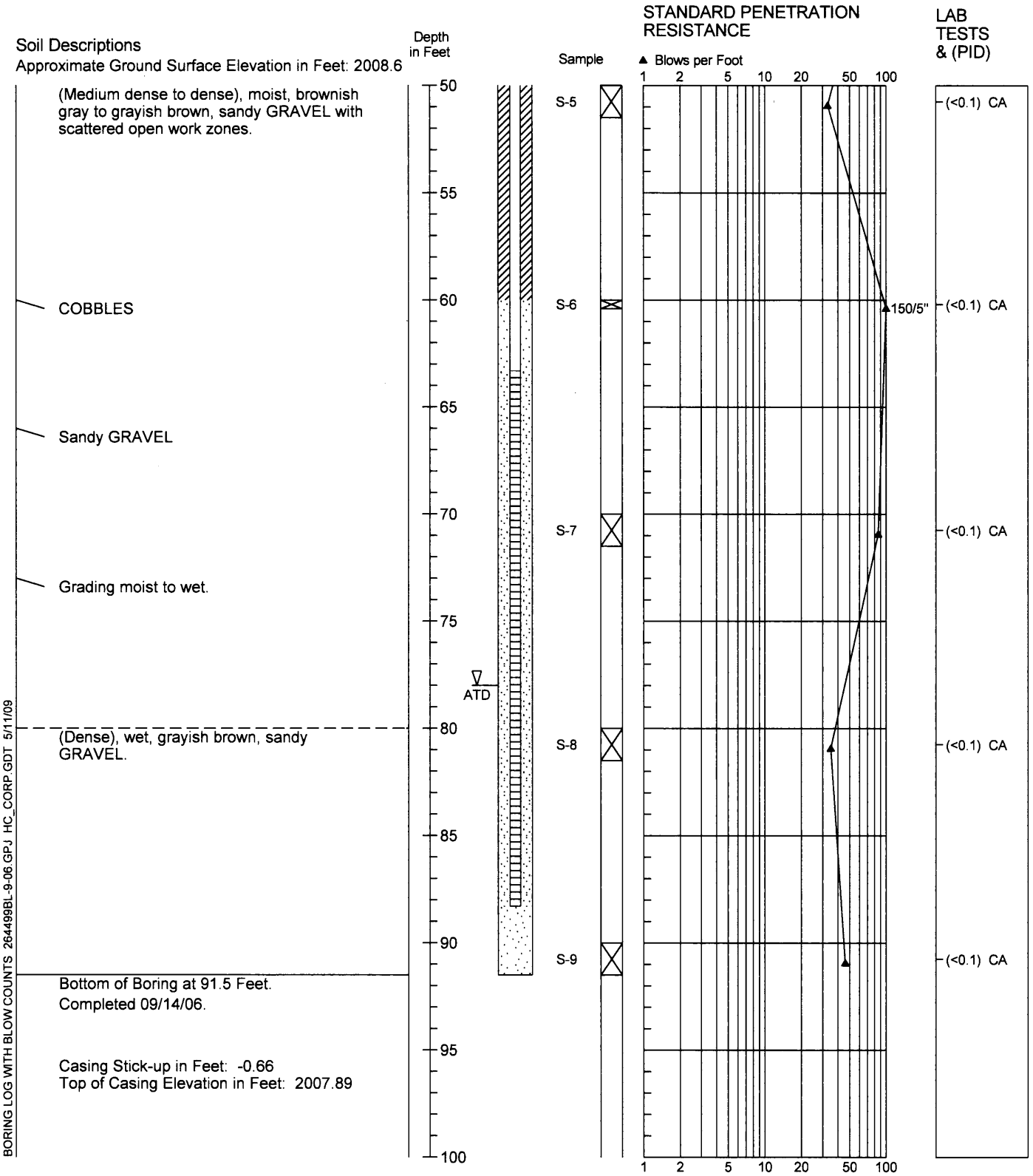
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 *9/06*

Figure A-44 *1/2*

Boring Log/Construction Data for Monitoring Well RM-MW-17S

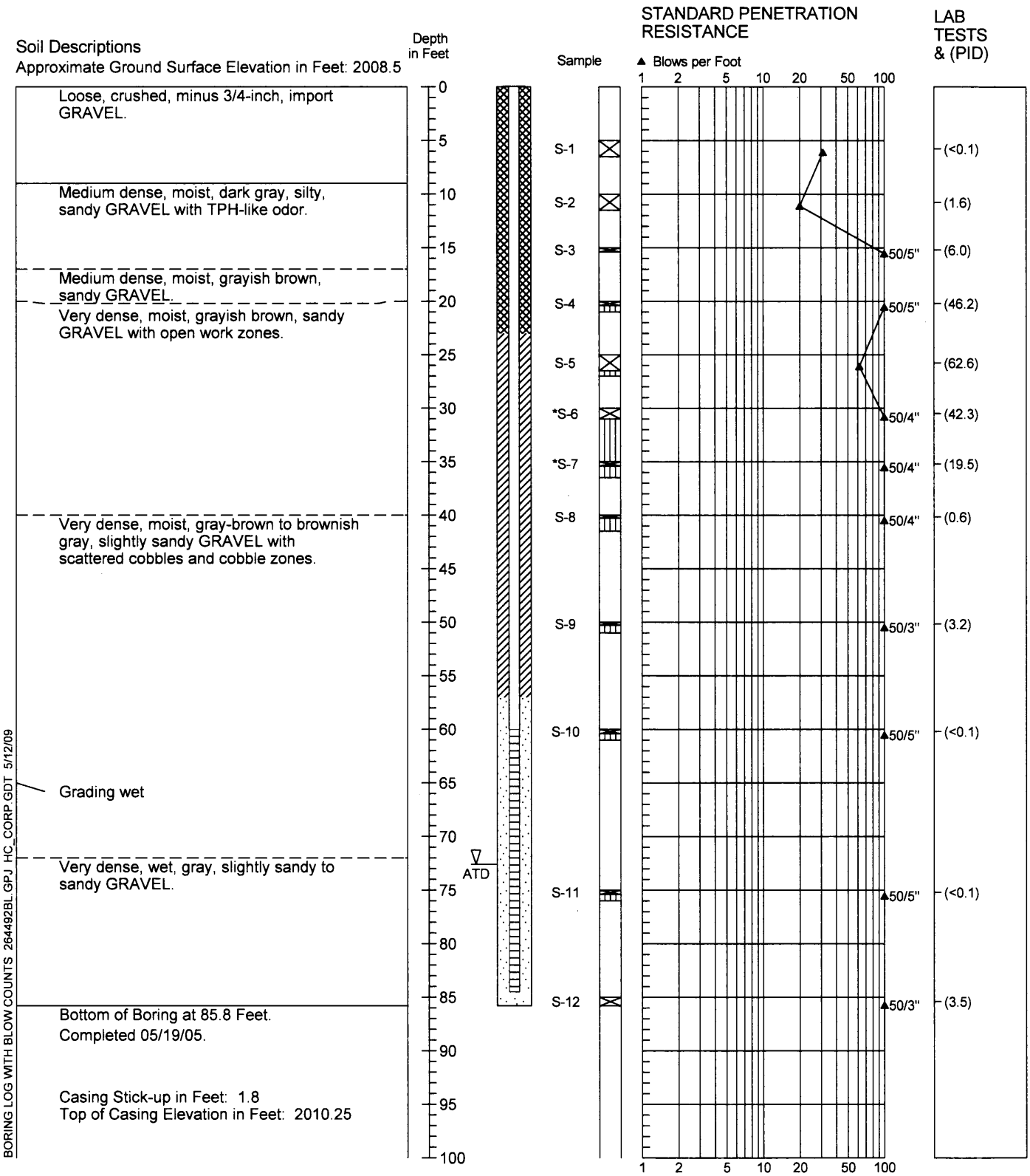


1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99	9/06
Figure A-44	2/2

Boring Log/Construction Data for Monitoring Well TS-MW-1S



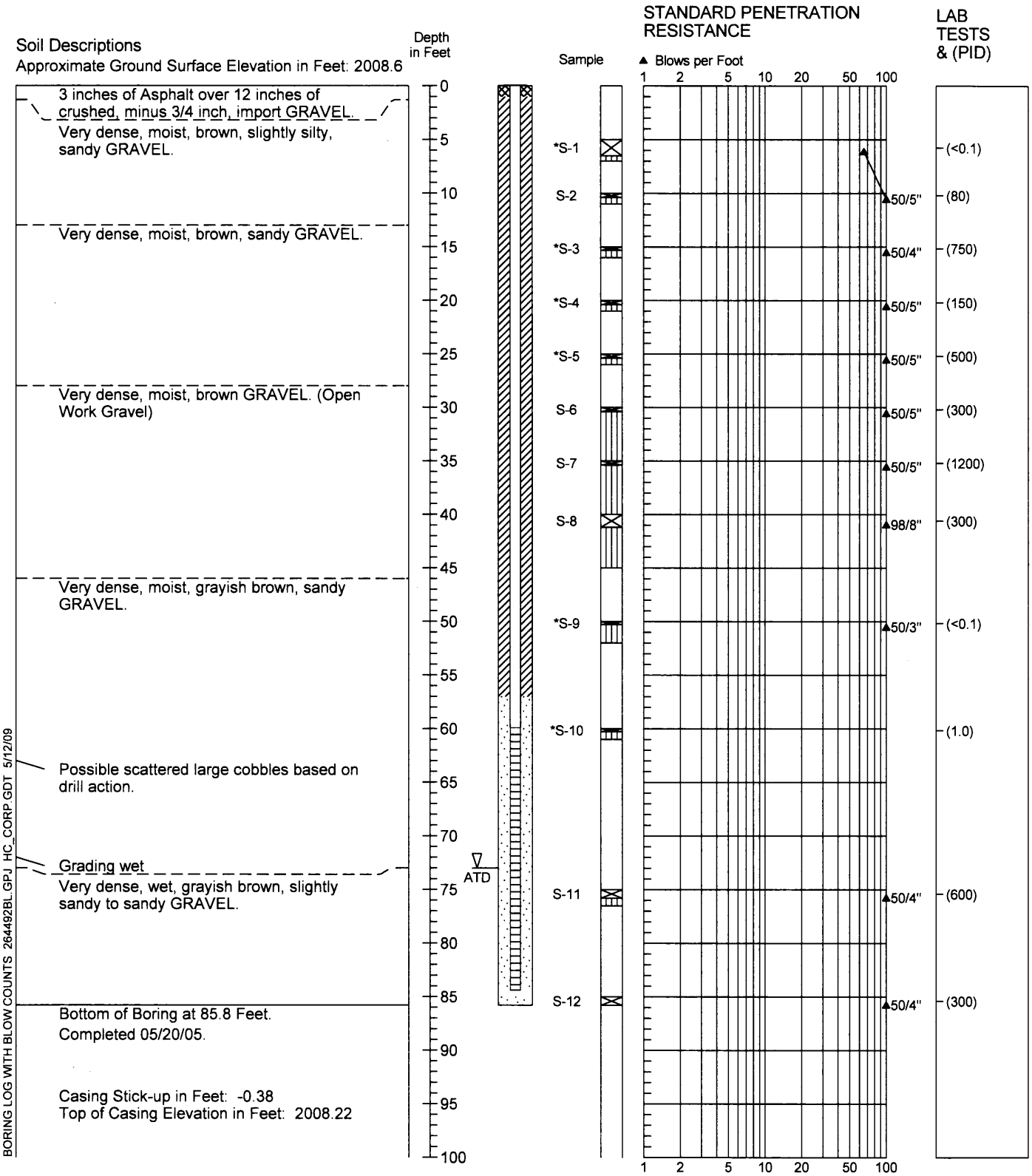
1. Refer to Figure B-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
4. Boring drilled to depth of 17 feet and abandoned with second boring drilled 4.5 feet to the south. Second boring drilled unsampled to depth of 15 feet with no recovery at that depth. Samples S-4 on are from second boring.

HARTCROWSER

2644-92 *5/05*

Figure A-45

Boring Log/Construction Data for Monitoring Well TS-MW-2S



1. Refer to Figure B-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.
4. PID readings not consistent with field observations and laboratory data.

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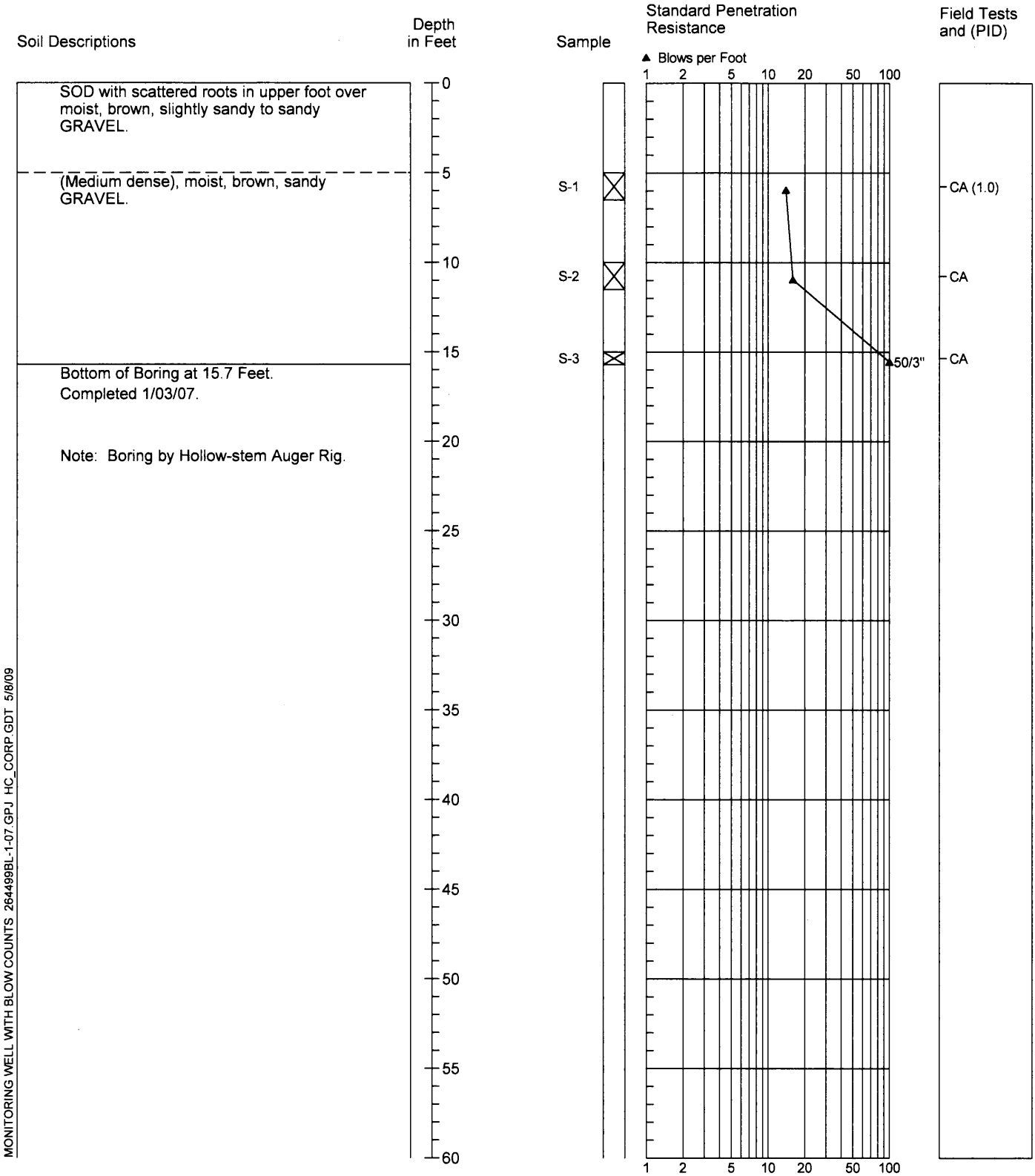
2644-92 *5/05*

Figure A-46

Boring Log CM-TL-SB-1



MONITORING WELL WITH BLOW COUNTS 264499BL-1-07.GPJ HC_CORP.GDT 5/8/09

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

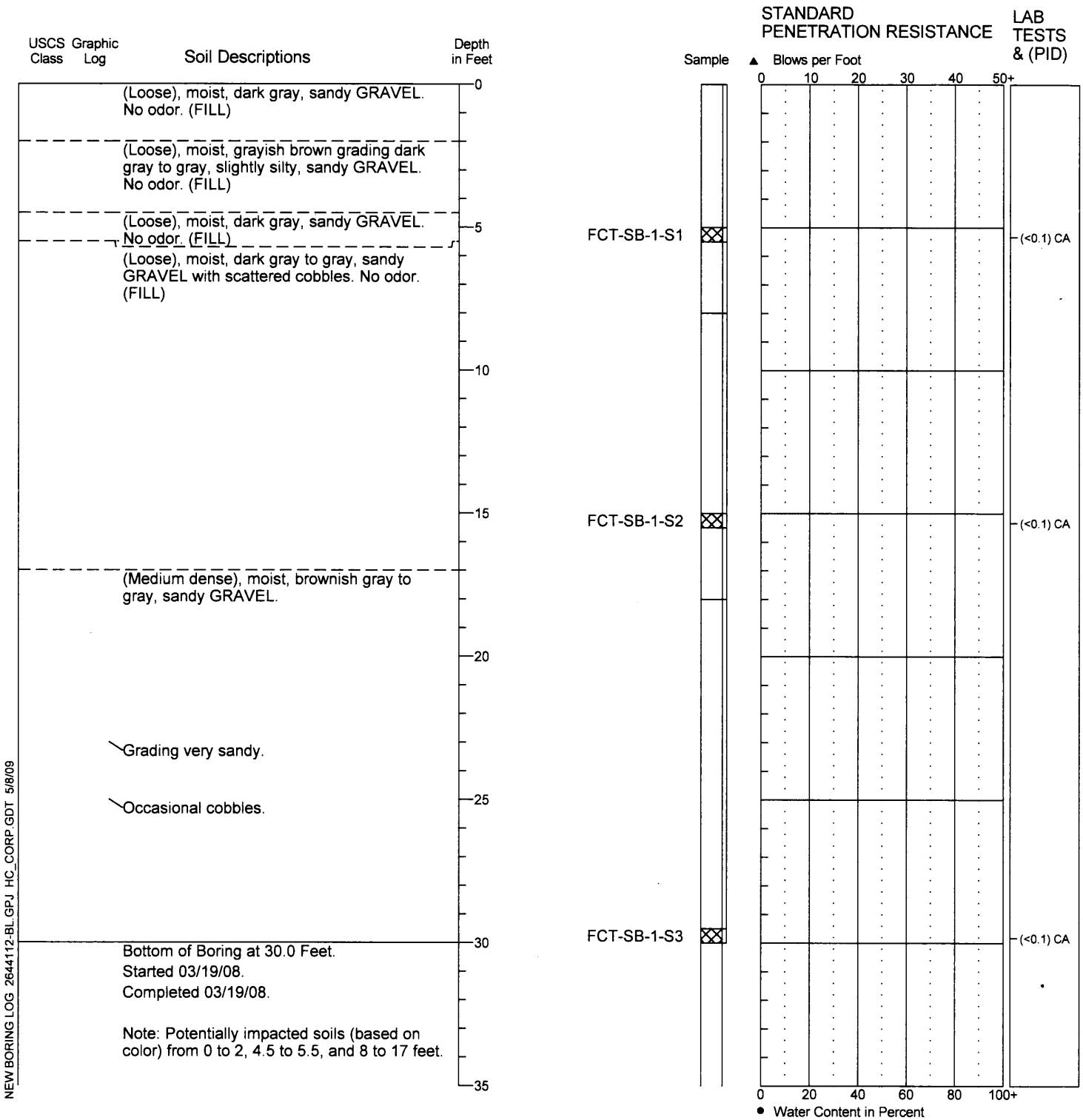
2644-99 **1/07**

Figure A-47

Boring Log FCT-SB-1

Location: See Figure 6-3.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic (Schramm T-300M)
Hammer Type: 4" I.D. Sample Barrel
Hole Diameter: 4 inches
Logged By: B. McDonald Reviewed By: A. Conrad



NEW BORING LOG 2644112-BL.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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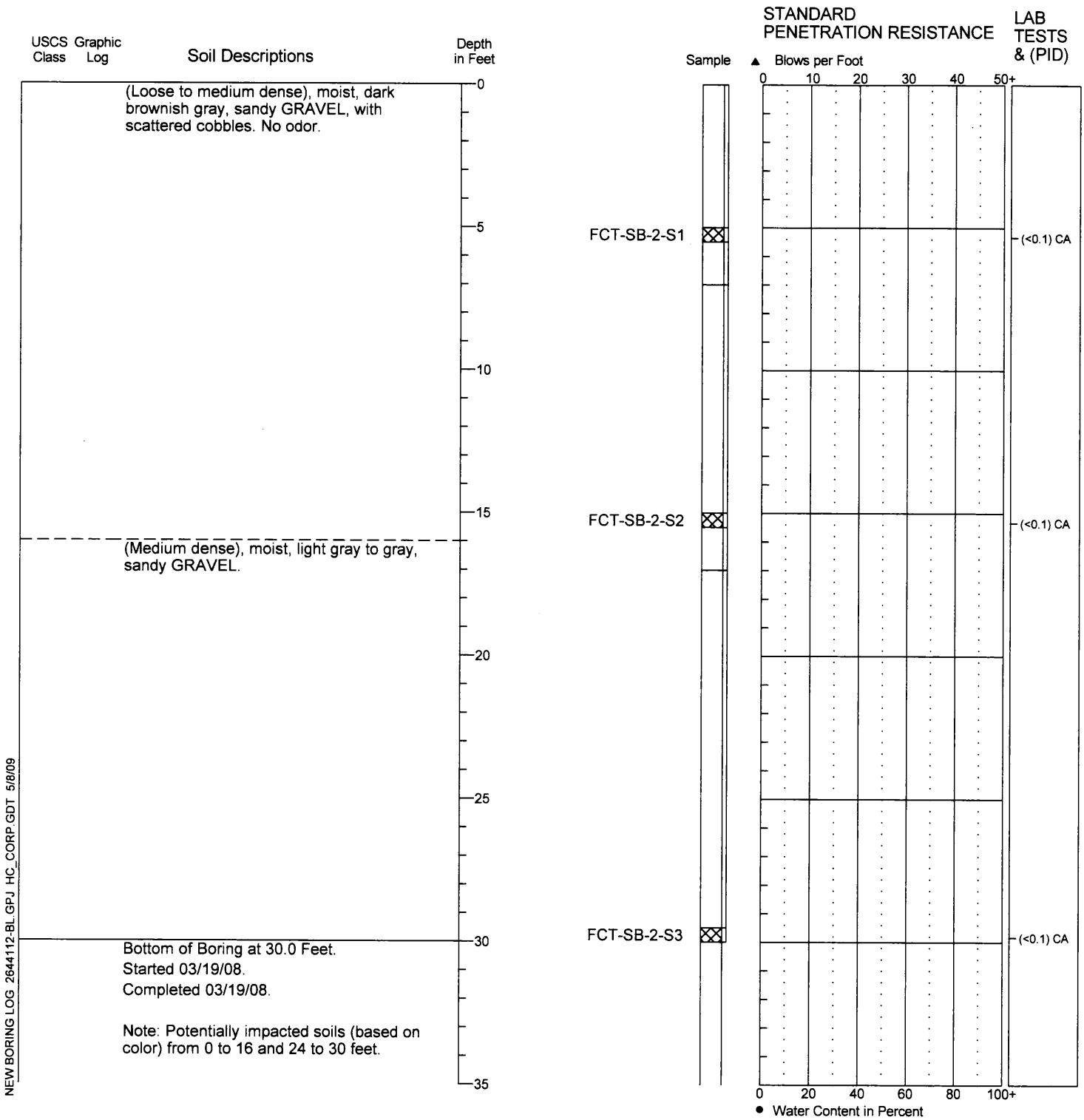
2644-112 **3/08**

Figure A-48

Boring Log FCT-SB-2

Location: See Figure 6-3.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic (Schramm T-300M)
Hammer Type: 4" I.D. Sample Barrel
Hole Diameter: 4 inches
Logged By: B. McDonald Reviewed By: A. Conrad



NEW BORING LOG 2644112-BL.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

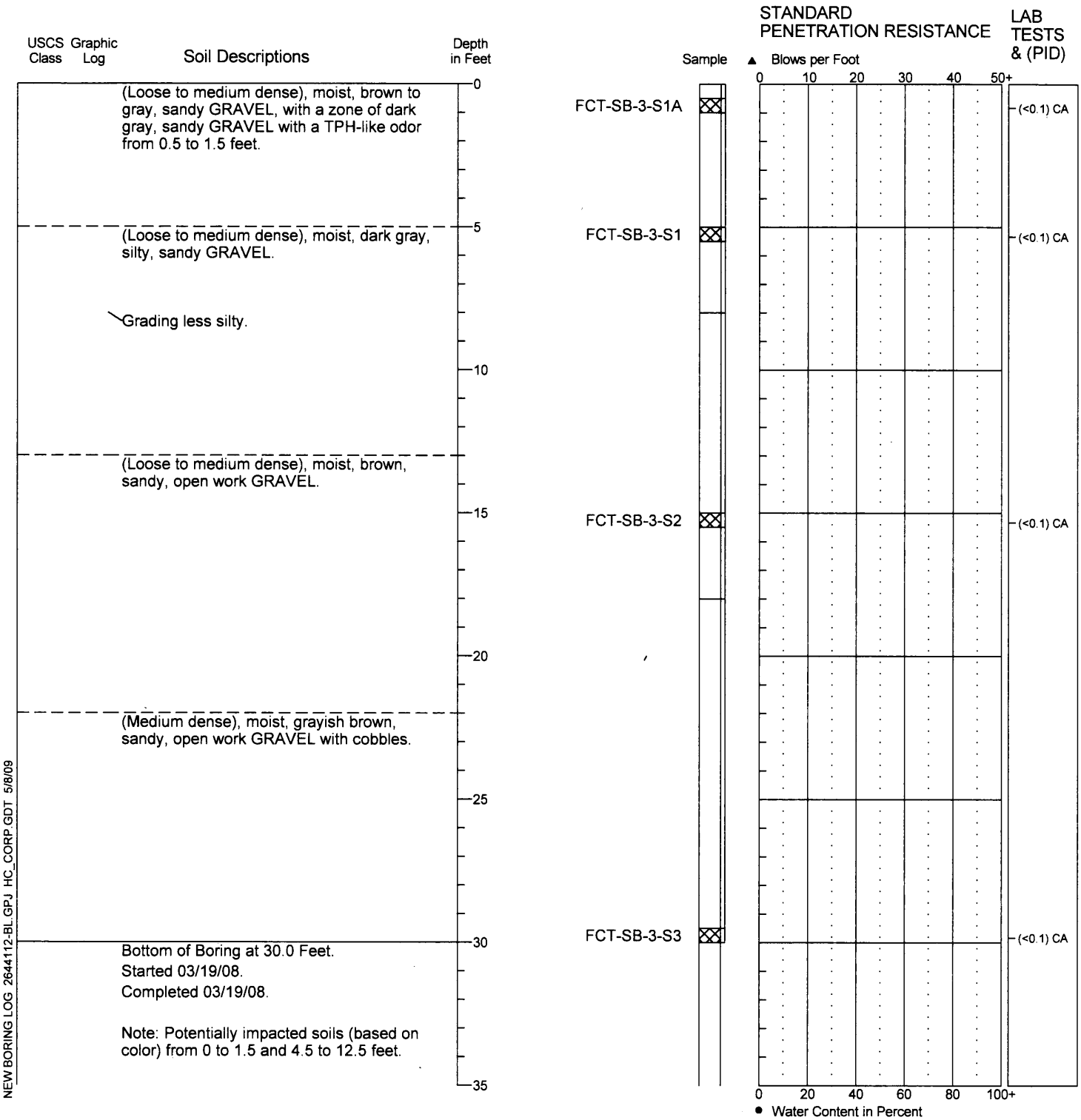
2644-112 **3/08**

Figure A-49

Boring Log FCT-SB-3

Location: See Figure 6-3.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic (Schramm T-300M)
Hammer Type: 4" I.D. Sample Barrel
Hole Diameter: 4 inches
Logged By: B. McDonald Reviewed By: A. Conrad



NEW BORING LOG 2644112-BL.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

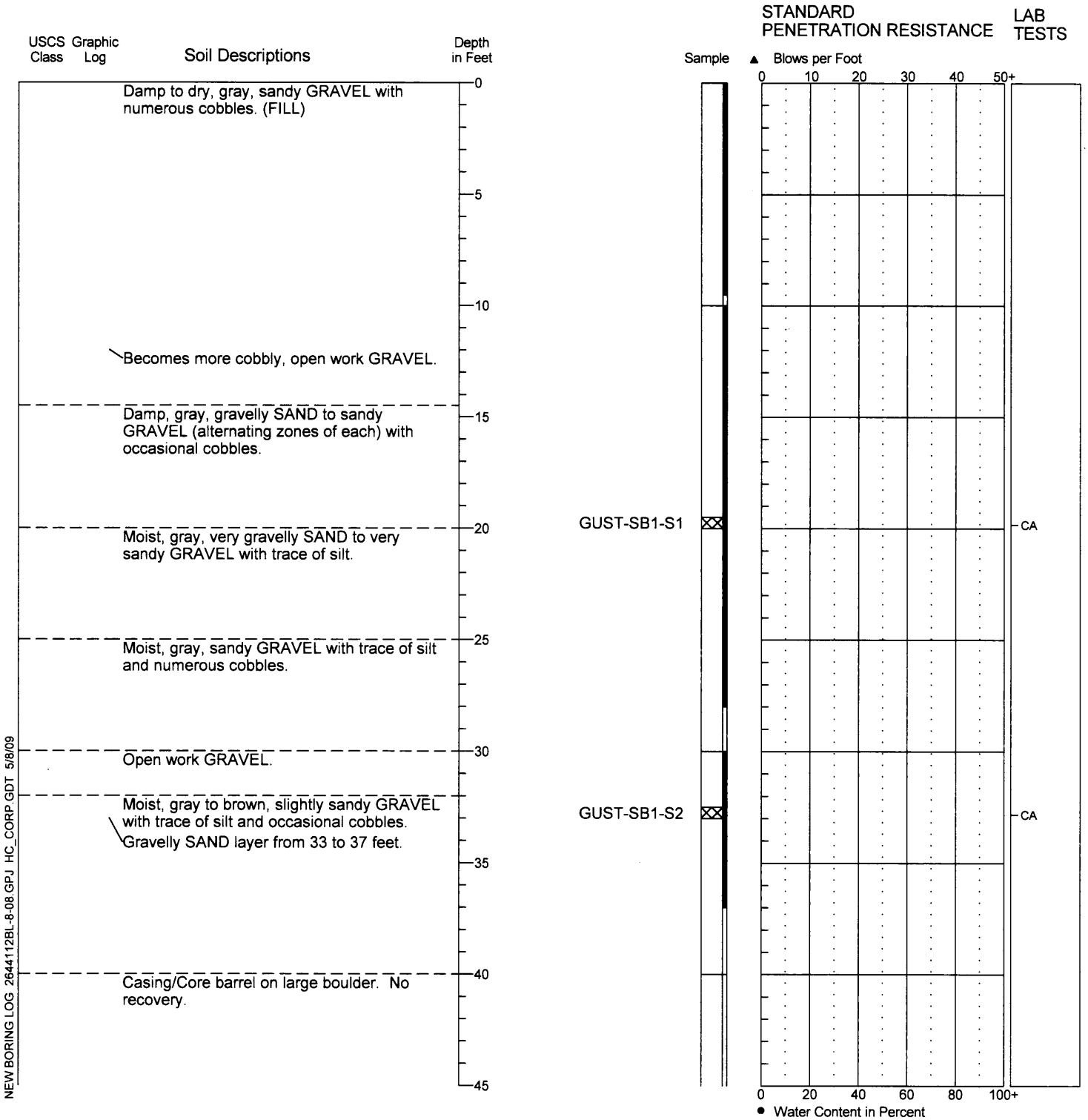
2644-112 **3/08**

Figure A-50

Boring Log GUST-SB1

Location: See Figure 5-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman



NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

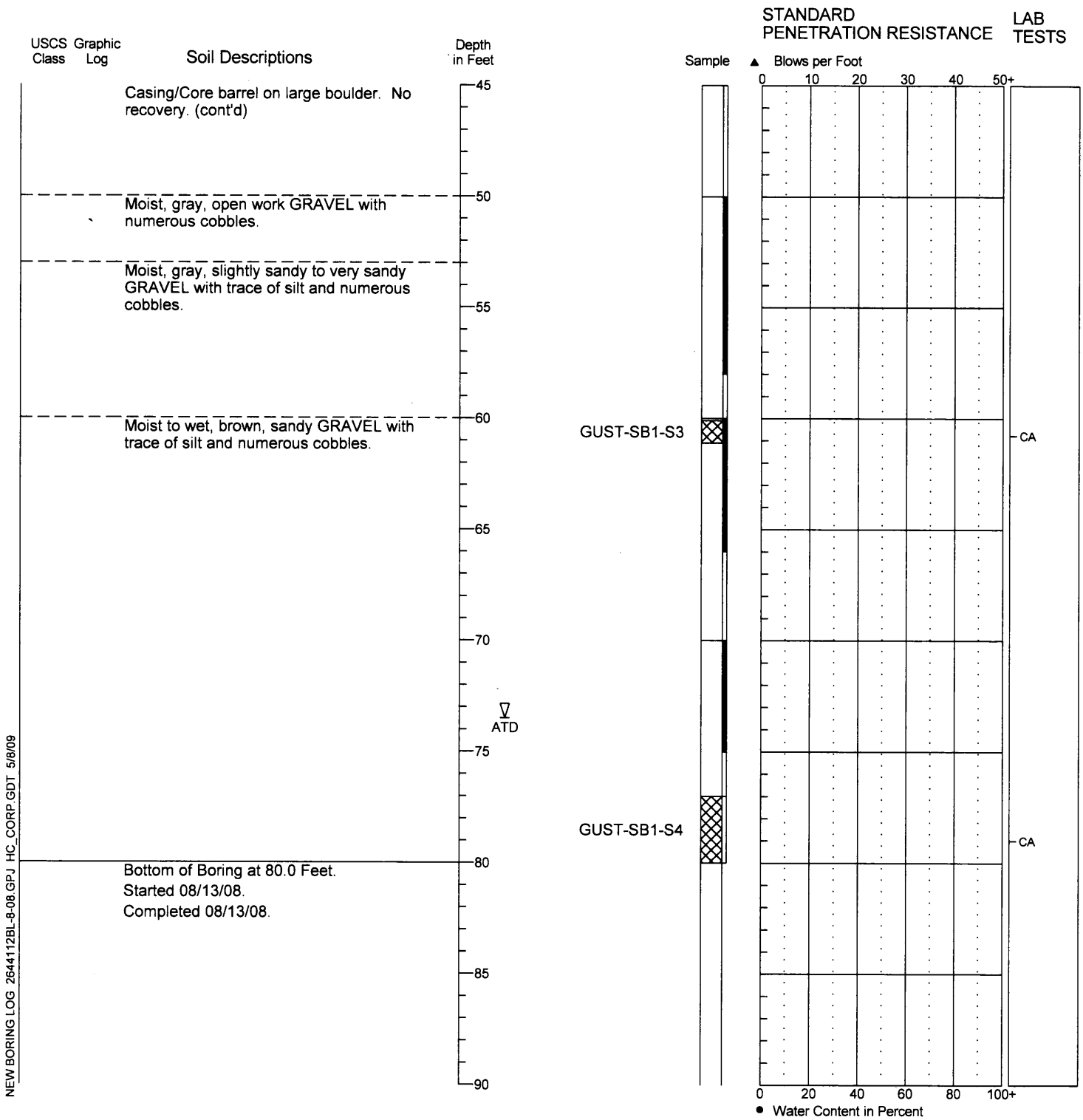
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Boring Log GUST-SB1

Location: See Figure 5-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman



NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

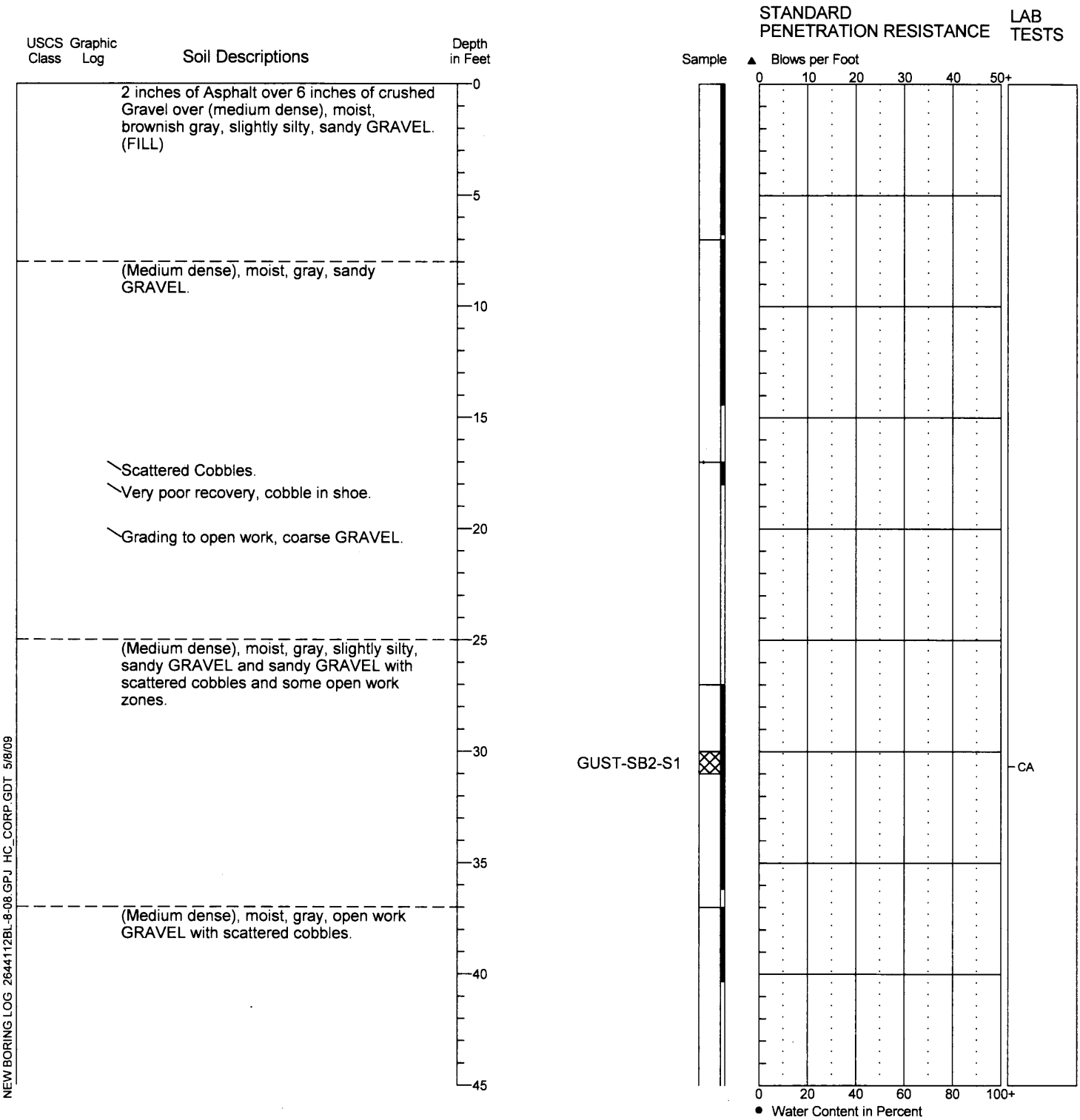
2644-112 **8/08**

Figure A-51 **2/2**

Boring Log GUST-SB2

Location: See Figure 5-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval
Hole Diameter: 4.5 inches
Logged By: B. McDonald/A. Inglish Reviewed By: M. Hardiman



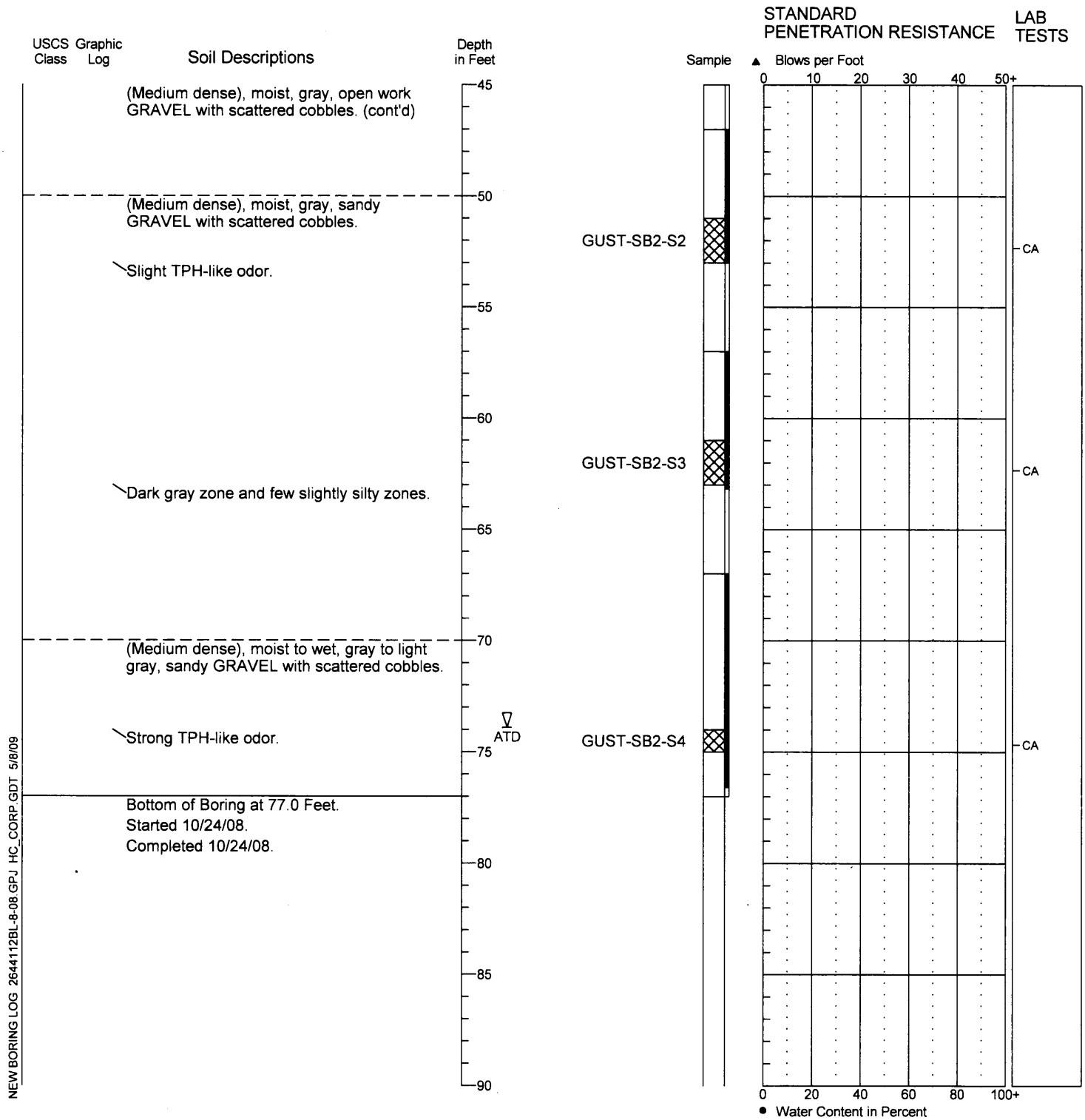
NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log GUST-SB2

Location: See Figure 5-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval
Hole Diameter: 4.5 inches
Logged By: B. McDonald/A. Inglish Reviewed By: M. Hardiman



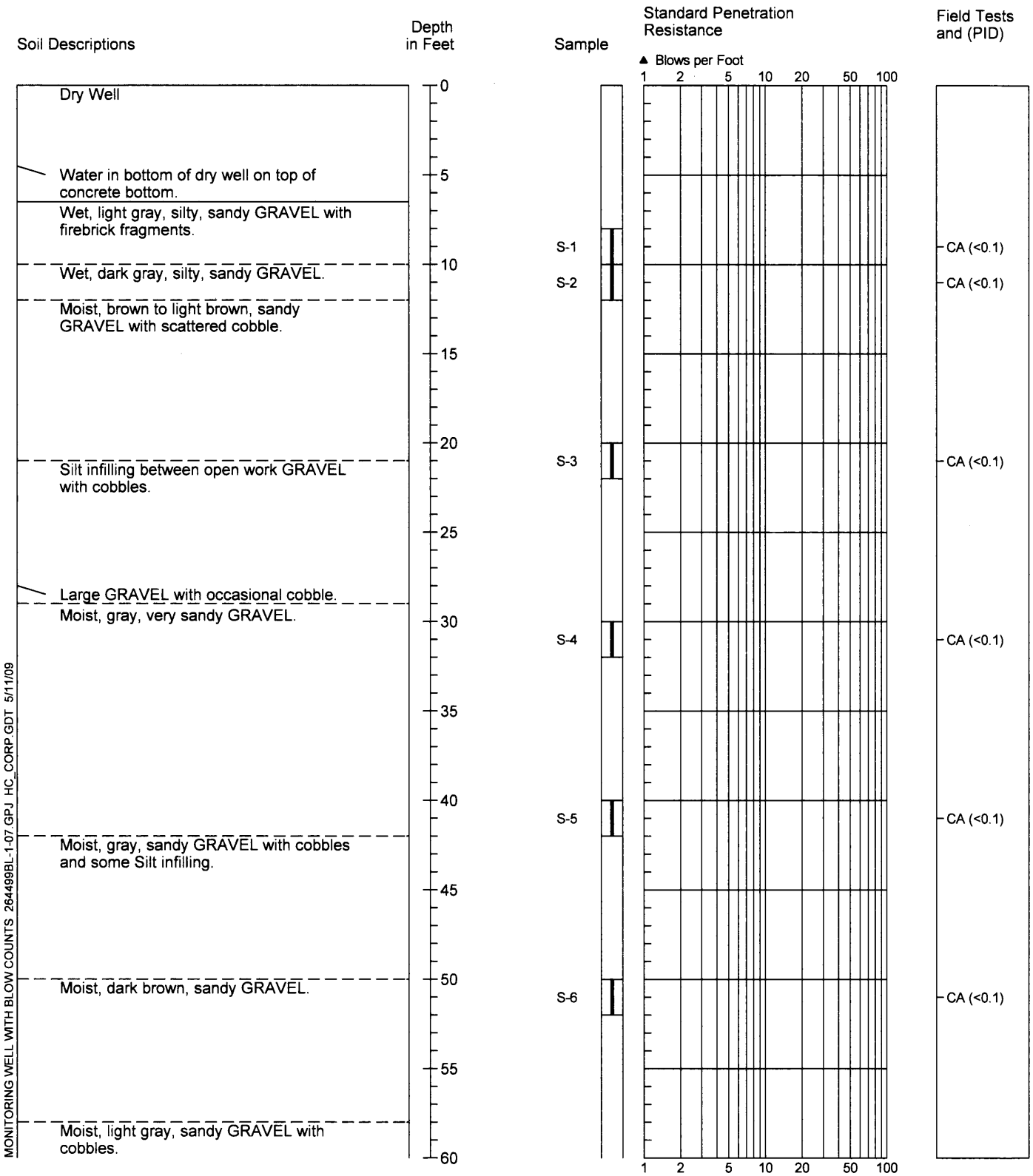
NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-112 10/08
Figure A-52 2/2

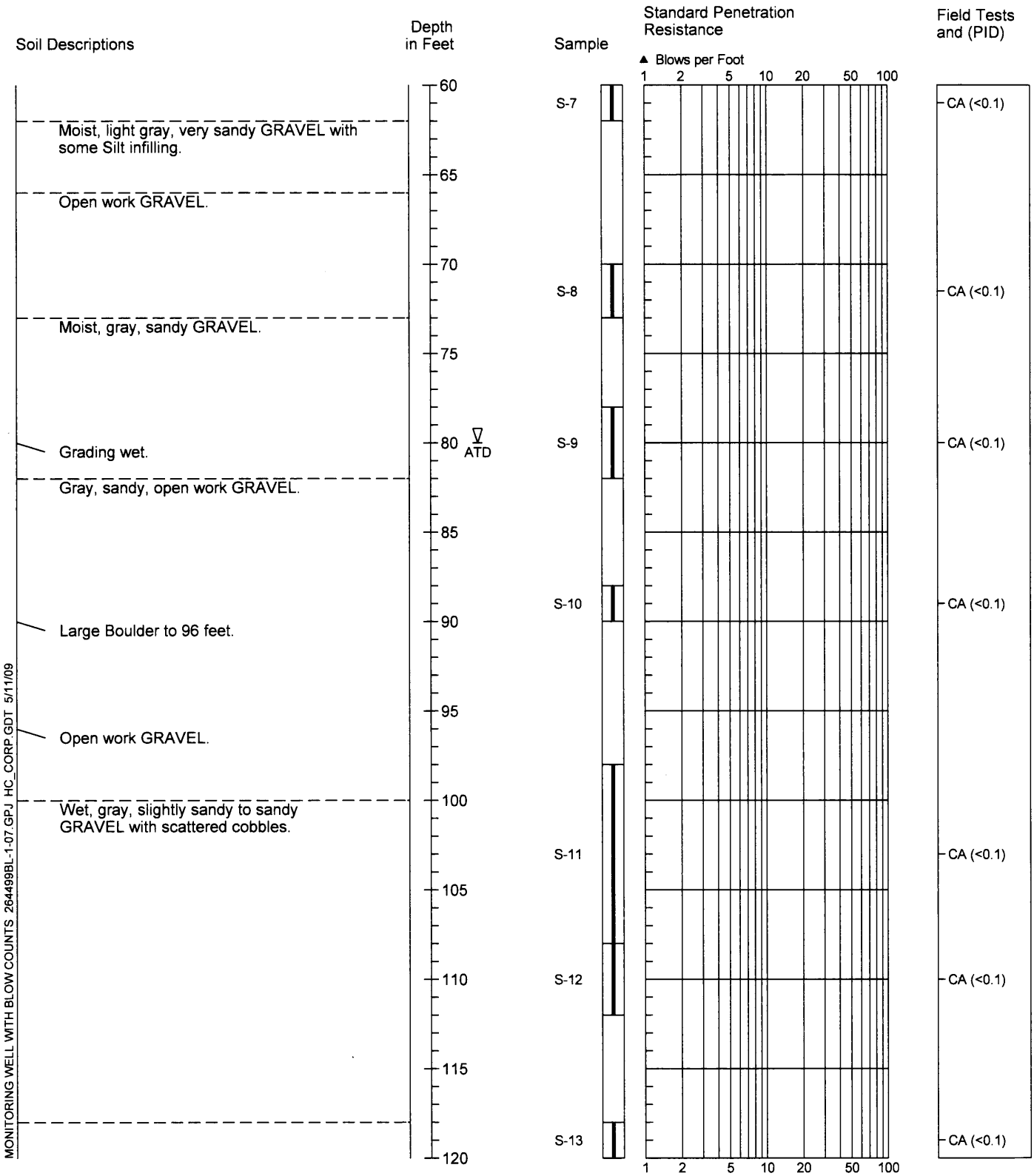
Boring Log HL-DW-SB-1



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

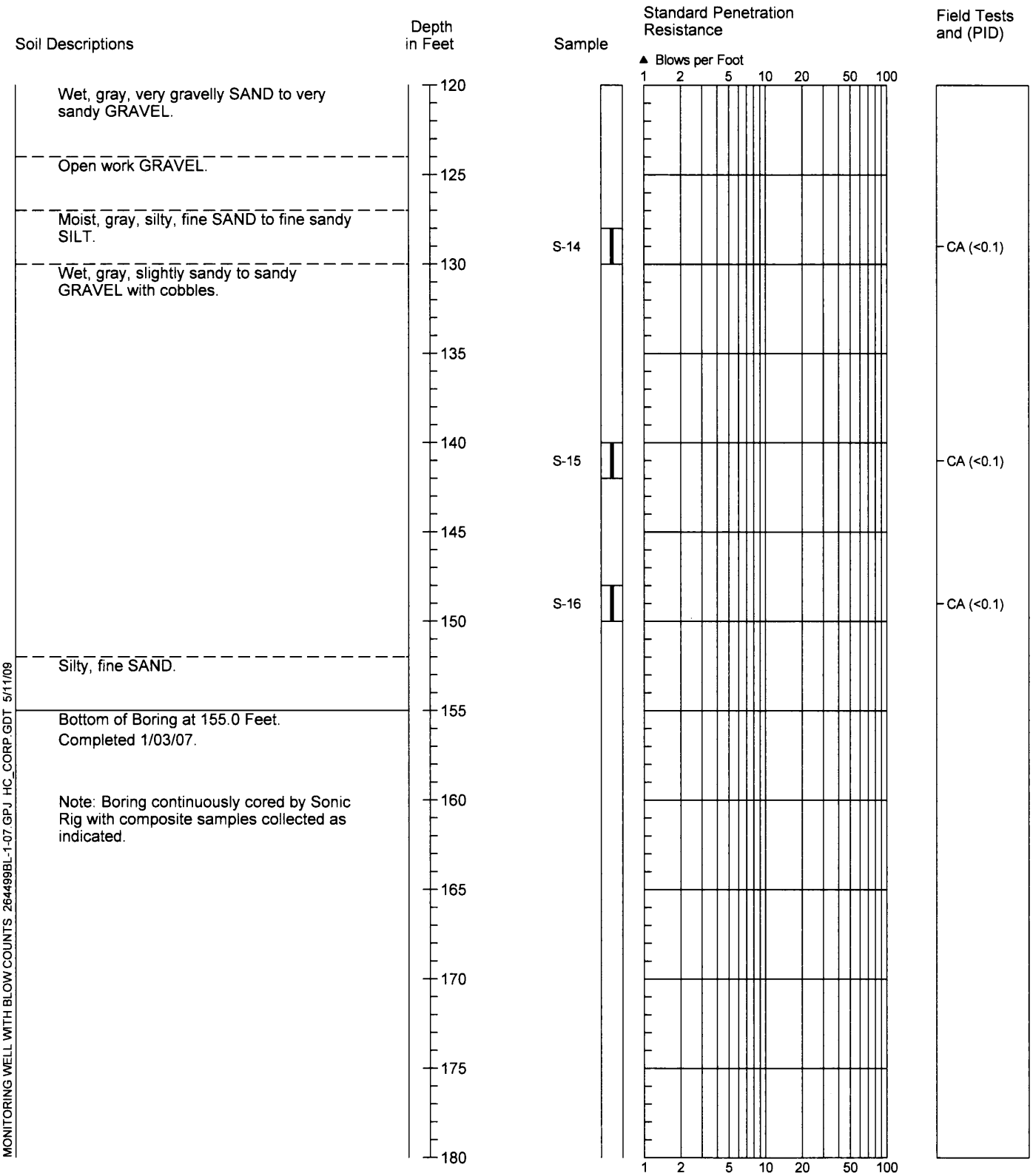
Boring Log HL-DW-SB-1



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

Boring Log HL-DW-SB-1



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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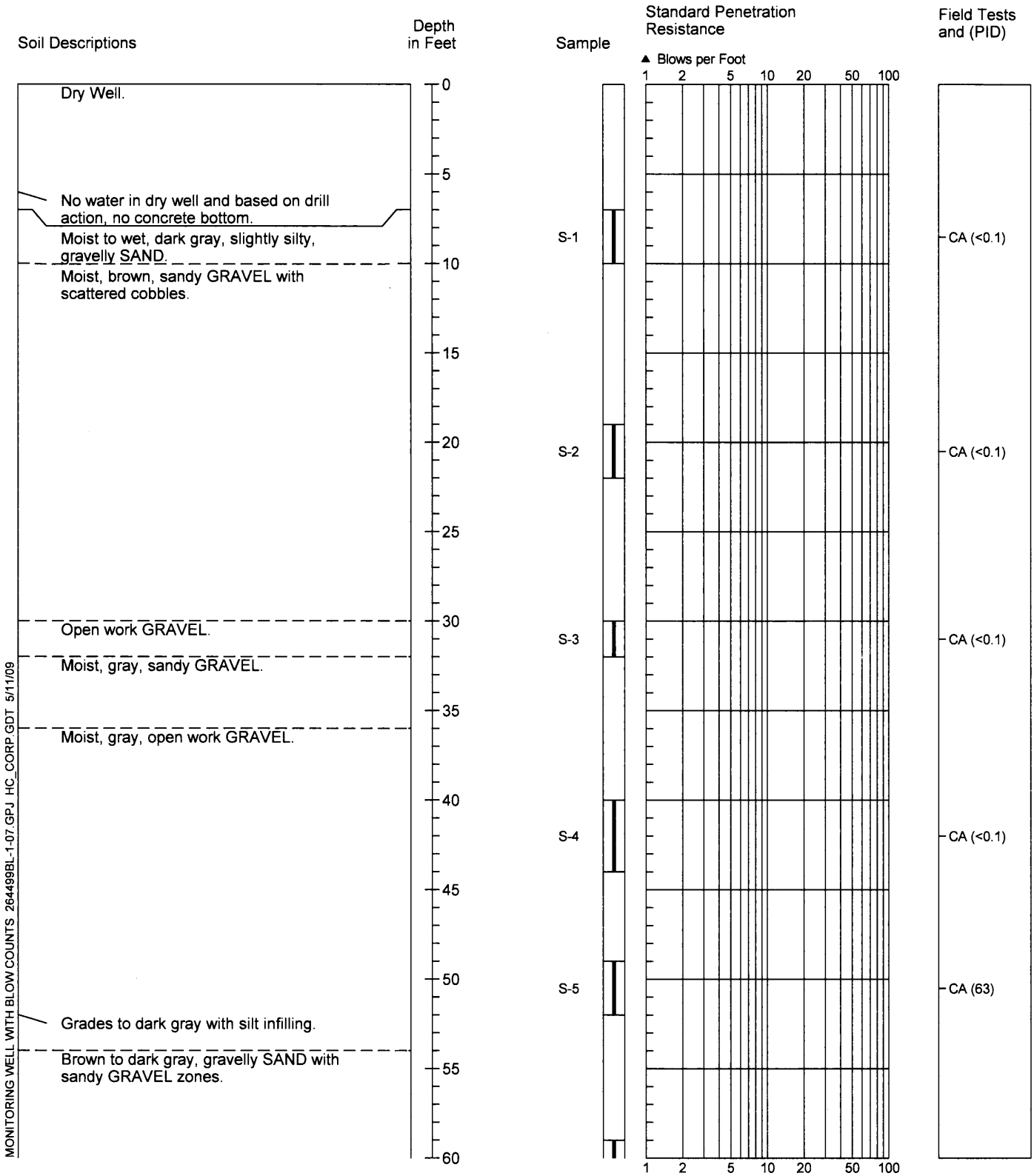
2644-99 *1/07*

Figure A-53 *3/3*

Boring Log HL-DW-SB-2



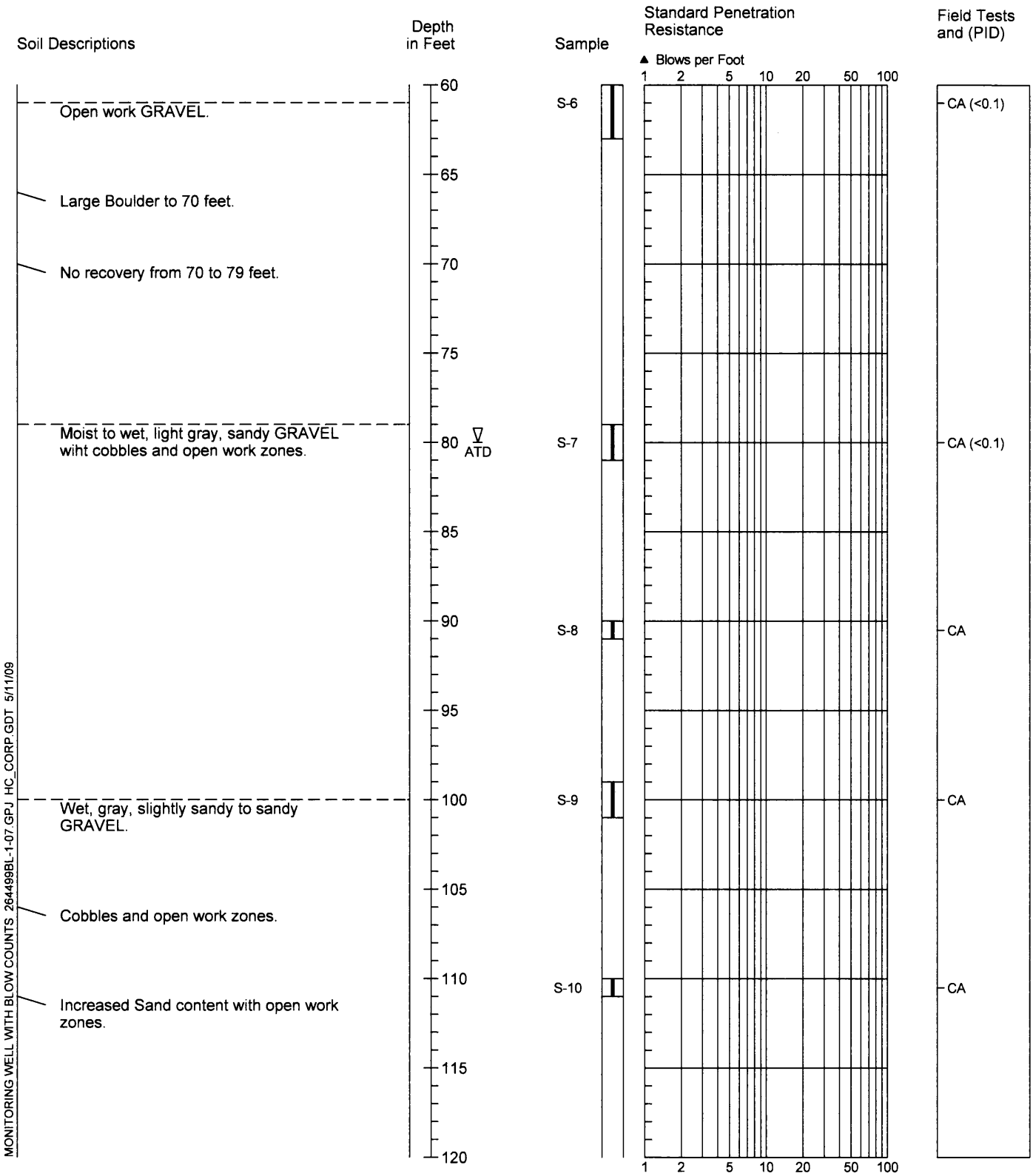
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-99 *1/07*

Figure A-54 *1/3*

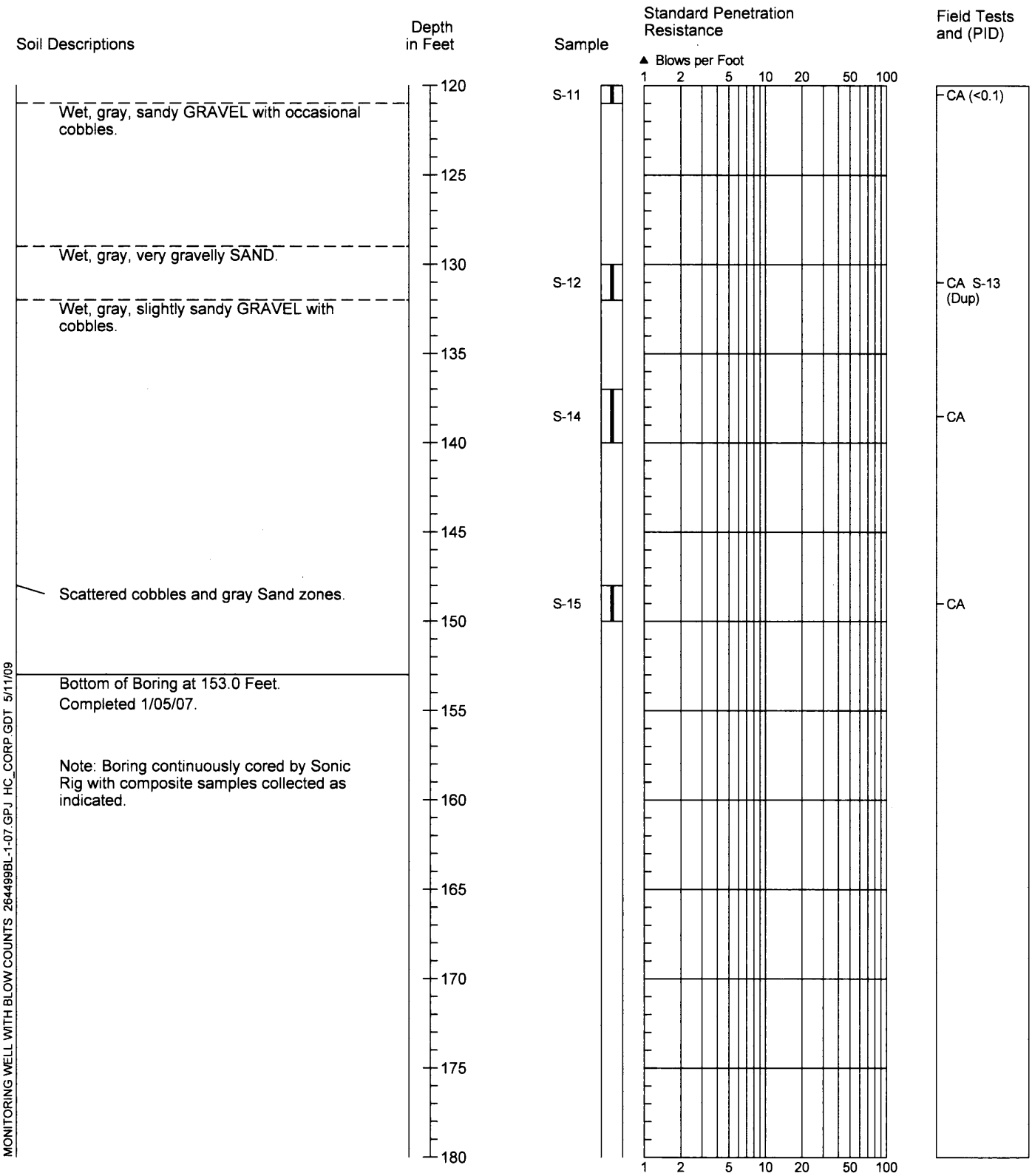
Boring Log HL-DW-SB-2



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

Boring Log HL-DW-SB-2



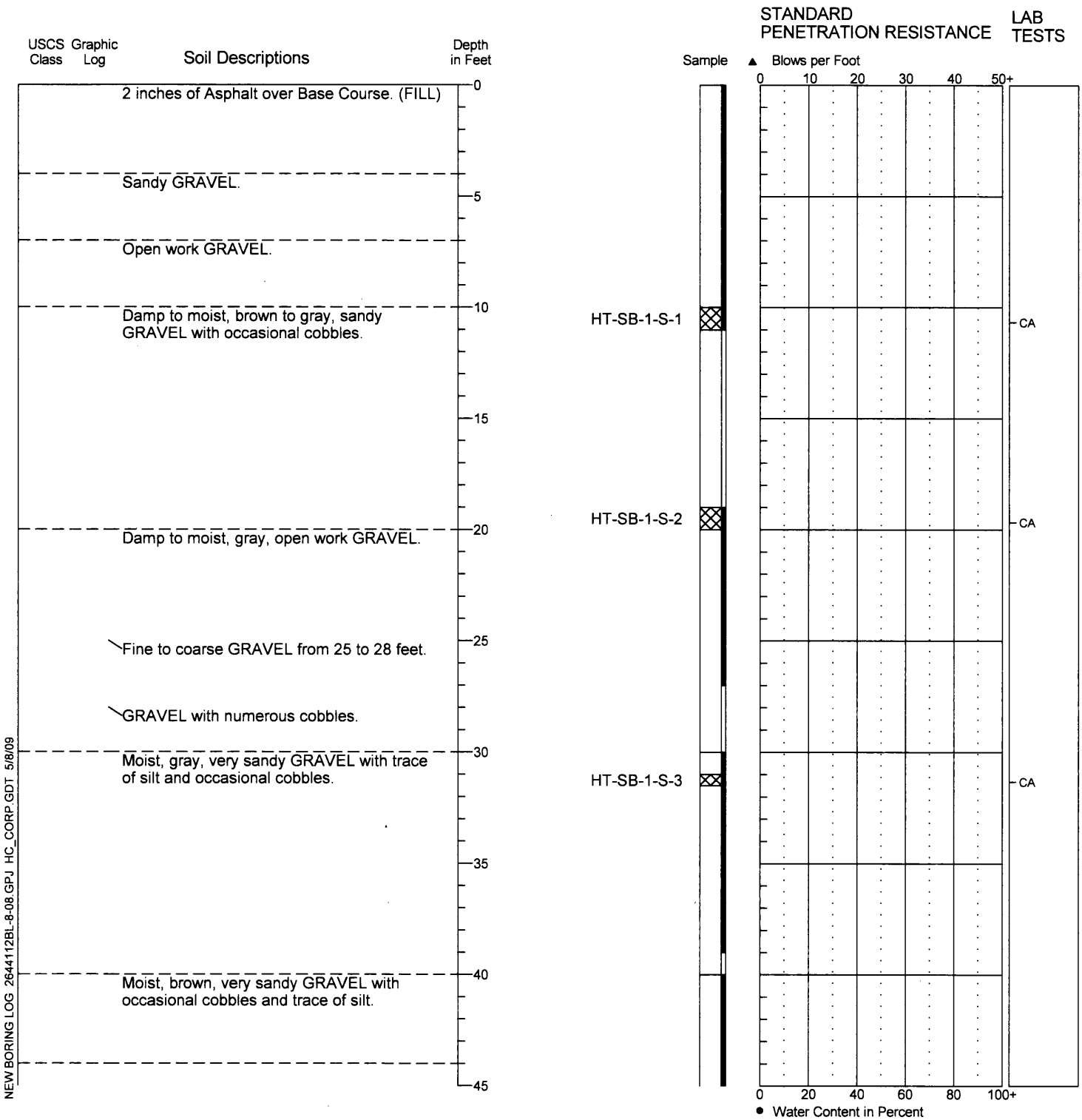
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Boring Log HT-SB-1

Location: See Figure 6-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval, Roto-Vibration
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman



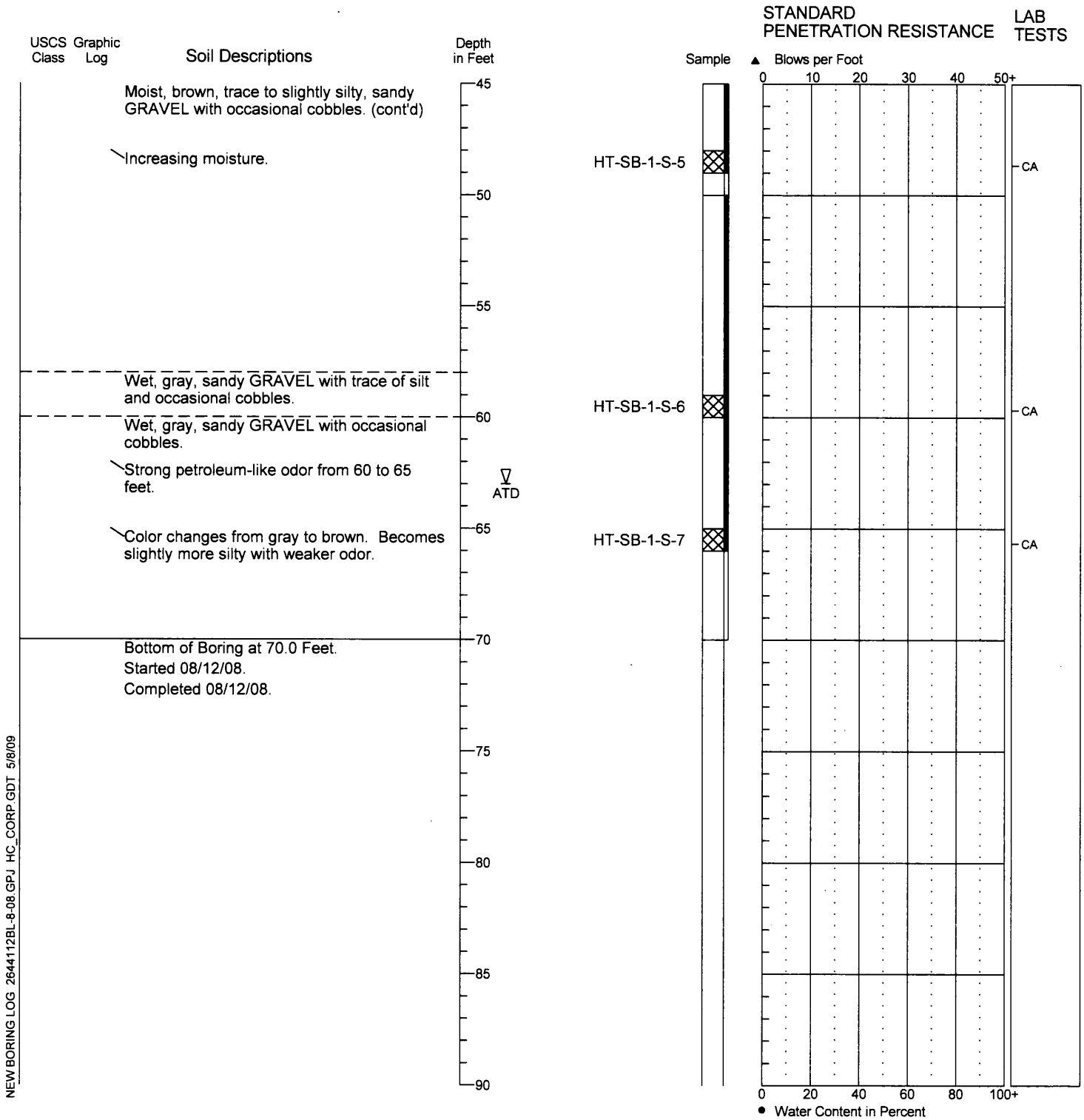
NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log HT-SB-1

Location: See Figure 6-4.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval, Roto-Vibration
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman

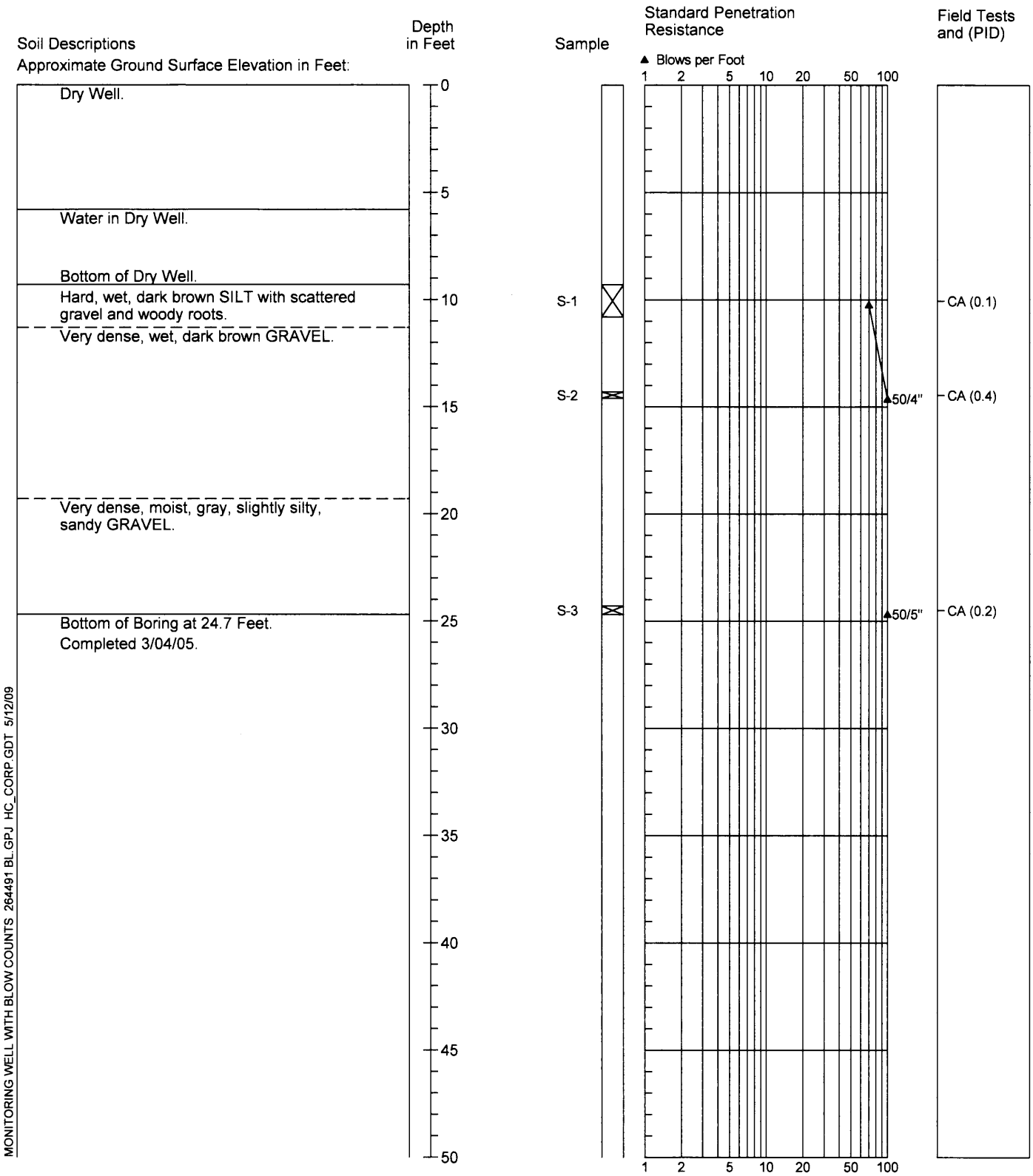


NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Boring Log INDBG-SB-1



MONITORING WELL WITH BLOW COUNTS 264491 BL.GPJ HC_CORP.GDT 5/12/09

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

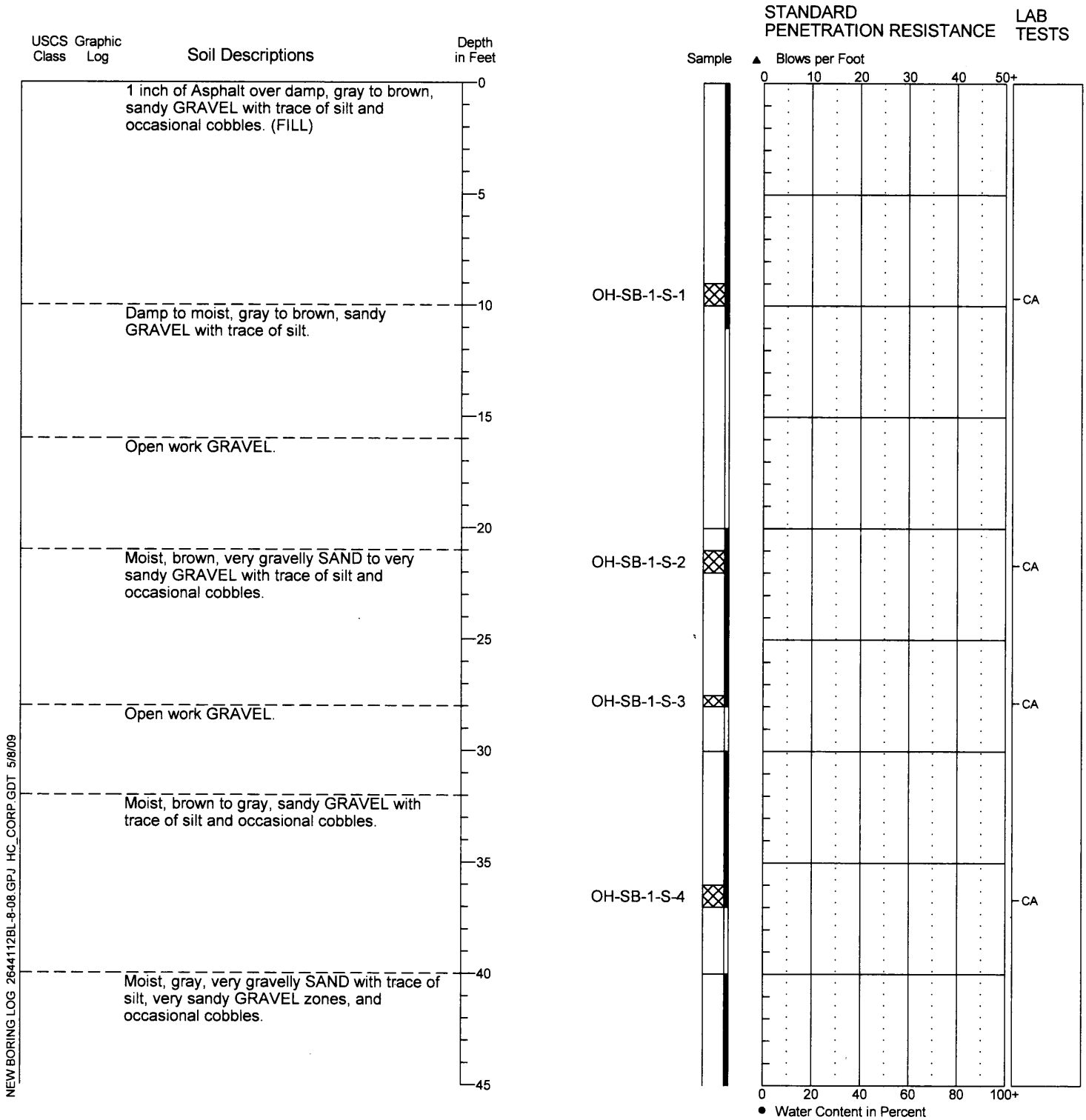
2644-91 *3/05*

Figure A-56

Boring Log OH-SB-1

Location: See Figure 5-5.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval, Roto-Vibration
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman



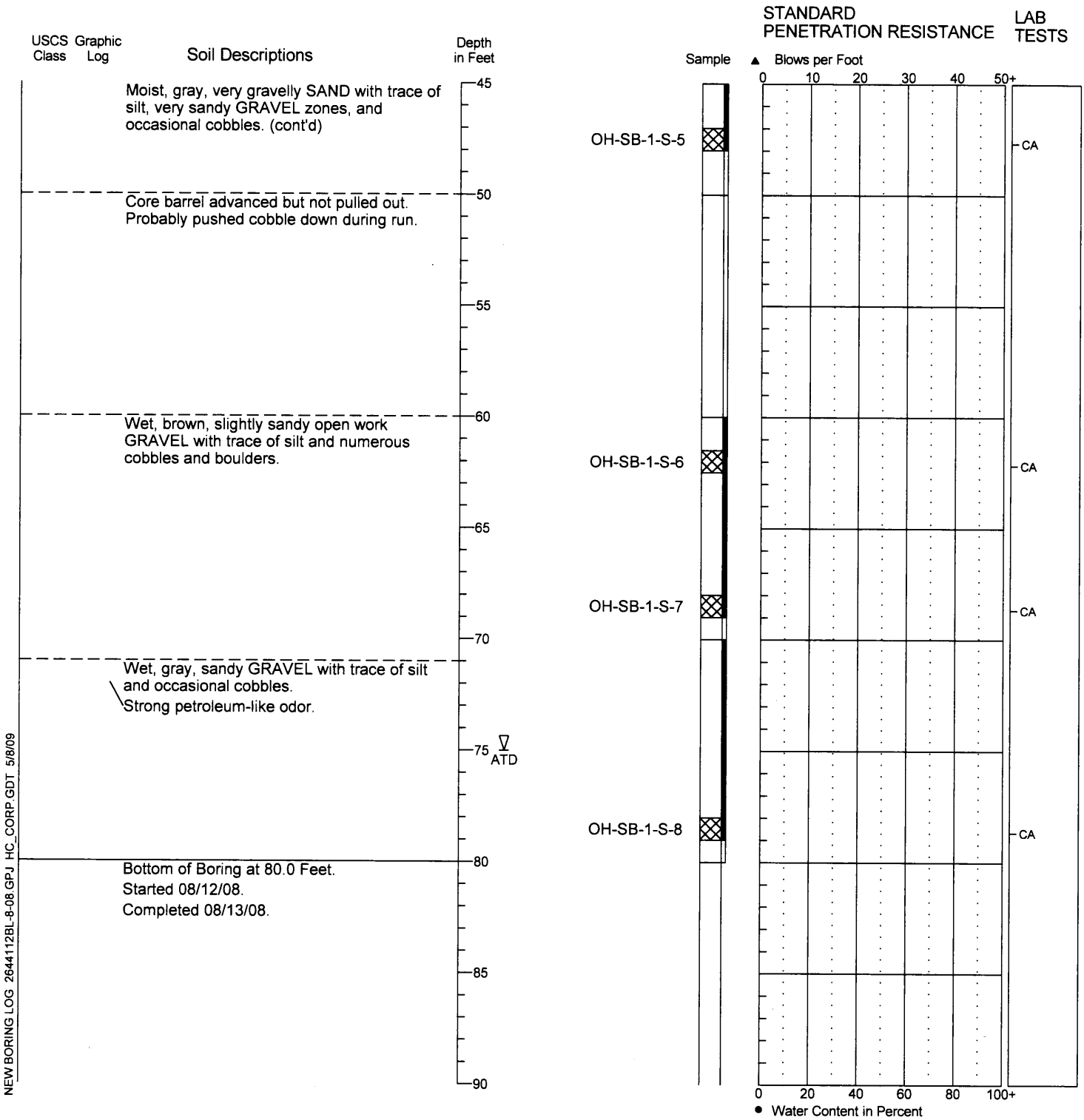
NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

Boring Log OH-SB-1

Location: See Figure 5-5.
Approximate Ground Surface Elevation: Feet
Horizontal Datum:
Vertical Datum:

Drill Equipment: Sonic - 4" I.D. Core Barrel
Hammer Type: 10' Core Retrieval, Roto-Vibration
Hole Diameter: 4.5 inches
Logged By: P. Cordell/J. Ebnet Reviewed By: M. Hardiman

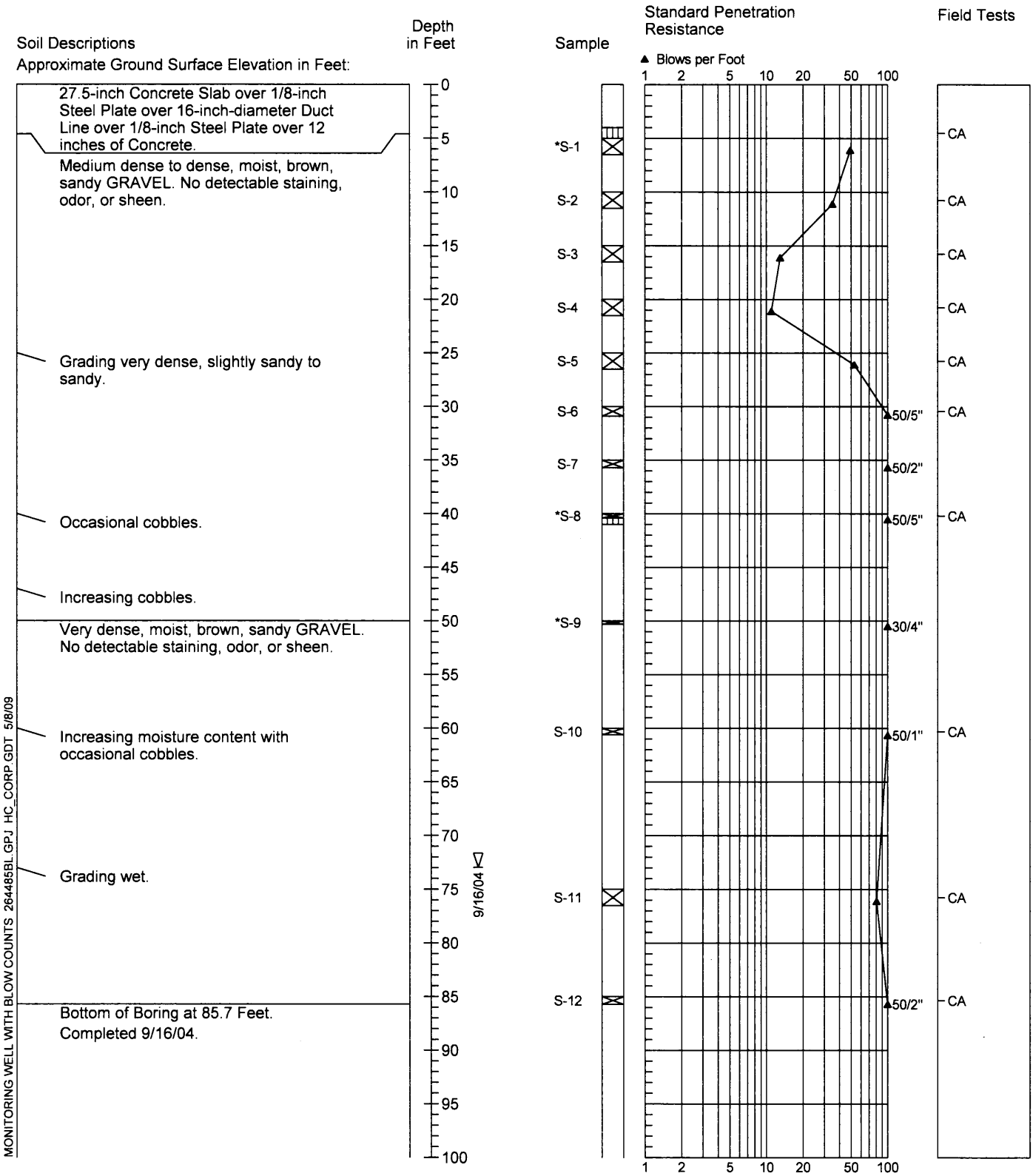


NEW BORING LOG 2644112BL-8-08.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

Boring Log RM-F4-SB-1



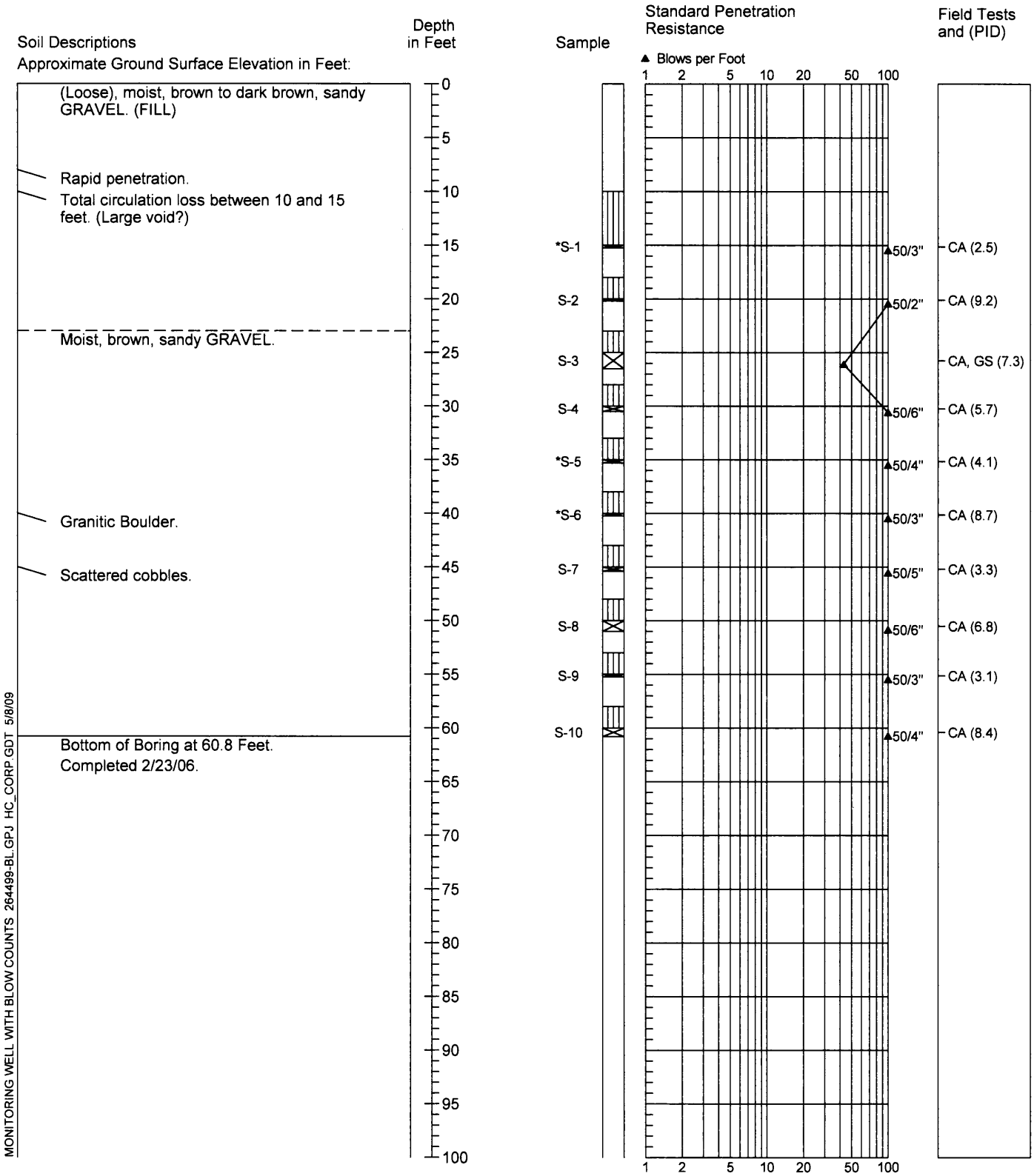
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

HARTCROWSER

2644-85 *9/04*

Figure A-58

Boring Log SDR-SB-1



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

2644-99 **2/06**

Figure A-59

Test Pit Log 05ORTP-1

Sample	Lab Tests	PID	Depth in Feet	SOIL DESCRIPTIONS
			0	(Loose), moist, gray, sandy GRAVEL.
			1	(Medium dense), moist, dark gray, slightly silty, sandy GRAVEL with scattered rubber, metal fragments (copper sulfate? - aqua blue tint), white substance (chalk?) and very dark zones (black) and floor blocks. (End Dumped FILL)
			2	
			3	
			4	(Medium dense), moist, brown, sandy GRAVEL.
S-1	CA, GS	3.5	5	
			6	Bottom of Exploration at 5.5 Feet. Completed 03/16/06. Note: Test pit located at north margin of man-made depression. Native soil/End Dumped FILL contact visible in side wall of test pit. See Note 4.
			7	
			8	
			9	
			10	

Test Pit Log 05ORTP-2

Sample	Lab Tests	Depth in Feet	SOIL DESCRIPTIONS
		0	2 inches of crushed GRAVEL over multiple layers of (medium dense), moist, dark brown, brown, gray, and dark gray, sandy GRAVEL with a few discontinuous zones of open work gravel.
		1	
		2	
		3	
		4	
S-1	CA	5	
		6	Bottom of Exploration at 5.0 Feet. Completed 03/16/06. Note: Test pit appears to be located outside area of man-made depression.
		7	
		8	
		9	
		10	

2 LOGS PER PAGE 264499-TP.GPJ TPANGLE.GDT 5/8/09

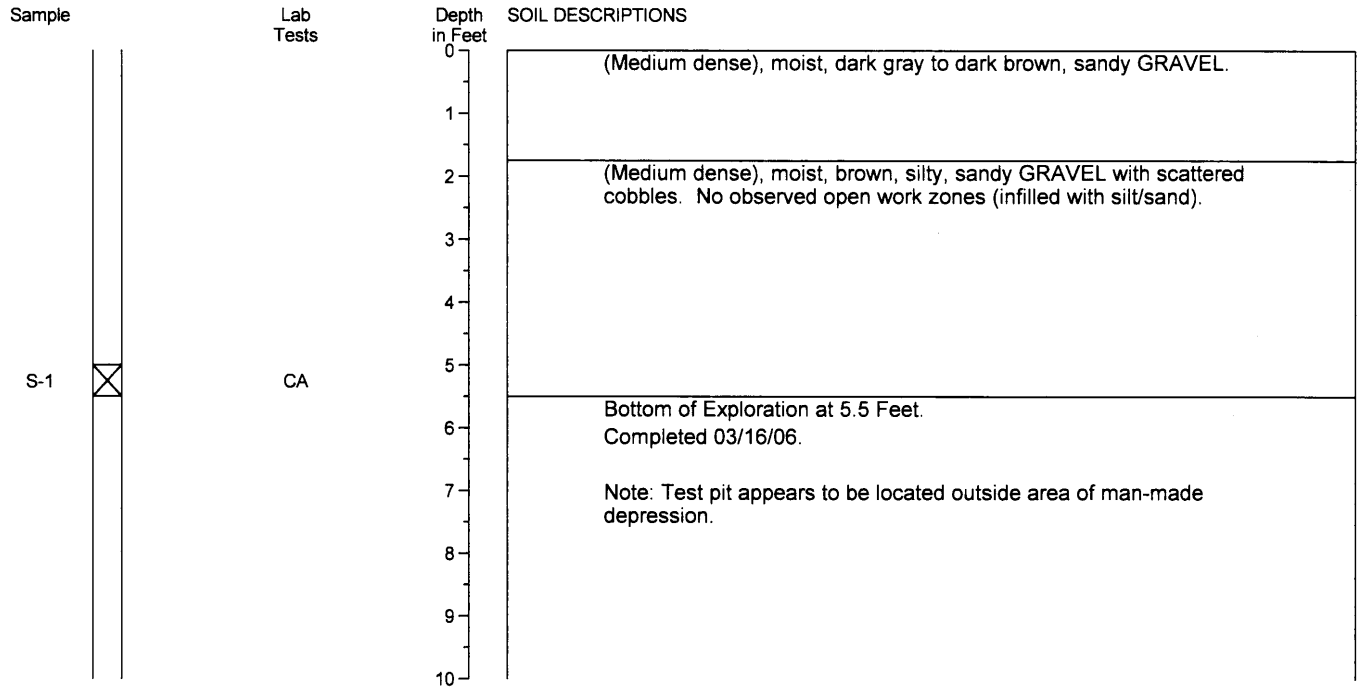
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
4. 05ORTP-1 cont'd - Contact dips from north edge of test pit to a depth of approximately 4 feet at the south edge of test pit. Sample collected of native material below this contact.

HARTCROWSER

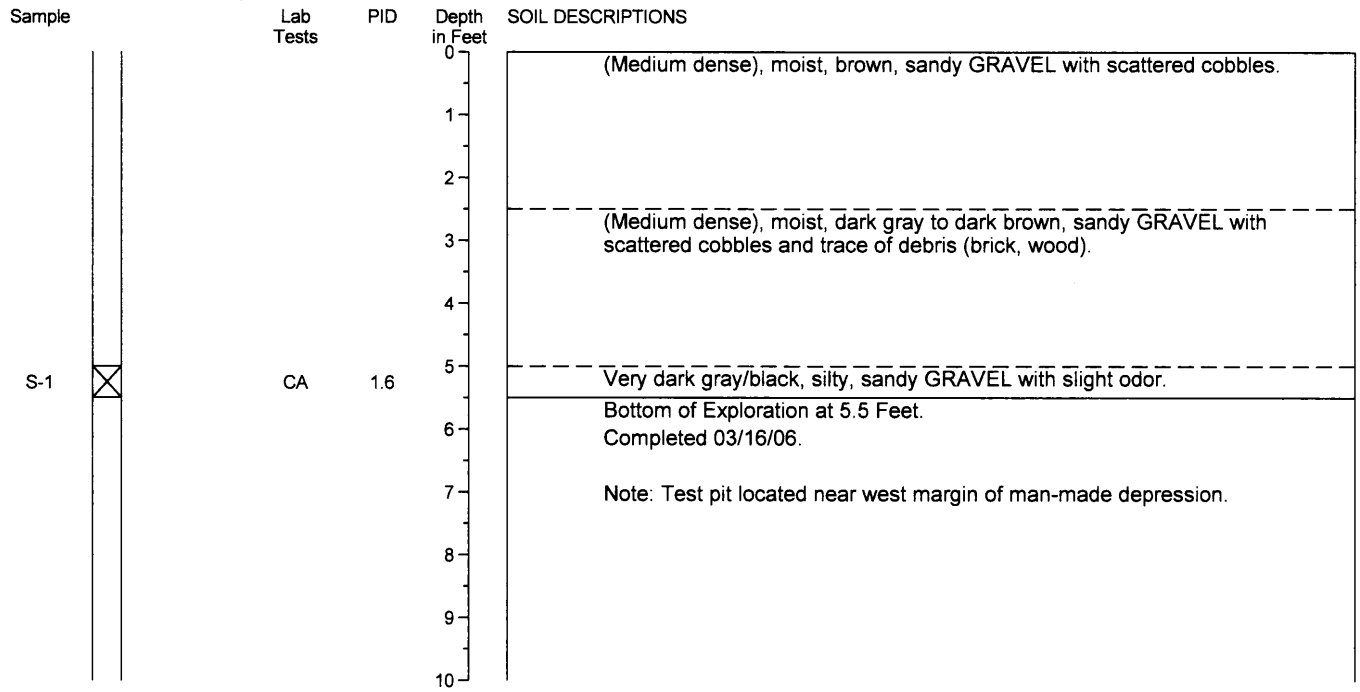
2644-99 3/06

Figure A-60

Test Pit Log 05ORTP-3



Test Pit Log 05ORTP-4

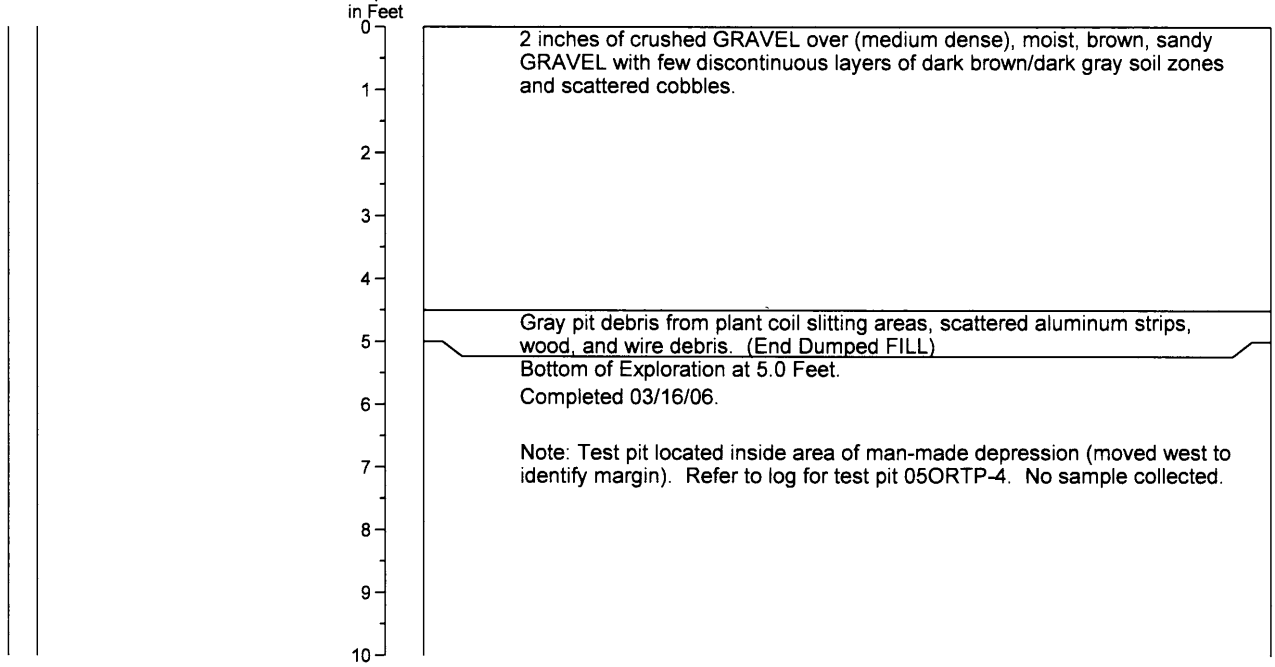


2 LOGS PER PAGE 264499-TP.GPJ TPANGLE.GDT 5/8/09

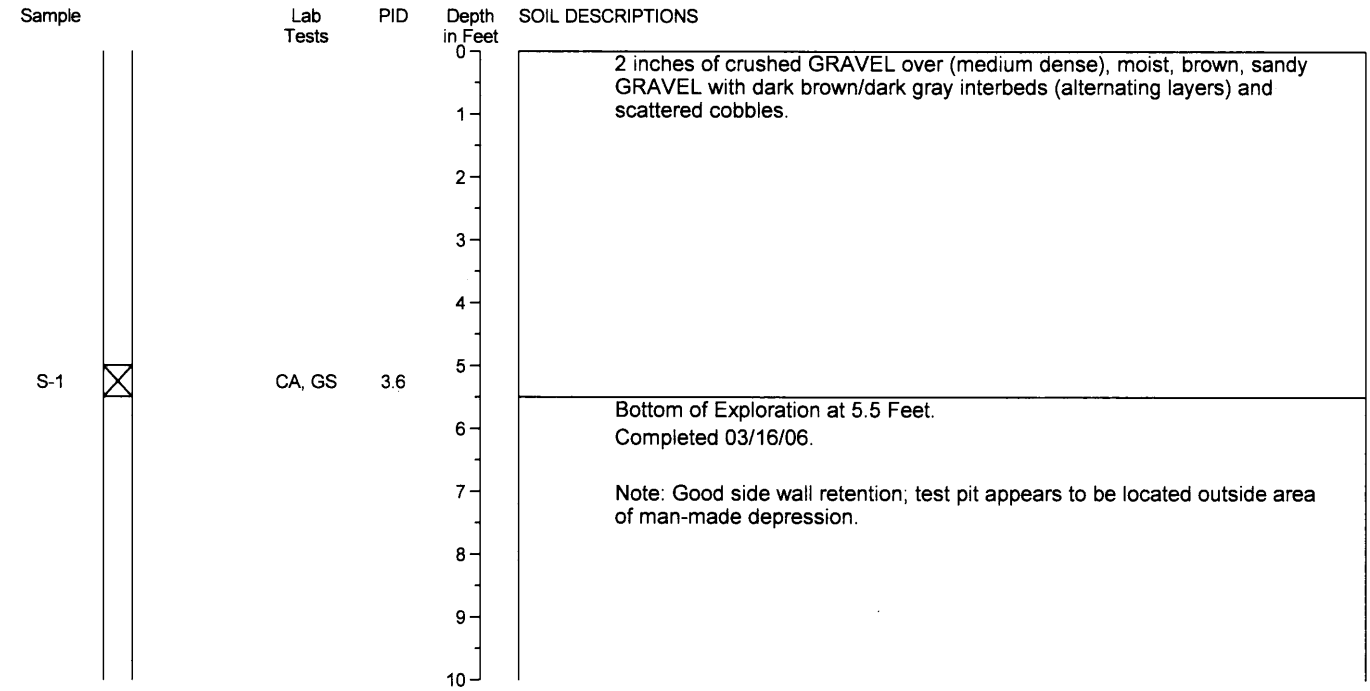
1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.

HARTCROWSER

Test Pit Log 05ORTP-4A



Test Pit Log 05ORTP-5



2 LOGS PER PAGE 264499-TP.GPJ TPANGLE.GDT 5/8/09

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 time of excavation. Conditions may vary with time.

HARTCROWSER

2644-99 *3/06*

Figure A-62

Test Pit Log 05ORTP-6

Sample	Lab Tests	PID	Depth in Feet	SOIL DESCRIPTIONS
			0	2 inches of crushed GRAVEL over (medium dense), moist, brown, sandy GRAVEL with occasional brick and metal debris.
			1	
			2	(Medium dense), moist, dark gray/black, sandy GRAVEL with abundant metal debris (aluminum strips), wire, wood, cloth, and cable. Odor detected. (End Dumped FILL)
			3	
			4	
S-1	CA	32.4	5	
			6	Bottom of Exploration at 5.5 Feet. Completed 03/16/06. Note: Test pit appears to be located inside area of man-made depression. Duplicate soil sample 05ORTP-100 split of sample 05ORTP-6.
			7	
			8	
			9	
			10	

Test Pit Log 05ORTP-7

Sample	Lab Tests	PID	Depth in Feet	SOIL DESCRIPTIONS
			0	2 inches of crushed GRAVEL over (medium dense), moist, brown to dark brown, sandy GRAVEL with scattered cobbles, near-surface metal piping (old air/water lines?), and occasional dark brown zones/discontinuous layers.
			1	
			2	
			3	
			4	(Medium dense), moist, very dark gray, slightly silty, sandy GRAVEL. (Odor detected and indication of past liquid migration observed).
S-1	CA	3.7	5	
			6	Brown, sandy GRAVEL.
			7	Bottom of Exploration at 6.5 Feet. Completed 03/16/06. Note: Test pit appears to be located outside area of man-made depression.
			8	
			9	
			10	

2 LOGS PER PAGE 264499-TP.GPJ TPANGLE.GDT 5/8/09

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 time of excavation. Conditions may vary with time.

HARTCROWSER

Test Pit Log FCT-TP- 1

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		Impacted surficial soil below former perimeter footing.	0				
		(Medium dense), moist, brownish gray to grayish brown, sandy GRAVEL with scattered cobbles to 12-inch-diameter.		TP-1-S1			CA
		(Medium dense), moist, grayish brown, sandy GRAVEL with scattered cobbles.	5	TP-1-S2			CA
		Scattered zones of open work GRAVEL.		TP-1-Bottom			CA
		Bottom of Test Pit at 9.5 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Very poor side wall retention of fill slope with strong TPH-like odor adjacent to former perimeter footing.	15				

Test Pit Log FCT-TP- 2

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		Impacted soil to 1.5-foot depth at former perimeter footing.	0				
		(Medium dense), moist, grayish brown, slightly sandy GRAVEL with cobbles up to 12-inch diameter.		TP-2-S1			CA
		(Medium dense), moist, brownish gray, open work GRAVEL.	5	TP-2-S2			CA
				TP-2-Bottom			CA
		Bottom of Test Pit at 9.5 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Open work gravel zones dipping ~15° to the west.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

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Figure A-64

Test Pit Log FCT-TP- 3

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		No detectable impacted soils below former perimeter footing.	0				
		(Medium dense), moist, grayish brown, sandy GRAVEL with scattered cobbles up to 12-inch diameter.		TP-3-S1			CA
			5				
		(Medium dense), moist, grayish brown, slightly sandy, open work GRAVEL.		TP-3-S2			CA
				TP-3-Bottom			CA
		Bottom of Test Pit at 9.5 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Open work gravel zones dipping ~20° to the west.	15				

Test Pit Log FCT-TP- 4

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		Impacted surficial soil below former perimeter footing.	0				
		(Loose to medium dense), moist, grayish brown, open work GRAVEL.		TP-4-S1			CA
			5				
				TP-4-S2			CA
				TP-4-Bottom			CA
		Bottom of Test Pit at 9.5 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Very poor side wall retention.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

HARTCROWSER

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Figure A-65

Test Pit Log FCT-TP- 5

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Loose), moist, grayish brown, open work GRAVEL.	0				
				TP-5-S1			CA
			5				
		Scattered cobbles.		TP-5-S2			CA
				TP-5-Bottom			CA
		Bottom of Test Pit at 9.0 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Impacted surficial soil on west side of excavation between depths of 2.0 to 2.5 feet.	15				

Test Pit Log FCT-TP- 6

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Loose to medium dense), moist, very dark brown to black, sandy GRAVEL with cobbles. Impacted surficial soil to 2-foot depth.	0				
		(Loose), moist, brown, open work GRAVEL. Impacted soil.		TP-6-S1			CA
		Very dark brown to black impacted soil extending below bottom of test pit.	5				
				TP-6-S2			CA
				TP-6-Bottom			CA
		Bottom of Test Pit at 9.0 Feet. Started 07/02/08. Completed 07/02/08.	10				
		Note: Very poor side wall retention.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

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Figure A-66

Test Pit Log FCT-TP- 7

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Medium dense), moist, brown, sandy GRAVEL with scattered cobbles and few oxidized zones.	0				
				TP-7-S1			CA
			5				
				TP-7-S2			CA
				TP-7-Bottom			CA
		Bottom of Test Pit at 9.0 Feet.	10				
		Started 07/02/08.					
		Completed 07/02/08.					
		Note: No observed impacted surficial soil below former perimeter footing.	15				

Test Pit Log FCT-TP- 8

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Medium dense), moist, grayish brown, sandy GRAVEL with open work zones and scattered cobbles.	0				
				TP-8-S1			CA
			5				
				TP-8-S2			CA
				TP-8-Bottom			CA
		Bottom of Test Pit at 10.0 Feet.	10				
		Started 07/03/08.					
		Completed 07/03/08.					
		Note: Impacted surficial soil in fill outside of former perimeter footing. Native soils do not appear to be impacted.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

HARTCROWSER

2644-112 7/08

Figure A-67

Test Pit Log FCT-TP- 9

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Loose to medium dense), moist, dark gray, open work GRAVEL.	0				
				TP-9-S1			CA
		(Medium dense), moist, grayish brown, sandy GRAVEL with open work/cobble zones to ~8 feet (dipping ~15° west).	5				
				TP-9-S2			CA
				TP-9-Bottom			CA
		Bottom of Test Pit at 9.0 Feet. Started 07/03/08. Completed 07/03/08.	10				
		Note: Impacted soil on western edge of former perimeter footing to depth of 4 feet.	15				

Test Pit Log FCT-TP-10

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Medium dense), moist, grayish brown, sandy GRAVEL with scattered cobbles.	0				
		Grayish brown, sandy GRAVEL with open work zones.		TP-10-S1			CA
			5				
				TP-10-Bottom			CA
		Open work GRAVEL and cobbles. (No soil matrix.)					
		Bottom of Test Pit at 9.0 Feet. Started 07/03/08. Completed 07/03/08.	10				
		Note: Impacted soil outside former perimeter footing to depth of 2 feet.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

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Figure A-68

Test Pit Log FCT-TP-11

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Medium dense), moist, grayish brown, sandy GRAVEL with scattered cobbles.	0				
				TP-11-Bottom			CA
		Bottom of Test Pit at 3.0 Feet.					
		Started 07/03/08.					
		Completed 07/03/08.	5				
		Note: Excavator not able to excavate deeper when extending over reinforced slab.					
			10				
			15				

Test Pit Log FCT-TP-12

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Loose), moist, grayish brown, open work GRAVEL with scattered cobbles. (No soil matrix.)	0				
				TP-12-S1			CA
			5				
		(Medium dense), moist, grayish brown, sandy GRAVEL.		TP-12-S2			CA
			10				
				TP-12-Bottom			CA
		Bottom of Test Pit at 11.0 Feet.					
		Started 07/03/08.					
		Completed 07/03/08.	15				

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

HARTCROWSER

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Figure A-69

Test Pit Log FCT-TP-13

Location: See Figure 2.
Approximate Ground Surface Elevation: Feet
Logged By: B. McDonald Reviewed By: G. Both

Horizontal Datum:
Vertical Datum:

USCS Class	Graphic Log	Soil Descriptions	Depth in Feet	Sample	Water Content in Percent	PID	LAB TESTS
		(Loose), moist, grayish brown, open work GRAVEL. (No soil matrix.)	0	TP-13-S1			CA
		(Loose), moist, grayish brown, open work GRAVEL with scattered cobbles.	5	TP-13-S2			CA
		Bottom of Test Pit at 11.0 Feet. Started 07/03/08. Completed 07/03/08. Note: Poor side wall retention to depth of 6 feet.	10 TP-13-Bottom 15				CA

NEW TEST PIT LOG 2644112-TP.GPJ HC_CORP.GDT 5/8/09

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. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater conditions, if indicated, are at time of excavation. Conditions may vary with time.
5. Depth measured from base of former perimeter tank footing.

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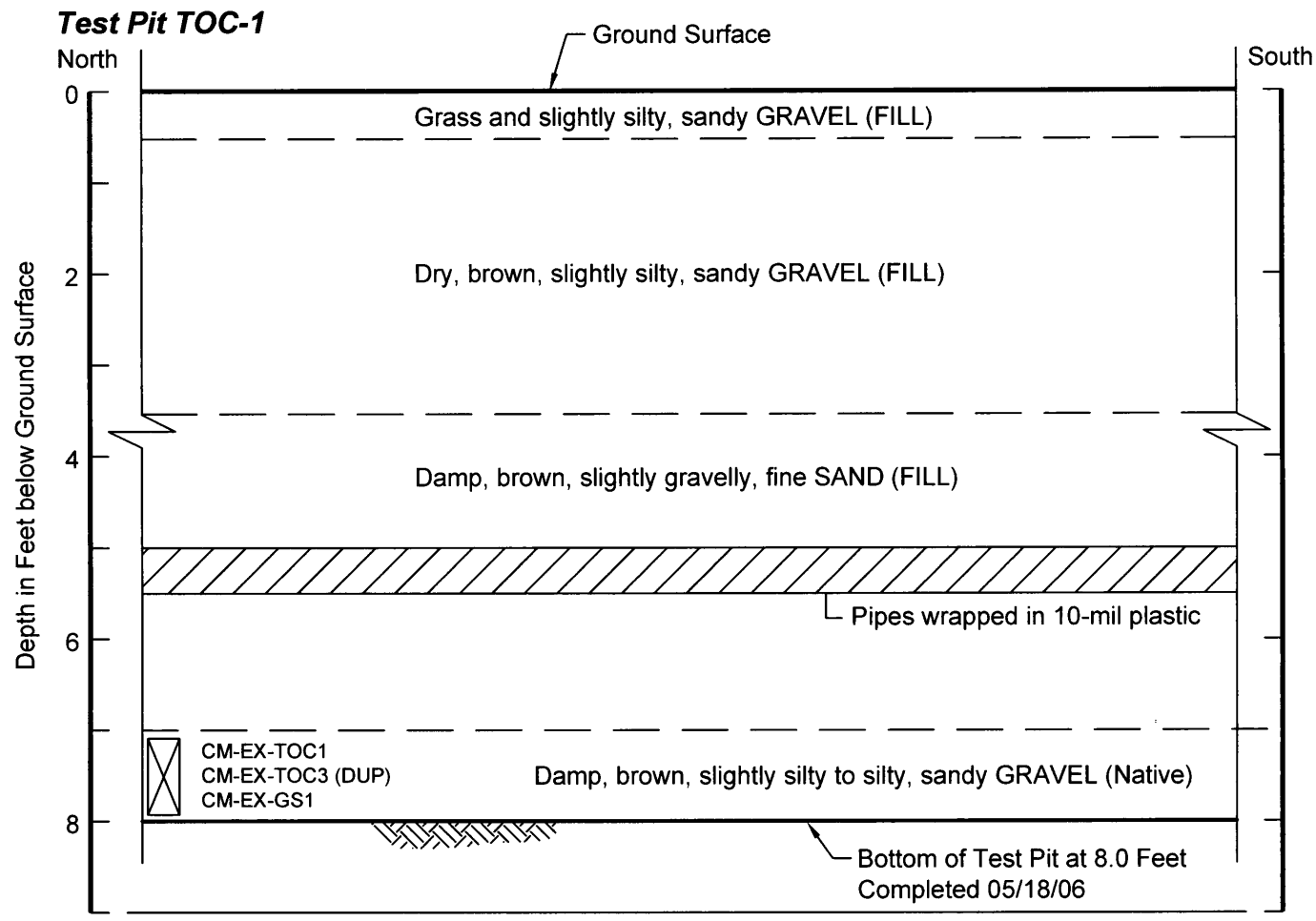
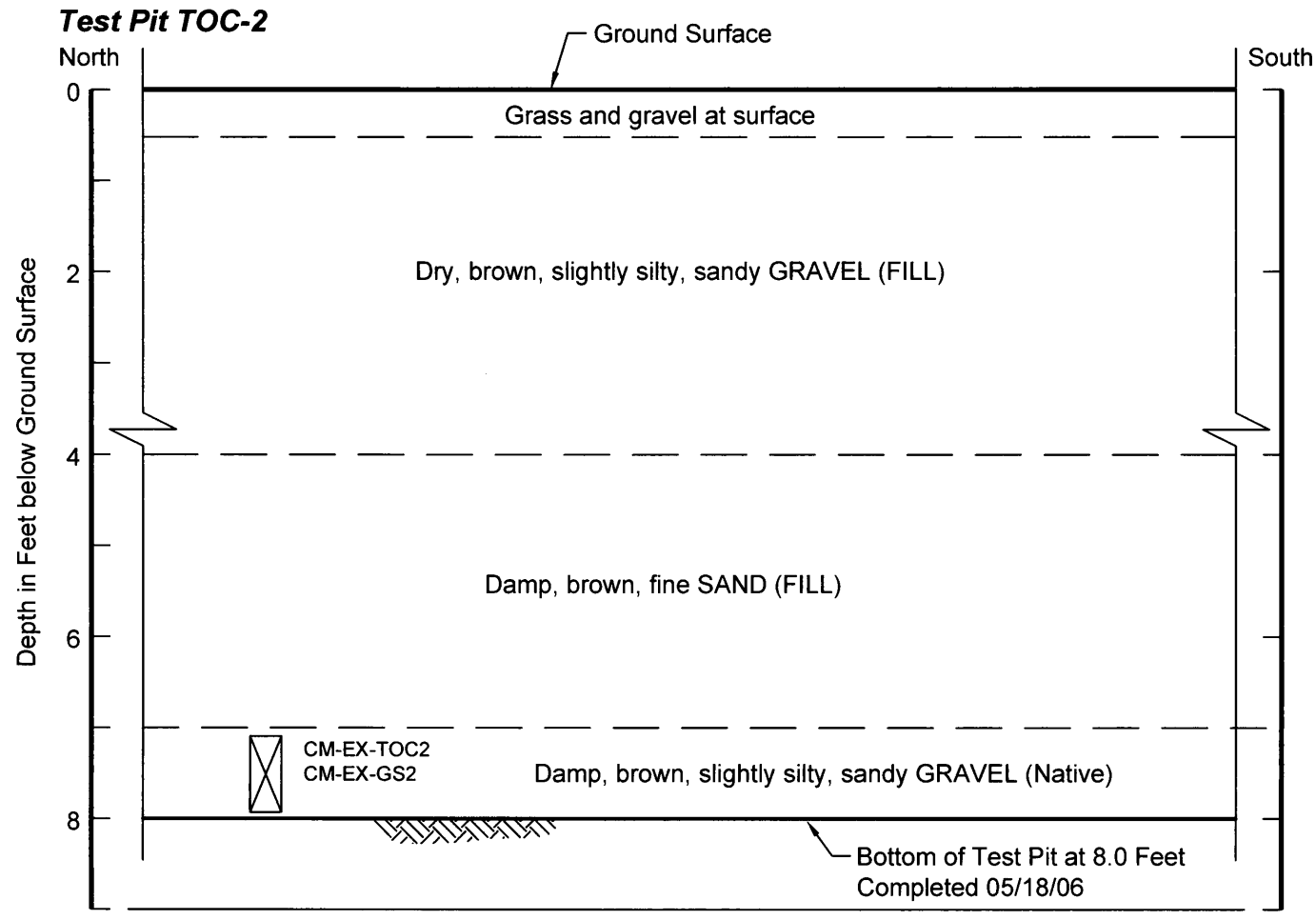
Figure A-70

Test Pit Log TOC-1 and TOC-2



Notes:

1. Collected two 5-gallon buckets of soil (CM-EX-GS1) at depth of 7 to 8 feet for grain size analysis.



Notes:

1. Collected two 5-gallon buckets of soil (CM-EX-GS2) at depth of 7 to 8 feet for grain size analysis.

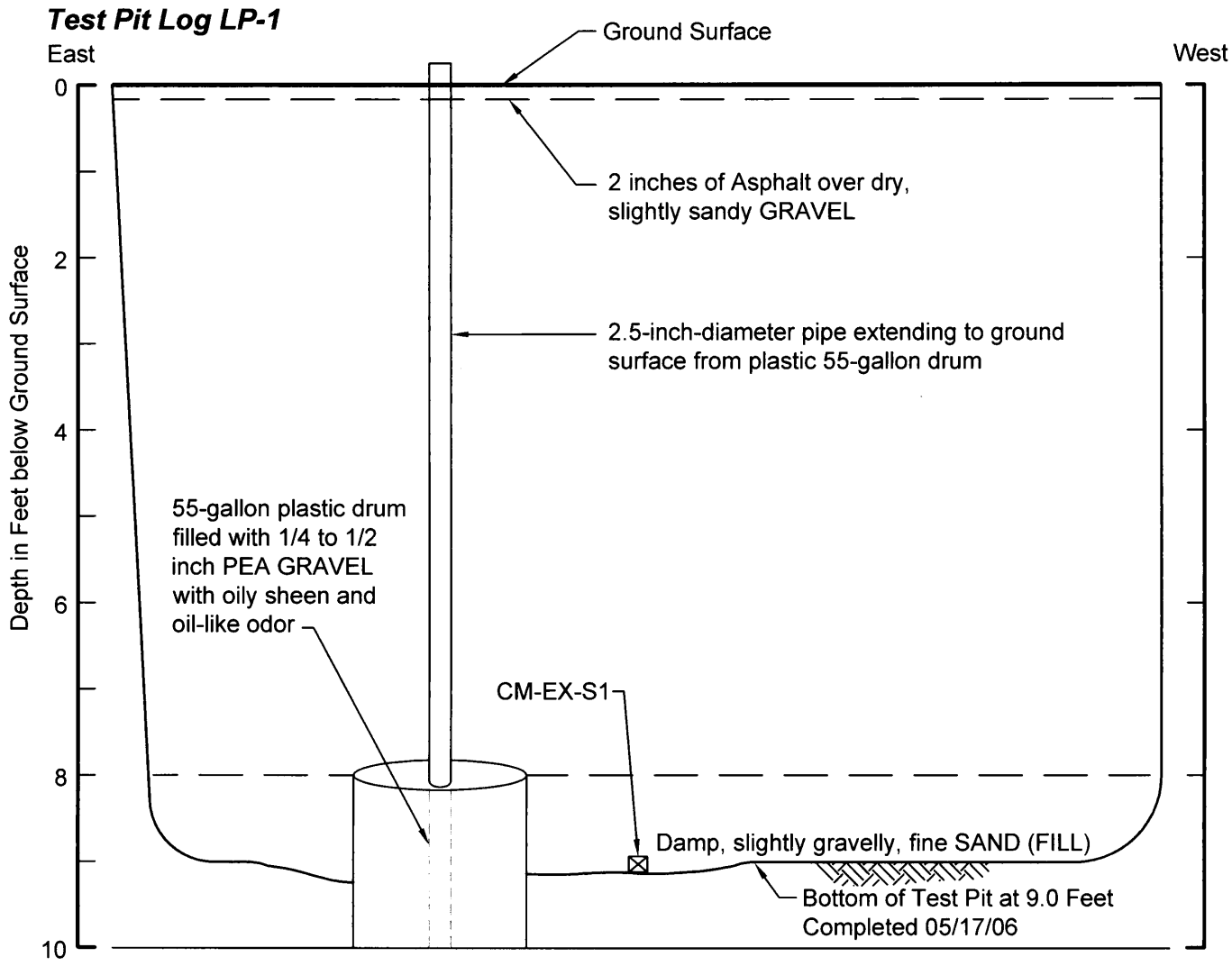
0 2 4
Scale in Feet

EAL 05/5/09 2644114-134.DWG

HARTCROWSER 5/09
2644-114
Figure A-71

Test Pit Log LP-1 and LP-2

Test Pit Log LP-1

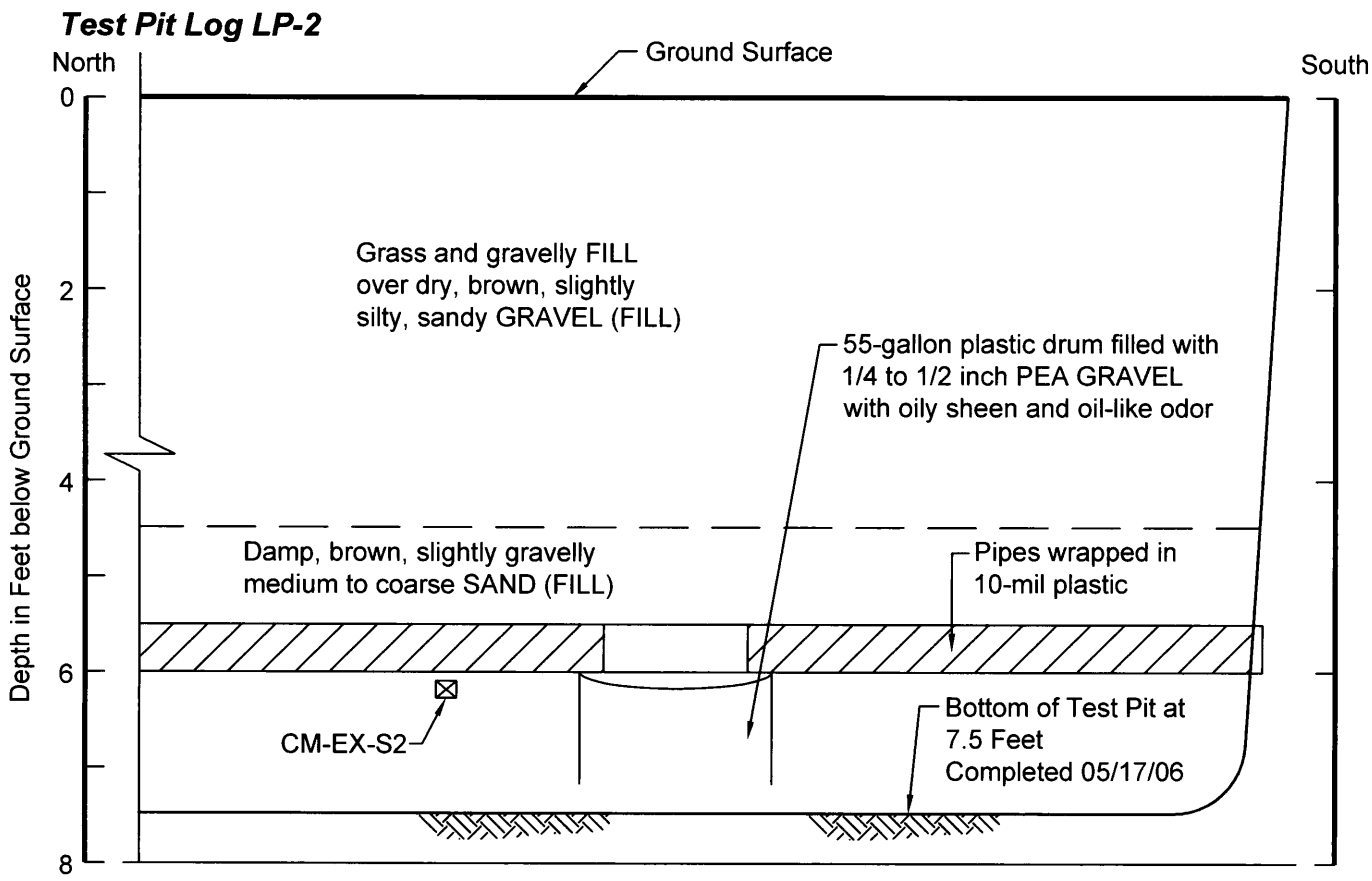


Notes:

1. Sample CM-EX-S1 collected adjacent to outside of 55-gallon plastic drum. (PID reading <0.1 ppm)

2. Pea gravel in drum had oily/chemical odor and slight oily-looking sheen (PID reading <0.1ppm)

Test Pit Log LP-2



Notes:

1. Sample CM-EX-S2 collected adjacent to outside of 55-gallon plastic drum. (PID reading <0.1 ppm)

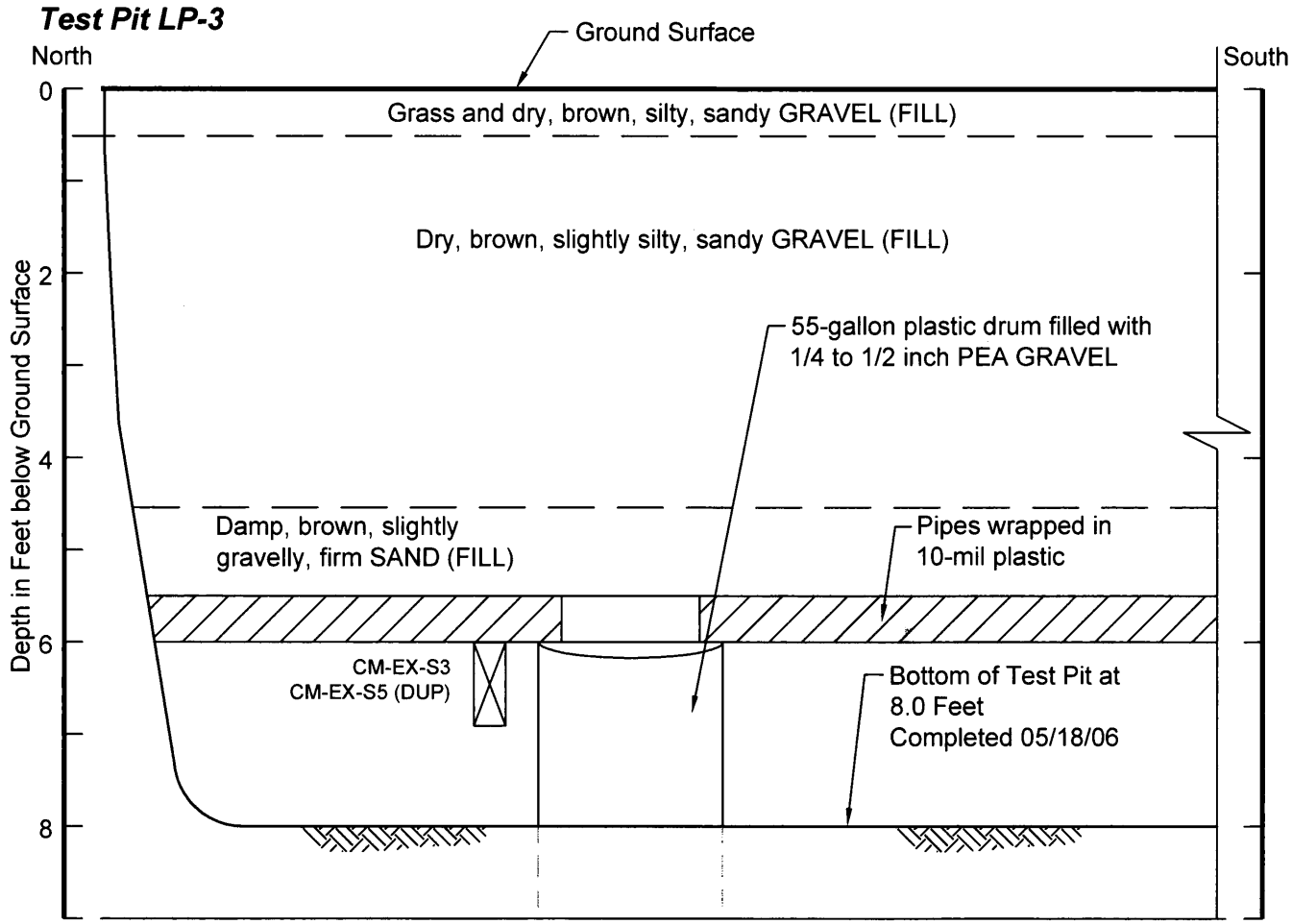
2. Pea gravel in drum had oily/chemical odor and slight oily-looking sheen (PID reading <0.1ppm)

0 2 4
Scale in Feet

HARTCROWSER
2664-114 5/09
Figure A-72

EAL 05/5/09 2644114-132.DWG

Test Pit Log LP-3



Notes:

1. Sample CM-EX-S3 and CM-EX-S5 (DUP) collected adjacent to outside of 55-gallon plastic drum. (PID reading <0.1 ppm)

EAL 05/5/09 2644114-133.DWG

0 2 4

Scale in Feet

HARTCROWSER

2644-114 5/09

Figure A-73

APPENDIX B
INPUT PARAMETERS AND DERIVATION OF SATURATED AND UNSATURATED SOIL SCREENING LEVELS

Table B-1 - Unsaturated 3-Phase Soil Screening Levels and Calculation Parameters for MTCA eqn 747-1

Chemical Constituent	3-Phase Soil Screening Level in mg/kg (a)	Chosen GW Level in µg/L (b)	Method B GW in µg/L	MCL in µg/L	Bulk Density in g/cc	Soil Water in cc/cc	Soil Air in cc/cc	Dilution Factor	H' in cc/cc	K_{oc} in ml/g	K_d in cc/g	foc in %	Data Source Checked (f)	
													H'	K_d & K_{oc}
Antimony	5.42	6	6.4	6	1.5	0.3	0.13	20	0	45	45	100.00%	CLARC online	CLARC online
Arsenic	0.0341	0.0583	0.0583	10	1.5	0.3	0.13	20	0	29	29	100.00%	CLARC online	CLARC online
Barium	1650	2000	3200	2000	1.5	0.3	0.13	20	0	41	41	100.00%	CLARC online	CLARC online
Beryllium	63.2	4	32	4	1.5	0.3	0.13	20	0	790	790	100.00%	CLARC online	CLARC online
Cadmium	0.69	5	8	5	1.5	0.3	0.13	20	0	6.7	6.7	100.00%	CLARC online	CLARC online
Chromium (c)	2000	100	24000	100	1.5	0.3	0.13	20	0	1000	1000	100.00%	CLARC online	CLARC online
Copper	263	592	592	1300	1.5	0.3	0.13	20	0	22	22	100.00%	CLARC online	CLARC online
Hexavalent Chromium	18.4	48	48	100	1.5	0.3	0.13	20	0	19	19	100.00%	CLARC online	CLARC online
Lead	NC	15		15	1.5	0.3	0.13	20	0	10000	10000	100.00%	EPA 9 PRGs	EPA 9 PRGs
Manganese	52.2	50	2240	50	1.5	0.3	0.13	20	0	52	52	100.00%	CLARC online	EPA 3
Mercury	2.09	2	4.8	2	1.5	0.3	0.13	20	0.47	52	52	100.00%	CLARC online	CLARC online
Nickel	130	100	320	100	1.5	0.3	0.13	20	0	65	65	100.00%	CLARC online	CLARC online
Selenium	5.2	50	80	50	1.5	0.3	0.13	20	0	5	5	100.00%	CLARC online	CLARC online
Silver	13.6	80	80	100	1.5	0.3	0.13	20	0	8.3	8.3	100.00%	CLARC online	CLARC online
Thallium	1.595	1.12	1.12	2	1.5	0.3	0.13	20	0	71	71	100.00%	CLARC online	CLARC online
Zinc	5970	4800	4800	5000	1.5	0.3	0.13	20	0	62	62	100.00%	CLARC online	CLARC online
Total PCBs	0.271	0.0438	0.0438	0.5	1.5	0.3	0.13	20		310000	310	0.10%	CLARC online	CLARC online
1-Methylnaphthalene (d)	2.19	32	32		1.5	0.3	0.13	20	0.021	3220	3.22	0.10%	EPA 9 PRGs	Montgomery
2-Methylnaphthalene	2.19	32	32		1.5	0.3	0.13	20	0.021	3220	3.22	0.10%	EPA 9 PRGs	Montgomery
Acenaphthene	97.9	960	960		1.5	0.3	0.13	20	0.0064	4900	4.9	0.10%	CLARC online	CLARC online
Anthracene	2230	4800	4800		1.5	0.3	0.13	20	0.0027	23000	23	0.10%	CLARC online	CLARC online
Benzo(a)pyrene	0.233	0.012	0.012	0.2	1.5	0.3	0.13	20	0.000046	970000	970	0.10%	CLARC online	CLARC online
Bis(2-Ethylhexyl)Phthalate	13.2	6	6.25	6	1.5	0.3	0.13	20	0.0000042	110000	110	0.10%	CLARC online	CLARC online
Dibenzofuran	5.09	32	32		1.5	0.3	0.13	20	0.000533	7760	7.76	0.10%	EPA 9 PRGs 2002	EPA 9 PRGs 2002
Di-n-butylphthalate	57.6	1600	1600		1.5	0.3	0.13	20	0.000000039	1600	1.6	0.10%	CLARC online	CLARC online
Di-n-octylphthalate	531000	320	320		1.5	0.3	0.13	20	0.0027	83000000	83000	0.10%	CLARC online	CLARC online
Fluoranthene	630	640	640		1.5	0.3	0.13	20	0.00066	49000	49	0.10%	CLARC online	CLARC online
Fluorene	101	640	640		1.5	0.3	0.13	20	0.0026	7700	7.7	0.10%	CLARC online	CLARC online
Naphthalene	4.49	160	160		1.5	0.3	0.13	20	0.02	1200	1.2	0.10%	CLARC online	CLARC online
N-Nitrosodiphenylamine	0.536	17.9	17.9		1.5	0.3	0.13	20	0.00021	1300	1.3	0.10%	CLARC online	CLARC online
Phenol	22	4800	4800		1.5	0.3	0.13	20	0.000016	29	0.029	0.10%	CLARC online	CLARC online
Pyrene	655	480	480		1.5	0.3	0.13	20	0.00045	68000	68	0.10%	CLARC online	CLARC online
1,1,1-Trichloroethane	1.61	200	7200	200	1.5	0.3	0.13	20	0.71	140	0.14	0.10%	CLARC online	CLARC online
1,1-Dichloroethane	8.73	1600	1600		1.5	0.3	0.13	20	0.23	53	0.053	0.10%	CLARC online	CLARC online
1,2,4-Trimethylbenzene	31.4	400	400		1.5	0.3	0.13	20	0.23	3700	3.7	0.10%	EPA 9 PRGs	EPA 9 PRGs
1,3,5-Trimethylbenzene	8.38	400	400		1.5	0.3	0.13	20	0.32	820	0.82	0.10%	EPA 9 PRGs	EPA 9 PRGs
2-Butanone (MEK)	19.7	4800	4800		1.5	0.3	0.13	20	0.0023	4.5	0.0045	0.10%	EPA 9 PRGs	EPA 9 PRGs
2-Chlorotoluene	2.39	320	320		1.5	0.3	0.13	20	0.15	160	0.16	0.10%	EPA 9 PRGs	EPA 9 PRGs
4-Chlorotoluene	4.18	560	560		1.5	0.3	0.13	20	0.15	160	0.16	0.10%	EPA 9 PRGs	EPA 9 PRGs
Acetone	3.21	800	800		1.5	0.3	0.13	20	0.0016	0.58	0.00058	0.10%	CLARC online	CLARC online
Benzene	0.00449	0.796	0.796	5	1.5	0.3	0.13	20	0.23	62	0.062	0.10%	CLARC online	CLARC online
Bromomethane	0.0519	11.2	11.2		1.5	0.3	0.13	20	0.26	9	0.009	0.10%	CLARC online	CLARC online
Carbon Disulfide	5.6	800	800		1.5	0.3	0.13	20	1.2	46	0.046	0.10%	CLARC online	CLARC online
Chloroform	0.0382	7.17	7.17	80	1.5	0.3	0.13	20	0.15	53	0.053	0.10%	CLARC online	CLARC online
Chloromethane	0.0215	3.37	3.37		1.5	0.3	0.13	20	0.98	35	0.035	0.10%	EPA 9 PRGs	EPA 9 PRGs
Dichlorodifluoromethane	47.1	1600	1600		1.5	0.3	0.13	20	14	58	0.058	0.10%	EPA 9 PRGs	EPA 9 PRGs
Ethylbenzene	5.99	700	800	700	1.5	0.3	0.13	20	0.32	200	0.2	0.10%	CLARC online	CLARC online
Isopropylbenzene	7.37	800	800		1.5	0.3	0.13	20	0.472	220	0.22	0.10%	EPA 9 PRGs	EPA 9 PRGs
m,p-Xylenes (e)	8.52	1000	16000	1000	1.5	0.3	0.13	20	0.3	200	0.2	0.10%	CLARC online	CLARC online

Table B-1 - Unsaturated 3-Phase Soil Screening Levels and Calculation Parameters for MTCA eqn 747-1

Chemical Constituent	3-Phase Soil Screening Level in mg/kg (a)	Chosen GW Level in µg/L (b)	Method B GW in µg/L	MCL in µg/L	Bulk Density in g/cc	Soil Water in cc/cc	Soil Air in cc/cc	Dilution Factor	H' in cc/cc	K_{oc} in ml/g	K_d in cc/g	foc in %	Data Source Checked (f)	
													H'	K_d & K_{oc}
Methylene Chloride	0.0218	5	5.83	5	1.5	0.3	0.13	20	0.09	10	0.01	0.10%	CLARC online	CLARC online
Naphthalene	4.49	160	160		1.5	0.3	0.13	20	0.02	1200	1.2	0.10%	CLARC online	CLARC online
N-Butylbenzene	19.5	320	320		1.5	0.3	0.13	20	0.54	2800	2.8	0.10%	EPA 9 PRGs	EPA 9 PRGs
N-Propylbenzene	19.5	320	320		1.5	0.3	0.13	20	0.54	2800	2.8	0.10%	EPA 9 PRGs 2002	EPA 9 PRGs 2002
o-Xylene	0.916	100	16000	100	1.5	0.3	0.13	20	0.21	240	0.24	0.10%	CLARC online	CLARC online
Sec-Butylbenzene	15.8	320	320		1.5	0.3	0.13	20	0.77	2200	2.2	0.10%	EPA 9 PRGs	EPA 9 PRGs
Styrene	0.0327	1.46	1.46	100	1.5	0.3	0.13	20	0.11	910	0.91	0.10%	CLARC online	CLARC online
Tert-Butylbenzene	15.6	320	320		1.5	0.3	0.13	20	0.52	2200	2.2	0.10%	EPA 9 PRGs	EPA 9 PRGs
Tetrachloroethene	0.000867	0.081	0.081	5	1.5	0.3	0.13	20	0.75	270	0.27	0.10%	CLARC online	CLARC online
Toluene	4.65	640	640	1000	1.5	0.3	0.13	20	0.27	140	0.14	0.10%	CLARC online	CLARC online
Total Xylenes	14.5	1600	1600	10000	1.5	0.3	0.13	20	0.28	230	0.23	0.10%	CLARC online	CLARC online
Trichloroethene	0.00325	0.492	0.492	5	1.5	0.3	0.13	20	0.422	94	0.094	0.10%	CLARC online	CLARC online

Notes:
(a) Based on a Fixed Parameter 3-Phase Partitioning Model for deriving soil concentrations for groundwater protection as specified in WAC 173-340-747, unless otherwise specified.
(b) Chosen groundwater level based on lowest value between Method B groundwater level and Maximum Contaminant Level (MCL).
(c) Screening level for chromium based on chromium (III).
(d) Screening level for 1-Methylnaphthalene based on 2-Methylnaphthalene
(e) Screening level for m,p-xylenes based on m-xylenes.
(f) Data Sources Checked:
Montgomery: Montgomery, John H., 1996. Groundwater Chemicals Desk Reference, 2nd Ed. Boca Raton: CRC Press (Lewis Publishers).
EPA 9 PRGs 2002: EPA Region 9 program table, 2002.
EPA 3: Value obtained from EPA Region 3 Screening Level website in 2006. Link no longer exists.
CLARC online: https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx
EPA 9 PRGs: http://www.epa.gov/region09/superfund/prg/
Blank indicates no MCL or Method B Groundwater Cleanup Level established.
NC indicates 3-Phase Soil Screening Level not calculated. MTCA Method A Soil Cleanup Level used as screening level (see Table 1-1).

Table B-2 - Saturated 3-Phase Soil Screening Levels and Calculation Parameters for MTCA eqn 747-1

Chemical Constituent	3-Phase Soil Screening Level in mg/kg (a)	Chosen GW Level in µg/L (b)	Method B GW in µg/L	MCL in µg/L	Bulk Density in g/cc	Soil Water in cc/cc	Soil Air in cc/cc	Dilution Factor	H' in cc/cc	K_{oc} in ml/g	K_d in cc/g	foc in %	Data Source Checked (e)	
													H'	K_d & K_{oc}
Antimony	0.272	6	6.4	6	1.5	0.4	0	1	0	45	45	100.00%	CLARC online	CLARC online
Arsenic	0.00171	0.0583	0.0583	10	1.5	0.4	0	1	0	29	29	100.00%	CLARC online	CLARC online
Barium	82.6	2000	3200	2000	1.5	0.4	0	1	0	41	41	100.00%	CLARC online	CLARC online
Cadmium	0.0349	5	8	5	1.5	0.4	0	1	0	6.7	6.7	100.00%	CLARC online	CLARC online
Chromium (c)	100	100	24000	100	1.5	0.4	0	1	0	1000	1000	100.00%	CLARC online	CLARC online
Hexavalent Chromium	0.926	48	48	100	1.5	0.4	0	1	0	19	19	100.00%	CLARC online	CLARC online
Lead	NC	15		15	1.5	0.4	0	1	0	10000	10000	100.00%	EPA 9 PRGs	EPA 9 PRGs
Manganese	2.61	50	2240	50	1.5	0.4	0	1	0	52	52	100.00%	CLARC online	EPA 3
Mercury	0.105	2	4.8	2	1.5	0.4	0	1	0.47	52	52	100.00%	CLARC online	CLARC online
Selenium	0.264	50	80	50	1.5	0.4	0	1	0	5	5	100.00%	CLARC online	CLARC online
Silver	0.687	80	80	100	1.5	0.4	0	1	0	8.3	8.3	100.00%	CLARC online	CLARC online
Total PCBs	0.0136	0.0438	0.0438	0.5	1.5	0.4	0	1		310000	310	0.10%	CLARC online	CLARC online
2-Methylnaphthalene	0.112	32	32		1.5	0.4	0	1	0.021	3220	3.22	0.10%	EPA 9 PRGs	Montgomery
Acenaphthene	4.98	960	960		1.5	0.4	0	1	0.0064	4900	4.9	0.10%	CLARC online	CLARC online
Anthracene	112	4800	4800		1.5	0.4	0	1	0.0027	23000	23	0.10%	CLARC online	CLARC online
Benzo(a)pyrene	0.0116	0.012	0.012	0.2	1.5	0.4	0	1	0.000046	970000	970	0.10%	CLARC online	CLARC online
Bis(2-Ethylhexyl)Phthalate	0.662	6	6.25	6	1.5	0.4	0	1	0.0000042	110000	110	0.10%	CLARC online	CLARC online
Dibenzofuran	0.257	32	32		1.5	0.4	0	1	0.000533	7760	7.76	0.10%	EPA 9 PRGs 2002	EPA 9 PRGs 2002
Di-n-butylphthalate	3.02	1600	1600		1.5	0.4	0	1	0.000000039	1600	1.6	0.10%	CLARC online	CLARC online
Di-n-octylphthalate	26600	320	320		1.5	0.4	0	1	0.0027	83000000	83000	0.10%	CLARC online	CLARC online
Fluoranthene	31.5	640	640		1.5	0.4	0	1	0.00066	49000	49	0.10%	CLARC online	CLARC online
Fluorene	5.11	640	640		1.5	0.4	0	1	0.0026	7700	7.7	0.10%	CLARC online	CLARC online
Naphthalene	0.238	160	160		1.5	0.4	0	1	0.02	1200	1.2	0.10%	CLARC online	CLARC online
N-Nitrosodiphenylamine	0.0283	17.9	17.9		1.5	0.4	0	1	0.00021	1300	1.3	0.10%	CLARC online	CLARC online
Phenol	1.52	4800	4800		1.5	0.4	0	1	0.000016	29	0.029	0.10%	CLARC online	CLARC online
Pyrene	32.8	480	480		1.5	0.4	0	1	0.00045	68000	68	0.10%	CLARC online	CLARC online
1,1,1-Trichloroethane	0.0853	200	7200	200	1.5	0.4	0	1	0.71	140	0.14	0.10%	CLARC online	CLARC online
1,1-Dichloroethane	0.543	1600	1600		1.5	0.4	0	1	0.23	53	0.053	0.10%	CLARC online	CLARC online
1,2,4-Trimethylbenzene	1.6	400	400		1.5	0.4	0	1	0.23	3700	3.7	0.10%	EPA 9 PRGs	EPA 9 PRGs
1,3,5-Trimethylbenzene	0.443	400	400		1.5	0.4	0	1	0.32	820	0.82	0.10%	EPA 9 PRGs	EPA 9 PRGs
2-Butanone (MEK)	1.4	4800	4800		1.5	0.4	0	1	0.0023	4.5	0.0045	0.10%	EPA 9 PRGs	EPA 9 PRGs
2-Chlorotoluene	0.143	320	320		1.5	0.4	0	1	0.15	160	0.16	0.10%	EPA 9 PRGs	EPA 9 PRGs
4-Chlorotoluene	0.25	560	560		1.5	0.4	0	1	0.15	160	0.16	0.10%	EPA 9 PRGs	EPA 9 PRGs
Acetone	0.23	800	800		1.5	0.4	0	1	0.0016	0.58	0.00058	0.10%	CLARC online	CLARC online
Benzene	0.000277	0.796	0.796	5	1.5	0.4	0	1	0.23	62	0.062	0.10%	CLARC online	CLARC online
Bromomethane	0.00331	11.2	11.2		1.5	0.4	0	1	0.26	9	0.009	0.10%	CLARC online	CLARC online
Carbon Disulfide	0.266	800	800		1.5	0.4	0	1	1.2	46	0.046	0.10%	CLARC online	CLARC online
Chloroform	0.00244	7.17	7.17	80	1.5	0.4	0	1	0.15	53	0.053	0.10%	CLARC online	CLARC online
Chloromethane	0.00108	3.37	3.37		1.5	0.4	0	1	0.98	35	0.035	0.10%	EPA 9 PRGs	EPA 9 PRGs
Dichlorodifluoromethane	0.551	1600	1600		1.5	0.4	0	1	14	58	0.058	0.10%	EPA 9 PRGs	EPA 9 PRGs
Ethylbenzene	0.341	700	800	700	1.5	0.4	0	1	0.32	200	0.2	0.10%	CLARC online	CLARC online
Isopropylbenzene	0.405	800	800		1.5	0.4	0	1	0.472	220	0.22	0.10%	EPA 9 PRGs	EPA 9 PRGs
m,p-Xylenes (d)	0.487	1000	16000	1000	1.5	0.4	0	1	0.3	200	0.2	0.10%	CLARC online	CLARC online
Methylene Chloride	0.00148	5	5.83	5	1.5	0.4	0	1	0.09	10	0.01	0.10%	CLARC online	CLARC online
Naphthalene	0.238	160	160		1.5	0.4	0	1	0.02	1200	1.2	0.10%	CLARC online	CLARC online
N-Butylbenzene	0.988	320	320		1.5	0.4	0	1	0.54	2800	2.8	0.10%	EPA 9 PRGs	EPA 9 PRGs
N-Propylbenzene	0.988	320	320		1.5	0.4	0	1	0.54	2800	2.8	0.10%	EPA 9 PRGs 2002	EPA 9 PRGs 2002
o-Xylene	0.0527	100	16000	100	1.5	0.4	0	1	0.21	240	0.24	0.10%	CLARC online	CLARC online
Sec-Butylbenzene	0.796	320	320		1.5	0.4	0	1	0.77	2200	2.2	0.10%	EPA 9 PRGs	EPA 9 PRGs

Table B-2 - Saturated 3-Phase Soil Screening Levels and Calculation Parameters for MTCA eqn 747-1

Chemical Constituent	3-Phase Soil Screening Level in mg/kg (a)	Chosen GW Level in µg/L (b)	Method B GW in µg/L	MCL in µg/L	Bulk Density in g/cc	Soil Water in cc/cc	Soil Air in cc/cc	Dilution Factor	H' in cc/cc	K_{oc} in ml/g	K_d in cc/g	foc in %	Data Source Checked (e)	
													H'	K_d & K_{oc}
Styrene	0.00175	1.46	1.46	100	1.5	0.4	0	1	0.11	910	0.91	0.10%	CLARC online	CLARC online
Tert-Butylbenzene	0.796	320	320		1.5	0.4	0	1	0.52	2200	2.2	0.10%	EPA 9 PRGs	EPA 9 PRGs
Tetrachloroethene	0.0000451	0.081	0.081	5	1.5	0.4	0	1	0.75	270	0.27	0.10%	CLARC online	CLARC online
Toluene	0.273	640	640	1000	1.5	0.4	0	1	0.27	140	0.14	0.10%	CLARC online	CLARC online
Total Xylenes	0.827	1600	1600	10000	1.5	0.4	0	1	0.28	230	0.23	0.10%	CLARC online	CLARC online
Trichloroethene	0.000187	0.492	0.492	5	1.5	0.4	0	1	0.422	94	0.094	0.10%	CLARC online	CLARC online

Notes:
(a) Based on a Fixed Parameter 3-Phase Partitioning Model for deriving soil concentrations for groundwater protection as specified in WAC 173-340-747, unless otherwise specified.
(b) Chosen groundwater level based on lowest value between Method B groundwater level and Maximum Contaminant Level (MCL).
(c) Screening level for chromium based on chromium (III).
(d) Screening level for m,p-xylenes based on m-xylenes.
(e) Data Sources Checked:
Montgomery: Montgomery, John H., 1996. Groundwater Chemicals Desk Reference, 2nd Ed. Boca Raton: CRC Press (Lewis Publishers).
EPA 9 PRGs 2002: EPA Region 9 program table, 2002.
EPA 3: Value obtained from EPA Region 3 Screening Level website in 2006. Link no longer exists.
CLARC online: https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx
EPA 9 PRGs: http://www.epa.gov/region09/superfund/prg/
Blank indicates no MCL or Method B Groundwater Cleanup Level established.
NC indicates 3-Phase Soil Screening Level not calculated. MTCA Method A Soil Cleanup Level used as screening level (see Table 1-2).

APPENDIX C
CHEMICAL DATA QUALITY REVIEW SUMMARY

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APPENDIX C
CHEMICAL DATA QUALITY REVIEW SUMMARY

C.1 Summary of Data Validation Effort

The quality assurance (QA) review of 688 soil samples and 3 soil gas samples collected from the Kaiser Trentwood facility from March 2005 to October 2008 has been completed for the RI/FS report. Soil samples collected prior to March 2005 and groundwater samples included presented in this report have been previously reviewed.

Samples were submitted to Columbia Analytical Services, Inc. (CAS) of Kelso, WA and Advanced Analytical Laboratories, Inc. (AAL) of Redmond, WA. The laboratory submitted data packages were reviewed by Hart Crowser. The quality assurance evaluation performed and the resulting data qualification recommendations have been summarized by laboratory sample delivery groups (SDGs) for the submitted packages.

The summaries of the laboratory analyses have been evaluated in accordance with the Quality Assurance Project Plan (QAPP) in the Phase I Remedial Investigation Work Plan (Hart Crowser 2005), specific method requirements, laboratory control limits, and EPA Data Validation Functional Guidelines (EPA 1994a and 1994b). Applicable methods include the Washington State Department of Ecology (Ecology) Method for TPH, EPA SW-846 Methods, EPA Methods for Chemical Analysis of Water and Wastes, Standard Methods (18th Edition) and laboratory Standard Operating Procedures (SOPs). Recommended data qualifiers are based on the EPA Data Validation Functional Guidelines; definitions of qualifiers are provided at the end of this appendix.

The analytical methods and reporting limit goals are outlined in the referenced QAPPs. Data for chemical analyses and data qualifiers are presented throughout sections in text. Laboratory certificates are presented by SDG on attached disk.

All data were validated to a standard data validation effort in accordance with the QAPPs. Raw data were reviewed where deemed appropriate by the reviewer.

C.2 Quality Assurance Objectives

The overall data quality objectives (DQOs), as set forth in the QAPP, are met, and the data for this project are acceptable for use as qualified. The completeness for the associated data is 100 percent. Detailed discussions of the data quality indicators used to quantitate the DQOs are presented below.

C.2.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Precision is generally evaluated using both matrix spike/matrix spike duplicate (MS/MSD) (or lab duplicate) results and field duplicate results. MS/MSD and lab duplicate results provide information on laboratory precision (only), while field duplicates provide information on field and lab precision combined.

Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the MS/MSD or duplicates. Analytical precision measurements were carried out on project-specific samples whenever possible at a minimum frequency of one per sample delivery group (SDG). Data qualifiers were assigned based on high RPDs of MS/MSD or laboratory duplicates.

The project-specific precision acceptance criteria for field duplicates was 50 percent RPD. Due to the heterogeneous nature of soil samples field duplicates often exceeded the acceptance criteria but no data were qualified based on field duplicate recovery alone. The field duplicate precision was not calculated if sample results were not detected above the reporting limits.

C.2.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. The accuracy of chemical test results was assessed by "spiking" samples with known standards (surrogates, laboratory control samples, blank spikes, and/or matrix spike) and measuring the percent recovery.

Accuracy measurements for all fractions were carried out at a minimum frequency of one per SDG. Recoveries of surrogates, MS/MSDs, blank spikes, and LCSs were generally acceptable for all analyses. Data qualifiers were required for some samples based on surrogate or MS recoveries being out of control limits. These data qualifications are described in greater detail within each data validation section below and are generally the result of matrix interferences in the samples.

C.2.3 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements. The completeness of the data is the number of acceptable data points over the total number of data points times 100. A target completeness goal for this work was 95 percent. No results were rejected

based on data QA/QC review; therefore, the completeness of the data for this project was 100 percent.

C.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Because of the use of standard techniques for both sample collection and laboratory analysis, the data collected from same sampling locations and depths should be comparable to both internal and other data generated.

C.3 Minor Problems Encountered

This section describes the common quality assurance issues that were found across all sections and analytes. Sections C.4 through C.10 detail specific qualification summaries for the data presented in each section of this report.

C.3.1 Detection Limit Goal Exceedances

Several samples results exceeded the reporting limit (RL) goal outlined in the QAPP. These exceedances were largely the result of dilution effects or matrix interferences and do not effect the quality of the results. Diesel/Fuel oil often had a reporting limit of 50 mg/kg which exceeded the reporting limit goal of 20 mg/kg specified in the QAPP.

The laboratory qualifiers applied to diluted samples "D" were removed from results where applicable. Laboratory “Ui” qualifiers applied to elevated RL due to matrix interference were updated to “U” qualifiers.

C.3.2 Detections between MRL and MDL

Results that fell between the MDL and RL were qualified by the laboratory with a “J” (estimated value). The J qualifier was replaced by Hart Crowser with a “T” (estimated value between MDL and RL) after August 2007 to comply with Ecology's new EIM database. Metal detections between the MDL and RL were qualified by the laboratory with a "B". The "B" qualifier was changed to a "J" prior to August 2007 and to a "T" after August 2007.

C.3.3 Method Blank Detection

Method blank contamination was present for some samples, resulting in the qualification of some results. Associated sample results less than five times the

blank contamination were qualified as not detected (U) samples below the MRL were generally raised to the MRL and qualified as not detected (U).

C.4 Section 2.0 Oil Reclamation Building Area

Fourty-seven soil samples and two soil gas samples collected from March 2005 to October 2008 are included in Section 2.0 Oil Reclamation Building Area. Data with associated qualifiers are presented in Tables 2-3, 2-5, 2-6, 2-12, 2-13, 2-14, 2-17, 2-18, 2-20, and 2-22 of Section 2.0.

C.4.1 PCBs

Continuing calibration verification (CCV) exceedances led to qualification of detections in samples 05ORTP-1, 05ORTP-6 and 05ORTP-100 as estimated (J).

C.4.2 TPH

Detections of Stoddard/mineral spirits in several of the soil samples analyzed were reported as detected, but could not be quantified using NWTPH-HCID. The laboratory reported these data with a "D."

C.4.3 Volatiles

Internal Standard failures in 05ORTP-6 and 05ORTP-100 lead to qualifications of detections as estimated (J).

Initial calibration (ICAL) exceedances led to qualification of detections of acetone and bromoform in associated samples as estimated (J). Continuing calibration verification (CCV) exceedances led to qualification of detections in several samples as estimated (J).

C.4.4 PAHs

Sample FO-MW-1S S-10 was analyzed outside of holding time, data were reported as estimated (J).

C.5 Section 3.0 Rail Car Unloading Area

Twenty-one soil samples collected from March 2005 to October 2008 are included in Section 3.0 Rail Car Unloading Area. Data with associated qualifiers are presented in Tables 3-3 and 3-4 of Section 3.0.

Samples RCU-TP-1-B-1, RCU-TP-3-B-1, RCU-TP-4-B-1, and RCU-TP-FL-B-1 were reanalyzed using a different method to achieve lower detection limits.

C.5.1 TPH

Results for sample FO-SP are qualified as "C" because the chromatographic pattern did not match the calibration standard.

C.5.2 Volatiles

Sample results for FO-SP were qualified as estimate (J) due to elevated receiving temperatures. Results qualified with a "T" for estimate between MDL and RL were qualified as "JT".

C.5.3 PAHs

Samples RCU-TP-1-B-1-RE, RCU-TP-3-B-1-RE, RCU-TP-4-B-1-RE, and RCU-TP-FL-B-1-RE were analyzed outside of holding times, data were reported as estimated (J). These samples were a reanalysis at lower detection limits of samples run within holding time.

C.5.4 Total Solids

Samples RCU-TP-1-B-1-RE, RCU-TP-3-B-1-RE, RCU-TP-4-B-1-RE, RCU-TP-FL-B-1-RE, and RCU-SP were analyzed outside of holding times, data were reported as estimated (J).

C.6 Section 4.0 Cold Mill Area

Twenty-one soil samples collected from March 2005 to October 2008 are included in Section 4.0 Cold Mill Area. Data with associated qualifiers are presented in Tables 4-1, 4-2, 4-3, and 4-6 of Section 4.0.

C.6.1 TPH

Detections of Kensol in sample CM-EX-S1 was reported as detected, but could not be quantified using NWTPH-HCID. The laboratory reported these data with a "D."

Samples TY-SS-01 and TY-SS-05 were reanalyzed for NWTPH-HCID using a silica gel cleanup remove biogenic interferences. The reanalysis was performed outside of the required hold time and was qualified as estimated (J).

C.6.2 Metals

Cadmium detections in samples CM-EX-1, CM-EX-2, CM-EX3 and CM-EX-4 were qualified as estimated due to a low Contract Required Detection Limit (CRDL) standard recovery.

C.7 Section 5.0 Oil House Area

Nineteen soil samples collected from March 2005 to October 2008 are included in Section 5.0 Oil House Area. Data with associated qualifiers are presented in Tables 5-7 and 5-10 of Section 5.0.

C.7.1 Volatiles

Laboratory Control Sample (LCS) and Laboratory Control Sample Duplicate (LCSD) associated with sample OH-SB-1-S6 exceeded control limits for several compounds. The sample was non detect for compounds except for 1,2,4-Trimethylbenzene, which was qualified as estimated (J).

Acetone was qualified as estimated (J) in samples OH-SB-1-S2 and OH-SB-1-S-40 because it was below the acceptance criteria for the continuing calibration verification standard.

The Trip Blank had detections for benzene and toluene between the MDL and MRL. Results in associated samples with benzene and toluene detections between the MDL and RL were elevated to the reporting limit and qualified as non detect (U).

C.8 Section 6.0 Wastewater Treatment Area

Seventy-eight soil samples collected from March 2005 to October 2008 are included in Section 6.0 Wastewater Treatment Area. Seventy samples were originally presented in the Tank Closure Report, South Field Constructed Tank (Hart Crowser 2008b) and include a QA review. Data with associated qualifiers of the eight remaining samples are presented in Table 6-9.

C.8.1 Metals

Matrix spike and matrix spike duplicate samples had a low recovery for antimony. Antimony results qualified as estimated (J).

C.8.2 Volatiles

Initial calibration exceedances caused detections of 4-Isopropyltoluene and n-Butylbenzene to be qualified as estimated (J) in sample HT-SB-1-S-6.

Acetone was qualified as estimated (J) in samples HT-SB-1-S-2, HT-SB-1-S-4, and HT-SB-1-S-20) because it was below the acceptance criteria for the continuing calibration verification standard.

The Trip Blank had detections for benzene and toluene between the MDL and MRL. Results in associated samples with benzene and toluene detections between the MDL and RL were elevated to the reporting limit and qualified as non detect (U).

C.9 Section 7.0 Truck Shop Area

Twenty-seven soil samples and one soil gas samples collected from March 2005 to October 2008 are included in Section 7.0 Truck Shop Area. Data with associated qualifiers are presented in Tables 7-3 and 7-5 of Section 7.0.

C.9.1 TPH

Detections of Stoddard/mineral spirits in several of the soil samples analyzed were reported as detected, but could not be quantified using NWTPH-HCID. The laboratory reported these data with a "D."

C.9.2 Semi-Volatiles

Samples TSMW-1S/S-3, TSMW-1S/S-7, and TSMW-1S/S-10 exceeded holding times by 2 days. Results for these samples were qualified as estimated (J).

C.10 Section 8.0 Former Discharge Ravines

Two hundred and sixteen samples collected from March 2005 to October 2008 are included in Section 8.0 Former Discharge Ravines. One hundred and twenty-four samples were originally presented in the West Discharge Ravine Interim Action Completion Report (Hart Crowser 2008a) which includes a QA review. Data with associated qualifiers for the ninety-two remaining samples are presented in Tables 8-1, 8-4, 8-5, and 8-6.

Samples WDR-PIA-01 through WDR-PIA-18 were incorrectly labeled by laboratory as WDR-P1A-01 through WDR-P1A-18.

C.10.1 PCBs

Continuing calibration verification (CCV) drifts of three aroclors lead to the qualification of detections in samples WDR-SS-1 through WDR-SS-18 and WDR-SS-100 as estimated (J).

Column confirmation criteria (greater than 40% difference) was exceeded for Aroclor 1248 in samples WDR-PIA-01, WDR-PIA-06, and WDR-PIA-07; Aroclor 1242 in sample WDR-PIA-12; and Aroclor 1254 in samples WDR-PIA-18 and SDR-SS1-PH2-1-S1. The higher of the two values for each sample was reported because no evidence of matrix interference was observed. Results were qualified as estimated (JP).

C.11 Section 9.0 Remelt/Hotline Area

Two hundred and sixty samples collected from March 2005 to October 2008 are included in Section 9.0 Remelt/Hotline Area. The data with associated qualifiers are presented in Tables 9-1, 9-2, 9-3, 9-4, 9-5 and 9-6.

C.11.1 PCBs

Samples HL-MW-27D S-1 and HL-MW-27D S-9 were reanalyzed outside of holding times specified in the QAPP. Results were qualified as estimated (J).

Column confirmation criteria (greater than 40% difference) were exceeded for all aroclors in samples RM-MW-15S S-3, RM-MW-15S S-4, RM-MW-15S S-5, and RM-MW-15S S-10 and for Aroclor 1254 in sample HL-MW-30s 7 1/2. Detections were reported from the column with the higher value and qualified as estimated (JP).

C.11.2 TPH

Detections of Heavy oil in sample RM-OE-3 was reported as detected, but could not be quantified using NWTPH-HCID. The laboratory reported these data with a "D."

C.11.3 Metals

Low matrix spike recovery led to the qualification of manganese detections as estimated (J) in samples HL-MW-26S-S1, HL-MW-26S-S4, HL-MW-26S-S7, HL-MW-27D-S1, HL-MW-27D-S4, and HL-MW-27D-S7.

Matrix spike recovery and relative percent difference exceedances in the laboratory duplicate resulted in the qualification of arsenic, barium, and manganese in samples HL-MW-24DD-S1, HL-MW-24DD-S4 and HL-MW-24DD-S7.

The arsenic results in sample HL-MW-30s 10' were qualified as estimated (J) due to relative percent differences in the laboratory duplicate for arsenic.

C.11.4 Volatiles

Elevated surrogate recoveries led to the qualification of detections as estimated in samples HL-MW-26S-S4, HL-MW-26S-S7, and HL-MW-27D-S1.

C.11.5 Total Organic Carbon

Samples HL-MW-27D S-1 and HL-MW-27D S-9 were reanalyzed outside of holding times specified in the QAPP. Results were qualified as estimated (J).

C.11.6 Total Solids

Samples HL-MW-26S-S1, HL-MW-26S-S4, and HL-MW-26S-S7 were analyzied out of holding times specified in the QAPP. Samples HL-MW-27D S-1 and HL-MW-27D S-9 were reanalyzed outside of holding times. Results were qualified as estimated (J).

C.12 References for Appendix C

EPA 1986. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C.

EPA 1994a. Contract Laboratory Program National Functional Guidelines for Organic Data Review. U.S. Environmental Protection Agency, Washington D.C.

EPA 1994b. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U. S. Environmental Protection Agency, Washington D.C.

EPA 1990. Test Methods for Evaluating Solid Waste. SW-846. 3rd edition. November 1990.

Hart Crowser 2005. Phase I Remedial Investigation Work Plan, Kaiser Trentwood Facility, Spokane, WA. Prepared for Kaiser Aluminum and Chemical Corporation. J-2644-95. December 21, 2005.

Hart Crowser 2008a. West Discharge Ravine Interim Action Completion Report, Kaiser Trentwood Facility, Spokane, Washington. Prepared for Kaiser Aluminum and Chemical Corporation. J-2644-110. February 25, 2008.

Hart Crowser 2008b. Tank Closure Report, South Field Constructed Tank. Kaiser Trentwood Facility, Spokane, Washington. Prepared for Kaiser Aluminum and Chemical Corporation. J-2644-99. November 12, 2008.

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DATA QUALIFIER DEFINITIONS

The following data qualifiers have been used in the text and the following tables based on a quality assurance review of the laboratory procedures and results:

U - Indicates the compound or analyte was analyzed for and not detected. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.

UJ - Indicates the compound or analyte was analyzed for and not detected. Due to quality control deficiencies identified during data validation the value reported may not accurately reflect the sample quantitation limit.

J - Indicates the compound or analyte was analyzed for and detected. The associated value is estimated but the data are usable for decision-making processes. "J " also indicated estimated values that fell between the Method Detection Limit (MDL) and the Reporting Limit (RL) prior to August 2007.

T - Estimated values that fell between the MDL and RL. Applied to data from August 2007.

P - PCB confirmation criteria exceeded. The relative percent difference is greater than 40% between the two analytical results.

D - Indicates the compound or analyte was analyzed for and was detected at or above the sample quantitation limit.

C - See comment. Qualifier used for results requiring additional explanation.

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