

To:	Seth Hendersen	From:	Tacia C. Miller, P.E., G.E. and Scott V. Mills, P.E., G.E.
Company:	Evergreen Group, LLC	Date:	June 1, 2015
Address:	3330 NW Yeon, #210 Portland, OR 97210		
cc:	Tim Terich, Froelich Engineers, LLC (via email only) Jennifer Jenkins, Ankrom Moisan Architects, Inc. (via email only)		
GDI Project:	EvergreenG-1-06		
RE:	Additional Geotechnical Explorations Block 137 Wizer Block Lake Oswego, Oregon		

INTRODUCTION

This memorandum provides a summary of our additional geotechnical borings for the proposed mixed-used development known as Block 137 in Lake Oswego, Oregon. The site is bound by A Avenue to the north, 1st Street to the east, Evergreen Road and Millennium Plaza Park to the south, and 2nd Street to the west. GeoDesign previously completed an investigation for the site and presented the results of our study in our report titled *Revised Report of Geotechnical Engineering Services; Block 137; Wizer Block; Lake Oswego, Oregon*, dated April 20, 2015. Our additional deeper borings were requested by the design and construction team to evaluate subsurface conditions for shoring design and construction.

ADDITIONAL GEOTECHNICAL BORINGS

Five additional borings (B-7 through B-11) were completed to a maximum depth of 41.5 feet below ground surface (BGS) (elevations 64.5 to 75.5 feet). Boring B-7 through B-9 were located within 2nd Street along the western edge of the site and borings B-10 and B-11 were located within existing paved parking areas along the eastern edge of the site. The attached Figure 1 shows the approximate exploration locations relative to the site boundaries and previous borings completed at the site. Boring logs are provided in the Attachment of this memorandum.

WESTERN EDGE

Site subsurface conditions encountered along the western edge of the site generally consist of fill to depths of 4 to 5.5 feet BGS (elevations 97 to 113 feet). The fill is comprised of gravel and silt and contains zones of wood. The fill in borings B-7 through B-9 is underlain by medium stiff to hard silt with varying amounts of clay and sand and clay with varying amounts of silt and sand to depths of up to 24 to 41.5 feet BGS (elevation 71 to 82 feet). Boulders and cobbles were observed in all

borings along the western edge and were encountered at depths ranging from 9 to 12.5 feet BGS (elevation 92.5 to 113 feet). Dense, clayey gravel to clay with gravel was encountered beneath the clay in boring B-7 (central west edge) extending to a depth of 35 feet BGS (elevation 71 feet) and is underlain by very stiff clay to the total depth explored of 41.5 feet BGS (elevation 64.5 feet). The clay in boring B-8 (located at southwest corner) is underlain by very dense, silty sand with clay and gravel to the total depth explored of 31.5 feet BGS (elevation 69.5 feet).

EASTERN EDGE

Fill was not encountered in additional borings B-10 and B-11 located along the eastern edge of the site. Subsurface conditions generally consist of medium stiff silt with varying amounts of sand to depths of 2.5 to 9.5 feet BGS (elevation 103.5 to 114.5 feet) and is underlain by medium dense to very dense gravel with varying amounts of clay, silt, and sand to a depth of 19 to 22 feet BGS (elevation 91 to 98 feet). Boulders and/or cobbles were encountered at depths ranging from 2.5 to 13.5 feet BGS (elevation 99.5 to 114.5 feet) and at 19 to 21 feet BGS (elevation 96 to 98 feet) in borings B-10 and B-11. The gravel is underlain by stiff to very stiff clay and silt with varying amounts of sand to depths of 34.5 to 41.5 feet BGS (elevation 71.5 to 82.5 feet). Boring B-11, located at the southeast corner, encountered medium dense to dense, silty sand with trace gravel beneath the clay and extends to the total depth explored of 41.5 feet BGS (elevation 75.5 feet)

TCM:SVM:kt

Attachments

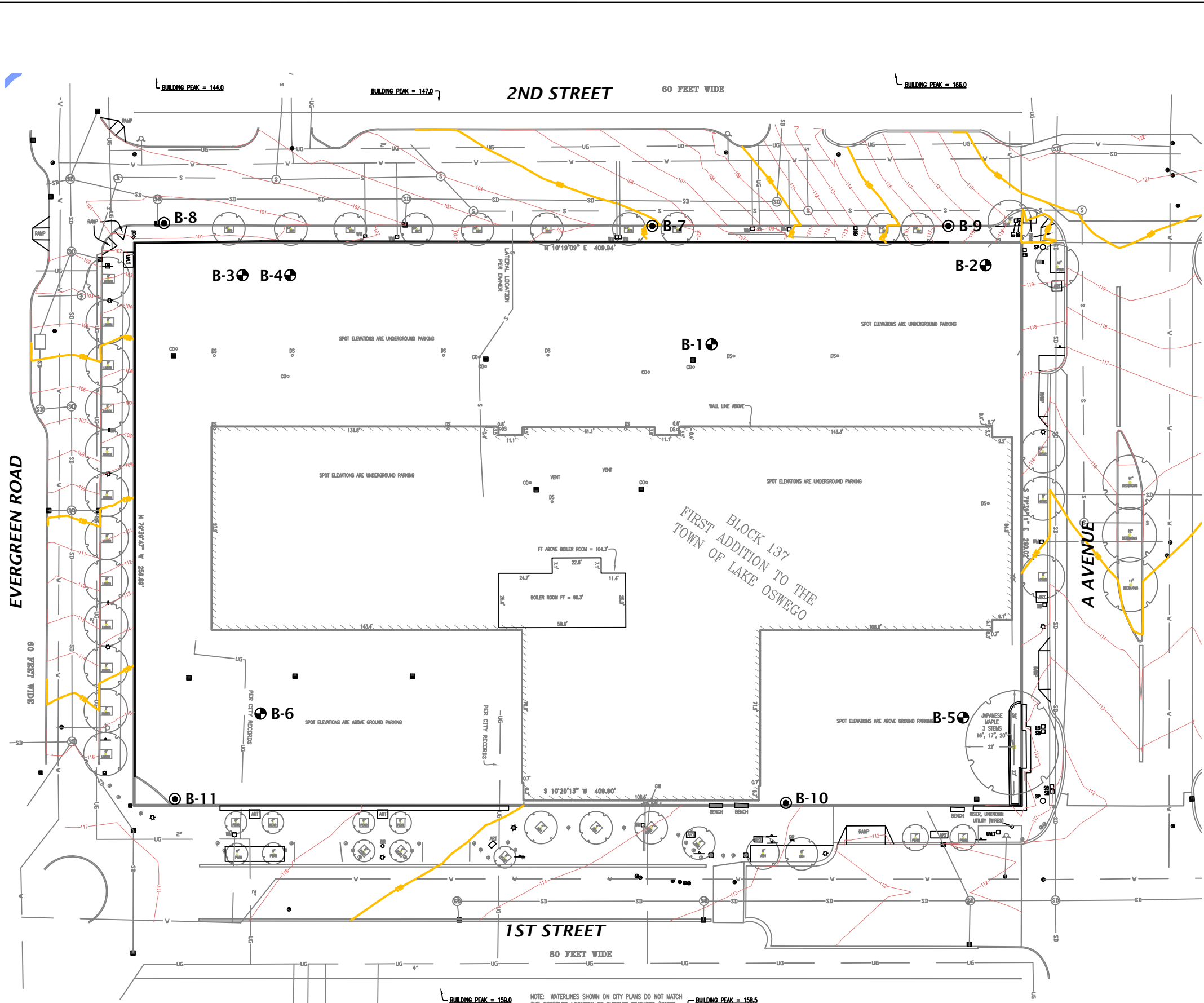
One copy submitted (via email only)

Document ID: EvergreenG-1-06-060115-geom.docx

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FIGURES



LEGEND:

- B-1 ⊕ BORING (JULY 2013)
- B-7 ⊙ BORING (MAY 2015)

NOTE:

1. BORINGS B-1 THROUGH B-4 COMPLETED USING LIMITED-ACCESS DRILL RIG IN BELOW-GRADE PARKING LEVEL.

NOTE: WATERLINES SHOWN ON CITY PLANS DO NOT MATCH THE OBSERVED LOCATION OF SURFACE FEATURES (WATER VALVES, METERS, ETC), ESPECIALLY IN FIRST STREET

ATTACHMENT

ATTACHMENT**FIELD EXPLORATIONS**

We explored the subsurface conditions at site for shoring construction by drilling five additional borings (B-7 through B-11) to depths of up to 41.5 feet BGS. Drilling services were provided by Hard Core Drilling of Dundee, Oregon. The borings were drilled using mud rotary drilling techniques on May 26 through 28, 2015. The locations of the explorations were determined in the field pacing from existing physical features and should be considered accurate only to the degree implied by the methods used.

A member of our geology staff observed the explorations. We obtained representative samples of the various soil encountered in the explorations.

SOIL SAMPLING

Samples were obtained from the borings using a 1½-inch-inside diameter, split-spoon sampler in general accordance with ASTM D 1586. The split-spoon samplers were driven into the soil with a 140-pound automatic hammer free falling 30 inches. The samplers were driven a total distance of 18 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the exploration logs, unless otherwise noted.

The average efficiency of the automatic SPT hammer used by Hard Core Drilling was 85.1 percent. A copy of the calibration testing is presented at the end of this attachment.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Exploration Key" (Table A-1) and "Soil Classification System" (Table A-2), which are included in this attachment. The exploration logs indicate the depths at which the soils or their characteristics change, although the change actually could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications and sampling intervals are shown on the exploration logs in this attachment.

SYMBOL	SAMPLING DESCRIPTION
	Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery
	Location of sample obtained using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery
	Location of sample obtained using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample obtained using Dames & Moore and 140-pound hammer or pushed with recovery
	Location of sample obtained using 3-inch-O.D. California split-spoon sampler and 140-pound hammer
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types

Observed contact between soil or rock units (at depth indicated)


Inferred contact between soil or rock units (at approximate depths indicated)

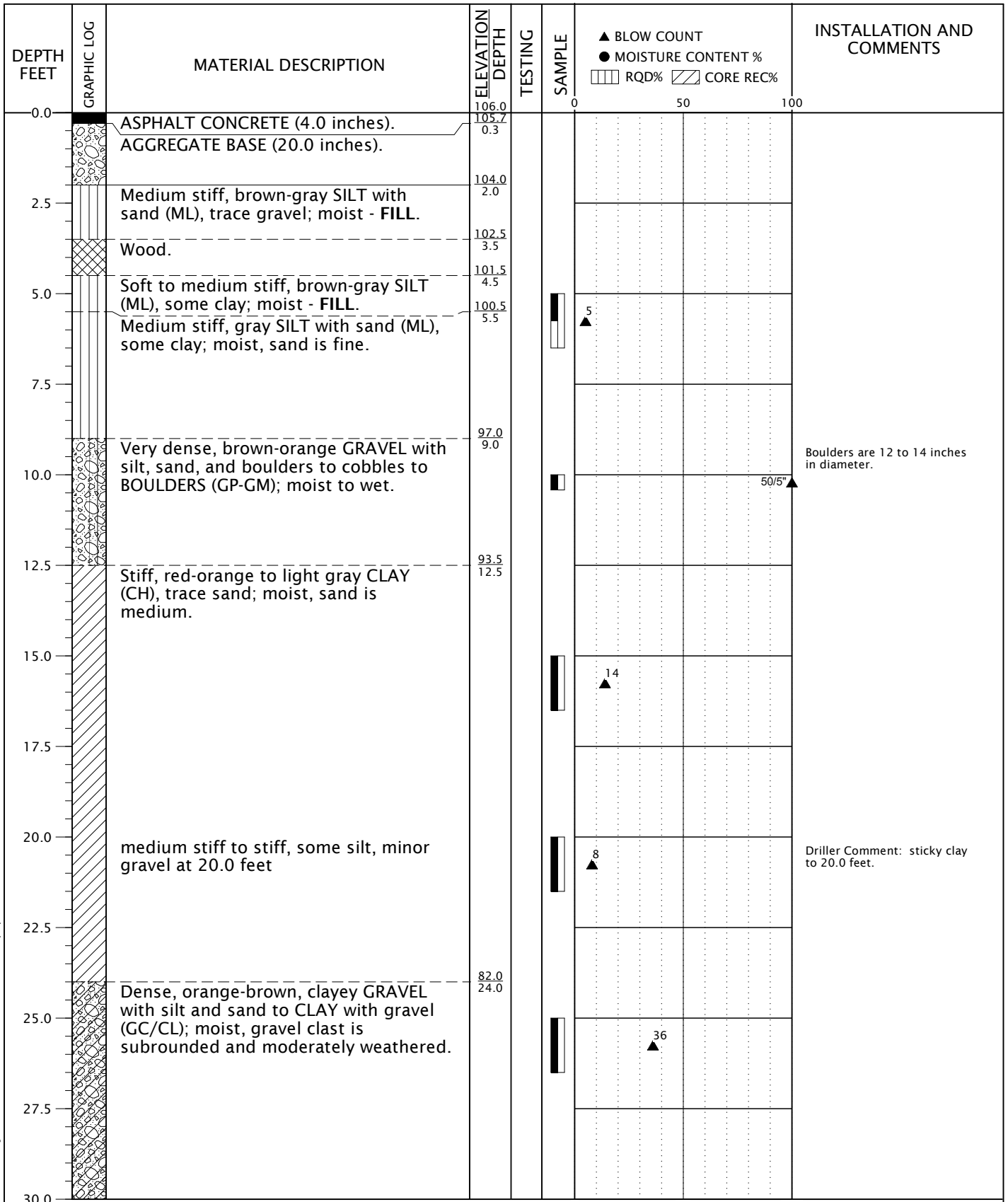
GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	PP	Pocket Penetrometer
CBR	California Bearing Ratio	P200	Percent Passing U.S. Standard No. 200 Sieve
CON	Consolidation	RES	Resilient Modulus
DD	Dry Density	SIEV	Sieve Gradation
DS	Direct Shear	TOR	Torvane
HYD	Hydrometer Gradation	UC	Unconfined Compressive Strength
MC	Moisture Content	VS	Vane Shear
MD	Moisture-Density Relationship	kPa	Kilopascal
OC	Organic Content		
P	Pushed Sample		

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
ppm	Parts per Million	MS	Moderate Sheen
		HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOILS									
Relative Density		Standard Penetration Resistance		Dames & Moore Sampler (140-pound hammer)		Dames & Moore Sampler (300-pound hammer)			
Very Loose		0 - 4		0 - 11		0 - 4			
Loose		4 - 10		11 - 26		4 - 10			
Medium Dense		10 - 30		26 - 74		10 - 30			
Dense		30 - 50		74 - 120		30 - 47			
Very Dense		More than 50		More than 120		More than 47			
CONSISTENCY - FINE-GRAINED SOILS									
Consistency		Standard Penetration Resistance		Dames & Moore Sampler (140-pound hammer)		Dames & Moore Sampler (300-pound hammer)		Unconfined Compressive Strength (tsf)	
Very Soft		Less than 2		Less than 3		Less than 2		Less than 0.25	
Soft		2 - 4		3 - 6		2 - 5		0.25 - 0.50	
Medium Stiff		4 - 8		6 - 12		5 - 9		0.50 - 1.0	
Stiff		8 - 15		12 - 25		9 - 19		1.0 - 2.0	
Very Stiff		15 - 30		25 - 65		19 - 31		2.0 - 4.0	
Hard		More than 30		More than 65		More than 31		More than 4.0	
PRIMARY SOIL DIVISIONS					GROUP SYMBOL		GROUP NAME		
COARSE-GRAINED SOILS (more than 50% retained on No. 200 sieve)		GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)		CLEAN GRAVELS (< 5% fines)		GW or GP		GRAVEL	
				GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)		GW-GM or GP-GM		GRAVEL with silt	
						GW-GC or GP-GC		GRAVEL with clay	
				GRAVELS WITH FINES (> 12% fines)		GM		silty GRAVEL	
						GC		clayey GRAVEL	
						GC-GM		silty, clayey GRAVEL	
		SAND (50% or more of coarse fraction passing No. 4 sieve)		CLEAN SANDS (<5% fines)		SW or SP		SAND	
				SANDS WITH FINES (≥ 5% and ≤ 12% fines)		SW-SM or SP-SM		SAND with silt	
						SW-SC or SP-SC		SAND with clay	
				SANDS WITH FINES (> 12% fines)		SM		silty SAND	
SC						clayey SAND			
SC-SM						silty, clayey SAND			
FINE-GRAINED SOILS (50% or more passing No. 200 sieve)		SILT AND CLAY Liquid limit less than 50		ML		SILT			
				CL		CLAY			
				CL-ML		silty CLAY			
				OL		ORGANIC SILT or ORGANIC CLAY			
		Liquid limit 50 or greater		MH		SILT			
				CH		CLAY			
				OH		ORGANIC SILT or ORGANIC CLAY			
HIGHLY ORGANIC SOILS					PT		PEAT		
MOISTURE CLASSIFICATION			ADDITIONAL CONSTITUENTS						
Term		Field Test		Secondary granular components or other materials such as organics, man-made debris, etc.					
dry		very low moisture, dry to touch		Silt and Clay In:		Sand and Gravel In:			
				Percent		Percent			
moist		damp, without visible moisture		Fine-Grained Soils		Fine-Grained Soils			
				Coarse-Grained Soils		Coarse-Grained Soils			
wet		visible free water, usually saturated		< 5		< 5			
				5 - 12		5 - 15			
				trace		trace			
				minor		minor			
				some		with			
				silty/clayey		with			
				> 12		15 - 30			
				> 30		sandy/gravelly			
				Indicate %					
 15575 SW Sequoia Parkway - Suite 100 Portland OR 97224 Off 503.968.8787 Fax 503.968.3068			SOIL CLASSIFICATION SYSTEM				TABLE A-2		



BORING LOG EVERGREENG-1-06-B7-11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT

DRILLED BY: Hard Core Drilling

LOGGED BY: JGH

COMPLETED: 05/26/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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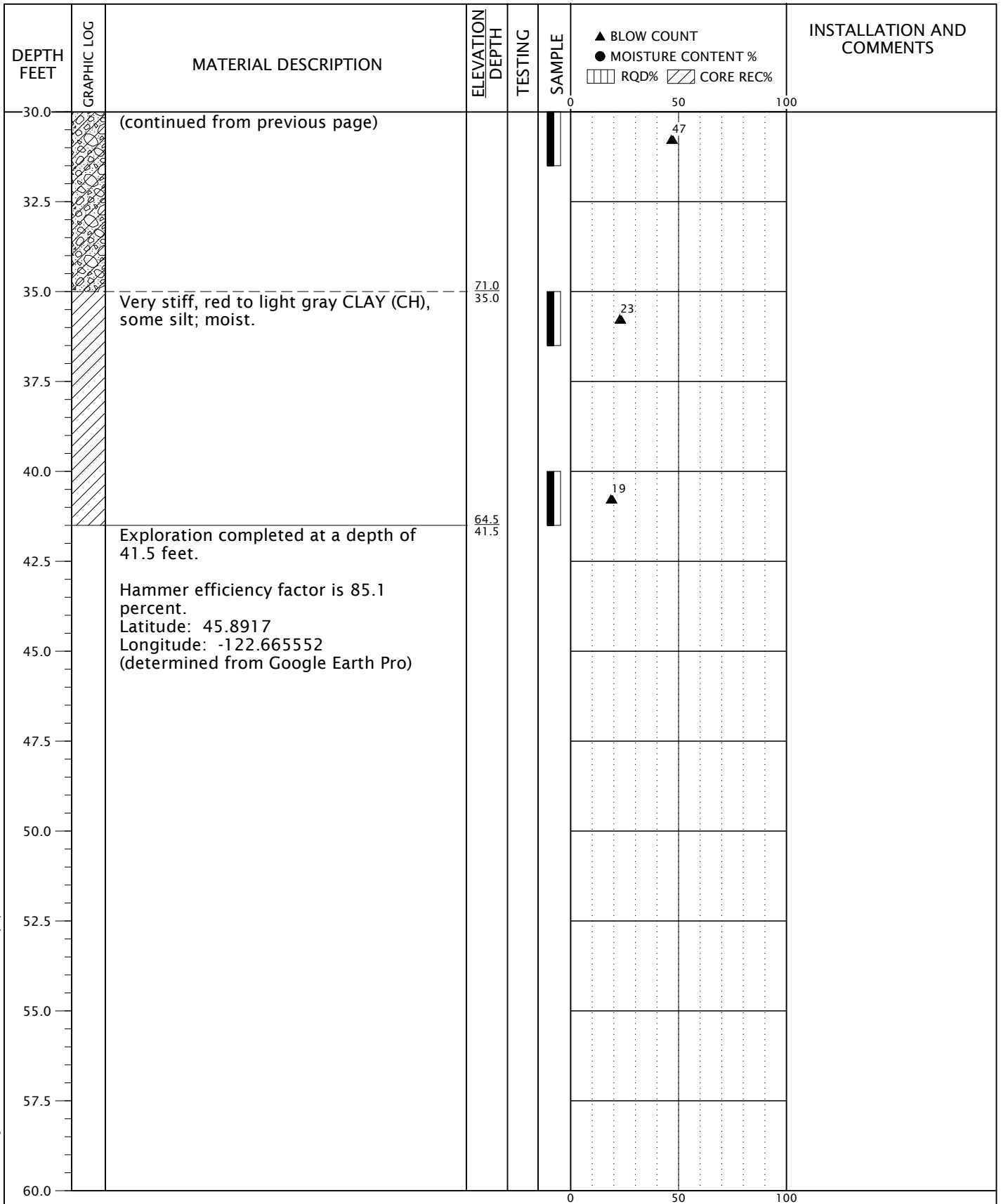
EVERGREENG-1-06

JUNE 2015

BORING B-7

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-1



DRILLED BY: Hard Core Drilling

LOGGED BY: JGH

COMPLETED: 05/26/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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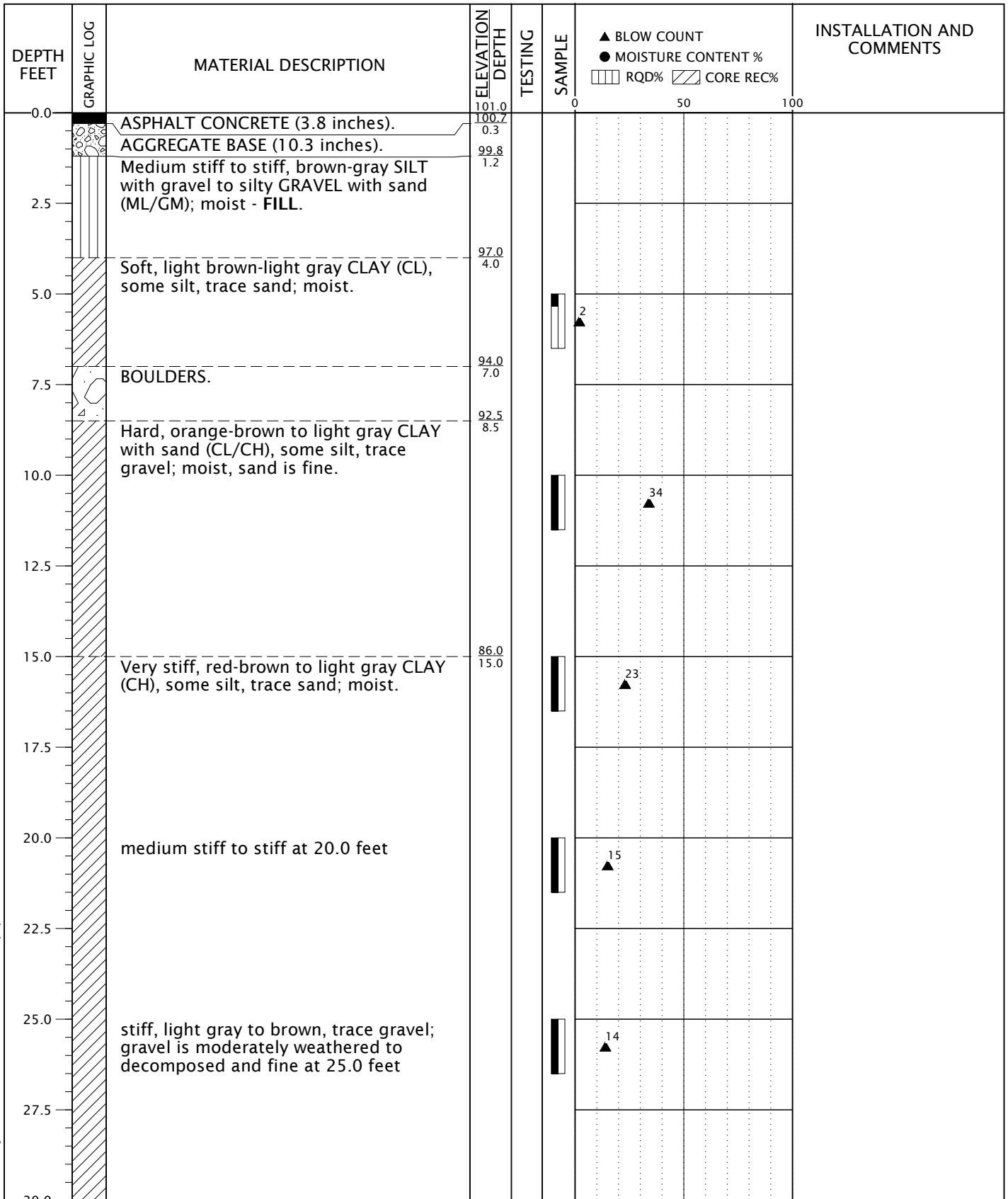
JUNE 2015

BORING B-7
(continued)

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-1

BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



DRILLED BY: Hard Core Drilling

LOGGED BY: JGH

COMPLETED: 05/26/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches

BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



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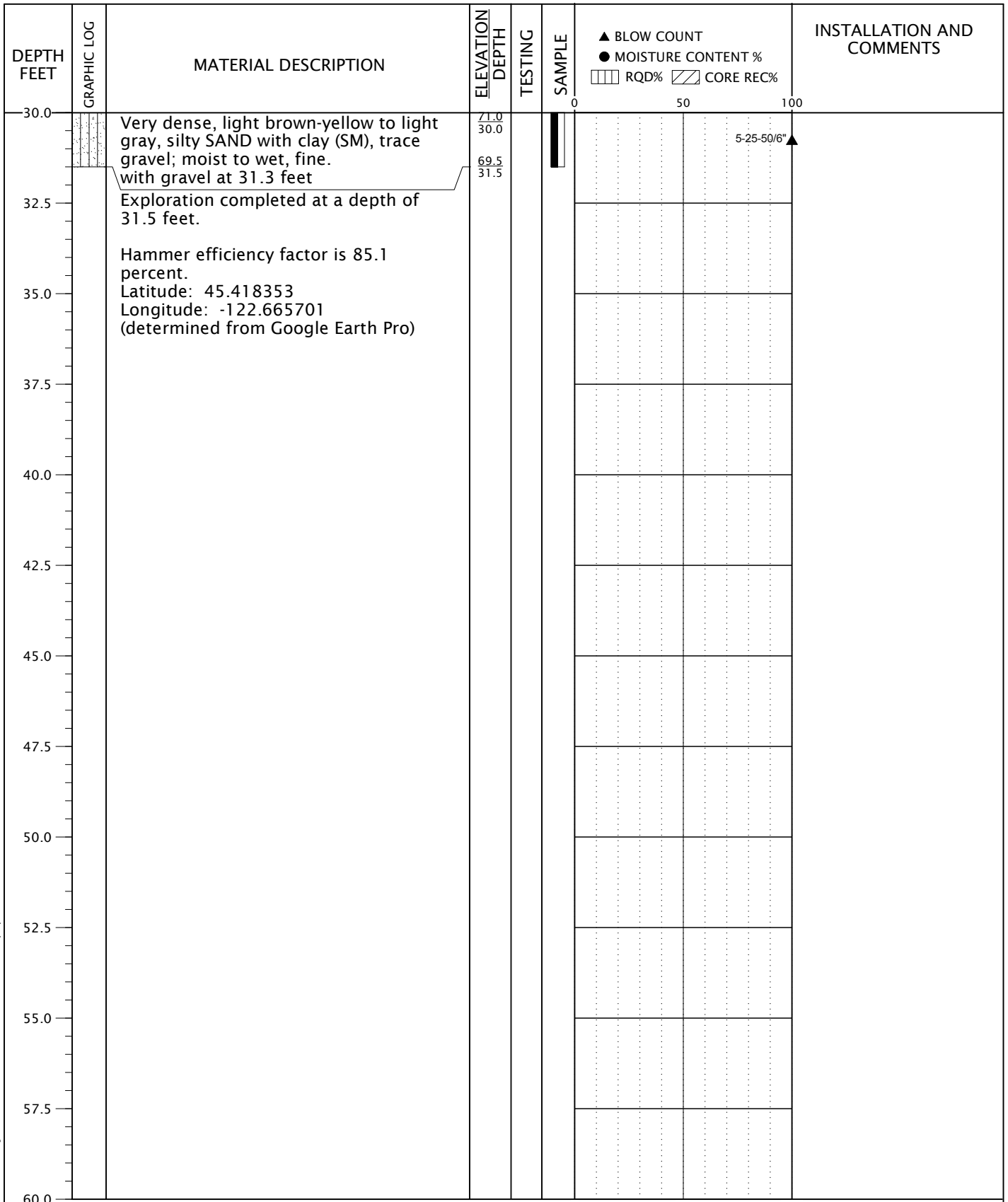
EVERGREENG-1-06

JUNE 2015

BORING B-8

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-2



DRILLED BY: Hard Core Drilling

LOGGED BY: JGH

COMPLETED: 05/26/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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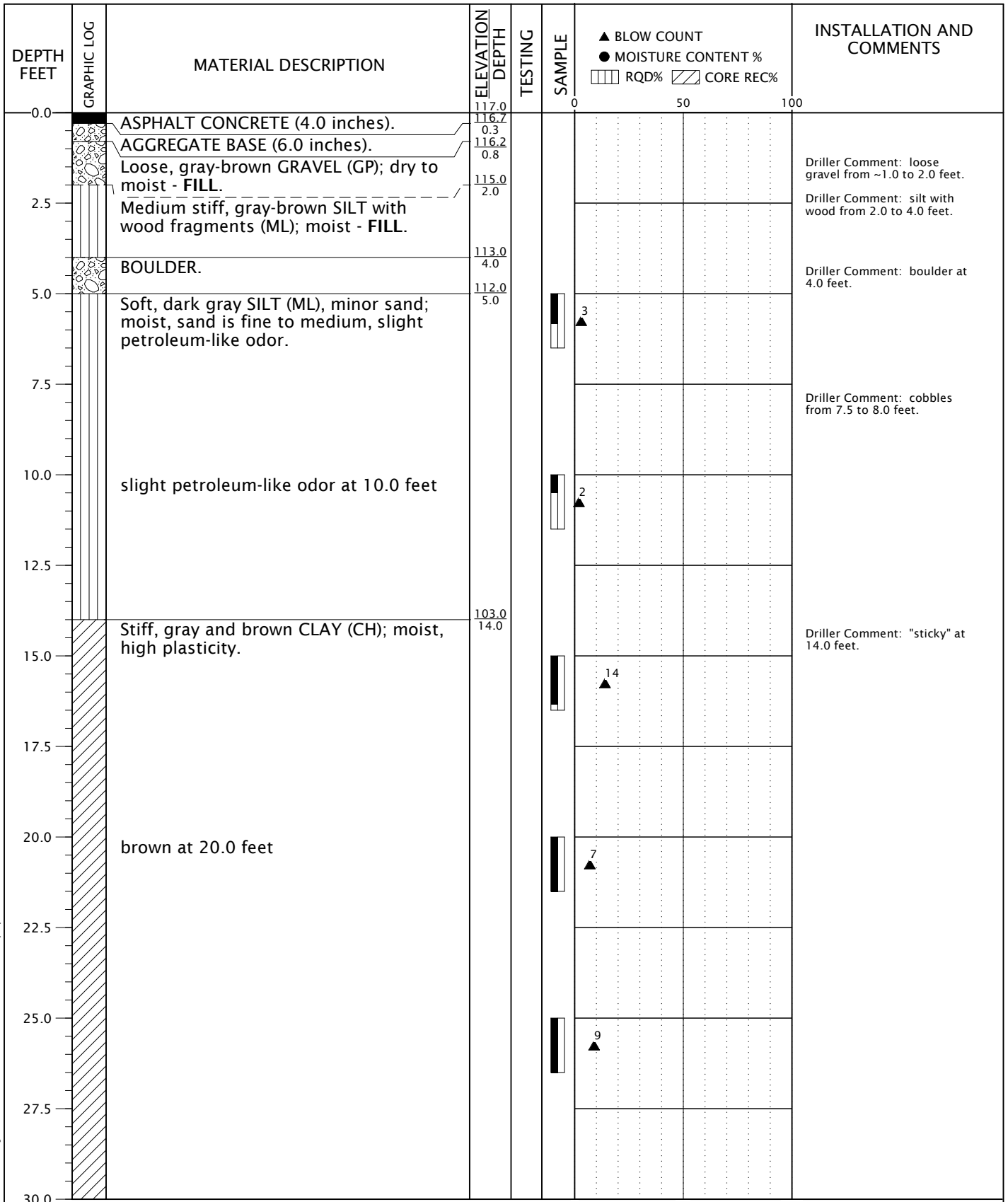
JUNE 2015

BORING B-8
(continued)

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-2

BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/27/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches

BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



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BORING B-9

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-3

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▩ CORE REC%			INSTALLATION AND COMMENTS	
						0	50	100		
30.0		(continued from previous page)							Driller Comment: stiffer at 34.0 feet.	
32.5										
35.0										
37.5										
40.0										
41.5				75.5 41.5						
42.5			Exploration completed at a depth of 41.5 feet.							
45.0			Hammer efficiency factor is 85.1 percent. Latitude: 45.41927 Longitude: -122.66552 (determined from Google Earth Pro)							
50.0										
55.0										
60.0										

DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/27/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches

BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



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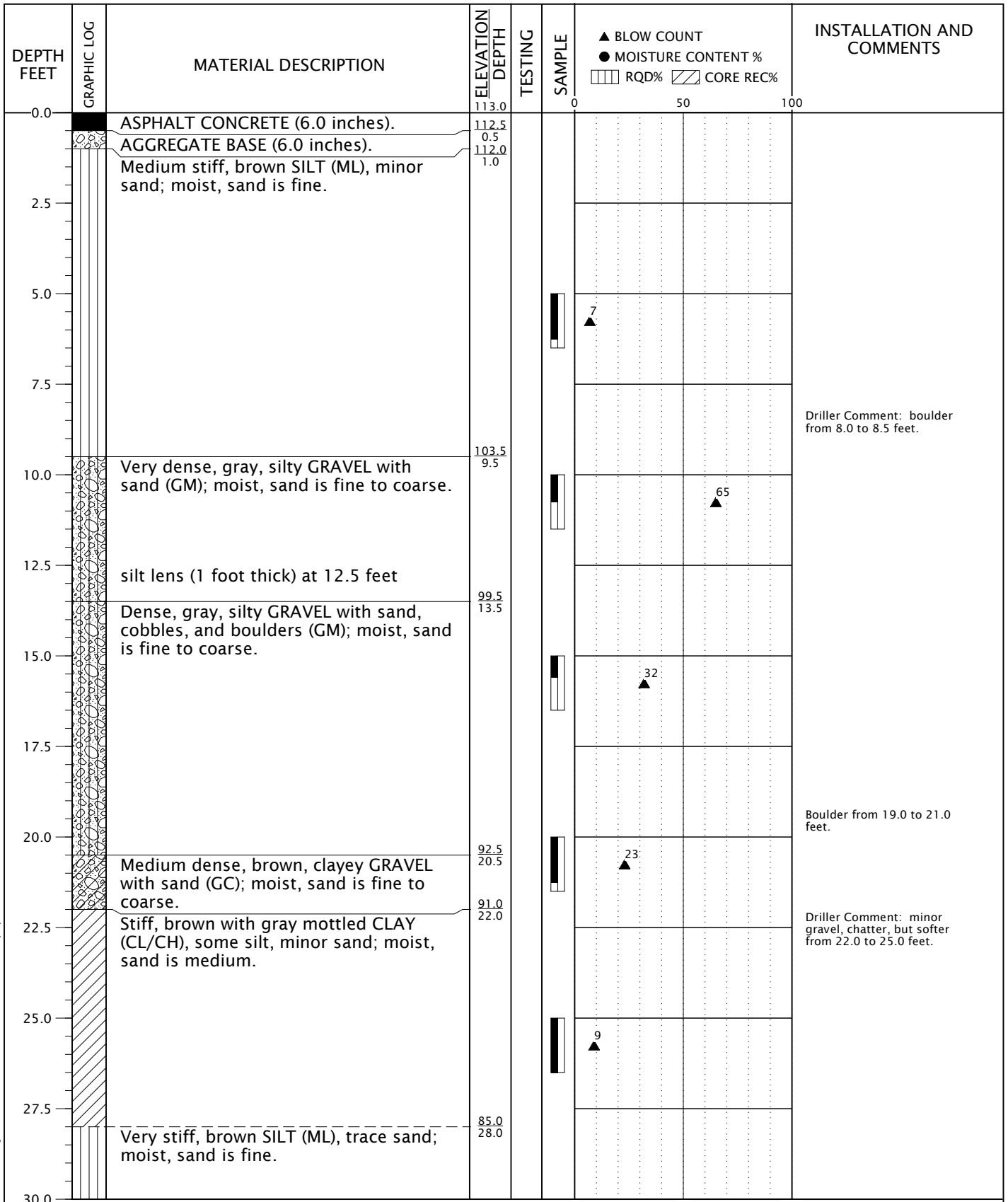
EVERGREENG-1-06

JUNE 2015

BORING B-9
(continued)

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-3



BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT

DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/27/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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BORING B-10

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▩ CORE REC%	INSTALLATION AND COMMENTS
30.0		(continued from previous page)				0 50 100	
32.5							
35.0							
37.5							Driller Comment: gravel at 37.0 feet.
40.0		Very stiff, red-brown with gray mottled CLAY (CL/CH), some silt, trace sand and gravel; moist, low to high plasticity.	73.0 40.0				
42.5		Exploration completed at a depth of 41.5 feet.	71.5 41.5				
45.0		Hammer efficiency factor is 85.1 percent. Latitude: 45.41910 Longitude: -122.66459 (determined from Google Earth Pro)					
47.5							
50.0							
52.5							
55.0							
57.5							
60.0						0 50 100	

DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/27/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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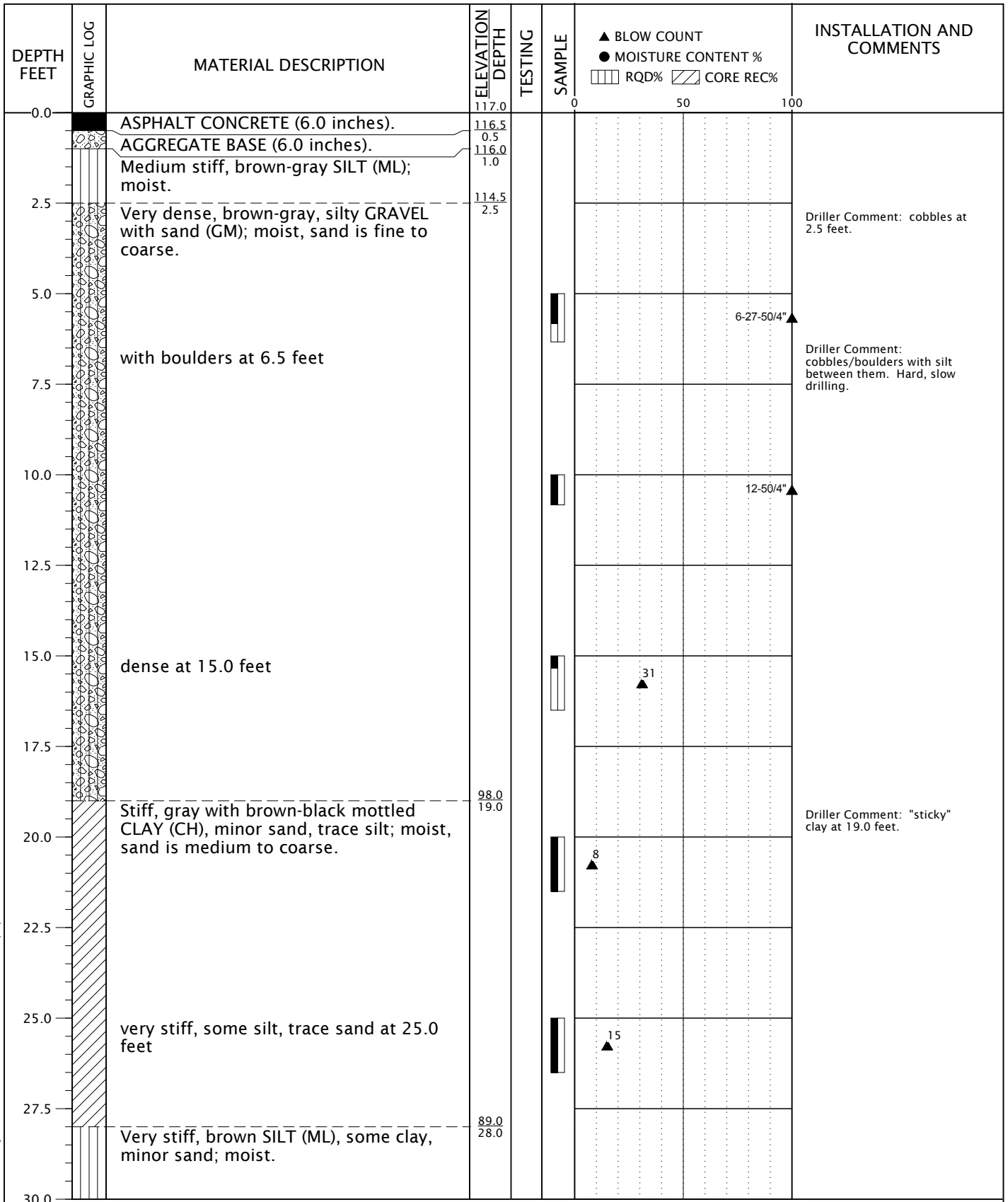
JUNE 2015

BORING B-10
(continued)

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-4

BORING LOG EVERGREENG-1-06-B7-11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT



BORING LOG EVERGREENG-1-06-B7_11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT

DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/28/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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JUNE 2015

BORING B-11

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-5

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▩ CORE REC%			INSTALLATION AND COMMENTS
						0	50	100	
30.0		(continued from previous page)							
32.5									
35.0		Medium dense, brown, silty SAND (SM); moist to wet, fine (alluvium).	82.5 34.5						
37.5									
40.0		dense, trace gravel; gravel is fine and subrounded at 40.0 feet.							
42.5		Exploration completed at a depth of 41.5 feet.	75.5 41.5						
45.0		Hammer efficiency factor is 85.1 percent. Latitude: 45.418174 Longitude: -122.664736 (determined from Google Earth Pro)							
47.5									
50.0									
52.5									
55.0									
57.5									
60.0									

DRILLED BY: Hard Core Drilling

LOGGED BY: CR

COMPLETED: 05/28/15

BORING METHOD: mud rotary (see document text)

BORING BIT DIAMETER: 4 7/8 inches



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JUNE 2015

BORING B-11
(continued)

BLOCK 137
LAKE OSWEGO, OR

FIGURE A-5

BORING LOG EVERGREEN-1-06-B7-11.GPJ GEODESIGN.CDT PRINT DATE: 6/1/15:KT

HARD CORE DRILLING - CME 75, RIG 103 SN#171857

OP: WMN

FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

EMX: Max Transferred Energy
ETR: Energy Transfer Ratio

BL#	depth ft	BLC bl/ft	FMX kips	VMX f/s	BPM **	EMX k-ft	ETR (%)
1	35.17	6	44	13.4	1.9	0.292	83.3
2	35.33	6	47	14.1	54.4	0.291	83.1
3	35.50	6	48	13.6	55.0	0.296	84.6
4	35.60	10	49	13.5	54.7	0.290	82.8
5	35.70	10	49	14.4	54.7	0.299	85.4
6	35.80	10	48	15.1	55.0	0.295	84.3
7	35.90	10	48	15.0	54.9	0.296	84.6
8	36.00	10	49	14.7	54.7	0.304	86.8
9	36.08	12	49	14.9	55.1	0.294	83.9
10	36.17	12	48	14.8	55.7	0.294	84.1
11	36.25	12	49	15.2	54.3	0.298	85.0
12	36.33	12	49	14.9	55.1	0.298	85.1
13	36.42	12	50	15.0	55.0	0.295	84.4
14	36.50	12	49	15.7	55.2	0.304	87.0
15	40.13	8	48	13.5	1.9	0.291	83.2
16	40.25	8	48	13.7	56.0	0.299	85.5
17	40.38	8	48	13.8	56.2	0.296	84.6
18	40.50	8	47	13.4	55.9	0.303	86.6
19	40.63	8	47	13.7	56.9	0.302	86.3
20	40.75	8	47	13.4	56.5	0.291	83.3
21	40.88	8	48	14.1	56.3	0.300	85.7
22	41.00	8	48	14.0	56.4	0.301	86.0
23	41.07	14	48	13.8	56.5	0.301	86.1
24	41.14	14	47	13.3	56.6	0.300	85.8
25	41.21	14	48	13.2	56.6	0.297	84.9
26	41.29	14	47	13.6	56.5	0.299	85.3
27	41.36	14	47	13.6	56.9	0.295	84.3
28	41.43	14	49	13.6	56.0	0.296	84.5
29	41.50	14	49	13.1	56.6	0.303	86.6
30	45.50	2	48	14.1	1.9	0.308	88.1
31	45.75	4	49	13.7	56.6	0.311	88.9
32	46.00	4	48	13.3	57.6	0.303	86.7
33	46.17	6	49	13.1	56.7	0.303	86.7
34	46.33	6	47	13.3	57.3	0.297	85.0
35	46.50	6	48	13.2	56.8	0.300	85.8
36	50.10	10	48	14.1	1.9	0.303	86.7
37	50.20	10	48	13.6	57.4	0.302	86.2
38	50.30	10	48	13.6	57.1	0.300	85.7
39	50.40	10	48	13.1	58.1	0.294	84.1
40	50.50	10	48	13.4	57.0	0.301	85.9
41	50.58	12	48	12.9	57.6	0.294	83.9
42	50.67	12	48	13.2	57.5	0.299	85.3
43	50.75	12	48	13.1	57.8	0.299	85.4
44	50.83	12	48	13.1	57.0	0.303	86.5
45	50.92	12	48	13.3	57.9	0.300	85.8
46	51.00	12	48	13.3	57.1	0.303	86.6
47	51.10	10	46	14.2	58.3	0.299	85.3
48	51.20	10	48	13.6	57.3	0.290	82.9
49	51.30	10	48	14.4	57.1	0.300	85.8
50	51.40	10	48	14.3	57.6	0.291	83.1
51	51.50	10	48	14.4	57.6	0.292	83.3
52	55.07	14	49	13.1	1.9	0.297	84.8
53	55.14	14	48	12.9	58.0	0.295	84.4
54	55.21	14	49	12.8	56.6	0.302	86.4
55	55.29	14	48	12.4	57.6	0.300	85.6
56	55.36	14	49	12.3	57.8	0.296	84.7
57	55.43	14	48	12.0	57.4	0.292	83.4
58	55.50	14	48	11.6	57.3	0.298	85.2
59	55.58	12	48	12.0	58.0	0.291	83.2
60	55.67	12	48	12.0	56.9	0.298	85.3
61	55.75	12	47	12.6	57.0	0.299	85.4
62	55.83	12	48	12.5	58.1	0.299	85.5
63	55.92	12	49	12.9	57.4	0.302	86.3
64	56.00	12	48	12.8	57.2	0.292	83.5
65	56.17	6	47	13.2	57.8	0.297	84.8
66	56.33	6	47	13.1	58.1	0.290	82.8
67	56.50	6	45	13.2	57.7	0.292	83.3

HARD CORE DRILLING - CME 75, RIG 103 SN#171857
OP: WMN

	FMX	VMX	BPM	EMX	ETR
	kips	f/s	**	k-ft	(%)
Average	48	13.6	52.6	0.298	85.1
Maximum	50	15.7	58.3	0.311	88.9
@ Blow#	13	14	47	31	31
Minimum	44	11.6	1.9	0.290	82.8

Total number of blows analyzed: 67