GEODESIGN INC

Memorandum

To:	Meganne Steele	From:	Tacia Miller and Scott Mills
Company:	METRO Planning Department TOD & Centers Implementation Program	Date:	June 6, 2007
Address:	600 NE Grand Avenue Portland, OR 97232		
cc:	n/a		
GDI Project:	MetroPD-1-01		
RE:	Beaverton Westgate Property Beaverton, Oregon		

INTRODUCTION

This memorandum provides a summary of subsurface conditions and preliminary recommendations for the Beaverton Westgate property in Beaverton, Oregon. Our summary is based on our knowledge of the site vicinity, our previous geotechnical and environmental studies for nearby adjacent sites, and our 1995 limited environmental study conducted at the site.

SUBSURFACE CONDITIONS

Based on our experience in the area, the site vicinity is mantled by fill to depths of at least 12.5 feet below the ground surface (BGS). The fill generally consists of medium stiff to stiff undocumented silt fill. Based on the previous site uses and fill depths observed in the near vicinity, it is likely that some areas of thicker fill and demolition debris are also present, particularly in the northeastern portion of the site (location of historical structure). The undocumented fill is underlain by native, medium stiff to very stiff silt. Layers of loose to dense sand with trace amounts of silt were observed in borings completed at the site and in the site vicinity. Interbedded sand layers were observed within the native silts to the maximum depths explored (121 feet BGS). Groundwater was observed at a depth of approximately 8 to 10 feet BGS in explorations completed at the site and near vicinity.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based on knowledge of the area and subsurface conditions, we have the following preliminary recommendations:

- **Variable Fill:** Based on limited explorations at the site and in the vicinity, undocumented fill is present to depths of at least 12.5 feet BGS. We are not aware of available records that document compaction of the fill material. In addition, buried debris from historical structures on the

northeastern portion of the site may be present. Concrete and miscellaneous construction debris in a loose gravel matrix was encountered beneath the surficial silt fill in previous explorations at adjacent sites.

- **Construction Considerations:** The site surface soils are very soft and will not be accessible with rubber-tire equipment. The contractor should be prepared to construct haul roads to protect the subgrade from construction traffic.
- **Structural Fill:** The site soils will likely have a moisture content that is above optimum and will require moisture conditioning before they can be used as structural fill. Scheduling construction for extended periods of dry weather may allow for the use of on-site soils for structural fill.
- **Foundations:** Depending on site development, lightly loaded structures can likely be supported on shallow spread footings bearing on underlying native, stiff soils or on granular pads. Multi-level structures (with their anticipated design foundation loads) will likely undergo excessive settlement if supported on conventional spread foundations bearing on the existing fill and underlying native silts. Multi-level structures will likely be required to be supported on a deep foundation system or on an intermediate-depth foundation system as follows:
  - Deep foundations consisting of piles founded in the underlying very stiff and very dense soils will provide adequate support at most column locations. Specialized installation techniques or alternative pile types will be required in areas of buried debris (if encountered).
  - Intermediate-depth foundation systems can consist of compacted gravel columns, specialty oversized drilled piers, or caissons. Gravel columns that rely on frictional capacities and soil improvement may require specialized design and will likely require specialized installation methods as a result of the anticipated buried debris over portions of the site.
- **Groundwater:** Shallow groundwater is present at the site. Groundwater, running soils, and difficult surface and constrained working conditions should be anticipated during construction.
- **Seismic:** We recommend that structures be designed using a seismic Site Class D. Results of our seismic hazard investigation for adjacent sites indicate there is a low seismic hazard for landslides, fault rupture, tsunamis, and amplification at the site.
- **Environmental:** The site has been historically occupied by agricultural land and was developed with the existing Westgate Theatre and associated parking areas in the early 1970s.
  - Our limited environmental study at selected areas of the site indicated that of the metals, only concentrations of arsenic exceeded regulatory criteria in site soils. However, the arsenic levels were within naturally occurring background levels for the Portland metro area and should not be a concern to the Oregon Department of Environmental Quality (DEQ).
  - Petroleum hydrocarbons were not detected in soil samples collected from near the southwest corner of the site. However, it is possible that an undocumented underground storage tank (UST) or other subsurface feature associated with this former structure may be present in this vicinity. If an undocumented UST or other subsurface feature is encountered during site development, it should be decommissioned in accordance with current DEQ requirements.

- We also recommend that a soil management plan be prepared for the property and proposed development to assist contractors with appropriate soil management methods and disposal, if required.

TCM:JDT:REB:kt

One copy submitted (via email only)

Document ID: MetroPD-1-01-060607-geom-summary.doc

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Geotechnical · Environmental · Geological

Memorandum

To:	Leila Aman	From:	Tacia C. Miller, P.E. and Scott V. Mills, G.E., P.E.
Company:	METRO	Date:	November 20, 2008
Address:	Planning Department 600 NE Grand Avenue Portland, OR 97232		
cc:	n/a		
GDI Project:	Metro-3-02		
RE:	Proposed Westgate Redevelopment Beaverton, Oregon Geotechnical Conditions and Preliminary Recommendations		

INTRODUCTION

This memorandum provides a summary of preliminary geotechnical conditions for the proposed Westgate redevelopment project. The proposed redevelopment will be located southeast of the intersection of SW Cedar Hills Boulevard and SW Westgate Drive in Beaverton, Oregon. The site is located west of the "The Round" and directly north of the TriMet/MAX line.

PROPOSED DEVELOPMENT

Based on our discussions with you and our review of preliminary concept plans from the METRO Westgate redevelopment website, the proposed development may consist of several at-grade, multi-story (estimated three to four stories) structures located on the southern portion of the site with residential upper levels and street level retail. In addition, an approximately 17-story office building is proposed on the northern end of the site. All structures will be located at grade. The development will also include associated residential parking areas and drive aisle/roadway between the office building and the residential/retail structures.

Development plans are conceptual, and foundation loads were not available at the time of this memorandum; however, we anticipate relatively high column loads on the order of 1,000 to 1,500 kips or greater for the office building. Based on the large foundation loads and the soil conditions at the site, we anticipate that the office building will be supported on deep foundations. The multi-story structures can likely be supported on shallow foundations such as spread footings, but will be dependent on actual structural loading.

become wet, the construction methods and schedule should be carefully considered with respect to protecting the subgrade to reduce the need to over-excavate disturbed or softened soil. The project budget should reflect the recommendations below if construction is planned during wet weather or when the surficial soils are wet.

If construction occurs when wet soils are present, site preparation activities may need to be accomplished using track-mounted excavating equipment that loads removed material into trucks supported on granular haul roads. The thickness of the granular material for haul roads and staging areas will depend on the amount and type of construction traffic. Generally, a 12- to 18-inch-thick mat of granular material is sufficient for light staging areas and the basic building pad, but is generally not expected to be adequate to support heavy equipment or truck traffic. The granular mat for haul roads and areas with repeated heavy construction traffic typically needs to be increased to between 18 to 24 inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site development, and the amount and type of construction traffic. The granular material should be placed in one lift over the prepared, undisturbed subgrade and compacted using a smooth-drum roller without the use of vibratory action. In addition, a geotextile fabric should be placed as a barrier between the subgrade and imported granular material in areas of repeated construction traffic. The geotextile should have a minimum Mullen burst strength of 250 pounds per square inch (psi) for puncture resistance and an apparent opening size between a U.S. Standard No. 70 and No. 100 Sieve.

Soil Amendment with Cement

As an alternative to the use of imported granular material for wet weather structural fill, an experienced contractor may be able to amend the on-site soils with portland cement or with limekiln dust and portland cement to obtain suitable support properties. Successful use of soil amendment depends on the use of correct mixing techniques, soil moisture content, and amendment quantities. Soil amending should be conducted in accordance with Oregon Standard Specifications for Construction (2008) 00344 (Treated Subgrade). Some processing of the soil may be required to protect the tilling equipment from damage due to oversize materials.

Specific recommendations, based on exposed site conditions, for soil amending can be provided if necessary. However, for preliminary design purposes, we recommend a target strength for cement-amended soils of 100 psi. The amount of cement used to achieve this target generally varies with moisture content and soil type. It is difficult to predict field performance of soils to cement amendment due to variability in soil response, and we recommend laboratory testing to confirm expectations. In general, 4 percent cement by weight of dry soil can be used when the soil moisture content does not exceed approximately 20 percent. If the soil moisture content is in the range of 25 to 35 percent, 4 to 7 percent by weight of dry soil is recommended. The amount of cement added to the soil may need to be adjusted based on field observations and performance. Moreover, depending on the time of year and moisture content levels during amendment, water may need to be applied during tilling to appropriately condition the soil moisture content.

foundation support and to limit differential settlement in the native, medium stiff silt soils near the ground surface. The pads should have a minimum thickness of 2 feet and should extend 1 foot beyond the footing perimeter. The crushed rock should have a maximum particle sized of 2 inches and should meet the specifications provided by the geotechnical engineer. Footing subgrades and construction of footing pads should be observed by a qualified geotechnical engineer or their representative.

Dimensions and Capacities

Continuous wall and isolated spread footings should be at least 18 and 24 inches wide, respectively. The bottom of exterior footings should be at least 18 inches below the lowest adjacent exterior grade. The bottom of interior footings should be established at least 12 inches below the base of the slab.

Footings bearing on crushed rock footing pads over the native silts should be sized based on an allowable bearing pressure of 3,000 pounds per square foot (psf). This is a net bearing pressure; the weight of the footing and overlying backfill can be ignored in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads. The allowable bearing pressure may be increased by up to one-third for short-term loads (such as those resulting from wind and seismic forces).

Lateral Resistance

Lateral loads can be resisted by passive earth pressure on sides of the footings and by friction on the base of the footings. We recommend a friction coefficient of 0.45 for computing the friction capacity of building foundations that bear on compacted crushed rock. Our analysis indicates that the available passive earth pressure for footings confined by native soils and structural fills is 350 pounds per cubic foot (pcf) modeled as an equivalent fluid pressure. Typically, the movement required to develop the available passive resistance may be relatively large; therefore, we recommend using a reduced passive pressure of 275 pcf equivalent fluid pressure. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. In addition, in order to rely upon passive resistance, a minimum of 10 feet of horizontal clearance must exist between the face of the footings and any adjacent down slopes.

Settlement

Shallow foundations established on crushed rock footing pads with real bearing pressures less than 3,000 psf should experience post-construction settlements of less than 1 inch. Differential settlements that approach one-half of the total settlements should be expected between adjacent footings with similar loads. We expect that the majority of the settlement will occur by the time construction is completed.

Memorandum

Our explorations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

TCM:JDT:kt
Attachments
Four copies submitted
Document ID: Metro-3-02-112008-geom.doc

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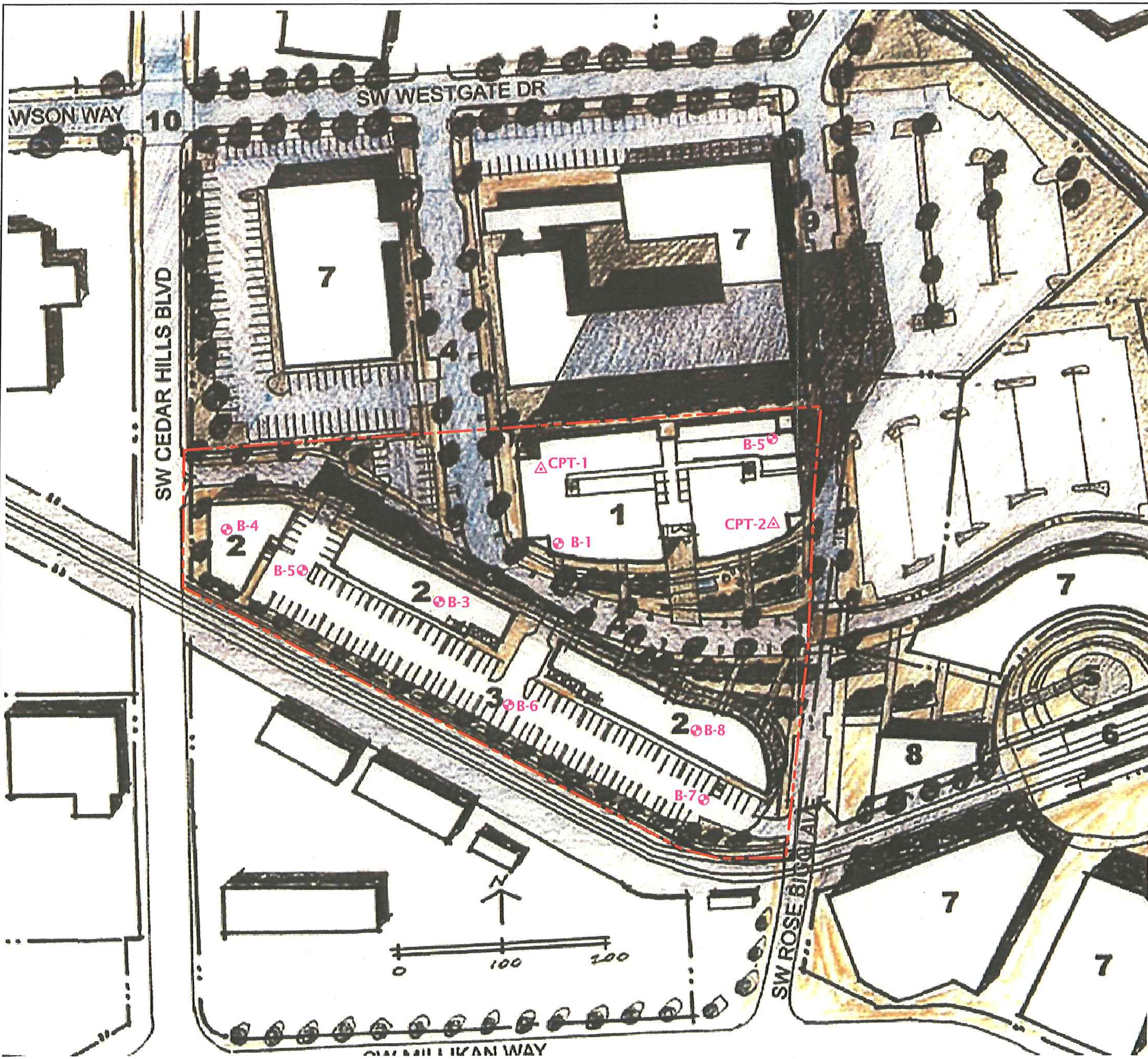

LEGEND:

B-1 BORING (SEPTEMBER/OCTOBER 2008)

CPT-1 CONE PENETROMETER (OCTOBER 2008)

SITE BOUNDARY

N

0 100 200

(SCALE IN FEET)

SITE PLAN BASED ON IMAGE OBTAINED FROM GROUP MACKENZIE

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File Name: \\chromite\Files\Jobs\M-R\Metro\Metro-3\Metro-3-02\Figures\CAD\Metro-3-02-SP01.dwg | Layout: FIGURE 1

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METRO-3-02

NOVEMBER 2008

SITE PLAN

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE 1

Memorandum

ATTACHMENT

FIELD EXPLORATIONS

GENERAL

Our subsurface exploration program included drilling eight borings (B-1 through B-8). The borings were drilled to depths ranging between 16.5 and 121.5 feet BGS. The explorations were drilled from September 29 through October 3, 2008 by Western States Soil Conservation Services of Hubbard, Oregon, using a truck-mounted drill rig utilizing mud-rotary drilling techniques. The explorations were observed by a member of our geological staff. We obtained representative samples of the various soils encountered in the explorations for geotechnical laboratory testing. Classifications and sampling depths are presented on the exploration logs included in this attachment.

Spence Vandehey of Banks, Oregon, advanced two CPT probe explorations (CPT-1 and CPT-2) on October 10, 2008. The CPT explorations were completed using a seismic electronic CPT probe manufactured by Hogentogler & Company, Inc. The probes were advanced to depths of approximately 79.5 and 84 feet BGS.

Approximate locations of our explorations are shown on Figure 1. The locations of the explorations were determined in the field by pacing from existing site features. This information should be considered accurate only to the degree implied by the methods used.

SOIL SAMPLING

We obtained disturbed and relatively undisturbed samples of the various materials encountered in the explorations for geotechnical laboratory testing. Classifications and sampling intervals are shown on the exploration logs included in 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 included in this attachment.

LABORATORY TESTING

CLASSIFICATION

The soil samples were classified in the laboratory to confirm field classifications. The laboratory classifications are included on the exploration logs if those classifications differed from the field classifications.

Memorandum

MOISTURE CONTENT

We tested the natural moisture content of selected samples obtained from the explorations in general accordance with American Society for Testing and Materials (ASTM) D 2216. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage. The moisture contents are presented on the exploration logs included in this attachment.

DRY DENSITY

We tested selected soil samples to determine the in-situ dry density. The tests were performed in general accordance with ASTM D 2937. The dry density is defined as the ratio of the dry weight of the soil sample to the volume of that sample. The dry density typically is expressed in units of pcf. The dry densities are presented on the exploration logs included in this attachment.

ATTERBERG LIMITS TESTING

The Atterberg limits (plastic and liquid limits) were performed on a selected sample in accordance with ASTM D 4318. The plastic limit is defined as the moisture content where the soil becomes brittle. The liquid limit is defined as the moisture content where the soil begins to act similar to a liquid. The plasticity index is the difference between the liquid and plastic limits. The test results are presented in this attachment.

FINES CONTENT ANALYSIS

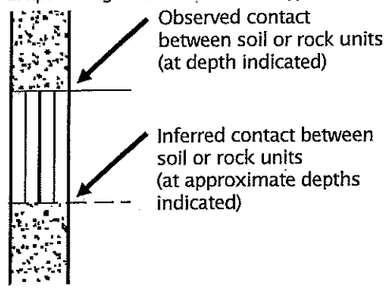
Two fines content determinations were completed on selected samples in general accordance with ASTM C 117 (percent passing a U.S. Standard No. 200 Sieve). The results of the fines content determinations are presented on the associated exploration logs included in this attachment.

STRENGTH TESTING

Direct shear tests were completed on three soil samples obtained from the explorations. The tests were conducted in general accordance with ASTM D 3080. The results of the direct shear tests are included 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 or 3-inch-O.D. split-spoon sampler and 140-pound hammer or pushed with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

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

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

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EXPLORATION KEY

TABLE A-1

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					
		Secondary granular components or other materials such as organics, man-made debris, etc.					
			Silt and Clay In:			Sand and Gravel In:	
Term	Field Test	Percent	Fine-Grained Soils	Coarse-Grained Soils	Percent	Fine-Grained Soils	Coarse-Grained Soils
dry	very low moisture, dry to touch						
moist	damp, without visible moisture	< 5	trace	trace	< 5	trace	trace
		5 – 12	minor	with	5 – 15	minor	minor
wet	visible free water, usually saturated	> 12	some	silty/clayey	15 – 30	with	with
					> 30	sandy/gravelly	sandy/gravelly

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SOIL CLASSIFICATION SYSTEM

TABLE A-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
0	ASPHALT CONCRETE.	0.2				
	Medium stiff to stiff, brown-gray mottled SILT with fine sand (ML); moist.				8	
5	grades to stiff with minor fine sand at 5.0 feet				9 ●	
	grades to medium stiff and moist to wet at 7.5 feet				5	
10	Hard, gray, fine, sandy SILT (ML); moist.	10.5		P		
	Loose, brown, fine, silty SAND (SM); wet.	12.0			7	
	Stiff, brown SILT (ML); moist.	13.2				
15	becomes gray with minor fine sand at 14.0 feet trace sand and moist to wet at 15.0 feet				11	
20	minor fine sand to sandy at 20.0 feet				13 ●	
25	grades to soft with minor fine sand and wet at 25.0 feet grades to very stiff with trace fine sand and moist at 25.4 feet				16	
30	trace to minor fine sand at 30.0 feet				17 ●	
35					17	
40					0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: EAM COMPLETED: 09/29/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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METRO-3-02

NOVEMBER 2008

BORING B-1

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-1

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 — 50 — 100)	INSTALLATION AND COMMENTS
40		grades to medium stiff and trace fine sand at 40.0 feet		DD DS	P	▲7 ●	DD = 94 pcf
45		with fine sand at 45.0 feet				▲13	
50		grades to very stiff with orange-brown mottles at 50.0 feet				▲23	
55		Medium dense, gray-brown mottled, fine to medium, silty SAND (SM); moist, rounded, weakly cemented.	55.0	P200		▲26 ●	P200 = 49%
60		Stiff, olive-gray with brown mottled SILT (MH); moist.	60.0	ATT		▲12 ●	LL = 90% PL = 34%
65		trace to minor fine sand at 65.0 feet				▲13	
70		becomes gray at 70.0 feet				▲10 ●	
75		Medium dense, olive-gray with brown mottled, fine, silty SAND (SM); moist.	75.0			▲29	
80		Very stiff, olive-gray with brown mottled SILT (ML), trace to minor fine sand; moist.	76.0				

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BORING B-1
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 — 50 — 100)	INSTALLATION AND COMMENTS
80	Medium dense, brown with orange-brown mottled, fine, silty SAND (SM) to sandy SILT (ML); moist.	80.0			▲25 ●	
85	Very stiff, brown with orange-brown mottled SILT (ML), trace to minor fine sand; moist.	85.0			▲28	
90	grades to stiff with orange mottles and trace fine sand at 90.0 feet				▲14 ●	
95	with orange-brown mottles and minor fine sand at 95.0 feet				▲19	
100	grades to hard with trace fine sand at 100.0 feet				● ▲45	
	Dense, dark gray, fine SAND with silt (SP-SM) to silty SAND (SM); moist.	100.8	P200			P200 = 23%
105	Dense, dark gray, fine to medium SAND with silt (SP-SM); moist.	105.4			▲45	
110	Stiff, gray with orange-brown mottled SILT (ML), minor fine sand; moist. without mottles and sand at 110.5 feet	110.0			▲14 ●	
115	Medium dense, dark gray, fine to medium SAND with silt (SP-SM); moist.	115.0			▲26	
120						

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: EAM COMPLETED: 09/29/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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BORING B-1
(continued)

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PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-1

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
120		Medium dense, dark gray, fine to coarse SAND (SP), minor silt; moist.	120.0			▲24 ●	Surface elevation was not measured at the time of exploration.
		Exploration completed at a depth of 121.5 feet.	121.5				
125							
130							
135							
140							
145							
150							
155							
160						0 50 100	

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BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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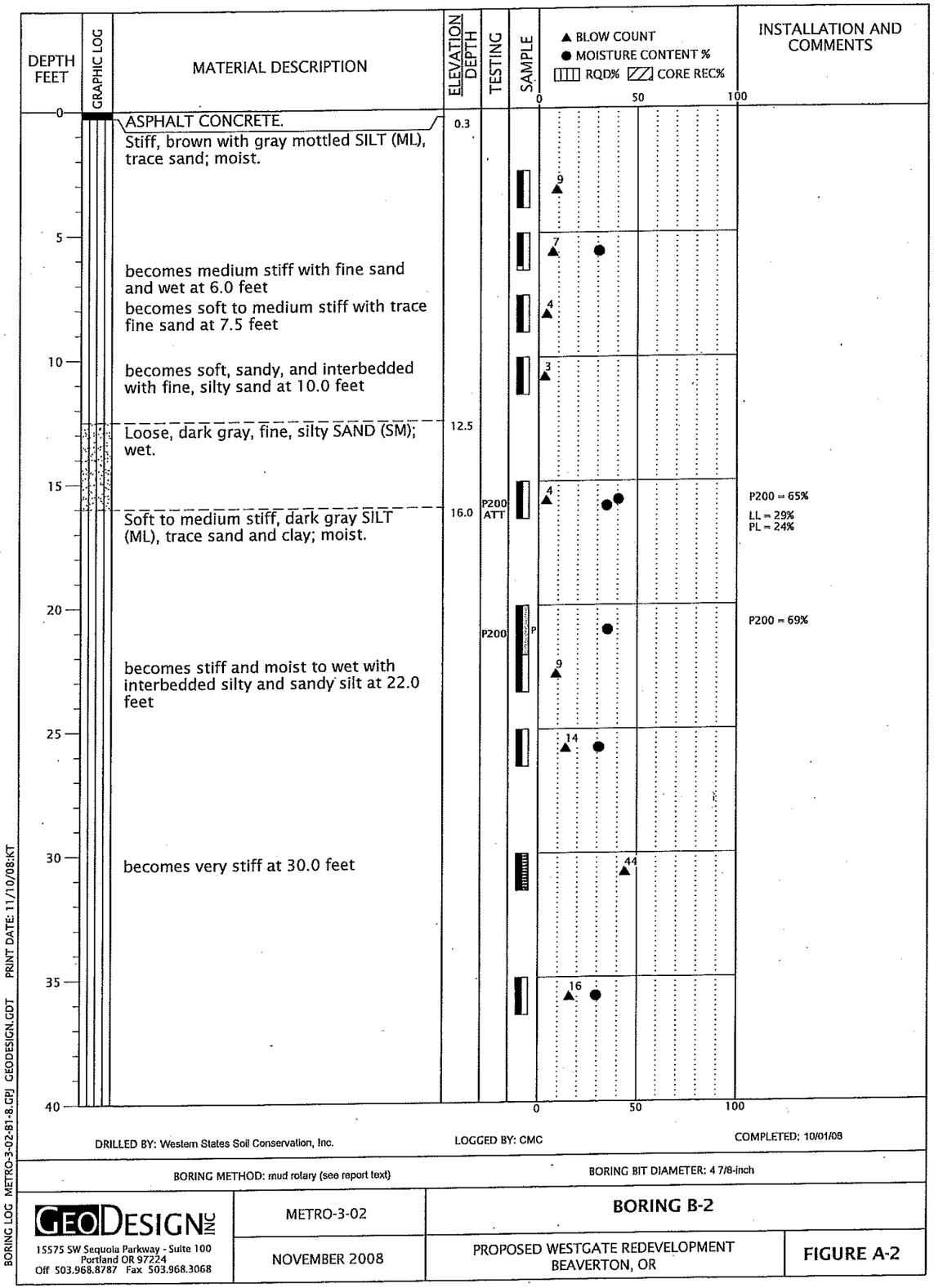
BORING B-1
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-1



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METRO-3-02	**BORING B-2**	
NOVEMBER 2008	PROPOSED WESTGATE REDEVELOPMENT BEAVERTON, OR	**FIGURE A-2**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
40		Stiff, blue-gray CLAY (CL); moist to wet.	40.0			▲ 10	
45						▲ 11 ●	
		Medium dense, dark gray to gray, fine to medium, silty SAND (SM), trace shell fragments; moist, subrounded, stratified.	48.5			▲ 53	
50							
55		Medium dense, red-brown with gray mottled, fine to medium, silty SAND (SM); moist.	54.0			▲ 14 ●	
60		Stiff, gray-brown CLAY (CH); moist.	59.5			▲ 13	
		trace sand at 62.5 feet					
65		becomes pale red-brown at 65.0 feet				▲ 9 ●	
		Very stiff, gray-brown with red-brown mottled SILT (ML); moist.	68.5			▲ 49	
70							
75						▲ 18 ●	
80		becomes hard, gray with brown mottles,					

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/01/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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METRO-3-02

NOVEMBER 2008

BORING B-2
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-2

BORING LOG METRO-3-02-81-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 — 50 — 100)	INSTALLATION AND COMMENTS
80		interbedded with clay and fine, silty sand at 79.0 feet				48	
85		becomes very stiff with minor sand at 85.0 feet				24	
		Very stiff, gray CLAY (CL); moist.	88.5				
90						23	
95		becomes light gray with brown and red-brown mottles, interbedded with silt and sandy silt at 95.0 feet				29	
100						18	
105		with iron oxide staining at 105.0 feet				24	
		Dense, dark green-gray to black, fine, silty SAND (SM); moist, subangular, predominantly basalt.	108.0				
110						49	
115						38	
		Hard, dark green-gray SILT (ML); moist.	116.0				
		Very stiff, dark green-gray to gray CLAY (CL); moist.	118.5				
120							

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/01/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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METRO-3-02

NOVEMBER 2008

BORING B-2
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-2

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
120		(continued from previous page)				▲ 17	
		Exploration completed at a depth of 121.5 feet.	121.5				Surface elevation was not measured at the time of exploration.
125							
130							
135							
140							
145							
150							
155							
160						0 50 100	

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BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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METRO-3-02

NOVEMBER 2008

BORING B-2
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-2

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▯▯▯ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
0	ASPHALT CONCRETE.	0.2				
	AGGREGATE BASE.	0.7				
	Medium stiff, dark gray with brown mottled SILT (ML), minor fine sand; moist.				▲ 7	
5	becomes brown with fine sand and moist to wet at 5.0 feet				▲ 6	
	becomes sandy and wet at 7.5 feet				▲ 7	
10					▲ 6	
15	grades to stiff, dark gray with minor fine sand, and wet with interbedded sandy silt at 16.5 feet			P	▲ 12	
20					▲ 10	
25	interbedded with clay at 25.0 feet				▲ 9	
30	becomes very stiff at 30.0 feet				▲ 16	
35					▲ 28	
40						

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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METRO-3-02

NOVEMBER 2008

BORING B-3

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-3

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
40	Stiff, gray CLAY (CL); moist.	40.0			▲ 12	
45	black mottles at 45.0 feet				▲ 8	
	Stiff to very stiff, gray with brown mottled SILT (ML), trace fine sand; moist.	48.5			▲ 15	
50	Exploration completed at a depth of 51.5 feet.	51.5				Surface elevation was not measured at the time of exploration.
55						
60						
65						
70						
75						
80					0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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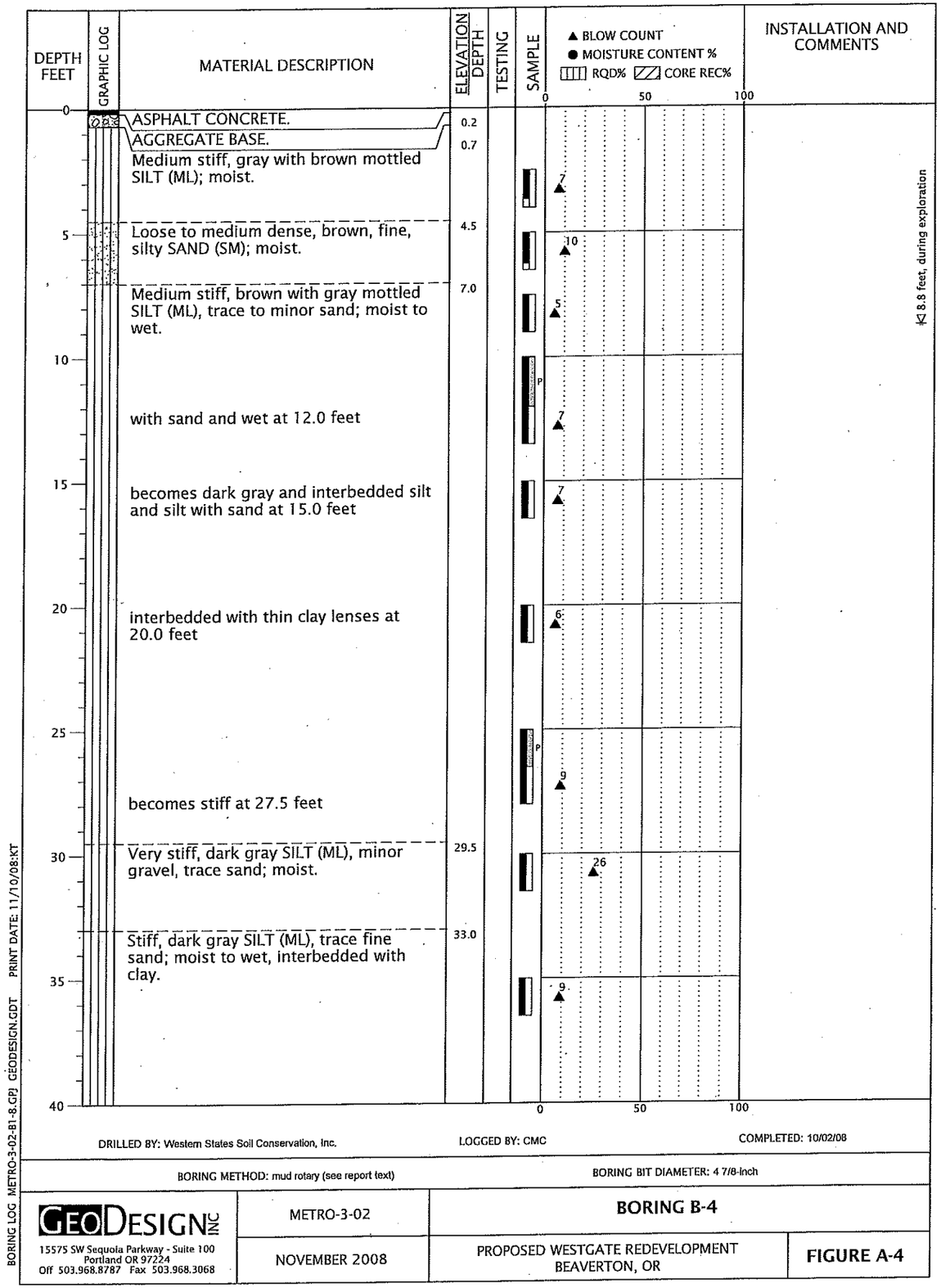
METRO-3-02

NOVEMBER 2008

BORING B-3
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-3



DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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METRO-3-02

NOVEMBER 2008

BORING B-4

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-4

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 / 50 / 100)	INSTALLATION AND COMMENTS
40	Stiff, gray CLAY (CL), trace fine sand; moist.	40.0			▲ 14	
45	becomes medium stiff at 45.0 feet				▲ 6	
	Stiff to very stiff, gray SILT (ML), minor fine sand; moist.	49.0				
50					▲ 15	
	Exploration completed at a depth of 51.5 feet.	51.5				Surface elevation was not measured at the time of exploration.
55						
60						
65						
70						
75						
80					0 / 50 / 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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NOVEMBER 2008

BORING B-4
(continued)

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▨ CORE REC% (0 — 50 — 100)	INSTALLATION AND COMMENTS
0		ASPHALT CONCRETE.	0.2				
		AGGREGATE BASE.	0.7		P		
		Medium dense, gray with brown mottled, fine, silty SAND (SM); moist.				10	
5		Soft, brown with dark brown mottled SILT (ML), trace to minor fine sand; moist to wet.	5.5			3	
10		becomes medium stiff and wet at 10.5 feet				5	▽ 10.5 feet, during exploration
15		becomes dark gray and sandy at 15.0 feet				7	
		Exploration completed at a depth of 16.5 feet.	16.5				Surface elevation was not measured at the time of exploration.
20							
25							
30							
35							
40						0 — 50 — 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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NOVEMBER 2008

BORING B-5

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-5

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
0		ASPHALT CONCRETE.	0.2				
		AGGREGATE BASE.	0.7				
		Stiff, brown with gray mottled SILT (ML), trace fine sand; moist.				▲ 9	
5		becomes medium stiff at 5.0 feet				▲ 6	
		dark brown mottles and moist to wet at 7.5 feet				▲ 6	
10		becomes sandy and wet at 10.5 feet				▲ 5	▽ 10.5 feet, during exploration
15		becomes dark gray and interbedded with fine, silty sand and clay at 15.0 feet	16.5			▲ 4	Surface elevation was not measured at the time of exploration.
		Exploration completed at a depth of 16.5 feet.					
20							
25							
30							
35							
40						0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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NOVEMBER 2008

BORING B-6

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-6

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▨ CORE REC% (0 / 50 / 100)	INSTALLATION AND COMMENTS
0		ASPHALT CONCRETE.	0.2				
		AGGREGATE BASE.	0.7				
		Stiff, dark gray with brown mottled SILT (ML); moist.			P	11	
5		becomes brown with dark brown mottles at 7.5 feet				10	
10		becomes medium stiff and wet at 11.5 feet				4	▽ 11.5 feet, during exploration
15		becomes stiff and dark gray with interbedded fine, silty sand at 15.0 feet				12	
		Exploration completed at a depth of 16.5 feet.	16.5				Surface elevation was not measured at the time of exploration.
20							
25							
30							
35							
40						0 / 50 / 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/02/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

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NOVEMBER 2008

BORING B-7

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-7

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% 0 50 100	INSTALLATION AND COMMENTS
0		ASPHALT CONCRETE.	0.2				
		AGGREGATE BASE.	0.7				
		Medium stiff, dark gray to brown with red-brown mottled SILT (ML), trace fine sand; moist.				▲6	
5		becomes medium stiff to stiff at 5.0 feet				▲8	
		becomes medium stiff with minor fine sand at 7.5 feet				▲6	
10					P		
		Medium stiff, dark gray, sandy SILT (ML); wet, interbedded with fine, silty sand.	13.5			▲7	
20		becomes stiff at 22.0 feet			P	▲10	
25		interbedded with clay at 25.0 feet				▲9	
30						▲14	
35		becomes very stiff at 35.0 feet				▲18	
40		Stiff, gray CLAY (CL), trace fine sand; wet.	38.5			0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/03/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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BORING B-8

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-8

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▨ RQD% ▨ CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
40		(continued from previous page)				8	
45		dark brown mottles and trace sand with fossil worm casts at 47.0 feet				13	
50		Very stiff, gray with brown mottled SILT (ML), trace sand; moist.	49.5			20	
		Exploration completed at a depth of 51.5 feet.	51.5				Surface elevation was not measured at the time of exploration.
55							
60							
65							
70							
75							
80						0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CMC COMPLETED: 10/03/08

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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METRO-3-02

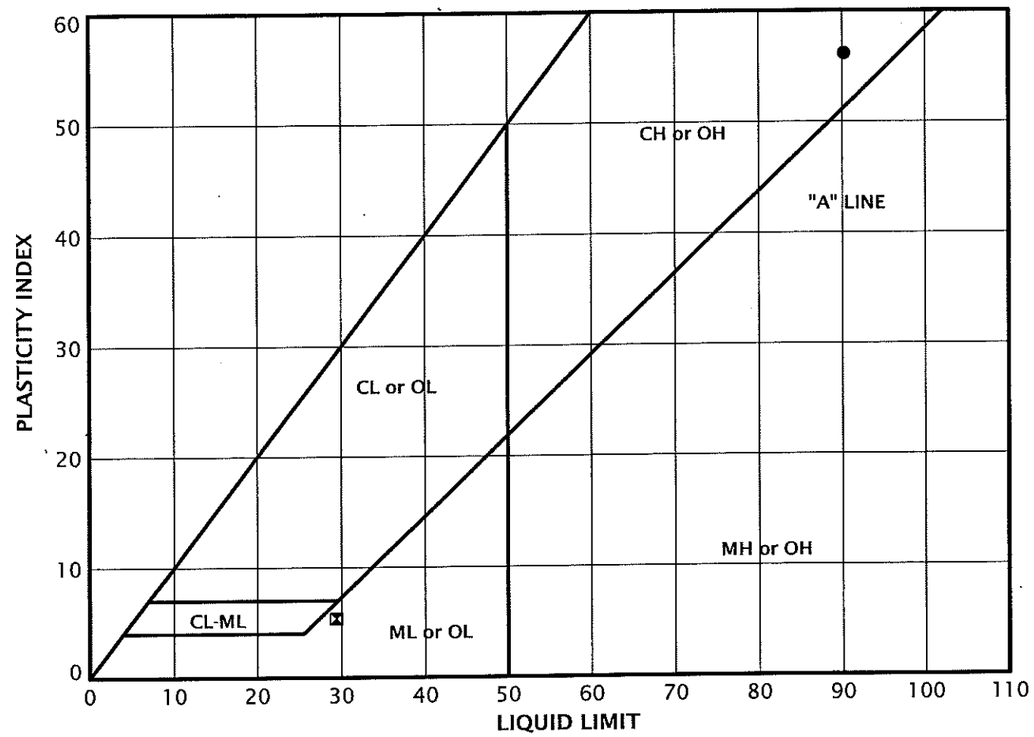
BORING B-8
(continued)

NOVEMBER 2008

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-8

BORING LOG METRO-3-02-B1-8.GPJ GEODESIGN.GDT PRINT DATE: 11/10/08:KT



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
●	B-1	60.0	37	90	34	56
⊠	B-2	16.0	34	29	24	5

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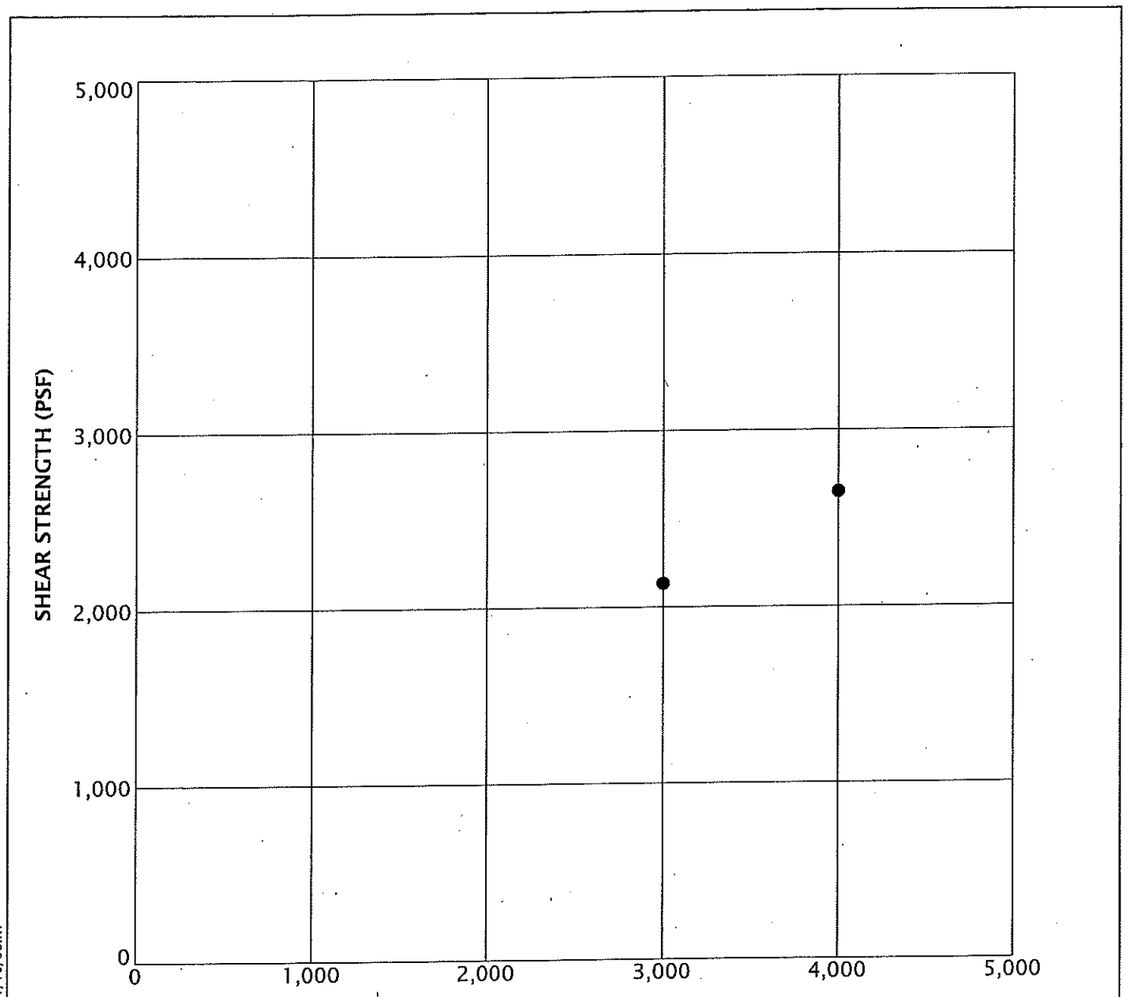
ATTERBERG LIMITS TEST RESULTS

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-9



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SOAKED
●	B-1	42.0	28	95	YES

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DIRECT SHEAR TEST RESULTS

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-10

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
B-1	5.0		34							
B-1	20.0		34							
B-1	30.0		34							
B-1	40.0		33							
B-1	42.0		28	94						
B-1	50.0		27							
B-1	55.0		22				49			
B-1	60.0		37					90	34	56
B-1	70.0		34							
B-1	80.0		36							
B-1	90.0		33							
B-1	100.8		30				23			
B-1	110.0		48							
B-1	120.0		35							
B-2	5.0		30							
B-2	15.0		40				65			
B-2	16.0		34					29	24	5
B-2	20.0		35				69			
B-2	25.0		31							
B-2	35.0		30							
B-2	45.0		25							
B-2	55.0		32							
B-2	65.0		39							
B-2	75.0		33							
B-2	85.0		22							
B-2	95.0		34							
B-2	105.0		31							

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METRO-3-02

NOVEMBER 2008

SUMMARY OF LABORATORY DATA

PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-11

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT (PERCENT)	PLASTIC LIMIT (PERCENT)	PLASTICITY INDEX (PERCENT)
B-2	115.0		35							

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METRO-3-02

NOVEMBER 2008

SUMMARY OF LABORATORY DATA
(continued)

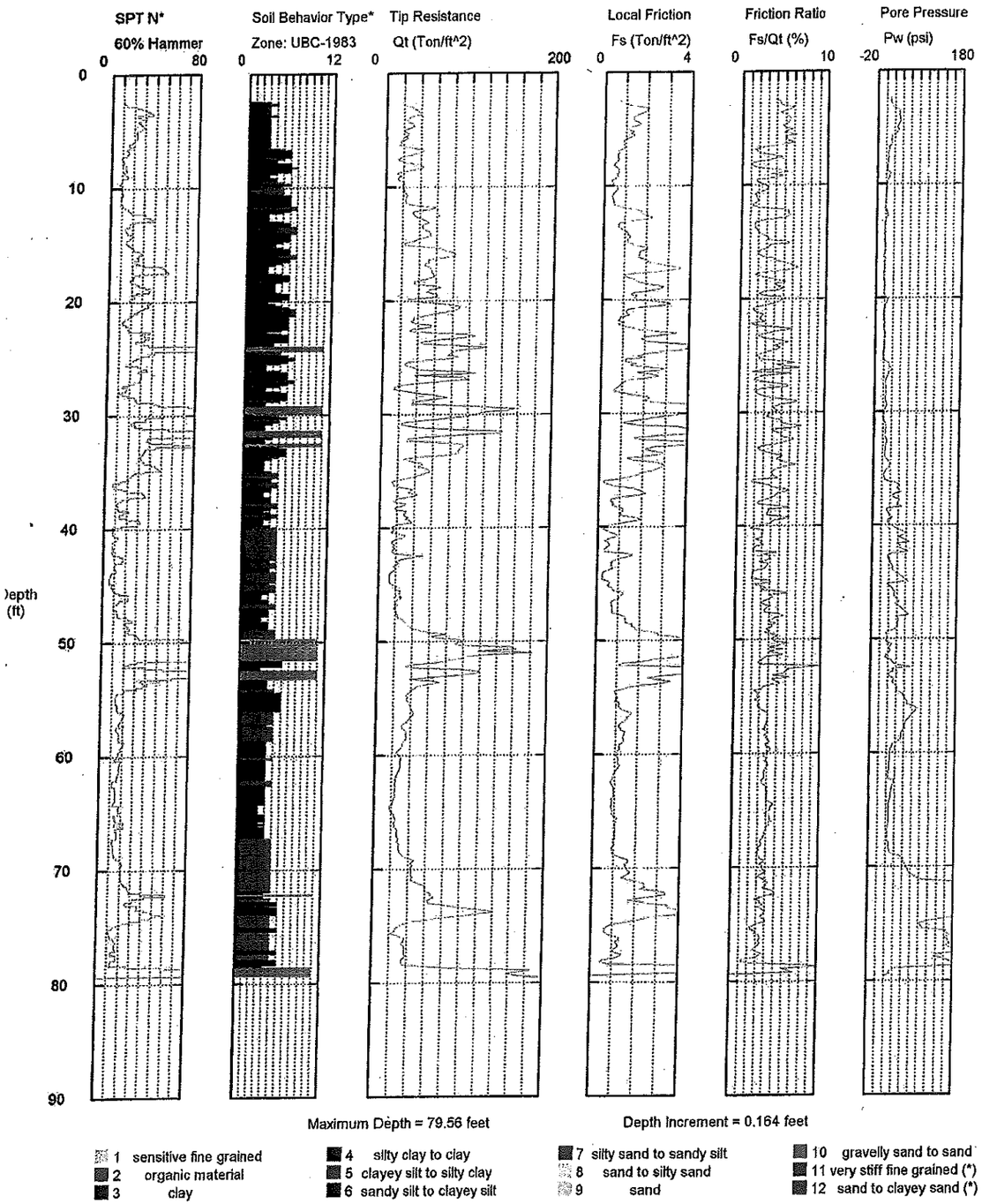
PROPOSED WESTGATE REDEVELOPMENT
BEAVERTON, OR

FIGURE A-11

GEODESIGN / CPT - 1 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP46
Cone Used: 4CH

CPT Date/Time: 10-10-08 09:50
Location: CPT1 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL

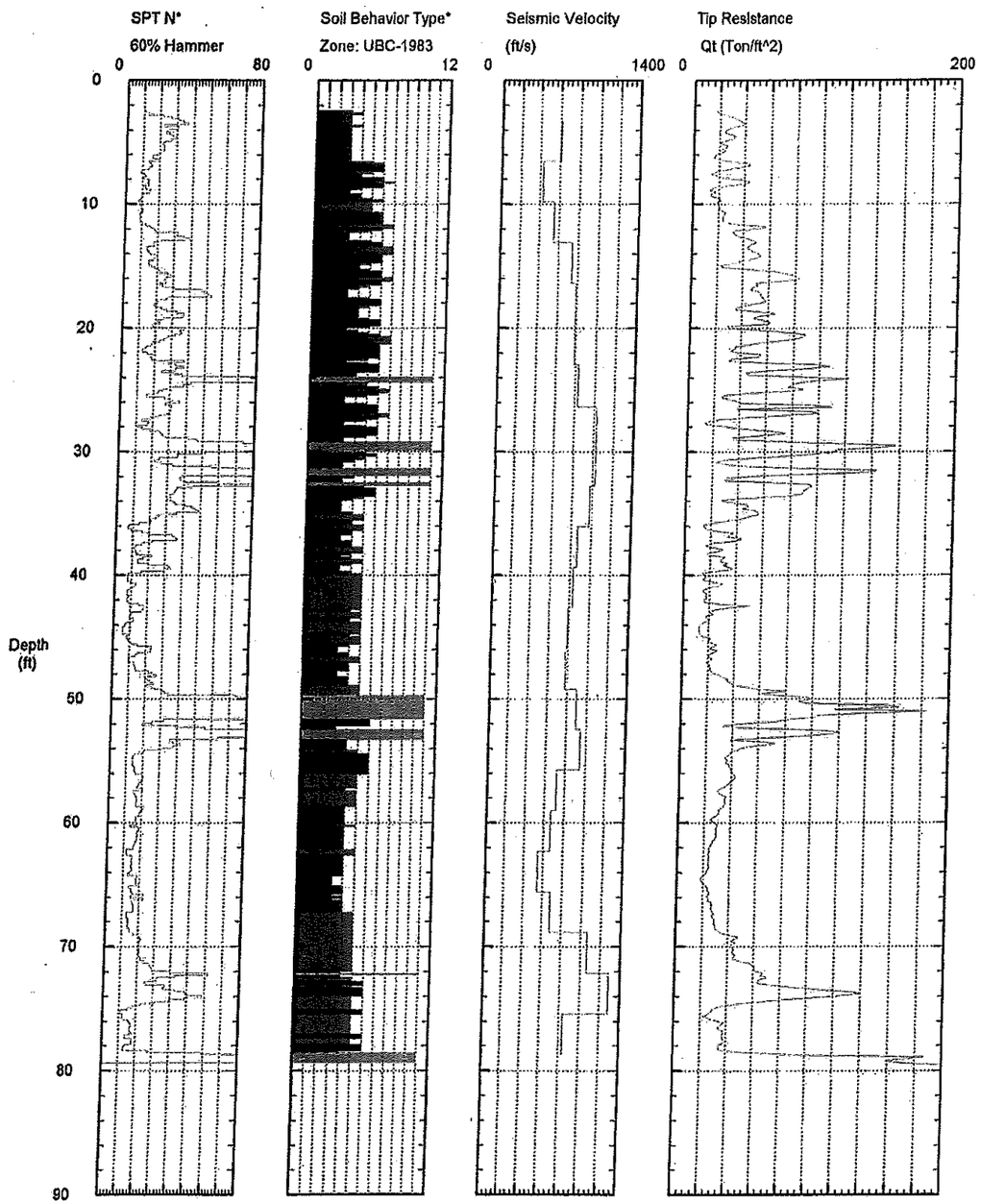


behavior type and SPT based on data from UBC-1983

GEODESIGN / CPT - 1 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP46
Cone Used: 4CH

CPT Date/Time: 10-10-08 09:50
Location: CPT1 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL



Maximum Depth = 79.56 feet

Depth Increment = 0.164 feet

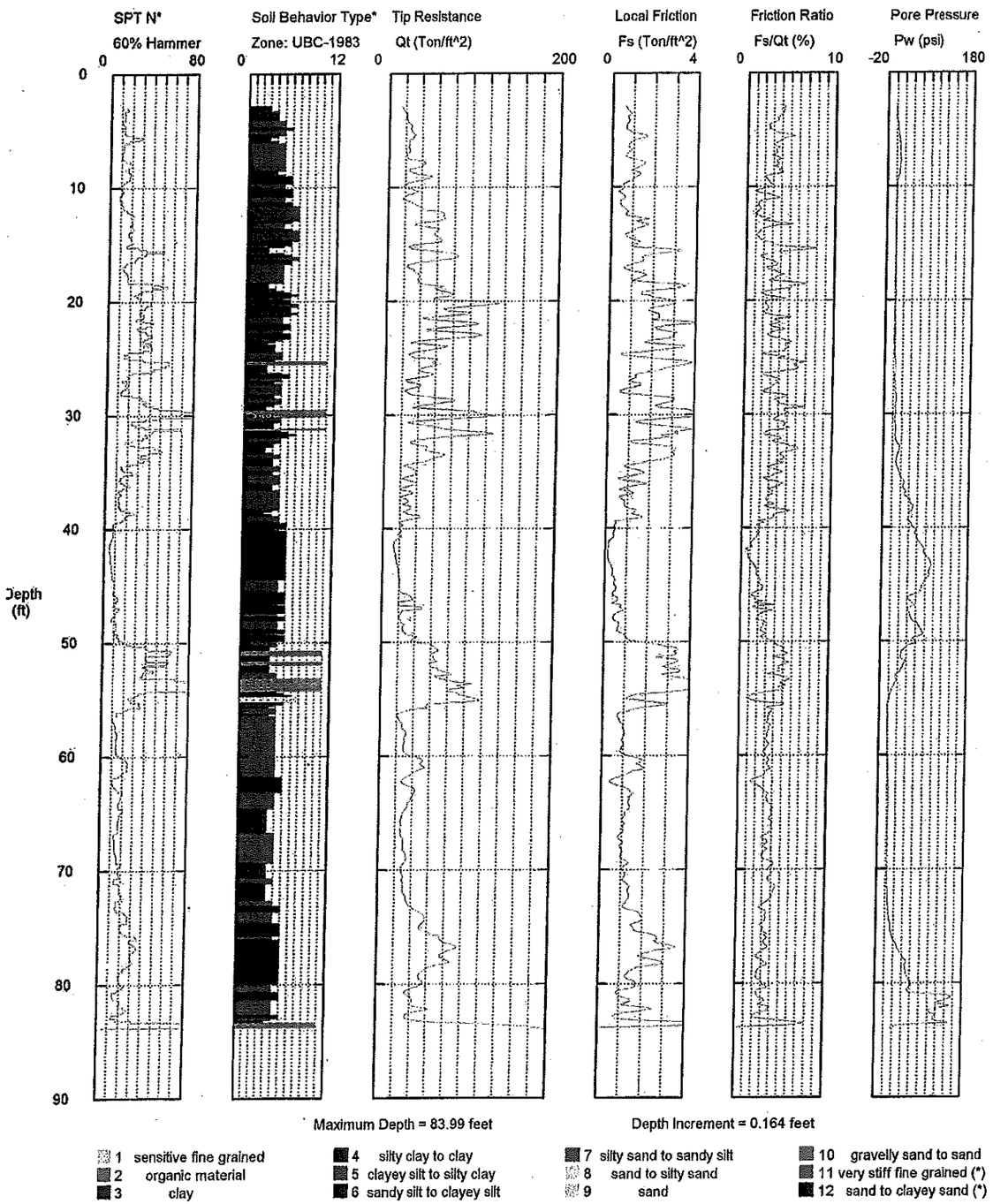
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

ıil behavior type and SPT based on data from UBC-1983

GEODESIGN / CPT - 2 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP47
Cone Used: 4CH

CPT Date/Time: 10-10-08 12:42
Location: CPT2 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL



Maximum Depth = 83.99 feet

Depth Increment = 0.164 feet

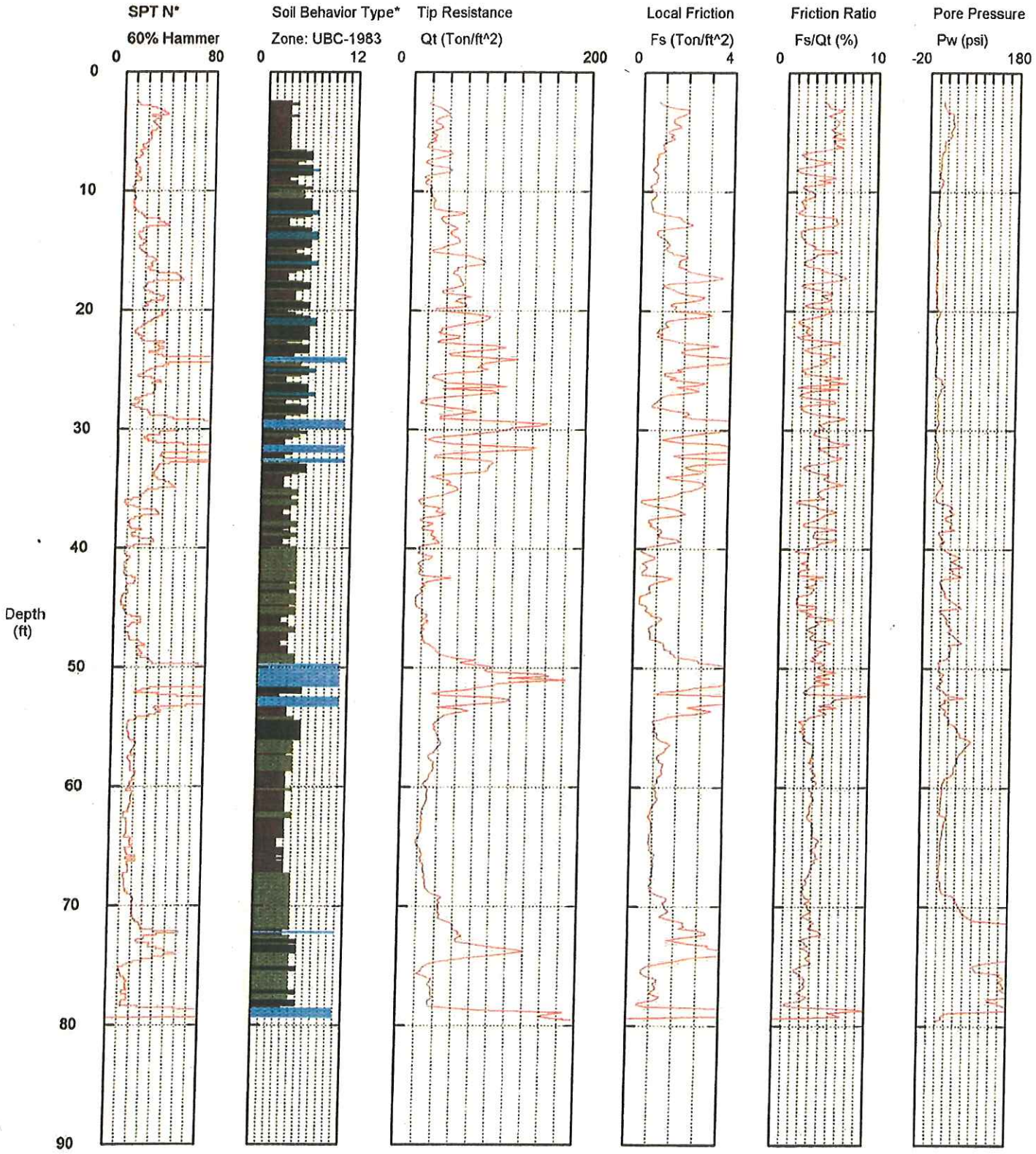
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

oil behavior type and SPT based on data from UBC-1983

GEODESIGN / CPT - 1 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP46
Cone Used: 4CH

CPT Date/Time: 10-10-08 09:50
Location: CPT1 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL



Maximum Depth = 79.56 feet

Depth Increment = 0.164 feet

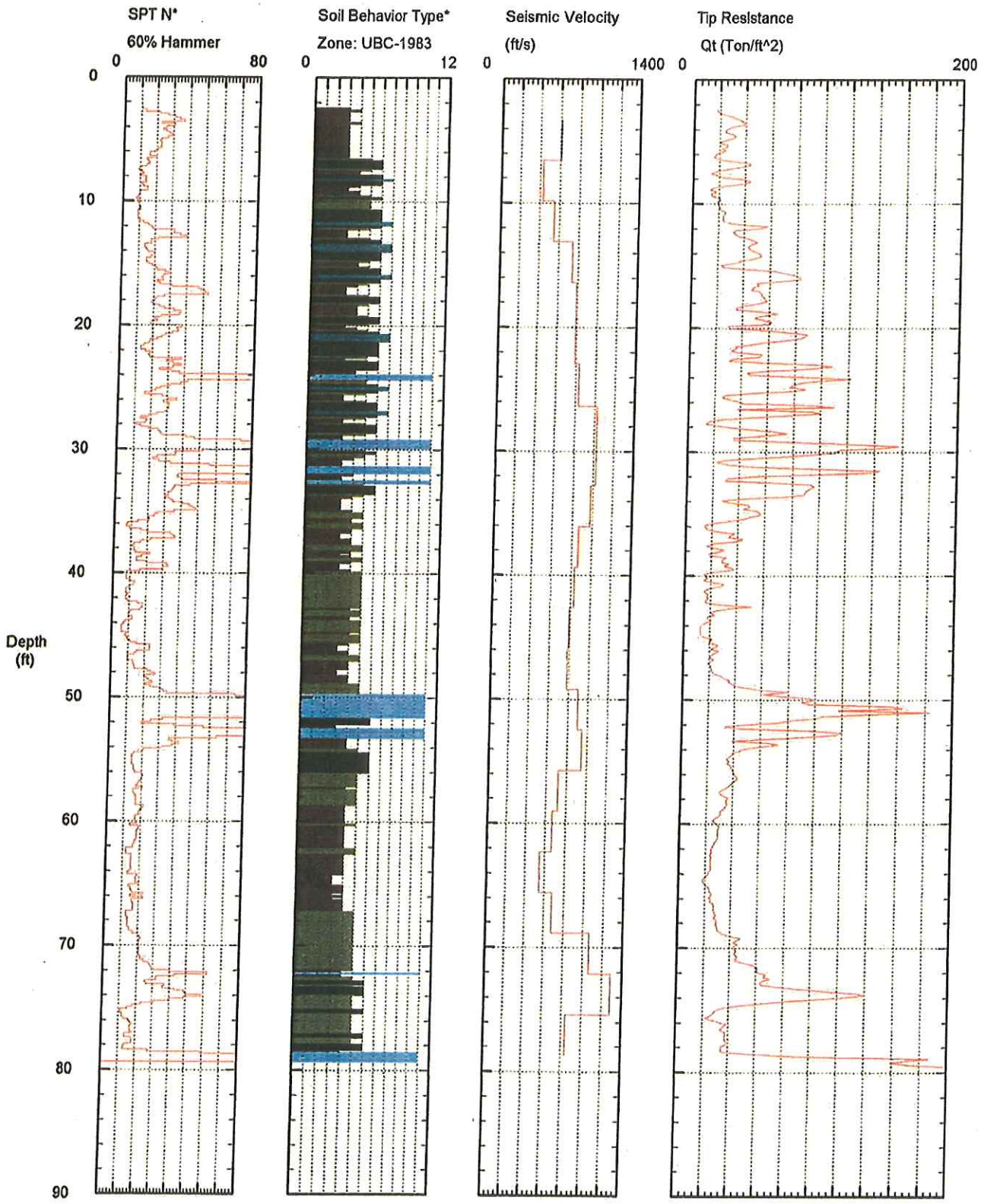
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Soil behavior type and SPT based on data from UBC-1983

GEODESIGN / CPT - 1 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP46
Cone Used: 4CH

CPT Date/Time: 10-10-08 09:50
Location: CPT1 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL



Maximum Depth = 79.56 feet

Depth Increment = 0.164 feet

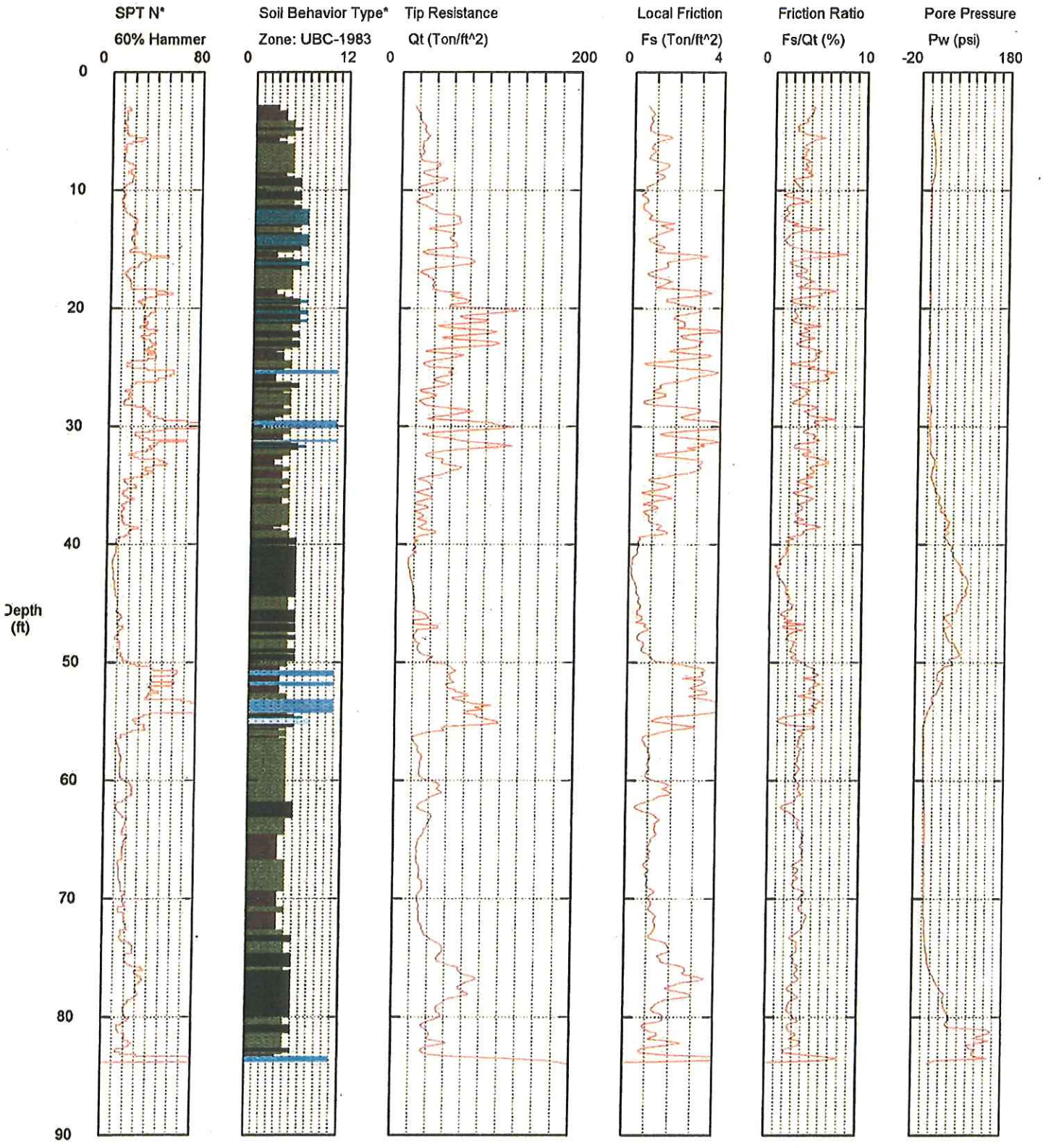
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Soil behavior type and SPT based on data from UBC-1983

GEODESIGN / CPT - 2 / MAX, WEST GT BEAV

Operator: JSP/SVAN/VAN EXP
Sounding: FILP47
Cone Used: 4CH

CPT Date/Time: 10-10-08 12:42
Location: CPT2 WEST GT BEA
Job Number: GD/ROUNDS-CDR HL



Maximum Depth = 83.99 feet

Depth Increment = 0.164 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

Soil behavior type and SPT based on data from UBC-1983