



GEOPACIFIC
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Westbank Projects Corp.
501 – 1067 West Cordova Street
Vancouver, B.C.
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Dec 14, 2016
File: 14469

Attention: Rachel Lee

**Re: Geotechnical Investigation Report: Proposed Mixed Use Development
1780 East Broadway, Vancouver, BC**

1.0 INTRODUCTION

We understand that it is proposed to construct a new mixed use development at the above referenced site. Preliminary design drawings prepared by Bing Thom Architects show five separate buildings up to 20 storeys in height over three levels of below grade parking. The development is shown to have commercial properties on the lower levels with the balance to be residential. The parking structure is to be constructed in close proximity to the property line on all sides. We expect moderately heavy wall and columns loads to be associated with this project.

This report presents the results of our geotechnical investigation and makes recommendations for the design and construction of the development. It has been prepared exclusively for Westbank Projects Corp., for their use and for the use of others on their development team, but remains the property of GeoPacific Consultants Ltd. We assume that this report would be updated once detailed design plans are available.

2.0 SITE DESCRIPTION

The site comprises the existing Safeway building and adjacent at grade parking area at 1780 East Broadway. The lot is nearly rectangular, aside from the north east corner being truncated by the adjacent railway right-of-way. The lot gently slopes from the east to the west with an approximate 2 m grade differential across the length of the site. The site is bounded by East Broadway to the north, a multifamily residential property to the east, 10th Ave to the south and the Commercial-Broadway Skytrain station to the west.

The location of the site is shown on our Drawing No. 14469-01, following the text of this report.

3.0 FIELD INVESTIGATIONS

The subsurface ground conditions at the site were investigated by others between April 30th and May 2nd, 2013 using a sonic drill rig, supplied and operated by Downrite Drilling Ltd. of Chilliwack, B.C., in relation to a previous development proposal. Nine (9) test holes were advanced to depths of between approximately 6.1 and 15.2 m below existing site grades. Standard Penetration Tests (SPTs) were conducted in several borehole locations to assist in determining in-situ density of the subsurface soils. Additionally, five (5) groundwater piezometers were installed to depths up to 10.7 m below the existing site grade.

The approximate test hole locations are shown on our Drawing No. 14469-01, following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Profile

The soil profile at the location of the test holes was generally consistent with the expected geology of the region according to the Geological Survey of Canada map 1484A. This region is expected to comprise of Vashon Drift and Capilano Sediments with bedrock present within 10m of the surface. The subsurface soil conditions encountered at the test hole locations generally consisted of a pavement structure over a sand and gravel fill, overlying till-like deposits above sedimentary bedrock (Tertiary bedrock).

A general description of the soils encountered at our test hole locations is given below.

FILL

Underlying the surficial 50-125 mm of asphalt was sand and gravel fill or gravelly sand fill with trace to some silt. The fill material was observed to be dense and extended between 0.2 to 2.4 m below the existing surface. In one test hole a 0.6 m thick layer of topsoil was encountered in the upper strata.

TILL

Dense to very dense glacial till was observed in all test holes ranging from 2.7 to 4.9 m in thickness. Till was brown to grey and was comprised of primarily sand with varying silt, clay and gravel constituents or silt with varying sand, clay and gravel constituents.

BEDROCK

Bedrock was encountered at depths between 4.0 and 5.5 m in eight of the nine test holes. Bedrock was reportedly weathered, generally soft, and consisted of either sandstone, siltstone or shale.

For specific subsurface soil descriptions at the test hole locations refer to the test hole logs provided in Appendix A, following this report.

4.2 Groundwater Conditions

Groundwater was encountered in five test holes, ranging from 3.1 to 7.7 m below the existing surface. Seasonal perched groundwater during wetter months is anticipated at the upper contact of the weather till-like deposits and within sandy zones.

We expect that the static groundwater level will be below the anticipated development grades for the majority of the excavation. The level of groundwater is expected to vary seasonally with highest levels reached during wet months of spring and winter. We expect that conventional sump and pump arrangements should be sufficient to contend with groundwater during construction.

5.0 DISCUSSION

The proposed development is anticipated to consist of a mixed use development with up to three levels of below grade parking. Based on results of our investigation and anticipated footing elevations of approximately 6 to 10 m below existing grades, we expect that the development will be founded on sandstone/siltstone bedrock. It is our opinion that the structure can be supported on conventional spread and strip footings.

We expect the three levels of below grade parking will be constructed close to the property line on all sides, which will require shoring to support neighbouring properties, structures, and/or utilities. We expected that underpinning may be required below the existing structures to the west and east. The requirements for shoring will depend on the final site layout and grading plans. Our design recommendations for temporary excavations are provided in Section 6.6.

The subsurface soils are not expected to be prone to liquefaction or other forms of ground softening under the design earthquake defined under the 2014 Vancouver Building By-Law.

We confirm, from a geotechnical stand point that the proposed development is feasible provided that the recommendations outlined in Section 6.0 are incorporated into the overall design.

6.0 RECOMMENDATIONS

6.1 Site Preparation

Existing structures, pavements, underground services, organic materials, fills, and loose or otherwise disturbed soils must be removed from the construction area.

We expect that the depths of stripping at this site will be dictated by the proposed underground parking elevations rather than the condition of the soils presented on-site.

The excavation should be graded to direct surface water to perimeter sumps and pumps. It is important that the bearing surface is blinded and protected with lean mix concrete immediately after final detail and review to preserve its bearing qualities. Any loosened/softened, fractured, or otherwise disturbed portions of the subgrade should be replaced with lean mix (5.0 MPa) concrete. Crushed gravel or engineered fill is not acceptable for foundation blinding material due to the anticipated loading requirements.

Grade reinstatement below floor slabs can be done using engineering fill. In the context of this report, engineered fill beneath floor slabs is defined as clean sand or sand and gravel fill, compacted in 300 mm loose lifts to a minimum of 98% of its Standard Proctor maximum dry density (ASTM D698), at a moisture content that is within 2% of optimum for compaction.

The geotechnical engineer shall be contacted for the review of stripping, engineered fill placement and compaction.

6.2 Building Foundations

We expect the building to be founded on sandstone/siltstone bedrock. Therefore, the proposed building can be founded on normal spread foundations, including pad and strip footings.

For a subgrade of intact sandstone bedrock, prepared as described above, foundations may be designed on the basis of a serviceability limit state (SLS) bearing pressure of 1000 kPa and a factored ultimate limit state (ULS) bearing pressure of 1500 kPa.

We estimate for foundations designed as recommended, settlements will not exceed 25 mm total and 2 mm per metre differential.

Irrespective of the allowable bearing pressures given, pad footings should not be less than 600 mm by 600 mm and strip footings should not be less than 450 mm in width. Footings should also be buried a minimum

of 450 mm below the surface for frost protection.

Foundation subgrades must be inspected by the geotechnical engineer prior to footing construction.

6.3 Seismic Design of Foundations

We have considered a design earthquake with a 2% probability of exceedance over a 50 year period which equates to a return period of 1 in 2475 years. Accordingly, we have considered an earthquake having a peak horizontal ground acceleration of 0.354g for this site (Ref. National Resources Canada, Site Coordinates: 49.261942 North 123.067916 West).

This site qualifies as “Site Class B” as defined in Table 4.1.8.4.A of the 2014 Vancouver Building By-Law. The subsurface soils beyond the depth of foundations are not considered prone to ground liquefaction or other forms of ground softening caused by earthquake induced ground motions.

6.4 Slab-On-Grade Floors

Floor slabs should be underlain by a minimum of 150 mm of a free draining granular material, such as compacted 19 mm clear crushed gravel. General grade reinstatement or backfill beneath slab on grade areas should be done with engineered fill, as described in Section 6.1. A moisture barrier should underlie the slab directly above the free draining granular material.

The under slab fill should be hydraulically connected to the perimeter drainage system to facilitate the removal of any water which accumulates under the slab. This is typically accomplished by providing weep holes through the foundation wall, above the level of the footing.

Compaction of the slab-on-grade fill must be reviewed by the geotechnical engineer.

6.5 Foundation Drainage

A perimeter drainage system will be required for the below grade structure to prevent the development of water pressure on the foundation walls and the basement floor slabs. Groundwater flows are expected to be light to moderate, likely in the range of 25 to 50 litres/minute for the entire excavation. These flow rates should be confirmed at the time of construction.

6.6 Temporary Excavations and Shoring

As noted above, shoring will likely be required in order to construct the proposed underground parking that is assumed to extend directly to the property lines, with potential underpinning of the adjacent buildings to the west and east. Some ground movements should be expected during installation of the shoring. Based on the soil conditions identified in our test holes and our experience with similar sites, we expect movements of up to 15 mm should be expected at face of excavation, decreasing to 5 mm at 3 m back of the excavation face.

It is our opinion that the natural soils are sufficiently strong that vertical cuts may be supported with the use of shotcrete shoring with ground soil anchors, which is the most economical system available in Greater Vancouver. Hollow core (self-drilling) anchors as well as some face saving measures should be anticipated within the upper granular surficial soils.

The Commercial-Broadway skytrain station to the west of the project location may be comprised of a pile

foundation that precludes the use of a conventional shotcrete and anchor shoring system. In this case alternative shoring solutions such as secant pile wall may be necessary. Our experience is that Translink or the City of Vancouver may have more strict requirements with respect to shoring adjacent to facilities such as these.

Observations during the site investigation as well as our experience in this area indicate that cobbles and boulders are present in the glacial till. Cobbles and small boulders can typically be removed with conventional excavation equipment. However, large boulders or bedrock may require splitting/blasting to facilitate their removal from site.

Some seepage into excavations from surficial fills, sand, and sandy lenses within the glacial till should be expected. We envisage that groundwater inflows can generally be controlled with conventional sumps and sump pumps.

Temporary cut slopes in excess of 1.2 m in height require inspection by a professional engineer in accordance with WorkSafe B.C. guidelines.

6.7 Lateral Pressures on Foundation Walls

Earth pressures against the foundation walls are dependent on factors such as, available lateral restraint along the wall, surcharge loads, backfill materials, compaction of the backfill and drainage conditions. We recommend that the foundation walls be designed to resist the following lateral earth pressures:

- Static: Triangular soil pressure distribution of $4.5H$ kPa, where H is equal to the total wall height in metres.
- Seismic: Inverted triangular soil pressure distribution of $2.5H$ kPa, where H is equal to the total wall height in metres

The preceding loading recommendations assume a clean, free draining sand and gravel backfill behind the foundation walls. We expect that the perimeter drainage system will be connected to the synthetic drainage material and sufficiently the groundwater level such that hydrostatic pressures against the foundation walls are eliminated.

Any additional surcharge loads located near the foundation walls should be added to the earth pressures given.

Backfill materials and procedures on or adjacent to the City properties should be in accordance with “The City of Vancouver Street Restoration Manual (Rev. August 2008)” by the City of Vancouver.

The geotechnical engineer should be contacted for the review of all backfill materials and procedures.

7.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

As required for Municipal “Letters of Assurance”, GeoPacific Consultants Ltd. will carry out sufficient field reviews during construction to ensure that the geotechnical design recommendations contained within this report have been adequately communicated to the design team and to the contractors implementing the design. These field reviews are not carried out for the benefit of the contractors and therefore do not in any way effect the contractors obligations to perform under the terms of his/her contract.

It is the contractors’ responsibility to advise GeoPacific Consultants Ltd. (a minimum of 48 hours in

advance) that a field review is required. Field reviews are normally required at the time of the following activities:

- | | | |
|----|-----------------|--|
| 1. | Excavation | Review of temporary cut slopes. |
| 2. | Shoring | Review of shoring installation and testing. |
| 3. | Engineered Fill | Review of fill materials and compaction. |
| 4. | Foundation | Review of foundation subgrade. |
| 5. | Slab-on-grade | Review of subgrade and under slab fill materials and compaction. |
| 6. | Backfill | Review of backfill materials and placement against foundation walls. |

It is critical that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also critical that contractors working on the site view this document in advance of any work being carried out so that they become familiar with the sensitive aspects of the works proposed. It is the responsibility of the developer to notify GeoPacific Consultants Ltd. when conditions or situations not outlined within this document are encountered.

8.0 CLOSURE

This report is prepared exclusively for Westbank Corp, for the purpose of providing geotechnical recommendations for the design and construction of the proposed mixed use development. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. However, please do not hesitate to call the undersigned if you should require any clarification or additional details.

For:

GeoPacific Consultants Ltd.

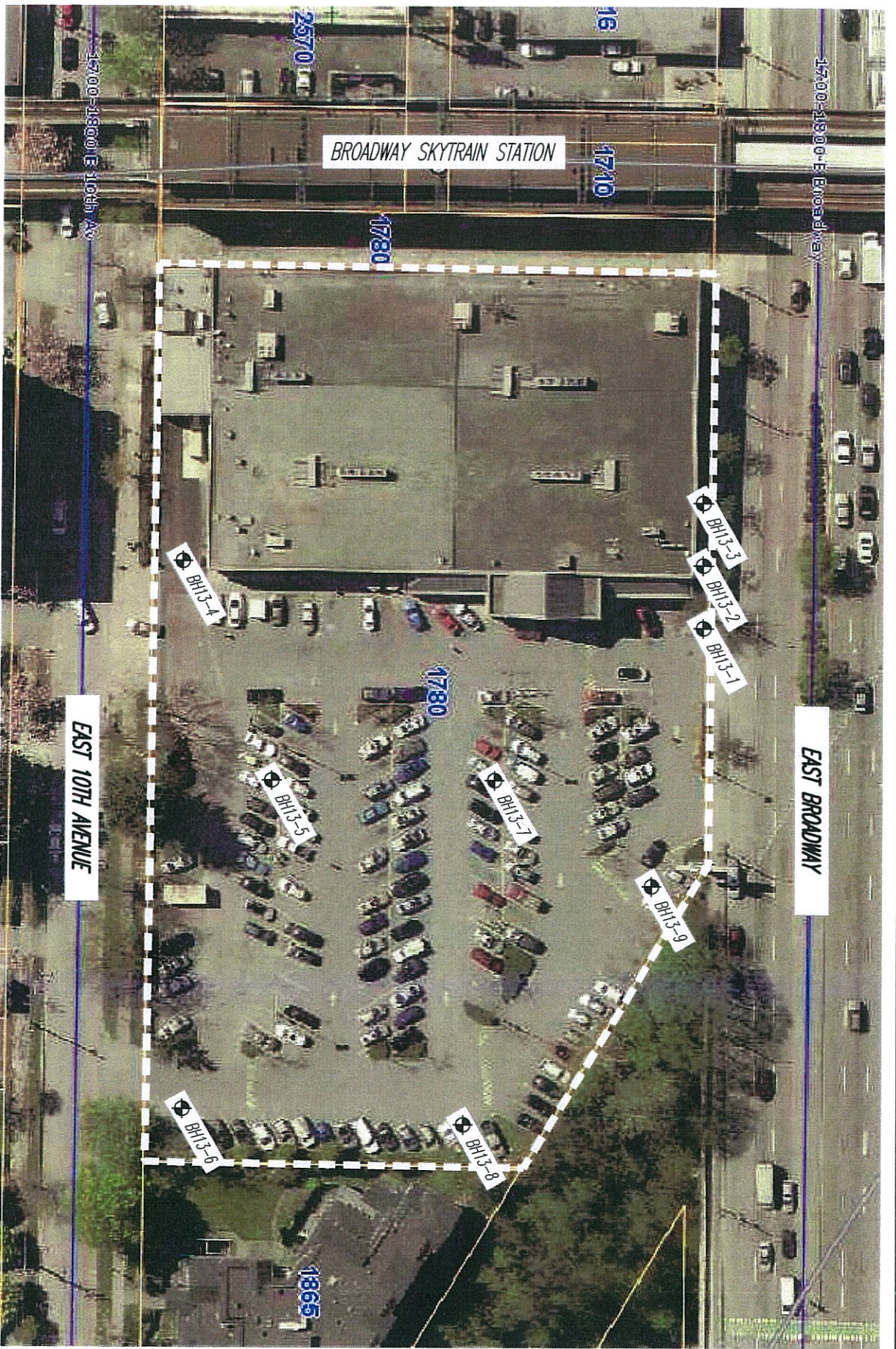
Kyle Doyle, B. Eng., E.I.T.
Geotechnical Engineer-in-Training

Reviewed By:



Matt Kokan, M.A.Sc., P.Eng.
Principal

DEC 14 2016



LEGEND:

BH13-# - BOREHOLE (BH) LOCATION BY OTHERS
 HOLE LOCATIONS ARE APPROXIMATE

SITE PLAN

SCALE = 1:800



GEOPACIFIC
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DRAWN BY: DECEMBER 12, 2016

H.S. APPROVED BY: M.L.K. REVIEWED BY: K.D.

SCALE: AS SHOWN

MIXED USE DEVELOPMENT
 BROADWAY AND COMMERCIAL, VANCOUVER, BC
 TEST HOLE LOCATION PLAN

PROJECT:

FILE NO.:

14469

DMC. NO.:

14469-01

REVISIONS:

A.
 B.
 C.

Appendix A: Test Hole Logs

BOREHOLE RECORD

BH13-1

CLIENT Canada Safeway LimitedPROJECT No. 123110609PROJECT Safeway Store #189, 1780 East Broadway

DATUM _____

NORTHING _____

LOCATION Vancouver, BC

ELEVATION _____

EASTING _____

DRILLING DATE May 1, 2013DRILLING CO. Downrite DrillingDRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			☐ Insitu Shear Vane (kPa) ☒ Remoulded Shear Vane (kPa) ☐ Pocket Penetrometer (kPa) ☒ Disturbed Torvane (kPa)				DEPTH (ft)
					TYPE	NUMBER	MOISTURE CONTENT (%)	50kPa	100kPa	150kPa	200kPa	
0	FL		FILL - 75mm pavement over brown silty Sand, trace gravel, dense		GS 1-1	8						0
1	FL		FILL - light brown, mottled gravelly Sand, some silt		GS 1-2							2
2			- dark brown sand, some silt, some gravel		GS 1-3							4
3	SM		Grey clayey, silty SAND, some gravel, dense		GS 1-4	9						6
4	SM		Brown SAND and GRAVEL, some silt		GS 1-5							8
5	GM		Brown sandy, clayey SILT, some gravel, reworked with grey siltstone		GS 1-6	9						10
6					GS 1-7	11						12
7	ML				GS 1-8	14						14
8												16
9												18
10												20
			End of Borehole at 6.1 m									22
												24
												26
												28
												30
												32
												34

Sample Type: GS - Grab Sample SPT - Standard Penetration Test

ST - Shelby Tube PT - Piston Tube CC - Continuous Core

Piezometer Backfill Type: ☒ Bentonite ☒ Sloughed ☒ Drill Cuttings ☒ Sand

Logged by: EV

Reviewed by: RI

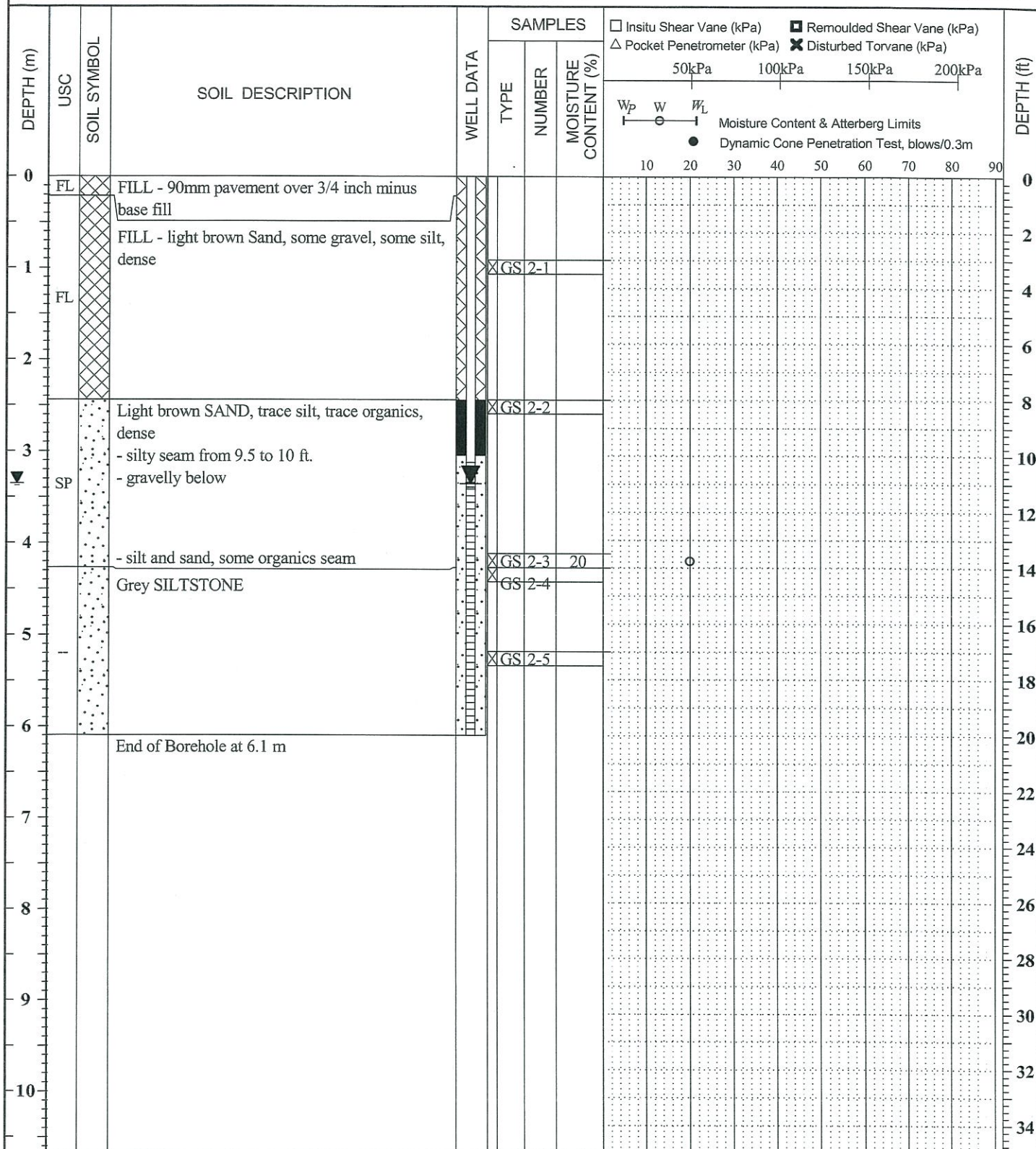
Date: April 30, 2013



BOREHOLE RECORD

BH13-2

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE May 1, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling



Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

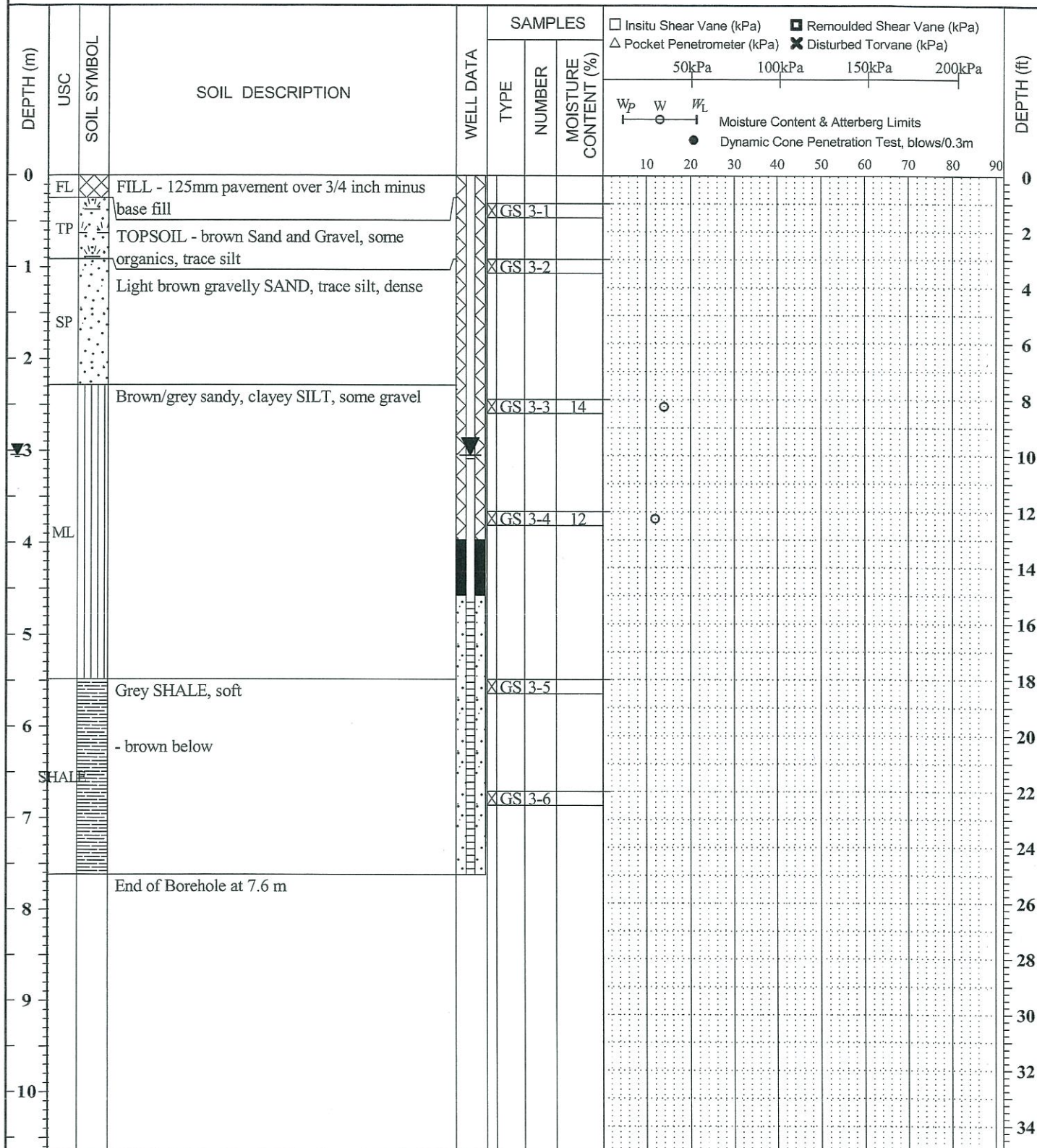
Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013



BOREHOLE RECORD

BH13-3

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE May 1, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling



Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: ☒ Bentonite ☒ Sloughed ☒ Drill Cuttings ☒ Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013



BOREHOLE RECORD

BH13-4

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE May 2, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA			SAMPLES		TESTS				DEPTH (ft)
				TYPE	NUMBER	MOISTURE CONTENT (%)	TYPE	NUMBER	W _p	W _L			
0	FL		FILL - 125mm pavement over 3/4 inch minus base fill										0
1	FL		FILL - brown gravelly Sand, some silt	XGS	4-1								2
2													4
3	SM		Light brown, mottled silty SAND, trace gravel, dense	XGS	4-2	9							8
4			- some gravel below										10
5													12
6													14
7													16
8													18
9													20
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Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013



BOREHOLE RECORD

BH13-4 cont'd

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE May 2, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			TESTS				DEPTH (ft)
					TYPE	NUMBER	MOISTURE CONTENT (%)	50kPa	100kPa	150kPa	200kPa	
11												36
12			SHALE		X	GS 4-8						38
13												40
14					X	GS 4-9						42
15			End of Borehole at 14.5 m									44
16												46
17												48
18												50
19												52
20												54
21												56
												58
												60
												62
												64
												66
												68
												70

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: Bentonite
 Sloughed
 Drill Cuttings
 Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013

BOREHOLE RECORD

BH13-5

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM NORTHING
 LOCATION Vancouver, BC ELEVATION EASTING
 DRILLING DATE May 2, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			50kPa 100kPa 150kPa 200kPa				DEPTH (ft)	
					TYPE	NUMBER	MOISTURE CONTENT (%)	W _p	W	W _L			
0	FL	×	FILL - 75mm pavement over brown Sand and Gravel, trace silt		XGS	5-1	9						0
1	SM		Light brown, mottled silty SAND, trace gravel, trace clay, dense - sand and gravel seams from 2.5 to 5 ft.		XGS	5-2	8						2
2			Light brown, mottled sandy, clayey SILT, some gravel, very stiff		XGS	5-3	8						4
3	ML		- light brown gravelly sand seam from 10 to 11 ft.		XGS	5-4	18						6
4													8
5			Grey SANDSTONE, soft		XGS	5-5							10
6													12
7			- siltstone intrusions, some lignite seams		XGS	5-6							14
8													16
9					XGS	5-7							18
9.1			End of Borehole at 9.1 m										20

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer ☐ Bentonite ☐ Sloughed ☐ Drill Cuttings ☐ Sand
 Backfill Type: ☐ Bentonite ☐ Sloughed ☐ Drill Cuttings ☐ Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013



BOREHOLE RECORD

BH13-6

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE April 30, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			Moisture Content & Atterberg Limits				DEPTH (ft)
					TYPE	NUMBER	MOISTURE CONTENT (%)	W _p	W	W _L		
0	FL	XXXX	FILL - 50mm pavement over brown Sand and Gravel, trace silt		XGS 6-1	12		○				0
1	SM		Light brown, mottled silty SAND, some gravel, some clay - visible cobbles at 2 ft.									2
2		ΔΔΔΔ	TILL - grey clayey Silt and Sand, some gravel		XGS 6-2	11		○				4
3		ΔΔΔΔ										6
4	TL	ΔΔΔΔ			XGS 6-3	9		○				8
5		ΔΔΔΔ										10
6		ΔΔΔΔ	Grey SANDSTONE, soft		XGS 6-4							12
7		ΔΔΔΔ	- lignite seams		XGS 6-5							14
8		ΔΔΔΔ										16
9		ΔΔΔΔ	- siltstone intrusions		XGS 6-6							18
10			End of Borehole at 9.1 m									20

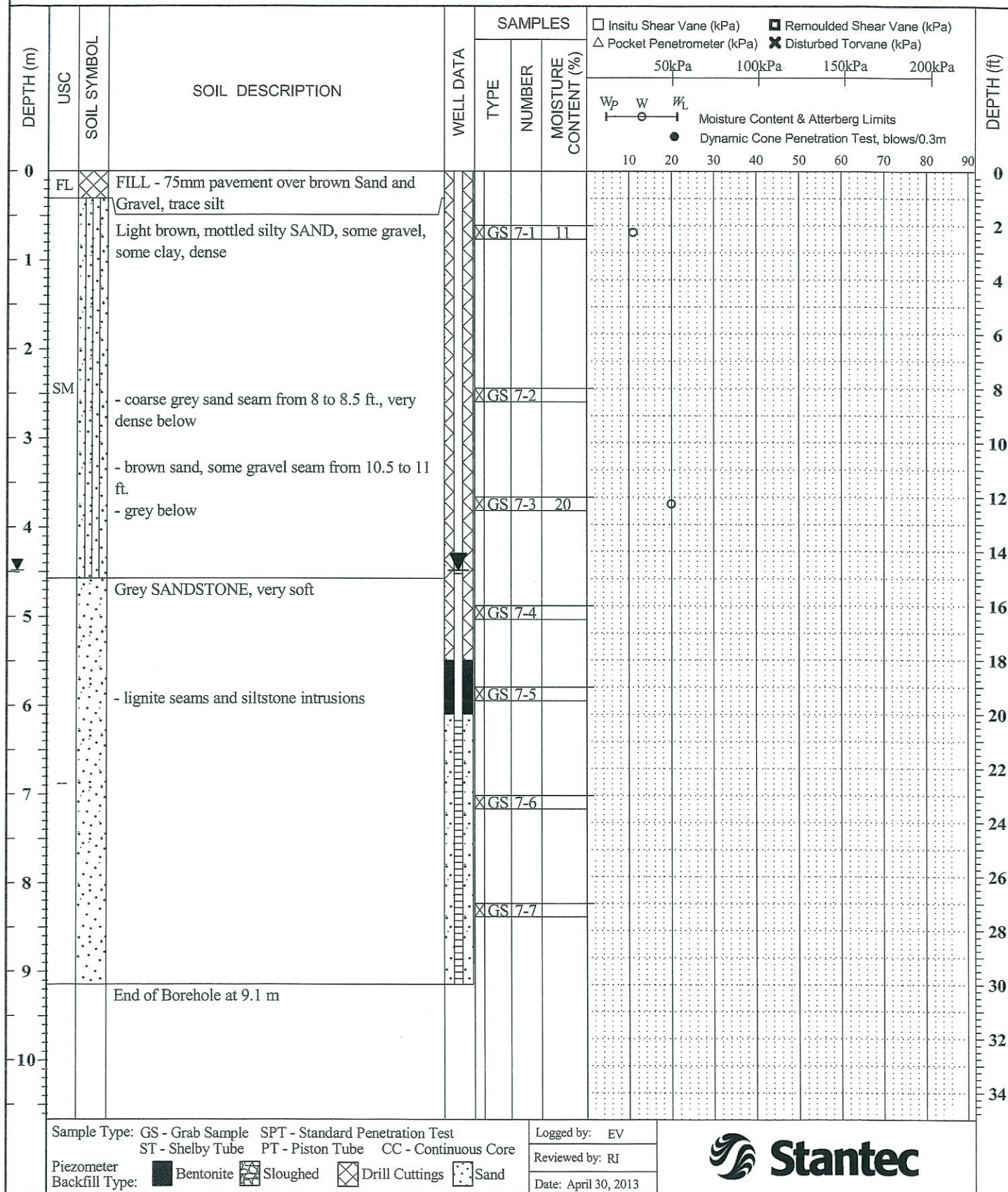
Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: Bentonite Sloughed Drill Cuttings Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013

BOREHOLE RECORD

BH13-7

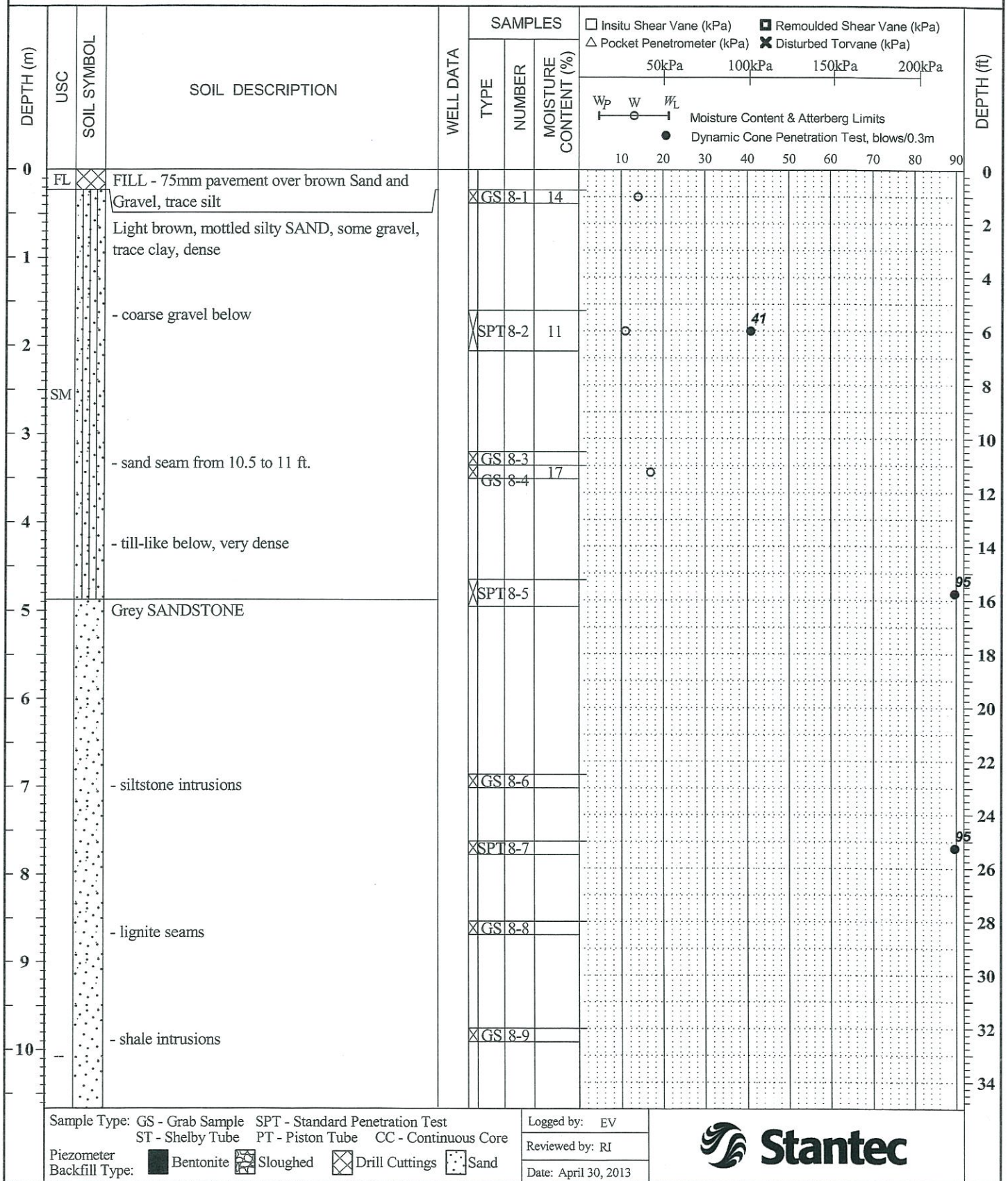
CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE May 2, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling



BOREHOLE RECORD

BH13-8

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE April 30, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling



BOREHOLE RECORD

BH13-8 cont'd

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE April 30, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			TESTS				DEPTH (ft)	
					TYPE	NUMBER	MOISTURE CONTENT (%)	☐ Insitu Shear Vane (kPa)	☐ Remoulded Shear Vane (kPa)	☐ Pocket Penetrometer (kPa)	☒ Disturbed Torvane (kPa)		
11					X	SPT8-10							36
12					X	GS8-11							38
13					X	GS8-12							42
14													44
15					X	GS8-13							48
15.2			End of Borehole at 15.2 m										50
16													52
17													54
18													56
19													58
20													60
21													62
													64
													66
													68
													70

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer ☐ Bentonite ☒ Sloughed ☒ Drill Cuttings ☒ Sand
 Backfill Type: ☐ Bentonite ☒ Sloughed ☒ Drill Cuttings ☒ Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013

BOREHOLE RECORD

BH13-9

CLIENT Canada Safeway Limited PROJECT No. 123110609
 PROJECT Safeway Store #189, 1780 East Broadway DATUM _____ NORTHING _____
 LOCATION Vancouver, BC ELEVATION _____ EASTING _____
 DRILLING DATE April 30, 2013 DRILLING CO. Downrite Drilling DRILLING METHOD Sonic Drilling

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL DATA	SAMPLES			Moisture Content & Atterberg Limits				DEPTH (ft)
					TYPE	NUMBER	MOISTURE CONTENT (%)	Insitu Shear Vane (kPa)	Remoulded Shear Vane (kPa)	Pocket Penetrometer (kPa)	Disturbed Torvane (kPa)	
0	FL	XXXX	FILL - 75mm pavement over brown Sand and Gravel, trace silt		GS	9-6						0
			Light brown silty SAND, some gravel, some clay, dense		GS	9-1	19					2
			- mottled below									4
			- sand and gravel seams from 5 to 7 ft.		GS	9-2						6
			- very dense below		GS	9-3	18					8
	SM		- grey below									10
					GS	9-4	16					12
												14
					GS	9-5						16
			Grey SANDSTONE with lignite seams									18
												20
												22
			Grey SHALE		GS	9-7						24
												26
	SHALE				GS	9-8						28
												30
			End of Borehole at 7.6 m									32
												34

Sample Type: GS - Grab Sample SPT - Standard Penetration Test
 ST - Shelby Tube PT - Piston Tube CC - Continuous Core
 Piezometer Backfill Type: ☒ Bentonite ☒ Sloughed ☒ Drill Cuttings ☒ Sand

Logged by: EV
 Reviewed by: RI
 Date: April 30, 2013

