



re: Geotechnical Review of SWMP Design
Proposed Stormwater Management Pond
301 Somme Street, Ottawa, Ontario

to: W.O. Stinson & Sons Ltd. – Scott Stinson – sstinson@wostinson.com

date: September 30, 2026

file: PH5075-MEMO.04-Rev.1

As requested, Paterson Group (Paterson) has completed a geotechnical review of the proposed stormwater management pond (SWMP) to be located onsite as part of the Site Plan application (SPA) for the proposed development at 301 Somme Street in Ottawa. This memorandum should be read in conjunction with the following reports:

- ☐ Paterson's Geotechnical Investigation Report PG7567-1-Rev.02 dated July 23, 2026
- ☐ Stantec Consulting Ltd. (Stantec) Site Servicing and Stormwater Management Report Project / File: 160402138 dated September 4, 2026
- ☐ Paterson's Groundwater Monitoring Program Memo PH5075-MEMO.02 dated July 15, 2026

Background

Paterson reviewed the following drawings for the proposed pond prepared by Stantec Consulting Ltd from a geotechnical perspective.

- ☐ Site Servicing Plan – Vehicle Yard Service Building – Project No. 160402138 – Dwg SSP-1 – Site Servicing Plan – dated September 4, 2026.
- ☐ Site Servicing Plan – Vehicle Yard Service Building – Project No. 160402138 – Dwg PD-1 and PD-2 – Pond Details - dated September 4, 2026.

Based on our review of the aforementioned drawings, the proposed pond is to be located within the south portion of the site. The available hydrogeological and geotechnical information was used to support the detailed design of the SWMP. The following sections summarize our geotechnical review and associated recommendations for the construction of the proposed ponds.

Proposed Pond

Based on our review of the attached Stormwater Design drawings and Site Servicing and Stormwater Management Report by Stantec, the proposed pond will consist of the following:



Pond Parameters:

☐ Pond Forebay Bottom Elevation:	87.60 m
☐ Pond Main Cell Bottom Elevation:	87.60 m
☐ Permanent Pool Elevation:	89.30 m
☐ 100 Year Water Level Elevation:	90.34 m
☐ Structure Base Elevations:	86.25 to 88.50 m

The pond will also include the construction of inlet and outlet structures with concrete headwalls and erosion protection through the use of rip-rap stone and filter cloth. Inlet structures will be connected to the stormwater drainage infrastructure. Outlet structures will be connected to existing approved stormwater drainage infrastructure that will subsequently drain into the Somme Street ditch and associated subdivision stormwater management system.

Based on our review, the side slopes for the proposed ponds are anticipated to be constructed to a maximum slope ranging from 3H:1V to 5H:1V which will tie into the proposed ground surface. The pond is proposed to be provided with a 0.75 m thick clay liner with an underlying impermeable geomembrane.

Field Observations

Field Investigation

A series of boreholes were put down on the subject parcel to delineate the subsurface soil conditions. Onsite investigations were completed by Paterson in 2025, 2021 and 2019 with further investigations completed by others in 2021, 2020, and 2008. The boreholes were distributed in a manner to provide general coverage of the subject site, taking into consideration underground services and available site access. The locations of the test holes on the property are delineated on the Test Hole Location Plan, drawing PG7327-1, attached.

The borehole locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (if encountered), were carefully observed and recorded. The soils encountered were classified texturally in the field and later reviewed in the laboratory.

Subsurface Soil Profile

Generally, the subsurface profile at the borehole locations were observed to consist of topsoil followed by an approximate 2.3 to 10 m thickness of fill material followed by a layer of clayey silt to silty clay and/or silty sand. Generally, the fill material consisted of silty sand and/or silty clay with varying amounts of organics, gravel, asphalt, concrete and



bedrock fragments. The boreholes were advanced to a maximum depth of 14.3 m below ground surface (bgs).

BH1-25 is located in proximity to the SWMP and extended to an elevation of 81.05 m (10.26 m depth). This borehole extends to greater than 5 m below the maximum structure depths.

Reference should be made to the test pit logs appended to this report for the details of the soil profiles encountered at each test hole location. The client should be aware that any information pertaining to soils are furnished as a matter of general information only and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.

Groundwater Level Monitoring

Three (3) boreholes completed during the June 2nd and 3rd, 2025 investigation (BH1-25, BH3B-25, and BH4-25) were instrumented with a monitoring well for the purpose of carrying out a groundwater monitoring program. The monitoring well installations were distributed in a manner to provide general coverage of the study area, taking into consideration existing site features. Each of the three monitoring wells was equipped with a submersible datalogger (TD-Diver, VanEssen Instruments) to accurately monitor fluctuations in the groundwater levels. The datalogger can measure the equivalent hydrostatic pressure of the water above the sensor diaphragm to calculate the total water depth. Details of the Groundwater Monitoring Program can be found in Paterson's Groundwater Monitoring Program Memo PH5075-MEMO.02 dated July 15, 2026, however the follow table has been taken from the report for discussion purposes:

Table 1: Groundwater Monitoring Summary				
Monitoring Well ID	Ground Surface Elevation (m asl)	Low Groundwater Elevation (m asl)	High Groundwater Elevation (m asl)	Difference in Groundwater Elevation (m asl)
BH1-25	91.31	87.51	89.00	1.49
BH3B-25	90.80	87.66	89.11	1.45
BH4-25	92.18	86.83	85.80	1.03

BH1-25 is the well which was installed closest to the proposed SWM facility at a distance of approximately 45 m. BH1-25 was installed to a depth of 5.6 m below ground surface (bgs) which had an elevation of 91.3 m ELE. As such, the bottom of the well was installed at 85.7 m ELE.

Design and Construction Recommendations

From a geotechnical perspective, the design concept of the proposed pond is considered acceptable and feasible. The following sections detail our review and associated design



and construction recommendations for the proposed pond concepts.

Groundwater Observations

Based on the seasonal groundwater measurements from the adjacent monitoring well (BH1-25), groundwater ranged seasonally from 87.5 to 89.0 m asl. The pond bottom is proposed at 87.6 m asl, and the permanent pool is proposed at 89.30 m asl. The permanent pool elevation exceeds the measured seasonal groundwater high during normal operations.

Groundwater Infiltration During Construction

The proposed SWMP will be located in an area where water infiltration will be required to be managed during the construction phase. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium and to undertake all proposed works in the dry. It is anticipated groundwater influx will be able to be managed by the earthwork's contractor using an open sump dewatering methodology.

It is worth noting that under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction.

In the event that an EASR is required to facilitate dewatering of the proposed SWMP, a minimum of three to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16.

Geosynthetic Liner

Due to the permeable soils expected to be encountered along the sidewalls and at the base of the proposed pond, a geosynthetic liner was proposed by Stantec across the pond footprint to act as a hydraulic barrier. Based on groundwater levels and proposed pond design configurations, the liner is anticipated to be subject to minor uplift pressure during periods of peak precipitation, but the permanent pool is expected to maintain a greater elevation during normal pond operations.

For preliminary design purposes, it is recommended that the geosynthetic liner be placed above an approximate 300 mm thickness of 19 mm clear crushed stone or reworked native soil which is placed directly over the approved surface. The liner should be placed at an elevation which accounts for the overlying ballast thickness (0.75 m of thick clay according to Stantec's Site Servicing and Stormwater Management report). The liner should extend up the side slopes of the pond, to approximately 0.3 m above the



permanent pond elevation, which is understood to be at an elevation of 89.3 m, corresponding to an approximate elevation of 89.6 m. The geomembrane liner is recommended to be installed as per the manufacturer's recommendations and installation guidelines to provide a relatively watertight liner system.

Ballast Review

Based on the seasonal groundwater measurements from the adjacent monitoring well (BH1-25), groundwater ranged seasonally from 87.5 to 89.0 m asl. The permanent pool is proposed at 89.30 m asl and is above the highest measured groundwater level. The permanent pool elevation exceeds the measured groundwater elevation during seasonally high periods and the liner would not be impacted by buoyancy concerns. As such, no ballast is required during normal pond operations.

The pond will need to have maintenance performed within the forebay for sediment removal in the future. It is anticipated that the permanent pool within the pond forebay will need to be lowered to complete maintenance activities. It is recommended to complete the maintenance in a dry-type summer period to reduce potential buoyancy impacts that could occur during seasonal spring groundwater highs. An optional method can be to install a monitoring well in proximity to the SWMP footprint to measure the groundwater levels prior to starting the maintenance field program.

Based on Paterson's review, to ensure the liner does not experience uplift during maintenance conditions, the 0.75 m ballast layer is considered to provide a minimum factor of safety of 1.25 against uplift where groundwater is up to 87.89 m asl on the exterior of the liner when the pond water level is drawn down to 87.60 m asl (pond bottom). This would result in an uplift pressure of 10.2 kPa (product of 1.04 m of groundwater uplift head and the unit weight of water, 9.81 kN/m³) and a resisting downward pressure of 12.75 kPa (product of 0.75 m of a brown silty clay liner material and a saturated unit weight of 17 kN/m³).

It is therefore recommended that a permanent monitoring well be installed adjacent to the SWMP to measure groundwater levels in the surrounding soils. The well should be located outside the pond footprint and beyond the zone of construction disturbance and screened across the anticipated range of water table fluctuation (i.e. 87.1 to 89.3 m asl). Groundwater levels from this well should be used to schedule maintenance (i.e. pond water level drawdown) for periods when surrounding water levels are at or near their seasonal low, typically late summer to early fall. The monitoring well should be constructed, maintained, and eventually decommissioned in accordance with O.Reg 903.

The current conceptual SWMP details are considered to be feasible for the SPA.



Excavation of Base and Pond Sidewalls

The long-term performance of the subject pond will depend on the stability of its excavation side slopes. Based on available drawings, it appears that the excavation side slopes are 3H:1V in the lower portion of the pond and flattening to 5H:1V in the upper portions of the pond. Since the pond sidewalls will consist of compacted fill, the currently proposed side slopes are considered to be stable in the long term and acceptable for construction of the proposed pond, from a geotechnical perspective. It is recommended that Paterson be informed during the excavation to conduct site inspections to verify the groundwater conditions at the time of construction.

Fill Placement

Fill used for grading, where required, can be undertaken by re-using site-generated soils. The site-generated material should be in a workable, relatively dry state (i.e., not saturated, wet, grey soils) and able to be placed, compacted and shaped using a suitably sized vibratory roller. All fill should be free of organics, inorganic debris, cobbles or fractured rocks greater than 200 mm in diameter.

The placement of the fill should be reviewed by Paterson at the time of placement. Compaction of the material may be achieved by making several and is recommended to be undertaken during dry and above-freezing conditions. The fill should not be frozen at the time of placement.

Fill used to raise the grade surrounding the pond in areas where settlement of the ground is not a major concern (i.e. beyond areas of settlement sensitive structures and surfaces, such as hardscaping), the site-generated fill could be placed in suitably sized lifts and compacted by the tracks of the earthworks equipment making several passes. The placement and preparation of the above-noted fill should be reviewed and approved at the time of construction by Paterson personnel.

Bearing Resistance Values - Concrete Structures

Due to the presence of a thick layer of existing fill, the proposed structures within the proposed SWMP will require extra precautions to prepare a sufficient bearing medium. The fill consists of a mixture of clay, silt, sand and gravel with trace of organics, concrete, asphalt and shaley limestone. It is important to note that the ground improvement program within the subject site did not include the pond area. As such, treatment to the subgrade level should be conducted prior to the placement of settlement sensitive structures.

It is recommended that the fill bearing medium below the proposed settlement sensitive structures be sub-excavated by a minimum 500 mm below the proposed foundation



footprint. The extend of the sub-excavation should be a minimum 500 mm beyond the face of the proposed footings in all directions.

The exposed subgrade level should be proof-rolled, under dry conditions and above freezing temperatures, using a vibratory roller making several passes, under the supervision of Paterson personnel. Any deleterious fill containing excessive amounts of organics or boulders larger in diameter than 150 mm in the longest direction, should be removed and replaced with an approved engineered fill.

Once the subgrade is properly prepared and approved by Paterson, a layer of woven geotextile liner such as Terrafix 200W or an approved equivalent should be placed directly above the subgrade. The geotextile liner should be covered with a layer of biaxial geogrid such as Terrafix TBX 2500 or an approved equivalent. The extent of the liners should match the extent of the remediated subgrade (500 mm beyond footing face). Once approved by Paterson, the liners should be backfilled with OPSS Granular A or Granular B Type II compacted to a minimum 98% of the material's SPMDD.

Any loose or soft areas within the subgrade should be removed and replaced with OPSS Granular A or Granular B Type II compacted to a minimum 98% of the material's SPMDD.

Bearing Resistance Values - Remediated subgrade

As such, structures for the proposed SWMP placed over a remediated subgrade consisting of 500 mm thick layer of engineered fill over the specified geosynthetic liners can be designed using a bearing resistance value at serviceability limit state (SLS) of **120 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **175 kPa** incorporating a geotechnical factor of 0.5 under ULS.

Footings designed using the bearing resistance values at SLS provided above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

Bearing Resistance Values – Untreated subgrade

Furthermore, structures placed directly over the existing deleterious fill can be designed using a bearing resistance value at serviceability limit state (SLS) of **40 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **65 kPa** incorporating a geotechnical factor of 0.5 under ULS.

Where loose fill is encountered at subgrade level, a proof-rolling program should be implemented, consisting of compacting the loose material with several passes of a vibratory drum roller under dry conditions and above freezing temperatures, and under the observation of Paterson. Large volumes of organics will be required to be removed where encountered and replaced with engineered fill as per the above recommendations.



It is important to note that settlements may occur due to the composition of organics and the lack of geogrid reinforcement if this option is selected.

Field Inspections

All fieldwork, including service bedding/spring-line/cover placement, roadway subgrade fill placement and roadway subbase, base and asphalt layer placement, should be reviewed and approved by Paterson at the time of construction. Paterson should be notified upon the commencement of work and establish a schedule for periodic inspections to be completed by field personnel throughout construction.

It should be noted that if winter construction is anticipated, the contractor should take every precaution to prevent frost from migrating below settlement sensitive structures. Reference should be made to the aforementioned geotechnical report for further detail regarding winter construction recommendations.

Conclusions

The SWMP review has indicated that the proposed design is considered feasible and acceptable from a geotechnical perspective. No additional measures are required under normal pond operation. However, it is recommended to include a permanent monitoring well adjacent to the SWMP to assist in completing maintenance activities during periods of seasonally low groundwater conditions. The permanent monitoring well should be installed post-construction of the SWMP/site grading to reduce potential damage due to construction activities.



We trust that the current submission meets your requirements.

Best Regards,

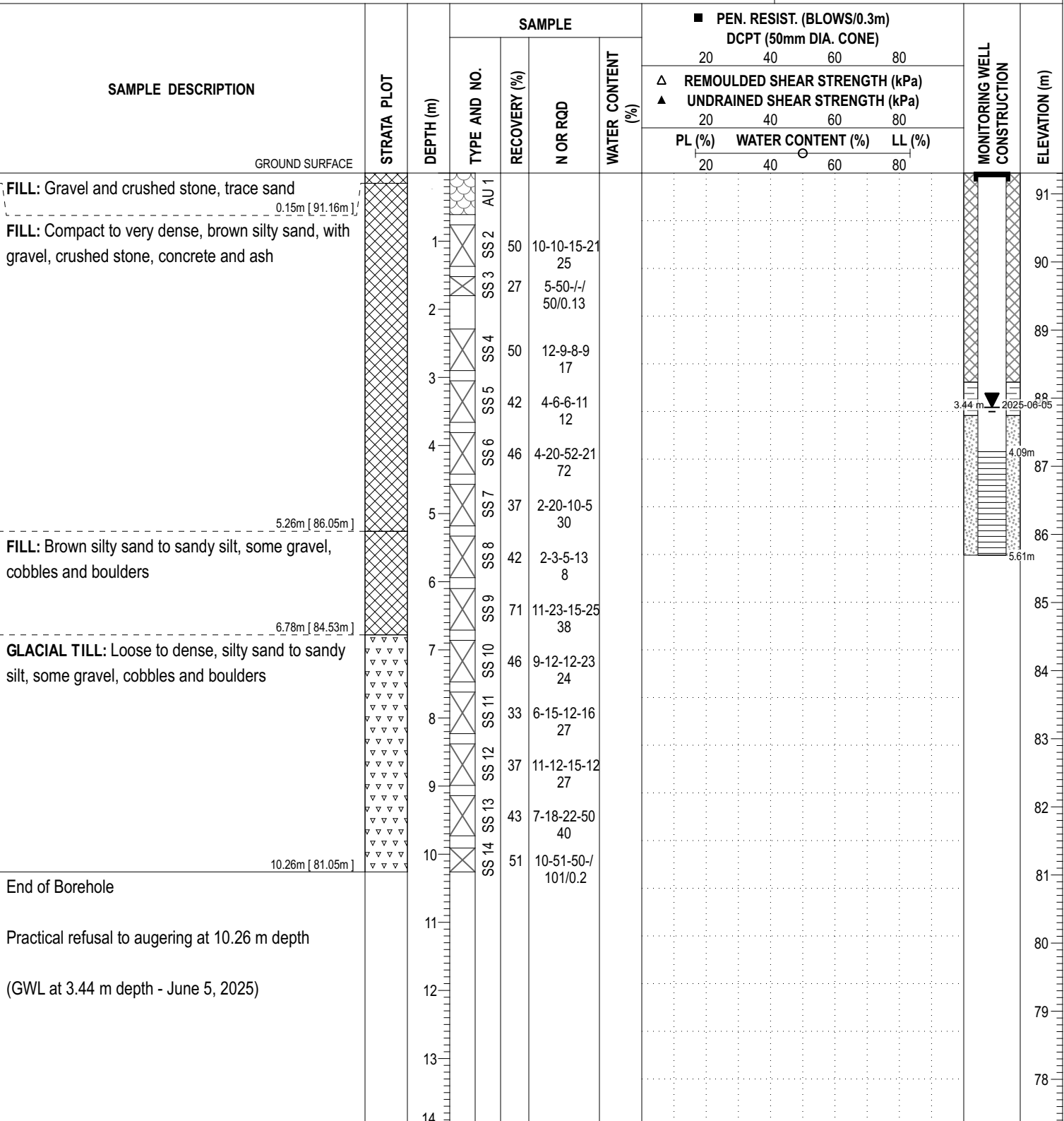
Paterson Group Inc.

Faisal I. Abou-Seido, P.Eng.

Michael Killam, P.Eng.



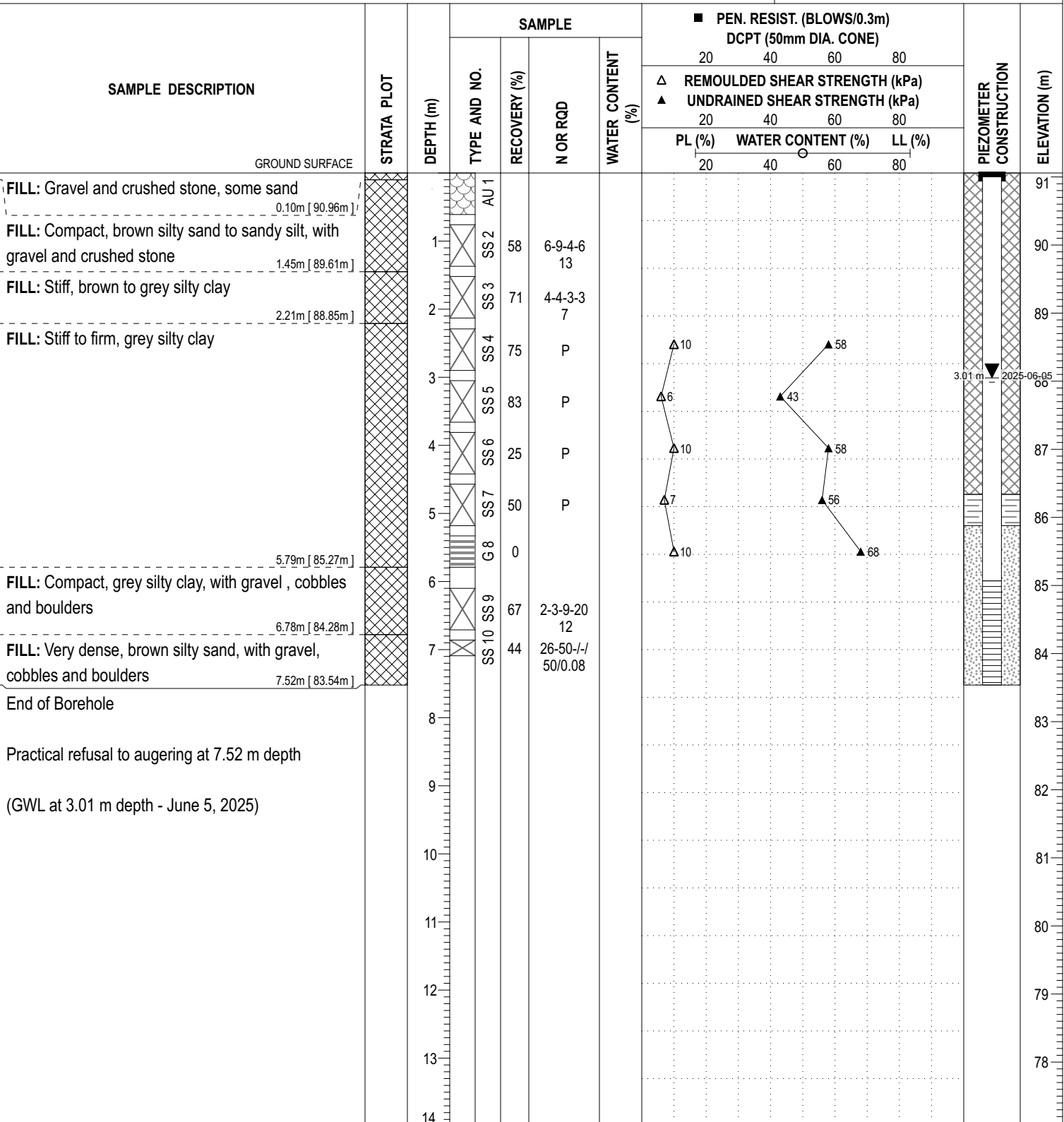
COORD. SYS.: MTM ZONE 9	EASTING: 379013.78	NORTHING: 5019022.56	ELEVATION: 91.31
PROJECT: Proposed Commercial Development			FILE NO. : PG7567
ADVANCED BY: CME-55 Low Clearance Drill			HOLE NO. : BH 1-25
REMARKS:			
DATE: June 2, 2025			



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COORD. SYS.: MTM ZONE 9	EASTING: 379026.72	NORTHING: 5019097.92	ELEVATION: 91.06
PROJECT: Proposed Commercial Development	FILE NO. : PG7567		
ADVANCED BY: CME-55 Low Clearance Drill	HOLE NO. : BH 2-25		
REMARKS:	DATE: June 2, 2025		



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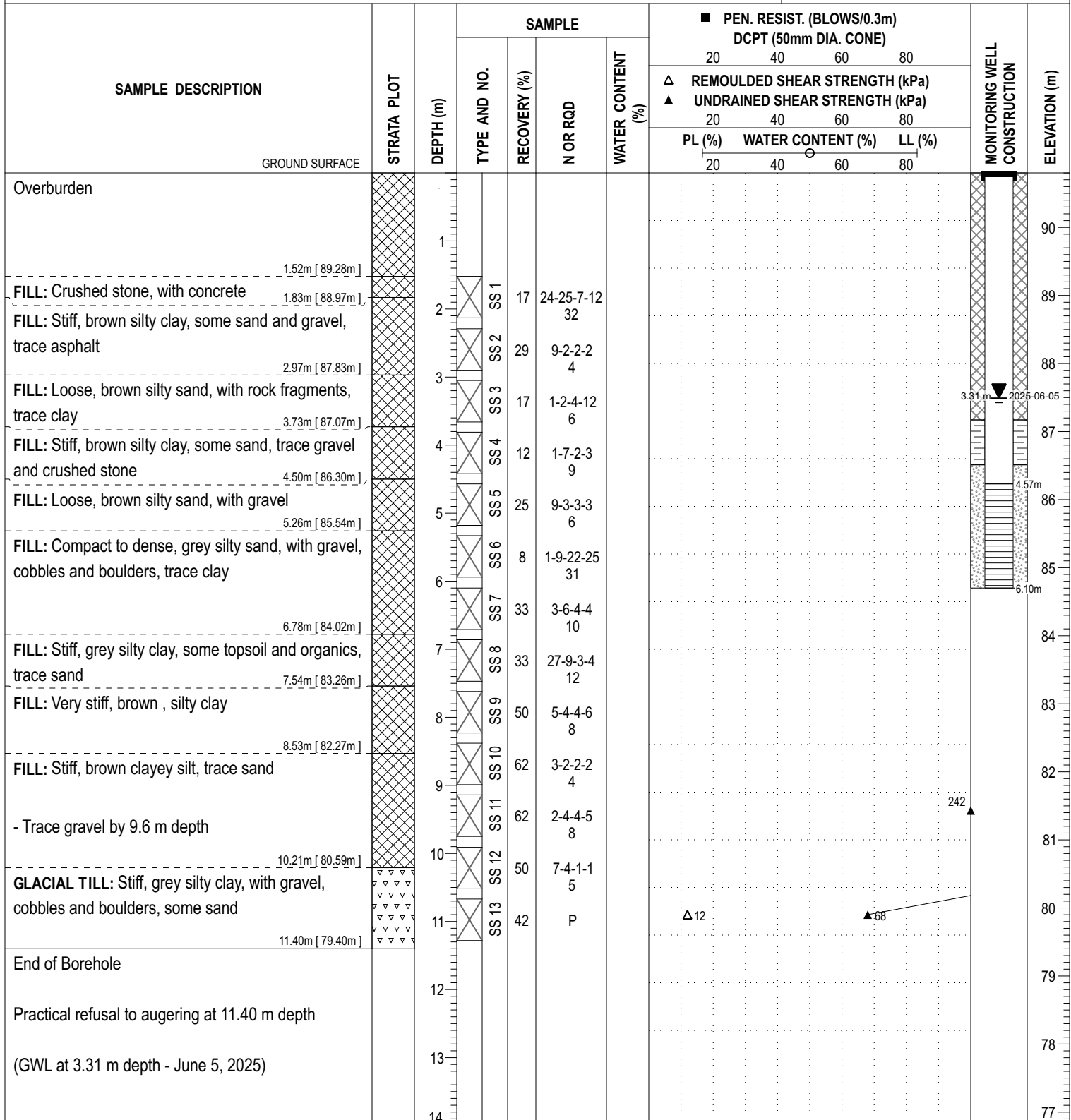
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COORD. SYS.: MTM ZONE 9	EASTING: 379084.55	NORTHING: 5019060.27	ELEVATION: 90.64
PROJECT: Proposed Commercial Development			FILE NO. : PG7567
ADVANCED BY: CME-55 Low Clearance Drill			HOLE NO. : BH 3A-25
REMARKS:			
DATE: June 2, 2025			

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE				■ PEN. RESIST. (BLOWS/0.3m)	PIEZOMETER CONSTRUCTION	ELEVATION (m)			
			TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	DCPT (50mm DIA. CONE)					
							20			40	60	80
							Δ REMOULDED SHEAR STRENGTH (kPa)					
							▲ UNDRAINED SHEAR STRENGTH (kPa)					
20	40	60	80	PL (%)	WATER CONTENT (%)	LL (%)						
20	40	60	80									

GROUND SURFACE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															</
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COORD. SYS.: MTM ZONE 9	EASTING: 379087.71	NORTHING: 5019059.84	ELEVATION: 90.80
PROJECT: Proposed Commercial Development			FILE NO. : PG7567
ADVANCED BY: CME-55 Low Clearance Drill			HOLE NO. : BH 3B-25
REMARKS:			DATE: June 2, 2025



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COORD. SYS.: MTM ZONE 9	EASTING: 379135.75	NORTHING: 5019162.49	ELEVATION: 92.18
PROJECT: Proposed Commercial Development			FILE NO. : PG7567
ADVANCED BY: CME-55 Low Clearance Drill			HOLE NO. : BH 4-25
REMARKS:			DATE: June 3, 2025

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE				■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE)				MONITORING WELL CONSTRUCTION	ELEVATION (m)
			TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	20 40 60 80					
							△ REMOULDED SHEAR STRENGTH (kPa)					
							▲ UNDRAINED SHEAR STRENGTH (kPa)					
							PL (%) WATER CONTENT (%) LL (%)					
20 40 60 80												
GROUND SURFACE												
FILL: Stiff brown silty clay, some gravel, trace sand - trace organics to 0.08 m depth		1	AU 1								92	
1.22m [90.96m]		SS 2	33	3-5-5-25 10							91	
FILL: Compact, brown silty sand, with gravel, trace topsoil and organics		2	SS 3	75	11-13-11-11 24							90
2.21m [89.97m]		SS 4	25	2-5-2-3 7								89
FILL: Stiff, brown silty clay, with gravel, some crushed stone and sand		3	SS 5	42	1-4-4-4 8							88
2.97m [89.21m]		SS 6	12	1-2-2-4 4								87
FILL: Loose, brown silty sand, some clay, trace wood and topsoil		4	SS 7	31	2-2-50-/ 52/0.25							86
3.73m [88.45m]		SS 8	25	1-2-2-2 4								85
FILL: Firm, brown silty clay, with gravel, some sand and crushed stone		5	SS 9	29	1-2-4-4 6							84
- Trace asphalt to 5.18 m depth		6	SS 10	46	1-2-1-1 3							83
6.02m [86.16m]		SS 11	58	1-3-2-2 5								82
FILL: Firm, grey silty clay, with gravel, cobbles and boulders, trace crushed stone and asphalt		7	SS 12	71	1-2-2-6 4							81
8.69m [83.49m]		SS 13	62	5-11-8-/ 19								80
8.99m [83.19m]		SS 14	83	1-1-1-1 2								79
TOPSOIL and organics		9	SS 15	100	1-1-1-2 2						242	
Compact, grey SILTY SAND to SANDY SILT		10	SS 16	83	0-0-0-0 0							242
9.45m [82.73m]		SS 17	100	P								242
GLACIAL TILL: Firm to stiff, brown clayey silt, trace gravel and sand		11	SS 18	100	1-2-3-1 5							
- Clay content increasing by 12.2 m depth		12										

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COORD. SYS.: MTM ZONE 9	EASTING: 379135.75	NORTHING: 5019162.49	ELEVATION: 92.18
PROJECT: Proposed Commercial Development			FILE NO. : PG7567
ADVANCED BY: CME-55 Low Clearance Drill			HOLE NO. : BH 4-25
REMARKS:			
DATE: June 3, 2025			

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE				■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE)			MONITORING WELL CONSTRUCTION	ELEVATION (m)	
			TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)	20	40	60			80
							△ REMOULDED SHEAR STRENGTH (kPa)					
							▲ UNDRAINED SHEAR STRENGTH (kPa)					
							PL (%)	WATER CONTENT (%)				LL (%)
20	40	60	80									
14.33m [77.85m]		14		SS 19	83	1-2-4-4 6					78	
Dynamic cone penetration test commenced at 14.33 m depth		15						11		100	77	
15.42m [76.76m]		16									76	
End of Borehole		17									75	
Practical refusal to DCPT at 15.42 m depth		18									74	
DCPT Pushed from 14.33 m to 15.01 m depth		19									73	
(GWL at 7.54 m depth - June 5, 2025)		20									72	
		21									71	
		22									70	
		23									69	
		24									68	
		25									67	
		26									66	
		27									65	
		28										

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

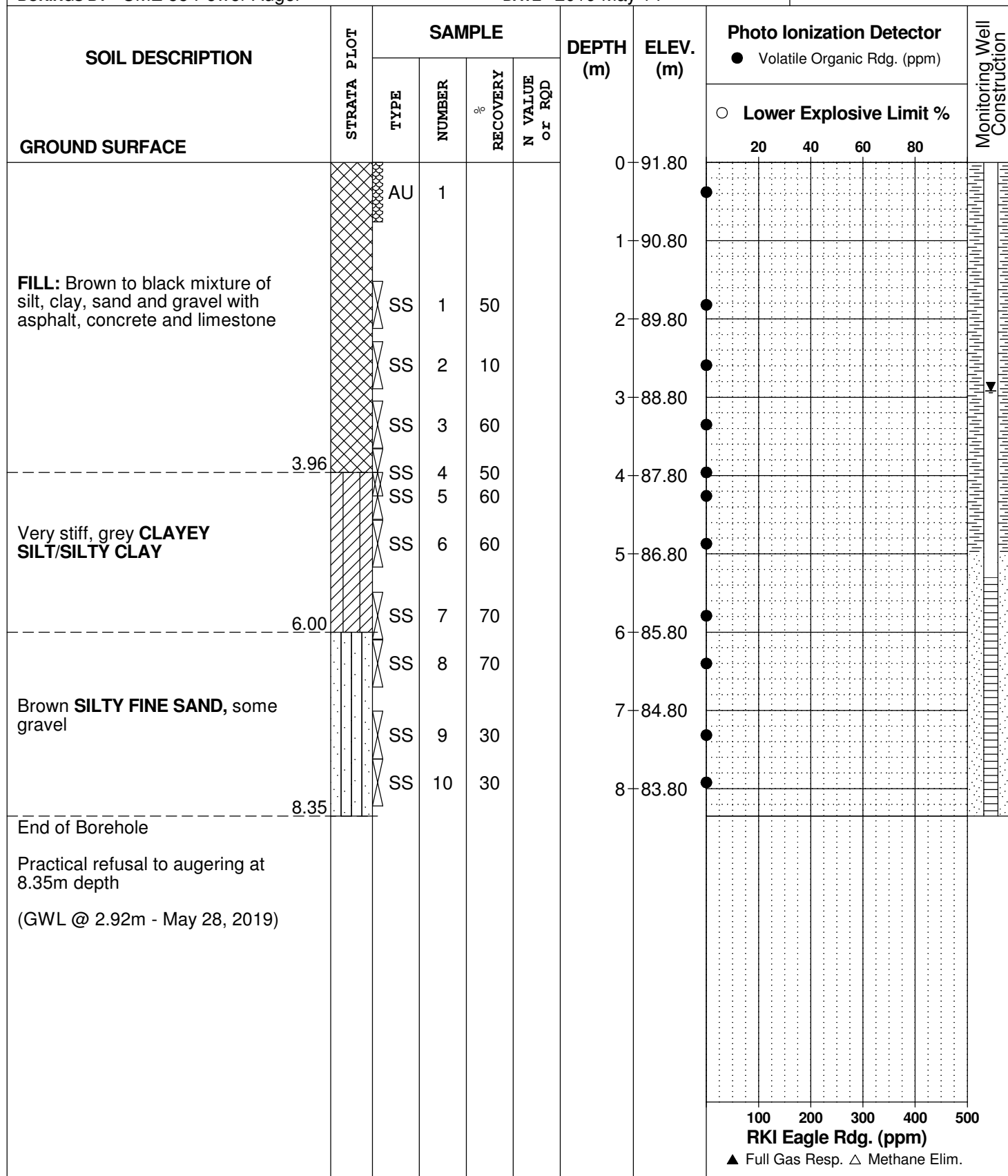
FILE NO.
PE4621

REMARKS

HOLE NO.
BH 1

BORINGS BY CME 55 Power Auger

DATE 2019 May 14



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

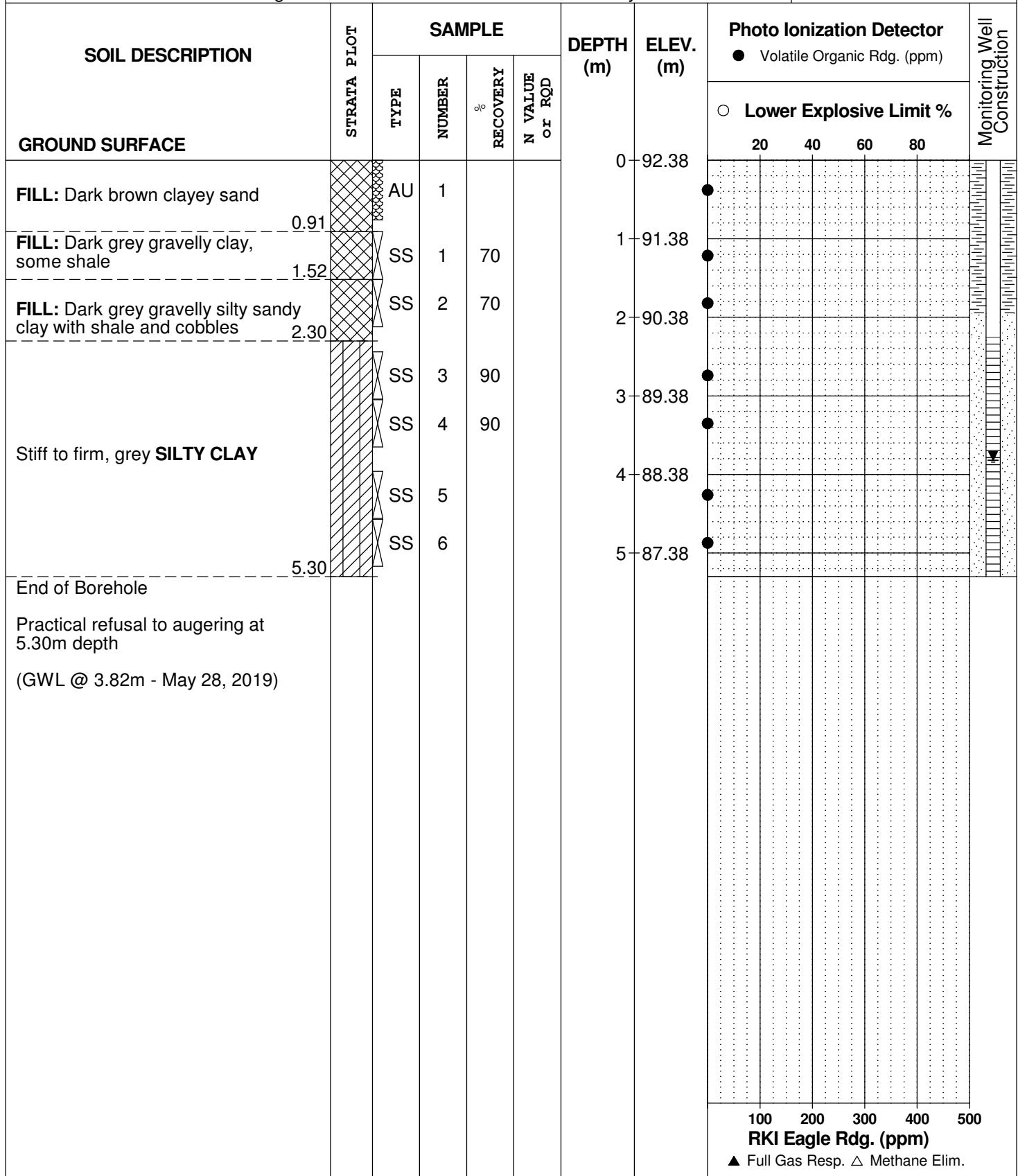
REMARKS

BORINGS BY CME 55 Power Auger

DATE 2019 May 15

FILE NO.
PE4621

HOLE NO.
BH 2



SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 5123 Hawthorne Road - Part 1
Ottawa, Ontario

DATUM Ground surface elevations provided R. W. Tomlinson Limited.

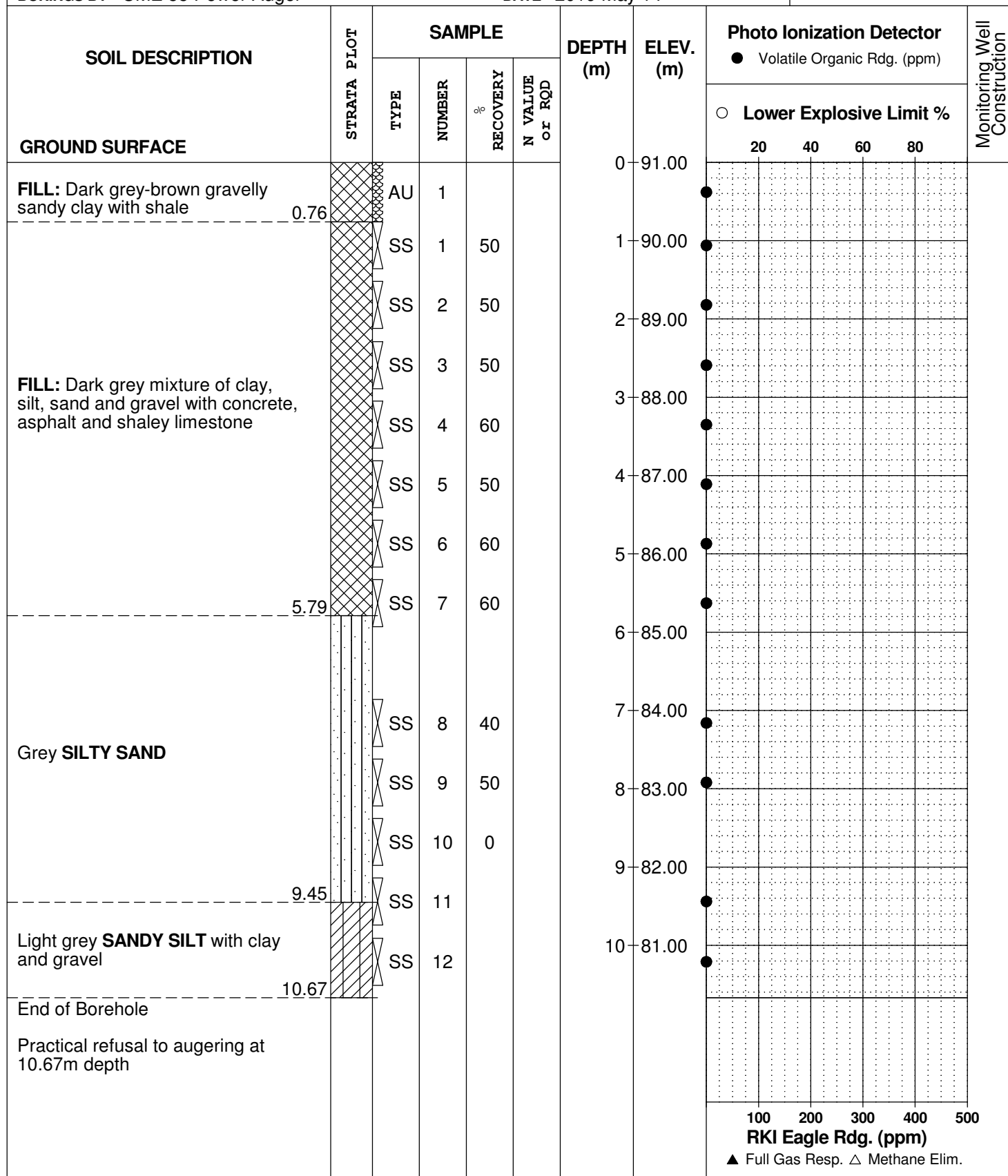
FILE NO.
PE4621

REMARKS

HOLE NO.
BH 3

BORINGS BY CME 55 Power Auger

DATE 2019 May 14



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t , is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = D_{60} / D_{10}

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$

Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$

Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.

Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

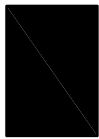
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.
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SYMBOLS AND TERMS (continued)

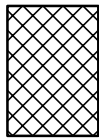
STRATA PLOT



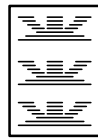
Topsoil



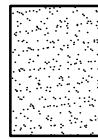
Asphalt



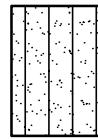
Fill



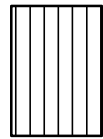
Peat



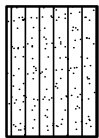
Sand



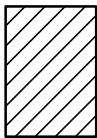
Silty Sand



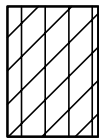
Silt



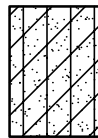
Sandy Silt



Clay



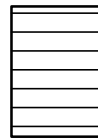
Silty Clay



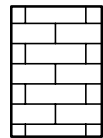
Clayey Silty Sand



Glacial Till



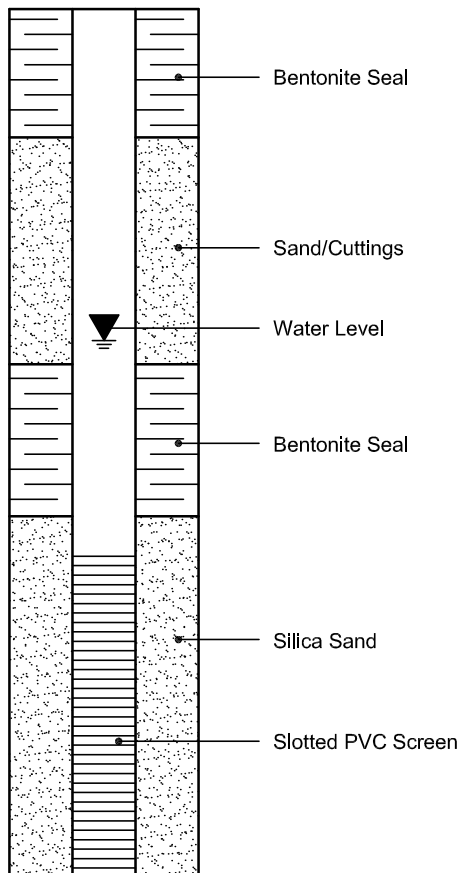
Shale



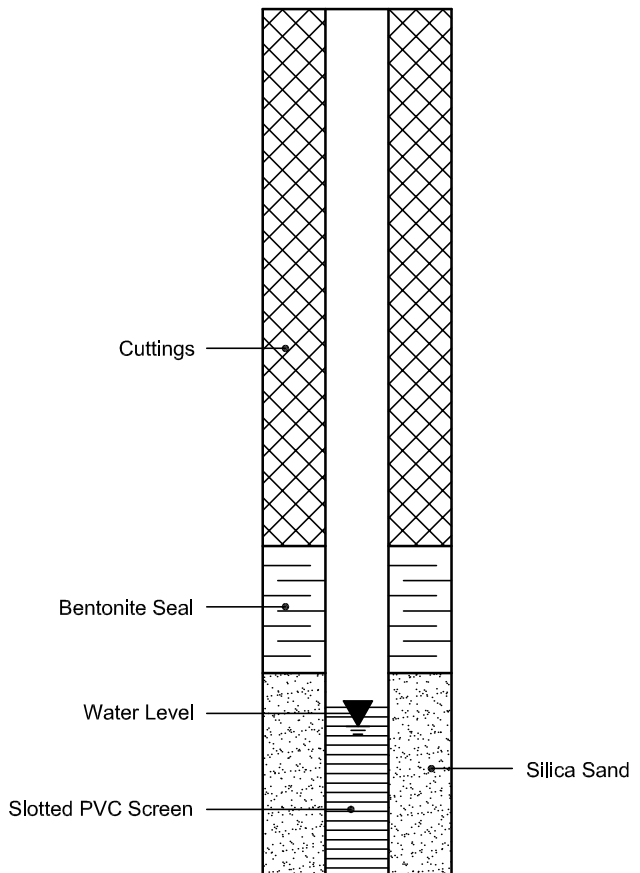
Bedrock

MONITORING WELL AND PIEZOMETER CONSTRUCTION

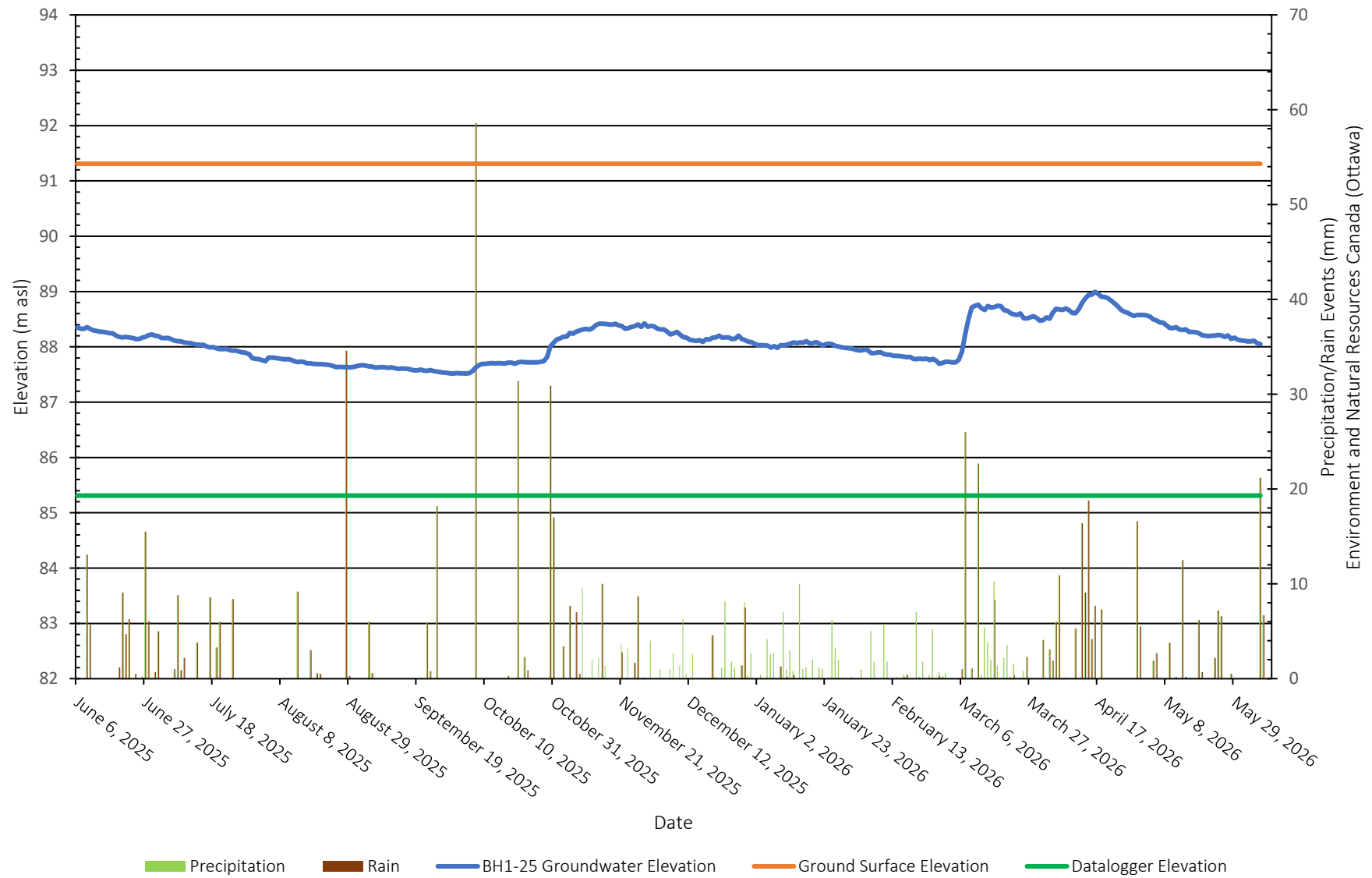
MONITORING WELL CONSTRUCTION

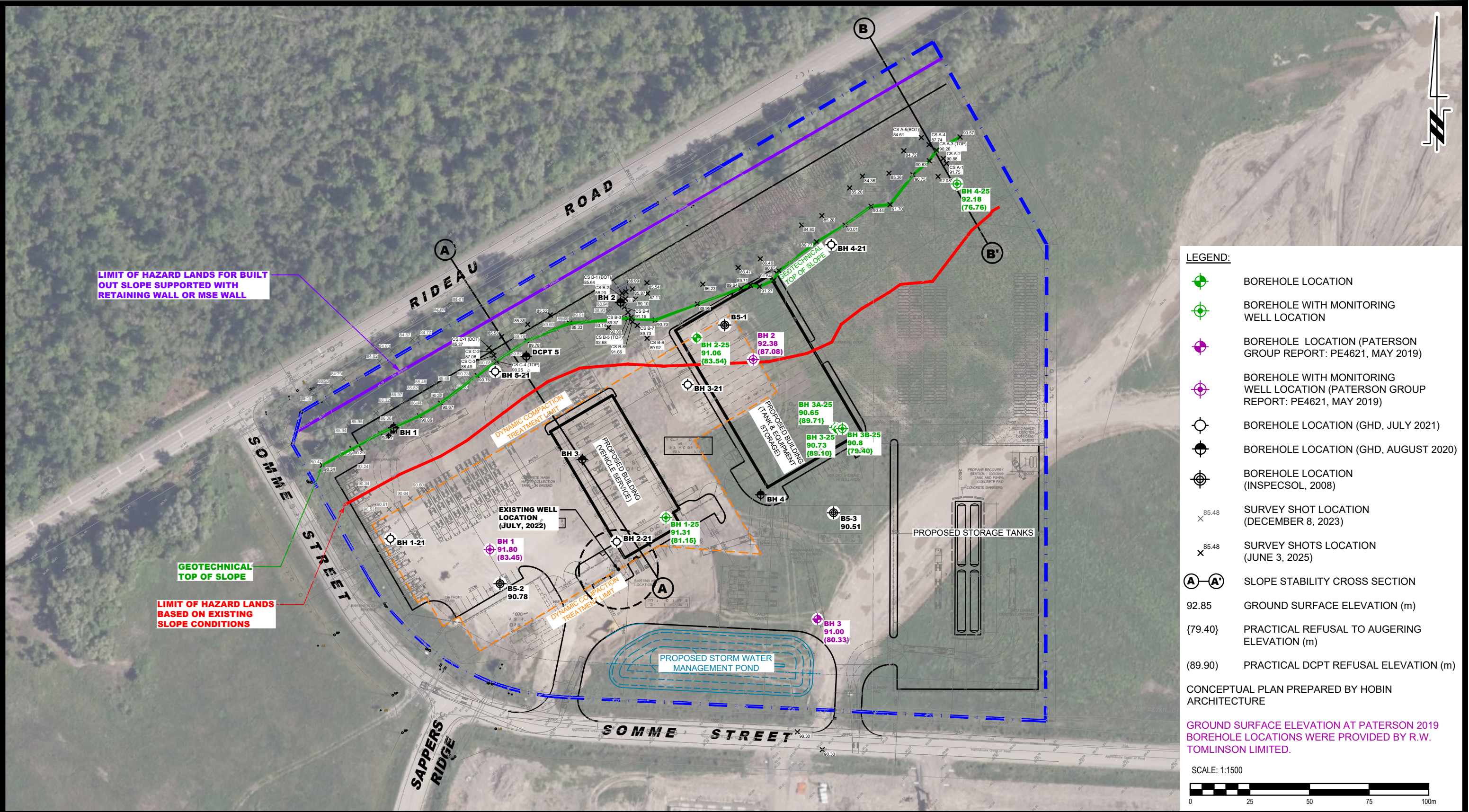


PIEZOMETER CONSTRUCTION



BH1-25 - Monitoring Well Water Elevations







9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

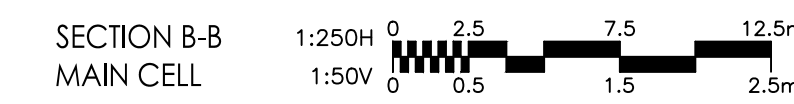
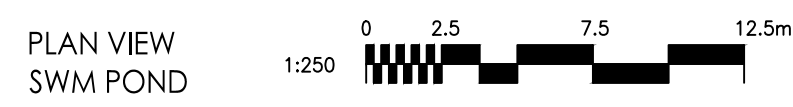
1	UPDATED TO NEW CONCEPTUAL PLAN	14/08/2025	SD
NO.	REVISIONS	DD/MM/YYYY	INITIAL

OTTAWA,
Title:

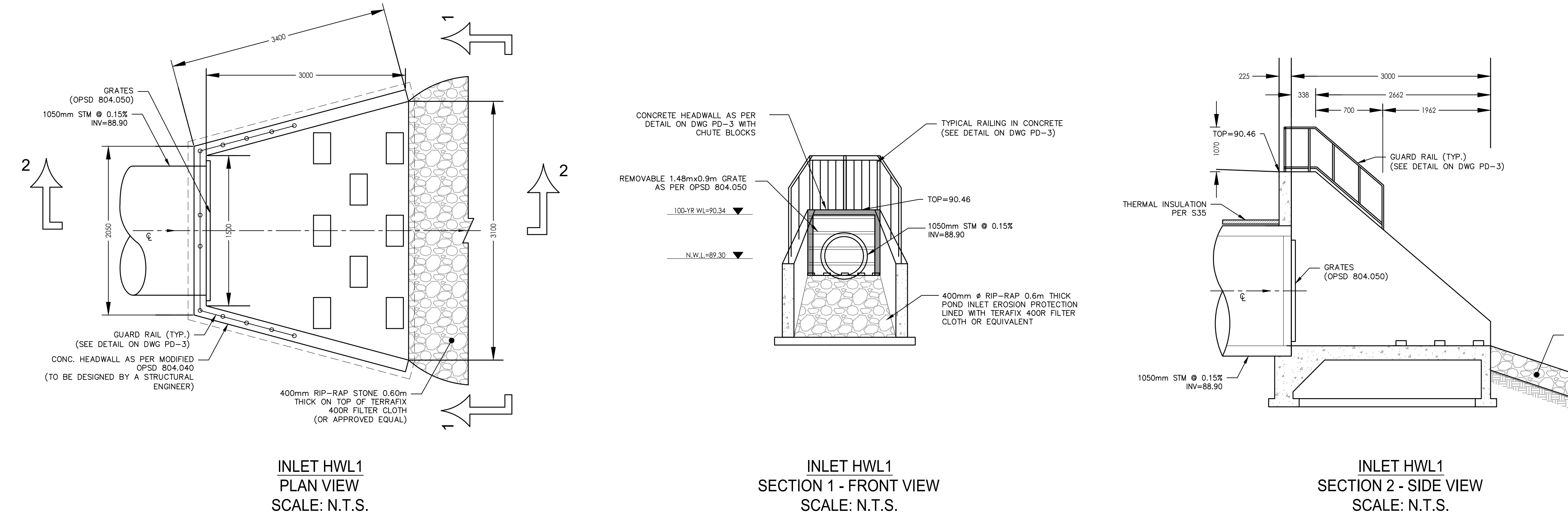
W.O. STINSON & SON LTD.
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
301 SOMME STREET
ONTARIO

TEST HOLE LOCATION PLAN

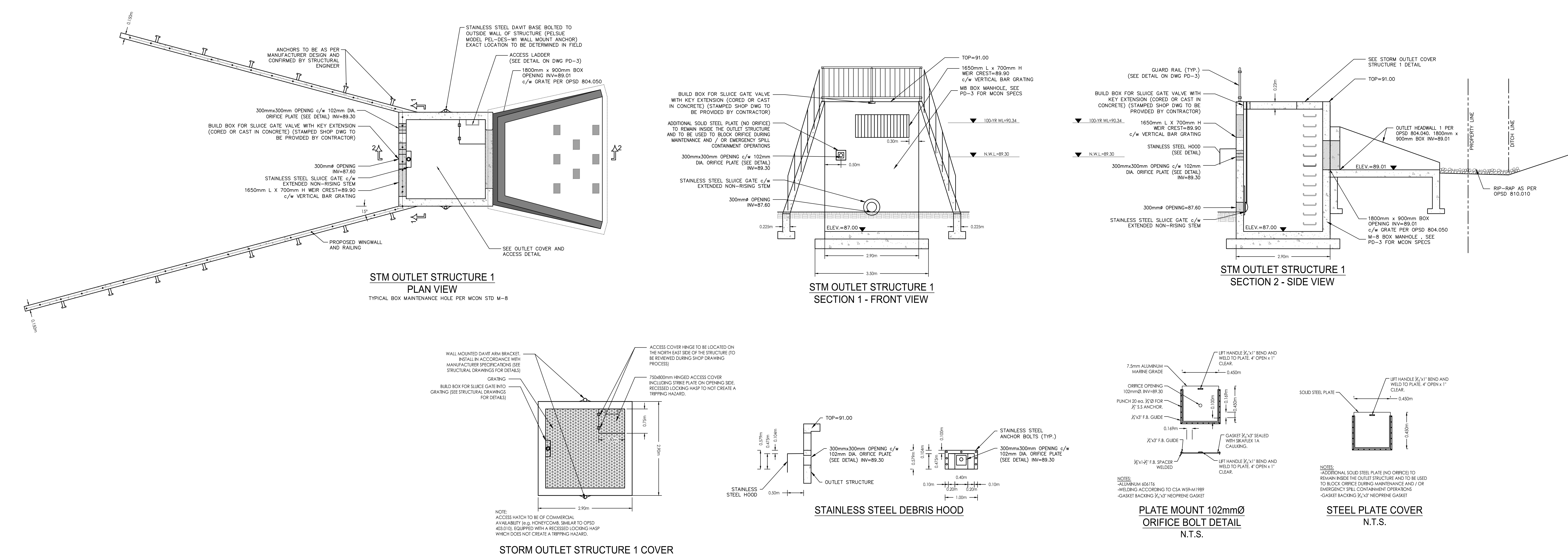
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Drawn by:	ZS	Report No.:	PG7567-1
Checked by:	PB	Dwg. No.:	PG7567-1
Approved by:	SD	Revision No.:	1



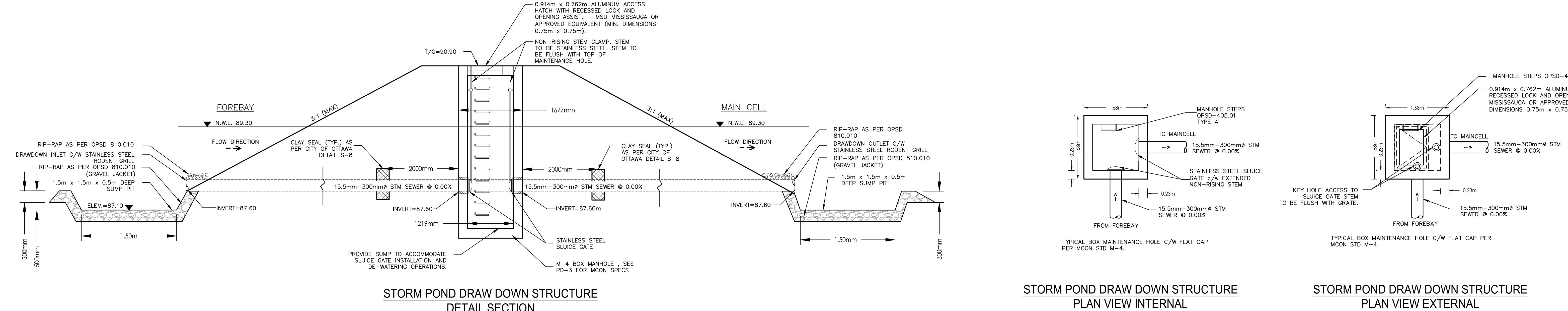
INLET DETAILS



OUTLET DETAILS



DRAW DOWN STRUCTURE DETAILS



Legend

Notes

Rev	Revised	By	App'd	YYMMDD
2	REVISED PER SEE PLAN AND CITY COMMENTS	MJS	PM	26.09.04
1	REVISED PER CITY COMMENTS	MJS	PM	26.04.07
0	ISSUED FOR REVIEW	MJS	PM	25.08.02
Revision				
By	App'd	YYMMDD		
MJS	DT	26.07.03		

Permit-Seal

Client/Project
W.O. Stinson & Son Ltd.

VEHICLE YARD SERVICE BUILDING
301 SOMME STREET
OTTAWA, ON, CANADA

Title
POND DETAILS

Project No. 160402138	Scale 1:500	Sheet PD-2	Revision 8 of 9
--------------------------	----------------	---------------	--------------------

200mmØ WATERMAIN TABLE A				
STATION	FRESH GRADE	TOP W/M	ITEM	
0+00	90.73	88.330	PUMP HYDRANT	
0+04.8	90.76	88.360	45° HORIZONTAL BEND	
0+08.8	90.88	88.480	45° HORIZONTAL BEND	
0+09.1	90.98	88.580	200mmØ x 200mm TEE	
0+041.1	91.05	88.650	200mm VALVE AND BOX	
0+040	91.11	88.710	TOP OF PIPE	
0+040	91.03	88.630	TOP OF PIPE	
0+100	91.16	88.760	TOP OF PIPE	
0+107.3	91.22	88.820	22.1° HORIZONTAL BEND	
0+118	91.37	88.970	22.1° HORIZONTAL BEND	
0+183.1	91.49	89.090	11.1° HORIZONTAL BEND	
0+185.7	91.84	89.480	200mmØ x 150mm TEE	
0+140	91.87	89.470	TOP OF PIPE	
0+140	91.82	89.420	TOP OF PIPE	
0+180	91.87	89.470	TOP OF PIPE	
0+200	91.78	89.380	TOP OF PIPE	
0+220	91.52	89.120	TOP OF PIPE	
0+229	91.60	89.200	200mmØ x 200mm TEE	

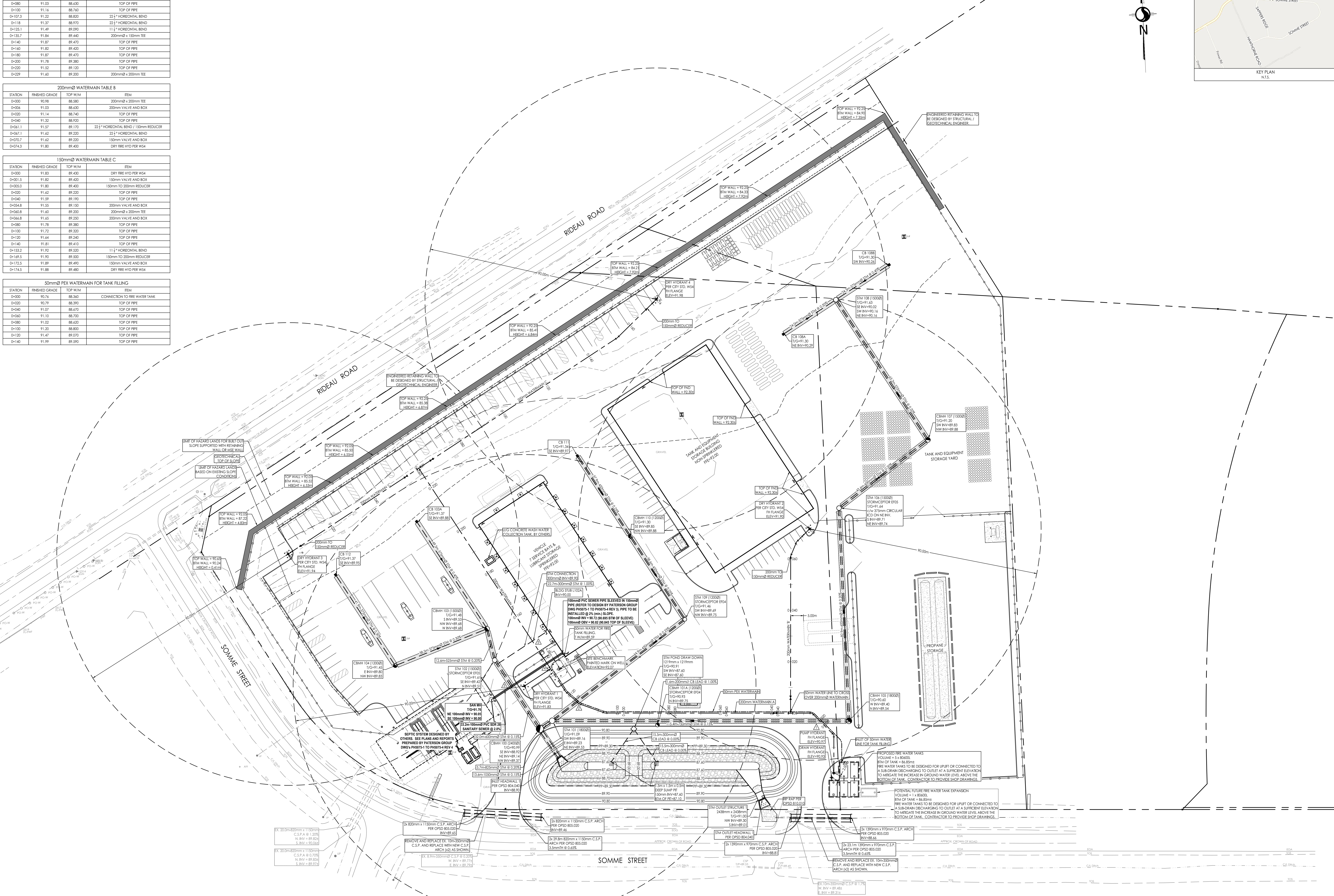
200mmØ WATERMAIN TABLE B				
STATION	FRESH GRADE	TOP W/M	ITEM	
0+006	91.03	88.630	200mm VALVE AND BOX	
0+020	91.14	88.740	TOP OF PIPE	
0+040	91.32	88.920	TOP OF PIPE	
0+041.1	91.37	89.170	22.1° HORIZONTAL BEND / 150mm REDUCER	
0+047.1	91.62	89.220	22.1° HORIZONTAL BEND	
0+070.7	91.62	89.220	150mm VALVE AND BOX	
0+074.3	91.80	89.400	DRY FIRE HYD PER WS4	

150mmØ WATERMAIN TABLE C				
STATION	FRESH GRADE	TOP W/M	ITEM	
0+000	91.83	89.430	DRY FIRE HYD PER WS4	
0+015	91.82	89.420	150mm VALVE AND BOX	
0+010.0	91.80	89.400	150mm TO 200mm REDUCER	
0+020	91.62	89.220	TOP OF PIPE	
0+040	91.39	89.190	TOP OF PIPE	
0+048.8	91.33	89.190	200mm VALVE AND BOX	
0+060.8	91.60	89.200	200mmØ x 200mm TEE	
0+068.8	91.65	89.250	200mm VALVE AND BOX	
0+080	91.78	89.380	TOP OF PIPE	
0+100	91.72	89.320	TOP OF PIPE	
0+120	91.64	89.240	TOP OF PIPE	
0+140	91.81	89.410	TOP OF PIPE	
0+153.2	91.92	89.520	11.1° HORIZONTAL BEND	
0+189.5	91.95	89.550	150mm TO 200mm REDUCER	
0+172.5	91.89	89.490	150mm VALVE AND BOX	
0+174.5	91.88	89.480	DRY FIRE HYD PER WS4	

50mmØ PEW WATERMAIN FOR TANK FILLING				
STATION	FRESH GRADE	TOP W/M	ITEM	
0+000	90.76	88.360	CONNECTION TO FIRE WATER TANK	
0+000	90.79	88.390	TOP OF PIPE	
0+040	91.07	88.670	TOP OF PIPE	
0+060	91.10	88.700	TOP OF PIPE	
0+080	91.02	88.620	TOP OF PIPE	
0+100	91.20	88.800	TOP OF PIPE	
0+120	91.47	89.070	TOP OF PIPE	
0+140	91.99	89.590	TOP OF PIPE	

SEWER AND WATERMAIN CROSSING TABLE						
CROSSING	STW INV	TOP WALL	STW INV	SAN INV	SAN INV	WTR TOP
▲	89.38(89.29)	90.13(90.22)				88.39
▲	89.54(89.45)	90.01(90.08)				88.74
▲	89.43(89.34)	90.02(90.10)	90.34(90.21)	90.30(90.30)		
▲			90.57(90.54)	90.67(90.65)	89.47	89.27
	89.94	90.24			89.47	

* BRACKETS DENOTE ADJUSTED VALUE WITH CONCRETE PIPE THICKNESS / SLEEVED SANITARY SERVICE



Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa, ON
Tel: 613.722.4420
www.stantec.com

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- Legend
- PROPOSED WATERMAIN
 - PROPOSED VALVE AND VALVE BOX
 - PROPOSED DRY FIRE HYDRANT PER WS4
 - PROPOSED SANITARY SEWER
 - PROPOSED STORM SEWER
 - PROPOSED CATCH-BAIN MANHOLE
 - PROPOSED CATCH-BAIN
 - EXISTING WATERMAIN
 - EXISTING VALVE AND VALVE BOX
 - EXISTING VALVE CHAMBER
 - EXISTING REDUCER
 - EXISTING FIRE HYDRANT
 - EXISTING COMBINED SEWER
 - EXISTING STORM SEWER
 - EXISTING CATCH-BAIN MANHOLE
 - PROPOSED DEPRESSION CURB LOCATIONS
 - PROPOSED BARRIER CURB
 - THERMAL INSULATION STORM SEWER WHERE COVER IS LESS THAN 2.0m AND ON SANITARY SEWER WHERE COVER IS LESS THAN 1.0m PER S.S.
 - ENGINEERED RETAINING WALL TO BE DESIGNED BY STRUCTURAL / GEOTECHNICAL ENGINEER
 - CHAIN LINK FENCE PER ARCHITECTURAL PLANS

Notes

2	REVISED PER SITE PLAN AND CITY COMMENTS	MJS	PM 26.09.04
1	REVISED PER CITY COMMENTS	MJS	PM 26.04.09
0	ISSUED FOR REVIEW	MJS	PM 25.08.22
Revision		By	App'd YY.NM.DT
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