Geotechnical Data Report

The Proposed Sir John Carling West Annex Building Demolition, 930 Carling Avenue, Ottawa

Prepared for:
Public Services and Procurement Canada
2720 Riverside Drive Ottawa, ON K1A 0S5

Prepared by:
Stantec Consulting Ltd.
400 – 1331 Clyde Avenue
Ottawa, ON K2C 3G4

Project No. 122170347

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1.0 INTRODUCTION

Public Services and Procurement Canada (PSPC) retained Stantec consulting Ltd. (Stantec)to provide geotechnical engineering services for the proposed demolition of the Sir John Carling West Annex Building located at 930 Carling Ave. in Ottawa, Ontario.

The purpose of the geotechnical investigation is to provide recommendation for sloping, shoring and backfilling of the proposed building demolition. The project background, summary of investigation, and factual data are provided in this geotechnical data report, while recommendation and discussion will be provided in a separate technical memorandum.

Limitations associated with this report and its contents are provided in the statement of conditions included in Appendix A.

1.1 SCOPE OF WORK

The work has been carried out in accordance with the PSPC Terms of Reference for the site dated December 23, 2019 and Stantec proposal No. 743985 dated January 7, 2020. The scope of work for this geotechnical investigation included the following:

- Advancing four boreholes and installing monitoring wells to determine the geotechnical conditions in the vicinity of the proposed demolition site.
- Performing laboratory tests including moisture content, grain size analysis, and Atterberg limits on selected soil samples.
- Preparing a geotechnical investigation report that provides:
  − a compilation and summary of the subsurface information from the existing environmental and geotechnical reports completed in the area of the building and data from the recommended supplementary investigation program.
  − geotechnical comments and input on temporary excavation (including shoring system options), temporary dewatering, backfilling requirements, and other geotechnical aspect that presents limitation regarding demolition on the site.

1.2 BACKGROUND

The building consists of a one and one-half story building (Sir John Carling West Annex) with two below grade levels (on the south side of the building) constructed between 1965 and 1967. The west annex was once part of an 11-storey office tower, which was demolished in 2014.

Based on existing building drawing (Sub-Basement Plan, Department of Agriculture Administration Building, Project No. CA 33-9-1, Job No. 5035, Drawing No. A10), the sub-basement floor elevation is at 71.2 m and 71.8 m at the mechanical room and warehouse, respectively. The building is constructed on piles according to the existing foundation plan (Department of Agriculture Administration Building, Project No. CA 55-9-1, Job No. 5035, Drawing No. S1). Pile caps are generally at 70.3 m, however, it could be between 66.8 m and 74.0 m. It is

recommended that contractor review the existing drawing for estimation and planning purposes.

PSPC has provided Stantec with a copy of the report presenting the results of the original drilling/geotechnical investigation carried out for the west annex building:

- Boring report No. 2503: Report on Subsurface Investigation for the Proposed Department of Agriculture Administration Building, Ottawa, Ontario, dated December 1962.

Review of this report indicates that the subsurface conditions vary considerably across the building footprint. Much of the building is underlain by a glacial till described as a gravel, sand and gravel, or silty sand and gravel till that contains many cobbles and boulders up to 0.9 m or more diameter. Deposits of stratified sand/silty sand and clay (inferred Champlain Sea/Leda clay) are present above the till, but extend below the sub-basement level, in the eastern portion of the building. The upper portion of the clay is described as desiccated with a firm to stiff consistency while the lower portion is described as being soft. The groundwater table typically slope from west to east across the building footprint.

Stantec also conducted Phase I, II, and III Environmental Site Assessment (ESA) at the site. These reports were reviewed as part of the investigation:

- Phase I ESA – New Ottawa Hospital Civic Campus, Carling Avenue and Preston Street, Ottawa, Ontario, by Stantec Consulting Ltd., dated August 23, 2017.
- Phase II ESA – New Ottawa Hospital Civic Campus, Ottawa, Ontario, by Stantec Consulting Ltd., dated September 7, 2017.
- Phase III ESA – Former Sir John Carling Building, 930 Carling Ave., Ottawa, Ontario (DFRP#08625), by Stantec Consulting Ltd., dated March 20, 2017.

Based on review of borehole findings, in the vicinity of the building, the overburden soils are mostly comprised of intervening layers of silty clay and sand or silty sand (encountered at boreholes MW16-7, MW16-7A, and MW16-9). A 7.0 m thick layer of fill material, described as crushed concrete and sandy silt, was encountered at borehole MW16-1 overlying a clay layer. At borehole MW 16-8 the silty clay layer extends from surface to 6.1 m depth.

The locations of the above-mentioned boreholes are shown on the Borehole Location Plan, Drawing No. 2 in Appendix B and the borehole records are provided in Appendix C.

A summary of the groundwater level elevations and depths from Stantec's Phase III ESA – Former Sir John Carling Building, 930 Carling Ave., Ottawa, ON (DFRP#08625), March 20, 2017, is provided in Table 1.1.

It should be noted that there is a pump in the basement of the west annex building to manage groundwater seepage into the building, to manage roof downspout water, and to remove water that enters the weeping tile system.

Table 1.1: Summary of Groundwater Level Elevations and Depths

Monitoring Well	Groundwater									
	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)
	March 17, 2016		August 3 and 8, 2016		August 31, 2016**		October 5, 2016**		October 24, 2016**	
MW16-1	5.3	72.0	1.5	75.8	-	-	-	-	-	-
MW16-1A	-	-	9.2*	68.8*	6.6	71.3	7.5	70.4	6.4	71.5
MW16-7	4.8	70.5	4.5	70.8	-	-	-	-	-	-
MW16-7A	-	-	5.0*	70.1*	2.7	72.0	3.9	71.2	3.0	72.1
MW16-8	-	-	5.2*	69.6*	4.9	69.9	4.4	70.5	4.3	70.6
MW16-9	-	-	5.2*	68.6*	3.2	70.6	3.0	70.8	2.7	71.1

*After drilling; the sump pump located in the basement of the building, to manage groundwater seepage, was shut off for one day prior to monitoring event

** Sump pump was on (however, based on the report, it is not clear whether the sump pump had an influence on summer or fall groundwater levels.)

It was hypothesized that the groundwater flow patterns in the vicinity of the building may be influenced by the former excavation for the tower.

Based on water levels observed at the Site (presented in the table above), shallow groundwater flow is interpreted to the north within the area of interest.

2.0 INVESTIGATION PROCEDURES

2.1 FIELD INVESTIGATION

The field drilling program was carried out on February 10 to 12, 2020. Four (4) boreholes were advanced at the approximate location shown on Drawing No. 2 in Appendix B.

The boreholes were drilled with a track mount drill rig. The subsurface stratigraphy encountered in each borehole was recorded in the field by experienced Stantec personnel while performing Standard Penetration Tests (SPT), as per ASTM Standard D1586-99. Split-spoon samples were collected at regular depth intervals in the boreholes. Field vane test was carried to estimate the undrained shear strength and intact remold strength of cohesive soil. All recovered soil samples were stored in moisture-proof bags. All samples were transported to the Stantec Ottawa laboratory for detailed geotechnical classification and testing.

Four (4) Monitoring wells (MW) identified as MW20-15, MW20-16, MW20-17, and MW20-18 were installed at borehole locations to allow for long term monitoring of groundwater levels. The monitoring wells consisted of 50 mm diameter rigid pipes with 3.0 m long screened portion installed at the bottom of the borehole. The monitoring wells were backfilled with filter sand up to approximately 0.6 m above the slotted screen section. The remaining portion of the borehole

annulus was backfilled with hole-plug seal and auger cuttings. The monitoring wells were secured using protective casing and cover.

Note that at borehole MW20-15, auger refusal occurred from an obstruction at a depth of 5.3 m. The borehole was backfilled with a mixture of auger cuttings and bentonite and a second borehole was advanced at an approximately 2.0 m offset and the soil stratigraphic description and in-situ test results are shown on borehole MW20-15 log in Appendix C.

2.2 SURVEY

The ground surface elevation at each borehole was surveyed (with level and rod) and are presented in the table below. Geodetic elevations at the borehole location are also shown on the Borehole Record in Appendix C.

Table 2.1: Summary of Boreholes Elevations

Monitoring Well	Ground Surface Elevation (m)
MW20-15	79.7
MW20-16	79.6
MW20-17	78.7
MW20-18	75.0

The borehole locations were measured in relation to site features and the approximate borehole locations are shown on Drawing No. 2 in Appendix B.

2.3 LABORATORY TESTING

All samples returned to the laboratory were subjected to detailed visual examination and additional classification. Moisture content determination, grain size analysis, and Atterberg Limits were conducted on selected soil samples.

The results of the laboratory tests are discussed in the text of this report and are provided on the Borehole (BH) Records in Appendix C and the figures included in the laboratory test results in Appendix D.

Soil samples will be stored for twelve (12) months after the issuance of the final report unless otherwise directed by the client.

3.0 RESULTS OF INVESTIGATION

Detailed descriptions of subsurface conditions encountered during site investigation at borehole locations are presented on the Borehole records provided in Appendix C. An explanation of symbols and terms used to describe the borehole records is also provided. Borehole locations are provided on Drawing No. 2 in Appendix B.

Generally, the subsurface conditions encountered within the boreholes consisted of topsoil and non-cohesive fill overlying a glacial till. However, native strata of silt and clay were also encountered at boreholes MW20-15 and MW20-18 locations, respectively, overlying the till layer and below the fill materials. Moreover, a cohesive fill layer was encountered overlying the till layer at MW20-16 at 1.5 to 2.3 m depth. Auger refusal was encountered at borehole MW20-15 at 5.3 m depth and auger grinding was noted in the fill materials at approximately 2.0 m depth at borehole MW20-17, which suggest the presence of oversized material.

The subsurface conditions encountered within the boreholes is generally consistent with the investigation conducted in 1962 and referenced in Section 2.1.

A brief description of the underlying soils encountered in the boreholes is provided below.

3.1 SURFICIAL MATERIALS

3.1.1 Topsoil

A layer of dark brown to black topsoil was observed at borehole MW20-15 location with a thickness of approximately 150 mm.

The top 0.6 m of soil was frozen at boreholes MW20-16 and MW-20-18, therefore boreholes were augered to 0.6 m depth and were sampled thereafter.

3.1.2 Fill

Fill was encountered in all boreholes and extended to depths ranging from 2.3 to 6.6 m. The fill was generally non-cohesive and consisted of sand and gravel, sand, and silty sand, except for silty clay with sand encountered at borehole MW20-16 from 1.5 to 2.3 m depth. Trace of organics was observed at borehole MW20-15 from 0.8 to 2.3 m depth. Auger refusal was encountered at borehole MW20-15 at 5.3 m depth and auger grinding was noted in the fill at borehole MW20-17 at 2.0 m depth, which suggests oversized material. Rock pieces were observed in borehole MW20-15 from 2.3 to 2.9 m depth and from 5.3 to 6.6 m depth.

The Standard Penetration Test (SPT) N-values measured in the field ranged from 5 to 26, indicating a loose to compact relative density, with the exception of N-values of 58 and 31 recorded at borehole MW20-15 from 5.3 to 6.6 m depth and 34 recorded at borehole MW20-17 from 0.8 to 1.5 m depth, indicating a dense to very dense relative density. Samples recovered from the fill were generally described moist and moisture content testing on a sample, MW20-16/SS1, yielded 17%.

One representative sample of the fill was submitted for grain size analysis testing. The sample composed of 65% sand and 35% fines (silt and clay size particles). The grain size distribution curve is shown on Figure No.1 in Appendix D. According to the Unified Soil Classification System (USCS), the material can be classified as silty sand (SM).

3.1.3 Silt

A grey silt stratum was encountered at borehole MW20-15 from 6.6 to 8.4 m depth, underlying the fill layer and overlying the till layer.

Based on the recorded N-values of 9 and 13, this silt layer has a generally loose to compact relative density. The recovered samples of this layer were described to be in a moist to wet condition.

3.1.4 Clay

A stratum of grey clay was encountered at borehole MW20-18 from 3.9 to 6.9 m depth, underlying the fill material and overlying the till layer.

The recovered samples of this layer were described to be in a moist to wet condition and moisture content testing on a sample, borehole MW20-16/SS7, yielded 54%. Atterberg Limits of this sample was determined as:

- Liquid Limit: 58
- Plastic Limit: 21
- Plastic Index: 37

The Atterberg Limits are shown on plasticity chart on Figure No. 2 in Appendix D, which classifies the sample as a high-plasticity (fat) clay (CH).

The field vane test measured an undrained shear strength of 66 kPa and 7 kPa intact and remolded strength, indicating a stiff consistency. The sensitivity of the clay, defined as the ratio of the undrained strength in the undisturbed state to the undrained strength in the remolded state, is approximately 9, indicating an extrasensitive clay.

3.1.5 Non-Cohesive Till

A non-cohesive glacial till deposit was encountered in all boreholes at 2.3 to 8.4 m depth, extending to 9.8 m depth (termination depth of boreholes). The standard Penetration Test (SPT) N-values for this material ranged from 8 to 48 indicating a loose to dense relative density, with the exception of N-values of 0 (sampler penetrated by the weight of hammer) and 2 at borehole MW20-16 from 2.3 to 3.7 m depth. Moisture content of the selected samples of this till was determined to be 8 to 17%. Three representative samples of this till soil were submitted for grain size analysis testing and the test results are summarized below. The grain size distribution curves are shown on Figure No. 3 in Appendix D.

- Gravel: 6-12%
- Sand: 43-54%
- Silt: 27-36%
- Clay: 10-15%

According to the USCS, the material can be classified as silty sand (SM).

Atterberg Limits of a sample of this till (MW20-16/SS10) was determined as:

- Liquid Limit: 13%
- Plastic Limit: 11%
- Plastic Index: 2%

The Atterberg Limits are shown on plasticity chart on Figure No. 2 in Appendix D, which classifies fine portion of the sample as a low-plasticity silt (ML).

3.2 GROUNDWATER

Groundwater levels observed in the four installed monitoring wells are presented in the table below:

Table 3.1: Summary of Groundwater Level Elevations and Depths

Monitoring Well	Ground Surface Elevation (m)	Approximate Groundwater Levels on Feb 12, 2020	
		Depth (m)	Elevation (m)
MW20-15	79.7	5.9	73.8
MW20-16	79.6	6.1	73.5
MW20-17	78.7	2.9	75.8
MW20-18	75.0	6.9	68.1

A perched water condition could be expected due to presence of granular fill over clayey soils, which was observed at wells MW20-17.

Fluctuations of the groundwater level due to seasonal variations or precipitation events should be anticipated. Groundwater level information presented in this report may not necessarily represent groundwater conditions at the time the construction work is carried out.

4.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of Public Services and Procurement Canada who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected site conditions
- Planning, design or construction

Respectfully submitted,

STANTEC CONSULTING LTD.

Ramin Ghassemi, P.Eng., Ph.D.
Geotechnical Engineering

Chris McGrath, P.Eng.
Senior Associate, Geotechnical Engineering

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5.0 REFERENCES

ASTM Standard D422-63: Standard Test Method for Particle-Size Analysis of Soils.

ASTM Standard D1586-99: Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

ASTM Standard D2216-98: Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

ASTM Standard D2487-00: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Boring report No. 2503: Report on Subsurface Investigation for the Proposed Department of Agriculture Administration Building, Ottawa, Ontario, dated December 1962.

Phase I ESA – New Ottawa Hospital Civic Campus, Carling Avenue and Preston Street, Ottawa, ON, by Stantec Consulting Ltd., dated August 23, 2017.

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Phase III ESA – Former Sir John Carling Building, 930 Carling Ave., Ottawa, ON (DFRP#08625), by Stantec Consulting Ltd., dated March 20, 2017.

APPENDIX A

Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

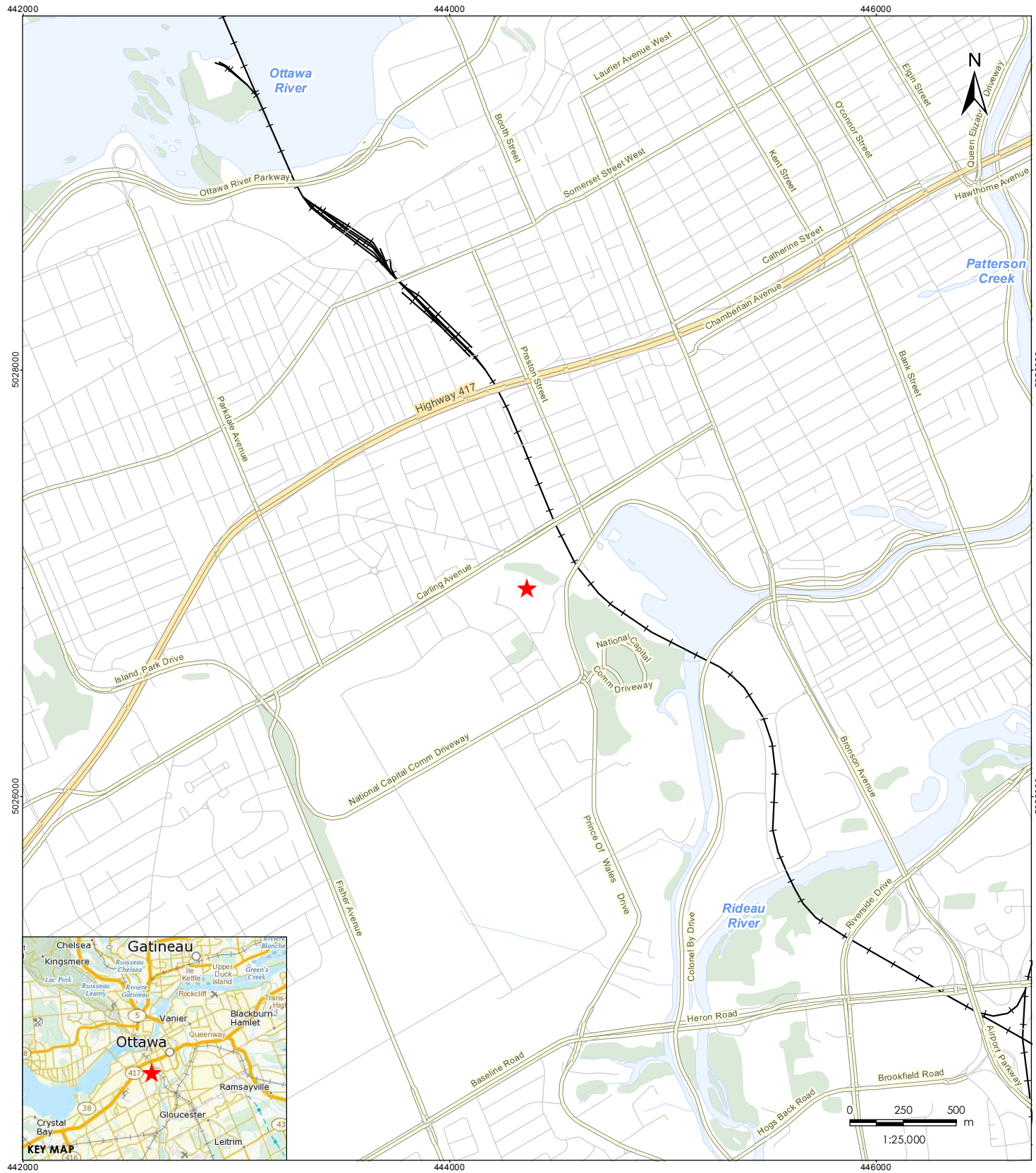
VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

Drawing No. 1 Key Plan

Drawing No. 2 Borehole Location Plan



Project No. 122170347

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Legend

★ Site Location

Notes

1. Coordinate System: NAD 1983 UTM Zone 18N
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.

Client/Project

Public Services and Procurement Canada
Geotechnical Assessment
Sir John Carling West Annex Demolition
930 Carling Avenue, Ottawa, ON

Drawing No.

1

Title

Key Plan

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N
3. Sewer Lines: Publics Works and Government Services Canada, Drawing - CEF_MA_2015-10-19.DWG, Date: 2015-11-09.
3. Orthoimagery: City of Ottawa, 2020. Imagery Date: 2017.

Legend

- Assumed Site Boundary
- Former Building Location (Demolished)
- High Voltage Electrical Manhole
- -SA- Sanitory Sewer Line
- -ST- Storm Water Sewer Line
- -UT- Underground High Voltage Line
- Borehole
- Monitoring Well
- Destroyed Monitoring Well
- Test Pit
- Manhole
- Water Sample Location

0 10 20 metres

1:1,000 (at original document size of 8.5x11)

Stantec

Project Location: Ottawa, ON
Project No.: 122170347

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Public Services and Procurement Canada
Geotechnical Assessment
Sir John Carling West Annex Demolition
930 Carling Avenue, Ottawa ON

Drawing No.: 2

Title
Borehole Location Plan

APPENDIX C

Symbols and Terms Used on Borehole Records

Borehole Records – Current Investigation

Borehole Records – Previous Investigation

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization 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 successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

Monitoring Well: MW20-15

Project:	The Proposed Sir John Carling West Annex Demolition	**Drilling method:**	Hollow Stem Auger / Split Spoon Sampler
Client:	Public Services and Procurement Canada	**Date started/completed:**	10-Feb-2020
Location:	930 Carling Ave., Ottawa, ON	**Ground surface elevation:**	79.71 m AMSL
Number:	122170347	**Top of casing elevation:**	79.61 m AMSL
Field investigator:	Tarek Ghadieh	**Easting:**	n/a
Contractor:	Downing Drilling	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	N Value	Diagram / Description
			Ground Surface	79.71					
			150 mm TOPSOIL	0.00					
			FILL: brown fine SAND, trace gravel, trace silt moist to frozen Contains coarse sand	79.55 0.15	1	SS	50%	7	Flush mount Concrete seal at surface
			trace organics 0.3 m thick layer of silt and sand at 0.9 m depth		2	SS	88%	13	
5				78.18					
	2		FILL: brown SILTY SAND, trace gravel, trace organics moist	1.52	3	SS	83%	8	
				77.42					
			FILL: brown fine SAND with silt, trace gravel moist rock piece at 2.7 m depth	2.29	4	SS	58%	22	
10			SS5 contains some light brown coarse sand		5	SS	42%	6	50 mm PVC pipe backfilled with holeplug
	4				6	SS	54%	5	
15					7	SS	38%	24	
			Auger refusal possibly on a boulder or cobble A new borehole was advanced at approximately 2 m offset SS8 contains rock fragments		8	SS	29%	58	Groundwater Level: 5.9 m depth on Feb 12, 2020
20	6		SS9 contains rock fragments		9	SS	75%	31	
			Loose to compact grey SILT, trace coarse sand moist	73.15 6.55	10	SS	19%	9	
25			moist to wet below 7.6 m depth		11	SS	79%	13	
	8			71.32					50 mm PVC slotted pipe backfilled with silica sand
			Compact grey SILTY SAND, trace gravel, trace clay TILL moist	8.38	12	SS	100%	10	
30					13	SS	42%	21	
	10		End of Borehole	69.95 9.75					

Screen Interval: 6.71 - 9.75 m BGS
Sand Pack Interval: 6.10 - 9.75 m BGS
Well Seal Interval: 0.91 - 6.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
SS - split-spoon sample
n/a - not available

Stantec

Drawn By/Checked By: Ramin Ghassemi

Monitoring Well: MW20-16

Project:	The Proposed Sir John Carling West Annex Demolition	**Drilling method:**	Hollow Stem Auger / Split Spoon Sampler
Client:	Public Services and Procurement Canada	**Date started/completed:**	10-Feb-2020 / 11-Feb-2020
Location:	930 Carling Ave., Ottawa, ON	**Ground surface elevation:**	79.55 m AMSL
Number:	122170347	**Top of casing elevation:**	79.40 m AMSL
Field investigator:	Tarek Ghadieh	**Easting:**	n/a
Contractor:	Downing Drilling	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	N Value	Lab Analyses	Diagram / Description
			Ground Surface	79.55						
			FILL: brown SILTY SAND, some clay, some gravel moist	0.00						Flush mount
					1	SS	63%	9	MC=17%	Concrete seal at surface
				78.03						
5			FILL: brown to grey SILTY CLAY with sand moist	1.52	2	SS	29%	7		
	2			77.27						
			Loose grey SANDY SILTY to SILTY SAND with clay, trace gravel TILL moist to wet	2.29	3	SS	71%	0	MC=13%	
10					4	SS	79%	2	MC=17%, Grain Size Analysis	50 mm PVC pipe backfilled with holeplug
			Gravel= 6%, Sand=43%, Silt=36%, Clay=15% a 0.4 m thick black smear	75.90						
			Compact brown SILTY SAND with clay and gravel TILL moist	3.66	5	SS	63%	28	MC=21%	
	4									
15			grey below 4.6 m depth		6	SS	100%	23	MC=11%	
					7	SS	92%	25	MC=8%	
20	6		Gravel= 9%, Sand=54%, Silt=27%, Clay=10%		8	SS	67%	25	MC=8%, Grain Size Analysis	Groundwater Level: 6.1 m depth on Feb 12, 2020
					9	SS	54%	11	MC=9%	
25				71.93						
	8		Compact grey SANDY SILT to SILT with sand, trace gravel TILL moist Liquid Limit = 13%, Plastic Limit= 11%, Plastic Index= 2%	7.62	10	SS	67%	30	MC=9%, Atterberg Limits	
					11	SS	58%	19	MC=9%	50 mm PVC slotted pipe backfilled with silica sand
30										
				69.80	12	SS	75%	10	MC=10%	
	10		End of Borehole	9.75						

Screen Interval: 6.71 - 9.75 m BGS
Sand Pack Interval: 6.10 - 9.75 m BGS
Well Seal Interval: 0.91 - 6.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
SS - split-spoon sample
n/a - not available

Stantec

Drawn By/Checked By: Ramin Ghassemi

Monitoring Well: MW20-17

Project:	The Proposed Sir John Carling West Annex Demolition	**Drilling method:**	Hollow Stem Auger / Split Spoon Sampler
Client:	Public Services and Procurement Canada	**Date started/completed:**	11-Feb-2020
Location:	930 Carling Ave., Ottawa, ON	**Ground surface elevation:**	78.67 m AMSL
Number:	122170347	**Top of casing elevation:**	75.59 m AMSL
Field investigator:	Tarek Ghadieh	**Easting:**	n/a
Contractor:	Downing Drilling	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	N Value	Diagram / Description
			Ground Surface	78.67					
			FILL: brown sand and gravel moist	0.00	1	SS	29%	17	Flush mount Concrete seal at surface
					2	SS	42%	34	
5					3	SS	46%	19	
	2		auger grinding noted at 2.0 m depth	76.38					
			Possible FILL Stone in SPT split spoon shoe impeded sampling	2.29	4	SS	4%	26	
10			Compact to loose brown SILTY SAND with clay and gravel TILL wet	75.62 3.05	5	SS	21%	12	Groundwater Level: 2.9 m depth on Feb 12, 2020 50 mm PVC pipe backfilled with holeplug
	4		moist below 3.8 m depth		6	SS	33%	9	
15			grey below 4.6 m depth		7	SS	92%	8	
					8	SS	46%	14	
20	6				9	SS	71%	24	
			occasional cobble from 6.7 to 7.6 m depth		10	SS	83%	13	
25			trace shale chips from 7.6 to 8.4 m depth		11	SS	71%	16	50 mm PVC slotted pipe backfilled with silica sand
	8				12	SS	83%	14	
30			wet below 9.1 m depth		13	SS	83%	9	
	10		End of Borehole	68.92 9.75					

Screen Interval: 6.71 - 9.75 m BGS
Sand Pack Interval: 6.10 - 9.75 m BGS
Well Seal Interval: 0.91 - 6.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
SS - split-spoon sample
n/a - not available

Stantec

Drawn By/Checked By: Ramin Ghassemi

Monitoring Well: MW20-18

Project:	The Proposed Sir John Carling West Annex Demolition	**Drilling method:**	Hollow Stem Auger / Split Spoon Sampler
Client:	Public Services and Procurement Canada	**Date started/completed:**	11-Feb-2020
Location:	930 Carling Ave., Ottawa, ON	**Ground surface elevation:**	75.04 m AMSL
Number:	122170347	**Top of casing elevation:**	74.95 m AMSL
Field investigator:	Tarek Ghadieh	**Easting:**	n/a
Contractor:	Downing Drilling	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Stratigraphic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	N Value	Lab Analyses	Diagram / Description
			Ground Surface	75.04						
			FILL: brown SAND and GRAVEL, some clay moist	0.00						Flush mount
					1	SS	50%	9		Concrete seal at surface
5										
	2				2	SS	50%	6		
				72.76						
			Fill: brown fine to meduim SAND (SM) moist Gravel= 0, Sand=65%, Silt and Clay=35%	2.29	3	SS	83%	10	Grain Size Analysis	
10					4	SS	71%	11		50 mm PVC pipe backfilled with holeplug
				71.18						
	4		Stiff grey fat CLAY (CH) moist	3.86	5	SS	100%	4		
15					6	SS	100%	2		
			Field vane test results: Undrain shear strength = 66 kPa, intact remold strength = 7 kPa							
20	6		Liquid Limit = 58%, Plastic Limit= 21%, Plastic Index= 37%		7	SS	100%	2	MC=54%, Atterberg Limits	
				68.18						Groundwater Level: 6.9 m depth on Feb 12, 2020
			Compact grey SILTY SAND with clay and gravel TILL moist to wet	6.86	8	SS	50%	10		
25			trace rock chips below 7.6 m depth							
	8		Gravel= 12%, Sand=51%, Silt=27%, Clay=10%		9	SS	63%	22	Grain Size Analysis	50 mm PVC slotted pipe backfilled with silica sand
					10	SS	38%	24		
30			dense below 9.1 m depth							
				65.29	11	SS	4%	48		
	10		End of Borehole	9.75						

Screen Interval: 6.71 - 9.75 m BGS
Sand Pack Interval: 6.10 - 9.75 m BGS
Well Seal Interval: 0.91 - 6.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
SS - split-spoon sample
n/a - not available

Stantec

Drawn By/Checked By: Ramin Ghassemi

STANTEC BOREHOLE AND WELL V2 122170347_930 CARLING AVENUE.GPJ STANTEC - DATA TEMPLATE.GDT 3/26/20 RGHASSEMI

Borehole: BH16-2

Project:	Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	79.20 m AMSL
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	J. Urben / B. Chenier	**Easting:**	444365.8
Contractor:	Strata Drilling Group	**Northing:**	5026932.5

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb● 200 400 600 800	Diagram	Description
			Ground Surface	79.20							
			TOPSOIL	0.00							
			CLAYEY SILT brown with orange mottling, sand, gravel, dry	79.05 0.15	1	DP	21" 70%	Energetics, PAH, Metals	<5 ● ○ <0.02		
					2a	DP	19" 63%		<5 ● ○ <0.02		
5			SILTY SAND grey-brown, with gravel, moist	77.68 1.52							
	2				2b	DP	19" 32%		<5 ● ○ <0.02		
10			- becomes grey, dry								
	4				3	DP	24" 40%		<5 ● ○ <0.02		
15			- with silt, moist								Bentonite backfill
					4	DP	12" 20%	VOC, PHC	<5 ● ○ <0.02		
20	6			73.11							
			No soil samples recovered	6.10							
				71.58							
25			CLAY grey, gravel, trace silt, wet	7.62							
	8				6	DP	12" 20%		<5 ● ○ <0.02		
30				70.06							
			End of Borehole	9.14							

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-1

Project:	Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	77.34 m AMSL
Number:	122511246	**Top of casing elevation:**	77.25 m AMSL
Field investigator:	J. Urben / B. Chenier	**Easting:**	444332.2
Contractor:	Strata Drilling Group	**Northing:**	5026985.7

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram	Description
			Ground Surface	77.34							
			TOPSOIL moist to wet	0.00 / 77.27							Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) grey, silt, trace clay, dry	0.08	1	DP	17" 28%	pH, Phenols	● <5 ○ <0.02		
5				75.82							
	2		SANDY SILT (FILL) brown, trace gravel, trace concrete dust, dry	1.52	2	DP	47" 78%		● <5 ○ 1.0		Bentonite backfill
10				74.30							50 mm ID PVC pipe
			SANDY SILT (FILL) grey, gravel, crushed concrete, brick fragments, dry	3.05	3	DP	31" 52%	Energetics	● <5 ○ 1.0		
	4										
15			- becomes grey		4	DP	26" 43%	Metals & Inorganics, Phenols	● <5 ○ 1.0		Groundwater Level: 5.29 m BGS 17-Mar-16
	6		- becomes moist to wet								
20				70.33	5	DP	30" 50%	PHC, VOC, PAH, Field Duplicate	● 10 ○ <0.02		Silica sand backfill
			CLAY grey, moist, black staining at 7.5 m BGS	7.01							50 mm ID slotted PVC pipe
25											
	8		- becomes wet		6	DP	30" 50%		● <5 ○ 1.0		
30				68.20							Slough
			End of Borehole	9.14							
	10										

Screen Interval: 5.64 - 8.69 m BGS
Sand Pack Interval: 5.33 - 8.69 m BGS
Well Seal Interval: 0.23 - 5.33 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-1A SS5

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-1A

Project:	Environmental Site Assessment	**Drilling method:**	Geoprobe 7822DT
Client:	Public Services and Procurement Canada	**Date started/completed:**	02-Aug-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	78.05 m AMSL
Number:	122511246	**Top of casing elevation:**	77.96 m AMSL
Field investigator:	R. Lee	**Easting:**	444332.2
Contractor:	Strata Drilling Group	**Northing:**	5026985.7

SUBSURFACE PROFILE				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Diagram / Description
			Ground Surface	78.05	
			Refer to MW16-1 for stratigraphy	0.00	Flushmount protective cover with concrete seal
5	2				
10	4				Bentonite backfill
15					50 mm ID PVC pipe
20	6				
25	8				Silica sand backfill
30					50 mm ID slotted PVC pipe
	10				Groundwater Level: 9.25 m BGS 8-Aug-16
				67.69	Cave in
			End of Borehole	10.36	

Screen Interval: 7.32 - 10.06 m BGS
Sand Pack Interval: 7.01 - 10.06 m BGS
Well Seal Interval: 0.23 - 7.01 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Installed to replace MW16-1 (destroyed)

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-3

Project:	Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	77.89 m AMSL
Number:	122511246	**Top of casing elevation:**	77.85 m AMSL
Field investigator:	J. Urben / B. Chenier	**Easting:**	444386.4
Contractor:	Strata Drilling Group	**Northing:**	5026952

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram / Description
			Ground Surface	77.89						
			TOPSOIL	0.00 77.63						Flushmount protective cover with concrete seal
			CRUSHED CONCRETE (FILL) with sand, gravel, dry	0.26	1	DP	9" 15%	Phenols	<5 ● ○ <0.02	Bentonite backfill
5			- brick fragments							50 mm ID PVC pipe
	2				2	DP	14" 23%	PAH, Metals & Inorganics	<5 ● ○ <0.02	
10				74.84						
			SAND (FILL) brown, gravel, dry	3.05	3	DP	10" 17%	Phenols, Energetics		Groundwater Level: 3.77 m BGS 17-Mar-16
	4			73.31						Silica sand backfill
15			GRAVEL (FILL) trace silt, moist	4.57	4	DP	11" 18%	VOC, pH, PHC		50 mm ID slotted PVC pipe
	6									
20			- with silt, trace clay, wet	71.48						
			CLAY grey, with gravel, wet	6.40	5	DP	31" 52%		<5 ● ○ <0.02	
25			- trace sand							Silica sand backfill
	8				6	DP	38" 63%		<5 ● ○ <0.02	
30				68.74						
			End of Borehole	9.14						

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.74 - 9.14 m BGS
Well Seal Interval: 0.23 - 2.74 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-7

Project:	Environmental Site Assessment	**Drilling method:**	GM100 (Direct Push)
Client:	Public Services and Procurement Canada	**Date started/completed:**	14-Mar-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	75.35 m AMSL
Number:	122511246	**Top of casing elevation:**	75.24 m AMSL
Field investigator:	J. Urben / B. Chenier	**Easting:**	444336.2
Contractor:	Strata Drilling Group	**Northing:**	5027014.9

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb● 200 400 600 800	Diagram	Description
			Ground Surface	75.35							
			TOPSOIL with grass, sand, dry	0.00 75.05							
			SILTY CLAY brown, soft, dry	0.30	1	DP	24" 100%		<5 <0.02		Flushmount protective cover with concrete seal
					2	DP	24" 67%	Phenols, Metals, Energetics, PAH	<5 <0.02		Bentonite backfill
5	2				3	DP	36" 60%		<5 1.0		50 mm ID PVC pipe
				72.61							
			SILTY SAND brown, coarse grained sand, gravel - becomes wet	2.74	4	DP	24" 80%	PHC, VOC, Field Duplicate	60 <0.02		
10	4		- grey		5	DP	30" 100%		<5 <0.02		
				70.78							
15			SILTY SAND grey, trace clay, gravel, moist	4.57	6	DP	36" 60%		<5 <0.02		Groundwater Level: 4.79 m BGS 17-Mar-16
											Silica sand backfill
20	6				7	DP	30" 50%		<5 <0.02		50 mm ID slotted PVC pipe
25	8										Slough
					8	DP	28" 47%		<5 <0.02		
30				66.21							
			End of Borehole	9.14							

Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.35 - 6.71 m BGS
Well Seal Interval: 0.23 - 3.35 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Field Duplicate - MW16-2A SS4

Stantec

Drawn By/Checked By: M. Ford

Monitoring Well: MW16-7A

Project:	Environmental Site Assessment	**Drilling method:**	Geoprobe 7822DT
Client:	Public Services and Procurement Canada	**Date started/completed:**	03-Aug-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	75.19 m AMSL
Number:	122511246	**Top of casing elevation:**	75.11 m AMSL
Field investigator:	T. Ghadieh	**Easting:**	444336.2
Contractor:	Strata Drilling Group	**Northing:**	5027014.9

SUBSURFACE PROFILE				SAMPLE DETAILS		INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Diagram / Description
			Ground Surface	75.19			
			TOPSOIL	0.00 74.89			Flushmount protective cover with concrete seal
			SILTY CLAY brown, soft, dry	0.30	1	DP	
5	2				2	DP	Bentonite backfill 38 mm ID PVC pipe
				72.15			
10			SILTY SAND brown, trace gravel, wet	3.05	3	DP	
	4						
15			- grey, with gravel, moist		4	DP	Groundwater Level: 5.07 m BGS 8-Aug-16
	6			69.10			
20			SILTY CLAY with sand, trace gravel, wet	6.10	5	DP	Silica sand backfill 38 mm ID slotted PVC pipe
25	8				6	DP	
				66.66			
			End of Borehole	8.53			
30							

Screen Interval: 5.49 - 8.53 m BGS
Sand Pack Interval: 4.88 - 8.53 m BGS
Well Seal Interval: 0.23 - 4.88 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

Installed to replace MW16-7 (destroyed)

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Drawn By/Checked By: M. Ford

Monitoring Well: MW16-8

Project:	Environmental Site Assessment	**Drilling method:**	Geoprobe 7822DT
Client:	Public Services and Procurement Canada	**Date started/completed:**	03-Aug-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	74.87 m AMSL
Number:	122511246	**Top of casing elevation:**	74.83 m AMSL
Field investigator:	T. Ghadieh	**Easting:**	n/a
Contractor:	Strata Drilling Group	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram / Description
			Ground Surface	74.87						
			SILTY CLAY light brown, with sand, trace gravel	0.00	1	DP	30" 50%	Metals, PAH	5	Flushmount protective cover with concrete seal
5	2		- becomes moist - dark brown, no gravel		2	DP	30" 50%		20	Bentonite backfill 38 mm ID PVC pipe
10	4		- grey, with light brown sand, moist		3	DP	30" 100%	VOC, PHC F1-F4, pH, Phenols	20	
15			- wet		4	DP	30" 100%		15	Silica sand backfill
					5	DP	30" 100%		<5	38 mm ID slotted PVC pipe
20	6				6	DP	30" 100%		5	Groundwater Level: 5.27 m BGS 8-Aug-16
			End of Borehole	68.77 6.10						
25	8									
30										

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.44 - 6.10 m BGS
Well Seal Interval: 0.23 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

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Monitoring Well: MW16-9

Project:	Environmental Site Assessment	**Drilling method:**	Geoprobe 7822DT
Client:	Public Services and Procurement Canada	**Date started/completed:**	03-Aug-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	73.79 m AMSL
Number:	122511246	**Top of casing elevation:**	73.78 m AMSL
Field investigator:	T. Ghadieh	**Easting:**	n/a
Contractor:	Strata Drilling Group	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV / Comb ● 200 400 600 800	Diagram / Description
			Ground Surface	73.79					
			SAND dark brown, with gravel, dry	0.00	1	DP	Phenols, pH, PAH	<5	Flushmount protective cover with concrete seal
					2	DP		<5	Bentonite backfill
				72.26					38 mm ID PVC pipe
5			SILTY CLAY light brown, with sand, dry	1.52	3	DP		<5	
	2				4	DP		<5	
			- brown, moist	70.74					
10			SILTY SAND brown, moist	3.05	5	DP		30	
				69.98					
	4		SILTY CLAY grey, with sand, wet	3.81	6	DP		5	Silica sand backfill
15									38 mm ID slotted PVC pipe
					7	DP		5	Groundwater Level: 5.16 m BGS 8-Aug-16
20	6			67.69					
			End of Borehole	6.10					
25									
	8								
30									

Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.44 - 6.10 m BGS
Well Seal Interval: 0.23 - 2.44 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
DP - direct push sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

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Drawn By/Checked By: M. Ford

Monitoring Well: MW16-14

Project:	Environmental Site Assessment	**Drilling method:**	Geoprobe 7822DT
Client:	Public Services and Procurement Canada	**Date started/completed:**	03-Aug-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	79.51 m AMSL
Number:	122511246	**Top of casing elevation:**	79.45 m AMSL
Field investigator:	T. Ghadieh	**Easting:**	n/a
Contractor:	Strata Drilling Group	**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS					INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Recovery	Lab Analyses	%LEL Comb▲ 20 40 60 80 / ppm OTOV ● Comb 200 400 600 800	Diagram / Description
			Ground Surface	79.51						
			SILTY CLAY (FILL) light brown, with gravel, moist	0.00	1	AS	18" 30%		<5	Flushmount protective cover with concrete seal
				77.98						
5			SILTY SAND (FILL) brown, with gravel, moist	1.52						Bentonite backfill
	2			77.22	2	AS	18" 30%	PAH	<5	38 mm ID PVC pipe
			SAND brown, poorly graded, wet	2.29						
10				76.46						
			SILTY CLAY grey-brown, with sand, trace gravel, wet	3.05	3	AS	20" 33%		<5	
	4									
15			- no gravel		4	AS	30" 100%		10	
					5	AS	30" 100%		10	
			- becomes grey, no sand							Silica sand backfill
20	6		- trace gravel		6	AS	30" 100%	Phenol, pH	20	38 mm ID slotted PVC pipe
					7	AS	30" 100%		5	Groundwater Level: 7.23 m BGS 8-Aug-16
25				71.89						
			End of Borehole	7.62						
30	8									

Screen Interval: 4.57 - 7.62 m BGS
Sand Pack Interval: 3.66 - 7.62 m BGS
Well Seal Interval: 0.23 - 3.66 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
AS - auger sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds

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Test Pit: TP16-1

Project:	Environmental Site Assessment	**Drilling method:**	
Client:	Public Services and Procurement Canada	**Date started/completed:**	28-Jul-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	78.39 m AMSL
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	B. Chenier	**Easting:**	n/a
Contractor:		**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb 200 400 600 800	Diagram / Description
			Ground Surface	78.39					
			SAND (FILL) trace silt, gravel, dry, brick, tile, and concrete debris	0.00	1	GS	Nitroglycerin, Phenol, pH	5	
					2	GS	PAH, Metals (D), Phenol, pH	<5	
5			- metal debris		3	GS	Nitroglycerin, PAH (D), Metals	<5	
	2				4	GS	Phenol (D), pH	10	
10					5	GS		15	Excavated material reinstated as backfill
	4				6	GS	VOC, Phenol (D), pH (D)	20	
15					7	GS	VOC, PAH, Nitroglycerin, Metals, Phenol, pH	20	
20	6			72.29					
			End of Test Pit	6.10					
25	8								
30									

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GS - grab sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds
(D) - field duplicate submitted for laboratory analysis

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Drawn By/Checked By: M. Ford

Test Pit: TP16-3

Project:	Environmental Site Assessment	**Drilling method:**	
Client:	Public Services and Procurement Canada	**Date started/completed:**	28-Jul-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	79.98 m AMSL
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	B. Chenier	**Easting:**	n/a
Contractor:		**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb ● 200 400 600 800	Diagram / Description
			Ground Surface	79.98					
			SAND (FILL) with gravel, trace clay, silt, dry	0.00	1	GS		<5 ●	
			- concrete debris		2	GS		<5 ●	
5	2		SAND and GRAVEL (FILL) with silt, trace clay, dry	1.52 78.46	3	GS		<5 ●	Excavated material reinstated as backfill
			SAND (FILL) with silt, trace clay, gravel, moist, brick debris	2.44 77.54	4	GS	PCB	<5 ●	
10			End of Test Pit	3.05 76.94					
15	4								
20	6								
25	8								
30									

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GS - grab sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PCB - polychlorinated biphenyls
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds
(D) - field duplicate submitted for laboratory analysis

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Test Pit: TP16-4

Project:	Environmental Site Assessment	**Drilling method:**	
Client:	Public Services and Procurement Canada	**Date started/completed:**	28-Jul-2016
Location:	Sir John Carling Building	**Ground surface elevation:**	79.15 m AMSL
Number:	122511246	**Top of casing elevation:**	n/a
Field investigator:	B. Chenier	**Easting:**	n/a
Contractor:		**Northing:**	n/a

SUBSURFACE PROFILE				SAMPLE DETAILS				INSTALLATION DETAILS	
Depth (ft)	Depth (m)	Graphic Log	Lithologic Description	Elevation (m AMSL) Depth (m BGS)	Sample Number	Sample Type	Lab Analyses	%LEL Comb▲ 20 40 60 80 ppm OTOV Comb ● 200 400 600 800	Diagram / Description
			Ground Surface	79.15					
			SAND (FILL) with clay, gravel, trace silt, dry to moist, brick debris	0.00 78.38	1	GS		<5	
			SILT (FILL) with sand, trace clay, moist, brick and concrete debris	0.76	2	GS		10	
5	2				3	GS		10	
			- with black sand	76.10	4	GS	PCB (D), PHC (D), VOC (D), PAH, Metals, Phenol (D)	5	Excavated material reinstated as backfill
10			SAND (FILL) with silt, trace clay, gravel, moist, brick and concrete debris	3.05 75.34	5	GS			
	4		SILT (FILL) with clay, trace sand, gravel, moist, brick and concrete debris	3.81	6	GS			
15			- with sand, trace clay, moist to wet	73.96	7	GS			
			End of Test Pit	5.18					
20	6								
25	8								
30									

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
GS - grab sample
ppm - parts per million by volume
n/a - not available

PAH - polycyclic aromatic hydrocarbons
PCB - polychlorinated biphenyls
PHC F1-F4 - petroleum hydrocarbon fractions 1 to 4
VOC - volatile organic compounds
(D) - field duplicate submitted for laboratory analysis

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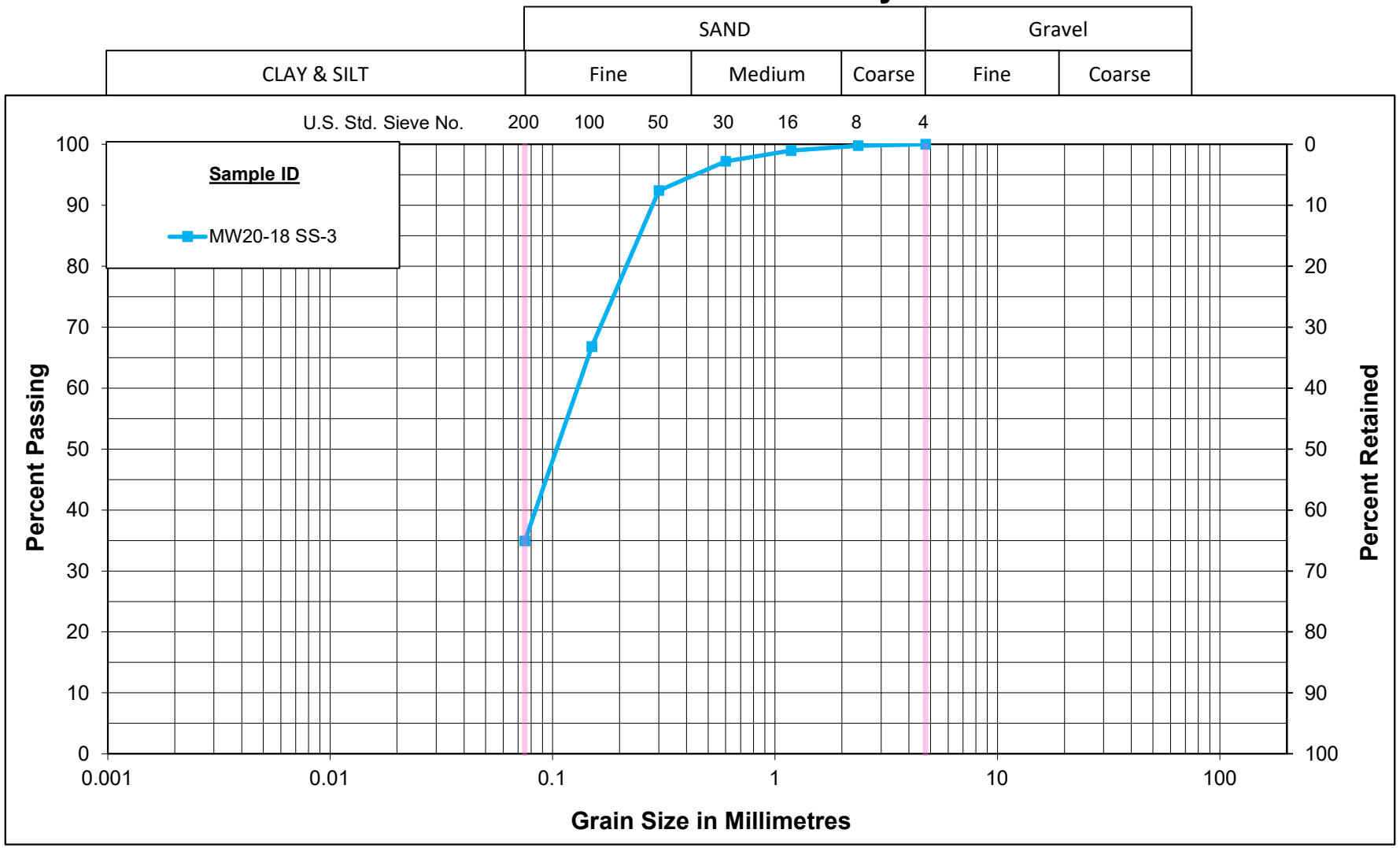
APPENDIX D

Laboratory Test Results

Unified Soil Classification System



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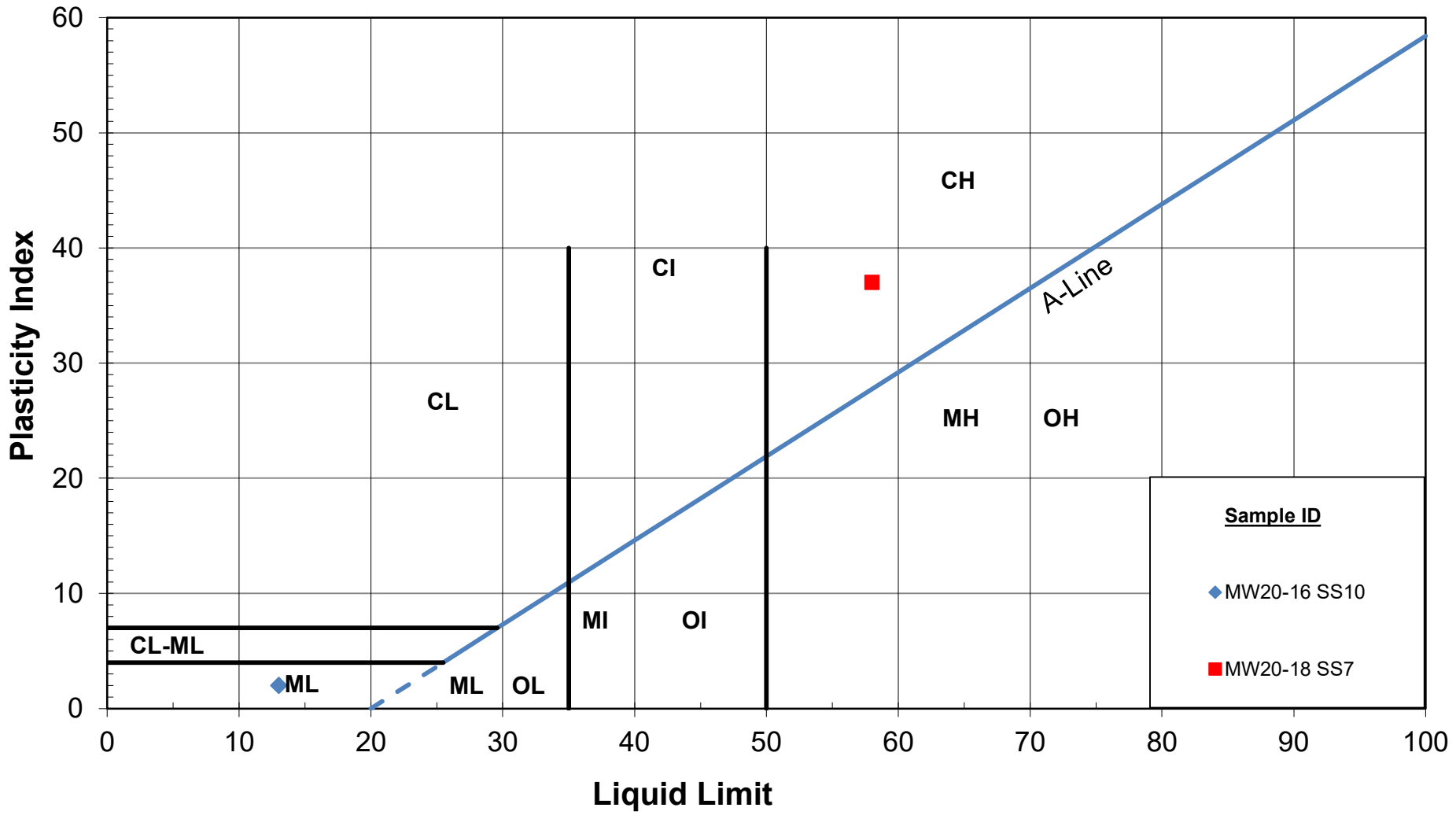
GRAIN SIZE DISTRIBUTION

Public Works & Government Service Canada

Environmental Engineering Service

Figure No.1

Project No. 122170347



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PLASTICITY CHART

Figure No.2

Project No. 122170347

Unified Soil Classification System

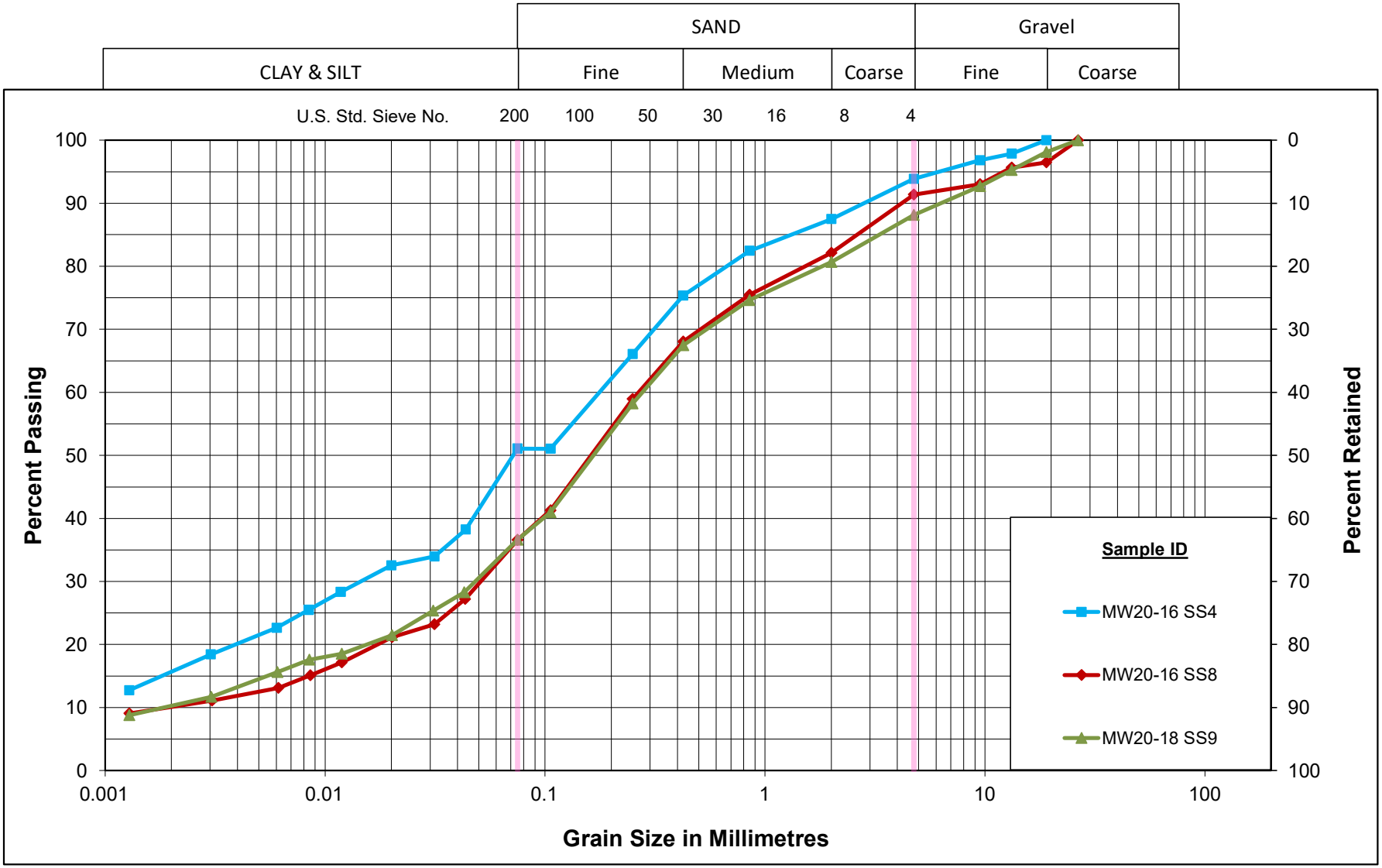

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Figure No. 3

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