December 11, 2015

Daniella Mavroudis, B. Arch Sc.
Project Management
PWGSC Public Works and Government Services Canada
4900 Yonge Street
Toronto, Ontario M2N 6A6

Subject: Geotechnical Investigation, Stores Building Parking Lot Upgrades
Warkworth Institution, Campbellford, Ontario
PWGSC Project No. R.074850.001
Our Project No. 141-14303-04

Dear Ms. Mavroudis:

WSP Canada Inc. (WSP) was retained by Public Works and Government Services Canada (PWGSC) to conduct a geotechnical investigation at the Warkworth Institution, located in the Municipality of Trent Hills, Ontario. The site a fully operational federal correctional facility with several out-buildings and structures in addition to the main facility and is located east of the Town of Warkworth. The main access to the facility is south of Northumberland County Road 29. The investigation is part of a larger scope of work which involves the redesign of the parking lot and associated sanitary lines between buildings WA04 and WA05.

The focus of the geotechnical investigation was to assess the pavement structure of the existing parking lot and immediate access roads and to provide recommendations with respect to the required rehabilitation. A visual inspection of the site confirmed that some potholes exist, utility crossings have heaved and in some locations the asphalt has completely deteriorated. The asphalt parking area is surrounding the Stores Building (WA04); and this building is the primary entry point into the institution for deliveries and therefore design recommendations must consider loading from heavy commercial vehicles.

The work included a geotechnical subsurface investigation, soil sampling and laboratory soil analysis. Details of methodology of the work program and our findings are summarized as follows.

1. Methodology

1.1 Borehole Program

Ten (10) pavement boreholes, designated as BH15-1 through BH15-10, were advanced to approximately 1.5 m below ground level (mBGL) to determine the subsurface profile in the parking lot area. The boreholes were advanced using a solid stem auger attached to a mini-excavator operated under the supervision of a qualified WSP geotechnical technician. The boreholes were inspected, sampled and logged onsite. Relative soil density was evaluated using a dynamic probe test (DPT) which consists of an 8 kg weight freefalling 750 mm onto a 19 mm diameter steel bar to determine the relative density of non-cohesive soils and the consistency of cohesive soils based on the number of blows

WSP Canada Inc.
294 Rink Street, Suite 103
Peterborough, ON K9J 2K2
www.wspgroup.com

for every 150 mm of penetration. Boreholes were backfilled with existing soil cuttings and the surface asphalt layer was reinstated with cold patch asphalt. Borehole logs are attached as Appendix A, and a borehole location plan is included as Figure 1.

1.2 Laboratory Tests

Upon completion of the borehole investigation all soils were reviewed by the project lead and six (6) soil samples from the drilling investigation were selected for particle size analysis (per ASTM D422). Results are included on the appended borehole logs and laboratory results are attached as Appendix B.

2. Findings

2.1 Subsurface Profile

Boreholes BH15-1 through BH15-10 were advanced at locations clear of underground utilities to depths varying from 1.2 mBGL to 1.6 mBGL. At all locations the borehole was extended beyond the inferred pavement base and sub base layer into the underlying subgrade material. All boreholes encountered asphalt from 150 mm to 200 mm thick, overlying a sand and gravel base/sub base and a presumed native subgrade material consisting of a clayey silt. Detailed descriptions of individually encountered materials are described below.

2.1.1 Asphalt

Asphalt was encountered at the surface of each borehole and was found to be generally between 150 mm and 200 mm thick. BH15-3 and BH15-7 had thinner asphalt within a thickness of 50 mm and 100 mm respectively.

2.1.2 Fill

Sand and gravel fill material was encountered underlying the asphalt at all boreholes. The material was encountered at varying depths of 0.1 mBGL to 0.2 mBGL and ranged in thickness from 0.1 m up to 0.9 m. The fill material was light brown to brown in colour and contained a trace to some silt. The material is presumed to be a granular fill used for the original road construction. The fill was moist at the time of the investigation, and has compact relative density based on DPT values of between 6 to greater than 50 blows per 150 mm of penetration.

A laboratory particle size distribution analysis was completed on select samples of the granular fill layers from beneath the asphalt layer at BH15-1, BH15-3, BH15-4, BH15-7. The test results are as follows (MIT Classification System):

- Gravel (greater than 2 mm) 44 % to 55 %
- Sand (0.06 mm – 2 mm sieve size) 32 % to 42 %
- Silt/Clay (< 0.06 mm sieve size) 10 % to 20 %

Based on the laboratory results the granular fill is not suitable to be used as a granular base or sub base material due to the fine fraction content which exceeds the specification maximum of 8% for this application. The test results are presented on the borehole logs in Appendix A and the particle size distribution curve is included in Appendix B.

2.1.3 Silt to Clayey Silt

Clayey silt was encountered underlying the granular fill material at each borehole location. The material was encountered at depths ranging from 0.3 mBGL to 1.1 mBGL and was up to 1.3 m thick. All boreholes were terminated in this material. The material was light brown to brown in colour and contained a trace to some sand and a trace of gravel. At boreholes BH15-2, BH15-7 and BH15-10, a dark brown material was encountered at approximately the midpoint of the clayey silt material and it is inferred that this was an organic-rich layer. The material appears to be generally compressed based on the DPT test results. The upper portion of the clayey silt material was inferred to be fill from a local borrow pit used to raise the grade of the area during original parking lot construction; as it appears to be consistent with other subgrade material at other borehole locations. This material was at approximately the plastic limit at the time of the investigation. Based on DPT results, the native silty clay material is considered to be hard-stiff to hard.

A laboratory particle size distribution analysis was completed on a select sample of the silt layer (GS5, from 1.2 mBGL to 1.4 mBGL. The test results are as follows (MIT Classification System):

- Gravel (greater than 2 mm) 1 %
- Sand (0.06 mm – 2 mm sieve size) 17 %
- Silt (0.002 mm – 0.06 mm sieve size) 64 %
- Clay (<0.002 mm sieve size) 18 %

The test results are presented on the borehole logs in Appendix A and the particle size distribution curve is included in Appendix B.

2.1.4 Groundwater

Groundwater was not encountered in any of the boreholes, however, it should be noted that groundwater levels will fluctuate with seasonal changes in precipitation. Hydraulic conductivities of soil within excavation zones are expected to be approximately 10^{-7} m/s for the clayey silt.

3. Geotechnical Design Recommendations

For the purpose of this project it is assumed that excavations for sanitary sewers will be roughly 1.8 m deep. The silt to clayey silt soils encountered at this depth shall be classified as Type 2 soils in accordance with the Occupational Health and Safety Act (OHSA). Type 2 soils must be excavated with an excavation sidewall of 1V:1H from 1.2 m above the excavation bottom. Excavations should be protected from exposure to precipitation and associated ground surface runoff and should be inspected regularly for signs of instability.

Based on the encountered subgrade material and groundwater conditions we anticipate dewatering to be significantly less than 50,000 L/day. Based on the anticipated hydraulic conductivity of the material any dewatering of the clayey silt should be manageable with sumps and filtered pumps. Depending on seasonal conditions and precipitation some water may be perched in the surficial granular fill layer, however it is assumed this water could be drained and would generate less than 50,000 L/day. As such, a Permit to Take Water (PTTW) is not required for the proposed improvements of the parking lot.

It is recommended that all deleterious materials such as organic topsoil and soft saturated materials be removed within the footprint of the areas to be rehabilitated and extending 2 m on all sides. Once the subgrade level has been achieved the material should be proof-rolled using a vibratory compactor and inspected by qualified personnel to determine the suitability of the subgrade for the proposed loading. If loose or soft subsoils are identified during the proof roll, they are to be removed and replaced with a material consistent with the subgrade, or otherwise approved by a qualified engineer.

The design detailed below in Table 1 will be suitable for proposed access roads and parking areas. We have included a heavy and light duty pavement structure, however due to the limited size of the site, it may be prudent from a constructability point to view to install only the heavy duty structure. The following table outlines minimum granular and pavement requirements.

Table 1: Summary of Minimum Pavement Structures

	Subbase Requirement	Base Requirements	Pavement Requirements
Heavy Duty Pavement	450 mm OPSS Granular B Type 1 or Type 2 Compacted to 98% of SPMDD	200 mm OPSS Granular A Compacted to 98% of SPMDD	65 mm OPSS HL4 Surface Course Compacted to 92.5 % to 97.5 % MRD 50 mm OPSS HL8 Base Course Compacted to 92.5 % to 97.5 % MRD
Light Duty Pavement	200 mm OPSS Granular B Type 1 or Type 2 Compacted to 98% of SPMDD	150 mm OPSS Granular A Compacted to 98% SPMDD	65 mm OPSS HL4 Compacted to 92.5 % to 97.5 % MRD

Subgrade conditions are critical to the long-term performance of the asphalt surface and the subgrade should be prepared in accordance with recommendations elsewhere in this document. All subgrades should be graded a minimum of 3 % to promote runoff away from the parking areas. It is notable that fine-grained (silty) subgrade soils at the site have a potential for frost heave, and good drainage is crucial for long term performance of the asphalt. Therefore, it is recommended that subdrains be installed below the proposed subbase layer. Subdrains should consist of 150 mm diameter geotextile-wrapped perforated pipe backfilled with a free-draining Granular B material and should be graded a minimum 2% to a positive outlet. Subdrain trenches should be installed around the perimeter of the parking lot and constructed a minimum 300 mm wide and 300 mm deep.

The thickness of the granular base material could be increased at the discretion of the Engineer, or granular sub-base layers could be added, to accommodate site conditions at the time of construction. The existing granular fills on site are not suitable for the proposed base or subbase construction and should be disposed of appropriately or placed and compacted beneath an approved granular material as outlined above.

The use of a reinforcing geotextile could be considered if seasonal conditions create more widespread soft subgrade conditions. This is not an uncommon practice with poor subgrade soils. The surfaces of access roads and parking areas should be graded to promote runoff to designated surface drainage features. Furthermore, final asphalt profile

should match existing grade elevations at buildings and maintain positive drainage away from structures and parking areas.

It is understood that infiltration trenches may be considered for stormwater management. The borehole data indicates the native clayey silt has a low hydraulic conductivity in the order of 10^{-7} m/s and is not suitable for efficient soak-away pits. Accordingly, a gallery design should be appropriately sized to accommodate the required storm event.

4. Conclusions

The geotechnical investigation identified a thin layer of granular material overlying clayey silt. The existing granular material and clayey silt is not sufficient for reuse as subbase or base granular under the rehabilitated parking lot and access roads. The material must be removed to accommodate a new pavement structure consisting of 65 mm HL4 over 50 mm HL8 overlying 200 mm Granular A overlying 450 mm Granular B Type I (heavy duty structure). The clayey silt has low hydraulic conductivity and subdrains are recommended to extend the life of the new parking lot and access roads.

5. Limitations

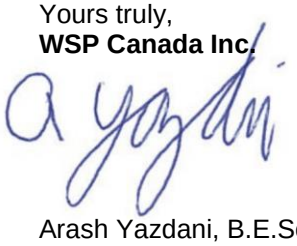
The data, conclusions and recommendations which are presented in this geotechnical report, and the quality thereof, are based on a scope of work authorized by the Client. While we believe the borehole information to be representative of site conditions, subsurface conditions between and beyond the investigated borehole locations may vary. If significant differences in the subsurface conditions described above are found, we should be contacted immediately to revise our findings and recommendations, if necessary.

The design recommendations provided in this report are intended for Designers and should not be construed as providing instructions to Contractors, who should form their own opinions about site conditions for tending, construction procedures and general planning. WSP Canada Inc. accepts no liability for use of or reliance on the report information by third parties, without express written consent.

We trust this brief report is acceptable. Please contact us if you have any questions.

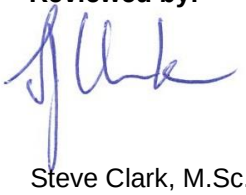
Yours truly,

WSP Canada Inc.



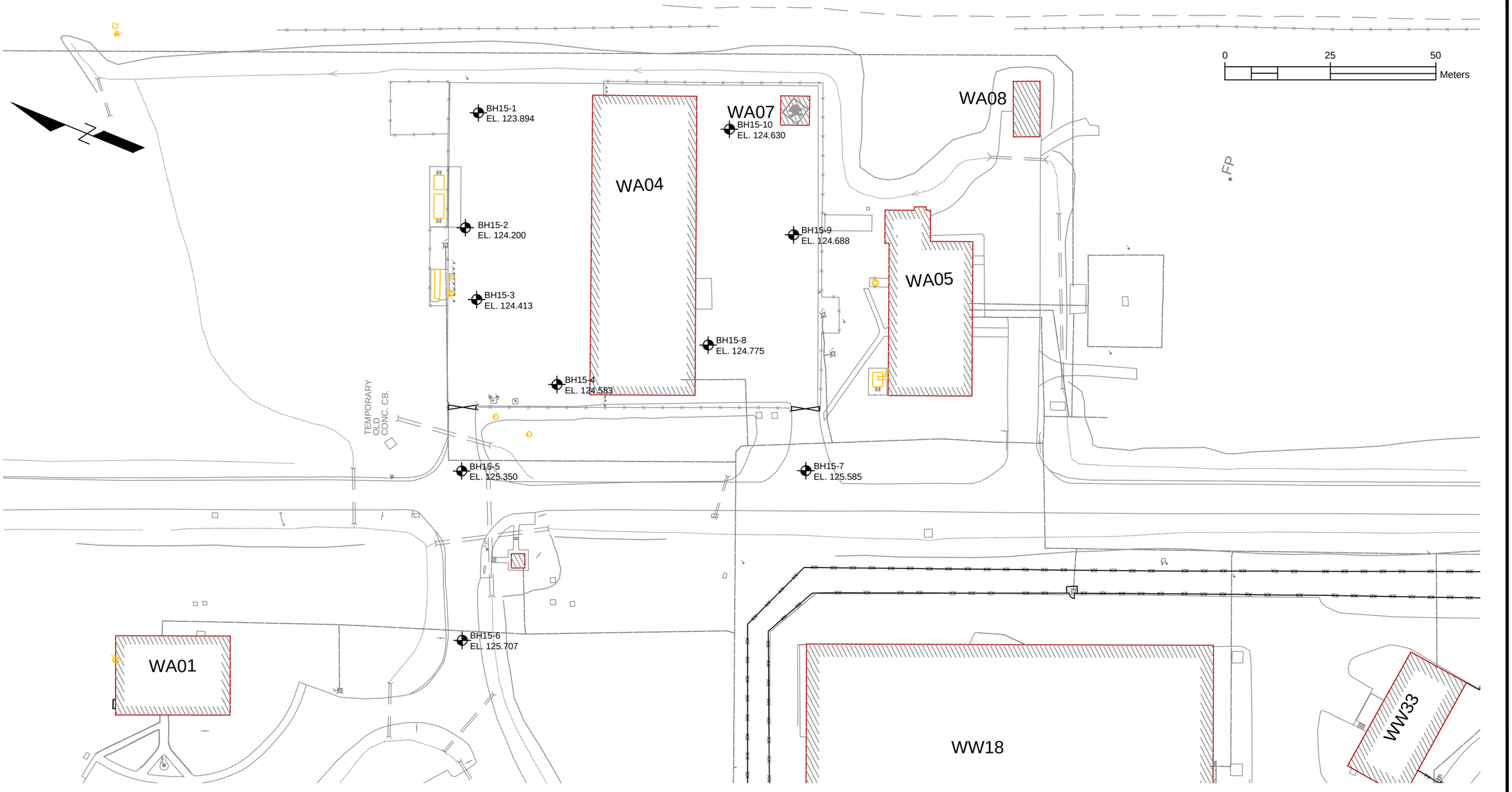
Arash Yazdani, B.E.Sc., E.I.T.
Geotechnical Project Lead

Reviewed by:



Steve Clark, M.Sc., P.Eng.
Senior Project Engineer

Figures



WSP
294 RINK STREET, SUITE 103
PETERBOROUGH (ONTARIO) CANADA K9J 2K2
TEL.: 705-743-6850 FAX: 705-743-6854
WWW.WSPGROUP.COM

IS.	RV.	DATE	DESCRIPTION

SEAL:

CLIENT:
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

CLIENT REF. #: --

PROJECT:
WARKWORTH INSTITUTION
CAMPBELLFORD, ON

PROJECT NO: 141-14303-04
DATE / DATE: NOV 2015
DESIGNED BY: --
DRAWN BY: SK
CHECKED BY: AY
DRAWING NO: FIGURE 1
SCALE:

TITLE: BOREHOLE LOCATION PLAN
DISCIPLINE: GEOTECHNICAL
ISSUE: --
RV. # 0
DATE OF: DEC 10, 2015

Appendix A

BOREHOLE EXPLANATION FORMS, BOREHOLE LOGS

TEST PIT LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the test pit logs prepared in gINT. Each of the headings used on the test pit log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Clay	<0.002 mm		
Silt	0.002 to 0.06 mm	"trace" (e.g. trace sand)	<10%
Sand	0.6 to 2 mm	"some" (e.g. some sand)	10% - 20%
Gravel	2 to 60 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	60 to 200 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>200 mm	noun (e.g. sand)	>50%

* Extension of MIT Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Dynamic Penetration Resistance Blows / 0.15 m	Consistency	Dynamic Penetration Resistance Blows / 0.15 m
Very Loose	<1	Soft	<1
Loose	1 to 3	Firm-Stiff	1 to 3
Compact	3 to 10	Stiff	3 to 5
Dense	<10	Very Stiff	5 to 10
		Hard	<10

The moisture conditions of cohesionless and cohesive soils are defined as follows.

COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.

Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "DPT" value, and the water content of each sample obtained. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS = Split Spoon Sample	GS = Grab Sample
ST = Thin Walled Shelby Tube	CS = Channel Sample
AS = Auger Flight Sample	WS = Wash Sample

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Probe Test (DPT's) - The number of blows required to advance a 19 mm diameter steel bar into subsoil. The bar is driven with a 8 kg hammer free falling 150 mm into the subsoil. The test shall be terminated when greater than 10 blows per 150mm of surface penetration is recorded.

Water Content -The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

WP - -Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

WL - -Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

BOREHOLE NO. BH15-1

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
BOREHOLE TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 123.9 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	"DPT" VALUE 10 20 30	WATER CONTENT % 10 20 30 (W_P W_L)	REMARKS
0.0	ASPHALT - 190mm:										
0.2	FILL: BROWN SAND AND GRAVEL, TRACE TO SOME SILT, MOIST, COMPACT			GS1	9						GSA GS1: Gravel: 48% Sand: 43% Silt: 9%
				GS2	6						
0.5	CLAYEY SILT: BROWN SILT TO CLAYEY SILT, TRACE TO SOME SAND, TRACE GRAVEL, APL, STIFF-HARD TO HARD			GS3	10						
				GS4	11						
1.0				GS5	12						
				GS6	17						
				GS7	17						
1.3	BOREHOLE TERMINATED AT 1.3 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-2

PROJECT NAME: WARKWORTH INSTITUTION

PROJECT NO.: 141-14303-04

CLIENT: PWGSC

DATE COMPLETED: Nov 10, 2015

TEST PIT TYPE: 168 mm SOLID STEM AUGER

SUPERVISOR: IAA

GROUND ELEVATION: 124.3 mASL

REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P W_L)	REMARKS
0.0	ASPHALT - 175mm :										
0.2	FILL: BROWN SAND AND GRAVEL, TRACE SILT, MOIST, DENSE			GS1	14						
				GS2	22						
0.5	CLAYEY SILT FILL: GREY TO DARK BROWN CLAYEY SILT (INFERRED FILL), SOME SAND, APL, HARD			GS3	15						
				GS4	13						
				GS5	13						
0.9	CLAYEY SILT: GREY TO DARK BROWN SANDY CLAYEY SILT, APL, HARD			GS6	13						DARK BROWN ORGANIC-RICH LAYER
1.2	BOREHOLE TERMINATED AT 1.2 m BELOW GROUND SURFACE IN CLAYEY SILT.			GS7	16						BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
1.0											
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-3

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 124.4 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0.0											
0.1	ASPHALT - 50mm:										
	FILL: LIGHT BROWN SANDY GRAVEL, SOME SILT, MOIST, DENSE TO COMPACT			GS1	12						
				GS2	14						
				GS3	9						GSA GS3: Gravel: 55% Sand: 33% Silt: 12%
				GS4	12						
					10						
0.9					11						
1.0	CLAYEY SILT: GREY SILT TO CLAYEY SILT, SOME SAND, APL, STIFF-HARD TO HARD			GS5	10						
				GS6	13						
				GS7	13						
1.4	BOREHOLE TERMINATED AT 1.4 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-4

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 124.6 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0.0	ASPHALT - 165mm:										
0.2	FILL: BROWN SAND AND GRAVEL, SOME SILT, MOIST, COMPACT TO HARD			GS1	6				44		GSA GS1: Gravel: 44% Sand: 36% Silt: 20%
				GS2	26						
				GS3	23						
					21						
0.8	SILT: BROWN SILT, SOME CLAY, SOME SAND, TRACE GRAVEL, APL, HARD			GS4	24				46		
1.0					22						
				GS5	20						GSA GS5: Gravel: 1% Sand: 17% Silt: 64% Clay: 18%
1.5	BOREHOLE TERMINATED AT 1.5 m BELOW GROUND SURFACE IN SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-5

PROJECT NAME: WARKWORTH INSTITUTION

PROJECT NO.: 141-14303-04

CLIENT: PWGSC

DATE COMPLETED: Nov 10, 2015

TEST PIT TYPE: 168 mm SOLID STEM AUGER

SUPERVISOR: IAA

GROUND ELEVATION: 125.4 mASL

REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0.0	ASPHALT - 150mm:										
0.2	FILL: LIGHT BROWN SAND AND GRAVEL, SOME SILT, MOIST, COMPACT TO DENSE			GS1 GS2 GS3	6 50/ 125mm				50		
1.0											
1.1	CLAYEY SILT: BROWN SILT TO CLAYEY SILT, TRACE TO SOME SAND, TRACE GRAVEL, APL			GS4 GS5							
1.5	BOREHOLE TERMINATED AT 1.5 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-6

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 125.7 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE / SHEAR STRENGTH	WATER CONTENT % (W_P – W_L)	REMARKS
0.0	ASPHALT - 200mm:										
0.2	FILL: LIGHT BROWN SAND AND GRAVEL, SOME SILT, MOIST, DENSE			GS1	20						
				GS2	50/ 125mm				50		
0.5	CLAYEY SILT: BROWN SILT TO CLAYEY SILT, SOME SAND, TRACE GRAVEL, APL										
1.0											
				GS3							
1.6	BOREHOLE TERMINATED AT 1.6 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-7

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 125.6 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE (10 20 30) / SHEAR STRENGTH	WATER CONTENT % (10 20 30) W_P W_L	REMARKS
0.0	ASPHALT - 100mm:										
0.1	FILL: LIGHT BROWN SAND AND GRAVEL, SOME SILT, MOIST, DENSE			GS1	21						GSA GS1: Gravel: 47% Sand: 40% Silt: 13%
0.3	CLAYEY SILT FILL: BROWN CLAYEY SILT (INFERRED FILL), SOME SAND, TRACE GRAVEL, APL, HARD				35						
				GS2	50/ 125mm				50		
0.9	CLAYEY SILT: GREY CLAYEY SILT, SOME SAND, TRACE GRAVEL, APL										DARK BROWN ORGANIC-RICH LAYER
1.0				GS3							
1.5	BOREHOLE TERMINATED AT 1.5 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-8

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 124.8 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P W_L)	REMARKS
0.0	ASPHALT - 175mm :										
0.2	FILL: LIGHT BROWN SANDY GRAVEL, SOME SILT, MOIST, COMPACT TO DENSE				10						
					10						
					11						
0.6	CLAYEY SILT: BROWN CLAYEY SILT, SOME SAND, TRACE GRAVEL, APL, HARD				12						
1.0				GS1	11						
					16						
					16						
				GS2	18						
1.6	BOREHOLE TERMINATED AT 1.6 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-9

PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 124.7 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P W_L)	REMARKS
0.0	ASPHALT - 165mm:										
0.2	FILL: LIGHT BROWN SANDY GRAVEL, SOME SILT, MOIST, COMPACT										
0.3	CLAYEY SILT: BROWN SILT TO CLAYEY SILT, SOME SAND, TRACE GRAVEL, APL, STIFF-HARD TO HARD										
					9						
					10						
					10						
				GS1	11						
1.0					13						
					13						
					14						
				GS2	15						
1.5	BOREHOLE TERMINATED AT 1.5 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

TEST PIT NO. BH15-10

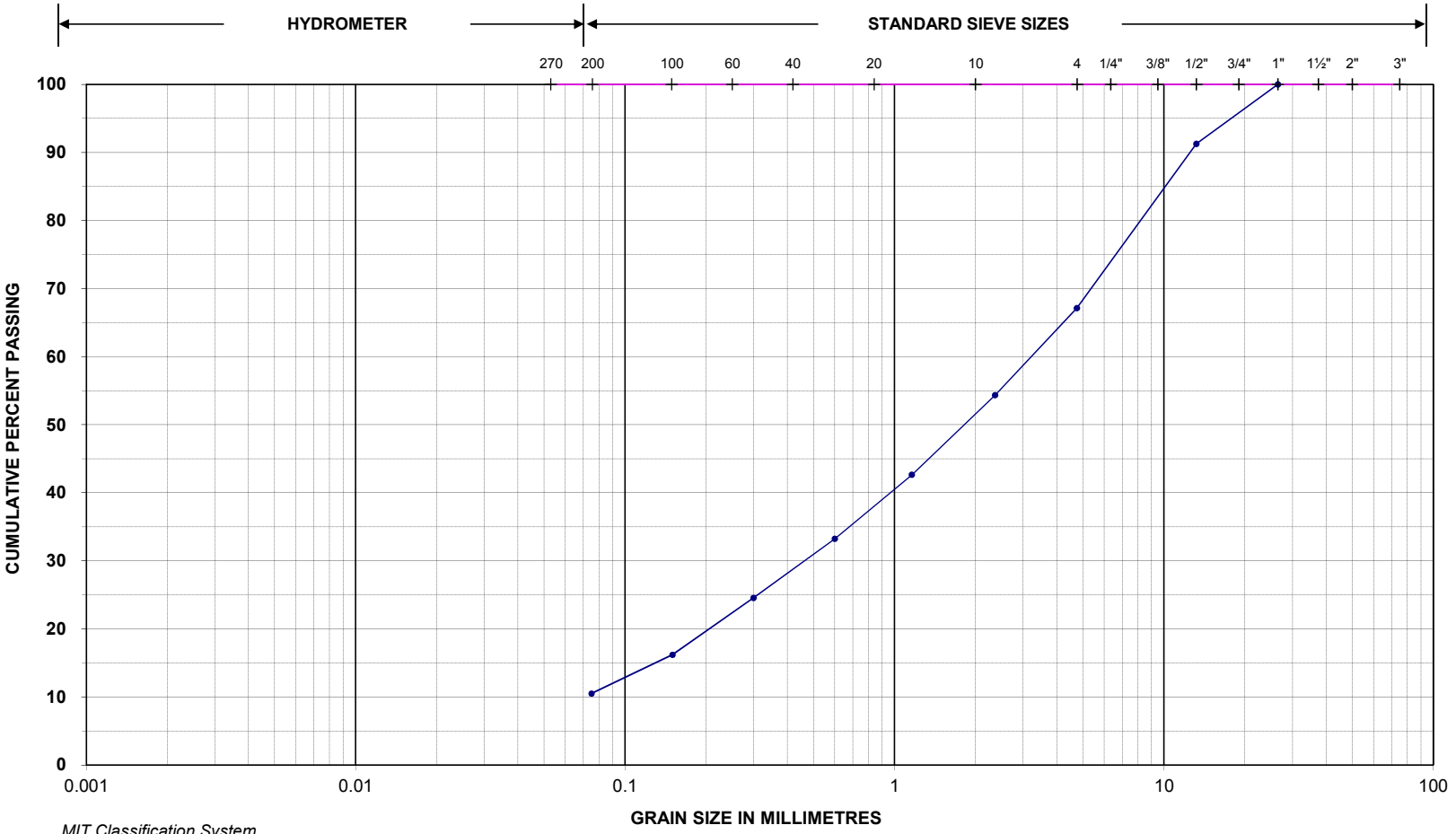
PROJECT NAME: WARKWORTH INSTITUTION
PROJECT NO.: 141-14303-04
CLIENT: PWGSC
DATE COMPLETED: Nov 10, 2015
TEST PIT TYPE: 168 mm SOLID STEM AUGER
SUPERVISOR: IAA
GROUND ELEVATION: 124.6 mASL
REVIEWER: AY

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE DPT VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE PID (ppm)	CONE PENETRATION "DPT" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / W_P W_L	REMARKS
0.0	ASPHALT - 175mm :										
0.2	FILL: LIGHT BROWN GRAVEL AND SAND, TRACE TO SOME SILT, MOIST										
0.3	CLAYEY SILT: BROWN SILT TO CLAYEY SILT, SOME SAND, TRACE GRAVEL, APL			GS1							GSA GS1: Gravel: 53% Sand: 32% Silt: 15% DARK BROWN ORGANIC-RICH LAYER
1.0											
1.6	BOREHOLE TERMINATED AT 1.6 m BELOW GROUND SURFACE IN CLAYEY SILT.										BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING
2.0											
3.0											
4.0											
5.0											

Appendix B

GEOTECHNICAL LABORATORY TEST RESULTS

PARTICLE SIZE DISTRIBUTION



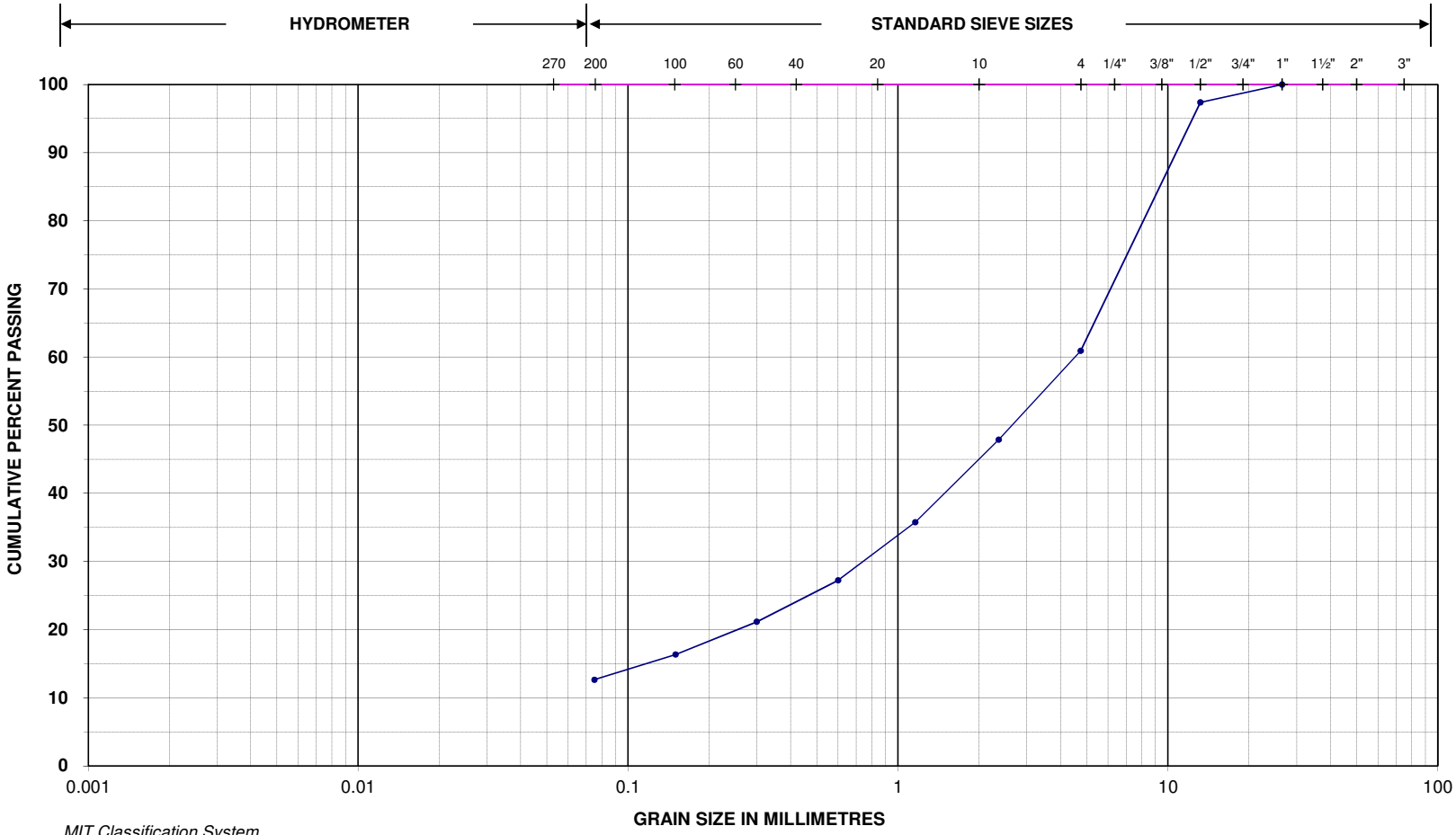
MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Institute - Parking Lot Upgrades
Project No.: 141-14303-04
Location ID.: BH15-1
Sample No./Depth: AS1

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine
37.5 mm	100.0	**1.16 mm**	42.6
26.5 mm	100.0	**0.60 mm**	33.2
13.2 mm	91.3	**0.30 mm**	24.6
4.75 mm	67.1	**0.15 mm**	16.2
2.36 mm	54.3	**0.075 mm**	10.5

PARTICLE SIZE DISTRIBUTION



MIT Classification System

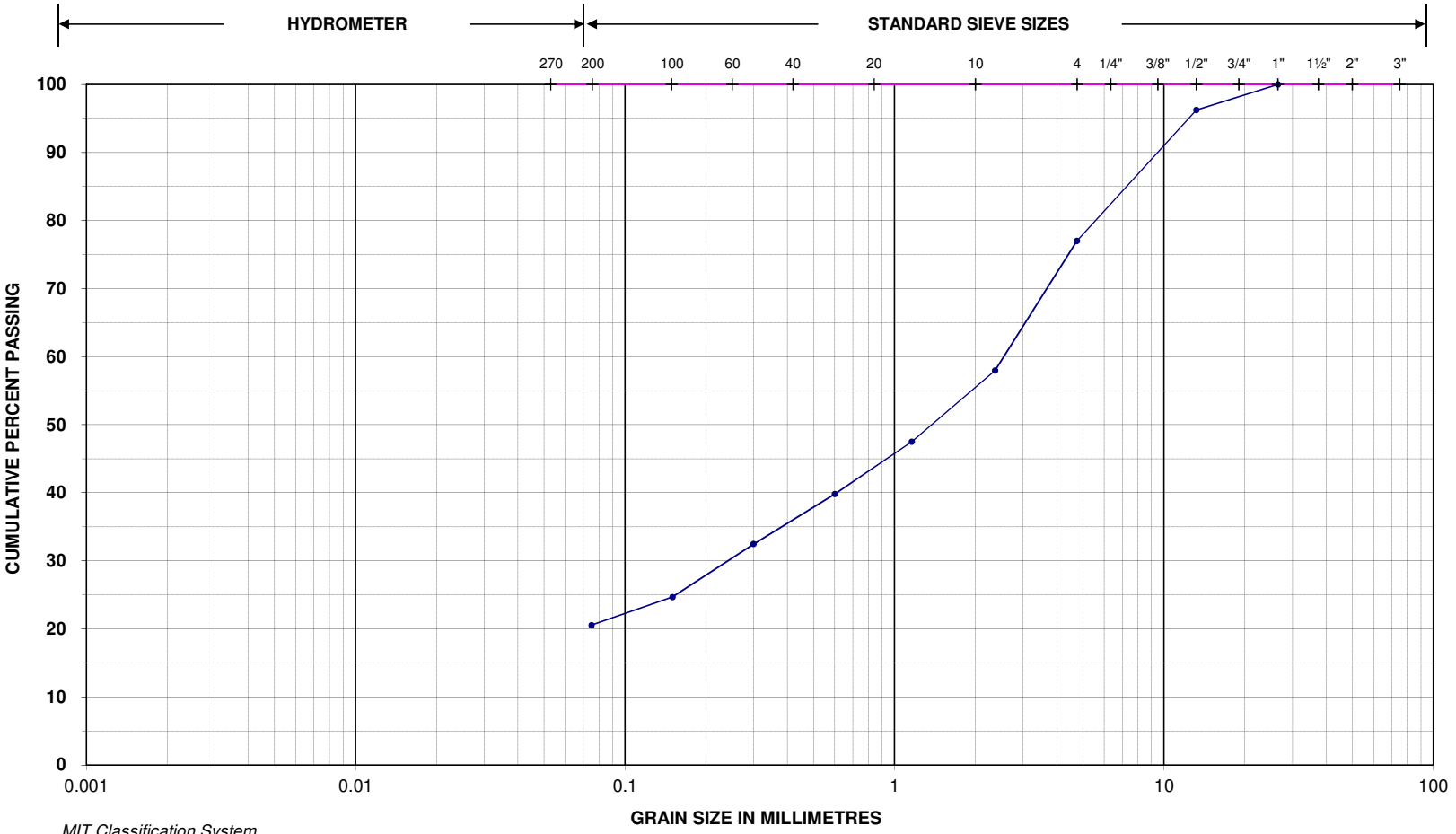
CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Institute - Parking Lot Upgrades **Project No.:** 141-14303-04

Location ID.: BH15-3 **Sample No./Depth:** AS3

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine
37.5 mm	100.0	**1.16 mm**	35.8
26.5 mm	100.0	**0.60 mm**	27.2
13.2 mm	97.4	**0.30 mm**	21.2
4.75 mm	60.9	**0.15 mm**	16.3
2.36 mm	47.9	**0.075 mm**	12.7

PARTICLE SIZE DISTRIBUTION



MIT Classification System

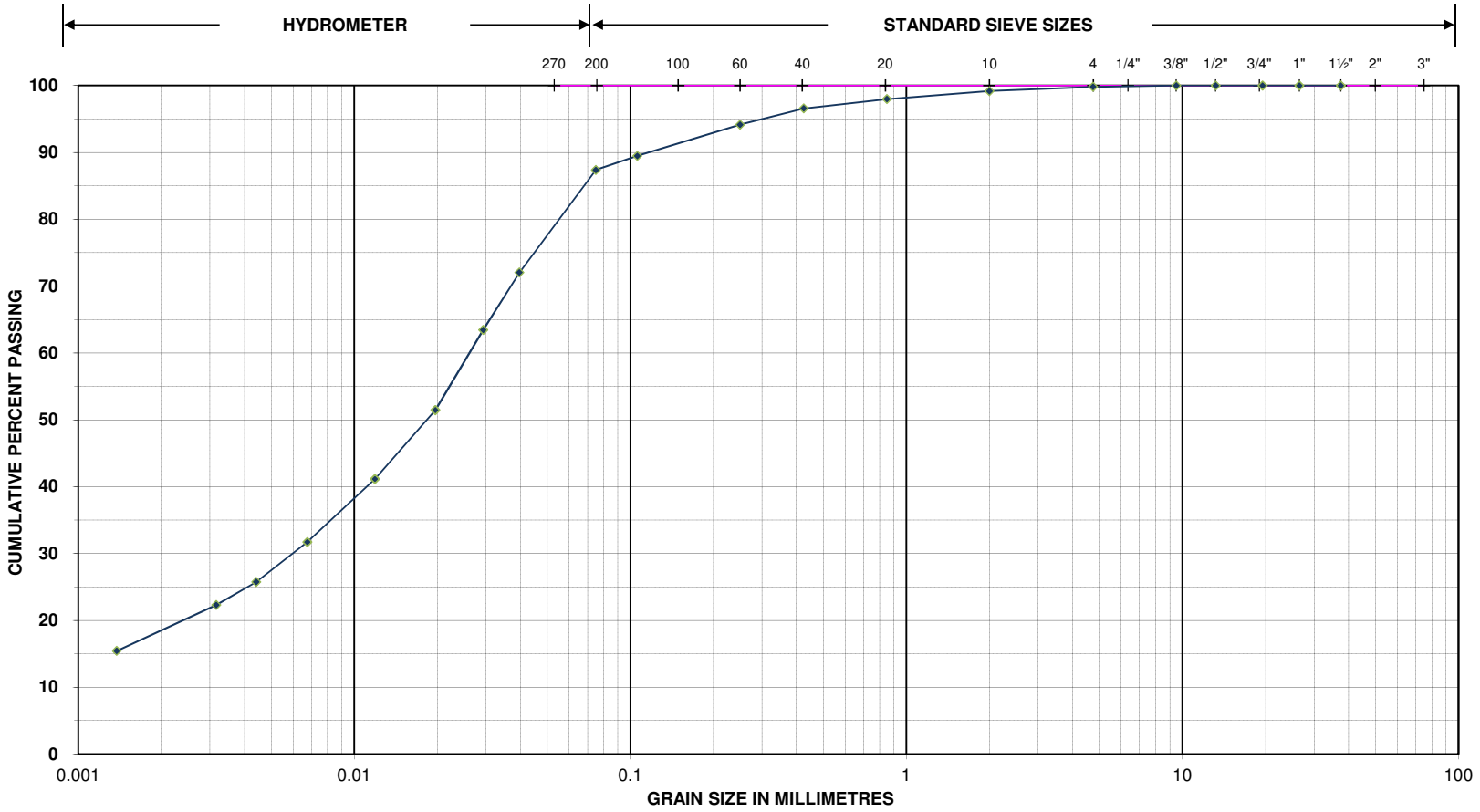
CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Intstitute - Parking Lot Upgrades **Project No.:** 141-14303-04

Location ID.: BH15-4 **Sample No./Depth:** AS1

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine
37.5 mm	100.0	**1.16 mm**	47.5
26.5 mm	100.0	**0.60 mm**	39.8
13.2 mm	96.2	**0.30 mm**	32.5
4.75 mm	77.0	**0.15 mm**	24.7
2.36 mm	58.0	**0.075 mm**	20.5

PARTICLE SIZE DISTRIBUTION ASTM D422



MIT Classification System

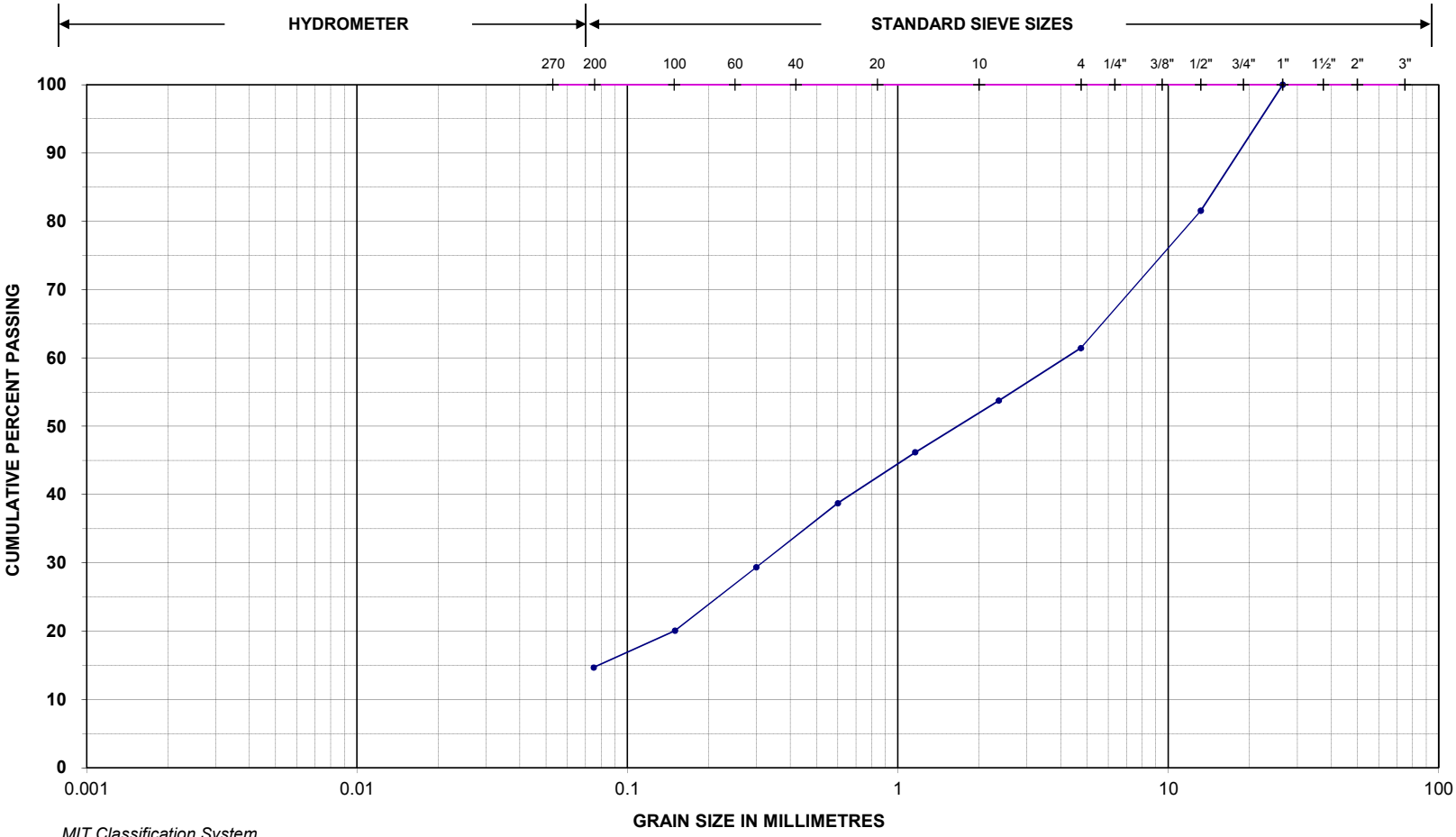
CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Institute - Parking Lot Upgrades **Project No.:** 141-14303-04

Location ID.: BH15-4 **Sample No./Depth:** AS5

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	98.0	**0.040**	72.0
13.2 mm	100.0	**0.425 mm**	96.6	**0.020**	51.5
9.50 mm	100.0	**0.250 mm**	94.2	**0.007**	31.7
4.75 mm	99.8	**0.106 mm**	89.5	**0.003**	22.3
2.00 mm	99.2	**0.075 mm**	87.4	**0.001**	15.4

PARTICLE SIZE DISTRIBUTION



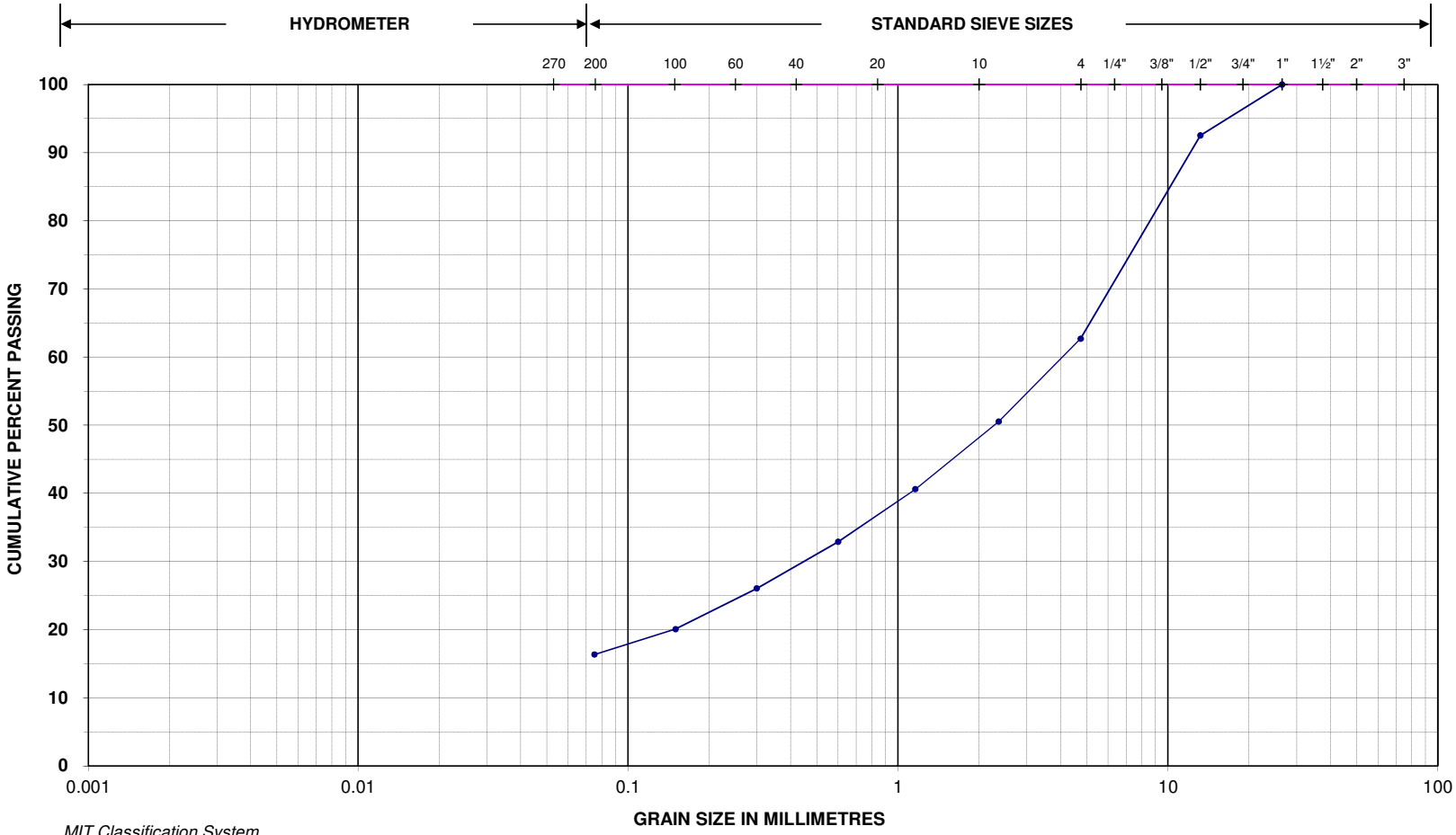
MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Institute - Parking Lot Upgrades
Project No.: 141-14303-04
Location ID.: BH15-7
Sample No./Depth: AS1

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine
37.5 mm	100.0	**1.16 mm**	46.2
26.5 mm	100.0	**0.60 mm**	38.7
13.2 mm	81.6	**0.30 mm**	29.4
4.75 mm	61.4	**0.15 mm**	20.1
2.36 mm	53.7	**0.075 mm**	14.7

PARTICLE SIZE DISTRIBUTION



MIT Classification System

CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	

Project Name: Warkworth Institute - Parking Lot Upgrades
Project No.: 141-14303-04
Location ID.: BH15-10
Sample No./Depth: AS1

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine
37.5 mm	100.0	**1.16 mm**	40.6
26.5 mm	100.0	**0.60 mm**	32.9
13.2 mm	92.5	**0.30 mm**	26.1
4.75 mm	62.7	**0.15 mm**	20.1
2.36 mm	50.5	**0.075 mm**	16.4