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July 24, 2002 Project No.: ONO11565

Mr. Shawn E. Dolan, P.Eng.
J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, Ontario K1Z 5M2

Dear Mr. Dolan:

Re: OC Transpo Parking Area Improvements

This letter presents the findings of our geotechnical investigation carried out for the proposed improvements to the parking area west of the North Garage at the OC Transpo facility located at the northwest corner of St. Laurent Blvd. and Belfast Road, in Ottawa Ontario.

A previous investigation was carried out by Jacques, Whitford and Associates Limited (JWA) in November 2001 (JWA Report No. ONO11483 dated November 12, 2001) to upgrade the existing parking lot to an asphalt parking area. Since 2001, the proposed scope of the upgrade has been expanded to include new access roads to the parking area. The present report updates the November 12, 2002, report to include additional field work carried out and recommendations related to the proposed access roads.

Background

The existing parking area is a gravel surface with no storm sewer drainage system. The area is used to store buses, including buses requiring repair. The improvement to this area is to construct access roads and enlarge and pave the parking area.

Methodology

The methodology is summarized in the following points:

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- A total of 12 test pits were marked on site on July 4, 2002, at locations in the proposed access lanes, existing gravel area and proposed new area. The test locations were established to compliment previous test locations investigated by JWA.
- Underground utility clearances at the test pit locations were obtained prior to digging.
- The test pits were excavated to varying depths of between 1.1 m to 2.9 m on July 10, 2002. The excavations extended through the fill to the underlying native subsoil. Samples of the soil were collected and returned to the JWA laboratory for analysis. All test pits were backfilled with the excavated material and tamped with the bucket.
- Selected soil samples were tested for moisture content and grain size distribution. Testing included a full sieve analysis on a composite sample of the existing gravel surface.
- The ground surface elevation at each test pit location was surveyed relative to the top of the floor slab of the north garage. The top of the floor slab is identified in the base plan has having a geodetic elevation of 69.26 m.

Details on the methodology of the November 2001 investigation are summarized in JWA Report No. ONO11483.

Investigation Results

The soil stratigraphy identified in the test pits is described on the attached test pit records. The test pit locations are shown on the Test Pit Location Plan, Drawing No. ONO11565-2.

JWA has carried out borehole investigations at this site in the past, last fall and prior to construction of the existing parking area. The locations of the relevant boreholes and test pits are shown on the Test Pit Location Plan and the respective borehole and test pit records are attached.

Existing Gravel Area:

The results of our investigations indicate that the average thickness of the existing gravel is approximately 325 mm and is in a dense state. Underlying the gravel surface material is a layer of fill consisting of compact dark grey sandy silt with some gravel, occasional cobbles. This fill extends to a depth of approximately 900 mm below the existing grades and appears to have been moved from another location within the site. The underlying till deposit consists of dark grey sandy silt, some gravel, occasional cobbles.

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Wooded Area for Access Road and Expanded Parking Area

Seven test pits were carried out in the wooded area, which had been cleared of trees and shrubs. Four test pits were located in the access road and three were dug in the area immediately west of the existing, fenced parking area. The results of our investigation of these test pits revealed that due to the rough grading left by the tree clearing equipment, the topsoil varied in thickness from 100 to 350 mm. Below the topsoil layer was a thin layer of light brown silty sand. Underlying this layer was the dense to very dense dark grey sandy silt, some gravel, occasional cobbles, till.

Groundwater was noticed in only a few test pits, Test Pits 02-2, 02-4, and 02-6. In these test pits, the groundwater was seeping in from the light brown sand layer near the surface. Generally the water was seeping in at a depth of 660 to 700 mm below the existing surface, with the exception of Test Pit 02-6, in which the water was seeping in at a depth of 1.12 m. Only Test Pit 02-2 had any accumulation of water in the bottom of the test pit. This accumulation amounted to approximately 50 mm in ¼ of the bottom area. Regardless of the water seepage, the sides of the excavation remained stable.

Drainage Ditch

The investigation included determining the type of material that is present along the sides and at the bottom of the drainage ditch. This was done near Test Pit 02-1, located at the start of the access road, north of the existing parking lot. The sides of the ditch had no topsoil on the east side and 75 mm on the west side. Below this topsoil was the dense sandy silt till. The bottom of the ditch was dug to determine the extent of the silt or sediment build up. The investigation found that there was approximately 300 mm of silt along the bottom of the ditch.

Geotechnical Recommendations

The results of investigation for the 12 test pits excavated in July 2001 is consistent with the findings of our earlier investigation. The following new pavement structure design is recommended for the access roads and other areas requiring new pavement structures:

40 mm	OPSS HL-3
100 mm	OPSS HL-8 (2 lifts)
150 mm	OPSS Granular A
450 mm	OPSS Granular B, Type II

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In the area of the existing parking area that has the gravel surface, this design could be minimized by regrading and recompacting the existing granular surface and adding the following:

40 mm	OPSS HL-3
100 mm	OPSS HL-8 (2 lifts)
250 mm	OPSS Granular 'A'

Due to the proposed use as a parking area for transit buses, it is recommended that a PG 64-34 asphalt cement be used for this project. This grade of asphalt will assist in reducing the development of ruts due to the heavy loading from the buses in hot temperatures.

All granular materials should be in conformance with the Ontario Provincial Standards Specifications (OPSS) Form 1010 for select granular material. The materials should be tested and approved by a geotechnical engineer prior to delivery to the site and should be compacted to at least 100% Standard Proctor Maximum Dry Density.

Prior to placing pavement granulars or subgrade fill, all organic material should be stripped from the surface. Stripping work should be inspected prior to placement of overlaying materials.

After stripping, the exposed subgrade surface should be proof-rolled using a large vibratory roller to locate any soft spots, if present. If soft spots are present, they should be subexcavated up to a maximum depth of 500 mm and replaced with compacted OPSS Earth Borrow or OPSS Select Subgrade Material (SSM). Where subexcavation is required within 1.2 m ~~of~~ ~~top~~ of finished pavement surface, 3H:1V transitions or frost tapers should be provided between the native soils and the backfill material. Where the proposed pavement is to tie-in or abutt to existing pavements, the following is recommended:

- Transitions at the subgrade line should be tapered at 10H:1V
- The upper lift of the hot mix material should be stepped into the existing pavement, by milling a 40 mm deep and 300 mm wide strip within the existing hot mix, beyond the edge of pavement.

Where required, subgrade fill may consist of either OPSS SSM or OPSS Earth Borrow. Since limited grade changes are proposed, it is recommended that Earth Borrow be restricted to site generated material. It is noted that the site material has a high silt content and may become difficult to compact under wet conditions. Both SSM and Earth Borrow must be compacted to 95% of Standard Proctor Maximum Dry Density.

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A sample of the existing granular material was obtained and tested against the OPSS gradation requirements. The test results indicate that the material met the gradation requirements for OPSS granular 'B' Type II material. This material is suitable to be re-used as granular 'B' material.

Trench Backfill

It is understood that the majority of the drainage will be in the form of surface sheet drainage. However if shallow storm sewers are installed to assist in the drainage, the trenches located in landscaped areas can be backfilled using the native till, provided adequate compaction is provided. Granular backfill (i.e. sand or Granular 'B' Type I) is recommended where the service trenches are below paved areas. The contractor should provide enough water and compactive effort to adequately compact the material. All backfill material should be tested in our laboratory prior to use to ensure the material is acceptable.

The bedding for the sewers and other utilities should be placed in accordance with pipe design requirements. It is recommended that a minimum of 150 mm of OPSS Granular 'A' material be placed below the pipe invert. A minimum of 300 mm vertical and side cover should be provided. These materials should be placed in lifts and compacted to 95% SPMDD.

Culvert Crossing

It is anticipated that the culvert design will be in accordance with one of the OPSD 800 series drawings. As part of the culvert design the following should be considered:

- The sediment build up within the ditch is estimated to be 300 mm deep and should be removed prior to installation of the culvert.
- Bedding should consist of Granular A or Granular B, Type I.
- A frost penetration depth , f, of 1.8 m should be used in design.

Drainage

It is assumed that standard ditching, with a ditch invert at least 300 mm below the bottom of pavement granulars will be provided to direct surface water to an appropriate outlet .

Where new pavements are proposed, the subgrade should be directed towards the ditches at a minimum grade of 3 %.

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If ditches are not proposed for both the parking and access road areas, subdrain design should be considered.

Inspection and Testing

A per our earlier report, it is recommended that inspection and testing be carried out at all stages of construction. If the existing granulars are to be kept in place, qualified inspectors should be present during the compaction of this layer to ensure that there are not any soft spots in the underlying subgrade. It is noted that much of this area was previously wooded and contained localized wetland areas with organic deposits. Soft spots would be likely if all of the organic material was not removed prior to placement of the existing fill (no evidence of buried organic material was observed in the test pits). If any soft spots are identified, remedial measures such as sub-excavation of soft material and replacement with additional granulars may be required.

Resistivity, pH, Sulphate and Chloride Testing

The pH, resistivity and chloride concentration provided in the following table are from soil sample TP02-1, BS-5 and may be used in assessing the degree of sulphate attack that is expected for concrete in contact with soil and ground water.

Sample ID: TP02-1, BS-5

Parameter	Units	DL	Results
Chloride	µg/g	5.0	<5.0
pH	pH units	0.050	8.4
Sulphate	µg/g	5.0	130
Resistivity	Ohm-m	0.10	43

Note: DL is the lowest detection limit normally attainable by the laboratory. Samples requiring dilution may be reported as being less than an elevated detection limit.

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Closure

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete.

A soil investigation is a limited sampling of a site. The conclusions given herein are based on information gathered at the specific borehole locations and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction, and other activities. Should any conditions at the site be encountered which differ from those at the borehole locations, we request that we be notified immediately in order to assess the additional information and its effects on the above conclusions.

We trust the information presented herein meets your present requirements. Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

JACQUES, WHITFORD AND ASSOCIATES LIMITED

Dave Morris, CET

J. G. A. Raymond Haché, M.Sc., P.Eng.
Manager, Geotechnical and Material Engineering Services

P:\2002\10000\11565\Soils report for test pits - July 16.doc

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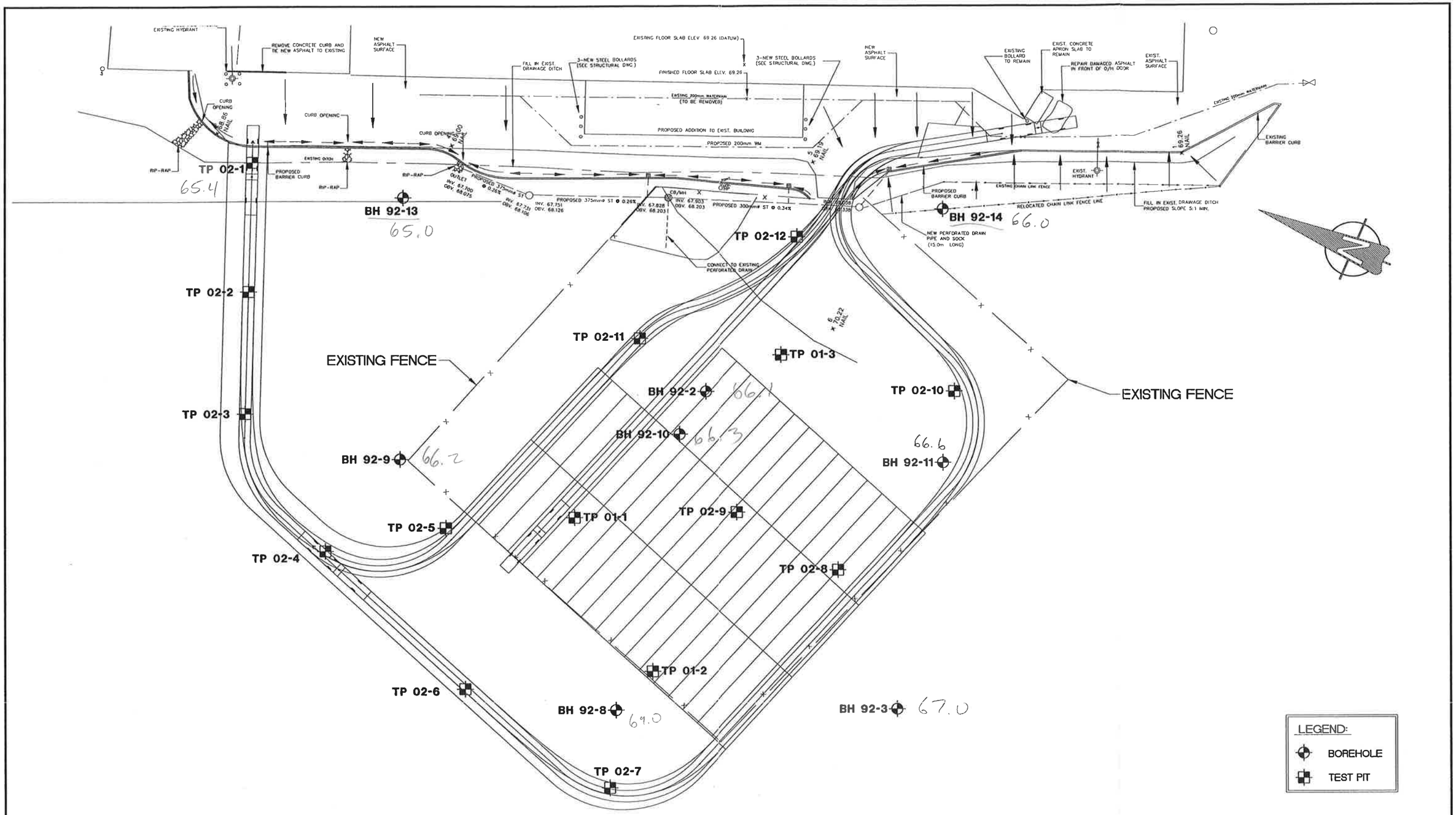
KEY PLAN

1 : 20 000

Reference : MapArt

DRAWING No. ONO11565-1



Jacques Whitford	REFERENCE : BASE PLAN PROVIDED BY J.L. RICHARDS AND ASSOCIATES LIMITED DWG. No. 16718-S1 DATED JUNE 1999 AND DWG. No. 17926 C OPT-1B-2 CAD14	SCALE : 1 : 750 DATE : 02/07/16 DWN. BY : GBB APP'D BY :	J.L. RICHARDS AND ASSOCIATES LIMITED GEOTECHNICAL INVESTIGATION OC TRANSPO PARKING AREA IMPROVEMENT OTTAWA, ONTARIO	TEST PIT LOCATION PLAN	DRAWING No.: ONO11565-2

11565-2

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Topsoil	-	mixture of soil and humus capable of supporting good vegetative growth
Peat	-	fibrous aggregate of visible and invisible fragments of decayed organic matter
Till	-	unstratified glacial deposit which may range from clay to boulders
Fill	-	any materials 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
Seam	-	2 mm to 75 mm
Parting	-	< 2 mm
Well Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	-	predominantly of one grain size

Terminology describing soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2488). The classification excludes particles larger than 76 mm (3 inches). This system provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

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

The standard terminology to describe cohesionless soils includes the compactness (formerly "relative density"), as determined by laboratory test or by the Standard Penetration Test 'N' - value.

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

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

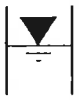
High - Weathering extends throughout rock mass. Rock is friable.

STRATA PLOT

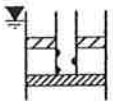
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols:

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

WATER LEVEL MEASUREMENT



Borehole or Standpipe



Piezometer

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond drilling bits.

N - VALUE

Numbers in this column are the results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. 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).

OTHER TESTS

S	Sieve analysis
G_s	Specific gravity of soil particles
k	Permeability (cm/sec)
	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
H	Hydrometer analysis
ã	Unit weight
C	Consolidation
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct shear
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$; the index corrected to a reference diameter of 50 mm)

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TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-1

LOCATION OC Transpo, Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	68.35							
	68.1	200 mm TOPSOIL						
		Compact, dark grey sandy silt, some gravel, trace rootlets: TILL			BS	1	---	---
	67.7	Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL						
1								
2								
	65.4			▼				
3		End of Test Pit Refusal on Bedrock (Grey shale)						
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWL-GLD 1156... JWEL.GPJ ...07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT: J.L. Richards & Associates Limited

LOCATION: OC Transpo. Parking Lot Expansion, Ottawa, Ontario

DATES: BORING 02-07-10 WATER LEVEL 02-07-10

BOREHOLE No. TP02-2

PROJECT No. ONO11565

DATUM: Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm)	SAMPLES: N-VALUE OR RQD
0	68.74							
	68.5	200 mm TOPSOIL						
	68.0	Compact, brown sand, some silt, trace organics: FILL			BS	1	---	---
1	67.5	Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL		▼	BS	2	---	---
		End of Test Pit						
2								
3								
4								
5								

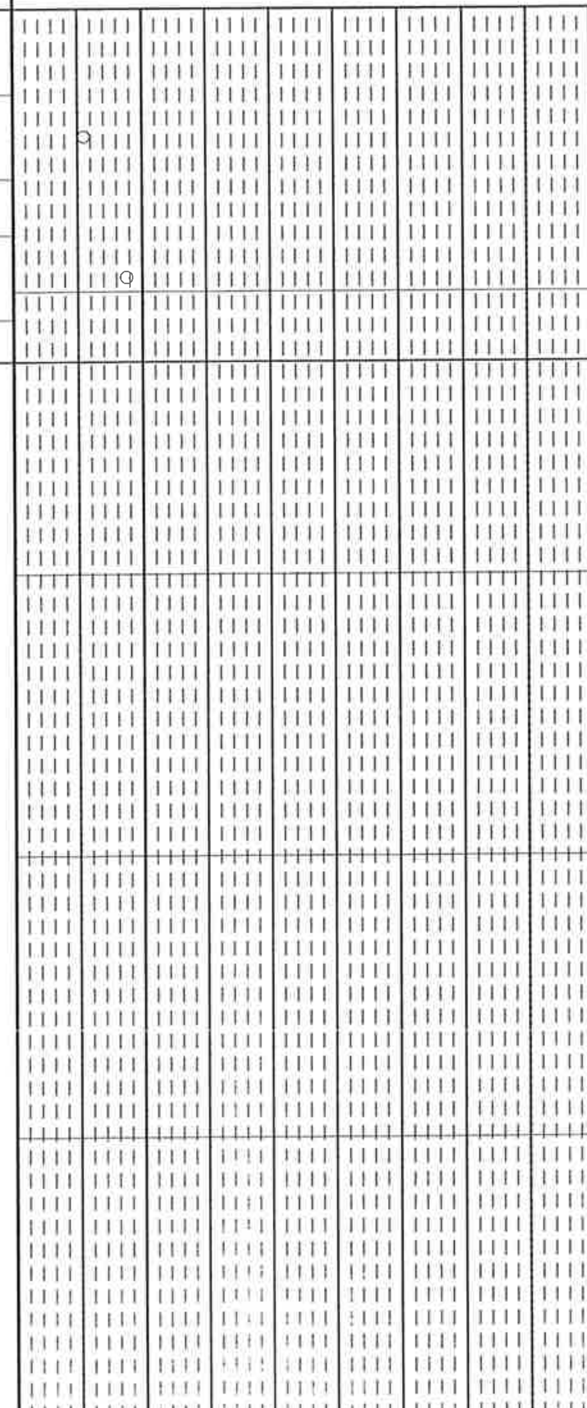
UNDRAINED SHEAR STRENGTH - kPa: 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P — W — W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m: ★

STANDARD PENETRATION TEST, BLOWS/0.3m: ●

10 20 30 40 50 60 70 80 90



▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-3

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	68.70							
	68.6	100 mm TOPSOIL						
		Compact, light brown sandy silt, trace rootlets: FILL			BS	1	---	---
	67.9							
1		Very dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	2	---	---
	67.5							
		End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

⬚ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWEL-VLD 1156.GPJ JWEL.GDT 18/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-4

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	69.66							
	69.6	100 mm TOPSOIL						
		Compact, light brown sandy silt, trace rootlets: FILL			BS	1	---	---
	69.0			▼				
		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	2	---	---
1	68.5				BS	3	---	---
		Very dense, dark grey sandy silt, some gravel: TILL						
	68.2							
		End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWL-GLB 1156...GPJ JWEL.GDT ...07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-5

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 — WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.56							
	70.3	250 mm TOPSOIL, wood fragments						
		Compact, dark grey sandy silt: FILL			BS	1	---	---
	69.8							
1		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	2	---	---
	69.5							
		End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

W_P W W_L

WATER CONTENT & ATTERBERG LIMITS

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

ONO 1156.GPJ JWELL.GDT 10/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-6

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.42							
	70.1	300 mm TOPSOIL			BS	1	---	---
	69.8	Loose, brown sandy silt, trace rootlets: FILL			BS	2	---	---
1		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL		▼	BS	3	---	---
					BS	4	---	---
2	68.1				BS	5	---	---
		End of Test Pit						
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWL-GLD 1156.GPJ JWEL.GDT 15/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-7

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	71.62							
	71.3	350 mm TOPSOIL						
		Compact, brown sandy silt, some gravel, occasional cobbles: FILL			BS	1	---	---
1	70.5							
		Compact, brown silty sand, some gravel, occasional cobbles: TILL			BS	2	---	---
					BS	3	---	---
	69.7							
2		Dense, dark grey sandy silt, some gravel, occasaional cobbles: TILL			BS	4	---	---
					BS	5	---	---
	69.0							
	68.8	Very dense, dark grey sandy silt, some gravel, occasaional cobbles: TILL						
3		End of Test Pit						
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWL-GLD 11565.GPJ JWEL.GDT 13/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-8

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	**70.32**							
	70.2	120 mm Sand and gravel: FILL						
		Crushed limestone: FILL						
	70.0	Dense, grey sandy silt, some gravel, occasional cobbles: TILL			BS	1	---	---
1	69.0	End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

▢ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JWL-GLD 11565.GPJ JWEL.GDT 19/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-9

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.26							
	70.1	200 mm Sand and gravel: FILL						
	69.8	Compact, dark grey silty sand, some gravel, occasional cobbles: TILL			BS	1	---	---
	69.7	Compact, light brown silty sand, some gravel, occasional cobbles: TILL			BS	2	---	---
1		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	3	---	---
	68.9	End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-10

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.12							
	70.0	100 mm Sand and gravel: FILL						
		Crushed limestone: FILL						
	69.8	Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	1	---	---
1	68.9	End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

▢ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

...GD 115... JWEL... ...J/07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP02-11

LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario — PROJECT No. ONO11565

DATES: BORING 02-07-10 — WATER LEVEL 02-07-10 — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	69.97							
	69.9	75 mm Sand and gravel: FILL						
		Crushed limestone: FILL						
	69.6							
		Dense, brown silty sand, some gravel, occasional cobbles: FILL			BS	1	---	---
1	69.0							
		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	2	---	---
	68.3							
		End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

▯ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

07/02

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited
BOREHOLE No. TP02-12
LOCATION OC Transpo. Parking Lot Expansion, Ottawa, Ontario
PROJECT No. ONO11565
DATES: BORING 02-07-10 WATER LEVEL 02-07-10
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	69.82							
	69.8	50 mm Sand and gravel: FILL						
	69.6	Crushed limestone: FILL						
		Dense, dark grey sandy silt, some gravel, occasional cobbles: TILL			BS	1	---	---
1	68.7							
	68.6	Very dense, dark grey sandy silt, some gravel, occasional cobbles: TILL						
		End of Test Pit						
2								
3								
4								
5								

UNDRAINED SHEAR STRENGTH - kPa
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa
□ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP01-1

LOCATION OC Transpo Parking Area Improvement — PROJECT No. ONO11483

DATES: BORING 01 11 07 WATER LEVEL — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.06							
		360 mm gravel with sand: FILL			BS	1	---	---
	69.7	Brown sand and silt, some gravel, trace clay, occasional cobbles: FILL			BS	2	---	---
1	69.1	Dense, grey silt and sand, some gravel, some clay: TILL			BS	3	---	---
	68.6	End of Test Pit						
2								
3								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited — BOREHOLE No. TP01-2

LOCATION OC Transpo Parking Area Improvement — PROJECT No. ONO11483

DATES: BORING 01 11 07 — WATER LEVEL — DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	70.36							
		330 mm gravel with sand: FILL			BS	1	---	---
	70.0							
		Compact, brown sand and silt, some gravel, trace clay: FILL			BS	2	---	---
	69.5							
1		Dense, grey silt and sand, some gravel, occasional boulders: TILL			BS	3	---	---
	68.9							
		End of Test Pit Note: Water trapped within upper fill.						
2								
3								

UNDRAINED SHEAR STRENGTH - kPa

50 100 150 200

W_P W W_L

WATER CONTENT & ATTERBERG LIMITS

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level

▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD AND ASSOCIATES LIMITED

TEST PIT RECORD

CLIENT J.L. Richards & Associates Limited
LOCATION OC Transpo Parking Area Improvement
DATES: BORING 01 11 07 WATER LEVEL

BOREHOLE No. TP01-3
PROJECT No. ONO11483
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N-VALUE OR RQD
0	69.76							
		410 mm gravel with sand: FILL			BS	1	---	---
	69.3							
		Brown clayey silt, some sand, some gravel, occasional cobbles: FILL			BS	2	---	---
	68.9							
1		Dense, dark brown-grey silt and sand, some gravel: TILL			BS	3	---	---
	68.3							
		End of Test Pit						
2								
3								

UNDRAINED SHEAR STRENGTH - kPa
50 100 150 200
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80 90

A-

▽ Inferred Groundwater Level
▼ Groundwater Level Measured in Standpipe

□ Field Vane Test, kPa
□ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-2

CLIENT O.C. Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa

DATES: BORING 92-05-08 WATER LEVEL 92-05-22

PROJECT No. 10320

BOREHOLE No. 92-2

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD
0	72.29	Ground Surface						
		Loose, brown, silt and sand, trace gravel: FILL			SS	1	550	4
	71.4				SS	2	500	8
1					SS	3	600	28
2		Loose to dense, brown to dark grey, silt and sand, some gravel, occasional cobbles and boulders: TILL		▼	SS	4	600	26
3					SS	5	600	10
4								
5					SS	6	360	11
6	66.1				SS	7	125	50/125
		End of Borehole on Inferred Bedrock						
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

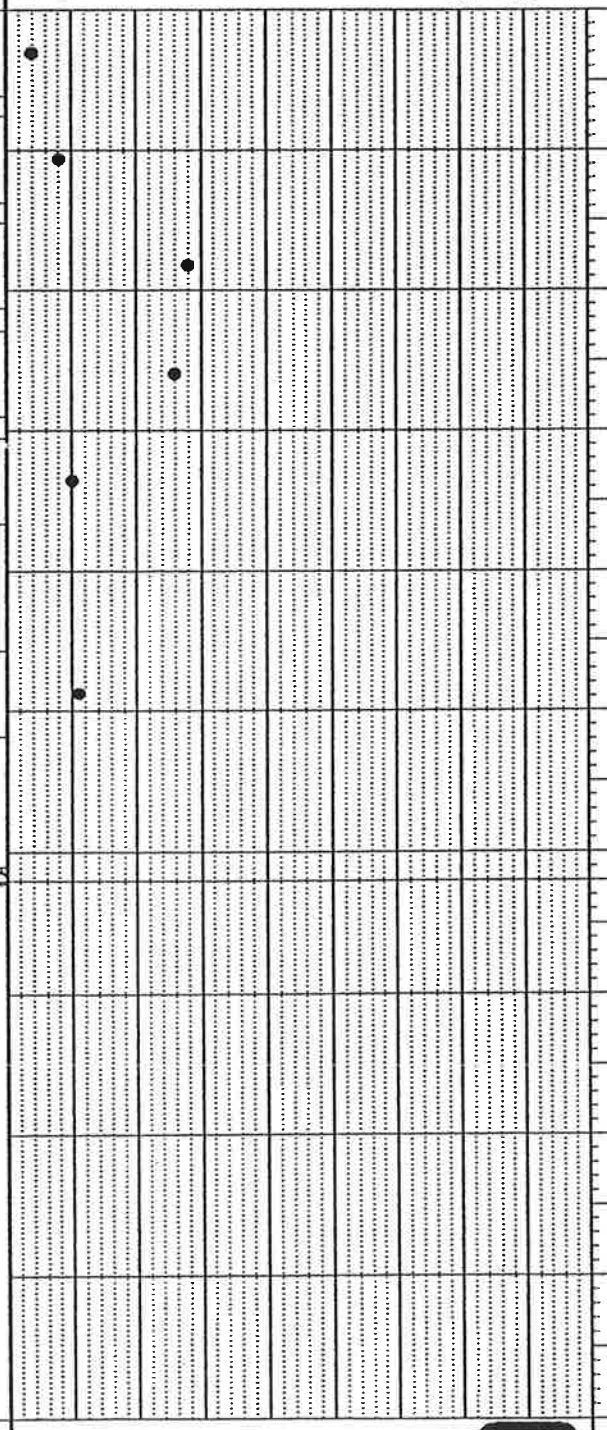
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m *

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-3

CLIENT O.C. Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa

DATES: BORING 92-05-08 WATER LEVEL 92-05-22

PROJECT No. 10320

BOREHOLE No. 92-3

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
0	72.19	Ground Surface						
0		Loose to compact, dark brown, silty sand, trace gravel, occasional cobbles and boulders: FILL			SS	1	500	10
1	71.1				SS	2	600	10
2		Compact to dense, dark brown to dark grey, silt and sand, some gravel, trace clay: TILL		▼	SS	3	550	24
2					SS	4	250	23
3					SS	5	275	12
4					SS	6	550	18
5	67.0				SS	7	550	82
5		End of Borehole on Inferred Bedrock						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

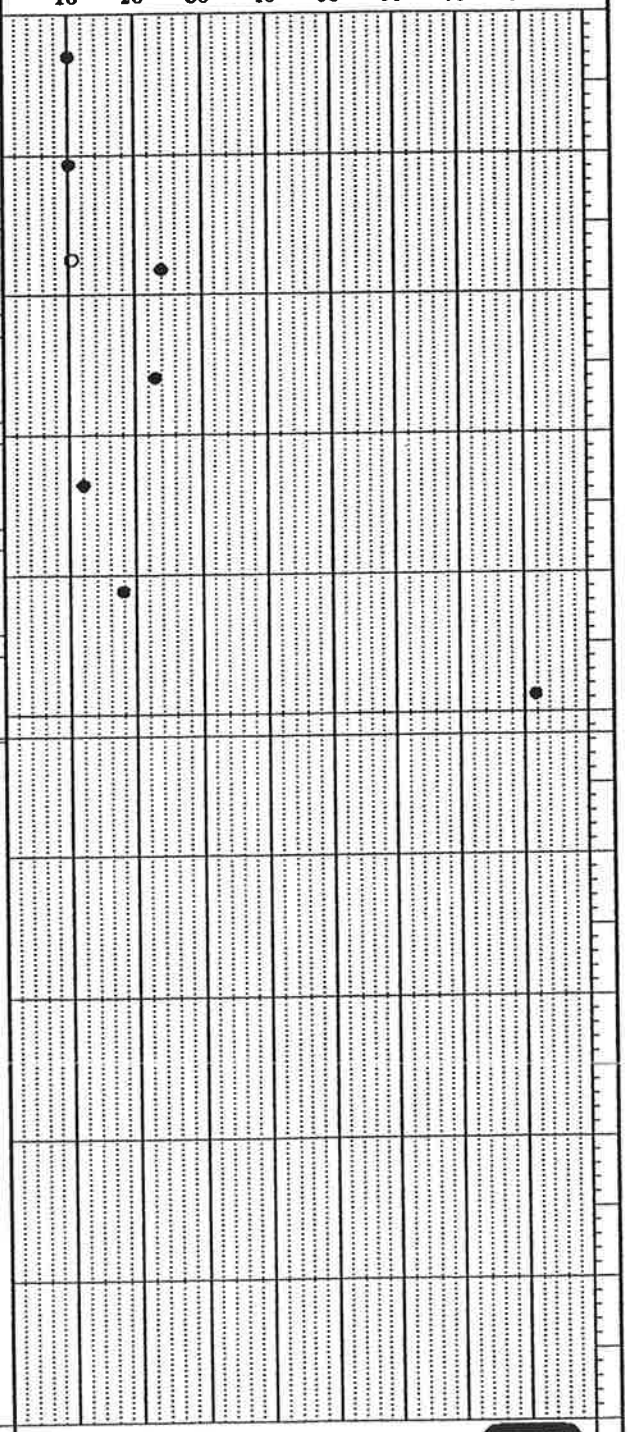
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



□ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-8

CLIENT Griffiths Rankin Cook Architects - OC Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

DATES: BORING 92-10-21 WATER LEVEL 92-11-04

PROJECT No. 10345

BOREHOLE No. 92-8

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
0	71.09	Cobbles, branches and trees @ surface						
	70.5	Loose, brown sand, some gravel, trace silty rootmat : FILL			SS	1	600	8
1		Dense, light brown to brown, silty sand, some gravel: TILL			SS	2	550	43
2	69.0				SS	3	500	32
		End of Borehole on Inferred Bedrock						
		Standpipe Dry						

UNDRAINED SHEAR STRENGTH - kPa

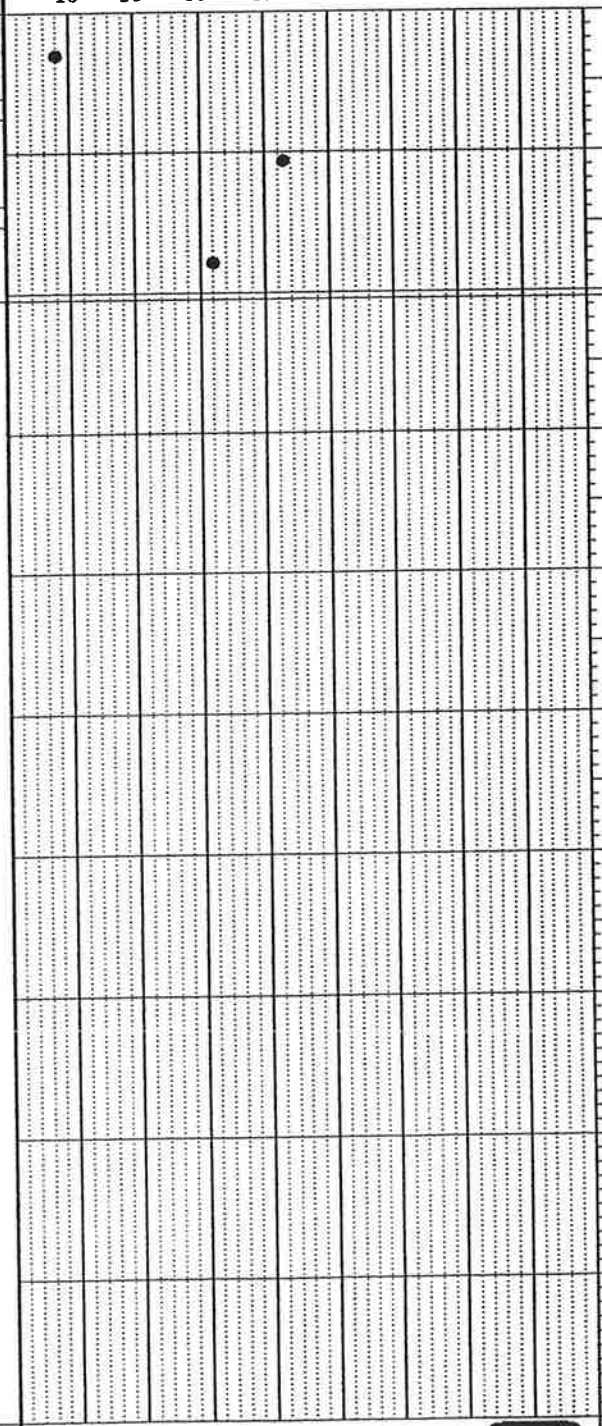
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



- ◘ Field Vane Test, kPa
- □ Remoulded Vane Test, kPa
- △ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-9

CLIENT Griffiths Rankin Cook Architects - OC Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

DATES: BORING 92-10-21 WATER LEVEL 92-11-04

PROJECT No. 10345

BOREHOLE No. 92-9

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
	69.12	Tall grass, brush and treed covered surface						
0	68.8	325 mm Dark brown, organic Topsoil & Rootmat			SS	1	325	10
1		Dense to compact, brown to grey silt and sand, some gravel, some clay : TILL		▼	SS	2	550	30
2					SS	3	600	49
	66.2				SS	4	500	17
3		End of Borehole on Inferred Bedrock						
4								
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

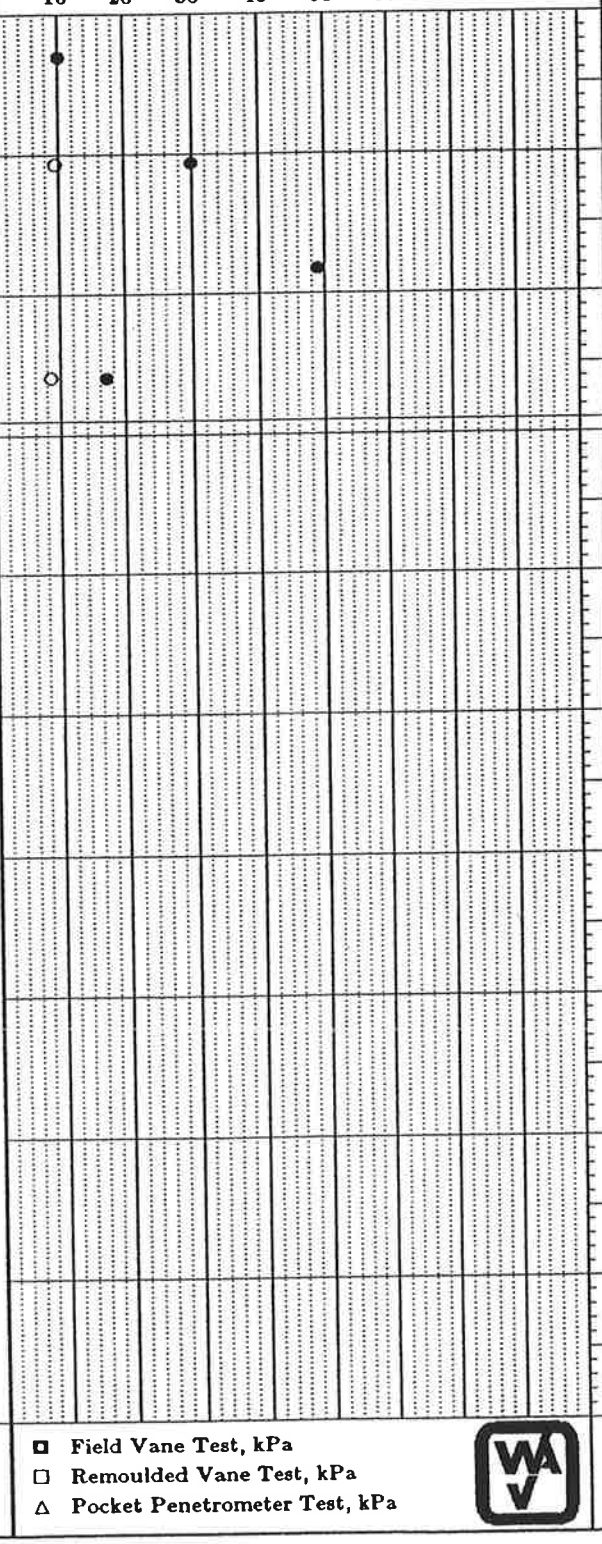
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-10

CLIENT Griffiths Rankin Cook Architects - OC Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

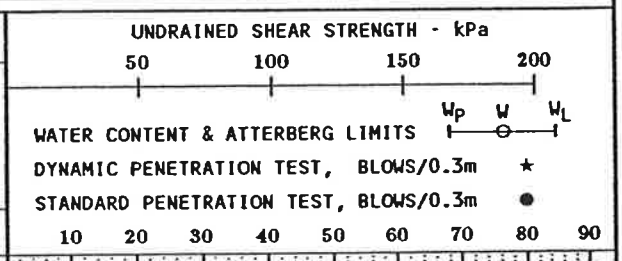
DATES: BORING 92-10-21 WATER LEVEL 92-11-04

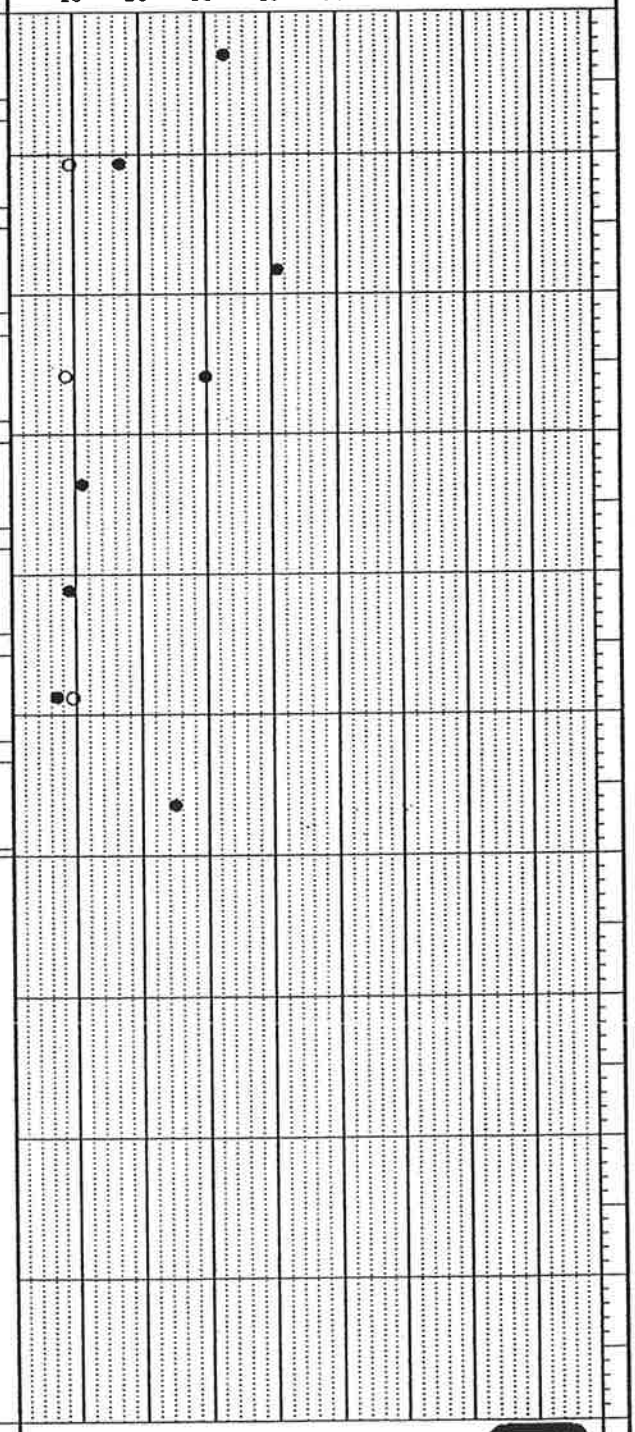
PROJECT No. 10345

BOREHOLE No. 92-10

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
	72.29	Brush & treed covered surface						
0	72.0	250 mm Loose, dark brown silty sandy rootmat			SS	1	200	33
1					SS	2	450	17
2					SS	3	500	41
		Dense to loose, brown to dark grey silty sand, some gravel, some clay : TILL			SS	4	600	30
3					SS	5	550	11
4					SS	6	450	9
5					SS	7	550	7
					SS	8	500	25
6	66.3	End of Borehole on Inferred Bedrock						
7								
8								
9								
10								





- Field Vane Test, kPa
- Remoulded Vane Test, kPa
- Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-11

CLIENT Griffiths Rankin Cook Architects - OC Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

DATES: BORING 92-10-21 WATER LEVEL -----

PROJECT No. 10345

BOREHOLE No. 92-11

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY mm	N-VALUE OR RQD
	71.61	Tall grass, brush & small treed surface						
0	71.5	100 mm silty sandy rootmat			SS	1	500	4
	71.0	Loose, dark brown to light brown SILTY SAND, trace gravel			SS	2	600	23
1					SS	3	600	26
2		Compact to loose, brown to grey silty sand, some gravel, trace clay : TILL			SS	4	600	12
3					SS	5	450	4
4					SS	6	600	9
					SS	7	450	55
5	66.6	-cobble						
		End of Borehole on Inferred Bedrock						
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

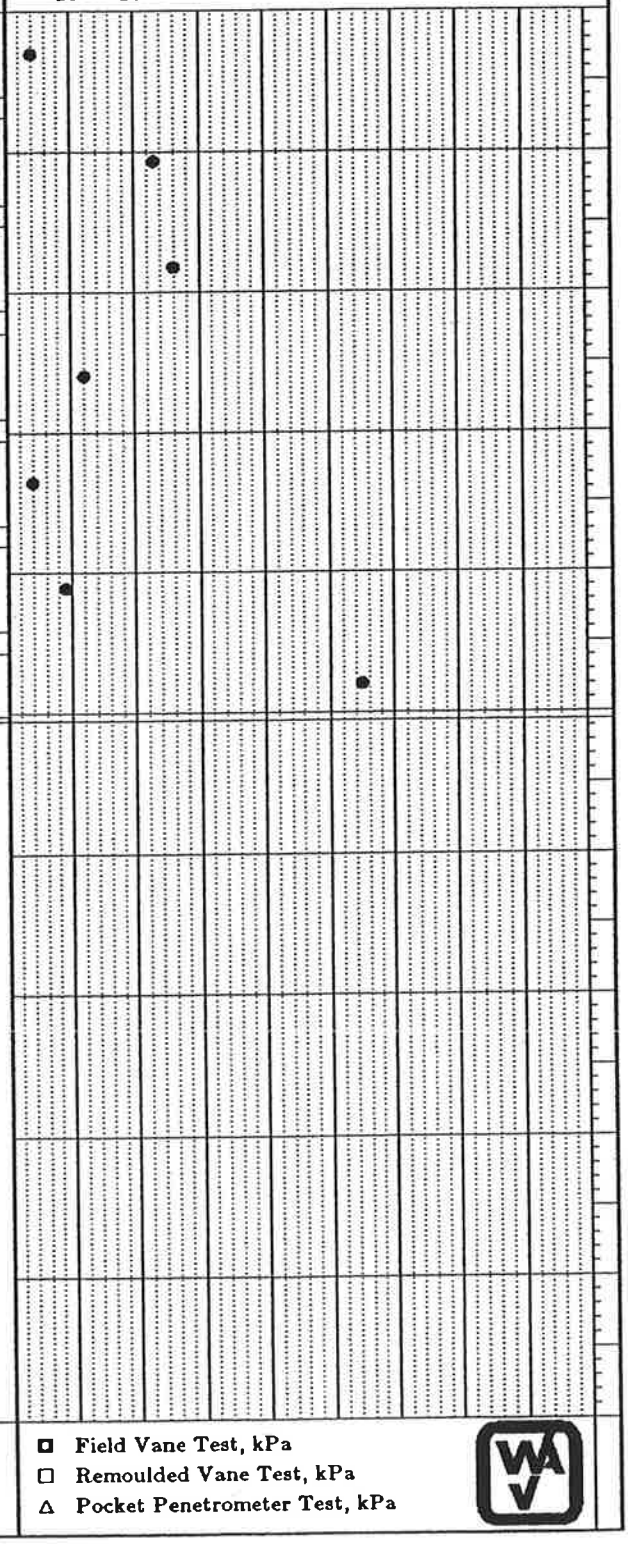
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

JACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-13

CLIENT Griffiths Rankin Cook Architects - OC Transpo

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

DATES: BORING 92-10-21 WATER LEVEL 92-11-04

PROJECT No. 10345

BOREHOLE No. 92-13

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY mm	SAMPLES N-VALUE OR RQD
0	68.62	Sand & gravel ballast (old railway)						
	68.2	400 mm Compact, sandy gravel : FILL						
1					SS	1	550	6
		Loose to compact, brown to grey silty sand, some gravel, trace clay : TILL			SS	2	400	21
2					SS	3	600	14
3					SS	4	500	28
	65.0							
4		End of Borehole on Inferred Bedrock						
5								
6								
7								
8								
9								
10								

UNDRAINED SHEAR STRENGTH - kPa

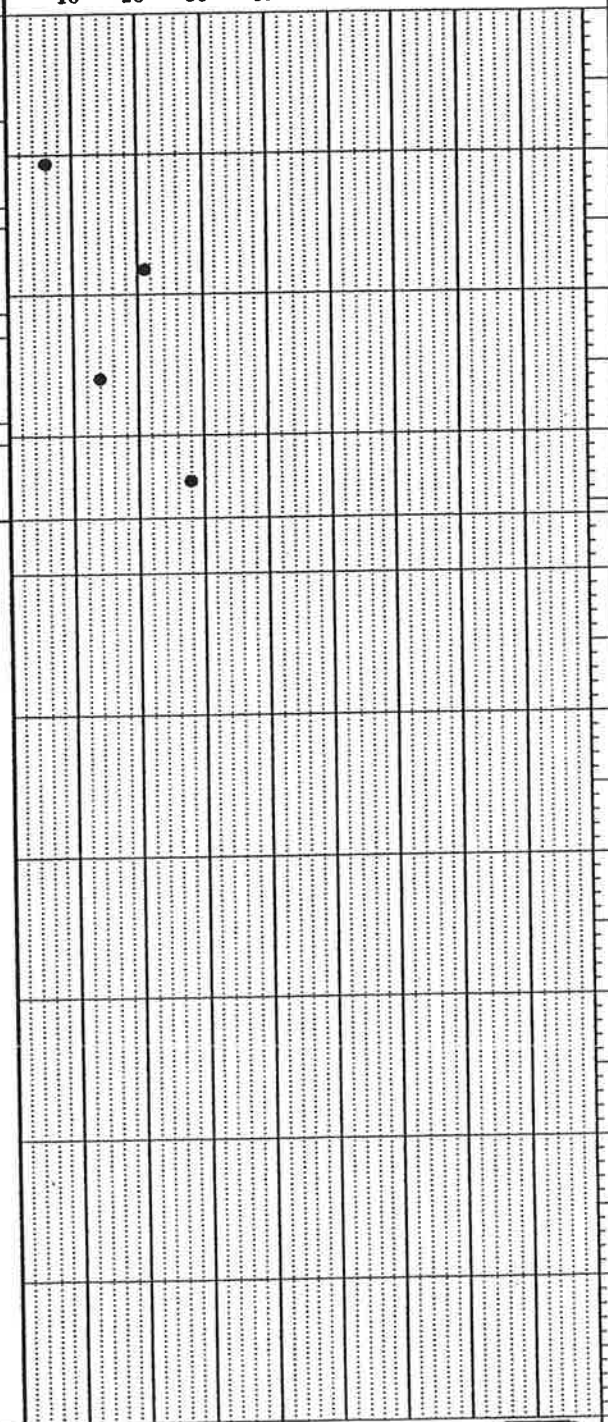
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



■ Field Vane Test, kPa

□ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

ACQUES, WHITFORD LIMITED

BOREHOLE RECORD

92-14

CLIENT Griffiths Rankin Cook Architects - OC Transpo

PROJECT No. 10345

LOCATION New Operations Garage, Belfast Road, Ottawa, Ontario

BOREHOLE No. 92-14

DATES: BORING 92-10-21 WATER LEVEL 92-11-04

DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY	SAMPLES N-VALUE OR RQD
	69.78	Sand & gravel ballast (old railway)					mm	
0	69.3	400 mm Compact sandy gravel: FILL						
1		Loose to compact, brown to grey silty sand, some gravel, some clay : TILL			SS	1	500	14
					SS	2	600	8
					SS	3	475	7
					SS	4	500	10
4	66.0	End of Borehole on Inferred Bedrock						
8								

UNDRAINED SHEAR STRENGTH - kPa

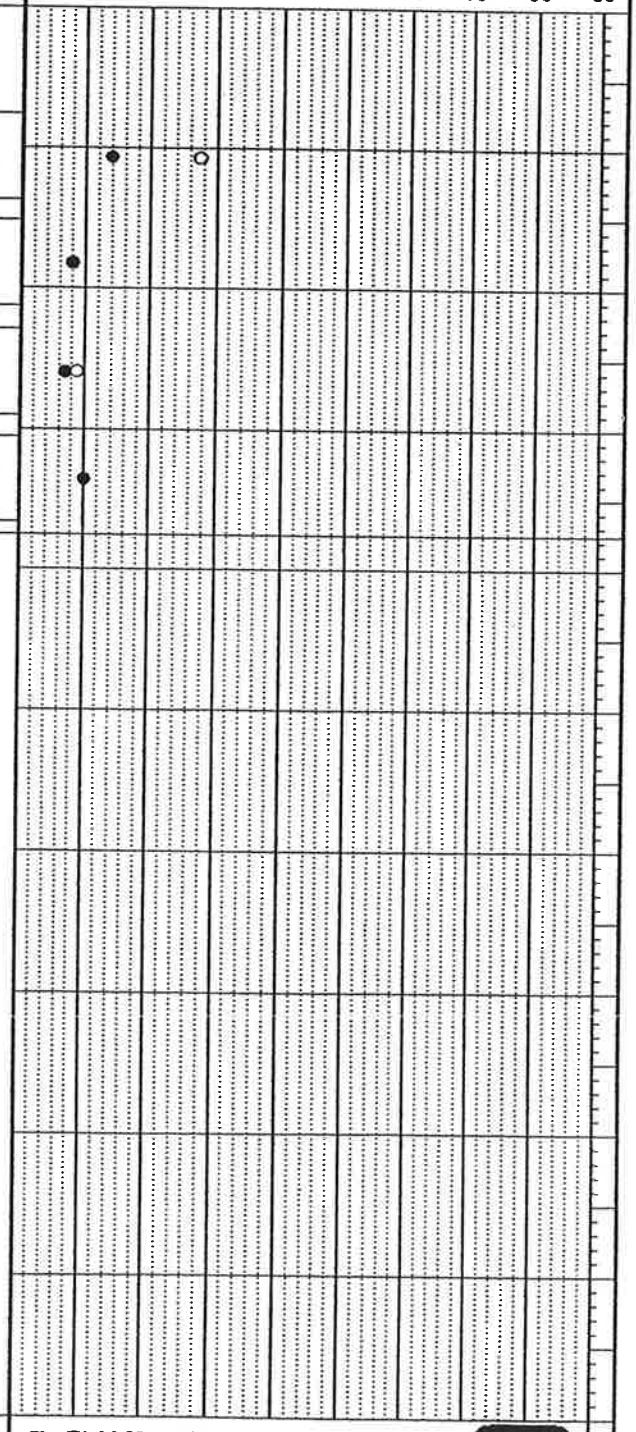
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC PENETRATION TEST, BLOWS/0.3m ★

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90



- ◘ Field Vane Test, kPa
- □ Remoulded Vane Test, kPa
- △ Pocket Penetrometer Test, kPa

Jacques Whitford
2781 Lancaster Rd. Tel: 613 738-0708
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Sieve Analysis

Client : JL Richards & Associates Limited
Project : OC Transpo Parking Area Imorovements
Material Type : Soils/Aggregate :
Proposed Use : Fill/Granulars : OPSS Granular A (Quarry Source)
Supplier :
Source: Granular Composite
Sampled From : Composite Sample
Sampled By : Dean Flanagan
Tested By : Guy Lavallee

Project No. : 11483
Test Method : LS 602 (ASTM C136)
Sample No.: 2805
Date Sampled : 07-Nov-2001
Date Tested : 08-Nov-2001

Wash Test Data

Sample Weight Before Sieve :	12347.2	Sample Weight Before Wash :	291.0		
Sample Weight After Sieve :	12328.1	Sample Weight After Wash :	228.7		
% Loss In Sieve :	0.15	% Passing No.200 :	21.4	Corrected :	7.490

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum. Wt. Retained	% Passing	Specification	
	Inches	mm	grams	grams		Min	Max
	3	76.2				100.0	100.0
	2	53				100.0	100.0
	1	26.5	1028.2	1028.2	91.7	100.0	100.0
	3/4	19	914.4	1942.6	84.3	85.0	100.0
	5/8	16	1421.9	3364.5	72.8		
	1/2	13.2	1337.8	4702.3	61.9	65.0	90.0
	3/8	9.5	1915.6	6617.9	46.4	50.0	73.0
+4	0.187	4.75	1409.0	8026.9	35.0	35.0	55.0
-4			4301.2	12328.1			
8	0.0937	2.36		68.6	26.7		
16	0.0469	1.18		122.5	20.3	15.0	40.0
30	0.0234	0.600		156.3	16.2		
50	0.0117	0.300		182.5	13.0	5.0	22.0
100	0.0059	0.150		202.9	10.6		
200	0.0029	0.075		224.3	8.0	2.0	10.0
-200				228.7			

Classification of Sample : % Gravel : 65.0 % Sand : 27.0 % Silt & Clay : 8.0

Remarks : 316.6g retained on the 37.5mm sieve.(97.4% Passing)

Laboratory Supervisor : Guy Lavallee CET Date : Nov 08/01

Jacques Whitford
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Sieve Analysis

Client : **JL Richards & Associates Limited**
Project : **OC Transpo Parking Area Imorovements**
Material Type : **Soils/Aggregate :**
Proposed Use : **Fill/Granulars : OPSS Granular A (Quarry Source)**
Supplier :
Source: **OC Transpo**
Sampled From : **TP 01-1, SA-2 360-920**
Sampled By : **Dean Flanagan**
Tested By : **Guy Lavallee**

Project No. : **11483**
Test Method : **LS 602 (ASTM C136)**
Sample No.: **2804**
Date Sampled : **07-Nov-2001**
Date Tested : **08-Nov-2001**

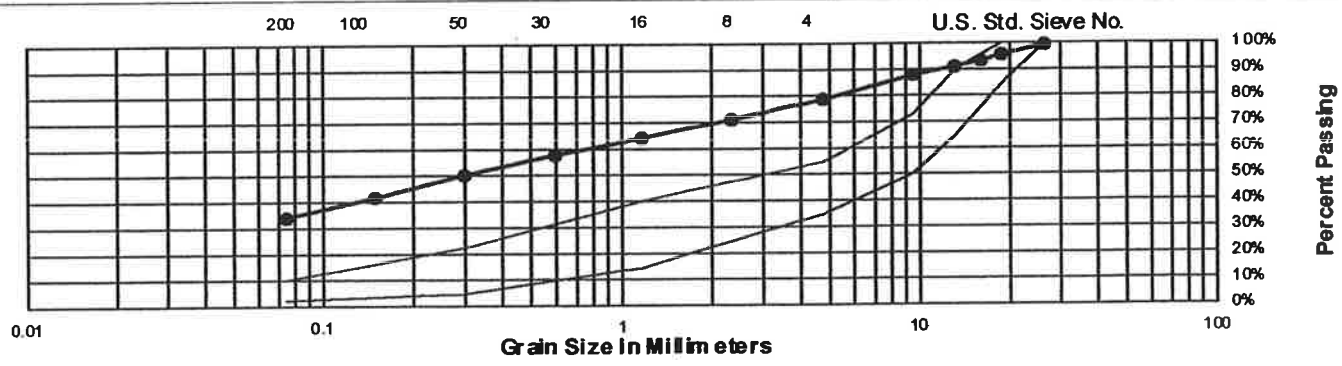
Wash Test Data

Sample Weight Before Sieve :	2973.1	Sample Weight Before Wash :	238.3		
Sample Weight After Sieve :	2967.5	Sample Weight After Wash :	137.2		
% Loss In Sieve :	0.19	% Passing No.200 :	42.4	Corrected :	33.284

Sieve Analysis

Sieve No.	Size of Opening		Wt. Retained	Cum. Wt. Retained	% Passing	Specification	
	Inches	mm	grams	grams		Min	Max
	3	76.2				100.0	100.0
	2	53				100.0	100.0
	1	26.5	29.6	29.6	99.0	100.0	100.0
	3/4	19	105.9	135.5	95.4	85.0	100.0
	5/8	16	67.9	203.4	93.2		
	1/2	13.2	77.5	280.9	90.6	65.0	90.0
	3/8	9.5	81.3	362.2	87.8	50.0	73.0
+4	0.187	4.75	276.3	638.5	78.5	35.0	55.0
-4			2329.0	2967.5			
8	0.0937	2.36		23.8	70.7		
16	0.0469	1.18		43.7	64.1	15.0	40.0
30	0.0234	0.600		63.8	57.5		
50	0.0117	0.300		87.3	49.7	5.0	22.0
100	0.0059	0.150		112.3	41.5		
200	0.0029	0.075		134.5	34.2	2.0	10.0
-200				137.2			

Classification of Sample : % Gravel : **21.5** % Sand : **44.3** % Silt & Clay : **34.2**



Remarks :

Laboratory Supervisor : Guy Lavallee CET **Date :** Nov 08/01