FOUNDATION INVESTIGATION REPORT
BELFAST ROAD UNDERPASS REHABILITATION
HIGHWAY 417 EXPANSION FROM VANIER PARKWAY TO OR 174
OTTAWA, ONTARIO

G.W.P. 4320-06-00, SITE No. 3-071

Geocres Number: 31G5-242

Report to

McCormick Rankin Corporation

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January 19, 2012
File: 19-1351-201B

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted for the proposed rehabilitation of the existing Belfast Road underpass structure over Highway 417 in Ottawa, Ontario. The structure rehabilitation is part of the Highway 417 Expansion project, from Vanier Parkway to OR 174.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, record of borehole sheets, stratigraphic profile and cross-sections, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the investigation.

Thurber carried out the investigation as a sub-consultant to McCormick Rankin Corporation, under the Ministry of Transportation Ontario (MTO) Agreement Number 4009-E-0007.

2 SITE DESCRIPTION

The Belfast Road Underpass is located on Highway 417 approximately 5km east of Ottawa city centre. The underpass spans approximately 49 m across Highway 417, between Coventry Road (Regional Road 50) at the north and Tremblay Road at the south. The existing underpass is a two-span structure supported by a pier and two abutments. The substructures are founded on steel H-piles driven to bedrock.

Land use surrounding the site is commercial/industrial in the northeast, northwest and southwest quadrants, and residential to the southeast. A rigid frame bridge structure crosses the Central Transitway immediately south of the underpass. The Rideau River is located approximately 1km to the west.

The site lies within the Ottawa Valley Clay Plains physiographic region, which comprises a clay plain interrupted by ridges of sand or rock. At the specific underpass site however, the general stratigraphy comprises glacial silt/sand till overlying bedrock at relatively shallow depth. The bedrock consists of the Carlsbad Formation, comprising dark grey shale interbedded with calcareous siltstone and limestone.

Photographs in Appendix C show the general nature of the site. No stability or performance issues were noted on the roadways and existing slopes adjacent to the abutments.

3 SITE INVESTIGATION AND FIELD TESTING

The site investigation and field testing for this project were carried out at various stages during the period July 16 to November 25, 2011 and consisted of the following:

- On July 16, 2011, Borehole BFR-01 was drilled to 8.2 m depth in the approach fill behind the north abutment. Borehole BFR-04 was attempted in the south approach but could not penetrate a concrete layer. Subsequently on November 15 and 16, 2011, both boreholes were extended into shale bedrock to evaluate anchor design behind the abutments. These boreholes were terminated at 16.2 and 16.5 m depth.
- Boreholes BFR-02 and BFR-03 were drilled adjacent to the existing pier on July 24, 2011. These boreholes were terminated in shale at 7.3 and 8.5 m depth.
- Boreholes 15N-05 and 23S-02 were drilled adjacent to the abutments on July 22 and 23, 2011 as part of the concurrent investigation for retaining walls. These boreholes were terminated in shale at 5.4 and 7.3 m depth.
- On August 10, 2011, Boreholes BFS-1 to BFS-3 were drilled within the initially proposed staging area located in the northeast quadrant of the Vanier Parkway interchange. The staging area has since been relocated and this borehole data is provided for information purposes only.
- Boreholes BRS-1 to BRS-3 were drilled on November 24 and 25, 2011 in the revised staging area located in the southeast quadrant of the Highway 417 / St. Laurent Boulevard interchange. These boreholes were terminated in shale at depths of 5.9 to 7.3 m.

The approximate locations of the boreholes are shown on the attached Borehole Locations and Soil Strata Drawings in Appendix D.

The borehole locations were marked in the field and utility clearances were obtained prior to commencement of drilling operations. A road cut permit was obtained for boreholes drilled on Belfast Road, and City of Ottawa consent was obtained for the boreholes drilled in the proposed staging areas.

The drilling was carried out using a CME 75 truck-mounted drill rig. A combination of hollow-stem auger drilling techniques and NQ coring methods were used to advance the boreholes. Overburden samples were obtained at selected intervals using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). All rock cores were logged, and the Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were determined.

The drilling and sampling operations were supervised on a full time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil and bedrock samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions in the open boreholes were observed during the drilling operations. Standpipe piezometers consisting of 19 mm PVC pipe with a slotted screen were installed in selected boreholes. The completion details of the piezometers are summarized in Table 3.1. Following the final water level reading, the piezometers will be decommissioned in general accordance with MOE Regulation 903. Upon completion of drilling, boreholes without a piezometer installation were backfilled with a mixture of bentonite holeplug and cuttings then asphalt cold patch at the surface.

Table 3.1 – Piezometer Details

Borehole	Tip Position (m)		Completion Details
	Depth	Elev.	
BFR-01	16.2	52.9	Sand filter from 16.2 to 14.3m, bentonite from 14.3 to 0.3m, then concrete to surface.
BFR-03	6.1	56.8	Sand filter from 8.5 to 2.7m, bentonite from 2.7 to 0.6m, cuttings from 0.6 to 0.15m, then asphalt cold patch to surface.
BFR-04	16.5	52.2	Sand filter from 16.5 to 14.6m, bentonite from 14.6 to 0.9m, concrete from 0.9 to 0.15m, then asphalt cold patch to surface.
15N-05	5.4	57.4	Sand filter from 5.4 to 3.0m, bentonite from 3.0 to 0.15m, then asphalt cold patch to surface.
23S-02	5.8	56.7	Sand filter from 7.3 to 2.1m, bentonite from 2.1 to 0.15m, then asphalt cold patch to surface.
BRS-2	7.3	61.6	Sand filter from 7.3 to 3.0m, bentonite from 3.0m to ground surface.
BFS-2	7.6	54.0	Sand filter from 7.6 to 4.3m, bentonite from 4.3 to 2.4m, cuttings from 2.4 to 0.05m, then asphalt cold patch to surface.

4 LABORATORY TESTING

All recovered soil samples were subjected to Visual Identification and moisture content determinations. Selected samples were also subjected to grain size distribution analyses (sieve and hydrometer) and Atterberg Limits testing, where appropriate. The results of this testing

program are summarized on the Record of Borehole sheets included in Appendix A and on the figures presented in Appendix B.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets in Appendix A and to the Borehole Locations and Soil Strata Drawings in Appendix D. An overall description of the stratigraphy based on the conditions encountered in the boreholes is given in the following paragraphs. However, the factual data presented in the borehole logs takes precedence over this general description and interpretation of the site conditions.

In general terms, the stratigraphy encountered in the boreholes consists of a pavement structure overlying silty sand fill, underlain by silt or silt fill, and then silty sand till. Shale bedrock was encountered below the till.

More detailed descriptions of the individual strata encountered at the existing bridge site and the staging area are presented below.

5.1 Underpass Site (Boreholes BFR-01 to BFR-04, 15N-05 and 23S-02)

5.1.1 Pavement Structure

A pavement structure consisting of 100 mm of asphalt over 700 mm of sand, some gravel, was encountered in Borehole BFR-01 drilled on Belfast Road at the north approach to the underpass. In Borehole BFR-04 drilled at the south approach, 75 mm of asphalt was encountered over approximately 1.0 m of concrete.

In Boreholes BFR-02, BFR-03, 15N-05 and 23S-02 drilled on Highway 417, the pavement structure consists of 200 mm of asphalt overlying 600 mm of gravelly sand.

Moisture contents of 1 to 3% were measured in the granular material.

5.1.2 Sand Fill

Fill was encountered below the pavement structure in all boreholes. In Boreholes BFR-01 and BFR-04 drilled in the approaches, the fill consists of brown to grey sand containing trace to some silt, trace gravel, and trace clay. In Boreholes BFR-02, BFR-03, 15N-05 and 23S-02, the fill consists of brown silty sand containing trace to some gravel and trace clay.

In Boreholes BFR-01 and BFR-04, the sand fill layer was 3.8 and 3.3 m thick with a lower boundary at 4.6 and 4.4 m depth (Elev. 64.4 and 64.3 m). In the other boreholes, the fill was 0.6 to 1.6 m thick with a lower boundary at depths of 1.4 to 2.3 m (Elev. 61.2 to 60.6 m).

SPT 'N' values recorded in the cohesionless fill ranged from 11 to 53 blows/0.3 m, indicating a compact to very dense relative density. The moisture contents ranged from 2 to 8%.

Grain size distribution analyses were carried out on three samples of the sand fill. The results of these tests are plotted on Figure B1, Appendix B, and are summarized below.

Gravel %	7 to 16
Sand %	53 to 74
Silt %	15 to 33
Clay %	3 to 5

5.1.3 Silt Fill

Brown silt fill containing trace to some sand and clay was encountered below the sand fill in Borehole BFR-04. The silt fill layer is 2.7 m thick with a lower boundary at 7.1 m depth (Elev. 61.6 m).

SPT 'N' values of 9 and 23 blows/0.3 m penetration were recorded in the silt fill, indicating a loose to compact condition. Moisture contents of 20 and 22% were measured.

5.1.4 Silt

Native greenish-grey silt containing some sand and trace clay was encountered below the sand fill in Borehole BFR-01. The silt layer is 1.5 m thick with a lower boundary at 6.1 m depth (Elev. 62.9 m).

An SPT 'N' value of 7 blows/0.3 m penetration was recorded in the native silt layer, indicating a loose condition. A moisture content of 38% was measured.

5.1.5 Silty Sand Till

Brown to dark grey silty sand till containing trace to some gravel and trace clay was encountered below the silt in Borehole BFR-01 and below the fill in the remaining boreholes.

The thickness of the silty sand till varied from 2.9 to 3.2 m in Boreholes BFR-02, BFR-03, 15N-05 and 23S-02, and the depth to the base of the till was 4.4 to 5.5 m (Elev. 58.3 to 57.4 m) in these boreholes. The till thickness was 7.0 and 4.8 m in Boreholes BFR-01 and BFR-04, with a lower boundary at 13.1 and 11.9 m depth (Elev. 55.9 and 56.8 m).

SPT 'N' values recorded in the silty sand till typically ranged from 32 blows/0.3 m penetration to 50 blows for no penetration, indicating a dense to very dense condition. Lower 'N' values of 4 and 26 blows/0.3 m were recorded in the upper part of the till in

Borehole BFR-01, indicating a loose to compact condition. Difficult augering was experienced in the till in five boreholes, and coring was required to advance Boreholes BFR-02 and BFR-03 through the till to the bedrock surface, indicating the possible presence of cobbles, boulders and shale slabs.

The moisture content of the silty sand till ranged from 3 to 12%.

Grain size distribution analyses were carried out on five samples of the silty sand till. The results of these tests are plotted on Figure B2, Appendix B, and are summarized below.

Gravel %	7 to 21
Sand %	44 to 56
Silt %	26 to 37
Clay %	3 to 12

Glacial tills are known to contain cobbles and boulders.

5.1.6 Shale Bedrock

Bedrock was encountered below the silty sand till and proven by coring in all boreholes except Borehole 15N-05. Borehole 15N-05 was terminated at the bedrock surface. The depths and elevations at which bedrock was encountered are summarized in Table 5.1.

Table 5.1 – Depths and Elevations of Bedrock Surface

Borehole	Bedrock Surface	
	Depth (m)	Elevation (m)
BFR-01	13.1	55.9
BFR-02	4.4	58.3
BFR-03	5.5	57.4
BFR-04	11.9	56.8
15N-05	5.4	57.4
23S-02	4.6	57.9

The bedrock was described as grey shale with hard limestone interbeds up to 50 mm in thickness. It was generally described as moderately weathered in Borehole BFR-02 and slightly weathered to fresh in the remaining boreholes. Total Core Recovery (TCR) in the bedrock was 100% in all runs except Run 2 in Borehole BFR-04 where the core barrel jammed resulting in no recovery.

The RQD values recorded in the shale generally ranged from 27 to 100%, indicating a widely variable rock quality ranging from poor to excellent. An RQD value of 18% reported in the initial run in Borehole BFR-03 resulted from commencement of coring in very dense till above the bedrock surface. An RQD value of 0% (very poor) was recorded

in the upper 1.2 m run in Borehole 23S-02. The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, ranged from 0 to greater than 10.

The estimated unconfined compressive strength of the rock, interpreted from point load tests conducted on intact rock cores, ranged from 12 to 33 MPa, indicating a weak to medium strong rock strength classification.

5.1.7 Water Levels

Groundwater was not observed in the boreholes during drilling. Water was added into the boreholes as part of the rock coring operations and therefore natural groundwater levels were not measured in the bedrock.

Standpipe piezometers were installed in selected borehole upon completion of drilling. The groundwater depths and elevations measured in the piezometer are shown in Table 5.2.

Table 5.2 – Groundwater Depths and Elevations

Borehole	Date	Water Level (m)	
		Depth	Elevation
BFR-01	29-Dec-11	5.4	63.6
BFR-03	26-Jul-11	3.5	59.4
	18-Aug-11	3.5	59.4
	20-Sep-11	3.8	59.1
	12-Oct-11	3.8	59.1
BFR-04	29-Dec-11	5.8	62.9
15N-05	26-Jul-11	2.9	59.9
	18-Aug-11	3.0	59.8
	12-Oct-11	3.2	59.6
23S-02	26-Jul-11	2.8	59.7
	18-Aug-11	2.8	59.7
	12-Oct-11	3.9	58.6

Seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

5.2 Staging Area (Boreholes BRS-1 to BRS-3)

5.2.1 Topsoil

A 75 to 100 mm thick layer of topsoil was encountered in the boreholes drilled in the staging area in the southeast quadrant of the St. Laurent Boulevard interchange. The thickness and extent of the topsoil are expected to vary between and beyond the borehole locations, and the information in this report should not be used for quantity estimating.

5.2.2 Sand to Silty Sand Fill

Sand to silty sand fill containing trace to some gravel and clay was encountered below the topsoil layer in all boreholes. The fill was described variously as brown, dark brown, grey and orange-brown. The thickness of the fill layer was 0.5 to 1.6 m with a lower boundary at depths of 0.6 to 1.7 m (Elev. 66.4 to 67.8 m).

SPT 'N' values of 7 to 16 blows/0.3 m were recorded in the fill, indicating a loose to compact condition. Moisture contents of 4 to 18% were measured.

The results of a grain size distribution analysis carried out on a sample of the fill are plotted on Figure B3, Appendix B, and summarized below.

Gravel %	18
Sand %	48
Silt %	24
Clay %	10

5.2.3 Sand and Gravel

A 0.6 m thick layer of sand and gravel was encountered below the fill in Borehole BRS-2. The lower boundary of this layer was at 2.3 m depth (Elev. 66.6 m).

An SPT 'N' value of 16 blows/0.3 m was recorded in the sand and gravel, indicating a compact condition. A moisture content of 3% was measured.

5.2.4 Silty Clay

Grey to dark brown silty clay was encountered below the fill and sand and gravel at depths of 0.6 to 2.3 m. The silty clay was sandy in Boreholes BRS-1 and BRS-2, and contained trace to some sand in Borehole BRS-3.

The thickness of the silty clay unit ranged from 1.1 to 2.1 m. The depth to the base of the silty clay was 1.9 to 3.4 m (Elev. 65.1 to 65.7 m).

SPT 'N' values recorded in the silty clay ranged from 6 to 18 blows/0.3 m penetration, indicating a firm to very stiff consistency. An 'N' value of 62 blows/0.225 m was recorded at the bedrock surface in Borehole BRS-2.

The moisture content of the silty clay varied from 13 to 42%.

Grain size distribution analyses were carried out on three samples of the silty clay. The results of these tests are plotted on Figure B4, Appendix B, and are summarized below. The results of Atterberg Limits tests conducted on the samples are plotted on Figure B5, Appendix B, and are also shown below.

Gravel %	0 to 5
Sand %	9 to 27
Silt %	36 to 38
Clay %	32 to 52
Liquid Limit	37 to 44
Plastic Limit	17 to 23

The results of the Atterberg Limits tests indicate that the silty clay has a medium plasticity with a group symbol of CI.

5.2.5 Shale Bedrock

Bedrock was encountered below the silty clay and proven by coring in all boreholes. The depths and elevations at which bedrock was encountered are summarized in Table 5.3.

Table 5.3 – Depths and Elevations of Bedrock Surface

Borehole	Bedrock Surface	
	Depth (m)	Elevation (m)
BRS-1	1.9	65.1
BRS-2	3.4	65.5
BRS-3	2.9	65.7

The bedrock was described as dark grey shale with hard limestone interbeds. It was generally described as fresh. Total Core Recovery (TCR) in the bedrock was 68 to 100%. The RQD values varied significantly, from 0% in the initial run in Boreholes BRS-1 and BRS-2, to 100 % in the final run in Borehole BRS-3. These values indicate a very poor to excellent quality rock. The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, ranged from 1 to 15.

The estimated unconfined compressive strength of the rock, interpreted from point load tests conducted on intact rock cores, ranged from 27 to 67 MPa, indicating a medium strong to strong rock strength classification.

5.2.6 Water Levels

Groundwater was not observed in the boreholes during drilling. Water was added into the boreholes as part of the rock coring operations and therefore natural groundwater levels were not measured in the bedrock.

A standpipe piezometer was installed in Borehole BRS-3 upon completion of drilling. The groundwater depths and elevations measured in the piezometer are shown in Table 5.4.

Table 5.4 – Groundwater Depths and Elevations

Borehole	Date	Water Level (m)	
		Depth	Elevation
BRS-2	29-Dec-11	3.0	65.9

Seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

6 MISCELLANEOUS

The borehole locations were selected and established in the field by Thurber Engineering Ltd. Surveyors from MMM Group determined the co-ordinates and ground surface elevations at the boreholes after completion of the site investigation.

Eastern Ontario Diamond Drilling Ltd. from Hawkesbury, Ontario supplied a truck mounted CME 75 drill rig and conducted the drilling, sampling and in-situ testing operations.

The field investigation was supervised by Mr. Luke Gilarski, E.I.T. and Mr. Ryan Kromer, E.I.T. of Thurber. Overall planning and supervision of the field program was conducted by Ms. Lindsey Blaine, E.I.T.

Interpretation of the field data and preparation of the report were carried out by Ms. Lindsey Blaine, E.I.T and Mr. Murray Anderson, P.Eng.

The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Ms. Lindsey Blaine, E.I.T.
Project Supervisor

L. Blaine
Jan. 19/12

Murray R. Anderson, P.Eng., M.Eng.
Senior Foundations Engineer

P.K. Chatterji, P.Eng., Ph.D.
Review Principal

THURBER

Appendix A

Record of Borehole Sheets

Appendix B

Laboratory Test Results

Appendix C

Site Photographs

Photograph 1: Belfast Road Underpass – Hwy 417 WBL

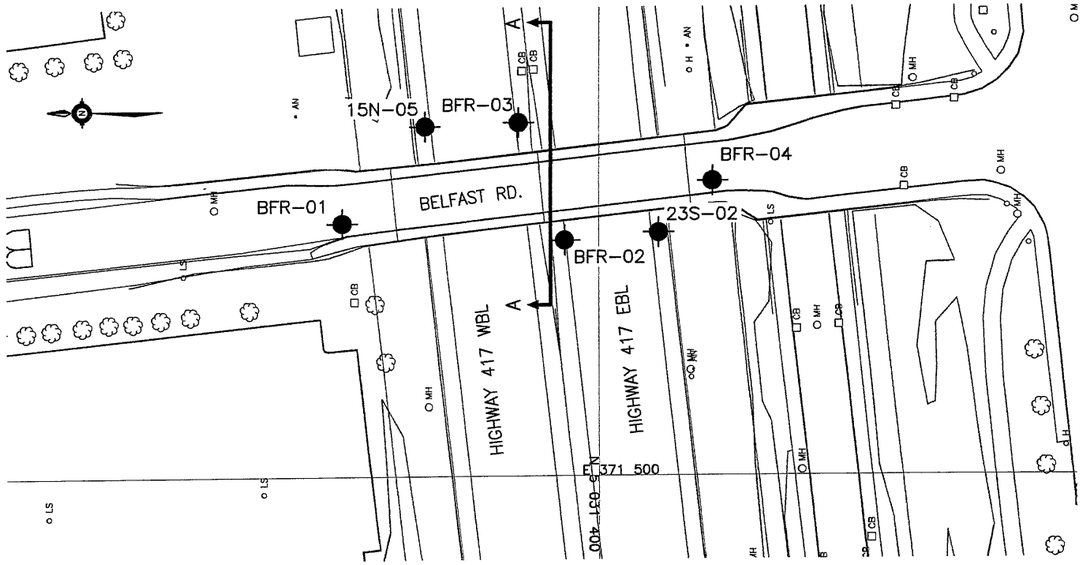
Photograph 2: Belfast Road Underpass – South End of Structure

Appendix D

Drawing

Borehole Locations and Soil Strata

MINISTRY OF TRANSPORTATION, ONTARIO



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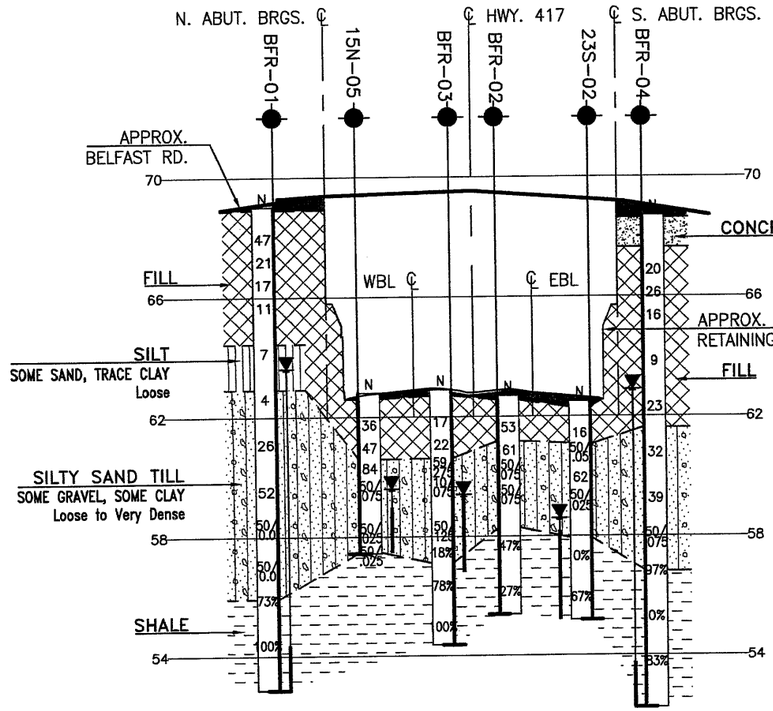

PROFILE ALONG BELFAST RD. UNDERPASS

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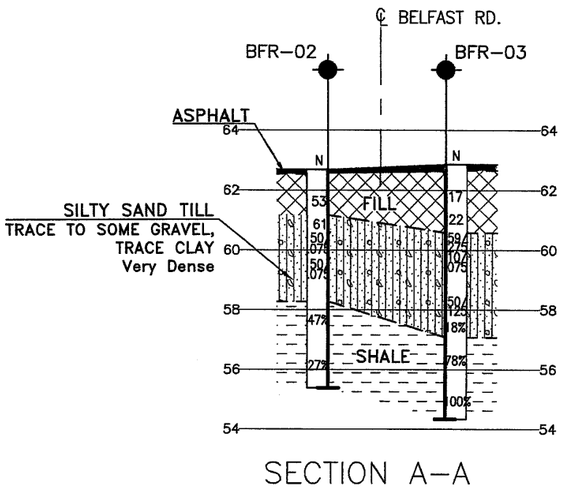

SECTION A-A

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

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P. K. CHATTERJI
Jan 19/12
PROVINCE OF ONTARIO

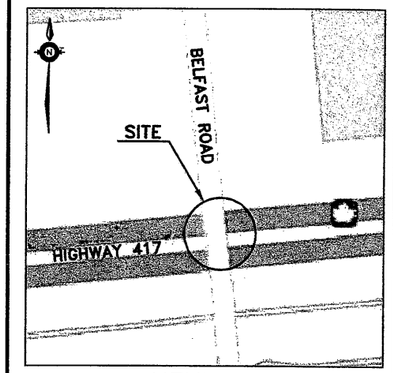
CONT No
WP No 4320-06-00

SHEET

HIGHWAY 417
BELFAST ROAD UNDERPASS
BOREHOLE LOCATIONS AND SOIL STRATA

McCORMICK RANKIN CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
BFR-01	69.0	5 031 442.8	371 542.6
BFR-02	62.7	5 031 405.7	371 539.6
BFR-03	62.9	5 031 413.4	371 559.6
BFR-04	68.7	5 031 381.0	371 549.6
15N-05	62.8	5 031 429.0	371 559.0
23S-02	62.5	5 031 390.0	371 540.9

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31G5-242

REVISIONS		
DATE	BY	DESCRIPTION

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DATE JAN. 2012
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

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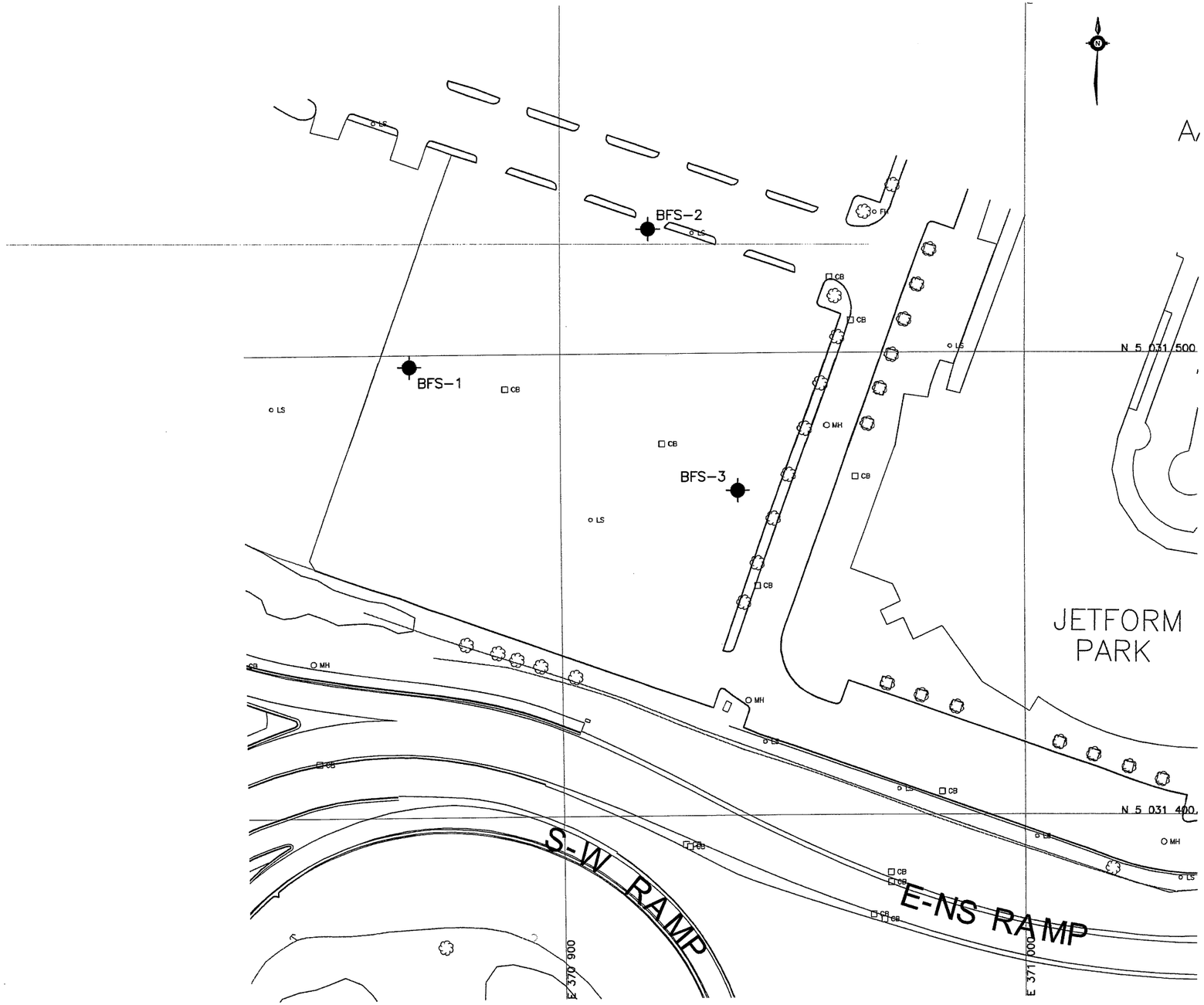
UNLESS OTHERWISE SHOWN



PLAN

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LICENSED PROFESSIONAL ENGINEER
M. R. ANDERSON
Jan 19/12
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LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Jan 19/12
PROVINCE OF ONTARIO

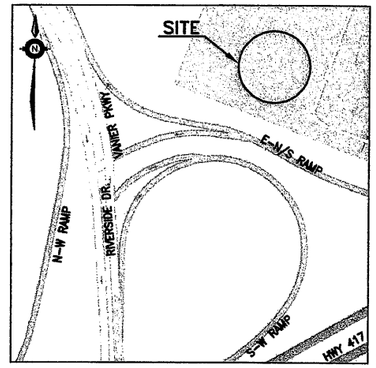
CONT No
WP No 4320-06-00

SHEET

HIGHWAY 417
BELFAST ROAD STAGING AREA
BOREHOLE LOCATION PLAN

McCORMICK RANKIN CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
BFS-1	61.4	5 031 497.4	370 867.4
BFS-2	61.7	5 031 527.1	370 919.1
BFS-3	61.7	5 031 470.3	370 938.3

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31G5-242

REVISIONS		
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METRIC

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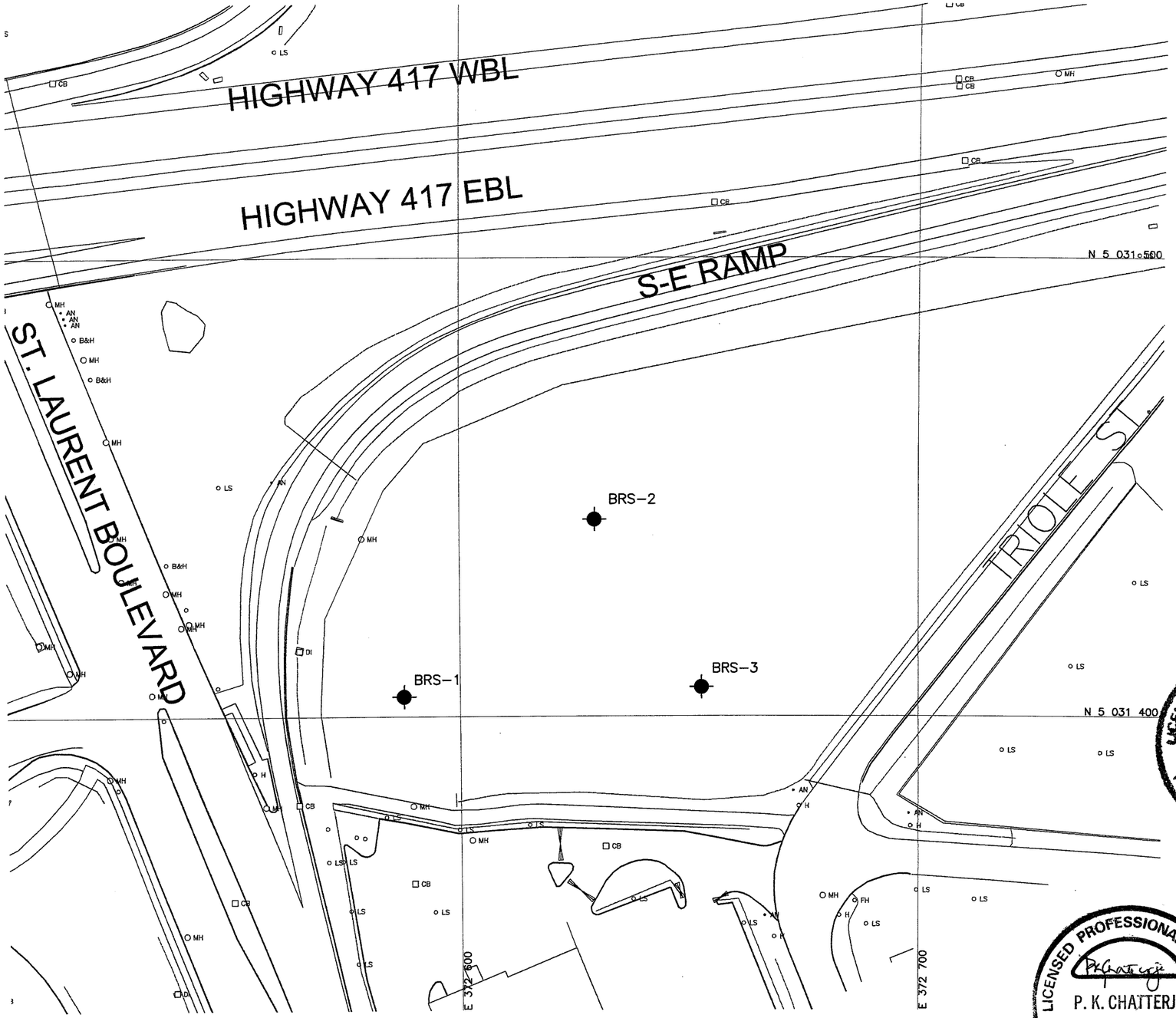

PLAN

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CONT No

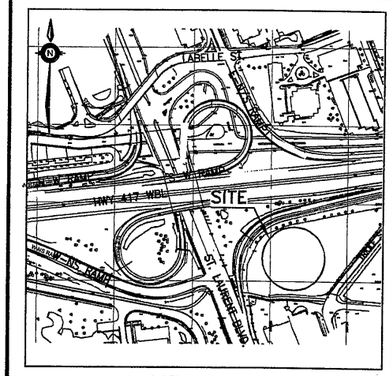
WP No 4320-06-00

HIGHWAY 417
BELFAST ROAD STAGING AREA
BOREHOLE LOCATION PLAN

SHEET

McCORMICK RANKIN CORPORATION

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

●	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
▽	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
BRS-1	67.1	5 031 404.4	372 587.9
BRS-2	68.9	5 031 442.9	372 629.7
BRS-3	68.6	5 031 406.3	372 652.7

LICENSED PROFESSIONAL ENGINEER
M. R. ANDERSON
Jan 19/12
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Jan 19/12
PROVINCE OF ONTARIO

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31G5-242

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN MC	CHK MC	CODE		LOAD	DATE JAN. 2012
DRAWN AN	CHK PKC	SITE 3-071		STRUCT	DWG 1

FILENAME: H:\Drafting\151\201\act1201-BoreholePlanProfile(BelfastRd).dwg
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