



THURBER ENGINEERING LTD.

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AECOM

Date: October 26, 2018

From: Rocio Palomeque Reyna, P.Eng.
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(Reviewed by P.K. Chatterji, P.Eng.)

File: 19402

**MEMORANDUM
FOUNDATION ASSESSMENT FOR THREE STRUCTURES
HIGHWAY 403 OVERPASSES AT MATHESON BOULEVARD
SITE NOS. 24-354/2 (#60), 24-354/3 (#62), 24-354/4 (#61)
GWP NO. 2207-16-00
ASSIGNMENT NO. 2016-E-0091
MISSISSAUGA, ONTARIO

GEOCRES NO. 30M12-423**

PART 1 FACTUAL INFORMATION

This memorandum presents the results of a foundation desktop study for three of the four existing structures at the Highway 403 crossing over Matheson Boulevard in Mississauga, Ontario.

This desktop study provides an assessment of the existing foundations of three overpass structures at this site based on existing GEOCRES information. The recommendations and comments provided in this memorandum are for planning, structural evaluation and preliminary design purposes only.

This memorandum with the interpolation and recommendations are intended for the use of AECOM and the Ministry of Transportation, and shall not be used or relied upon for any other purposes or by any other parties including the construction contractor. The contractor must make their own interpretation based on the factual data in Part 1 of this memorandum. Where comments are made on construction, they are provided only in order to highlight those aspects which could affect the design of the project. Contractors must make their own interpretation of the factual information provided as it may affect equipment selection, proposed construction methods and scheduling.

1. SITE DESCRIPTION

The site is located on Highway 403 where it crosses over Matheson Boulevard, on the south side of the Hwy 401/Hwy 403/Hwy 410 interchange in Mississauga, Ontario. The three existing structures addressed by this memorandum are as follows:



- Highway 403 Westbound (Hwy 403 WB) Collector Overpass at Matheson Boulevard (Site 24-354/2)
- Highway 403 Eastbound (Hwy 403 EB) Express Overpass at Matheson Boulevard (Site 24-354/3)
- Highway 403 Westbound (Hwy 403 WB) Express Overpass at Matheson Boulevard (Site 24-354/4).

Based on information provided by AECOM, historical general arrangement and foundation layout drawings, the existing Hwy 403 WB Collector, Hwy 403 EB Express and Hwy 403 WB Express structures are three independent single-span bridges, each supported on two abutments. It is understood that the abutments are supported on spread footings founded on shale bedrock. The bridge decks consist of pre-stressed concrete (CPCI) girders. Available information of each bridge is provided in Table 1.

Table 1.- Bridge Data

Site No. Bridge # ⁽¹⁾	Bridge Name	Span (m)	Deck Width (m)	Year of Construction	Rehabilitation History
24-354/2 (#60) ⁽¹⁾	Hwy 403 WB Collector Overpass at Matheson Blvd.	20.3	24.5	1983	No rehabilitation.
24-354/3 (#61) ⁽¹⁾	Hwy 403 EB Express Overpass at Matheson Blvd.	20.3	16.7	1977	No rehabilitation. Widened to median by 4.2 m in 2003.
24-354/4 (#62) ⁽¹⁾	Hwy 403 WB Express Overpass at Matheson Blvd.	20.3	16.1	1977	No rehabilitation. Widened to median by 4.2 m in 2003.

⁽¹⁾ Bridge # based on previous investigation conducted in 1976. (References 1 to 3 below)

The natural terrain in the area is generally flat to undulating. The ground surface adjacent to the structures ranges between approximate Elevations 164 and 165 m. Matheson Boulevard was constructed in a cut of approximately 6 m deep. The Highway 403 grade is at approximate Elevations 166 to 167 m, and the Matheson Boulevard grade is at approximate Elevations 159 to 160 m. The existing bridge approaches have been constructed as approximately 2H : 1V cut slopes.

The mapping in the Physiography of Southern Ontario by Chapman and Putnam shows that the site lies within the physiographic region known as the Peel Plain. The Peel Plain contains deep river and stream valleys, and is characterized by cohesive glacial till with shale and limestone fragments. The soil deposit is underlain at relatively shallow depths by grey shale bedrock of the Georgian Bay Formation.



2. SUBSURFACE CONDITIONS

During the preparation of this memorandum, reference has been made to information on subsurface conditions and foundation recommendations contained in previous foundation reports for the site. Site investigations within the area of the three bridges were completed by the then Ministry of Transportation and Communications (MTC) and reported in the following GEOCREs documents:

- Foundation Investigation Report for Highway 403 EB Collector over Matheson Boulevard, W.P.127-66-67, Site 24-81-354A, Highway 403, District 6, Toronto, GEOCREs No. 30M12-150, dated December 1982, Pavement & Foundation Design Section (Reference 1).
- Foundation Investigation Report for Highway 403 WB Collector over Matheson Boulevard, W.P.127-66-68, Site 24-81-354B, Highway 403, District 6, Toronto, GEOCREs No. 30M12-151, dated March 1982, Pavement & Foundation Design Section, (Reference 2).
- Foundation Investigation Report for Highway 403 EB at Matheson Boulevard, Bridge # 61, W.P.36-74-03, Site 24-354C, Highway 403 WB at Matheson Boulevard, Bridge # 62, W.P.36-74-02, Site 24-354D, District 6, Toronto, GEOCREs No. 30M12-115, dated March 1977, Soil Mechanics Section (Reference 3).

A geotechnical investigation more recently conducted for the Highway 403 EB Collector overpass at Matheson Boulevard was also used as reference:

- Foundation Investigation and Design Report, Matheson Boulevard Overpass, Structure Site No. 24-354/1, Highway 410 Widening from south of Highway 401 to Queen Street, Regional Municipality of Peel, G.W.P. 2144-07-00(a), GEOCREs No. 30M12-349, Report Number 11-1111-0083-1, prepared by Golder Associates, dated January 2013 (Reference 4).

The available GEOCREs information relevant to this desktop study is attached in Appendices A and B.

A total of 8 boreholes (numbered 1 to 8) were drilled and sampled in close proximity to the three subject bridges (References 1 to 3) in the 1975 - 1976 investigation prior to construction of the highway. The boreholes were located near the alignments of the north and south abutments of the EBL and WBL Collectors. These boreholes were advanced to depths of 1.5 m to 9.1 m (Elevations 155.6 to 164.3 m) below the original ground surface.

Results of these boreholes indicated that the subsurface conditions consisted predominantly of 0.5 m of topsoil overlying shale bedrock with limestone bands. A 1.2 m to 1.8 m thick layer of clayey silt till containing sand, gravel and shale fragments was contacted below the topsoil in Boreholes 7 and 8 drilled in the vicinity of the Hwy 403 EB Collector bridge. Top of weathered shale was contacted at depths ranging from 0.5 m to 1.8 m (Elevations 166.6 to 162.6 m).



Five boreholes (numbered MB-1 to MB-5) from the 2011 - 2013 investigation (Reference 4) were advanced at the Matheson Boulevard overpass at the Hwy 403 EB Collector. Boreholes MB-1 and MB-5 were located near the south and north abutments, respectively, whereas Boreholes MB-2, MB-3 and MB-4 were advanced from the Matheson Boulevard grade. The boreholes were terminated at depths ranging from 4.2 m to 7.6 m (Elevations 161.9 to 151.6 m).

Results of these boreholes revealed the presence of pavement structure overlying stiff to hard clayey silt approach fill at the Highway 403 grade, and typically compact silty sand to gravelly sand fill at Matheson Boulevard grade. The highway approach fill is 1.5 to 3.0 m thick, and the Matheson fill is up to 2.4 m thick. On Matheson Boulevard, the top of shale bedrock was encountered at depths ranging from 0.6 m to 2.4 m (Elevations 158.6 to 156.7 m).

The bedrock consists of slightly weathered to fresh shale of the Georgian Bay Formation, which contains hard limestone interbeds and clay seams. At highway grade, the top of weathered shale was encountered at 3.1 to 3.4 m depths, between Elevations 163.5 to 162.3 m. SPT 'N' values measured in the weathered shale were greater than 50 blows for less than 0.3 m penetration indicating practical refusal conditions. Relatively sound shale was found below the weathered zone. The Total Core Recovery (TCR) was between 90 percent and 100 percent, and the Rock Quality Designation (RQD) values ranged from 0 to 90 percent, but generally over 40 percent, indicating a rock mass of typically poor to good quality with some very poor quality zones. Fracture Indices (FI) were not reported.

Top of shale elevations encountered in all the available boreholes for each of the three subject bridges are summarized in the following tables.

Hwy 403 WB Collector (Site 24-354/2, Bridge #60)

Location	Borehole	Top of Weathered Shale Elevation (m)	Top of Sound Shale Elevation (m)
North Abutment	2, 4 ⁽¹⁾	166.6 to 166.0	163.7
South Abutment	1, 3 ⁽¹⁾	165.5 to 165.4	164.4 to 162.5

Hwy 403 WB Express (Site 24-354/4, Bridge # 62)

Location	Borehole	Top of Weathered Shale Elevation (m)	Top of Sound Shale Elevation (m)
North Abutment	4 ⁽¹⁾	166.0	163.7
South Abutment	3 ⁽¹⁾	165.5	164.4



Hwy 403 EB Express (Site 24-354/3, Bridge #61)

Location	Borehole	Top of Weathered Shale Elevation (m)	Top of Sound Shale Elevation (m)
North Abutment	6 ⁽¹⁾	164.7	Not reported
	MB-3 ⁽²⁾	156.9	Below 156.6
	MB-4 ⁽²⁾	158.6	Below 157.7
South Abutment	5 ⁽¹⁾	164.3	161.7
	MB-2 ⁽²⁾	156.7	Below 156.2

(1) Information from References 1 to 3 obtained before the highway was built.

(2) Information from Reference 4 obtained after the overpasses and cut were constructed.

Point load tests were carried out on selected samples of the intact shale rock cores collected during the 2011 - 2013 investigation. The approximate Unconfined Compressive Strength (UCS) correlated with the point load test results ranged from 17.4 MPa to 45.5 MPa. Laboratory Unconfined Compression tests were conducted on three selected shale rock core specimens. The results of the Unconfined Compression tests are summarized below:

Borehole	Sample depth (m)	Sample Elevation (m)	Unconfined Compressive Strength (UCS) (MPa)
MB-2	3.0	156.1	17.7
MB-2	6.2	153.0	16.2
MB-4	7.1	153.1	15.6

Based on the test results outlined above, the shale bedrock within the depth of exploration is generally classified as weak containing strong limestone interbeds.

Groundwater was not reported for the open boreholes during the 1976 field investigation. In the 2011 - 2013 investigation, water level was observed in the boreholes at depths ranging from 1.5 m to 2.1 m (Elevations 157.0 to 157.7 m). A piezometric reading taken in Borehole MB-5 on November 13, 2011 indicated that the groundwater level was at 1.6 m depth (Elevation 164.9 m).



PART 2 ENGINEERING DISCUSSION AND PRELIMINARY RECOMMENDATIONS

Archived design drawings indicate that the abutments of the three subject Highway 403 overpasses over Matheson Boulevard are supported on spread footings founded on shale bedrock. Retaining walls/wingwalls have been constructed parallel to Highway 403 at each abutment. These walls are supported on spread footings perched above the Matheson Boulevard grade. Further details of the existing foundations are presented below.

3. EXISTING FOUNDATIONS

Site 24-354/2 (Bridge #60) – Hwy 403 WB Collector Overpass at Matheson Boulevard

No general arrangement and foundation layout drawings of this bridge is available.

Prior to Construction

The 1976 MTC report from GEOCREC No. 30M12-115 (Reference 3) recommended that the north and south abutments of the original bridges be supported on spread footings founded on the weathered or sound shale bedrock. For footings constructed on weathered shale bedrock, an allowable bearing value of up to 480 kPa (5 t.s.f.) was recommended for footing design. For footings placed within the sound shale bedrock, an allowable bearing value of up to 960 kPa (10 t.s.f.) was recommended. Based on Boreholes 1 to 4, the top of the weathered shale bedrock ranged from Elevations 166.6 to 165.4 m; and the top of sound bedrock is at approximate Elevations 164.4 to 162.5 m.

The approach cuts for this structure at Matheson Boulevard were estimated to be up to 6.4 m in depth. It was recommended that the cuts through shale be treated as earth cuts and be constructed with 2H : 1V slopes.

Upgrading

The 1982 MTC report from GEOCREC No. 30M12-151 (Reference 2) recommended that the north and south abutments of the then proposed bridge be supported on spread footings founded on sound shale bedrock at or below Elevation 158.0 m. The recommended factored bearing capacity at ULS for abutment footings founded in shale bedrock was 1,500 kPa. The SLS condition does not govern footing design on shale bedrock. For the approach retaining walls, the same ULS design value was recommended for spread footings founded at or below Elevation 162.5 m in the sound shale. Alternatively, the retaining wall footings could be designed to be founded higher in the weathered shale using an ULS value of 1,000 kPa. No stability problems were anticipated for permanent embankment slopes constructed to a 2H :1V geometry.

Site 24-354/3 (Bridge #61)– Hwy 403 EB Express Overpass at Matheson Boulevard

Based on historical general arrangement and foundation layout drawings (Reference 3), for Bridge #61 dated September 1976, both abutments were designed to be supported on spread footings founded at Elevation 158.6 m which corresponds to sound shale bedrock based on available information. The embankment slopes were designed to have inclinations of 2H : 1V.

Client: AECOM

File No.: 19402

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Date: October 26, 2018

Page: 6 of 11



The foundation layout drawings and the foundation report do not provide design geotechnical resistances for the footings of Bridge #61.

Site 24-354/4 (Bridge #62) – Hwy 403 WB Express Overpass at Matheson Boulevard

Based on historical general arrangement and foundation layout drawings (Reference 3), for Bridge #62 dated September 1976, both abutments were designed to be supported on spread footings founded at Elevation 158.0 m which corresponds to sound shale bedrock based on available information. The embankment slopes were designed to have inclinations of 2H : 1V.

The foundation layout drawings and the foundation report do not provide design geotechnical resistances for the footings of Bridge #62.

4. FOUNDATION ASSESSMENT

This section provides foundation assessment and comments regarding the feasibility of carrying out the rehabilitation works described below and potential widening/replacement of the structures.

It is understood that during the present design stage, consideration is being given to rehabilitation of these three existing bridges. Information provided by AECOM indicates that the rehabilitation program will include the following:

Site No. (Bridge #)	Bridge Name	Rehabilitation program
24-354/2 (#60) ⁽¹⁾	Hwy 403 WB Collector Overpass at Matheson Blvd.	<ul style="list-style-type: none"> - Replace asphalt & waterproofing - Repair deck top - Replace barrier walls - Replace expansion joints
24-354/3 (#61) ⁽¹⁾	Hwy 403 EB Express Overpass at Matheson Blvd.	<ul style="list-style-type: none"> - Replace asphalt & waterproofing - Repair deck top - Replace barrier walls - Replace ballast walls - Replace approach slabs - Convert to semi-integral abutment
24-354/4 (#62) ⁽¹⁾	Hwy 403 WB Express Overpass at Matheson Blvd.	<ul style="list-style-type: none"> - Replace asphalt & waterproofing - Repair deck top - Replace barrier walls - Replace ballast walls - Replace approach slabs - Convert to semi-integral abutment

⁽¹⁾ Bridge # based on previous investigation conducted in 1976. (References 1 to 3)

Information provided by AECOM indicates that the increase in loading on the foundation elements associated with the rehabilitation works will be less than 10 percent. Bridge widening or deck replacement is not currently recommended. However, the latest information provided by AECOM indicates that widening of the EB Express Overpass may be required.



Based on the information provided by the historical drawings and the GEOCRETS reports, the factored geotechnical resistance at ULS and geotechnical resistance at SLS (up to 25 mm settlement) for the abutment footings founded on shale bedrock are presented in Table 2. The SLS condition does not govern footing design on sound bedrock. The SLS condition does not govern footing design on sound bedrock. The geotechnical resistances have been assessed in accordance with the requirements of the Canadian Highway and Bridge Design Code (CHBDC) 2014.

Table 2.- Recommended Geotechnical Resistances for Spread Footings Founded on Bedrock

Site No. (Bridge #)	Bridge Name	Location	Top of Weathered Shale Elevation (m)	Geotechnical Resistances for Foundation Assessment	Top of Sound Shale Elevation (m)	Geotechnical Resistances for Foundation Assessment
24-354/2 (#60) ⁽¹⁾	Hwy 403WB Collector Overpass at Matheson Blvd.	North abutment	166.6 to 166.0 ⁽¹⁾	Factored ULS of 1,000 kPa SLS of 700 kPa	163.7 ⁽¹⁾	Factored ULS of 1,500 kPa
		South abutment	165.5 to 165.4 ⁽¹⁾		164.4 to 162.5 ⁽¹⁾	SLS does not govern
24-354/3 (#61) ⁽¹⁾	Hwy 403EB Express Overpass at Matheson Blvd.	North abutment	164.7 ⁽¹⁾ 156.9 ⁽²⁾ 158.6 ⁽²⁾	Factored ULS of 1,000 kPa SLS of 700 kPa	156.6 to 157.7 ⁽²⁾	Factored ULS of 1,500 kPa
		South abutment	164.3 ⁽¹⁾ 156.7 ⁽²⁾		161.7 ⁽¹⁾ to 156.2 ⁽²⁾	SLS does not govern
24-354/4 (#62) ⁽¹⁾	Hwy 403WB Express Overpass at Matheson Blvd.	North abutment	166.0 ⁽¹⁾	Factored ULS of 1,000 kPa SLS of 700 kPa	163.7 ⁽¹⁾	Factored ULS of 1,500 kPa
		South abutment	165.5 ⁽¹⁾		164.4 ⁽¹⁾	SLS does not govern

⁽¹⁾ Before cut was constructed.

⁽²⁾ After cut was constructed.

The above values can be used for carrying out an assessment of the existing structures and for preliminary design of any modifications that may be necessary. If widening/replacement is required, the above values may be used for preliminary assessment, but an additional foundation investigation will be required for detail design.

A consequence factor of 1 was utilized in this design adopting the typical consequence level. A geotechnical resistance factor of 0.5 for bearing, and 0.8 for settlement, both adopted for typical degree of understanding, were used to obtain the above values, as per CHBDC 2014, Clause 6.9.



For sliding resistance at the footing and weathered shale interface, an ultimate coefficient of friction, $\tan \delta$, of 0.5 may be used for evaluation.

From a foundation engineering perspective and based on the loading conditions shown in the table above, it is considered that the existing footings can be reused provided that the footings are structurally sound and satisfy the structural requirements.

5. TEMPORARY EXCAVATIONS AND GROUNDWATER CONTROL

Temporary excavations will be required at the existing embankment fills of Highway 403 EB Express Overpass at Matheson Blvd. (24-354/3) in order to carry out the conversion to semi-integral abutments. Excavations may also be required for other rehabilitation works at this and other sites.

The selection of the method of excavation through soils is the responsibility of the contractor and must be based on his equipment, experience and interpretation of the site conditions. The selected equipment must be capable of removing, penetrating or otherwise handling oversized obstructions including cobbles and boulders within the existing fills and native soils.

For rock excavation (if required), the contractor is responsible for assessing the type, size and power rating of the required equipment. It must be noted that the shale bedrock becomes stronger with depth and contains strong limestone bands; specialized methods such as rock-breaking equipment, ripping, and pneumatic breaking to dislodge the rock slabs must be considered for rock excavation.

Excavations should be inspected regularly for evidence of instability if they have been left open for extended periods of time and following periods of heavy rain or thawing. Exposed soil slopes should be covered with plastic sheetings to protect against precipitation and surface runoff. Care must be taken during excavation to avoid disturbing and undermining travelled lanes of the roadways that will remain open.

During excavation, seepage is anticipated from the existing fill and fracture/joints within the shale bedrock (if excavation extends into bedrock). Drainage ditches supplemented by pumping from filtered sumps may be considered for use at this site to control groundwater seepage, surface runoff and precipitation. Surface runoff should be diverted away from the excavation at all times. The design of the unwatering systems is the responsibility of the Contractor.

6. APPROACH FILLS

The existing north and south forward slopes at the Matheson Boulevard overpasses at Highway 403 are typically vegetated with grass. Available information indicates that these slopes have been designed to have an inclination of 2H : 1V.



It is recommended that new forward slopes, where required, be designed to match the existing slope configuration. Provided that the exposed slopes are reinstated to a final configuration of 2H : 1V or flatter in accordance with the recommendations in this memorandum, the forward slopes will remain stable. Disturbed or regraded slopes must be provided with erosion protection in accordance with OPSS.PROV 804.

7. ROADWAY PROTECTION

It is envisaged that roadway protection will be required during the rehabilitation of the three structures. In accordance with the foundation terms of reference and to provide geotechnical recommendations for the roadway protection design, six new boreholes, two for each of the three Matheson bridges, will be advanced to confirm the founding conditions.

Foundation recommendations for the roadway protection design and related aspects will be provided in a foundation report for each bridge. The roadway protection system should be designed to satisfy the movement requirements stipulated in OPSS.PROV 539.

The design of roadway protection (temporary shoring) should be the responsibility of the Contractor. All shoring systems must be designed by a Professional Engineer experienced in such designs.

8. ADJACENT STRUCTURES AND BURIED UTILITIES

Buried utilities might be present within the rehabilitation areas of the three bridges. It is recommended that the exact locations and elevations of these utilities be established by the designer, and compared with the extent of the potential work zones related to the structure rehabilitation and associated works.

9. ADDITIONAL INVESTIGATION

For detail design of bridge widening or replacement, it will be necessary to carry out additional site investigation, laboratory and field testing to support the preparation of foundation design recommendations.

10. CLOSURE

We trust the above satisfies your requirements. Should you have any questions regarding this memorandum, please do not hesitate to contact the undersigned.



Yours truly,
THURBER ENGINEERING LTD.



Rocío Palomeque Reyna, P.Eng.
Geotechnical Engineer



Sydney Pang, P.Eng.
Associate, Senior Foundation Engineer



P.K. Chatterji, P.Eng.
Principal, Designated MTO Contact

Attachments:

- Appendix A Subsurface Information from GEOCREs
- Appendix B Archived General Arrangement and Foundation Layout Drawings

Client: AECOM
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Date: October 26, 2018
Page: 11 of 11



Appendix A

Subsurface Information from GEOCREG

RECORD OF BOREHOLE NO 1

WP 36-74-02/03 LOCATION Co-ords. 15,852,964 N; 960,697 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE November 27, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY M.S.

SOIL PROFILE		STRAT. PLOT	SAMPLES		GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS		
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE		'N' VALUES	20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %	
544.2	Ground Level															
1.5	Topsoil															
	Weathered		1	SS	100%	540										
533.2	Sound		2	SS	100% Rec 80%	530										
11.0			3	BXL	Rec 80%											
			4	BXL	Rec 40%											
			5	BXL	Rec 100%											
	Shale Bedrock with limestone bands	6	BXL	Rec 100%	520											
516.2	End of Borehole				510											

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 36-74-02/03 LOCATION Co-ords. 15,853,023 N; 960,775 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE December 1, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY M.T.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	WATER CONTENT %				
544.5	Ground Level															
	Topsoil															
1.5	Weathered															
539.5	Shale Sound		1	SS	102	540										
5.0																
536.4			2	SS	100											
8.1	End of Borehole															
						530										

20
15 \diamond 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
 ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 36-74-02/03 LOCATION Co-ords. 15,853,080.N; 960,723 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE November 28, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY H.T.

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS			
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L			GR	SA	SI
546.1	Ground Level																		
	Topsoil																		
1.5	Weathered		1	BS	100%	540													
537.1																			
9.0	Sound		2	BXL	Rec 100%														
			3	BXL	Rec 100%	530													
			4	BXL	Rec 100%														
	Shale Bedrock with limestone bands		5	BXL	Rec 100%	520													
517.1																			
29.0	End of Borehole					510													

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 36-74-02/03 LOCATION Co-ords. 15,853,174 N; 960,970 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE December 1, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY M.T.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT w			UNIT WEIGHT γ	REMARKS		
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH W_P w W_L ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT % 10 20 30	
540.4	Ground Level																	
1.5	Topsoil																	
530.4	Weathered		1	SS	91													
10.0	Sound		2	SS	100% Rec	1" 530												
	Shale Bedrock with limestone bands		3	BXL	100% Rec													
			4	EXL	80% Rec													
			5	EXL	80% Rec	520												
510.4			6	EXL	95% Rec													
30.0	End of Borehole					510												

OFFICE REPORT ON OIL EXPLORATION

RECORD OF BOREHOLE NO 6

WP 36-74-02/03 LOCATION Co-ords. 15,853,030 N; 960,930 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE December 1, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY M.I.

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		
542.0	Ground Level													
	Topsoil													
1.5	Weathered Shale		1	SS	100, 1"	540								
537.0														
5.0	End of Borehole					530								

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
 ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 36-74-02/03 LOCATION Co-ords. 15,853,225 N; 961,050 E. ORIGINATED BY VK
 DIST 6 HWY 403 BORING DATE December 1, 1975 COMPILED BY VK
 DATUM Geodetic BOREHOLE TYPE CME (5.1) M.V.H.S. CHECKED BY M.S.

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		'N' VALUES	20	40	60	80	100	SHEAR STRENGTH w_p — w — w_L O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		
539.6	Ground Level													
0.0	Het. mix. of clayey silt, sand & gravel	[Symbol]	1	SS	118.9"									
533.6	Glacial Till Hard with shale fragments													
6.0	Weathered Shale	[Symbol]	2	SS	100.1"									
529.5						530								
10.1	End of Borehole													
						520								

OFFICE REPORT ON SOIL EXPLORATION

PROJECT <u>11-1111-0083</u>	RECORD OF BOREHOLE No MB-1	SHEET 1 OF 1	METRIC
G.W.P. <u>2144-07-00</u>	LOCATION <u>N 4832250.3; E 292926.1</u>	ORIGINATED BY <u>MS</u>	
DIST <u>Central HWY 410</u>	BOREHOLE TYPE <u>CME-55 Track-mount, 108 mm Inner Diameter Hollow Stem Augers</u>	COMPILED BY <u>NK</u>	
DATUM <u>Geodetic</u>	DATE <u>November 16, 2011</u>	CHECKED BY <u>LCC</u>	

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
			NUMBER	TYPE	"N" VALUES			20	40	60						80	100
165.7	GROUND SURFACE																
0.0	TOPSOIL																
	Clayey silt with sand, trace to some gravel, containing pockets of silty sand (FILL) Stiff to hard Brown to grey Moist		1	SS	19		165										
			2	SS	13												
			3	SS	33		164										
			4	SS	19		163										
162.7	SILTY CLAY, some gravel, trace to some sand (TILL)																
3.0	Hard		5	SS	61/28									14	9	59	18
162.3	Brown to grey																
3.4	Moist																
161.5	SHALE (BEDROCK)		6	SS	98/23		162										
4.2	Weathered Grey																
	END OF BOREHOLE																
	NOTE: 1. Borehole dry on completion of drilling.																

GTA-MTO.001 111110083.GPJ GAL-MISS.GDT 8/3/12

+ 3, X 3: Numbers refer to Sensitivity O 3% STRAIN AT FAILURE

PROJECT		RECORD OF BOREHOLE			SHEET 1 OF 1		METRIC					
11-1111-0083		No MB-2										
G.W.P. 2144-07-00		LOCATION N 4832266.9 E 292911.9			ORIGINATED BY MS							
DIST Central HWY 410		BOREHOLE TYPE CME-55 Track-mount, 108 mm Inner Diameter Hollow Stem Augers			COMPILED BY NK							
DATUM Geodetic		DATE January 4 and 5, 2012			CHECKED BY LCC							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100	PLASTIC LIMIT			NATURAL MOISTURE CONTENT
159.1	GROUND SURFACE											
0.0	ASPHALT											
0.2	Sand, trace to some silt, trace gravel (FILL) Compact Brown Moist											
157.0												
156.7	Gravel, some sand (FILL) Compact Brown Wet											
2.4			1	SS	65/0.28							
156.2	Weathered SHALE SHALE (BEDROCK)											
2.9			1	RC	REC 100%							RQD = 49%
			2	RC	REC 100%							RQD = 24%
	Bedrock cored from 2.9 m to 7.3 m Refer to Record of Drillhole MB-2 for bedrock coring details		3	RC	REC 100%							RQD = 56%
			4	RC	REC 100%							RQD = 71%
151.8	END OF BOREHOLE											
7.3	NOTES: 1. The top of 2.4 m of soil was removed prior to drilling the borehole using a vacuum truck, because the borehole was located in close proximity to existing underground services. The soil description in the upper 2.4 m is based on visual classification during field operations. 2. Water level in open borehole at a depth of 2.1 m (Elev. 157.0 m) upon completion of overburden drilling.											

GTA-MTD-001 111110083.GPJ CAL-MISS.GDT 8/3/12

PROJECT: 11-1111-0083

RECORD OF DRILLHOLE: MB-2

SHEET 1 OF 1

LOCATION: N 4832266.9 ; E 292911.9

DRILLING DATE: January 4 and 5, 2012

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55 Trackmount

DRILLING CONTRACTOR: Geo-Environmental Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY		R.Q.D. %	FRACT INDEX PER 0.3 m	B Angle	DIP w.r.t. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY K, cm/sec	Diameter Point Load Index (MPa)	S.M.C. AVG.	NOTES	
								TOTAL CORE %	SOLID CORE %					PL - Planar	CU - Curved	PO - Polished					MB - Mechanical Break
								FLT - Fault	BD - Bedding					PL - Planar	CU - Curved	PO - Polished					MB - Mechanical Break
		GROUND SURFACE		156.17																	
3		SHALE BEDROCK (GEORGIAN BAY FORMATION), containing fossiliferous LIMESTONE interbeds Slightly weathered to fresh Grey Laminated Medium strong		2.90	1														UC=17.7 MPa (Axial)		
4				2															(Axial)		
5	HQ RC HW Casing				3															(Axial)	
6					4															(Axial) UC=16.2 MPa	
7		END OF DRILLHOLE		151.75															(Axial)		
				7.32																	

GTA-RCK 018 111110083.GPJ GAL-MISS.GDT 8/3/12

DEPTH SCALE

1 : 50



LOGGED: MS

CHECKED: NK

PROJECT 11-1111-0083	RECORD OF BOREHOLE No MB-3	SHEET 1 OF 1	METRIC
G.W.P. 2144-07-00	LOCATION N 4832274.4 ; E 292898.2	ORIGINATED BY MS	
DIST Central HWY 410	BOREHOLE TYPE CME-55 Track-mount, 108 mm Inner Diameter Hollow Stem Augers	COMPILED BY NK	
DATUM Geodetic	DATE January 4, 2012	CHECKED BY LCC	

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa							WATER CONTENT (%)
159.1	GROUND SURFACE														
0.0	ASPHALT														
0.2	Silty sand, some gravel, trace clay (FILL) Dense to compact Brown Moist		1	SS	38	▽								17 62 20 1	
157.7			2	SS	17		158								
1.5	Gravelly sand, some silt, trace clay (FILL) Loose Grey Wet		3	SS	8		157								28 55 13 4
156.9			4	SS	50/0.13		156								RQD = 44%
2.5	Weathered SHALE SHALE (BEDROCK)		1	RC	REC 91%	155								RQD = 48%	
	Bedrock cored from 2.5 m to 7.0 m Refer to Record of Drillhole MB-3 for bedrock coring details		2	RC	REC 100%	154								RQD = 43%	
			3	RC	REC 100%	153									
			4	RC	REC 100%										RQD = 48%
152.1	END OF BOREHOLE														
7.0	NOTES: 1. Water level in open borehole at a depth of 1.5 m (Elev. 157.6 m) upon completion of overburden drilling.														

GTA-MTO.001 111110083.GPJ CAL-MISS.GDT 8/3/12

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT: 11-1111-0083

RECORD OF DRILLHOLE: MB-3

SHEET 1 OF 1

LOCATION: N 4832274.4 ; E 292898.2

DRILLING DATE: January 4, 2012

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55 Trackmount

DRILLING CONTRACTOR: Geo-Environmental Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOR	% RETURN	RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.3 m	DISCONTINUITY DATA	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Index (MPa)	RMC	AVG.	NOTES						
									TOTAL CORE %	SOLID CORE %									B Angle	DIP WILL CORE AXIS	10	10	10	10
									UN - Joint	BD - Bedding									PI - Planar	PO - Polished	MB - Mechanical Break			
		GROUND SURFACE		156.64																				
3		SHALE BEDROCK (GEORGIAN BAY FORMATION), containing fossiliferous LIMESTONE interbeds, and highly weathered clay zones at depths of 3.4 m (Elev. 155.7 m), 5.8 m (Elev. 153.3 m) and 6.7 m (Elev. 152.4 m) Slightly weathered to fresh Grey Laminated Medium strong		2.45	1																			
4				2																				
5				3																				
6				4															(Axial)					
7		END OF DRILLHOLE		152.06														(Axial)						
8				7.03																				
9																								
10																								
11																								
12																								

GTA-RCK 018 111110083.GPJ GAL-MISS.GDT 8/3/12

DEPTH SCALE
1 : 50



LOGGED: MS
CHECKED: NK

RECORD OF BOREHOLE No MB-4 SHEET 1 OF 1 METRIC

PROJECT 11-1111-0083 G.W.P. 2144-07-00 LOCATION N 4832277.8 ; E 292903.0 ORIGINATED BY MS

DIST Central HWY 410 BOREHOLE TYPE CME-55 Track-mount, 108 mm Inner Diameter Hollow Stern Augers COMPILED BY NK

DATUM Geodetic DATE January 5, 2012 CHECKED BY LCC

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa						
159.2	GROUND SURFACE													
0.0	ASPHALT													
0.2	Silty sand, trace gravel (FILL)		1	SS	36									
158.6	Dense Brown Moist													
0.6	SHALE (BEDROCK) Weathered Grey		2	SS	90/0.25									
157.7	SHALE (BEDROCK)													
1.5	SHALE (BEDROCK)		1	RC	REC 100%									RQD = 0%
			2	RC	REC 100%									RQD = 23%
			3	RC	REC 100%									RQD = 41%
	Bedrock Cored from 1.5 m to 7.6 m Refer to Record of Drillhole MB-4 for bedrock coring details		4	RC	REC 88%									RQD = 27%
			5	RC	REC 100%									RQD = 90%
151.6	END OF BOREHOLE													
7.6	NOTES: 1. Water level in open borehole at a depth of 1.5 m (Elev. 157.7 m) upon completion of overburden drilling.													

GTA-MTO.001 111110083.GPJ GAL-MISS.GDT 8/3/12

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

PROJECT: 11-1111-0083

RECORD OF DRILLHOLE: MB-4

SHEET 1 OF 1

LOCATION: N 4832277.8 ;E 292903.0

DRILLING DATE: January 5, 2012

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55 Trackmount

DRILLING CONTRACTOR: Geo-Environmental Drilling Inc.

DEPTH SCALE METRES	DRILLING RECORD	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH	COLOUR % RETURN	RECOVERY		R.O.D. %	FRACT INDEX PER 0.3 m	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY K, cm/sec	Diameter Index (MPa)	D.L. (mm)	M.C. (mm)	AVGL.	NOTES		
							TOTAL CORE %	SOLID CORE %			B Angle	DIP w.r.t. CORE AXIS	TYPE AND SURFACE DESCRIPTION								W	H
							00000	00000			00000	00000	00000	00000							00000	00000
	GROUND SURFACE		157.66																			
2	SHALE BEDROCK (GEORGIAN BAY FORMATION), containing fossiliferous LIMESTONE interbeds Slightly weathered to fresh Grey Laminated Medium strong		1.52	1																(Axial)		
3			2																		(Axial)	
4			3																			(Axial)
5			4																			(Axial)
6			5																			(Axial)
7			151.56																		UC-15.6 MPa	
8	END OF BOREHOLE		7.62																			

GTA-RCK 018 111110083.GPJ GAL-MISS.GDT 8/3/12

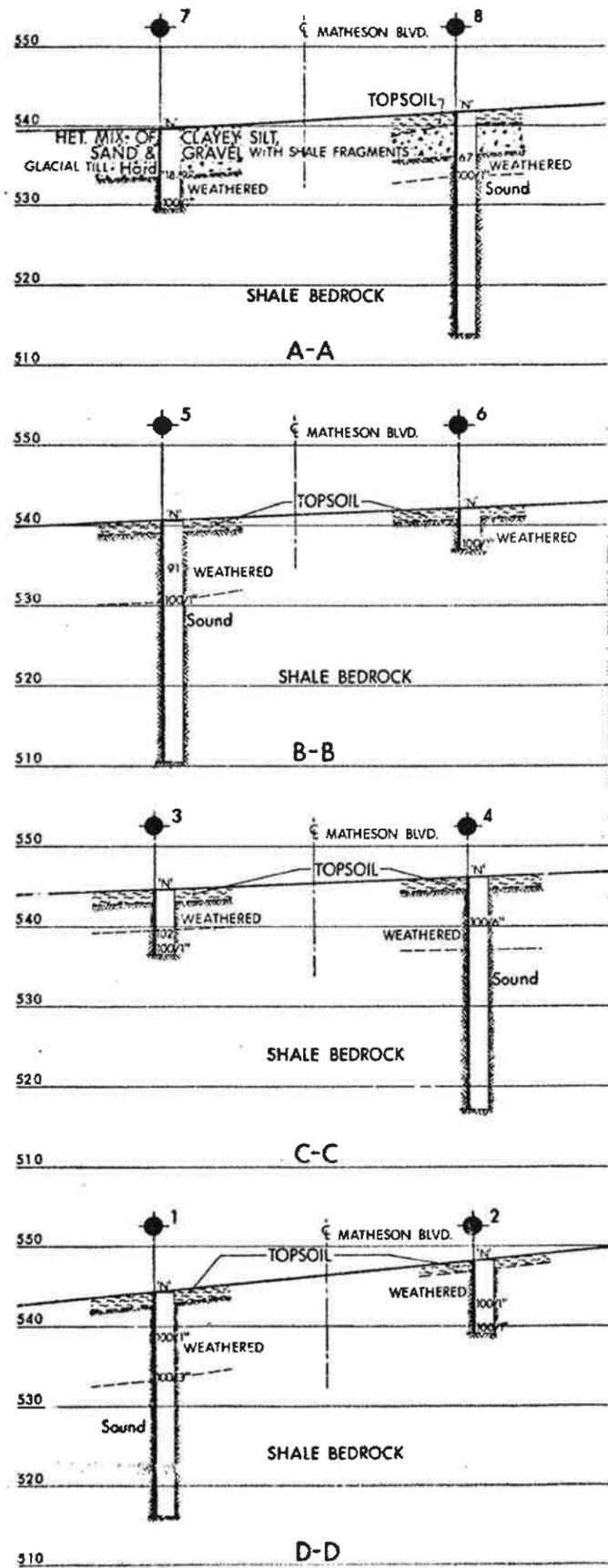
DEPTH SCALE
1 : 50



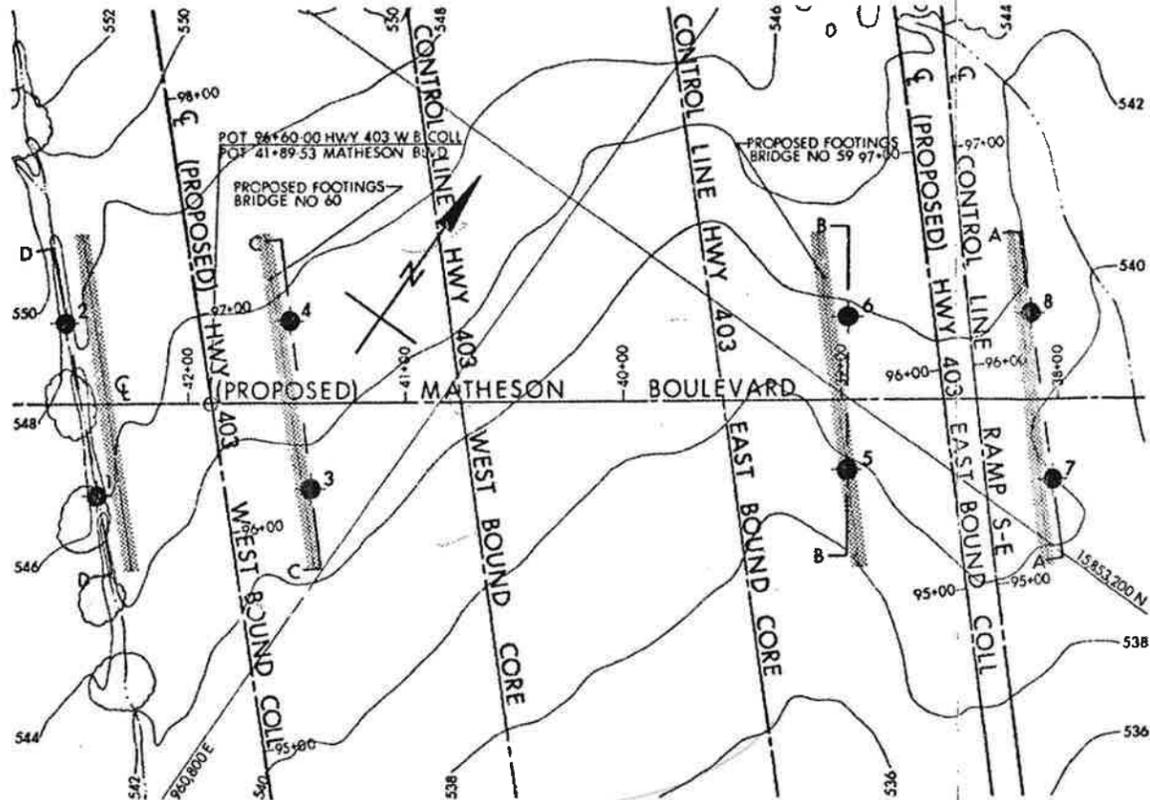
LOGGED: MS
CHECKED: NK

PROJECT		11-1111-0083		RECORD OF BOREHOLE No MB-5		SHEET 1 OF 1		METRIC																	
G.W.P.		2144-07-00		LOCATION		N 4832294.2, E 292887.4		ORIGINATED BY		MS															
DIST		Central HWY 410		BOREHOLE TYPE		CME-55 Track-mount, 108 mm Inner Diameter Hollow Stem Augers		COMPILED BY		NK															
DATUM		Geodetic		DATE		November 13, 2011		CHECKED BY		LCC															
ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)											
			NUMBER	TYPE	T _N VALUES			20	40						60	80	100	20	40	60	80	100	10	20	30
166.5	GROUND SURFACE																								
0.0	ASPHALT																								
0.5	Silty sand and gravel (FILL) Compact Brown Moist																								
165.1	Clayey silt, trace to some sand, trace gravel (FILL) Very stiff		1	SS	22																				
1.5	Grey Moist																								
163.5	SILTY CLAY with gravel, trace to some sand (TILL) Very stiff to hard Grey Moist to wet		2	SS	15																				
			3	SS	60																				
163.5	SHALE (BEDROCK) Weathered Grey		4	SS	50:03																				
3.1			5	SS	50:03																				
161.9	END OF BOREHOLE		6	SS	50:03																				
4.6	NOTE: 1. Water level in piezometer at a depth of 1.6 m (Elev. 164.9 m) on November 13, 2011.																								

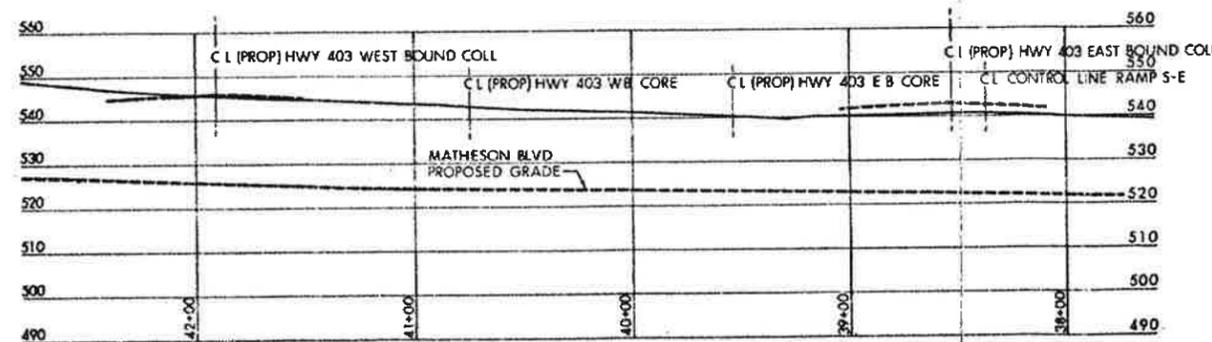
GTA-MTO 001 111110083.GPJ GAL-MISS.GDT 8/3/12



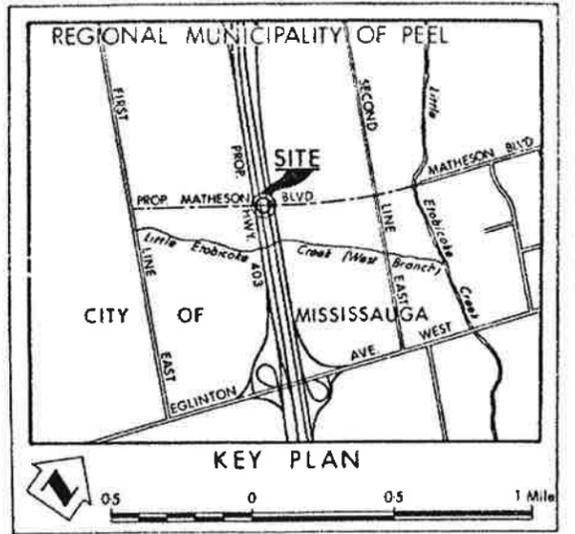
SECTIONS
SCALE 40 FT. HORIZ
20 10 0 20 40
SCALE 20 40 FT. VERT
10 5 0 10 20



PLAN
SCALE 40 80 FT



PROFILE - MATHESON BLVD
SCALE 80 FT HORIZ
40 20 0 20 40
SCALE 20 40 FT VERT
20 10 0 20 40



- LEGEND**
- Bore Hole
 - ⊕ Dynamic Cone Penetration Resistance Test
B/F CONE - Blows/Ft. Cone Test (250 Ft. lbs. energy/blow)
 - ⊕ Bore Hole & Cone Test
 - ⊕ Water Levels established at time of field investigation, NOV. 27, 28 & DEC. 1, 1975

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	544.2	15,852,964	960,697'
2	548.1	15,853,020	960,640
3	544.5	15,853,023	960,775
4	546.1	15,853,080	960,723
5	540.4	15,853,174	960,970
6	542.0	15,853,230	960,930
7	539.6	15,853,225	961,050
8	541.9	15,853,280	960,997

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISION	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION

MATHESON BOULEVARD
(STRUCTURES NO. 59 AND NO. 60)

HIGHWAY NO. PROP. 403 DIST. NO. 6
REGIONAL MUNICIPALITY OF PEEL
CITY OF MISSISSAUGA LOT _____ CON. _____

BORE HOLE LOCATIONS & SOIL STRATA

SUBWD. V. K. CHECKED	WP. NO. 36-74-02 & 03	DATE: APR. 1976
DRAWN N. T. CHECKED	WD. NO.	367402 & 03-A
DATE: April 21, 1976	SITE NO. 24-354	BRIDGE DRAWING NO.
APPROVED	CONF. NO.	



REF. FENCO NO. 6536-1B7

METRIC

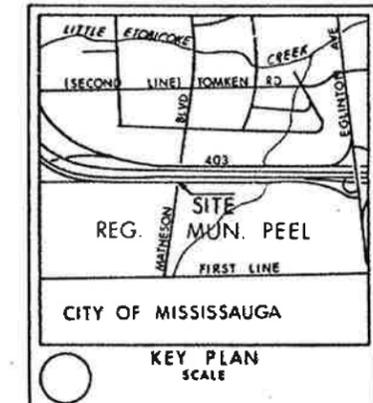
NOTE:
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN
STATIONS IN KILOMETRES • METRES

CONT No
WP No 127-66-68



HWY 403 W.B. COLLECTOR OVERPASS AT MATHESON BLVD.
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND

- ◆ Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- ⬇ W.L. at time of investigation
- NO W.L. Encountered

No	ELEVATION	STATION	OFFSET
1	165.9	7+576.6	14.8 RT.
2	167.1	7+552.8	16.0 RT.
3	166.0	7+580.0	14.2 LT.
4	166.5	7+557.0	15.0 LT.

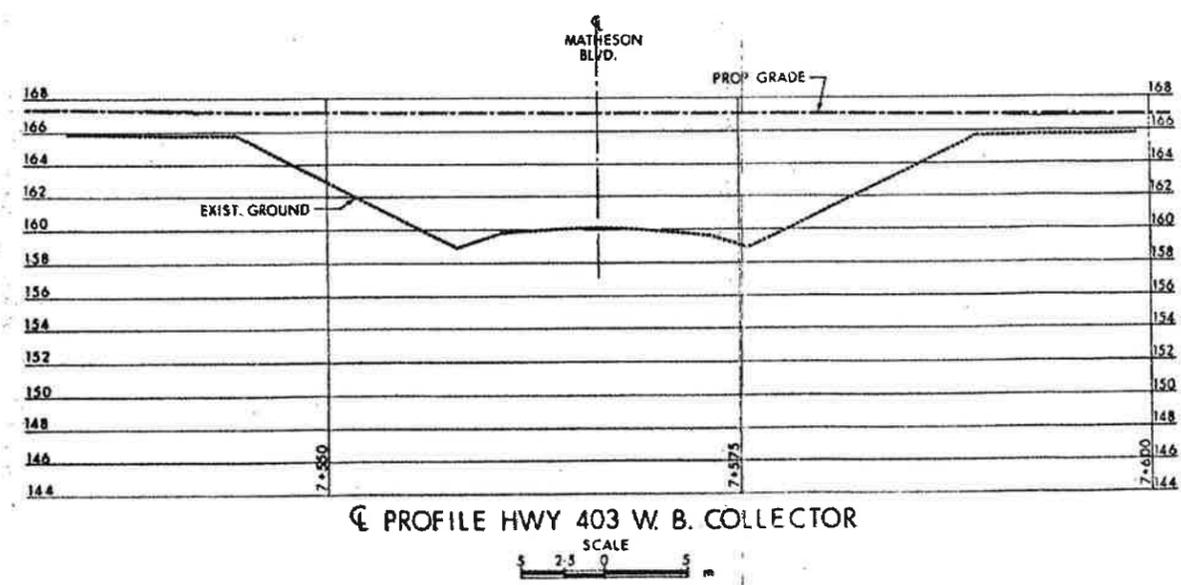
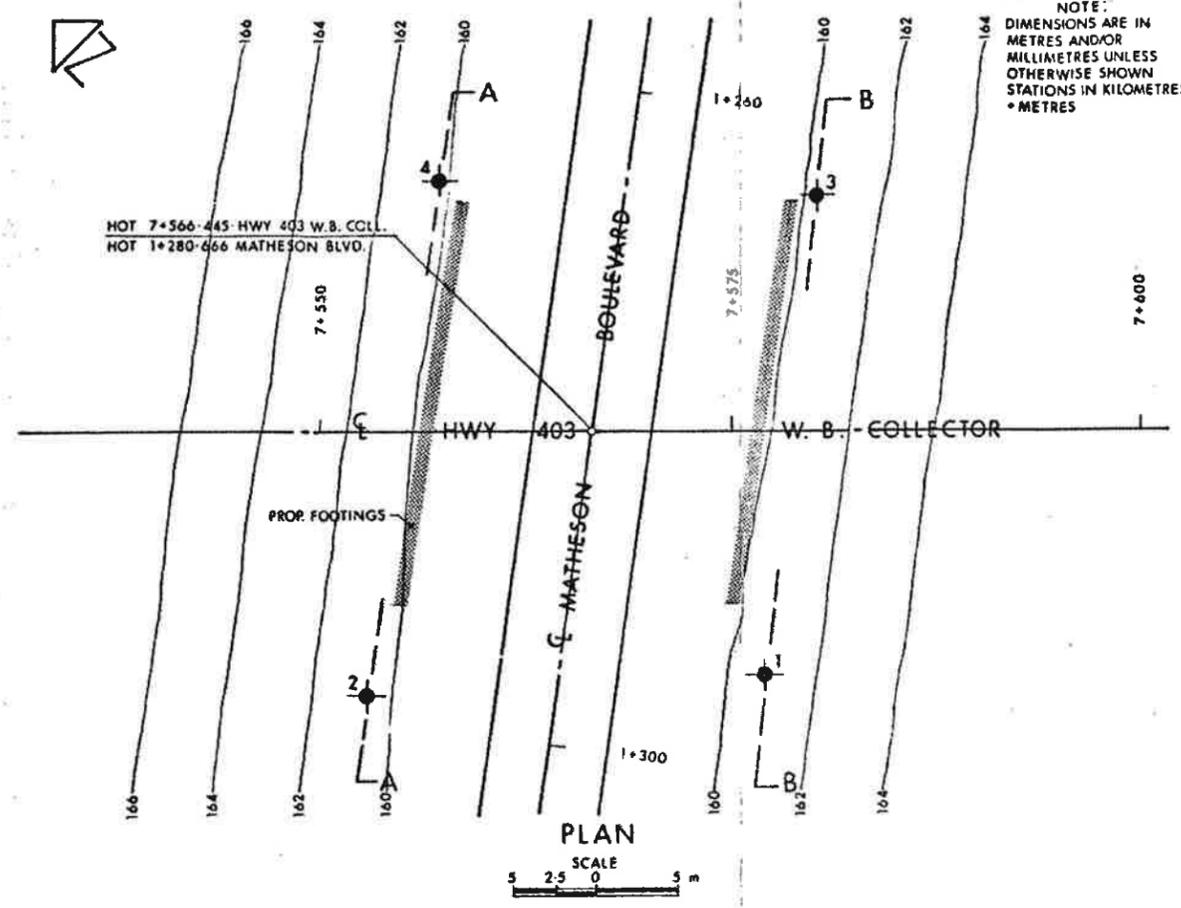
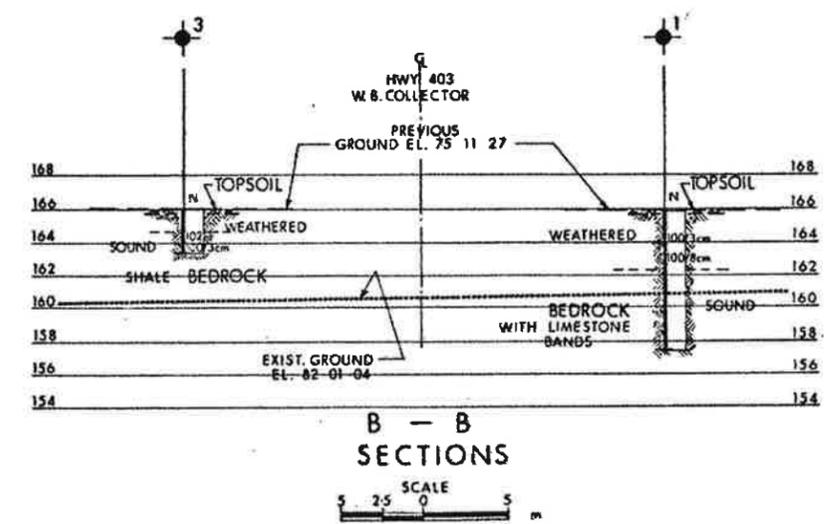
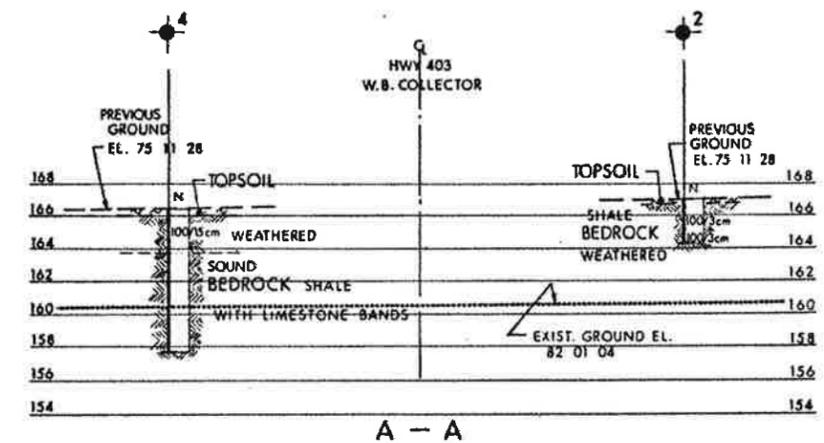
BH ELEVATIONS AS OF 75 11 18

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

Geocres No 30M12-151

HWY No	403	DIST	6
SUBMIT K. CHECKED	DATE 02 02 18	SITE 24-81-354 B	
DRAWN K. CHECKED	APPROVED	SWG 127668-A	



PROFILE HWY 403 W.B. COLLECTOR

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No.2144-07-00(a)



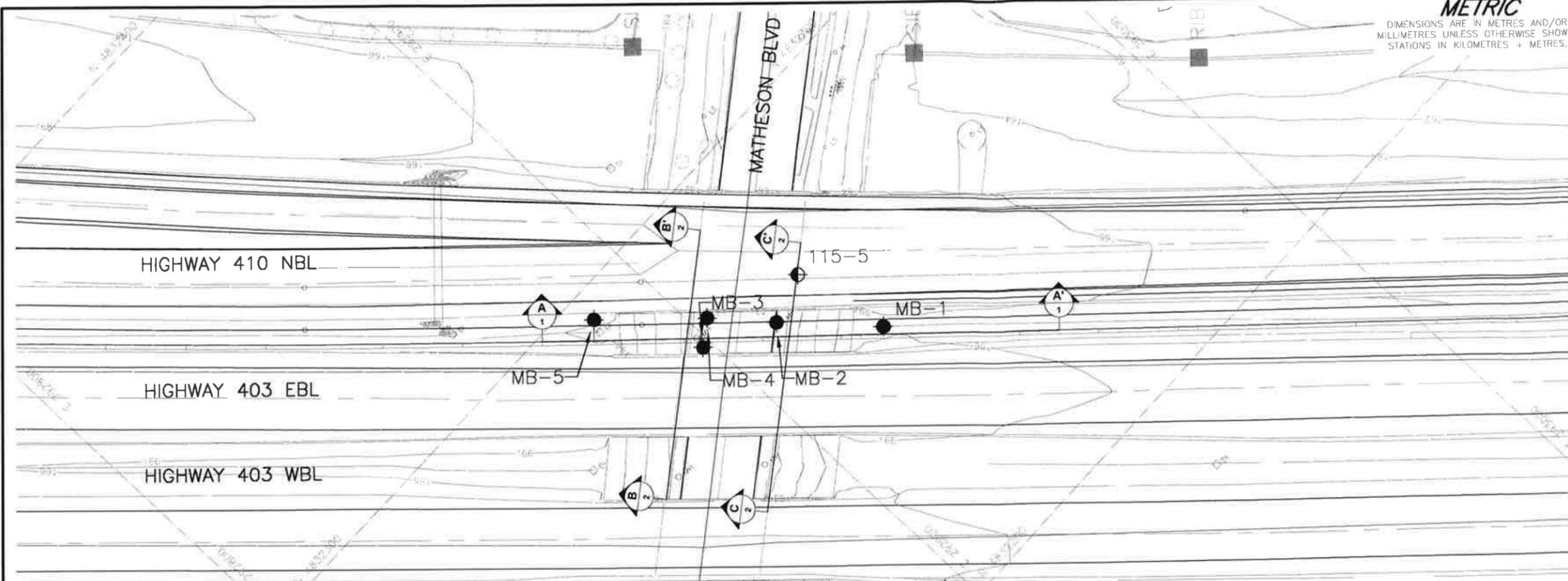
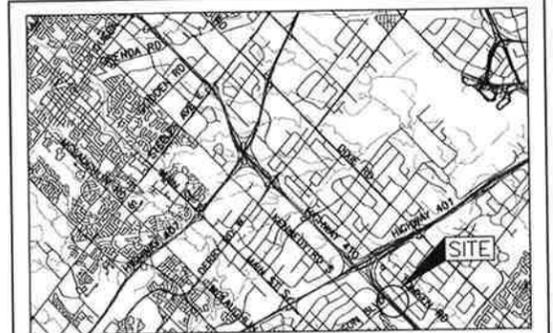
MATHESON BOULEVARD OVERPASS
HIGHWAY 410 WIDENING

SHEET

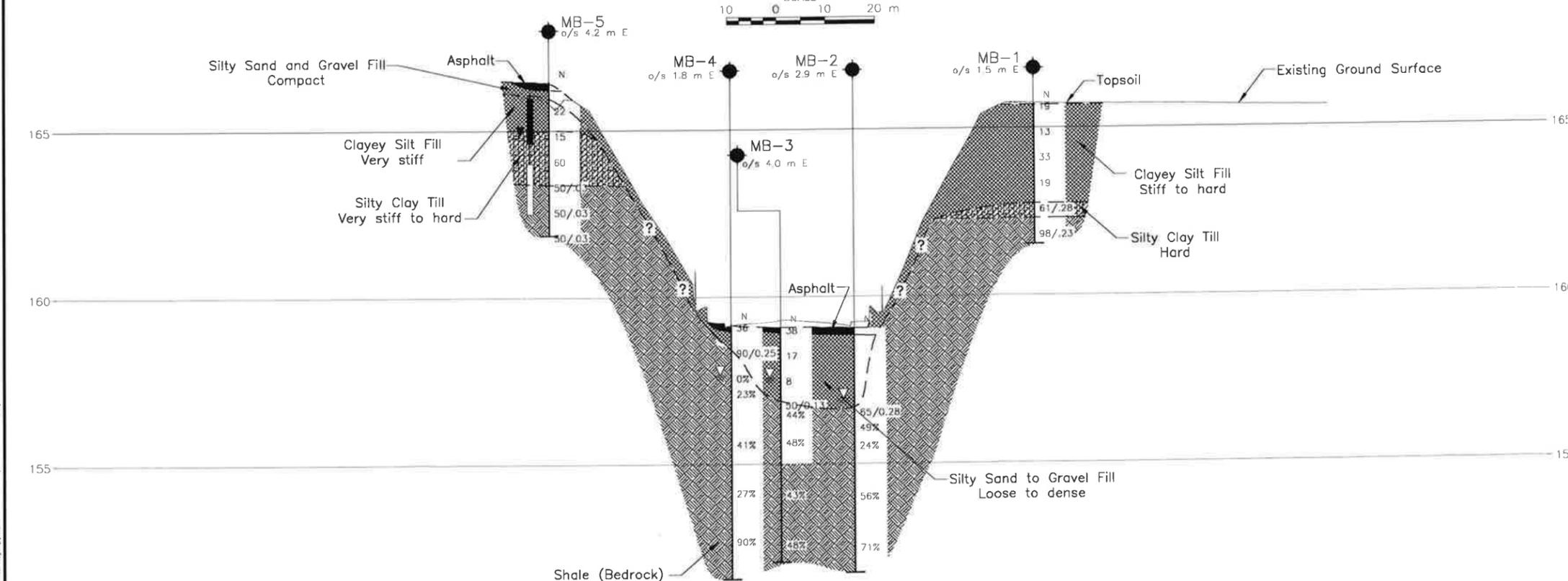
BOREHOLE LOCATION AND SOIL STRATA



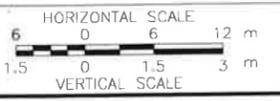
Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



PLAN



SECTION A-A'



LEGEND

- Borehole - Current Investigation
- ⊕ Borehole - Previous Investigation (Geocres No. 30M12-115)
- Seal
- Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- WL in piezometer, measured on Nov. 13, 2011
- WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
115-5	164.7	4832270.1	292921.9
MB-1	165.7	4832250.3	292926.1
MB-2	159.1	4832266.9	292911.9
MB-3	159.1	4832274.4	292898.2
MB-4	159.2	4832277.8	292903.0
MB-5	166.5	4832294.2	292887.4

NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

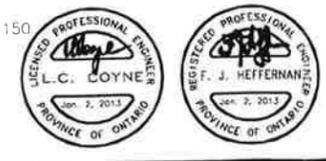
REFERENCE

Base plans provided in digital format by URS Canada Inc., (drawing file "Hwy410 (hwy401 - Queen St)_plan.dwg", received November 29, 2011).

NO.	DATE	BY	REVISION

Geocres No. 30M12-349

HWY. 410	PROJECT NO. 11-1111-00B3	DIST.
SUBM'D. NK	CHKD. LCC	DATE: 1/2/2013
DRAWN: CD	CHKD. NK	APPD. LCC
		SITE: 24-354/
		DWG. 2/1



METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No. 2144-07-00(a)

MATHESON BOULEVARD OVERPASS
HIGHWAY 410 WIDENING
SOIL STRATA

SHEET



Golder Associates Ltd.
MISSISSAUGA, ONTARIO, CANADA



LEGEND

- Borehole - Current investigation
- ⊙ Borehole - Previous Investigation (Geocres No. 30M12-115)
- ⊥ Seal
- ⊥ Piezometer
- N Standard Penetration Test Value
- 16 Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% Rock Quality Designation (RQD)
- ⊥ WL in piezometer, measured on Nov. 13, 2011
- ⊥ WL upon completion of drilling

BOREHOLE CO-ORDINATES

No.	ELEVATION	NORTHING	EASTING
115-5	164.7	4832270.1	292921.9
MB-1	165.7	4832250.3	292926.1
MB-2	159.1	4832266.9	292911.9
MB-3	159.1	4832274.4	292898.2
MB-4	159.2	4832277.8	292903.0
MB-5	166.5	4832294.2	292887.4

NOTES

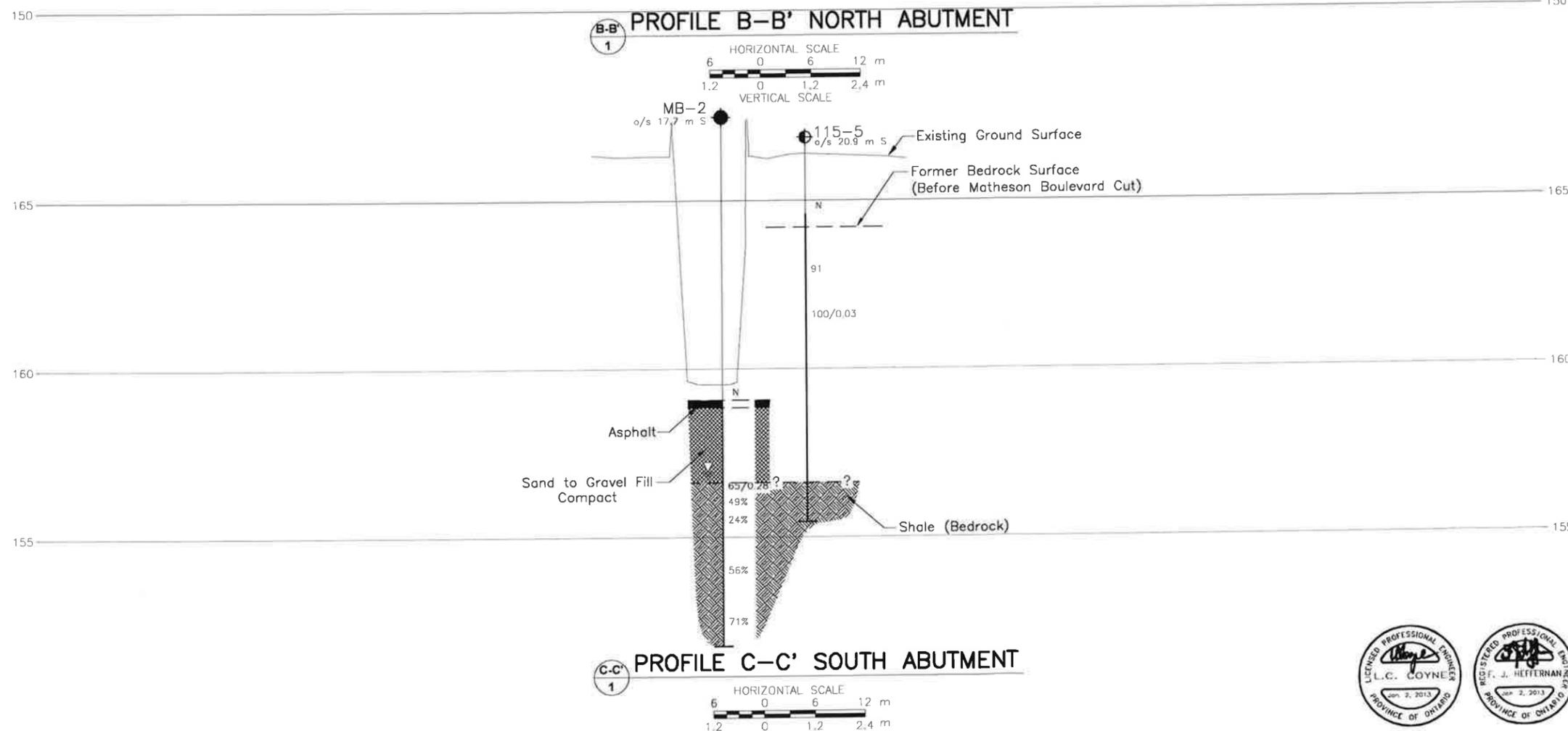
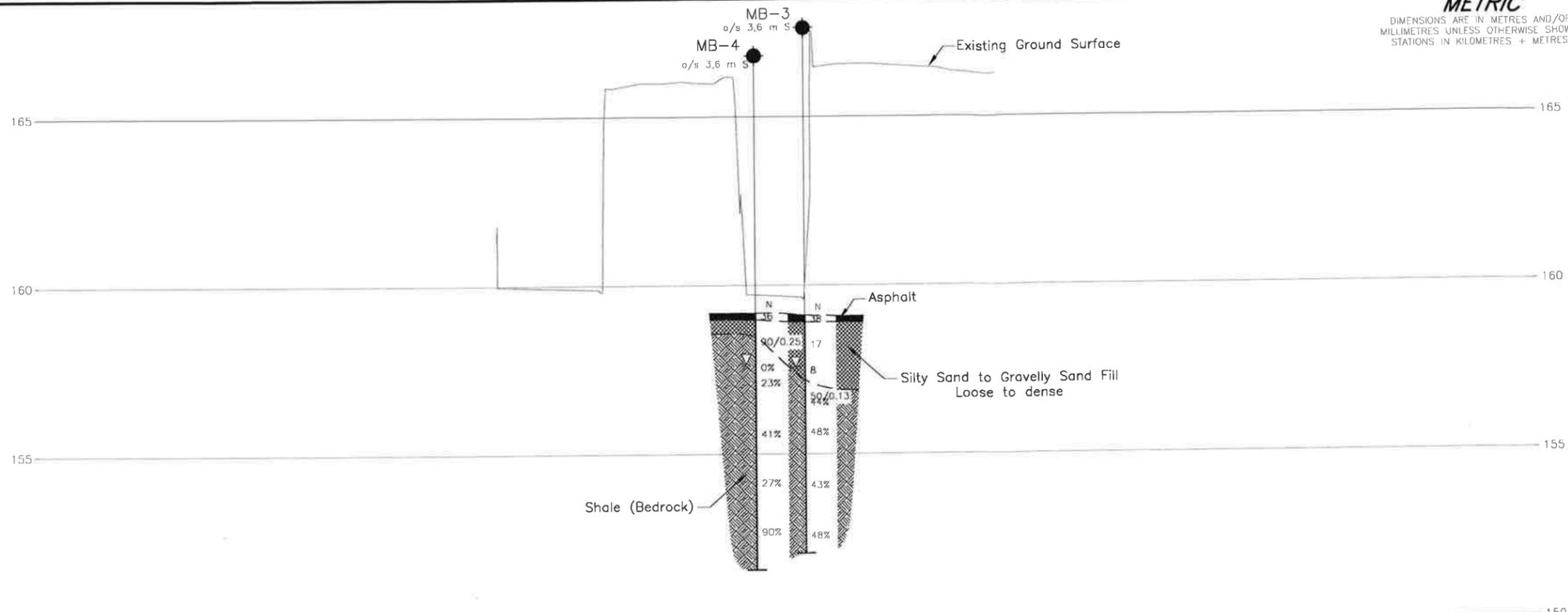
This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contract Documents.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

The complete Foundation Investigation and Design Report for this project and other related documents may be examined at the Materials Engineering and Research Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with Section GC 2.01 of OPS General Conditions.

REFERENCE

Base plans provided in digital format by URS Canada Inc., (drawing file "Hwy410 (hwy401 - Queen St).plan.dwg", received November 29, 2011).



NO.	DATE	BY	REVISION

Geocres No. 30M12-349

HWY 410	PROJECT NO. 11-1111-0083	DIST.
SUBM'D. NK	CHKD. LCC	DATE: 1/2/2013
DRAWN: CD	CHKD. NK	APPD. LCC

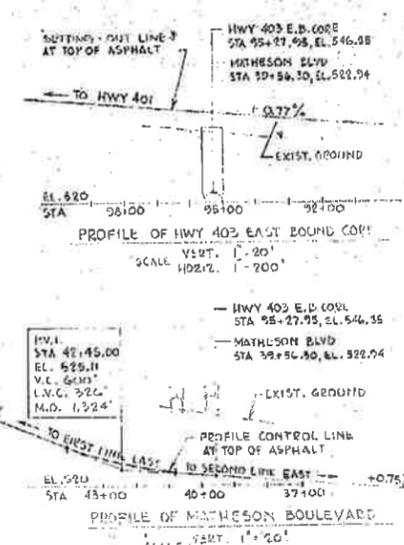
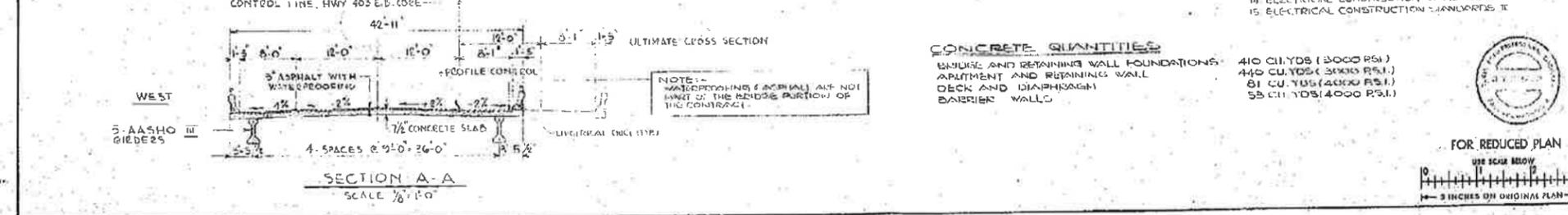
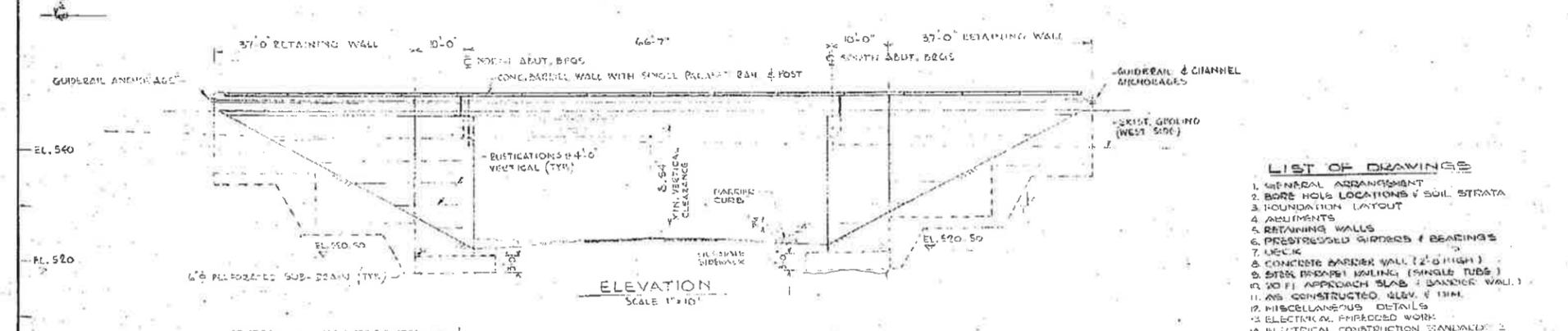
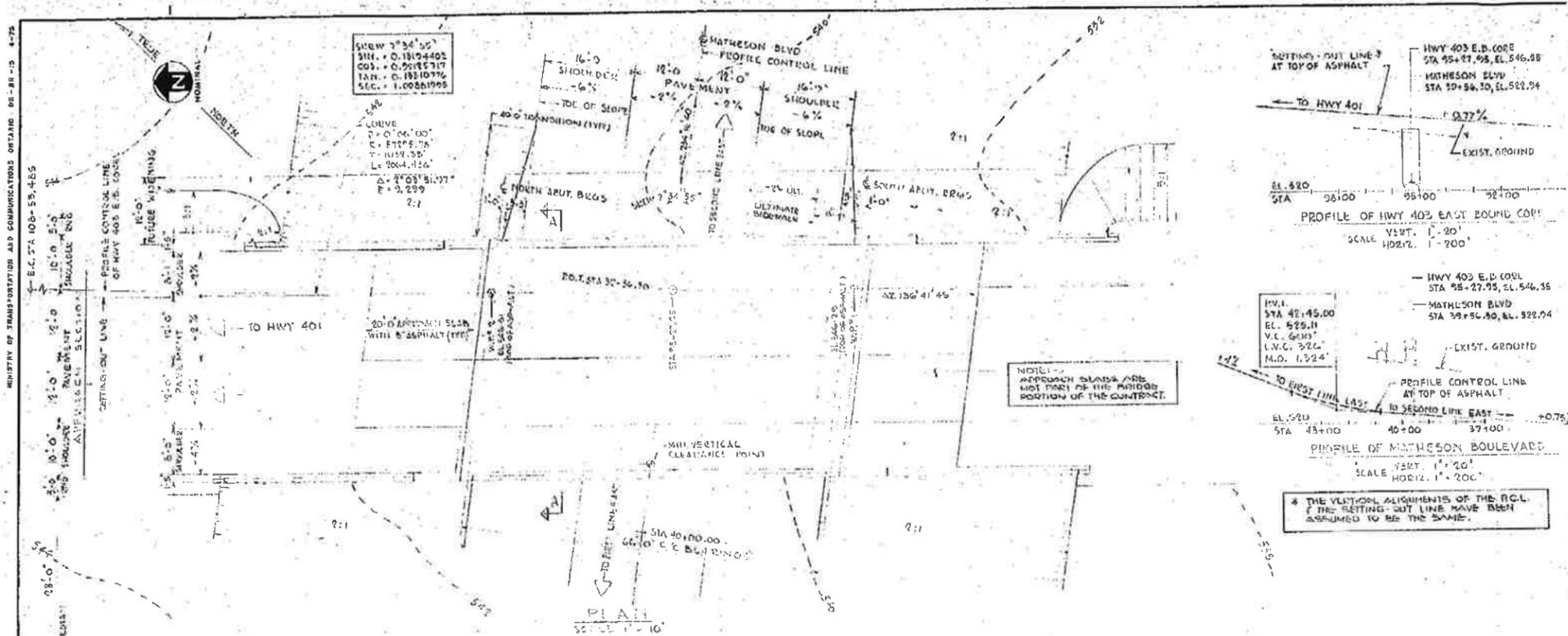
SITE: 24-354/1
DWG: 2/2



Appendix B

Archived General Arrangement and Foundation Layout Drawings

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, OTTAWA, ONTARIO, CANADA



DISTRICT No 6
CONT No
WP No 36-74-05

HWY. 403 E.B. AT MATHESON BLVD.
(BRIDGE # 61)
GENERAL ARRANGEMENT

SHEET



FENCO
FENCO CONSULTANTS LTD.

- NOTES:
- CLASS OF CONCRETE**
PRESTRESSED BEAMS = SEE DIV. NO. 6
DECK, CURBS & BARRIER WALL = 4000 P.S.I.
ALL OTHER = 3000 P.S.I.
- GRADE OF REINFORCING STEEL**
REINFORCING STEEL TO BE HARD GRADE WITH A MINIMUM YIELD STRENGTH OF 50,000 P.S.I.
- CLEAR COVER TO REIN. STEEL**
FOUNDATIONS & SURFACES IN CONTACT WITH EARTH
DECK SLAB TOP = 2"
DECK SLAB BOTTOM
CURBS, BARRIER WALLS & DIAPHRAGMS
ALL OTHER = 1 1/2"
- * TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED THE TOP LAYER SHALL BE PLACED FIRST TO CONCRETE WITH A CLEAR COVER OF 2 1/2" TOLERANCE.
- PRESTRESSING NOTES**
FOR PRESTRESSING NOTES SEE DIV. NO. 6.
- CONSTRUCTION NOTES**
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF 1/8".
NO CONCRETE SHALL BE PLACED ABOVE THE BEARING SEATS UNTIL CONCRETE IN THE DECK HAS BEEN PLACED.

- LIST OF DRAWINGS**
1. GENERAL ARRANGEMENT
 2. BORE HOLE LOCATIONS & SOIL STRATA
 3. FOUNDATION LAYOUT
 4. ALIGNMENTS
 5. RETAINING WALLS
 6. PRESTRESSED GIRDERS & BEARINGS
 7. DECK
 8. CONCRETE BARRIER WALL (2'-0" HIGH)
 9. STEEL BRACKET BOLTING (SINGLE TUBS)
 10. 20' FT. APPROACH SLAB & BARRIER WALL
 11. AS CONSTRUCTED SLEV. & 13M.
 12. MISCELLANEOUS DETAILS
 13. ELECTRICAL PRELIMINARY WORK
 14. ELECTRICAL CONSTRUCTION STANDARDS
 15. ELECTRICAL CONSTRUCTION STANDARDS II

CONCRETE QUANTITIES
BRIDGE AND RETAINING WALL FOUNDATIONS
APPROACH AND RETAINING WALL
DECK AND DIAPHRAGM
BARRIER WALLS

410 CU. YDS. (3000 P.S.I.)
440 CU. YDS. (3000 P.S.I.)
81 CU. YDS. (4000 P.S.I.)
53 CU. YDS. (4000 P.S.I.)

FOR REDUCED PLAN
USE SCALE BELOW

0 1 2 3 4 5 6 7 8 9 10
1/4" = 1" ON ORIGINAL PLAN

REVISIONS

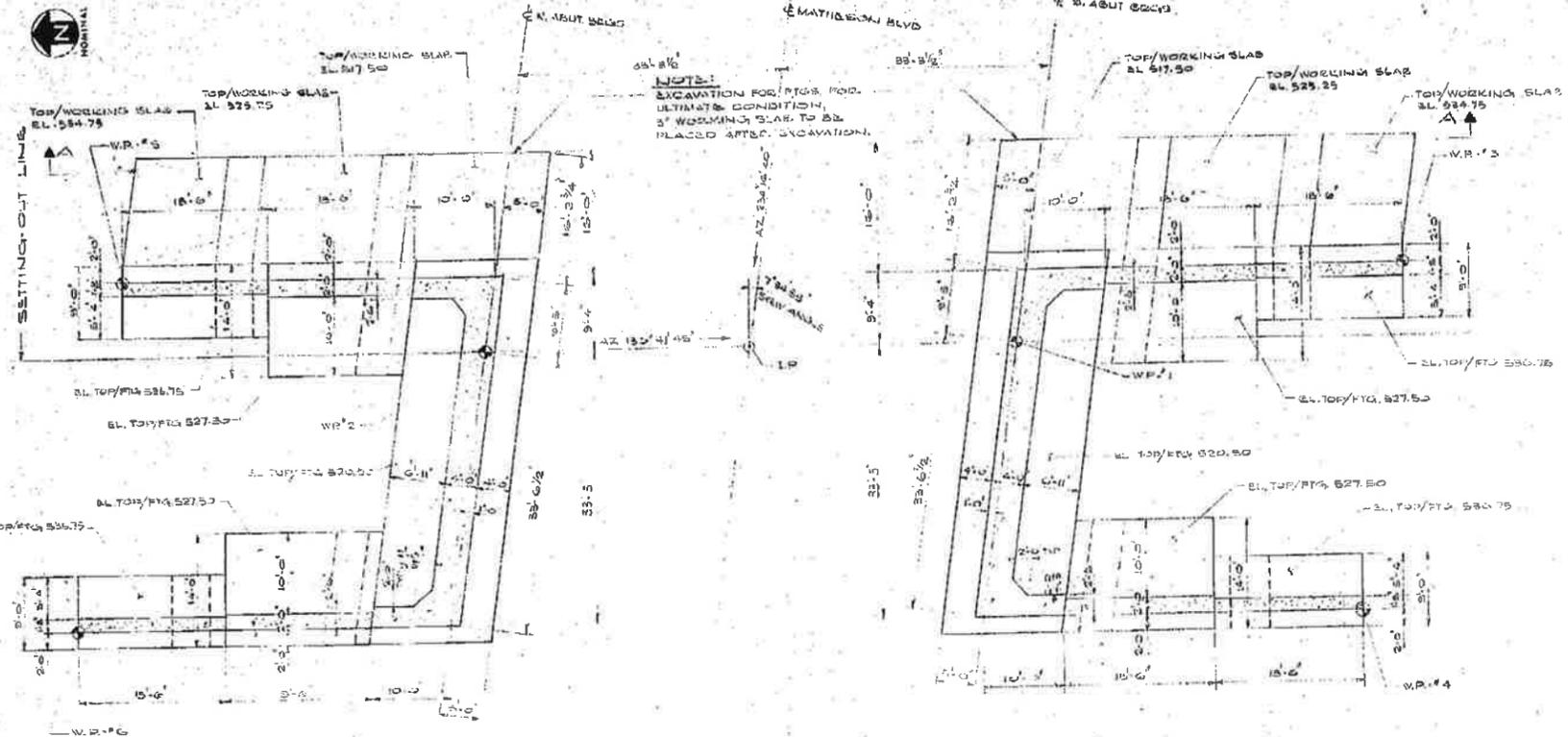
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DESIGN W.T. CHECKED BY LOADING NO. 20-44 DATE 5/1/74
DRAWING W.W. CHECKED BY SITE No 24-35-CC-1000-1

RECEIVED
JAN 12 1977

FENCO No. G10-1K-1

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS OREGON DP-88-15 4-75



FOUNDATION PLAN
SCALE 1/8" = 1'-0"

DESCRIPTION	STATION	CO-ORDINATES	
		NORTH	EAST
P.P.	06+27.25 105.489 8.8	853 185.155	960 004.235
W.P. #1		853 180.891	960 027.129
W.P. #2		853 189.415	960 051.461
W.P. #3		853 112.256	960 052.010
W.P. #4		853 087.174	960 052.734
W.P. #5		853 212.115	960 055.877
W.P. #6		853 208.052	960 071.924

DISTRICT No 6	SHEET
CONT No WP No 36-74-03	
HWY 403 E. & MATHESON BLVD. (BRIDGE G.I.)	FENCO FENCO CONSULTANTS LTD
FOUNDATION LAYOUT	

NOTE:
FOR GENERAL NOTES SEE DRAWING
THIS DRAWING IS TO BE IN CONSTRUCTION WITH OVER NO. 11 B.



SECTION A-A
SCALE 1/2" = 1'-0"

FOR REDUCED PLAN
SEE SCALE BELOW

REVISIONS

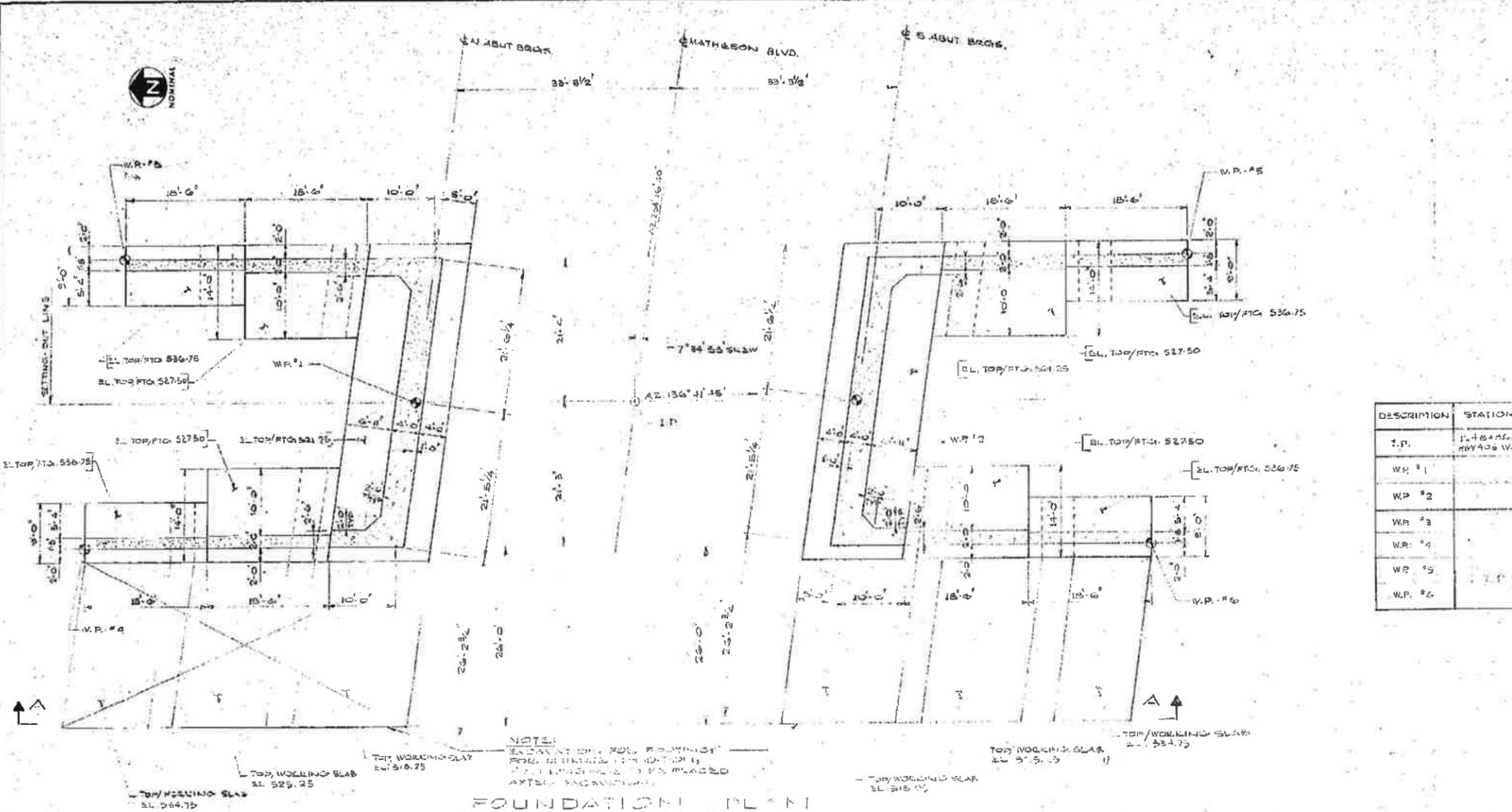
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RECEIVED
JAN 12 1977

FILED NO. 6710-11-3

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS DRAWING 29-25-15 4-75



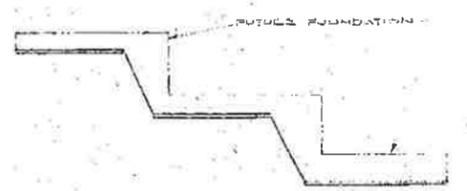
DISTRICT No 6		○
CONT No WP No 26-74-02		
HWY 403 WB. MATHESON 24.V.D. (20.100.02 * 02)		SHEET
FOUNDATION LAYOUT		
FENCO FENCO CONSULTANTS LTD.		

DESCRIPTION	STATION	COORDINATES	
		NORTH	EAST
I.P.	1+6+72.10 HWY 403 W.B.	853 095.608	967 807.070
W.P. #1		853 118.505	967 784.782
W.P. #2		853 071.441	967 870.460
W.P. #3		853 166.663	967 770.023
W.P. #4		853 141.382	967 735.152
W.P. #5		853 048.803	967 880.163
W.P. #6		853 024.722	967 845.292

NOTES:
 1. ELEVATIONS FOR FOOTINGS FROM FINISH FLOOR TO BE PLACED AFTER FOUNDATION.
 2. TOP WORKING SLAB ELEVATIONS TO BE PLACED AFTER FOUNDATION.

FOUNDATION PLAN
SCALE 1/8" = 1'-0"

NOTES:
 1. FOR GENERAL NOTES SEE DWG. NO. 1.
 2. THIS PLAN TO BE READ IN CONJUNCTION WITH DWG. NO. 2 & 3.



SECTION A-A
SCALE 1/8" = 1'-0"



SOFT 115
 CADRES No.



FOR REDUCED PLAN
 USE SCALE BELOW

1 INCHES ON ORIGINAL PLAN

REVISIONS	DATE	BY	DESCRIPTION

DESIGN BY: CHECKED BY: LOADING BY: DATE: 10/10/76
 DRAWING NO: CONFORM SITE No 24-584-DWG 3
 FENCO DWG. NO. 26-74-02-3