

30M05-103
GEOCRES No.

FOUNDATION INVESTIGATION & DESIGN REPORT

W.P. 70-76-01

DIST. 4

HWY. 60 Station STR. SITE N/A

Pedestrian Tunnel
Third Line Station, Oakville

DISTRIBUTION

T. Swinton (6) TATOA
R. Hore
J. Anderson }
R. Fitzgibbon } cover only
G. Sloan }
Files ✓

GEOCRES

30M5-103
GEOCRES No.

DATE

OCT 28 1975

INTRODUCTION

A request for a foundation investigation at the site of a proposed Pedestrian Tunnel at the new Third Line commuter rail station in the town of Oakville was received from Mr. T. Swinton, Plant Design Supervisor (T.A.T.O.A.) in a memorandum dated October 5, 1976.

Following this request a field investigation, consisting of three boreholes, was carried out by the Soil Mechanics Section to determine the sub-soil conditions existing at the site.

A muskeg vehicle mounted flight auger machine using solid augers and rock coring equipment was employed for the boring operation.

This report contains the results of the field investigation together with our recommendations pertaining to the design and construction of the proposed Pedestrian Tunnel.

In this report, the vertical measurements (elevations) are referenced to an assumed datum, using the intersection of the Pedestrian Tunnel centerline and the most northerly rail. An arbitrary elevation of 100.0' was assigned to this datum. For horizontal distances the same intersection point was used as the reference mark.

SITE DESCRIPTION

A commuter rail ('GO') station is proposed along the north side of the CNR some 1300 ft. west of the existing Third Line road in the Town of Oakville. Pedestrian access between the platform and parking lot will be provided by means of a tunnel under the existing and future CNR tracks.

At present, there are three sets of tracks. The adjacent area immediately north of the railway is cleared and part of Ontario Hydro right-of-way. The land formation in general is flat and dipping slightly to the north. South of the CNR right-of-way, the buildings, workshops and storage areas of Procor Industries are situated.

Physiographically, the area lies in the region referred to as the Iroquois Plain.

SUBSOIL

General

The subsurface conditions as determined from the borings were found to be quite uniform. Below a relatively shallow (up to 2.0 ft. thick) topsoil and clayey silt zone, shale bedrock was encountered.

The boundaries between different deposits are shown on the Record of Borehole Sheets attached to the Appendix. The estimated stratigraphical profile of Drawing No. 707601-A is based upon this information.

Bedrock

The surficial topsoil and clayey silt layer is underlain by shale bedrock at every borehole location.

The bedrock can be separated into two distinct zones. Above elev. 85 ± the shale is very badly decomposed (weathered) and was penetrated without difficulties with conventional augering methods in BH # 1 & 2.

Standard Penetration Tests carried out within the weathering portion gave 'N' values to range from 6 blows per foot to over 100 blows for 5 in. of penetration. The natural moisture content of the samples obtained appear from visual examination to be very low. In BH #1A, which was put down adjacent to BH #1, core samples were obtained to determine the layered characteristics and extent of the weathering of this zone. The core samples were examined by MTC geologist Ms. Z. Koniuszy and a detailed description is included in the Appendix.

Below elev. 85 ± the shale is sound as indicated by the 100% recovery. This portion of the bedrock was found to contain bands and lenses of limestone.

GROUNDWATER CONDITIONS

Groundwater level observations were carried out in the open boreholes some 24 hours after the completion of the boring operations.

Boreholes #1 and 1A were found to be dry to approx. elev. 88.5 (12.5' below ground level). At this level, both boreholes were found to be 'caved-in'.

In BH #2, water was observed at about 2.8' below ground level. It is our assessment that this water was left in the borehole due to the drilling operations. It can be inferred therefore that the groundwater level in the vicinity of the proposed tunnel is at or below elev. 88.5

DISCUSSION AND RECOMMENDATIONS

It is proposed to build a Pedestrian Tunnel under the CNR tracks to provide a connection between the rail platform and the future 'Go Transit' station parking lot. According to available information, the invert of the tunnel will be some 16 ft. below the base of rails (Elev. 84 ±).

Borings have indicated the subsoil to consist of about 2 ft. of overburden which is followed by shale bedrock. Above elev. 85 ± (13 ft. depth) the shale is weathered, but sound below this level.

It is our opinion that the weathered portion can be excavated without any difficulties.

Below elev. 85 ± the shale is sound. However, due to the brittle nature of this type of bedrock it is considered that conventional machines such as backhoes should be able to excavate without undue difficulties.

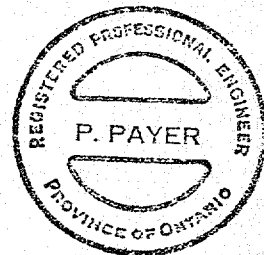
Bearing pressures up to 15 tsf are recommended for the sound portion of the shale bedrock.

It is assumed that the construction of the tunnel will be completed within a very short period of time, in which case, the shale can be excavated with vertical slopes and will remain stable.

No major dewatering problems are anticipated. Any seepage into the excavation can be handled by pumping.

P. Payer
P. Payer, P. Eng.
Senior Engineer


K. G. Selby
For: K.G. Selby, P. Eng.
Supervising Engineer




Oct/76

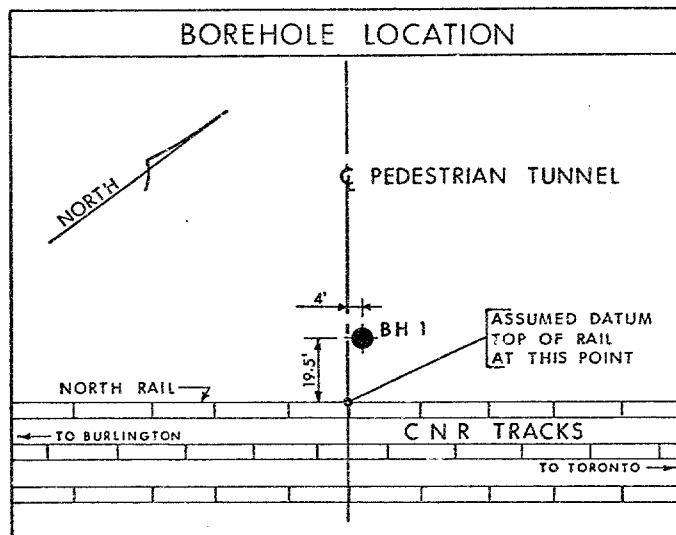
APPENDIX

RECORD OF BOREHOLE NO 1

WP 70-76-01 LOCATION See Sketch Below ORIGINATED BY PP
 DIST 4 HWY 'Go' Station BORING DATE Oct. 13, 1976 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Cont. Flight Auger CHECKED BY 

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					w_p w w_L				
							SHEAR STRENGTH					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
101.2	Ground Level															
0.0	Topsoil & clayey silt & shale fragments.					100										
99.2																
2.0	Shale		1	SS	6											
			2	SS	50											
			3	SS	97	4½"										
			4	SS	51											
			5	SS	142	9"										
			6	SS	112	5"										
			Bedrock	7	SS	130										
		8		SS	93	2"										
	Weathered	9	SS	61	1½"											
85.4																
15.8	Refusal End of Borehole															

Note: Hole caved in
at El. 88.5

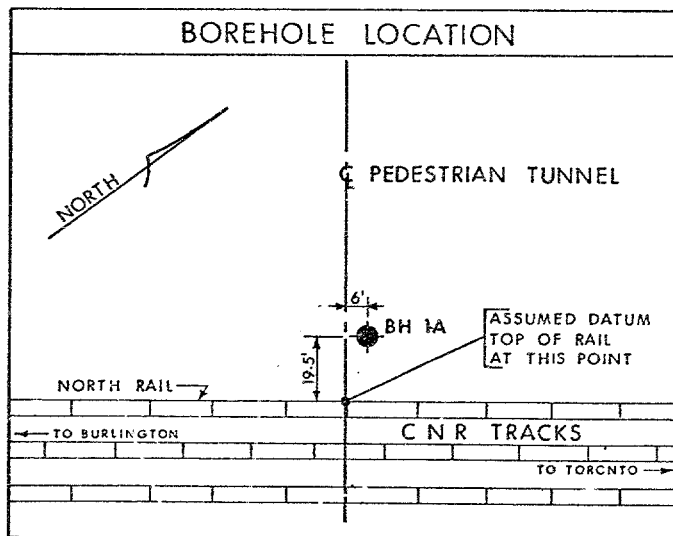


MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1A

WP 70-76-01 LOCATION See Sketch Below ORIGINATED BY PP
DIST 4 HWY 'Go' Station BORING DATE October 13 & 14, 1976 COMPILED BY PP
DATUM Assumed BOREHOLE TYPE BXL Rock Coring CHECKED BY *[Signature]*

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	w_p	w	w_L		
101.0	Ground Level															
0.0	Topsoil & clayey silt															
99.0	shale fragments.					100										
2.0																
	Shale Bedrock		1	RC BXL	Rec. 61%											
	Weathered		2	RC BXL	Rec. 69%											
			3	RC BXL	Rec. 80%	90										
85.3																
15.7	Sound		4	RC BXL	Rec. 100%											
	occasional limestone															
	layers.		5	RC BXL	Rec. 100%	80										
75.9																
25.1	End of Borehole															
	Note: Hole caved in at El. 88.5															

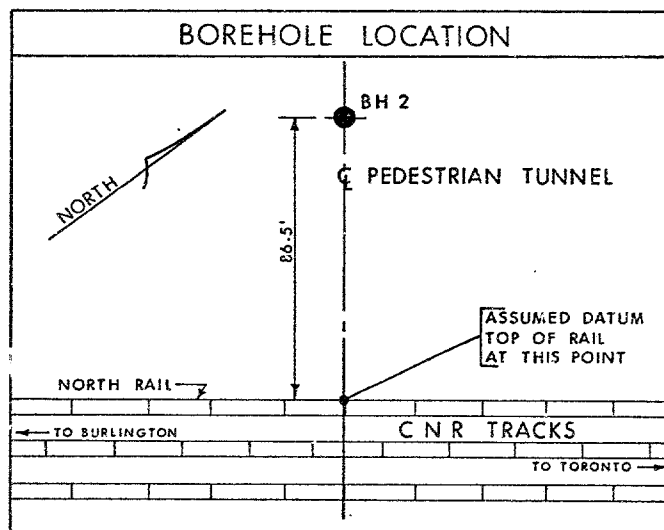


ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 70-76-01 LOCATION See Sketch Below ORIGINATED BY PP
 DIST 4 HWY 'Go' Station BORING DATE October 14, 1976 COMPILED BY PP
 DATUM Assumed BOREHOLE TYPE Cont. Flight Auger & BXL Rock Coring CHECKED BY PP

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 % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W_L		
97.6	Ground Level														
0.0	Topsoil & clayey silt														
96.1															
1.5															
	Shale		1	SS	74										
	Bedrock		2	SS	51										
			3	SS	38/1"										
	Weathered		4	SS	103/5"										
			5	SS	115/6"	90									
85.3															
12.3	Sound occasional limestone layers.		7	RC BXL	Rec. 100%										
79.3						80									
18.3	End of Borehole														





Memorandum

To: Mr. P. Payer,
Sr. Engineer,
Soil Mechanics Section,
1st Floor, West Building.

From: Pavement Structure Design Section,
Geotechnical Office,
1st Floor, West Building.

Attention:

Date: October 18, 1976.

Our File Ref.

In Reply to

Subject:

W.P. 70-76-01
District 4 - Hamilton

The two bore holes of this project were drilled in Queenston Formation belonging to the Upper Ordovician Age. Both of them cut through red shale with characteristic reddish and greenish thin layers and lenses of argillaceous shaly limestone. Shale of this formation is easily broken by weathering processes into fine reddish clay soil.

B.H. #1A

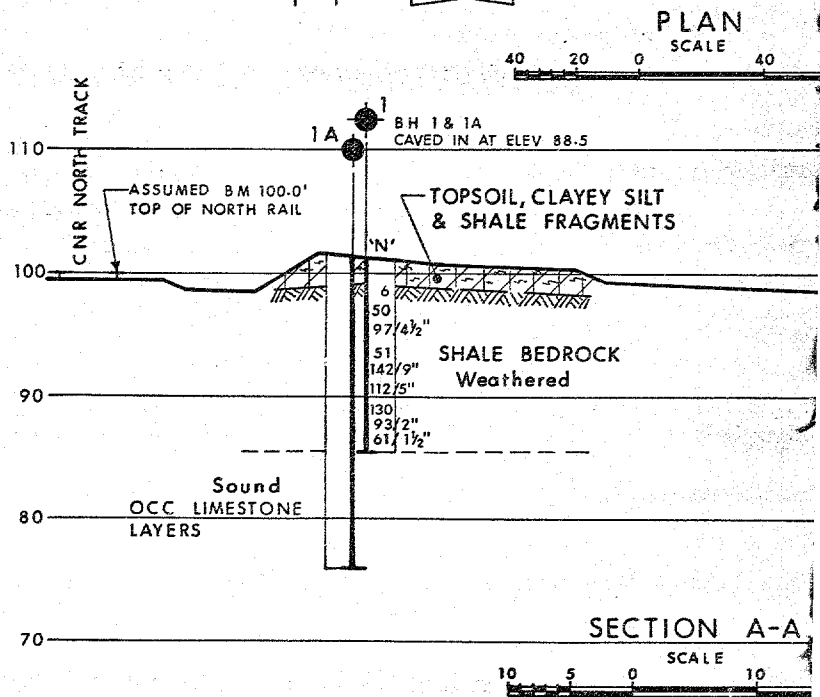
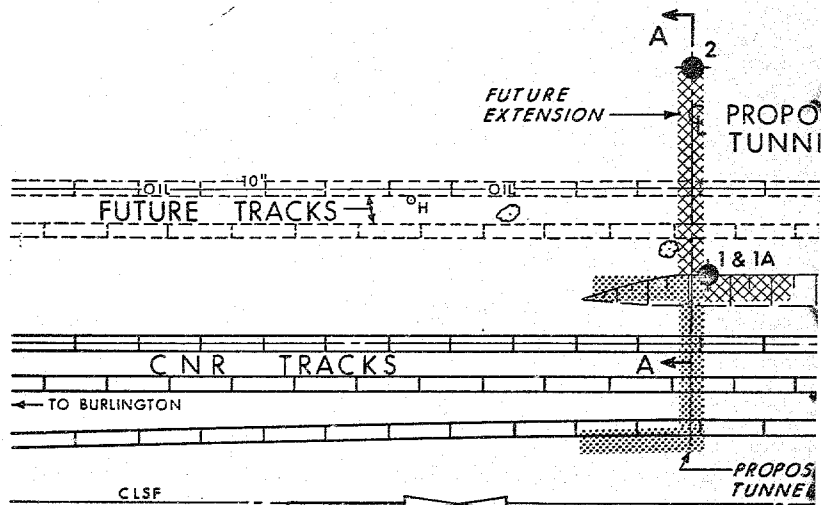
- | | |
|---------------|--|
| 4.1' - 15.7' | Red shale with few green shale layers, very soft absorptive. |
| 15.7' - 16.0' | Limestone, greenish grey, shaly slightly argillaceous, medium hard. |
| 16.0' - 17.2' | Red shale, medium soft with layers and irregular spots of greenish shale. Slightly argillaceous. |
| 17.2' - 17.6' | Limestone, greenish grey, shaly slightly argillaceous, medium hard. |
| 17.6' - 25.2' | Red shale, medium soft with layers and irregular spots of greenish shale. Few thin lenses of greenish grey argillaceous limestone. |

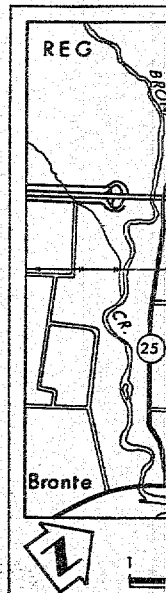
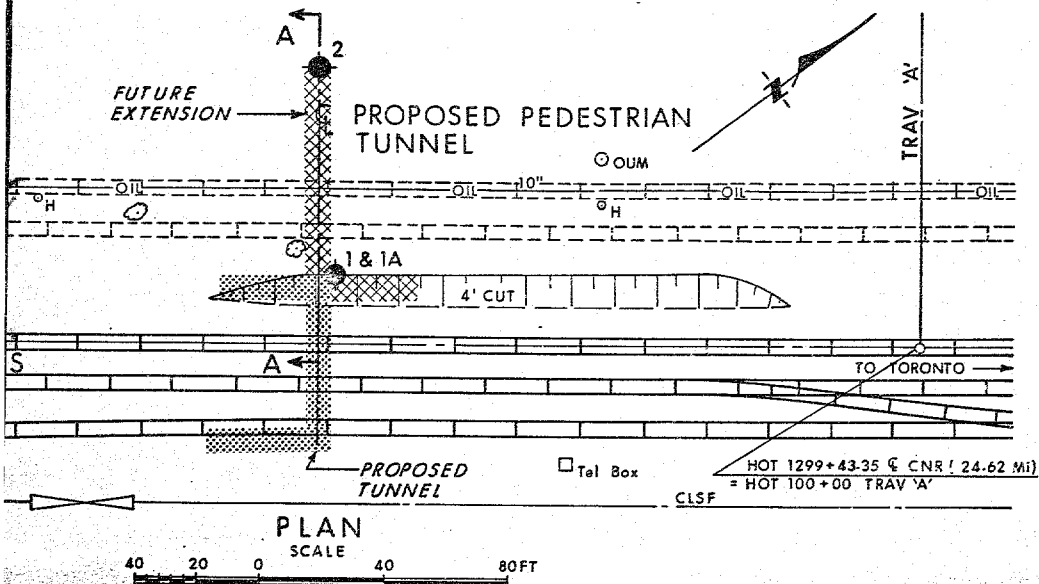
B.H. #2

- | | |
|---------------|---|
| 13.0' - 13.3' | Limestone, greenish-grey, medium hard, argillaceous. |
| 13.3' - 18.3' | Red shale, medium soft with few thin lenses of green shale and few lenses of greenish grey highly shaly argillaceous limestone. |

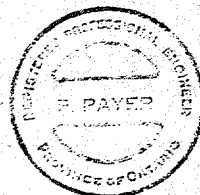
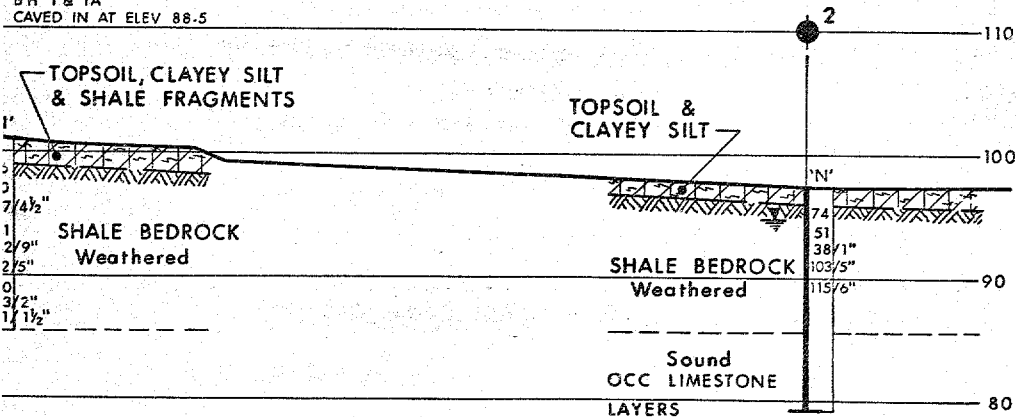
Z. Koniuszy
Z. Koniuszy,
Geologist.

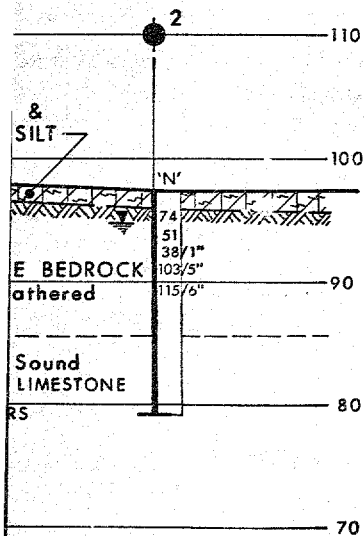
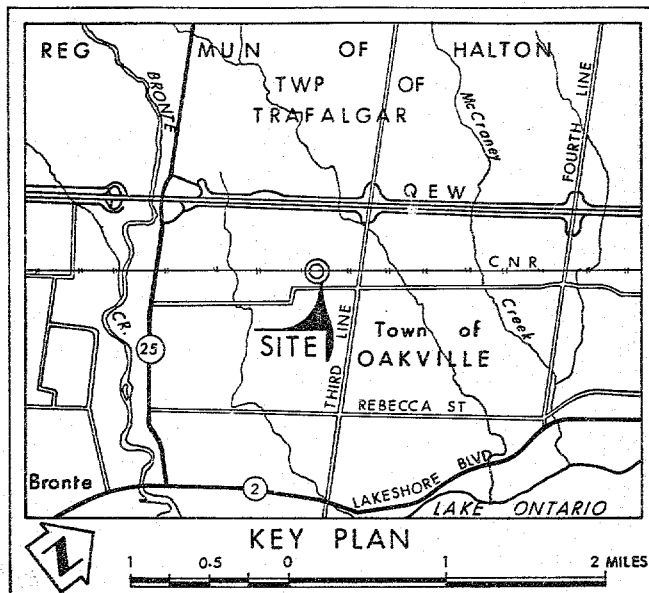
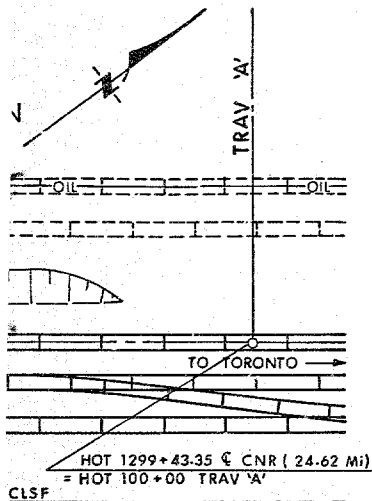
ZK/sd





BH 1 & 1A
CAVED IN AT ELEV 88.5





LEGEND			
	Bore Hole		
'N'	Blows/ft (Std Pen Test 350 ft lbs energy)		
	W L at time of investigation Oct /1976		
No	ELEVATION	STATION	OFFSET
1.	101.2 *	SEE PLAN & RECORD OF BOREHOLE SHEETS	
1A	101.0 *		
2	97.6 *		

* ASSUMED DATUM



Ministry of
Transportation and
Communications

ENGINEERING SERVICES BRANCH

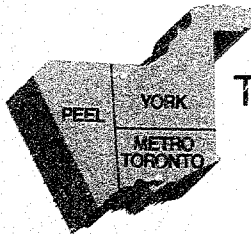
Reg Mun HALTON; Twp TRAFALGAR; Town of OAKVILLE; Dist 4

DATE Oct 21, 1976

WP 70-76-01

Dwg No 707601-A

PROPOSED PEDESTRIAN TUNNEL
(THIRD LINE 'GO' STATION - OAKVILLE)



Toronto Area Transit Operating Authority

3625 DUFFERIN STREET, DOWNSVIEW, ONTARIO M3K 1Z2 (416) 630-2635

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Managing Director
W.T. HOWARD

October 5, 1976

Mr. K. G. Selby
Geotechnical Office
Soils Mechanics Section
Ministry of Transportation
and Communications
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

Dear Sir:

Re: Proposed Third Line Commuter Rail Station
Town of Oakville - W.P. 70-76-01

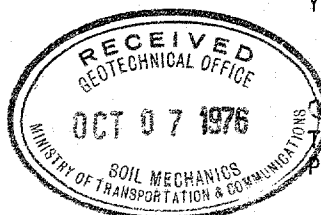
This is to confirm our telephone conversation of October 4th, with respect to the pedestrian tunnel proposed for the new GO commuter station to be developed at the Third Line.

Would you please arrange for a borehole foundation investigation (2 holes required) for this proposed underpass, providing a connection between the rail platform and station parking lot. Three copies of the report on the subsoil data from the foundation investigation are requested.

With this tunnel located entirely within CN Rail right-of-way, a flagman will be provided and staking of the underground utilities will be carried out by CN. I must stress that during the site drilling operations, the CN flagman must be obeyed at all times. To co-ordinate the timing of this work would you please contact Mr. P. Webber of CN at 365-3582.

Enclosed herewith, two prints of the station layout plan showing the tunnel site with the approximate locations for the borehole investigation. The drilling work will, however, be subject to the site conditions as staked or marked in field.

Yours very truly,



J. Swinton
J. Swinton
Plant Design Supervisor

Enclosures

Mr. T. Swinton
T.A.T.O.A.
3625 Dufferin Street
Downsview, Ontario.

Materials and Testing Office
Central Region

2 July 1976

W.P. 70-76-01, Lakeshore GO Rail,
Third Line Station Parking Lot and Access Road
District 4, Hamilton

For the proposed Third Line GO station, a parking area will be built along the north side of the CNR, west of the Third Line Road. The station is between Bronte and Oakville. The parking area lies partly on Ontario Hydro right-of-way, and partly on lands owned by Hansetic Holdings. The layout for the initial parking area provides for about 210 cars, kiss and ride parking and a bus loop, together with an access road and covers an area of some 1000' along the CNR with a depth of 160'. For future parking expansion, an adjacent 800' x 60' for 350 cars parking lies just west of the Third Line. The total parking will therefore extend from the Third Line Road westerly for 1800'. 45

The general area was once under glacial Lake Iroquois. The flat terrain slopes faintly to the south to Lake Ontario. The soils overburden is red medium clay with remnants of severely weathered shale and varies in depth from 5' to 10'. The underlying bedrock is a soft shale with minor bands of limestone.

A soils investigation by power auger was done on June 22 nd. The logs of the borings and sketches showing the locations of the borings are attached. The boring logs have also been typed on acetate paper to be attached to the contract documents. As shown in the boring logs, bedrock was found in nearly all borings and at depths from 5' to 10'. The moisture content of the overburden is very low and in most of the borings, close to dry. This is chiefly a feature of the character of the medium clay - severely weathered shale overburden material and to a lesser extent of the time of the year.

As far as depths are concerned, the grading will be very light cut and fill. The soils found adjacent to the project will be a mixture of medium clay and weathered shale and can be used as earth borrow. Granular 'A' will 46

probably be obtained from quarry sources in the Milton and Campbellville areas, with haul distance of about 15 miles. There are also some Granular 'B' sources in this area; others are near Acton and Georgetown, but involve hauls of 20 and 25 miles.

Recommendations are:

1. Topsoil

Topsoil depths vary from 5" to 12". For the design, a depth of topsoil stripping of 9" should be used.

2. Granular Materials

As for many projects in this area, it is recommended that only Granular 'A' be used.

3. Pavement Design

For the red clay-weathered shale subgrade, the recommended pavement is:

- (a.) 18" Granular 'A', and 1½" HL3 for the parking areas and the kiss and ride area.
- (b.) 18" Granular 'A', and 4½" HL (1½" HL3 over two 1½" HL6 binder courses), for access road and bus loop areas.

Provide for a minimum 2½% cross-fall of the earth grade to facilitate the drainage of the granular bed.

PA/RDG/sw

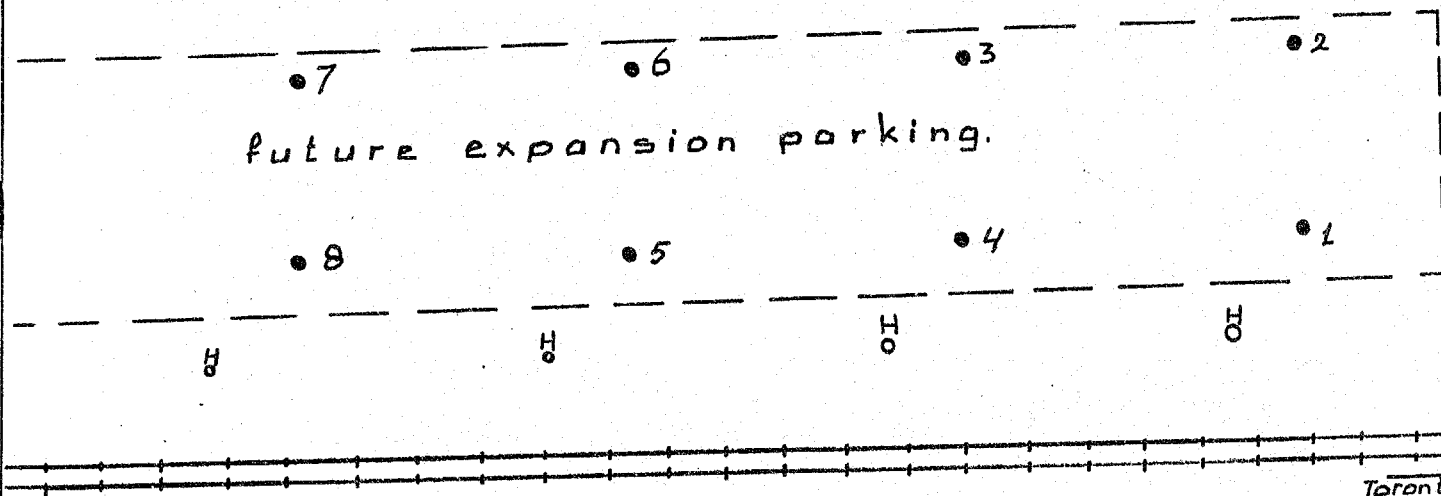
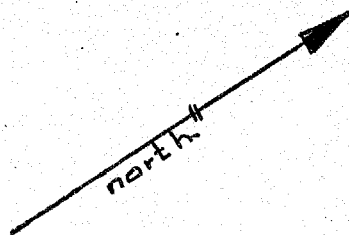


P. Arkema
Senior Soils Engineer

Encl.: Boring logs
Sketches of
boring locations

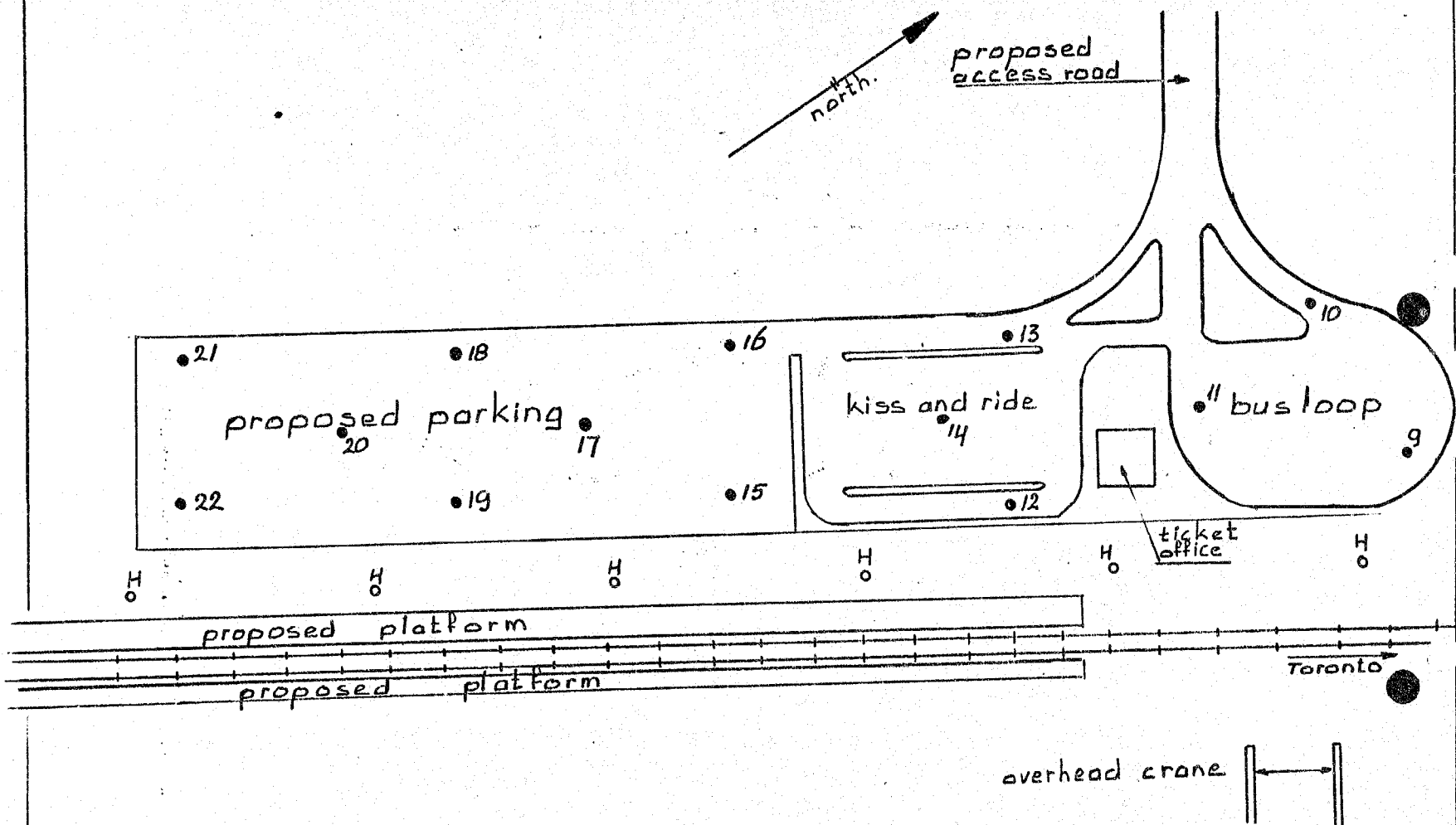
For: R.D. Gunter
Regional Materials Supervisor

c.c. C.R. Robertson
M. Ernesaks
G. Norman
R. Fitzgibbon
G.A. Wrong



W.P. 70-76-01.
Proposed Third Line GO Station.
Boring Locations. (1 of 2).
1" = 100'

June 22/76



W.P. 70-76-01.
Proposed Third Line GO Station.
Boring Locations. (2 of 2).

1" = 100'

June 22/76

BH #1

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 17" Br.Cl.Lo.-Lt.Cl. Dry
 17" - 5' Red Br. Lt.-M.Cl. Dry
 5' + NFP BR.

BH #2

0 - 6" Dk.Br.Cl.Lo.Tps.
 6" - 15" Br.Cl.Lo.-Lt.Cl. Dry
 15" - 5½' Red Br.Lt.-M.Cl. Dry
 5½' + NFP BR.

BH #3

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 14" Br.Cl.Lo.-Lt.Cl. Dry
 14" - 7' Red Br.Lt.-M.Cl. Dry
 7' + NFP BR.

BH #4

0 - 9" Dk.Br.Cl.Lo.Tps.
 9" - 21" Br.Cl.Lo.-Lt.Cl. Dry
 21" - 6' Red Br. Lt.-M.Cl. Dry 76-WB-32
 6' + NFP BR.

BH #5

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 16" Br.Cl.Lo.-Lt.Cl. Dry
 16" - 5½' Red Br. Lt.-M.Cl. Dry
 5½' + NFP BR.

BH #6

0 - 10" Dk.Br.Cl.Lo.Tps.
 10" - 6½' Red Br. Lt.-M.Cl. Dry
 6½' + NFP BR.

BH #7

0 - 12" Dk.Br.Cl.Lo.Tps.
 12" - 7½' Red Br. Lt.-M.Cl. Dry
 7½' + NFP BR.

BH #8

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 17" Br.Cl.Lo.-Lt.Cl. Dry
 17" - 9½' Red Br. M.Cl. Dry
 9½' + NFP BR.

Soils Survey DataDate of Survey

June 22, 1976

Type of Survey

Power Auger

NOTES

1. The moisture and surface conditions apply only to the time of the survey.
2. The boundaries between soil strata and also the earth-rock contact have been established only at bore hole locations. Between bore holes the boundaries are assumed from geological evidence and may be subject to error.

sil - lt cl

f-vfsa. 9
 si 53
 cl 38
 vfsa:si 62

MVD
 MDD
 OM
 FM

135.8 p.c.f
 118.6
 14.4
 10.8

1 of 2.

(future expansion parking).

W.P. 70-76-01.

Proposed Third Line GO. Station.Boring Logs.

June 22/76

BH #9

0 - 8" Dk.Br.Cl.Lo.Tps.
 8" - 20" Br.Cl.Lo.-Lt.Cl. Dry
 20" - 9' Red Br. Lt.-M.Cl. Dry (7' - 9' Limestone
 Fragments)
 9' + NFP BR.

BH #10

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 18" Br.Cl.Lo.-Lt.Cl. Dry
 18" - 10' Red Br. Lt.-M.Cl. Dry (9' - 10' Limestone
 Fragments)
 10' + NFP BR.

BH #11

0 - 6" Dk.Br.Cl.Lo.Tps.
 6" - 2' Br.Cl.Lo.-Lt.Cl. Dry
 2' - 11' Red Br. Lt.-M.Cl. Dry

BH #12

0 - 8" Dk.Br.Cl.Lo.Tps.
 8" - 18" Br.Cl.Lo.-Lt.Cl. Dry
 18" - 10' Red Br.Lt.-M.Cl. Dry
 10' + NFP BR.

BH #13

0 - 7" Dk.Br.Cl.Lo.Tps.
 7" - 22" Br.Cl.Lo.-Lt.Cl. Dry
 22" - 10' Red Br.Lt.-M.Cl. Dry
 10' + NFP BR.

BH #14

0 - 8" Dk.Br.Cl.Lo.Tps.
 8" - 22" Br.Cl.Lo.-Lt.Cl. Dry
 22" - 11' Red Br. M.Cl. Dry 76-WB-33.

BH #15

0 - 6" Dk.Br.Cl.Lo.Tps.
 6" - 14" Br.Cl.Lo.-Lt.Cl. Dry
 14" - 9' Red Br. M.Cl. Dry (8' - 9' Wet-Sat.)
 9' + NFP BR.

BH #16

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 18" Br.Cl.Lo.-Lt.Cl. Dry
 18" - 8' Red Br. Lt.-M.Cl. Dry
 8' + NFP BR.

BH #17

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 14" Br.Cl.Lo.-Lt.Cl. Dry
 14" - 9' Red Br. M.Cl. Dry
 9' + NFP BR.

BH #18

0 - 6" Dk.Br.Cl.Lo.Tps.
 6" - 18" Br.Cl.Lo.-Lt.Cl. Dry
 18" - 8½' Red Br. M.Cl. Dry
 8½' + NFP BR.

BH #19

0 - 5" Dk.Br.Cl.Lo.Tps.
 5" - 14" Br.Cl.Lo.-Lt.Cl. Dry
 14" - 8½' Red Br. M.Cl. Dry
 8½' + NFP BR.

BH #20

0 - 9" Dk.Br.Cl.Lo.Tps.
 9" - 20" Br.Cl.Lo.-Lt.Cl. Dry
 20" - 9' Red Br. M.Cl. Dry
 9' + NFP BR.

BH #21

0 - 6" Dk.Br.Cl.Lo.Tps.
 6" - 18" Br.Cl.Lo.-Lt.Cl. Dry
 18" - 8' Red Br. M.Cl. Dry
 8' + NFP BR.

BH #22

0 - 4" Dk.Br.Cl.Lo.Tps.
 4" - 12" Br.Cl.Lo.-Lt.Cl. Dry
 12" - 8½' Red Br. M.Cl.
 8½' + NFP BR.

si c l l o - (s i l o)

f-vf sa	19	M.W.D.	140.3
si.	59	M.D.D.	123.9
cl.	22	O.M.	13.1
vf sa 15:	78	F.M.	56.

LL 23.0 PL 14.0 RI 9.0.

2 of 2

W.P. 70-76-01.

Proposed Third Line G.D. Station.
Boring Logs.

June 22/76.

DOCUMENT NO. GEOCRES 3045-103

GEOCRES No. 3045-103

DIST. 4 REGION CENTRAL

W.P. No. 70-76-01

CONT. No. 77-407

W. O. No. _____

STR. SITE No. _____

HWY. No. 66 STATION _____

LOCATION PEDISTRIAN TUNNEL

THIRD LINE STATION, OAKVILLE

OVERLAY OPERATIONS TO BE INCLUDED WITH THIS REPORT. 1

REMARKS: _____

30M5-103

