



GEOCRES No:

30M12-125

NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

all one project

GO ALRT.

*route
feasibility study*

Oakville to Scarborough

8 reports

**SECTION 1
OAKVILLE**

**ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION**

PURCHASE ORDER M00-24

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FOUNDATION REPORT
For
Preliminary Feasibility Study
of GO-ALRT Northern Section
Section 1, Oakville

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from the City of Mississauga, Public Works Department. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soil data from adjacent sites. Additional soils data may be available from the City of Oakville, Regional Municipalities of Halton and Peel, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is roughly bounded by the following:

North	-	Eglinton Avenue
South	-	CNR Line
East	-	Erin Mills Parkway
West	-	Trafalgar Rd.

Soil conditions are quite constant across the site consisting of a heterogeneous mixture of clay, silt, sand and gravel till to a silty clay.

Pockets of sand and silty sand are distributed throughout the area. The water table in the area tends to be at or near the ground surface.

Bedrock is generally a grey shale, with limestone interbeds, of the Georgian Bay Formation changing to red shale of the Queenstone Formation towards Oakville.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix.

An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design Office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

Other Considerations

Along a number of routes, rather long sections of cut and cover have been identified. Consideration should be given to long continuous tunnel sections utilizing a tunnel boring machine. Tunnelling may prove to be cost effective with the added benefit of minimizing disruption to existing conditions.

Preferred Route

From the soil mechanics viewpoint, no one route in this section is more advantageous than another.

Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. J.S. Alter, Student Engineer, and reviewed by Mr. B.E. Ruck and Mr. M.S. Devata.

A handwritten signature in black ink, appearing to read "B.E. Ruck", written in a cursive style.

B.E. Ruck
Project Foundations Engineer

M.S. Devata, P. Eng.
Chief Foundations Engineer
(East)

APPENDIX

REFERENCES - M.T.C.

<u>PLAN NO.</u>	<u>GEOCRES NO.</u>	<u>LOCATION</u>
161	3M12-125	Hwy. 403 & Erin Mills Parkway
162	-129	Hwy. 403 & Winston Churchill Blvd.
163	-170	Hwy. 407 & Hwy. 403
164	-128	Hwy. 403 & Burnhamthorpe Rd.
165	-127	Hwy. 403 & Hwy. 5
166	- 39	Hwy. 5 & Mississauga Rd.
168	- 41	QEW & Shooks Hill
169	-121	QEW & Winston Churchill Blvd.
170	30M5-114	QEW & Hwy. 403
172	30M12-43	Hwy. 122 & CNR
174	30M5-120	QEW & Trafalgar Rd.
175	- 92	Oakville Go Station
176	-140	GO-ALRT Oakville Creek

REFERENCES-CITY OF MISSISSAUGA-PUBLIC WORKS

<u>PLAN NO.</u>	<u>PUBLIC WORKS NO.</u>	<u>LOCATION</u>
F	Z31 PN 81-222	Eglinton Ave. & Erin Mills Parkway
G	Z31 T76008	Burnhamthorpe Rd. & Erin Mills Parkway

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 1 ROUTE A LOCATION Trafalgar Rd from CNR to HEPC
 APPROX ORIGINAL GROUND ELEVATION 99-162 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#174 Elev. approx. 111 m. 0-2 m Silty Clay, Stiff to V. Stiff 2 m Shale Bedrock W.L. not established</p> <p>#175 Elev. approx. 100 m. 0-2 m Sandy & Silty Clay Fill 2-3 m Silty Clay, Stiff 3 m Shale Bedrock W.L. approx. elev. 99 m.</p> <p>#176 Elev. approx. 103 m 0-3 m Silty Clay, Firm to Hard 3 m Shale Bedrock W.L. approx. elev. 103 m -Surface</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings in hard or very dense deposits, or on bedrock. -dewatering of footing excavations may be required in the granular deposits.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or steeper in sound bedrock should be stable with minor dewatering. -in property restricted areas and sandy soils soldier piles and lagging with minor dewatering. (pre-augering of some piles may be required)</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER</p> <p>(2) No information available north of QEW.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 1 _____ ROUTE A _____ LOCATION HEPC From Trafalgar Rd to Erin Mills Parkway _____
 APPROX ORIGINAL GROUND ELEVATION 132-176 m _____ PROPOSED GRADE ELEVATION ELEVATED, CUT AND COVER _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERNECES:</u> #165 Elev. approx. 171 m. 0-2 m Silt, Dense to Hard 2-4 m Sand, Dense to V. Dense 4-9 m Silty Clay, Sand & Gravel Till, Hard 9 m Shale Bedrock W.L. approx. elev. 170 m.	<u>ELEVATED</u> (Winston Churchill Blvd. to Erin Mills Parkway) -probable spread footings. <u>CUT AND COVER</u> (Highway 403 - Erin Mills Parkway) -temporary slopes of 1:1 or steeper in sound bedrock should be stable with minor dewatering. -in sandy soils, soldier piles and lagging with dewatering will probably be necessary. (pre-augering of some piles may be required).	No information available along route.
#166 Elev. approx. 105 m. 0-1 m Granular Fill 1-3 m Silty Sandy Clay, Soft 3 m Shale Bedrock W.L. not established		

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 1 ROUTE B LOCATION Hwy. 403/Ford Dr. From CNR To Eglinton Avenue
 APPROX ORIGINAL GROUND ELEVATION 100-185 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES :</u></p> <p>#163 Elev. approx. 181 m. 0-8 m Silty Clay, Sand & Gravel Till, V.Stiff to Hard W.L. approx. elev. 180 m.</p> <p>#164 Elev. approx. 82 m. 0-11 m Silty Clay, Sand & Gravel Till, Hard 11-19 m Silt, V. Dense W.L. approx. elev.</p> <p>#165 Elev. approx. 171 m. 0-2 m Silt, Dense to Hard 2-4 m Sand, Dense to V. Dense 4-9 m Silty Clay, Sand & Gravel Till, Hard 9 m Shale Bedrock W.L. approx. elev. 170 m.</p> <p>#170 Elev. approx. 145 m. 0-2 m Silty Clay, Stiff to Hard 2 m Shale Bedrock W.L. approx. elev. 142 m.</p>	<p><u>ELEVATED</u> -majority of piers could be founded on spread footings in hard or very dense deposits or on bedrock.</p> <p><u>CUT WITH SIDE SLOPES</u> -generally 2:1 slopes should be stable.</p> <p><u>CUT AND COVER</u> -temporary slopes of 1:1 or steeper in sound bedrock should be stable with minor dewatering. -in sandy soils soldier piles and lagging with minor dewatering.</p> <p><u>TUNNEL</u> -soil and bedrock provides favourable conditions for tunnelling. -speical techniques such as compressed air may be required in sandy soils.</p>	<p><u>(1) ELEVATIONS</u></p> <p>ELEVATED</p> <p>CUT WITH SIDE SLOPES</p> <p>CUT AND COVER</p> <p>TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 1 ROUTE C LOCATION Winston Churchill Blvd From CNR Line to Eglinton Ave.
 APPROX ORIGINAL GROUND ELEVATION 110-176 m PROPOSED GRADE ELEVATION See Remarks (2)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#162 Elev. approx. 173 m. 0-8 m Silty Clay, Sand & Gravel Till, V. Stiff to Hard 8-17 m Silty Clay, V. Dense to Hard W.L. approx. 168 m.</p> <hr/> <p>#169 Elev. approx. 143 m. 0-2 m Silty Clay, Stiff to Hard 2 m Shale Bedrock W.L. approx. elev. 142 m.</p> <hr/>	<p><u>ELEVATED</u> -majority of piers could be founded on spread footings within native soil.</p> <p><u>CUT WITH SIDE SLOPES</u> -generally 2:1 slopes should be stable.</p> <p><u>CUT WITH RETAINING WALLS</u> -retaining walls supported on spread footings within native soils.</p> <p><u>CUT AND COVER</u> -probable soldier pile and lagging in property restricted areas. (pre-augering of piles may be required) -temporary slopes of 1:1 or steeper in sound bedrock should be stable in other areas.</p> <p><u>TUNNEL</u> -soil and bedrock provides favourable conditions for boring machine.</p>	<p>(1) Very little information available along route.</p> <p>(2) <u>ELEVATIONS</u></p> <p>ELEVATED CUT WITH SIDE SLOPES CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 1 _____ ROUTE D _____ LOCATION Erin Mills Parkway from CNR Line to The Collegeway _____

APPROX ORIGINAL GROUND ELEVATION 98-148 m _____ PROPOSED GRADE ELEVATION See Remarks (1) _____

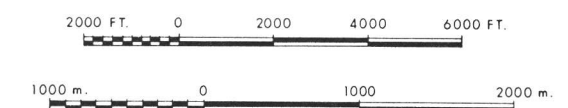
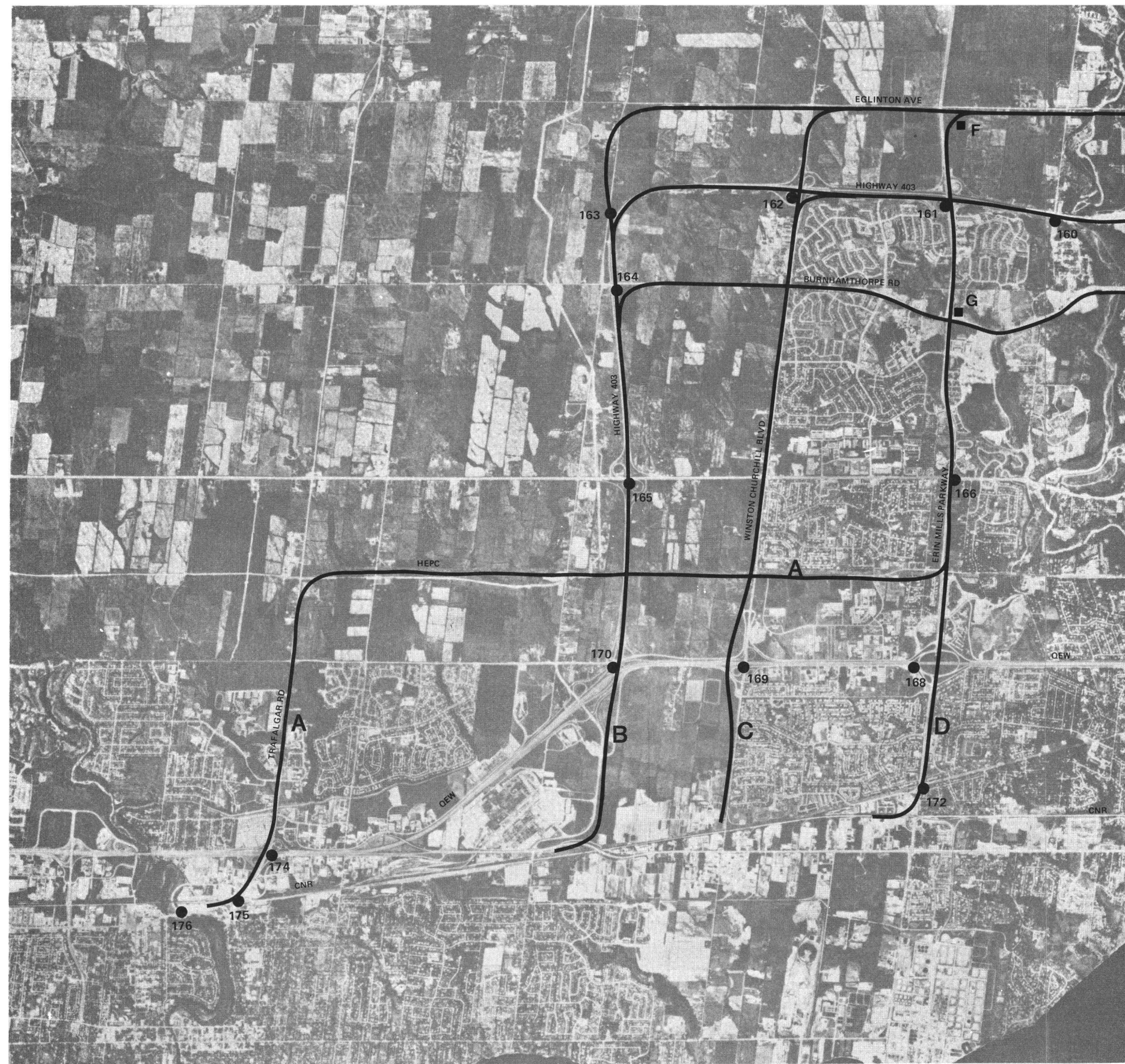
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#166 Elev. approx. 105 m. 0-1 m Granular Fill 1-3 m Silty Sandy Clay, Soft 3 m Shale Bedrock W.L. not established</p> <p>#168 Elev. approx. -not known 0-2 m Silty Clay, Stiff 2 m Shale Bedrock W.L. not established</p> <p>#172 Elev. approx. 98 m. 0-3 m Silty Clay, Stiff 3 m Shale Bedrock W.L. approx. elev. 97 m.</p>	<p><u>CUT WITH RETAINING WALLS</u></p> <p>-retaining walls supported on spread footings within native soils.</p> <p>-dewatering in sandy soils.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or steeper in sound bedrock should be stable with minor dewatering.</p> <p>-in property restricted areas and sandy soils; soldier piles and lagging with dewatering. (pre-augering of some piles may be required)</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for boring machine.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>CUT WITH RETAINING WALLS CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

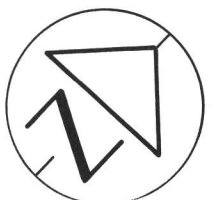
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 1 ROUTE D LOCATION Erin Mills Parkway, From The Collegeway To Eglinton Ave.
 APPROX ORIGINAL GROUND ELEVATION 148-168 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#161 Elev. approx. 162 m. 0-3 m Silty Clay, Sand & Gravel Till, Hard 3-12 m Silt to Sandy Silt, V. Dense 12-25 m Silty Sand, V. Dense 25 m Shaley Limestone Bedrock W.L. approx. elev. 161 m.</p> <hr/> <p>F Elev. approx. 168 m. 0-1 m Silt Till, V. Stiff to Hard 1 m Shale Bedrock W.L. approx. elev. 164 m</p> <hr/> <p>G Elev. approx. 159 m. 0-2 m Silty Clay Till, Compact 2 m Shale Bedrock W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings in hard or very dense deposits, or on bedrock.</p> <p>-dewatering of footing excavations may be required in sandy soils.</p>	



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 1
OAKVILLE





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

**SECTION 2
MISSISSAUGA**

**ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION**

PURCHASE ORDER M00-24

GO-ALRT DIST 6

DISTRIBUTION

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Files**

DATE:

FOUNDATION REPORT
For
Preliminary Feasibility Study
of GO-ALRT Northern Section
Section 2, Mississauga

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from the City of Mississauga, Public Works. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the Regional Municipality of Peel, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is roughly bounded by the following:

North	-	Eglinton Avenue
South	-	Burnhamthorpe
East	-	Etobicoke Creek
West	-	Ninth Line/Hwy. 403

The Hwy. 10 Route extends south to the CNR just north of Lake Ontario.

Soil conditions are quite constant across the site consisting of a heterogeneous mixture of clay, silty sand and gravel till to a silty, sandy clay.

The water table is high throughout the area. Drainage of the area is accomplished by a number of small creeks and rivers which have formed fairly shallow valleys through the overburden.

Bedrock is generally a grey shale with limestone interbeds of the Georgian Bay Formation changing to red shale of the Queenstone Formation towards the western end of the area.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design Office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

Other Considerations

Along most routes, when crossing existing roads or structures, it has been proposed to use cut and cover techniques. Consideration should be given to tunnelling in these areas, since disruption to traffic flow and other existing conditions would be minimized and therefore may prove to be cost effective.

Preferred Route

From the soil mechanics viewpoint, no one route in this section is more advantageous than another.

Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. J.S. Alter, Student Engineer, and reviewed by Mr. B.E. Ruck and Mr. M.S. Devata.



B.E. Ruck

Project Foundations Engineer

M.S. Devata, P. Eng.

Chief Foundations Engineer,
East

APPENDIX

M.T.C REFERENCES

PLAN NO.	GEOCRE NO.	LOCATION
109	30M11-43	Hwy.401 & Hwy. 27.Richview Expressway
141	30M12-87	Hwy. 410 & Eglinton Ave.
144	-72	Hwy. 403 & Little Etobicoke Creek
145	-83	Hwy. 403 & Heart Lake Rd.
146	-137	Hwy. 403 & Central Parkway
147	-69	Hwy. 403 & Hwy. 10
148	-112	Etobicoke Creek
149	-6	Burnhamthorpe Rd. & Renforth Creek
151	-132	Hwy. 403 & Mavis Rd.
152	-46	Hwy. 10 & CPR
153	-45	Hwy. 10 & Cooksville
155	30M11-153	Hwy. 10 & CNR
159	30M12-134	Hwy. 403 & CPR
160	-124	Hwy. 403 & Mississauga Rd.
161	-125	Hwy. 403 & Erin Mills Parkway
162	-129	Hwy. 403 & Winston Churchill Blvd.
163	-170	Hwy. 407 & Hwy. 403
164	-128	Hwy. 403 & Burnhamthorpe Rd.

CITY OF MISSISSAUGA, PUBLIC WORKS REFERENCES

PLAN NO.	PUBLIC WORKS NO.	LOCATION
D	Z35 PN73-051	Eglinton Ave. & Dixie Rd.
F	Z31 PN81-222	Eglinton Ave. Erin Mills Parkway
G	Z31 T76008	Burnhamthorpe Rd. & Erin Mills Parkway
H	Z30 PN73-062	Burnhamthorpe Rd. & Mavis
I	Z29 PN83-211	Eglinton Ave. & Hwy. 10
J	Z28 PN77-086	Burnhamthorpe Rd. & Cawthra Rd.
K	Z26 PN79-118	HEPC & Etobicoke Creek
L	Z26 PN73-155	Burnhamthorpe Rd. & Rockwood Rd.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. ___ Section 2 ___ ROUTE ___ A ___ LOCATION ___ Eglinton Ave. From Benforth Dr. to Hwy. 403 ___
 APPROX ORIGINAL GROUND ELEVATION ___ 137-163 m ___ PROPOSED GRADE ELEVATION ___ ELEVATED & CUT WITH ___
 RETAINING WALLS

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#108 Elev. approx. 156 m. 0-3 m Silty Clay, Stiff to V. Stiff 3-6 m Silty Clay, Sand & Gravel Till, Dense W.L. approx. elev. 154 m.</p> <p>#141 Elev. approx. 161 m. 0-11 m Silty Clay, Sand & Gravel Till, Hard 11 m Shale Bedrock W.L. approx. elev. 161 m - Surface</p> <p>#148 Elev. approx. 152 m. 0-4 m Sandy Silt Till, Dense to V. Dense 4 m Shale Bedrock -W.L. not established</p> <p>D Elev. approx. 163 m. 0-3 m Silty Clay, V. Stiff to Hard 3 m Shale Bedrock W.L. approx. elev. 162 m.</p>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within till or on shale bedrock.</p> <p>-within sandy silt, dewatering of footing excavation may be required.</p> <p><u>CUT WITH RETAINING WALL</u></p> <p>-retaining walls could be founded on spread footings.</p> <p>-dewatering could be handled by sumps.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE A LOCATION Eglinton Ave. From Hwy. 403 to Ninth Line

APPROX ORIGINAL GROUND ELEVATION 158-186 m PROPOSED GRADE ELEVATION ELEVATED, CUT WITH RETAINING WALL

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#141 Elev. approx. 161 m. 0-11 m Silty Clay, Sand & Gravel Till Hard 11 m Shale Bedrock W.L. approx. elev. 161- surface</p> <p>F Elev. approx. 168 m. 0-1 m Silt Till, V. Stiff to Hard 1 m Shale Bedrock W.L. approx. elev. 164 m.</p> <p>I Elev. approx. 164 m. 0-3 m Silty Clay Till, Stiff to Hard 3 m Shale Bedrock W.L. not established.</p>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within native soil.</p> <p><u>CUT WITH RETAINING WALL</u></p> <p>-retaining walls could be founded on spread footings.</p>	<p>Information along route is limited.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE B LOCATION HEPC from Eglinton Ave. to Cawthra Rd.
 APPROX ORIGINAL GROUND ELEVATION 132-150 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#144 Elev. approx. 135 m 0-1 m Silty Clay, Stiff 1-8 m Silty Clay, Sand & Gravel Till, Hard 8-14 m Silty Sand, V. Dense W.L. approx. elev. 135 m -surface</p> <p>#145 Elev. approx. 148 m. 0-11 m Silty Clay, Sand & Gravel Till, Stiff to Hard W.L. approx. elev. 147 m.</p> <p>K Elev. approx. 149 m. 0-2 m Silty Clay, Stiff to Hard 2 m Shale Bedrock W.L. approx. elev. 147 m.</p>	<p><u>ELEVATED</u> (FIELDGATE DR. TO CAWTHRA RD.) -piers could be founded on spread footings within native soil.</p> <p><u>CUT WITH SIDE SLOPES</u> -2:1 slopes should be stable.</p> <p><u>CUT WITH RETAINING WALLS</u> (Tomken Rd. to Cawthra Rd.) -retaining walls could be founded on spread footings.</p> <p><u>CUT AND COVER</u> -temporary slopes of 1:1 or steeper in sound bedrock areas should be stable. -soldier pile and lagging in conjunction with dewatering in silty sand soils. -piles may require pre-augering.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT WITH SIDE SLOPES CUT WITH RETAINING WALLS CUT AND COVER</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE B LOCATION Hwy. 403 from Cawthra Rd. to Mavis Rd.
 APPROX ORIGINAL GROUND ELEVATION 150-165 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#145 Elev. approx. 148 m. 0-11 m Silty Clay, Sand & Gravel Till, Stiff to Hard W.L. approx. elev. 147 m.</p> <p>#146 Elev. approx. 146 m. 0-6 m Silty Clay, Sand & Gravel Till, Hard 6 m Shale Bedrock W.L. not established</p> <p>#147 Elev. approx. 160 m. 0-1 m Fill Material 1-2 m Silty Clay, Sand & Gravel, Hard 2 m Shale Bedrock W.L. approx. elev. 160 m -surface</p> <p>#151 Elev. approx. 168 m. 0-5 m Silt, Compact to V. Dense 5-10 m Silty Clay, V.Stiff to Hard 10 m Limestone & Shale Bedrock W.L. approx. elev. 166 m.</p>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within native soil.</p> <p><u>CUT WITH SIDE SLOPES</u></p> <p>-2:1 slopes should be stable.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or steeper in sound bedrock areas should be stable.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED</p> <p>CUT WITH SIDE SLOPES</p> <p>CUT AND COVER</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE B LOCATION Hwy. 403 From Mavis Rd. to Ninth Line
 APPROX ORIGINAL GROUND ELEVATION 115-178 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #151 Elev. approx. 168 m. 0-5 m Silty, Compact to V. Dense 5-10 m Silty Clay, V. Stiff to Hard 10 m Limestone & Shale Bedrock W.L. approx. 166 m. #159 Elev. approx. 146 m. 0-12 m Silty Clay, Sand & Gravel Till, Hard 12 m Limestone Bedrock W.L. approx. elev. 137 m. #160 Elev. approx. 141 m. 0-9 m Silty Clay, Sand & Gravel Till, V. Stiff to Hard 9 m Shaley Limestone Bedrock W.L. approx. elev. 135 m.	<u>ELEVATED</u> -piers could be founded on spread footings within native soil. -high crossing over Credit River may require end bearing piles driven to sound bedrock. <u>FILL WITH SIDE SLOPES</u> -generally 2:1 slopes adequate -high fills may require berms or reinforced slopes. <u>CUT WITH SIDE SLOPES</u> -generally 2:1 slopes adequate <u>CUT AND COVER</u> -temporary slopes of 1:1 or steeper in sound bedrock areas should be stable.	<u>1. ELEVATIONS</u> ELEVATED FILL WITH SIDE SLOPES CUT WITH SIDE SLOPES CUT AND COVER
	<u>(REFERENCE CONTINUED)</u> #161 Elev. approx. 162 m. 0-3 m Silty Clay Sand & Gravel Till, 3-12 m Silt to Sandy Silt, V. Dense 12-25 m Silty Sand, V. Dense 25 m Shaley Limestone Bedrock W.L. approx. elev. 161 m.	<u>REF. CONTINUED</u> #162 Elev. approx. 173 m. 0-8 m Silty Clay, Sand & Gravel Till, V. Stiff to Hard 8-17 m Silty Clay, V. Dense to Hard W.L. approx. elev. 168 m. #163 Elev. approx. 181 m. 0-8 m Silty Clay Sand & Gravel Till, V. Stiff to Hard W.L. approx. elev. 180 m.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE C LOCATION Burnhamthorpe Rd. From Etobicoke Creek to Hwy. 10
 APPROX ORIGINAL GROUND ELEVATION 126-145 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>J Elev. approx. 144 m. 0-2 m Silt Till, V.Stiff 2 m Shale Bedrock W.L. approx. elev. 140 m.</p> <hr/> <p>L Elev. approx. 148 m. 0-5 m Silt & Sand Till, Hard W.L. approx. elev. 147 m.</p> <hr/>	<p><u>ELEVATED</u></p> <ul style="list-style-type: none"> -piers could be founded on spread footings within native soil. -within sandy silt dewatering of footing excavations may be required. <p><u>CUT/FILL WITH RETAINING WALLS</u></p> <ul style="list-style-type: none"> -retaining walls could be founded on spread footings within native soil. -dewatering could be handled by sumps. <p><u>CUT WITH SIDE SLOPES</u></p> <ul style="list-style-type: none"> -generally 2:1 side slopes adequate. <p><u>CUT AND COVER</u></p> <ul style="list-style-type: none"> -temporary slopes of 1:1 or steeper in sound bedrock areas should be stable. -in silty sand soils, soldier pile and lagging with dewatering may be needed. -piles may require pre-augering. 	<p>(1) Information along route is limited.</p> <p>(2) <u>ELEVATIONS</u></p> <p>ELEVATED CUT/FILL WITH RETAINING WALLS CUT WITH SIDE SLOPES CUT AND COVER</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 2 _____ ROUTE C _____ LOCATION Burnhamthorpe Rd. From Hwy. 10 to Hwy. 403 _____
 APPROX ORIGINAL GROUND ELEVATION 115-159 m _____ PROPOSED GRADE ELEVATION See remarks (2) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #164 Elev. approx. 182 m. 0-11 m Silty Clay, Sand & Gravel Till, Hard 11-19 m Silt, V. Dense W.L. approx. elev. 179 m. G Elev. approx. 159 m. 0-2 m Silty Clay Till, Compact 2 m Shale Bedrock W.L. not established. H Elev. approx. 163 m. 0-2 m Silty Clay Till, Hard 2 m Shale Bedrock W.L. approx. elev. 161 m.	<u>ELEVATED</u> -piers could be founded on spread footings within native soil. <u>CUT WITH RETAINING WALLS</u> -retaining walls could be founded on spread footings. -minor dewatering anticipated. <u>CUT AND COVER</u> -temporary slopes of 1:1 or steeper in sound bedrock areas should be stable OR -soldier pile and lagging in property restricted areas. -piles may require pre-augering.	(1) Information along route is limited. (2) <u>ELEVATIONS</u> ELEVATED CUT WITH RETAINING WALLS CUT AND COVER

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE D LOCATION Joining Route Between Eglinton Ave. & Hwy. 403
 APPROX ORIGINAL GROUND ELEVATION 165-170 m PROPOSED GRADE ELEVATION ELEVATED, CUT WITH RETAINING WALLS

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCE:</u></p> <p>#147 Elev. approx. 160 m. 0-1 m Fill Material 1-2 m Silty Clay, Sand & Gravel, Hard 2 m Shale Bedrock W.L. approx. elev. 160m-surface</p> <hr/>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within native soil.</p> <p><u>CUT WITH RETAINING WALLS</u></p> <p>-retaining walls could be founded on spread footings within native soil.</p>	<p>Limited information available along this route.</p> <p style="text-align: right;">1 ∞ 1</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE E LOCATION Hwy. 10 from Eglinton Ave. To Dundas St. E.
 APPROX ORIGINAL GROUND ELEVATION 114-175 m PROPOSED GRADE ELEVATION See Remarks (2)

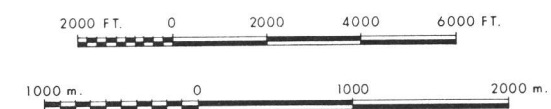
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#152 Elev. approx. 126 m. 0-3 m Sand, Loose 3-4 m Clay, Stiff to V. Stiff 4 m Shale Bedrock W.L. not established.</p> <hr/> <p>I Elev. approx. 164 m. 0-3 m Silty Clay Till, Stiff to Hard 3 m Shale Bedrock W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within native soil. -in areas of clay, end bearing piles driven to sound bedrock (approx. 5 m) may be needed.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or steeper in sound bedrock areas should be stable. -soldier pile and lagging in conjunction with dewatering in sandy soil -piles may require pre-augering.</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for tunnelling.</p>	<p>(1) Information along route is limited.</p> <p>(2) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

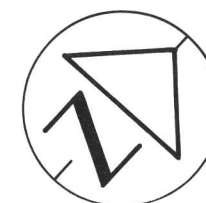
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 2 ROUTE E LOCATION Hwy. 10 from Dundas St. E. To CNR
 APPROX ORIGINAL GROUND ELEVATION 84-114 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#153 Elev. approx. 164 m. 0-1 m Gravel & Sand Fill 1-2 m Clay & Sand, Stiff 2-5 m Sandy Silty Clay Till, Dense 5 m Shale Bedrock W.L. approx. elev. 163 m.</p> <hr/> <p>#155 Elev. approx. 84 m. 0-1 m Fill & Organic Topsoil 1-2 m Fine Silty Sand W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-piers could be founded on spread footings within native material. -in some areas, may need end bearing piles to sound bedrock.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or 1.5:1 should be stable. -in sandy areas may need soldier pile and lagging in conjunction with dewatering.</p> <p><u>TUNNEL (QEW)</u></p> <p>-special techniques such as compressed air methods or extensive dewatering may be required.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p>



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 2
MISSISSAUGA





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

**SECTION 3
ETOBICOKE**

**ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION**

PURCHASE ORDER M00-24

GO-ALRT DIST 6

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DATE:

FOUNDATION REPORT
FOR
Preliminary Feasibility Study
of GO-ALRT Northern Section
Section 3, Etobicoke

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from Metro Roads Dept. Toronto. Along some routes, little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the City of Etobicoke, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is roughly bounded by the following:

North - Finch Avenue
South - Hwy.401/Eglinton Avenue
East - Humber River
West - Etobicoke Creek

Soil conditions across the site are quite uniform and generally consist of a stiff to hard silty clay till with sand overlying shale bedrock.

Drainage of the area is handled mainly by the Humber River and Etobicoke Creek.

Bedrock is generally a grey shale, with limestone interbeds, of the Georgian Bay Formation.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix.

An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design Office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

Effect on existing Hydro Tower Foundations

The effects on the hydro tower foundations will largely be governed by whether or not the foundation are supported on piles. Comments for both cases are given below.

With Piles - effect on existing footings will be minimal if bases of piles are not disturbed by new construction.

Without Piles -

Cut - groundwater level will be permanently lowered and hence some settlement of existing structures could be expected.

- if cut slope is too close to existing footing, then movement of the footing toward the cut might occur.

Retaining Walls - groundwater level will be lowered and settlement will likely occur.

- if proper construction techniques are utilized (i.e. tie back walls) then movement of the footings will be minimal.

Cut and Cover - settlement will occur if groundwater is permanently lowered (this will be determined by the type of tunnel constructed)

- if proper construction techniques are utilized then movement of existing footings should be minimal.

Preferred Route

From the soil mechanics viewpoint, no one route in this section is more advantageous than another.

Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. B.E Ruck, Project Foundation Engineer and reviewed by Mr. M.S. Devata, Chief Foundation Engineer, East.

A handwritten signature in black ink, appearing to read "B.E. Ruck", with a stylized, flowing script.

B.E. Ruck
Project Foundations
Engineer

M.S. Devata, P. Eng.
Chief Foundations
Engineer, (East)

APPENDIX

REFERENCES: M.T.C.

<u>Plan No.</u>	<u>Geocres No.</u>	<u>Description</u>
83	30M11-121	Hwy. 401 and Weston Rd.
87	-123	Hwy. 401 and Pine Point Arena
89	-118	Hwy. 401 and Islington
94	-64	Hwy. 401 and Kipling Ave.
96	-70	Kipling Ave. & C.N.R.
97	-62	Hwy. 401 and Dixon Rd.
99	-69	Hwy. 27E and West Service Rd.
100	-58	Hwy. 27 and Belfield Rd.
101	-61	Hwy. 27 and Dixon Rd.
102	-56	Hwy. 401 and Hwy. 27
105	-148	Carlingview Storm Sewer
107	-48	Airport Expy. & Renforth Dr.
108	-47	Hwy. 401 and Etobicoke Cr.
113	30M12-49	Hwy. 401 and Etobicoke Cr.
115	-109	Hwy. 409 and Viscount Rd.
117	-52	Hwy. 427 and Campus Rd.
118	-57	Hwy. 427 and American Dr.
119	-56	Hwy. 427 and Mimico Cr.
121	-58	Hwy. 427 and C.N.R.
125	-63	Hwy. 27 and West Humber River
126	30M11-133	Islington and Finch

REFERENCES - METRO ROADS

<u>Plan No.</u>	<u>Description</u>
1	Albion Rd. and West Humber River
102	C.N.R. and Kipling Ave.
210	Thistletown Bridge at Humber River
214	Jockey Club Blvd. and Rexdale

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 3 _____ ROUTE A _____ LOCATION Hwy. 401 from Humber River to Dixon Road _____

APPROX ORIGINAL GROUND ELEVATION 122 to 168 m _____ PROPOSED GRADE ELEVATION See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#83 Elev. approx. 137 m. 0-9 m Sandy Silt, Stiff to Hard 9-19 m Silty Sand Till, Dense to V. Dense W.L. approx. elev. 128 m.</p> <p>#87 Elev. approx. 139 m. 0-12 m Silty Clay Till, Stiff to Hard W.L. approx. elev. 130 m.</p> <p>#89 Elev. approx. 158 m. 0-16 m Silty Clay Till, V. Stiff to Hard 16-19 m Silty to Silty Sand, V. Dense W.L. approx. elev. 150 m.</p> <p>#94 Elev. approx. 152 m. 0-8 m Silty Clay Till, Compact to V. Dense W.L. approx. elev. 151 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings however, in limited areas of loose sand, piles may be required.</p> <p><u>TUNNEL</u></p> <p>-conditions appear suitable for machine boring. -in limited areas of sandy soils, special techniques such as compressed air will be required.</p> <p><u>CUT WITH RET. WALL</u></p> <p>-retaining walls could be founded on spread footings within native soils. -permanent, lowering of W.L. may be required with resulting settlements of adjacent structures possible.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED</p> <p>TUNNEL</p> <p>CUT WITH RET. WALL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE A LOCATION Hwy. 401 from Dixon Rd. to Renforth Dr.
 APPROX ORIGINAL GROUND ELEVATION 146 to 166 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#97 Elev. approx. 164 m 0-11 m Silty Clay Sand Till, Hard W.L. approx. elev. 61 m.</p> <p>#102 Elev. approx. 150 m. 0-9 m Silty Clay Till, V. Stiff to Hard 9-11 m Sand to Silty Sand, V. Dense 11-17 m Silty Clay, Hard W.L. approx. elev. 148 m.</p> <p>#107 Elev. approx. 160 m. 0-4 m Silty Clay, V. Stiff to Hard 4-10 m Sandy Silt, V. Dense 10 m Shale Bedrock W.L. at surface</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native material.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 3, _____ ROUTE _____ B _____ LOCATION Outer Airport from Hwy. 427 to Sta 35+00 _____
 APPROX ORIGINAL GROUND ELEVATION _____ 160 to 173 m _____ PROPOSED GRADE ELEVATION _____ See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#113 Elev. approx. 170 m. 0-12 m Silty Clay, Stiff to Hard 12-21 m Silty Clay, Sand & Gravel Till, V. Dense/Hard 21 m Shale Bedrock W.L. approx. elev. 169 m.</p> <p>#115 Elev. approx. 170 m. 0-12 m Silty Clay, Stiff to Hard 12-21 m Silt Clay Till Hard (V. Dense) 21 m Shale W.L. approx. elev. 169 m.</p> <p>#118 Elev. approx. 156 m. 0-14 m Silty Clay, Sand & Gravel Till, Stiff to Hard W.L. approx. elev. 155 m.</p>	<p><u>ELEVATED</u></p> <ul style="list-style-type: none"> -majority of piers could be founded on spread footings. -some footing excavations may require shoring and dewatering. <p><u>RETAINING WALLS</u></p> <ul style="list-style-type: none"> -could be founded on spread footings within native soils. -permanent lowering of W.L. will likely be required with possible settlements of adjacent structures possible. <p><u>CUT AND COVER</u></p> <ul style="list-style-type: none"> -soldier pile and lagging OR temporary slopes of 1:1 to 1.5:1 with some dewatering. <p><u>TUNNEL</u></p> <ul style="list-style-type: none"> -conditions appear favourable for machine boring however, special techniques will be required in areas of sandy soils. 	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED RETAINING WALLS CUT AND COVER TUNNEL</p> <p>(2) Available information along this route is limited.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE B LOCATION Outer Airport from Sta 35+00 to Hwy 401
 APPROX ORIGINAL GROUND ELEVATION 144 to 169 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCE:</u> #113 Elev. approx. 170 m. 0-12 m Silty Clay, Stiff to Hard 12-21 m Silty Clay, Sand & Gravel Till, V. Dense/Hard 21 m Shale Bedrock W.L. approx. elev. 169m.	<u>CUT AND COVER</u> -soldier pile and lagging OR temporary slopes of 1:1 to 1.5:1 should be stable. <u>ELEVATED</u> -majority of piers could be founded on spread footings within native material. <u>TUNNEL</u> -conditions appear suitable for machine boring.	(1) <u>ELEVATIONS</u> CUT AND COVER ELEVATED TUNNEL (2) Available information along route is limited.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 3 _____ ROUTE _____ B-D _____ LOCATION _____ Hwy. 427 from Hwy. 27 to Hwy. 409 _____
 APPROX ORIGINAL GROUND ELEVATION _____ 160 - 173 m _____ PROPOSED GRADE ELEVATION _____ Elevated _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#119 Elev. approx. 157 m. 0-12 m Silty Clay, Sand & Gravel Till, Stiff to Hard 12 m Shale Bedrock W.L. approx. elev. 155 m</p> <p>#121 Elev. approx. 166 m. 0-21 m Silty Clay, Sand & Gravel Till, Stiff to Hard W.L. approx. elev. 165 m.</p> <p>#125 Elev. approx. 152 m. 0-1 m Silty Clay, Stiff to V. Stiff 1-3 m Silty Sand, Compact to V. Dense 3 m Shale Bedrock W.L. approx. elev. 151 m.</p> <p>#214 Elev. approx. 162 m. 0-12 m Silty Clay Till, Firm to Hard 12-15 m Silty Sand, V.Dense W.L. approx. elev. 160 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native soils.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE D LOCATION Hwy. 427 from Hwy. 409 to South Junction Renforth Drive

APPROX ORIGINAL GROUND ELEVATION 155 to 170 m PROPOSED GRADE ELEVATION ELEVATED - AT GRADE

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#105 Elev. approx. 164 m. 0-6 m Silty Clay, Sand & Gravel Fill, V. Stiff to Hard W.L. approx. elev. 160 m.</p> <hr/> <p>#107 Elev. approx. 160 m. 0-4 m Silty Clay, V. Stiff to Hard 4-10 m Sandy Silt, V. Dense 10 m Shale Bedrock W.L. at surface.</p> <hr/> <p>#108 Elev. approx. 156 m. 0-3 m Silty Clay, Stiff to V. Stiff 3-6 m Silty Clay, Sand & Gravel Till, Dense W.L. approx. elev. 154 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native material however, in some areas of tall columns, pile foundations may be required.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE E LOCATION Inner Airport
 APPROX ORIGINAL GROUND ELEVATION 160 to 174 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#115 Elev. approx. 170 m. 0-12 m Silty Clay, Stiff to Hard 12-21 m Silt Clay Till Hard (V. Dense) 21 m Shale W.L. approx. elev. 169 m.</p> <p>#117 Elev. approx. 166 m. 0-21 m Silty Clay, Sand & Gravel Till, V. Stiff to Hard 21 m Shale Bedrock W.L. approx. elev. 165 m.</p> <p>#118 Elev. approx. 156 m. 0-14 m Silty Clay, Sand & Gravel Till, Stiff to Hard W.L. approx. elev. 155 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native material.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 3 ROUTE _____ G LOCATION _____ Richview - Claireville Hydro Corridor from
 Finch Ave. to CNR Main Line _____
 APPROX ORIGINAL GROUND ELEVATION _____ 148-168 m PROPOSED GRADE ELEVATION _____ See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#99 Elev. approx. 165 m. 0-4 m Silty Clay Hard 4-10 m Silty Clay, Stiff to V. Stiff 10-11 m Sand & Silt Seams, Loose 11-18 m Silt Till, Very Dense W.L. approx. elev. 160 m</p> <hr/> <p>#125 Elev. approx. 152 m. 0-1 m Silty Clay, Stiff to V. Stiff 1-3 m Silty Sand, Compact to V. Dense 3 m Shale Bedrock W.L. approx. elev. 151 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings with some settlement expected. -to minimize settlement, piles may be required.</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 to 1.5:1 should be stable. OR -soldier pile and lagging with some piles requiring pre-augering.</p> <p><u>TUNNEL</u></p> <p>-conditions appear favourable for machine boring however, special techniques such as compressed air may be required to control groundwater in sandy soils.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p> <p>(2) See text for comments regarding effects on Hydro Tower Foundations.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

Richview - Claireville Hydro Corridor From

PURCHASE ORDER No. Section 3 ROUTE G LOCATION CNR Main Line to Hwy. 27

APPROX ORIGINAL GROUND ELEVATION 160-169 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#99 Elev. approx. 165 m. 0-4 m Silty Clay, Hard 4-10 m Silty Clay, Stiff to V. Stiff 10-11 m Sand & Silt Seams, Loose 11-18 m Silt Till, Very Dense W.L. approx. elev. 160 m</p> <hr/> <p>#100 Elev. approx. 163m. 0-20 m Silty Clay, V.Stiff to Hard 20 m Shale Bedrock W.L. approx. elev. 162m.</p> <hr/> <p>#101 Elev. approx. 164 m. 0-12 m Silty Clay W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings with some settlement to be expected.</p> <p>-piles may be required in some areas to minimize settlements.</p>	<p>(1) See text for comments regarding effects on Hydro Tower Foundations.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

Richview Hydro Corridor

PURCHASE ORDER No. Section 3 ROUTE H LOCATION from Humber River to Hwy. 409

APPROX ORIGINAL GROUND ELEVATION 125-165 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#1 Elev. approx. 125 m. 0-1 m Fill 1-10 m Silt Till, Compact to V. Dense W.L. at ground surface</p> <hr/> <p>#96 Elev. approx. 158 m. 0-11 m Silt Till, Compact to V. Dense 11-15 m Sand Till, V. Dense W.L. approx. elev. 154 m.</p> <hr/> <p>#102 Elev. approx. 157 m. 0-11 m Silt Till, Compact to V. Dense 11-15 m Sand Till, V. Dense W.L. approx. elev. 152 m.</p> <hr/>	<p><u>ELEVATED</u> -majority of piers could be founded on spread footings.</p> <p><u>CUT WITH RET. WALL</u> -retaining walls could be founded on spread footings within native soils. -slopes of 2:1 should be stable.</p> <p><u>TUNNEL</u> -soil appears favourable for boring machine, however, within sand till, special techniques to control groundwater (i.e. compressed air) may be required.</p>	<p>(1) <u>ELEVATIONS</u> ELEVATED CUT WITH RET. WALL TUNNEL</p> <p>(2) Available information along this route is extremely limited.</p> <p>(3) See text for comments regarding effects on Hydro Tower Foundations.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

Richview Hydro Corridor

PURCHASE ORDER No. _____ Section 3 _____ ROUTE H _____ LOCATION _____ from Hwy. 409 to Hwy. 427 _____

APPROX ORIGINAL GROUND ELEVATION 146-158 m _____ PROPOSED GRADE ELEVATION See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#96 Elev. approx. 158 m. 0-11 m Silt Till, Compact 11-15 m Sand Till, V. Dense W.L. approx. elev. 154 m.</p> <hr/> <p>#97 Elev. approx. 164 m. 0-11 m Silty Clay Sand Till, Hard W.L. approx. elev. 161 m.</p> <hr/> <p>#102 Elev. approx. 150 m. 0-9 m Silty Clay Till, V. Stiff to Hard 9-11 m Sand to Silty Sand, V. Dense 11-17 m Silty Clay, Hard W.L. approx. elev. 160 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be supported on spread footings within native soil. -impact on existing foundations should be limited.</p> <p><u>CUT WITH RET. WALL</u></p> <p>-retaining walls could be founded on spread footings within native soils. -permanent lowering of groundwater may be required and hence settlement of adjacent structures may result.</p>	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT WITH RET. WALL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE J LOCATION Finch Ave/Hwy. 27 from Humber River to Martin Grove Rd.
 APPROX ORIGINAL GROUND ELEVATION 133 to 163 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#125 Elev. approx. 152 m. 0-1 m Silty Clay, Stiff to V. Stiff 1-3 m Silty Sand, Compact to V. Dense 3 m Shale Bedrock W.L. approx. elev. 151 m.</p> <p>#126 Elev. approx. 133 m. 0-3 m Sand, Compact 3-5 m Sandy Silt, V.Loose 5-8 m Silt Till, Dense to V. Dense 8 m Shale Bedrock W.L. approx. elev. 129 m.</p> <p>#210 Elev. approx. 133 m. 0-3 m Sand, Compact 3-5 m Sandy Silt V.Loose to Dense 5-11 m Silt Till, V.Loose to V. Dense 11 m Weathered Shale W.L. approx. elev. 129 m.</p>	<p><u>ELEVATED</u></p> <ul style="list-style-type: none"> -in vicinity of Humber River, end bearing piles driven to bedrock will be required. -elsewhere, piers could probably be founded on spread footings. -dewatering and shoring of footing excavations in sandy soils may be required in Humber River area. <p><u>CUT AND COVER</u></p> <ul style="list-style-type: none"> -temporary slopes of 1:1 to 1.5:1 should be stable. OR -soldier pile and lagging with some piles requiring pre-augering. -it is possible that shale bedrock may be encountered. <p><u>TUNNEL</u></p> <ul style="list-style-type: none"> -conditions appear favourable for machine boring in silty clay. -special techniques such as compressed air may be required in silty sand. 	<p>(1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p> <p>(2) Available information along route is limited.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE J-F LOCATION Hwy. 27/Finch from Grove Rd to Rexdale Blvd.
 APPROX ORIGINAL GROUND ELEVATION 150-167 m PROPOSED GRADE ELEVATION See remarks (1)

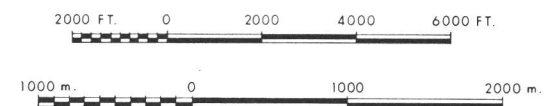
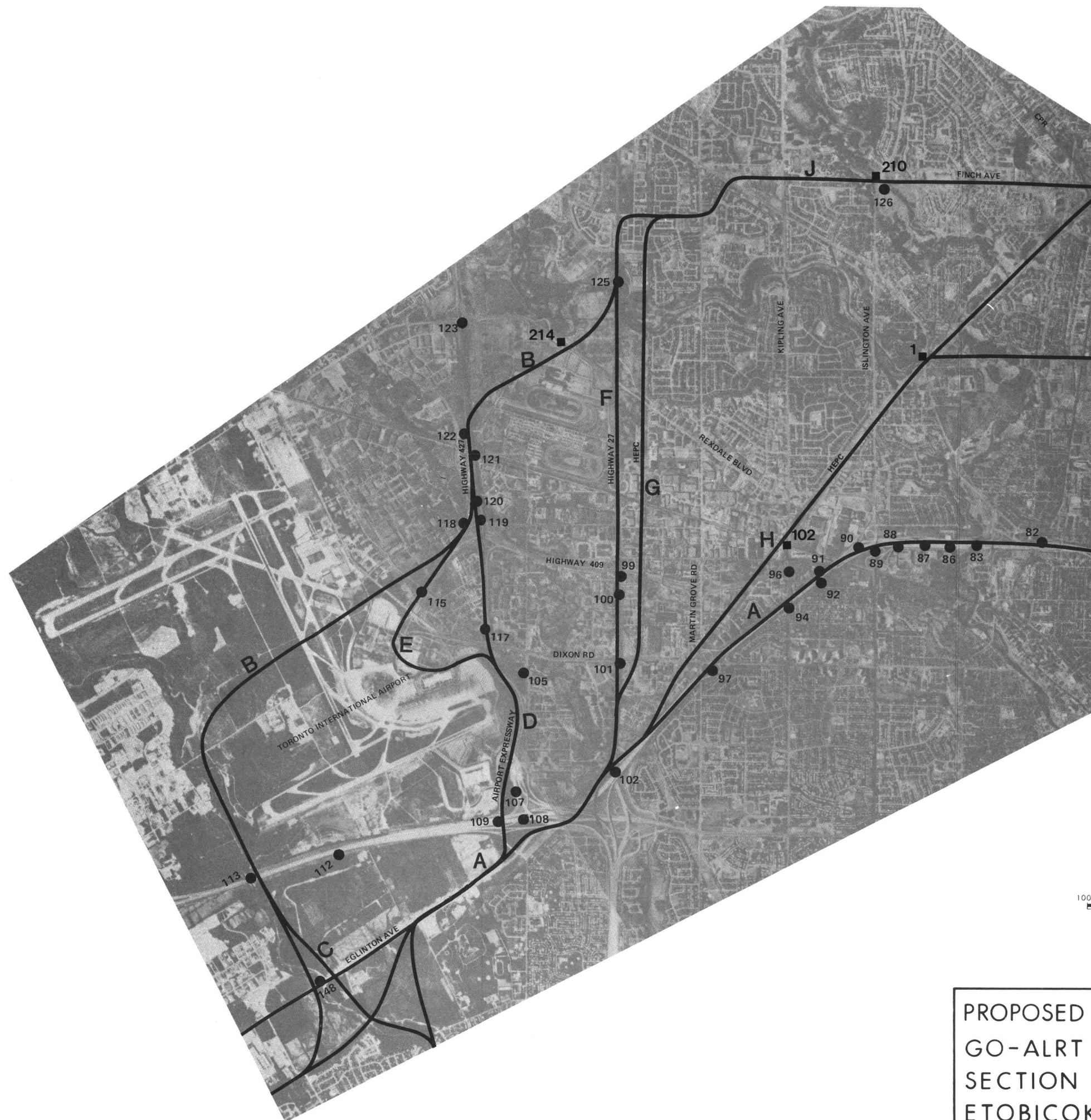
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #99 Elev. approx. 165 m. 0-4 m Silty Clay, Hard 4-10 m Silty Clay, Stiff to V. Stiff 10-11 m Sand & Silt Seams, Loose 11-18 m Silt Till, Very Dense W.L. approx. elev. 160 m. <hr/> #125 Elev. approx. 152 m. 0-1 m Silty Clay, Stiff to V. Stiff 1-3 m Silty Sand, Compact to V. Dense 3 m Shale Bedrock W.L. approx. elev. 151 m.	<u>ELEVATED</u> -majority of piers could be founded on spread footings with some settlement expected. -to minimize settlement, piles may be required. <u>CUT AND COVER</u> -temporary slopes of 1:1 to 1.5:1 should be stable. OR -soldier pile and lagging with some piles requiring pre-augering. <u>TUNNEL</u> -conditions appear favourable for machine boring, however, special techniques such as compressed air may be required to control groundwater in sandy soils.	(1) <u>ELEVATIONS</u> ELEVATED CUT AND COVER TUNNEL

FOUNDATION DATA SHEET

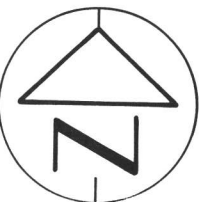
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 3 ROUTE F LOCATION Hwy. 27 from Rexdale Blvd. to Hydro Crossing
 APPROX ORIGINAL GROUND ELEVATION 167 to 145 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #99 Elev. approx. 165 m. 0-4 m Silty Clay, Hard 4-10 m Silty Clay, Stiff to V. Stiff 10-11 m Sand & Silt Seams, Loose 11-18 m Silt Till, V. Dense W.L. approx. elev. 160 m. <hr/> #100 Elev. approx. 163 m. 0-20 m Silty Clay, V. Stiff to Hard 20 m Shale Bedrock W.L. approx. elev. 160m. <hr/> #101 Elev. approx. 164 m. 0-12 m Silty Clay W.L. not established <hr/> #102 Elev. approx. 150 m. 0-9 m Silty Clay Till, V. Stiff to Hard 9-11m Sand to Silty Sand, V. Dense 11-17m Silty Clay, Hard W.L. approx. elev. 148 m.	<u>ELEVATED</u> -majority of pier could be founded on spread footings with some settlement to be expected. -piles may be required in some areas to minimize settlements. <u>CUT AND COVER</u> -temporary slopes of 1:1 to 1.5:1 should be stable or soldier pile and lagging with some pre-augering likely. <u>TUNNEL</u> -conditions appear to be favourable for machine boring but, special techniques may be required in sandy soils to control groundwater. <u>EMBANKMENT</u> -no problems anticipated with 2:1 slopes. <u>CUT/FILL WITH RET. WALLS</u> -retaining walls could be founded on spread footings within native soils. -slopes of 2:1 should be stable.	(1) <u>ELEVATIONS</u> ELEVATED CUT AND COVER TUNNEL AT GRADE EMBANKMENT CUT/FILL WITH RET. WALLS



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 3
ETOBICOKE





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

SECTION 4
NORTH YORK West
ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

PURCHASE ORDER M00-24
GO-ALRT DIST 6

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DATE:

FOUNDATION REPORT
For
Preliminary Feasibility Study
of GO-ALRT Northern Section
NORTH YORK WEST

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from the Metro Roads Dept., Toronto. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the City of North York, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is bounded by the following:

North - Finch H.E.P.C.
South - Hwy. 401
East - Dufferin St./Allen Rd.
West - Humber River

Soil conditions are quite variable across the site but generally consist of silty clays and silt tills with varying water table elevations. Pockets of sand and silty sands are distributed throughout the area.

The Humber River and Black Creek drain the area, and in some areas have eroded rather deep river valleys through the overburden.

Bedrock is a grey shale with limestone interbeds of the Georgian Bay Formation.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

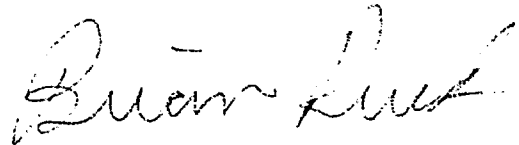
Preferred Route

From the soil mechanics viewpoint, no one route in this section is more advantageous than another.

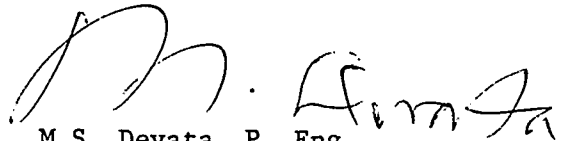
Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. J.S. Alter, Student Engineer and reviewed by Mr. B.E. Ruck, Project Foundations Engineer and Mr. M.S. Devata, Chief Foundation Engineer, East.



B.E. Ruck
Project Foundations Engineer



M.S. Devata, P. Eng.
Chief Foundation Engineer, East

APPENDIX

REFERENCE - M.T.C.

<u>PLAN NO.</u>	<u>GEOCRES NO.</u>	<u>LOCATION</u>
62	30M14-148	Finch Ave. & W. Don River
64	30M11- 74	Hwy. 401 & Avenue Road
65	81	Hwy. 401 & Dufferin Street
66	82	Hwy. 401 & CNR
68	85	Hwy. 401 & Keele Street
69	87	Lorne Bruce Drive
71	136	Hwy. 401 & Springview Avenue
72	134	Hwy. 401 & Black Creek
73	135	Hwy. 401 & Jane Street
75	127	Hwy. 401 & Hwy. 400
77	130	Hwy. 400 at Sheppard Avenue
82	124	Hwy. 401 & Hwy. 400
83	121	Hwy. 401 & Weston Road
84	30M13- 12	Hwy. 400 & Finch Avenue
89	30M11-118	Hwy. 401 & Islington Avenue
126	133	Islington Ave. & Finch Ave.

REFERENCES - METRO ROADS

<u>METRO ROADS NO.</u>	<u>LOCATION</u>
177	Finch Ave. W. & CNR Line
256	Sheppard Ave. W. & Dufferin St.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE A LOCATION Hwy. 401 from Allen Rd. to Keelè St.
 APPROX ORIGINAL GROUND ELEVATION 180-192 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #64 Elev. approx. 186 m. 0-9 m Silty Clay Till, Firm to Hard -W.L. approx. elev. 183 m. <hr/> #65 Elev. approx. 192 m. 0-13 m Silty Clay, V. Stiff to Hard 13-15 m Silty Clay, V. dense -W.L. approx. elev. 184 m. <hr/> #66 Elev. approx. 184 m. 0-2 m Silty Fill, Loose to Compact 2-17 m Silt Till, Compact to Very Dense -W.L. approx. elev. 181 m. <hr/>	<u>ELEVATED</u> -majority of piers could be founded on spread footings within native soils.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE A LOCATION Hwy. 401 from Keele St. to Jane St.

APPROX ORIGINAL GROUND ELEVATION 152-180 m PROPOSED GRADE ELEVATION ELEVATED, FILL WITH RETAINING WALLS

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#68 Elev. approx. 167 m. 0-14 m Silty Clay, Stiff to Hard -W.L. approx. elev. 165 m.</p> <p>#69 Elev. approx. 138 m. 0-10 m Silty Clay, Firm to V. Stiff 10-11 m Silty Sand, Dense to V. Dense -W.L. approx. elev. 137 m.</p> <p>#71 Elev. approx. 135 m. 0-4 m Desiccated zone, Silty Clay, V. Stiff to Hard 4-16 m Silty Clay, Soft to Firm 16-25 m Sandy Silt to Silty Sand, Dense to V. dense 25-31 m Silty Clay (till), V. Dense 31-34 m Sound Shale bedrock -W.L. approx. elev. 130 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could probably be founded on spread footings within native material, however, in the vicinity of Reference 71, piles may be required.</p> <p><u>FILL WITH RETAINING WALLS</u></p> <p>-retaining walls could be founded on spread footings within native material.</p>	
	<p><u>REFERENCE CONT.</u></p> <p>#72 Elev. approx. 125 m. 0-4 m Fill, Compact 4-26 m Silty Clay, Firm to Hard -W.L. approx. elev. 121 m.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 4 _____ ROUTE A _____ LOCATION Hwy. 401 from Jane St. to Humber River _____
 APPROX ORIGINAL GROUND ELEVATION 124-152 m _____ PROPOSED GRADE ELEVATION ELEVATED _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #73 Elev. approx. 123 m. 0-6 m Silty Fine Sand, Compact to Dense 6-23 m Silty Clay, Stiff to V. Stiff 23-37 m Silt to Silty Fine Sand, Compact 37 m Bedrock -W.L. approx. elev. . 121 m.	<u>ELEVATED</u> -majority of piers could probably be founded on spread footings, however, piers for elevated area over 10 m around Humber River will likely require piles driven to dense till.	
#75 Elev. approx. 128 m 0-1 m Sand and Gravel Fill 1-8 m Silty Clay Till, Firm to V. Stiff -W.L. approx. elev. 127 m.	<u>REFERENCES CONTINUED</u> #83 Elev. approx. 137 m 0-8 m Clayey Sandy Silt, Stiff to Hard 8-18 m Clayey Silty Sand(till), Dense to V. Dense -W.L. approx. elev. 127 m.	
#82 Elev. approx. 137 m. 0-3 m Clay, Hard to V. Stiff 3-18 m Silty Clay Till, V. Stiff to Stiff 18-23 m Sand, Dense 23-31 m Silty Clay Till, V. Stiff -W.L. unknown		

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE B LOCATION Sheppard Ave. from Dufferin St. to Black Creek
 APPROX ORIGINAL GROUND ELEVATION 155 to 199 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>Reference:</u> #256 Elev. approx. 196 m. 0-4 m Silt Till, Hard 4-11 m Silt Till, Very Stiff to Stiff -W.L. unknown	<u>ELEVATED</u> -majority of piers could probably be founded on spread footings, however, piers for high crossing of Black Creek will likely require piles. <u>CUT AND COVER</u> -probable soldier pile and lagging OR temporary slopes of 1:1 to 1.5:1 should be stable. <u>TUNNEL</u> -conditions are probably suitable for machine boring, however, special techniques may be required in stiff silt till.	1) <u>ELEVATIONS</u> ELEVATED CUT AND COVER TUNNEL 2) Information along route is extremely limited.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE B LOCATION Sheppard Ave. from Black Creek to Albion Rd.
 APPROX ORIGINAL GROUND ELEVATION 135-155 m PROPOSED GRADE ELEVATION See Remarks 1

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p>Reference:</p> <p>#77 Elev. approx. 147 m.</p> <p>0-3 m Sandy Clay, Firm to V. Stiff</p> <p>3-9 m Silty Clay, V. Stiff to Hard, Firm to V. Stiff</p> <p>9-10 m Sandy Clay, V. Stiff</p> <p>10-12 m Silty Sand, V. Stiff</p> <p>12-16 m Shaley Rock Layers</p> <p>16m Bedrock</p> <p>-W.L. approx. elev. 143 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could probably be founded on spread footings, however, piers for high crossing of Humber River will likely require piles.</p> <p><u>CUT AND COVER</u></p> <p>-probable soldier pile and lagging in conjunction with dewatering in sandy soils OR temporary slopes of 1:1 to 1.5:1 should be stable.</p> <p><u>TUNNEL</u></p> <p>-conditions are probably suitable for a boring machine.</p>	<p>1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p> <p>2) Information along route is extremely limited.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 4 _____ ROUTE C _____ LOCATION Finch Ave. from Dufferin St. to Keele St. _____

APPROX ORIGINAL GROUND ELEVATION 192-197 m _____ PROPOSED GRADE ELEVATION ELEVATED _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#62 Elev. approx. 162 m. 0-2 m Sand, Dense 2-4 m Silt, V. Dense 4-6 m Sand, V. Dense 6-9 m Silt Till, V. Hard -W.L. approx. elev. 161 m.</p> <hr/> <p>#177 Elev. approx. 197 m. 0-5 m Silt Till, Compact to Dense 5-14 m Sand Till, V. Dense -W.L. approx. elev. 195 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native soils.</p> <p>-dewatering of footing excavations could likely be handled by pumping from sumps.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 4 _____ ROUTE C _____ LOCATION Finch Ave. from Keele St. to Jane St. _____
 APPROX ORIGINAL GROUND ELEVATION _____ 173 to 197 m. _____ PROPOSED GRADE ELEVATION _____ ELEVATED _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#62 Elev. approx. 162 m. 0-2 m Sand, Dense 2-4 m Silt, V. Dense 4-6 m Sand, V. Dense 6-9 m Silt Till, V. Hard -W.L. approx. elev. 161 m.</p> <p>#84 Elev. approx. 172 m. 0-15 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff to Hard -W.L. approx. elev. 163 m.</p> <p>#177 Elev. approx. 197 m. 0-5 m Silt Till, Compact to Dense 5-14 m Sand Till, V. Dense -W.L. approx. elev. 195 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native soils.</p> <p>-dewatering of footing excavations could likely be handled by pumping from sumps.</p> <p><u>BLACK CREEK CROSSING</u></p> <p>-no information available at crossing but soils appear favourable for spread footings.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE C LOCATION Finch Ave. form Jane St. to Islington Ave.
 APPROX ORIGINAL GROUND ELEVATION 135 to 178 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#84 Elev. approx. 172 m. 0-15 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff to Hard -W.L. approx. elev. ... 163 m.</p> <hr/> <p>#126 Elev. approx. 133 m. 0-2 m Fill 2-5 m Sand, Loose 5-10 m Silt Till, Compact to Dense 10 m - Weathered Shale -W.L. approx. elev. 129 m.</p> <hr/>	<p><u>ELEVATED</u> Vicinity of Hwy. 400</p> <p>-majority of piers could probably be founded on spread footings within native material.</p> <p><u>ELEVATED</u> Vicinity of Islington Ave.</p> <p>-piers likely require pile foundations in excess of 5 m long.</p> <p>-excavations for pile caps below the W.L. may require shoring and dewatering.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE D LOCATION Finch HEPC from Dufferin St. to Black Creek
 APPROX ORIGINAL GROUND ELEVATION 185 to 205 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#62 Elev. approx. 162 m. 0-2 m Sand, Dense 2-4 m Silt, V. Dense 4-6 m Sand, V. Dense 6-9 m Silt Till, V. Hard -W.L. approx. elev. 161 m.</p> <p>#177 Elev. approx. 197 m. 0-5 m Silt Till, Compact to Dense 5-14 m Sand Till, V. Dense -W.L. approx. elev. 195 m</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could probably be founded on spread footings.</p> <p><u>CUT AND COVER</u></p> <p>-if soldier pile and lagging employed then some piles may require pre-augering. -seepage could be handled by pumping from sumps.</p> <p><u>CUT WITH RET. WALL</u></p> <p>-retaining walls could be founded on spread footings within native material. -no problems anticipated with 2:1 slopes.</p> <p><u>BLACK CREEK CROSSING</u></p> <p>-no information available but soils appear favourable for spread footings.</p>	<p><u>1) ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER CUT WITH RET. WALL</p> <p>2) No information available directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 4 _____ ROUTE D _____ LOCATION Finch HEPC from Black Creek to CPR south of Finch _____
 APPROX ORIGINAL GROUND ELEVATION 154 to 185 m _____ PROPOSED GRADE ELEVATION See Remarks 1 _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#84 Elev. approx. 172 m. 0-15 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff to Hard -W.L. approx. elev. 163 m.</p> <hr/> <p>#126 Elev. approx. 133 m. 0-2 m Fill 2-5 m Sand, Loose 5-10 m Silt Till, Compact to Dense 10m- Weathered Shale -W.L. approx. elev. 129 m.</p> <hr/>	<p><u>ELEVATED</u> -majority of piers could probably be founded on spread footings, however, some may require piles.</p> <p><u>CUT WITH RET. WALLS</u> -retaining walls could be founded on spread footings within native material. -slopes of 2:1 should be stable.</p> <p><u>CUT AND COVER</u> -probable soldier pile and lagging. -some piles may require pre-augering. -dewatering will be required in sand deposits.</p> <p><u>TUNNEL</u> -Till provide good conditions for boring machine. -no major problems anticipated.</p>	<p>1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT WITH RET. WALLS CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. section 4 ROUTE D LOCATION HEPC from CPR to Albion Road
 APPROX ORIGINAL GROUND ELEVATION 123 to 154 m PROPOSED GRADE ELEVATION See Remarks 1

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#77 Elev. approx. 147 m. 0-3 m Sandy Clay, Firm to V. Stiff 3-9 m Silty Clay, V.Stiff 9-10 m Sandy Clay, V.Stiff 10-12 m Silty Sand, V.Dense 12-16 m Shaley Rock Layers 16 m Bedrock -W.L. approx. elev. 143 m.</p> <p>#84 Elev. approx. 172 m. 0-15 m Het. mixture of Clay, Silt, Sand & Gravel, V.Stiff to Hard. -W.L. approx.elev. 163 m.</p> <p>#89 Elev. approx. 159 m. 0-17 m Silty Clay Till, V. Stiff to Hard 17-20 m Silty Sand, V. Dense -W.L. approx. elev. 150 m.</p>	<p><u>ELEVATED</u> -majority of piers could probably be founded on spread footings within native material.</p> <p><u>CUT AND COVER</u> -probable soldier pile and lagging. -some soldier piles may require pre-augering. -dewatering will be required if cut intersects silty sand layers.</p> <p><u>CUT WITH RET. WALLS</u> -retaining walls could be founded on spread footings within native material. -slopes of 2:1 should be stable.</p>	<p>1) <u>ELEVATIONS</u> ELEVATED CUT AND COVER CUT WITH RET. WALLS</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE E LOCATION Highway 400 from Hwy. 401 to Sheppard Avenue
 APPROX ORIGINAL GROUND ELEVATION 128 -- 150 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#75 Elev. approx. 128 m. 0-1 m Sand & Gravel Fill 1-8 m Silty Clay Till, Firm to V. Stiff -W.L. approx. 127 m</p> <hr/> <p>#77 Elev. approx. 147 m. 0-3 m Sandy Clay, Firm to V. Stiff 3-9 m Silty Clay, V. Stiff 9-10 m Sandy Clay, V. Stiff 10-12 m Silty Sand, V. Dense 12-16 m Shaley Rock Layers 16m Bedrock -W.L. approx. elev. 143 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native soils.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE F LOCATION CNR Line (Sheppard Ave.)-Keele St./Keele St. to Finch Ave.
 APPROX ORIGINAL GROUND ELEVATION 194-206 m PROPOSED GRADE ELEVATION See Remarks (1) HEPC

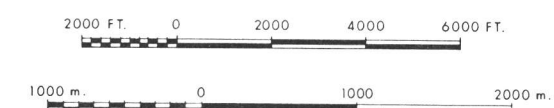
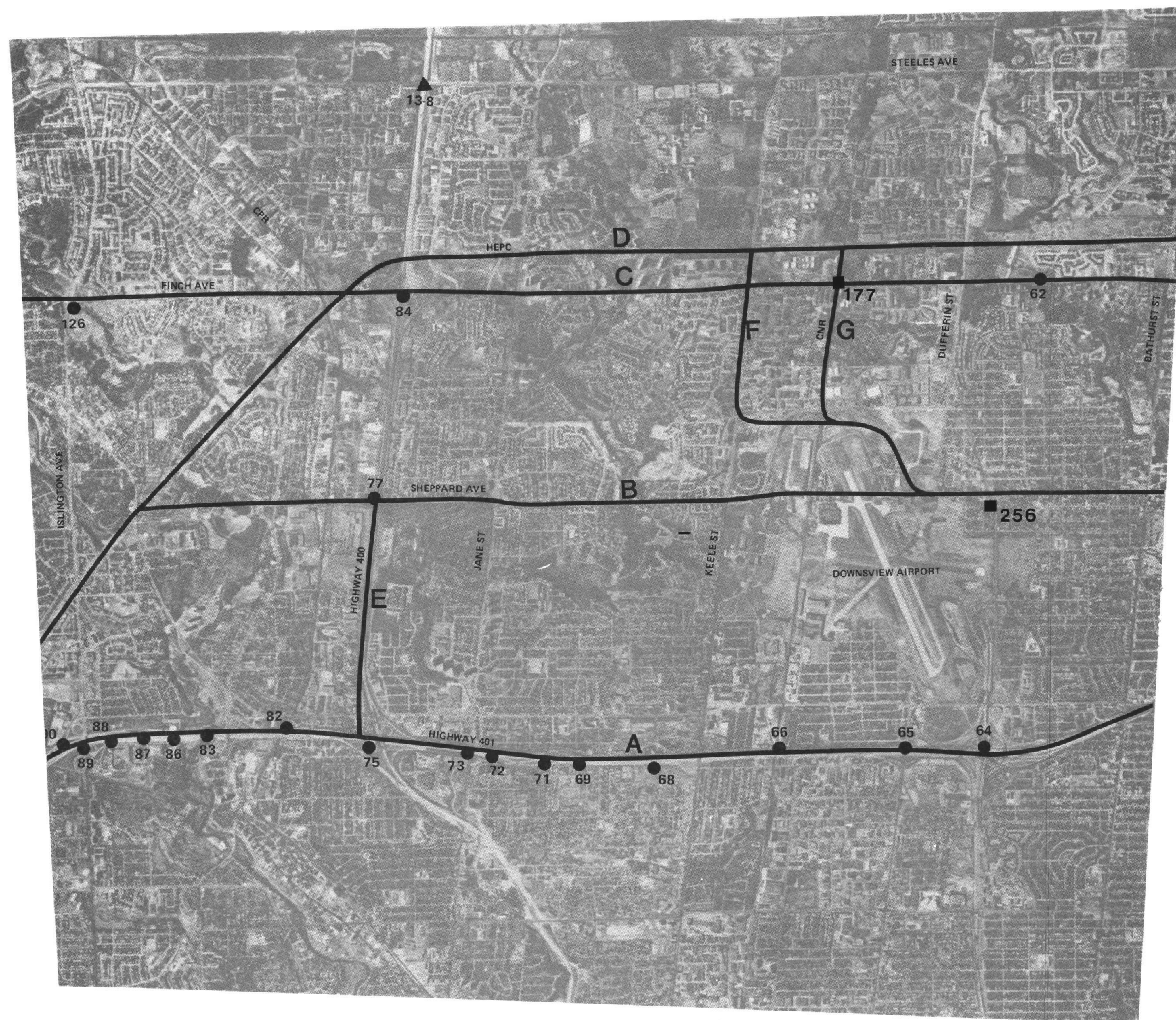
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCE:</u> #177 Elev. approx. 197 m. 0-5 m Silt Till, Compact to Dense 5-14 m Sand Till, V. Dense -W.L. approx. elev. 195 m.</p> <hr/>	<p><u>ELEVATED</u> -majority of piers could probably be founded on spread footings in native soils.</p> <p><u>CUT WITH RETAINING WALLS</u> -retaining walls could probably be founded on spread footings within native material. -no problems anticipated using 2:1 slopes.</p> <p><u>CUT AND COVER</u> -probable soldier pile and lagging OR temporary slopes of 1:1 to 1.5:1 should be stable.</p>	<p>1) <u>ELEVATIONS</u> ELEVATED CUT WITH RETAINING WALLS CUT AND COVER</p> <p>2) No information available directly along route.</p>

FOUNDATION DATA SHEET

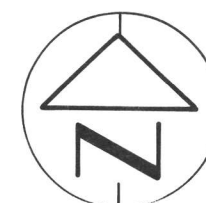
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 4 ROUTE G LOCATION Sheppard Ave. from Allen Rd. to CNR line. CNR line from Sheppard Ave. to Finch HEPC
 APPROX ORIGINAL GROUND ELEVATION _____ PROPOSED GRADE ELEVATION _____
 ELEVATED, CUT WITH RETAINING WALLS

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCE:</u> #177 Elev. approx. 197 m. 0-5 m Silt Till, Comapct to Dense 5-14 m Sand Till, V. Dense -W.L. approx. elev. 195 m. _____	<u>ELEVATED</u> -majority of piers could be founded on spread footings within native soils. <u>CUT WITH RETAINING WALLS</u> -retaining walls could be founded on spread footings within native soils. -no problems anticipated with 2:1 slopes.	Information along route is extremely limited.



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 4
NORTH YORK West





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

SECTION 5
NORTH YORK East
ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

PURCHASE ORDER M00-24
GO-ALRT DIST 6

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DATE:

FOUNDATION REPORT
FOR
Preliminary Feasibility Study
of GO-ALRT Northern Section
NORTH YORK EAST

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from Metro Roads Dept., Toronto. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the City of North York, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is bounded by the following:

North	- Finch H.E.P.C.
South	- Hwy. 401
East	- Victoria Park Avenue
West	- Dufferin Street/Allen Rd.

Soil conditions are quite variable across the site but generally consist of silty sands and silt tills with varying water table elevations. Pockets of loose sand and soft silt tills are distributed throughout the area.

A number of branches of the Don River drain the area and have eroded rather deep river valleys through the overburden, the most notable being the "Hogg's Hollow" west of Yonge St.

Bedrock is a grey shale with limestone interbeds of the Georgian Bay Formation.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

OTHER CONSIDERATIONS

Along certain routes, rather long sections of cut and cover have been identified. Consideration should be given to long continuous tunnel sections utilizing a tunnel boring machine.

Although dewatering systems in the cohesionless soils located along some routes would be necessary for both methods, tunnelling may prove to be cost effective with the added benefit of minimizing disruptions to existing conditions.

In locations where fills with retaining walls have been identified, consideration should be given to steepening the slopes utilizing reinforced earth methods thereby limiting the height of wall required or eliminating it altogether. Side slopes of 1:1 or steeper can be realized.

Preferred Route

From the soils mechanics viewpoint, no one route in this section is more advantageous than another.

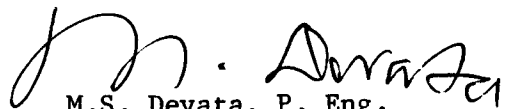
Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. B.E. Ruck, Project Foundations Engineer and reviewed by Mr. M.S. Devata, Chief Foundation Engineer, East.



B.E. Ruck
Project Foundations Engineer



M.S. Devata, P. Eng.
Chief Foundations Engineer
(East)

APPENDIX

REFERENCES - M. T. C.

Plan No.	Geocres No.	Location
39	30M14-80	Hwy. 401 & Victoria Park Ave.
40	-130	Hwy. 404 & McNicoll Ave.
41	-133	Hwy. 404 & Finch Ave.
44	-82	Hwy. 401 & Don Valley Parkway
45	-83	Leslie St. & Sheppard Ave.
46	-64	New Cummer Ave. & C.N.R.
47	-65	Don River & Cummer Ave.
48	-90	Hwy. 401 & Leslie Street
53	-86	Duncan Mills Rd. & Don River
56	-90	Hwy. 401 & Bayview Avenue
57	-122	Hwy. 401 & Yonge Street
58	-135	Hwy. 401 & Yonge Street
60	-136	Don River & Sheppard Avenue
61	-151	Don River & Don River Blvd.
62	-148	Finch Ave. & West Don River
63	30M11-72	Hwy. 401 & Avenue Road
64	-79	Hwy. 401 & Allen Road
180	-80	Hwy. 401 & Bathurst Street
14-101	30M14-101	Yonge Street & C.N.R.

REFERENCES - METRO ROADS

Metro Roads No.	Location
21	Don Mills Rd. & Finch Ave.
48	Hwy. 404 & Sheppard Ave.
51	Hwy. 404 & Finch Ave
86	Finch Ave. & Don River
87	Finch Ave. & C.N.R.
119	Sheppard Ave. & Buchan Ct.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE A LOCATION Hwy. 401 from west of Don River to Dufferin St.
 APPROX ORIGINAL GROUND ELEVATION _____ PROPOSED GRADE ELEVATION See remarks (2)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #63 Approx. elev. 178 m. 0-2 m Granular Fill Loose 2-8 m Silty Sand, V. Dense 8-10 m Clay Hard 10-12 m Sand V. Dense -W.L. not established #64 Approx. elev. 186 m. 0-9 m Clayey Silt Till, Firm to Hard -W.L. approx. elev. 183 m. #80 Elev. approx. 183 m. 0-2 m Fill 2-12 m Silt Till, Compact to V. Dense 12-13 m Silty Sand, V. Dense -W.L. approx. elev. 178 m.	<u>ELEVATED</u> -majority of piers could be founded on spread footings within native material. -in areas of silty sand, footing excavations may require shoring and dewatering. <u>FILL/FILL WITH RET. WALL</u> -retaining walls could be supported on spread footings within native soils. -slopes of 2:1 should be stable. <u>CUT AND COVER</u> -probable soldier pile and lagging in conjunction with dewatering in sandy soils. <u>TUNNEL</u> -special techniques such as compressed air may be required in sandy soils. -silt till provides good conditions for boring machine.	1) Recommendations for north and south of Hwy. 401 are the same. <u>2) ELEVATIONS</u> ELEVATED FILL/FILL WITH RET. WALL CUT & COVER TUNNEL
	<u>REFERENCES CONT.</u> #58 Elev. approx. 135 m 0-28 m Silty Sand to Sandy Silt, Stiff to Hard -W.L. approx. elev. 129 m.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. ___ Section 5 ___ ROUTE ___ A ___ LOCATION ___ Hwy. 401 from Bayview to West of DON RIVER (WEST BRANCH) ___
 APPROX ORIGINAL GROUND ELEVATION ___ N/A ___ PROPOSED GRADE ELEVATION ___ See Remarks ___

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #56 Elevation uncertain 0-8 m Silty Clay with Sand, Firm to Hard 8-9 m Silt, V. Dense -W.L. approx. 3 m below ground surface #57 Approx. elev. 157 m. 0-1 m Fill, Sandy Silt 1-7 m Clayey Sandy Silt Till, very Stiff 7-10 m Sand, V. Dense 10-12 m Clayey Silt, V. Stiff 12-15 m Sandy Silt Till V. Dense -W.L. approx. elev. 170 m #58 Elev. approx. 135 m 0-28 m Silty Sand to Sandy Silt Stiff to Hard -W.L. approx. elev. 129 m. _____	<u>ELEVATED</u> -probable spread footings east of Yonge Street with pile foundations required for Don River Crossing <u>FILL/FILL WITH RET. WALLS</u> -berms may be required for stability <u>CUT & COVER</u> -no major problems anticipated with soldier pile and lagging system. <u>TUNNEL</u> -special techniques such as compressed air may be required for Yonge Street vicinity	<u>1) ELEVATIONS</u> ELEVATED FILL/FILL WITH RET. WALLS CUT AND COVER TUNNEL

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE A LOCATION Hwy. 401 from Don Mills Rd. to Bayview Avenue
 APPROX ORIGINAL GROUND ELEVATION N/A PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #53 Approx. elev. 125 m. 0-6 m Sand, Compact 6-15 m to Dense 6-15 m Sandy Silt Till, Dense 15-18 m Sand & Gravel Matrix, V. Dense -W.L. approx. elev. 123 m. #55 Approx. elev. 146 m. 0-4 m Clayey Silt 4-6 m Silty Fine Sand, Loose to Compact 6-19 m Silty Clay, Soft to Firm 19-35 m Clayey Silt Till Very Dense -W.L. approx. 138 m. #56 <u>ELEVATION UNCERTAIN</u> 0-8 m Silty Clay with Sand Firm to Hard 8-9 m Silt, V. Dense -W.L. approx. 3 m below ground surface — — — —	<u>ELEVATED</u> -in vicinity of Leslie Street pile foundations will be required elsewhere, spread footings could be utilized. -shoring and dewatering of footing excavations may be required. <u>CUT & COVER</u> -probable soldier pile and lagging in conjunction with major dewatering. <u>TUNNEL</u> -special techniques such as compressed air will be required in non-cohesive soils. <u>FILL/FILL WITH RET. WALL</u> -berms may be required to ensure stability -some settlement can be anticipated.	1) <u>ELEVATIONS</u> ELEVATED CUT AND COVER TUNNEL FILL/FILL WITH RET. WALL

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE A LOCATION Hwy. 401 from Victoria Park Avenue to Don Mills Road
 APPROX ORIGINAL GROUND ELEVATION N/A PROPOSED GRADE ELEVATION See Remarks 1

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#39 Elev. approx. 174 m. 0-2 m Fill 2-14 m Silty Clay Till V. Stiff to Hard 14-24 m Sandy Silt, Loose to V. Dense -W.L. approx. elev. 169 m.</p> <p>#44 Approx. elev. 157 m. 0-3 m Clayey Silt Stiff to V. Stiff 3-13 m Sandy Silt to Silty Sand, Dense to V. Dense -W.L. approx. elev. 154 m.</p> <p>#53 Approx. elev. 128 m 0-6 m Sand, Compact to Dense 6-15 m Sandy Silt Till Dense 15-18 m Sand & Gravel Matrix V. Dense -W.L. approx. elev. 123 m.</p>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings. -shoring and dewatering of footing excavations in sandy silt will likely be required.</p> <p><u>CUT AND COVER</u></p> <p>-probable soldier pile and lagging in conjunction with major dewatering in sandy silt.</p> <p><u>TUNNEL</u></p> <p>-cohesionless soils require special techniques to ensure stability during construction, i.e. compressed air, etc.</p>	<p><u>1. ELEVATIONS</u></p> <p>ELEVATED TUNNEL CUT AND COVER</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE B LOCATION Sheppard Avenue from Victoria Park to Leslie Street
 APPROX ORIGINAL GROUND ELEVATION 132 to 184 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #39 Elev. approx. 174 m. 0-2 m Fill 2-14 m Silty Clay Till, V. Stiff to Hard 14-24 m Sandy Silt, Loose to V. Dense -W.L. approx. elev. 169 m. #48 Elev. approx. 177 m. 0-14 m Silty Clay Till Stiff to Hard -W.L. approx. elev. 172 m. #119 Elev. approx. 136 m 0-4 m Silty Clay Fill, Firm 4-7 m Organics, Stiff 7-9 m Silty Clay, Firm to Stiff 9-15 m Silty Sand, Dense to V. Dense -W.L. approx. elev. 129 m.	<u>ELEVATED</u> -majority of piers could be founded on spread footings within native material except in vicinity of reference #119 where piles would be required. -water in footing excavations could probably be handled by pumping from sumps. <u>CUT & COVER</u> -generally soldier pile and lagging with minor dewatering.	1) <u>ELEVATIONS</u> <u>ELEVATED</u> CUT AND COVER
	<u>REFERENCES CONT.</u> #45 Approx. elev. 142 m 0-2 m Silty Sand, Very loose to Compact 2-6 m Silty Clay, Very Stiff to Firm 6-15 m Sandy to Clayey Silt, Hard -W.L. approx. elev. 140 m.	

FOUNDATION DATA SHEET
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE B LOCATION Sheppard Avenue from Leslie Street to Yonge Street
 APPROX ORIGINAL GROUND ELEVATION 132 to 182 m. PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #45 Approx. elev. 142 m 0-2 m Silty Sand, Very loose to Compact 2-6 m Silty Clay, Very Stiff to Firm 6-15 m Sandy to Clayey Silt, Hard -W.L. approx. elev. 140 m. #48 Approx. elev. 128 m. 0-6 m Sand, Loose 6-11 m Clay, Firm 11-18 m Sand, Compact to Dense 18-27 m Till, Very Dense -W.L. not established #57 Approx. elev. 177 m. 0-1 m Fill, Sandy Silt 1-7 m Clayey Sandy Silt Till, Very Stiff 7-10 m Sand, V. Dense 10-12 m Clayey Silt Till V. Dense 12-15 m Sandy Silt Till V. Dense -W.L. approx. elev. 170 m	<u>ELEVATED</u> -majority of piers could probably be founded on spread footings within native materials except in vicinity of reference #48 where piles would be required. <u>CUT & COVER</u> -generally soldier piles and lagging with minor dewatering. <u>TUNNEL</u> -alternating layers of cohesive and cohesionless soils will require special techniques. i.e. compressed air	1) <u>ELEVATIONS</u> ELEVATED TUNNEL CUT AND COVER 2) Available information limited west of Leslie Street.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 5 _____ ROUTE B _____ LOCATION Sheppard Avenue from Yonge Street to Dufferin Street _____
 APPROX ORIGINAL GROUND ELEVATION 142 to 197 m _____ PROPOSED GRADE ELEVATION See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES</u> #57 Approx. elev. 177 m. 0-1 m Fill Sandy Silt 1-7 m Clayey Sandy Silt Till, Very Stiff 7-10 m Sand, V. Dense 10-12 m Clayey Silt, V. Stiff 12-15 m Sandy Silt Till V. Dense -W.L. approx. elev. 170 m. #60 Approx. elev. 157 m. 0-12 m Silty Sand Dense 12-25 m Sandy Silt Till, Stiff 25-39 m Silty Sand with Gravel, V. Dense Bedrock at elev. 101 m. -W.L. approx. elev. 146 m.	<u>ELEVATED</u> -generally spread footings except in vicinity of reference #61 where piles would be required -possibly require shoring and dewatering of footing excavations. <u>FILL</u> -slopes of 2:1 will probably be stable and will require protection from erosion. <u>TUNNEL</u> -alternating layers of cohesive and cohesionless soils will require special techniques i.e. compressed air. <u>CUT AND COVER</u> -generally soldier pile and lagging in conjunction with major dewatering. <div style="text-align: center;"> <u>REFERENCES CONT.</u> #61 Approx. elev. 147 m. 0-6 m Sand, Loose 6-13 m Silty Sand Till V. Dense -W.L. approx. elev. 143 m. </div>	<u>1) ELEVATIONS</u> ELEVATED FILL TUNNEL CUT AND COVER 2) Available information along route is limited.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 5 _____ ROUTE _____ C _____ LOCATION _____ Finch Avenue from Victoria Park to Leslie Street _____
 APPROX ORIGINAL GROUND ELEVATION _____ 155 to 190 m _____ PROPOSED GRADE ELEVATION _____ See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#41 Approx. elev. 174 m. 0-1 m Silty Sand Compact 1-4 m Clayey Silt Stiff to Hard 4-8 m Sandy Silt to Silty Sand Compact to Very Dense -W.L. approx. elev. 174 m.</p> <p>#51 Approx. elev. 175 m. 0-4 m Sandy Silt Till, Firm to Hard 4-17 m Silty Sand Dense to V. Dense -W.L. approx. elev. 169 m.</p> <p>#87 Approx. elev. 154 m. 0-2 m Fill 2-11 m Silty Clay Stiff to V. Stiff becoming firm with depth. 11-13 m Silty Sand, Dense -W.L. approx. elev. 151 m</p>	<p><u>ELEVATED</u></p> <p>-east of Sta 18+900 (approx.) piers can probably be founded on spread footings. -in areas where footing excavations extend below W.L. dewatering and shoring may be required. -west of Sta 18+900 (approx.) pile foundations will likely be required.</p> <p><u>CUT AND COVER</u></p> <p>-areas of Sandy Silt may require major dewatering scheme in conjunction with soldier pile & lagging. -in areas of silty clay, long piles may be required.</p> <p><u>TUNNEL</u></p> <p>-within sandy silt, special techniques such as compress air will be required. -west of Sta 18+900 (approx.) special techniques will be required in firm silty clay.</p>	<p><u>ELEVATIONS</u></p> <p>ELEVATED CUT AND COVER TUNNEL</p> <p>2) Soils quite variable along this segment.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 5 _____ ROUTE _____ C _____ LOCATION Finch Avenue from Leslie Street to Yonge Street _____
 APPROX ORIGINAL GROUND ELEVATION _____ 142 to 195 m _____ PROPOSED GRADE ELEVATION _____ See remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#87 Elev. approx. 154 m. 0-2 m Fill 2-11 m Silty Clay Stiff to V.Stiff becoming Firm Depth 11-13 m Silty Sand, Dense -W.L. approx. elev. 151 m.</p> <p>#86 Elev. approx. 165 m. 0-3 m Fill 3-10 m Silt Till Very Dense -W.L. elev. approx. 162 m.</p> <p>#62 Elev. approx. 162 m. 0-2 m Sand,Dense 2-4 m Silt, V.Dense 4-6 m Sand V. Dense 6-9 m Silt Till Very Hard -W.L. approx. elev. 161 m.</p>	<p><u>TUNNEL</u></p> <p>- in vicinity of Leslie Street special techniques will be required in firm silty clay. -in vicinity of Yonge Street, soil conditions uncertain but probably silt till, if so, then no major problems anticipated.</p> <p><u>CUT & COVER</u></p> <p>-probable soldier pile + lagging with dewatering required in sandy soils.</p> <p><u>ELEVATED</u></p> <p>-in vicinity of Leslie Street and Don River, probable pile foundations, otherwise spread footings.</p> <p><u>FILL & CUT WITH SIDE SLOPES</u></p> <p>-no problems anticipated with 2:1 slopes.</p>	<p>1) <u>ELEVATIONS</u></p> <p>TUNNEL CUT & COVER CUT WITH SIDE SLOPES ELEVATED FILL CUT WITH SIDE SLOPES</p> <p>2) Available information along this route is limited.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE C LOCATION Finch Avenue from Yonge Street to Dufferin Street
 APPROX ORIGINAL GROUND ELEVATION 164 to 194 m PROPOSED GRADE ELEVATION See Remarks(1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #62 Approx. elev. 162 m. 0-2 m Sand, Dense 2-4 m Silt, V. Dense 4-6 m Sand, V. Dense 6-9 m Silt Till Very Hard -W.L. approx. elev 161 m. <hr/> #86 Approx. elev. 165 m. 0-3 m Fill 3-10 m Silt Till V. Dense -W.L. approx. elev. 162 m <hr/> #14-101 Approx. elev. 186 m 0-9 m Silt Till, Dense to V. Dense 9-14 m Silty Sand, V. Dense -W.L. not encountered <hr/>	<u>TUNNEL</u> -anticipated soil at tunnel locations is silt till- good conditions for boring machine <u>CUT & COVER</u> -some pre-augering of soldier piles may be required. <u>CUT WITH SIDE SLOPES</u> -no problems with 2:1 slopes providing W.L. is permanently lowered. <u>ELEVATED</u> -majority of piers could be founded on spread footings. <u>FILL</u> -no problems anticipated with 2:1 slopes.	1) <u>ELEVATIONS</u> TUNNEL CUT & COVER CUT WITH SIDE SLOPES ELEVATED FILL 2) Available information along this route is limited.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE D LOCATION Finch HEPC from Victoria Park to Leslie
 APPROX ORIGINAL GROUND ELEVATION 152 to 188 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #40 Approx. elev. 186 m. 0-1 m Topsoil 1-7 m Sandy Silt Compact to Hard 7-17 m Silty Sand Dense to V.Dense -W.L. approx. elev. 176 m. #46 Approx. elev. 156 m. 0-7 m Clay till- Silty Sand Stiff to Hard 7-20 m Clayey Silt, Dense to V.Dense -W.L. not established #21 Approx. elev. 168 m. 0-3 m Sand to Silty Sand Compact to V. Dense 3-12 m Silty Sand + Gravel, Dense to V. Dense -W.L. approx. elev. 164 m.	<u>TUNNEL</u> -special techniques such as compressed air may be required for section east of approx. Sta 19+000. <u>CUT & COVER</u> -generally soldier pile + lagging with major dewatering. <u>CUT WITH RET. WALL</u> -retaining walls can be founded on spread footings within native soils. -side slopes of 2:1 should be stable -permanent dewatering system may be required. <u>FILL WITH RET. WALL/FILL</u> -retaining walls can be founded on spread footings within native material -slopes of 2:1 should be stable. <u>ELEVATED</u> -majority of pier could be founded on spread footings. -excavations below W.L. may require dewatering.	<u>1) ELEVATIONS</u> TUNNEL CUT AND COVER CUT WITH RET. WALL FILL WITH RET. WALL FILL ELEVATED

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE D LOCATION Finch HEPC from Leslie St. to Yonge St.
 APPROX ORIGINAL GROUND ELEVATION 134 to 192 m PROPOSED GRADE ELEVATION See remarks (1)

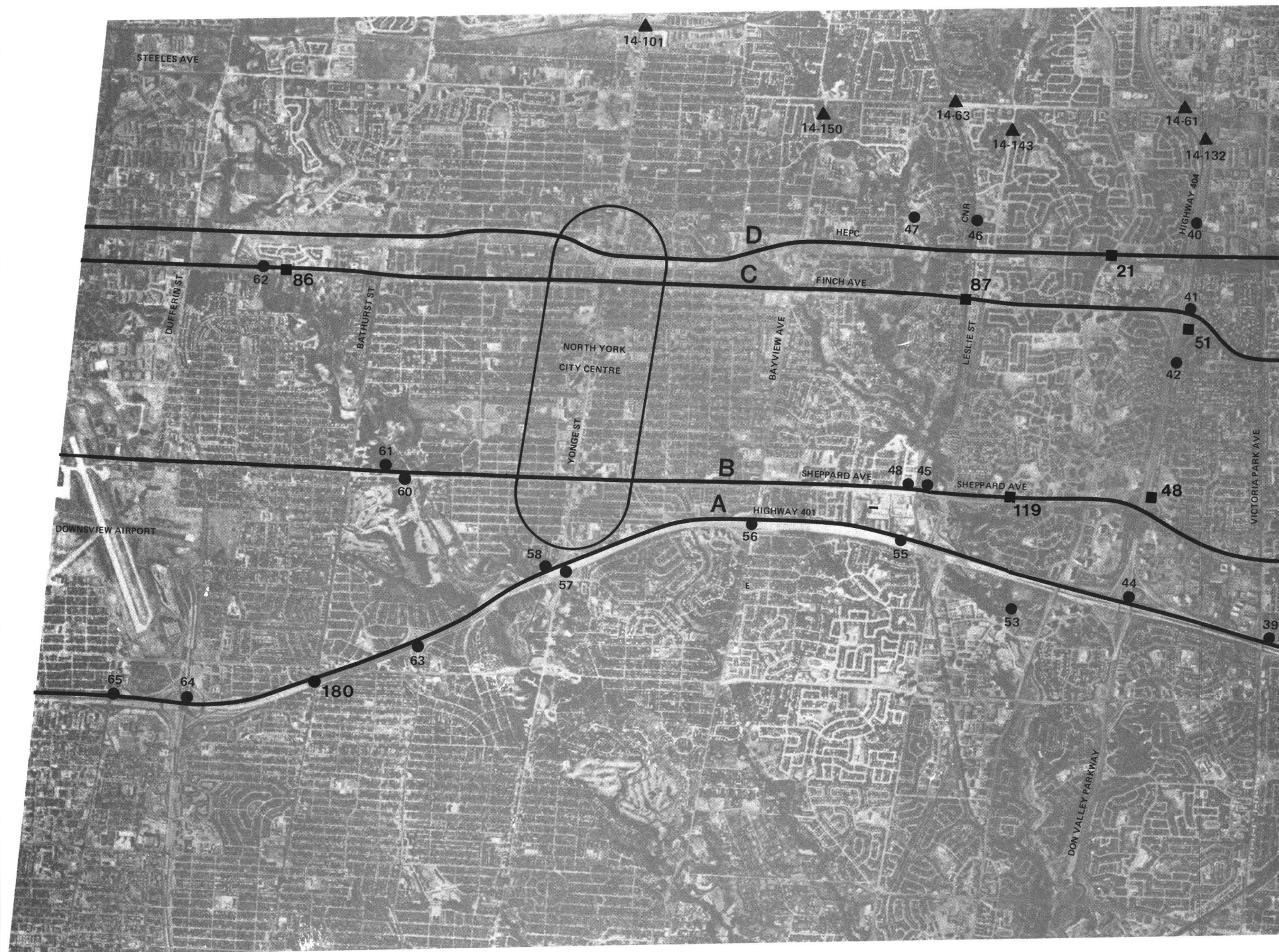
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #46 Approx. elev. 156 m. 0-7 m Clay till- Silty Sand Stiff to Hard 7-20 m Clayey Silt, Dense to V.Dense -W.L. not established #47 Approx. elev. 154 m. 0-4 m Sand, Dense 4-15 m Clay, Stiff to Very Stiff 15-22 m Silty Sand Till, Dense 22-25 m Clay, Stiff to V. Stiff 25-30 m Silty Sand Till, V. Dense -W.L. approx. elev. 149 m.	<u>TUNNEL</u> -no major problems anticipated utilizing boring machine in competent cohesive soils. <u>CUT & COVER</u> -probable soldier pile + lagging -some piles may require pre-augering. <u>CUT WITH RET. WALL</u> -retaining walls could be founded on spread footings within native soils -slopes of 2:1 should be stable -a permanent dewatering system may be required <u>FILL/FILL WITH RET. WALL</u> -retaining walls could be founded on spread footings within native soils -slope of 2:1 should be stable <u>ELEVATED</u> -majority of piers could be founded on spread footings.	<u>10 ELEVATIONS</u> TUNNEL CUT & COVER CUT WITH RET. WALL FILL/FILL WITH RET. WALL ELEVATED 2) No available information for western part of this route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 5 ROUTE D LOCATION Finch HEPC from Yonge St. to Dufferin St.
 APPROX ORIGINAL GROUND ELEVATION 168 to 193 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#62 Approx. elev. 162 m. 0-2 m Sand, Dense 2-4 m Silt, V. Dense 4-6 m Sand, V. Dense 6-9 m Silt Till, Very Hard -W.L. approx. elev. 161 m.</p> <p>#86 Approx. elev. 165 m. 0-3 m Fill 3-10 m Silt Till, V. Dense -W.L. approx. elev. 162 m.</p> <p>#14-101 Approx. elev. 186m 0-9 m Silt Till, Dense to V. Dense 9-14 m Silty Sand, V. Dense -W.L. not encountered</p>	<p><u>TUNNEL</u> -anticipate silt till for majority of route - good conditions for boring machine.</p> <p><u>CUT & COVER</u> -some soldier piles may require pre-augering.</p> <p><u>CUT WITH RET. WALL</u> -retaining walls could be founded on spread footings within native soils. - a permanent dewatering system may be required - slopes of 2:1 should be stable</p> <p><u>FILL/FILL WITH RET. WALL</u> -retaining walls could be founded on spread footings within native soils -slopes of 2:1 should be stable.</p> <p><u>ELEVATED</u> -majority of piers could be founded on spread footings.</p>	<p>1) <u>ELEVATIONS</u></p> <p>TUNNEL CUT & COVER CUT WITH RET. WALL FILL/FILL WITH RET. WALL AT GRADE ELEVATED</p> <p>2) No information available directly on route.</p>



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 5
NORTH YORK East





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

SECTION 6
SCARBOROUGH West
ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

PURCHASE ORDER M00-24
GO-ALRT DIST 6

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DATE:

FOUNDATION REPORT
FOR
Preliminary Feasibility Study
of GO-ALRT Northern Section
Scarborough West Section

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from Metro Roads Dept. Toronto. Along some routes, little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the City of Scarborough, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is roughly bounded by the following:

North	- Finch Avenue H.E.P.C.
South	- Ellesmere Road
East	- Markham Road
West	- Victoria Park Avenue

Soil conditions across the site are fairly uniform and generally consist of silty sands with a high water table. In some areas, pockets of very soft to soft silty clay are present, but these appear to be of limited extent.

The creeks which drain the area tend to be rather small with fairly shallow valleys.

Bedrock is generally a grey shale with limestone interbeds of the Georgian Bay Formation.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

Preferred Route

From the soil mechanics viewpoint, no one route in this section is more advantageous than another.

Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. B. E. Ruck, Project Foundation Engineer and reviewed by Mr. M. S. Devata, Chief Foundation Engineer, East.



B.E. Ruck
Project Foundation Engineer



M.S. Devata, P. Eng.
Chief Foundation Engineer, East

APPENDIX

REFERENCES - M.T.C.

<u>PLAN NO.</u>	<u>GEOCRES NO.</u>	<u>LOCATION</u>
25	30M14-32	Hwy. 401 & Markham Road
26	-141	CPR & Markham Road
28	-35	Hwy. 401 & Highland Creek
29	-36	Hwy. 401 & McCowan Road
31	-67	Hwy. 401 & Highland Creek
32	-66	Midland Avenue & CPR
33	-68	Hwy. 401 & CNR Overhead
34	-71	Hwy. 401 at Kennedy Road
36	-73	Hwy. 401 & Birchmount Road
37	-77	Hwy. 401 & Warden Avenue
38	-153	Hwy. 401 & Victoria Park Avenue
39	-80	Hwy. 401 & Victoria Park Avenue
40	-130	Hwy. 404 & McNicoll Avenue
41	-133	Hwy. 404 & Finch Avenue
42	-165	Hwy. 404 & Van Horne Avenue

REFERENCES - METRO ROADS

<u>METRO ROADS NO.</u>	<u>LOCATION</u>
100	Sheppard Avenue & Kennedy Road
246	Ellesmere Road & CNR
254	McCowan Road, South Hwy. 401

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE A LOCATION Hwy. 401 from McCowan Rd. to Kennedy Rd.
 APPROX ORIGINAL GROUND ELEVATION 166 to 170 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V. Soft to Soft 2-4 m Silty Sandy Clay (till) Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand, Loose to Dense 9.5-12.5 m Clayey Silty Sand (till) Very Dense 12.5-24 m Silty Sand, Very firm to firm -W.L. not known #31 Elev. approx. 162 m. 0-2 m Silty Sand to Sandy Silt, Compact to V. Dense 2-4 m Clayey Silt, V. Stiff to Hard 4-15 m Silty Sand to Sandy Silt, Compact to V. Dense -W.L. not known — — — —	<u>ELEVATED:</u> <u>West of Brimley Rd.</u> i) Possible spread footings with dewatering and shoring of excavations probable. <u>East of Brimley Rd.</u> i) Probable pile foundations. ii) Approx. pile tip elevation 145 m.	
	<u>REFERENCES CONT.</u> #33 Elev. approx. 164 m. 0-12 m Silty Sand to Silt Compact to V. Dense 12-19 m Silty Sand to Sand Dense to V. Dense -W.L. 162 m. #34 Elev. approx. 169 m. 0-11 m Sandy Silt, Compact to V. Dense 11-20 m Clayey Silt, Hard to V. Dense -W.L. 166 m.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE A LOCATION Hwy. 401 from Kennedy Rd. to Victoria Park Avenue
 APPROX ORIGINAL GROUND ELEVATION 173 to 186 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References;</u> #34 Elev. approx. 169 m 0-11 m Sandy Silt, Compact to V. Dense 11-20 m Clayey Silt, Hard or V. Dense -W.L. 166 m. #36 Elev. approx. 175 m. 0-12 m Silty Sand to Sandy Silt Compact to V. Dense -W.L. 168 m. #37 Elev. approx. 178 m. 0-7 m Sand V. Dense 7-11 m Silty Sand, V. Dense -W.L. 172 m. #38 Elev. approx. 176 m. 0-5 Sand Silt (till) Dense to Very Dense -W.L. not known	<u>ELEVATED: East of Pharmacy Avenue</u> i) Probable spread footings. ii) Shoring may be required in silty sand deposits. <u>ELEVATED: West of Pharmacy Avenue</u> i) Probable pile foundations.	
	<u>REFERENCE CONT.</u> #39 Elev. approx. 174 m. 0-1 m Fill (Clayey Silt) Compact 1-15 m Clayey Silt (till) Compact to V. Dense 15-25 m Sandy Silt, V. Dense	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE A LOCATION Hwy. 401 from Markham Rd. to McCowan Rd.
 APPROX ORIGINAL GROUND ELEVATION 160 to 166 m. PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #25 Elev. approx. 159 m. 0-5 m Sandy Silt, Dense to V. Dense 5-9 m Clayey Silt with Sand tr. Gravel Hard. -W.L. approx. 1 m below surface. #28 Elev. approx. 158 m. 0-2 m Organic Clay-Silt Stiff to Very Soft 2-6 m Clayey Silt Very Stiff to Hard #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V. Soft to Soft 2-4 m Silty Sandy Clay (till) Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand Loose to Dense 9.5-12.5 m Clayey Silty Sand (till) Very dense 12.5-24 m Silty Sand Very firm to firm	<u>ELEVATED 0-10 m.</u> i) The majority of the piers can be supported on spread footings. ii) At some locations, soft subsoils exist and short pile foundations may be required. iii) Shoring and dewatering of footing excavations located within the sandy silt may be required. <u>ELEVATED: GREATER THAN 10 m.</u> i) Probable pile foundations. ii) Pile lengths in the order of 10 m.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 6 _____ ROUTE B _____ LOCATION Sheppard Ave. from McCowan Rd. to Kennedy Rd. _____

APPROX ORIGINAL GROUND ELEVATION 165 to 178 m. _____ PROPOSED GRADE ELEVATION Elevated _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #32 Elev. approx. 173 m. 0-1 m Sandy Silt, Compact 1-11 m Sandy Silt to Clayey Silt (till) Very Dense -W.L. 165 m. ----- #100 Elev. approx. 166 m. 0-7 m Clayey Sand Dense to V. Dense -W.L. unknown -----	<u>ELEVATED</u> - generally spread footings. - footing excavations below W.L. in Sandy soils may require dewatering and shoring.	i) Our information along this route is limited.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE B LOCATION Sheppard Avenue from Kennedy Rd. to Victoria Park Ave.
 APPROX ORIGINAL GROUND ELEVATION 172 to 186 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References;</u> #100 Elev. approx. 166 m. 0-7 m Clayey Sand Dense to V. Dense -W.L. unknown — — — —</p> <p>#39 Elev. approx. 174 m. 0-1 m Fill Clayey Silt Compact 1-15 m Clayey silt (till) Compact to V. Dense 15-25 m Sandy Silt V. Dense — — — —</p>	<p><u>ELEVATED</u></p> <p>-the majority of piers can probably be founded on spread footings however some may require short pile foundations.</p>	<p>i) No information available directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE C LOCATION Finch Ave. from McCowan Rd. to Kennedy Rd.
D Finch HEPC from McCowan Rd. to Kennedy Rd.
 APPROX ORIGINAL GROUND ELEVATION 178 to 185 PROPOSED GRADE ELEVATION Elevated
185 to 191

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> <u>None</u> -probable Clayey Sand or Sandy Silt	<u>ELEVATED</u> -probable spread footings.	i) No available information along either route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 6 _____ ROUTE C _____ LOCATION Finch Ave. from Kennedy Rd. to Victoria Park Ave.
Finch HEPC from Kennedy Rd. to Victoria Park Ave.
 APPROX ORIGINAL GROUND ELEVATION 175 to 187 m. _____ PROPOSED GRADE ELEVATION Elevated _____
180 to 192 m.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #40 Elev. approx. 186 m. 0-7 m Sandy Silt, Compact to Hard 7-17 m Silty Sand, Dense to V. Dense -W.L. approx. elev. _____ 176 m. #41 Elev. approx. 174 m. 0-1 m Silty Sand, Compact . 1-4 m Clayey Silt, Stiff to Hard 4-8 m Sandy Silt to Sand, Compact to V. Dense #42 Elev. approx. 184 m. 0-6 m Silt Till, Stiff to Hard, Compact to V. Dense 6-13 m Silty Sand, V. Dense.	<u>ELEVATED</u> -the majority of piers could be founded on spread footings. -dewatering of footing excavations could probably be handled by pumping from sumps.	i) No information available directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE E LOCATION Ellesmere Rd. from Markham Rd. to Brimley
 APPROX ORIGINAL GROUND ELEVATION 155-180 PROPOSED GRADE ELEVATION Elevated 0-10 m.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>#25 Elev. approx. 159 m. 0-5 m Sandy Silt, Dense to V. Dense 5-9 m Clayey Silt with Sand tr, Gravel, Hard -W.L. approx. 1 m below surface.</p> <p>— — — —</p> <p>#254 Elev. approx. 164 m. 0-9 m Sandy Silt Till Compacted to V. Dense 9-13 m Sand, V. Dense -W.L. varies between elev. 154 and 159m.</p> <p>— — — —</p>	<p><u>ELEVATED</u></p> <p>-majority of pier footings could be supported on spread footings.</p> <p>-footing excavations below W.L. may require dewatering and shoring.</p>	<p>i) No information directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE E LOCATION Ellesmere Rd. from Brimley to Warden H.E.P.C.
 APPROX ORIGINAL GROUND ELEVATION 163 to 179 m. PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>Reference:</u> #246 Elev. approx. 163 m. 0-3 m Fill 3-8 m Silty Sand Till Compact 8-11 m Sandy Silt, V. Dense 11-15 m Silty Sand Till -W.L. varies between elev. 159 and 162m. — — — —	<u>ELEVATED</u> -majority of piers can be founded on spread footings. -footing excavations below the W.L. may require dewatering and shoring.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE E LOCATION Warden HEPC from Ellesmere to Finch HEPC
 APPROX ORIGINAL GROUND ELEVATION 171 to 190 m. PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>#37 Elev. approx. 178 m. 0-7 m Sand, V. Dense 7-11 m Silty Sand, V. Dense -W.L. 172 m.</p> <p>#38 Elev. approx. 176 m. 0-5 m Sand Silt(till) Dense to Very Dense -W.L. not known</p> <p>#40 Elev. approx. 186 m. 0-7 m Sandy Silt, Compact to Hard 7-17 m Silty Sand, Dense to V. Dense</p> <p>#41 Elev. approx. 174 m. 0-1 m Silty Sand, Compact 1-4 m Clayey Silt, Stiff to Hard 4-8 m Sandy Silt to Silt, Compact to V. Dense</p> <p>— — — —</p>	<p><u>ELEVATED</u></p> <p>- majority of piers can be founded on spread footings however in some areas loose sand might be present and short piles may be required.</p> <p>-footing excavations below W.L. may require shoring and dewatering.</p>	<p>i) Little available information directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 6 _____ ROUTE _ F _ LOCATION Kennedy Rd. from Ellesmere to Finch H.E.P.C. _____
 APPROX ORIGINAL GROUND ELEVATION _____ 165 to 187 _____ PROPOSED GRADE ELEVATION _____ Elevated _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #246 Elev. approx. 163 m. 0-3 m Fill 3-8 m Silty Sand Till, Compact 8-11 m Sandy Silt, V. Dense 11-15 m Silty Sand Till -W.L. varies between elev. 159 and 162m. _____ #34 Elev. approx. 169 m. 0-11 m Sandy Silt Compact to V. Dense 11-20 m Clayey Silt Hard or V. Dense _____ #100 Elev. approx. 166 m. 0-7 m Clayey Sand, Dense to V. Dense -W.L. unknown _____	<u>ELEVATED</u> -majority of piers could be founded on spread footings. within silty sand deposit. -footing excavations below W.L. may require dewatering and shoring.	1) No information available north of Sheppard Avenue on this route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE G LOCATION C.N.R. from Ellesmere to Sheppard
 APPROX ORIGINAL GROUND ELEVATION 163 to 172 m. PROPOSED GRADE ELEVATION Elevated.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #33 Elev. approx. 164 m. 0-12 m Silty Sand to Silt, Compact to V. Dense 12-19 m Silty Sand to Sand, Dense to V. Dense. -W.L. 162 m. #246 Elev. approx. 163 m. 0-3 m Fill 3-8 m Silty Sand Till, Compact 8-11 m Sandy Silt, V. Dense. 11-15 m Silty Sand Till -W.L. varies between elev. 159 and 162 m. — — — —	<u>ELEVATED</u> -most piers could be founded on spread footings within silty sand deposit. -footing excavations below W.L. may require dewatering and shoring.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE H LOCATION Progress Avenue from Markham Rd. to McCowan Rd.
 APPROX ORIGINAL GROUND ELEVATION 148 to 160 m. PROPOSED GRADE ELEVATION Elevated 0-10 m.
Elevated 7-10 m.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #25 Elev. approx. 159 m. 0-5 m Sandy Silt, Dense to V. Dense 5-9 m Clayey Silt with Sand tr. Gravel Hard -W.L. approx. 1 m below surface. #28 Elev. approx. 158 m. 0-2 m Organic Clay-Silt Stiff to Very Soft 2-6 m Clayey Silt Very Stiff to Hard -W.L. Free Artesian Water #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V. Soft to Soft 2-4 m Silty Sandy Clay (till), Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand Loose to Dense 9.5-12.5 m Clayey Silty Sand (till) very Dense 12.5-24 m Silty Sand, Very firm to firm -W.L. not known — — — —	<u>ELEVATED 0-10 m.</u> i) Short pile foundations in areas of soft silty clay. ii) Spread footings at other locations. iii) Shoring of footing excavations may be required in areas of sandy silt. <u>ELEVATED: GREATER THAN 10 m.</u> i) Possible spread footings or short pile foundations dependant on site specific subsoil conditions. ii) May require dewatering of spread footing excavations in areas of sandy silt.	No information available directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE H LOCATION Progress Avenue from Brimley Rd. to Kennedy Rd.
 APPROX ORIGINAL GROUND ELEVATION 162 to 175 m PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V.Soft to Soft 2-4 m Silty Sandy Clay (till) Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand Loose to Dense 9.5-12.5 m Clayey Silty Sand (till) Very dense 12.5-24 m Silty Sand Very firm to firm #31 Elev. approx. 162 m. 0-2 m Silty Sand to Sandy Silt, Compact to V. Dense. 2-4 m Clayey Silt, V.Stiff to Hard 4-15 m Silty Sand to Sandy Silt, Compact to V. Dense -W.L. not known — — — —	<u>ELEVATED</u> -majority of piers founded on spread footings. -footing excavations below the W.L. may require dewatering and shoring. -in areas of loose sand, short piles may be required.	i) No information available directly on route.
	<u>REFERENCES CONT.</u> #254 Elev. approx. 164 m. 0-9 m Sandy Silt Till Compact to V. Dense 9-13 m Sand V. Dense -W.L. Variable between elev. 154 and 159 m. — — — —	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE J LOCATION Brimley Rd. from Ellesmere to Hwy. 401
 APPROX ORIGINAL GROUND ELEVATION 164 to 174 m. PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>#33 Elev. approx. 164 m. 0-12 m Silty Sand to Silt, Compact to V. Dense 12-19 m Silty Sand to Sand Dense to V. Dense -W.L. 162 m. — — — —</p> <p>#246 Elev. approx. 163 m. 0-3 m Fill 3-8 m Silty Sand Till, Compact 8-11 m Sandy Silt, V. Dense 11-15 m Silty Sand Till, -W.L. varies between elev. 159 and 162 m. — — — —</p>	<p><u>ELEVATED</u></p> <p>-majority of piers can be founded on spread footings.</p> <p>-footing excavations below the W.L. may require dewatering and shoring.</p>	<p>i) No information available directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE K LOCATION McCowan Rd. Ellesmere Ave. to Sheppard Ave.
 APPROX ORIGINAL GROUND ELEVATION 163 to 175 m. PROPOSED GRADE ELEVATION Elevated 0-10 m.
Elevated 10 m.

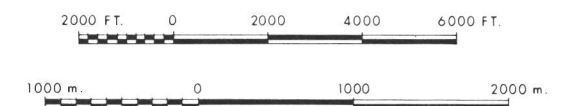
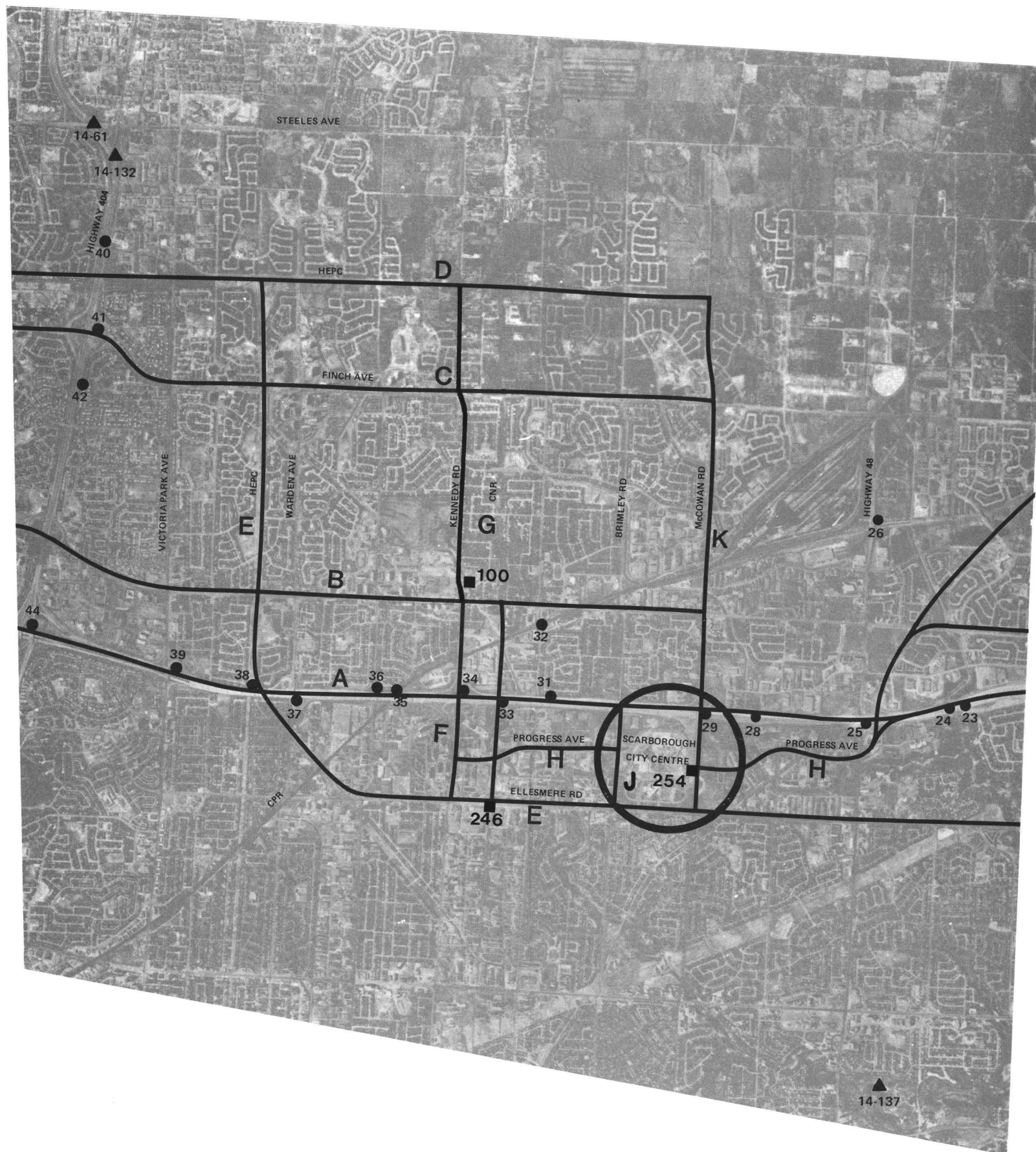
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #28 Elev. approx. 158 m. 0-2 m Organic Clay-Silt, Stiff to Very Soft 2-6 m Clayey Silt, Very Stiff to Hard -W.L. Free Artesian Water #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V. Soft to Soft 2-4 m Silty Sandy Clay (till), Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand, Loose to Dense 9.5-12.5 m Clayey Silty Sand (till), Very dense. 12.5-24 m Silty Sand, Very firm to firm. -W.L. not known	<u>ELEVATED</u> i) In areas of soft clays and silt, pile foundations will be required. ii) In other areas, spread footings could be utilized. iii) Footing excavations along this segment will probably not encounter groundwater, but shoring of excavations might still be required.	 i) Soils quite variable in this area. ii) Little information available on this segment.

FOUNDATION DATA SHEET

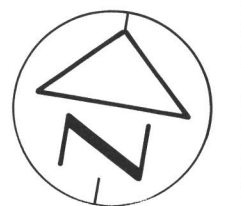
PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 6 ROUTE K LOCATION McCowan Rd. from Sheppard to Finch H.E.P.C.
 APPROX ORIGINAL GROUND ELEVATION 173 to 186 m. PROPOSED GRADE ELEVATION Elevated

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #26 Elev. approx. 166 m. 0-5 m Silty Sand, generally Dense 5-7 m Silt, Dense 7-17 m Dense -W.L. approx. elev. 164m. #29 Elev. approx. 161 m. 0-1 m Peat 1-2 m Silty Clay, V. Soft to Soft 2-4 m Silty Sandy Clay (till) Soft to Stiff 4-4.5 m Sand, Loose to Med. 4.5-9.5 m Gravelly Sand Loose to Dense 9.5-12.5 m Clayey Silty Sand (till) Very dense 12.5-24 m Silty Sand, Very firm to firm -W.L. not known — — — —	<u>ELEVATED</u> -majority of piers can be founded on spread footings within silty sand deposit. -near Sheppard Avenue, soft clays and loose sands may be present and pile foundations might be required. -Footing excavations within the silty sand deposit may require shoring and dewatering.	No available information along this route.



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 6
SCARBOROUGH West





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

SECTION 7
SCARBOROUGH East/PICKERING
ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

PURCHASE ORDER M00-24
GO-ALRT DIST 6

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DATE:

FOUNDATION REPORT
For
Preliminary Feasibility Study
of GO-ALRT Northern Section
Scarborough East/Pickering Section

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from Metro Roads Dept., Toronto. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the City of Scarborough, Ontario Hydro, CN/CP rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is roughly bounded by the following:

North	-	Steeles Avenue
South	-	Kingston Road
East	-	Liverpool Road
West	-	Markham Road

Soil conditions across the study area are quite variable and range from clay plains in the southern Pickering Section through sand plains followed by till plains as one moves to the northwest into Scarborough.

A number of rivers have eroded rather deep river valleys through the overburden, the most notable being the Rouge and Highland Creek.

Bedrock to the east is a grey and black shale of the Whitby Formation and to the west is a grey shale with limestone interbeds of the Georgian Bay Formation.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design office.

Other Considerations

Along the southern routes, rather long sections of cut and cover have been identified. Consideration should be given to long continuous tunnel sections utilizing a tunnel boring machine.

Although dewatering systems in the cohesionless soils located along some routes would be necessary for both methods, tunnelling may prove to be cost effective with the added benefit of minimizing disruption to existing conditions.

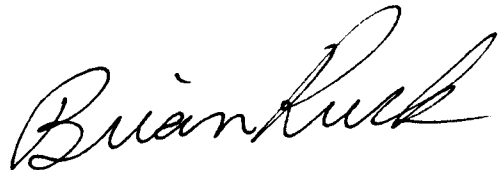
Preferred Route

From the soil mechanics viewpoint, routes 'F' and 'G' present the least foundation problems.

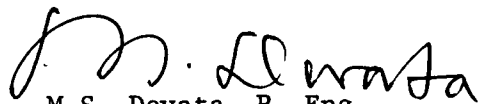
Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided.

This report was written by Mr. B. E. Ruck, Project Foundations Engineer and reviewed by Mr. M. S. Devata, Chief Foundations Engineer, East.



B.E. Ruck
Project Foundations Engineer



M.S. Devata, P. Eng.
Chief Foundations Engineer (East)

APPENDIX

REFERENCES - M.T.C.

PLAN NO.	GEOCRE NO.	LOCATION
9	30 M14-170	Hwy. 401 7km W. of Liverpool Rd.
10	" - 15	Hwy. 401 and Whites Rd.
12	" - 17	Hwy. 401 and Rouge River
14	" - 21	Hwy. 401 and Port Union Rd.
15	" - 23	Hwys. 2, 2A and 401
16	" - 25	Hwy. 401 and 2A
17	" - 26	Hwy. 401 and Meadowvale Rd.
18	" - 27	Hwy. 401 at Conlins Rd.
19	" - 28	Hwy. 401 at Morningside Avenue
23	" - 34	Hwy. 401 at Highland Cr.
24	" - 33	Hwy. 401 and Centennial College Road
25	" - 32	Hwy. 401 and Markham Rd.
26	" - 141	CPR and Hwy. 48
28	" - 35	Hwy. 401 and Highland Cr.

REFERENCES - METRO ROADS

PLAN NO.	METRO ROADS NO.	LOCATION
A	160 a-z	Along Kirkham's Rd. from Sheppard to Finch
B	121	Sheppard and Highland Cr.
C	116, 253	Highland Creek and Markham Rd.
BB	264	Highland Creek and Old Kingston Rd.
CC	238	Highland Creek and Kingston Rd.
DD	250	Steeles and Rouge River

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE AL LOCATION Ellesmere Avenue Sta 700000 to 701400

APPROX ORIGINAL GROUND ELEVATION 160 to 145 m PROPOSED GRADE ELEVATION 1) Elevated 0-10 m
2) Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #23 Elev. approx. 152 m 0-10 m Clayey Silt Fill 10-15 m Silt & Sand Silt Compact to V. Dense 15-20 m Clayey Silt (Hard) - W.L. at bottom of fill — — — — #24 Elev. approx. 146 m 0-3 m Organic Silt 3-5 m Silty Sand Dense to V Dense 5-18 m Clayey Silt, Hard 18-21 m Glacial Till, Hard - W.L. at ground surface — — — — #25 Elev. approx. 159 m 0-5 m Sandy Silt-Dense to V Dense 5-9 m Clayey Silt with Sand tr. Gravel, Hard. - W.L. about 1 m below surface	<u>ELEVATED</u> - could be founded on spread footings within sandy silt. - dewatering of footing excavations will likely be required. OR - end bearing piles driven to hard clayey silt layer. <u>CUT & COVER</u> - problems would be encountered with high water table within sandy silt layer. - probably need soldier pile and lagging in conjunction with major dewatering. <u>RET. CUTS</u> - retaining walls could be founded on spread footings within the cut.	1) Soils quite variable along route. 1i) No information directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE A2 LOCATION Ellesmere Avenue Sta 701400 To 702800

APPROX ORIGINAL GROUND ELEVATION 130 - 145 PROPOSED GRADE ELEVATION Elevated; Cut & Cover

Rolling Ret. Cuts

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> — — — — #19 Elev. approx. 143 m. 0-5 m Clay with Gravel V. Stiff 5-12 m Silty Sand, V. Dense - W.L. variable — — — — #21 Elev. approx. 163 m 0-10 m Clayey Silt Till, Firm to Hard - W.L. approx. elev. 161 m — — — — #23 Elev. approx. 152 m 0-10 m Clayey Silt Fill 10-15 m Silt & Sandy Silt Compact to V. Dense 15-20 m Clayey Silt, Hard -W.L. at bottom of fill	<u>ELEVATED SECTIONS</u> -probable pile foundation for Highland Creek -probable spread footings for elevated section east of Nielson Road <u>CUT & COVER</u> (at Nielson Rd) -probable soldier pile + lagging with minor dewatering system <u>RET. CUTS</u> -retaining walls probably founded on piles.	i) Soils variable across site. ii) No information directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE A3 LOCATION Ellesmere Road

APPROX ORIGINAL GROUND ELEVATION 115 to 135 PROPOSED GRADE ELEVATION Elevated; Cut & Cover
Rolling Ret. Cuts

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #18 Elev. approx. 134 m 0-15 m Sand to Silty Sand, Very Loose to Very Dense -W.L. approx. 1 m below ground surface — — — — #19 Elev. approx. 143 m 0-5 m Clay with Gravel V. Stiff 5-12 m Silty Sand, V. Dense - W.L. variable	<u>ELEVATED SECTION WEST OF MILITARY TRAIL</u> -probable pile foundations <u>ELEVATED SECTION EAST OF MILITARY TRAIL</u> -probable spread footings <u>CUT & COVER</u> -probable soldier pile & lagging with major dewatering <u>RET. CUTS</u> -probable spread footings for retaining walls	 1) Soils variable. ii) No information directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE A4 LOCATION Ellesmere Road Sta 704200 to 705600
 APPROX ORIGINAL GROUND ELEVATION 118 to 128 PROPOSED GRADE ELEVATION Elevated 0-10
Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #17 Elev. approx. 122 m 0-6 m Clay Till-Stiff 6-12 m Sand + Gravel V. Dense -W.L. at ground surface — — — — #18 Elev. approx. 134 m 0-15 m Sand to Silty Sand, Very Loose to Very Dense -W.L. approx. 1 m below ground surface — — — —	<u>ELEVATED</u> -probable spread footings. <u>CUT & COVER</u> -probable soldier pile + lagging and major dewatering in sand deposits with minor dewatering in till deposits.	1) No information directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE A5 LOCATION Ellesmere Road Sta 705600 to 707000
 APPROX ORIGINAL GROUND ELEVATION Approx. 120 m PROPOSED GRADE ELEVATION Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #15 Elev. approx. 115 m. 0-12 m Glacial Till V. Dense - Hard -W.L. approx. elev. 113 m. ----- #16 Elev. approx. 115 m. 0-8 m Sandy Clay Fill V. Dense 8-14 m Clay Till V. Dense -W.L. approx. elev. 114 m. ----- #17 Elev. approx. 122 m. 0-6 m Clay Till 6-12 m Sand + Gravel V. Dense -W.L. at ground surface	<u>CUT & COVER</u> -minor dewatering with soldier. pile + lagging OR, -temporary cut slopes of 1:1 should be stable.	i) No information available directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE D1 LOCATION Hwy. 401 Sta 700000 to 701400

APPROX ORIGINAL GROUND ELEVATION 155 to 163 m PROPOSED GRADE ELEVATION Elevated 0-10 m
Ret. Cuts.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #23 Elev. approx. 152 m. 0-10 m Clayey Silt Fill 10-15 m Silty Sand Compact to V. Dense 15-20 m Clayey Silt-Hard -W.L. at bottom of fill. #24 Elev. approx. 146 m.. 0-3 m Organic Silt 3-5 m Silty Sand Dense to V. Dense 5-18 m Clayey Silt, Hard 18-21 m Glacial Till, Hard -W.L. at ground surface #25 Elev. approx. 159 m. 0-5 m Sandy Silt, Dense to V. Dense 5-9 m Clayey Silt with sand tr. Gravel Hard -W.L. approx. 1 m below surface	<u>ELEVATED 0-10 m.</u> - could be founded on spread footings within sandy silt or on end bearing piles driven to hard clayey silt layer. <u>RET. CUTS</u> -soldier pile + lagging with major dewatering within sandy silt layer -retaining walls on spread footings	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE D2 LOCATION Hwy. 401 Sta 701400 to 702800
 APPROX ORIGINAL GROUND ELEVATION 160 to 166 PROPOSED GRADE ELEVATION Cut, Tunnel, Ret. Cut

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #21 Elev. approx. 163 m. 0-10 m Clayey Silt Till, Firm to Hard -W.L. approx. elev. 161 m.	-no major problems are anticipated. -temporary cut slopes should be stable at 1:1 -ideal soil conditons for tunnelling operations	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE D3 LOCATION Hwy. 401 Sta 702800 to 704200

APPROX ORIGINAL GROUND ELEVATION 135 to 160 PROPOSED GRADE ELEVATION Ret. Cut; Cut; Cut & Cover tunnel
Variable

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #18 Elev. approx. 134 m. 0-15 m Sand to Silty Sand V. Loose to V. Dense. -W.L. approx. 1 m below ground surface — — — — #19 Elev. approx. 134 m. 0-5 m Clay with Gravel V. Stiff 5-12 m Silty Sand - V. Dense -W.L. variable	<u>ELEVATED</u> -probable water problems requiring major dewatering of sand deposits. - stability of Ret. Cuts could be adversely affected by high water levels in sand. <u>EAST OF Sta 703500</u> -sand deposits require major dewatering. <u>TUNNEL</u> -special techniques such as compressed air methods or extensive dewatering may be required west of Sta 703500 -no problems anticipated for the tunnel east of Sta 703500	i) Dewatering may depress W.L. in nearby areas, consequently settlements of nearby properties can be anticipated.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 7 _____ ROUTE D4 _____ LOCATION Hwy. 401 Sta 704200 to 705600 _____
 APPROX ORIGINAL GROUND ELEVATION 124-133 m _____ PROPOSED GRADE ELEVATION On grade: elevated 0-10 m _____
 Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #17 Elev approx. 122 m. 0-6 m Clay Till 6-12 m Sand + Gravel V. Dense W.L. at ground surface — — — — #18 Elev. approx. 134 m. 0-15 m Sand to Silty Sand V. Loose to V. Dense W.L. approx. 1 m below ground surface	<u>ELEVATED 0-10 m</u> -probable spread footings within clay till deposit -water in footing excavation probably handled by pumping from sumps <u>CUT & COVER</u> -major dewatering problems if excavation extends into sand and gravel deposit - possible aquifer of unknown lateral extent.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE D5 + D6 LOCATION Hwy. 401 Sta 705600 to 707300
 APPROX ORIGINAL GROUND ELEVATION 110-125 m PROPOSED GRADE ELEVATION Tunnel; on grade; cut & cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #16 Elev. approx. 115 m. 0-8 m Sandy Clay Till V. Dense 8-14 m Clay Till V. Dense W.L. approx. elev. 114 m — — — — — #17 Elev. approx. 122 m. 0-6 m Clay Till 6-12 m Sand + Gravel V. Dense W.L. at ground surface — — — — —	<u>WEST OF MEADOWVALE ROAD</u> ELEVATED -probable spread footings within clay till TUNNEL -special techniques such as compressed air methods or extensive dewatering may be required. CUT -major dewatering if cuts extend into sand + gravel (possible aquifer) <u>EAST OF MEADOWVALE</u> <u>CUT & COVER</u> - no major problem anticipated in dense clay till - temporary slopes of 1:1 should be stable up to 7 m and beyond 7 m 2:1 slopes will be necessary to ensure overall stability. <u>TUNNEL</u> - soil conditions favourable for machine boring	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE E5, E6 LOCATION Sheppard Avenue - Sta 705600 to 708400
 APPROX ORIGINAL GROUND ELEVATION 117-127 m PROPOSED GRADE ELEVATION Elevated 0-10 m
Cut & Cover, Tunnel

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #14 Elev. approx. 113 m. 0-17 m Clayey silt Till, Hard 17-32 m Clayey Silt to Silt, Hard -W.L. at surface ----- #15 Elev. approx. 115 m. 0-12 m Glacial Till, V. Dense-Hard -W.L. approx. elev. 113 m. ----- #16 Elev. approx. 115 m. 0-8 m Sandy Clay Till V. Dense 8-14 m Clay Till, V. Dense -W.L. approx. elev. 114 m. ----- #17 Elev. approx. 122 m. 0-6 m Clay Till 6-12 m Sand + Gravel V. Dense -W.L. at ground Surface	<u>ELEVATED</u> -probable spread footings founded within Glacial Till. -water in footing excavations probably handled by pumping from corner sump. <u>CUT + COVER</u> -west end of route E5 probably located in sand + gravel thus major dewatering scheme required along with soldier pile + lagging system. -elsewhere; no major problems are anticipated within cohesive till. <u>TUNNEL</u> -no major problems anticipated in cohesive till. -conditions favourable for machine boring.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 7 _____ ROUTE G9-G12 _____ LOCATION Northern Route Sta 711200 to 716800 _____
 APPROX ORIGINAL GROUND ELEVATION _____ 116 to 128 m _____ PROPOSED GRADE ELEVATION _____ See Remarks #2 _____
 128 to 140 m _____
 102 to 116 m _____
 116 to 90 m _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>#9 Elev. approx. 84 m. 0-6 m Silty Clay, V. Stiff 6-8 m Silty Fine Sand Dense to V. Dense</p> <p>8 m Shale -W.L. approx. elev 80 m.</p> <p>— — — —</p> <p>#10 Elev. approx. 104 m. 0-6 m Silty Clay Till, V. Stiff to Hard.</p> <p>6-9 m Gravelly Sand Till</p> <p>-W.L. approx. elev. 103 m.</p>	<p><u>ELEVATED</u></p> <p>-probable pile foundations with pile lengths approx. 6-8 m.</p> <p>-spread footings possible in some areas with dewatering not a major problem.</p> <p><u>FILL</u></p> <p>-no problems anticipated with 2:1 slopes</p> <p><u>RET. FILL</u></p> <p>-retaining walls could probably be founded on spread footings within silty clay.</p>	<p>1) Little information available on this route.</p> <p>2) Elevations</p> <p><u>G9</u> - Fill - Elevated</p> <p><u>G10</u> - Elevated</p> <p><u>G11</u> - Elevated</p> <p><u>G12</u> - Elevated - Ret. Fill</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

GC1-GC2

PURCHASE ORDER No. Section 7 ROUTE F6 LOCATION Malvern - CNR Sta 700000 to 708400
 APPROX ORIGINAL GROUND ELEVATION 135 to 152 PROPOSED GRADE ELEVATION See Remarks 2
128 to 139
120 to 130

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #A (at Sheppard) Elev. approx, 128 m. 0-5 m Fine Sand + Silt, V. Loose to V. Dense -W.L. approx. elev.127 m. #A (at Finch) Elev. approx. 143 m. 0-6 m Clayey Silt Firm to V. Stiff 6-8 m Fine Sand, Compact to Dense -W.L. approx. elev. 141 m.	<u>ELEVATED</u> -probable short pile foundations <u>CUT WITH SIDE SLOPES AND ON GRADE FILL</u> -no problems anticipated with 2:1 slopes	1) No information available directly on route. 2) <u>Elevations</u> <u>GC1</u> -Elevated -Cut with slopes -On Grade <u>GC2</u> - On Grade/Fill <u>F6</u> -On Grade/Fill

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE F7-F10 LOCATION Malvern - CNR Sta 708400 to 714000
 APPROX ORIGINAL GROUND ELEVATION 110 to 125 m PROPOSED GRADE ELEVATION See Remarks (2)
105 to 120 m
88 to 105 m
85 to 90 m

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #7 Elev. approx. 91 m. 0-15 m Clayey Silt to Sandy Silt Till Stiff to Hard -W.L. approx. elev. 85 m. #9 Elev. approx. 84 m. 0-6 m Silty Clay, V. Stiff 6-8 m Silty Fine Sand, Dense to V. Dense 8 m Shale -W.L. approx. elev. 80 m. #10 Elev. approx. 104 m. 0-6 m Silty Clay Till, V. Stiff to Hard 6-9 m Gravelly Sand Till -W.L. approx. elev. 103 m. #12 Elev. approx. 92 m. 0-17 m Fill 17-31 m Silty Sand to Sandy Silt, Compact to Dense 31-34 m Glacial Till, Very Dense 34 m Shale	<u>ELEVATED</u> -probable short pile foundations at eastern end with longer pile foundations to west. <u>RET. FILLS/CUTS</u> -no problems anticipated with slopes of 2:1 -retaining walls could be founded on spread footings within nature material	1) Little information available directly on route. 2) <u>Elevations</u> <u>F7</u> - On Grade/Fill/Cut - Elevated - Ret. Fill <u>F8</u> - Ret. Fill/Cut - On Grade <u>F9</u> - On Grade/Ret. Cut/Fill - Elevated <u>F10</u> - Elevated - Ret. Fill - On Grade

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE E2-E4 LOCATION Sheppard Avenue Sta 701400 to 705600
 APPROX ORIGINAL GROUND ELEVATION 130-160 m PROPOSED GRADE ELEVATION Elevated 0-10 m
Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #18 Elev. approx. 134 m. 0-15 m Sand to Silty Sand V. Loose to V. Dense -W.L. approx. 1 m below ground <hr/> #19 Elev. approx. 143 m. 0-5 m Clay with Gravel, V. Stiff 5-12 m Silty Sand, V. Dense -W.L. variable <hr/> #21 Elev. approx. 163 0-10 m Clayey Silt Till, Firm to Hard -W.L. approx. elev. 161 m. <hr/> #17 Elev. approx. 122 m. 0-6 m Clay Till-Stiff 6-12 m Sand + Gravel, V. Dense -W.L. at ground surface	<u>ELEVATED</u> -probably spread footings founded in clay till however, some areas of loose sand may require short piles. <u>CUT & COVER</u> -no problems anticipated along route E2 however, routes E3 and E4 will probably require major dewatering of sand deposits.	1) No information directly on route.

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE G1 LOCATION Northern Sta 700000 to 701400

APPROX ORIGINAL GROUND ELEVATION 143 to 165 m PROPOSED GRADE ELEVATION Elevated over 10 m
Elevated under 10 m

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
References: #23 Elev. approx. 152 m. 0-10 m Clayey Silt Fill 10-15 m Silt + Sand Silt Compact to V. Dense 15-20 m Clayey Silt-Hard -W.L. at bottom of fill.	<u>ELEVATED 0-10 m.</u> -could be founded on spread footings within sandy silt or on end bearing piles driven to hard clayey silt layer.	
#24 Elev. approx. 146 m. 0-3 m Organic Silt 3-5 m Silty Sand Dense to V. Dense 5-18 m Clayey Silt, Hard 18-21 m Glacial Till, Hard -W.L. at ground surface	<u>RET. CUTS</u> -soldier pile + lagging with major dewatering within sandy silt layer. -retaining walls on spread footings.	
#25 Elev. approx. 159 m. 0-5 m Sandy Silt, Dense to V. Dense 5-9 m Clayey Silt with Sand tr. Gravel Hard -W.L. approx. 1 m below surface		
# C Elev. approx. 148 m. 0-3 m Fill 3-9 m Silty Sand, Very Dense 9 m Silt trace, Sand, Clay, very Dense -W.L. approx. elev. 145 m.		

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE B1/B2 LOCATION Highland Creek 700000 to 701400
APPROX ORIGINAL GROUND ELEVATION 95-130 PROPOSED GRADE ELEVATION Elevated over 10 m
Variable

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>-Chapman + Putnam Map 2226. Pysiography of the South Central Portion of Southern Ontario.</p> <p>-probable sand plains</p> <p>-W.L. probably near elevation of Highland Creek</p>	<p><u>ELEVATED</u></p> <p>-elevated sections over 10 m probably require pile foundations.</p> <p>-if fills are anticipated, in some areas they will be in excess of 35 m high-stabilty of fill material itself could be a problem ie. berms or multiple berms required.</p> <p><u>RET. CUTS</u></p> <p>-probable spread footings for retaining walls.</p>	<p>i) No available information along route.</p>

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FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE 62 LOCATION Northern Sta 701400 to 702800

APPROX ORIGINAL GROUND ELEVATION 155 to 165 m. ----- PROPOSED GRADE ELEVATION Elevated over 10 m. -----
Elevated under 10 m.

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>References:</u></p> <p>— — — —</p> <p>#26 Elev. approx. 166 m.</p> <p>0-14 m Fine Sand, Dense</p> <p>-W.L. approx. elev. 164 m.</p> <p>#B Elev. approx. 158 m.</p> <p>0-1 m Fill</p> <p>1-7 m Sandy Silt Till, Dense to V. Dense</p> <p>7-10 m Sand, Very Dense</p> <p>-W.L. approx elev. 155m.</p>	<p><u>ELEVATED</u></p> <p>-probable spread footings founded in dense sand or sandy silt till.</p> <p>-footing excavations within dense sand will probably require shoring and possibly dewatering.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE G3 to G5 LOCATION Northern Sta 702800 to 707000
 APPROX ORIGINAL GROUND ELEVATION 163 to 167 PROPOSED GRADE ELEVATION See Remarks
164 to 135 140 to 153

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #26 Elev. approx. 166 m. 0-14 m Fine Sand Dense -W.L. approx. elev. 164m. ----- #DD Elev. approx. 149 m. 0-6 m Sandy Silt, V. Dense 6-14 m Sand Silt Till, Very Dense -W.L. approx. elev. 147 m. ----- #A (at Finch) Elev. approx. 143 m. 0-6 m Clayey Silt, Firm to V. Stiff 6-8 m Fine Sand, Compact to Dense -W.L. approx. elev. 141 m.	<u>ELEVATED</u> (G3) -probable spread footings with shoring and dewatering or short piles. (G4-G5)-possible spread footings but more likely short piles driven to sandy silt till. ----- <u>RET. CUTS</u> -permanent dewatering system probably required. -retaining walls could be founded on spread footings ----- <u>ON GRADE/FILL</u> -no stabilitiy problems anticipated with 2:1 slopes.	G3 -Elevated 0-10 m -Ret. Cuts G4 -On grade/fill -Elevated over 10 m G5 -Elevated -On grade/fill

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 7 ROUTE G6-G8 LOCATION Northern Route Sta 707000 to 711200
 APPROX ORIGINAL GROUND ELEVATION 130 to 150 m PROPOSED GRADE ELEVATION 140 to 148 m
140 to 144 m See Remarks 2

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #A (at Finch) Elev. approx. 143 m. 0-6 m Clayey Silt, Firm to V. Stiff 6-8 m Fine Sand, Compact to Dense -W.L. approx. elev. 141 m.	<u>ELEVATED</u> -either spread footings with dewatering and shoring of excavations or short pile foundations depending on soil conditions at specific sites. <u>ON GRADE/FILL</u> -no problems anticipated with 2:1 slopes <u>ON GRADE/CUT</u> -probably require permanent dewatering system	1) No information available along this route. 2) Elevations G6 - Elevated - On Grade/Fill - On Grade/Cut G7 - On Grade - Elevated under 10 m - On Grade/Fill G8 - On Grade/Fill - Elevated - Fill

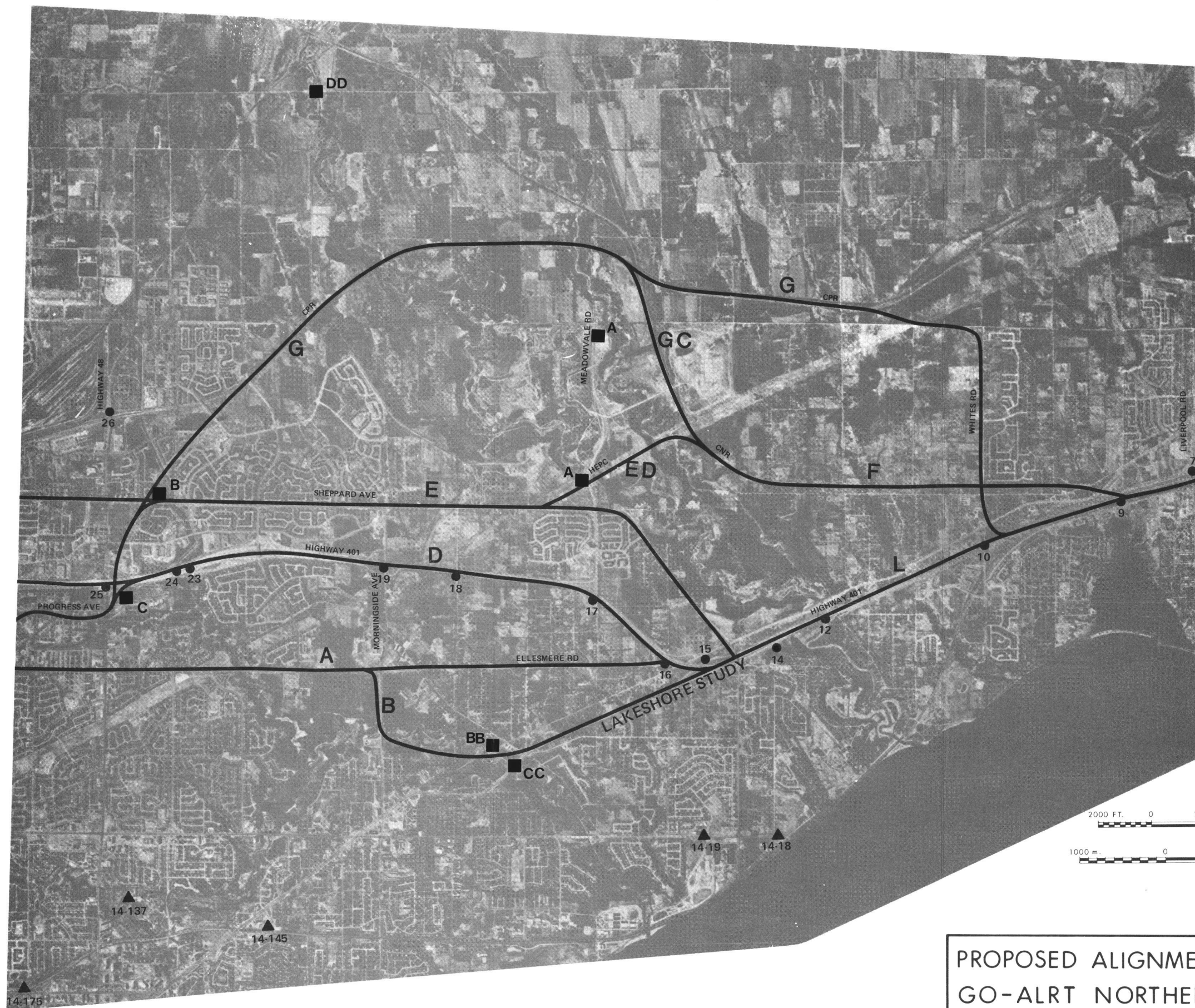
FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

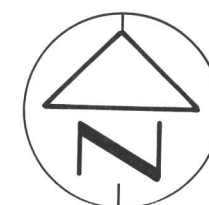
PURCHASE ORDER No. _____ Section 7 _____ ROUTE E1 _____ LOCATION Sheppard Avenue 700000 to 701400 _____

APPROX ORIGINAL GROUND ELEVATION 160-164 m _____ PROPOSED GRADE ELEVATION Elevated 0-10 m _____
Cut & Cover

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References;</u> #23 Elev. approx. 152 m. 0-10 m Clayey Silt Fill 10-15 m Silt & Sand Silt Compact to Dense 15-20 m Clayey Silt (Hard) -W.L. at bottom of fill. #24 Elev. approx. 146 m. 0-3 m Organic Silt 3-5 m Silty Sand Dense to V Dense 5-18 m Clayey Silt, Hard 18-21 m Glacial Till, Hard -W.L. at ground surface #25 Elev. approx. 159 m. 0-5 m Sandy Silt-Dense to V. Dense 5-9 m Clayey Silt with Sand, Gravel, Hard. -W.L. about 1 m below surface #26 Elev. approx. 166 m. 0-14 m Fine Sand Dense -W.L. approx. elev. 164 m.	<u>ELEVATED</u> -probable spread footings founded in Dense sand. -footing excavations will probably require shoring and dewatering. <u>CUT & COVER</u> -soldier pile + lagging with major dewatering scheme.	 i) No available information directly on route.



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 7
SCARBOROUGH East/PICKERING





NORTHERN SECTION



Ontario

Ministry of
Transportation and
Communications

SECTION 8
MISSISSAUGA / BRAMPTON
ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

PURCHASE ORDER M00-24
GO-ALRT DIST 6

DISTRIBUTION

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DATE:

FOUNDATION REPORT
For
Preliminary Feasibility Study
of GO-ALRT Northern Section
MISSISSAUGA / BRAMPTON

INTRODUCTION

The Foundation Design Section was requested by GO-ALRT to provide preliminary foundation recommendations for the proposed Northern Route based on existing data sources. For this report, the Ministry's Geocres system was utilized and additional data was obtained from the City of Brampton, Public Works and the City of Mississauga, Public Works. Along some routes little or no information was available from the noted sources, and the recommendations given are based on extrapolations of soils data from adjacent sites. Additional soils data may be available from the Regional Municipality of Peel, Ontario Hydro, CN rail etc., but these agencies were not contacted because of the urgency of the project.

DESCRIPTION OF THE AREA AND GEOLOGY

The area under study is bounded by the following:

North	-	Queen Street/Hwy. 7
South	-	Burnhamthorpe Road
East	-	Dixie Road
West	-	Hwy. 10

Soil conditions are quite constant across the site consisting of a heterogeneous mixture of clay, silt, sand and gravel till to a silty clay.

Pockets of silty sand are distributed throughout the area. The water table in the area is high.

The creeks which drain the area tend to be rather small with fairly shallow valleys.

Bedrock is generally a grey shale with limestone interbeds, of the Georgian Bay Formation changing to red shale of the Queenstone Formation around Brampton.

DISCUSSION AND RECOMMENDATIONS

General

A number of routes have been proposed for this section and are shown on the plan located in the Appendix.

Our comments and recommendations for each route are given on the Foundation Data Sheets included in the Appendix. An explanation of information supplied on the data sheets is outlined below.

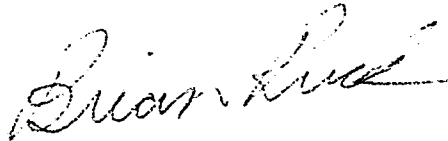
1. The numbering system used for the references was developed for the purposes of the feasibility study only. The actual Geocres numbers of each site are given in the Appendix.
2. The original ground elevations given, represent the highest and lowest profile elevations and do not necessarily reflect the actual nature of the topography.
3. The references have been summarized for the purposes of this report and the complete file of each location can be found in the Foundation Design office.
4. The lettering system used to identify the various routes has been developed for the purpose of this report only, and differs from that used by the planning consultant.

Preferred Route

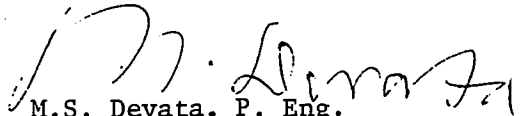
From the soil mechanics viewpoint, no one route in this section is more advantageous than another

Miscellaneous

Once a final alignment has been determined, a detailed foundation investigation will be required so that site specific recommendations can be provided. This report was written by Mr. J.S. Alter, Student Engineer, and reviewed by Mr. B.E. Ruck and Mr. M.S. Devata.



B.E. Ruck
Project Foundations Engineer



M.S. Devata, P. Eng.
Chief Foundation Engineer, East

APPENDIX

REFERENCES - M.T.C

Plan No.	Geocres No.	Location
127	30M12-22	Hwy. 401 & Dixie Road
128	80	Bramalea Creek and Parking Lot Road
129	21	Hwy. 10 & Etobicoke Creek
131	117	Hwy.410 & Etobicoke Creek
132	122	Hwy.410 Culverts
133	135	Industrial Access Road & Hwy.410
134	26	Hwy.410 & Hwy.401
136	66	Hwy.410 & Hwy.401
137	183	Hwy.10 & Hwy.410
139	150	Hwy.403 at Matheson Blvd.
140	113	Little Etobicoke Ck.Culvert
141	87	Bridge 37, Hwy.410 & Eglinton Avenue
142	75	Bridge 38, Hwy. 403 & Hwy. 410
145	83	Hwy.403 Ext.& Heart Lake Rd.

REFERENCES - CITY OF MISSISSAUGA PUBLIC WORKS

Plan No.	Public Works No.	Location
A	Z42 PN73-146	Courtney Park Dr. & Dixie Road
B	Z36 T-77039	Hwy. 10 & Matheson Blvd.
D	Z35 PN73-051	Eglinton Ave. & Dixie Rd.
I	Z29 PN83-211	Eglinton Ave. & Hwy. 10
J	Z28 PN77-086	Burnhamthorpe Rd. & Cawthra Road
L	Z26 PN73-155	Burnhamthorpe Rd. & Rockwood Road

REFERENCES - CITY OF BRAMPTON PUBLIC WORKS

Plan No.	Public Works No.	Location
AA	F-4 S-6	George St. Parking
BB	G-3 S-6	Main Street
CC	G-4 S-4	Kennedy Rd. Subway CNR
DD	G-5 S-3	Whitehorse Lands Hwy.10 Steeles Avenue
EE	H-4 S-4	Queen St. E of Kennedy St.
FF	I-4 S-1	Brampton Transit
GG	I-4 S-2	Glidden Rd.-CNR overpass

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE A LOCATION Proposed Hwy. 407 from Hwy. 10 to Dixie Road
APPROX ORIGINAL GROUND ELEVATION 184 to 208 m PROPOSED GRADE ELEVATION Elevated
Cut & Cover, Tunnel

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>Reference:</u></p> <p>#131 Elev. approx. 197 m. 0-1 m Silty Sand Loose 1-7 m Het. mixture of Clay, Silt, Sand and Gravel, V. Stiff 7 m Shale Bedrock -W.L. approx. elev. 195 m.</p> <hr/>	<p><u>ELEVATED</u> (Hwy. 10 to Kennedy Rd.) -probable spread footings</p> <p><u>CUT & COVER</u> -minor dewatering with soldier pile and lagging. or -temporary slopes of 1:1 should be stable.</p> <p><u>TUNNEL</u> -shale bedrock favourable for boring machine.</p>	<p>No information directly on route.</p>

-1-

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE B LOCATION Derry Road from Hwy. 10 to Dixie Road
 APPROX ORIGINAL GROUND ELEVATION 176 m - 204 m PROPOSED GRADE ELEVATION Elevated, Cut & Cover,
Tunnel

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>Reference:</u> #132 Elev. approx. 192 m 0-10 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff -W.L. approx. elev. 191 m. <hr/>	<u>ELEVATED</u> -probable spread footings. <u>CUT & COVER</u> -minor dewatering with soldier pile and lagging. or -temporary slopes of 1:1 should be stable. <u>TUNNEL</u> -soil conditions favourable for boring machine.	No information directly on route.

-2-

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE C LOCATION Dixie Road - Burnhamthorpe Road to Hwy. 401
 APPROX ORIGINAL GROUND ELEVATION 144-162 m PROPOSED GRADE ELEVATION Elevated Tunnel

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#127 Elev. approx. 161 m. 0-11 m Silty Clay, Sand Till, Hard 11 m Shale Bedrock -W.L. approx. elev. 160 m.</p> <hr/> <p>D Elev. approx. 163 m. 0-3 m Silty Clay, V. Stiff to Hard 3 m Shale Bedrock -W.L. approx. elev. 162 m.</p> <hr/> <p>L Elev. approx. 148 m. 0-5 m Silt and Sand Till Hard -W.L. approx. elev. 147 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-probable spread footing.</p> <p><u>TUNNEL</u></p> <p>-shale bedrock and soil provides favourable conditions for boring machine.</p>	<p>Little available information directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE C _____ LOCATION Dixie Road - Hwy. 401 to Proposed Hwy. 407 _____

APPROX ORIGINAL GROUND ELEVATION 162 - 186 m _____ PROPOSED GRADE ELEVATION See Remarks (2) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #127 Elev. approx. 161 m. 0-11 m Silty Clay, Sand Till, Hard 11 m Shale Bedrock -W.L. approx. elev. 160 m. <hr/> A Elev. approx. 172 m. 0-5 m Silty Clay Till, V. Stiff 5 m Shale Bedrock -W.L. approx. elev. 168 m. <hr/>	<u>ELEVATED (except airport runway approach area)</u> - probable spread footings <u>FILL/FILL WITH RET. WALL</u> - retaining walls could be supported on spread footings within native soils - slopes of 2:1 should be stable <u>CUT & COVER</u> - minor dewatering with soldier pile and lagging - temporary slopes of 1:1 should be stable <u>TUNNEL</u> - soil and shale bedrock provides favourable conditions for boring machine	1) Little available information directly on route. 2) <u>ELEVATIONS</u> ELEVATED FILL/FILL WITH RET. WALL CUT AND COVER TUNNEL

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE C LOCATION Dixie Road-Proposed Hwy. 407 to Queen St./Hwy. 7
 APPROX ORIGINAL GROUND ELEVATION 186 - 216 m PROPOSED GRADE ELEVATION See Remarks (2)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>References:</u> #128 Elev. approx. 186 m. 0-2 m Silty Clay, Stiff to V.Stiff 2 m Dolomite Bedrock -W.L. approx. elev. 185 m. <hr/> FF Elev. approx. 203 m. 0-0.5 m Clayey Silt, Stiff 0.5-1.5 m Sand Silt, Loose to Dense 1.5-5 m Sand, Dense -W.L. approx. elev. 200 m. <hr/> GG Elev. approx. 206 m. 0-4 m Clayey Silt Till, Hard 4 m Limestone Bedrock -W.L. approx. elev. 203 m. <hr/>	<u>ELEVATED</u> -probable spread footings <u>CUT -RET. WALLS</u> -retaining walls supported on spread footings within native soils. -in sandy soils may need dewatering. <u>CUT AND COVER</u> -probable soldier pile and lagging in conjunction with dewatering in sandy soils. -temporary slopes of 1:1 should be stable in other areas. <u>TUNNEL</u> -soil and bedrock provides favourable conditions for boring machine. -special techniques such as compressed air may be required in sandy soils.	1) No information directly on route. 2) <u>ELEVATIONS</u> ELEVATED CUT - RET. WALLS CUT & COVER TUNNEL

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE D _____ LOCATION Cawthra Rd./Hwy. 403 - Burnhamthorpe Road to Eglinton Ave.
 APPROX ORIGINAL GROUND ELEVATION 144 to 158 m _____ PROPOSED GRADE ELEVATION See Remarks _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#141 Elev. approx. 161 m. 0-11 m Het. mixture of Clay, Silt, Sand & Gravel, Hard 11 m Shale Bedrock -W.L. at surface 161 m.</p> <hr/> <p>#142 Elev. approx. 151 m. 0-9 m Het. mixture of Clay, Silt, Sand & Gravel, Stiff to Hard 9-20 m Silty Sand, V. Dense -W.L. at Surface -151 m.</p> <hr/> <p>J Elev. approx. 144 m. 0-2 m Silt Till, V. Stiff to Hard 2 m Shale Bedrock -W.L. approx. elev. 140 m.</p> <hr/>	<p><u>ELEVATED</u></p> <ul style="list-style-type: none"> -Majority of piers could be founded on spread footings within native material. -in areas of silty sand, footing excavations may require shoring and dewatering. <p><u>CUT-- RET. WALLS</u></p> <ul style="list-style-type: none"> -retaining walls supported on spread footings within native soils. -in silty sand may need dewatering. <p><u>CUT AND COVER</u></p> <ul style="list-style-type: none"> -probable soldier pile and lagging in conjunction with dewatering in sandy soils. -temporary slopes of 1:1 should be stable in other areas. <p><u>TUNNEL</u></p> <ul style="list-style-type: none"> -soil and bedrock provides favourable conditions for boring machine. - special techniques such as compressed air may be required in sandy soils. 	<p><u>ELEVATIONS</u></p> <p>ELEVATED CUT - RETAINING WALLS CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE D _____ LOCATION Hwy. 403 - Eglinton Avenue to Hwy. 401 _____
 APPROX ORIGINAL GROUND ELEVATION 158 - 182 m _____ PROPOSED GRADE ELEVATION See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES</u> #136 Elev. approx. 181 m. 0-2 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff to Hard 2 m Shale Bedrock -W.L. approx. elev. 180 m. <hr/> #139 Elev. approx. 166 m. 0-1 m Topsoil 1 m Shale Bedrock -W.L. not established <hr/> #140 Elev. approx. 152 m. 0-3 m Het. mixture of Clay, Silt, Sand & Gravel, V. Stiff to Hard 3-5 m Silty Sand, V. Dense -W.L. approx. elev. 151 m. <hr/>	<u>ELEVATED</u> Piers could be founded on spread footings within native material. <u>FILL RET. WALLS</u> -Retaining walls supported on spread footings within native soils. <u>CUT - RET. WALLS</u> -Retaining walls supported on spread footings within native soils. -dewatering in sandy soils. <u>CUT AND COVER</u> -temporary slopes of 1:1 should be stable. -soldier pile and lagging in conjunction with dewatering in sandy soils. <u>TUNNEL</u> -soil and bedrock provides favourable conditions for boring machine.	1) <u>ELEVATIONS</u> ELEVATED FILL RETAINING WALLS CUT RETAINING WALLS CUT AND COVER TUNNEL
	<u>REFERENCE CONTINUED</u> #141 Elev. approx. 161 m. 0-11 m Het. mixture of Clay, Silt, Sand & Gravel, Hard -11 m Shale Bedrock -W.L. at Surface - 161 m. <hr/>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE D _____ LOCATION Hwy. 410 - Hwy. 401 to Proposed Hwy. 407 _____
 APPROX ORIGINAL GROUND ELEVATION 182 - 195 m _____ PROPOSED GRADE ELEVATION CUT & COVER & TUNNEL _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES</u> #132 Elev. approx. 192 m. 0-10 m Het. mixture of Clay, Silt, Sand & Gravel, Stiff to Hard -W.L. approx. elev. 191 m. <hr/> #133 Elev. approx. 186 m. 0-14 m Het. mixture of Clay, Silt, Sand & Gravel, Stiff to Hard 14 m Bedrock -W.L. approx. elev. 183 m. <hr/> #134 Elev. approx. 184 m. 0-4 m Het. mixture of Clay, Silt, Sand & Gravel, Stiff to Hard 4 m Shale and Limestone Bedrock -W.L. approx. elev. 182 m. <hr/>	<u>CUT & COVER</u> -Temporary Slopes of 1:1 should be stable with minor dewatering. <u>TUNNEL</u> -soil and bedrock provides favourable conditions for boring machine.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE D LOCATION Hwy. 410 - Proposed Hwy. 407 to Queen Street
 APPROX ORIGINAL GROUND ELEVATION 182 - 222 m PROPOSED GRADE ELEVATION CUT AND COVER & TUNNEL

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#131 Elev. approx. 197 m. 0-1 m Silty Sand Loose 1-7 m Het. mixture of Clay, Silt, Sand and Gravel, V. Stiff</p> <p>7 m Shale Bedrock -W.L. approx. elev. 195 m</p> <hr/> <p>GG Elev. approx. 206 m 0-4 m Clayey Silt Till, Hard</p> <p>4 m Limestone Bedrock -W.L. approx. elev. 203 m.</p> <hr/>	<p><u>CUT AND COVER</u></p> <p>-Temporary slopes of 1:1 should be stable with minor dewatering.</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for boring machine.</p>	<p>Little available information directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE E LOCATION Hwy. 10 - Eglinton Avenue to Proposed Hwy. 407
 APPROX ORIGINAL GROUND ELEVATION 168-207 m PROPOSED GRADE ELEVATION See Remarks (1)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#137 Elev. approx. 200 m. 0-8 m Silty Clay Fill, Firm to V. Stiff 8-10 m Silty Clay Till, Hard 10 m Shale Bedrock -W.L. approx. elev. 191 m.</p> <hr/> <p>B Elev. approx. 185 m. 0-1 m Topsoil 1-7 m Silty Sand, Compact to V. Dense -W.L. approx. elev. 181 m.</p> <hr/> <p>I Elev. approx. 164 m. 0-3 m Silty Clay Till, Stiff to Hard 3 m Shale Bedrock -W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-Piers could be founded on spread footings within native material</p> <p><u>CUT - RET. WALLS</u></p> <p>-retaining walls supported on spread footings within native soils -dewatering in sandy soils</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 or steeper in bedrock areas should be stable -soldier pile and lagging in conjunction with dewatering in sandy soils.</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for boring machine -special techniques such as compressed air may be required in areas of silty sand.</p>	<p>1) <u>ELEVATIONS</u></p> <p>ELEVATED CUT - RET. WALLS CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE _____ E _____ LOCATION Hwy. 10 - Proposed Hwy. 407 to Queen Street _____
 APPROX ORIGINAL GROUND ELEVATION _____ 207 - 218 m. _____ PROPOSED GRADE ELEVATION _____ See Remarks (1) _____

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>#129 Elev. approx. 201 m. 0-2 m Silty Clay, Soft 2-3 m Silty Clay 3 m Shale Bedrock -W.L. not established</p> <p>BB Elev. approx. 214 m. 0-2 m Silty Sand Fill, Loose 2-3 m Silty Clay Till, Stiff 3 m Shale Bedrock -W.L. approx. elev. 210 m.</p> <p>DD Elev. approx. 207 m. 0-7 m Clayey Silt Till -W.L. not established</p>	<p><u>ELEVATED</u></p> <p>-Piers could be founded on spread footings within native material.</p> <p><u>CUT - RET. WALLS</u></p> <p>-retaining walls supported on spread footings within native soils. -dewatering in silty sand soils</p> <p><u>CUT AND COVER</u></p> <p>-temporary slopes of 1:1 should be stable -soldier pile and lagging in conjunction with dewatering in silty sand soils</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for boring machine.</p>	<p><u>ELEVATIONS</u></p> <p>ELEVATED CUT - RET. WALLS CUT AND COVER TUNNEL</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE F LOCATION Steeles Avenue - Hwy. 10 to Dixie Road
 APPROX ORIGINAL GROUND ELEVATION 191 - 212 m PROPOSED GRADE ELEVATION See Remarks (2)

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES:</u> #128 Elev. approx. 186 m. 0-2 m. Silty Clay, Stiff to V. Stiff 2 m Dolomite Bedrock -W.L. approx. elev. 185 m. <hr/> DD Elev. approx. 207 m. 0-7 m Clayey Silt Till -W.L. not established <hr/>	<u>ELEVATED</u> -probable spread footings on native material <u>CUT AND COVER</u> -probable soldier pile and lagging with minor dewatering or -temporary slopes of 1:1 should be stable. <u>TUNNEL</u> -shale bedrock and native soil suitable for boring machine.	1) No information directly available on route. 2) <u>ELEVATIONS</u> ELEVATED CUT AND COVER TUNNEL

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE G LOCATION CNR Line - Hwy. 10 to Dixie Road
 APPROX ORIGINAL GROUND ELEVATION 198 - 218 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>BB Elev. approx. 214 m. 0-2 m Silty Sand Fill, Loose 2-3 m Silty Clay Till, Stiff 3 m Shale Bedrock -W.L. approx. elev. 210 m.</p> <hr/> <p>CC Elev. approx. 219 m. 0-7 m Clayey Silt Till, V. Stiff to Hard 7-10 m Fine Sand, Compact to V. Dense 10 m Shale Bedrock -W.L. approx. elev. 215 m.</p> <hr/> <p>GG Elev. approx. 206 m. 0-4 m Clayey Silt Till, Hard 4 m Limestone Bedrock -W.L. approx. elev. 203 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native material.</p> <p>-in areas of sand, footing excavations may require shoring and dewatering.</p>	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE H LOCATION Kennedy Road - Steeles Avenue to Queen Street
 APPROX ORIGINAL GROUND ELEVATION 207-224 m PROPOSED GRADE ELEVATION Elevated, Cut & Cover, Tunnel

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCES:</u></p> <p>CC Elev. approx. 219 m. 0-7 m Clayey Silt Till, V. Stiff to Hard 7-10 m Fine Sand, Compact to V. Dense 10 m Shale Bedrock -W.L. approx. elev. 215 m.</p> <hr/> <p>EE Elev. approx. 220 m. 0-3 m Sandy Silt Till, Compact to V. Dense 3-6 m Silty Sand Till, V. Dense 6 m Shale Bedrock -W.L. not established</p> <hr/>	<p><u>ELEVATED</u></p> <p>-majority of piers could be founded on spread footings within native material.</p> <p>-in areas of sand & silty sand, footing excavations may require shoring and dewatering.</p> <p><u>CUT AND COVER</u></p> <p>-Temporary slopes of 1:1 should be stable.</p> <p>-soldier pile and lagging in conjunction with dewatering in sandy soils.</p> <p><u>TUNNEL</u></p> <p>-soil and bedrock provides favourable conditions for boring machine.</p> <p>-special techniques such as compressed air may be required in sandy soils.</p>	<p>Little available information directly on route.</p>

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. _____ Section 8 _____ ROUTE J _____ LOCATION Queen Street/Hwy. 7 - Hwy. 10 to Dixie Road _____
 APPROX ORIGINAL GROUND ELEVATION 214-222 m _____ PROPOSED GRADE ELEVATION ELEVATED, TUNNEL _____

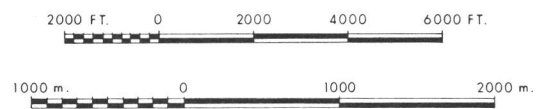
SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<u>REFERENCES</u> AA Elev. approx. 211 m. 0-1 m Gravel Fill, Compact 1-3 m Sand and Silt Fill, Loose to Compact 3-8 m Silty Clay, V. Stiff to Hard -W.L. approx. elev. 209 m. <hr/> EE Elev. approx. 220 m. 0-3 m Sandy Silt Till, Compact to V. Dense 3-6 m Silty Sand Till, V. Dense 6 m Shale Bedrock -W.L. not established <hr/>	<u>ELEVATED</u> -Majority of piers could be founded on spread footings within native material. -in areas of sand and silty sand, footing excavations may require shoring and dewatering. <u>TUNNEL</u> -soil and bedrock provides favourable conditions for boring machine. -special techniques such as compressed air may be required in sandy soils.	

FOUNDATION DATA SHEET

PROPOSED GO-ALRT NORTHERN ROUTE

PURCHASE ORDER No. Section 8 ROUTE K LOCATION Centennial Park - Hwy. 10 to Brampton Station
 APPROX ORIGINAL GROUND ELEVATION 206-218 m PROPOSED GRADE ELEVATION ELEVATED

SUBSURFACE CONDITIONS	RECOMMENDATIONS	REMARKS
<p><u>REFERENCE</u></p> <p>BB Elev. approx. 214 m.</p> <p>0-2 m Silty Sand Fill, Loose</p> <p>2-3 m Silty Clay Till, Stiff</p> <p>3 m Shale Bedrock -W.L. approx. elev. 210 m.</p> <hr/>	<p><u>ELEVATED</u></p> <p>-probable spread footings.</p>	<p>No information directly on route.</p>



PROPOSED ALIGNMENTS
GO-ALRT NORTHERN ROUTE
SECTION 8
MISSISSAUGA/ BRAMPTON

