

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M13-60

DIST. 6 REGION

W.P. No. 88-78-29

CONT. No. 88-79

W. O. No.

STR. SITE No. 37-1133

HWY. No. 400

LOCATION C.N.R. Overhead

Ramp 400S-407 E-W

No of PAGES -

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

G.I.-30 SEPT. 1976

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

DIST. No. 6

CONT No

WP No 88-78-29

CNR OVERPASS

RAMP 400 S TO 407 EW

(400 DETOUR)

GENERAL ARRANGEMENT

Giffels

Giffels Associates Limited

Consulting Engineers and Architects

SHEET

NOTES:

- CLASS OF CONCRETE**
- PRESTRESSED GIRDERS 35MPa
 - PIERS 35MPa
 - TRACK PROTECTION 20MPa
 - REINAILDER 30MPa
- REINFORCING STEEL**
- REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BAR MARKS WITH SUFFIX 'C' DENOTE COATED BARS.
- CLEAR COVER TO REINFORCING STEEL**
- | | |
|--|--------------------------|
| FOOTINGS | 100 ± 25 |
| ABUTMENTS, WINGWALLS AND RETAINING WALLS | OUTSIDE FACE 80 ± 20 |
| | INSIDE FACE 70 ± 20 |
| DECK | TOP 70 ± 20 |
| | BOTTOM AND SIDES 40 ± 10 |
| PIERS | 60 ± 20 |
| APPROACH SLABS | 80 ± 20 |
| REMAINDER UNLESS NOTED OTHERWISE | 70 ± 20 |
- CONSTRUCTION NOTES**
- BEARING SEATS SHALL BE FINISHED LEVEL AND TO THE SPECIFIED ELEVATIONS.
- CONCRETE BARRIER WALLS ON RETAINING WALLS SHALL NOT BE CAST UNTIL THE RETAINING WALL BACKFILL HAS BEEN COMPLETED.

LIST OF DRAWINGS

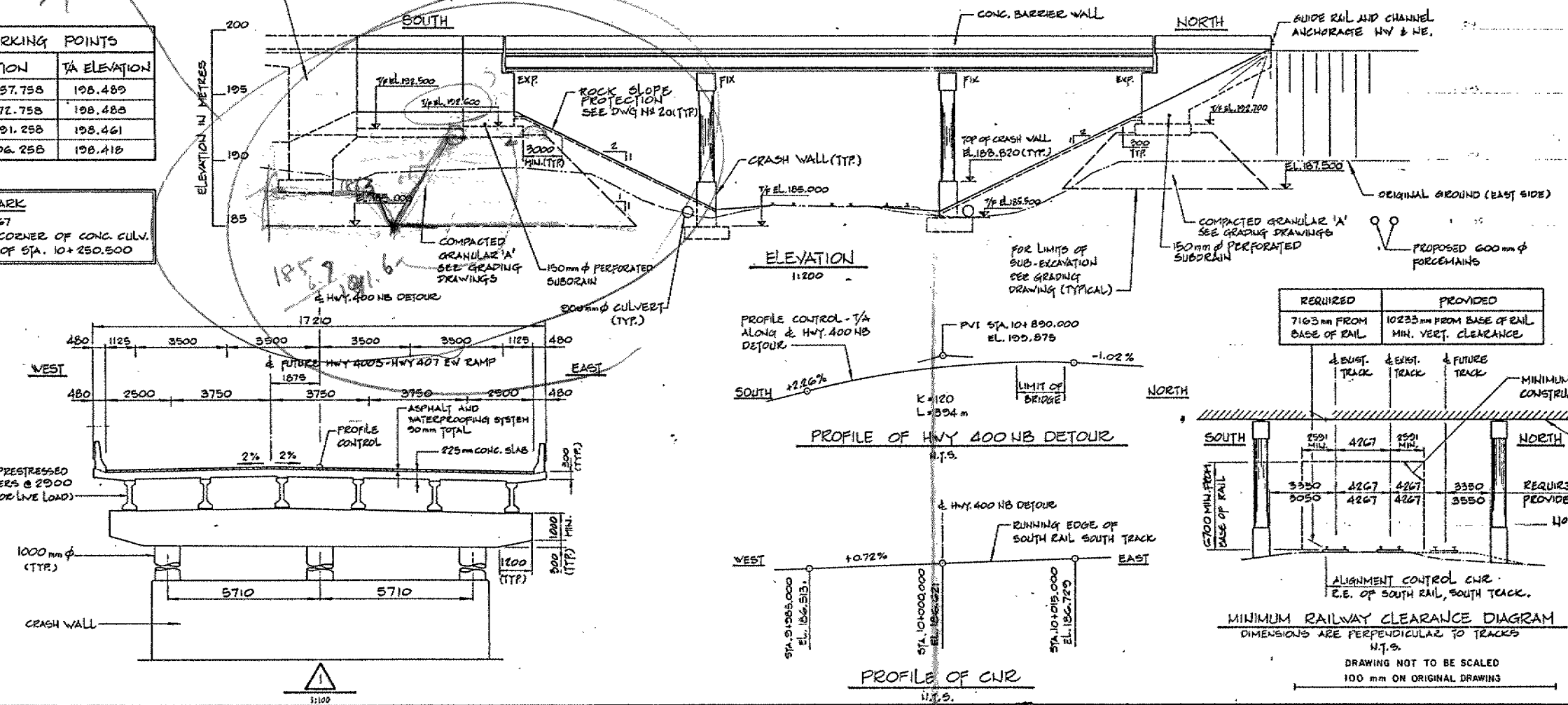
- 1 GENERAL ARRANGEMENT
- 2 BOREHOLE LOCATION AND SOIL STRATA
- 3 TRACK PROTECTION
- 4 FOOTING LAYOUT
- 5 FOOTING REINFORCEMENT
- 6 SOUTH ABUTMENT
- 7 NORTH ABUTMENT
- 8 SOUTH WINGWALLS AND RETAINING WALLS
- 9 NORTH WINGWALLS
- 10 PIER DETAILS
- 11 PRESTRESSED GIRDERS AND BEARINGS
- 12 DECK LAYOUT
- 13 DECK REINFORCEMENT
- 14 6000 mm APPROACH SLABS
- 15 BARRIER WALLS - DECK AND NORTH WINGWALLS
- 16 BARRIER WALLS - SOUTH WINGWALLS & RET. WALLS
- 17 JOINT ANCHORAGE AND ARMOURING
- 18 AS CONSTRUCTED ELEV & DIM
- 19 BRIDGE DATA AND SITE NUMBER DATA
- 20 STANDARD DETAILS
- 21 QUANTITIES - STRUCTURE

on May 6/88
agreed among
M. private
D. Wong
T. ...

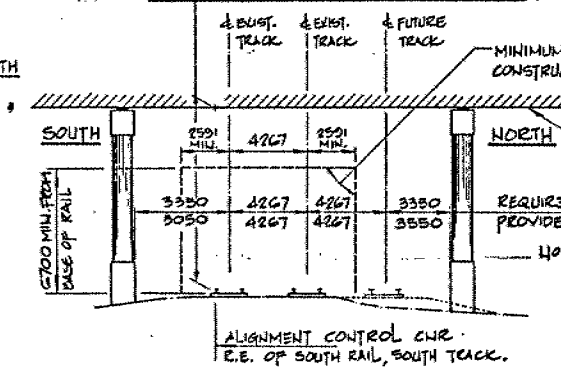
WORKING POINTS		
STATION	TA	ELEVATION
VP1	10+957.758	198.489
VP2	10+972.758	198.488
VP3	10+991.258	198.461
VP4	11+006.258	198.418

BENCH MARK
ELEV. 186.167
CG ON NE CORNER OF CONG. CULV.
40.0m E. OF STA. 10+250.500

6 - CPCL 1200 PRESTRESSED
CONCRETE GIRDERS @ 2900
(CONTINUOUS FOR LIVE LOAD)



REQUIRED	PROVIDED
7103 mm FROM BASE OF RAIL	10233 mm FROM BASE OF RAIL
	MIN. VERT. CLEARANCE



LICENCE
PROFESSIONAL
ENGINEER
R. S. STOKO
ONTARIO

REGISTERED PROFESSIONAL
ENGINEER
E. P. BRUMFITT
PROVINCE OF ONTARIO

APPLICABLE STANDARD DRAWINGS:		
DD - 3515	OPSD - 500.02	
REVISIONS		
DATE	BY	DESCRIPTION
DESIGN	RSS	CHECK/SSS
DRAWING	AKL	CHECK/SSS
LOADING	DHBC - A-83	DATE JAN. 88
SITE No	37-1133	DWG 1

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
WP No 88-78-29



CNR OVERPASS
RAMP 400 S TO 407 EW
(400 DETOUR)
TRACK PROTECTION

SHEET

Giffels Giffels Associates Limited
Consulting Engineers and Architects

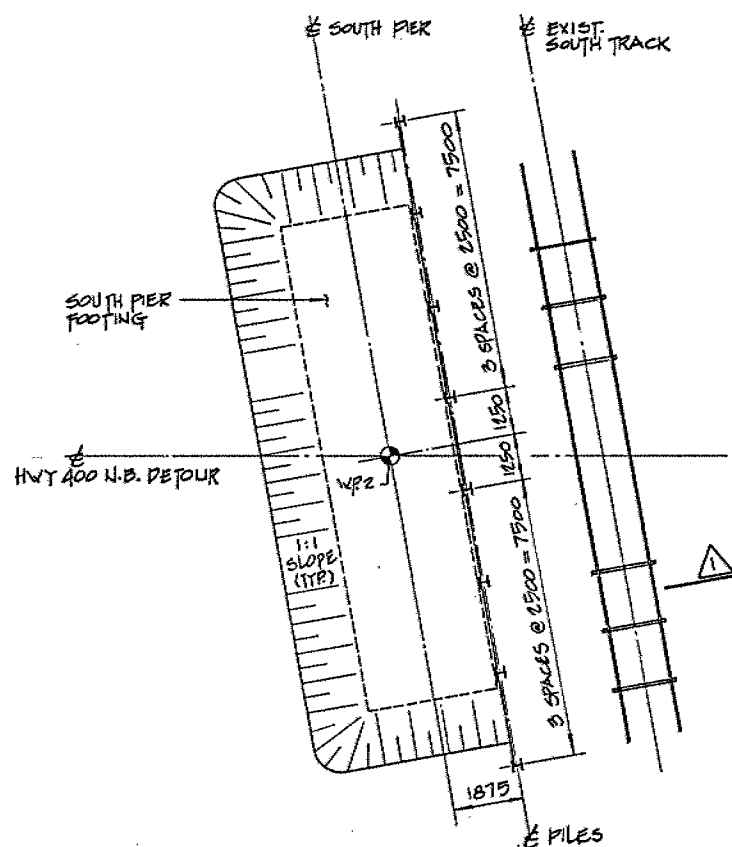
NOTES:

- ALTERNATIVE SHORING DESIGNS MAY BE CONSIDERED BY THE ENGINEER. ALTERNATIVE DESIGNS SHALL CONFORM TO THE FOLLOWING CRITERIA:

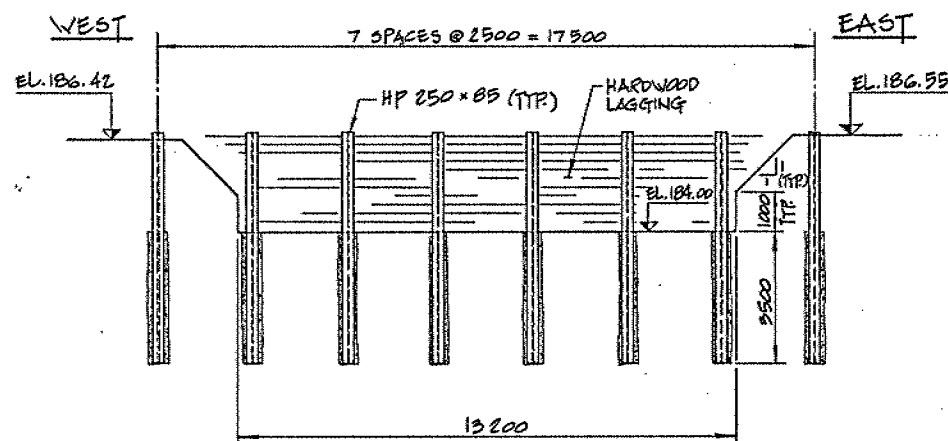
(a) RAILROAD LIVE LOAD SURCHARGE -
2.44 m OF FILL

THE CONTRACTOR SHALL SUBMIT SIX COPIES OF CALCULATIONS AND SHOP DRAWINGS, SHOWING FULL DETAILS OF THE PROPOSED SHORING SYSTEM TO THE ENGINEER FOR REVIEW PRIOR TO COMMENCING WORK. ALL CALCULATIONS AND SHOP DRAWINGS SHALL BE STAMPED AND SIGNED BY A QUALIFIED PROFESSIONAL ENGINEER LICENCED IN ONTARIO.

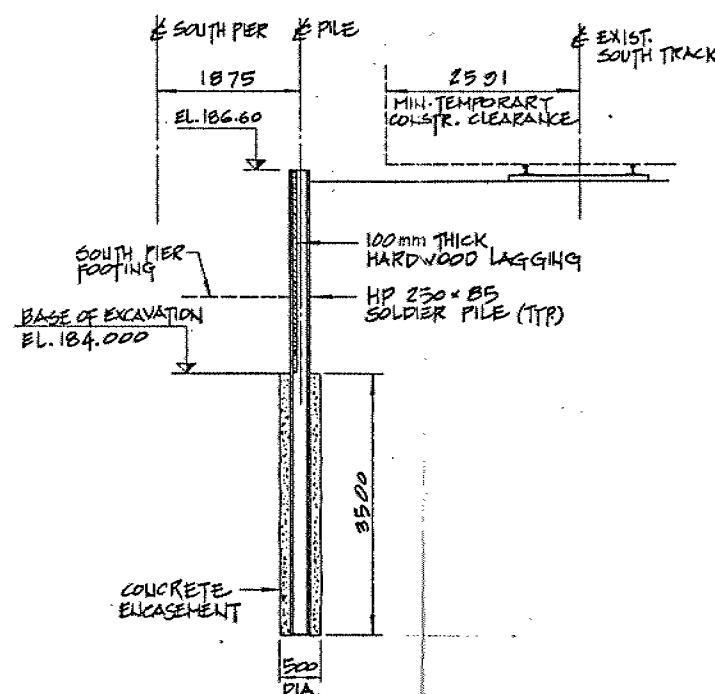
- CLASS OF CONCRETE FOR SOLDIER PILE EMBEDMENT SHALL BE 20 MPA.



PLAN
1:100



ELEVATION
1:100



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION	DATE
DESIGN	RSS	CHECK	LOADING OHBDC-A-83	JAN. 88
DRAWING	AP	CHECK	SITE No 37-1133	DWG 3



DOMINION SOIL INVESTIGATION INC.

CONSULTING SOIL & FOUNDATION ENGINEERS

104 CROCKFORD BLVD., SCARBOROUGH, ONTARIO, CANADA, M1R 3C6

(416) 751-6565

GEOTECHNICAL INVESTIGATION

C. N. R. OVERPASS - RAMP 400S-407-W

W.P. 88-78-29, SITE 37-73-1133

HIGHWAY 400, DISTRICT 6

TOWN OF VAUGHAN, ONTARIO

Ref. No. 83-3-19

July, 1983

Prepared For:

The Ministry of Transportation and Communications
Pavement and Foundation Design Section
Central Building
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

Distribution:

10 copies - Ministry of Transportation & Communications
2 copies - Dominion Soil Investigation Inc.

GEO. NO 30M13-60

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A P P E N D I X

Appendix 'A', Statement of Limitation

E N C L O S U R E S

BOREHOLE LOGS	Enclosures 1 to 9 inclusive
GRAIN SIZE DISTRIBUTION CURVES	Figures 1 to 6 inclusive
BOREHOLE LOCATION PLAN	Drawing 887829-A



1.0 INTRODUCTION

This report describes the findings of a geotechnical investigation carried out at the site of a proposed grade separation at Canadian National Railways and Highway 400 northbound detour (Ramp 400S-407 E-W) immediately north of Steeles Avenue in the Town of Vaughan, Ontario (Site 37-73-1133). The investigation was requested by the Ontario Ministry of Transportation and Communications, and authorization to carry out the work was received from the Pavement and Foundation Design Section of the Ministry.

The purpose of the investigation was to determine the subsoil and groundwater conditions at the site; to establish the engineering properties of the substrata; to make recommendations pertaining to the design of the foundations of the proposed structure; and to evaluate the construction conditions.

The field work was started on April 13, 1983, but due to difficult access conditions existing at that time, it was continued and finalized during the period of June 20 - 29, 1983. During this period, seven boreholes were drilled to depths ranging between 8.1 and 18.6 m and two dynamic cone

.../...

penetration tests were extended ^{from} (to) 2.4 to 3 m. The locations of the boreholes and the cone penetration tests are shown on Drawing No. 887829-A, and the subsurface conditions encountered are presented on the Record of Borehole sheets.

.../...



2.0 SUMMARIZED SUBSOIL CONDITIONS

Details of the subsurface conditions encountered in the boreholes are given on the individual Record of Boreholes, and inferred subsoil profiles are presented on Drawing No. 887829-A.

The subsurface conditions can be summarized briefly as follows: Underlying some topsoil and fill, the subsoil is a silty clay till to Elevations ranging between 181.2 and 180.2 m (4.6 to 9.3 m below the ground surface) where it is underlain by a 3.7 to 8.5 m thick sand layer. This sand is in turn underlain by a second glacial till sheet consisting of silty clay.

The relevant index and engineering properties of the principal soil strata are briefly discussed in the following paragraphs.

- 2.1 Silty Clay (Glacial Till): Underlying a veneer of topsoil and fill (maximum depth 1.3 m) the boreholes encountered a silty clay till extending to between 4.6 and 9.3 m below the ground surface (i.e. to Elevations ranging between 181.2 and 180.2 m). The till is a mixture of a wide range of particle

.../...



sizes and as shown in Figure 1, it consists of 2 to 3% gravel, 39 to 47% sand, 44 to 49% silt and 7 to 9% clay size particles. The presence of occasional coarse gravel and cobbles were also inferred during the drilling.

The following index properties were measured in the laboratory:

Liquid Limit	= 17 - 25%
Plastic Limit	= 10 - 15%
Plasticity Index	= 5 - 10
Moisture Content	= 6 - 19%

Based on these test results the till is described as a silty clay of low plasticity. It also contains somewhat coarser (i.e. basically non-cohesive sandy silt till) zones or layers and some silt and sand seams. Occasional relatively weaker clay seams or lenses were also noted.

The measured bulk unit weights range from 19.3 to 22.7 kN/m³. Standard Penetration tests gave 'N'-values ranging from 17 to more than 100 blows/0.3 m. An unconfined compression and a quick triaxial compression test performed in the laboratory on suitable split spoon samples gave undrained shear strength values of 158 and 330 kPa respectively. From these results and a visual and tactile examination of the soil samples, the consistency of the deposit is described as very stiff to hard.

.../...



- 2.2 Sand: Below elevations ranging between 181.2 and 180.2 m, the till is underlain by a water bearing sand deposit. Boreholes 13, 14 and 17 were terminated in this sand deposit at or above Elevation 177.2 m. In the remaining boreholes, the sand was found to extend to Elevations ranging between 176.5 and 171.8 m, where it is underlain by a second till sheet. The thickness of the sand layer sandwiched between the two clayey till sheets thus ranges, at the borehole locations, between 3.7 and 8.5 m.

The grain size distribution of representative samples of the sand is presented in Figures 2, 3 and 4. From the grading curves, it can be seen that the sand ranges from a relatively well graded material with some gravel (Figure 4) to uniformly graded fine sand and silty fine sand (Figures 2 and 3). The finer sand is generally more prevalent within the upper zones where it is also occasionally stratified with some silt, clay and till seams or lenses. With depth, the sand generally attains a relatively coarser texture. The sand is water bearing and from the observed water levels and the fact that the material backed up in the hollow stem augers during drilling, the water in the sand is believed to be under a sub-artesian head.

.../...

- 2.3 Silty Clay (Glacial Till): Underlying the sand, a second till sheet was encountered in Boreholes 11, 12, 15 and 16, at elevations ranging between 176.5 and 171.8 m. In these boreholes, the silty clay till deposit was penetrated for a vertical distance of 0.5 to 6.4 m (i.e. to Elevations ranging between 171.3 and 170.1 m where the boreholes were terminated).

The second till sheet is essentially similar to the upper till. The grain size distribution of two samples from the deposit is given in Figure 5, indicating 8 to 9% gravel, 36 to 41% sand, 40 to 44% silt and 10 to 12% clay size particles. Atterberg tests gave the following results:

Liquid Limit	=	18 - 22%
Plastic Limit	=	10 - 16%
Plasticity Index	=	6 - 8
Moisture Content	=	8 - 9%

These results show that the material is a silty clay of low plasticity.

From Penetration Indices of 48 to more than 100, the consistency of the lower till is described as hard.

.../...

3.0 GROUNDWATER CONDITIONS

Groundwater conditions in the open boreholes were observed during the drilling and periodically after their completion. In addition, piezometers were installed in four of the boreholes to enable us to monitor the groundwater levels over a prolonged period of time. Two piezometers were installed in the lower till sheet (Boreholes 11 and 12) and the other two piezometers in the water bearing sand stratum sandwiched between the two till sheets (Boreholes 15 and 16).

Water level readings carried out in the open boreholes and piezometers are shown on the individual borehole logs.

The groundwater levels recorded at the time of the investigation ranged between Elevations 185.1 m (Boreholes 12 and 13) and 185.7 m (Boreholes 11 and 17) and there was no noticeable difference in the piezometric water head measured in the sand and the lower till sheet. The water in the sand stratum, however, was under a sub-artesian pressure, indicating a confined aquifer.

.../...

4.0 DISCUSSION OF THE RESULTS

We understand that the proposed bridge will be a three-span, 36.5 m long structure and will carry Ramp 400S-407E-W just east of the existing Highway 400/C.N.R. overpass. The structure will be part of Highway 400 detour when the Highway 400/407 Interchange is constructed.

Underlying a thin veneer of topsoil and fill (maximum depth 1.3 m), the boreholes have revealed the presence of two glacial till sheets of very stiff to hard silty clay separated by a 3.7 to 8.5 m thick, compact to very dense water bearing sand layer. The groundwater table was recorded between Elevations 185.7 and 184.7 m (i.e. 0.7 to 4.4 m below the existing ground surface).

4.1 Foundations

The upper silty clay till is suitable to support normal spread footing foundations. The footings should be placed below the topsoil, fill and the surficially weathered zones of the upper till. Recommended foundation levels and corresponding bearing pressures are given in Table I, following this page.

.../...



TABLE I
Foundation Level -Bearing Capacity

Location	Relevant Boreholes	Highest* Recommended Foundation Level (m)	<u>Bearing Capacity</u>	
			Ultimate Limit States kPa	Servicability Limit States Type II kPa
South Abutment	11	186.5	540	340
South Pier	12, 13	184.0	540	340
North Pier	14, 15	184.5	540	340
North Abutment	16, CT1	187.5	540	340
East Retaining Wall	CT1, 17	188.0	540	340
West Retaining Wall	16, CT2	187.5	540	340

* In the selection of foundation level, no consideration was given to frost protection.

.../...

Si

Total and differential settlements corresponding to the recommended bearing pressure for Serviceability Limit State Type II are expected to be of the order of 25 mm and 15 mm, respectively.

Under inclined loading conditions, the bearing capacity at the ultimate limit state should be reduced in accordance with Clause 6.7.3.3.5 of the Ontario Highway Bridge Design Code 1979 (OHBDC).

The footings should have a minimum of 1.2 m earth cover for frost protection and it is recommended that the footing excavations be inspected and approved by a geotechnical engineer to ensure that the footings rest on undisturbed natural subsoil capable of sustaining the design pressure.

4.2 Lateral Earth Pressures

Assuming that free-draining granular material is used for backfill and adequate drainage is provided behind the abutments and retaining walls (Figures 6.9.6.1 OHBDC) the lateral earth pressures can be calculated by using the following equivalent fluid pressures:

On the retaining walls, where active earth pressure conditions could develop :

.../...

At Ultimate Limit State: 8 kPa/m

At Serviceability Limit State Type II: 6.5 kPa/m

The rigid walls of the abutments, however, should be designed to withstand the at-rest earth pressures which can be evaluated using the following equivalent fluid pressures:

At Ultimate Limit State: 10 kPa/m

At Serviceability Limit State Type II: 8.5 kPa/m

For the above values, it has been assumed that the slope of the backfill behind the retaining structure will approximately be level.

The over-compaction of the backfill could lead to the development of large horizontal pressures behind the retaining walls and the abutments. Vibratory compaction equipment for use behind the abutment walls and the retaining walls must therefore be restricted in size as per current M.T.C. specifications.

Water accumulation in the backfill behind the retaining structures should be prevented by the use of perforated pipes and weep holes.

.../...



For the evaluation of the sliding resistance of the foundation, the ultimate value of the angle of friction between the underside of the foundations and the very stiff to hard silty clay till can be taken as 20 degrees.

4.3 Approach Fills

The design of the approach fills will not be limited by the strength of the foundation materials underlying the site and therefore no stability or settlement problems are foreseen. The sides of the approach embankments could therefore be constructed with 2 horizontal in 1 vertical side slopes provided that clean, compacted earth fill is used. The faces of the embankment should, however, be adequately protected against surface erosion.

4.4 Construction

Excavations in the very stiff to hard till will stand unsupported with nearly vertical faces. Where they extend more than 1.2 m, however, the faces should be cut back to a 1:1 slope in order to comply with the Provincial Safety Regulations.

Allowing for a 0.5 m rise in the water table (Elev. 186.2 m) we estimate that excavations extending to Elevation 184.0 m

.../...

will have a safety factor greater than 1.3 against basal heave due to the groundwater pressure acting at the interface of the sand stratum and the overlying silty clay till. Potentially critical conditions may develop if the excavations extend below Elevation 183.0 m.

No major problems due to groundwater seepage are envisaged since only shallow excavations are expected. Surface water should, however, not be allowed to accumulate in the excavations and any material that may be softened should be removed by hand immediately before pouring the footings.

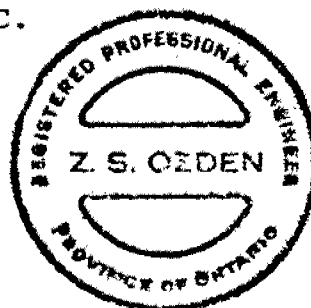
5.0 STATEMENT OF LIMITATION

The Statement of Limitation, as quoted in Appendix 'A', is an integral part of this report.

DOMINION SOIL INVESTIGATION INC.

Z. S. Ozden
for Z. S. Ozden, P. Eng.

I. P. Lieszkowsky
I. P. Lieszkowsky, P. Eng.
ZSO:ag



A P P E N D I X

APPENDIX 'A'
STATEMENT OF LIMITATION

The conclusions and recommendations in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation.

We recommend that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known, in our analysis certain assumptions had to be made. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis.

In cases where these recommendations are not followed, the company's responsibility is limited to report accurately the information encountered in the testholes.

The comments given in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

ENCLOSURES

RECORD OF BOREHOLE No 11

METRIC

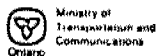
W P 88-78-29 LOCATION Co-ords. 4,848,294N; 301,982E ORIGINATED BY RM
 DIST 6 HWY 400 BOREHOLE TYPE HOLLOW STEM AUGERING & WASHBORING COMPILED BY Z.S.O.
 DATUM GEODETIC DATE 1983.04.13 and 1983.04.14 CHECKED BY Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100						
189.2	GROUND LEVEL																	
	200 mm Topsoil some organics		1	SS	25		188											
			2	SS	36		SEAL											
			3	SS	27		SEAL											
	v. stiff to hard hard		4	SS	88		186											
		brown grey	5	SS	69													3 39 49 9
	SILTY CLAY		6	SS	73		184											
	some sand, embedded gravel (Glacial Till)		7	SS	38													
			8	SS	50	0.08m	182											Soil backed up in augers at 12 m.
			9	SS	38													Advance by washboring inside aug- ers.
180.8							180											0 98 2 0
8.4			10	SS	10*													0 98 2 0
	SAND, fine to medium compact to v. dense grey, wet		11	SS	56		178											
			12	SS	13		176											April 12 April 14
175.8																		Sample 12: no recovery, wash sample taken
13.4			13	SS	55	0.15m	174											8 36 44 12
	SILTY CLAY																	
	some sand, embedded gravel (Glacial Till)		14	SS	52	0.15m	172											Augers @ 16.8 m; advance by washboring ahead.
	hard, grey		15	SS	92	0.25m												
170.6			16	SS	53	0.15m												
18.6	END OF BOREHOLE																	*N-value on probably disturbed soil. Date W.L. Apr. 14 186.1 June 21 185.7 June 27 185.7 June 29 185.7

+3, x5: Numbers refer to
 Sensitivity

20
 15 5 (%) STRAIN AT FAILURE
 10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 12				METRIC
W P	88-78-29	LOCATION	Co-ords. 4,848,300.4N; 301,964.3E	
DIST	6 HWY 400	BOREHOLE TYPE	HOLLOW STEM AUGERING & WASHBORING	
DATUM	GEODETIC	DATE	1983.06.27 and 1983.06.28	
			ORIGINATED BY	R.M.
			COMPILED BY	Z.S.O.
			CHECKED BY	Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100							SHEAR STRENGTH	WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE							
185.8	GROUND LEVEL															
0.0	Fill : Sandy Silt															
185.0																
0.8			1	SS	55											
	SILTY CLAY		2	SS	38											
	some sand,		3	SS	29											
	embedded gravel		4	SS	32											
	(Glacial Till)		5	SS	27											
	hard to v.stiff		6	SS	27											
180.2	grey		7	SS	41											
5.6			8	SS	46											
	dense															
	v.dense		9	SS	86											
	Sand, some silt															
	traces of gravel															
	grey, wet		10	SS	82/	0.28m										
176.5			11	SS	88/	0.28m										
9.3			12	SS	90											
	SILTY CLAY															
	some sand,															
	embedded gravel															
	(Glacial Till)															
	hard, grey		13	SS	48											
170.1			14	SS	85/	0.28m										
15.7	END OF BOREHOLE															

SEALED

PIEZOMETER

0.28m

0.28m

20 40 60 80 100

○ UNCONFINED + FIELD VANE

● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT

NATURAL MOISTURE CONTENT

LIQUID LIMIT

W_p W W_L

WATER CONTENT (%)

Soil back-up in augers @ 6 m.

Advance by washboring inside the augers.

June 27

June 28

Augers @ 10.7 m; advance by washboring ahead.

Date W.L.

June 28 182.

June 29 185.

July 7 185.

Soil back-up in augers @ 6 m.
Advance by washboring inside the augers.

June 27
June 28

Augers @ 10.7 m; advance by washboring ahead.

Date W.L.
June 28 182.1
June 29 185.3
July 7 185.1

+3, x5 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION


 Ministry of
Transportation and
Communications
Ontario

RECORD OF BOREHOLE No 13

METRIC

W P 88-78-29 LOCATION Co-ords. 4,848,304N; 301,980.5E ORIGINATED BY R.M.
 DIST 6 HWY 400 BOREHOLE TYPE HOLLOW STEM AUGER COMPILED BY Z.S.O.
 DATUM GEODETIC DATE 1983.06.27 CHECKED BY Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
185.9	GROUND LEVEL																
0.0	v. stiff hard	brown grey	1	SS	28												
	SILTY CLAY some sand, embedded gravel (Glacial Till)		2	SS	59												
			3	SS	45												
			4	SS	36												
			5	SS	31												
			6	SS	45												
181.1	SAND some silt & gravel dense, grey, wet		7	SS	31												
4.8			8	SS	50												
			9	SS	40												
177.8	END OF BOREHOLE																
8.1																	

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to Sensitivity
 20
 15 5 (%) STRAIN AT FAILURE
 10



RECORD OF BOREHOLE No 14

METRIC

W P 88-78-29 LOCATION Co-ords. 4,848,320.4N; 301,962.2E ORIGINATED BY R.M.
DIST 6 HWY 400 BOREHOLE TYPE HOLLOW STEM AUGER COMPILED BY Z.S.O.
DATUM GEODETIC DATE 1983.06.22 CHECKED BY Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
185.7	GROUND LEVEL																
0.0 185.1	Fill, silty clay so. sand																
0.6	SILTY CLAY some sand, embedded gravel (Glacial Till) grey hard dense to compact		1	SS	85/												
			2	SS	43												
			3	SS	50												
			4	SS	50												
			5	SS	39												
			6	SS	24												
180.2	dense Sand with traces of gravel grey, wet.		7	SS	2*												
5.5			8	SS	38												
			9	SS	45												
177.6	END OF BOREHOLE																
8.1																	

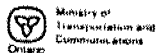
Date W.L.
June 27 185.2

+3, x5: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 15

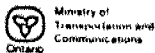
METRIC

W P 88-78-29 LOCATION Co-ords. 4,848,325N; 301,979.4E ORIGINATED BY R.M.
 DIST 6 HWY 400 BOREHOLE TYPE HOLLOW STEM AUGERING & WASHBORING COMPILED BY Z.S.O.
 DATUM GEODETIC DATE 1983.06.21 and 1983.06.22 CHECKED BY Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
185.8	GROUND LEVEL																
0.0	50 mm topsoil																
185.0	silty clay, some sand		1	SS	54												
0.8	grey/brown grey																
	SILTY CLAY																
	some sand,		3	SS	50												
	embedded gravel,		4	SS	61												
	(Glacial Till)																
	hard		5	SS	56												
181.2			6	SS	40											0 84 16 0	
4.6	SAND		7	SS	33												
	some silt and gravel		8	SS	40											14 84 2 0	
	grey, wet		9	SS	47												
	dense		10	SS	74											20 71 9 0	
	v.dense		11	SS	98												
173.8			12	SS	76											June 21	
12.0	SILTY CLAY															June 22	
	some sand,		13	SS	49											9 41 40 10	
	embedded gravel															Soil backed up at 11.9m.	
	(Glacial Till)															Advance by washboring inside the augers to 12.2 m.	
	hard		14	SS	56												
170.1																	
15.7	END OF BOREHOLE															Augers at 12.2m; advance by washboring ahead.	
																Date W.L. June 27 185.3	

+3, x⁵: Numbers refer to Sensitivity
 20
 15
 10
 5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 16

METRIC

W P 88-78-29 LOCATION Co-ords. 4,848,335N; 301,960.6E ORIGINATED BY R.M.
 DIST 6 HWY 400 BOREHOLE TYPE HOLLOW STEM AUGER COMPILED BY Z.S.O.
 DATUM GEODETIC DATE 1983.06.20 CHECKED BY Z.S.O.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
189.6	GROUND LEVEL																
0.0	50 mm topsoil																
189.0	Fill, silty sand tr. grav.																
0.6	possible fill to 1m		1	SS	17												
			2	SS	21												
			3	SS	25												
	v. stiff		4	SS	84												
	hard		5	SS	60												
	brown grey		6	SS	55												
	SILTY CLAY		7	SS	90												
	some sand,		8	SS	57												
	embedded gravel																
	(Glacial Till)		9	SS	47												
180.3			10	SS	54												
9.3	v. dense		11	SS	27												
	compact		12	SS	56												
	v. dense		13	SS	65												
	Sand		14	SS	70												
	some silt & gravel		15	SS	83												
	grey, wet		16	AS	-												
171.8																	
17.8																	
171.3	Silty Clay Till																
18.3	END OF BOREHOLE																

+3, x5: Numbers refer to 20
Sensitivity 15 \pm 5 (%) STRAIN AT FAILURE
10

Date W.L.
 June 21 185.3
 June 27 185.2
 June 29 185.2
 July 7 185.2

OFFICE REPORT ON SOIL EXPLORATION



Ministry of
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Communications

RECORD OF BOREHOLE No 17

METRIC

W P 88-78-29

LOCATION Co-ords. 4,848,348.2N; 301,976.6E

ORIGINATED BY R.M.

DIST 6 HWY 400

BOREHOLE TYPE HOLLOW STEM AUGER

COMPILED BY Z.S.O.

DATUM _____ GEODETIC

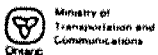
DATE 1983.06.29

CHECKED BY 750

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES												
								SHEAR STRENGTH kPa									
189.7	GROUND LEVEL																
0.0	Fill, Silty Clay																
188.4	traces of gravel, brown		1	SS	18												
1.3			2	SS	24												
			3	SS	24												
	brown grey		4	SS	22												
	SILTY CLAY		5	SS	23												
	some sand,		6	SS	40												
	embedded gravel		7	SS	28												
	(Glacial Till)		8	SS	37												
	v.stiff to hard		9	SS	100/	0.25m											
180.4			10	SS	32												
9.3	dense v.dense		11	SS	73												
	SAND																
	some silt & gravel																
177.2	grey, wet		12	SS	70/	0.15m											
12.5	END OF BOREHOLE																
									</								

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to Sensitivity



RECORD OF CONE TEST No 1										METRIC			
W P 88-78-29		LOCATION Co-ords. 4,848,339N; 301,977.4E				ORIGINATED BY R.M.							
DIST 6 HWY 400		BOREHOLE TYPE DYNAMIC CONE PENETRATION TEST				COMPILED BY Z.S.O.							
DATUM GEODETIC		DATE 1983.06.29				CHECKED BY Z.S.O.							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20					
189.8	GROUND LEVEL												
0.0													
186.9													
3.0	END OF CONE TEST												

OFFICE REPORT ON SOIL EXPLORATION

+3, x⁵: Numbers refer to Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE


 Ministry of
Transportation and
Communications

RECORD OF CONE TEST No 2

METRIC

W P 88-78-29 LOCATION Co-ords. 4,848,346.6N: 301,959.6E ORIGINATED BY P.M.
 DIST 6 HWY 400 BOREHOLE TYPE DYNAMIC CONE PENETRATION TEST COMPILED BY Z.S.O.
 DATUM GEODETIC DATE 1983.06.29 CHECKED BY Z.S.O.

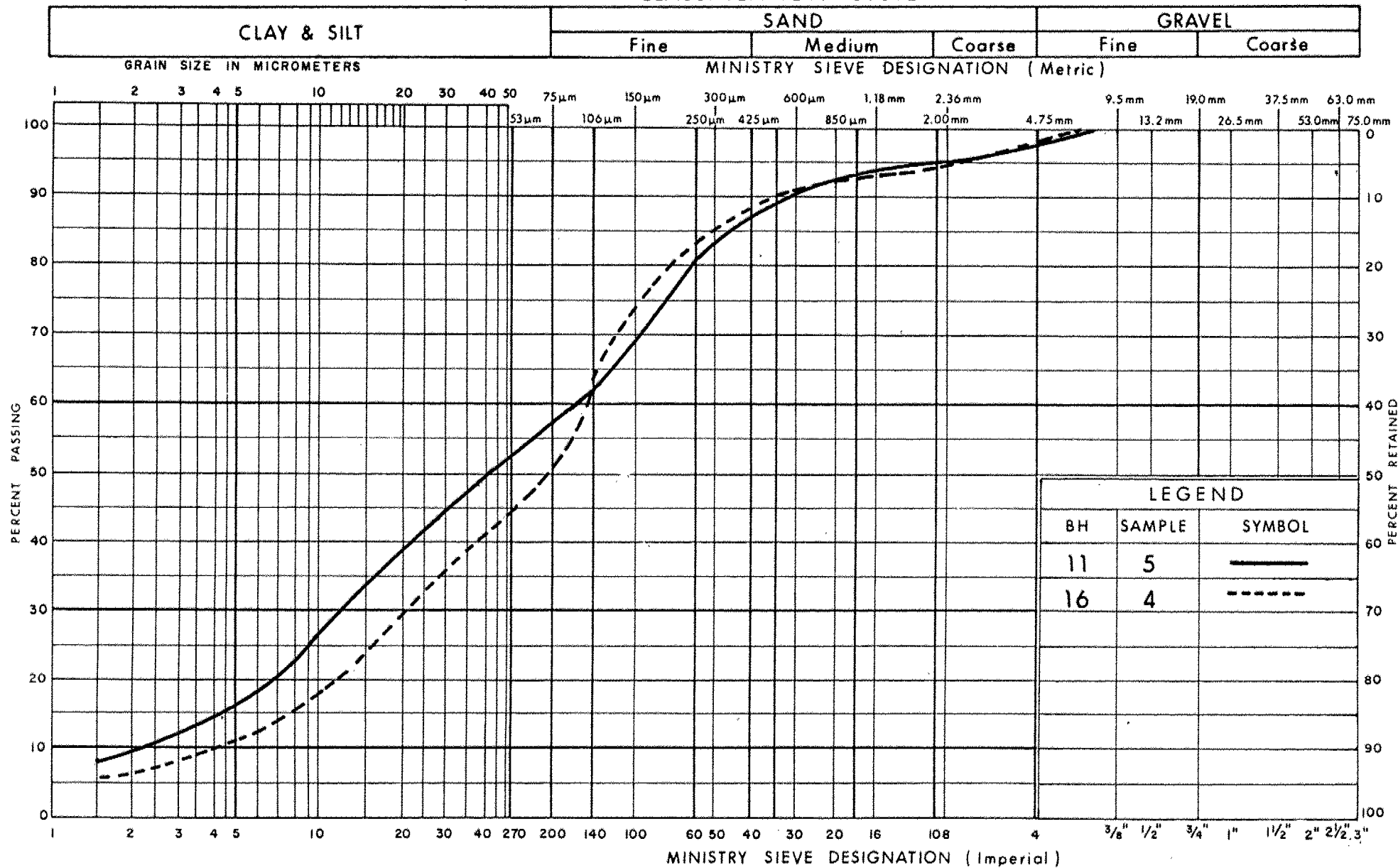
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
189.1	GROUND LEVEL												
0.0							188						
186.7													
2.4	END OF TEST								120	0.23	m		

 +³, x⁵: Numbers refer to
Sensitivity

 20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

UNIFIED SOIL CLASSIFICATION SYSTEM



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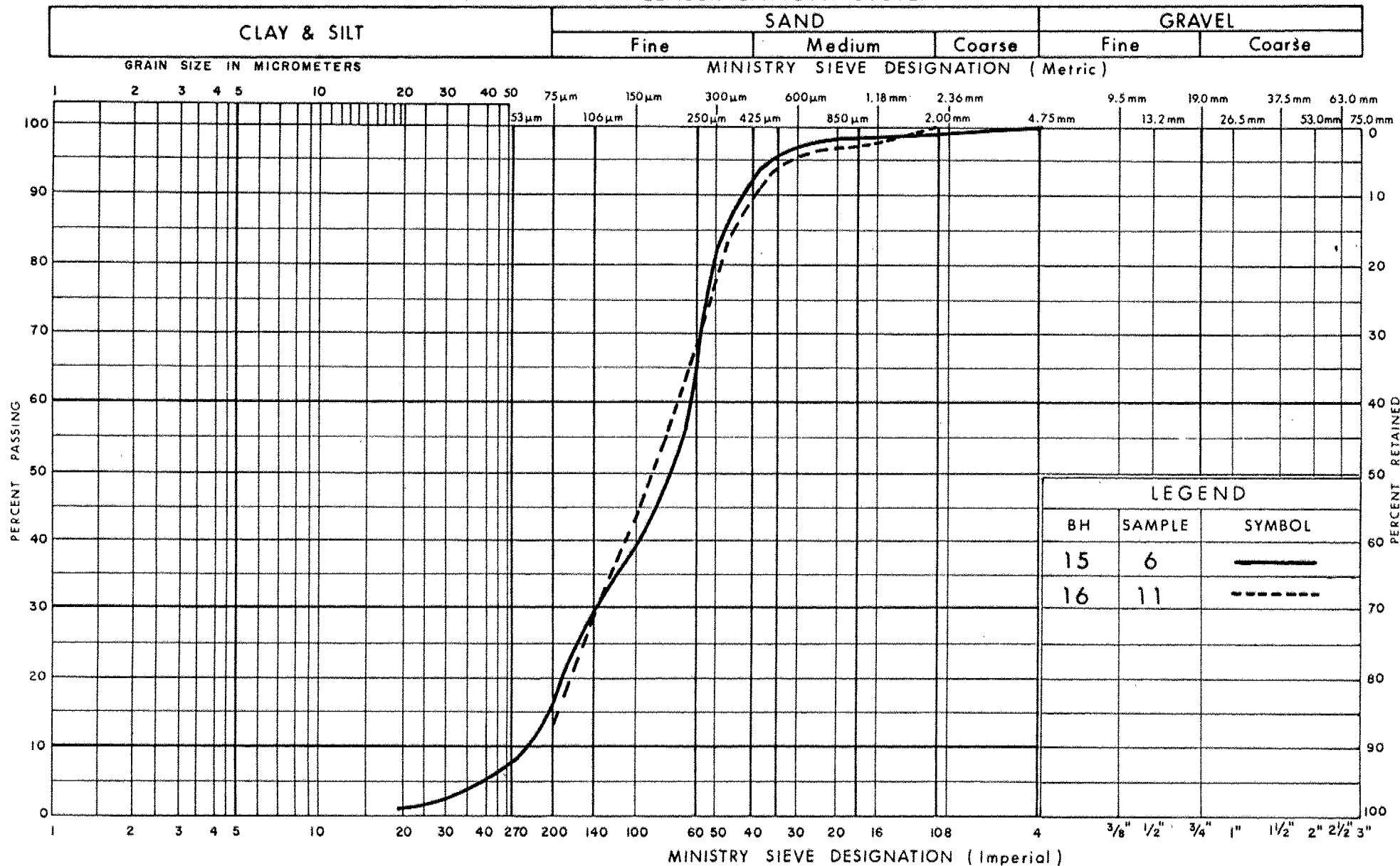
GRAIN SIZE DISTRIBUTION

SILTY CLAY (Glacial Till)

FIG No 1

W P 88-78-29

UNIFIED SOIL CLASSIFICATION SYSTEM



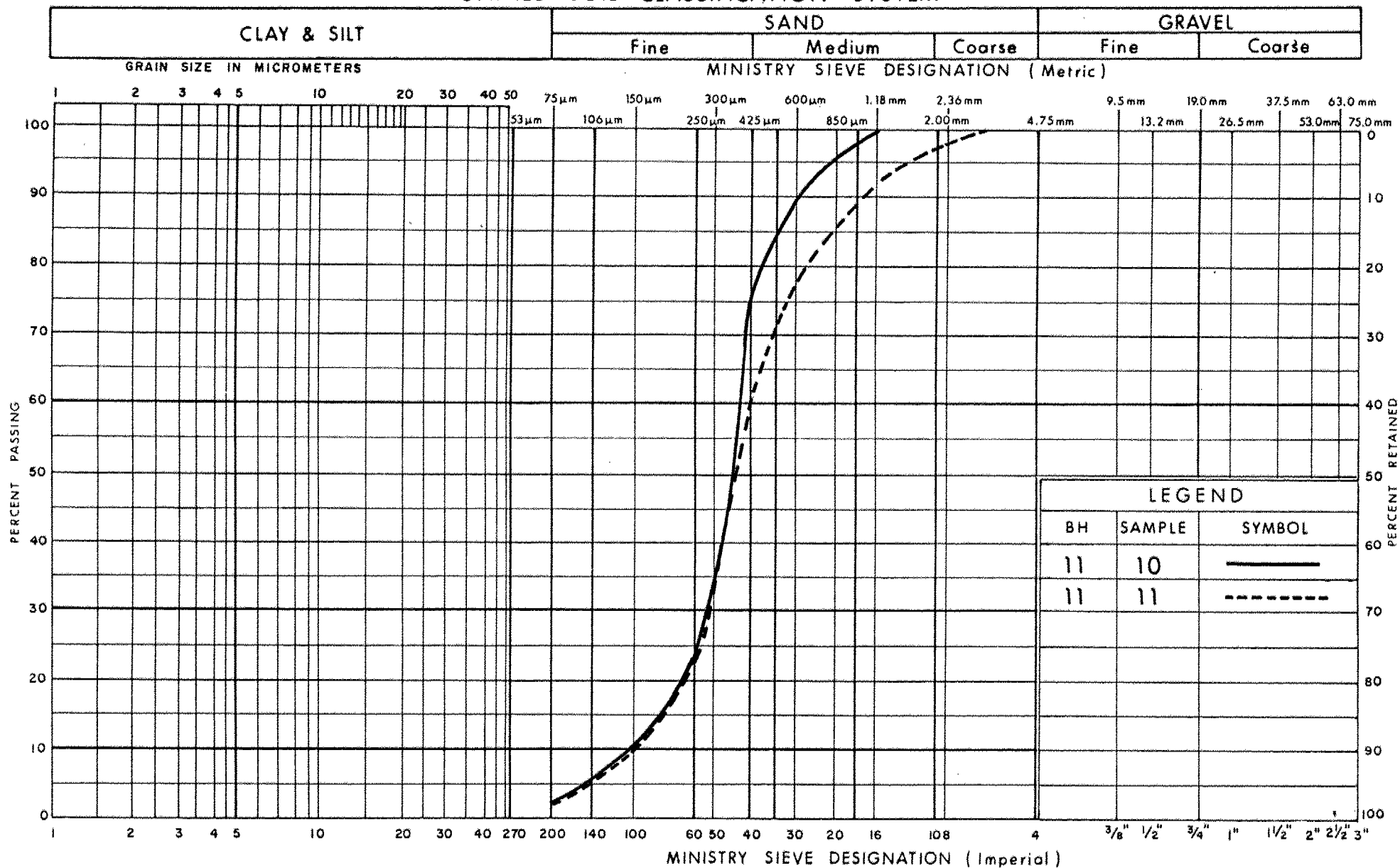
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Communications

GRAIN SIZE DISTRIBUTION SILTY FINE SAND

FIG No 2

W P 88-78-29

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario

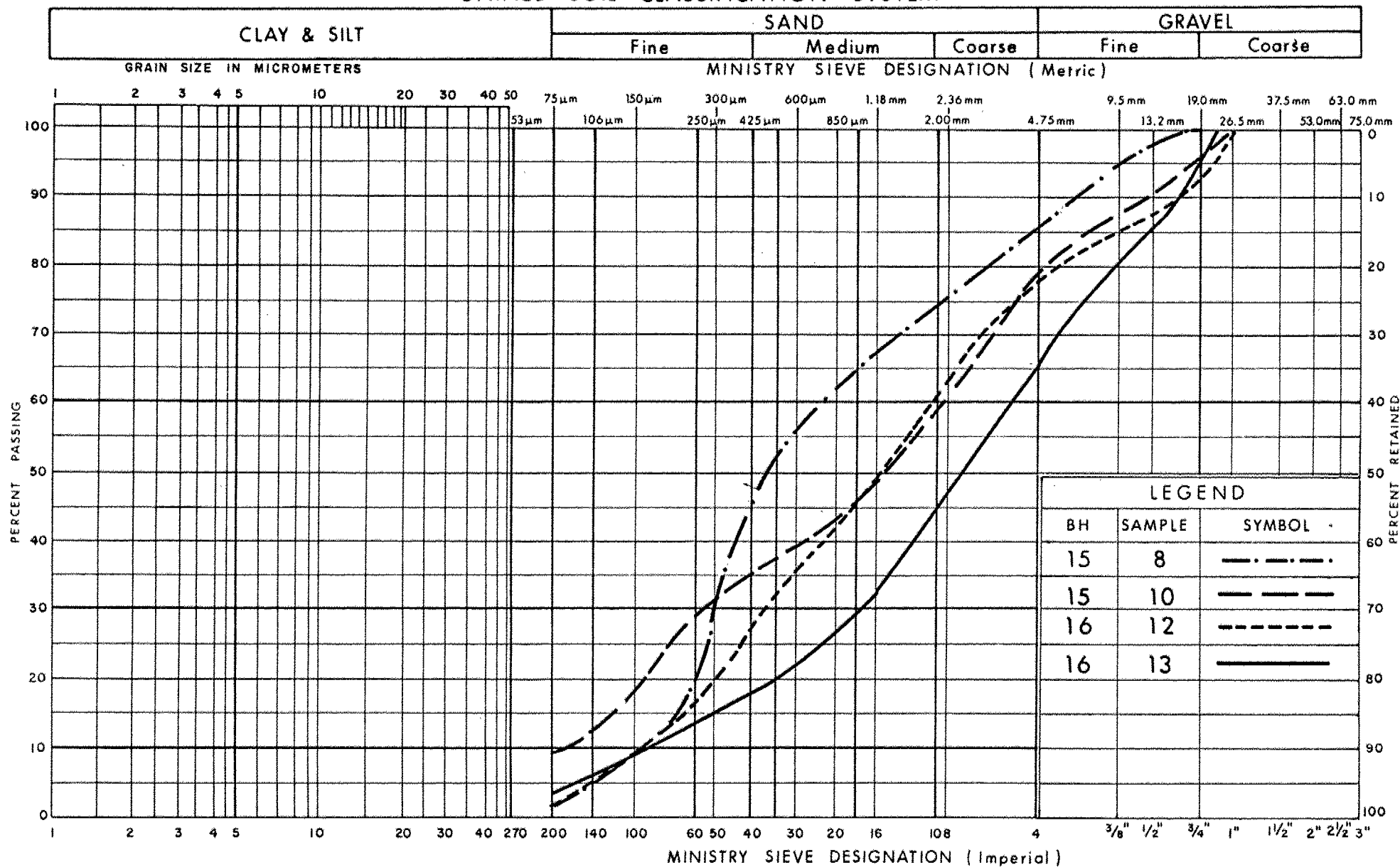
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Transportation and
Communications

GRAIN SIZE DISTRIBUTION FINE SAND

FIG No 3

W P 88-78-29

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario

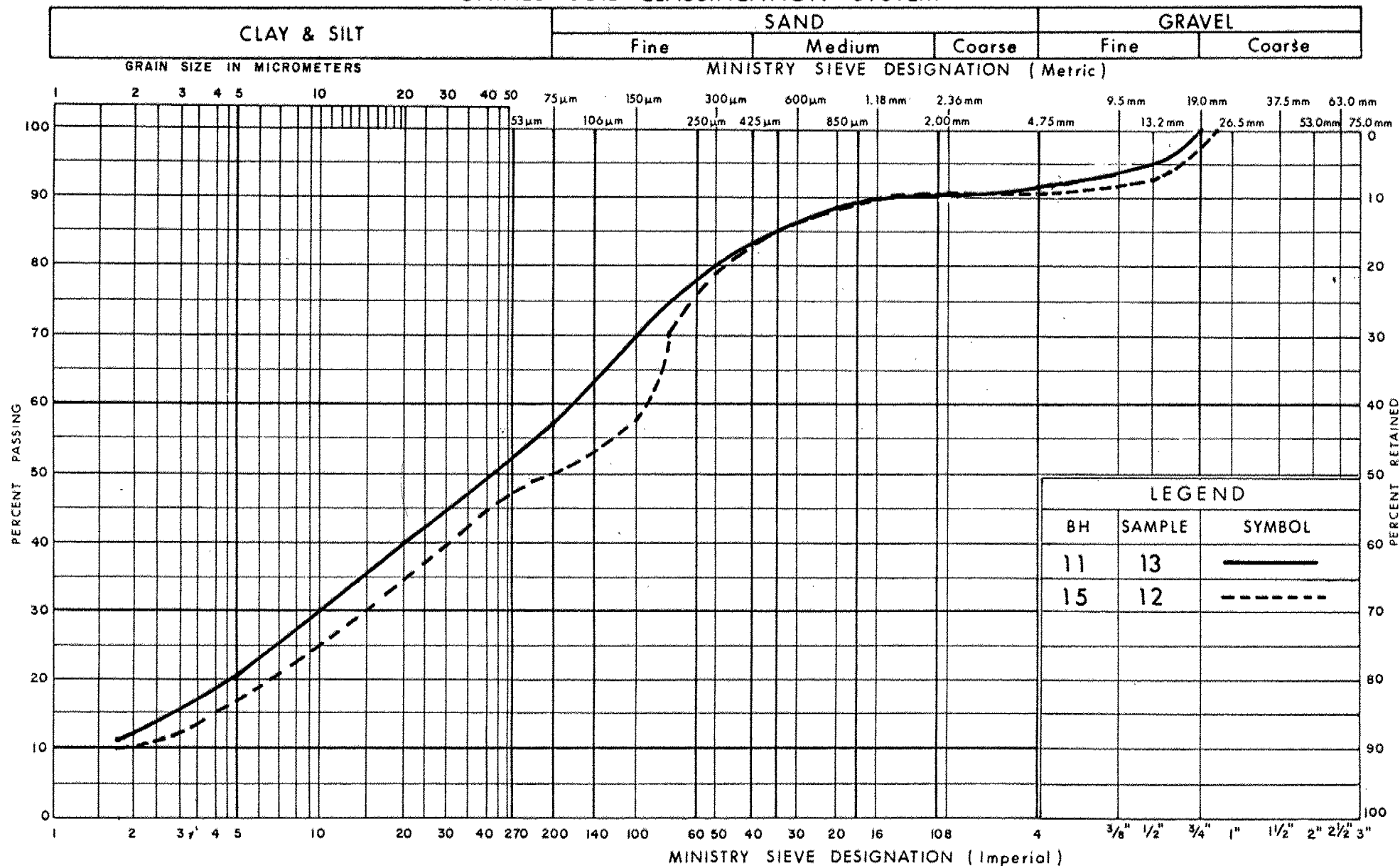
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Communications

GRAIN SIZE DISTRIBUTION
SAND
some Gravel and traces of Silt.

FIG No 4

W P 88-78-29

UNIFIED SOIL CLASSIFICATION SYSTEM

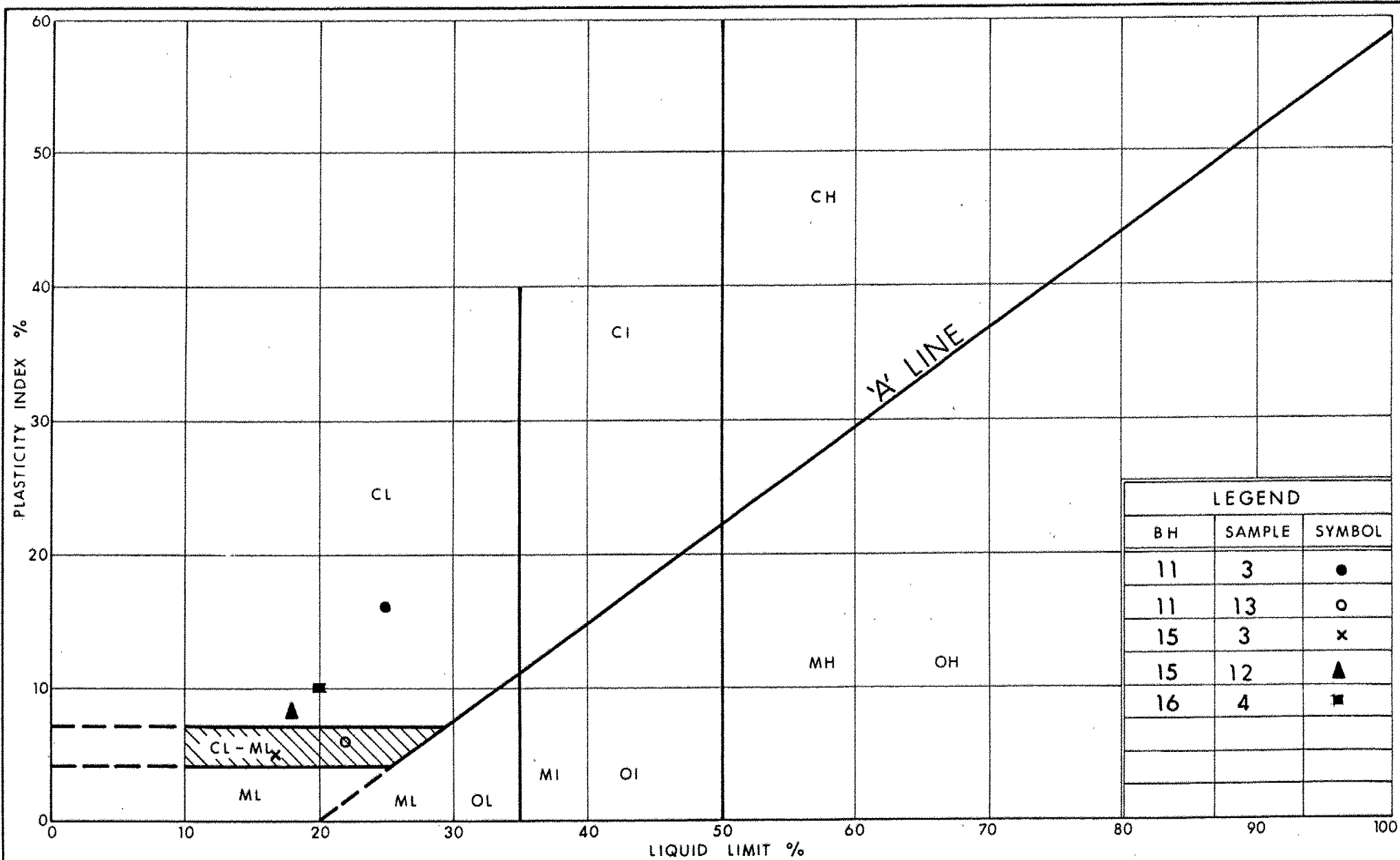


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Transportation and
Communications

GRAIN SIZE DISTRIBUTION
SILTY CLAY (Glacial Till)

FIG No 5

W P 88-78-29



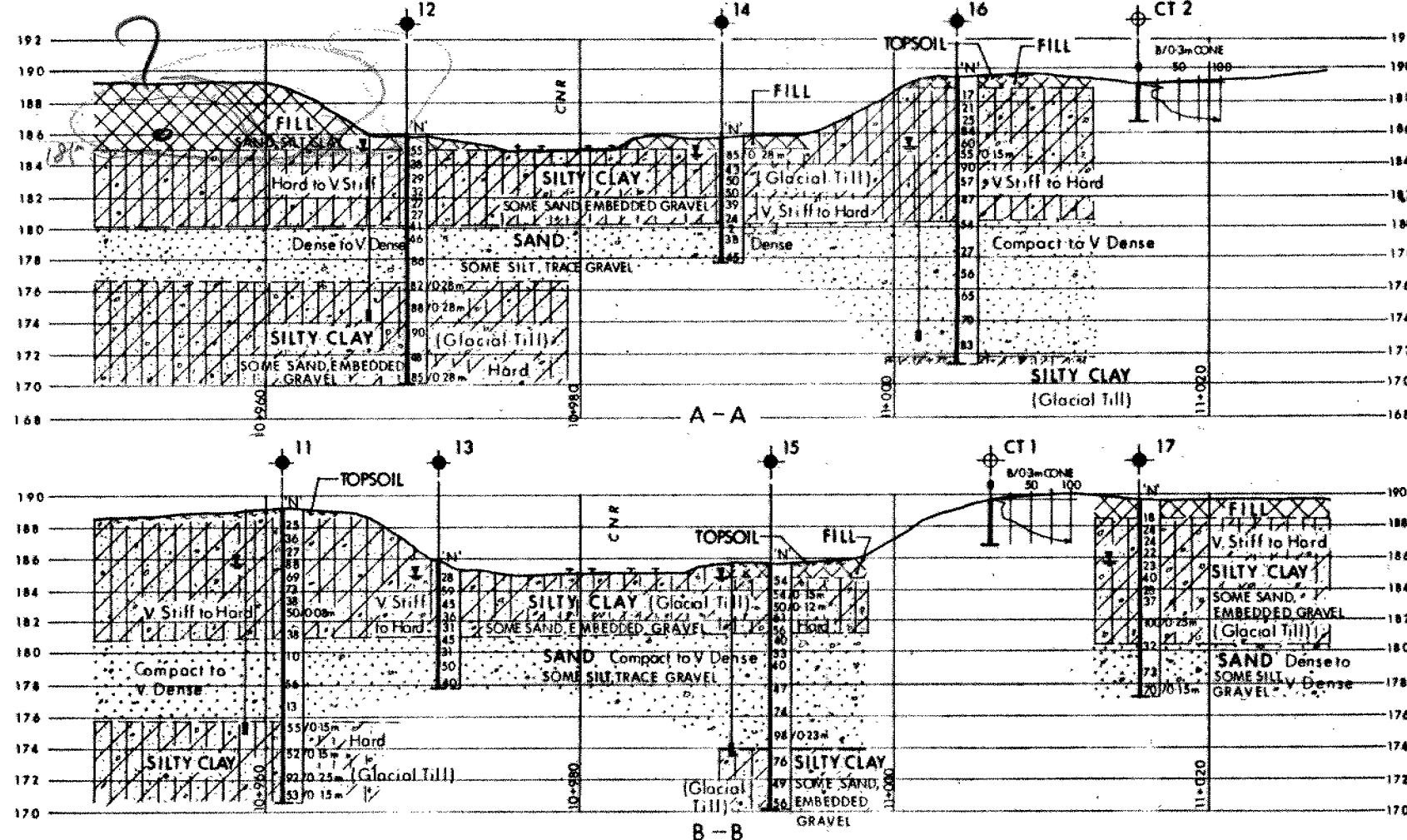
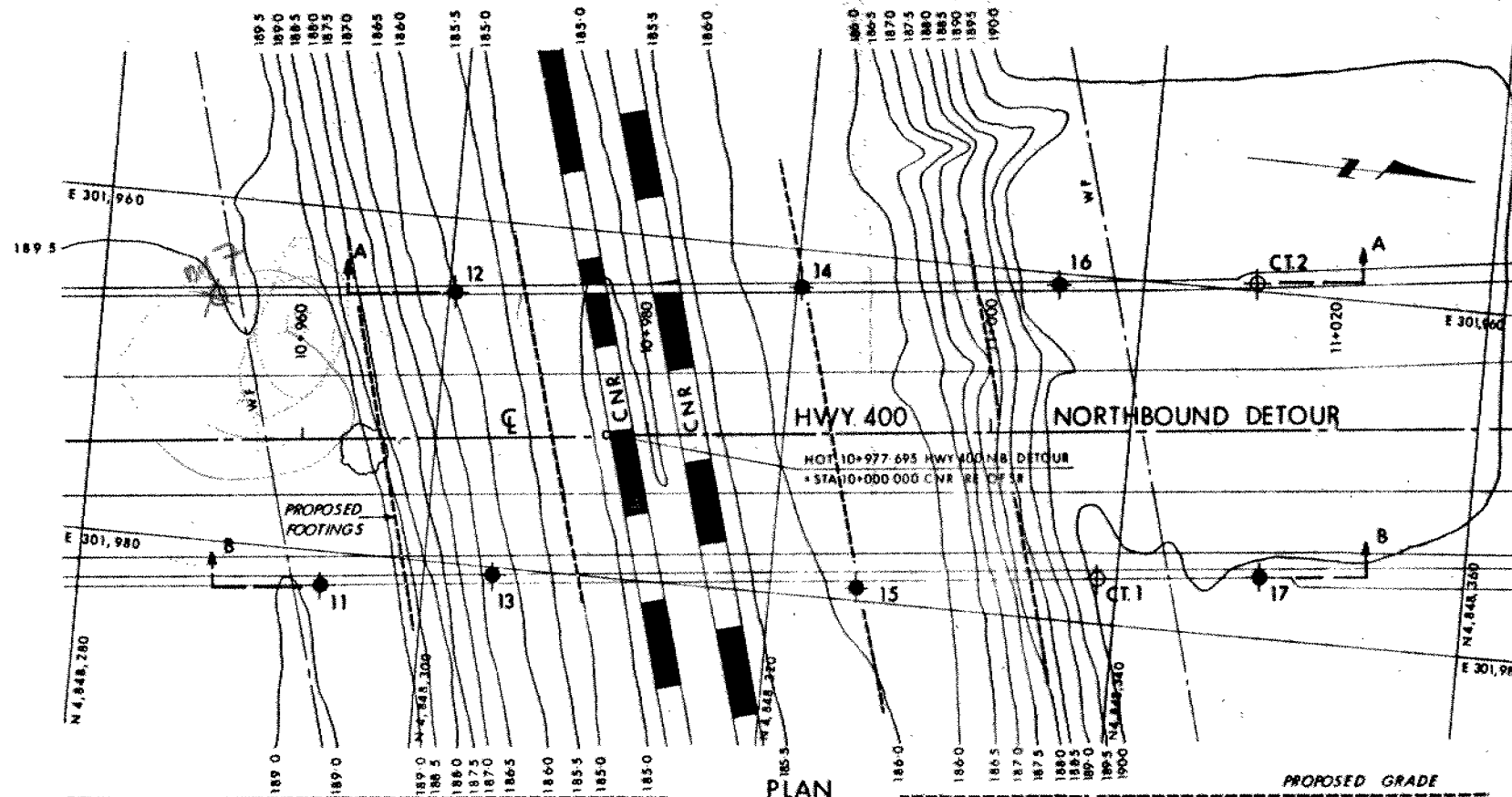
Ontario

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Transportation and
Communications

PLASTICITY CHART SILTY CLAY (Glacial Till)

FIG No 6

W P 88-78-29



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

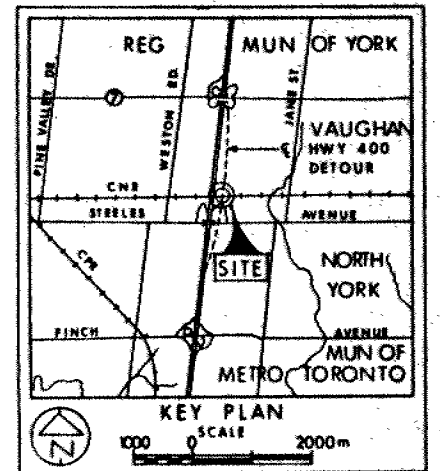
CONT No
WP No 88-78-29



GRADE SEPARATION AT CANADIAN
NATIONAL RAILWAY & HWY 400 DETOUR
BORE HOLE LOCATIONS & SOIL STRATA

SHEET

DOMINION SOIL INVESTIGATION INC.



LEGEND

- ◆ Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ◆ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- ✚ WL at time of investigation 1983 07
- ⊥ PIEZOMETER

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
11	189.2	4,848,294	301,982
12	185.8	4,848,300.4	301,964.3
13	185.9	4,848,304	301,980.5
14	185.7	4,848,320.4	301,962.2
15	185.8	4,848,325	301,979.4
16	189.6	4,848,335	301,960.6
17	189.7	4,848,348.2	301,976.6
CT1	189.8	4,848,339	301,977.4
CT2	189.1	4,848,346.6	301,959.6

SECTIONS
SCALE 0 5m

NOTE

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

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.



REV	DATE	BY	DESCRIPTION

Geocres No 30M13-60

HWY No 400 NORTHBOUND DETOUR DIST 6

SUBMIT IPL CHECKED IPL DATE 1983 07 13 SITE 37-73-1133

DRAWN F.L. CHECKED IPL APPROVED J. L. LESZKOWSKI DWG 887829-A

MINISTRY OF TRANSPORTATION

M I N U T E S O F M E E T I N G

Project: Hwy 400 N.B. Detour Structures
CNR O'Pass W.P. 88-78-29 Site 37-1133
Hwy 400 N.B. Detour
Over Ramp to Steeles Ave W.P. 88-78-30 Site 37-1132

Date: Friday, May 6, 1988 **Time:** 11:30 AM

Place: Foundation Section
Room 315, Central Building
MTO

Present: Mr. M. Devata, Foundation Design
Mr. T. Kim, Foundation Design
Mr. Dennis Wong, Structural Section

Purpose of Meeting:


To review and finalize bottom of excavation in area between CNR O'Pass and Hwy 400 N.B. Detour over the ramp to Steeles Ave.

Discussion and Decisions

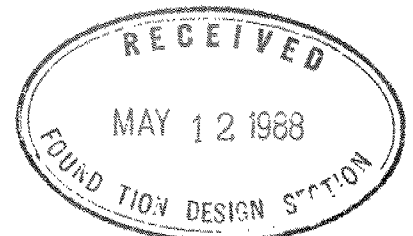
The soil data around this area was reviewed and it was decided that the bottom of excavation shall be stepped from 186.50 for the north abutment of the structure of the Hwy 400 N.B. Detour over the ramp to Steeles Ave E.W. to 185.00 for the CNR O'Pass. Dennis Wong was given the guidelines to work out the boundary. A proposed detail by Dennis Wong is attached with this minute.

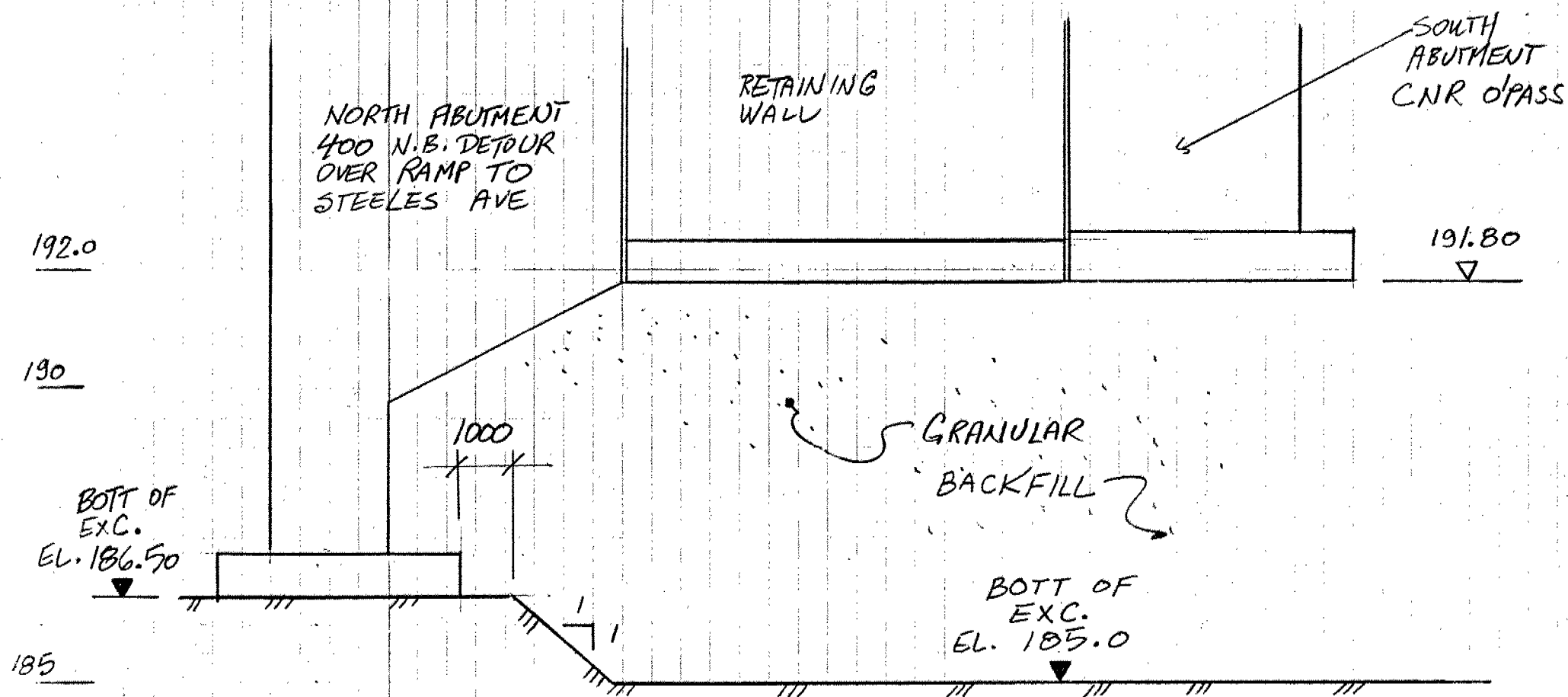
Minutes recorded by D. Wong. Please report any errors and omissions ASAP.

Minutes Prepared By:


Dennis Wong
Structural Engineer

Distribution:
Those Present
Mr. S.P. Setya, Greer Galloway & Assoc. Ltd.
Mr. W. Lachmaniuk, Giffels Assoc. Ltd.
Mr. G. Al-Bazi, Structural Office





LIMIT FOR EXCAVATION FOR FOUNDATIONS
BETWEEN CNR O'PASS & 400 N.B. DETOUR
OVER RAMP TO STEELES AVE E.W.

SCALE 1:100

memorandum



Tel: 3731

To: G. Al-Bazi
Design Engineer
Structural Office

Date: 1988 02 18

From: Foundation Design Section
Room 315, Central Building

RE: C.N.R. Overpass
Ramp 400S to 407 EW
W.P. 88-78-29, Hwy. 400
Site No. 37-1133

The submitted final drawings and provisions have been reviewed by this section.

As discussed in a meeting on December 8, 1987, a soldier pile/lagging cantilever system with a 500 mm diameter lean concrete encasement should be implemented below the base of excavation for the south abutment. All soldier piles in the vicinity of the foundation should be left in place cut off 1 m below the final grade, and covered with fill material to prevent long term softening of the subsoils as a result of pile extraction and water ingress into the resultant pile cavities.

All other recommendations contained within the Foundation Investigation Report are still applicable for structure design and construction purpose.

Taehee Kim
T.C. Kim, P. Eng.
Project Foundations Engineer

TCK/mmj

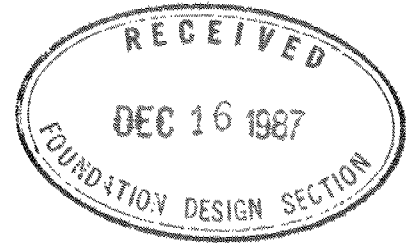
c.c. - K. Bassi
G.C.E. Burkhardt
A. Wittenberg

30 International Blvd.
Toronto (Rexdale), Ontario
Canada M9W 5P3

Telex 06-989215
Telephone
(416) 675-5950

Offices:
Toronto, Ottawa

WP 88-78-29



MINUTES OF MEETING

SUBJECT: Ministry of Transportation, Ontario
Project No. W8709303

DATE: Tuesday, December 8, 1987

PRESENT:

M.S. Devata	-	MTO
T.C. Kim	-	MTO
G. Al-Bazi	-	MTO
E.P. Brumfitt	-	Giffels
R.S. Stofko	-	Giffels

Discussion

Action By

1. The track protection for the south pier of the CNR Overpass, Ramp 400 S to 407 EW was discussed.
2. Mr. Devata recommended a soldier pile/lagging cantilever system with a 500 mm diameter lean concrete encasement below the base of excavation. Preliminary design calculations indicated that a 2.0 m pile embedment below the base of excavation (El. 184.00) would be adequate with a 6'-8' pile spacing. This however did not include the railway surcharge loading.
3. R. Stofko pointed out that the equivalent railway surcharge loading is 8' of fill.
4. The design criteria was discussed and agreed upon. See attached figure.
5. During augering and installation of piles, the minimum railway construction clearance would be infringed upon. A proposed scheme will be presented to CN Rail for comments.
6. Giffels will investigate the feasibility of reducing the width of the pier footing in order to move the track protection system further away from the tracks.

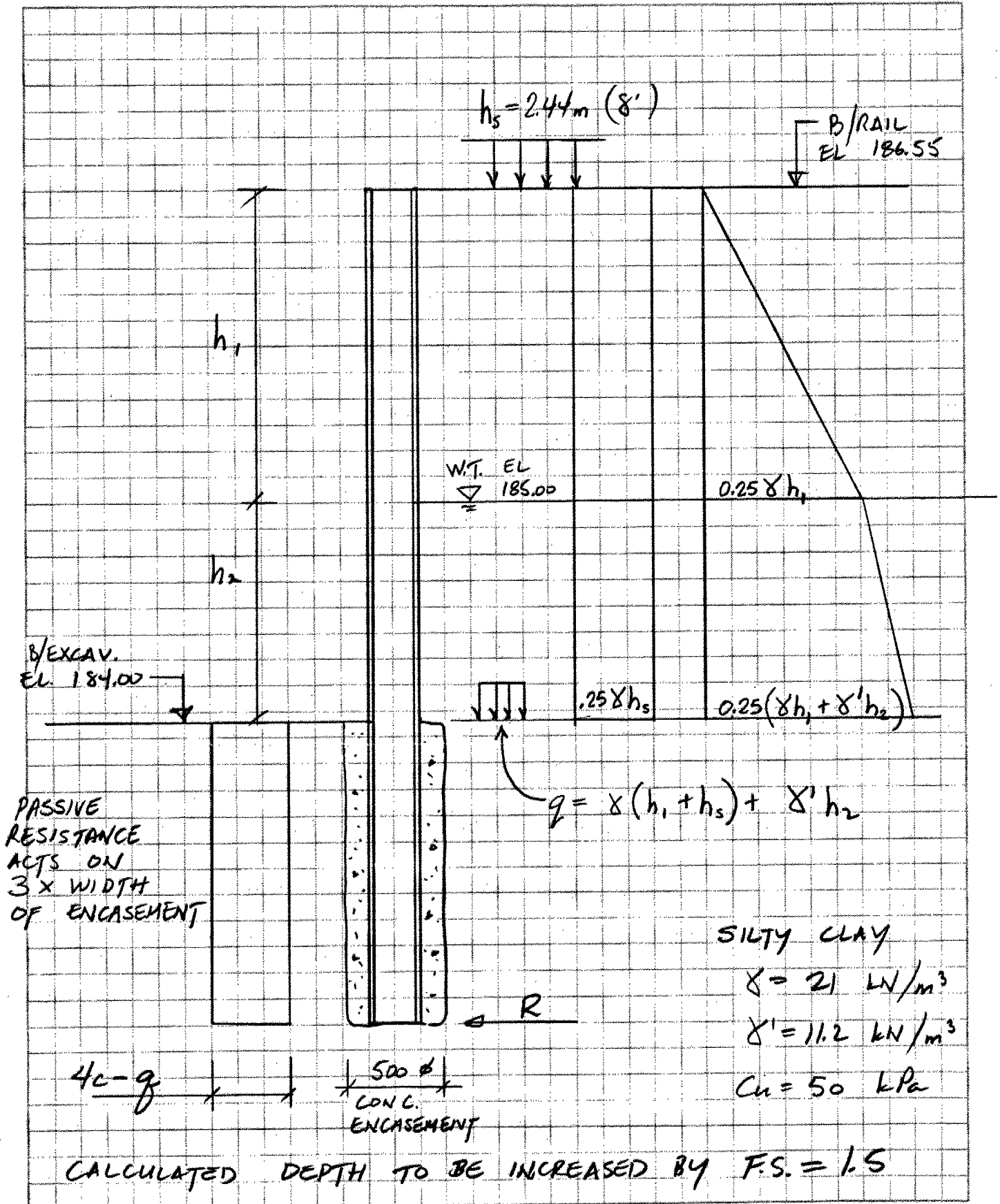
MTC

Giffels

RS:aw:Al61(119)

cc: M.S. Devata
G. Al-Bazi
E.P. Brumfitt
J. Cover
File

158



memorandum



To: K. Bassi
Head, Design Section
Structural Office
3501 Dufferin Street

Date: 1987 11 23

Atten: G. Al-Bazi, Design Engineer

From: Foundation Design Section
Room 315, Central Building

RE: C.N.R. Overpass
Ramp 400 S to 407 EW (400 Detour)
W.P. 88-78-29 Site 37-73-1133
District 6, Toronto

Further to your memorandum dated 87 10 15 and the telephone conversation between your G. Al-Bazi and our T. Kim, we have reviewed the preliminary Drawing No. Pl for the above-noted structure and provide the following comments:

- ✓ 1. To remove the topsoil, fill and the surficially weathered zones of the upper fill, excavation should be reached down to an elevation of 185.0 m for the south abutment and 187.5 m for the north abutment as shown on Drawing No. Pl.
- ✓ 2. The base of the Granular 'A' pad should be placed on the level ground surface as indicated on Drawing No. Pl.
- ✗ 3. It is not clear where the cross-section is taken from the plan (No Arrows).
- ✓ 4. On north abutment, horizontal distance between the front face of the concrete footing and the outer slope should be maintained at least 3000 mm as shown on a sketch of abutment on compact fill attached (existing distance is only 2.4 m).
- ✓ 5. A symbol of a slope at the north abutment should be deleted on the cross section.
- ✓ 6. The original ground surface for both abutments should be revised as shown on Drawing No. Pl.

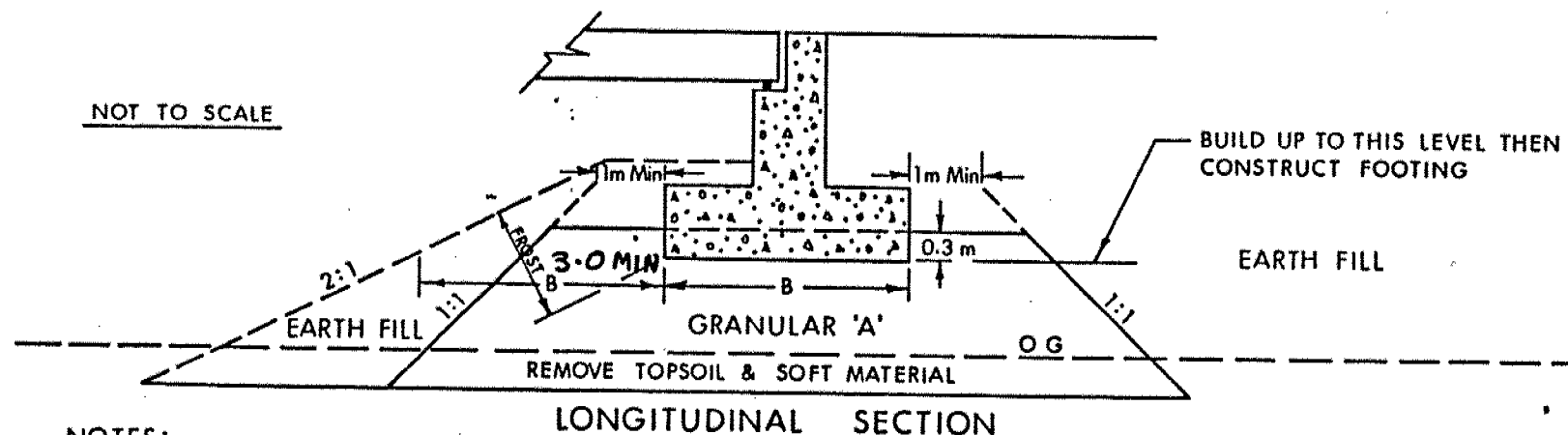
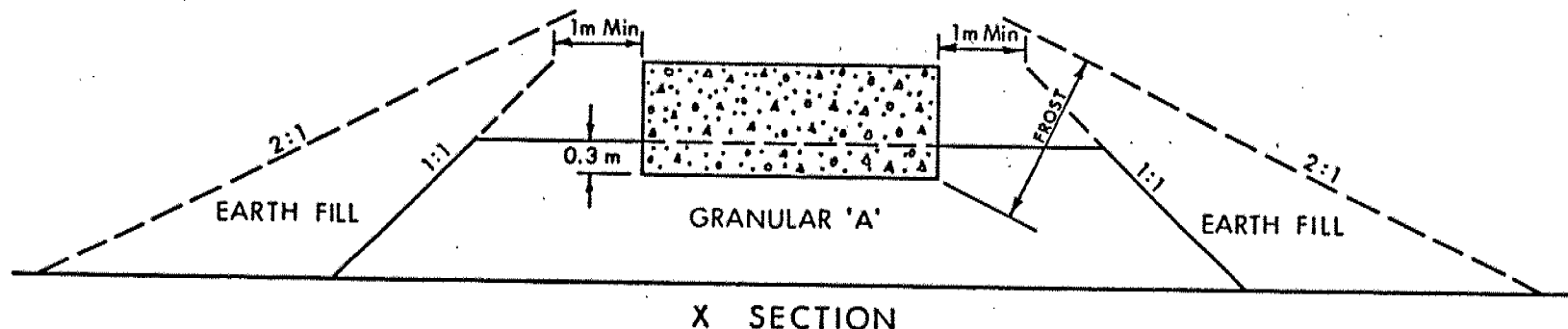
We believe that this memorandum meets with your present requirements. If you have any questions, please contact us.

Taeckul Kim

T.C. Kim, P. Eng.
Project Foundations Engineer

for

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



NOTES:

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.
- 2 - PLACE GRANULAR 'A' & EARTH FILL TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M T C STANDARDS.
- 3 - CONSTRUCT CONCRETE FOOTING.
- 4 - PLACE REMAINDER OF GRANULAR 'A' & EARTH FILL AS REQUIRED.

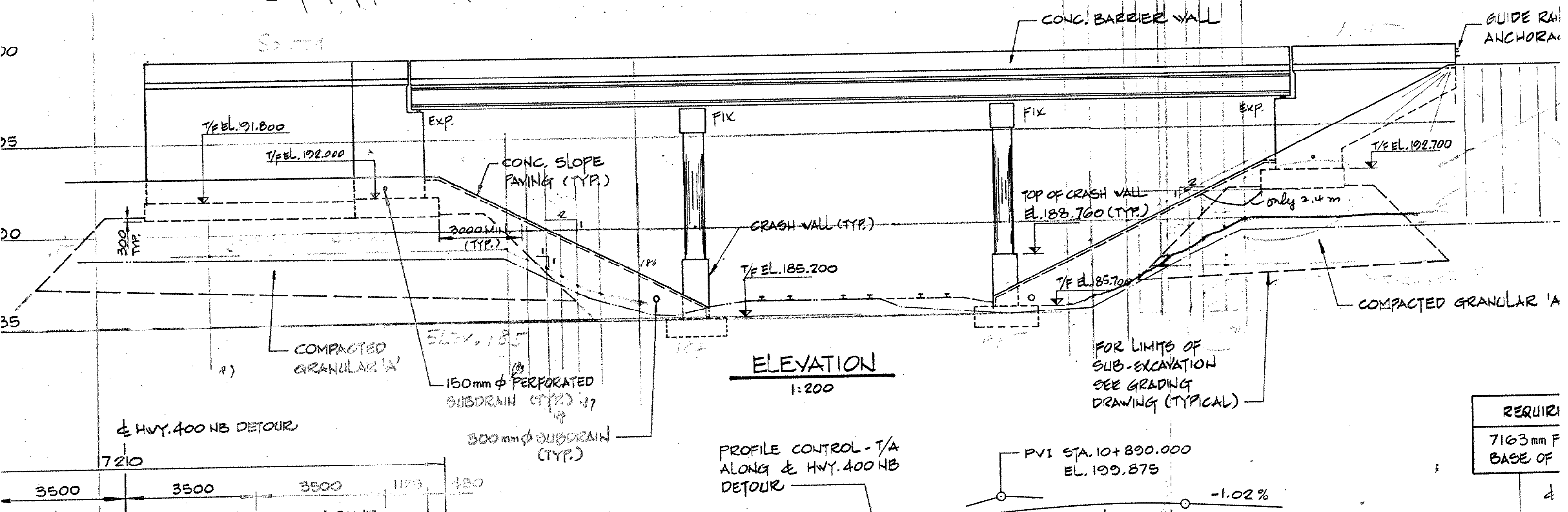
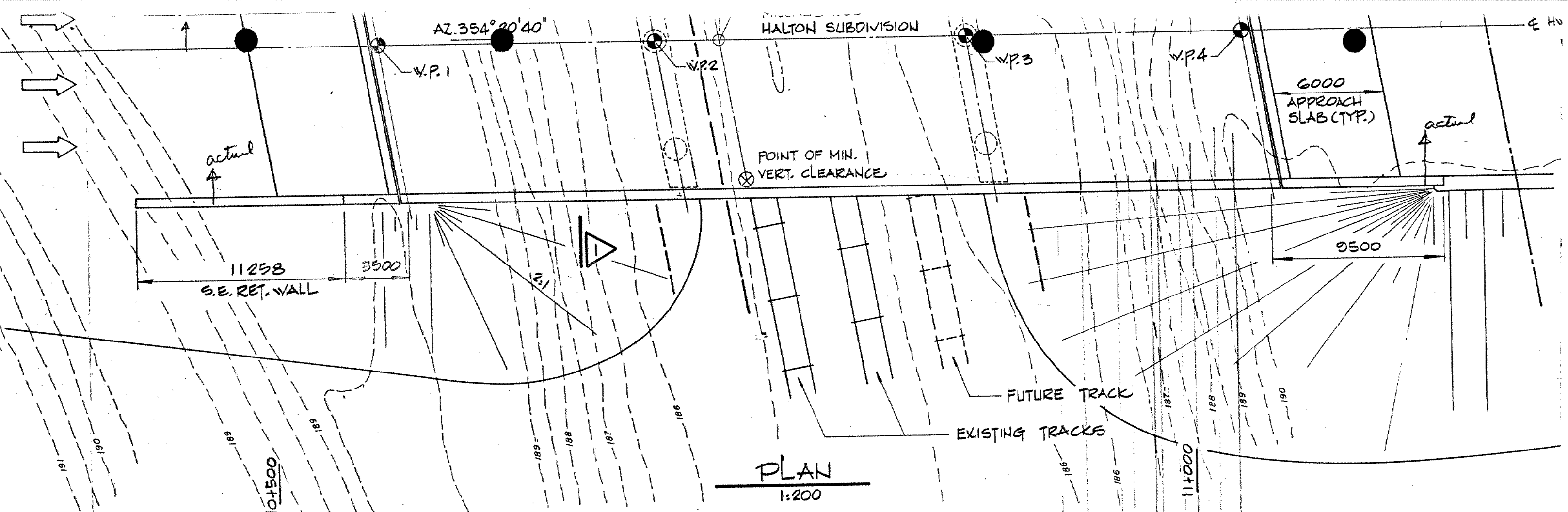


Ministry of
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Communications

ABUTMENT ON COMPACTED FILL
SHOWING GRANULAR 'A' CORE

FIG No

W P





Ontario

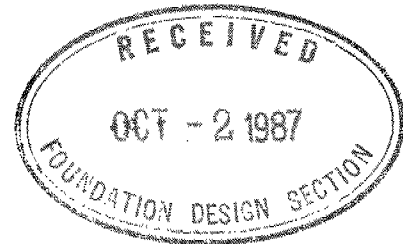
Tel: (416) 235-4959

Ministry of
Transportation and
Communications

Structural Office,
4th floor,
3501 Dufferin Street,
Downsview, Ontario.
M3K 1N6.

October 1st, 1987.

Mr. Ted Brumfitt, P. Eng.,
Manager - Bridge Engineering,
Giffels Associates Ltd.,
30 International Boulevard,
Rexdale, Ontario.
M9W 5P3.



Dear Sir:

Re: CNR Overpass - Ramp 400 S,
W.P. 88-78-29, Site 37-73-1133,
District 6.

Further to our telephone conversation of September 23, 1987 regarding the placement of compacted granular pad under the abutments footing, the following has been recommended by Mr. Murty Devata.

1. Remove the topsoil, fill and the surficially weathered zones of the upper fill.
2. The granular pad including the earth fill in front of the abutment footing should be 3.0 m minimum.
3. The footing should be anchored 300 mm into the pad.
4. The bearing capacity at Ultimate Limit States is 800 KPa and at Serviceability Limit States is 340 KPa.
5. A sketch of abutment on compacted fill is attached for your information.

Yours truly,

G. Al-Bazi,
Design Engineer.

GAB/cf
attch.

c.c. M. Devata
R. Jeffries

memorandum



To: Mr. W.L. Lin
Design Engineer (Central)
Structural Office

Date: 84 07 25

From: Foundation Design Section
Room 315, Central Building

RE: CNR Overpass
Ramp 400S to 407 E.W.
W.P. 88-78-29, Site 37-73-1123
District 6, Toronto

We have reviewed preliminary drawings P1-1 and P1-2 for the noted structure and provide the following comments:

- 1) The Foundation Report did not recommend granular 'A' cores for the abutments, however, this is an acceptable alternative. Recommended design loads are 350 kPa at S.L.S. Type II, and 900 kPa at U.L.S.
- 2) The 1:1 slope for the granular 'A' core should be shown on the elevation of drawing P1-1.
- 3) The granular 'A' core should be extended 0.3 m above the base of the abutment footings according to current practice (copy attached).

A handwritten signature in cursive script, appearing to read "B.E. Ruck".

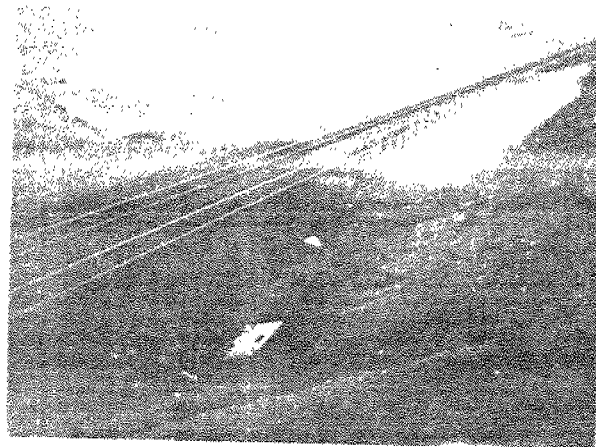
B.E. Ruck
Project Foundations Engineer

for

M.S. Devata
Chief Foundations Engineer
(East)

BER/MD/mb

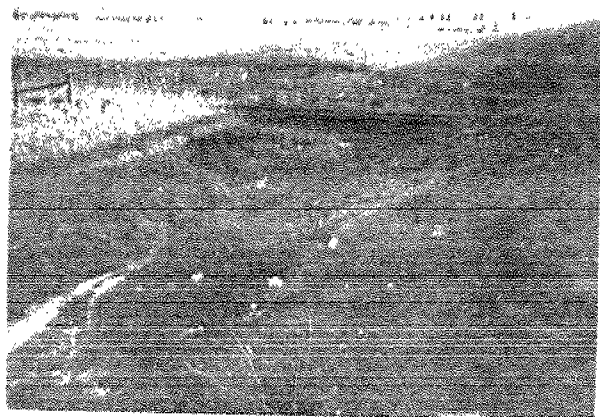
C.N.R. O'HEAD
RAMP 400S - 407 E-W
SITE 37-73-1133, W.P. 88-7-29
HIGHWAY 400, DISTRICT 6, TORONTO



LOOKING EAST ALONG C.N.R. FROM
HIGHWAY 400/C.N.R. O'PASS



LOOKING NORTH ALONG PROPOSED
RAMP 400S - 407 E-W, TOWARDS
C.N.R.



LOOKING SOUTH ALONG PROPOSED
RAMP 400S - 407 E-W, TOWARDS
C.N.R.