

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-77

DIST. 6 REGION Central

W.P. No. 127-66-45

CONT. No. 76-120

W. O. No. 73-11064

STR. SITE No.

HWY. No.

LOCATION Proposed Structure at the  
Crossing of Ramp E-N Over  
Heart Lake Rd., Bridge #53

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 4

REMARKS: documents to be unfolded  
before microfilming

# FOUNDATION INVESTIGATION REPORT

For

Ramp E-N Over Heart Lake Road

Bridge #53

District #6, Toronto

W.P. 127-66-45, Site No. 24-332

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## INTRODUCTION

This report contains results of a foundation investigation carried out at the above mentioned project site. The field work was carried out during the period of August 7th to August 10th, 1973, utilizing diamond drilling equipment. It consisted of four sampled boreholes, each accompanied with a dynamic cone penetration test.

## SITE DESCRIPTION AND GEOLOGY

The site is located about one mile east of the existing Hwy. 401 and Hwy. 10 interchange in the City of Mississauga.

Topographically, the general area is flat to gently undulating. The land is utilized for farming purposes.

Physiographically, the site is located in the region referred to as the "Peel Plain". Across this plain rivers and streams have cut deep valleys and consequently there are no large undrained depressions, swamps, or bogs, although in many of the interstream areas the drainage is imperfect.

The characteristic geological material of this region is a glacial till containing large amounts of fragments of shale and limestone. The overburden is underlain by dark grey shale bedrock of the Meaford-Dundas Formation.

## SUBSURFACE CONDITIONS

### General

Subsoil at the site consists of a relatively shallow deposit ranging in thickness from 5 to 9 feet of glacial till which is a heterogeneous mixture of clayey silt, sand and gravel, followed by shale bedrock.

Description of the various soil types encountered in each borehole are shown on the Record of Borehole Sheets, together with a summary of field and laboratory tests performed on samples. The inferred subsoil stratigraphy, together with the locations and elevations of all the borings, is shown on Drawing No. 24-332-2 of the Contract Drawings.

From the ground level downward the various strata are described in some detail with regard to soil types and physical properties as follows:

Heterogeneous Mixture of Clayey Silt, Sand and Gravel  
(Glacial Till)

This deposit was encountered in all borings. It extends from immediately below a thin layer of topsoil or fill material down to the bedrock surface. The composition of the fill material where found is similar to that of the glacial till which is a heterogeneous mixture of clayey silt, sand and gravel. The thickness of this deposit ranges from 5 to 9 feet. A thin transition zone (1 to 1.5 feet thick), which is a mixture of glacial till and weathered shale, exists at the bottom of this deposit.

Laboratory tests carried out on a limited number of samples indicate the following physical properties:

	<u>Min.</u>		<u>Max.</u>	<u>Average</u>
Natural Moisture Content (W) %	13	-	17	15
Liquid Limit ( $W_L$ ) %	30	-	35	33
Plastic Limit ( $W_p$ ) %	19	-	22	21

The Atterbert Limit test results, given in the table, are also summarized on the Plasticity Chart, Figure No. 2. The testing indicates that the cohesive soil is inorganic with the plasticity in the low range.

Grain size distribution curves are included in the Appendix of this report (Figure No. 1).

Standard Penetration Tests carried out within this cohesive deposit gave 'N' values ranging from 21 blows per foot to 76 blows per foot. The consistency of the overall deposit is estimated to range from very stiff to hard.

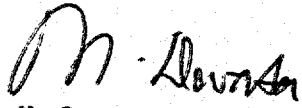
### Bedrock - Shale With Occasional Limestone Layers

The glacial till deposit is underlain by a shale bedrock at all of the boring locations. The surface of the bedrock varies between elevation 559 and elevation 561. The upper 1 to 3.5 feet of the bedrock appeared to be in a weathered condition; below this depth it is considered to be sound.

The bedrock is composed of dark grey shale interbedded with occasional layers of limestone.

### GROUNDWATER CONDITIONS

Water level observations were carried out in the open boreholes during the period of the field investigation, August, 1973. The results indicate that the groundwater level varies between elevation 562 and elevation 565 which corresponds to levels ranging from 3 to 5 feet below the existing ground surface.

  
M. Devata, P. Eng.  
Supervising Engineer



MD/gs  
December, 1976

## ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 1

WP 127-66-45

LOCATION Or-ordin. N.15,857,852; E.959,083

ORIGINATED BY CP

DIST 6 HWY 401 &amp; 403

BORING DATE August 7 &amp; 8, 1973

COMPILED BY JB

DATUM Geodetic

BOREHOLE TYPE Diamond Drill &amp; Cone Test

CHECKED BY *W*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
566.8	Ground Level															
0.0	Het. mix. of clayey silt & sand & gravel (Glacial Till) Grey		1	SS	28											3 19 46 32
560.8	Very Stiff to Hard		2	SS	76											
559.3	Transition Zone		3	SS	61											
7.5	Weathered Sound		4	SS	75											
	Shale bedrock with interbedded layers of limestone. Dark Grey		5	RC	67%											
550.0			6	RC	87%											
16.8	End of Borehole															

20  
15  $\pm$  5 % STRAIN AT FAILURE  
10

## ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 2

WP 125-66-45

LOCATION Co-ords. N.15,857,875 E.959,056

ORIGINATED BY CP

DIST 6 HWY 401 &amp; 403

BORING DATE August 8 &amp; 9, 1973

COMPILED BY JR

DATUM Geodetic

BOREHOLE TYPE Diamond Drill &amp; Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE FLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	W VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
566.8	Ground Level															
0.0	Het. mix. of clayey silt sand & gravel (glacial till)		1	SS	23											
	Very Stiff to Hard		2	SS	34											
559.3	Transition Zone		3	SS	51											
9.5	Weathered		4	SS	100											
	Sound		5	RC	50											
551.9	Shale bedrock with interbedded limestone layers. Dark Brown		6	RC	99%											
14.9	End of Borehole															

20  
15  $\phi$  5 % STRAIN AT FAILURE  
10

## ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 3

WP 127-66-45

LOCATION Co-ords. N.15,857,768 E.959,015

ORIGINATED BY CP

DIST 6 HWY 401 &amp; 403

BORING DATE August 9-10, 1973

COMPILED BY JB

DATUM Geodetic

BOREHOLE TYPE Diamond Drill &amp; Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$	
567.8	Ground Level														
564.8	Fill material - clayey silt with sa. & grav.		1	SS	60										GR SA SI CL
3.0	Net. mix. of clayey silt & grav. (glacial till). Grey. Hard		2	SS	32										5 5 60 30
559.8	Transition Zone		3	SS	39										
8.0	Weathered Sound Shale bedrock with occ. interbedded limestone layers. Dark grey		4	SS	102										
553.8			5	RC	722										
14.0	End of Borehole		6	RC	922										
						550									

20  
15  $\phi$  5 % STRAIN AT FAILURE  
10

## ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE NO 4

WP 127-66-45

LOCATION Co-ords. N.15,857,825 E.958,992

ORIGINATED BY JB

DIST 6 HWY 401 &amp; 403

BORING DATE August 10, 1973

COMPILED BY JB

DATUM Geodetic

BOREHOLE TYPE Diamond Drill &amp; Cone Test

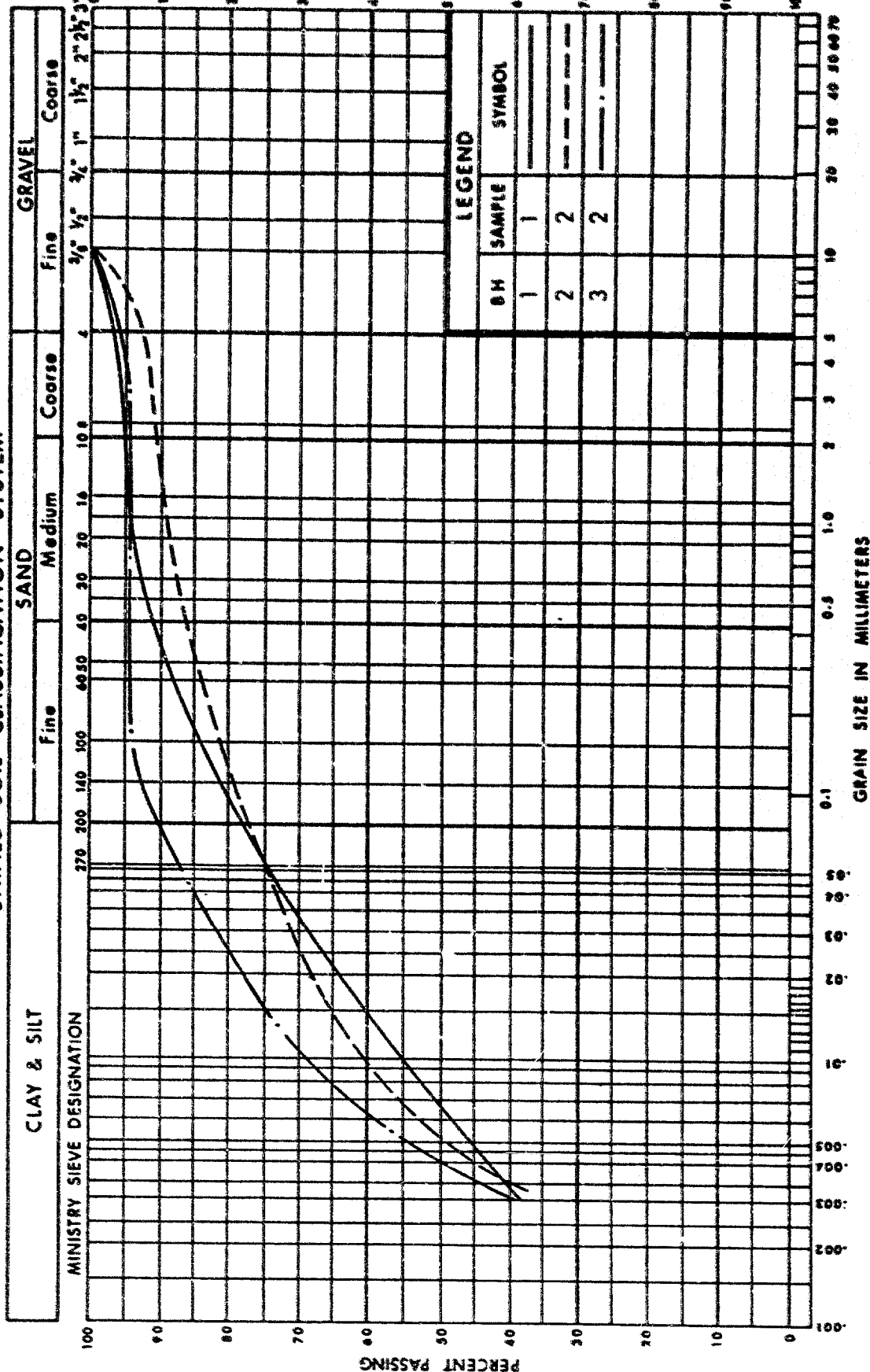
CHECKED BY *JB*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
569.5	Ground Level															
0.0	Net. mix. of clayey silt, sand and gravel (glacial till) Very Stiff to Hard Grey		1	SS	21											
			2	SS	35											
			3	SS	35											
561.0	Transition Zone		4	SS	100/3"											
8.5	Weathered		5	RC	50%	560										
	Sound Shale bedrock with occ. interbedded layers of limestone. Dark Grey		6	RC	94%											
552.6																
16.9	End of Borehole					550										

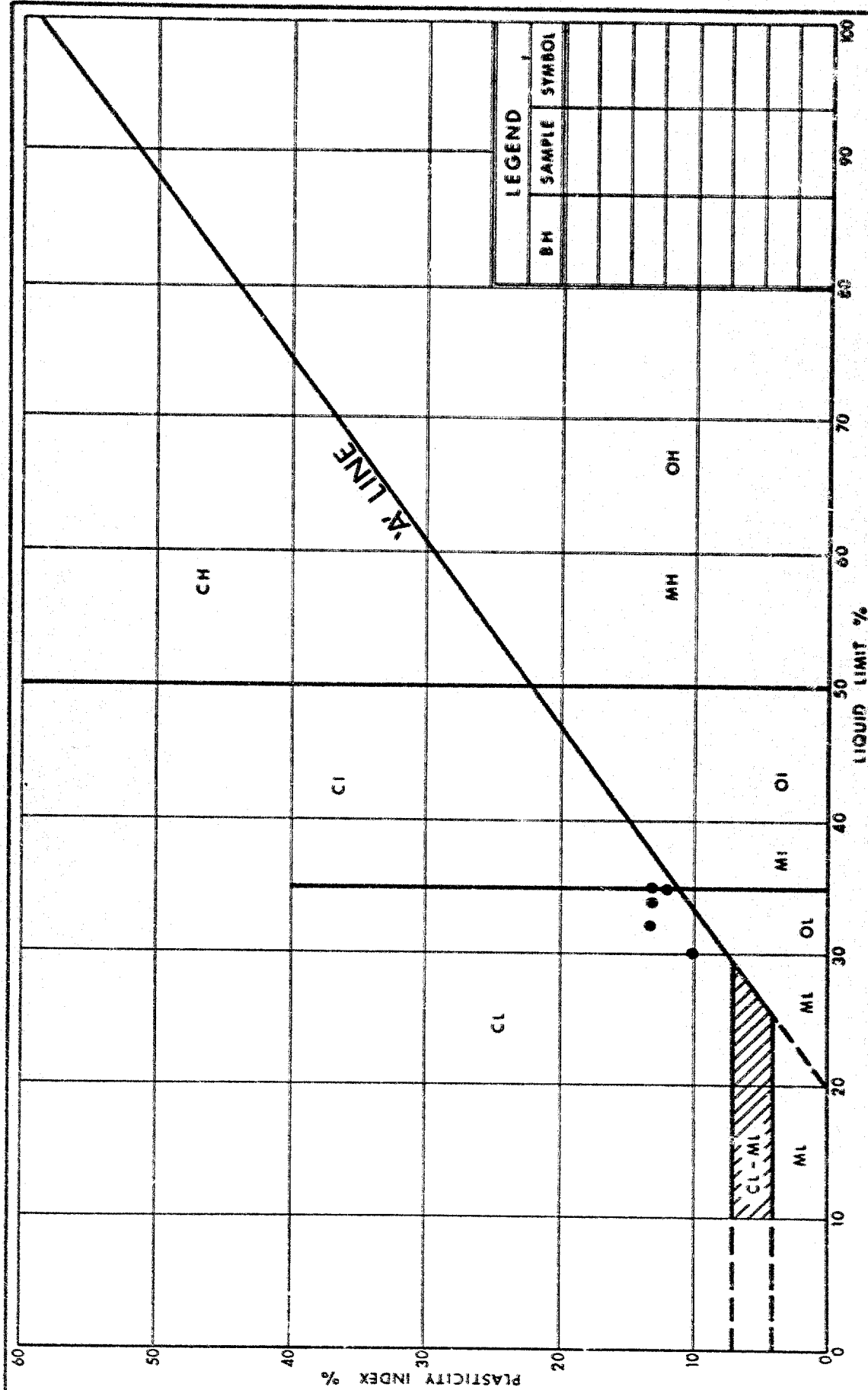
20  
15  $\diamond$  5 % STRAIN AT FAILURE  
10



# UNIFIED SOIL CLASSIFICATION SYSTEM



**GRAIN SIZE DISTRIBUTION**  
**GLACIAL TILL**  
 HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL



FOUNDATION INVESTIGATION REPORT  
For  
The Proposed Structure at the  
Crossing of Ramp E-N  
Over Heart Lake Rd. (Bridge #53)  
Town of Mississauga, County of Peel  
District No. 6 (Toronto)  
Site No. 24-332  
W.O. 73-11064 -- W.P. 127-66-45

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1. INTRODUCTION:

The present proposals for the construction programme of Hwy 401 - Hwy. 403 complex will require a major interchange in the vicinity of the intersection of Hwy. 401 and Heart Lake Road. This interchange, designated as 401/410/403 complex, will incorporate some twenty-one structures.

A request for a foundation investigation at the site of the proposed Bridge No. 53 (Ramp E-N over Heart Lake Road) was received from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, in a memorandum dated July 30, 1973.

Following this request a field investigation was carried out by the Foundations Office to determine the subsoil, bedrock and groundwater conditions existing at the site.

This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and the stability of the approach fills and cuts.

## 2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site of the proposed structure is located about one mile east of the existing Hwy. 401 and Hwy. 10 interchange, in the Town of Mississauga.

Topographically, the general area is flat to gently undulating. The land is utilized for farming purposes.

Physiographically, the site is located in the region referred to as the "Peel Plain". Across this plain rivers and streams have cut deep valleys and consequently there are no large undrained depressions, swamps, or bogs, although in many of the interstream areas the drainage is imperfect.

The characteristic geological material of this region is a glacial till containing large amounts of shale and limestone. The overburden is underlain by dark grey shale bedrock of the Meaford-Dundas Formation.

## 3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of four sampled boreholes, each accompanied with a dynamic cone penetration test was carried out during the course of the field work. Boring was achieved by means of a conventional diamond drilling equipment adapted for soil sampling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler; the energy used in driving it conformed to the requirements of the Standard Penetration Test (SPT).

The bedrock proven at all borehole locations using BXL rock coring equipment.

All boreholes were surveyed in the field by District No. 6 (Toronto), Construction Personnel. The locations referenced to a co-ordinate system and elevations referenced to Geodetic Datum and are shown on Drawing No. 73-11064A which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory.

#### 4. SOIL TYPES AND SOIL CONDITIONS:

##### 4.1) General:

Generally uniform subsoil conditions were found to prevail over the site area. The subsoil consists of a relatively shallow deposit ranging in thickness from 5 to 85 feet of glacial till which is a heterogeneous mixture of clayey silt, sand and gravel, followed by shale bedrock.

The boundaries of the different deposits are shown on the Record of Borehole sheets contained in the Appendix. The estimated stratigraphical profile of Drawing No. 73-11064A is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil types and physical properties as follows:

##### 4.2) Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till):

This deposit was encountered in all borings. It extends from immediately below a thin layer of topsoil or fill material (B.H. #3) down to the bedrock surface. The composition of the fill material as found in B.H. #3, is similar to that of the glacial till which is a heterogeneous mixture of clayey silt, sand and gravel. The thickness of this deposit ranges from 5 (B.H. #3) to 8.5 (B.H. #4) feet. A thin transition zone (1 to 1.5 feet thick), which is a mixture of glacial till and weathered shale, exists at the bottom of this deposit.

Laboratory tests carried out on a limited number of samples indicate the following physical properties:

	<u>Min.-Max.</u>	<u>Average</u>
Natural Moisture Content (W) %	13 - 17	15
Liquid Limit ( $W_L$ ) %	30 - 35	33
Plastic Limit ( $W_p$ ) %	19 - 29	23

The atterberg limit test results, given in the table,

are also summarized on the Plasticity Chart, Figure No. 2. The testing indicates that the cohesive soil is inorganic with the plasticity in the low range.

Grain-size distribution curves are included in the Appendix of this report (Figure No. 1).

Standard Penetration Tests carried out within this cohesive deposit gave 'N' values ranging from 21 blows per foot to 76 blows per foot. The consistency of the overall deposit is estimated to range from very stiff to hard.

#### 4.3) Bedrock - Shale With Occasional Limestone Layers:

The glacial till deposit is underlain by a shale bedrock at all of the boring locations. The surface of the bedrock varies between elevation 559 (Borehole #1) and elevation 561 (Borehole #4).

The core recovery ranged from 50% to 99% at the borehole locations. Based on the core recovery and inspection of the core samples the upper 1 to 3.5 feet of the bedrock appeared to be in a weathered condition.

The bedrock is composed of dark grey shale interbedded with occasional layers of limestone.

### 5. GROUNDWATER CONDITIONS:

Groundwater level observations were carried out during the period of the field investigation July 1973, open boreholes. The observed water levels are presented on the individual Record of Borehole sheets as well as on Drawing No. 73-11064A. The results indicate that the groundwater level varies between elevation 562 and elevation 564 which correspond to levels ranging from 3 to 5 feet below the existing ground surface.

### 6. DISCUSSION AND RECOMMENDATIONS:

#### 6.1) General:

It is proposed to construct a single span (80') structure (Bridge No. 53) to carry Ramp E-N over the reconstructed Heart

Lake Road. Bridge No. 53 will be part of the proposed Hwy. 401 and Hwy. 403 interchange complex.

The proposed profile grade of the Heart Lake Road in the vicinity of the structure will be at approximate elevation 550, whereas that of Ramp E-N will be at elevation 586. The existing ground surface ranges from elevation 566 to elevation 570; however, the existing Heart Lake Road embankment is up to 22 feet above the surrounding terrain. In order to accommodate these grades fills up to 22 feet and cuts up to 17 ft. will be required.

As described in the previous paragraphs of this report, the subsoil at the site consists of a relatively shallow deposit (5 - 8.5 feet) of glacial till followed by shale bedrock.

#### 6.2) Abutment Foundations:

The excavation for the reconstructed Heart Lake Road in the vicinity of the abutment locations will be carried out into the shale bedrock.

The footings of the proposed abutments may be founded on the sound bedrock. A minimum of 4 ft. of earth cover should be provided for the underside of the footings, since the shale is considered susceptible to frost action. To prevent the shale from being softened by uncontrolled surface runoff water at foundation level it may be advantageous that a concrete working slab be poured immediately after the excavation reached the required foundation level. If these procedures are followed, safe design loads up to 10 t.s.f. may be used for design purposes.

A coefficient of friction of 1.0 between the rough concrete surface and sound shale may be assumed in order to compute the horizontal resistance of the footings.

The settlement of the footings will be negligible in magnitude.

The level of the groundwater in the overburden as established during the field investigation is well above the footing excavation bases. This condition, however, should not

present any major dewatering problems, due to the relatively impervious nature of the subsoil. Any seepage into the excavations could be easily handled by employing conventional techniques, such as pumping from sumps.

If the structure is designed as a rigid frame, then a coefficient of earth pressure at rest ( $K_0$ ) of 0.5 should be assumed for the granular fill behind the wall, when designing the abutment walls. However, if some movement of the top of the wall is permitted, then a coefficient of active earth pressure ( $K_a$ ) of 0.33 can be used.

In order to relieve the buildup of excess hydrostatic pressure behind the abutment walls, drainage measures in accordance with current M.T.C. Standards should be provided.

### 6.3) Approaches:

As described previously the approaches will consist of partial fill and cut sections. The maximum fill height is about 22 ft. and the deepest portion of the cut is in the order of 17 ft.

#### 6.3.1) Fills:

The underlying subsoil (Glacial Till) is competent to support the proposed 22 ft. high embankment constructed with 2:1 forward and side slopes.

The settlement due to consolidation of the subsoil caused by embankment loading will be negligible in magnitude and it is assumed that major portion of the settlement will take place immediately following the completion of the fill placement.

The fill should consist of well compacted acceptable material.

The topsoil and any soft surficial material should be removed in accordance with the pertinent standards within the construction area.

#### 6.3.2) Cuts:

The cuts for Heart Lake Road, up to 17 ft. deep will be



made through the glacial till and into the shale bedrock. Since the shale when it is exposed to air, frost action and weathering tends to erode and disintegrate quickly, should be treated as earth cut.

It is recommended, therefore, that the cut slopes be protected with an adequate cover of topsoil and sodded.

7. MISCELLANEOUS:

The field investigation was carried out during the period of August 7 to August 10, 1973, under the supervision of Mr. C. S. Poon and Mr. J. Bangs, Project Foundations Engineers.

Equipment was owned and operated by Canadian Longyear Limited.

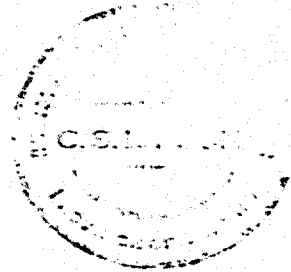
This report was written by Mr. C. S. Poon, Project Foundations Engineer.

The entire project was under the general supervision of Mr. M. Devata, Supervising Foundations Engineer, who also reviewed this report.

  
C. S. Poon, P. Eng.

  
M. Devata, P. Eng.

CSP/ao  
Nov. 2, 1973.



DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 1

JOB 73-11064 LOCATION Co-ords. 15,557,852 N; 959,083 E.  
 W.P. 127-66-45 BORING DATE August 7 & 8, 1973  
 DATUM Geodetic BOREHOLE TYPE Diamond Drill

ORIGINATED BY CP  
 COMPILED BY JF  
 CHECKED BY JK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		PLASTIC LIMIT			
							20	40	60	80		
							SHEAR STRENGTH P.S.F.		WATER CONTENT %		P.C.F.	GR SA SI CL
							○ UNCONFINED      + FIELD VANE		W <sub>p</sub> ——— W <sub>L</sub>		Y	
							● QUICK TRIAXIAL      × LAB VANE		W <sub>p</sub> ——— W <sub>L</sub>			
566.8	Ground level									10 20 30 40		
0.0	Het. Mix. of clayey silt, sand & gravel		1	SS	28					0 ———		3 19 46 32
560.8	Glacial till Grey		2	SS	74							562.3
559.3	very stiff to hard		3	SS	61							
559.3	Transition zone		4	SS	33							
7.5	Weathered		5	RC	67							
9.0	sound		6	RC	87							
550.0	Shale bedrock with interbedded layers of limestone											
16.8	Dark grey											
	End Borehole											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE NO 2

JOB 73-11064 LOCATION Co-ords. 15,857,875 N; 959,056 E.  
 W.P. 127-66-45 BORING DATE August 8 & 9, 1973  
 DATUM Geodetic BOREHOLE TYPE Diamond Drill

ORIGINATED BY CP  
 COMPILED BY JB  
 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT $w_L$			BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	20	40	60	80	100	PLASTIC LIMIT $w_p$	WATER CONTENT $w$		
566.8	Ground level															
0.0	Heterogeneous Mixture of clayey silt, sand and gravel (glacial till) very stiff to hard		1	SS	23											
			2	SS	24											
559.3	Transition zone		3	SS	51											
7.5	Weathered		4	RC	50%											
9.6	Shale bedrock with interbedded limestone layers		5	RC	50%											
551.9	Dark brown sand		6	RC	99%											
14.9	End of borehole															

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

# RECORD OF BOREHOLE N°3

JOB 73-11064

LOCATION Co-ords. 15,857,788 N; 959,015E

ORIGINATED BY CP

W.P. 127-66-15

BORING DATE August 9-10, 1973

COMPILED BY TB

DATUM Geodetic

BOREHOLE TYPE Diamond Drill

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$			BULK DENSITY	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT — $w_p$						
							20 40 60 80 100					WATER CONTENT — $w$						
							SHEAR STRENGTH P.S.F.					$w_p$ — $w$ — $w_L$						
						○ UNCONFINED + FIELD VANE					WATER CONTENT %			Y	P.C.F.	GR. S.A. SI. C.		
						● QUICK TRIAXIAL x LAB VANE					20 30 40							
567.8	Ground level																	
0.0	Fill Material-clayey silt with sa. & grav.		1	SS	100.74	560												
564.8			2	SS	32													
3.0	Het. Mix. of clayey sil. sand & grav. Plac- ial till grey hard		3	SS	30													
560.8	Transition zone		4	SS	110.3													
8.0	Weathered sound		5	RC	72%													
9.0	Shale bedrock with occ. interbedded lime- stone layers D. Grey		6	RC	92%													
553.8																		
14.0	End of Borehole																	
						550												

DESIGN SERVICES BRANCH

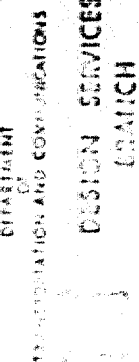
FOUNDATIONS OFFICE

## RECORD OF BOREHOLE NO 4

JOB 73-1106L LOCATION Co-ords. 15,857,825 N; 958,992 E.  
 W.P. 127-66-1.5 BORING DATE August 10, 1973  
 DATUM Geodetic BOREHOLE TYPE Diamond Drill

ORIGINATED BY JP  
 COMPILED BY JP  
 CHECKED BY OK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$			BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	$W_P$	$W$	$W_L$		
569.5	Ground level															
0.0	Ret. mix. of clayey silt, sand, and gravel (Glacial till) very stiff to hard		1	SS	27											
			2	SS	35											
			3	SS	45											
561.0	Transition zone		4	SS	117											
8.5	Weathered		5	RC	50%	560										
	Shale bedrock with sound opp. inter. layers of limestone dark grey		6	RC	91%											
552.6																
16.9	End of Borehole					550										



# GRAIN SIZE DISTRIBUTION

# GLACIAL TILL

HET. MIX OF CLAYEY SILT, SAND & GRAVEL

U.P. No. 127-66-45

JCS No. 73-1064

**FIG. 1**

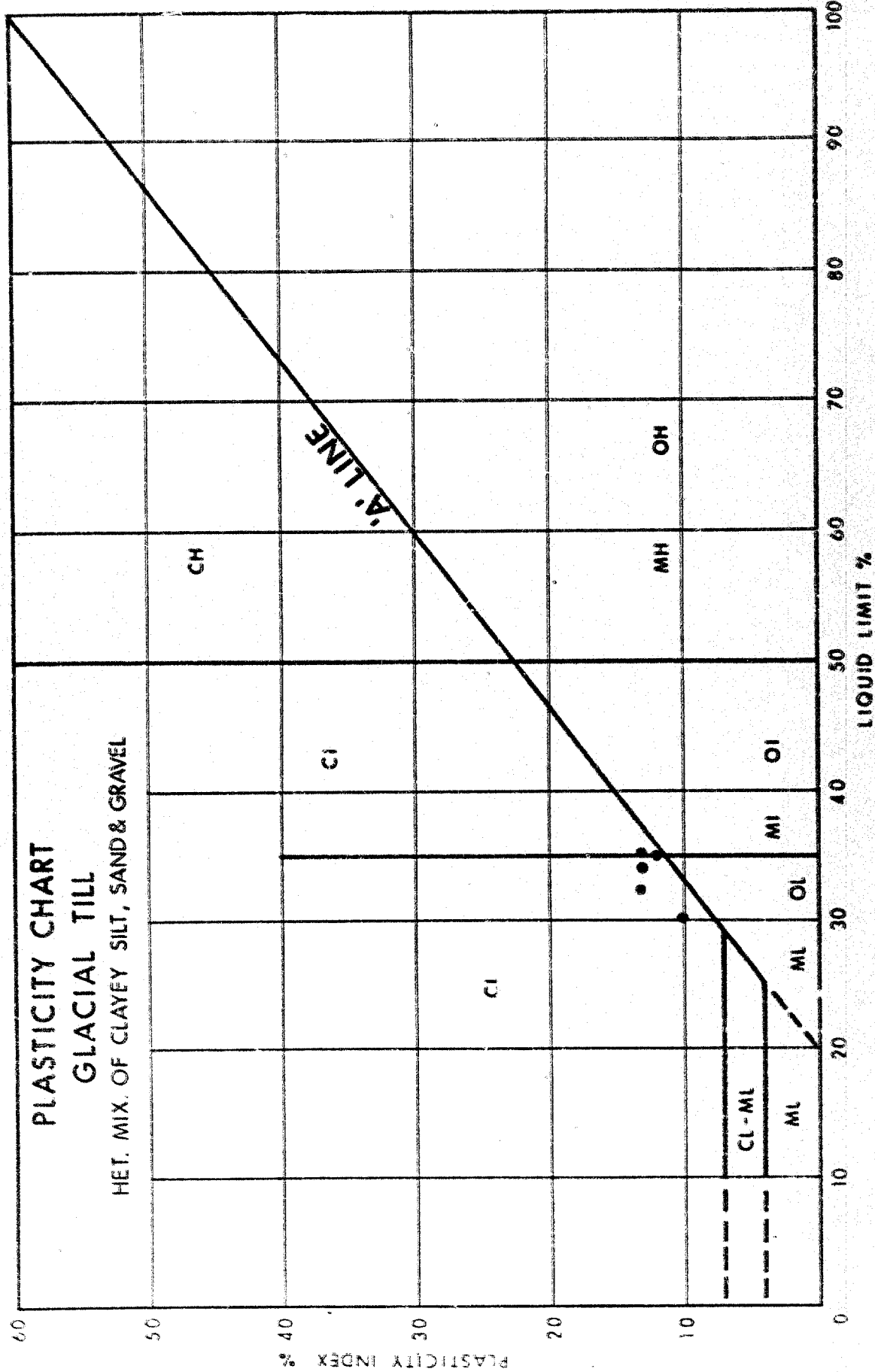
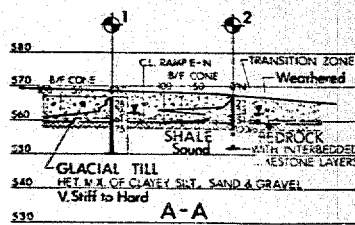
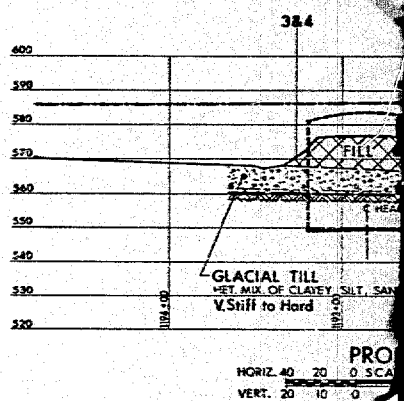
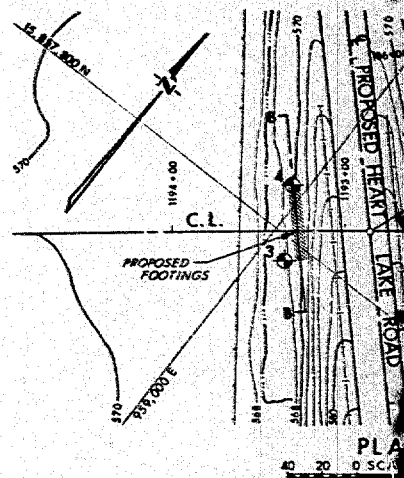
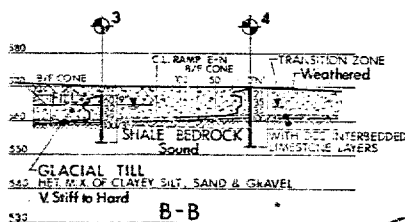
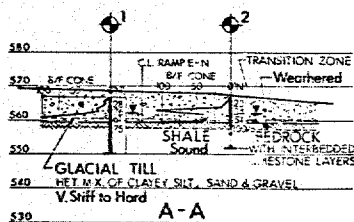
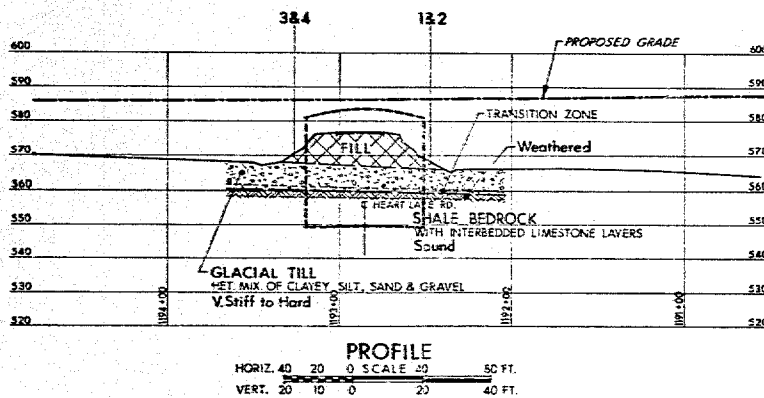
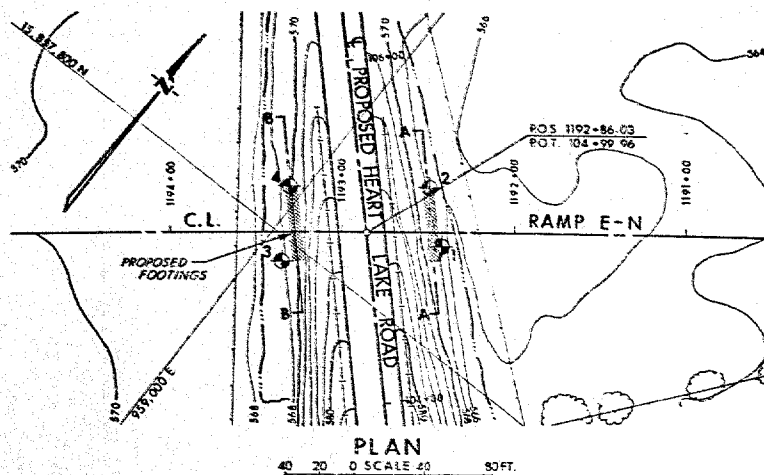


FIG. 2



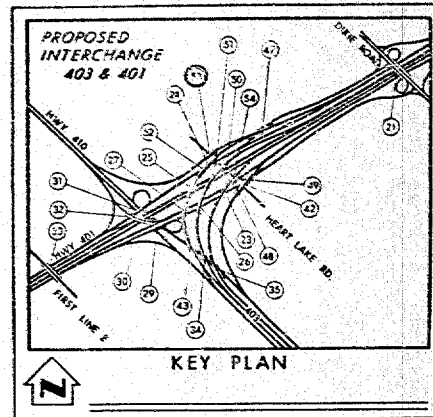
SECT





### SECTIONS

0 10 20 40 SCALE 20 FT.



### LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ↓ Water Levels established at time of field investigation, Aug 1973.

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	566.8	15,857,852	959,083
2	566.8	15,857,875	959,056
3	567.8	15,857,788	959,015
4	569.5	15,857,825	958,992

### NOTE

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the TORONTO District Office.

### NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO  
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

### BRIDGE No. 53

RAMP E-N OVER HEART LAKE ROAD

HIGHWAY NO. 401/403 DIST. NO. 6

CO. PEEL

TOWN OF MISSISSAUGA LOT CON.

### BORE HOLE LOCATIONS & SOIL STRATA

SUBMD C.P.	CHECKED	WP NO. 127-00-25	DRAWING NO.
DRAWN S.R.	CHECKED	WO NO. 73-11064	73-11064 A
DATE NOV 5, 1973	S.I.F. NO.		BRIDGE DRAWING NO.
APPROVED	CONT. NO.		

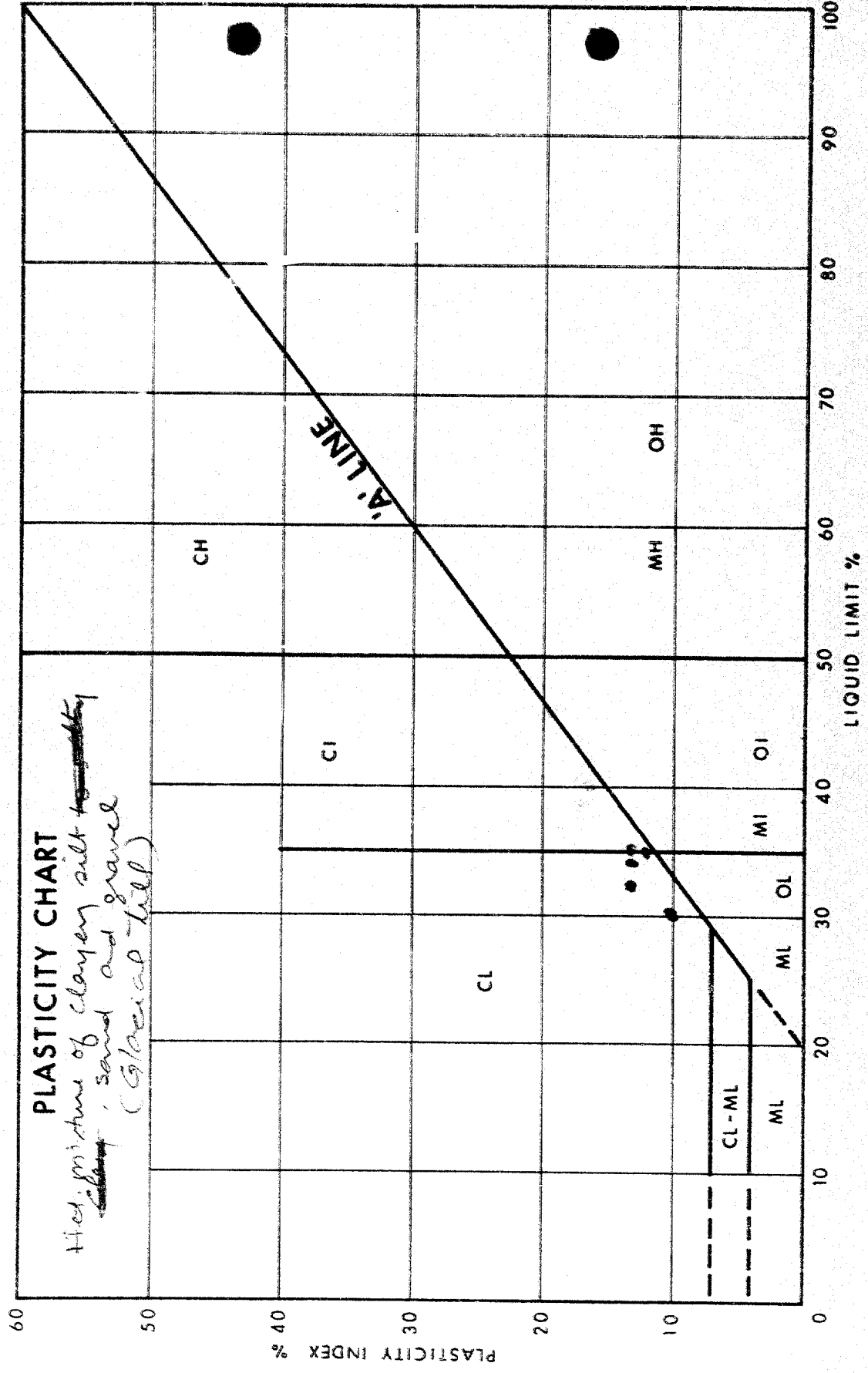
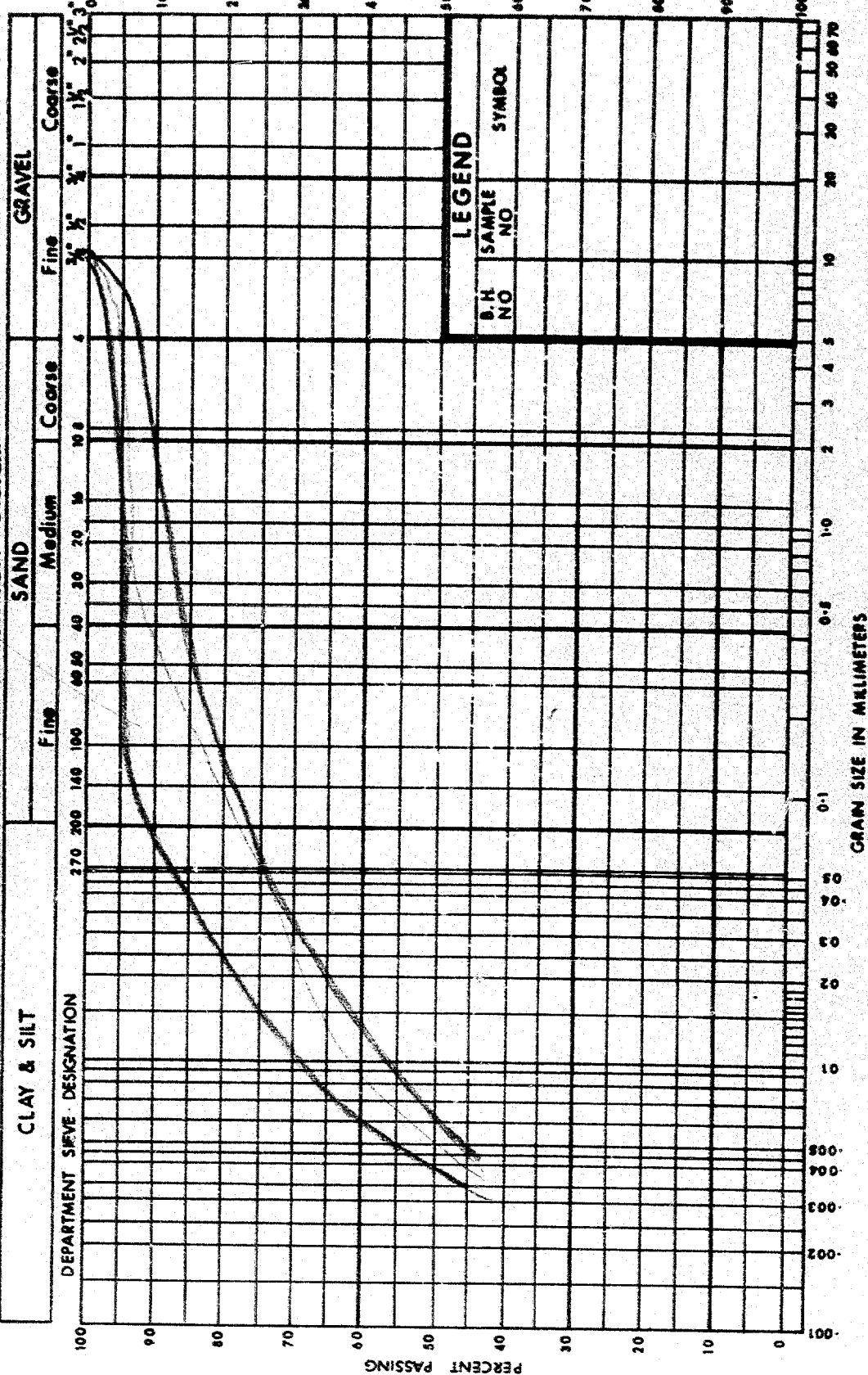


FIG. 2

WO73-11064

*curves not envelope*

# UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

**GRAIN SIZE DISTRIBUTION**  
Het. mix of clayey silty sand + gravel  
(5% gravel)

W.P. No. 127-66-45  
JOB No. 73-11064

Fig. 1

MEMORANDUM

TO: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
West Building.

FROM: G. C. E. Burkhardt,  
Structural Planning Office,  
3501 Dufferin Street.

ATTENTION: Mr. M. Devata

DATE: July 30, 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: Ramp E-N Over Heart Lake Road,  
Bridge #53,  
Site 24-332; W.P. 127-66-45,  
District 6, Toronto.

The above mentioned structure is a part of the Hwy. 401/410/403 Interchange as covered by W.P. 127-66-01. The location is shown on the attached "Scheme of Interchange".

You are requested to carry out the foundation investigation and prepare the Report (Due date December 5th, 1973).

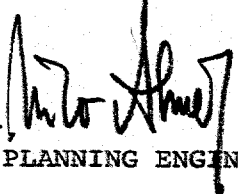
Attached are also two copies of Fenco Drawing No. 3983-3K-3 on which the following information is shown:

- a) Proposed structure type and footing location (marked in red)
- b) Profile of intersecting roads
- c) Co-ordinates of control point and alignment.

The location of footings is tight to the centreline of Heart Lake Road determined by the co-ordinated point 1 (marked in green) which should have been staked out by Fenco.

The approximate location of the existing 30" watermain is also shown on the drawing (in blue).

MAA:Lc  
Attach.

  
M. A. Almer,  
STRUCTURAL PLANNING ENGINEER,  
for:  
G. C. E. Burkhardt,  
REG. STRUCTURAL PLANNING ENG.

c.c. W. Roters  
J. D. Barclay  
R. Fitzgibbon  
J. Anderson

NDA DEC 5/73 ✓

DOCUMENT VERIFICATION IDENTIFICATION

GEOCRES No. 36 M 12-77

DIST. 6 REGION CENTRAL

W.P. No. 127-46-45

CONT. No. 76-120

W. O. No. 73-118.4

STR. SITE No.

HWY. No.

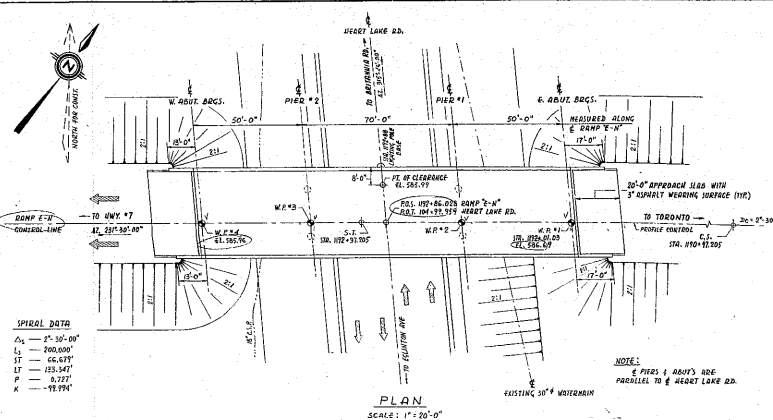
LOCATION REMOVED STRUCTURE AT THE

CROSSING OF RAMP E-N OVER HEART

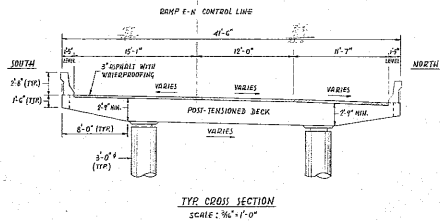
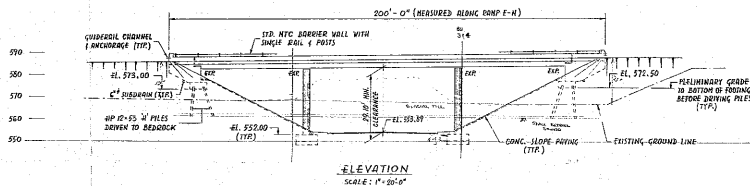
LAKE RD BRIDGE # 53

OVERSIGHT DRAWINGS TO BE INCORPORATED INTO THIS REPORT 4

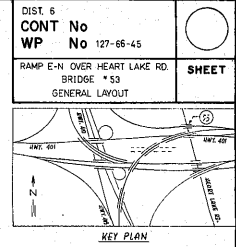
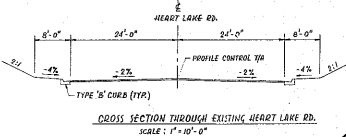
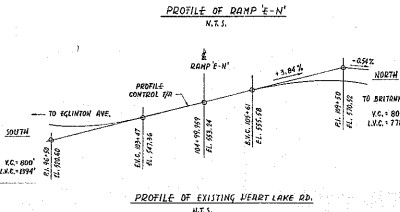
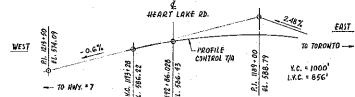
REMARKS



**SPIRAL DATA**  
 $A_1 = 1^\circ 10' 00''$   
 $L_1 = 200.000'$   
 $ST = 66.677'$   
 $LT = 125.147'$   
 $P = 6.727'$   
 $K = 93.994'$



- LIST OF DRAWINGS**
1. GENERAL LAYOUT
  2. ABUT. HOLE LOCATIONS & JOIL STRATA
  3. FOOTING LAYOUT & REINFORCEMENT
  4. ABUTMENTS
  5. PIER DETAILS
  6. DECK LAYOUT & SCALED ELEV'S
  7. DECK REINFORCEMENT
  8. CABLE DETAILS - LONGITUDINAL
  9. TRANSVERSE CABLES
  10. BARRIER WALL
  11. STEEL PARAPET DRILLING (UNCLE TUBE)
  12. 20 FT. APPROACH SLAB (BARRIER WALL)
  13. DETAILS OF CONC. SLOPE PAVING
  14. STANDARD DETAILS - I
  15. STANDARD DETAILS - II
  16. STANDARD DETAILS - III
  17. AS CONSTRUCTED DECK & B.W.
  18. ELECTRICAL SHADDED WORK
  19. ELECTRICAL CONSTRUCTION STANDARDS

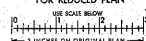


- GENERAL NOTES**
- CLASS OF CONCRETE**  
 DECK, BARRIER WALLS & PIER COLUMNS — 5000 P.S.I.  
 REMAINERS — 5000 P.S.I.
- GRADE OF REINFORCING STEEL**  
 SPIRAL — C40, REMAINERS — C60  
 SLEAD COVER TO REINFORCING STEEL
- FOOTING BATHING** — PIER COLUMNS — 1/4"  
 APPROACH SLABS — 2"  
 DECK, TOP — 2", BOTT. — 1/4"  
 BARRIER WALLS — 1/4"
- CONSTRUCTION NOTES**
- THE CONTRACTOR IS RESPONSIBLE FOR TIGHTENING, BENDING, HEAT, AND LEVEL TO THE APPROVED SPECIFICATIONS WITH A 1/4" TOLERANCE.
  - NO CONCRETE SHALL BE PLACED ABOVE THE ABUT. BEARING SLABS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED AND CROUTED.
  - THE CONTRACTOR IS RESPONSIBLE FOR THE REMOVAL OF ALL FORM WORK.
  - TO ACHIEVE THE MIN. COVER OF 2" (DECK IN DECK), THE TOP LAYER SHALL BE PLACED, PAID TO CONCRETING WITH A CLEAR COVER OF 2", 1/4" TOLERANCE.

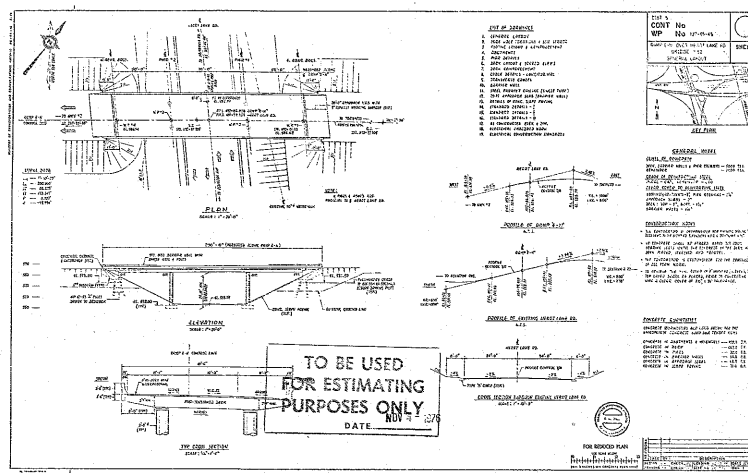
- CONCRETE QUANTITIES**
- CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS
- CONCRETE IN ABUTMENTS & WING WALLS — 122.5 C.Y.  
 CONCRETE IN DECK — 421.2 C.Y.  
 CONCRETE IN PIERS — 52.0 C.Y.  
 CONCRETE IN BARRIER WALLS — 34.8 C.Y.  
 CONCRETE IN APPROACH SLABS — 48.8 C.Y.  
 CONCRETE IN SLOPE PAVING — 71.0 C.Y.

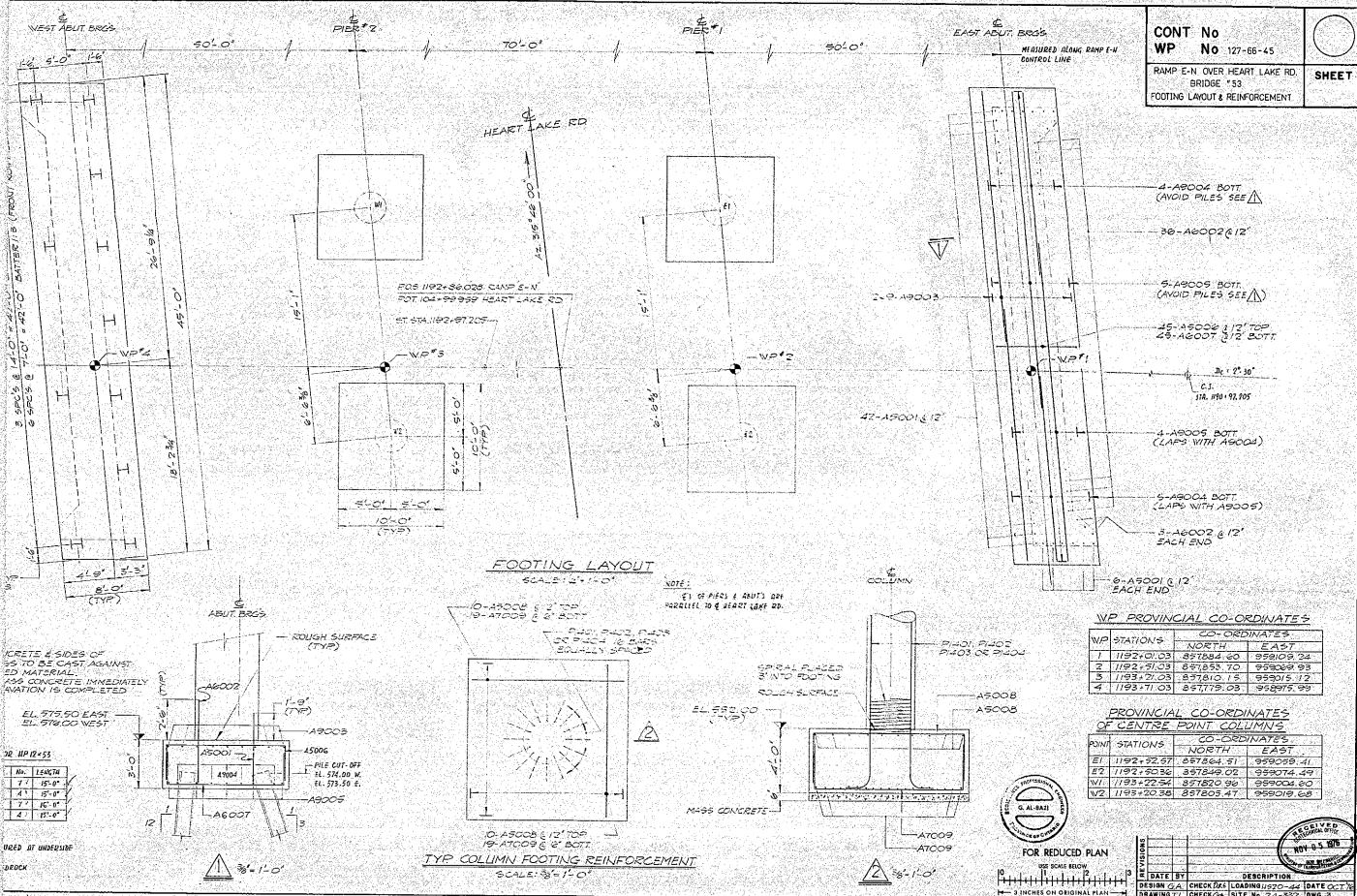


FOR REDUCED PLAN



DATE	BY	DESCRIPTION
DESIGN	C.B.	CHECKING (LOADING 12/10/74) RATE 201/74
DRAWING	P.R.	CHECKING (DATE No 24-335) 10/6/74





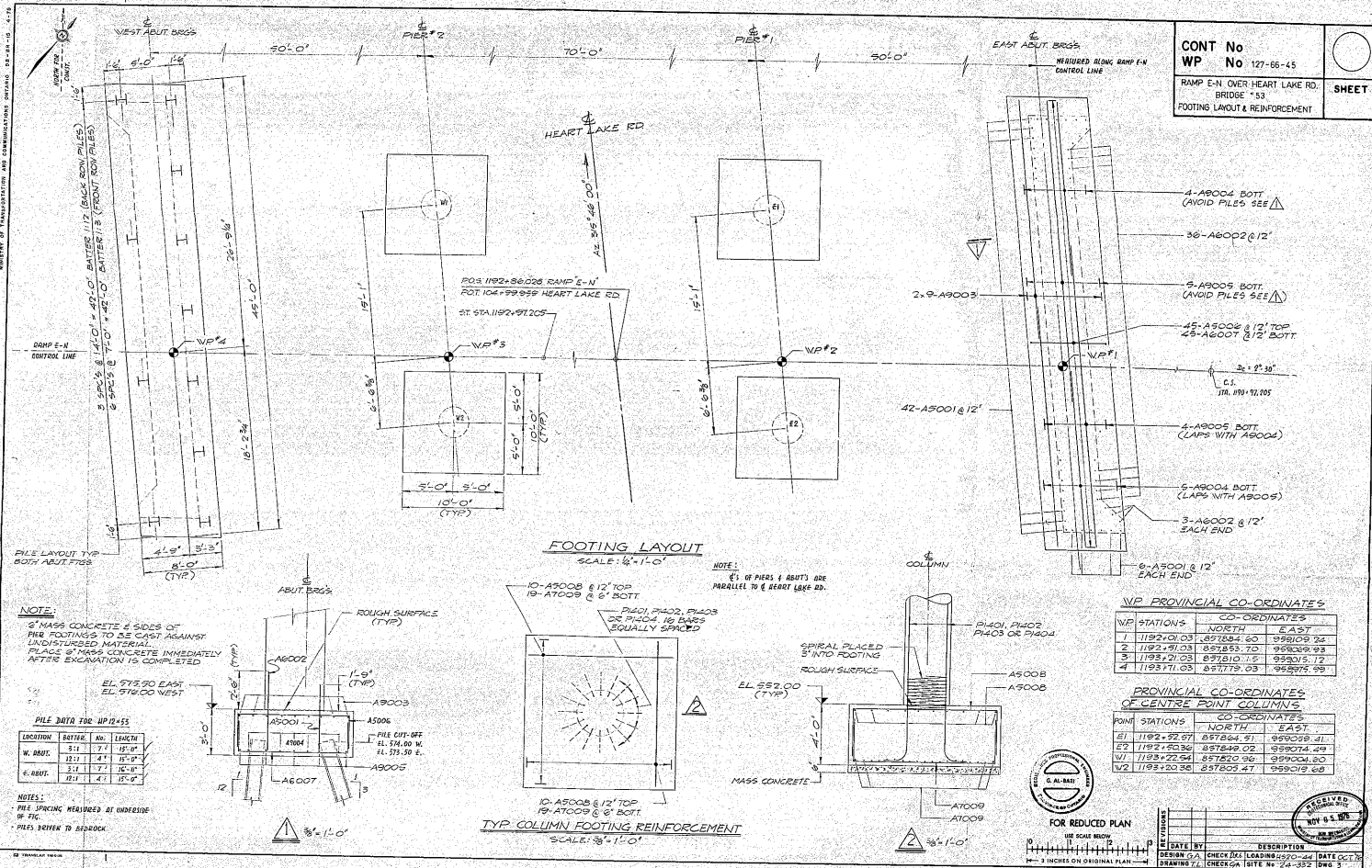


SHEET OF TRANSMISSION AND CONSTRUCTION DRAWING 12-10-15 4-13

CONT No  
WP No 127-66-45

RAMP E-N OVER HEART LAKE RD.  
BRIDGE #53

FOOTING LAYOUT & REINFORCEMENT



30M12-77

