

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 40P1-59

DIST. 4 REGION                     

W.P. No. 71-62-00

CONT. No. 81-43

W. O. No.                     

STR. SITE No.                     

HWY. No. 403

LOCATION Burford Twp. Rd. and  
Hwy 403

No of PAGES -                     

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.                     

REMARKS:



# METRIC

DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE SHOWN.  
ELEVATIONS, COORDINATES, CURVE  
AND ALIGNMENT DATA ARE IN METRES.  
STATIONS ARE IN KILOMETRES + METRES.

## NOTES

### CLASS OF CONCRETE

DECK & PIER COLUMN - 35 MPa  
BARRIER WALLS - 30 MPa  
REMAINDER - 20 MPa  
OR AS NOTED ON THE DRAWINGS.

### REINFORCING STEEL

GRADE 400  
REINFORCING BAR MARKS WITH  
SUFFIX 'C' TO BE COATED BARS.

### CLEAR COVER TO REINF. STEEL

FOOTINGS, ABUTMENTS  
AND PIER COLUMN - 75 mm  
DECK TOP - 50 mm  
DECK BOTTOM - 40 mm  
OR AS NOTED ON THE DRAWINGS.

### CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE  
FOR FINISHING THE BEARING  
SEATS DEAD LEVEL TO THE  
SPECIFIED ELEVATIONS WITH A  
TOLERANCE OF  $\pm 3$  mm.  
NO CONCRETE SHALL BE PLACED  
ABOVE THE ABUTMENT BEARING  
SEATS UNTIL THE CONCRETE IN  
THE DECK HAS BEEN PLACED,  
STRESSED AND GROUTED.

TO ACHIEVE THE MINIMUM CLEAR  
COVER OF 50 mm SPECIFIED AT  
TOP OF DECK, THE TOP LAYER OF  
REINFORCEMENT SHALL BE  
PLACED PRIOR TO CONCRETING,  
WITH A CLEAR COVER OF  $65 \pm 15$  mm  
TOLERANCE.

### LIST OF DRAWINGS

- 1 GENERAL PLAN
- 2 BOREHOLE LOCATION & SOIL TESTS
- 3 FOOTINGS
- 4 NORTH ABUTMENT
- 5 SOUTH ABUTMENT
- 6 PIER DETAILS
- 7 DECK DETAILS & ABUT. BEARINGS
- 8 LONGITUDINAL CABLE DETAILS
- 9 TRANSVERSE CABLE DETAILS
- 10 DECK REINFORCING I
- 11 DECK REINFORCING II
- 12 BARRIER WALL
- 13 6000 APPROACH SLAB
- 14 DETAILS OF CONC. SLOPE PAVING
- 15 AS CONSTRUCTED ELEV. & DIM.
- 16 STANDARD DETAILS I
- 17 STANDARD DETAILS II
- 18 STANDARD DETAILS III
- 19 BRIDGE ELECTRICAL DETAILS TYPE IV
- 20 BRIDGE DATE & SITE NUMBER DATA

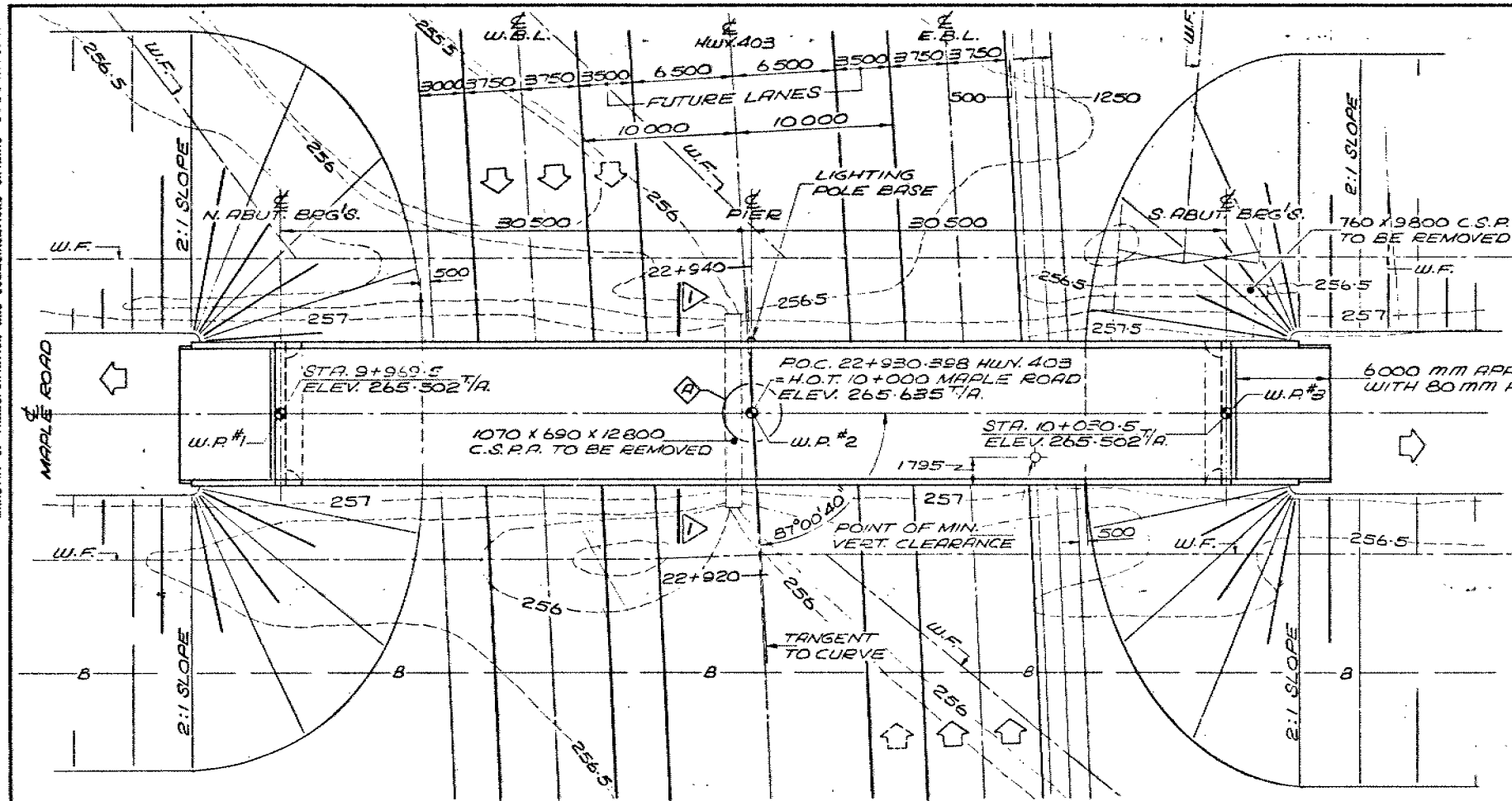
### CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED  
BELOW FOR THE APPROPRIATE  
LUMP SUM TENDER ITEMS:

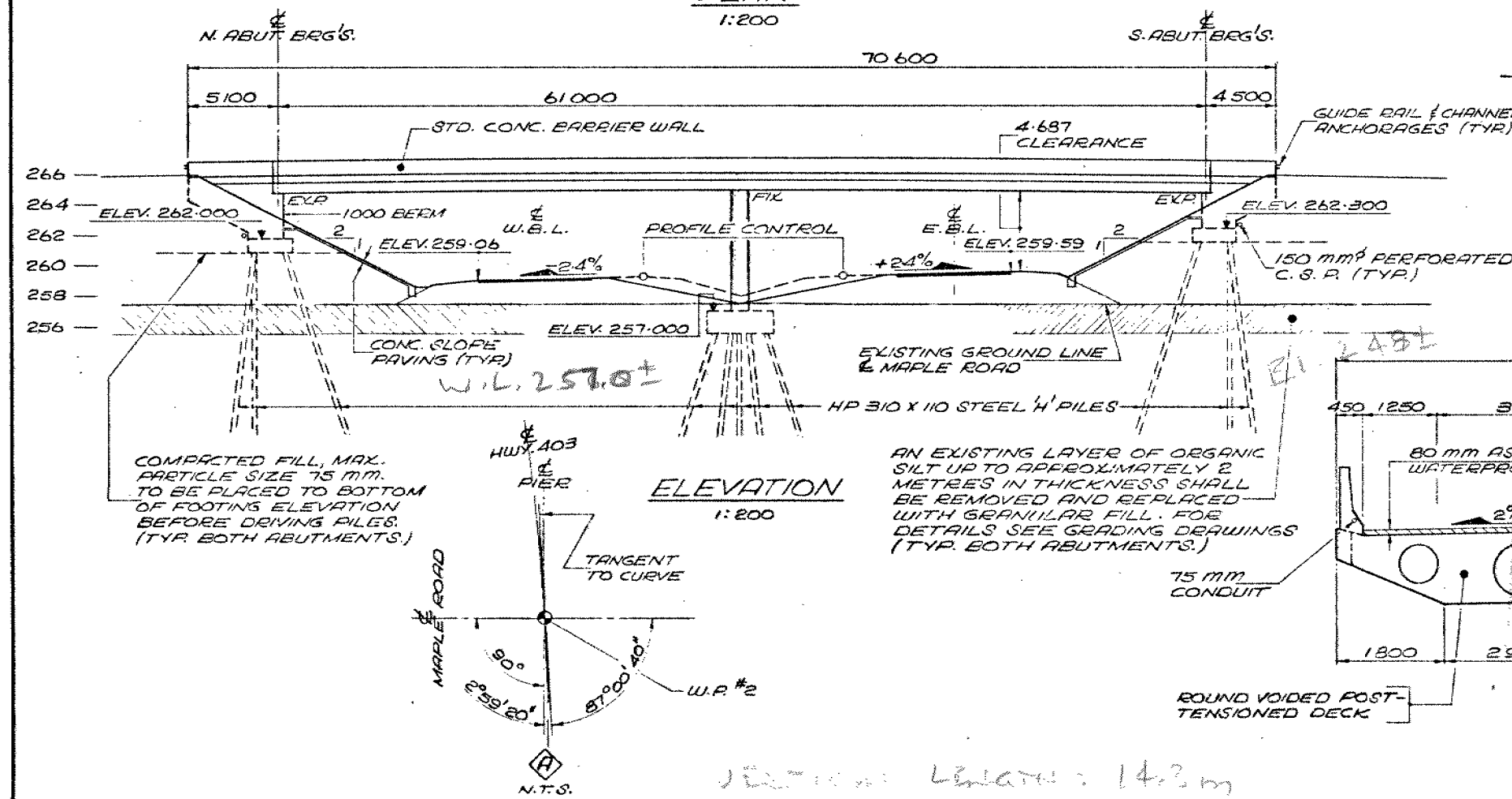
CONCRETE IN ABUTMENTS AND  
WINGWALLS 20 MPa 70 m<sup>3</sup>  
PIER COLUMN 35 MPa 8 m<sup>3</sup>  
PRESTRESSED CONCRETE IN  
BRIDGE DECK 477 m<sup>3</sup>  
CONC. IN BARRIER WALLS 35 m<sup>3</sup>  
CONC. IN APPROACH SLABS 26 m<sup>3</sup>  
CONC. IN SLOPE PAVING 27 m<sup>3</sup>

REVISIONS	DATE	BY	DESCRIPTION

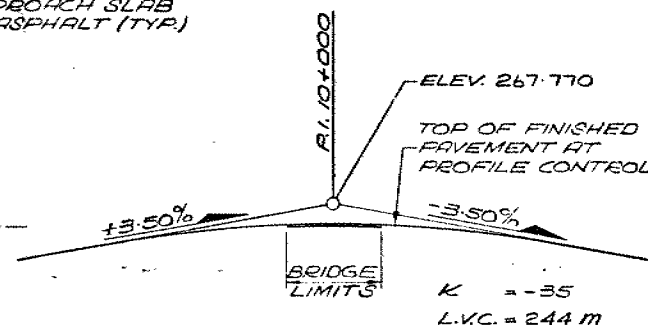
DESIGN: A. KOTIEFF  
DRAWING: 71-62-01  
CHECK: A. KOTIEFF  
LOADING: HS 20-44  
SITE No: 1-1-1  
DWG: 1



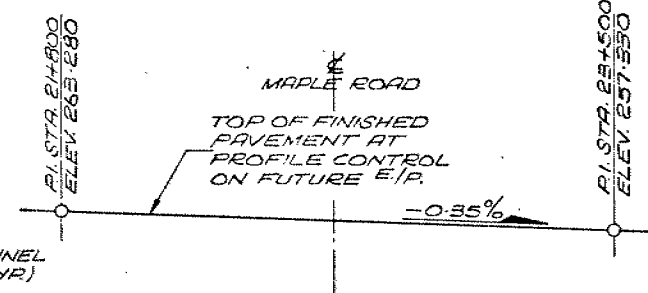
PLAN  
1:200



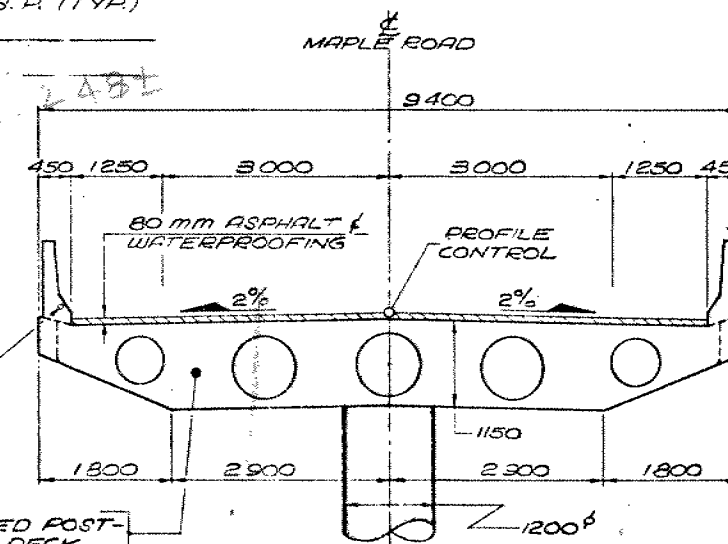
ELEVATION  
1:200



PROFILE OF MAPLE ROAD  
N.T.S.

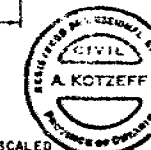


PROFILE OF HWY. 403  
N.T.S.



1:50

DRAWING NOT TO BE SCALED  
100 mm ON ORIGINAL DRAWING



Vertical Limitation: 14.3 m

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO DE-MIN 1984 73 01

DIST. No 4 HWY. 403

CONT No  
WP No 71-62-01

MAPLE ROAD UNDERPASS  
FOOTINGS



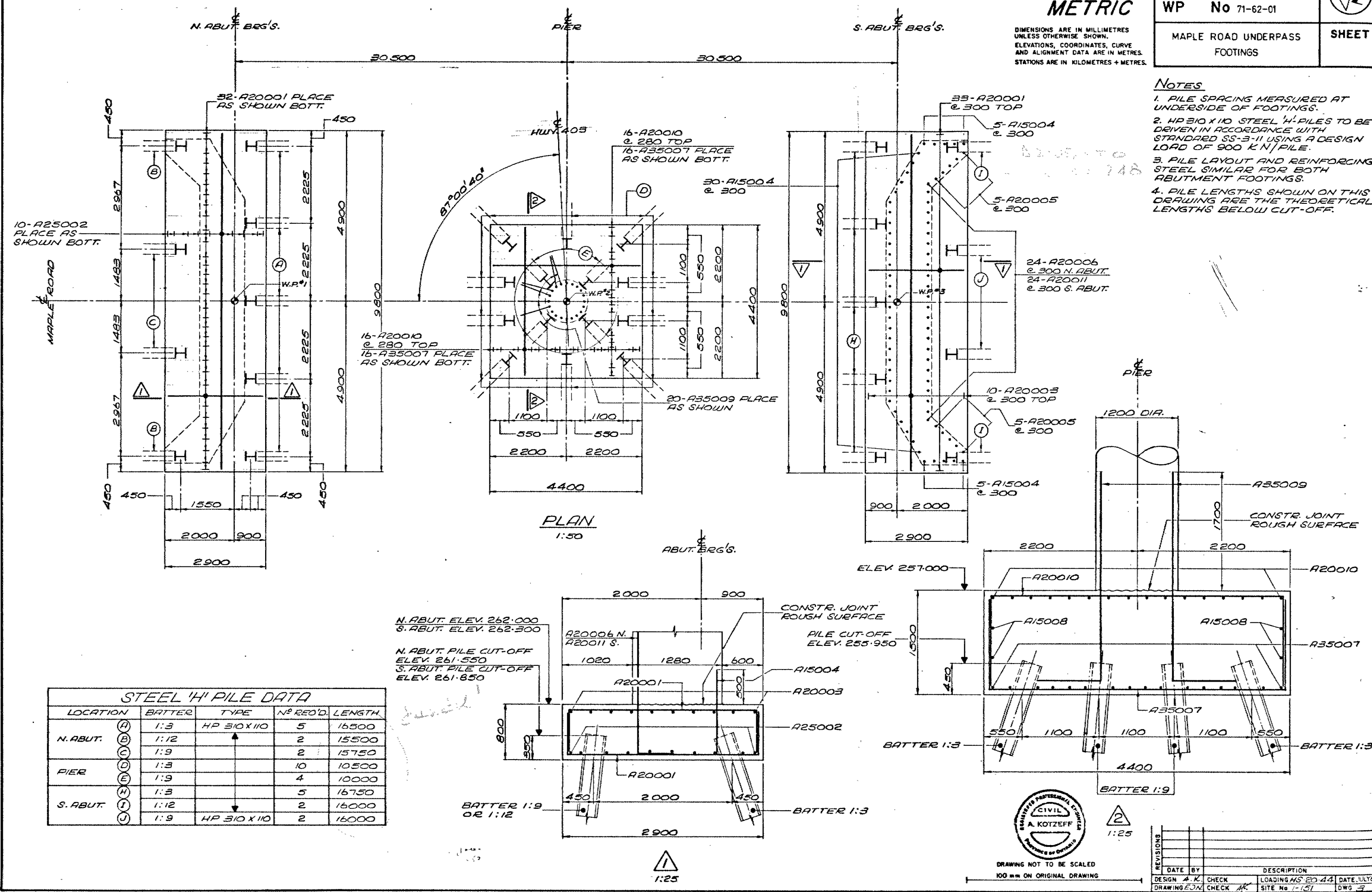
SHEET

**METRIC**

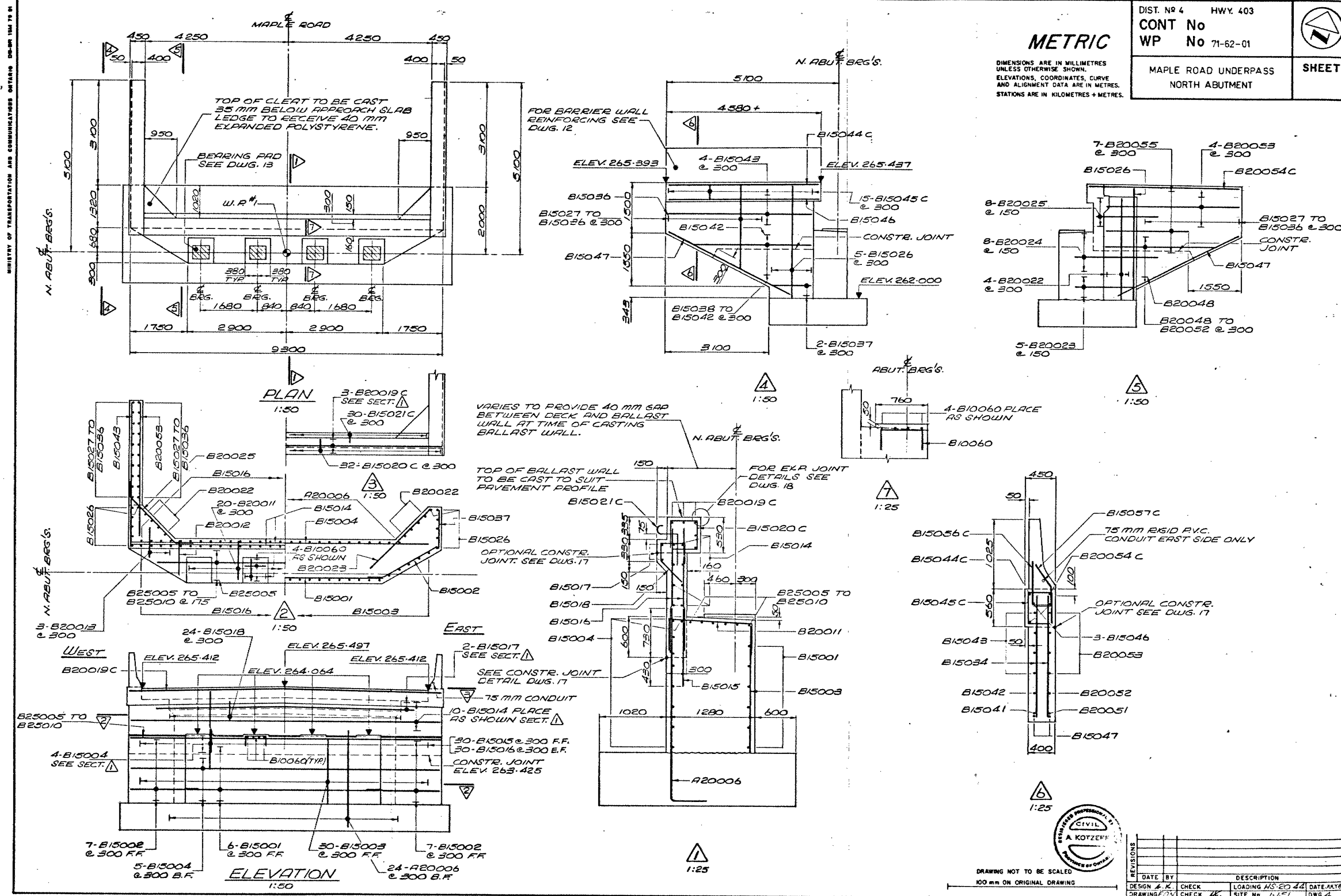
DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE SHOWN.  
ELEVATIONS, COORDINATES, CURVE  
AND ALIGNMENT DATA ARE IN METRES.  
STATIONS ARE IN KILOMETRES + METRES.

**NOTES**

1. PILE SPACING MEASURED AT UNDERSIDE OF FOOTINGS.
2. HP 310 X 110 STEEL 'H' PILES TO BE DRIVEN IN ACCORDANCE WITH STANDARD SS-3-II USING A DESIGN LOAD OF 900 K N / PILE.
3. PILE LAYOUT AND REINFORCING STEEL SIMILAR FOR BOTH ABUTMENT FOOTINGS.
4. PILE LENGTHS SHOWN ON THIS DRAWING ARE THE THEORETICAL LENGTHS BELOW CUT-OFF.



DIMENSIONS ARE IN MILLIMETRES  
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AND ALIGNMENT DATA ARE IN METRES.  
STATIONS ARE IN KILOMETRES + METRES



## MEMORANDUM

TO: Mr. A. P. Watt, (4)  
Regional Structural Planning Eng.,  
Southwestern Region,  
London, Ontario.

FROM: Foundations Office,  
Design Services Branch,  
West Bldg., Downsview.

ATTENTION: Mr. S. Jants.

DATE: July 11, 1972.

OUR FILE REF. IN REPLY TO JUL 20 1972

## SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For  
Burford Twp. Rd. Overpass of Proposed  
Hwy. #403 1.5 Mi. West of Brantford  
West Limits, District #4 (Hamilton)  
W.O. 72-11046 --- W.P. 71-62

40 P1-59  
GEOCRES No.

81-43

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above-mentioned site.

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

AGS/ao  
Atch.

cc: Messrs. D. W. Farren

B. R. Davis

A. Rutka

W. A. Zonnenberg

C. R. Robertson

B. J. Giroux

J. R. Roy

G. A. Wrong

B. A. Singh

*agstermac*  
A. G. Stermac,  
PRINCIPAL FOUNDATIONS ENGINEER.

Foundations Files  
Documents ✓

## TABLE OF CONTENTS

1. INTRODUCTION.
  2. DESCRIPTION OF THE SITE AND GEOLOGY.
  3. FIELD AND LABORATORY INVESTIGATIONS.
  4. SUBSOIL CONDITIONS.
    - 4.1) General.
    - 4.2) Fine to Medium Sands.
    - 4.3) Sandy Silt With Some Clay and Gravel (Glacial Till).
    - 4.4) Groundwater Conditions.
  5. DISCUSSION AND RECOMMENDATIONS.
    - 5.1) General.
    - 5.2) Structure Foundation.
  6. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT  
For  
Burford Twp. Rd. Overpass of Proposed  
Hwy. #403 1.5 Mi. West of Brantford West Limits  
District #4 (Hamilton)  
W.O. 72-11046                      ---                      W.P. 71-62

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1. INTRODUCTION:

The Foundations Office was requested by Mr. S. Jants, Bridge Planning Technician, South-Western Region, to carry out a foundation investigation at the site of Burford Township Road (Maple Rd.) overpass of proposed Hwy. #403. The memo containing the request was dated March 23, 1972. In accordance with the request, a field and subsequent laboratory investigation was carried out under the supervision of this Office; the results of which are compiled in this report, together with recommendations concerning structure foundations.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site of the proposed crossing is situated some five miles north of the town of Burford, along existing Maple Rd. The general topography is undulating. The vicinity is occupied by farmlands, the main crop being corn. There is a small stream running through the site of the proposed project, the depth of which varies between 1 foot and 2 feet.

Geologically, the area belongs to the physiographic region known as the "Norfolk Sand Plain". The sands and silts of this region were deposited as a delta in glacial lakes Whittlesey and Warren. A great discharge of meltwater from the Grand River area entered the lakes between the ice-front and the moraines to the north-west, building the delta from west to east as the glacier withdrew. The moraines today are partially buried by sand.

3. FIELD AND LABORATORY INVESTIGATIONS:

The field investigation consisted of eight sampled boreholes and some fifteen dynamic cone penetration tests. Soil sampling was carried out according to conventional methods, by means of split-spoon samplers. The sampler was advanced by a 140 lbs. hammer, falling freely a distance of 30 inches. The number of hammer blows required to drive the sampler 12 inches into the soil was recorded as the Standard Penetration "N" value. The recovered soil samples were examined and identified in the field by the field technician. Upon arrival in the laboratory all the samples were again classified, using some simple routine tests. Some of the representative specimens were subjected to grain size analyses, Atterberg limit tests and moisture content determinations.

Field and laboratory test results are plotted on the accompanying borelogs. The locations and elevations of the borings are shown on Drawing #72-11046A, together with the estimated stratigraphical cross sections, projected to the proposed footing locations.

4. SUBSOIL CONDITIONS:

4.1) General:

Granular type subsoils predominate at the site, consisting of sands with traces of silt and gravel, underlain by sandy silts with some clay and gravel (glacial till). The surficial soils contain some organic and vegetable matter within a depth of 4-5 ft. A brief description of the deposits follows.

4.2) Fine to Medium Sands:

The sand layers were found to extend to some 22 ft. - 33 ft. below ground level (elevation 809-819 ft.). The uppermost 3-6 ft. of the sands are contaminated with organic and decomposed vegetable matter. The organic content renders this portion of the soils rather impervious and slightly plastic. Under the dark grey and black organic soils, the fine to medium sands are grey



in colour, containing up to 20% silt size particles and occasionally traces of gravel. Standard penetration "N" values recorded within this stratum range from 4 blows per ft. up to over 100 blows per ft. corresponding to loose to very dense relative density. Due to the high groundwater level, instability of the sands developed quite frequently at the bottom of the holes. It is assumed that some loosening of the sands was caused by quick conditions under the unbalanced hydrostatic heads. In order to alleviate boiling of the sands, water pressure was applied in most of the borings.

The natural moisture contents within the upper 20 ft. or so was measured to range from 15% to 20%, diminishing to 9% - 12% below this depth.

4.3) Sandy Silt With Some Clay and Gravel (Glacial Till):

Around elevation 809 ft. - 819 ft. extending to the bottom of boreholes, sandy silts with some clay and gravel were encountered. Very high penetration resistances were noted in this deposit, 100 blows usually resulting in less than 12 inch penetration. Atterberg limit tests yielded plastic limits of 11% - 13% and liquid limits of 15% - 16%. Laboratory grain size analyses revealed a heterogeneous particle distribution, the range of gravel particles being 1% - 22%, sand 30% - 85%, silt 12% - 45% and clay 5% - 11%.

4.4) Groundwater Conditions:

Groundwater levels were established in each borehole within the uppermost organic deposit, as shown on the borelog sheets. Boreholes were left open for a few days after completion, and the equilibrium water levels were recorded to be between 0.8 ft. and 3 ft. below ground level, corresponding to geodetic elevations of 841 ft. - 843 ft.

## 5. DISCUSSION AND RECOMMENDATIONS:

### 5.1) General:

The present proposal calls for a twin overhead structure at this location, to carry proposed Hwy. #403 over Burford Twp. road (Maple Rd.). The top of granular of Hwy. #403 at the crossing is designed to be at elevation 865 ft. some 20 ft. above the existing grade of Maple Road. The height of the approach fills will be some 21 - 22.5 ft., and it is surmised that perched abutments will be constructed within the fills.

As discussed earlier, beneath a 22-23 ft. deep deposit of very loose to very dense sand layer, very dense glacial tills were observed around elevation 809 ft. - 819 ft.

### 5.2) Structure Foundation:

On account of the uppermost 10-15 ft. of very loose to compact sands, combined with organic contents and high water pressures, spread foundations for the proposed structure do not appear to be economically feasible. It is recommended, therefore, that the entire structure, abutments as well as piers be supported on piles, driven into the very dense glacial deposit. It is felt that the use of steel tubular piles will be the most practical under the existing soil conditions. Piles should be driven according to Standard BD-82-7, using design loads of 60 ton per pile. On 12-3/4 O.D. steel tubes above loads may be reached by driving the piles to elevation 810 ft. - 815 ft., some 27-34 ft. below general ground surface. In constructing perched abutments, pile caps may be poured within the embankments. In this event care should be taken not to place bouldery fill at the pile locations. Four foot cover should be provided for the pile caps for frost protection.

No stability problems are foreseen for the approach embankments, provided that they are built with 2 horizontal to 1 vertical slopes.

The surficial organic material should be removed under the approach fills, footings and proposed road beds and replaced by suitable backfill. The horizontal and vertical extent of the organic deposit ought to be determined by the Regional Materials

Engineer.

It is assumed that excavations extending below the groundwater level will "boil up" due to the susceptibility of the sands to unbalanced hydrostatic heads. In order to eliminate quick conditions, a dewatering scheme will be necessary for the excavations below the groundwater level.

6. MISCELLANEOUS:

The field work carried out during May 9 - 17, 1972, was supervised by Mr. W. V. Urie, Field Technician.

The equipment used was owned and operated by P.V.K. Drilling Company, Burford, Ontario.

This report was prepared by Mr. A. K. Barsvary, Senior Foundations Engineer, and reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.

*A. K. Barsvary*

A. K. Barsvary, P. Eng.



*K. G. Selby*

K. G. Selby, P. Eng.

AKB/ao  
July 10, 1972.

APPENDIX I

CHECKED BY 

[illegible]



CHECKED BY \_\_\_\_\_

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. FEET	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. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	$w_p$ ——— $w$ ——— $w_L$ WATER CONTENT %			
844.6	Ground level.										
						840					
						830					
820.6											
24.0	End of cone test.					820					

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

## RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 72-11046

LOCATION 100 + 59 15' Lt. Ø

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 15, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

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. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
844.4	Ground level.															
0.0	Organic sand some sl. Black and grey.		1	SS	26	840										
837.9			2	SS	5											
6.5	Fine to medium sand with some silt and traces of gravel.  Loose to very dense.  Grey.		3	SS	7											
			4	SS	17											
			5	SS	32	830										
			6	SS	30											
			7	SS	67											
			8	SS	104	820										
816.9																
27.5	End of borehole.					810										

End of cone elev. 826.8

W1. 842.0

1.91 (.8)



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 72-11046

LOCATION 100 + 97 14' Rt. Ø

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 12, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Dynamic Cone Penetration

CHECKED BY *So*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — $w_L$				BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	PLASTIC LIMIT — $w_p$					
							20	40	60	80	100		
							SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							○ UNCONFINED + FIELD VANE		$w_p$ — $w$ — $w_L$				
							● QUICK TRIAXIAL x LAB. VANE						
844.0	Ground level.												
0.0						840							
						830							
						820							
818.5													
25.5	End of cone test.					810							

## DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

## DESIGN SERVICES BRANCH

## RECORD OF BOREHOLE No. 6

## FOUNDATION SECTION

JOB 72-11046

LOCATION 100 + 60 16' Rt. Ø

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 16, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

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. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	$w_p$	$w$	$w_L$		
844.1	Ground level.															
0.0	Organic sandy silt some roots. Loose.		1	SS	5	840										
837.6	Black and grey.		2	SS	5											
6.5	Fine to medium sand.		3	SS	3											
	Very loose to dense.		4	SS	19											
	Grey.		5	SS	24	830										
			6	SS	22											
			7	SS	31											
			8	SS	44	820										
817.1																
27.0	Silty sand traces of clay (Glacial Till)		9	SS	162/10"											
810.7	Very dense.		10	SS	100/5"											
33.4	End of borehole.					810										

End of cone elev. 819.1

1 48 45 6

FOUNDATION SECTION

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— $w_L$		BULK DENSITY $\gamma$ P.C.F.	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT						PLASTIC LIMIT ——— $w_p$		
							20	40	60	80			100	WATER CONTENT ——— $w$	
						SHEAR STRENGTH P.S.F.		$w_p$ ——— $w$ ——— $w_L$		WATER CONTENT % 10 20 30					
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE									
841.4	Ground level.														
0.0	Organic sandy silt some roots.					840									
835.9	Black and grey.		1	SS	5										
5.5	Fine to medium sand, some silt.  Loose to very dense.  Grey.		2	SS	9										
			3	SS	15										
			4	SS	17										
			5	SS	43										
			6	SS	38										
			7	SS	62										
			8	SS	118/11"										
23.0	Sandy silt with clay and gravel.														
812.4	Hard.		9	SS	116/11"										
29.0	End of borehole.					810									

CHECKED BY

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — $w_L$		BULK DENSITY $\gamma$	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	WATER CONTENT — $w$	WATER CONTENT — $w$	WATER CONTENT — $w$		
841.1	Ground level.											
0.0	Organic sandy silt some roots. Black and grey.		1	SS	2	840						
4.0	Fine to medium sand to gravelly sand, traces of silt.  Loose to very dense.		2	SS	10							
			3	SS	13							
			4	SS	20							
			5	SS	21							
			6	SS	24							
			7	SS	42							
818.4			8	SS	100/6"	820						
23.0	Silty sand some clay. Glacial Till. & gravel											
812.9	Very dense.		9	SS	100/6"							
28.5	End of borehole.					810						

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS  
DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 72-11046 LOCATION 99 + 01 49' Lt. Ø ORIGINATED BY W.V.U.  
W.P. 71-62 BORING DATE May 12, 1972 COMPILED BY P.M.  
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration CHECKED BY So

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — $w_L$		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT — $w_p$	WATER CONTENT — $w$		
							SHEAR STRENGTH P.S.F.				
							○ UNCONFINED + FIELD VANE				
							● QUICK TRIAXIAL x LAB. VANE				
81.1.8	Ground level.					840					
0.0						830					
						820					
818.0											
23.8	End of cone test.					810					



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

## RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 72-11046

LOCATION 99 + 02 19' Lt.

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 12, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

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	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80			100
842.3	Ground level.											
0.0	Trace of Organics	1	SS	4	840							
		2	SS	9								
	Fine to medium sand,	3	SS	13								
	traces of silt.	4	SS	12								
		5	SS	39	830							
	Loose to very dense.	6	SS	57								
		7	SS	15								
		8	SS	95	820							
815.3												
27.0	Silty sand, traces of clay and gravel. (Glacial Till)	9	SS	131								
808.3	Very dense.	10	SS	165/11 1/2"	810							
34.0	End of borehole.				800							

End of cone elev. 819.3

2 88 (10)

5 55 35 5

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

## RECORD OF BOREHOLE No. 13

FOUNDATION SECTION

DESIGN SERVICES BRANCH

JOB 72-11046

LOCATION 99 + 41 11' Rt. Ø

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 9, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

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. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	$w_p$	$w$	$w_L$		
845.0	Ground level.															
0.0	Organic sandy silt mottled grey and black		1	SS	4											
838.5	Very loose.		2	SS	7											
6.5	Fine to medium sand, traces of silt.		3	SS	19											
			4	SS	27											
			5	SS	22											
			6	SS	32											
	Compact to dense.		7	SS	41											
			8	SS	25											
818.0			9	SS	100/5"											
27.0	Sandy silt to sand with some silt, traces of clay and gravel.															
811.1	(Glacial Till)v. dense.		10	SS	100/5"											
33.9	End of borehole.															

End of cone elev. 818.2

3 85 (12)



CHECKED BY

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION		RESISTANCE		LIQUID LIMIT — $w_L$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		RESISTANCE		LIQUID LIMIT — $w_L$			
							20	40	60	80	100	PLASTIC LIMIT — $w_p$		
							SHEAR STRENGTH P.S.F.				WATER CONTENT %			
							○ UNCONFINED		+ FIELD VANE					
							● QUICK TRIAXIAL		x LAB. VANE					
844.4	Ground level.													
0.0						840								
						830								
819.6						820								
24.8	End of cone test.													

## DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

## DESIGN SERVICES BRANCH

## RECORD OF BOREHOLE No. 15

## FOUNDATION SECTION

JOB 72-11046LOCATION 99 + 41 49' Rt. ØORIGINATED BY W.V.U.W.P. 71-62BORING DATE May 11, 1972COMPILED BY P.M.DATUM GeodeticBOREHOLE TYPE Dynamic Cone PenetrationCHECKED BY LD

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. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % $w_p$ — $w$ — $w_L$					
841.4	Ground level.																
0.0						840											
					830												
					820												
816.6																	
24.8	End of cone test.					810											

SHEAR STRENGTH P.S.F.

- UNCONFINED + FIELD VANE  
● QUICK TRIAXIAL x LAB. VANE

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES BRANCH

## RECORD OF BOREHOLE No. 16

FOUNDATION SECTION

JOB 72-11046

LOCATION 99 + 04 49' Rt.

ORIGINATED BY W.V.U.

W.P. 71-62

BORING DATE May 9, 1972

COMPILED BY P.M.

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %			
842.2	Ground level.										
0.0	Trace of Organics.	1	SS	10	840						
		2	SS	14							
	Fine to medium sand traces of silt and gravel.	3	SS	10							
		4	SS	14							
		5	SS	7	830						
	Seam of silty sand	6	SS	14							
		7	SS	18							
	Loose to very dense. Grey.	8	SS	47	820						
		9	SS	100/4"							
809.2		10	SS	100/6"	810						
33.0	Sandy silt some clay and gravel (Glacial Till) Very dense.										
805.7											
36.5	End of borehole.				800						

End of cone elev. 818.3

1 75 20 4

## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

### DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

### TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

### SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

# ABBREVIATIONS USED IN THIS REPORT

## SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
$S_r$	DEGREE OF SATURATION
$w_L$	LIQUID LIMIT
$w_P$	PLASTIC LIMIT
$I_P$	PLASTICITY INDEX
s	SHRINKAGE LIMIT
$I_L$	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
$I_C$	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
$e_{max}$	VOID RATIO IN LOOSEST STATE
$e_{min}$	VOID RATIO IN DENSEST STATE
$I_D$	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY $D_r$ IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
$m_v$	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
$c_v$	COEFFICIENT OF CONSOLIDATION
$C_c$	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
$T_v$	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION INTERCEPT
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

## STRESS AND STRAIN

u	PORE PRESSURE
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

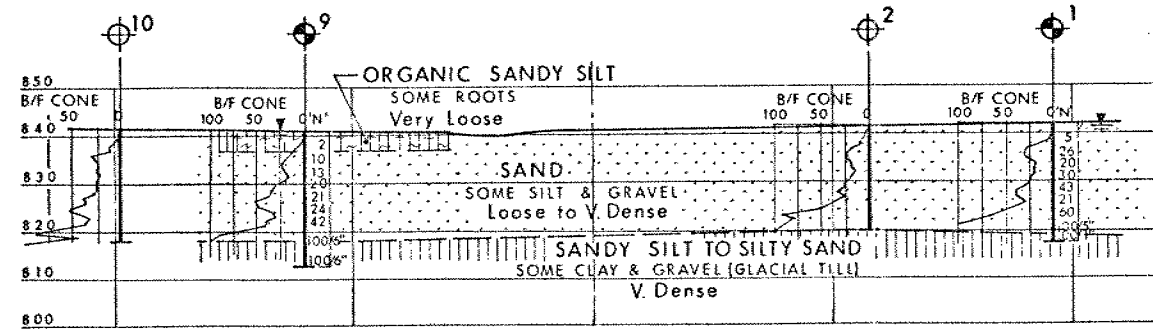
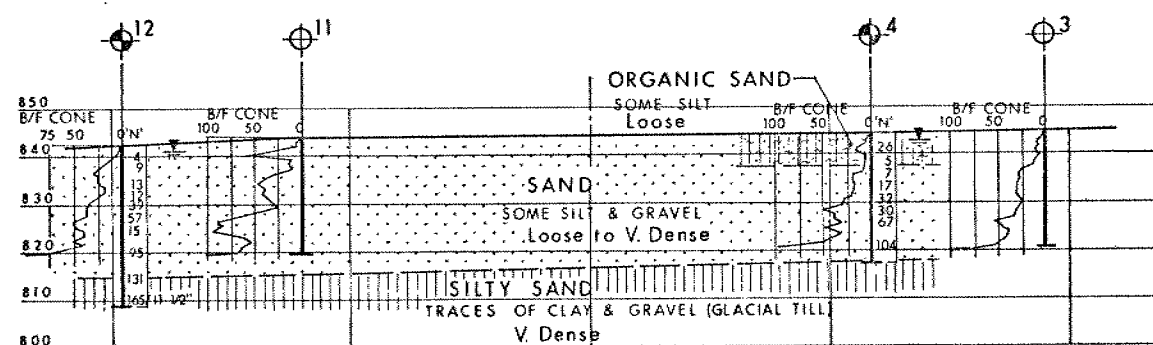
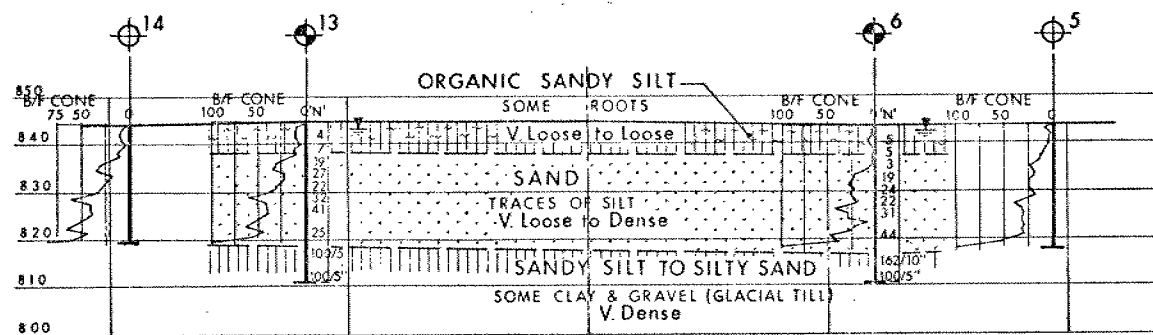
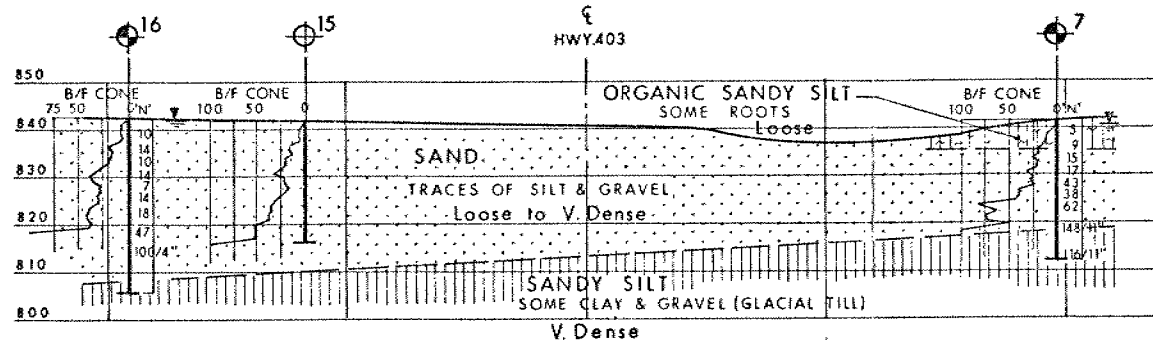
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

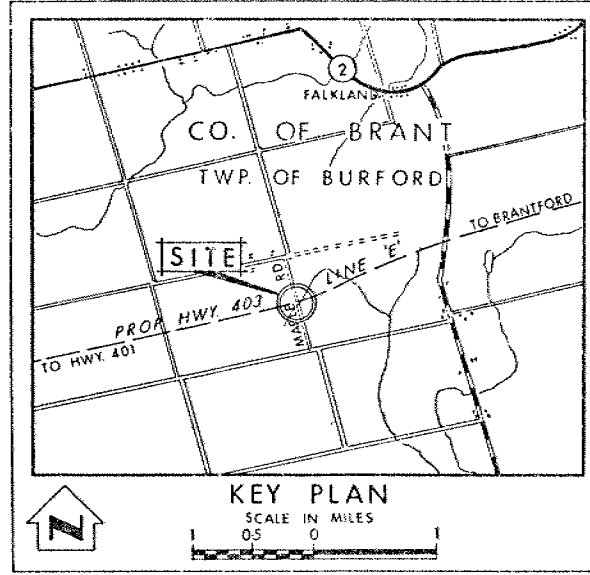
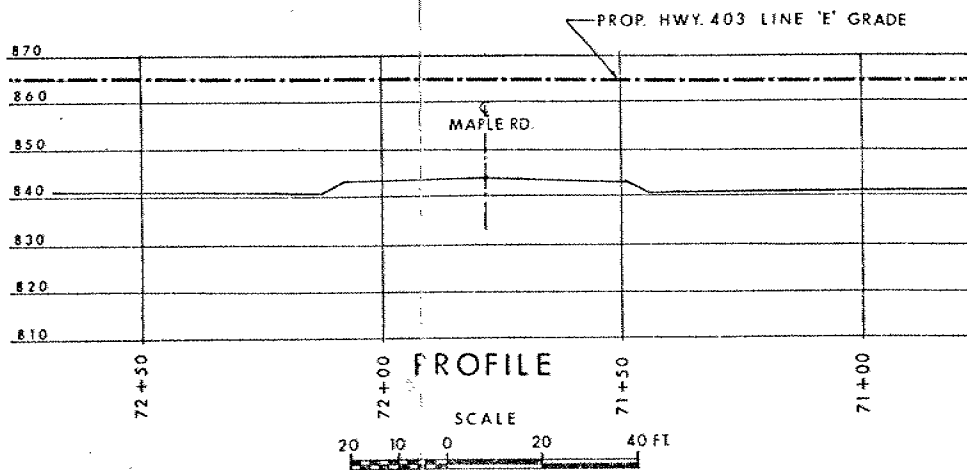
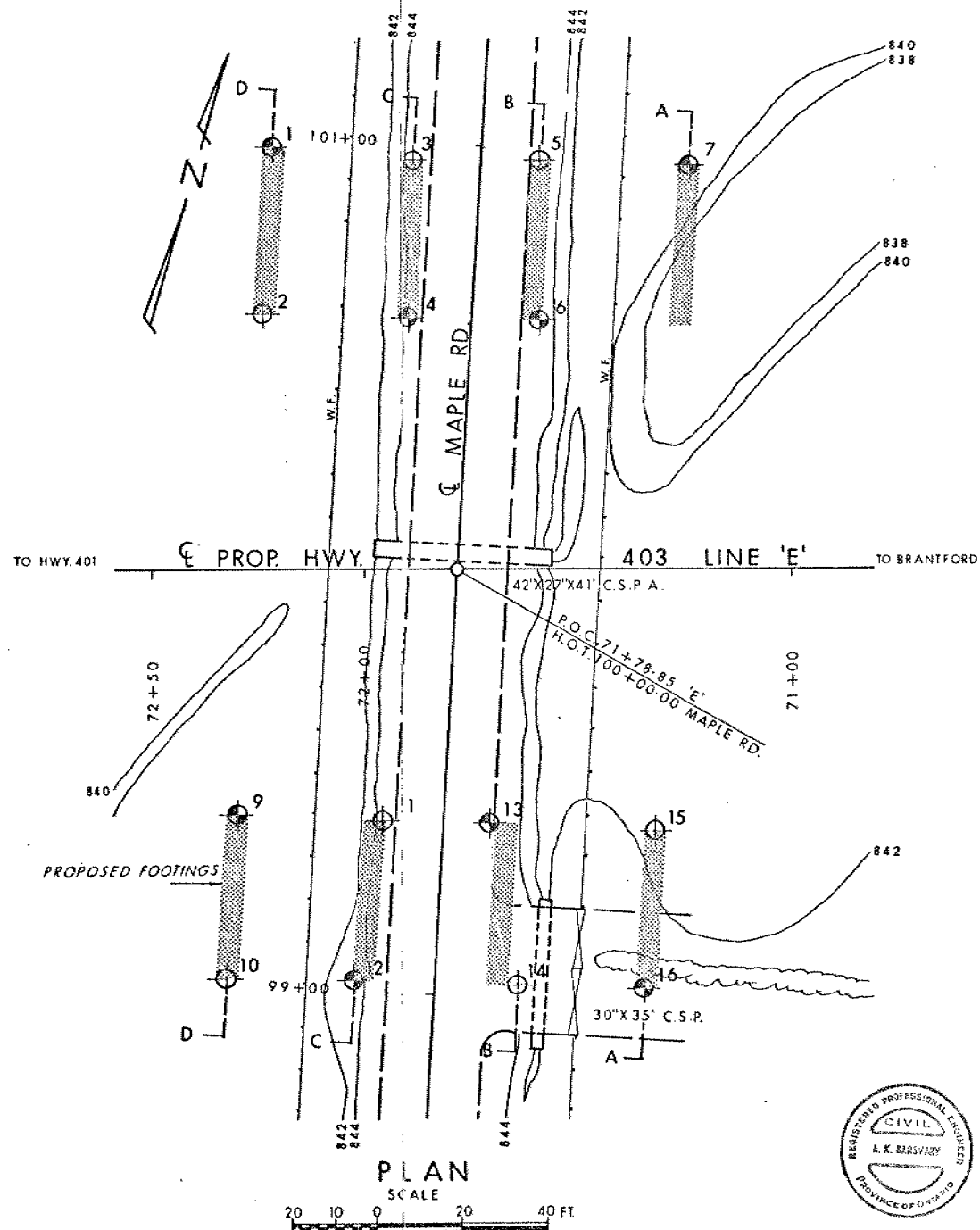
## SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL



**D-D SECTIONS**

20 10 0 20 40 FT.



- LEGEND**
- Bore Hole
  - Cone Penetration Test
  - Bore Hole & Cone Test
  - Water Levels established at time of field investigation MAY 1972

NO.	ELEVATION	STATION	OFFSET
1	841.8	100+96	49' LT.
2	841.4	100+58	49' LT.
3	844.6	100+95	16' LT.
4	844.4	100+59	15' LT.
5	844.0	100+97	14' RT.
6	844.1	100+60	16' RT.
7	841.4	100+98	49' RT.
9	841.4	99+40	48' LT.
10	841.8	99+01	49' LT.
11	844.0	99+40	14' LT.
12	842.3	99+02	19' LT.
13	845.0	99+41	11' RT.
14	844.4	99+04	19' RT.
15	841.4	99+41	49' RT.
16	842.2	99+04	49' RT.

NOTE: BORE HOLE 8 NOT DONE IN FIELD

**NOTE**

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION & COMMUNICATIONS  
DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

**MAPLE RD.**

HIGHWAY NO. 403 PROP. LINE 'E' DIST. NO. 4  
CO. BRANT  
TWP. BURFORD LOT 3 & 4 CON. 3

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBMD A.B. CHECKED: W.P. NO 71-62-00  
DRAWN O.L.J. CHECKED: JOB NO 72-11046  
DATE 14 JULY 1972 SITE NO.  
APPROVED: CONT. NO.

DRAWING NO. 72-11046A  
BRIDGE DRAWING NO.



Ministry of  
Transportation and  
Communications

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 1

METRIC

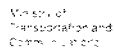
W P 71-62 LOCATION Sta. 9+970.0, o/s 14.9 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 16 & 17 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
256.6	Ground Level													
0.0	Organics		1	SS	5		256							
			2	SS	26									
	Fine to medium sand with some silt and gravel.		3	SS	20		254							0 87 (13)
			4	SS	30									
	Loose to very dense.		5	SS	43		252							
	Grey.		6	SS	21									
			7	SS	60									
249.9							250							
6.7	Sandy silt, some gra.		8	SS	100/	127 mm								
248.9	(Glacial Till) v. dense		9	SS	100/	25 mm								
7.7	End of Borehole													

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to  
Sensitivity

20  
15  
10  
5  
[%] STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



## HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE No 2

METRIC

W P 71-62 LOCATION Sta. 9+982.3, o/s 14.9 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 16 CHECKED BY RS

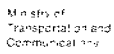
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LQUID LIMIT W <sub>L</sub>	UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	WATER CONTENT (%)		
256.5	Ground Level						256						
0.0							254						
							252						
249.9							250						
6.6	End of Cone Test							100/229 mm					

**+<sup>3</sup>, x<sup>5</sup> :** Numbers refer to Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION





## RECORD OF BOREHOLE No 3

METRIC

W P 71-62 LOCATION Sta. 9+971.0, o/s 4.9 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 15 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
257.4	Ground Level													
0.0							256							
							254							
							252							
250.1														
7.3	End of Cone Test									100/279 mm				

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION



Ministry of  
Transportation and  
Communications  
Ontario

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 4

METRIC

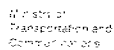
W P 71-62 LOCATION Sta. 9+982.0, o/s 4.6 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 15 CHECKED BY RS

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 <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
257.4	Ground Level												
0.0	Organic sand, some si. Black and grey.		1	SS	26		256						
255.4			2	SS	5								
2.0	Fine to medium sand with some silt and traces of gravel.		3	SS	7		254						
	Loose to very dense. Grey.		4	SS	17								
			5	SS	32								
			6	SS	30		252						
			7	SS	67								
			8	SS	104		250						
249.0													
8.4	End of Borehole												

+3, x5: Numbers refer to  
Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



## RECORD OF BOREHOLE No 5

METRIC

W P 71-62 LOCATION Sta. 9+970.4, o/s 4.3 m LT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 12 CHECKED BY RS

SOIL PROFILE				SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES	20			40	60	80	100	W <sub>p</sub>		
257.3	Ground Level														GR SA SI CL
0.0							256								
							254								
							252								
							250								
249.5															
7.8	End of Cone Test									100/ 152 mm					

**+3, x5 :** Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION



Ministry of  
Transportation and  
Communications  
Ontario

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 6

METRIC

W P 71-62 LOCATION Sta. 9+981.7, o/s 4.9 m LT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger COMPILED BY RS  
DATUM Geodetic DATE 1972 05 16 CHECKED BY RS

SOIL PROFILE		STRAT PLOT	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	N' VALUES			20	40	60	80	100					
257.3	Ground Level																
0.0	Organic sandy silt some roots. Loose. Black and grey.		1	SS	5		256										
255.3			2	SS	5												
2.0	Fine to medium sand. Very loose to dense. Grey.		3	SS	3		254										
			4	SS	19												
			5	SS	24												
			6	SS	22		252										
			7	SS	31												
			8	SS	44		250										
249.0																	
8.3	Silty sand traces of clay (Glacial Till) Very dense		9	SS	162	254 mm	248										1 48 45 6
247.1																	
10.2	End of Borehole		10	SS	100	127 mm											

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

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 7

METRIC

W P 71-62 LOCATION Sta. 9+970.1, o/s 14.9 m LT of Maple Road ORIGINATED BY WVL  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 17 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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					
256.5	Ground Level																
0.0	Organic sandy silt some roots. Black and grey.		1	SS	5		256										
254.8			2	SS	9												
1.7	Fine to medium sand, some silt.  Loose to very dense.  Grey.		3	SS	15		254										2 81 (17)
			4	SS	17												
			5	SS	43												
			6	SS	38		252										
			7	SS	62												
249.5							250										
7.0	Sandy silt with clay and gravel. (Glacial Till)		8	SS	148/	279 mm											22 30 37 11
247.7	Hard.		9	SS	116/	279 mm	248										
8.8	End of Borehole																

+3, x5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 9

METRIC

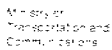
W P 71-62 LOCATION Sta. 10+018.3, o/s 14.6 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 11 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	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						
256.5	Ground Level													
0.0	Organic sandy silt some roots.						256							
255.3	Black and grey.		1	SS	2									
1.2	Fine to medium sand to gravelly sand, traces of silt.		2	SS	10									
	Loose to very dense.		3	SS	13		254							
			4	SS	20									
			5	SS	21		252							
			6	SS	24									
			7	SS	42		250							
249.5			8	SS	100	152 mm								
7.0	Silty sand some clay & gravel. Glacial Till.													
247.8	Very dense.		9	SS	100	152 mm	248							
8.7	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10



## RECORD OF BOREHOLE No 10

METRIC

W P 71-62 LOCATION Sta. 10+030.2, o/s 14.9 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 12 CHECKED BY RS

[illegible]

<sup>+</sup>3, x<sup>5</sup> : Numbers refer to Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION



Ministry of  
Transportation and  
Communications  
Ontario

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 11

METRIC

W P 71-62 LOCATION Sta. 10+018.3, o/s 4.3 m RT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 13 CHECKED BY RS

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 <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
257.3	Ground Level											
							256					
							254					
							252					
							250					
249.7	End of Cone Test								100/279 mm			
7.6												

+3, x5 : Numbers refer to  
Sensitivity

20  
15 - 5 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION





Highway Engineering Division  
Engineering Materials Office - Soil Mechanics Section

# HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE No 12

METRIC

W P 71-62 LOCATION Sta. 10+029.9, o/s 5.8 m RT of Maple Road ORIGINATED BY WVU  
 DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
 DATUM Geodetic DATE 1972 05 12 CHECKED BY RS

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 <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES									
256.7	Ground Level													
0.0	Trace of Organics		1	SS	4		256							
			2	SS	9									
	Fine to medium sand, traces of silt.		3	SS	13		254							
			4	SS	12									
	Loose to very dense.		5	SS	39									
			6	SS	57		252							
			7	SS	15									
			8	SS	95		250							
248.5														
8.2	Silty sand, traces of clay and gravel. (Glacial Till)		9	SS	131		248							
	Very dense.													
246.3			10	SS	165/292mm									
10.4	End of Borehole													

+3, x5 : Numbers refer to Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION



2. 6. 1. 1  
Transcribed and  
checked

# HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

## RECORD OF BOREHOLE No 13

METRIC

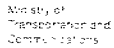
W P 71-62 LOCATION Sta. 10+018.0, o/s 3.4 m LT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 09 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
257.6	Ground Level													
0.0	Organic sandy silt mottled grey and black Very loose.		1	SS	4									
255.6			2	SS	7									
2.0	Fine to medium sand, traces of silt.		3	SS	19									
			4	SS	27									
	Compact to dense.		5	SS	22									
			6	SS	32									
			7	SS	41									
			8	SS	25									
249.4														
8.2	Sandy silt to sand with some silt, traces of clay and gravel. (Glacial Till)		9	SS	100/127									
247.3	Very dense.		10	SS	100/127									
10.3	End of Borehole													

+3, x<sup>5</sup>: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10

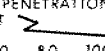

OFFICE REPORT ON SOIL EXPLORATION



## RECORD OF BOREHOLE No 14

METRIC

W P 71-62 LOCATION Sta. 10+029.3, o/s 5.8 m LT @ Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 12 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT <div><div>20406080100</div></div>	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT <div><div>WpWwLc</div></div>	UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES						
257.4	Ground Level										
0.0											
249.8											
7.6	End of Cone Test										

<sup>3</sup>, x<sup>5</sup> : Numbers refer to Sensitivity

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

20

15 - 4

10

RECORD OF BOREHOLE No 15

METRIC

W P 71-62 LOCATION Sta. 10+018.0, o/s 14.9 m LT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Dynamic Cone Penetration Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 11 CHECKED BY RS

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 <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
256.5	Ground Level												
0.0							256						
							254						
							252						
							250						
248.9	End of Cone Test							100/229 mm					
7.6													

+3, x5: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION



Ministry of  
Transportation and  
Communications  
Ontario

HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 16

METRIC

W P 71-62 LOCATION Sta. 10+029.3, o/s 14.9 m LT of Maple Road ORIGINATED BY WVU  
DIST 4 HWY 403 BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY RS  
DATUM Geodetic DATE 1972 05 09 CHECKED BY RS

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 <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
256.7	Ground Level												
0.0	Trace of Organics		1	SS	10		256						
			2	SS	14								
	Fine to medium sand traces of silt and gravel.		3	SS	10		254						
			4	SS	14								
			5	SS	7								
	Seam of silty sand		6	SS	14		252						
			7	SS	18								
	Loose to very dense		8	SS	47		250						
	Grey		9	SS	100	101 mm	248						
246.6			10	SS	100	152 mm	246						
10.1	Sandy silt some clay and gravel (Glacial Till) Very dense												
245.6													
11.1	End of Borehole												

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to  
Sensitivity

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

OFFICE REPORT ON SOIL EXPLORATION



## METRIC

DIMENSIONS ARE IN MILLIMETRES  
UNLESS OTHERWISE SHOWN.  
ELEVATIONS, COORDINATES, CURVE  
AND ALIGNMENT DATA ARE IN METRES.  
STATIONS ARE IN KILOMETRES + METRES.

## NOTES

## CLASS OF CONCRETE

DECK & PIER COLUMN - 35 MPa  
 BARRIER WALLS - 30 MPa  
 REMAINDER - 20 MPa  
 OR AS NOTED ON THE DRAWINGS.

## REINFORCING STEEL

## GRADE 400

REINFORCING BAR MARKS WITH  
SUFFIX 'C' TO BE COATED BARS.

## CLEAR COVER TO REINF. STEEL

FOOTINGS, ABUTMENTS  
AND PIER COLUMN - 75 mm  
 DECK TOP - 50 mm  
 DECK BOTTOM - 40 mm  
 OR AS NOTED ON THE DRAWINGS.

## CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE  
FOR FINISHING THE BEARING  
SEATS DEAD LEVEL TO THE  
SPECIFIED ELEVATIONS WITH A  
TOLERANCE OF  $\pm 3$  mm.  
 NO CONCRETE SHALL BE PLACED  
ABOVE THE ABUTMENT BEARING  
SEATS UNTIL THE CONCRETE IN  
THE DECK HAS BEEN PLACED,  
STRESSED AND GROUTED.

TO ACHIEVE THE MINIMUM CLEAR  
COVER OF 50 mm SPECIFIED AT  
TOP OF DECK, THE TOP LAYER OF  
REINFORCEMENT SHALL BE  
PLACED PRIOR TO CONCRETING,  
WITH A CLEAR COVER OF  $65 \pm 15$  mm  
TOLERANCE.

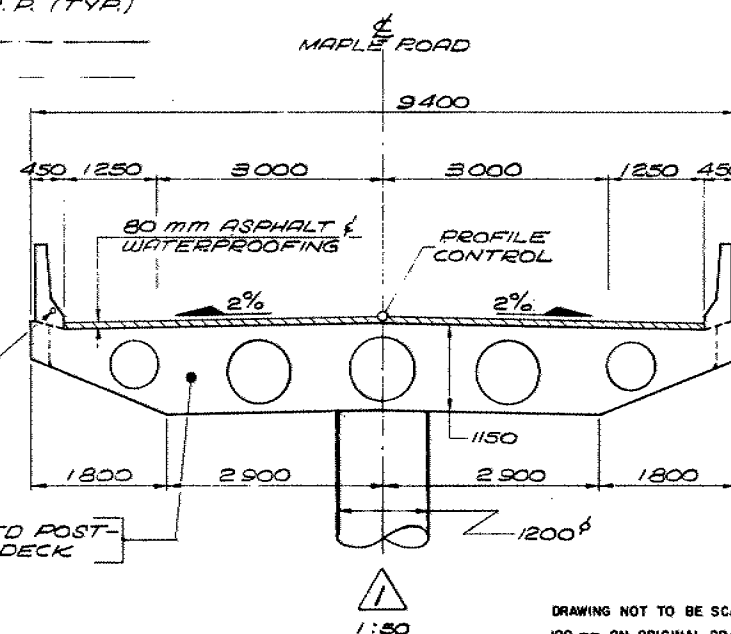
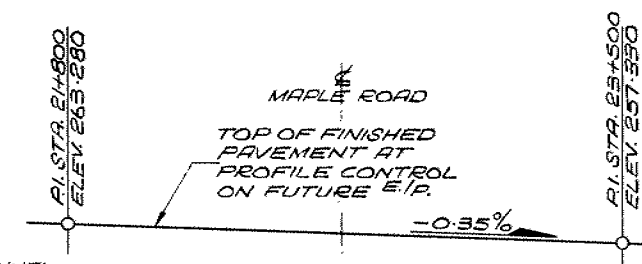
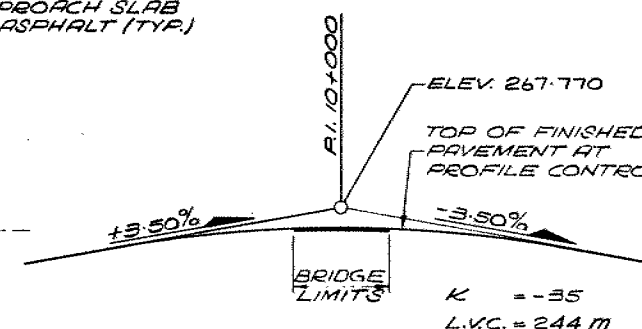
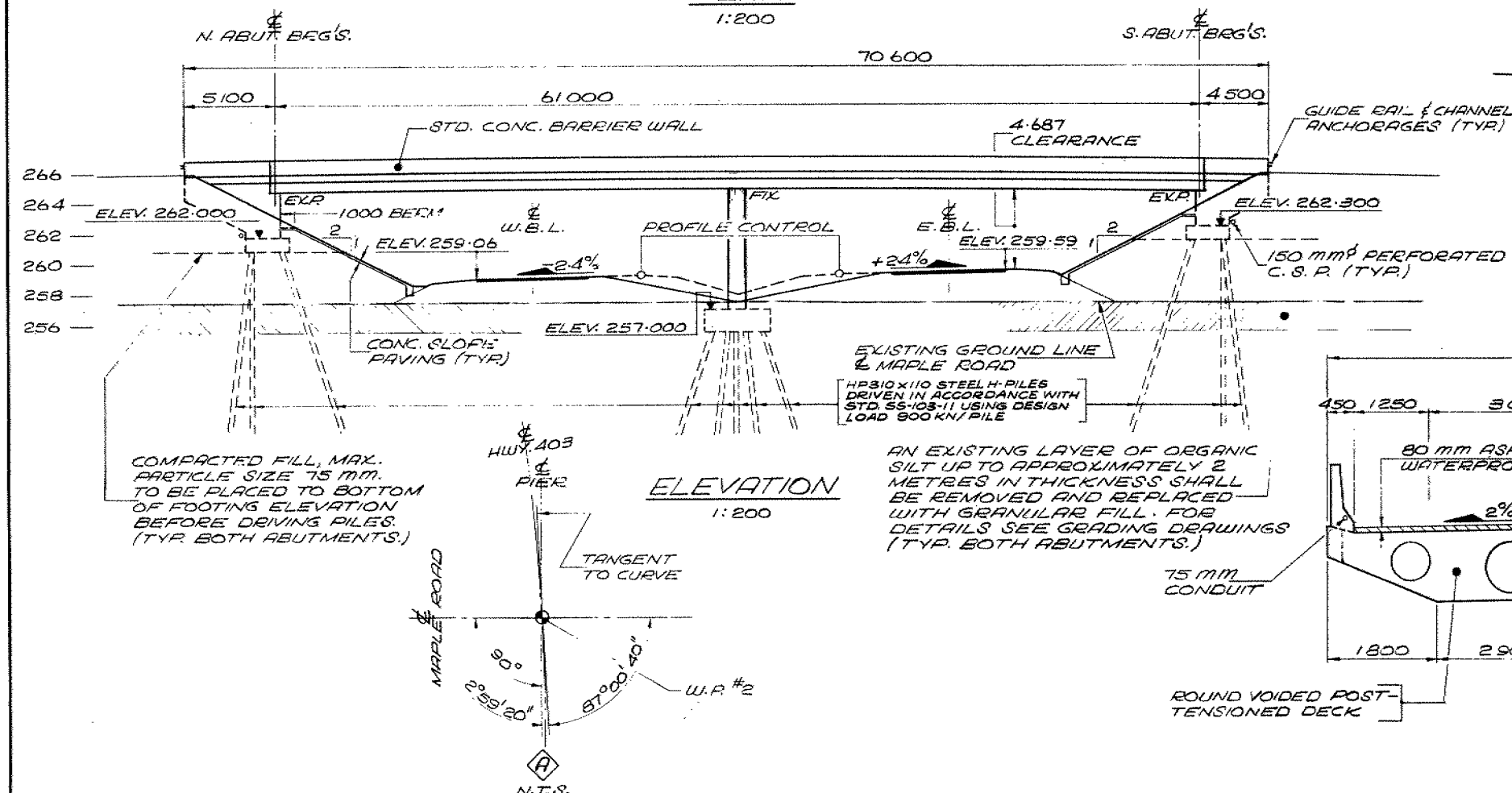
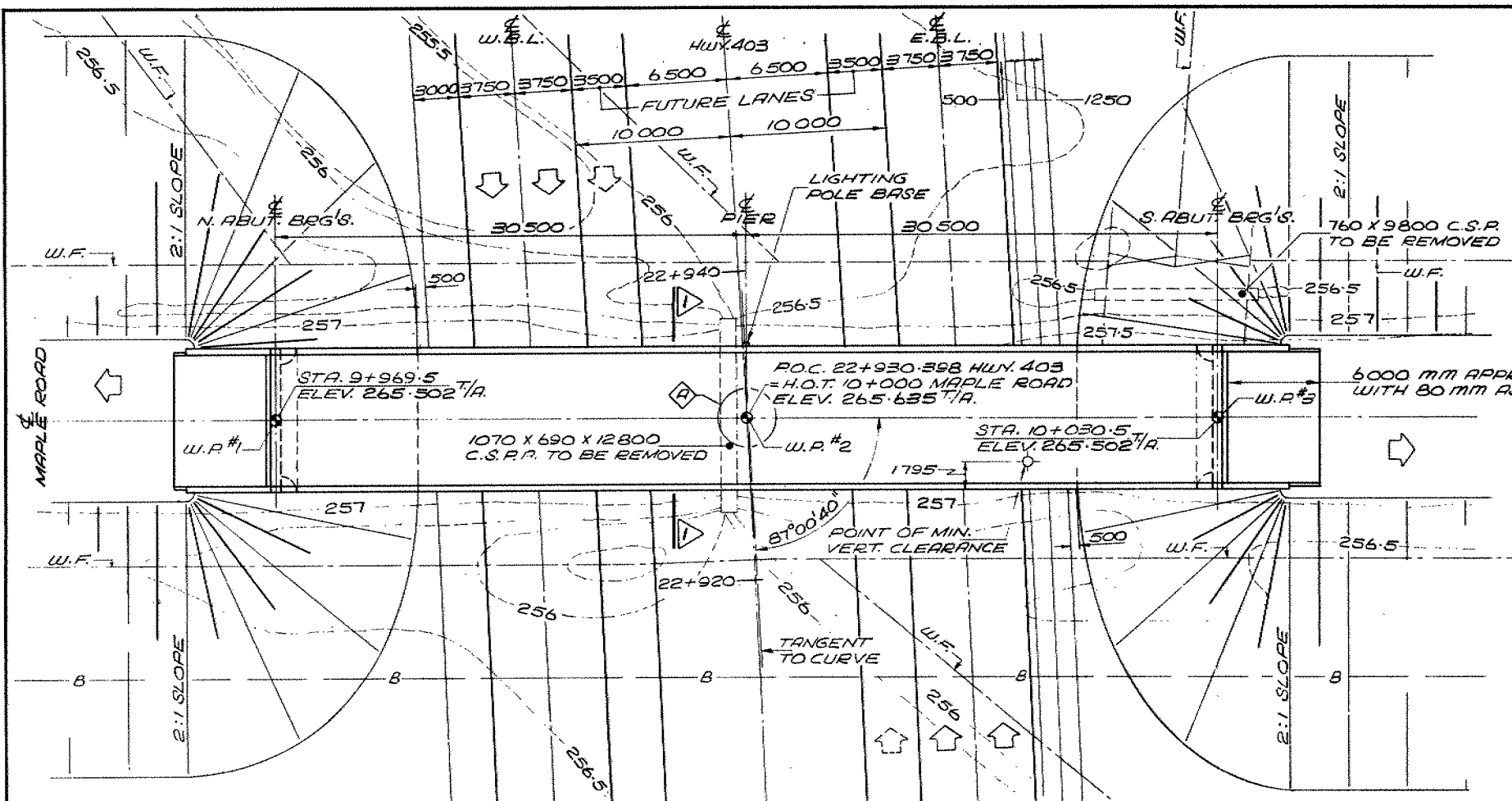
## LIST OF DRAWINGS

- 1 GENERAL PLAN
- 2 BOREHOLE LOCATION & SOIL STRATA
- 3 FOOTINGS
- 4 NORTH ABUTMENT
- 5 SOUTH ABUTMENT
- 6 PIER DETAILS
- 7 DECK DETAILS & ABUT. BEARINGS
- 8 LONGITUDINAL CABLE DETAILS
- 9 TRANSVERSE CABLE DETAILS
- 10 DECK REINFORCING I
- 11 DECK REINFORCING II
- 12 BARRIER WALL
- 13 6000 MM APPROACH SLAB
- 14 DETAILS OF CONC. SLOPE PAVING
- 15 AS CONSTRUCTED ELEV. & DIM.
- 16 STANDARD DETAILS I
- 17 STANDARD DETAILS II
- 18 STANDARD DETAILS III
- 19 BRIDGE ELECTRICAL DETAILS TYPE IV
- 20 BRIDGE DATE & SITE NUMBER DATA
- 21 PILE DRIVING-STEAM & DIESEL HAMMERS

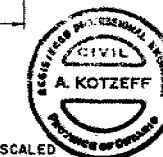
## CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED  
BELOW FOR THE APPROPRIATE  
LUMP SUM TENDER ITEMS:

CONCRETE IN ABUTMENTS AND WINGWALLS	20 MPa	70 m <sup>3</sup>
PIER COLUMN	35 MPa	8 m <sup>3</sup>
PRESTRESSED CONCRETE IN BRIDGE DECK		477 m <sup>3</sup>
CONC. IN BARRIER WALLS		35 m <sup>3</sup>
CONC. IN APPROACH SLABS		26 m <sup>3</sup>
CONC. IN SLOPE PAVING		27 m <sup>3</sup>



DRAWING NOT TO BE SCALED  
100 mm ON ORIGINAL DRAWING



DATE	BY	DESCRIPTION
DESIGN	A.K.	CHECK PKP
DRAWING	EDM	CHECK
LOADING	H.S.	20-44
DATE	JULY 90	
SITE No	1-151	DWG 1

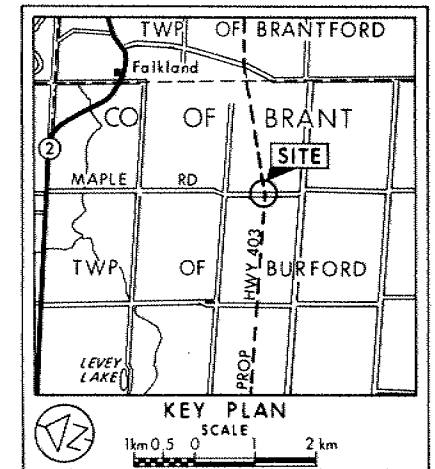
# METRIC

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

CONT No 81-43  
WP No 71-62-01

MAPLE ROAD UNDERPASS  
(6.1 km West of Hwy 24A)  
BORE HOLE LOCATIONS & SOIL STRATA

SHEET  
135



## LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊙ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L. at time of investigation 1972.05

No	ELEVATION	STATION	OFFSET MAPLE ROAD
1	256.6	9+970.7	14.9m RT
2	256.5	9+982.3	14.9m RT
3	257.4	9+971.0	4.9m RT
4	257.4	9+982.0	4.6m RT
5	257.3	9+970.4	4.3m LT
6	257.3	9+981.7	4.9m LT
7	256.5	9+970.1	14.9m LT
9	256.5	10+018.3	14.6m RT
10	256.6	10+030.2	14.9m RT
11	257.3	10+018.3	4.3m RT
12	256.7	10+029.9	5.8m RT
13	257.6	10+018.0	3.4m LT
14	257.4	10+029.3	5.8m LT
15	256.5	10+018.0	14.9m LT
16	256.7	10+029.3	14.9m LT

## NOTE

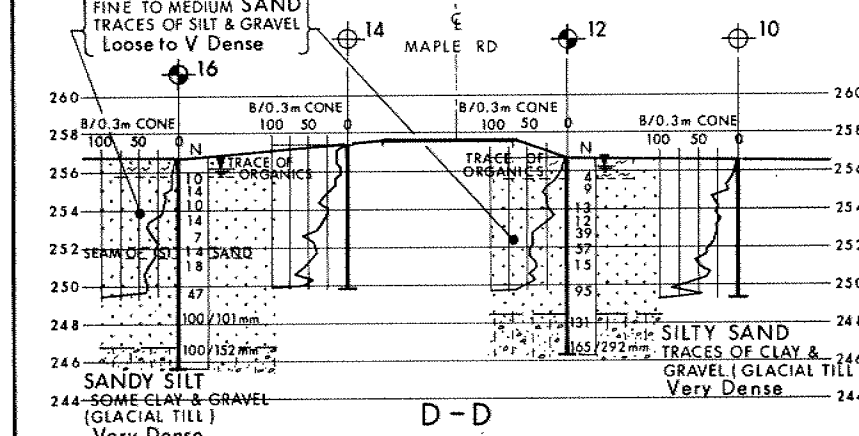
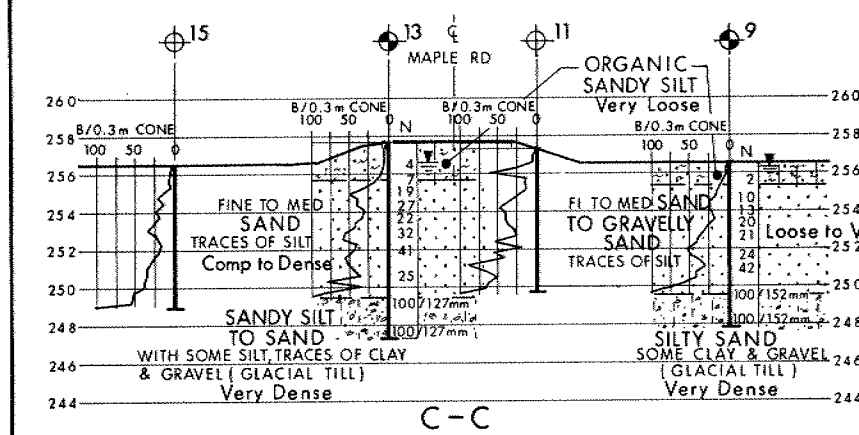
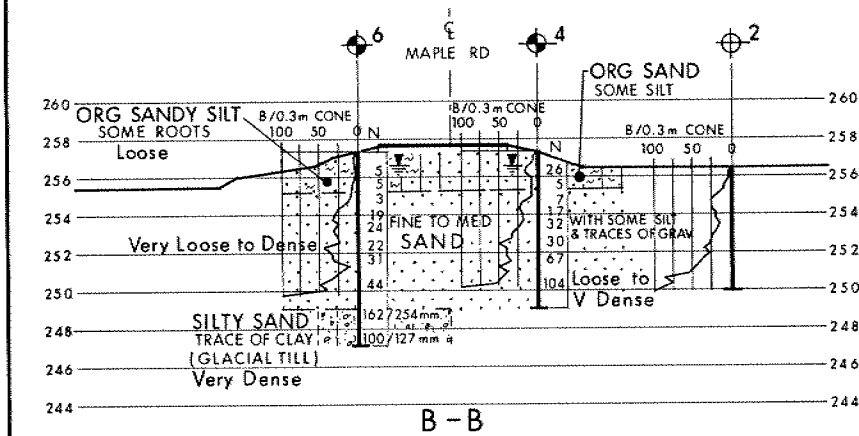
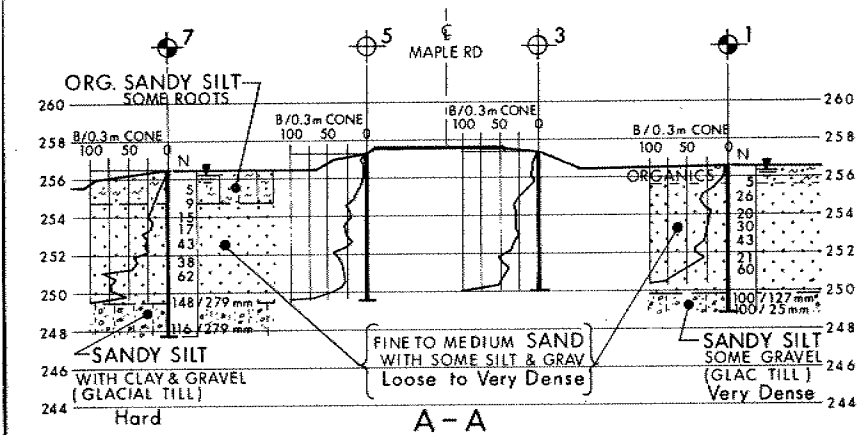
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

DATE	BY	DESCRIPTION

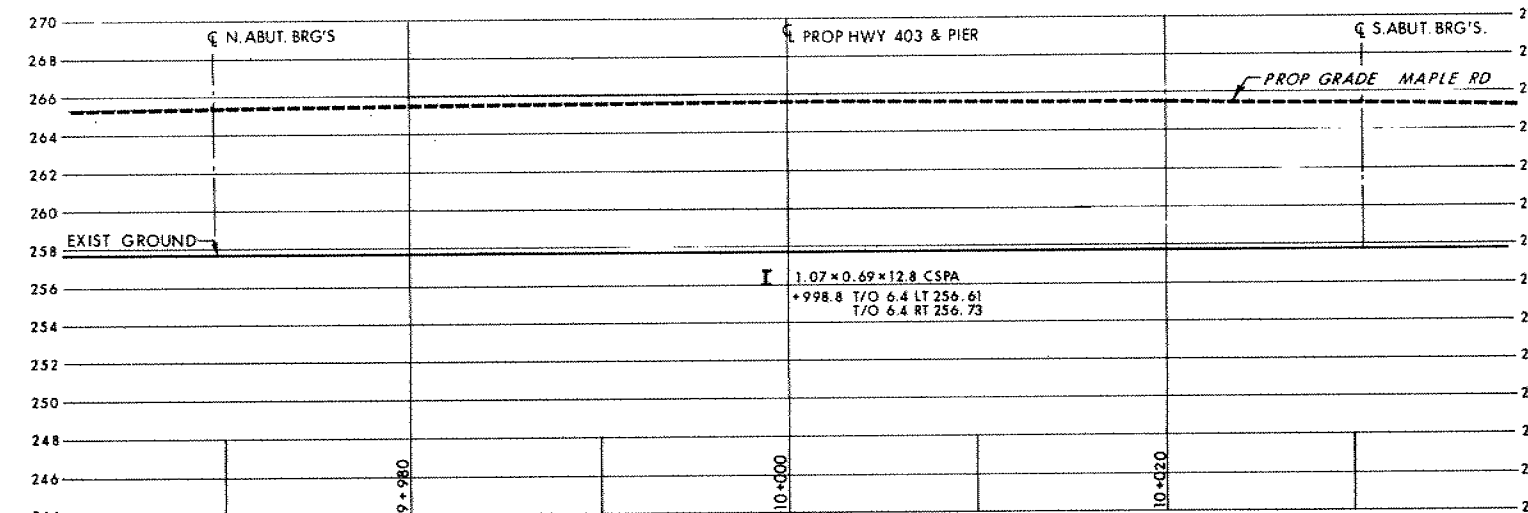
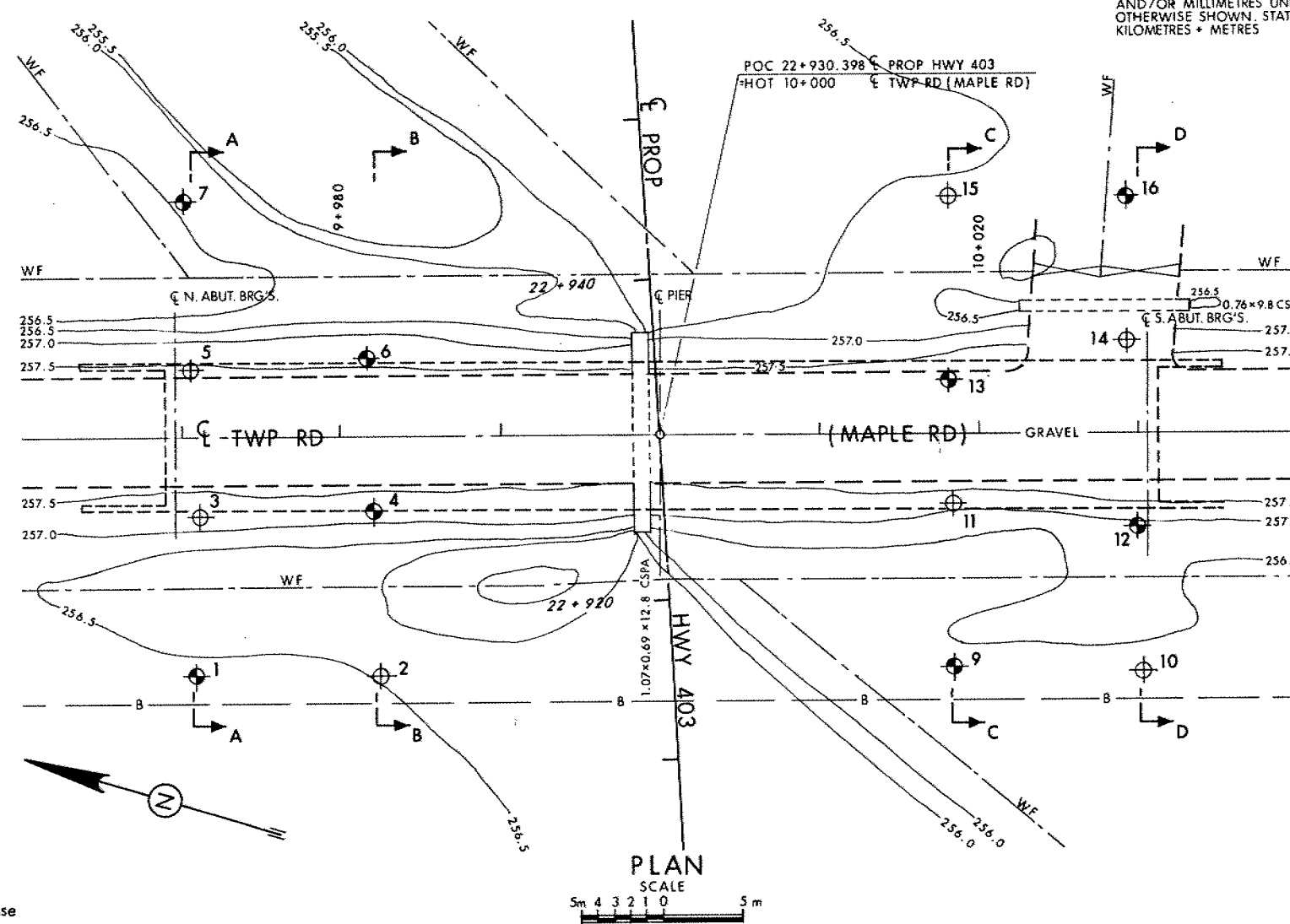
Geocres No 40P1-59

HWY No 403	CHECKED	DATE 1979 12 13	DIST 4
SUBWD K5	CHECKED	APPROVED	SITE 1-151
DRAWN R5	CHECKED		DWG 2

REF No E-5549-1, 1979 04



D-D SECTIONS  
SCALE  
5m 4 3 2 1 0 5m



PROFILE-MAPLE RD  
SCALE  
5m 4 3 2 1 0 5m