

REMARKS: _____

T. NO. 2		SHEET
CONT No WP No 40-66-04		
COUNTY RD. 14 INTER- CHANGE UNDERPASS GENERAL LAYOUT		
WYLLIE & UFNAL LIMITED CONSULTING ENGINEERS		

NOTES:

CLASS OF CONCRETE

DECK & BARRIER WALLS 5000 PSI
PIER & COLUMNS 5000 PSI
REINFORCED 5000 PSI
DECK NOTED ON THE DRAWINGS.

CLEAR COVER ON REINFORCING STEEL

FOOTINGS, ABUTMENTS & PIER COLUMNS: 3" DECK 2" TOP, 1 1/2" BOTTOM. OR AS NOTED ON THE DRAWINGS.

REINFORCING STEEL GRADE

ALL STEEL GRADE 400
REINFORCING BARS WITH DESIGNATION 'C' AT END OF BAR MARK SHALL BE COATED BARS

CONSTRUCTION NOTES:

THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE BENCHMARK BEING USED TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BENCHMARK BEING USED. THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED & CURED.

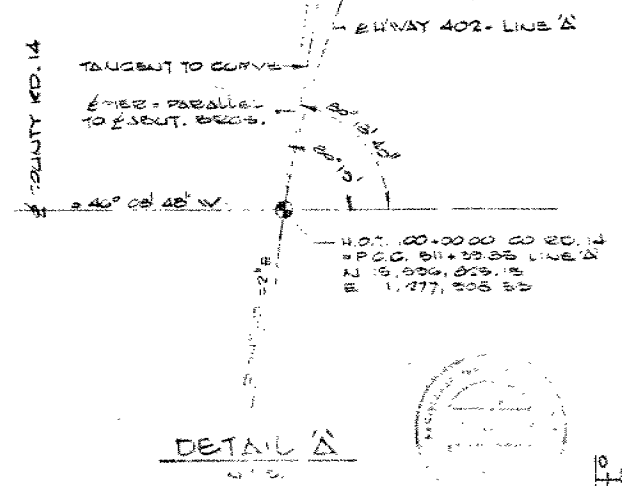
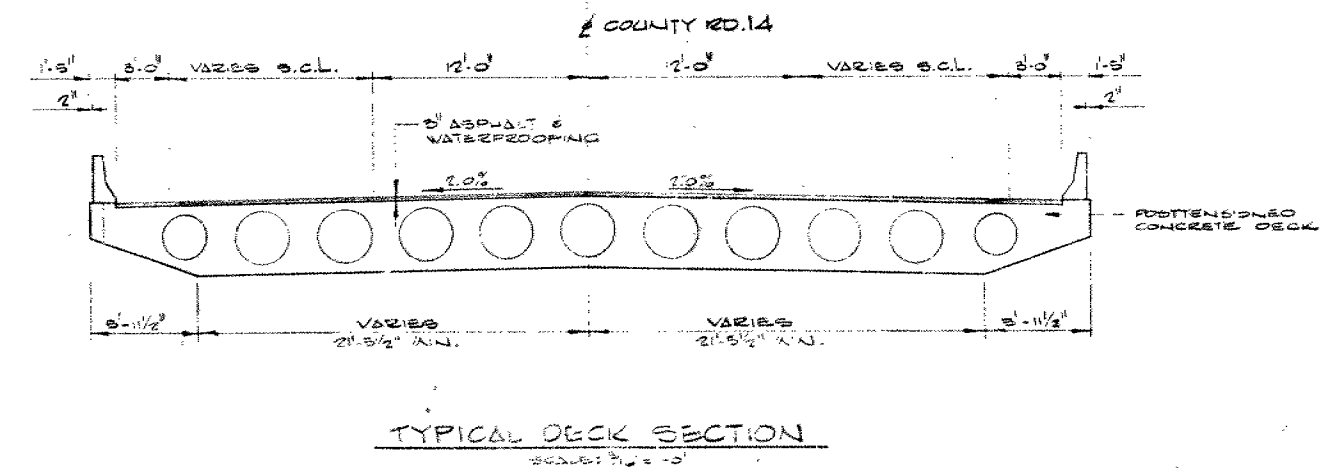
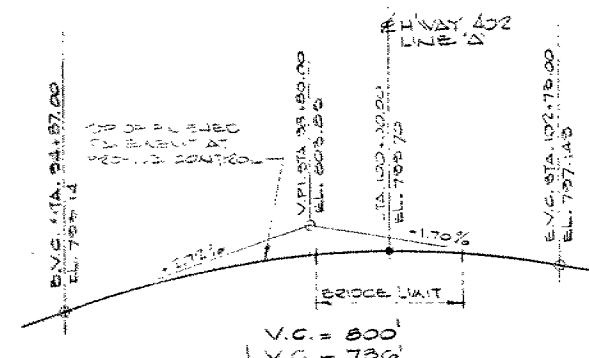
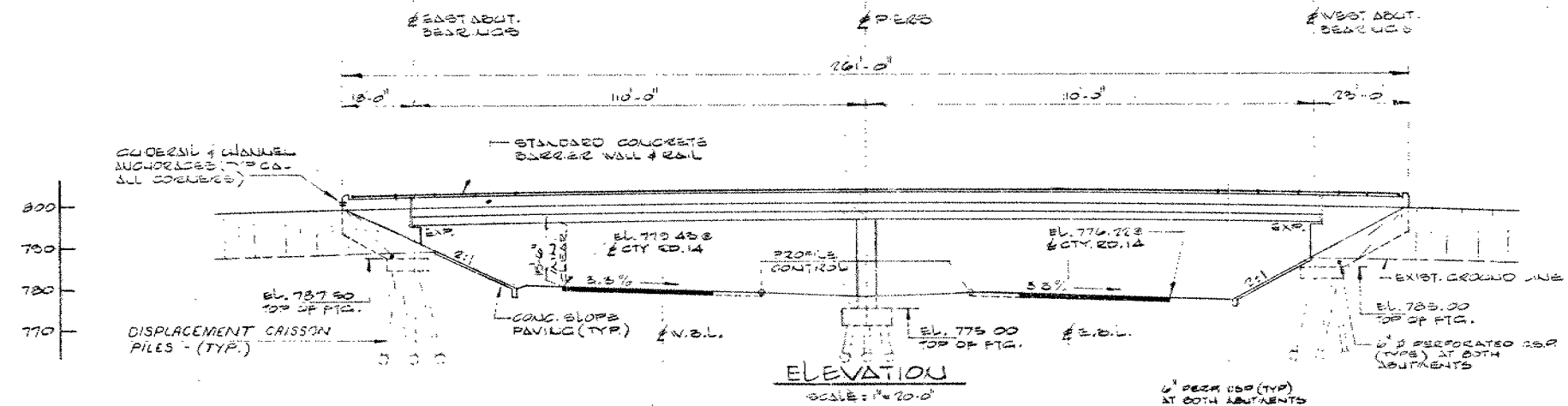
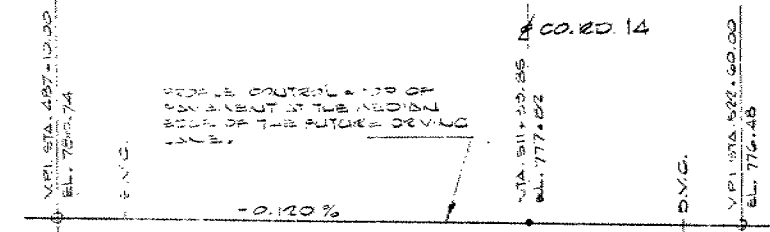
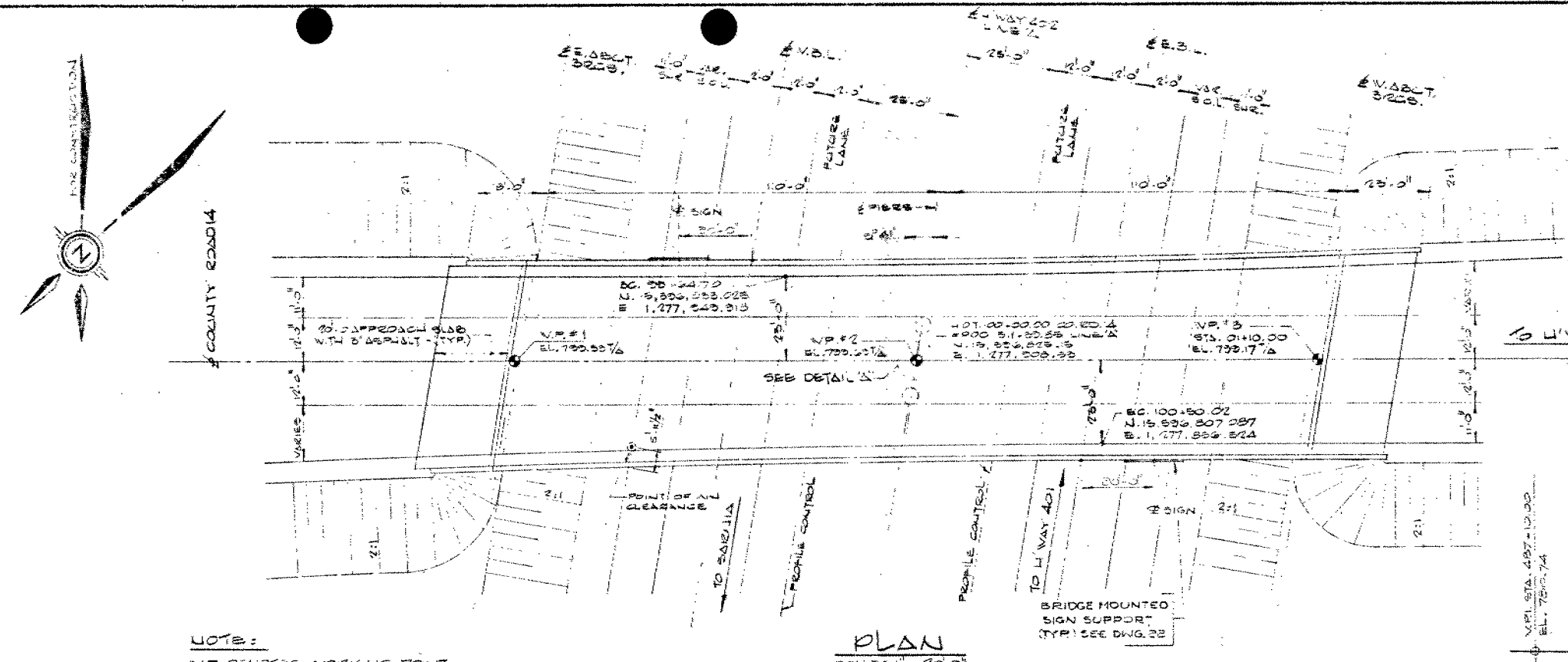
B.M. ELEV. 792.24
GEODETIC DATUM
U.S.N. 11 53, 2001 10' CURRY TREE
240 FT. OF STA. 512+37

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE BASED ON THE APPROXIMATE CONCRETE VOLUMES BASED ON THE FOLLOWING:

CONC. IN PIERS, ABUTMENTS & WINGWALLS 5000 PSI 22 CU. YD.
WINGWALLS 5000 PSI 201 CU. YD.
CONCRETE IN DECK 123 CU. YD.
CONCRETE IN APPROACH SLABS 27 CU. YD.
CONCRETE IN BARRIER WALLS 45 CU. YD.
CONCRETE IN SLOPE PAVING 57 CU. YD.

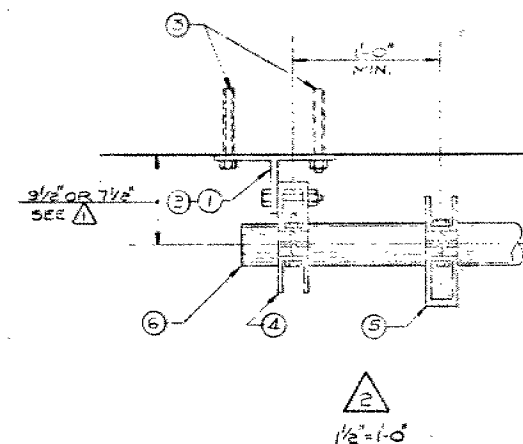
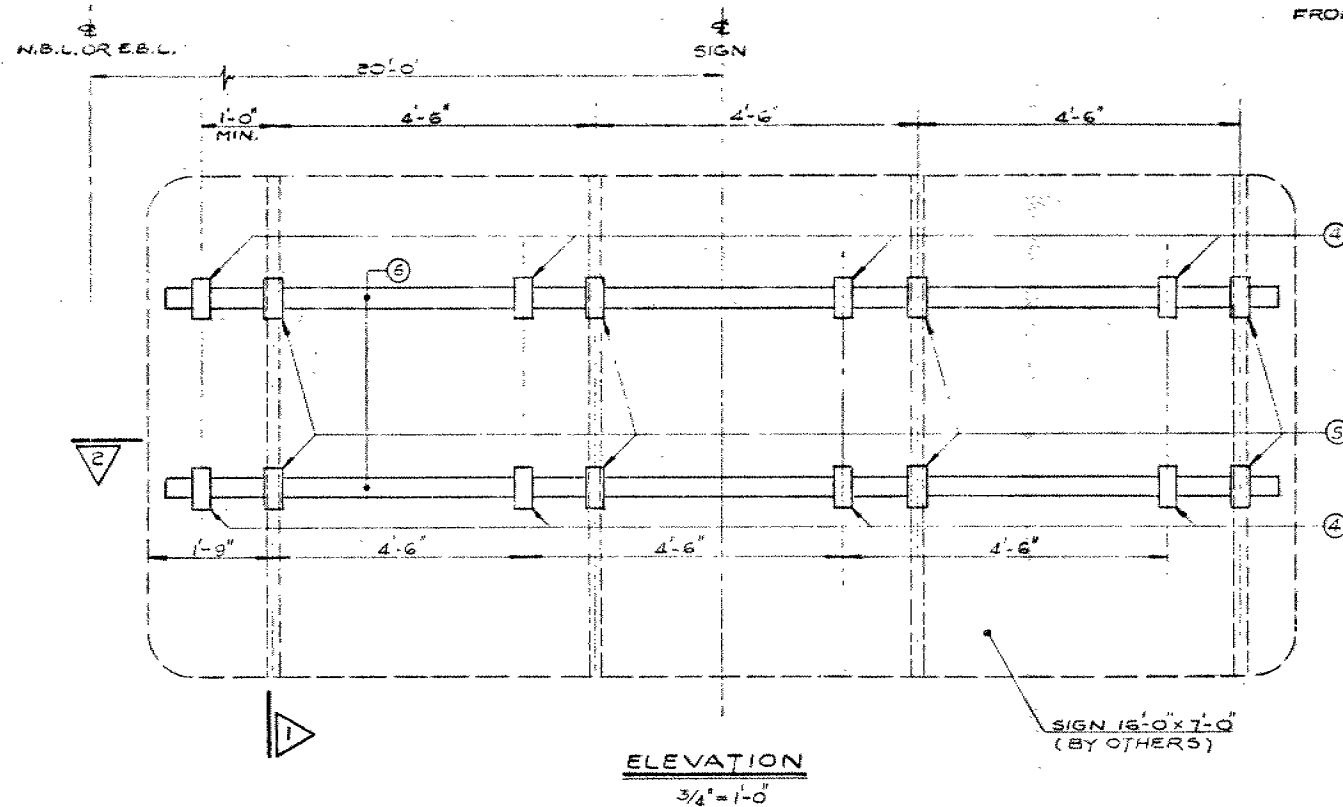
- LIST OF DRAWINGS**
- 1 - GENERAL LAYOUT
 - 2 - BENCHMARK LOCATION & SOIL STRATA
 - 3 - FOOTING LAYOUT - I
 - 4 - FOOTING LAYOUT - II
 - 5 - EAST ABUTMENT - I
 - 6 - EAST ABUTMENT - II
 - 7 - WEST ABUTMENT - I
 - 8 - WEST ABUTMENT - II
 - 9 - PIER DETAILS
 - 10 - DECK LAYOUT
 - 11 - LONGITUDINAL CABLE DETAILS
 - 12 - TRANSVERSE CABLE DETAILS
 - 13 - DECK REINFORCING
 - 14 - BARRIER WALL
 - 15 - STEEL RAILING
 - 16 - APPROACH SLABS
 - 17 - CONC. SLOPE PAVING
 - 18 - STANDARD DETAILS - I
 - 19 - " " " " - II
 - 20 - " " " " - III
 - 21 - AS CONSTRUCTED ELEV. & DIM'S.
 - 22 - OVERHEAD SIGN SUPPORT



FOR REDUCED PLAN:
USE SCALE BELOW
1" = 3" ON ORIGINAL PLAN

REVISIONS	DATE	BY	DESCRIPTION

NOTE:
LOCATION TO BE SHIFTED IN FIELD TO BE 1'-0" MIN
FROM STEEL RAILING POST ANCHORAGES.



CONT No WP No 40-66-04	
CTY. RD. 14 INTER. UPASS	SHEET
OVERHEAD SIGN SUPPORT	

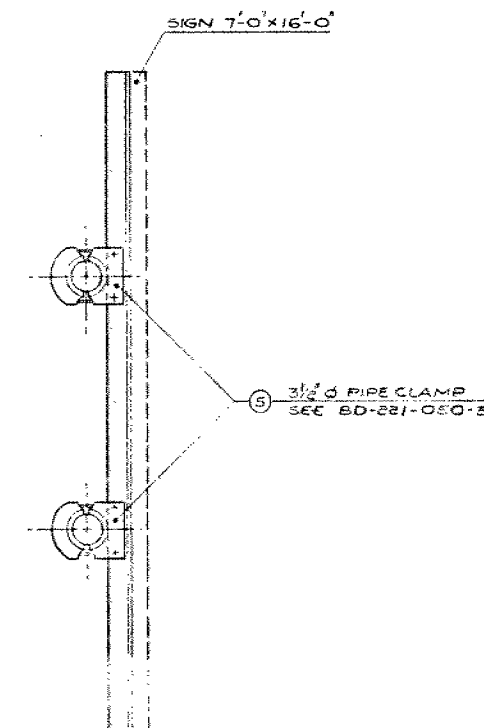
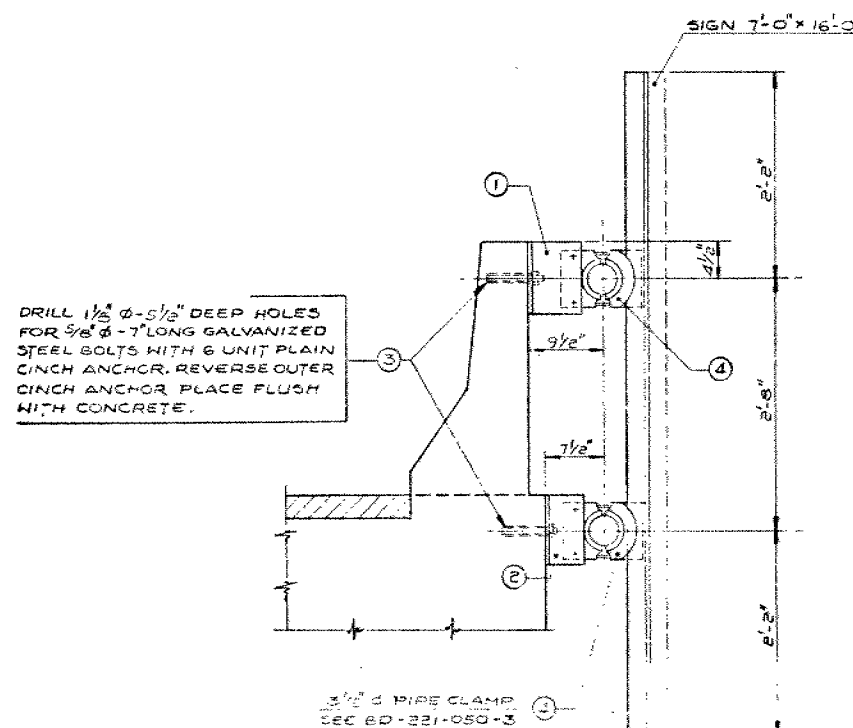
NOTES:

ALL STAINLESS STEEL BOLTS, NUTS & WASHERS TO BE ALLOY 304 COLD FINISH CENTRELESS GROUND MIN. YIELD STRESS 44,000 P.S.I.
TOLERANCE $\pm 1/16$ " UNLESS OTHERWISE SPECIFIED.
ALL STEEL "T" CONNECTIONS SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH C.S.A. SPECIFICATIONS G164
ALL ANCHOR BOLTS SHALL BE CHECKED BY THE ENGINEER BEFORE PLACING SIGN.
ALL ANCHOR BOLTS & WASHERS SHALL BE GALVANIZED STEEL.
ALL NUTS SHALL BE A NYLON TYPE LOCKNUT E.S.N.A. ELASTIC STOP NUT OR EQUAL.
QUANTITIES SHOWN BELOW ARE FOR TWO SIGN SUPPORTS.
DO NOT SCALE DRAWING.
FOR LOCATION OF SIGN SUPPORT STRUCTURES SEE DWG.1

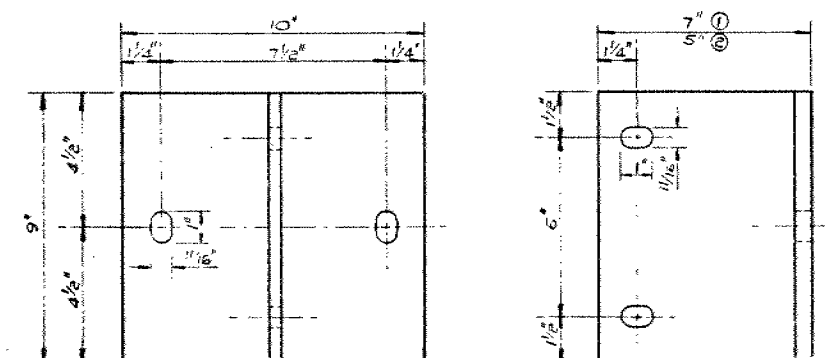
NOTE:
12-SIGN CLAMPS (BD-221-050-3)
TO BE DELIVERED TO THE DISTRICT
SIGN OFFICE.

BILL OF MATERIALS

QTY	NAME	FIG	MATERIAL	ROUGH DIMENSIONS	REMARKS
3	CONNECTING TEE (7" STEM)	1	G40-12	W7x30.5x9'L	
8	CONNECTING TEE (5" STEM)	2	G40-12	W7.5x27.0x9'L	
22	ANCHOR BOLTS WITH NUTS & WASHERS	3	STEEL	5/8" ϕ 15 UNC 7'L	GALV. STEEL
16	PIPE CLAMP (FOR STRUCTURE)	4		SEE BD 221-050-3	
16	PIPE CLAMP (FOR SIGN)	5		SEE BD 221-050-3	
4	SUPPORT PIPE WITH PIPE CAPS	6	6511N-T6	3 1/2" ϕ SCH 40 15'-6'L	

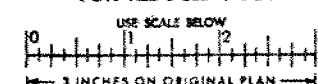


TYPICAL SECTION
AT SIGN CLAMPS



DETAIL FIG. 1 & 2
N.T.S.

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION	DATE
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

MEMORANDUM

TO: A.P. Watt (2)
Regional Structural Planning Engineer
Southwestern Region, London

FROM: Soil Mechanics Section
Geotechnical Office
West Bldg.

ATTENTION:

DATE: February 2, 1976

OUR FILE REF.

IN REPLY TO

FEB - 5 1976

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For
The Proposed Overpass Structures
At Crossing of Co. Rd. #14 and
Proposed Hwy. #402, EBL, WBL
Co: Middlesex; Twp: Caradoc
District #2 (London Ont)
W.P. 40-66-04 & 05

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 requirements. Should additional information be required, please do not hesitate to contact our Office.

K.G. Selby

K.G. Selby
Supervising Engineer

KGS/bp

cc: R.S. Pillar
C.S. Grebski
B.J. Giroux
G.A. Wrong
A. Wittenberg
J.R. Roy
D.P. Collins

R. Hore

~~A.E. McKim~~

J. Anderson

A. Crowley

G. Sloan

Files

Record Services

) Memo only

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2. SITE DESCRIPTION
3. SUBSURFACE CONDITIONS
 General
 Fill; Silt, Sand & Gravel
 Silty Sand to Sandy Silt
4. GROUNDWATER LEVEL
5. DISCUSSION AND RECOMMENDATIONS

FOUNDATION INVESTIGATION REPORT

For

The Proposed overpass structures
At Crossing of Co. Rd. #14 and
Proposed Hwy. #402, EBL, WBL
Co: Middlesex; Twp: Caradoc
District #2 (London Ont)
W.P. 40-66-04 & 05

1. INTRODUCTION

A Foundation Investigation, consisting of eight boreholes was carried out at the above described location to determine the subsoil conditions.

This report contains factual and interpreted soil data together with recommendations for the design and construction of the proposed structures and approaches.

2. SITE DESCRIPTION

The proposed overpass structures, will be located approx. 2.5 miles east of the intersection of Co. Rd. #14 and Hwy. #81. The surrounding terrain is flat and cultivated farm land. The existing Co. Rd. #14 embankment is about 6-7 ft. high.

Physiographically the site is situated in the region referred to as the Caradoc Sand Plains. Sands and other light-textured waterlaid deposits are characteristics for this region.

3. SUBSURFACE CONDITIONS

General

Generally, uniform subsoil conditions were found to prevail over the area investigated. The subsoil consists of a deep deposit of sand and silt mixture. The percentage of the sand and silt sizes vary in a somewhat random fashion. Fill material was encountered in B.H. #5.

Fill; Silt, Sand & Gravel

This material was found in B.H. #5 to a depth of about 8 ft. and constitutes the fill placed for the county road. It consists of silt, sand and gravel. The relative density is compact.

Silty Sand to Sandy Silt

Silty sand to sandy silt was encountered in all seven boreholes immediately below a thin layer (2-3") of topsoil or the above mentioned fill. The thickness appears to be over 140 ft. (B.H. #7) where the boring was terminated.

The material in the deposit consists of sands and silts with varying proportion. In the upper 40-45 ft. zone the sand sizes range from 52% to 96% and the silts from 4% to 45%. A few samples also contained 3 to 4% of clay particles. The results of the grain-size analyses performed on selected samples are plotted in an envelope form on Fig. 1.

An approx. 5 ft. thick silt with some clay layer was found in B.H.'s #6,7 and 8 at elevation 740 \pm . Below elevation 740 the silt is the predominant fraction (over 60%). Reference should be made to Fig. 2 of the appendix. Boreholes which were advanced beyond elevation 720 contained occ. layers and zones of clayey silt, silty clay and silt.

Standard penetration tests, carried out within the deposit gave 'N' values ranging from 4 to over 100 blows per foot. Based on the obtained 'N' values the relative density of the overall deposit may be classified as loose to very dense. The loose portion is confined to the uppermost part of the stratum. A sharp increment in the 'N' values occurs in general at the following elevations:

- a) 662-666
- b) 645-648
- c) 627-630 (B.H.'s #7,8 & 9 excluded)

The natural moisture content ranges from 14% to 25%.

4. GROUNDWATER LEVEL

The following groundwater levels were observed during the field investigation:

B.H. #2	Elevation	Not established
#4	"	774.5
#5	"	Not established
#6	"	Not established
#7	"	773.4
#8	"	773.0
#9	"	774.5

5. DISCUSSION AND RECOMMENDATIONS

1. General

The proposal is to construct skewed twin three-span (33'-70'-33') overpass structures at this location. The proposed profile grade is at elevation 812 which is approx. 22' above the pavement of Co. Rd. 14. The original ground level varies between elevation 782 and elevation 785.

2. Abutment Foundations

Two types of foundation are recommended for consideration.

a. Spread Footings on Compacted Fill

The abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. may be assumed. The granular material should consist of Granular 'A' and should be fully compacted according to the current MTC standards. A detailed construction scheme is outlined on Fig. 3 of the appendix.

b. Piled Foundations

Franki type displacement caissons may be used for footing support for both abutments and piers. The bulb of the pile can be formed

at approx. elevation 764 \pm . For different sizes of piles the following safe design loads are recommended:

14 in.	-	70 tons
18 in.	-	125 tons
22 in.	-	150 tons

Alternatively, the abutments may be constructed within the approaches and supported on piles driven through the fill to approx. elevation 745 \pm . In the case of 12 3/4" O.D. and 1/4" thick wall steel tube piles, a safe design load of 40 tons per pile may be used. The pile driving is to be controlled by employing the Hiley Dynamic Pile Driving Formula. (MTC standard SS3-11) For the proposed piers, if founded on steel tube piles, the same recommendations as to design load and estimated tip elevation also apply.

3. For Frost Protection the base of the footings and the pile caps should be located at a minimum depth of 4 ft.
4. Because the location of the groundwater level was found to be at elevation 773-775, and the pile caps at elevation 778, no dewatering problems are anticipated.
5. No stability problems are anticipated for the 30 ft. high approach fills constructed with 2:1 side and forward slopes. The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.
6. Settlement of the subsoil due to the construction of the structure approaches should be immediate.

P. Payer
P. Payer
Senior Engineer

K.S. Selby
K.S. Selby
Supervising Engineer



APPENDIX

RECORD OF BOREHOLE NO 2

WP 40-66-04/05 LOCATION Co-ords. 15,596,888 N; 1,277,876 E. ORIGINATED BY MK
 DIST 2 HWY 402 BORING DATE October 31, 1975 COMPILED BY OJ
 DATUM Geodetic BOREHOLE TYPE Washbore-BX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		25	50	75	100	125	W_P	W	W_L		
783.2	Ground Level															GR SA SI CL
0.0	Silty sand to sandy silt. Loose to Very Dense	•	1	SS	9	780										0 76 (24)
			2	SS	10											
			3	SS	21											
			4	SS	19	770										0 96 (4)
			5	SS	47											
			6	SS	34											
			7	SS	79	760										
			8	SS	27											
			9	SS	24											
			10	SS	150/10"	750										0 87 (13)
			11	SS	164											
			12	SS	30	740										
			13	SS	95											
			14	SS	63	730										
			15	SS	85/4"											
726.7																
56.5	End of Borehole															

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

RECORD OF BOREHOLE NO 4

WP 40-66-04/05 LOCATION Co-ords. 15,596,897 N; 1,277,926 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE October 31, 1975 COMPILED BY O.I.
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	W_P	W	W_L		
784.5	Ground Level															
0.0																
	Silty sand to		1	SS	7	780										
	sandy silt,		2	SS	5											
	traces of clay.		3	SS	5											
			4	SS	9											
			5	SS	24	770										
			6	SS	12											
			7	SS	22											
			8	SS	97											
	Loose to Very Dense		9	SS	71	760										
			10	SS	19											
			11	SS	16	750										
			12	SS	45											
			13	SS	24	740										
			14	SS	34											
			15	SS	156	730										
725.5			16	SS	101	5"										
59.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 40-66-04/05

LOCATION Co-ords. 15,596,847 N; 1,277,960 E.

ORIGINATED BY MK

DIST 2 HWY 402

BORING DATE November 4, 1975

COMPILED BY OJ

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
789.0	Ground Level															
0.0	Fill Material, mixture of silt, sand & gravel		1	SS	10											
	Compact		2	SS	30											
781.0			3	SS	12											
8.0			4	SS	5											
	Silty sand to sandy silt, traces of clay.		5	SS	22											
			6	SS	9											
			7	SS	39											
			8	SS	22											
			9	SS	77											
			10	SS	39											
	Loose to Very Dense		11	SS	17											
			12	SS	55											
			13	SS	55											
			14	SS	38											
			15	SS	19											
			16	SS	139											
			17	SS	99											
722.5			18	SS	57											
66.5	End of Borehole															

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

RECORD OF BOREHOLE NO 6

WP 40-66-04/05 LOCATION Co-ords. 15,596,844 N; 1,278,023 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE November 4, 1975 COMPILED BY OJ
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	W_P	W	W_L		
782.0	Ground Level															
0.0	Silty sand to sandy silt. Loose to Very Dense Silt some Clay		1	SS	4	780										0 58 39 3 0 91 (9) 0 0 78 22
			2	SS	10											
			3	SS	11											
			4	SS	48											
			5	SS	20											
			7	SS	17											
			8	SS	41											
			9	SS	86											
			10	SS	24											
			11	SS	18											
			12	SS	100	5"										
			13	SS	87											
			14	SS	12											
			15	SS	91											
			16	SS	112											
			17	SS	58											
725.5																
56.5	End of Borehole															

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

RECORD OF BOREHOLE NO 7

WP 40-66-04/05 LOCATION Co-ords. 15,596,758 N; 1,277,926 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE November 4, 1975 COMPILED BY OJ
DATUM Geodetic BOREHOLE TYPE Washbore-BX Casing CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
782.9	Ground Level															
0.0																
	Silty sand		1	SS	6	780										
			2	SS	8											
			3	SS	16											
			4	SS	28											
			5	SS	150	770										
			6	SS	102											
			7	SS	57											
			8	SS	94											
			9	SS	28											
			10	SS	27											
			11	SS	120											
			12	SS	77											
			13	SS	19											
			14	SS	64											
			15	SS	33											
			16	SS	73											
			17	SS	99											
			18	SS	85											
			19	SS	46											
						660										

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

RECORD OF BOREHOLE NO 7 cont.

WP 40-66-04/05 LOCATION Co-ords. 15,596,758 N; 1,277,926 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE November 4, 1975 COMPILED BY OJ
DATUM Geodetic BOREHOLE TYPE Washbore-BX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
			20	SS	81/5"	670										
						660										
			21	SS	-	650										
642.9																
140.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

WP 40-66-04/05 LOCATION Co-ords. 15,596,684 N; 1,277,886 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE November 11, 1975 COMPILED BY OJ
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
785.0	Ground Level															
0.0	Silty sand to sandy silt Loose to Very Dense silt some clay		1	SS	7											
			2	SS	12											
			3	SS	11											
			4	SS	14											
			5	SS	53											0 95 (5)
			6	SS	85											
			7	SS	108											
			8	SS	134											
			9	SS	115											0 79 (21)
			10	SS	137											
			11	SS	24											
			12	SS	18											
			13	SS	105											
			14	SS	52											
733.5			15	SS	34											0 0 83 17
51.5	End of Borehole															

20
15 0-5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 9

WP 40-66-04/05

LOCATION Co-ords. 15,596,842 N; 1,277,830 E.

ORIGINATED BY MK

DIST 2 HWY 402

BORING DATE November 25, 1975

COMPILED BY OJ

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES		25 50 75 100 125	SHEAR STRENGTH	w_p w w_L	WATER CONTENT %		
784.5	Ground Level											
0.0			1	SS	5							
			2	SS	11							
			3	SS	18							
			4	SS	14							
	Silty Sand		5	SS	23							
	to		6	SS	18							
	Sandy Silt		7	SS	38							
			8	SS	65							
			9	SS	110							
			10	SS	53							
			11	SS	19							
	Loose to Very Dense		12	SS	28							
			13	SS	89							
			14	SS	29							
			15	SS	40							
			16	SS	35							
			17	SS	39							
	occasional layers and zones of clayey silt, silty clay and silt		18	SS	28							
			20	SS	44							
			21	SS	24							

CONT.

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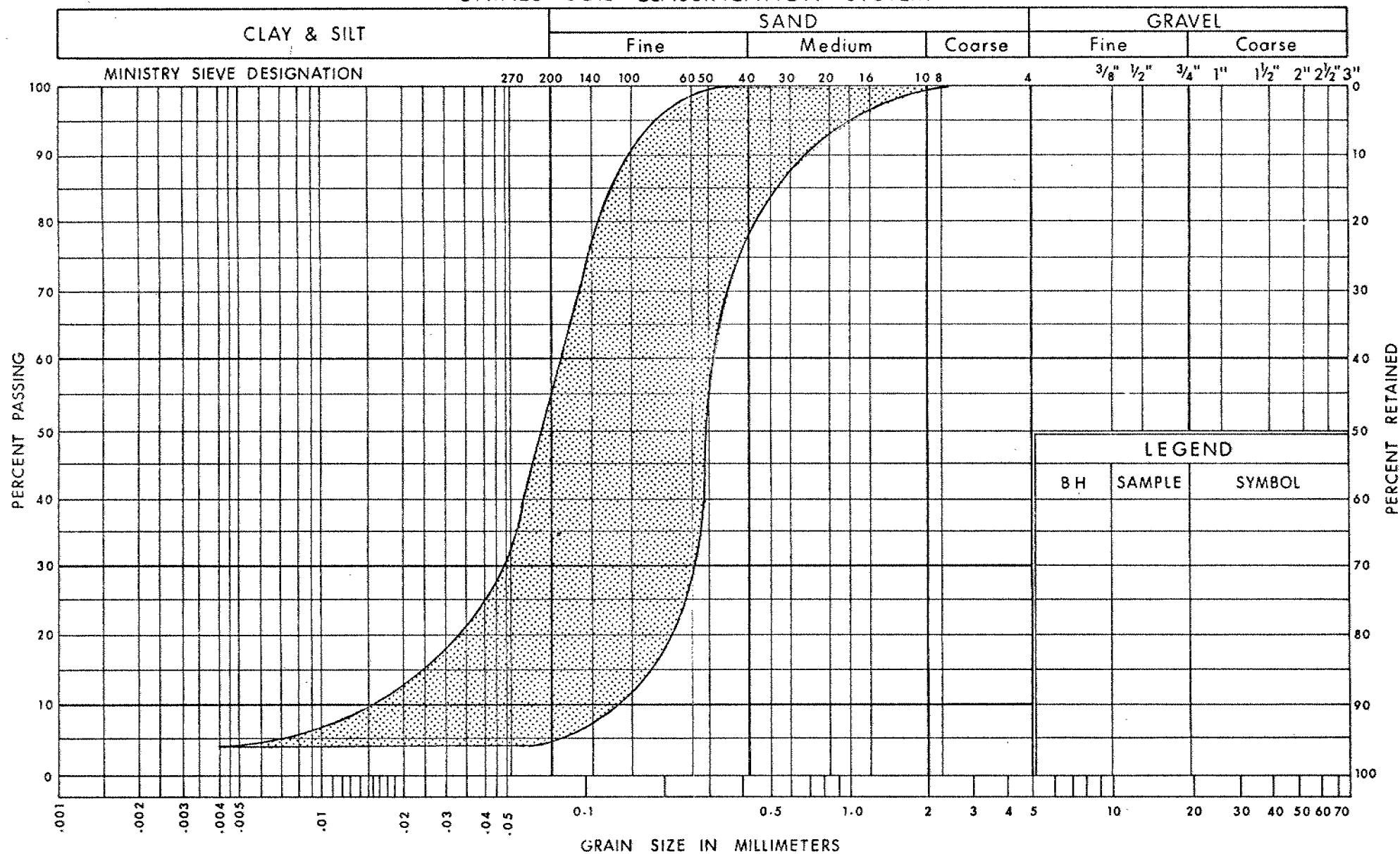
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 9 cont.

WP 42-66-04/05 LOCATION Co-ords. 15,596,842 N; 1,277,830 E. ORIGINATED BY MK
 DIST 2 HWY 402 BORING DATE November 25, 1975 COMPILED BY OJ
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	W_P	W	W_L			10
						680											
			22	SS	61												0 0 91 9
						670											
663.0			23	SS	28												
121.5	End of Borehole																

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario
ENGINEERING SERVICES BRANCH

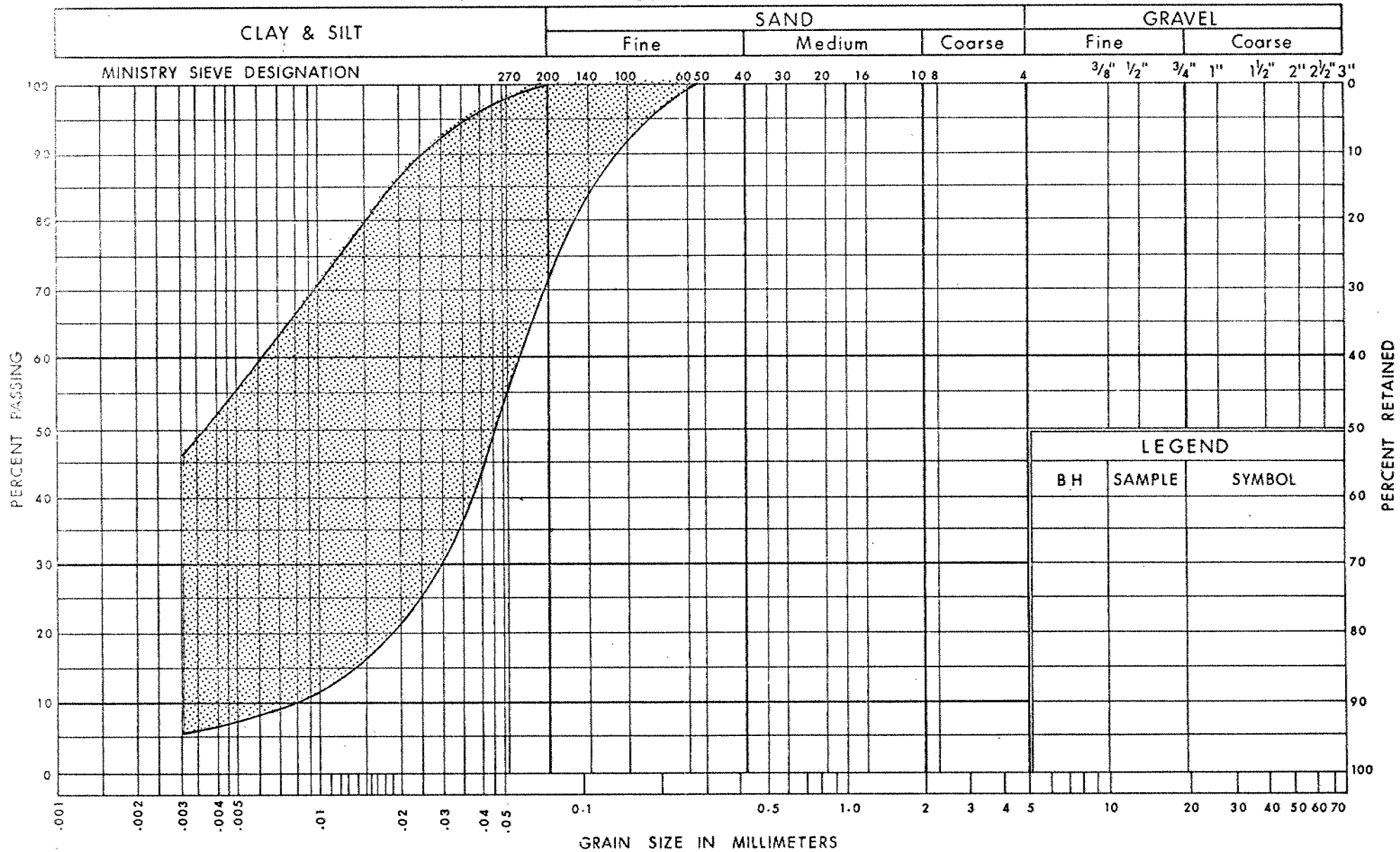
Ministry of
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GRAIN SIZE DISTRIBUTION
SILTY SAND TO SANDY SILT
UPPER ZONE

FIG No 1

W P 40-66-04/05

UNIFIED SOIL CLASSIFICATION SYSTEM

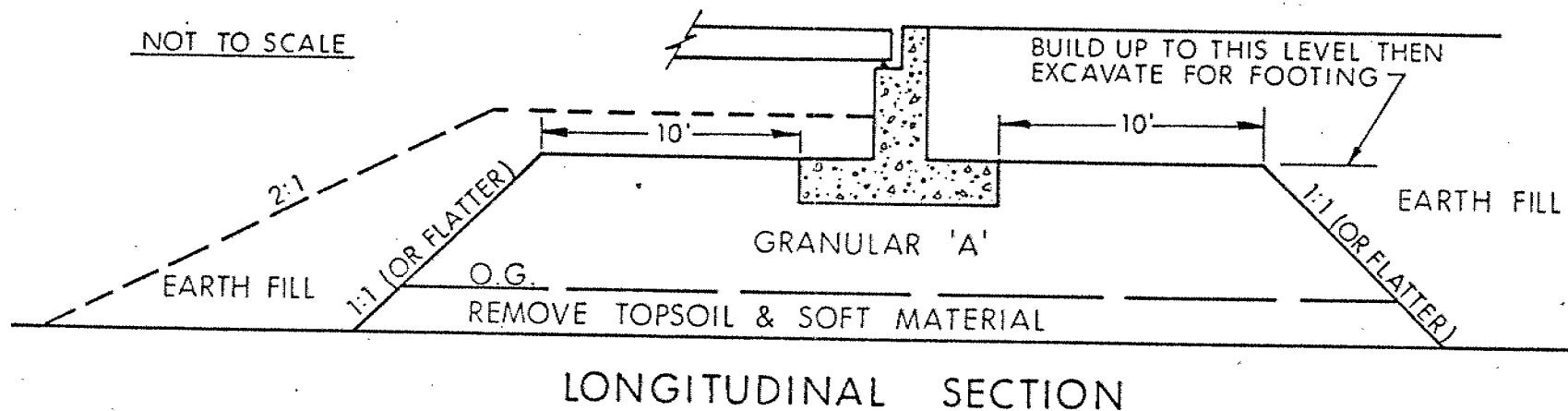
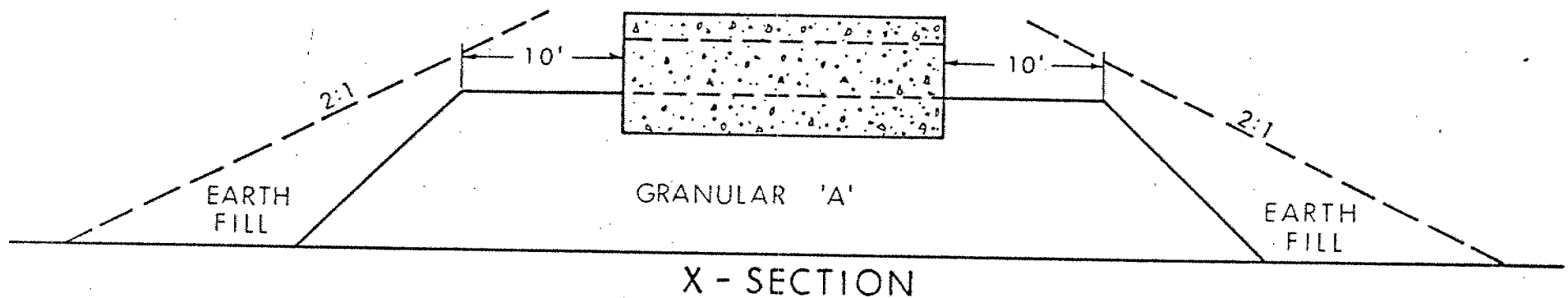


GRAIN SIZE DISTRIBUTION
SILTY SAND TO SANDY SILT
LOWER ZONE

FIG No 2

W P 40-66-04/05

ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	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
w_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
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 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
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

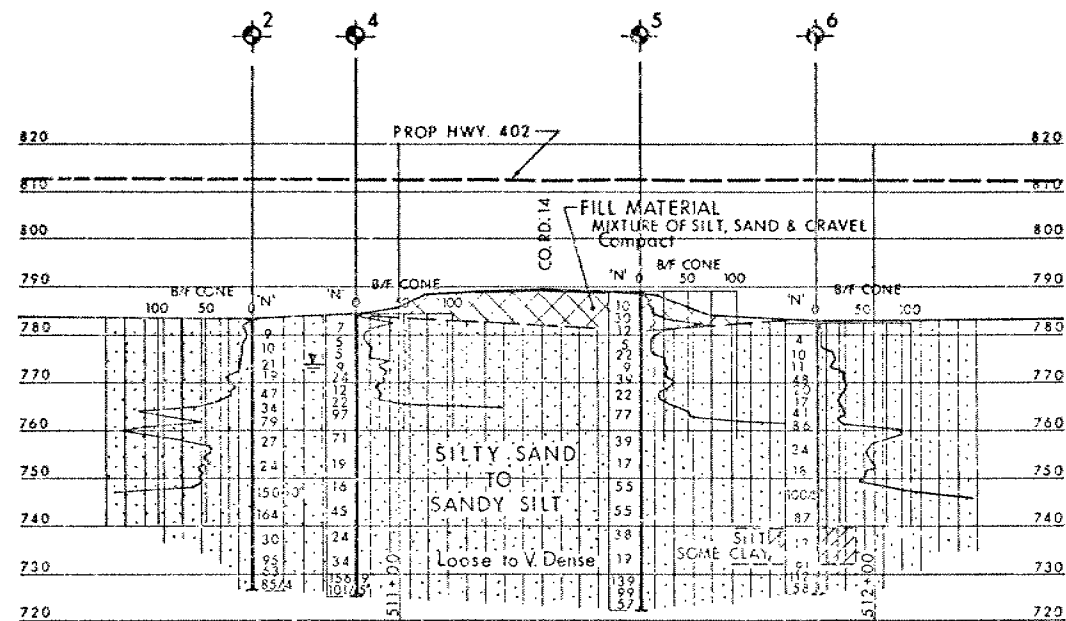
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

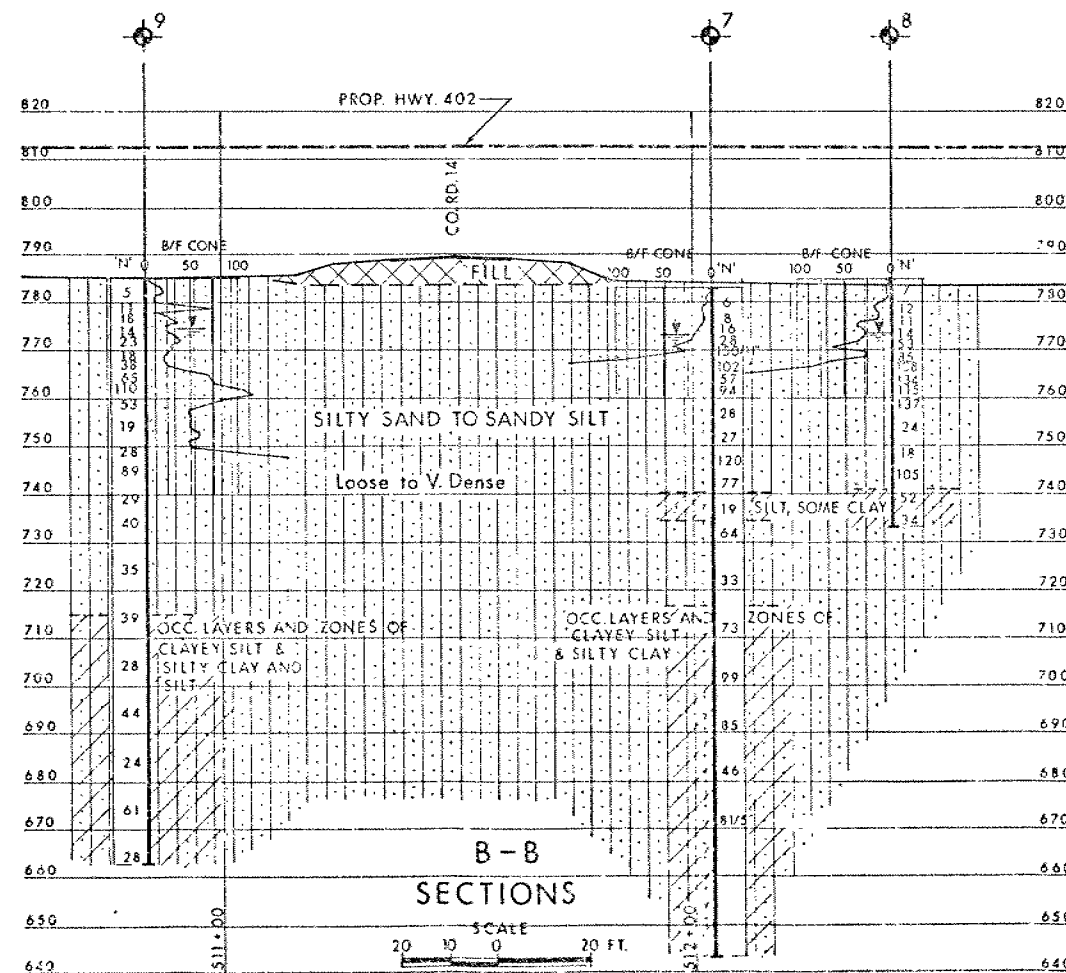
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

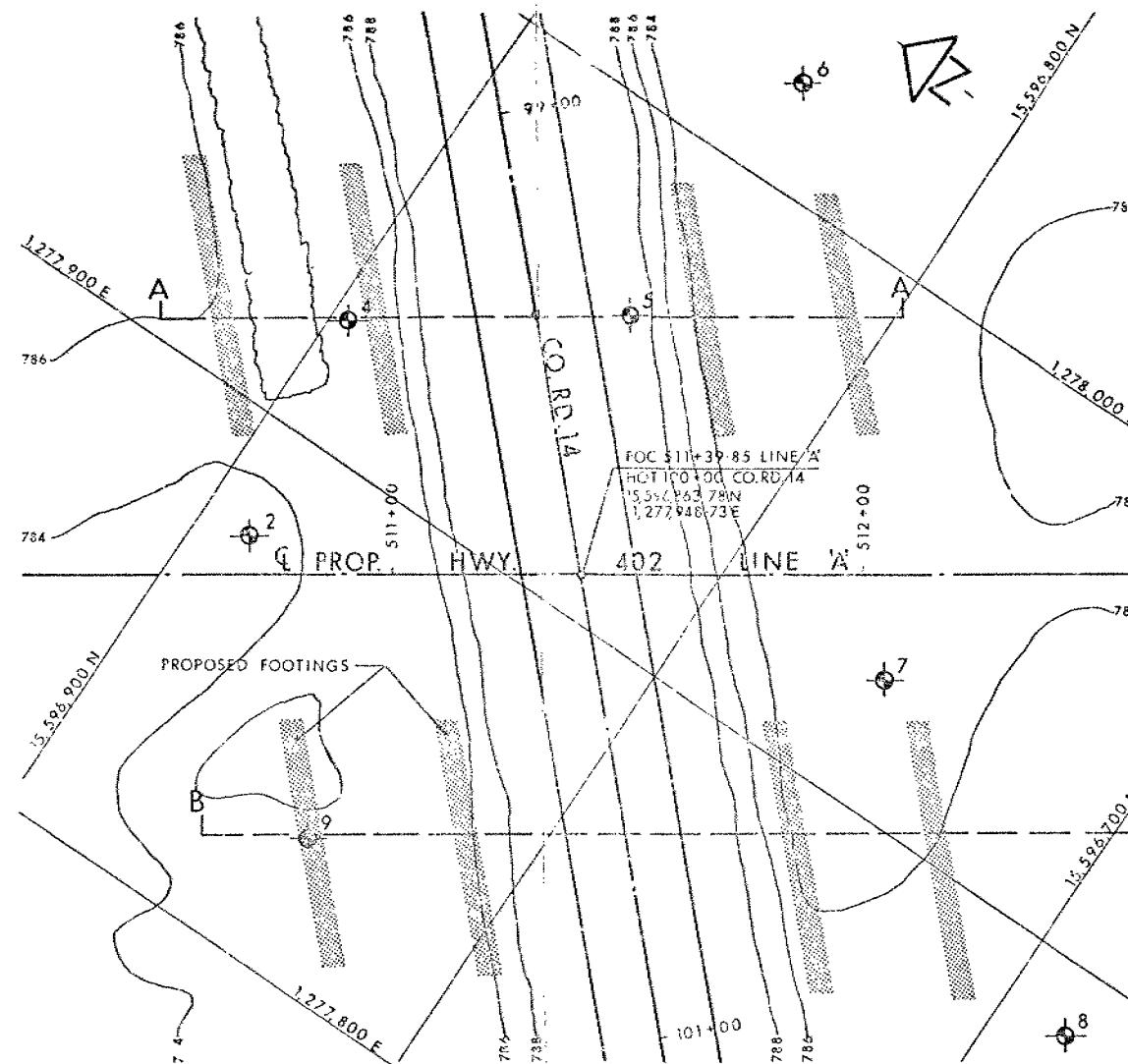
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



A-A

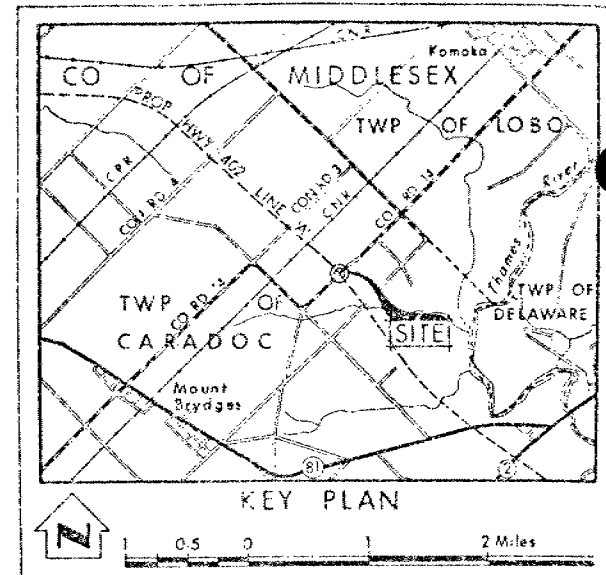


B-B
SECTIONS



PLAN

SCALE
20 10 0 20 FT.



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Resistance Test
B/F CONE - Blows/Ft. Cone Test (350 Ft. lbs. energy/bow)
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, OCT 1975
NO Water Levels established in BORE HOLE NO 2, 5 & 6.

NO	ELEVATION	CO-ORDINATES NORTH	EAST
2	783.2	15,596,888	1,277,875
4	784.5	15,596,897	1,277,926
5	789.0	15,596,847	1,277,960
6	782.0	15,596,844	1,278,021
7	782.9	15,596,758	1,277,926
8	781.0	15,596,684	1,277,885
9	784.5	15,596,842	1,277,830

NOTE: FOR CONTRACT DOCUMENTS
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the LONDON 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
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

COUNTY ROAD 14

HIGHWAY NO Proposed 402 LINE 'A' DIST. NO 2
CO MIDDLESEX
TWP CARADOC

BORE HOLE LOCATIONS & SOIL STRATA

SUBMIT PP	CHECKED	APR NO 40-66-04 & 05	DRAW NO NO
DRAWN OL J.	CHECKED	NO NO	406604 & 05-A
DATE JAN. 29 1976	SITE NO 19-533	BRIDGE DRAW NO NO	
APPROVED	CONT NO		