

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40J16-54

DIST. 1 REGION SOUTHWESTERN

W.P. No. 91-74-02

CONT. No. 75-085

W.O. No. _____

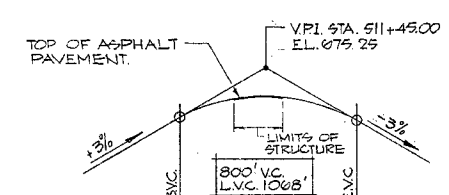
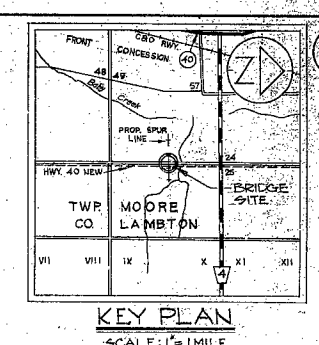
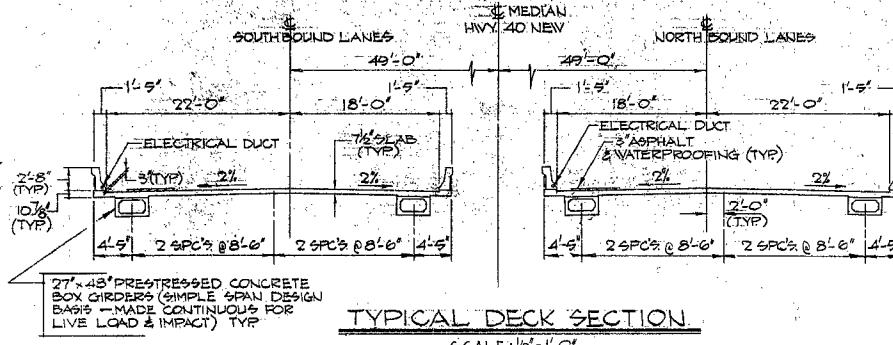
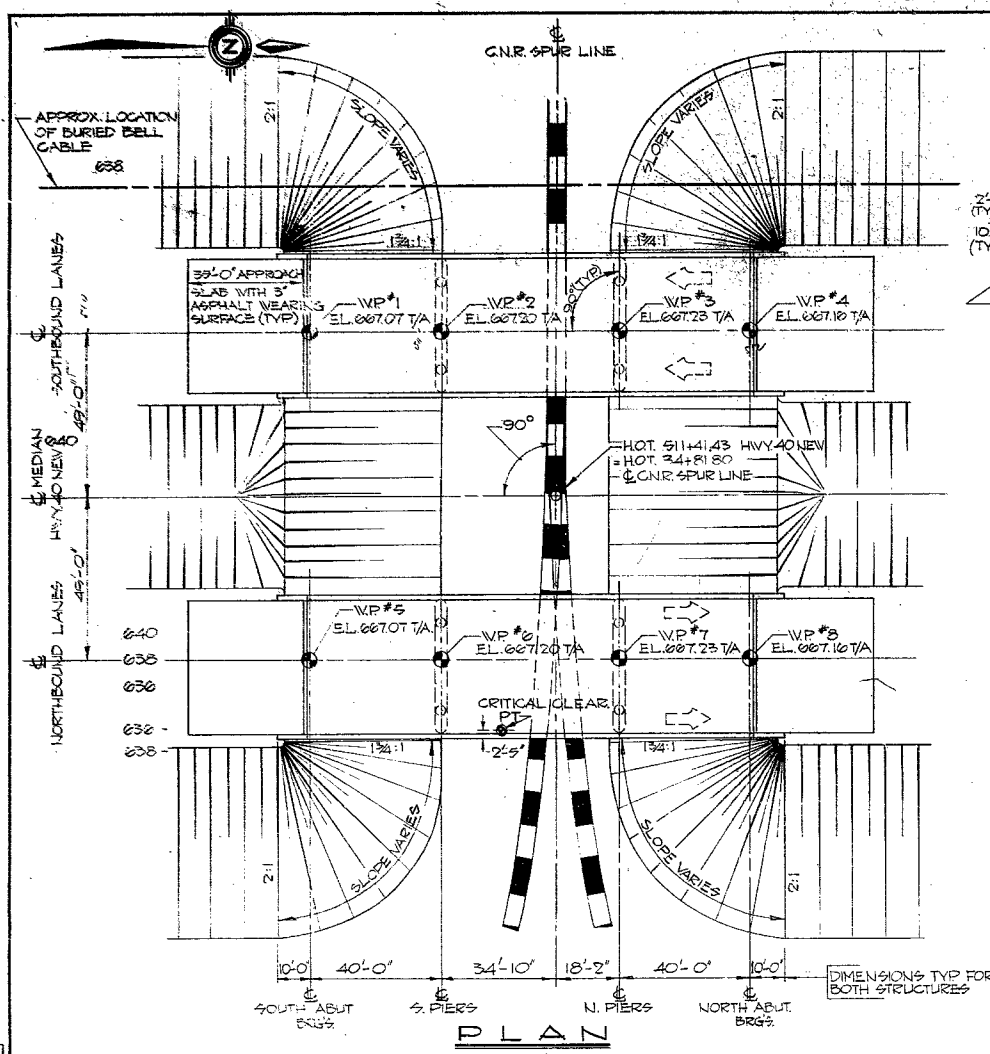
STR. SITE No. 14-377

HWY. No. 40

LOCATION CNR SPUR LINE
OVERHEAD

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: documents to be unfolded
before microfilming



CONCRETE QUANTITIES		S.B.L. STRUCTURE	N.B.L. STRUCTURE
CONCRETE IN PIERS ABUTMENTS & WINGWALLS	4000 PSI	27 C.Y.	27 C.Y.
CONCRETE IN DECK & DIAPHRAGMS	4000 PSI	118 C.Y.	118 C.Y.
CONCRETE IN BARRIER WALLS	4000 PSI	20 C.Y.	20 C.Y.
CONCRETE IN APPROACH SLABS	5000 PSI	117 C.Y.	117 C.Y.

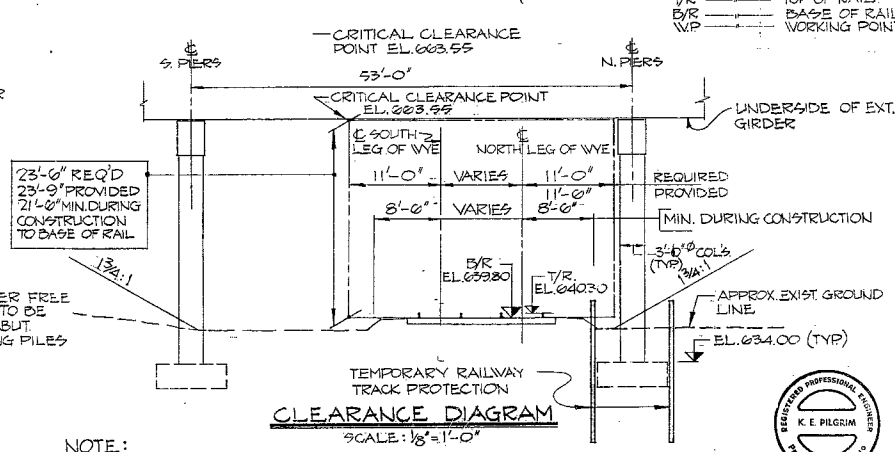
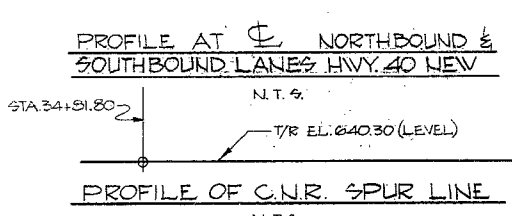
- LIST OF DRAWINGS
- SHEET 1 GENERAL LAYOUT
 - 2 BORE HOLE LOCATIONS & SOIL STRATA
 - 3 FOUNDATION LAYOUT & REINFORCEMENT
 - 4 ABUTMENTS
 - 5 PIERS
 - 6 PRESTRESSED BOX GIRDERS & BEARINGS
 - 7 DECK DETAILS
 - 8 DECK REINFORCEMENT
 - 9 55 FT. APPROACH SLAB (FOR BARRIER WALL)
 - 10 CONCRETE BARRIER WALLS (2'-8" HIGH)
 - 11 STEEL PARAPET RAILING (SINGLE TUBE)
 - 12 STANDARD DETAILS I
 - 13 STANDARD DETAILS II
 - 14 TRACK PROTECTION
 - SHEET 15 BRIDGE ELECTRICAL DETAILS - TYPE E

NOTES:

CLASS OF CONCRETE
DECK, BARRIER WALLS & PIER COLUMNS - 4000 p.s.i.
PRESTRESSED GIRDERS & APPROACH SLABS - 5000 p.s.i.
REMAINDER - 3000 p.s.i.

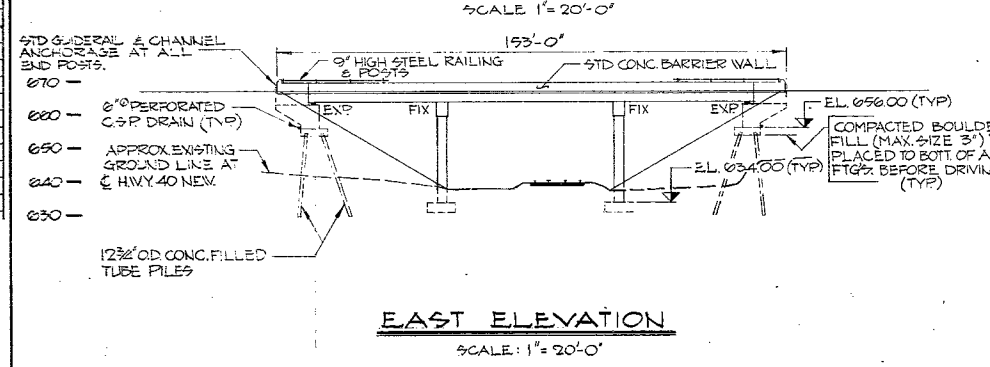
CLEAR COVER TO REINFORCING STEEL
FOOTINGS, ABUTMENTS 3" COLUMNS 2 1/2"
DECK TOP 2" BOTT. 1"
DIAPHRAGMS 1 1/2"
AND/OR AS NOTED ON DRAWINGS

CONSTRUCTION NOTES
NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED. THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS AS SHOWN WITH A TOLERANCE OF ± 1/8".

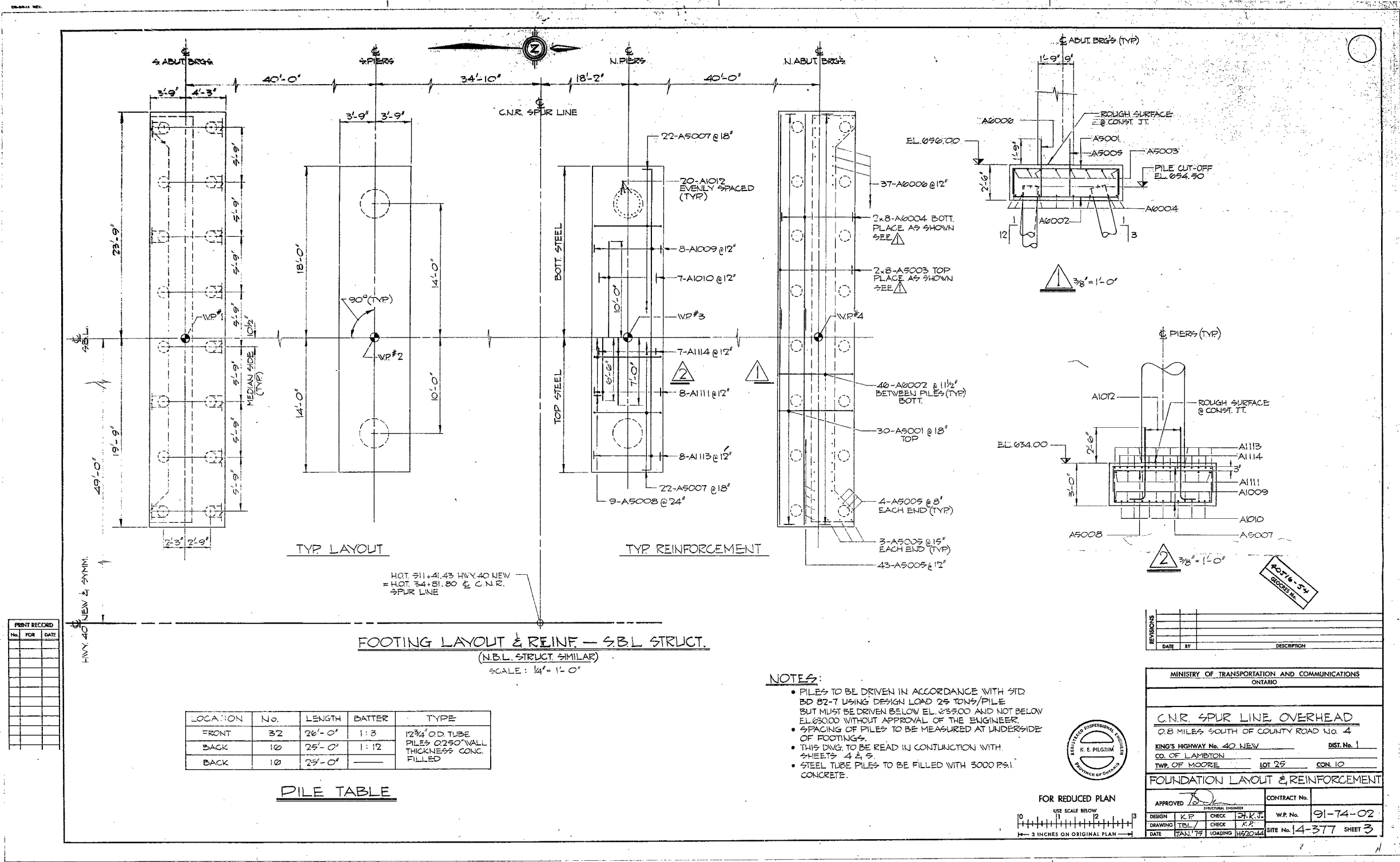


NOTE:
CLEARANCES SHOWN ARE PERPENDICULAR TO TRACK.

NO.	FOR	DATE



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO	
C.N.R. SPUR LINE OVERHEAD	
0.8 MILES SOUTH OF COUNTY ROAD No. 4	
KING'S HIGHWAY No. 40 NEW	DIST. No. 1
CO. OF LAMBTON	
TWP. OF MOORE	LOT 25 CON. 10
GENERAL LAYOUT	
APPROVED: [Signature]	CONTRACT No. [Blank]
DESIGN: K.P.	CHECK: [Signature]
DRAWING: T.D.L.	CHECK: K.P.
DATE: JAN. 75	LOADING: [Blank]
SITE No. 14-377 SHEET 1	



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

40J16-54

GEOCREs No.

TO: Mr. A.P. Watt (2), FROM: Soil Mechanics Section,
Reg. Structural Planning Engineer, Geotechnical Office,
Southwestern Region, London. West Building, Downsview.

ATTENTION: DATE: September 11th, 1974.

OUR FILE REF. IN REPLY TO SEP 17 1974

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For
Proposed C.N.R. Spur Line Overhead
on Highway 40 New, 0.8 Miles South of
County Road No. 4, District #1, Chatham.
W.P. 91-74-02, Site 14-377.

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the abovementioned 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.

K.G. Selby
K.G. Selby,
Supervising Engineer.

KGS/mj

c.c. E.J. Orr
B.R. Davis
A. Wittenberg
F.C. Brown
B.J. Giroux
J.R. Roy
G.A. Wrong
P. Lewycky
Files
Documents

TABLE OF CONTENTS:

1. INTRODUCTION.
2. SITE CONDITIONS.
3. FIELD AND LABORATORY WORK.
4. SUBSOIL CONDITIONS.
 - 4.1) General.
 - 4.2) Clayey Silt to Silty Clay, Traces of Some Sand, Traces of Gravel.
5. GROUNDWATER CONDITIONS.
6. RECOMMENDATIONS.
 - (i) Three Span Structure - Perched Abutments.
 - (ii) Structural Plate Super Span.
7. MISCELLANEOUS.

FOUNDATION INVESTIGATION REPORT

For

Proposed C.N.R. Spur Line Overhead
on Highway 40 New, 0.8 Miles South of
County Road No. 4, District No. 1, Chatham.

W.P. 91-74-02,

Site 14-377.

1. INTRODUCTION:

A request for a foundation investigation for the above project was received from Mr. A.P. Watt, Regional Structural Planning Engineer, in a memo dated June 7th, 1974. Two proposals were to be considered:

(1) A 3-span structure, (2) A structural plate super-span.

Subsequently a field investigation was carried out by the Soil Mechanics Section to determine the subsoil conditions at this location. This report contains the results of that investigation and our recommendations concerning the design of foundations for the proposed structure.

2. SITE CONDITIONS:

The site is located on New Highway 40, 2.0 miles east of the Village of Corunna and 0.8 Miles south of County Rd. #4. The surrounding area is relatively flat; mainly agricultural with wooded sections.

Physiographically, the site is located in the region referred to as the St. Clair Clay Plains.

3. FIELD AND LABORATORY WORK:

The field work consisted of 9 sampled boreholes and 17 cone penetration tests. The boreholes were advanced using a Bombardiere mounted CME 45, modified for soil sampling purposes using solid-stem augers. Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. Undisturbed samples were obtained by using 2-inch I.D. Shelby tubes which were pushed into the soil either by hand

or hydraulically. Field vane tests were performed 18 inches below disturbed levels where possible.

The cone tests were carried out using a driving energy of 350 ft.-lbs. per blow for advancement.

The location and elevation of the boreholes and cone tests were surveyed in the field by personnel from the District Office and are marked on Drawing No. 91-74-02A which accompanies this Report.

Samples were examined in the field by the field engineer. Laboratory tests were performed on selected samples to determine Unconfined and Triaxial Shear Strengths, Bulk Densities, Natural Moisture Content, and Grain-Size Distributions. The results of the field and laboratory tests are shown on the Record of Borehole sheets contained in the Appendix of this Report.

4. SUBSOIL CONDITIONS:

4.1) General.

The upper strata consists of a stiff to very stiff layer of clayey silt and is underlain by a stiff to very stiff layer of silty clay. Traces to some sand was encountered in both layers. Traces of gravel^{was} also found in the upper layer.

The subsoil described from ground level downwards is as follows:

4.2) Clayey Silt to Silty Clay, Traces to Some Sand, Traces of Gravel.

In the upper portion of the soil layer, clayey silt, traces to some sand, traces of gravel was encountered in all boreholes from zero feet to depths varying from 10 to 40 feet. The underlying layer changed to a silty clay, traces to some sand which continued down to bedrock (elev. 492.8 ft., 150.2 metres).

The Standard Penetration 'N' values ranged from 13 to 42 blows per foot, the average value being 22 blows/foot.

The field vane tests taken in the clayey silt layer showed the soil shear strength to be greater than 2000 p.s.f. (95.8 kN/m^2). In the lower silty clay region the soil shear strength varied from 500 to 1900 p.s.f. (25 to 90 kN/m^2), the shear strength increasing with depth.

The physical properties as determined by lab tests are as follows:

Natural Moisture Content	13.5% - 23%
Liquid Limit	28% - 43%
Plastic Limit	14% - 22%

Unconfined Undrained Shear Strength

Clayey Silt Layer	2545 - 3830 p.s.f. (121.8 - 183.4 kN/m^2)
Silty Clay Layer	1150 - 1655 p.s.f. (55.1 - 79.2 kN/m^2)

Triaxial Undrained Shear Strength

Clayey Silt Layer	1045 - 3730 p.s.f. (50.1 - 178.6 kN/m^2)
Silty Clay Layer	1060 - 2040 p.s.f. (50.8 - 97.7 kN/m^2)

Plasticity Charts are included in the Appendix.
Grain-size Distribution Charts were not plotted.

5. GROUNDWATER CONDITIONS:

Water was observed in all boreholes at varying depths, except for Borehole Nos. 3 and 17. The water levels have been noted on the Record of Borehole Sheets in the Appendix. It should be noted that frequent heavy rains occurred during the field investigations at this site.

6. RECOMMENDATIONS:

Subsoil conditions at this site are comparable with conditions at the site of the C.N.R. and Hwy. 40-A, line 'A' Revision W.P. 53-63 (Report No. 63-F-12). In view of the satisfactory performance of the above structure which is a perched abutment design completed in 1966 our recommendations are as follows:

(i) Three Span Structure - Perched Abutments.

As the minimum height of the approach fills will be in the order of 30 ft., long term settlements of up to 5 inches can be expected beneath the fill. Since the largest part of the settlement will be due to the weight of the approach embankment it is recommended that the latter be constructed as far in advance of the structure as possible. Settlements of the perched abutments of $3\frac{1}{2}$ to 4 inches of the footings after construction can therefore be expected. The abutments may be supported on 12-3/4 inch O.D. steel tube piles driven closed-end through the fill to 8 ft. below original ground. Care should be taken that no bouldery fill is placed within the approaches through which piles have to be driven. It is further recommended that this portion of the fill contains no grain sizes larger than 3 inches. A design load of 25 tons per pile may be used. This loading has been confirmed by pile load tests at similar sites.

The piers may be supported on spread footings with a design load of 3 t.s.f. Settlements for the footings of up to 1.5 inches are expected. At least 4 ft. of clear cover for frost protection is required for the footings and pile caps.

Because the bedrock is at least 150 ft. below ground, end bearing piles are believed to be uneconomical at this locations.

(ii) Structural Plate Super Span.

The structural plate super span is an acceptable alternative to a 3-span structure. Construction of the structural plate super span should be according to current M.T.C. standards. As previously mentioned, settlements up to 5 inches are expected beneath the fill, hence the differential structure should be designed to accommodate settlements of the same order of magnitude.

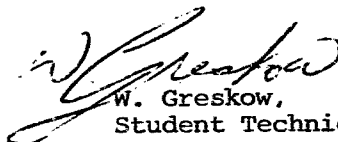
No stability problems are anticipated for the approach fills provided 2:1 side slopes are used.


7. MISCELLANEOUS:

The field work was carried out during the period June 24th to July 9th, 1974, under the supervision of Mr. W.P. Greskow, Student Technician, who also prepared this Report.

The equipment was owned and operated by Master Soil Investigation Limited.

This Report was reviewed by Mr. K.G. Selby, Supervising Engineer.


W. Greskow,
Student Technician


K.G. Selby,
Supervising Engineer.

WG/mj

A P P E N D I X I

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 1

FOUNDATIONS OFFICE

 JOB _____ LOCATION 120' E. Sta. 510+79 N.B.L. Hwy. 401
 W.P. 91-74-02 BORING DATE July 3, 1974
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger, Washbore & Cone Test

 ORIGINATED BY WG
 COMPILED BY WG
 CHECKED BY _____

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W $W_P \quad W \quad W_L$	WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. LOT	NUMBER TYPE						
194.4 0.0	Ground Level								
637.8 0.0	Brown		1 SS 20	630				17.3	5 28 47 20
			2 SS 24	630					
			3 SS 12	632.0					0 12 53 35
			4 SS 35						0 11 50 39
			5 SS 23						∇ 622.5
			6 SS 18	620					0 11 46 43
			7 SS 12	619.0					
	Clayey Silt, Some Sand, Traces of Gravel		8 SS 20	610					
			9 SS 20	605.9					
	Stiff to V. Stiff		10 TW PH	600	3730 3830 2240			131.0 2.10	0 2 70 28
	Grey		11 SS 13	590					
				179.8					
177.2 17.2	Silty Clay		12 TW PH	580				124	0 6 50 44
581.4 56.4				175.8				1.99	
	Traces of Sand		13 SS 17	570				1.95	
	Stiff to V. Stiff			173.7					
	Grey			560					
				170.7					
				550				118	
				167.0				1.99	0 1 35 21
				540				1.63	
				164.0					

RECORD OF BOREHOLE NO 1 Continued

JOB _____ LOCATION 120' Lt. Sta. 510+79 N.B.L. Hwy 40N
W.P. 91-74-C2 BORING DATE July 3, 1974
DATUM Geodetic BOREHOLE TYPE Solid Stem Auger, Washbore & Cone Test

ORIGINATED BY WE
COMPILED BY WE
CHECKED BY WEL

SOIL PROFILE			SAMPLES			ft./m ELEV. SCALE	DYNAMIC PENETRATION, RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L	BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
m. ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT BLOWS/m					
			15	SS	25	530 161.5				
						520 158.5				
			16	SS	14	510 155.4		○ —		0 6 45 15
						500 152.4				
150.2	492.8						+ > 2080			
144.2	145.0 (Bedrock)		17	BXL	100%	490				
149.3	489.1					480 146.3				
45.1	148.1 End of Borehole						50 100 kn/m ²			

OFFICE REPORT ON SOIL EXPLORATION

FOUNDATIONS OFFICE

ORIGINATED BY _____
COMPILED BY _____
CHECKED BY _____

20
15 \diamond 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 3

FOUNDATIONS OFFICE

JOB _____ LOCATION 116 St. Ste. 511-58 N.E.L. Hwy. 40 N ORIGINATED BY WB
 W.P. 91-74-02 BORING DATE July 2, 1974 COMPILED BY WB
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test CHECKED BY WB

SOIL PROFILE		SAMPLES		ELEV. SCALE Ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (C.F.T.) 20 40 60 80 100	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W $W_p \quad W \quad W_L$	BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLT	NUMBER TYPE					
194.2 0.0	Ground Level							
175.0 0.0	Brown		1 SS 21	530				0 11 55 34
			2 SS 22	542.0				no water observed
	Clayey Silt		3 SS 23					
			4 SS 24					
	Some Sand,		5 SS 25					
	Tr. of Gravel		6 SS 26	520			133.0	
				189.0			2.13	
	Stiff to V. Stiff		7 TW 27		304.0 324.0		132.5	0 9 58 33
					224.0		2.12	
	Grey		8 SS 28	510				
				185.9				
			9 SS 29					
				600				
				182.9				
			10 SS 30					
				590			122.0	
				177.6	+s=1.8		1.95	
			11 TW 31					
					+s=1.8		119.5	
			12 TW 32				1.92	
				550			121.5	
				176.8			1.95	
175.0 19.2	574.5		13 TW 33				119.5	0 6 49 45
					+s=1.9		1.92	
19.2 63.0	End of Borehole			570				
				173.7				
					50 100 KN/m ²			

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 4

FOUNDATIONS OFFICE

JOB _____ LOCATION 2141 St. of Coll. 500-94 N. 11.1. 207. 10. 7
 W.P. 92-74-02 BORING DATE June 28, 1974
 DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY JS
 COMPILED BY JS
 CHECKED BY JS

SOIL PROFILE		SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 30 40 50 60 70 80 90 100 SHEAR STRENGTH P.S.F. O UNCONFINED * FIELD VANE ● QUICK TRIAXIAL * LAB VANE	LIQUID LIMIT _____ PLASTIC LIMIT _____ WATER CONTENT _____ WATER CONTENT %	BULK DENSITY Y P.C.F. GR S.A. CL	REMARKS
ELEV DEPTH FEET	DESCRIPTION	STRAT. UNIT	NUMBER TYPE					
194.8 6.0	637.6 6.0	Ground Level						
	Probable Clayey Silt			630 192.0				
189.1 4.9	621.6 16.0	End of Cone Test		180 189.1				

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 5

JOB _____ LOCATION 78' Lt. of Sta. 510+77 N.B.L. Hwy 40N
W.P. 91-74-02 BORING DATE June 27, 1974
DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY W.G.
COMPILED BY W.G.
CHECKED BY W.G.

SOIL PROFILE			SAMPLES			ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \quad w \quad w_L$ WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)					
m. 194.5 0.0	638.3 0.0	Ground Level								
		Probable Clayey silt								
189.0 5.5	620.3 18.0	End of Cone Test								

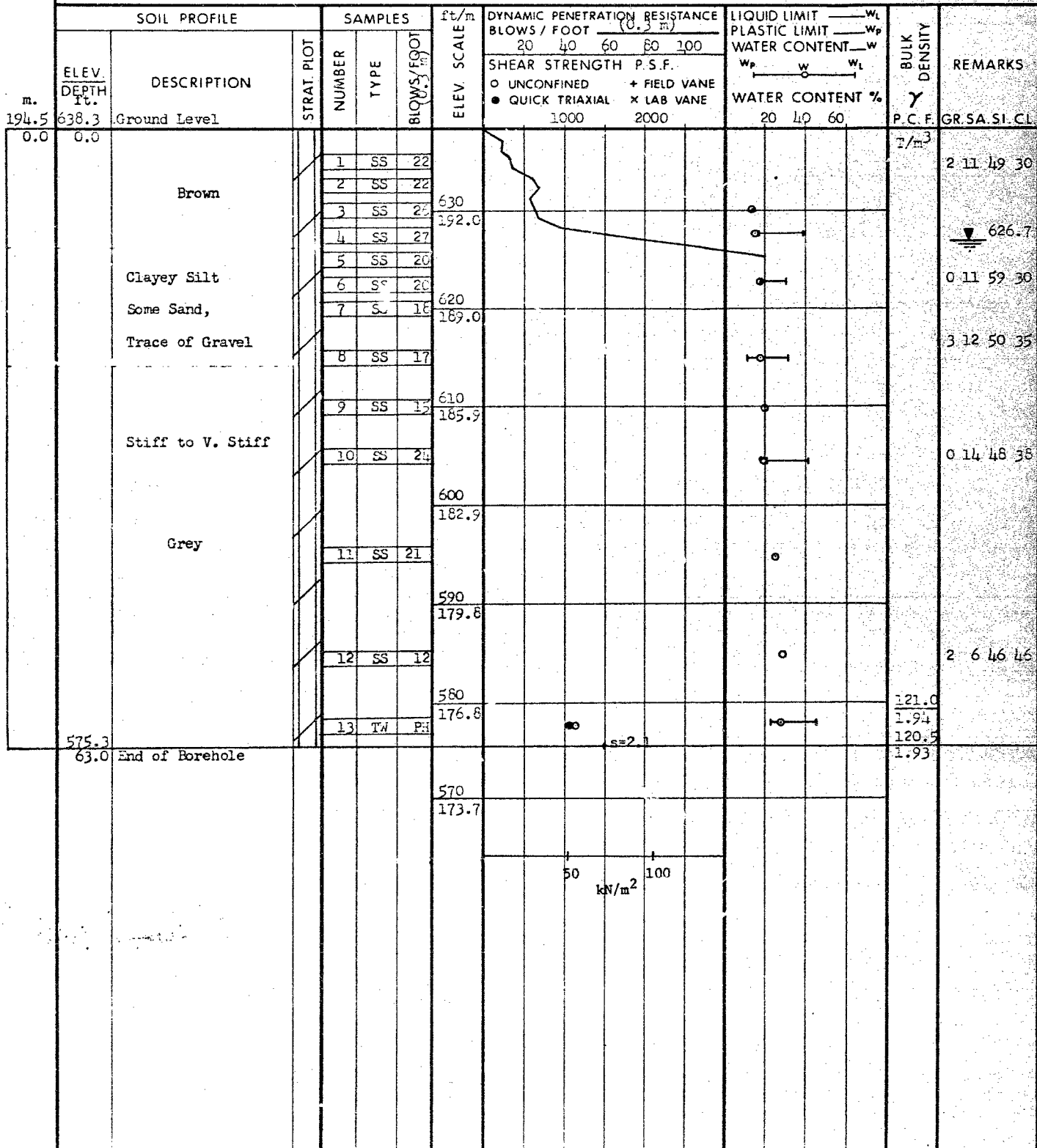
OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 6

 JOB _____ LOCATION 77' Lt. of Sta. 511+12 N.B.L. Hwy. LON
 W.P. 91-74-02 BORING DATE June 27, 1974
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test

 ORIGINATED BY W.G.
 COMPILED BY W.G.
 CHECKED BY W.G.


OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 7

JOB _____ LOCATION 75' E. of Sta. 511+59 N.B.L. Hwy. 40N
 W.P. 91-74-02 BORING DATE June 27, 1972
 DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY W.G.
 COMPILED BY W.G.
 CHECKED BY W.G.

SOIL PROFILE			SAMPLES		P.C.F.	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % w_p — w — w_L	BULK DENSITY γ P.C.F. GR SA SI CL	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
194.4 0.0	637.9 0.0	Ground Level							
	Probable Clayey Silt								
189.2 5.2	621.0 16.9	End of Cone Test							

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 8

JOB _____ LOCATION 75' E. of Sta. 511+92 N.B.L. Hwy. 40N ORIGINATED BY W.G.
 W.P. 91-74-02 BORING DATE June 28, 1974 COMPILED BY W.G.
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test CHECKED BY S.L.

SOIL PROFILE			SAMPLES			ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F. GR.SA.SI.CI T/m ³	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT (0.3 m)					
194.3 0.0	Ground Level									
637.6 0.0	Brown Clayey Silt		1	SS	16					
			2	SS	20	630				
			3	SS	28	192.0				
			4	SS	29					
	Some Sand, Traces of Gravel		5	SS	22					
			6	SS	21	620				
	Stiff to V. Stiff		7	SS	28	169.0				
			8	SS	17	610				
			9	SS	23	185.9				
	Grey					600				
			10	SS	15	182.9				
						590				
			11	SS	11	179.8				
176.6 17.7	End of Borehole		12	TW	FA	560				
579.6 58.0						176.0				
						570				
						173.7				

RECORD OF BOREHOLE NO 9

JOB _____ LOCATION 20' It. of Sta. 510+77 N.B.T. Hwy. 40N
W.P. 91-74-02 BORING DATE June 26, 1974
DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test

ORIGINATED BY W.C.
COMPILED BY W.C.
CHECKED BY W.C.

SOIL PROFILE			SAMPLES			ft./m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT — w _L PLASTIC LIMIT — w _p WATER CONTENT — w w _p — w — w _L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH m. ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
195.2 0.0 194.4 0.8	640.4 0.0 637.9 2.5	Ground Level Sand, some silt, tr. gravel (Fill) Brown, Compact	X			195.1			T/m ³	1 15 59 25
		Brown		1	SS	13		○		6 20 51 23
				2	SS	14		○		0 12 49 39
		Clayey Silt		3	SS	17	630	○		623.1
		Some Sand, Tr. of Gravel.		4	SS	23	172.0	○	1	
				5	SS	23		○	1	
		Sandy in Upper Layers, becoming silty clay with depth.		6	SS	19		○		
				7	SS	13	620 189.0			
		Stiff to V. Stiff		8	TW	PH		○ ●	1	130 2.08 0 11 (89) 128.5 2.06 130.5 2.09
				9	TW	PH	610 185.9	+ 2240 ● ●		
				10	SS	16	600 162.9		1	0 5 61 34
				11	SS	16	590 179.8			
176.5 18.7	578.9 61.5	End of Borehole		12	SS	14	580 176.8	○	1	0 14 41 45
							570 173.7			
							50 100 kN/m ²			

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 10

JOB _____ LOCATION 22' Lt. of Sta. 511+12 N.B.L. Hwy. 40N
 W.P. 91-74-02 BORING DATE June 26, 1974
 DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY W.G.
 COMPILED BY W.G.
 CHECKED BY _____

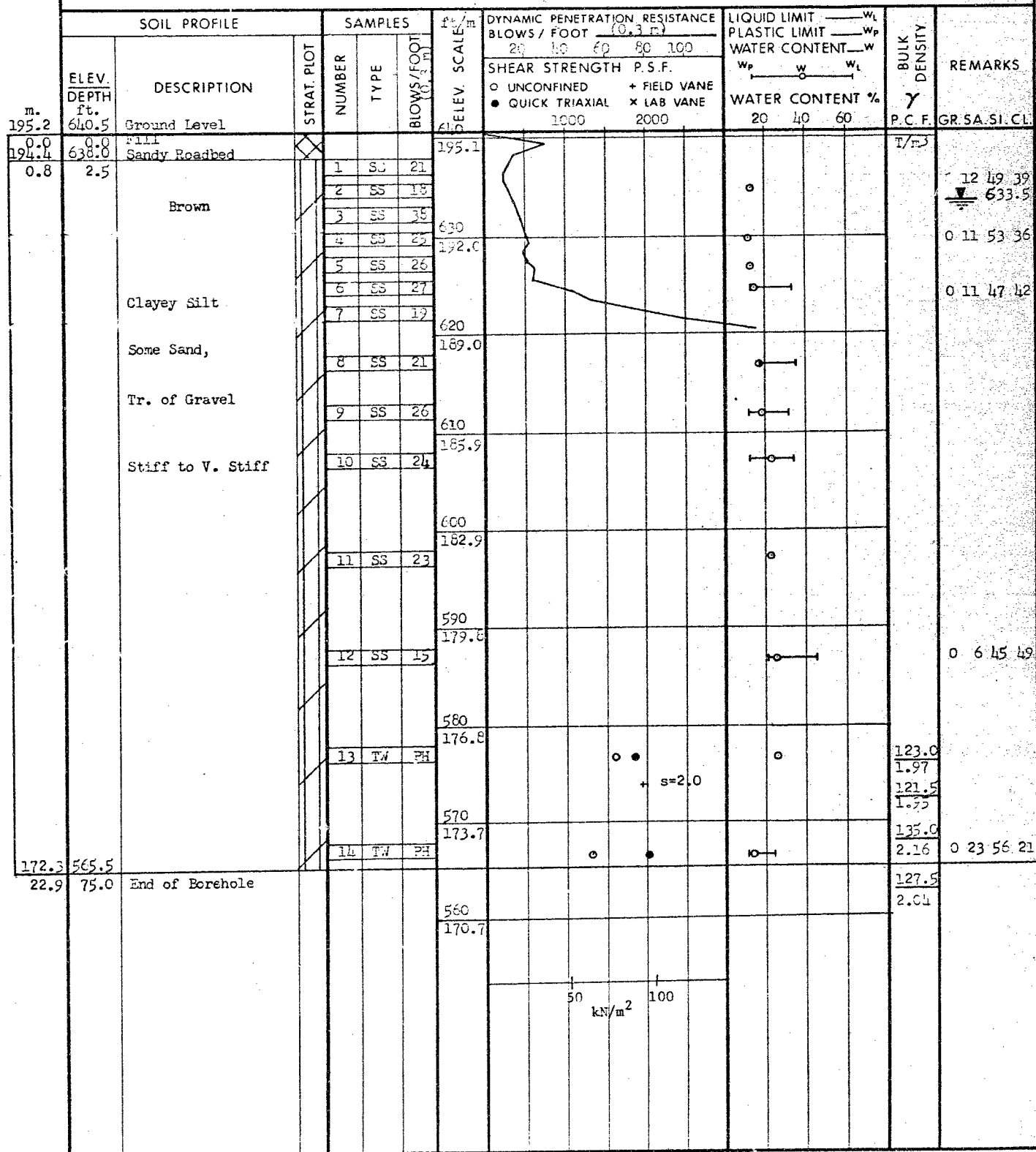
SOIL PROFILE			SAMPLES		ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	BULK DENSITY γ P.C.F. GR SA SI CL	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
m. 195.2 0.0	610.4 0.0	Ground Level			195.1				
	Probable Clayey Silt				630 192.0				
189.2 5.8	621.6 18.9	End of Cone Test			620 189.0				

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 11

 JOB _____ LOCATION 18' E. of Sta. 511+59 N.B.L. Hwy. MON
 W.P. 91-74-02 BORING DATE June 28, 1974
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test

 ORIGINATED BY W.G.
 COMPILED BY W.G.
 CHECKED BY A.L.


OFFICE REPORT ON SOIL EXPLORATION

JOB _____ LOCATION 20' E. of Sta. 512+03 N.B.I. Hwy. 40N
W.P. 91-74-02 BORING DATE June 25, 1974
DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY W.G.
COMPILED BY W.G.
CHECKED BY W.

15 $\frac{20}{\phi}$ 5 % STRAIN AT FAILURE
30

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 13

FOUNDATIONS OFFICE

JOB _____ LOCATION 22' W. of Sta. 510+82 N.B.I. Hwy. 401
W.P. 91-74-C2 BORING DATE June 25, 1974
DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY W.G.
COMPILED BY W.G.
CHECKED BY _____

SOIL PROFILE			SAMPLES		ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_p</u> WATER CONTENT <u>W</u> <u>W_p</u> — <u>W</u> — <u>W_L</u> WATER CONTENT % <u>γ</u>	BULK DENSITY <u>γ</u>	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER TYPE	BLOWS/FOOT (0.3 m)					
m. 193.5 0.0	634.8 0.0	Ground Level							
		Probably clayey silt							
190.2	623.9				630 192.0				
3.3	10.9	End of Cone Test			620 189.0				

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 14

FOUNDATIONS OFFICE

JOB _____ LOCATION 20' E. of Sta. 511-19 N.E.L. Hwy. LCN
 W.P. 91-74-02 BORING DATE June 24, 1974
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test

ORIGINATED BY W.G.
 COMPILED BY W.G.
 CHECKED BY J

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W	W_L		
m. 193.8 0.0	635.7 0.0	Ground Level														GR.SA.SI.CL
	Brown		1	SS	27	630										0 11 53 35
			2	SS	35	192.0										623.1
			3	SS	18											0 11 53 36
			4	SS	17	620										
	Clayey Silt		5	SS	14	189.0										
	Some Sand,		6	SS	16											
	Tr. of Gravel		7	SS	16	610										0 13 55 32
			8	SS	22	165.9										
	Stiff to V. Stiff		9	SS	19	600										
						162.9										
	Grey		10	SS	13	590										0 6 44 50
						179.8										
177.3	581.7		11	SS	19											
16.5	54.0	End of Borehole				500										
						176.8										

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 15

FOUNDATIONS OFFICE

JOB _____ LOCATION 23' Rt. of Ste. 511-61 N.E.L. Hwy. 10N
W.P. 91-74-02 BORING DATE June 25, 1973
DATUM Geodetic BOREHOLE TYPE Cone Test

ORIGINATED BY H.C.
COMPILED BY H.C.
CHECKED BY _____

SOIL PROFILE						SAMPLES			ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT %								
m. 193.6 0.0	636.0 0.0	Ground Level																
						630 192.0												
		Probable Clayey Silt				620 189.0												
188.3 5.5	618.0 18.0	End of Cone Test				610 186.0												

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 16

FOUNDATIONS OFFICE

JOB _____ LOCATION 23' Rt. of Sta. 511+98 N.E.L. Hwy. 401

W.P. -74-02 BORING DATE June 25, 1974

DATUM Geodetic BOREHOLE TYPE Solid Stem Auger & Cone Test

ORIGINATED BY M.G.

COMPILED BY M.G.

CHECKED BY _____

SOIL PROFILE			SAMPLES		ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.2" tip) 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F. GR. SA. SI. CL. T/m ³	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
m. 194.3 0.0	Ground Level								
636.7 0.0	Brown Clayey Silt		1	SS	23				
			2	SS	32	630			
			3	SS	21	192.0			
	Some Sand,		4	SS	15				
	Tr. Gravel		5	SS	17				
			6	SS	17	620			
						189.0			
			7	SS	17				
	Stiff to V. Stiff		8	SS	16	610			
						165.9			
			9	SS	25				
			10	SS	31	600			
						162.9			
	Grey		11	SS	23				
						590			
						179.8			
			12	SS	16				
						580			
						176.8			
			13	TW	PH				
173.7 20.4	End of Borehole					570			
						173.7			
						560			
						170.7			

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 17

FOUNDATIONS OFFICE

JOB _____
W.P. 91-74-C2
DATUM Geodetic

LOCATION 187' Lt. of Sta. 511+42 N.B.L. Hwy. 401
BORING DATE July 9, 1974
BOREHOLE TYPE Solid Stem Auger & Cone Test

ORIGINATED BY W.C.
COMPILED BY W.C.
CHECKED BY W.C.

SOIL PROFILE			SAMPLES			ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m)					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ T/m ³	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
m. 194.6 0.0	636.5 0.0	Ground Level														
	Clayey Silt		1	SS	23											
	Some sand,		2	SS	21											
	Tr. of Gravel		3	SS	24	630										
	Brown		4	SS	21	192.0										
	Very Stiff		5	SS	27											
			6	SS	18											
			7	SS	17	420.0										
187.6 7.0	615.5 23.0	End of Borehole				185.9										

OFFICE REPORT & SOIL EXPLORATION

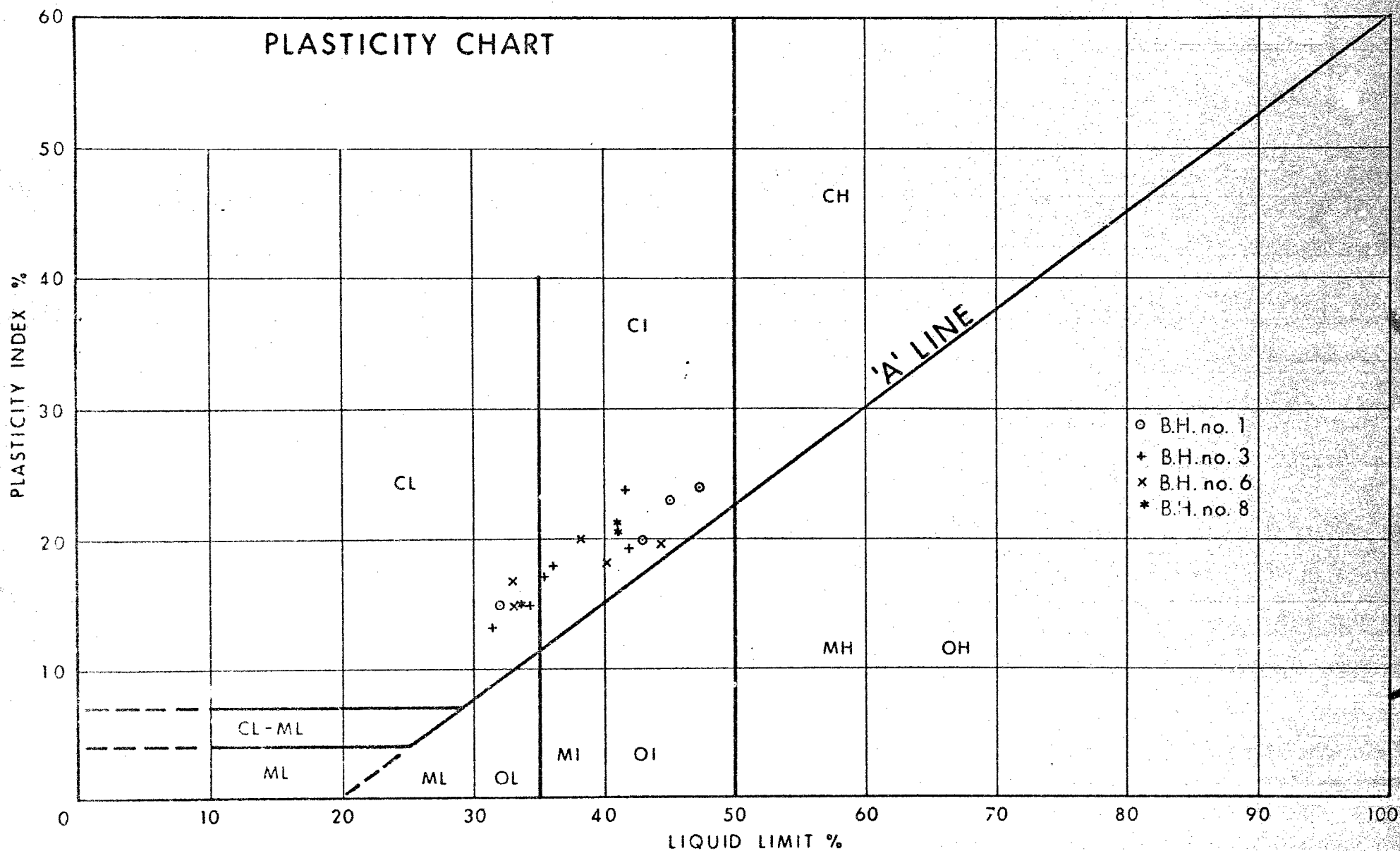


FIG. 1

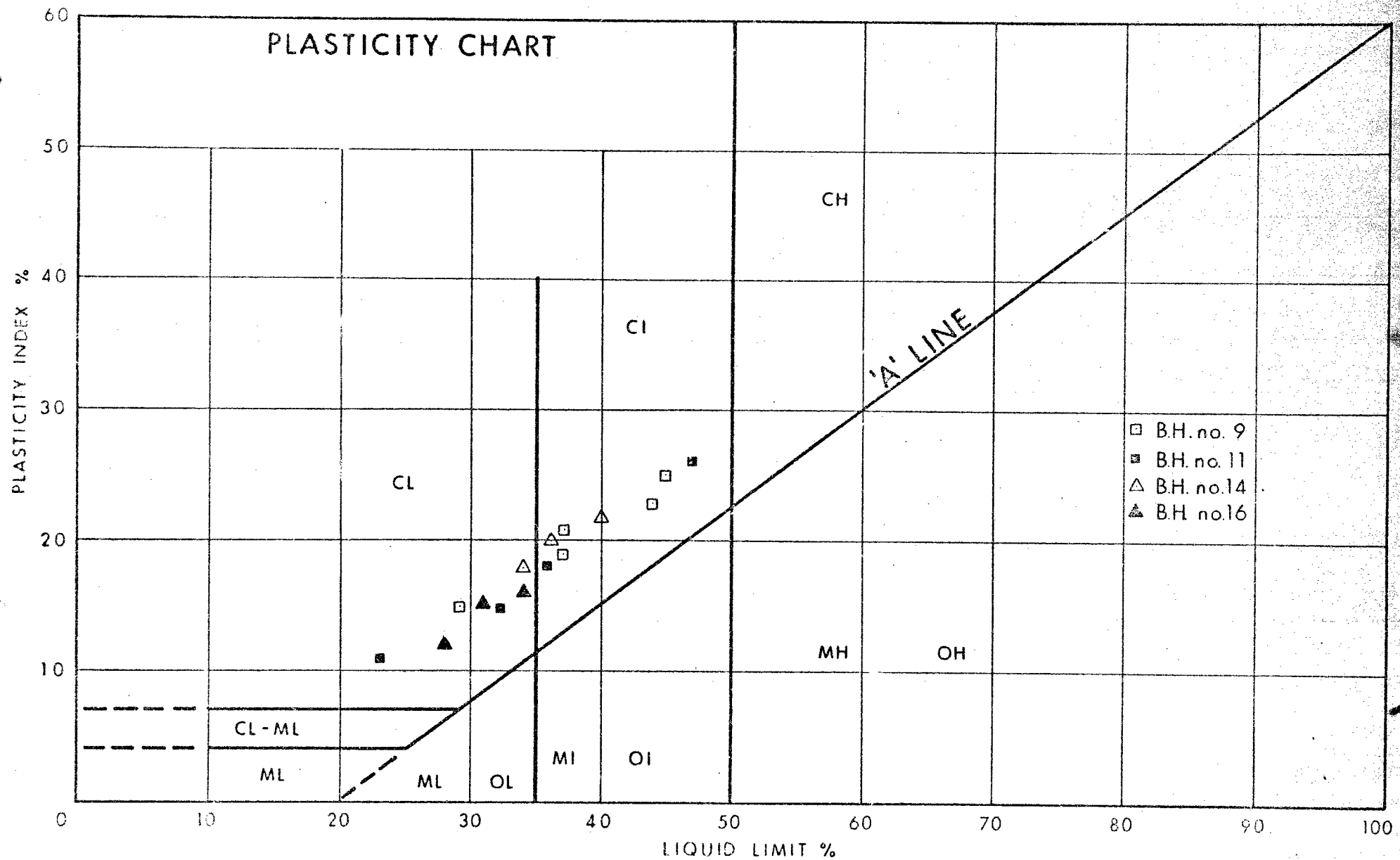


FIG. 2

D-9a (Rev Jan

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 (SOIL 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
σ'	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

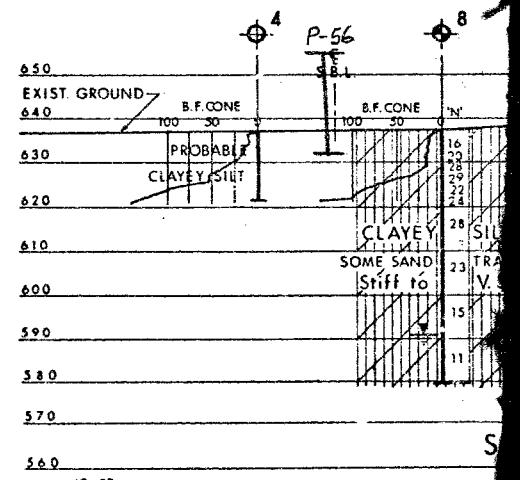
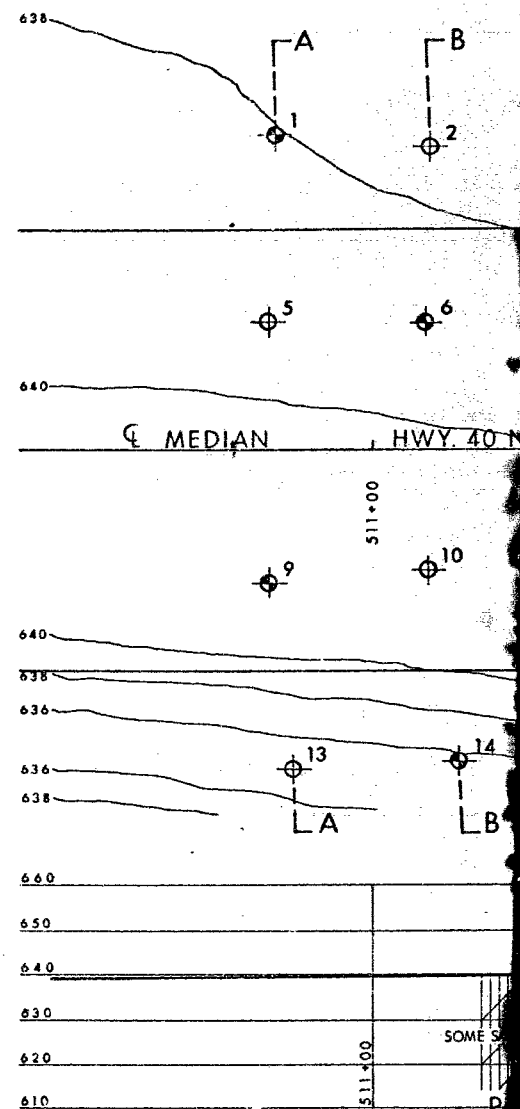
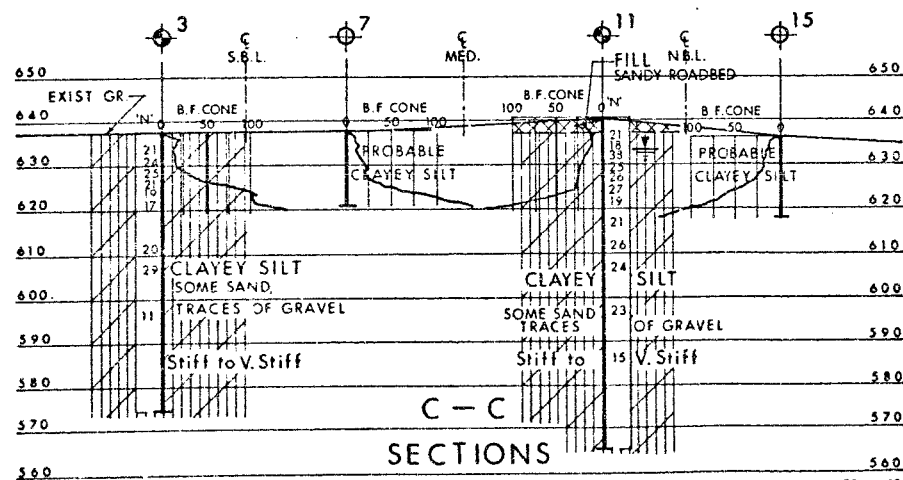
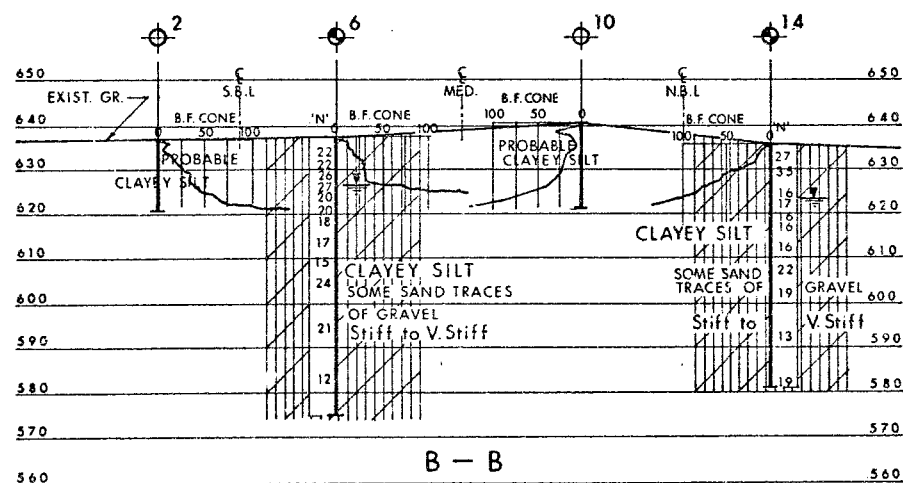
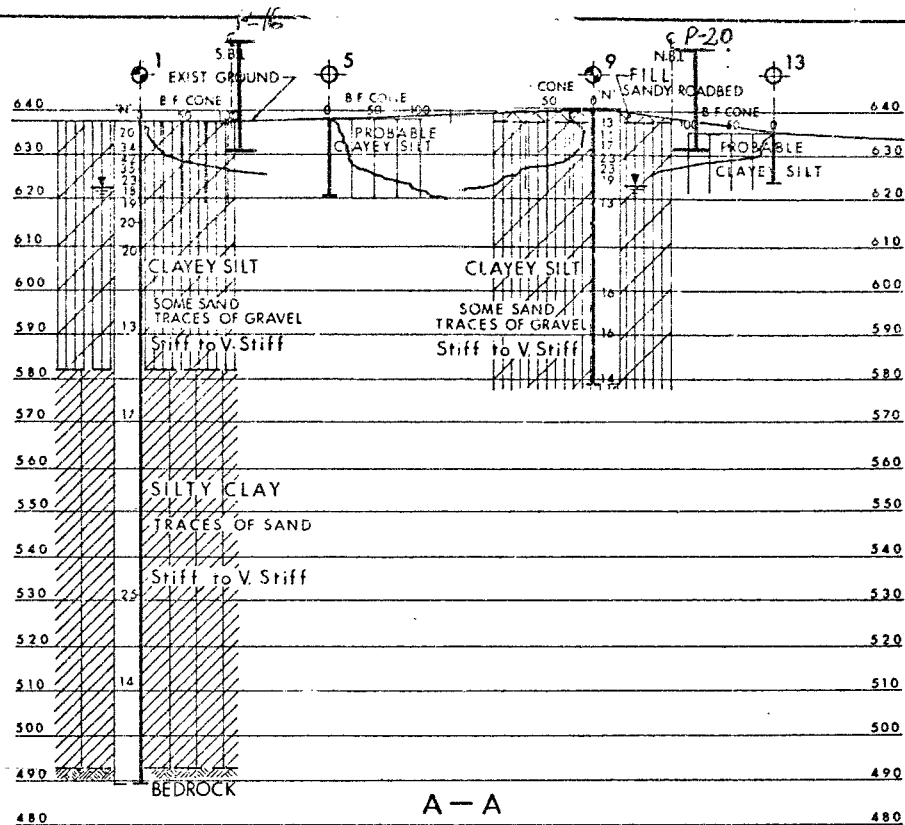
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

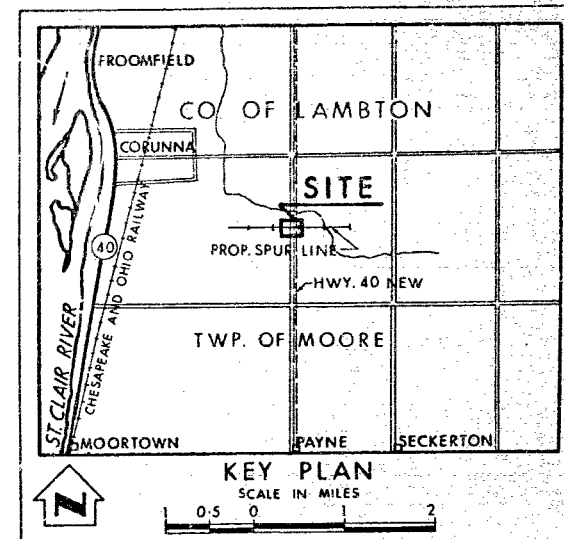
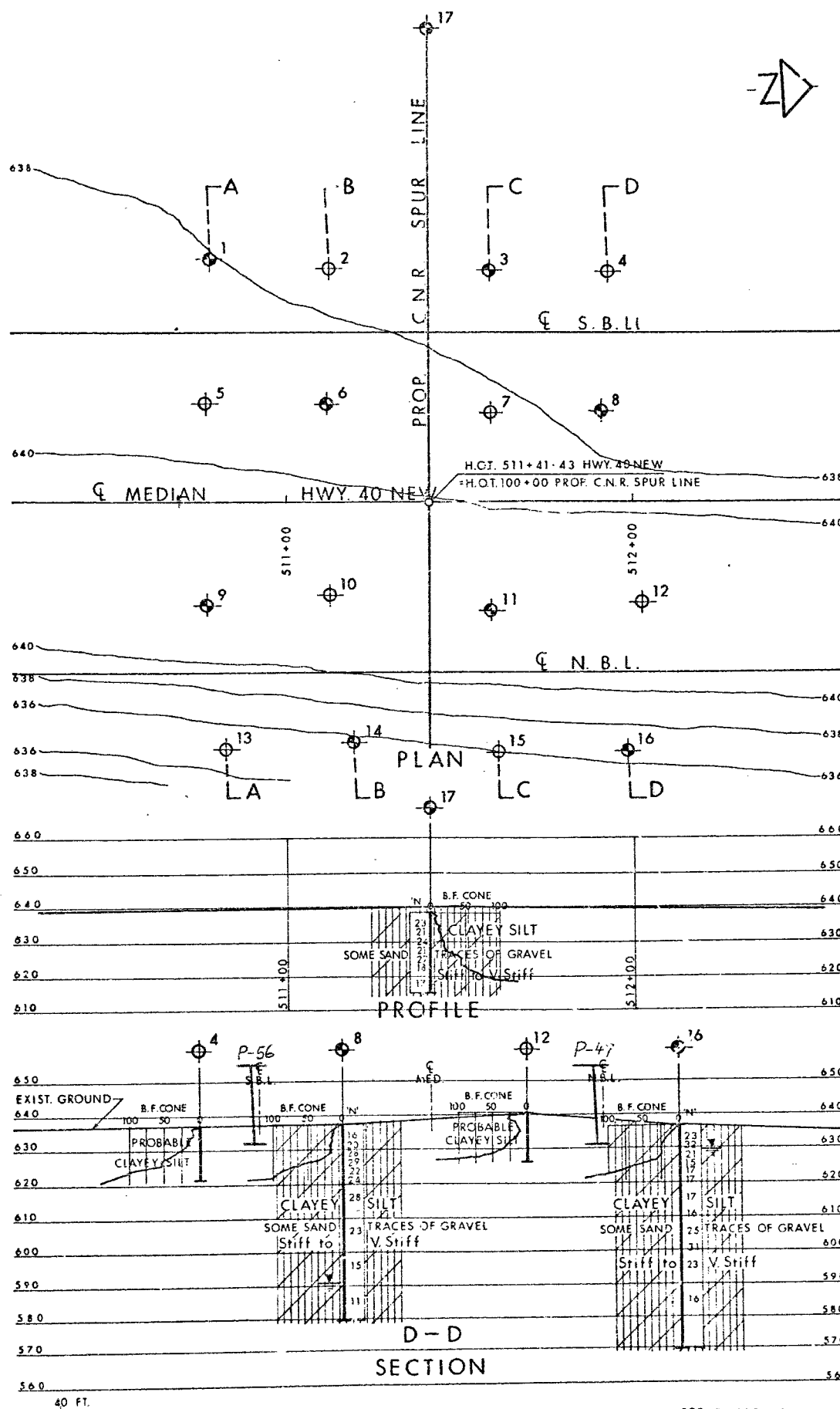
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BE
N	DIMENSIONLESS COEFFICIENT TO SPECIFIC GRAVITY. DEPT. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



SCALE 0 20 40 FT.



LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, JULY 1974
No Water Levels observed in B.H. No. 3 & 17

NO.	ELEVATION	STATION	OFFSET N. B. L.
1	637-8	510+79	120' LT.
2	637-8	511+12	117' LT.
3	637-5	511+58	116' LT.
4	637-6	511+94	116' LT.
5	638-3	510+77	78' LT.
6	638-3	511+12	77' LT.
7	637-9	511+59	75' LT.
8	637-6	511+92	75' LT.
9	640-4	510+77	20' LT.
10	640-4	511+12	22' LT.
11	640-5	511+59	18' LT.
12	640-8	512+03	20' LT.
13	634-8	510+82	22' RT.
14	635-7	511+19	20' RT.
15	636-0	511+61	23' RT.
16	636-7	511+98	23' RT.
17	638-5	511+42	187' 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.

NOTE: FOR CONTRACT DOCUMENT

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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION

CROSSING
HWY. 40 NEW & C.N.R. SPUR LINE
HIGHWAY NO. 40 NEW DIST. NO. 1
CO. LAMBTON
TWP. MOORE LOT 25 CON. 10

BORE HOLE LOCATIONS & SOIL STRATA			
SUBMD W.G. CHECKED	WP NO 91-74-02	DRAWING NO. 917402-A	
DRAWN O.L.J. CHECKED	WO NO	BRIDGE DRAWING NO	
DATE 23 AUG 1974	SITE NO 14-377		
APPROVED	CONT. NO.		

REF E-5354-1

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 75-85 STRUCTURE W.P. NO. 91-74-02
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25
HAMMER DETAILS: TYPE B-300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 3400
TYPE OF ANVIL OR CAP SINGLE HEAVY DUTY WEIGHT OF ANVIL OR CAP 1100
PILE DETAILS 12 3/4" O.D. TUBE 0.250" WALL THICK. 33 1/2 FT BATTER: VERTICAL
PILE NO. 56 LOCATION N. ABUT. S.B.L. DATE DRIVEN OCT-28-75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1	4		26			51			76	
	2	2		27			52			77	
	3	2		28			53			78	
	4	2		29			54			79	
	5	4		30			55			80	
	6	6		31			56			81	
	7	6		32			57			82	
	8	7		33			58			83	
	9	10		34			59			84	
	10	11		35			60			85	
	11	12		36			61			86	
	12	10		37			62			87	
	13	13		38			63			88	
	14	13		39			64			89	
	15	16		40			65			90	
	16	18		41			66			91	
	17	21		42			67			92	
	18	29		43			68			93	
	19	35		44			69			94	
	20	36		45			70			95	
	21	40		46			71			96	
	22	46		47			72			97	
25'-1"	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	4	4	5	5	5	5
MEASURED REBOUND IN INCHES	.61	.62	.75	.75	.75	.61
FINAL LENGTH OF PILE	22'-11"					FINAL CUT OFF ELEVATION 654.50

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

TIP EL. 631.6

SIGNED John Batsacutsas
NAME (PRINT) JOHN BATSA CUTSAS
DATE OCT-28-75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube \pm 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 75-85 STRUCTURE W.P. NO. 91-74-02
CONTRACTOR BERMINHAM DESIGN LOAD OF PILE 2.5
HAMMER DETAILS: TYPE B-300 BERMINHAM WEIGHT 7700 HEIGHT OF FALL OR ENERGY 34,000
TYPE OF ANVIL OR CAP SINGLE-HEAVY DUTY WEIGHT OF ANVIL OR CAP 1100
PILE DETAILS 12 3/4" O.D. TUBE PILE 0.250" WALL THICK 33 1/6 / FT BATTER: 1:3
PILE NO. 47 LOCATION N. ABUT. N.B.L. FRONT DATE DRIVEN OCT-29-75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1	2		26			51			76	
	2	2		27			52			77	
	3	2		28			53			78	
	4	2		29			54			79	
	5	2		30			55			80	
	6	2		31			56			81	
	7	4		32			57			82	
	8	5		33			58			83	
	9	9		34			59			84	
	10	10		35			60			85	
	11	11		36			61			86	
	12	10		37			62			87	
	13	10		38			63			88	
	14	14		39			64			89	
	15	14		40			65			90	
	16	15		41			66			91	
	17	18		42			67			92	
	18	25		43			68			93	
	19	39		44			69			94	
	20	41		45			70			95	
	21	48		46			71			96	
	22	46		47			72			97	
27.5	23	50		48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	3	4	5	5	6
MEASURED REBOUND IN INCHES	.65	.63	.6	.59	.59	.59
FINAL LENGTH OF PILE	24'-5"					
FINAL CUT OFF ELEVATION	654.50					

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED John B. Tsachtsas
NAME (PRINT) JOHN B. TSACHTSAS
DATE OCT-29-75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 75-85 STRUCTURE W.P. NO. 91-74-02
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TON
HAMMER DETAILS: TYPE B-300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 34000
TYPE OF ANVIL OR CAP Single Heavy Duty WEIGHT OF ANVIL OR CAP 1100
PILE DETAILS 12 3/4" O.D. TUBE 0.250 WALL 1" THICK SHOULDER BATTER: 1:3
PILE NO. 16 LOCATION SOUTH ABUT. S.B.L. DATE DRIVEN OCT-31-75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1	2		26			51			76	
	2	2		27			52			77	
	3	2		28			53			78	
	4	1		29			54			79	
	5	1		30			55			80	
	6	2		31			56			81	
	7	4		32			57			82	
	8	4		33			58			83	
	9	5		34			59			84	
	10	6		35			60			85	
	11	8		36			61			86	
	12	9		37			62			87	
	13	10		38			63			88	
	14	10		39			64			89	
	15	11		40			65			90	
	16	15		41			66			91	
	17	18		42			67			92	
	18	20		43			68			93	
	19	22		44			69			94	
	20	23		45			70			95	
	21	25		46			71			96	
	22	30		47			72			97	
	23	35		48			73			98	
28-11	24	40		49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	3	3	4	4	5
MEASURED REBOUND IN INCHES	.25	.25	.30	.32	.35	.36
FINAL LENGTH OF PILE <u>25-3"</u>	FINAL CUT OFF ELEVATION <u>654.50</u>					

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED John Batschelet
NAME (PRINT) JOHN BATSCHELET
DATE OCT-31-75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 75-85 STRUCTURE W.P. NO. 91-74-02
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 25 TON
HAMMER DETAILS: TYPE B-300 WEIGHT 7700 HEIGHT OF FALL OR ENERGY 34000
TYPE OF ANVIL OR CAP SINGLE HEAVY DUTY WEIGHT OF ANVIL OR CAP 1100
PILE DETAILS 12 3/4" O.D. TUBE 0.250 WALL 1" THICK SHOE BATTER: 1:3
PILE NO. 20 LOCATION SOUTH ABUT. N.R.L. DATE DRIVEN Nov-3-75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1	1		26			51			76	
	2	1		27			52			77	
	3	2		28			53			78	
	4	2		29			54			79	
	5	2		30			55			80	
	6	2		31			56			81	
	7	3		32			57			82	
	8	3		33			58			83	
	9	4		34			59			84	
	10	10		35			60			85	
	11	10		36			61			86	
	12	10		37			62			87	
	13	14		38			63			88	
	14	15		39			64			89	
	15	17		40			65			90	
	16	24		41			66			91	
	17	24		42			67			92	
	18	25		43			68			93	
	19	27		44			69			94	
	20	33		45			70			95	
	21	37		46			71			96	
	22	42		47			72			97	
	23	42		48			73			98	
27-1	24	43		49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	3	3	3	4	5	5
MEASURED REBOUND IN INCHES	.38	.38	.38	.30	.25	.25
FINAL LENGTH OF PILE	24-9"					
FINAL CUT OFF ELEVATION	654.50					

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED John Batsakis
NAME (PRINT) JOHN BATSAKIS
DATE Nov-3-75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

[illegible]

MEMORANDUM

TO: Mr. K. G. Selby, Supvrg. Eng.
Soils Mechanics Section
Geotechnical Office
West Bldg., Downsview

FROM: Structural Planning Office
Southwestern Region, London

ATTENTION:

DATE: June 7, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 91-74-02, Bridge Site 14-377
C.N.R. Spur Line Overhead
0.8 miles south of Cty. Rd. 4
Hwy. 40 New
District 1, Chatham

W.C. 74-11025

Would you kindly arrange to have a foundation investigation conducted at the above location.

I have enclosed two copies of the contract sheets 20 & 21 with the proposed location of the centreline of C.N.R. tracks crossing Highway 40N at station 511+50± indicated. The cross section Highway 40 New is 24' pavement - 74' median - 24' pavement controlled access.

The foundation investigation report should comment on whether this site is acceptable for a structural plate super span design similar to the attached C.N.R. Spur Line Overpass proposed on the St. Thomas Expressway preliminary plan site number 5-212 sheet P2, sheet 3 & 4.

The report should also comment on a three span proposal such as the attached C.N.R. Overhead, drawing number D-6071-1, using similar spans at right angles to Highway 40 New, separate structures for S.B.L. and N.B.L., and cross sections from median edge of bridge of 3' curb - 4' clearance - 12' driving lane - centreline Hwy. 40N - 12' driving lane - 8' clearance - 3" curb for each bridge.

A letter indicating whether a structural plate super span is acceptable at this site and giving recommendations for both the structural plate super span and the 3 span bridge is requested as soon as possible in advance of the final foundation report.

The northbound lane sub-grade material has been placed and District staff are in the area to aid in the location of the structure. Please note that Bell Canada is in the area.

A. P. Watt

A. P. Watt
Regional Structural Planning Engineer

APW:sz
Enc.

cc A. Crowley
J. Anderson
J. L. Keen
K. Dodge



CHANGED TO AUG 30 BY J. ANDERSON (JULY 25 74) IF E A.M. BY AUG 7 1974

COMPLETION DATE

- (1) Full Report - *AUG 14 1974*
- (2) LETTER WITH RECOMMENDATIONS - *JULY 23*

Mr. A.P. Watt,
Reg. Structural Planning
Engineer,
Structural Planning Office,
Southwestern Region,
London.

Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

July 11th, 1974.

RE: C.N.R. Spur Line Overhead,
0.8 Miles South of County
Road #4, Highway 40 New,
District #1, Chatham,
W.P. 91-74-02, Bridge Site 14-377.

A request for a foundation investigation at the above site was received from Mr. A.P. Watt, Regional Structural Planning Engineer in a memo dated June 7th, 1974. A letter giving recommendations for both a structural plate super span and a 3 span bridge was also requested as soon as possible in advance of the final foundation report. A brief review of subsoil conditions and recommendations for the approach fills and foundations for the two types of structures follows:

Subsoil Conditions.

The subsoil at this location consists of at least 150 ft. of clayey silt to silty clay overlying bedrock. Standard penetration 'N' values for this material range from 18 to 29 blows/foot for the upper 20 ft., averaging 24 blows. Below 20 ft. the 'N' values decrease somewhat, ranging between 11 and 24 and averaging 17 blows/ft. Shear strengths for the upper 20 ft. are expected to vary from 2000 to 4000 p.s.f. whereas below 20 ft., a range of 1500 to 2000 p.s.f. appears reasonable.

Recommendations.

Subsoil conditions at this site are comparable with conditions at the site of the C.N.R. and Hwy. 40-A, line 'A' Revision W.P. 53-63 (Report No. 63-P-12). In view of the satisfactory performance of the above structure which was completed in 1966 our recommendations are as follows:

July 11th, 1974.

Mr. A.P. Watt - RE: W.P. 91-74-02.

(i) Three Span Structure.

As the minimum height of the approach fills will be in the order of 30 ft., settlements of up to 5 inches can be expected beneath the fill. Since the largest part of the settlement will be due to the weight of the approach embankment it is recommended that the latter be constructed as far in advance of the structure as possible. Settlements at the abutments of $3\frac{1}{2}$ to 4 inches are therefore expected. The abutments may be supported on 12-3/4 inch O.D. steel tube piles driven closed-end through the fill to 8 ft. below original ground. Care should be taken that no bouldery fill is placed within the approaches through which piles have to be driven. It is further recommended that this portion of the fill contains no grain sizes larger than 3 inches. A design load of 25 tons per pile may be used.

The piers may be supported on spread footings with a design load of 3 t.s.f. Settlements for the footings of up to 1.5 inches are expected. At least 4 ft. of clear cover for frost protection is required for the footings and pile caps.

Because the bedrock is at least 150 ft. below ground, end bearing piles are believed to be uneconomical at this location.

(ii) Structural Plate Super Span.

The structural plate super span is an acceptable alternative to a 3-span structure. Construction of the structural plate super span should be according to current M.T.C. standards. As previously mentioned, settlements of 5 inches are expected beneath the fill, hence this type of structure should be designed to accommodate 5-inch settlements.

No stability problems are anticipated for the approach fills provided 2:1 side slopes are used.

July 11th, 1974.

Mr. A.P. Watt - RE: W.P. 91-74-02.

The complete report will be forwarded to you as soon as possible. Please do not hesitate to call up if you have any questions on the above recommendations.

WJA/mj

c.c. Messrs. A. Crowley
J. Anderson
J. Keen
M. Dodge

W.J. Alcock
Project Engineer
For:
K.G. Selby
Supervising Engineer

Files
Documents

1572

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

Attention of K. Selby

Mr. F. E. Loscombe
Regional Superintendent of
Engineering Surveys
Southwestern Region
Mr. J. Rule
Sr. Drafting Supervisor

Structural Planning Office
Southwestern Region
London

July 26, 1974

N.P. 91-74-02, Bridge Site 14-377
C.N.R. Spur Line Overhead
0.8 miles south of Cty. Rd. #4
Hwy. 40 New
District 1, Chatham

Would you kindly arrange to have a bridge site plan prepared for the above noted structure.

Attached please find the survey request for the preparation of the bridge site plan.

It is my understanding that the bridge site plan may be available by approximately August 2, 1974.

A. P. Watt

A. P. Watt
Regional Structural Planning Engineer

APW:sm
Enc.

cc K. Selby
J. Anderson
A. Crowley
M. Dodge



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. K. G. Selby, Supvrg. Eng.
Soils Mechanics Section
Geotechnical Office
West Bldg., Downsview

FROM: Structural Planning Office
Southwestern Region
London

ATTENTION:

DATE: August 2, 1974

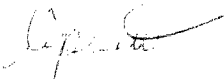
OUR FILE REF:

IN REPLY TO:

SUBJECT: W.P. 91-74-02, Bridge Site 14-377
C.N.R. Spur Line Overhead
0.8 miles south of Cty. Rd. 4
Hwy. 40 New
District 1, Chatham

Attached please find one copy of the bridge site plan E-5354-1 for the above site as per Wally Greskow's request.

An additional bridge site plan will be sent to you in the near future showing the elevation of the C.N.R. Spur Line so that an accurate roadway grade line can be assessed.



A. P. Watt
Regional Structural Planning Engineer

APW:sm
Enc.



MEMORANDUM

TO: Mr. K. G. Selby, Supvr. Eng.
Soils Mechanics Section
Geotechnical Office
West Bldg., Downsview

FROM: Structural Planning Office
Southwestern Region
London

ATTENTION:

DATE: August 12, 1974

OUR FILE REF

IN REPLY TO

SUBJECT: W.P. 91-74-02, Bridge Site 14-377
C.N.R. Spur Line Overhead
0.8 miles south of Cty. Rd. #4
Highway 40 New
District 1, Chatham

Further to my memorandum of June 7, 1974, please find the bridge site plan E-5354-1 for the above site giving the top of rail through the Super Span as elevation 640.30.

This information has been supplied by Mr. M. Armstrong, C.N.R., London, by telephone August 9, 1974.

The completed Foundation Investigation Report would be appreciated as soon as possible.

APW
A. P. Watt
Regional Structural Planning Engineer

APW:sm
Enc.

cc A. Crowley
T. A. Hickey

