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GEOCRES No. 40I14-65DIST 2 REGION SouthwesternW.P. No. 88-69-03CONT. No. 79-20W. O. No. 71-11063

STR. SITE No. \_\_\_\_\_

HWY. No. \_\_\_\_\_

LOCATION CPR Subway at  
St. Thomas Expressway, City of  
St. Thomas

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded  
before microfilming

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

40114-65

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

ATTENTION: DATE: March 11th, 1974.

OUR FILE REF. IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

C.P.R. Subway at St. Thomas Expressway,  
City of St. Thomas, County of Elgin,  
District #2, (London)

W.O. 71-11063

W.P. 88-69-03

We have reviewed our Foundation Report (W.O. 71-11063) for possible differential settlements between the foundations. This letter contains our recommendations regarding the same. This memo forms part of Foundation Report W.O. 71-11063 and should be attached to it.

The subsoil at this site consists of a deep (approx. 100 ft.) deposit of very stiff to hard clayey silt (glacial till). The general ground level at this location varies between elevation 788 - 790 ft., while the final profile grade of the St. Thomas Expressway will be at approximate elevation 768 - 770 ft. This will mean a cut with a maximum depth of about 20 ft. Because of the relatively hard consistency of the material, it was not possible to push a Shelby tube to obtain an undisturbed sample. Therefore, we do not have any test results on the basis of which possible settlements can be calculated. Furthermore, laboratory test results are notoriously unreliable for computing elastic deformations, which are the major concern at this site. However, the deformations here will be relatively small, because of the hard consistency of the material and because the moisture content of the soil is at or near the plastic limit.

Mr. A.P. Watt - RE: W.O. 71-11063.

The deformations mentioned in the following text are only estimates based upon our past experiences in the areas with similar subsoil conditions and on the experiences of others as mentioned in technical literature.

The final differential settlements between footings will depend upon construction sequence. The contributing factors to the overall deformations will be:

- 1) Settlement of abutment footings due to superimposed load. 0.5 in.
- 2) Settlement of pier footings due to superimposed load. 0.5 - 1.0 in.
- 3) Heave of pier footings due to elastic (immediate) heave of the base of the excavation. (Heave was calculated using  $E = 1200$  TSF. Effect of heave on the abutment footings will be negligible.) 1.0 in.
- 4) Heave of pier footings due to long-term heave of the base of the excavation. 0.5 in.
- 5) Settlement of pier footings due to the reduction in bearing capacity of the soil as a result of the excavation. Negligible

It should be borne in mind that the heave will be greater at the centre of the excavation (Pier #2) than near its limits (Piers #1 & #3). The differential settlement can be minimized by excavating to the final profile grade before completing the superstructure.

Mr. A.P. Watt - RE: W.O. 71-11063.

Based on the above figures, it is recommended that if the structure is completed before excavation to the final grade elevation, it should be designed for differential settlements of 1.0 in. between the abutment (which will settle) and the adjacent pier (which will heave).

We believe that this will prove adequate for your design purposes. Should additional information be required, please contact this Office.

*Prakash*  
Anand Prakash  
Senior Engineer

For:

K.G. Selby  
Supervising Engineer

AP/mj

C.C. E.J. Orr  
B.R. Davis  
A. Wittenberg  
L.E. Walker  
B.J. Giroux  
J.R. Roy  
G.A. Wrong  
B.A. Singh  
R. Temple (FENCO)

Files ✓  
Documents

FOUNDATION INVESTIGATION REPORT  
For  
C.P.R. Subway at St. Thomas Expressway  
City of St. Thomas Co. of Elgin  
District No. 2 (London)  
W.O. 71-11063      --      W.P. 88-69-03

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1. INTRODUCTION:

A request for a foundation investigation for a subway at the crossing of C.P.R. tracks and St. Thomas Expressway, was received from Mr. T. P. Hodgson, Bridge Location Engineer, in a memo, dated June 23, 1971.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approach cuts.

2. DESCRIPTION OF SITE:

The site of the proposed crossing is located in the eastern part of the city of St. Thomas.

The surrounding area is flat with barren land on the east side and cultivated farm land on the west side of the tracks.

Physiographically, the site is located in the region referred to as the Mount Elgin Moraines.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of ten sampled boreholes and ten dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of a continuous flight auger machine (Penn Drill), and a C.M.E. hollow stem auger machine,

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES: (cont'd) ... adapted for soil sampling and diamond drilling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler: the energy used in driving it, conformed to the requirements of the Standard Penetration Test. Undisturbed samples were recovered using 2-inch I.D. Shelby tubes which were pushed into the soil hydraulically.

Dynamic cone penetration tests were carried out adjacent to each borehole. Driving energy used to advance the cone was 350 ft. - lbs. per blow.

All boreholes were surveyed in the field by personnel from London Region Engineering Survey Section. The locations and elevations of the borings are shown on Drawing No. 71-11063A, which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection, laboratory tests were carried out on selected samples to determine the following physical properties:

Atterberg Limits

Moisture Content

Grain-Size Distribution

Undrained Shear Strength

Bulk Density

Consolidation Characteristics

The results of the field and laboratory tests are summarized on the Record of Borehole sheets contained in the Appendix to the report.

#### 4. SUBSOIL CONDITIONS:

##### 4.1) General:

Generally, uniform subsoil conditions were found to prevail over the area investigated. The subsoil consists of a deep deposit of clayey silt with some sand and traces of gravel (glacial till).

The boundaries between various soil types are shown on the Record of Borehole sheets. The estimated stratigraphical profile shown on Drawing No. 71-11063A is based upon this information.

A detailed description of the soil type and soil properties is given, as follows:

##### 4.2) Clayey Silt, Some Sand, Traces of Gravel (Glacial Till):

This was the only soil type encountered at the site, and all boreholes were terminated in this deposit. The deepest borehole was 81.5 ft. in depth.

The material is relatively uniform in composition. It consists of clayey silt, with some sand and traces of gravel, and is of glacial origin. No conspicuous sand layers were intersected, but it is possible that some randomly distributed sand partings could be present. It is believed that a thin sand layer was intersected in Borehole #2, between the ground level and a depth of 10 ft. This borehole was soon filled up with water up to 2.5 ft. below the ground level.

The consistency of the material varies from very stiff to hard, as indicated by 'N' values. It was not possible to push the field vane manually, indicating that the undrained shear

4. SUBSOIL CONDITIONS: (cont'd) ...

4.2) Clayey Silt, Some Sand, Traces of Gravel  
(Glacial Till): (cont'd) ...

strength everywhere was more than 2,000 p.s.f.

Physical properties of the deposit, as determined from laboratory tests, are as follows: (See Fig. #1)

		<u>Min.</u>	<u>Max.</u>	<u>Average</u>
Liquid Limit	(%)	26	37	31
Plastic Limit	(%)	21	14	17
Natural Moisture Content	(%)	22	15	17

Grain-size analyses indicate the following distributions, and are plotted on Fig. #2.

		<u>Min.</u>	<u>Max.</u>	<u>Average</u>
Gravel	(%)	0	8	2
Sand	(%)	6	22	11
Silt	(%)	37	63	54
Clay	(%)	22	55	33

5. GROUNDWATER CONDITIONS:

The following water levels were recorded in the boreholes at the time of investigation.

Borehole	1	Elevation	776.2
	2		789.0
	5		715.2

No water levels were established in boreholes 7 and 10. All other boreholes were dry.

From the above table it is seen that a high water level (only 2.7 ft. below ground level) was observed in Borehole #2. In



5. GROUNDWATER CONDITIONS: (cont'd) ...

an attempt to locate the source of water, three additional boreholes, 20, 15 and 10 ft. deep were put down adjacent to each of the Boreholes 2, 3 and 4. Holes adjacent to Borehole 2 were filled up to 2.5 to 2.8 ft. below ground level. Boreholes 3 and 4, and those adjacent to them were all dry.

It is believed that the water in Borehole 2 came from a sand layer between the ground surface and a depth of 10 ft. The water, from precipitation and surface run off, was probably trapped in this relatively pervious layer. The remaining stratum is relatively impervious. Water seepage in Borehole 1 is also of a localized nature, and small in quantity.

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a subway to carry St. Thomas Expressway under the C.P.R. tracks. This will require a cut. The maximum depth of the cut is about 21 ft.

Subsoil at the site consists of very stiff to hard clayey silt with some sand and traces of gravel (glacial till).

The C.P.R. tracks will be carried over a 4-span <sup>ok</sup> structure. The grade of the St. Thomas Expressway at this point is Elevation 772.0, approximately. The investigation has revealed that the subsoil is capable of providing adequate bearing capacity. Therefore, it is recommended that the proposed piers be founded on spread footings constructed at least <sup>ok</sup> 4.0 ft. below the finished grade. A safe bearing capacity of 3.0 tons/sq. ft. may be assumed for design purposes.

It is recommended that the proposed abutments be constructed

6. DISCUSSION AND RECOMMENDATIONS: (cont'd) ...

within the approach on spread footing type foundations. A safe bearing capacity of 3.0 tons/sq. ft. may be assumed for design purposes for footings placed at or below Elevation 782.0. *ok*

All footings should have a minimum cover of  $\frac{1}{4}$  ft. for frost protection. *ok*

It is believed that the ground water level is below the level of excavation. However, some local zones of perched water may be encountered, which can be handled by pumping. Because of relatively impermeable nature of the subsoil, no dewatering problems are anticipated.

No stability problems are anticipated for 2:1 side slopes of the cut. It is possible, however, that perched water may be encountered in the sides of the cuts during constructions. If persistent seepage results from these perched zones, it will be necessary to cover the affected areas with a filter blanket, consisting of 18 inches of Granular 'A' type material. This, however, can only be decided during construction.

7. MISCELLANEOUS:

The field investigation was carried out during the period July 7-13, 1971, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

Equipment was owned and operated by P.V.K. and Sons Ltd.

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

August, 1971

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71-11063 LOCATION Co-ords. 549,459 N; 359,780 E. ORIGINATED BY AP  
 W.P. 88-69 BORING DATE July 7, 1971 COMPILED BY AP  
 DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger Cone CHECKED BY [Signature]

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	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	WATER CONTENT % $w_p$ — $w$ — $w_L$				
792.2	Ground Level						SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE									
	Clayey silt, some sand, traces of gravel (Glacial Till)  Hard		1	SS	35	790										2 10 57 31  776.2 July 13/71  11 58 27  764.2 July 8/71
			2	SS	31	780										
			3	SS	47											
			4	SS	38	770										
			5	SS	37											
760.7			6	SS	31											
31.5	End of Borehole					760										

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 71-11063

LOCATION Co-ords. 549, 465 N; 360,075 E.

ORIGINATED BY AP

W.P. 88-69-03

BORING DATE July 7, 1971

COMPILED BY AF

DATUM            Geodetic

BOREHOLE TYPE Cont. Flight Auger: Cone

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION BLOWS / FOOT 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 % 10 20 30	BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT					
791.7	Ground Level									
	Clayey silt, some sand, traces of gravel (Glacial Till)  Very Stiff to Hard		1	SS	29	790				789. July 8/71 3 10 57 30  8 17 44 31  2 11 55 32
			2	SS	38	780				
			3	SS	30					
			4	SS	31	770				
765.2			5	SS	24					
26.5	End of Borehole					760				

## RECORD OF BOREHOLE No. 3

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MATERIALS & TESTING OFFICE

## FOUNDATION SECTION

JOB 71-11063 LOCATION Co-ords 549,454 N; 360,375 E. ORIGINATED BY AP  
W.P. 88-69-03 BORING DATE July 7 - 8, 1971 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger; Cone CHECKED BY [Signature]

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	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT							WATER CONTENT %		
							20	40	60	80	100			$w_p$	$w$	$w_L$
							SHEAR STRENGTH P.S.F.									
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE										
798.7	Ground Level															
0.0	Clayey silt, some sand, traces of gravel  (Glacial Till)  Very Stiff to Hard		1	SS	51	790									3 11 51 35	Borehole Dry
		2	SS	46												
		3	SS	32												
		4	SS	22												
		5	SS	30												
772.2																
26.5	End of Borehole					770										

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 4

## FOUNDATION SECTION

JOB 71-11063

LOCATION Co-ords. 549,459 N; 360,772 E.

ORIGINATED BY AP

W.P. 88-69-03

BORING DATE July 8, 1971

COMPILED BY AF

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger: Cone

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 ——— $w_p$				WATER CONTENT ——— $w$
							20	40	60	80			
							SHEAR STRENGTH P.S.F.		WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		$w_p$ ——— $w$ ——— $w_L$				
804.7	Ground Level												
0.0	Clayey silt, some sand, traces of gravel (Glacial Till)  Very Stiff to Hard												
			1	SS	54	800						2 11 58 29	
			2	SS	44								
			3	SS	29	790						2 11 (87)	
			4	SS	30								
778.2			5	SS	21	780						1 11 58 30	
26.5	End of Borehole											Borehole Dry	
						770							

# RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 71-11063 LOCATION Co-ords. 549,368 N; 359,522 E. ORIGINATED BY AP  
W.P. 88-69-03 BORING DATE July 9, 1971 COMPILED BY AP  
DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger & Cone CHECKED BY \_\_\_\_\_

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY $\gamma$	REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE	BLOWS / FOOT			PLASTIC LIMIT		
							20 40 60 80 100			WATER CONTENT		
							SHEAR STRENGTH P.S.F.			$w_p$ ——— $w_L$		
							○ UNCONFINED + FIELD VANE		WATER CONTENT %			
							● QUICK TRIAXIAL x LAB VANE		10 20 30			
790.2	Ground Level										P.C.F.	GR SA SI CL
	Clayey silt, some sand, traces of gravel (Glacial Till)  Very Stiff to Hard		1	SS	32	790						1 12 58 29
			2	SS	34	780						2 10 51 37
			3	SS	25	770						1 6 49 44
			4	SS	43	760						1 9 48 42
			5	SS	26	750						3 10 57 30
			6	SS	31	740						
			7	SS	34	730						
			8	SS	30	720						
			9	SS	33	710						
			10	SS	41							
			11	SS	46							
708.7	End of Borehole											
81.5												

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 71-11063

LOCATION Co-ords. 549,461 N; 359,581 E.

ORIGINATED BY AP

W.P. 88-69-03

BORING DATE July 12, 1971

COMPILED BY AP

DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger Cone

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	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					$w_p$ — $w$ — $w_L$				
							20	40	60	80	100	WATER CONTENT % 10 20 30				
SHEAR STRENGTH P.S.F.							UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE									
788.7	Ground Level															
747.2	Stiff Very Stiff to Hard  Clayey silt, some sand, traces of gravel (Glacial Till)		1	SS	13	780									2 10 18 30	
			2	SS	29											
			3	SS	31											
			4	SS	45											
			5	SS	27											
			6	SS	24											
			7	SS	27											
			8	SS	22											
741.5	End of Borehole														6 10 49 35 Borehole Dry	

Stiff  
Very Stiff  
to HardClayey silt, some sand,  
traces of gravel  
(Glacial Till)

2 10 78 30

0 12 58 30

2 9 57 32

6 10 49 35  
Borehole  
Dry



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-11063

LOCATION Co-ords. 549,55' N; 359,633 E.

ORIGINATED BY AP

W.P. 88-69-03

BORING DATE July 12-13, 1971

COMPILED BY AP

DATUM Goodetic

BOREHOLE TYPE Cont. Flight Auger Cone

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 $\gamma$	REMARKS			
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80			100	10	20
789.5	Ground Level					SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % $w_p$ — $w$ — $w_L$						
	Clayey silt, some sand, traces of gravel (Glacial Till) Very Stiff to Hard	1	SS	30									2 7 49 42	
		2	SS	21	780									2 6 52 40
		3	SS	32										2 6 52 40
		4	SS	32	770									3 11 (86)
		5	SS	27										3 11 (86)
		6	SS	16	760									2 6 37 55
		7	TW	PH										2 6 37 55
		8	SS	30	750									2 6 37 55
		9	SS	25	740									2 18 46 34
		10	SS	55	730									2 18 46 34
708.0		11	SS	37	710								3 22 44 31	
81.5	End of Borehole													

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 71-11063 LOCATION Co-ords. 549,412 N; 359,516 E. ORIGINATED BY AP  
 W.P. 88-69-03 BORING DATE July 12, 1971 COMPILED BY AP  
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger; Cone CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		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	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	$w_p$ — $w$ — $w_L$ WATER CONTENT % 10 20 30			
790.9	Ground Level											
	Soft Very Stiff to Hard		1	SS	2							
			2	SS	41							4 11 53 32
	Clayey silt, some sand, traces of gravel (Glacial Till)		3	SS	29							
			4	SS	33							3 12 63 22
			5	SS	30							
			6	SS	35							1 12 57 30
			7	SS	29							
749.4			8	SS	32							1 11 58 30
41.5	End of Borehole											Borehole Dry

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 71-11063

LOCATION Co-ords. 545,518 N; 359,560 E.

ORIGINATED BY AP

W.P. 88-69-03

BORING DATE July 12, 1971

COMPILED BY AP

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger; Cone

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	ELEV. SCALE	20	40	60	80	100			10
788.6	Ground Level													
0.0	Stiff Very Stiff to Hard		1	SS	11									
			2	SS	34	780								
	Clayey silt, some sand, traces of gravel (Glacial Till)		3	SS	28									
			4	SS	20	770								
			5	SS	32									
			6	SS	34	760								
			7	SS	34									
			8	SS	36	750								
747.1														
41.5	End of Borehole													Borehole Dry

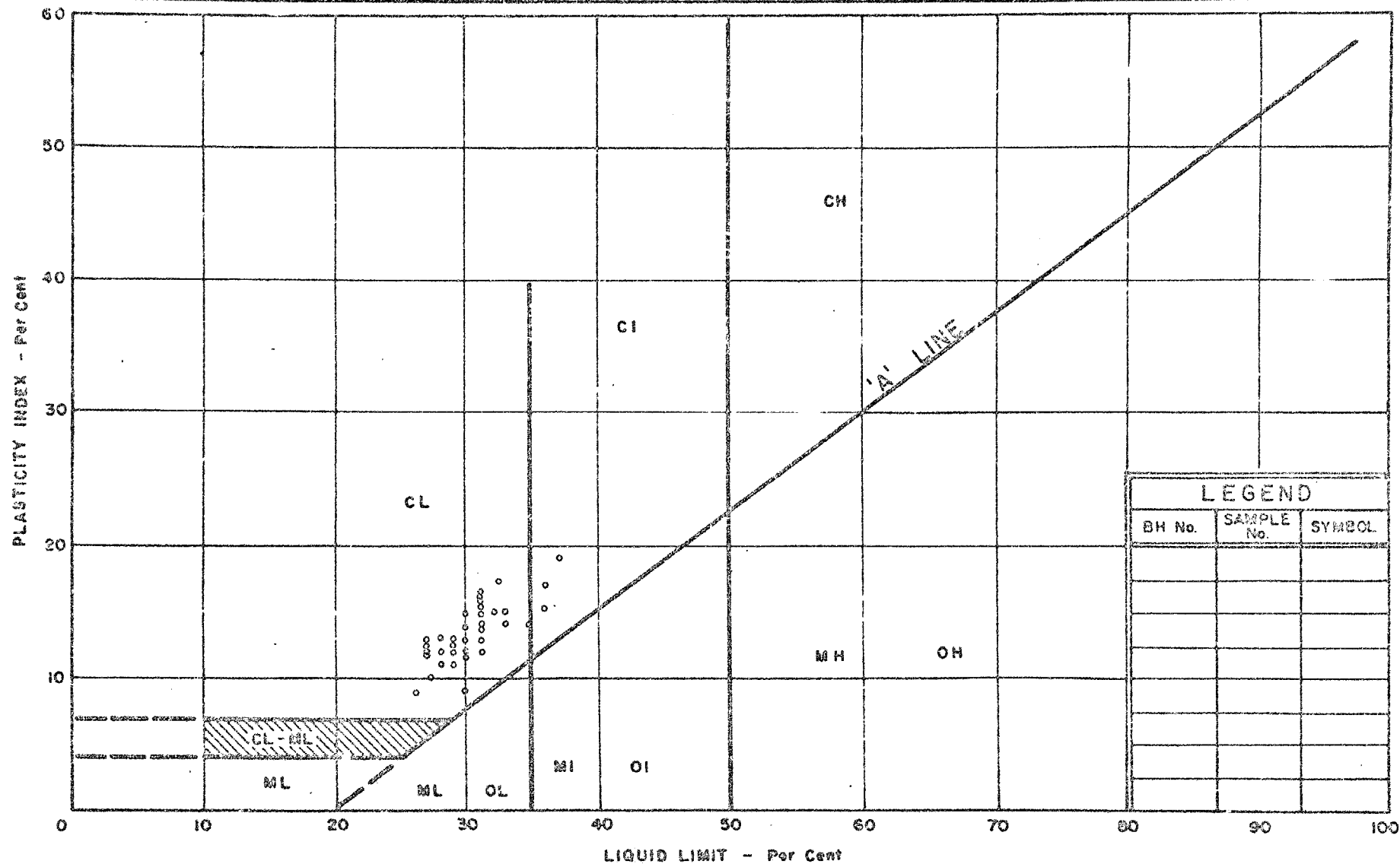
## FOUNDATION SECTION

ORIGINATED BY AP

COMPILED BY AF

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		
787.2	Ground Level						SHEAR STRENGTH P.S.F.		$w_p$ — $w$ — $w_L$			
	Clayey silt, some sand, traces of gravel (glacial Till)  Very Stiff to Hard						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		10 20 30			
			1	SS	34	780						2 9 58 31
			2	SS	29							0 11 58 31
			3	SS	35	770						
			4	SS	33							1 10 56 33
			5	SS	39	760						
755.7			6	SS	20							2 10 46 42
31.5	End of Borehole					750						



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

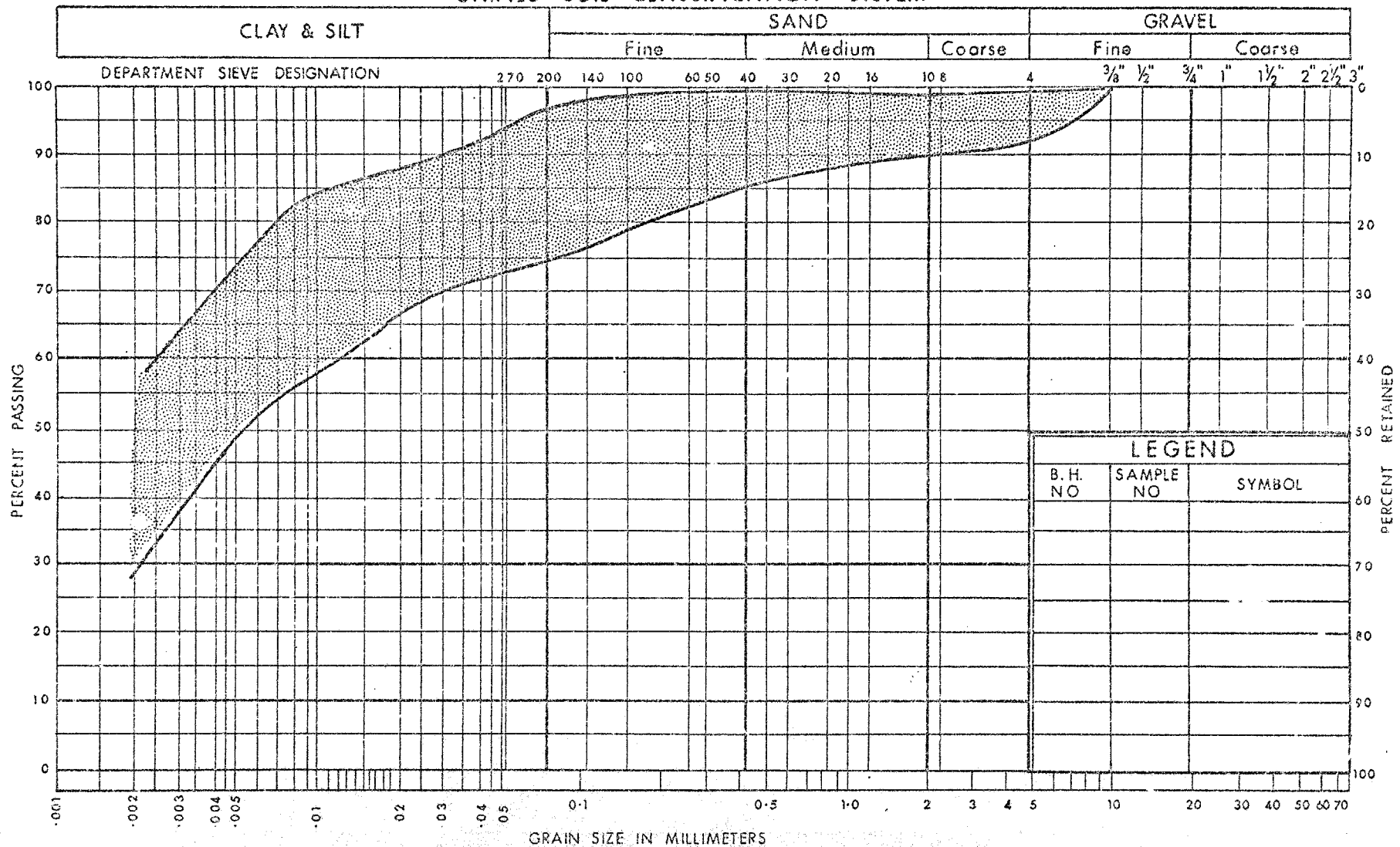
## PLASTICITY CHART

W.P. No. 88-69-03

JOB No. 71-11063

FIG. 1

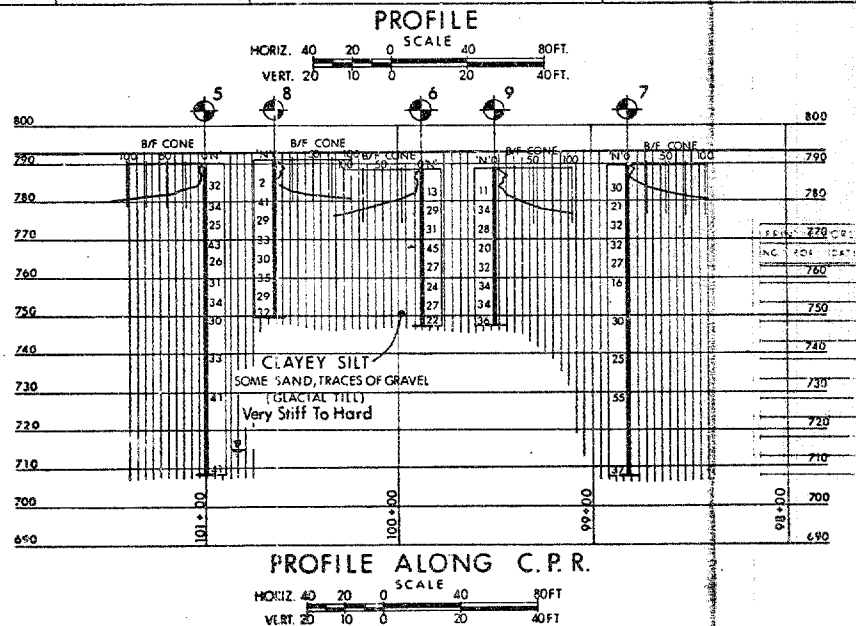
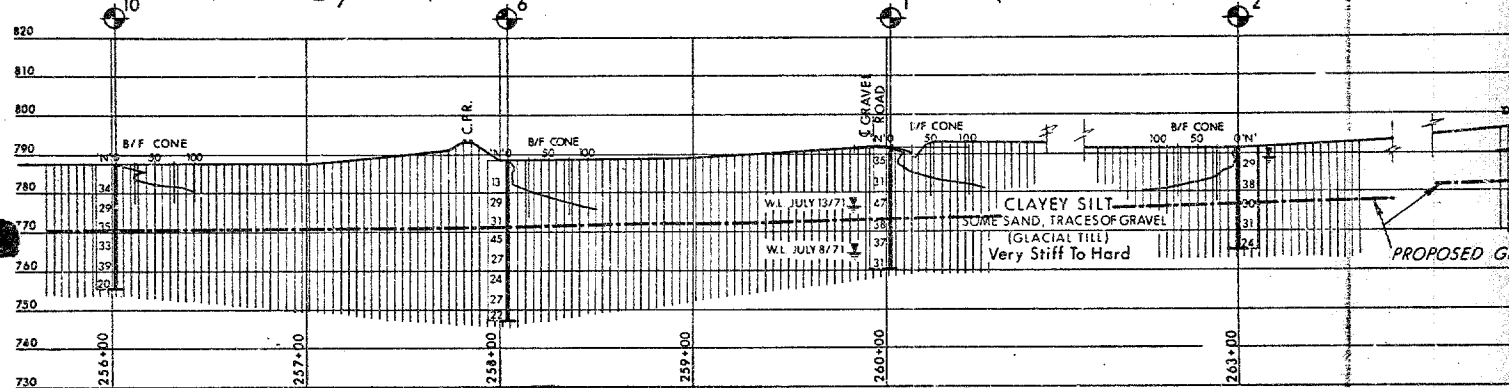
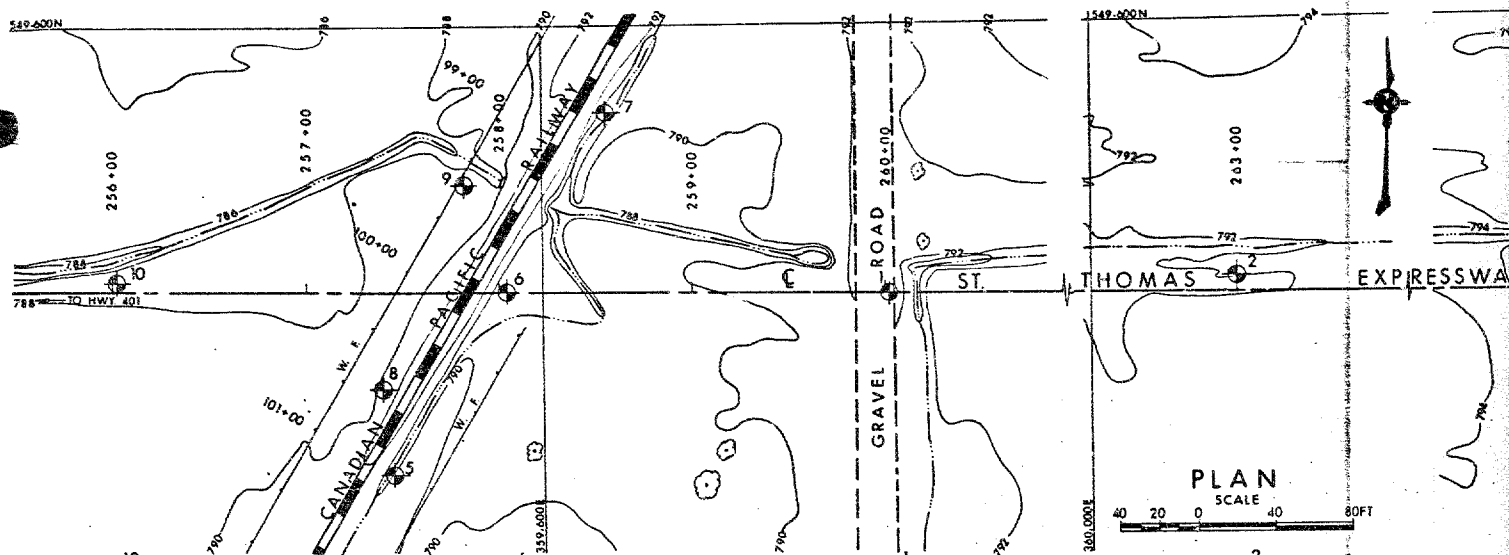
# UNIFIED SOIL CLASSIFICATION SYSTEM

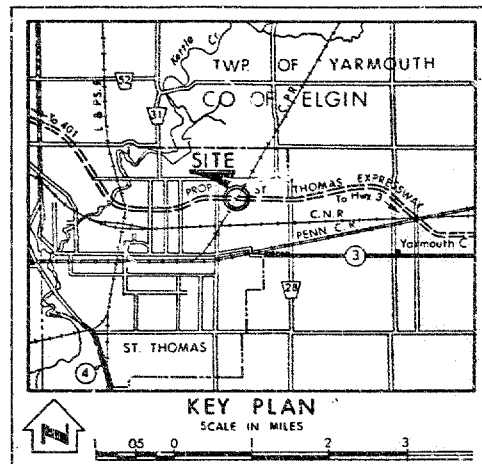
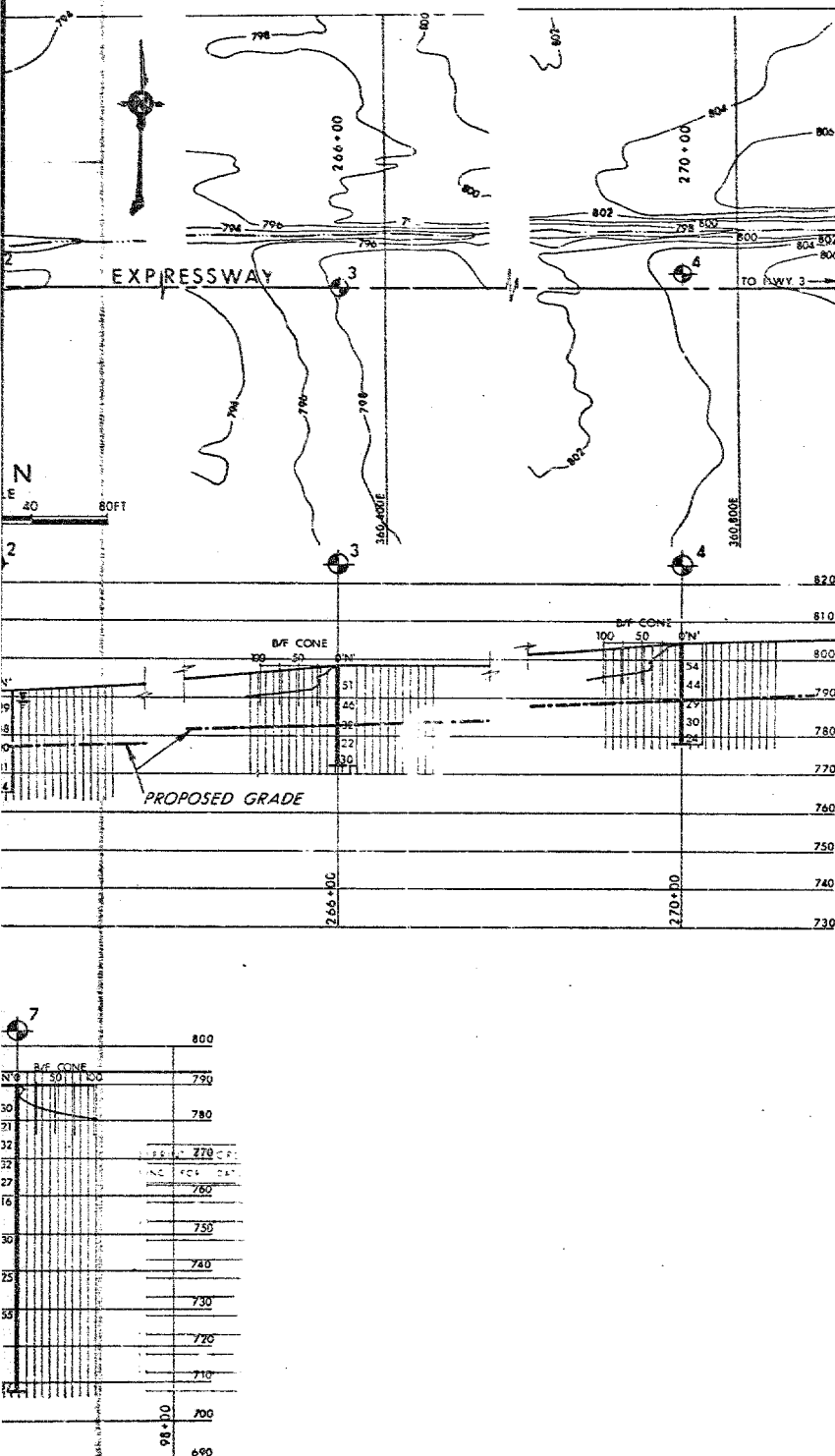


DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

GRAIN SIZE DISTRIBUTION  
CLAYEY SILT

W.P. No. 88-69-03  
JOB No. 71-11063  
FIG. 2





### LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation, JULY, 1971
- Water Levels not established in Boreholes 7 & 10.

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	792.2	549,459	359,780
2	791.7	549,465	360,075
3	798.7	549,454	360,375
4	804.7	549,459	360,772
5	790.2	549,368	359,522
6	788.7	549,461	359,581
7	789.5	549,555	359,622
8	790.9	549,412	359,516
9	788.6	545,518	359,560
10	787.2	549,466	359,380

### — 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.

VISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS  
DESIGN SERVICES BRANCH — FOUNDATION OFFICE

### CANADIAN PACIFIC RAILWAY

HIGHWAY NO. ST. THOMAS EXPRESSWAY DIST. NO. 2  
CO. ELGIN CITY OF ST. THOMAS  
TWP. YARMOUTH LOT CON.

### BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTAL P. CHECKED <input checked="" type="checkbox"/>	W.P. NO. 88-69-03	DRAWING NO.
DRAWN BY <input checked="" type="checkbox"/>	JOB NO. 71-11063	71-11063A
DATE AUGUST 18, 1971	SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>	PRINCIPAL FOUNDATION ENGINEER	CONT. NO.



Mr. A.E. McKim  
Head, Southwestern Section  
Structural Office  
2nd Floor, West Building

Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building

78 11 08

Mr. J. Keen

Re: C.P.R. Subway  
W.P. 88-69-03, Site 5-221  
Hwy. 3N, District 2, London

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During a recent review of this project it was noted that the drawings showed an interim grade line. This suggests the structure will be built prior to the grading being completed and that the footing and sewer excavations may be backfilled to the interim grade line to prevent the ponding of water. On prior projects in the area (Burwell Road and 1st Avenue) this series of events led to inadequate support for false work supporting the deck and to a claim being made against the Ministry. A method of avoiding this problem is outlined in the attached correspondence. This or some alternate measure should be adopted to prevent a recurrence of problems with inadequate support for false work.



P. Stuart  
Project Engineer

For: K.G. Selby  
Supervising Engineer

PS/KGS/gs

Attach.

cc: R. Temple (Fenco)  
M. Duckett  
Files ✓

MEMORANDUM

TO: Mr. C. Mirza,  
Head, Soils Mechanics Section,  
West Building, Downsview.

FROM: Structural Office,  
West Building, Downsview.

ATTENTION:

DATE: September 3rd, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 88-69-03, Site 5-221  
C.P.R. Subway,  
Highway 3N (St. Thomas Expressway, Sta. 257 + 79.65)  
District #2.

This memo serves to confirm our meeting with you Friday August 30th, 1974 at which time we expressed our concern re various aspects of the construction for the above proposed structure.

Of particular concern is the capability of the soil to support the heavy falsework loads that will be imposed by the 5'6" deep concrete deck. This problem is complicated by the fact that the bridge is in cut and large footing excavations will be necessary along with excavation for the 72 inch storm sewer.

In view of the similarity of this project to the Burwell Road site would you kindly review this project with a view to the prevention of potential construction problems.

We look forward to receiving your comments and recommendations.

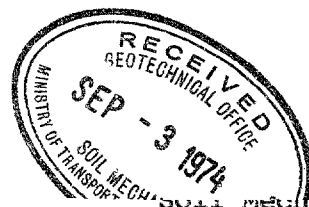


JLK/cf

J. L. Keen,  
Reg. Structural Design Engineer,

for: C. S. Grebski,  
Structural Design Engineer.

cc B. Davis, Manager, Structural Office  
cc D.J.S. King, Senior Project Design Engineer,  
Southwestern Region, London.



Mr. J.L. Keen,  
Regional Structural Design Engineer,  
Southwestern Region, London.

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

September 4th, 1974.

RE: C.P.R. Subway, St. Thomas Expressway,  
Sta. 257+79.65, Site #5-221,  
W.P. 88-69-03, District #2, London.

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This memo summarizes the main points of our recent discussions relating to certain construction aspects of the abovementioned project.

- (1) Deck design as presently proposed is continuous cast in place reinforced concrete. Such a design cannot tolerate falsework settlements in excess of 1/2" immediate (i.e. before initial set) and about 1/2" in the period following.
- (2) To construct the bridge footings and install the 72-inch trunk storm sewer the contractor will have to excavate to a maximum depth of 35 ft. below the existing ground level. Such excavations will cover about 80% of the plan area of the bridge.
- (3) To provide falsework support while constructing the deck, the Contractor may elect to use a spread footing placed on the ground surface. If this is the case, as can be seen from (2) most of the footings or mud sills will be on backfill material. In the light of our experiences with the 1st Avenue and Burwell Road structures it is our view that the severe requirements of (1) will not be met if the backfill material consists of the native soil taken from the excavations. It is therefore our recommendation that all backfill material below the level of the mud sills consist of granular material which meets the requirements of M.T.C. Form 1010 for Granular 'B'. This material should be compacted according to M.T.C. Form 314.03.08. Prior to placing any of the backfill material, all softened soil should be carefully removed from the excavation slopes.

continued . . . /2

September 4th, 1974.

Mr. J.L. Keen - RE: W.P. 88-69-03.

- (4) The use of a retarding agent in the concrete might be required to delay the initial set until complete spans are poured.
- (5) It might be economically advantageous to consider another type of deck design which can be constructed with much less severe requirements than the present design.
- (6) The foregoing comments in general may apply to a lesser extent to W.P. 88-69-07, Site #5-217, C.N.R. Subway, mileage 14+72 Talbotville Subdivision.

K.G. Selby,  
Supervising Engineer.

KGS/mj

c.c. G. Metcalfe  
W. Sawyer  
A.P. Watt  
R. Adachi  
R. Temple  
D.J.S. King

Files  
Documents

DOCUMENT NO. \_\_\_\_\_

GEOCRES No. 40714-65

DIST 2 REGION Southwestern

W.P. No. 88-68-03

CONT. No. 79-20

W. O. No. 71-11063

STR. SITE No. \_\_\_\_\_

HWY. No. \_\_\_\_\_

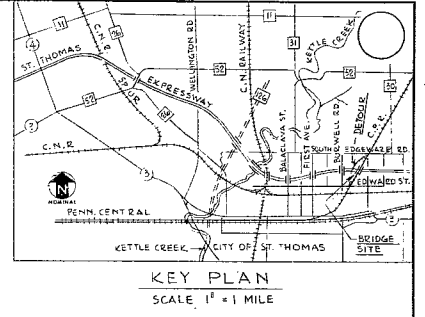
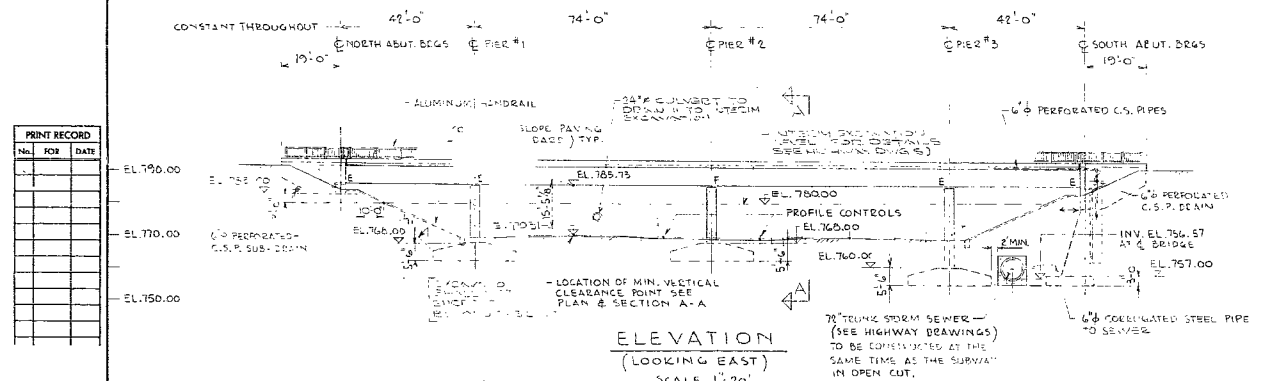
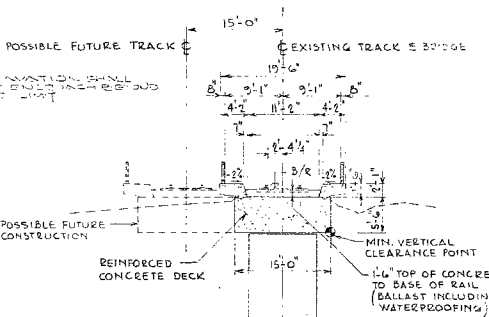
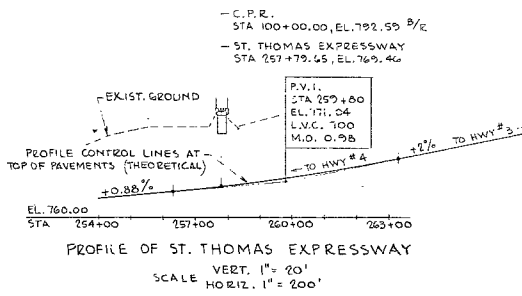
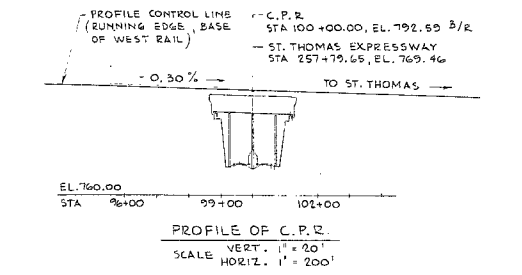
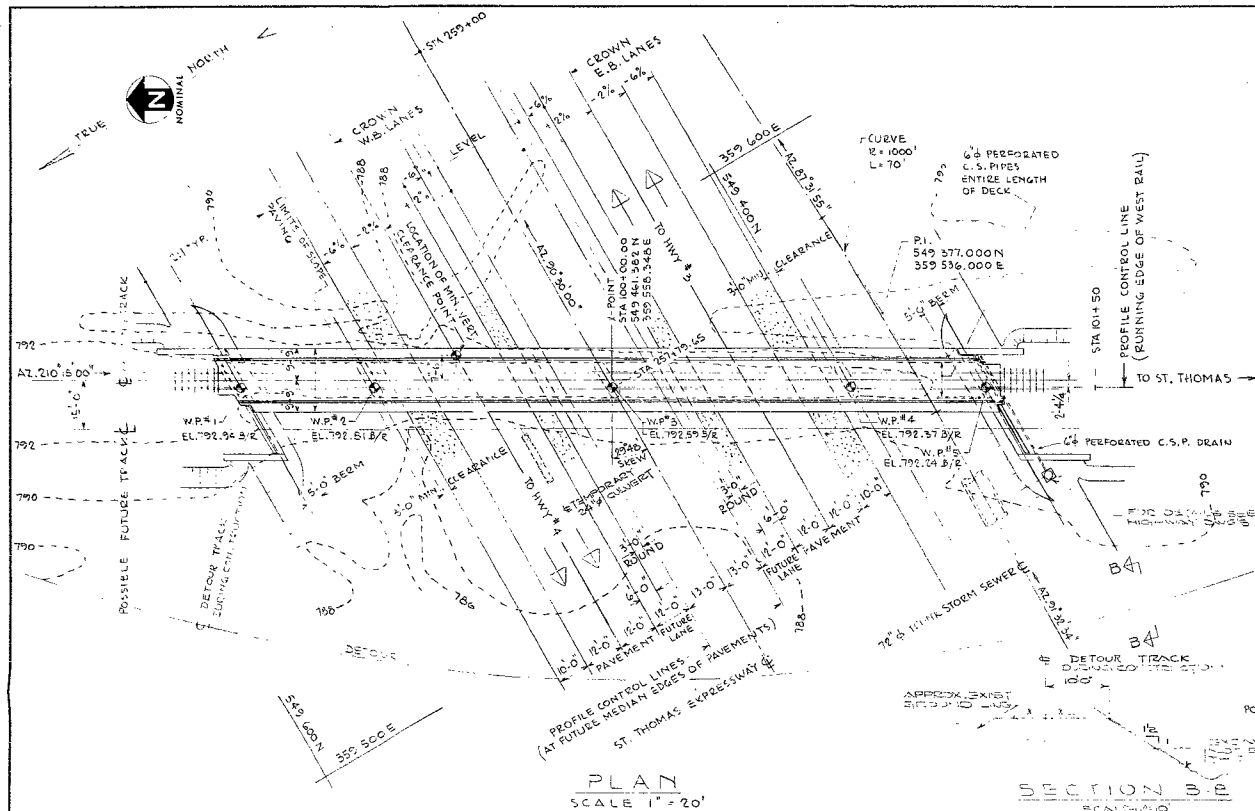
LOCATION CPR Subway at St. Thomas  
Expressway, City of St. Thomas

OTHER COMMENTS \_\_\_\_\_ 3

REMARKS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**GENERAL NOTES**

LIVE LOADING COOPER'S E70 WITH DIESEL IMPACT.

CLASS OF CONCRETE

PIERZ SHAFTS 3000 P.S.I.

DECK & TRAINMAN'S WALK 4000 P.S.I.

REMAINDER 3000 P.S.I.

CLEAR COVER TO REINFORCING STEEL

FOOTINGS & SURFACES IN CONTACT WITH EARTH - 3' TRAINMAN'S WALK 1 1/2"

ALL OTHER SURFACES 2"

**CONSTRUCTION NOTES**

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH TOLERANCE OF 1/8 INCH.

\* SOUTH ABUTMENT: PILL TO BE PLACED TO THE ELEVATION OF CONSTRUCTION ADJUST TOP OF THE ABUTMENT 1 P.C.S. BEFORE PROCEEDING WITH THE CONSTRUCTION OF THE REMAINING PORTION OF THE ABUTMENT.

**REINFORCING STEEL**

THE REINFORCING STEEL IN THE DECK HAS TO BE PLACED TO GO WITH A MINIMUM YIELD POINT OF 60 K.S.I. IN ACCORDANCE WITH C.S.A. G.30.12 - 1972.

- LIST OF DRAWINGS**
- 5-221-1 GENERAL ARRANGEMENT
  - 2 BOREHOLE LOCATIONS & SOIL STRATA
  - 3 FOUNDATION LAYOUT
  - 4 NORTH ABUTMENT - DIMENSIONS
  - 5 NORTH ABUTMENT - REINFORCEMENT
  - 6 SOUTH ABUTMENT - FOOTING & BUTTRESSES
  - 7 SOUTH ABUTMENT - BEARING BEAM & WINGWALLS
  - 8 PIERS
  - 9 DECK - DIMENSIONS
  - 10 DECK - REINFORCEMENT
  - 11 HANDRAIL
  - 12 STANDARD DETAILS
  - 5-221-13 DETAILS OF CONCRETE SLOPE PAVING

Mike Duckat

Burnell - 151 Ave

REVISIONS		DESCRIPTION	
DATE	BY		

**40114-65**

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS  
ONTARIO

FOUNDATION OF CANADA ENGINEERING CORPORATION LIMITED

C.P.R. SUBWAY

ST. THOMAS EXPRESSWAY STA 257+79.65

KING'S HIGHWAY No. 3N (ST. THOMAS EXPRESSWAY) DIST. No. 2

CO. OF ELGIN CITY OF ST. THOMAS R.R. 287

TWP. OF YARMOUTH LOT 12, 14 & 15 CON.

**GENERAL ARRANGEMENT**

APPROVED	CONTRACT No.
DESIGN R. S. I. CHECK B.T.P.	W.P. No. 88-69-03
DRAWING V.W. CHECK B.T.P.	SITE No. 5-221 SHEET 1
DATE JUNE 1974	LOADING COOPER E70

FENCO No 3802-11K-1

