

DOCUMENT MICROFILMING IDENTIFICATION

G.I-30 SEPT 1976

GEOCRES No. 30M12-121

DIST. 4 REGION Central

W.P. No. 125-66-12

CONT. No. 78-09

W. O. No. _____

STR. SITE No. 24-375

HWY. No. QEW

LOCATION Winston Churchill

Boulevard Interchange Underpass

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded
before microfilming

INTRODUCTION

The Soil Mechanics Section was requested to carry out a foundation investigation for a new proposed interchange underpass at the intersection of the Queen Elizabeth Way and Winston Churchill Boulevard.

Following this request a total of six dynamic penetration tests and ten boreholes were carried out at or adjacent to the proposed abutment and pier locations to determine the subsoil conditions which are of significance to the planning and design of the proposed structure.

This report contains the results obtained from our investigations, along with our recommendations pertaining to the approaches and proposed structure.

SITE DESCRIPTION

The site is located within the physiographic region known as the Iroquois Plain. This region is a strip of land bordering Lake Ontario from the Niagara River to the Trent River varying in width from a few hundred yards to eight miles. Inundated in the late Pleistocene time by a body of water known as Lake Iroquois, it is characterized by old deltas, off-shore deposits and soft red shale shorecliffs. This shale is of the Queenston Formation of the Upper Ordovician age.

The land immediately adjacent to the site has a relatively flat topography sloping only slightly to the south. Drainage ditches excavated within the area have exposed the underlying red shale bedrock characteristic of the Queenston shale area.

This area has for many years been a leading early truck crop area but recently has undergone considerable industrial, commercial and residential development.

SUBSURFACE CONDITIONS

General

Subsoil within the vicinity of the site generally consists of topsoil overlying a random mixture of sand and gravel, silt, clayey silt and clean rubble. This layer overlies red shale bedrock.

Borings performed through or immediately adjacent to the shoulders of the existing service roads indicated that this random mixture of sand and gravel, silt and clean rubble extends from ground level to the underlying layer of red clayey silt, a depth varying between 0.5 and 4.0 feet.

Borings performed outside these areas indicated a surficial layer of topsoil approximately 6 inches thick followed by a layer of red clayey silt. As shown on the Record of Borehole Sheets, this cohesive clayey silt layer varies in thickness from 1.5 to 7.5 feet.

A more complete description of the various soil types is as follows.

Medium to Coarse Sand, Trace of Fine Gravel and Silt

This homogeneous granular material was intersected only in Borehole 3. Based upon a Standard Penetration Test 'N' value of 5 blows/foot, the material within this zone has a 'loose' denseness. It is believed that this material is a granular fill covering the 18 inch concrete storm water drain pipe running parallel to the ditch line on the north side of the Q.E.W.

Sand and Gravel (Rubble)

This fill material consists of a mixture primarily of sand and gravel, with pockets of silty clay and crushed brick. Standard Penetration Test 'N' values ranging between 14 and 20 blows/foot are indicative of a compact relative density. This granular material was intersected in boreholes 1, 2 and 7 through the shoulders of the north and south service roads and extends from ground surface to a depth ranging between 0.5 and 2.0 feet.

Clayey Silt

This soil is the predominating overburden material throughout the site. In some areas, however, it is overlain by the previously described granular material. The consistency differs between the south side and north side of the Q.E.W. Standard Penetration Test 'N' values taken on the north side ranging from 42 to 82 blows/foot indicate a hard consistency.

Similarly, 'N' values obtained from tests on the south side ranging from 14 to 61 blows/foot indicate a stiff to hard consistency.

Atterberg Limit tests performed on the samples obtained indicated the following limits.

	<u>Range</u>	<u>Average</u>
Plastic Limit	17-19%	18%
Liquid Limit	28-33%	30%
Moisture Content	13-17%	14%

These results are plotted on the Plasticity Chart on Figure 1 within the Appendix of this report. Organic content tests performed on the samples indicate it to range between 0.4% and 4.7% within the top 2.5 to 6.5 feet.

Bedrock

Bedrock consists primarily of a red shale which predominates throughout this region. Core samples indicate this shale to be fine textured, soft, fissile and readily broken down into a reddish clay soil if exposed to weathering agents. Frequent bands of greyish-green shale approximately 1 to 4 inches thick were also encountered. Several layers of medium hard, fine textured limestone were also intercepted in all boreholes. These bands varied in thickness from .1 to 1.0 feet. A more detailed description may be found on the Diamond Drill Record sheets contained within the Appendix.

It is estimated that approximately the upper 3 feet of the bedrock is considerably weathered. For this reason, the bedrock surface was extremely difficult to determine. However, based upon Dynamic Cone Penetration tests and Standard Penetration tests, it is estimated that the bedrock surface elevation varies between 462.6 and 468.7 with the average being 465.7. Bedrock elevations so determined in each borehole are shown on the Record of Borehole sheets.

Groundwater

Groundwater levels in B.H.'s 1, 2, 3, 3A, 7A and 8 were not observed because, due to their close proximity to the travelled highway, they had to be filled in immediately after completion and before the groundwater could stabilize. In B.H.'s 4, 5, and 6 no groundwater was observed during augering down to the bedrock surface. However, rock cores were taken in these holes and this involved the use of water. After completion

of drilling operations in these holes water levels stabilized within one or two days at the following elevations: 465.0, 468.5 and 471.8, respectively.

In borehole 7 augering was continued into the bedrock to a depth of about 12 feet below the bedrock surface (i.e. to elev. 451.7). The hole remained dry until augering reached elevation 457+ at which time it filled with water eventually rising to elevation 463.5 within about 2 hours after completion of the borehole. No further water levels were measured in this hole.

From the foregoing it is concluded that

- (1) The bedrock contains fissures in the upper 10 feet which act as aquifers.
- (2) Excavations within the overburden are not likely to encounter groundwater.
- (3) Excavations which penetrate the bedrock may possibly encounter aquifers which produce water under static heads to elevations 465-471.

DISCUSSION AND RECOMMENDATIONS

General

It is proposed to construct a six lane three span underpass structure at this site with span lengths of 86.0' - 152.0' - 86.0'. The proposed grade elevations will be about 496 feet at the abutments and about 498 feet at the centre of the midspan.

Structure

The proposed structure abutments may be constructed within the approach fills and founded on end bearing piles driven to bedrock. In this case steel H piles are recommended using the maximum allowable design load for the particular section used. For estimating purposes, it should be assumed that the piles will penetrate about 1 foot below the bedrock surface as shown on Drawing 1256612-A. Alternatively, the proposed abutments may be founded on spread footings constructed within the hard clayey silt stratum which overlies the bedrock or within the sound bedrock at or about the following elevations using the design loads as noted:

North Abutment

Within overburden at elev. 466.0 - 5 t.s.f.

Within bedrock at elev. 462.0 - 10 t.s.f.

South Abutment

Within overburden at elev. 466.0 - 5 t.s.f.

Within bedrock at elev. 462.0 - 10 t.s.f.

The proposed piers may be founded at elevation 462 within the sound bedrock in which case design loads up to 10 t.s.f. may be assumed.

In computing resistance to lateral pressures a coefficient of friction equal to 0.4 may be assumed to apply between the bedrock or clayey silt subsoil and the underside of spread footings. A minimum of 4 feet of cover should be provided for frost protection for footings or pile caps. No dewatering problems are anticipated for footings constructed with the overburden. In the case of footings constructed in the bedrock it is possible that water bearing fissures may be encountered. In this event dewatering can be achieved by pumping from suitably constructed sumps.

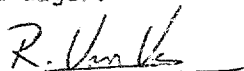
Concrete working slabs will be necessary to protect the foundation surfaces immediately on exposure since the shale bedrock and also the clayey silt subsoil softens rapidly on exposure to moisture. Differential settlements between piers and abutments will be negligible.

Approaches

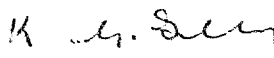
Approach fills approximately 25 feet in height will be required. No stability problems are anticipated. At locations where piles are to be driven grain size of fill should not exceed 3 inches.

MISCELLANEOUS

All field work was performed under the direct supervision of Mr. R. Van Veen during the period of October 21st to October 26th, 1976 using a tracked vehicle mounted C.M.E. 45 solid auger.



R. Van Veen
Project Engineer



K.G. Selby, P. Eng.
Supervising Engineer

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 125-66-12

LOCATION Co-ords. N.15,809,379 E.956,428

ORIGINATED BY RVV


DIST 4 HWY Q.E.W.






BORING DATE October 22, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger, BXL Core & Cone Test

CHECKED BY 

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH O 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 % 20 40 60	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES					
469.5	Ground Level									
468.0	Sand & gravel (100%) FILL - compact		1	SS	14					
1.5	Clayey silt. Red		2	SS	42					
464.0	Hard		3	SS	100/24"					
5.5	Bedrock - Red Shale		4	SS	125/75"					
	Soft Fissile with bands of greyish- green shale and limestone		5	SS	218/29"					
			6	SS	125/74"					
			7	SS	130/75"					
			8	SS	100/73"					
446.0			9	RC BXL	rec. 100%					
23.5	End of Borehole Note: Water Level not established.									

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 2

WP 125-66-12 LOCATION Co-ords. N.15,809,290 E.956,359 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 22, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger & BXL Core CHECKED BY EF

SOIL PROFILE			SAMPLES			GROUND WATER	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	VALUES		20	40	60	80	100	W_P	W	W_L		
470.6		Ground Level														
0.0		Sand & gravel, fill	1	SS	18	470										
		Clayey Silt. Red	2	SS	82											
465.1		Hard	3	SS	81.3"											
5.5		Bedrock - Red Shale	4	RC	Rec. 93%											
		Soft, Fissile with bands of greyish-green shale and limestone.	5	RC	Rec. 98%	460										
455.6			6	RC	100%											
15.0		End of Borehole														
		Note: Water Level not established.														

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 125-66-12

LOCATION Co-ords. N.15,809,308 E.956,470

ORIGINATED BY RVV


DIST 4 HWY Q.E.W.




BORING DATE October 21, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger, BXL Core & Cone Test

CHECKED BY 

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w_L		
468.1	Ground Level														
0.0	Sand, medium to coarse trace of fine gravel & silt. Fill. Loose		1	SS	5										
464.1	Clayey silt. Red trace of gravel. Hard		2	SS	65										
462.6			3	RC BXL	Rec. 91%										
5.5	Bedrock - Red Shale, Soft, Fissile with bands of greyish- green shale and limestone.		4	RC BXL	Rec. 98%										
460.1			5	RC BXL	Rec. 100%										
18.0	End of Borehole Note: Water Level not established.														

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3A

WP 125-66-12

LOCATION Co-ords. N.15,809,307 E.956,465

ORIGINATED BY RVV

DIST 4 HWY Q.E.W.

BORING DATE October 21, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid 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	20	40	60	80	100	WATER CONTENT %		
468.1	Ground Level													
0.0	Topsoil													
464.1	Sand, medium to coarse trace of fine gravel & silt. Fill. L. G. se													
462.6	Clayey silt, Red, Hard													
5.5	Bedrock - Red Shale, Soft, fissile with bands of greyish- green shale & limestone.													
454.8			1	SS	100/4"									
			2	SS	100/4"									
13.3	End of Borehole Note: Water Level not established.													

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 125-66-12 LOCATION Co-ords. N.15,809,260 E.956,426 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 21, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger & BXL Core CHECKED BY Φ

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		20	40	60	80	100	W_P	W	W_L		
469.5	Ground Level															
0.0	Topsoil															
464.5	Clayey Silt Red Hard		1	SS	61											
5.0	Bedrock - Red Shale, Soft, fissile with bands of greyish- green shale and limestone		2	SS	100/0											
			3	RC BXL	Rec. 65%	460										
			4	RC BXL	Rec. 95%											
452.0			5	RC BXL	Rec. 100%											
17.5	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 125-66-12 LOCATION Co-ords. N.15,809,198 E.956,578 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 25, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger & BXL Core & Cone Test CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER	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		20	40	60	80	100	W_P	W	W_L		
470.5	Ground Level															
0.0	Topsoil															
	Clayey silt, trace of organics		1	SS	20											
464.5	Red Hard		2	SS	115											
6.0	Bedrock - Red Shale, Soft, fissile with bands of greyish-green shale and limestone.		3	RC BXL	Rec. 90%											
453.8			4	RC BXL	Rec. 100%	460										
16.7	End of Borehole															

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

WP 125-66-12 LOCATION Co-ords. N.15,809,150 E.956,535 ORIGINATED BY RVV
 DIST 4 HWY Q.E.W. BORING DATE October 25 & 26, 1976 COMPILED BY RVV
 DATUM Geodetic BOREHOLE TYPE Solid Auger & BXL Core & Cone Test CHECKED BY *JP*

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT W_L		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	PLASTIC LIMIT W_p		
473.0	Ground Level					ELEV	SHEAR STRENGTH				WATER CONTENT %			
0.0	topsoil						O UNCONFINED + FIELD VANE				W_p — W_o — W_L			GR SA SI CL
	Clayey silt		1	SS	14	470								
	Red	trace of organics	2	SS	61									
465.0	Stiff to Hard		3	SS	100%									
8.0	Bedrock - Red Shale		4	BXL	100%									
	Soft, fissile with bands of greyish-green shale and limestone.		5	RC BXL	Rec. 80%	460								
			6	RC BXL	Rec. 78%									
			7	BXL	100%									
446.7			8	RC BXL	Rec. 98%	450								
26.3	End of Borehole													

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 125-66-12

LOCATION Co-ords. N.15,809,166 E.956,638

ORIGINATED BY RVV

DIST 4 HWY Q.E.W.

BORING DATE October 26, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger and Cone Test

 CHECKED BY 4.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ 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 % 20 40 60	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
471.9	Ground Level									
469.9	Sand & gravel (Rubble) Fill Compact		1	SS	20	470				
2.0	Clayey silt, trace of organics		2	SS	16					
	layers of fine sand		3	SS	25					
463.4	Hard		4	SS	130/10"					
8.5	Bedrock - Red Shale		5	SS	180/8"	460				
	Soft, fissile with bands of greyish-green shale and limestone		6	SS	100/4"					
451.7			7	SS	100/3"					
20.2	End of Borehole									

 Hydro-static Head
Hydro-static pressure encountered

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7A

WP 125-66-12

LOCATION Co-ords. N.15,809,168 E.956,641

ORIGINATED BY RVV

DIST 4 HWY Q.E.W.

BORING DATE October 26, 1976

COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger & BXL Core

CHECKED BY *ef.*

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		20	40	60	80	100	w_p	w	w_L		
471.9	Ground Level															
469.9	Sand & gravel (Rubble) Fill Compact					470										
2.0	Clayey silt, trace of organics															
463.4	layers of fine sand															
8.5	Hard															
	Bedrock - Red Shale		1	RC	33%	460										
	Soft, fissile with bands of greyish-green shale and limestone.		2	RC BXL	Rec. 68%											
451.2			3	RC BXL	Rec. 100%											
20.7	End of Borehole															
	Note: Water Level not established.															

OFFICE-REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

WP 125-66-12

LOCATION Co-ords. N.15,809,085 E.956,570

ORIGINATED BY RVV


DIST 4 HWY Q.E.W.

BORING DATE October 26, 1976

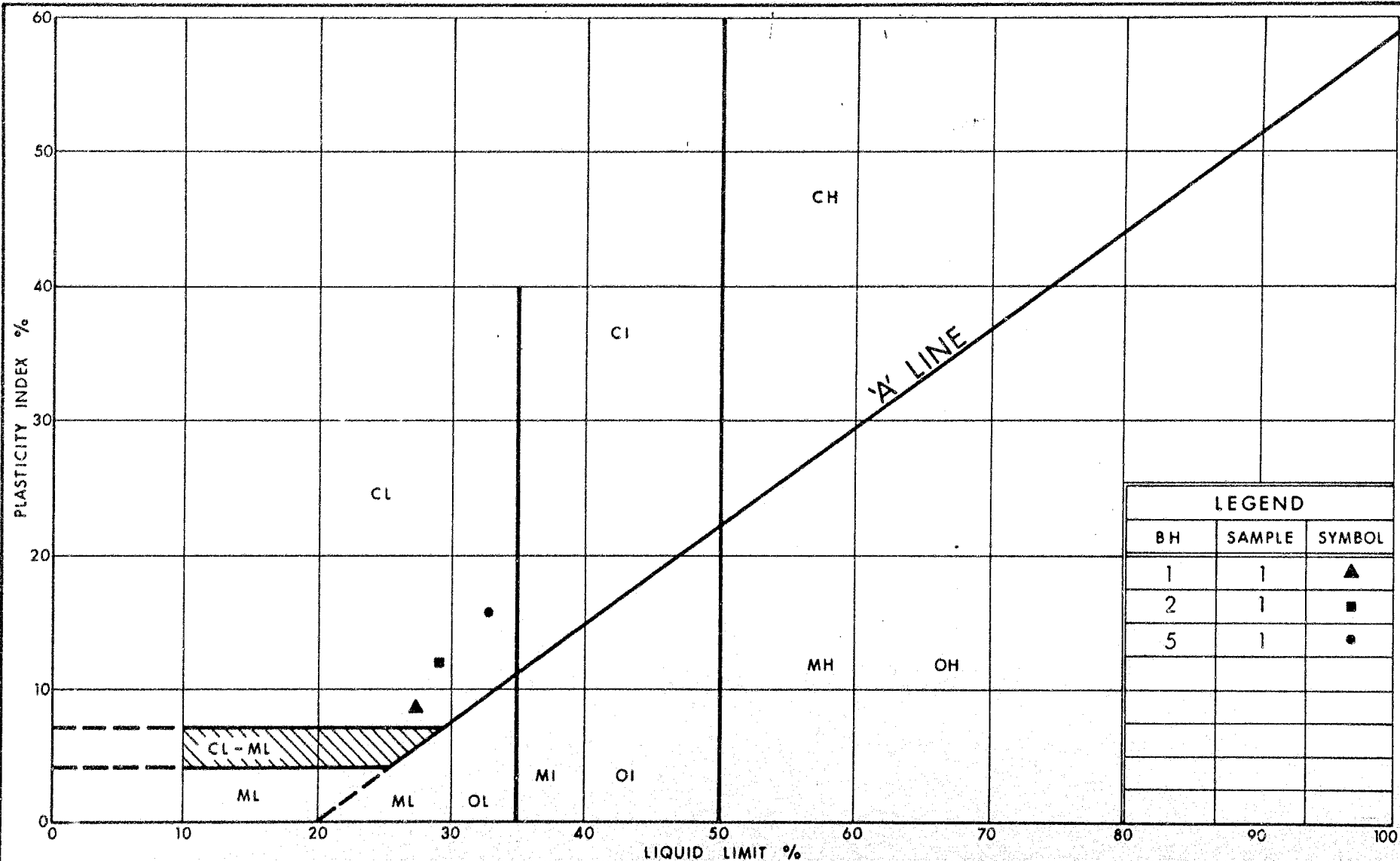
COMPILED BY RVV

DATUM Geodetic

BOREHOLE TYPE Solid Auger & EXL Core & Cone Test

CHECKED BY 

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w_L		
473.7	Ground Level														
0.0	trace of organics & gray Clayey silt		1	SS	51										
468.7	Red Hard		2	SS	50										
4.0	Bedrock - Red Shale		3	SS	100										
	Soft, fissile with bands of greyish-green shale and Limestone.		4	RC	64										
			5	RC EXL	Rec. 94%										
455.6			6	RC EXL	Rec. 77%										
18.1	End of Borehole Note: Water Level not established.														



LEGEND		
BH	SAMPLE	SYMBOL
1	1	▲
2	1	■
5	1	●



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ENGINEERING SERVICES BRANCH

PLASTICITY CHART CLAYEY SILT

FIG No 1

W P 125-66-12



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Communications

DIAMOND DRILL RECORD

HOLE NO. 1 & 2 SHEET NO. _____

PROPERTY LOCATION W.P. 125-66-12
QEW & Winston Churchill Blvd.
LATITUDE _____
DEPARTURE _____
BEARING _____

DIP
90°

TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER			REMARKS
FROM	TO					
		HOLE #1				
18.5'	18.7'	Shale, red colour, fine texture, soft fissile, absorptive.				
18.7'	19.3'	Limestone, shaly, light grey colour, fine texture, med. hard				
19.3'	21.3'	Shale (Same description as above for shale)				
21.3'	21.6'	Limestone (Same description as above for limestone)				
		HOLE #2				
6.0'	6.6'	Limestone, (Same description as above for Limestone)				
6.6'	8.3'	Shale (Same description as above for Shale)				
8.3	8.5'	Limestone (Same description as above for Limestone)				
8.5	15.0'	Shale (Same description as above for Shale)				

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



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DIAMOND DRILL RECORD

HOLE NO. 3 SHEET NO. _____

DIP

PROPERTY LOCATION W.P. 125-66-12
QEW & Winston Churchill Blvd.
LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER			REMARKS
FROM	TO					
		HOLE #3				
6.5'	10.8'	Shale, red colour, fine texture, soft fissile, absorptive.				
10.8'	11.1'	Limestone, shaly, light grey colour, fine texture, med. hard				
11.1'	14.0'	Shale (Same description as above for Shale)				
14.0'	14.2'	Limestone (Same description as above for Limestone)				
14.2'	14.5'	Shale (Same description as above for Shale)				
14.5'	15.5'	Limestone (Same description as above for Limestone)				
15.5'	17.5'	Shale (Same description as above for Shale)				
17.5'	18.0'	Limestone (Same description as above for Limestone)				

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



Ministry of
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Ontario

DIAMOND DRILL RECORD

HOLE NO. 4 SHEET NO. _____

PROPERTY W.P. 125-66-12
LOCATION QEW & Winston Churchill Blvd.
LATITUDE _____
DEPARTURE _____
BEARING _____

DIP
90°

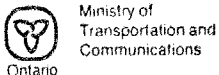
TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER			REMARKS
FROM	TO					
		Hole #4				
6.1'	6.4'	Limestone, shaly, light grey colour, fine texture, med. hard				
6.4'	7.9'	Shale, red colour, fine texture, soft fissile, absorptive.				
7.9'	8.1'	Limestone, (Same description as above for Limestone)				
8.1'	10.1'	Shale, (Same description as above for Shale)				
10.1'	10.8'	Limestone, (Same description as above for Limestone)				
10.8'	13.7'	Shale, (Same description as above for Shale)				
13.7'	13.9'	Limestone, (Same description as above for Limestone)				
13.9'	17.3'	Shale, (Same description as above for Shale)				

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



DIAMOND DRILL RECORD

HOLE NO. 5 SHEET NO.

DIP

90°

PROPERTY LOCATION W.P. 125-66-12
QEW & Winston Churchill Blvd.
LATITUDE
DEPARTURE
BEARING

TOTAL FOOTAGE _____

ELEV. COLLAR _____

DATUM _____

DATE STARTED _____

DATE COMPLETED _____

DRILLED BY _____

LOGGED BY _____

[illegible]

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



Ministry of
Transportation and
Communications

DIAMOND DRILL RECORD

HOLE NO. 6 SHEET NO. _____

DIP

90°

PROPERTY W.P. 125-66-12
LOCATION QEW & Winston Churchill Blvd.
LATITUDE _____
DEPARTURE _____
BEARING _____

TOTAL FOOTAGE _____

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER			REMARKS
FROM	TO					
		HOLE #6				
8.3'	20.4'	Shale, red colour, fine texture, soft fissile, absorptive.				
20.4'	20.9'	Limestone, shaly, light grey colour, fine texture, med. hard				
20.9'	22.0'	Shale (Same description as above for Shale)				
22.0'	22.5'	Limestone (Same description as above for Limestone)				
22.5'	24.2'	Shale (Same description as above for Shale)				
24.2'	24.3'	Limestone (Same description as above for Limestone)				
24.3'	24.6'	Shale (Same description as above for Shale)				
24.6'	24.7'	Limestone (Same description as above for Limestone)				
24.7'	25.0'	Shale (Same description as above for Shale)				
25.0'	25.2'	Limestone (Same description as above for Limestone)				
25.2'	25.7'	Shale (Same description as above for Shale)				
25.7'	25.8'	Limestone (Same description as above for Limestone)				
25.8'	26.3'	Shale (Same description as above for Shale)				

DATE OF EXAMINATION November 23/76

B.K. Glassford



DIAMOND DRILL RECORD

HOLE NO. 7 SHEET NO.

DIP

90°

PROPERTY _____ W.P. 125-66-12 _____
LOCATION _____ QEW & Winston Churchill Blvd. _____
LATITUDE _____
DEPARTURE _____
BEARING _____

TOTAL FOOTAGE _____

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



HOLE NO. 8 SHEET NO. _____

DISEASE

90°

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

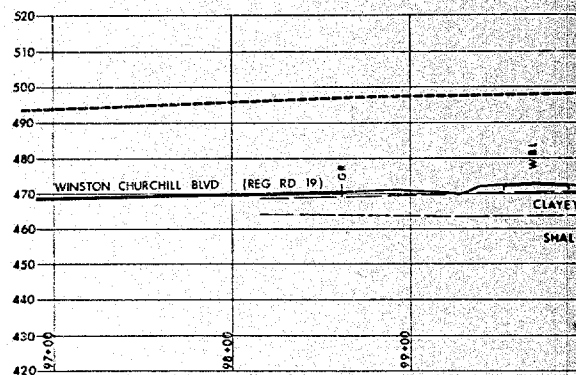
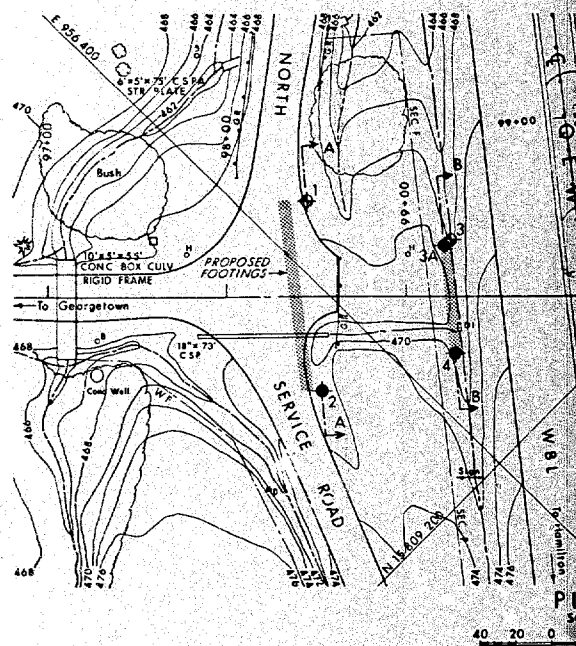
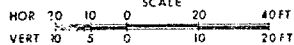
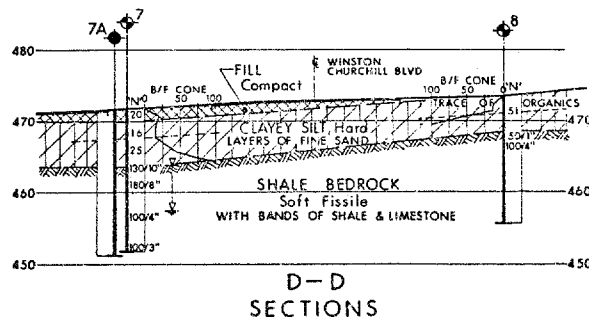
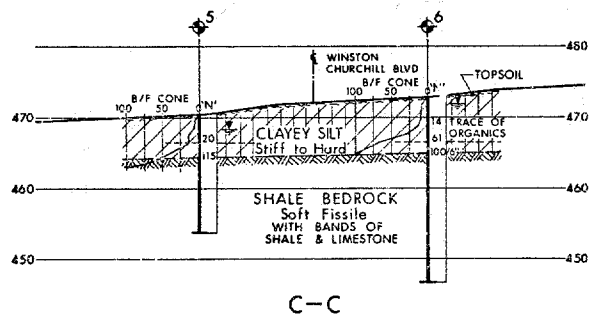
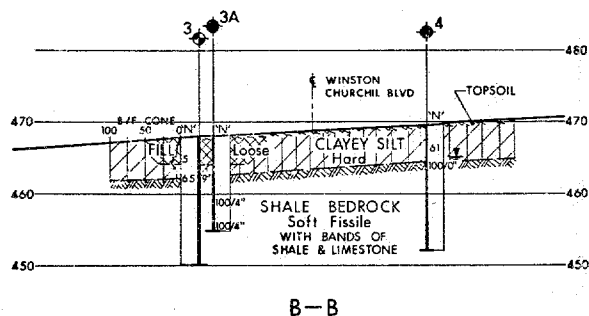
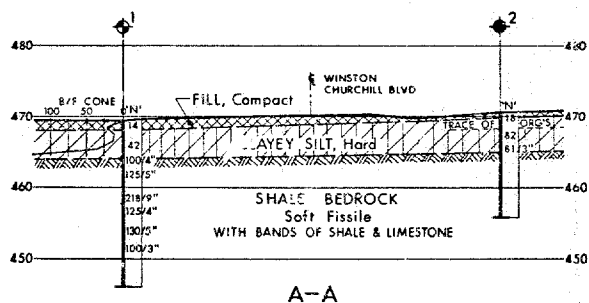
LOGGED BY

PROPERTY LOCATION W.P. 125-66-12
QEW & Winston Churchill Blvd.
LATITUDE
DEPARTURE
BEARING

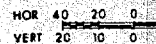
TOTAL FOOTAGE _____

DATE OF EXAMINATION November 23, 1976

B. K. Glassford



PROFILE WINSTON CHURCHILL BLVD



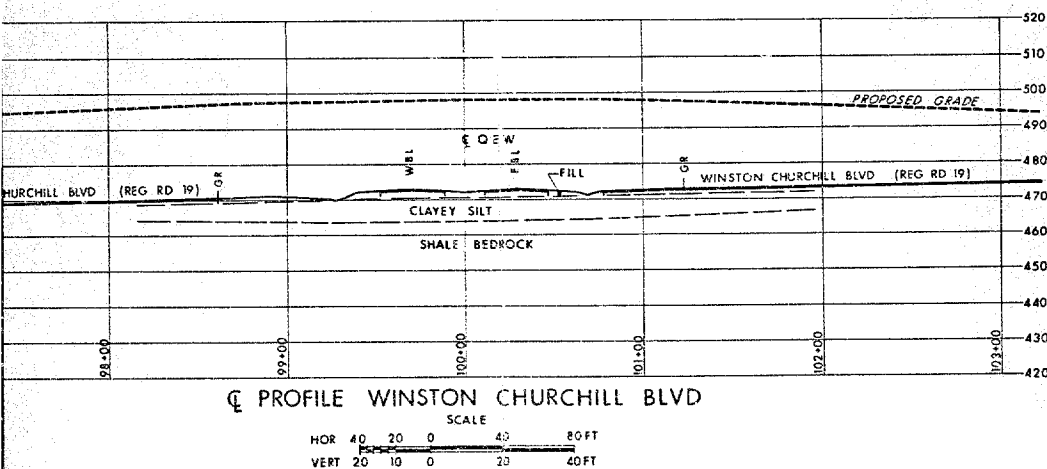
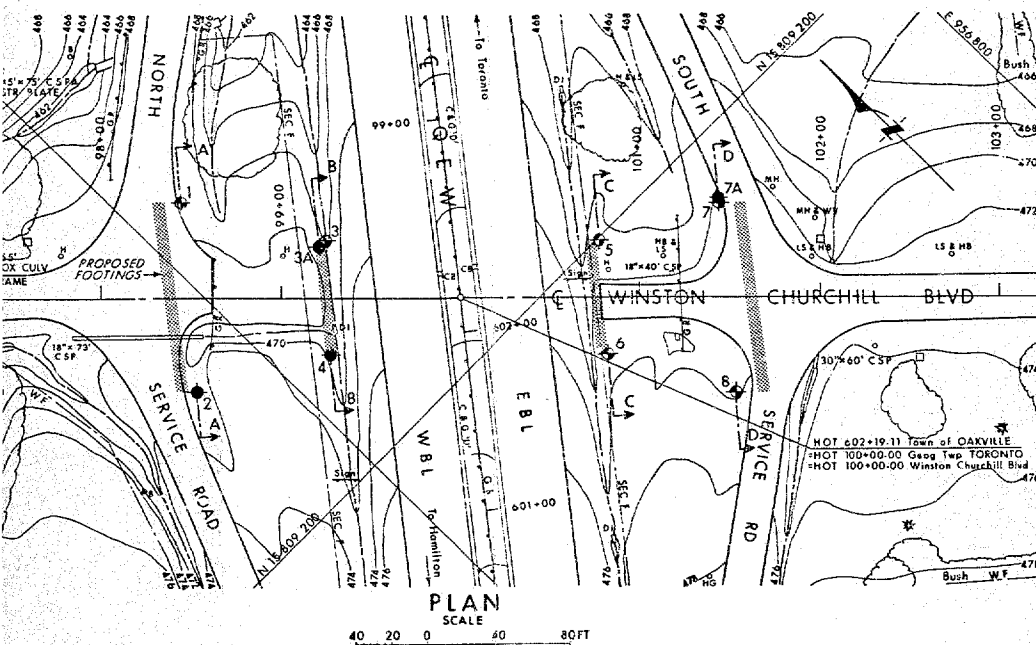
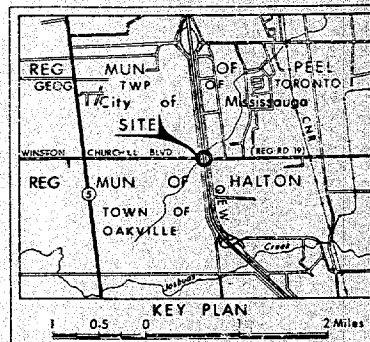
CONT No
WP No 125-66-12



WINSTON CHURCHILL BLVD

SHEET

BORE HOLE LOCATIONS & SOIL STRATA



- LEGEND**
- Bore Hole
 - ⊕ Dynamic Cone Penetration Test (Cone)
 - ⊕ Bore Hole & Cone
 - W Blows/ft (Std Pen Test 350 ft lbs energy)
 - CONE Blows/ft (60° Cone, 350 ft lbs energy)
 - W L at time of investigation Oct 1976
 - W L NOT ESTABLISHED IN BORE HOLE # 1, 2, 3, 3A, 7, 7A & 8
 - Head
 - Hydrostatic Pressure
 - Encountered

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	469.5	15 809 379	956 428
2	470.6	15 809 298	956 359
3	468.1	15 809 308	956 470
3A	468.1	15 809 307	956 465
4	469.5	15 809 260	956 426
5	470.5	15 809 198	956 578
6	473.0	15 809 150	956 535
7	471.9	15 809 166	956 638
7A	471.9	15 809 168	956 641
8	473.7	15 809 085	956 570

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

HWY No QEW ST. 4
SURVEY CHECKED DATE Dec 8, 1976 SITE 24-375
DRAWN CHECKED APPROVED TWC1256612-A

REF No B-81-QEW-1

October 26, 1977

W.P. 125-66-12

MEETING OF
STRUCTURAL REVIEW COMMITTEE

TIME: 9:00 a.m. October 26, 1977

PLACE: Boardroom "B", West Building

ATTENDING: Messrs K. Luczka - Construction Branch
W. Lin - Structural Office
K. Carter - Quality Assurance
D. Waller - Regional Construction Office
✓ P. Payer - Soil Mechanics Section (part time)
D. Gluppe - Structural Office
V. Korlu - Soil Mechanics Section
(part time)

Projects Reviewed:

W.P. 125-66-12 : Site 24-375
Winston Churchill Blvd. Underpass
Q.E.W. District 4.

W.P. 127-66-12: Site 24-319
Eglinton Avenue Underpass
Bridge #37
Highway 403, District 6.

W.P. 127-66-25: Site 23-237
Cawthra Road, Southbound Underpass
Bridge #38
Hwy 403, District 6.

Winston Churchill Blvd./W.P. 125-66-12

Mr. Lin presented the bridge pointing out the design features.

Drawing #1

It was decided to use the same concept as Dorval regarding the closing of traffic lane on the Q.E.W.
Add note about 2 $\frac{1}{2}$ " cover.

Drawing #2

The designer is asked to check the possibility of the piles interfering at the North West and South East corners.
Also add angle at South West corner.



Drawing #5

Add asterisk to radial dimensions.
Add note about radial dimensions when asterisk is used.

Drawing #7

Use note 6 on other abutment drawing.
Remove note 5.
Use asterisk on note 6.

Drawing #8

What does 'K' means in table?

Drawing #9

Is there a possibility of casting the median later.

Drawing #11

Remove the work grout from note 2.
Add transverse to note 5.
Change 5" to $4\frac{1}{2}$ " in cable spacing to allow more room for exterior vibration.

Drawing #12

Is a transverse stressing sequences required.

Drawing #14

Stirrups to be bent in.

Drawing #21

Call for class "B" in notes for Expansion Joint.
Check section 2. Why is deck lowered $\frac{1}{4}$ "?

Add cover plate to seal at sidewalk as in Steeles Avenue. Also lower plate of Expansion Joint Anchorage to give more cover.

Add special to cover Roadway protection details.

W.P. 127-66-12/Eglinton Avenue Underpass

Mr. Lin mentioned that all the existing services will be relocated by a former contract. Mass concrete backfill will be used on this contract to fill in any places where the grade is lowered by the first contract.

Drawing #4

Change dimensions of dowels to suit spiral cover of 2".

Drawing #7

Add construction joint on elevation of wingwall and remove the word parallel from notes.

Drawing #10

Same as drawing #7.

Drawing #11

Add note to say elevation of column is based on the bearing thickness shown (recommended by Ken Carter)

Remove 3" cover note on section 1.

Drawing #14

Remove "wire" from note 6.

Drawing #15

Add standard note about pocket treatment rather than one shown.

Drawing #17

Add "grout vent typical" at the ends of the transverse cables at loops.

Drawing #29

Add class "B" to expansion joint.

W.P. 127-66-25/Cawthra Road Southbound Underpass

Drawing #3

Check level of granular pad with foundation section.

Drawing #4

Add note about expansion joint at end of wingwall.

Drawing #5

Same as drawing #4.

Drawing #8

Add height of slope portion of Deck.

Drawing #10

Remove " grout" on note" 2'. Remove note 4.

Drawing #12

Update barrier wall (2" cover)

Drawing #17

Change anchorage plate of expansion joint to give more cover.

No other points were brought up and the meeting adjourned at
11:50 a.m.

D.R. Gluppe
D.R. Gluppe.

DRG:ld

c.c.

All present
J.B.Wilkes
R.A.Dorton
C.S.Grebski
K. Bassi
E. Van Beilen
M.R.Ernesaks
D.E.Thrasher
W.MacFarlane



Memorandum

To: Mr. C. Mirza
Head, Soil Mechanics Section
West Building

From: G.C.E. Burkhardt
Structural Section
3501 Dufferin St.

Attention: Mr. K. Selby

Date: February 28, 1977

Our File Ref.

In Reply to

Subject: Re: Winston Churchill Blvd. Underpass
Site 24-375 W.P. 125-66-12
Q.E.W. District 4

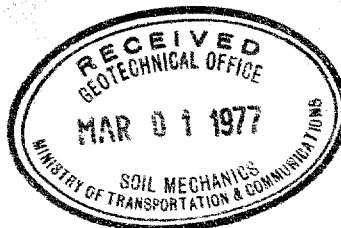
The Winston Churchill Blvd. Underpass which originally was conceived as a 3 span configuration is now being proposed as a 4 span structure with an additional centre pier to be located in the Q.E.W. 22 ft. centre median.

As discussed with Mr. K. Selby it appears a pier in the centre median will present no problem for the foundations and that no additional borings were anticipated.

RJ:sg

R.A. Jeffries
Structural Planning Supervisor
for:
G.C.E. Burkhardt
Head, Structural Section

c.c. W. Roters
W. Lin



MINUTES OF MEETING

Subject: Ministry of Transportation & Communications
WP 125-66-12, Queen Elizabeth Way - Winston
Churchill Boulevard Interchange,
Giffels Job Number W7676

Time & Place: 10:30 AM, November 9, 1976
Offices of Giffels, Davis & Jorgensen Limited

Purpose: Progress Review Meeting 1976-3

Attendance:

K. Worsley	Planning & Design	Central Region	MTC
R. Jeffries	Structural Planning	"	"
E. Shedler	Surveys & Plans	"	"
A. Shopoff	Geotechnical Office	"	"
K. Williams	Traffic Control	Head Office	"
W. Kelly	Priority Development	"	"
B. Hitchcock	Giffels		
I. Hausmanis	"		
J. Melichercik	"		
J. Kreutzer	"		
* T. Jarosz	"		

* Part-time attendance

Discussion:

Action by:

A. Geometric Design

1. The detailed geometrics for the interchange have been completed and submitted to the M.T.C. The service roads have been left out because their locations have not yet been finalized.
2. A plan of the future location of the service road in the southeast quadrant is to be submitted to the M.T.C. by November 15, 1976.
3. There are two options for the service road in the northeast quadrant:
 - (i) a connection to Speakman Drive
 - (ii) retaining the existing proposal (close to the E-NS ramp)

Giffels

M.T.C. to conduct further investigation



Action by:

B. Surveys and Plans

1. The alignment plan, list of coordinates, and curve data were supplied to the Surveys and Plans office. Mr. Shedler indicated it would take 2 weeks to lay out the interchange.
2. The Surveys office will commence field work on November 22, 1976. All information, including service road alignment to be provided by this date. M.T.C., Giffels
3. No request for cross section data has been issued as of yet. Giffels indicated that sections for the ramps and service roads can be taken from 1":40' plans. Edge of pavement elevations and cross sections at the north and south connections of Winston Churchill Boulevard would be required. Giffels to prepare a survey request plan. Giffels
4. Mr. Shedler indicated that drainage inverts are known and that these would be supplied along with an updated 1":40' plan by November 19, 1976. Survey notes for Winston Churchill Boulevard will also be provided. M.T.C.
5. All survey information received by Giffels is to be assessed and further requests are to be made if necessary. Giffels

C. Soils

- which one?*
1. The M.T.C. Geotechnical office is to commence field work on November 29, 1976. M.T.C.
 2. The Geotechnical office requires stations on the Q.E.W. in the area of the speed change lanes. Giffels to submit a request to the Surveys and Plans office to obtain the information required by the Geotechnical office. Giffels
 3. Giffels to advise of any proposed storm sewer locations. Giffels

D. Right-of-Way

1. The title search has been requested by the M.T.C. and will be forwarded to Giffels when available. M.T.C.

Action by:

E. Traffic Control Office

1. There have been no further developments since the last progress meeting.
2. The revised terms of reference for the surveillance system have been received by Giffels.

F. Utilities

1. Giffels to contact utility companies and advise of possible utility relocations.
2. Giffels to set up a meeting with the utility companies and the M.T.C. District 4 Utilities Engineer to discuss utility locations.

Giffels

Giffels

G. Electrical Design

1. The actual scope of the work has not yet been established. M.T.C. to resolve the degree of illumination required for the interchange.

M.T.C.

Please bring any errors or omissions in these minutes to the attention of I. Hausmanis.

Distribution:

W. Greskow (15 cc.)
B. Hitchcock
G. Tilly
J. Melichercik
J. Kreutzer
J. Walker
T. Jaresz



Ministry of
Transportation and
Communications

Memorandum

To: Mr. R. Van Veen,
Soils Engineer,
Soil Mechanics Section,
1st Floor, West Building.
Attention:

From: Pav't Design and Management Section,
Engineering Materials Office,
1st Floor, West Building.

Date: November 24, 1976.

Our File Ref.

In Reply to

Subject:

W.P. 125-66-12
QEW & Winston Churchill Blvd.
District 6 - Toronto

The eight bore holes of this project were drilled in the Queenston Formation of Upper Ordovician age. All eight holes cut through red shales with characteristic reddish and greenish thin layers, and lenses of argillaceous limestone. The shales of this formation are fissile and easily broken down into a reddish clay soil.

B.K. Glassford

B.K. Glassford,
Geologist.

BKG/sd
Attached



Memorandum

To: Mr. C. Mirza
Head, Soil Mechanics Section
West Building

From: Structural Planning Office
5th Floor
Central Region

Attention:

Date: 13th September, 1976

Our File Ref.

In Reply to

Subject: WINSTON CHURCHILL BLVD. OVERPASS
SITE 24-375 W.P. ~~125-66-12~~
HWY. Q.E.W. DISTRICT 4 :

*Correct w.p.
125-66-12*

*len.
sep 15/76*

A new interchange on the Q.E.W. at Winston Churchill Blvd. is presently scheduled for 1977.

At present a three span structure, six lanes wide is proposed to carry Winston Churchill Blvd. over the Q.E.W.

Preliminary details of the proposed structure and roadway alignment are indicated on the enclosed plans.

These plans include:

Q.E.W./Winston Churchill Blvd - Plan (B8278) ... 2 copies
Winston Churchill Blvd - Profile ... 2 copies

Could you please prepare a Foundation Investigation Report of sufficient scope to facilitate the design of the proposed structure.

The current schedule calls for a complete Foundation Investigation by December 8, 1976.

Should additional clarification and/or details be required, please do not hesitate to call this office.

R. A. Jeffries

encl.

R.A. Jeffries
STRUCTURAL PLANNING SUPERVISOR
for:
G.C.E. Burkhardt
REG. STRUCTURAL PLANNING ENG.

c.c. Z. Byblow
D. Gunter
J. Anderson
R. Fitzgibbon
W. Roters

*Ken
Please discuss
start availability
with Murray
to get need to know
for*



*KGS
M.D.
J.P. 62m
KGS*

DOCUMENT NO. 125-66-12

GEOCRES No. 36 H 12 - 121

DIST 4 REGION GENERAL

W.P. No. 125-66-12

CONT. No. 78-09

W.C. No.

STR. SITE No. 24-315

HWY. No. QEW

LOCATION WINSTON CHURCHILL BVD

INTERCHANGE UNDERPASS

DATE OF INSPECTION 12/1/67

REMARKS

30H12-121

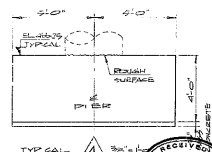
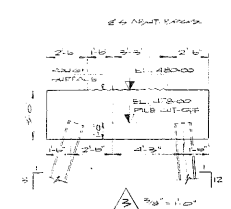
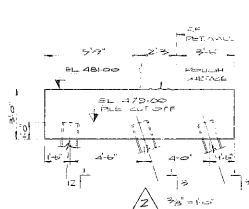
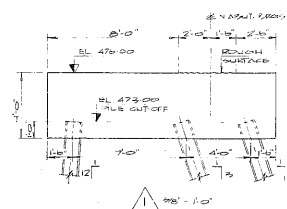
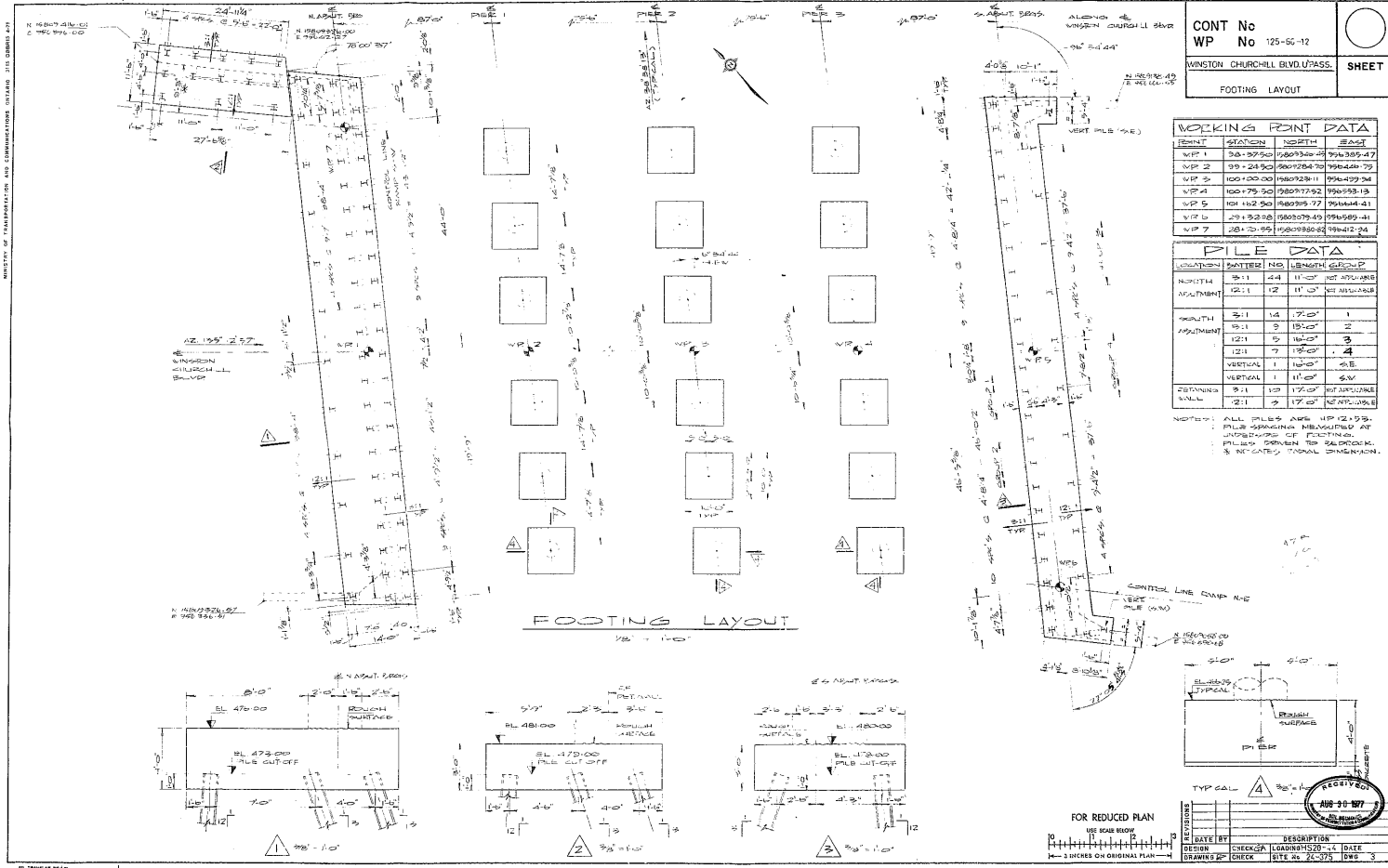
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WP No 125-56-12
WINSTON CHURCHILL BLVD U/PASS
FOOTING LAYOUT

SHEET

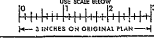
POINT	STATION	NORTH	EAST
WP 1	30+22.50	5807339.43	796389.47
WP 2	30+24.50	5807284.70	796444.72
WP 3	100+00.00	5807239.11	796499.34
WP 4	100+75.50	5807177.92	796553.13
WP 5	101+12.50	580715.77	796604.41
WP 6	20+52.50	5807079.49	796585.41
WP 7	20+50.50	5807080.83	796412.24

LOCATION	WATER	NO	LENGTH	GROUP
NORTH	11	44	11'-0"	NOT APPLICABLE
NORTH	12	12	11'-0"	NOT APPLICABLE
SOUTH	11	14	17'-0"	1
SOUTH	11	9	15'-0"	2
SOUTH	12	5	14'-0"	3
SOUTH	12	7	15'-0"	4
VERTICAL	1	13'-0"	45.75	
VERTICAL	1	11'-0"	5.75	
STATIONS	11	12	17'-0"	NOT APPLICABLE
STATIONS	12	3	17'-0"	NOT APPLICABLE

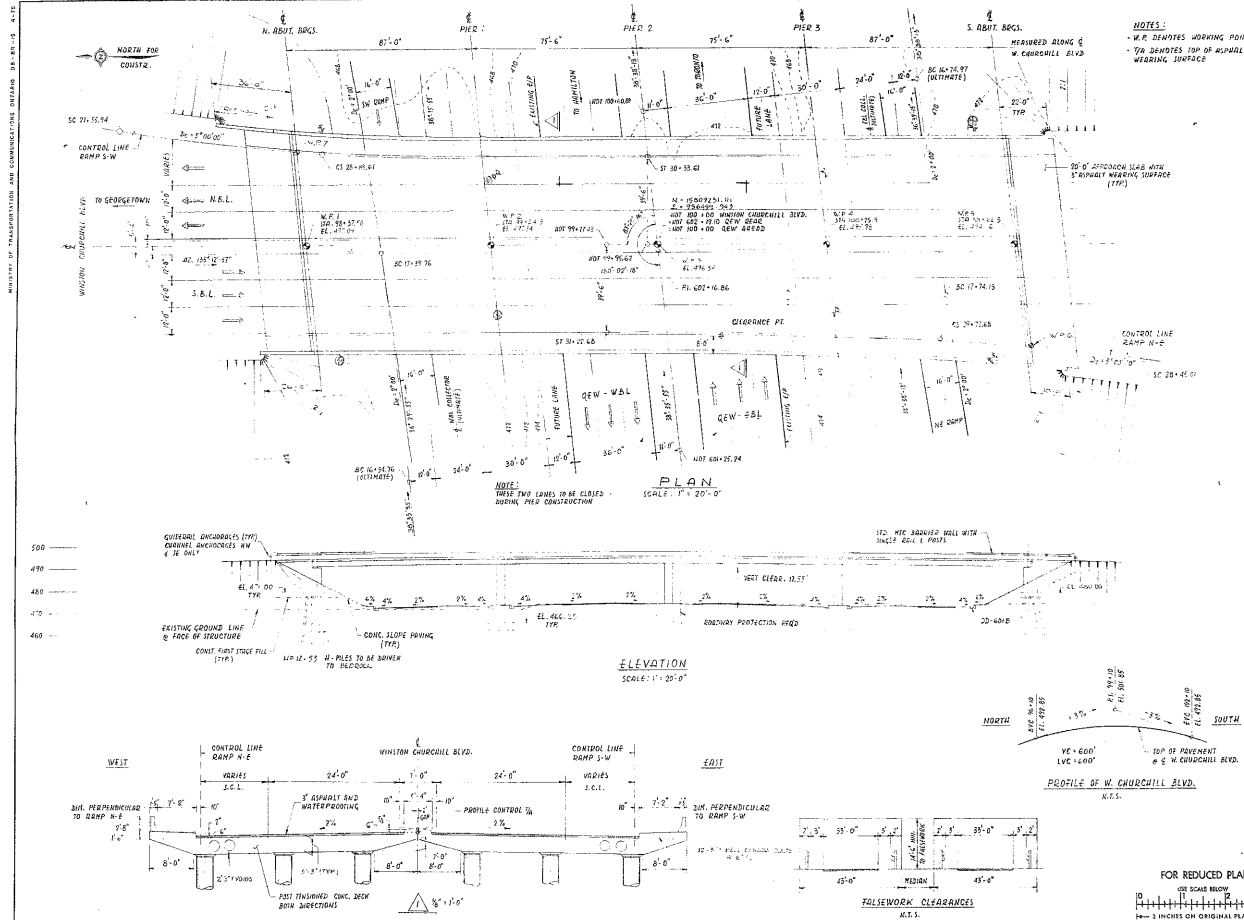
NOTES: ALL PILES ARE UP 12.5%
PILE SPACING MEASURED AT
INTERMEDIATE OF FOOTING
PILES DRIVEN TO BEDROCK
& NOTED TOTAL DRIBBLE



FOR REDUCED PLAN
USE SCALE BELOW



REVISION	DATE	BY	DESCRIPTION
1	08-30-87	ALB	DESIGN
2			CHECKED
3			LOADING
4			DATE
5			DRAWN
6			CHECK
7			SITE
8			DATE
9			DWG
10			SHEET



NOTES:
- W.P. DENOTES WORKING POINT
- D.A. DENOTES TOP OF ASPHALT
WEARING SURFACE

DIST. 4
CONTRACT No
WP No. 125-65-12
WINSTON CHURCHILL BLVD. VIADUCT
GENERAL LAYOUT

SHEET

G.B.M. 650066 EL. 470.842
CONCRETE: MONUMENT AT NORTHWEST CORNER OF QUEEN ELIZABETH
BLVD. IS SET WESTWARD IN CENTER LINE OF TOWN OF DOWNSVILLE
TOWNING. STREET INTERSECTION OF QUEEN ELIZABETH BLVD. IS SET
EASTWARD IN POWER POLE TOWER IN TOP OF CONCRETE AT
GROUND LEVEL. ESTABLISHED BY TOPOGRAPIHICAL SURVEY
24-11-11. 100-11-11. 100-11-11. 100-11-11.

- GENERAL NOTES**
- CLASS OF CONCRETE**
DECK, PIER, SIDEWALK, CURB & BORDER WALLS 3000 PSI
PIER FOOTING 3500 PSI
RETAINING WALL 3000 PSI
- GRADE OF REINFORCING STEEL**
EQUIV. 3000 PSI
COL. JOINT, STRUTS & GABLE SUPPORTS 4000 PSI
CEMENTUM 4000 PSI
- CLASS (GRADE) OF REINFORCING STEEL**
DECK, TOP & 2. ELEVATION - 10"
COLUMNS 10"
SPRINKLER ALLEYS 10"
RETAINING WALLS 10"
SEPARATOR 10"

- CONSTRUCTION NOTES**
- THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THE BIDDING
ITEMS BEING USED TO THE INCURRED EXTENT WITH A
TOLERANCE OF 1/2".
 - NO CONCRETE SHALL BE PLACED ABOVE THE ADJACENT BIDDING
ITEMS UNTIL THE CONCRETE IN DECK AND BIDDING IS PLACED.

- LIST OF DRAWINGS**
1. GENERAL LAYOUT
 2. BIDDING LAYOUT
 3. FOOTING LAYOUT
 4. FOOTING REINFORCEMENT
 5. NORTH ABUTMENT
 6. SOUTH ABUTMENT
 7. DECK DETAIL I
 8. DECK DETAIL II
 9. DECK DETAIL III
 10. DECK DETAIL IV
 11. GABLE DETAIL I
 12. GABLE DETAIL II
 13. GABLE DETAIL III
 14. DECK DETAIL V
 15. DECK DETAIL VI
 16. CONCRETE GABLE WALL (WITH SIDEWALK)
 17. TO IT. APPLICATION BOARD
 18. DETAIL OF SLOPE PAVING
 19. DETAIL OF SLOPE PAVING
 20. DETAIL OF SLOPE PAVING
 21. DETAIL OF SLOPE PAVING
 22. AS CONSTRUCTED ELEV. & DATA

COMPLETE QUANTITIES

NO.	DESCRIPTION	QTY	UNIT
1	CONCRETE IN PIER	3000	CU YD
2	CONCRETE IN PIER FOOTING	4000	CU YD
3	CONCRETE IN RETAINING WALL	3000	CU YD
4	CONCRETE IN GABLE WALL	3000	CU YD
5	CONCRETE IN SIDEWALK	3000	CU YD
6	CONCRETE IN SLOPE PAVING	3000	CU YD
7	CONCRETE IN SIDEWALK	3000	CU YD

RECEIVED
AUG 30 1977
100-11-11

FOR REDUCED PLAN
SEE SCALE BELOW
10 20 30 40 50 60 70 80 90 100
1" = 20' HORIZONTAL
1" = 2' VERTICAL

