

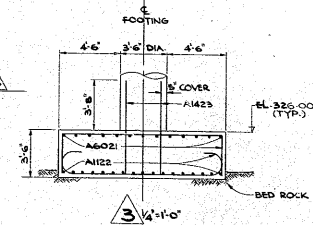
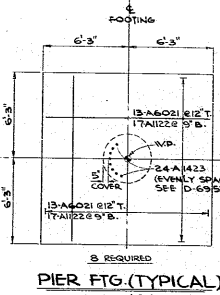
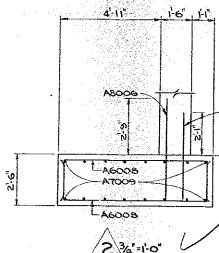
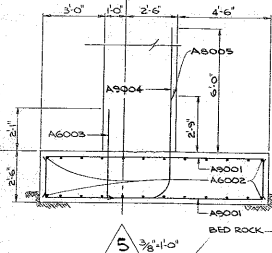
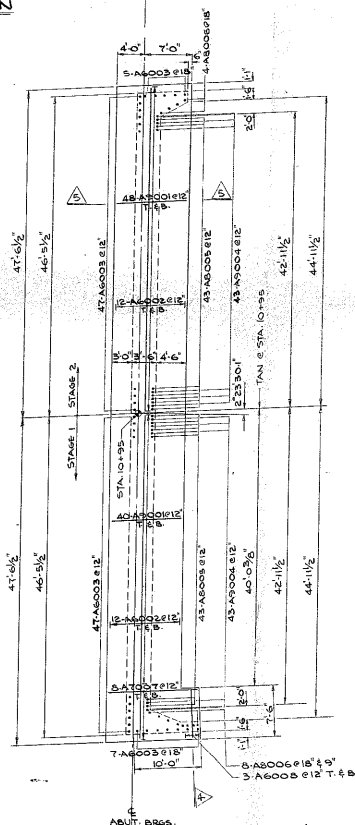
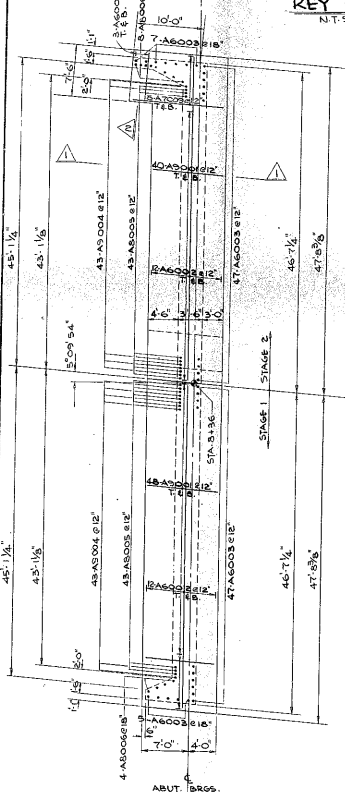
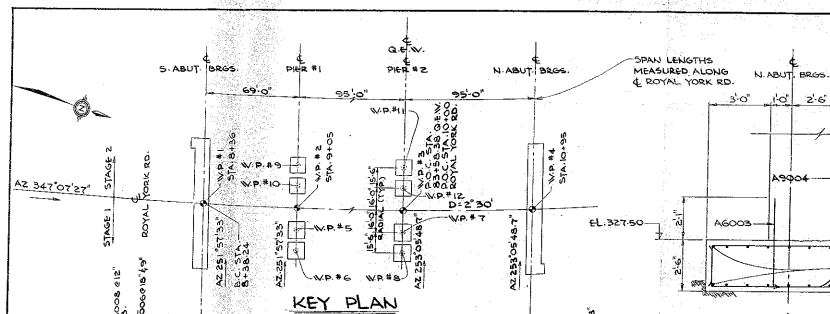
#69-F-60

W.P. 314-65-02

Q.E.W.

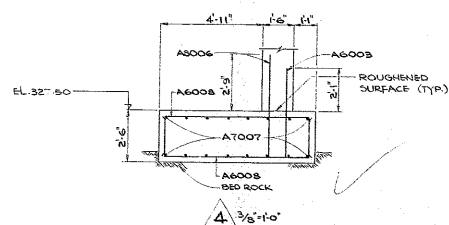
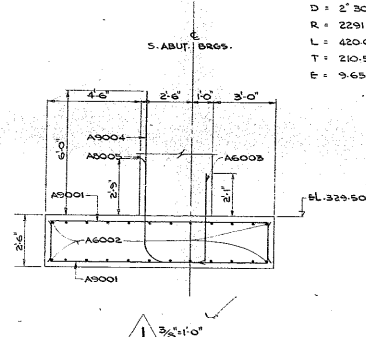
ROYAL YORK ROAD  
UNDERPASS STRUCTURE





**CURVE DATA**

Δ = 10° 30' 00"  
D = 2' 30' 00"  
R = 2291.83'  
L = 420.00'  
T = 210.53'  
E = 9.65'



**Note:** S. ABUTMENT TO BE CAST ON UNDISTURBED SOIL.  
PIER #1, PIER #2 & N. ABUTMENT TO BE CAST ON SOUND BED ROCK.

DESCRIPTION	CO-ORDINATES		STA. ON ROYAL YORK RD.
	N	E	
W.P. #1	181679.32	222159.23	8+36
2	181746.36	222142.97	9+05
3	181837.79	222117.21	10+00
4	181928.08	222087.69	10+95
5	181751.32	222156.21	
6	181756.13	222172.97	
7	181842.45	222132.52	
8	181846.95	222147.35	
9	181736.59	222112.96	
10	181741.40	222127.72	
11	181828.64	222087.07	
12	181833.14	222101.90	

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO  
BRIDGE DIVISION

69-60

**ROYAL YORK ROAD UNDERPASS  
BRIDGE No. 1**

KING'S HIGHWAY No. Q.E.V. DIST. No. 6  
CO. YORK BOROUGH OF ETOBICOKE  
TWP. LOT CON.

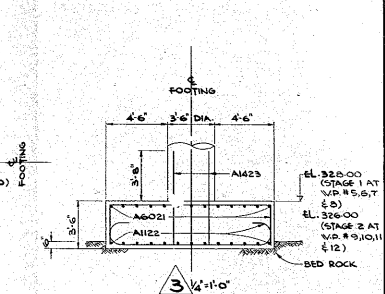
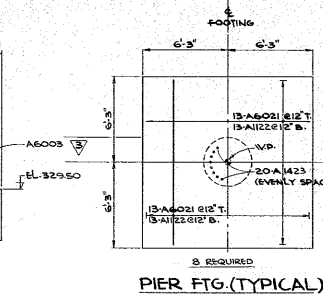
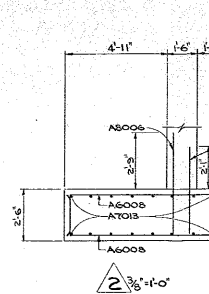
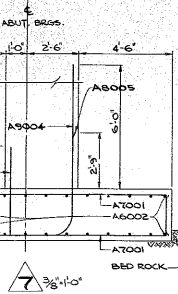
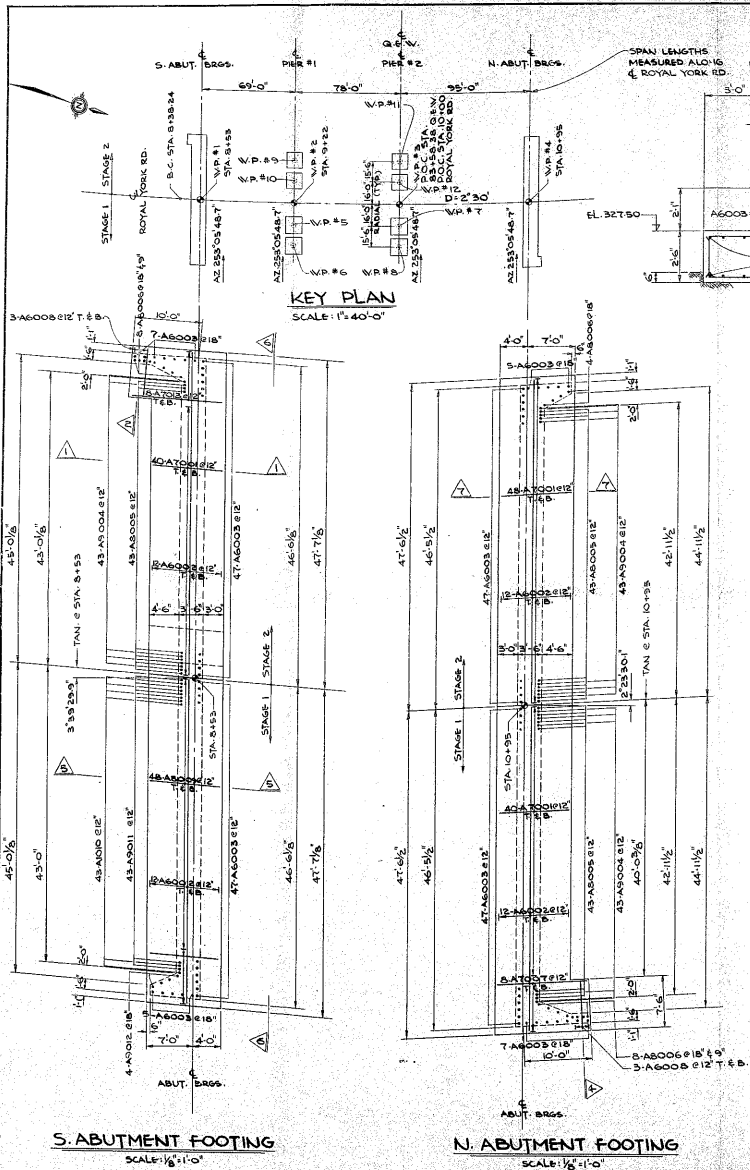
**FOOTING DETAILS**

APPROVED: 37-241 W.P. No. 314-65-2

DESIGN: R. K. CHECK: D. R. G. CONTRACT: NEW  
DRAWING: R. M. V. CHECK: B. K. DRAWING: No. D-6957-3  
DATE: MAR. 1971 LOADINGS: BS 20-44



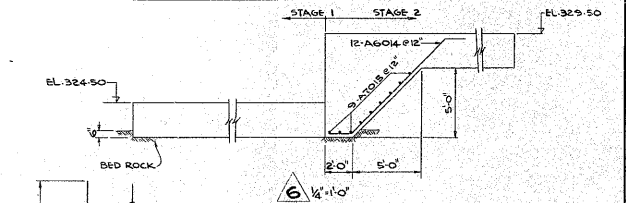
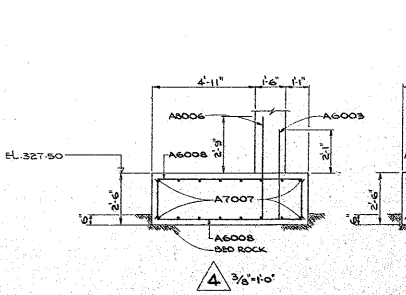
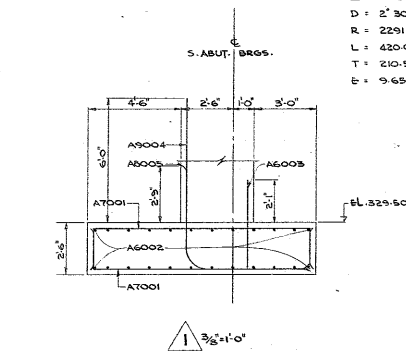




**CURVE DATA**

Δ = 10° 30' 00"  
D = 2° 30' 00"  
R = 2291.85'  
L = 420.00'  
T = 210.59'  
E = 9.65'

DESCRIPTION	CO-ORDINATES		STA. ON ROYAL YORK RD.
	N	E	
W.P. #1	181675.55	222155.45	8+53
2	181762.80	222158.64	9+22
3	181837.79	222117.21	10+00
4	181928.08	222087.69	10+95
5	181677.45	222155.95	
6	181771.96	222168.79	
7	181842.45	222132.52	
8	181846.75	222147.35	
9	181753.64	222108.45	
10	181758.14	222123.32	
11	181825.64	222087.07	
12	181833.14	222101.90	



Note: ALL FOOTINGS TO BE CAST ON UNDISTURBED ROCK OR SOIL AS NOTED.  
& ABUT. BRGS. & PIERS ARE PARALLEL.

FOR REDUCED PLAN  
USE SCALE BELOW



REVISIONS		DATE BY DESCRIPTION	
DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION 69-F-60			
<b>ROYAL YORK ROAD UNDERPASS</b>			
KING'S HIGHWAY No. Q.E.W. CO. YORK TWP.		DIST. No. 6 BOROUGH OF STOKES LOT CON.	
<b>FOOTING DETAILS</b>			
APPROVED DESIGN: R.L.M. CHECK: D.R.G. DATE: AUG 970 LOADING: 15.244	BRIDGE NUMBER CONTRACT INVA. DRAWING NO.	SITE No. 37-241 I.T. No. 314-65-2	D-6759-3

## MEMORANDUM

To: Mr. B. R. Davis,  
Bridge Engineer,  
Bridge Office,  
Admin. Bldg.

FROM: Foundation Section  
Materials & Testing Office,  
Room 107, Lab. Bldg.

DATE: September 18, 1969

ATTENTION: Mr. S. McCombie

OUR FILE REF.

IS REPLY TO

SEP 23 1969

SUBJECT:

## FOUNDATION INVESTIGATION REPORT

For

Proposed Underpass Structure  
At the Crossing  
of the Q.E.W. and Royal York Road  
Borough of Etobicoke  
Metropolitan Toronto  
District No. 6 (Toronto)  
W.J. 69-F-60 W.P. 314-65-02

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

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

AGS/ia  
Attach.

cc: Messrs. B.R. Davis (2)  
H.A. Tregaskes  
D.W. Farren  
G.K. Hunter (2)  
F.G. Allen  
W.S. Melinyshyn

*A. G. Sternac*  
A. G. Sternac  
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. T.J. Kovich  
B.A. Singh

Foundation Files  
General Files.

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2. DESCRIPTION OF THE SITE AND GEOLOGY.
3. FIELD AND LABORATORY WORK.
4. SUBSOIL AND BEDROCK CONDITIONS.
  - 4.1) General
  - 4.2) Existing Embankment Fill.
  - 4.3) Glacial Till.
  - 4.4) Shale Bedrock.
5. GROUNDWATER CONDITIONS.
6. DISCUSSION AND RECOMMENDATIONS.
  - 6.1) General.
  - 6.2) Pier Foundations.
  - 6.3) Abutment Foundations.
  - 6.4) Approach Embankments.
7. MISCELLANEOUS.

FOUNDATION INVESTIGATION REPORT  
For  
Proposed Underpass Structure  
At the Crossing  
of the Q.E.W. and Royal York Road  
Borough of Etobicoke  
Metropolitan Toronto  
District No.6 (Toronto)  
W.J. 69-F-60 W.P.314-65-02

---

I. INTRODUCTION:

It is proposed to reconstruct the Q.E.W. from the Gardiner Expressway easterly. In conjunction with this work the Foundation Section was requested to carry out a subsoil investigation for the proposed underpass structure, which will replace the existing structure, at the aforementioned location. The request was contained in a memo from the Bridge Location Section (Mr. W.S.Melinyshyn, Regional Bridge Location Engineer), dated July 28th, 1969. An investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the site.



1. INTRODUCTION: cont'd...

This report contains the results of the investigation, together with recommendations pertaining to the foundations of the structure, as well as the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located at the existing intersection of the Q.E.W. Highway and Royal York Road, in the Borough of Etobicoke, Metropolitan Toronto. The existing Eastbound and Westbound lanes of the Q.E.W. each have three paved lanes; the Eastbound and Westbound lanes are divided by a median approximately 36 feet in width. In the vicinity of the existing Royal York structure the Q.E.W is depressed approximately 2 to 4 feet below the surrounding terrain, which is grass covered and flat lying to gently undulating in relief between elevations 304 to 306.

The existing reinforced concrete 2 span (80'-80') underpass structure, carrying Royal York Road over the Eastbound and Westbound lanes of the Q.E.W., has a bridge deck approximately 52 feet in width. It carries two lanes of traffic. The associated approach embankments have a maximum height of the order of 18 feet above existing ground surface. In general the structure appears in good condition.

2. DESCRIPTION OF THE SITE AND GEOLOGY: cont'd...

Physiographically the site is situated in the "Iroquois Plain", which borders the shoreline of Lake Ontario. The "Plain", in the vicinity of the site, is characterized by a thin veneer of glacial till directly overlying shale bedrock, of the Meaford-Dundas formation, Ordovician Period. The glacial till is generally cohesive in nature.

3. FIELD AND LABORATORY WORK:

Six cased boreholes, four of which are accompanied by a dynamic cone penetration test, were put down at the proposed structure site. The borings were advanced by a conventional diamond drill rig adopted for soil sampling purposes.

Samples of the fill and natural subsoil were recovered at required depths in a 2" O.D. split-spoon sampler, which was hammered into the soil in accordance with the specifications for carrying out the Standard Penetration Test. The same method was used to advance the dynamic cone penetration test. Bedrock was proven in all the borings by obtaining EXT size rock core samples. The groundwater level conditions across the site, at the time of the investigation, were determined by recording the water levels in all the open boreholes.

The locations and elevations of the boreholes, which were surveyed by District #6 personnel, are shown on Drawing 69-F-60A, together with a number of estimated stratigraphical sections across the site.

3. FIELD AND LABORATORY WORK: cont'd....

All the samples obtained were subjected to a careful visual inspection in the laboratory prior to any testing being carried out. Following this inspection, tests were carried out on certain samples to determine the engineering properties of the various soil types, namely:

Natural Moisture Contents

Grain-Size Distributions

Atterberg Limits

The results of this testing are plotted on the Record of Borelog sheets and summarized on Figures 1 to 3, inclusive, all contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The parent subsoil stratum across the site is a hard glacial till, some 2.5 to 8.5 feet in thickness; it is composed of clayey silt with a trace to some sand and gravel. The glacial till is directly underlain by shale bedrock.

The existing approach embankments have a maximum height of the order of 18 feet above existing ground surface. The fill within the embankment is heterogeneous in nature, varying from stiff clayey silt to compact sandy silt.

The boundaries of the various deposits, as determined in the borcholes, are shown on the accompanying borelog sheets.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General: cont'd.

The stratigraphic sections, plotted on Drawing 69-F-60A, have been inferred from this data.

From ground surface downwards, the various soil types encountered are as follows:

4.2) Existing Embankment Fill

The approach embankments have a maximum height of about 18 feet. Based on the boring put through the embankment (BH #1), the fill is quite heterogeneous in composition. At this borehole location the majority of the fill is composed of a stiff to very stiff ('N' values between 10 and 20 blows/ft.) Clayey silt with some sand and a trace of gravel. Sandwiched within this cohesive material, however, is a 7 foot thick granular fill, composed of a compact ('N' values of 10 blows/ft.) silt to sandy silt with some clay and a trace of gravel. A grain-size distribution curve, for a sample obtained from both the cohesive and non-cohesive portions of the fill, is plotted on Figure #1 in the Appendix of this report.

The results of two Atterberg limit tests, carried out on samples of the fill, are plotted on the Borelog sheets and summarized on the Plasticity Chart (Figure #3).

4. SUBSOIL AND BEDROCK CONDITIONS: cont'd.)

4.3) Glacial Till:

Underlying the embankment fill, where it exists, and a thin topsoil cover elsewhere, is the predominant overburden stratum across the site, composed of a brown to grey glacial till. The thickness of the stratum varies from 2.5 feet in BH #5 to 8.5 feet in BH #1. The glacial till is generally composed of a matrix of clayey silt to silty clay binding sand and gravel sizes - i.e. it is cohesive in nature. There are granular zones located randomly throughout, however, where the deposit is basically composed of silt, sand and gravel. At the location of BH's #1 and 2, where the stratum is most extensive, the upper 4.5 to 5 feet has been softened due to weathering. Grain-size distribution curves, for samples of the glacial till obtained using 2" O.D. sampling equipment, are plotted on Figure #2.

Two Atterberg limit tests were carried out on representative samples of the more cohesive portions of the glacial till. The results of this testing are summarized on Figure #3. This testing gave the following values for the liquid and plastic limits and corresponding moisture content.

cont'd./7

4. SUBSOIL AND BEDROCK CONDITIONS: cont'd.)

4.3) Glacial Till: cont'd.

Liquid Limit	33.0	41.0
Plastic Limit	18.0	23.0
Moisture Content	19.0 %	16.0 %

From these values it is estimated that the cohesive glacial till stratum is inorganic with a plasticity in the low to intermediate range. The natural moisture content is consistently at or slightly below the liquid limit.

Standard penetration resistance testing was carried out within the glacial till; the results are plotted on the Borelog sheets. This testing gave 'N' values which varied from 108 blows/ft. to 100 blows/5 inches. In the upper weathered zone, encountered at BH's #1 and 2, however, the recorded 'N' values were 10 and 23 blows/ft. Based on these results it is estimated that the consistency of the basically cohesive glacial till is hard. In the upper weathered zone, discussed above, the consistency ranges from stiff to very stiff.

4.4) Shale Bedrock:

Bedrock was proven in all the borings by obtaining between 3.5 and 8 feet of BXT size rock core samples. The surface of the bedrock varies from approximately elevation 323.5 in BH's #2 and #4 to 327 in BH #5.

The bedrock is composed of a grey shale with random interbeds of limestone. In general, bedrock is sound throughout,

4. SUBSOIL AND BEDROCK CONDITIONS:

4.4) Shale Bedrock: cont'd.

however, some signs of fracturing and jointing were observed in the upper 1 to 2 feet at the majority of the boring locations.

5. GROUNDWATER CONDITIONS:

Groundwater level observations have been carried out, during the period of the investigation, by recording the water levels in the open boreholes. The observations are recorded on the borelog sheets and summarized on Drawing No. 69-F-60 A. The results of these measurements indicate that the groundwater level, is between 2.5 and 10 feet below ground surface - i. e. between elevations 323 and 326.5.

In the boring put down through the existing fill (BH #1), the groundwater level was encountered at a depth of 16 feet below the crest of embankment, this corresponds to elevation 331.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to replace the existing structure at the crossing of Royal York Road and the Q.E.W. with a three span (70'-77'-95') underpass structure. The width of the bridge deck will be increased to 93 feet - i.e. the

## 6. DISCUSSION AND RECOMMENDATIONS:

### 6.1 General: cont.'d.

proposed structure will allow for three lanes of traffic in either direction. Further, the alignment along Royal York Road is being revised such that, the new centre line will be approximately 60 feet east of the existing centre line. In the vicinity of the structure the profile grades of the Q.E.W. and Royal York Road will be approximately at elevations 331 and 351.5, respectively. The heights of the reconstructed approach fills of the Royal York Road will be of the order of 20 to 21 feet - i.e. an increase of about 2 to 3 feet above the existing approach fills. In addition to this increase in height it will be necessary to extend the existing embankment in an easterly direction by adding fill.

The Westbound and Eastbound lanes of the Q.E.W. will be relocated slightly to the north; an extra paved lane will be added in either direction, bringing the total number of lanes to four in each direction. In addition provision is being made for a future collector lane to be located south of the Eastbound lane.

The parent material across the site is a hard cohesive glacial till, which varies between 2.5 and 8.5 feet in thickness. The glacial till is directly underlain by shale bedrock. The existing embankments, which are as high as 18 feet above existing ground surface, were formed of fill of a heterogeneous nature, which varies from stiff silty clay to clayey silt to compact silt

cont'd./10



6. DISCUSSION AND RECOMMENDATIONS:

6.1) General: cont'd.)

The piers can be founded within the parent subsoil, while the abutments can be 'perched' within the approach fills. The foundation recommendations for these respective elements are discussed in the sections to follow.

6.2) Pier Foundations:

The parent cohesive glacial till is competent. The piers, therefore, can be founded on spread footings, located within this stratum at or below elevation 328.0. In all cases a minimum of four feet of earth cover should be provided to the underside of the footings for frost protection purposes. Spread Footings, meeting the aforementioned requirements, can be designed using a safe bearing pressure of up to 5.0 t.s.f.

The footings will probably be located above the groundwater level recorded during the period of the investigation (W.L. between elevation 323 and 326). Therefore, no major dewatering problems are anticipated, during the footing excavation phase. Any groundwater seepage or surface run-off into the excavations could be handled using standard techniques, such as pumping from sumps etc.

6. DISCUSSION AND RECOMMENDATIONS:

6.2) Pier Foundations: cont'd.

Settlement of the foundation subsoil will take place due to induced footing pressure. For footings of the size contemplated, inducing the aforementioned bearing pressure, the settlement will be negligible, since the foundation subsoil is relatively incompressible. Further, this settlement will be elastic in nature - i.e. take place during or immediately following the construction period.

6.3) Abutment Foundations:

The proposed abutments may be 'perched' within the approach fills. Due to the re-alignment along Royal York Road the western portion of the abutment footings will be located within the existing fill, while the eastern portion will be within newly placed fill. If a spread footing scheme was employed the integrity of the abutments may be adversely affected, due to the differential in the settlement induced within the existing and recently placed fill, under the applied footing pressure. Based on this consideration it is recommended that the abutments for the structure be supported on end-bearing piles, driven to bedrock. For estimating purposes the elevation of the pile tips can be assumed to be as follows:

South Abutment - elevation 323

North Abutment - elevation 325

cont'd./12

6. DISCUSSION AND RECOMMENDATIONS:

6.3) Abutment Foundations: cont'd.

The allowable loads will depend on the pile section chosen (eg. 12 BP 74 steel H - piles may be designed for 90 tons per pile).

No rock or bouldery fill should be placed within the plan limits of the piles.

6.4) Approach Embankments:

As discussed previously the existing embankments will be increased in height by about 2 to 3 feet above that existing, in addition they will be widened in an easterly direction (total width of widening approximately 60 feet). The maximum height of the proposed fills will be of the order of 20 to 21 feet. No stability problems are anticipated for embankments with standard 2:1 slopes, provided the additional fill required is i) properly keyed into the existing embankment, in accordance with current D.H.C. specifications and ii) it is properly compacted.

Settlement of the foundation subsoil due to the added surcharge loading of the fill, will be negligible.

7. MISCELLANEOUS:

The field work, performed during the period of August 1st and 8th, 1969, was supervised by Mr. V. Korlu, Project Foundation Engineer.

The preparation of this report was undertaken by Mr. B. T. Darch, Senior Foundation Engineer.

The investigation was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who reviewed this report.

Equipment used was owned and operated by Canadian Longyear Company Limited.

September, 1969.

APPENDIX I.

## FOUNDATION SECTION

ORIGINATED BY VK

COMPILED BY VK

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    100	SHEAR STRENGTH PSF			$w_p$ $w$ $w_L$
							<div><div>○ UNCONFINED</div><div>● QUICK TRIAXIAL</div></div> <div><div>+ FIELD VANE</div><div>x LAB. VANE</div></div>				
334.7	Ground Level										
1.0	Clayey silt (topsoil) Mottled grey & brown (weathered) Stiff		1	SS	10	330				0 24 45 31	
324.6	Clayey silt with a tr. to some sand & gravel. (Glac. fill) Brown Hard		2	SS	108						
9.5	Brown Fractured		3	SS	100/2"					$\gamma$ 324.	
319.1	Shale Bedrock, interbeds of limestone (Grey) Sound		4	BXT	100%					WL in open BH	
15.0	End of Borehole		5	BXT	89%	320				Aug. 1/69	
						310					



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No.3

FOUNDATION SECTION

JOB 69-F-60

LOCATION Q.E.W. &amp; Royal York Rd. Co-ords. 181,776 N; 222,174 E.

ORIGINATED BY VK

W.P. 314-65-02

BORING DATE August 6, 1969

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Washboring-BXCasing - BXT Rock Core

CHECKED BY 4/

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED * FIELD VANE ● QUICK TRIAXIAL * LAB. VANE		$w_p$ — $w$ — $w_L$ WATER CONTENT %			
328.9	Ground Level										GR SA SI CL
1.0	Clayey silt (topsoil)										▼ 326.5
325.4	Some sand & gr. (Gl. Hard)	1	SS	122							WL in open BH
3.5	Brown Fractured Shale Bedrock, interbeds of limestone	2	BXT 98%								Aug. 6/69
319.6	Sound				320						
2.3	End of Borehole				310						



FOUNDATION SECTION

MATERIALS & TESTING OFFICE		LOCATION Q.E.W. & Royal York Rd. Co-ords. 181,857 N; 222,220 E.		ORIGINATED BY	VK
JOB	69-F-60	BORING DATE August 6, 1969		COMPILED BY	VK
W P	314-65-02	BOREHOLE TYPE Washboring-BX Casing - BXT Rock Core		CHECKED BY	<i>[Signature]</i>
DATUM	Geodetic				

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT	PLASTIC LIMIT	WATER CONTENT	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	WATER CONTENT %	WATER CONTENT %	WATER CONTENT %		
328.9	Ground Level										
0.5	Clayey silt - topsoil										
323.4	Clayey silt - to some sand & gr. (Glac. fill)	1	SS	100/5"							63 11 15 11
5.5	(occ. sand & grav. zones)	2	SS	100/7"							<u>323.</u>
	Hard	3	BXL	100%	320						WL in open BH
317.3	Shale Bedrock, interbeds of Limestone										Aug. 6/69
11.6	(Grey) Sound										
	End of Borehole				310						

## FOUNDATION SECTION

ORIGINATED BY VK

COMPILED BY VK

CHECKED BY

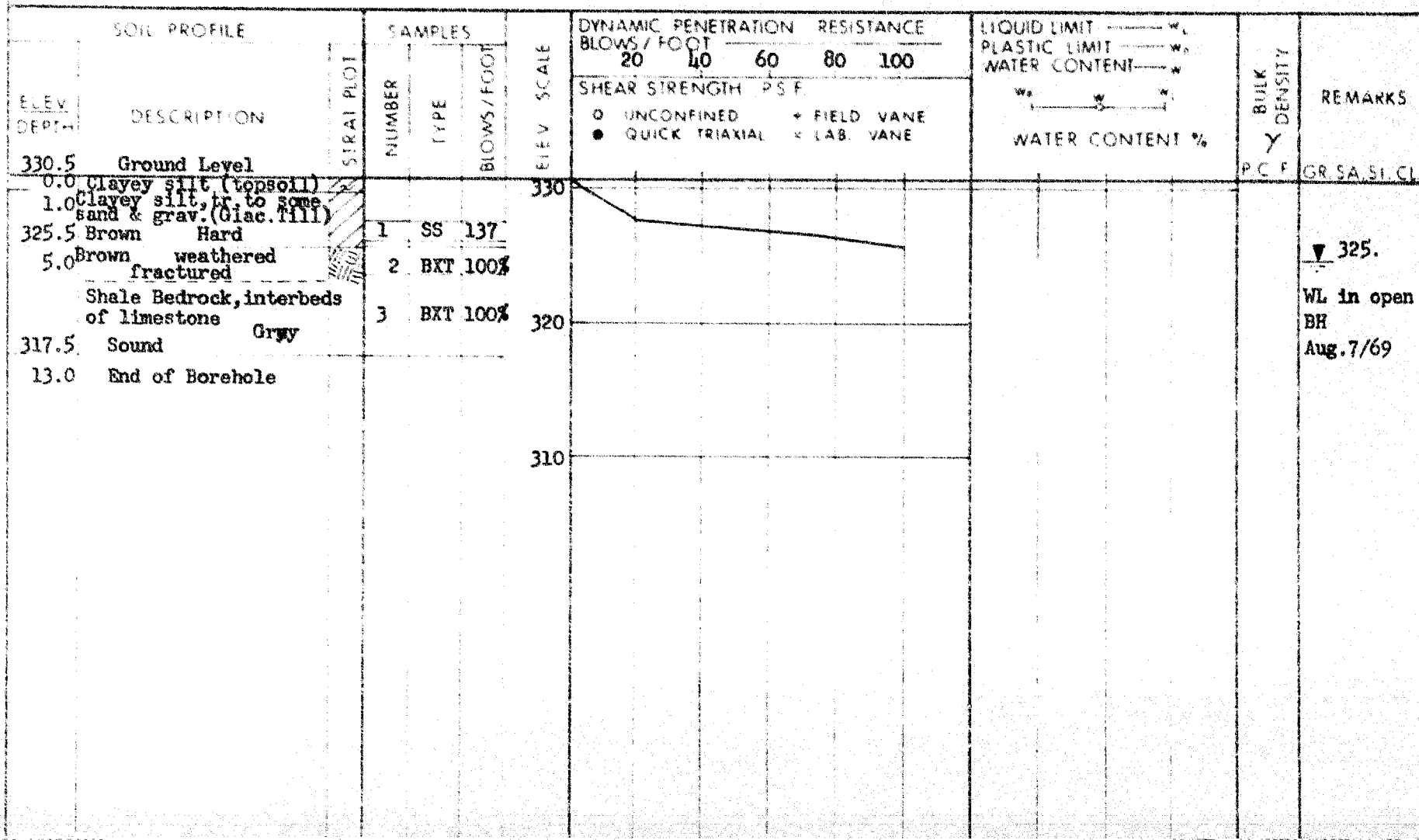
SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE						LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			BULK DENSITY  Y P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	SITING PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	BLOWS/FOOT 20 40 60 80 100					SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 10 20 30	
347.0	Ground Level																
0.0	Clayey silt with some sand & a tr. of gravel (Fill) (Brown)	X															
342.0	Stiff	X	1	SS	10												
5.0	Silt to sandy silt with some clay & a tr. of gravel (Fill) (occ. seams of clayey silt up to 1" thick)	X	2	SS	10	340										0 8 76 16	
335.0	Compact	X	3	SS	10											0 23 50 27	
12.0	Clayey silt with some sand & a tr. of gravel (fill)	X	4	SS	10											V 331.	
329.5	Stiff to very stiff	X	5	SS	20	330										WL in open BH Aug. 8/69	
17.5	Clayey silt, tr. to some sand & gr. (Giac. Fill)	X	6	SS	157												
327.0	Hard, Brown, Weathered Fractured	X	7	BXT	80%												
323.4	Shale Bedrock - Sound	X	8	BXT	100%												
23.6	End of Borehole					320											

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

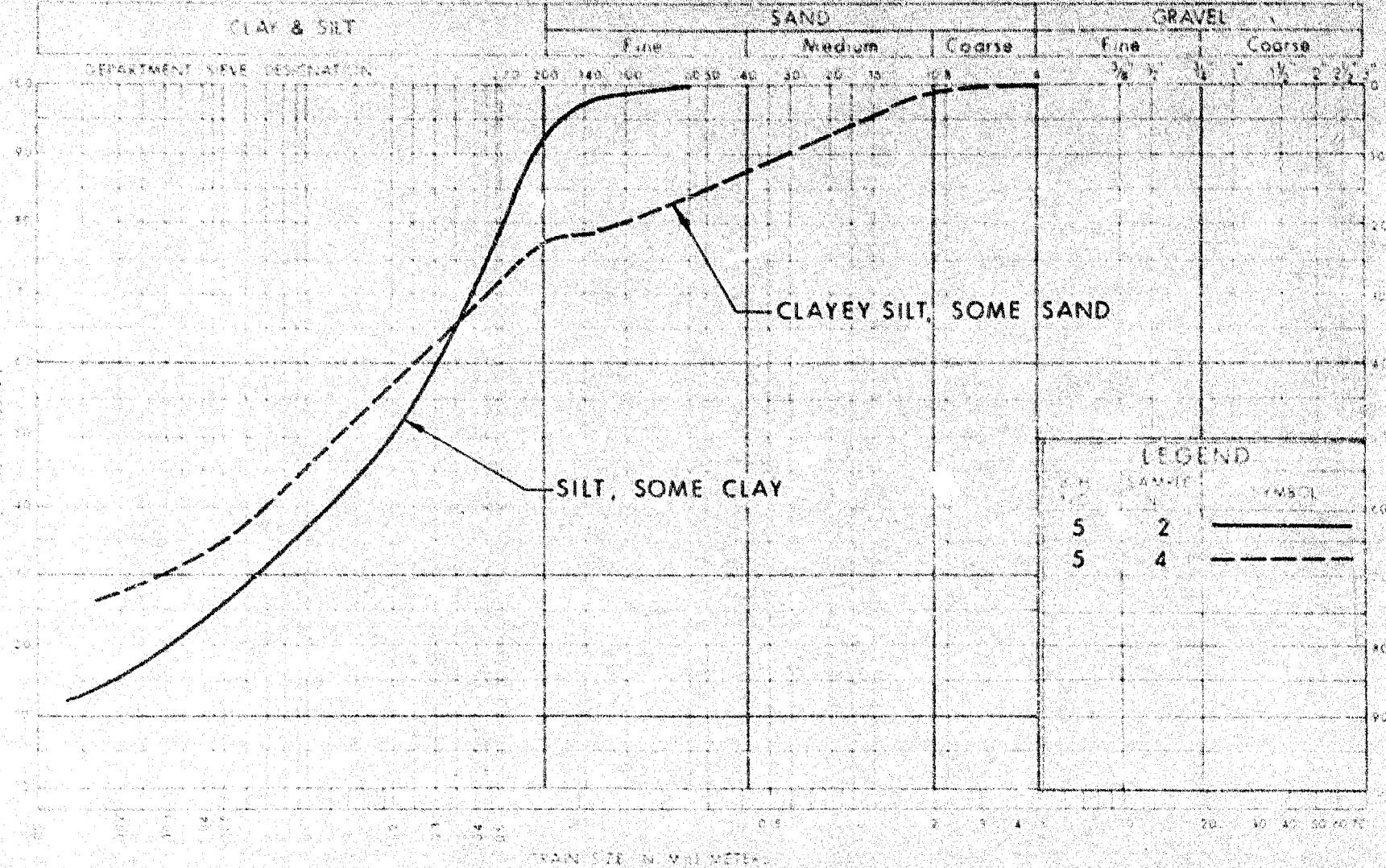
# RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-66-122 LOCATION Q.E.W. Royal York Rd. Co-ords. 181,940 N;222,123 BORIGINATED BY VK  
W.P. 314-65-02 BORING DATE Aug. 7, 1969 COMPILED BY VK  
DATUM Geodetic BOREHOLE TYPE Washboring-BX Casing-BXT Rock Core - Cone Test CHECKED BY



# UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF HIGHWAYS  
MATERIALS AND  
TESTING  
DIVISION

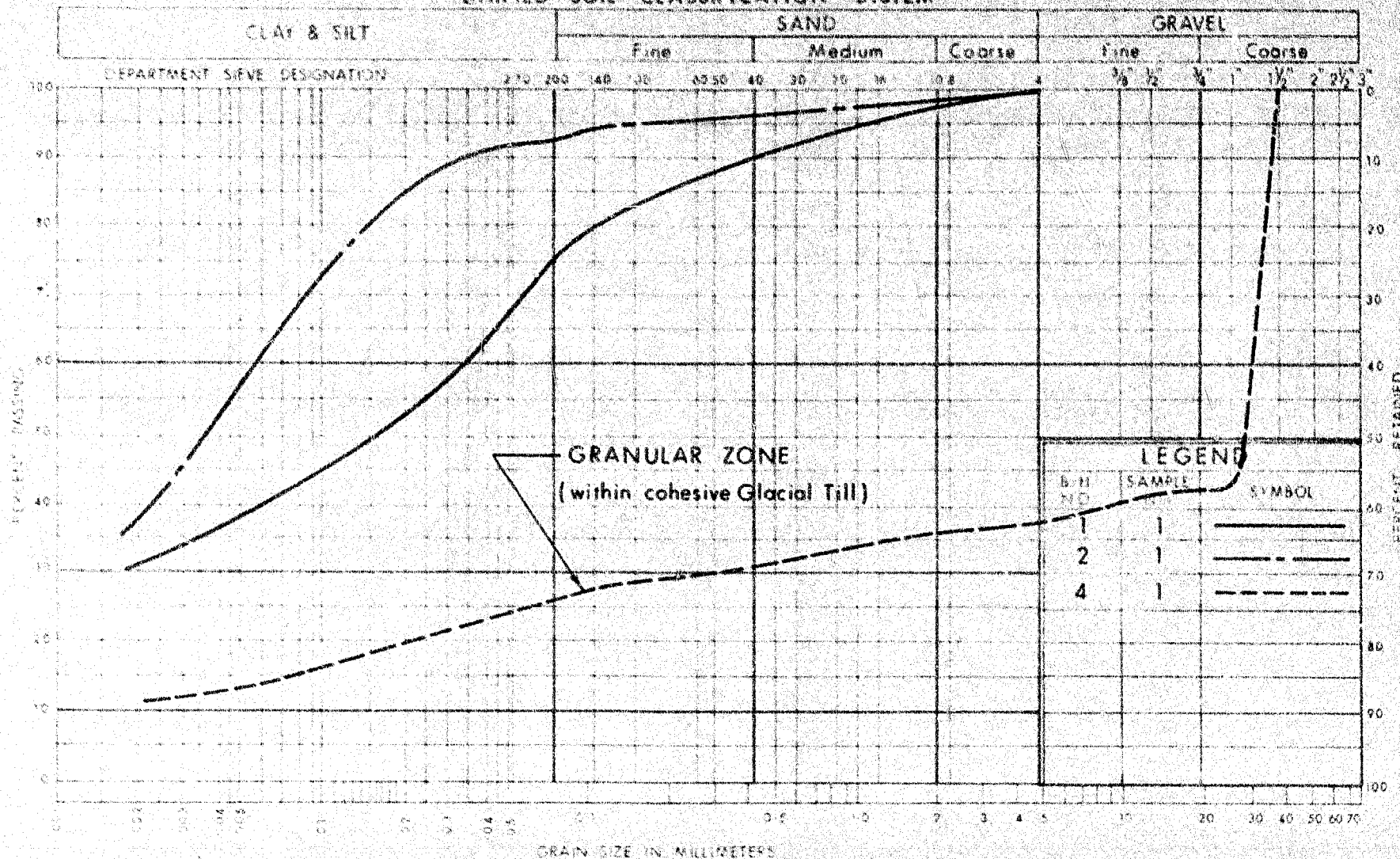
## GRAIN SIZE DISTRIBUTION FILL

W.P. No. 314-65-02

JOB No. 69-F-60

FIG. NO. 1

# UNIFIED SOIL CLASSIFICATION SYSTEM

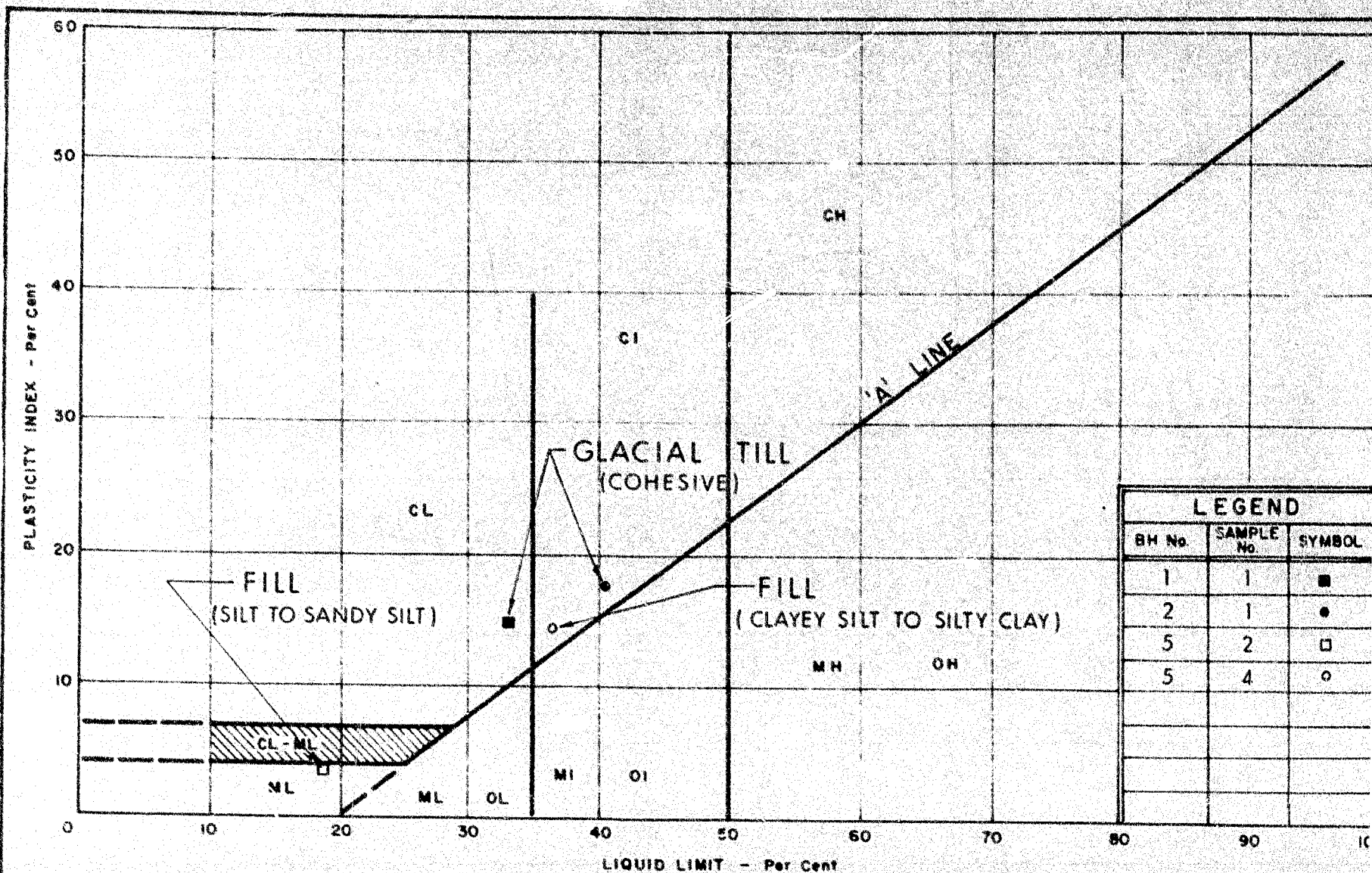


DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

**GRAIN SIZE DISTRIBUTION**  
**GLACIAL TILL**  
CLAYEY SILT TO SILTY CLAY, TRACE TO SOME SAND & GRAV. FIG. NO. 2

WP No. 314-65-02

JOB No. 69-F-60



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## PLASTICITY CHART

WP No. 314 - 65 - 02

JOB No. 69 - F - 60

FIG. NO. 3



## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

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

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

### DESCRIPTION OF SOIL

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

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

### TYPE OF SAMPLE

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

### SOIL TESTS

Q <sub>u</sub>	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

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

### GENERAL

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

### STRESS AND STRAIN

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

### EARTH PRESSURE

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

### FOUNDATIONS

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

### SLOPES

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





MEMORANDUM

*AGS*

TO: Mr. A. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Building.

FROM: C. S. Grebski,  
Bridge Office.

ATTENTION:

DATE: August 19, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT: Royal York Road Underpass  
Borough of Etobicoke  
W.P. 314-65-2, Site 37-241  
Q.E.W., District No. 6

*69-F-60*

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

*[Signature]*  
C. S. Grebski,  
Bridge Design Engineer.

CSG:DE

Attach.

c.c. Foundation Office.

*[Signature]*

*No comment.*

*[Signature]*

*M. Devata  
27th Aug/70*

69-F-60

MEMORANDUM

To: Mr. A.G. Stermac, Prin. Foundation Engineer, Room 107, Lab. Building.

From: W.S. Melinyslyn, Bridge Office.

ATTENTION:

DATE: July 28th, 1969.

OUR FILE REF.

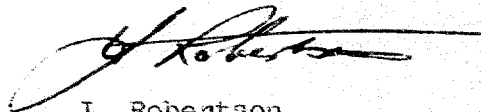
IN REPLY TO

SUBJECT: Royal York Rd. Underpass,  
W.P. 314-65-02, Site 37-241,  
District 6, Hwy. Q.E.W.

The attached marked up partial print, B-80-68, details the approximate location of the proposed footing for the above detailed structure. Also enclosed are prints taken from the Functional Planning Report showing the Proposed Grade. Field Reconnaissance Report will be forwarded in the near future covering this site.

Would you kindly arrange to have a foundation investigation of sufficient magnitude to allow the Bridge Office to proceed with the structure design.

JR/cew  
Encl.  
cc E. Cross



J. Robertson,  
BRIDGE LOCATION SUPERVISOR,  
for:  
W.S. Melinyslyn,  
REGIONAL BRIDGE LOCATION ENGINEER.

## MEMORANDUM

69-F-60

To: Mr. L.G. Sternac,  
Prin. Foundation Engineer,  
Room 107,  
Lab. Building.

FROM: W.S. Melinyshyn,  
Bridge Office.

ATTENTION:

DATE: July 28th, 1969.

OUR FILE REF.

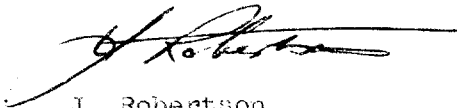
IN REPLY TO

SUBJECT: Royal York Rd. Underpass,  
W.P. 314-65-02, Site 37-241,  
District 6, Hwy. Q.E.W.

The attached marked up partial print, B-80-55, details the approximate location of the proposed footing for the above detailed structure. Also enclosed are prints taken from the Functional Planning Report showing the Proposed Grade. Field Reconnaissance Report will be forwarded in the near future covering this site.

Would you kindly arrange to have a foundation investigation of sufficient magnitude to allow the Bridge Office to proceed with the structure design.

JR/cew  
Encl.  
cc E. Cross

  
J. Robertson,  
BRIDGE LOCATION SUPERVISOR,  
for:  
W.S. Melinyshyn,  
REGIONAL BRIDGE LOCATION ENGINEER.

## MEMORANDUM

TO: Mr. A. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Building

FROM: C.S. Grebski

ATTENTION:

DATE: March 15, 1971

OUR FILE REF.


IN REPLY TO

SUBJECT: Royal York Rd. Underpass  
Bridge No. 1  
W.P. 314-65-2, Site No. 37-241  
Q.E.W., District No. 6

69-F-60

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

  
C.S. Grebski,  
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Office

*NO*  
*Comments*  
*P.T.D.*  
*March 22/71*  
*il*  
*17 May 71*  
*No comments.*  
*M. Devita*  
*March 23/71*