

DOCUMENT VERIFICATION INFORMATION

GEOCRES No. 4037-7.

DIST. 1 REGION SOUTHWESTERN.

W.P. No. 257-66-06

CONT. No. 77-43

W. O. No. \_\_\_\_\_

STR. SITE No. 6-291

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

LOCATION E.C. ROW EXPRESSWAY

NORTH SERVICE RD. + C+O RAILWAY  
CROSSING.

OVERSIGHT DRAWINGS TO BE INCLUDED WITH THIS REPORT 3

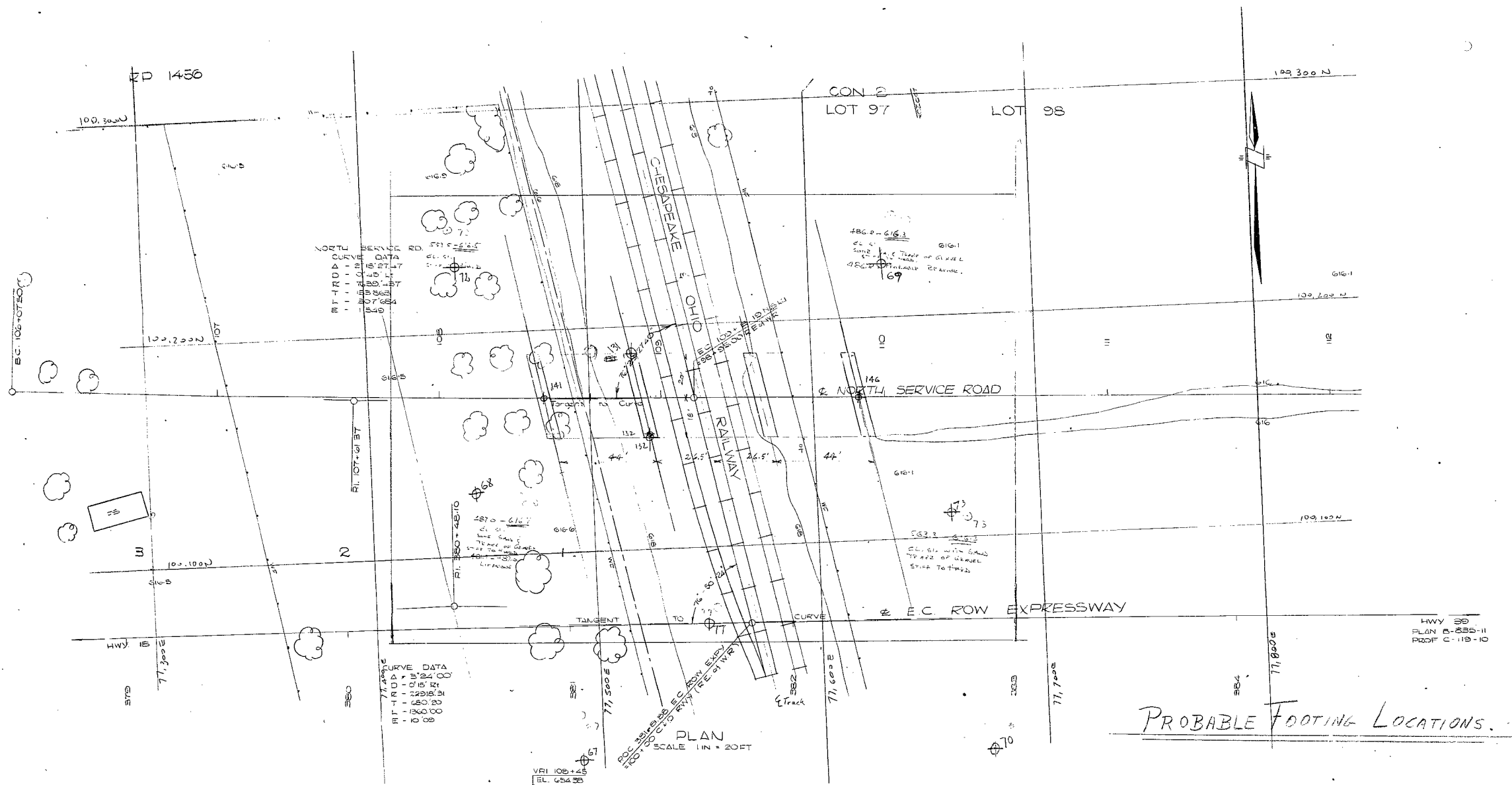
REMARKS: \_\_\_\_\_

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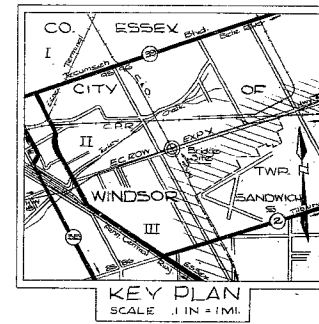
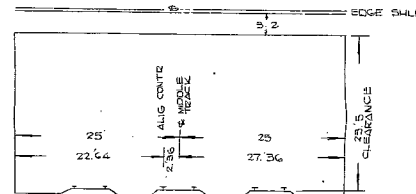
## CITY of WINDSOR



10' 12' 12' 12' 12'

10' 12' 12' 12' 12'

X-SECT PROPOSED STRUCTURE  
NORTH SERVICE RD X C.O. RWY.



WP 257-66-06 71-1115

DATE	REVISIONS & ADDITIONS	BY	CHKD

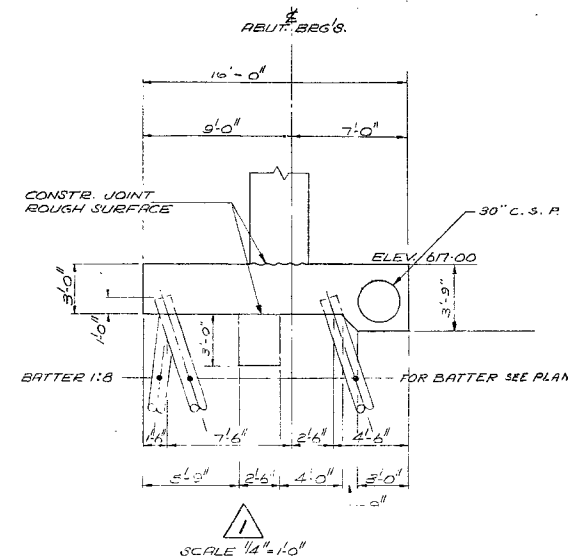
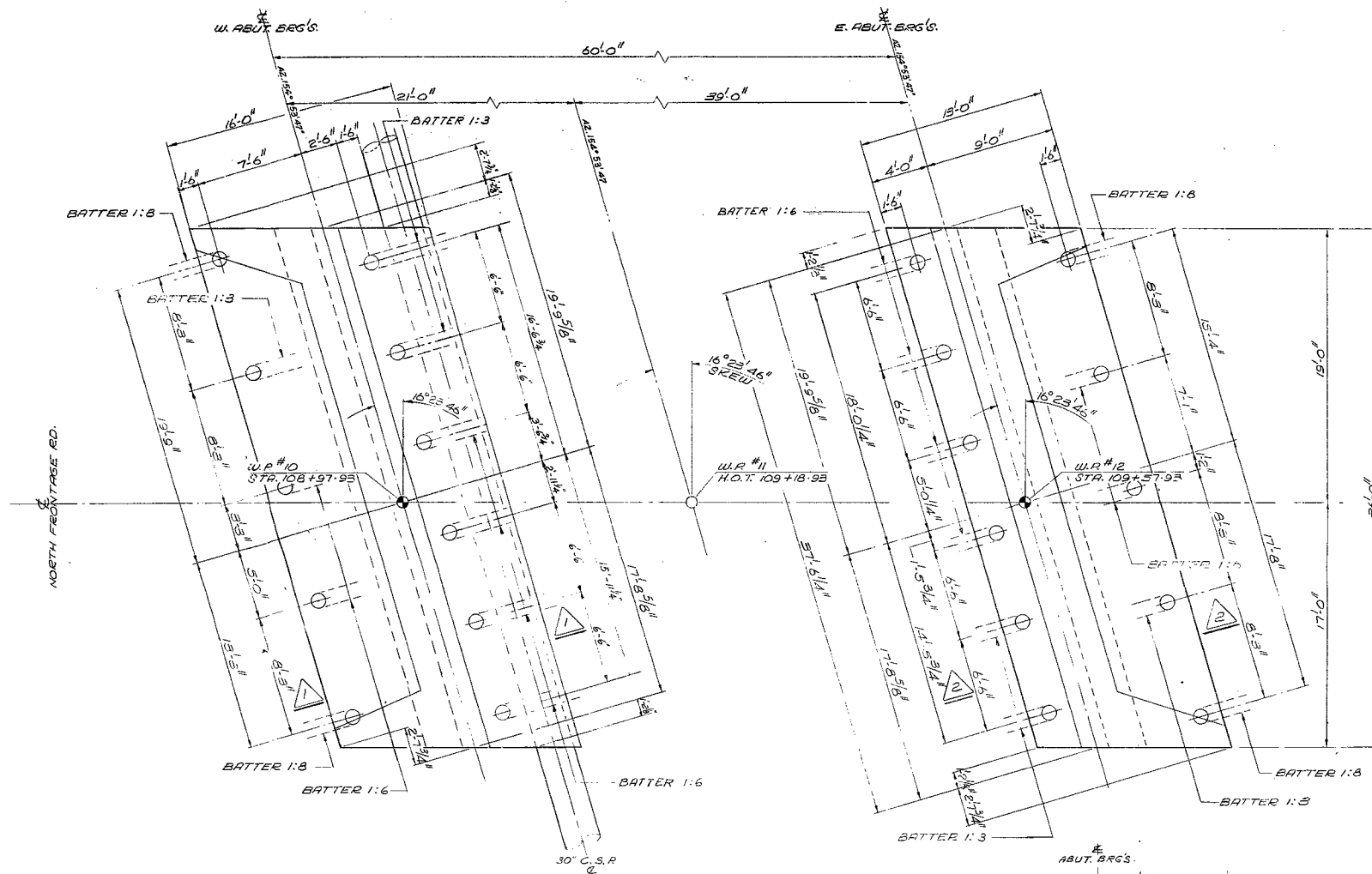
ONTARIO DEPARTMENT OF  
TRANSPORTATION & COMMUNICATIONS  
DESIGN SERVICES BRANCH  
ENGINEERING SURVEYS OFFICE

## BRIDGE SITE

PROPOSED CROSSING  
AT  
CHESAPEAKE & OHIO RWY.  
AND  
E.C. ROW EXPRESSWAY  
NORTH SERVICE ROAD  
LOT 97 CITY OF WINDSOR CON 2 COUNTY OF ESSEX

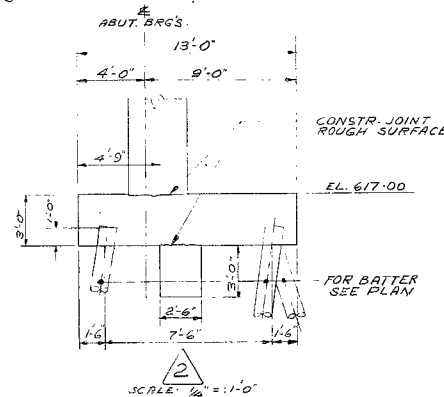
SCALE AS SHOWN	DISTRICT 1 CHATHAM	REGION SOUTH WESTERN
W.D. 5992-257-66-06	Date of Survey JULY 68	Date of Plan JULY 71
SURVEY BY Chief of Party PHOTOGRAMMETRY Supervisor	DRAWN BY Draftsman - E.C. ROW Supervisor - G.W. MOORE	SITE
CHECKED BY Draftsman Supervisor - G.W. MOORE	PLAN E-5308-1	

4037-7

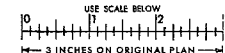


NOTE  
FOOTING TO BE POURED AGAINST  
UNDISTURBED GROUND.

PLAN  
SCALE 1/4" = 1'-0"



FOR REDUCED PLAN  
USE SCALE BELOW



LIST OF 12 3/4" O.D. STEEL TUBE PILES (WALL THICKNESS 1/4")

LOCATION	Nº PILES	LENGTH	DESIGN LOAD
W. ABUT.	11	133'-0"	120 T. / PILE
E. ABUT.	11	133'-0"	120 T. / PILE

NOTE: -DRIVING ENERGY MUST NOT EXCEED 30,000 FT.  
LBS/BLOW WHEN PILES ARE PENETRATING  
THE ZONE BELOW ELEV. 495.00.

W.R.	STATIONS	CO-ORDINATES	
		NORTH	EAST
10	108+97.95	362967.33	870318.91
11	109+18.95	362970.31	870339.07
2	109+57.95	362976.41	870377.62

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO			
C & O RAILWAY O'HEADS NORTH FRONTAGE ROAD KING'S HIGHWAY No. E.C. ROWLEY. DIST. No. 1 CO. ESSEX CITY OF WINDSOR LOT 97 & 98 CON. 2			
FOOTING LAYOUT		CONTRACT No.	
APPROVED	DESIGN	C.F.P.	CHECK
DATE	DES. 73	CHECK	C.F.P.
LOADING	13.20.44	W.P. No.	257-66-06
SITE No. 6-291		SHEET 3	

4037-7



GEOCRES No. 4057-7  
DIST. 1 REGION SouthwesternW.P. No. 257-66-06CONT. No. 77-43

W. O. No. \_\_\_\_\_

STR. SITE No. 6-291

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

LOCATION E.C. Row Expressway  
North Service Rd. & C. & O. Railway  
CrossingOVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3REMARKS: documents to be unfolded  
before microfilming

Mr. C. Grebski,  
Structural Design Engineer,  
Structural Design Section,  
West Bldg., Downsview

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

August 27th, 1974.

J. Keen

W.P.'s 257-66-03,04,05,06,07,09,21  
E.C. Row Expy., Windsor,  
District #1 (Chatham)

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Following is a summary of the main points of our discussion on August 22, 1974 regarding piled foundations for the abovementioned projects.

1. For the C. & O. Rwy. structures a cost estimate of spread footings versus piled foundations indicates a much smaller saving in favour of spread footings than previously anticipated. This is partly due to the fact that as a result of the recent pile tests we are able to reduce the number of piles required by about 25%. In view of this and other (mainly settlement) considerations it was decided to adopt the piled foundation design.

2. A restriction on the use of pile driving hammers delivering more than 30,000 ft.lbs. per blow when the pile tips are within 3 ft. of bedrock, to be incorporated in the contract, requires that the bedrock surface be defined accurately at locations where piles are to be driven. To achieve this it will be necessary for the Soil Mechanics Section to carry out additional borings at all of the structure sites. In order to meet the present design schedule this drilling work should be completed and reported on by the end of October 1974.

*K.G. Selby*

K.G. Selby  
Supervising Engineer

KGS/rgb

C.C. A. Watt  
J. Anderson

Files  
Documents

Mr. A. P. Watt,  
Regional Structural Planning Eng.,  
Southwestern Region,  
London, Ontario.

Foundations Office,  
Design Services Branch,  
West Bldg., Downsview.

Mr. B. J. McKenna.

November 17, 1972.

*E. C. Row Expressway  
Walker Road Overpass  
C. & O. Railway Overheads  
Foundation Investigation Reports Review  
District #1, Chatham*

We have reviewed the proposed alignment and grade revisions  
(dated October 1972) at the following structure locations:

Walker Road Overpass

W.P. 257-66-04  
Bridge Site 6-285  
Site Plan: E-4882-1  
Foundation Investigation Report: 71-11113

C. & O. Railway Overhead on North Frontage Road

W.P. 257-66-06  
Bridge Site 6-291  
Site Plan: E-5308-1  
Foundation Investigation Report: 71-11115

C. & O. Railway Overhead on E.C. Row Expressway

W.P. 257-66-05  
Bridge Site 6-292  
Site Plan: E-5307-1  
Foundation Investigation Report: 72-11114

C. & O. Railway Overhead on South Frontage Road

W.P. 257-66-06  
Bridge Site 6-293  
Site Plan: E-5309-1  
Foundation Investigation Report: 72-11116

November 17, 1972.

It is concluded that the proposed revisions will not warrant additional field investigations and, consequently, the recommendations pertaining to the structure foundations and to the stability of the approach embankments contained in the foundation reports will not be altered.

Therefore, the recommendations of the foundation reports should be followed.

The name changes, from north and south service roads to north and south frontage roads, together with the introduction of the new Ontario co-ordinate system in place of the previous grid system are noted. It is our opinion, that changing the grid system, indicated on the foundation report drawings already in circulation is not warranted. However, the final contract drawing will be updated and the necessary amendment will be made.

PP/ao

cc: J. Anderson  
J. L. Keen  
A. Crowley

Foundations Files ✓  
Documents

For:

*P. Payer*  
P. Payer,  
Project Foundations Engineer,  
K. G. Selby,  
Supervising Foundations Engineer.



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac  
Principal Foundation Engineer  
Foundation Office  
West Bldg., DOWNSVIEW

FROM: Structural Planning  
Southwestern Region

ATTENTION:

DATE: October 26, 1972

OUR FILE REF.

IN REPLY TO

SUBJECT: E. C. Row Expressway  
Walker Road Overpass  
C. & O. Railway Overheads  
Foundation Investigation Reports Review  
District 1, Chatham

Enclosed please find revised E plans with alignment and grade revisions (Oct. 1972) for the following structures on the E. C. Row Expressway and North and South Frontage Roads in Windsor.

(a) Walker Road Overpass, W.P. 257-66-04, Bridge Site 6-285  
Site Plan E-4882-1, Rev. Oct. 1972

The original alignment and proposed foundation locations shown in red were the ones sent to you Oct. 12, 1971 and reported on in your Foundation Report W.O. 71-11113 dated December 9, 1971. The location of the Bore Hole and Cone Penetration Tests from your foundation report have been plotted on the enclosed E plans. The proposed new foundation locations are shown in blue on the two marked up E plans enclosed.

(b) C. & O. Railway Overhead on North Frontage Road, W.P. 257-66-06,  
Bridge Site 6-291, Site Plan E-5308-1, Rev. Oct. 1972

The original alignment and proposed foundation locations shown in red were the ones sent to you on Oct. 12, 1971 and reported on in your Foundation Report W.O. 71-11115 dated Dec., 1971. The location of the Bore Hole and Cone Penetration Tests from your foundation report have been plotted on the enclosed E plans. The proposed new foundation locations on the revised alignment are shown in blue on the two marked up E plans enclosed.

(c) C. & O. Railway Overhead on E. C. Row Expressway  
W.P. 257-66-05, Bridge Site 6-292, Site Plan E-5307-1, Rev. Oct. '72

The original alignment and proposed foundation locations shown in red were sent to you on Oct. 12, 1971 and reported on in your Foundation Report W.O. 71-11114 dated Dec. 10, 1971. The location of the Bore Hole and Cone Penetration Tests from your foundation report have been plotted on the enclosed E plans. The proposed new foundation locations on the revised alignment are shown in blue on the two marked up E plans enclosed.

Mr. A. G. Stermac

Page 2

October 26, 1972

(d) C. & O. Railway Overhead on South Frontage Road,  
W.P. 257-66-07, Bridge Site 6-293, Site Plan E-5309-1, Rev. Oct. '72

The original alignment and proposed foundation locations shown in red were sent to you on Oct. 12, 1971 and reported on in your Foundation Report W.O. 71-11116 dated Dec. 1971. The location of the Bore Hole and Cone Penetration Tests from your foundation report have been plotted on the enclosed E plans. The proposed new foundation locations on the revised alignment are shown in blue on the two marked up E plans enclosed.

Currently survey personnel from Southwestern Region are laying out the new alignment of the Central Avenue Extension. This alignment is approximately 700' west of the alignment previously sent you for the CN/CP Railway Overhead on Central Avenue Ext., W.P. 257-66-09, Bridge Site 6-287 and reported on by you in Foundation Report 71-11118 dated Dec. 1971. As soon as the new E plan for this bridge site has been prepared, we will be forwarding this to you with a request for a new foundation investigation. This is scheduled to be completed before November 15, 1972.

In view of the very tight schedule assigned to the Walker Rd., C. & O. and Central Avenue Extension structures, we are forwarding you now the information on the Walker Rd. and the C. & O. structures so that you may access what additional foundation investigation you may consider desirable in advance of the Central Ave. Ext. Railway Overhead foundation request in order that we may receive your foundation recommendations at the earliest possible date.

The E plans enclosed are all on the Ontario co-ordinate system rather than the project co-ordinate grid previously used. This involves both a horizontal translation and angular rotation to the former grid system.

We are enclosing ICES COGO output sheets giving the new co-ordinates for all the Bore Holes and Cone Tests previously co-ordinated by you in the reports for Walker Rd. and the C. & O. Railway Overheads (4 reports). In this printout the original point has been identified by its No. in the report. The old co-ordinates appear in the print out with this No. The point is then redefined for the purpose of recalculating its new co-ordinates by adding 10, i.e.; BH 68 becomes BH 78 and the new co-ordinates established. Some notes in red have been added to the computer output to clarify this point. Since all the E. C. Row geometry is now being calculated on the Ontario grid (3<sup>rd</sup> Modified Traverse Mercator Grid System), would you please have the bore hole co-ordinates in your Foundation Reports W.O. 71-11113, 4, 5, and 6 shown on the drawing at the end of each report revised to the Ontario Grid also.

Mr. A. G. Stermac

Page 3

October 26, 1972

It should also be noted that the title of North and South Service Roads shown on the E plans has been revised to North and South Frontage Roads.

Enclosed please find photographs of the Walker Road Overpass and C. & O. Railway Overhead Bridge Sites.

In order to avoid any delays when replying to this memorandum would you please send a copy direct to Mr. J. L. Keen, Regional Structural Design Engineer.

*Boym McKenna*

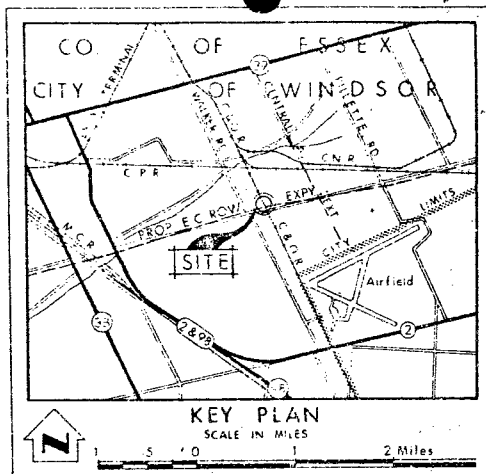
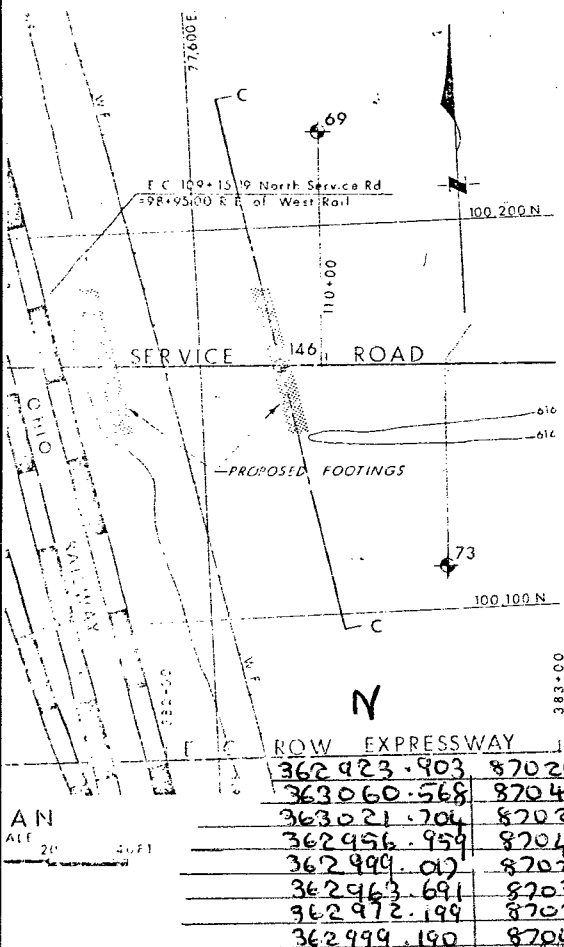
B. J. McKenna

Structural Location Engineer

BJMcK:sz

Enc.

cc C. Grebski  
A. McConnell  
A. Crowley  
J. Anderson



LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation in Boreholes 131 & 141 only Nov. 1971		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
08	616.7	100,128	77,447
69	616.3	100,724	77,633
72	616.5	100,230	77,441
73	616.3	100,111	77,660
131	618.8	100,186	77,519
132	618.8	100,150	77,526
141	616.3	100,170	77,879
146	616.3	100,164	77,620

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.

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DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS  
DESIGN SERVICES BRANCH - FOUNDATION OFFICE

CHESAPEAKE & OHIO RAILWAY  
AND  
NORTH SERVICE ROAD  
HIGHWAY NO. 1 C. ROW EXPRESSWAY DIST. NO. 1  
CO. ESSEX CITY OF WINDSOR  
TWP LOT 97 CON. II

BORE HOLE LOCATIONS & SOIL STRATA

SUBV. P.P. CHESAPEAKE 1973-257-66-126  
DRAWN BY J. H. H. 1973-11115  
DATE 1973-11-15  
BRIDGE DRAWING NO. 71-11115A

## MEMORANDUM

71-11115

To: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
Design Services Branch,  
West Building, DOWNSVIEW, Ont.

FROM: Bridge Planning,  
Southwestern Region,  
London, Ontario.

ATTENTION:

DATE: October 12, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 257-66-06, Bridge Site 6-291  
C. & O. Railway Overhead  
1.5 miles east of Hwy. 2  
North Frontage Road  
E. C. Row Expressway  
District 1, Chatham

Would you kindly arrange to have a Foundation Investigation conducted at the above location. I have enclosed two copies of bridge site plan E-5308-1 with the probable footing locations marked in red.

The portion plan showing the utilities, the field reconnaissance report and the list of utilities personnel supplied with the foundation request for the C. & O. R. O'Head at E. C. Row Expressway, W.P. 257-66-05, are applicable to this site.

I would like to point out that foundation report W.J.68-F-15-3, Walker Road to Burwell Road, containing factual information only, has been issued on July 10, 1969.



SJ/fs  
Encls.

S. Jants,  
Bridge Planning Technician

For: A. P. Watt,  
Regional Bridge Planning Engineer,  
Southwestern Region.

cc: Mr. C. Grobski  
Mr. A. Crowley

Dec. 29<sup>th</sup> 1971

## MATERIALS & TESTING DIVISION

## RECORD OF BOREHOLE NO. 72

**FOUNDATION SECTION**

LOCATION Co-ords. 100,230 N; 77,441 E.

ORIGINATED BY AP

BORING DATE April 3, 1968

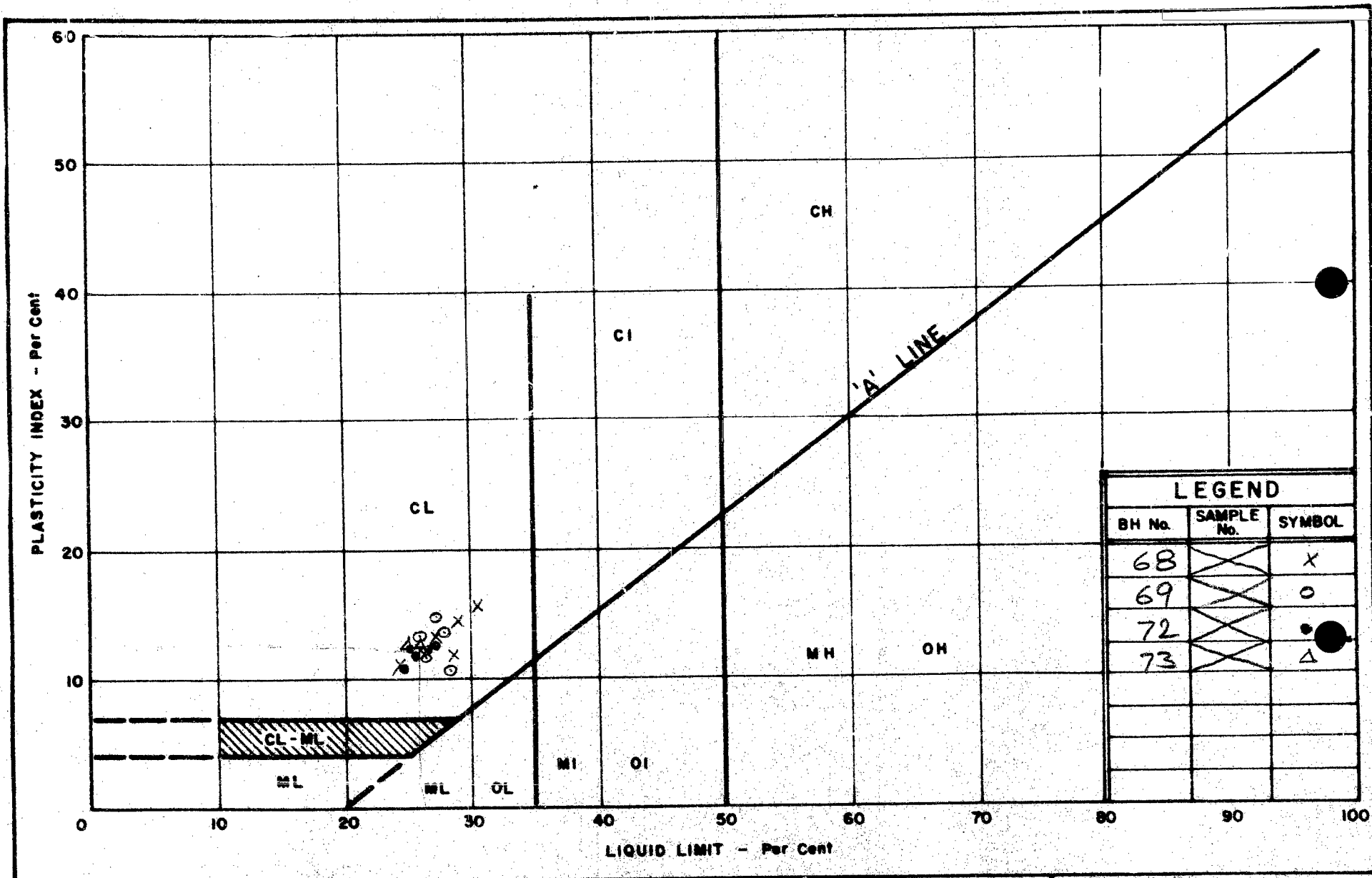
COMPILED BY \_\_\_\_\_ AMS

DATUM \_\_\_\_\_ Geodetic

BOREHOLE TYPE Continuous flight auger

**CHECKED BY**

[illegible]



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

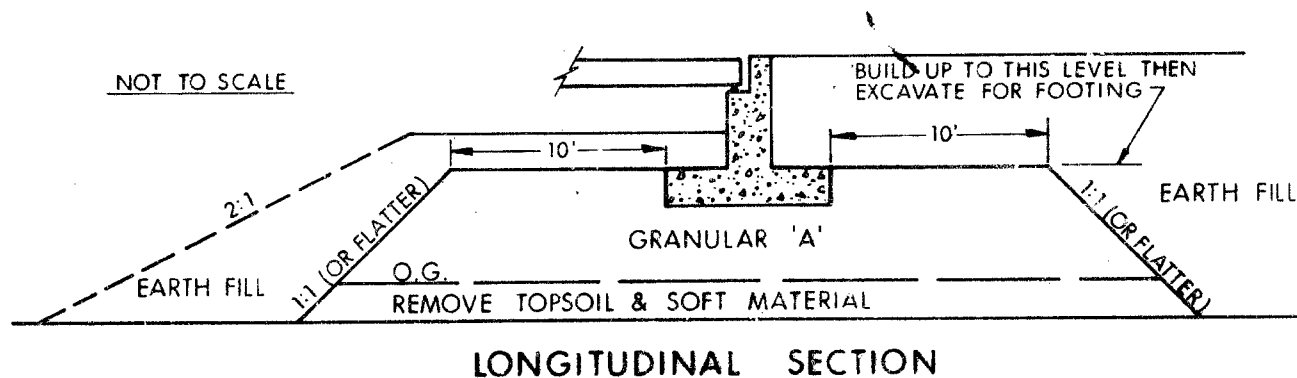
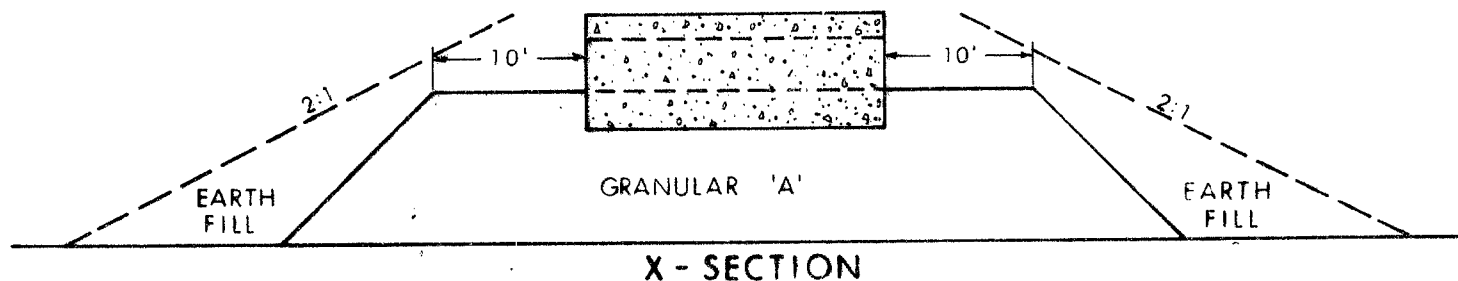
# PLASTICITY CHART

CLAYEY SILT  
FIGURE ④ ①

WP No. 257-66-06

JOB No. 71-1115

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



## NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT ~~STANDARDS~~ STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.



FOUNDATION INVESTIGATION REPORT  
for  
The Proposed E.C. Row Expressway  
North Service Road and C. & O. Railway Crossing  
Lot 97                      Con. 2  
City of Windsor - County of Essex  
District #1 (Chatham)  
W.O. 71-11115 - W.P. 257-66-06

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1. INTRODUCTION:

A request for a Foundation Investigation at the crossing of the proposed E. C. Row Expressway North Service Road and C. & O. Railway was received from Mr. A. P. Watt, Regional Bridge Planning Engineer, in a memorandum dated October 12, 1971.

A preliminary Foundation Investigation covering this area was carried out in April 1968 (68-11015-3). A more detailed field investigation was subsequently carried out to determine the subsoil conditions existing at the site.

This report contains the results of both investigations and our recommendations pertaining to the design of the proposed structure foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site of the proposed overpass structure is situated in the eastern part of the City of Windsor just north of the intersection of the existing E. C. Row Blvd. and C. & O. Railway.

The surrounding terrain, with the exception of the approx. 2 ft. high railway embankment and the approx. 3 ft. deep drainage ditches, is flat and cultivated farmland.

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

### 3. FIELD AND LABORATORY INVESTIGATION PROCEDURE:

A total of 7 sampled boreholes and 8 dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of bombardier mounted continuous flight auger machines, and conventional diamond drilling equipment adapted for soil sampling purposes. During the field work, disturbed samples were obtained by means of 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 or by hand. Where possible, field vane tests were carried out at elevations generally 12 inches below sample depths.

Dynamic cone penetration tests were carried out adjacent to each borehole, and also at one other location. Driving energy to advance the cone was 350 ft.-lbs. per blow.

The bedrock was proved at one borehole location using AXT rock coring equipment.

All boreholes were surveyed in the field by personnel from London Region Engineering Surveys Section. The locations and elevations of the borings are shown on Drawing No. 71-11115A 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

The test results are summarized on the Record of Borehole Sheets contained in the Appendix of this report.

#### 4. SOIL TYPES AND SOIL CONDITIONS:

##### 4.1) General:

Generally uniform subsoil conditions were found to prevail over the site area. The subsoil consists of a deep deposit of cohesive soil, followed by limestone bedrock. The boundaries between different deposits are shown on the Record of Borehole Sheets attached to the Appendix. The estimated stratigraphical profile of Drawing 71-11115A is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil types and soil properties, as follows:

##### 4.2) Clayey Silt with Sand and Traces of Gravel:

This deposit was intersected in all borings and extends from immediately below the ground surface, down to the bedrock surface for a minimum depth of 130 ft. The material in the deposit consists of clayey silt with sand and traces of gravel. A plot of Plasticity Index versus Liquid Limit (Fig. 1) shows the points to fall within the CL Zone. In some boreholes relatively thin layers of granular soils were found to occur within the main deposit.

A highly overconsolidated zone due to the desiccation and/or weathering, with a thickness ranging from 9 to 21 ft. was found to extend from the upper surface of the stratum. This zone is brown in colour due to oxidation and apart from the upper 3 to 5 ft. (frost affected zone) has a very stiff to hard consistency: 'N' values ranged from 20 to 98 blows per foot. Based on the Standard Penetration Test results only, the undrained shear strength of this dessicated zone is estimated to be in the order of 2,500 PSF to 10,000 PSF. Below the desiccated layers the colour of the soil is grey and the consistency ranges somewhat randomly from stiff to hard. For design purposes the following undrained Shear Strength Values are suggested:

Ground Level	-	El. 610	2,000 PSF
El. 610	-	El. 602	5,000 PSF
El. 602	-	El. 590	2,500 PSF
El. 590	-	El. 487	1,500 PSF

Physical properties of the overall deposit, as determined from field and laboratory tests, are as follows:

Natural Moisture Content: (%)	11.5 to 18.6
Liquid Limit: (%)	23.8 to 30.4
Plastic Limit: (%)	12.3 to 16.7
Bulk Density: (PCF)	131 to 137
Unconfined Shear Strength: (PSF)	664 to 2,620
Field Vane Test: (PSF)	960 to 2,000 +
Sensitivity:	1.2 to 1.9
'N' Value: (Blows/Ft.)	8 to 98

Typical Grain-Size Distribution Curves are included in the Appendix of this report (Fig.2).

#### 4.3) Limestone Bedrock:

Bedrock at this site was found to consist of generally sound limestone at El. 487 (B.H. #68).

#### 5. GROUNDWATER CONDITIONS:

The following Groundwater Levels were observed during the field investigation:

B.H.# 68	Not Established
69	Not Established
72	Not Established
73	Not Established
131	El. 613.4
141	El. 611.3
146	Not Established

It is pointed out that the foregoing quoted figures may not represent the true Groundwater Levels, due to the relatively impermeable nature of the subsoil and the short duration of the field work.

## 6. DISCUSSION AND RECOMMENDATIONS:

### 6.1) General:

It is proposed to build a three-span (44'-53'-44') overpass structure at the crossing of the E. C. Row Expressway North Service Road and the C. & O. Railway. The proposed profile grade of the E. C. Row Expressway will be approximately 27 ft. above the existing C. & O. Railway grade (rail) of El. 620.

As described in the previous paragraphs of this report, the subsoil at the site consists of a deep deposit of clayey silt with sand and traces of gravel, underlain by limestone bedrock. The upper portion of the deposit contains 9 to 21 ft. thick very stiff to hard desiccated zone. Below this zone the undrained shear strength of the material decreases. The desiccated crust appears to be suitable for Spread Footing Type Foundations.

Because of the compressible nature of the subsoil, it is inevitable that consolidation settlements will occur over a long term period due to the imposed loads of structure and embankment. Past experience, however, indicates that these settlements will be of a minor nature.

### 6.2) Foundations:

#### a) Spread Footings in Original Ground:

The entire structure may be supported on spread footings placed within the very stiff to hard desiccated zone of the subsoil between El. 610. and El. 602. A safe net pressure of 3.5 TSF may be assumed for design purposes.

The desiccated zone is susceptible to softening on contact with water, therefore, it is recommended that the base of the footing excavations be protected by a concrete working slab, immediately on exposure.

All foundations should be protected against frost action by at least 4 feet of earth cover. No dewatering problems are anticipated.

The estimated maximum settlement will be in the order of 1.0 to 1.5 inches under the pier footings.

b) Spread Footings on Compacted Fill:

As an alternative, the abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 TSF may be assumed. The granular material should consist of G.B.C. Class 'A and should be fully compacted according to the current standards. A detailed construction scheme is outlined on Figure 3 of the Appendix.

c) Perched Abutments on Short Piles:

As a second alternative, the abutments may be constructed within the approach fills and supported on short piles driven through the fill and some 10 ft. into the original ground. In the case of 12-3/4" O.D. and 1/4" thick wall steel tube piles, a safe design load of 25 tons per pile may be used.

It should be pointed out, that this latter proposal is based on experience with similar structures and similar sub-soil conditions in the general area.

Regardless of which method is adopted (a, b, or c), the structure should be built to accommodate the 3.0 to 3.5 inches differential settlement between the abutments and piers.

d) End-Bearing Piles:

As another alternative, the abutments and piers may be supported on steel H-piles driven to bedrock. The maximum allowable load for the particular steel section may be assumed for design purposes.

6.3) Approach Embankments:

The shear strength of the subsoil is such that it will be able to safely support the 31 ft. high approach embankments constructed with 2:1 slopes. The fill should consist of well compacted acceptable materials. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven, and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.

Based on performance of structures and embankments built in the same general area and under somewhat similar sub-soil conditions, it is estimated that a maximum settlement of 4 to 5 inches will take place over a long period of time under fill at the abutment location.

To minimize the effect of differential settlements between the abutments and pier footings, it is recommended that the approach embankments be built in advance of the structure for as long a period as possible. The topsoil and the soft surficial material should be removed in accordance with the pertinent standards within the construction area.

7. MISCELLANEOUS:

The field investigation was carried out during the period April 1 to 3, 1968, and November 17, 18 and 25, 1971, under the supervision of Mr. A. Prakash and Mr. P. Payer, Project Foundation Engineers.

The equipment used was owned and operated by Dominion Soil Investigation Ltd., and Master Soil Investigation Ltd.

This report was written by P. Payer and reviewed by K. G. Selby, Supervising Foundation Engineer.

*P. Payer*  
P. Payer, P.Eng.



December, 1971.

*K. G. Selby*  
K. G. Selby, P.Eng.

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 131

FOUNDATION SECTION

JOB <u>72-11115</u>	LOCATION <u>Co-ords. 100, 188N; 77, 519E</u>	ORIGINATED BY <u>P.P.</u>
W.P. <u>257-66-06</u>	BORING DATE <u>Nov. 17, 1971</u>	COMPILED BY <u>P.P.</u>
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Cont. Flight Auger</u>	CHECKED BY <u>162</u>

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	Liquid Limit ———— $w_L$	BULK DENSITY	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 P.S.F.	$w_p$ ———— $w$ ———— $w_L$			
							○ UNCONFINED + FIELD VANE	WATER CONTENT %			
							● QUICK TRIAXIAL x LAB. VANE	10 20 30			
618.8											
0.0	Clayey silt with sand and trace of gravel V. Stiff To Hard		1	SS	12	610					
			2	SS	18						
			3	SS	33						
			4	SS	64						
			5	SS	51						
			6	SS	84						
			7	SS	51						
			8	SS	28						
			9	SS	20						
			10	SS	22						
597.3											
27.5	End of Borehole					590					



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No.68 (68-11015-3) FOUNDATION SECTION

JOB 71-11115

LOCATION Co-ords. 100, 128N; 77, 447E.

ORIGINATED BY AP

W.P. 257-66-06

BORING DATE April 1 & 2, 1968

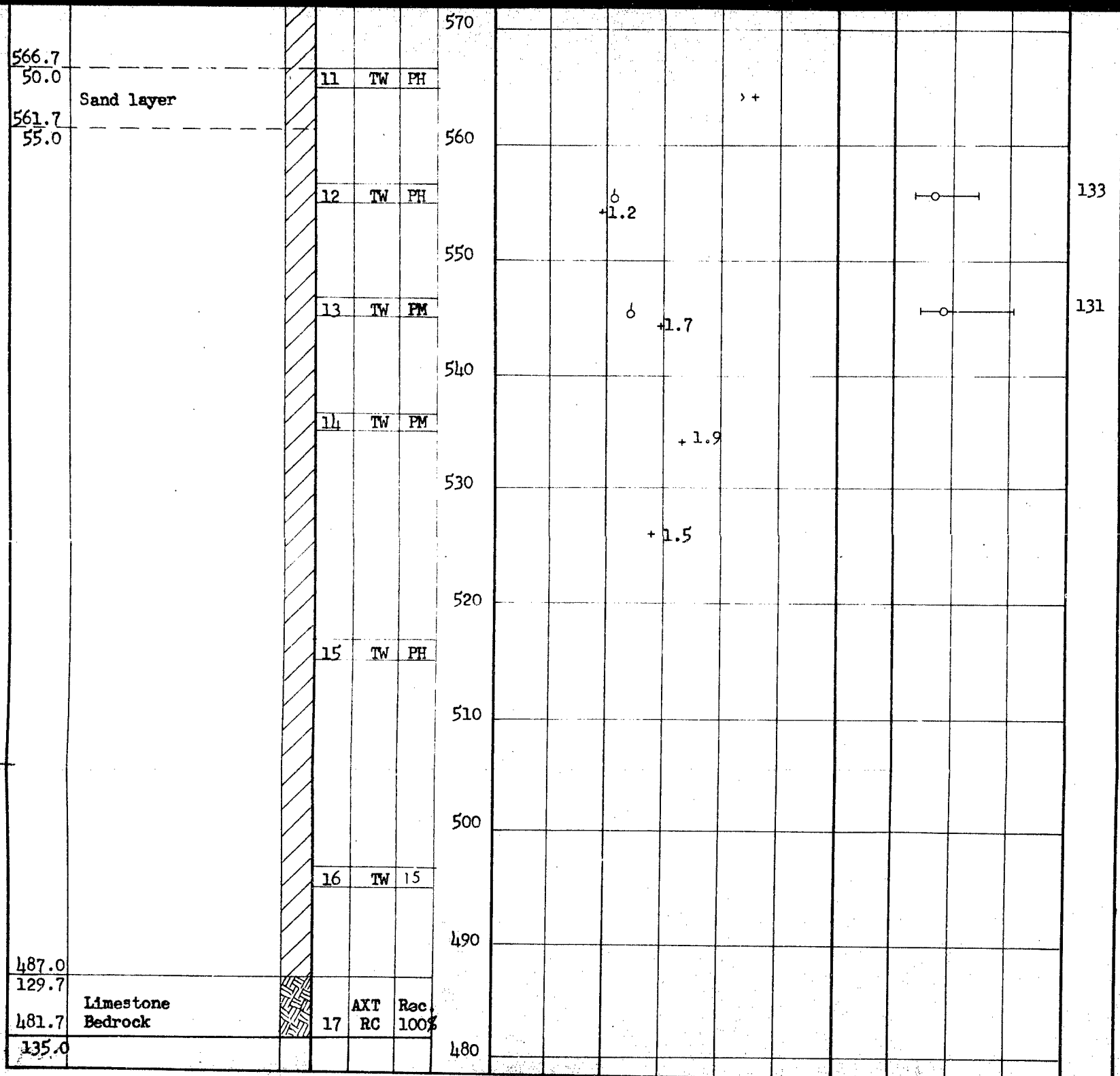
COMPILED BY **AMS**

DATUM Geodetic

BOREHOLE TYPE      Cont. flight auger

CHECKED BY *752*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w <sub>L</sub> PLASTIC LIMIT ——— w <sub>p</sub> WATER CONTENT ——— w			BULK DENSITY Y	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.					WATER CONTENT %					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE 500 1000 1500 2000 2500					w <sub>p</sub> ——— w ——— w <sub>L</sub> 10 20 30			P.C.F.	GR. SA. SI. CL.	
616.7 0.0	Ground level																
	Clayey silt with sand traces of gravel		1	SS	10												
			2	SS	39	610											
			3	SS	44												
			4	SS	29												
			5	SS		600											
			6	TW	PH											137	2 28 47 23
			7	TW	PH	590											
			8	TW	PH												
			9	TW	PH	580											
			10	TW	PH											135	2 29 44 25
566.7 50.0	Sand layer		11	TW	PH												
561.7 55.0						560											
			12	TW	PH										133		



MATERIALS &amp; TESTING OFFICE

JOB 71-11115

LOCATION Co-ords. 100, 224N; 77, 633E

ORIGINATED BY GEH

W.P. 257-66-06

BORING DATE April 2 &amp; 3, 1968

COMPILED BY **AMS**

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— W <sub>L</sub>	BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— W <sub>P</sub>			WATER CONTENT ——— W
							20 40 60 80 100	W <sub>P</sub> ——— W ——— W <sub>L</sub>			10 20 30
							SHEAR STRENGTH P.S.F.				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				
							500 1000 1500 2000 2500				
616.3	Ground level										
0.0											
			1	SS	17						
			2	SS	62	610					
			3	SS	98						
			4	SS	70						
			5	SS	43	600					
			6	SS	33						
			7	SS	23	590					
			8	SS	24						
			9	SS	24	580					
			10	TW	PM						
			11	TW	PM	570					
			12	TW	PM						
						560					

Hard  
to very stiff  
Stiff

Clayey silt, with  
sand, traces of  
gravel.

100/10"

ρ +1.5

+1.6

+1.8

133

1 30 43 26

1 30 37 32

Clayey silt, with  
sand, traces of  
gravel.

11 TW PM

570

12 TW PM

+1.6

+1.8

560

13 TW PM

Q

+1.8

—○—

134

550

14 TW PM

> +

540

15 TW PM

530

520

510

500

490

480

545.3

71.0

Sand seams

541.3

75.0

486.8

129.5

Probable Bedrock  
End of Borehole

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 72 (68-11015-3) FOUNDATION SECTION

JOB 71-11115 LOCATION Co-ords. 100, 230N; 77, 441E. ORIGINATED BY A.P.  
W.P. 257-66-06 BORING DATE April 3, 1968 COMPILED BY AMS  
DATUM Geodetic BOREHOLE TYPE Continuous flight auger CHECKED BY MS

SOIL PROFILE			SAMPLES			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 ——— $w_p$				
						SHEAR STRENGTH P.S.F.					WATER CONTENT ——— $w$				
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					$w_p$ ——— $w$ ——— $w_L$				
616.5	Ground level					20	40	60	80	100					
0.0			1	SS	8										
			2	SS	25										
			3	SS	16										
			4	SS	50										
			5	SS	21										
			6	TW	PH										
			7	TW	PH										
			8	TW	PH										
			9	TW	PH										
			10	TW	PH										
			11	TW	PH										
563.5															
53.0	End of Borehole														

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 73 (68-11015-3) FOUNDATION SECTION

JOB 73-11115 LOCATION Co-ords. 100, 111N; 77, 660E. ORIGINATED BY GEH  
W.P. 257-66-06 BORING DATE April 3, 1968 COMPILED BY AMS  
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — $w_L$			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS/FOOT	20	40	60	80	100	PLASTIC LIMIT — $w_p$	WATER CONTENT — $w$		
616.3	Ground level															
0.0																
	Clayey silt with sand, traces of gravel		1	SS	59	610										
			2	SS	83											
			3	SS	34	600										
			4	SS	22											
			5	SS	20	590										
			6	SS	19											
			7	TW	PH	580										
			8	TW	PH											
			9	TW	PH											
563.3																
53.0	End of Borehole															

FOUNDATION SECTION

CHECKED BY *KJ*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION BLOWS / FOOT	RESISTANCE	LIQUID LIMIT ———— $w_L$	PLASTIC LIMIT ———— $w_p$	WATER CONTENT ———— $w$	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.	$w_p$	$w$	$w_L$	P.C.F.	GR. SA. SI. CL.
618.8	Ground level						○ UNCONFINED      + FIELD VANE ● QUICK TRIAXIAL    x LAB. VANE					
0.0	Probable clayey silt with sand and trace of gravel					610						
603.8												
15.0	End of Conehole					600						





DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 146

FOUNDATION SECTION

JOB 71-11115 LOCATION Co-ords. 100, 101N; 77, 6203

ORIGINATED BY P.P.

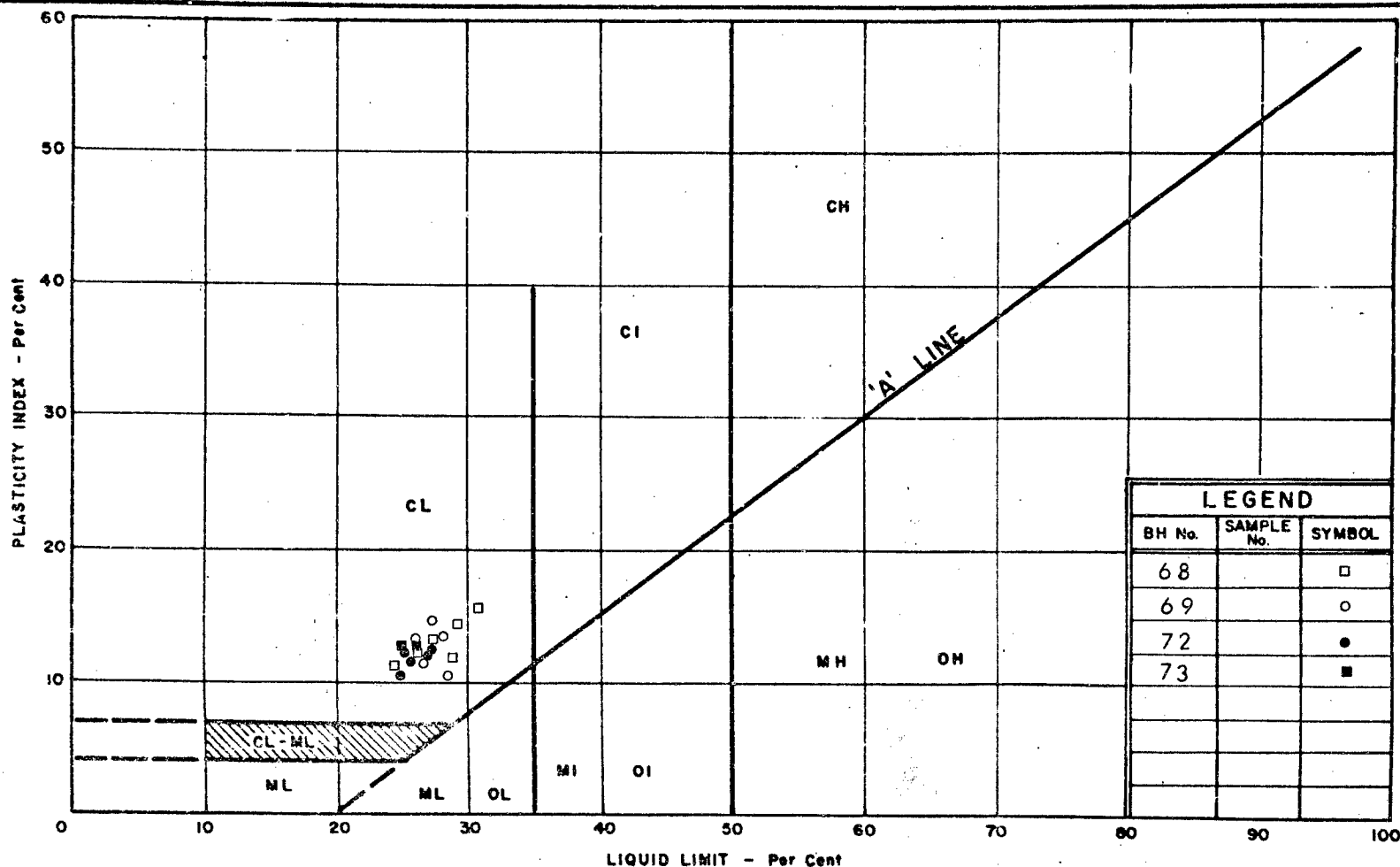
W.P. 257-16-06 BORING DATE Nov. 25, 1971

COMPILED BY P.P.

DATUM Geodetic BOREHOLE TYPE Cont. Flight Auger

CHECKED BY H.V.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY Y	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		WATER CONTENT % 10 20 30			
616.3	Ground level											
0.0	Clayey silt with sand and trace of gravel Stiff to hard		1	SS	17							
			2	SS	38							
			3	SS	57							
			4	SS	33							
			5	SS	10							
			6	SS	14							
593.8			7	SS	14							
22.5	End of Borehole					590						



LEGEND		
BH No.	SAMPLE No.	SYMBOL
68		□
69		○
72		●
73		■



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

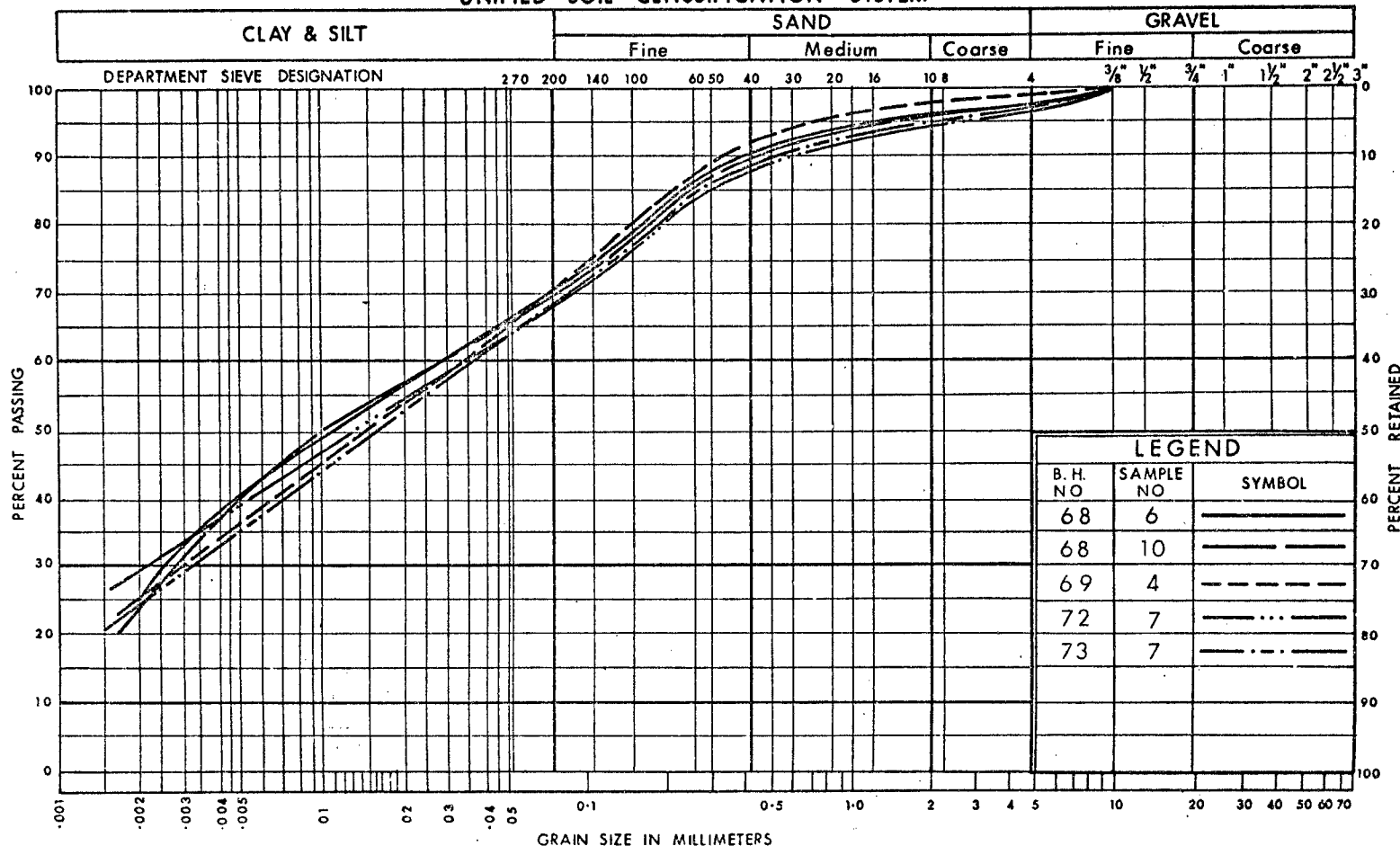
## PLASTICITY CHART CLAYEY SILT

WP No. 257-66-06

JOB No. 71-11115

FIG. NO. 1

# UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
B. H. NO.	SAMPLE NO.	SYMBOL
68	6	—————
68	10	—————
69	4	- - - - -
72	7	— · · · —
73	7	— · · · —

DEPARTMENT  
OF  
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES  
BRANCH

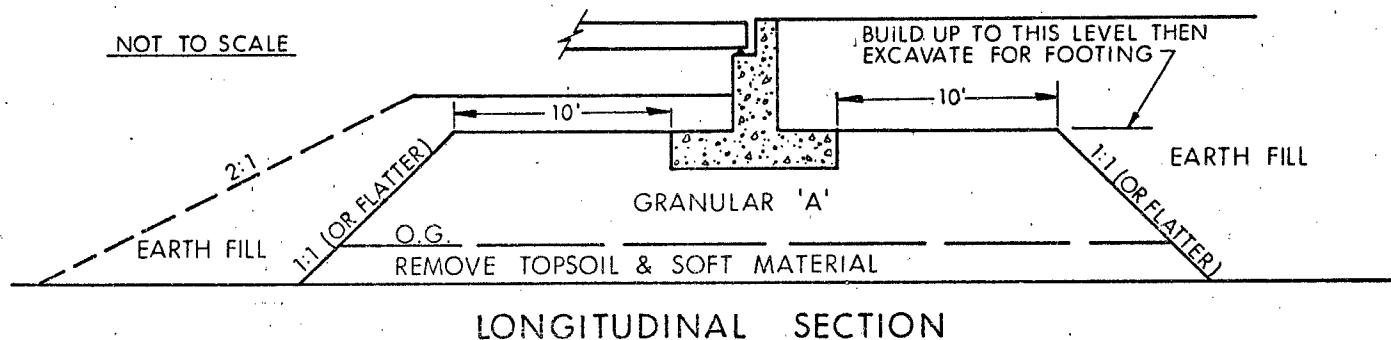
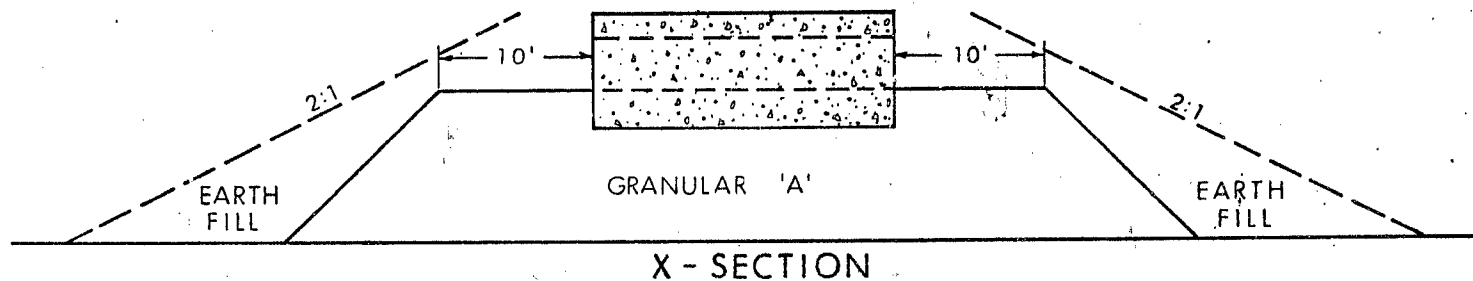
## GRAIN SIZE DISTRIBUTION CLAYEY SILT

W.P. No. 257-66-06

JOB No. 71-11115

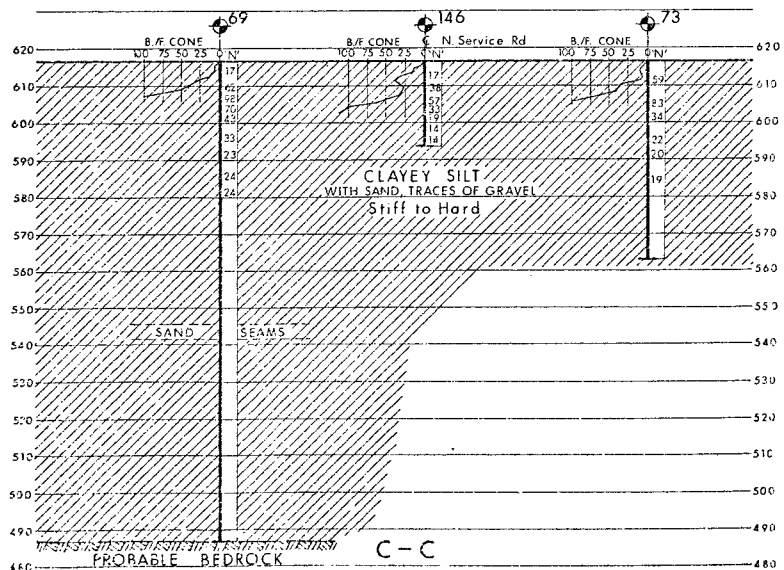
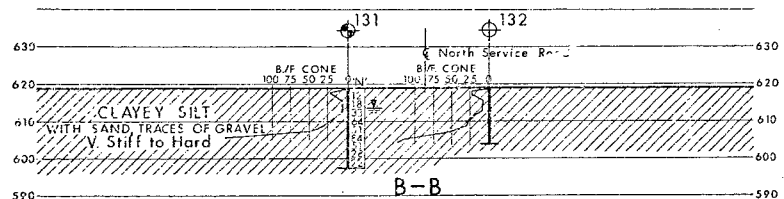
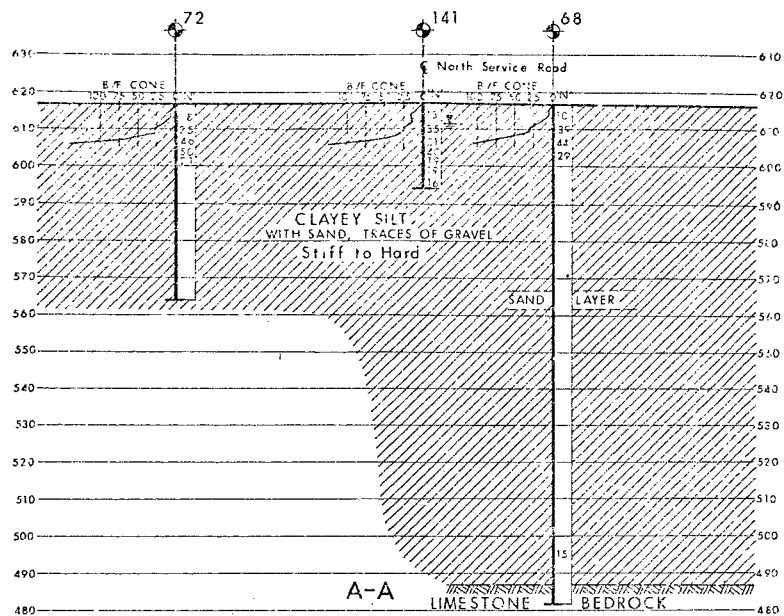
FIG. NO. 2

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



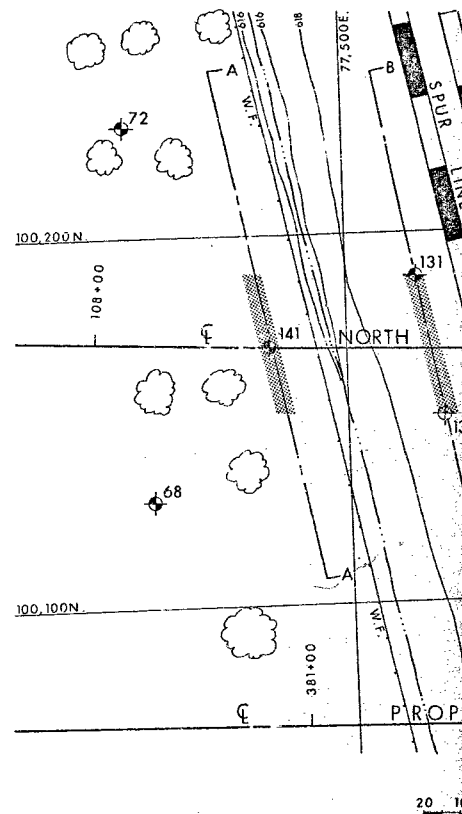
## NOTES

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



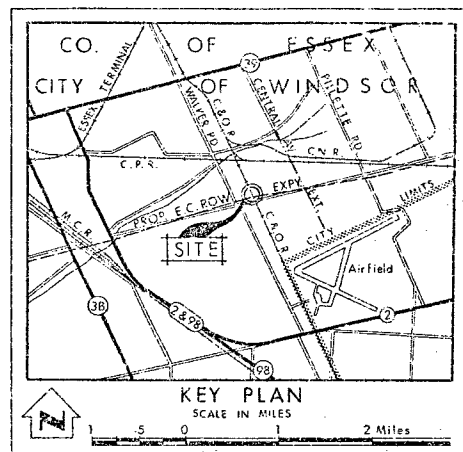
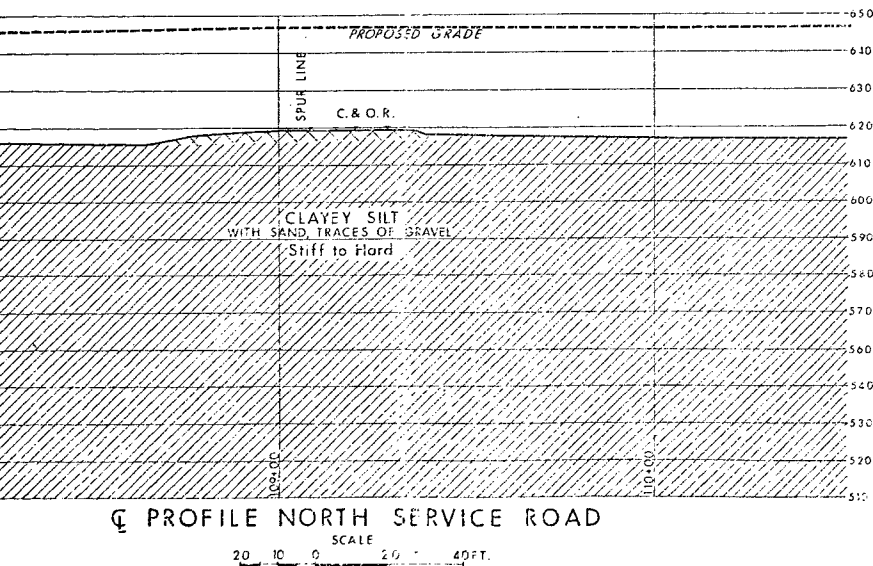
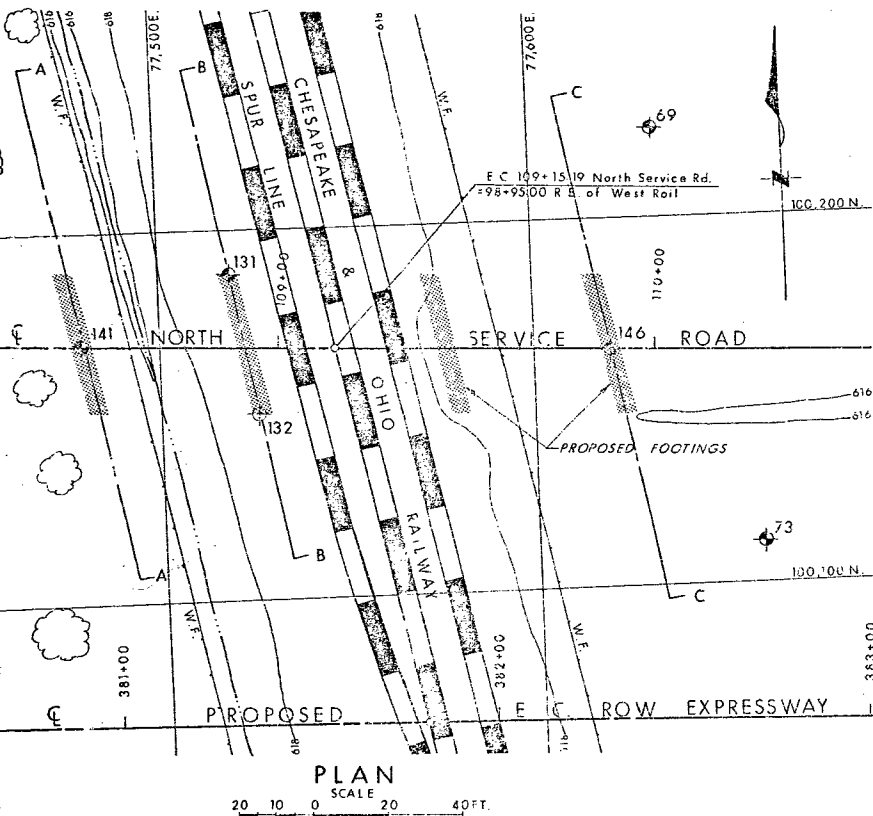
### SECTIONS

SCALE 20 10 0 20 40 FT.



### PROFILE

20 10 0 20 40 FT.



LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation in Boreholes 131 & 141 only Nov. 1971		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
68	616.7	100,123	77,447
69	616.3	100,224	77,633
72	616.5	100,230	77,441
73	616.3	100,111	77,660
131	618.8	100,188	77,519
132	618.8	100,150	77,526
141	616.3	100,170	77,479
146	616.3	100,164	77,620

**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.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION & COMMUNICATIONS  
DESIGN SERVICES BRANCH — FOUNDATION OFFICE

**CHESAPEAKE & OHIO RAILWAY**  
AND  
**NORTH SERVICE ROAD**  
HIGHWAY #10 E.C. ROW EXPRESSWAY DIST. NO. 1  
CO. ESSEX City of WINDSOR  
FWP. LOT 97 CON. 11

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBMIT P.F.	CHECKED	W.P. NO. 257-66-06	DRAWING NO.
DRAWN	CHECKED	JOB NO 71-11115	71-11115A
DATE Dec 17, 1971	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	DATE		

REF. NO. E-5308-1