

Copy for the information of

Mr. M. Devata, Supervising Foundation Engineer,
Room 107, Lab. Building

Bridge Division,
Downsview, Ontario,
January 26, 1967

DeLeuw, Cather and Company
of Canada Limited,
Consulting Engineers,
Billings Bridge Plaza,
Riverside Drive,
Ottawa 8, Ontario

Attention: Mr. G. Saunders, P. Eng.

RE: W.P. 423-64, Site 3-255
Acres Rd. Overpass Structure
Ottawa Queensway Extension
0.4 Miles West of Hwy. #15
District No. 9

Dear Sir:

Enclosed please find a memo from M. Devata of the Foundation Section to the Bridge Office dated January 20, 1967. This memo is intended to serve as an interim report for the above structure pending the completion of the Foundation Investigation Report.

Mr. Grebski and I feel that the 90 tons recommended for the tube piles may be too high and have suggested that the allowable load be limited to 80 tons for a 12-3/4" O.D. tube pile having a wall thickness of 0.250 inches. We believe that by lowering the allowable load to 80 tons there will be less chance of buckling the shell during its installation. We would be interested in your considered opinion regarding this point.

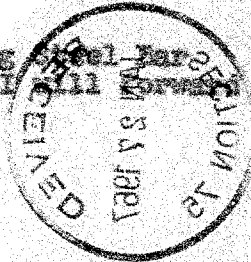
..... 2

PR: W.P. 423-64, Site 3-255
Acres Rd. Overpass Structure
Ottawa Queensway Extension
0.4 Miles West of Hwy. #15
District No. 9

I have also enclosed one copy each of DB-B.8.1.1(Rev.), "Post-tensioning Cable Friction" and DB-B.12.4.3, "Reinforcing Steel Bar Schedule Program". These are included for your general information.

The Instruction Manual for the Reinforcing Steel Bar Schedule Program is currently being revised. I will forward you a copy when it is available.

Yours truly,



JLK:rd

J.L. Keen, P. Eng.,
Senior Bridge Project Engineer

Encls.

c.c. M. Devata

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. B. B. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

From: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Date: January 20, 1967

Our File Ref.

In Reply To:

SUBJECT:

FOUNDATION INVESTIGATION REPORT

For

The Proposed Crossing of Acres Rd. (Line 'A') and
Ottawa Queensway Extension (Line 'D')
-- District #9 (Ottawa) --

W.J. 66-F-110 (R)

-- W.P. 423-64

A request to conduct a foundation investigation at the above mentioned site, was contained in a memo dated November 18, 1966, from the Bridge Section (Mr. G. Scott, Regional Bridge Location Engineer, Kingston).

The site is located 2,500 feet west of the junction of Hwy's 7 and 15 and the Queensway in Lots 15 and 16, Concession II, Ottawa Front, in the Township of Nepean, Carleton County.

Due to the urgency of this project, we have been requested to submit our written recommendations as soon as the field and laboratory work have been completed. The final report will be submitted after the completion of the drawings and borelogs. A brief review is given below, of subsoil conditions, together with recommendations for the structure foundations and approach fills.

Subsoil:

Subsoil at the site consists generally of an irregularly layered deposit of soils varying from silty clay to silty sand underlain by a dense to very dense deposit of sand to silty sand with a trace of gravel. In the upper layers, silty clay to clayey silt predominates. With increasing depth the proportion of silt and sand seams and layers increases until the deposit is predominantly sandy silt to silty sand. At a depth of 27 ft. to 37 ft. the deposit of sand to silty sand with a trace of gravel is encountered. All boreholes were terminated in this material at depths of 51.5 to 81.5 feet.

Field vane and quick triaxial test results indicate undrained shear strengths between 1,000 and 2,000 p.s.f. The unconfined compression test results are lower, but are not considered truly representative because of the layered nature of the soil.

cont'd. / 2 ...

Recommendations:

It is proposed to construct two separate three-span overpass structures at this site. Subsoil conditions are not considered favourable for spread footing type foundations; therefore, it is recommended that piers and abutments be established on end-bearing piles driven into the dense silty sand to sand deposit. Large displacement type piles should be used. The final depth and capacity should be controlled in the field according to the D.H.O. Standards DD-1218 and DD-1219. For estimating purposes, the piles should penetrate to about elevation 172.0 (i.e., a depth of about 45 feet) where an allowable load of 90 tons can be used on 12-3/4" O.D. tubular steel piles.

The proposed embankments will be approximately 20 to 25 feet above the existing ground level. No stability problems are anticipated provided that standard 2:1 slopes are constructed.

Due to the highly variable nature of the subsoils, an accurate prediction of settlements caused by the embankment loads, cannot be made; however, from experience with similar deposits, settlements of 6 to 8 inches might be expected.

The complete foundation report will be forwarded to you as soon as possible. Please do not hesitate to call us if further queries arise.

JHLP/MdeP

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
C. R. Robertson
G. Scott
J. E. Gruspier
B. A. Singh

Foundations Office
Gen. Files

M. Devata

M. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

MEMORANDUM

Mr. A. Stermac,
Principal Foundation Engineer,
Administration Building,
DOWNSVIEW, Ontario.

FROM: Mr. G. Scott,
Regional Bridge Location Engineer,
KINGSTON, Ontario.

DATE: February 21, 1967

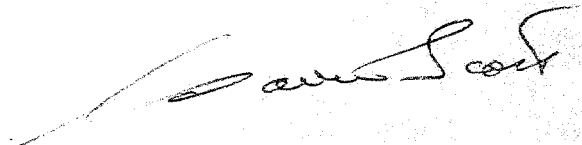
R FILE REF.

IN REPLY TO

SUBJECT: W.P. 423-64, Site 3-255, Acres Road Interchange
Ottawa Queensway, District 9

We understand Functional Planning have decided to change the subject proposal from two overpass structures as originally planned to one underpass structure as shown on the accompanying portion print of DM-5240-1.

We will be pleased to know as to whether you will consider it necessary to have additional borings in connection with the revised project.



G. Scott,
REGIONAL BRIDGE LOCATION ENG.

GS/h1

Enc.

Contacted Mr Scott on Feb 28/1967 and advised that we would like to have final grades of Acres Rd and the Ottawa Queensway for the revised scheme. The details will be available in a weeks time. After reviewing that information we would advise the requirement for additional borings.

M. Swata
Feb 28/67.

48" x 89" C.I.P.

ORME

IV

E. CARVER

H.E.R.C.

P.H. 30+00

SILVER CREEK

P-1870-48

MIN. R/W REQ'D

OT. 25+40 CS W.B.L.

± 26+40 ACRES RD LINE 'A'
± 25+15 E.B.L.

ASPHALT PAVEMENT

La-150'

E.C. 27+67 E.B.L.

± 27+25 LEG 'A'

± 27+25 E.B.L.

± 24+15 ACRES RD.
± 39+15 LEG 'A'

Dc-5°

PAV'T MARKINS ONLY

OC-1°43'

WP. 423-64

DM 5240-1

1'2 100'

D.H.O.
KINGSTON
RECEIVED

B 21 1967

BRIDGE
OFFICE

S.T. 23+62-25

C.S. 22+12-25

S.C. 20+35-58

20+00

19+45-58

MIN. R/W REQ'D

P.I. 21+54.02

± 20+65 ACRES RD
60'

EST. SPIRAL DATA
OS-1030'
LS-150.00
TS-203.44

MEMORANDUM

66F-110

Mr. A. G. Stermac,
Principal Foundation Engineer,
Laboratory Building,
DOWNSVIEW, Ontario.

FROM: Bridge Division,
KINGSTON, Ontario.

DATE: March 8, 1967

FILE REF.

IN REPLY TO

SUBJECT: W.P. 423-64, Site 3-255, Acres Road Underpass,
Ottawa Queensway, District 9

We have just received the attached print of Preliminary Bridge Plan Drawing D-6136-P1 for the subject structure. Please note our letter of March 7 in which we issued a request to you in connection with the foundation investigation.

We would be pleased to have your remarks on this plan.

G. Scott /HNL

G. Scott
REGIONAL BRIDGE LOCATION ENG.

GS/hl
Enc.

MEMORANDUM

Mr. A. G. Stermac,
Principal Foundation Engineer,
Laboratory Building,
DOWNSVIEW, Ontario.

FROM: Bridge Division,
KINGSTON, Ontario.

DATE: March 7, 1967

FILE REF.

IN REPLY TO

SUBJECT:

W.P. 423-64, Site 3-255, Acres Road Underpass,
Ottawa Queensway, District 9

Herewith please find two prints of Plan E-4638-1 showing our proposed location of the subject structure.

A foundation investigation was previously made in this area for two overpass structures and it may be that that information is suitable for the structure as now proposed.

Please inform us as to whether you consider it necessary to make a new foundation investigation at this time.

for M. H. Caird
G. Scott

REGIONAL BRIDGE LOCATION ENG.

GS/hl
Encls.

Copy for the information of

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

Mr. G. Scott,
Regional Bridge Location Engineer,
Kingston Regional Office

Bridge Division,
Downsview, Ontario

March 7, 1967

Acres Road Underpass Structure
0.4 Miles West of Jct. Hwy. 15
W.P. 423-64, Site 3-255
Ottawa Queensway, District 9

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-6136-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$330,000.
This cost includes tender, materials, engineering and sundry
construction.

Any comments or revisions you may have should be submitted
within three weeks.

CSG:rd

C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. R. Forrest
E. Cross
A. Stermac
S. McCombie

AGJ

Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Division,
Admin. Bldg.

Foundation Division,
Materials Testing Div.,
Room 107, Lab. Bldg.

March 9, 1967

Acres Road Underpass Structure,
0.4 Miles West of Jct. Hwy. 15,
W.P. 423-64, Site 3-255, W.J. 66-F-110,
Ottawa Queensway - District #9 (Ottawa).

We have reviewed the Preliminary Dwg. B-6136-P1
for the above mentioned structure, and submit the following
comments:

We note that the structure has been changed from
an overpass to an underpass structure. Recommendations
contained in our Foundation Report W.J. 66-F-110, are generally
applicable in the case of an underpass structure.

Regarding the Preliminary Plan for the above
mentioned structure, we have no further comments.

AD/WdeF

cc: Messrs. S. McCombie
G. Scott

Foundation Files
Gen. Files

M. Devata

M. Devata,
SUPERVISING FOUNDATION ENGR.

For:

A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

MEMORANDUM

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

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

DATE: February 1, 1967

OUR FILE REF.

IN REPLY TO:

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Crossing of Acres Road
(Line 'A' and Ottawa Queensway
Extension (Line 'D')
District #9 (Ottawa)
W.J. 66-F-110 (R) -- W.P. 423-64

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

We believe 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/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
C. R. Robertson
G. Scott
J. E. Gruspier
B. A. Singh

Foundations Files
Gen. Files

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

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FOUNDATION INVESTIGATION REPORT
For
The Proposed Crossing of Acres Road
(Line 'A' and Ottawa Queensway
Extension (Line 'D'))
District #9 (Ottawa)
W.J. 66-F-110 (R) -- W.P. 423-64

1. INTRODUCTION:

A request, dated November 18, 1966, to conduct a foundation investigation at the proposed crossing of Acres Road and the Ottawa Queensway Extension, was received from the Bridge Planning Section (Mr. G. Scott - Kingston).

It is proposed to extend the Ottawa Queensway to the west and at the crossing of Acres Road to construct two 3-span overpass structures.

Subsequently, a foundation investigation was conducted at the proposed site to determine the subsoil conditions. Field and laboratory test results, together with discussion and recommendations for the structure foundations and embankment design, are reported herein.

2. TOPOGRAPHY AND GEOLOGY:

The site is located approximately 2,500 feet west of the junction of highways 7 & 15 and the Ottawa Queensway, and is situated in Lots 15 and 16, Concession II, Ottawa Front, in the Township of Nepean, County of Carleton.

The surrounding area is open pasture land to the south and is residentially developed to the north. Overall, the area is relatively flat. Physiographically, the site lies in the area known as the Lowlands of the St. Lawrence and, more specifically, as the Ottawa Valley Clay Plains.

cont'd. /2 ...

2. TOPOGRAPHY AND GEOLOGY: (cont'd.) ...

The deposits in the area probably were laid down during and immediately following the Wisconsin glaciation at which time the area was depressed from the effect of the glaciation. Salty or brackish waters, known as the Champlain Sea, inundated the area and then gradually receded as the land rebounded to its present level. These deposits are underlain by bedrock, chiefly of Paleozoic age.

3. FIELD AND LABORATORY WORK:

Using conventional diamond drilling equipment adapted for soil sampling purposes, 3 sampled boreholes and 5 dynamic cone penetration tests were carried out at the site. A driving energy of 350 ft.-lbs. per blow was used for the dynamic cone penetration tests.

In cohesive materials, 2-inch I.D. Shelby tube samples were obtained by manually pushing the tube into the soil, if possible. Otherwise, samples of cohesive and non-cohesive materials were obtained, using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test. In-situ shear strength was established, where possible, with a field vane test.

Samples were visually examined and identified in the field and subsequently, in the laboratory. Laboratory tests were conducted on selected representative samples to determine, where applicable, Atterberg limits, bulk density, grain-size distribution, natural moisture content, and shear strength. The shear strength was determined by means of quick triaxial and unconfined compression tests.

Results of the laboratory and field tests, together with the location and elevations of the boreholes, are presented in the appendix of this report.

cont'd. /3 ...

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at the site consists generally of an irregular layered deposit of soils varying from silty clay to silty sand underlain by a deep deposit of sand to silty sand with a trace of gravel followed by a deposit of bouldery till and then bedrock.

4.2) Silty Clay to Silty Sand:

This stratum was encountered in all boreholes at the ground surface and extended to a depth of 27 to 37 feet. The deposit was very irregularly layered. In general, in the upper layers, silty clay to clayey silt layers predominated with some silt and sand seams. This material had a shear strength in the order of 1,000 p.s.f. to 2,000 p.s.f., indicating a stiff consistency. Unconfined compression test results indicated lower shear strengths of a minimum of 500 p.s.f.; however, these results are not considered truly representative because of the layered nature of the soil. With increasing depth, the proportion of silt and sand seams increased until the deposit was predominantly sandy silt to silty sand which gave 'N' values of 3 to 8 blows per foot, indicating a very loose to loose relative density.

The clayey silt and silty clay layers had liquid limits between 21 and 48 percent, plastic limits between 15 and 35 percent, and moisture contents of 23 to 50 percent.

The silty sand to sandy silt layers generally graded between 13 and 68 percent sand with 69 and 25 percent silt, respectively, and the remainder clay sizes. The moisture content of these layers was about 21 to 30 percent.

cont'd. /4 ...

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

4.3) Sand to Silty Sand:

This deposit extended for the full depth of the exploration and, except for minor variations in gravel content, was sand to silty sand with a trace of gravel. 'N' values varied from about 30 to 117 blows per foot, indicating a dense to very dense relative density.

At a depth of 31.5 ft. and 62.2 ft. in boreholes 5 and 6, respectively, considerable gravel was encountered. These depths may represent the contact with a deposit of sand and gravel with boulders which was indicated in the Preliminary Report 66-F-19.

Gradation curves of the material generally indicated 48 to 94 percent sand sizes with 15 to 2 percent gravel sizes, respectively, and the remainder silt and clay sizes. Natural moisture contents are not available because the high permeability of the deposit permitted saturation with the drilling water prior to sampling.

4.4) Bouldery Till and Bedrock:

These deposits were not explored in this investigation, but are discussed in the Preliminary Report 66-F-19, and are assumed to underlie the sand to silty sand stratum. The bedrock was shale, presumably the Chazy shale of Paleozoic age.

4.5) Groundwater:

The groundwater level was observed in borehole 6 at the time of investigation and was about elevation 213.4 which corresponds to a depth of 3.5 feet.

5. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct 2 separate 3-span overpass structures some 158 feet long. Subsoil consists of an irregularly layered deposit of materials varying from silty clay to silty sand underlain by a deep deposit of silty sand to sand with a trace of gravel.

cont'd. /5 ...

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

The layered material is about 27 to 37 feet thick and is not suitable for the economical use of conventional spread-footing type foundations. The deeper deposit of silty sand to sand does provide a competent foundation material; therefore, a pile-type of foundation is recommended for the piers and abutments. Large displacement type piles should be used. The final depth and capacity should be controlled in the field according to the D.H.O. Standards DD-1218 and DD-1219. Although the relative density of the deposit is rather variable, it is expected that a 12-3/4" O.D. tubular steel pile could be designed for an allowable load of 80 tons when driven to a depth of about 45 feet (El. 172.0).

The proposed approach embankments will be approximately 20 to 25 feet above the existing ground level. No stability problems are anticipated, provided that standard 2:1 side slopes are constructed. Care should be taken that no boulders are in the fill in the area where piles are to be driven.

Although the surface material is predominantly clayey silt to silty clay, some silty sand and sand seams and layers occurred irregularly. Hence, some dewatering scheme might be required for the pile cap excavation.

6. SUMMARY:

The results of a foundation investigation for the proposed crossing of Acres Road and the Ottawa Queensway Extension are presented.

The subsoil at the site consists of some 27 to 37 feet of layered material containing layers of soil varying from silty clay to silty sand underlain by a deep deposit of sand to silty sand with a trace of gravel.

The abutments and piers of the proposed structures should be supported on large displacement pile-type foundations driven into the sand to silty sand stratum.

6. SUMMARY: (cont'd.) ...

No stability problems are anticipated for the proposed embankments of about 25 feet in height with standard 2:1 side slopes.

Excavations into silty sand or sand layers could require some dewatering scheme; otherwise, no problems are anticipated for the pile cap excavations.

7. MISCELLANEOUS:

The field investigation was carried out in the period December 17 to December 23, using equipment owned and operated by F. E. Johnston Drilling Co. Ltd., under the supervision of Mr. L. Palmer, Project Foundation Engineer, who subsequently prepared this report.

The entire project was under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed this report.

February 1967

APPENDIX I.

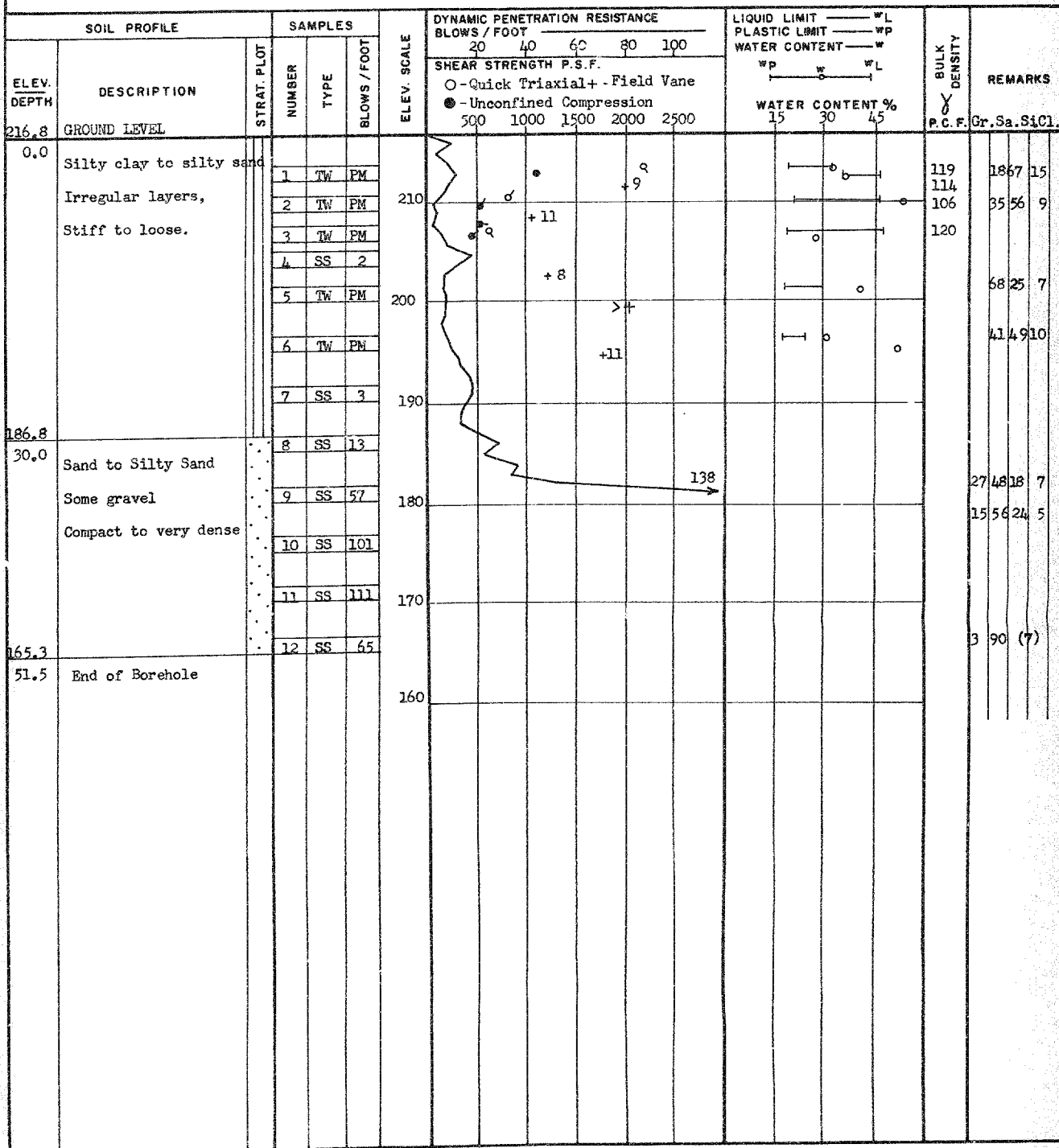
DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 66-F-110(R) LOCATION Queensway & Acres Rd. 25/95 E.B.L., o/s 33.5' Rt. ORIGINATED BY L.P.
W.P. 423-64 BORING DATE December 19, 1966 COMPILED BY L.P.
DATUM Geodetic BOREHOLE TYPE Washboring (NX, BX) CHECKED BY SL



DEPARTMENT OF HIGHWAYS - ONTARIO				RECORD OF BOREHOLE NO. 5				FOUNDATION SECTION								
MATERIALS & TESTING DIVISION																
JOB 66-F-110(R)				LOCATION Queenaway & Acres Rd., 21/400 E.B.L., o/s 331 Lt.				ORIGINATED BY L.P.								
W.P. 423-64				BORING DATE December 21, 1966				COMPILED BY L.P.								
DATUM Geodetic				BOREHOLE TYPE Washboring, NX, BX				CHECKED BY <i>LL</i>								
SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY		REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ - Quick Triaxial + - Field Vane ● - Unconfined Compression			WATER CONTENT % WP WL			P.C.F. G- S _a Si Cl			
217.8	GROUND LEVEL						20 40 60 80 100									
0.0	Silty Clay to Silty Sand.		1	TW	PM	12 ⁿ							121	13	69	18
	Irregular layers		2	TW	PM	210		+20					115	11	59	30
	Stiff		3	TW	PM			+8					124			
			4	TW	PM								117			
			5	TW	PM	200							129	30	58	12
			6	TW	PM								115	54	39	7
190.8			7	TW	PM	190							120	47	46	7
27.0	Sand to Silty Sand		8	SS	38											
	Trace of Gravel		9	SS	75	180										
	Dense to Very Dense		10	SS	78											
			11	SS	70	170										
			12	SS	101											
			13	SS	73	160										
			14	SS	60											
			15	SS	69	150										
			16	SS	43											
136.3	Some Gravel		17	SS	74	140										
81.5	End of Borehole					130										

145

289 (9)

285 (13)

294 (4)

2064 (16)

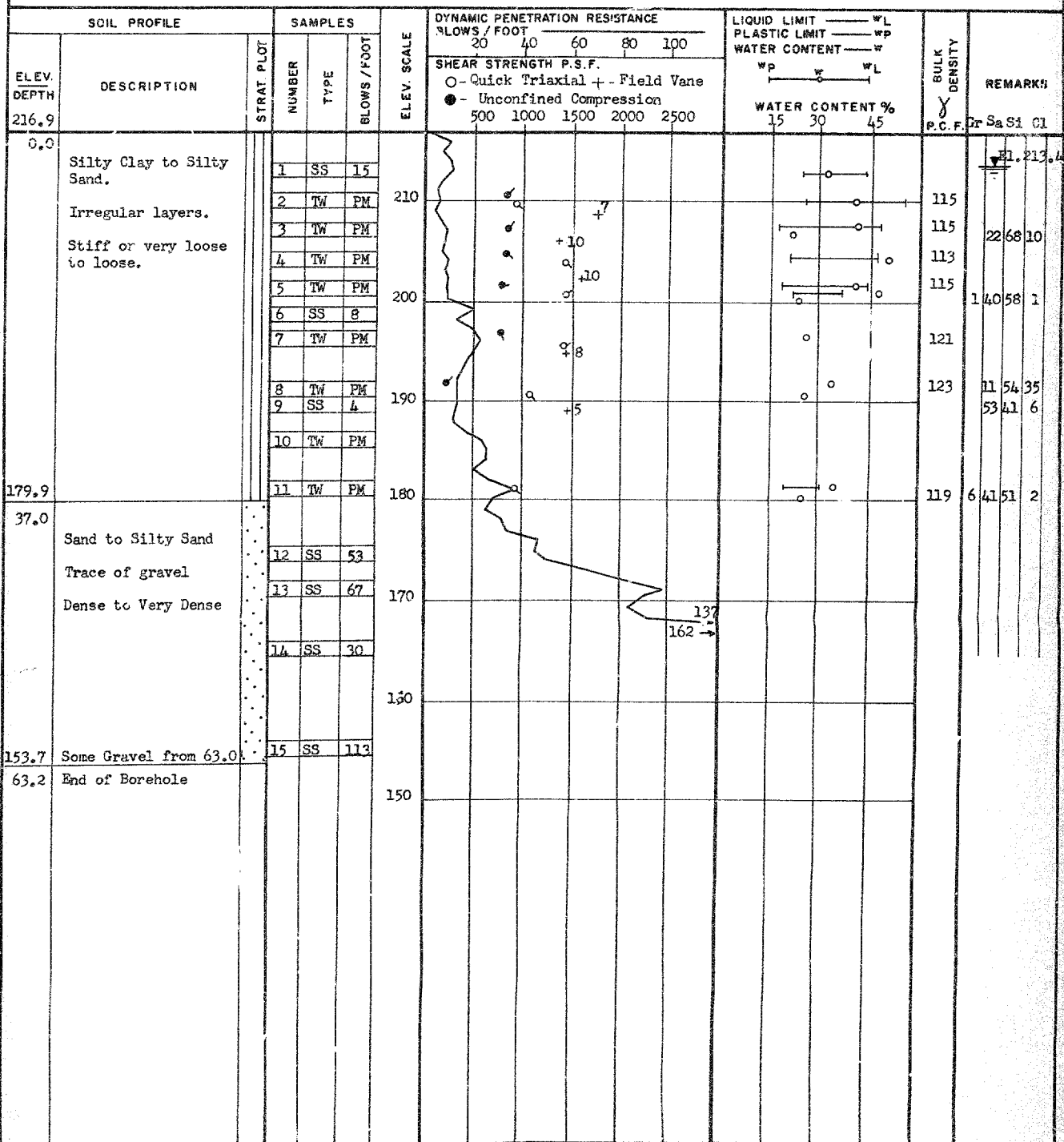
DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 66-F-110(R) LOCATION Queensway & Acres Rd., 24/47 W.B.L., o/s 22.5' Rt. ORIGINATED BY L.P.
 W.P. 423-64 BORING DATE December 19, 1967 COMPILED BY L.P.
 DATUM Geodetic BOREHOLE TYPE Washboring NX, BX CHECKED BY HLR



DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JCS 66-F-110(R)

LOCATION Queensway & Acres Rd., 25 + 89 E.B.L. o/s 33' Lt.

ORIGINATED BY L.P.

W. P. 423-64

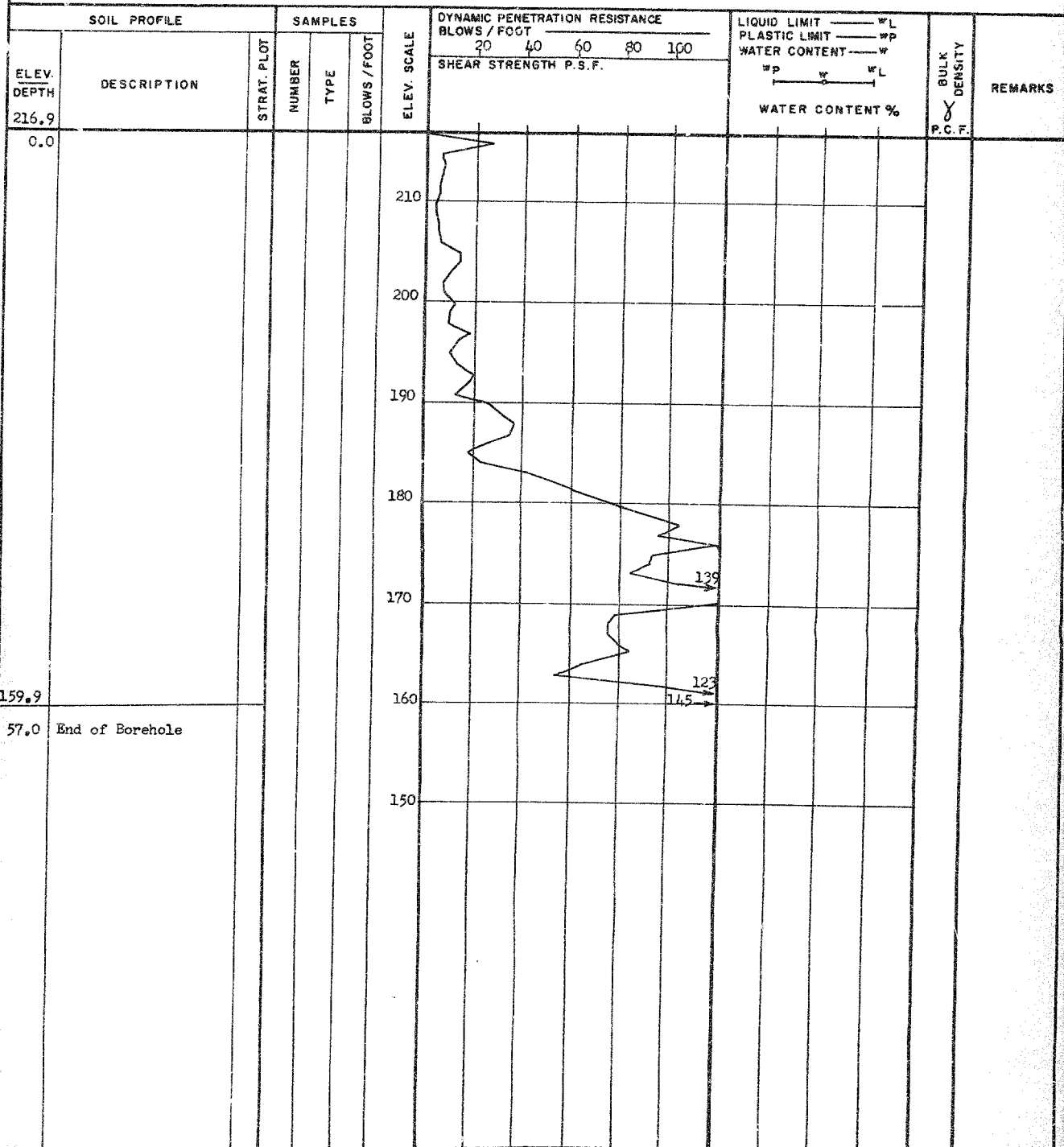
BORING DATE December 21, 1966

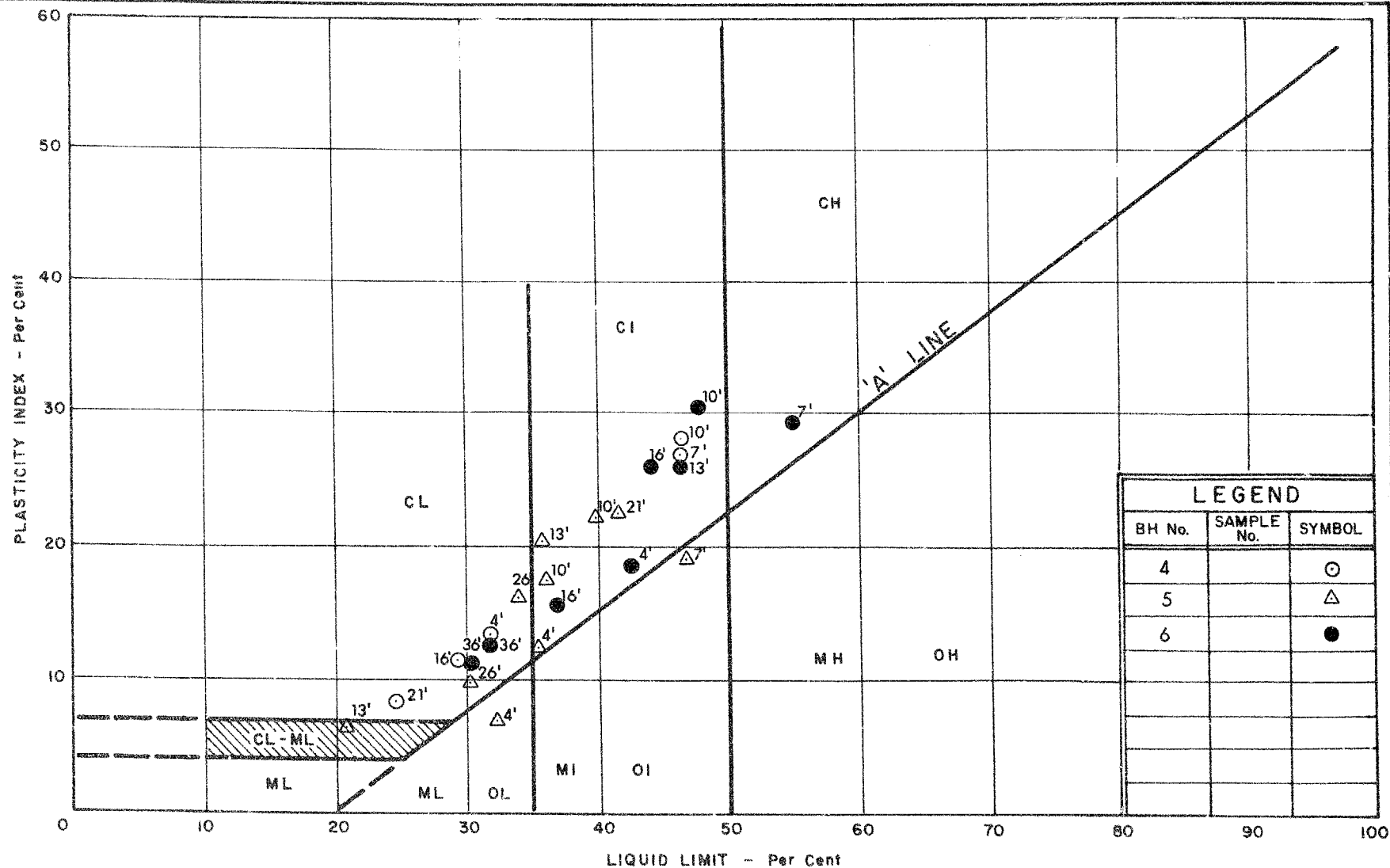
COMPILED BY L.P.

DATUM Geodetic

BOREHOLE TYPE Dynamic Cone Penetration Test

CHECKED BY AK





LEGEND		
BH No.	SAMPLE No.	SYMBOL
4		○
5		△
6		●



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART

WP No. 423-64

JOB No. 66-F-110



ONTARIO

GRAIN SIZE DISTRIBUTION
BOREHOLE 4 - Sample No. as Shown.

JOB No. 66-F-110

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT

SAND

GRAVEL

DEPARTMENT SIEVE DESIGNATION

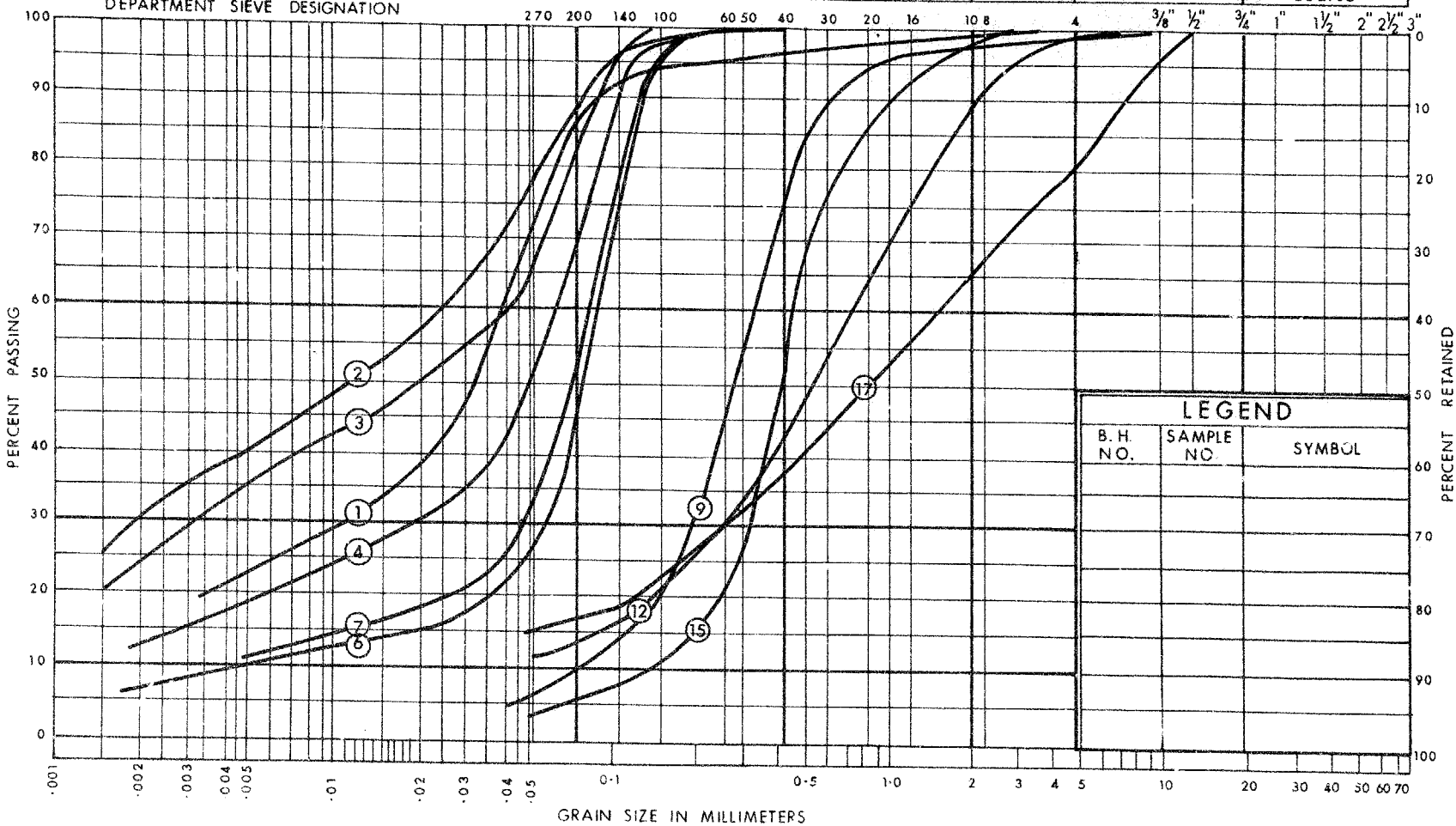
Fine

Medium

Coarse

Fine

Coarse



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION
BOREHOLE 5 - Sample No. as Shown.

W.P. No. 423-64
JOB No. 66-F-110

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY & SILT

SAND

GRAVEL

Fine

Medium

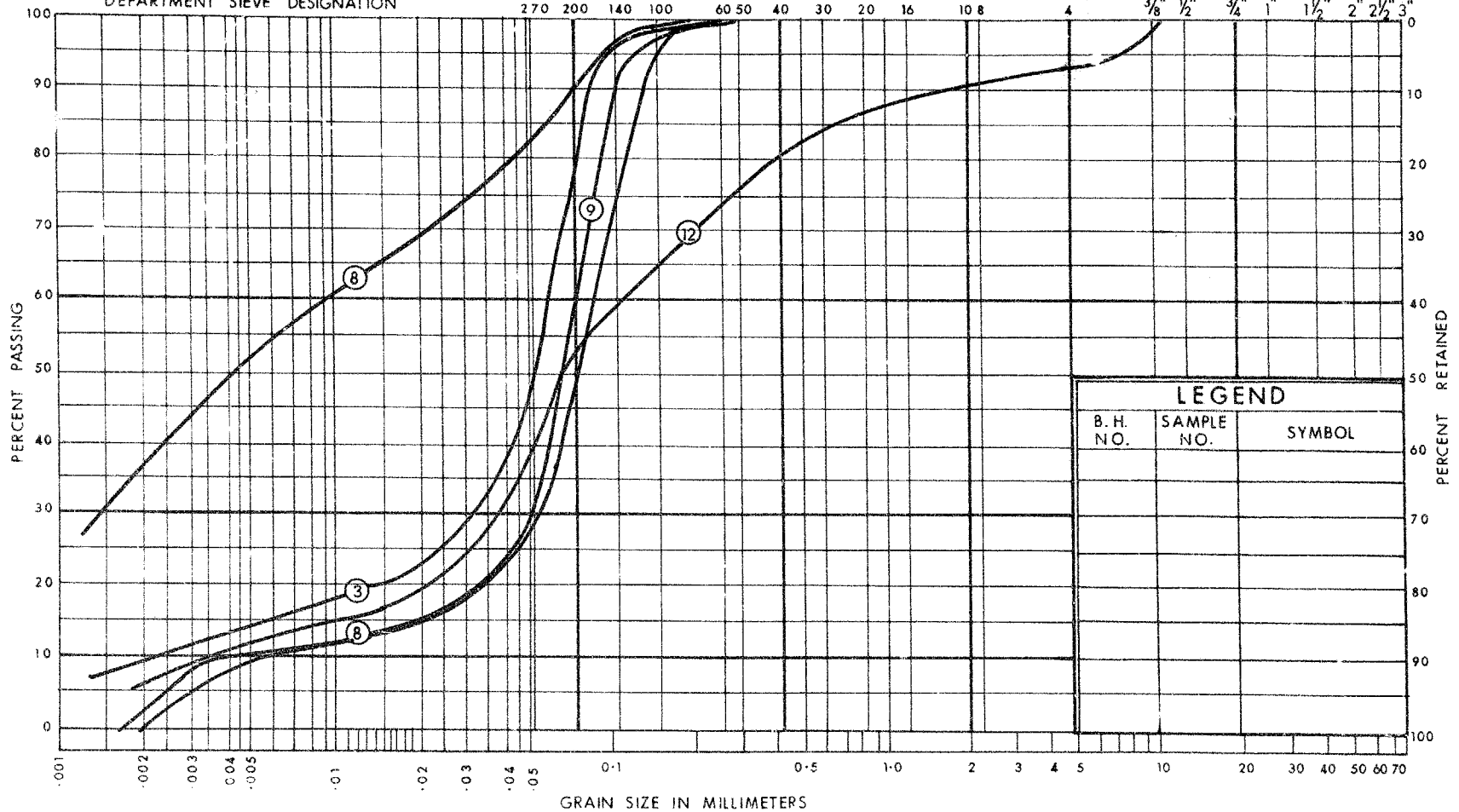
Coarse

Fine

Coarse

DEPARTMENT SIEVE DESIGNATION

270 200 140 100 60 50 40 30 20 16 10 8 4 3/8" 1/2" 3/4" 1" 1 1/2" 2" 2 1/2" 3"



LEGEND

B. H. NO.	SAMPLE NO.	SYMBOL



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION
BOREHOLE 6 Sample No. as Shown.

W.P. No. 423-64

JOB No. 66-F-110

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
W.S.	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

Qu	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

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

GENERAL

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

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

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

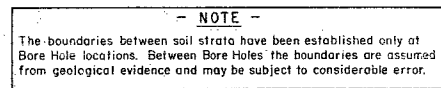
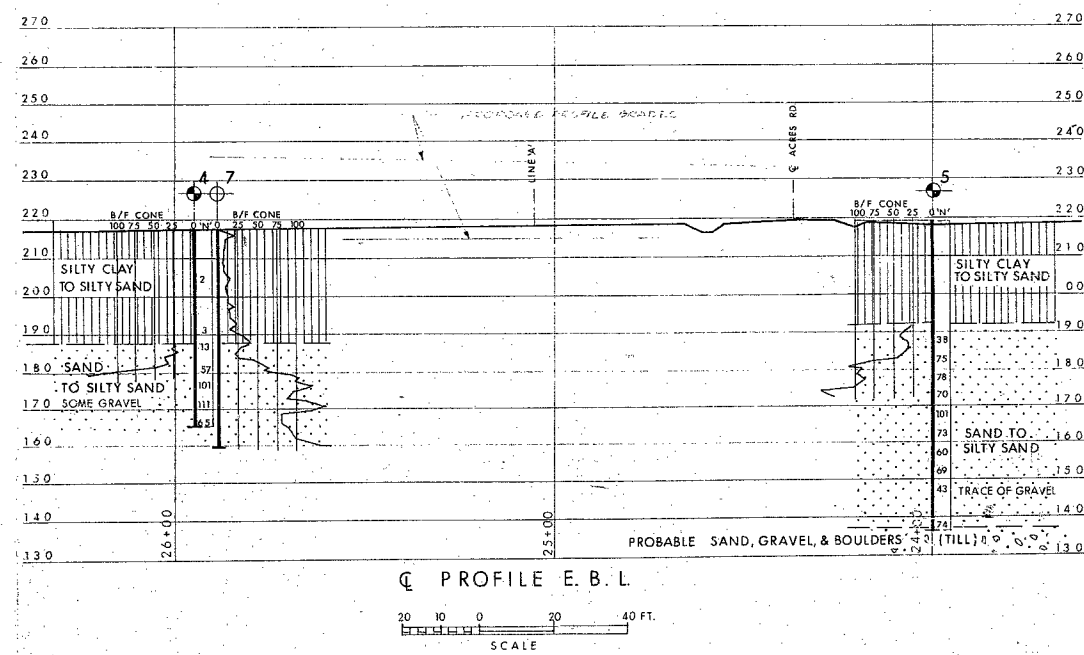
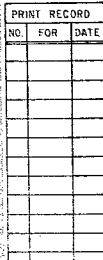
FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION 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
β	ANGLE OF SLOPE TO HORIZONTAL

#66-F-(R)-110
W.P. #423-64
OTTAWA
QUEENSWAY
ACRES ROAD
LINE 'A'

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING DIVISION - FOUNDATION SECTION			
<h1>ACRE ROAD - LINE 'A'</h1>			
KING	O. OTTAWA QUEENSWAY LINE 'D'		DIST. NO. 9
C.O. <u>GR</u>	TOWNSHIP - <u>CARleton</u>		
TWP. <u>NEPEAN</u>	LOT <u>15 & 16</u>	CON. <u>II</u>	
<h2>BORE HOLE LOCATIONS & SOILS STRATA</h2>			
SUBMG. L.P.	CHECKED <u>✓</u>	W.P. NO. <u>443-64</u>	M.S.T. DRAWING NO.
DRAWN M.D.	CHECKED <u>✓</u>	JOB NO. 66-F-110	66-F-110A
DATE 28 JAN. 1967	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <u>R. J. [Signature]</u>	SENT NO.		

REF. NO. E-4627