

67-F(R)-91

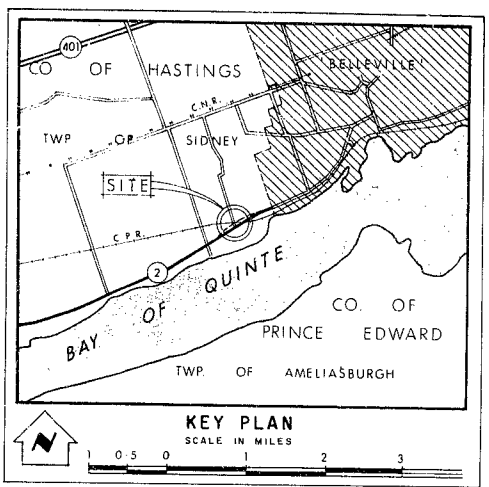
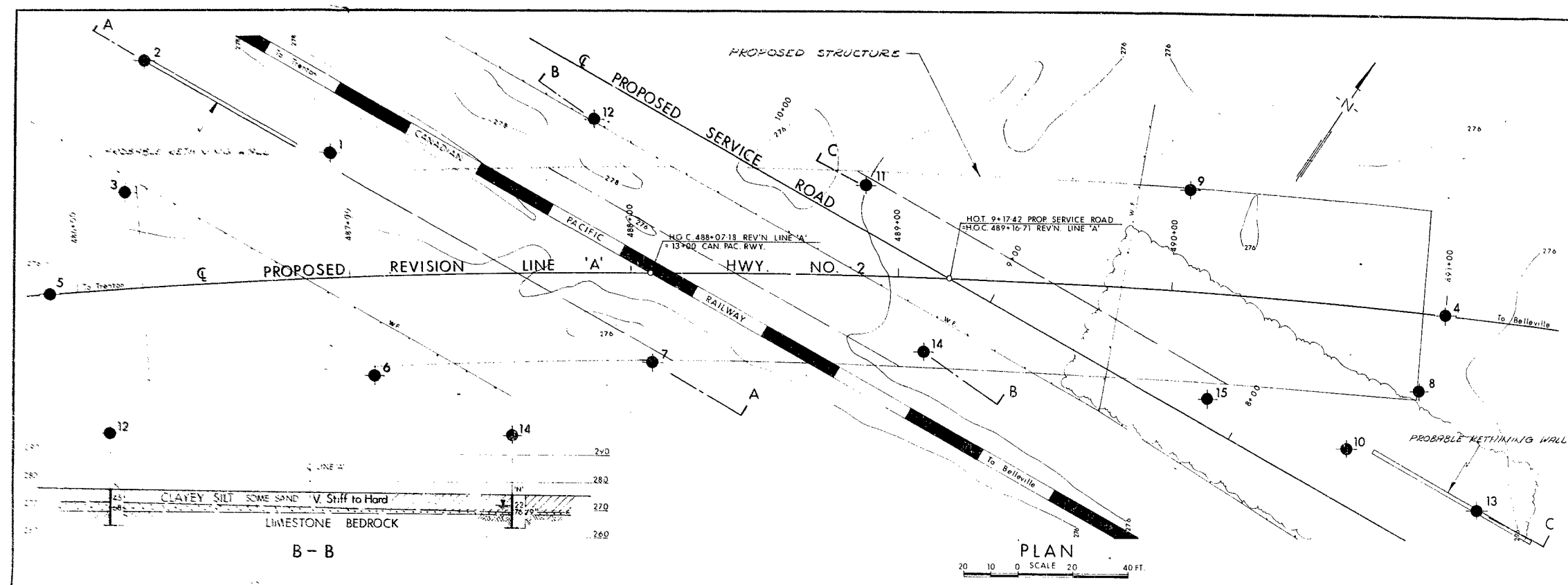
W.P. # 3-63

Hwy # 2

CANADIAN

PACIFIC

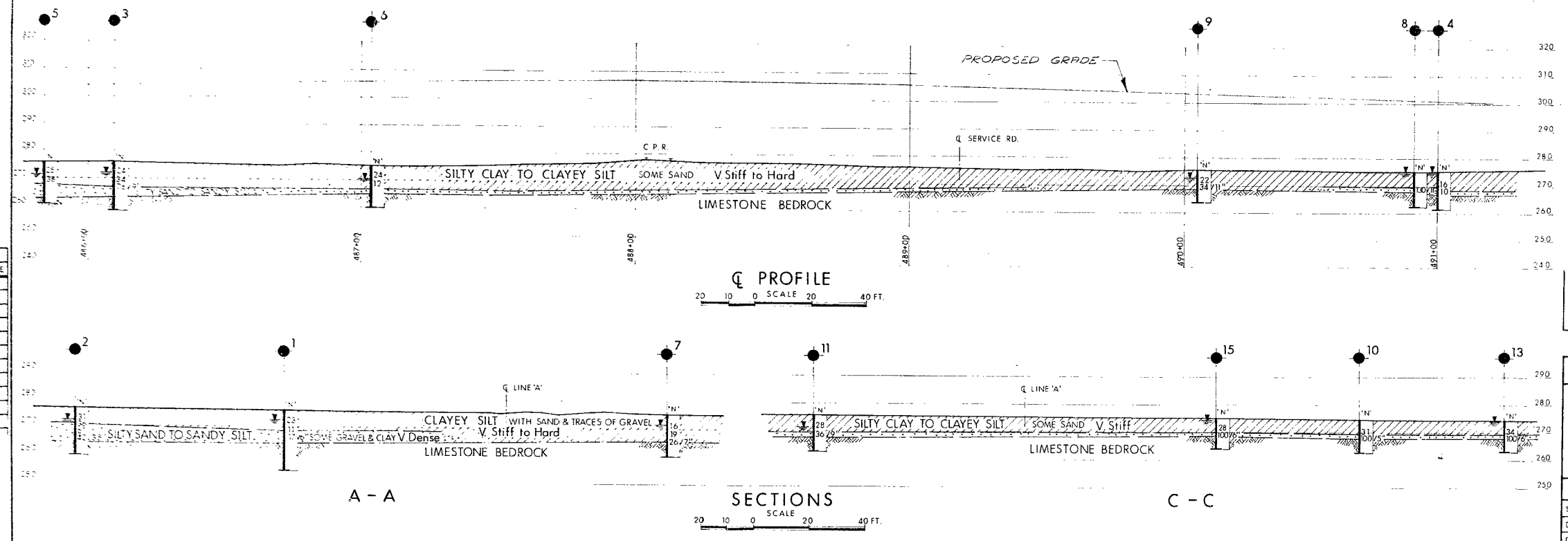
RAILWAY



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation, SEPT 1967		

NO.	ELEVATION	STATION	OFFSET
1	276.3	486+93	46' LT.
2	276.8	486+29	83' LT.
3	276.2	486+19	35.5' LT.
4	275.2	491+00	C
5	275.9	485+90	C
6	274.9	487+07	36' RT.
7	275.9	488+09	32.5' RT.
8	274.7	490+93	28' RT.
9	275.7	490+05	37' LT.
10	274.8	490+67	52' RT.
11	276.0	488+85	32.5' LT.
12	276.9	487+89	56' LT.
13	274.5	491+17	69' RT.
14	275.6	489+10	28.5' RT.
15	275.2	490+15	38.5' RT.

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 HIGHWAYS - ONTARIO			
MATERIALS & TESTING DIVISION - FOUNDATION SECTION			
CANADIAN PACIFIC RAILWAY			
KING'S HIGHWAY NO. 2 REV'N. LINE 'A'		DIST. NO. 8	
CO. HASTINGS		TWP. SIDNEY	
LOT 33		CON. B.F.	
BORE HOLE LOCATIONS & SOIL STRATA			
SUBM'D. P.P.	CHECKED	W.P. NO. 3-63	M.B.T. DRAWING NO.
DRAWN S.O.	CHECKED	JOB NO. 67-F-91	67-F(R)-91A
DATE 6 NOV 1967	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	PRINCIPAL FOUNDATION ENGINEER	CONT NO.	

PRIN. RECORD	NO.	FOR	DATE

REF. NO. E-4650-1

MEMORANDUM

W.P. 3-63

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division,
Admin. Bldg.

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

Attention: Mr. S. McCombie

DATE: November 7, 1967

OUR FILE REF.

IN REPLY TO

NOV 7 1967

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at C.P.R. and
King's Hwy. #2 - Prop. Rev'n. Line 'A'
Lot 33, Con. B.F.
Twp. of Sidney, Co. of Hastings
District No. 8 (Kingston)
W.J. 67-F(R)-91 -- W.P. 3-63

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/Mjef
Attach.

cc: Messrs. B. R. Davis (2)

H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
E. A. Cash
J. E. Gruspier
G. Scott
B. A. Singh

Foundations Files
Gen. Files ✓

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

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FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at C.P.R. and
King's Hwy. #2 - Prop. Rev'n. Line 'A'
Lot 33, Con. B.F.
Twp. of Sidney, Co. of Hastings
District No. 8 (Kingston)
W.J. 67-F(R)-91 -- W.P. 3-63

1. INTRODUCTION:

A request for a foundation investigation at the site of the proposed crossing of the Canadian Pacific Railway and King's Hwy. #2 - Proposed Rev'n. Line 'A', was received from Mr. G. Scott, Regional Bridge Location Engineer, in a memo dated September 11, 1967.

Following this request, a field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site.

This report contains the information resulting from the field investigation, together with recommendations pertaining to the design of the proposed structure foundations.

The field work consisted of 15 sampled boreholes. The locations and elevations of all the test holes are shown on Dwg. 67-F(R)-91A which accompanies this report.

2. DESCRIPTION OF THE SITE:

The proposed structure site is located west of Belleville City limits.

The surrounding area is flat and partially built up.

Certain portions of the site investigated appeared to be soft at the extreme ground level during the time of the investigation.

Physiographically, the site is located in the region referred to as Napanee Plain.

3. FIELD AND LABORATORY WORK:

The field work consisted of 15 sampled boreholes. The locations and elevations of all borings are shown on Dwg. 67-F(R)-91A which forms part of this report.

Boring was achieved by means of conventional diamond drilling equipment. Samples were recovered by a split-spoon sampler, and the number of blows required to drive it was recorded. The energy used in driving it, conformed to the requirements of the Standard Penetration Test. Rock samples were obtained by the use of an AXT core barrel.

The samples were visually examined and classified at the site as well as in the laboratory. Tests were carried out on selected samples for classification purposes.

Laboratory and field test results have been summarized on the Record of Borehole sheets and are included in the Appendix of this report.

4. SOIL TYPES AND SOIL CONDITIONS:

4.1) General:

Subsoil at the site consists of about two different deposits overlying limestone bedrock. In general, the conditions are fairly uniform over the whole site investigated, but somewhat variable in depth.

The boundaries of the different types of deposit as determined in the boreholes, are shown on the accompanying Record of Borehole sheets and the estimated stratigraphical profile contained in Dwg. 67-F(R)-91A is based on this information.

From ground level downward, the various soil types are as follows:

cont'd. /3 ...

4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.2) Silty Clay to Clayey Silt -
With Sand and Traces of Gravel:

This deposit extends from original ground level at all borehole locations, for depths ranging from 5 to 10 feet.

The chief components of the material were found to be silt and clay with some sand and traces of gravel. Typical grain-size distribution curves are included in the Appendix of this report. Based on the results of laboratory tests, the physical properties are summarized as follows:

Liquid Limit	:	28% to 52%
Plastic Limit	:	13% to 29%
Natural Moisture Content	:	17% to 45%

The 'N' values ranged from 10 to 45 blows per foot. The consistency may be described as stiff to hard.

4.3) Sandy Silt to Silty Sand:

This deposit underlies the silty clay to clayey silt stratum at all borehole locations with the exception of B.H. #7 and B.H. #9. The thickness was found to vary between 1.5 and 6 feet.

The material consists of a heterogeneous mixture of silt and sand with varying proportions, and some gravel and clay. Typical grain-size distribution curves are included in the Appendix. The natural moisture content ranged from 7% to 13%. The 'N' values varied from 61 to over 100 blows per foot which indicates a very dense relative density.

cont'd. /4 ...

4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.4) Bedrock:

Limestone bedrock was encountered in all boreholes by obtaining AXT-size core samples. The limestone is dark to medium grey in colour, hard, medium-grained texture, and shows numerous small shale partings throughout.

The depth to the bedrock varied from 6.5 to 13 feet. Reference should be made to the Record of Borehole sheets for bedrock surface elevation encountered at different locations.

5. GROUNDWATER CONDITIONS:

The following groundwater levels were observed:

B.H. #2	- 4.8'	Below Ground Level	- 6	days after investigation			
3	- 4.2'	" " "	- 6	" "	" "	" "	" "
4	-	At Ground Level	- 5	" "	" "	" "	" "
5	- 4.3'	Below Ground Level	- 5	" "	" "	" "	" "
6	- 4.5'	" " "	- 5	" "	" "	" "	" "
7	- 4.0'	" " "	- 5	" "	" "	" "	" "
9	- 2.8'	" " "	- 4	" "	" "	" "	" "
11	- 4.4'	" " "	- 4	" "	" "	" "	" "
13	-	At Ground Level	- 3	" "	" "	" "	" "

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a 5-span structure at the proposed new crossing of King's Hwy. #2 and the Canadian Pacific Railway, just west of Belleville.

The maximum height of the contemplated approach fills is in the order of 30 ft. above the existing ground level.

The subsoil at the site was found to consist of clayey silt to silty clay with sand and traces of gravel, followed by a granular type deposit which is underlain by limestone bedrock. The depth to the bedrock varied from 6.5 to 13 feet.

cont'd. /⁵ ...

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

Due to the prevailing subsurface conditions, it is recommended that the piers and the proposed retaining walls be founded on spread footing type foundations placed directly on sound bedrock. The rock surface on which the foundation is to be placed should be carefully inspected before placing the concrete and, if any serious cracks or weathered conditions are apparent, the excavation should be carried down to a level where the rock is relatively sound. Up to 10 tons per sq. ft. may be used for design purposes. It should be pointed out that in some cases, it would require up to 13 ft. of excavation.

Since the excavation will be carried below the observed groundwater level, a dewatering scheme should be employed. The most suitable method under the prevailing conditions, appears to be utilizing sumps from which the water can be pumped out.

The proposed perched abutments should be supported by means of piled foundations. For this purpose, steel H-piles driven through the fill to the bedrock are believed to be the most practical. The maximum allowable loads for the particular pile section adopted should be assumed for design purposes.

Due to the presence of soft material in the extreme upper portion of the clayey silt to silty clay deposit, it is recommended that all the soft material be removed within the entire construction area prior to placing the fill. The stripping and backfilling should be in accordance with the current D.H.O. Standards.

If the recommendations are followed, no stability problems are anticipated for the approach fills provided with 2:1 standard slopes.

cont'd. /6 ...

7. SUMMARY:

A foundation investigation at the proposed structure site is reported.

The subsoil at the site was found to consist of clayey silt to silty clay with sand and traces of gravel, followed by sandy silt to silty sand with some gravel and clay, followed by limestone bedrock.

It is recommended that the piers and retaining walls be supported on spread footing type foundations placed directly on sound bedrock. The perched abutments should be supported on H-piles driven to the bedrock.

A dewatering scheme may be required.

All soft material should be removed within the construction area.

No stability problems are anticipated for the proposed approach embankments.

8. MISCELLANEOUS:

The field work was carried out from September 18 to September 22, 1967. The equipment used was owned and operated by Master Soil Investigation Ltd., and Canadian Longyear Ltd.

The field investigation was supervised directly by Mr. P. Payer, Project Foundation Engineer, who also prepared this report.

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

November 1967.

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

LOCATION Sta. 486 + 93 46' Lt.

FOUNDATION SECTION

W.P. 3-63

BORING DATE Sept. 18, 1967

ORIGINATED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore, BX Casing

COMPILED BY _____ PP

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOE 67-F(R)-91

LOCATION Sta. 486 + 29; 83' Lt.

ORIGINATED BY PP

W. P. 3-63

BORING DATE Sept. 19, 1967

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore, BX Casing

CHECKED BY [Signature]

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOS 67-F(R)-91

LOCATION Sta. 486 + 19 35.5' Lt.

ORIGINATED BY PP

W.P. 3-63

BORING DATE Sept. 19 & 20, 1967

COMPILED BY _____ PP

DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY *JS*

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

[illegible]

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

LOCATION Sta. 485 + 90 Ø

ORIGINATED BY PP

BORING DATE Sept. 20, 1967

COMPILED BY _____ PP

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY LR

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

W.P. 3-63

DATUM Geodetic

RECORD OF BOREHOLE NO. 6

LOCATION Sta. 487 + 07 36' Rt.

LOCATION _____
BORING DATE Sept. 20, 1967

BOREHOLE TYPE Washbore - BX Casing

FOUNDATION SECTION

FP

ORIGINATED BY _____

COMPILED BY PP

CHECKED BY

[illegible]

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W				BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT % 20 40 60					
275.9	Ground Level															
0.0	Clayey silt with sand and traces of gravel. Very stiff		1	SS	16	270									271.9 Gr. 7, Sa. 27 Si. 42, Cl. 24	
265.7			2	SS	19											
10.2	Limestone		3	SS	26/7"											
260.7	Bedrock					260										
15.2	End of Borehole															

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 67-F(R)-91

LOCATION Sta. 490 + 93; 28' Rt.

ORIGINATED BY PP

W.P. 3-63

BORING DATE Sept. 21, 1967

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY AK

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

W.P. 3-63

DATUM Geodetic

LOCATION Sta. 490 + 05; 37' Lt.

BORING DATE Sept. 21, 1967

BOREHOLE TYPE Washbore - BX Casing

FOUNDATION SECTION

ORIGINATED BY PP

COMPILED BY PP

CHECKED BY LR.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W				BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT % 20 40 60					
275.7	Ground Level																
0.0	Silty clay to clayey silt, with some sand & trace of gravel. Very stiff.		1	SS	22	270										272.9 Gr. 5, Sa. 17 Si. 36, Cl. 42	
268.7			2	SS	34/11"												
7.0	Limestone		3	RC	90%												
263.7	Bedrock																
12.0	End of Borehole					260											

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

W.P. _____ 3-63

DATUM Geodetic

RECORD OF BOREHOLE NO. 10

LOCATION Sta. 490 + 67; 52' Rt.

BOHRING DATE Sept. 21, 1967

BOREHOLE TYPE Washbore - BX Casing

FOUNDATION SECTION

ORIGINATED BY PP

COMPILED BY PP

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 11

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

LOCATION Sta. 488 + 85; 32.5' Lt.

ORIGINATED BY PP

W.P. _____ 3-63

BORING DATE Sept. 21, 1967

COMPILED BY _____ PP

DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					
276.0	Ground Level											
0.0	Silty clay to clayey silt with some sand.		1	SS	28	270						
269.3	Very stiff		2	SS	36/9*							
6.7	Sandy silt. Very dense											271.6 Gr. 21, Sa. 37 Si. 32, Cl. 10
8.5	Limestone Bedrock		3	RC	AJT 70%							
262.5												
13.5	End of Borehole					260						

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO.12

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

LOCATION Sta. 487 + 89 56' Lt.

ORIGINATED BY PP

W. P. _____ 3-63

BORING DATE Sept. 22, 1967

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY SR.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____	LIQUID LIMIT ——— WL	PLASTIC LIMIT ——— wp	WATER CONTENT ——— w	BULK DENSITY P.C.F. Y	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	wp	w	wL		
276.9	Ground Level											
0.0	Clayey silt with some sand.					270						
272.0	Hard		1	SS	45							
4.9	Sandy silt to silty sand.		2	SS	68							
268.9	with some gr. & tr. clay. V. Dense.		3	RC	AXT							
8.0	Limestone		4	RC	AXT							
263.9	Bedrock											
13.0	End of Borehole					260						

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 14

FOUNDATION SECTION

JOB 67-F(R)-91

LOCATION Sta. 489 + 10; 28.5' Rt.

ORIGINATED BY PP

W. P. 3=63

BORING DATE Sept. 22, 1967

COMPILED BY _____ PP

DATUM _____ Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	w _p	w	w _L		
275.6	Ground Level											
0.0	Clayey silt with sand. Very stiff.		1	SS	22	270						271.7 Gr.O, Sa.29 Si.37, Cl.34
268.6	Silty sand		2	SS	76/9"							
7.0	Limestone											
263.6	Bedrock		3	RC	AXT 100%							
12.0	End of Borehole					260						

RECORD OF BOREHOLE NO. 15

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 67-F(R)-91

LOCATION Sta. 490 + 15; 38.5' Rt.

ORIGINATED BY _____ PP

W.P. 3-63


BORING DATE Sept. 22, 1967

COMPILED BY _____ PP

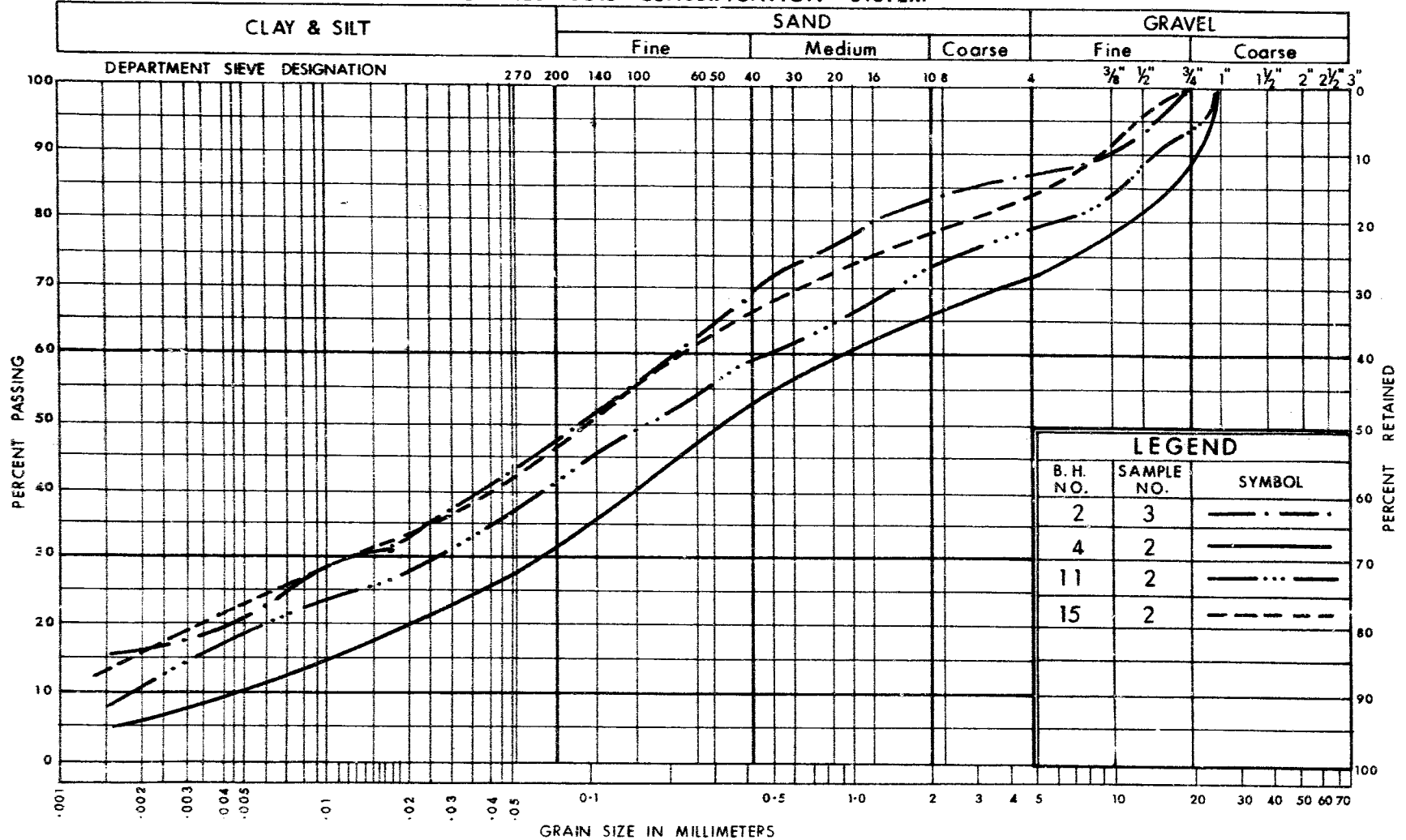
DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY JK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT _____ WL PLASTIC LIMIT _____ WP WATER CONTENT _____ W WP _____ WL WATER CONTENT % 20 40 60				BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.									
275.2	Ground Level															
0.0	Silty clay to clayey silt with some sand.					270									Gr. 16, Sa. 37 Si. 31, Cl. 16	
270.0	Very stiff		1	SS	28											
268.4	Silty sand with some gr. & clay. V. Dense.		2	SS	100%											
6.8	Limestone															
263.4	Bedrock		3	RC	Axt 100%											
11.8	End of Borehole					260										

UNIFIED SOIL CLASSIFICATION SYSTEM



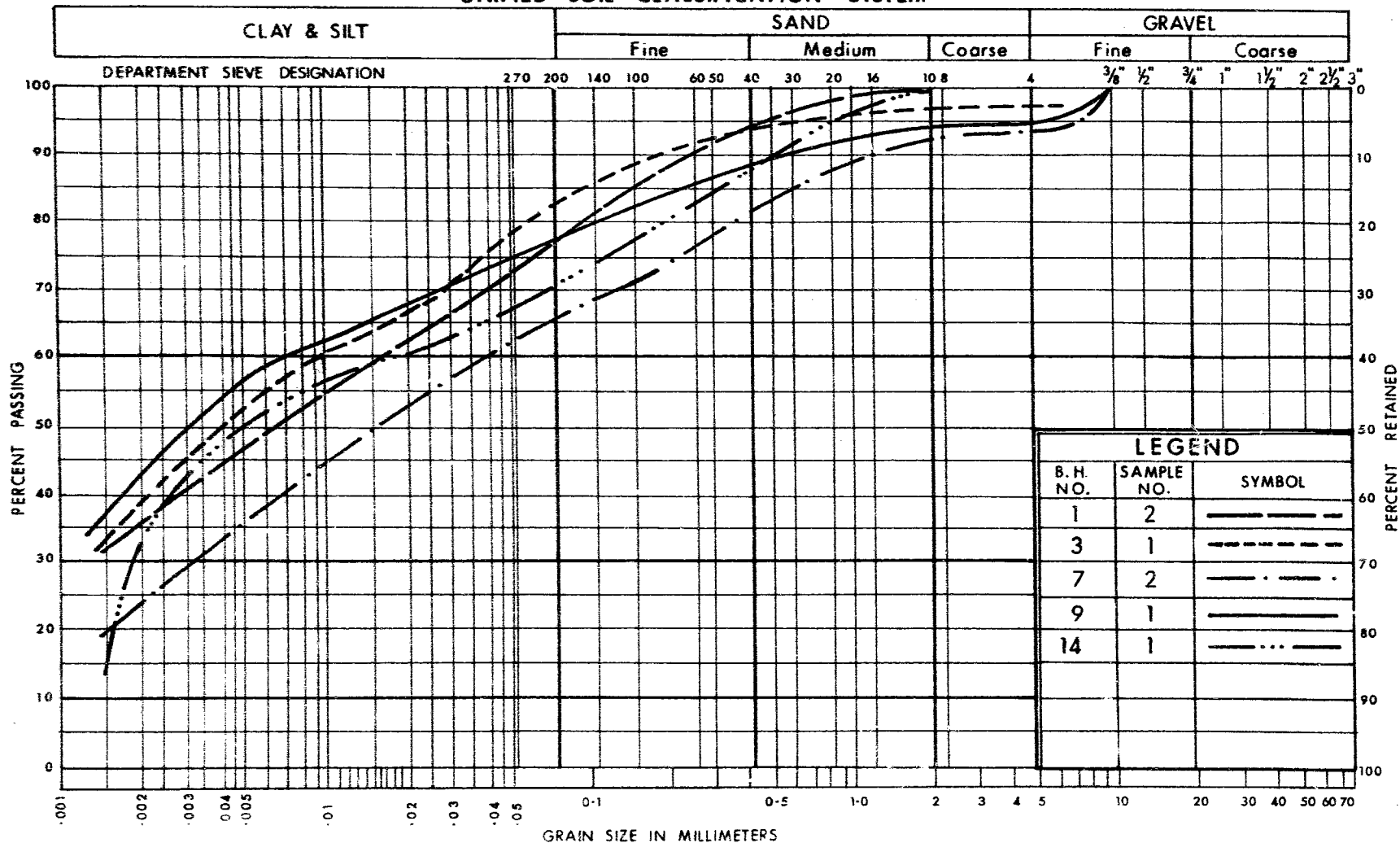
DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION
SILTY SAND TO SANDY SILT.

W P No. 3 - 63.

JOB No. 67 - F - 91

UNIFIED SOIL CLASSIFICATION SYSTEM



ONTARIO

DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISIONGRAIN SIZE DISTRIBUTION
CLAYEY SILT TO SILTY CLAY.

W.P. No. 3 - 63.

JOB No. 67-F-91

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 _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	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_r	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

	= 3.1416
	BASE OF NATURAL LOGARITHMS 2.7183
	OR $\ln a$ NATURAL LOGARITHM OF a
	OR $\log a$ LOGARITHM OF a TO BASE 10
	TIME
	ACCELERATION DUE TO GRAVITY
v	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	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

401 & Keele Street
Downsview, Ontario

October 13, 1967

Canadian Longyear Limited
35 Brydon Drive
Rexdale, Ontario

Dear Sirs:

This is to confirm our request of September 18, 1967 for the supply of a Diamond Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Belleville, Ontario, Sept. 20, 1967.

This project bears Job Number 67-F-91.

Yours truly,

M. G. Selby

WHS:md

M. G. Selby
Supervising Foundation Engineer
for A. C. Starnac
Principal Foundation Engineer

cc: W. Konings
Foundation Files 110
General File

401 & Keels Street
Downsview, Ontario

October 10, 1967

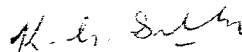
Master Soil Investigation
104 Kenhar Drive
Weston, Ontario

Dear Sirs:

This is to confirm our request of September 15, 1967 for the supply of a Diamond Drill together with all necessary equipment as specified under the terms of our Contract Agreement, at C.P.R. & Hwy. #2, Belleville, Ontario.

This project bears job number 67-P-91.

Yours truly,



KGS:mt

K. G. Selby
Supervising Foundation Engineer
for: A. G. Sternac
Principal Foundation Engineer

cc: H. Kornings
Foundation Files // 0
General File

MEMORANDUM

67-F-91

To: Mr. K. Selby,
Foundation Engineer.

From: Materials & Testing Div.

Date: November 3, 1967

Our File Ref.

In Reply To

SUBJECT: Diamond Drill Cores - Projects 67-F-91, 67-F-47,
67-F-88, 67-F-94

Project 67-F-91

Rock core is limestone. Dark to medium grey in colour, hard, medium grained texture and shows numerous small shale partings throughout.

<u>Hole</u>	<u>Rock Type</u>	<u>Bedrock Footage</u>
2	Limestone Rock	13'0"
3	"	13'5"
4	"	9'0"
8	"	7'9"
10	"	7'4"
11	"	9'0"
12	"	10'0"
13	"	7'0"

Project 67-F-88

The rock core is limestone. Dark to medium grey colour, medium grained texture, hard with some shale partings throughout.

<u>Hole</u>	<u>Rock Type</u>	<u>Bedrock Footage</u>
1	Limestone	13'0"
2	"	10'0"
3	"	10'0"
4	"	10'5"

Project 67-F-94

Rock core is a soft shaley limestone with interbedded layers of hard, medium grained limestone.

<u>Hole</u>	<u>Rock Type</u>	<u>Bedrock Footage</u>
1	Shaley Limestone	10'6"
2	"	7'5"
3	Limestone	6'0"
4	Shaley Limestone	6'0"
5	"	5'5"
6	"	5'5"
7	"	5'5"
8	"	7'0"
9	"	9'0"
10	"	11'0"
11	"	39'0"
12	Limestone	33'5"
13	Shaley Limestone	29'5"
14	Limestone	20'0"

Project 67-F-47

Rock core is a granitic rock type. Pink in colour, hard and uniform medium texture throughout. Possible joint fractures are present in the overall structure of the rock.

<u>Hole</u>	<u>Rock Type</u>	<u>Bedrock Footage</u>
1	Granitic	11'0"
2	"	12'8"
3	"	11'2"

B. K. Glassford

BKG:mv

B. K. Glassford,
Geologist.

Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

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

Bridge Division,
Downsview, Ontario

February 6, 1968

C.P.R. Overhead
0.5 Miles W. of Belleville W. Limits
W.P. 3-63, Site 11-497
Highway 2, District No. 8

Attached herewith are prints of the Preliminary Bridge Plan Drawing B-6398-P for the above-mentioned structure.

The estimated cost of the proposed structure is \$375,000. 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. Grubski,
Bridge Design Engineer

Attach.

c.c. S. McCombie
A. Stermac (2)
J. Anderson

67-F-91

OK.

A.K.B.

1/0 comments
Feb. 27th 1968

W. L. Sullivan

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: November 6, 1969

OUR FILE REF.

IN REPLY TO


SUBJECT: C.F.R. Overhead
0.6 Miles West of Belleville W. Limits
W.P. 3-63, Site No. 11-257
Highway 2, District 8

67F91(R)

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.

CSG:rd


C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. Foundation Section

NOV 13 69

NO COMMENTS

A.K.B.

ALLS