cc: Gen. Files

23-64-363

Mr. A. M. Toye,

Bridge Engineer.

Materials & Research Section,

(Foundations Office).

Attention: Mr. A. McConkie.

May 29, 1961.

D.H.O. FOUNDATION INVESTIGATION REPORT.

W.J. 61-F-40 -- W.P. 114-61.

Re: Snelgrove (Etobicoke) Creek, on Hwy. 10, Twp. of Chinguacousy, County of Peel, District No. 6.

Attached to this memo, we are forwarding to you, the Foundation Investigation Report for the above mentioned location; this report has been prepared by our Section.

The conclusions and recommendations contained therein are self-explanatory and we believe, adequate and sufficient for your future design work.

Should there be any other additional questions in connection with this site that you would like to discuss, please feel free to call on our Office.

L. G. Soderman,
PRINCIPAL FOUNDATION ENGR.
Per:

A. G. Sternac

(A. G. Sternac,
SUPERVISING FOUNDATION ENGR.)

MMC/MeC
Attach.
cc: Messrs. A. M. Toye (2)
H. A. Ireguakes
E. D. McMillan
I. C. Campbell
C. Fraser
T. J. Kovich
J. Roy
J. E. Crumpler
E. R. Faint
F. Berman
A. Watt
Foundations Office
Gen. Files.

TABLE OF CONTENTS

FOUNDATION INVESTIGATION

For

Proposed Bridge Structure over
Snelgrove (Etobicoke) Creek, on
Hwy. No. 10, Twp. of Chinguacousy,
County of Peel, District No. 6.
W.J. 61-F-40 — W.P. 114-61.

1. INTRODUCTION:

It is proposed to construct a new bridge over Snelgrove Creek, approximately 120 feet North of the existing structure which is located 6 miles North of Brampton, on Hwy. 10, in the County of Peel, (Stn. 238 + 60 at ℄; Plan B 3961-1). At this location, waters of Snelgrove Creek are proposed to be diverted, between Con. 1W and 1E, on Lot 20.

A subsoil investigation was carried out at the site of this structure and this report contains the field and laboratory findings and recommendations for its foundation.

2. DESCRIPTION OF SITE AND GEOLOGY:

Except for the pasture farmland, the area on either side of Hwy. 10 is generally undulating. There are buildings on both sides of the highway. The existing bridge is in bad shape with cracks clearly visible and the concrete spalling. The adjacent river banks are protected by hand-placed rip-rap. There are indications that the slopes have moved, resulting in the damage to the bridge.

Geologically, the site under consideration, is located in the area of the Peel Plain. The underlying material in this plain is still containing Palaeozoic shale and limestone.

cont'd. /2 ...

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

Field work consisted of four sampled boreholes and dynamic cone penetration tests adjacent to each borehole. Conventional wash boring procedure was followed. Samples were recovered at depths required by means of a 2" O.D. split-spoon sampler. The dimensions of the spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test.

Elevations of the boreholes were taken from the contours drawn on the given plan (B 3961-1).

Samples were visually examined and identified in the field before being transported to the laboratory. Upon receipt in the laboratory, grain size distribution curves and Atterberg limits of a few typical samples were determined. Laboratory and field test results have been summarised and are given in this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The investigation has shown that in general, the subsoil stratification can be considered as quite regular and uniform. Apart from a thin topsoil layer, there are three more distinctive layers encountered in the following succession: Silty sand and clayey sand, silty fine sand, and finally, till. Occasionally, pockets of materials containing a rather large amount of one of the composing ingredients, were encountered. These pockets or limited seams, do not basically alter the overall picture and, consequently, the overall properties of the subsoil. A detailed description of the main three soil layers with reference also to the isolated pockets of different materials, is given below:-

cont'd. /3 ...

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

4.2) Silty Sand and Clayey Sand:

This layer was encountered in all the boreholes. The upper 6 feet contain slightly more clay and therefore, the soil appears to have a certain plasticity. At greater depth, silt replaces clay as the sand admixture. Occasionally, smaller or greater quantities of gravel were encountered. Such was the case in borings 2 and 3 between approx. elevations 819.0 and 813.0. In boring 1, a 5-foot layer with a large amount of red shale particles was encountered but basically, the properties are similar to the ones of the rest of the layer.

The average depth of this layer is about 12 feet, while the maximum depth encountered was 16.5 feet in boring 4 (elev. 809.5).

The density of the layer increases with depth and a very dense state of compaction is encountered everywhere at greater depth. The 'N' values are about or above 50 at a depth of 10 feet below the present ground level. Ground water was encountered in this layer and the exact ground water conditions are described under a subsequent separate heading.

The color of this layer is dark brown at the top, changing to light brown and then grey, with depth.

4.3) Silty Fine Sand:

This layer was encountered below the one described in the preceding paragraph. No gravel was found in this layer. From the Standard Penetration tests, it was concluded that the layer is in a very dense state of compaction. The color of the layer is grey. It should be noted that this particular material was not traced in boring 4, but the differences between this layer and the overlying one, are

cont'd. 4 ...

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

4.3) Silty Fine Sand: (cont'd.) ...

sometimes insignificant, especially as far as the foundation properties are concerned.

On the average, it cntains 67% sand, 28% silt and 3% clay.

4.4) Silt:

This layer, composed basically of silty clay and gravel, was encountered in all the borings at approximately the same elevations. The lowest elevation was 806.0 in boring 3, and the highest, 809.5 in boring 4. The layer is hard and very dense. The gravel contained in this layer is fine. In boring 1, at elevation 799.0, a reddish and grey layer of silty sand and gravel was found. The depth of this layer is undetermined. In boring 3, at elevation 797, a layer of very dense silt was encountered. In boring 2, a layer of silty sand with gravel was encountered between elevations 804.5 and 807.0. All this indicates that the subsoil can be regarded as uniformly stratified and relatively homogeneous only in a broad sense. However, the mentioned and described differences have no significant bearing on the foundation properties in this particular case.

5. GROUND WATER CONDITIONS:

Observations and measurements of the ground water level indicate that it lies quite close to the ground surface. It should be noted that the given ground water elevations could easily change and that they are representative only for the period of the investigation. The ground water levels found in the different borings are as follows:-

cont'd. /5 ...

5. GROUND WATER CONDITIONS: (cont'd.) ...

Boring No.	Elevation
1	823.5 ft.
2	825.0 "
3	823.3 "
4	824.3 "

The level of water in the creek was found to vary only slightly, between elevations 823 and 822, during the period of this investigation.

6. DISCUSSION AND RECOMMENDATIONS:

In the preceding paragraph, the different layers and their prospective properties were described in detail. As was clearly pointed out, the soil stratification can, in general, be considered as regular. There are pockets of materials within the different layers that have a preponderance of one or the other basic component, but for the particular foundation problem, this phenomenon has no practical bearing. A few feet below ground level, the soil is already in a dense or even very dense state of compaction and as such, is competent of supporting the footings of the proposed structure. Adequate bearing support can be found at any depth below elevation 820.0. It is recommended that a safe bearing load of 3.0 T.S.F. be taken for the footing design.

A new creek bed will be excavated for the diversion. Presumably, the creek bottom will be at approx. elevation 816.0 and the bridge footing bottoms should be at least five feet below this elevation. The final and exact footing elevation should be decided

cont'd. /6 ...

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

on grounds of scour protection. It should be noted that there are clear scour signs at the old bridge site and that the underlying material at the new location is scour susceptible.

Because of the relatively high ground water table, the excavation and construction of the footings will present a problem. There are a number of ways to overcome these difficulties - e.g., by lowering of the water table by well point pumping, or by the use of driven sheet piles with either pumping or tremie concrete sealing. The choice of construction and dewatering methods should be left entirely to the contractor. However, he should be made well aware that the procedure he proposes and intends to use should, in no way, decrease the bearing capacity of the subsoil and that this remains entirely his responsibility.

In case of a deterioration of the soil conditions resulting from the applied procedures, he would have to undertake, at his own cost, any measures and additional construction found necessary by D.N.D. supervising or design personnel.

7. SUMMARY:

The stratification of the investigated subsoil can be described, in a broad sense, as regular and the encountered soil layers, as relatively uniform. Isolated pockets and non-continuous seams of materials with a preponderance of one of the basic components were encountered. These local irregularities have no significant bearing on the foundation problem because all the encountered layers were dense to very dense or hard, and very competent to support the footing loads.

cont'd. /7 ...

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

It is recommended that spread footings be placed at the necessary depth, but below elevation 820.0 and a safe bearing pressure of up to 3.0 T/sq.ft. be used.

Because of scour protection reasons, the foundation depth will presumably be at approximately elevation 811 or lower. Due to the presence of a relatively high water level and the proximity of the creek, the footing excavations will present a certain problem as far as dewatering is concerned. A number of alternatives to overcome this problem are mentioned in the report. The final choice should be left to the contractor, but he should be made well aware that it is entirely his responsibility that the bearing capacity of the ground remains unaltered during the construction period.

No stability problems are anticipated for any embankment fills provided the soft organic topsoil is removed prior to fill placement.

8. <u>ACKNOWLEDGEMENT</u>:

Field work was commenced on May 1, 1961 and was completed by May 8, 1961, under the supervision of Mr. B. M. Ghadiali.

Equipment was owned and operated by a two-man crew of Dominion Soil Investigation Co. of Toronto.

May 1961.

REPORT PREPARED BY: B.M. Ghadiali
B. M. Ghadiali,
PROJECT FOUNDATION ENGINEER.

REPORT APPROVED BY: A.G. Stermac
A. G. Stermac,
SUPERVISING FOUNDATION ENGINEER.

FORM OB-ML-126 (REV. 1959.)--59-5008

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 114-61 BORE HOLE NO. 1

JOB 61-F-40 STATION 238+90 (40 Rt)

DATUM 827.0' COMPILED BY B.K.

BORING DATE May 2/61. CHECKED BY B.M.G.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) O
VANE TEST (C) AND SENSITIVITY (S) +
NATURAL MOISTURE AND LIQUIDITY INDEX LI X
LIQUID LIMIT
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	827.0	
	Top S. 1	825.0	
	Clayey sand, silty sand & occasional gravels. Red shale from = 9'to14'. W.L. ▽ Loose becoming dense & V. dense with depth. Brown changing to grey with depth.	823.5	
		812.5	10
	Silty fine sand. V. dense. Grey.	807'	20
	Silty clay & gravels (Till) Hard. Grey.	799.0	
	Silty sand & gravels (Till) V. dense.	796.3	30
	End of borehole. Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		

STRENGTH AND PENETRATION RESISTANCE P.S.F.

BLOWS/FT. 25 50 75 100

Penetration ends @elev. 815.0'

105-9"

CONSISTENCY

MOIST. CONTENT - % DRY WT.

SAMPLE	NATURAL UNIT WT. P.C.F.
S1	-
S2	-
S3	-
S4	-
S5	-
S6	-
S7	-

FORM OB-ML-126 (REV. 1959.) — 59-5008

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 114-61 — BORE HOLE NO. 2

JOB 61-F-40 — STATION 238+30 (40 Rt)

DATUM 826.5' — COMPILED BY B.K.

BORING DATE May 3/61 — CHECKED BY B.M.C.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) — O
VANE TEST (C) AND SENSITIVITY (S) — +
NATURAL MOISTURE AND LIQUIDITY INDEX — LI / X
LIQUID LIMIT
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	826.5	0
	Top Soil W.L. ▽	825.0	
	Clay sand, silty sand & gravels. Loose becoming dense & V. dense with depth. Brown changing to grey with depth.		10
		812.5	
	Silty fine sand. V. dense. Grey.		20
		807.0	
	Silty sand & gravels. (Till) V. dense. Grey & Reddish.	804.5	
	Silty clay & gravels. (Till) Hard. Grey.	800.5	
	End of borehole.		30
	Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		40

STRENGTH AND PENETRATION RESISTANCE — P.S.F. — BLOWS/FT. 25 50 75 100

Penetration ends @ elev. 812.0'

CONSISTENCY — MOIST. CONTENT - % DRY WT. 10 20 30

SAMPLE — NATURAL UNIT WT. P.C.F.

S1 -
S2 -
S3 -
S4 -
S5 -

FORM OB-ML-126 (REV. 1959.) — 58-5697

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 114-61 — BORE HOLE NO. 3

JOB 61-F-40 — STATION 238+30 (40' Lt.)

DATUM 827' — COMPILED BY B.K.

BORING DATE May 4/61. — CHECKED BY B.M.G.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
VANE TEST (C) AND SENSITIVITY (S) — +
NATURAL MOISTURE AND LIQUIDITY INDEX — LI
LIQUID LIMIT — X
PLASTIC LIMIT — |

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	827.0	0
	Top Soil	825.0	
	Clay sand, silty & gravels. Some organic material up to 7' depth. W.L. ▽ Loose becoming dense & V. dense with depth. Brown changing to grey with depth.	823.3	
		814.0	10
	Silty fine sand. Dense. Grey.		
		806.0	20
	Silty clay, silt & gravels (Till) Hard. Grey.		
		795.5	30
	End of borehole. Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.		40

STRENGTH AND PENETRATION RESISTANCE — P.S.F. — BLOWS/FT. 25 50 75 100

Penetration ends @elev.815.0'

CONSISTENCY — MOIST. CONTENT - % DRY WT.

SAMPLE	NATURAL UNIT WT. P.C.F.
S1	-
S2	-
S3	-
S4	-
S5	-
S6	-

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 114-61 — BORE HOLE NO. 4

JOB 61-F-40 — STATION 238+90 (40' Lt.)

DATUM 827' — COMPILED BY B.K.

BORING DATE May 5/61. — CHECKED BY B.M.G.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) — O
VANE TEST (C) AND SENSITIVITY (S) — +
NATURAL MOISTURE AND LIQUIDITY INDEX — LI X
LIQUID LIMIT —
PLASTIC LIMIT —

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	827.0	0
	Top Soil	825.5	
	Silty sand, some clayey sand & occasional gravels. W.L. = V. loose becoming dense & V. dense with depth. Brown changing to grey with depth.	824.3	
	Silty clay, sand & gravels. (Till) Hard. Grey.	809.5	20
	End of borehole. Penetration resistance profile shown; obtained by driving a 2" dia. cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow.	800.5	30

STRENGTH AND PENETRATION RESISTANCE
P.S.F.
BLOWS/FT. 25 50 75 100
10
Penetration ends @elev. 817.1'

CONSISTENCY
MOIST. CONTENT - % DRY WT.

SAMPLE	NATURAL UNIT WT. P.C.F.
S1	-
S2	-
S3	-
S4	-
S5	-

FORM OB—ML—222
FEB 59
1M-58-5569

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-40
W.P. 114-61

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S1	3'-4.5'	Clayey silt, sand & some organic material. Soft. D. Brown.	5	-	-	-	-	-	
	S2	6'-7.5'	Clayey sand & silty sand. Loose. Brown to Br. Grey.	3	-	-	-	-	-	
	S3	10'-11.5'	Clay shale & clayey sand with gravels. V. dense. Br. red & grey.	65	-	-	-	-	-	
	S4	15'-16.5'	Silty fine sand. V. dense. Grey.	116	-	-	-	-	-	
	S5	20'-21.5'	Silty sand & gravels. V. dense. Grey.	62	-	-	-	-	-	
	S6	25'-26.5'	Silty clay with some sand & gravels. (Till) Hard. Grey.	62	-	-	-	-	-	
	S7	30'-30.8'	Silty sand & gravels with clayey silt. (Till) V. dense. Grey.	105-9"	-	-	-	-	-	
2	S1	5'-6.5'	Silty sand & gravels. (1" size stone) Med. dense. Brown.	19	-	-	-	-	-	
	S2	10'-11.5'	Silty sand & clayey sand with fine gravels. Dense. Grey.	49	-	-	-	-	-	
	S3	15'-16'	Silty fine sand. V. dense. Grey.	79	-	-	-	-	-	
	S4	20'-21.5'	Silty sand & gravels with clayey silt. (Till) V. dense. Grey & reddish.	57	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-40
W.P. 114-61

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
2	S5	25'-26.5'	Silty clay & some fine gravels. (Till) Hard. Grey.	92	13.2	15.3	20.5	-	-	
3	S1	5'-6.5'	Silty fine sand & decayed material. Loose. Br. Grey.	2	-	-	-	-	-	
	S2	10'-11.5'	Silty sand & fine gravels. Dense. Br. Grey.	45	-	-	-	-	-	
	S3	15'-16.5'	Silty fine sand. V. dense. Grey.	86	-	-	-	-	-	
	S4	20'-21.5'	Silty sand, silty clay & fine gravels. (Till). Dense. Grey.	42	-	-	-	-	-	
	S5	25'-26.5'	Silty clay & fine gravels. Hard. Grey.	64	-	-	-	-	-	
	S6	30'-31.5'	Silt, clayey silt & trace of fine gravels. Hard. Grey.	62	-	-	-	-	-	
4	S1	5'-6.5'	Silty sand. Loose. Brown.	2	-	-	-	-	-	
	S2	10'-11.5'	Silty sand & some gravels. Dense. Grey.	34	-	-	-	-	-	
	S3	15'-16.5'	Silty fine sand. V. dense. Grey.	76	-	-	-	-	-	
	S4	20'-21.5'	Silty clay & sandy silt with gravels. (Till). Hard. Grey.	94	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 61-F-40
W.P. 114-61

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
4	S5	25'-26.5'	Silty clay & fine gravels. (Till). Hard. Grey.	51	-	-	-	-	-	
			S denotes split spoon sample.							

Materials and Research Division

February 28, 1962

Mr. R. W. Loughney,
Vice President,
Wellpoint Dewatering Corporation,
880 East 141st Street,
New York 54, N.Y.

Re: Etobicoke (Snelgrove) Creek
Diversion and Hwy. No. 10,
District No. 6, Toronto, Ont.

Dear Dick:-

As agreed upon during our telephone conversation of Tuesday, February 27th, I am sending you a copy of the plan of the structure and a copy of the plan where the subsoil conditions are shown. Please do not pay any attention to the sheet piles shown on Drawing No. D-5013-P; they are part of a scheme that could be used as an alternative to the wellpointing. If wellpointing is used, probably only sheet pile walls in front of the entrance and exit of the barrel arch will be used.

Notice, also, the South-West wing wall protruding into the present creek.

We would appreciate it if you could give us an estimate of the complete cost of dewatering the necessary area, including here, the mobilization, installation, operation, and all other items.

It would also be very useful to know the necessary time for installation and starting of operation - something similar to what was considered for the St. Davids job.

I would like to emphasize that the penetration diagrams refer to the dynamic cone penetration. This is a 2" cone (60° angle) driven with an energy of 350 ft. lb. per blow.

cont'd. /2 ...

Mr. R. W. Loughney, Vice President,
Wellpoint Dewatering Corp'n.

February 28, 1962.

The Standard Penetration Test 'N' values are written in ink alongside each borehole.

I think that it would be quite realistic to assume that the ground water level is at or slightly above the creek water level.

I trust the information supplied is adequate, and hope to hear from you in the near future.

Yours very truly,

A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Encls. (2)

cc: Foundations Office
Gen. Files

#61-F-40

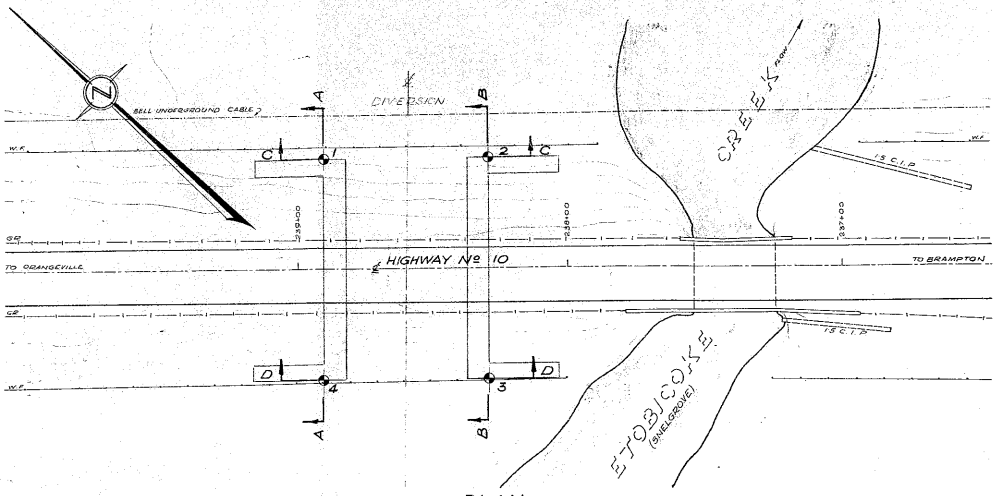
W.P. #114-61

Hwy. #10

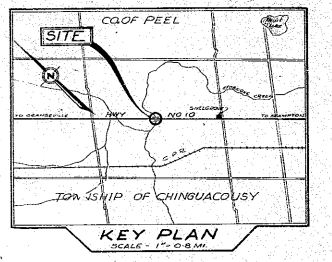
DIVERSION

ETOBICOKE

(SNELGROVE) CR.



PLAN
SCALE 1" = 20'

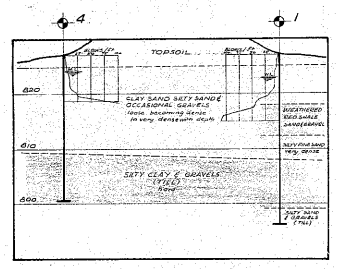


KEY PLAN
SCALE - 1" = 0.8 MI.

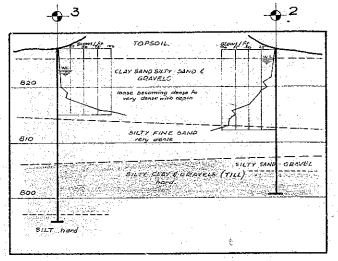
LEGEND

BORE AND PENETRATION HOLE

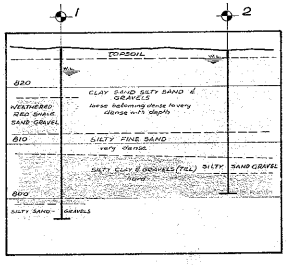
HOLE	ELEVATION	STATION	OFFSET
1	827.00	238+90	40'RT
2	826.50	238+30	40'RT
3	827.00	238+30	40'LT
4	827.00	238+90	40'LT



A – A

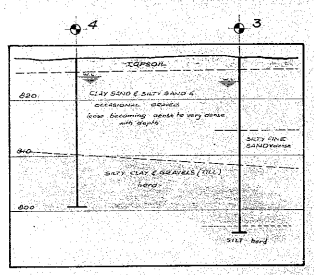


B – B

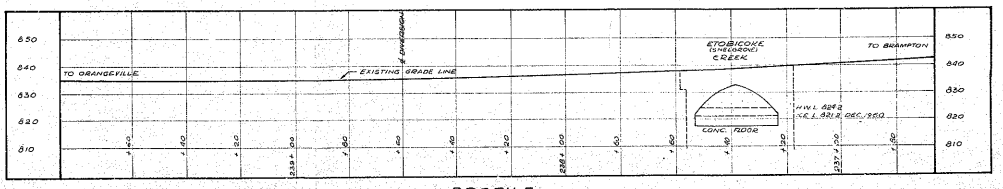


C – C

SCALE FOR SECTIONS VERTICAL 1"=10' HORIZONTAL 1"=20'



D – D



PROFILE
SCALE 1"=20'

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION

ETOBICOKE (SNELGROVE) CREEK DIVERSION & HWY No. 10

ORIGINATED: B. GHADIALI	DISTRICT NO.: 6	DATE: 31 MAY 1961
DRAWN: J. Ferguson	W.P. NO.: 114-61	JOB NO.: 61-F-40
CHECKED:	SCALE: AS SHOWN	DRAWING NO.: 61-F-40A
APPROVED:		