

DOCUMENT VERIFICATION

GEOCRES No. 40 J16 - 043

DIST. 1 REGION SOUTHWESTERN

W.P. No. 43-65-18

CONT. No. 70-239

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

STR. SITE No. 14-366

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

LOCATION TALFORD CREEK STRUCTURE

CULVERT

OVERLAY SPANNING TO BE INDICATED ON REPORT 2

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

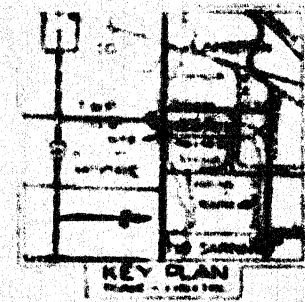
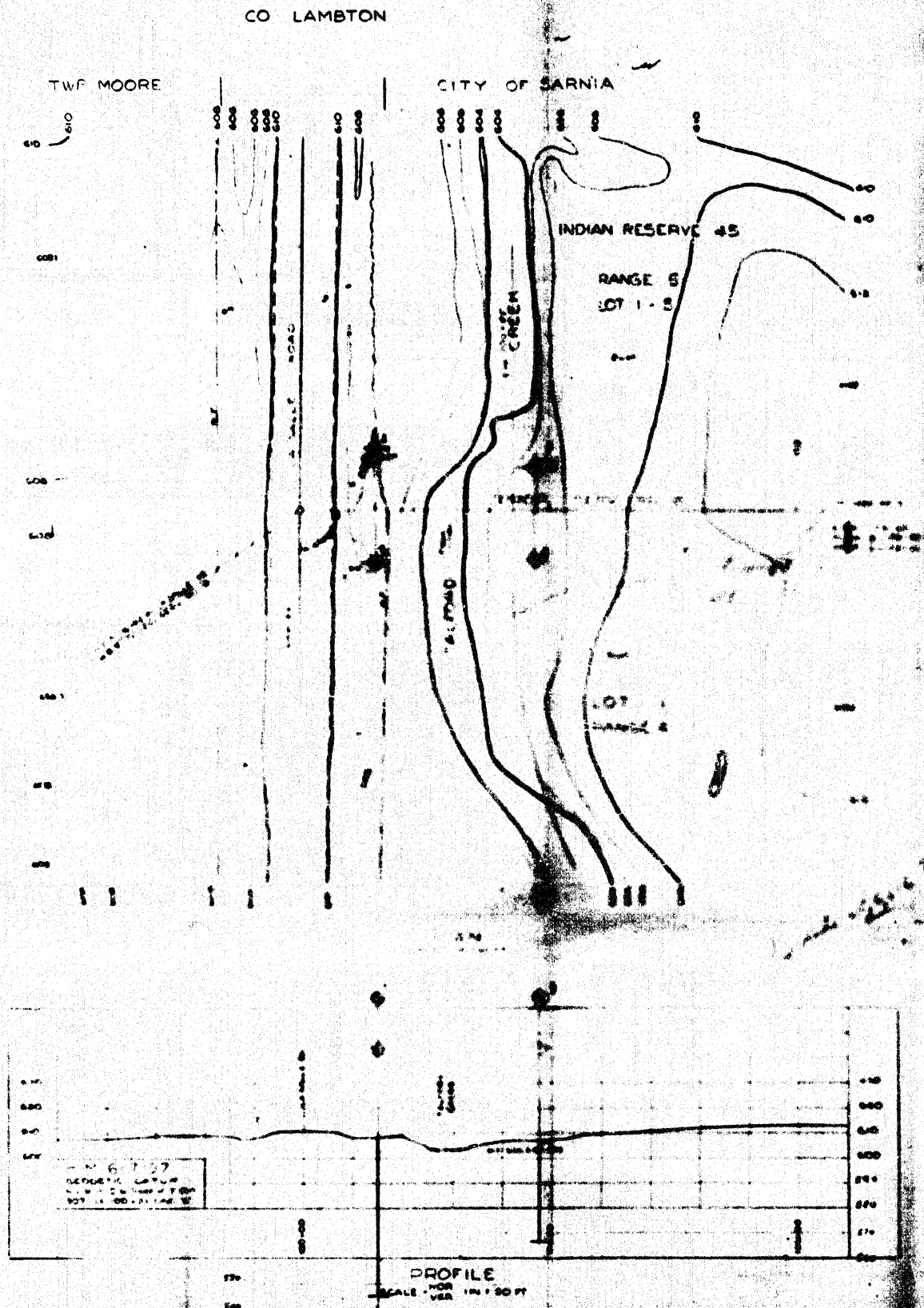
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E-4001-1

E-4001-1



ENGINEERING SECTION

PRINT

DEPARTMENT OF HIGHWAYS ONTARIO

DESIGN BRANCH

ENGINEERING SURVEYS OFFICE

BRIDGE SITE

PROPOSED CROSSING

TALFORD CREEK

PROP SERV. RD 'B'

SARNIA INDIAN RESERVE 45

LOTS 1-561

RANGE 45

CITY OF SARNIA

CO LAMBTON

SCALE	DISTRICT	REGION
AS SHOWN	CHATHAM	SOUTH WESTERN

M.O. 55-48-65-11	Date	Survey	Site
11-11-11	11-11-11	11-11-11	11-11-11

SURVEY BY

Checked by - C. McDonald

Supervised by - R. A. Smith

CHECKED BY

Supervised by - R. A. Smith

PLAN 1" = 40 FT

[illegible]

CITY OF SARNIA

**CARNIA INDIAN RESERVE 45**

TWP. MOORE

04. H.A.D. B. CR. SERVICE DESIGNED  
NOTMAL.CO - 23. EVERAGE 42 - AINPAA YTTI

PRINTED IN U.S.A.

"PERFECT" CROSS SECTION  
10 X 10 - ONE INCH  
EUGENE DIETZGEN CO.

**Keywords:** child sexual abuse; disclosure; social support

\*PERFECT\* LEAD SECTION  
10 X 10 -> ONE INCH  
EUGENE DIEZGEN CO.

WILLIAM L. B. B.

40J16-043

DOCUMENT MICROFILMING IDENTIFICATION

GEOCREs No. 40J16-043

DIST. 1 REGION Southwestern

W.P. No. 43-65-18

CONT. No. 70-239

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

STR. SITE No. 14-366

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

LOCATION Telford Creek Structure  
Culvert

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 82

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

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\_\_\_\_\_

FOUNDATION INVESTIGATION REPORT  
For  
Talford Creek Structure  
At LaSalle Road  
Proposed Service Road 'B'  
C.A.H. #40  
District No. 1 (Chatham)  
W.O. 70-11101 - W.P. 43-65-18

1. INTRODUCTION:

In a memo dated October 29, 1970, a request was submitted by Mr. A. P. Watt, Regional Bridge Planning Engineer, Southwestern Region, for a foundation investigation at the location of the above structure.

The investigation was carried out by the Foundation Section. Presented in this report are the results of this investigation, together with the recommendations regarding the structure foundations.

2. DESCRIPTION OF THE SITE:

The site is located at the crossing of Talford Creek by the proposed Service Road 'B', C.A.H. #40 at LaSalle Road.

LaSalle Rd. runs east from existing Hwy. #40 and forms the southern boundary to the City of Sarnia. The proposed Service Road 'B' runs north from LaSalle Rd. some 2-1/2 miles East of existing Hwy. #40.

Talford Creek, in the area of the crossing, lies adjacent and approximately parallel to LaSalle Road. The ground immediately north of LaSalle Road is flat for some 20 feet before sloping down to the creek bed at approx. 2:1 slopes. The creek bed is 6 feet wide and beyond this the terrain rises very slowly initially at about 6:1. For some 18 feet beyond this, it is relatively flat.

2. DESCRIPTION OF THE SITE: (cont'd.) ...

The existing road grade is at elev. 610.7, some 8 feet above the creek bed.

The topography is flat: south of LaSalle Road is cultivated farmland; north is the Sarnia Indian Reserve which, in the immediate area, is bush-covered.

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

3. FIELD AND LABORATORY INVESTIGATION:

The field work consisted of two sampled boreholes and four dynamic cone penetration tests.

Undisturbed samples were obtained by means of 2" I.D. Shelby tubes pushed manually into the subsoil. Disturbed samples were obtained using a 2" O.D. split-spoon sampler; the energy used for driving conformed to the requirements of the Standard Penetration Test. Vane tests were carried out, where possible, 1-1/2 feet below the sample depths.

The equipment used consisted of a diamond drill adapted for soil sampling purposes.

All samples were visually identified in the field and then returned to the laboratory where further tests were carried out to determine Atterberg Limits, moisture contents, bulk density, grain-size distribution and undrained shear strength.

The locations and elevations of the boreholes were surveyed by personnel from London Region and are shown in the Appendix of this report, together with the results of the field and laboratory tests.

4. SUBSOIL CONDITIONS:

The subsoil at the site consists of a deep deposit of clayey silt to silty clay with some sand and traces of gravel; both boreholes were terminated within this stratum. The deposit is described in more detail as follows:

4.1) Clayey Silt - Silty Clay with some Sand and traces of Gravel:

The deposit was found to underlie the topsoil and extended down to the termination of both boreholes - i.e., to a depth of 63 feet in Borehole #1 (elev. 545.2) and to a depth of 40 feet in Borehole #3 (elev. 566.3). It is most probable that this deposit continues down to the surface of the bedrock which is apparently around 140 feet deep.

Above elev. 563.2 in Borehole #1 and elev. 572.0 in Borehole #3, the material is classed as clayey silt - silty clay; below these elevations the material is silty clay.

Laboratory and field tests gave the following results:

	<u>Clayey Silt - Silty Clay</u>	<u>Silty Clay</u>
Moisture Content %	17 - 28	27 - 31
Liquid Limit %	30 - 47	44 - 45
Plastic Limit %	16 - 23	21 - 23
Bulk Density p.c.f.	127 - 130.5	120 - 121

Considering the strength of the whole deposit:

Field vane values varied from 1,450 p.s.f. to over 2,000 p.s.f. with sensitivities ranging from 1.9 to 2.3.

Unconfined compression tests gave shear strengths ranging from 1,000 p.s.f. to 2,500 p.s.f.

A plot of Shear Strength vs. Depth is shown in the Appendix. For design purposes, the material can be taken as over 2,000 p.s.f. above elev. 579.0; below this the strength drops sharply to an average value of 1,600 p.s.f.

## 5. GROUNDWATER ELEVATIONS:

Groundwater elevations, observed at the close of field operations were found to be as follows:

B.H. #1	:	Elev. 607.4
B.H. #2	:	Elev. 597.3

It must be noted that the above water levels may not represent the true groundwater levels due to the relatively impermeable nature of the subsoil and the short duration of the field work.

The water level in the creek at the time of the field investigation, was elev. 603.9; in the spring, though, the level can be as high as the existing road grade - i.e., elev. 610.7.

## 6. DISCUSSION AND RECOMMENDATIONS:

### 6.1) General:

It is proposed to build a structure to carry proposed Service Road 'B', C.A.H. #40 over Talford Creek. Several possible types of structure are being considered, as shown below:

- a) 2 - 14'  $\emptyset$  multiplate pipes - grade at elev. 613.
- b) 2 - 17' x 11.2' multiplate pipe arches - grade at elev. 612.
- c) 25' x 10' concrete box - grade at elev. 613.
- d) 30' clear span bridge - grade at elev. 615 to 616.

The existing road grade is at elev. 610.7, some 8 feet above the creek bed.

A slight diversion of the creek some 25 feet north is planned.



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

6.1) General: (cont'd.) ...

Subsoil at the site consists of a deep deposit of stiff to hard clayey-silt to silty clay.

Recommendations concerning the foundations for the proposed structure, are given below:

6.2) Alternatives (a) & (b) Multiplate Pipes or Pipe Arches, And (c) Concrete Box Culvert:

No particular problems are anticipated should either of the above alternatives be adopted, provided construction is according to D.H.O. standards after provision of an initial 12" minimum thickness granular pad.

6.3) Alternative (d) Bridge Structure:

Should this alternative be adopted, the structure can be founded on spread footings at or below elev. 599.0 with a safe bearing pressure of 2 tons/sq.ft.

If scour is a problem, protection can be provided by sheet piling left permanently in place around the footings.

For frost protection, it will be necessary to ensure that the footings are at least 4 feet below the lowest established water level.

As an alternative to the above, the footings may be supported on timber piles. In the case of No. 14 treated timber piles, 20 tons design load for 40 ft. penetration into original ground is recommended.

The topsoil stripping should be in accordance with the pertinent D.H.O. standards.

Pile caps also should be placed a minimum of 4 feet below the lowest established water level to give the necessary frost protection.

Protection against scour should be provided up to H.W.L. in the vicinity of the structure.

7. MISCELLANEOUS:

The field investigation was carried out from October 29, 1970 to November 6, 1970, under the supervision of Mr. G. Allen, Project Foundation Engineer, who also prepared this report.

Equipment used was owned and operated by P.V.K. & Sons Drilling Co.

Mr. K. G. Selby, Supervising Foundation Engineer, reviewed this report.

November, 1970

Shear strength  
1000 2000

Telford Creek 70-11101

= 1  
= 3

○ uncured  
+ field name

610

Groundwater #1  
#3

Creek bottom

600

590

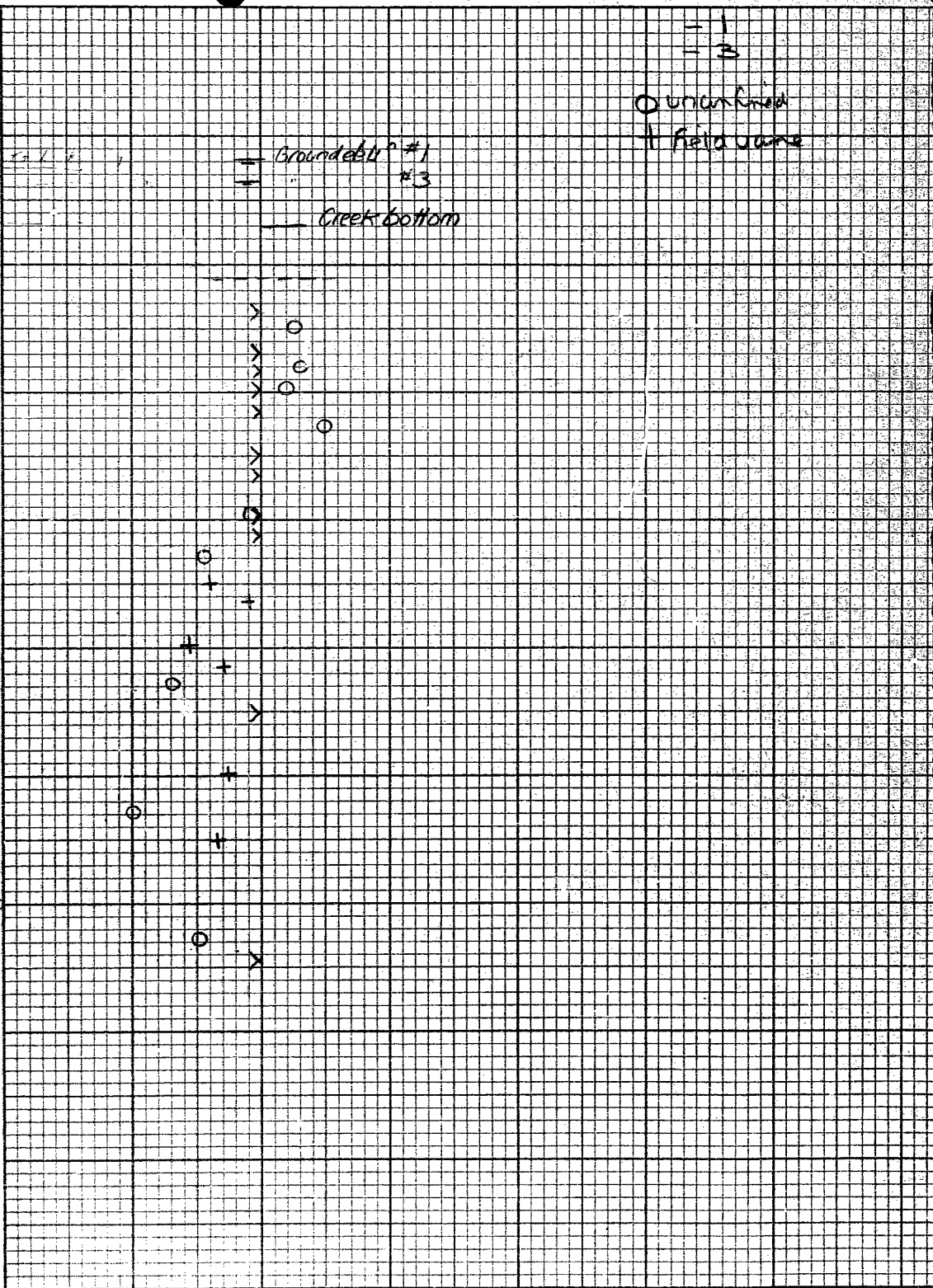
580

570

560

540

10 X 10 TO THE INCH 47 0782  
10 X 13 INCHES  
KEUFFEL & ESSER CO.  
MADE IN U.S.A.



DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT <u>70-11101</u>		SITE <u>Sarnia</u>		BOREHOLE No. <u>3</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	3.0 4.5	1" Ø1"	Round	—	25	75	High	Dull	None	Tough	Earthy	Mottled Gray-Brown	Strong	20	Clayey Silt with some Sand (classified)	CL
2	6.0 7.5	1" Ø1"	"					Dull	"	"	"	"	"	45	as above (class)	CL
3	9.0 10.5	1" 16"	"	—	20	80		Dull Shiny				Grey		23	Clayey silt-silty clay some Sand	CL CI
4	12.0 13.5	3" Ø1"	Sub Round	5	15	80		Dull Shiny				"		20	Clayey Silt-silty Clay some Sand, traces Gravel	CL CI
6	20.0 21.5	1" 2"	"	3								"		11	as above	CL CI
8	30.0 31.5											"		11	Silty Clay as above	CL CI
9	35.0 36.5											"		X	Silty Clay (with some Sa. traces Gravel)	CI

NOTES:— VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:—

DEPARTMENT OF HIGHWAYS — ONTARIO  
MATERIALS AND TESTING OFFICE  
**VISUAL CLASSIFICATION SHEET**

PROJECT 70-11101 SITE Sarnia BOREHOLE No. 1 GROUND ELEVATION \_\_\_\_\_

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	30 45	1/2"	Round	—	20	80	High	Dull	None	Tough	Earthy	Brown	Strong	19	Clayey Silt with some Sand (dss)	CL
2	60 75	1/8"	"	—	17	83	"	Shiny	"	"	"	"	"	31	Silty Clay with some Sa. (dss)	CI
3	90 105	"	"	—	15	85	"	"	Slow	"	"	"	"	16	Silty Clay with some Sand.	CL- CI
7	25.0 26.5	"	"		25	75	"	"	"	"	"	Grey	"	14	cl. Silt h. " " " "	CL CI
9	35.0 36.5	"	"	—	22	88	"	"	"	"	"	"	"	9	" " " " "	CL CI
11	450 465	3/4"	"	3	28	75	"	"	"	"	"	"	"	11	Silty Clay trace Gravel	CI
														—		

NOTES:— VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

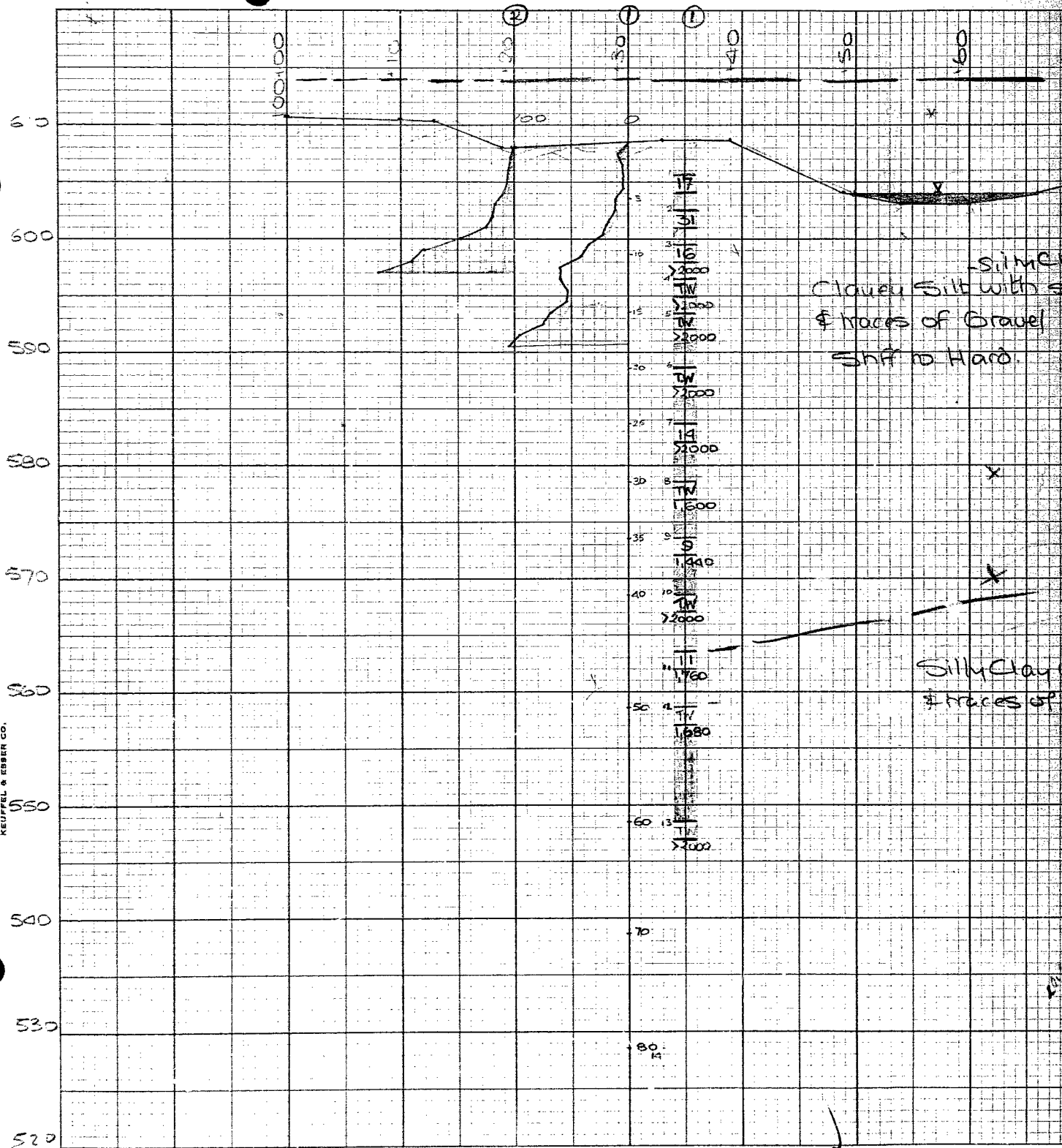
REMARKS:—

70-11101 Sumia

CAN 40

S Rd 'B'

Telford Creek



Hand-drawn geological cross-section on graph paper. The top profile is labeled "Silty Clay" and "Clay, silt with some sand & traces of gravel" and "Sh# to Hard". The bottom profile is labeled "Silty Clay with some sand" and "Traces of Gravel". A vertical scale on the right indicates depths from 0 to 100 feet. A north arrow is also present.

40316-043

DEPARTMENT OF HIGHWAYS- ONTARIO		<b>RECORD OF BOREHOLE No. 1</b>		FOUNDATION SECTION	
MATERIALS & TESTING OFFICE					
JOB <u>70-11101</u>	LOCATION <u>Sta. 100 + 30 o/s 21' Rt.</u>	ORIGINATED BY <u>GA</u>			
W.P. <u>43-65-18</u>	BORING DATE <u>Oct. 29, 30 &amp; November 4, 1970</u>	COMPILED BY <u>GA</u>			
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Washboring NX Casing</u>	CHECKED BY <u>///</u>			

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$		BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %			
608.2	Ground Level						20 40 60 80 100				
0.0	Clayey silt-silty clay with some sand and traces of gravel  Stiff to Hard		1	SS	19						
			2	SS	31						
			3	SS	16						
			4	TW	PM						
			5	TW	PM						
			6	TW	PM						
			7	SS	14						
			8	TW	PM						
			9	SS	9						
			10	TW	PM						
563.2	Silty clay with some sand & traces gravel  Stiff		11	SS	11						
45.0			12	TW	PM						
			13	TW	PM						
545.2											
63.0	End of Borehole										



40516-043

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-11101 LOCATION Sta. 100 + 30 o/s 25' Lt. ORIGINATED BY GA  
 W.P. 43-65-18 BORING DATE November 4, 1970 COMPILED BY GA  
 DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY RL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — $w_L$ PLASTIC LIMIT — $w_p$ WATER CONTENT — $w$	BULK DENSITY $\gamma$ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT			
608.0	Ground Level						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE	$w_p$ — $w$ — $w_L$ WATER CONTENT %		GR. SA. SI. CL.
0.0						600				
597.0										
11.0	End of Cone Test						End of Cone			

40316-043

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING OFFICE

## RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-11101

LOCATION Sta. 100 + 0 o/s 17' Lt.

ORIGINATED BY GA

W.P. 43-65-18

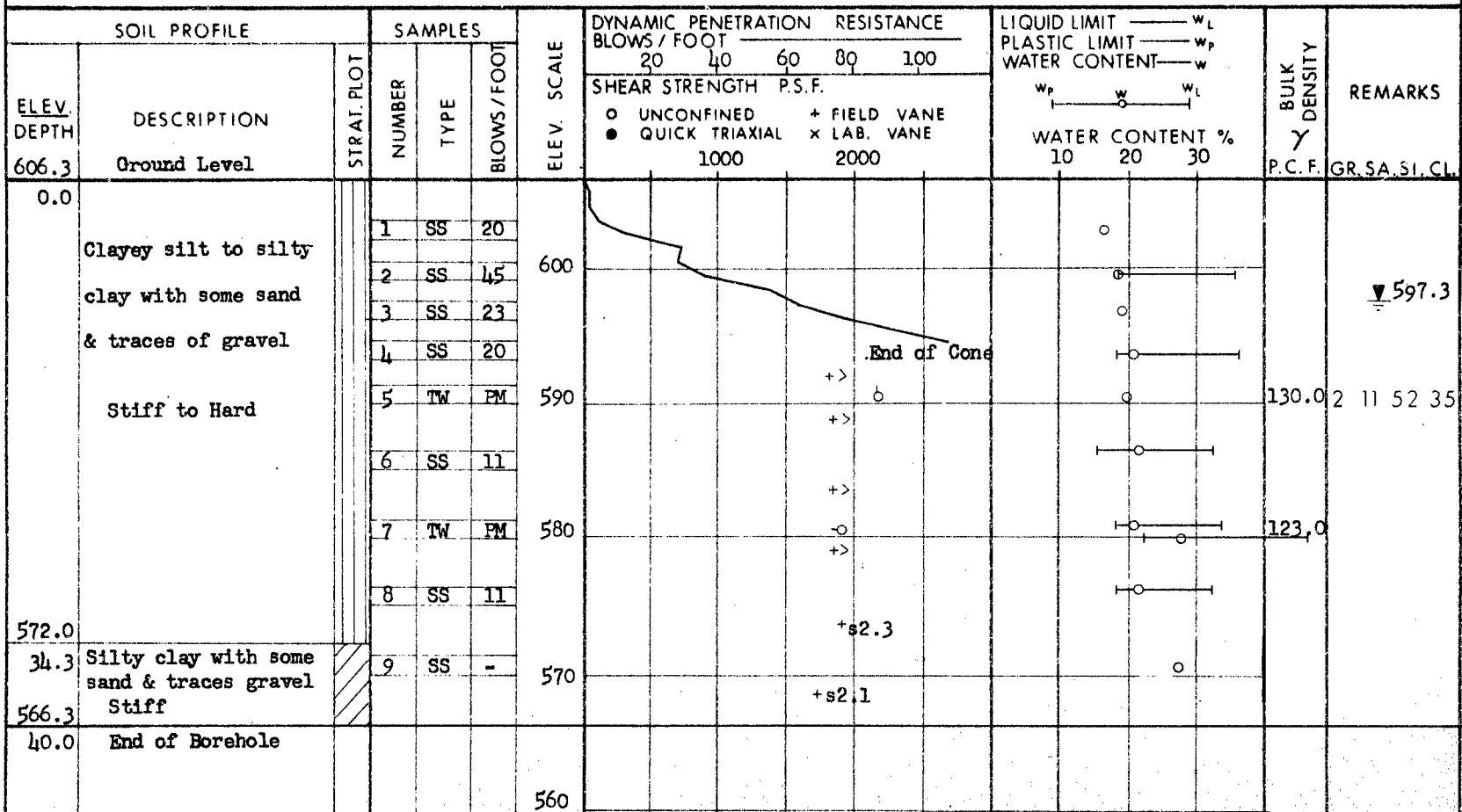
BORING DATE November 4 &amp; 5, 1970

COMPILED BY GA

DATUM Geodetic

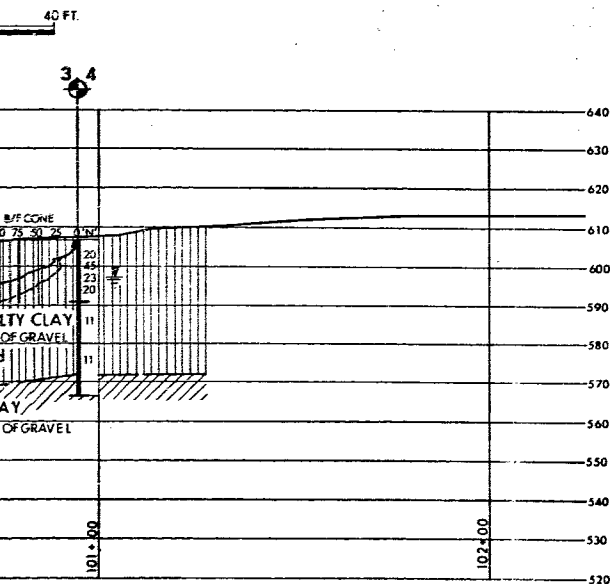
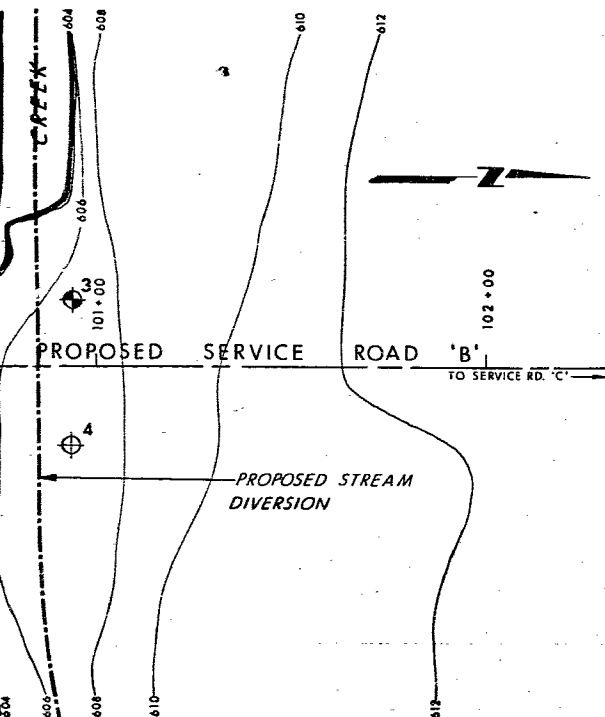
BOREHOLE TYPE Washboring NX Casing

CHECKED BY

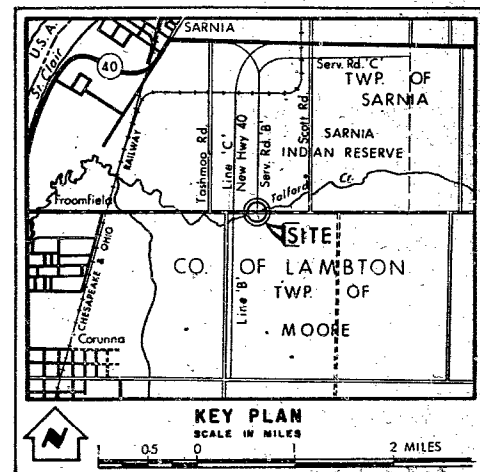








SERVICE RD. 'B'



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. NOV. 1970.		
NO.	ELEVATION	STATION	OFFSET
1	608-2	100+30	21' RT.
2	608-0	100+30	25' LT.
3	606-3	100+95	17' LT.
4	606-9	100+94	20' 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 OFFICE - FOUNDATION SECTION			
<b>TALFORD CREEK</b>			
KING'S HIGHWAY NO. 40 LINE 'C' SERVICE RD. 'B' DIST. NO. 1			
CO. LAMBTON			
TWP. SARNIA LOT CON.			
<b>BORE HOLE LOCATIONS &amp; SOIL STRATA</b>			
SUBMITT. G. A.	CHECKED <input checked="" type="checkbox"/>	W.P. NO. 43-65-18	M.T. DRAWING NO.
DRAWN E. D.	CHECKED <input checked="" type="checkbox"/>	JOB NO. 70-11101	<b>70-11101A</b>
DATE	NOV. 16, 1970	SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>A. B. Thomas</i>	CONT. NO.		