

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M15 - 38

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

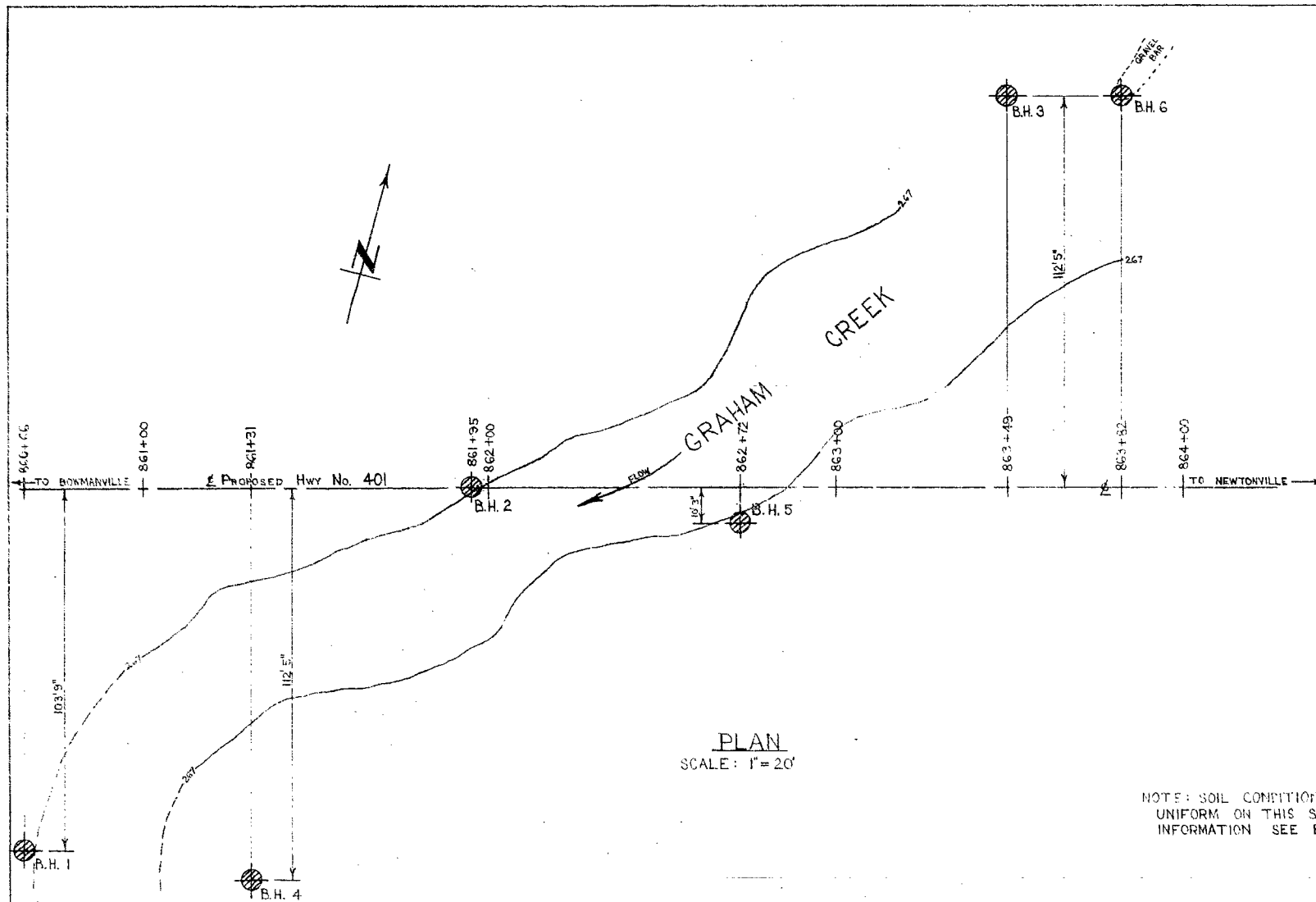
HWY. No. 401

LOCATION GRAHAM CREEK,
NEAR NEWCASTLE,

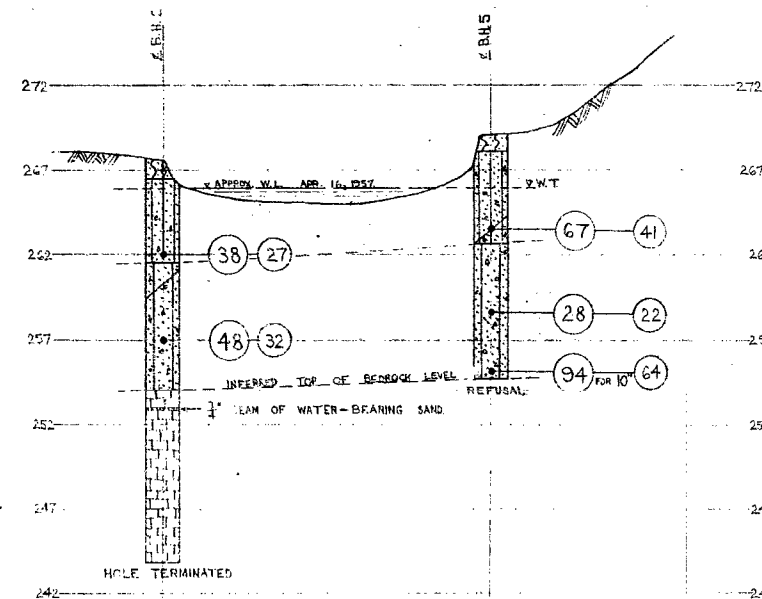
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. ONE

REMARKS: _____

G.I.-30 SEPT. 1976



NOTE: SOIL CONDITIONS ARE VERY UNIFORM ON THIS SITE. FOR OTHER INFORMATION SEE BOREHOLE LOGS.



LEGEND

- ORGANIC SILTY AND SANDY TOPSOIL
- VERY FINE SANDY SILT GRITS
- SILTY FINE TO COARSE SAND, GRITS AND GRAVEL
- BEDROCK, DOLOMITIC LIMESTONE
- 48 - FIELD OR "N" VALUES, STANDARD PENETRATION TEST
- 32 - CORRECTED "N" VALUES, TAKING INTO ACCOUNT STONE INTERFERENCE, SILT CONTENT, AND POSITION OF WATER TABLE

30M15-38
GEOCRE No.



30M15-38
GEOCRE No.

e.m. peto & associates ltd.
SOIL SITE INVESTIGATION
AT
GRAHAM CREEK-HWY. 401 BRIDGE
NEAR NEWCASTLE, ONT.
FOR
DEPARTMENT OF HIGHWAYS OF ONTARIO
PLANNING AND DESIGN BRANCH
OUR JOB No. 5734 DATE: MAY 1, 1957
CLIENTS PLAN No. E 3233-1 PER: M. M.

BA 594

AN INDEPENDENT ORGANIZATION PROVIDING A COMPLETE SOIL ENGINEERING & INVESTIGATION SERVICE

e. m. peto associates ltd.

30M15-38

YOUR REFERENCE:-

850 roselawn avenue,

OUR REFERENCE:- 5734

TORONTO, ONTARIO.

RUssell 1 - 4955.

REPORT ON

SOIL SITE INVESTIGATION

GRAHAM CREEK - HWY. NO. 401 BRIDGE

NEAR NEWCASTLE, ONTARIO

for

DEPARTMENT OF HIGHWAYS OF ONTARIO

PLANNING AND DESIGN BRANCH

30M15-38
GEOCREs No.

TERMS OF REFERENCE:

We were retained, by a letter from Mr. J. C. McAllister of the Bridge Department dated April 2nd, 1957, to perform a complete investigation of soil and foundation conditions at the site of the proposed Graham Creek Bridge.

Six test holes in all were to be put down at suggested locations shown on the D.H.O. site plan No. E-3233-1, but otherwise the depths of the holes, method of sampling, any laboratory testing, etc. were left to our discretion.

If refusal or bedrock was encountered at a relatively shallow depth, this was to be proven by coring a distance of at least 10 feet in one or more of the holes, using a diamond core bit and barrel.

Water table levels were to be carefully noted.

METHOD OF OPERATIONS:

The equipment was moved to the site immediately upon completion of the previous job at the proposed Highway 401 - C.P.R. overhead bridge to the East. Work was commenced April 17th and was completed April 20th, 1957.

METHOD OF OPERATIONS: (Cont'd)

The six test holes were finally located as shown on the site plan at the rear of this report.

The material encountered was generally very dense and non-cohesive. The holes were therefore put down by driving and cleaning out 2-1/2" diameter flush joint casing (with some difficulty), and then sampling ahead of the casing at 5 ft. intervals with the 2" standard split barrel sampler. The standard penetration test results were also recorded, these being the number of blows of a 140 lbs. hammer dropping 30" required to drive the 2" sampler a distance of one foot.

Once refusal was encountered at test hole 2, the diamond drill bit and core barrel were used, and 10 ft. of core were extracted, and it was definitely proven that refusal was on sound rock.

Ground water levels were measured upon completion of each hole.

All the soil samples and the rock core were carefully examined and complete borehole logs were drawn up. These are included at the rear of this report. The samples will be retained for a period of at least 30 days, after which they will be discarded unless we are otherwise notified.

All elevations mentioned in this report are referred to Geodetic datum, and were obtained from a D.H.O. bench mark which was a nail in the North face of a 3'6" elm tree 73 feet right of station 861 + 83.

SITE AND GEOLOGY:

The topography at the site is generally undulating to hilly, and the stream valley itself is not too well defined at this point. The stream is 1 to 3 feet deep, and flowing with fairly high velocity. The stream bed is mostly composed of gravel and small boulders, and there are boulders exposed throughout the area.

The stream is prone to periodic flooding, with much of the trouble apparently being caused by a culvert downstream from the site, where the stream flows under the C.N.R. railway tracks. This culvert appears to be undersized and ice and logs occasionally jam in the opening to create a damming effect.

The site lies in a sandy limestone till plain, the till containing limestone fragments resulting from glacial action on the Trenton and Black River Limestone.

SOIL CONDITIONS:

Apart from minor surficial strata of organic soil and stream-transported and deposited materials, soil conditions on the site are quite uniform.

Silty Sand with Grits and Gravel

The major soil stratum on the site, which can be broadly termed a sandy till, grades from a sandy silt with grits and gravel to a silty sand with grits and gravel. The consistency of this material is generally dense to very dense, and its colour is light grey. What we have termed grits and gravel is actually angular, grey-black limestone fragments. The soil is saturated and is relatively permeable. This stratum is from 8-1/2 to 14 feet thick and overlies the bedrock beneath.

Corrected standard penetration test values in this stratum vary from 22 to well over 100.

Limestone Bedrock

Directly underlying the dense sandy till stratum is a dark grey to brownish-black dolomitic limestone, which contains a few fossils. The top surface of the limestone is relatively flat, with a gentle slope following the stream gradient. It varies between elevations 252.8 to 255.4, the higher elevation being over 300 ft. upstream from the lower one.

At the one spot where a sample of rock core was actually taken the rock was very sound below an elevation of approximately 252.5 and was certainly capable of tolerating loads in the order of 10 tons per sq. ft. with safety. We have in the past crushed cylindrical samples of rock core in similar material with a concrete testing machine and have obtained ultimate compressive strengths of over 100 tons per sq. ft. The rock is stronger than any concrete, with strengths averaging 7600 p.s.i.

WATER CONDITIONS:

As stated above, the sandy till stratum, although dense, is relatively permeable. The ground water table at the site is therefore equal to the adjacent stream water level, and fluctuates as the stream level rises or falls.

At the time of this investigation the stream water level near the proposed centre-line of Hwy. No. 401 was at elevation 265.55, with a stream gradient of from 0.4 ft. to 0.5 ft. per 100 ft. run.

RECOMMENDATIONS AND CONCLUSIONS:

1. Although bedrock is at shallow depths, it would not be practicable to drive short piles to bedrock for the foundations of the structure. Any type of piles other than steel H-piles would encounter extreme resistances in driving.
2. Assuming that a bridge structure is designed for this site, it could be founded on spread footings which should be based on the sandy silt or silty sand material below the loose surface deposits. Ordinarily these footings should be at the highest elevations possible commensurate with good soil conditions, so as to have the least trouble with water in the excavations. However, on this particular site we feel that any spread footings should be 5 feet below stream level because of the danger of some small potential scour. Such footings could have allowable bearing capacities of 2.2 tons per sq. ft. for square footings or 2.8 tons per sq. ft. for strip footings with widths limited to a maximum of 6 feet.
3. Although quicking would not be a factor, there would be problems with water seepage in any excavation because of the relatively permeable nature of the soil and the difficulty in driving sheeting.
4. It is our opinion that the best structure for this site would be a large box culvert of the proper capacity for the stream flow. If such a structure is used, measures should be taken to prevent any possibilities of scour at the upstream face. If any wingwalls are used to channel the flow into the culvert the small footings under these should be at least 4 feet below stream level to avoid scour. If possible the culvert should be constructed at the time of minimum stream flow in late summer.

E. E. PETO ASSOCIATES LTD.,



E. E. Peto, P. Eng.

EL:sb

May 3rd, 1957.

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO





BOREHOLE LOG

Job Name Hwy. 401 - Crahan Creek Bridge Job No. 5234 Borehole No. 1
 Client Dept. of Highways Casing BX (2 1/2" diam.) Boring Date April 17, 1957
 Datum Geodetic Compiled By M. Miranda Checked By E. M. Peto

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS

	UNDISTURBED	S. S. 2" STANDARD SPLIT TUBE SAMPLE	V. T. IN SITU VANE SHEAR TEST
	FAIR	S. L. SPLIT BARREL WITH LINERS	Q/u UNCONFINED COMPRESSIVE STRENGTH
	DISTURBED	S. T. THIN-WALLED SHELBY TUBE SAMPLE	W. L. WATER LEVEL IN CASING
	LOST	W. S. WASH SAMPLE	W. T. GROUND WATER TABLE IN SOIL
		R. C. ROCK CORE	

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft	WATER LEVELS, SOIL MOISTURE & REMARKS
SILTY AND SANDY TOP SOIL	DARK BROWN		0' 0" 208.5					
			1' 0" 207.5					W. L. 38" ± S. VANE W. L. AT THIS POINT
SILT AND FINE SAND PEBBLES	GREYISH-BROWN	DENSE	5' 0" 202.5			S. S.	32	VERY ANGULAR GRAY-BLACK LIMESTONE FRAGMENTS OCCUR THROUGHOUT
CLAYEY SILT WITH SAND AND GRAVEL SOME VERY FINE SAND	LIGHT GREY	DENSE	10' 0" 197.5			S. S.	43	W. L. MODER CLAY CONTENT
SILTY SAND WITH GRITS AND GRAVEL	GREY	DENSE	15' 0" 192.5			S. S.	150/6"	VERY
			16' 0" 191.5					REFUSAL. PROBABLY BEDROCK.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO
BOREHOLE LOG

Borehole No. 2

Boring Date April 17-18, 1957.

Checked By E. M. Peto

ABBREVIATIONS

V. T. IN SITU VANE SHEAR TEST

Q/c UNCONFINED COMPRESSIVE STRENGTH

W.L. WATER LEVEL IN CASING

W. T. GROUND WATER TABLE IN SOIL

R. C. ROCK CORE

SOIL DESCRIPTION	COLOR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
SILT AND SANDY TOPSOIL	LIGHT BROWN		0' 6" 267.5					V.L.T. = 10"
VERY FINE SAND SILT SOME GRAVEL	LIGHT GREY	DENSE	5' 0" 262.5		X	S.S.	38	VERY LIGHT MINOR CLAY CONTENT
SILT MEDIUM TO COARSE SAND LIMESTONE FRAGMENTS	LIGHT GREY	DENSE	10' 0" 257.5		2 X	S.S.	48	WET
			13' 0" 254.5					VIRTUAL REFUSAL AT 13' 0"
DOLOMITIC AND SOME FOSSILIFEROUS LIMESTONE	DARK GREY TO BROWNIISH-BLACK	CAN BE SCRATCHED WITH A KNIFE	26' 0" 247.5			R.C.		NO FLAWS OR FAULTS BELOW 14' 9". 100% CORE RECOVERY
			28' 0" 243.5			R.C.		HOLE TERMINATED.

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Hwy. 401 - Graham Creek

Job No. 5734

Borehole No. 3

Client Dept. of Highways of Ontario

Casing BX (2-1/2" diam.)

Boring Date April 18th, 1957

Datum Geodetic

Compiled By M. Mindess

Checked By E. M. Peto

SAMPLE CONDITION



UNDISTURBED



FAIR



DISTURBED



LOST

SAMPLE TYPE

S.S. 2" STANDARD SPLIT TUBE SAMPLE

S.L. SPLIT BARREL WITH LINERS

S.T. THIN-WALLED SHELBY TUBE SAMPLE

W.S. WASH SAMPLE

R.C. ROCK CORE



ABBREVIATIONS

V.T. IN SITU VANE SHEAR TEST

Q_u UNCONFINED COMPRESSIVE STRENGTH

W.L. WATER LEVEL IN CASING

W.T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft	WATER LEVELS, SOIL MOISTURE & REMARKS
FINE TO COARSE SAND AND GRAVEL	LIGHT GREY-BROWN	LOOSE TO COMPACT	3' 2" 263.3					
			7' 261.0					W.L. = 2' 0" - STREAM ALL AT THIS POINT
SILTY FINE SAND WITH GRITS AND GRAVEL	LIGHT GREY-BROWN	VERY DENSE	5' 0" 254.0		1	 S.S.	66	WET. ANGULAR GREY-BLACK Limestone FRAGMENTS THROUGHOUT
	LIGHT GREY	EXTREMELY DENSE	10' 0" 239.0		2	 S.S.	100/7	WET.
			4' 7" 234.4					REFUSAL. BEDROCK.

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG





Job Name Hwy. 401 - Graham Creek Job No. 5734
 Client Bridge
Dept. of Highways of Ontario Casing BX (2-1/2" diam.)
 Datum Geodetic Compiled By M. Mindess

Borehole No. 4
 Boring Date April 19th 1957
 Checked By E. M. Peto

SAMPLE CONDITION



SAMPLE TYPE

ABBREVIATIONS

 UNDISTURBED
 FAIR
 DISTURBED
 LOST

S. S. 2" STANDARD SPLIT TUBE SAMPLE
 S. L. SPLIT BARREL WITH LINERS
 S. T. THIN-WALLED SHELBY TUBE SAMPLE
 W. S. WASH SAMPLE
 R. C. ROCK CORE

V. T. IN SITU VANE SHEAR TEST
 Q/u UNCONFINED COMPRESSIVE STRENGTH
 W. L. WATER LEVEL IN CASING
 W. T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No. and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
SANDY TOPSOIL	BROWN		0' 0" 267.6					
FINE TO MEDIUM SAND SOME GRAVEL		LOOSE TO CONTACT						W.T. = 2' 5" STREAM WL. AT THIS POINT.
SILTY FINE TO MEDIUM SAND SOME GRAVEL	LIGHT BROWN-GRAY	COMPACT TO DENSE	5' 0" 252.6		1 	S.S.	28	WET
			13' 2" 257.6		2 	S.S.	113	WET - HIGH NUMBER OF BLOWS PARTIALLY DUE TO STONE INTERFERENCE.
			14' 2" 253.4					REFUSAL. PROBABLY BEDROCK.

e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Hwy. 401 - Graham Creek

Job No. 5734

Borehole No. 5

Client Dept. of Highways of Ontario

Casing LX (2-1/2" diam.)

Boring Date April 20th, 1957.

Datum Geodetic

Compiled By M. Mindess

Checked By E. M. Peto

SAMPLE CONDITION

- ☒ UNDISTURBED
- ☒ FAIR
- ☒ DISTURBED
- ☒ LOST

SAMPLE TYPE

- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- Q_u UNCONFINED COMPRESSIVE STRENGTH
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft.	WATER LEVELS, SOIL MOISTURE & REMARKS
ORGANIC, SILTY TOP SOIL	DARK BROWN		0' 0" 249.1					
VERY FINE SANDY SILT CLAY AND GRAVEL	DARK GREY-BROWN	VERY DENSE	5' 0" 254.1		1	<input checked="" type="checkbox"/> S.S.	67	W.T. = 3' 0" ± STREAM W.L. AT THIS POINT. QUITE MOIST. MINOR CLAY CONTENT.
SILTY FINE SAND, CLAY AND GRAVEL	LIGHT GREY	COMPACT	10' 0" 259.1		2	<input checked="" type="checkbox"/> S.S.	28	WET. HIGHER SILT CONTENT.
AS ABOVE. SOME MEDIUM SAND		EXTREMELY DENSE	14' 0" 264.8		3	<input checked="" type="checkbox"/> S.S.	94/10	WET.
								REFUSAL. PROBABLY BEDROCK.





e. m. peto associates ltd.

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Hwy. 401 - Graham Creek Job No. 5734 Borehole No. 6
 Client Dept. of Highways of Ontario Casing BA (2-1/2" diam.) Boring Date April 19th, 1957
 Datum Geodetic Compiled By M. Mindess Checked By E. M. Peto

SAMPLE CONDITION



-  UNDISTURBED
-  FAIR
-  DISTURBED
-  LOST

SAMPLE TYPE

- S.S. 2" STANDARD SPLIT TUBE SAMPLE
- S.L. SPLIT BARREL WITH LINERS
- S.T. THIN-WALLED SHELBY TUBE SAMPLE
- W.S. WASH SAMPLE
- R.C. ROCK CORE

ABBREVIATIONS

- V.T. IN SITU VANE SHEAR TEST
- Q/u UNCONFINED COMPRESSIVE STRENGTH
- W.L. WATER LEVEL IN CASING
- W.T. GROUND WATER TABLE IN SOIL

SOIL DESCRIPTION	COLOUR	Density or Consistency	Depth Elevation	Legend	Sample No and Condition	Sample Type	No. of Blows per Ft	WATER LEVELS, SOIL MOISTURE & REMARKS
SAND AND GRAVEL - STREAM BED		LOOSE TO COMPACT	0' 0" ∇ 265.7			∇ STREAM WATER	LEVEL	SATURATED
SILTY FINE SAND GRITS AND GRAVEL	LIGHT GREY	EXTREMELY DENSE	5' 0" ∇ 261.7		1 	S.S.	100/6"	WET THE GRITS AND GRAVEL THROUGHOUT CONSIST OF ANGULAR, GREY BLACK LIMESTONE FRAGMENTS
AS ABOVE, SOME MEDIUM SAND		EXTREMELY DENSE	10' 0" ∇ 256.7 11' 4" ∇ 255.4		2 	S.S.	100/6"	WET REFUSAL, PROBABLY BEDROCK.