

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40 P7-41

W.P. No. \_\_\_\_\_

CONT. No. \_\_\_\_\_

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

STR. SITE No. \_\_\_\_\_

HWY. No. 401

LOCATION PROP. Hwy. 401 O'PASS  
TWP. of BLENHEIM -  
OXFORD CO.

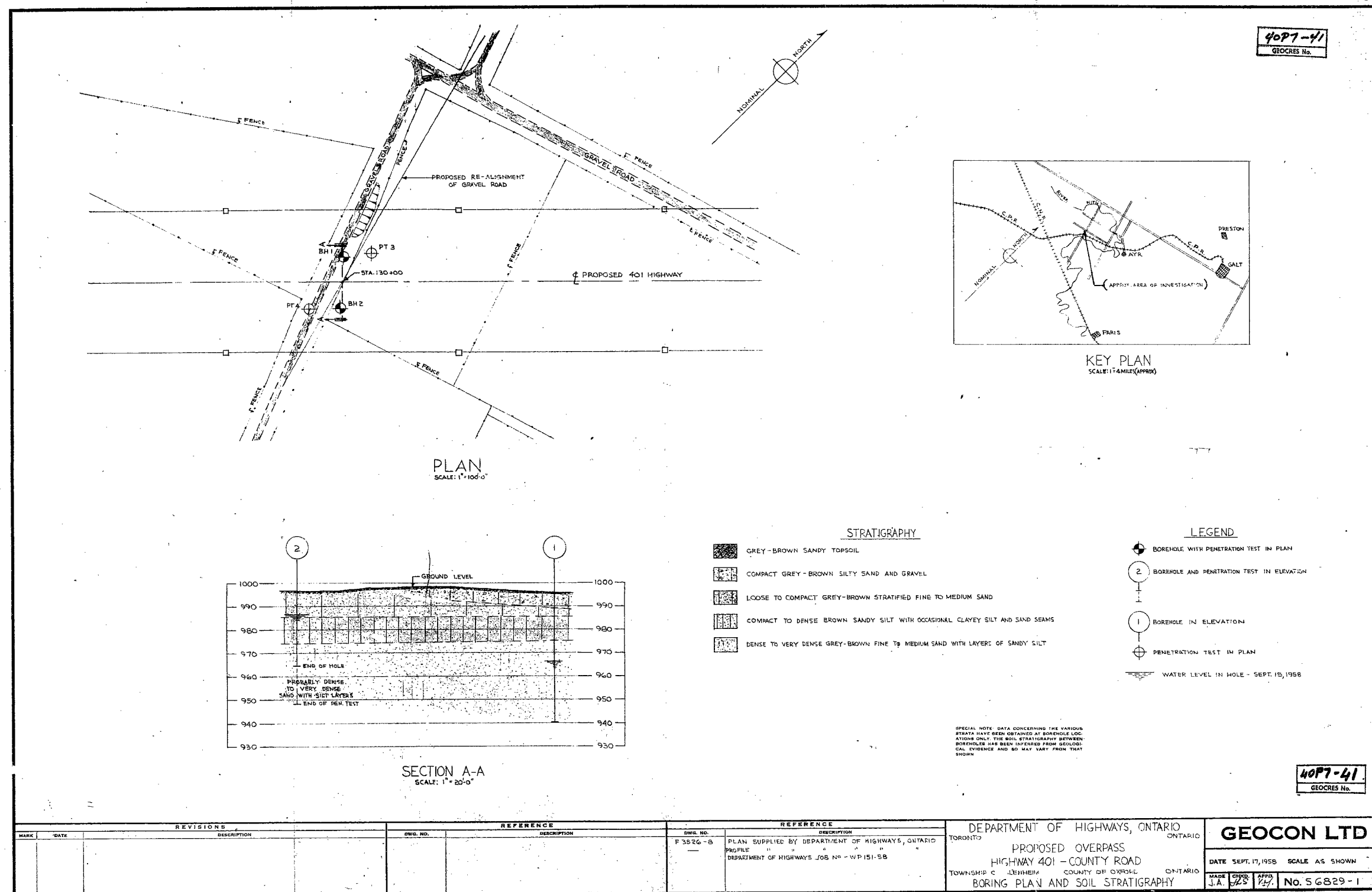
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. ONE

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

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DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40 P7-4i

W.P. No. \_\_\_\_\_

CONT. No. \_\_\_\_\_

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

STR. SITE No. \_\_\_\_\_

HWY. No. 401

LOCATION PROP. Hwy. 401 O'PASS  
TWP. of BLENHEIM -  
OXFORD CO.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. ONE

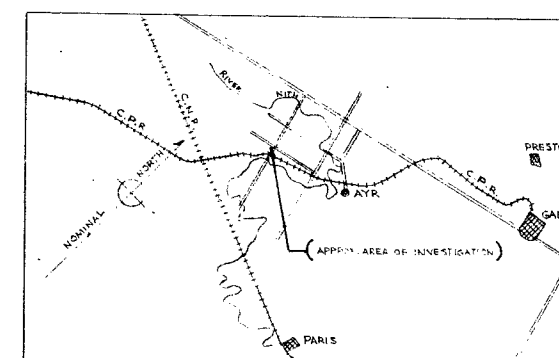
REMARKS: \_\_\_\_\_

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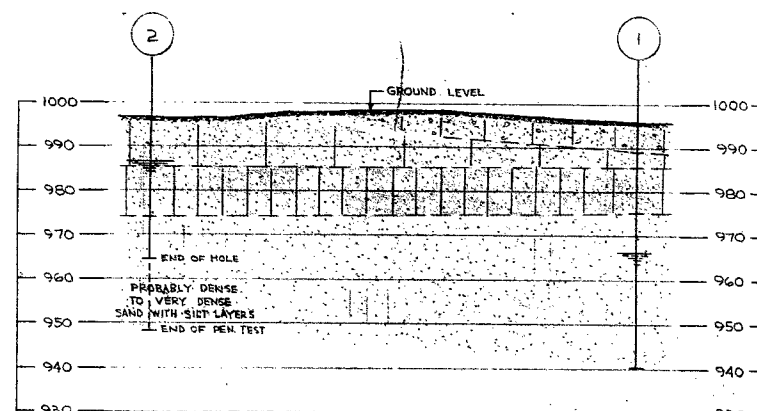
\_\_\_\_\_

G.I.-30 SEPT. 1976








KEY PLAN  
SCALE: 1" = 4 MILES (APPROX)

PLAN  
SCALE: 1" = 100'-0"








SECTION A-A  
SCALE: 1" = 20'-0"

## STRATIGRAPHY

- |   |  |
|---|--|
|  | GREY-BROWN SANDY TOPSOIL   |
|  | COMPACT GREY-BROWN SILTY SAND AND GRAVEL                                     |
|  | LOOSE TO COMPACT GREY-BROWN STRATIFIED FINE TO MEDIUM SAND                   |
|  | COMPACT TO DENSE BROWN SANDY SILT WITH OCCASIONAL CLAYEY SILT AND SAND SEAMS |
|  | DENSE TO VERY DENSE GREY-BROWN FINE TO MEDIUM SAND WITH LAYERS OF SANDY SILT |

### LEGEND

- LEGEND
-  BOREHOLE WITH PENETRATION TEST IN PLAN
-  BOREHOLE AND PENETRATION TEST IN ELEVATION
-  1
-  BOREHOLE IN ELEVATION
-  PENETRATION TEST IN PLAN
- U.S. GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION  
WASHINGTON, D.C. 20506
- WATER LEVEL IN HOLE - SEPT. 15, 1958

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

40P7-4  
GEOCRES No.

REVISIONS			REFERENCE		REFERENCE	
MARK	DATE	DESCRIPTION	DWG. NO.	DESCRIPTION	DWG. NO.	DESCRIPTION
			F 3526-B	PLAN SUPPLIED BY DEPARTMENT OF HIGHWAYS, ONTARIO PROFILE " " " DEPARTMENT OF HIGHWAYS JOB NO - WP 151-58		

DEPARTMENT OF HIGHWAYS, ONTARIO  
TORONTO

PROPOSED OVERPASS  
HIGHWAY 401 - COUNTY ROAD

TOWNSHIP OF BLENHEIM COUNTY OF OXFORD ONTARIO

BORING PLAN AND SOIL STRATIGRAPHY

## GEOCON LTD

DATE SEPT. 17, 1958 SCALE AS SHOWN

MADE CHKD APPD  
J.A. JZS [initials] No. 56829-

BLENNHEIM TWP. BR. 3 BA 813

BA813

40P7-41
GEOCRE No.

S6829  
REPORT  
TO  
DEPARTMENT OF HIGHWAYS, ONTARIO  
ON  
SOIL CONDITIONS AND FOUNDATIONS  
PROPOSED HIGHWAY 401 OVERPASS  
TOWNSHIP OF BLENHEIM 3  
COUNTY OF OXFORD                      ONTARIO

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- 3 copies - Geocon Ltd,  
Toronto, Ontario.

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## HEAD OFFICE

180 VALLÉE ST., MONTREAL 18, QUEBEC  
TELEPHONE UN. 6-7632

Rexdale, Ontario,  
September 29th, 1958.

BA 813

## DISTRICT OFFICES

14 HAAS ROAD  
REXDALE, TORONTO, ONT.  
TEL. CH. 4-8641

3355 WEST BROADWAY AVE.  
VANCOUVER 8, B.C.  
TEL. CH. 5810

Department of Highways, Ontario,  
Parliament Buildings,  
Toronto 2, Ontario.

40P7-41  
GEOCREs No.

Attention: Mr. A. M. Teye, P. Eng.,  
Bridge Engineer.

Re: WP151-58,  
Soil Investigation,  
Proposed Highway 401 Overpass,  
Township of Blenheim,  
County of Oxford, Ontario.

Dear Sirs:

This letter reports the results of the above investigation carried out in accordance with your instructions and our proposal dated September 8th, 1958 and accepted on September 10th, 1958. The object of this investigation was to determine and interpret the soil conditions at the above site as they affect the design of foundations for the proposed overpass structure.

The site of the proposed Highway 401 overpass is located on the road allowance between lots 6 and 7 of Concession IX in the Township of Blenheim, County of Oxford, Ontario. The ground level at the site varies between about elevations 995 and 1005.

From an inspection of the site and available geological information, it is known that the site is covered by fluvial deposits of silts, sands and gravels. These deposits are probably underlain by glacial till which rests on dolomitic bedrock of the Salina Formation.

## PROCEDURE

The field work, which was carried out between September 5th and



ST. JOHN'S

HALIFAX

LONDON

QUEBEC

VANCOUVER

MONTREAL

TORONTO



PROCEDURE (continued)

September 12th, 1958, inclusive, consisted of 2 detailed boreholes with adjacent dynamic penetration tests and 2 additional dynamic penetration tests. The borings were put down to depths between 48 and 61 feet using a skid-mounted standard machine drillrig.

The location of the boreholes and dynamic penetration tests, together with the inferred soil stratigraphy are shown on Drawing S6829-1 attached to this letter. A detailed log of each boring is given on the Office Reports on Soil Exploration in Appendix I.

The soil samples obtained will be stored until April 1st, 1959 and will then be destroyed unless further instructions are received.

Elevations are referred to Geodetic Datum and were obtained from a Department of Highways, Ontario bench mark consisting of a spike driven into a tree located about 50 feet south of borehole 2.

SOIL CONDITIONS

The principal soil strata encountered by the borings are as follows:

Topsoil

The site is generally covered by about 6 inches of grey-brown sandy topsoil.

Compact Grey-Brown Silty Sand and Gravel

Beneath the topsoil in borehole 1 and also probably beneath the topsoil in penetration test 4 is a stratum of grey-brown silty sand and gravel, about 7 feet in thickness. The sand and gravel sizes contained in the stratum range from fine to coarse. Some silt sizes are also present in the stratum.

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SOIL CONDITIONS (continued)

Compact Grey-Brown Silty Sand and Gravel (continued)

Two standard penetration resistance or "N" values of 25 and 20 blows per foot obtained in the stratum together with the results of the dynamic penetration tests indicate that the relative density is generally compact.

The average wet unit weight of the stratum is estimated to be about 125 pounds per cubic foot.

Loose to Compact Grey-Brown Sand

Underlying the topsoil in borehole 2 and the compact sand and gravel in borehole 1, a stratum of grey-brown sand, about 4 to 11 feet in thickness, was encountered. The stratum tends to be horizontally stratified with streaks of dark brown and consists of fine to medium sand with some silt sizes.

Standard penetration resistance or "N" values ranging from 12 to 33 blows per foot together with the results of the dynamic penetration tests indicate that the relative density of the stratum ranges from loose to very compact and is generally compact.

A field falling head permeability test carried out at the base of the stratum gave an average coefficient of permeability of  $3 \times 10^{-5}$  centimeters per second.

The average wet unit weight of the stratum is estimated to be about 120 pounds per cubic foot.

Compact to Dense Brown Sandy Silt

The sand is underlain by a stratum of brown sandy silt, about 10



SOIL CONDITIONS (continued)

Compact to Dense Brown Sandy Silt (continued)

feet in thickness. Thin horizontal layers of fine sand and clayey silt, varying from about 1/16 to 2 inches in thickness, were occasionally encountered throughout the stratum.

Standard penetration resistance or "N" values ranging from 19 to 37 blows per foot, with one value greater than 100 blows per foot, together with the results of the dynamic penetration tests indicate that the relative density of the stratum is generally compact to dense. The high "N" value of greater than 100 was obtained in a clayey silt layer.

Two field falling head permeability tests performed in the stratum gave average coefficients of permeability of  $3 \times 10^{-5}$  and  $8 \times 10^{-5}$  centimeters per second.

The average wet unit weight of the stratum may be taken as 130 pounds per cubic foot.

Dense to Very Dense Grey-Brown Sand

Underlying the compact to dense silt, a stratum of grey-brown sand was encountered and was penetrated for a maximum depth of about 35 feet in borehole 1 and for probably 40 feet in penetration test 3. The stratum is composed of horizontally stratified sand varying in grain size from fine to medium. Sandy silt layers generally varying from about 1/8 to 2 inches in thickness, and up to 9 inches in thickness, were frequently encountered in the stratum below a depth of about 10 feet. In the lower 7 feet of borehole 1, horizontal layers of till-like material, up to 4 inches in thickness, consisting of a sand and silt matrix with small gravel up to about 1/4 inches in size, were also occasionally encountered.

SOIL CONDITIONS (continued)

Dense to Very Dense Grey-Brown Sand (continued)

The relative density of the stratum is erratic, varying between dense and very dense, as indicated by the results of the standard and dynamic penetration tests.

One field falling head permeability test gave an average coefficient of permeability of  $2 \times 10^{-3}$  centimeters per second for the upper portion of the stratum.

The average wet and submerged unit weights of the stratum may be taken as 130 and 70 pounds per cubic foot respectively.

WATER CONDITIONS

From water level readings taken in the boreholes during the course of the investigation, it appears that the groundwater level is at about elevation 966. However, caving of borehole 2 occurred at about elevation 986 one day after drilling was completed and the water level rose to this elevation. The reason for the caving and presence of water at this elevation is not clear, but is thought due either to filling of the hole by surface rain water or seepage from possible water bearing seams within the sandy silt stratum.

DISCUSSION

It is proposed to locate the Highway 401 overpass as shown on Drawing S6829-1 at approximately the grade of the existing gravel side road and to re-align the side road and carry it under Highway 401 in a cut. According to the Department of Highways, Ontario preliminary profiles, the new elevation of the gravel roadway at the overpass would be at elevation 982 or below. The actual structural details of the proposed overpass have not as yet been decided

DISCUSSION (continued)

on and for purposes of this report, it has been assumed that a conventional one span structure in concrete would be constructed.

With a subway at elevation 982 or below as proposed, foundations of the proposed overpass would have to be carried down to at least elevation 978 for frost protection purposes. Below this elevation the sandy silt and underlying sand strata are in a dense condition and therefore considered suitable for the economical use of spread footing foundations. It is recommended that this type of foundation be adopted for the overpass. Based on the minimum "N" value of 46 obtained below elevation 978 and taking into account the results of the dynamic penetration tests, an allowable bearing value of 3 tons per square foot could be used for footing design; although depending on the design and practical considerations the actual load imposed by the structure would probably not be of this order.

From observations taken during the course of the investigation, it appears that the groundwater level is at about elevation 965. However caving of borehole 2 occurred at about elevation 986 several days after drilling was completed. The reason for the caving is not clear, but is thought due either to filling of the hole by surface rain water or seepage from possible water bearing seams within the sandy silt stratum. Because there is a tendency for this material to cave under the action of seeping water, sheeting of the footing excavation will probably be required.

If groundwater is encountered during excavation of the cut, it is recommended that the slopes below the line of saturation be protected directly with a one foot thick blanket of well graded sand and gravel, which would form part of the required permanent protective cover for the slopes. It is further recommended that subsequently the entire slope be similarly protected against surface erosion and frost action. At the same time adequate permanent drainage

Department of Highways, Ontario,  
September 29th, 1958,  
Page 7.

DISCUSSION (continued)

should be provided at the toe of the slopes. Preferably, this drainage system should be installed prior to the construction of the overpass.

Provided adequate surface protection and drainage measures are applied as described above, side slopes of 1 vertical to  $1\frac{1}{2}$  horizontal may be used for the cut.

We believe that this letter report, which was written by Mr. J.L. Seychuk and checked by Mr. M.A.J. Matich, contains all the information on the soil conditions at the site, necessary for design of the crossing to be finalized. Should you require any further information, or if you have any questions relating to this report, we would be pleased if you would give us a call.

Yours very truly,

GEOCON LTD



J. L. Seychuk, P. Eng.,  
Senior Soils Engineer.

JLS/dw  
36829

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APPENDIX I

OFFICE REPORTS ON SOIL EXPLORATION

## EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

The object of this form is to enable a comprehensive study of the soil to be made by combining on one sheet all of the information obtained from the boring. An explanation of the various columns of the report follows.

### ELEVATION AND DEPTH

This column gives the elevation and depth of boundaries between the various soil strata. The elevation is referred to the datum shown in the general heading.

### WATER CONDITIONS

In this column the water level in the casing at the time of boring or the water table in the ground, determined by a series of observations in a piezometer or standpipe, is indicated to scale by a horizontal line with the symbol W.L. or W.T. above the line. A notation of any complicated groundwater conditions will be made in this column.

### DESCRIPTION

A description of the soil, using standard terminology, is contained in this column. The consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

Consistency	U-Strength Tons/sq. ft.	Relative Density	Standard Penetration Resistance. Blows/ft.
Very soft	0.03 to 0.25	Very loose	0 to 4
Soft	0.25 to 0.5	Loose	4 to 10
Firm	0.5 to 1.0	Compact	10 to 30
Stiff	1.0 to 2.0	Dense	30 to 50
Very stiff	2.0 to 4.0	Very dense	over 50
Hard	over 4.0		

### STRATIGRAPHIC PLOT

The stratigraphic plot follows the standard symbols of the National Research Council, Canada.

### ELEVATION SCALE

The information in all columns is plotted to a true elevation scale which is shown in this column.

### GRAPHS

The main body of the report forms a graph which is used to plot to correct elevation the important soil properties which are obtained through field and laboratory tests. The scales and symbols for the plotting are shown at the head of the column.

### OTHER TESTS

In this column are shown, by symbol, the other field or laboratory tests which have been performed on the soil and for which the results have not been plotted on the above graph.

### SAMPLES

The first three columns describe the condition, type and number of each sample obtained from the boring. The location and extent of each sample is plotted to scale.

In the last column is shown the penetration resistance in blows of 4200 inch-pounds required to drive one foot of the sampler into the ground. When a 2 inch Drive Sampler is used the result obtained is termed the "Standard Penetration Resistance".

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## OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 56829 BORING # 1 DATUM GEODETIC CASING BX  
 BORING DATE SEPT. 8, 1958 REPORT DATE SEPT. 16, 1958 COMPILED BY J.A. CHECKED BY J.B.  
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

### SAMPLE CONDITION



A.S. - AUGER SAMPLE  
 S.T. - SLOTTED TUBE  
 W.S. - WASHED SAMPLE  
 D.O. - DRIVE-OPEN  
 D.F. - DRIVE-FOOT VALVE  
 C.S. - CHUNK SAMPLE

### SAMPLE TYPES

F.S. - FOIL SAMPLE  
 S.O. - SLEEVE-OPEN  
 S.F. - SLEEVE-FOOT VALVE  
 T.O. - THIN WALLED OPEN  
 R.C. - ROCK CORE

### ABBREVIATIONS

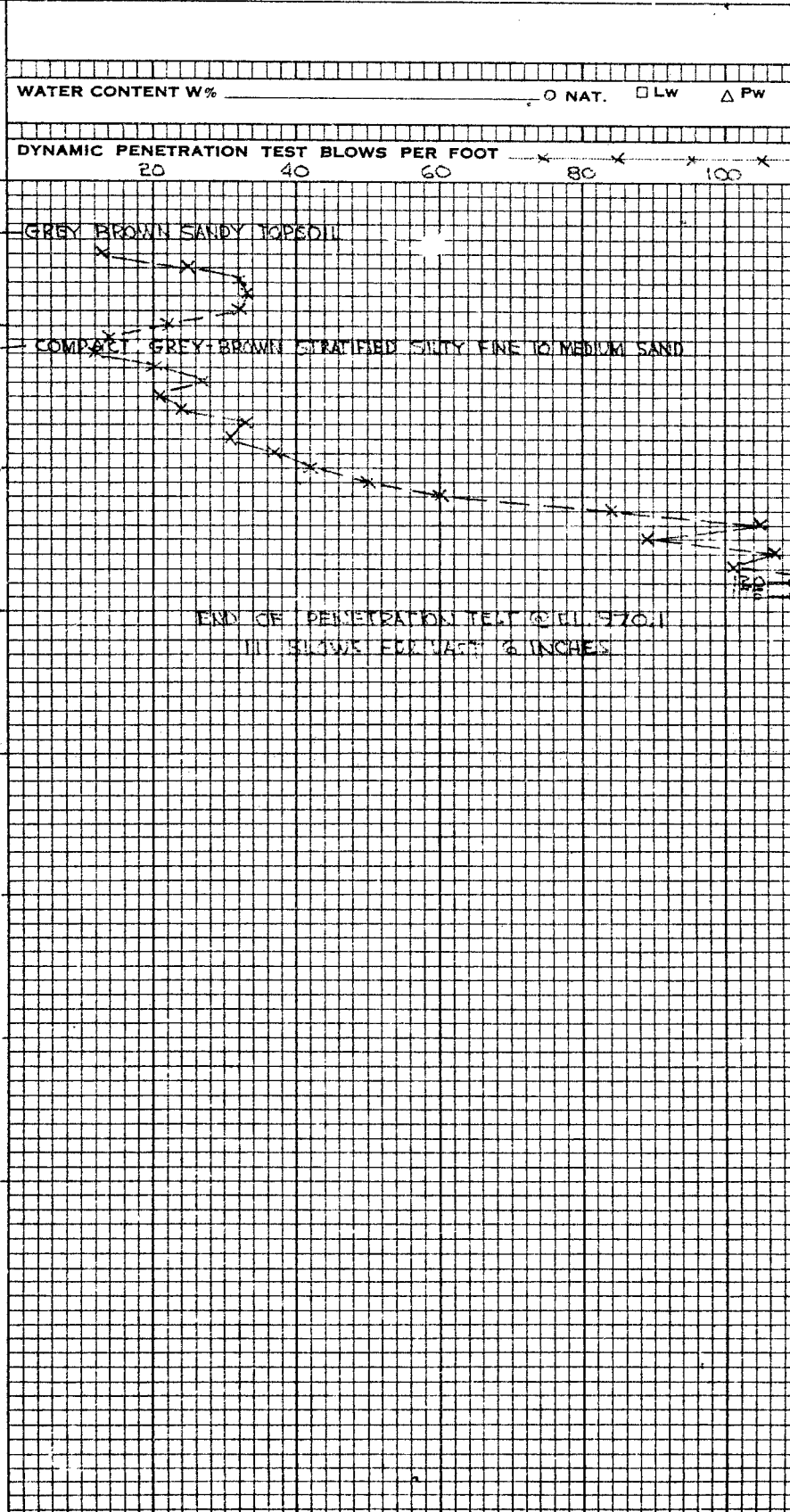
V - IN-SITU VANE TEST  
 M - MECHANICAL ANALYSIS  
 U - UNCONFINED COMPRESSION  
 QC - TRIAXIAL CONSOLIDATED QUICK  
 Q - TRIAXIAL QUICK  
 S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT  
 K - PERMEABILITY  
 C - CONSOLIDATION

WL - WATER LEVEL IN CASING  
 WT - WATER TABLE IN SOIL

### SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE
995.6		GROUND LEVEL		
0.4		COMPACT GREY-BROWN SILTY SAND AND GRAVEL		
989.1				
6.5		COMPACT TO DENSE BROWN SANDY SILT WITH OCCASIONAL SAND SEAMS		
985.6				
10.0				
975.4	W.L. @ EL. 966.1 SEPT. 15, 1958			
20.0				
		DENSE TO VERY DENSE GREY-BROWN FINE TO MEDIUM SAND WITH LAYERS OF SANDY SILT		
940.6				
55.0		END OF HOLE		



### OTHER TESTS





### SAMPLES

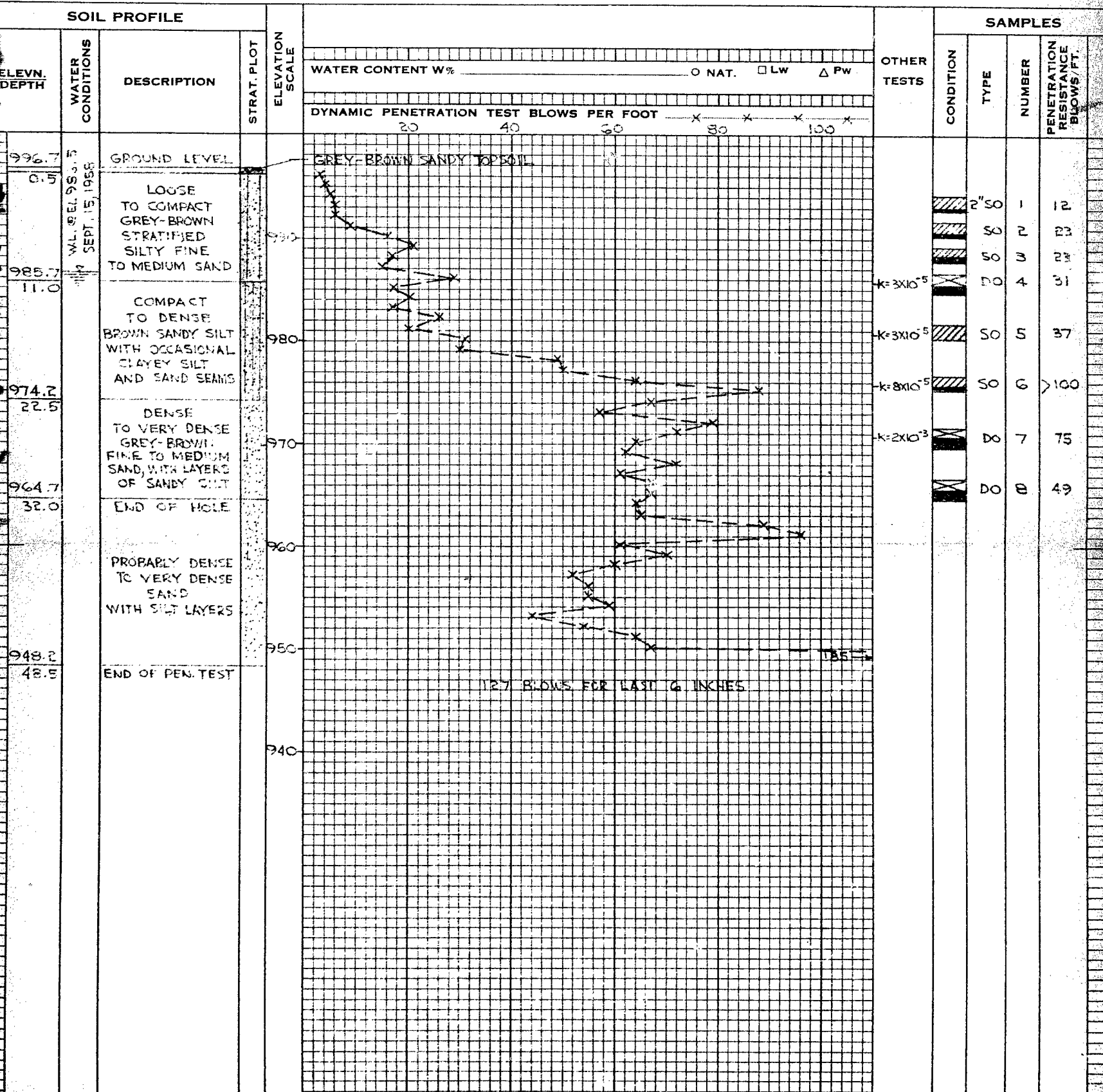
CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
	250	1	25
	DO	2	20
	SO	3	33
	SO	4	19
	SO	5	23
	SO	6	35
	SO	7	23
	SO	8	58
	SO	9	72
	SO	10	46
	SO	11	47
	SO	12	65
	SO	13	50
	WS	14	—

# GEOCON

## OFFICE REPORT ON SOIL EXPLORATION

CONTRACT S 6319 BORING # 2 DATUM GEODETIC CASING BX  
 BORING DATE SEPT 10, 1958 REPORT DATE SEPT 16, 1958 COMPILED BY J. A. CHECKED BY J. S.  
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION		SAMPLE TYPES		ABBREVIATIONS	
	DISTURBED	A.S. - AUGER SAMPLE	F.S. - FOIL SAMPLE	V - IN-SITU VANE TEST	$\gamma$ - WET UNIT WEIGHT
	FAIR	S.T. - SLOTTED TUBE	S.O. - SLEEVE-OPEN	M - MECHANICAL ANALYSIS	K - PERMEABILITY
	GOOD	W.S. - WASHED SAMPLE	S.F. - SLEEVE-FOOT VALVE	U - UNCONFINED COMPRESSION	C - CONSOLIDATION
	LOST	D.O. - DRIVE-OPEN	T.O. - THIN WALLED OPEN	QC - TRIAXIAL CONSOLIDATED QUICK	
		D.F. - DRIVE-FOOT VALVE	R.C. - ROCK CORE	Q - TRIAXIAL QUICK	WL - WATER LEVEL IN CASING
		C.S. - CHUNK SAMPLE		S - TRIAXIAL SLOW	WT - WATER TABLE IN SOIL







# GEOCON

## OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 56829 PENETRATION TEST BORING # 4 DATUM GEODINIC CASING         
 BORING DATE SEPT 12, 1958 REPORT DATE SEPT 17, 1958 COMPILED BY J.A. CHECKED BY J.S.  
 SAMPLER HAMMER WT. 300 LBS. DROP 15 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

### SAMPLE CONDITION



### SAMPLE TYPES

A.S. - AUGER SAMPLE  
 S.T. - SLOTTED TUBE  
 W.S. - WASHED SAMPLE  
 D.O. - DRIVE-OPEN  
 D.F. - DRIVE-FOOT VALVE  
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE  
 S.O. - SLEEVE-OPEN  
 S.F. - SLEEVE-FOOT VALVE  
 T.O. - THIN WALLED OPEN  
 R.C. - ROCK CORE

### ABBREVIATIONS

V - IN-SITU VANE TEST  
 M - MECHANICAL ANALYSIS  
 U - UNCONFINED COMPRESSION  
 QC - TRIAXIAL CONSOLIDATED QUICK  
 Q - TRIAXIAL QUICK  
 S - TRIAXIAL SLOW  
 γ - WET UNIT WEIGHT  
 K - PERMEABILITY  
 C - CONSOLIDATION  
 WL - WATER LEVEL IN CASING  
 WT - WATER TABLE IN SOIL

### SOIL PROFILE

### SAMPLES

