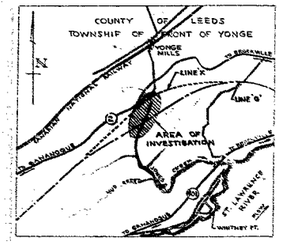
63-F-207-C

W.P. # 178-61

Hwy. # 401 &

Jones Creek

Crossing



KEY PLAN

SCALE 1" TO 0.8 MILES

HIGHWAY No. 2

LOT 10 / LOT 9

LOT 9 / LOT 8

JOHN BENNETT

LINE 'X'

2°00'

TO HWY. 2

CLARENCE COOK

FIRST TRIAL E ESTABLISHED BY H.G. GOLDER & ASSOCIATES, MAY 1963

JONES CREEK

BASE LINE (H.G. GOLDER & ASSOC. LTD.) USED TO LOCATE BORINGS AND OBSERVATION BOREHOLES MAY 1963

LINE 'G'

SOUNDINGS
LOAM TO CLAY & ROCK

SWAMP

Pr. Cabin

RECOMMENDED LOCATION
FUNCTIONAL PLANNING SECTION DEC, '62

R.O.W.

J O N E S C R E E K

SCATTER
0.5" - 6.5"
PINE, BIRCH & OAK

SCALE 1" TO 100'-0"

LEGE

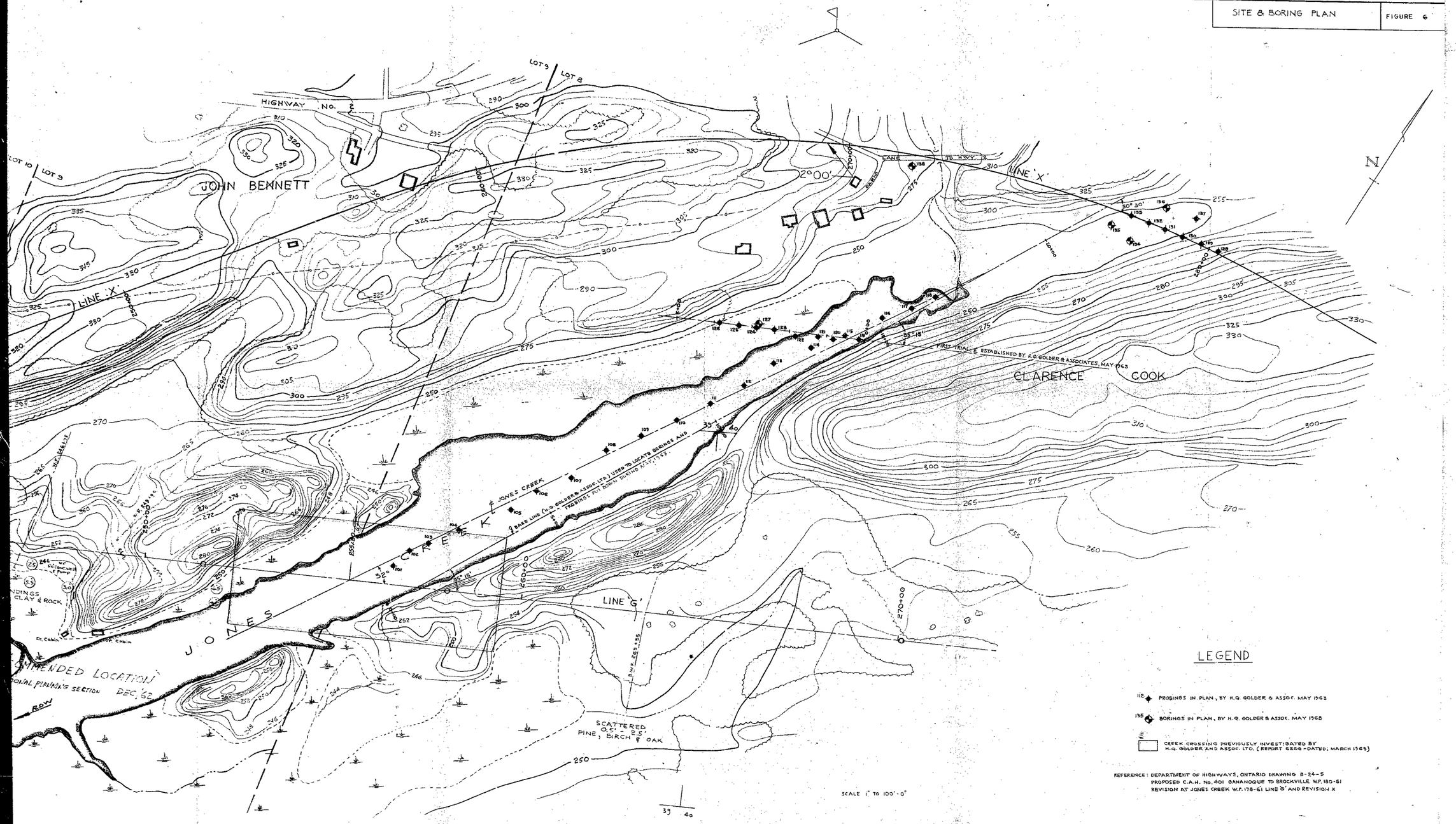
PROBINGS IN PLAN, BY

BORINGS IN PLAN, BY

CREEK CROSSING F
H.G. GOLDER AND AS

REFERENCE: DEPARTMENT OF HIGHWA
PROPOSED C.A.H. No. 401
REVISION AT JONES CREE

SITE & BORING PLAN | FIGURE 6



LEGEND

112 ◆ PROBINGS IN PLAN, BY H.Q. GOLDER & ASSOC. MAY 1965

135 ◆ BORINGS IN PLAN, BY H.Q. GOLDER & ASSOC. MAY 1965

CREEK CROSSING PREVIOUSLY INVESTIGATED BY H.Q. GOLDER AND ASSOC. LTD. (REPORT 6269 - DATED: MARCH 1965)

REFERENCE: DEPARTMENT OF HIGHWAYS, ONTARIO DRAWING 8-24-5
PROPOSED C.A.H. No. 401 GANANOQUE TO BROCKVILLE W.P. 180-61
REVISION AT JONES CREEK W.P. 178-61 LINE 'G' AND REVISION X

SCALE 1" TO 100'-0"

GOLDER & ASSOCIATES

Made MH
Chkd. [illegible]
Appd. [illegible]

63-F-207C

H. Q. GOLDER & ASSOCIATES LTD.

CONSULTING CIVIL ENGINEERS

H. Q. GOLDER
V. MILLIGAN
L. G. SODERMAN

2444 BLOOR STREET WEST
TORONTO 9, ONTARIO
767-9201
763-4103

REPORT

TO

DEPARTMENT OF HIGHWAYS, ONTARIO

ON

SITE INVESTIGATION

PROPOSED JONES CREEK CROSSING

HIGHWAY 401 - LINE X

WP 178-61

BROCKVILLE ONTARIO

Distribution:

11 copies - Department of Highways, Ontario,
Toronto, Ontario.

2 copies - H. Q. Golder & Associates Ltd.,
Toronto, Ontario.

June, 1963 6346

TABLE OF CONTENTS

ABSTRACT

The results of an investigation to determine the subsoil conditions in the vicinity of the proposed Highway 401 crossing over Jones Creek near Brockville, Ontario are reported and recommendations are made for the foundation design of two small bridge structures and a rockfill embankment on the proposed Line X alignment.

The subsoil conditions along the proposed Line X alignment in the vicinity of Jones Creek consist of a series of rock outcrops between which lie layered silt and clay deposits which generally grade to stratified silts and sands which contain some gravel with increasing depth. The latter deposit overlies bedrock.

The proposed single or twin bridge structures at about station 272+50, Line X, may be founded on spread footings founded on bedrock, as discussed in the report.

The proposed rockfill embankment, up to about 50 feet in height above present ground level, between about stations 276+60 and 281+60, Line X, may be constructed as discussed.

INTRODUCTION

H. Q. Golder & Associates Ltd. have been retained by the Department of Highways, Ontario to carry out a site investigation in the vicinity of the proposed Highway 401 crossing over Jones Creek near Brockville, Ontario.

The purpose of the investigation was to define the subsoil conditions along the centreline of Jones Creek between the proposed Line G and Line X alignments (see Figure 6) and along the Line X alignment, and to make recommendations for the foundation design of two small bridge structures and a proposed rockfill embankment on Line X.

PROCEDURE

The field work for the investigation was commenced on May 13, 1963 and completed on June 4, 1963. During this time 33 dynamic penetration tests and 5 borings, 3 of which had accompanying dynamic penetration tests, were put down by means of a machine drillrig owned and operated by the F. E. Johnston Drilling Co. Ltd. The drillrig was mounted on a raft for over-water work and skid-mounted for land work.

The borings and dynamic penetration tests were located approximately with reference to a base line established by H. Q.

Golder & Associates Ltd. along the east bank of Jones Creek. This base line was tied in with Line G which had been staked by others in the field. The locations of boreholes 134, 135 and 136 were marked in the field upon completion of the investigation in case it is necessary to tie in their locations accurately at a later date. Detailed logs for each boring and dynamic penetration test are given on the Records of Boreholes and on the figures.

The soil samples obtained during the investigation were returned to our laboratory for examination and testing. The results of the laboratory testing are plotted on the Records of Boreholes and on the figures.

The borehole and dynamic penetration test elevations were determined with reference to a bench mark located in the south root of a 2.0 feet diameter oak tree 41 feet left of station 258+92, Line G. The elevation of this bench mark is given as 259.51, Geodetic datum, on Department of Highways, Ontario Plan E-4139-1 dated September, 1962.

SITE TOPOGRAPHY AND GEOLOGY

The proposed site is located approximately 9 miles southwest of Brockville, Ontario within the physiographic region called the "Leeds Knobs and Flats" (Champman and Putnam, 1951).

The region consists primarily of scattered rock outcrops between which lie clay deposits laid down by the Champlain Sea.

Bedrock in the area consists of various types of altered sedimentary rocks, crystalline limestones and dolomites, gneisses and quartzites of the Grenville Series of Precambrian Age, which are intruded, metamorphosed and deformed by bodies of granite, syenite and other igneous rocks (Wilson, 1946). Bedrock surface is very irregular.

SUBSURFACE CONDITIONS

During the initial stage of the investigation a series of probings were put down along the approximate centre-line of Jones Creek between Line G and Line X. The inferred soil conditions along this line are shown on Figure 7 . Following a review of this data at the Department of Highways, Ontario it was decided to investigate the soil conditions along Line X (see Figure 6).

A visual inspection of the portion of Line X between about stations 271+00 and 281+60 indicated that rock was outcropping at surface, or was within a few feet of surface, between about stations 271+00 and 276+60, while it appeared to be at some depth below ground surface between about stations 276+60 and 281+60.

Several borings and probings put down in the latter area indicated that the upper stratum in this area was a generally stiff to very stiff brown clayey silt which graded to a grey layered fissured clay and clayey and sandy silts below about elevation 240, general ground level being about elevation 250 in this area. The individual layers of the layered material vary irregularly in thickness from about 1/16 ins. to 1 or 2 ins.

The undrained shear strength of the clayey stratum was measured by in situ vane shear tests and undrained triaxial compression tests. The results of these tests are summarized in a plot of undrained shear strength versus depth below ground surface, on Figure 10. The measured undrained shear strengths ranged from about 1,500 to greater than 2,300 lb/sq.ft. An average value of 2,000 lb/sq.ft. was assumed for design. The sensitivity of the clayey material, as measured by the in situ vane, ranged generally from about 6 to 12.

The clayey stratum was found to overlie stratified sandy silts and sands with some fine gravel in boreholes 135 and 136. This deposit, which extended to bedrock in these borings, contained some layers or lenses of grey clayey silt. The 'N' values obtained in the stratum ranged generally from 8 to 17

blows/ft., with two values of greater than 100 blows/ft. immediately above bedrock surface in borehole 135. These high values are considered to be due to the sampler striking large gravel or bedrock.

Bedrock was cored in AXT size for about 8 to 10 feet in boreholes 134, 135 and 138, the latter borehole being put down to check the rock conditions in the general area of two proposed bridge structures over Jones Creek. Bedrock was found to be a hard crystalline rock and contained some fractures to the cored depth of 10 feet. Surficial inspection of the rock near borehole 138 indicated that there were some joints in the rock which dipped slightly ($10^{o}\pm$) to the south. The vertical distance between the joints was typically about 1 foot, but could be several feet.

The water level in Jones Creek ranged between about elevations 245.2 and 246.0 during the field investigation. The water levels in boreholes 127, 134, 135 and 136 were about ground surface during the drilling of these holes. No artesian water conditions were noted in the boreholes during the investigation.

DISCUSSION

General

A proposed revision of Highway 401 is to cross Jones Creek near Brockville, Ontario. One possible alignment, Line G, has been investigated (our report 6264, dated March, 1963). The present investigation was instigated to try and find a more economic alignment than Line G across the creek. The area to be investigated was bounded on the south by Line G and on the north by Line X, which is located approximately 2,200 feet north of Line G at Jones Creek. A series of probings were put down along the centreline of Jones Creek between these alignments and a meeting was held at the Department of Highways, Ontario on May 22, 1963 to discuss the results of these initial probings. The probings (see Figure 7) indicated that there was no marked improvement in the subsoil conditions along the creek from those encountered at Line G until close to Line X. In view of these results it was decided to concentrate the investigation on Line X which appeared to skirt the deep muskeg deposits in Jones Creek.

Bridge Structures

It is understood that single or twin bridge structures with spans of about 20 to 30 feet will be construction at

about station 272+50, Line X, to carry the proposed highway over Jones Creek. The bridge or bridges will probably be small rigid frame structures. At this point the creek flows in a narrow rock channel with bedrock at surface or underlain by only a few feet of overburden. The proposed structure or structures should be founded on spread footings founded on bedrock. One boring (number 138), which was put down to determine the condition of bedrock in this area showed that the hard crystalline rock contained some fractures to the cored depth of about 9 feet. For this reason, the design bearing pressure for spread footings founded in the upper portion of bedrock should be limited to 20 tons/sq.ft. The footing should be dowelled into the rock to prevent possible shear at the footing/rock interface. Further, in view of the slightly sloping joint system noted in bedrock in this area, the dowels should be carried down 8 to 10 feet below rock surface and grouted in place. Settlement of the proposed structure or structures, if founded as recommended above, will be negligible.

The proposed grade at about station 272+50 will necessitate an earth or rockfill embankment up to about 29 feet above present ground surface. It is not known whether the deck of the small bridge structures will be at grade level

or will be below this level with fill placed on top to grade level. In either case, the fill in the vicinity of the structures should be a clean free draining granular material which is well compacted in place. Provision should be made for adequate drainage of the fill behind the abutments.

Side Hill Rock Cut

The proposed alignment and grade will necessitate a side hill rock cut involving both lateral and longitudinal transitions from rock cut to rock fill between about stations 273+00 and 276+60. This portion of the highway should be detailed according to the standard Department of Highways, Ontario specifications for side hill rock cuts.

Rockfill Embankment

A rockfill embankment with a crest width of about 150 feet and a maximum height of about 50 feet above present ground level is to be constructed between about stations 276+60 and 281+60, a length of about 500 feet. Computations were carried out to check the stability of such an embankment resting on the layered silt and clay subsoil. The computations indicated that the factor of safety against rotational or sliding block types failures (total stress analyses) was 1.3,

assuming that no frictional resistance is mobilized in the rockfill and that the undrained shear strength of the layered silt and clay is about 2,000 lb/sq.ft.; it was further assumed that the side slopes of the rockfill were about 1¼ horizontal to 1 vertical, this slope being typical for end dumped rock fill.

The proposed embankment will settle due to settlements within the rockfill and due to consolidation of the layered silt and clay under the additional weight of the fill. Settlement within the rockfill could be reduced by careful placing of the fill, but it is probable that the fill, in this case, will be end dumped. Consequently, the settlement within the rockfill could be about 1 to 2 percent of the height of the fill and for a 50 feet high embankment this gives a settlement of about 6 to 12 inches. The major portion of this settlement would probably occur during construction.

The consolidation settlement within the layered silt and clay may be estimated on the basis of consolidation tests carried out on samples of the material. One consolidation test was carried out on a clayey silt layer in the layered silt and clay stratum and the results of this test are shown on

Figure 11. Consolidation data for similar material encountered along Line G are reported in our report 6264, dated March, 1963, and the results summarized in the table following Figure 11 in this report. Based on the results of these tests and assuming that the clayey stratum has been lightly overconsolidated, we estimate that the consolidation settlement below the maximum height of embankment of about 50 feet should be about 3 inches. This settlement will probably occur over several years.

It is understood that a culvert will be placed below the rockfill. It is recommended that the culvert be relatively flexible in order to accommodate deflection caused by the settlements of the embankment. The culvert should be underlain by and backfilled with a well compacted clean non-frost susceptible granular material such as class 'B' granular fill (D.H.O. Form 314). The depth of granular material below the culvert should be sufficient to limit frost heave to an acceptable amount, probably about 4 to 5 feet. Scour should be prevented at the ends of the proposed culvert by placing a rip rap cover over the fill and natural ground.

N. R. McCammon, P. Eng.

V. Milligan, P. Eng.

NRMcC:IMB
6346

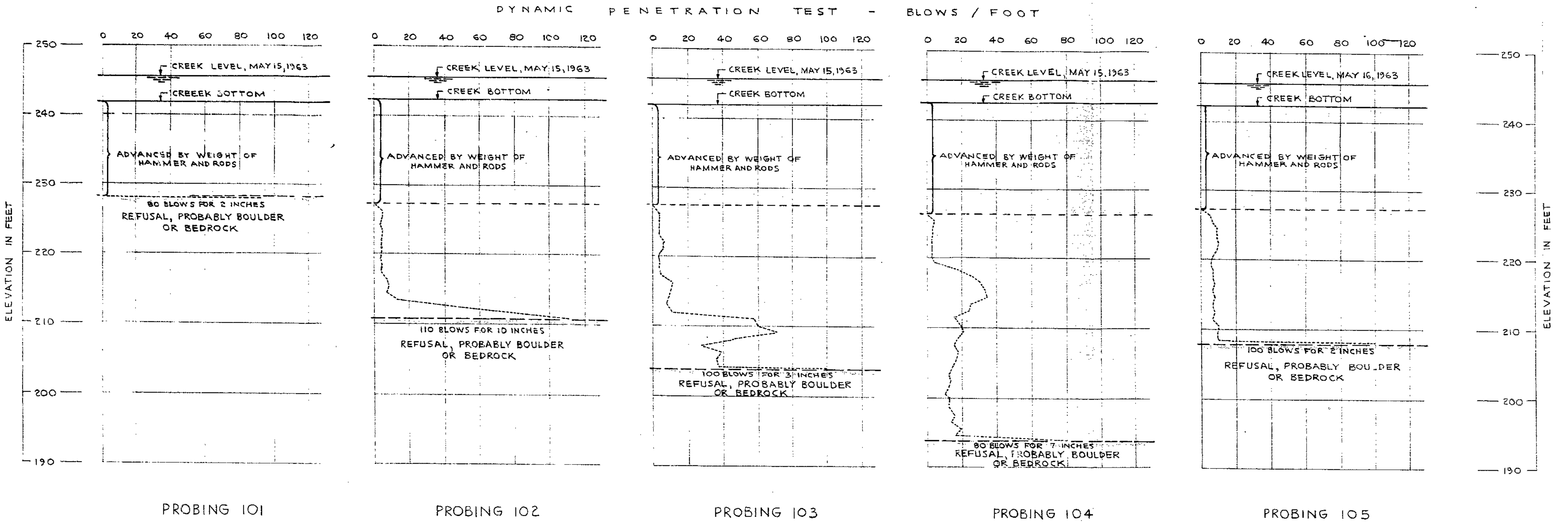
GOLDER & ASSOCIATES

REFERENCES

CHAPMAN, L.J., and PUTNAM, D.F.,"The Physiography of Southern Ontario", University of Toronto Press, 1951.

WILSON, A.E., "Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec", Geological Survey Memoir No. 241, Canada Department of Mines and Resources, Ottawa, 1946.

DETAILS OF PROBINGS 101 TO 105 | FIGURE 1



LEGEND

- PROBABLY MUSKEG
- PROBABLY CLAY WITH SOME SAND AND GRAVEL LAYERS
- REFUSAL, PROBABLY BOULDER OR BEDROCK

NOTES

I) STRATIGRAPHY INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS AND PREVIOUS WORK IN THE AREA. NO SAMPLES OBTAINED.

II) DYNAMIC PENETRATION TESTS CARRIED OUT MAY 15 TO MAY 16, 1963 USING 140 LB. HAMMER WITH 30 IN. DROP.

III) FOR LOCATIONS OF PROBINGS SEE FIGURE 6.

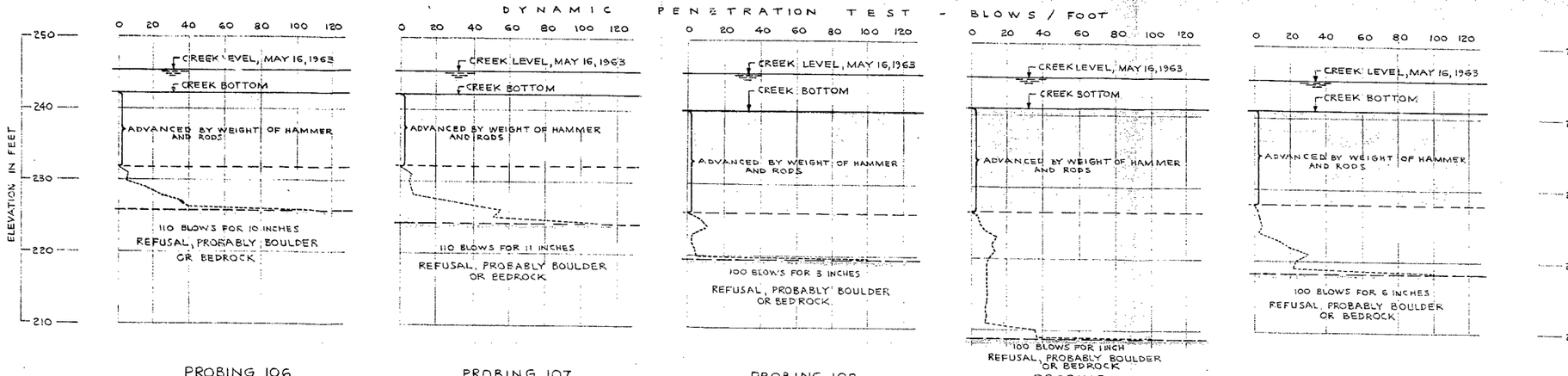
IV) ALL ELEVATIONS ARE TO GEODETIC DATUM.

GOLDER & ASSOCIATES

Made
Chkd.
Appd.

DETAILS OF PROBINGS 106 TO 115

FIGURE 2



LEGEND

- PROBABLY MUSKEG
- PROBABLY CLAY WITH SOME SAND AND GRAVEL LAYERS
- REFUSAL, PROBABLY BOULDER OR BEDROCK

NOTES

I) STRATIGRAPHY INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS AND PREVIOUS WORK IN THE AREA. NO SAMPLES OBTAINED.

II) DYNAMIC PENETRATION TESTS CARRIED OUT MAY 16, 1963 USING 140 LB HAMMER WITH 30 IN. DROP.

III) FOR LOCATIONS OF PROBINGS SEE FIGURE 6.

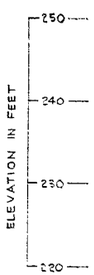
IV) ALL ELEVATIONS ARE TO GEODETIC DATUM.

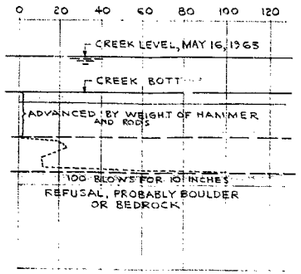
GOLDER & ASSOCIATES

Made M.L.
Chkd. A.S.C.
Appd. W.W.

DETAILS OF PROBINGS 116 TO 123

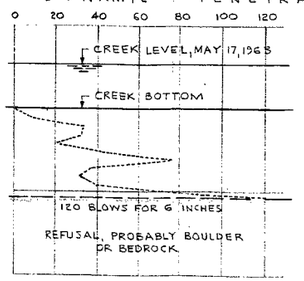
FIGURE 3



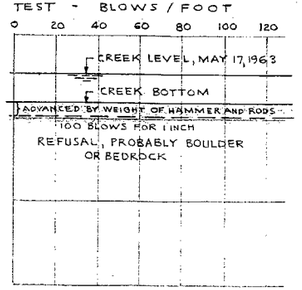


PROBING 116

DYNAMIC PENETRATION TEST - BLOWS / FOOT



PROBING 117



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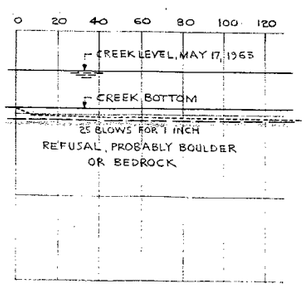

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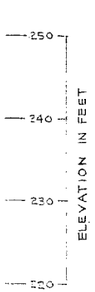


LEGEND

- PROBABLY MUSKEG
- PROBABLY CLAY WITH SOME SAND AND GRAVEL LAYERS
- REFUSAL, PROBABLY BOULDER OR BEDROCK

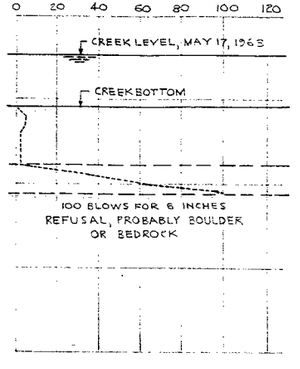
NOTES

I) STRATIGRAPHY INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS AND PREVIOUS WORK IN THE AREA. NO SAMPLES OBTAINED.

II) DYNAMIC PENETRATION TESTS CARRIED OUT MAY 16 TO MAY 21, 1963 USING 140 LB. HAMMER WITH 30 IN. DROP.

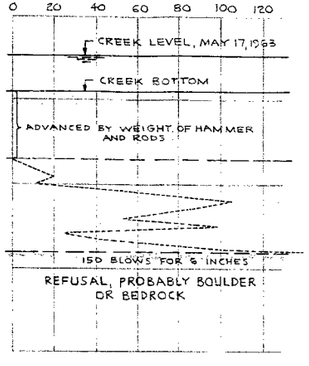
III) FOR LOCATIONS OF PROBINGS SEE FIGURE 6.

IV) ALL ELEVATIONS ARE TO GEODETIC DATUM.



PROBING 120

DYNAMIC PENETRATION TEST - BLOWS / FOOT



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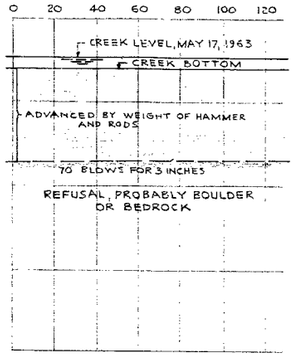

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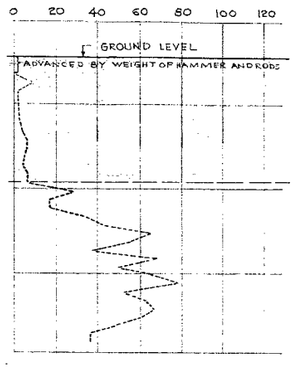
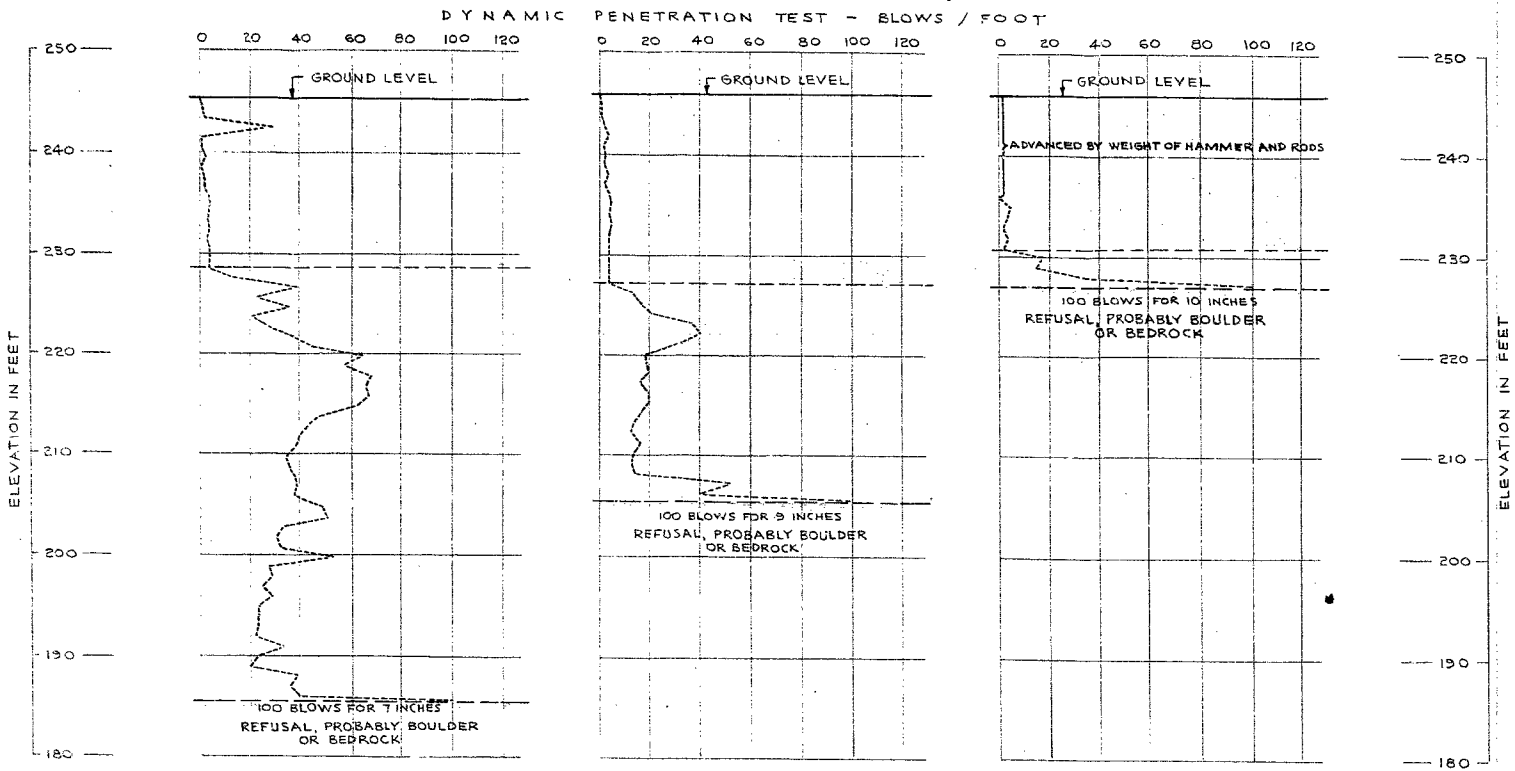


PROBING 123

GOLDER & ASSOCIATES

Made W.H.
Chkd. A.D.H.
Appd. R.E.

DETAILS OF PROBINGS 124 TO 126 | FIGURE 4



PROBING 124 PROBING 125 PROBING 126

LEGEND

- PROBABLY MUSKEG
- PROBABLY CLAY WITH SOME SAND AND GRAVEL LAYERS
- REFUSAL, PROBABLY BOULDER OR BEDROCK

NOTES

I) STRATIGRAPHY INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS AND PREVIOUS WORK IN THE AREA. NO SAMPLES OBTAINED.

II) DYNAMIC PENETRATION TESTS CARRIED OUT MAY 21 TO MAY 22, 1963 USING 140 LB. HAMMER WITH 30 IN. DROP.

III) FOR LOCATIONS OF PROBINGS SEE FIGURE 6 .

IV) ALL ELEVATIONS ARE TO GEODETIC DATUM.

GOLDER & ASSOCIATES

Made W.J.
Chkd. A.J.B.
Appd. ...

PROJECT No. 6346

RECORD OF BOREHOLE 127

LOCATION SEE FIGURE 6 BORING DATE MAY 22, 1963 DATUM GEODETIC

BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER NX & BX CASING

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT — LB. DROP — INCHES

ELEVN / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FT.
245.9 / 0.0	GROUND LEVEL				
	VERY SOFT TO SOFT BROWN FIBROUS MUSKEG WITH AN OCCASIONAL SANDY LAYER, 2FT. LAYER OF GRAVEL BETWEEN 16 AND 18 FT. DEPTH		1	2" TP	Ph
			2	"	Ph
			3	"	Ph
225.9 / 20.0			4	DO	29
	GREY CLAYEY SILT WITH A FEW LAYERS OF GREY SILTY SAND PROBABLY HARD TO FIRM		5	"	70
			6	"	23
			7	TO	10
210.9 / 35.0	END OF HOLE				

ELEVATION SCALE: 250, 240, 230, 220, 210

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH C, LB./SQ.FT. +-VANE, ⊕-REM.V. 100 200 300 400 500

COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT P_L W L_L

W.L. IN BOREHOLE AT ELEV. 245.9 MAY 22, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED A.M.S.

PROJECT No. 6346

RECORD OF BOREHOLE 134

LOCATION SEE FIGURE 6 BORING DATE MAY 27, 1963 DATUM GEODETIC

BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER NX CASING

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS / FT.
249.4	GROUND LEVEL				
0.0	DARK BROWN TOPSOIL				
1.0	VERY STIFF TO STIFF BROWN CLAYEY SILT TRACE SAND BECOMING A GREY LAYERED FISSURED CLAY AND SANDY OR CLAYEY SILT BELOW ABOUT ELEV. 240, FEW THIN SEAMS OF MEDIUM SAND		1	2" TO	22
			2	"	4
			3	"	11
228.1			4	"	20
21.3	HARD PINK COLOURED CRYSTALLINE ROCK, CONTAINS SOME FRACTURES (BEDROCK)		5	AXT RC	-
220.1			6	"	-
29.3	END OF HOLE				

ELEVATION SCALE: 250, 240, 230, 220, 210

DYNAMIC PENETRATION RESISTANCE, BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM.V. • - Q. 1000 2000 3000 4000 5000

100 BLOWS FOR 11 INCHES REFUSAL

END OF PEN. TEST AT ELEV. 226.5

COEFFICIENT OF PERMEABILITY K, CM. / SEC.

WATER CONTENT, PERCENT: P_L W L_L 10 20 30 40

W.L. IN BOREHOLE AT ELEV. 249.4 MAY 28, 1963

γ=130

γ=130

C

20 15 10 5 AXIAL STRAIN AT FAILURE, PERCENT

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M.W.

CHECKED M.J.B.

PROJECT No. 6346

RECORD OF BOREHOLE 135

LOCATION SEE FIGURE 6 BORING DATE MAY 28, 1963 DATUM GEODETIC

BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER NX CASING

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES: NUMBER	TYPE	BLOWS / FT.
248.8 / 0.0	GROUND LEVEL DARK BROWN TOPSOIL				
1.0	VERY STIFF GREY AND BROWN CLAYEY SILT WITH SOME SAND BECOMING A GREY LAYERED FISSURED CLAY AND CLAYEY OR SANDY SILT BELOW ABOUT EL. 240		1	2" TO	Pm
			2	DO	38
			3	TO	14
228.3			4	"	12
20.5	COMPACT TO VERY DENSE MEDIUM AND COARSE SANDS WITH SOME LAYERS OF GREY CLAYEY SILT		5	DO	10
218.8			6	"	>100
				"	>100
30.0	HARD CRYSTALLINE ROCK GENERALLY PINK IN COLOUR WITH SOME BANDS OF DARK GREEN, CONTAINS SOME FRACTURES (BEDROCK)		8	AXT R.C.	-
			9	"	-
208.8			10	"	-
40.0	END OF HOLE				

ELEVATION SCALE: 250, 240, 230, 220, 210, 200

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM.V.: 1000 2000 3000 4000 5000

100 BLOWS FOR 6 INCHES
END OF PEN. TEST AT ELEV. 217.3

COEFFICIENT OF PERMEABILITY K, CM./SEC.

WATER CONTENT, PERCENT: P_L W L_L

W.L. IN BOREHOLE AT ELEV. 248.8 MAY 29, 1963

VERTICAL SCALE 1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN M. W.

CHECKED M. W. S.

PROJECT No. 6346

RECORD OF BOREHOLE 136 & 138

LOCATION SEE FIGURE 6 BORING DATE MAY 30-31, 1968 DATUM GEODETIC

BOREHOLE TYPE WASH BORING BOREHOLE DIAMETER NX & BX CASING

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES PEN. TEST HAMMER WEIGHT 140 LB. DROP 30 INCHES

ELEVN. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS / FT.
251.0	GROUND LEVEL				
0.0	DARK BROWN TOPSOIL				
1.0	VERY STIFF BROWN AND GREY CLAYEY SILT WITH AN OCCOSIONAL GRAVEL SIZE PARTICLE GRADING TO A GREY LAYERED FISSURED CLAY AND CLAYEY OR SANDY SILTS BELOW ABOUT EL. 241, SOME ORGANIC MATERIAL IN UPPER 3 FEET		1	2" TO	Pm
			2	DO	45
			3	TO	16
			4	"	8
231.0					
20.0	LOOSE TO COMPACT STRATIFIED GREY SANDY SILTS, SOME CLAYEY SILT LAYERS OR LENSES		5	DO	8
			6	"	17
215.0			7	"	14
56.0	END OF HOLE REFUSAL, BOULDER OR BEDROCK				
280.2	GROUND LEVEL				
0.0	BROWN SANDY TOPSOIL				
1.0	LOOSE TO COMPACT GREY SANDY AND CLAYEY SILT				
274.3					
5.9	HARD LIGHT GREY CRYSTALLINE ROCK. CONTAINS A FEW STEEPLY INCLINED FRACTURES (BEDROCK)		1	AXT R.C.	-
			2	"	-
265.8					
14.4	END OF HOLE				

ELEVATION SCALE: 260, 250, 240, 230, 220, 210, 290, 280, 270, 260

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH C, LB./SQ.FT. + - VANE, ⊕ - REM.V. ● - ⊙. 1,000 2,000 3,000 4,000 5,000

COEFFICIENT OF PERMEABILITY K, CM. / SEC.

WATER CONTENT, PERCENT P_L W L_L 10 20 30 40

136

138

W.L. IN BOREHOLE AT ELEV. 251.0 MAY 31, 1968

γ=127

100 BLOWS FOR 4 INCHES

END OF PEN. TEST AT ELEV. 211.7

20 15 10 5 AXIAL STRAIN AT FAILURE, PERCENT

VERTICAL SCALE 1 INCH TO 10'-0"

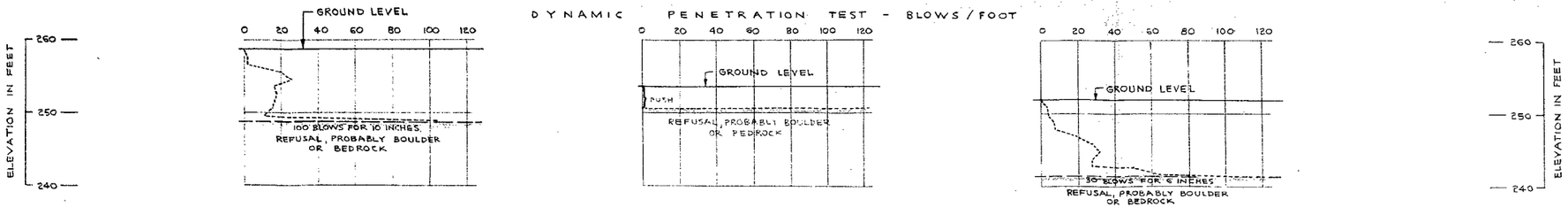
GOLDER & ASSOCIATES

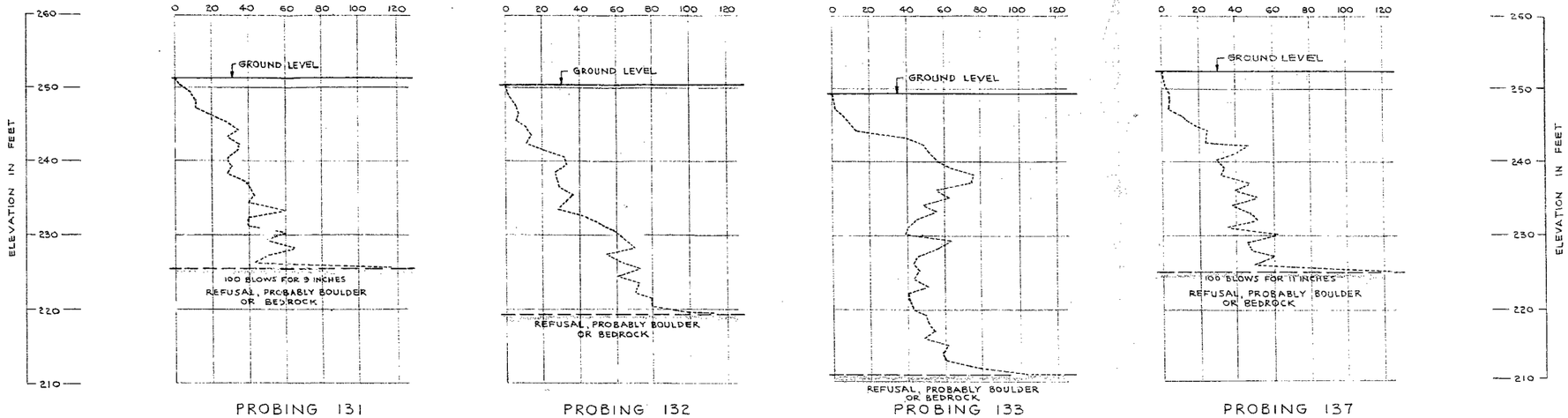
DRAWN M.W.

CHECKED M.W.G.

DETAILS OF PROBINGS 128 TO 133, & 137 | FIGURE 5

DYNAMIC PENETRATION TEST - BLOWS / FOOT





LEGEND

- PROBABLY CLAY WITH SOME SAND AND GRAVEL LAYERS
- REFUSAL, PROBABLY BOULDER OR BEDROCK

NOTES

I) STRATIGRAPHY INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS AND PREVIOUS WORK IN THE AREA. NO SAMPLES OBTAINED.

II) DYNAMIC PENETRATION TESTS CARRIED OUT MAY 23 TO MAY 30, 1963 USING 140 LB. HAMMER WITH 30 IN. DROP.

III) FOR LOCATIONS OF PROBINGS SEE FIGURE 6.

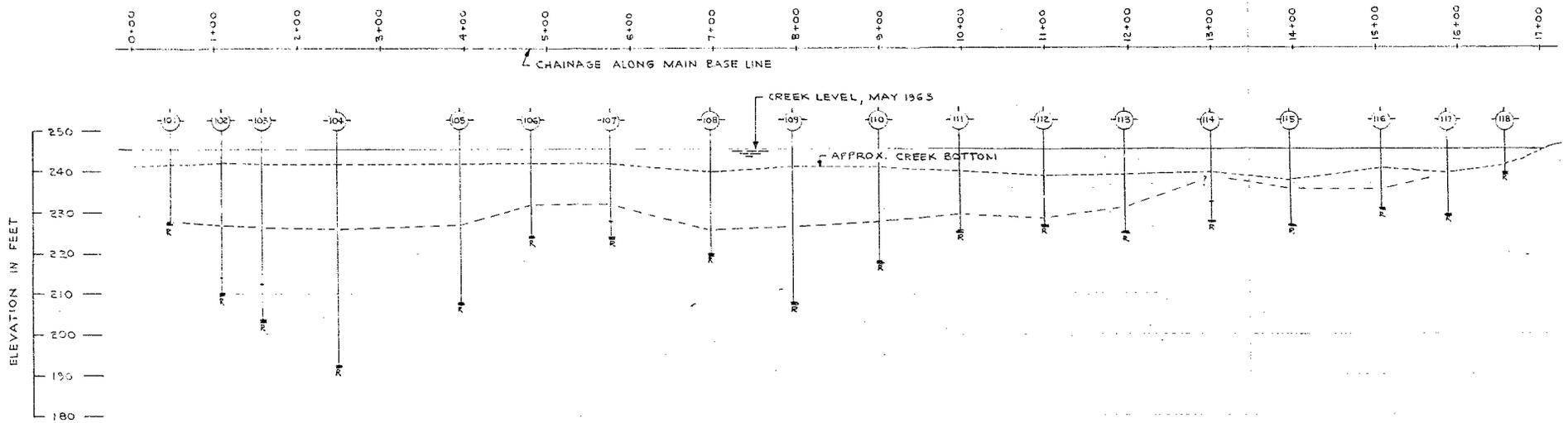
IV) ALL ELEVATIONS ARE TO GEODETIC DATUM.

GOLDER & ASSOCIATES

Made
Chkd.
Appd.

INFERRED SOIL STRATIGRAPHY
ALONG CENTRELINE JONES CREEK

FIGURE 7



INFERRED SOIL STRATIGRAPHY ALONG CENTRELINE JONES CREEK

HORIZONTAL SCALE 1" TO 100'-0" VERTICAL SCALE 1" TO 20'-0"

NOTES

i) DATA INFERRED FROM RESULTS OF DYNAMIC PENETRATION TESTS ONLY. NO SAMPLES OBTAINED.

ii) APPROXIMATE BASE LINE ESTABLISHED BY H.Q. GOLDER & ASSOCIATES, MAY 1963

LEGEND

101 PROBINGS IN ELEVATION, BY H.Q. GOLDER & ASSOC. LTD. MAY 1963

STRATIGRAPHY

PROBABLY **MUSKEG**

PROBABLY **CLAY** WITH SOME SAND AND GRAVEL LAYERS

REFUSAL, PROBABLY BOULDER OR BEDROCK

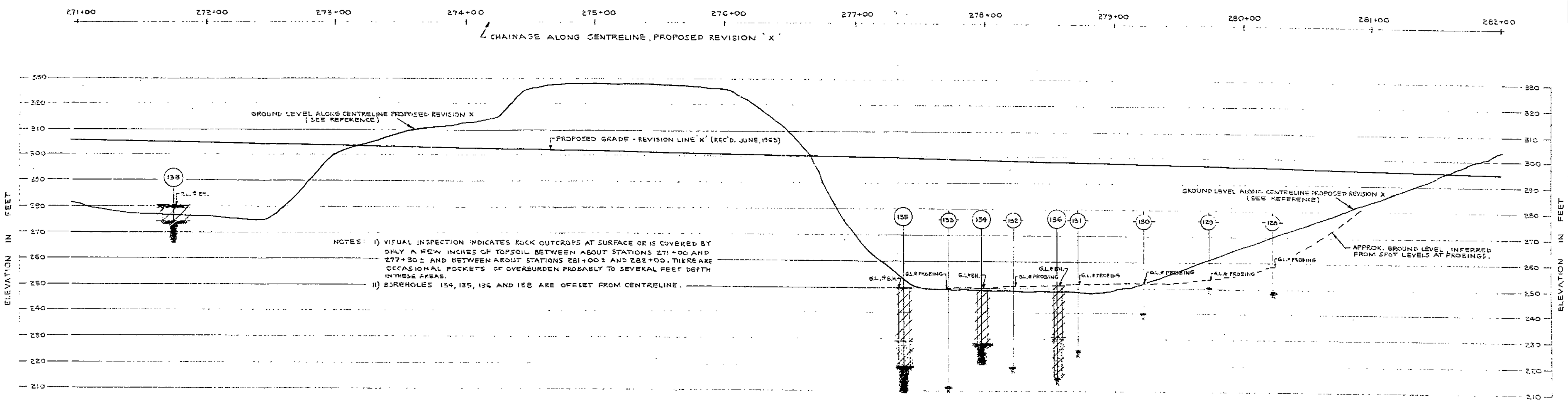
SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED BY BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

GOLDER & ASSOCIATES

Made MJ
Chkd. [illegible]
Appd. [illegible]

INFERRED SOIL STRATIGRAPHY
ALONG LINE X, STA. 271+00 TO STA. 282+00

FIGURE 8



REFERENCE: DEPARTMENT OF HIGHWAYS, ONTARIO DRAWING, PROFILE OF PROPOSED C.A.H. No. 401 GANANOQUE TO BROCKVILLE G.P. 68. W.P. 180-61 REVISION LINE X, AT JONES CREEK STR. W.P. 179-61. (REC'D. JUNE, 1963)

SCHEMATIC SECTION ALONG CENTRELINE, PROPOSED REVISION LINE 'X'

HORIZ. SCALE 1" TO 40'-0"   VERT. SCALE 1" TO 20'-0"

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.

LEGEND

(136) BORINGS IN ELEVATION BY H.G. GOLDER & ASSOC. MAY 1963

(131) PROBINGS IN ELEVATION BY H.G. GOLDER & ASSOC. MAY 1963

STRATIGRAPHY

- DARK BROWN **TOPSOIL**.
- VERY STIFF TO STIFF GREY AND BROWN **CLAYEY SILT** BECOMING A GREY LAYERED FISSURED **CLAY** AND **CLAYEY OR SANDY SILTS** BELOW ABOUT ELEV. 240
- GENERALLY LOOSE TO COMPACT STRATIFIED **SILTY SANDS** WITH SOME GREY CLAYEY SILT LAYERS OR LENSES.
- HARD CRYSTALLINE **BEDROCK**.
- **REFUSAL**, BOULDER OR BEDROCK.

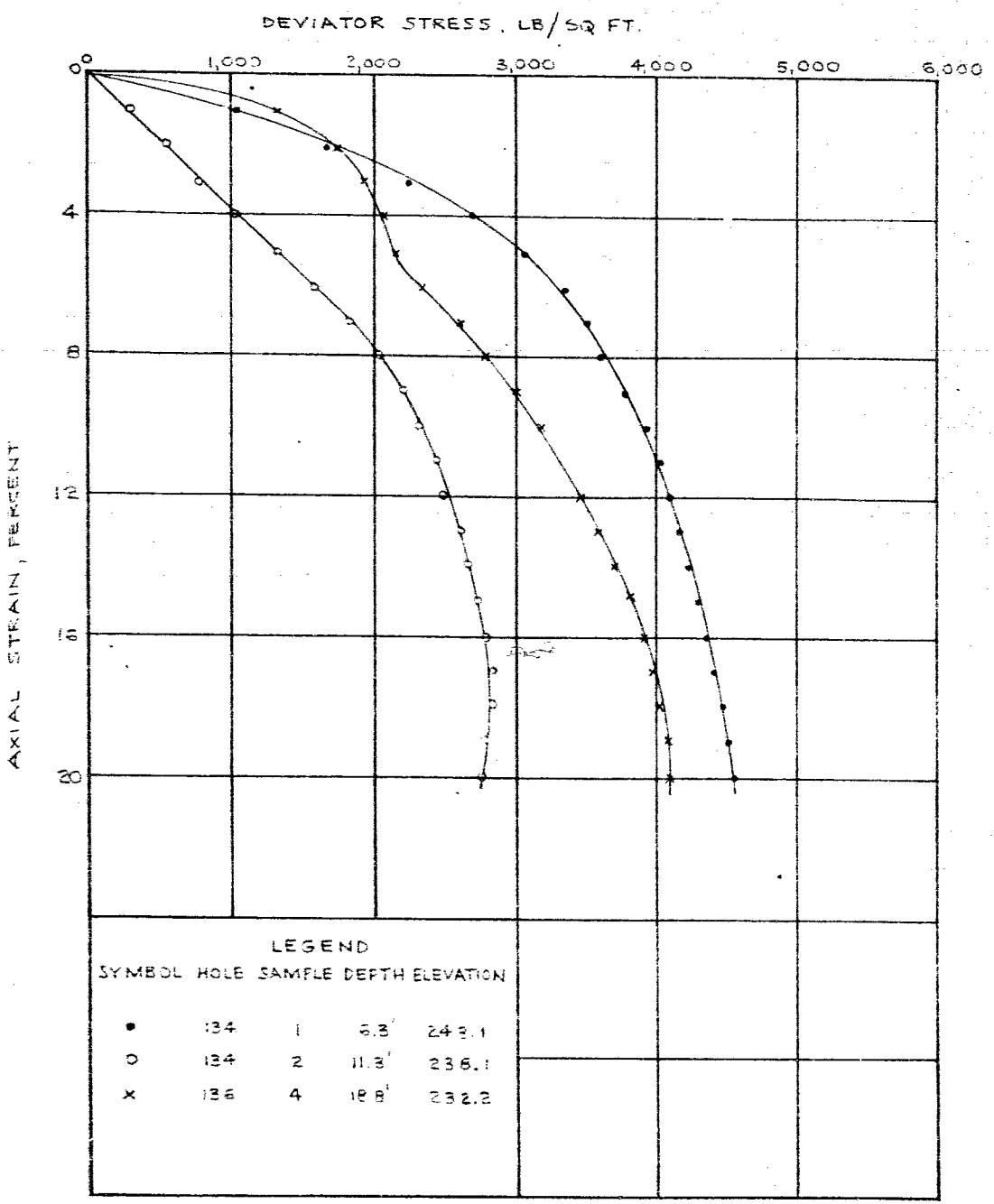
GOLDER & ASSOCIATES

Made
Chkd.
Appd.

UNDRAINED TRIAXIAL COMPRESSION TESTS

STRESS - STRAIN CURVES

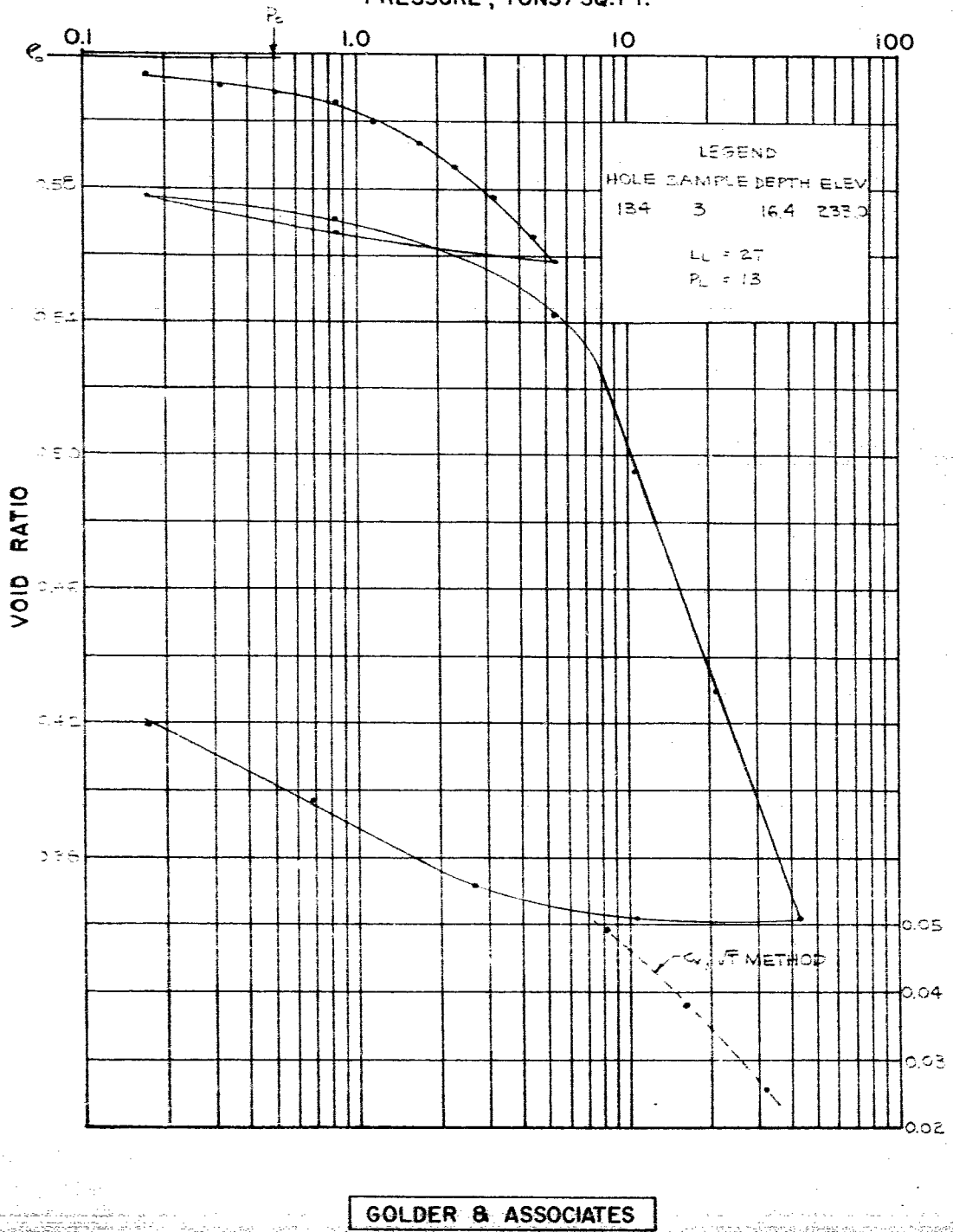
FIGURE 9



GOLDER & ASSOCIATES

VOID RATIO - PRESSURE CURVES
CONSOLIDATION TEST

FIGURE 11



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CONSOLIDATION TESTS - SUMMARY OF RESULTS

Layered Silty Clay and Clayey Silt

	BH	SA	Depth, ft.	Elevation	L_L	P_L	e_o	C_c	C_{cr}
Present Investigation									
Clayey Silt Layer	134	3	16.4	233.0	27	13	0.62	0.22	0.02
Previous Investigation (Our Report 6264, dated March, 1963).									
Silty Clay Layer	1	5	31.7	212.5	34	16	1.20	0.62	0.04
Clayey Silt Layer	3	8	40.8	203.4	27	14	0.62	0.20	0.01
Silty Clay Layer	5	7	35.4	208.8	56	21	1.30	0.95	-

In the above table:

L_L = Liquid Limit
P_L = Plastic Limit
e_o = Initial void ratio
C_c = Laboratory compression index
C_{cr} = Laboratory rebound compression index

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