

B.D.478

RACEY, MacCALLUM AND ASSOCIATES LIMITED

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A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers AND ASSOCIATED STAFF



MONTREAL: 4123 SHERBROOKE STREET WEST, FITZROY 5261
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THE E. B. ALLEN INSPECTION COMPANY
ISOTOPE PRODUCTS LIMITED,
RADIOGRAPHERS
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METEOROLOGIST
JACQUES POULIN,
QUEBEC LAND SURVEYOR
THE VIBRATION ENGINEERING COMPANY

REPORT NO. S-500-505/55/T-91-1

Toronto, Ontario,
June 1st, 1955.

55F-2042

Ontario Department of Highways,
c/o G. C. Parker and Associates Limited,
195 Main Street, West,
HAMILTON, Ontario.

Attention: Mr. D. C. Cram

RE: FOUNDATION INVESTIGATION HIGHWAY BRIDGE
WEST OF BURLINGTON, ONTARIO, CROSSING C.N.R.,
(BEING THE BURLINGTON CONNECTION - Q.E.W.
AND FREEMAN TO WOLFE ISLAND HIGHWAY)

Dear Sirs:

Following your instructions we have carried out the drilling
of ~~seven~~ (7) boreholes at the above site, and we now wish to report on
our findings as follows.

LOCATION OF THE SITE AND OF THE BOREHOLES

The site is located approximately 1000 feet north of the
Niagara Falls and Hamilton Cloverleaf of the Queen Elizabeth Highway in
the Township of Nelson. Location is shown on the attached sketch map.

The location of the boreholes is shown on the attached
sketch plan. The twelve (12) boreholes, originally required, have been
reduced to seven (7) on account of the uniformity of the soil at the
site. Boreholes Nos. 6 (4) and 7 (3) had to be transferred about eight feet

REPORT NO. S-500-505/55/T-91-1 Cont'dLOCATION OF THE SITE AND OF THE BOREHOLES Cont'd

to avoid damage to a telephone line. The borehole numbers are given in the sequence of their completion, the originally proposed borehole number is shown in brackets for your convenience. The boreholes were spotted and levelled to determine their elevation by our engineer in the field. The elevations refer to M.S.L.

THE DRILLING WORK

The equipment was brought to the site on Saturday, April 23rd, 1955. Borehole No. 1, however, could not be started before April 26th because of heavy rainfall on the preceding day. Borehole No. 1 was completed on April 27th. Borehole No. 2 was begun on April 28th and completed the following day. Borehole No. 3 was drilled from April 30th to May 2nd. Borehole No. 4 was drilled on the third and fourth of May. Borehole No. 5 was begun on May 5th and completed on May 6th. Borehole No. 6 took from May 7th to May 9th. The last borehole No. 7 was begun on May 10th and completed on May 11th, on which day the equipment was moved from the site and returned to Toronto.

Drilling was performed with a standard diamond core drill, manufactured by C. AYRE. The soil was penetrated with 3" diameter extra-heavy-duty drivepipe with a 350 pound hammer, dropped 20 inches. Soil sampling was carried out in borehole No. 1 every 2.5 feet while the intervals in the subsequent boreholes were increased to 5 feet. Only split barrel samples of 2 inch outside diameter were taken. The number of blows squalling to 4200 in. lbs. was counted and plotted in the attached

REPORT NO. 3-500-505/55/T-91-1 Cont'dTHE DRILLING WORK Cont'd

Engineering Data Sheets. The number of blows on the drive pipe per foot of penetration was counted additionally and entered in the diagram for reference purposes. The depths of the boreholes were 28.5', 24', 26', 26.5', 25.5', 20.5' and 20.5' in the sequence of the borehole numbers. The depths were determined by the penetration resistance of the drivepipe.

DISCUSSION OF THE RESULTS AND CONCLUSIONS

The soil as recovered with the split barrel sampler was classified as a reddish grey and grey silty clay with occasional occurrence of fine gravel. The clay proved to be of very stiff and extremely stiff consistency.

For classification purposes and a consideration of the compressibility of the soil some laboratory tests were carried out. The Atterberg tests on two samples taken in Borehole No. 1 (12) at 7.5 feet depth and in borehole No. 5 (1) at 10 foot depth showed a clay of low plasticity with a liquid limit of 29.6% and 27.3%, a plastic limit of 13.6% and 14.1% respectively. The water contents determined on 6 samples in borehole No. 1 and four samples of borehole No. 5 show values slightly above or even below the plastic limit, decreasing with depth. Only one sample taken at 5 feet depth in borehole No. 1 had a higher water content of 21.8%.

The number of blows per foot of penetration of the two-inch split barrel sampler is indicative for the unconfined compressive strength as was found by innumerable correlations in the past. From this experience the bearing capacity of the clay on the subject site is, with a factor of safety of three, generally above 3 tons per sq. ft. at a level 5 feet below

REPORT NO. S-500-505/55/T-91-1 Cont'd

DISCUSSION OF THE RESULTS AND CONCLUSIONS Cont'd

ground level, where the first penetration test by the sampling procedure was performed.

The bearing values actually exceed this figure substantially with increasing depth in most of the boreholes. However, we consider the above allowable load which is based on the lowest penetration resistance observed in several of the boreholes of 5 foot depth as sufficient for the anticipated structures.

The consistency of the clay which is little above or below the plastic limit promises that uniform settlement of a negligible amount will occur but that practically no differential settlement may be expected.

We trust that this information is satisfactory and shall be pleased to clarify matters further if you so desire.

Yours very truly,

RACEY, MACCALLUM AND ASSOCIATES LIMITED

K.T.

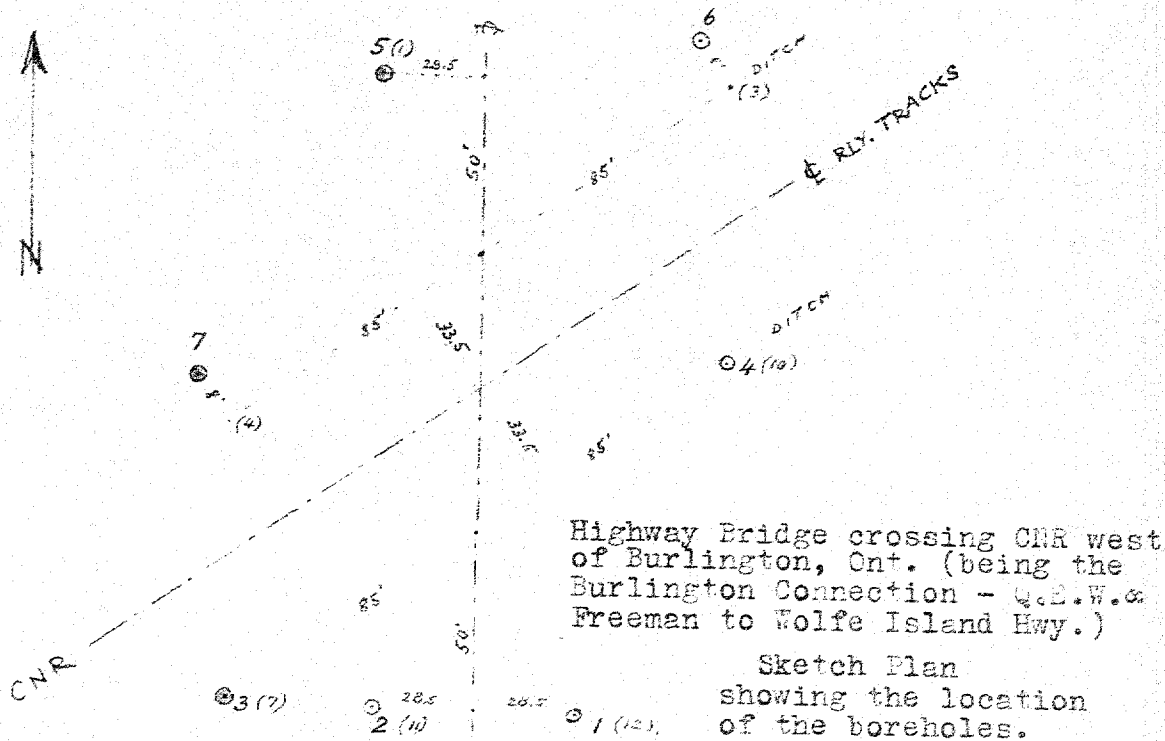
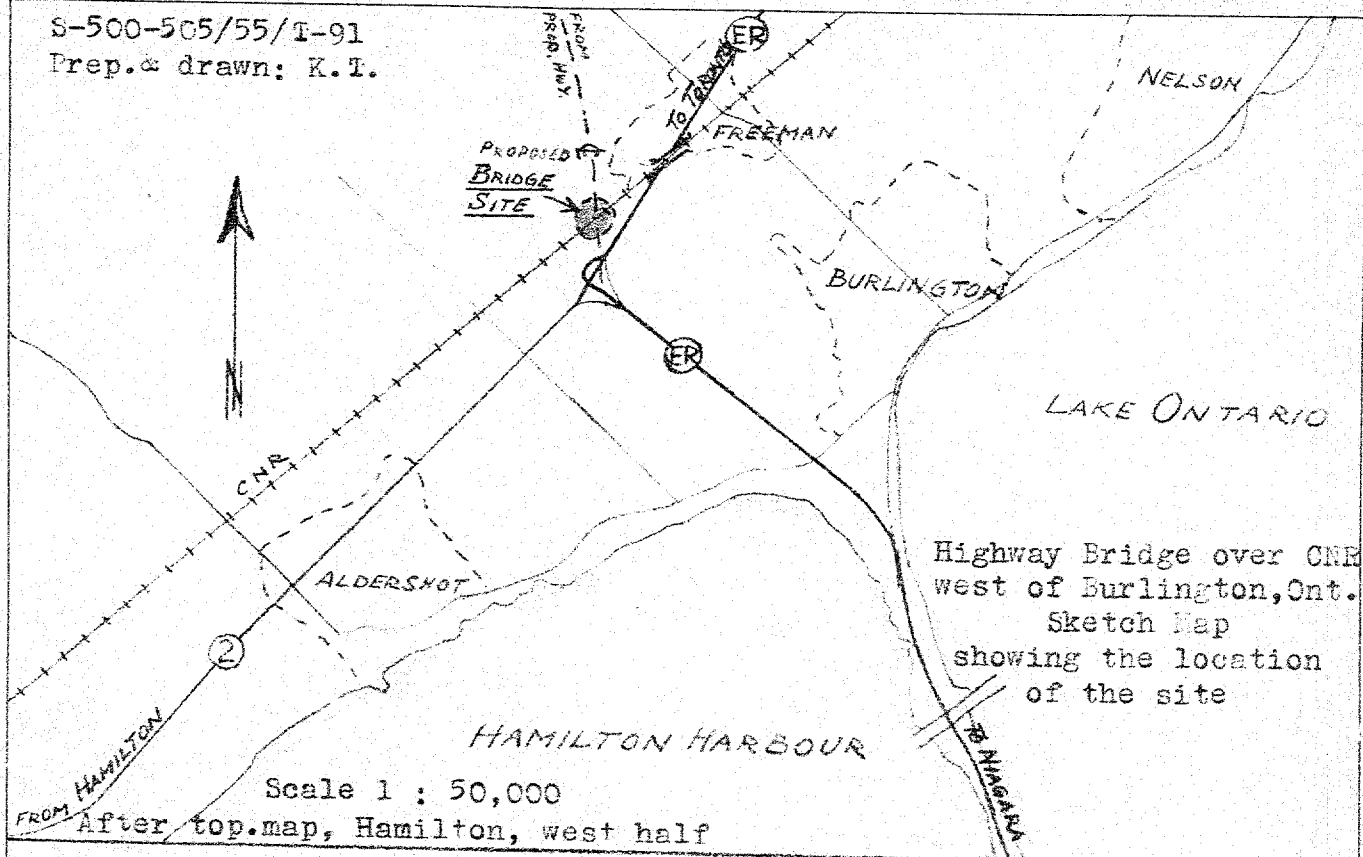
KT/PW

K. Tubbesing, P. Eng.

Original and
two copies

- C. G. Parker and Associates Limited, Hamilton, Ontario,
Attention: Mr. D. C. Gramm
c.c.'s: 2 - Racey, MacCallum and Associates Limited, Montreal, P.Q.
1 - Soils Engineer

S-500-505/55/I-91
 Prep. & drawn: K.T.



RACEY, MacCALLUM & ASSOCIATES, Ltd.

Hole Begun 26/4/55

Foundation Engineering Division

Hole Ended 27/4/55 Engineering Data Sheet for Borehole: 1 (12)

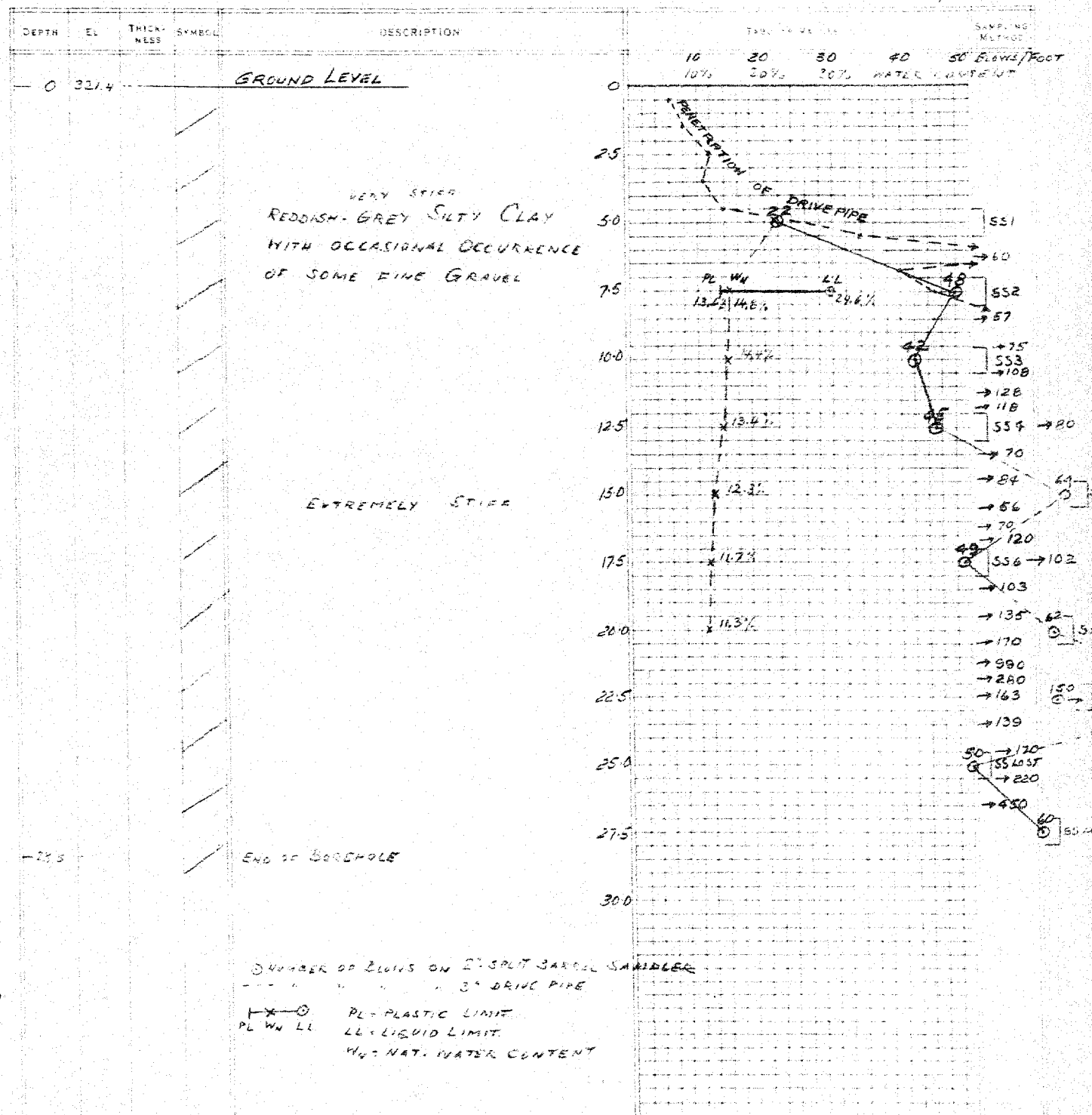
Heller

Job Name: Rwy. Bridge crossing CNR west of Burlington

BFW FKT

Job Located: west of Burlington, Ontario

Checked by

Hole Located: as shown on attached sketch mapHole Elevation: 321.4 Datum: M.S.L.6 / 5 / 55
Day / Month / Year

DEPTH	EL.	THICK- NESS	SYMBOL	DESCRIPTION	TASUOKA VALUES	SAMPLING METHOD
0	321.9			GROUND LEVEL	10 20 30 40 50 BLOW/FT	
				VERY STIFF REDDISH-GREY SILTY CLAY WITH OCCASIONAL OCCURRENCE OF SOME FINE GRAVEL		
				EXTREMELY STIFF		
				END OF BOREHOLE		

Hand-drawn graph showing blow count data (SS1, SS2, SS3) plotted against depth (0 to 250 feet). The graph includes a line representing the penetration of the drive pipe and a line representing the blow count data. The blow count data shows a sharp increase in blow count starting around 100 feet depth, reaching a peak of 315 blows per foot at 225 feet depth, and then decreasing to 250 blows per foot at 250 feet depth. The graph also includes a line representing the penetration of the drive pipe, which is labeled "PENETRATION OF DRIVE PIPE".

DEPTH (ft)	SS1 (blows/ft)	SS2 (blows/ft)	SS3 (blows/ft)
0			
25			
50	25		
75		70	
100		83	
125		81	
150		56	148
175		76	102
200		104	
225		167	
250		176	
		SS LOST	
		139	
		140	
		212	
		325	
		52	275
		SS	250
			247
			278
			315

Hole Begun 30/4/55

Foundation Engineering Division

Hole Ended 2/5/55 Engineering Data Sheet for Borehole: 3 (7)

Helper

Job Name: Hwy. Bridge crossing Ch. west of Burlington

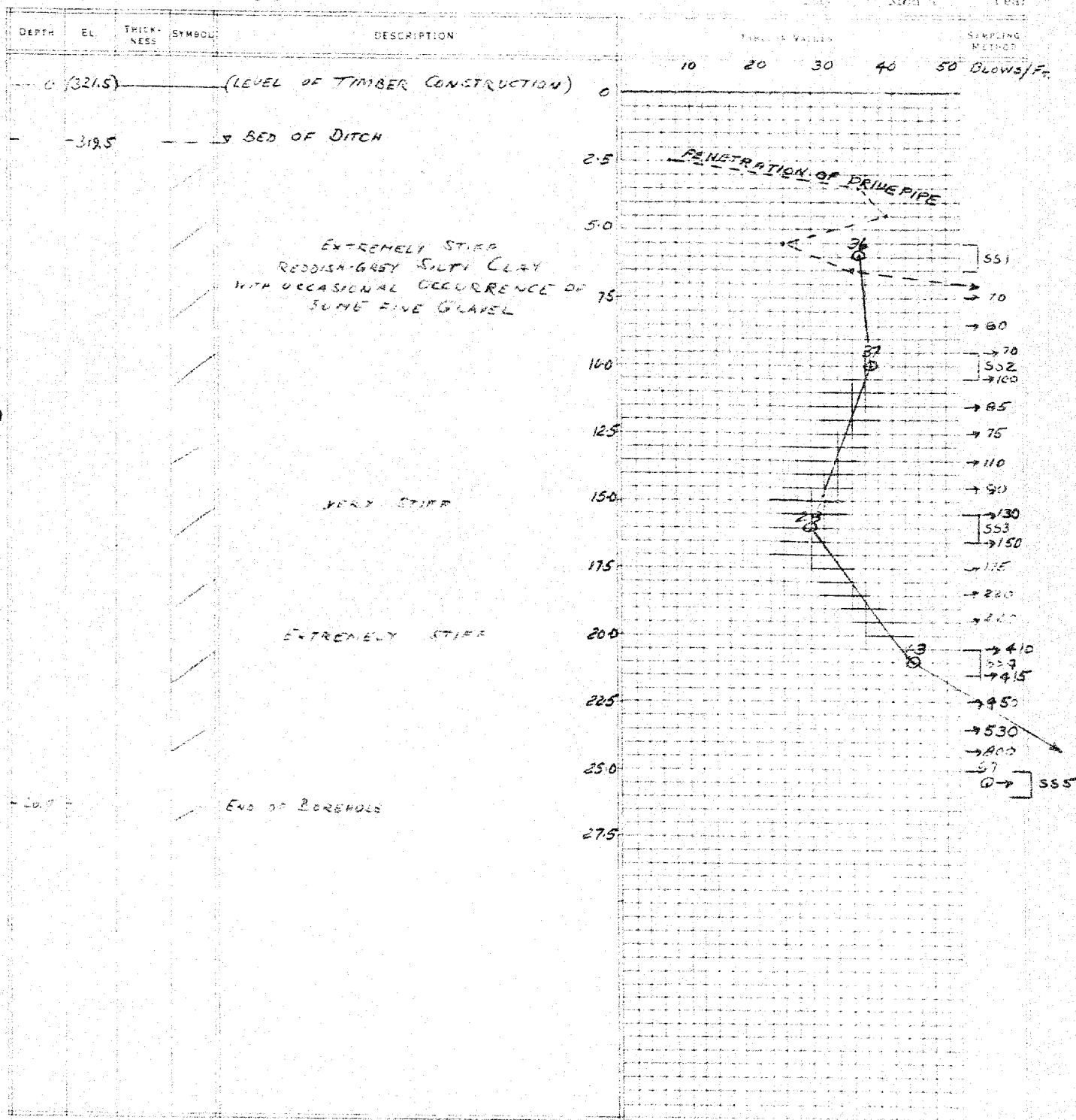
B.F.W. & K.T.
Checked by

Job Located: west of Burlington, Ontario

Hole Located: as shown on attached sketch map

Hole Elevation: 314.5 Datum: M.S.L.
(BED OF DITCH)

Day 6/5/55 Month Year



Order No. 5-500-505/55/791 RACEY, MACCALLUM AND ASSOCIATES

LIMITED

M. CHEVRIER
Driller

Hole Begun 3/5/55

Foundation Engineering Division

Hole Ended 4/5/55

Engineering Data Sheet for Borehole: 4 (10)

Helper

Job Name: Hwy. Bridge crossing Cnr west of Burlington

B. W. E. K.
Checked by

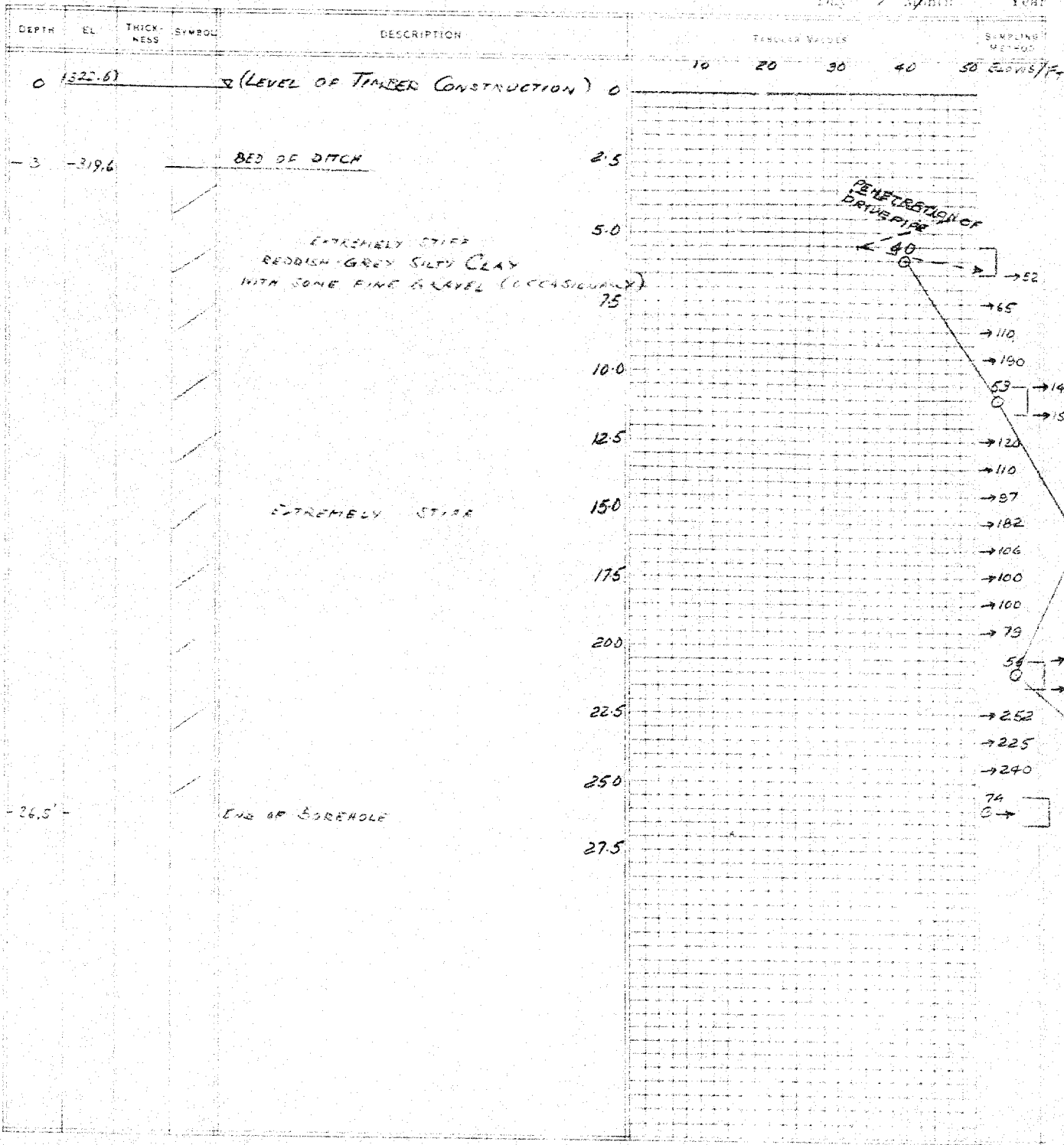
Job Located: west of Burlington, Ontario

Hole Located: as shown on attached sketch map

Hole Elevation: 319.6 Datum: M.S.L.

(BED OF DITCH)

Day 6/5/55 Month 6 Year 55



LIMITED

Discussion

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3 (1)

History

B.F.M. A.K.T.

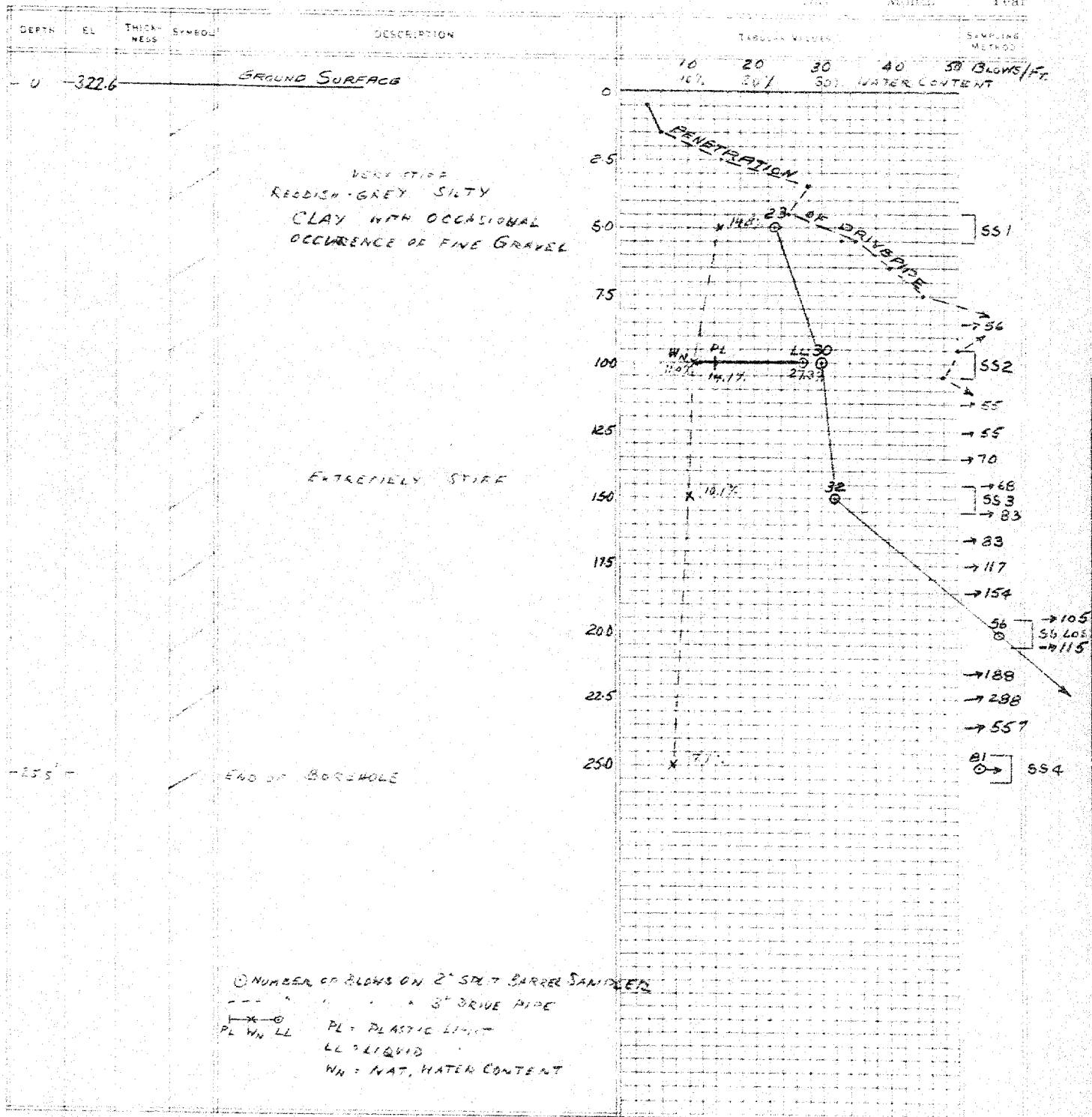
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Hole Located: as shown on attached sketch map

Hole Elevation: 322.6' Datum: M.S.L.

10/5/55

Mon: Year



Order No.: 5-500-505/55/T-91 RACEY, MACCALLUM AND ASSOCIATES
LIMITED

M. CHEVRIER
Driller

Hole Begun 7/5/55

Foundation Engineering Division

Hole Ended 9/5/55

Engineering Data Sheet for Borehole: 6(3)

Helper

Job Name: Hwy. Bridge crossing CMA west of Burlington

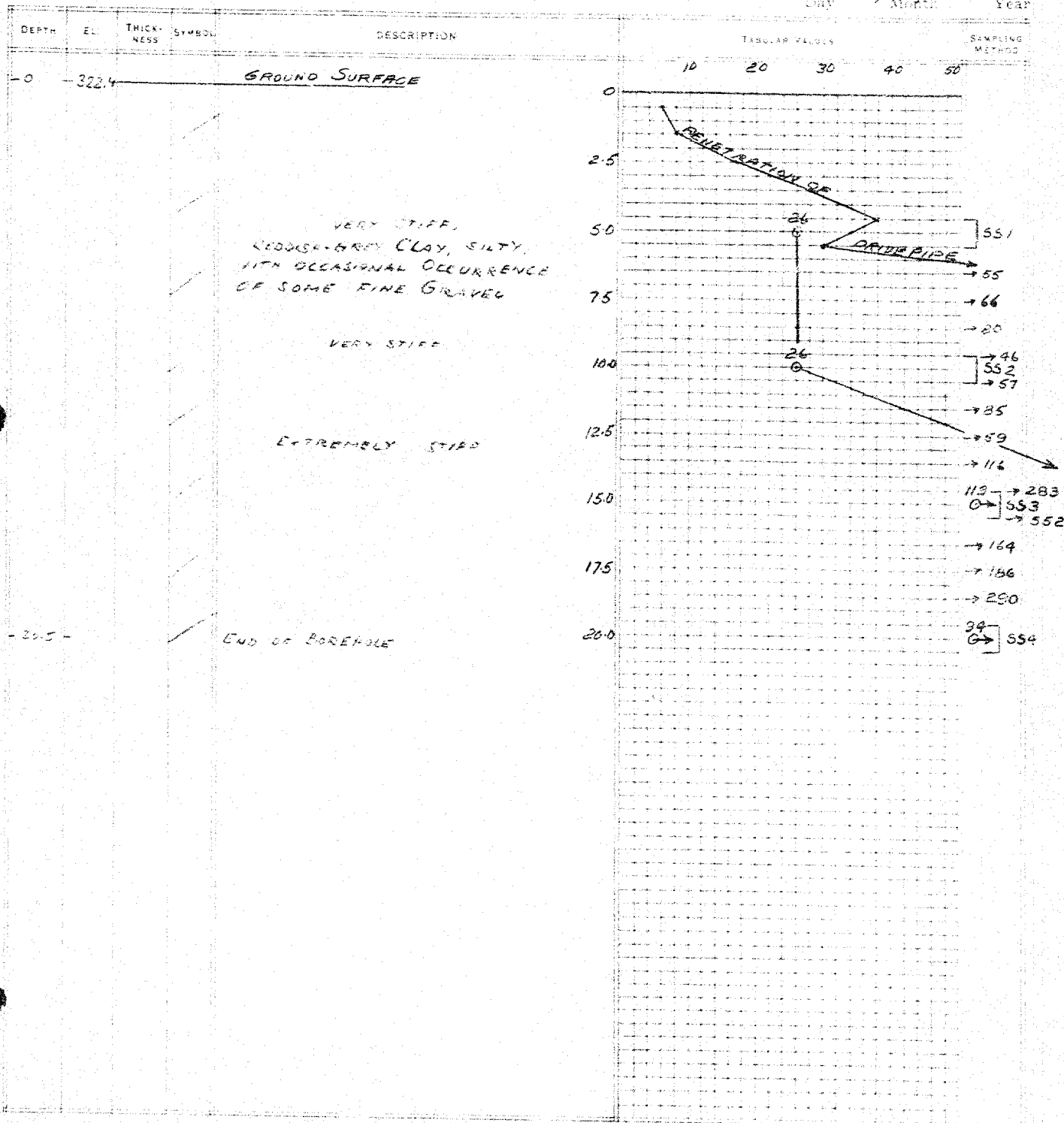
Job Located: west of Burlington, Ontario

Hole Located: as shown on attached sketch map

Hole Elevation: 322.4 Datum: M.S.L.

B.F.W. K.T.
Checked by

10/5/55
Day Month Year



Hole Begun 10/5/55

Foundation Engineering Division

Hole Ended 11/5/55

Engineering Data Sheet for Borehole: 7(4)

Helper

Job Name: Hwy. Bridge crossing CNR west of Burlington

E. F. H. T.
Checked by

Job Located: west of Burlington, Ontario

Hole Located: as shown on attached sketch map

Hole Elevation: 322.9 Datum: M.S.L.

20 / 5 / 55
Day / Month / Year

