

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30 M 11 - 172

DIST. 6 REGION CENTRAL

W.P. No. _____

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. _____

LOCATION PHARMACY AVENUE

BRIDGE OVER DON RIVER

SCARBOROUGH TWP

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE
MICROFILMED

Plot on 30M11

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CONSULTING CIVIL ENGINEERS

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REPORT

TO

MORRISON, MERSHFIELD, MILLMAN & HUGGINS LTD.

ON

SITE INVESTIGATION

PROPOSED PHARMACY AVENUE BRIDGE

TOWNSHIP OF SCARBOROUGH, ONTARIO.

30m 11-177
GEOCRE No.

Distribution:

4 copies - Morrison, Mershfield, Millman & Huggins Ltd.,
Toronto, Ontario.

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

October, 1962

6244

ABSTRACT

The results of an investigation carried out at Massey Creek and Pharmacy Avenue in the Township of Scarborough, Ontario are reported. The purpose of the investigation was to determine foundation conditions for a proposed bridge and the properties of an existing approach fill. It was found that the soil conditions consisted of a thin layer of alluvium followed by dense sands and very dense layered silts. The existing embankment was found to be composed of heterogeneous clayey and sandy fill.

Recommendations are made for founding the abutments of the proposed three span bridge on piles driven through the approach fill to the dense sands, and the piers on spread footings in the dense sand. It is concluded that the existing embankment can be incorporated directly into the new approach fill subject to certain limitations which are discussed.

INTRODUCTION

H. Q. Golder & Associates Ltd. have been retained to carry out a site investigation for a proposed new bridge to carry Pharmacy Avenue across Massey Creek in the Township of Scarborough, Ontario. The purpose of the investigation, as outlined in the proposal to Morrison, Hershfield, Millman and Huggins Ltd. dated September 4, 1962, was to determine the soil conditions at the site, including the properties of the existing approach embankment, and to make recommendations regarding the foundation and embankment design for the new structure.

PROCEDURE

Three boreholes were put down at the site in the period September 10th to 14th, 1962; two of these were put down through the existing embankment at the approximate abutment locations for the proposed bridge and the third was put down from the valley floor near one of the pier locations. The work was carried out using a trailer-mounted diamond drillrig driving BX casing and sampling at approximately 5 feet vertical intervals.

The data obtained from each borehole is detailed on the Records of Boreholes at the rear of the report. Locations of the boreholes and the inferred soil stratigraphy at the site is shown on Figure 1. Results of laboratory testing are plotted on the Records of Boreholes and the figures which follow.

All elevations employed in the report are referred to the Township of Scarborough datum which is also the Geodetic datum. They were obtained with reference to Scarborough Benchmark No. 382 at the southeast corner of Pharmacy Avenue and Prairie Drive which elevation was given as 410.61.

SITE DESCRIPTION AND GEOLOGY

At the point where it crosses Pharmacy Avenue, Massey Creek occupies a ravine at about Elevation 560. The width of the ravine here is about 500 feet and the banks rise at a slope of about 2:1, to a general elevation of about 400.

This area occupies the ancient beach of Lake Iroquois, the glacial predecessor of the present Lake Ontario. Beneath the remnant beach sands, the stratigraphy is commonly a sequence of glacial tills and interglacial deposits originating in the various stages of the Pleistocene period. The sequence from top to bottom is usually a thin layer of glacial till underlain by stratified sands, silts and clays of the Scarborough and Don beds followed by older glacial till and Dundas shale bedrock of Paleozoic age which, in this area, is probably below Elevation 200.

SOIL CONDITIONS

The investigation confirmed that natural soil conditions in the ravine consist of a thin layer of alluvium underlain by compact to dense sands. The alluvium, which ranged in thickness from 3 to 9 feet, was in a loose to compact state and was composed

of silty sand to sand with some gravel, containing occasional traces of organic matter. The sands underlying the alluvium were encountered at about Elevation 356 in the south and central portion of the site and at about Elevation 362 in Borehole 1 on the north. They were generally in a dense state and were composed of fine to medium sand with a trace to some silt. A grading curve for the alluvium and typical grading curves for the sand are given in Figures 2 and 3.

The sands are underlain at about Elevation 345 by dense to very dense silt with layers of silty fine sand and some clayey layers. Grading curves for the silt are shown on Figure 4.

The boreholes put down through the existing embankment indicated that the fill is of heterogeneous composition ranging from sand to silty clay, with the clay estimated to form the greater proportion. Atterberg limits carried out on samples of the clayey fill are plotted on the Records of Boreholes and indicate a wide range in plasticity. Undrained shear strengths of 1,320 and 1,690 pounds per square foot were measured on two samples of the fill, and it is estimated that some of the material may have strengths as low as 1,000 pounds per square foot. Occasional traces of organic matter were noted in some samples.

DISCUSSION

It is understood that the existing single arch concrete bridge at Mansey Creek is to be replaced by 3 simply supported spans of approximately 60 foot length. Further, the existing grade is to be raised approximately 15 feet at the bridge and the width of the roadway increased to about 75 feet. The total height of the approach embankment will therefore be approximately 35 feet above the floor of the ravine.

In view of the generally heterogeneous nature of the existing embankment, there can be no question of founding the abutments of the proposed bridge on spread footings in the fill unless the existing material was removed and replaced with well-compacted granular fill. Therefore, it is recommended that the abutments be founded on piles driven to refusal in the dense sands. Assuming a 12 inch diameter displacement pile in the sands, a safe load of 40 tons per pile can be assumed for design.

The pier for the bridge may be founded on spread footings in the sands below Elevation 356 at an allowable load of 3,500 pounds per square foot for an assumed footing width of approximately 10 feet. Settlement of the pier would be small, less than 1 inch and would occur in the course of construction.

It should be noted that groundwater levels in the sand will be close to creek level, which was at approximately Elevation 358 during the investigation. This will necessitate the control

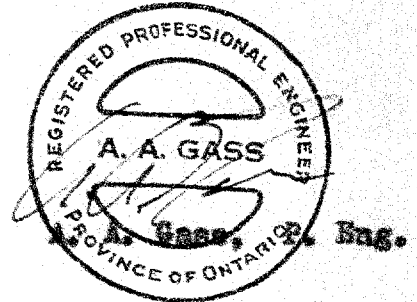
of groundwater in the pier excavations in order to preserve the insitu density of the sand. Wellpoints would provide ideal control, but for excavations which extend only 2 or 3 feet below groundwater level it may be sufficient to install and pump from gravel packed sumps. Either system should be installed and pumped so that the groundwater level is never closer than 1 foot below the bottom of the excavation at any time, and no loss of ground should be permitted due to pumping.

The existing fill may be incorporated directly in the new approach embankment provided that suitable material is selected for the new section and control is exercised over its placing. No treatment of the existing embankment is required except to remove any organic topsoil and loose slope wash or slough material. The new section will be stable, but some settlement due to consolidation of the old fill may be expected.

This settlement is not likely to be large, perhaps of the order of 3 to 4 inches maximum, but would affect the transition from the approach fill to the piled abutment. This can be alleviated by placing the approach fill to at least full height in the vicinity of the abutment as soon as possible in order to maximize the time which elapses between placing of the fill and final paving.

It would also be desirable to incorporate a short transition approach slab from the fill to each abutment.

AR/jb
6244



October, 1962

[Signature]
for V. Milligan, P. Eng.

RECORD OF BOREHOLE 1

30m11-173

LOCATION SEE FIGURE 1

BORING DATE SEPT. 10, 11, 1962

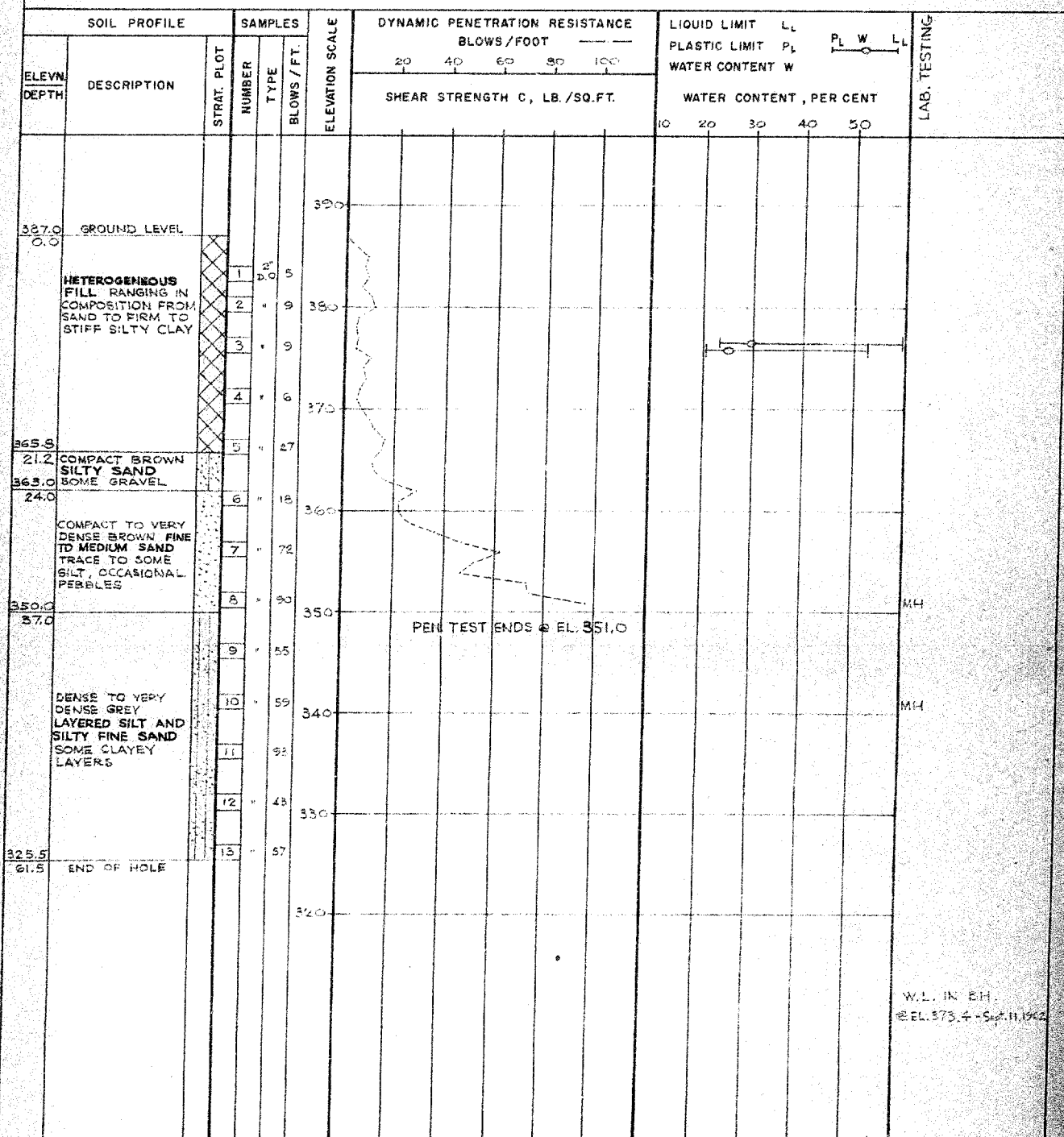
DATUM GEODETI C GEOCRE No.

BOREHOLE TYPE WASH BORING

BOREHOLE DIAMETER BX

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES

PEN. TEST HAMMER WEIGHT LB. DROP INCHES



VERTICAL SCALE

1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN P.C.

CHECKED H.S.

RECORD OF BOREHOLE 2

LOCATION SEE FIGURE 1

BORING DATE SEPT. 11, 12, 1962

DATUM GEODETIC

30m11-172
GEOCRE No.

BOREHOLE TYPE WASH BORING

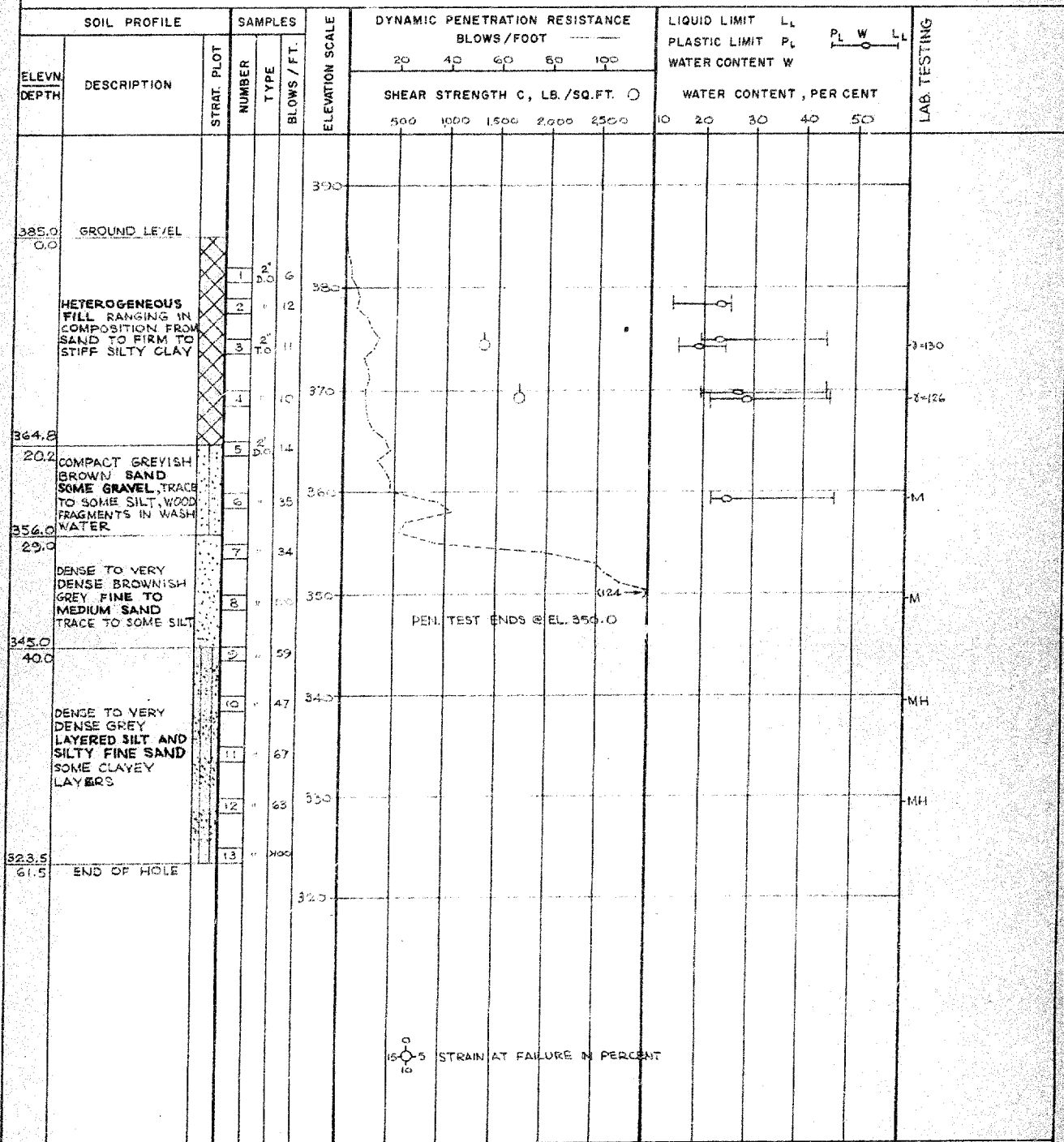
BOREHOLE DIAMETER BX

SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES

PEN. TEST HAMMER WEIGHT LB.

DROP

INCHES

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN P. C.
CHECKED *HC*

RECORD OF BOREHOLE 3

LOCATION SEE FIGURE 1

BORING DATE SEPT. 13, 14, 1962

DATUM GEODETIC

30m11-172

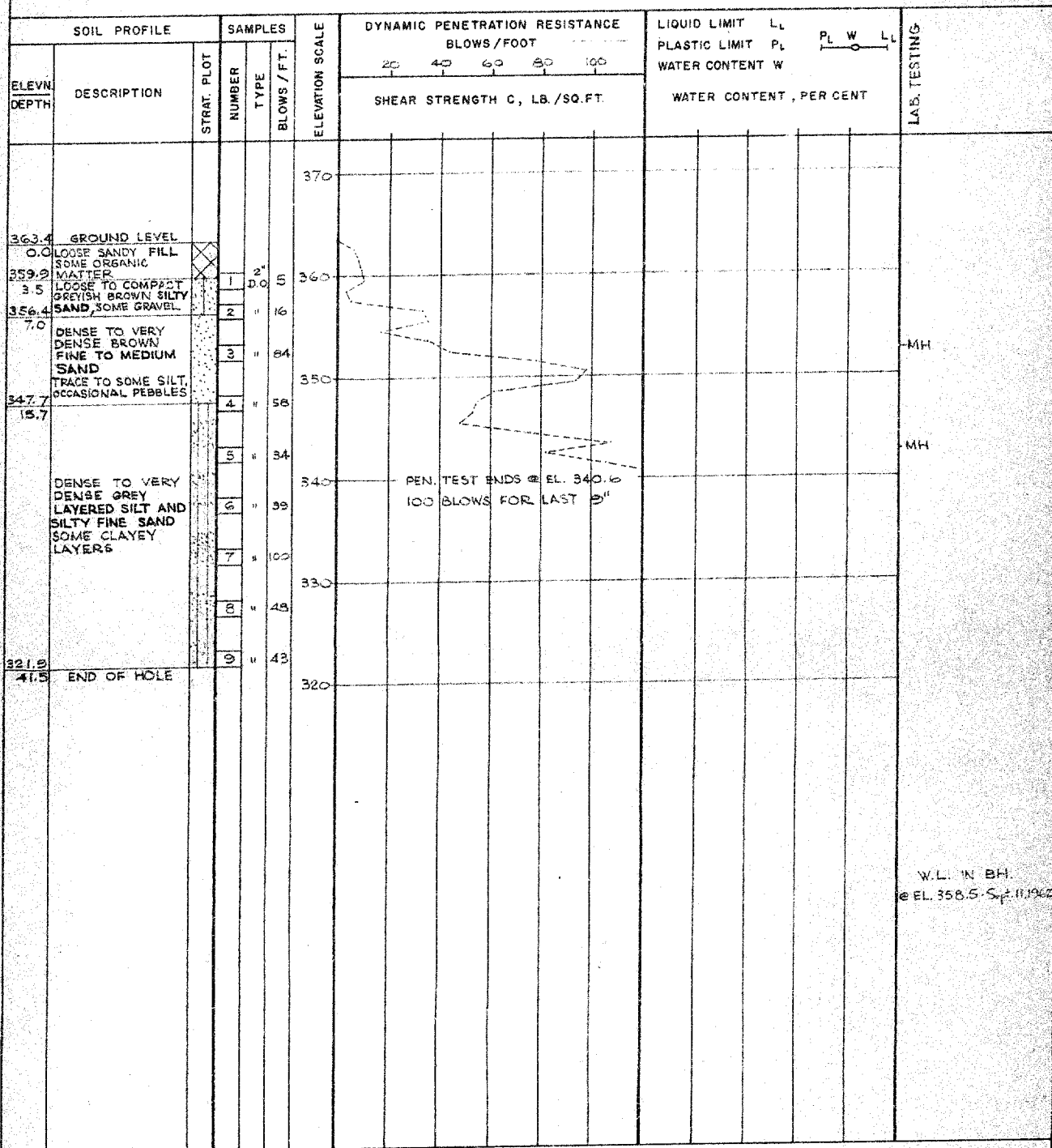
GEOCRE No.

BOREHOLE TYPE WASH BORING

BOREHOLE DIAMETER BX

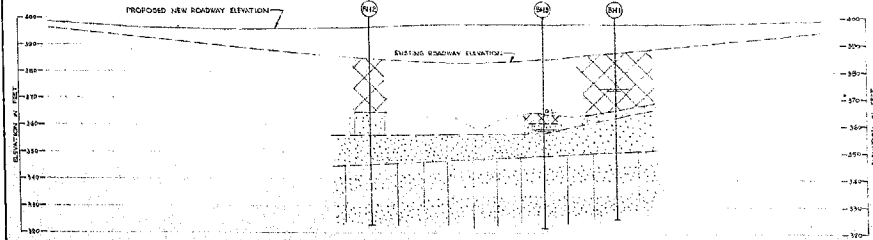
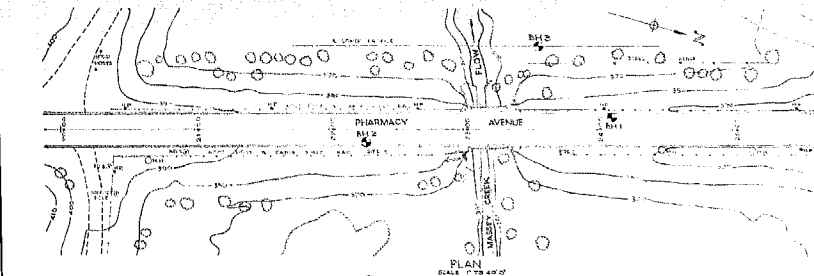
SAMPLER HAMMER WEIGHT 140 LB. DROP 30 INCHES

PEN. TEST HAMMER WEIGHT LB. DROP INCHES

VERTICAL SCALE
1 INCH TO 10'-0"

GOLDER & ASSOCIATES

DRAWN P.C.
CHECKED *AC*



SECTION ALONG CENTRE LINE OF ROADWAY

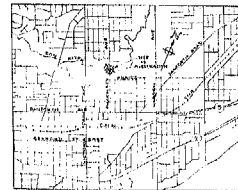
SCALE: HORIZ. 1" TO 40'-0"

VERT. 1" TO 20'-0"

LEGEND

- BOREHOLE IN PLAN
- BOREHOLE IN ELEVATION
- WATER LEVEL IN BOREHOLE

NOTE: THE WATER LEVEL IN THE BOREHOLES IS SHOWN AT THE TIME OF BORING. IT MAY VARY FROM THAT SHOWN.



KEY PLAN

SCALE: 1" TO 0.4 MILES (APPROX.)

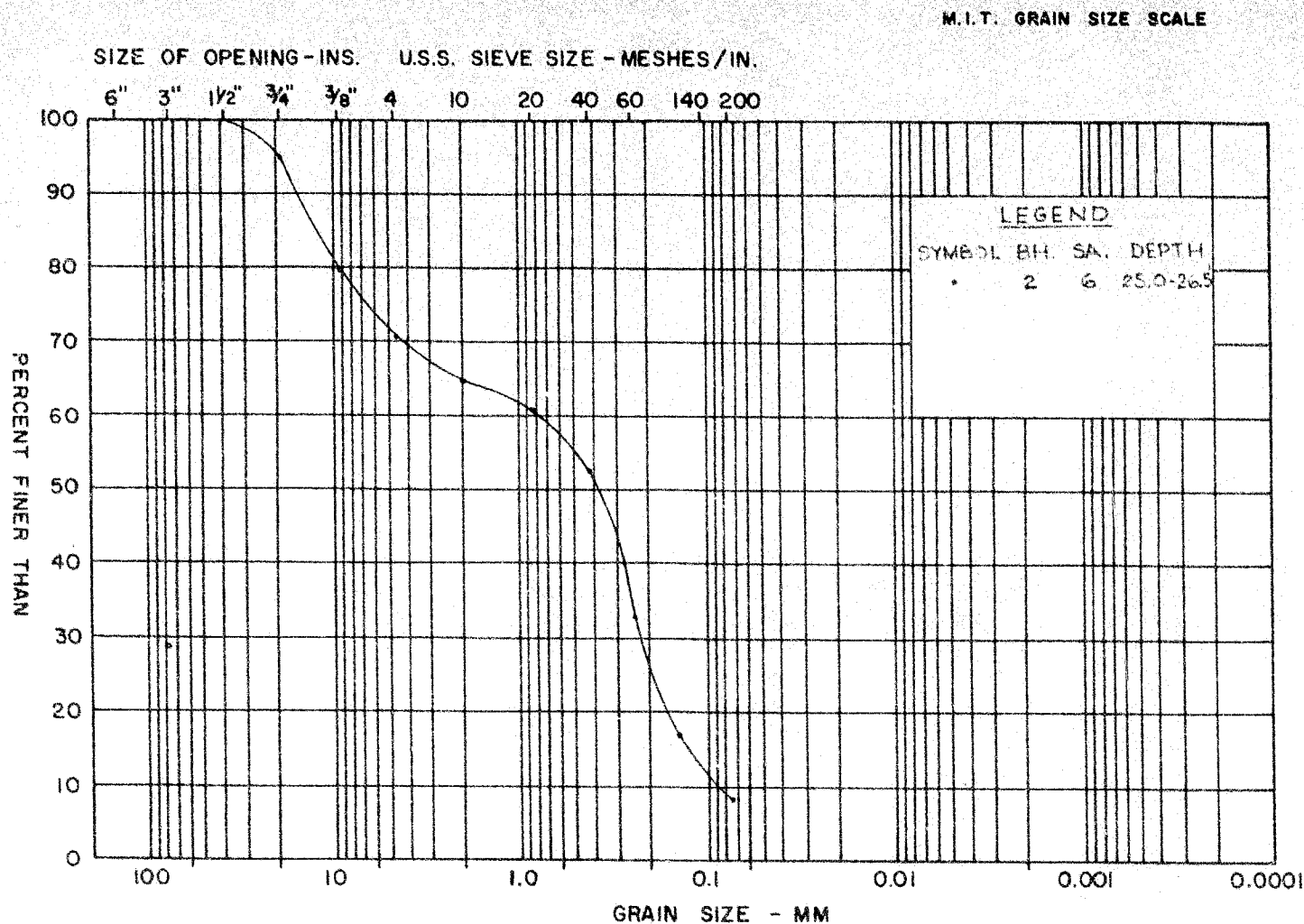
30 m 11-172

GEORES No.

SOIL STRATIGRAPHY

- HETEROGENEOUS FILL RANGING IN COMPOSITION FROM SAND TO FIRM TO STIFF SILTY CLAY
- LOOSE TO COMPACT BROWN TO GREYISH BROWN SILTY SAND, SOME GRAVEL, WOOD FRAGMENTS IN WASH WATER
- COMPACT TO VERY DENSE BROWN TO BROWNISH GREY FINE TO MEDIUM SAND, TRACE TO SOME SILT, OCCASIONAL PEBBLES
- DENSE TO VERY DENSE GREY LAYERED SILT AND SILTY FINE SAND, SOME CLAYEY LAYERS

REFERENCE		MORRISON, HERSHFIELD, MILLMAN & HUGGINS LTD. TORONTO, ONTARIO	GOLDER & ASSOCIATES CONSULTING CIVIL ENGINEERS TORONTO, ONTARIO
CHG. NO.	DESCRIPTION		
PLAN AND PROFILE OF PHARMACY AVENUE - TOWNSHIP OF SCARBOROUGH, ROAD DEPARTMENT, SEPT. 1955	PROPOSED PHARMACY AVE BRIDGE SCARBOROUGH	BORING PLAN & SOIL STRATIGRAPHY	DATE OCT. 6, 1961 SCALE AS SHOWN
MADE P.C.	CHKD. M.B.	APPD. P.B.	FIGURE 1



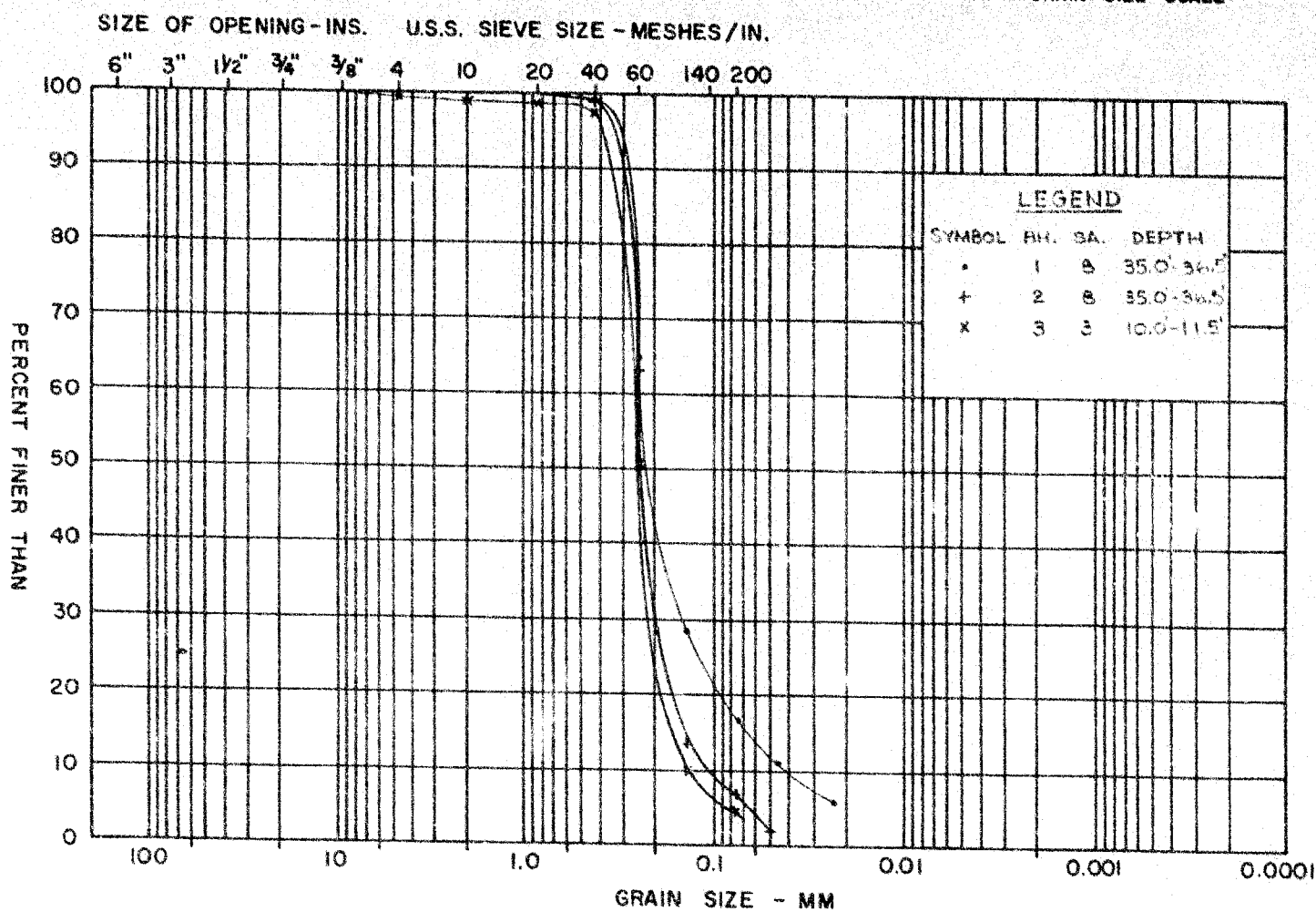
COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED	

GRAIN SIZE DISTRIBUTION
SAND, SOME GRAVEL

FIGURE 2

GOLDER & ASSOCIATES

M.I.T. GRAIN SIZE SCALE



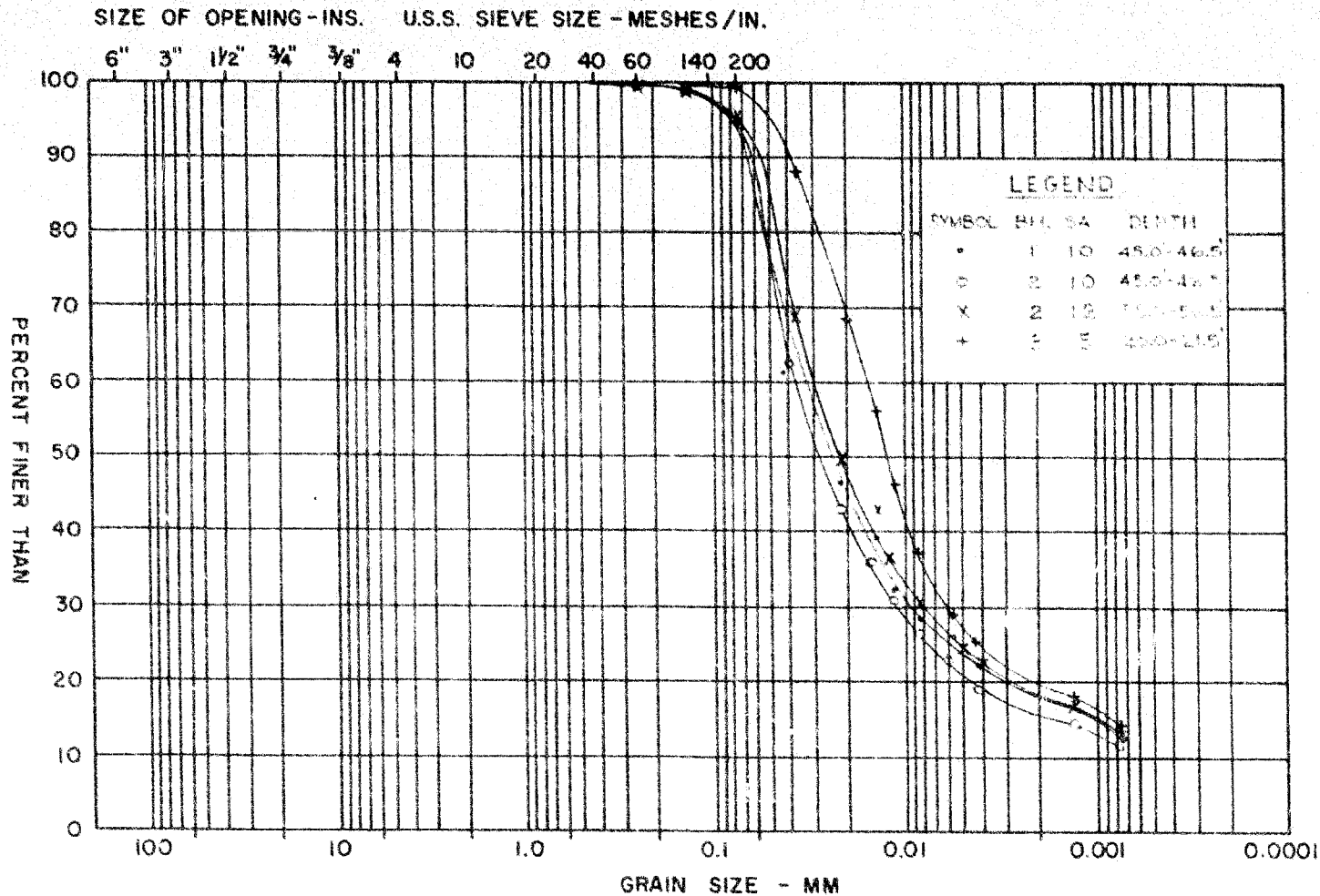
GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION
FINE TO MEDIUM SAND

FIGURE 3

COBBLE SIZE	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE		CLAY SIZE
	GRAVEL SIZE			SAND SIZE			FINE GRAINED		

M.I.T. GRAIN SIZE SCALE



GOLDER & ASSOCIATES

GRAIN SIZE DISTRIBUTION
LAYERED SILT AND SILTY FINE SAND

FIGURE 4