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W.P. No. 54-82-06

CONT. No.

W. O. No.

STR. SITE No. 24-484

HWY. No. 401

LOCATION HWY 401, 410 & 10 INTERCHANGE (BRIDGE #69)

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

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FOUNDATION INVESTIGATION REPORT
BASKETWEAVE, STRUCTURE #69
HIGHWAY 401/410/10 INTERCHANGE

W.P. 54-82-06 SITE 24 - 484

DISTRICT 6 TORONTO

01/83.310 AUGUST, 1983

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1.0 INTRODUCTION

Morton & Partners Limited has been retained by the Ministry of Transportation and Communications of the Province of Ontario to carry out a foundation investigation at the site of a proposed westbound basket-weave, Structure #69 at Site 24-484, W.P. 54-82-06, on the north side of Highway 401, between Highways 410 and 10. This location lies in the City of Mississauga, Municipal Region of Peel, Ontario.

This report summarizes the results of this investigation. Sections 2 to 5 inclusive provide factual information. Section 6 is interpretive and contains recommendations for foundation treatment based on the conceptual and preliminary design information provided in Plan E, Plan B-81-401-6 and supporting documentation. The planned structure comprises a concrete tunnel with offset wing walls combined with two long approach fills. The tunnel structure will be partly in cut.

2.0 SITE

The site is located on the north side of the present westbound lanes of Highway 401, close to the east end of the approach ramps to Highway 10. Title to the land is presently held by Pinetree Development Company Limited, 75 Ingram Drive, Toronto, Ontario, who were contacted for permission of access. The northwest corner of the site abuts onto the existing M.T.C. Maintenance Yard which is located on the east side of Highway 10, immediately north of the westbound to northbound exit ramp that extends off Highway 401 onto Highway 10. The land ranges from being densely wooded with mature trees to open degenerative farmland; however, some dense to light brush cover exists in some areas.

3.0 PHYSIOGRAPHY AND GEOLOGY

The proposed structure and associated major highway interchange is located on the height of land that forms the watershed between the Humber and Credit River valleys. The shallow, broad valleys that exist eastward and westward from the site are identified as those of the Little Etobicoke Creek and Cooksville Creek respectively. The overall trend of the height of land is approximately northwest to southeast, across Highway 401.

The west half of the site is relatively flat to slightly depressional at about Geodetic Elevation 192.5 m to 193.0 m and exhibits seasonal ponding of water. A low, gentle rise of ground at the east end of the intended wingwall and tunnel structure forms the line of the watershed, up to about Elevation 195.3 m at a point located southward from Borehole 6.

The general physiographic region in which the site area is located is known as the Peel Clay Plain. The plain is of glacial origin and was formed during the late stages of Wisconsin Glacial Ice retreat some 12,500 to 15,000 years ago, by deposition of glacial or pro-glacial sediments within a series of ephemeral pondings that occurred between the waning ice remnant in the Lake Ontario Basin and the higher land of the Oak Ridges and Niagara Escarpment to the north and west respectively. Post-depositional reworking of the uppermost contact of the glacial sediments (the tills) by the lake water of these pondings created a modified till layer, which was followed by deposition of lacustrine clays and silts. In several areas of higher ground, the till that originally blanketed bedrock was removed by wave erosion at the margin of the lake pondings. Bedrock exposed thereby has since been subjected to normal weathering and seasonal volume change, to create pockets of residual soil. All these features are evident at this site.

Bedrock in the vicinity of the site comprises an uppermost series of deep red shales and soft mudstones of the Queenston Formation, overlying the transitional contact beds with an underlying sequence of variegated green, grey and reddish shales of the Meaford Unit of the Meaford-Dundas Formation. Both formations are of Paleozoic age. The

3.0 PHYSIOGRAPHY AND GEOLOGY (Continued)

rocks are known to possess high levels of residual (lateral) stress. Bedding is near-horizontal, with a gentle southwestward regional dip of about 1^{o}.

Due to the existence of highly imbalanced regional lateral stresses in the bedrock of the area, the upper layers of rock tend to be frequently buckled or fractured. This results in elongated, confined zones of broken (rubbled) rock which trend approximately WNW to ESE regionally at intervals of 200 to 600 m. Such upward buckling, rubbling and bedding plane separation tends to accelerate weathering, and discrete areas of resultant clayey rock or gouge are known to exist.

The very varied lithology and repetitive interlayering of the rock, often combined with varying absence or presence of an impervious "cap" of clay till, has also resulted in varied degrees of weathering in the rock mass. This produces a condition of construction difficulty, wherein layers of sounder rock pass repeatedly downwards into soft, weathered broken rock, or give way to clayey fissures or clay-filled bedding plane partings. Variation in the degree of weathering that is associated with stress release phenomena create similar rapid lateral changes in rock quality.

The contact level and character of bedrock revealed in the boreholes at the site conforms very closely with the general information discussed foregoing and with the published information contained in such documents as Ontario Geological Survey Maps 2226 (Physiography of Southern Ontario) and 2333 (Paleozoic Geology of Brampton Sheet).

Seismic risk along the north fringe of the Lake Ontario-Lake Erie Trend is noted in Federal Department of Mines publications as Level 1. No seismically sensitive soils exist at the site, therefore seismic constraints or possible damage to the intended structure is to be considered remote and can be disregarded.

4.0 FIELD WORK

The field work for this investigation was carried out during the period of August 3rd to 31st, 1983 inclusive and consisted of nine detailed boreholes and four cone tests at the locations shown on the attached drawing. Prior to drilling the boreholes some tree felling and brushing had to be carried out during this study, to allow survey layout and drill equipment access. Authority for access and for tree or brush clearing was obtained prior to entry onto the land from Pine-tree Development Company Limited, 75 Ingram Drive, Toronto. Site layout surveying of the boreholes and cone tests was done by Morton & Partners Limited crew prior to control line layout by M.T.C. Survey Party*.

The initial seven boreholes were advanced through overburden and into bedrock with a power auger using solid stem or hollow stem augers. NXL size core drilling of bedrock was carried out in four selected holes so as to establish the overall quality of the rock. Two additional hand auger holes in which several in situ 50.8 mm diameter vane tests were completed, were put down alongside cone test holes 8 and 9 within the upper stratum of stiff clay.

Samples were taken during augering using a split spoon driven by the Standard Penetration Test (SPT) method. Bedrock was core drilled using an NXL core barrel. All samples were shipped to our laboratory for further examination and testing. Samples remaining after testing will normally be stored for a period of three months following the date of this report but will thereafter be discarded, unless instructions to the contrary are received.

Boreholes were left standing open wherever possible to determine the groundwater level.

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* This work had to be done twice as all original stakes were removed by parties unknown, between initial layout and start of drilling

Elevations referred to in this report are metric and relate to two temporary benchmarks supplied by M.T.C. Survey Crew. These bench marks are identified as follows:

a. S.E. Bolt on East side of base overhead sign on Highway 401 westbound, approaching Highway 10 off ramp; El 196.523

b. South Door sill (metal) in East face of M.T.C. brick garage building at Highways 10 and 401; EL 195.113.

As advised by the Survey Crew, ground levels were run from Bench Mark 'a' and closed out to Bench Mark 'b'.

A summary of the survey data for borehole locations and elevations is given in Table 1.

5.0 SOIL CONDITIONS

The soil strata and the range of elevations between which they occur at the borehole locations are listed following:

SOIL TYPE	THICKNESS, m	APPROXIMATE RANGE OF EL, m
TOPSOIL	0.10 → 0.30	193.0 - 194.0
SILTY CLAY (Peel Ponding Sediment)	0 → 1.56	191.0 - 193.0
SILTY CLAY (Modified Till)	0 → 0.75	190.25 - 191.5
V. SILTY CLAY WITH SAND (TILL)	0 → 2.18	189.75 - 193.6
RESIDUAL SOIL (intensely weathered red shale)	0 → 1.0	193.0 - 194.0
BEDROCK (variably weathered to sound, red to grey)		upper contact level at 193.0 to 189.75

TABLE 1

B/H No.	GROUND ELEVATION	M.T.C. SUGGESTED FOOTING LEVEL	COORDINATES NORTH	COORDINATES EAST	DEPTH	ELEVATION OF BOTTOM OF HOLE
Core Hole 1	192.75	191.1	4832 504	290 684	5.83	186.92
Auger Hole 2	192.70	open	4832 512	290 727	6.19	186.51
Core Hole 3	192.77	open	4832 550	290 743	6.87	185.90
Auger Hole 4	192.86	open	4832 550	290 780	4.68	188.18
Core Hole 5	192.98	open	4832 585	290 798	6.46	186.52
Auger Hole 6	193.51	190.7	4832 582	290 840	6.18	187.33
Core Hole 7	193.78	190.7	4832 596	290 869	7.92	185.86
Cone Test 8	192.67	191.1	4832 529	290 715	2.73	189.94
Cone Test 9	192.78	open	4832 532	290 754	2.63	190.15
Cone Test 10	192.84	open	4832 568	290 770	2.44	190.40
Cone Test 11	193.01	190.7	4832 566	290 809	2.35	190.66

Detailed description of soil conditions, soil stratigraphy and extent, groundwater levels and the results of laboratory testing are given in the attached "RECORD OF BOREHOLE" drawings. An estimated stratigraphical profile along centreline of the proposed westbound collector structure is given in the appended Site Plan and Profile, Drawing 01/83.310 - 1. This latter drawing has been derived from Site Plan E.

The various dominant soil units are briefly summarized in the following paragraphs.

5.1 Topsoil

A surficial layer of organic-rich mineral soil was intersected in each borehole. Thickness of definable A and B horizons ranged from 0.10 m at Borehole 6 to 0.30 m at Borehole 2. The organic content and moisture content varied significantly between conditions in the flat ground versus the conditions in the low rise at the east end of the site; ie the topsoil at Boreholes 1, 2 and 3 and Cone Holes 8 and 9 is significantly thicker, wetter and richer in organics than at any of the other test locations. The particulate mineral soil comprises clay and silt.

5.2 Silty Clay with trace Sand

A layer of mottled, variegated and variably silty clay was recorded beneath the topsoil at Borehole, Corehole or Cone Test Numbers 1, 2, 3, 8/8A and 9/9A. The area is flat to slightly depressional and forms the west half of the site. The clay is visibly sandy and silty and is identified as having been formed by deposition within a late or post-glacial body of water believed to comprise one of the so-called Peel Pondings. A vague till texturing is apparent at the fringe of the stratum and near the base, where the change to underlying glacial till is largely transitional by textural modification. The soil is moist, fissured in part, contains root fibres and is generally of stiff consistency as determined by in situ vane shear tests and SPT or CPT penetration resistance values and by Torvane tests done in the laboratory on several carefully wrapped and transported SPT samples.

The clay contains no evidence of stone or gravel content, see Figure 11a. Plasticity as determined by Atterberg Limits tests ranges from I_p = 11 to 32, while Liquid Limit values range from L_L = 31 to 57 (see Figure 12 and relevant Borehole Logs).

5.3 Silty Clay with trace to Some Sand (Modified Glacial Till)

A thin layer (wedge) of silty clay till exists beneath the foregoing lacustrine clay stratum at Boreholes 2 and 3 and possibly Cone Holes 8/8A, 9/9A and 10. The upper contact is transitional, through glacial lake water surface or wave action and is characterized by a mottled greenish yellow-brown to grey coloration. The stratum is further characterized by its sandy to silty nature and the presence of scattered fine gravel sizes. Consistency has been determined as very stiff based on in situ vane strength tests (the vane could only be partially penetrated by hand into the base of the borehole) and by SPT and CPT penetration resistance values.

5.4 Very Silty Clay with Sand, trace Gravel (Glacial Till)

This overburden unit is the most extensive stratum of overburden soil present at the site and it was intersected in all but Boreholes 7 and Hand Auger Holes 8A and 9A (which were too shallow to penetrate to the upper contact). Cone Tests 8, 9, 10 and 11 appear to have penetrated into the layer and possibly through it to the underlying hard bedrock "caprock". It was found to be in a dense to very dense state, at least as recorded by the SPT and Dynamic Cone Test penetration values. More clayey portions are to be regarded as very stiff to hard. Grain size analyses as plotted in Figure 11c show the material to be of very heterogenous grade including gravel and clay-sized particulate mineral soil along with the predominant silt and sand sizes. The soil varies from being entirely non-plastic to a low plasticity clay, see Figure 12. Auger response during drilling indicates that small stones or cobbles to medium-sized boulders exist at random within the material. A reddish shale content is also evident near the base of the layer, at least in some of the boreholes. Indeed, the basal till

material appears to be interlayered with broken beds of hard bedrock at some points, over a vertical distance of a few cm to 0.5 m.

At Borehole 7 a thin remnant of the stratum may be present only, due to late glacial erosion. Positive identification of the layer has not been made, however, and material recovered during sampling is classified more precisely as being that of a residual accumulation of weathered, fragmented shale bedrock.

The glacial till stratum, where present, appears to form a semi-pervious "cap" to the underlying fissured and broken bedrock.

5.5 Bedrock

Bedrock was augered and sampled using the SPT method in all seven boreholes and was core drilled in Boreholes 1, 3, 5 and 7. Core drilling was done using an NXL sized core barrel with water as the drilling fluid.

At higher levels the rock is identified lithologically as a deep red mudstone-shale, with intermittent beds (or zones) of greenish grey colouration that appear to be associated with a slightly coarser mudstone grainsize. The shale and mudstone is variously present in a highly weathered to fairly sound condition, with sound and weak layers tending to alternate in a random manner up and down the sequence. Rarely, a hard, grey bed of siltstone, sandstone or limestone was intersected, usually associated at its base with an intensely weathered shale zone or clay parting. This rock is tentatively identified as belonging to the Queenston Shale Formation.

At lower levels the rock becomes distinctly more varied lithologically and contains a more frequent incidence of hard beds of grey limestone, sandstone or siltstone. The shale and mudstones still make up more than 50 per cent of the sequence, however, as well as being often present in a moderately to severely weathered condition. This lower sequence of beds may form the lowest transitional zone

of the Queenston Formation or, more likely, the uppermost contact zone of the underlying, older Meaford-Dundas Formation.

In several of the holes the rock was found to be quite severely fractured and in all the core drill holes a "zero" RQD was recorded. Core recoveries recorded for each run ranged from a low of 15 per cent to a high of 89 per cent. In most instances a heavy red wash was returned up the casing to surface, confirming the overall poor quality of the bedrock. Zones of probable clayey shale gouge (or "rubbled rock") were noted wherein no core was recovered or the augers penetrated readily. Variable weathering of the rock persisted down to the maximum 7.9 m depth that was penetrated.

It was found to be characteristic in several of the boreholes that the first contact with bedrock at the base of the silt/sand till comprised a hard bed (or several beds) of sandstone, siltstone or limestone.

6.0 GROUNDWATER

During drilling and augering, free water was encountered as cleft water in the bedrock. Such water was normally recorded to be entering the borehole only after considerable depth had been obtained and after the clayey upper zones of more severely weathered shale rock had been penetrated. In most cases, water was slow to enter the boreholes and continued to rise after 2 to 4 days. A quasi-stable position appeared to have been reached on September 6th, 1983 in Boreholes 1, 2 and 7, which is interpreted as reflecting the current position of the general groundwater table. Subsequent readings in all holes on September 16th, 1983 showed water at ground surface due to protracted heavy rainfall.

Temporary and longer term (possibly stable) water levels, as measured at the site prior to a period of heavy rain are given in the individual Record of Borehole drawings. For ease of reference they are summarized in Table 2 below.

WATER LEVEL DATA

		FIRST RECORD			END OF FIELDWORK			FINAL RECORD Sept. 6th 1983	
		Depth	Elevation	Date	Depth	Elevation	Date	Depth	Elevation
Core Drill Hole	1	3.08	189.67	Aug. 29				0.5	192.25
Auger Hole	2	5.30	187.40	Aug. 29				0.4	192.30
Core Drill Hole	3	3.45	189.32	Aug. 27				2.2	190.57
Auger Hole	4	2.41	190.45	Aug. 26				1.50	191.36
Core Drill Hole	5/5A	3.36	189.62	Aug. 26	2.60	190.38	Aug. 29	2.30	190.68
Auger Hole	6	3.06	190.45	Aug. 26				2.30	191.21
Core Drill Hole	7/7A	3.45	190.33	Aug. 26				1.30	192.48

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 General

The project forms part of the ongoing development of the complex highway interchange links that are to exist between Highways 401, 403 410 and 10.

The proposed basketweave will involve the westbound collector lanes of Highway 401 and the Exit Ramp to Highway 10 for north- or southbound transfer traffic. The structure is to comprise a constructed tunnel of about 150 m length which will carry the westbound 401 Collector Lanes beneath the E → NS Ramp. Two wing walls of graded height will be required, one at each end of the tunnel, to confine the E → NS Ramp embankment. The maximum height of envisaged wall is approximately 8 m. At this time each wall is being considered as a rigid reinforced concrete structure, though the possibility of constructing the walls of reinforced (improved) earth is still open.

Approximately 2 m of cut to finished pavement grade from present ground surface will be involved at the eastern approach to the tunnel.

7.2 Structural Foundations

Footings for the proposed two retaining walls and tunnel structures must be provided with not less than 1.2 m of earth cover, for frost protection. At Boreholes 4, 5, 6 and 7 this level will coincide approximately with the groundwater table and the footing beds tentatively suggested by M.T.C. plans and sections will be in bedrock shale. Westward from an oblique line drawn 10 m or thereabouts west from Borehole 4 to the same relative distance west from Borehole 5, the tunnel and west retaining wall footings at currently indicated design grades will rest variously on very dense silt and sand till, very stiff silty clay till and somewhat less stiff modified silty clay till or lacustrine silty clay deposit. The suggested foundation grades (M.T.C.) range from El 191.15 for the west retaining wall to El 190.75 for the easterly retaining wall.

For uniformity in load capacity design and foundation response it is recommended that the foundation level for the west end of the tunnel and the west retaining wall be lowered by the apparently requisite 0.45 m or less to bring the footing to bear directly on very stiff or dense clayey silt (glacial till) at elevations which range from about El 190.5 at Cone Test/Auger Hole 8/8A to the ground surface at points located eastward from the line of Borehole 4 to Cone Test 10.

Providing that the foregoing measures are taken and anticipated conditions prevail it is recommended that a bearing pressure of 600 kPa be used as the factored bearing capacity for the ultimate limits states (ULS) design.

The bearing capacity at Serviceability Limit States (SLS) Type II for the foundations in bedrock or hard or dense tills (ie unyielding) will normally be greater than the factored capacity at ULS and, in our opinion, for foundation elevations recommended earlier the design of the foundation will not be governed by settlement. A design value of 300 kPa is suggested.

The above recommendations allow for the possible presence of clay seams or partings and sizable zones of broken or rubbled zones of rock in the bedrock foundation area located east of about Boreholes 10 and 4, as well as reflecting the stiff to very stiff state of the silty clay till at Boreholes 2 and 3. Higher bearing capacities could be available, but would require detailed large size test drilling of the bedrock* and would require lowering of the footings through the clay till to the underlying very dense clayey to only slightly cohesive silt and sand till.

Settlement of the footings founded as noted, using the recommended bearing pressure, is estimated to be small and should be less than the 25 mm guidelines specified by the Ontario Highway Bridge Design Code.

7.3 Foundation Excavation

As noted, the groundwater level recorded some 5 days after the time of the investigation lay close to or a short depth below ground level, at least prior to a period of intense rainfall. After heavy rain, the flat to slightly depressional wooded area forming the west half of the site became flooded. Nevertheless, no particularly critical dewatering problem should exist for foundation construction providing that the requisite grade cut extending eastward from the structure is completed initially. Such initial cut-through to roadway subgrade level will thereby provide for both drainage of the cleft water in the bedrock and any surface ponding on the flat western part of the construction area.

The two glacial till layers and the clayey lacustrine sediment stratum appear to be sufficiently impervious to yield only nominal seepage into any excavation. Minor pockets of more pervious water-bearing non-cohesive silt or sand in the basal till unit are not

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* To identify, categorize and quantify the clay seams and broken rock (rubbled) zones.

expected to yield any significant (let alone sustained) seepage inflow. Most seepage will be from the broken bedrock.

Margins of excavations, where in excess of 1.20 m height, must be cut back or supported by shoring to comply with regulatory requirements. A dressed-back slope of 55 degress in the silty lacustrine clay, clay or sand tills or fractured bedrock should be adequate for the short-term duration of construction.

7.4 Embankments

The height of the approach embankments will be of the order of 5 m to 7 m above present ground level. On the assumption that the subsurface conditions encountered to the southeast of the proposed tunnel and retaining wall structure during this investigation prevail, the approximately 5 m high east approach embankment and foundation should be stable under the standard 2 horizontal to 1 vertical side slope planned.

Some minor consolidation settlement of the toe must be anticipated in the vicinity of Cone Test 9, however, where a 2 m thick (or greater) layer of stiff silty clay exists. In situ vane tests in the layer have yielded values of shear strength of as low as 50 KPa. Since the area and depth of softer clay that will underlie the east approach fill toe is fairly restricted, we recommend that it should be dug out and replaced with appropriate compacted granular fill. The fill slope can thereby be retained at the anticipated 2 horizontal to 1 vertical conditions and possible consolidation problems eliminated.

In contrast to the foregoing, the embankment that is to extend westward from the basketweave tunnel will be supported at it base on a more extensive area of the same stiff clay. This foundation layer extends to a depth of 2.1 m at Cone Test 8. The general properties of the stratum of clay* in the fill foundation area indicated that

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* N values during SPT Sampling and Dynamic Cone Penetration Testing, plus water content, Atterberg Limits density tests, field vane tests and field and laboratory Torvane shear strength tests.

adequate strength to support the approximate 7 m fill is available. Some settlement will occur through consolidation of the clay, however, and it is recommended that appropriate measures be taken in designing the road surfacing where the overpass lanes come off the rigid tunnel structure onto the embankment fill. Negative loading on the outer face of the tunnel wall will also occur through such consolidation of the fill foundation stratum. The major portion of any such negative adhesion load may be eliminated if a slight reverse batter is built in to the plane of the wall surface.

An alternative possibility to reduce relative movement at pavement level along the line of junction between the fill and the tunnel is to excavate the clay stratum for some distance back from the line of the tunnel foundation. A minimum horizontal distance of 15 to 20 m is suggested. The lateral and outer margins of such subexcavation should be sloped to provide a transition in the overall amount of consolidation settlement.

8.0 CLOSURE

The project layout and field work supervision for this investigation was carried out by Mr. B. Ripley, B.Sc. (Geol) and Dr. K.C. Lau, PhD., using equipment owned, operated or leased by Morton & Partners Limited. Laboratory tests and basic analysis of soil parameters were performed by Dr. Lau. Assistance was provided by Mr. Paul Welch, C.E.T. The analysis and this report were prepared by Mr. D. Peter Hegler, MASc., P.Eng. and Mr. J.D. Morton, M.Eng., P.Eng.

Respectfully submitted,

MORTON & PARTNERS LIMITED

John D. Morton, M.Eng., P.Eng.
Principal

JDM/sf

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 1

METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832504 North, 290684 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger + NXL Core; Vertical COMPILED BY
DATUM Geodetic DATE August 26th - 29th, 1983 CHECKED BY JDM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.75	Ground Surface										
0.0 / 192.49	TOPSOIL		1	BULK	-						
0.26	SILTY CLAY, trace sand, mottled yellowish-grey, stiff, fissured and seamed, root fibres					▼ Sep.6	0.50				
			2	SS	10		192			19.8	0 8 65 27
190.92	V. SILTY CLAY		3	SS	44		191			20.0	0 16 50 32
1.83	SILT WITH SAND, trace gravel, well graded, very dense, reddish grey to red-brown (GLACIAL TILL)		4	SS	70					22.1	11 31 38 20
189.83	transitional boundary						190				
2.92	SHALE: very weathered (shaley clay) to less weathered with depth; mixed red to green-grey colour; fissured, layered, wet. Clay seams to 1.5 mm thick exist between sounder rock layers throughout.		5	SS	100/70mm	▽ Aug.29	3.08			22.4	
							189				
			6	SS	110/165mm						
			7	NX	% Recov. 78		188				
186.92							187				
5.83	END OF BOREHOLE										
							186				

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 2 METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832512 North, 290727 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger; Vertical COMPILED BY
DATUM Geodetic DATE August 26th - 30th, 1983 CHECKED BY JDM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 20 30 40	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
192.70	Ground Surface										
0.0 / 192.40	TOPSOIL		1	BULK	-						
0.30	SILTY CLAY, trace sand; mottled grey-green and lt. brown; stiff, fissured; root fibres					▼ Sep.6	0.40				
							192				
			2	SS	11				58%		0 0 53 47
190.84			3	SS	15		191			20.3	0 7 48 45
1.86	SILTY CLAY, trace sand and gravel, very stiff, mottled grey-brown										
190.25	(MODIFIED TILL)										
2.45	SILT WITH SAND, trace clay only, trace gravel; very dense, mottled		4	SS	53				○	21.4	
189.73	(GLACIAL TILL)						190				
2.97	BEDROCK: v. weathered shaley clay to less weathered shale with bands of sound siltstone, sandstone or limestone;		5	SS	100/60mm				○	24..	
	2 to 25 mm thick clay seams evident within sounder rock sequence, associated with base of many harder beds;						189				
	close-spaced bedding; very poor to fair rock quality (RQD = 0) strength variably soily to very high;		6	SS	100/8mm		188				
	slight cleft water evident below zone of more intense weathering					▽ Aug.29	5.30				
							187				
186.51			7	SS	100/0mm						
6.19	END OF BOREHOLE						186				

$_{+}{}^{3}$, $_{\times}{}^{5}$: Numbers refer to Sensitivity

15 20 5 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 3 METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832512 North, 290743 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger + NXL Corehole; Vertical COMPILED BY JDM
DATUM Geodetic DATE August 26th - 29th, 1983 CHECKED BY JDM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 20 30 40	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.77	Ground Surface										
192.63	TOPSOIL		1	BULK	-						
0.14	SILTY CLAY, trace sand, root fibres, stiff, mottled greenish grey and brown						192				
191.37			2	SS	14				53.7%	19.3	0 7 38 55
1.40	SILTY CLAY, some sand, trace gravel, very stiff, mottled grey-brown (MODIFIED TILL)		3	SS	26		191				
190.62											
2.15	SILT WITH SAND, some to trace clay, trace gravel, v. dense, mottled yellow-brown (GLACIAL TILL)		4	SS	54/25mm	Sep.6 2.20				22.1	7 33 44 16
190.11							190				
2.66	BEDROCK: v. weathered shaley clay to moderately sound shale with interbedded thin sound limestones, sandstones and siltstones; 2mm to 25 mm clay seams evident within sounder rock sequence. Close-spaced bedding to laminated; very poor to fair rock quality (RQD = 0). Strength variably soily to very high		5	NX	&Rec. 31						
			6	NX	68	Aug.27 3.45	189				
			7	NX	49		188				
			8	NX	76		187				
185.90							186				
6.87	END OF BOREHOLE										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 4 METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832550 North, 290780 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger; Vertical COMPILED BY JDM
DATUM Geodetic DATE August 26th - 30th, 1983 CHECKED BY JDM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT W_p / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 20 30 40	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.86	Ground Surface										
192.74	TOPSOIL		1	BULK	-						
0.12	V. SANDY CLAY WITH SILT V. Dense (hard), moist, mottled yellow-brown (GLACIAL TILL)		2	SS	26		192		○	20.4	
			3	SS	44	Sept.6 1.50	191		○	21.4	
190.56											
2.30	BEDROCK: very to slightly weathered red clay shale to shale, with greenish or grey thin interbeds of sound siltstone or limestone; close-spaced bedding oriented sub-horizontally; very poor to good rock quality; strength variably very low to very high. Minor cleft water evident below upper very weathered (clayey) zone		4	SS	73	Aug.26 2.41	190		○	21.1	
			5	SS	100/15mm		189				
188.18			6	SS	100/1mm						
4.68	END OF BOREHOLE						188				
							187				
							186				

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 5/5A

METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832585 North, 290798 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger + NXL Coring; Vertical COMPILED BY JDM
DATUM Geodetic DATE August 26th - 30th, 1983 CHECKED BY JDM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.98	Ground Surface										
192.86	TOPSOIL		1	BULK	-						
0.12	SANDY SILT, some to trace clay only, trace gravel; v. dense, light mottled yellow-brown (reddish at base), fissured										
	(GLACIAL TILL)		2	SS	127		192		8.9	21.6	5 27 48 20
191.52											
1.46	BEDROCK: v. weathered red shaley clay to slightly weathered shale with light greenish or mottled grey thin interbeds of limestone, siltstone or mudstone; sub-horizontal, closely spaced bedding to laminated; very poor to fair rock quality, with rock mass generally rubbled or broken (RQD = 0); strength varies from very low to very high depending on lithology. Some cleft water noted before start of core drilling.		3	SS	84		191			22.2	
			4	SS	100/140mm	Sep.6 2.30 Aug.29 2.60				21.7	
			5	SS	100/203mm	Aug.26 3.36	190			21.7	
			6	SS	100/20mm						
			7	NX	% Rec. 15		189				
			8	NX	15		188				
							187				
186.52											
6.46	END OF BOREHOLE										

FOOTNOTE: Unable to obtain proper drill water circulation in Borehole 5 (possibly loss of water into rubbled, fissured rock). Hole 5A reaugered 2m distant (NW) from initial test hole, and core drilled to requisite depth.

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 6

METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832582 North, 290840 East ORIGINATED BY

DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow Stem Auger, Vertical COMPILED BY JDM

DATUM Geodetic DATE August 26th, 1983 CHECKED BY JDM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
193.51	Ground Surface										
193.61	TOPSOIL										
0.10	SANDY SILT, trace gravel; variably some to trace clay; v. dense mottled light grey or brown, fissured						193				
	(GLACIAL TILL)		1	SS	72				○	21.5	
192.11							192				
1.40	BEDROCK: dark red very weathered shaley clay to slightly weathered laminated shale or soft mudstone with thin interbeds of grey, sound siltstone or limestone; rock variously very low to very high strength and soundness depending on lithology; sub-horizontally bedded at close spacing;		2	SS	56				○	21.5	
						▼	Sep.6 2.30				
			3	SS	86		191		○	22.2	
						▽	Aug.26 3.06				
	RQD = 0.		4	SS	100/62mm				○8.8	22.7	
	Some cleft water noted below upper zone of more intensely weathered, clayey shale						190				
							189				
			5	SS	100/114mm				○9.4	22.3	
							188				
187.33			6	SS	100/76mm						
6.18	END OF BOREHOLE										

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

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Ontario

RECORD OF BOREHOLE No 7/7A

METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832596 North, 290869 East ORIGINATED BY

DIST 6(TOR) HWY 401 BOREHOLE TYPE Hollow & Solid Stem Augers + NXL Corehole; Vertical COMPILED BY JDM

DATUM Geodetic DATE August 26th - 30th, 1983 CHECKED BY JDM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
193.78	Ground Surface										
193.62	TOPSOIL										
0.16	WEATHERED BEDROCK: (RESIDUAL SOIL) soily mottled red and grey shale or mudstone										
192.78	transition		1	SS	43		193		○	22.6	
1.00	BEDROCK: dark red or greenish grey very weathered clayey shale to sound shale, mudstone, siltstone or limestone; 2 to 25 mm clay seams present in sounder rock sequence.					Sep.6 1.30					
			2	SS	44		192		○	22.2	
	Rock of very poor to fair quality & rubbled (RQD = 0); strength variably soily to very high, depending on lithology and degree of weathering; subhorizontally bedded at close spacing to laminated.		3	SS	120/255mm				○ 9.7	22.6	
			4	SS	100/35mm		191				
	Cleft water evident before start of core drilling.					Aug.26 3.45					
			5	SS	100/76mm		190				
							189				
					% Core Rec.						
			6	NX	36		188				
	0.5 m core dropped from barrel on Pull #6, recovered by 0.15 m overdrilling in Run 6A.										
							187				
185.86			7	NX	89						
7.92	END OF BOREHOLE										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 8/8A METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832529 North, 290715 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Cone Test, with Hand Auger Hole for Insitu Vane Test COMPILED BY JDM
DATUM Geodetic DATE August 29th, 1983, September 16th, 1983 CHECKED BY JDM

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 50 100 150 200 250 (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 20 30 40	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.67	Ground Surface										
192.40	TOPSOIL										
0.27	SILTY CLAY, trace sand; stiff, fissured, mottled brown and grey, frequent root fibres						192				
191.0							191				
1.67	End of Auger Hole and Vane Tests										
189.96							190				
2.73	END OF CONE TEST										

RECORD OF BOREHOLE No 9/9A METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832532 North, 290754 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Cone Test, with Hand Auger Hole for Vane Tests alongside COMPILED BY JDM
DATUM Geodetic DATE August 29th, 1983, September 16th, 1983 CHECKED BY JDM

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa 50 100 150 200 250 (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL — WATER CONTENT (%) 20 30 40	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.78	Ground Surface										
192.5	TOPSOIL										
0.28	SILTY CLAY, trace sand; stiff, fissured, mottled brown and grey, frequent root fibres to 1.5 m depth						192				
191.11							191				
1.67	End of Auger Hole and Vane Tests										
190.15											
2.63	END OF CONE TEST										

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

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RECORD OF BOREHOLE No 10 — METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832568 North, 290770 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Cone Test COMPILED BY JDM
DATUM Geodetic DATE August 30th, 1983 CHECKED BY JDM

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, x LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L / WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
192.84	Ground Surface						192				
							191				
190.40											
2.44	END OF CONE TEST										

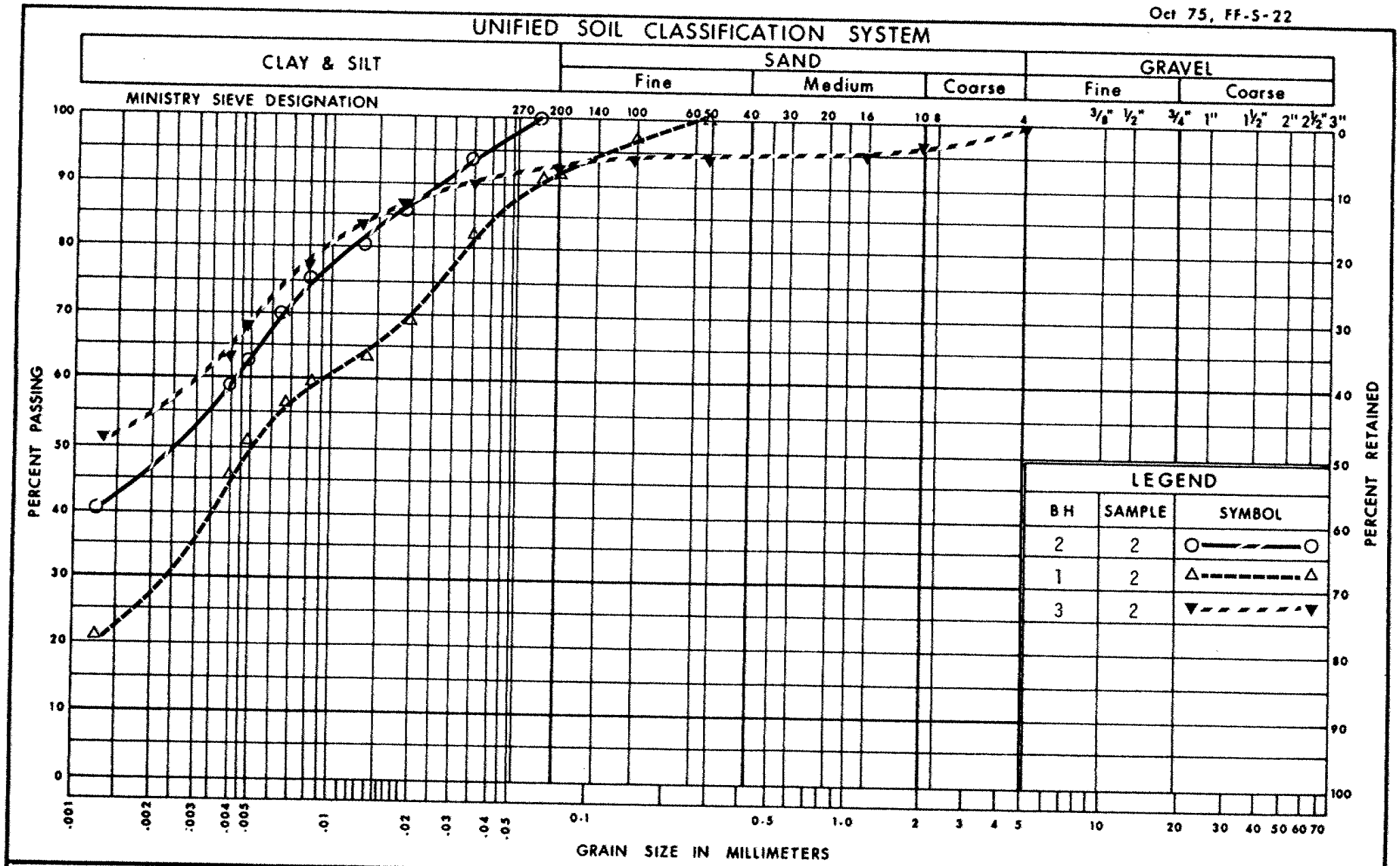
RECORD OF BOREHOLE No 11 — METRIC

W P 54-82-06 (Site 24-484) LOCATION 4832566 North, 290809 East ORIGINATED BY
DIST 6(TOR) HWY 401 BOREHOLE TYPE Cone Test COMPILED BY JDM
DATUM Geodetic DATE August 30th, 1983 CHECKED BY JDM

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, x LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L / WATER CONTENT (%) (20 30 40)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
193.00	Ground Surface						193				
							192				
							191				
190.65											
2.35	END OF CONE TEST										

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10



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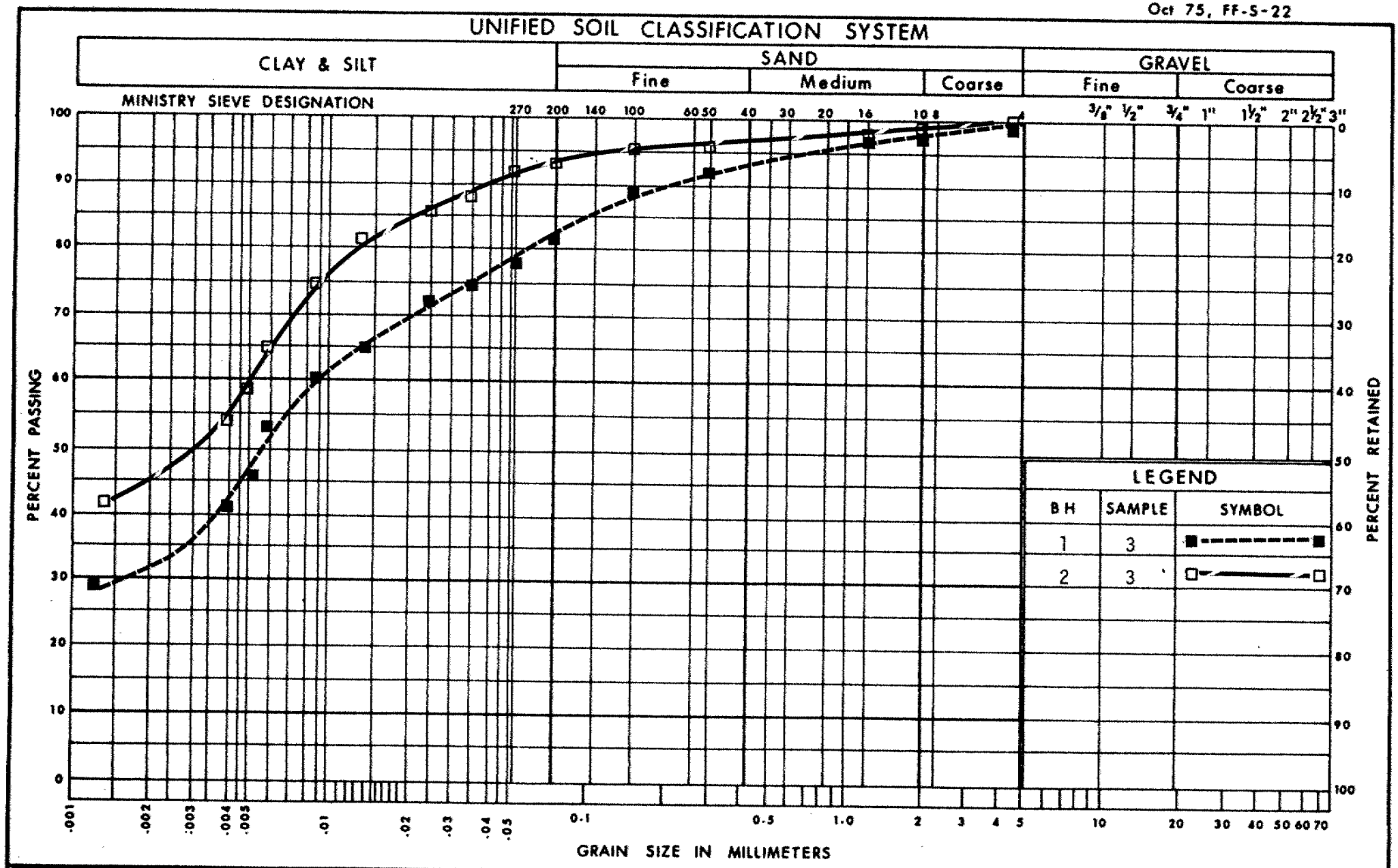
GRAIN SIZE DISTRIBUTION

Lacustrine Silty Clay Stratum, trace Sand in part only

FIG No 11(a)

W P 54-82-06

Site 24-484, District 6



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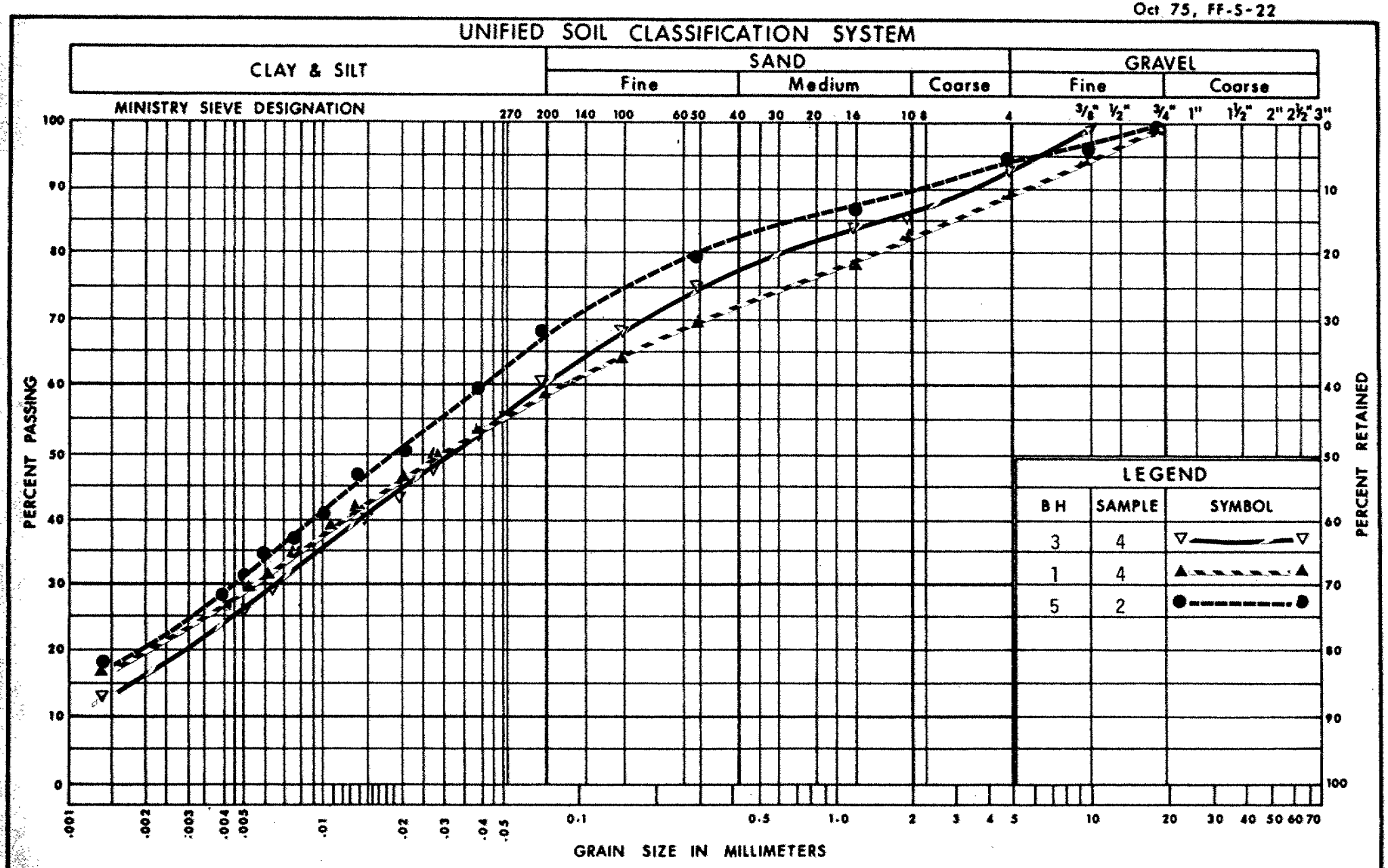
GRAIN SIZE DISTRIBUTION

Silty Clay with trace to some Sand (Modified Till Unit)

FIG No 11(b)

W P 54-82-06

Site 24-484, District 6



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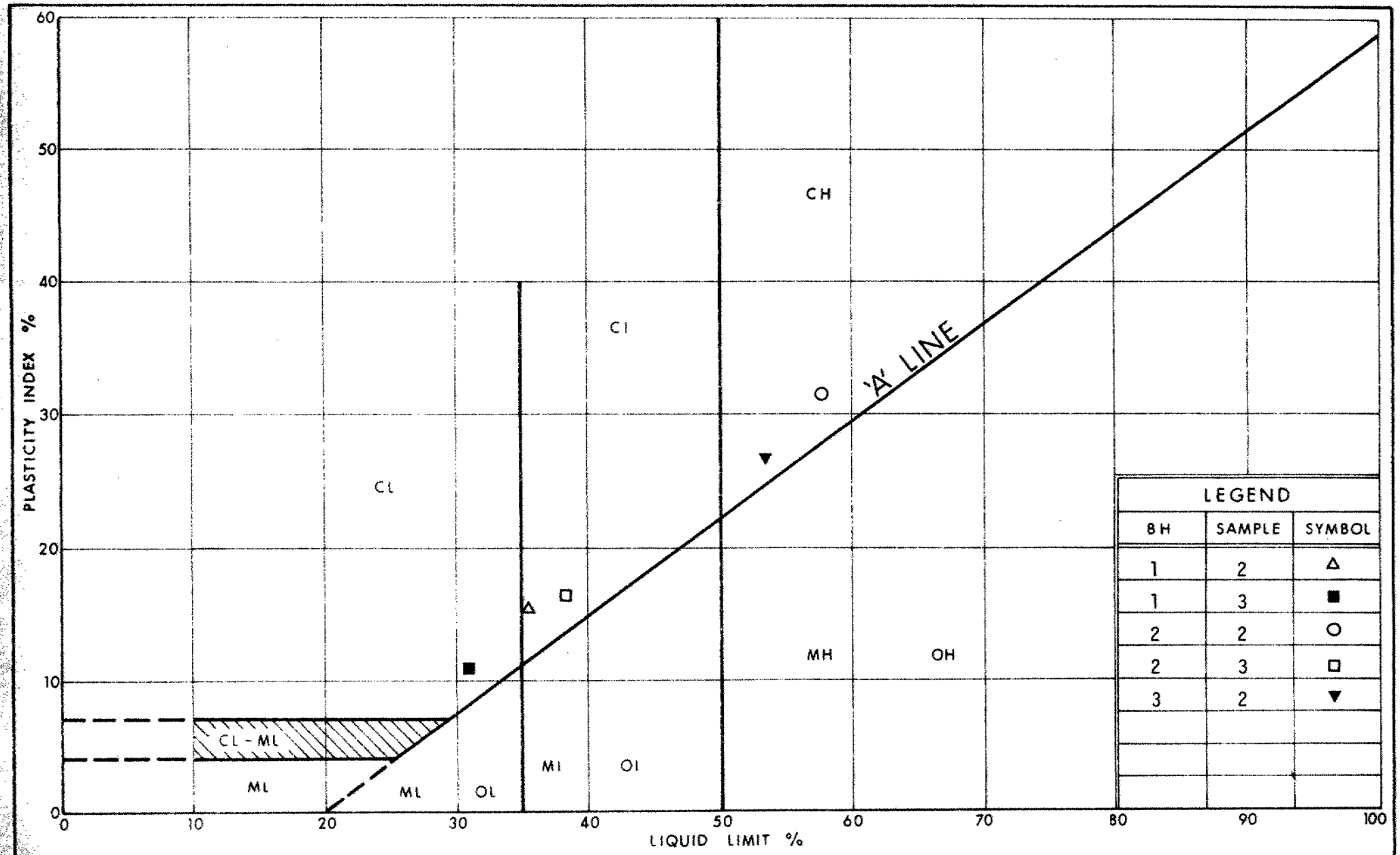
GRAIN SIZE DISTRIBUTION

V. Silty Clay with Sand to v. sandy clay with silt, trace Gravel
(Glacial Till Unit)

FIG No 11(c)

W P 54-82-06

Site 24-484, District 6



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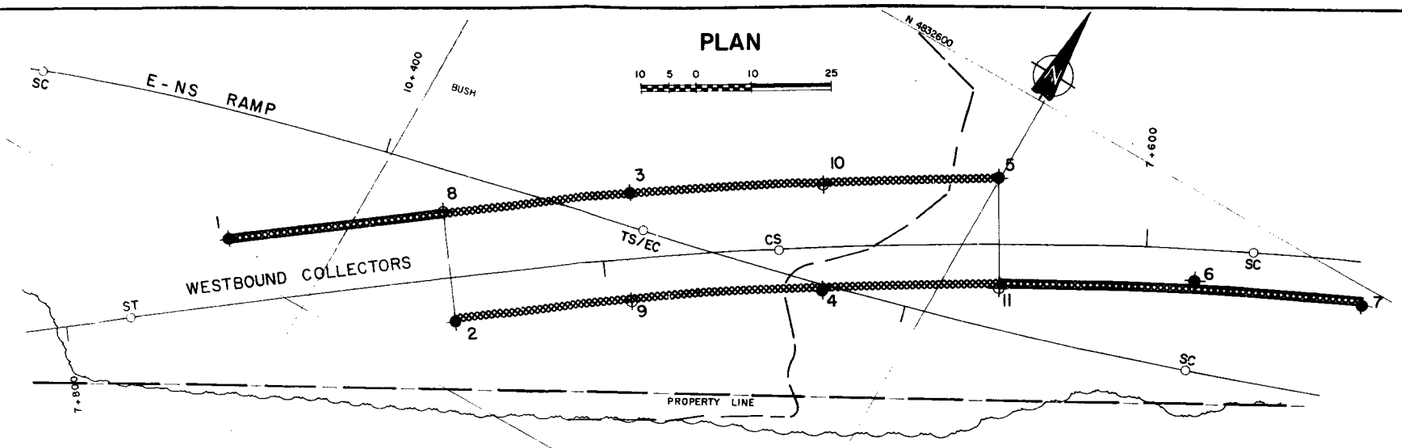
PLASTICITY CHART

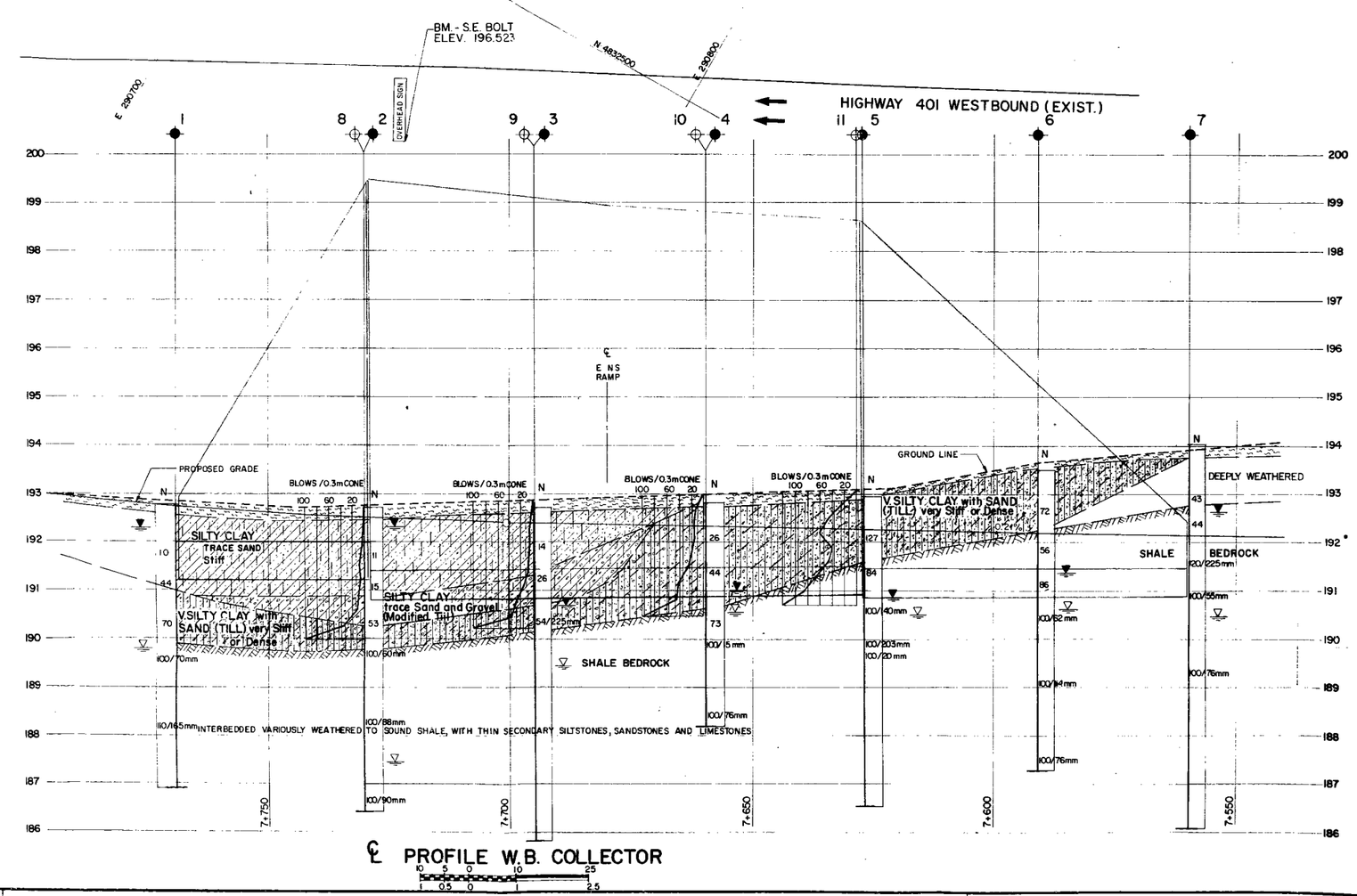
Sandy and/or Silty Clay, low to high plasticity

FIG No 12
W P 54-82-06
Site 24-484, District 6

OVERSIZE DRAWING(S)

PLAN





℄ PROFILE W.B. COLLECTOR

10 5 0 10 25
1 0.5 0 1 2.5

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN STATIONS IN KILOMETRES + METRES

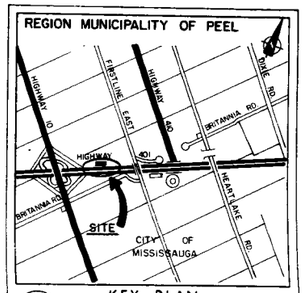
CONT No
WP No 54-82-06

STRUCTURE No.69 BASKETWEAVE
W.B. COLLECTORS / E-NS RAMP
BORE HOLE LOCATIONS & SOIL STRATA

N

SHEET

MORTON & PARTNERS LTD.



KEY PLAN
SCALE
1km 0.5 0 1 km

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L at time of investigation
- W.L after 5 days
- Retaining Wall Foundation
- Tunnel Wall Foundation

No	ELEVATION	BORE & CONE HOLE COORDINATES NORTH	EAST
1	192.75	4832504	290684
2	192.70	4832512	290727
3	192.77	4832550	290743
4	192.86	4832550	290780
5	192.98	4832585	290798
6	193.51	4832582	290840
7	193.78	4832596	290869
8/8A	192.67	4832529	290715
9/9A	192.78	4832532	290754
10	192.84	4832568	290770
11	193.01	4832566	290809

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

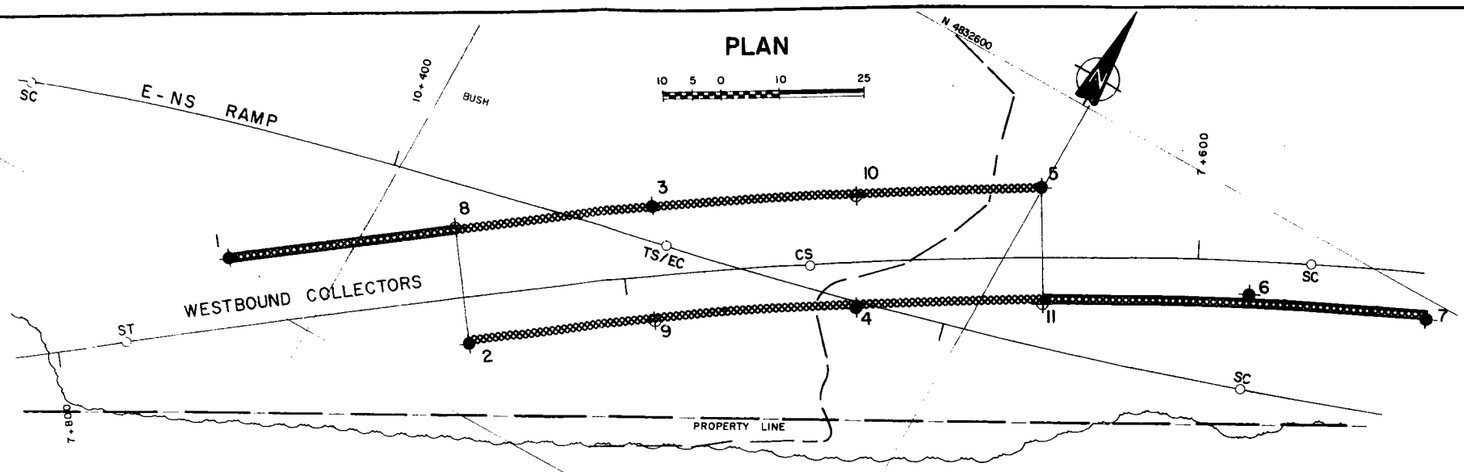
NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

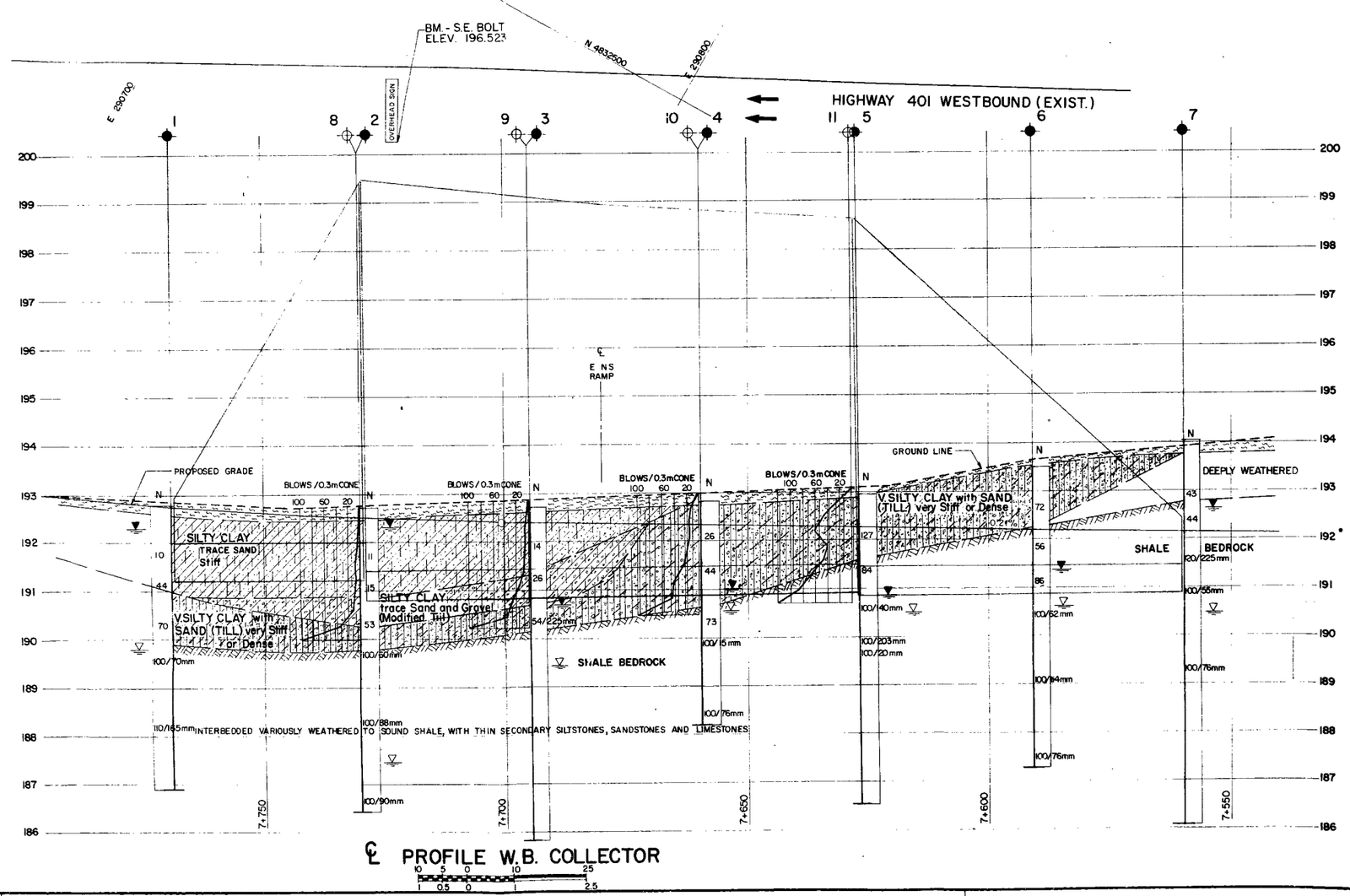
REV	DATE	BY	DESCRIPTION

Geocres No 30M12-184

HWY No 401-HWY 410/403 TO HWY 10			DIST 6 (TOR)
SUBM'D J.M.	CHECKED J.M.	DATE AUG. 31/83	SITE 24-484
DRAWN V.N.	CHECKED	APPROVED	DWG 548206-A

PLAN





℄ PROFILE W.B. COLLECTOR

10 5 0 10 25
1 0.5 0 1 2.5

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN STATIONS IN KILOMETRES + METRES.

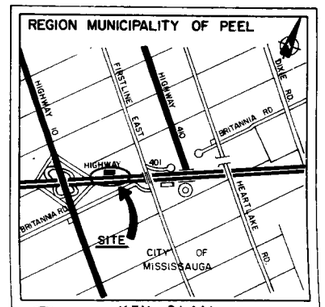
CONT No
WP No 54-82-06

STRUCTURE No.69 BASKETWEAVE
W.B. COLLECTORS/E-NS RAMP
BORE HOLE LOCATIONS & SOIL STRATA

N

SHEET

MORTON & PARTNERS LTD.



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N — Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE — Blows/0.3m (60° Cone, 475 J/blow)
- W.L at time of investigation
- W.L after 5 days
- Retaining Wall Foundation
- Tunnel Wall Foundation

No	ELEVATION	BORE & CONE HOLE COORDINATES NORTH	EAST
1	192.75	4832504	290684
2	192.70	4832512	290727
3	192.77	4832550	290743
4	192.86	4832550	290780
5	192.98	4832585	290798
6	193.51	4832582	290840
7	193.78	4832596	290869
8/8A	192.67	4832529	290715
9/9A	192.78	32532	290754
10	192.84	4832568	290770
11	193.01	4832566	290809

NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REV	DATE	BY	DESCRIPTION

Geocres No 30M12-184

HWY No. 401-HWY 410/403 TO HWY 10			DIST 6 (TOR)
SUBM'D J.M.	CHECKED J.M.	DATE AUG. 31/83	SITE 24-484
DRAWN V.N.	CHECKED	APPROVED	DWG 548206-A