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W.P. No. 113-69-01

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 401

LOCATION Proposed Retaining Wall / Don Valley Parkway

No. of Pages -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

cc: FOUNDATIONS (RM. 110)

Department of Transportation and Communications

MEMORANDUM

30M 14 - 82

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

From: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

Date: May 31, 1971

Our File Ref.

In reply to JUN - 7 1971

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Wall
At
Hwy. #401 and Don Valley Parkway
Borough of North York, Co. of York
District No. 6 (Toronto)
W.O. 71-11027 -- W.P. 113-69-01

Attached, we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. B. R. Davis
F. G. Allen
D. W. Farren
G. K. Hunter (2)
H. Greenland
G. C. E. Burkhardt (2)
T. J. Kovich
B. J. Giroux
B. A. Singh

Foundations Files ✓
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Wall
At
Hwy. #401 and Don Valley Parkway
Borough of North York, Co. of York
District No. 6 (Toronto)
W.O. 71-11027 -- W.P. 113-69-01

1. INTRODUCTION:

The Foundation Section was requested to carry out a foundation investigation to determine the subsoil conditions existing at the above-mentioned site. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Bridge Planning Engineer, Toronto.

This report contains the results of our field investigation, together with our recommendations pertaining to the foundations of the retaining wall.

2. DESCRIPTION OF SITE:

The site is located in the area of Hwy. #401 and Don Valley Parkway interchange in Metropolitan Toronto. The proposed retaining wall is situated between the west bound center core and the west bound collector lanes of Hwy. #401. At this place, immediately to the north of the retaining wall, the W.B. lanes transfer traffic from the center core to the collector lanes. The revision of the W.B. transfer lanes necessitates the proposed retaining wall. Ramp B, Don Valley S.B. - Hwy. #401 W.B. (center core), will not be affected by the retaining wall.

..... 2.

2) DESCRIPTION OF SITE: (cont'd) ..

The entire width of Hwy. # 401 is located within cut area. There is a 10 ft diameter sewer (Victoria Diversion Sewer) crossing the highway, and the existing Metro shaft going down to the sewer is so situated that the proposed retaining wall will be constructed over it.

3. FIELD AND LABORATORY WORK

The field work at the proposed site consisted of a total of six sampled boreholes and eight dynamic cone penetration tests. The boreholes were advanced using continuous flight augers. Disturbed samples were obtained using a 2 - inch O.D. Split- spoon sampler driven according to the specifications for the Standard Penetration Test.

Dynamic cone penetration tests were carried out adjacent to each borehole, and also at two other locations. Driving energy to advance the cone was 350 ft. lbs. per blow.

Samples were visually examined in the field and subsequently in the laboratory. Tests were carried out on selected samples to determine the following physical properties:

Grain Size Analysis

Atterberg Limits

Natural Moisture Content

The results of field and laboratory tests are summarized in the Record of Borehole Sheets, which are contained in the Appendix to the report.

The locations and elevations of the borings are shown on Drawing No. 71-11027 A, which accompanies this report.

4. SUBSOIL CONDITIONS

4.1) General:

In general, the subsoil at the site consists of clayey silt, followed by a deposit of sandy silt to sand. All the boreholes were terminated in the latter deposit.

The boundaries between various soil types are shown on the Record of Borehole sheets. The estimated stratigraphical profile shown on Drawing No. 71-11027 A is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil types and soil properties as follows:

4.2) Clayey Silt:

This material was found in boreholes 1, 2, 3, and 4, from ground surface downward. In boreholes 7 and 8 its presence and depth was estimated from the dynamic cone penetration test results. In general, the depth of this deposit decreases from west to east. The maximum depth at the west end of the retaining wall (B.H. #1) was 18.0 ft., which is more than 20 ft. below the proposed footing level at this place.

The material consists of clayey silt with sand and traces of gravel, and is of glacial origin. The 'N' values ranged from 8 to 25 blows per foot indicating a stiff to very stiff consistency, but in general the consistency was stiff.

Physical properties of the material as determined from the laboratory tests are as follows, and are as follows, and are plotted on Fig. 1:

..... 4.

4. SUBSOIL CONDITIONS: (cont'd) ...

4.2) Clayey Silt: (cont'd) ...

	Min.	Max.	Average
Liquid Limit	17%	24%	22%
Plastic Limit	12%	14%	14%
Natural Moisture Content	13%	16%	15%

The grain size analyses indicate the following distributions and are plotted on Fig. 2:

Gravel	4 - 8 %
Sand	24 - 34 %
Silt	39 - 48 %
Clay	17 - 30 %

4.3) Sandy Silt to Silty Sand

This deposit was encountered in all boreholes. In boreholes 5 and 6 it was found from ground surface downward, but in other boreholes it was overlain by a clayey silt layer. In borehole 4 this material probably constitures the backfill for the Metro shaft. All boreholes were terminated in this deposit.

The material consists of sandy silt to silty sand with varying amounts of gravel and traces of clay. The 'N' values ranged from 7 blows per foot to 100 blows for 3 inches indicating a loose to very dense relative density, but, in general, the relative density was dense to very dense.

..... 5.

4. SUBSOIL CONDITIONS: (cont'd) ...

4.3) Sandy Silt to Silty Sand: (cont'd) ...

The grain size analyses indicate the following distributions, and are plotted on Fig. 3:

Gravel	1 - 20 %
Sand 31	31 - 62 %
Silt	7 - 54 %
Clay	2 - 16 %

5. GROUNDWATER CONDITIONS:

The water levels in various boreholes at the time of investigation were as follows:

Borehole 1	Elev. 479.5
2	503.0
3	506.8
4	507.0
5	504.5
6	Hole dry at el. 504.6

6. DISCUSSION AND RECOMMENDATIONS:

At this location on Hwy. # 401, two transfer lanes transfer west bound traffic from the center core to the collector lanes. It is proposed to revise the W.B. transfer lanes. This requires construction of a retaining wall between the collector lanes (which lie to the north) and Ramp B (which lies to the south). Ramp B joins the center core near the west end of the retaining wall.

..... 6.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd) ...

Ground level on the north side is higher than the pavement of Ramp 'B'. The difference between elevations of the collector lanes and Ramp B pavement at the east end is about 6 ft. and at the west end is about 11ft. The difference in ground elevation behind and immediately in front of the retaining wall varies from 2-3 ft. at either end to about 9 ft. in the middle, resulting in total height of wall which varies from 6 ft. to 13 ft. The total length of the wall is about 720 ft.

Subsoil at the site consists of stiff clayey silt followed by loose to very dense sandy silt to silty sand.

At the east end from station 1183 + 20 to station 1185 + 20, it is recommended that the retaining wall be supported on spread footings. The footings should be placed at least 4 ft. below the finished ground elevation in front of the retaining wall, i.e. at or below elevation 516 at station 1183 + 20 and at or below elevation 526 at station 1185 + 20. At intermediate Stations, the footings may be stepped accordingly. A safe bearing capacity of 3 tons/sq. ft. may be used for design purposes.

At the west end from station 1178 + 00 to station 1181 + 60, it is recommended that the retaining wall be supported on short steel H-piles driven at least 10 ft. into the very dense sandy stratum, i.e. to approximately elevation 475 at station 1178 + 00 and to elevation 487 at station 1181+60. A design load of 70 tons/pile should be achieved for such piles.

..... 7.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd) ...

Between Station 1181 + 60 and Station 1183 + 20, problems are created because of a 10 ft. diameter underground sewer which crosses the retaining wall at an angle, and because of the Metro shaft at Station 1182 + 38. It is not advisable to drive piles near the sewer, lest it might cause damage to the sewer. Also, it is not known if the shaft can carry the additional load of the retaining wall. Therefore, it is recommended that in this section an excavation should be made to a depth of 4 ft. below the proposed footing level (4 ft. below the ground level in front of the wall). The side slopes of the excavation should be 1:1 (see Fig.4). The excavation should be backfilled up to 2 ft. above the proposed footing level with well compacted granular 'A' material. It should then be re-excavated down to the footing elevation. The retaining wall should then be supported on spread footings placed on this granular pad. A bearing capacity of 2 tons/sq. ft. can be assumed for design purposes.

In case of the shaft not being capable of supporting the entire load of the retaining wall, it should be cut at the level of excavation for the Granular 'A' as described above (i.e. approximately 10 ft. below ground level in front of the retaining wall). The shaft should then be bridged at this level and a new entrance made well south of the retaining wall, which can then be supported on spread footings on granular 'A' as described above.

..... 8.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd) ...

However, if the shaft can carry the entire weight of the wall placed directly upon it, then, the shaft may be extended to the top of the wall if necessary, or an entrance may be constructed in front of the wall.

As an alternative to piles, the length of wall from station 1178 + 00 to 1181 + 60 may be supported on spread footings placed on a 6 ft. deep granular pad as described above.

Consideration should also be given to a bin-type retaining wall instead of a conventional concrete retaining wall. The bin-type retaining wall should be supported on spread footings which should be placed on a 6 ft. thick well compacted granular pad between stations 1178 + 00 and 1183 + 20 and on original ground between stations 1183 + 20 and 1185 + 20.

Because of the compressible nature of the clayey silt stratum, some differential settlements are anticipated between stations 1178 + 00 and 1183 + 20. Therefore, if a conventional type retaining wall supported on spread footings is constructed in this section, then it should be constructed in shorter than usual panels and construction joints provided to accommodate the differential settlements.

Since the retaining wall is higher at the east end than at the west end, the footings should be stepped accordingly.

The horizontal resistance of the retaining structure can be computed assuming a value of 0.4 for the coefficient of friction (n) between the base of the footing and the underlying subsoil.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd) ...

A minimum cover of 4 ft. should be provided for frost protection.

The groundwater level is at such a depth as to cause no dewatering problem.

The granular backfill to the wall should conform to D.H.O. Standards SD-4-58. In this case, the coefficient of active earth pressure (K_a) can be taken as 0.33.

To relieve the buildup of excess hydrostatic pressure behind the retaining wall, suitable weepholes should be provided.

7. MISCELLANEOUS:

The field work for this project was carried out during the period April 5-14, 1971, under the supervision of Mr. A. Prakash, Project Foundation Engineer, who also prepared this report.

The equipment used was owned and operated by Dominion Soil Investigation Ltd.

This report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

January, 1971

APPENDIX I

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 71 - 11027 LOCATION Co-ord's: 55,589 N; 73,542 E ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 6-7, 1971 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
503.5	Ground Level					
0.0	Clayey Silt to Silt with Sand and Traces of Gravel Stiff		1	SS	9	500
			2	SS	10	
			3	SS	18	490
485.5			4	SS	13	
18.0	Sandy Silt with Traces of Gravel and Clay Very dense		5	SS	115/9"	480
			6	SS	90	
			7	SS	58	470
467.5			8	SS	100/6"	
36.0	End of Borehole					460

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	5 34 44 17
	4 27 39 30
	11 37 43 9
	▼ 479.5
	4 38 48 10

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 71 - 11027 LOCATION Co-ord's: 55,603 N; 73,692 E ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 6, 1971 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE
508.5	Ground Level					
0.0	Clayey Silt, with Sand and Traces of Gravel		1	SS	25	
			2	SS	11	500
	Stiff to very Stiff		3	SS	15	
494.5						
14.0	Compact to Very dense Sandy Silt to Silty Sand, some Clay and Traces of Gravel		4	SS	26	
			5	SS	100/9"	490
			6	SS	66	
			7	SS	100/3"	480
			8	SS	100/9"	
			9	SS	100/9"	470
467.2						
41.3	End of Borehole					460

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

w_P w w_L

WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	E1.503.0 ▼
6	26 44 24
9	39 44 8
9	37 42 12
8	45 37 16

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 71-11027 LOCATION Co-ord's: 55,615N; 73,830 E ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 5, 1971 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY AC

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
511.8	Ground Level					
	Clayey Silt with Sand and Traces of Gravel.		1	SS	13	510
			2	SS	8	
501.8	Stiff					
10.0	Loose (13.5) Sandy Silt to Silty Sand, Traces of Gravel & Clay.		3	SS	9	500
			4	SS	97.	
			5	SS	115	490
	Very Dense		6	SS	98	
			7	SS	118	480
475.5			8	SS	100/9"	
36.3	End of Borehole					470

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR. SA. SI. CL.

4 24 48 24
▼ 506.8
5 34 54 7
14 47 32 7
4 45 49 2

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 71-11027 LOCATION Co-ord's: 55,623 N: 73,964 E ORIGINATED BY AP

W.P. 113-69-01 BORING DATE April 8, 1971 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
518.0	Ground Level					
0.0	Clayey Si. with Sand Traces of gr.					
513.0	Stiff		1	SS	14	
5.0	Silty Sand to Sand with varying amounts of gravel & Traces of Clay. (Backfill for Metro Shaft) Loose to Dense		2	SS	11	510
			3	SS	40	
			4	SS	7	500
497.0	Wood		5	SS	100/6"	
21.0	End of Borehole Probable Concrete					490

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

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w

w_P w w_L

WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

REMARKS GR. SA. SI. CL.

8 29 46 17

744 40 9

▼ 507.0

20 59 12

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 71-11027 LOCATION Co-ord's: 55,649 N; 74,125E ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 8, 1971 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY

SOIL PROFILE ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
521.5	Ground Level					520
	Sandy Silt to Silty Sand Varying Amounts of Gravel, & Traces of Clay. Dense 6.0 Compact 14.0 Very Dense		1	SS	47	
			2	SS	15	
			3	SS	20	510
			4	SS	100/6"	
			5	SS	100/5"	500
			6	SS	100/4"	
490.0			7	SS	17	490
31.5	End of Borehole					480

DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB. VANE

LIQUID LIMIT — w_L
PLASTIC LIMIT — w_P
WATER CONTENT — w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	13 36 47 4
	20 30 40 10
	2 58 40
	▼ 504.5
	2 52 36 10
	1 62 37

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 71-11027 LOCATION Co-Ord's: 55,663 N; 74,266 E; ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 7, 1971 COMPILED BY AP
DATUM Geodetic BOREHOLE TYPE Continuous Flight Auger, & Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
525.0	Ground Level					
0.0	Sandy Silt with Traces of Gravel and Clay. Dense to very Dense		1	SS	47	520
			2	SS	42	
			3	SS	79	510
			4	SS	100/6"	
504.6			5	SS	100/5"	
20.4	End of Borehole					500

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB. VANE

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P w w_L
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	9 43 44 4
	6 42 47 5
	4 31 51 14
	Hole dry

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 71-11027 LOCATION Co-ord's: 55,641 N; 74,030 E ORIGINATED BY AP

W.P. 113-69-01 BORING DATE April 13, 1971 COMPILED BY AP

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY AL

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — w_P w w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
519.5	Ground Level									
0.0	Probable Clayey Silt with Sand, and traces of Gravel									
506.6	Stiff						100/11"			
12.9	End of Cone Test Probable Sandy Silt to Sand, Traces of Gravel & Clay Very Dense									

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

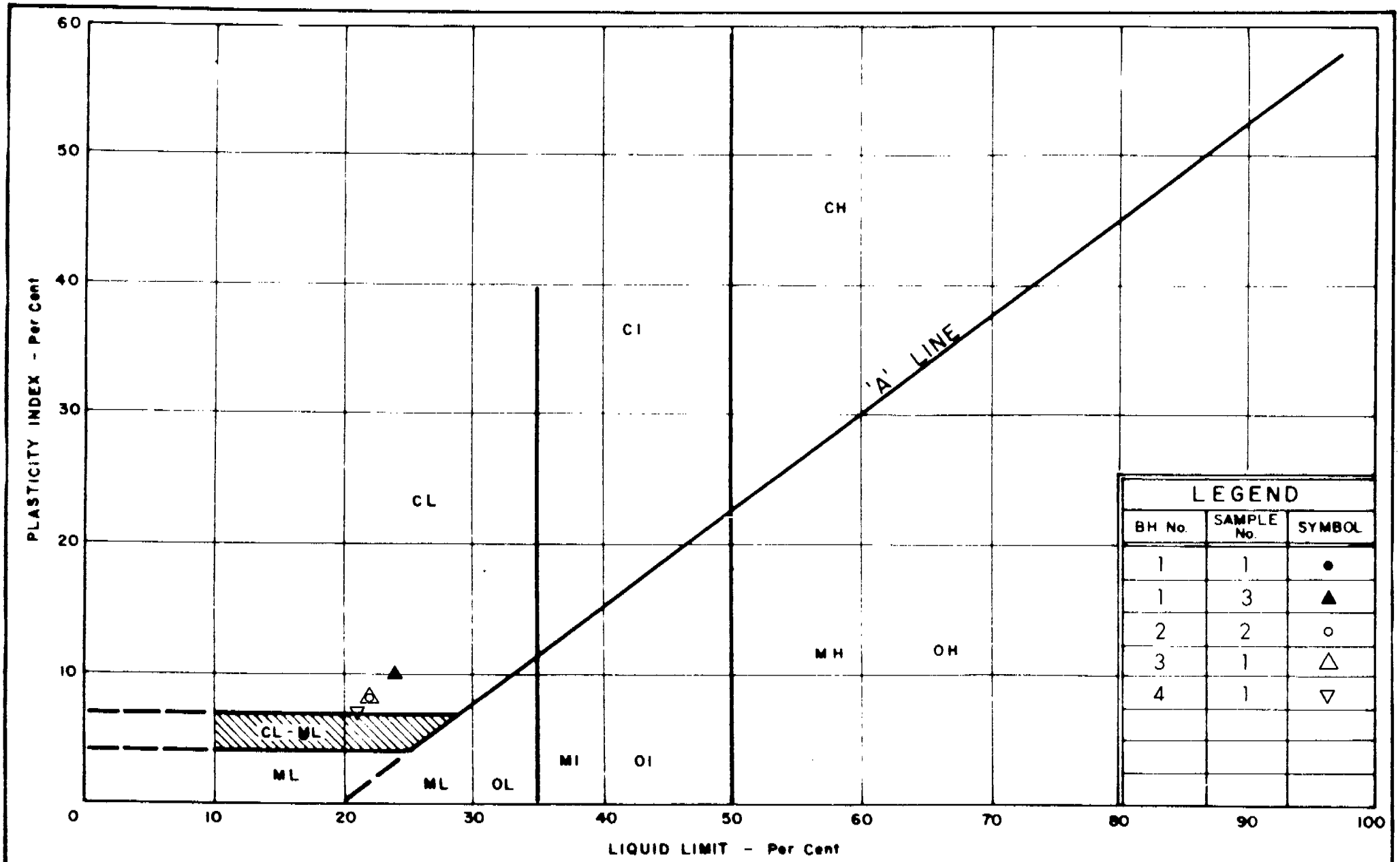
RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 71-11027 LOCATION CO-ORD'S: 55,628 N; 73,914 E ORIGINATED BY AP
W.P. 113-69-01 BORING DATE April 13,1971 COMPILED BY AP
DATUM GEODETIC BOREHOLE TYPE DYNAMIC CONE PENETRATION TEST CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE	LIQUID LIMIT w_L / PLASTIC LIMIT w_P / WATER CONTENT w — w_P w w_L WATER CONTENT %	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
515.5	GROUND LEVEL									
0.0	PROBABLE CLAYEY SILT WITH SAND AND TRACES OF GRAVEL									
509.5	STIFF					510				
6.0	PROBABLE SANDY SILT TO SAND TRACES OF GRAVEL & Clay									
504.0	Dense to Very Dense									
11.5	END OF CONE TEST					500				

FORM OB-MT-252
REVISED JU[illegible] 1966

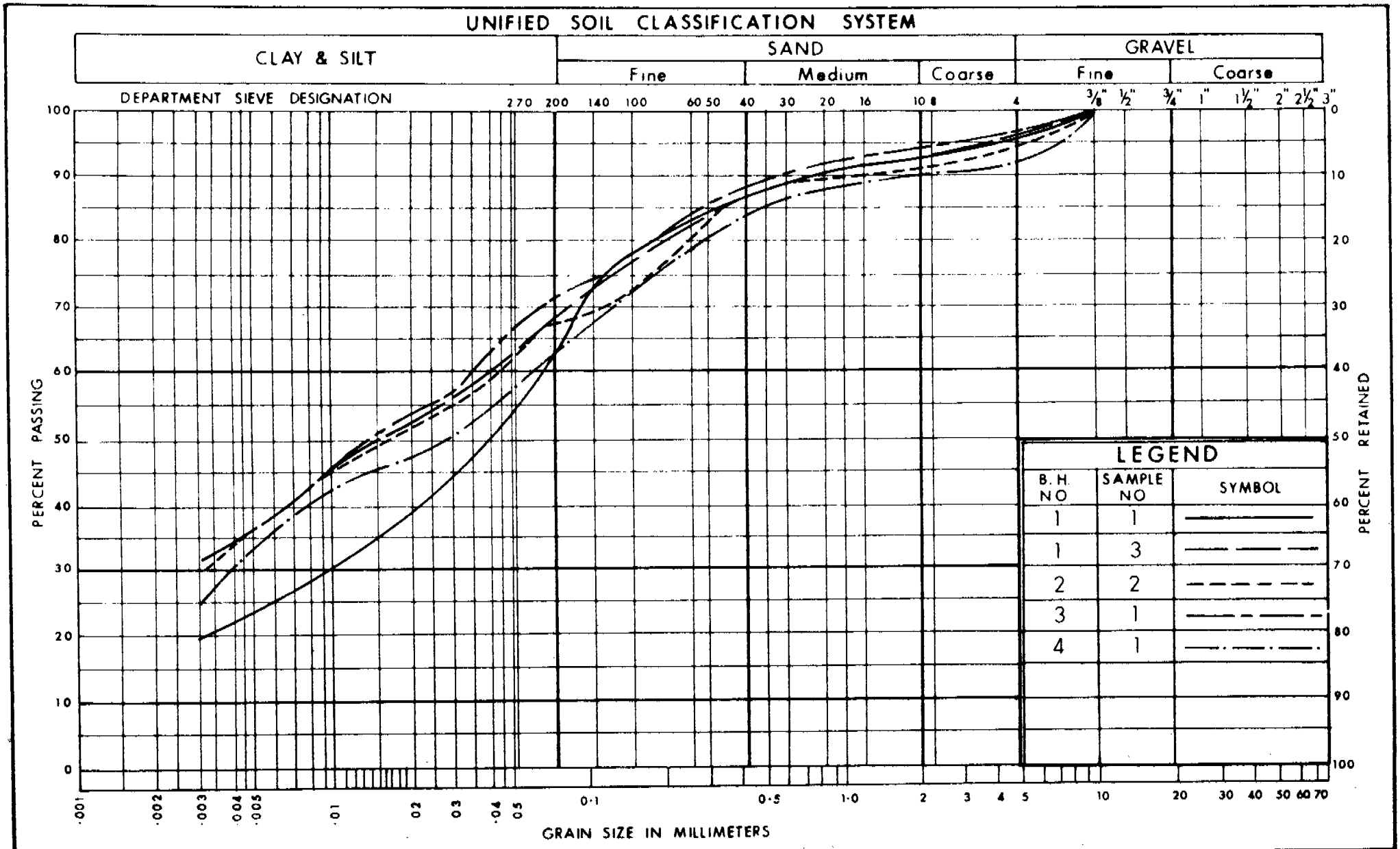


DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
CLAYEY SILT

W.P. No. 113 - 69 - 01
JOB No. 71 - 11027
FIG. 1

FORM OB MT - 1
REV. APR 1965



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

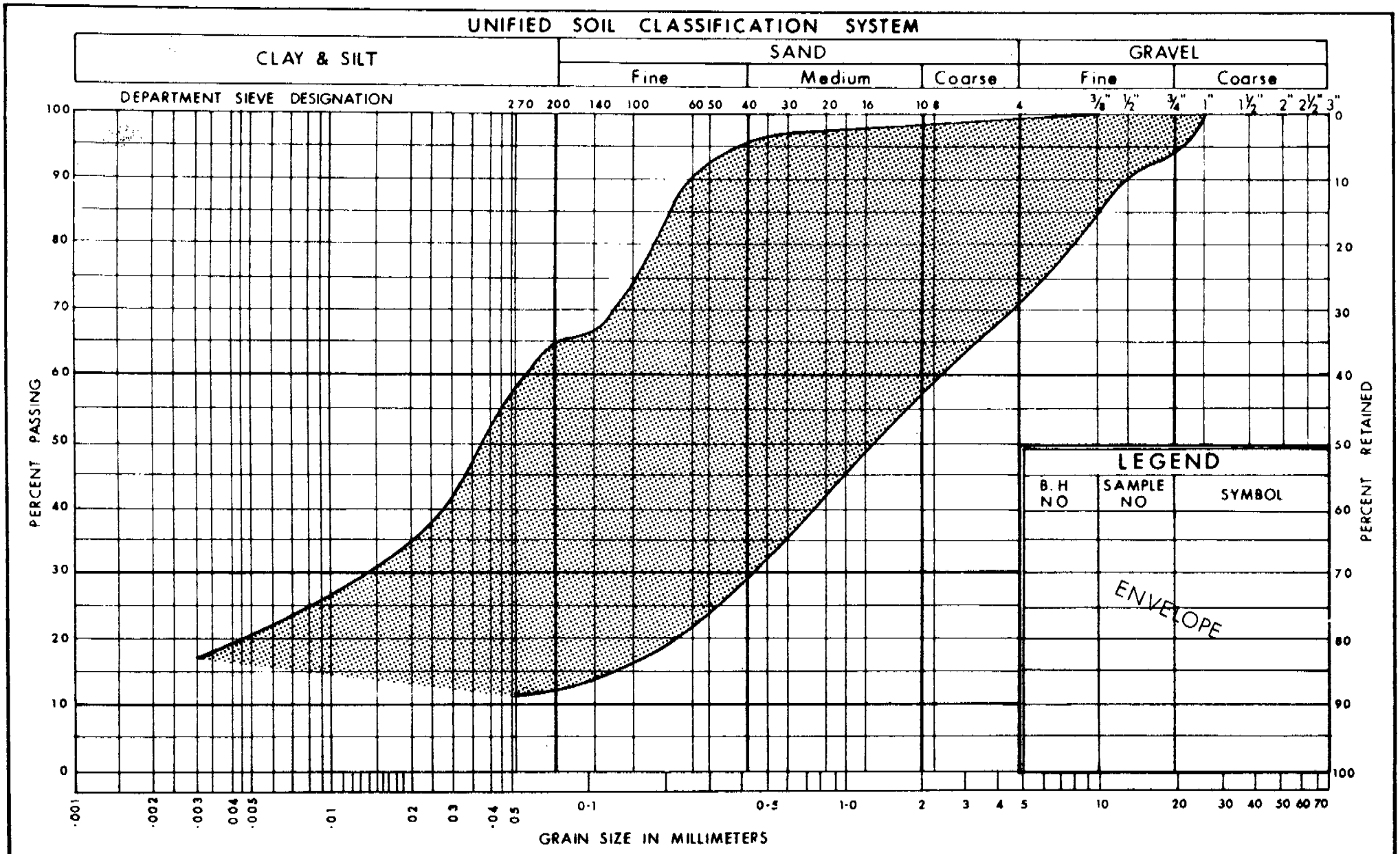
CLAYEY SILT

W.P. No. 113 - 69 - 01

JOB No. 71 - 11027

FIG. 2

FORM OB MT-
REV. APR. 196



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION

SANDY SILT TO SILTY SAND

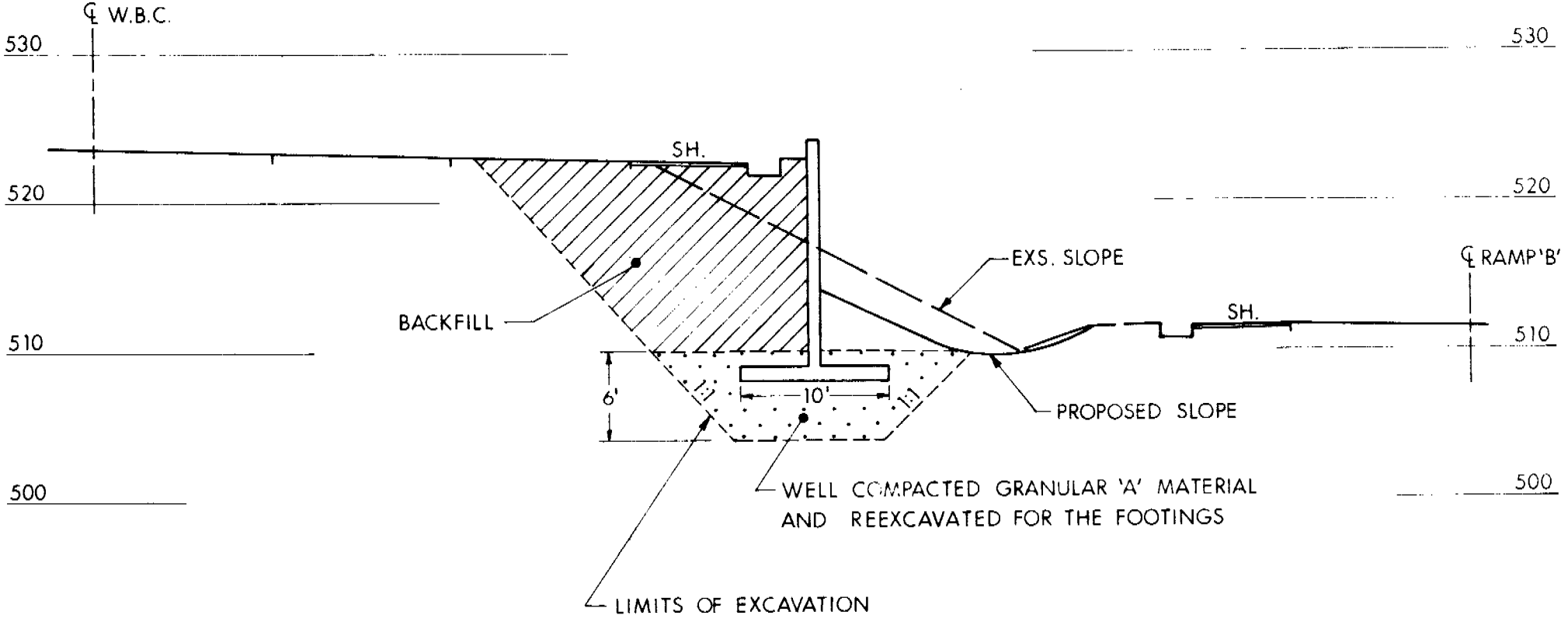
W.P. No. 113 - 69 - 01

JOB No: 71 - 11027

FIG. 3

SPREAD FOOTINGS ON GRANULAR PAD

TYPICAL SECTION



SCALE 1" = 10'

FIG. 4

JOB No: 71-11027

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

CONSISTENCY	'N' BLOWS / FT.	c LB. / SQ. FT.	DENSENESS	'N' BLOWS / FT.
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_P	PLASTIC LIMIT
I_P	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX $= \frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta \sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3·1416
e	BASE OF NATURAL LOGARITHMS 2·7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ε	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

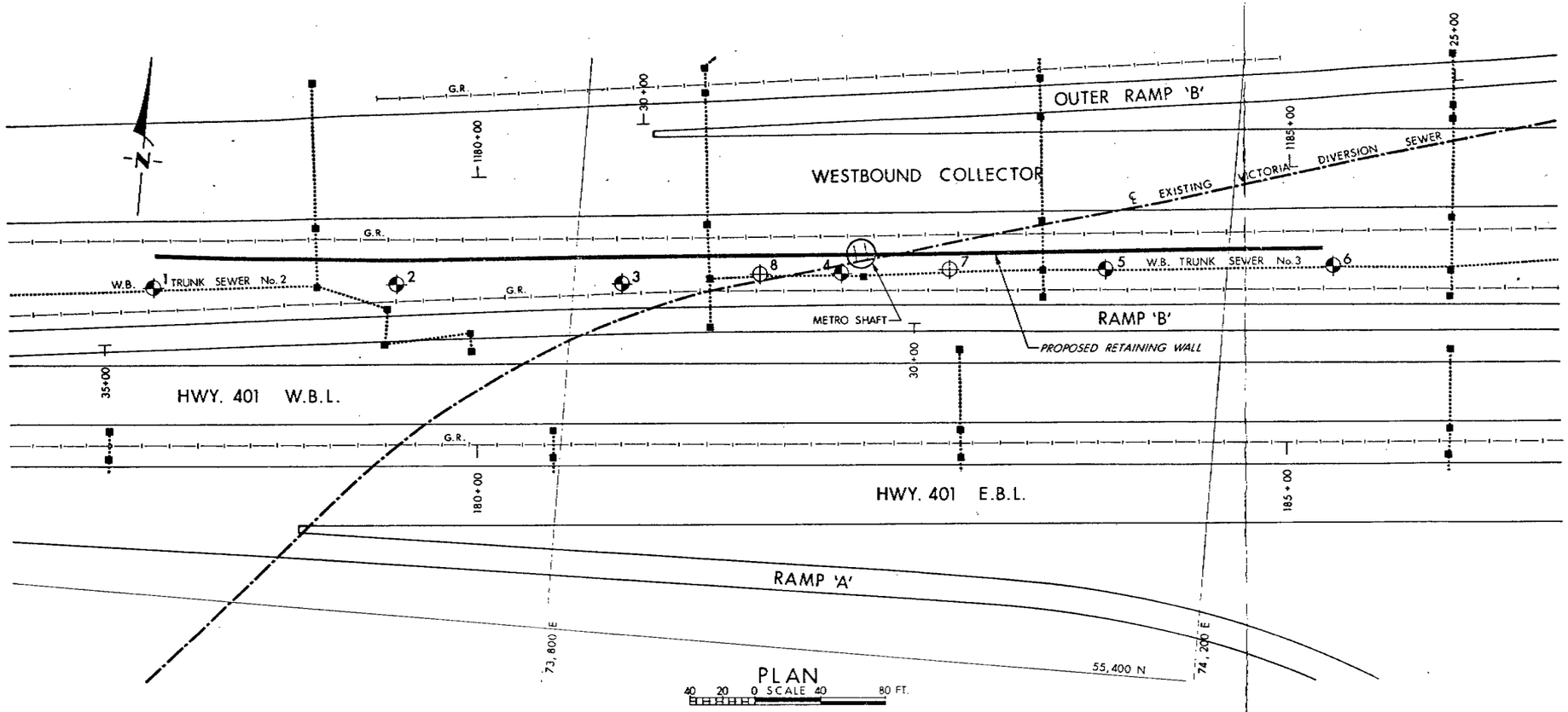
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

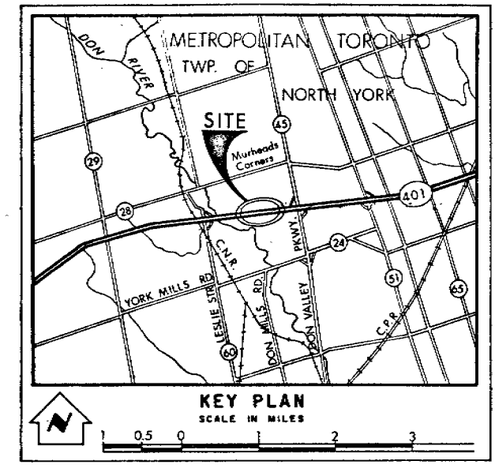
FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL





LEGEND

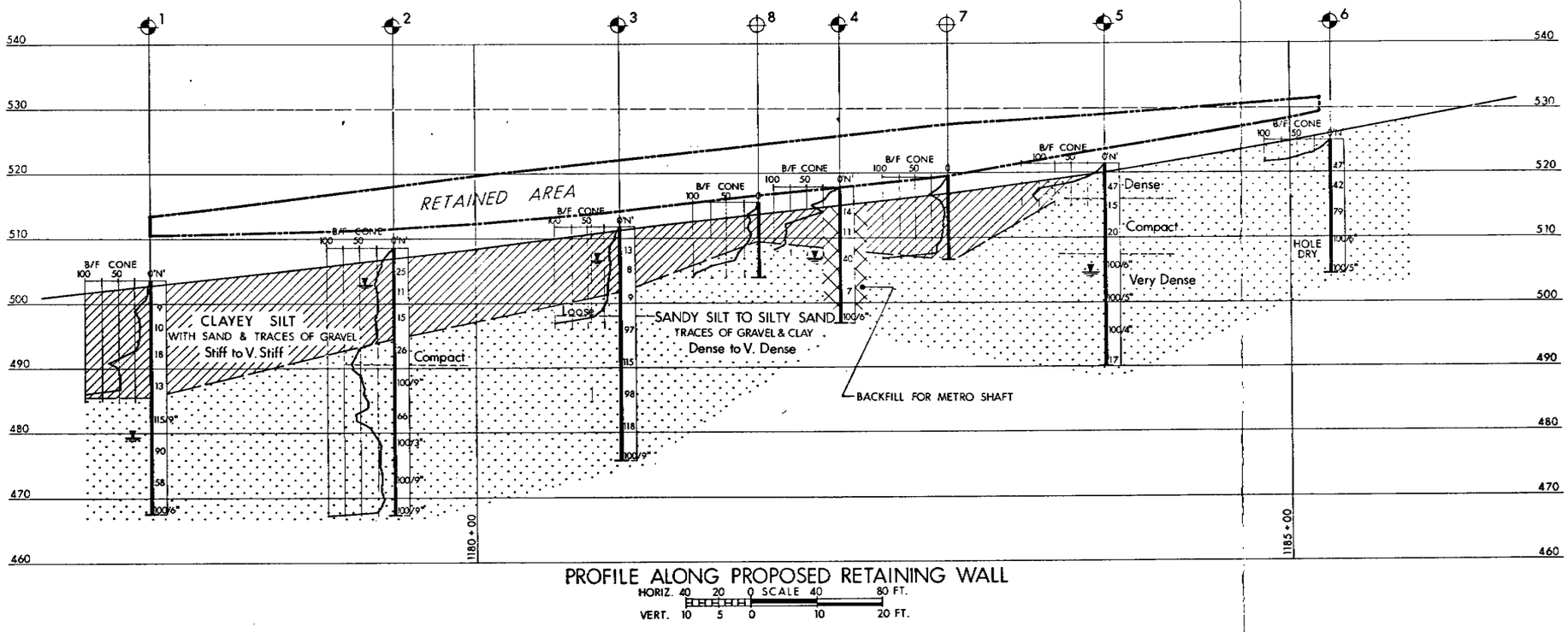
- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. APRIL 1971.

NO.	ELEVATION	CO-ORDINATES NORTH	CO-ORDINATES SOUTH
1	503.5	55,589	73,542
2	508.5	55,603	73,692
3	511.8	55,615	73,830
4	518.0	55,623	73,964
5	521.5	55,649	74,125
6	525.0	55,663	74,266
7	519.5	55,641	74,030
8	515.5	55,628	73,914

633400
48-7300
30 MILD
17

– NOTE –

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.



PROFILE ALONG PROPOSED RETAINING WALL

HORIZ. 40 20 0 SCALE 40 80 FT.

VERT. 10 5 0 10 20 FT.

REVISIONS			
	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS – ONTARIO
MATERIALS & TESTING OFFICE – FOUNDATION SECTION

PROPOSED RETAINING WALL

KING'S HIGHWAY NO. 401 (W.B.) & DON VALLEY PKWY DIST. NO. 6
CO. METROPOLITAN TORONTO
TWP. NORTH YORK LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D A.P.	CHECKED	W.P. NO. 113-69-01	M.&T. DRAWING NO. 71-11027A
DRAWN S.R.	CHECKED	JOB NO. 71-11027	
DATE MAY 7, 1971		SITE NO.	BRIDGE DRAWING NO.
APPROVED (PRINCIPAL FOUNDATION ENGINEER)		CONT. NO.	

71-11027

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Room 107,
Lab. Building.

Attention:

From: G. C. E. Burkhardt,
Bridge Planning Section,
Central Building.

Date: March 29, 1971.

Our File Ref.

In Reply To

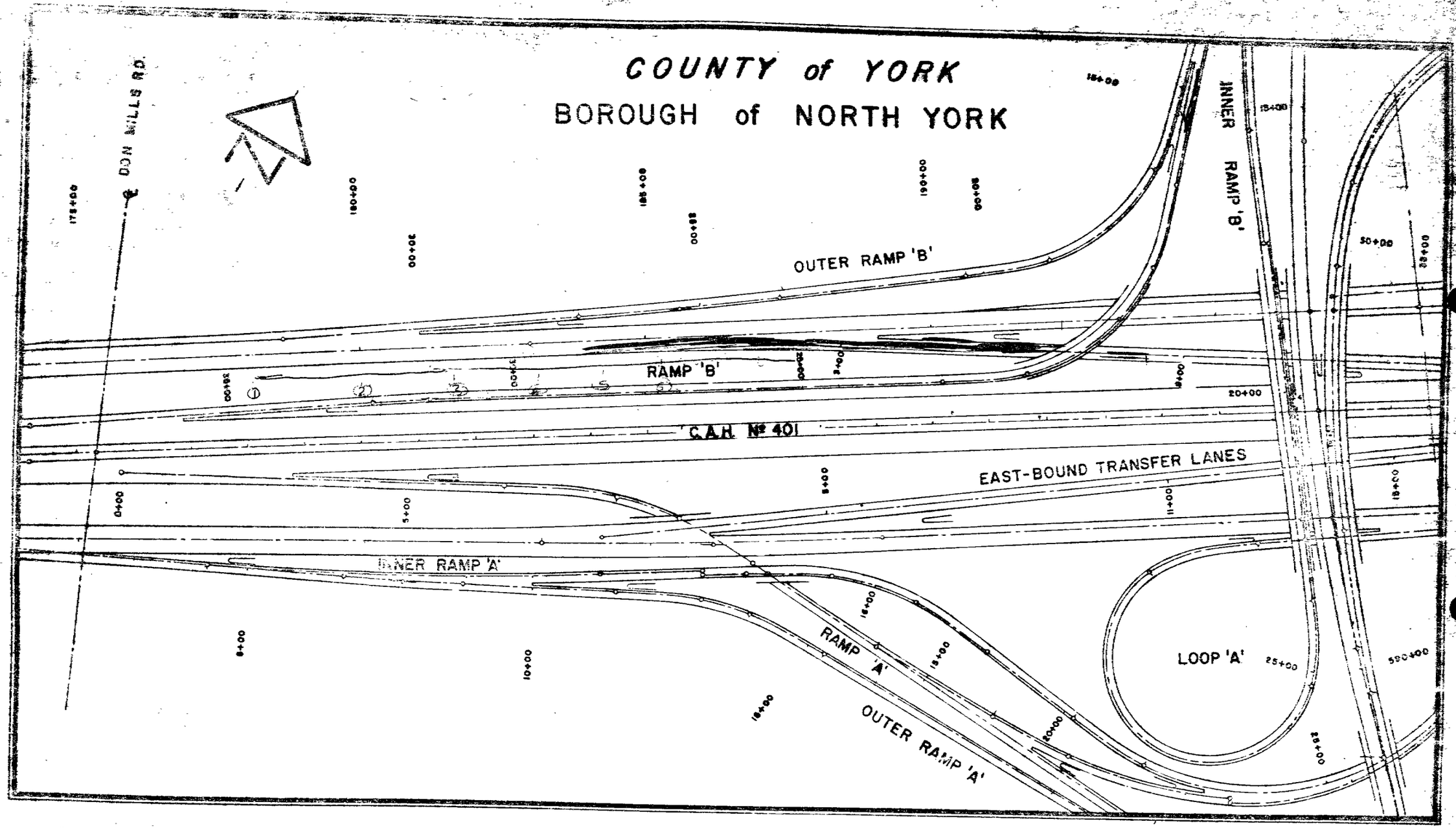
Subject: Retaining Wall,
W.P. 113-69-01, Site 37,
Revision of W.B. Transfer Lanes
@ Hwy. 401 and Don Valley Parkway.

Enclosed please find alignment, plan and profile details for the above noted Retaining Wall Structure. Could you please have a Foundation Investigation instituted for this structure as soon as possible. Road Design's completion date for this job is August 17, 1971. If scheduling is too-tight, perhaps preliminary recommendations could be forwarded soon after your field work is completed.

JIM:lc
Encl.

J. I. McDougall,
REG. BRIDGE LOCATION ENGINEER,
for:
G. C. E. Burkhardt,
REG. BRIDGE PLANNING ENGINEER.

c.c. C. S. Grebski
J. G. Celmins
R. Fitzgibbon


COUNTY of YORK
BOROUGH of NORTH YORK
DON MILLS RD.
OUTER RAMP 'B'
INNER RAMP 'B'
RAMP 'B'
C.A.H. № 401
EAST-BOUND TRANSFER LANES
INNER RAMP 'A'
RAMP 'A'
OUTER RAMP 'A'
LOOP 'A'

COUNTY of YORK
BOROUGH of NORTH YORK