

ONTARIO
DEPARTMENT OF HIGHWAYS
MATERIALS AND RESEARCH DIVISION

RETAINING WALL "D" ON RAMP "D"
SOUTH SIDE OF HWY. #401, HOGG'S HOLLOW
DISTRICT #6, TORONTO, ONT.

(W.P. 193-58)-

WP 85-59(-1)

SUBSOIL CONDITIONS

Submitted by
DOMINION SOIL INVESTIGATION LIMITED
77 Crockford Boulevard
SCARBOROUGH - ONTARIO

Our Ref: 2-10-6

OCTOBER 1962.

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I N T R O D U C T I O N

A letter of authorization dated October 4th, 1962 was received from the Ontario Department of Highways, Materials and Research Division, to conduct a subsoil investigation at the site of a proposed retaining wall, south of Highway #401, between Avenue Road and Hogg's Hollow in Toronto.

Number, location and depth of the boreholes were as agreed upon and the test holes were set out on the site with the aid of a drawing (No. D-5034-24) provided to us.

The purpose of the investigation was to reveal the subsurface conditions.

I. DESCRIPTION OF SITE AND GEOLOGY

The proposed retaining wall comprises a part of the modernization of Highway #401 between Avenue Road and Yonge Street. The existing highway cannot satisfy the needs of a rapidly increasing traffic and therefore its widening and the addition of new collector roads were decided upon.

Owing to the fact that this part of Toronto is densely populated, thus the land is expensive, every part of the available right-of-way must be utilized. Therefore, the embankments will be supported by a retaining wall wherever the road level is not the same as the general ground surface.

North York has been heavily glaciated in the Pleistocene Age; consequently, the encountered materials were deposited and precompressed to a very great degree by the thick ice shields which covered the site for thousands of years.

II. FIELD WORK

Field work was carried out during the period October 4th to 18th, 1962 and comprised eight boreholes at the locations shown on Enclosure #2. The boreholes were advanced to the required sampling depths by a mounted, continuous flight power auger or by washboring. In the latter case, they were lined or partly lined with Bx casing.

Standard penetration tests were made at frequent intervals using a 2 in. outside diameter split spoon driven into the bottom of the clean borehole by a constant driving energy (140 pound hammer dropping 30 inches). These tests provided disturbed samples of the substrata indicating their relative density and consistency.

The samples were shipped to our laboratory where they were thoroughly examined and classified. The results of this analysis, together with all field observations and test results, comprise the basis on which the geotechnical properties of the substrata are being evaluated.

The stratification of the subsoil, sampling depths and the results of the penetration tests are recorded on geotechnical data sheets comprising Enclosures #3 to #10 inclusive.

III. SUBSURFACE CONDITIONS

The substrata - as outlined in Paragraph I - are of glacial origin. They can be described as tills, i.e. materials whose main characteristic is that they are non-sorted and non-stratified. Therefore, it is very difficult to speak of "stratigraphy" at the site, especially when the wide spacing (nearly 500 ft.) between the individual boreholes is considered.

Generally, however, it can be stated that the subsoil is very dense or hard; consequently, no design or construction problems are anticipated. The water tables - wherever encountered - are recorded on the data sheets.

DOMINION SOIL INVESTIGATION LIMITED

L. S. Rolko

LSR/oed

L. S. Rolko, P.Eng.,
Senior Soils Engineer.

Encls.

E n c l o s u r e s

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS		GROUND WATER LEVEL	DEPTH OF CAVE-IN
		COARSE	FINE	COARSE	MEDIUM	FINE						
Ø	> 8"	3"	3/4"	4.76mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
U.S. Standard Sieve Size :				No.4	No.10	No.40	No.200					

SAMPLE TYPES.

AS Auger sample	RC Rock core	TP Piston, thin walled tube sample
CS Sample from casing	% Recovery	TW Open, thin walled tube sample
ChS Chunk sample	SS Split spoon sample	WS Wash sample

SAMPLER ADVANCED BY static weight : w
 " pressure : p
 " tapping : t

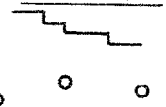
OBSERVATIONS
 MADE WHILE
 CORING

Steady pressure
 No pressure
 Intermittent pressure

Washwater returns
 Washwater lost

PENETRATION RESISTANCES.

SYMBOL:



322

DYNAMIC PENETRATION RESISTANCE : to drive a 2"Ø, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot.

STANDARD PENETRATION RESISTANCE, -N- : to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SOIL PROPERTIES.

W % Water content	γ _n Natural bulk density (unit weight)	k Coeff. of permeability
LL % Liquid limit	e Void ratio	C Shear strength in terms of total stress
PL % Plastic limit	RD Relative density	φ Angle of int. friction in terms of effective stress
PI % Plasticity index	C _v Coeff. of consolidation	C' Cohesion
LI Liquidity index	m _v Coeff. of volume compressibility	φ' Angle of int. friction

UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —

TRIAXIAL COMPRESSION TEST



UNCONFINED TEST



LABORATORY

VANE TEST



FIELD

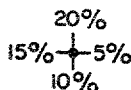
TEST



POCKET PENETROMETER TEST



Strain at failure is represented by direction of stem



St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS :

RD :

Very loose	0 - 15 %
Loose	15 - 35 %
Compact	35 - 65 %
Dense	65 - 85 %
Very dense	85 - 100 %

COHESIVE SOILS :

C lbs/sq.ft.

Very soft	less than 250
Soft	250 - 500
Firm	500 - 1000
Stiff	1000 - 2000
Very stiff	2000 - 4000
Hard	over 4000

OUR REFERENCE NO. 2-10-6

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . .

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 587.8

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 5, 1962.

ENCLOSURE NO. 3

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	N ₆₀ or Advancement of Sampler	blows per foot	lb-sq ft	water content %		
587.8	0	TOPSOIL									
585.0											
	5			1	SS	108					
580.0		BROWN DAMP VERY DENSE									
	10	SILT <i>sand layer</i>		2	SS	63					
575.0		TILL									
	15	<i>traces of sand</i>		3	SS	180					
570.0		GREY MOIST VERY DENSE SILTY SAND TILL		4	SS	240					
565.0		<i>boulder</i>									
	25	GREY DAMP HARD CLAYEY SANDY SILT TILL		5 ₇	SS ₇	400 ₇					
560.0		<i>with cobbles</i>									
	30			6 ₇	SS ₇	400 ₇					
555.0											

DETAILS OF
EXTRAPOLATED
-N- VALUES:

SA #	BLOWS:
3.	40/6" - 60/4"
4	80/6" - 20/1"
5	100/3"
6	100/3"

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 2 . .

OUR REFERENCE NO. 2-10-6

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 586.0

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 4, 1962

ENCLOSURE NO. 4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE Blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- or Adjusted No. of Blows	SHEAR STRENGTH lbs./sq. ft.					PI W LI			
586.0	0	TOPSOIL													
	5	BROWN DAMP HARD SANDY CLAYEY SILT TILL		1	SS	69									
580.0															
	10	<i>coarse sand and gravel</i>		2	SS	166									
575.0															
	15	BROWN DAMP VERY DENSE FINE SAND		3	SS	168									
570.0															
	20	<i>boulder</i>		4	SS	106									
565.0															
	25	COARSE VERY DENSE SUBANGULAR GRAVEL		5	SS	400									
560.0															
	30	BROWN MOIST HARD SANDY CLAYEY SILT TILL BROWN SATURATED VERY DENSE SILTY FINE SAND		6	SS	360									
555.0															

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA #	BLOWS:
2	31/6" - 69/5"
3	30/6" - 70/5"
4	47/6" - 53/6"
5	100/3"
6	70/6" - 30/1"

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA #	BLOWS:
2	31/6" - 69/5"
3	30/6" - 70/5"
4	47/6" - 53/6"
5	100/3"
6	70/6" - 30/1"

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 577.2

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 4, 1962

ENCLOSURE NO. 5

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advance of Sample	SHEAR STRENGTH lbs. sq. ft.		PL W LI		
577.2	0	TOPSOIL									
575.0	5	BROWN MOIST <i>red clay layers</i> FIRM SANDY CLAYEY SILT		1	SS	6	0				
570.0	10			2	SS	236		0			
565.0	15	BROWN VERY DENSE SILT WITH SAND POCKETS		3	SS	300		0			
560.0	20			4	SS	300		0			
555.0	25			5	SS	1200		0			
550.0	30	BROWN VERY DENSE SILTY FINE SAND		6	SS	300		0			
545.0											

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA#	BLOWS:
2	41/6" - 59/3"
3	75/6" - 25/1"
4	100/4"
5	100/1"
6	100/4"

DETAILS OF
EXTRAPOLATED
-N- VALUES:

SA#	BLOWS:
2	41/6" - 59/3"
3	75/6" - 25/1"
4	100/4"
5	100/1"
6	100/4"

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 567.4

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 6, 1962.

ENCLOSURE NO. 6

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE Blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N- VALUES OF SAMPLE	SHEAR STRENGTH lbs/sq ft		PI W LI		
567.4	0	TOPSOIL									
565.0	5	BROWN DAMP VERY DENSE SANDY SILT TILL <i>slightly cemented</i>		1	SS	42		0			
560.0	10			2	SS	150			0		
555.0	15	GREY MOIST HARD SILTY CLAY TILL WITH SEAMS OF WET SILTY FINE SAND		3	SS	49		0			
550.0	20	BROWN VERY DENSE SILTY FINE SAND		4	SS	300			0		
545.0	25			5	SS	80			0		
540.0	30	GREYISH BROWN DAMP HARD CLAYEY SILT TILL		6	SS	75		0			
535.0	35										

DETAILS OF
EXTRAPOLATED
- N - VALUES :

SA #	BLOWS :
2	75/6" - 25/2"
4	50/6" - 50/2"

DETAILS OF
EXTRAPOLATED
- N - VALUES :

SA [#]	BLOWS :
2	75/6" - 25/2"
4	50/6" - 50/2"

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 SURF ELEVATION: 561.3

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 6, 1962.

ENCLOSURE NO. 7

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLE			PENETRATION RESISTANCE Blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	NO. of Sample	SHEAR STRENGTH lb. sq. ft.					P ₁	W	P ₂	
561.3	0	TOPSOIL													
560.0				1	SS	36									
555.0	5	HARD CLAYEY SILT		2	SS	69									
		TILL <i>brown</i> <i>grey</i>													
	10	WITH SAND LAYERS		3	SS	36									
545.0	15			4	SS	200									
	20	GREY DAMP VERY DENSE SANDY SILT TILL		5	SS	108									
535.0	25														

DETAILS OF
EXTRAPOLATED
- N - VALUES :

SA. #	BLOWS:
4	100/6"
5	46/6" - 54/6"

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 559.1

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 6"
 DATE: OCT. 9, 1962.

ENCLOSURE NO. 8

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N ₆₀ or Advancement of Sampler			PI	W	
559.1	0	TOPSOIL									
555.0	5	DAMP HARD SANDY CLAYEY SILT	Δ	1	SS	96					
550.0	10	TILL	Δ	2	SS	102					
545.0	15	<i>brownish grey</i>	Δ	3	SS	52					
540.0	20	LIGHT GREY VERY DENSE DRY SANDY SILT <i>layered structure</i>	Δ	4	SS	300					
535.0	25			5	SS	200					
530.0	30										

DETAILS OF
EXTRAPOLATED
- N - VALUES :

SA.#	BLOWS :
2	20/6" - 45/4"
4	100/4"
5	100/6"

OUR REFERENCE NO. 2-10-6

GEOTECHNICAL DATA SHEET FOR BOREHOLE ... 7 ...

CURRENT PROJECT: ONTARIO DEPARTMENT OF HIGHWAYS
RETAINING WALL (RAMP "D")
LOCATION: AVENUE ROAD, TORONTO
DATUM ELEVATION: 535.7

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 7/8"
DATE: OCT. 11, 1962.

ENCLOSURE NO. 9

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot		CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advance- ment of sampler	SHEAR STRENGTH lbs/sq ft		PI W LI		
535.7	0										
	5	COMPACT BROWN DAMP FINE SAND		1	SS	17					
530.0											
	10	BROWNISH GREY DAMP COMPACT SILTY FINE SAND <i>slightly cemented</i>		2	SS	23					
525.0											
	15	BROWNISH GREY HARD DRY SANDY CLAYEY SILT TILL	A	3	SS	300					
520.0			A								
			A								
			A								
	20	LAYERS OF DAMP HARD SILT CLAYEY SILT AND SAND	A	4	SS	130					
515.0											
				5	SS	200					
510.0	25										

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA #	BLOWS:
3	50/6" - 50/2"
4	35/6" - 65/6"
5	50/6" - 100/6"

DETAILS OF
EXTRAPOLATED
- N - VALUES:

SA #	BLOWS:
3	50/6" - 50/2"
4	35/6" - 65/6"
5	50/6" - 100/6"

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. H.

CH'D: L. S. R.

CLIENT: ONTARIO DEPARTMENT OF HIGHWAYS
 PROJECT: RETAINING WALL (RAMP "D")
 LOCATION: AVENUE ROAD, TORONTO
 DATUM ELEVATION: 555.9

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 4 1/2"
 DATE: OCT. 18, 1962.

ENCLOSURE NO 10

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N ₆₀ or 45° penetration of sampler	0	20	40	60	80	100	PI	W	
555.9	0	FILL													
	5	LIGHT VERY DENSE DRY FINE TO MEDIUM SAND		1	SS	52									
550.0															
	10			2	SS	56									
545.0		VERY DENSE MOIST FINE SAND AND SILT													
	15			3	SS	71									
540.0		VERY DENSE DAMP FINE LIGHT GREY SAND													
	20			4	SS	83									
535.0															
	25														
530.0															

Mr. A. M. Teye,
Bridge Engineer,
Bridge Division.

Mr. A. G. Sternac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
November 2, 1962.

Attn: Mr. E. McLaughlin.

Re: Soil Investigation Report by
Dominion Soil Investigation, Ltd.
Retaining Wall 'D' on Ramp 'D',
South Side of Hwy. #401, Hogg's
Hollow, Dist. #6, Toronto - W.P.193-58.

Attached, we are sending you the above-mentioned
report submitted by Dominion Soil Investigation, Ltd.

The report contains only factual information.
From this information, it can be concluded that from the foundation
point of view, the soil is very good and no problems are anticipated.
A safe bearing load of up to 4 tons/sq.ft. can be used in design.

The ground at borehole 7 and 7A, respectively, is
very steep and at the time of the investigation, it was not clear
as to exactly where the wall will be situated, and therefore, two
boreholes instead of one, were carried out. It appears that at
lower elevation (B.H. 7), the soil is not as dense as in B.H. 7A
and therefore, a possible reduction of allowable bearing loads will
have to be considered if the wall is to be situated at the lower
terrain.

If there are any queries in connection with this
report, or additional information required, please feel free to
call on our office.

AGG/MLM
Attach.

A. G. Sternac
A. G. Sternac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. M. Teye (2)
B. A. Tragoshes
R. D. McMillan
G. E. Hunter
C. Fraser
T. J. Kovich
J. Roy
J. C. Crispier
E. E. Saint
E. Screen
A. Pitt
Foundations Office
Gen. Files.

Materials and Research Division

October 4, 1962.

Dominion Soil Investigation, Ltd.,
77 Crockford Blvd.,
Scarborough, Ontario.

Attention: Mr. A. Renna.

Re: ⁶⁵⁻⁵⁹⁽⁻¹⁾ W.P. 193-58, Hwy. #401,
Retaining Wall 'D' on Ramp 'D',
South Side of Hwy. #401, Hogg's Hollow,
District #6, Toronto.

Dear Sir:-

Please consider this your authority to carry out a core drilling operation at the above site. Plans and profiles were provided to your representative on October 3, 1962.

It is understood that a qualified Soils Engineer will be in charge of the field work at all times.

The factual data should be submitted to the Foundation Section as soon as possible.

Charges for the work performed will be in accordance with your Schedule of Rates, dated February 17, 1962, and invoice to be addressed to the attention of the undersigned.

Yours very truly,

Althman
For A. Rutka,

MATERIALS & RESEARCH ENGINEER

WDS/MGF

cc: Messrs. S. McCombie
C. K. Hunter
C. Fraser
T. J. Kovich
W. D. Smith (2)

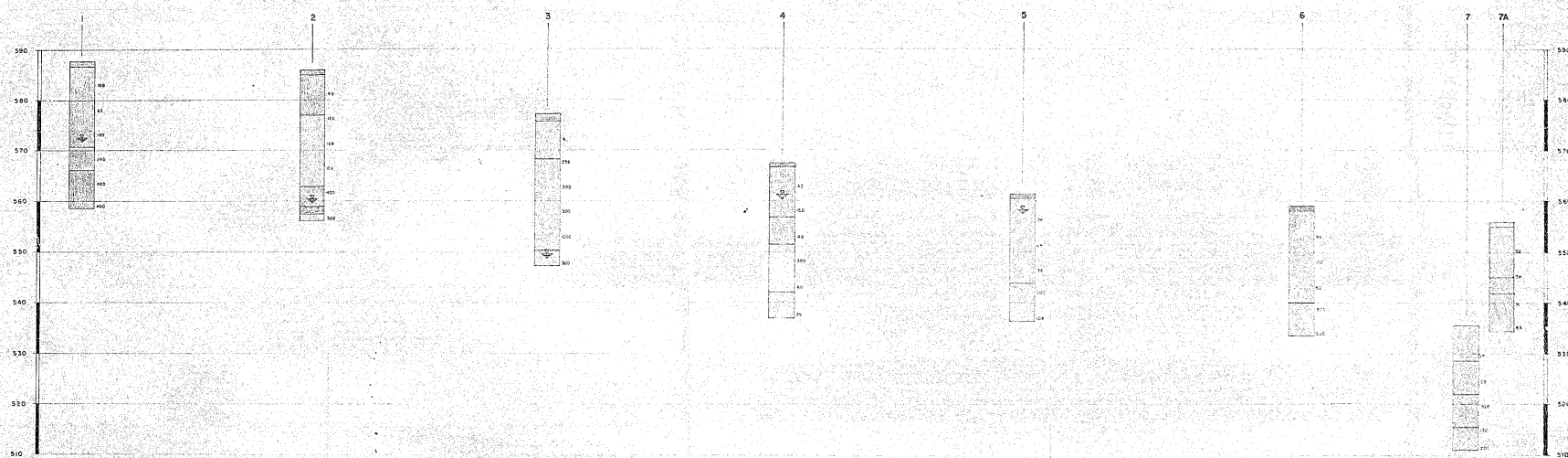
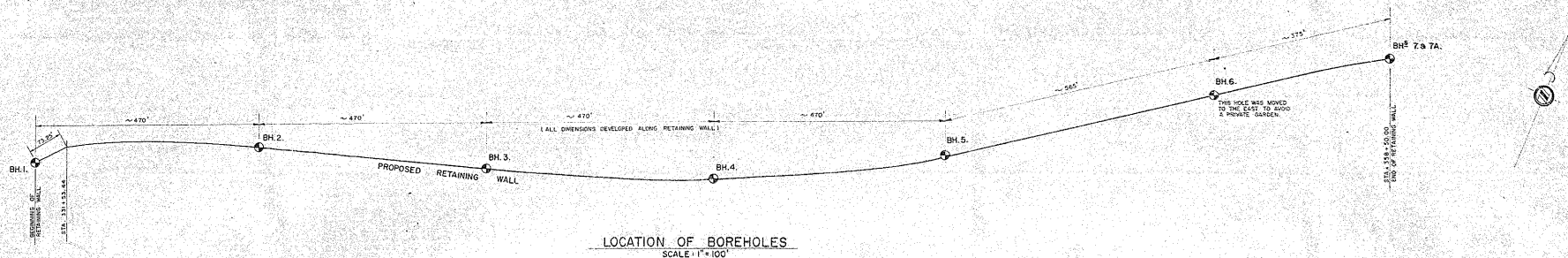
Mrs. T. Tate
Foundations Office
Gen. Files.

#62-F-206

W.P. #85-59-01

HWY. #401

RETAINING WALL
"D" ON RAMP "D"



LEGEND

	TOPSOIL		SAND, SILTY SAND SAND AND SILT
	SILT AND SANDY SILT		GRAVEL
	SILTY SAND, (slightly compressed)		SILTY CLAY TILL
	CLAY SILT OR SANDY CLAYEY SILT TILL		

OUR REF. No. 2-10-6	DEPARTMENT OF HIGHWAYS ONTARIO MATERIALS & RESEARCH DIVISION
ENCL. No. 2	AVENUE ROAD - RETAINING WALL RAMP "D"
DATE OCTOBER 1962	
DRAWN BY: V.R.	DOMINION SOIL INVESTIGATION LIMITED
CHECKED BY: L.R.	77 CROCKFORD BOULEVARD SCARBOROUGH ONTARIO