

DEPARTMENT OF HIGHWAYS ONTARIO

23-67-40

MEMORANDUM

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.
Attention: Mr. S. McCombie

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

DATE: September 20, 1966

OUR FILE REF.

IN REPLY TO: **OCT 26 1966**

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)
W.J. 66-F-47 -- W.P. 275-64-4

Enclosed, please find our complete foundation investigation report for Retaining Walls No's 10, 11, 7, 15, 1, 16, 18, 19, 25, 26, 13, 14, 9, 40, 5 and 6, to be constructed at the Q.E.W. and Hwy. #27 Interchange.

We believe the information contained in the report will be sufficient for your design purposes. If any points require further clarification, please contact this Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
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Foundations Office
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A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

FOUNDATION INVESTIGATION REPORT
For

Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)

W.J. 66-F-47 - W.P. 275-64-4

1. INTRODUCTION:

A request for a foundation investigation at the sites of a number of retaining walls to be constructed as part of the proposed Q.E.W. and Hwy. #27 interchange was received by this Section on May 6, 1966. The request was made verbally by Mr. R. Strain, Direct Expenditures Supervisor, Program Division, and Mr. J. McAllister, Bridge Location Supervisor, Bridge Division.

Due to the urgency of the work, the investigations for each wall are reported separately as soon as the field work is completed, and according to a particular time schedule supplied to us by Mr. Strain. The individual walls are identified by number.

Field work, laboratory work, and the preparation of the Record of Borehole sheets, have been undertaken by Dominion Soil Investigation Ltd.

This report contains the results of the field and laboratory investigations, together with our recommendations pertaining to foundation design.

2. DESCRIPTION OF SITE:

The site is located in the general area of the intersection of Hwy. #27 and the Q.E.W. in the Twp. of Etobicoke, Metropolitan Toronto. The surrounding district is heavily built up both of light industry and residential buildings. The topography of this area may be described as flat to gently undulating.

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

Physiographically, the area is situated in the low-lying part of the region referred to as the Iroquois Plain which was formed during the late Pleistocene period by the body of water since designated Lake Iroquois. Soils in this part of the region are mainly heavy-textured shale and limestone tills.

3. SUBSOIL CONDITIONS:

Subsoil over the site area, consists generally of deposits of silty sand to sandy silt followed by clayey silt, sand and gravel (glacial till), followed by shaley limestone bedrock. Depth to bedrock ranges from about 4 feet (El. 365.0) at the south end of the project to about 30 feet (El. 350.0) at the north end. The boundaries between the different deposits are shown on the borelog sheets contained in the Appendix of this report. The estimated stratigraphical profiles shown on Drawings 66-F-47-A, B, C, etc., are based upon this information. Detailed descriptions of the subsoil conditions at each of the retaining wall sites investigated, are given separately in Section 4 below:

4. DISCUSSION AND RECOMMENDATIONS:

Sixteen retaining walls are included in this project. These are numbered: 10, 11, 7, 15, 1, 16, 18, 19, 25, 26, 5, 6, 9, 40, 13 and 14. Subsoil conditions and recommendations for the individual retaining wall foundations are discussed separately, as follows:

cont'd. /3

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

RETAINING WALL #10 -

1. Soil Conditions:

Four borings were carried out at the site of this wall. The borings are numbered: 23, 24, 25 and 26. Subsoil consists of from 1 to 4 feet of sandy silt to silty sand fill material, followed by about 22 feet of very stiff to hard glacial till, followed by limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clay, silt, sand and gravel in varied proportions, but is generally of a cohesive nature. Ground water level in the borings was found to range from just below the ground surface to about 7 feet below.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-F-47A.

2. Recommendations:

The proposed retaining wall may be supported on spread footings founded within the hard glacial till stratum. It is estimated that a safe net pressure of 3.5 t.s.f. can be achieved for footings located about 4 feet below present original ground level. In this event, the base of the footings would range from El. 377.0 at the south end of the wall, to El. 379.0 at the north end. For footings placed 6 feet below present original ground level, design pressures up to 4.5 t.s.f. may be assumed.

In computing the resistance to lateral movement on the footing bases, an adhesion value of 3000 p.s.f. may be assumed to act between the underside of footings and the subsoil.

For backfill to the retaining walls, you are referred to a memo from Mr. A. Rutka, Materials and Testing Engineer, to Mr. A. M. Toye, Bridge Engineer, dated March 27, 1963, the subject being: "Hwy. #401, Toronto Bypass Retaining Wall Backfill."

No dewatering problems are anticipated.

cont'd. /4

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

RETAINING WALL #11 -

1. Soil Conditions:

Five borings were drilled at the site of this wall and are numbered: 20, 27, 28, 29 and 30. Subsoil consists of up to 6 feet of sandy silt to silty sand fill material, followed by 20 to 24 feet of hard glacial till, followed by limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clay, silt, sand and gravel in varied proportions, but is generally of a cohesive nature. Ground water levels in the borings were found to range from 1 to 4 feet below the ground surface.

The locations and elevations of the borings, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47B.

2. Recommendations:

The proposed wall may be supported on spread footings founded within the hard glacial till stratum. For footings founded some 4 feet below present original ground level, a safe net pressure of 3.5 t.s.f. may be assumed for design purposes. In this event, the base of the footings would range from El. 377.0 at the south end of the wall, to El. 383.0 at the north end. For footings placed 6 feet below present original ground level, design pressures up to 4.5 t.s.f. may be assumed.

In computing the resistance to lateral movement on the footing bases, an adhesion value of 3000 p.s.f. may be assumed to act between the underside of footing and the subsoil.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

No dewatering problems are anticipated.

cont'd. /5

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

RETAINING WALL #7 -

1. Soil Conditions:

Three borings were carried out at the site of this wall. The borings are numbered: 19, 37 and 38. Subsoil consists of from 2 to 4 feet of sandy silt fill material, followed by a very dense deposit of glacial till, followed by shaley limestone bedrock. The glacial till deposit extends for about 27 feet and consists generally of sandy silt with traces of gravel, changing to clayey silt with sand and gravel in the lower 10 feet. Groundwater levels in the borings ranged from 3 to 4 feet below the ground surface.

The locations and elevations of all borings, together with the inferred soil stratigraphy, are shown on the attached Drawing #66-F-47C.

2. Recommendations:

The proposed wall may be founded at approximately El. 375.0 in which case, allowable pressures up to 4.5 t.s.f. may be assumed for design purposes.

In computing the resistance to lateral movement on the footing bases, a friction coefficient of 0.5 may be assumed to act between the bottom of the footing and the subsoil.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

This type of subsoil is susceptible to conditions of unbalanced hydrostatic head. It is believed, however, that dewatering of the relatively shallow excavations should present no major problems.

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

RETAINING WALL #15 -

1. Soil Conditions:

Seven borings have been carried out at the site of this retaining wall and are numbered: 20, 40, 41, 42, 106, 107, and 123. Subsoil consists of from 3 to 17 feet of sand and silt fill material, followed by a very dense deposit of glacial till, ranging in depth from 12 to 20 feet, followed by shaley limestone bedrock. The glacial till deposit consists generally, of fine sandy silt with traces of gravel. Pockets of hard clayey silt with some sand and gravel and shale fragments are also contained within the deposit. Groundwater levels were found to range from 2 to 9 feet below the ground surface in the boreholes, and corresponded closely to the elevations of the original ground surface.

The locations and elevations of the borings, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47D.

2. Recommendations:

At this location the proposed finished ground level on the low side of the retaining wall is approximately 5 to 18 feet higher than the present ground surface. In this case, three alternative types of foundation are proposed for consideration:

a) The proposed wall may be founded some four feet below the original ground surface, assuming a design pressure of 4.5 t.s.f. In this case, the base of footing will range from El. 367.0 at the south end of the wall, to El. 375 at the north end. A friction coefficient of 0.45 may be assumed to apply between the underside of footings and the soil. A dewatering scheme may be required since the soil is likely to 'boil' under conditions of unbalanced hydrostatic head.

cont'd. /7 ...

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

RETAINING WALL #15 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

b) The proposed wall footings may be placed within the fill material some four feet below the finished level and be supported on steel H-piles driven to bedrock, or to practical refusal in the glacial till overlying the rock. For design purposes, the maximum allowable load for the particular section used may be assumed.

c) The proposed walls may be founded on spread footings placed on well compacted G.B.C. Class 'A' fill material. The depth of the foundation should be not less than 4 feet below finished ground level. The G.B.C. Class 'A' material should extend for a minimum width of 3 feet on each side of the footings in the plane of the footing tops. It should then slope down at 1:1 to the existing ground level. All topsoil and loose existing fill material should be removed prior to placing the new granular fill. A safe net pressure of 2 t.s.f. may be assumed for design purposes.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

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

RETAINING WALL #1 -

1. Soil Conditions:

Thirteen borings were carried out at the site of this wall. These are numbered: 6, 43, 44, 55, 56, 57, 58, 60, 132, 147, 148, 149, and 150. Subsoil consists of 3 to 9 feet of silty sand to sandy silt fill material, followed by a very dense deposit of glacial till, followed by shale bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. The thickness of the till deposit ranges from 8 to 27 feet. Groundwater level in the borings was found to be from 3 feet to 11 feet below the ground surface.

The locations and elevations of the boreholes, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47E.

2. Recommendations:

The proposed wall may be founded on spread footings placed 4 feet below finished ground level. In this event, the base of the footings will range from about El. 336.0 at the west end of the wall, to El. 356.0 at the east end. An allowable net pressure of 4.5 tons per sq. ft. may be assumed for design purposes. An adhesion value of 3000 p.s.f. may be assumed to act between the bottom of footings and the soil for purposes of computing lateral resistance.

Where convenient, depending on the depth of excavation, part of the wall may be founded on sound bedrock, utilizing a design pressure of 10.0 t.s.f. Vertical expansion joints should be constructed between the parts of the wall founded on rock and on till.

For backfill to the retaining wall, recommendations for Wall #10 should be followed.

Dewatering problems are anticipated west of B.H. 56 since the soil here at the foundation level is of a fine-grained granular nature and as such, is susceptible to conditions of unbalanced hydrostatic heads.

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

RETAINING WALL #16 -

1. Soil Conditions:

Two borings were drilled at the location of this wall. These are numbered: 45 and 46. Subsoil consists of about 5 feet of sandy silt to silty sand fill material, followed by 11 to 13 feet of very dense glacial till, followed by shaley limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. Ground water level in the boreholes was found to range from 3 to 6 feet below the ground surface.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-F-47F.

2. Recommendations:

The finished ground line on the low side of this wall ranges from approximate El. 344 at the west end to El. 363 at the east end. In this case, part of the wall at the west end will be founded, of necessity, in bedrock. The remaining portion of the wall should be founded 4 feet below the finished ground line, or 4 feet below the surface of the glacial till stratum shown on Drawing #66-F-47F, whichever is the lower elevation. For the portion of wall founded on rock, design loads up to 10 t.s.f. may be assumed. Elsewhere, allowable pressures up to 4 t.s.f. are recommended. Vertical expansion joints should be constructed between the parts of the wall founded on rock and on overburden. An adhesion value of 3000 p.s.f. may be assumed to act between the bottom of footings and the soil.

For backfill to the wall, recommendations for Wall #10 should be followed.

No dewatering problems are anticipated.

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

RETAINING WALL #18 -

1. Soil Conditions:

Ten borings were carried out at the site of this wall. These are numbered: 7, 52, 61, 62, 63, 64, 151, 152, 153, and 154. Subsoil consists of 5 to 10 feet of silty fine sand, followed by a very dense deposit of glacial till, followed by shale bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. The thickness of the till deposit ranges from 10 to 23 feet. Groundwater level in the borings was found to be 4 to 11 feet below the ground surface.

The locations and elevations of the boreholes, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47G.

2. Recommendations:

The proposed wall may be founded on spread footings placed 4 feet below finished ground level. In this event, the base of the footings will range from El. 338.0 at the west end of the wall to El. 350.0 at the east end. An allowable net pressure of 4.5 tons per sq. ft. may be assumed for design purposes. An adhesion value of 3000 p.s.f. may be assumed to act between the bottom of footings and the soil for purposes of computing lateral resistance.

For backfill to the retaining wall, recommendations for Wall #10 should be followed.

No dewatering problems are anticipated since the soil is relatively impermeable.

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

RETAINING WALL #19 -

1. Soil Conditions:

Two borings were drilled at the location of this wall. These are numbered: 53 and 54. Subsoil consists of about 3 feet of sandy silt to silty sand fill material, followed by 4 to 7 feet of very dense silty fine sand, followed by about 10 feet of hard glacial till, followed by shale bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. Groundwater level in the boreholes was found to range from 4 to 5 feet below the ground surface.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-F-47H.

2. Recommendations:

The finished ground line on the low side of this wall ranges from approximate El. 367.0 at the west end to El. 352.0 at the east end. It is recommended to found the wall on spread footings placed 4 feet below the surface of the original ground, or 4 feet below the finished ground line, whichever is the lowest elevation. In this event, the base of the wall will range from El. 360.0 at the west end to El. 347.0 at the east end. Allowable pressures of 4.5 t.s.f. may be assumed for design purposes. Dewatering problems may be encountered since part of the excavation will be in fine-grained granular soil. In this event, care must be taken to prevent 'boiling' of the excavation bases. A friction coefficient of 0.5 may be assumed to act between the bottom of footings and the soil.

For backfill to the wall, recommendations for Wall #10 should be followed.

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

RETAINING WALL #25 -

1. Soil Conditions:

Boreholes #69, 70, 130 and 131, were drilled at the site of this retaining wall. Subsoil at the wall location consists of up to 10 feet of dense silty fine sand overlying about 15 feet of glacial till, followed by shale bedrock. The glacial till deposit ranges from a very dense sandy silt with some clay and gravel, to a hard clayey silt containing sand and gravel. The lower ten feet of the deposit contains numerous shale fragments. Groundwater level in the borings was found to range from 6 to 13 feet below the level of existing ground at the centre-line of the proposed wall.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-F-47J.

2. Recommendations:

The proposed wall may be founded on spread footings located some 4 - 6 feet below finished ground levels utilizing a design pressure of 3 t.s.f. The footing elevations recommended at each borehole location, are as follows:

B.H. #70	--	El. 330.0
B.H. #69	--	El. 334.0
B.H. #130	--	El. 341.0
B.H. #131	--	El. 343.0

Intermediate points may be interpolated.

In computing the resistance to lateral movements, a friction coefficient of 0.45 may be assumed to apply between the footing bases and the subsoil below.

cont'd. /13 ...

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

RETAINING WALL #25 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

Due to the granular nature of the subsoil, it is possible that dewatering problems will be encountered and, therefore, precautions should be taken to prevent 'boiling' of the excavation bases.

For backfill to the retaining wall, recommendations given for Wall #10 should be followed.

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

RETAINING WALL #26 -

1. Soil Conditions:

Six borings were carried out at the site of this wall. These are numbered: 66, 67, 68, 116, 117 and 118. Subsoil consists of from 5 to 8 feet of loose to dense silty fine sand, followed by about 5 feet of compact to very dense fine to coarse sand to silty sand, followed by about 20 feet of hard glacial till. The hard glacial till deposit is underlain by shale bedrock and consists of clayey silt with some embedded fine gravel. Groundwater in the boreholes was found to range from 8 to 11 feet below the ground surface over most of the area.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-F-47K.

2. Recommendations:

The proposed wall may be founded on spread footings placed 4 feet below finished ground level. An allowable pressure of 3.0 t.s.f. may be assumed for design purposes. If higher pressures are required, 4.5 t.s.f. may be achieved at a depth of 6 feet below finished ground level. No major dewatering problems are anticipated since the groundwater level appears to be fairly low at the south-west half of the wall where the footings will be based in granular soil, and at the north-east half the bases will be in cohesive soil (see Drawing #66-F-47K).

In computing resistance to lateral pressures, a friction coefficient of 0.5 may be assumed for the footings on granular soil, and an adhesion value of 3000 p.s.f. may be assumed for the footings on cohesive soil.

Backfill to the retaining walls should be as recommended for Wall #10.

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

RETAINING WALL #9 -

1. Soil Conditions:

Two boreholes were drilled at the site of this wall. These holes are numbered 106 and 142. Subsoil at the site from ground level downward, was found to consist of about 5 feet of sand and gravel fill material, followed by about 20 feet of glacial till, followed by shale bedrock. The glacial till deposit consists generally of a heterogeneous mixture of clay, silt, sand and gravel, and ranges from very dense silty sand to hard clayey silt.

Groundwater in the boreholes was found to range from el. 383.0 to el. 377.0.

The locations and elevations of the borings, together with the estimated subsoil stratigraphy, are shown on Drawing #66-F-47V.

2. Recommendations:

The finished ground level on the low side of this wall ranges from zero to 14 feet above the present ground level. For spread footings it will be necessary to found the proposed retaining wall at or below el. 376.0 in which case a design load of 3.5 t.s.f. may be assumed. Since the south half of the wall will be constructed within fill material, it might be more economical to found this portion of the wall on piles. In this event, the most suitable piles would be steel H-piles, end bearing in the very dense glacial till layers. It is estimated that a design load of 70 tons/pile will be achieved at or about el. 370.0.

cont'd. /16 ...

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

RETAINING WALL #9 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

A dewatering scheme will be necessary if excavations are carried out below the groundwater level. Subsoil at this site is susceptible to conditions of unbalanced hydrostatic head and is likely to 'boil' under such conditions.

For backfill to the walls, recommendations for Wall #10 should be followed.

In computing the resistance to lateral pressures, a friction coefficient of 0.45 may be assumed for spread footings on granular soil, and an adhesion value of 3000 p.s.f. may be assumed for footings on cohesive soil.

cont'd. /17 ...

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

RETAINING WALL #40 -

1. Soil Conditions:

Two borings were carried out in the vicinity of this wall and are numbered 59 and 141. Subsoil consists of about 4 feet of silty fine sand, followed by at least 22 feet of very dense clayey silt and sand with some gravel (glacial till). Groundwater in the borings ranged from 12 to 22 feet below the ground surface.

The locations and elevations of the borings, together with the estimated soil stratigraphy, are shown on Drawing #66-F-47X.

2. Recommendations:

The proposed wall may be founded some 4 feet below finished ground level utilizing design pressures up to 3.5 t.s.f. In this event, the elevation of the footings will range from el. 344.0 at the south end to el. 336.0 at the north end. No dewatering problems are anticipated.

For computing resistance to lateral pressure, an adhesion value of 3000 p.s.f. may be assumed to act between the footing bottoms and the soil.

For backfill to the walls, recommendations for Wall #10 should be followed.

cont'd. /18 ...

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

RETAINING WALL #13 -

1. Soil Conditions:

The soil profile along the proposed wall is based on 4 boreholes numbered: 22, 34, 35 and 36, and plotted on the attached Drawing #66-F-47R. In each borehole immediately below the ground surface, a fill stratum was observed. In boreholes 22 and 34, at the south portion of the wall, the fill is about 6 - 7 ft. thick, comprising sandy silt with some clay and organic matter. The layer has a loose to compact relative density. The fill below the north portion of the wall is only some 1 - 1.5 ft. thick, consisting mainly of sand and gravel.

Underlying the fill, a heterogeneous mixture of clayey silt and sandy silt with traces of some gravel (glacial till), was encountered. Portions of the deposit, being granular in nature, have relative densities of "dense to very dense," while the cohesive layers exhibit hard consistencies. In borehole #22, shaley limestone bedrock was proved by diamond drilling from elevation 361 ft. down to 355 ft.

Groundwater was encountered in each borehole at some 4 - 7 ft. below ground level.

Locations and elevations of the boreholes as well as the estimated soil profile, are plotted on the enclosed Drawing #66-F-47R.

2. Recommendations:

In view of the foregoing, the proposed retaining wall may be supported on spread footings at relatively shallow depths.

The recommended elevations of the footing at the borehole locations, are as follows:

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

RETAINING WALL #13 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

No. of Borehole	Elevation of Base of Footing
22	381 ft. or below
34	381 ft. " "
35	390 ft. " "
36	395 ft. " "

At the above elevations, a safe bearing pressure of 4.5 t.s.f. may be assumed for design purposes.

Excavation for the footings, mainly at the south portion of the wall, will extend below the observed groundwater level. At these locations where the subsoil is of a granular nature, some "boiling" may occur under conditions of unbalanced hydrostatic head; consequently, a dewatering scheme may be necessary.

For calculations of resistance to sliding between the base of the wall and the soil, a coefficient of friction of 0.45 (for the granular sandy silts), or an adhesion value of 3000 p.s.f. (for the cohesive clayey silts), may be used.

cont'd. /20 ...

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

RETAINING WALL #14 -

1. Soil Conditions:

Four boreholes were carried out at the site of the proposed wall. The boreholes from south to north are numbered: 102, 31, 32 and 33. Subsoil in borehole #31 was found to be a clayey silt with some gravel (glacial till). This material is of a cohesive nature, having a consistency ranging from stiff to hard. In the rest of the boreholes the subsoil was observed to be sandy silt, silty sand and sand (glacial till). The latter deposits have characteristics of granular soils and they are all very dense. In borehole #102, which was drilled to a depth of 64 ft., from elevation 369.0 ft., numerous shale layers and sand seams were encountered, followed by weathered bedrock. Sound shale bedrock was proved from elevation 332 ft. down to elevation 327.0 ft.

Groundwater level was observed in each borehole. The depths of water level varied between 2 ft. and 9 ft. below ground level.

The locations and elevations of the boreholes, together with the stratigraphical profile, are plotted on the attached Drawing #66-F-47S.

2. Recommendations:

The proposed retaining wall may be supported on spread footings, within the hard and very dense glacial till deposit.

The bottom of footing should be placed some 5 - 7 ft. below present ground level.

Recommended footing elevations at the locations of the boreholes are tabulated as follows:

cont'd. /21 ...

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

RETAINING WALL #14 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

No. of Borehole	Elevation of Base of Footing
102	384 ft. or below
31	384 ft. " "
32	387 ft. " "
33	392 ft. " "

At the recommended elevation, a safe bearing pressure of 4.5 t.s.f. may be assumed for design purposes.

During the excavation, some groundwater may be encountered. The sandy silt layer appears to be susceptible to unbalanced hydrostatic head; nevertheless, it is believed that due to the anticipated shallow depths below the water level, major dewatering problems will probably not arise.

In computing the resistance of the wall against lateral earth pressure, a friction coefficient of 0.45 may be assumed to apply between the footing bases and the underlying soil.

Backfill to the retaining walls should be as recommended for Wall No. 10.

cont'd. /22 ...

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

RETAINING WALL #5 -

1. Soil Conditions:

Three boreholes - numbered 49, 50 and 51 - were carried out at the vicinity of the proposed wall.

Below the ground level, a fill material was observed, consisting of silty sand with gravel and traces of clay. The relative density of the fill is generally loose. The thickness of the layer increases toward the south, being 5 ft. at borehole #49 and 9 ft. at borehole #51.

The fill is underlain at each borehole by a glacial deposit of clayey silt with some sand and gravel. The stratum exhibits a hard consistency.

At el. 343 - 345 ft., shale bedrock with bands of limestone was encountered and proved by diamond drilling to a maximum depth of 20 ft.

Groundwater level was established in the borings between el. 348 ft. and 353 ft.

Locations and elevations of the boreholes, together with the estimated soil profile along the length of the wall are shown on Drawing #66-F-47T.

2. Recommendations:

Due to the increasing depth of excavation for the design ground line, and also on account of the inadequate strength of the fill to support the wall, recommendations for a uniform footing design cannot be given.

The north portion of the wall along an approximate length of 80 - 90 ft., may be supported on spread footings at 4 ft. below the proposed grade. The footings will likely be placed on sound bedrock, in which case, an allowable bearing capacity of 10 t.s.f. may be assumed for design purposes.

cont'd. /23 ...

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

RETAINING WALL #5 - (cont'd.)...

2. Recommendations: (cont'd.) ...

The next portion of about 200 - 250 ft. should also be founded on spread footings within the hard clayey silt stratum. The depth of the footing will vary between 4 - 7 ft. below the future grade. An allowable pressure of 4.0 t.s.f. is recommended for this section.

For the remaining length of the wall, three alternative solutions are suggested:

a) The portion in question may be supported on spread footings within the glacial till at or below el. 347 ft. The depth of the footing is estimated to be between 6 and 11 ft. below design grade. 4.0 t.s.f. design load may be employed for this foundation.

b) The wall may also be founded on a well compacted granular backfill, at some 4 ft. below the proposed grade. In this case, the loose sandy fill should be excavated down to the top of the hard glacial till (approx. el. 347 ft.) For the method of construction of the G.B.C. class A backfill, we refer to the recommendations (para. c) for Retaining Wall No. 15. A safe pressure of 2 t.s.f. may be assumed on the compacted backfill.

c) The footings for the section may be placed at four ft. below finished grade and be supported on short H-piles driven to bedrock (approx. el. 345 ft.), or to practical refusal within the glacial till.

The maximum allowable load for the section used may be assumed for design purposes.

cont'd. /24 ...

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

RETAINING WALL #5 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

For methods a) or b), it is to be noted that the silty sand fill is susceptible to conditions of unbalanced hydrostatic head. It is believed, however, that the bottom of the excavations will not "boil" after reaching the cohesive glacial till.

Vertical expansion joints should be incorporated between the portions of the wall supported on bedrock, glacial till and granular backfill.

In computing the resistance along the bottom of the footings against lateral earth pressure, an adhesion value of 3000 p.s.f. may be assumed in the clayey silt, and a friction coefficient of 0.45 for the granular backfill.

cont'd. /25 ...

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

RETAINING WALL #6 -

1. Soil Conditions:

Three boreholes were drilled along the proposed retaining wall and are numbered: 45, 47, and 48.

Subsoil consists of a 6 - 8 ft. thick layer of silty sand fill material with some gravel, having a compact to dense relative density. The fill is underlain by a stratum of hard clayey silt with embedded gravel and occasional shale fragments (glacial till). Shale bedrock with limestone bands were encountered at around el. 348 ft. below the south half of the proposed wall, and at around el. 342 ft. at the north end.

Free water level was noticed in each borehole between el. 352 ft. and el. 355 ft.

The locations and elevations of the boreholes, together with the stratigraphical profile along the proposed wall, are shown on the enclosed Drawing #66-F-47U.

2. Recommendations:

The proposed wall may be supported on spread footings.

Due to the relatively shallow depths of the bedrock below the design ground line, the footings may be placed on bedrock along the whole length of the wall. In this case, the depth of the footing will be some four ft. below the design ground line at the north end of the wall (el. 340 ft.), and some eight to nine ft. below it at the south end (approx. el. 347 - 348 ft.). By placing the footing on rock, a design load of 10 t.s.f. may be employed.

As an alternative, footings may also be placed at four ft. below the finished ground line. In this case, the north portion of the wall will be supported within the shaley

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

RETAINING WALL #6 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

bedrock; the south portion, however, will be in the hard clayey silt stratum. A safe pressure of 10 t.s.f. may be imposed on the portion of the footings supported on sound rock, and 4.0 t.s.f. on the portion supported within the clayey silt.

Bertical expansion joints should be constructed between the parts of the wall founded on rock and on the overburden.

No major dewatering problems are anticipated for the excavations.

An adhesion value of 3000 p.s.f. may be assumed for the calculation of the resisting forces against sliding along the bottom of the footing placed in the overburden.

APPENDIX I

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 :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
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
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_s	SENSITIVITY

$$\tau_f = c' + \sigma' \tan \phi'$$

$$\tau_f = c_u + \sigma \tan \phi_u$$

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 (YOUNG'S 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_0	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

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 24 . .

OUR REFERENCE NO. 6 - 5 - 29
 W.J. 66 - F - 47
 CLIENT: D.H.O.
 PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE
 LOCATION: 181,040 N. 208,090 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING & CORING
 DIAMETER OF BOREHOLE: 4"
 DATE: MAY 17, 1966
 W.P. 275 - 64-4
 ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY			REMARKS	
				NUMBER	TYPE	Advancement of Sampler	blows per foot				water content %				
							2,0	4,0	6,0	8,0	10,0	PL	W	LI	
							SHEAR STRENGTH lbs/sq ft								
384.6	0	GROUND SURFACE													
382.8	1.8	SANDY SILT FILL		1	S.S.	18									W.L. EL. 384.1' MAY 20, 1966
380.0	5	Very Dense greenish brown grey		2	S.S.	110									
375.0	10	SANDY, CLAYEY SILT TILL		3	S.S.	97									
				4	S.S.	70									
370.7	13.9	Intermittent layers of Hard Grey SILTY CLAY TILL and CALCAREOUS SHALES		5	S.S.	82/11"									
370.0				6	R.C.										
				7	R.C.	28%									
				8	R.C.	52%									
365.0	20	SHALE		9	S.S.	50/1 1/2"									
				10	R.C.	83%									
361.3	23.3	Grey SHALES - LIMESTONE BEDROCK		11	R.C.	76%									
360.0	25														
	27.3	END OF BOREHOLE													
355.0	30														

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 2.5.

OUR REFERENCE NO. 6-5-39
 W.J. 66-F-47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 181,200 N. 208,025 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: AUGERING

DIAMETER OF BOREHOLE: 4"

DATE: MAY 17, 1966

W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS			
				NUMBER	TYPE	N- or Advancement of Sampler	2.0	4.0	6.0	8.0	10.0	PL	W	LI		10	20	30
384.8	0	GROUND SURFACE																
	1.0	SANDY SILT FILL	□															
	5	Stiff Hard to Very Hard	□	1	S.S.	37												
380.0		SILTY CLAY TILL	□	2	SS	79												
	10	greenish brown grey	□	3	S.S.	52												
375.0		(shale fragments)	□	4	S.S.	85												
	13.75		□	5	S.S.	64/6"												
370.0	15	END OF BOREHOLE																
365.0	20																	

W.L. El. 379.8'
 MAY 20, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 26 . .

OUR REFERENCE NO. 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE

LOCATION: 181,480 N. 207,935 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING & CORING

DIAMETER OF BOREHOLE: 4"

DATE: MAY 17 & 18, 1966

W. P. 275 -- 64 - 4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS				
				NUMBER	TYPE	N- or Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI		10	20	30	40
386.7	0	GROUND SURFACE																	
385.0		Brown CLAYEY, SANDY SILT FILL	○																
382.7	4.0	Hard to Very Hard	○	1	S.S.	12													
380.0	5	SILTY CLAY	○	2	S.S.	41													
	10	greenish brown grey	○	3	S.S.	57													
375.0		TILL	○	4	S.S.	67													
373.7	13.5	SANDY and GRAVELLY	○	5 A B	S.S.	76/8"													
	15		○	6	S.S.	75/4"													
370.0	16.0	calcareous shale cobble and boulders	○	7	R.C.														
	20		○	8	R.C.														
	20		○	9	R.C.														
20.8			○	10	R.C.	75/4"													

W.L. El. 386.4'
MAY 20, 1966

100/5"

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 28 . .

OUR REFERENCE NO. 6-5-39
 W. J. 66-F-47

CLIENT: D.H.O.
 PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE
 LOCATION: 181,292 N. 208,285 E.
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 18, 1966
 W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY			REMARKS	
				NUMBER	TYPE	N or Advancement of Sampler	blows per foot	20	40	60	80	100	water content %	PL		W
383.8	0	GROUND SURFACE														
		3" TOPSOIL														
380.0	3.0	Stiff Very Hard														
	5	SILTY CLAY greenish brown grey		1	S.S.	65/6"										
375.0	10	TILL		2	S.S.	70/6"				100/7'						
				3	S.S.	115										
371.8	12.0	Very Dense		4	S.S.	100/6"										
370.0	15	Grey		5	R.C.											
		SANDY, GRAVELLY SILT TILL		6	S.S.	50/4"										
365.0	20	(shale fragments)		7	R.C.											
20.8		END OF BOREHOLE		8	S.S.	60/4"										

W.L. El. 381.6'
 MAY 20, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE 29...

OUR REFERENCE NO. 6-5-39
 W. J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. B HWY. No 27 INTERCHANGE
 LOCATION: 181,568 N. 208, 195 E.
 DATUM ELEVATION: 6.5 C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE 2 3/8"
 DATE MAY 17 & 18, 1966
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N - Z Advancement of Sampler	2,0	4,0	5,0	8,0	10,0	PL	W	LI	
							SHEAR STRENGTH lbs/sq ft								
385.3	0	GROUND SURFACE													
	1.5	GRAVEL, SAND, SILT, CLAY FILL	*												W. L. El. 384.1' MAY 20, 1966
	5	Very Stiff Very Hard SILTY CLAY TILL	some organic matter	1	SS.	27									
380.0				2	SS.	70									
	10	greenish brown grey		3	SS.	99									
375.0				4	SS.	55									6R. 9%, Sa. 41% SL. 38%, CL. 12%
374.3	11.0	Very Dense Grey SANDY, GRAVELLY SILT TILL		5	SS.	118									
370.0	15	cobbles boulders		6	R.C.										
367.3	18.0			7		50/11									
	20	Alternate layers of Hard SILTY CLAY TILL and SHALE		8	R.C.	30%									
365.0				9	R.C.	37%									
	25			10	R.C.	29%									
360.0															
359.3	26.0	Grey SHALE with hard bands of LIMESTONE	X	11	R.C.	97%									
355.0	30														
	31.0	END OF BOREHOLE													
	35														
350.0															

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M.

CHD: J.P.L.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 3 J . .

OUR REFERENCE NO 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D.H.O.

PROJECT: Q. E. W. S. HWY. NO 27 INTERCHANGE

LOCATION: 182,087 N 208,025 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING AUGERING & CORING

DIAMETER OF BOREHOLE 4"

ENCLOSURE NO

DATE: JUNE 13, 1966

W. P. 275 - 64 - 4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N - Z Advancement of Sampler	blows per foot						
							2.0 4.0 6.0 8.0 10.0						
							SHEAR STRENGTH lbs/sq ft						
392.9	0	GROUND SURFACE											
391.4	1.5	SANDY GRAVEL (FILL)											
390.0	5	Stiff to Very Hard CLAYEY SILT with some embedded GRAVEL		1	A.S.								
		(GLACIAL TILL)		2	S.S.	38							
385.0	10			3	S.S.	71							
		Brown Grey		4	S.S.	93							
380.0	15			5	S.S.	81/8'							
		boulders		6	S.S.	25/0"							
376.4	16.5	SANDY below el. 376.9 Ft.		7	R.C.								
375.0				8	S.S.	75/32"							
19.3	2.0	END OF BOREHOLE											

W.L. 391.7 Ft.
 JUNE 15, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 3 2 .

OUR REFERENCE NO. 6 - 5 - 39

W.J. 66 - F - 47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. I N^o 27 INTERCHANGE

LOCATION: 182,390 N 207,925 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING AUGERING & CORING
DIAMETER OF BOREHOLE 4" ENCLOSURE NO.

DATE: JUNE 13 & 14, 1966

W.J. 275 - 64 - 4

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	7' or Advancement of Sampler	20	40	60	80	100	PL	W	LI	
393.2	0	GROUND SURFACE													
		6" TOPSOIL													
		Compact to Dense Brown-Grey Mottled SANDY SILT with some GRAVEL and a trace of CLAY													
390.0	5			1	S.S.	31									
387.7	5.5	predominantly SANDY		2	S.S.	25/1"									
385.0				3	S.S.	75/4"									
384.4	8.8	(GLACIAL TILL)		4	S.S.	83/6"									
380.0		numerous boulders and SHALE fragments below el. 381.0 Ft.		4 A	R.C.										
	15			5	S.S.	75/2"									
				6	R.C.										
375.0				7	S.S.	100/4"									
	19.5	END OF BOREHOLE													
	20														


 W.L. 389.4 Ft.
 JUNE 15, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 3.3 . .

OUR REFERENCE NO. 6-5-39
 W.J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE
 LOCATION 182,640N 207,845 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASH BORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: JUNE 15, 1966
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %			REMARKS	
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	100	PL	W		LI
399.4	0	GROUND SURFACE													
		7" TOPSOIL													
		Compact Brown SILTY FINE SAND with some GRAVEL (PROBABLY FILL)		1	S.S.	18									
395.0	5	Very Dense SILTY SAND with some GRAVEL		2	S.S.	43									
				3	S.S.	103									
390.0	10			4	S.S.	75/6"									
				5 A B	S.S.	152									
385.0	15	Very Dense Brown FINE SAND		6	S.S.	60/3"									
				7	S.S.	100/6"									
380.0	20	END OF BOREHOLE													
	20.5														

100/3 1/2"

W.L. 389.4 Ft.
 JUNE 15, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 35 .

OUR REFERENCE NO. 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: O. E. W. & HWY. N^o 27 INTERCHANGE

LOCATION: 182, 395 N 207, 645 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: JUNE 11, 1966

W. P. 275 - 60 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI		
				SHEAR STRENGTH			lbs/sq ft									
							5	10	15	20						
395.4	0	GROUND SURFACE														
		8" SAND & GRAVEL FILL														
		Very Hard Brown-Grey Mottled														
390.0	5	CLAYEY SILT with some GRAVEL (GLACIAL TILL)		1	S.S.	84										
				2	S.S.	45										
385.0	10	boulder		3	S.S.	50/1"										
				3A	R.C.											
	12.5	Very Dense Grey		4	S.S.	98/11"										
380.0	15	SILTY SAND with some GRAVEL (wet)		5		50/3"										
	20			6	S.S.	100/1"										
375.1	20.1	END OF BOREHOLE														

W.L. 389.6 Ft.
JUNE 15, 1966.

$\gamma_s = 133$ P.C.F.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 36 .

OUR REFERENCE NO. 6 - 5 - 39

W.J. 66 - F - 47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 182,740N 207,550E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: JUNE 13 & 14, 1966

W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	2,0	4,0	6,0	8,0	100		
399.5	0	GROUND SURFACE											
398.0	1.5	GRAVELLY, SANDY SILT FILL											
		Compact to		1	S.S.	28							
395.0	5	Very Dense Greenish Brown SANDY SILT with some GRAVEL (GLACIAL TILL)		2	S.S.	80/3"							
				3	S.S.	100/3"							
390.0	10			4	S.S.	80/6"							
389.0	10.5			5	S.S.	50/4"							
385.0	15	Very Hard Grey CLAYEY SILT with some embedded GRAVEL (GLACIAL TILL)		6	S.S.	50/2"							
380.0	19.1			7	S.S.	100/1"							
	20	END OF BOREHOLE											



W.L. 395.7 Ft.
JUNE 15, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 37.

OUR REFERENCE NO. 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 180,175 N; 208,300 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING AUGERING & CORING

DIAMETER OF BOREHOLE 4"

DATE: MAY 19, 1966

W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	2,0	4,0	6,0	8,0	10,0	PL	W	LI	
381.0	0	GROUND SURFACE													
	1.5	Dark Brown SILTY TOPSOIL		1	S.S.	6									
	5	Compact Very Dense FINE SANDY SILT with a trace of fine gravel. oxidized brown grey		2	S.S.	59/6"									
375.0				3	A B	S.S. 50/3"									
	10	(GLACIAL TILL)		4	S.S.	74/6"									
370.0	12.0	----- sand and gravel seam -----		5	S.S.	69/6"									
	13.8	-----		6	S.S.	83/6"									
365.0	15														
	17.9	Intermittent layers of Grey CLAYEY SILT and SHALE		7	R.C.										
360.0	20	END OF BOREHOLE		8	S.S.	94/5"									

W. L. El. 379.4'
MAY 20, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 40 . .

OUR REFERENCE NO 6 - 5 - 39
 W. J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE
 LOCATION: 180, 465 N.; 208, 485 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 20, 1966
 W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY			REMARKS	
				NUMBER	TYPE	Advancement of Sampler	blows per foot				water content %				
							2,0	4,0	6,0	8,0	10,0	PL	W	LI	
							SHEAR STRENGTH				lbs/sq ft				
388.9	0	GROUND SURFACE													
		6" TOPSOIL													
		Brown FINE SAND and SILT with some gravel		1	S.S.	13									
385.0	5	FILL													
		Dark Brown ORGANIC SANDY SILT		2	S.S.	29									
380.0	10			3	S.S.	17									
		V. Stiff, Multicoloured CLAYEY SILT (TILL)		4	S.S.	27									
375.0	13.0														
		Very Dense Grey SILT with some fine sand (saturated)		5	S.S.	115									
				6	S.S.	50/3"									
370.0	20														
				7	S.S.	40/2"									
365.0	25														
				8	S.S.	90/9"									
25.25		END OF BOREHOLE													

W. L. El. 379.5'
 MAY 20, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 42 . .

OUR REFERENCE NO. 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE

LOCATION: 180, 045 N.; 208, 665 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: MAY 20, 1966

W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N ₆₀ Advancement of Sampler	2,0	4,0	6,0	8,0	10,0		
379.2	0	GROUND SURFACE											
	1.0	GRANULAR FILL Compact, Dark Brown ORGANIC SANDY SILT (boulder) FILL		1	S.S.	23							
375.0	4.0	Very Dense FINE SANDY SILT Greenish Brown Grey trace of gravel		2	S.S.	27							
	5			3	S.S.	54							
	10			4	S.S.	70							
370.0		Saturated SILT		5	S.S.	50/6"							
	13.0			6	S.S.	22							
365.0	15	(GLACIAL TILL)		7	S.S.	80/8"							
	17.0			8	R.C.								
362.2	20	Grey SHALE with hard bands of LIMESTONE		9	R.C.	80%							
360.0													
	22.0	END OF BOREHOLE											

W. L. El. 377'
MAY 20, 1966
Boulder at 3', moved
B.H. 1 ft. north.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 43 . .

OUR REFERENCE NO. 6 - 5 - 39

W.J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 177, 221 N; 208, 255 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING AUGERING & CORING

DIAMETER OF BOREHOLE: 4"

ENCLOSURE NO.

DATE: MAY 25, 1966

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %		REMARKS	
				NUMBER	TYPE	N or Advancement of Sampler	2,0	4,0	6,0	8,0	10,0	PL	LI		
363.4	0	GROUND SURFACE													
		TOPSOIL													
	1.5	Compact, Brown SILTY FINE SAND													
360.0	5	Very Dense Grey SILT		1	S.S.	50/4"									
	8.0	with some sand and gravel													
355.0	10	(clayey)		2	S.S.	68									
	12.0														
350.0	15	(shale fragments)		3	S.S.	78									
	16.0	Grey		4	S.S.	51/6"									
347.4	20	SHALE BEDROCK with bands of hard LIMESTONE		5	R.C.	84.8%									
345.0				6	R.C.	75%									
	21.5	END OF BOREHOLE													

W. L. El. 360.2'
MAY 27, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 4.5 .

OUR REFERENCE NO. 6 - 5 - 39
 W. J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE
 LOCATION: 177,385 N, 209,568 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 24 & 25, 1966
 W. P. 275 - 64 - 4

ENCLOSURE NO

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY				REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	blows per foot					water content %				
							2.0 4.0 6.0 8.0 10.0					PL W LI				
							SHEAR STRENGTH lbs/sq ft					10 20 30 40				
360.6	0	GROUND SURFACE														
		4" ASPHALT														
		Compact, Brown GRAVELLY to SANDY SILT FILL														
355.0	5.5	Grey CLAYEY SILT with some embedded coarse sand and fine gravel. (GLACIAL TILL)		1A B	S.S.	21										
350.0	10			2	S.S.	26										
		Very Stiff Very Hard														
345.0	15	Alternate layers of Hard CLAYEY SILT and SHALEY LIMESTONE		3	S.S.	10073										
342.6	18.0			4	R.C.											
340.0	20	Grey SHALEY LIMESTONE and SHALE BEDROCK		5	R.C.											
				6	R.C.											
335.0	25.5	END OF BOREHOLE														

W.L. El. 355.6'
 MAY 28, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 46 . .

OUR REFERENCE NO. 6 - 5 - 39
W. J. 66 - F - 47

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE
LOCATION: 177,440 N; 209,729 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: MAY 24, 1966
W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI	
362.6	0	2" ASPHALT Loose SANDY SILT and GRAVEL FILL													
360.0															
358.6	4.0	Compact, Brown Stratified SILTY FINE SAND		1	S.S.	21									
355.6	7.0	Grey Hard CLAYEY V. Stiff SILT		2	S.S.	40									
355.0															
350.0	11.5	some embedded fine gravel. V. Hard (GLACIAL TILL)		3	S.S.	25									
		Shale Fragments		4	S.S.	95/10"									
347.6	15			5	S.S.	100/1"									
345.0	17.5	SHALE BEDROCK		6	R.C.										
	20	END OF BOREHOLE													

W.L. El. 358.7
MAY 24, 1966
CAVE IN El. 358.6
MAY 28, 1966
So. 70% ; Si. 30%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 48 . . .

OUR REFERENCE NO. 6-5-39

YOUR REF. No. W. J. 66-F-47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE

LOCATION: 177,020 N ; 209,600 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: JULY 19-20. 1966.

W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS	
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI			
360.4	0	GROUND SURFACE															
		2" ASPHALT															
		Dense Brown GRAVELLY SAND (FILL)															
356.4	4	Compact Brown-Grey SILTY SAND with a trace of GRAVEL and CLAY (FILL)															
355.0	5			1	SS	II											
352.4	8	Very Hard Grey CLAYEY SILT with embedded GRAVEL (GLACIAL TILL)															
350.0	10			2	SS	80											
347.9	12.5	Grey SHALE with intermittent layers of LIMESTONE															
345.0	15			3	RC	62%											
				4	SS	100/2"											
343.2	17.2	weathered sound BEDROCK															
				5	RC	67%											
340.0	20			6	SS	100/2"											
				7	RC	80%											
		END OF BOREHOLE															

Gr. 9% ; Sa. 52 %
Sl. 30% ; Cl. 9%

W.L. 352.0 Ft.
JULY 20. 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 49 . . .

OUR REFERENCE NO. 6-5-39
 YOUR REF. W. J. 66-F-47
 CLIENT D. H. O.
 PROJECT Q. E. W. & HWY. No. 27. INTERCHANGE
 LOCATION 177,260 N ; 209,400 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE 2 3/8"
 DATE JULY 18, 1966.
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY				REMARKS		
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	100	PL	W	LI		10	20
359.2	0	GROUND SURFACE															
		1" ASPHALT	[Symbol]														
		Compact to Loose Brown SAND, GRAVEL CLAY & SILT (FILL)	[Symbol]	1a	CS												
355.0	4.5	ORGANIC TOPSOIL	[Symbol]	1b	CS												
354.0	5.2	Very Stiff to Very Hard, Grey CLAYEY SILT	[Symbol]	2	SS	18											
350.0	10	with some SAND and a trace of GRAVEL (GLACIAL TILL)	[Symbol]	3	SS	70/2"											
345.0	15		[Symbol]	4	SS	80/4"											
343.2	16	Grey SHALE with intermittent LIMESTONE BANDS	[Symbol]	5	RC	43 %											
340.0	20	BEDROCK	[Symbol]	6	RC	97 %											
335.0	25		[Symbol]														
		END OF BOREHOLE															
330.0	30																

W.L. 353.5 Ft.
 Gr. 5% ; Ss. 20%
 Sl. 60% ; Cl. 15%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 50 . . .

OUR REFERENCE NO. 6-5-39
YOUR REF. W.J. 66-F-47

CLIENT: D.H.O.
PROJECT: Q.E.W & HWY. No. 27. INTERCHANGE
LOCATION: 177,080 N ; 209,455 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: JULY 19, 1966.
W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	100	PL	
357.9	0	GROUND SURFACE											
		2" ASPHALT											
355.0	5	Loose Brown - Grey SILTY SAND with some GRAVEL and a trace of CLAY (FILL)		1	SS	6							
350.0	10	Very Hard Grey CLAYEY SILT with SHALE FRAGMENTS		2	SS	100/6"							
347.9				3	SS	100/1 1/2"							
345.3 345.0	12.6	Dark Grey SHALE BEDROCK with some hard bands of LIMESTONE		4	RC	79 %							
340.0	20			5	RC	100 %							
335.0		END OF BOREHOLE											

Gr. 10 % ; Sa. 50 %
Sl. 35 % ; Cl. 5 %

W.L. 343.6 Ft.
JULY 19, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 5!

OUR REFERENCE NO. 6-5-39
YOUR REF. W.J.66-F-47

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
LOCATION: 176,920 N ; 209,500 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: JULY 19, 1966.
W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY water content %				REMARKS		
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI	10		20	30
357.4	0	GROUND SURFACE																
	1.0	SAND and GRAVEL Loose SILTY SAND with a trace of GRAVEL and CLAY (FILL)																
355.0				1	SS	5												
	5			2	SS	3												
350.0																		
348.7	8.7	ORGANIC TOPSOIL		3	SS	3												
347.4	10	Very Hard Grey CLAYEY SILT with SHALE fragments		4	SS	100/4"												
345.0	12.4	Grey SHALE with intermittent layers of LIMESTONE BEDROCK		5	SS	100/1"												
	15			6	RC	80%												
340.0		END OF BOREHOLE																
	20																	
335.0																		

▼ W.L. 352.4 Ft.
Gr. 5% ; Sa. 50%
Sl. 37% ; Cl. 8%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 52 .

OUR REFERENCE NO. 6 - 5 - 39
 W. J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE
 LOCATION: 177, 045 N; 207, 873 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 26 & 27, 1966
 W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS		
				NUMBER	TYPE	N ₆₀ or Adj. of Sampler	2,0	4,0	6,0	8,0	10,0	PL	W	LI	10		20	30
364.8	0	GROUND SURFACE																
360.8 360.0	4.0 5	Dark Brown Compact SANDY SILT FILL																
		Dense Brown SILTY Grey FINE SAND (layered structure)		1	S.S.	44												
355.0	9.3 10	Very Hard, Grey CLAYEY SILT		2	S.S.	155												
352.8	12.0	varved structure less hard																
350.0	15	embedded coarse sand and fine gravel.		3	S.S.	103												
349.3				4	S.S.	98												
345.0	19.5 20	Grey SHALE BEDROCK with bands of Hard LIMESTONE		5	S.S.	50.1"												
				6	R.C.	84.6%												
340.0	25			7	R.C.	49%												
				8	R.C.	29.1%												
335.0	28.0 30	END OF BOREHOLE																

W. L. El. 361.0'
 MAY 28, 1966
 S_u 85% ; S_i 15%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 5.4 . .

OUR REFERENCE NO. 6 - 5 - 39

W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. № 27 INTERCHANGE

LOCATION: 176, 835 N; 207, 528 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: MAY 25 & 26, 1966

W. J. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	2.0	4.0	6.0	8.0	100	PL	W	LI	
365.9	0	GROUND SURFACE													
		5" TOPSOIL													
363.4	2.5	SANDY SILT FILL Brown													
	5	Dense Very Dense SILTY FINE SAND (layered structure)		1	S.S.	34									
360.0				2	S.S.	79									
355.4	9.5			3	S.S.	100/3									
355.0	10	Very Hard, Grey CLAYEY SILT with some embedded coarse sand and fine gravel. (GLACIAL TILL)		4	S.S.	70/6"									
	15			5	S.S.	82									
350.0	15.5	Alternate layers of Hard CLAYEY SILT and SHALE.		6	R.C.										
345.0	20	END OF BOREHOLE													

100/6"

W.L. El. 362.1'
MAY 28, 1966
Sa. 75% ; Si. 25%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 56 . .

OUR REFERENCE NO. 6 - 5 - 39

W.J. 66-F-47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE

LOCATION 176, 532 N ; 207,662 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING

DIAMETER OF BOREHOLE 4"

DATE: JUNE 1, 1966

W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY				REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	blows per foot					water content %				
							2,0	4,0	6,0	8,0	10,0	PL	W	LI		
							SHEAR STRENGTH					lbs/sq ft				
363.3	0	GROUND SURFACE														
		6" TOPSOIL														
		Brown														
360.0		Compact to Dense														
	5	FINE SAND														
		with some silt			1	S.S.	45									
355.0	8.0	Hard, Grey														
	10	CLAYEY SILT			2	S.S.	39									
		with embedded														
		gravel.														
350.0	15	sandy			3	S.S.	50/2"									
345.0					4	S.S.	75/6"									
343.3	20	(boulder)			5	R.C.	30%									
340.0		Dark Grey			6	R.C.	77.8%									
		CALCAREOUS SHALE														
		BEDROCK														
24.5	25	END OF BOREHOLE														

100/11"

Sa. 85 % ; Si. 15 %

W.L. El. 357.2'
JUNE 3, 1966

Gr. 26 % ; Sa. 26 %
Si. 38 % ; Cl. 10 %

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 57 . .

OUR REFERENCE NO. 6 - 5 - 39
 W.J. 66 - F - 47
 CLIENT: D. H. O
 PROJECT: O. E. W. & HWY. NO 27 INTERCHANGE
 LOCATION: 176, 218 N ; 207, 395 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING & CORING
 DIAMETER OF BOREHOLE: 4"
 DATE: JUNE 1 & 2, 1966
 W.P. 275 - 64 - 4
 ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY				REMARKS
				NUMBER	TYPE	N ₆₀ or Advancement of Sampler	blows per foot					water content %				
							2,0	4,0	6,0	8,0	10,0	PL	W	LI		
							SHEAR STRENGTH					lbs/sq ft				
360.8	0	GROUND SURFACE														
360.0		4" GRAVEL FILL														
		Compact to Dense Greyish - Brown														
	5	SILTY, SANDY GRAVEL													Gr. 69% ; Sa. 17% Si. 15%	
355.0	5.8	Hard, Grey (boulders)													W.L. El. 354.5' JUNE 3, 1966	
	10	CLAYEY SILT with embedded gravel.													Gr. 10% ; Sa. 20% Si. 50% ; Cl. 20%	
350.0		(GLACIAL TILL)														
	15	(boulder)														
345.0		Very Dense Grey													Gr. 15% ; Sa. 40% Si. 40% ; Cl. 5%	
	17.5	SANDY SILT with some clay and gravel (GLACIAL TILL)														
340.0																
	20															
	24.0	Alternate layers of CLAYEY SILT and SHALE														
336.8	25															
335.0																
	28.8															
330.0	30	END OF BOREHOLE														

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 58 .

OUR REFERENCE NO 6-5-39
W.J. 66-F-47

CLIENT: D.H.O.
PROJECT: Q.E.W. & HWY No 27 INTERCHANGE
LOCATION: 175,900 N ; 207,155 E
DATUM ELEVATION: G.S.C.

METHOD OF BORING: AUGERING & CORING
DIAMETER OF BOREHOLE: 4"
DATE: JUNE 2 8 3, 1966
W.P. 275-64-4

ENCLOSURE NO

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI		
							SHEAR STRENGTH lbs./sq ft									
354.7	0	GROUND SURFACE														
		4" GRAVEL FILL Reddish Brown FINE SAND														
352.2	2.5															
350.0	5	Hard to very Hard Grey CLAYEY SILT		1	S.S.	29										
		with some embedded Gravel (Glacial TILL)														
345.0	10			2	S.S.	66										
		(boulders)														
340.0	15			3	S.S.	93										
		frequent boulders below el. 335 ft.		3A	R.C.											
335.0	20			4	S.S.	75/6"										
				5	R.C.											
330.0	25			5A	R.C.											
				6	S.S.	79										
325.0	30			7	S.S.	25/1"										
				7A	R.C.											
324.2	30.5	Dark Grey SHALE with bands of Hard LIMESTONE		8	S.S.	77/5"										
				9	R.C.	53%										
320.0	35			10	R.C.	50%										
315.0	40	END OF BOREHOLE														

W.L. EL. 343.4
JUNE 6, 1966.

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CH'D.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 60 . .

OUR REFERENCE NO 6-5-39
W.J. 66-F-47

CLIENT: D.H.O.
PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE
LOCATION: 175, 712 N.; 207, 005 E.
DATUM ELEVATION: G.S.C.

METHOD OF BORING: AUGERING & CORING
DIAMETER OF BOREHOLE 4"
DATE: JUNE 6, 1966
W.P. 275-64-4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N or Adjustment of Sampler	20	40	60	80	100	PL	W	LI	
351.4	0	GROUND SURFACE													
350.0		8" SANDY TOPSOIL													
		Very Dense SANDY SILT with some gravel and a trace of clay.													
345.0	5			1	S.S.	53									GR. 10%; So. 20% Sl. 58%; Cl. 12% W.L. El. 345' JUNE 11, 1966
	7.5	Brown Grey (GLACIAL TILL)													
340.0	10			2	S.S.	64									GR. 5%; So. 35% Sl. 55%; Cl. 5%
	15			3	S.S.	67 1/4"									
335.0	20	(boulders)		4	R.C.										
	25	sand content increases below elev. 330 ft.		5	S.S.	80 3/4"									
330.0				5A	R.C.										GR. 25%; So. 45% Sl. 30%
				6	S.S.	50 1/2"									
				7	R.C.										
				8	S.S.	72 1/8"									
				9	W.S.										
				10	S.S.	25 1/4"									
				11	W.S.										
				12	S.S.	90 2/5"									
				12A	W.S.										
				13	S.S.	100 1/2"									
				13A	R.C.										
				14	S.S.	100 1/4"									
315.0		END OF BOREHOLE													
	40														

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 61.

OUR REFERENCE NO. 6-5-39
 W.J. 66-F-47

CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE
 LOCATION: 176,500 N ; 207,440 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE 2 3/8"
 DATE: MAY 31, 1966
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS			
				NUMBER	TYPE	Zb Adjustment of Sample	20	40	60	80	100	PL	W	LI	10		20	30	40
							SHEAR STRENGTH lbs/sq ft												
364.4	0	GROUND SURFACE																	
	1.5	3" TOPSOIL to SANDY SILT FILL																	
	5	Dense, Brown SILTY FINE SAND		1	S.S.	7.5											Sa. 82% ; Si. 18%		
356.4	8.0	Hard to V. Hard Grey CLAYEY SILT with some embedded gravel.		2	S.S.	4.2											Gr. 7% ; Sa. 26% Si. 50% ; Cl. 17%		
355.0	10			3	S.S.	7.5													
350.0	15			4	S.S.	75/6"													
	17.0	thin seams of silt or fine sand.		5	S.S.	55/4"													
345.0	20			6	S.S.	100/2"													
341.6	22.8	Grey SHALE BEDROCK		7	R.C.	70%													
340.0	25																		
	27.76	END OF BOREHOLE																	
335.0	30																		

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: D.A.M. CHD

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 62 . .

OUR REFERENCE NO. 6 - 5 - 39
 W.J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE
 LOCATION: 176, 315 N ; 207, 295 E
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: JUNE 1 - 3, 1966
 W.P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N- N- Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI	
363.0	0	GROUND SURFACE													
		3" TOPSOIL Compact													
361.0 360.0	2	SANDY SILT Fill													
	5	Compact Brown FINE SAND. (trace of organic matter above elev. 357.0')		1	S.S.	26									
355.0 353.5	9.5 10	Very Hard Grey CLAYEY SILT with some embedded Gravel (GLACIAL TILL)		2	S.S.	51									
	15	(boulders)		3	S.S.	100/5"									
345.0	20			4	R.C.										
343.0				5	S.S.	100/2"									
340.0	25	Alternate Layers of Hard CLAYEY SILT (TILL) and SHALE		6	R.C.										
				7	S.S.	65/6"									
				8	R.C.										
				9	S.S.	60/3"									
				10	R.C.										
335.0				11	S.S.	40/2"									
	30			12	R.C.										
				13	S.S.	100/3"									
330.0	35			14	R.C.	30%									
325.0	35-2	END OF BOREHOLE		15	S.S.	100/2"									

W.L. EL. 352.0'
 JUNE 6, 1966.

NOTE:
 SLIGHT ARTESIAN PRESS.
 OBSERVED BETWEEN
 EL. 333 and 328 Ft.
 HEAD FEW INCHES
 ABOVE GROUND.
 PRESSURE CEASED
 AFTER 1/2 HOUR.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 6.3 .

OUR REFERENCE NO. 6-5-39
 W. J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27
 LOCATION: 176, 155 N ; 207, 155 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
 DIAMETER OF BOREHOLE 2 3/8"
 DATE: JUNE 3 - 6, 1966
 W. P. 2 75 - 64 - 4
 ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	Advancement of Sampler	2,0	40	6,0	8,0	100	PL	W	LI	
361.0	0	GROUND SURFACE													
360.0		3" TOPSOIL Generally Dense to Compact Brown	[Symbol]												
355.0	5	FINE SAND with some SILT	[Symbol]	1	S.S.	42									
352.0	9	Hard to very Hard Grey CLAYEY SILT with some embedded gravel (Glacial TILL)	[Symbol]	2	S.S.	41									
350.0	10														
345.0	15			3	S.S.	60									
340.0	20	(boulder)	[Symbol]	4	S.S.	100/0"								No Penetration	
				5	R.C.										
				6	S.S.	60/6"									
335.0	25			7	R.C.										
				8	S.S.	75/6"									
				9	R.C.										
332.1	28.9	Alternate Layers of CLAYEY SILT and SHALE	[Symbol]	10	S.S.	60/4"									
330.0	30			11	R.C.										
				12	S.S.	60/4"									
				13	R.C.	50%									
328.0	33	Dark Grey SHALE BEDROCK	[Symbol]	14	S.S.	100/0"								No Penetration	
325.0	35			15	R.C.	60%									
38.0	40	END OF BOREHOLE													
320.0															

W. L. EL. 354.0'
 JUNE 8, 1966

VERTICAL SCALE: 1 IN TO 5 FT.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 64 . .

OUR REFERENCE NO 6 - 5 - 39
W.J. 66 - F - 47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 176,225 N ; 207,033 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE: JUNE 6 & 7, 1966

W.P. 275 - 64 - 4

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS		
				NUMBER	TYPE	N or Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI	10		20	30
361.1	0	GROUND SURFACE																
360.0		12" SANDY TOPSOIL Compact to Dense Brown	[Symbol]															
	5	FINE SAND with some SILT	[Symbol]															
355.0				1	S.S.	43												
354.1	7	Hard to Very Hard Grey	[Symbol]															
	10	CLAYEY SILT with some embedded GRAVEL	[Symbol]	2	S.S.	46												
350.0				3	S.S.	58												
	15	(GLACIAL TILL)	[Symbol]	4	S.S.	38												
345.0		(boulder)	[Symbol]	5	S.S.	68/10"												
	20		[Symbol]	6	R.C.													
340.0			[Symbol]	7	S.S.	95												
21.5		END OF BOREHOLE																

W.L. 356.0 Ft.
 JUNE 8, 1966.
 So 82% ; Si 18%

100/10"

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 6.6 .

OUR REFERENCE NO. 6 - 5 - 39

W.J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE

LOCATION: 174,748 N, 206,020 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: MAY 27, 1966

W.J. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N or Adjustment of Sampler	blows per foot				PL W LI				
							2,0	4,0	6,0	8,0	100				
							SHEAR STRENGTH lbs/sq ft								
351.9	0	GROUND SURFACE													
350.0	1.9	4" TOPSOIL Loose Dark Brown													
345.0	6.9	SILTY FINE SAND FILL		1	S.S.	4									So. 75% ; Si. 25%
343.4	8.5	Hard, Grey CLAYEY SILT with some embedded fine gravel.		2	S.S.	40									GR. 4% ; So. 42% Si. 46% Cl. 8%
340.0	11.9														
335.0	16.9	(GLACIAL TILL)		3	S.S.	85									
330.0	21.9	thin fine sand and silt seams		4	S.S.	71									GR. 16% ; So. 30% Si. 43% ; Cl. 11%
	23.9	shale fragments		5	S.S.	65									
326.3	25.6			6	S.S.	100/2"									
325.0	26.9	Dark Grey SHALE BEDROCK		7	R.C.	70%									W.L. El. 329.0' JUNE 2, 1966
320.0	31.9	END OF BOREHOLE													
	35														

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CHD.-

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 67 . .

OUR REFERENCE NO. 6-5-39
W.J. 66-F-47

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. N° 27 INTERCHANGE
LOCATION: 174,558 N; 205,882 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: MAY 30, 1966
W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS		
				NUMBER	TYPE	N - Z - Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI		10	20
353.3	0	GROUND SURFACE															
		3" TOPSOIL															
		Loose to Compact Oxidized, Brown SILTY FINE SAND															
350.0	5																
347.8	5.8	Dense, Brown SANDY, GRAVELLY SILT		1	S.S.	75/6"											So. 82%; Si. 18%
345.0																	W. L. E. 345.3' JUNE 2, 1966
344.3	9.0	Very Hard Grey CLAYEY SILT with embedded fine gravel. (GLACIAL TILL)		2	S.S.	60											
340.0	15			3	S.S.	74											
				4	S.S.	70											GR. 10%; So. 35% Si. 43%; Cl. 12%
335.0	20	Shale Fragments		5	S.S.	92/8"											
				6	S.S.	50/3"											
330.0	25			7	S.S.	50/2"											
325.0	30	Layers of Hard Shale		8	S.S.	100/3"											
322.3	31.0	Grey SHALE BEDROCK		9	R.C.												
320.0	33.2	END OF BOREHOLE		10	S.S.	100/2"											
	35																

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CHD:

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 6 8 . .

OUR REFERENCE NO. 6 - 5 - 39
 W. J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. N^o 27 INTERCHANGE
 LOCATION: 174,400 N; 205,770 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 30, 1966
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %				REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI		
							SHEAR STRENGTH lbs/sq ft									
352.6	0	GROUND SURFACE														
350.0	5	Compact, brown SANDY SILT some tar, ashes FILL		1 A B	S.S.	15										
347.3	5.3	Dense to Compact Brown SILTY SAND with some gravel		2	S.S.	36										
345.0																
342.3	10.3			3 A B	S.S.	28										
340.0		Very Hard Grey CLAYEY SILT		4	S.S.	62										
	15			5	S.S.	72										
335.0		with some embedded fine gravel. (GLACIAL TILL)		6	S.S.	50/3"										
	20															
330.0	22.0	Intermittent layers of SHALE and CLAYEY SILT	X V X X	7	R.C. 50%											
	25		X X X X	8	S.S.	100/1/2"										
		END OF BOREHOLE														

100/8"

GR. 19%; S_c. 47%
 Si. 31%; Cl. 3%
 W. L. E. 343.8'
 JUNE 2, 1966
 GR. 12%; S_c. 60%
 Si. 18%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 69 . .

OUR REFERENCE NO. 6 - 5 - 39
 W. J. 66 - F - 47
 CLIENT: D. H. O.
 PROJECT: Q.E.W. B HWY. N° 27 INTERCHANGE
 LOCATION: 174, 648 N; 205, 172 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 29 - 30, 1966
 W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY water content %	REMARKS
				NUMBER	TYPE	N ₆₀ Advancement of Sampler	blows per foot	2.0	4.0	8.0		
351.7	0	GROUND SURFACE										
	1.0	TOP SOIL Loose FINE SAND with some org. matter										
345.0	4.0	Dense, Brown SILTY FINE SAND with seams of med. to coarse sand and occasional pockets of silt.		1	S.S.	39						GR. 5%; Sa. 60% Si. 2.4%; Cl. 1%
	10.3	Very Hard Grey CLAYEY SILT with embedded coarse sand and gravel. (GLACIAL TILL)		2	S.S.	61						
335.0	17.0	Very Dense Grey SAND & SILT with some gravel, shale fragments and a trace of clay. (GLACIAL TILL)		3	S.S.	67/8"						GR. 8%; Sa. 40% Si. 35%; Cl. 5%
	20			4	S.S.	50/5"						W.L. EL. 332.5' MAY 31, 1966
	25			5	S.S.	50/4"						
	25			6	S.S.	25 7/8"						
327.0	25	Grey SHALE BEDROCK with bands of LIMESTONE		7	R.C.	25%						
325.0				8	R.C.	46.6%						
	30			9	R.C.	60.6%						
		END OF BOREHOLE										
320.0												
	35											

VERTICAL SCALE 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 70 . .

OUR REFERENCE NO. 6-5-39
 W. J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE
 LOCATION: 174,768 N; 206,282 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: MAY 27, 1966
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY			REMARKS
				NUMBER	TYPE	N- Advancement of Sampler	blows per foot					water content %			
							20	40	60	80	100	PL — W — LI			
							SHEAR STRENGTH					lbs/sq ft			
352.1	0	GROUND SURFACE													
	1.0	TOPSOIL													
350.0		SILTY FINE SAND FILL													
	5	to													
345.0		GRAVELLY SAND FILL		1A B	S.S.	12									
				2	C.S.										
	9.0	Very Dense Grey		3	S.S.	54									
340.0	10	SANDY SILT													
	15	with some clay and embedded FINE GRAVEL.		4	S.S.	48									
335.0		(GLACIAL TILL)													
	18.0			5	S.S.	40/3"									
330.0	20	Shale Fragments													
	25			6	S.S.	7/2"									
326.9	25.2	Grey		7	R.C.	50%									
325.0		SHALE BEDROCK		8	R.C.	78.4%									
320.0	31.75	END OF BOREHOLE													
	35														

W. L. E1. 328-2'
 MAY 31, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 102 .

OUR REFERENCE NO. 6-6-25

CLIENT: D. H. O.
 PROJECT: O. E. W. & HWY. No. 27 INTERCHANGE
 LOCATION: 181, 980 N ; 208, 074 E
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/4"
 DATE: JUNE 21 - 24, 1966
 WR 278-64

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY			REMARKS
				NUMBER	TYPE	WATER CONTENT %	2.0	4.0	6.0	8.0	10.0	PL	W	
390.1	0	GROUND SURFACE												
	1	dark grey Silt seam												
	2													
	5	Very Dense Sandy SILT with some Gravel and Clay		1	SS	86								W.L. 384.2 ft. JUNE 25, 1966
				2	SS	112								
	10	brown grey (Glacial Till)		3	SS	90/70								
				4	SS	75/60								
	15			5	SS	95/70								
	20			6	SS	100/72								
	20.5	Numerous SHALE layers and SAND seams		7	R.C.	12 %								CAVE-IN 369.0 ft. JUNE 25, 1966
	21			8	SS	100/72								
	23			9	R.C.	20 %								
	30			10 A	SS	100/73								
	35			11	R.C.	0 %								
	40			12	SS	100/73								
	43			13	SS	100/70								
	45	grey SHALE BEDROCK		14	R.C.	45 %								
	50			15	R.C.	50 %								
	55	Broken, weathered		16	R.C.	15 %								
	60	Sound		17	R.C.	95 %								
	65	END OF BOREHOLE												

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: C.F. CHD

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 1.0.6 .

OUR REFERENCE NO 6 - 6 - 24

CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. NO 27 INTERCHANGE
 LOCATION: 180, 640 N; 208, 460 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: JUNE 25-27, 1966
 W P 35 - 65

ENCLOSURE NO

ELEVATION +ft	DEPTH +ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %				REMARKS		
				NUMBER	TYPE	No. of Advancement of Sampler	2,0	4,0	6,0	8,0	10,0	PL	W	LI		10	20
382.7	0	GROUND SURFACE															
380.0		Compact CLAYEY SILT and GRAVEL (FILL)															
379.2	3.5	Compact, Brown COARSE SAND															
375.0	5	Very Dense Grey SAND and SILT with a trace of GRAVEL and CLAY (GLACIAL TILL)		1	S.S.	60											W.L. 376.2 Ft. JUNE 28, 1966. Gr. 7% ; Sa. 32% Si 49% ; Cl. 12%
	10			2	S.S.	75/6"											Gr. 8% ; Sa. 46% Si. 46%
370.0	15	Very Dense Grey SILT with a trace of CLAY and some FINE SAND SEAMS		3	S.S.	80/8"											Sa. 15% ; Si 80% CL 5%
				4	S.S.	100/4"											
				5	S.S.	40/2"											
365.0	20	Very Dense Grey SAND and SILT		6	W.S.												
				7	S.S.	60/6"											Sa. 40% ; Si. 60%
360.0	23	Hard CLAYEY SILT (GLACIAL TILL)		8	S.S.	100/4"											
359.7	25																
357.6	25.1	Grey SHALE BEDROCK		9	R.C.	95%											
355.0	30																
	30.5	END OF BOREHOLE															
350.0	35																

VERTICAL SCALE 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CH'D

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 118 . .

OUR REFERENCE NO. 6-5-39
 W. J. 56-F-47
 CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. NO 27 INTERCHANGE

LOCATION: 174,060 N; 205,508 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: AUGERING

DIAMETER OF BOREHOLE 4"

DATE: JUNE 15, 1966

W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	LI	
352.8	0	GROUND SURFACE													
	1-3	SANDY TOPSOIL		1	SS	4									
350.0		Loose to Compact Brown		2	SS	6									
	5	SILTY FINE SAND		3 A B	SS	12									
345.7 345.0	7-1			4 A B	SS	50									
				5	SS	107/9"									
	10	Very Dense Greyish Brown FINE to COARSE SAND		6 A B C	SS	64									
340.0	12-7			7	SS	31									
	15	Hard, Grey CLAYEY SILT with some embedded gravel. (GLACIAL TILL)													
	16.5			8	SS	36									
335.0		END OF BOREHOLE													
	20														

W. L. EL. 341.8'
 JUNE 15, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 123 . .

OUR REFERENCE NO 6-5-39
YOUR REF W. J. 66-F-47

CLIENT: D. H. O.
PROJECT: Q. E. W. B HWY. No. 27. INTERCHANGE
LOCATION 179, 815 N ; 208, 730 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 3"
DATE: JULY 26, 1966.
W. P. 275-64-4

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY water content % PL W LI	REMARKS	
				NUMBER	TYPE	N- Advancement of Sampler	20	40	60	80			100
376.1	0	GROUND SURFACE											
375.0		Compact Brown GRAVELLY SAND with some SILT (FILL)	(Symbol: dots in circles)	1	SS	19							
370.1	6.0	Dense Brown FINE SAND	(Symbol: dots)	2	SS	51							
368.9	7.2	Very Hard Grey CLAYEY SILT with some embedded GRAVEL and Shale fragments (GLACIAL TILL)	(Symbol: diagonal lines)	3	SS	75/6"							
365.0	10			4	SS	50/2"							
361.3	14.8			5	SS	100/2"							
360.0	15	Grey SHALE BEDROCK	(Symbol: cross-hatch)	6	SS	100/NP							
355.0	20	END OF BOREHOLE		7	RC 92%								

W.L. 371.3 Ft.
JULY 26, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 130 .

OUR REFERENCE NO. 6-5-39
 YOUR REF. W. J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
 LOCATION: 174,345 N; 205,915 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 3"
 DATE: AUG. 22, 1966.
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	No. or Advancement of Sample	20	40	60	80	100	PL	
353.0	0	GROUND SURFACE											
		3" TOPSOIL											
350.0	5	Compact, Brown SILTY FINE SAND		1	SS	11							
345.5 345.0	7.5												
	10	Hard to V. Hard Grey CLAYEY SILT with some sand and embedded gravel.	T	2	SS	31							
340.0	15		T	3	SS	44							
		(GLACIAL TILL)		4	SS	64							
335.0	20		T	5	SS	56							
			T	6	WS								
			T	7	SS	59							
330.0 329.5	23.5	Very Hard, Grey CLAYEY SILT with some embedded gravel and occasional layers of weathered shale.	T	8	SS	20/NP							
	25		T	9	RC								
			T	10	SS	52/6 ¹							
325.0	30			11	SS	50/1 ¹							
		END OF BOREHOLE											
320.0	35												

W.L. 346.8 Ft.
 AUG. 23, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 131 . .

OUR REFERENCE NO 6-5-39
YOUR REF. W. J. 66 - F - 47

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: 174, 165 N ; 205, 760 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 3"
DATE: AUG. 18, 1966.
W.P. 275 - 64 - 4

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	100	PL	W	LI	
352.9	0	GROUND SURFACE													
		4" TOPSOIL													
		Loose, Brown SILTY SAND													
350.0	5	CLAYEY SILT SEAM		1	SS	2									
		Compact, Brown MEDIUM SAND with a trace of silt and gravel		2	SS	17									
345.0	8.0			3	SS	28									
	10			4	SS	33									
340.0	12.0	Very Hard Grey		5	SS	80/4"									
	15	boulder CLAYEY SILT with embedded gravel.		6	SS	77									
335.0	20	and		7	SS	90/9"									
		SHALE FRAGMENTS below elev. 332'		8	RC										
330.0	25			9	SS	20/NP									
		END OF BOREHOLE													

W.L. 346.4 Ft.
AUG. 23, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 132 .

OUR REFERENCE NO. 6 - 5 - 39
 Your Ref. No. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No. 27 INTERCHANGE -

LOCATION: 175, 812 N.; 207, 212 E. R.W. No. 1

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: AUG 26, 1966

W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	2.0	4.0	6.0	8.0	10.0	PL	
355.4	0	GROUND SURFACE											
		6" TOPSOIL											
		Loose to Compact Brown FINE SAND											
350.0	5												
349.6	5.8			1	SS	49							
		Very Hard Grey CLAYEY SILT		2	SS	52							
345.0	10	with some embedded gravel and shale fragments.		3	SS	54							
		(GLACIAL TILL)		4	SS	72							
340.0	15			5	SS	72							
		10		6	SS	90							
335.0	20	boulder		7	SS	100/NF							
		Very Dense SANDY SILT (GLACIAL TILL)		8	SS	100/4							
330.0	25												
25.3		END OF BOREHOLE											

W.L. El. 352.8'
AUG. 26, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 141 .

OUR REFERENCE NO. 6-5-39
 YOUR REF. W. J. 66-F-47
 CLIENT: D. H. O.
 PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
 LOCATION: 175,580 N; 206,980 E.
 DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 3"
 DATE: AUG. 23, 1966.
 W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %		REMARKS	
				NUMBER	TYPE	—N— or Adv. No. of Sampler	20	40	60	80	100	PL		LI
352.1	0	GROUND SURFACE												
350.0		3" TOPSOIL												
		Loose, Brown SILTY FINE SAND												
347.6	4.5	Very Dense CLAYEY	T	1	SS	48								
345.0	5													
		brown-grey, mottled grey		2	SS	73								
340.0	10	SILT & SAND with some gravel. (GLACIAL TILL)	T	3	SS	45								
				4	SS	61								
				5	SS	98/9"								
				6	SS	60/3"								
				7	SS	78/8"								
335.0	15													
330.0	20													
	25													
325.0	30	END OF BOREHOLE												

W.L. El. 330.8'
 AUG. 25, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 142.

OUR REFERENCE NO. 6 - 5 - 39
 YOUR REF. W. J. 66 - F - 47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE

LOCATION: 180,540 N; 208,540 E.

DATUM ELEVATION: S. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: AUG. 24 & 25, 1966

W. P. 275 - 64 - 4

ENCLOSURE NO.

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	0	40	60	80	100	PL	
383.3	0	GROUND SURFACE											
380.0	4.5	Dense to Compact Brown SAND & GRAVEL with a trace of silt.	T										
375.0	8.3	Hard, Grey CLAYEY SILT some gravel (GLACIAL TILL)	T	1	S.S.	28							
			T	2	S.S.	50/4"							
370.0	10	Very Dense Grey SILT with some sand and a trace of fine gravel.	T	3	S.S.	58/6"							
			T	4	S.S.	70/6"							
	15	(GLACIAL TILL)	T	5	S.S.	75/6"							
365.0	20		T										
20.75		END OF BOREHOLE		6	S.S.	50/3"							

W. L. E. I. 381.8'
 AUG 25, 1966

7-150

GEOTECHNICAL DATA SHEET FOR BOREHOLE 147

OUR REFERENCE NO. 6-5-39
 YOUR REF. NO. W.J. 66-F-47

CLIENT: D. H. O.
 PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE - R.W. NO 1
 LOCATION: 176,455 N, 207,590 E.
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: SEPT. 14, 1966
 W.P. 275-64-1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	No. of Advancement of Sampler	20	40	60	80	100	PL	W	LI	
363.9	0	GROUND SURFACE													
		4" TOPSOIL													
		Very Dense Brown		1	C.S.										
360.0	5	FINE SAND with some silt		2	S.S.	65									
				3	S.S.	54									
355.0		COARSE SAND Seam													
354.1	9-8 10	Hard, Grey CLAYEY SILT (GLACIAL TILL)		4	S.S.	46									
				5	S.S.	43									
349.0	14-9 15	Very Dense Grey SANDY SILT with occasional shale fragments.		6	S.S.	82/8"									
				7	S.S.	115									
345.0				8	S.S.	200/2"									
344.2	19-7 20			9	S.S.	200/2"									
		Grey WEATHERED SHALE		10	S.S.	250/2"									
				11	S.S.	200/2"									
340.0				12	S.S.	200/2"									
	25			13	S.S.	200/2"									
				14	S.S.	200/2"									
				15	S.S.	200/2"									
	27-1			16	S.S.	150/1"									
335.0	30	END OF BOREHOLE													

W.L. El. 359.9'
 SEPT. 15, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE 148

OUR REFERENCE NO. 6-5-39
Your Ref. No. WJ. 66-F-47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. NO 27 INTERCHANGE - R.W. NO 1

LOCATION: 176,625 N; 207,735 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: SEPT. 15, 1966

W. P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	No. of Advancement of Sampler	20	40	60	80	100	PL	W	LI	
							SHEAR STRENGTH lbs/sq ft								
363.9	0	GROUND SURFACE													
		3" ASPHALT 6" GRAVEL													
		Dense, Brown FINE SAND with some silt		1	C.S.										
360.0	5			2	S.S.	118									
357.1	6.8	Very Dense Grey		3	S.S.	2571"									
355.0	10	CLAYEY to SANDY SILT with some gravel and shale fragments.		4	S.S.	122									
				5	S.S.	176/0"									
350.0	15			6	S.S.	75/2"									
		(GLACIAL TILL)		7	S.S.	190/2"									
				8	S.S.	100/4"									
345.0	20	Dark Grey		9	S.S.	210/5"									
344.4		Extremely WEATHERED SHALE		10	S.S.	200/2"									
				11	S.S.	150/5"									
340.0	25			12	S.S.	200/2"									
		END OF BOREHOLE		13	S.S.	160/NE									Hammer Bouncing
335.0	30														

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: D. A. M. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 149.

OUR REFERENCE NO. 6-5-39
Your Ref. No. W.J. 66-F-47

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE - R.W. No 1

LOCATION: 176,780 N; 207,860 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: SEPT 19, 1966

W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	2.0	4.0	6.0	8.0	10.0	PL	W	LI	
364.2	0	GROUND SURFACE													
		3" ASPHALT 3" GRAVEL													
		Dense, Brown SILTY, VERY FINE SAND													
360.0	5			1	C.S.										
				2	S.S. 80/3"										
357.0	7.2	Hard, Grey CLAYEY SILT (GLACIAL TILL)													
355.0	10			3	S.S. 100/5"										
				4	S.S. 43										
351.9	12.3	SILT SEAM													
351.2	13.0	Very Dense, Grey SILTY SAND (GLACIAL TILL)													
350.0	15			5 ^A	S.S. 38										
				5 ^B	S.S. 38										
347.7	16.5	Hard, Grey SILTY CLAY with some gravel. (boulder) (GLACIAL TILL)													
345.0	19.2			7	S.S. 100/5"										
				8	R.C.										
				9	S.S. 100/2"										
				10 ^A	S.S. 170/6"										
				10 ^B	S.S. 170/6"										
		Grey WEATHERED SHALE													
				11	S.S. 200/2"										
				12	S.S. 200/4"										
				13	S.S. 250/4"										
340.0	22.8	END OF BOREHOLE													

W.L. El. 354.9'
SEPT. 20, 1966

Hammer Bouncing

GEOTECHNICAL DATA SHEET FOR BOREHOLE .151..

OUR REFERENCE NO. 6 - 5 - 39
Your Ref. No. 66 - F - 47

CLIENT: D.H.O.
PROJECT: Q.E.W. & HWY. No. 27 INTERCHANGE - R.W. No. 18
LOCATION: 176, 945 N; 207, 768 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: SEPT. 20, 1966
W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI	
365.1	0	GROUND SURFACE													
		12" TOPSOIL													
		Very Dense Brown													
360.0	5	SILTY FINE SAND		1	C.S.										
				2	S.S.	81									
358.1	7.0	Very Hard CLAYEY SILT		3	S.S.	95									
		to		4	S.S.	110									
355.0	10	Very Dense SANDY SILT		5	S.S.	100/8"									
		with some embedded gravel and shale fragments. (boulder)		6	S.S.	100/6"									
350.0	15	(GLACIAL TILL)		7	S.S.	100/NP									
				8	S.S.	120/6"									
				9	S.S.	105/6"									
345.0	20	WEATHERED SHALE		10	S.S.	100/3"									
		END OF BOREHOLE		11	S.S.	150/4"									
344.0	21.1			12	S.S.	200/4"									

▼ W.L. El. 358.8'
SEPT. 20, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 152.

OUR REFERENCE NO. 6 - 5 - 39
 Your Ref. No. W.J. 66 - F - 47

CLIENT: D. H. O.
 PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE - R.W. No 18
 LOCATION: 176,715 N; 207,625 E.
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING
 DIAMETER OF BOREHOLE: 2 3/8"
 DATE: SEPT. 23, 1966
 W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY			REMARKS
				NUMBER	TYPE	Z _s Advancement of Sampler	2.0	4.0	6.0	8.0	10.0	water content %			
							blows per foot					Pl W Il			
							SHEAR STRENGTH					lbs/sq ft			
364.1	0	GROUND SURFACE													
		3" ASPHALT 6" GRAVEL													
		Dense Brown													
360.0	5	SILTY FINE SAND		1	W.S.										
				2	S.S.	62									
357.1	7.0	GRAVEL		3A	W.S.										
356.4	7.7	Very Hard Grey		3	S.S.	65									
355.0	10	CLAYEY SILT (GLACIAL TILL)		4	S.S.	106/11"									
				5	S.S.	130/2"									
351.5	12.6			6	S.S.	200/5"									
350.0	15	Very Dense Grey SANDY SILT with occasional small gravel and shale fragments.		7	S.S.	108/6"									
				8 ^A _B	S.S.	162/9"									
345.0	20			9 ^A _B	S.S.	100/3"									
				10 ^A _B	S.S.	200/3"									
344.0	20.1	Grey WEATHERED SHALE		11	S.S.	100/1"									
				12	S.S.	200/5"									
				13	S.S.	200/4"									
340.0	23.5	END OF BOREHOLE		14	R.C.	82%									
	25														

▼ W.L. El. 353.3 ft.
 Sept. 26, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 153 .

OUR REFERENCE NO. 6-5-39

Your Ref. No. W.J. 66-F-47

CLIENT: D.H.O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE - R.W. No 18

LOCATION: 176, 608 N; 207, 490 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 2 3/8"

DATE: SEPT. 21, 1966

W.P. 275-64-4

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot				CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- Advancement of Sampler	2:0	4:0	6:0	8:0	10:0	PL	W	
362.9	0	GROUND SURFACE												
		3" ASPHALT 9" GRAVEL												
360.0		Loose, Brown SILTY FINE SAND												
	5			1	S.S.	3								
356.1	6.8	Very Hard Grey CLAYEY SILT with some fine gravel and shale fragments (GLACIAL TILL)												
355.0				2	S.S.	65								
	10			3	S.S.	62								
	15			4	S.S.	100/5"								
350.0				5	S.S.	100/5"								
				6	S.S.	100/1"								
				7	S.S.	81								
345.0				8	S.S.	160/5"								
343.5	19.4	Grey Weathered SHALE												
	20			9A	S.S.	190/6"								
				10	S.S.	200/5"								
				11	S.S.	200/6"								
340.0				12B	S.S.	200/5"								
				13	S.S.	200/2"								
	25			14	S.S.	250/4"								
25.25	25	END OF BOREHOLE												

▼ W.L. El. 357.0 ft
Sept. 26, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE 154.

OUR REFERENCE NO. 6-5-39
Your Ref. No. W.J. 66-F-47

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE - R.W. No 18

LOCATION: 176,420 N.; 207,375 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASH BORING

DIAMETER OF BOREHOLE: 2 3/8"

ENCLOSURE NO.

DATE: SEPT. 21 & 22, 1966

W. P. 275-64-4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	No. of Advancement of Sampler	20	40	60	80	100	PL	W	LI	
364.0	0	GROUND SURFACE													
		6" TOPSOIL													
		Dense, Brown FINE SAND with some silt													
360.0	5			1	S.S.	64									
356.5	7.5			2	S.S.	31									
355.0	10	Hard, Grey CLAYEY SILT with some embedded gravel		3	S.S.	63									
				4	S.S.	70/4"									
350.0	15			5	S.S.	100									
		(SHALE FRAGMENTS BELOW EL. 349 ft.)		6	S.S.	130									
345.0	20	(GLACIAL TILL)		7	S.S.	49									
341.0	23.0			8	S.S.	108									
340.0	25	Grey, Weathered SHALE		9	S.S.	200/4"									
25.1		END OF BOREHOLE		10	S.S.	200/4"									

W.L. El. 354.8 ft.
 Sept. 22, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE 201

OUR REFERENCE NO 6-5-39
Your Ref. No W. J. 66 - F - 47

CLIENT D. H. O.
PROJECT Q. E. W. & HWY No 27 INTERCHANGE. - R. W. No 7
LOCATION 179,985 N 208,335 E
DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 2 3/8"
DATE JAN. 16 - 18. 1967.
W. P. 275 - 64 - 4

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %		REMARKS		
				NUMBER	TYPE	N or Advancement of Sampler	20	40	60	80	100	PL	W		LI	
378.6	0	GROUND SURFACE														
		12" TOPSOIL Loose, Brown FINE SAND														
375	3.5	Very Stiff to Hard CLAYEY SILT with some embedded Gravel (GLACIAL TILL) Greenish Grey Grey		1	SS	17										
	5			2	SS	29										
372				3	SS	52										
370 369.6	9.0			4	SS	100/3"										
	10	Shale Fragments below el. 366 FT.		5	SS	100/2"										
365				6	SS	100/NP										
				7	RC	100/1"										
	15	Granite Boulder		8	SS	200/1"										
363.1	15.5			9	RC	49%										
360	20	Grey Weathered SHALE		10	RC	22%										
357.1	21.5			11	SS	7/7"										
		END OF BOREHOLE														

W.L. 373.9
JAN. 20. 1967.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 202.

OUR REFERENCE NO. 6-5-39
Your Ref. No. W. J. 66 - F - 47

CLIENT D. H. O.
PROJECT Q. E. W. & HWY. No 27 INTERCHANGE R. W. No 7
LOCATION 179, 840 N 208, 365 E.
DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 2 3/8"
DATE JAN. 18, 1967.

ENCLOSURE NO

W. P. 275 - 64 - 4

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N - N Advancement of Sampler	20	40	60	80	100	PL	W	LI	
376.6	0	GROUND SURFACE													
375		15" TOPSOIL Compact to Dense Brown, Organic SANDY SILT some Clay FILL		1	SS	34									
371.4	5.2	Dense, Brown FINE SAND with some Silt		2	SS	36									
369				3	SS	100/3"									
368.1	8.5	Very Dense SANDY SILT with a trace of Clay and some Gravel (GLACIAL TILL)		4	SS	7 1/6"									
365				5	SS	150/2"									
363.6	13.0	Hard Grey CLAYEY SILT with a trace of Gravel and increasing Shale Fragments with depth		6	SS	150/5"									
360				7	SS	200/2"									
356.5	20.1	Possibly extremely Weathered SHALE below el. 360.6 Ft.		8	SS	200/2"									
355		END OF BOREHOLE		9	SS	150/1"									

W. L. 373.3
JAN. 20, 1967.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 203 .

OUR REFERENCE NO 6-5-39
Your Ref. No W. J. 66-F-47

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE. R. W. No 7
LOCATION: 179,695 N 208,400 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: JAN. 19 - 20, 1967.
W. P. 275 - 64 - 4

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI	
376.5	0	GROUND SURFACE													
375 374.5	2.0	SAND & GRAVEL some Clay FILL													
	5	Loose to Compact Brown FINE SAND with some Silt		1	SS	5									
				2	SS	1 1/2									
370				3	SS	21									
367.7	8.8	Hard Grey CLAYEY SILT (GLACIAL TILL)		4	SS	98/6"									
365	11.5	Grey Weathered SHALE		5	SS	100/4"									
				6	SS	170/2"									
360.9 360	15 15.6	Sound Grey SHALE BEDROCK		7	SS	140/1"									
358.5 355	20	END OF BOREHOLE		8	RC	85%								CAVE IN EL. 375.5	

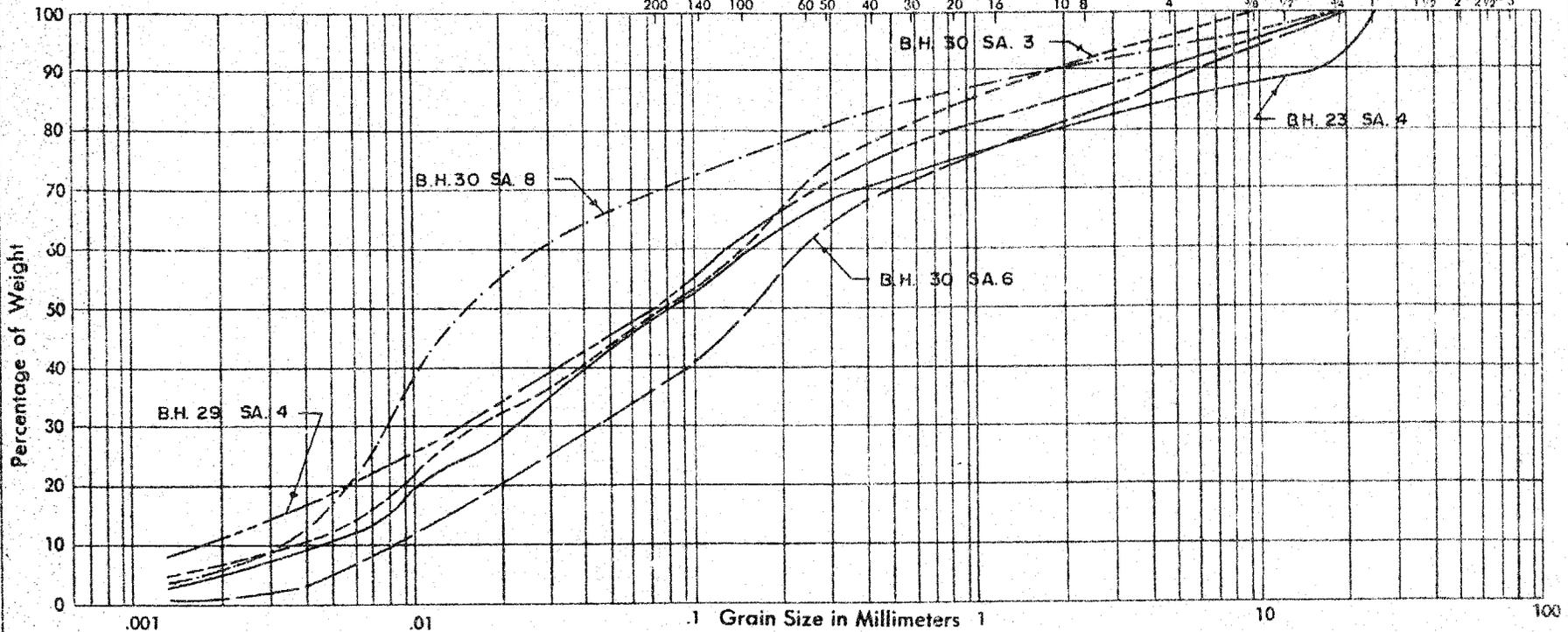
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6 - 5 - 39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W. J. 66 - F - 47 , W.P. 275-64-4 COEFFICIENT OF UNIFORMITY
 LOCATION: Q.E.W. & HWY. No 27 INTERCHANGE COEFFICIENT OF CURVATURE
 BOREHOLE NO.: 23 29 30 30 30
 SAMPLE NO.: 4 ' 4 ' 3 ' 6 ' 8
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:
 SAND and SILT
 with some GRAVEL and CLAY

PLASTIC PROPERTIES:

LIQUID LIMITED % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

Enclosure No.

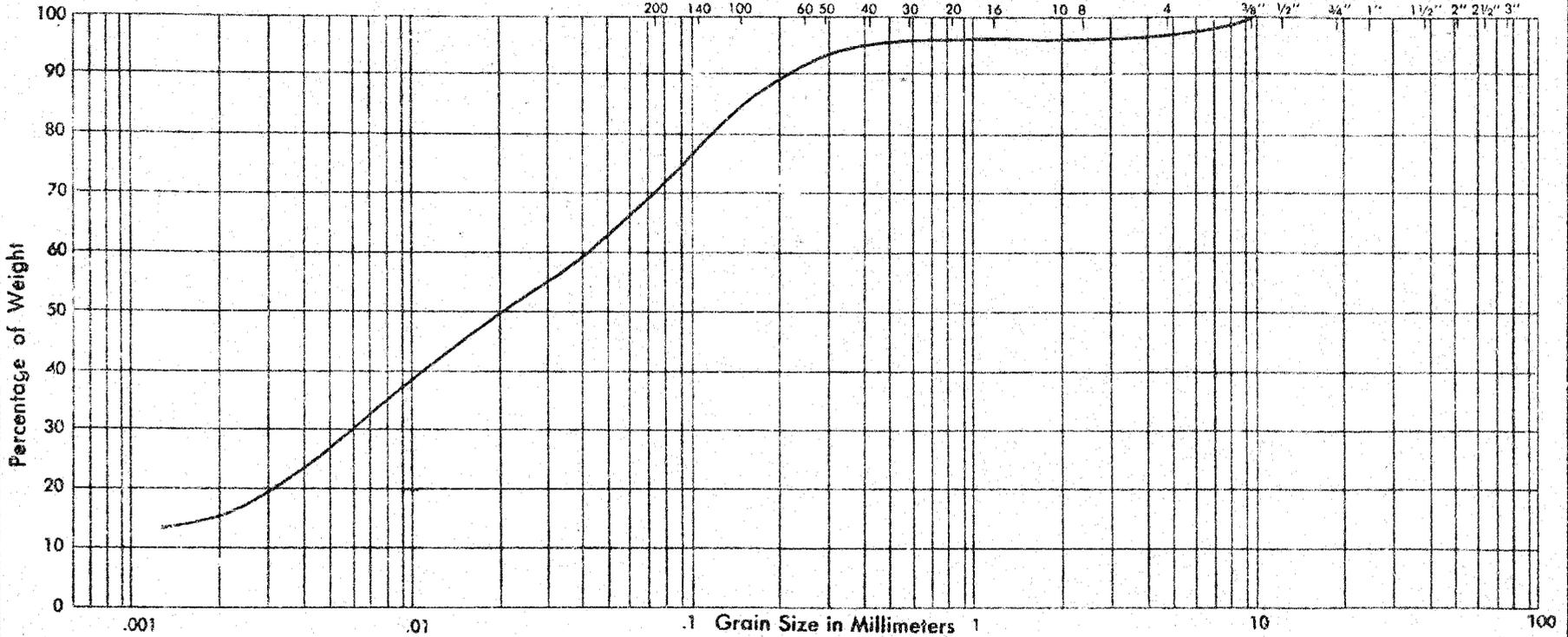
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39
YOUR REF. No. W.P. 275-64-4

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL		
	FINE	MEDIUM	COARSE	FINE	COARSE	



PROJECT: Q. E. W. & HWY. 27. INTERCHANGE
 LOCATION: RETAINING WALL No. 13.
 BOREHOLE NO.: 34
 SAMPLE NO.: 1
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
 COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:
SANDY SILT with some CLAY

PLASTIC PROPERTIES:
 LIQUID LIMIT % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

Enclosure No.

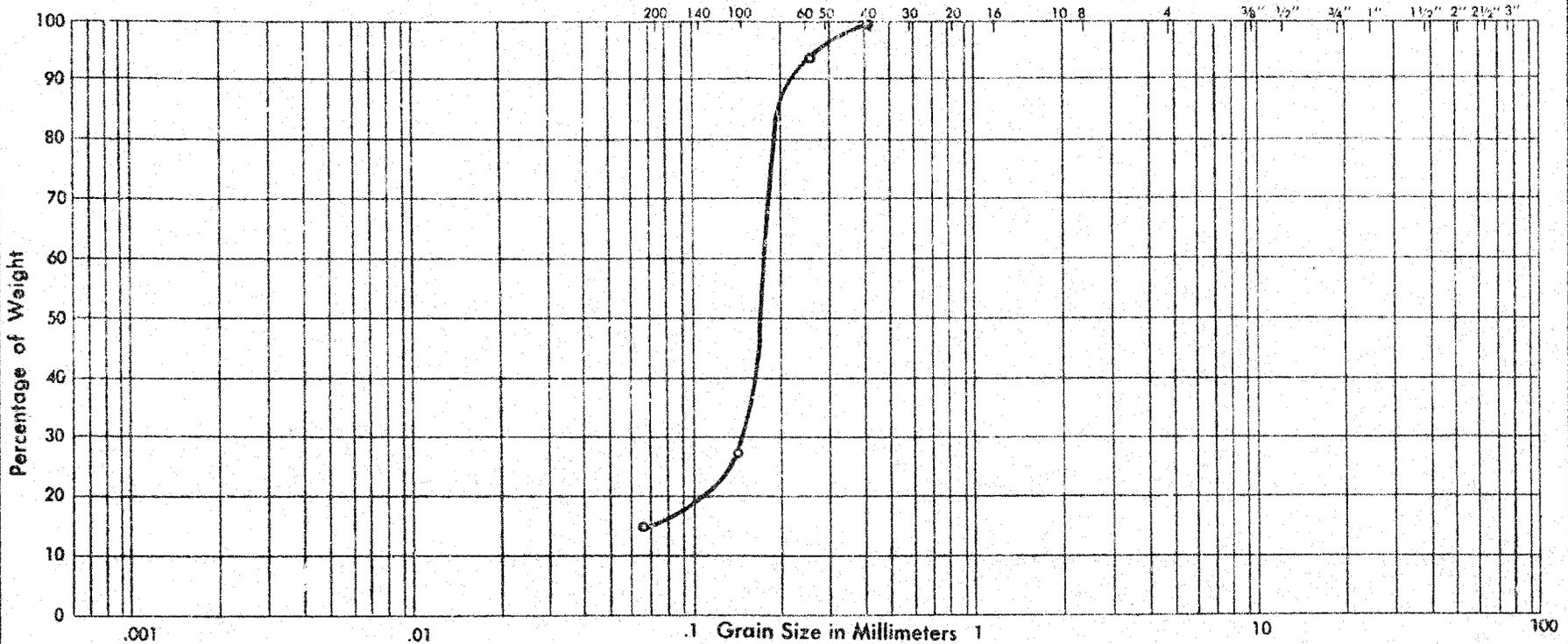
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W.J. 66-F-47; W.P. 275-64-4
 LOCATION: Q.E.W. & HWY. N^o 27
 BOREHOLE NO.: 44
 SAMPLE NO.: 1
 DEPTH OF SAMPLE: 4 ft.
 ELEVATION OF SAMPLE: 359 ± ft.

COEFFICIENT OF UNIFORMITY
 COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:
 FINE SAND with some silt.

PLASTIC PROPERTIES:
 LIQUID LIMIT % ==
 PLASTIC LIMIT % ==
 PLASTICITY INDEX % ==
 MOISTURE CONTENT % ==
 ACTIVITY ==

Enclosure No.

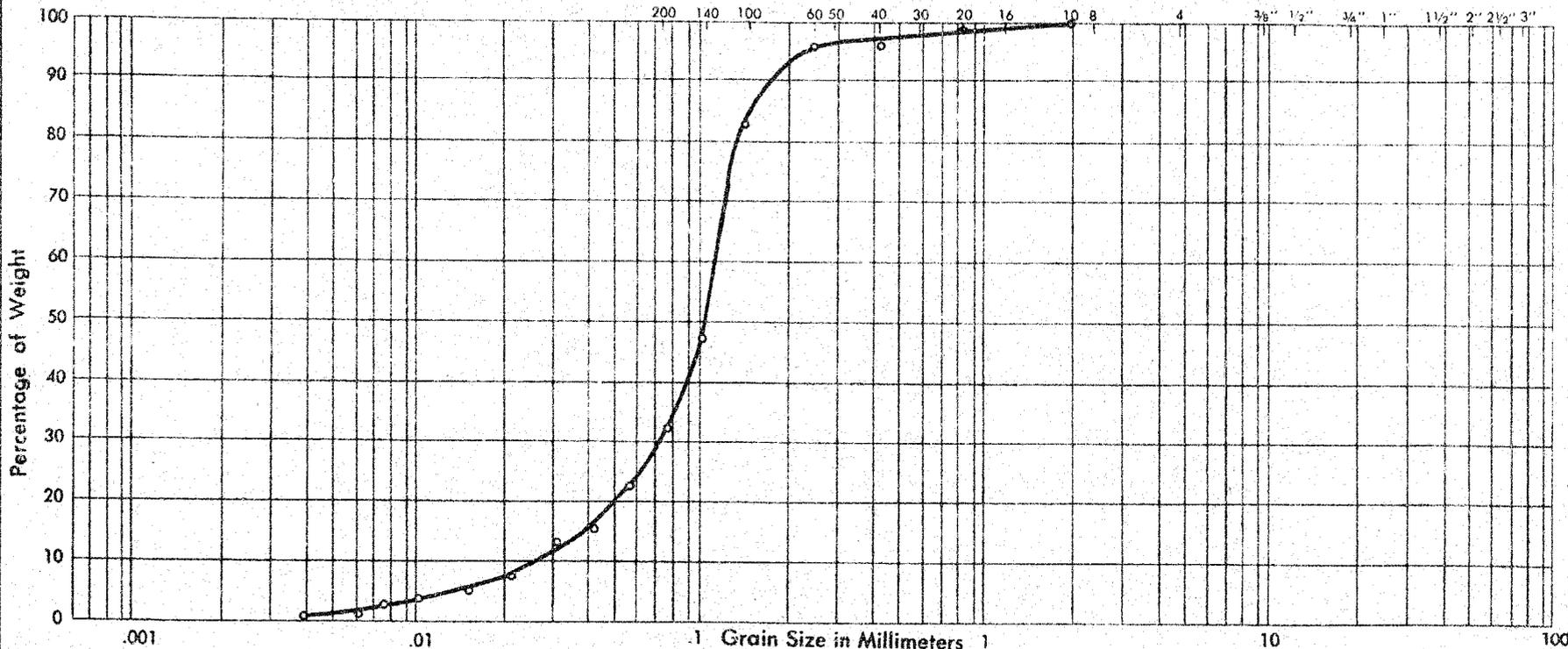
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6 - 5 - 39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W.J. 66-F-47 ; WP 275-64-4
 LOCATION: Q.E.W. & HWY. № 27
 BOREHOLE NO.: 46
 SAMPLE NO.: 1
 DEPTH OF SAMPLE: 4 ft.
 ELEVATION OF SAMPLE: 357 ± ft.

COEFFICIENT OF UNIFORMITY
 COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

Classification of Sample and Group Symbol:

SILTY FINE SAND

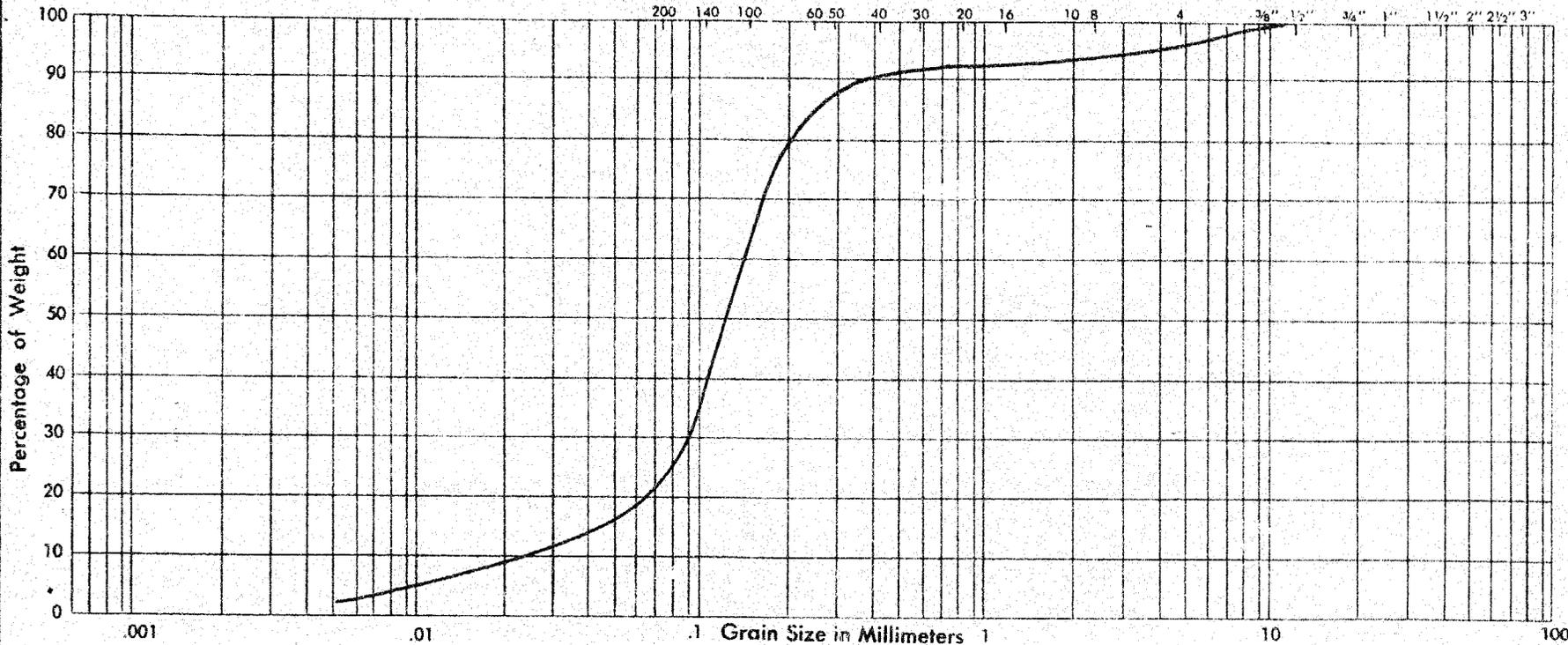
Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED
GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39
 YOUR REF. No. W.P. 275-64-4

UNIFIED SOIL CLASSIFICATION
 SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

LOCATION: RETAINING WALLS No. 5 & 6.

BOREHOLE NO.: 47

SAMPLE NO.: 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

FINE SAND with some SILT

Enclosure No.

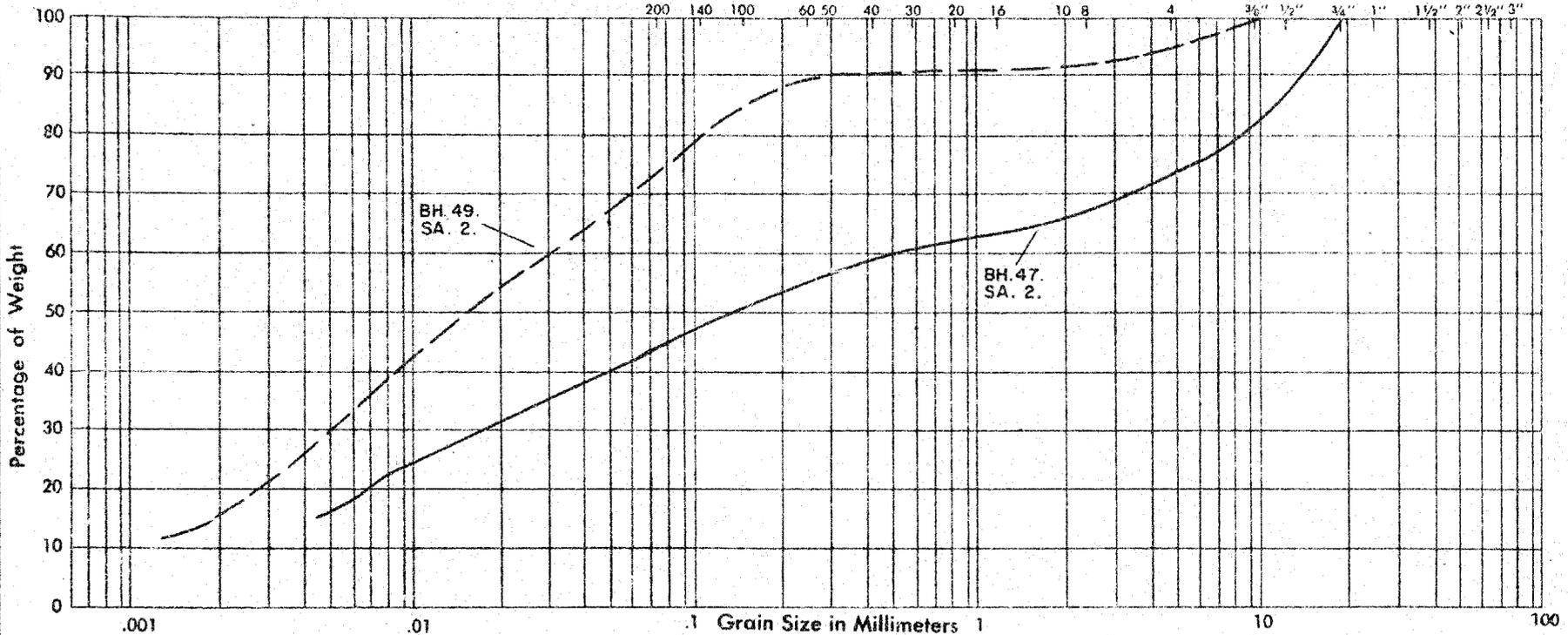
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO 6-5-39
YOUR REF. No. W.P. 275-64-4

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
 LOCATION: RETAINING WALLS No. 5 & 6.
 BOREHOLE NO.: 47 ; 49
 SAMPLE NO.: 2 2
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
 COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % ==
 PLASTIC LIMIT % ==
 PLASTICITY INDEX % ==
 MOISTURE CONTENT % ==
 ACTIVITY ==

Classification of Sample and Group Symbol:
 SAND and SILT
 with some GRAVEL and CLAY
 (GLACIAL TILL)

Enclosure No.

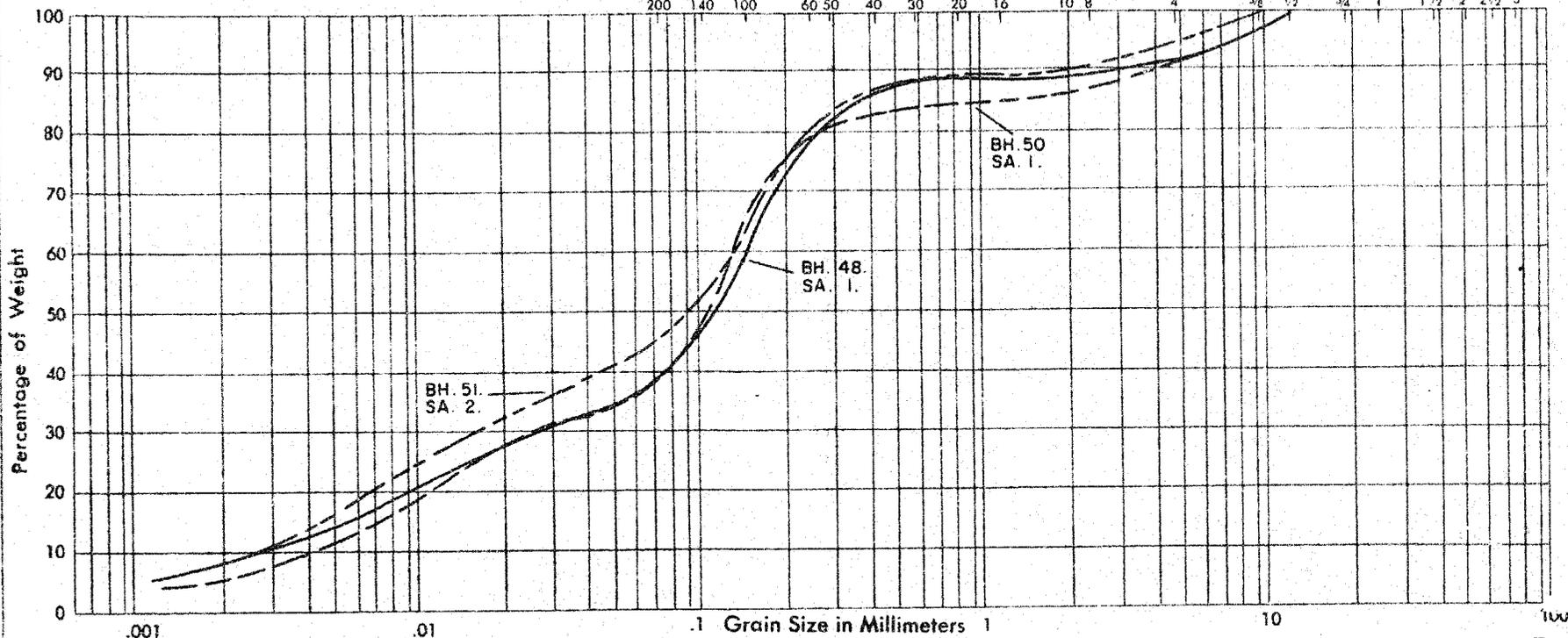
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39
YOUR REF. No. W.P. 275-64-4

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL		
	FINE	MEDIUM	COARSE	FINE	COARSE	



PROJECT: Q.E.W. & HWY. No. 27 INTERCHANGE
 LOCATION: RETAINING WALLS No. 5 & 6.
 BOREHOLE NO.: 48 ; 50 ; 51
 SAMPLE NO.: 1 1 2
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
 COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

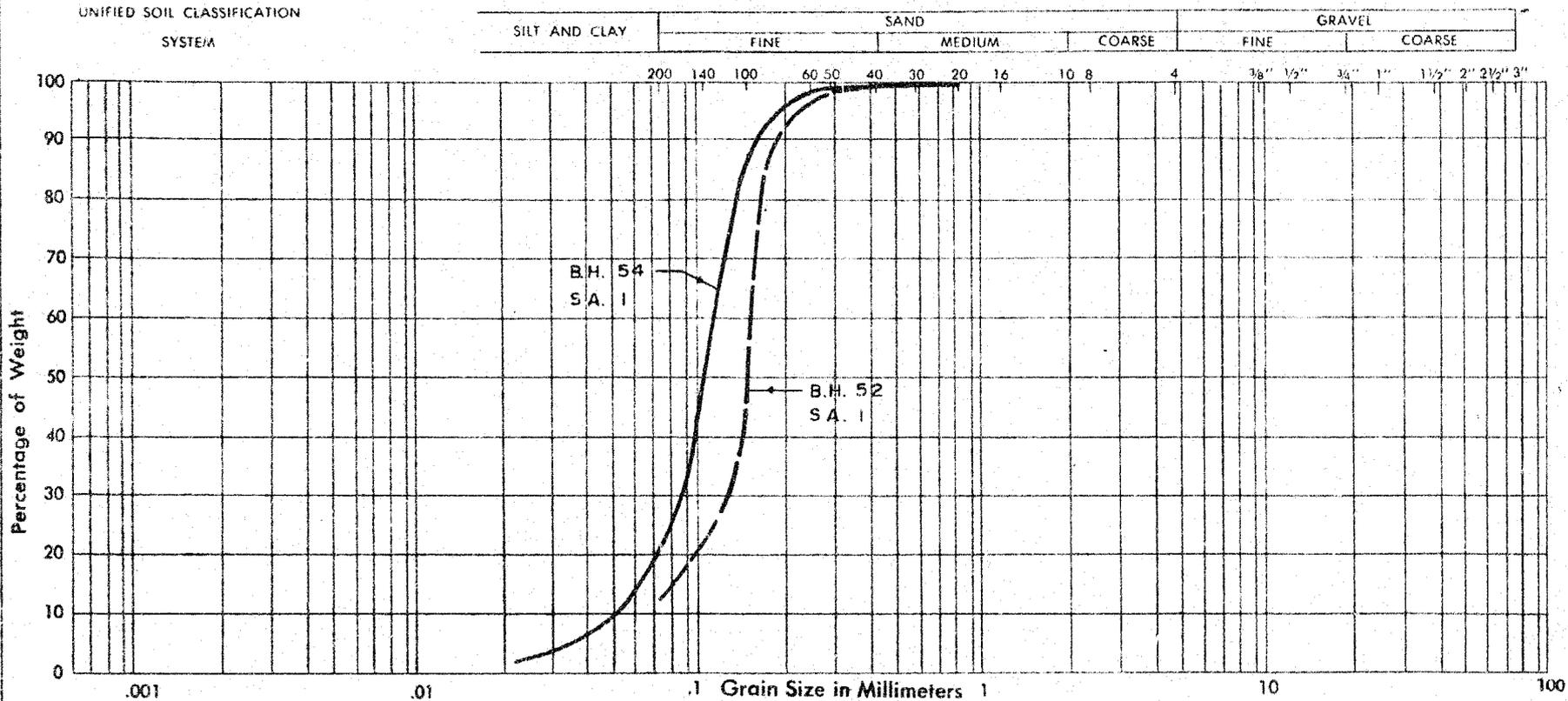
Classification of Sample and Group Symbol:
SILTY SAND
 with a trace of CLAY and GRAVEL
 (FILL)

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39



PROJECT: W.J. 66 - F - 47, W.P. 275 - 64 - 4

LOCATION: Q.E.W. & HWY. No 27

BOREHOLE NO.: 52 54

SAMPLE NO.: 1 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY ~ 2.5

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

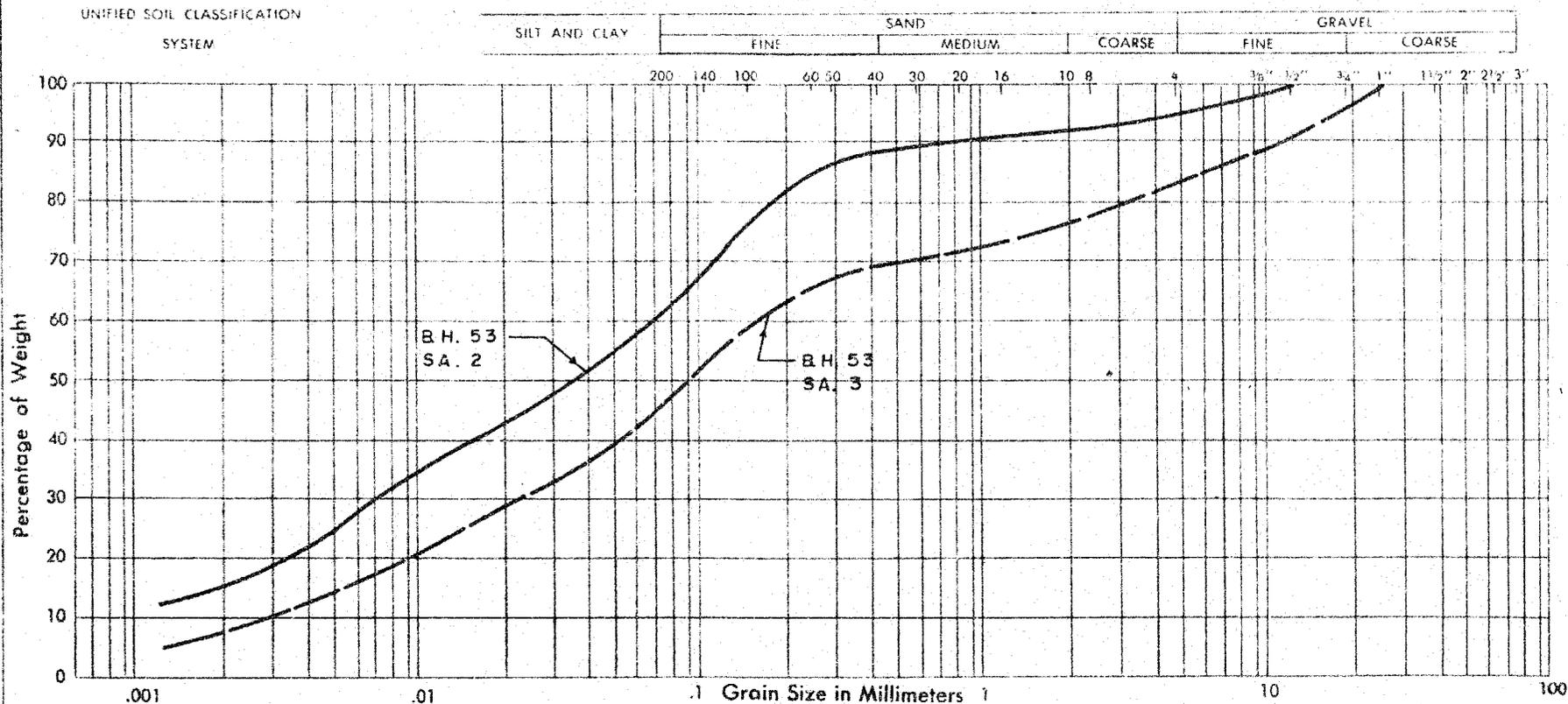
SILTY FINE SAND

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39



PROJECT: W. J. 66-F-47; W.P. 275-64-4

LOCATION: Q. E. W. 6 HWY. Nº 27

BOREHOLE NO.: 53 53

SAMPLE NO.: 2 3

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

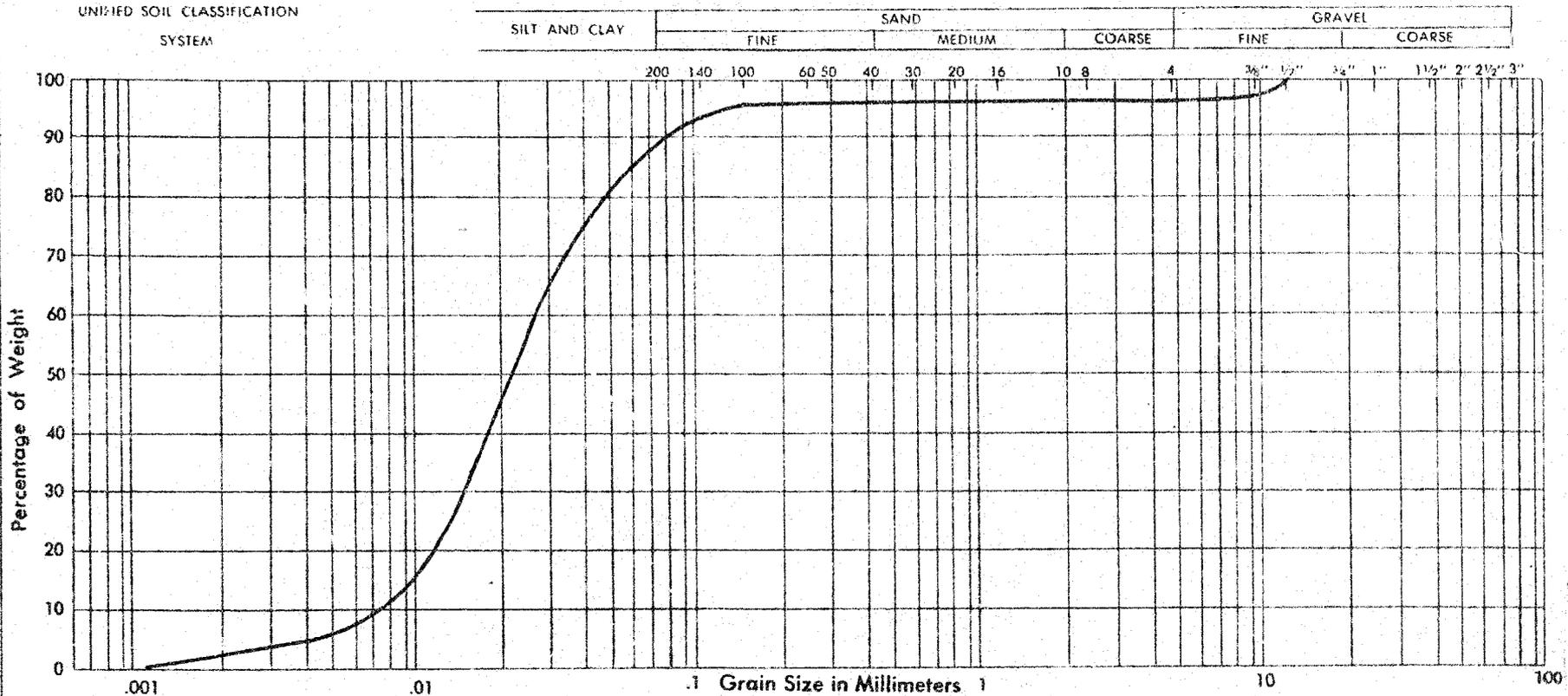
SANDY SILT with some CLAY and a
trace of FINE GRAVEL

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39



PROJECT: W.J. 66-F-47, W.P. 275-64-4

LOCATION: Q.E.W. 8 HWY. No 27

BOREHOLE NO.: 55

SAMPLE NO.: 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

SILT with trace of SAND and CLAY

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Enclosure No.

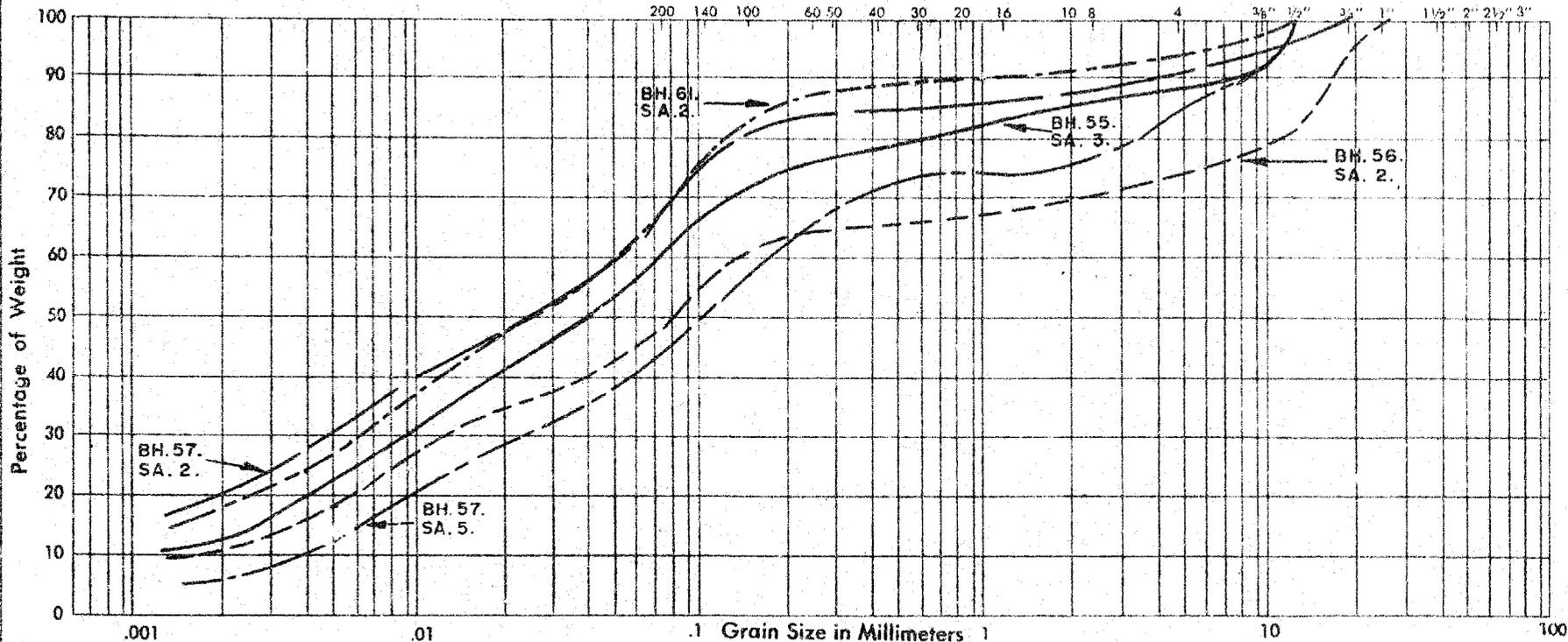
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W. J. 66-F-47, W. P. 275-64-4

LOCATION: Q. E. W. 8 HWY. N° 27

BOREHOLE NO.: 55 ; 56 ; 57 ; 57 ; 61

SAMPLE NO.: 3 2 2 5 2

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:
 SANDY SILT with some GRAVEL
 and CLAY
 (GLACIAL TILL)

Enclosure No.

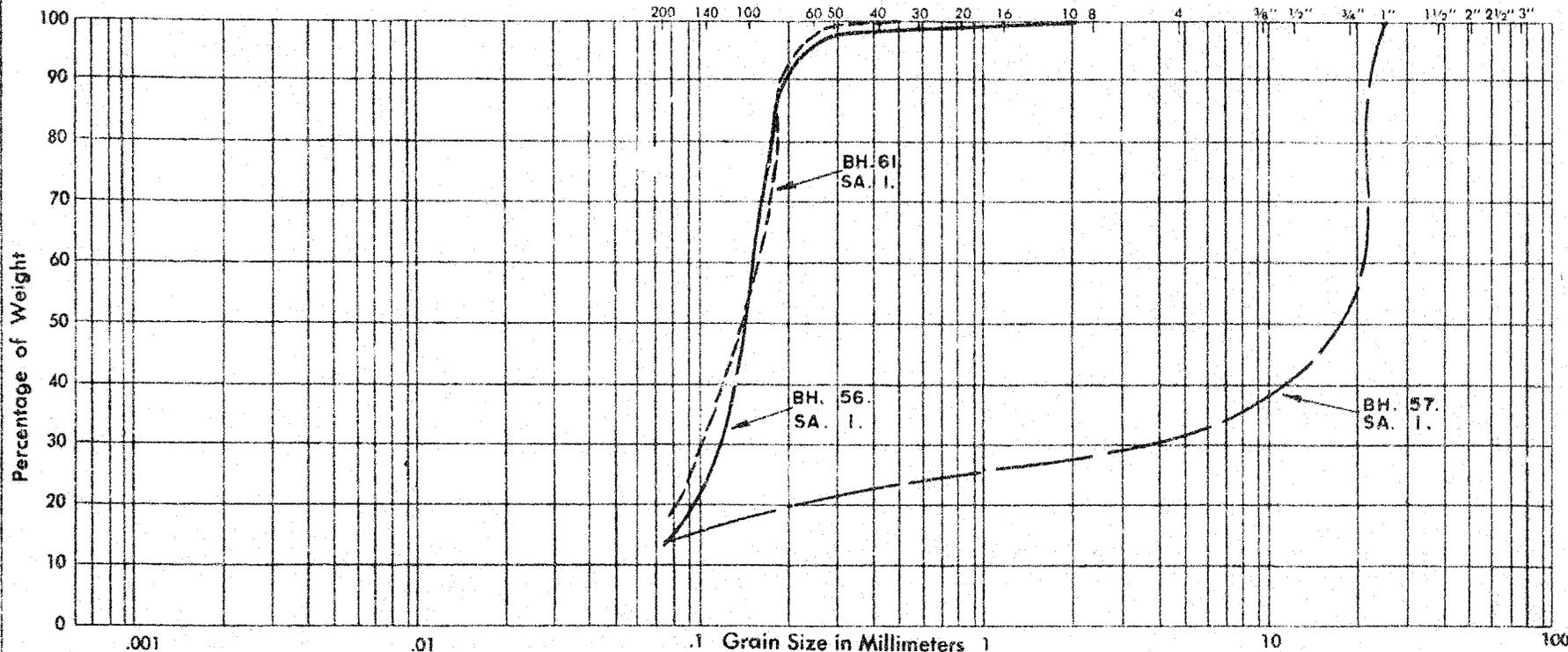
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W. J. 66-F-47, W. P. 275-64-4

LOCATION: Q. E. W. & HWY. N° 27

BOREHOLE NO.: 56 ; 57 ; 61

SAMPLE NO: 1 1 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

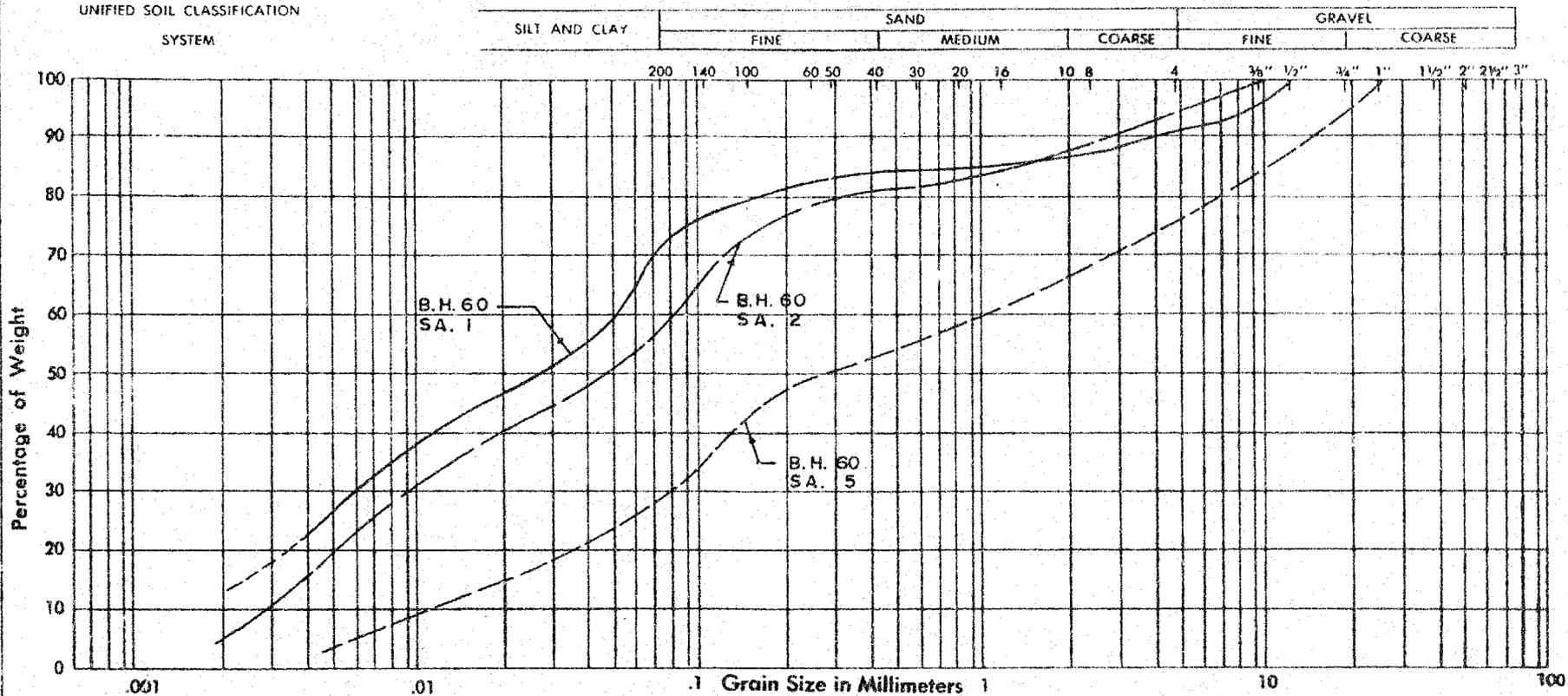
SAND (and GRAVEL) with some SILT

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6 - 5 - 39



PROJECT: W. J. 66-F-47; W.P. 275-64-4 COEFFICIENT OF UNIFORMITY
 LOCATION: Q. E. W. 8 HWY. N^o 27 COEFFICIENT OF CURVATURE
 BOREHOLE NO.: 60 ; 60 ; 60
 SAMPLE NO.: 1 ; 2 ; 5
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:
 SANDY SILT with some GRAVEL and a trace of CLAY
 (GLACIAL TILL)

PLASTIC PROPERTIES:

LIQUID LIMITED % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

Enclosure No.

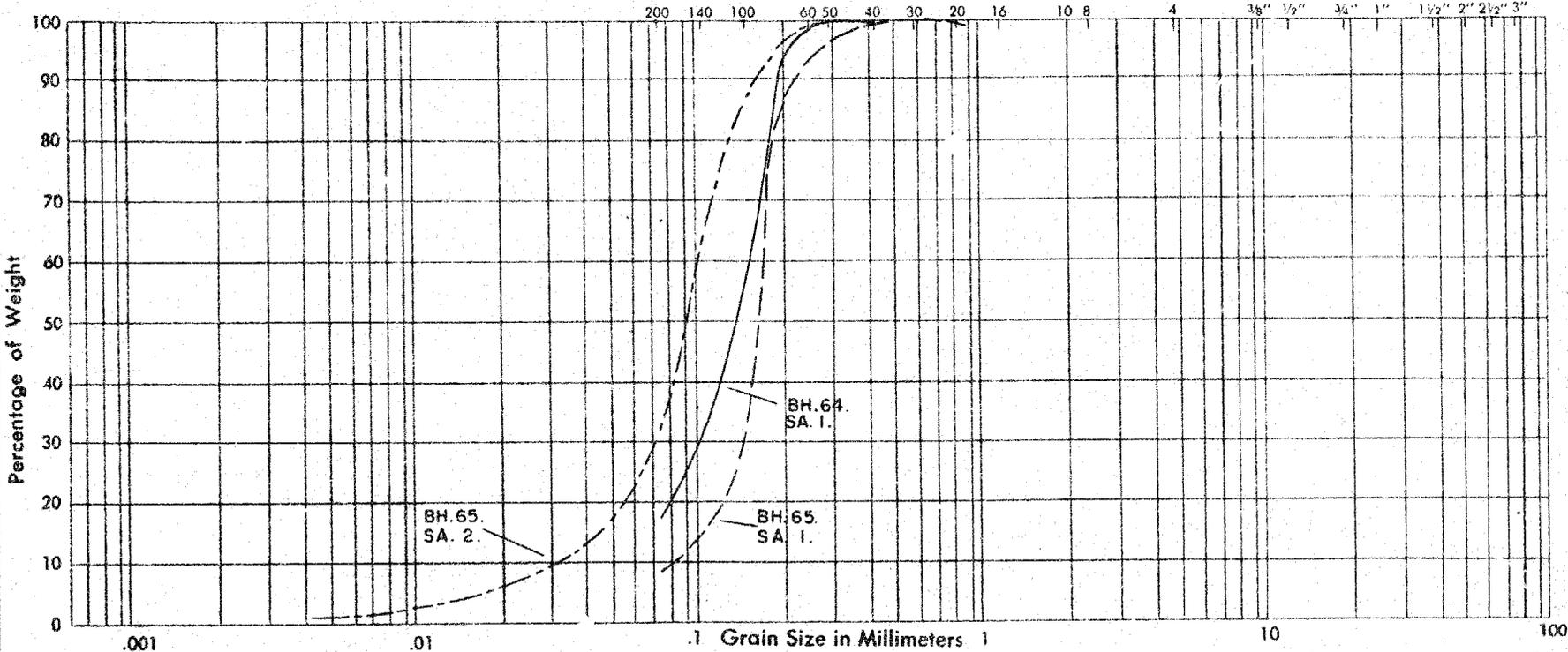
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39
YOUR REF. No. W.P. 275-64-4
W.J. 66-F-47

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
 LOCATION: RETAINING WALL No. 22.
 BOREHOLE NO.: 64 ; 65 ; 65
 SAMPLE NO.: 1 1 2
 DEPTH OF SAMPLE:
 ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:
FINE SAND
 with some to a trace of SILT

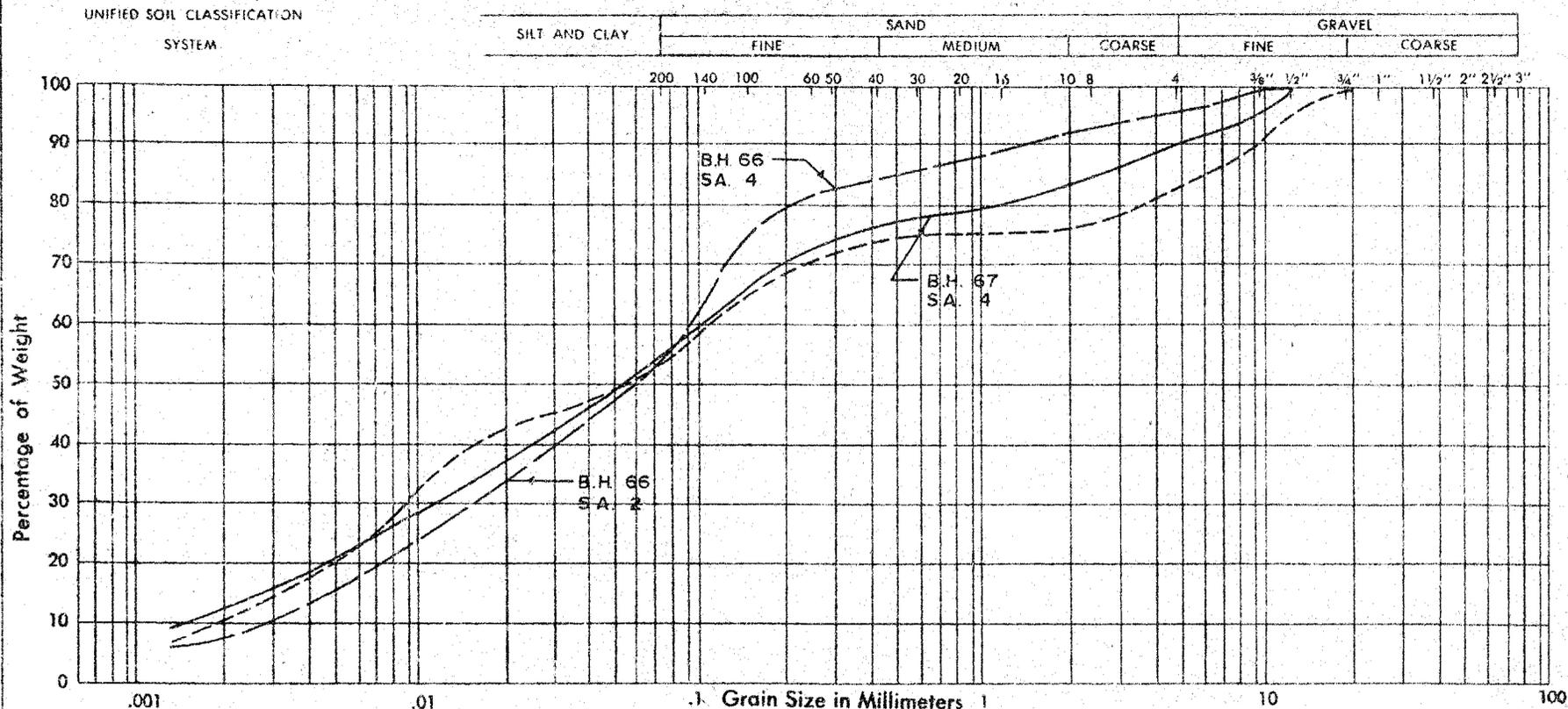
PLASTIC PROPERTIES:
 LIQUID LIMITED % =
 PLASTIC LIMIT % =
 PLASTICITY INDEX % =
 MOISTURE CONTENT % =
 ACTIVITY =

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6 - 5 - 39



PROJECT: W. J. 66-F-47, W.P. 275-64-4

LOCATION: Q.E.W. & HWY. No 27

BOREHOLE NO.: 66 66 67

SAMPLE NO.: 2 ; 4 ; 4

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMIT % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

SILT and SAND
with some GRAVEL and CLAY
(GLACIAL TILL)

Enclosure No.

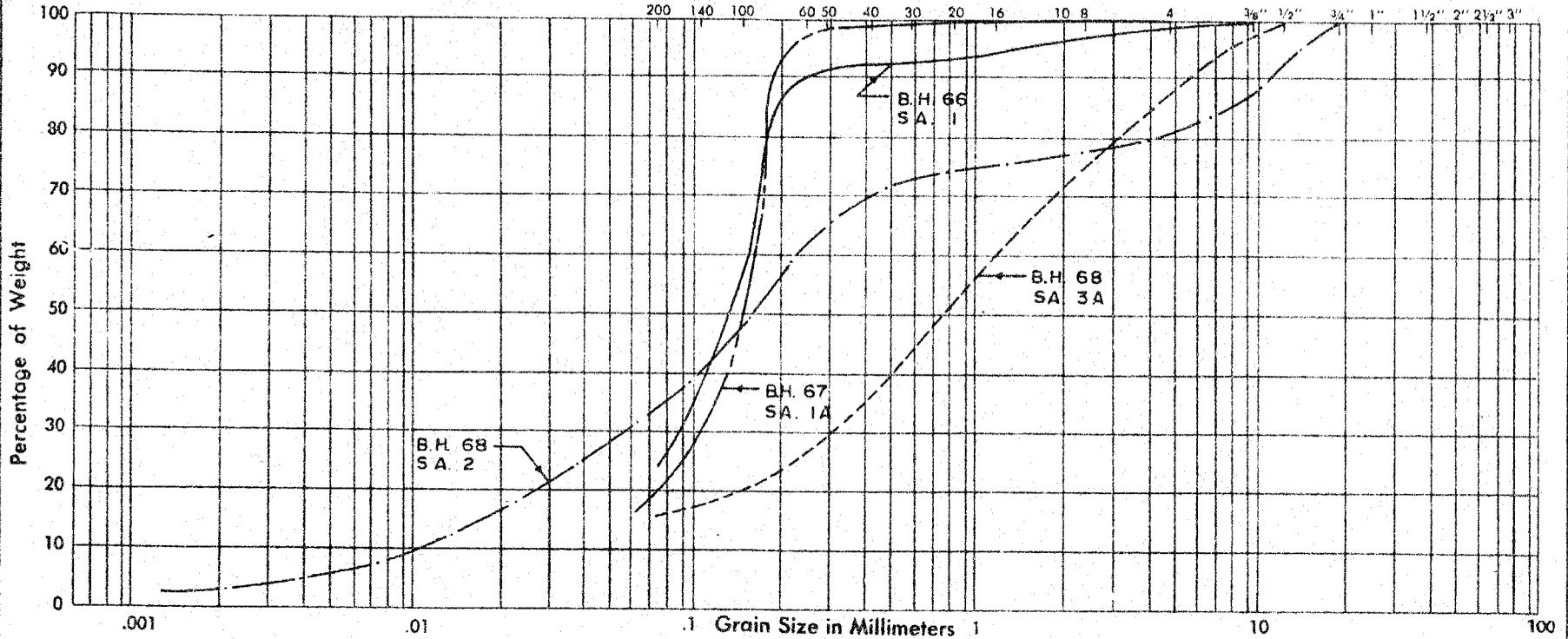
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-5-39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: W.J. 66-F-47, W.P. 275-64-4

LOCATION: Q.E.W. & HWY. No 27

BOREHOLE NO.: 66 67 68 68

SAMPLE NO.: 1 ; 1A ; 2 ; 3A

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY =

Enclosure No.

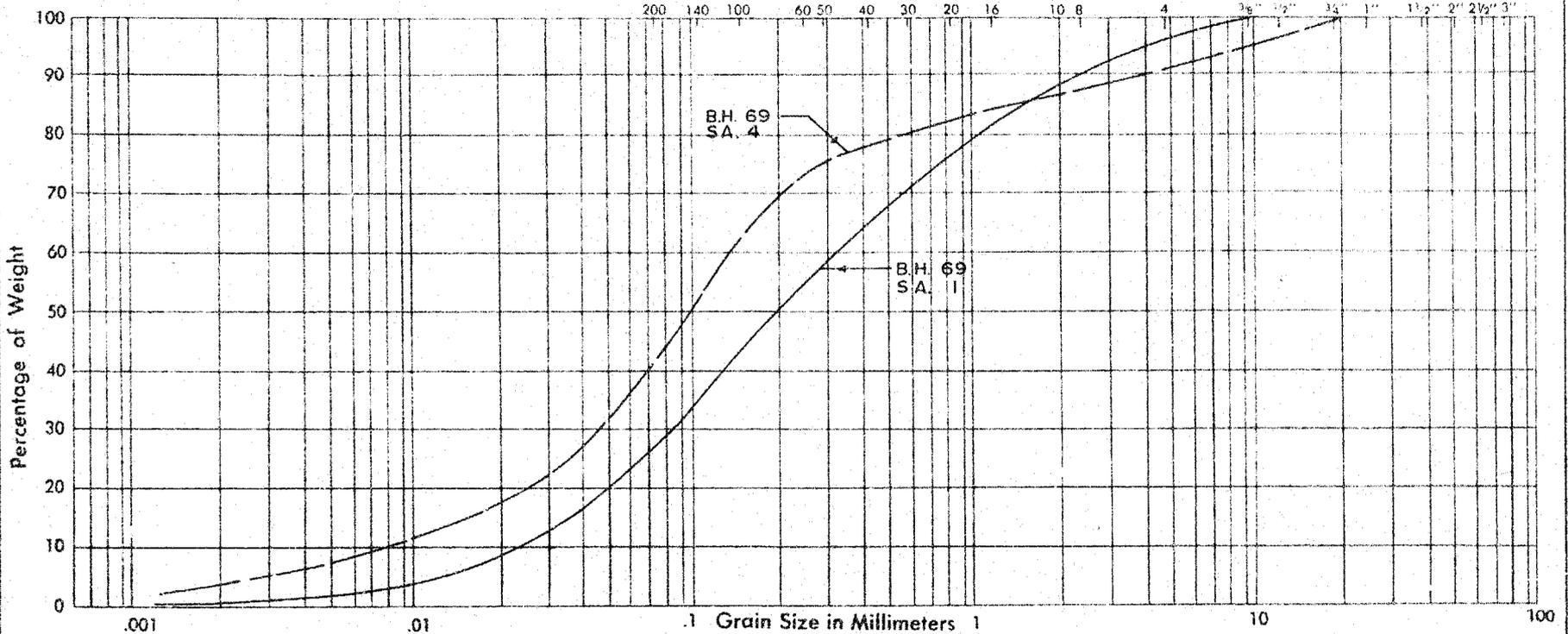
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO 6-5-39

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY		SAND				GRAVEL			
		FINE		MEDIUM	COARSE	FINE		COARSE	



PROJECT: W.J. 66-F-47, WP. 275-64-4

LOCATION: Q.E.W. & HWY. No 27

BOREHOLE NO.: 69, 69

SAMPLE NO.: 1, 4

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

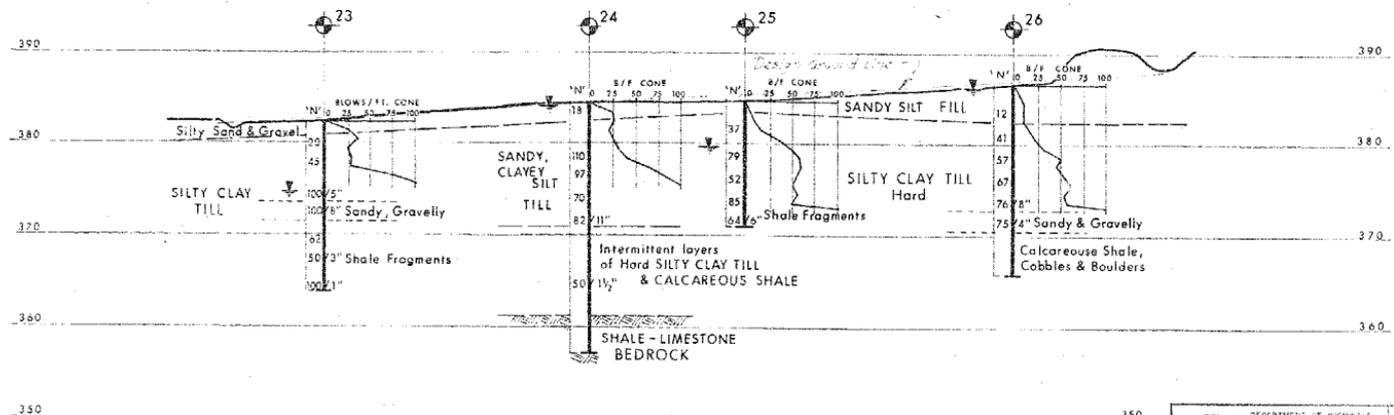
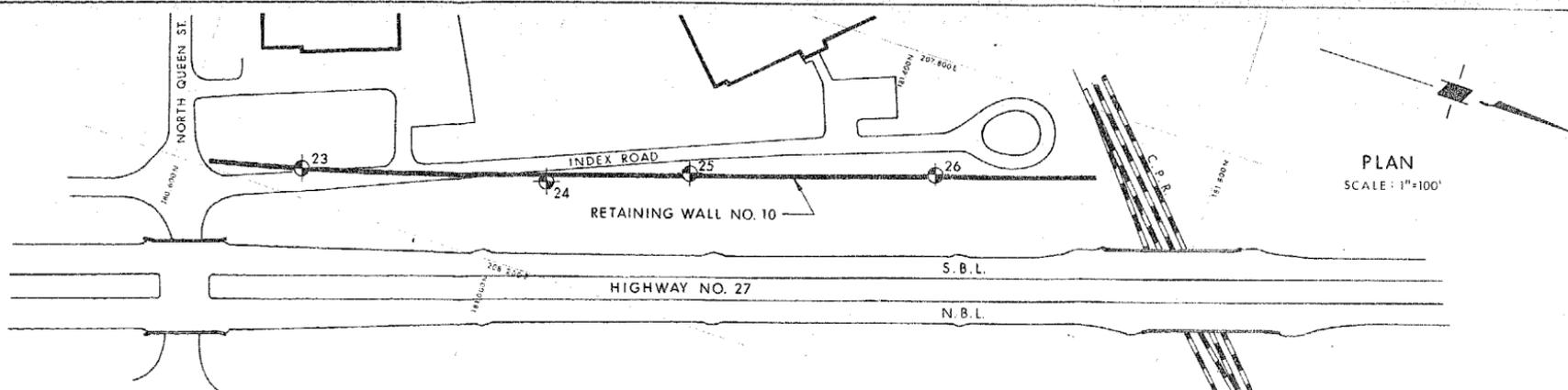
MOISTURE CONTENT % =

ACTIVITY =

Classification of Sample and Group Symbol:

SILTY SAND with a trace of gravel and clay

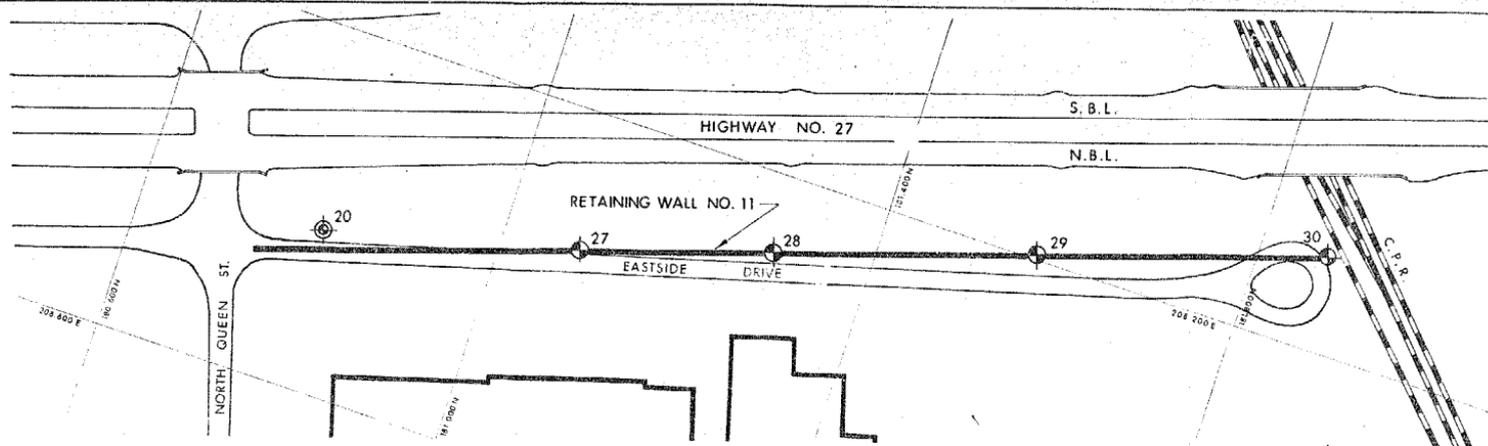
Enclosure No.



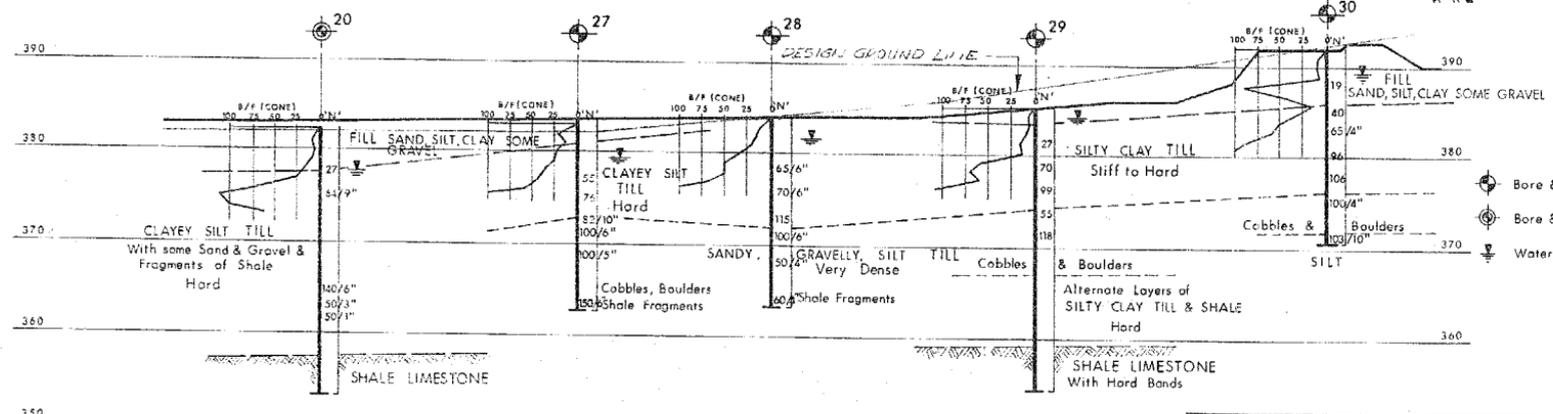
- LEGEND
- Bore & Cone Penetration Hole (Dominion Soil)
 - Water Levels at time of investigation (20 May 1966)

SECTION ALONG RETAINING WALL
SCALE: Vert. 1" = 10'
Horiz. 1" = 100'

 ONTARIO	DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & G.E.W. INTERCHANGE RETAINING WALL NO. 10
	DATE 25 MAY 1966	APPROVED



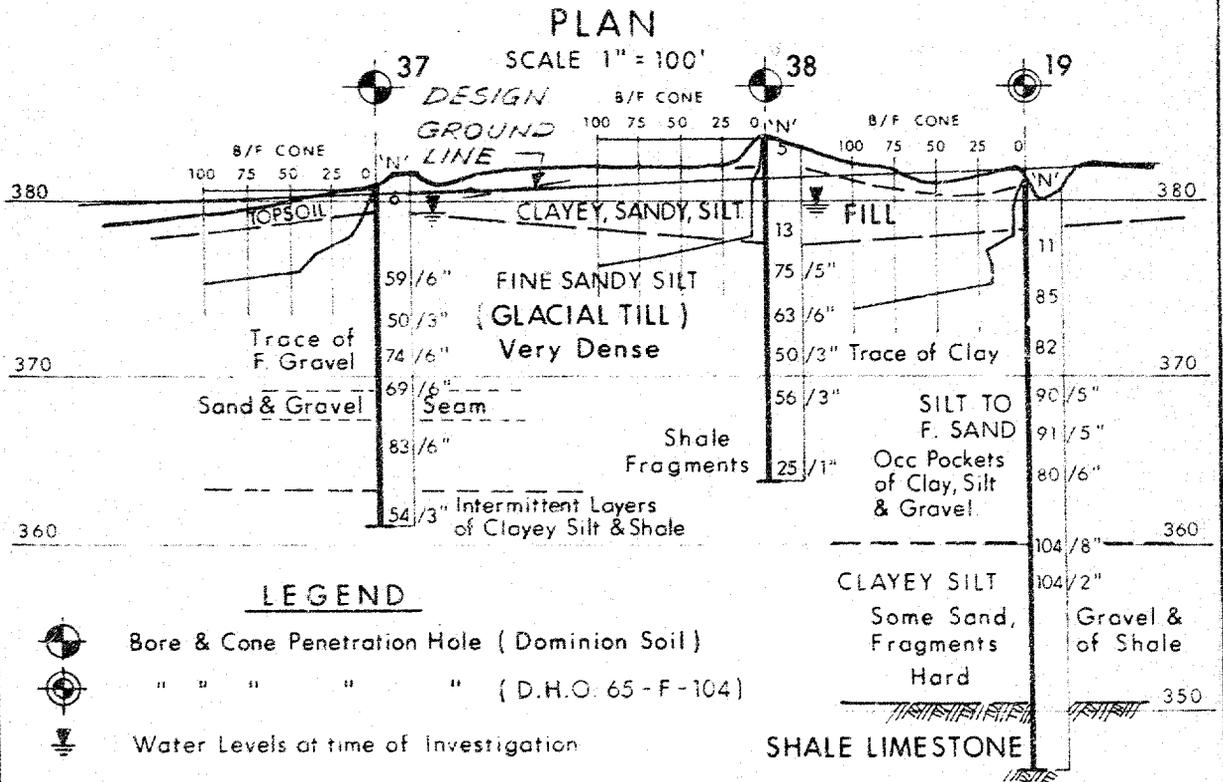
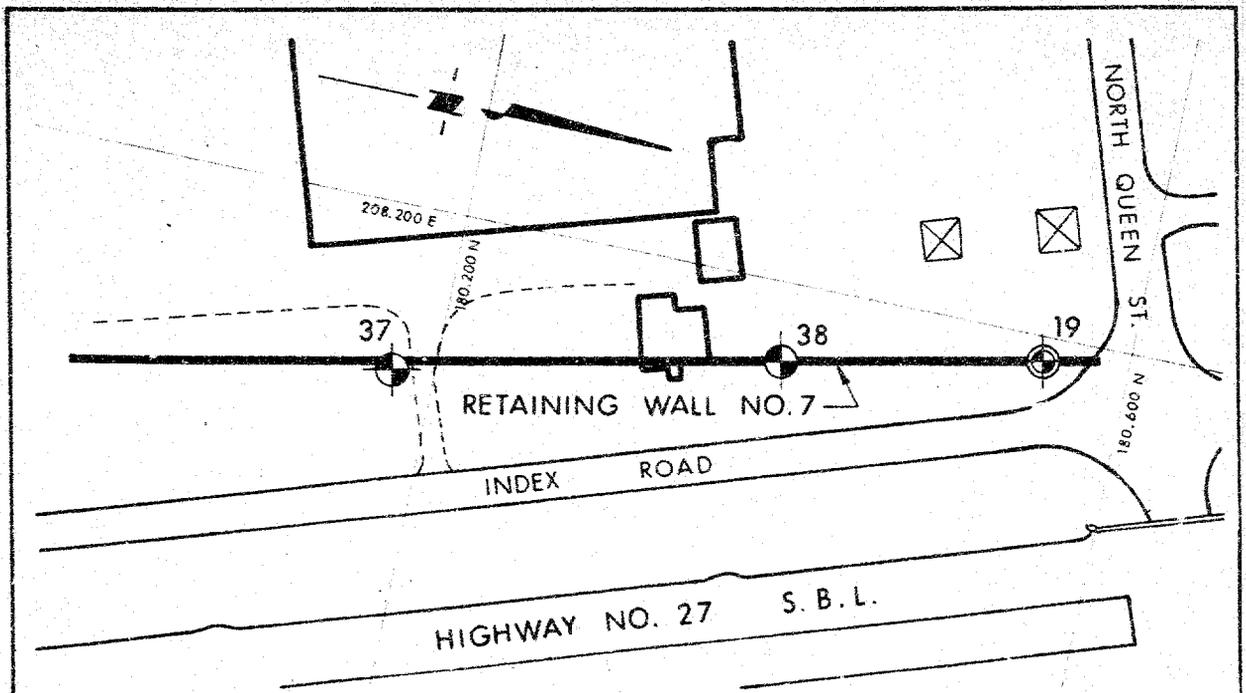
PLAN
SCALE 1" = 100'



- LEGEND**
- Bore & Cone Penetration Hole (Dominion Soil)
 - Bore & Cone Penetration Hole (D.H.O. 65-F-104)
 - Water Levels at time of Investigation

SECTION ALONG RETAINING WALL
VERT. 1" = 10'
SCALE HORIZ. 1" = 100'

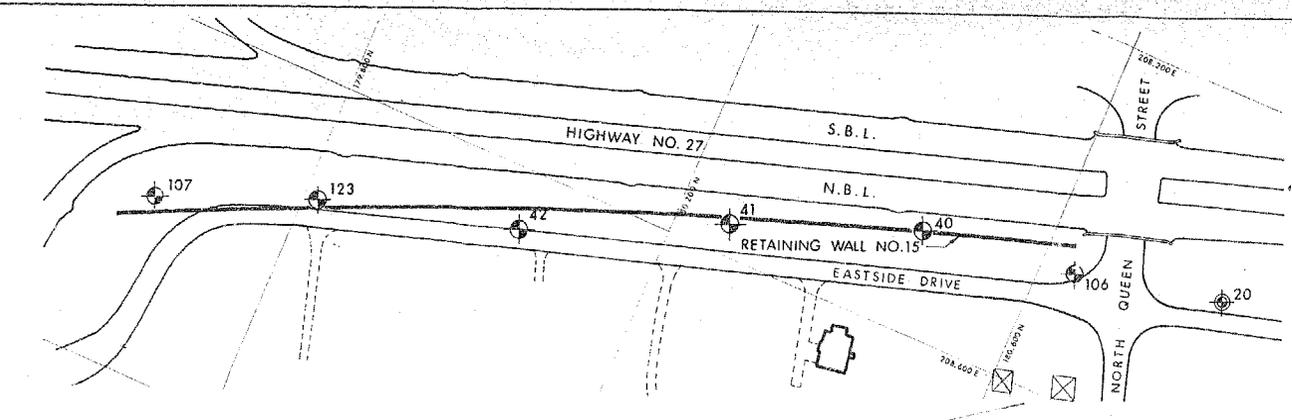
 ONTARIO	DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE RETAINING WALL NO. 11
	DATE 27 MAY, 1966	W.P. 275-64-4 APPROVED: <i>K. S. Sully</i>



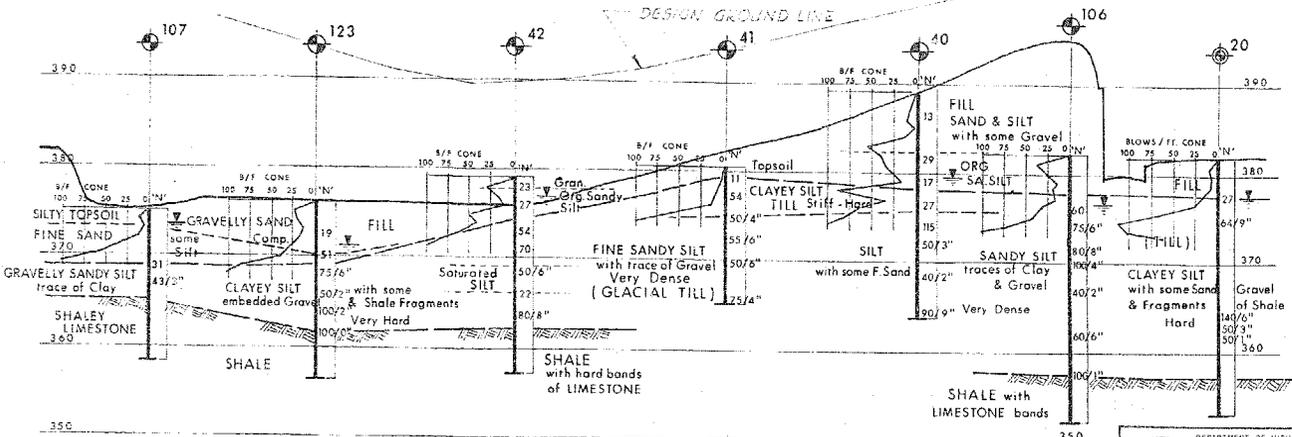
SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10', Horiz. 1" = 100'

 DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION ONTARIO	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE	
	RETAINING WALL NO. 7	
	W.P. 275-64-4	JOB 66-F-47
DATE 2 JUNE 1966	APPROVED <i>G. Bailey</i>	DRAWING NO. 66-F-47C



PLAN
SCALE: 1" = 100'



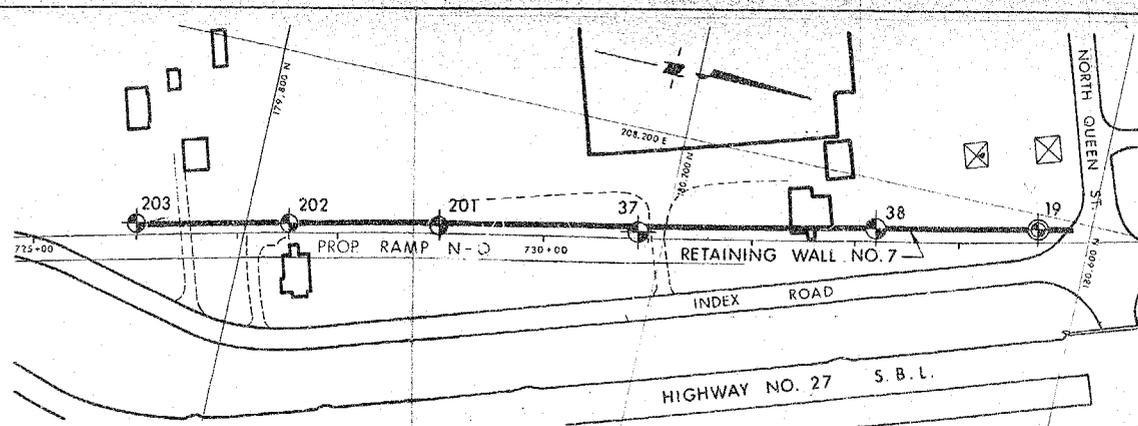
- LEGEND
- Bore & Cone Penetration Hole (Dominion Soil)
 - Water Levels at time of investigation (20 May 1966)
 - Bore & Cone Penetration Hole (D.H.O. 65-F-104)

SECTION ALONG RETAINING WALL

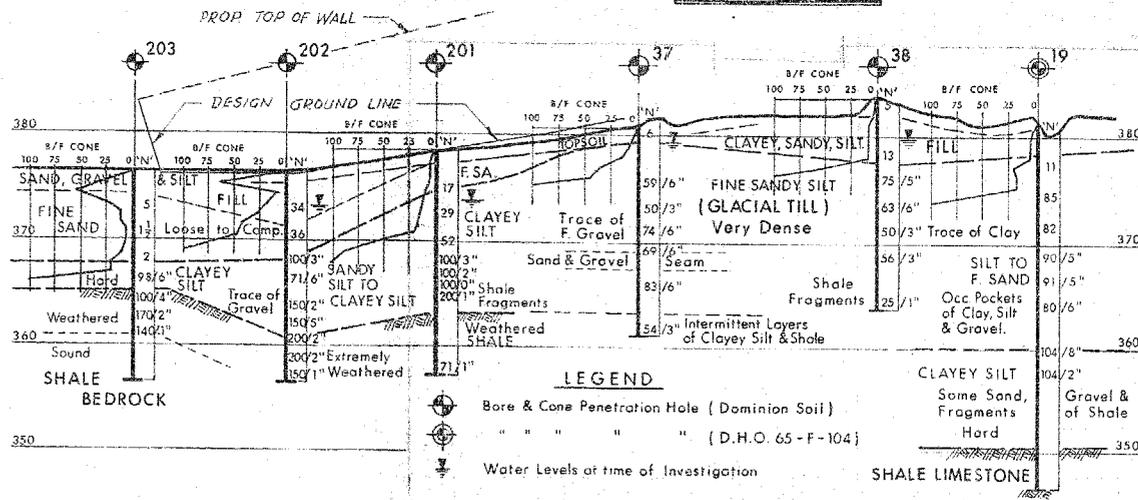
Scale: Vert 1" = 10'
Horiz 1" = 100'

REVISED 11 AUG. 1966

 ONTARIO DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE
	RETAINING WALL NO. 15
DATE 2 JUNE 1966	WP 275-64-4 APPROVED <i>Althorpe</i> JOB 66-F-47 66-F-47D



PLAN



LEGEND

- Bore & Cone Penetration Hole (Dominion Soil)
- " " " " (D.H.O. 65-F-104)
- ▽ Water Levels at time of Investigation

SECTION ALONG RETAINING WALL

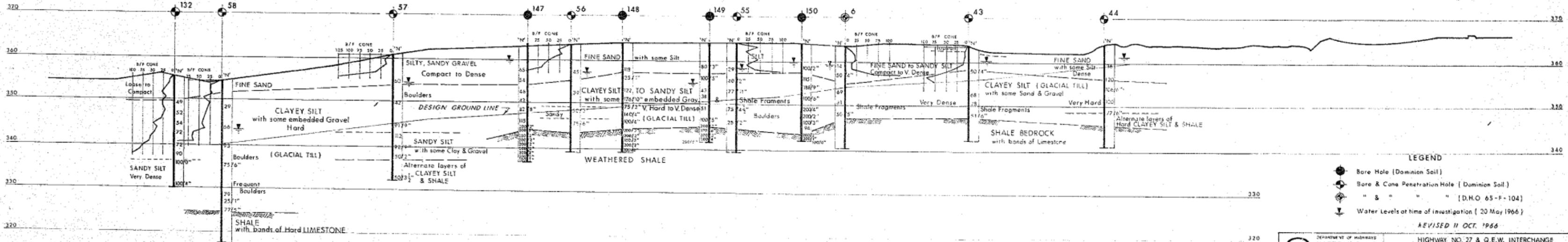
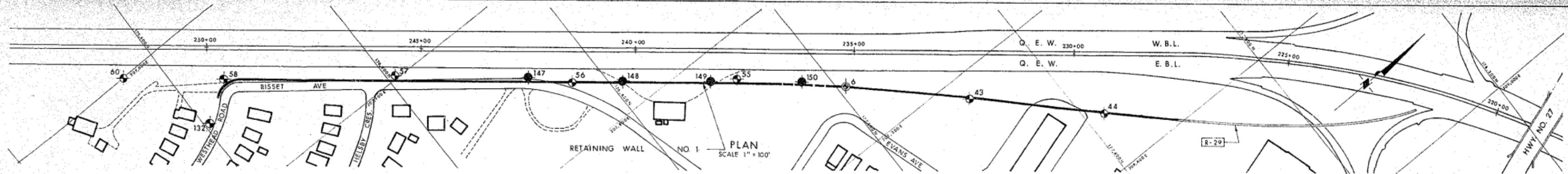


NOTE
The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office Downtown, and at the Toronto District Office.

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

DATE	RETAINING WALL EXTENDED 300' SOUTH
BY	MARK POLLEY, CIVIL ENGINEER
NO.	201, 202 & 203 ADDED
REVISION	

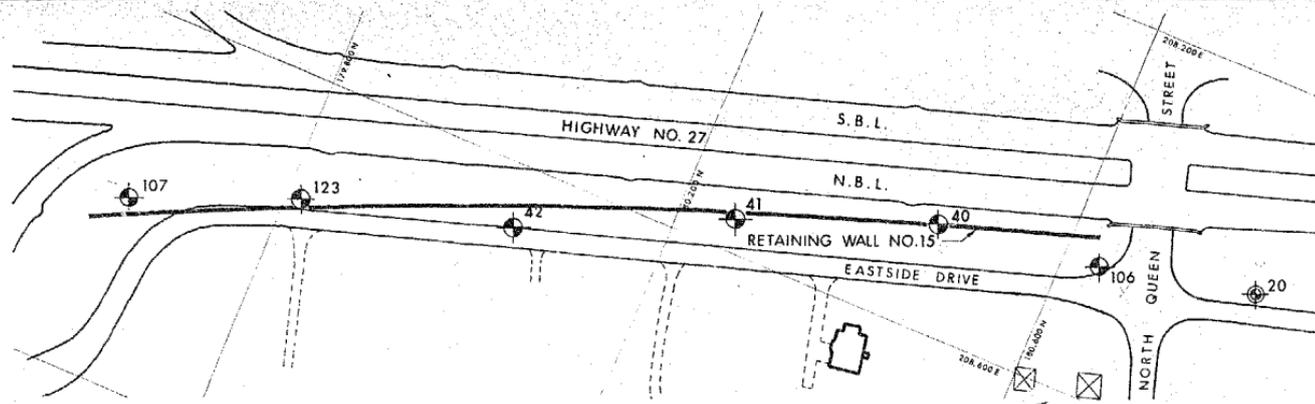
DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING DIVISION - TORONTO REGION			
RETAINING WALL No 7			
KING'S HIGHWAY NO. 27 & D.E.W. INTERCHANGE DIST. NO. 9			
CD			
TWP. E15B/S04E			
LOT			
CON.			
BORE HOLE LOCATIONS & SOIL STRATA			
SUBNO. P-5	CHECKED A.B.	HR. NO. 275-64-4	M.B.T. DRAWING NO.
SPANN. D-R	CHECKED J.E.	APP. NO. 80-1-47	66-F-47C
DATE 2 JUNE 1966	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	SCALE NO.		



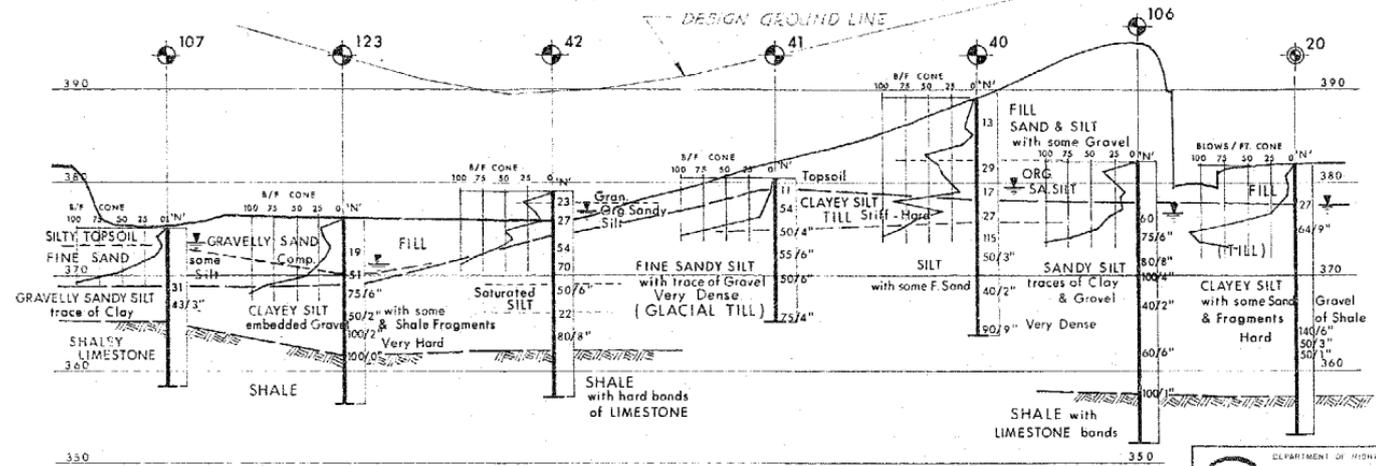
SECTION ALONG RETAINING WALL
 Vert. 1" = 10'
 Horiz. 1" = 100'


 DEPARTMENT OF HIGHWAYS
 MATERIALS and
 TESTING
 DIVISION
 ONTARIO

REVISIONS: REVISED 11 OCT. 1966
 HIGHWAY NO. 27 & Q.E.W. INTERCHANGE
RETAINING WALL NO. 1
 WP 275-64-4 JOB 66-F-47
 DATE 26 JULY 1966 APPROVED [Signature] DRAWING NO. 66-F-47 E



PLAN
SCALE: 1" = 100'

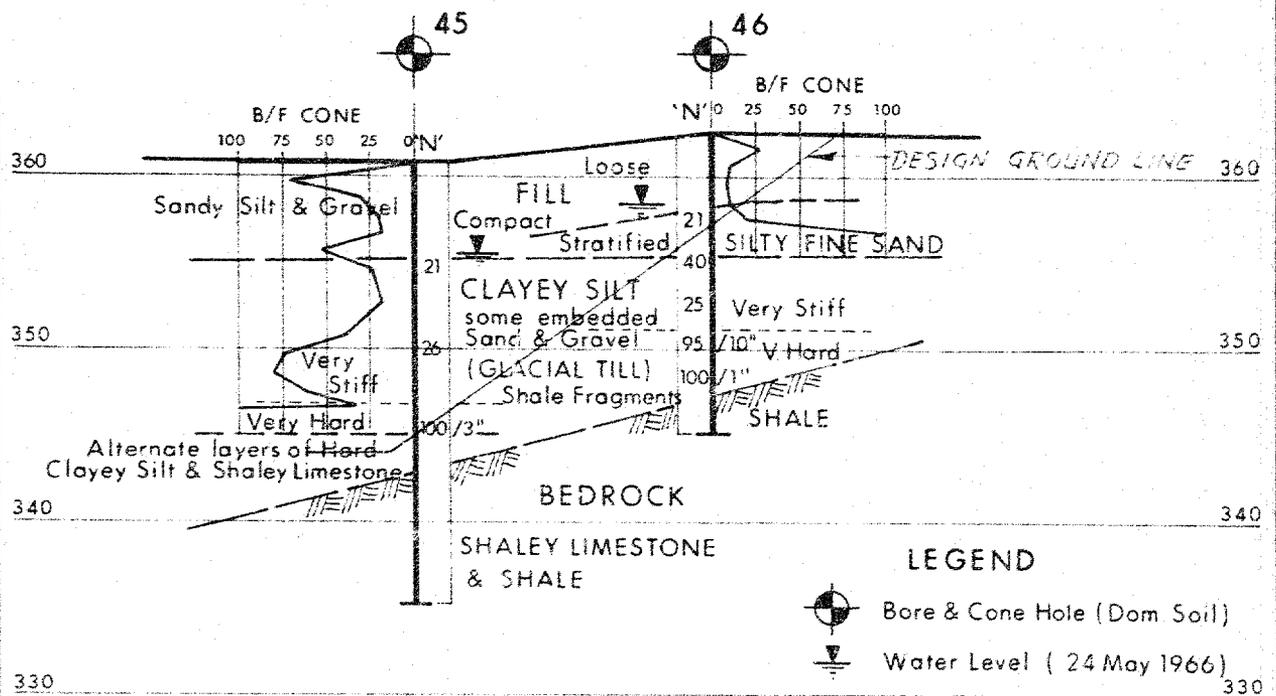
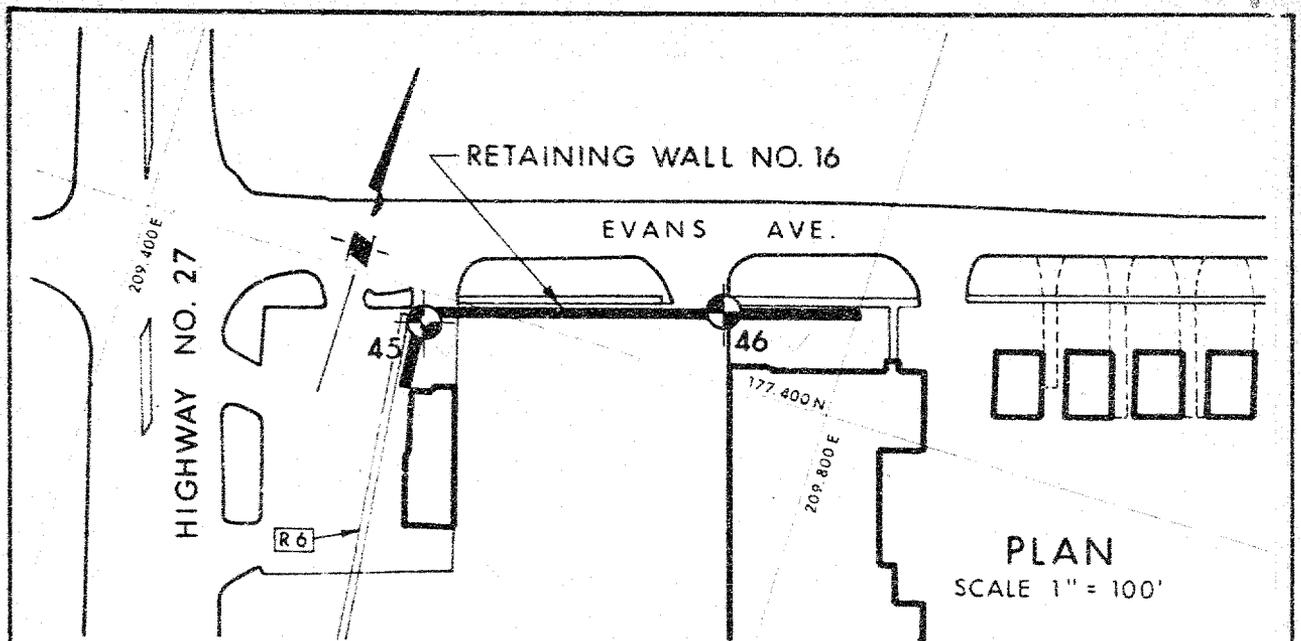


SECTION ALONG RETAINING WALL
SCALE: Vert. 1" = 10'
Horiz. 1" = 100'

- LEGEND
- Bore & Cone Penetration Hole (Dominion Soil)
 - Water Levels at time of investigation (20 May 1966)
 - Bore & Cone Penetration Hole (DHO 65-F-104)

REVISED 11 AUG 1966

 DEPARTMENT OF HIGHWAYS ONTARIO	MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE RETAINING WALL NO. 15
	DATE 2 JUNE 1966	APPROVED <i>alderman</i> WP 275-64-4



SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
 Horiz. 1" = 100'



DEPARTMENT OF HIGHWAYS
 MATERIALS and
 TESTING
 DIVISION

ONTARIO

HIGHWAY NO. 27 & Q.E.W. INTERCHANGE

RETAINING WALL NO. 16

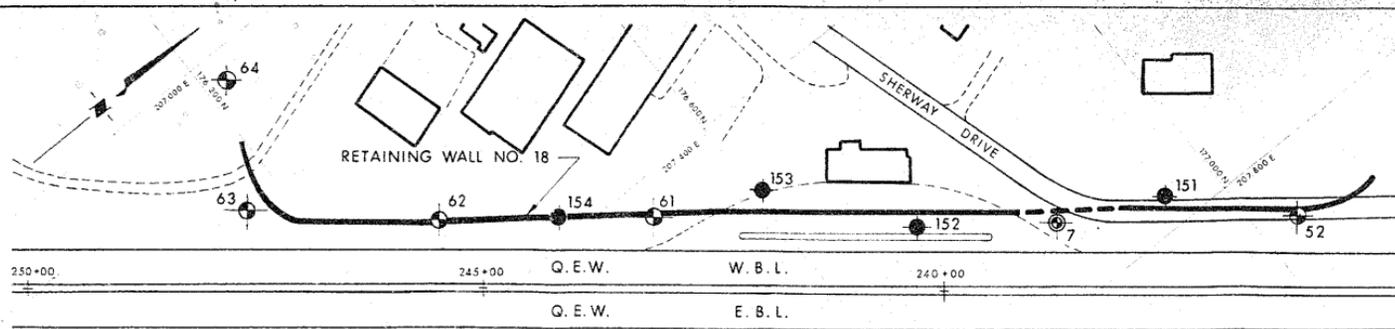
W.P. 275-64-4

JOB 66-F-47

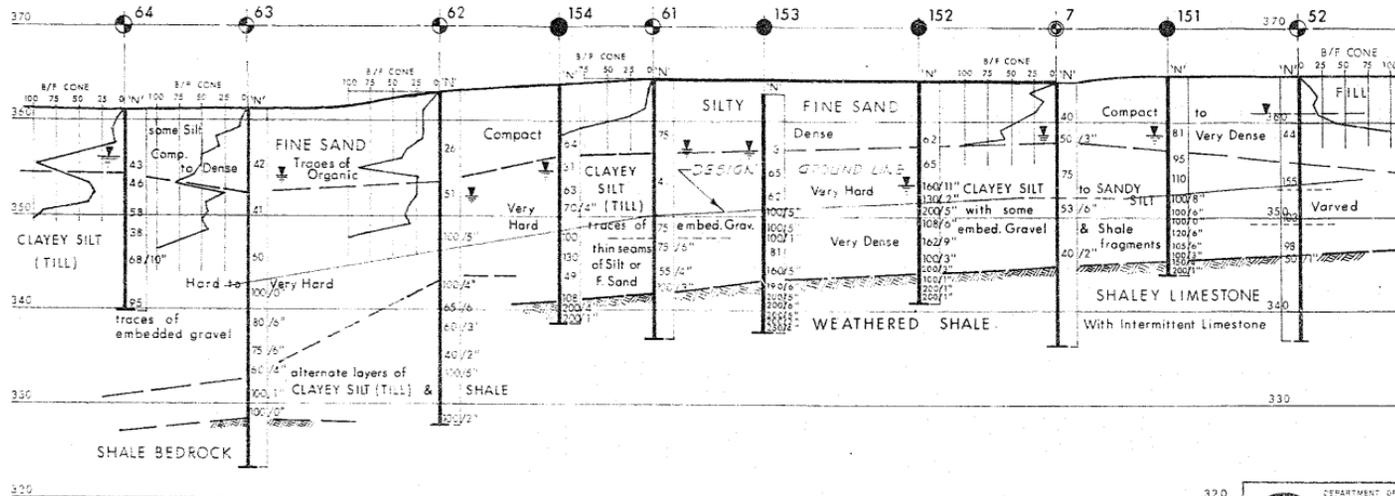
DATE 9 JUNE 1966

APPROVED

DRAWING NO. 66-F-47 F



PLAN
SCALE 1" = 100'



LEGEND

- Bore Hole (Dominion Soil)
- ⊕ Bore & Cone Penetration Hole (Dominion Soil)
- ⊕ Bore & Cone Penetration Hole (D.H.O. 65-F-104)
- ▽ Water Levels at time of Investigation (6 June 66)

SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
Horiz. 1" = 100'



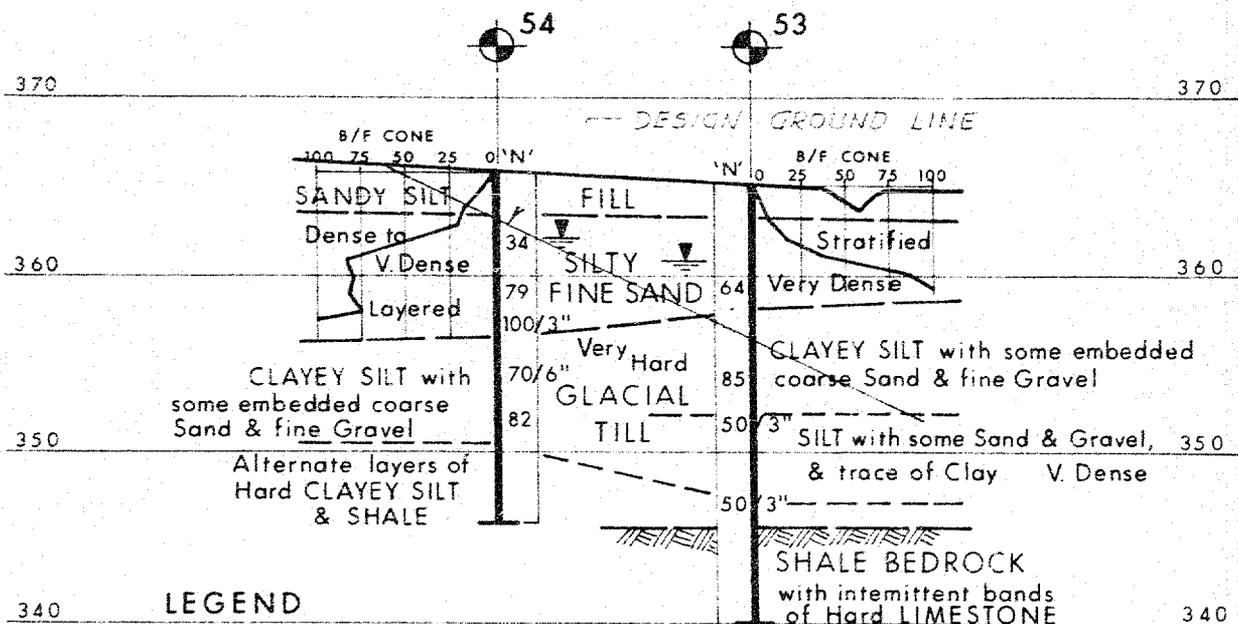
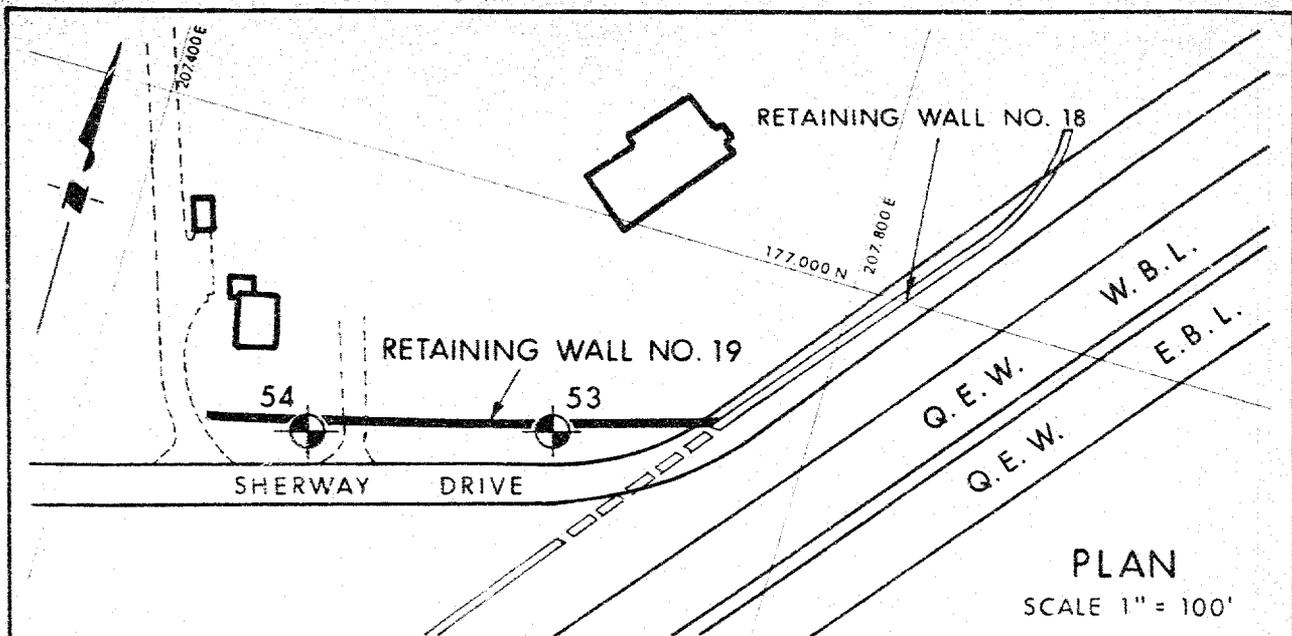
DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

HIGHWAY NO. 27 & Q.E.W. INTERCHANGE
RETAINING WALL NO. 18

WP 275-64-4 JOB 66-F-47

DATE 30 JUNE 66 APPROVED *Althorn* DRAWING NO. 66-F-47 G

18 OCT. 1966
REVISED 12 AUG. 1966



- Bore & Cone Hole (Dom. Soil)
- Water Level (28 May 1966)

SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
 Horiz. 1" = 100'



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

ONTARIO

HIGHWAY NO. 27 & Q.E.W. INTERCHANGE

RETAINING WALL NO. 19

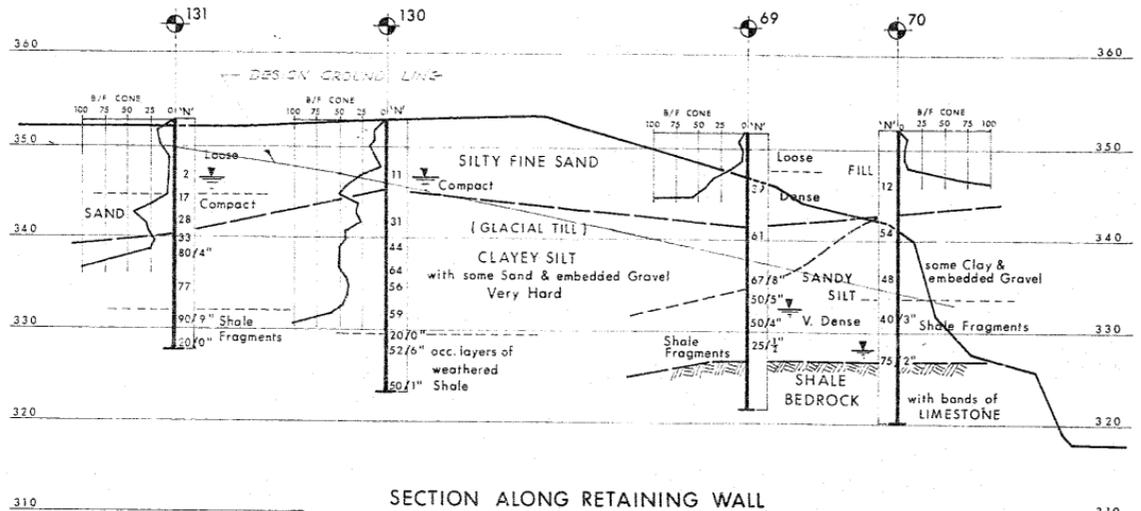
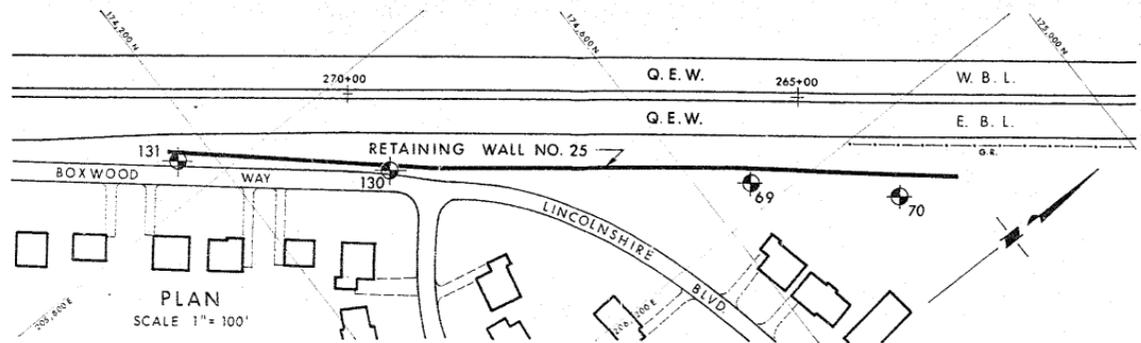
W.P. 275 - 64 - 4

JOB 66-F-47

DATE 15 JUNE 1966

APPROVED *[Signature]*

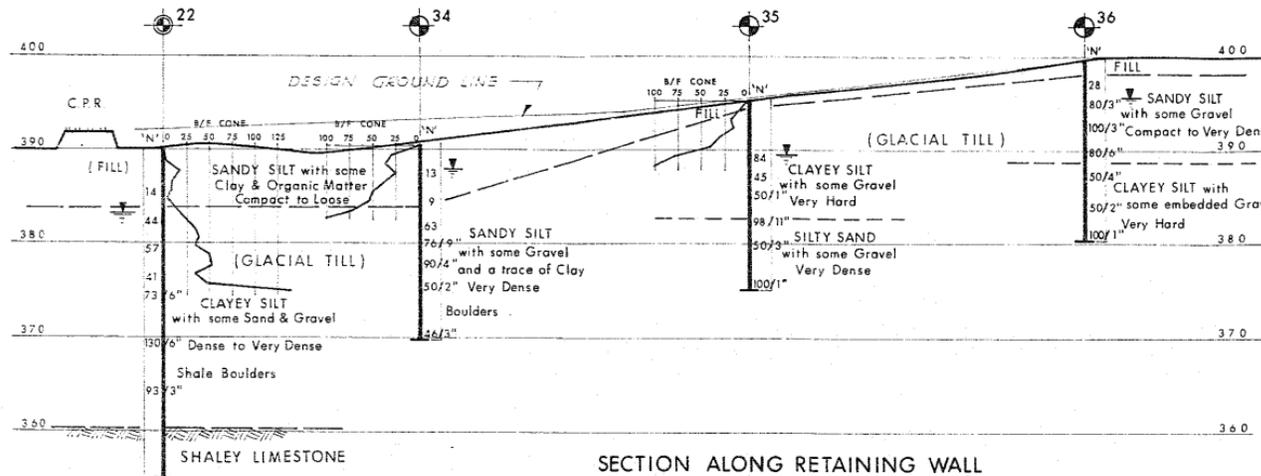
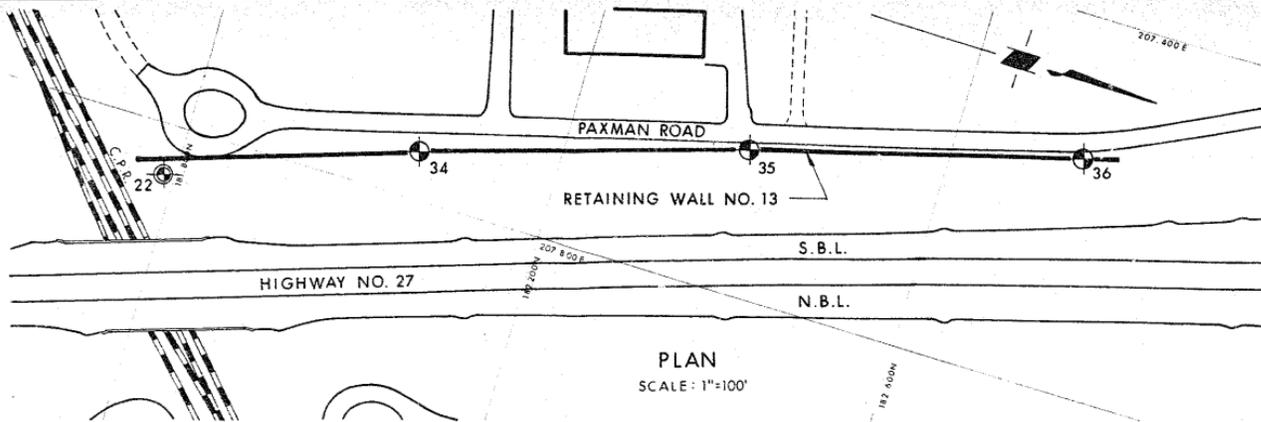
DRAWING NO. 66-F-47 H



- LEGEND
- Bore & Cone Penetration Hole (Dominion Soil)
 - Water Levels at time of investigation

REVISED 31 AUG. 1966

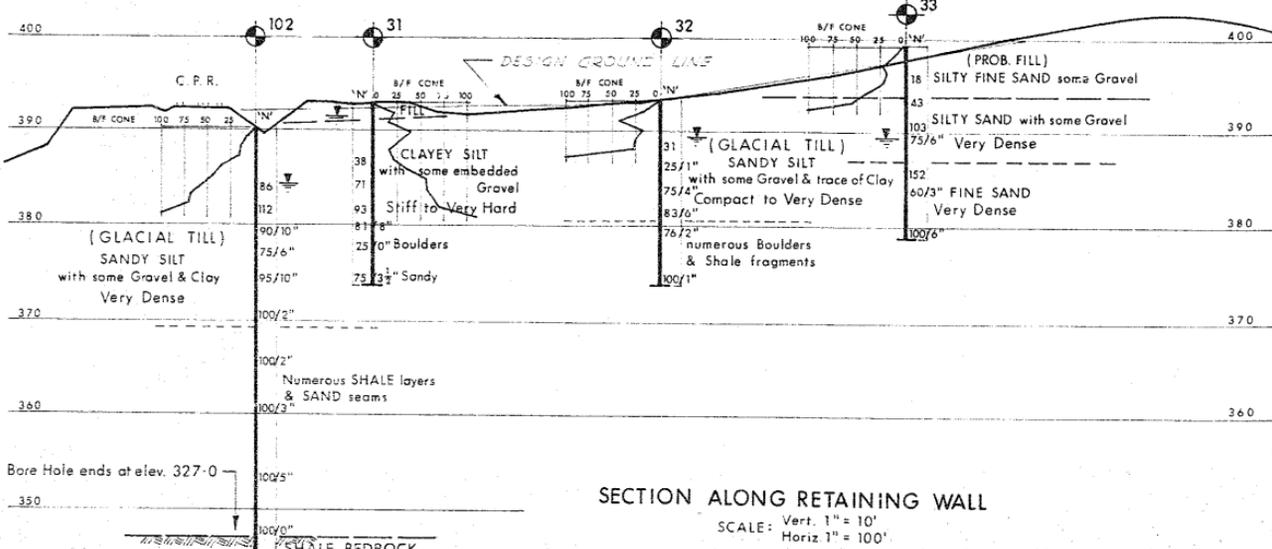
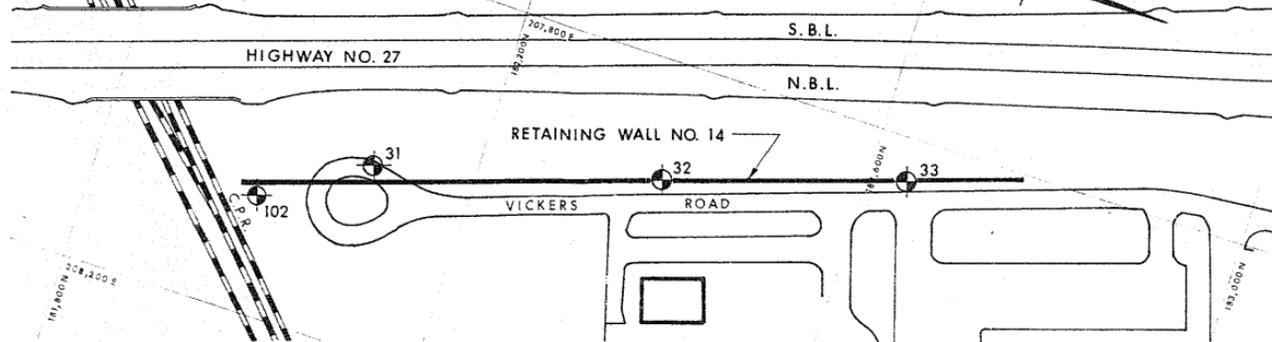
 DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION ONTARIO	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE
	RETAINING WALL NO. 25
DATE 23 JUNE 1966	W.P. 274-64-4 APPROVED <i>Alfred Mac</i> JOB 60-F-47 DRAWING NO. 66-F-47J



- LEGEND**
- Bore & Cone Penetration Hole (Dominion Soil)
 - " " " " (D.H.O. 65-F-104)
 - Water Levels at time of investigation

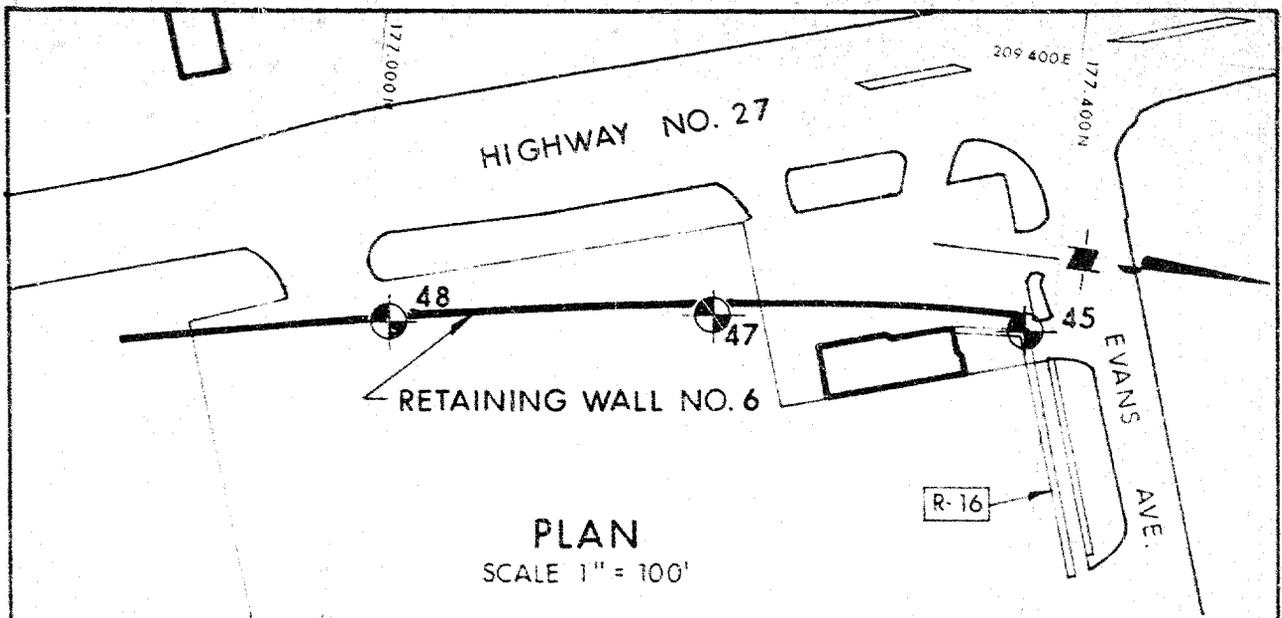
 DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION ONTARIO	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE
	RETAINING WALL NO. 13
WP 275-64-4	JOB 66-F-47
DATE 27 JULY 1966	APPROVED <i>[Signature]</i> DRAWING NO. 66-F-47R

PLAN
SCALE: 1"=100'

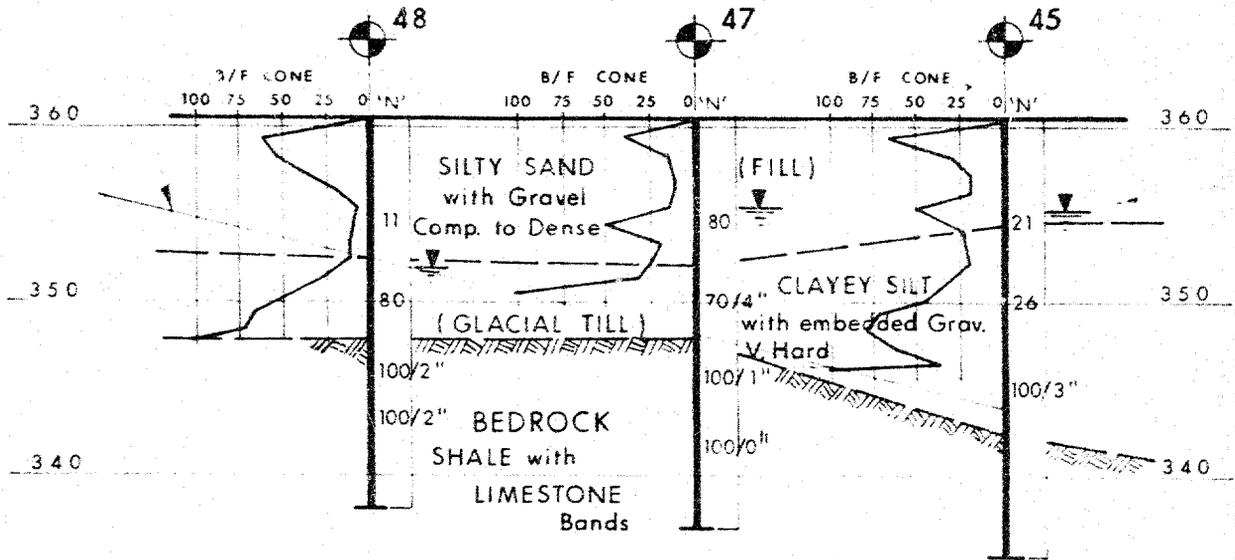


LEGEND
 Bore & Cone Penetration Hole (Dominion Soil.)
 Water Levels at time of investigation

	DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE RETAINING WALL NO. 14	
	DATE 25 JULY 1966	APPROVED <i>Al. H. ...</i>	WP 275-64-4 JOB 66-F-47 DRAWING NO. 66-F-47S



PLAN
SCALE 1" = 100'



LEGEND

- Bore & Cone Hole (Dom. Soil)
- Water Level

SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
Horiz. 1" = 100'



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

HIGHWAY NO. 27 & Q.E.W. INTERCHANGE

RETAINING WALL NO. 6

W.P. 275-64-4

JOB 66-F-47

DATE 26 JULY 1966

APPROVED *[Signature]*

DRAWING NO. 66-F-47 U

HIGHWAY NO. 27 N.B.L.

RETAINING WALL NO. 9

EASTSIDE

106

142

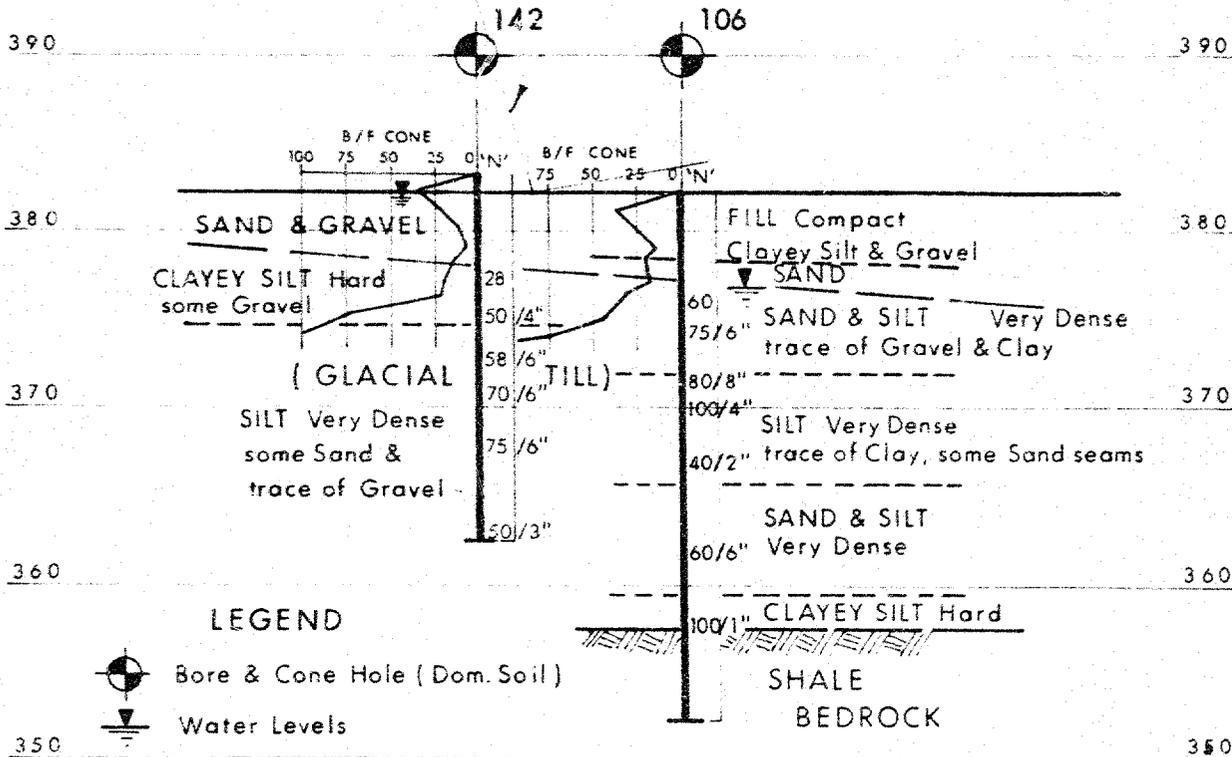
DRIVE

NORTH QUEEN ST

208,600 E
N009,001

PLAN

SCALE 1" = 100'



SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
Horiz. 1" = 100'



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

HIGHWAY NO 27 & Q.E.W. INTERCHANGE

RETAINING WALL NO. 9

W P 275 - 64 - 4

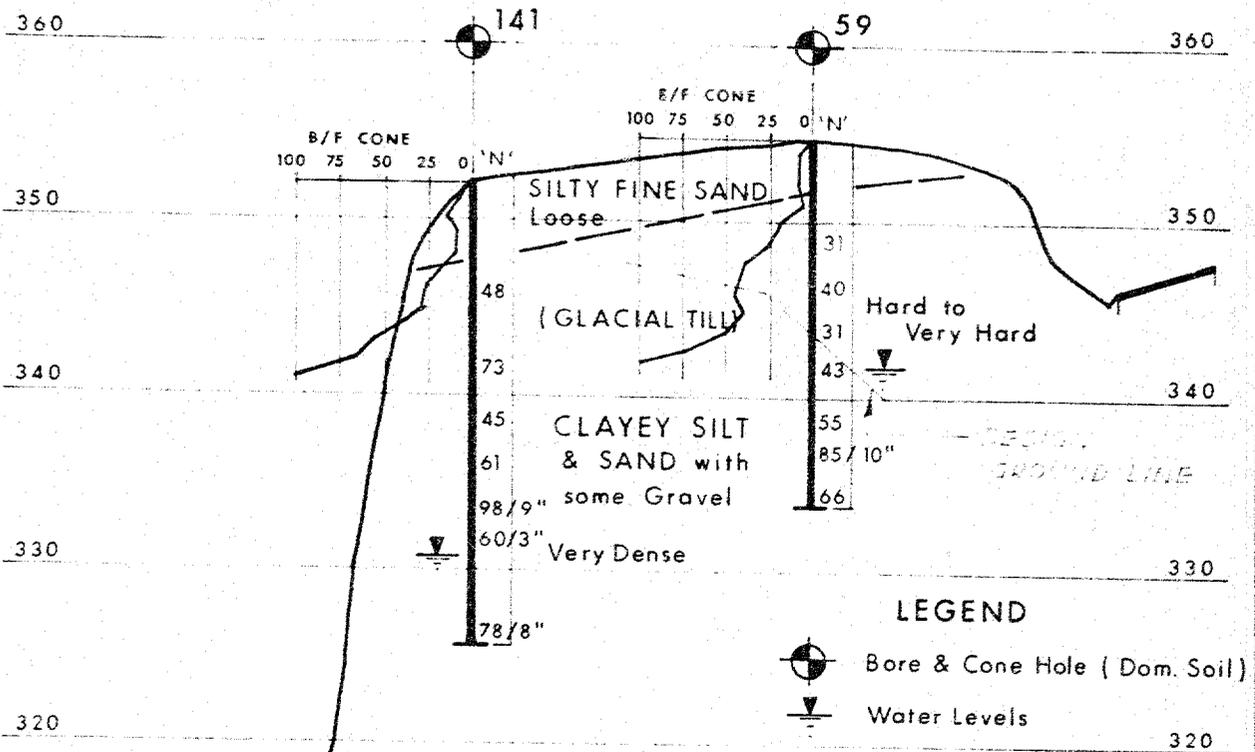
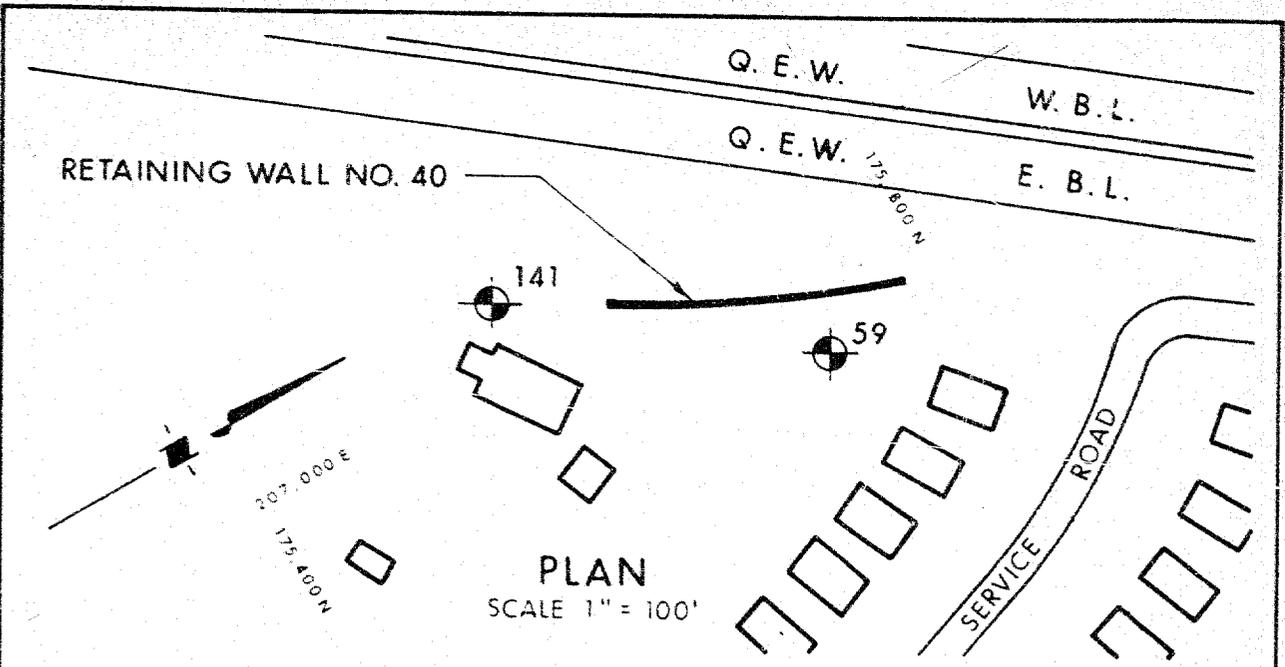
JOB 66-F-47

DATE 1 SEPT. 1966

APPROVED

DRAWING NO.

66-F-47 V



SECTION ALONG RETAINING WALL

SCALE: Vert. 1" = 10'
Horiz. 1" = 100'

 DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION ONTARIO	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE RETAINING WALL NO. 40	
	W P 275-64-4	JOB 66-F-47
DATE 2 SEPT. 1966	APPROVED <i>[Signature]</i>	DRAWING NO. 66-F-47X

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. S. McCumbe

DATE: February 2, 1967

OUR FILE REF.

IN REPLY TO:

SUBJECT: W.P. 275-64-4; Retaining Wall #7B,
Q.E.W. and Hwy. #27 Interchange,
District #6 (Toronto)

A memo by the Regional Bridge Location Engineer, dated January 5, 1967, was received by this Section. In the memo, additional soils investigation was requested at the site of the proposed Retaining Wall #7B extension.

Three additional boreholes were placed along the 300-ft. long extension. The borings were carried out by Dominion Soil Investigation Ltd., together with the preparation of the geotechnical data sheets.

A brief description of the subsoil and recommendations for the foundations for the entire revised structure is appended to this memo.

It is requested that Page #5 and Drawing #66-F-47C of the original report, #66-F-47, be destroyed and replaced by the enclosed new Page 5 and Drawing #66-F-47C (Revised). The attached three new borelogs should also be attached to the original report.

K. G. Selby

AKB/MdeF
Attach.

- cc: Messrs. B. R. Davis (2)
- H. A. Tregaskes
- D. W. Farren
- G. K. Hunter (2)
- F. Allen
- W. S. Melinyshyn
- T. J. Kovich
- B. A. Singh

K. G. Selby,
SUPERVISING FOUNDATION ENGINEER
For:
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

Foundations Files ✓
Gen. Files

Mr. B. R. Davis,
Bridge Engineer,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

October 26, 1966

OCT 26 1966

FOUNDATION INVESTIGATION REPORT

For

Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)

W.J. 66-P-47 -- W.P. 275-64-4

The foundation report for the above project has now been completed and contains our final recommendations for the following Retaining Walls No's 10, 11, 7, 15, 1, 16, 18, 19, 25, 26, 13, 14, 9, 40, 5, and 6.

In order to expedite the work of the Bridge Office and Road Design Office, advance copies of partial reports for each individual wall were issued to these offices as soon as they were completed by us. Due to the fact that a number of revisions have taken place concerning the layout of the retaining walls, it has been necessary to revise some of the foundation recommendations for certain walls since the time that they were issued in the form of advance copies. You are, therefore, requested to destroy all advance copies of the partial reports pertaining to the retaining walls listed above.

AGS/ndef
Attach.

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

cc: Messrs. B. R. Davis (2)
C. K. Hunter (2)

Foundations Office
Gen. Files

DOMINION SOIL INVESTIGATION LIMITED

17 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3881



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

26th January 1967.

Mr. A.G. Stermac, P.Eng.,
Principal Foundations Engineer,
Materials Testing Division,
Department of Highways, Ontario,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. A. Barsvary, P.Eng., Senior Engineer

Re: Q.E.W. and Highway #27 Interchange

Dear Sirs,

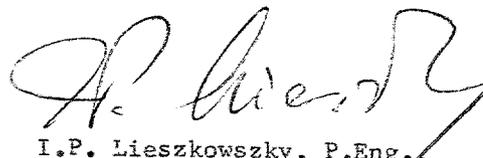
We have the pleasure of forwarding you fourteen copies of the records of boreholes No. 201, 202 and 203, pertaining to retaining wall No. 7 of the above project.

In view of the urgency on this project the samples were classified only visually without substantiating it by laboratory tests. However, if for purpose of reference you would like to have laboratory tests performed on some of the recovered samples we would be glad to oblige.

We trust that you will find the enclosed information and data in order.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED


I.P. Lieszkowszky, P.Eng.,
Chief Engineer.

IPL/me
Enclosures.

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3651



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

Our Ref. No: 6-5-39
Your Ref: W.J. 66-F-47

5th October 1966.

Mr. A.G. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby P.Eng.

Re: Soil Investigation for Q.E.W. and Hwy. No. 27
Interchange. Retaining Walls No. 1, 18 and 6.

Dear Sirs,

This letter accompanies fourteen copies of the records of
Boreholes No. 132, 151, 152, 153, 154 and 171 put down in connection
with the above structures.

We trust that you will find the records to your satisfaction.

Yours very truly,

DOMINION SOIL INVESTIGATION LTD.

I.P. Lieszkowszky P.Eng.
Chief Engineer.

IPL/me
Enclosures.

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565



BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 8-3351

FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66886

Mr. A.G. Stermac, Principal Foundation Engineer,
Department of Highways, Ontario,
Materials & Testing Division,
Downsview Avenue,
Downsview, Ontario.

September 29, 1966

Attention: Mr. K. Selby, P.Eng.

Dear Sir,

We are pleased to enclose the following Borehole Logs and
Grain Size Curves, that were requested by your Drafting department
on September 28, 1966.

Borehole Nos. (23 to 58 inclusive, 60 to 70 inclusive, 102, 106,
✓107, 116, 117, 118, 123, 130, 131, 141, 142), 7 copies ✓
of each.

Borehole Nos. (147, 148, 149, 150,) 3 copies of each.

Borehole No. ✓ 59 - 22 copies.

Grain Size Curves. (23, 29, 30,) 34, 44, 47, (47, 49)
(48, 50, 51,) (52, 54,) 55,
(55, 56, 57,) (58, 57, 61,) 53,
(66, 67, 68,) (66, 67,) 69 - 7 copies of each.

Grain Size Curves. (104, 106,) (104, 105, 106,) (107, 108,) ✓
(107, 108, 109, 120,) 49, - 14 copies of each.

Grain Size Curves. 60, 64, - 3 copies of each.

We thank you for giving us this opportunity to be of
service to you.

Yours Very Truly,

DOMINION SOIL INVESTIGATION LTD.

D. Mumford.

DM/mm

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

BRANCH
869 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 8-3881



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

Our Ref: 6-5-39
Your Ref: W.J.66-F-47

28th September 1966.

Mr. A.G. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways, Ontario,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P.Eng.

Re: Soil Investigation for Q.E.W. and Highway 27
Interchange, Retaining Wall No. 1

Dear Sirs,

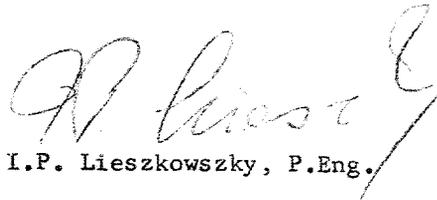
Enclosed are eleven copies of the records of boreholes No. 147, 148, 149 and 150 pertaining to the above structure.

The purpose of these additional boreholes was to establish, if possible, with more reliance the boundary between the weathered zone of the bedrock and the overlying glacial till deposit. What is believed to be the most likely boundary between these strata is indicated on the borehole logs.

We trust that you will find the forwarded information adequate for your purposes.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED


I.P. Lieszkowszky, P.Eng.

IPL/me
Enclosures

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE 3-3881



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66886

August 29, 1966.

Our Ref. No. 6-5-39
Your Ref. No. W. J. 66-F-47

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials and Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. & Hwy. # 27 Interchange,
Retaining Walls No. 9, 25, and 40.

Dear Sirs:

This letter accompanies eleven copies of the records of boreholes No. 130, and 131 (Retaining Wall No. 25); borehole No. 141 (Retaining Wall No. 40); and borehole No. 142 (Retaining Wall No. 9).

Boreholes No. 130 and 131 supplement the information shown on the records of boreholes 69 and 70, reported to you on June 20th, 1966. These additional boreholes were made necessary by the extension of Retaining Wall No. 25 in the westerly direction.

Borehole No. 141 was put down at the west end of the proposed Retaining Wall No. 40. Information about the subsurface conditions at the east end of the same retaining wall can be obtained from boreholes No. 59 and 60 put down in connection with Retaining Walls No. 23 and 24. These were reported to you on July 6th, 1966.

For Retaining Wall No. 9 which is located on the east side of Highway No. 27, just south of the North Queen Street, only 1 borehole was put down. This borehole (borehole No. 142) is located at the south end of the proposed Retaining Wall. For further information, reference should be made to borehole No. 106 located near the north end of this retaining wall. Borehole No. 106 was put down in connection with Bridge No. 15 and was reported to you on July 18th, 1966. For the sake

D O M I N I O N S O I L I N V E S T I G A T I O N L I M I T E D

Our Ref. No. 6-5-39

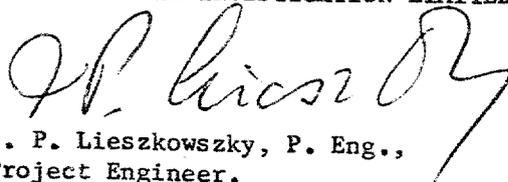
Page 2

of completeness however, the records of this borehole have been again reproduced and 11 copies are attached to this letter.

We trust that you will find the information shown on these borehole logs sufficient, however, should there be any questions please do not hesitate to call us.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,



I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

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TELEPHONE GE. 3-5351



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
54 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 6696

August 3, 1966.

Our Ref. 6-5-39
Your Ref. V. J. 66-F-47

Mr. A. G. Sternac,
Principal Foundation Engineer,
Materials and Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.,

Re: Soil Investigation for Q.E.W. & Hwy. #27 Interchange,
Retaining Wall No. 15.

Dear Sirs:

This letter accompanies the records of borehole No. 123, which was put down at the south end of the extension of Retaining Wall No. 15. Results of the other boreholes pertaining to this structure were reported to you on June 1st, 1966.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowsky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED
12 BROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

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FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

July 27, 1966.

Our Ref. 6-5-39
Your Ref. W.J. 66-F-47

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. and Hwy. #27
Interchange, Retaining Walls No. 5 and 6.

Dear Sirs:

We are forwarding you herewith eleven (11) copies of the records of boreholes No. 47, 48, 49, 50, and 51 put down at the approximate locations of Retaining Walls No. 5 and 6. Please note that because of the traffic conditions on Hwy. #27 boreholes 49, 50, and 51 were relocated on the west side of the road about 30 to 40 feet from the proposed location of the structure.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowsky
I. P. Lieszkowsky, P. Eng.,
Project Engineer.

IFL/ds

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

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FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

July 22, 1956.

Our Ref. 6-5-39
Your Ref. W.J. 66-F-47

Mr. A. G. Stermac
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. and Hwy. # 27
Interchange Retaining Walls No. 13 and 14.

Dear Sirs:

Enclosed are eleven (11) copies of boreholes No. 34, 35, 36 and 31, 32, 33, pertaining to retaining walls No. 13 and 14 respectively.

We trust that you will find the records of these boreholes to your satisfaction.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowsky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

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FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 68896

July 12, 1966.

Our Ref. No. 6-5-39
Your Ref. W. J. 66-F-47

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.,

Re: Soil Investigation for Q. E. W. and Hwy. #27
Interchange, Retaining Wall No. 22.

Dear Sirs:

Please find enclosed eleven (11) copies of the records of Boreholes No. 64 and 65, and the result of the sieve analysis performed in connection with the proposed retaining wall No. 22.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

BRANCH
368 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE 3-8851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

July 6, 1966.

Our Ref. No. 6-5-39
Your Ref. W. J. 66-F-47

Mr. A. G. Stermac,
Principal Foundation Engineer,
Materials & Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.,

Re: Soil Investigation for Q. E. W. and
Hwy. #27 Interchange for Retaining
Walls No. 23 and 24.

Dear Sirs:

This letter accompanies the records of boreholes No. 59 and 60 put down at the proposed locations of retaining walls No. 23 and 24 respectively.

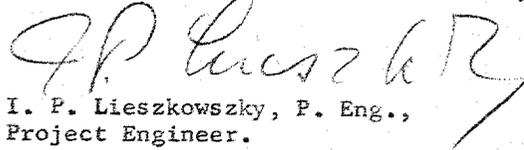
In the area of borehole No. 59, the subsoil immediately below the proposed foundation level is a clayey silt of low plasticity (P.I. = 10 to 14) and very hard consistency. The undrained shear strength of the clayey silt, measured in the laboratory by unconfined compression tests, ranges between 9,500 and 12,700 pounds per square foot as shown on the Geotechnical Data Sheet of the borehole.

In borehole No. 60 the subsoil is a predominantly granular glacial till as indicated by the attached grain size distribution curves and the low plasticity Index (3.5) obtained in the Atterberg Test.

The observed ground water level ranges between elevations 341.5 and 345 ft.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,


I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

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369 QUEENS AVENUE
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TELEPHONE GE. 3-3651



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66996

June 29, 1966.

Our Ref. No. 6-5-39
Your Ref. W. J. 66-F-47

Mr. A. G. Stermac,
Principal Foundations Engineer,
Materials and Testing Division,
Department of Highways,
Downsview Avenue,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q. E. W. and Hwy. #27
Interchange. Retaining Walls No. 20 and 21.

Dear Sirs:

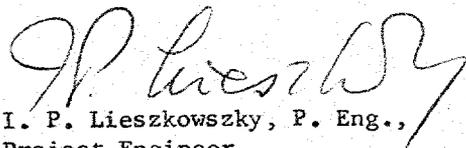
Enclosed herewith are eleven (11) copies of the records of boreholes No. 55,56,57, 58 and No. 61,62,63 pertaining to the above retaining walls.

The soil stratigraphy in the area of these retaining walls is similar to that reported earlier. A shallow stratum (2.5 to 9.5 ft.) of very fine sand is followed by the very hard or very dense clayey silt or sandy silt till deposits which in turn are underlain by the shale bedrock. The ground water level generally lies within the top silty sand stratum.

Particularly noteworthy is however, the artesian condition observed in borehole No. 62 between elevations 333 and 328 ft. only about 10 feet below the proposed foundation level. The total head is about 30 ft. (slightly above the ground surface) but since the pressure ceased after half an hour the source of water appears to be limited.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,


I. P. Lieszkowsky, P. Eng.,
Project Engineer.

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

RANCH
369 QUEENS AVENUE
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TELEPHONE GE. 9-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66886

June 20, 1966.

Our Ref: 6-5-39
Your Ref: W.J. 66-F-47

Department of Highways, Ontario,
Materials & Testing Division,
Downsview St.,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. and Hwy. 27
Interchange, Retaining Walls No. 25 and 26

Dear Sirs:

Enclosed are eleven (11) copies of the records of boreholes Nos. 66, 67, 68, 69, 70, 116, 117 and 118. Boreholes Nos. 116 and 118 inclusive were put down at the extension of retaining wall No. 26, in front of Watson's Apple Storage Ltd. The boreholes were put down approximately 4 ft. south of the south face of the existing structure.

Results of the laboratory tests performed on representative samples recovered from the above boreholes are shown on the Geotechnical Data Sheets for the boreholes or on separate enclosures also attached to this letter.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowsky
I. P. Lieszkowsky, P. Eng.
Project Engineer.

IPL/jvm
Encls.

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE 3-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66856

June 15, 1966.

Our Ref: 6-5-39
Your Ref: W.J. 66-F-47

Department of Highways, Ontario,
Materials & Testing Division,
Downsview St.,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. and Highway #27
Interchange, Retaining Walls Nos. 18 & 19

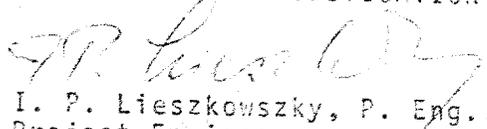
Dear Sirs:

Boreholes Nos. 52, 53 and 54, pertaining to the above Retaining Walls, have been completed and records of the borings are enclosed herewith.

The soil conditions encountered are typical of the area. The surface of the shale bedrock was encountered between Elevations 345 and 350 feet. It is overlain by a very dense or very hard glacial deposit, covered by about 10 feet of silty fine sand. The ground water level which lies at an average elevation of 361 feet, was encountered within this silty sand stratum. In view of the permeable nature and the uniform grading of this sand, this may create some dewatering problems during construction. Typical grain size distribution curves are also enclosed.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,


I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/jvm

D O M I N I O N S O I L I N V E S T I G A T I O N L I M I T E D
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 421-2567

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FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
94 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66895

June 7, 1966.

Our Ref: 6-5-39
Your Ref: W.J. 66-F-47

Department of Highways, Ontario,
Materials & Testing Division,
Hwy. 401 and Keele Street,
Downsview, Ontario.

Attention: Mr. K. Selby, P. Eng.

Re: Soil Investigation for Q.E.W. & Hwy. 27
Interchange, Retaining Walls No. 1 & 16

Dear Sirs:

Enclosed are eleven (11) copies of the records of boreholes No. 43, 44, 45 and 46 and of two grain size distribution curves.

To depths ranging between 5 and 8 feet below the ground surface, the site in the area of the proposed retaining walls No. 1 and 16 is underlain by silty fine sand (Sand: 70 - 85%; Silt: 15 - 30%) followed by clayey silt deposits of glacial origin. The bedrock was encountered between elevations 342 and 347 feet.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

I. P. Lieszkowszky
I. P. Lieszkowszky, P. Eng.,
Project Engineer.

IPL/jvm
Encls.

DOMINION SOIL INVESTIGATION LIMITED

77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE ~~XXXXXXXX~~

751-6565

RANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

May 25, 1966.

Our Ref: 6-5-39

Your Ref: W.J. 66-F-47

Department of Highways, Ontario,
Materials & Testing Division,
Hwy. 401 & Keele St.,
DOWNSVIEW, Ontario.

Attention: Mr. K. Selby, P.Eng.

Re: Soil Investigation for Q.E.W. & Hwy. #27
Interchange, Retaining Walls No. 10 & 11

Dear Sirs:

Enclosed with this letter we are forwarding you eleven (11) copies of the records of the boreholes pertaining to the above two structures (B.H.'s No. 23 to 30 inclusive).

As shown, the site at these locations is underlain by very hard clayey or very dense predominantly silty glacial till deposits.

Atterberg tests indicate that the Liquid Limit of the clayey deposits ranges between 24 and 28% with corresponding Plasticity Indices of 8 to 12. Particularly noteworthy are the high shear strength values measured by unconfined compression tests performed on slightly disturbed split spoon samples. Taking the shear strength as one-half of the unconfined compressive strength most of the measured values fall generally between 15,000 and 20,000 P.S.F. These high shear strength values are substantiated also by the negative Liquidity Indices and the high standard penetration resistances.

Typical grain size distribution curves of the more sandy and silty till strata are shown on a separate enclosure

cont'd.

6-5-39

Page 2.

indicating a well graded mixture of particles ranging between the clay and gravel sizes (clay: 2 to 12%, silt: 35 to 45%, sand: 35 to 50%, gravel: 3 to 15%).

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,



I. P. Lieszkowszky, P.Eng.,
Project Engineer.

IPL/is

- FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)
W.J. 66-F-47 - W.P. 275-64-4

1. INTRODUCTION:

A request for a foundation investigation at the sites of a number of retaining walls to be constructed as part of the proposed Q.E.W. and Hwy. #27 interchange was received by this Section on May 6, 1966. The request was made verbally by Mr. R. Strain, Direct Expenditures Supervisor, Program Division, and Mr. J. McAllister, Bridge Location Supervisor, Bridge Division.

Due to the urgency of the work, the investigations for each wall are reported separately as soon as the field work is completed, and according to a particular time schedule supplied to us by Mr. Strain. The individual walls are identified by number.

Field work, laboratory work, and the preparation of the Record of Borehole sheets, have been undertaken by Dominion Soil Investigation Ltd.

This report contains the results of the field and laboratory investigations, together with our recommendations pertaining to foundation design.

2. DESCRIPTION OF SITE:

The site is located in the general area of the intersection of Hwy. #27 and the Q.E.W. in the Twp. of Etobicoke, Metropolitan Toronto. The surrounding district is heavily built up both of light industry and residential buildings. The topography of this area may be described as flat to gently undulating.

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

Physiographically, the area is situated in the low-lying part of the region referred to as the Iroquois Plain which was formed during the late Pleistocene period by the body of water since designated Lake Iroquois. Soils in this part of the region are mainly heavy-textured shale and limestone tills.

3. SUBSOIL CONDITIONS:

Subsoil over the site area, consists generally of deposits of silty sand to sandy silt followed by clayey silt, sand and gravel (glacial till), followed by shaley limestone bedrock. Depth to bedrock ranges from about 4 feet (El. 365.0) at the south end of the project to about 30 feet (El. 350.0) at the north end. The boundaries between the different deposits are shown on the borelog sheets contained in the Appendix of this report. The estimated stratigraphical profiles shown on Drawings 66-F-47-A, B, C, etc., are based upon this information. Detailed descriptions of the subsoil conditions at each of the retaining wall sites investigated, are given separately in Section 4 below:

4. DISCUSSION AND RECOMMENDATIONS:

Seventeen retaining walls are included in this project. These are numbered 10, 11, 7, 15, 1, 16, 18, 19, 25, 26, 20, 21, 23, 24, 22, 13 and 14. Subsoil conditions and recommendations for the individual retaining wall foundations are discussed separately, as follows:

cont'd. /3

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

RETAINING WALL #10 -

1. Soil Conditions:

Four borings were carried out at the site of this wall. The borings are numbered: 23, 24, 25 and 26. Subsoil consists of from 1 to 4 feet of sandy silt to silty sand fill material, followed by about 22 feet of very stiff to hard glacial till, followed by limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clay, silt, sand and gravel in varied proportions, but is generally of a cohesive nature. Ground water level in the borings was found to range from just below the ground surface to about 7 feet below.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-P-47A.

2. Recommendations:

The proposed retaining wall may be supported on spread footings founded within the hard glacial till stratum. It is estimated that a safe net pressure of 3.5 t.s.f. can be achieved for footings located about 4 feet below present original ground level. In this event, the base of the footings would range from El. 377.0 at the south end of the wall, to El. 379.0 at the north end. For footings placed 6 feet below present original ground level, design pressures up to 4.5 t.s.f. may be assumed.

In computing the resistance to lateral movement on the footing bases, an adhesion value of 3000 p.s.f. may be assumed to act between the underside of footings and the subsoil.

For backfill to the retaining walls, you are referred to a memo from Mr. A. Rutka, Materials and Testing Engineer, to Mr. A. M. Toye, Bridge Engineer, dated March 27, 1963, the subject being: "Hwy. #401, Toronto Bypass Retaining Wall Backfill."

No dewatering problems are anticipated.

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

RETAINING WALL #11 -

1. Soil Conditions:

Five borings were drilled at the site of this wall and are numbered: 20, 27, 28, 29 and 30. Subsoil consists of up to 6 feet of sandy silt to silty sand fill material, followed by 20 to 24 feet of hard glacial till, followed by limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clay, silt, sand and gravel in varied proportions, but is generally of a cohesive nature. Ground water levels in the borings were found to range from 1 to 4 feet below the ground surface.

The locations and elevations of the borings, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47B.

2. Recommendations:

The proposed wall may be supported on spread footings founded within the hard glacial till stratum. For footings founded some 4 feet below present original ground level, a safe net pressure of 3.5 t.s.f. may be assumed for design purposes. In this event, the base of the footings would range from El. 377.0 at the south end of the wall, to El. 383.0 at the north end. For footings placed 6 feet below present original ground level, design pressures up to 4.5 t.s.f. may be assumed.

In computing the resistance to lateral movement on the footing bases, an adhesion value of 3000 p.s.f. may be assumed to act between the underside of footing and the subsoil.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

No dewatering problems are anticipated.

cont'd. /5

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

RETAINING WALL #7 -

1. Soil Conditions:

Three borings were carried out at the site of this wall. The borings are numbered: 19, 37 and 38. Subsoil consists of from 2 to 4 feet of sandy silt fill material, followed by a very dense deposit of glacial till, followed by shaley limestone bedrock. The glacial till deposit extends for about 27 feet and consists generally of sandy silt with traces of gravel, changing to clayey silt with sand and gravel in the lower 10 feet. Groundwater levels in the borings ranged from 3 to 4 feet below the ground surface.

The locations and elevations of all borings, together with the inferred soil stratigraphy, are shown on the attached Drawing #66-F-47C.

2. Recommendations:

The proposed wall may be founded at approximately El. 375.0 in which case, allowable pressures up to 4.5 t.s.f. may be assumed for design purposes.

In computing the resistance to lateral movement on the footing bases, a friction coefficient of 0.5 may be assumed to act between the bottom of the footing and the subsoil.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

This type of subsoil is susceptible to conditions of unbalanced hydrostatic head. It is believed, however, that dewatering of the relatively shallow excavations should present no major problems.

cont'd. /6 ...

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

RETAINING WALL #15 -

1. Soil Conditions:

Seven borings have been carried out at the site of this retaining wall and are numbered: 20, 40, 41, 42, 106, 107, and 123. Subsoil consists of from 3 to 17 feet of sand and silt fill material, followed by a very dense deposit of glacial till, ranging in depth from 12 to 20 feet, followed by shaley limestone bedrock. The glacial till deposit consists generally, of fine sandy silt with traces of gravel. Pockets of hard clayey silt with some sand and gravel and shale fragments are also contained within the deposit. Groundwater levels were found to range from 2 to 9 feet below the ground surface in the boreholes, and corresponded closely to the elevations of the original ground surface.

The locations and elevations of the borings, together with the inferred soil stratigraphy, are shown on the accompanying Drawing #66-F-47D.

2. Recommendations:

At this location the proposed finished ground level on the low side of the retaining wall is approximately 5 to 18 feet higher than the present ground surface. In this case, three alternative types of foundation are proposed for consideration:

a) The proposed wall may be founded some four feet below the original ground surface, assuming a design pressure of 4.5 t.s.f. In this case, the base of footing will range from El. 367.0 at the south end of the wall, to El. 375 at the north end. A friction coefficient of 0.45 may be assumed to apply between the underside of footings and the soil. A dewatering scheme may be required since the soil is likely to 'boil' under conditions of unbalanced hydrostatic head.

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

RETAINING WALL #15 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

b) The proposed wall footings may be placed within the fill material some four feet below the finished level and be supported on steel H-piles driven to bedrock, or to practical refusal in the glacial till overlying the rock. For design purposes, the maximum allowable load for the particular section used may be assumed.

c) The proposed walls may be founded on spread footings placed on well compacted G.B.C. Class 'A' fill material. The depth of the foundation should be not less than 4 feet below finished ground level. The G.B.C. Class 'A' material should extend for a minimum width of 3 feet on each side of the footings in the plane of the footing tops. It should then slope down at 1:1 to the existing ground level. All topsoil and loose existing fill material should be removed prior to placing the new granular fill. A safe net pressure of 2 t.s.f. may be assumed for design purposes.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

cont'd. /8

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

RETAINING WALL #16 -

1. Soil Conditions:

Two borings were drilled at the location of this wall. These are numbered: 45 and 46. Subsoil consists of about 5 feet of sandy silt to silty sand fill material, followed by 11 to 13 feet of very dense glacial till, followed by shaley limestone bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. Ground water level in the boreholes was found to range from 3 to 6 feet below the ground surface.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-F-47F.

2. Recommendations:

The finished ground line on the low side of this wall ranges from approximate El. 344 at the west end to El. 363 at the east end. In this case, part of the wall at the west end will be founded, of necessity, in bedrock. The remaining portion of the wall should be founded 4 feet below the finished ground line, or 4 feet below the surface of the glacial till stratum shown on Drawing #66-F-47F, whichever is the lower elevation. For the portion of wall founded on rock, design loads up to 10 t.s.f. may be assumed. Elsewhere, allowable pressures up to 4 t.s.f. are recommended. Vertical expansion joints should be constructed between the parts of the wall founded on rock and on overburden. An adhesion value of 3000 p.s.f. may be assumed to act between the bottom of footings and the soil.

For backfill to the wall, recommendations for Wall #10 should be followed.

No dewatering problems are anticipated.

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

RETAINING WALL #19 -

1. Soil Conditions:

Two borings were drilled at the location of this wall. These are numbered: 53 and 54. Subsoil consists of about 3 feet of sandy silt to silty sand fill material, followed by 4 to 7 feet of very dense silty fine sand, followed by about 10 feet of hard glacial till, followed by shale bedrock. The glacial till deposit consists of a heterogeneous mixture of clayey silt, sand and gravel, and is generally of a cohesive nature. Groundwater level in the boreholes was found to range from 4 to 5 feet below the ground surface.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-F-47H.

2. Recommendations:

The finished ground line on the low side of this wall ranges from approximate El. 367.0 at the west end to El. 352.0 at the east end. It is recommended to found the wall on spread footings placed 4 feet below the surface of the original ground, or 4 feet below the finished ground line, whichever is the lowest elevation. In this event, the base of the wall will range from El. 360.0 at the west end to El. 347.0 at the east end. Allowable pressures of 4.5 t.s.f. may be assumed for design purposes. Dewatering problems may be encountered since part of the excavation will be in fine-grained granular soil. In this event, care must be taken to prevent 'boiling' of the excavation bases. A friction coefficient of 0.5 may be assumed to act between the bottom of footings and the soil.

For backfill to the wall, recommendations for Wall #10 should be followed.

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

RETAINING WALL #25 -

1. Soil Conditions:

Boreholes #69 and #70 were drilled at the site of this retaining wall. Subsoil at the wall location consists of up to 6 feet of dense silty fine sand overlying about 15 feet of glacial till, followed by shale bedrock. The glacial till deposit ranges from a very dense sandy silt with some clay and gravel, to a hard clayey silt containing sand and gravel. The lower ten feet of the deposit contains numerous shale fragments. Groundwater level in the borings was found to be about 13 feet below the level of existing ground at the centre-line of the proposed wall.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-F-47J.

2. Recommendations:

The finished ground level on the low side of this wall ranges from El. 338.0 at the south end, to El. 332.0 at the north end. Since the depth to bedrock ranges from 10 to 5 feet below these levels, it may be the most economical solution to found the wall on spread footings placed directly onto the rock, utilizing a design pressure of 10 t.s.f. In any event, the wall may be founded wholly or partially on spread footings within the overburden at or below a depth of 4 feet below the finished ground level. In this case, footings within the overburden may be designed assuming an allowable pressure up to 4.0 t.s.f. Vertical expansion joints should be constructed between footings on rock and footings on overburden.

In computing the resistance to lateral movements, a friction coefficient of 0.45 may be assumed to apply between the footing bases and the subsoil below.

Due to the granular nature of the subsoil, it is possible

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

RETAINING WALL #25 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

that dewatering problems will be encountered and, therefore, precautions should be taken to prevent 'boiling' of the excavation bases.

For backfill to the retaining wall, recommendations given for Wall #10 should be followed.

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

RETAINING WALL #26 -

1. Soil Conditions:

Six borings were carried out at the site of this wall. These are numbered: 66, 67, 68, 116, 117 and 118. Subsoil consists of from 5 to 8 feet of loose to dense silty fine sand, followed by about 5 feet of compact to very dense fine to coarse sand to silty sand, followed by about 20 feet of hard glacial till. The hard glacial till deposit is underlain by shale bedrock and consists of clayey silt with some embedded fine gravel. Groundwater in the boreholes was found to range from 8 to 11 feet below the ground surface over most of the area.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Drawing #66-F-47K.

2. Recommendations:

The proposed wall may be founded on spread footings placed 4 feet below finished ground level. An allowable pressure of 3.0 t.s.f. may be assumed for design purposes. If higher pressures are required, 4.5 t.s.f. may be achieved at a depth of 6 feet below finished ground level. No major dewatering problems are anticipated since the groundwater level appears to be fairly low at the south-west half of the wall where the footings will be based in granular soil, and at the north-east half the bases will be in cohesive soil (see Drawing #66-F-47K).

In computing resistance to lateral pressures, a friction coefficient of 0.5 may be assumed for the footings on granular soil, and an adhesion value of 3000 p.s.f. may be assumed for the footings on cohesive soil.

Backfill to the retaining walls should be as recommended for Wall #10.

4. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...
RETAINING WALL #20 -

1. Soil Conditions:

Five boreholes were drilled at the site of this wall. These are numbered: 16, 55, 56, 57, and 58. Subsoil at the site from ground level downward, was found to consist of from 4 to 9 feet of compact to very dense silt and fine sand with gravel, followed by a hard clayey silt with some gravel and boulders - (glacial till). The thickness of this material was found to vary from 8 to 21 feet. At two borehole locations (56 and 57), the glacial till deposit is interbedded with a 3-to 6-foot thick layer of very dense sandy silt.

Calcareous shale and shaley limestone bedrock was encountered in all boreholes, following the clayey silt deposit.

Groundwater in the boreholes was found to range from 4 to 12 feet below ground level.

The locations and elevations of boreholes, together with the estimated stratigraphical profile, are shown on Dwg. #66-F-47L.

2. Recommendations:

The proposed retaining wall may be founded on spread footings, placed 4 feet below finished ground level. An allowable pressure of 3.5 t.s.f. may be assumed for design purposes. Some dewatering problems are anticipated since the excavation for the wall foundation will be carried into the sandy silt layer, which is suspected to be water-bearing.

In computing resistance to lateral pressures, a friction coefficient of 0.45 may be assumed for the footings on granular soil and an adhesion value of 3000 p.s.f. may be assumed for the footings on cohesive soil.

For backfill to the wall, recommendations for Wall #10 should be followed.

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

RETAINING WALL #21 -

1. Soil Conditions:

Four borings were carried out at the site of this wall and are numbered: 7, 61, 62 and 63. Subsoil at the site was found to consist of up to 10 feet of compact to very dense silty fine sand to fine sand with traces of organics, followed by 14 to 25 feet of clayey silt, with some sand and silt seams, also containing some gravel and fragments of shale. This deposit (glacial till) is followed by shale and shaley limestone bedrock.

The depth to the groundwater level as observed in the borings, was found to vary from 6 to 11 feet below the ground surface.

The locations and elevations of the borings, together with the inferred subsoil stratigraphy, are shown on the accompanying Dwg. #66-F-47M.

2. Recommendations:

In view of the foregoing, it is recommended that the proposed retaining wall be founded on spread footings, some 4 feet below the finished ground line, where a safe design pressure of 3.5 t.s.f. may be achieved. No major dewatering problems are anticipated, but the presence of the sand and silt seams within the cohesive layer should be kept in mind.

In computing the resistance to lateral movements on the footing bases, an adhesion value of 3000 p.s.f. may be used for design purposes.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

cont'd. /17 ...

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

RETAINING WALL #23 -

1. Soil Conditions:

Two borings, #58 and #59, were carried out during the course of the field investigation to determine the subsoil conditions existing at the site of the proposed wall location. The subsoil was found to consist of up to 3 ft. of fine sand, followed by a very stiff to hard clayey silt with some gravel and boulders (glacial till), followed by shale bedrock at El. 324.5.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Dwg. #66-F-47N.

2. Recommendations:

In view of the foregoing, spread footing type foundations are recommended for the wall at or below El. 349, where safe loads of up to 2.5 t.s.f. may be assumed for design purposes.

No dewatering problems are anticipated, since the depth to the groundwater level as observed in the borings, was found to be 5 to 8 feet below the base of the recommended excavation level.

In computing the resistance to lateral movements on the footing bases, an adhesion value of 2000 p.s.f. may be used for design purposes.

For backfill to the retaining walls, the recommendations given for Wall #10 should be followed.

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

RETAINING WALL #13 -

1. Soil Conditions:

The soil profile along the proposed wall is based on 4 boreholes numbered: 22, 34, 35 and 36, and plotted on the attached Drawing #66-F-47R. In each borehole immediately below the ground surface, a fill stratum was observed. In boreholes 22 and 34, at the south portion of the wall, the fill is about 6 - 7 ft. thick, comprising sandy silt with some clay and organic matter. The layer has a loose to compact relative density. The fill below the north portion of the wall is only some 1 - 1.5 ft. thick, consisting mainly of sand and gravel.

Underlying the fill, a heterogeneous mixture of clayey silt and sandy silt with traces of some gravel (glacial till), was encountered. Portions of the deposit, being granular in nature, have relative densities of "dense to very dense," while the cohesive layers exhibit hard consistencies. In borehole #22, shaley limestone bedrock was proved by diamond drilling from elevation 361 ft. down to 355 ft.

Groundwater was encountered in each borehole at some 4 - 7 ft. below ground level.

Locations and elevations of the boreholes as well as the estimated soil profile, are plotted on the enclosed Drawing #66-F-47R.

2. Recommendations:

In view of the foregoing, the proposed retaining wall may be supported on spread footings at relatively shallow depths.

The recommended elevations of the footing at the borehole locations, are as follows:

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

RETAINING WALL #15 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

No. of Borehole	Elevation of Base of Footing
22	381 ft. or below
34	381 ft. " "
35	390 ft. " "
36	395 ft. " "

At the above elevations, a safe bearing pressure of 4.5 t.s.f. may be assumed for design purposes.

Excavation for the footings, mainly at the south portion of the wall, will extend below the observed groundwater level. At these locations where the subsoil is of a granular nature, some "boiling" may occur under conditions of unbalanced hydrostatic head; consequently, a dewatering scheme may be necessary.

For calculations of resistance to sliding between the base of the wall and the soil, a coefficient of friction of 0.45 (for the granular sandy silts), or an adhesion value of 3000 p.s.f. (for the cohesive clayey silts), may be used.

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

RETAINING WALL #14 -

1. Soil Conditions:

Four boreholes were carried out at the site of the proposed wall. The boreholes from south to north are numbered: 102, 31, 32 and 33. Soil in borehole #31 was found to be a clayey silt with some gravel (glacial till). This material is of a cohesive nature, having a consistency ranging from stiff to hard. In the rest of the boreholes the subsoil was observed to be sandy silt, silty sand and sand (glacial till). The latter deposits have characteristics of granular soils and they are all very dense. In borehole #102, which was drilled to a depth of 64 ft., from elevation 369.0 ft., numerous shale layers and sand seams were encountered, followed by weathered bedrock. Sound shale bedrock was proved from elevation 332 ft. down to elevation 327.0 ft.

Groundwater level was observed in each borehole. The depths of water level varied between 2 ft. and 9 ft. below ground level.

The locations and elevations of the boreholes, together with the stratigraphical profile, are plotted on the attached Drawing #66-F-47S.

2. Recommendations:

The proposed retaining wall may be supported on spread footings, within the hard and very dense glacial till deposit.

The bottom of footing should be placed some 5 - 7 ft. below present ground level.

Recommended footing elevations at the locations of the boreholes are tabulated as follows:

cont'd. /21 ...

4. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...
RETAINING WALL #14 - (cont'd.) ...
2. Recommendations: (cont'd.) ...

No. of Borehole	Elevation of Base of Footing
102	384 ft. or below
31	384 ft. " "
32	387 ft. " "
33	392 ft. " "

At the recommended elevation, a safe bearing pressure of 4.5 t.s.f. may be assumed for design purposes.

During the excavation, some groundwater may be encountered. The sandy silt layer appears to be susceptible to unbalanced hydrostatic head; nevertheless, it is believed that due to the anticipated shallow depths below the water level, major dewatering problems will probably not arise.

In computing the resistance of the wall against lateral earth pressure, a friction coefficient of 0.45 may be assumed to apply between the footing bases and the underlying soil.

Backfill to the retaining walls should be as recommended for Wall No. 10.

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

RETAINING WALL #5 -

1. Soil Conditions:

Three boreholes - numbered 49, 50 and 51 - were carried out at the vicinity of the proposed wall.

Below the ground level, a fill material was observed, consisting of silty sand with gravel and traces of clay. The relative density of the fill is generally loose. The thickness of the layer increases toward the south, being 5 ft. at borehole #49 and 9 ft. at borehole #51.

The fill is underlain at each borehole by a glacial deposit of clayey silt with some sand and gravel. The stratum exhibits a hard consistency.

At el. 343 - 345 ft., shale bedrock with bands of limestone was encountered and proved by diamond drilling to a maximum depth of 20 ft.

Groundwater level was established in the borings between el. 348 ft. and 353 ft.

Locations and elevations of the boreholes, together with the estimated soil profile along the length of the wall are shown on Drawing #66-F-47T.

2. Recommendations:

Due to the increasing depth of excavation for the design ground line, and also on account of the inadequate strength of the fill to support the wall, recommendations for a uniform footing design cannot be given.

The north portion of the wall along an approximate length of 80 - 90 ft., may be supported on spread footings at 4 ft. below the proposed grade. The footings will likely be placed on sound bedrock, in which case, an allowable bearing capacity of 10 t.s.f. may be assumed for design purposes.

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

RETAINING WALL #5 - (cont'd.)...

2. Recommendations: (cont'd.) ...

The next portion of about 200 - 250 ft. should also be founded on spread footings within the hard clayey silt stratum. The depth of the footing will vary between 4 - 7 ft. below the future grade. An allowable pressure of 4.0 t.s.f. is recommended for this section.

For the remaining length of the wall, three alternative solutions are suggested:

a) The portion in question may be supported on spread footings within the glacial till at or below el. 347 ft. The depth of the footing is estimated to be between 6 and 11 ft. below design grade. 4.0 t.s.f. design load may be employed for this foundation.

b) The wall may also be founded on a well compacted granular backfill, at some 4 ft. below the proposed grade. In this case, the loose sandy fill should be excavated down to the top of the hard glacial till (approx. el. 347 ft.) For the method of construction of the G.B.C. class A backfill, we refer to the recommendations (para. c) for Retaining Wall No. 15. A safe pressure of 2 t.s.f. may be assumed on the compacted backfill.

c) The footings for the section may be placed at four ft. below finished grade and be supported on short H-piles driven to bedrock (approx. el. 345 ft.), or to practical refusal within the glacial till.

The maximum allowable load for the section used may be assumed for design purposes.

cont'd. /24 ...

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

RETAINING WALL #5 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

For methods a) or b), it is to be noted that the silty sand fill is susceptible to conditions of unbalanced hydrostatic head. It is believed, however, that the bottom of the excavations will not "boil" after reaching the cohesive glacial till.

Vertical expansion joints should be incorporated between the portions of the wall supported on bedrock, glacial till and granular backfill.

In computing the resistance along the bottom of the footings against lateral earth pressure, an adhesion value of 3000 p.s.f. may be assumed in the clayey silt, and a friction coefficient of 0.45 for the granular backfill.

File

66-7-47 correspondence
a 7

Hwy. 401 & Keele St.,
Downsview, Ontario.

Materials and Testing Division

January 16, 1967

Mr. S. Cumming, P. Eng.,
Bridge Engineer,
De Leuw, Cather & Company of Canada Ltd.,
1127 Leslie Street,
Don Mills,
Toronto, Ontario.

Attention: Mr. D. Hazeman

Dear Sir:

Re: Roadway Protection at Hwy. 27 & Evans Ave.

With reference to your letter of January 13, 1967, and the attached drawing regarding the above subject, we wish to make the following comments:

The rock in the subject area is mainly shale in various stages of soundness. In view of this fact, it may happen that the rock could be somewhat weathered in certain areas.

As shown on the drawing, the embedment of the bearing piles after footing excavation will be in the order of \pm 2.5 to 3.0 ft. Because of the above reasons, we would suggest that this depth be increased to 4 ft. minimum. In this way, the weakest point will be strengthened, and an added factor of safety achieved with comparatively little additional cost.

Sincerely yours,

A. C. Sternac

A. C. Sternac
Principal Foundation Engineer

AGS/MdeF

cc: Foundations Files ✓
Gen. Files

*2/10/51
OK*

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

RETAINING WALL #6 - (cont'd.) ...

2. Recommendations: (cont'd.) ...

bedrock; the south portion, however, will be in the hard clayey silt stratum. A safe pressure of 10 t.s.f. may be imposed on the portion of the footings supported on sound rock, and 4.0 t.s.f. on the portion supported within the clayey silt.

Vertical expansion joints should be constructed between the parts of the wall founded on rock and on the overburden.

No major dewatering problems are anticipated for the excavations.

An adhesion value of 3000 p.s.f. may be assumed for the calculation of the resisting forces against sliding along the bottom of the footing placed in the overburden.

CONSULTING ENGINEERS

January 13th, 1967.

Department of Highways of Ontario,
Materials and Testing Division,
Downsview, Ontario.

Attention: Mr A. Stermac, P.Eng.,
Principal Foundation Engineer.

Dear Sir:

Re: Roadway Protection at Hwy. 27 & Evans Ave.

Further to your telephone conversation with our Mr. D. Hageman, enclosed please find the design assumptions and details of the above roadway protection for your information.

As discussed in our conversation we do not have the necessary space available for concrete deadman or a similar type of anchorage for the roadway protection. As you agreed that the rock formation in this location is suitable we have specified either grouted or mechanical rock anchors with a prestressing element as a tie-back for the roadway protection.

We have used an equivalent fluid pressure of 40 lbs./cu.ft. in our analysis. The bearing piles are predrilled to approximately $2\frac{1}{2}$ or 3 feet below the excavation level and their bottoms encased with concrete to prevent horizontal displacement. This results in a horizontal load on the rock of about 4 tons/s.f.

Each of the stressing elements will be loaded to a test force of nearly twice the design load and a maintenance clause has been included in the special provisions, making the stressing contractor responsible for the installation for the duration of the contract, both of which should ensure a satisfactory rock anchorage.

We trust that the above information is satisfactory and would appreciate your comments.

Yours very truly,
DE LEUW, CATHER & COMPANY OF CANADA LIMITED.

S. Cumming, P. Eng.

for
S. Cumming, P.Eng.,
Bridge Engineer.

SC/DWH/da
encl.

DOMINION SOIL INVESTIGATION LIMITED
77 CROCKFORD BOULEVARD - SCARBOROUGH ONTARIO CANADA - TELEPHONE 751-6565

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 3-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD
34 BREDFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

3rd November 1966.

Notes on Bedrock encountered on Job No: 6-10-21

Bedrock was encountered in all eight boreholes, approximately at the elevations shown on the preliminary subsoil profiles.

The bedrock consisted of a brown to grey shale with layers of limestone and occasional clay seams. The upper surface of the shale in each borehole was weathered for approximately 2 to 4 feet. This weathered layer would be relatively easy to excavate by mechanical means.

Even below the weathered zone the shale exhibits numerous cleavage planes. Consequently it could be excavated without resorting to blasting techniques, although this would greatly expedite matters.

In a nearby excavation, it was observed that a large backhoe had penetrated about 5 feet into the shale. By questioning the work crew concerned it was found that the excavation had taken several days.

In summation: It is considered that mechanical excavation of up to 5 feet of bedrock is practical. The length of time taken for excavation can, however, not be estimated with any degree of accuracy.



Department of Highways Ontario

Copy for the information of

Mr. K. Selby, Supervising Foundation Engineer, Foundation Section, Room 107,
Lab. Bldg.

Mr. C. Grebski,
Bridge Design Engineer,
Admin. Bldg.

Bridge Division,
Downsview, Ontario.

Attention: Mr. W. McFarlane

August 26, 1966.

M.F. 275-66-4,
Retaining walls, Contract No. 3,
O.E.W. and Highway No. 27,
District No. 6.

Ret. Wall No. 16

Due to difficulty of construction and the small amount of property involved it has been decided that wall No. 16 can be eliminated and paved slope guarded by pedestrian pipe rail, be substituted.

Ret. walls No. 5, 6, 17 and 19

The profile of the top of these walls will be raised by two inches (2") to meet the revised outside of curb caused by the revision to 8" curbs, over structures No. 1 and No. 6.

Wall No. 5

This will confirm that wall No. 5 will be built in two stages as previously indicated.

Wall No. 6 shall be built completely in the first contract for O.E.W. and Highway No. 27 Interchange.

JONCA/aw

J. C. McAllister,
for W. Melnychyn,
Regional Bridge Location Engineer.

c.c. R. Strain
R. McCabe
W. Katarynczuk
K. Selby

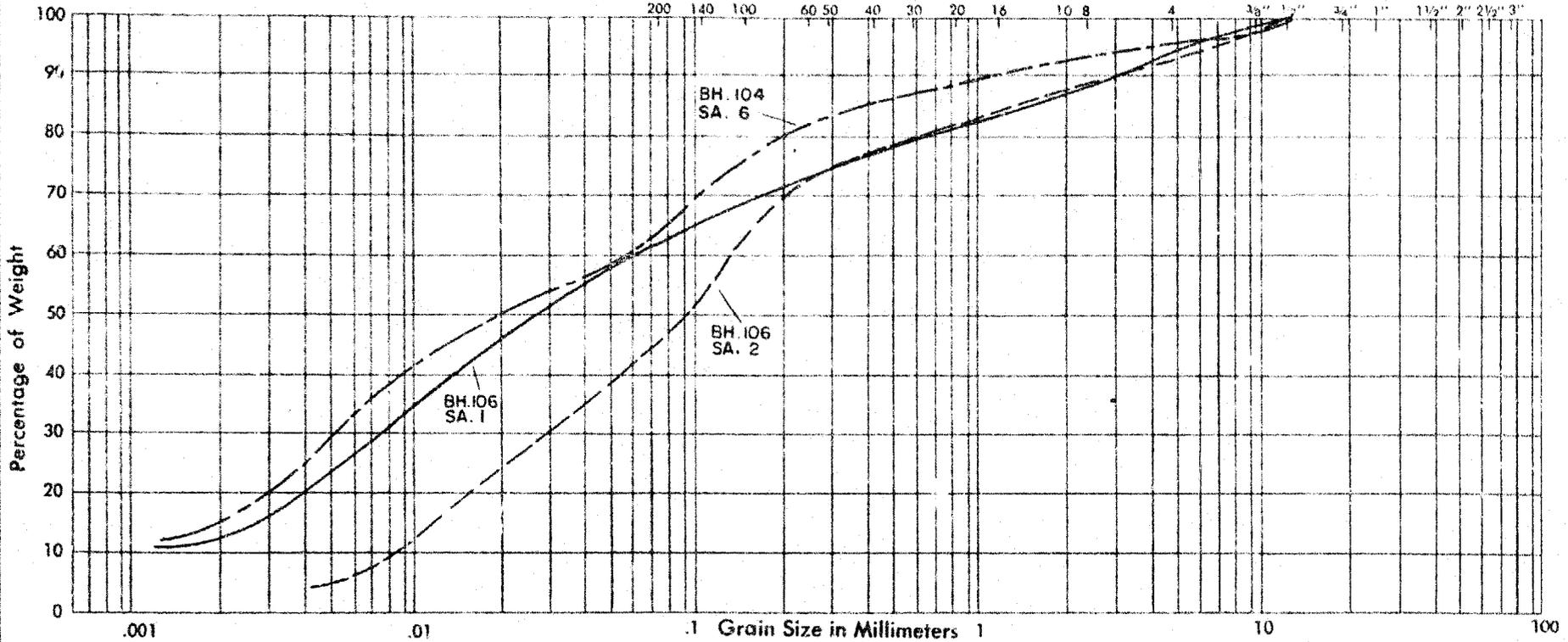
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-24
YOUR REF. No. W.P. 35-65

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND						GRAVEL		
	FINE		MEDIUM		COARSE		FINE	COARSE	



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

COEFFICIENT OF UNIFORMITY

PLASTIC PROPERTIES.

LOCATION: BRIDGE No. 15.

COEFFICIENT OF CURVATURE

LIQUID LIMITED % ||

BOREHOLE NO.: 104 ; 106 ; 106

PLASTIC LIMIT % ||

SAMPLE NO.: 6 1 2

PLASTICITY INDEX % ||

DEPTH OF SAMPLE.

MOISTURE CONTENT % ||

ELEVATION OF SAMPLE.

ACTIVITY ||

Classification of Sample and Group Symbol:

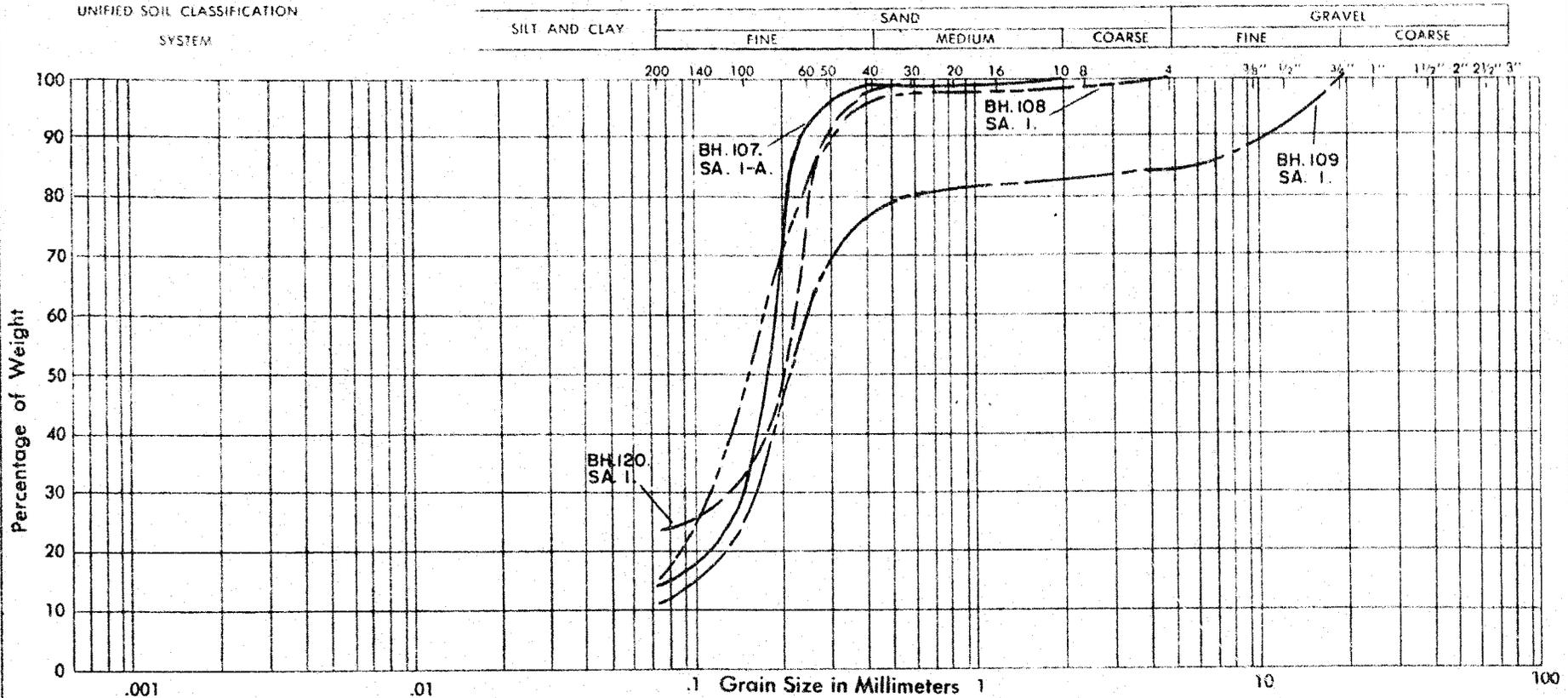
SAND and SILT
with a trace of GRAVEL and CLAY

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-18
YOUR REF. No. W.P. 238-61-5



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE

LOCATION: BRIDGE No. 7.

BOREHOLE NO.: 107 ; 108 ; 109 , 120

SAMPLE NO.: I-A | | |

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % ==
 PLASTIC LIMIT % ==
 PLASTICITY INDEX % ==
 MOISTURE CONTENT % ==
 ACTIVITY ==

Classification of Sample and Group Symbol:

FINE SAND
with some SILT

Enclosure No.

Mr. T. J. Kovich,
Regional Materials Engineer,
Central Region (Toronto),
Room 134-A, Lab. Bldg.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

August 19, 1966

Re: Elevation of Bedrock, Vicinity of Q.E.W.
& Hwy. #27, w.P.'s #275-64-1, #275-64-2,
#47-65-1, #275-64-3 and #275-64-4.

Regarding your memo of August 17th concerning the above subject and the information that there is likely to be a claim on behalf of the contractor on Contract No. 66-102 because of "wrong" elevations of bedrock, we wish to advise you of the following:

This Section has carried out directly or indirectly - (work done by a consultant), quite an extensive investigation in the area of the Q.E.W. - Hwy. 27 intersection. As a matter of fact, some of the investigations are still in progress - i.e., the field work has not yet been completed. The investigations are for structures (more than 30) as well as for retaining walls (about 40). Some of the retaining walls are several hundred feet long.

The field boring is done either by using an auger type machine or a diamond drill - depending on a number of considerations.

The distance between the boreholes is determined, based also, on a number of considerations. Often these distances are altered during the field investigation because conditions encountered, differ from those that were anticipated.

The boreholes are between 2 and 4 inches in diameter.

In view of the scope of the investigation and the methods used, it is quite possible that in places, the boundaries between geologically different but otherwise quite similar materials, are incorrectly established.

Three main reasons can be quoted for this discrepancy:

(1) The change of materials may have occurred between sampling which is usually done every 3 ft. This could already account for a difference of two feet.

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(2) Sometimes, it is not possible to determine the difference between two materials on the basis of the inspection of either the disturbed material from the borehole, or even the sample retrieved in the Standard Penetration sampler; and

(3) There is always the probability of sometimes quite considerable variations of the boundaries between two adjacent boreholes.

A very good illustration of the point in question has recently been encountered on Wall No. 4 (south side of the Q.E.W.), Contract No. 66-102.

We were advised by the Construction Division that a discrepancy in the bedrock elevations as shown in the foundation report and as found in the field, had been reported. We inspected the open excavation and established, beyond doubt, that in one of the boreholes (No. 5) an error of approx. 3.5 ft. in bedrock elevation determination had been committed. In other boreholes the agreement was very satisfactory (except B.H. 6 where the discrepancy was 1.5 ft.). Although the mistake was apparent, we were still not quite sure whether it was due to an oversight or to the exploration method used. Therefore, we brought in the same drilling equipment (Penn. drill) and drilled a hole 12 inches behind the face of the excavation where the stratigraphy was clearly distinguishable. To our surprise, neither the disturbed material coming out of the borehole, nor samples from the Standard Penetration sampler, enabled us to determine the boundary between the overlying till material and the underlying shale. The shale was weathered to such an extent that the drilling and sampling action produced a material that could not have been distinguished from the overlying till. It should be mentioned that both materials are of the same colour and often chips of shale are embedded in the till.

It would, therefore, appear that in spite of the very careful and conscientious material inspection, an error can be made.

It is probably quite appropriate on this occasion, to raise again the question of rock definition in the D.E.O. Contract Documents. The contractor (C. A. Pitts) on Contract No. 66-102, has used the same equipment to excavate the overlying till as he used to remove the weathered shale, and has in no way, incurred any additional cost. The fact, though, that part of the contractor's excavation was in what is geologically defined as "rock"

Mr. T. J. Kovich,
Regional Materials Engr.,
Central Region (Toronto).

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entitles him to a different price for this part of his work.
It is our opinion that some thought should be given to this
problem.

AGS/MdeF

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. Rutka
G. A. Wrong

Foundations Office
Gen. Files

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer.

From: T.J. Kovich.

Date: August 17th, 1966.

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Elevation of Bedrock, Vicinity of QEW
& Hwy.#27, W.P.'s #275-64-1, #275-64-2,
#47-65-1, #275-64-3 and #275-64-4.

I have been advised by Engineering Audit that there will likely be a claim by the Contractor on Contract #66-102 (C.A. Pitts) with regards to the "wrong" elevation of the bedrock at the location of the retaining walls.

As you are likely aware, rock excavation prices are paid for on both solid and weathered rock, and the price for rock excavation for footings usually comes fairly high. Therefore, it is imperative that the elevation be established quite accurately.

I was wondering whether the information given by your office to the Designers may have misled them, i.e. top of solid rock instead of top of weathered rock was shown on your drawings. In discussing this with Ken Selby last week, he intimated this may have been so.

However, because of the extensive estimating work still to be done on the other projects in this area, I would suggest that your staff review this point quite carefully.

TJK/hd
c.c. G.A. Wrong.


T.J. Kovich,
Regional Materials Engineer.

66-F-47

W.P. # 275-64-4

Q.E.W. :

Hwy. # 27

INTERCHANGE

