

66-F- 48

W.P. # 275-64-1

Q.E.W. ε'

Hwy. # 27

INTERCHANGE

MEMORANDUM

W.P. 275-64-1
23-68-10-

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

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

Attention: Mr. S. McCombie

DATE: November 28, 1966

OUR FILE REF.

IN REPLY TO:

NOV 30 1966

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)
W.J. 66-F-48 -- W.P. 275-64-1

Enclosed, please find our complete foundation investigation report for Retaining Walls No's 2, 3, 4, 8, 12, 17, 27, 29, 30, 31, 33, 34, 35, 28, 39, 37, 36, and 38, 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
G. K. Hunter (2)
P. Allen
T. J. Kovich
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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-48 - W.P. 275-64-1

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.

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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-48-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:

Fourteen retaining walls are included in this project. These are numbered: 2, 3, 4, 8, 12, 17, 27, 29, 30, 31, 32, 33, 34, and 35.

15, 5B, 25, 29, 27, 26, 28, 128, 142

cont'd. /3 ...

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

RETAINING WALL #2 -

1. Soil Conditions:

Four boreholes were located along the proposed wall, and they were numbered: 145, 80, 144, and 143. Below a 3 - 6 ft. predominantly fill layer of sand and silty sand, the glacial till stratum was identified in the borings. The 4 - 6 ft. thick glacial deposit is of a cohesive nature, classified to be clayey silt with sand and gravel and fragments of shale. Between el. 348 and 354 ft., grey shale bedrock underlies the overburden. The bedrock appears to be weathered within at least the upper 10 ft.

Groundwater level was established within the sand, at around el. 354 ft.

The locations and elevations of the borings with the estimated soil profile, are plotted on the attached Drawing #66-F-48A.

2. Recommendations:

Along the larger portion of the proposed wall, the design grade is located beneath the bedrock surface. At this section, the wall will be supported on spread footings within the shale bedrock, at some four ft. below future ground level. The north - approximately 100-ft. long portion of the wall - may be supported on spread footings, either in bedrock, necessitating somewhat deeper (roughly 8 ft.) excavations; or within the till overburden at four ft. below the proposed ground line.

A bearing pressure of 10 t.s.f. may be assumed for footings within the shale and 3.5 t.s.f. within the hard glacial till.

Vertical expansion joints should be installed between the portions supported on bedrock and on overburden.

For the computations of resistance against sliding along the bottom of footing, an adhesion value of 3000 t.s.f. may be used within the cohesive glacial till.

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

RETAINING WALL #2 - (cont'd.) ...

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

A bearing pressure of 10 t.s.f. may be assumed for footings within the sound shale, and 3.5 t.s.f. within the hard glacial till.

Vertical expansion joints should be installed between the portions supported on bedrock and on overburden.

For the computations of resistance against sliding along the bottom of footing, an adhesion value of 3000 p.s.f. may be used within the cohesive glacial till.

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

RETAINING WALL #3 -

1. Soil Conditions:

The soils investigation consisted of two boreholes drilled in the vicinity of the wall. The holes were numbered 72 and 73.

A heterogeneous fill material forms the upper 6-ft. portion of the subsoil, consisting of silty sand, sand and gravel. The relative density of the fill varies from compact to dense. The fill is underlain by hard glacial till. Part of the till was identified to be a cohesive clayey silt, exhibiting a hard consistency: part of it, however, is of a granular nature, having very dense relative density. Grey shale bedrock with occasional limestone layers was observed at around el. 352 - 351 ft., extending to the end of the drilling at el. 342 ft.

The groundwater level was observed within the fill, at around el. 360 - 361 ft.

On the attached Drawing #66-F-48B, the locations and elevations of the borings, also the estimated soil profile, are shown.

2. Recommendations:

It is recommended to support the wall on spread footings within the hard and very dense glacial deposit. By placing the footing at approximate el. 358 ft., some four ft. below design ground line, a safe load of 3.0 t.s.f. may be employed on the footing base. By placing the footing at el. 356 ft., some six ft. beneath the proposed grade, the bearing capacity may be increased to 4.0 t.s.f.

The sandy silt portion of the glacial till is believed to be susceptible to unbalanced hydrostatic conditions; consequently, a dewatering scheme might be necessary.

cont'd. / 6 ...

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

RETAINING WALL #3 - (cont'd.) ...

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

For the computations of resistance of the wall against lateral thrust along the base, a friction coefficient of 0.45 may be assumed within the sandy silt, and an adhesion value of 3000 p.s.f. within the clayey silt.

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

RETAINING WALL #8 -

1. Soil Conditions:

The soil profile along the proposed retaining wall was based upon 2 boreholes. Borehole #39 was drilled by Dominion Soil Investigation Ltd., while hole #18 formed part of the preliminary soil survey, supervised by the Foundation Section.

A compact to very dense silty sand with some gravel was found to be the uppermost layer, extending to a depth of 7 - 9 ft. Underlying the silty sand, the glacial deposit follows, having an average depth of 8 - 9 ft. In Borehole #18 the glacial till appears to be a cohesive clayey silt with a hard consistency, whereas in Borehole #39, a granular variety of the till was observed and identified to be a silty sand of a very dense nature. Shaley limestone follows the glacial till, the upper surface of which was established at around el. 359 - 361 ft.

The groundwater level lies within the silty sand stratum around el. 374.5 ft.

Locations and elevations of the boreholes, together with the estimated stratigraphical profile, are shown on Drawing #66-F-48D.

2. Recommendations:

The design ground line of the wall is between el. 386 and 400 ft. from the south end to the north, respectively; consequently, a fill of some 20 ft. high will be constructed.

Two alternative solutions for the footings are recommended as follows:

cont'd. /8 ...

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

RETAINING WALL #8 - (cont'd.) ...

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

a) The footing of the proposed wall may be placed within the well compacted fill, some four ft. below finished grade, and be supported on H-piles driven to bedrock or to practical refusal. Refusal is anticipated to be reached at around el. 358 - 361 ft.

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

b) The wall may also be supported on spread footings placed some four ft. below finished grade on well compacted G.B.C. Class 'A' fill material. The G.B.C. Class 'A' should extend for a minimum width of 3 ft. on each side of the footing in the plane of the footing tops, and should slope down at 1:1 to the existing ground level. All topsoil should be removed prior to placing the granular fill. 2 t.s.f. safe bearing capacity may be assumed for design purposes.

No dewatering problems are anticipated.

A friction coefficient of 0.45 is estimated to apply between the bottom of footing and the granular fill.

cont'd. /9 ...

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

RETAINING WALL #27 -

1. Soil Conditions:

The soil stratigraphy is based on five sampled boreholes, placed along the location of the proposed wall. Hole #5 was drilled during the preliminary soil survey, while holes #78, 79, 127 and 128 were carried out recently by Dominion Soil Investigation Ltd.

From ground elevation, extending to el. 356 - 360 ft., a compact to dense mixed fill was observed. The fill material was identified to be clayey silt, sand with some silt, and sandy gravel. Underlying the fill, the very dense glacial till was disclosed, which is mainly granular in nature, being sandy silt with gravel. In certain limited locations, however, the till exhibits some cohesion and may be specified to be clayey silt. Between el. 351 and 354 ft., shale bedrock with layers of limestone was encountered. Ground water was observed within the sandy fill stratum around el. 361 - 362 ft.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-F-48G.

2. Recommendations:

The design ground line of the proposed wall is between el. 363 ft. and 366 ft. near existing ground surface.

Spread footings are recommended for the structure, supported within the very dense sand and silt glacial till. The base of the footing should be lowered to el. 357 ft., some 6 - 9 ft. below design ground. At this elevation a safe bearing pressure of 4 t.s.f. may be employed.

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

RETAINING WALL #27 - (cont'd.) ...

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

Since the till at this location is rather permeable, it is believed to be susceptible to unbalanced hydrostatic conditions. Dewatering of the excavations, therefore, might be necessary.

In computing the resistance of the wall against lateral earth pressure, a friction coefficient of 0.45 may be taken to act along the bottom of the footing and the soil underneath.

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DISCUSSION AND RECOMMENDATIONS: (cont'd.)

RETAINING WALL #33 -

1. Soil Conditions:

Boreholes #16, 82 and 83 were drilled at the proximity of the proposed wall.

From ground elevation, extending to approx. el. 359 ft. at the south end of the wall and to approx. el. 357 ft. at the north, a sand to silty sand deposit lies, displaying loose to dense relative density. The sand is underlain by the very dense glacial till, which is predominantly granular. At the north side, however, a cohesive clayey silt variety of the till appears, having hard consistency. Around el. 350 ft., shale bedrock was observed and proved for a depth of 13 ft. by diamond drilling.

Locations and elevations of the boreholes, together with the estimated stratigraphical profile, projected to the location of the wall, are shown on Drawing #66-F-48M.

2. Recommendations:

The design ground line of the retaining wall slopes from el. 356 ft. down to el. 354 ft., the length being about 290 ft.

Since the bedrock lies around el. 350 ft., some 4 - 6 ft. below design ground, it is recommended that the footing be placed on rock, at or below el. 350 ft. Ten (10) t.s.f. safe pressure may be used for design purposes at the specified depth. A coefficient of friction of 0.45 may be assumed for calculating the resistance against sliding along the base of the footing.

No major dewatering problems are foreseen for the excavations.

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

RETAINING WALL #17 -

1. Soil Conditions:

Boreholes #2, 81, and 146, were drilled at the proximity of the proposed wall, supervised by the Foundation Section or by Dominion Soil Investigation Ltd. Subsoil at the site consists of a 4 - 6 ft. deep layer of compact silty sand, underlain by glacial till, which in turn, is followed by shale bedrock.

The glacial till was identified to be either a cohesive clayey silt of hard consistency or a very dense sandy silt. The upper surface of the bedrock was observed to be at el. 351 ft. in hole #81; at el. 352 ft. in hole #146, and at el. 344 ft. in hole #2. The upper 3 - 10 ft. portion of the bedrock is badly weathered and disintegrated.

The groundwater level was established to be around el. 345 ft.

The locations and elevations of the boreholes as well as the estimated soil profile, may be seen on Drawing #66-F-48F.

2. Recommendations:

The design ground line of retaining wall #17 is at el. 344 ft. at the south end and 341 ft. at the north. These elevations are well within the shale bedrock.

Spread footings, some four ft. below finished grade, are recommended for the wall. It is believed that at this depth the wall will be supported entirely on relatively sound bedrock. The allowable bearing capacity of the bedrock is estimated to be 10 t.s.f. at the recommended depth.

No dewatering problems are foreseen.

cont'd. /13 ...

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

RETAINING WALL #34 -

1. Soil Conditions:

Boreholes #85 and 86 were placed along the proposed wall by Dominion Soil Investigation Ltd. The soil stratigraphy based on the holes, is fairly uniform. Below a 3 - 4 ft. thick loose to very dense silty fine sand, the clayey silt glacial till was found. The layer contains some sand and gravel, but predominantly, it is of a cohesive nature, the consistency being very hard. At el. 361 - 362 ft., the shale bedrock with limestone bands underlies the till. The upper 4 - 5 ft. portion of the bedrock is extremely weathered. The surface of the sound rock is estimated to be around el. 357 - 358 ft.

Water level was encountered in the borings at el. 363 - 364 ft.

The locations and elevations of the boreholes as well as the estimated soil profile, are shown on Drawing #66-F-48N.

2. Recommendations:

The design ground line of the proposed wall is some 18 ft. higher than the existing ground at the south end, and some 12 ft. higher at the north. On account of the rather high fill, a piled foundation appears to be the most economical. Steel H-piles are recommended to be driven to bedrock or to practical refusal, which will likely be reached around el. 360 - 362 ft. The pile cap should be placed at depths 4 ft. below design ground line. The maximum allowable load for the particular pile section used may be employed for design purposes.

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

RETAINING WALL #29 -

1. Soil Conditions:

Three borings, numbered: 4, 71 and 72, were lowered at this site at the locations shown on Drawing #66-F-48H, together with the soil profile based on these boreholes.

The upper layer was found to be a compact to dense silty sand and gravel, below which the glacial till follows. The till was identified to be silt and fine sand in hole #71, and clayey silt in holes #72 and 4, having an average depth of 9 ft. The very dense material revealed some gravel, and at the lower elevations, layers of shale. Shale bedrock with bands of limestone, underlies the till at el. 350 - 352 ft. The upper few ft. of the bedrock is believed to be weathered.

Ground water level was observed in holes #71 and 72 between el. 360 and 362 ft.

2. Recommendations:

The southern half of the design ground line follows generally the existing ground; the northern half, however, will be on fill and will rise to approx. el. 376 ft.

Two alternative solutions are recommended for the footings:

- 2.1) The whole wall may be supported on spread footings at or below el. 358 ft. within the glacial till. A safe load of 4 t.s.f. may be used at the base of the footing.
- 2.2) The very deep excavations through the proposed fill beneath the north portion of the footing will probably not be economical. Consideration should be given, therefore, to supporting the wall on piles along the northern portion. Timber piles should be driven to or below el. 357 ft., at which elevation an estimated 25 Tons/pile may be achieved. Timber piles should be treated since they

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

RETAINING WALL #29 - (cont'd.) ...

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

2.2) (cont'd.) ...

will be almost entirely above ground water level. The bottom of the pile cap should be placed 4 ft. below finished ground level.

2.3) Excavation below the south half of the wall will be carried down into the silt and fine sand stratum, which is believed to be susceptible to unbalanced hydrostatic head. Some dewatering scheme will, therefore, be necessary.

2.4) In computing the resistance against lateral earth pressure, a friction coefficient of 0.45 may be used within the silt and fine sand, and an adhesion value of 3000 p.s.f. within the clayey silt.

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

RETAINING WALL #4 -

1. Soil Conditions:

Six boreholes and three cone penetration tests were performed along the proposed retaining wall.

A brief description of the soils encountered in the borings is as follows:

The existing highway and ramp fills consist of gravelly sand to sandy silt soils of generally compact relative density. From the natural ground level down to about el. 362 - 365 ft., a compact to dense silty fine sand deposit was exposed, which in turn, was underlain by the clayey silt glacial till. The consistency of the till was found to be hard; the thickness of the layer diminishing towards the north, being about 6 ft. in borehole #90 and almost non-existent in hole #168. Weathered shale bedrock was encountered below the till, the upper surface of which lies between el. 358 and 365 ft.

Ground water level was established to be around el. 364 - 366 ft.

The locations and elevations of the borings, together with the estimated soil profile along the wall, are shown on Drawing #66-F-48C.

2. Recommendations:

- 2.1) The design ground line of the proposed wall is about el. 366 ft. at the south end, sloping down to el. 355 ft. at the north, approximately half of its length lying within the overburden, half within the weathered bedrock.

cont'd. /17 ...

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

RETAINING WALL #4 - (cont'd.) ...

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

2.2) Spread footings are recommended for the structure, supported entirely within the weathered bedrock. The minimum depth of the footings should be four ft. below design ground level; however, beneath the southern, approximately 150-ft. portion of the wall, excavations should be carried deeper in order to reach the bedrock. It is estimated that at the south end of the wall, the rock will be reached around el. 357 - 358 ft., some 8 - 9 ft. below design ground line. Ten t.s.f. safe bearing pressure may be assumed for footings supported on bedrock at or below the suggested elevations.

2.3) The south 80 - 100 ft. portion of the wall may also be supported within the hard clayey silt, some 6 ft. below design ground line. Adopting this method, a safe design load of 4 t.s.f. may be employed for the section of wall supported on the clayey silt. Vertical expansion joints should be incorporated between the section supported on overburden and the one on bedrock.

No major dewatering problems are anticipated.

For the computations of resistance against lateral earth pressure, an adhesion value of 3000 p.s.f. may be assumed along the bottom of footing supported on the clayey silt till.

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

RETAINING WALL #12 -

1. Soil Conditions:

The soil stratigraphy was established by drilling holes #3 and 79 at the vicinity of the proposed wall.

In both holes, fill material was disclosed right below ground. In hole #3, the depth of fill is 7 ft., the material being clayey silt. In hole #79, the 4.5-ft. thick fill is predominantly a granular fine sand with some silt. Underlying the fill, and extending down to el. 352 - 354 ft., clayey and sandy silt (glacial till) was exposed. The layer has a hard consistency or very dense relative density and contains some shale fragments. Shale bedrock with intermittent limestone layers was observed around el. 352 - 354 ft.

Ground water level in the borings was found at el. 362 ft. within the fill layer.

Locations and elevations of the boreholes, also the estimated stratigraphical profile, are presented on Drawing #66-F-48E.

2. Recommendations:

Retaining Wall #12 is designed to be a parapet wall; hence, no appreciable load will be transferred along the wall to the subsoil. The foundation design for parapet walls calls for Size No. 10 timber piles driven to 10 ft. below pile cap. Since the walls will settle about the same amount as the new embankment, careful compaction of the fill is essential in order to minimize or eliminate settlements.

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

RETAINING WALL #28 -

1. Soil Conditions:

Three boreholes, numbered: 74, 75, and 76, were drilled at the site of the proposed wall. The borings revealed a 15 - 18 ft. thick layer of compact to dense silty sand and sandy silt with some gravel. Standard penetration "N" values of the stratum range from 15 to 63 blows/ft. A two-ft. thick pocket of organic silt, within the layer was also observed. Underlying the fill around el. 365 - 370 ft., silt and sand deposits follow, having compact to very dense relative density. Between el. 363 and 360 ft. the shale bedrock was encountered, the top two ft. of which was found to be weathered.

Ground water level was established in hole #75 at el. 364 ft., within the sand and silt layer.

Locations and elevations of the borings, together with the stratigraphical profile, are plotted on attached Drawing #66-F-48Q.

2. Recommendations:

The design ground line is around el. 398 ft. at the north end of the wall, and at about 386 ft. at the south.

It is believed that the existing fill material does not exhibit sufficient strength for spread footing type foundations. It is recommended, therefore, that the footings be supported on steel H-piles driven to bedrock or to practical refusal.

Refusal is estimated to be obtained around el. 360 - 363 ft. The footing supported on H-piles, should be placed 4 ft. below design ground line for frost protection. A design load equal to the allowable maximum for the section used, may be employed on the H-piles.

No dewatering problems for the excavations are expected.

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

RETAINING WALL #30 -

1. Soil Conditions:

Two boreholes were drilled at the site, numbered: 15 and 84. In each hole below ground elevation, extending to el. 361 - 362 ft., silty sand deposits were encountered, having compact to dense relative density. Below the silty sand, the glacial till stratum was found. The till at this location is partly cohesive clayey silt with a hard consistency, partly sand and silt with a relative density of "very dense". Some gravel was present in both holes. The upper surface of the shale bedrock was established at el. 352 - 353 ft. The uppermost, approx. 8 ft. of the rock is weathered. Some 13-ft. depth of the shale was proved in borehole #64 by diamond drilling.

Ground water level was observed at el. 360 - 362 ft., some 6 - 7 ft. below existing ground.

The locations and elevations of the boreholes as well as the soil profiles, are shown on Drawing #66-F-48J.

2. Recommendations:

- 2.1) The design ground line of Wall #30 ranges from approx. el. 372 ft. down to approx. el. 356 ft.

The wall may be supported on spread footings within the hard glacial till, at or below el. 359 ft. The footing should be placed at a minimum of four ft. below finished ground; however, below the west portion of the wall, considerably deeper excavation will be necessary in order to reach the glacial till.

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

RETAINING WALL #30 - (cont'd.) ...

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

- 2.2) The footing of the west portion of the wall may also be placed four ft. below the proposed ground line and be supported on steel H-piles driven to bedrock. The rock is believed to be reached around el. 351 ft. The maximum allowable load for the section used may be assumed on the H-piles. A vertical expansion joint should be installed between the section supported on piles and the one on spread footings.

In calculating the resistance against lateral earth pressure along the bottom of the wall, an adhesion value of 3000 p.s.f. may be used.

The glacial till appears to be slightly susceptible to conditions of unbalanced hydrostatic head; consequently, some dewatering problems might be experienced.

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

RETAINING WALL #31 -

1. Soil Conditions:

Two boreholes were drilled at the site, numbered: 15 and 84. In each hole below ground elevation, extending to el. 361 - 362 ft., silty sand deposits were encountered, having compact to dense relative density. Below the silty sand, the glacial till stratum was found. The till at this location is partly cohesive clayey silt with a hard consistency, partly sand and silt with a relative density of "very dense". Some gravel was present in both holes. The upper surface of the shale bedrock was established at el. 352 - 353 ft. The uppermost, approx. 8 ft. of the rock is weathered. Some 13-ft. depth of the shale was proved in borehole #84 by diamond drilling.

Ground water level was observed at el. 360 - 362 ft., some 6 - 7 ft. below existing ground.

The locations and elevations of the boreholes as well as the soil profiles, are shown on Drawing #66-F-48K.

2. Recommendations:

- 2.1) The design ground line of Wall #31 ranges from approx. el. 372 ft. down to approx. el. 356 ft.

The wall may be supported on spread footings within the hard glacial till, at or below el. 360 ft. The footing should be placed at a minimum of four ft. below finished ground; however, below the east portion of the wall, considerably deeper excavation will be necessary in order to reach the glacial till.

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

RETAINING WALL #31 - (cont'd.) ...

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

- 2.2) The footing of the east portion of the wall may also be placed four ft. below the proposed ground line and be supported on steel H-piles driven to bedrock. The rock is believed to be reached around el. 352 - 353 ft. The maximum allowable load for the section used may be assumed on the H-piles. A vertical expansion joint should be installed between the section supported on piles and the one on spread footings.

In calculating the resistance against lateral earth pressure along the bottom of the wall, a friction coefficient of 0.45 may be used.

The glacial till appears to be slightly susceptible to conditions of unbalanced hydrostatic head; consequently, some dewatering problems might be experienced.

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

RETAINING WALL #35 -

1. Soil Conditions:

Boreholes #12 and 87 were drilled at the site of the proposed wall by the D.H.O., and by Dominion Soil Investigation Ltd., respectively.

In Hole #12 below a 5 - 6 ft. layer of sand deposit, the shale bedrock was found at el. 364 ft. Some 3 - 4 ft. of the rock is weathered.

In Hole #87 sandy silt fill was observed to be the uppermost layer, underlain by thin deposits of fine sand and clayey silt (till). The surface of the shale was established at el. 366 ft. The effect of weathering was noticed within the upper five ft. of the bedrock.

Groundwater level was found to be at el. 371 ft. The locations and elevations of borings, together with the stratigraphical profile, are shown on Drawing #66-F-48P.

2. Recommendations:

The design ground line of the proposed retaining wall slopes from el. 404 ft. at the north end down to el. 394 ft. at the south; it will be some 23 - 26 ft. above existing ground level.

Due to the new fill, to be constructed at this site, a piled foundation appears to be the most economical for the wall. Steel H-piles are recommended to be driven to bedrock or to practical refusal, which is estimated to be reached between el. 364 ft. and 367 ft. The base of the pile cap should be four ft. below design ground line. The maximum allowable load for the particular H-section used, may be employed on the piles.

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

RETAINING WALL #36 -

1. Soil Conditions:

Boreholes #124 and 125 were drilled at the vicinity of the proposed wall.

A 13 - 15 ft. thick layer of heterogeneous fill material forms the uppermost stratum, consisting of clayey silts, sandy silts and silty sands. The material has compact to very dense relative density. Underlying the fill at el. 370 - 372 ft., dense and hard glacial deposits were observed, partly granular, partly of cohesive nature. At el. 366 - 367 ft., shale bedrock follows which was found to be weathered down to depths of 2 to 5 ft. A thickness of 10 ft. of the shale was proved by diamond drilling. The groundwater level was established within the glacial till, around el. 367 - 371 ft.

Locations of the borings, also the stratigraphical profile, are presented on Drawing #66-F-48T.

2. Recommendations:

The southern 290 - 300 ft. length of the wall is proposed to be a parapet wall; the remaining approx. 120 ft. length will, however, be constructed as a retaining structure. The height of the retaining wall will reach about 21 ft. at the south end.

The foundations of the perched walls call for Size #10 timber piles driven 10 ft. below pile cap. The future embankment below the perched wall will be around 23 - 24 ft. high. Very careful compaction of the fill is essential since the perched wall will settle roughly as much as the fill itself.

cont'd. /26 ...

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

RETAINING WALL #36 - (cont'd.) ...

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

The northern portion of the wall should be supported on steel H-piles driven to bedrock or to practical refusal. It is assumed that refusal will be reached around el. 366 - 367 ft. A safe load equal to the structural strength of the H-section used, may be employed on the piles driven to bedrock. The bottom of the pile cap should be four ft. below design ground line, in order to provide for frost protection.

cont'd. /27 ...

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

RETAINING WALL #37 -

1. Soil Conditions:

Three boreholes, numbered: 111, 112, and 126, were drilled at the vicinity of the proposed wall.

The soil stratigraphy, revealed by the borings, is as follows:

Below a 15-ft. thick silty sand fill, a layer of dense fine sand was found, which in turn, was underlain by glacial till. Part of the till was identified to be granular sandy silt; part of it, however, is of a granular nature, being clayey silt. Penetration 'N' values in the till indicated a hard consistency or very dense relative density. Around el. 361 - 363 ft., shale bedrock was proved for a thickness of 10 ft. by diamond drilling.

Groundwater level was observed in Hole #111 at el. 377 ft.

Locations of the borings as well as the soil profile, are presented on Drawing #66-F-48S.

2. Recommendations:

The southern half of the wall is designed to be a parapet wall; the northern half will, however, be a retaining structure with increasing height, reaching approximately 21 ft. at the north end.

The foundations of the perched walls call for size #10 timber piles driven 10 ft. below pile cap. Attention should be paid to the careful compaction of the fill, since the perched wall will settle the same amount as the future fill itself.

cont'd. /28 ...

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

RETAINING WALL #37 - (cont'd.) ...

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

The northern portion of the wall should be supported on steel H-piles driven to bedrock or to practical refusal. Refusal is likely to be reached around el. 362 - 364 ft. A load equal to the structural strength of the H-section used, may be assumed on the piles driven to bedrock.

The bottom of the pile cap should be four ft. below design ground line to provide for frost protection.

cont'd. /29 ...

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

RETAINING WALL #39 -

1. Soil Conditions:

Based upon the information obtained by boreholes #111, 112, and 126, the soil stratigraphy at this site is as follows:

Below a 15-ft. thick silty sand fill, a layer of dense fine sand was found, which in turn, was underlain by glacial till. Part of the till was identified to be granular sandy silt; part of it, however, is of a granular nature, being clayey silt. Penetration 'N' values in the till indicated a hard consistency or very dense relative density. Around el. 361 - 363 ft., shale bedrock was proved for a thickness of 10 ft. by diamond drilling.

Groundwater level was observed in Hole #111 at el. 377 ft.

Locations of the boreholes as well as the soil profile along the proposed wall, are shown on Drawing #66-F-48R.

2. Recommendations:

Wall #39 is designed to be a parapet wall, hence no appreciable load will be transferred along the wall to the subsoil. The foundation design for parapet walls calls for Size #10 timber piles driven to 10 ft. below pile cap. Since the walls will settle about the same amount as the new embankment, careful compaction of the fill is essential in order to minimize or eliminate settlements.

cont'd. /30

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

RETAINING WALL #38 -

1. Soil Conditions:

Borehole #96 was drilled in the vicinity of the proposed wall.

From ground level to a depth of 11 ft. a gravelly sand fill material was found in the boring, having compact to dense relative density. Underneath the fill the original organic topsoil was encountered. Silty fine sand and sandy silt glacial till follows the topsoil down to el. 365 ft. The very dense glacial material was underlain by shale bedrock. A thickness of nine ft. of the rock was proved by diamond drilling with recoveries of 75 - 85%.

Groundwater level was observed at el. 371 ft., just below the original topsoil.

Locations of the boreholes as well as the soil profile along the wall, are shown on Drawing #66-F-48U.

2. Recommendations:

It is understood that the proposed Wall #38 will be some 100 ft. long, having a maximum height of some 12 - 13 ft. above design ground line. The future grade will be around el. 397 ft. some 13 ft. higher than the existing ground.

Footing at some four ft. below design ground line, supported on steel H-piles, appears to be the most economical proposition at this site. Piles should be driven to practical refusal, which will likely be reached around el. 365 ft. A safe load, equal to the structural strength of the H-section used may be assumed on the piles.

APPENDIX I

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 39 . .

OUR REFERENCE NO 6-6-28

YOUR REF. W.J. 66-F-48

CLIENT: D. H. O.

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

LOCATION. 180,090 N : 208,445 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 3"

DATE JULY 22, 1966.

W. P. 275-64-1

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 % PL W LI	
							SHEAR STRENGTH lbs./sq ft		
378.2	0	GROUND SURFACE							
		10" SILTY TOPSOIL Dense Brown SILTY SAND with a trace of GRAVEL and CLAY		1	SS	39			Gr. 4% ; Sa. 58% Si. 33% ; Cl. 5%
375.0 374.7	3.5	Very Dense Brown FINE SAND Grey and SILT		2	SS	64			Gr. 11% ; Sa. 44% Si. 40% ; Cl. 5%
	5			3	SS	70			W.L. 374.5 Ft. JULY 27, 1966.
370.0				4	SS	92/10"			
368.7	9.5 10	Very Dense Grey SILTY SAND with some GRAVEL and a trace of CLAY (GLACIAL TILL)		5	SS	50/3"			Sa. 50% ; Si. 50%
365.0				6	WS				
363.2	15	Very Hard Grey CLAYEY SILT (GLACIAL TILL)		7	SS	50/4"			Gr. 18% ; Sa. 47% Si. 30% ; Cl. 5%
360.0	18.8			8	SS	100/NP			
	20	END OF BOREHOLE							

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 7! . .

OUR REFERENCE NO. 6-6-28

W.J. 66-F-48

CLIENT: D. H. O.

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

LOCATION: 177, 710 N ; 208, 725 E

DATUM ELEVATION: G. S. C.







METHOD OF BORING: AUGERING & CORING

DIAMETER OF BOREHOLE: 4"

DATE: MAY 24, 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	N- or Advancement of Sampler	20	40	60	80	100	PL	W	LI	
364.0	0	GROUND SURFACE													
		8" TOPSOIL													
		Compact Brown													
360.0		SILTY FINE SAND		1	A.S.										
359.0	5	Very Dense Grey		2	S.S.	71									
		SILT and FINE SAND													
		with some													
355.0	10	SHALE Fragments		3	S.S.	102/10"									
		trace of GRAVEL													
		and CLAY		4	S.S.	93									
		(GLACIAL TILL)													
350.5	13.5	Grey		5	S.S.	104/7"									
350.0	15	weathered		6	R.C.	53 %									
		SHALE		7	R.C.	100%									
		with bands of													
		LIMESTONE		8	R.C.	30%									
345.0	19-33														
	20	END OF BOREHOLE													

W.L. 361.8 Ft.
MAY 26, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 72 . .

OUR REFERENCE NO. 6-6-28

YOUR REF. W.J. 66-F-48

CLIENT: D. H. O.

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

LOCATION: 177,810 N ; 208,800 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 3"

DATE: JULY 22, 1966.

W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs/sq ft		
365.6	0	GROUND SURFACE								
		Dense SAND and GRAVEL (FILL)								
363.1	2.5	Compact Brown FINE SAND with some SILT		1	CS					
360.0	5									
359.6	6.0	Very Hard Grey CLAYEY SILT with some embedded SHALE fragments (GLACIAL TILL)		2	SS	35				
				3	SS	56				
355.0	10			4	SS	72				
353.6	12.0	Alternate layers of CLAYEY SILT (TILL) and SHALE		5	SS	70/L"				
				5A	WS					
350.6	15	Grey SHALE BEDROCK		6	SS	50 NP				
350.0				7	RC	60 %				
345.0	20	END OF BOREHOLE								

W.L. 360.3 Ft.
JULY 22, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE 73...

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: 177,965 N ; 208,840 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: JULY 20, 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	2-6 No. of Advancement of Sampler	20	40	60	80	100	FL	W	LI		
365.4	0	GROUND SURFACE														
		Compact to Dense Brown SILTY SAND with a trace of GRAVEL (FILL)		1	CS										Gr. 8 % ; Sa. 67 % Si. 25 % W.L. 361.3' JULY 21, 66	
360.0	5	(boulder)		1a	WS										Gr. 3 % ; Sa. 80 % Si. 17 %	
359.6	5.8	Very Dense Grey SANDY SILT with some embedded GRAVEL and a trace of CLAY		2	BX										Gr. 18 % ; Sa. 30 % Si. Cl. 52 %	
		(GLACIAL TILL)		3	SS	60/5"										
				4	SS	50/1"										
355.0	10			5	RC											
				5a	AX											
				6	SS	80/6"									Gr. 23 % ; Sa. 40 % Si. Cl. 37 %	
353.0	12.4			7	SS	50/NP										
350.0	15	Grey SHALE BEDROCK with occasional LIMESTONE layers		8	RC	80 %										
				9	RC	66 %										
345.0	20			10	RC	34 %										
		END OF BOREHOLE														
340.0	25															

NOTE:
Artesian condition
noted during drilling
at el. 356.0 Ft.
Measured total Head
11'-9" (EL. 367.8 Ft.)
Pressure subsided
overnight.

NOTE:
Artesian condition
noted during drilling
at el. 356.0 Ft.
Measured total Head
11'-9" (EL. 367.8 Ft.)
Pressure subsided
overnight.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 74 . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48

CLIENT D. H. O.
PROJECT Q. E. W. B. HWY. No. 27, INTERCHANGE, R.W. No. 28
LOCATION 178, 465 N; 209, 025 E.
DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 3"
DATE AUG. 4, 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	Advancement of Sampler	20	40	60	80	100	Pl	
384.3	0	GROUND SURFACE											
		Compact to Dense Brown SILTY SAND with a trace of gravel.		1	SS	31							Sa. 79 % ; Si. 21 %
380.0	5			2	SS	24							
375.0	10	(F I L L)		3	SS	31							
				4	SS	45							Hole Dry
370.0	15	some organic matter below El. 369 ft.		5	SS	15							Sa. 85 % ; Si. 15 %
365.0	19-0	Very Dense SILT and SAND some gravel and clay.		6	WS								CAVE - IN El. 367.2 ft. Aug. 8, 1966
362.6	21-7	Grey, Weathered Broken SHALE		7	SS	60/10"							Gr. 15 % ; Sa. 40 % Si. 35 % ; Cl. 10 %
361.5	22-6												
360.0	25	Grey SHALE BED ROCK		8	RC	24 %							
355.0	30	END OF BOREHOLE											

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. G. H. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 75 . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F-48

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE, R.W. N° 28
LOCATION: 176, 772 N; 209,010 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: AUG. 3, 1966.
W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	Advancement of Sampler	blows per foot	SHEAR STRENGTH	water content %		
384.8	0	GROUND SURFACE									
		Compact to Dense Brown GRAVELLY SAND to SANDY SILT (FILL)		1	SS	29					
380.0	5			2	SS	22					
	6.0			3	SS	38					
375.0	10										
372.3	12.5	Dark Brown ORG. SILT, some clay		4	SS	43					
370.8	14.0										
370.0	15	Compact to Dense FINE SAND with some silt.		5	SS	20					Sa. 88 % ; Si. 12 %
				6	WS						
365.0	20	Brown Grey		7	SS	61					
364.3	20.5										
		Very Dense, Grey SAND and SILT with some gravel and shale fragments.		8	SS	75/5"					Gr. 23 % ; Sa. 48 % Si. 29 %
360.8	24.0										
360.0	25	Grey CALCAREOUS SHALE BEDROCK		9	RC	83 %					Gr. 22 % ; Sa. 30 % Si - CL 48 %
355.0	30	END OF BOREHOLE									

GEOTECHNICAL DATA SHEET FOR BOREHOLE 76

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F-48

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27 INTERCHANGE, R.W. No. 28
LOCATION: 178, 920 N; 208, 980 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: AUG. 3, 1966.
W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE				CONSISTENCY		REMARKS
				NUMBER	TYPE	N ₆₀ or adj. value of Sample	blows per foot				water content %		
							20 40 60 80 100				PL W LI		
							SHEAR STRENGTH lbs. sq. ft.						
385.6	0	GROUND SURFACE											
		Dense, Brown SILTY SAND with some gravel		1	CS								
380.0	5	(FILL)		2	SS	90							
				3	SS	45							
375.0	10			4	SS	45							
				5	SS	62							
370.0	15			6	SS	63							
368.6	17.0	Very Dense Brown FINE SAND with some silt		7	SS	77							
365.0	20												
362.1	23.5	Grey, Weathered Broken SHALE		8	SS	100/NP							
360.0	25	Grey SHALE BEDROCK		9	RC	70%							
355.0	30	END OF BOREHOLE											
	35												

Sa. 88 % ; Sl. 12 %

CAVE - IN
El. 364.3 ft.
Aug. 4, 1966

Hole Dry

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 77 . .

OUR REFERENCE NO. 6-6-28

YOUR REF. W. J. 65 - F - 48

CLIENT: D. H. O.

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

LOCATION: 178,620 N, 209,100 E

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 3"

DATE: JULY 27, 1966.

W. P. 275 - 64 - 1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content %	REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs. sq. ft.		
370.5	0	GROUND SURFACE								
369.3	1.2	TOPSOIL								
366.0	4.5	Dense Brown SILT and SAND (FILL)								
365.0	0	Compact to Dense SILTY FINE SAND to GRAVELLY SAND		1	SS	27				
362.0	8.5	Very Dense Grey SILT with embedded SHALE fragments (GLACIAL TILL)		2	SS	75/5				
360.0	10			3	SS					
358.0	12.5			4	RC	44 %				
355.0	15			5	RC	60 %				
350.0	20	Grey SHALE with intermittent LIMESTONE Bands BEDROCK		6	RC	55 %				
345.0	25			7	RC	72 %				
340.0	30									
335.0	35	END OF BOREHOLE								

HOLE DRY

CAVE - IN
EL. 364.4 Ft.
JULY 29, 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 78 . . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W.J. 66 - F - 48

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: 178,305 N ; 209,840 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: JULY 22, 1966.
W.P. 275 - 64 - 1

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 %				
							20 40 60 80 100					PL	W	LI		
							SHEAR STRENGTH lbs/sq ft									
365.5	0	GROUND SURFACE														
		6" TOPSOIL														
		Compact to Dense Brown FINE SAND with some SILT														
360.0	5.5	Very Dense SAND and SILT with some SHALE Fragments and GRAVEL trace of CLAY (GLACIAL TILL)		1	SS	75										
				2	SS	80/6"										
355.0	10			3	SS	100/6"										
				4	SS	100/2"										
350.0	15			5	SS	100/NP										
		Grey SHALE BEDROCK		6	RC	92%										
345.0	20	END OF BOREHOLE														

W.L. 360.7 Ft.
JULY 27, 1966.
Sa. 85 % ; Si. 15 %

Gr. 22 % ; Sa. 36 %
Si. 35 % ; Cl. 7 %

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 79 . . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W.J. 66-F-48

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: 17B, 430 N ; 210,030 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: JULY 22, 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 % PL W LI	REMARKS
				NUMBER	TYPE	N or Advancement of Sampler	20	40 60 80 100		
362.9	0	GROUND SURFACE								
360.0	3.3	Compact to Dense Brown FINE SAND with some SILT		1	SS	44				SS. IA.
359.6	5	Very Dense Grey SAND and SILT with a trace of GRAVEL and CLAY (GLACIAL TILL)		2	SS	60/4"				SS. IB.
355.0	9.0			3A	SS	75/1"				
353.9	10	Grey SHALE with intermittent layers of LIMESTONE		3	WS					
350.0	15	BEDROCK		4	RC	91 %				
				5	RC	85 %				
345.0	20	END OF BOREHOLE								

W.L. 361.4' JULY 22, 66.
Sa. 85 % ; Si 15 %
Gr. 10 % ; Sa. 40 %
Sl. 45 % ; Cl. 5 %

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48

CLIENT: D. H. O.
PROJECT: Q.E.W. & HWY No. 27. INTERCHANGE
LOCATION: 177,650 N ; 209,470 E
DATUM ELEVATION: G. S. C.

GEOTECHNICAL DATA SHEET FOR BOREHOLE ... 80.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 3/8"
DATE: JUNE 16, 1966.
W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N or Advancement of sampler	blows per foot	SHEAR STRENGTH lbs/sq ft		
357.6	0	GROUND SURFACE								
355.0		Loose, Brown FINE SAND (FILL)								
353.6	4.0	ORGANIC TOPSOIL								
352.6	5	Dense SILTY SAND		1	SS	50				
351.1	6.5	Alternate layers of CLAYEY SILT (GLACIAL TILL) and SHALE		2	RC	50 %				
350.0				3	RC	33 %				
347.6	10			4	SS	100/2"				
345.0		Grey SHALE		5	RC	40 %				
340.0	15	BEDROCK		6	SS	100/NP				
335.0	20			7	RC	67 %				
330.0	25			8	RC	97 %				
325.0	30			9	RC	31 %				
				10	RC	90 %				
320.0	35	END OF BOREHOLE								

W.L. 354.0 Ft.
JUNE 17, 1966.

Gr. 9%; Sa. 66 %
Si. 25 %

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 81 . .

OUR REFERENCE NO. 6-6-28

YOUR REF. W.J. 66-F-48

CLIENT D. H. O.

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

LOCATION 177,685 N; 209,390 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 3"

DATE JULY 25, 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	N ₆₀ or Equivalent of Sampler	20	40	60	80	100	PL	W		LI
358.7	0	GROUND SURFACE													
		12" TOPSOIL													
		Compact, Brown-Grey													
		SILT and FINE SAND													
		(layered)													
355.0	4-0	Very Dense													
	5	Brownish Grey													
		SANDY SILT													
		with some gravel													
		and a trace of clay													
350.0	8-0	Grey, EXTREMELY													
	9-8	WEATHERED SHALE													
348-9	10														
345.0	15	Grey SHALE													
		with intermittent													
		hard bands of													
		LIMESTONE													
340.0	20														
335.0	25														
330.0	30	END OF BOREHOLE													

W. L. 355-4 Ft.
JULY 26, 1966

GR. 12% ; SA. 36%
SI. 45% ; CL. 7%

VERTICAL SCALE 1 IN. TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. G. H. CHD

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 82 . . .

OUR REFERENCE NO 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
LOCATION: 178, 480 N; 210, 550 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: JULY 28, 1966.
W. P. 275 - 64 - 1

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY		REMARKS	
				NUMBER	TYPE	No. Advancement of Sampler	blows per foot					water content %			
							SHEAR STRENGTH lbs/sq ft					PL	W		
362.7	0	GROUND SURFACE													
		12" TOPSOIL													
		Compact, Brown													
		FINE SAND													
360.0	2.5	Very Dense		1	CS										
	5	SANDY SILT													
		with some		2	SS	75									
		Brown - gravel													
355.0		Grey													
	10	SHALE FRAGMENTS		3	SS	92/6"									
		BELOW EL. 353 ft.													
350.4	12.3	Grey SHALE		4	RC	64 %									
350.0		with bands													
	15	of LIMESTONE		5	RC	54 %									
		BEDROCK													
345.0	20			6	RC	82 %									
340.0	25														
		END OF BOREHOLE													

W.L. 360 ft.
July 28, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 83 . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.
PROJECT: Q. E. W. 8 HWY. No. 27. INTERCHANGE
LOCATION: 178,306 N; 210, 678 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE 3"
DATE: JULY 29, 1966.
W. P. 275-64-1

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	SHEAR STRENGTH lbs/sq ft	water content % PL W LI		
362.0	0	GROUND SURFACE									
		12" TOPSOIL									
		Loose, Brown									
360.0	2.5	FINE SAND									
	5	Very Dense									
		SANDY SILT									
		with some clay									
		and gravel.									
355.0	8.3	Brown (GLACIAL Grey TILL)		1	SS	77					
	10	SHALE FRAGMENTS		2	SS	50 1/2"					
		BELOW EL. 354 ft.		3	SS	50 1"					
350.0	12.0			4	WS						
	15	Grey SHALE		5	RC	52 %					
		with layers									
		of LIMESTONE									
345.0	20	BEDROCK		6	RC	88 %					
340.0											
		END OF BOREHOLE									

W.L. 359 ft.
July 29, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 84 . .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27 INTERCHANGE
LOCATION: 178,940 N, 210,502 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: JULY 26, 1966
W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content %	REMARKS
				NUMBER	TYPE	N- Adjustment of Sampler	blows per foot	SHEAR STRENGTH lbs./sq. ft.		
368.0	0	GROUND SURFACE								
365.0	5	Compact to Dense Brown SILTY FINE SAND		1	SS	100/2"				So. 87% ; Si. 13% W.L. 362 ft. July 26, 1966
360.0	10	Very Dense SAND and SILT with some clay and gravel (GLACIAL TILL) SHAPE FRAGMENTS BELOW EL. 356 ft.		2	CS					Gr. 6% ; So. 38% Si. 42% ; Cl. 14%
355.0	15			3	SS	100/NP				
350.0	20	Grey SHALE with LIMESTONE layers.		4	RC	10%				Gr. 18% ; So. 40% Si. 34% ; Cl. 8%
345.0	25	weathered sound BEDROCK		5	SS	50/3"				
340.0	30			6	RC	64%				
				7	SS	100/NP				
				8	RC	70%				
				9	SS	100/NP				
				10	RC	97%				
335.0		END OF BOREHOLE								

GEOTECHNICAL DATA SHEET FOR BOREHOLE 85

OUR REFERENCE NO. 6-6-28

YOUR REF. W.J. 66.-F-48

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE, R.W. N^o 34

LOCATION: 178,397 N; 208,720 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE 3"

DATE: JULY 28, 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	N - or Advancement of Sampler	20	40	60	80	100	PL	W	LI		
							SHEAR STRENGTH lbs/sq ft					10 20 30 40				
368.0	0	GROUND SURFACE														
365.0		Loose to Dense Brown FINE SAND with some silt.														
364.5	3.5	Very Hard CLAYEY SILT with some sand and grav. (GLACIAL TILL)		1	SS	60/6"										
361.3	6.7	Grey Extremely Weathered Broken SHALE		2	SS	35/2"										
360.0	10			3	SS	100/8"										
356.4	11.6			4	SS	100/1 1/2"										
355.0	15	Grey SHALE with layers of LIMESTONE.		5	RC	65%										
		BEDROCK		6	SS	100/1"										
				7	RC	74%										
350.0	20			8	SS	100/NP										
		END OF BOREHOLE														

W.L. 363.7 ft.
July 29, 1966

Gr. 3% ; Ss. 22%
Sl. 50% ; Cl. 25%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 86 . .

OUR REFERENCE NO 6-6-28
YOUR REF. W. J. 66-F-48

CLIENT: D.H.O.

PROJECT: Q. E. W. & HWY. No. 27 INTERCHANGE, R.W. No. 34

LOCATION. 178,845 N; 208,710 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 3"

DATE JULY 27 1966

W. P. 275 - 64 - 1

ENCLOSURE NO

[illegible]

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 87 . .

OUR REFERENCE NO 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE - R. W. No. 35

LOCATION: 179, 475 N ; 208, 600 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 3"

DATE: JULY 29, 1966.

W.P. 275 - 64 - 1

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	SHEAR STRENGTH lbs / sq ft	water content % Pl W LI		
375.7	0	GROUND SURFACE									
		6" TOPSOIL Loose to Compact SANDY SILT FILL									
370.0	5.5	Dense FINE SAND		1	SS	23					
	7.0	Very Hard, Grey CLAYEY SILT (GLACIAL TILL)		2	SS	100/4"					
366.2	9.5	Grey Extremely Weathered SHALE		3	SS	100/2"					
365.0	10			4	SS	100/2"					
	15	Grey Sound SHALE BEDROCK		5	SS	100/NP					
360.0				6	RC 75 %						
	20			7	SS	100/NP					
355.0		END OF BOREHOLE									

W. L. El. 371.0 ft.
July 29, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . . 90

OUR REFERENCE NO. 6-6-14

CLIENT: D.H.O.
 PROJECT: BRIDGE No. 3, O.E.W. & HWY. 27.
 LOCATION: 178,590 N ; 209,356 E
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: AUGERING
 DIAMETER OF BOREHOLE: 4"
 DATE: JUNE 30, 1966.
 W.P. 238-61-2

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- Advance- ment of Sampler	20	40	60	80	100	PL	W	LI	
369.7	0	GROUND SURFACE													
		Compact to Dense Brown SILTY FINE SAND with a trace of CLAY		1	AS										Sa. 67 % Si. 30 % ; Cl. -3 % W.L. 365.2 Ft. JULY 6, 1966.
365.0	5			2	SS	39									
363.7	6.0	Very Dense Grey SILTY SAND with a trace of GRAVEL and CLAY		3	SS	71/5"									Gr. 8 % ; Sa. 59 % Si. 25 % ; Cl. 8 %
360.0	10			4	SS	75/3"									
357.2	12.5			5	RC	58 %									
355.0	15	Grey SHALE with intermittent layers of LIMESTONE BEDROCK		6	RC	4c %									
350.0	20			7	RC	18 %									
345.0	25			8	RC	78 %									
340.0	30	END OF BOREHOLE													
335.0	35														

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. G. H. CHD.

OUR REFERENCE NO. 6-6-22

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . 96X.

CLIENT: D.H.O.
 PROJECT: Q.E.W. B HWY. no. 27 INTERCHANGE.
 LOCATION 179,729 N ; 208,706 E
 DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING.
 DIAMETER OF BOREHOLE: 2 3/8"

ENCLOSURE NO

DATE: JULY 15, 1966

W.P. 238-61-6

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N ₆₀ by Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs./sq ft		
383.2	0	GROUND SURFACE								
380.0		Compact to Dense CLAYEY		1 A	CS	-				
375.0		Brown GRAVELLY SAND with some SILT (FILL)		1	SS	64				Gr. 28 % ; Sa. 55 % Sl. 17 %
372.7		ORGANIC TOPSOIL		2 A B	SS	21				
381.2		SILTY FINE SAND		3 A B	SS	56				
370.0		Very Dense Brown to Grey SANDY SILT with some GRAVEL and CLAY (GLACIAL TILL)		4	SS	70/6"				
365.0				5	SS	80/6"				
360.0		Grey SHALE BEDROCK		6	R.C. 75 %					
				7	R.C. 85 %					
	25	END OF BOREHOLE								

W.L. 371.0 Ft.
 JULY 18, 1966.
 SS-3A.
 Gr. 4 % ; Sa. 71 %
 Sl. 25 %
 SS-3B.
 Gr. 9 % ; Sa. 27 %
 Sl. Cl. 64 %

OUR REFERENCE NO: 6-6-22

GEOTECHNICAL DATA SHEET FOR BOREHOLE . . III.

CLIENT: D.H.O.
 PROJECT: Q.E.W. & HWY. no. 27 INTERCHANGE
 LOCATION: 179,502 N ; 208,778 E
 DATUM ELEVATION G.S.C.

METHOD OF BORING: WASHBORING.

DIAMETER OF BOREHOLE: 2 3/8"

DATE: JULY 14, 1966

W.P. 238-61-6

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY		REMARKS
				NUMBER	TYPE	Advancement of Sampler	blows per foot	SHEAR STRENGTH lbs / sq ft	water content %	PL W LI	
383.9	0	GROUND SURFACE									
380.0	5	Generally Dense Brown SILTY SAND (FILL)			SS	60/6"					
375.0	10			2 A	WS	—					
370.0				2	SS	37					
369.4	14.5			3	SS	26					
368.4	15.5	ORGANIC TOPSOIL									
366.9	17.0	Compact Brown FINE SAND		4	SS	17					
365.0	20	Very Hard Grey CLAYEY SILT (GLACIAL TILL)		5	SS	60/3"					
363.6	20.3			6	SS	100/2"					
360.0	25	Grey SHALE BEDROCK		7	R.C.	80 %					
		END OF BOREHOLE									

Gr. 12 % ; Sa. 68 %
 Si. 20 %
 W.L. 377.2 Ft.
 JULY 18, 1966.
 Sa. 80 % ; Si. 20 %

Gr. 4 % ; Sa. 50 %
 Si. 46 %

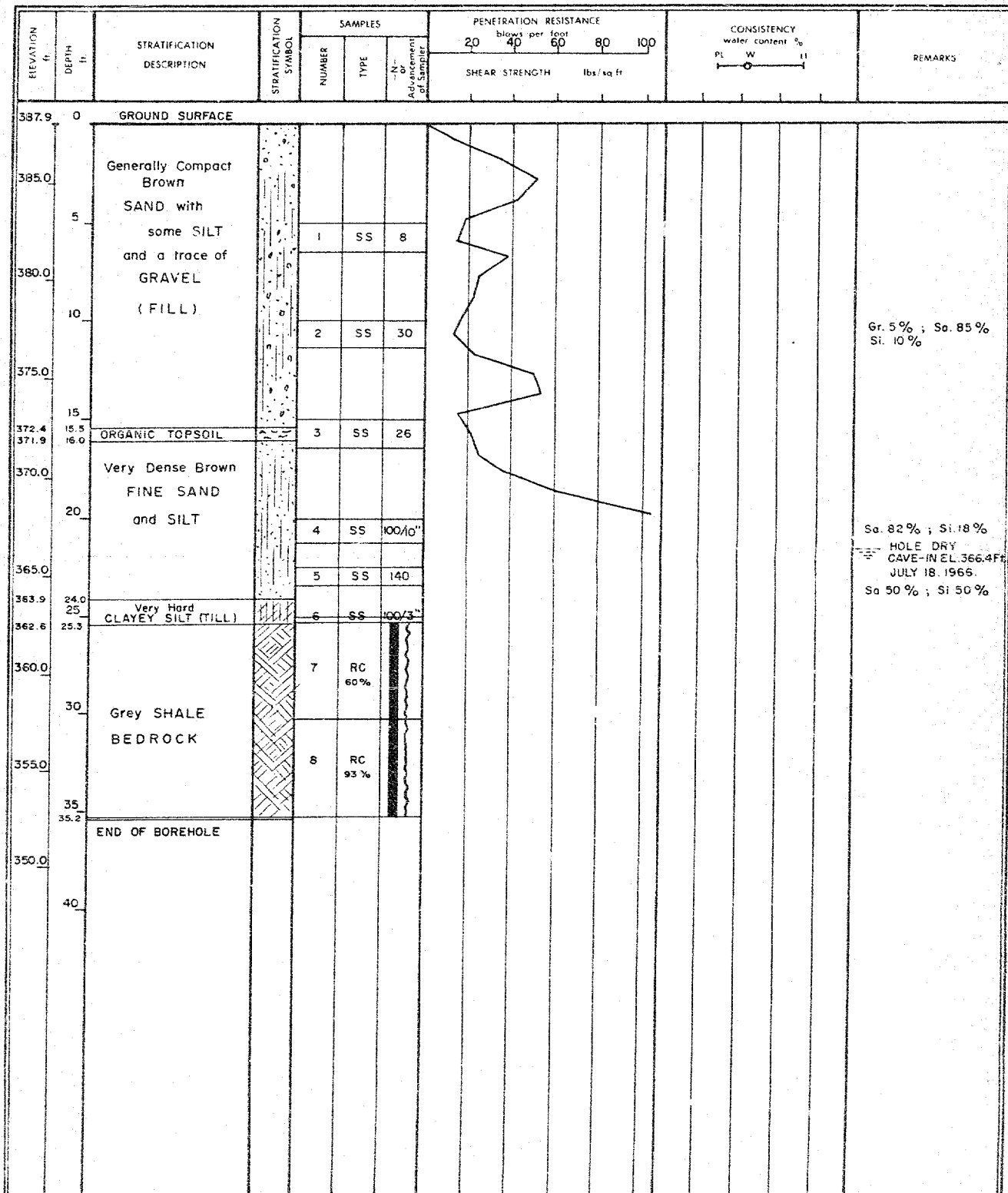
GEOTECHNICAL DATA SHEET FOR BOREHOLE 112

OUR REFERENCE NO. 6-6-20

CLIENT: D. H. O.
PROJECT: BRIDGE No. 10. Q.E.W. & HWY. No. 27.
LOCATION: 179,180 N ; 208,890 E
DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 7/8"
DATE: JULY 13, 1966.
W.P. 34-65-2

ENCLOSURE NO.



VERTICAL SCALE 1 IN. TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE: V. C. H. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 124 .

CUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE, R.W. No. 36

LOCATION: 179,530 N ; 208, 653 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 3"

DATE: AUG. 4, 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	
384.7	0	GROUND SURFACE												
		6" TOPSOIL												
382.7	2.0	SILTY FINE SAND												
		to												
		CLAYEY, SANDY SILT												
380.0	5	(FILL)												
378.7	6.0			1	SS	49								
		SILTY SAND												
		with a trace of												
		gravel												
375.0	10	Very Dense												
		(FILL)												
				2	SS	65								
371.7	13.0													
		Black, FINE SAND												
		with some silt												
370.0	15	Dense												
		Very Hard, Grey												
		SILTY CLAY with trace												
		of gravel, shale fragments												
367.2	17.5													
		Grey												
365.0	20													
		Weathered												
		Sound												
		SHALE												
		BED ROCK												
360.0	25													
		END OF BOREHOLE												

Gr. 2 % ; Sa. 72 %
Si. - Cl. 26 %

Sa. 73 % ; Si. - Cl. 27 %

W. L. E. 370.6 ft
Aug. 8, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 125 .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE, R.W. N° 36

LOCATION: 179, 325 N; 208, 712 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE: 3"

DATE: AUG. 5, 1966

W. P. 275-64-1

ENCLOSURE NO.

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE		CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N or Advancement of sampler	blows per foot	SHEAR STRENGTH lbs/sq ft		
386.0	0	GROUND SURFACE								
		12" TOPSOIL								
		Boulder								
		CLAYEY, SANDY SILT (FILL)		1	SS	17				
		to								
381.5	4.5	SILTY SAND		2	SS	15				Gr. 8 %; Sa. 56 % Si - Cl. 36 %
380.0	5	with a trace of gravel.								
		(FILL)								
375.0	10	Compact to Dense		3	SS	51				Gr. 7 %; Sa. 58 % Si - Cl. 35 %
				4	SS	100				
370.0	15	Black, SILT and FINE SAND		5	SS	39				
369.0	17	Dense, Brown FINE SAND		6	SS	63				Sa. 86 % Si. 16 % W.L. El. 367.2 ft. Aug. 8, 1966
366.2	18.8	with some silt		7	SS	100/3"				
365.0	20	Grey		8	SS	100/2"				
		Extremely Weathered		9	WS					
361.0	25	SHALE		10	SS	100/2"				
360.0		to								
		Sound		11	RC	90 %				
		SHALE								
		BEDROCK								
355.0	30	END OF BOREHOLE								
	35									

VERTICAL SCALE: 1 IN TO 5 FT

DOMINION SOIL INVESTIGATION LIMITED

MADE V. G. H. CHD.

GEOTECHNICAL DATA SHEET FOR BOREHOLE 126

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.
PROJECT: Q. E. W. & HWY. No. 27 INTERCHANGE, R.W. No 37
LOCATION: 179,292 N; 208,883 E.
DATUM ELEVATION: G. S. C.

METHOD OF BORING WASHBORING
DIAMETER OF BOREHOLE 3"
DATE AUG. 2, 1966.
W. P. 275-64-1

ENCLOSURE NO

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE	CONSISTENCY water content % PL W LI	REMARKS
				NUMBER	TYPE	N or Advance-ment of Sampler	blows per foot		
							20 40 60 80 100		
							SHEAR STRENGTH lbs./sq ft		
373.0	0	GROUND SURFACE							
		9" TOPSOIL							
		Dense, Brown FINE SAND with some silt		1	SS	38			
370.0	5			2	SS	51			
366.5	6.5	V. Dense, Grey SANDY SILT with some clay, gravel and shale fragments.		3	SS	100/2½"			
365.0		(GLACIAL TILL)		4	WS				
	10			5	SS	100/3"			
361.0	12.0	Grey		5A	WS				
360.0		Weathered Sound SHALE		6	SS	100/1"			
359.0	15	BEDROCK		7	RC	83%			
355.0	20	END OF BOREHOLE							

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 127 .

OUR REFERENCE NO. 6-6-28

YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. O.

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

LOCATION: 178,490 N ; 210,245 E

DATUM ELEVATION G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE 3"

DATE: AUG. 5. 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	N or Advancement of Sampler	20	40	60	80	100	PL	W	
362.6	0	GROUND SURFACE												
360.0		12" TOPSOIL												
359.6	3.0	Compact, Brown SAND with some SILT		A B	SS	44								
	5	Very Dense Grey SAND and SILT with some GRAVEL SHALE Fragments with a trace of CLAY		2	SS	54/6"								
355.0				3	SS	50/2"								
353.8	8.8													
350.0	10	Grey SHALE with layers of LIMESTONE BEDROCK		4	RC	30%								
	15			5	RC	71%								
345.0		END OF BOREHOLE												
	20													

SAMPLE 1A.

SAMPLE 1B.

W.L. 361.0 Ft.
AUG. 8. 1966.
Sa. 75% ; SI. 22%
Cl. 3%
Gr. 9% ; Sa. 46%
SI. 40% ; Cl. 5%
Gr. 18% ; Sa. 37%
SI. 37% ; Cl. 8%

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 128 .

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F - 48

CLIENT: D. H. C.
PROJECT: Q. E. W. & HWY. No. 27. INTERCHANGE
LOCATION: 178,585 N ; 210,475 E
DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 3"
DATE: AUG. 8. 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	N or Adjustment of Sampler	20	40	60	80	100	PL	W	LI	
366.6	0	GROUND SURFACE													
365.0		SAND and GRAVEL (FILL)													
364.1	2.5	Compact Brown SANDY GRAVEL with some ORGANIC MATTER (FILL)		1	SS	19									
360.0	5														
357.6	9.0	Very Dense Grey SANDY SILT with some SHALE Fragments, GRAVEL and a trace of CLAY (GLACIAL TILL)		2	SS	04/10'									
355.0	10														
351.6	15			3	SS	50 1/2'									
350.0		Grey SHALE with hard bands of LIMESTONE BEDROCK		4	RC	42%									
345.0	20			5	RC	57%									
340.0	25			6	RC	77%									
340.0	25	END OF BOREHOLE													
335.0	30														

W.L. 361.0 Ft.
AUG. 8. 1966.

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 143.

OUR REFERENCE NO. 6 - - 28

Your Ref. No. W.J. 66 - F - 48

CLIENT: D. H. O.

PROJECT: G.E.W. & HWY. No 27 INTERCHANGE - R.W. No 2

LOCATION: 177,930 N; 209,522 E.

DATUM ELEVATION G.S.C.

















METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE SEPT. 12, 1966

WP. 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	N or Advancement of Sampler	2,0	4,0	6,0	8,0	100	PL	W	
362.9	0	GROUND SURFACE												
		8" TOPSOIL Brown												
360.0	3.0	MEDIUM SAND												
	5	Very Hard Grey		1	C.S.									
		CLAYEY SILT with some sand and gravel (GLACIAL TILL)		2	S.S.	190/10"								
355.0				3	S.S.	168/9"								
353.7	9.2			4	S.S.	200/3"								
	10			5	S.S.	200/3"								
		Grey WEATHERED SHALE		6	S.S.	200/5"								
350.0				7	S.S.	200/4"								
	15			8	S.S.	210/4"								
				9	S.S.	210/4"								
				10	S.S.	210/3"								
				11	S.S.	200/3"								
				12	S.S.	250/4"								
345.0				13	S.S.	200/2"								
	20			14	S.S.	200/2"								
	20.2	END OF BOREHOLE		15	R.C.									

W.L. E1.360.3'

SEPT. 14, 1966

W.L. El. 360.3'
SEPT. 14, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 144 .

OUR REFERENCE NO. 6 - 6 - 28
Your Ref. No. WJ. 66 - F - 48

CLIENT D. H. O.

PROJECT Q. E. W. & HWY. No. 27 INTERCHANGE -- R.W. No. 2

LOCATION 177, 810 N; 209, 495 E.

DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE SEPT. 8, 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	N- or Advance of Sampler	2.0	4.0	6.0	8.0	10.0	PL	W	LI	
363.7	0	GROUND SURFACE													
		6" TOPSOIL													W.L. El. 361.3' SEPT. 8, 1966
		CLAYEY SILT, SAND, GRAVEL (FILL)		1	C.S.										
360.0															
358.9	5	TOPSOIL		2	A B C	SS.	28								
	5.6	Very Hard Grey													
355.0		CLAYEY SILT		3		S.S.	61								
	10	with some embedded gravel and shale fragments													
				4	A B	S.S.	100/6"								
351.7	12.0			5	A B	S.S.	200/5"								
		Grey													
350.0		WEATHERED			6		SS.	200/7"							
		SHALE			6A		WS.	140/7"							
	15				7		S.S.	140/7"							
					7A		WS.	200/7"							
	16.1	END OF BOREHOLE		8		S.S.	200/7"								
				9		R.C.									
345.0	20														

W.L. El. 361.3'
SEPT. 8, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE 145.

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No 27 INTERCHANE - R. W. No 2

LOCATION: 177,510 N; 209,495 E.

DATUM ELEVATION: G. S. C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE: SEPT. 9, 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	N- or Advancement of Sampler	2.0	4.0	6.0	8.0	10.0	PL	LI	
358.5	0	GROUND SURFACE												
355.0		3" TOPSOIL												
		SILTY SAND												
		with some gravel												
354.1	4.4	Hard, Grey		1	C.S.									
	5	CLAYEY SILT		2	S.S.	30								
		(GLACIAL TILL)												
350.5	8.0			3A	S.S.	155/10'								
350.0				3B										
	10	Grey		4	S.S.	200/3"								
		WEATHERED		5A	S.S.	200/4"								
		SHALE		5B										
				6	S.S.	200/1 1/4"								
				7	S.S.	200/1 1/4"								
345.0				8	S.S.	200/2"								
	15			9	S.S.	100/NP								
	15.5	END OF BOREHOLE		10	R.C.	42 %								
340.0	20													

WL. EL. 356.0'
SEPT. 12, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE .146.

OUR REFERENCE NO. 6-6-28

Your Ref No. W.J. 66-F-48

CLIENT D.H.O.

PROJECT Q.E.W. & HWY. No 27 INTERCHANGE - R.W. No 17

LOCATION 177,550 N; 209,400 E.

DATUM ELEVATION G.S.C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE SEPT 7, 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. or Advance of Sampler	20	40	60	80	100	PL	LI		
360.0	0	GROUND SURFACE													
		8" TOPSOIL Brown													
		GRAVELLY SAND and SILT (FILL)		1	C.S.										
355.0	4.5	Very Stiff Grey-Brown, mottled CLAYEY SILT		2	S.S.	16									
352.5	7.5	Grey WEATHERED SHALE		3	S.S.	260/26"									
				4	S.S.	200/34"									
350.0	10			5	S.S.	175/24"									
				6	S.S.	150/23"									
				7	S.S.	170/24"									
				8	S.S.	200/24"									
				9	S.S.	300/34"									
345.0	15			10	S.S.	250/22"									
				11	S.S.	200/25"									
				12	S.S.	250/25"									
342.8	17.2	END OF BOREHOLE													
340.0	20														

W.L. EL. 355.0'
SEPT. 9, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE .168.

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

CLIENT: D. H. O.

PROJECT: Q. E. W. & HWY. No 27 INTERCHANGE - R.W. No 4

LOCATION 178, 880 N; 209, 070 E.

DATUM ELEVATION G. S. C.

METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

ENCLOSURE NO

DATE: SEPT. 23-26, 1966

W.P. 275 - 64 - 1

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	N or Advance of Sampler	2.0	4.0	6.0	8.0	10.0	PL	LI	
370.9	0	GROUND SURFACE												
370.0		10" TOPSOIL												
		Brown												
		SILTY FINE SAND												
		Dense												
365.0	5													
	6.0													
		Grey												
		EXTREMELY												
		WEATHERED												
		SHALE												
360.0	10													
358.3	12.6	END OF BOREHOLE												
355.0	15													

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

GEOTECHNICAL DATA SHEET FOR BOREHOLE .169.

OUR REFERENCE NO 6 - 6 - 28
Your Ref. No W.J. 66 - F - 48

CLIENT D. H. O.

PROJECT Q.E.W. & HWY. No 27 INTERCHANGE — R.W. No 4

LOCATION 178,685 N; 209,053 E.

DATUM ELEVATION: G.S.C.


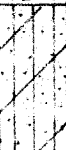




METHOD OF BORING WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE SEPT. 26, 1966

ENCLOSURE NO

W.P. 275 - 64 - 1

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	
375.6	0	GROUND SURFACE													
374.8	0.8	TOP SOIL													
		GRAVELLY SILTY SAND to CLAYEY SILT (FILL)													
370.0	5.3	TOP SOIL		1 A B C	S.S.	16									
	6.0	Brown SILTY FINE SAND		2	S.S.	11									
	10	Compact to Dense													
365.5				3 A B	S.S.	44									
363.8	11.8	Grey SILTY CLAY TILL		4 A B	S.S.	116/7"									
362.3	13.3														
	15	Grey S H A L E		5	S.S.	200/2"									
360.0				6	S.S.	200/2"									
				7	S.S.	200/3"									
				8	S.S.	200/3"									
		weathered sound		9	S.S.	200/1"									
356.4	19.2			10	R.C.	100%									
355.0	20	END OF BOREHOLE													

W. L. E. 364.3 ft
Sept. 27, 1966

W. L. E. 364.3 ft.
Sept. 27, 1966

GEOTECHNICAL DATA SHEET FOR BOREHOLE . 17.0 .

OUR REFERENCE NO. 6 - 6 - 28

Your Ref. No. W.J. 66-F-48

CLIENT: D. H. O.

PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE - R.W. No 4

LOCATION: 178, 572 N; 209, 240 E.

DATUM ELEVATION: G.S.C.

METHOD OF BORING: WASHBORING

DIAMETER OF BOREHOLE 2 3/8"

DATE: SEPT. 26 - 27, 1966

ENCLOSURE NO.

W. P. 275 - 64 - 1

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	
								SHEAR STRENGTH lbs/sq ft								
369.7	0		GROUND SURFACE													
			6" TOPSOIL													
368.2	1.5		SANDY FILL													
			Brown													
			FINE SAND													
365.0	5		Dense		1	S.S.	52									
362.7	7.0		Hard, Grey CLAYEY SILT		2	S.S.	69									
360.0	10		(GLACIAL TILL)		3A	S.S.	100/2"									
359.2	10.5				4	S.S.	200/2"									
			Grey		5	S.S.	200/4"									
			Weathered		6	S.S.	200/6"									
355.0	15		SHALE		7	S.S.	200/2"									
					8	S.S.	200/4"									
					9	S.S.	200/4"									
	16.5		END OF BOREHOLE		10	S.S.	200/NF									
350.0	20															

W. L. El. 364.9'

Sept. 27, 1966

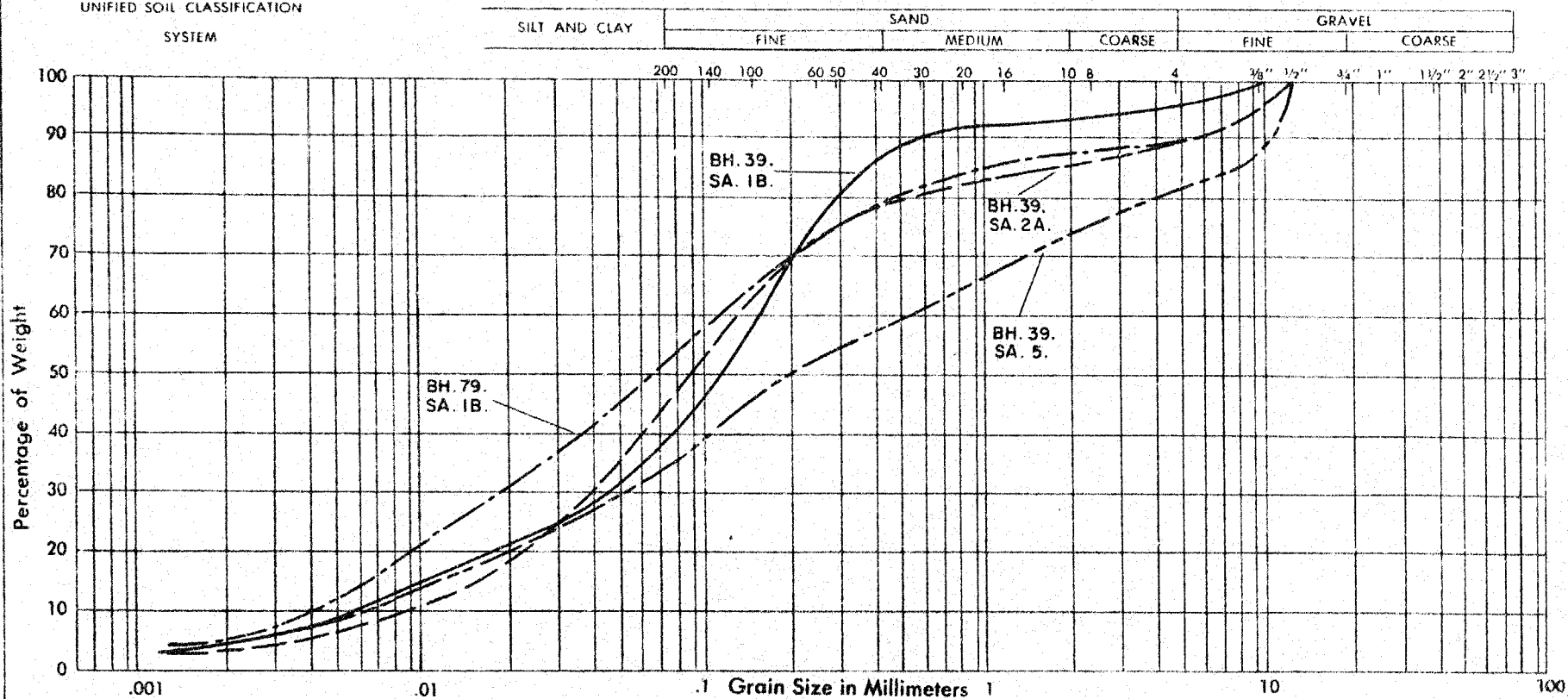
W.L. El. 364.9'
Sept. 27, 1966

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
YOUR REF. W.J. 66-F-48

UNIFIED SOIL CLASSIFICATION
SYSTEM



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

LOCATION: RETAINING WALLS No. 8. and 12.

BOREHOLE NO.: 39 ; 39 ; 39 ; 79

SAMPLE NO.: 1B 2A 5 1B

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % =

PLASTIC LIMIT % =

PLASTICITY INDEX % =

MOISTURE CONTENT % =

ACTIVITY % =

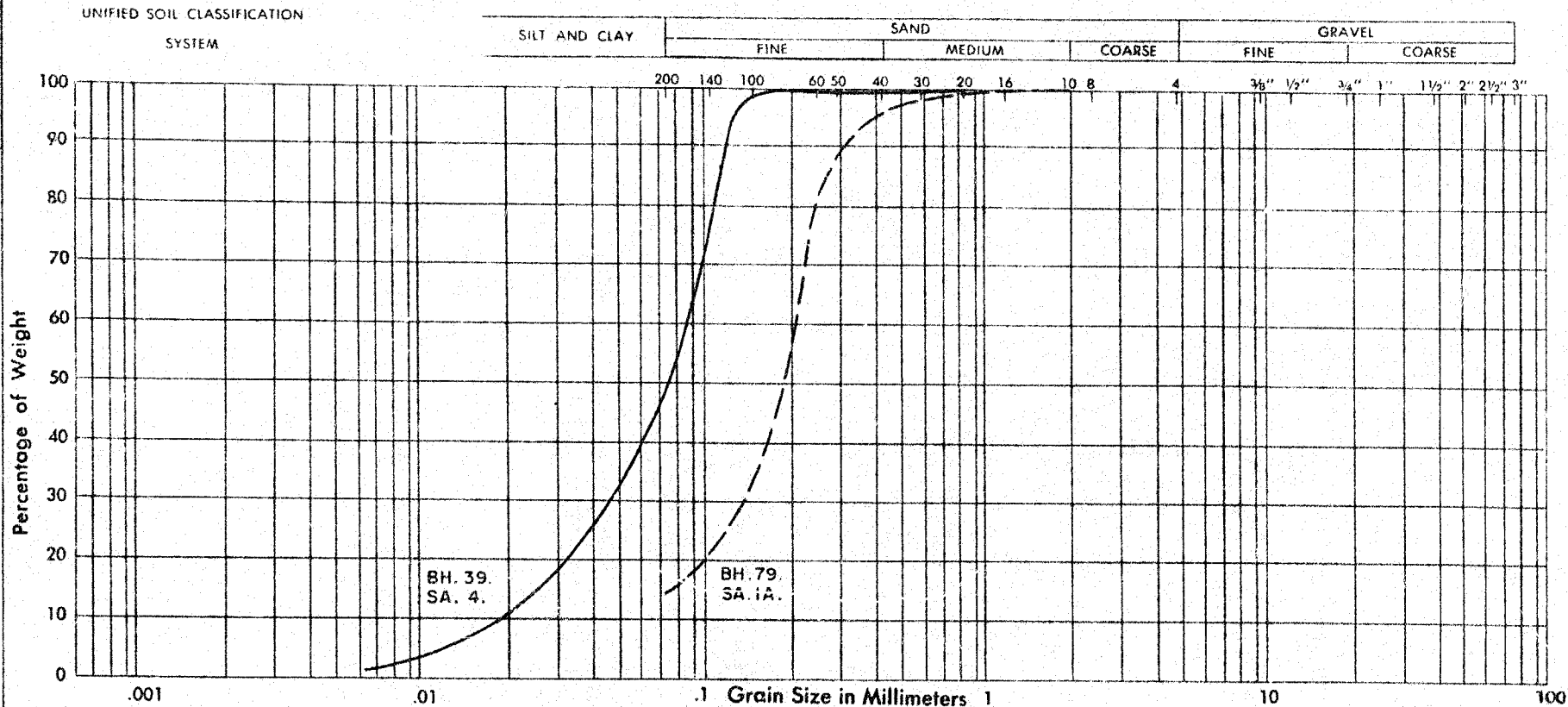
Classification of Sample and Group Symbol:
SILTY SAND
with a trace of CLAY and GRAVEL

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: RETAINING WALLS No. 8. and 12.
BOREHOLE NO.: 39 ; 79
SAMPLE NO.: 4 1A.
DEPTH OF SAMPLE:
ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:
FINE SAND and SILT

PLASTIC PROPERTIES:

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

Enclosure No.

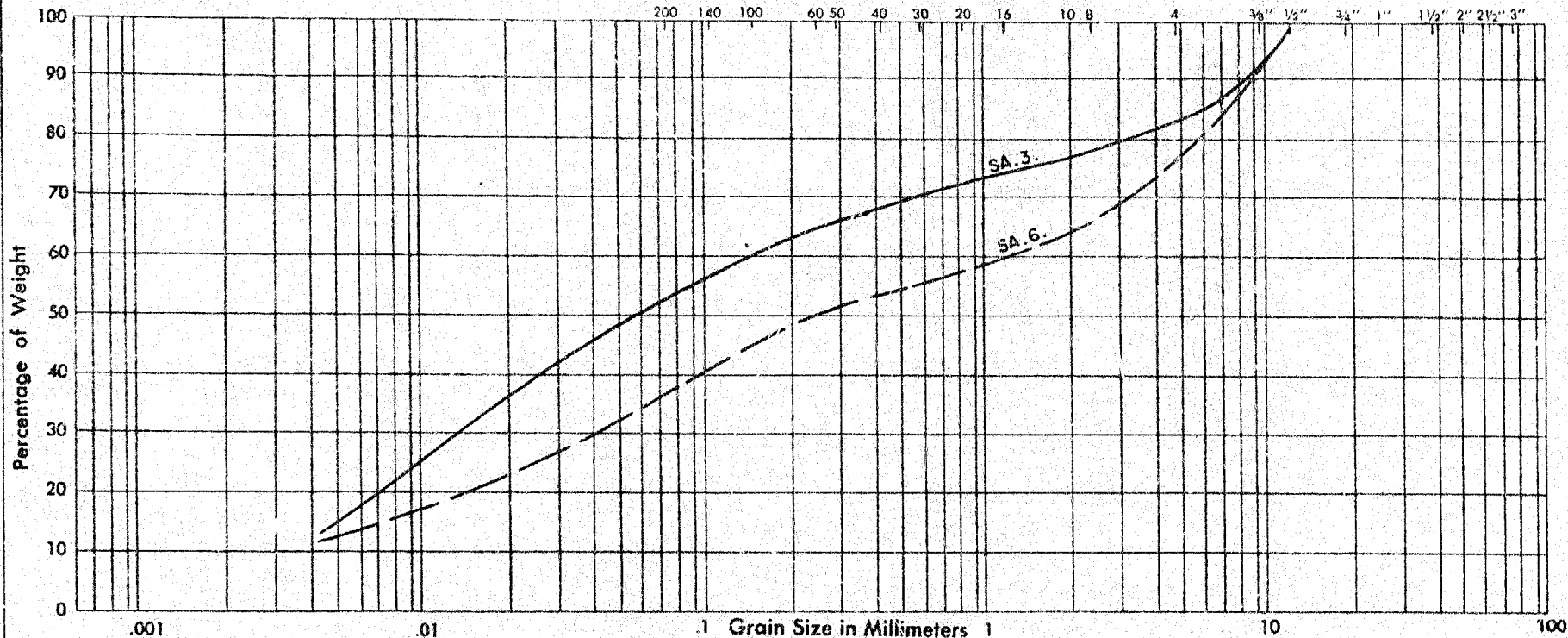
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66-F-48

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. 3.

BOREHOLE NO.: 73 ; 73

SAMPLE NO.: 3 6

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:

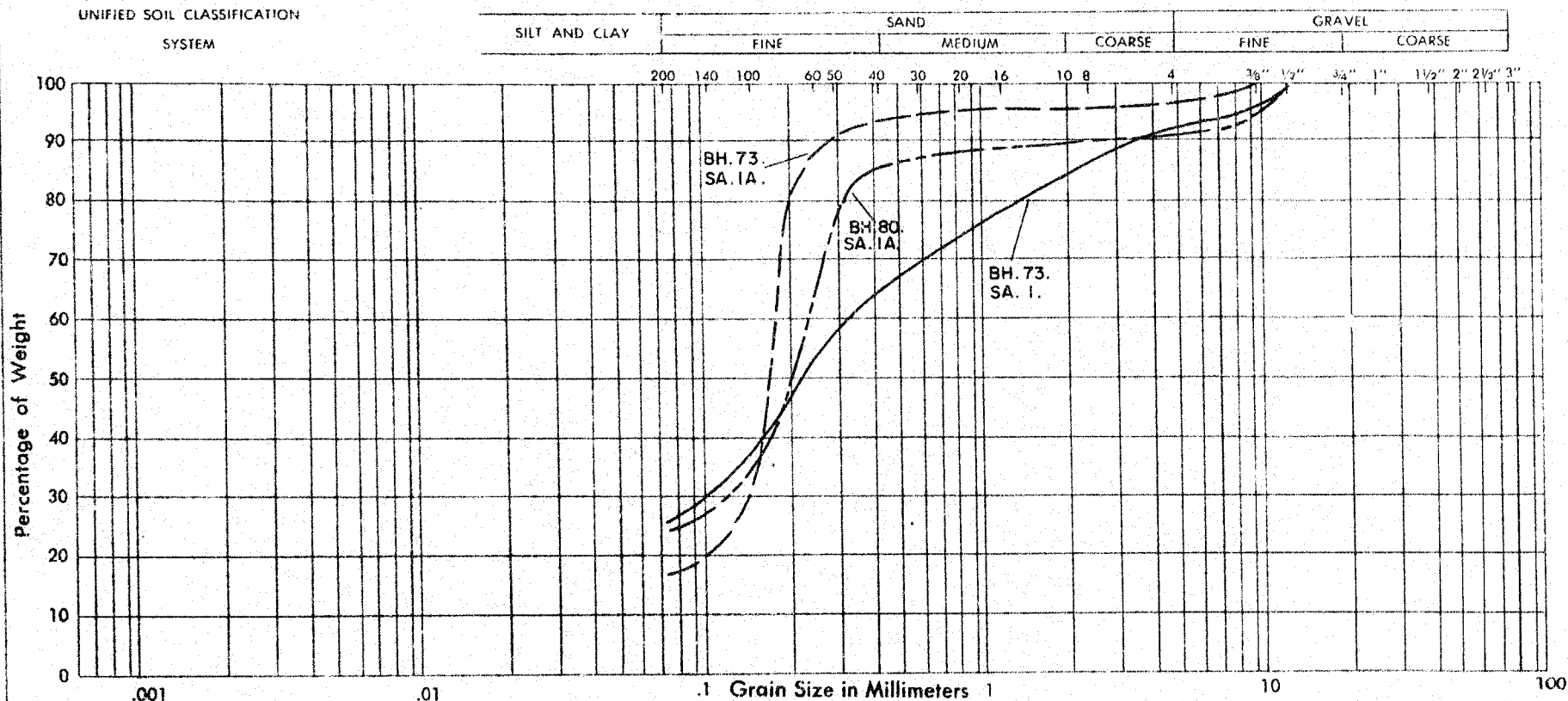
SANDY SILT with some GRAVEL
and a trace of CLAY

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
YOUR REF. W.J. 66-F-48



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

LOCATION: RETAINING WALLS No. 2 & 3.

BOREHOLE NO.: 73 ; 73 ; 80

SAMPLE NO.: 1 1A 1A

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

Enclosure No.

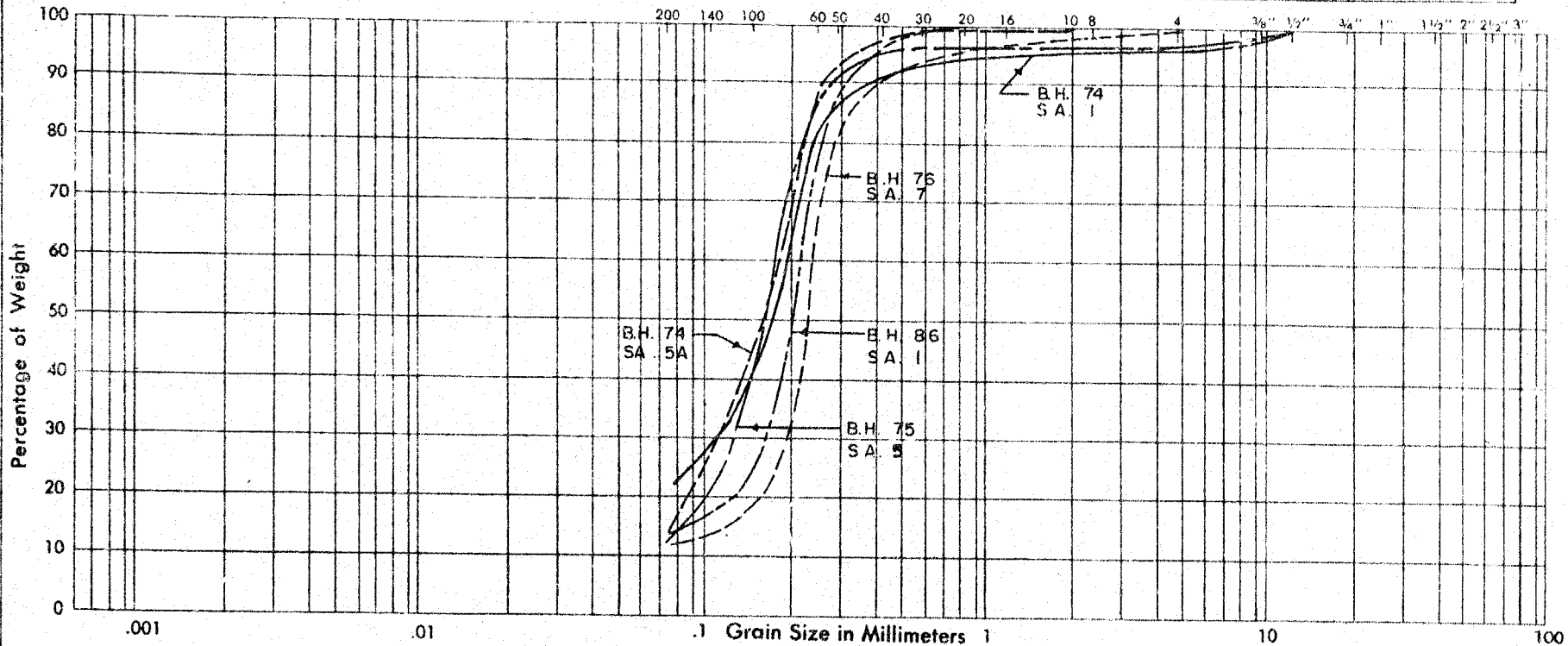
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND				GRAVEL	
	FINE	MEDIUM	COARSE		FINE	COARSE



PROJECT: Q.E.W. 8 HWY. NO 27 INTERCHANGE
LOCATION: RETAINING WALLS NO 28 & 34
BOREHOLE NO.: 74, 74, 75, 76, 86
SAMPLE NO.: 1, 5A, 7, 7, 1
DEPTH OF SAMPLE:
ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

FINE SAND with some silt.

PLASTIC PROPERTIES:

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

Enclosure No.

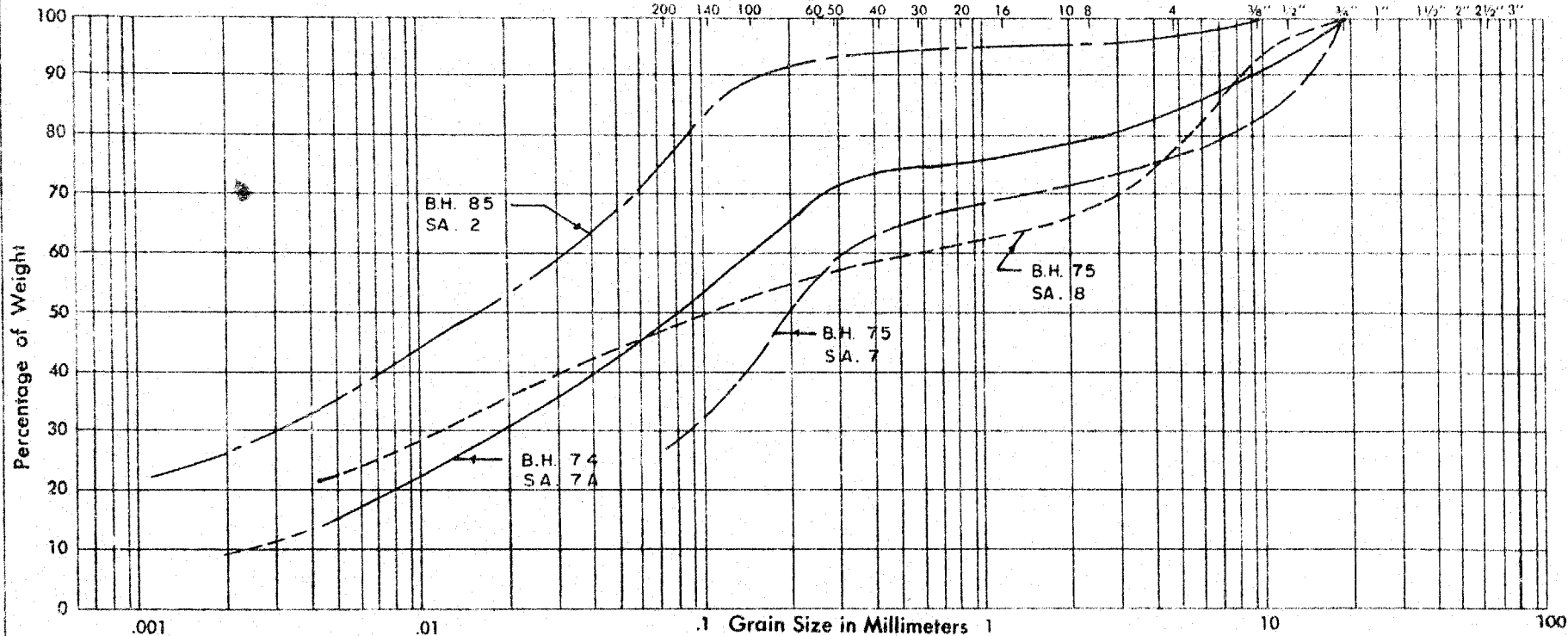
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

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
LOCATION: RETAINING WALLS No 28 & 34 COEFFICIENT OF CURVATURE
BOREHOLE NO.: 74 75 75 85
SAMPLE NO.: 7A 7 8 2
DEPTH OF SAMPLE:
ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:

SILT & SAND with some clay and gravel.

PLASTIC PROPERTIES:

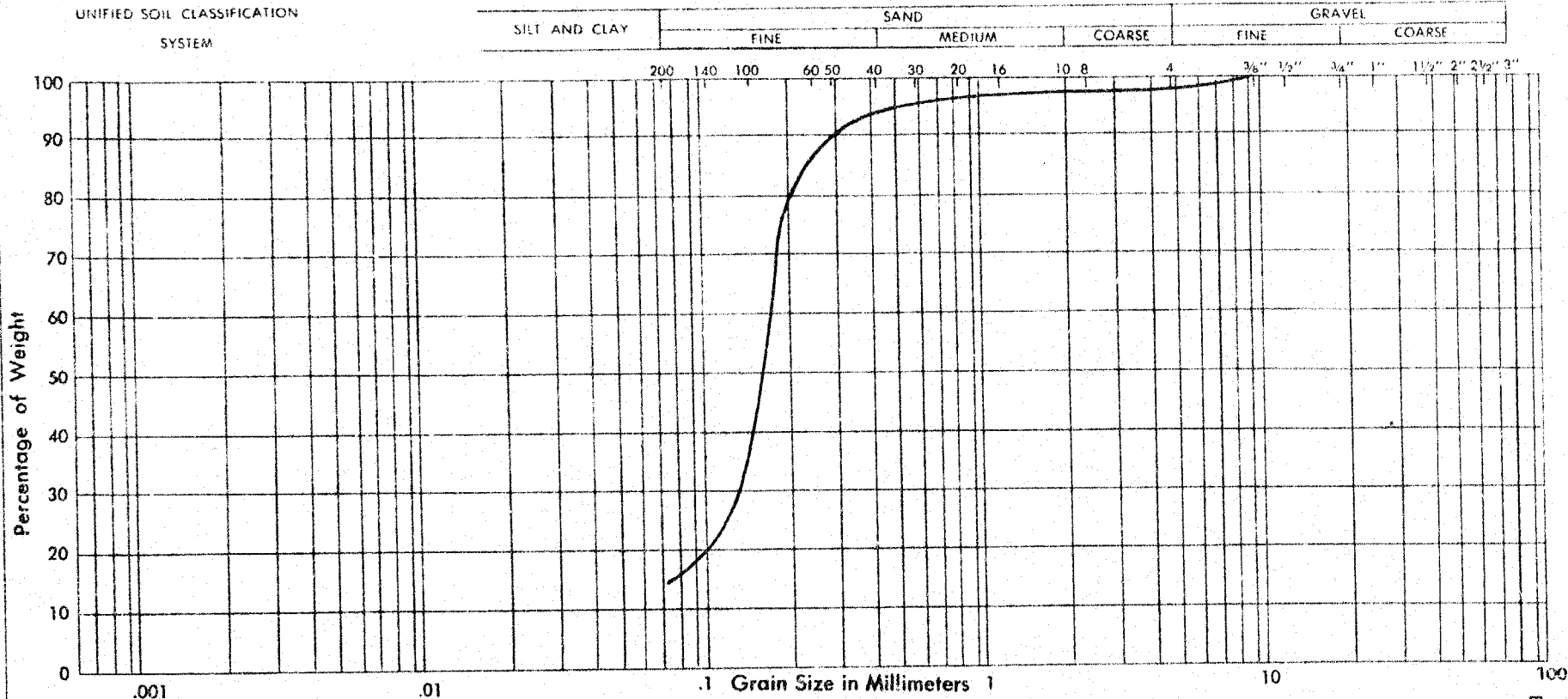
LIQUID LIMIT % =
PLASTIC LIMIT % =
PLASTICITY INDEX % =
MOISTURE CONTENT % =
ACTIVITY =

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
YOUR REF. W. J. 66 - F-48



PROJECT: Q.E.W. & HWY. No. 27. INTERCHANGE
LOCATION: RETAINING WALL No. 27.
BOREHOLE NO.: 78.
SAMPLE NO.: 1-A.
DEPTH OF SAMPLE:
ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY
COEFFICIENT OF CURVATURE

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

PLASTIC PROPERTIES:

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

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

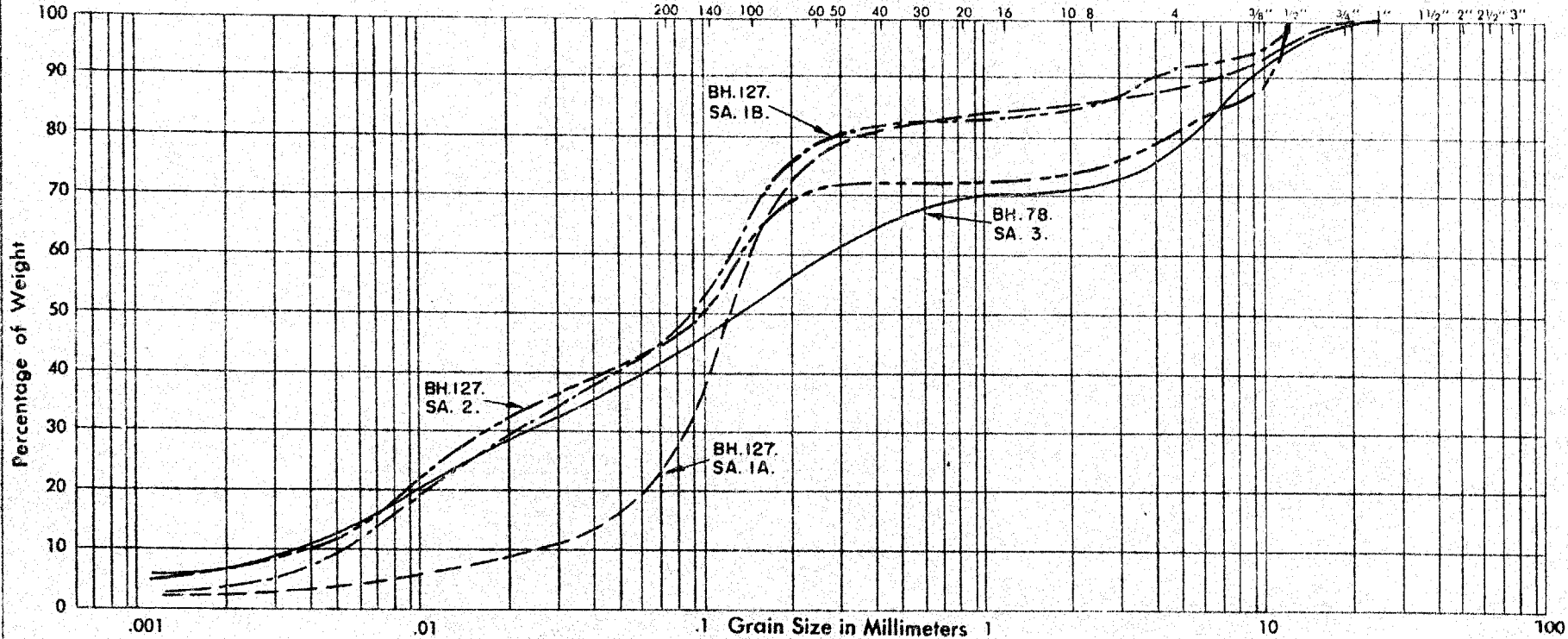
GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO 6-6-28

YOUR REF. W.J. 66-F-48

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. 27.

BOREHOLE NO.: 78 ; 127 ; 127 ; 127

SAMPLE NO.: 3 1A 1B 2

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

PLASTIC PROPERTIES:

LIQUID LIMITED % ==

PLASTIC LIMIT % ==

PLASTICITY INDEX % ==

MOISTURE CONTENT % ==

ACTIVITY ==

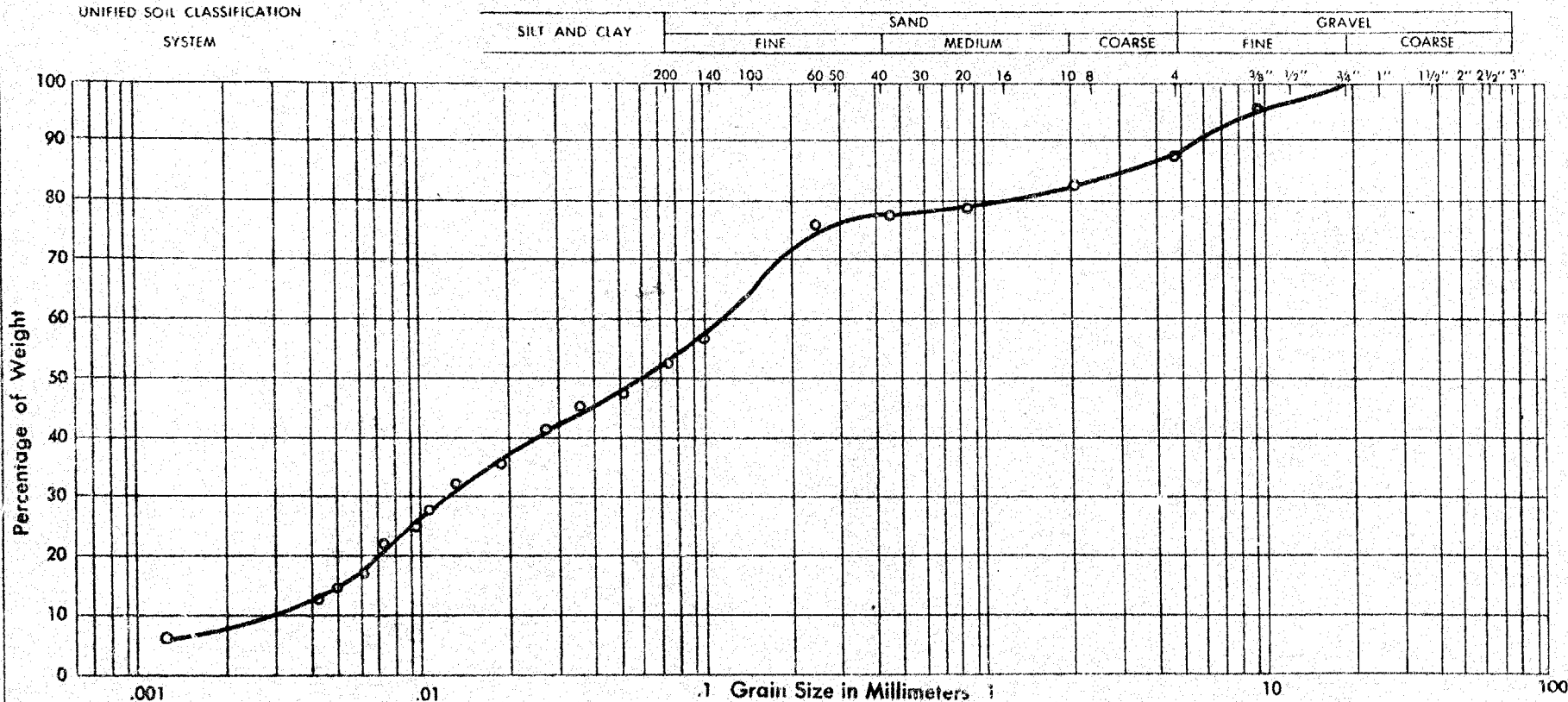
Classification of Sample and Group Symbol:
SAND and SILT
with some GRAVEL and a trace of CLAY
(GLACIAL TILL)

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J.66-F-48



PROJECT: Q.E.W. & HWY. No 27 INTERCHANGE
LOCATION: RETAINING WALL No 17
BOREHOLE NO.: 81
SAMPLE NO.: 1
DEPTH OF SAMPLE: 5'-6.5'
ELEVATION OF SAMPLE: 353' ±

COEFFICIENT OF UNIFORMITY
COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

SANDY SILT with some gravel and a trace of clay

PLASTIC PROPERTIES:

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

Enclosure No.

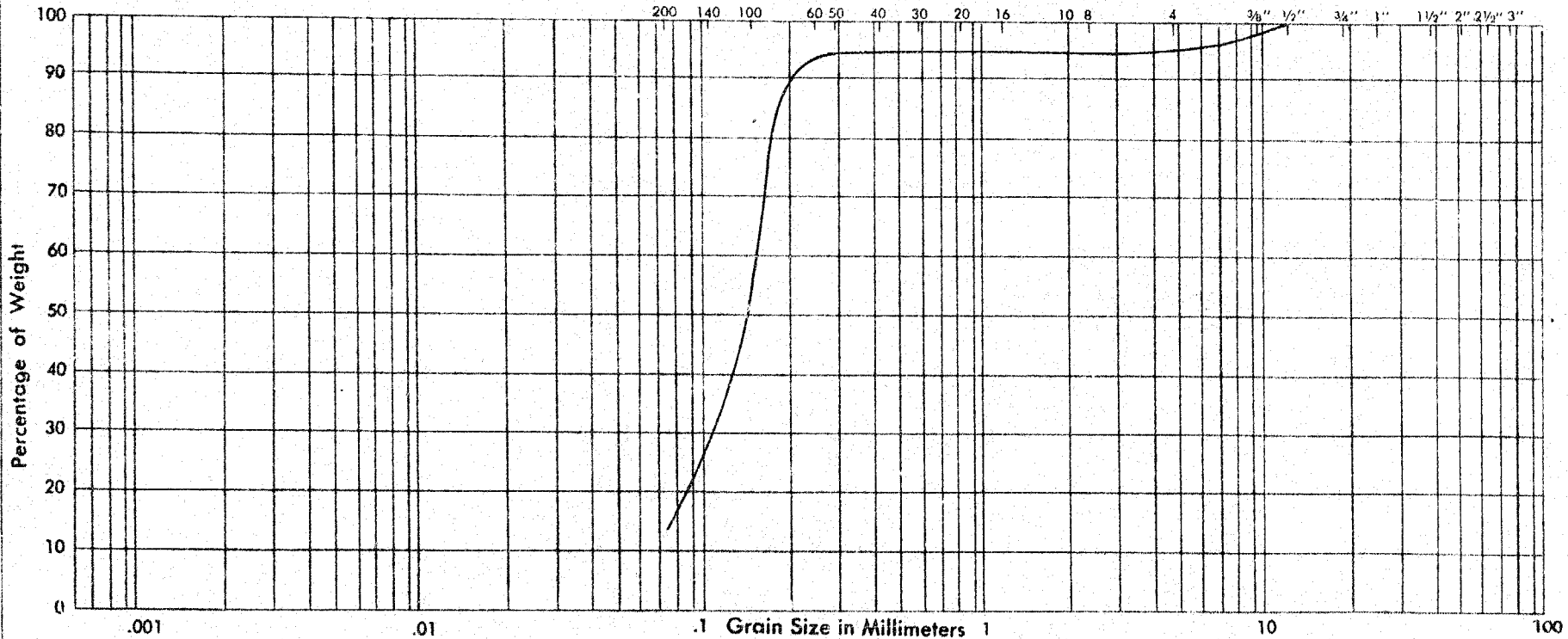
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

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 31
BOREHOLE NO.: 84
SAMPLE NO.: 1
DEPTH OF SAMPLE: 5'
ELEVATION OF SAMPLE: 363'

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.

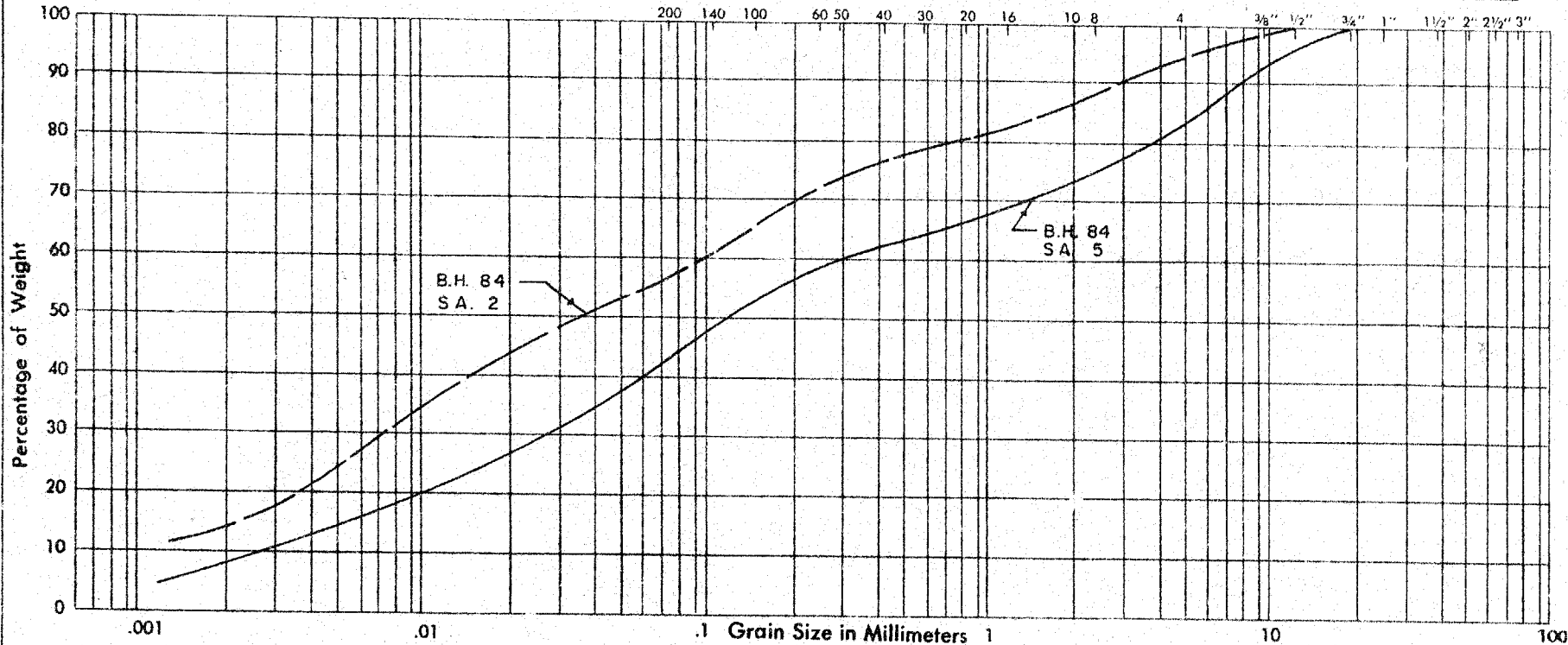
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. No. W.J. 66-F-48

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 31

BOREHOLE NO.: 84 ; 84

SAMPLE NO.: 2 ; 5

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

COEFFICIENT OF UNIFORMITY

COEFFICIENT OF CURVATURE

Classification of Sample and Group Symbol:

SILT and SAND with some clay and gravel

PLASTIC PROPERTIES:

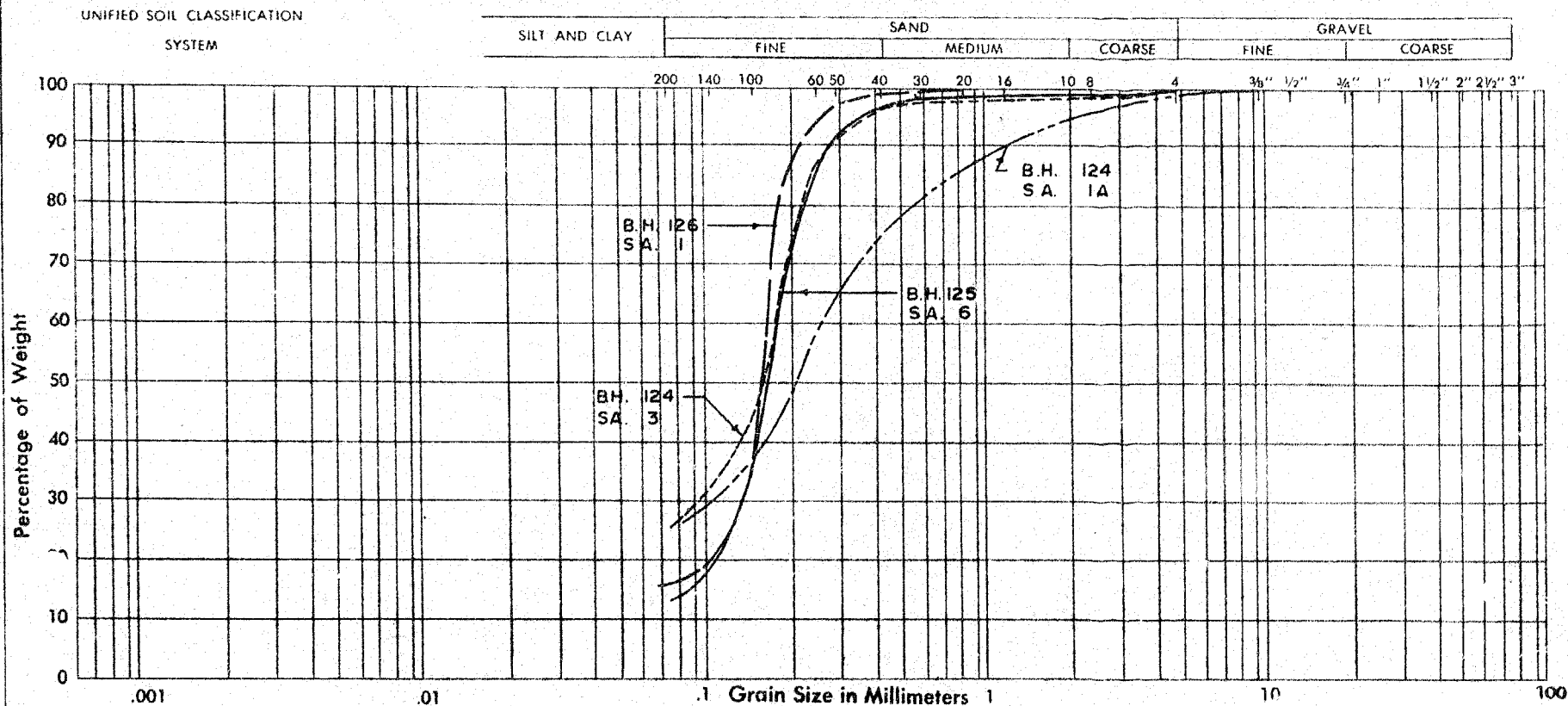
LIQUID LIMITED % ==
PLASTIC LIMIT % ==
PLASTICITY INDEX % ==
MOISTURE CONTENT % ==
ACTIVITY ==

Enclosure No.

DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6-6-28
Your Ref. W.J. 66-F-48



PROJECT: Q.E.W. & HWY. N° 27 INTERCHANGE

LOCATION: RETAINING WALLS N° 36 & 37

BOREHOLE NO.: 124 124 125 126

SAMPLE NO.: 1A 3 6 1

DEPTH OF SAMPLE:

ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:

FINE SAND
with some SILT

PLASTIC PROPERTIES:

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

Enclosure No.

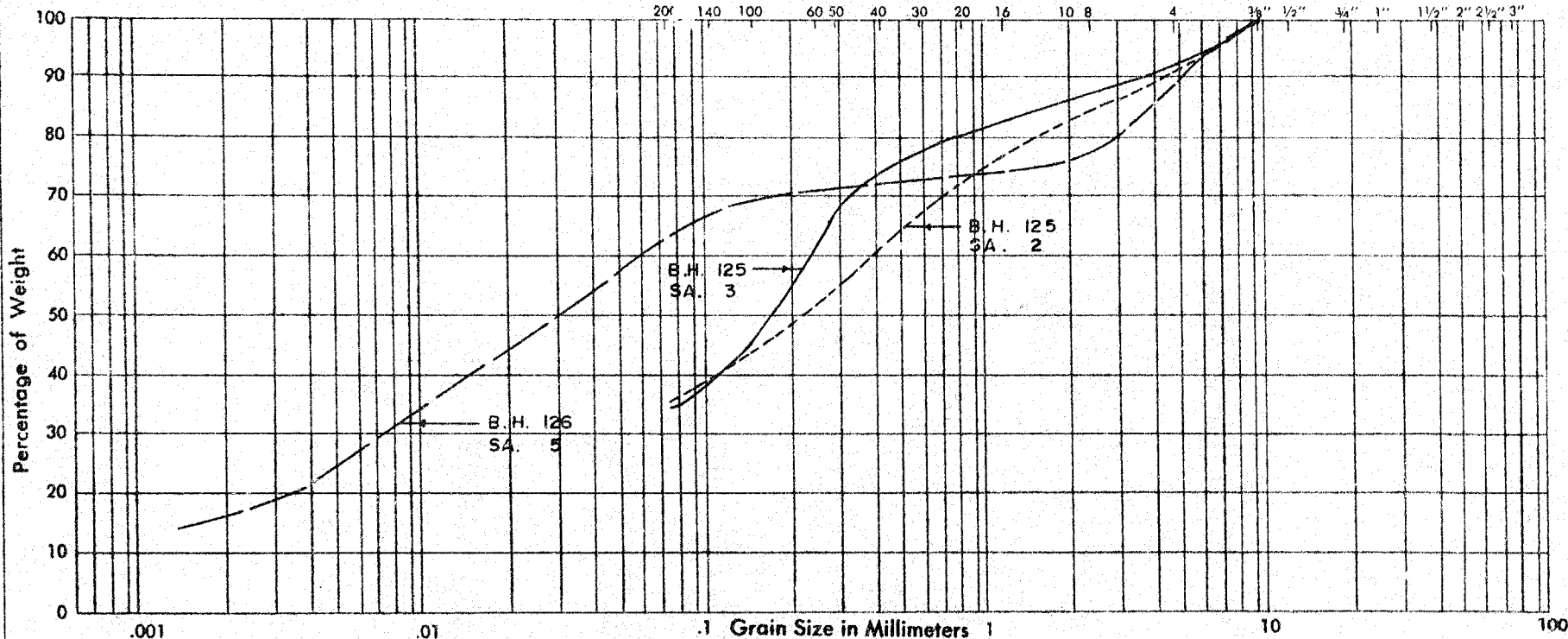
DOMINION SOIL INVESTIGATION LIMITED

GRAIN SIZE DISTRIBUTION

OUR REFERENCE NO. 6 - 6 - 28
Your Ref. W.J. 66 - F-48

UNIFIED SOIL CLASSIFICATION
SYSTEM

SILT AND CLAY	SAND			GRAVEL	
	FINE	MEDIUM	COARSE	FINE	COARSE



PROJECT: Q.E.W. & HWY. N° 27 INTERCHANGE COEFFICIENT OF UNIFORMITY
LOCATION: RETAINING WALLS N° 36 & 37 COEFFICIENT OF CURVATURE
BOREHOLE NO.: 125, 125, 126
SAMPLE NO.: 2, 3, 5
DEPTH OF SAMPLE:
ELEVATION OF SAMPLE:

Classification of Sample and Group Symbol:
SANDY SILT
with a trace of GRAVEL and CLAY

PLASTIC PROPERTIES:

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

Enclosure No.

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_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	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

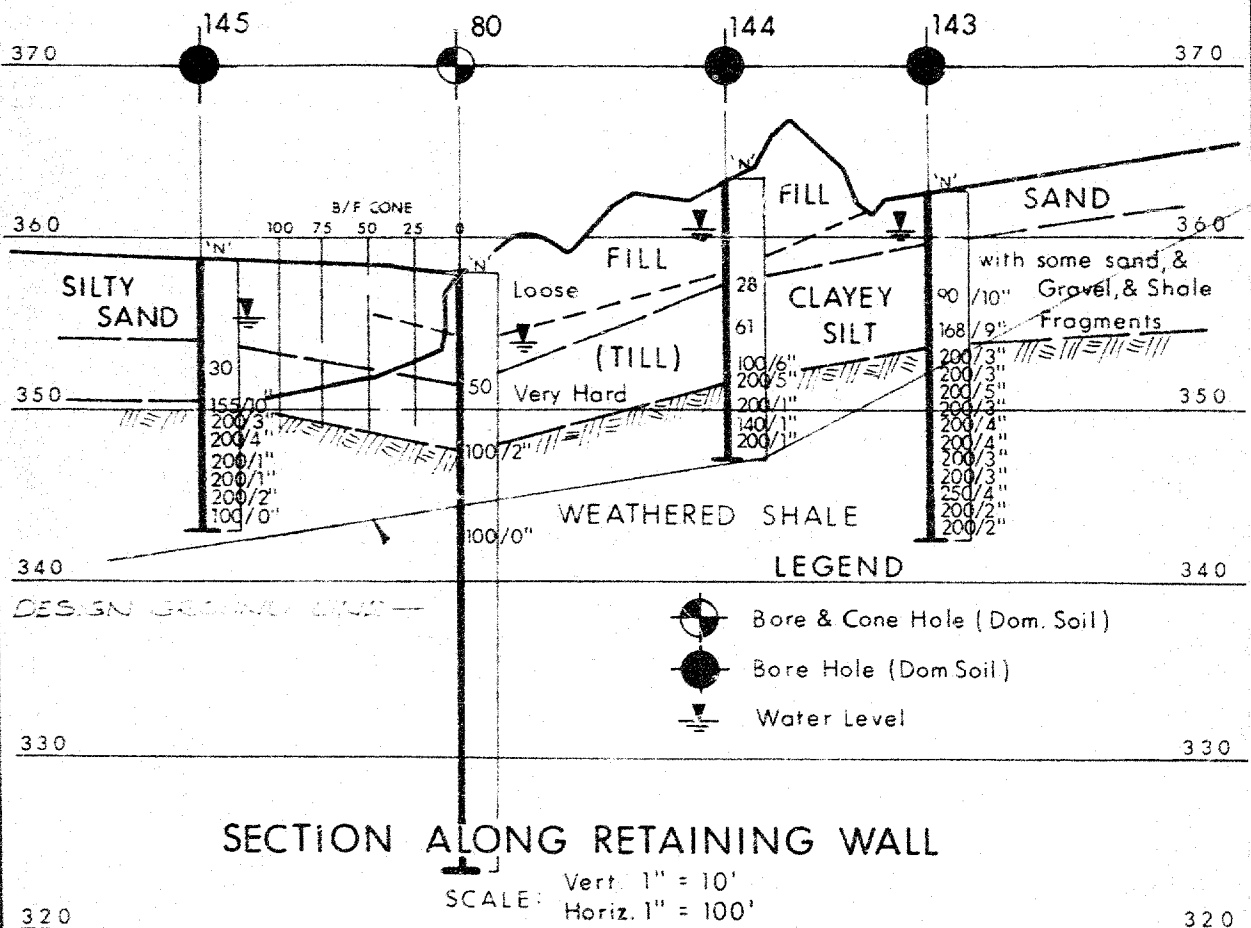
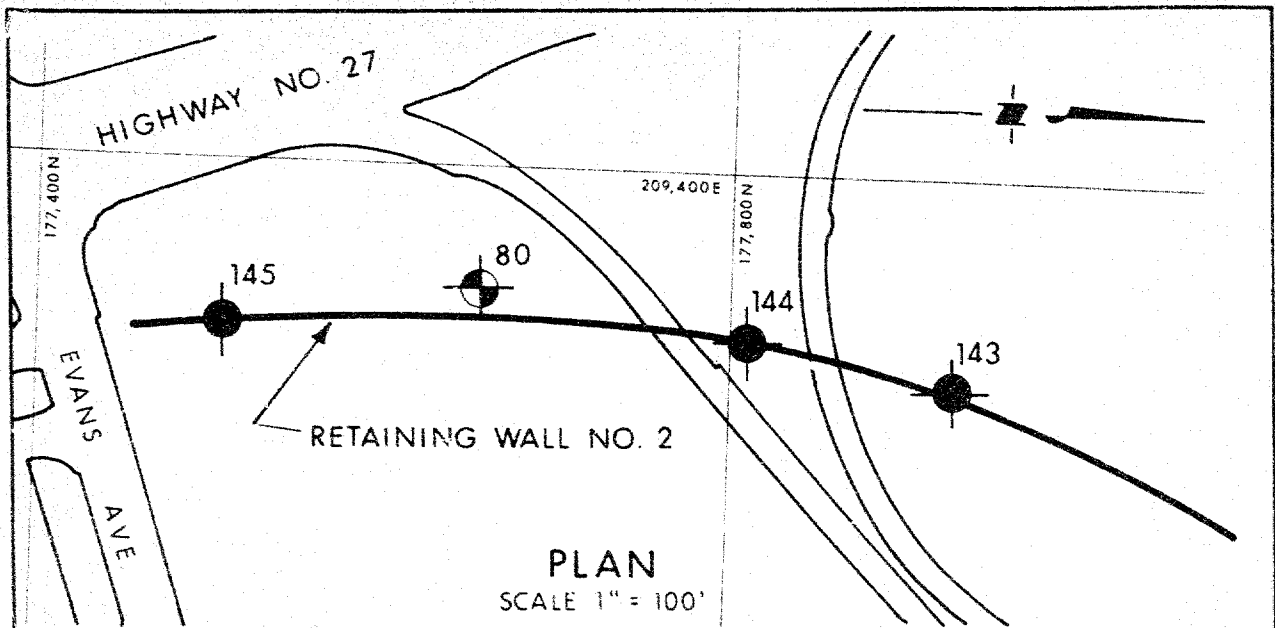
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

ONTARIO

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

RETAINING WALL NO. 2

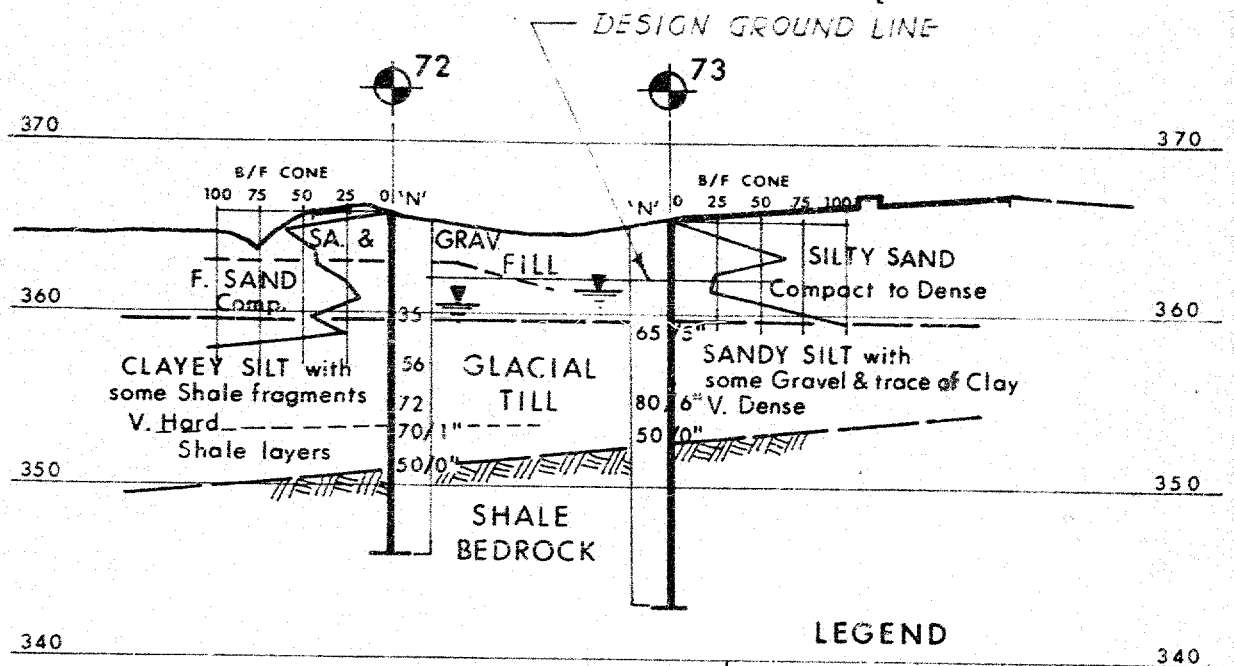
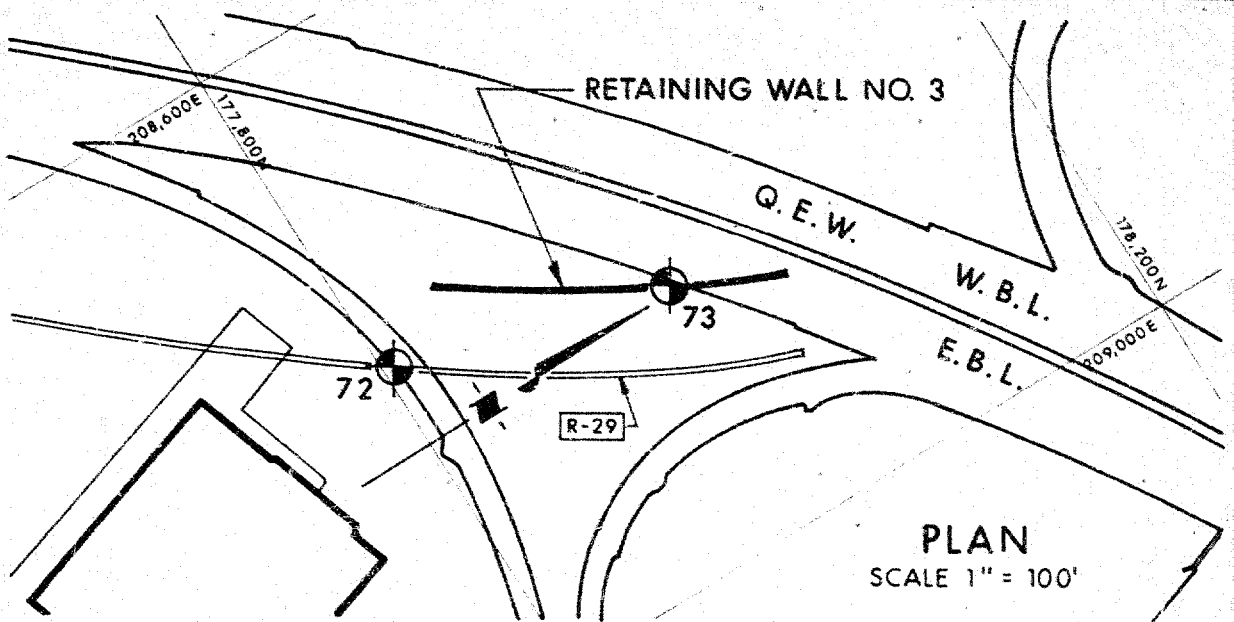
W P 275-64-1

JOB 66-F-48

DATE 12 OCT. 1966 (REV)

APPROVED

DRAWING NO. 66-F-48 A



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. 3

W.P. 275-64-1

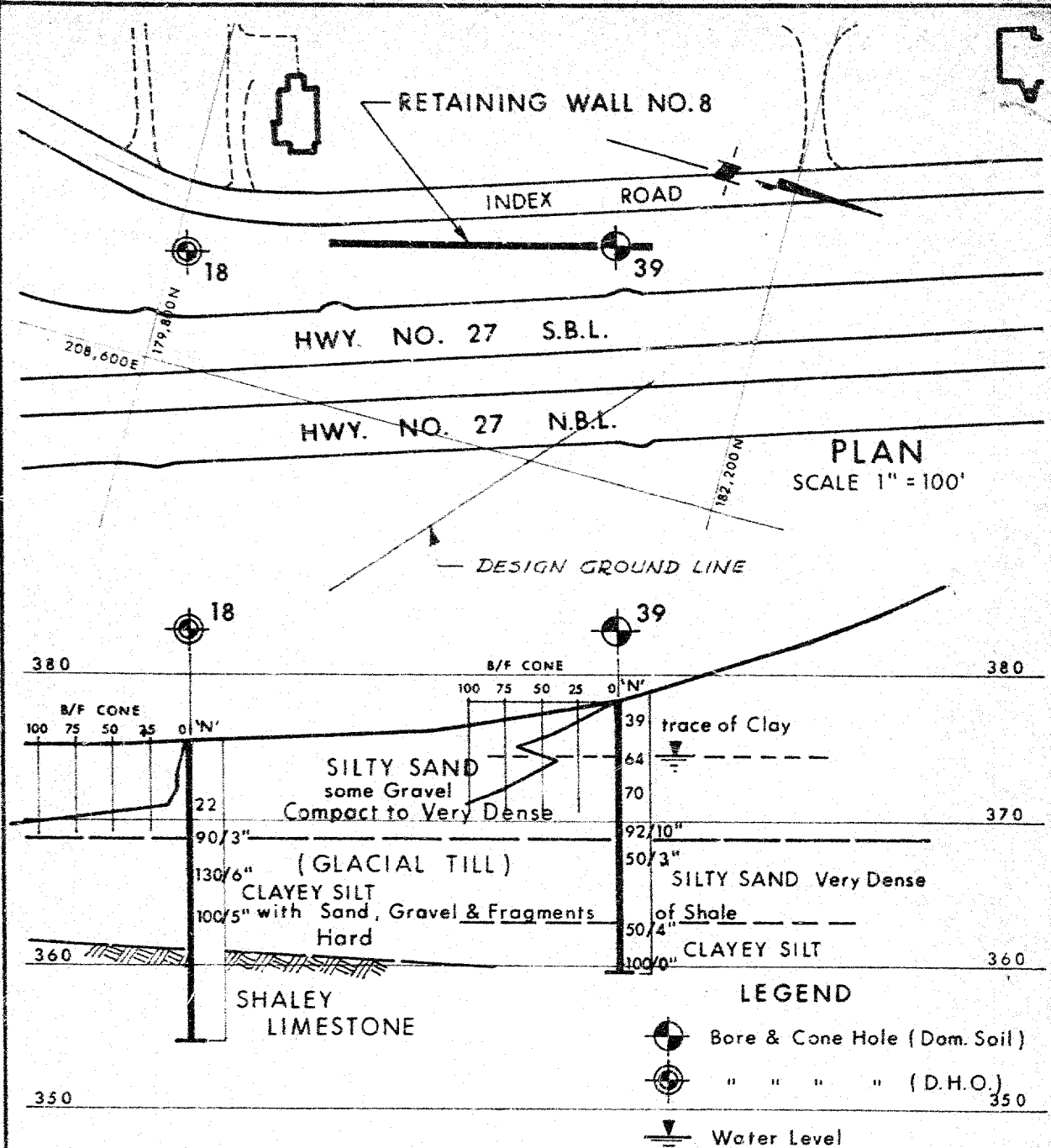
JOB 66-F-48

DATE 5 AUG. 1966

APPROVED

Altmann

DRAWING NO. 66-F-48 B



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. 8

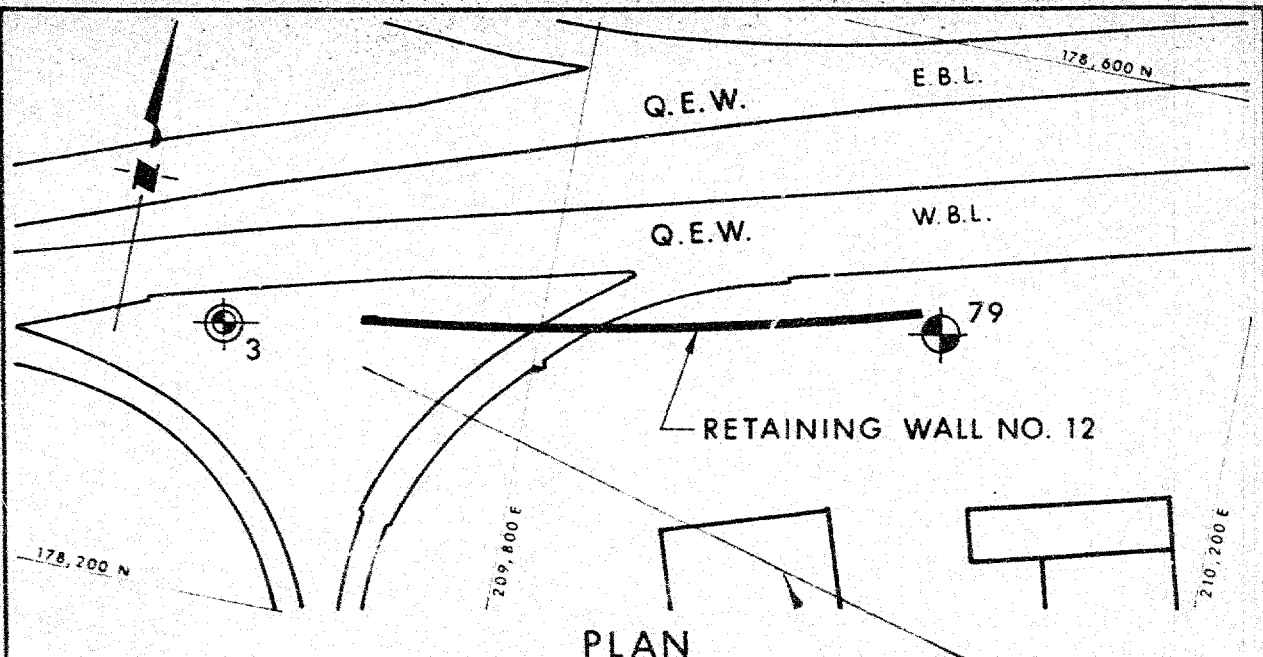
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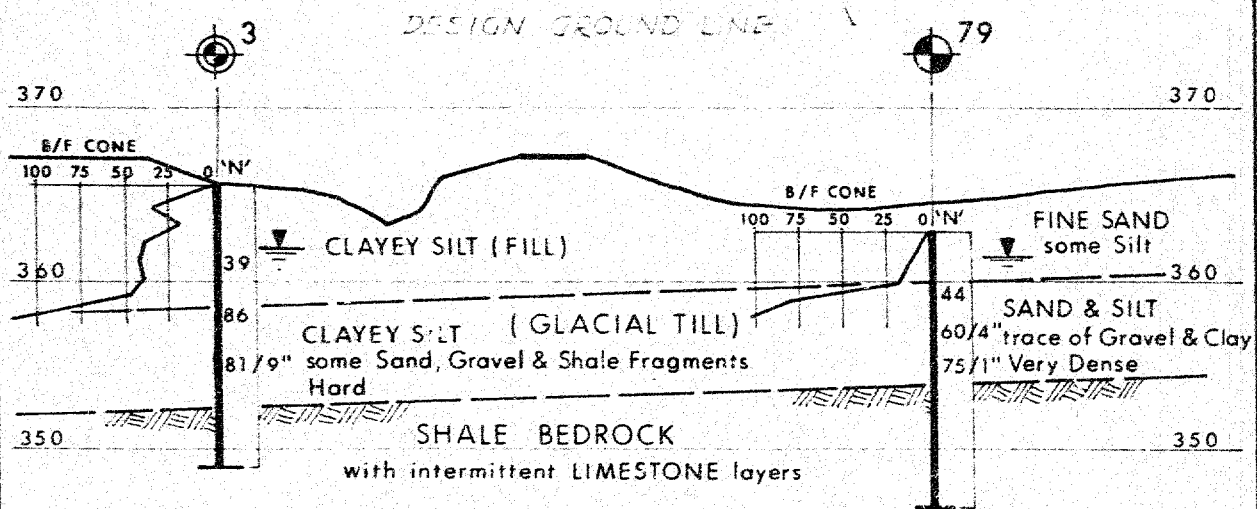
DATE 10 AUG. 1966

APPROVED *Alf Thomas*




DRAWING NO. 66-F-48D



PLAN
SCALE 1" = 100'



LEGEND

-  Bore & Cone Hole (Dominion Soil)
-  " " " " (D.H.O.)
-  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. 12

W.P. 275-64-1

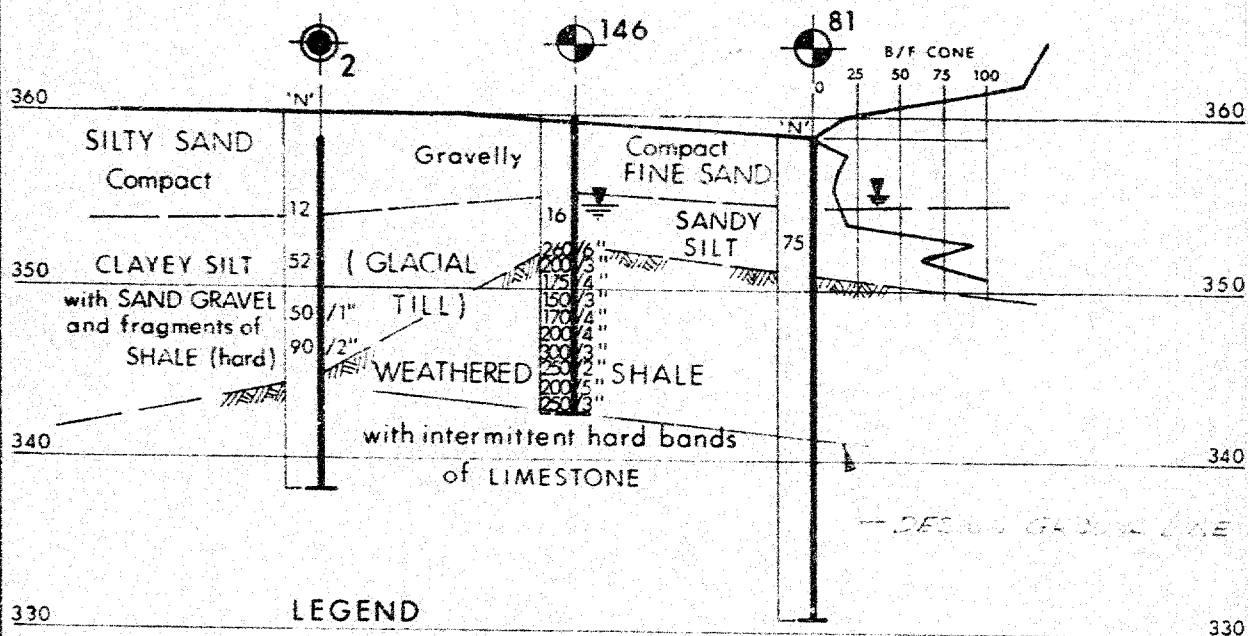
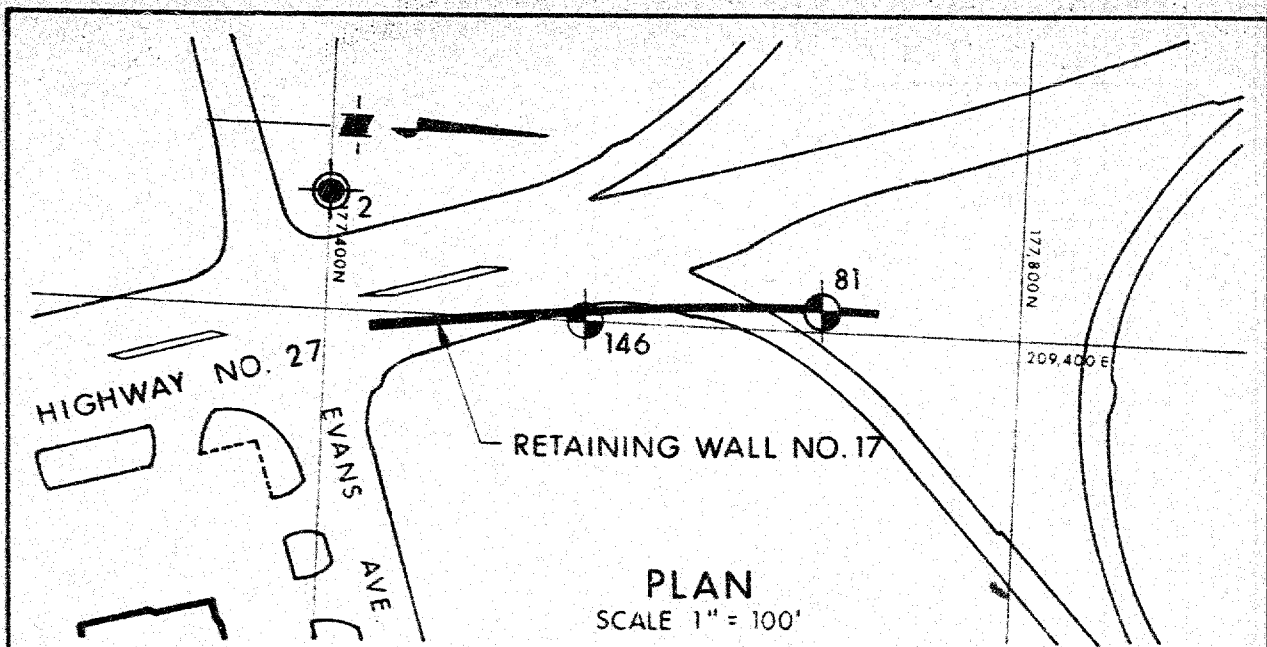
JOB 66-F-48

DATE 16 AUG. 1966

APPROVED

[Signature]

DRAWING NO. 66-F-48E



SECTION ALONG RETAINING WALL

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

REVISED 14 OCT. 1966



DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

ONTARIO

HIGHWAY NO 27 & G.E.W. INTERCHANGE

RETAINING WALL NO. 17

W.P. 275-64-1

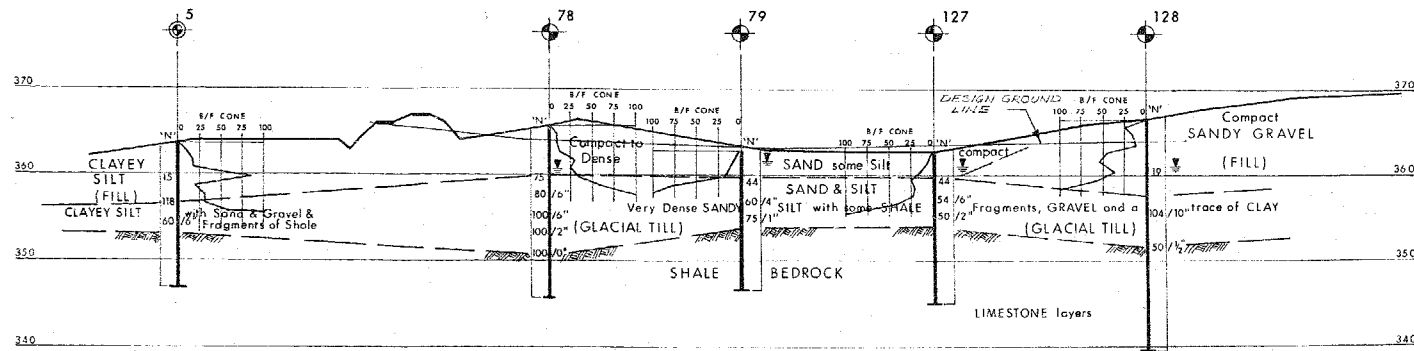
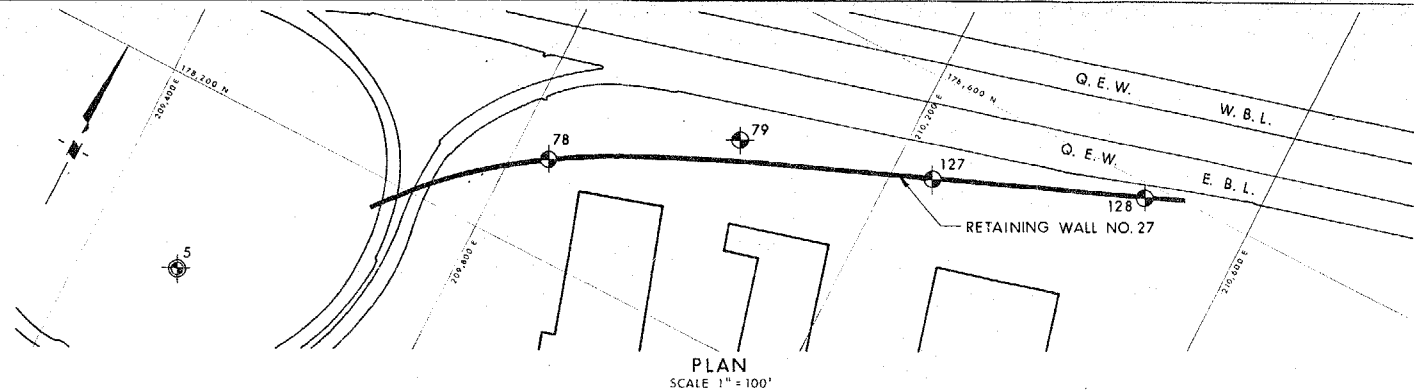
JOB 66-F-48

DATE 23 AUGUST 1966

APPROVED

Alf Stenmark

DRAWING NO. 66-F-48F



- LEGEND
- ⊙ Bore & Cone Hole (D.H.O.)
 - ⊙ 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

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

RETAINING WALL NO. 27

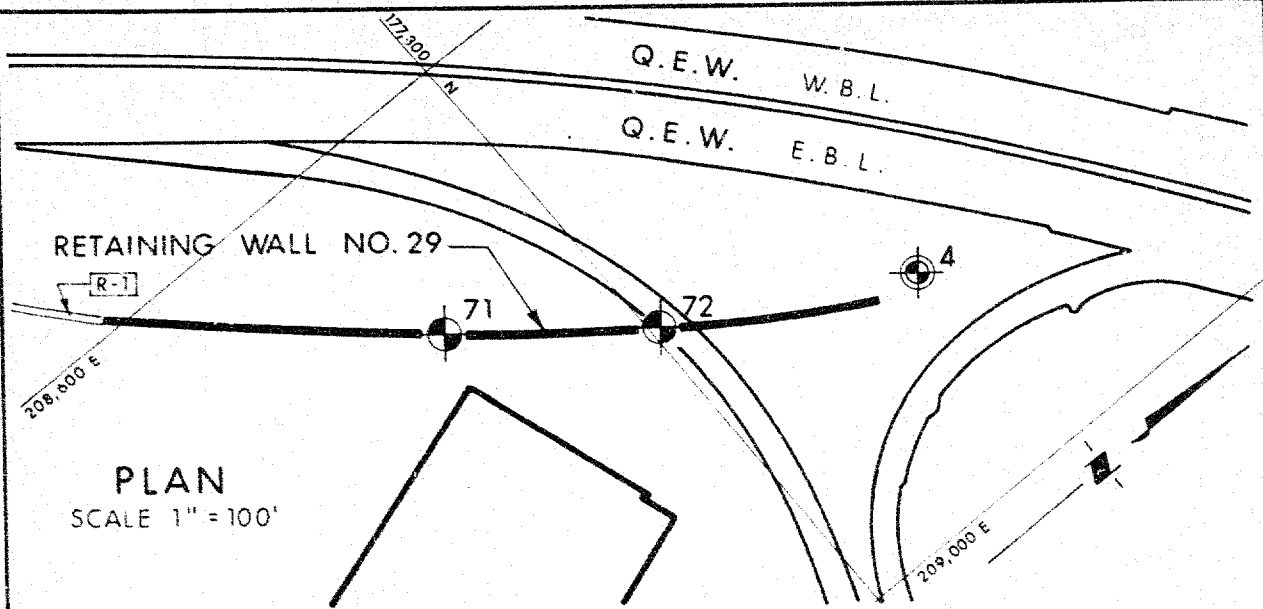
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JOB 66-F-48

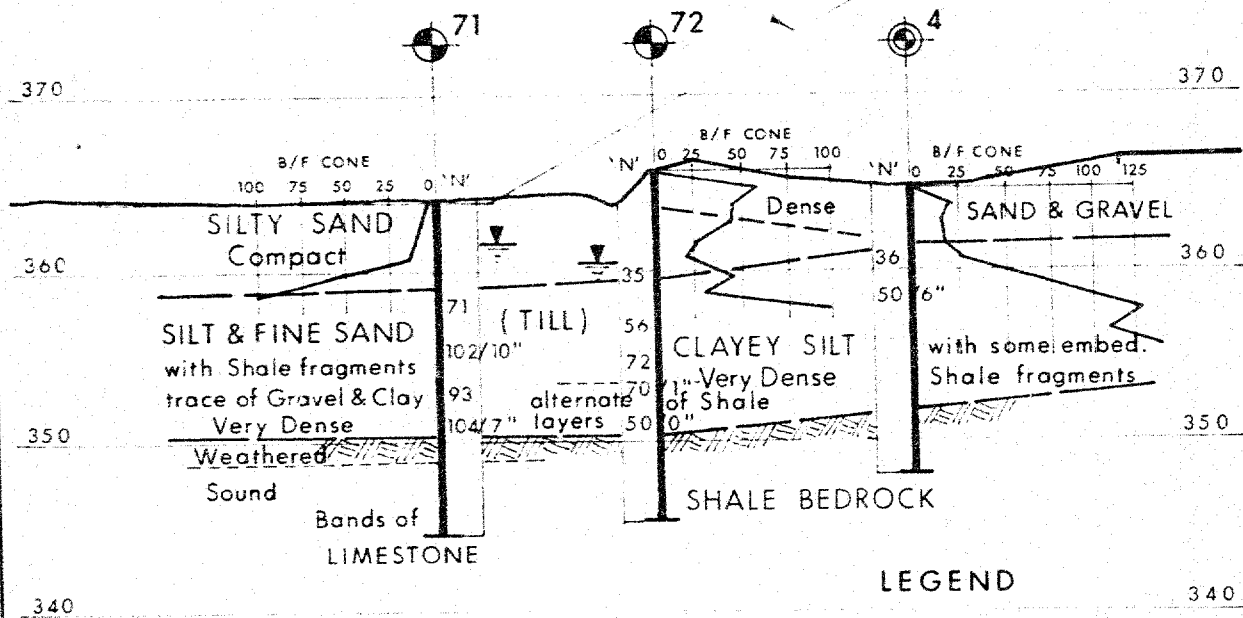
DATE 7 SEPT. 1966

APPROVED *alsterwald*

DRAWING NO. 66-F-48 G



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.29

W.P. 275-64-1

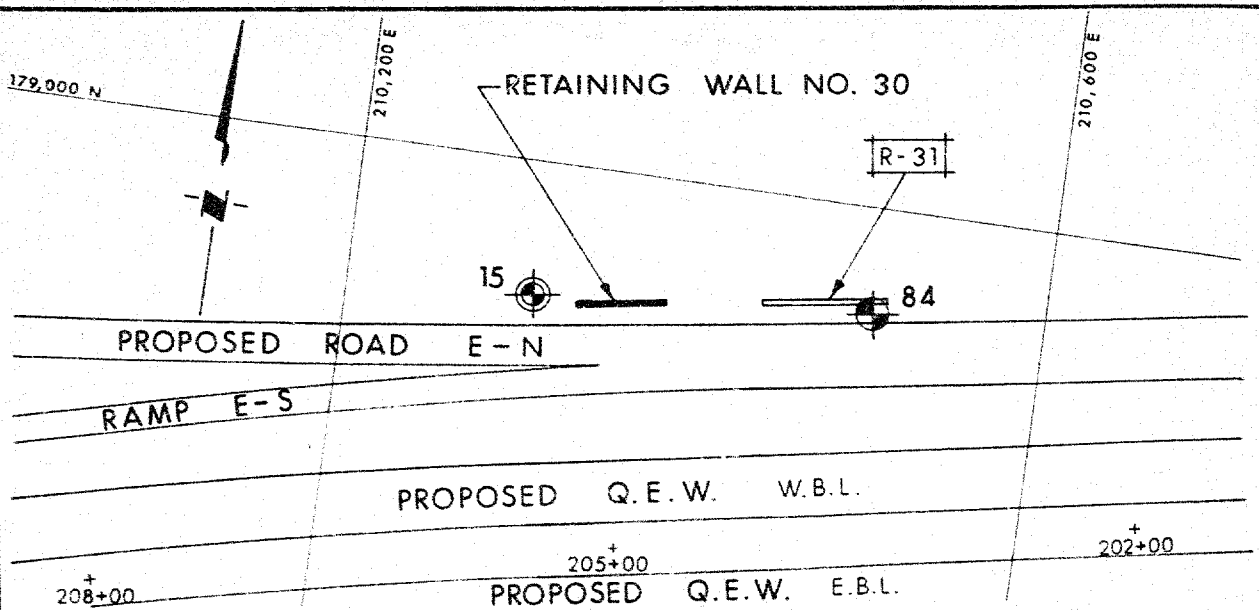
JOB 66-F-48

DATE 6 SEPT. 1966

APPROVED *[Signature]*

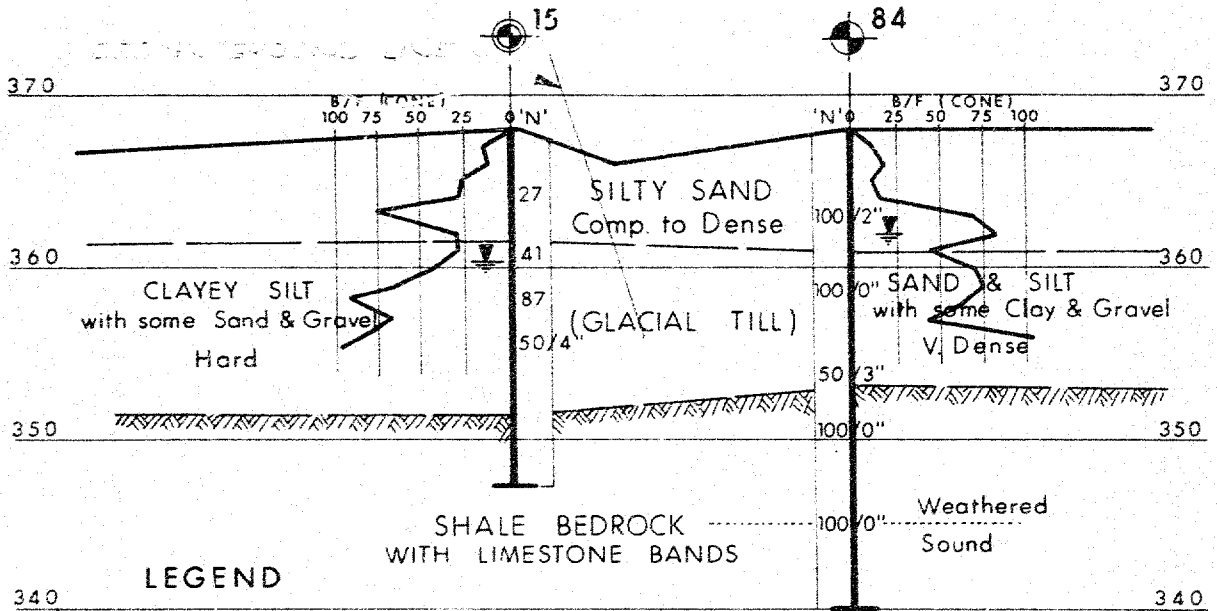
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Hand's copy



PLAN

SCALE 1" = 100'



LEGEND

- Bore & Cone Hole (Dom. Soil)
- " " " " (D.H.O.)
- Water Level

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. 30

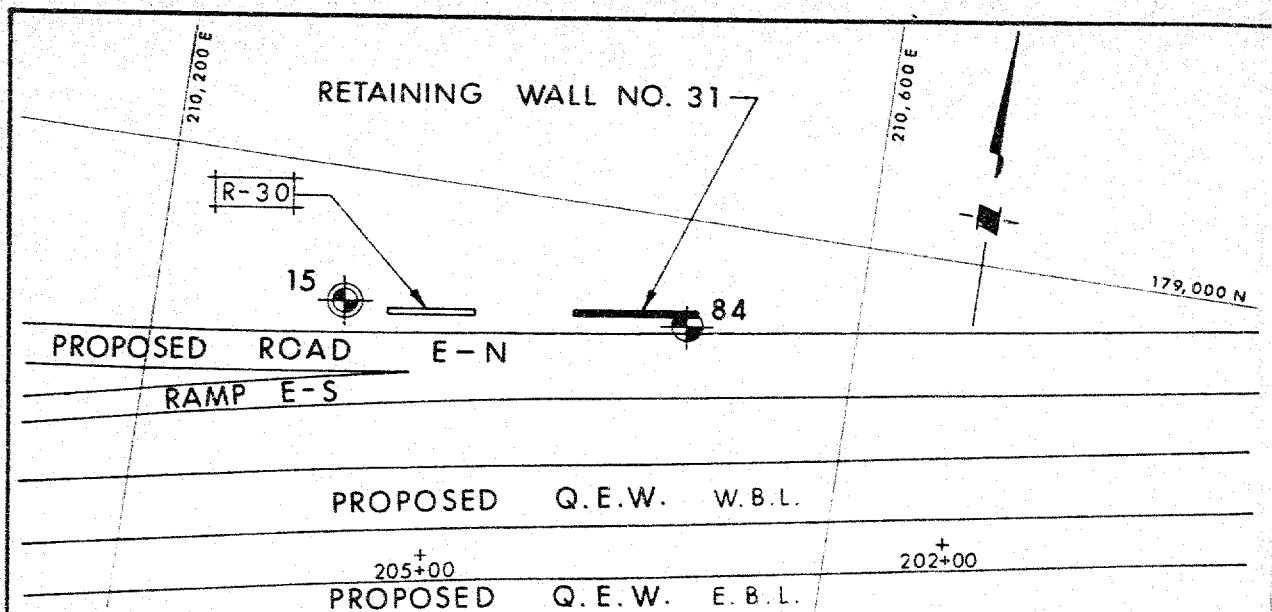
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JOB 66-F-48

DATE 7 SEPT. 1966

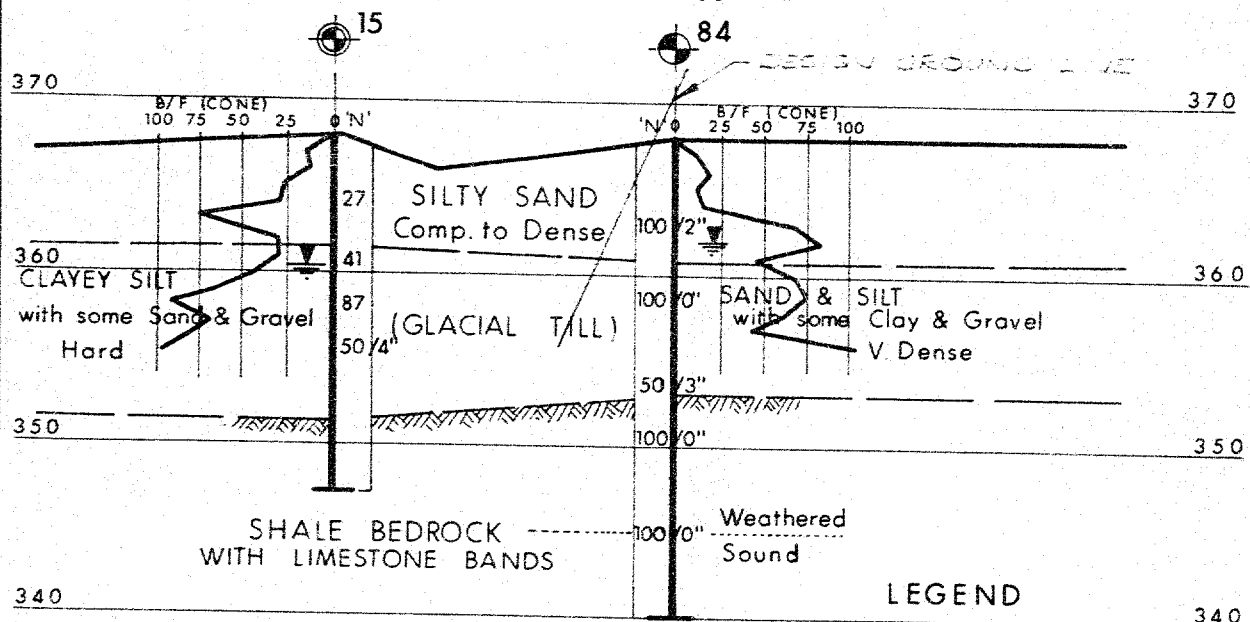
APPROVED *Alfarnes*

DRAWING NO. 66-F-48 J



PLAN

SCALE 1" = 100'



SECTION ALONG RETAINING WALL

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



ONTARIO

DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

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

RETAINING WALL NO.31

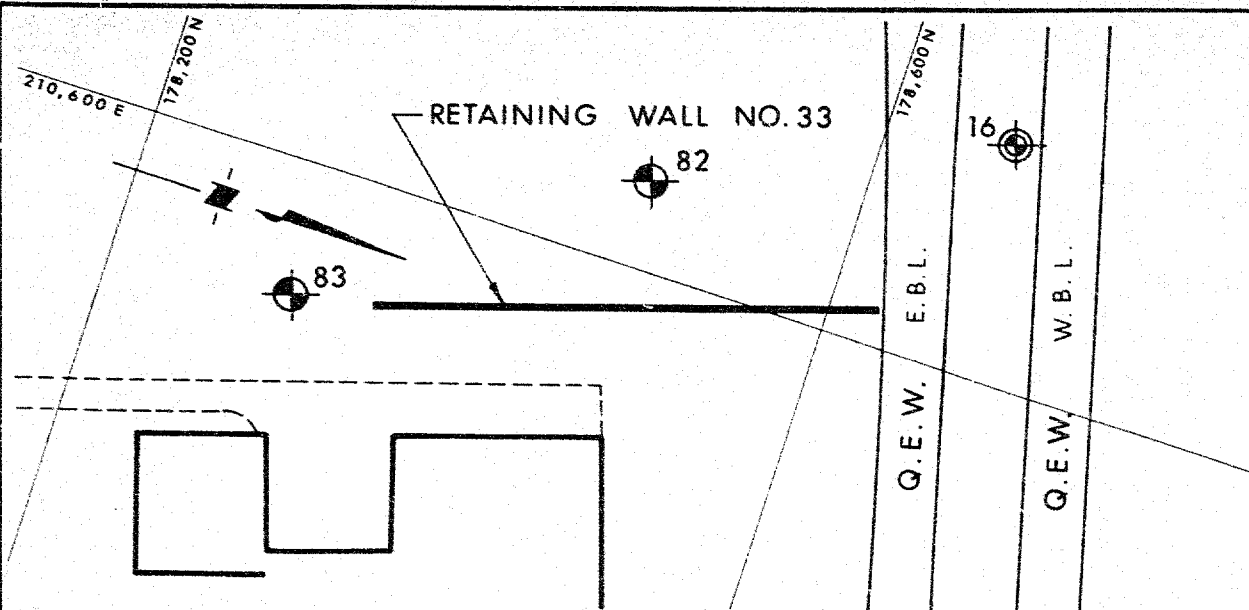
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JOB 66-F-48

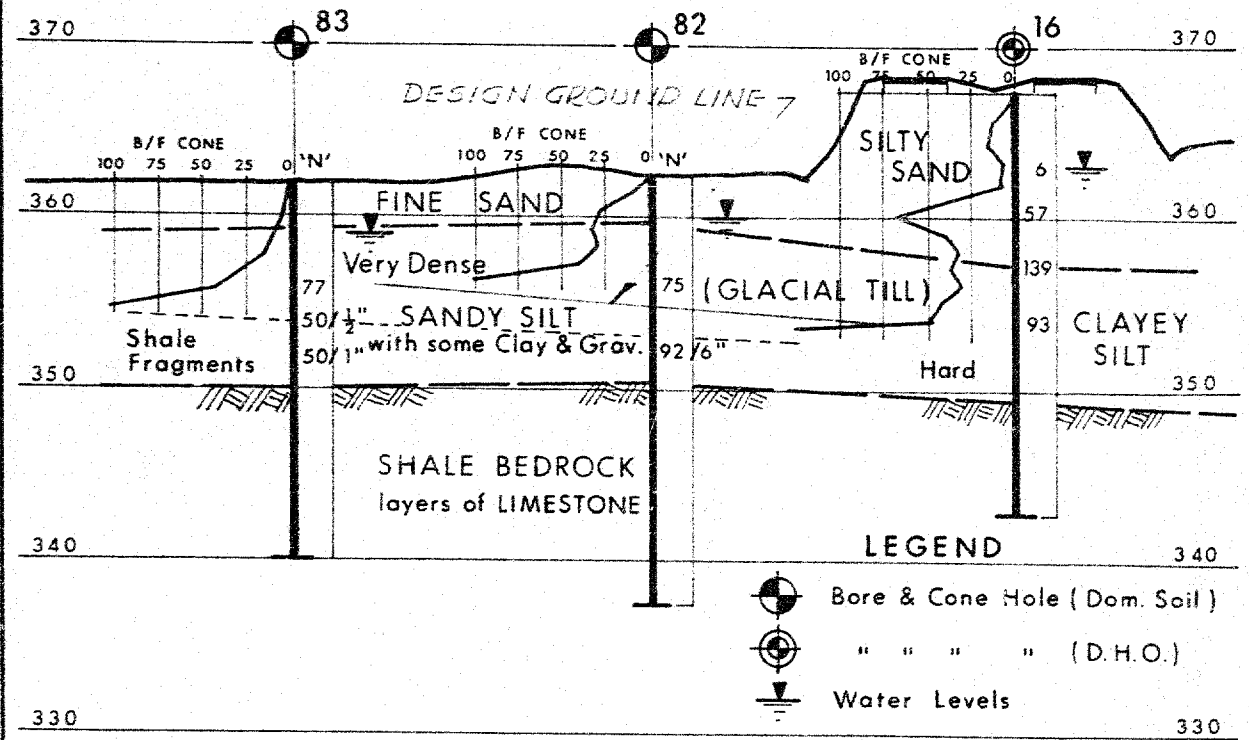
DATE 7 SEPT. 1966

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DRAWING NO. 66-F-48 K



PLAN
SCALE 1" = 100'



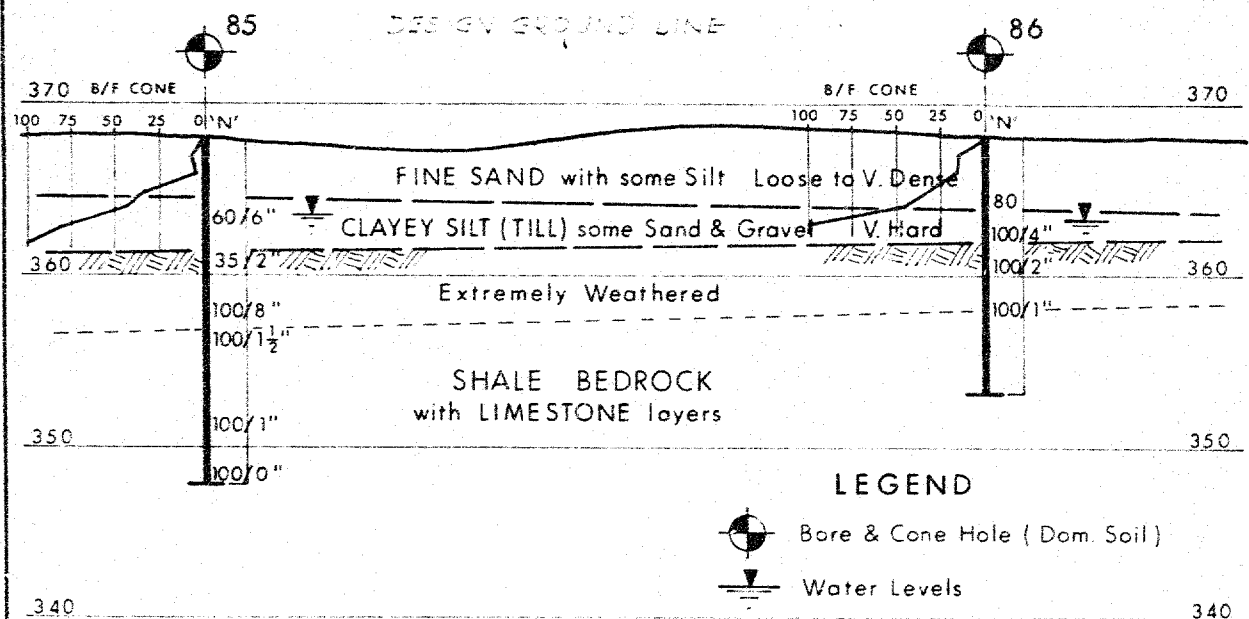
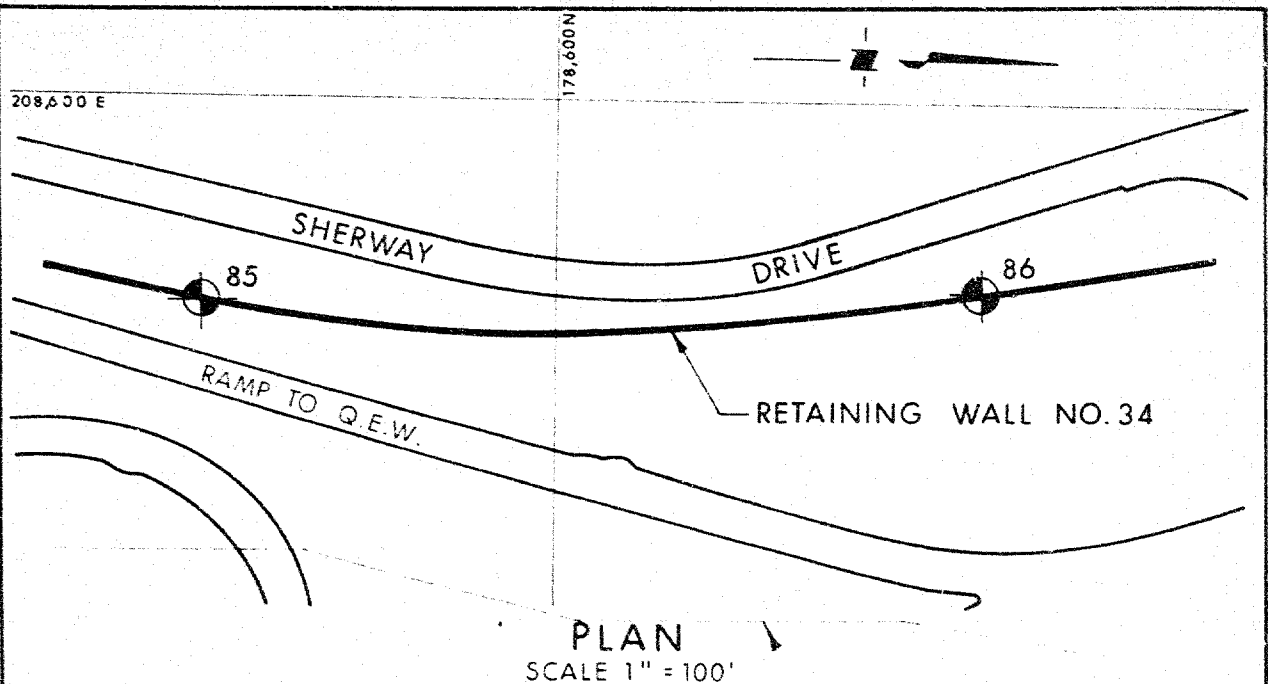
LEGEND

- Bore & Cone Hole (Dom. Soil)
- " " " " (D.H.O.)
- Water Levels

SECTION ALONG RETAINING WALL

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

 ONTARIO	DEPARTMENT OF HIGHWAYS MATERIALS and TESTING DIVISION	HIGHWAY NO. 27 & Q.E.W. INTERCHANGE RETAINING WALL NO.33	
		W.P. 275-64-1	JOB 66-F-48
DATE 12 SEPT. 1965		APPROVED <i>[Signature]</i>	DRAWING NO. 66-F-48 M



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. 34

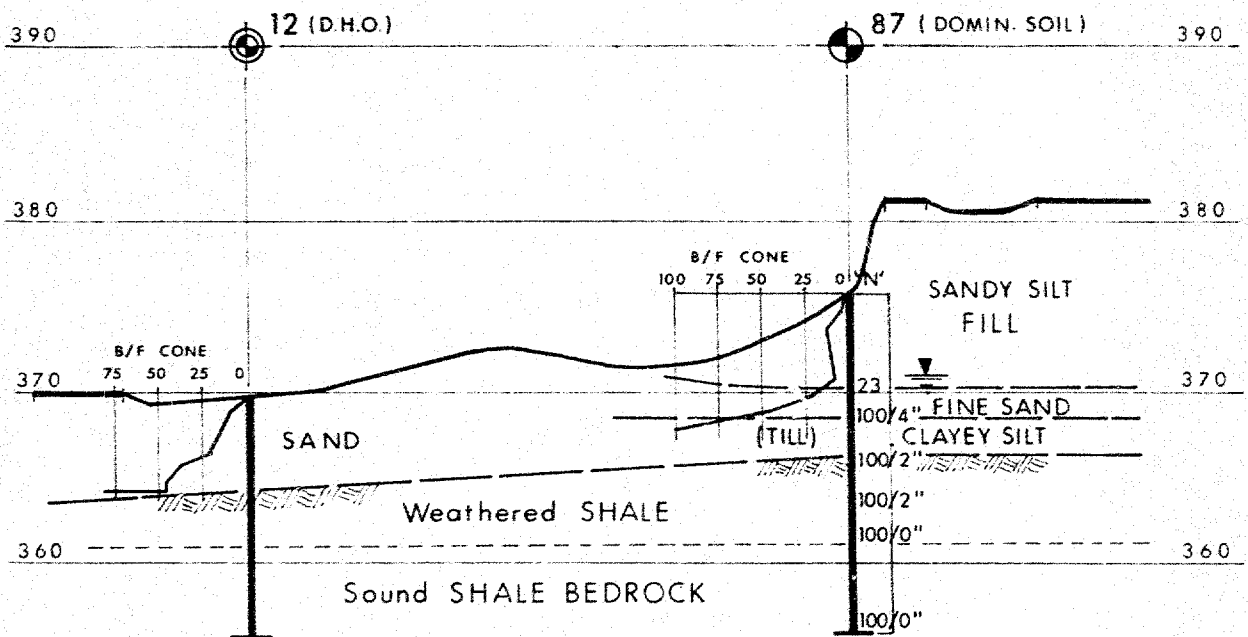
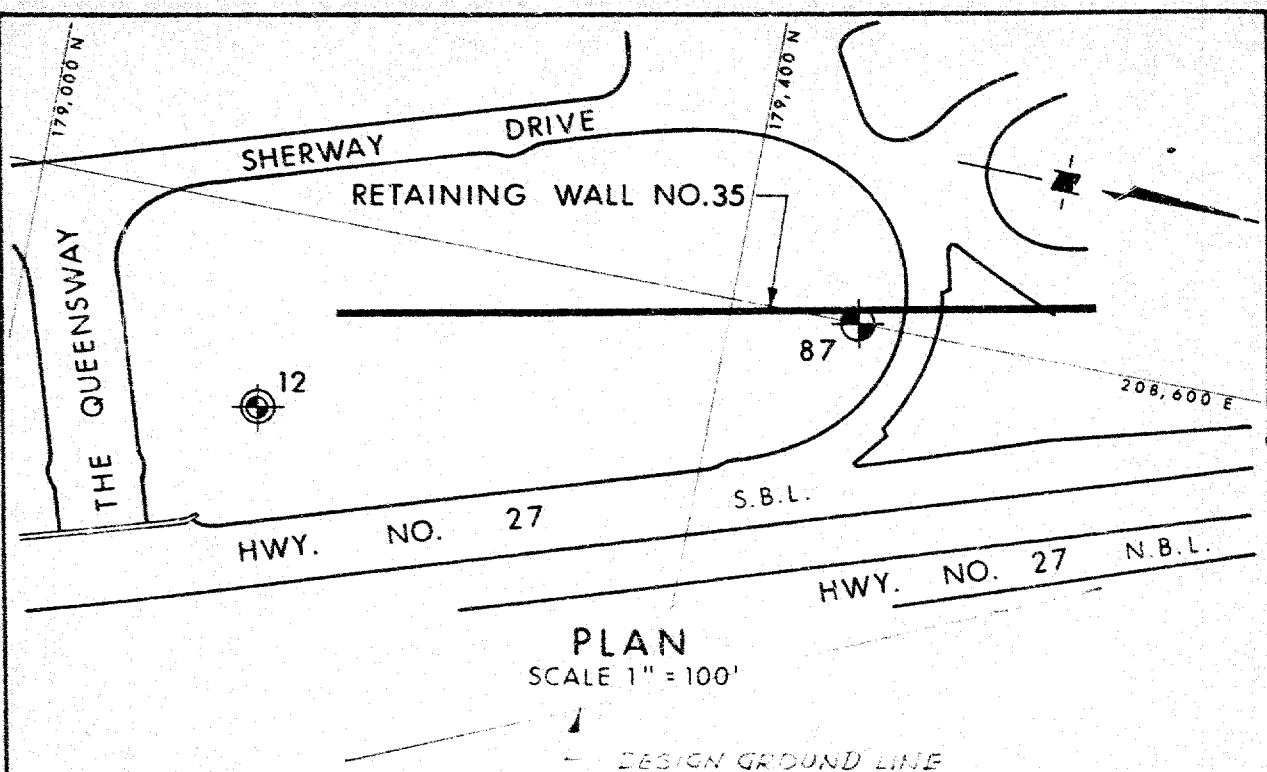
W.P. 275-64-1

JOB 66-F-48

DATE 20 SEPT. 1966

APPROVED

DRAWING NO. 66-F-48 N



ONTARIO

DEPARTMENT OF HIGHWAYS
**MATERIALS and
TESTING
DIVISION**

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

RETAINING WALL NO.35

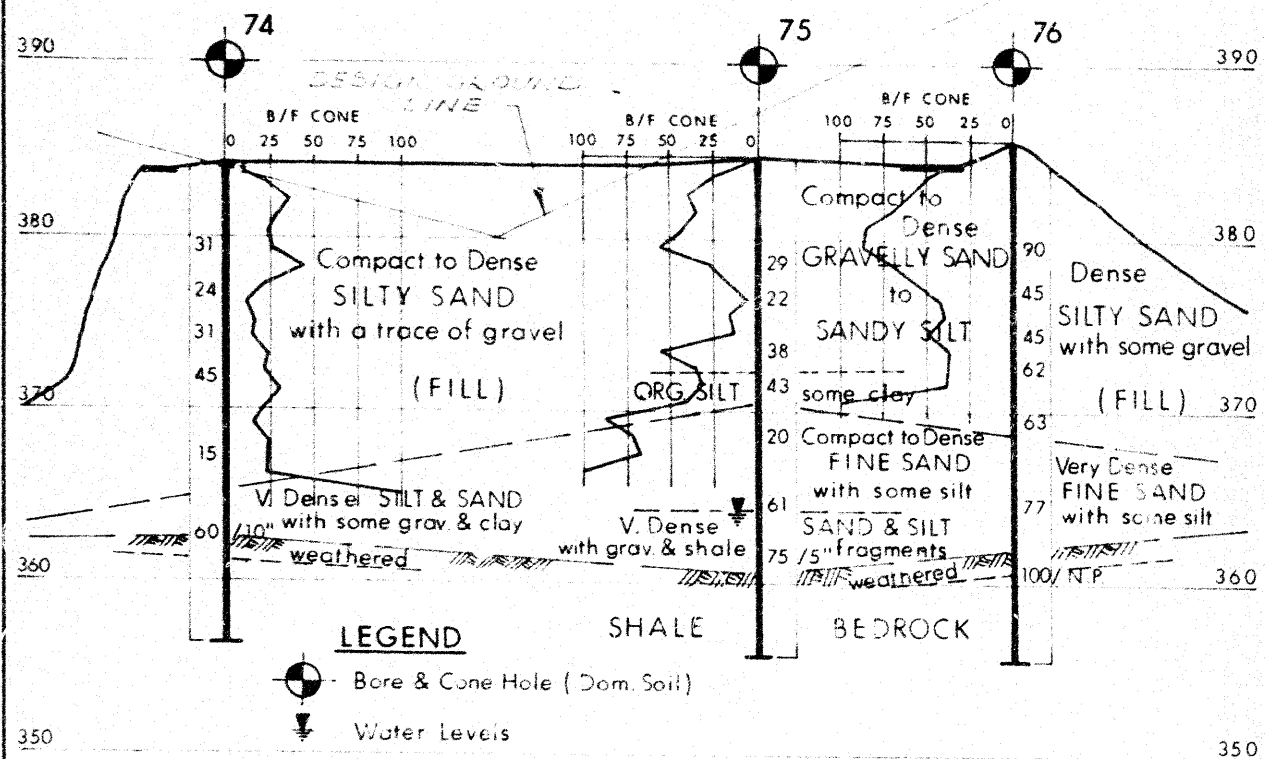
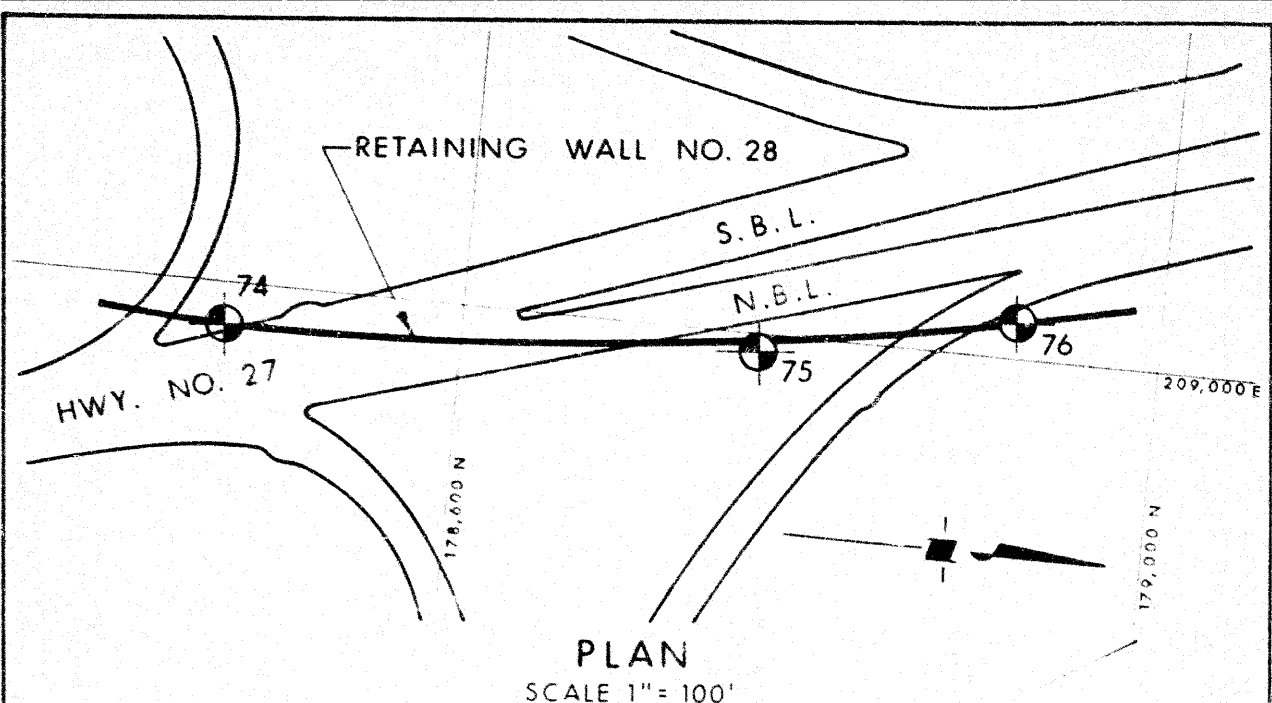
W.P. 275-64-1

JOB 66-F-48

DATE 25 OCT. 1966

APPROVED *Alpham*

DRAWING NO. 66-F-48 P



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. 28

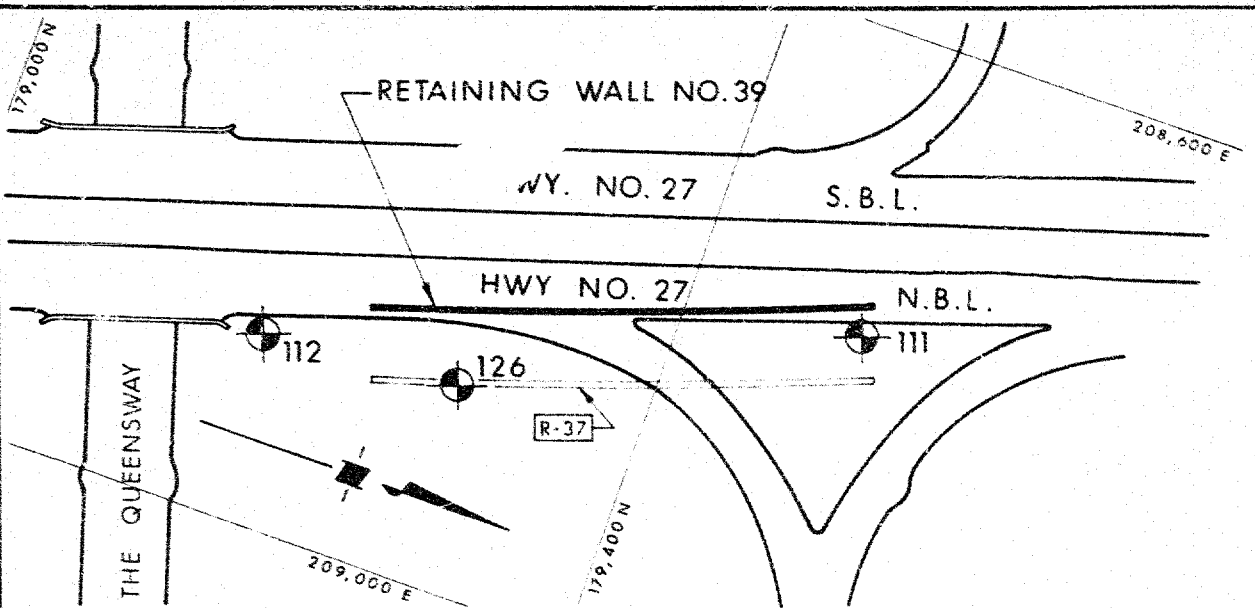
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JOB 66-F-48

DATE 20 SEPT. 1966

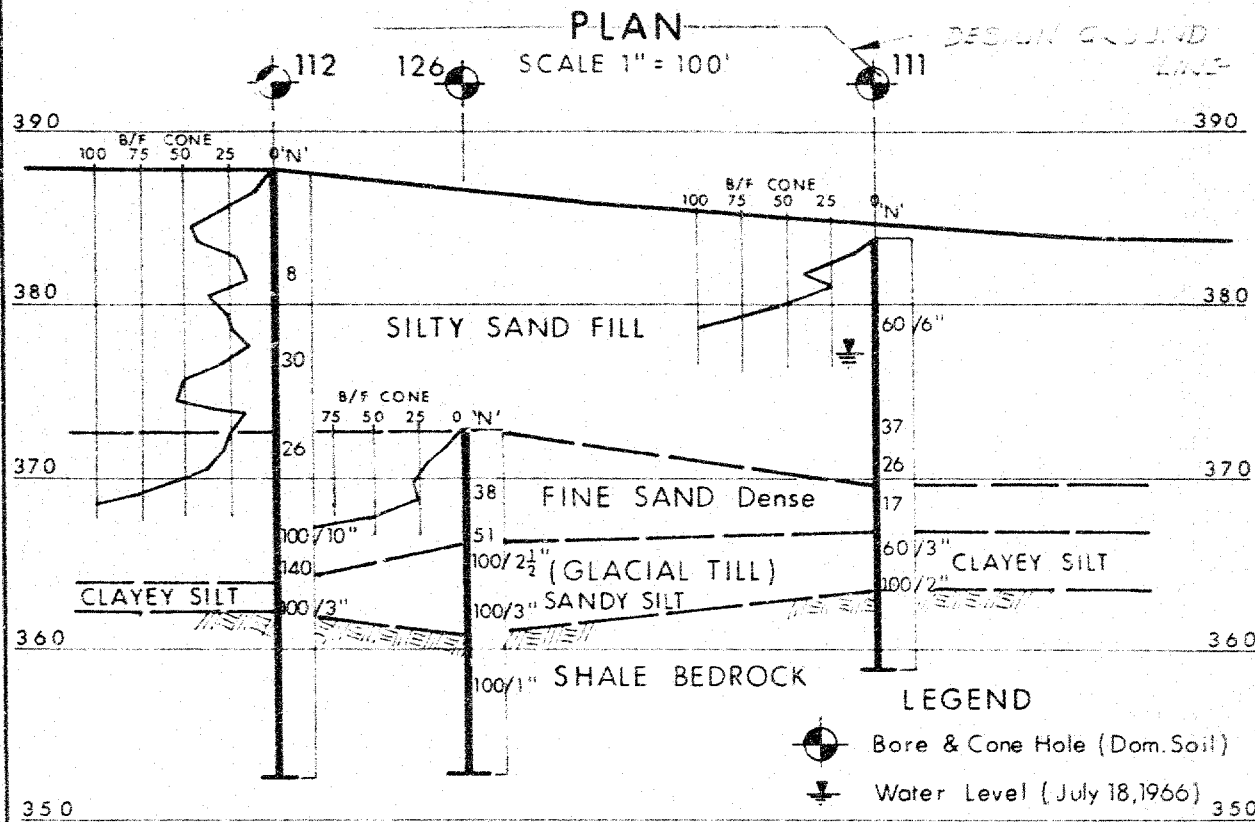
APPROVED

DRAWING NO. 66-F-48 Q



PLAN

SCALE 1" = 100'



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. 39

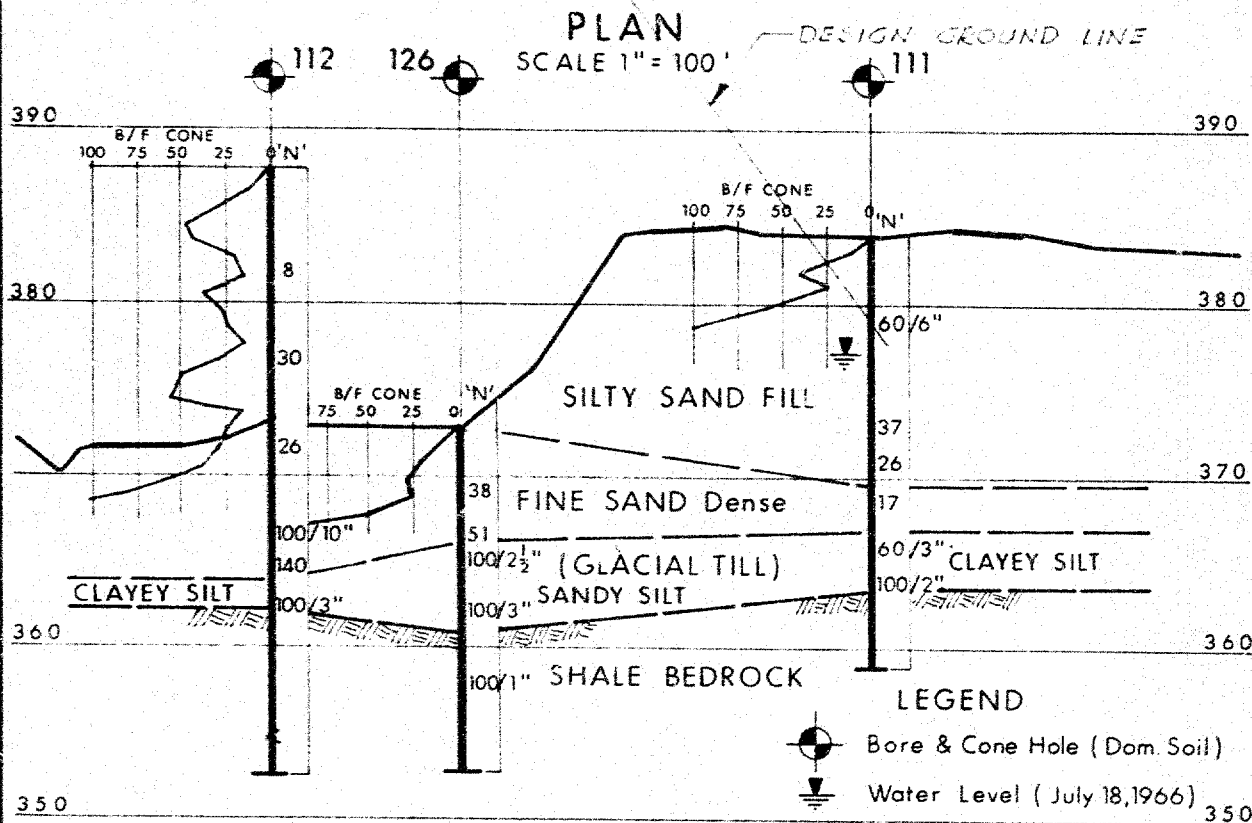
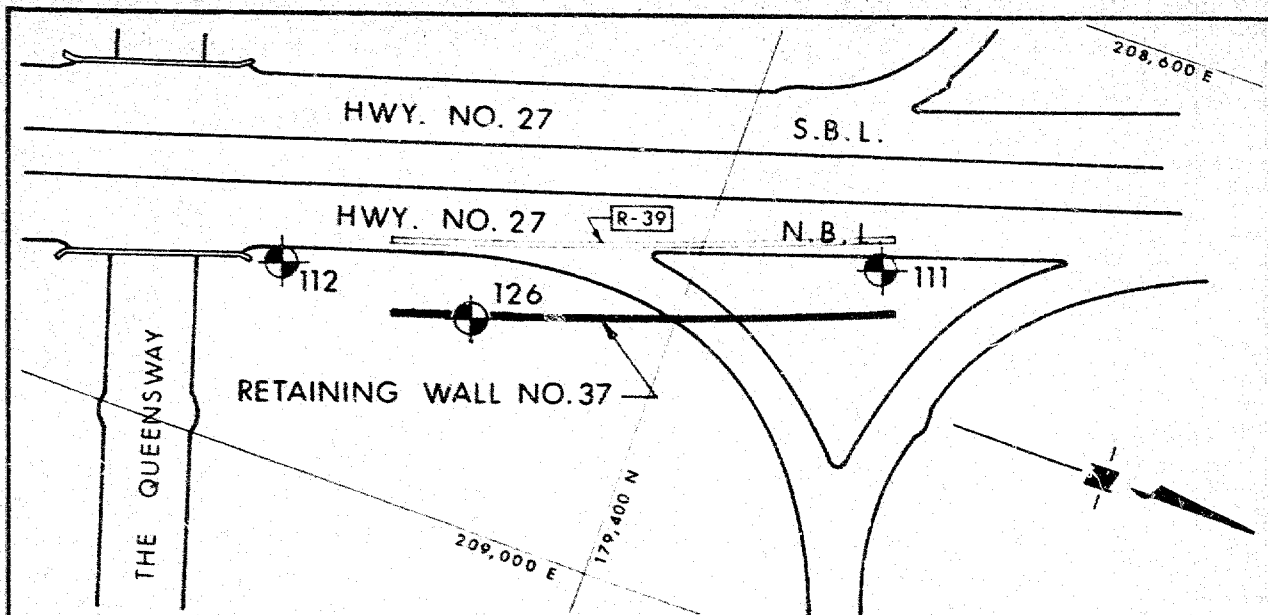
W.P. 275-64-1

JOB 66-F-48

DATE 2 NOV. 1966

APPROVED *[Signature]*

DRAWING NO. 66-F-48 R



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 37

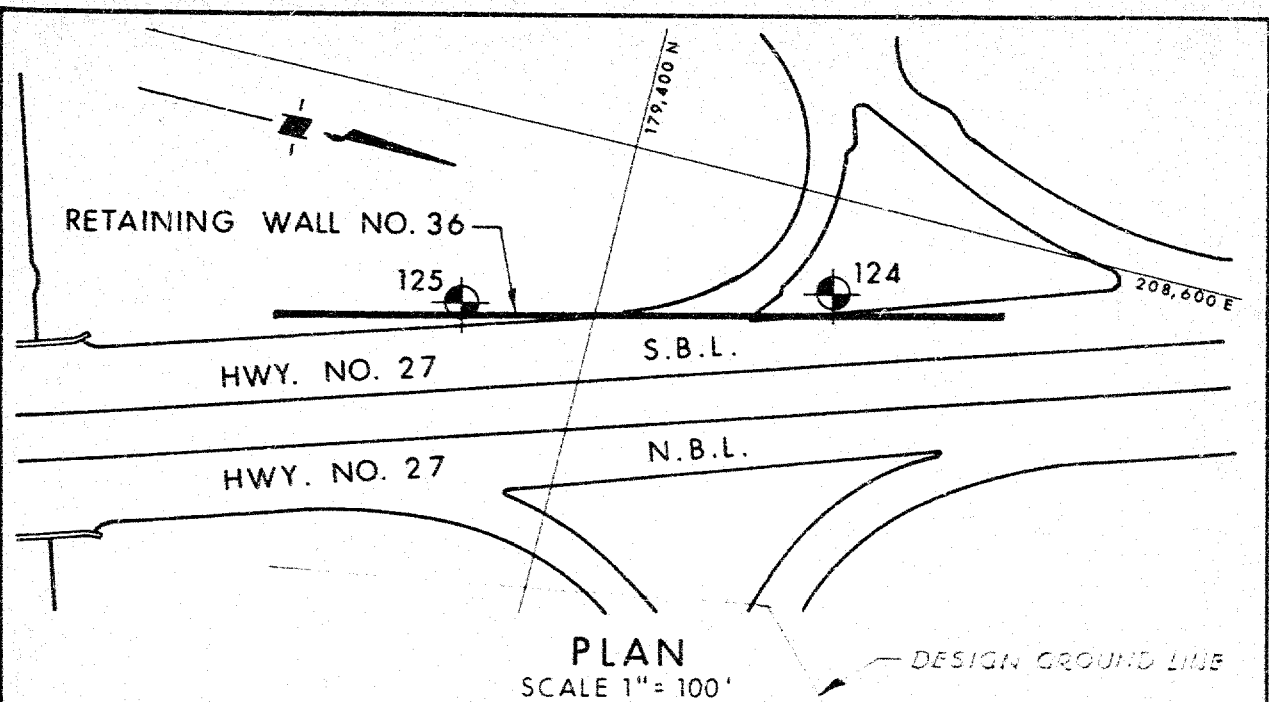
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JOB 66-F-48

DATE 2 NOV. 1966

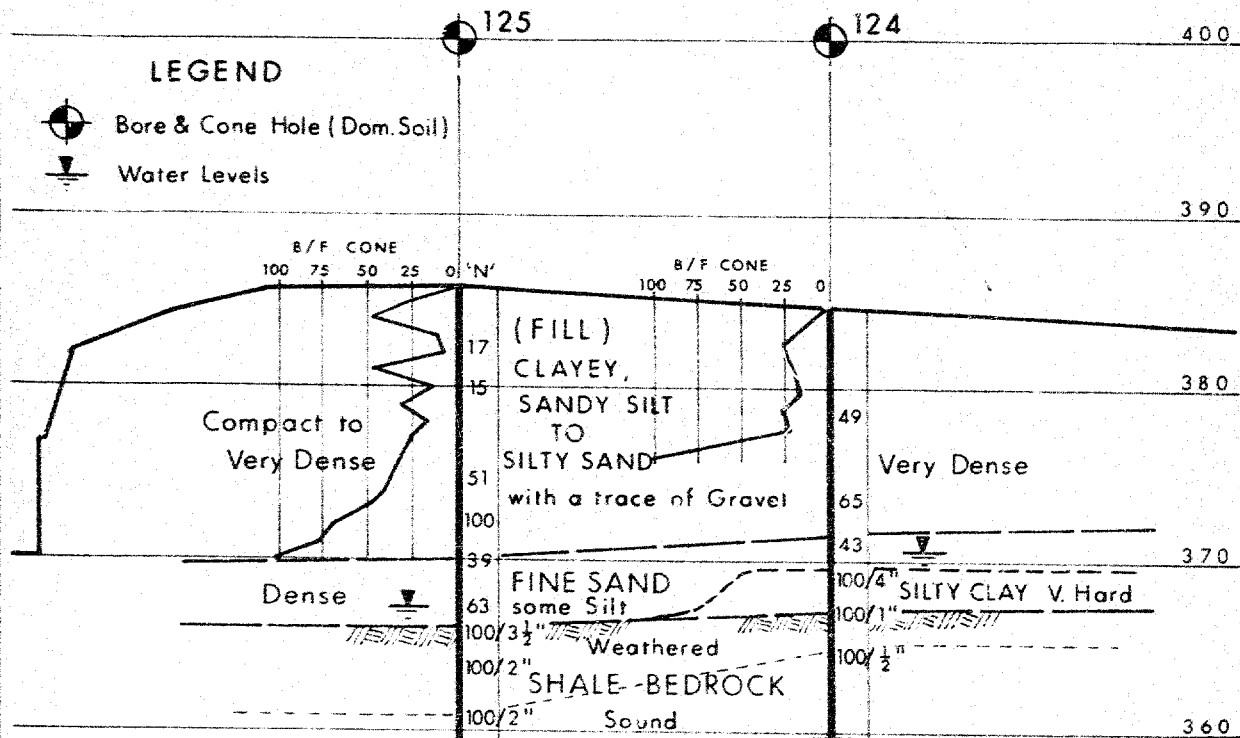
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DRAWING NO. 66-F-48 S



LEGEND

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



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. 36

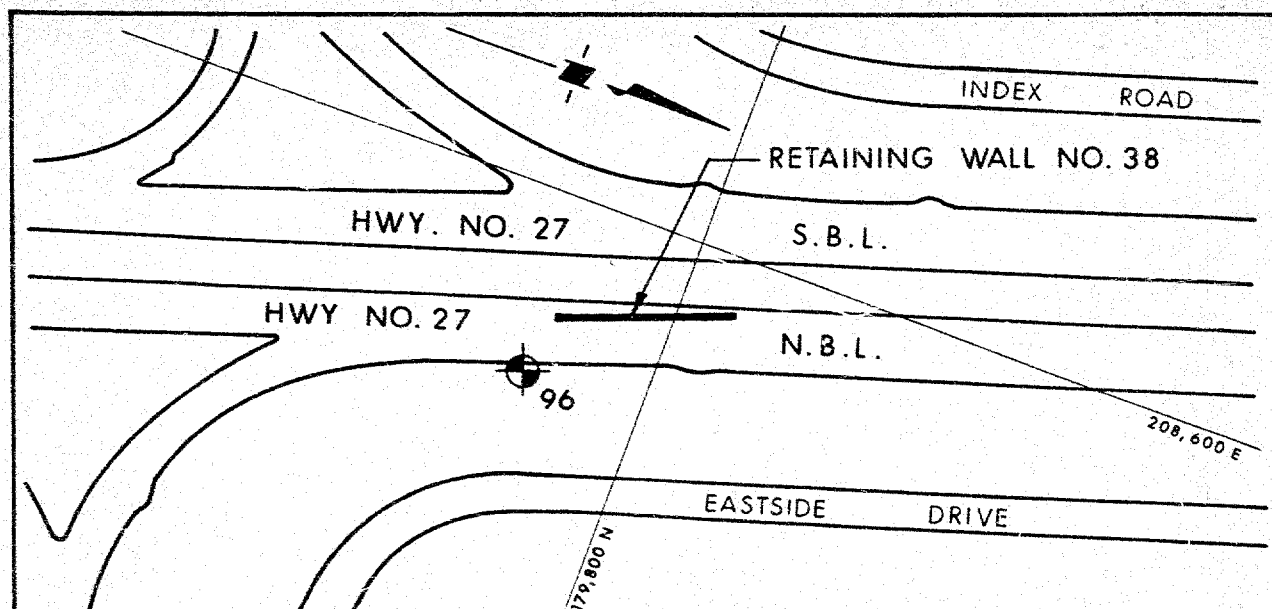
W.P. 275-64-1

JOB 66-F-48

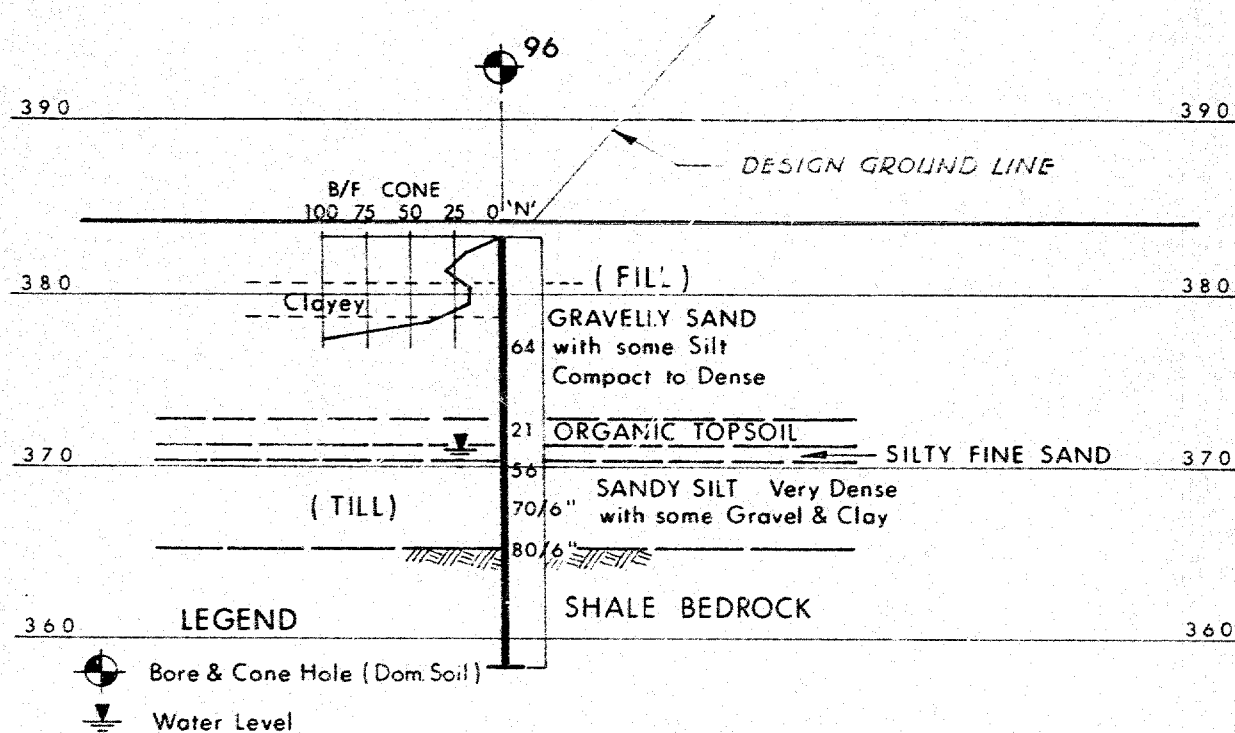
DATE 8 NOV. 1966

APPROVED

DRAWING NO. 66-F-48 T



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. 38

W.P. 275-64-1

JOB 66-F-48

DATE 15 NOV 1966

APPROVED

DRAWING NO. 66-F-48 U

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

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 2-3851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 86896

U.O. 2391-65-129

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.



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

May 20, 1966

Materials and Testing Division

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

Attention: Mr. E. H. King, Chief Engr.

Re: Foundation Investigation -
Retaining Walls - No's. 1 - 33, inclusive,
Q.E.W. & Hwy. 27 Interchange, District 6 (Toronto).
W.P. 275-64-4 -- W.J. 66-F-42
W.P. 275-64-1 -- W.J. 66-F-42 ✓

Dear Sir:

This is to authorize you to carry out a foundation investigation at the above mentioned site.

You are requested to carry out borings at locations shown on the site plan which was given to your Mr. I. Lieszkowski on May 11, 1966, to carry out all field and laboratory work necessary to define the soil conditions, and to furnish us with completed borelog sheets for each boring.

Arrangements have been made to have the borehole locations staked out in the field by personnel from District 6 construction staff. You are advised to contact Mr. T. Murphy (Tel. 249-3182) in connection with this.

As agreed, the work will commence immediately and you are requested to submit eleven (11) copies of each borelog sheet according to a time schedule which has already been discussed with you.

Charges for the work will be in accordance with your Schedule of Rates effective April 1, 1966, and the invoice should be addressed to the attention of the undersigned.

cont'd. /2

Dominion Soil Investigation Ltd.,
77 Crookford Blvd.,
Scarborough, Ont.

Attn: Mr. K. H. King, Chief Engr.

May 20, 1966

We are attaching Purchase Order J 34809, covering the purchase of any new material required for this work, in order that you may use this as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

Yours very truly,



KGS/Mief
Attach.

A. Rutka,
MATERIALS & TESTING ENGINEER

cc: Messrs. S. McCombie
G. K. Hunter
J. C. Thatcher
T. J. Kovich
Mrs. I. Steinberg
A. Crowley
H. Szymanski (2) ✓
H. Konings
Foundations Office
Gen. Files (2)

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.

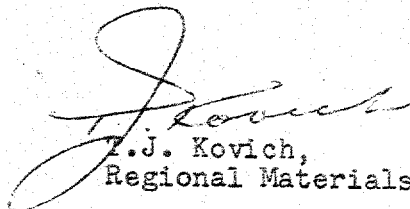
I have been advised by Engineering Audit that there will likely be a claim by the Contractor on Contract #66-102 (C.A. Pitts) with regards to the "wrong" elevation of the bedrock at the location of the retaining walls.

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.


Mr. T. J. Kevich,
Regional Materials Engr.,
Central Region (Toronto).

- 3 -

August 19, 1966

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/M&P


A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. Rutka
C. A. Wong

Foundations Office
Gen. Files

August 19, 1966

(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.R.C. 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"

cont'd. /3 ...

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.

cont'd. /2 ...

FOUNDATION INVESTIGATION REPORT
For
Proposed Retaining Walls at
Q.E.W. and Hwy. #27 Interchange
District #6 (Toronto)
W.J. 66-F-48 - W.P. 275-64-1

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.

cont'd. /2 ...

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-48-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:

Fourteen retaining walls are included in this project. These are numbered: 2, 3, 4, 8, 12, 17, 27, 29, 30, 31, 32, 33, 34, and 35.

cont'd. /3 ...

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

RETAINING WALL #2 -

1. Soil Conditions:

Two boreholes were located at the vicinity of the proposed wall. Borehole #5 was drilled under the supervision of the Foundation Section during the preliminary soils investigation, while borehole #80 was carried out by Dominion Soil Investigation Ltd.

Below a 6 - 7 ft. thick fill layer, consisting of fine sand and clayey silt deposits, the glacial till stratum was identified in both borings. The till is of a cohesive nature, classified as "clayey silt with sand and gravel and fragments of shale." In hole #5, the upper surface of the hard till lies at el. 356 ft.; in hole #80, it was observed at el. 351 ft. Grey shale bedrock underlies the overburden, the upper surface of which was noticed at approximate el. 351 - 352 ft. near the north end of the proposed wall, and roughly at el. 348 ft. at the location of borehole #80.

Groundwater level was established within the fill material, at around el. 354 ft.

The locations and elevations of the borings with the estimated soil profile, are plotted on the attached Drawing #66-F-48A.

2. Recommendations:

Along the larger portion of the proposed wall, the design grade is located beneath the bedrock surface. At this section the wall will be supported on spread footings within the shale bedrock, at some four ft. below future ground level. The north - approximately 100-ft. long portion of the wall may be supported on spread footings, either in bedrock, necessitating somewhat deeper (roughly 8 ft.) excavations; or within the till overburden at four ft. below the proposed grade.

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

RETAINING WALL #2 - (cont'd.) ...

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

A bearing pressure of 10 t.s.f. may be assumed for footings within the sound shale, and 3.5 t.s.f. within the hard glacial till.

Vertical expansion joints should be installed between the portions supported on bedrock and on overburden.

For the computations of resistance against sliding along the bottom of footing, an adhesion value of 3000 p.s.f. may be used within the cohesive glacial till.

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

RETAINING WALL #3 -

1. Soil Conditions:

The soils investigation consisted of two boreholes drilled in the vicinity of the wall. The holes were numbered 72 and 73.

A heterogeneous fill material forms the upper 6-ft. portion of the subsoil, consisting of silty sand, sand and gravel. The relative density of the fill varies from compact to dense. The fill is underlain by hard glacial till. Part of the till was identified to be a cohesive clayey silt, exhibiting a hard consistency: part of it, however, is of a granular nature, having very dense relative density. Grey shale bedrock with occasional limestone layers was observed at around el. 352 - 351 ft., extending to the end of the drilling at el. 342 ft.

The groundwater level was observed within the fill, at around el. 360 - 361 ft.

On the attached Drawing #66-F-48B, the locations and elevations of the borings, also the estimated soil profile, are shown.

2. Recommendations:

It is recommended to support the wall on spread footings within the hard and very dense glacial deposit. By placing the footing at approximate el. 358 ft., some four ft. below design ground line, a safe load of 3.0 t.s.f. may be employed on the footing base. By placing the footing at el. 356 ft., some six ft. beneath the proposed grade, the bearing capacity may be increased to 4.0 t.s.f.

The sandy silt portion of the glacial till is believed to be susceptible to unbalanced hydrostatic conditions; consequently, a dewatering scheme might be necessary.

cont'd. /6 ...

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

RETAINING WALL #3 - (cont'd.) ...

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

For the computations of resistance of the wall against lateral thrust along the base, a friction coefficient of 0.45 may be assumed within the sandy silt, and an adhesion value of 3000 p.s.f. within the clayey silt.

cont'd. / 7 ...

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

RETAINING WALL #8 - (cont'd.) ...

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

a) The footing of the proposed wall may be placed within the well compacted fill, some four ft. below finished grade, and be supported on H-piles driven to bedrock or to practical refusal. Refusal is anticipated to be reached at around el. 358 - 361 ft.

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

b) The wall may also be supported on spread footings placed some four ft. below finished grade on well compacted G.B.C. Class 'A' fill material. The G.B.C. Class 'A' should extend for a minimum width of 3 ft. on each side of the footing in the plane of the footing tops, and should slope down at 1:1 to the existing ground level. All topsoil should be removed prior to placing the granular fill. 2 t.s.f. safe bearing capacity may be assumed for design purposes.

No dewatering problems are anticipated.

A friction coefficient of 0.45 is estimated to apply between the bottom of footing and the granular fill.

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

RETAINING WALL #22 -

1. Soil Conditions:

The soil stratigraphy is based on five sampled boreholes, placed along the location of the proposed wall. Hole #5 was drilled during the preliminary soil survey, while holes #78, 79, 127 and 128 were carried out recently by Dominion Soil Investigation Ltd.

From ground elevation, extending to el. 356 - 360 ft., a compact to dense mixed fill was observed. The fill material was identified to be clayey silt, sand with some silt, and sandy gravel. Underlying the fill, the very dense glacial till was disclosed, which is mainly granular in nature, being sandy silt with gravel. In certain limited locations, however, the till exhibits some cohesion and may be specified to be clayey silt. Between el. 351 and 354 ft., shale bedrock with layers of limestone was encountered. Ground water was observed within the sandy fill stratum around el. 361 - 362 ft.

The locations and elevations of the borings, together with the estimated stratigraphical profile, are shown on Drawing #66-P-483.

2. Recommendations:

The design ground line of the proposed wall is between el. 363 ft. and 366 ft. near existing ground surface.

Spread footings are recommended for the structure, supported within the very dense sand and silt glacial till. The base of the footing should be lowered to el. 357 ft., some 6 - 9 ft. below design ground. At this elevation a safe bearing pressure of 4 t.c.f. may be employed.

cont'd. /10 ...

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

RETAINING WALL #33 -

1. Soil Conditions:

Boreholes #16, 82 and 83 were drilled at the proximity of the proposed wall.

From ground elevation, extending to approx. el. 359 ft. at the south end of the wall and to approx. el. 357 ft. at the north, a sand to silty sand deposit lies, displaying loose to dense relative density. The sand is underlain by the very dense glacial till, which is predominantly granular. At the north side, however, a cohesive clayey silt variety of the till appears, having hard consistency. Around el. 350 ft., shale bedrock was observed and proved for a depth of 13 ft. by diamond drilling.

Locations and elevations of the boreholes, together with the estimated stratigraphical profile, projected to the location of the wall, are shown on Drawing #66-P-48M.

2. Recommendations:

The design ground line of the retaining wall slopes from el. 356 ft. down to el. 354 ft., the length being about 290 ft.

Since the bedrock lies around el. 350 ft., some 4 - 6 ft. below design ground, it is recommended that the footing be placed on rock, at or below el. 350 ft. Ten (10) t.s.f. safe pressure may be used for design purposes at the specified depth. A coefficient of friction of 0.45 may be assumed for calculating the resistance against sliding along the base of the footing.

No major dewatering problems are foreseen for the excavations.

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

RETAINING WALL #27 - (cont'd.) ...

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

Since the till at this location is rather permeable, it is believed to be susceptible to unbalanced hydrostatic conditions. Dewatering of the excavations, therefore, might be necessary.

In computing the resistance of the wall against lateral earth pressure, a friction coefficient of 0.45 may be taken to act along the bottom of the footing and the soil underneath.

cont'd. /11 ...

COPIES
Oct. 27/66

TO: MR. B. R. DAVIS,
BRIDGE DIVISION -
Attn: Mr. J. McAllister

FROM: MR. A. G. STERMAC,
FOUNDATION SECTION

ADVANCE COPIES

(2 sets each)

RETAINING WALLS - W.J. 66-P-48 (Hwy. Q.E.W. & Hwy. 27 Interchange)

Page No. 3 - Wall #2 - (Revised - p. 3 only - Please destroy existing p. 3)

Additional Walls -

Page No. 12 - Wall #17

13 - Wall #34

14) - Wall #29

15)

16) - Wall # 4

17)

18 - Wall #12

19 - Wall #28

20) - Wall #30

21)

22) - Wall #31

23)

STRUCTURE - W.J. 65-P-104 (Q.E.W. & Hwy. #27 Interchange)

Structure No. 5 (W.P. 238-61-4) - Advance Copies - (2 sets)

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 751-6565

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: 56896

Our Ref. No: 6-6-28
Your Ref: 66-F-48

21st 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 Proposed Q.E.W. and
Hwy. #27 Interchange. Retaining Walls No. 36 and 37

Dear Sirs,

We have the pleasure of enclosing herewith eleven (11) copies of boreholes No. 124, 125 and 126 put down in connection with the above retaining walls.

Results of mechanical sieve analyses and hydrometer tests in form of grain size distribution curves are also attached.

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

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED

I.P. Lieszkowsky, P.Eng.,
Chief Engineer.

IPL/me
Enclosures.

De Leuw, Cather & Company of Canada Ltd.

CONSULTING PROFESSIONAL ENGINEERS
1127 LESLIE STREET - DON MILLS, ONTARIO

MAILING SLIP

CONSIGNEE'S COPY

CONSIGNEE: Mr. Anthony Stermac,
Principal Foundation Engineer,
Department of Highways of Ontario,
Downsview, Ontario.

DATE: October 20th, 1966.

ATTENTION: Mr. A. Barsvary

SUBJECT: Q.E.W. & Hwy. 27 Interchange

PROJECT NO. W.P. 275-64-1
275-64-4

ENCLOSED HERewith (OR UNDER SEPARATE COVER) ARE THE FOLLOWING.

COPIES	ITEM	FILE NUMBER	ISSUE NO.	TITLE OR REMARKS
9	P	T-279-1H	1	<u>Retaining Walls</u> Pavement Elevation and Retaining Walls Location Dwg. #: 1643, 1644, 3507, 3508, 3509, 3510 3546, 3756, 3757 'A' Retaining Walls locations final 'B' Grading preliminary As per your request

DE LEUW, CATHER & COMPANY
OF CANADA LTD.

C.P. Kolundzic

PER _____

ITEM CODE

P-PRINTS B-BAR LISTS
S-SPECIFICATIONS
R-REPORTS T-TRACINGS
F-FORMS

RECEIVED BY _____

De Leuw, Cather & Company of Canada Ltd.

CONSULTING PROFESSIONAL ENGINEERS
1127 LESLIE STREET - DON MILLS, ONTARIO

MAILING SLIP

RECEIPT COPY

PLEASE ACKNOWLEDGE RECEIPT OF THE ITEMS LISTED BY SIGNING AND RETURNING THIS FORM

CONSIGNEE: Mr. Anthony Sternac,
Principal Foundation Engineer,
Department of Highways of Ontario,
Downsview, Ontario.

DATE: October 20th, 1966.

ATTENTION: Mr. A. Barstary

SUBJECT: Q.E.W. & Hwy. 27 Interchange

PROJECT NO. W.P. 275-64-1
275-64-4

ENCLOSED HEREWITH (OR UNDER SEPARATE COVER) ARE THE FOLLOWING.

COPIES	ITEM	FILE NUMBER	ISSUE NO.	TITLE OR REMARKS
	P	T-279-1H	1	<u>Retaining Walls</u> Pavement Elevation and Retaining Walls Location Dwg. #: 1943, 1644, 3507, 3508, 3509, 3510 3546, 3756, 3757 'A' Retaining Walls locations final 'B' Grading preliminary As per your request

DE LEUW, CATHER & COMPANY
OF CANADA LTD.

C.P. Kolundzic

PER _____

ITEM CODE

P-PRINTS B-BAR LISTS
S-SPECIFICATIONS
R-REPORTS T-TRACINGS
F-FORMS

RECEIVED BY _____

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 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66896

Our Ref. No: 6-6-28
Your Ref: W.J. 66-F-48

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. 35 and 4.

Dear Sirs,

This letter accompanies eleven copies of the records of
Boreholes No. 87, 168, 169 and 170 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
569 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

Our Ref: 6-6-28
Your Ref: W.J-66-F-48

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 Walls No. 2 and 17

Dear Sirs,

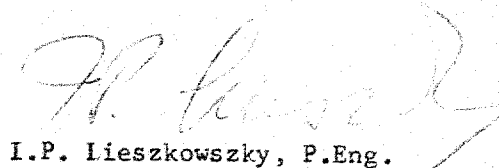
Enclosed are eleven copies of the records of boreholes No. 143, 144, 145 and 146 put down in connection with the above structures.

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 751-6565

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: 66886

September 14, 1966.

Our Ref: 6-6-28
Your Ref: W.J.66-F-48

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. & Highway #27
Interchange Retaining Wall No. 28 and 34

Dear Sirs:

Enclosed are 11 copies of the records of boreholes
No. 74, 75, 76, 85 and 86, put down at the locations of the
above retaining walls.

Also enclosed are 11 copies of the grain size dis-
tribution curves.

Should you have any queries regarding these boreholes,
please do not hesitate to contact us.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

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

IPL/jvm
Encls.

DOMINION SOIL INVESTIGATION LIMITED

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

BRANCH
863 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

Our Ref: 6-6-28
Your Ref; WJ 66-F-48

September 7, 1966

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. & Highway No. 27,
Interchange Retaining Wall No. 30, 32, 34.

Dear Sirs:

Enclosed are 11 copies of the records of boreholes No. 82, 83 and 84 together with the grain size distribution curves of representative samples recovered from borehole No. 84.

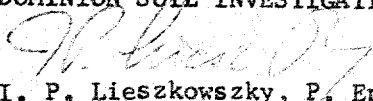
These boreholes pertain to retaining wall No. 31, 32 and 33 respectively. Additional information for retaining wall No. 32 can be obtained from borehole No. 128 reported to you on Aug. 19, 1966.

There was no borehole put down for retaining No. 30 since this area was already covered by your borehole No. 15.

We trust that you will find the information shown on the borehole logs to your satisfaction.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,


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

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

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE 3-9851



FOUNDATION ENGINEERS

ASSOCIATED COMPANY
SOIL TESTING AND ENGINEERING LTD.
34 BRENTFORD ROAD,
KINGSTON 5, JAMAICA, WEST INDIES
TELEPHONE: 66696

August 19, 1966.

Our Ref. 6-6-28
Your Ref. 66-F-48

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

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

Re: Soil Investigation for Q.E.W. & Hwy. #27, Interchange,
Retaining Walls No. 17, 27, and 29.

Dear Sirs:

Enclosed with this letter are eleven (11) copies of the records of boreholes No. 81, 78, 127, 128, and 71. These boreholes were put down in connection with the above retaining walls.

The results of borehole No. 72, which together with borehole No. 71 furnished information about the subsurface conditions in the area of retaining wall No. 29, have already been reported to you on August 5, 1966.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

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

IPL/ds

De Leuw, Cather & Company of Canada Ltd.

CONSULTING PROFESSIONAL ENGINEERS
1127 LESLIE STREET - DON MILLS, ONTARIO

MAILING SLIP CONSIGNEE'S COPY

CONSIGNEE: Mr. K. Selby,
Supervising Foundations Engineer,
Materials & Testing Division,
Department of Highways of Ontario,
Downsview, Ontario.

DATE: August 19/66

ATTENTION:

SUBJECT: Q.E.W. & Hwy. 27 Interchange

W.P. 275-64-1
PROJECT NO. W.P. 275-64-4

ENCLOSED HERewith (OR UNDER SEPARATE COVER) ARE THE FOLLOWING.

COPIES	ITEM	FILE NUMBER	ISSUE NO.	TITLE OR REMARKS
2	P	T-279-3S	-	1" = 100' Plans Showing latest additions, relocations & deletions outlined in red Dwg. # 4689 & 4690
2	P	T-279-1H	1	1" = 400' General Layout of Structures as requested by telephone Aug. 17/66

DE LEUW, CATHER & COMPANY
OF CANADA LTD.

PER C. Kolundizic

ITEM CODE

P-PRINTS B-BAR LISTS
S-SPECIFICATIONS
R-REPORTS T-TRACINGS
F-FORMS

RECEIVED BY _____

De Leuw, Cather & Company of Canada Ltd.

CONSULTING PROFESSIONAL ENGINEERS

1127 LESLIE STREET - DON MILLS, ONTARIO

MAILING SLIP

RECEIPT COPY

PLEASE ACKNOWLEDGE RECEIPT OF THE ITEMS LISTED BY SIGNING AND RETURNING THIS FORM

CONSIGNEE: Mr. K. Selby,
Supervising Foundations Engineer,
Materials & Testing Division,
Department of Highways of Ontario,
Downsview, Ontario.

DATE: August 19/66

ATTENTION:

SUBJECT: Q.E.W. & Hwy. 27 Interchange

W.P. 275-64-1
PROJECT NO. W.P. 275-64-4

ENCLOSED HERewith (OR UNDER SEPARATE COVER) ARE THE FOLLOWING.

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DE LEUW, CATHER & COMPANY
OF CANADA LTD.

PER C. Kolundzic

ITEM CODE

P-PRINTS B-BAR LISTS
S-SPECIFICATIONS
R-REPORTS T-TRACINGS
F-FORMS

RECEIVED BY _____

DOMINION SOIL INVESTIGATION LIMITED

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

BRANCH

369 QUEZENS 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

August 10, 1966.

Our Ref. 6-6-28

Your Ref. W.J. 66-F-48

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. 4.

Dear Sirs:

Please find enclosed eleven (11) copies of the records of borehole No. 77, put down in connection with the above structure. Additional information for the foundation design of this retaining wall can be obtained from borehole No. 90 (Bridge No. 3) and borehole No. 75 (Retaining Wall No. 28).

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

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

IPL/ds

De Leuw, Cather & Company of Canada Ltd.

CONSULTING PROFESSIONAL ENGINEERS
1127 LESLIE STREET - DON MILLS, ONTARIO

MAILING SLIP

CONSIGNEE'S COPY

CONSIGNEE: Mr. K. Selby
Supervising Foundations Engineer
Materials & Testing Division
Department of Highways of Ontario
Downsview, Ont.

DATE: August 8, 1966

ATTENTION:

SUBJECT: Q.E.W. & Hwy. 27 Improvements

PROJECT NO. WP.275-64-1
WP.275-64-4

ENCLOSED HERewith (OR UNDER SEPARATE COVER) ARE THE FOLLOWING.

COPIES	ITEM	FILE NUMBER	ISSUE NO.	TITLE OR REMARKS
1	P	T-279-35	-	1" = 100' Plans showing latest additions and relocations of retaining walls outlined in red (Drawing # 3489 & 3490)

DE LEUW, CATHER & COMPANY
OF CANADA LTD.

ITEM CODE

P-PRINTS B-BAR LISTS
S-SPECIFICATIONS
R-REPORTS T-TRACINGS
F-FORMS

PER J. H. Josselyn

RECEIVED BY

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

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

August 5, 1966.

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. & Hwy. #27
Interchange, Retaining Walls No. 8 and 12

Dear Sirs:

We are forwarding you herewith eleven (11) copies of the records of boreholes No. 39 and 79, together with the results of the laboratory tests performed on representative samples.

Also enclosed is, for your convenience, the log of borehole No. 72 which was put down at the location of Retaining Wall No. 29, but which contains information, together with borehole No. 73, for the design of Retaining Wall No. 3.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

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

IPL/ds

DOMINION SOIL INVESTIGATION LIMITED

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

BRANCH
369 QUEENS AVENUE
LONDON, ONTARIO
TELEPHONE GE. 9-3881



FOUNDATION ENGINEERS

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

August 2, 1966.

Our Ref. 6-6-28
Your Ref. W.J. 66-F-48

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

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

Re: Soil Investigation for Q.E.W. and Hwy. #27 Interchange,
Retaining Walls No. 2 and 3.

Dear Sirs:

Enclosed are eleven (11) copies of the records of boreholes No. 73 and 80, put down at your request at the proposed locations of the above retaining walls. The results of laboratory sieve analyses and hydrometer tests are also attached.

We would like to draw your attention to the artesian conditions noted on borehole No. 73. Other than this there were no unusual conditions noticed.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED,

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

IPL/ds

May, 401 & Leslie St.,
Scarborough, Ontario.

May 20, 1966

Materials and Testing Division

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

Attention: Mr. K. H. Ling, Chief Exec.

Re: Foundation Investigation -
retaining walls - No's. 1 - 33, inclusive,
H.B.W. & Hwy. 27 Interchange, District 6 (Toronto).
M.F. 275-64-4 --- M.J. 66-P-45
M.F. 275-64-1 --- M.J. 66-P-47

Dear Sir:

This is to authorize you to carry out a foundation investigation at the above mentioned site.

You are requested to carry out borings at locations shown on the site plan which was given to your Mr. I. Lisakowski on May 11, 1966, to carry out all field and laboratory work necessary to define the soil conditions, and to furnish us with completed boring sheets for each boring.

Arrangements have been made to have the borehole locations staked out in the field by personnel from District 6 construction staff. You are advised to contact Mr. T. Murphy (Tel. 249-3182) in connection with this.

As agreed, the work will commence immediately and you are requested to submit eleven (11) copies of each boring sheet according to a time schedule which has already been discussed with you.

Charges for the work will be in accordance with your Schedule of a fee effective April 1, 1966, and the invoice should be addressed to the attention of the undersigned.

cont'd. /2

Dominion Soil Investigation Ltd.,
77 Creekford Blvd.,
Scarborough, Ont.

Attn: Mr. A. H. King, Chief Engr.

May 23, 1960

We are attaching Purchase Order J 34809, covering the purchase of any new material required for this work, in order that you may use this as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

Yours very truly,

KGS/Hdf
Attach.

A. Rutka,
MATERIALS & TESTING ENGINEER

cc: Messrs. S. McCombie
G. K. Hunter
J. C. Thatcher
T. J. Kovich
Mrs. I. Steinberg
A. Crowley
H. Szymanski (2)
H. Konings
Foundations Office
Gen. Files (2)

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT
CONDITION OF ORIGINAL DOCUMENT

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

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

Attention: Mr. S. McCombie

November 30, 1966

FOUNDATION INVESTIGATION REPORT

For

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

W.J. 66-F-48 -- W.P. 275-64-1

The foundation report for the above project has now been completed and contains our final recommendations for the following Retaining Walls No's 2, 3, 4, 8, 12, 17, 27, 29, 30, 31, 33, 34, 35, 28, 39, 37, 36, and 38.

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/PdeP

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

cc: Mr. G. K. Hunter

Foundations Office
Gen. Files

MEMORANDUM

FOUND. FILE COPY

66-F-48

To: Mr. K.G. Selby,
Supervising Foundation Engineer,
Materials & Testing,
Lab. Building

FROM: Bridge Division,
Downsview, Ontario

DATE: November 22, 1966

OUR FILE REF.

IN REPLY TO

SUBJECT: Retaining Wall #34
W.P. 275-64-1
District No. 6

Further to our telephone conversations of November 21, this will confirm that we will be placing the footing for the above retaining wall at elevation 364.00 where adjacent to Bridge #12; and at or below elevation 364.00 at the south end of the retaining wall, keeping within the till layer. At these elevations we would obtain 9 k.s.f. bearing capacity.

Thank you for your punctual reply to our question.

H.S. Bawcutt

H.S. Bawcutt,
for:
C.S. Grebski,
Bridge Design Engineer

HSB:rd

66-F-48

MEMORANDUM

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

FROM: Bridge Division,
Downsview, Ontario.

DATE: January 5th, 1967.

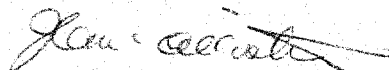
OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 275-64-1, Retaining Wall 7B,
Q.E.W. & Hwy. #27, Interchange,
District #6.

This will confirm Mr. Selbys conversation with Mr. Melinyshyn, regarding further soils required for the extension proposed to the above wall.

Attached are two prints showing the alignment of the wall and two prints of the proposed profile.



JCMcA/cew
Attach.
cc A. Crowley
R. Strain

J. C. McAllister,
for W. S. Melinyshyn,
Regional Bridge Location Engineer.

Department of Highways Ontario

Copy for the information of
Mr. K. Selby, Foundation Section,
Lab. Building

Mr. W. Melinyshyn,
Regional Bridge Location Engineer,
Bridge Division

Bridge Division,
Downsview, Ontario

January 4, 1967

Retaining Wall 7 (7B)
W.P. 275-64-1, District No. 6
Q.E.W. & Hwy. 27 Interchange

We are in receipt of a revised profile of the above retaining wall. This provides for an additional 300' to be added to the south end of this wall.

Since the original bore-holes (#19, #38 and #37) do not indicate data in the area of the south end of the revised wall, we would be obliged if you would provide us with some sub-soil information at Stations 928 ± and 926 ±, or at whatever locations you deem necessary.

H.S. Bawcutt

H.S. Bawcutt,
for:
C.S. Grebski,
Bridge Design Engineer

HSB:rd

c.c. K. Selby

File

66-7-47