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GEOCRES No. 30M5-26

DIST. 4 REGION

W.P. No. 231-58-2

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 403

LOCATION Hwy 403 -
BETWEEN KING ST & LONGWOOD RD

No of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FOUNDATION INVESTIGATION
CHEDOKE EXPRESSWAY
BETWEEN KING ST. & LONGWOOD RD.

W.P. 231-58-2

60-F-78

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND TESTING OFFICE

30M5-26

GEOCREs No.

Mr. A. M. Toye,
Bridge Engineer.
Materials Research Section.

October 3, 1960.

B.H.C. FOUNDATION INVESTIGATION
W.J. 60-F-7(B) - W.P. 231-53-2.

Attention: Mr. C. McCombie.

Re: Chedoke Expressway - Hwy. #403 between
King Street & Longwood Road, District #4.

Accompanying this memo, is our detailed report on the subsoil conditions at the above site. Also contained in this report are results obtained by E. M. Peto & Associates, and a copy of a letter by Dr. H. G. Golder.

The area described in this report, is presently known as "The City of Hamilton Dump Area", and presents a considerable problem in the design of the new Expressway. We believe that our recommendations for the solution of the various problems in connection with this area, should prove adequate for your future design work.

If further assistance is required, please do not hesitate to contact our Office.

cc: Mr. Toye
attach.

cc: Messrs. A. M. Toye (2)

H. A. Fregaskes
D. G. Hamdy
I. Campbell
R. G. Richardson
T. J. Kovich
J. Watt

C. G. Parker (4)
Foundations Office
Gen. Files.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGINEER.
Per:

A. Sternberg

(A. Sternberg,
FOUNDATIONS OFFICE (H.C.))

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FOUNDATION INVESTIGATION

FOR

Chedoke Expressway
Hwy. #403 between King Street
& Longwood Road, District #4
N.J.60-F-7 (B) H.P.231-58-2

1. INTRODUCTION:

A detailed subsoil investigation by drilling was carried out between Longwood Road and King Street, where the proposed Chedoke Expressway runs from south to north.

Subsequently, on July 29th, 1960, four test pits were dug with a backhoe in order to supplement the results of the borings.

Results of the investigation carried out by the Department of Highways as well as by E.M. Peto & Associates, are included in this report. A copy of the letter of Dr. H.O. Golder with his recommendations for the portion where the expressway crosses the garbage dump at Hamilton, is also included.

The site is located in the western part of Hamilton between Longwood Road and King Street, and is presently known as "The City of Hamilton Dump Area".

The dump area presents a considerable problem in the design of the new expressway. Our recommendations for the solution of the various problems in connection with this area are contained in this report.

2. FIELD & LABORATORY WORK:

In order to obtain sufficient information on the types and properties of the subsoil, sampled boreholes supplemented by the same number of dynamic cone penetration tests were carried out. The density of cohesionless material was determined in the field by means of the Standard Penetration Test. Samples recovered in the split spoon were used for

2. FIELD & LABORATORY WORK: (Cont'd.) ...

classification purposes. In cohesive organic materials as well as in clays, 2" Ø thin-walled shelby tube samples were taken at required depths. In addition, in-situ vane tests were carried out wherever possible, in order to determine field shear strength values.

In the Laboratory, routine tests for index properties were carried out on selected representative samples.

Laboratory and field test results have been summarized in Table #1 and are included under Appendix I. The location of boreholes is shown on Drawing No. 60-F-7 (B).

3. SUBSOIL CONDITIONS:

The stratigraphy of the soil at the site varies considerably from Sta. 388/00 to Sta. 420/00. Detailed descriptions of various soil types encountered in each boring, are shown in Appendix I of this report. The estimated stratigraphical profile of Drawing 60-F-7 B is based upon this information.

In order to make it simpler, the profile has been divided into three convenient portions and described as follows:

Sta. 388/00 to Sta. 400/00

Sta. 400/00 to Sta. 409/00

Sta. 409/00 to Sta. 419/00

3.1 Stratigraphy of Subsoil from Sta. 388/00 to Sta. 400/00

The subsoil between Sta. 388/00 and Sta. 400/00 consists mainly of the following materials:

Recent Refuse and Decayed Sanitary Fills

Organic clay

Inorganic clay

3.1 Stratigraphy of Subsoil from Sta. 388+00 to Sta. 400+00 (Cont'd.)

Sand with excessive fines & sandy silt.

3.1.1 Recent Refuse and Decayed Sanitary Fill:

Between approximately Sta. 388+00 to Sta. 397+00 the deposit of recent refuse extends below the surface for a depth of 7ft. to 10ft., followed by decomposed sanitary fill of 8 to 20ft. deep.

From Sta. 397+00 to Sta. 400+00, the deposit of recent refuse was not encountered at all, and the decomposed sanitary fill followed immediately below the surface.

The recent refuse consists predominantly of paper and cardboard, whereas the decomposed sanitary fill consists of ashes, cinders, tins and sand.

3.1.2 Organic clay of intermediate to high plasticity

Underlying the deposits of sanitary fill is a layer of organic clay. This layer has a maximum depth of 25 ft. in B.H. #33 and a minimum depth of 10 ft. in B.H. #28. Occasional pockets of fine sand were encountered in this stratum. Generally, the consistency of this material of intermediate to high plasticity, varies from very soft to Hard Stiff. It was also observed that the content of organic matter decreases with depth.

In B.H. #35, immediately below the sanitary fill and above the organic clay, a layer approximately 10 ft. thick of sand with organic matter was encountered.

Engineering properties determined from field and Laboratory tests were found to be as follows:

Natural Unit weight (average)

100 p.c.f.

3.1.2 Organic clay of Intermediate to high plasticity (Cont'd.) ...

Moisture Content range	27% - 131%
Liquid Limit range	60% - 144%
Plastic Limit range	28% - 68%
Shear Strength (in-situ Vane tests)	440 - 960 p.s.f.

3.1.3 Inorganic clay of Intermediate to High Plasticity

This material immediately underlies the organic clay and covers most of the site, but was not observed in B.H. #27, 29 and #33. The thickness of this material varies considerably with a maximum of 20 ft. in B.H. #28, to a minimum of 5 ft. in B.H. #32. It contains, in varying amounts, silt and fine sand. Pockets of sand and silt are also present. Occasionally, shells and fragments of wood were observed in this stratum which might be the deposit of an old stream. In general, the consistency of this material of Intermediate to High plasticity, varies from soft to stiff. Values of some of the physical properties are as follows:

Natural unit weight	115 - 122 p.c.f.
Moisture Content range	25% - 46%
Liquid Limit range	36% - 60%
Plastic Limit range	18% - 30%
Shear Strength	440 - 1120 p.s.f.

3.1.4 Sand with excess of fines & sandy silts:

This material immediately underlies the inorganic clay stratum in most of the places but not in B.H. #27, 29 & 32. In these three boreholes sandy silt was encountered below the organic clay deposits.

In B.H. #31, 32 & 33, the top layers are predominantly sandy silt which exhibits non-cohesive characteristics. As the depth increases this

3.1.4 Sand with excess of fines & sandy silts: (Cont'd.) ...

material changes to sand with excess of fines, and then to sand, well graded. Sand with excess of fines followed by well graded sand was observed in all the borings. Occasional pockets of clay were also encountered in this stratum.

Generally, the top layers of sandy silt and sand with excess of silt particles are loose to Med dense, whereas the bottom layers of well graded sand are med. dense to dense. The moisture content of this sand stratum varies from 9% to 36% and the penetration resistance varies within the range of 3 to 44 blows/ft.

3.2 Stratigraphy of subsoil from Sta. 400+00 to Sta. 409+00

3.2.1 General:

From the available subsoil information it can be concluded that this area was once covered by a swamp or creek and later filled with refuse.

Detailed description of the various soil types encountered in each of the borings are shown in Appendix I of this report. The description of the encountered layer is given below.

3.2.2 Decomposed Sanitary fill

This deposit extends over the entire area except in B.B. #521 & #522. All the refuse is very well decomposed and generally consists of ashes, cinders with sand and glass pieces of tins. This material is predominantly a non-cohesive material of loose density. Because of the loose state of this material, considerable settlements can be anticipated during the embankment construction.

3.2.3 Organic clay of Intermediate to High plasticity

This material is predominant over the entire area and generally follows the deposits of decomposed refuse. In B.H. #25, 26 & 608, a layer of sand with fragments of timber and ashes of approximately 5 ft. to 12 ft. was encountered between the deposits of decomposed sanitary fill and organic clay.

In general, the consistency of the organic clay of intermediate to high plasticity, varies from soft to stiff. Occasional pockets of silt with organic matter of low plasticity were observed in this stratum. The content of organic matter decreases with depth. Values of some of the physical properties determined from field and laboratory tests are as follows:

Natural Unit weight (average)	100 p.c.f.
Moisture Content	31% - 87%
Liquid Limit	34% - 126%
Plastic Limit	23% - 94%
Shear Strength (in-situ Vane Tests)	400 - 1200 p.s.f.

3.2.4 Inorganic clay of low to Intermediate plasticity

This deposit extends below the organic clay deposits in B.H. #25, 26 and #521, but was not observed in B.H. #608 & #5. This same material was also encountered at greater depths in B.H. #21 & 522. The consistency of this layer varies from med. stiff to stiff. Fine sand is contained within this deposit, together with thin seams of silt and fine sand. Values of some of the physical properties of this material are as follows:

Undrained Shear Strength	900 - 1200 p.s.f.
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3.2.4 Inorganic clay of Low to Intermediate plasticity: (Cont'd.)

Liquid Limit	25% - 49%
Plastic Limit	16% - 21%
Natural Moisture content	16% - 31%

3.2.5 Sand with excess of fines:

This stratum extends below the deposits of organic or inorganic clay in all the borings. Occasionally pockets of well graded sand were encountered in that deposit. The content of silt varies considerably and it is very difficult to distinguish between layers of non-cohesive deposits of silty sand and sandy silt. These granular deposits occasionally contain fragments of decayed timber. The density of this material varies from loose to dense. Physical properties of this material are as follows:

Moisture content	11% - 47%
Penetration Resistance	3 - 40 blows per ft.
Bulk Density	125 - 135 p.c.f.

3.3 Stratigraphy of Subsoil from Sta. 409+00 to Sta. 419+00:

The subsoil between Sta. 409+00 and Sta. 419+00 consists mainly of the following materials:

3.3.1 Decomposed Sanitary fill and sand & gravel fill:

This deposit extends below groundlevel between Sta. 411+00 to Sta. 417+00 (in B.H. #38 & #16) but was not observed in any other borings. The decomposed deposit consists mainly of ashes, and cinders with decayed refuse. In B.H. #4 a thin layer of sand and gravel fill was found immediately below the ground surface. The density of these deposits is generally loose.

3.3.2 Organic clay of high plasticity:

This material immediately underlies the fill material in B.H. #38, 16 & #4 but was not encountered in B.H. #22, #622. It varies in thickness from 10 ft. in B.H. #16 to about 15 ft. in B.H. #38. The properties of this material are very similar to those of the organic clay which were already described under 3.2.3.

3.3.3 Sand with excess of fines:

This material extends below groundlevel in B.H. #22, whereas in B.H. #622 a thin 5 ft. layer of clay with fine sand covers this deposit. In B.H. #22, 16 and #4 this deposit extends below the organic clay. The thickness of this stratum varies from 45 ft. in B.H. #22 to 5 ft. in B.H. #38. It contains seams of silt with fine sand, but it has the characteristics of a non-cohesive material. The density of this material varies from loose to dense. The moisture content of this material varies from 11% to 23% and the penetration resistance from 7 blows/ft. in the loose deposits to a maximum of 91 blows/ft. in the dense material.

3.3.4 Inorganic clay of low plasticity:

This material was encountered in only two of the boreholes (B.H. #38 & #16) immediately below the sand stratum. It contains silt and some fine sand and occasionally pockets of silt. Generally, the consistency of this material of low plasticity is medium stiff to stiff.

4. GROUND WATER OBSERVATIONS:

Field observations and measurements carried out during the exploration programme showed that the ground water level was approximately at Elev. 236.0 to 254.0. Most of the borings were carried out in the vicinity of the existing open sanitary and storm sewer. The water level

4. GROUND WATER OBSERVATIONS: (Cont'd.) ...

observed in these borings was at a slightly higher level than the water level in the sewer, which at that time was at Elev. 244.0. The boreholes which were far away from the influence of the open sewer, showed slightly lower levels than the water level in the sewer.

Neither artesian water conditions nor water bearing sand seams were encountered during the exploration.

5. DISCUSSION & RECOMMENDATIONS:

5.1 General

The construction of the Chedoke Expressway in and around the dump area will include the building of an approximately 20 ft. high roadway as well as some other structures. It has already been explained that this part of the expressway has been divided into three sections. The discussion and recommendations are therefore made for each of those sections separately.

5.2 Sta. 388/00 to Sta. 400/00

The field investigation has revealed that between Sta. 389/00 and 398/00 the refuse deposit has a high content of organic matter and that this is in a rather early stage of decomposition. Due to this fact large settlements under the embankment load could be expected. Settlements would not only be large but also very nonuniform and therefore intolerable. To eliminate this undesirable and intolerable inconvenience, it is recommended that this fresh garbage be excavated. The layer of this fresh, recent garbage is about 8 feet thick and it extends to about the ground water level. Therefore, no problem is anticipated in connection with this operation.

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.2 Sta. 388+00 to Sta. 400+00

Below the layer of fresh garbage there is some more old garbage and other compressible organic and inorganic material. All this material will consolidate under the load of the new embankment. In order to accomplish as much settlement as possible within the shortest possible time, surcharging of the embankment is recommended.

The excavation of the garbage should be carried out according to the D.H.O. Standards DD-406 & DD-407. The material used for the replacement of the excavated garbage as well as for the embankment should be granular fill compacted according to the usual specifications and requirements. The surcharge should be 10 ft. high and should not be compacted. The slopes of this surcharge can be made as 1:1 or as steep as they can be formed. The surcharge should be placed between Sta. 389+00 and Sta. 400+00. To determine the degree to which the surcharge has been effective, settlement plates are to be installed in two sections (Sta. 394+00 and Sta. 398+00). In each section there will be four plates, two on the left and two on the right side at 13 and 55 feet of centre line, respectively. The details of the installation as well as all the necessary instructions are given in a separate report.

When the excavation of the garbage is completed it is recommended to use heavy rollers for the compaction of the underlying material. These rollers are afterwards used also on the compaction of the fill material. Since the underlying material is loose, rollers should be used, the load of which can be gradually increased. An ultimate roller load of about 50 tons is recommended. The number of passes as well as the load

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.2 Sta. 388/00 to Sta. 400/00

increments of the roller will be determined in the field by the supervising engineer on the basis of his observations and the results obtained.

The excavation, transport and new disposal area of the garbage will also represent a special problem because of the unusual and bad odour of the garbage. It is recommended that deodorants be used during this operation in order to reduce the inconvenience as much as possible. Steps have been undertaken by the consultant, C. C. Parker & Associates as well as by the Department of Highways to decide on the best and most effective and appropriate chemical and method to be applied.

5.3 Station 400/00 to Sta. 409/00

The investigation has revealed that in this region there is no recent undecomposed garbage, but only old decomposed garbage underlain by organic and inorganic soft material. It is recommended that no sub-excavation be undertaken here but the embankment be built on the existing ground. The embankment height here is about 20 feet. Stability analyses have shown the factor of safety to be just slightly above 1.0 and no surcharging is therefore proposed. Prior to placing the fill the ground should be placed in layers and compacted to the required density. The specifications for this operation are given elsewhere.

This section of the Chedoke Expressway differs from the one described in the previous paragraph. The stratification is different and so are the soil properties. It is therefore, recommended that settlement observations plates as well as piezometers be installed in this section.

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.3 Station 400+00 to Sta. 409+00

It is proposed that the settlement plates be placed at Sta. 403+00, Sta. 406+80 and Sta. 408+50. The piezometers should also be placed at the same stations. The information obtained from these instruments will enable the supervising engineer in the field to decide whether some surcharge is necessary and if so whether and when it can be placed.

Between Sta. 400+00 and Sta. 408+00 an open sewer crosses the proposed line of the Ghedoke Expressway. This open sewer channel is going to be abandoned and backfilled. The investigation revealed that the subsoil along the sewer channel, up to some 25 feet depth, has a very low shear strength. As was stated already earlier that the height of the embankment above the existing groundlevel in this region is about 20 ft. Before any fill is placed the open sewer channel will have to be backfilled and the ground levelled off. It is emphasized here that the sewer has to be backfilled first, and backfilled to at least 300 feet away from the future embankment toe. The filling operation should be commenced from the most convenient place and carried out both in the upstream and downstream direction. The material that will displace under the weight of the fill will form a mud wave which should be removed by a dredgeline in order to enable further displacement of the very soft material. Before the backfill operation begins a diversion channel or some other arrangement for the sewer has to be completed.

5.4 Sta. 409+00 to Sta. 419+00

The investigation has shown that only between Sta. 414+00 and Sta. 416+00 some organic matter, clinders and ashes are found. Elsewhere no appreciable amounts were encountered. The soil conditions in this

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.4 Sta. 409/00 to Sta. 419/00

section are more favourable than those of the sections described earlier and it is therefore suggested that the normal construction procedure be used, i.e., no surcharge be placed. Before placing the fill, the whole area between Sta. 412/00 and Sta. 417/00 should be compacted with a roller of up to 50 tons capacity. The fill material should be placed in layers and compacted to the required density.

6. SUMMARY:

This report deals with the Onedoke Expressway between Sta. 388/00 and Sta. 419/00, which is part of the garbage dump area of the city of Hamilton.

Between Sta. 388/00 and Sta. 397/00 the garbage is of very recent origin and therefore not decomposed. This refuse which extends on the average to 8 feet below groundlevel should be excavated and replaced. The excavation should be carried out according to the D.H.O. Standards DD-406 and DD-407. Prior to placing the backfill, the trench should be compacted by means of a roller, the weight of which is gradually increased to 50 tons. The fill material that is subsequently placed should be placed in layers and compacted to the required density. Granular material should be used for the embankment. In order to speed up the settlements a 10 ft. surcharge should be placed on top of the embankment between Sta. 387/00 and Sta. 400/00 and left there as long as possible. The surcharge material need not be compacted. Settlement plates should be installed at Sta. 394/00 and Sta. 398/00.

Between Sta. 400/00 and 409/00 the ground should be compacted by means of an up to 50 tons roller prior to placing the fill material. No surcharge is foreseen here because of the very low factor

6. SUMMARY: (Cont'd.) ...

of safety of the embankment fill. To find out whether and when surcharge can be placed settlement plates and piezometers should be installed at Sta. 403/00, 406/80 and 408/50.

Between Sta. 409/00 and 419/00 the embankment is relatively low and no surcharge is foreseen. The ground should also be compacted prior to placing the fill.

The existing sewer channel is being abandoned and realigned. The old channel should be filled up to groundlevel to at least 300 feet from the toe of the new road embankment prior to placing the fill. By that time a suitable sewer diversion arrangement should already be finished.

To minimize the inconvenience caused by the bad odor developed during the excavation and haulage of the garbage, a suitable deodorant spray should be applied.

7. MISCELLANEOUS:

The field investigation was carried out during the period of Dec. 1959, to April 1960, under the supervision of Messrs: I. Johnston, F. Norman, B. Ghadiali, K. Selby and M. Devata project engineers of the Foundation Section of the D.H.O. Part of the work was carried out using hired equipment from Johnston Drilling Company and Canadian Longyear Co. Ltd., and the remainder, using the D.H.O. equipment.

SEPT. 1960.

REPORT PREPARED BY: *M. Devata*
M. Devata
Project Pdn. Engineer

REPORT APPROVED BY: *A. Sternac*
A. Sternac
Foundation Office Engineer

APPENDIX I

HUGH Q. GOLDER P.E.
CONSULTING CIVIL ENGINEER

Consulting Civil Engineer

1722A AVENUE ROAD

TORONTO 12

PHONE 7-1111

July 29th. 1960

Mr. A. Butka,
Department of Highways,
Parliament Buildings,
Toronto.

Dear Sir,

Chedoke Expressway

This letter is to record the agreement reached with your engineers on our joint visit to the area in which the above proposed road crosses the garbage dump at Hamilton.

The visit was made on July 29th. and four holes were dug with a backhoe at different points on the centre-line.

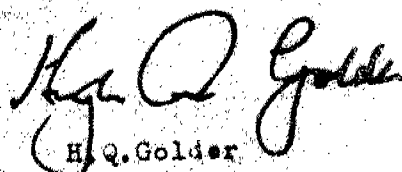
Pit No.1 was near borehole 33, Pit No.2 was near borehole 29, Pit No.3 was near borehole 625 at chainage 405+60, and Pit No.4 was between boreholes 16 and 38.

At pits 2,3 and 4, the garbage can be left in position. It should be pre-loaded by a bank of good granular material to a height about 10 feet greater than the height of the proposed road embankment. The longer this can be left in place the better. The red Queenston Shale will be suitable for this purpose.

At pit 1, the garbage is quite recent having been placed in January of this year. This refers to the top seven feet of garbage. This material has not rotted, has a very bad smell, and cannot be left in position under a roadway. It must be removed. The material below seven feet can be left in, but should be pre-loaded as suggested above.

In general the length over which the garbage is to be removed is from chainage 398 to 390 - new chainages. The volume to be removed is about 30,000 cu.yds. The operation will need to be carefully planned and carried out quickly because of the nuisance due to the bad smell of the garbage.

Yours faithfully,


H. Q. Golder

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

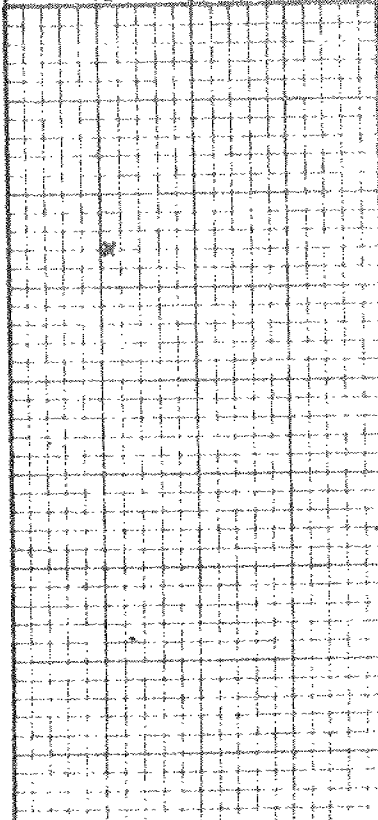
W.F. 231-58-2 BORE HOLE NO. 3
JOB 60-F-7 (B) STATION 21+00 E
DATUM 259.0' COMPILED BY B. K.
BORING DATED Dec. 22/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	↓ Groundlevel	259.0	0	25	50 75 100
	Sand & gravel (fill)	254.0			
	Decayed Refuse-Loose-dark brown	253.0			
		249.0	10		
	Sandy clay with decayed refuse-med. stiff-Brown	239.0	20		
	Silty clay - stiff - Brown	232.5	30		
	End of borehole		40		
			50		
			60		
			70		
			80		

CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.					
20	40	60	80		
				S1	
				S2	
				S3	

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 4

JOB 60-P-7 H

STATION 419+00 E. BLVD

DATUM 257.0'

COMPILED BY B. K.

BORING DATE Dec. 22/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE _____
2" SHELBY TUBE _____
2" SPLIT TUBE _____
2" DIA. CONE _____
2" SHELBY _____
CASING _____

LEGEND

1/2 UNCONFINED COMPRESSION (Qu) _____ O
VANE TEST (C) AND SENSITIVITY (S) _____ +
NATURAL MOISTURE AND LIQUIDITY INDEX _____ LI
LIQUID LIMIT _____ X
PLASTIC LIMIT _____

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	BLOWS/FT.
	↓ Groundlevel	257.0	0	25 50 75 100	
	Sand & gravel (fill)	252.0			
	Organic matter with sand, Soft, dark brown	239.0	10		
	Sand with excessive silt particles, Med. Dense to Dense, Brown	230.5	20		
	End of borehole		30		

CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.		
	S1	-
	S2	-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.F. 231-58-2

BORE HOLE NO. #13

JOB 60-P-7 B

STATION 413+50 (50ft Lt C)

DATUM 254.0'

COMPILED BY B.K.

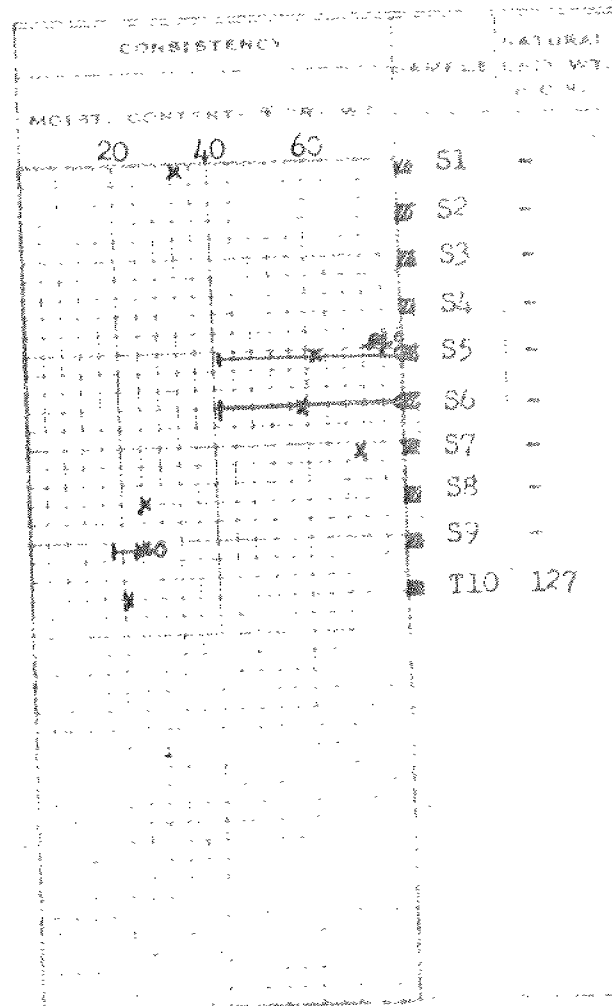
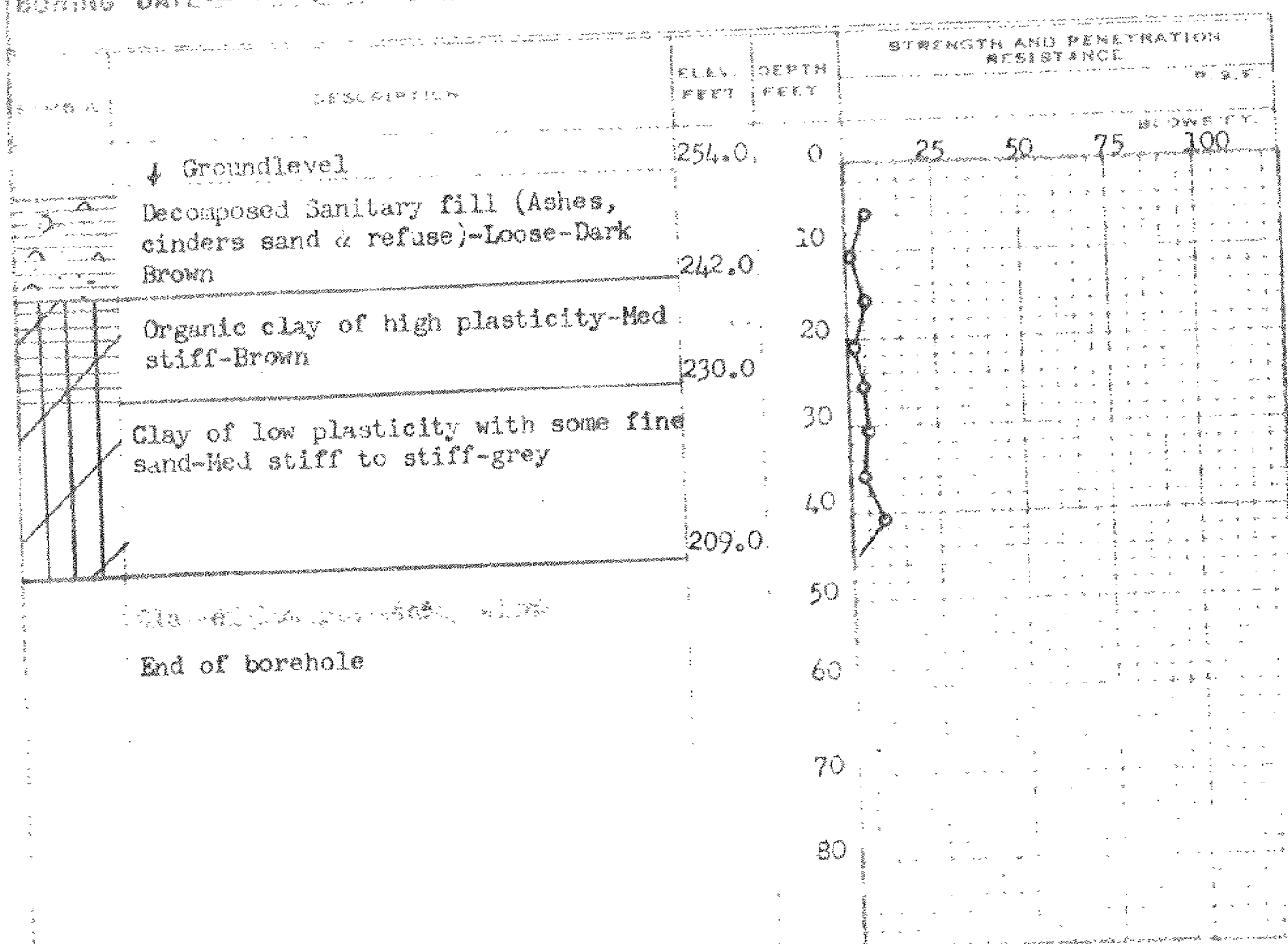
BORING DATE Mar. 18/60

CHECKED BY

2" DIA SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) O
VANE TEST (C) AND SENSITIVITY (S) +
NATURAL MOISTURE AND LIQUIDITY INDEX 1
LIQUID LIMIT
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-F-7 B

DATUM 254.0'

BORING DATE Mar. 22/60

BORE HOLE NO. 5

STATION 409+00 8' 11" of E BLVD

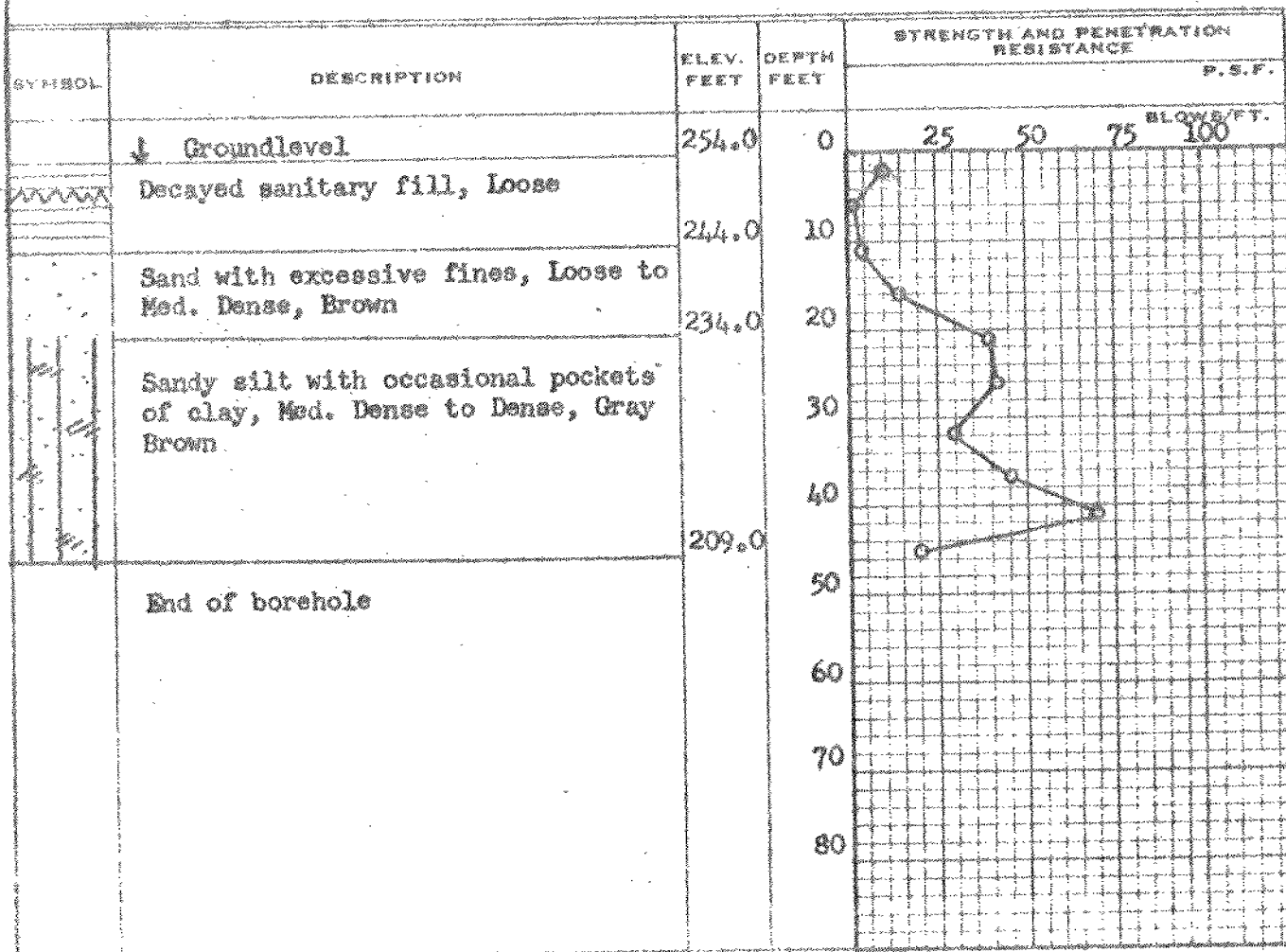
COMPILED BY B. K.

CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.					
20	40	60	80		
				S1	
				S2	
				S3	
				S4	
				S5	
				S6	
				S7	
				S8	
				S9	
				S10	

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. #16

JOB 60-F-7 B

STATION 416+00 (43' Lt of E BLVD)

DATUM 253.0'

COMPILED BY B.K.

BORING DATE Mar. 21/60

CHECKED BY H.D.

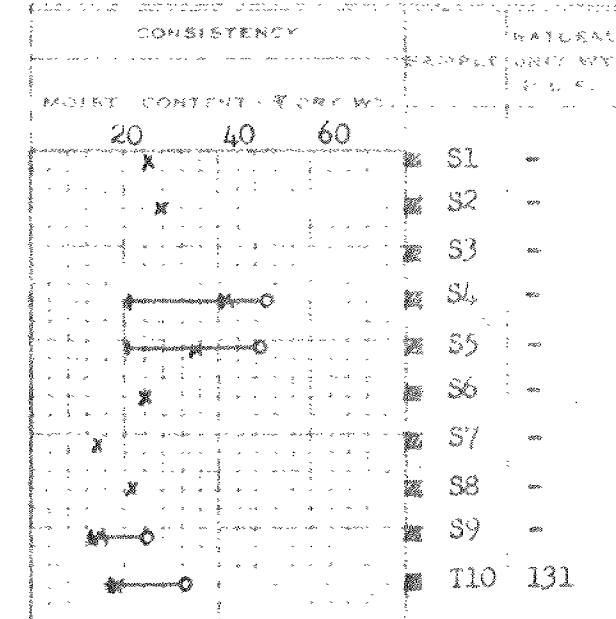
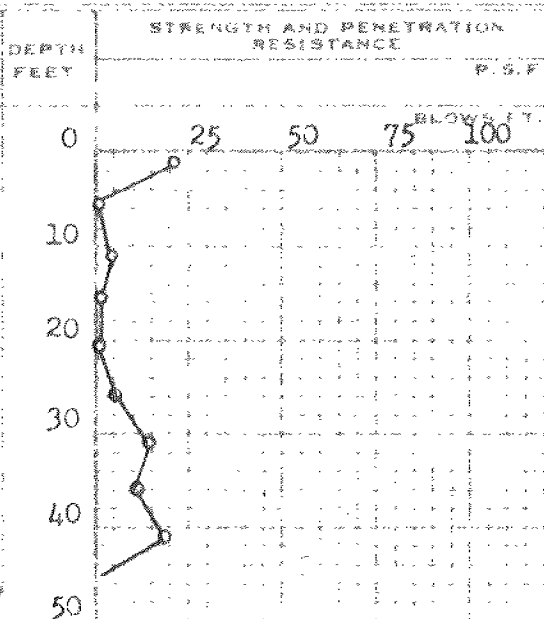
2" DIA SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT

DEPTH FEET	DESCRIPTION	ELEV. FEET
0	↓ Groundlevel	253.0
10	Decomposed Sanitary fill (mostly ashes with sand, clay & refuse Loose	246.5
20	Clay of Intermediate plasticity-occasional pockets of organic matter-soft-Brown	239.0
30	Sand with excessive fines-Loose to Med Dense-Brown	228.0
40	Clay of low plasticity-Soft to Med Stiff-occasional pockets of sand-grey	219.0
50		205.0

End of borehole



DEPARTMENT OF HIGHWAYS - ONTARIO

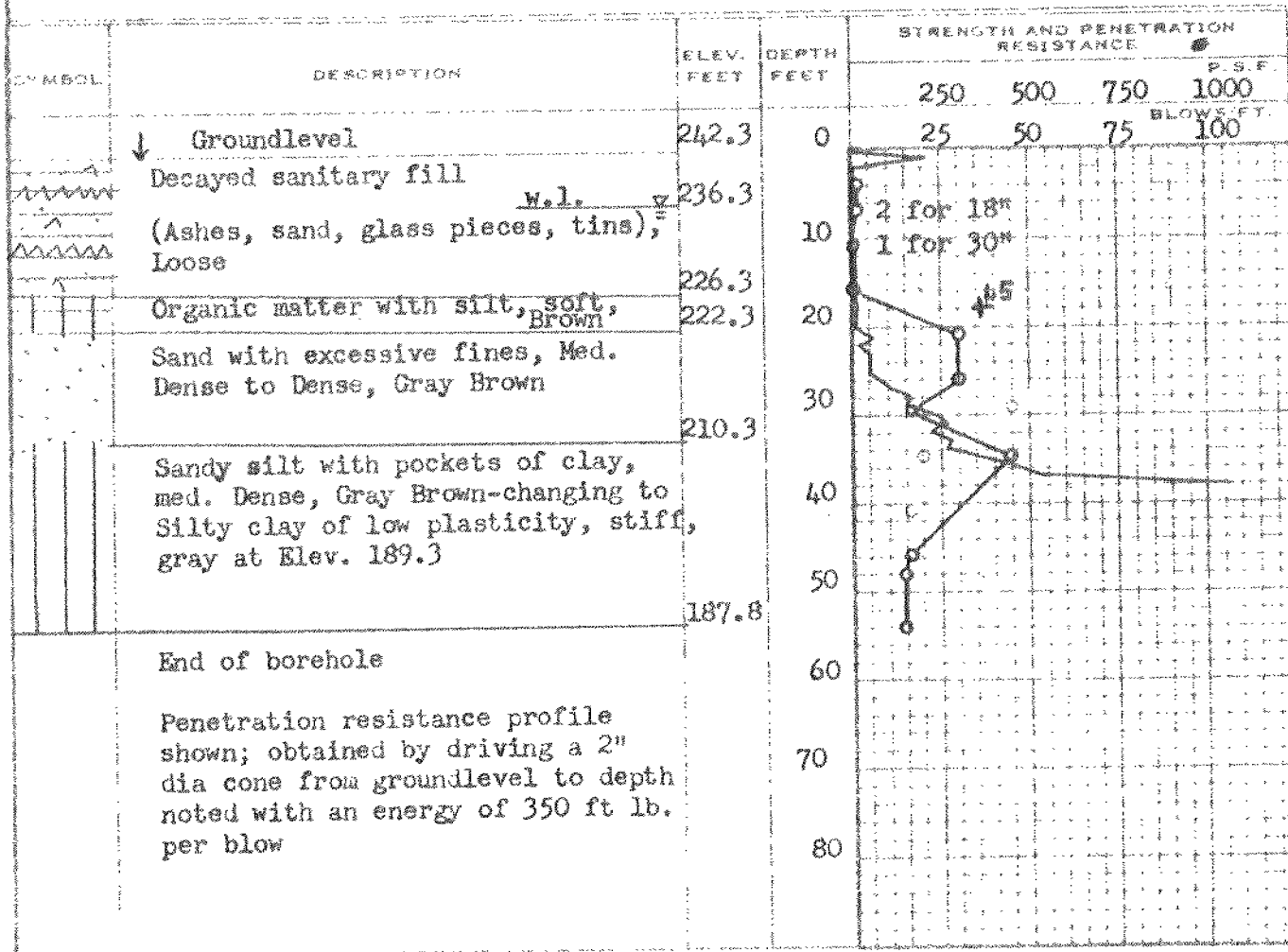
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. 21
 JOB 60-F-7 B STATION 408+58 (4 ft Lt of B)
 DATUM 252.3' COMPILED BY B. K.
 BORING DATE Mar. 25/60 CHECKED BY M. D.

2" DIA SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) \circ
 VANE TEST (C) AND SENSITIVITY (S) \times
 NATURAL MOISTURE AND LIQUIDITY INDEX \square
 LIQUID LIMIT \square
 PLASTIC LIMIT \square



CONSISTENCY				NATURAL	
MOIST. CONTENT - % DRY WT.				SAMPLE UNIT WT	
20	40	60	80	P.C.F.	
				S1	-
				S2	-
				S3	-
				S4	-
				S5	-
				S6	-
				S7	-
				S8	-
				S9	-
				S10	-
				S11	-
				S12	-

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 231B-58

BORE HOLE NO. 22

JOB 60-F-7 B

STATION 410/10 E BLVD

DATUM 255.0'

COMPILED BY B. K.

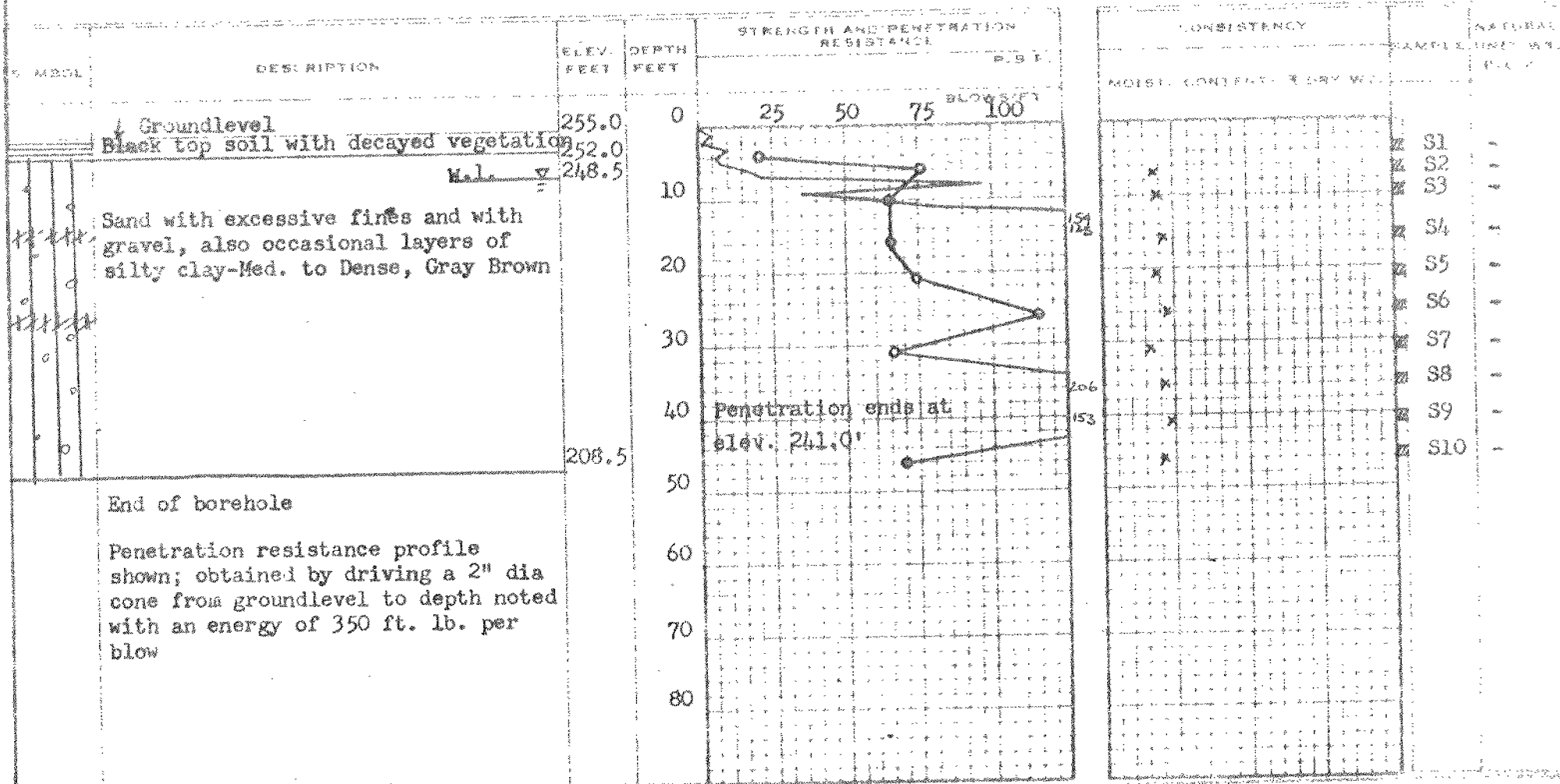
BORING DATE Mar. 28/60

CHECKED BY M. D.

2" DIA SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA CONE
2" SHELBY
CASING

LEGEND

1/2" UNCONFINED COMPRESSION (QU)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



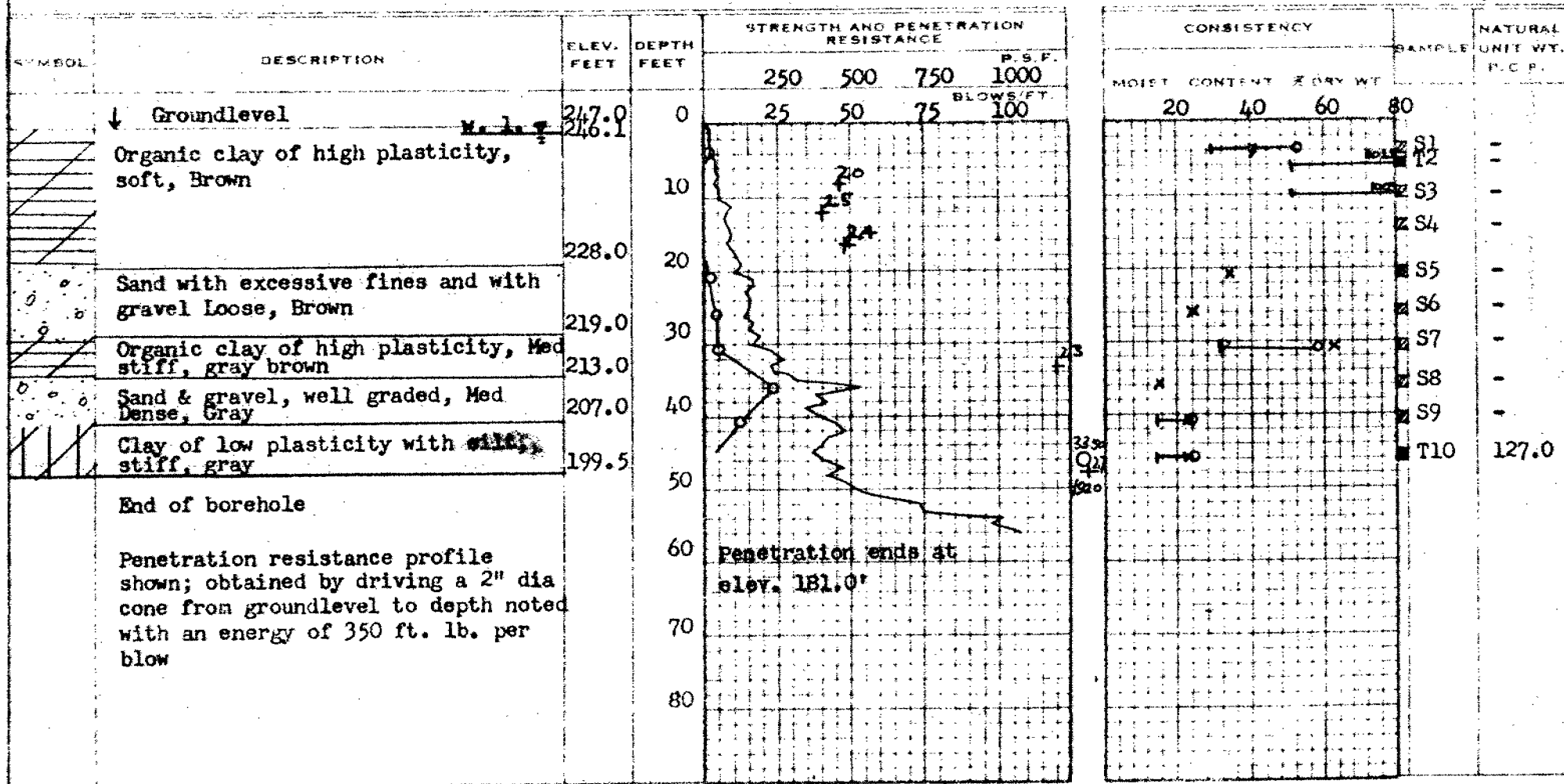
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. 23
JOB 60-F-7 B STATION 409+65 (156 ft Lt of E)
DATUM 247.0' COMPILED BY B. K.
BORING DATE Mar. 31/60 CHECKED BY M. D.

2" DIA SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) \circ
VANE TEST (C) AND SENSITIVITY (S) $+$
NATURAL MOISTURE AND LIQUIDITY INDEX \times
LIQUID LIMIT \circ
PLASTIC LIMIT $-$



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W F 231-58-3

BORE HOLE NO. 24

JOB 60-F-7 B

STATION 408+60 (85 ft Rt of C)

DATUM 246.5'

COMPILED BY B. K.

BORING DATE Mar. 30/60

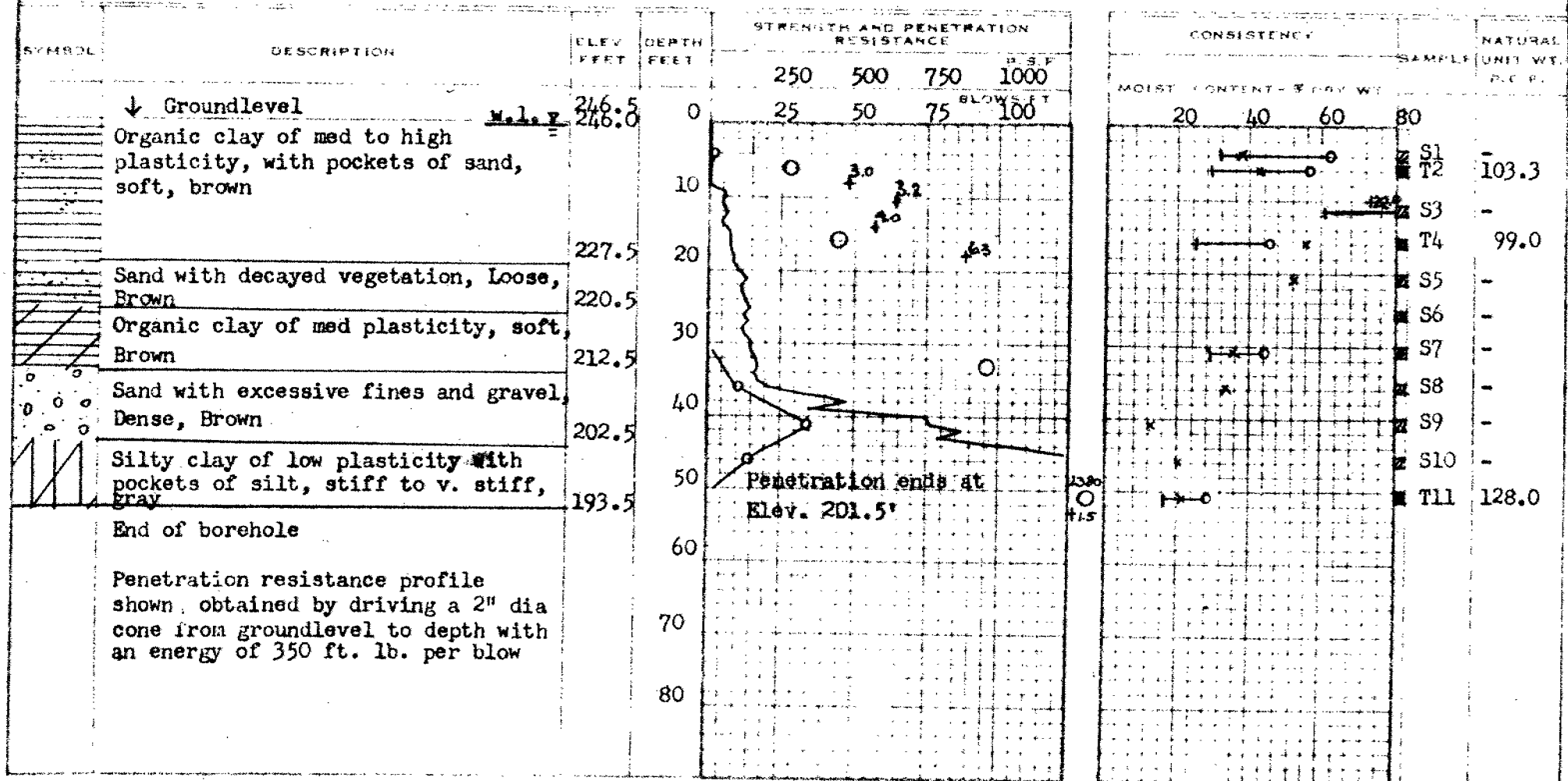
HECKED BY H. D.

(EBL)

2" DIA. SPLIT TUBE
2" SHE. BY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHE. BY
CASING

LEGEND

UNCONFINED COMPRESSION (QU) (O)
VANE TEST (G) AND SENSITIVITY (S) (+)
NATURAL MOISTURE AND LIQUIDITY INDEX (X)
LIQUID LIMIT (—)
PLASTIC LIMIT (—)



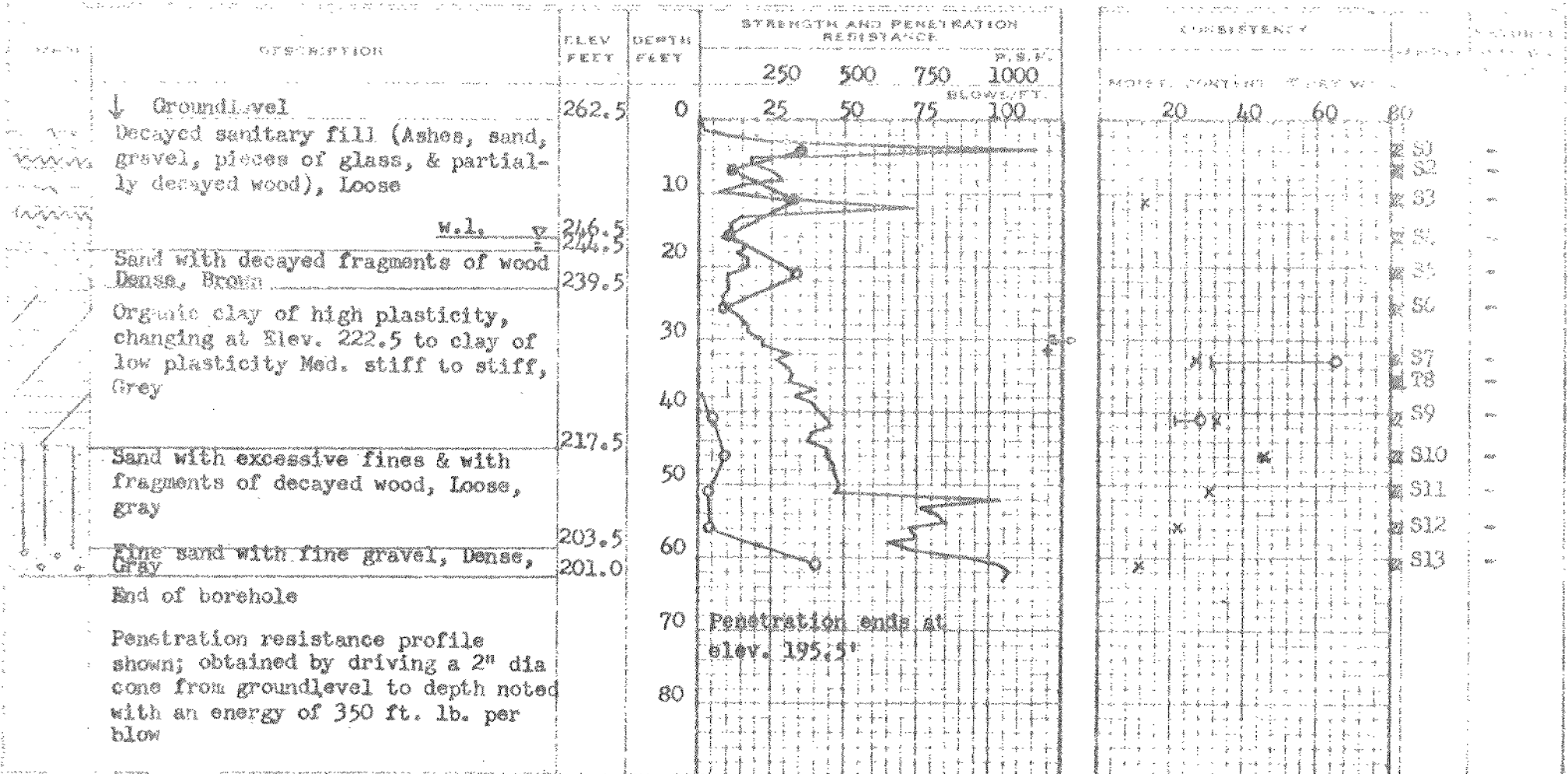
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

NO. 23-58-2 BORE HOLE NO. 25
 NO. 60-F-7 B STATION 400+15 (35 ft. of E.)
 ELEV. 262.5' COMPILED BY B. K.
 BORING DATE Apr. 13/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE
 2" SHEET PILE TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHEET PILE
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (C_u)
 VANE TEST (C_v) AND SENSITIVITY (S_v)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.H. 231-58-2

BORE HOLE NO. 26

JOB 60-F-7 B

STATION 401/15 (55th of E)

DEPTH 262.0'

COMPILED BY B. K.

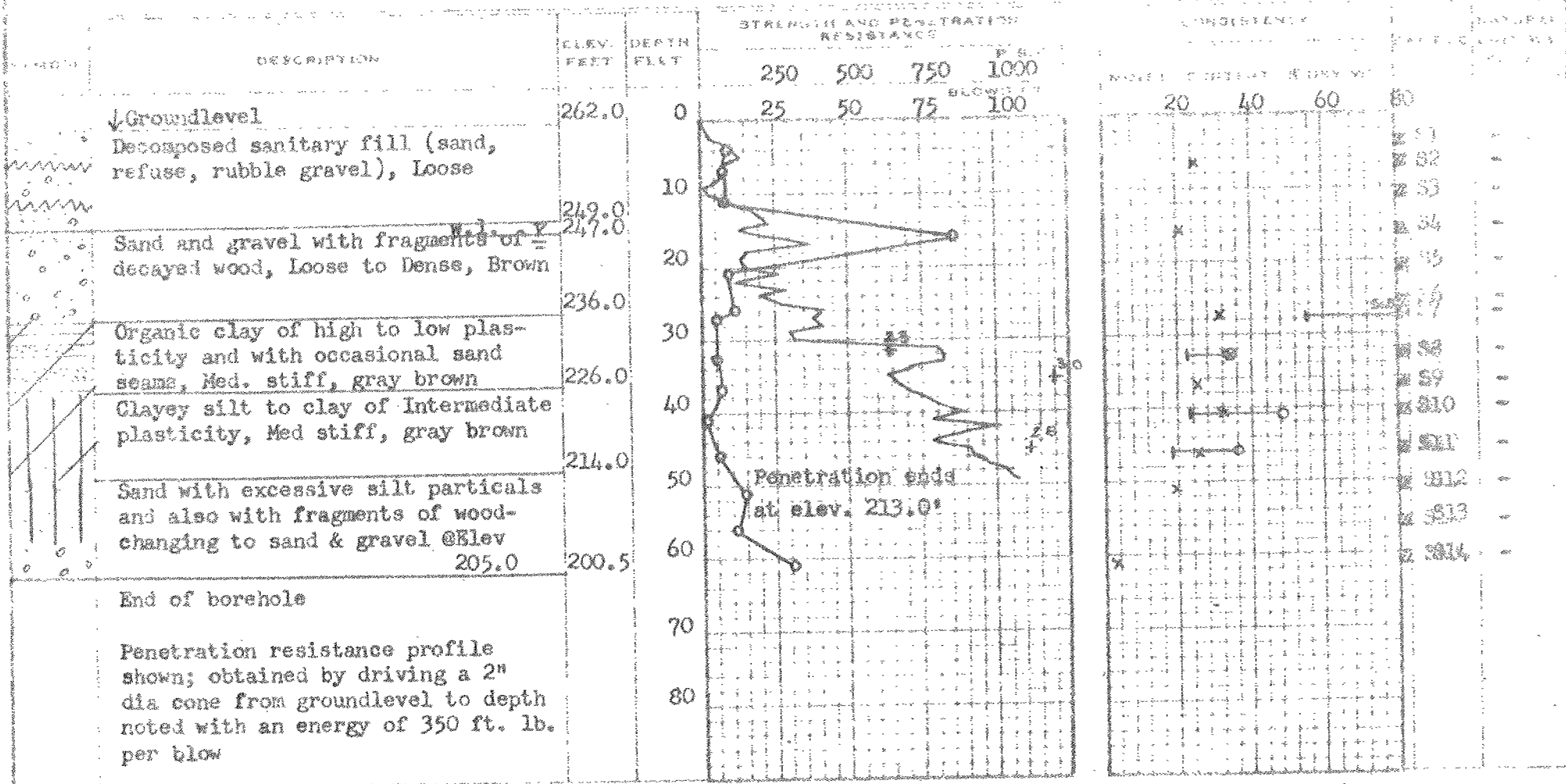
WORKING DATE Apr. 1/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

UNCONFINED COMPRESSION (QU)
PAVE. TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQ. LIMIT
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

R 231-58-2

BORE HOLE NO. 28

JOB 60-F-7 B

STATION 397+15 (4ft Lt of C)

SECTION 262.0'

COMPILED BY B. K.

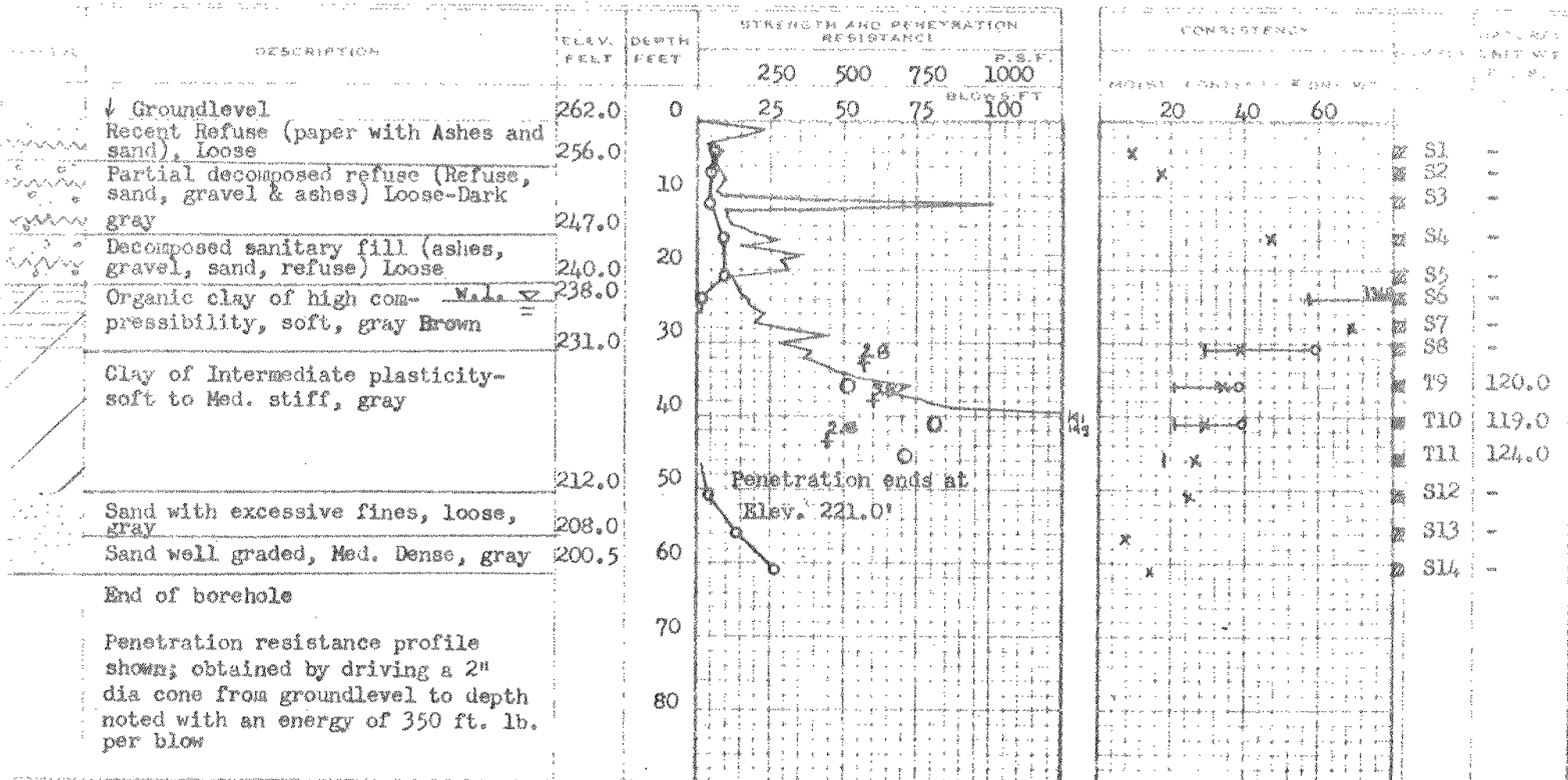
BOHRING DATE Apr. 11/60

CHECKED BY H. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASIN

LEGEND

UNCONFINED COMPRESSION (Qu)
VANE TEST (C) AND SEAS (D) (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 27

JOB 60-F-7 B

STATION 399+15 (4th Rt. of E.)

DATUM 262.5'

COMPILED BY B. K.

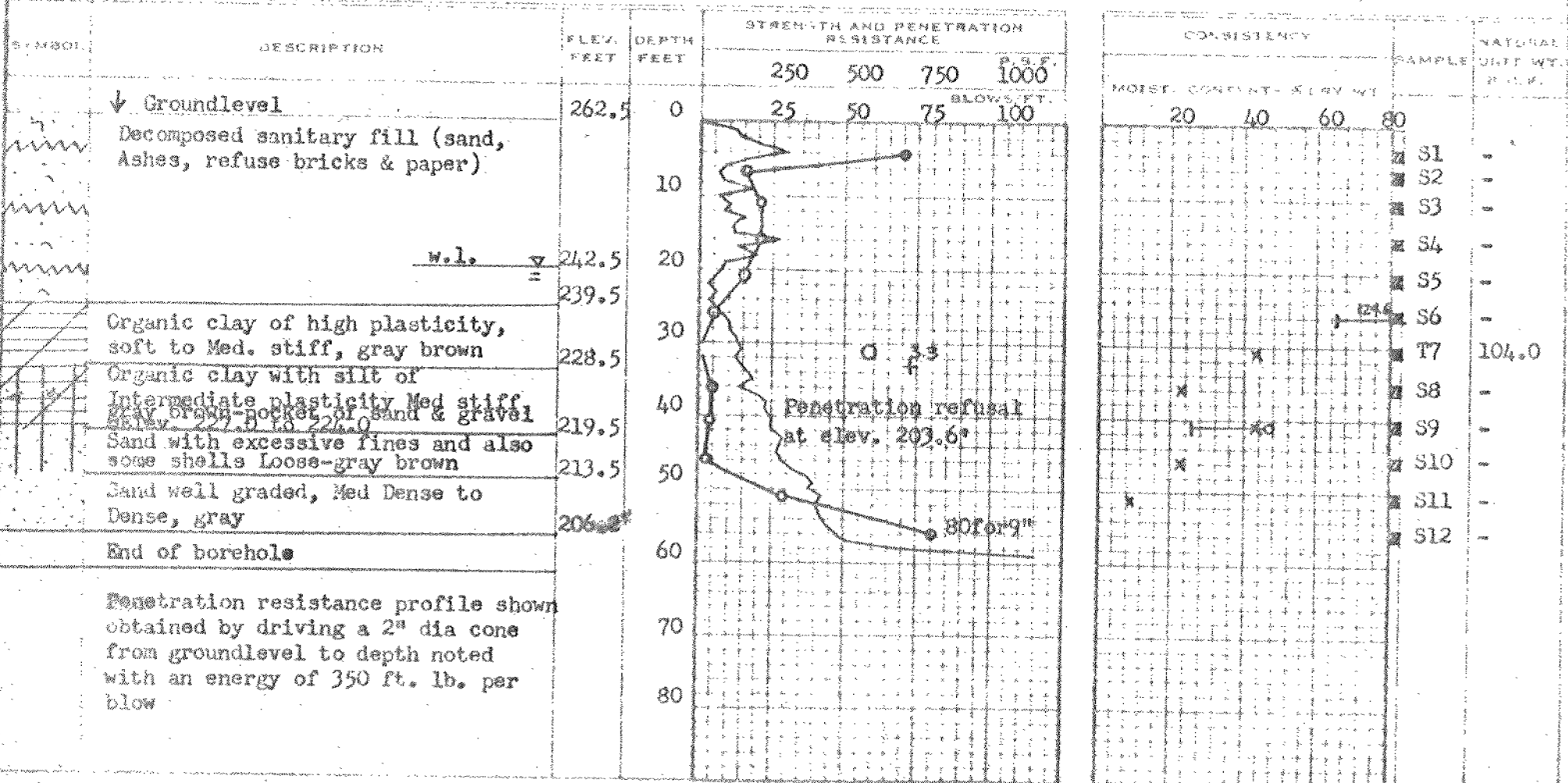
BORING DATE Apr. 5/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

D.P. 231-58-2

BORE HOLE NO. 29

FOR 6-7 B

STATION 398/15 (7 ft. E. of E)

ELEV. 261.0'

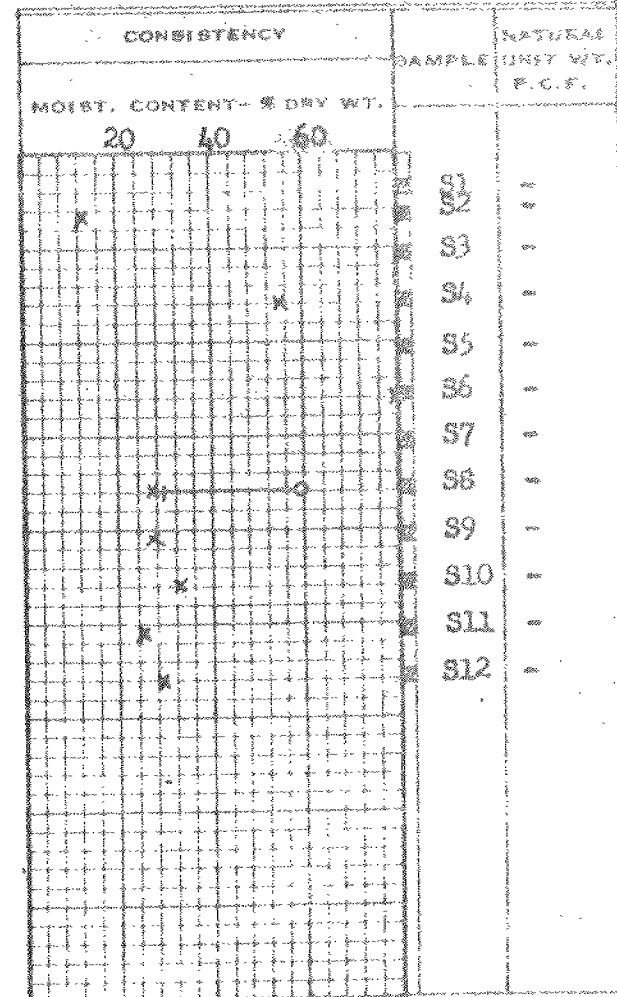
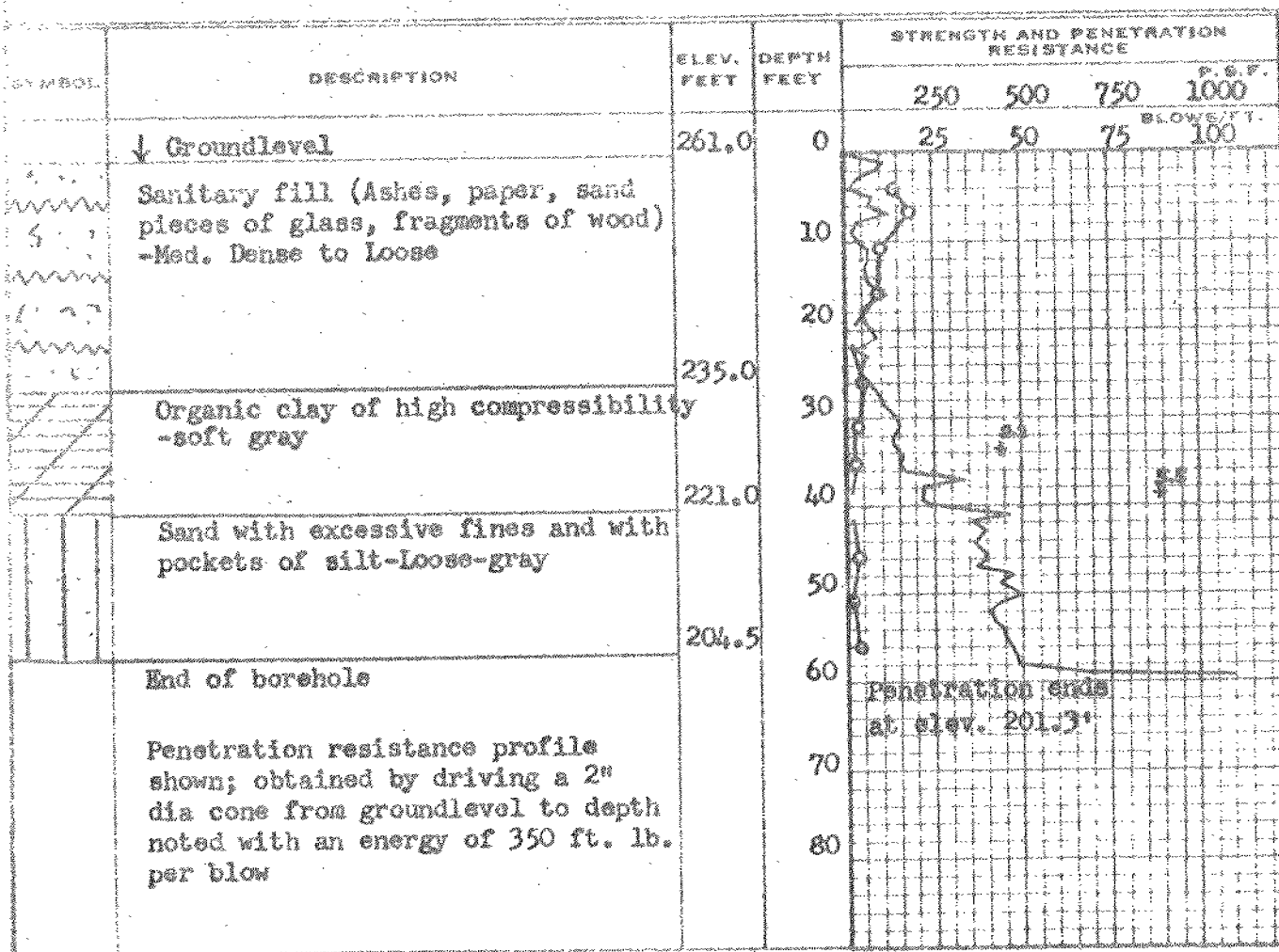
COMPILED BY B. K.

BORING DATE Apr. 7/60

CHECKED BY M. D.

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u) \bigcirc
VANE TEST (C) AND SENSITIVITY (S) \times
NATURAL MOISTURE AND LIQUIDITY INDEX \times
LIQUID LIMIT \times
PLASTIC LIMIT \times



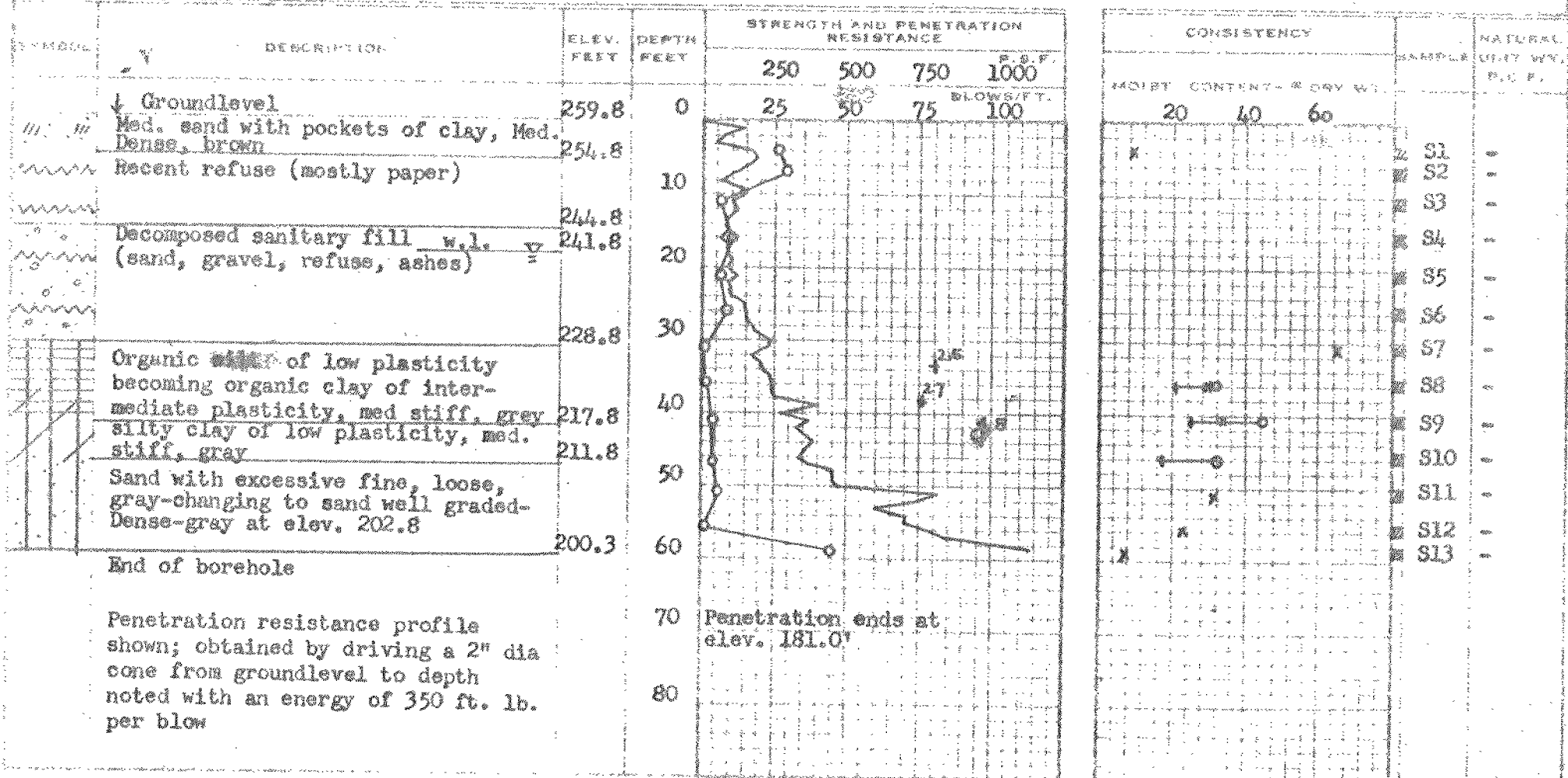
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. 30
 JOB 60-7-B STATION 396+00 (371 ft of 6)
 ELEV. 259.8' COMPILED BY B. K.
 BORING DATE Apr. 12/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO. 31

60-F-7 B

STATION 396+95 (11 ft Lt of E)

REFUM 258.5'

COMPILED BY B. K.

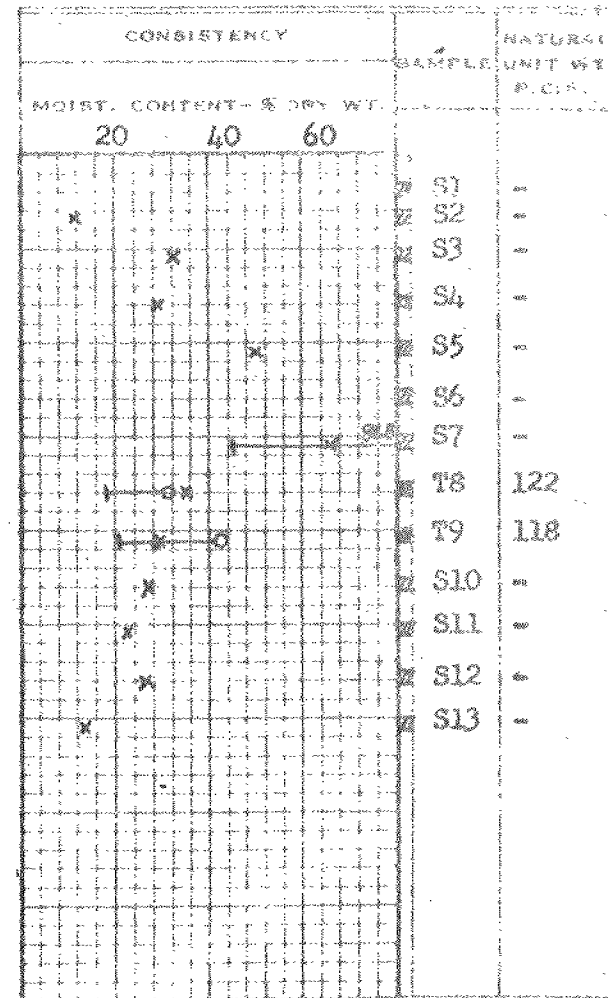
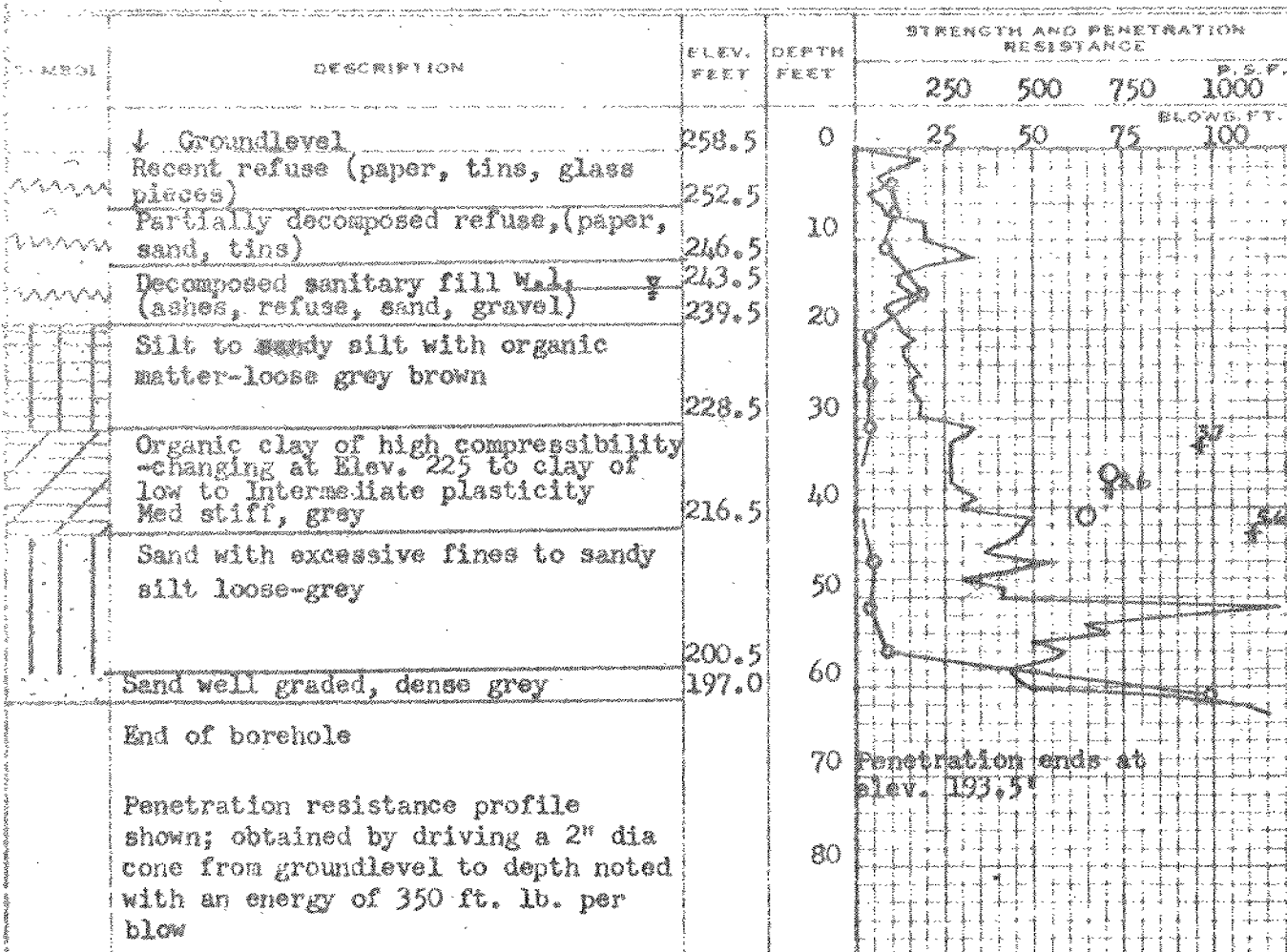
WORKING DATE Apr. 12/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) \bigcirc
VANE TEST (C) AND SENSITIVITY (S) \times
NATURAL MOISTURE AND LIQUIDITY INDEX ∇
LIQUID LIMIT \sim
PLASTIC LIMIT $-$

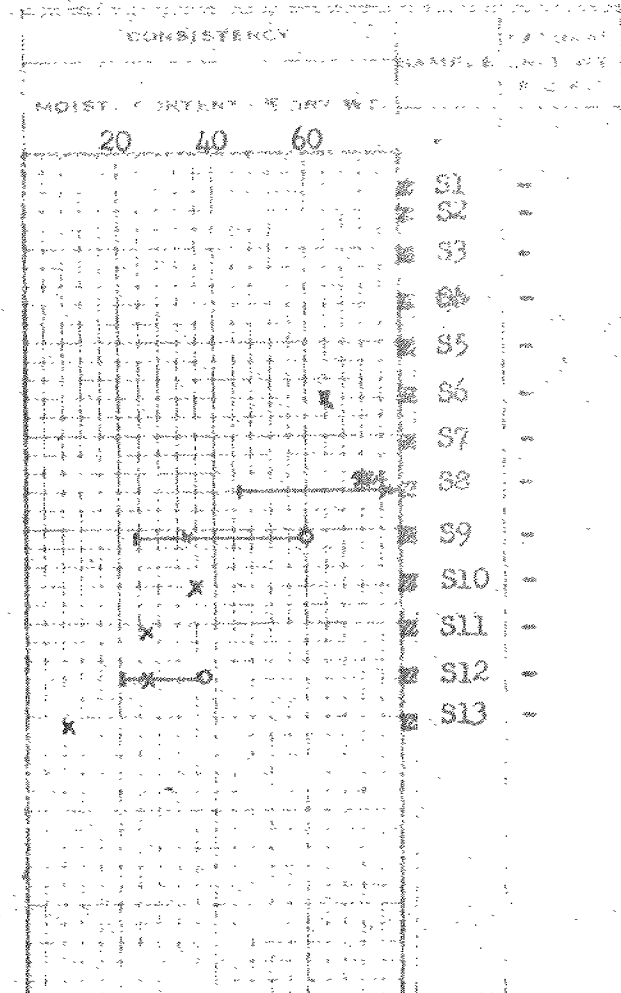
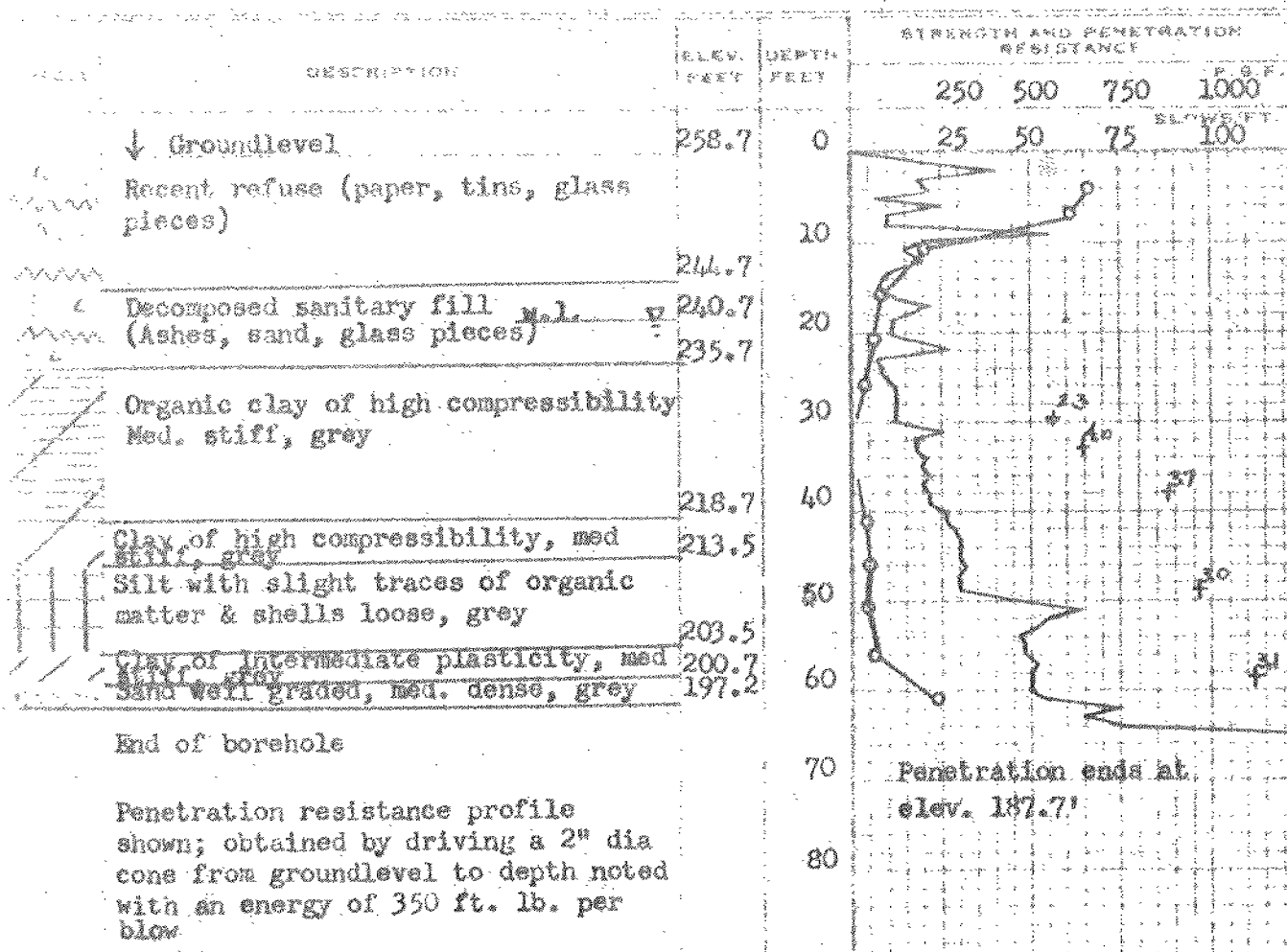


DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

P 231-58-2 BORE HOLE NO. 32
 60-F-7-B STATION 397/05 (18th Rt of E)
 258.7' COMPILED BY B. K.
 DATE Apr. 14/60 CHECKED BY M. D.

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

231-58-2

BORE HOLE NO. 33

60-F-7 B

STATION 393/05 (18ft. 11 of E)

ELEV. 258.5

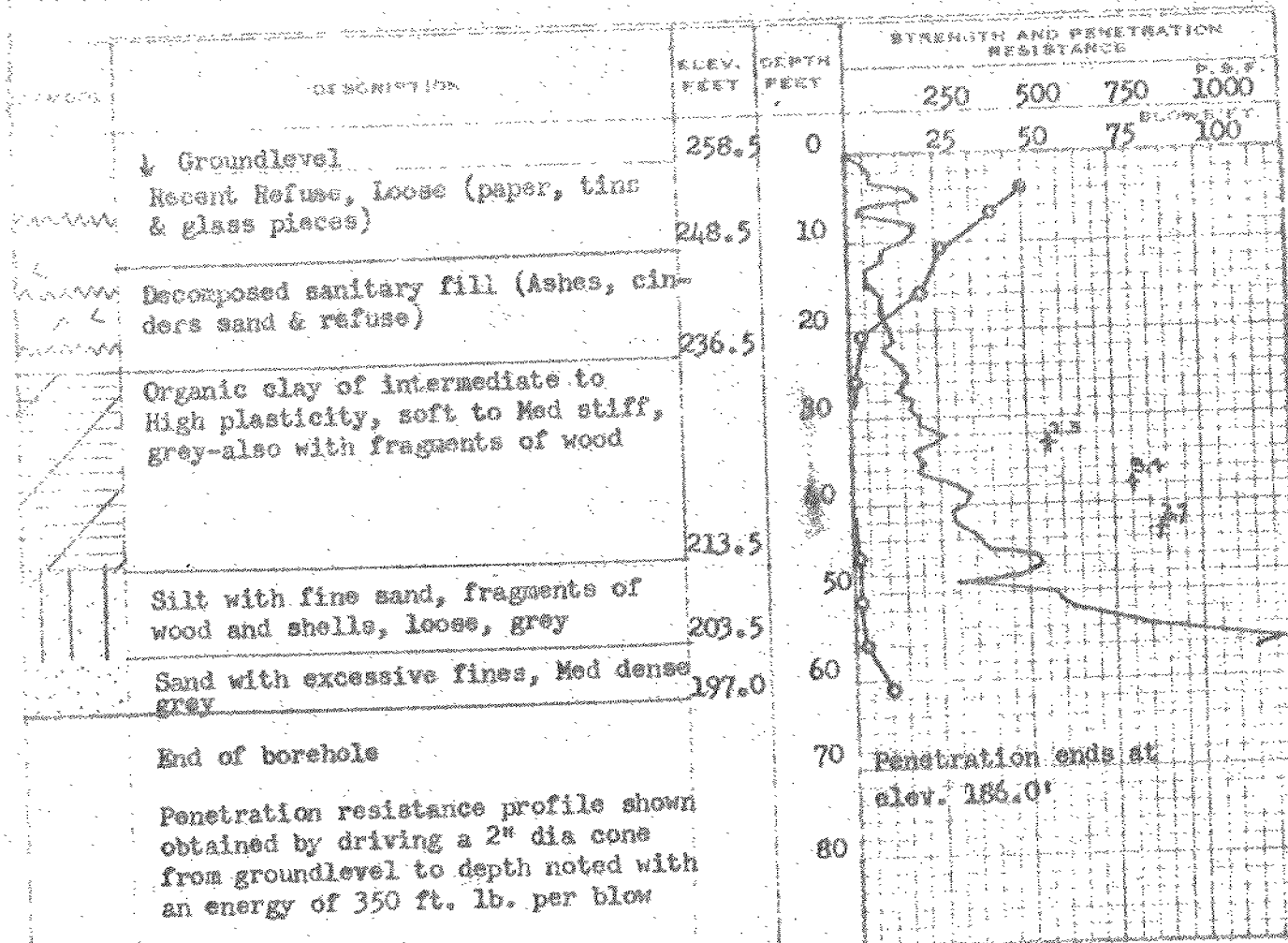
COMPILED BY B. K.

BORING DATE Apr. 20/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (C) O
VANE TEST (C) AND SENSITIVITY (S) S
NATURAL MOISTURE AND LIQUIDITY INDEX L
LIQUID LIMIT X
PLASTIC LIMIT X


CONSISTENCY		NATURAL
MOIST. CONTENT - % DRY WT		UNIT WT
20	40	60
		S1
		S2
		S3
		S4
		S5
		S6
		S7
		S8
		S9
		S10
		S11
		S12
		S13

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 34

SSB 60-F-7 B

STATION 391+55 (37th of E)

W.P. 259.0'

COMPILED BY B. K.

DRIVING DATE Apr. 22/60

CHECKED BY M. D.

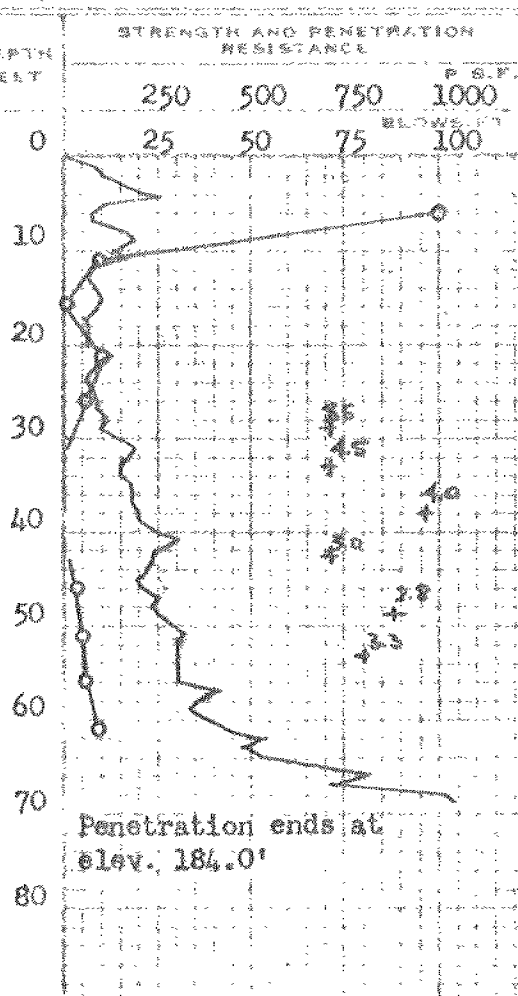
2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT

DESCRIPTION	ELEV. FEET	DEPTH FEET
↓ Groundlevel	259.0	0
Recent Refuse (paper, tins, cardboard, rubble)	247.0	10
Decomposed Sanitary fill (sand, Ashes, tins)	235.0	20
Organic clay of high compressibility soft to Med Stiff, grey-occasionally with fragments of wood & shells	236.0	30
Clayey Silt changed at Elev. 209.0 to clay of Intermediate to High plasticity, Med stiff, grey	220.0	40
Sand well graded, Loose, gray	201.0	50
End of borehole	198.5	60

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



CONSISTENCY	NATURAL
MOIST CONTENT & DRY WT.	SAMPLE UNIT WT. P.C.F.
20 40 60	
	S1 -
	S2 -
	S3 -
	S4 -
	S5 -
	S6 -
	S7 -
	S8 -
	S9 -
	S10 -
	S11 -
	S12 -

LEGEND

BORE HOLE NO. 35.

STATION 389+55 (30ft. It. of 6) 2" DIA. SPLIT TUBE

COMPILED BY B. K.

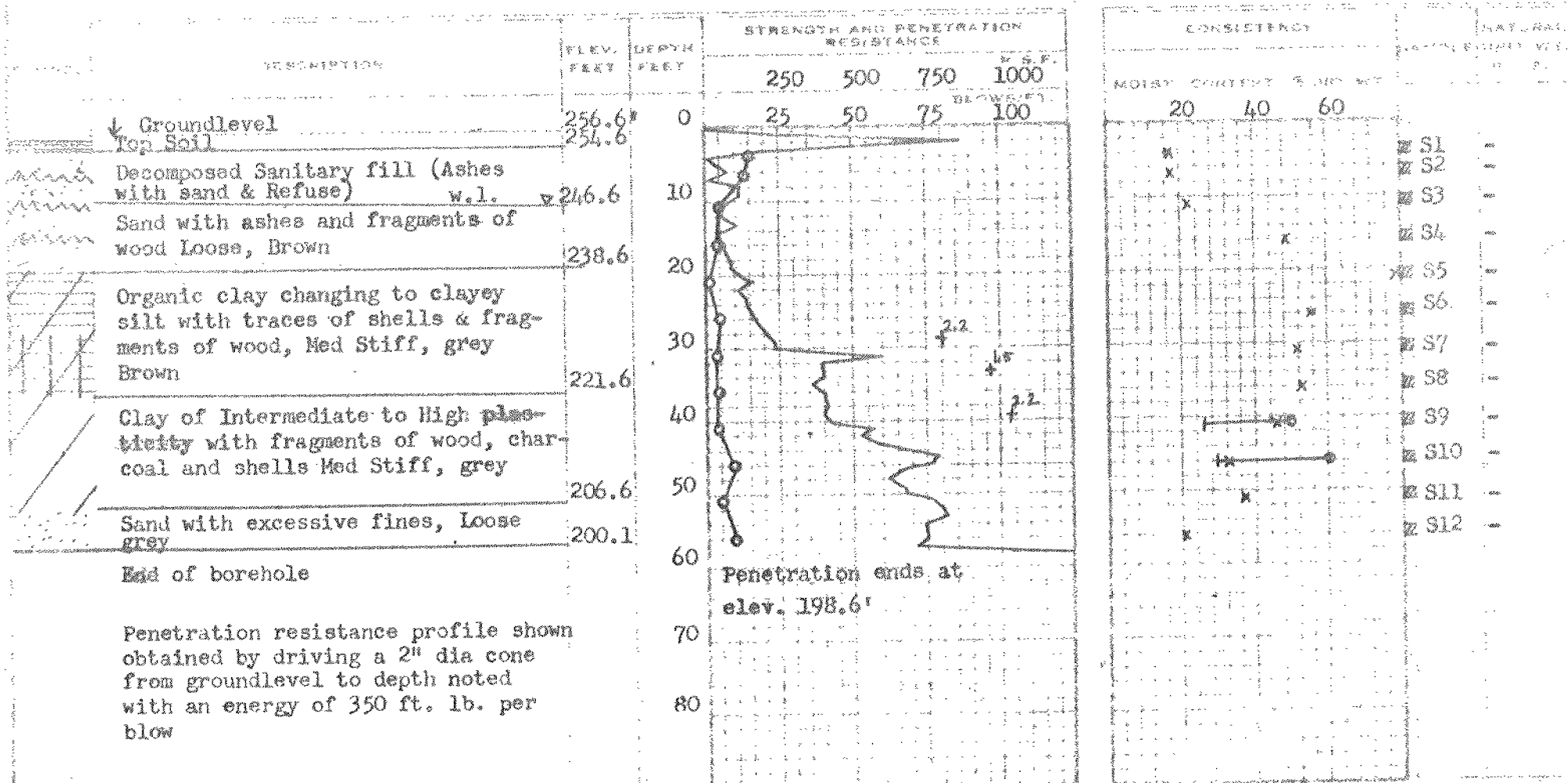
CHECKED BY... H. D.

2" DIA. SPLIT TUBE
2" SHELVEY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELVEY
CASING

```

1/2 UNCONFINED COMPRESSION (QU) _____ C
VANE TEST (C) AND SENSITIVITY (S) _____ +
NATURAL MOISTURE AND _____ U
LIQUIDITY INDEX _____ Y
LIQUID LIMIT _____
PLASTIC LIMIT _____

```



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

231-58-2

BORE HOLE NO. 36

860-F-7 B

STATION 410+00 E.W.B.L.

UM 260.5'

COMPILED BY B. K.

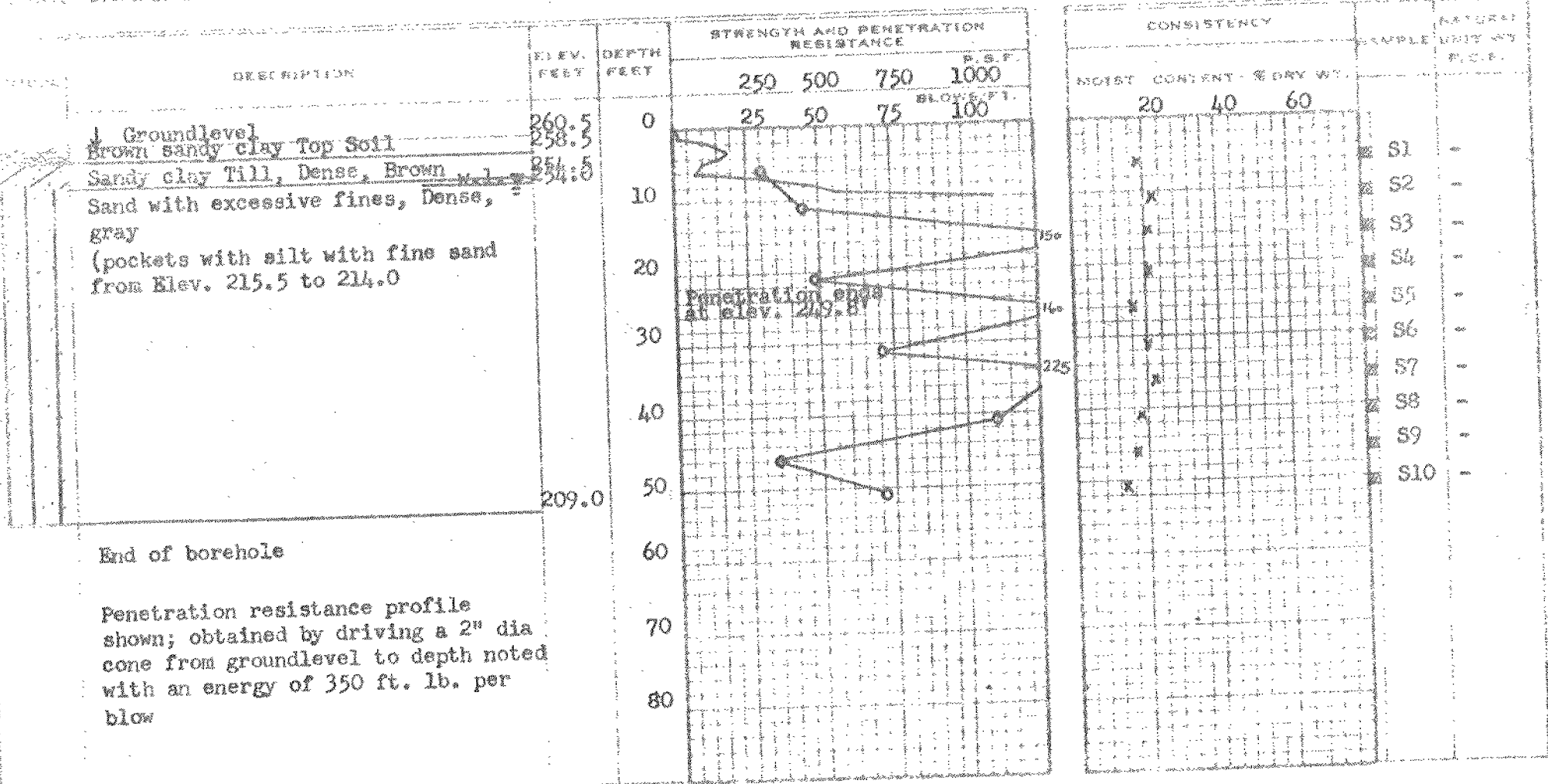
DATE Apr. 5/60

CHECKED BY K. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (C_u)
VALE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



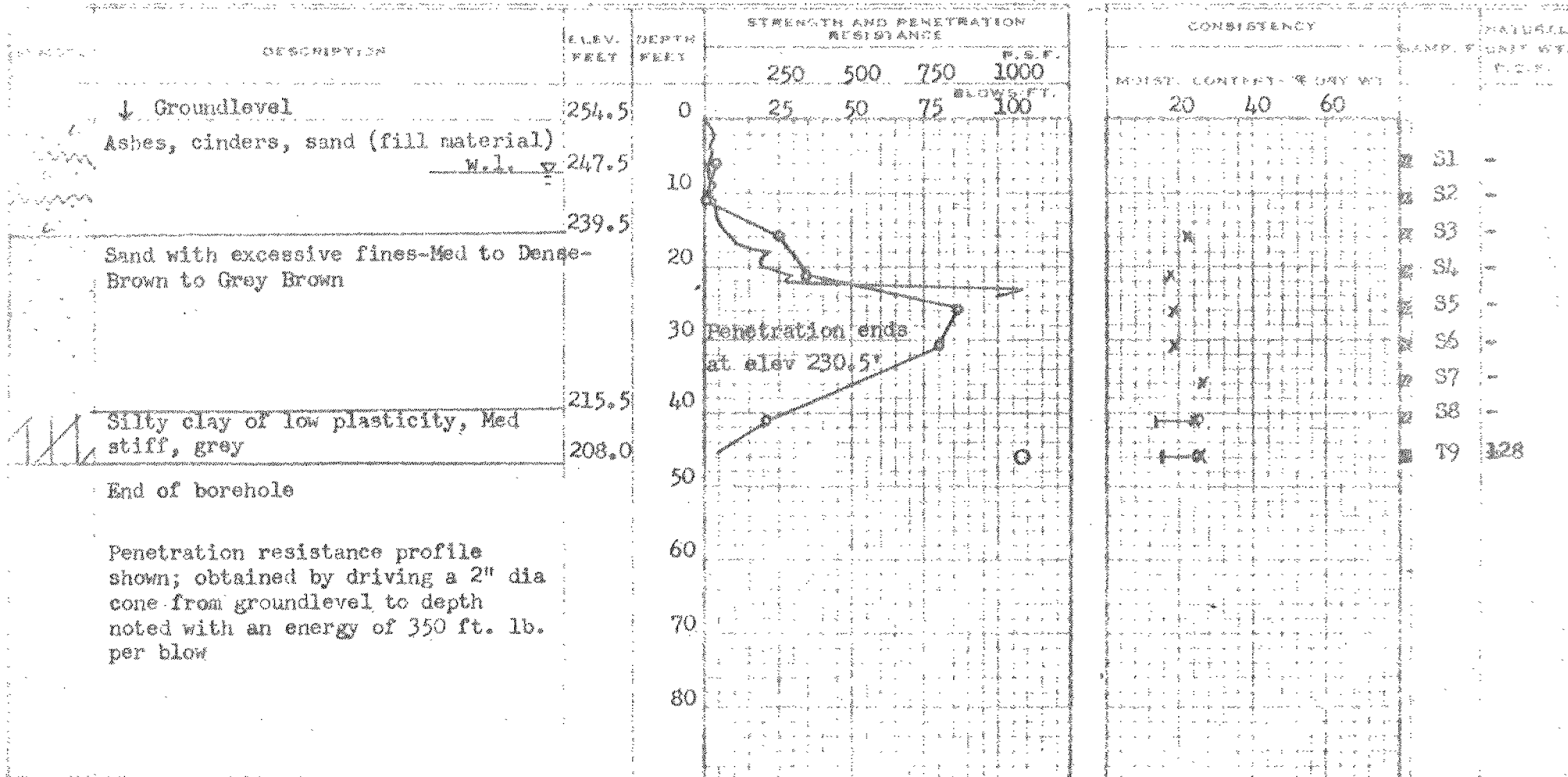
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

REF. 231-58-2 BORE HOLE NO. 37
 60-F-7 B STATION 410+00 E. B. L.
 ELEV. 254.5' COMPILED BY B. K.
 RECORDING DATE Apr. 6/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SHELBY
 CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU) O
 VANE TEST (C) AND SENSITIVITY (S) +
 NATURAL MOISTURE AND LIQUIDITY INDEX U
 LIQUID LIMIT X
 PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

231-58-2

BORE HOLE NO. 38

60-F-7 B

STATION 414+00 (E.B.L.)

255.0'

COMPILED BY B. K.

DATE Apr. 7/60

CHECKED BY H. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT

DESCRIPTION

ELEV. FEET

DEPTH FEET

STRENGTH AND PENETRATION RESISTANCE

250 500 750 1000

25 50 75 100

BLOW/FT.

CONSISTENCY

MOIST. CONTENT - % DRY WT.

20 40 60

NATURAL
SAMPLE UNIT WT.
P.C.T.

↓ Groundlevel

255.0

Ashes, cinders, decayed refuse
(fill material), Loose

w.l.

248.0

242.0

Organic clayey silt of high plas-
ticity, Med Stiff, grey Brown

225.0

Sand well graded, Dense, grey

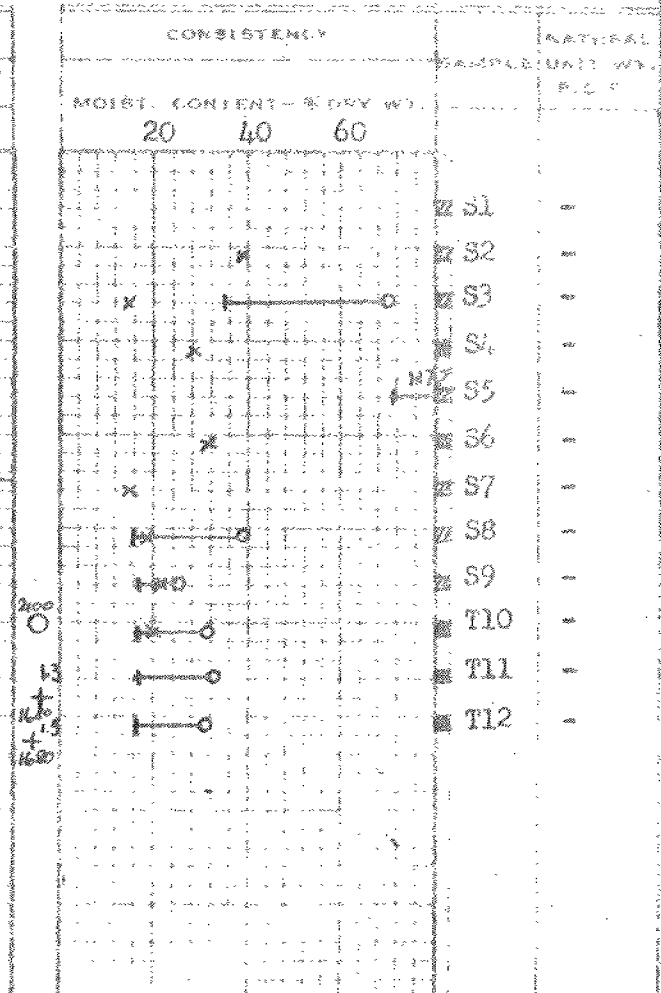
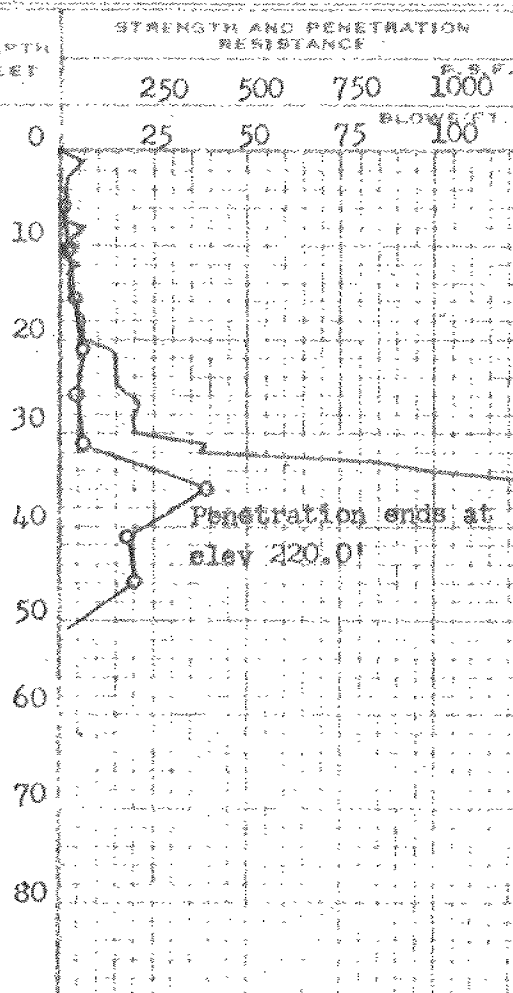
220.0

Clay of low plasticity, stiff, grey

192.0

End of borehole

Penetration resistance profile
shown; obtained by driving a 2"
dia cone from groundlevel to depth
noted with an energy of 350 ft. lb.
per blow



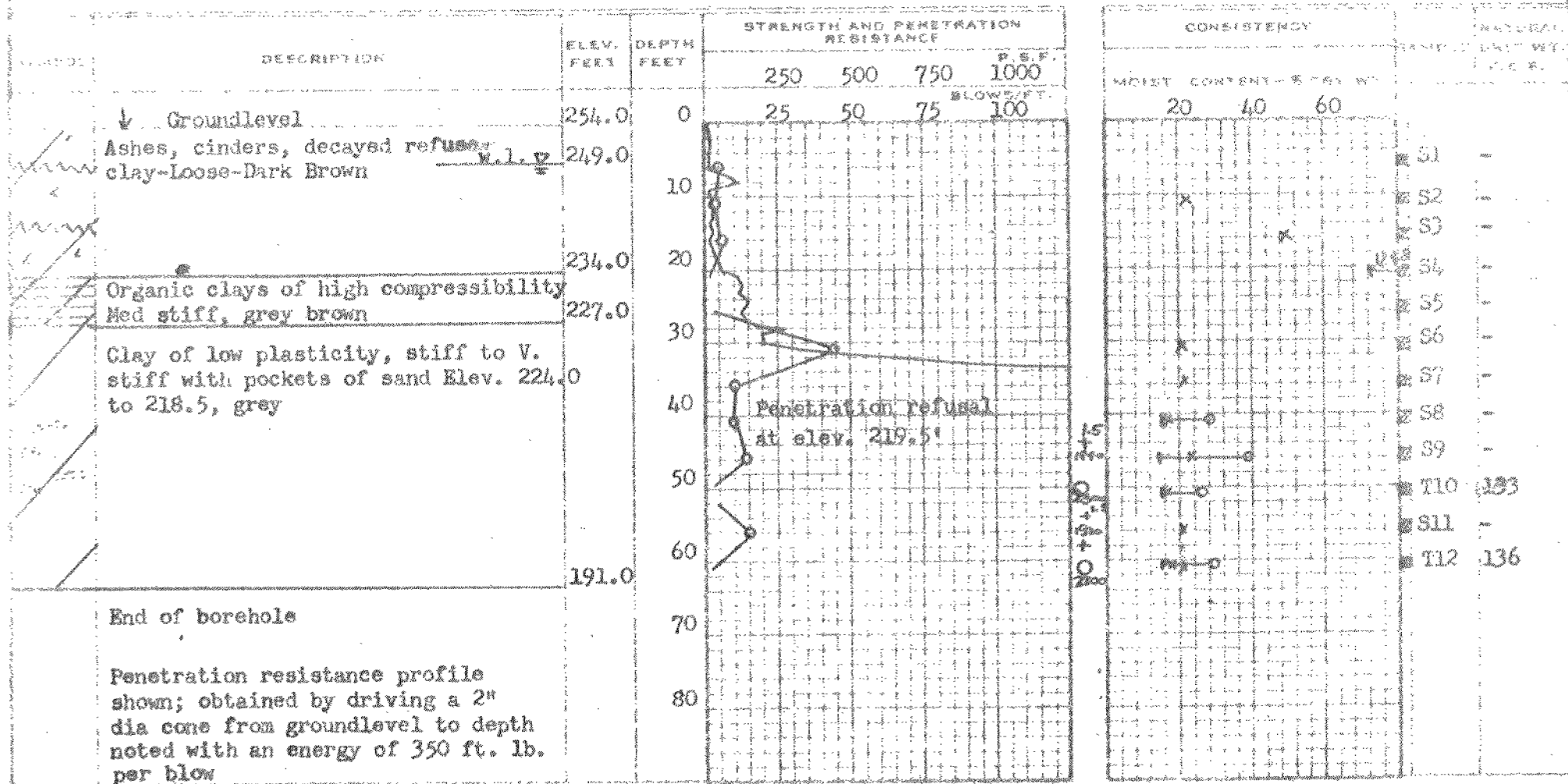
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. 39
60-F-7 B STATION 414/00 & W. B. L.
ELEV. 254.0' COMPILED BY B.K.
LOGGING DATE Apr. 7/60 CHECKED BY M.D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.F. 231-58-2

BORE HOLE NO. 608

JCK 60-P-7 B

STATION 403+82 E BLVD

ELEV. 252.0'

COMPILED BY B.K.

BORING DATE May 17/60

CHECKED BY M.D.

LEGEND

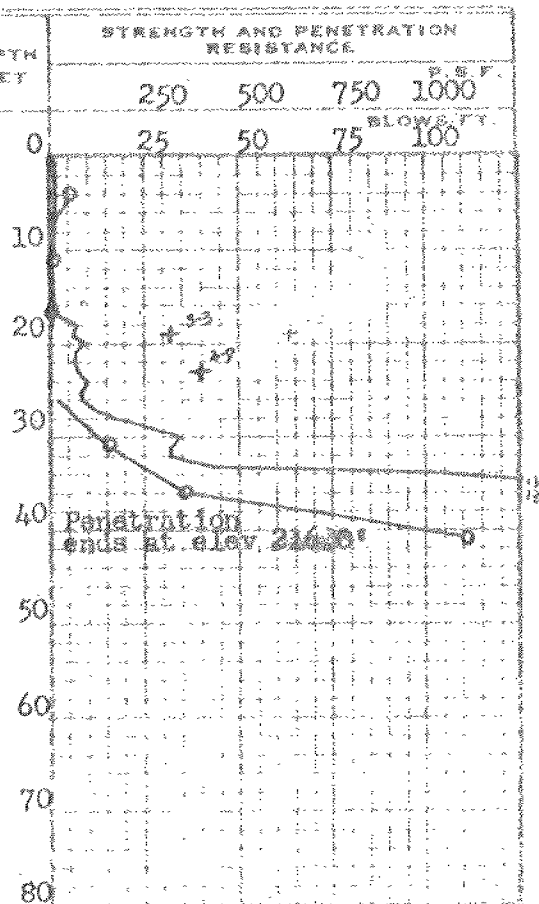
1/2 UNCONFINED COMPRESSION (Q_u) — O
 VANE TEST (C) AND SENSITIVITY (S) — +
 NATURAL MOISTURE AND LIQUIDITY INDEX — X
 LIQUID LIMIT — —
 PLASTIC LIMIT — —

DESCRIPTION	ELEV. FEET	DEPTH FEET
↓ Groundlevel	252.0	0
Ashes, Sand, Cinders Loose	247.0	5
Organic matter with silt & fine Sand-Loose grey Brown	236.0	16
Sand with excessive fines-occasional fragments of wood-top layers contains organic matter-Med Dense to Dense, grey	228.0	24
	210.5	42

End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow

2" DIA SPLIT TUBE —
 2" SHELBY TUBE —
 2" SPLIT TUBE —
 2" DIA CONE —
 2" SHELBY —
 CASING —



CONSISTENCY	NATURAL
MOIST. CONTENT - % DRY WT.	SAMPLE UNIT NO.
30 60 90 120	
	S1
	S2
	S3
	S4
	S5
	S6
	S7
	S8
	S9

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. #625
60-F-7 B STATION 407+17 E BLVD
DATUM 252.0' COMPILED BY M. D.
BORING DATE June 27/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)
VANE TEST (C) AND SENSITIVITY (S)
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				250	500	750	1000
				P.S.F.			
				BLOWS/FT.			
	↓ Groundlevel	252.0	0	25	50	75	100
	Cinders, Ashes with traces of M.I. & decomposed refuse	248.0	10				
		241.0					
	Organic matter (peat) with fragments of wood-soft, Brown	232.0	20				
	Organic clays with seams of gravel-soft to Med stiff	223.5	30				
	Sand with excessive fines-Dense-gray	220.5					

CONSISTENCY			SAMPLE	NATURAL UNIT WT. S.C.F.
MOIST. CONTENT - % DRY WT.				
20	40	60		
			S1	-
			S2	-
			S3	-
			S4	-
			S5	-
			S6	-
			S7	-

MATERIALS AND RESEARCH SECTION

[illegible]

COMPILED BY B.K.

CHECKED BY: M.D.

1/2 UNCONFINED COMPRESSION (C) _____
 VANE TEST (C) AND SENSITIVITY (S) _____
 NATURAL MOISTURE AND
 LIQUIDITY INDEX _____
 LIQUID LIMIT _____
 PLASTIC LIMIT _____

DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION	
			RESISTANCE	P.S.F.
↓ Groundlevel	258.0	0		
Garbage, fresh	251.0			
Sand, loose, brown	249.0	10		
Old garbage, cinders & ashes brown, loose	243.0	20		
End of borehole				

OPEN PIT NO

SECRET

STATION 398771 (32' Lt)

COMPILED BY B.K.

CHECKED BY M.D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
TASING

LEGEND

UNCONFINED COMPRESSION (Q _u)	0
WANE TEST (C) AND SENSITIVITY INDEX	10
NATURAL MOISTURE AND	10
LIQUIDITY INDEX	10
PLUG LIMIT	10
PLASTIC LIMIT	10

DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
			P.S.F.	BLOWS/FT.
↓ Groundlevel	262.0	0		
Old garbage (about 3 years old) Loose, Dark brown	256.0	10		
Ashes, sand & gravel with decayed garbage	249.0	20		
End of borehole				

[illegible]

OPEN PIT NO.

STATION 407+17 (5' Rt)

COMPILED BY B.K.

CHECKED BY.....M.D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU).....	0
VAN TEST (C) AND SENSITIVITY (S).....	45
NATURAL MOISTURE AND	
LIQUIDITY INDEX.....	1
LIQUID LIMIT.....	1
PLASTIC LIMIT.....	1

DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
			P.S.F. BLOW 4 FT	
↓ Groundlevel		0		
Topsoil	252.0			
cinder, ashes, Loose	247.0			
W.L.		10		
End of excavation				

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

OPEN PIT NO.

~~WORE-HOLE-NO.~~ 4

STATION 415/07 (30' Lt)

COMPILED BY B.K.

CHECKED BY M.D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (Qu)	O
VANE TEST (C) AND SENSITIVITY (S)	+s
NATURAL MOISTURE AND	LI
LIQUIDITY INDEX	X
LIQUID LIMIT	
PLASTIC LIMIT	

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	BLOWS/FT.
	↓ Groundlevel				
	Topsoil	254.0	0		
	Cinders with some sand & gravel. Loose	248.5			
	End of excavation		10		

[illegible]

SOIL ENGINEERING SERVICE - TORONTO, ONTARIO

BOREHOLE LOG

Job Name Chedoke expressway Job No. 6035 Borehole No. 522
Client Dept. of Highways of Ontario Casing BX Boring Date Mar. 31 - April 1, 1960
Elevation Geodetic Compiled By Sam Checked By B.L.

SAMPLE CONDITION

SAMPLE TYPE

ABBREVIATIONS

UNDISTURBED

 FAIR

☒ DISTURBED

LOST

A.S. AUGER SAMPLE
C.S. CASING SAMPLE
S.S. 2" STANDARD SPLIT TUBE SAMPLE
S.L. SPLIT BARREL WITH LINERS
S.T. THIN-WALLED SHELBY TUBE SAMPLE
W.S. WASH SAMPLE
R.C. ROCK CORE

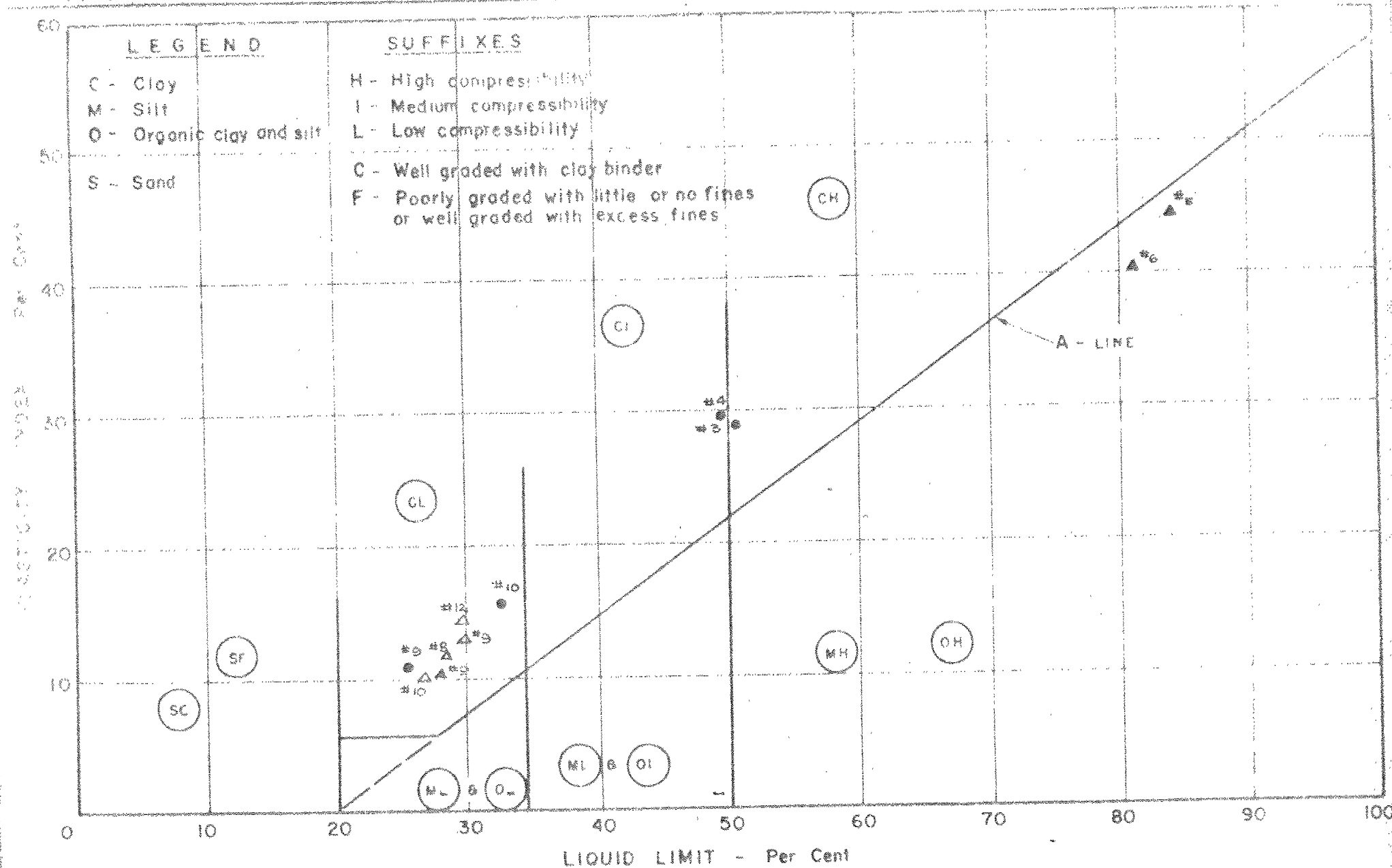
V.T. IN SITU VANE SHEAR TEST
C. SOIL SHEAR STRENGTH LBS/SQ.FT.
W.L. WATER LEVEL IN CASING
W.T. GROUND WATER TABLE IN SOIL
W.T.P.L. WETTER THAN PLASTIC LIMIT
D.T.P.L. DRIER THAN PLASTIC LIMIT

[illegible]

SHEAR STRENGTH VS. DEPTH



JOB 60-F-7 D

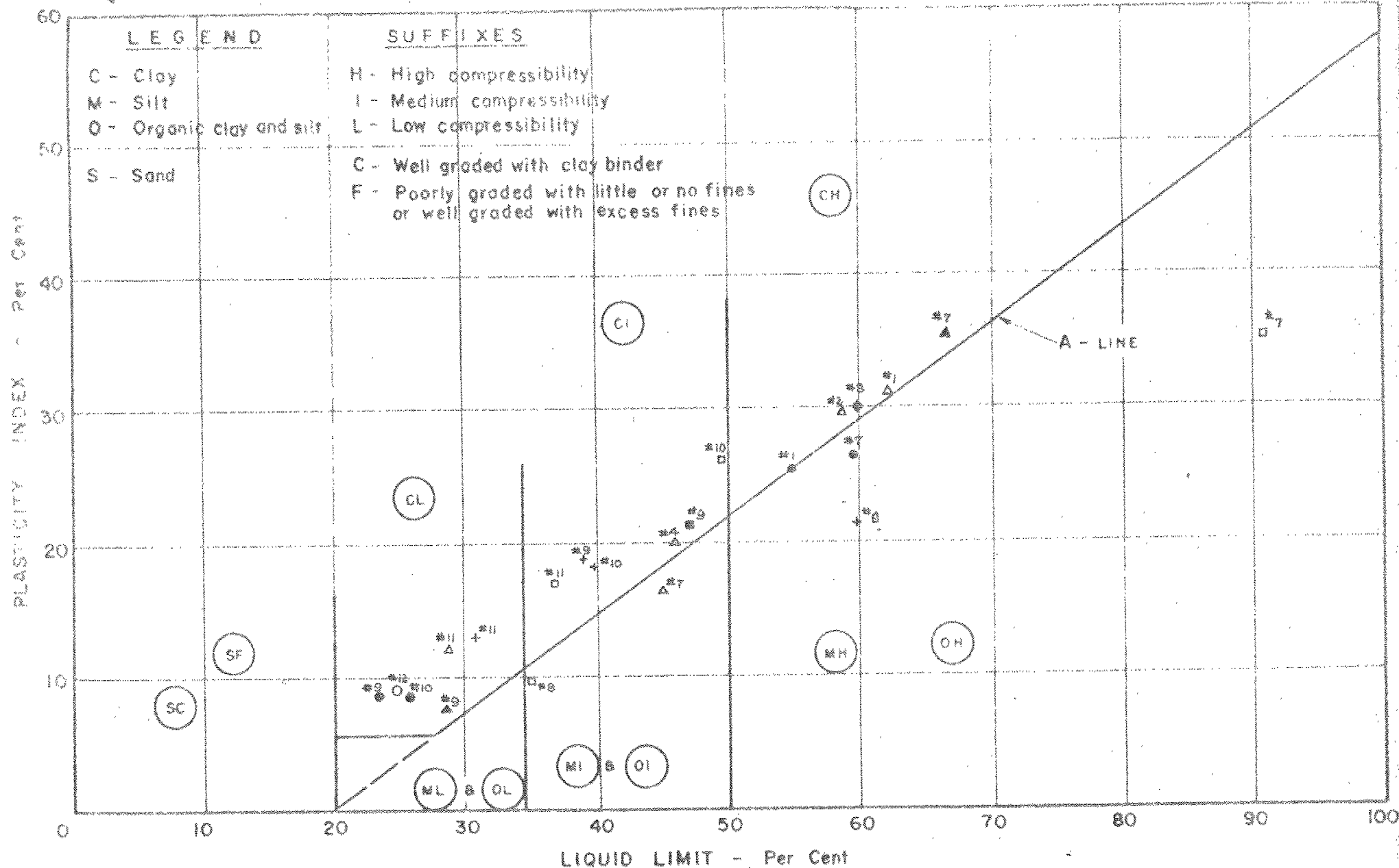


NOTES

- B.H. #16 ●
- B.H. #13 ▲
- B.H. #39 △

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION
PLASTICITY CHART

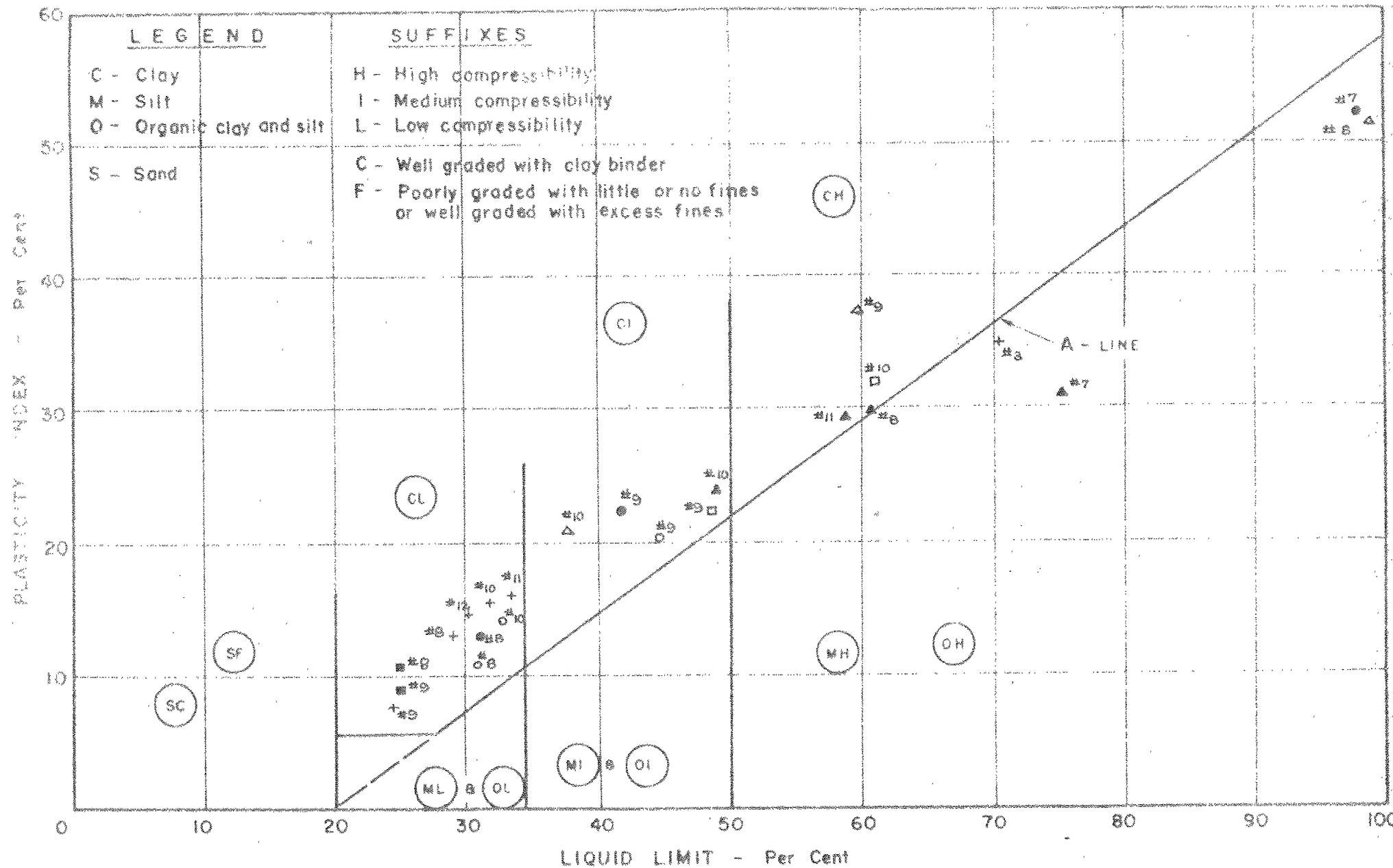
Job No. 60-F-7 (B) W.P. No. _____
Location CHODOKE EXPRESSWAY (STA. 420+00 TO STA. 380+00)



NOTES B.H. #21 ○ B.H. #26 □
B.H. #23 ● B.H. #27 ■
B.H. #24 ▲ B.H. #28 +
B.H. #25 ▲ B.H. #29 ⊕

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION
PLASTICITY CHART

Job No. 60-F-7 (B) W.P. No. _____
Location CHEDOKÉ EXPRESSWAY (STA. 420 TO STA. 380)



NOTES

BH # 30 ○

BH # 31 ●

BH # 32 ▲

B.H. # 34 ▲

B.H. # 35 □

B.H. # 37 ■

B.H. # 38 +

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH SECTION
PLASTICITY CHART

Job No. 60-F-7(B) W.P. No.

Location CHEDOKE EXPRESSWAY (STA. 420+00 TO STA. 360+00)

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B

W.P. 231-58-2

SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETR RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
S1	15'-16.5'	Sandy clay with decayed refuse, loose	4	-	-	-	-	-	
S2	20'-21.5'	Sandy clay, Brown	11	-	-	-	-	-	
S3	25'-26.5'	Silty clay, very stiff, Brown	21	21.6	-	-	-	-	
S1	20'-21.5'	Sand with excessive silt particals, Med Dense Brown	25	-	-	-	-	-	
S2	25'-26.5'	" " , Dense Brown	39	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

TEST NO.	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psi	UNIT WEIGHT p.c.f.	REMARKS
5	S1	1.5'-3'	Decayed Sanitary Fill, Med Dense	10	-	-	-	-	-	
	S2	5'-6.5'	" " Loose	1	13.0	-	-	-	-	
	S3	10'-11.5'	Sand with excessive fines, loose, Brown	3	-	-	-	-	-	
	S4	15'-16.5'	" " Med Dense, Brown	14	-	-	-	-	-	
	S5	20'-21.5'	Sandy Silt, Dense, Brown	39	-	-	-	-	-	
	S6	25.8'-26.8'	" " "	42	-	-	-	-	-	
	S7	30.3'-32'	" Med Dense "	29	-	-	-	-	-	
	S8	35.5'-37'	" Dense "	45	-	-	-	-	-	
	S9	40'-41'	" " "	69	-	-	-	-	-	
	S10	44'-45'	Sandy Silt, Dense, Gray	20	23.5	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

WELL NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
21	S1	3'-4.5'	Decayed Sanitary fill (Ashes, Sand glass pieces, tins)-Loose	2	27.2	-	-	-	-	
	S2	6'-7.5'	" " (Refuse, Sand clay & Ashes)	2-18"	25.5	-	-	-	-	
	S3	10'-11.5'	(No Recovery of sample)	1-30"	-	-	-	-	-	Probably Loose sanitary fill
	S4	15'-16.5'	Organic matter with slight traces of silt, very soft, Brown	1	202.0	-	-	-	-	
	WANE	18'		-	-	-	-	360	-	Sens: 1.5
	S5	20'-21.5'	Sandy silt with clay and decayed matter Dense, Gray	30	43.0	-	-	-	-	
	S6	25'-26.5'	No Recovery of sample	30	-	-	-	-	-	Sand observed in washings
	S7	28.5'-30'	Sand with excessive fines and gravel Med Dense Brown	17	21.5	-	-	-	-	
	S8	34'-35.5'	Sand with excessive fines and well graded sand	44	17.7	-	-	-	-	
	S9	40'-41.5'	Clayey silt, Med Dense, Gray Brown	20	19.5	-	-	-	-	
	S10	45'-46.5'	Sandy silt with pockets of clay, Med Dense, Gray Brown	16	18.1	-	-	-	-	
	S11	47'-48.5'	Sandy silt, Med Dense, Gray Brown	14	20.1	-	-	-	-	
	S12	53'-54.5'	Silty clay of low plasticity, stiff, gray brown	14	25.8	16.3	25.5	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B
W.P. 231-58-2

NO. 1	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
22	S1	3'-4.5'	Sand with excessive fines & with gravel Med Dense, Brown	22	-	-	-	-	-	
	S2	6'-7.5'	" " Dense, Brown	77	14.9	-	-	-	-	
	S3	9'-10.5'	Sand with excessive fines, and pocket of Silty clay, Dense, Brown	65	15.5	-	-	-	-	
	S4	15'-16.5'	Med to Coarse sand with seams of Silty sand, Dense, Brown	65	17.0	-	-	-	-	
	S5	20'-21.5'	Sand with excessive fines, Dense, Brown	74	15.8	-	-	-	-	
	S6	25'-26.5'	" " Brown	115	18.2	-	-	-	-	
	S7	30'-31.5'	" " Brown	66	13.4	-	-	-	-	
	S8	35'-36.5'	" " Brown	>100	17.3	-	-	-	-	
	S9	40'-41.5'	" " Brown	>100	19.2	-	-	-	-	
	S10	45'-46.5'	" " Brown	70	16.6	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

FILE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
13	S1	3'-4.5'	Organic clay of high plasticity, soft, brown	2	40.4	29.3	54.4	-	-	
	T2	5'-6.5'	Organic clay of high plasticity, soft, brown	P	110.0	51.2	102.5	210	81.5	
	VANE	8.0'		-	-	-	-	480	-	Sens: 2.0
	S3	9'-10.5'	" " " " "	P	102.0	51.1	100.3	-	-	
	VANE	12'		-	-	-	-	400	-	Sens: 2.5
	S4	13.5'-15'	" " " " "	P	84.0	-	-	-	-	
	VANE	16.5'		-	-	-	-	480	-	Sens: 2.4
	S5	20'-21.5'	Sand with excessive fines, with gravel and pieces of rubble, very loose, Brown	2	33.0	-	-	-	-	
	S6	25'-26.5'	" " "	4	24.3	-	-	-	-	
	S7	30'-31.5'	Organic clay with high plasticity, Med stiff, Brown	5	63.0	31.5	57.9	-	-	
	VANE	33.5'		-	-	-	-	1200	-	Sens: 2.3
	S8	35'-36.5'	Sand & gravel, well graded, med Dense Grey	23	14.3	-	-	-	-	
	S9	40'-41.5'	Clay of low plasticity, stiff, gray	12	22.5	14.9	23.2	-	-	
	T10	45'-46.5'	Clay of low plasticity, with silt, stiff, gray	P	23.2	16.3	25.0	3350	127.0	
	VANE	47.5'		-	-	-	-	1920	-	Sens: 2.7

JOB 60-F-7 B

W.P. 231-58-2

SUMMARY OF FIELD & LABORATORY TESTS

SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
S1	3'-4.5'	Organic clay of high plasticity, soft, Brown	2	38.0	31.2	62.0	-	-	
T2	5'-6.5'	Organic clay with sand, high plasticity, soft, Brown	P	43.7	28.9	58.7	280	103.3	
VANE	8'		-	-	-	-	480	-	Sens: 3.0
VANE	10.5'		-	-	-	-	640	-	" 3.2
S3	10.5'-12'	Organic clay of very high plasticity soft, Brown	P	106.0	60.9	122.0	-	-	
VANE	14'		-	-	-	-	560	-	Sens: 4.0
T4	15'-16.5'	Organic clay of intermediate plasticity soft, Brown	P	76.0	25.7	45.8	430	99.0	
VANE	18'		-	-	-	-	880	-	Sens: 6.3
S5	20'-21.5'	Sand with excessive fine and with decayed vegetation, loose, Brown	P	51.8	-	-	-	-	
S6	25'-26.5'	Organic clay, soft, Brown	P	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SOIL NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETIN RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
	S7	30'-31.5'	Organic clay of intermediate plasticity, Med Stiff, Brown	P	35.6	28.8	44.5	-	-	
	VANE	33.5'		-	-	-	-	960	-	Sens: 4.0
	S8	35'-36.5'	Sand with gravel, Med Dense, Brown	11	34.9	-	-	-	-	
	S9	40'-41.5'	Sand with excessive fines, Dense Brown	34	13.6	-	-	-	-	
	S10	45'-46.5'	Layers of silt & clay, Med Dense Brown	14	20.5	-	-	-	-	
	T11	50'-51.5'	Silty clay of low plasticity, Stiff, Gray	P	21.9	16.6	28.3	2350	128.0	
	VANE	53'		-	-	-	-	1280	-	Sens: 1.5

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SAMPLE NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
S1	3'-4.5'	Decayed Sanitary fill (Ashes, sand, gravel wood, glass pieces)	-	-	-	-	-	-	
S2	6'-7.5'	" " "	12	-	-	-	-	-	
S3	10'-11.5'	" " "	33	13.4	-	-	-	-	
S4	15'-16.5'	No Recovery of sample	10	-	-	-	-	-	Probably Saturated sanitary fill
S5	20'-21.5'	Sand with decayed fragments of wood, Dense, Brown	33	-	-	-	-	-	
S6	25'-26.5'	Organic clay of high plasticity, Med Stiff Brown	8	86.9	94.2	126.2	-	-	
WANE	31.5'		-	-	-	-	1200	-	Sens: 3.0
S7	32'-33.5'	Organic clay with silt of high plasticity, Stiff, grey	8	26.4	30.2	65.9	-	-	
T8	35'-36.5'	" " "	P	-	-	-	-	-	
S9	40'-41.5'	Clay of low plasticity with decayed wood Med Stiff to stiff, grey	5	31.2	21.0	28.0	-	-	
S10	45'-46.5'	Silt with fine sand and decayed wood Loose, grey	9	47.7	-	-	-	-	
S11	50'-51.5'	Sand with excessive fines, with gravel and fragments of wood, Loose, Grey	3	30.4	-	-	-	-	
S12	55'-56.5'	" " "	3	22.2	-	-	-	-	
S13	60'-61.5'	Fine sand with gravel, Dense, Grey	40	11.0	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET. RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
26	S1	3'-4.5'	Decayed Sanitary fill (sand, rubble, refuse), Loose	9	-	-	-	-	-	
	S2	6'-7.5'	" " "	8	24.1	-	-	-	-	
	S3	10'-11.5'	" " "	8	-	-	-	-	-	
	S4	15'-16.5'	Sand & gravel with fragments of decayed wood, Dense, Brown	86	20.6	-	-	-	-	
	S5	20'-21.5'	" " " Loose, Brown	9	100.0	-	-	-	-	
	S6	25'-26.5'	No Recovery of Sample	12	-	-	-	-	-	Probably sat. sand & gravel
	S7	26.5'-28'	Organic clay of high plasticity, Med Stiff, gray brown	5	31.6	55.6	90.8	-	-	
	VANE	31.5'		-	-	-	-	640	-	Sens: 2.3
	S8	32'-33.5'	Organic silt of low plasticity, Med Stiff gray Brown	5	34.4	23.7	34.4	-	-	
	VANE	35.5'		-	-	-	-	1200	-	Sens: 3.0
	S9	36'-37.5'	Clayey silt with traces of decayed vegetation, Med Stiff, gray Brown	6	25.2	-	-	-	-	
	S10	40'-41.5'	Clay of Intermediate plasticity, Med Stiff, gray Brown	2-18"	31.2	23.1	49.2	-	-	
	VANE	43.5'		-	-	-	-	1120	-	Sens: 2.8
	S11	45'-46.5'	" " " "	5	25.9	19.2	36.1	-	-	
	S12	50'-51.5'	Sand with excessive Silt particals and with gravel, Med Dense, Gray	14	19.8	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N	MOIST.	PLASTIC	LIQUID	SHEAR	UNIT	REMARKS
				RESIST. BLOWS/FT	CONT. %	LIMIT %	LIMIT %	STRENGTH p.s.f.	WEIGHT p.c.f.	
60	S13	55'-56.5'	Sand well graded with fragments of wood, Med Dense, gray	11	-	-	-	-	-	
	S14	60'-61.5'	Sand well graded, Dense, gray	31	3.9	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-8-7 B

W.P. 231-58-2

SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS-FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
S1	3'-4.5'	Sand, cinders & pieces of rubble fill, Dense	70	-	-	-	-	-	
S2	6'-7.5'	Partially decomposed sanitary fill (sand, bricks, Ashes, paper, card-board)	15	-	-	-	-	-	
S3	10'-11.5'	" " "	21	-	-	-	-	-	
S4	15'-16.5'	Decomposed Sanitary fill (sand, Ashes, refuse & paper)	21	-	-	-	-	-	
S5	20'-21.5'	No Recovery of Sample	15	-	-	-	-	-	Probably sat. Refuse
S6	25'-26.5'	Organic clay of high plasticity, soft, Brown	5	144.0	67.7	124.6	-	-	
T7	30'-31.5'	" " " "	P	43.0	-	-	580	104.0	
WANE	33'		-	-	-	-	720	-	Sens: 3.3
S8	35'-36.5'	Sand with gravel and traces of decayed vegetation - Loose - gray	5	23.6	-	-	-	-	
S9	40'-41.5'	Organic clay with silt of Intermediate plasticity, Med Stiff, gray brown	4	43.1	25.6	46.9	-	-	
S10	45'-46'	Sand with excessive fines and also traces of some shells, Loose, Gray Brown	3	22.2	-	-	-	-	
S11	50'-51.5'	Sand, well graded, Med Dense, Gray	28	9.0	-	-	-	-	
S12	55'-56.5'	" "	80-9"	-	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
28	S1	3'-4.5'	Recent Refuse (mostly paper with Ashes & sand), Loose	7	8.7	-	-	-	-	
	S2	6'-7.5'	Partially Decomposed Refuse (Refuse, sand gravel and Ashes) Loose-Dark Gray	5	17.7	-	-	-	-	
	S3	10'-11.5'	" " " "	4	-	-	-	-	-	
	S4	15'-16.5'	Decomposed Sanitary fill (Refuse, Ashes, sand & gravel) Loose	9	47.3	-	-	-	-	
	S5	20'-21.5'	No Recovery of sample " "	9	-	-	-	-	-	Saturated Refuse - probably
	S6	23'-24.5'	Organic clay of high compressibility soft, gray Brown	2	94.5	57.0	131.8	-	-	
	S7	27'-28.5'	" " "	P	68.9	-	-	-	-	
	S8	30'-31.5'	" " "	P	39.3	28.6	59.9	-	-	
	VANE	33'		-	-	-	-	560	-	Sens: 2.8
	T9	35'-36.5'	Clay of Intermediate plasticity, soft, gray	P	33.4	20.3	38.6	510	120	
	VANE	38'		-	-	-	-	600	-	Sens: 3.8
	T10	40'-41.5'	" " " , Med Stiff, Gray	P	28.8	20.6	39.0	810	119	
	VANE	43.5'		-	-	-	-	440	-	Sens: 2.8
	T11	45'-46.5'	Clay of low plasticity, Med Stiff, gray	P	25.9	18.2	31.0	710	124.0	
	S12	50'-51.5'	Sand with excess fines, Loose, gray	4	24.5	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

TEST NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psf.	UNIT WEIGHT pcf.	REMARKS
13	S13	55'-56.5'	Sand well graded with fragments of wood Med Dense, Gray	13	7.6	-	-	-	-	
	S14	60'-61.5'	" " "	27	14.4	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	REMARKS
1	S1	3'-4.5'	Sanitary fill (Ashes, paper, sand, glass pieces fragments of wood) Med Dense	14	-	-	-	-	-	
	S2	6'-7.5'	" " "	18	12.4	-	-	-	-	
	S3	10'-11.5'	" " "	10	-	-	-	-	-	
	S4	15'-16.5'	" " Loose	9	55.9	-	-	-	-	
	S5	20'-21.5'	" " Very Loose	P	100.0	-	-	-	-	
	S6	25'-26.5'	Organic clay of high compressibility soft, gray Brown	5	80.7	-	-	-	-	
	S7	30'-31.5'	" " "	3	94.8	-	-	-	-	
	VANE	33.5'		-	-	-	-	440	-	Sens: 2.2
	S8	35'-36.5'	Organic clay of high compressibility soft, gray	3	27.5	29.7	59.7	-	-	
	VANE	38.5'		-	-	-	-	880	-	Sens: 5.5
	S9	40'-41.5'	Sand with excessive fines and fragments of wood-Loose-grey	P	27.5	-	-	-	-	
	S10	45'-46.5'	Silt with fine sands, Loose, grey	3	31.5	-	-	-	-	
	S11	50'-51.5'	Silt with fine sand, Loose, grey	2	24.8	-	-	-	-	
	S12	55'-56.5'	Sand with excessive fines, Loose, grey	3	29.3	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
10	S1	3'-4.5'	Med Sand with pockets of clay, Med Dense, Brown	27	8.5	-	-	-	-	
	S2	6'-7.5'	Recent Refuse (paper with rubble & Ashes) Med Dense	28	-	-	-	-	-	
	S3	10'-11.5'	" " Loose	7	-	-	-	-	-	
	S4	15'-16.5'	Decomposed Sanitary fill (Sand, gravel Ashes)-Med Dense	10	-	-	-	-	-	
	S5	20'-21.5'	" " (Ashes, Sand)	7	-	-	-	-	-	
	S6	25'-26.5'	No Recovery of Sample	8	-	-	-	-	-	Probably Sat. Refuse
	S7	30'-31.5'	30-31.0 Decomposed Sanitary fill 31.0-31.5 Organic clay, soft, Brown	1	65.6	-	-	-	-	
	VANE	33.5'		-	-	-	-	800	-	Sens: 2.5
	S8	35'-36.5'	Silty clay of low plasticity, with traces of organic matter, Med Stiff, Gray Brown	2	29.0	20.2	30.7	-	-	
	VANE	38.5'		-	-	-	-	760	-	Sens: 2.7
	S9	40'-41.5'	Clay of Intermediate plasticity, with organic matter Med Stiff, gray brown	4	33.8	24.3	44.3	-	-	
	VANE	43.5'		-	-	-	-	960	-	Sens: 4.8
	S10	45'-46.5'	Silty clay of low plasticity, Med stiff, gray	4	-	18.7	32.7	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
10	S11	50'-51.5'	Sand with excessive fines, loose, gray	6	31.2	-	-	-	-	
	S12	55'-56.5'	" " "	2	22.5	-	-	-	-	
	S13	58'-59.5'	Sand well graded, Dense, gray	44	7.0	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B

W.P. 231-58-2

HOLE NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH D.S.F.	UNIT WEIGHT P.C.F.	REMARKS
31	S1	3'-4.5'	Recent Refuse (paper, glass pieces)	10	-	-	-	-	-	
	S2	6'-7.5'	Partially Decomposed Refuse (paper, Sand glass pieces)	11	11.4	-	-	-	-	
	S3	10'-11.5'	Decomposed Sanitary fill (Ashes & Refuse with sand & gravel)-Loose	8	30.8	-	-	-	-	
	S4	15'-16.5'	" " - Med Dense	19	28.2	-	-	-	-	
	S5	20'-21.5'	Silt with organic matter, loose, gray Brown	4	50.0	-	-	-	-	
	S6	25'-26.5'	25-26.0 Silt with organic matter) Loose 26-26.5 Sandy Silt with organic matter (Loose	4	88.0	-	-	-	-	
	S7	30'-31.5'	Organic clay of high compressibility, Med Stiff, grey	4	66.7	45.0	97.5	-	-	
	VANE	33.5'		-	-	-	-	960	-	Sens: 3.7
	T8	35'-36.5'	Silty clay of low plasticity, Med stiff, grey	P	35.7	18.0	31.0	710	122	
	VANE	38'		-	-	-	-	720	-	Sens: 3.6
	T9	40'-41.5'	Clay of Intermediate plasticity-Med stiff, grey	P	29.8	20.6	42.3	640	118	
	VANE	43'		-	-	-	-	1120	-	Sens: 5.6
	S10	45'-46.5'	Sand with excessive fines, Loose, grey	5	26.8	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
S11	50'-51.5'	Sandy silt, Loose, grey	3	21.8	-	-	-	-	
S12	55'-56.5'	" " "	8	26.2	-	-	-	-	
S13	60'-61.5'	Sand well graded, Dense, gray	99	14.6	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psi	UNIT WEIGHT pcf	REMARKS
S1	3'-4.5'	Recent Refuse (mostly paper, tins, glass pieces)	66	-	-	-	-	-	
S2	6'-7.5'	" " "	62	-	-	-	-	-	
S3	10'-11.5'	" " "	20	-	-	-	-	-	
S4	15'-16.5'	Decomposed Sanitary fill (Ashes, sand, glass pieces) Loose	8	103.0	-	-	-	-	
S5	20'-21.5'	No Recovery of Sample	7	-	-	-	-	-	Probably sat. Refuse
S6	25'-26.5'	Organic clayey silt, soft, grey	4	64.4	-	-	-	-	
VANE	29.5'		-	-	-	-	560	-	Sens: 2.3
S7	30'-31.5'	Organic clay of high compressibility Med stiff, grey	P	100.0	80.2	130.5	-	-	
VANE	33'		-	-	-	-	640	-	Sens: 4.0
S8	35'-36.5'	" " " "	P	77.8	46.7	98.4	-	-	
VANE	38'		-	-	-	-	880	-	Sens: 3.7
S9	40'-41.5'	Clay of high compressibility, Med stiff, grey	4	34.0	23.4	60.1	-	-	
S10	45'-46.5'	Silt with traces of organic matter, grey	5	35.8	-	-	-	-	
VANE	49'		-	-	-	-	960	-	Sens: 3.0
S11	50'-51.5'	Silt with traces of shells, grey	4	25.7	-	-	-	-	
S12	55'-56.5'	Clay of Intermediate plasticity, Med stiff grey	3	25.4	20.4	37.5	133	-	Sens: 3.1

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	REMARKS
VANE	58.5'		-	-	-	-	1120	-	Sens: 3.1
S13	60'-61.5'	Sand well graded, Med Dense, gray	23	8.3	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 237-38-2

TEST NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENCTN RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	REMARKS
33	S1	3'-4.5'	Recent Refuse (paper, tins & glass pieces)	50	-	-	-	-	-	
	S2	6'-7.5'	" " "	42	-	-	-	-	-	
	S3	10'-11.5'	10-10.5 Recent Refuse 10.5-11.5 Decomposed sanitary fill	27	20.3	-	-	-	-	
	S4	15'-16.5'	Decomposed Sanitary fill (Ashes with sand & refuse)	21	50.6	-	-	-	-	
	S5	20'-21.5'	" " "	4	-	-	-	-	-	
	S6	25'-26.5'	Organic clay of Intermediate plasticity soft Brown	2	182.0	23.5	39.6	-	-	
	S7	30'-31.5'	Silt with organic matter, soft, Brown	P	132.0	-	-	-	-	
	VANE	33'		-	-	-	-	560	-	Sens: 2.3
	S8	35'-36.5'	Organic clay of high plasticity, Med stiff, grey	P	93.0	-	-	-	-	
	VANE	38'		-	-	-	-	800	-	Sens: 3.4
	S9	40'-41.5'	" " "	P	39.8	-	-	-	-	
	VANE	43'		-	-	-	-	880	-	Sens: 3.7
	S10	45'-46.5'	Silt with fine sand and fragments of wood, loose, grey	2	38.1	-	-	-	-	
	S11	50'-51.5'	" " "	2	34.4	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 E

W.P. 231-58-2

TEST NO.	SAMP. NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIM. T %	LIQUID LIM. T %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
1	S12	55'-56.5'	Silt with fine sand and fragments of wood, Loose, grey	3	36.2	-	-	-	-	
	S13	60'-61.5'	Sand with excessive fines, Med Dense, grey	10	23.8	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B

W.P. 231-58-2

NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psi	UNIT WEIGHT pcf	REMARKS
	S1	5'-6.5'	Recent Refuse (paper, tins, carboard rubble)	100	-	-	-	-	-	
	S2	10'-11.5'	" " " "	9	-	-	-	-	-	
	S3	15'-16.5'	Decomposed Sanitary fill (sand, Ashes, tins)	1-18"	-	-	-	-	-	
	S4	20'-21.5'	" " "	10	76.8	-	-	-	-	
	S5	25'-26.5'	Organic matter with silt, soft, brown	6	131.0	-	-	-	-	
	VANE	29.5'		-	-	-	-	720	-	Sens: 3.6
	S6	30'-31.5'	Organic clays of high compressibility Med stiff, grey	P	-	-	-	-	-	
	VANE	33'		-	-	-	-	720	-	Sens: 4.5
	S7	35'-36.5'	" " " "	P	78.2	44.1	74.8	-	-	
	VANE	38'		-	-	-	-	960	-	Sens: 4.0
	S8	40'-41.5'	" " " "	P	44.2	31.2	61.1	-	-	
	VANE	42.5'		-	-	-	-	720	-	Sens: 3.0
	S9	45'-46.5'	Clayey silt, Med stiff grey	3	32.1	-	-	-	-	
	VANE	49'		-	-	-	-	880	-	Sens: 2.8
	S10	50'-51.5'	Clay of Intermediate plasticity, Med stiff	5	38.5	25.2	48.8	-	-	
	VANE	53.5'		-	-	-	-	800	-	Sens: 3.3

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 D

W.P. 231-58-2

NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH p.s.f.	UNIT WEIGHT p.c.f.	REMARKS
34	S11	55'-56.5'	Clay of high plasticity, Med stiff, gray	6	41.8	30.3	59.2	-	-	
	S12	60'-61.5'	Sand well graded, loose, gray	8	18.7	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO	DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH (PSF)	UNIT WEIGHT (PCF)	REMARKS
S1	3'-4.5'	Decomposed sanitary fill (Ashes with sand and refuse)	15	16.7	-	-	-	-	
S2	6'-7.5'	" (Ashes, paper, sand)	13	16.7	-	-	-	-	
S3	10'-11.5'	Sand with ashes and fragments of wood loose, gray Brown	5	22.0	-	-	-	-	
S4	15'-15.5'	Sand with excessive fines and with ashes loose, gray	4	49.5	-	-	-	-	
S5	20'-21.5'	Organic matter with silt & with traces of refuse and some fine sand-soft, gray	2	79.0	-	-	-	-	
S6	25'-26.5'	" " "	5	56.2	-	-	-	-	
VANE	28.5'		-	-	-	-	800	-	Sens: 2.2
S7	30'-31.5'	Organic silt Med stiff, gray brown	4	51.8	-	-	-	-	
VANE	33.5'		-	-	-	-	960	-	Sens: 1.5
S8	35'-36.5'	Organic clayey silt, Med stiff, gray brown	4	52.6	-	-	-	-	
VANE	39.5'		-	-	-	-	1040	-	Sens: 2.2
S9	40'-41.5'	Clay of Intermediate plasticity with decomposed charcoal, Med stiff, gray	4	46.0	26.0	49.1	-	-	
S10	45'-46.5'	Clay of high compressibility with fragments of wood & shells, Med stiff, gray	9	33.4	29.0	60.7	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

NO.	SAMP NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT.	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH psf.	UNIT WEIGHT p.c.f.	REMARKS
35	S11	50'-51.5'	50-50.5 clay of high compressibility 50.5-51.5 Sand with excessive fines with fragments of wood-loose, grey	5	36.4	-	-	-	-	
	S12	55'-56.5'	Sand with excessive fines, loose, grey	9	20.2	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-55-2

SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET'N RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH pcf	UNIT WEIGHT pcf	REMARKS
31	5'-6.5'	Sandy clay till, Dense, Brown	31	18.4	-	-	-	-	
32	10'-11.5'	Sand with excessive fines and pockets of clay, Dense, Brown	44	22.2	-	-	-	-	
33	15'-16.5'	Sand with excessive fines, Dense, Brown	>100	21.0	-	-	-	-	
34	20'-21.5'	" "	48	21.2	-	-	-	-	
35	25'-26.5'	Sand well graded, Dense, grey Brown	>100	16.7	-	-	-	-	
36	30'-31.5'	Sand with excessive fines, Dense, grey, brown	72	20.5	-	-	-	-	
37	35'-36.5'	" " "	>100	22.1	-	-	-	-	
38	40'-41.5'	" " "	110	18.3	-	-	-	-	
39	45'-46.5'	Silt with fine sand, Dense, grey	34	17.7	-	-	-	-	
40	50'-51.5'	Sand with excessive fines, Dense, grey	72	15.5	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B Struct

W.P. 231-58-2

SAMPLE NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET N RESIST. BLOWS FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	REMARKS
31 S1	5'-6.5'	Ashes, cinders, sand (fill material) loose	3	-	-	-	-	-	
S2	10'-11.5'	" " "	1	87.5	-	-	-	-	
S3	15'-16.5'	Sand with excessive fines, Med Dense Brown	25	22.4	-	-	-	-	
S4	20'-21.5'	" " " "	34	17.3	-	-	-	-	
S5	25'-26.5'	" " " "	86	18.4	-	-	-	-	
S6	30'-31.5'	" " " "	80	18.9	-	-	-	-	
S7	35'-36.5'	" " " "	-	26.1	-	-	-	-	
S8	40'-41.5'	Silty clay of low plasticity, Med stiff, grey	22	24.2	14.7	24.6	-	-	
T9	45'-46.5'	" " "	P	24.8	15.5	24.6	1080	128	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-7 B

W.P. 231-58-2

SAMPLE NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOW/FT	MOIST. CONT. %	PLASTIC LIM. %	LIQUID LIM. T %	SHEAR STRENGTH PSE	UNIT WEIGHT LB/FT ³	REMARKS
S1	5'-6.5'	Ashes with organic matter, Loose	1	-	-	-	-	-	
S2	10'-11.5'	Ashes, cinders & decayed refuse, Loose	2	39.6	-	-	-	-	
S3	15'-16.5'	Organic clays of high compressibility Med stiff, grey Brown	3	15.2	35.8	70.5	-	-	
S4	20'-21.5'	" " "	6	28.0	135.7	182.5	-	-	
S5	25'-26.5'	" " "	4	107.1	72.9	117.7	-	-	
S6	30'-31.5'	" " "	7	31.3	-	-	-	-	
S7	35'-36.5'	Sand well graded, Dense, grey	39	15.9	-	-	-	-	
S8	40'-41.5'	Clay of low plasticity, stiff, grey	18	18.2	16.0	29.3	-	-	
S9	45'-46.5'	" " " "	20	21.9	17.2	24.9	-	-	
T10	50'-51.5'	" " " "	P	20.0	16.5	31.7	2100	128.0	
VANE 53'			-	-	-	-	>2000	-	Sens: > 1.4
T11	55'-56.5'	" " " "	P	-	17.6	33.9	-	-	
VANE 58'			-	-	-	-	1690	-	Sens: 1.3
T12	60'-61.5'	" " " "	P	-	16.2	30.8	-	-	
VANE 63'			-	-	-	-	1680	-	Sens: 1.9

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B

W.P. 231-58-2

SAMPLE NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENET. RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH %	UNIT WEIGHT PCF	REMARKS
S1	5'-6.5'	Ashes, cinders, fragments of wood & sand (fill material) Loose	5	-	-	-	-	-	
S2	10'-11.5'	" " " "	3	22.4	-	-	-	-	
S3	15'-16.5'	Ashes with pockets of clay and with fragments of wood, Loose	6	49.5	-	-	-	-	
S4	20'-21.5'	Organic clays of high compressibility Red stiff, gray Brown	P	117.6	72.1	124.8	-	-	
S5	25'-26.5'	" " "	P	128.8	109.3	150.0	-	-	
S6	30'-31.5'	Sand with pockets of clay, Dense, grey	44	20.2	-	-	-	-	
S7	35'-36.5'	35-35.5 Sand 35.5-36.5 Clay of low plasticity, stiff, grey	10	21.1	-	-	-	-	
S8	40'-41.5'	Clay of low plasticity, stiff, grey	9	17.1	16.1	28.2	-	-	
VANE	44.0'		-	-	-	-	1840	-	Sens: 1.5
S9	45'-46.5'	" " " "	13	23.1	15.4	29.6	-	-	
T10	50'-51.5'	" " " "	P	17.4	16.4	26.4	2300	133	
VANE	54'		-	-	-	-	1920	-	Dens: 1.5
S11	55'-56.5'	Clay of low plasticity with seams of sand v. stiff, grey	15	21.2	-	-	-	-	
VANE	58'		-	-	-	-	>2000	-	Sens: 1.9

SUMMARY OF FIELD & LABORATORY TESTS

JOB 6-1-62

W.P. 75-1-62

NO.	SAMPLE DEPTH (FEET)	GENERAL DESCRIPTION	PENETN RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSI	UNIT WEIGHT PCF	REMARKS
61	0.5-1.5	Clay of low plasticity, v. stiff grey	P	17.9	15.5	29.5	2300	136	
62	6.5		-	-	-	-	>2000	-	Sens: 1.3
		denotes split spoon sample							
		" shelly tube sample							

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-1-1 S.

W.P. 231-28-2

	DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST BLWS/FT	MOIST CONT %	PLASTIC LIMIT %	LIQ. LMT %	SHEAR STRENGTH PSF	UNIT WEIGHT PCF	
31	0'-2.5'	Ashes with sand, Loose	6	26.7	-	-	-	-	
32	6'-7.5'	Ashes & cinders, Loose	P	-	-	-	-	-	
33	10'-11.5'	Sand & Ashes, Loose	2	74.8	-	-	-	-	
34	16'-17.5'	16-17.0 Sand, Brown, Loose 17-17.5 Organic matter with silt, soft	1	113.0	-	-	-	-	
35	19'		-	-	-	-	640	-	Sens: 3.3
36	20'-21.5'	Organic matter with fragments of wood and some fine sand, soft, brown	P	75.0	-	-	-	-	10.7% organic
37	23'		-	-	-	-	800	-	Sens: 2.9
38	25'-26.5'	Sand with some organic matter Loose Brown	P	23.0	-	-	-	-	
39	30'-31.5'	Sand with excessive fines, Med Dense, gray	16	42.5	-	-	-	-	
40	35'-36.5'	" " " , Dense Grey	36	19.2	-	-	-	-	
41	40'-41.5'	" " "	112	17.8	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-1-7-31

W.P. 231-58-2

SAMPLE NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETIN RESIST. BLOW/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH (PSI)	UNIT WEIGHT (PCF)	REMARKS
S1	0'-1.5'	Decomposed Sanitary fill (Ashes with sand & refuse)	22	25.4	-	-	-	-	Frozen
S2	5'-6.5'	" " " " Loose	-	28.0	-	-	-	-	
S3	10'-11.5'	" " " " Loose	4	-	-	-	-	-	
S4	15'-16.5'	Clay of Intermediate plasticity with slight traces of organic matter-soft	2	41.2	21.2	50.0	-	-	
S5	20'-21.5'	" " "	2	35.0	20.1	49.1	-	-	
S6	25'-26.5'	Sand with excessive fine-loose-grey brown	6	24.0	-	-	-	-	
S7	30'-31.5'	Sand with excessive fines-Med Dense grey brown	14	14.3	-	-	-	-	
S8	35'-36.5'	Clay of low plasticity with fine sand Med Dense-grey	11	21.6	-	-	-	-	
S9	40'-41.5'	" " "	18	15.4	13.9	25.1	-	-	
T10	45'-46.5'	" " "	P	19.0	16.5	32.0	-	131	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-F-2 E

W.P. 231-58-2

NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST, BLOWS FT	MO-ST. CONT. %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	ALMAY'S
S1	0'-1.5'	Decomposed Sanitary fill (Ashes, cinders sand, with refuse) Loose	Frozen Ground	32.3	-	-	-	-	
S2	5'-6.5'	" " "	6	-	-	-	-	-	
S3	10'-11.5'	" " "	2	-	-	-	-	-	
S4	15'-16.5'	Organic clay of high plasticity-Med stiff-Brown	5	91.5	-	-	-	-	
S5	20'-21.5'	" " "	2	61.9	40.6	84.0	-	-	
S6	25'-26.5'	" " "	4	59.5	41.4	81.4	-	-	
S7	30'-31.5'	Clay of low plasticity-Med stiff grey	5	70.8	-	-	-	-	
S8	35'-36.5'	" " "	4	24.4	-	-	-	-	
S9	40'-41.5'	" " "stiff-grey	8	24.0	17.9	27.9	-	-	
T10	45'-46.5'	" " " "	P	21.6	-	-	-	127	

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-7 B

W.P. 231-58-2

NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST. BLOWS FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH PSF	UNIT WEIGHT PCF	REMARKS
81	3-4.5'	Cinders, Ashes with some sand and traces of decomposed refuse, loose	1	29.2	-	-	-	-	
82	6-7.5'	"	2	56.5	-	-	-	-	
83	10-11.5'	10-11.0 Cinders & Ashes 11.0-11.5 Organic matter (Peat) with fragments of wood	P	57.0	-	-	-	-	
VANE	13.0'		P	-	-	-	560	-	Sens: 5.6
84	15-16.5'	Organic matter (Peat) soft	P	151.5	-	-	-	-	
VANE	18.0'		P	-	-	-	400	-	Sens: 2.9
85	20-21.5'	Organic clayey silt with seams of gravel, soft, gray brown	P	55.5	-	-	-	-	
86	25-26.5'	Organic silt	P	44.8	-	-	-	-	
VANE	28.0'		P	-	-	-	940	-	Sens: 2.6
87	30-31.5'	Sand with excessive fines	34	20.5	-	-	-	-	

SUMMARY OF FIELD & LABORATORY TESTS

CARRIED OUT BY E. M. PETO

JOB 6033-E.M. Peto
JOB 60-1-7 E.M. Peto
W.P. 231-58-2

SAMPLE NO.	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETRA RESIST. BLOWS/FT	MOIST. CONT. %	PLASTIC LIMIT %	LIQUID LIM %	SHEAR STRENGTH P.S.F.	UNIT WEIGHT P.C.F.	REMARKS
38	12'6"-13'0"	s.l.	-	55.3	-	-	-	-	
30	13'0"-13'6"	s.l.	-	157.9	-	-	220	81	Non Plastic
30	12'0"-12'6"	s.l.	-	130	-	-	290	84	Placed in Jar
28	12'6"-13'0"	s.l.	-	108.5	46.2	62.0	-	-	
20	13'0"-13'6"	s.l.	-	81.4	-	-	137	95	Placed in Jar
68	13'6"-14'0"	s.l.	-	40.8	-	-	-	-	Grey brown sandy Placed in Jar
60	14'0"-14'6"	s.l.	-	-	-	-	-	-	Liner sample dest
25	19'6"-20'0"	s.l.	-	32.4	21.2	36.1	-	-	Placed in Jar
20	20'0"-20'6"	s.l.	-	42.9	-	-	310	111	Placed in Jar

s.s. split spoon sample
s.l. split spoon with liners

OVERSIZE DRAWING

Mr. A. M. Teye,
Bridge Engineer.
Materials & Research Section.

October 21, 1960.

ADDITIONAL COMMENTS and
CLARIFICATION - 8A-1116-A.

Attention: Mr. S. McCombie.

Re: D.H.O. FOUNDATION INVESTIGATION REPORT
Chedoke Expressway - Hwy. #403 between
King Street & Longwood Road, District #4,
W.J. 60-F-7(B) -- W.P. 231-58-2, Sept./60.

In connection with our above-mentioned report, we would like to make some additional comments and clarify a few items:

1) On Page 10 of this report, a granular material is recommended as the replacement of the excavated recent garbage. It has already been decided that the shale from the borrow area on Wolfe Island will be used for this purpose.

2) On Page 10, it is also recommended that the up to 50 T roller be also used for the compaction of the embankment. The price for the use of this roller being certainly higher than that for the Sheepsfoot roller, this recommendation should not be contained in the specifications.

3) In Section 5.3 for the part of the highway between - Station 400 + 00 and 409 + 00, no berm is recommended. Later in the text, it is stated that maybe a berm will be placed. To avoid any misunderstanding, the following comment is made:-

The calculations of the stability of the embankment between the afore-mentioned Stations, based on the available information, indicate that the factor of safety is only slightly greater than 1.0. Therefore, no surcharge, although desirable, could have been recommended. Because of many assumptions that had to be made in the calculations, it was recommended to install settlement plates and piezometers and through them, evaluate whether the above-mentioned assumptions were correct, or whether more favourable conditions prevail. In this latter case, a surcharge would be called for, although it was initially not recommended.

4) On Page 10, Stations, locations and the number of settlement plates are given. In a previous memorandum to the Bridge Office, dated 12/9/1960, other data referring to the same subject, are contained. In order to avoid any confusion, it should be known that the recommendations contained in the report have superseded those contained in the memo to the Bridge Office, and are the only valid ones.

5) A number of conclusions and recommendations contained in the report are based on information and results which are only partly representative. This is because of the extremely difficult and heterogeneous subsoil conditions. Therefore, it is most likely that during construction, some minor changes will have to be made. It is here brought to the attention of the designer that clauses should be contained in the specifications which provide for the execution and payment of such alterations or additional works.

L. G. Soderman,
PRINCIPAL FOUNDATIONS ENGR.
Per:

Atterman

(A. Stermac,
FOUNDATIONS OFFICE ENGR.)

AS/MdeF

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
D. G. Ramsay
I. C. Campbell
R. E. Richardson
T. J. Kovich
A. Watt
C. C. Parker & Assoc. (4)
Foundations Office
Gen. Files.

Mr. J.C. Thatcher,
District Engineer, Hamilton.
Materials & Research Division.

September 4, 1962.

Chedoke Expressway, Cont. 62-109
50 Ton Rubber-Tired Roller.

The grading Sub-Contractor owns a heavy rubber tired roller. The weight can be varied from 12 tons, empty, to over 50 tons, loaded. The tire pressure can be increased from 60 p.s.i. to 90 p.s.i.

Earth compaction on this Contract is being paid for on an hourly rental basis. The Contractor proposes to have the Heavy Roller included on the list of approved compaction equipment for this Contract, at a rate of about 3 times that for a Wobbly Wheel.

The following information and suggestions are for your consideration in this matter.

1. Heavy R/T Rollers have been used successfully on large Airfield, Dam and Highway projects. Only the economics of their use on this particular project is at issue.
2. Investigations into roller efficiency are time consuming and difficult because of the number of variables involved, e.g. soil types and moistures.

The results of an "Investigation of the Performance of Pneumatic-tired Rollers in the Compaction of Soil" by the Road Research Laboratory, Harmondsworth, England, are applicable. Tests were carried out in heavy clay, sandy clay, sand and gravelly sandy clay. The rollers weighted 12, 20 and 45 tons. Tire pressures were: 36, 80, 90 and 140 p.s.i.

Field compaction studies with a heavy rubber-tired roller (weight 50 and 60 tons, tire pressure 90 and 150 p.s.i.) were conducted by the U.S. Army in consultation with A. Casagrande.

Continued.../2

- Results of these two investigations indicate that
- a) the hourly output ratio of a 45 ton roller to a 12 ton roller is 720 c.y. to 260 c.y., i.e. about 2.8 to 1. This ratio is based on a 9 in. thick compacted layer for the 45 ton roller against a 5 in. thick layer for the 12 ton roller.
 - b) The soil density tends to fall by 2 to 5 percentage points for each 6" in depth of layer (depending on the tire pressure and moisture content).
 - c) To achieve the greatest output of compacted soil the highest practical towing speed needs to be employed with, if necessary, a slight increase in the number of passes.
3. A large proportion of the earth fill on this Contract will be placed in separate ramps and structure approaches. It is probable that the rate of fill in some of these and in other locations will be less than the capacity of the Heavy Roller. In this event the Heavy Roller will be costlier than the use of one or two wobbly wheels (or sheepfoot rollers).

On the other hand, it can be advantageous, in the restricted space of a ramp, to have only one roller operating instead of two or three. In this case, the Heavy Roller may facilitate a better use of the scraper capacity.

4. The towing speed and consequently the output of the Heavy Roller, more so than that of a lighter roller, will be reduced when operating on the inclined grades of the ramps.

Conclusion:

- a) The Heavy Roller can compete with light rollers only if a minimum rate of placing (app. 350 c.y. per hour) in any single location can be counted on. This is not the case on this Contract.
- b) Inclined grades cut down the efficiency of the Heavy Roller. A large proportion of fill on this Contract will be placed on ramps.
- c) When operating in restricted filling space the Contractor may be able to better utilize his scraper capacity by the use of the Heavy Roller.
- d) The Heavy Roller is an excellent piece of equipment. Its economical use depends on an efficient compaction control which is not always available. For this reason the Heavy Roller would probably be generally uneconomical in a "compaction by hourly rental" contract, but would be well suited to a "compaction by results" contract.

- e) Since the Heavy Roller is on site, a trial period of, say, one hundred hours may turn out to be useful. During this period a check on the roller output could be kept.

R. Schonfeld,
For: T.J. Kovich,
Regional Soils Engineer.

AS/be
C.C.H. Nixon
L.R. Radie
T.J.K. /
Files

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section.

October 21, 1960.

ADDITIONAL COMMENTS and
CLARIFICATION -

Attention: Mr. S. McCombie.

Re: D.H.O. FOUNDATION INVESTIGATION REPORT
Chedoke Expressway - Hwy. #403 between
King Street & Longwood Road, District #4,
W.J. 60-F-7(B) -- W.P. 231-58-2, Sept./60.

In connection with our above-mentioned report, we would like to make some additional comments and clarify a few items:

1) On Page 10 of this report, a granular material is recommended as the replacement of the excavated recent garbage. It has already been decided that the shale from the borrow area on Wolfe Island will be used for this purpose.

2) On Page 10, it is also recommended that the up to 50 T roller be also used for the compaction of the embankment. The price for the use of this roller being certainly higher than that for the sheepfoot roller, this recommendation should not be contained in the specifications.

3) In Section 5.3 for the part of the highway between - Station 400 + 00 and 409 + 00, no berm is recommended. Later in the text, it is stated that maybe a berm will be placed. To avoid any misunderstanding, the following comment is made:-

The calculations of the stability of the embankment between the afore-mentioned stations, based on the available information, indicate that the factor of safety is only slightly greater than 1.0. Therefore, no surcharge, although desirable, could have been recommended. Because of many assumptions that had to be made in the calculations, it was recommended to install settlement plates and piezometers and through them, evaluate whether the above-mentioned assumptions were correct, or whether more favourable conditions prevail. In this latter case, a surcharge would be called for, although it was initially not recommended.

cont'd. / 2 ...

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5) A number of conclusions and recommendations contained in the report are based on information and results which are only partly representative. This is because of the extremely difficult and heterogeneous subsoil conditions. Therefore, it is most likely that during construction, some minor changes will have to be made. It is here brought to the attention of the designer that clauses should be contained in the specifications which provide for the execution and payment of such alterations or additional works.

L. C. Soderman,
PRINCIPAL FOUNDATIONS ENG'G.
Per:

Attest

(L. C. Soderman,
FOUNDATIONS OFFICE ENG'G.)

L. C. Soderman

cc: Messrs. A. F. Toye (2)
H. A. Fregaskes
D. C. Massey
I. C. Campbell
H. E. Richardson
T. J. Kovich ✓
A. Watt
C. C. Parker & Assoc. (4)
Foundations Office
Gen. Files.



ONTARIO

DEPARTMENT OF HIGHWAYS

Memo to Mr. L.G. Soderman,.....

Date.....October 4th, 1960.....

.....Foundation Engineer.....

Subject Foundation Section Report,
Hwy. #403 between King Street &
Longwood Rd. M.J. 60-F-7(5),
W.P. 231-58-2.

From Soils Section.....

With regard to the above report, the following
comments are made:

- (1) The fill material for the embankment, which will be placed after the fresh garbage has been removed, is described in the report as "granular material". In fact, shale material from the Wolfe Island cut will be used.
- (2) It is suggested in the report that the 50 tons "garbage roller" will be used for the compaction of the embankment fill. This does not conform with our recommendations made for shale fill compaction which have been agreed upon after thorough consideration and lengthy discussions.
- (3) In section 5:3 of the report, it is stated that between stations 400+00 and 409+00, the safety factor for the proposed 20' high embankment is only slightly above 1:0, and that, therefore, no surcharge is proposed. Reading on, however, it is said that three sets of settlement platforms and piezometers should be installed and that it will be decided, from observations made in the field, whether a surcharge is necessary.
Should not this point be further elaborated.
- (4) Section 5:4 of the report suggests that no surcharge be applied between stations 409+00 and 419+00. It also points out that "some organic matter, cinder and ashes" were found between stations 414+00 and 416+00. The depth of this old garbage layer in this location is over 25 feet.

Will this not leave a short (app. 150' long) soft area, liable to differential settlement, behind unless a short section of surcharge is applied?

In your letter to the Bridge Office, 12/9/60, five (5) settlement platforms per cross section were recommended i.e. at centre line, 20' right centre line, 20' left centre line and 75' right centre line, 75' left centre line. Accordingly, five platforms each were provided for in C.C. Parkers' Contract Bill of Quantities. The report, however, asks for four settlement platforms per cross section, at 13' right and left centre line and 55' right and left centre line.

Which of these recommendations applies?

(6) I have been under the impression that the 10' surcharge was a round and general figure, and that the actual height of surcharge would depend on settlement observations during construction. If this is correct, should this point not be dealt with in the report?

RS/hl
c.c. T.J. Kovich,
R. Schonfeld,
Files.

R. Schonfeld
R. Schonfeld,
Project Soils Engineer.

PERIOD FROM

TENDER FOR AND ORDER SENT TO

Ontario Department of Highways

23-61-174-A

Block

Subject

Mr. L.C. Soderman,
Foundation Engineer.
Soils Section.

October 4th, 1960.

Foundation Section Report,
Hwy. #403 between King Street &
Longwood Rd. W.J.60-P-7(B),
W.P.231-58-2.

With regard to the above report, the following comments are made:

- (1) The fill material for the embankment, which will be placed after the fresh garbage has been removed, is described in the report as "granular material". In fact, shale material from the Wolfe Island cut will be used.
- (2) It is suggested in the report that the 50 tons "garbage roller will be used for the compaction of the embankment fill. This does not conform with our recommendations made for shale fill compaction which have been agreed upon after thorough consideration and lengthy discussions.
- (3) In section 5:3 of the report, it is stated that between stations 400/00 and 409/00, the safety factor for the proposed 20' high embankment is only slightly above 1:0, and that, therefore, no surcharge is proposed. Reading on, however, it is said that three sets of settlement platforms and piezometers should be installed and that it will be decided, from observations made in the field, whether a surcharge is necessary.

Should not this point be further elaborated.

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Will this not leave a short (app.150' long) soft area, liable to differential settlement, behind unless a short section of surcharge is applied?

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RS/h1
c.c. T.J. Kovich,
R. Schonfeld,
Files.


R. Schonfeld,
Project Soils Engineer.

Mr. H. Greenland,
District Engineer,
Hamilton, Ontario.

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
February 22, 1963

Movement of Retaining Wall -
Overpass at Ramp 'L',
Chedoke Expressway, Dist. #4,
Cont. 61-174 -- W.S. 59-T-7(3).

In response to a verbal request to the Foundation Section by Mr. Harry Nixon of C. C. Parker & Associates, the undersigned, together with Mr. M. Devata, visited the site on February 21, 1963.

Relative movement of the order of an inch occurred between the South retaining wall and the South abutment on the east-bound lane. The rubber joint at the top was torn. No movements were visible on other parts of the structure.

Subsoil conditions at the site, described in the Foundation Report, are satisfactory from the foundation viewpoint. No settlement problem would be expected under the design load of 3 T.S.F. At the present moment, the pressure on the subsoil due to the weight of the footings and the walls, is only 1/2 T.S.F. It is, therefore, very unlikely that the movement can result from settlement. On the other hand, the silty sand and sandy silt subsoils are very susceptible to frost action. No measure for frost protection was visible at the site. A hole was dug close to the spot where noticeable movement has occurred behind the wall down to the level of the bottom of the footing. Lenses of ice up to 1/8 in. thick were clearly visible throughout this depth. Pools of ice were also present behind the walls on the ground surface. These observations indicate that the movements are due to frost heave.

It is therefore recommended that the pouring of the decks be delayed till spring so that the structure can settle back. If this is not feasible due to scheduling or conditions of contract, some other measures have to be taken before the concrete for the decks are poured.

We believe that the above information is sufficient for your present purposes; however, if we can be of further assistance, please do not hesitate to contact our office.

KYL/ade7

cc: Mr. H. Nixon - C.C. Parker & Assoc.

Mr. T. J. Kevich

Foundations Office -- Gen. Files

R. Y. Lo,

SUPERVISING FOUNDATION ENGINEER

For: A. G. Stermac,

PRINCIPAL FOUNDATION ENGINEER

4 Jan 1963
R. Y. Lo

Mr. T. J. Kovich,
Regional Soils Engr.,
Toronto.

Mr. A. G. Starnac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

February 20, 1963

Attn: Mr. P. Schoenfeld

Hwy. No. 403, Garbage Dump
Settlement Record

Large settlements were expected on the embankment through the garbage dump. In order to speed up the rate of settlement, a 10-ft. surcharge, to remain for a year, was recommended and accepted. Plates to record the rate and magnitude of settlements were installed at two stations 394+00 and 398+00. The results of the settlement plate readings up to January 25, 1963, are shown on the attached drawing.

Two obvious conclusions can be drawn from these graphical presentations:

- 1) The settlements that have taken place are very substantial.
- 2) The settlement rate is gradually decreasing.

The above conclusions are, however, only qualitative. A quantitative analysis of the settlement records would be rather ambiguous because of some apparent incorrectness in the survey of the plates. Between August 3, 1962 and October 12, 1962, an unusually large settlement was recorded. A subsequent investigation revealed that during this period, the temporary bench mark was lost and another had to be used afterwards. Although assurance was obtained that all necessary precautions were undertaken to preserve accuracy, the recorded settlements indicate that this was not successfully accomplished.

The settlement readings taken during the latter part of 1962 and in January 1963, show inconsistencies and thus, also, make a quantitative analysis meaningless.

The original plan asked for the surcharge to be left for one year only. It has now been in place for nearly two years and according to the present requirements, should be removed shortly, and the material used for fill construction on an adjacent contract.

cont'd. /2 ...

Mr. T. J. Kovich, Reg. Soils Engr.
Attention: Mr. R. Schonfeld.

February 20/63

We were asked whether we would agree with this, since there are indications that the settlements are still going on.

After reviewing the available records, we have come to the conclusion that the surcharge should be removed because of the following reasons:

The rate of settlements has decreased very considerably and, although it is impossible to attribute any numerical values, it can be concluded that further settlements will be small. The fact that by removing the surcharge, unloading of the subsoil will take place, further settlements could be negligible.

Failing to remove the surcharge would cause considerable additional costs for the purchase and haulage of fill material for the above-mentioned contract, and the disposal and waste of the surcharge next year.

In the light of the above-explained predictions, we feel that such costs are unwarranted.

ADS/MicF
Attach.(2)

A. G. Starnac
A. G. Starnac,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office ✓
Gen. Files.

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FOUNDATION INVESTIGATION

FOR

Chedoke Expressway
Hwy. #403 between King Street
& Longwood Road, District #4
W.J.60-F-7 (B) W.P.231-58-2

1. INTRODUCTION:

A detailed subsail investigation by drilling was carried out between Longwood Road and King Street, where the proposed Chedoke Expressway runs from south to north.

Subsequently, on July 29th, 1960, four test pits were dug with a backhoe in order to supplement the results of the borings.

Results of the investigation carried out by the Department of Highways as well as by E.M. Pete & Associates, are included in this report. A copy of the letter of Dr. H.Q. Golder with his recommendations for the portion where the expressway crosses the garbage dump at Hamilton, is also included.

The site is located in the western part of Hamilton between Longwood Road and King Street, and is presently known as "The City of Hamilton Dump Area".

The dump area presents a considerable problem in the design of the new expressway. Our recommendations for the solution of the various problems in connection with this area are contained in this report.

2. FIELD & LABORATORY WORK:

In order to obtain sufficient information on the types and properties of the subsail, sampled boreholes supplemented by the same number of dynamic cone penetration tests were carried out. The density of cohesionless material was determined in the field by means of the Standard Penetration Test. Samples recovered in the split spoon were used for

2. FIELD & LABORATORY WORK: (Cont'd.) ...

classification purposes. In cohesive organic materials as well as in clays, 2" ϕ thin-walled Shelby tube samples were taken at required depths. In addition, in-situ vane tests were carried out wherever possible, in order to determine field shear strength values.

In the Laboratory, routine tests for index properties were carried out on selected representative samples.

Laboratory and field test results have been summarized in Table #1 and are included under Appendix I. The location of boreholes is shown on Drawing No. 60-F-7 (B).

3. SUBSOIL CONDITIONS:

The stratigraphy of the soil at the site varies considerably from Sta. 388/00 to Sta. 420/00. Detailed descriptions of various soil types encountered in each boring, are shown in Appendix I of this report. The estimated stratigraphical profile of Drawing 60-F-7 B is based upon this information.

In order to make it simpler, the profile has been divided into three convenient portions and described as follows:

Sta. 388/00 to Sta. 400/00

Sta. 400/00 to Sta. 409/00

Sta. 409/00 to Sta. 419/00

3.1 Stratigraphy of Subsoil from Sta. 388/00 to Sta. 400/00

The subsoil between Sta. 388/00 and Sta. 400/00 consists mainly of the following materials:

Recent Refuse and Decayed Sanitary Fills

Organic clay

Inorganic clay

3.1 Stratigraphy of Subsoil From Sta. 388/00 to Sta. 400/00 (Cont'd.)

Sand with excessive fines & sandy silt.

3.1.1 Recent Refuse and Decayed Sanitary Fill:

Between approximately Sta. 388/00 to Sta. 397/00 the Deposit of recent refuse extends below the surface for a depth of 7ft. to 10ft., followed by decomposed sanitary fill of 8 to 20ft. deep.

From Sta. 397/00 to Sta. 400/00, the deposit of recent refuse was not encountered at all, and the decomposed sanitary fill followed immediately below the surface.

The recent refuse consists predominantly of paper and cardboard, whereas the decomposed sanitary fill consists of ashes, cinders, tins and sand.

3.1.2 Organic clay of Intermediate to high plasticity

Underlying the deposits of sanitary fill is a layer of organic clay. This layer has a maximum depth of 25 ft. in B.H. #33 and a minimum depth of 10 ft. in B.H. #28. Occasional pockets of fine sand were encountered in this stratum. Generally, the consistency of this material of intermediate to high plasticity, varies from very soft to Med Stiff. It was also observed that the content of organic matter decreases with depth.

In B.H. #35, immediately below the sanitary fill and above the organic clay, a layer approximately 10 ft. thick of sand with organic matter was encountered.

Engineering properties determined from field and Laboratory tests were found to be as follows:

Natural Unit weight (average)

100 p.c.f.

3.1.2 Organic clay of Intermediate to high plasticity (Cont'd.) ...

Moisture Content range	27% - 131%
Liquid Limit range	60% - 144%
Plastic Limit range	28% - 68%
Shear Strength (in-situ Vane tests)	440 - 960 p.s.f.

3.1.3 Inorganic clay of Intermediate to High Plasticity

This material immediately underlies the organic clay and covers most of the site, but was not observed in B.H. #27, 29 and #33. The thickness of this material varies considerably with a maximum of 20 ft. in B.H. #28, to a minimum of 5 ft. in B.H. #32. It contains, in varying amounts, silt and fine sand. Pockets of sand and silt are also present. Occasionally, shells and fragments of wood were observed in this stratum which might be the deposit of an old stream. In general, the consistency of this material of Intermediate to High plasticity, varies from soft to stiff. Values of some of the physical properties are as follows:

Natural unit weight	115 - 122 p.c.f.
Moisture Content range	25% - 46%
Liquid Limit range	36% - 60%
Plastic Limit range	18% - 30%
Shear Strength	440 - 1120 p.s.f.

3.1.4 Sand with excess of fines & sandy silts:

This material immediately underlies the inorganic clay stratum in most of the places but not in B.H. #27, 29 & 32. In these three boreholes sandy silt was encountered below the organic clay deposits.

In B.H. #31, 32 & 33, the top layers are predominantly sandy silt which exhibits non-cohesive characteristics. As the depth increases this

3.1.4 Sand with excess of fines & sandy silts: (Cont'd.) ... material changes to sand with excess of fines, and then to sand, well graded. Sand with excess of fines followed by well graded sand was observed in all the borings. Occasional pockets of clay were also encountered in this stratum.

Generally, the top layers of sandy silt and sand with excess of silt particles are loose to Med dense, whereas the bottom layers of well graded sand are med. dense to dense. The moisture content of this sand stratum varies from 9% to 36% and the penetration resistance varies within the range of 3 to 44 blows/ft.

3.2 Stratigraphy of subsoil from Sta. 400+00 to Sta. 409+00

3.2.1 General:

From the available subsoil information it can be concluded that this area was once covered by a swamp or creek and later filled with refuse.

Detailed description of the various soil types encountered in each of the borings are shown in Appendix I of this report. The description of the encountered layer is given below.

3.2.2 Decomposed Sanitary fill

This deposit extends over the entire area except in B.R. #521 & #522. All the refuse is very well decomposed and generally consists of ashes, cinders with sand and glass pieces of tins. This material is predominantly a non-cohesive material of loose density. Because of the loose state of this material, considerable settlements can be anticipated during the embankment construction.

3.2.3 Organic clay of Intermediate to High plasticity

This material is predominant over the entire area and generally follows the deposits of decomposed refuse. In B.H. #25, 26 & 608, a layer of sand with fragments of timber and ashes of approximately 5 ft. to 12 ft. was encountered between the deposits of decomposed sanitary fill and organic clay.

In general, the consistency of the organic clay of intermediate to high plasticity, varies from soft to stiff. Occasional pockets of silt with organic matter of low plasticity were observed in this stratum. The content of organic matter decreases with depth. Values of some of the physical properties determined from field and laboratory tests are as follows:

Natural Unit weight (average)	100 p.c.f.
Moisture Content	31% - 87%
Liquid Limit	34% - 126%
Plastic Limit	23% - 94%
Shear Strength (in-situ Vane Tests)	400 - 1200 p.s.f.

3.2.4 Inorganic clay of low to Intermediate plasticity

This deposit extends below the organic clay deposits in B.H.#25, 26 and #521, but was not observed in B.H. #608 & #5. This same material was also encountered at greater depths in B.H. #21 & 522. The consistency of this layer varies from med. stiff to stiff. Fine sand is contained within this deposit, together with thin seams of silt and fine sand. Values of some of the physical properties of this material are as follows:

Undrained Shear Strength	900 - 1200 p.s.f.
--------------------------	-------------------

3.2.4 Inorganic clay of low to Intermediate plasticity: (Cont'd.)

Liquid Limit	25% - 49%
Plastic Limit	16% - 21%
Natural Moisture content	16% - 31%

3.2.5 Sand with excess of fines:

This stratum extends below the deposits of organic or inorganic clay in all the borings. Occasionally pockets of well graded sand were encountered in that deposit. The content of silt varies considerably and it is very difficult to distinguish between layers of non-cohesive deposits of silty sand and sandy silt. These granular deposits occasionally contain fragments of decayed timber. The density of this material varies from loose to dense. Physical properties of this material are as follows:

Moisture content	11% - 47%
Penetration Resistance	3 - 40 blows per ft.
Bulk Density	125 - 135 p.c.f.

3.3 Stratigraphy of Subsoil from Sta. 409/00 to Sta. 419/00:

The subsoil between Sta. 409/00 and Sta. 419/00 consists mainly of the following materials:

3.3.1 Decomposed Sanitary fill and sand & gravel fill:

This deposit extends below groundlevel between Sta. 411/00 to Sta. 417/00 (in B.H. #38 & #16) but was not observed in any other borings. The decomposed deposit consists mainly of ashes, and cinders with decayed refuse. In B.H. #4 a thin layer of sand and gravel fill was found immediately below the ground surface. The density of these deposits is generally loose.

3.3.2 Organic clay of high plasticity:

This material immediately underlies the fill material in B.H.#38, 16 & #4 but was not encountered in B.H. #22, #622. It varies in thickness from 10 ft. in B.H. #16 to about 15 ft. in B.H. #38. The properties of this material are very similar to those of the organic clay which were already described under 3.2.3.

3.3.3 Sand with excess of fines:

This material extends below groundlevel in B.H. #22, whereas in B.H. #622 a thin 5 ft. layer of clay with fine sand covers this deposit. In B.H. #22, 16 and #4 this deposit extends below the organic clay. The thickness of this stratum varies from 45 ft. in B.H. #22 to 5 ft. in B.H. #38. It contains seams of silt with fine sand, but it has the characteristics of a non-cohesive material. The density of this material varies from loose to dense. The moisture content of this material varies from 11% to 23% and the penetration resistance from 7 blows/ft. in the loose deposits to a maximum of 91 blows/ft. in the dense material.

3.3.4 Inorganic clay of low plasticity:

This material was encountered in only two of the boreholes (B.H.#38 & #16) immediately below the sand stratum. It contains silt and some fine sand and occasionally pockets of silt. Generally, the consistency of this material of low plasticity is medium stiff to stiff.

4. GROUND WATER OBSERVATIONS:

Field observations and measurements carried out during the exploration programme showed that the ground water level was approximately at Elev. 236.0 to 254.0. Most of the borings were carried out in the vicinity of the existing open sanitary and storm sewer. The water level

4. GROUND WATER OBSERVATIONS: (Cont'd.) ...

observed in these borings was at a slightly higher level than the water level in the sewer, which at that time was at Elev. 244.0. The boreholes which were far away from the influence of the open sewer, showed slightly lower levels than the water level in the sewer.

Neither artesian water conditions nor water bearing sand seams were encountered during the exploration.

5. DISCUSSION & RECOMMENDATIONS:

5.1 General

The construction of the Chedoke Expressway in and around the dump area will include the building of an approximately 20 ft. high roadway as well as some other structures. It has already been explained that this part of the expressway has been divided into three sections. The discussion and recommendations are therefore made for each of those sections separately.

5.2 Sta. 388/00 to Sta. 400/00

The field investigation has revealed that between Sta. 389/00 and 398/00 the refuse deposit has a high content of organic matter and that this is in a rather early stage of decomposition. Due to this fact large settlements under the embankment load could be expected. Settlements would not only be large but also very nonuniform and therefore intolerable. To eliminate this undesirable and intolerable inconvenience, it is recommended that this fresh garbage be excavated. The layer of this fresh, recent garbage is about 8 feet thick and it extends to about the ground water level. Therefore, no problem is anticipated in connection with this operation.

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.2 Sta. 388+00 to Sta. 400+00

Below the layer of fresh garbage there is some more old garbage and other compressible organic and inorganic material. All this material will consolidate under the load of the new embankment. In order to accomplish as much settlement as possible within the shortest possible time, surcharging of the embankment is recommended.

The excavation of the garbage should be carried out according to the D.H.C. Standards DD-406 & DD-407. The material used for the replacement of the excavated garbage as well as for the embankment should be granular fill compacted according to the usual specifications and requirements. The surcharge should be 10 ft. high and should not be compacted. The slopes of this surcharge can be made as 1:1 or as steep as they can be formed. The surcharge should be placed between Sta. 389+00 and Sta. 400+00. To determine the degree to which the surcharge has been effective, settlement plates are to be installed in two sections (Sta. 394+00 and Sta. 398+00). In each section there will be four plates, two on the left and two on the right side at 13 and 55 feet of centre line, respectively. The details of the installation as well as all the necessary instructions are given in a separate report.

When the excavation of the garbage is completed it is recommended to use heavy rollers for the compaction of the underlying material. These rollers are afterwards used also on the compaction of the fill material. Since the underlying material is loose, rollers should be used, the load of which can be gradually increased. An ultimate roller load of about 50 tons is recommended. The number of passes as well as the load

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.2 Sta. 388/00 to Sta. 400/00

increments of the roller will be determined in the field by the supervising engineer on the basis of his observations and the results obtained.

The excavation, transport and new disposal area of the garbage will also represent a special problem because of the unusual and bad odour of the garbage. It is recommended that deodorants be used during this operation in order to reduce the inconvenience as much as possible. Steps have been undertaken by the consultant, C.C. Parker & Associates as well as by the Department of Highways to decide on the best and most effective and appropriate chemical and method to be applied.

5.3 Station 400/00 to Sta. 409/00

The investigation has revealed that in this region there is no recent undecomposed garbage, but only old decomposed garbage underlain by organic and inorganic soft material. It is recommended that no sub-excavation be undertaken here but the embankment be built on the existing ground. The embankment height here is about 20 feet. Stability analyses have shown the factor of safety to be just slightly above 1.0 and no surcharging is therefore proposed. Prior to the placement of the fill the ground should be compacted with the earlier mentioned roller. The fill should be placed in layers and compacted to the required density. The specifications for this operation are given elsewhere.

This section of the Chedoke Expressway differs from the one described in the previous paragraph. The stratification is different and so are the soil properties. It is therefore, recommended that settlement observations plates as well as piezometers be installed in this section.

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.3 Station 400+00 to Sta. 409+00

It is proposed that the settlement plates be placed at Sta. 403+00, Sta. 406+80 and Sta. 408+50. The piezometers should also be placed at the same stations. The information obtained from these instruments will enable the supervising engineer in the field to decide whether some surcharge is necessary and if so whether and when it can be placed.

Between Sta. 400+00 and Sta. 408+00 an open sewer crosses the proposed line of the Chedoke Expressway. This open sewer channel is going to be abandoned and backfilled. The investigation revealed that the subsoil along the sewer channel, up to some 25 feet depth, has a very low shear strength. As was stated already earlier that the height of the embankment above the existing groundlevel in this region is about 20 ft. Before any fill is placed the open sewer channel will have to be backfilled and the ground levelled off. It is emphasized here that the sewer has to be backfilled first, and backfilled to at least 300 feet away from the future embankment toe. The filling operation should be commenced from the most convenient place and carried out both in the upstream and downstream direction. The material that will displace under the weight of the fill will form a mud wave which should be removed by a dredgeline in order to enable further displacement of the very soft material. Before the backfill operation begins a diversion channel or some other arrangement for the sewer has to be completed.

5.4 Sta. 409+00 to Sta. 419+00

The investigation has shown that only between Sta. 414+00 and Sta. 416+00 some organic matter, cinders and ashes are found. Elsewhere no appreciable amounts were encountered. The soil conditions in this

5. DISCUSSION & RECOMMENDATIONS: (Cont'd.) ...

5.4 Sta. 429/00 to Sta. 419/00

section are more favourable than those of the sections described earlier and it is therefore suggested that the normal construction procedure be used, i.e., no surcharge be placed. Before placing the fill, the whole area between Sta. 412/00 and Sta. 417/00 should be compacted with a roller of up to 50 tons capacity. The fill material should be placed in layers and compacted to the required density.

6. SUMMARY:

This report deals with the Chedoke Expressway between Sta. 388/00 and Sta. 419/00, which is part of the garbage dump area of the city of Hamilton.

Between Sta. 388/00 and Sta. 397/00 the garbage is of very recent origin and therefore not decomposed. This refuse which extends on the average to 8 feet below groundlevel should be excavated and replaced. The excavation should be carried out according to the D.H.O. Standards DD-406 and DD-407. Prior to placing the backfill, the trench should be compacted by means of a roller, the weight of which is gradually increased to 50 tons. The fill material that is subsequently placed should be placed in layers and compacted to the required density. Granular material should be used for the embankment. In order to speed up the settlements a 10 ft. surcharge should be placed on top of the embankment between Sta. 387/00 and Sta. 400/00 and left there as long as possible. The surcharge material need not be compacted. Settlement plates should be installed at Sta. 394/00 and Sta. 398/00.

Between Sta. 400/00 and 409/00 the ground should be compacted by means of an up to 50 tons roller prior to placing the fill material. No surcharge is foreseen here because of the very low factor

6. SUMMARY: (Cont'd.) ...

of safety of the embankment fill. To find out whether and when surcharge can be placed settlement plates and piezometers should be installed at Sta. 403+00, 406+80 and 408+50.

Between Sta. 409+00 and 419+00 the embankment is relatively low and no surcharge is foreseen. The ground should also be compacted prior to placing the fill.

The existing sewer channel is being abandoned and realigned. The old channel should be filled up to groundlevel to at least 300 feet from the toe of the new road embankment prior to placing the fill. By that time a suitable sewer diversion arrangement should already be finished.

To minimize the inconvenience caused by the bad odor developed during the excavation and haulage of the garbage, a suitable deodorant spray should be applied.

7. MISCELLANEOUS:

The field investigation was carried out during the period of Dec. 1959, to April 1960, under the supervision of Messrs: I. Johnston, F. Norman, R. Ghadiali, K. Selby and M. Devata project engineers of the Foundation Section of the D.H.C. Part of the work was carried out using hired equipment from Johnston Drilling Company and Canadian Longyear Co. Ltd., and the remainder, using the D.H.C. equipment.

SEPT. 1960.

REPORT PREPARED BY:

M. Devata
Project Engr. Engineer

REPORT APPROVED BY:

F. Norman
Foundation Office Engineer

DEPARTMENT OF HIGHWAYS, ONTARIO
 MATERIALS AND RESEARCH SECTION

 DEFECTS IN NEGATIVE DUE TO
 CONDITION OF ORIGINAL DOCUMENT

W.P. 231-38-2

JOB 00-7-7 B

DATE 258.7'

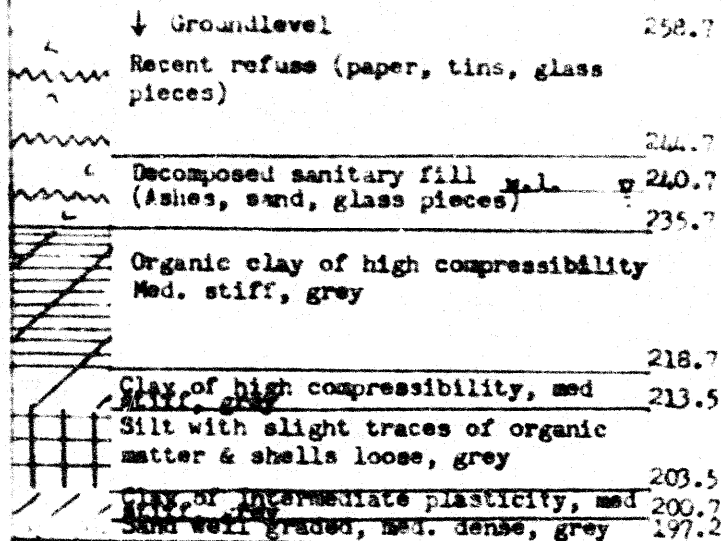
BORING DATE Apr. 14/60

BORE HOLE NO. 32

ELEV. 397.05 (18ft. N. of C)

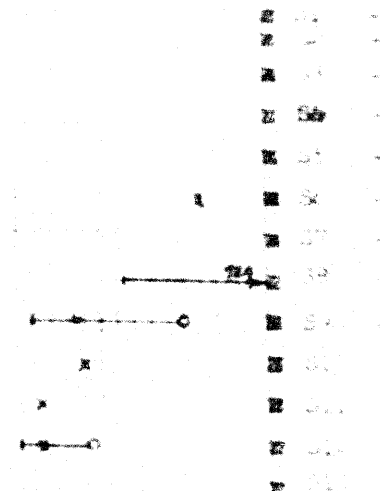
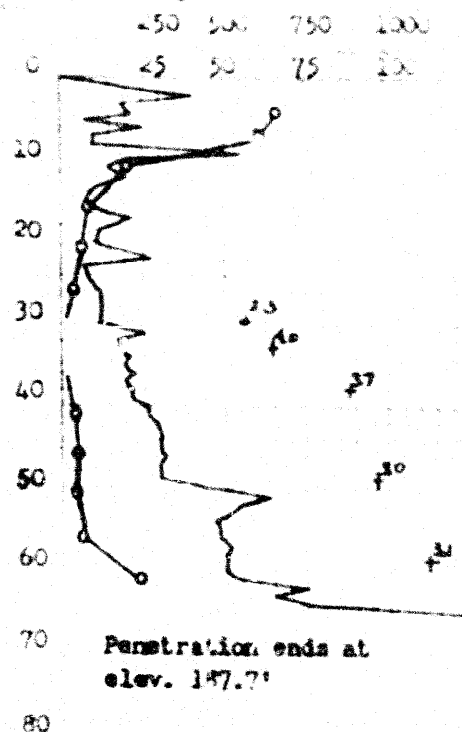
R. L.

H. D.



End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 33

JOB 60-P-7 B

STATION 393+05 (18th Lt. of E)

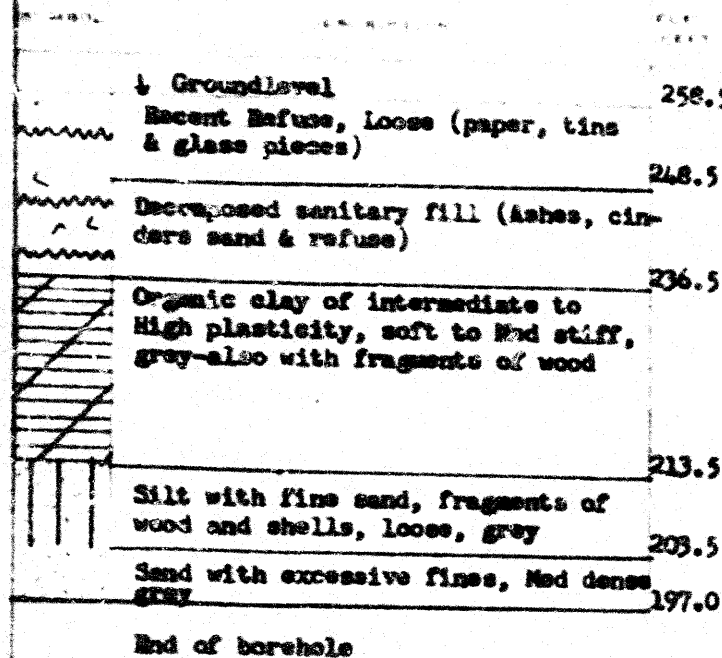
DATUM 258.5

COMPILED BY B. E.

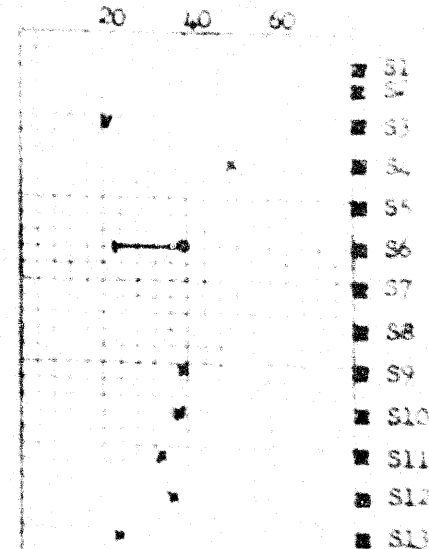
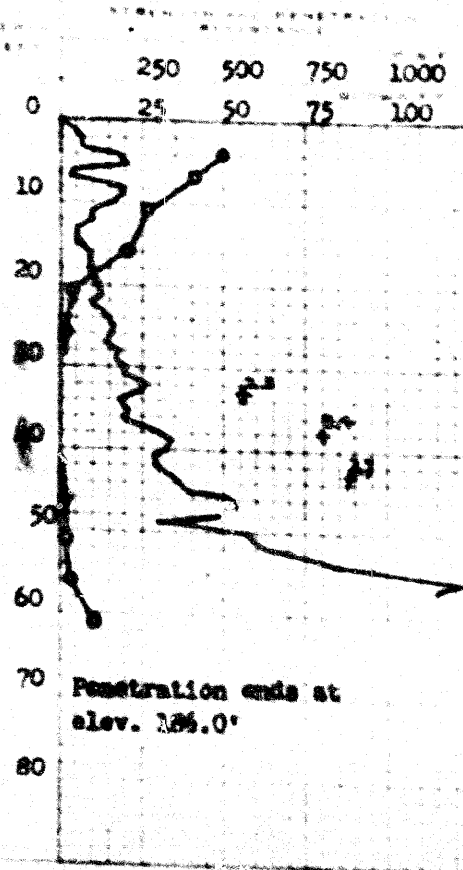
BORING DATE Apr. 20/60

CHECKED BY H. D.

LEGEND



Penetration resistance profile shown obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-F-7 B

DATUM 259.0'

BORING DATE Apr. 22/60

BORE HOLE NO. 34

STATION 391+80 (37 ft. of E)

COMPILED BY B. E.

CHECKED BY M. D.

2" DIA. SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE


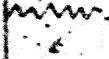



2" DIA. CONE

2" SHELBY

CASIN.

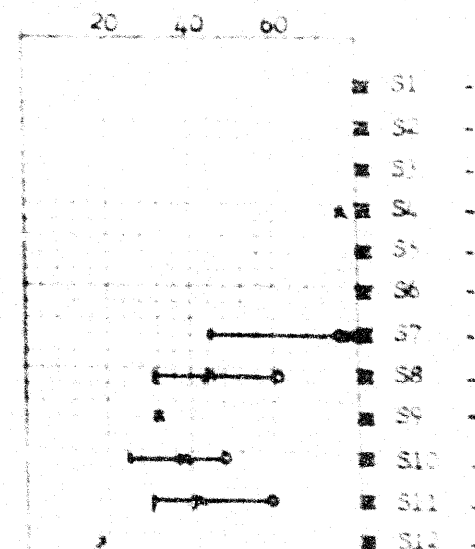
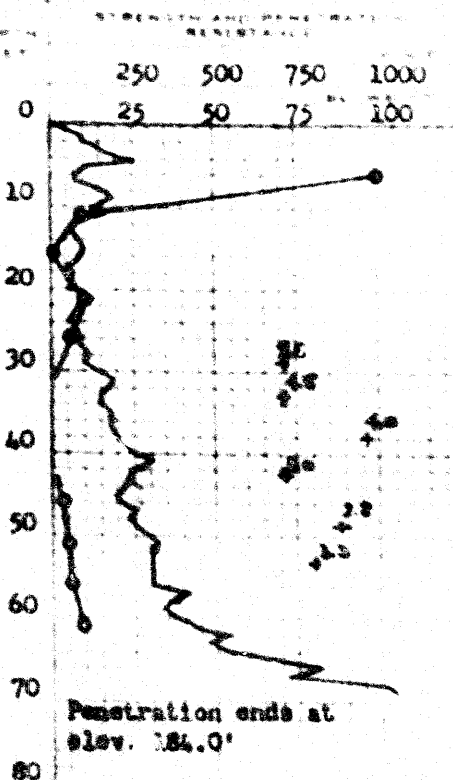
LEGEND

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASIN.

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	259.0	0
	Recent Refuse (paper, tins, cardboard, rubble)		
		247.0	12
	Decomposed Sanitary fill (sand, ashes, tins)	235.0	24
		236.0	23
	Organic clay of high compressibility soft to Med Stiff, gray-occasionally with fragments of wood & shells	220.0	39
		220.0	39
	Clayey Silt changed at Elev. 209.0 to clay of Intermediate to High plasticity, Med stiff, gray	201.0	58
		201.0	58
	Sand well graded, Loose, gray	198.5	60.5

End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 35

JOB 60-P-7 B

STATION 389+55 (30ft. E of C)

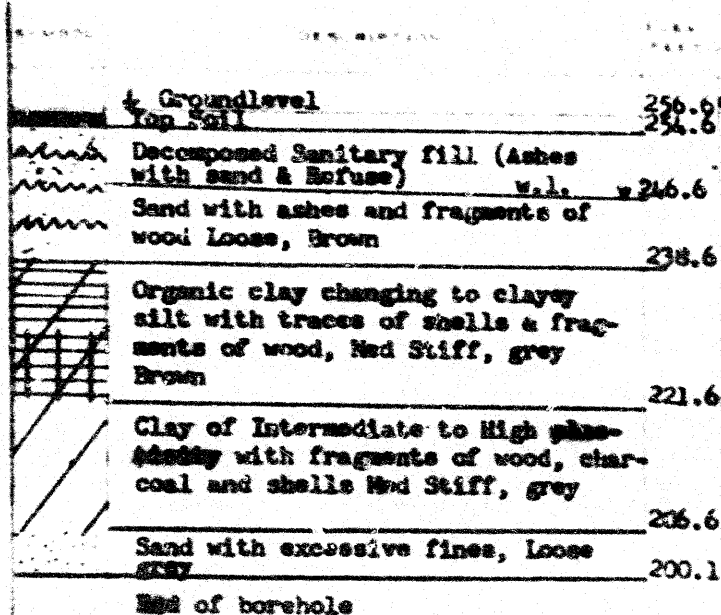
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COMPILED BY B. K.

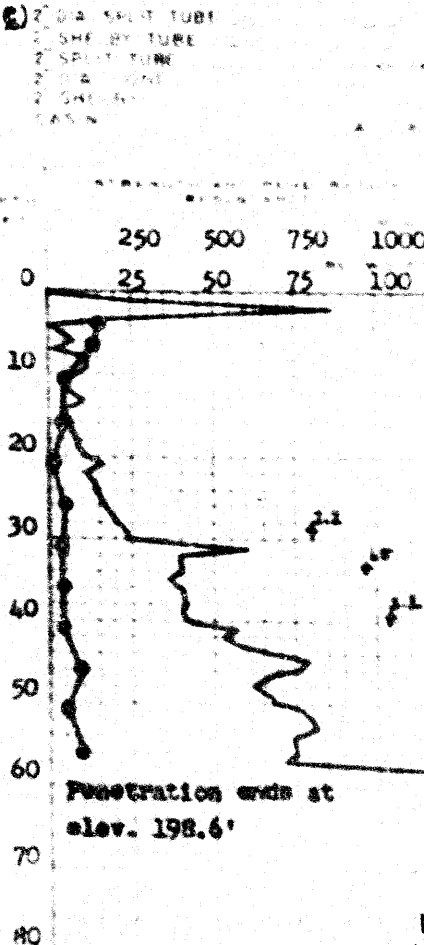
BORING DATE Apr. 27/60

CHECKED BY H. D.

LEGEND



Penetration resistance profile shown obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 21

JOB 60-F-7 B

STATION 408/58 (4ft Lt of 2)

DATUM 252.3'

COMPILED BY B. K.

BORING DATE Mar. 25/60

CHECKED BY H. D.

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

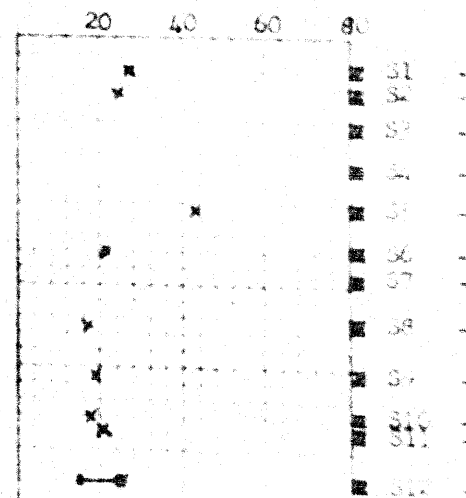
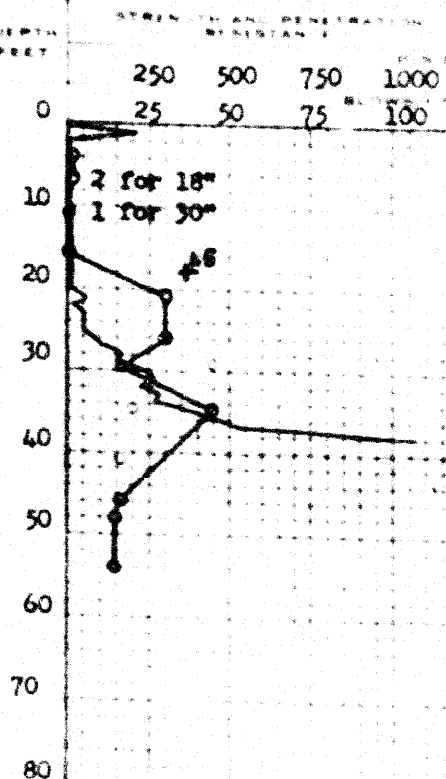
LEGEND

1. SOIL SAMPLE LOCATION ON PLAN
2. VERTICAL SCALE OF PENETRATION RESISTANCE
3. NATURAL SCALE OF PENETRATION RESISTANCE
4. PENETRATION RESISTANCE SCALE
5. PENETRATION RESISTANCE SCALE

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
↓	Groundlevel	242.3	0
~~~~~	Decayed sanitary fill	236.3	6
~~~~~	(Ashes, sand, glass pieces, tins), Loose	226.3	16
~~~~~	Organic matter with silt, soft, Brown	222.3	20
~~~~~	Sand with excessive fines, Med. Dense to Dense, Gray Brown	210.3	32
~~~~~	Sandy silt with pockets of clay, med. Dense, Gray Brown-changing to Silty clay of low plasticity, stiff, gray at Elev. 189.3	187.8	55

End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft lb. per blow



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT.

DEPARTMENT OF HIGHWAYS, ONTARIO  
MATERIALS AND RESEARCH SECTION

W P 231B-58

JOB 60-P-7 B

DATUM 255.0'

BORING DATE Mar. 28/60

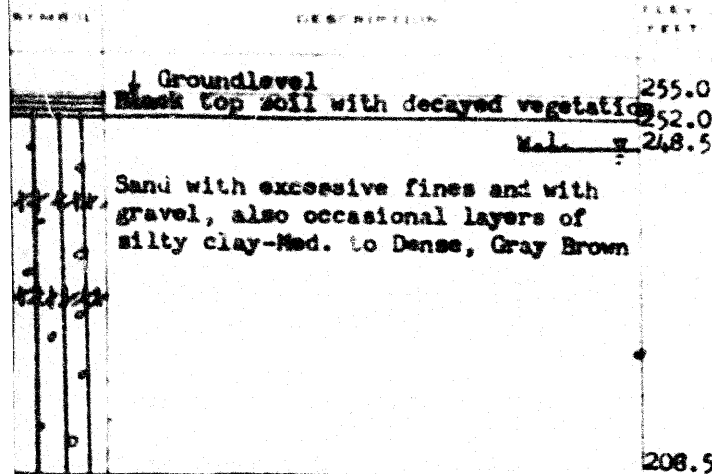
BORE HOLE NO 22

STATION 410+10 &amp; BLVD

COMPILED BY B. K.

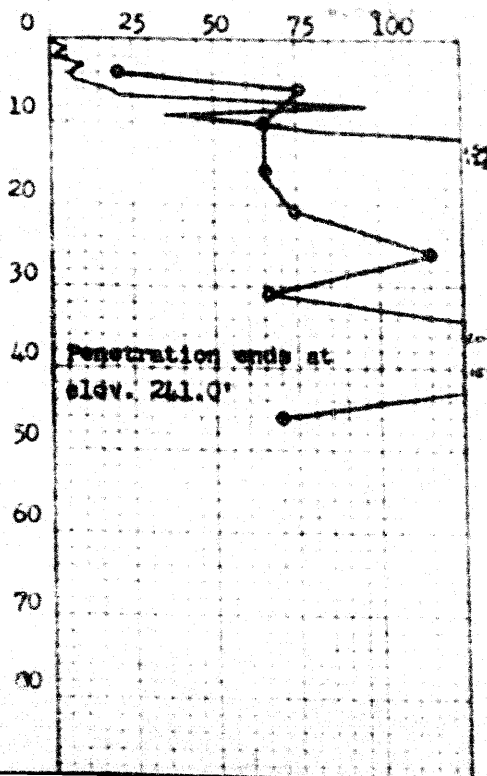
CHECKED BY M. U.

1. 2" DIA. SPLIT TUBE  
 2. 2" DIA. TUBE  
 2. 2" DIA. TUBE  
 2. 2" DIA. TUBE  
 2. 2" DIA. TUBE  
 2. 2" DIA. TUBE



End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



31  
32  
33  
34  
35  
36  
37  
38  
39  
40

DEFECTS IN NEGATIVE DUE TO  
 CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAY - ONTARIO  
MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 23

JOB 60-P-7 B

STATION 409+65 (156 ft. E. of E)

DATUM 247.0'

COMPILED BY B. K.

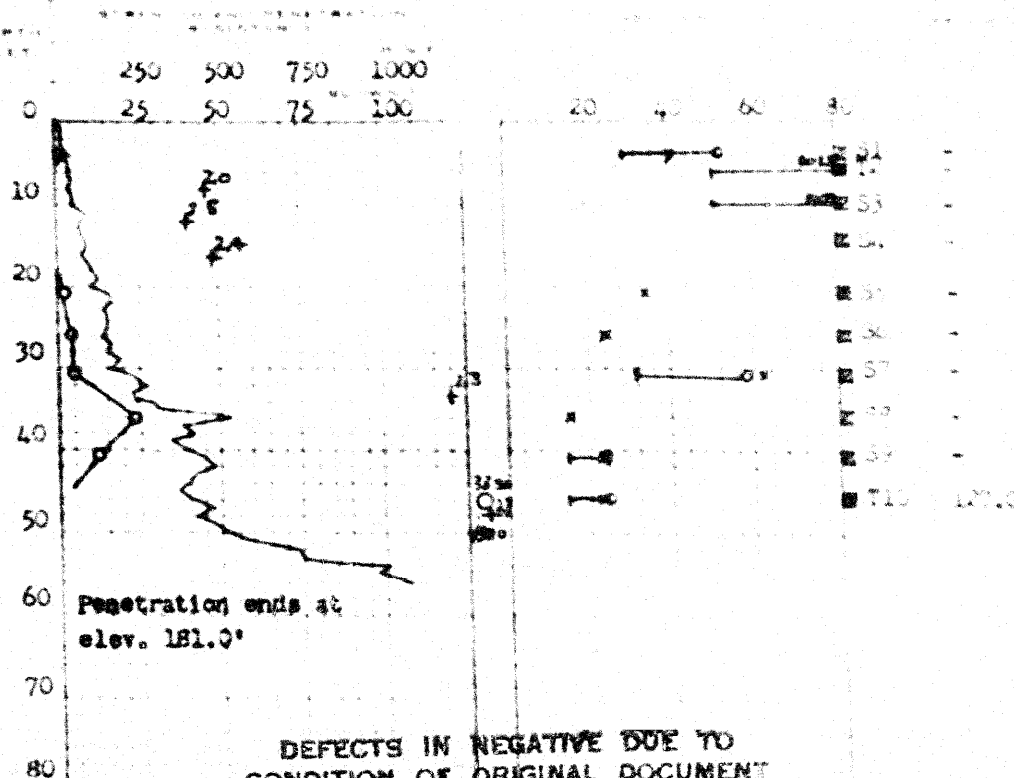
BORING DATE Mar. 31/60

CHECKED BY H. D.

DESCRIPTION	ELEV. FEET	DEPTH FEET
↓ Groundlevel	247.0	0
Organic clay of high plasticity, soft, Brown	246.1	
	228.0	
Sand with excessive fines and with gravel Loose, Brown	219.0	
Organic clay of high plasticity, Med stiff, gray brown	213.0	
Sand & gravel, well graded, Med dense, Gray	207.0	
Clay of low plasticity with silt, stiff, gray	199.5	

End of borehole

Penetration resistance profile  
 shown; obtained by driving a 2" dia  
 cone from groundlevel to depth noted  
 with an energy of 350 ft. lb. per  
 blow



## DEPARTMENT OF HIGHWAY CONSTRUCTION

## MATERIALS AND RESEARCH SECTION

W P 231-58-3

HOLE NO. 21

JOB 60-P-7 B

WASH-60(85ft Rt of E (EBL)

DATE 24.5'

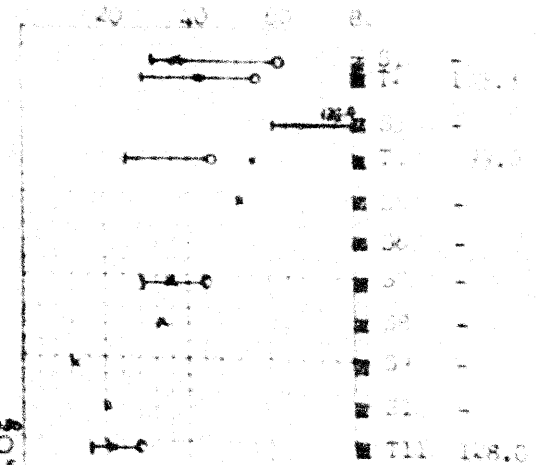
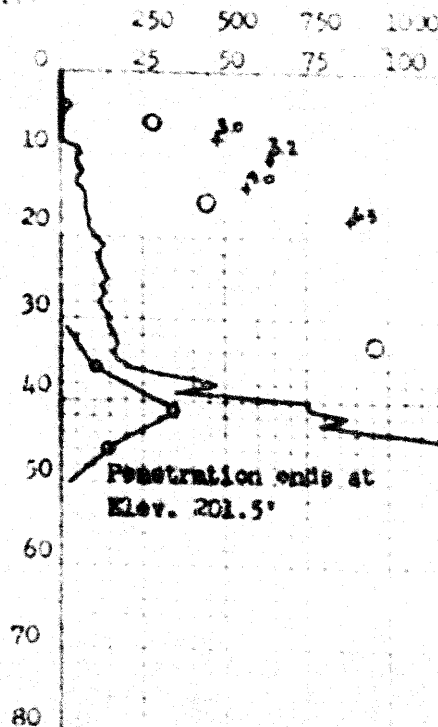
M. L. B. E.

BORING DATE Mar. 30, 60

M. L. B. E.

↓ Groundlevel	246.5
Organic clay of med to high plasticity, with pockets of sand, soft, brown	246.0
Sand with decayed vegetation, loose, Brown	227.5
Organic clay of med plasticity, soft, Brown	220.5
Sand with excessive fines and gravel, Dense, Brown	212.5
Silty clay of low plasticity with pockets of silt, stiff to v. stiff, Gray	202.5
End of borehole	193.5

Penetration resistance profile shown obtained by driving a 2" dia cone from groundlevel to depth with an energy of 350 ft. lb. per blow



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

## DEPARTMENT OF HIGHWAYS, CONN. DIV.

## MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO. 25

JOB 60-F-7 B

STATION 400+15 (35 ft. of E.)

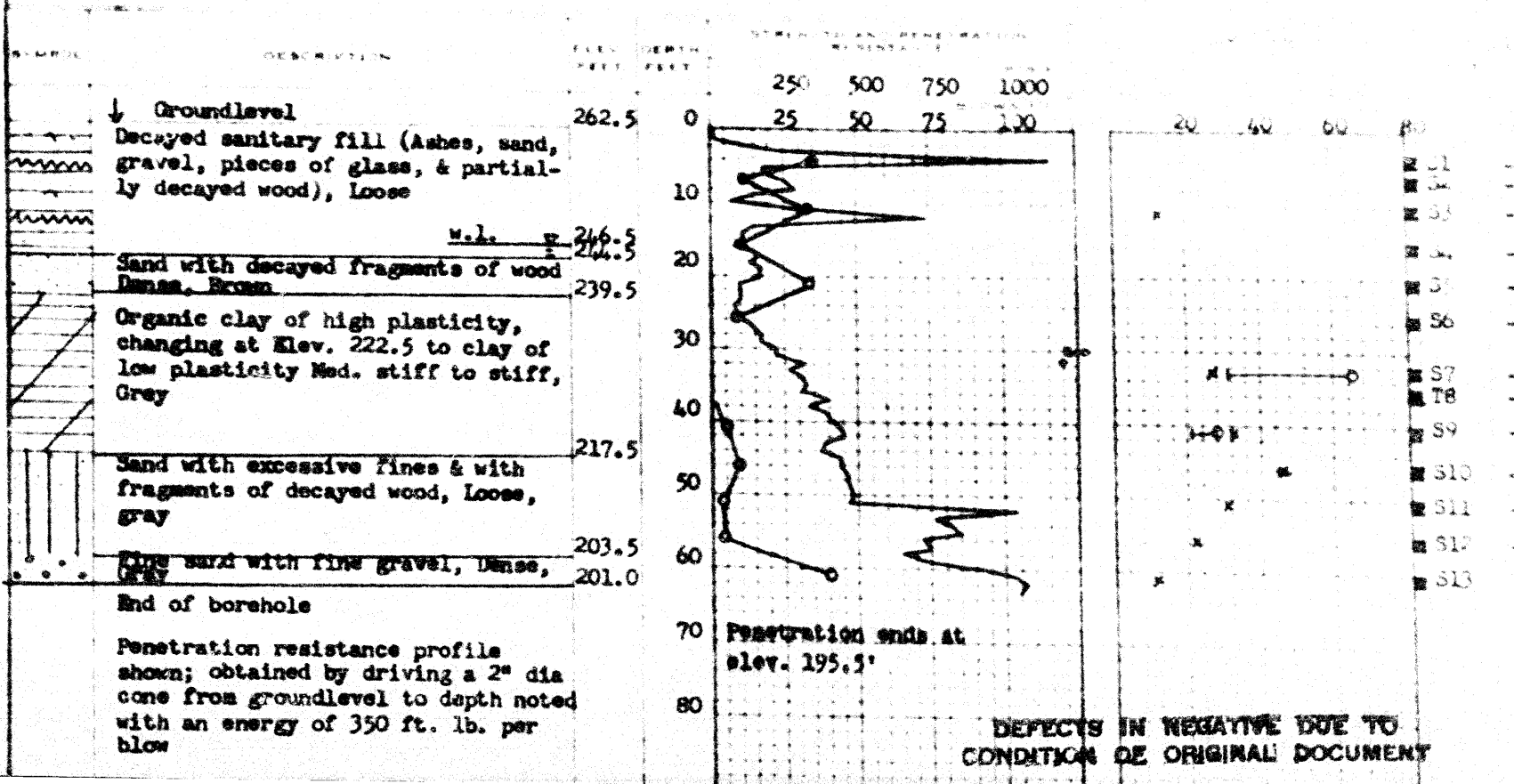
DATUM 262.5'

COMPILED BY B. K.

BORING DATE Apr. 13/60

CHECKED BY M. D.

1. SOIL TEMPERATURE  
2. SOIL MOISTURE  
3. SOIL TEMPERATURE  
4. SOIL MOISTURE  
5. SOIL TEMPERATURE  
6. SOIL MOISTURE  
7. SOIL TEMPERATURE  
8. SOIL MOISTURE  
9. SOIL TEMPERATURE  
10. SOIL MOISTURE



## DEPARTMENT OF HIGHWAYS, CIVIL ENGINEERING

## MATERIALS AND RESEARCH SECTION

P 231-58-2

BURE HOLE NO. 26

60-F-7 B

401415(55L of E)

DATUM 262.0'

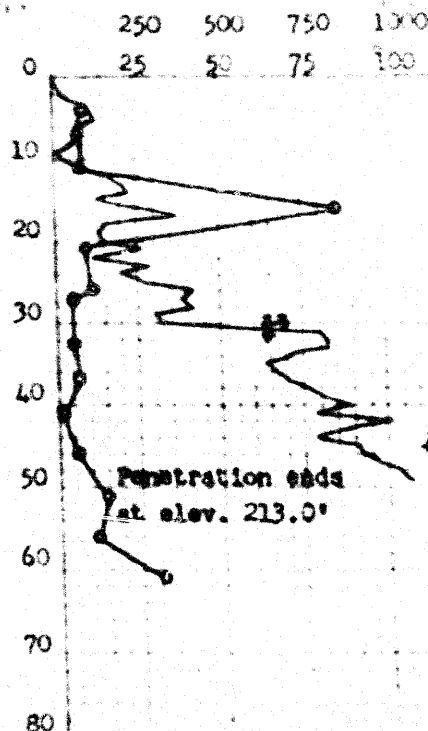
M. K. B. K.

BORING DATE Apr. 1/60

M. D.

↓Groundlevel	262.0
Decomposed sanitary fill (sand, refuse, rubble gravel), Loose	
Sand and gravel with fragments of decayed wood, Loose to Dense, Brown	249.0 247.0
Organic clay of high to low plasticity and with occasional sand seams, Mod. stiff, gray brown	236.0
Clayey silt to clay of Intermediate plasticity, Mod stiff, gray brown	226.0
Sand with excessive silt particles and also with fragments of wood-changing to sand & gravel @ Elev	214.0
End of borehole	205.0 200.5

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS, ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 27

JOB 60-F-7 B

STATION 399+15 (4ft Rt of E)

DATUM 262.5'

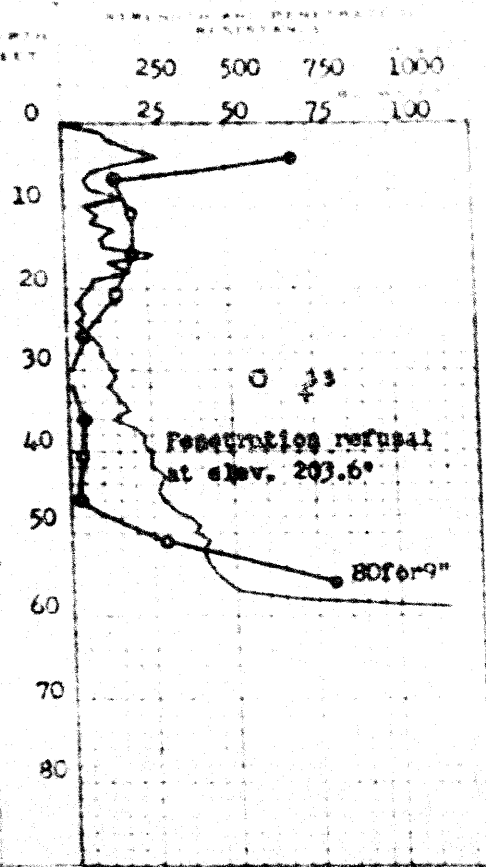
COMPILED BY B. K.

BORING DATE Apr. 5/60

CHECKED BY M. D.

1. SOIL TYPE  
2. SOIL CLASSIFICATION  
3. SOIL COLOR  
4. SOIL MOISTURE  
5. SOIL TEMPERATURE  
6. SOIL pH  
7. SOIL SPECIFIC GRAVITY  
8. SOIL LIQUIDITY LIMIT  
9. SOIL PLASTICITY LIMIT  
10. SOIL SHREDDING  
11. SOIL SPLITTING  
12. SOIL TENSILE STRENGTH  
13. SOIL COMPRESSIVE STRENGTH  
14. SOIL PERMEABILITY  
15. SOIL SWELLING  
16. SOIL SETTLEMENT  
17. SOIL CONSOLIDATION  
18. SOIL CEMENTATION  
19. SOIL CARBON CONTENT  
20. SOIL ORGANIC CONTENT  
21. SOIL NITROGEN CONTENT  
22. SOIL PHOSPHORUS CONTENT  
23. SOIL POTASSIUM CONTENT  
24. SOIL SODIUM CONTENT  
25. SOIL CALCIUM CONTENT  
26. SOIL MAGNESIUM CONTENT  
27. SOIL ZINC CONTENT  
28. SOIL COPPER CONTENT  
29. SOIL MANGANESE CONTENT  
30. SOIL IRON CONTENT  
31. SOIL CHROMIUM CONTENT  
32. SOIL NICKEL CONTENT  
33. SOIL LEAD CONTENT  
34. SOIL CADMIUM CONTENT  
35. SOIL MERCURY CONTENT  
36. SOIL BARIUM CONTENT  
37. SOIL STRONTIUM CONTENT  
38. SOIL BROMINE CONTENT  
39. SOIL IODINE CONTENT  
40. SOIL FLUORINE CONTENT  
41. SOIL SILICON CONTENT  
42. SOIL ALUMINUM CONTENT  
43. SOIL TITANIUM CONTENT  
44. SOIL VANADIUM CONTENT  
45. SOIL CHLORINE CONTENT  
46. SOIL SULFUR CONTENT  
47. SOIL PHOSPHORUS CONTENT  
48. SOIL NITROGEN CONTENT  
49. SOIL CARBON CONTENT  
50. SOIL OXYGEN CONTENT  
51. SOIL HYDROGEN CONTENT  
52. SOIL NITROGEN CONTENT  
53. SOIL CARBON CONTENT  
54. SOIL OXYGEN CONTENT  
55. SOIL HYDROGEN CONTENT

DEPTH (FEET)	DESCRIPTION
262.5	Groundlevel
	Decomposed sanitary fill (sand, Ashes, refuse bricks & paper)
242.5	
239.5	
228.5	Organic clay of high plasticity, soft to Med. stiff, gray brown
219.5	Organic clay with silt of Intermediate plasticity Med stiff
213.5	Sand with excessive fines and also some shells Loose-gray brown
206.5	Sand well graded, Med Dense to Dense, gray
	End of borehole



DEPTH (FEET)	RESISTANCE (lb/ft²)	RESISTANCE (tons)
0	0	0
10	100	10
20	200	20
30	300	30
40	400	40
50	500	50
60	600	60
70	700	70
80	800	80



DEPARTMENT OF HIGHWAY INDIANA  
MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 28

JOB 60-F-7 B

STATION 397+15 (4ft Lt of E)

DATUM 262.0'

COMPILED BY B. K.

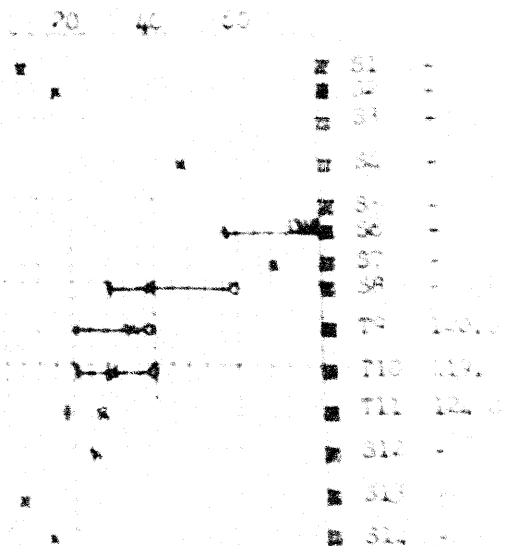
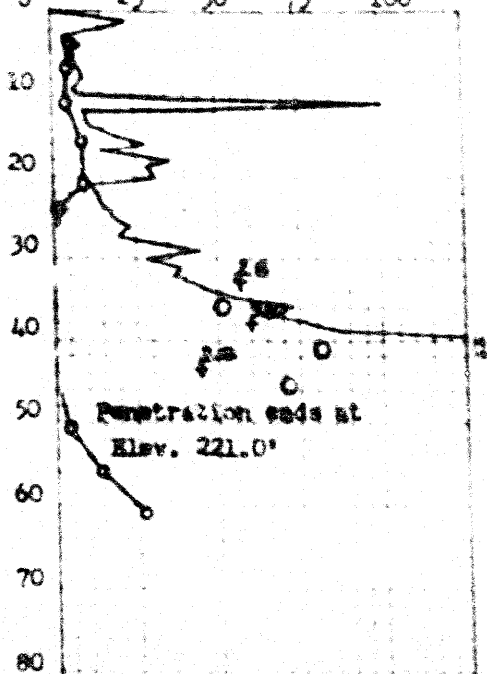
BORING DATE Apr. 11/60

CHECKED BY M. D.

	ELEV. FEET
Groundlevel	262.0
Recent Refuse (paper with Ashes and sand), Loose	256.0
Partial decomposed refuse (Refuse, sand, gravel & ashes), Loose-Dark gray	247.0
Decomposed sanitary fill (ashes, gravel, sand, refuse) Loose	240.0
Organic clay of high compressibility, soft, gray Brown	238.0
	231.0
Clay of Intermediate plasticity-soft to Med. stiff, gray	
	212.0
Sand with excessive fines, loose, gray	208.0
Sand well graded, Med. Dense, gray	200.5
End of borehole	

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow

250 500 750 1000  
25 50 75 100



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 29

JOB ~~7-7~~ 7 B

STATION 398+15 (Part 11 of 8)

DATUM 261.0'

COMPILED BY B. K.

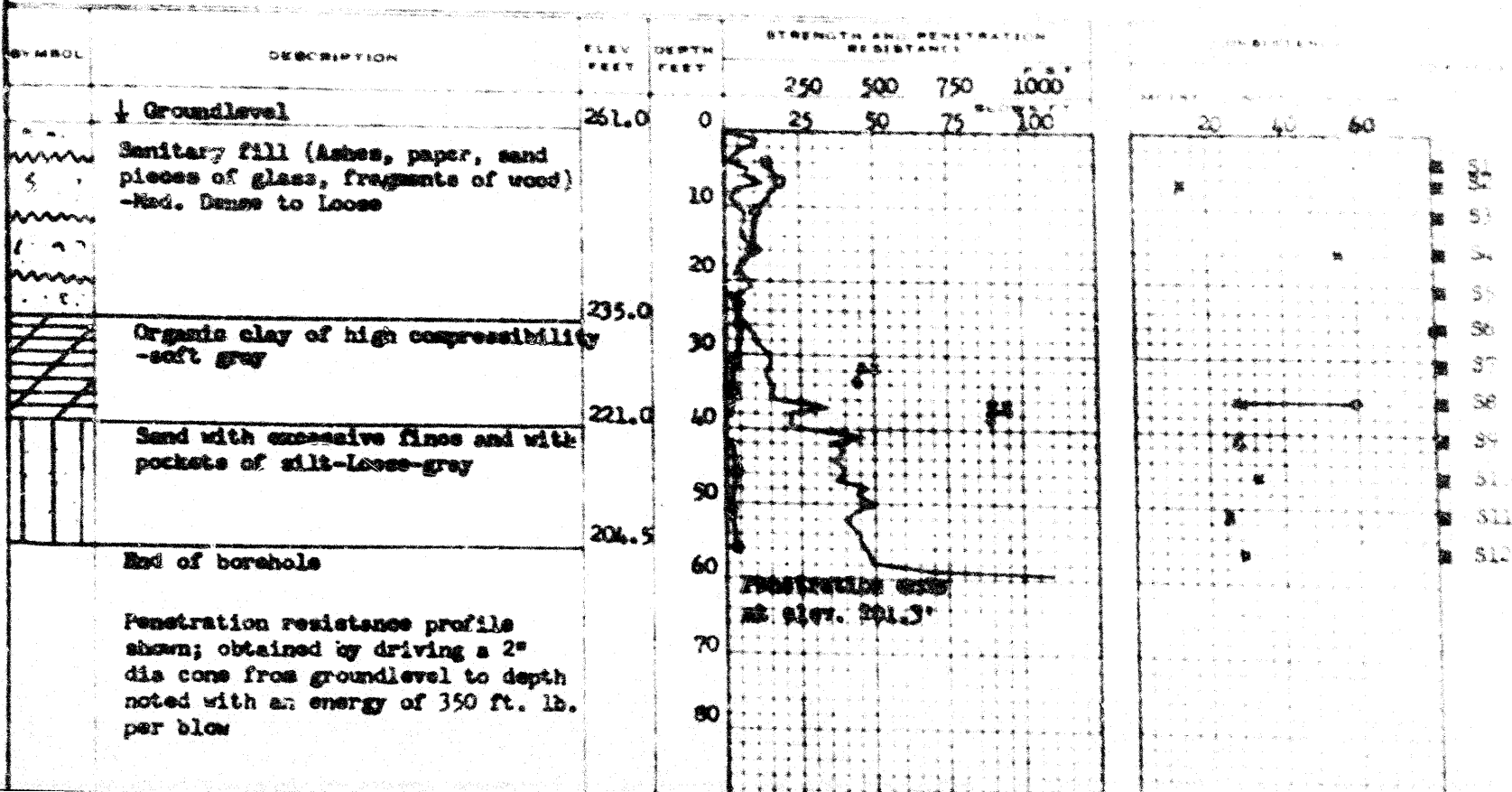
BORING DATE Apr. 7/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

### LEGEND

LYING ON THE COMPRESSION LOG  
VANE TESTS AND PENETRATION  
NATURAL MOISTURE AND  
RELATIVE HUMIDITY



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W P 231-58-2

BORE HOLE NO 30

JOB 60-8-7 B

STATION 396+00(371A of S)

DATUM 259.8'

COMPILED BY B. K.

BORING DATE Apr. 12/60

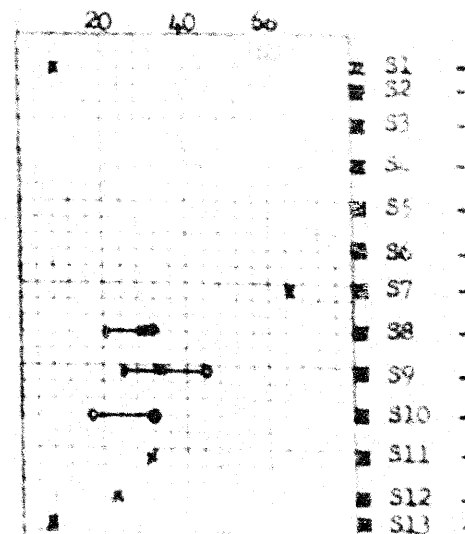
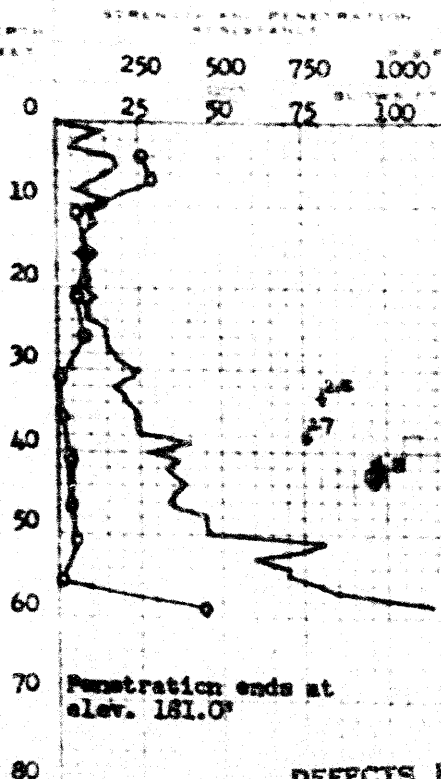
CHECKED BY N. D.

2' DIA SPLIT TUBE  
2' SHELBY TUBE  
2' SPLIT TUBE  
2' DIA CONE  
2' SHELBY  
CASIN

LEGEND

1. UNCONSOLIDATED MATERIALS  
2. TESTS AND RESULTS  
3. NATURAL MATERIALS

DEPTH FEET	DESCRIPTION	ELEV. FEET
0	Groundlevel	259.8
	Med. sand with pockets of clay, Med. brown	254.8
	Recent refuse (mostly paper)	
		244.8
	Decomposed sanitary fill (sand, gravel, refuse, ashes)	241.8
		228.8
	Organic <del>clay</del> of low plasticity becoming organic clay of intermediate plasticity, med stiff, gray	217.8
	Silty clay of low plasticity, med. stiff, gray	211.8
	Sand with excessive fine, loose, gray-changing to sand well graded- dense-gray at elev. 202.8	200.3
	End of borehole	



Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W P 231-58-2

JOB 60-F-7 B

DATUM 258.5'

BORING DATE Apr. 12/60

BORE HOLE NO 31

STATION 396-95 (11st Lt of E)

COMPILED BY B. K.

CHECKED BY M. D.

2" DIA SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

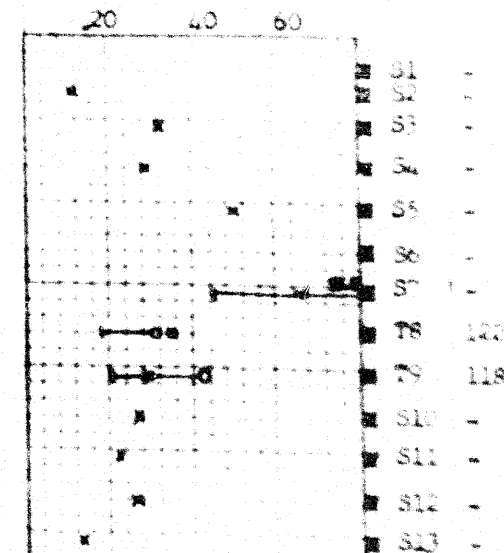
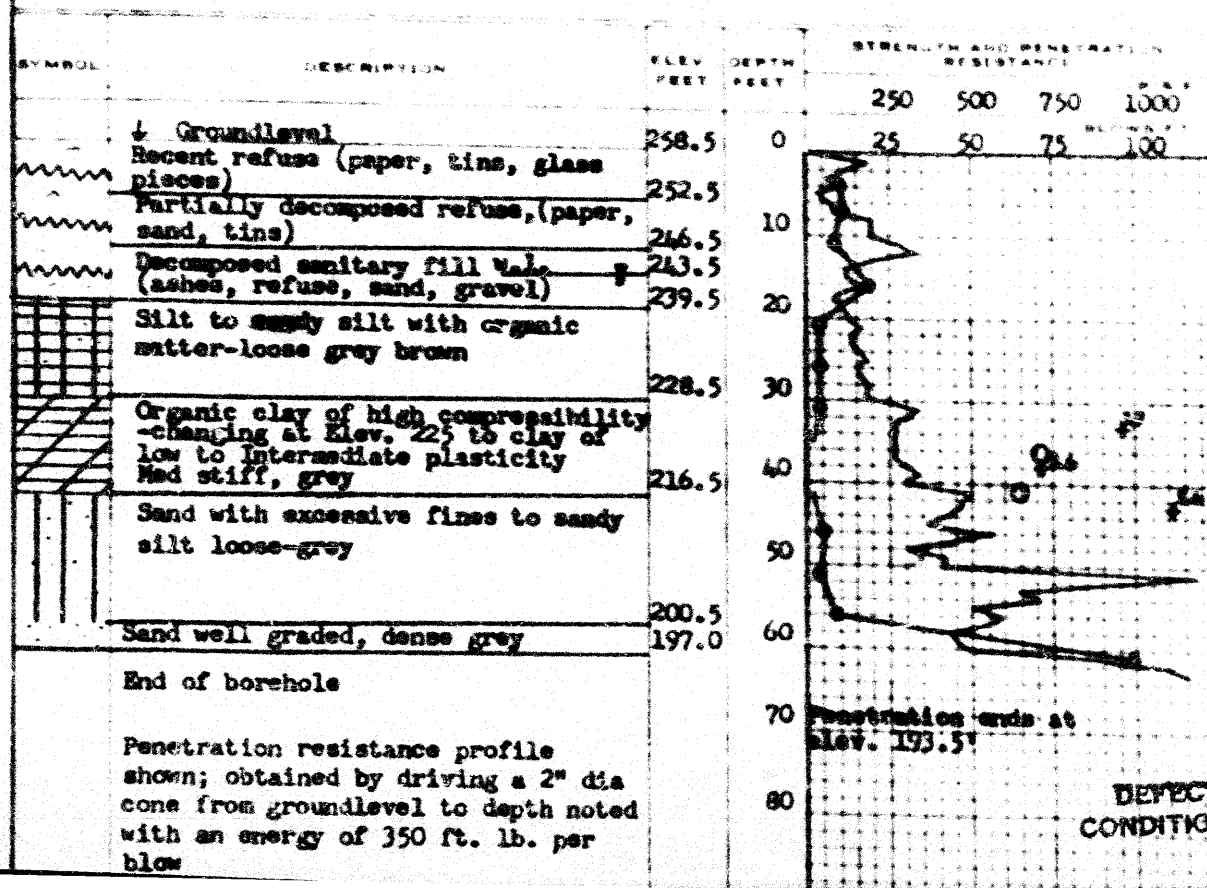
2" DIA CONE

2" SHELBY

CASING

## LEGEND

1. SOIL TYPE, COMPOSITION, COLOR  
2. VANE TEST AND PENETRATION  
3. NATURAL MOISTURE CONTENT  
4. LIQUID LIMIT  
5. PLASTIC LIMIT  
6. PLASTICITY INDEX



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

**HUGH Q. COLDER** *Eng.*  
Supt. HIGH. ROAD.

Consulting Civil Engineer

**1722A AVENUE ROAD**

**TORONTO 12**

**Phone 7-4333**

**July 29th. 1960**

**Mr. A. Ratha,  
Department of Highways,  
Parliament Buildings,  
Toronto.**

Dear Sir,

**Chedoke Expressway**

This letter is to record the agreement reached with your engineers on our joint visit to the area in which the above proposed road crosses the garbage dump at Hamilton.

The visit was made on July 29th. and four holes were dug with a backhoe at different points on the centre-line.

Pit No.1 was near borehole 33, Pit No.2 was near borehole 29, Pit No.3 was near borehole 625 at chainage 405+60, and Pit No.4 was between boreholes 16 and 38.

In pits 1, 3 and 4, the garbage can be left in position. It should be pre-loaded by a bank of good granular material to a height about 10 feet greater than the height of the proposed road embankment. The longer this can be left in place the better. The red Lenoir Shale will be suitable for this purpose.

At pit 2, the garbage is quite recent having been placed in January of this year. This refers to the top seven feet of garbage. This material has not rotted, has a very bad smell, and cannot be left in position under a roadway. It must be removed. The material below seven feet can be left in, but should be pre-loaded as suggested above.

In general, the length over which the garbage is to be removed is from chainage 380 to 480 - new chainages. The volume to be removed is about 30,000 cu. yds. The operation will need to be carefully planned and carried out quickly because of the nuisance due to the bad smell of the garbage.

Very truly,  
Yours

*Hugh Q. Colder*  
H. Q. Colder

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

## APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2 BORE HOLE NO. 3  
JOS 60-F-7 (B) STATION 21+00 E  
DATUM 259.0' COMPILED BY B. K.  
BORING DATED Dec. 22/60 CHECKED BY M. D.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

LEGEND

1/2 UNCONFINED COMPRESSION (QU)  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE P.S.F.
	↓ Groundlevel	259.0	0	
	Sand & gravel (fill)	254.0		
	Decayed Refuse - Loose - dark brown	253.0		
	Sandy clay with decayed refuse - med. stiff - Brown	249.0	10	
	Silty clay - stiff - Brown	239.0	20	
		232.5	30	
	End of borehole			

CONSISTENCY	NATURAL MOISTURE
MOIST. CONTENT - % DRY WT.	MOIST. WT.
20 40 60 80	
	S1
	S2
	S3

**DEPARTMENT OF HIGHWAYS - ONTARIO**  
**MATERIALS AND RESEARCH SECTION**

W.P. 231-58-2

BORE HOLE NO. 4

JOB 60-P-7 B

STATION 419+00 @ BLVD

DATUM 257.0'

COMPILED BY B. K.

BORING DATE Dec. 22/60

CHECKED BY M. D.

2" DIA. SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA. CONE

2" SHELBY

CASING

**LEGEND**

1/2 UNCONFINED COMPRESSION (QU)

VANE TEST (C) AND SENSITIVITY (S)

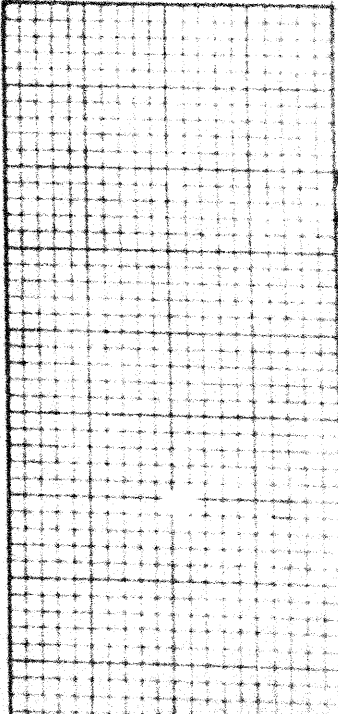
NATURAL MOISTURE AND

LIQUIDITY INDEX

LIQUID LIMIT

PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	
				P.S.F.	
	Groundlevel	257.0	0	25	50 75 100
	Sand & gravel (fill)	252.0			
	Organic matter with sand, Soft, dark brown	251.0	10		
		239.0	20		
	Sand with excessive silt particles, Med. Dense to Dense, Brown	230.5	30		
	End of borehole		40		
			50		
			60		
			70		
			80		

CONSISTENCY		NATURAL
MOIST. CONTENT % DRY WT.		SAMPLE UNIT WT
		S1
		S2



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-P-7 B

DATUM 254.0'

BORING DATE Mar. 22/60

BORE HOLE NO. 5

STATION 409+00 8' L.A. of E BLVD. DIA. SPLIT TUBE

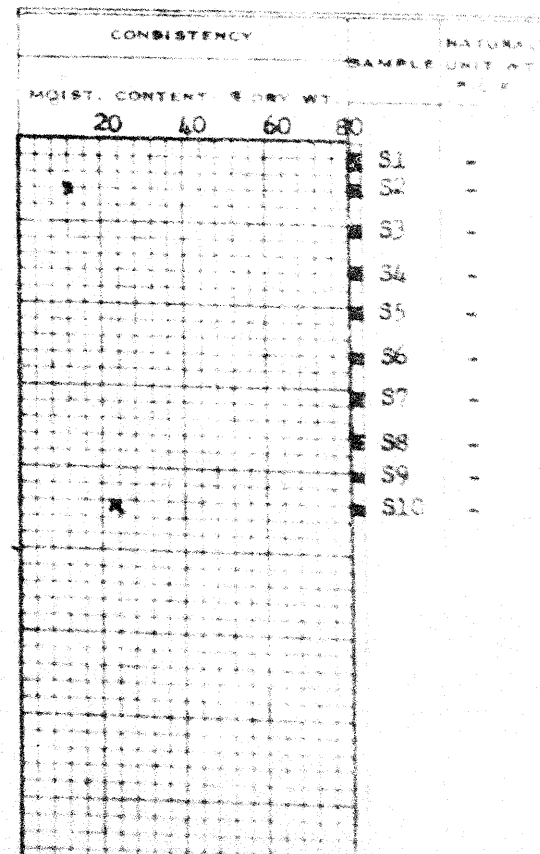
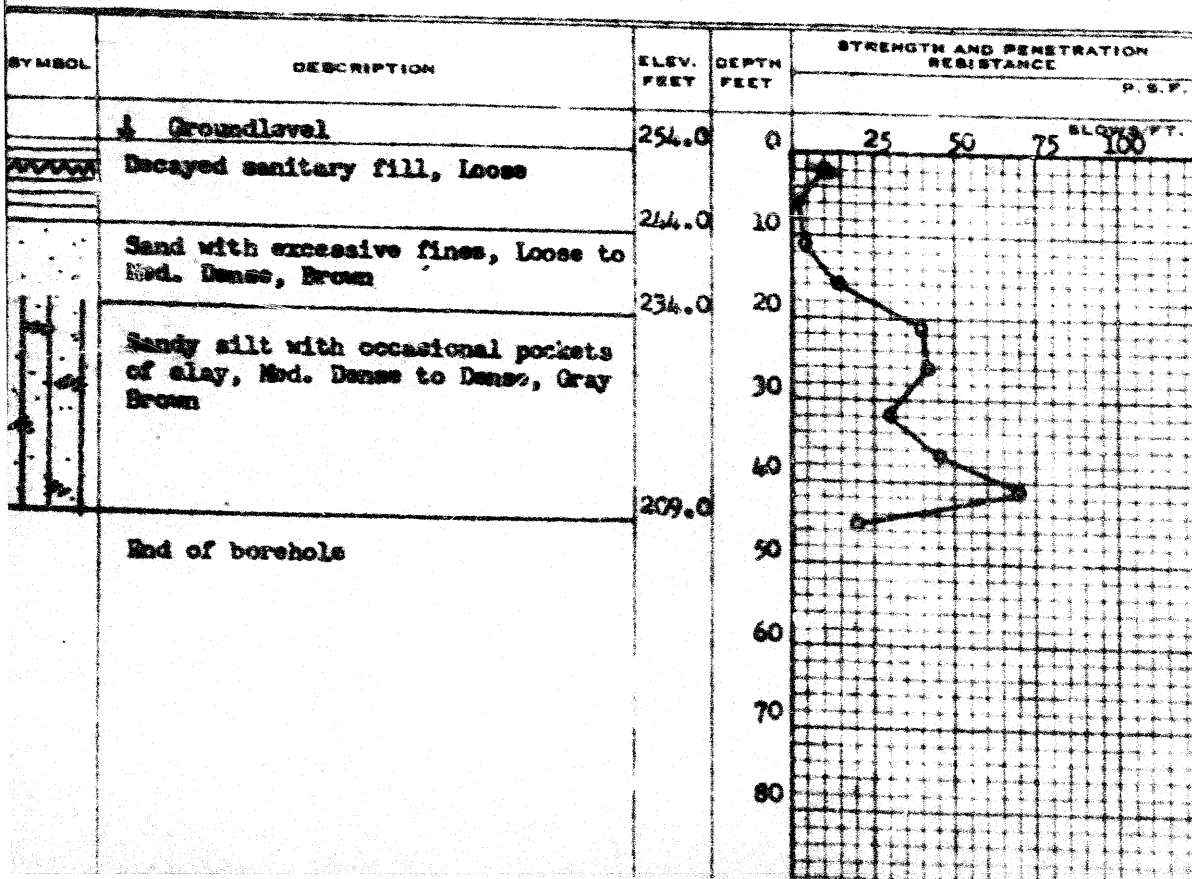
COMPILED BY B. K.

CHECKED BY M. D.

2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

### LEGEND

1/2 UNCONFINED COMPRESSION (QU)  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

LP 231-58-2

BORE HOLE NO. #13

OB 60-P-7 B

STATION 413+50 (50ft Lt. E)

ELEV. 254.0'

COMPILED BY B.K.

DRILLING DATE Mar. 18/60

CHECKED BY

2" DIA SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA CONE

2" SHELBY

CASING

### LEGEND

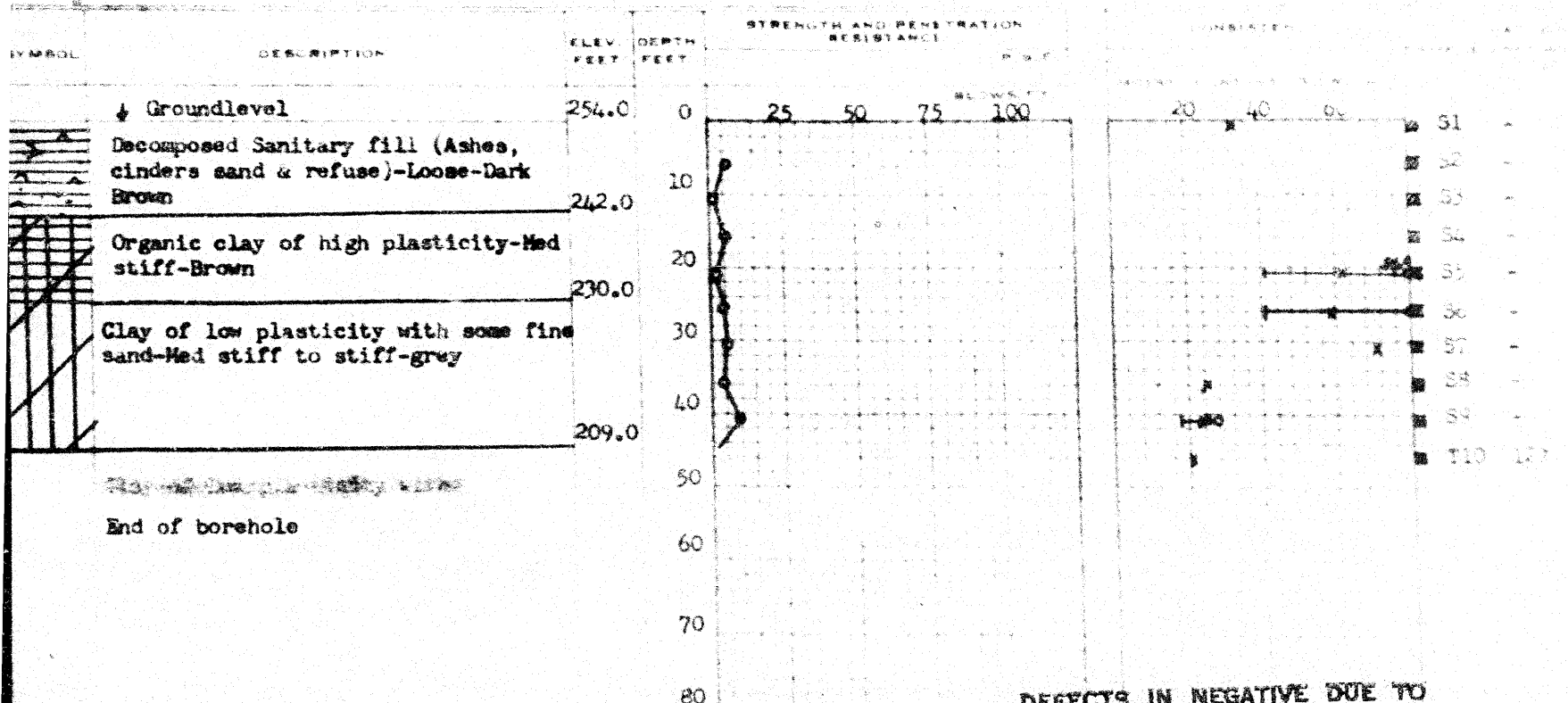
UNCONFINED COMPRESSION (C_u)

VANE TESTS (AND CONSISTENCY)

NATURAL MOISTURE AND

LIQUID LIMIT

PLASTIC LIMIT



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-F-7 B

DATUM 253.0'

BORING DATE Mar. 21, 60

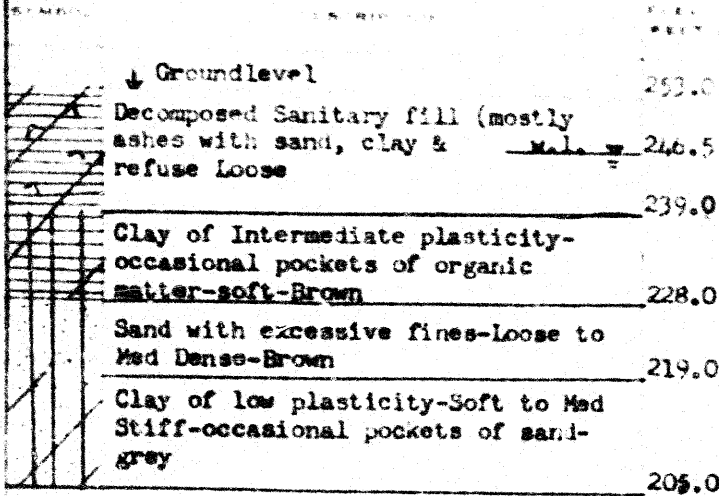
BORE HOLE NO. #16

STATION 416+20 (43' Lt. of E BLVD)

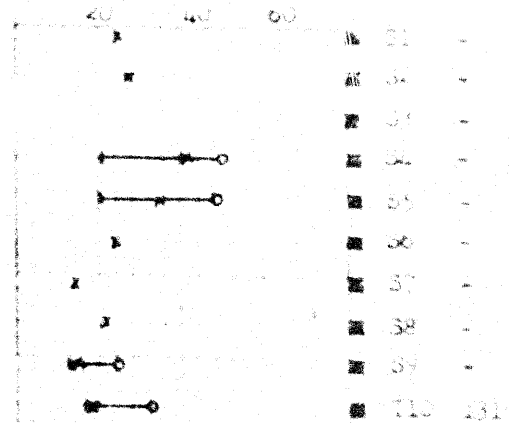
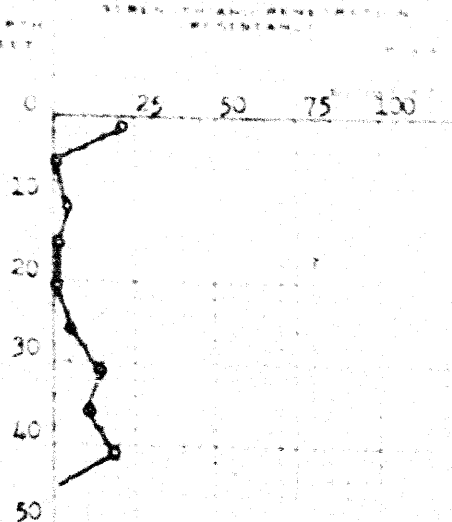
COMPILED BY E.K.

CHECKED BY K.O.

LEGEND



End of borehole



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-F-7 B

DATUM 253.0'

BORING DATE Mar. 21/60

BORE HOLE NO #16

STATION 416+00 (43' L. of C

BLVD

COMPILED BY B.K.

CHECKED BY M.D.

1. SPLIT TUBE

2. SPLIT TUBE

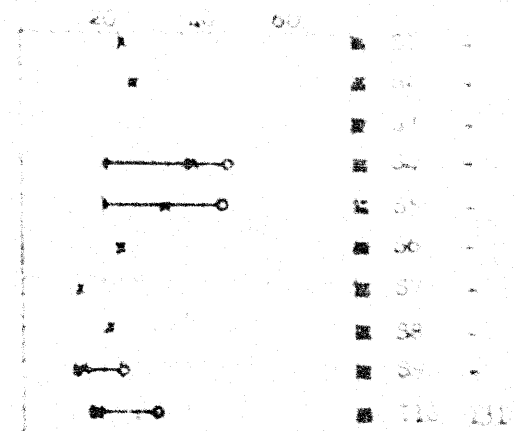
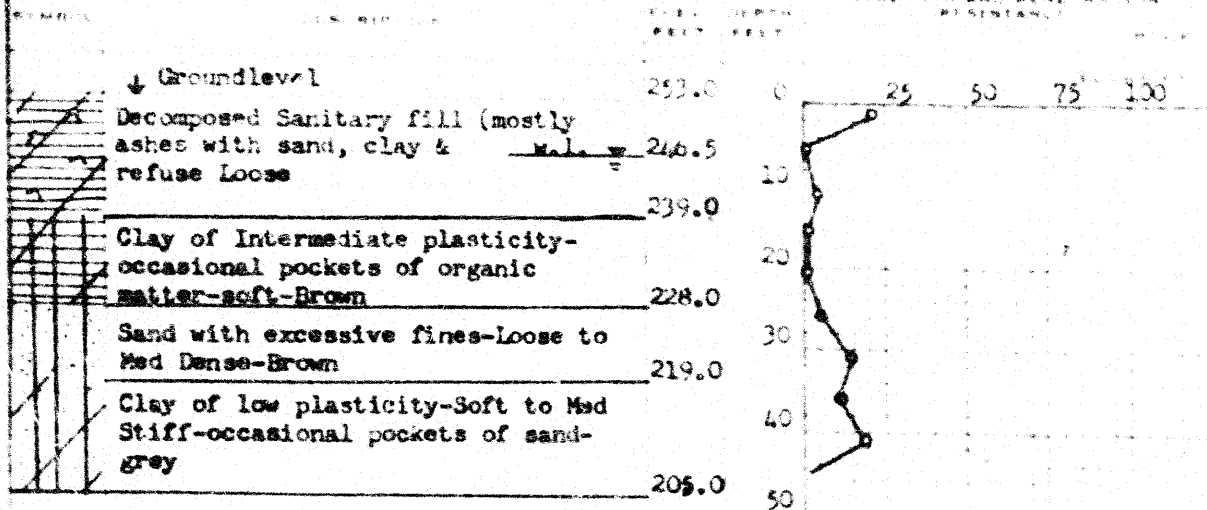
3. SPLIT TUBE

4. SPLIT TUBE

5. SPLIT TUBE

6. SPLIT TUBE

LEGEND



DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 36

JOB 60-F-7 B

STATION 410+00 R.W.B.L.

DATUM 260.5'

COMPILED BY B. K.

BORING DATE Apr. 5/60

CHECKED BY M. D.

2" DIA SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA CONE  
2" SHELBY  
CASING

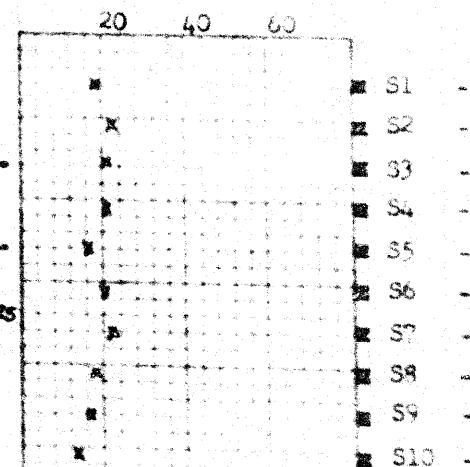
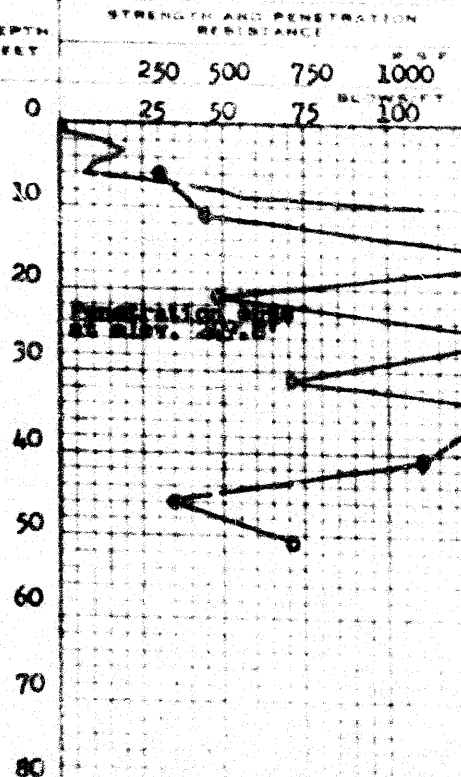
### LEGEND

2" DIA SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA CONE  
2" SHELBY  
CASING

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	Groundlevel	260.5	0
	Brown sandy clay Top Soil	258.5	2
	Sandy clay Till, Dense, Brown	254.0	6
	Sand with excessive fines, Dense, gray		
	(pockets with silt with fine sand from Elev. 215.5 to 214.0)		
		209.0	

End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

JOB 60-F-7 B

DATUM 254.5'

BORING DATE Apr. 6/60

BORE HOLE NO. 37

STATION 410+00 @ E. B. L.

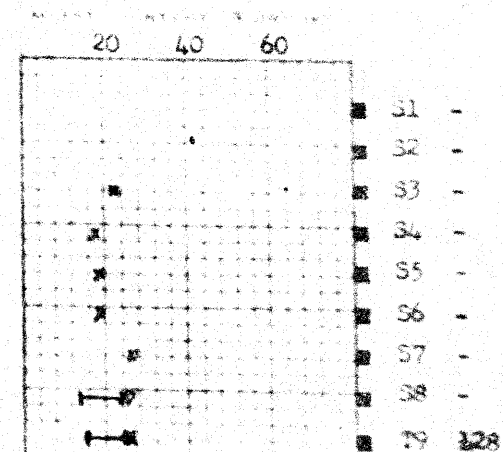
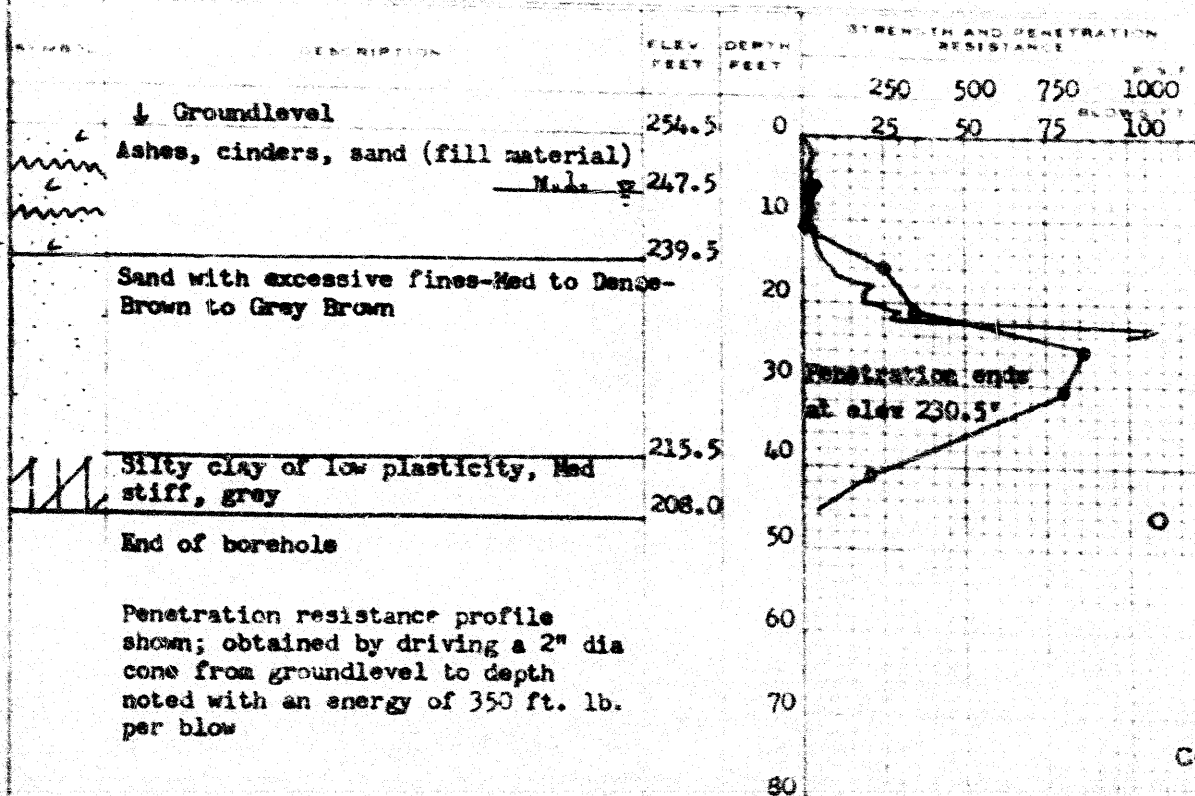
COMPILED BY B. K.

CHECKED BY M. D.

2" DIA SPLIT TUBE  
 2" SHELBY TUBE  
 2" SPLIT TUBE  
 8" DIA CONE  
 2" SHELBY  
 CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (Q_u)  
 VANE TEST (C AND SENSITIVITY)  
 NATURAL MOISTURE AND  
 LIQUIDITY INDEX  
 PLASTICITY INDEX



DEFECTS IN NEGATIVE DUE TO  
 CONDITION OF ORIGINAL DOCUMENT

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 38

JOB 60-F-7 B

STATION 411+00 (E.B.L.)

DATUM 255.0'

COMPILED BY B. K.

BORING DATE Apr. 7/60

CHECKED BY H. D.

2" DIA SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

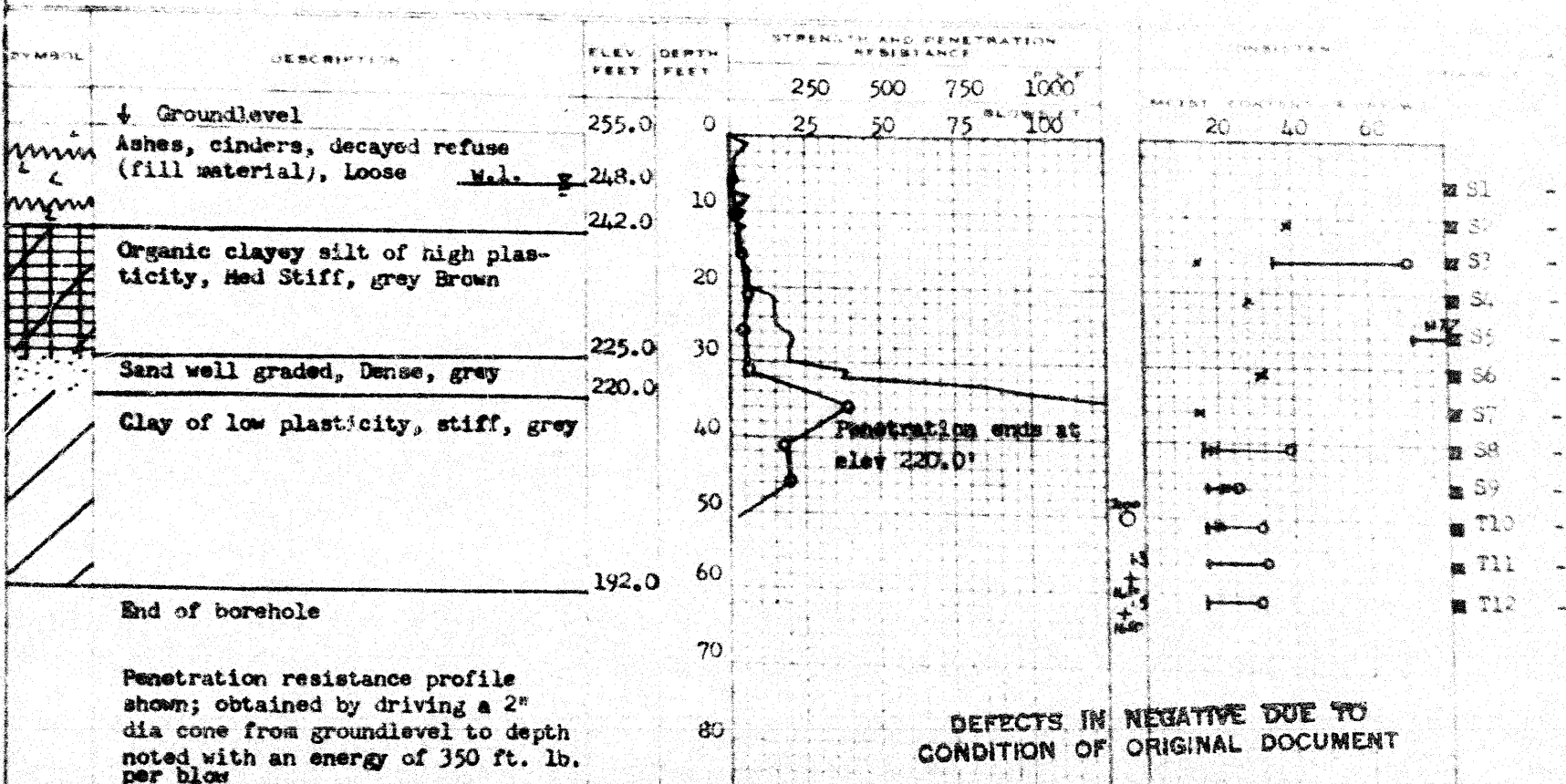
2" DIA CONE

2" SHELBY

CASING

## LEGEND

UNCONSOLIDATED COMPRESSION (C_u)  
 VANE TEST (C_v) AND PENETRATION (P)  
 NATURAL MOISTURE AND  
 LIQUIDITY INDEX  
 PLASTIC LIMIT



# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 39

JOB 60-P-7 B

STATION 414+00 E. W. B. L.

DATUM 254.0'

COMPILED BY B.K.

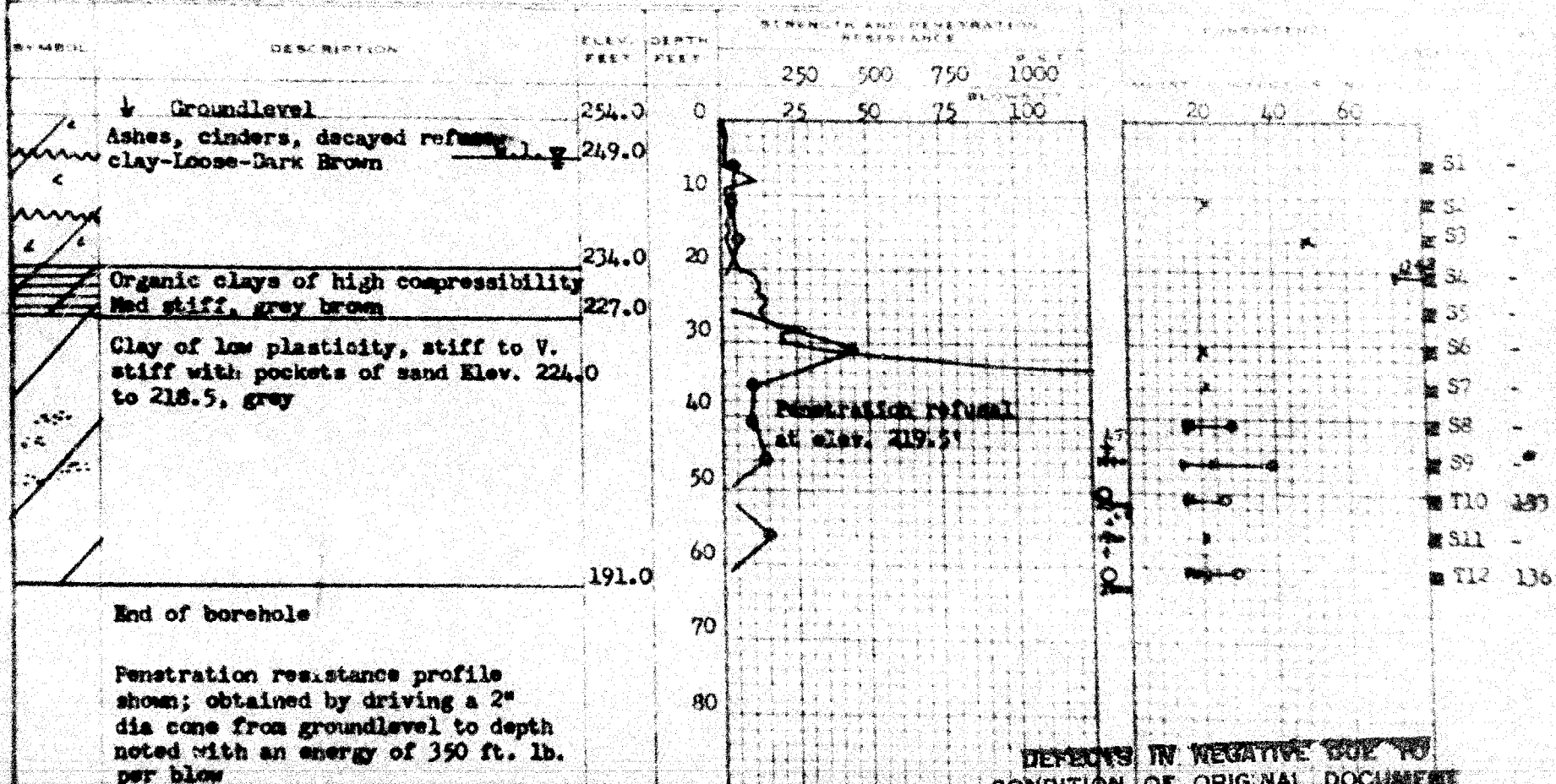
BORING DATE Apr. 7/60

CHECKED BY M.D.

2" DIA SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

UNCONFINED COMPRESSION (C_u)  
VANE TEST (C_v) AND SHEAR TESTS  
NATURAL MOISTURE AND  
LIQUIDITY LIMIT  
PLASTICITY INDEX





## OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

BORE HOLE NO. 608

JOB 60-F-7 B

STATION 403+82 E BLVD

DATUM 252.0'

COMPILED BY B.K.

BORING DATE May 17/60

CHECKED BY M.D.

2" DIA SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA CONE  
2" SHELBY  
CASING

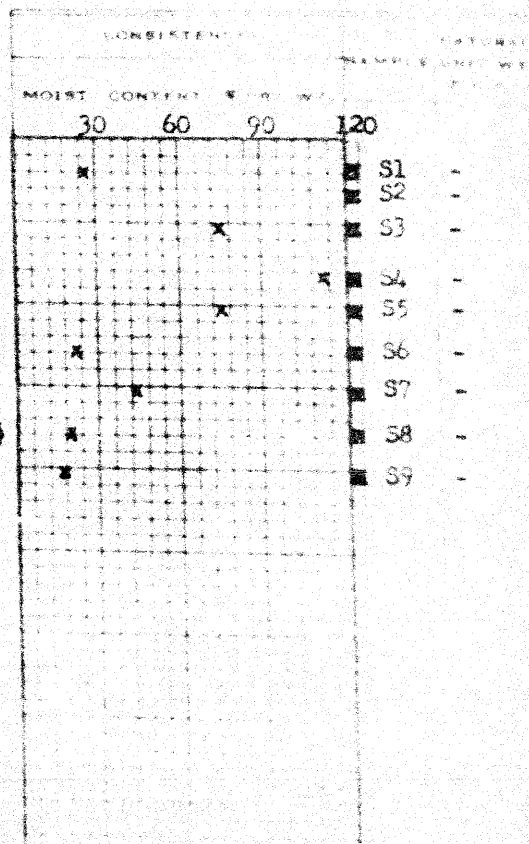
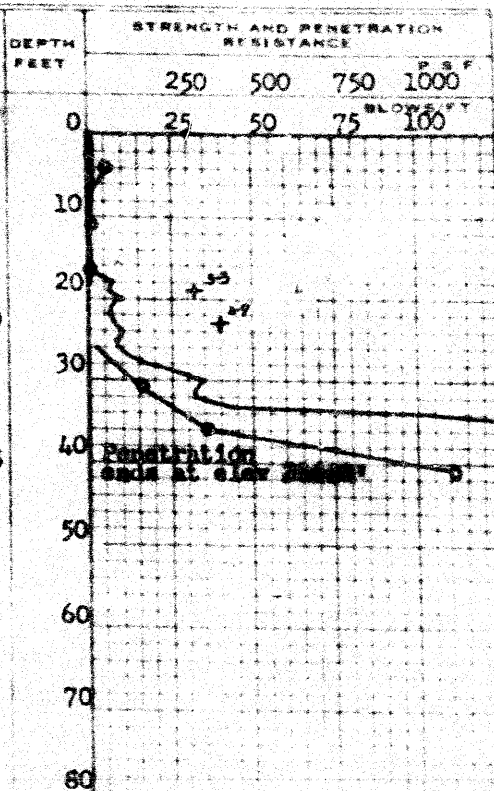
## LEGEND

UNCONFINED COMPRESSION (QU)  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET
	↓ Groundlevel	252.0	0
	Ashes, Sand, Cinders Loose	247.0	5
		236.0	16
	Organic matter with silt & fine Sand-Loose grey Brown	228.0	24
	Sand with excessive fines-occasional fragments of wood-top layers contains organic matter-Med Dense to Dense, grey	210.5	41.5

End of borehole

Penetration resistance profile shown; obtained by driving a 2" dia cone from groundlevel to depth noted with an energy of 350 ft. lb. per blow



# DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

N.P. 231-58-2

JOB 60-P-7 B

DATUM 252.0'

BORING DATE June 27/60

BORE HOLE NO. #625

STATION 407+17 E BLVD

COMPILED BY H. D.

CHECKED BY N. D.

2" DIA. SPLIT TUBE  
2" SHELBY TUBE  
2" SPLIT TUBE  
2" DIA. CONE  
2" SHELBY  
CASING

## LEGEND

1/2 UNCONFINED COMPRESSION (QUI)  
VANE TEST (C) AND SENSITIVITY (S)  
NATURAL MOISTURE AND  
LIQUIDITY INDEX  
LIQUID LIMIT  
PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				250	500	750	1000
	↓ Groundlevel	252.0	0	25	50	75	100
	Cinders, Ashes with traces of w.l. & decomposed refuse	248.0					
		241.0	10				
	Organic matter (peat) with fragments of wood-soft, Brown	232.0	20				
	Organic clays with seams of gravel-soft to Med stiff	223.5					
	Sand with excessive fines-Dense-gray	220.5	30				

CONSISTENCY			NATURAL UNIT WT
MOIST. CONTENT	FL. WT	W.T.	
20	40	60	
			31
			32
			33
			34
			35
			36
			37

DEPARTMENT OF HIGHWAYS, ONTARIO  
 MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

OPEN PIT NO

~~W.P. 231-58-2~~

1

JOB 60-P-7 B

STATION 393+37 (5' Lt)

DATUM 258.0'

COMPILED BY B.K.

BORING DATE July 29/60

CHECKED BY M.D.

 1. SOIL SAMPLES  
 2. SOIL TESTS  
 3. SOIL LOGS  
 4. SOIL CORRECTION  
 5. SOIL CORRECTION

DESCRIPTION	ELEV. FEET	DEPTH FEET
↓ Groundlevel	258.0	0
Garbage, fresh	251.0	
Sand, loose, Brown	249.0	10
Old garbage, cinders & ashes Brown, loose	243.0	20
End of borehole		

 DEFECTS IN NEGATIVE DUE TO  
 CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

OPEN PIT NO

~~BORE-HOLE NO~~ 2

JOB 60-F-7 B

STATION 398+71(32' LL)

DATUM 262.0'

COMPILED BY B.K.

BORING DATE July 29/60

CHECKED BY H.D.

2" DIA. SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA. CONC.

2" SHELBY

CASING

## LEGEND

1" DIA. CONC. (COMPRESSION)



2" DIA. CONC. (COMPRESSION)

NATURAL MOISTURE (SAND)

NATURAL MOISTURE (CLAY)

NATURAL MOISTURE (SILT)

NATURAL MOISTURE (LOESS)

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE
	↓ Groundlevel	262.0	0	
	Old garbage (about 3 years old)			
	Loose, Dark brown	256.0		
	Ashes, sand & gravel with		10	
	decayed garbage	249.0		
	End of borehole		20	

DEFECTS IN NEGATIVE DUE TO  
 CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

OPEN PIT NO.

~~W.P. 231-58-2~~

3

JOB 60-P-7 B

STATION 407+17 (5' Rt)

DATUM 252.0'

COMPILED BY B.K.

BORING DATE July 29/60

CHECKED BY M.D.

2" DIA. SPIG. TUBE

2" SHELL TUBE

2" SPIG. TUBE

2" DIA. CONE

2" SHELL

CASING

LEGEND

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	SYSTEM OF AND PENETRATION RESISTANCE
↓	Groundlevel	252.0	0	
~~~~~	cinder, ashes, Loose	247.0		
	End of excavation		10	

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND RESEARCH SECTION

W.P. 231-58-2

OPEN PIT NO.

~~BORE-HOLE NO.~~

4

JOB 60-2-7 B

STATION 415+07 (30' L)

DATUM 254.0'

COMPILED BY B.K.

BORING DATE July 29/60

CHECKED BY M.D.

7" DIA SPLIT TUBE

2" SHELBY TUBE

2" SPLIT TUBE

2" DIA CONE

7" SHELBY

CASING

LEGEND

UNSATURATED COMPRESSION TEST
 VENT TESTS AND PENETRATION
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 PLASTICITY INDEX
 FLOW VALUE

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE
	Ground level	254.0	0	
	Excavation	248.5	10	
	End of excavation			

DEFECTS IN NEGATIVE DUE TO
 CONDITION OF ORIGINAL DOCUMENT

SUMMARY OF FIELD & LABORATORY TESTS

JOB 60-P-14
140-17-1
 W P 31-18-2
212-58-3

HOLE NO	SAMP NO	SAMPLE DEPTH (FEET)	MATERIAL DESCRIPTION	PENETN RESIST BLOW/FT	MOIST CONT %	PLASTIC LIMIT %	LIQUID LIMIT %	SHEAR STRENGTH (PSF)	UNIT WEIGHT (PCF)	REMARKS
9	S1	5'-6.5'	Organic clay of high plasticity-Med stiff-grey brown	6	-	-	-	-	-	
	S2	10'-11.5'	Organic clay of high plasticity, with fragments of wood, ashes-Med stiff-grey brown	3	60.9	40.6	72.2	-	-	
	S3	15'-16.5'	Gravelly sand, well graded, with some clay particles and some organic matter	10	43.6	-	-	-	-	
	S4	20'-21.5'	Sand with excessive fines and with slight traces of gravel-Med Dense-grey	25	-	-	-	-	-	
	S5	25'-26.5'	Sand with excessive fines-Dense-grey	69	17.4	-	-	-	-	
	S6	30'-31.5'	Sand with excessive fines, seams of clay-Med Dense-grey	29	17.3	-	-	-	-	
	S7	35'-36.5'	35-40.5 Clay of low plasticity-grey 37.5-40.5 Sand with excessive fines-Med Dense-grey	33	13.4	-	-	-	-	
	S8	40'-41.5'	Sand with excessive fines-Dense-grey	47	13.5	-	-	-	-	
	S9	45'-46.5'	Silt with fine sand-Med Dense-grey	16	18.5	-	-	-	-	
	S10	50'-51.5'	Clay with fine sand-V. stiff-grey	24	19.3	-	-	-	-	
	T11	55'-56.5'	" " " "	P	13.7	-	-	-	-	
	VANE	59'	DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENT	-	-	-	-	1600	-	Sens: 2.0

August 11, 1960.

C. C. Parker, Parsons & Brinckerhoff, Ltd.,
Consulting Engineers,
795 Main Street West,
Hamilton, Ontario.

Attention: Mr. J. W. Disbar.

Re: Chedoke Expressway - Hamilton Garbage Area.

Dear Sir:-

In order to speed up the design work, we are herewith submitting to you, a short summary of our recommendations for the part of the Chedoke Expressway through the Hamilton garbage area. All the results of the field and laboratory work, together with the discussion, will be contained in a separate report which will be forwarded to you in the near future.

1. In the area where the garbage has been dumped recently, chainage 398 to 390, the fresh garbage has to be excavated and removed. The depth of this garbage is about 7 feet and therefore, the overall volume of garbage to be removed will be about 30000 cu. yds.
2. In the rest of the garbage area, the garbage is older - i.e., placed earlier and therefore more decomposed and denser. The nature and quality of this older garbage is also quite different from the new, and it is therefore recommended that this garbage be left in place and the Expressway built on top of it.

cont'd. /2 ...

Recommendations: (cont'd.) ...

3. In order to speed up the settlements, two methods are recommended:-
 - a) Use of heavy rollers to compact the entire garbage area - i.e., where the garbage is left in place, as well as where the new garbage has been removed. The compaction should be carried out with rollers whose weight is gradually increased up to 100 tons. By this procedure, the existing garbage will already be brought into a much denser state.
 - b) Construction of the fill with a surcharge of about 10 feet. This surcharge should be left in place as long as possible and should also be erected as soon as possible. The fill and the surcharge will also contribute to the further consolidation of the subsoil, especially at greater depth where the heavy roller was not effective. The fill should be well compacted, as required by the specifications.
4. Since the excavation of the garbage, because of the bad odour, will present a technically and politically serious problem, it is recommended that deodorants be used, the whole operation well planned and organized, and carried out within the shortest possible time, working around the clock. Plenty of earth material should be at hand to cover the excavated garbage when dumped in the new area.

We believe that the above recommendations will enable you to continue and finish your design work, and that the construction of this part of the Expressway will start very soon. However, should there be any additional questions in connection with this problem that you would like to discuss, please feel free to call on our Office.

Yours very truly,

L. G. Boderman,
PRINCIPAL FOUNDATIONS ENGR.
Per:

Attorney
(A. Stermac,
FOUNDATIONS OFFICE ENGR.)

AS/MdeF

cc: C. C. Parker (2)
A. Putka
Foundations Office
Gen. Files

Mr. A. M. Ioye,
Bridge Engineer.
Materials & Research Section.

October 3, 1960.

F.B.I. FORENSTRATION INVESTIGATION

A.J. 60-1-7(3) - S.S. 231-58-2

Attention: Mr. S. McLaughlin.

Re: Chadoka Expressway - Hwy. #401 between
King Street & Longwood Road, District #4.

Accompanying this memo, is our detailed report on the subsoil conditions at the above site. Also contained in this report are results obtained by A. M. Ioye & Associates, and a copy of a letter by Dr. H. L. Golder.

The area described in this report, is presently known as "The City of Hamilton Pump Area", and presents a considerable problem in the design of the new Expressway. We believe that our recommendations for the solution of the various problems in connection with this area, should prove adequate for your future design work.

If further assistance is required, please do not hesitate to contact our office.

A. M. Ioye,
attach.

cc: Mr. Ioye (2)

Mr. J. H. Hargrave

Mr. J. H. Hargrave

Mr. J. H. Hargrave

Mr. J. H. Hargrave

Mr. J. H. Hargrave

Mr. J. H. Hargrave

Mr. J. H. Hargrave (4)

Communications Office

Mr. J. H. Hargrave

A. M. Ioye,

Principal Engineer, F.B.I.

cc:

A. M. Ioye

Mr. J. H. Hargrave

Mr. J. H. Hargrave

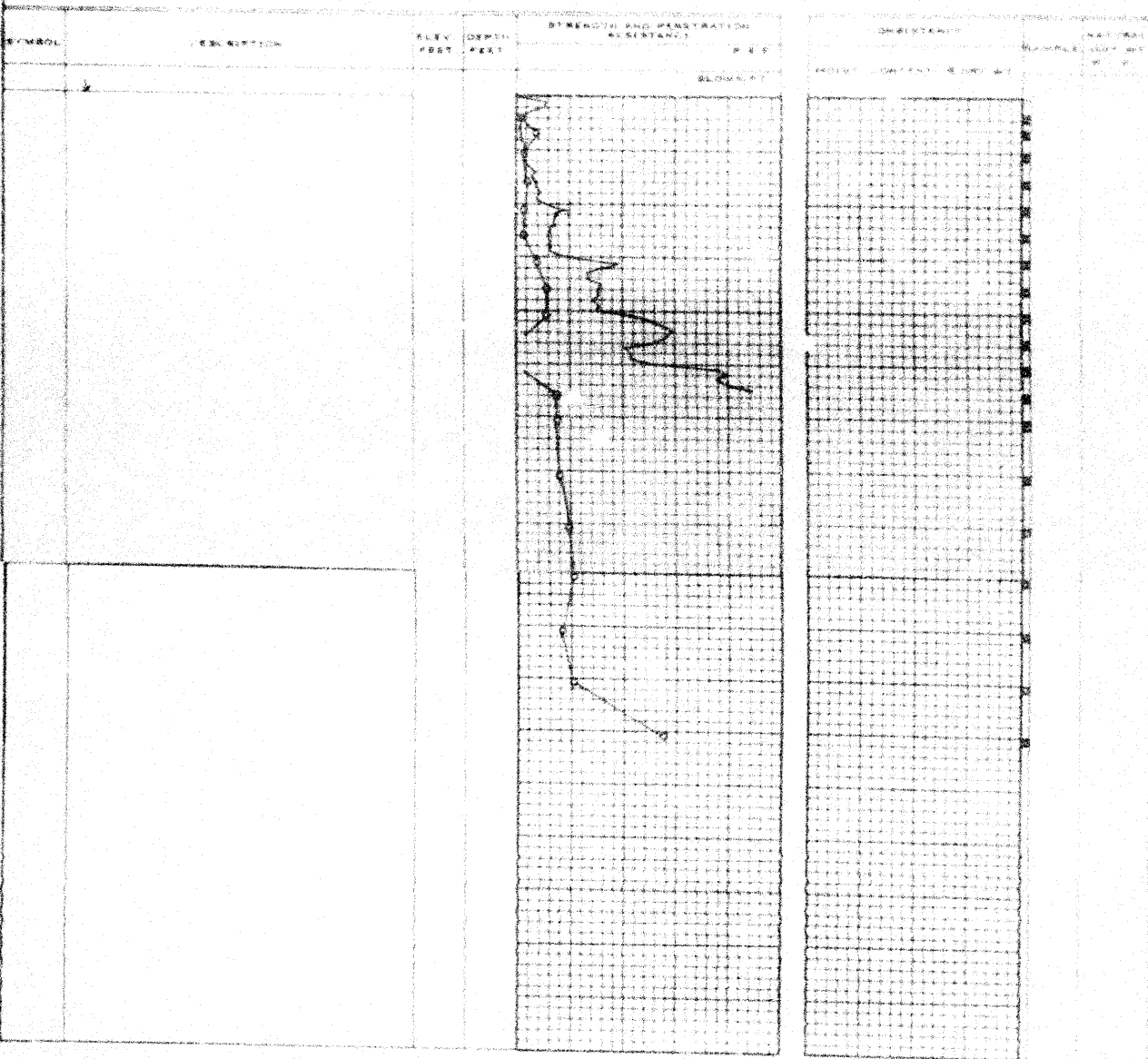
DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. _____
JOB _____ STATION _____
DATUM _____ COMPILED BY _____
BORING DATE _____ CHECKED BY _____

2" DIA. SPLIT TUBE
2" SHELBY TUBE
2" SPLIT TUBE
2" DIA. CONE
2" SHELBY
CASING

LEGEND

UNCONFINED COMPRESSION (QU)
WIRE TEST (AND SENSITIVITY) (S)
NATURAL MOISTURE AND
LIQUID LIMIT
PLASTIC LIMIT



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS AND RESEARCH SECTION

W.P. _____ BORE HOLE NO. 604
 JOB 60-F-1 STATION _____
 DATUM 102.0 COMPILED BY B.K.
 BORING DATE April 26/60 CHECKED BY _____

2" DIA. SPLIT TUBE
 2" SPIGOT TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 2" SPIGOT
 CASING

LEGEND

UNCONFINED COMPRESSION (Qu) 0
 VANE TEST (C) AND SENSITIVITY (S) 0
 NATURAL MOISTURE AND LIQUIDITY INDEX 0
 LIQUID LIMIT 0
 PLASTIC LIMIT 0

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE	P.S.P.	MOISTURE CONTENT	COMBUSTION	NATURAL UNIT WT. P.C.P.
<u>SL</u>			0					
			10					
			20					
			30					
			40					
			50					
			60					
			70					
			80					
			90					
			100					
			110					
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			900					
			910					
			920					
			930					
			940					
			950					
			960					
			970					
			980					
			990					
			1000					

* 604 740
2 837 740

62 740
632 740

604 740
2 837 740

... ..

1. *Chrysomelidae* (Beetles) - 100
 2. *Curculionidae* (Weevils) - 100
 3. *Chrysomelidae* (Beetles) - 100
 4. *Curculionidae* (Weevils) - 100
 5. *Chrysomelidae* (Beetles) - 100
 6. *Curculionidae* (Weevils) - 100
 7. *Chrysomelidae* (Beetles) - 100
 8. *Curculionidae* (Weevils) - 100
 9. *Chrysomelidae* (Beetles) - 100
 10. *Curculionidae* (Weevils) - 100

[illegible]

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

SECRET

4-11-61

Overturning Moment due to T_1 & T_2

Size ① $\frac{3.5 \times 8.5}{2} \times 8.5 \times 0.5 = 127.500$

② $\frac{10 \times 17}{2} \times 8.5 \times 0.5 = 373.750$

③ $\frac{17 \times 24}{2} \times 10 \times 0.5 = 1020.000$

④ $\frac{26 \times 30}{2} \times 10 \times 0.5 = 1950.000$

⑤ $\frac{10 \times 25}{2} \times 6 \times 0.5 = 375.000$

⑥ $\frac{35 \times 5}{2} \times 10 \times 0.5 \times 0.5 = 468.750$

$+ 2,976.500$
 $= 546.300$

Size ⑦ $\frac{20 \times 16}{2} \times 10 \times 0.5 \times 0.5 = 80.500$

⑧ $\frac{5 \times 11}{2} \times 10 \times 0.5 \times 0.5 = 32.000$

⑨ $\frac{17 \times 8}{2} \times 10 \times 25 \times 0.5 = 102.000$

⑩ $\frac{2 \times 7}{2} \times 22 \times 0.5 = 77.000$

$= 246.300$

Overturning Moment due to Tension Crack $\frac{1}{2} T_u \times h$

$= \frac{1}{2} \times 62.6 \times 2.5 \times 1.1 = 16.150$

Due to Tension Crack

Restoring Moment $= R \sum C_i + R \sum W_i \cos \phi$

$= R \left(\frac{\pi R B \times C}{180} \right) + R \sum W_i \cos \phi$

Case ① \rightarrow No Strength in Fill

$R \left(\frac{\pi R B \times C}{180} \right) = 74 \left(\frac{\pi \times 2 \times 45 \times 500}{180} \right) = 2,240.000$

F.S. $= \frac{2,240.000}{2,268,350} = 0.98$

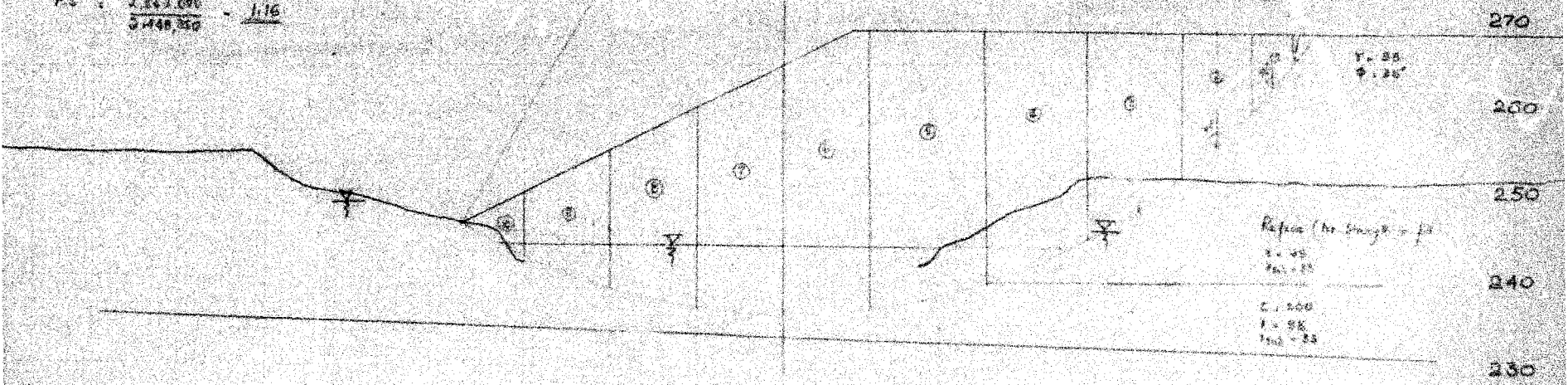
Case ② \rightarrow Assuming Strength in Fill

$= 2,240.000 + R \sum W_i \cos \phi$

$+ 74 \tan 36^\circ (2,150 \times \cos 30 + 10,250 \times \cos 4.7)$

$= 2,240.000 + 512.000 = 2,852.000$

F.S. $= \frac{2,852.000}{2,448,350} = 1.16$



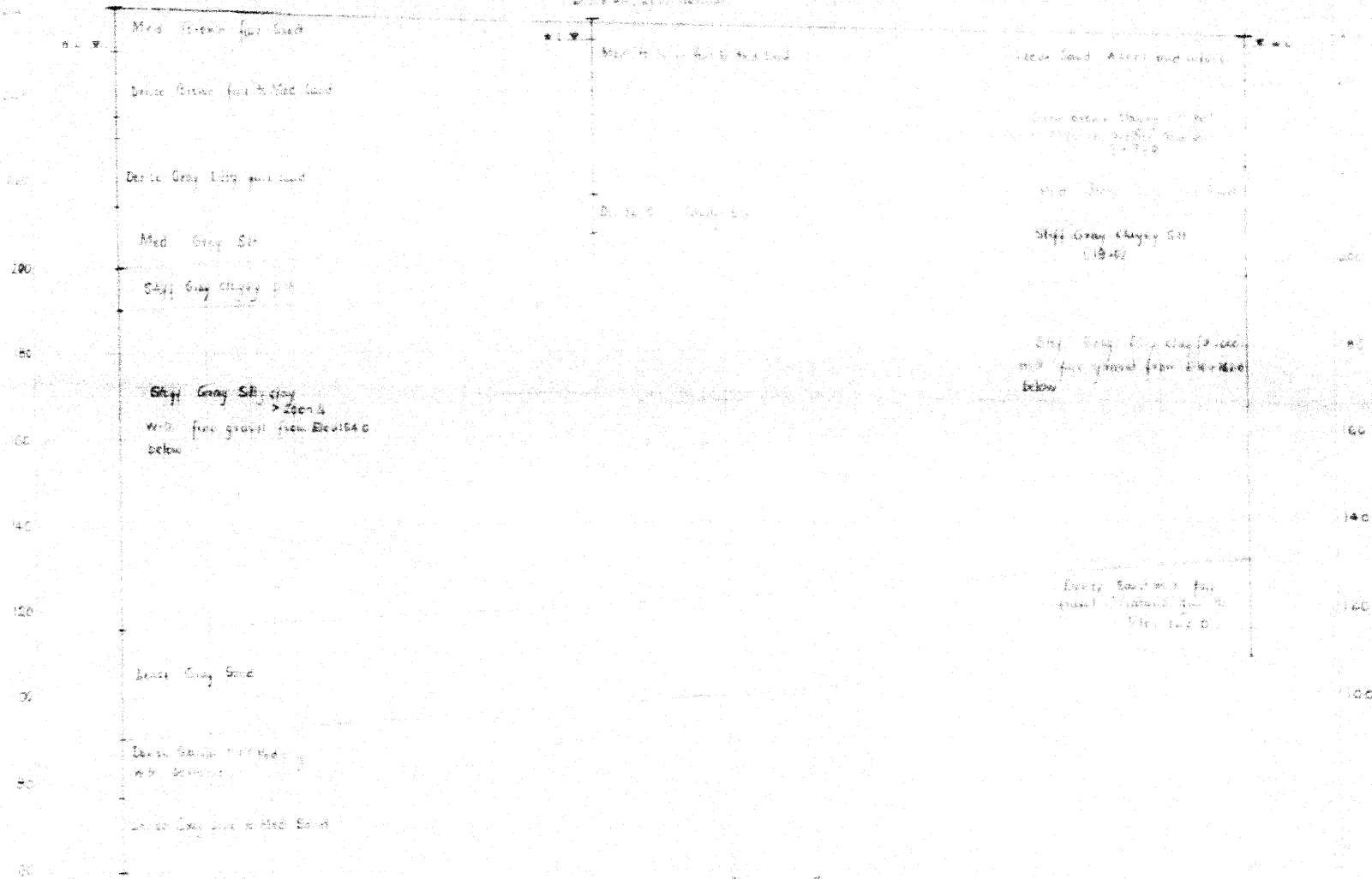
Section at 408+60 (NEW LINE)

33-61-11A

B.H. # 601

B.H. # 604

B.H. # 604



1961

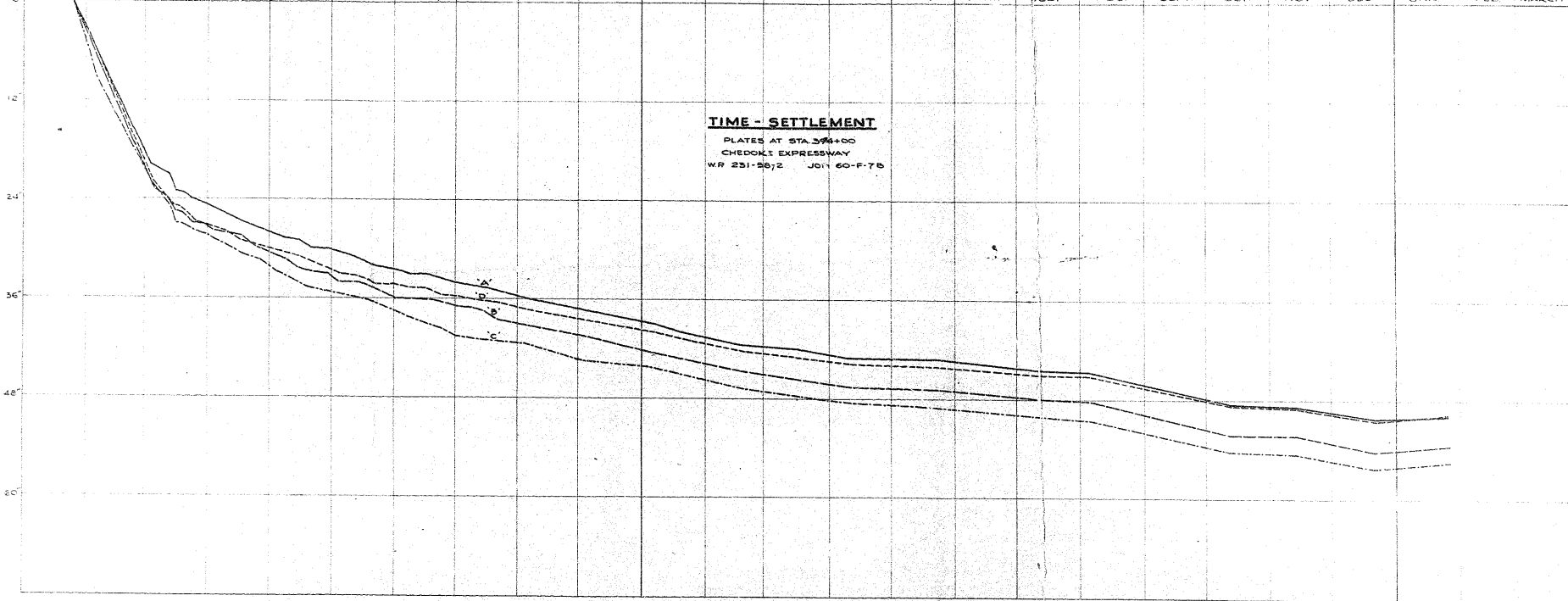
1962

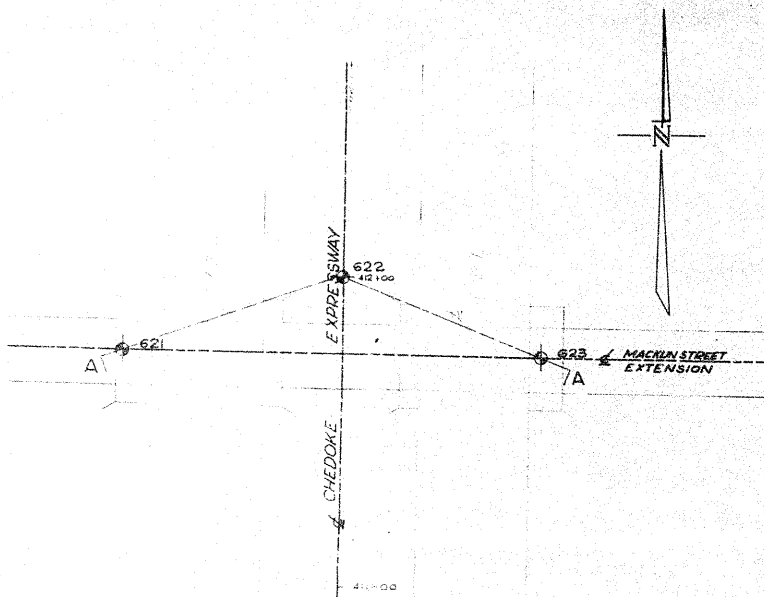
1963

MARCH APRIL MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MARCH APRIL MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MARCH

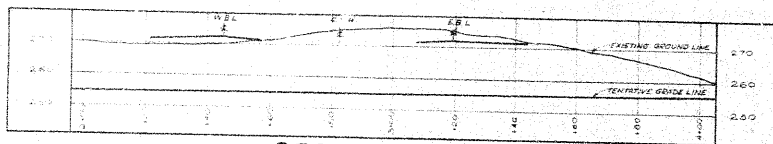
TIME - SETTLEMENT

PLATES AT STA. 394+00
CHEDOKI EXPRESSWAY
WR 231-2872 JUN 60-F-75

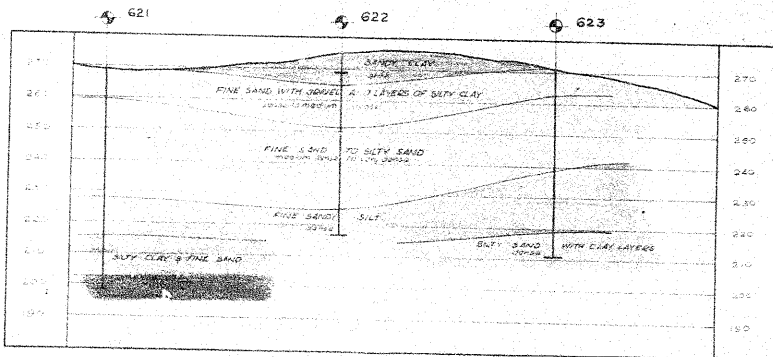




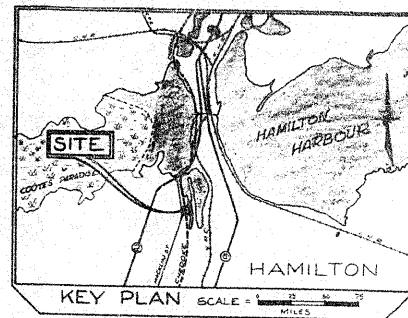
PLAN



PROFILE



A — A



9-161-77-EC

LEGEND

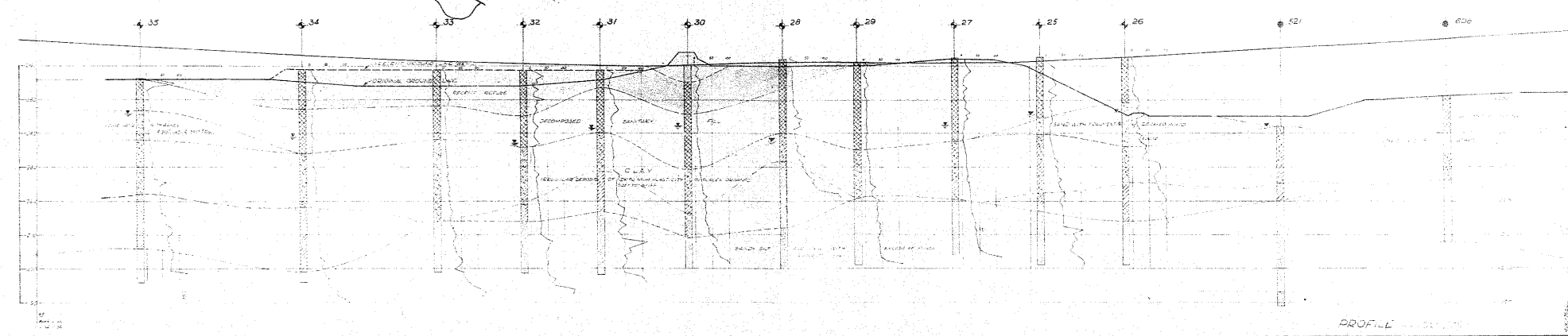
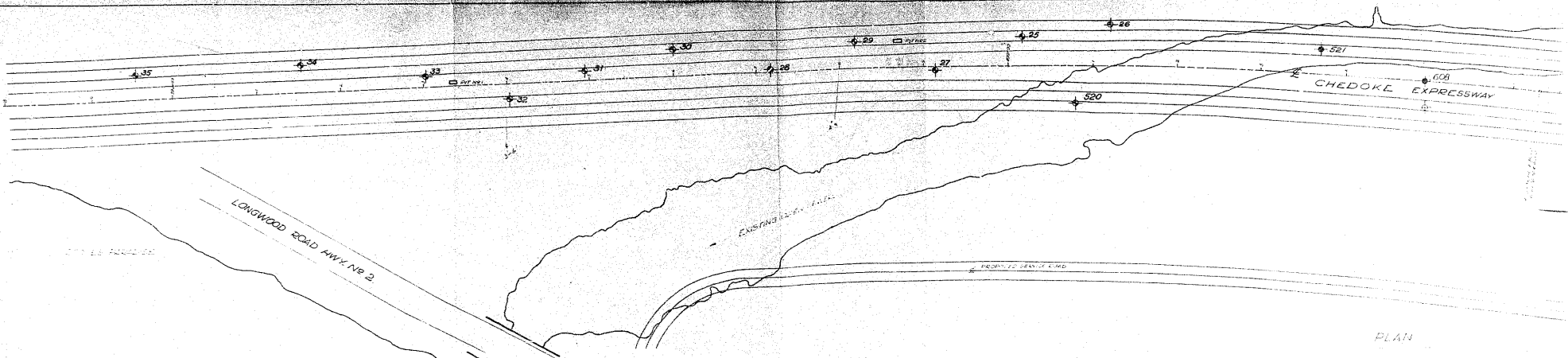
BORE & PENETRATION HOLE			
BORE NO.	ELEVATION	STATION	DISTANCE FROM E
621	2690'	411+75	70' LT
622	2690	412+00	E
623	2720	411+75	68' RT

NOTE:
THE BOUNDARIES BETWEEN SOILS SET BY THIS PLAN ARE BASED ONLY ON THE BORE DATA. SOILS MAY BE DIFFERENT FROM THOSE SHOWN ON THIS PLAN. THE ASSUMED SOILS ARE BASED ON THE BORE DATA AND SHOULD BE USED ONLY FOR THE PURPOSES OF THIS PLAN.

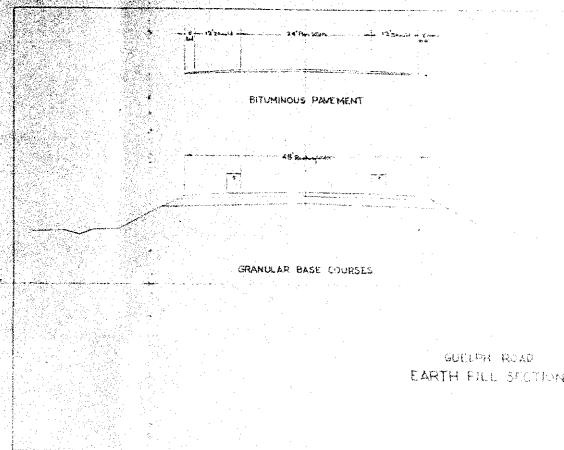
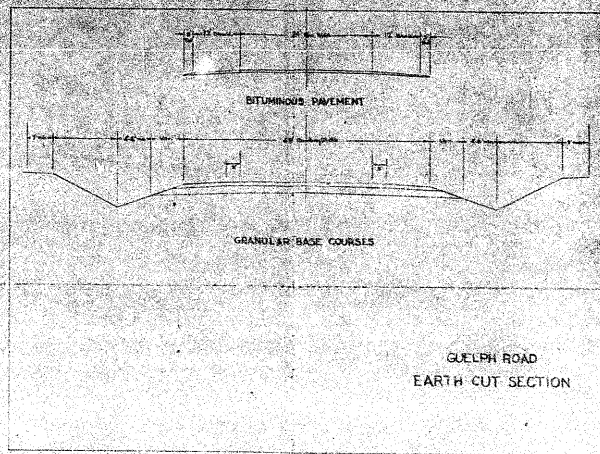
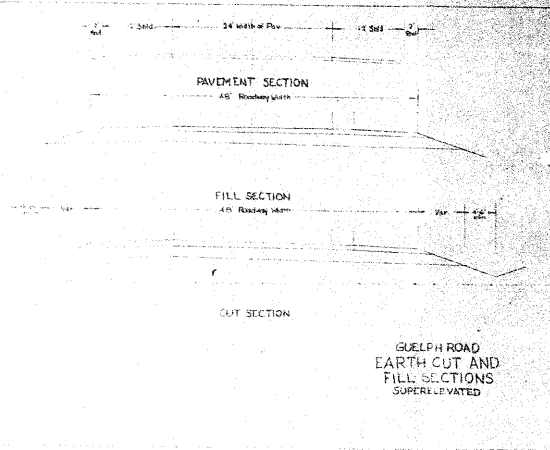
DEPARTMENT OF HIGHWAYS - ONTARIO
HIGHWAY DESIGN DIVISION

MACKLIN STREET EXTENSION

PROJECT NO. 403
DATE: 1967
DESIGNED BY: [Signature]
CHECKED BY: [Signature]
APPROVED BY: [Signature]
60-27-A



PLAN 401-50-2
 HWY 403
 DISTRICT 4
 TRACED FROM SHEET 45



DESIGN YEAR A.D.T.-5000-10000

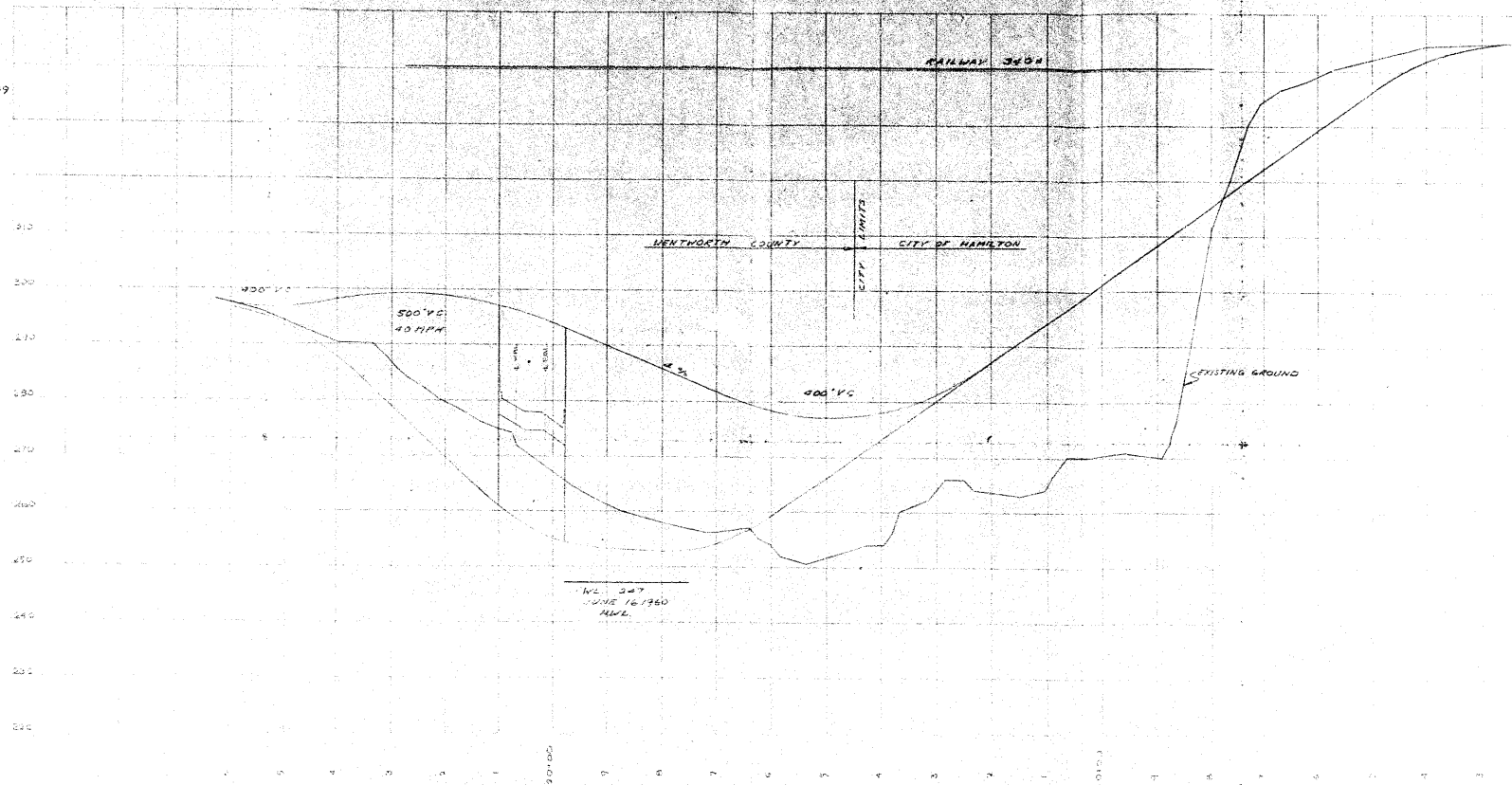
CROSS SECTIONS OF GUELPH ROAD
 SHOWING PROPOSED DESIGN CHANGES

NO. 231-56-2

HWY 403

DISTRICT 4

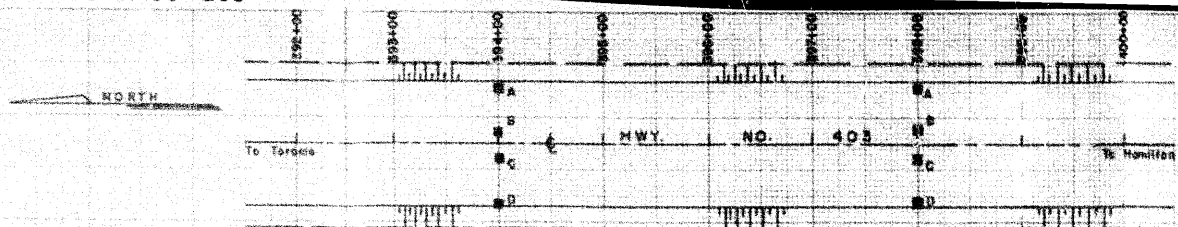
TRACED FROM SHEET 39



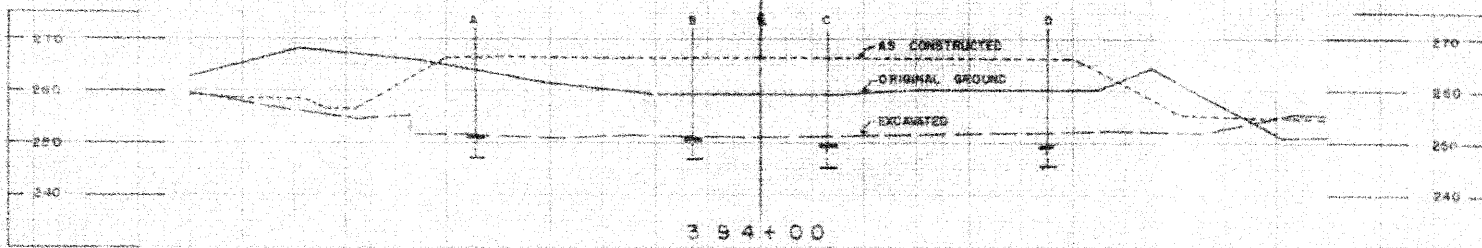
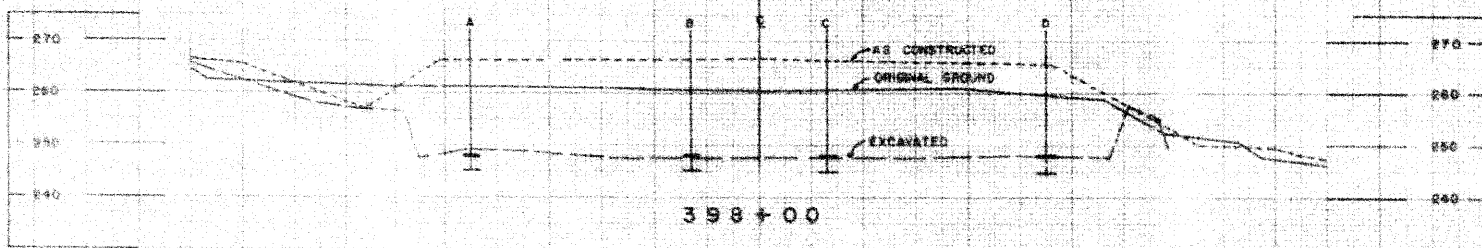
DESIGN YEAR ADT 5000-10000

APPROXIMATE DRAINAGE ROAD AT
STATION 10+00 WITH PROPOSED
IMPROVEMENTS AT STATION 10+00

10/13/60

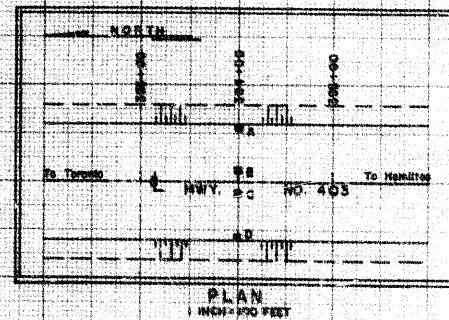
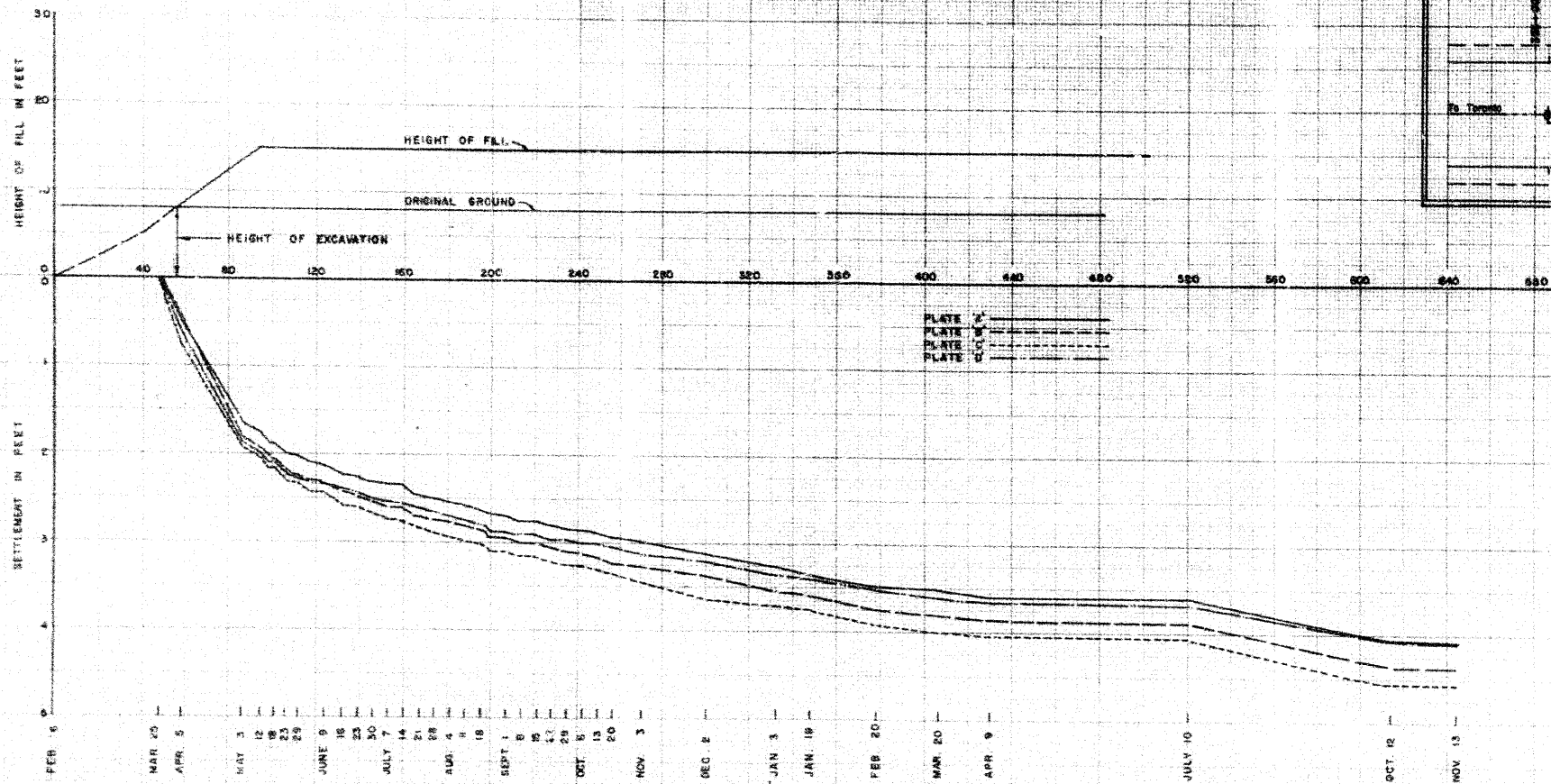


P L A N



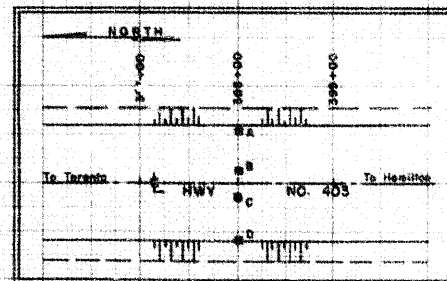
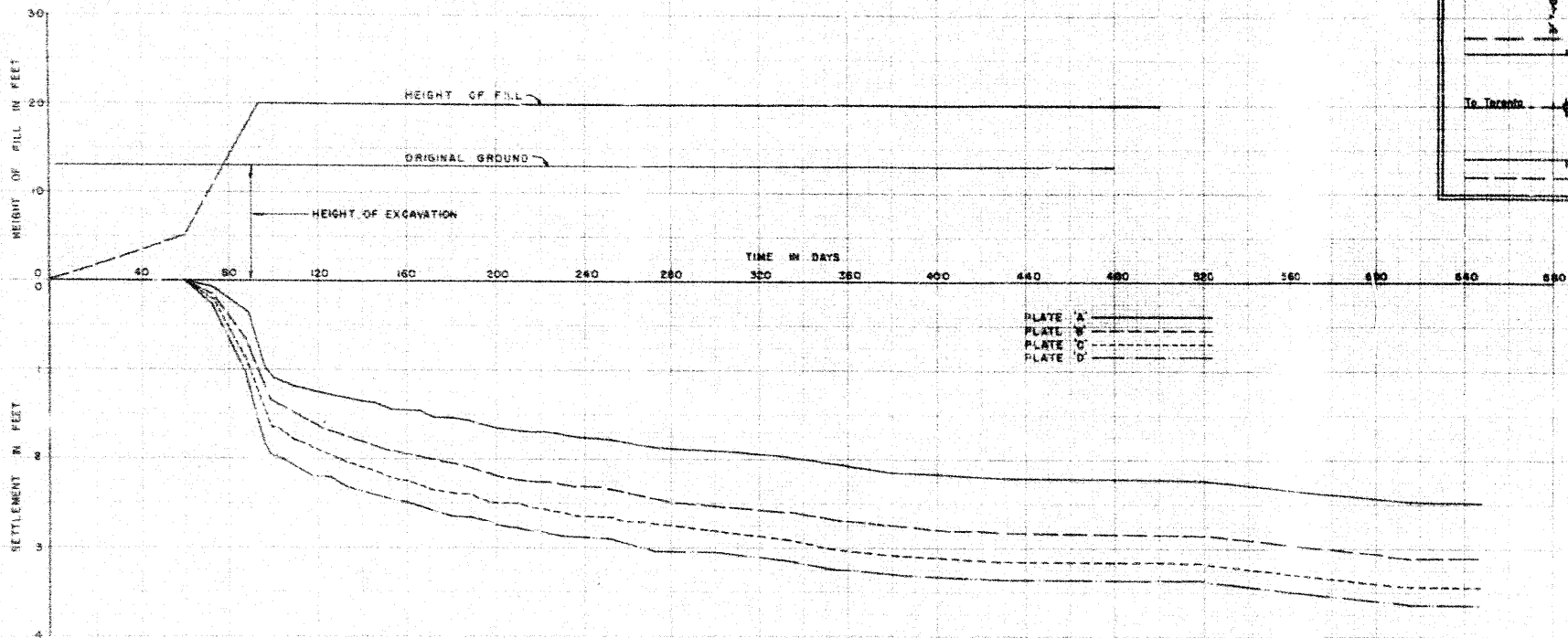
HWY. NO. 403

STA. 394+00



HWY. NO. 403

STA. 398+00

PLAN
1 INCH = 100 FEET

FEB 6

APR 6

MAY 5

MAY 12

MAY 19

MAY 26

JUNE 2

JUNE 9

JUNE 16

JUNE 23

JULY 1

JULY 8

JULY 15

JULY 22

AUG 5

AUG 12

AUG 19

AUG 26

SEP 2

SEP 9

SEP 16

SEP 23

OCT 1

OCT 8

OCT 15

OCT 22

OCT 29

NOV 5

NOV 12

NOV 19

NOV 26

DEC 3

DEC 10

DEC 17

DEC 24

JAN 1

JAN 8

JAN 15

JAN 22

JAN 29

FEB 5

FEB 12

FEB 19

FEB 26

MAR 5

MAR 12

MAR 19

MAR 26

APR 2

APR 9

APR 16

APR 23

APR 30

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MAY 21

MAY 28

JUN 4

JUN 11

JUN 18

JUN 25

JUL 2

JUL 9

JUL 16

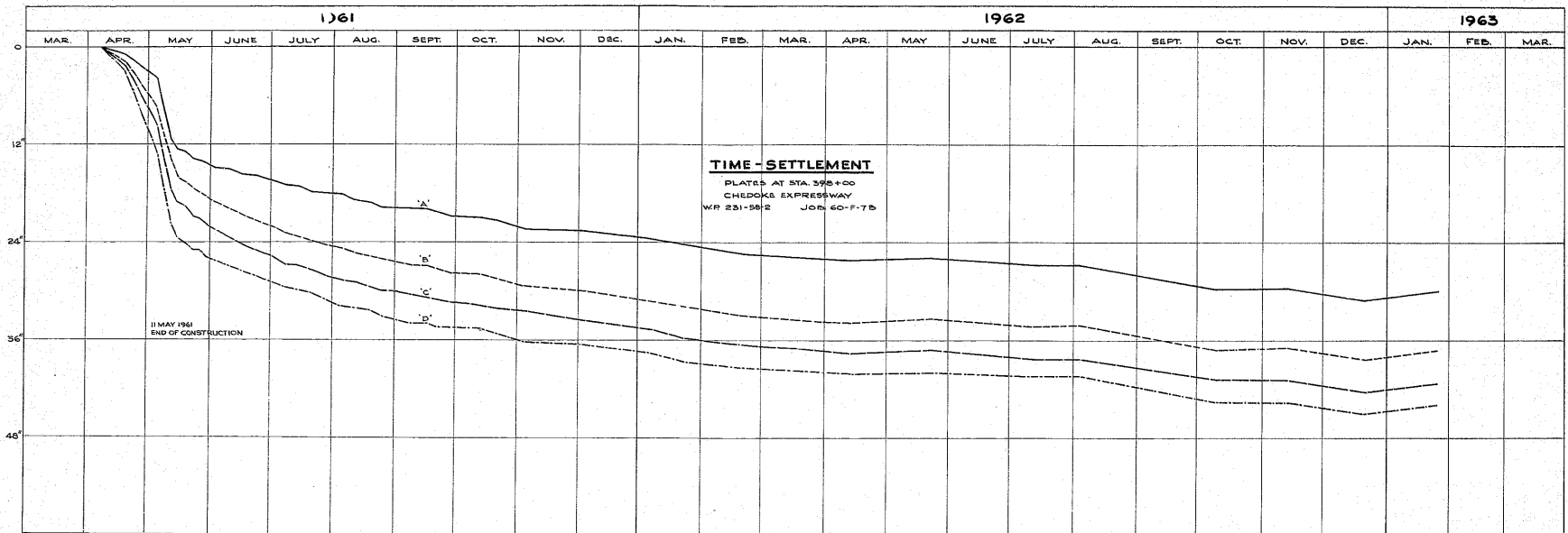
W.P. 231-58-2

HWY. 403

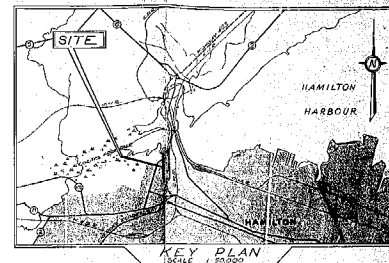
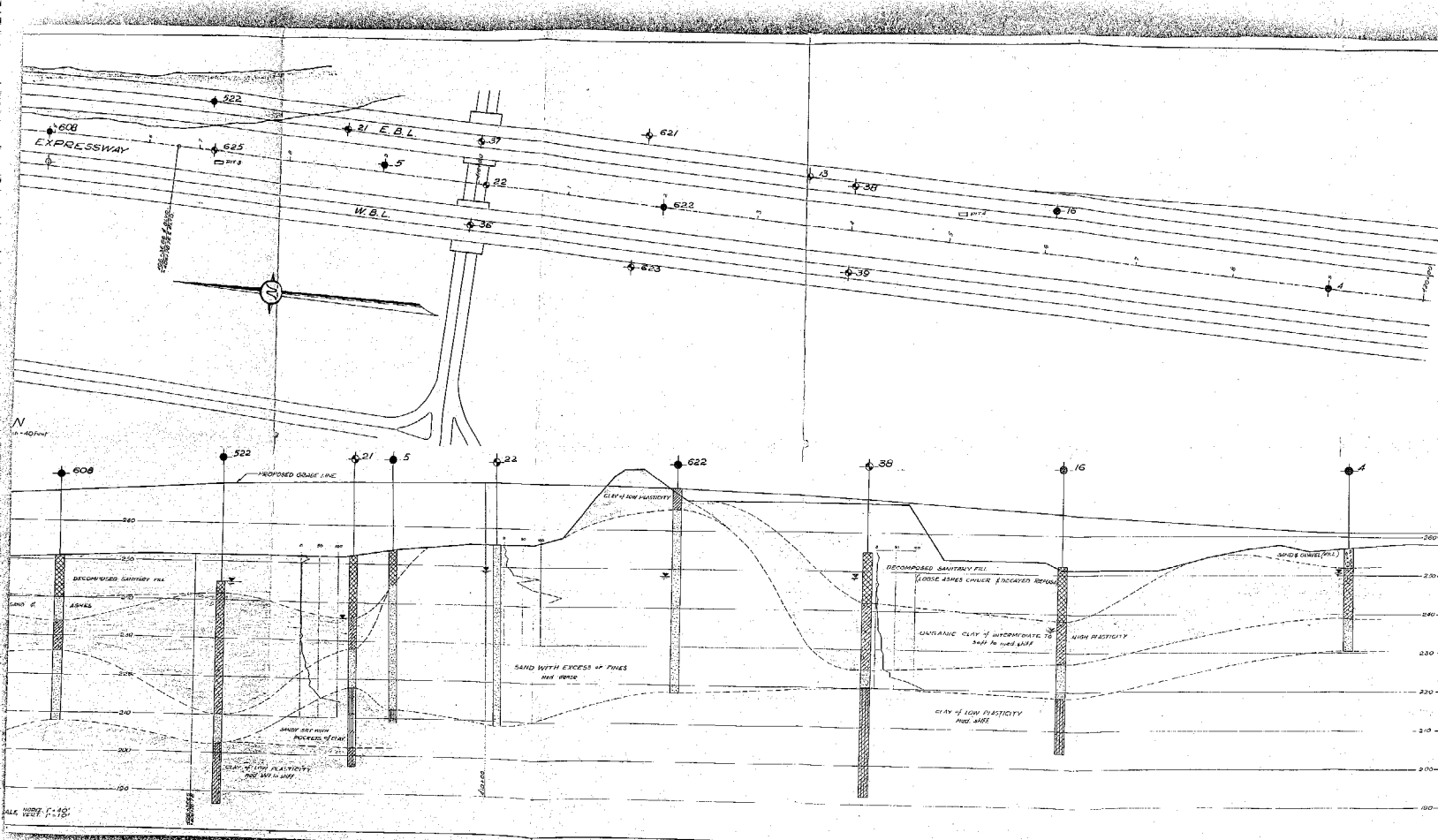
(KING &

LONGWOOD)

30MS-26



30MS-26
 10/10/61



LEGEND									
◆ POINT HOLE	⊕ PENETRATION HOLE	⊕ PENETRATION HOLE							
INLET	ELEVATION	DIAMETER	OUTLET	ELEVATION	DIAMETER	STATION	DIAMETER	INLET	ELEVATION
4	287.00	418+00	5	288.00	418+00	38+30	418+00	18	287.00
5	288.00	418+00	6	288.00	418+00	38+30	418+00	19	288.00
16	288.00	418+00	17	288.00	418+00	38+30	418+00	20	288.00
21	288.00	418+00	22	288.00	418+00	38+30	418+00	23	288.00
24	288.00	418+00	25	288.00	418+00	38+30	418+00	26	288.00
27	288.00	418+00	28	288.00	418+00	38+30	418+00	29	288.00
30	288.00	418+00	31	288.00	418+00	38+30	418+00	32	288.00
33	288.00	418+00	34	288.00	418+00	38+30	418+00	35	288.00
36	288.00	418+00	37	288.00	418+00	38+30	418+00	38	288.00
39	288.00	418+00	40	288.00	418+00	38+30	418+00	41	288.00
42	288.00	418+00	43	288.00	418+00	38+30	418+00	44	288.00
45	288.00	418+00	46	288.00	418+00	38+30	418+00	47	288.00
48	288.00	418+00	49	288.00	418+00	38+30	418+00	50	288.00
51	288.00	418+00	52	288.00	418+00	38+30	418+00	53	288.00
54	288.00	418+00	55	288.00	418+00	38+30	418+00	56	288.00
57	288.00	418+00	58	288.00	418+00	38+30	418+00	59	288.00
60	288.00	418+00	61	288.00	418+00	38+30	418+00	62	288.00
63	288.00	418+00	64	288.00	418+00	38+30	418+00	65	288.00
66	288.00	418+00	67	288.00	418+00	38+30	418+00	68	288.00
69	288.00	418+00	70	288.00	418+00	38+30	418+00	71	288.00
72	288.00	418+00	73	288.00	418+00	38+30	418+00	74	288.00
75	288.00	418+00	76	288.00	418+00	38+30	418+00	77	288.00
78	288.00	418+00	79	288.00	418+00	38+30	418+00	80	288.00
81	288.00	418+00	82	288.00	418+00	38+30	418+00	83	288.00
84	288.00	418+00	85	288.00	418+00	38+30	418+00	86	288.00
87	288.00	418+00	88	288.00	418+00	38+30	418+00	89	288.00
90	288.00	418+00	91	288.00	418+00	38+30	418+00	92	288.00
93	288.00	418+00	94	288.00	418+00	38+30	418+00	95	288.00
96	288.00	418+00	97	288.00	418+00	38+30	418+00	98	288.00
99	288.00	418+00	100	288.00	418+00	38+30	418+00	101	288.00

DEPARTMENT OF HIGHWAYS ONTARIO
MATERIALS & RESEARCH SECTION

CHEYENNE EXPRESSWAY
BETWEEN LONGBRIDGE ROAD AND KING STREET
STATION 388+00

DESIGNED BY: [Signature]
CHECKED BY: [Signature]
DATE: [Date]
SCALE: AS SHOWN
60-F-7B