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G.I.-30 SEPT. 1976

GEOCRES No. 31G-45

DIST. 9 REGION Eastern

W.P. No. 35-66-14

CONT. No. 72-173

W. O. No. 70-F-002

STR. SITE No. 27-212

HWY. No. 417

LOCATION RUSSEL CTY. RD. 3
(2.2 MI W of RUSSEL CTY. RD. 7)
STRUCTURE

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Laboratory Building,
Downsview, Ontario.

From: Bridge Section,
Kingston, Ontario.

Attention:

Date: December 4, 1969.

Our File Ref.

In reply to

Subject: W.P. 35-66-14, Site 27-212,
County Road 3 Overpass,
(2.2 Miles West of Casselman),
Highway 417, District 9-Ottawa

70-F-2

We are sending to you herewith two prints of Bridge Site Plan E-4682-1 on which we have marked the proposed location of the above structure. Also enclosed are two copies of your Field Reconnaissance Report.

We would be pleased if you will make arrangements for the necessary foundation investigation and to have your report, the scheduled date for which is January 14, 1970.

T. C. Kingsland
Regional Bridge Planning Engineer

TCK/hl
Encls.

c.c. (with encls.)
Bridge Office Files Section (Mr. S. McCombie)
c.c. Mr. R. Forrest

FIELD RECONNAISSANCE REPORT 70-F-2

REQUIRED BY FOUNDATION SECTION
FOR

FF-69
SEPT. 1968

W.P. NO. 35-66-14 HIGHWAY NO. 417 DISTRICT 9 SITE PLAN NO. E-4682-1 PROFILE NO. C-327-3-4
RIVER CROSSING ☐ GRADE SEPERATION ☒ R.R.X. ☐ OTHER (SPECIFY) _____
ALTERNATE SCHEME (IF ANY) _____

EXISTING SITE CONDITIONS

DESCRIPTION:

TOPOGRAPHY: HILLY ☐ ROLLING ☐ VALLEY ☐ GULLIED ☒ FLAT ☐
VEGETATION: TREES ☒ BRUSH ☒ GRASS ☐ SWAMP ☐ FARM CROPS ☐ CLEARED ☒
SNOW COVER: 0"-6" ☐ 6"-12" ☐ >12" ☐
ROCK OUTCROP (SPECIFY LOCATIONS) None visible

UNDERGROUND UTILITIES: UTILITY COMPANY TELEPHONE NO. FOR DEFINITE LOCATION

1 _____
2 _____
Aerial 3 Telephone & Hydro wires along County Road 3
4 _____
5 _____

EXISTING STRUCTURE(S): N/A

FOUNDATIONS: SPREAD FOUNDATIONS ☐ SIZE _____ ELEVATION(S) _____
PILES ☐ TYPE _____ LENGTH(S) _____
DESIGN LOAD _____ T.S.F. _____ TONS/PILE
CONDITION OF STRUCTURE _____

APPROACHES: CUT ☐ FILL ☐ SIDE SLOPES _____
BERMS YES ☐ NO ☐

OTHER OBSERVATIONS (USE BACK OF SHEET TO DESCRIBE ANY FAILURES IN AREA, PAST PERFORMANCE OF EXISTING APPROACHES & STRUCTURE, ETC.)

ACCESSIBILITY

IS STRUCTURE LOCATED ON D.H.O. RIGHT OF WAY? YES ☐ NO ☒ IF NO,
HAS PERMISSION BEEN OBTAINED TO ENTER PROPERTY? YES ☐ NO ☒ IF NO,
PROPERTY OWNER(S):

	NAME	ADDRESS	TELEPHONE NO.
1	Renaud Foucher	?	
2	Marie Jean Racine or		
3	Euclide Racine	R. R. 3 Casselman	764-5483
4			

WHO WILL OBTAIN NECESSARY PERMISSION? Property Section, Eastern Region
HAS SITE BEEN SURVEYED & STAKED? YES ☒ NO ☐ IF YES, DATE OF MOST RECENT SURVEY _____
WILL CLEARING BE NECESSARY TO ENTER SITE AREA? YES ☐ NO ☒
IS SITE ACCESSIBLE TO WHEELED VEHICLES? YES ☒ & NO ☐ (Yes, for holes to be drilled along Co. Rd. 3 and high land)

IF RIVER CROSSING:
WILL A RAFT BE NECESSARY? YES ☐ NO ☐ IF YES, GIVE MAX. DEPTH OF WATER _____ FT
CURRENT: SWIFT ☐ MODERATE ☐ SLOW ☐

DRILLING OPERATIONS

NEAREST SOURCE OF WATER (GIVE HAULING DISTANCE, IF KNOWN) Creek at site
ADDITIONAL INVESTIGATION REQUIRED FOR THE FOLLOWING PURPOSES:
ALTERNATE SCHEME: YES ☐ NO ☐ IF YES, SPECIFY _____
HYDROLOGIC REASONS: YES ☐ NO ☐ IF YES, SPECIFY (SCOUR, ETC.) _____

REMARKS

NEAREST AVAILABLE ACCOMODATION: Hotels in Casselman
OTHER COMMENTS: _____

DATE December 4, 1969
REGIONAL BRIDGE ~~LOCATION~~ Planning ENGINEER H. Kingsland

CRM 112-2N6 R42 72-173

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

31G-45

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

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

Attention: Mr. S. McCombie

Date: February 10, 1970

Our File Ref.

In reply to FEB 13 1970

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Hwy. 417
Eastbound and Westbound Lanes
And County Road No. 3
Twp. of Cambridge - Co. of Russell
District No. 9 (Ottawa)
W.J. 70-F-2 -- W.P. 35-66-14

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

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis
H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
C. R. Robertson
T. C. Kingsland (2)
J. E. Gruspier
B. A. Singh

Foundations Files
Gen. Files

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FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Hwy. 4,
Eastbound and Westbound Lanes
And County Road No. 3
Twp. of Cambridge - Co. of Russell
District No. 9 (Ottawa)
W.J. 70-F-2 -- W.P. 35-66-14

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation at the site of the above mentioned proposed crossing. The request was contained in a memo from the Bridge Section (Mr. T. C. Kingsland, Regional Bridge Planning Engineer), dated December 4, 1969. An investigation was subsequently carried out by this Section in order to determine the subsoil and groundwater conditions at the site. This report contains the results of this investigation, together with our recommendations pertaining to the foundations of the proposed structure and the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located about 3 miles west of Casselman where County Rd. No. 3 crosses a creek located within a 20 to 25 ft. deep gully. The profile grade of County Rd. #3 at this crossing varies from elevation 208 at the approaches to the gully to about elevation 202 directly above the creek. The creek is diverted under the roadway fill by means of a 72" x 37' C.S.P. culvert located perpendicular to the roadway. The ground surface of the creek valley floor within the gully, is about elev. 186. The gully side slopes range from near vertical at the top to as flat as 4 horizontal to 1 vertical near the bottom. With the exception of this gully, the surrounding area is generally flat-lying and used mainly for agricultural purposes.

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2. DESCRIPTION OF THE SITE AND GEOLOGY: (cont'd.) ...

Physiographically, the site is located within the "Winchester Clay Plains" physiographic region. The predominant stratum throughout the "Winchester Clay Plains" is composed of a marine clay (Leda clay) deposited by the Champlain Sea. This clay stratum overlies a glacial till deposit which is followed by limestone bedrock.

3. FIELD AND LABORATORY WORK:

Eight sampled boreholes, accompanied by dynamic cone penetration tests, were carried out during the course of the field investigation by means of three standard diamond drill rigs adapted for soil sampling purposes.

Samples of the surficial sand and the lower glacial till were obtained in a 2-inch O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. The cohesive overburden was sampled with 2-inch I.D. Shelby tubes, which were manually pushed into the soil. In addition, field vane tests were carried out to determine the undrained shear strength characteristics of the clay stratum. Bedrock was proven at all the borehole locations by obtaining AXT size rock core samples.

The locations and elevations of all the boreholes were surveyed by personnel from the Kingston Region Engineering Surveys Section, and are shown on Drawing 70-F-2A; estimated stratigraphical profiles across the site are shown on Dwg. 70-F-2B. The elevations given in this report are referenced to a geodetic datum.

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this inspection, laboratory tests were carried out on certain samples to determine the physical properties of the various soil types, namely:

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3. FIELD AND LABORATORY WORK: (cont'd.) ...

Natural Moisture Contents
Atterberg Limits
Bulk Densities
Grain-Size Distributions
Undrained Shear Strengths
Consolidation Characteristics

The results of the laboratory tests are plotted on the Record of Borelog sheets and are summarized on Figures 1 to 5 inclusive, all contained in the Appendix to this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The predominant stratum across the site is a deposit of laminated clay and silty clay with a total thickness ranging between 38 and 66 ft. This cohesive deposit is overlain by fill material within the creek valley floor, and by an 8-ft. thick surficial cover of silty sand to sandy silt beyond the valley slopes. Within the valley floor immediately beneath the fill material is a 6 to 8-ft. thick stratum of silty fine sand with organics.

The laminated clay and silty clay deposit is underlain by a glacial till stratum of 7 to 15 ft. thickness, which is followed by sound limestone bedrock. The various soil types encountered at this site are described in further detail below:

4.2) Fill Material:

Fill material, consisting of a silty fine sand with traces of gravel, was encountered at the locations of Boreholes 2, 3 and 8. The thickness of the fill material ranged from 8 ft. at B.H. 2 to 16 ft. at B.H.'s 3 and 8. The Standard Penetration Resistance 'N' values varied between 4 and 18 blows/ft., indicating that the roadway fill material for County Rd. #3 is poorly compacted.

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

4.3) Silty Fine Sand:

A surficial stratum of silty fine sand was encountered at those boreholes which were located on the higher ground beyond the valley slopes, namely, at B.H.'s 1, 5, 6 and 9. The thickness of this stratum averages about 8 ft. where encountered. At the location of B.H. 9, the thickness of this stratum was, however, only 4 ft. An envelope encompassing typical grain-size distribution curves for samples from this deposit, is shown on Figure 2 in the Appendix. The natural water content of the deposit, determined from laboratory testing, was found to vary between 20 and 30%. Standard penetration tests, carried out within the deposit, gave 'N' values which range between 13 and 38 blows/ft., with the average being about 25 blows/ft. Based on these results, it is estimated that the relative density of the granular soil ranges from compact to dense.

At the locations of B.H.'s 3 and 8, a 6 to 8-ft. thick deposit of silty fine sand with some clay and organic matter was encountered immediately below the fill material - i.e., at an elevation corresponding to the existing valley floor elevation. The grain-size distribution characteristics were found to be similar to those of the silty sand stratum encountered on the higher ground beyond the valley slopes. The 'N' values within this slightly organic granular stratum averaged about 6 blows/ft., indicating the relative density of this material to be loose.

4.4) Laminated Clay and Silty Clay:

Underlying the silty sand or fill material is the predominant stratum across the site - a laminated clay and silty clay deposit varying in thickness between 38 ft. (at B.H. 3) and 66 ft. (at B.H. 1). At the location of B.H. 7, the upper 5 ft. of the deposit contained some sand and traces of organics.

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

4.4) Laminated Clay and Silty Clay: (cont'd.) ...

The overall deposit consists of alternate grey-brown clay and grey silty clay laminations in the order of 4 to 6 inches thick. Below about elevation 160 across the site, however, this deposit has a dark grey colour and contains some black organic mottling with traces of shell fragments.

Numerous silt and sand seams from 1/2 inch to 2 inches in thickness were encountered throughout the deposit. In addition, below about elevation 160, the deposit contains layers of silt and fine sand up to 12 inches in thickness.

The physical properties of this deposit, as determined by field and laboratory testing, are summarized on Figure 2 in the Appendix, and are tabulated as follows:

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

4.4) Laminated Clay and Silty Clay: (cont'd.) ...

	Grey-Brown Clay Layers		Grey Silty Clay Layers	
	Range	(Avg.)	Range	(Avg.)
Natural Moisture Content (W) - %	49 - 77	(68)	43 - 71	(55)
Liquid Limit (W_L) - %	57 - 77	(64)	36 - 49	(43)
Plastic Limit (W_P) - %	21 - 30	(26)	20 - 29	(24)
Liquidity Index (L_I)	1.0 - 1.5	(1.1)	0.7 - 3.0	(1.5)
Bulk Density (γ) - PCF (overall deposit)	- 98 - 107		(102)	

Undrained Shear Strength (C_u) - PSF:	Overall Deposit Range	Sensitivity
Field Vanes	500 - 1600	4 - 25
Lab. Vanes	540 - 1580	4 - 14
Lab. Tests	370 - 890	-

Consolidation Characteristics:	Range
Initial Void Ratio (e_o)	1.86 - 2.05
Compression Index (C_c)	1.3 - 1.4

The Atterberg limit tests are plotted on the Plasticity Chart, Figure 3, in the Appendix. These indicate that the deposit is mainly an inorganic laminated soil of alternate layers of high plasticity (CH) and intermediate plasticity (CI).

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

4.4) Laminated Clay and Silty Clay: (cont'd.) ...

As shown on the summary plot of Figure 1, the natural moisture content of the deposit is generally higher than the liquid limit, resulting in a liquidity index of about 1.0 for the overall deposit, which indicates that the soil is sensitive to remoulding. This is corroborated by the undrained shear strength measurements of the natural and remoulded material which resulted in sensitivities as high as 25 for the field vane tests and 14 for the laboratory vane tests. The consistency of the overall deposit, as determined from the undrained shear strength testing, increases from firm at the surface of the deposit to stiff below about elevation 160.

The undrained shear strength values obtained from the laboratory tests, were generally lower than those obtained from the field testing. It is considered that this is primarily due to the unavoidable sample disturbance caused by the field and laboratory handling and subsequent testing of the sensitive clay.

The consolidation characteristics of the stratum were determined by carrying out two laboratory consolidation tests, the results of which are shown as Void Ratio (e) versus Logarithm of Pressure (log - p) curves on Figure 4 in the Appendix. The results are summarized on Figure 1, and indicate that the clay is normally consolidated - i.e., the stratum has not been subjected in the past to any pressure in excess of the existing effective overburden pressure ($P'_c = P'_o$). The relatively high values for the initial void ratio (e_o) and the compression index (C_c) are within the normal range for "Leda" clay.

4.5) Heterogeneous Mixture of Silt, Sand and Gravel - (Glacial Till):

A deposit consisting of a heterogeneous mixture of silt, sand and gravel (glacial till), was encountered immediately below the clay stratum, between elevations 140 and 144. This deposit was found to vary randomly in thickness between 7 and 15 ft. across the site.

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

4.5) Heterogeneous Mixture of Silt, Sand and Gravel - (Glacial Till): (cont'd.) ...

The glacial till is essentially of a granular nature; however, at some locations, slightly cohesive zones were encountered in the upper portions of the deposit immediately below the stratum.

Laboratory tests on representative samples indicate an average moisture content for the overall deposit of about 8 per cent. The grain-size distributions of the overall deposit are shown on Figure 5 in the Appendix.

The Standard Penetration Resistance 'N' values in this deposit generally increased with depth and ranged from 15 to 130± blows/ft. These 'N' values indicate the non-cohesive glacial till to be compact to very dense, the upper cohesive zones being of stiff to hard consistency.

4.6) Bedrock:

Bedrock was proven at all the borehole locations by obtaining a minimum of 5 ft. of AXT size rock core. The surface of the bedrock was found to vary from elevation 136 (@ B.H. 5) to elevation 128 (@ B.H. 6).

Examination of the rock cores indicates that the bedrock is composed of a slightly fossiliferous and crystalline limestone containing occasional thin shale seams of 2 to 4 inches thickness. Core recoveries were generally in excess of 90 per cent, indicating the bedrock to be sound. During the core drilling operations at the location of B.H.'s 1, 3 and 5, a considerable loss of water was noticed after the rock had been cored for about 2 ft. This loss of water during drilling may be due to open joints within the bedrock.

5. GROUNDWATER CONDITIONS:

Water level observations were carried out in the open boreholes during the period of the investigation and indicate that the water level across the site is approximately 3 to 19 ft. below

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5. GROUNDWATER CONDITIONS: (cont'd.) ...

the ground surface - i.e., between about elevations 185 and 197. These are summarized on the individual Borelog sheets and on Drawing 70-F-2B. Generally, the groundwater level on the higher ground beyond the creek valley is situated at about elevations 195 - 197, whereas within the valley the groundwater level varies between elevations 185 and 188.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct two parallel overpass structures to carry the East- and Westbound lanes of Hwy. 417 over County Rd. No. 3, some 3 miles west of Casselman. Present proposals call for three-span structures (50'-68'-96' for the W.B.L., and 62'-80'-93' for the E.B.L.) with the profile grade of Hwy. 417 at about elevation 225 for both overpasses. According to the available information, the existing County Rd. No. 3 will be maintained at the same grade without any revisions.

The investigation has revealed the presence of a surficial deposit of compact silty fine sand, some 8 ft. in thickness followed by an extensive deposit of laminated clay and silty clay of firm to stiff consistency. The cohesive deposit, which is some 38 to 66 ft. thick, is followed by a granular type of glacial till deposit of 7 to 15 ft. thickness. Sound limestone bedrock was encountered across the site at depths of 60 to 86 ft. below the ground surface - i.e., between elevations 128 and 136.

The presence of an extensive deposit of soft and highly compressible laminated clay and silty clay at a relatively shallow depth below ground surface requires that steps must be taken to ensure overall stability of the approach embankments, and that the structure must be supported on piled foundations. As the stability and settlement of the approach fills are the major problems at this site, they will be discussed first.

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

6.2) Approach Embankments:

6.2.1) Stability Considerations:

The critical condition for stability of an embankment on normally consolidated clays, as is the case with the clay stratum at this site, generally occurs during or immediately after construction. This being the case, a total stress analysis ($\phi = 0$ condition) provides a suitable means of assessing the stability of the embankment sections. In this method of analysis, stability is governed by the applied loads and by the stress-strain and undrained shear strength properties of the foundation and embankment soils.

Analyses have been carried out, therefore, in terms of total stresses, by the use of the electronic computer, to determine the stability of the fill sections. A minimum factor of safety of 1.3 with respect to stability, has been used in these computations for circular arc type failure surfaces. The results of the analyses indicate that:

Westbound Lane Structure -

i) For the proposed three-span structure, no stability problems are anticipated in the longitudinal direction for the east approach fill with a standard 2:1 slope (see Figure 7). However, a stability problem does exist for such fills in a westerly direction towards the creek. In order to improve the stability, it is recommended that the toe of the west approach fill be located at about Sta. 245+70.

ii) For the west approach, a berm constructed to elev. 208 is required in order to improve stability in the longitudinal direction, as shown on Fig. 6.

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

6.2) Approach Embankments: (cont'd.) ..

6.2.1) Stability Considerations: (cont'd.) ...

Westbound Lane Structure - (cont'd.) ...

iii) Alternatively, the stability of the west approach in the longitudinal direction can be improved by positioning the west abutment Centre-line bearings at Sta. 242+10 without altering the natural slopes of the valley. Any nominal fills required can be constructed with 2:1 slopes.

Eastbound Lane Structure -

i) In the transverse direction no stability problems are anticipated with standard 2:1 slopes for the proposed fills of the three-span structure.

ii) In the longitudinal direction for the suggested three-span scheme, fills with standard 2:1 slopes will not be stable. In order to improve stability in the longitudinal direction a berm up to elev. 208 will be required for both east and west approaches as shown on Fig. 6.

iii) Alternatively, the stability of the approaches in the longitudinal direction can be improved by locating the Centre-line bearings of the abutment at Sta. 239+55 and Sta. 243+15 for the west and east abutments, respectively as shown on Fig. 7. Any nominal fills required can be constructed with standard 2:1 slopes.

6.2.2) Settlement Considerations:

The loose to compact surficial sand stratum will undergo settlements, due to the imposed embankment loading. However, it is believed that such settlements will be of an immediate nature.

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

6.2) Approach Embankments: (cont'd.) ...

6.2.2) Settlement Considerations: (cont'd.) ...

In addition, elastic settlements (immediate settlements) will take place within the clay stratum due to the imposed embankment loads. No attempt was made to compute such immediate settlements, since these will be realized during construction of the embankments.

The underlying highly compressible clay stratum will undergo consolidation settlement under the weight of the approach fills. As discussed elsewhere, it appears that two proposals can be considered:

i) A three-span structure with berms in the longitudinal direction, where necessary.

ii) A longer structure without altering the natural slopes of the valley.

Computations have only been carried out for proposal ii) above in order to determine the amount and time rate of consolidation settlement for a fill height of 10 ft. The results of these computations are tabulated below:

Ht. of Fill	Total Consolidation Settlement (in inches) For Various Time Periods					
	6 Mos.	1 Yr.	2 Yrs.	7 Yrs.	15 Yrs.	30 Yrs.
10 ft.	4	9	12	15	21	30
Percentage Consolidation	12%	25%	33%	50%	75%	90%

Since the clay deposit is normally consolidated - ($P'_c = P'_o$), consolidation settlements for higher fills with berms for proposal i) will be quite excessive. The preliminary estimate indicates settlements up to 60 inches can be anticipated. However, the Foundation Section will carry out the necessary computations if

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

6.2) Approach Embankments: (cont'd.) ...

6.2.2) Settlement Considerations: (cont'd.) ...

the proposal i) with berms is the only choice.

In order to minimize post-construction settlements, it would be advantageous to construct the approach fills well in advance of the structure foundations. It appears that pre-loading of fills for a period of 2 years will be beneficial if scheduling permits.

6.3) Structure Foundations:

The stability considerations are such that two proposals can be considered at the crossing of Hwy. 417 (E.B.L. & W.B.L.) and County Rd. No. 3. These are as follows:

	(1) Three-span Structure with Berms in the Longitudinal Direction (Ref. Fig. 6)	(2) Structure Without Altering the Natural Slopes of the Valley (Ref. Fig. 7)
W.B.L. Structure -		
℄ Bearing of West Abut.	Sta. 242+77	Sta. 242+10
℄ Bearing of East Abut.	Sta. 244+91	Sta. 245+78
E.B.L. Structure -		
℄ Bearing of West Abut.	Sta. 240+12	Sta. 239+55
℄ Bearing of East Abut.	To suit Berm shown	Sta. 243+15

Because of the soft and compressible nature of the subsoil, the structure piers and abutments should be supported on end-bearing piles driven to the bedrock for the aforementioned alternative schemes. The allowable pile load would be dependent on the section chosen - for example, 12 BP 74 steel H-piles, driven to the bedrock could be designed to carry 90 tons/pile.

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

6.3) Structure Foundations: (cont'd.) ...

Movement of the subsoil due to strain imposed by the embankment loading, will generally tend to displace the long slender piles laterally and can cause rotation of the abutments. In view of this, we recommend that consideration be given to supporting the extreme ends of the wing walls on end-bearing piles founded as aforementioned. It is considered that this will improve the stability of the abutment in the longitudinal direction. No bouldery or rock fill should be placed in areas where piles are to be driven.

Pile caps should be founded at a sufficient depth below finished grade so as to ensure adequate frost protection.

A temporary dewatering scheme will be required if pile caps are constructed below the groundwater level within the various perneable silty sand strata.

7. MISCELLANEOUS:

The field work for this project was carried out during the period January 6 - 27, 1970, by Messrs. C. Mirza, Project Foundation Engineer, H. Szymanski and H. R. Stankaitis (Technicians).

Equipment used was owned and operated by F. E. Johnston Co. Ltd.

This report was prepared by Mr. Mirza, and reviewed by Mr. M. Devata, Supervising Foundation Engineer, who was in general charge of the project.

February, 1970

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 239 + 80 ℄ EBL Hwy. 417 o/s 25' Lt. ORIGINATED BY HRS
W.P. 35-66-14 BORING DATE January 13, 14 & 22, 1970 COMPILED BY CM
DATUM Geodetic BOREHOLE TYPE Washboring - NX Casing; Cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
214.7	Ground Level					
0.0	Topsoil					
1.5	Silty fine sand Compact Brown		1	SS	22	
			2	SS	20	
206.0			3	SS	2	
8.7	Laminated clay (Grey Brown) and silty clay (Grey) with random silt seams (½ - 1" thick) throughout Firm to stiff		4	TW	PM	
			5	TW	PM	
			6	TW	PM	
			7	TW	PM	
			8	TW	PM	
			9	TW	PM	
			10	TW	PM	
			11	TW	PM	
			12	TW	PM	
160±			13	TW	PM	
55±	Stiff Dark Grey with org. mottling. occ. silt layers up to 12" thick		14	TW	PM	
			15	TW	PM	
			16	TW	PM	
140.0						
74.7	Het.mix of silt, sand & gravel with trace of clay (Glacial Till)		17	SS	28	
			18	SS	80/2"	
			19	WS	-	
128.7	Compact - V. Dense					
86.0	Limestone Bedrock Sound		20	AXT	100%	
123.4						
91.3	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w
WATER CONTENT % 20 40 60

BULK DENSITY γ P.C.F.

REMARKS	GR. SA. SI. CL.
	0 58 (42)
Lost TW#4 ▼ 197.0	
	103
lost sample	
no recovery drill with bicone bit	

% STRAIN AT FAILURE

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 240 + 80 ℄ EBL Hwy. 417 o/s 20' Rt. ORIGINATED BY CM
W.P. 35-66-14 BORING DATE January 12 - 13, 1970 COMPILED BY CM
DATUM Geodetic BOREHOLE TYPE Washboring - NX & BX Casing; Cone CHECKED BY

SOIL PROFILE ELEV. / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
204.8	Ground Level					
0.0	Fill Material Silty fine sand with trace of organics.		1	SS	4	200
196.8	Loose. Brown		2	SS	4	
8.0			3	SS	6	
	Laminated clay to silty clay					190
						180
						170
						160
						150
139.8						140
65.0	Het.mix.of silt,sand & gravel with trace to some clay (Glacial Till)		4	SS	10	
131.8	Loose - Very dense		5	SS	53	
73.0	Limestone Bedrock					130
127.8	Sound		6	AXT	94%	
77.0	End of Borehole					120

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

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_p
WATER CONTENT —— w
WATER CONTENT % 20 40 60

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

0 74 (26)

▼ 192.0

Washed ahea through clay stratum

44 39 (17)

20
15 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969)

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 241 + 40 ℄ EBL Hwy. 417 o/s 25' Lt. ORIGINATED BY HS

W.P. 35-66-14 BORING DATE January 13 - 15 & 20 - 21, 1970 COMPILED BY CM

DATUM Geodetic BOREHOLE TYPE Washboring - NX Casing; Cone CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS / FOOT
204.4	Ground Level				
0.0	Fill Material				
	Silty fine sand with trace of gravel		1	SS	8
			2	SS	5
	Loose		3	SS	6
	Brown		4	SS	6
188.0			5	SS	4
16.4	Silty fine sand with trace of clay & org. matter.		6	SS	6
182.4	Loose. Grey		7	SS	9
22.0			8	SS	1
	Laminated clay to silty clay				
	Firm to stiff				
144.4			9	SS	33
60.0	Het.mix. of silt, sand & gravel with trace of clay (Glacial Till)		10	SS	48
	Dense to very dense				
133.0	Grey		11	AXT	60%
71.4	Limestone Bedrock				
128.0	Sound		13	AXT	100%
76.4	End of Borehole				

ELEV. SCALE: 200, 190, 180, 170, 160, 150, 140, 130, 120

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
w_P w w_L
WATER CONTENT %
20 40 60

BULK DENSITY γ P.C.F.

REMARKS GR. SA. SI. CL.

2 54 (44)

▼ 188.4

0 61 (39)

24 43 28 5

20
15 ◇ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969)

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 243 + 00 ℄ EBL Hwy. 417 o/s 20' Lt. ORIGINATED BY HRS
W.P. 35-66-14 BORING DATE January 9, 12, 13 & 27, 1970 COMPILED BY CM
DATUM Geodetic BOREHOLE TYPE Washboring - NX & BX Casing; Cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
214.7	Ground Level				
0.0	Topsoil				
1.0	Silty fine sand Compact to dense Brown		1	SS	38
206.2			2	SS	21
8.5	Laminated clay (grey brown) and silty clay (grey) with random silt seams (½ - 2" thick) throughout. Firm to stiff		3	TW	PM
			4	TW	PM
			5	TW	PM
			6	TW	PM
			7	TW	PM
			8	TW	PM
			9	TW	PM
			10	TW	PM
160±					
55±	Dark grey with organic mottling. Occ. silt layers up to 12" thick.		11	TW	PM
143.2			12	TW	PM
			13	SS	80
71.5	Het. mix. of silt, sand & gravel with some clay (Glacial Till) Very dense. Grey				
136.2					
78.5	Limestone Bedrock Sound				
130.2					
84.5	End of Borehole				

ELEV. SCALE: 210, 200, 190, 180, 170, 160, 150, 140, 130

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

SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE — 400 800 1200 1600 2000

LIQUID LIMIT w_L — PLASTIC LIMIT w_p — WATER CONTENT w — WATER CONTENT % 20 40 60

BULK DENSITY γ P.C.F.: 98; 102; 106

REMARKS: GR. SA. SI. CL.

▼ 195.7

Lost TW sample
18 59 22 10

20
15 ⊹ 5 % STRAIN AT FAILURE
10

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

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 242 + 50 ℄ WBL Hwy. 417 O/S 30' Rt. ORIGINATED BY CM
W.P. 35-66-14 BORING DATE January 7 - 13, 1970 COMPILED BY CM
DATUM Geodetic BOREHOLE TYPE Washboring - NX & BX Casing; Cone CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
214.3	Ground Level					
0.0	Topsoil					
1.0	Silty fine sand to fine sandy silt Compact. Brown		1	SS	20	
205.8			2	SS	13	
8.5	Laminated clay (grey-brown) and silty clay (grey) with random silt seams (½-1" thick) throughout. Firm to stiff		3	TW	PM	
			4	TW	PM	
			5	TW	PM	
			6	TW	PM	
			7	TW	PM	
			8	TW	PM	
			9	TW	PM	
			10	TW	PM	
160±						
54±	Stiff Dark grey with organic mottling. occ. silt & fine sand layers 6-12" thick		11	SS	8	
			12	TW	PM	
143.3			13	TW	PM	
71.0	Het.mix.of silt,sand & gravel with trace of clay (Glacial Till) Compact to dense		14	SS	11	
			15	SS	15	
			16	SS	45	
128.3			17	AXT	44%	
86.0	Limestone Bedrock Sound		18	AXT	100%	
121.9						
92.4	End of Borehole					

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 400 800 1200 1600 2000
LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT % 20 40 60

BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
	0 36 (64)
99	
102	▼188.0
101	
	lost TW sample
	9 27 20 4

20
15 ÷ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969)

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 243 + 30 WBL Hwy. 417 o/s 20' Lt. ORIGINATED BY HS

W.P. 35-66-14 BORING DATE January 16, 19 -20, 1970 COMPILED BY GM

DATUM Geodetic BOREHOLE TYPE Washboring-NX, BX Casing; Cone CHECKED BY JK

ELEV. DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
188.6	Ground Level				
0.0	With some sand & trace of organics mottled brown-grey		1	SS	6
183.6			2	TW	PM
5.0	Laminated clay (Grey brown) and silty clay (grey) with random silt seams (½-1" thick) throughout		3	TW	PM
			4	TW	PM
			4A	SS	-
	Firm to stiff				
160±					
29±	Dark grey with org. mottling; occ. silt layers 6-12" thick		5	TW	PM
			6	TW	PM
143.6	Stiff				
45.0	Het.mix. of silt, sand & gravel with trace to some clay		7	SS	23
			8	SS	65
	Compact to very dense Grey		9	SS	105
128.9					
59.7	Limestone Bedrock		10	AXT	95%
124.1	Sound				
64.5	End of Borehole				

ELEV. SCALE: 180, 170, 160, 150, 140, 130, 120

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

SHEAR STRENGTH P.S.F. — ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE — 400 800 1200 1600 2000

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

WATER CONTENT % — 20 40 60

BULK DENSITY γ P.C.F.: 98

REMARKS: ▼185.3

GR. SA. SI. CL.

20
13 ⊹ 5 % STRAIN AT FAILURE
10

FORM OB-MT-126 (REV. 1969)

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 24+00 ℄ WBL Hwy. 417 o/s 35' Rt. ORIGINATED BY HRS
W.P. 35-66-14 BORING DATE January 15 - 20, 1970 COMPILED BY CM
DATUM Geodetic BOREHOLE TYPE Washboring-NX & BX Casing; Cone CHECKED BY

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT
203.7	Ground Level				
0.0	Fill Material				
	Fine sand with trace of silt and gravel		1	SS	18
			2	SS	2
			3	SS	4
	Very loose to compact		4	SS	6
187.7			5	SS	4
16.0	Silty fine sand with some clay & organic matter.		6	SS	5
			7	SS	5
179.7	Loose. Grey				
24.0	Clay to silty clay		8	TW	PM
	Firm to stiff				
	Grey brown to grey				
140.2					
63.5	Het.mix.of silt,sand & gravel with trace to some clay.		9	SS	19
			10	SS	142
	Compact to very dense				
129.7	Grey				
74.0	Limestone Bedrock		11	AXT	100%
124.2	Sound				
79.5	End of Borehole				

ELEV. SCALE: 200, 190, 180, 170, 160, 150, 140, 130

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT —— w_L
PLASTIC LIMIT —— w_P
WATER CONTENT —— w
w_P — w — w_L
WATER CONTENT %
20 40 60

BULK DENSITY γ P.C.F.

REMARKS GR.SA.SI.CL.

▼ 188.0

20
15 ⊹ 5 % STRAIN AT FAILURE
10

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 70-F-2 LOCATION Sta. 24+87 ℄ WBL Hwy. 417 o/s 28' Lt. ORIGINATED BY HRS
W.P. 35-66-14 BORING DATE January 6 - 8, 1970 COMPILED BY GM
DATUM Geodetic BOREHOLE TYPE Washboring - NX & BX Casing; Cone CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
203.8	Ground Level					
0.0	Silty fine sand					
200.3	Brown		1	TW	PM	200
3.5	Laminated clay (Grey-Brown) and silty clay (Brown) with random silt seams (½-1" thick throughout)		2	TW	PM	
			3	TW	PM	190
			4	TW	PM	
	Firm to stiff		5	TW	PM	180
			6	TW	PM	
			7	TW	PM	170
			8	TW	PM	
160±						160
44±	Stiff Dark Grey with org. mottling occ. silt layers 4 - 8" thick		9	TW	PM	
			10	TW	PM	
144.3			11	TW	PM	150
59.5	Het.mix.of silt, sand and gravel with trace of clay (glacial Till) Compact to very dense Grey		12	SS	15	
			13	SS	44	140
132.3			14	SS	130/4"	
71.5	Limestone Bedrock Sound		15	AXT	100%	
125.3			16	AXT	100%	130
78.5	End of Borehole					
						120

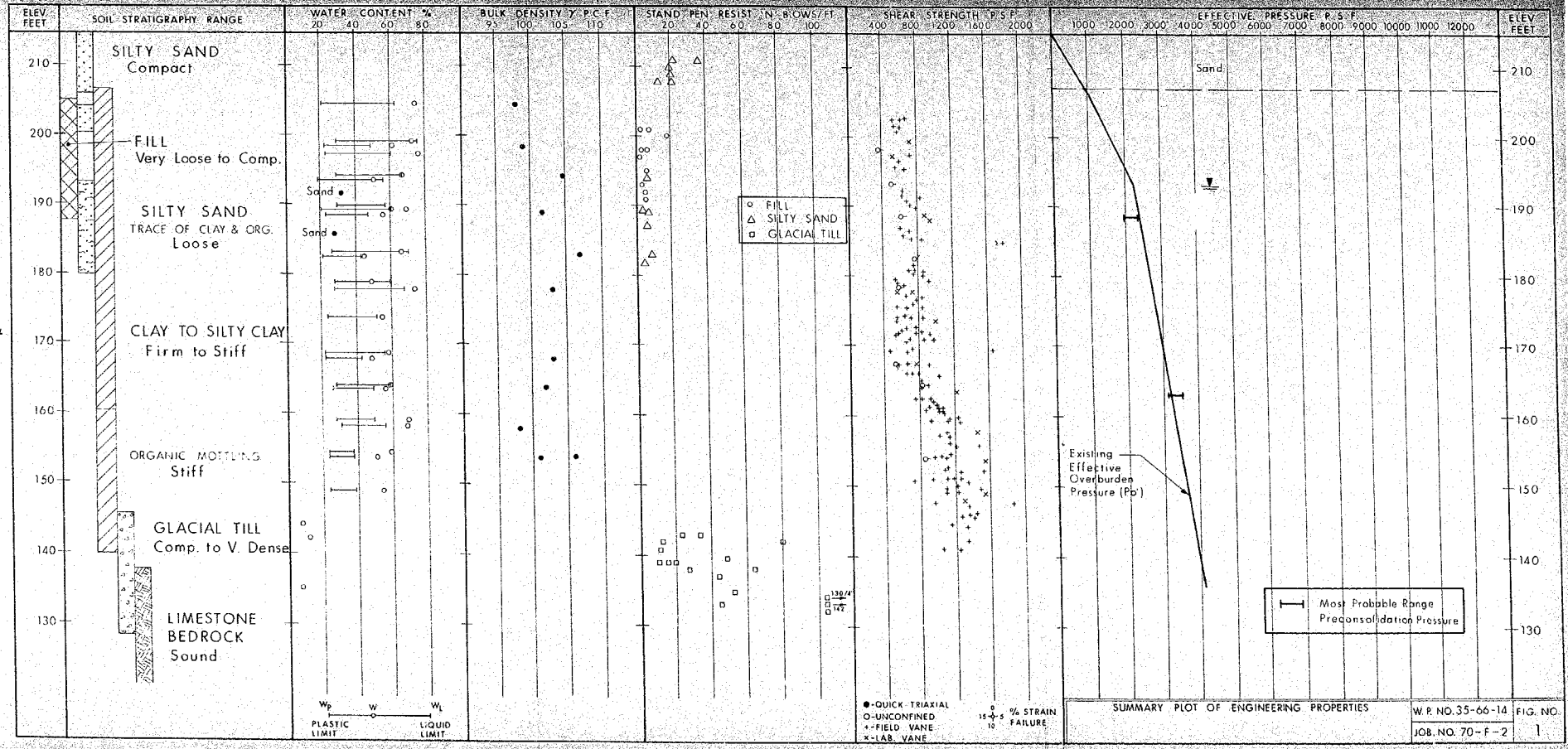
DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT
20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT w_L
PLASTIC LIMIT w_P
WATER CONTENT w
WATER CONTENT %
20 40 60

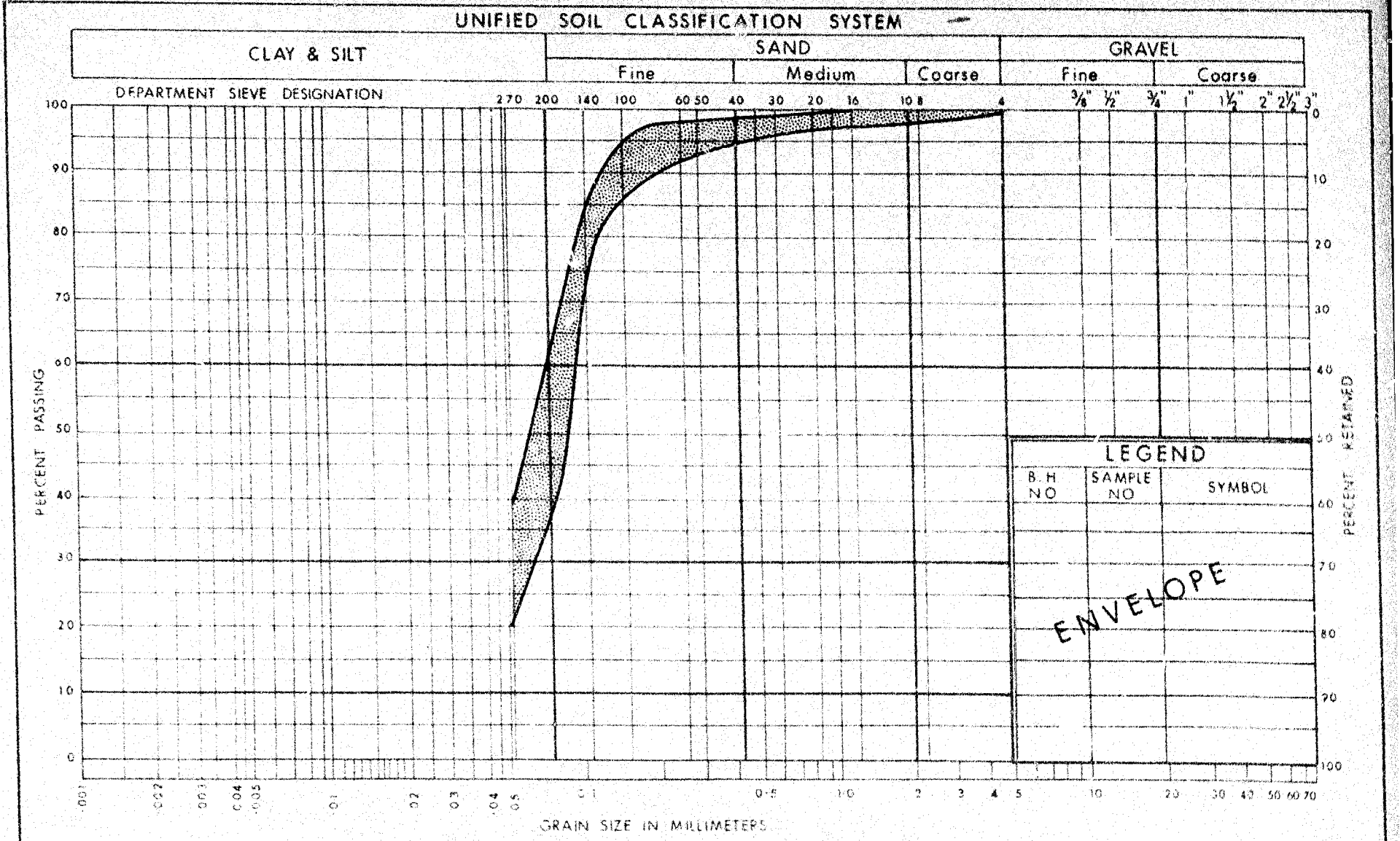
BULK DENSITY γ P.C.F.

BULK DENSITY	REMARKS GR.SA.SI.CL.
	▼ 195.8
105	
107	
103	
	52 32 12 4
	22 39 35 4

15 20 10 5 % STRAIN AT FAILURE


ELEV. FEET
SOIL STRATIGRAPHY RANGE
WATER CONTENT %
BULK DENSITY γ P.C.F.
STAND. PEN. RESIST. N BLOWS/FT.
SHEAR STRENGTH P.S.F.
EFFECTIVE PRESSURE P.S.F.
SILTY SAND
Compact
FILL
Very Loose to Comp.
SILTY SAND
TRACE OF CLAY & ORG.
Loose
CLAY TO SILTY CLAY
Firm to Stiff
ORGANIC MOTTLING
Stiff
GLACIAL TILL
Comp. to V. Dense
LIMESTONE
BEDROCK
Sound
Sand
Sand
FILL
SILTY SAND
GLACIAL TILL
Existing
Effective
Overburden
Pressure (Po')
Most Probable Range
Preconsolidation Pressure
PLASTIC LIMIT
LIQUID LIMIT
●-QUICK TRIAXIAL
O-UNCONFINED
+-FIELD VANE
×-LAB. VANE
% STRAIN
FAILURE
SUMMARY PLOT OF ENGINEERING PROPERTIES
W.P. NO. 35-66-14
JOB. NO. 70-F-2
FIG. NO. 1

FORM 08 MT-17
REV APR 1965

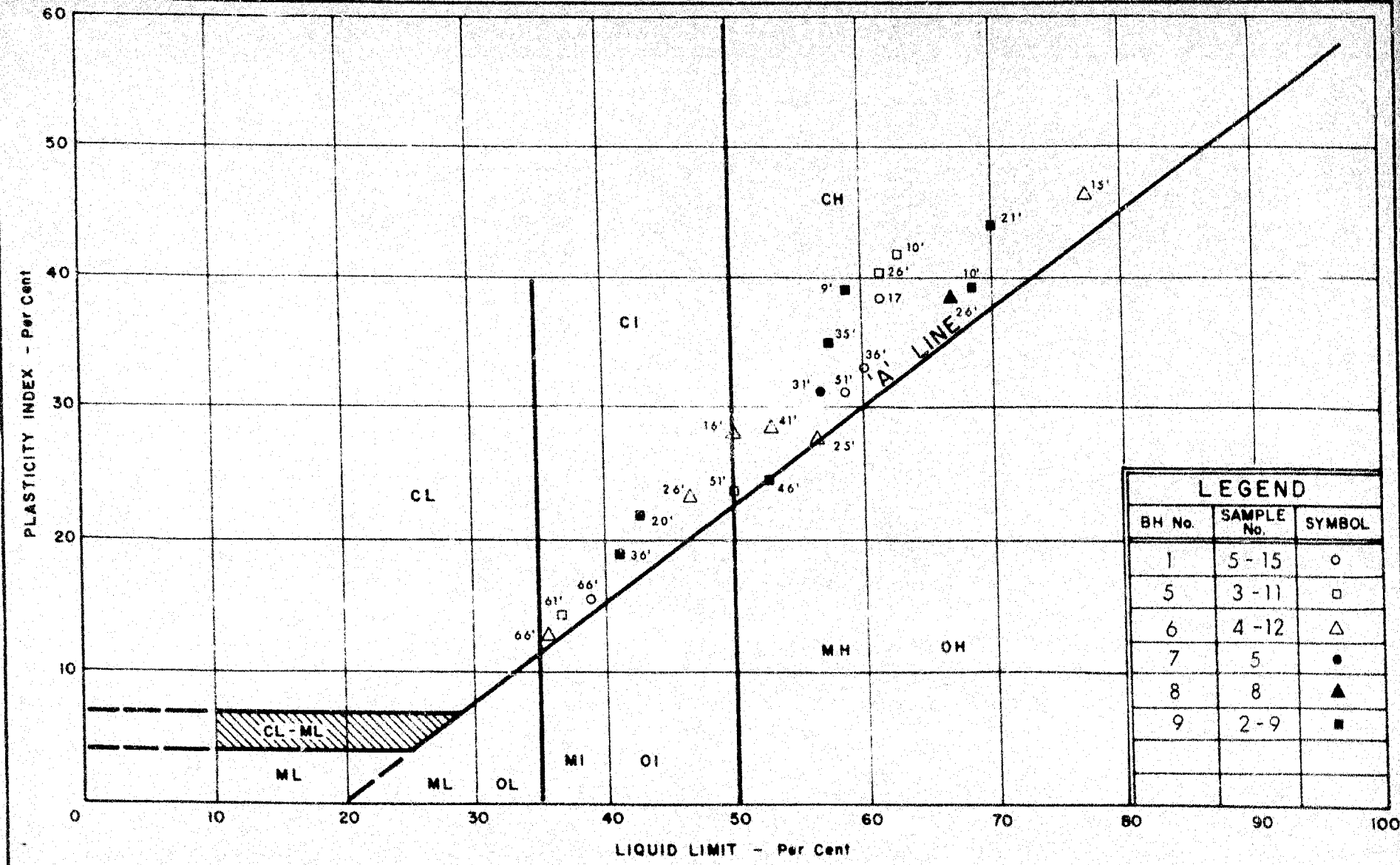


DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

GRAIN SIZE DISTRIBUTION
SILTY FINE SAND

W.P No. 35-66-14
JOB No. 70-F-2
Fig. 2

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



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

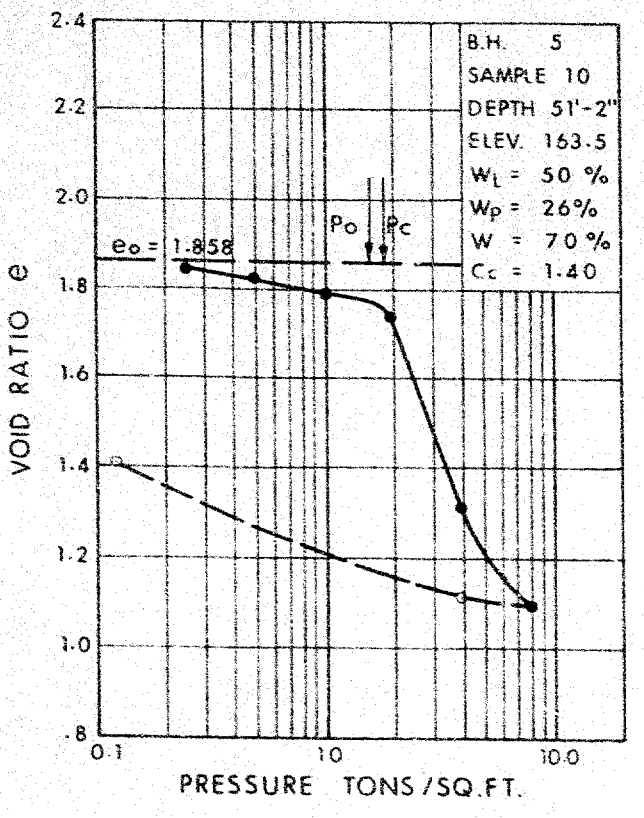
PLASTICITY CHART

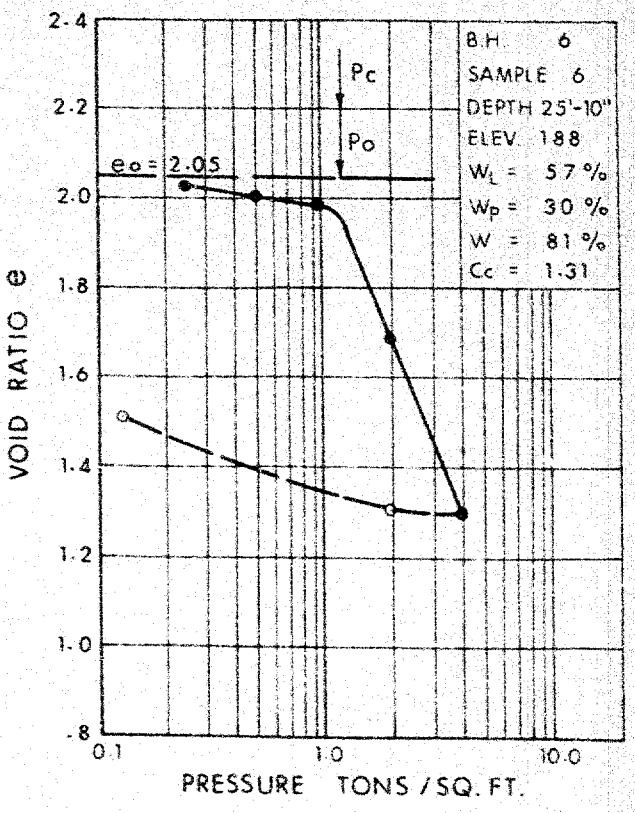
CLAY TO SILTY CLAY

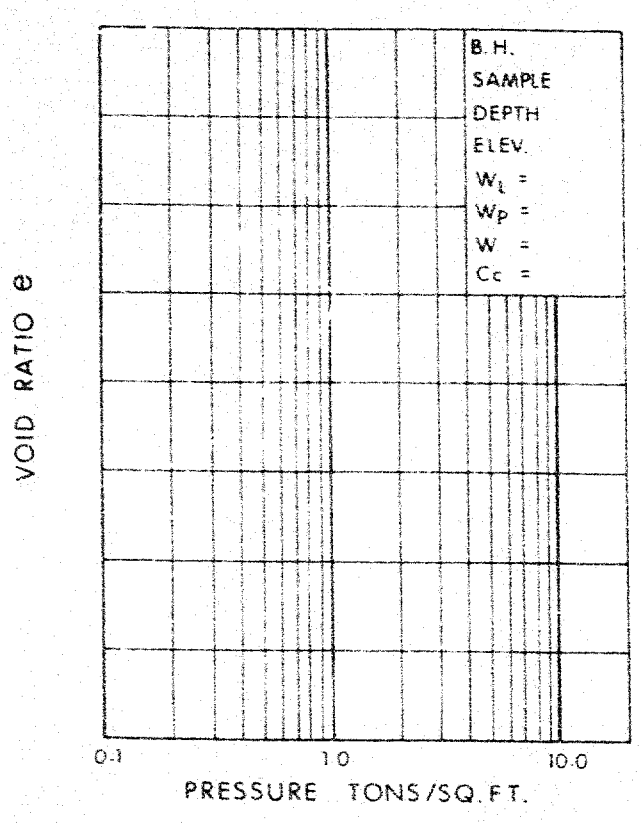
W.P. No. 35 - 66 - 14
JOB No. 70 - F - 2
FIG. NO. 3

VOID RATIO – PRESSURE CURVES

JOB NO. 70 – F – 2







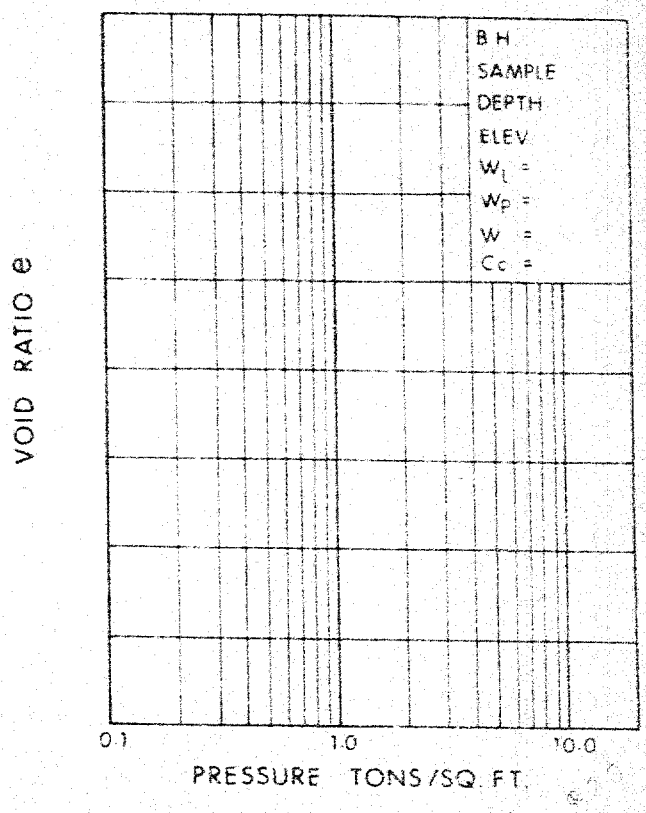
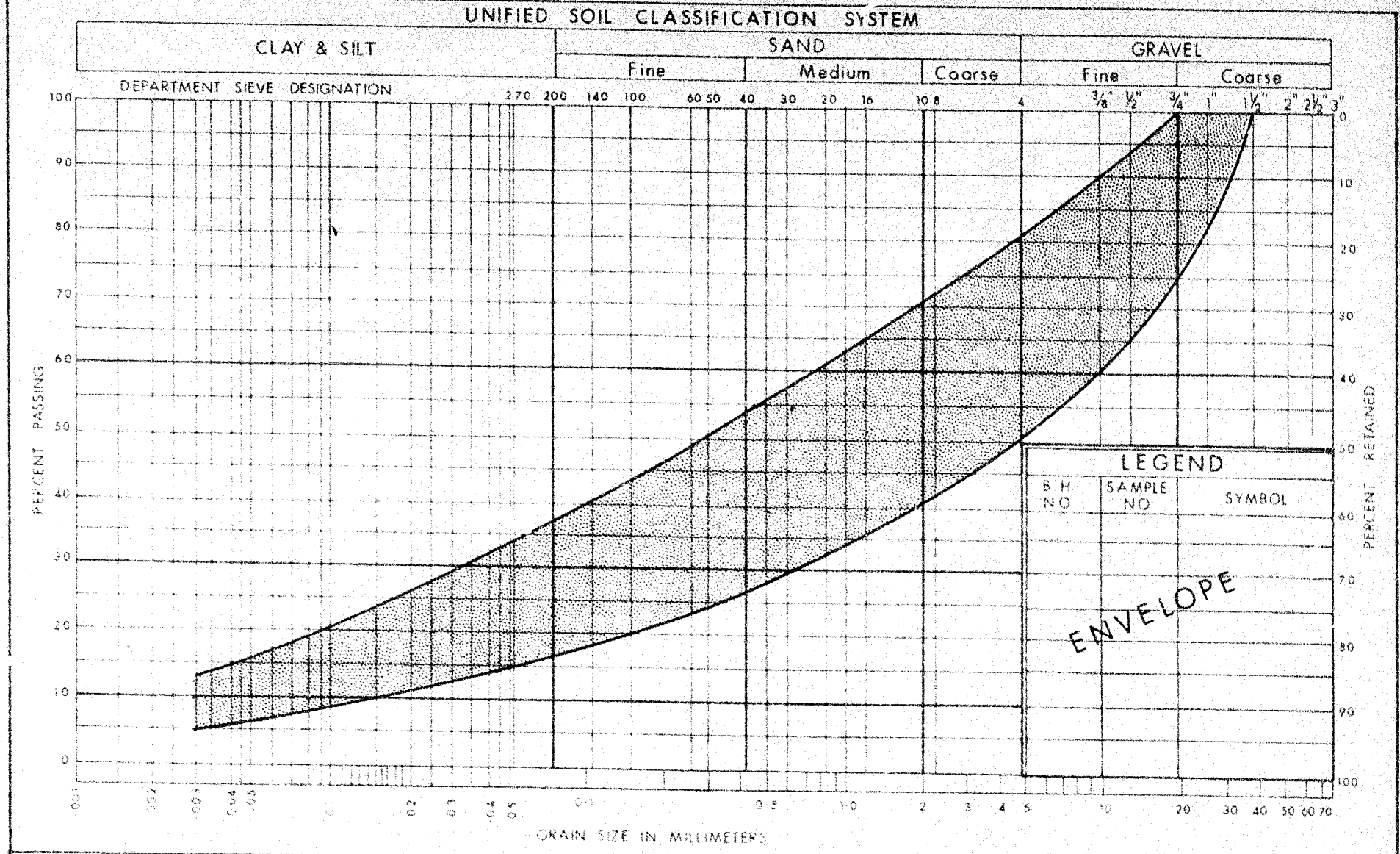


FIG. 4

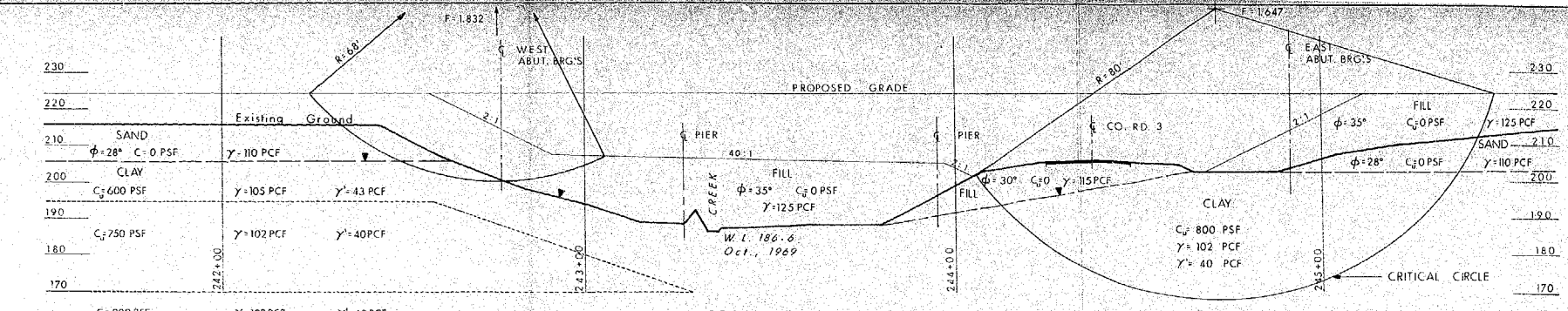
FORM. OB MT- 17
REV. APR. 1965



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

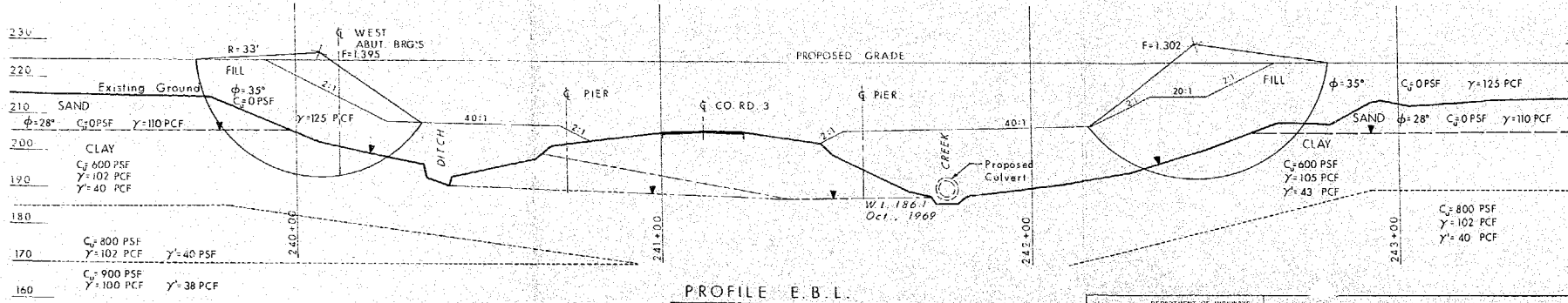
GRAIN SIZE DISTRIBUTION
GLACIAL TILL

WP No. 35 – 66 – 14
JOB No. 70 – F – 2
Fig 5



PROFILE W.B.L.

SCALE 1" = 20'



PROFILE E.B.L.

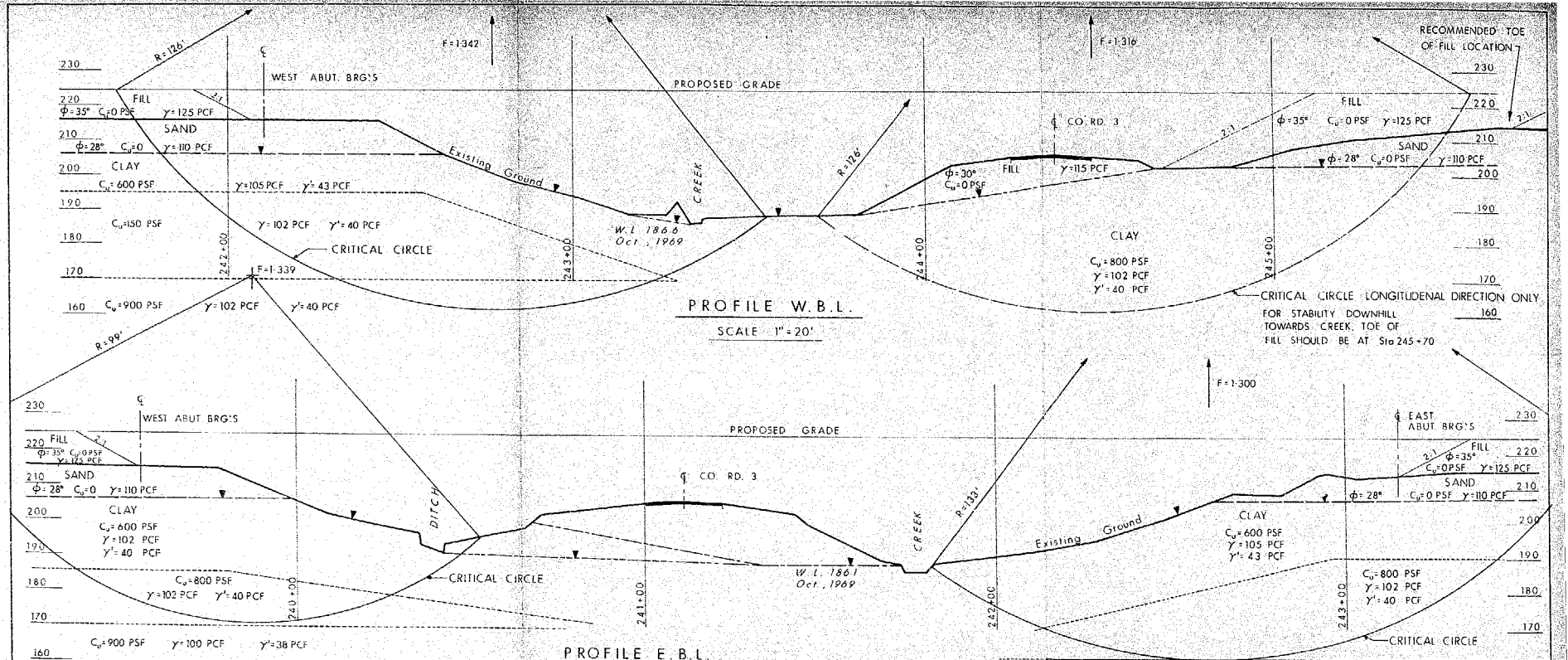
SCALE 1" = 20'

DEPARTMENT OF HIGHWAYS ONTARIO
MATERIALS and TESTING DIVISION

PROPOSED 3 SPAN SCHEME WITH BERMS

W.P. 35-66-14 DIST. 9 JOB 70-F-2

DATE APRIL 1, 1970 APPROVED Fig. No 6



DEPARTMENT OF HIGHWAYS ONTARIO
MATERIALS and TESTING DIVISION

SUGGESTED ABUTMENT LOCATIONS WITHOUT BERMS

W. P. 35-66-14 | DIST. 9 | JOB 70-F-2

DATE APRIL 3, 1970 | APPROVED | Fig. No. 7

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TYPE OF SAMPLE

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

SOIL TESTS

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

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

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

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

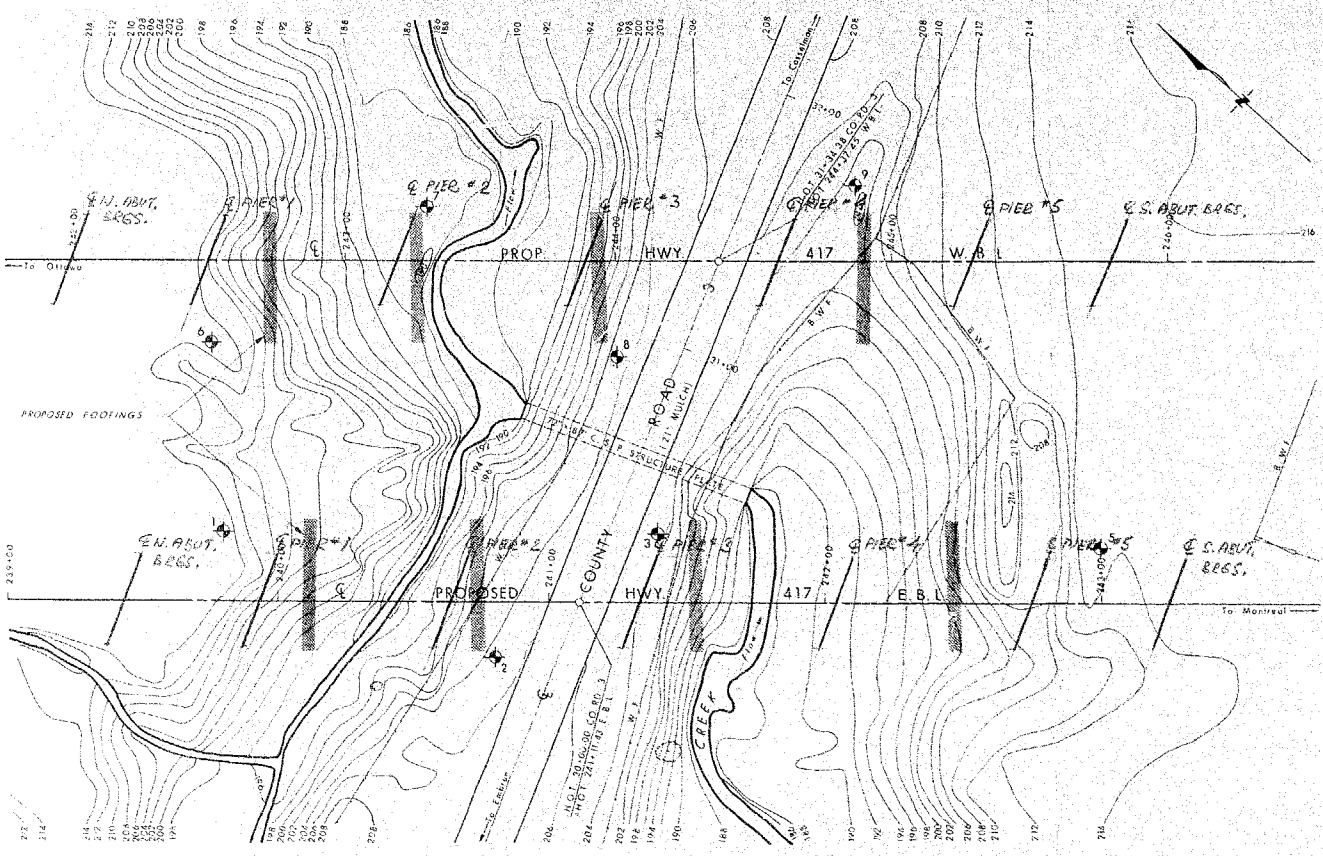
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

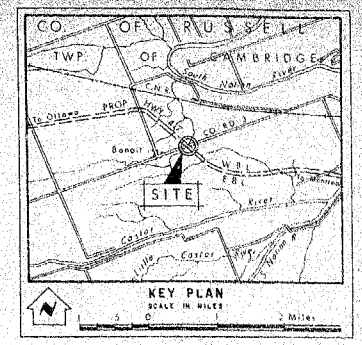
FOUNDATIONS

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

SLOPES

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





LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, Feb 1970

NO.	ELEVATION	STATION	OFFSET
1	214.7	239+80	25' LT. E.B.L.
2	204.8	240+80	20' RT. E.B.L.
3	204.4	241+30	25' LT. E.B.L.
5	214.7	243+00	20' LT. E.B.L.
6	214.3	742+50	30' RT. W.B.L.
7	188.6	743+30	20' LT. W.B.L.
8	203.7	744+00	35' RT. W.B.L.
9	203.8	744+87	28' LT. W.B.L.

NOTE

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

PRINT RECORD		
NO.	FOR	DATE

REVISIONS			
DATE	BY	DESCRIPTION	

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

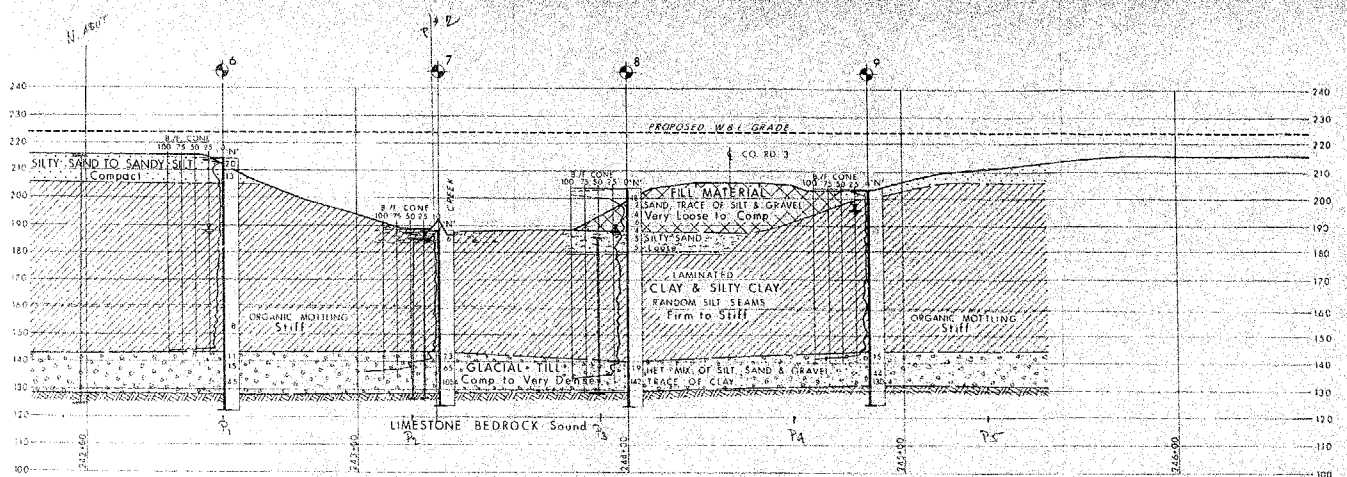
COUNTY RD. 3

KING'S HIGHWAY NO. 417 E.B.L. & W.B.L. DIST. NO. 9
CO. RUSSELL
TWP. CAMBRIDGE LOT 19 CON. V & VI

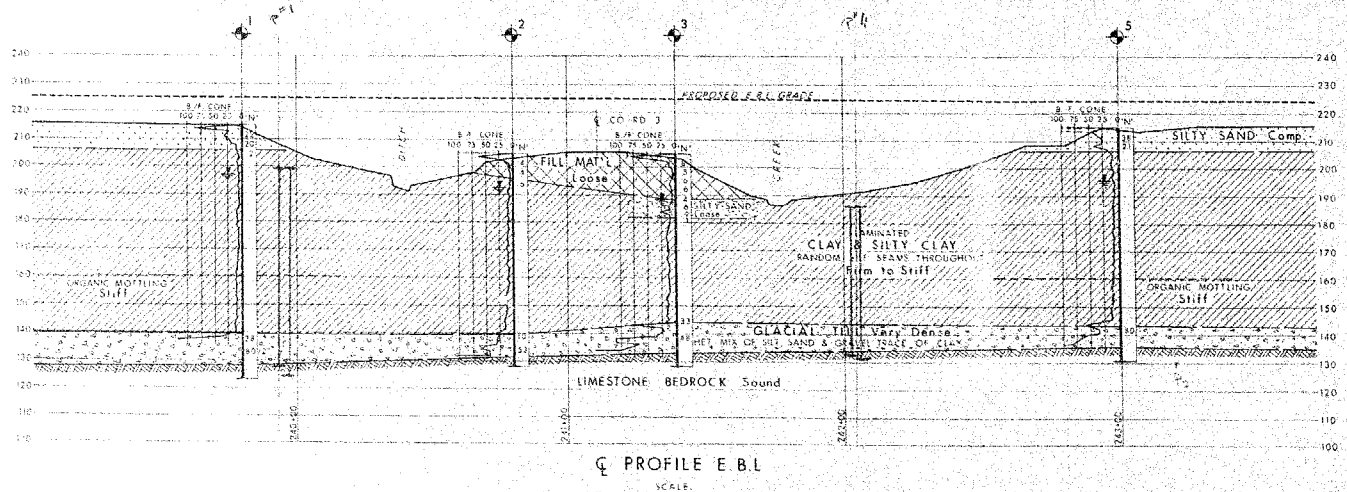
BORE HOLE LOCATIONS

SUBM'D C.M.	CHECKED	W.P. NO. 35-66-16	H.D.T. DRAWING NO. 70-F-2A
DRAWN C.P.	CHECKED	JOB NO. 70-F-2	
DATE Feb. 3, 1970		SITE NO.	BRIDGE DRAWING NO.
APPROVED		CONT. NO.	

REF. NO. E-4882-1



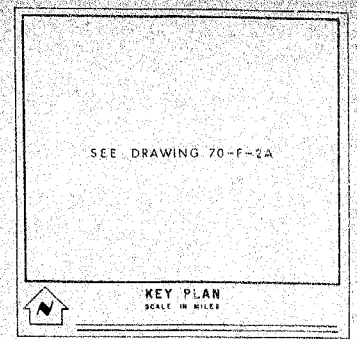
℄ PROFILE W.B.L.



℄ PROFILE E.B.L.

SCALE

25 10 0 20 40FT.



ACTUAL PILES SHOWN THUS

LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. Feb. 1970

NO.	ELEVATION	STATION	OFFSET

– NOTE –

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

REVISIONS			
DATE	BY	DESCRIPTION	

PRINT RECORD		
NO.	FOR	DATE

REF. NO. E-4682-1

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

COUNTY RD. 3

KING'S HIGHWAY NO. 417 E.B.L. & W.B.L. DIST. NO. 9
CO. RUSSELL
TWP. CAMBRIDGE LOT 19 CON. V & VI

PROFILES & SOIL STRATIGRAPHY

SUBMD. C.M.	CHECKED	W.P. NO. 35-66-14	N.B.T. DRAWING NO. 70-F-2B
DRAWN G.P.	CHECKED	JOB NO. 70-F-2	
DATE Feb. 5 1970	SITE NO.		BRIDGE DRAWING NO.
APPROVED	CONT. NO.		

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

Attention: Mr. S. McCombie

Date: April 10, 1970

Our File Ref.

In reply to

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Crossing at Hwy. 417
Eastbound and Westbound Lanes
And County Road No. 3
Twp. of Cambridge - Co. of Russell
District No. 9 (Ottawa)
W.J. 70-F-2 -- W.P. 35-66-14

(Report distributed February 13, 1970)

R E V I S I O N S -

Page 10 - Westbound Lane Structure -

Text of Items i) and ii) revised.

Page 11 - Westbound Lane Structure - iii)

Text of Item (iii) revised.

- Eastbound Lane Structure - iii)

3rd line - Sta. 239+60 - changed to Sta. 239+55.

Page 13 - 6.3) Structure Foundations:

Table -

W.B.L. Structure -

℄ Bearing of West Abut. (2) -
Sta. 242+20 - changed to Sta. 242+10.

℄ Bearing of East Abut. (2) -
Sta. 244+91 - changed to Sta. 245+78.

E.B.L. Structure -

℄ Bearing of West Abut. (2) -
Sta. 239+60 - changed to Sta. 239+55.

℄ Bearing of East Abut. (1) -
Sta. 242+47 - changed to read: "To suit Berm shown".

..... 2

FOUNDATION INVESTIGATION REPORT - Hwy. 417 -
W.J. 70-F-2 -- W.P. 35-66-14

Revisions ....

In view of the foregoing revisions, would you kindly delete from your copy(s) of the mentioned report pages 10, 11 and 13, and insert revised pages, as well as revised Figures 6 and 7, attached hereto.

Thank you.

M. Devata

MD/MdeF
Attach. (5)

M. Devata
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. B. R. Davis
H. A. Tregaskes
D. W. Farren
S. J. Markiewicz
C. R. Robertson
T. C. Kingsland (2)
J. E. Gruspier
B. A. Singh

Foundations Files
Gen. Files

done

Department of Highways Ontario
Copy for the information of

Mr. A. Stermac

Mr. T.C. Kingsland,
Reg. Bridge Planning Engineer,
Kingston Regional Office,
Kingston, Ontario

Bridge Office,
Downsview

April 24, 1970

County Rd. 3 Overpass - W.B.L.
2.2 Miles West of Casselman
W.P. 35-66-23, Site 27-212
Highway 417, District No. 9

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-6830-P for the above-mentioned structure.

The estimated cost of the proposed structure is $200,000. This cost includes tender, materials, engineering and sundry construction.

Any comments or revisions you may have should be submitted within three weeks.

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. S. McCombie
A. Stermac (2)
J. Anderson

cc: Foundations Rm. 110

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. C. S. Grebski,
Bridge Design Engineer,
Bridge Office,
Admin. Bldg.

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

Attention:

Date: April 30, 1970

Our File Ref.

In reply to

Subject: County Rd. #3 Overpass - E.B.L. & W.B.L.
2.2 Miles West of Casselman -
W.P. 35-66-14 & 23 - W.J. 70-F-2
Highway 417 - District No. 9 (Ottawa)

We have reviewed the Preliminary Drawings D-6823-P (E.B.L. Overpass) and D-6830-P (W.B.L. Overpass) for the above structures, and have the following comments:

1) The end-bearing steel 'H' 12 BP 53 piles should be driven to the surface of the bedrock. Since the thickness of the glacial till stratum at this site is nominal, we feel that the piles will penetrate to bedrock. The note indicating that piles should be driven to practical refusal, should be amended accordingly.

ii) For the proposed structures, the height of the approach fills is about 10 ft. In our Foundation Report we estimated that the settlements beneath such fills, due to consolidation of the clay deposit, would be in the order of 30 inches. We also estimated that, of this amount, about 12 inches should be realized within a period of about 2 years after completion of the fills to grade. In view of this, we reiterate our recommendation that the approach fills should be constructed as early as possible and should be left in place for as long a period as is practically feasible prior to construction of the structure foundations.

N. Devata,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

ND/Mdcf

cc: Messrs. D. McComble
T. C. Kingsland
S. J. Markiewicz

Foundations Files
Gen. Files

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. S. J. Markiewicz,
Regional Road Design Engineer,
Kingston, Ontario.

From: Bridge Section,
Kingston, Ontario.

Attention: Mr. R.H.B. Bennett

Date: May 25, 1970.

Our File Ref.

In reply to

Subject: W.P. 35-66-14 (E.B.L.), Site 27-212,
W.P. 35-66-23 (W.B.L.), Site 27-212,
County Road 3 Overpass,
(2.2 Miles West of Casselman),
Highway 417, District 9 - Ottawa

70-F-2

With reference to the proposed structures at the above mentioned site, I should like to draw your attention to the recommendations for the approach embankments of the structures contained on Pages 10 to 13 of the Foundation Investigation Report issued February 13, 1970. In particular, on Page 13, there is a recommendation to preload the approach fills for a period of two years before work on the structures is commenced.

I wish to emphasize the importance of this recommendation from the point of view of the effect of post-construction settlements on the bridge abutments and I should be glad if you would notify me if it appears likely that a lesser period will be available for preloading.

T. C. Kingsland
Regional Bridge Planning Engineer

TCK/hl

c.c. M. R. Ernesaks - Att. A. J. Percy
A. G. Stermac - Att. M. Devata
C. S. Grebski - Att. K. Bassi
Bridge Office Files Section (S. McCombie)

This copy for: Mr. [redacted] G. Stermac
Att. Mr. M. Devata

Mr. S. J. Markiewicz,
Regional Road Design Engineer,
Kingston, Ontario.

Bridge Section,
Kingston, Ontario.

Mr. R.H.B. Bennett

May 27, 1970.

W.P. 38-66-14 (E.B.L.), Site 27-212,
W.P. 38-66-23 (W.B.L.), Site 27-212,
County Road 3 Overpass,
(2.2 Miles West of Casselman),
Highway 417, District 9 - Ottawa

70-F-2

Further to my memo of May 25, Foundations Section, Downsview, has recommended the following sequence for fill placing at the abutments of the above structures:

1) Place fill to profile grade and final slopes at each abutment.

2) Place additional preload fill to 3 ft. above profile grade, keeping to the same toes of slopes as for 1).

3) Remove surcharge to profile grade after 24 months, subexcavate to abutment foundation elevations prior to driving piles, constructing abutments and backfilling with granular fill behind abutments.

T. C. Kingsland
Regional Bridge Planning Engineer

TCK/hl

c.c. M. R. Ernesaks - Att. A. J. Percy
A. G. Stermac - Att. M. Devata
C. S. Grebski - Att. K. Emani
Bridge Office Files Section (S. McCombie)

Department of Highways Ontario

Copy for the information of
Mr. A. Stermac

Mr. T.C. Kingsland,
~~Reg. Bridge Planning Engineer,~~
Kingston Regional Office,
Kingston, Ontario

Bridge Office,
Downsview

July 6, 1970

County Rd. 3 Overpass
E.B.L. and W.B.L.
W.P. 35-66-14 & 35-66-23
Site No. 27-212
Highway 417, District 9

70-F-2

Enclosed are four prints of revised Preliminary Plans D-6823-P1 and D-6830-P1 for the above-mentioned structures.

The structures have been shifted 2 ft. towards the East to provide the increased lateral clearance to Co. Rd. #3 which Regional Functional Planning had considered to be desirable.

The cost of the structures remain unchanged at $200,000 each.

CSG:rd

C.S. Grebski,
Bridge Design Engineer

Encls.

c.c. S. McCombie
A. Stermac (2)
J. Anderson

cc: FOUNDATIONS

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. C. S. Grebski
Bridge Design Engineer
Bridge Office
Admin. Bldg.

Attention:

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

Date: July 10, 1970

Our File Ref.

In reply to

Subject:

County Rd. #3 Overpass - E.B.L. & W.B.L.
2.2 Miles West of Casselman
W.P. 35-66-14 & 23 - W.J. 70-F-2
Highway 417 - District No. 9 (Ottawa)

We have reviewed the Preliminary Drawings D-6823-P1 (E.B.L. Overpass) and D-6830-P1 (W.B.L. Overpass) for the above structures, and have the following comments:

i) The end bearing steel 'H' 12 BP 53 piles should be driven to the surface of the bedrock. Since the thickness of the glacial till stratum at this site is nominal, we feel that the piles will penetrate to bedrock. The note indicating that piles should be driven to practical refusal, should be amended accordingly.

MD/lm

M. Devata,
SUPERVISING FOUNDATION ENGR.

cc: Messrs. S. McCombie
T. C. Kingsland
S. J. Markiewicz

For: A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

Foundation Files
Gen. Files

70-F-2

FENCO

Foundation of Canada Engineering Corporation Limited

2200 Yonge St.
Toronto, Canada
416-481-4481
Cable 'Foundaneng'
Telex 02 2814

September 28, 1970

Mr. A.G. Stermac, P.Eng.
Principal Foundation Engineer
Materials and Testing Office
Department of Highways, Ontario
Downsview 464, Ontario

Attention: Mr. M. Devata
Supervising Foundation Engineer

Dear Sir,

HIGHWAY No. 417
W.P. 35-66-03
COUNTY ROAD No. 3 - CULVERT

This is to confirm our discussions in your office with regards to replacement of existing 72" diameter C.S.P. under County Road No. 3 with a concrete box culvert.

The existing 72" diameter C.S.P. is failing, with joints open, asphalt coating almost all lost and strutted to prevent further cave-in. The pavement structure indicates settlement with apparent loss of sub-grade material. This culvert, if not replaced will exist between the County Road No. 3 overpasses and some 20 feet below the footing and 30 foot horizontal clearance.

It was our opinion that the culvert should be replaced now, prior to construction of the structure footings. Replacement of the culvert after completion of Highway No. 417, could result in possible undermining and costly roadway and bridge protection during replacement of the culvert.

Based on your foundation report, you confirmed that an allowable load of 1 kip per square foot is permissible. To eliminate a battery of C.S.P. culverts as a replacement and in addition a culvert is required under the Service Road, a concrete box culvert of approximately 12 x 8 feet is proposed to satisfy drainage requirements.

From our discussions it is our understanding that you concur with the recommendations as follows:-

1) Remove existing C.S.P. culvert and replace prior to construction of footings for the new structure.

2) A concrete box culvert will be acceptable if a 12 inch granular mat is placed, projecting minimum 2 feet outside face of culvert.

Yours very truly,
FOUNDATION OF CANADA ENGINEERING
CORPORATION LIMITED

R.S. Adachi, P.Eng.
HIGHWAY ENGINEER

RSA/bhw
3691

cc: Mr. R. Bennett - D.H.O., Kingston

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: October 14, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT: County Rd. 3 Overpass-E.B.L.
2.2 Miles West of Casselman
W.P. 35-66-14, Site 27-212
Highway 417, District No. 9

70-F-2

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C.S. Grebski,
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Office

No Comments
M. Devata
Oct 21/70

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

70-1100Z

Copy for the information of Mr. B. Darch

Mr. M. Peverett,
District Construction Engineer,
OTTAWA, Ontario.

Systems Design Office,
KINGSTON, Ontario.

Mr. R. Graham

August 8, 1972.

Contract 70-232 Highway 417
Limoges to Casselman
District 9, Ottawa

Further to our field meeting on July 31, 1972, we enclose two sets of sketches showing proposed revisions to the profiles for County Road 3 and the Service Road, also tentative storm sewer system to alleviate the erosion of the slopes on the service road.

The grade raise over the culvert at the service road has been discussed with the Foundation Section and appears satisfactory. The grade on County Road 3 still requires excavation of the existing pavement but this is unavoidable if the standards for this type of roadway are to be adhered to. We would hope, however, that the higher grade will minimise excavation problems.

The storm sewer scheme has been drawn up with only a limited amount of information available, so it is recommended that it be used only as a guide and that you locate the units and the ditches to best suit the existing conditions.

We further advise that Materials and Testing recommend that the grade raise over the culvert be left to the latest possible date and that the granular be ramped down to the existing in the interim.

GM/sac
Encl.

G. McMillan,
Project Design Engineer.

cc-- E. Saint
B. Darch
R. S. Adacht

RECEIVED
FOUNDATIONS OFFICE
AUG 1 1 1972
Ministry of Transportation & Communications

70-110027-D
Site Planning

Mr. T. C. Muir,
Contract Control Engineer,
Contract Control Office.

B. J. McGaffigan,
Program Staging & Evaluation Engineer,
Program Office.

August 8, 1972.

W. P. 36-66-02 - Hwy. 417
East of Cty. Rd. #3A E'ly to Cty. Rd. #21.

Further to recent conversations regarding this Work Project, I submit the following proposals for inclusion in the Contract Document.

1. A Special Provision restricting the contractor from working on County Road #21 Structure until March 1, 1973.

   This restriction is due to a 6 month settlement required for the advance fills which are scheduled for completion August 31st, 1972.

   Foundations (Mr. M. Devata) has indicated that if settlement results are better than expected this period could possibly be reduced to four (4) months at the discretion of the District Engineer.

2. With the above restriction, a reasonably tight schedule results.

3. The District Office has also indicated that they require a restriction of July 1st, 1973 for the paving operation on this project.

for B. J. McGaffigan,
Program Staging & Evaluation Engineer.

BJM/me

c. c. H. Chyc
D. A. Barr
M. Devata ✓
J. Callaghan
J. R. Wear

Mr. T. C. Muir,
Contract Control Engineer,
Contract Control Office.

S. J. McCaffigan,
Program Staging & Evaluation Engineer,
Program Office.

August 4, 1972.

W.P. 35-66-02 - Hwy. 417
<u>East of Cty. Rd. #3A E'ly to Cty. Rd. #21.</u>

Further to recent conversations regarding this Work Project, I submit the following proposals for inclusion in the Contract Document.

1. A Special Provision restricting the contractor from working on County Road #21 Structure until March 1, 1973.

   This restriction is due to a 6 month settlement required for the advance fills which are scheduled for completion August 31st, 1972.

   Foundations (Mr. M. Devata) has indicated that if settlement results are better than expected this period could possibly be reduced to four (4) months at the discretion of the District Engineer.

2. With the above restriction, a reasonably tight schedule results.

3. The District Office has also indicated that they require a restriction of July 1st, 1973 for the paving operation on this project.

S. J. McCaffigan,
Program Staging & Evaluation
Engineer.

SJM/me

c.c. H. Clyde
D. A. Barr
M. Devata
J. Callaghan
L. R. Wear

RECEIVED
FOUNDATIONS OFFICE
AUG 8 1972
Ministry of Transportation & Communications

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

70-11002.

Copy for the information of Mr. M. Devata

Mr. A. J. Percy,
Regional Manager,
Systems Design,
KINGSTON, Ontario.

Structural Planning
KINGSTON, Ontario.

Mr. S. J. Markiewicz

August 10, 1972.

Regional Road #5 Interchange Underpass
W.P. 437-64-00, Site #3-287
Highway 417, District 9, Ottawa

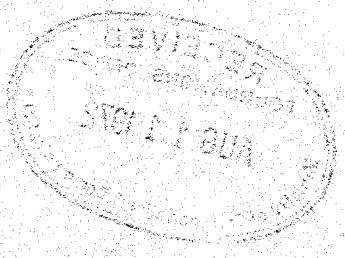
We are forwarding herewith one print of Drawing D-7066-1 together with the pertinent correspondance, regarding Contours which have been revised to conform with the recommendations of Giffels Associates. Would you please review the drawing and provide us with your comments regarding its acceptability in meeting your requirements? Particular attention should be paid to the Contours at the north-west approach.

We would be pleased to receive your comments within the next two weeks.

JHT/TCK/sac
Encl.

cc-- M. Devata
C. S. Grebski

J. H. Tondeur,
for T. C. Kingsland,
Regional Structural Planning Engineer.



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

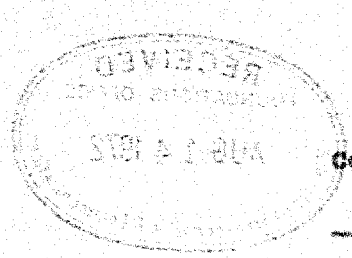
W.O 70 - 1002.

Copy for the information of Mr. B. Darch

Mr. N. Peverett,
Construction Engineer,
OTTAWA, Ontario.
Mr. R. Graham

Systems Design Office,
KINGSTON, Ontario.

August 11, 1972.



Contract 70-232 Highway 417
Limoges to Casselman
District 9, Ottawa

Further to my letter of August 8, 1972, this is to advise that the Foundations Section, having completed detailed computations with the revised grade on the Service Road, do not recommend that the grade be raised over the creek, as the factor of safety would be reduced to about 1.16.

It will be necessary, therefore, to taper out the grade raise in the cut into the existing grade over the creek and steepen up the approaches to County Road 3.

If further clarification is required please call the undersigned.

GM/sac

C. McMillan,
Project Design Engineer.

cc-- E. Saint
B. Darch

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

WO 70-1102

BTP aug 29/72

Copy for the information of
B. DARCH

~~Mr. M. Pevonsey,~~
District Construction Engineer,
Ottawa.

Systems Design Office,
Kingston.

R. Graham

August 28th, 1972.

Contract 70-232, Highway 417,
Limoges to Casselman;
District #8 - Ottawa.

With respect to the grade on the service road at County Road 3, Murray Batten has discussed the matter further with Barry Darch and it is felt that the grade raise is acceptable. (1' granular blanket after 6 months)

Please, therefore, ignore my letter of August 11th on this subject and abide by the one written August 8th.

G. McMillan
Project Design Engineer.

GM/ss
c. c. to: E. Saint
B. Darch.

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

Copy for the information of

W.O. 70-1100-2 PBD. Oct. 20/72

~~Mr. B. T. Darch~~

Mr. A. J. Percy,
Regional Manager of Systems Design,
KINGSTON, Ontario.

Materials and Testing Office,
KINGSTON, Ontario.

October 18th, 1972

W. P. 3767-03, C.P.R. Overhead Structure, Dist. #9, Ottawa

Further to our discussion with Mr. B. T. Darch, Senior Foundation Engineer, please be advised that stripping on the approach embankments is to be carried out in the area 50' from the abutments on each side.

The stripping width of embankment will be from the toe to the toe of fill slopes. The excavated area is to be backfilled by acceptable earth.

S.N. Chen

S. N. Chen,
For: A. M. Batten,
Senior Soils Supervisor

SNC/AMB/sgp

c. c. J. E. Callaghan
B. T. Darch
A. R. Rutka
G. A. Wrong

OVER

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285
(REVISED NOV. 1971)

DESIGN SERVICES BRANCH
FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 BP 74

PILE NO. 2 LOCATION PIER #2 W&L EAST PIER DATE DRIVEN FEB 19/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
60'	1			26			51	16		76	
8:00 a.m.	2		10:30 a.m.	27			52	17		77	
32'	3		12:00 p.m.	28			53	20		78	
	4		12:00 p.m.	29			54	24		79	
	5		12:30 p.m.	30			55	22		80	
	6		62'	31			56	23		81	
	7			32			57	31		82	
	8			33		3:00 p.m.	58	(2") 99		83	
	9			34		3:15 p.m.	59	BEDROCK		84	
	10			35			60			85	
	11			36			61			86	
	12			37			62			87	
	13			38			63			88	
	14			39			64			89	
	15			40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43	1		68			93	
	19			44	2		69			94	
	20			45	5		70			95	
	21			46	6		71			96	
	22			47	7		72			97	
	23			48	7		73			98	
	24			49	8		74			99	
	25			50	10		75			100	

HEIGHT OF HAMMER

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE (62'-4½") 57'10" FINAL CUT OFF ELEVATION 185.00'

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M Neilson

NAME (PRINT) M. NEILSON

DATE Feb 20/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

Notes:-

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12¾" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12¾" x ½" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285
(REVISED NOV. 1971)

DESIGN SERVICES BRANCH
FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 BP 74

PILE NO. 6 LOCATION PIER #2 WEST PIER (IN B.L.) DATE DRIVEN FEB 20/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
32'	1			26			51	28		76	
7'10cm	2			27			52	134		77	
	3			28			53	135		78	
	4			29			54	99		79	
	5		10'ccam	30			55	41		80	
	6		To 10.5Cam	31			56	29		81	
	7		SPLICING	32			57	45		82	
	8		12'ccam	33		1.50	58	39		83	
	9		12.30 PM	34		2.10	59	45		84	
	10		62'	35			60			85	
	11			36			61			86	
	12			37			62			87	
	13			38			63			88	
	14			39			64			89	
	15			40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43	1		68			93	
	19			44	2		69			94	
	20			45	6		70			95	
	21			46	5		71			96	
	22			47	8		72			97	
	23			48	8		73			98	
	24			49	11		74			99	
	25			50	14		75			100	

WEIGHT OF HAMMER

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE (62'-35') 58'7" FINAL CUT OFF ELEVATION 185.00

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

185.00
2.50
182.50

SIGNED M Neilson
NAME (PRINT) M. NEILSON
DATE FEB 21/73
ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form 03-MT-285
(REVISED NOV. 1971)

DESIGN SERVICES BRANCH
FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD # 3 (E.B.L)

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DAMPG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T.

PILE DETAILS 12 BP 74

PILE NO. 1 LOCATION PIER #4 (EAST PIER) DATE DRIVEN FEB 16/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
60'-0"	1			26			51	12		76	
7:10 a.m.	2		60'0"	27			52	13		77	
30'	3		10:10 a.m.	28			53	21		78	
	4		TO 11:30 a.m.	29		2:20 PM	54	22		79	
	5		SPLICING	30		2:30 PM	55	BEDROCK		80	
	6		12:00 a.m.	31			56			81	
	7		12:30 PM	32			57			82	
	8		60"	33			58			83	
	9			34			59			84	
	10			35			60			85	
	11			36			61			86	
	12			37			62			87	
	13			38			63			88	
	14			39			64			89	
	15			40	1		65			90	
	16			41	3		66			91	
	17			42	4		67			92	
	18			43	5		68			93	
	19			44	5		69			94	
	20			45	5		70			95	
	21			46	5		71			96	
	22			47	5		72			97	
	23			48	5		73			98	
	24			49	9		74			99	
	25			50	9		75			100	

WEIGHT OF HAMMER

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE (60'0"-5) 55' FINAL CUT OFF ELEVATION 186.00

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M. Neilson
NAME (PRINT) M. NEILSON
DATE Feb. 17/73
ATTACH SKETCH OF PILE NUMBERING SYSTEM

186.00
55.00
131.00 TP

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3 E.B.L.

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T.

PILE DETAILS 12 BP 74

PILE NO. 5 LOCATION PIER #4 E.B.L. (WEST ~~EAST~~ PIER) DATE DRIVEN FEB 15/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
30'0"	1			26			51	9		76	
7:20 a.m.	2		60'0"	27			52	11		77	
	3		11:20 a.m.	28		4:00 PM	53	12		78	
	4		12:00 p.m.	29		TO 4:20	54	DRIVEN TO BEDROCK (-5")-		79	
	5		SPLICING	30			55			80	
	6		12:30 p.m.	31			56			81	
	7		70 12:30 PM	32			57			82	
	8			33			58			83	
	9			34			59			84	
	10			35			60			85	
	11			36			61			86	
	12			37			62			87	
	13			38			63			88	
	14			39			64			89	
	15			40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43	3		68			93	
	19			44	3		69			94	
	20			45	5		70			95	
	21			46	6		71			96	
	22			47	6		72			97	
	23			48	7		73			98	
	24			49	9		74			99	
	25			50	9		75			100	

WEIGHT OF HAMMER

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE (60-0-6⅜) 53.5' FINAL CUT OFF ELEVATION 186.00

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

26.00
50.20
232.80

SIGNED M. Neilson

NAME (PRINT) M. NEILSON

DATE FEB 16/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3 UNDERPASS

CONTRACTOR C. A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 BP 74

PILE NO. 5 LOCATION NORTH ABUTMENT W.B.L. DATE DRIVEN FEB 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
10:10 A.M.	1	1		26	1	12:30	51	6		76	4
50'	2	1		27	1		52	6		77	5
	3	1		28	1		53	3		78	6
	4	1		29	2		54	4		79	12
	5	1		30	1		55	4		80	16
	6	1		31	2		56	4		81	32
	7	1		32	2		57	4		82	35
	8	1		33	1		58	3		83	25
	9	1		34	3		59	4		84	17
	10	2		35	2		60	3		85	17
	11	2		36	2		61	3		86	20
	12	1		37	3		62	3		87	20
	13	2		38	2		63	3		88	40
	14	2		39	2		64	3	1:30 P.M.	89	90
	15	1		40	4		65	3	REFUSAL	90	95 5"
	16	2		41	3		66	3	BEDROCK	91	
	17	1		42	4		67	3		92	
	18	2		43	3		68	3		93	
	19	1		44	4		69	3		94	
	20	2		45	3		70	3		95	
	21	1		46	4		71	3		96	
	22	2	11:00	47	4		72	3		97	
	23	1	744'-9A	48	5		73	4		98	
	24	2	SPLICING	49	4		74	6		99	
	25	1	12:00 P.M.	50	5		75	6		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 89'7" FINAL CUT OFF ELEVATION 214.00

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

214.0
89.6
124.4

SIGNED M Neilson

NAME (PRINT) M NEILSON

DATE February 28/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

NP. 35-66-04 14-17 22-24

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 BP 74

PILE NO. 4 LOCATION NORTH ABUTMENT W. BL. DATE DRIVEN FEB 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
9:30 A.M	1	N		26	N	12:00	51	4		76	39
50'	2	N		27	1	12:30	52	4		77	27
	3	4		28	1		53	3		78	29
	4	3		29	2		54	4		79	24
	5	1		30	1		55	4		80	30
	6	1		31	1		56	5		81	32
	7	1		32	1		57	6		82	37
	8	1		33	1		58	4		83	34
	9	2		34	1		59	3		84	32
	10	1		35	2		60	5		85	30
	11	1		36	1		61	4		86	33
	12	1		37	1		62	5		87	34
	13	2		38	2		63	3		88	34
	14	1		39	3		64	5	2:00	89	32
	15	1		40	2		65	4	2:10	90	80
	16	2		41	2		66	4	REFUSAL @ 91' BEDROCK.		
	17	1		42	2		67	4		92	
	18	1		43	4		68	5		93	
	19	2		44	4		69	6		94	
	20	1		45	2		70	6		95	
	21	1		46	2		71	7		96	
	22	1		47	3		72	12		97	
	23	2	10:10 A.M	48	4		73	12		98	
	24	1	11:30 A.M	49	3		74	26		99	
	25	1	SPLICING	50	4		75	28		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE ~~86'2"~~ 89'6" FINAL CUT OFF ELEVATION 214.00

214.0
89.5
124.5

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M. Neilson

NAME (PRINT) M. NEILSON

DATE February 28/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-113 STRUCTURE COUNTY ROAD # 3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25T

PILE DETAILS 12 BP 74

PILE NO. 1 LOCATION PIER # 3 W.B.L. DATE DRIVEN FEB 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
31'	1			26			51	20		76	
7:20 AM	2			27			52	18		77	
	3			28			53	33		78	
	4		10:00	29			54	30		79	
	5		11:10	30	↓		55	29		80	
	6		SPACING	31	1		56	35		81	
	7		31'=62'	32	1	11:35	57	46		82	
	8			33	1	11:50	58	REFUSAL BEDROCK		83	
	9			34	1		59			84	
	10			35	2		60			85	
	11			36	1		61			86	
	12			37	1		62			87	
	13			38	1		63			88	
	14			39	2		64			89	
	15			40	2		65			90	
	16			41	2		66			91	
	17			42	2		67			92	
	18			3	2		68			93	
	19			44	1		69			94	
	20			45	2		70			95	
	21			46	2		71			96	
	22			47	2		72			97	
	23			48	8		73			98	
	24			49	19		74			99	
	25	↓		50	21		75			100	

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 57'1" FINAL CUT OFF ELEVATION 186.00'

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M. Neilson

NAME (PRINT) M. NEILSON

DATE March 15/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

186.00
57.10
128.9'

TIP:

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD # 3

CONTRACTOR C-A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DAIMAG D-12 WEIGHT 1-38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 B.P. 74

PILE NO. ~~14~~ 11 LOCATION NORTH ABUTMENT E.B.L. DATE DRIVEN FEB. 23/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
8:00 a.m	1	1		26	2		51	1		76	5
AG'	2	2		27	1		52	1		77	6
	3	2		28	1		53	1		78	9
	4	1		29	1		54	1		79	7
	5	1		30	1		55	1		80	7
	6	1		31	1		56	1		81	11
	7	1		32	1		57	1		82	20
	8	1		33	1		58	1		83	25
	9	1		34	1		59	1		84	19
	10	1		35	1		60	1	5:00 P.M.	85	6"/30
	11	1		36	2		61	2	DROVE TO	86	BEDROCK.
	12	1		37	1		62	1		87	
	13	2		38	2		63	1		88	
	14	2		39	1		64	1		89	
	15	1		40	2		65	1		90	
	16	2		41	1		66	1		91	
	17	2		42	2		67	1		92	
	18	1	12:00	43	1		68	1		93	
	19	1	12:30	44	2		69	1		94	
	20	1	2:00 P.M.	45	1		70	1		95	
	21	1	SPLICING	46	2		71	1		96	
	22	1	FEB. 29/73	47	1		72	1		97	
	23	1	3:00 P.M.	48	1		73	2		98	
	24	1		49	2		74	1		99	
	25	1		50	1		75	3		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 86' 1" FINAL CUT OFF ELEVATION 213.50

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

213.5
86.1
127.4

SIGNED M. Nielson

NAME (PRINT) M. NIELSON

DATE Feb. 28/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DOWNSVIEW, ONTARIO — ATTACH SKETCH OF PILE NUMBERING SYST

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR CAMPBELLS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT 1.38 HEIGHT OF FALL ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 B.P. 74

PILE NO. ____ LOCATION PIER #2 E.B.L. DATE DRIVEN FEB 22/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
11:00 a.m.	1			26			51	9		76	
38'	2			27			52	9		77	
	3			28			53	9		78	
	4			29			54	10		79	
	5			30			55	11		80	
	6			31			56	9		81	
	7			32			57	10		82	
	8			33	5		58	9		83	
	9			34	2		59	10		84	
	10			35	1		60	14		85	
	11			36	1		61	19		86	
	12		12:00	37	1		62	19		87	
	13		12:30	38	1		63	33		88	
	14		12:30	39	1	2:10 2:30	64	30		89	
	15		1:30	40	1	BEDROCK	65	33		90	
	16		SPLICING	41	1		66			91	
	17		68'	42	1		67			92	
	18			43	1		68			93	
	19			44	2		69			94	
	20			45	1		70			95	
	21			46	1		71			96	
	22			47	5		72			97	
	23			48	10		73			98	
	24			49	13		74			99	
	25			50	10		75			100	

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE ____ FINAL CUT OFF ELEVATION 192.00

192.0
65.0
127.0

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M. Nielson

NAME (PRINT) M. NEILSON

DATE Feb 24/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-M1-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.3E HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25T

PILE DETAILS 12 BP 74

PILE NO. 7 LOCATION NORTH ABUTMENT E. B.L. DATE DRIVEN FEB 27/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
46'	1	3		26	3		51	3		76	2
8:00AM	2	2		27	2		52	3		77	5
	3	1		28	3		53	3		78	7
	4	1		29	2		54	3		79	7
	5	1		30	3		55	2		80	7
	6	1		31	2		56	2		81	8
	7	1		32	2		57	3		82	7
	8	3		33	2		58	2		83	7
	9	2		34	2		59	2		84	11
	10	3		35	2		60	2		85	19
	11	3		36	3		61	3	11:10AM	86	24
	12	4		37	2		62	2	11:20AM	87	40
	13	3		38	3		63	3	(-2")	88	54
	14	3		39	3		64	2	REFUSAL	89	BEDROCK
	15	1		40	3		65	2		90	
	16	2		41	5		66	2		91	
	17	1		42	5		67	3		92	
	18	1	9:00 AM	43	4		68	2		93	
	19	1	10:45AM	44	3		69	2		94	
	20	2	SPLICING	45	3		70	3		95	
	21	1	92' TOTAL	46	3		71	3		96	
	22	1		47	4		72	2		97	
	23	1		48	3		73	3		98	
	24	2		49	4		74	3		99	
	25	3		50	3		75	3		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 87'10" FINAL CUT OFF ELEVATION 213.50'

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

213.5
87.9
125.6

SIGNED M Nielsen

NAME (PRINT) M. NIELSON

DATE March 15/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

TIP

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD # 3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS TYPE DALMAG D-13 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 B.P.T.A

PILE NO. 4 LOCATION PIER # 1 E.B.L. EAST SIDE DATE DRIVEN FEB 22/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
9:00 a.m.	1			26	1		51	3		76	20
44'	2			27	1		52	2		77	
	3			28	1		53	3		78	
	4			29	2		54	2		79	
	5			30	2		55	2		80	
	6			31	1		56	2		81	
	7			32	1		57	3		82	
	8			33	1		58	3		83	
	9			34	1		59	2		84	
	10			35	2		60	1		85	
	11			36	3		61	2		86	
	12			37	3		62	1		87	
	13			38	2		63	1		88	
	14			39	2		64	2		89	
	15			40	3		65	2		90	
	16			41	2		66	1		91	
	17		5:30 p.m.	42	3		67	4		92	
	18		11:00 a.m.	43	2		68	9		93	
	19		SPLICING	44	3		69	12		94	
	20		~~82~~ 82'	45	1		70	12		95	
	21		12:00 P.M.	46	3		71	13		96	
	22		12:30 P.M.	47	1		72	13		97	
	23			48	1		73	10		98	
	24			49	2	1:30 PM	74	14		99	
	25			50	1	1:40 PM	75	20		100	

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE (82'-6") 75'3" FINAL CUT OFF ELEVATION ± 199.00

199.00
-75.20
123.80

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

SIGNED M. Nielson

NAME (PRINT) M. NEILSON

DATE FEB 23/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form OB-MT-285 (REVISED NOV. 1971)

DESIGN SERVICES BRANCH

FOUNDATION OFFICE

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-173 STRUCTURE COUNTY ROAD #3

CONTRACTOR C.A. PITTS DESIGN LOAD OF PILE REFUSAL

HAMMER DETAILS: TYPE DALMAG D-12 WEIGHT 1.38 HEIGHT OF FALL OR ENERGY 22,500

TYPE OF ANVIL OR CAP STEEL WEIGHT OF ANVIL OR CAP .25 T

PILE DETAILS 12 BP 74

PILE NO. 6 LOCATION PIER #1 E.B.L. (WEST SIDE) DATE DRIVEN FEB 23/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
9:30 a.m.	1			26			51	3		76	
40'	2			27			52	3		77	
	3			28			53	2		78	
	4			29			54	3		79	
	5			30			55	2		80	
	6			31			56	3		81	
	7			32			57	4		82	
	8			33			58	3		83	
	9			34			59	5		84	
	10			35			60	9		85	
	11			36	2		61	11		86	
	12			37	2		62	20		87	
	13		10:10 a.m.	38	1		63	20		88	
	14		12:00 a.m.	39	2		64	20		89	
	15		12:30 P.M.	40	3		65	20		90	
	16		SPLICING	41	2		66	20		91	
	17		78'	42	3		67	12		92	
	18			43	2		68	12		93	
	19			44	2		69	25		94	
	20			45	3		70	39		95	
	21			46	2	2:20 P.M.	71	46		96	
	22			47	2	2:30 P.M.	72			97	
	23			48	3		73			98	
	24			49	2		74			99	
	25			50	1		75			100	

WEIGHT OF HAMMER

WEIGHT OF HAMMER

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 71' FINAL CUT OFF ELEVATION 199.00

RECEIVED

REPORT TO BE SENT TO:- PRINCIPAL FOUNDATION ENGINEER
DESIGN SERVICES BRANCH
DEPARTMENT OF
TRANSPORTATION AND
COMMUNICATIONS
DOWNSVIEW, ONTARIO

199.00
71'
128.00

SIGNED M. Neilson

NAME (PRINT) M. NEILSON

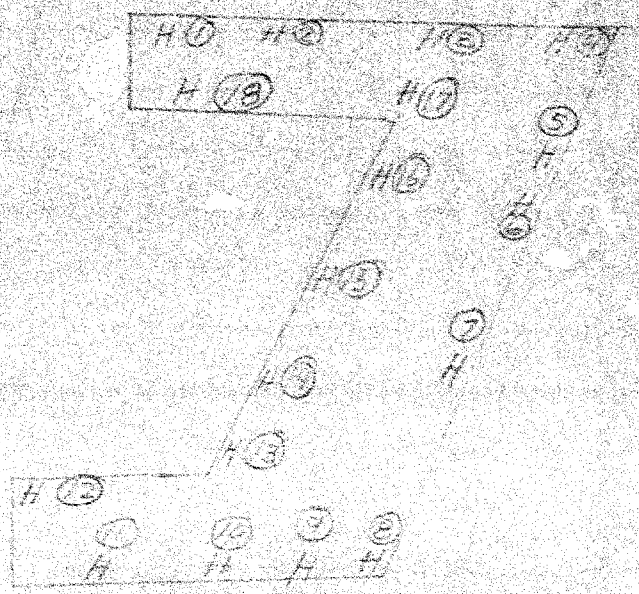
DATE Feb. 24/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

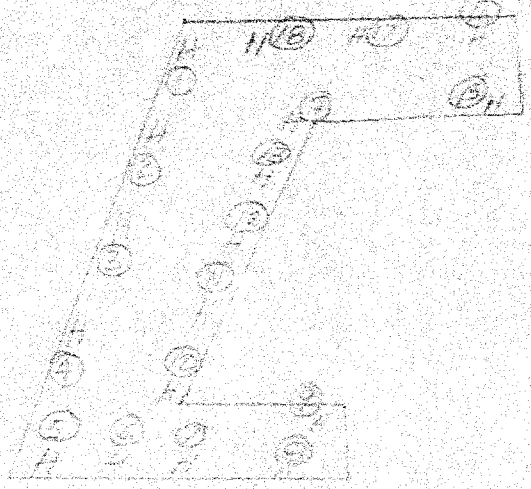
OVER

10-F-2

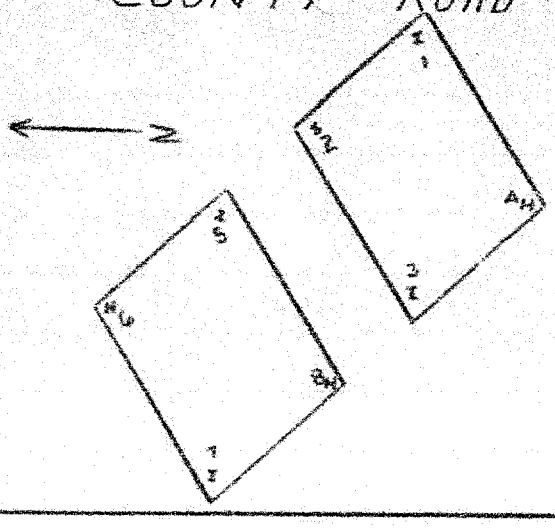
County Road No3 ... North ...



County RD No3, W.B.L. North Abutment

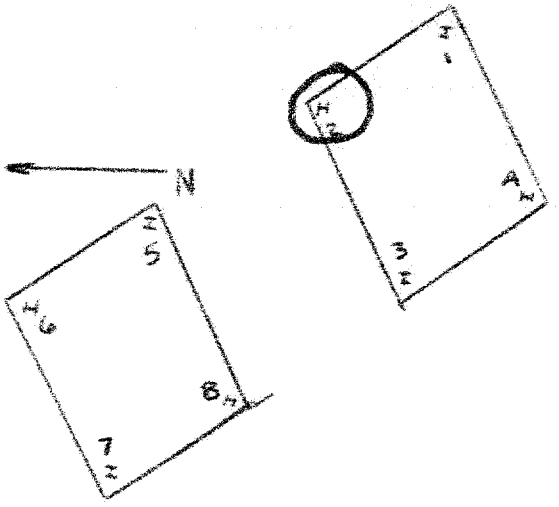


COUNTY ROAD #3 UNDERPASS



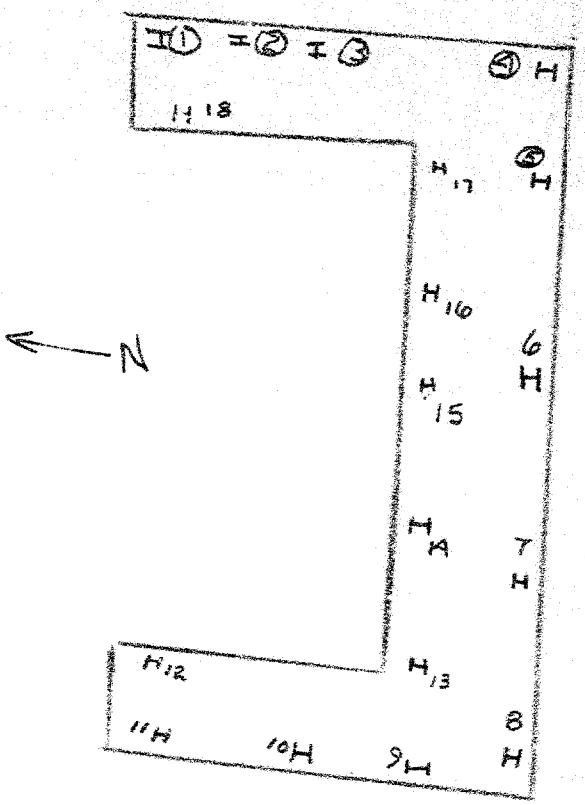
PIER #3 W.B.L. EAST PIER

PIER # 2 W BL

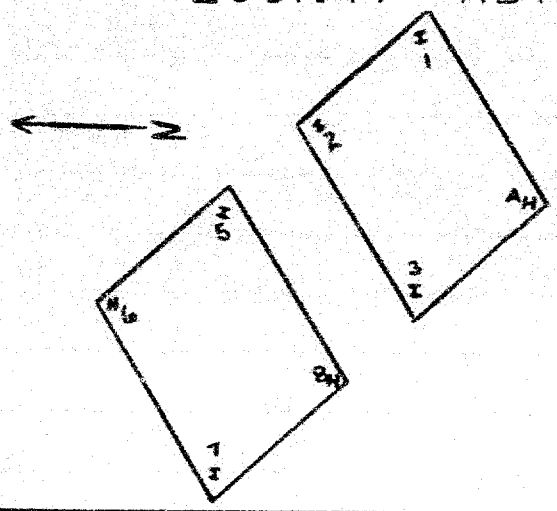


OVER

COUNTY RD # 3 ABUTMENT E.B.L.

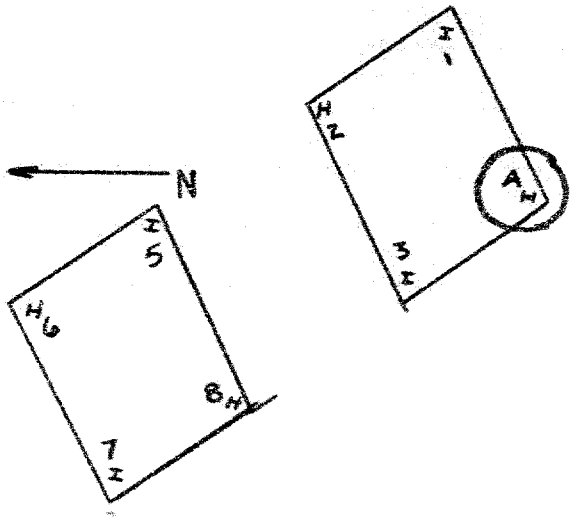


COUNTY ROAD #3 UNDERPASS



PIER FOOTING #2 EBL

PIER #1 EBL



SUMMARY OF PILE DRIVING RECORDS

W.O. 70-F-2 W.P. 35-66-14 CONT. 72-173 DIST. 9

SITE Unit 417 & County 23 & 3

DATE DRIVEN FEB. 16-24/73 WEIGHT OF ANVIL 0.25 T

HAMMER TYPE 3-12 WEIGHT 1.38 T ENERGY 22,500 FT LBS.

LOCATION OF PILES	PILE				ESTIMATED TIP EL. (ft.)	DIFFERENCE Longer(+) Shorter(-) Than Estimated (ft.)	REMARKS
	TYPE	NO.	LENGTH (ft.)	TIP EL. (ft.)			
WEST BOUND LANE							
PIER # 2	12-BP-74	6	58.6	126.4	128-136	+ 1.6	
WEST FOOTING							
W.B.L							
P-2							
EAST FOOTING	—11—	2	57.9	121.1	—4—	+ 0.9	RE
E.B.L.							
P-1							R
EAST FOOTING	—4—	4	75.2	123.8	—11—	+ 4.2	
E.B.L							
P-1							PRIVATE
WEST FOOTING	—4—	6	71.5	127.5	—11—	+ 0.5	
E.B.L							
P-4							
WEST FOOTING	—4—	5	53.2	132.8	—4—	—	
E.B.L							
P-4							
EAST FOOTING	—4—	1	55.0	131.0	—4—	—	
W.B.L							
P-3	—4—	1	57.1	128.9	—4—	—	
NORTH ABUT.	—4—	5	89.6	124.4	—4—	+ 3.6	