

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 40I12-20

DIST. 2 REGION Southwestern

W.P. No. 154-73-01

CONT. No. 74-132

W. O. No. 73-11-107

STR. SITE No. _____

HWY. No. 2

LOCATION Approx. 2.5 miles (4.0 km)

west of Wardville, Hwy 2.

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: DOCUMENTS TO BE UNFOLDED BEFORE

MICROFILMED

73-11107

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. K. G. Selby
Supervising Foundation Engineer
Foundation Office
West Bldg., Downsview

FROM: Structural Planning Office
Southwestern Region

ATTENTION:

DATE: January 8, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 154-73-01, Culvert Replacement
Approximately 2.5 miles west of Wardsville
Highway 2
District 2, London

Would you kindly arrange to have a foundation investigation conducted at the above location.

I have enclosed two prints of E.T.R. 99-2/10-0. In red I have indicated the location of the 84" C.I.P. replacement culvert if boring is the accepted method. Invert elevation will be 1' below existing streambed.

If the open cut method is selected, tentatively a 6'x5' rigid frame concrete box will be placed at the location of the existing culvert.

In the case of boring, the sideslopes will be steepened to 1:1 to shorten the length of boring operation. After the C.I.P. is placed the sideslopes will be restored.

The fill in the area of the existing culvert has settled approximately 6" last fall and the resulting bump has been patched with asphalt.

Fill stability and suitability for reuse, in case of open cut construction or reconstruction of side slopes, should be established. Some boreholes will be required to locate any possible voids in the fill above and beside the existing culvert.

Your report should be available by the end of January 1974.



S. Jants
Structural Planning Supervisor

SJ:sz
Enc.

cc J. G. Forster
D. J. S. King
A. Crowley

Geotechnical Office,
Engineering Services Branch,
1201 Wilson Avenue,
Downsview, Ontario.
MM 108

January 10, 1974.

Master Soil Investigation Ltd.,
104 Kenhar Drive,
Weston, Ontario.
M9L 1N4

Dear Sirs:

This letter confirms our request of January 4, 1974, for the supply of a M.V. Mounted Auger (M.C.A.) together with all necessary equipment, as specified under the terms of our Contract Agreement, at Wandersville, Ontario, on January 11, 1974. Since this project is located on your route back to London from Project W.O. 73-11104 there will be no mobilization charges.

Our Project Number is W.O. 73-11107.

Yours truly,

RGS/ps

K. G. Selby,
SUPERVISING FOUNDATIONS ENGINEER.

c.c. K. W. Fry
(Attn: Mrs. M. Porter)

Foundations Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

Copy for the information of

Mr. A. Rutka

To Ken Selby / AR

73-11-107

Mr. F. E. Loscombe,
Reg. Super't of Eng. Surveys,
Southwestern Region.

Mr. W. R. Agnew,
Field Supervisor,
Engineering Surveys.

Mr. P. J. Rule

January 18, 1974.

W.P. 154-73-01, Hwy. 2, Job 78-73
Borehole elevations at culvert
Township of Moss, County of Middlesex
District No. 2 - London
Party Chief - L. L. Leslie

Please be advised that the request received from K. Selby, Foundations Section, Head Office, has been completed and field information is now in Engineering Surveys drafting office.

As this request was for borehole elevations no alignment was established on ground.

A copy of elevations has been left with site engineer.

Boreholes were located from E Hwy. 2 by plus (+) and o/sat.

I am turning over to you the following information:

1 book borehole elevations


W. R. Agnew,
Field Supervisor.

c.c. Mr. A. Wittenberg, Att. D. Harrol,
Mr. A. Rutka, Att. K. Selby,
Mr. J. Roy, Att. J. Forster,
Mr. A. Watt,
Mr. A. Crowley.

WRAswh

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

Copy for the information of Mr. K. Selby

Mr. F. E. Loscombe,
Reg. Super^y of Eng. Surveys,
Southwestern Region.

Mr. W. R. Agnew,
Field Supervisor,
Engineering Surveys.

Mr. P. J. Rule

February 4, 1974.

W.P. 154-73-01, Hwy. 2, Job 78-73
Culvert Replacement & Stream Diversion
Township of Moss, County of Middlesex
District No. 2 - London
Party Chief - G. Telford

Please be advised that the request received from D. Merrill, Design Group Engineer, Systems Design Section dated December 6, 1973 has been completed in field on January 25, 1974 and field notes are now in Engineering Surveys drafting section.

ALIGNMENT:

This was established from 248+00 to 253+00 using ties shown on ETR sheets 99-2/40. At Sta 250+83 a traverse line was run at 90° to E of Hwy. 2 from 0+00 on S to 6+00 on N, Sta 2+90 on traverse = Sta 250+83 E Hwy. 2. Book 1 of 1.

DETAIL:

This was updated within the limits of the W.P. as described in alignment. All Hydro and Bell utilities are shown on portion print of ETRs.

PROFILE:

This was taken for 300' n'ly from N end and for 1000' s'ly from S end of existing culvert at Sta 250+68. Book 1 of 1.

SECTIONS:

Sections were taken at 50' intervals from 248+00 to 250+00 and from 251+50 to 253+00 extending from fence line to fence line. Extra sections were taken at 250+30 and 250+83 150' right and left.

Sections were taken at 50' intervals extending 50' right and left from 0+00 to 2+00 and from 3+70 to 6+00 on traverse line for creek diversion. All sections are in loose-leaf note form. Book 1 of 1.

Continued.....

Mr. F. E. Loscombe

- 2 -

February 4, 1974.

CLEARING & GRUBBING:

Taken within limits of W.P., from 245+00 to 255+00.

I am turning over to you the following information:

- 1 book field notes
- 4 portion prints of diversion
- 1 field print from ETRs utilities.



W. R. Agnew,
Field Supervisor.

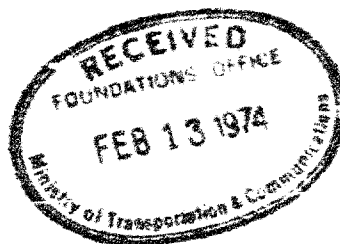
C.C.

Mr. A. Vitterberg, Att. D. Merrill,

Mr. J. Forster,

Mr. A. Crowley,

Mr. K. Selby Att P.Kargemagi.



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT <u>73-11107</u>		SITE _____		BOREHOLE No. <u>1</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	4.5 6				90	10				BR			SAND TR SI & CL			
2	9.2 10.8				50	50				DRY BR			SI WITH SAND TR ORG			
3	12 13.5				10	90				BROWN			CL-SI TR SAND			
4	15 16.5				"	"				"			"			
5	20.5 22				"	"				COBBLES BR			"			
6	25 26.5				"	"				"			"			
7	30- 31.5				"	"				"			"			
8	35 36.5				"	"				"			"			
9	40 41.5				"	"				"			"			

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 73-11107 SITE _____ BOREHOLE No. 2 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	5.5			10	10	80						BK			CL - SI TO SS & GL	
2	TW			"												
3	16.6			"	"	"						"				
4	TW															
5	25.5			"	"	"						"				
6	TW															
7	36.5				40	60						BL			SI some SAND & GL	
8	40.5				"	"						PART BK			"	
9	45.6				70	30						"			SAND some SI	

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT <u>73-11107</u>		SITE _____		BOREHOLE No. <u>2</u>		GROUND ELEVATION _____										
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
10	48 29.5				10	90				BR			OC - SI TR SAND			
11	51 52.5				1	11				GRPY			"			
12	55 56.5				1	11				"			"			
13	60 61.5				1	11				"			"			
14	65 66.5				1	11				"			"			

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

VISUAL CLASSIFICATION SHEET

PROJECT <u>73-11107</u>		SITE _____		BOREHOLE No. <u>3</u>		GROUND ELEVATION _____										
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL		
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL											SAND	SILT & CLAY
1	25			10	20	70				GR			CL-SI some SF TR GR			
2	56												"			
3	1011			1	"	"				"			"			
4	70															
5	2021			1	"	"				"			"			
6	2526			1	"	"				"			"			
7	3031												SAND TR SI & ORG.			
8	3536												CL-SI some sand TR GRG.			
9	70															

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 73-11107 SITE 3 BOREHOLE No. _____ GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
10	44 46										OR			CL-SI some S TR ORG.		
11	49 50.5										GRAY			CL-SI TR S		
12	53 54.5															
13	56 57.5															
14	60 61.5															
15	64 65.5															
16	70 71.5															

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 73-11107 SITE _____ BOREHOLE No. 4 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT & CLAY								
1	3-4.5				60	40				Brown			SAND some SILT	
2	4.5-7.5				20	80				"			CL-SI TO S	
3	7.5-10.5				10	90				"			"	
4	10.5-15									GRAY				
5	15-20				10	90				GRAY			CL-SI TO S	
6	20-25				"	"				"			"	
7	25-30				"	"				"			"	
8	30-35				"	"				"			"	
9	35-40				"	"				"			"	

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

VISUAL CLASSIFICATION SHEET

PROJECT 73-11107 SITE _____ BOREHOLE No. 4 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
10	40 41.5				10	70					GRDY			CL-SI TO S.		
11	50 51.5				1											
										</						

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

MEMORANDUM

TO: Mr. A. P. Watt, (2)
Regional Structural Planning Eng.,
Southwestern Region,
London, Ontario.

FROM: Soil Mechanics Section,
Geotechnical Office,
West Bldg., Downsview.

ATTENTION:

DATE: February 5, 1974.

OUR FILE REF.

IN REPLY TO FEB 11 1974

40112-20
GEOCHES No.

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Culvert Replacement Approx. 2.5 miles (4.0 km)
West of Wardsville, Highway 2
District #2, London
W.O. 73-11107 -- W.P. 154-73-01
Cont. 74-132.

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above-mentioned 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.

K. G. Selby

K. G. Selby,
SUPERVISING FOUNDATIONS ENGINEER.

KGS/ao
Atch.

c.c. E. J. Orr
B. R. Davis
A. Rutka
A. Wittenberg
L. E. Walker
B. J. Giroux
J. R. Roy
G. A. Wrong
B. A. Singh

Files
Documents

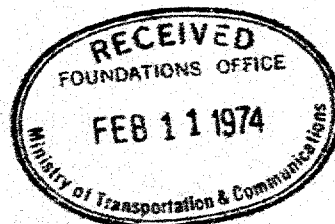


TABLE OF CONTENTS

1. INTRODUCTION
 2. SITE DESCRIPTION AND GEOLOGY
 3. FIELD AND LABORATORY INVESTIGATION
 4. SUBSOIL CONDITIONS
 - 4.1) General
 - 4.2) Silty Clay some Sand (Fill)
 - 4.3) Sand Traces of Clay and Silt
 - 4.4) Sand with Silt, to Silt with Sand,
Some Clay
 - 4.5) Silty Clay some Sand (Till)
 5. GROUNDWATER CONDITIONS
 6. DISCUSSION AND RECOMMENDATIONS
 - 6.1) General
 - 6.2) Foundation
 - 6.2.1) Open Cut Method
 - 6.2.2) Tunnelling Method
 7. MISCELLANEOUS
-

Foundation Investigation Report
For
Culvert Replacement Approx. 2.5 miles (4.0 km)
West of Wardsville, Highway 2
District #2, London
W.O. 73-11107 W.P. 154-73-01

1. INTRODUCTION:

A foundation investigation has been carried out at the above mentioned site to determine the existing sub-soil and groundwater conditions. A request for this investigation was received in a memorandum from Mr. S. Jants, Structural Planning Supervisor for the Southwestern Region, dated January 8, 1974. This report contains the results of the field and laboratory investigation together with recommendations for the Culvert Replacement proposals.

2. SITE DESCRIPTION AND GEOLOGY:

The site of this investigation is on Highway 2 where it crosses a valley created by a tributary of the Thames River. The fill over the existing culvert settled approximately 6" last fall and the resulting depression has been patched with asphalt. The culvert under the middle of the fill has settled 6 to 12 inches and the sides of the culvert, in places have been pushed in, and subsequently braced with timbers. Also in places the bottom of the culvert footing are visible. The embankment carrying Highway 2 over the valley is about 42 feet (12.8 m) high. The slopes of the valley are partially covered with trees and scrub. The surrounding area is relatively flat and used for agriculture.

Physiographically the area is part of the Bothwell Sand Plain which is the delta of the Thames River in glacial Lake Warren. The sands are spread thinly over the clay floor and the Thames River and it's tributaries have cut 50 to 100 feet (15.2 to 30.5 m) deep valleys into the plain.

The field work consisted of 4 sampled boreholes and 5 dynamic cone tests with 4 of the cone tests being adjacent to the 4 boreholes. The drilling was done by a muskeg vehicle mounted C.M.E. 55 equipped with standard augers. Boreholes 2 and 3 were put through the fill. Borehole 2 was placed on the center line of the proposed C.I.P. and Borehole 3 was placed beside the existing culvert. Disturbed samples were obtained by driving a split spoon sampler into the subsoil. Undisturbed samples were taken using 2 inch 50.8 mm) ID thin walled Shelby tubes pushed into the soil hydraulically. In situ undrained shear strength was measured using a M.T.C. vane.

Soil samples were identified in the field and again upon arrival in the laboratory. Tests to determine moisture content, grain size, organic content and Atterberg Limits were carried out on representative samples. Soil samples obtained from the Shelby tubes were subjected to unconfined compression, quick triaxial and laboratory vane tests. All field and laboratory test results are recorded on the accompanying borelog sheets.

The groundwater levels across the site were determined by recording the water levels in the open boreholes over the period of the investigation.

The locations and elevations of the boreholes as well as a stratigraphical profile are plotted on Drawing 73-11107A attached at the end of this report. The surveying of the site was carried out by personnel from the Southwestern Region Engineering Surveys Section.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil at this site consists of 42 feet of (12.8 m) fill overlying the original soil. The fill contains from the top down about 1.5 feet (0.5 m) of gravelly sand, followed by silty clay some sand. The original soil probably starts with the sand with silt to silt with sand which was encountered in three boreholes.

Following this is a silty clay some sand, till. A brief description of the layers is given below.

4.2) Silty Clay Some Sand (Fill):

The majority of the fill consisted of cohesive soil described as silty clay some sand. In BH #2 the material extends down 30 feet (9.2 m) to elevation 655.6 feet (197.3 m), and in BH #3 to 31 feet (9.4 m) to elevation 654.9 feet (199.6 m). The colour of the silty clay varied from brown to greyish brown due to oxidation. Traces of organics (4.2%) were found in Borchole #2 between 19 and 22 feet (5.8 and 6.7 m) below the surface.

The consistancy of the fill varied from stiff to very stiff. Grain size analyses yielded the following distribution:

		<u>Average</u>
Gravel	0 %	0%
Sand	7 -31%	16%
Silt	33-50%	41%
Clay	33-55%	43%

The following physical properties were obtained from laboratory tests:

Natural Moisture Content (%)	- 19-28
Liquid Limited (%)	- 33-46
Plastic Limited (%)	- 19-23
Bulk Density (Pcf)	-126-132.5
(T/m ³)	-2.02-2.12

Undrained Shear Strength

Field Vane (psf)	>2,000
(kN/m ²)	> 95 8

Unconfined Compression Test (Psf)	1610 - 2500
(kN/m ²)	77.1 - 120.0
Triaxial Compression Test (Psf)	3310
(kN/m ²)	158.5

The standard penetration "N" values varied from 9 to 22 blows per foot. A typical grain size curve envelope and plasticity chart are included in the Appendix as Figures 4 and 1 respectively.

4.3) Sand Traces of Clay and Silt:

This layer was encountered in Boreholes 2 and 3, 30 to 33 feet, (9.2 to 10.1 m) below the surface. The thickness varied from 0.5 to 3 feet, (0.2 to 0.9 m). The "N" value measured within this deposit was 13 blows per foot corresponding to a compact relative density. The natural moisture content and grain size distribution are as follows:

Natural Moisture Content (%)	- 11
Gravel (%)	- 0
Sand (%)	- 83
Silt and Clay (%)	- 17

A typical grain size curve is included in the Appendix as Figure 3.

4.4) Sand with Silt to Silt with Sand,
Some Clay:

This material is probably the start of original ground. It was encountered in 3 of the 4 boreholes. In Borehole #1 and #4 this layer was the first sampled and extended down 11 feet (3.4 m) and 4 feet (1.2 m) respectively. In Borehole #2 it was encountered 33 feet (10.1 m) below the surface and extended for 14 feet (4.3 m) between elevation 652.6 and 638.6 feet, (elevation 198.9 and 194.7 m).

The "N" values measured within the sand with silt to silt with sand were between 4 and 27 blows per foot corresponding to a loose to compact relative density. The natural moisture content and grain size distribution are as follows:

Natural Moisture Content (%)	-	19-34
Gravel (%)	-	0
Sand (%)	-	36-66
Silt (%)	-	18-43
Clay (%)	-	6-25

A typical grain size curve is included in the Appendix as Figure #2.

4.5) Silty Clay some Sand (Till):

All the Boreholes were terminated within this layer. The silty clay some sand is a deep deposit which is glacial till in origin. The "N" values within this deposit were between 16 and 39 blows per foot. Traces of organics were found in BH #3, 31 to 47 feet (9.4 to 14.3 m) below the surface. Laboratory grain size analyses yielded the following distribution:

Gravel (%)	-	0
Sand (%)	-	9-17
Silt (%)	-	42-58
Clay (%)	-	32-47

The following physical properties were obtained from field and laboratory tests:

Natural Moisture Content (%)	-	18-28
Liquid Limit (%)	-	36-44
Plastic Limit (%)	-	18-23

Undrained Shear Strength

<u>Field Vane</u>	(psf)	>2000
	(kN/m ²)	>95.8
<u>Laboratory Vane</u>	(psf)	1645 - 1720
	(kN/m ²)	78.8 - 82.35
<u>Unconfined Compression Test</u>	(psf)	2500
	(kN/m ²)	119.7

The consistency of the deposit varied from stiff to hard with a localized soft zone in Borehole #3 probably due to the closeness of the culvert. A typical grain size curve envelope is included in the Appendix as Figure #4.

5. GROUNDWATER CONDITIONS:

The following groundwater levels were observed during the field investigation:

BH. #1 - 643.5
BH. #2 - not established
BH. #3 - not established
BH. #4 - 643.5

The levels in Boreholes 2 and 3 were not established because of the short duration of the field work, but it is assumed that the water level will be the same as in the other Boreholes.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

There are two proposals for the replacement of the existing culvert. An 84" C.I.P. culvert is proposed 15 feet (4.6 m) north of the present culvert with an invert elevation 1 foot (0.3 m) below the existing streambed. The method of construction will be to tunnel the culvert through the embankment with the sideslopes steepened to 1:1 during

construction to shorten the length of tunnelling. The second proposal consists of a 6 x 5 ft. rigid frame concrete box using an open cut method.

The subsoil at the site consists of silty clay some sand (fill) followed in some boreholes by sand, traces of clay and silt, then sand with silt to silt with sand some clay and finally a silty clay, some sand, till.

6.2) Foundations:

6.2.1) Open Cut Method:

For this proposal the existing 4' x 3' concrete culvert, open type, will be replaced by a 6' x 5' rigid frame concrete box. If the highway is to be used during construction roadway protection will be required. Any vertical slopes of the culvert excavation below the open cut slopes will require sheeting and adequate bracing. The natural groundwater levels at the site may undergo seasonal variation. Depending on the time of the year some dewatering procedure may be required in order to place the culvert concrete in the dry.

6.2.2) Tunnelling Method:

In this case a 84 " C.I.P. will be placed 15 ft. (4.6 m) north of the existing culvert. The suggested method of construction is to steepen the slopes to 1:1, place these sections of the culvert and then restore the slopes to 2:1. Following this the rest of the C.I.P. may be tunnelled through the center portion of the embankment.

The culvert should be designed and placed according to the appropriate Ministry standards using Granular 'B' material as bedding. At the time of construction any soft material found below the proposed culvert base elevation should be excavated and replaced with Granular 'B' material.

To prevent piping through the backfill a 3 ft. (0.9 m) thick clay seal should be provided at the upstream end and a filter blanket 3 ft. (0.9 m) thick placed at the down-

stream end. If slopes are rip-rapped, it should be placed so as to cover both seal and filter.

Temporarily steepening slopes to 1:1 for construction purposes should present no problems provided the exposed surfaces are protected from surface water or heavy rainfall which could have the effect of softening the cohesive fill material in a very short time. Roadway protection will be required for Highway 2 and all excavations with vertical sides should be sheeted and adequately braced as excavation proceeds and until such time as the excavations are backfilled.

Steps should be taken that the existing culvert does not cause further settlement of the fill. This may be accomplished by filling the bottom of the culvert with concrete so that material below the footing can not be washed away, and also to prevent the sides of the culvert from being further pushed in.

Depending on the seasonal variation of the groundwater and the granular nature of some of the subsoil a dewatering scheme may be required so that dry working conditions prevail.

Fill suitability for reuse can best be determined by the Regional Soils Office.

Regardless of the method chosen this Office should analyze the stability of the temporary slopes in any proposed construction scheme.

7. MISCELLANEOUS:

The field work was carried out from January 10 to January 16, 1974, and was supervised by Mr. P. Korgemagi, Project Foundations Engineer.

The equipment used was owned and operated by Master Soils Investigation, Rexdale, Ontario.

This report was written by Mr. P. Korgemagi, and reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.

P. Korgemagi

P. Korgemagi, P. Eng.

K. G. Selby

K. G. Selby, P. Eng.

PK/sh

February 1, 1974.

APPENDIX 1

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 1

FOUNDATIONS OFFICE

JOB 73-11107

LOCATION STA., 250 + 93, O/S 126' RT, of Hwy.2

ORIGINATED BY PK

W.P. 154-73-01

BORING DATE January 10, 1974

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger and Cone Test

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 25 50 75 100 125	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w $w_p \quad w \quad w_L$ WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F. GR SA SI CL t/m ³	REMARKS
ELEV. DEPTH m.	DESCRIPTION	NUMBER	TYPE					
198.0	649.7							
0.0	0.0							
	Ground Level							
	top soil							
	sand with silt, some clay loose	1	SS 9					0 59 26 13
194.0	638.7							
	traces of organic	2	SS 4	640				0 54 40 6
3.4	11.0							
	Silty clay	3	SS 19	195.3				0 11 51 38
	some sand	4	SS 21					
	grey (till)			630				
	very stiff to hard	5	SS 20	192.3				0 11 49 40
		6	SS 34	620				
		7	SS 26	189.4				0 10 51 3
		8	SS 30					
185.4	608.2							
		9	SS 35	610				
12.6	41.5							
	End of Borehole							

LOCATION Sta., 250 + 83, 0/s 18.5' RT of Hwy. 2

ORIGINATED BY DE

BORING DATE January 15, 16, 1974

COMPILED BY PK

BOREHOLE TYPE Auger and Cone Test

CHECKED BY _____

20
15 ϕ 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 73-11107

LOCATION Sta., 250 + 71, \circ /s 18.5' LT., & Hwy. 2

ORIGINATED BY PK

W.P. 154-73-01

BORING DATE January 14 to 15, 1974

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Auger and cone test

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft./m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	25	50	75	100	125	w_p	w	w_L		
209.1	685.9	Ground Level													
0.0	0.0	Gravelly Sand													
0.5	1.5		1	SS	22										
		Silty clay	2	SS	12	680									0 14 50 3
		some sand	3	SS	13	207.1									
		traces of gravel	4	TW	PH	670									
		(fill) Brown	5	SS	17	204.2									0 16 42 4
		Stiff to very	6	SS	19	660									
		Stiff	7	SS	13	201.3									0.C. 4.15
199.4	654.3	sand compact	8	SS	15	650									0 31 34 3
9.2	31.0	Traces of	9	TW	PH	198.1									643.5
		Organics	10	SS	3	640									0 14 47 3
		soft	11	SS	38	195.1									
		Silty clay	12	SS	39	630									0 10 58 3
		Some sand	13	SS	32	192.0									0 11 42 4
		Grey (till)	14	SS	35										0 17 47 3
		Very stiff to	15	SS	36	620									0 10 50 4
		Hard	16	SS	36	189.0									
187.3	614.4														
21.8	71.5	End of Borehole													

ORIGINATED BY PK

COMPILED BY _____ DR

CHECKED BY _____

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 5

FOUNDATIONS OFFICE

JOB 73-11107

LOCATION Sta., 250 + 83, 9/s 18.5' LT, 6 Hwy. 2

ORIGINATED BY PK

WP 154-73-01

BORING DATE January 14, 1974

COMPILED BY PK

DATUM Geodetic

BOREHOLE TYPE Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE ft / m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m)	SHEAR STRENGTH P.S.F. (kN/m ²) ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w WATER CONTENT % $w_p \rightarrow w \rightarrow w_L$	BULK DENSITY γ t/m ³	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT 0.3 m						
209.1 ft 686.0	Ground Level										
0.0 0.0	Probable gravelly sand										
	probable silty Clay										
	Some Sand (Fill)										
202.7 665.1											
6.4 20.9	End of Cone Test										

OFFICE REPORT ON SOIL EXPLORATION

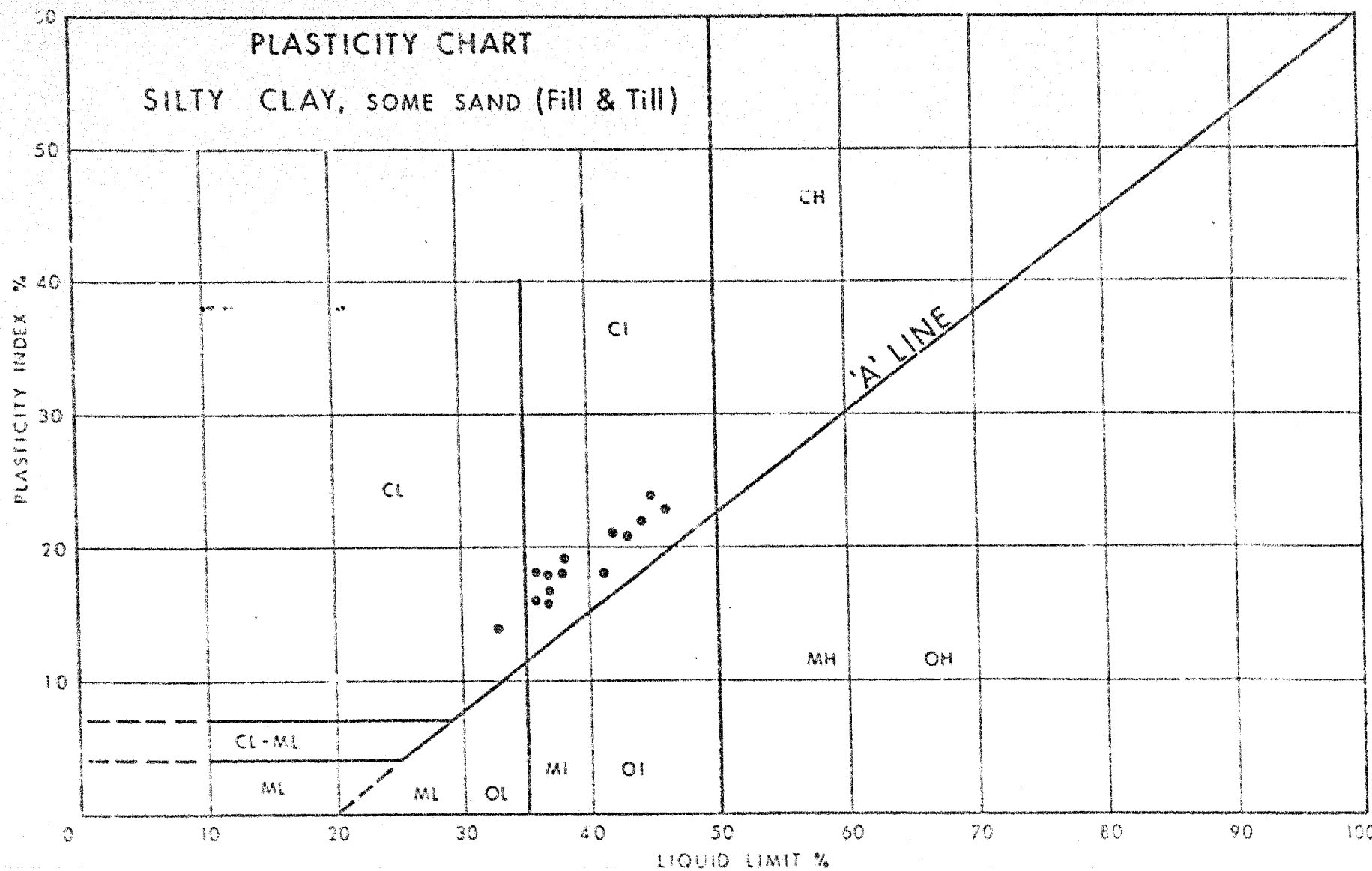


FIG. 1

GRAIN SIZE DISTRIBUTION

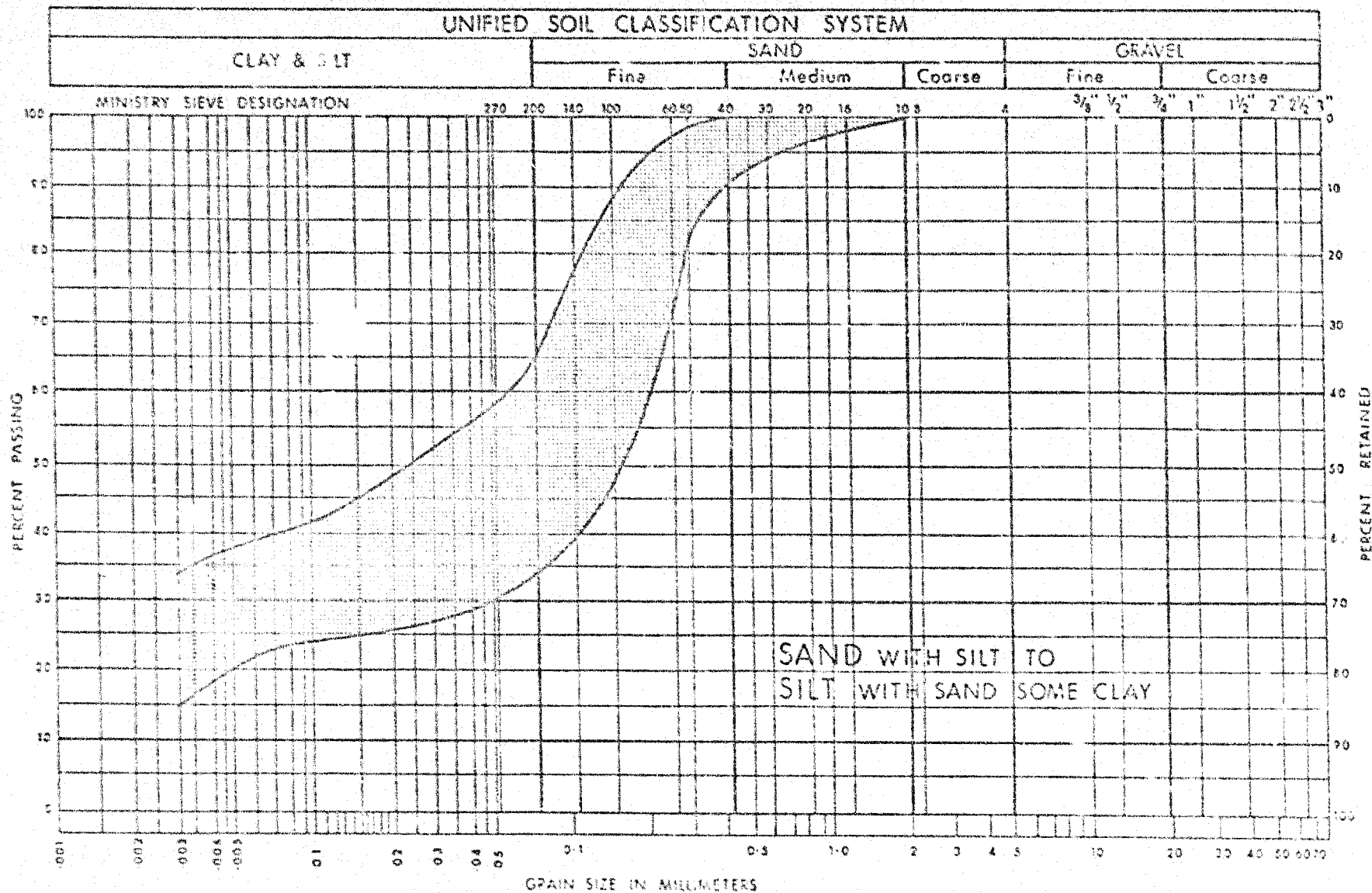


FIG. 2

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

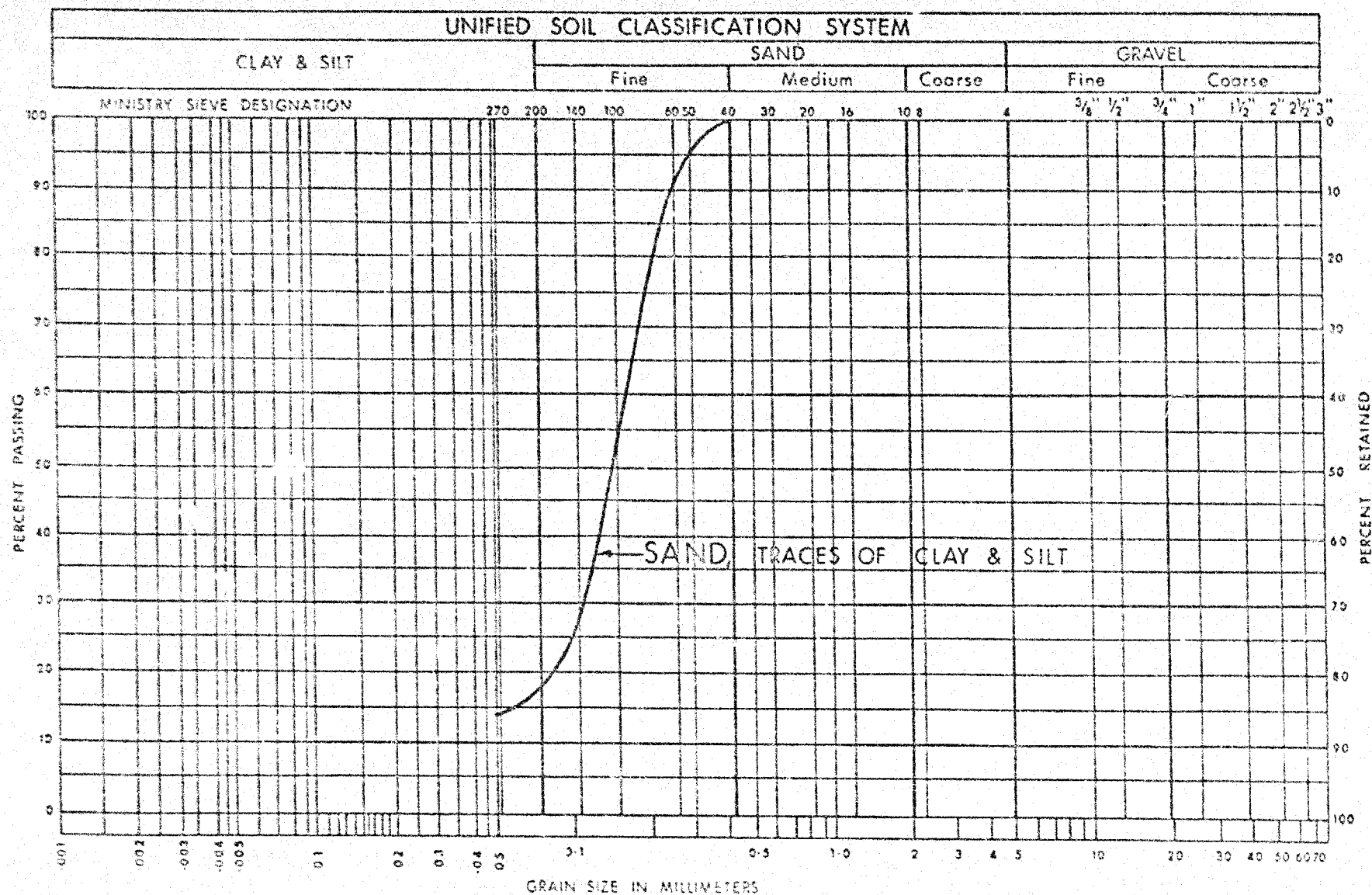


FIG. 3

WO. 73-11107

GRAIN SIZE DISTRIBUTION

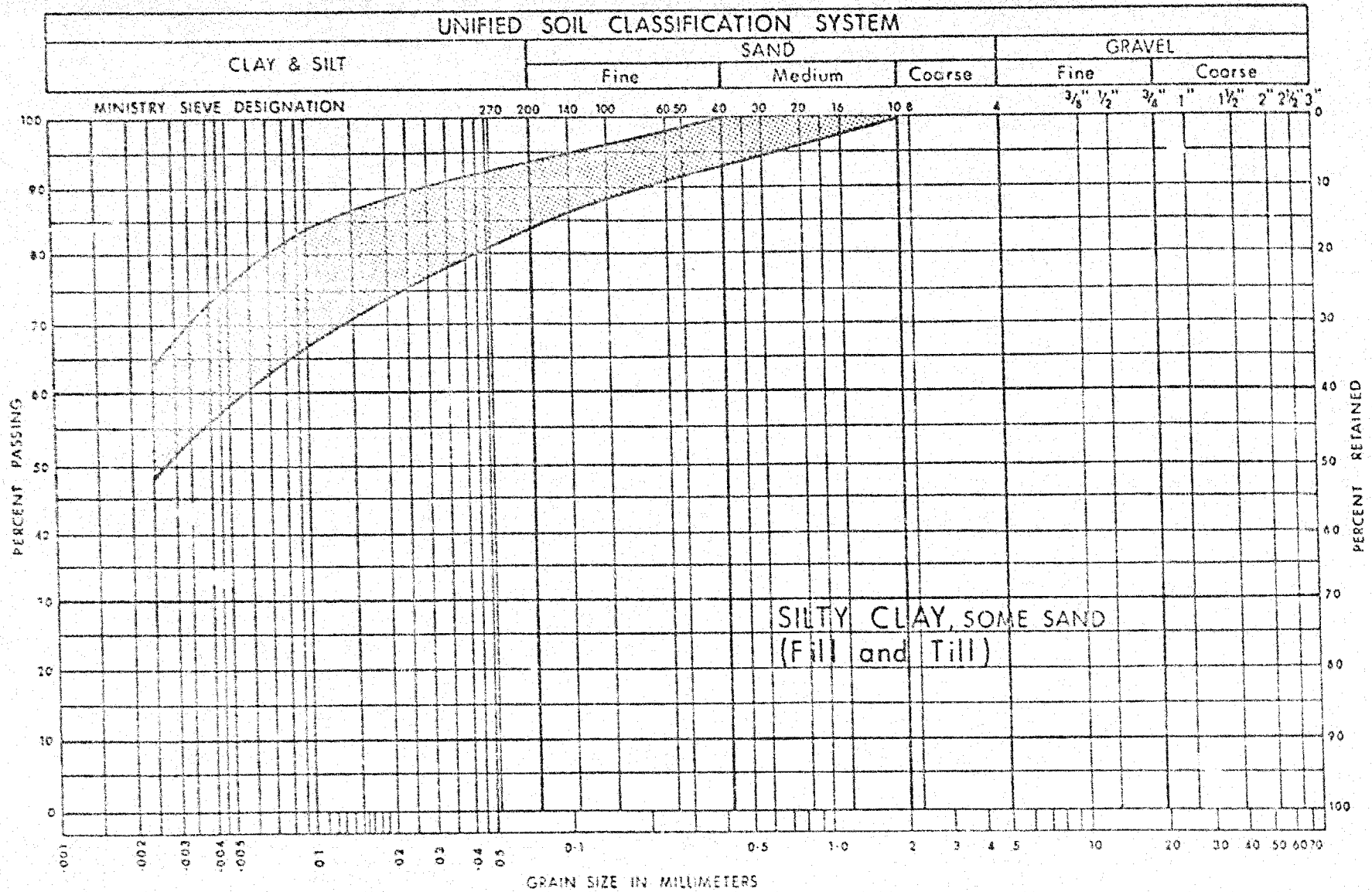


FIG. 4

FD-9a (Rev. 7-73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TERMS TO BE USED IN DESCRIBING SOILS :-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" " ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS 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
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX $= \frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
Q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta\sigma}$
C_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR $= \frac{C_v t}{d^2}$ (d , DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

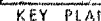
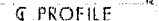
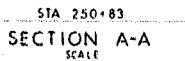
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

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

SLOPES

H	VERTICAL HEIGHT OF SLOPE
U	DEPTH BELOW TOP OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



自 1980 年 1 月 1 日起

- **Bore Hole**
- **Cone Penetration Test**
- **Bore Hole & Cone Test**
- **Winter Levels established at end of field investigation, Jan. 1974**

NO.	ELEVATION	STATION	OFFSET
1	649.7	250+93	150' 41"
2	685.6	250+85	185' 61"
3	685.9	250+71	185' 11"
4	687.5	250+79	187' 11"
5	686.0	250+82	186' 11"

NOTE: FOR CONTRACT DOCUMENT
The complete foundation investigation report for this structure may be examined at the District Office and Foundation Office, University, and at the 140001 District Office.

NOTE
The boundaries between eel chain have been established only of
Pore Hole Location. Between Pore Holes the boundaries are assumed
from geological evidence.

[illegible]

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

CULVERT REPLACEMENT (2.5 MILES WEST OF WOODSVILLE)

HIGHWAY NO. 2 DISTRICT NO. 2
CO. MIDDLESEX
TWP. MOSSA LOC. 22 CORNER OF R.R.

BORE HOLE LOCATIONS & SOIL STRATA

$\frac{d}{dt} \left(\frac{1}{2} m v^2 \right) = \frac{1}{2} m \frac{dv^2}{dt}$

DATE 10-18-91 BY SP-6 JAC

[illegible]

Date May 15, 1974

APPROVED SCHEDULE FOR 1974 - 75

Page 4 of 15

PROGRAM OF CONSTRUCTION

DISTRICT No. 2, LONDON

W.P. No.	HWY. No.	Type of work	LOCATION	Date of		Tend. open.	CONT. No.
				Advert.	Award.		
154-73-01	2	Culvert Replace.	2.5 Mi. West of Wardsville.	June 12/74	July 3/74 no award due to lack of bids.	14	74-58 74-132
				Aug 14/74	sep 4/74	22	

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, OTTAWA

For the information of

MR. J. WEAR

All Regional Managers

Standards Section
 Eastern Region Branch
 East Building
 Downsview
 May 24, 1971

CONCRETE HEADWALL (SD-8-23)

This memorandum cancels Standard SD-8-23, Revision A, dated July 8, 1971. A new self-supporting Concrete Headwall Standard is now being designed by the Structural Office, and should be available shortly.


Our records show that SD-8-23 may have been used on the following Work Projects:

U.P. 35-73-02;	151-67-04;	127-66-36;	94-72-02
43-63-01;	600-74-02;	252-63-02;	251-63-01
83-69-01;	89-69-01;	115-67-04;	25-72-02
131-73-04;	552-65;	22-67-04;	600-74-02
154-73-04			

In issuing a new Standard, the following information is pertinent: type and diameter of pipe, channel outline, side slopes and fill height above headwall.

Would you please insure that this information is submitted to the Standards Section for all Projects containing Standard SD-8-23.

DJW/sg


 D.J. Sander
 Standards Engineer.

c.c. J. Wear
 B. Davis

a resolution to head?

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. Wear,
Project Review Engineer,
Systems Design Branch,
East Building.

FROM: Structural Office,
West Building.

ATTENTION:

DATE May 27, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 154-73-01 - Culvert Replacement,
2.5 Miles West of Wardsville,
Highway 2, District 2 London.

At your request we have prepared the attached drawing for an alternative design for the "headwalls" for the above culvert replacement.

The change was necessitated by our recommendation that the original design (as per SD-8-23 modified) was unsuitable for this size of pipe.

We have checked the attached drawing for structural adequacy and completeness; however we have not checked any of the other contract drawings or documents and have not made any changes to them which may be necessary because of the revised wall design.

We would like to call the following points to your attention:

- (a) Concrete and reinforcing steel quantities will have changed.
- (b) The length of the wall has been increased to 45'-6" to accommodate 2:1 channel bank slopes. In the original design we think that the 1'-6" of concrete above the pipe was neglected in calculating the wall length.
- (c) Footing excavation has been changed.
- (d) Granular Backfill and wall drains have been added.
- (e) Hook bolts have been added to anchor the pipe to the wall.

DMcC/im
Attach.


D. McCune,
Contract Standards Engineer.

Mr. A. Wittenberg,
Manager, Systems Design,
London.

Materials and Testing Office,
London.

Mr. D. King.

March 28, 1974.

Culvert Replacement, Highway #2,
W.P. 154-73-01, London District.

73-1187

A review was made of the fill slopes on this project, where it is intended to tunnel a 84" pipe through the fill. It is understood that the intentions are to remove a portion of the toe of fill slope and proceed tunnelling from this point rather than trim the slope to a 1:1 slope and tunnel from this point. This will involve preparing a bedding for the pipe extending beyond the limits of the tunnelling.

The bedding and backfill material to the pipe should consist of a well graded Granular "B" with depths and widths placed per the standard for this type of installation. As noted in the Foundation Report a 3 ft. thick clay plug should be provided at the upstream end of the pipe and a filter blanket 3 ft. thick at the downstream end, and slopes re-rapped at both ends of the pipe so as to cover both the seal and filter areas. The clay plug should include all areas where gravel is placed and from 1 - 2 ft. above the high water level for the pipe.

In restoring the fill slopes, it was concluded that much of the unstable problem in the fill slopes is caused by water run off from the shoulder of the road within the fill section. At the time of reviewing this area recently, water was ponded on the shoulder and had no place to go other than seep into the fill area and out the slopes. The following proposals are recommended.

- (i) Curb and gutter is suggested along the edge of pavement for the length of fill with a drainage system provided beneath the curb with outlet at the ends of the fill.
- (ii) The sloughed material along the both slopes should be removed. For estimating purposes this extends from (i) Station 249 + 35 to Station 251 + 15 (right hand side) and (ii) Station 249 + 65 to Station 251 + 65 (left hand side) and will require an average depth of 3 ft to be removed

A. Wittenberg
Regional Manager
London, Ontario

Systems Design
East Building
Downsview, Ontario

D. King

June 3, 1974

Contract 74-58, W.P. 154-73-01, Highway 2
Culvert Replacement 2.5 miles west of Wardsville,
District 2, London

The following is a confirmation of discussion with D. Merrill and action taken concerning end treatment for the culvert to be installed on the above contract.

Recommendation was received to provide a retaining wall structure at the ends of culvert in place of the headwall treatment shown on standard SD-8-23.

The Structural Office was requested to review and participate in a revised design of end treatment for large size pipes. A design was received as per memo of May 27, 1974, attached, and the Project Review Section amended the contract documents as follows:

- 1) Standard for retaining wall replaced SD-8-23 formerly included in contract.

An additional note was placed on the Standard to specify that if concrete pipe culvert was chosen, then reinforcing steel was to be adjusted in location and cut to suit. The same standard number was chosen in order to retain the appropriate cross-references.

- 2) The tender item for Concrete in Headwall was changed to concrete in Retaining Walls and the quantity adjusted downward, due to an overall reduction in "section". The length of wall was increased as the original length did not appear to consider the height of wall above pipe.
- 3) A cost comparison requested from the Estimating Office revealed the following:

	Headwall	Retaining Wall
Volume of Concrete	111 cu yds	58 cu yds
Anticipated Construction Cost.	\$10,711.00	\$13,177.50 *

*including \$1,642.50 for Granular Backfill.

...../2

- 4) The special provision applied to the work was modified appropriately and retained the intent to pay for excavation as part of the price in placing concrete. Granular backfill was to be as elsewhere provided.
- 5) The Granular 'C' item was increased to accommodate the extent of granular required and shown on the new standard. The main breakdown sheet in the contract was adjusted accordingly, as well as, the tender item.
- 6) No adjustment was made to the quantities of rip rap or slope protection for the increase in wall length.
- 7) The contract alterations were made in time to be included in the contract without addendum.

D. J. Zander has served notice, as per attached, that a review of the requirements for similar projects of placing concrete walls at the ends of culverts is to be directed to the Standards Section. It is anticipated that a revised standard will be available shortly for distribution.

JRW/jc
Attach. (2)

J. R. Wear
Project Review Engineer

c.c. D.J. Zander
D. McCune
B. Davis
B. Giroux
L. Walker
W. Melinysbyn
E.J. Willis

copy circulated to: A. Kelly
E. Orr

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. Wear,
Project Review Engineer,
Systems Design Branch,
East Building.

FROM: Structural Office,
West Building.

ATTENTION:

DATE: June 4th, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT:


Re: W.P. 154-73-01 Culvert Replacement,
2.5 miles west of Wardsville,
Hwy. 2, District 2, London.

This will confirm our telephone conversation of last week regarding the sketch prepared by this Office for the retaining walls (headwalls) at the outlet and inlet of the above culvert replacement.

Your Office will revise the sketch to make it applicable for both C.S.P. and concrete pipe alternatives by:

- 1) Labelling the anchor bolts "for C.S.P. only".
- 2) Deleting the reference to C.S.P. where the pipe diameter is shown and showing an I.D. only without reference to type of pipe.

Your Office will contact the Designer in London Region to clarify the problem of possible settlement of the retaining wall and consequent troublesome affects on a rigid pipe.


D. McCune,
Contract Standards Engineer.

DM/eh

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: C. Mirza
Soil Mechanics Section
West Building

FROM: Project Review Section
Systems Design Branch
East Building

ATTENTION: K. Selby

DATE: June 6, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT: Contract 74-58, W.P. 154-73-01, Highway 2
Culvert Replacement, 2.5 miles west of Wardsville,
District 2, London

A standard headwall treatment applicable to the ends of culverts has been replaced by a recently designed retaining wall tailored for the above contract.

In speaking with the Regional Systems Design representative, some concern was evident during design in the choice of end wall treatment vs retaining wall for bearing pressure.

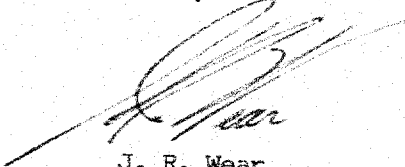
As discussed, would you please review the attached and advise on:

- 1) Adequate bearing support provided by the native material;
- 2) Consequential affect of placing concrete in the wall directly around the straight wall, jacking quality, concrete pipe. Wall thickness of the pipe is 9 $\frac{1}{4}$ inches, and
- 3) Advisability of construction joints in the wall.

The contract is to be advertised June 12, 1974.

JRW/jc

c.c. D.J. Zander
D. McCune
B. Davis
B. Giroux
L. Walker
W. Melinyshyn
E.J. Willis
A. Wittenberg


J. R. Wear
Project Review Engineer



Attach. (3) copy of June 4th memo from D. McCune
" " June 3rd memo to A. Wittenberg
std + plan and profile from contract

Mr. J.R. Wear,
Project Review Engineer,
Project Review Section,
Systems Design Branch,
East Bldg., Downsview.

Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

June 11th, 1974.

Culvert Replacement, 2.5 Miles West of Wardsville,
Highway #2, District #2, London,
W.O. 73-11107, W.P. 154-73-01.

We have reviewed the drawings for the above job and our comments regarding the questions raised by you are as follows:

1. A safe bearing capacity of 2 tons/sq. ft. may be used for footings placed at approximate elevation 634 or below.

The groundwater level at the time of the field investigation was found to be at elevation 643.5. However, no major dewatering scheme will be required, because the footing will be founded in the relatively impermeable silty clay (till) stratum.

2. Because of the cohesive nature of the subsoil, the retaining wall will settle, but the pipe, which will be tumbled, will not settle. The maximum settlement under the wall is estimated to be about 1 inch. Because of this differential settlement between the pipe and the retaining walls, stresses will be transferred to the pipe, which may result in the cracking of the pipe or the opening of the next joint in the pipe. Therefore, it is recommended a 1-inch thick extension joint filled with flexible material be provided between the pipe and the wall.
3. The underlying subsoil is cohesive in nature, and will, therefore, settle under the superimposed loads. The differential settlements, will be small and no special construction joints in the wall should be necessary.

A. Prakash

A. Prakash,
Senior Engineer,

For: K.G. Selby,
Supervising Engineer.

AP/mj

C.C. D.J. Zander

D. McCune

B. Davis

B. Giroux

L. Walker

W. Melinsyshyn

E.J. Willis

A. Wittenberg

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS:

W.P. 154-73-01
W.O. 73-11107

Foundation Report By:

Review of Design Drawings By:

Design Drawing No.'s:

..... P. KERGEMAGI
..... P. KERGEMAGI
..... 1 SET. OF PREL. CONTRACT DRAWINGS
..... FOLDER OF DOCUMENTS

1. Does footing design comply with our report or subsequent memos?
2. If answer to 1. is No, is present design acceptable?
3. Has sufficient field work been done?
4. Are estimated pile lengths shown on Drawings correct?
If not, make a new list.
5. If excavation of unsuitable soil is recommended, is this shown on Drawings?
6. Are approaches designed in accordance with our report? Check slopes and berm lengths.
7. Do you anticipate any construction problems?
i.e., dewatering, stability of temporary slopes or excavations.
8. Summarize your comments; on separate sheet if necessary.

No Comment.

Drawings Received

Reviewed

..... April 24 1974
..... April 24 1974

Signed

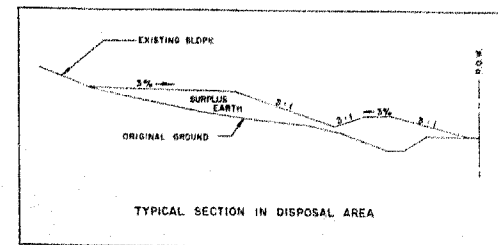
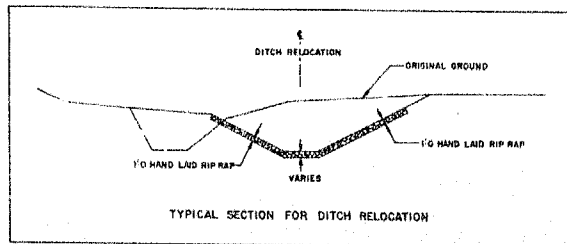
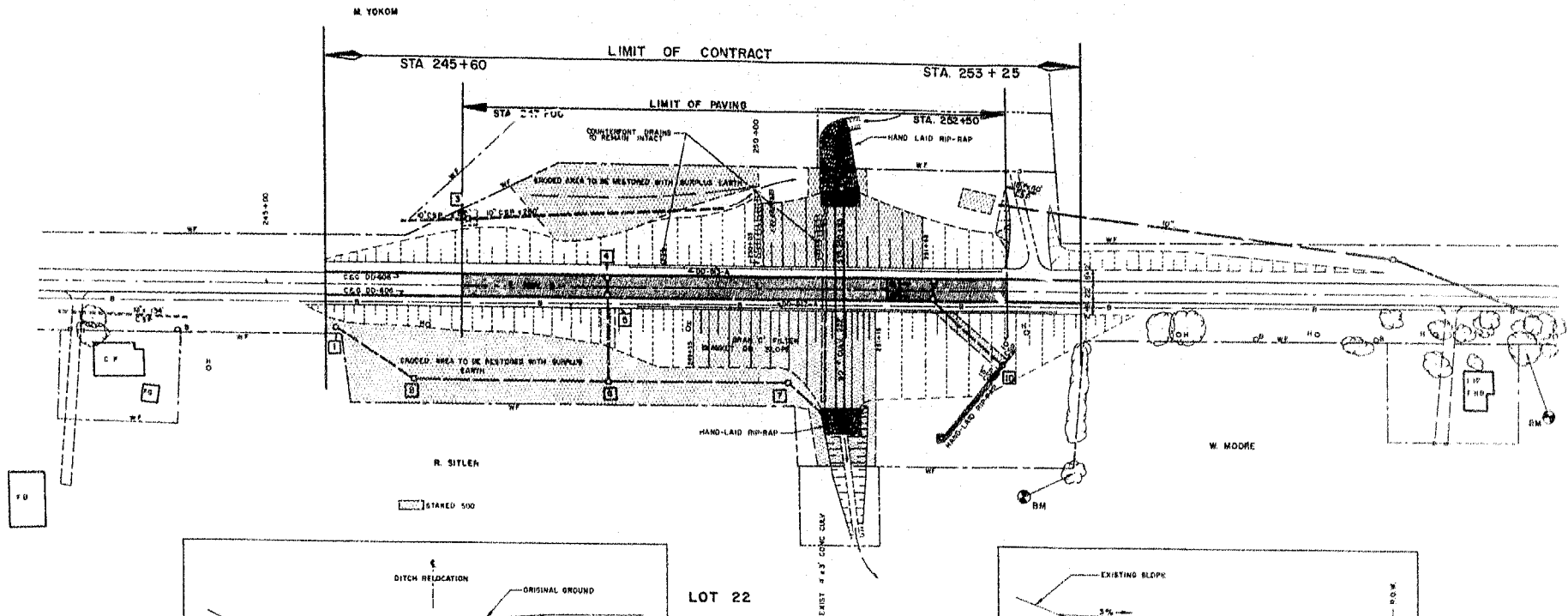
..... P. KERGEMAGI

CO. OF MIDDLESEX
TWP. OF MOSA

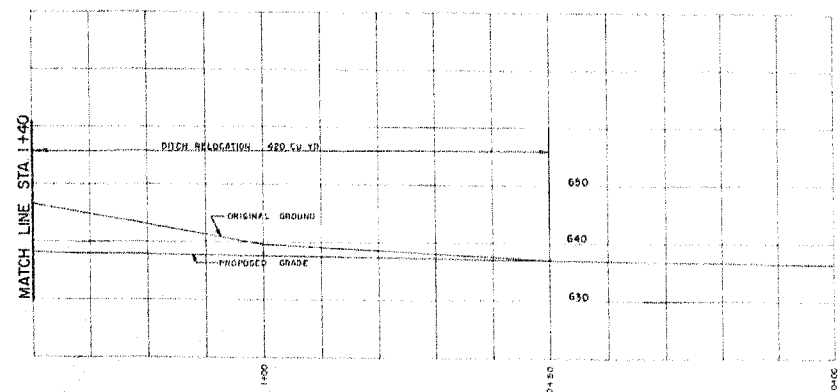
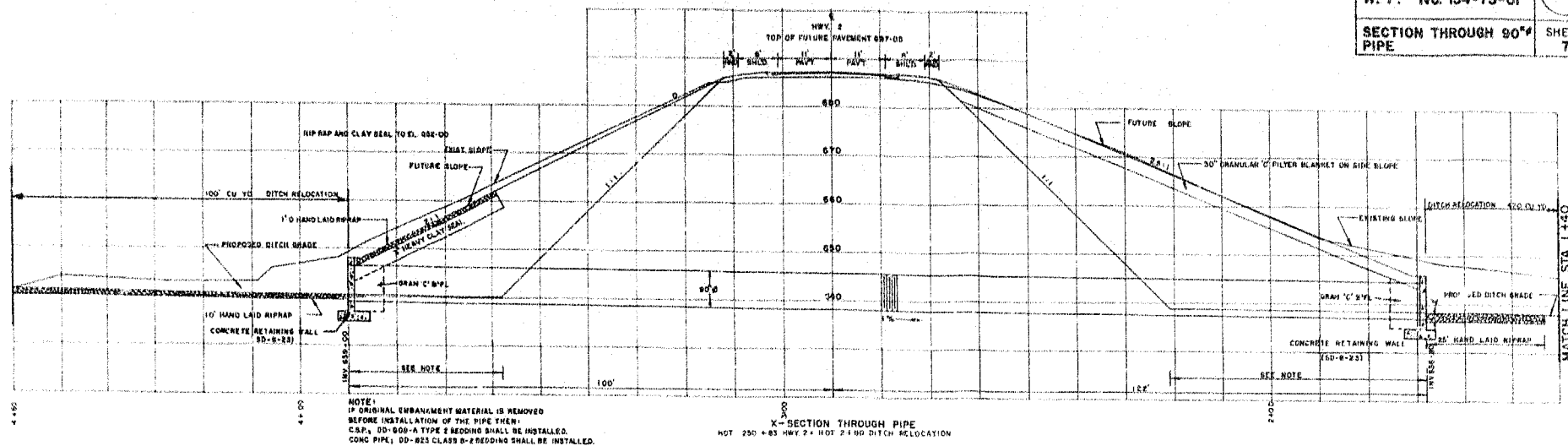
CONT. No. 74-58
W.P. No. 154-73-01
NEW CONSTRUCTION
STA. 245+60 STA. 253+25



LOT 22



SCALE
75' 0' 50'



SCALE

Vertrieb: B. Hoesl & Co.

