

G.I-30 SEP 1976

GEOCRES No. 40-14-91
DIST 2 REGION Southwestern
W.P. No. 41-66-11
CONT. No. 78-66
W. O. No. _____
STR. SITE No. 19-541
HWY. No. 402

LOCATION Sharon Road Underpass

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: photos enclosed
documents to be unfolded before
microfilming



Memorandum

Mr. S. Jants
Structural Planning Supervisor
Structural Planning Office
Southwestern Region, London

From: Soil Mechanics Section
Geotechnical Office
West Building, Downsview

Attention:

Date: August 18, 1975

Our File Ref.

In Reply to

Subject:

SHARON ROAD UNDERPASS
Hwy. 402 Dist. 2 London
W.P. 41-66-11 Site 19-541

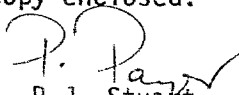
After the grade was lowered a further borehole was placed at this site to augment the foundation information. Considering this further information and the fact that a square footing will be used to support the center pier it is recommended that the loading on a footing for this pier at elevation 768 be 2.5 tons per sq. ft.

Alternately, the center pier may be supported on piles.

If #14 treated timber piles are used a 40 foot pile will carry a design load of 30 tons. A review of this recommendation will be made following pile loading tests carried out in the fall of 1975.

Steel H piles driven to approximate elevation 640 may be loaded to the structural capacity of the section chosen.

Please add the borelog for B.H. #4 to your report and replace the foundation drawing with the revised copy enclosed.


P.J. Stuart
Project Engineer

For

K.G. Selby
Supervising Engineer

c.c. E.J. Orr
B.R. Davis
B.J. Giroux
G.A. Wrong
A.P. Watt
A. Wittenberg
J.R. Roy
L.E. Walker
R. Hore
Files
Record Services

FOUNDATION INVESTIGATION REPORT
for

Sharon Road Underpass, Hwy. 402
Twp. of Delaware, Dist. 2, London
W.P. 41-66-11 Site 19-541

1. INTRODUCTION

A request for a foundation investigation at the abovementioned site was received from Mr. A. P. Watt, Regional Structural Planning Engineer, Southwestern Region, London.

A field investigation was subsequently carried out by the Soil Mechanics Section to determine the subsoil conditions existing at the site. This report contains the results of our field and laboratory investigations, together with our recommendations relating to the design of the proposed structure foundations.

2. DESCRIPTION OF THE SITE

The proposed underpass is located 3.5 miles west of Highway 4 where Highway 402 crosses an existing paved County Road at a skew angle of 47 degrees. The site is situated in an area of gently rolling cultivated farm land.

Physiographically, the surrounding area is referred to as the Mount Elgin Ridges.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES

Field work consisted of three sampled boreholes advanced employing 2-3/4 inch hollow stem augers, as well as three dynamic cone penetration tests.

Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. 'Undisturbed' samples were recovered using 2-inch I.D. Shelby tubes advanced into the soil hydraulically. Field vane tests were attempted, none however failed under a shear value in excess of 2200 lbs. per sq. ft.

All boreholes were surveyed in the field by personnel from London Region Engineering Surveys Section. The locations and elevations of the boreholes are shown on Drawing No.416611-A, which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection, laboratory tests were carried out on selected representative samples to determine the following physical properties:

- Atterberg Limits
- Natural Moisture Content
- Grain-size Distribution
- Undrained Shear Strength

The test results are summarized on the Record of Borehole sheets contained in the appendix of this report.

4. SUBSOIL CONDITIONS

Subsoil at this site consists of a deposit of silty clay to clayey silt which extends from immediately below the ground surface to a depth in excess of 100 ft.

The deposit may be divided into three zones according to strength characteristics. The upper zone with a thickness of approximately 15 ft. represents the desiccated crust. It is brown in colour and apart from the upper 3 to 5 ft., which is affected by frost action, has a very stiff to hard consistency. Based on Standard Penetration Test results, which range from 30 to 78, and on unconfined compression tests, it is estimated that the undrained shear strength of this layer varies with depth from in excess of 10,000 p.s.f. to 3,000 p.s.f.

The second zone, found from approximately 15 to 35 ft. below the ground surface has a stiff to very stiff consistency. Standard Penetration 'N' values range from 12 to over 20 blows per foot. Based on these values, and on field vane tests, the undrained shear strength of the soil is estimated to be in excess of 2000 p.s.f.

The third and deepest zone penetrated extends from a depth of approximately 35 ft. to over 100 ft. Standard Penetration 'N' values for this zone are in excess of 40, indicating a hard consistency.

5. DISCUSSION AND RECOMMENDATIONS

(5.1) General

The proposed structure will cross Highway 402 at a skew angle of 47 degrees. It will consist of two 134 ft. spans if skewed abutments are employed. If non-skewed abutments are used, the spans will be increased to 148 ft. in length. The approach fills will be approximately 22 ft. in height.

(5.2) Structure Foundations

CENTER PIER -

It is recommended that the center pier be supported on a spread footing type foundation at approximate elevation 778.0. A net safe bearing pressure of 4 tons per sq. ft. may be used for design purposes. Resistance to sliding may be determined using an adhesion design value of 2000 p.s.f.

PERCHED ABUTMENTS ON SHORT PILES -

The abutments may be constructed within the approach fills supported on steel tube piles (12-3/4" X 1/4") driven to elevation 778.0. The piles must not be driven below this elevation as the undrained shear strength decreases with depth. A safe load of 25 tons per pile should be assumed for design purposes. Any horizontal loading should be resisted by battered piles.

PERCHED ABUTMENTS ON COMPACTED FILL -

As an alternative, the abutments may be supported on spread footings placed on well compacted G.B.C. Class 'A'. A net safe design load of 2.5 t.s.f. may be assumed. For calculations of sliding resistances, a friction coefficient of 0.6 may be assumed to apply between the footing and G.B.C. Class 'A'. A detailed construction scheme is outlined on Fig. 1 of the appendix.

SETTLEMENTS -

Long term settlements of 3 inches at the abutments and $1\frac{1}{2}$ inches under the center pier are anticipated. Any bridge design should therefore have the ability to tolerate the resulting differential settlements. To minimize these differential settlements between the abutments and the center pier footings, it is recommended that the approach embankments be built in advance of the structure by as long a period as possible.

DEWATERING -

No dewatering problems are anticipated during excavations for footings due to the relatively impervious nature of the subsoil.

(5.3) Approach Embankments

No stability problems are anticipated with 22 ft. embankment fills if 2:1 slopes are employed. Care, however, should be taken that no material exceeding 3 inch grain size is placed in the fills through which piles have to be driven.

(5.4) Frost Protection

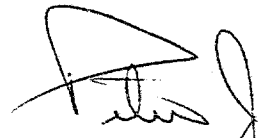
All pile caps or spread footings should be protected against frost action by a minimum 4 ft. of cover.

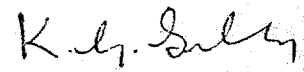
6. MISCELLANEOUS

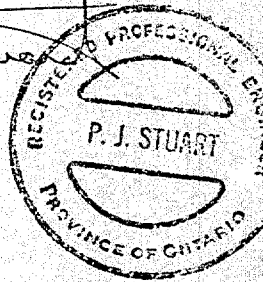
The field work on the project was carried out March 25th and 26th, 1975 under the supervision of Mr. P. J. Stuart, Project Foundation Engineer, who also prepared this report.

The equipment used was owned and operated by P.V.K. Drilling.

This report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.


P. J. STUART
Project Engineer


K. G. SELBY
Supervising Engineer



April 1975

RECORD OF BOREHOLE NO 1

W.P. 41-66-11

LOCATION CO-ORDS. 15,586,000N; 1,305,576 E.

ORIGINATED BY PJS

DIST. 2 HWY. 402

BORING DATE MARCH 26, 1975

COMPILED BY PJS

DATUM GEODETIC

BOREHOLE TYPE 2 3/4" HOLLOW STEM AUGER

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
785.4	GROUND LEVEL															
0.0																
	Silty Clay		1	SS	39	780										0 0 32 68
	to		2	SS	68											
	Clayey Silt		3	SS	46											
	Trace of Sand		4	SS	30	770										
			5	SS	27											
	Stiff		6	SS	19	760										
	to		7	SS	15											
	Hard		8	SS	12	750										0 4 58 38
			9	SS	40	740										
			10	SS	45	730										
			11	SS	41	720										0 11 49 40
			12	SS	46	710										
			13	SS	40	700										
686.4						690										2 1 59 32
99.0	End of Borehole NOTE: Water level not established															

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE NO 2

W.P. 41-66-11

LOCATION CO-ORDS. 15,585,948N; 1,305,438E.

ORIGINATED BY PJS

DIST. 2 HWY. 402

BORING DATE MARCH 25, 1975

COMPILED BY PJS

DATUM GEODETIC

BOREHOLE TYPE HOLLOW STEM AUGER

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
784.9	GROUND LEVEL									
0.0	Silty Clay to Clayey Silt Trace of Sand Stiff to Hard		1	SS	10	780				0 0 53 47
			2	SS	53					
			3	SS	69					
			4	SS	78					
			5	SS	39	770				0 0 60 40
			6	SS	26					
			7	SS	19					
			8	SS	22					
			9	SS	14	760				
750.9			10	SS	14					
34.0	End of Borehole NOTE: Water level not established									

RECORD OF BOREHOLE NO 3

W.P. 41-66-11

LOCATION CO-ORDS. 15,585,875N; 1,305,328E.

ORIGINATED BY PJS

DIST. 2 HWY. 402

BORING DATE March 27, 1975

COMPILED BY PJS

DATUM GEODETIC

BOREHOLE TYPE HOLLOW STEM AUGER

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ P.C.F.	REMARKS % GR. SA. SI. CL.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
785.2	GROUND LEVEL															
0.0	Silty Clay to Clayey Silt Trace of Sand Stiff to Hard		1	SS	40	780										0 0 57 43
			2	SS	56											
			3	SS	48											
			4	TW	PH											
			5	TW	PH	770										0 2 47 51
			6	SS	20											
			7	SS	10											
						760										
						750										
746.2			8	SS	46											6 15 49 30
39.0	End of Borehole NOTE: Water Level not established															

W.P. 41-66-11

LOCATION Co-ords. 15,585,931 N; 1,305,470 E.

ORIGINATED BY RD

DIST. 2 HWY. 402

BORING DATE July 16/75

COMPILED BY KD

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

[illegible]

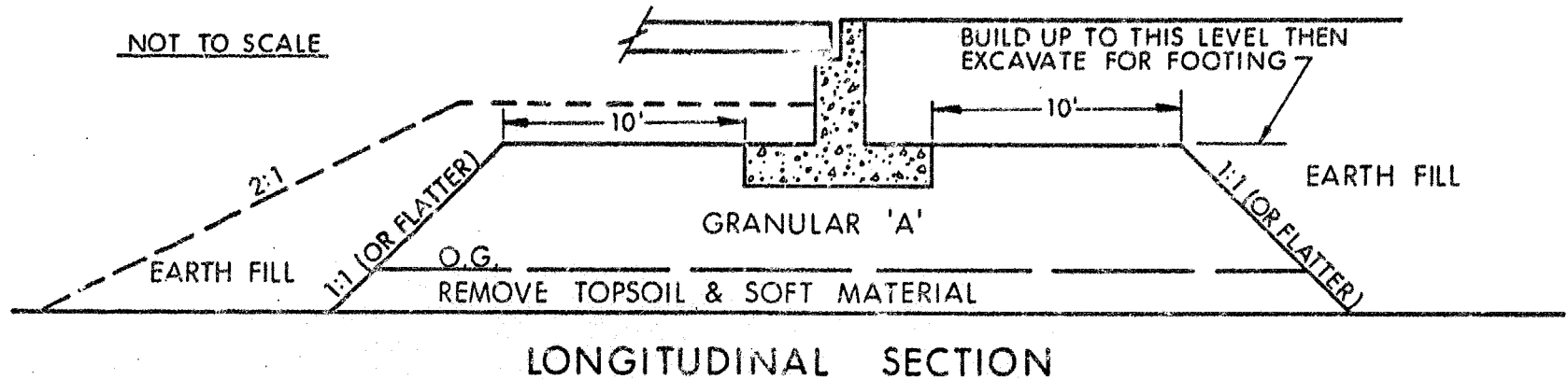
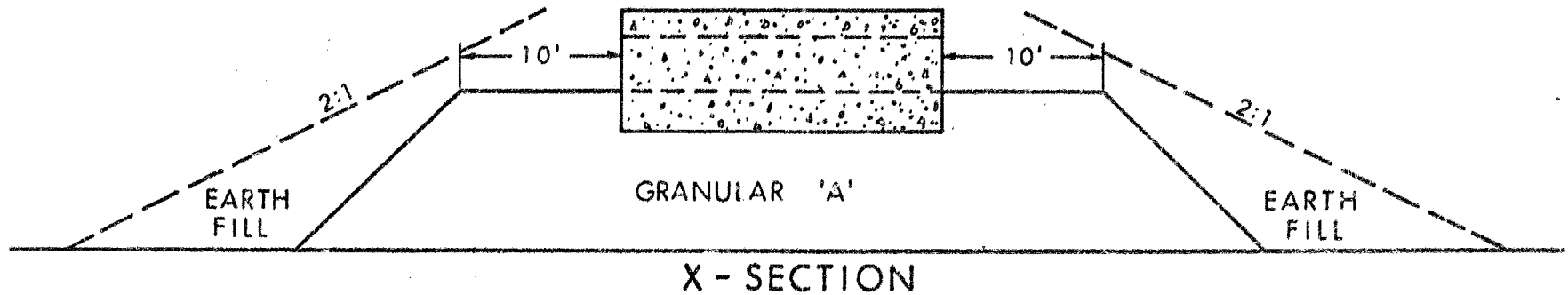
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4 Continued

W.P. 41-66-11 LOCATION Co-ords. 15,585,931 N; 1,305,470 E. ORIGINATED BY RD
 DIST. 2 HWY. 402 BORING DATE July 16/75 COMPILED BY RD
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger CHECKED BY JP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS % GR. SA SI. CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	IN' VALUES		20	40	60	80	100	w_p	w	w_L		
681.0	Continued															
104.0	Silty Clay to Clayey Silt					680										
	Stiff to Hard					670										
			9	SS	39	660										
			10	SS	94	650										
			11	SS	167											0 6 62 32
638.5			12	SS	100	640										12 23 50 15
146.5	Clayey Silt, cobbles and gravel (Glacial Till)		13	BXL	98%											
633.8																
151.2	End of Borehole															
	note: W.L. not established															

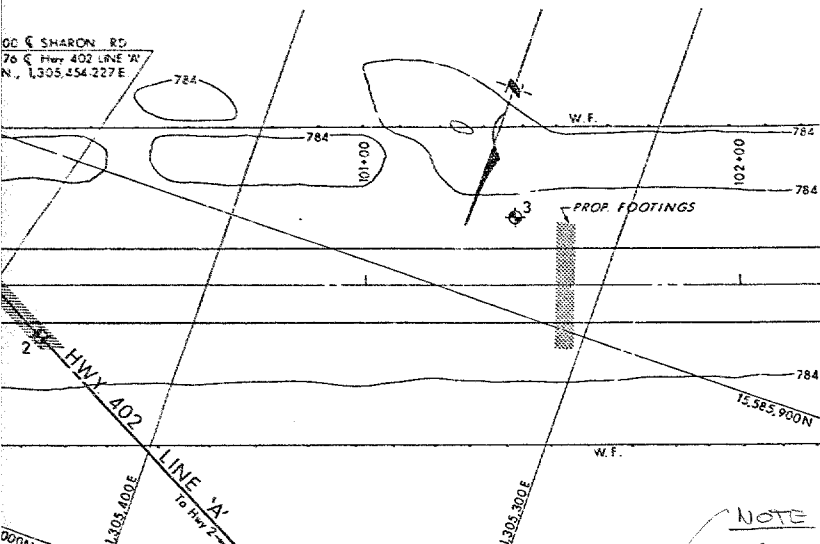
ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



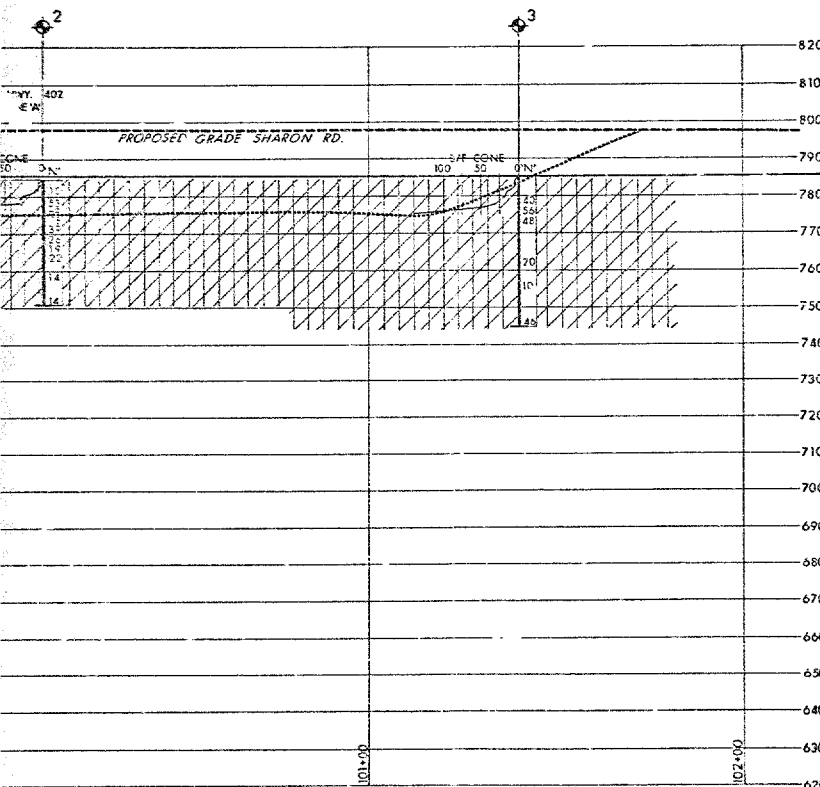
NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

00 & SHARON RD.
76 & Hwy 402 LINE 'A'
N. 1,305,454.227 E



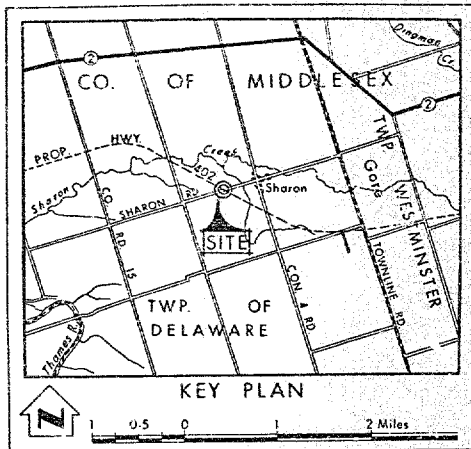
AN
LE
20 40FT.



SHARON RD.
ALE
20 40FT.

NOTE

WATER LEVELS WERE NOT
OBSERVED IN ANY OF
THE BORE HOLES



LEGEND

- Bore Hole
- Dynamic Cone Penetration Resistance Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation
- Water Levels NOT established at time of field investigation

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	785.4	15,586,000	1,305,576
2	784.9	15,585,948	1,305,438
3	785.2	15,585,875	1,305,328
4	785.0	15,585,931	1,305,470

NOTE: FOR CONTRACT DOCUMENT
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the LONDON District Office.

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION
Aug/75	G.P.	B.H. 4	ADDED ON PLAN & PROFILE

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE—SOIL MECHANICS SECTION

SHARON ROAD

HIGHWAY NO. Prop. 402 LINE 'A' DIST. NO. 2
CO. MIDDLESEX
TWP. DELAWARE LOT. 10 & 11 CON. III

BORE HOLE LOCATIONS & SOIL STRATA

SURVED P.J.S. [checked]	W.P. NO. 41-66-11	DRAWING NO.
DRAWN [checked]	A.C. NO.	416611-A
DATE April 24, 1975	157E NO 19-541	BRIDGE DRAWING NO.
APPROVED	CONT. NO.	



Memorandum

To: Mr. A. Wittenberg,
Regional Manager,
Regional Planning & Design,
Southwestern Region, London.

Attention:

From: Structural Office,
West Building, Downsview.

Date: May 24, 1977.

Our File Ref.

In Reply to

Subject: Sharon Road Underpass,
W. P. 41-66-11, Site 19-541,
Highway 402, District 2.

Based on the information supplied by Mr. R. W. Bratty, Project Manager of Giffels, Davis & Jorgensen, the General Plan of contract drawing sheet one has been revised to show the location of culverts, storm sewers and the grading contours. Consequently the bridge material list and Note to Regional Planning and Design Office should be revised as follows:

1. Note to Regional Planning and Design Office

Change item (d) "Water for compaction... (The approximate quantity of Granular Backfill is to read 235 cu yd)".

2. Material List

Change "Cement (Bridge) - ton - to read 257".
Delete Protection Board for Bridge Waterproofing.

Enclosed for your record is the half size print of drawing No. 19-541-1, please supersede the previous print of sheet one.

One copy of the revised print is also being forwarded to each of the following offices.

Structural Contract Section
Regional Structural Planning Engineer
Regional Planning & Design Office
Systems Design Project Review Section
District Office
Estimating Office
Assistant Construction Engineer (Structural)
Structural Maintenance Engineer
Soil Mechanics Section
Giffels, Davis & Jorgensen.



RK/cf
Enc.

R. Kan
R. Kan,
Structural Project Engineer.

J. Wear	J. Keen	K. Bassi	D. P. Collins
B. Giroux	A. McKim	E. Van Beilen	C. Mirza
A. Watt	N. Zoltay	R. W. Bratty (Giffels Davis & Jorgensen)	



Memorandum

To: Mr. S. Jants
Structural Planning Supervisor
Structural Planning Office
Southwestern Region, London

From: Soil Mechanics Section
Geotechnical Office
West Building, Downsview

Attention:

Date: July 9, 1975

Our File Ref.

In Reply to

Subject:

SHARON ROAD UNDERPASS
Hwy. 402, Dist. 2, London
W.P. 41-66-11, Bridge Site 19-541

I wish to point out that the footing elevations given for this structure in my memo of May 23, 1975 were in error. Elevation 870 for the center pier footing should read 770 and the abutment foundations will be founded at 781 not 881.

P.J. Stuart
Project Engineer

For

K.G. Selby
Supervising Engineer

c.c. E.J. Orr
B.R. Davis
B.J. Giroux
G.A. Wrong
A. Wittenberg
J.R. Roy
A.P. Watt
L.E. Walker
R. Hore
J. Anderson
A. Crowley
Files ✓
Record Services



Memorandum

To: Mr. S. Jants
Structural Planning Supervisor
Structural Planning Office
Southwestern Region, London

From: Soil Mechanics Section
Geotechnical Office
West Building, Downsview

Attention:

Date: May 23, 1975

Our File Ref. W.P. 41-66-11

In Reply to

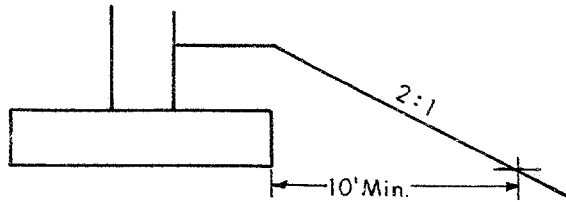
Subject:

SHARON ROAD UNDERPASS
Hwy. 402, Dist. 2, London
W.P. 41-66-11, Bridge Site 19-541

The lowering of the grade by 8 feet as indicated in your letter of May 6, 1975 will remove most of the desiccated crust at this site. This will necessitate the following changes in the foundation recommendations:

The center pier may be supported on a spread footing type of foundation at approximate elevation 870 with a design load of 2 tons per square foot. Total settlement of approximately $1\frac{1}{2}$ inches is anticipated.

The abutments may be supported on spread footings at approximate elevation 881 with a design load of 4 tons per square foot. The front face of the footing must be placed at least 10 feet from the cut slope as shown below.



Total settlement for the abutments is anticipated to be approximately 2 inches.

PETER STUART

for: K. G. SELBY
Supervising Engineer

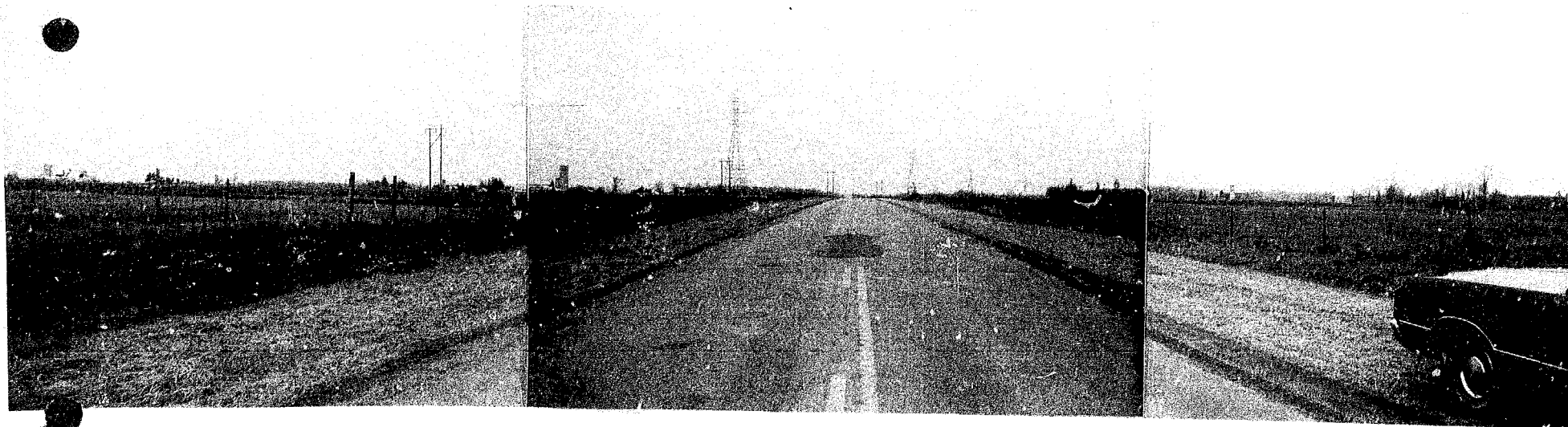
c.c. E. J. Orr
B. R. Davis
B. J. Giroux
G. A. Wrong
A. Wittenberg
J. R. Roy
A. P. Watt
L. E. Walker
R. Hore
J. Anderson)
A. Crowley) memo only
Files ✓
Record Services

W.P. 41-66-11

Sharon Road Underpass

Hwy. 402

Bridge Site 19-541



General View

looking west on Township Road

DOCUMENT VIDEO IMAGE INFORMATION

GEOCRES No. 40114-91

DIST. 2 REGION Southwestern

W.P. No. 41-66-11

CONT. No. 78-66

W. O. No. _____

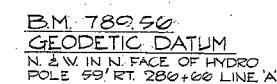
STR. SITE No. 19-541

HWY. No. 402

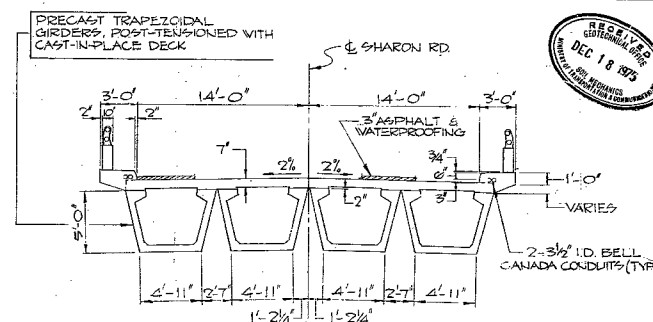
LOCATION Sharon Rd. Underpass

OVERALL DRAWING TO BE INCLUDED IN THE REPORT 3

REMARKS: _____



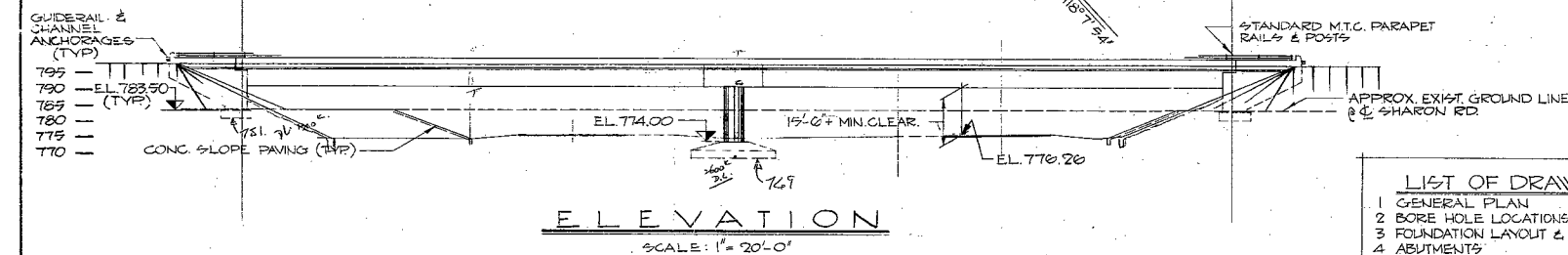
SHEET



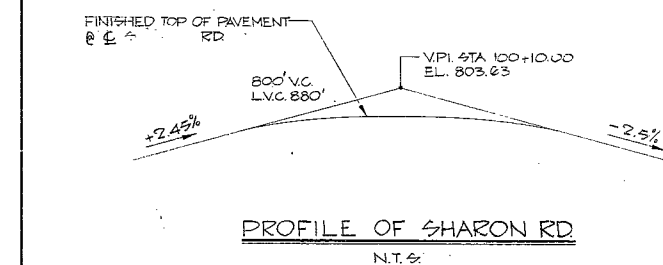
TYP. DECK SECTION
SCALE: $\frac{3}{16}'' = 1'-0''$

NOTES:

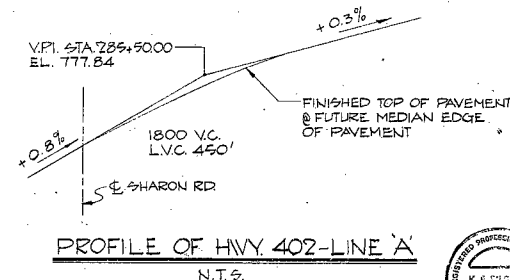
- W.P. DENOTES WORKING POINT.
- T/A. DENOTES TOP OF ASPHALT WEARING SURFACE.



ELEVATION
SCALE: 1" = 20'-0"



PROFILE OF SHARON RD.
N.T.S.



PROFILE OF HWY. 402-LINE 'A'
N.T.S.

LIST OF DRAWINGS

- 1 GENERAL PLAN
- 2 CORE HOLE LOCATIONS & SOIL STRATA
- 3 FOUNDATION LAYOUT & PIER
- 4 ABUTMENT
- 5 GIRDER, CABLE DETAILS & BEARINGS
- 6 GIRDER REINFORCEMENT
- 7 DECK DETAILS & TRANSVERSE CABLES
- 8 DECK REINFORCEMENT & CONST. SEQUENCE
- 9 PARAPET WALL DETAILS
- 10 STEEL PARAPET RAILING
- 11 20 FT. APPROACH SLAB
- 12 DETAILS OF CONC. SLOPE PAVING
- 13 STANDARD DETAILS I
- 14 STANDARD DETAILS II

HIVY. 402 LINE A
CURVE DATA

Δ _____ 5° 33' 14"
 D _____ 0° 15' LT.
 R _____ 22918.31'
 T _____ 1111.05
 L _____ 2221.56
 E _____ 202.94

GENERAL NOTES:

CLASS OF CONCRETE

DECK & CURBS	4500 P.S.I.
PIER COLUMN & PARAPET WALLS	4000 P.S.I.
PRECAST GIRDERS	6000 P.S.I.
REMAINDER	3000 P.S.I.

CLEAR COVER TO REINFORCING STEEL

FOOTINGS, ABUTMENTS, WINGWALLS ————— 3"
PIER COLUMN ————— 2 1/2"
DECK — TOP 2', BOTT. 1 1/2' CURBS 2'
AND/OR AS NOTED ON DWGS.

REINFORCING STEEL GRADE

PRECAST GIRDERS	GRADE	40
DECK SLAB (TRANS) PIER (MAIN REINF.)	GRADE	60
REMAINDER	GRADE	50

CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF $\pm 1/8"$. NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED & GROUTED.

CONCRETE QUANTITIES

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS :

CONCRETE IN PIERS ABUTMENTS & WING WALLS	4000 PSI -	CU YDS
	3000 PSI -	CU YDS
PRESTRESSED CONCRETE BRIDGE DECK		CU YDS
CONCRETE IN PARAPET WALLS		CU YDS
CONCRETE IN APPROACH SLABS		CU YDS
CONCRETE IN SLOPE PAVINGS		CU YDS

FOR REDUCED PLAN

USE SCALE BELOW

0 1 2 3

3 INCHES ON ORIGINAL PLAN

3	REVISIONS						
	DATE	BY	DESCRIPTION				
	DESIGN	K.P.	CHECKER	K.K.	LOADING	H520-44	DATE DEC 1
	DRAWING	T.T.	CHECKER	K.K.	SITE	NO. 10-6A	DWG. 1

