

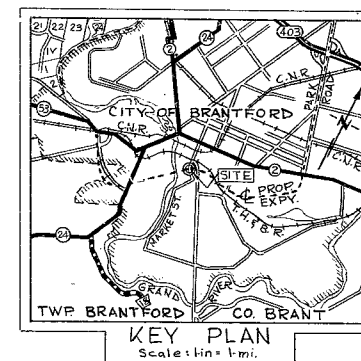
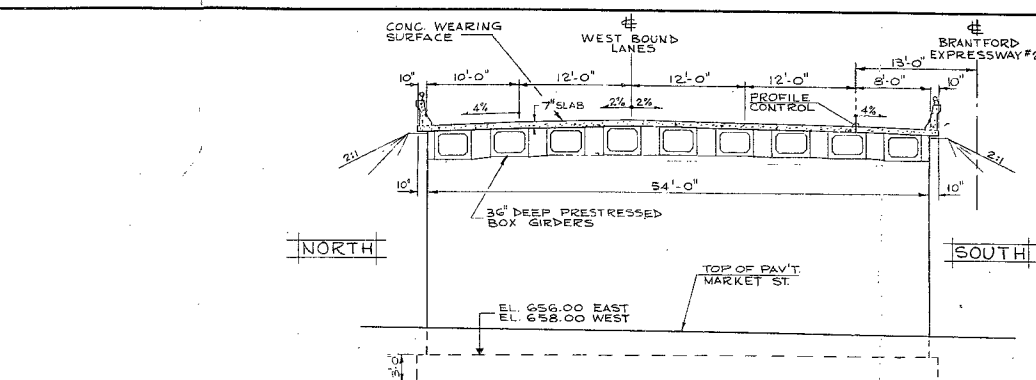
#69-F-116

W.P. 70-68-03

BRANFORD EXPWY. #2

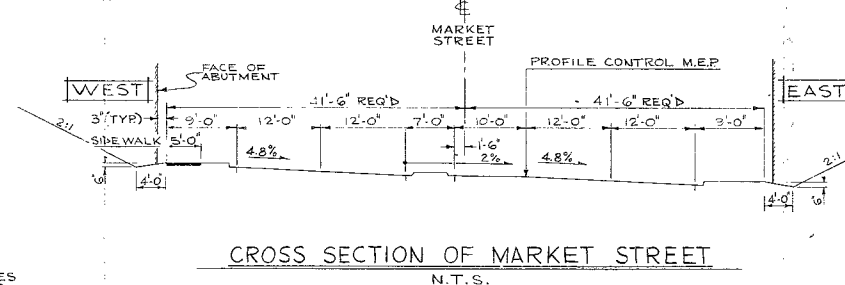
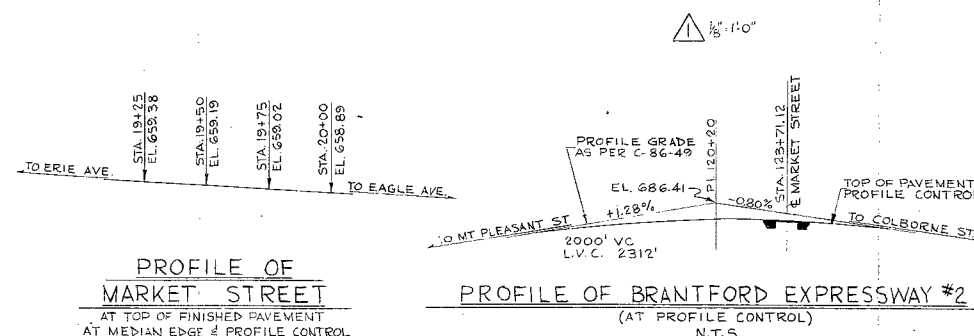
MARKET STREET

OVERPASS.

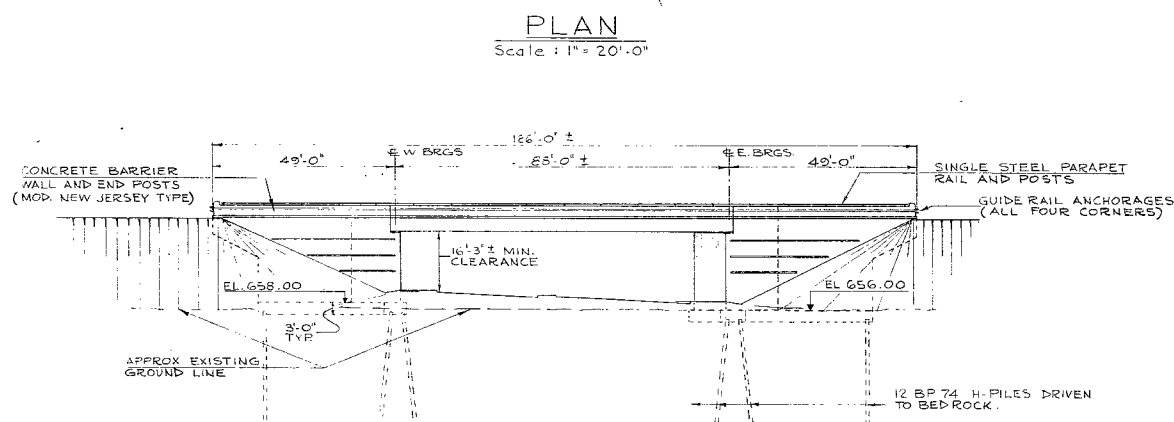


1. CLASS OF CONCRETE
PRECAST MEMBERS ————— 6000 P.S.I.
DECK SLAB & DIAPHRAGMS — 4000 P.S.I.
CONCRETE BARRIER WALL — 4000 P.S.I.
REINFORCER ————— 3000 P.S.I.
2. CLEAR COVER ON REINFORCING STEEL
FOOTINGS & ABUTMENTS ————— 3"
DECK SLAB ————— TOP ————— 1 1/2"
————— BOT. ————— 1"
CONCRETE BARRIER WALL ————— 1 1/2"
APPROACH SLABS ————— 2"
AND/OR AS NOTED ON DRAWINGS
3. CONSTRUCTION NOTES
THE CONTRACTOR IS RESPONSIBLE FOR
FINISHING THE BEARING SEATS DEAD
LEVEL TO THE SPECIFIED ELEVATIONS
WITH A TOLERANCE OF $\pm \frac{1}{8}$ ".

NO CONCRETE SHALL BE PLACED ABOVE
THE ABUTMENT BEARING SEATS UNTIL
THE CONCRETE IN THE DECK HAS BEEN
PLACED.



B.M. ELEV. 655.52
GEODETIC DATUM
CUT '4' ON CONC. FLOOR @ N. END OF GARAGE
DOOR ON WEST SIDE OF PEPSI COLA PLANT
109.0' RT. 121+74

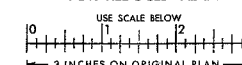


D-6852 - 1 GENERAL LAYOUT
- 2 BORE HOLE LOCATIONS & SOIL STRATA
- 3 SITE LAYOUT & FOOTING LAYOUT PLAN
- 4 FOOTING REINFORCEMENT
- 5 WEST ABUTMENT
- 6 EAST ABUTMENT
- 7 WINGWALLS
- 8 DECK DETAILS
- 9 PRESTRESSED BOX GIRDERS
- 10 APPROACH SLABS
- 11 STANDARD DETAILS
- 12 CONCRETE BARRIER WALL (2'-8" HIGH)
- 13 DETAILS OF 8" HIGH STEEL PARAPET RAILING

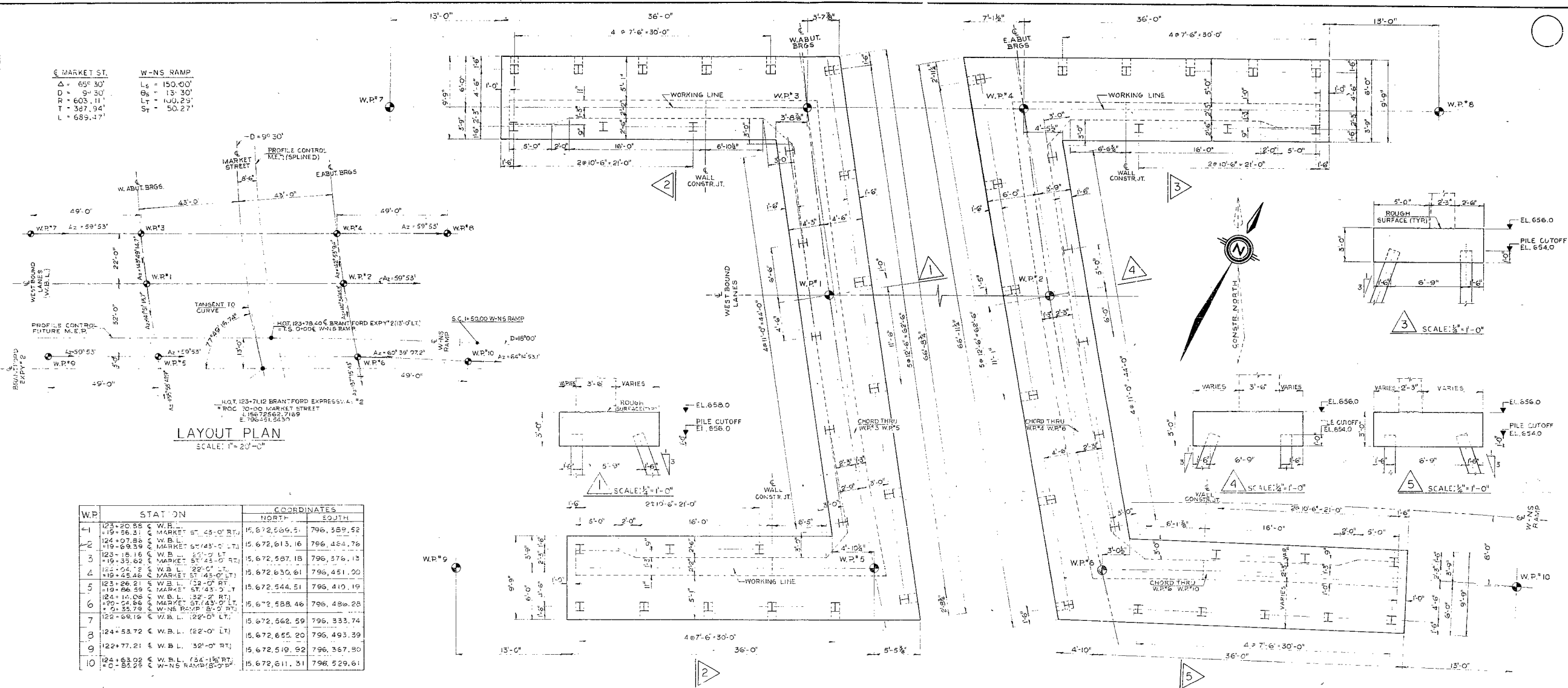
[illegible]

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION			
69-1-16			
<u>MARKET STREET OVERPASS</u> <u>WESTBOUND LANES</u> (CITY OF BRANTFORD)			
KING'S HIGHWAY No. BRANTFORD EXPRESSWAY #2 DIST. No. 4			
CO. OF BRANT			
CITY OF BRANTFORD		LOT	CON.
GENERAL LAYOUT			
APPROVED		SITE No. 1-170	W.P. No. 70-6850
DESIGNED ENGINEER		CONTRACT	
DESIGN G. Z.S.	CHECK K.P.	Nos.	
DRAWING G.F.M.S.	CHECK K. Z.S.	DRAWING No.	
DATE DEC. 70	LOADING 4520-44	D-6852-1	

FOR REDUCED PLAN:



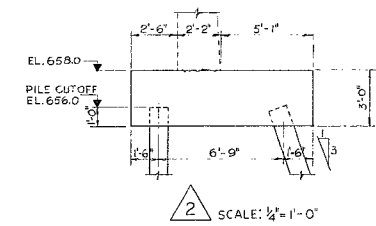
MARKET ST.
 Δ = 65° 30'
 D = 9° 30'
 R = 603.11
 T = 387.94
 L = 689.47
 W-NS RAMP
 L₁ = 150.00'
 L₂ = 13.30'
 L₃ = 100.29'
 ST = 50.27'



W.P.	STATION	COORDINATES	
		NORTH	EAST
1	123+20.55 C.W.B.	15,672,566.51	796,589.52
2	123+26.88 C.W.B.	15,672,613.16	796,484.76
3	123+33.21 C.W.B.	15,672,587.18	796,376.13
4	123+39.54 C.W.B.	15,672,630.61	796,451.00
5	123+45.87 C.W.B.	15,672,544.51	796,410.19
6	123+52.20 C.W.B.	15,672,588.46	796,486.28
7	123+58.53 C.W.B.	15,672,562.59	796,333.74
8	124+04.86 C.W.B.	15,672,655.20	796,493.39
9	124+11.19 C.W.B.	15,672,519.52	796,367.50
10	124+17.52 C.W.B.	15,672,611.31	796,529.61

FOOTING LAYOUT PLAN

SCALE: 1/8" = 1'-0"



W-NS RAMP LAYOUT
N.T.S.

STATION	STATION B	Z1	Z2
123+78.40	0+00.00	8'-10"	8'-10"
123+84.73	0+10.00	8'-10"	8'-10"
123+91.06	0+20.00	8'-10"	8'-10"
124+07.40	0+30.00	8'-10"	8'-10"
124+13.73	0+40.00	8'-10"	8'-10"
124+20.06	0+50.00	8'-10"	8'-10"
124+26.39	0+60.00	8'-10"	8'-10"
124+32.72	0+70.00	8'-10"	8'-10"
124+39.05	0+80.00	8'-10"	8'-10"

PILES SUPPLIED

LOCATION	NO.	LENGTH	BATTER
WEST ABUT.	11	64'-0"	1:5
EAST ABUT.	11	52'-0"	1:3

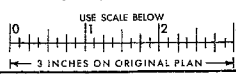
ALL PILES ARE 12 BP 74.
DESIGN LOAD 95 TONS PER PILE.
PILES TO BE DRIVEN TO BEDROCK.

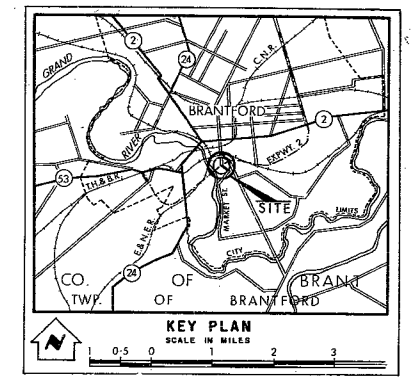
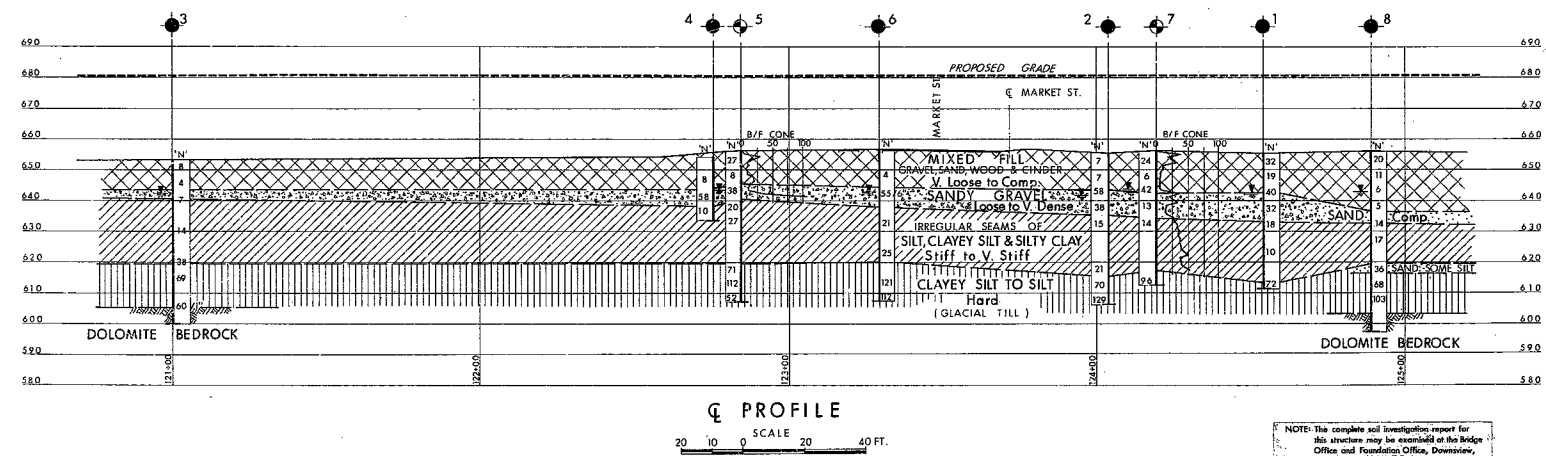
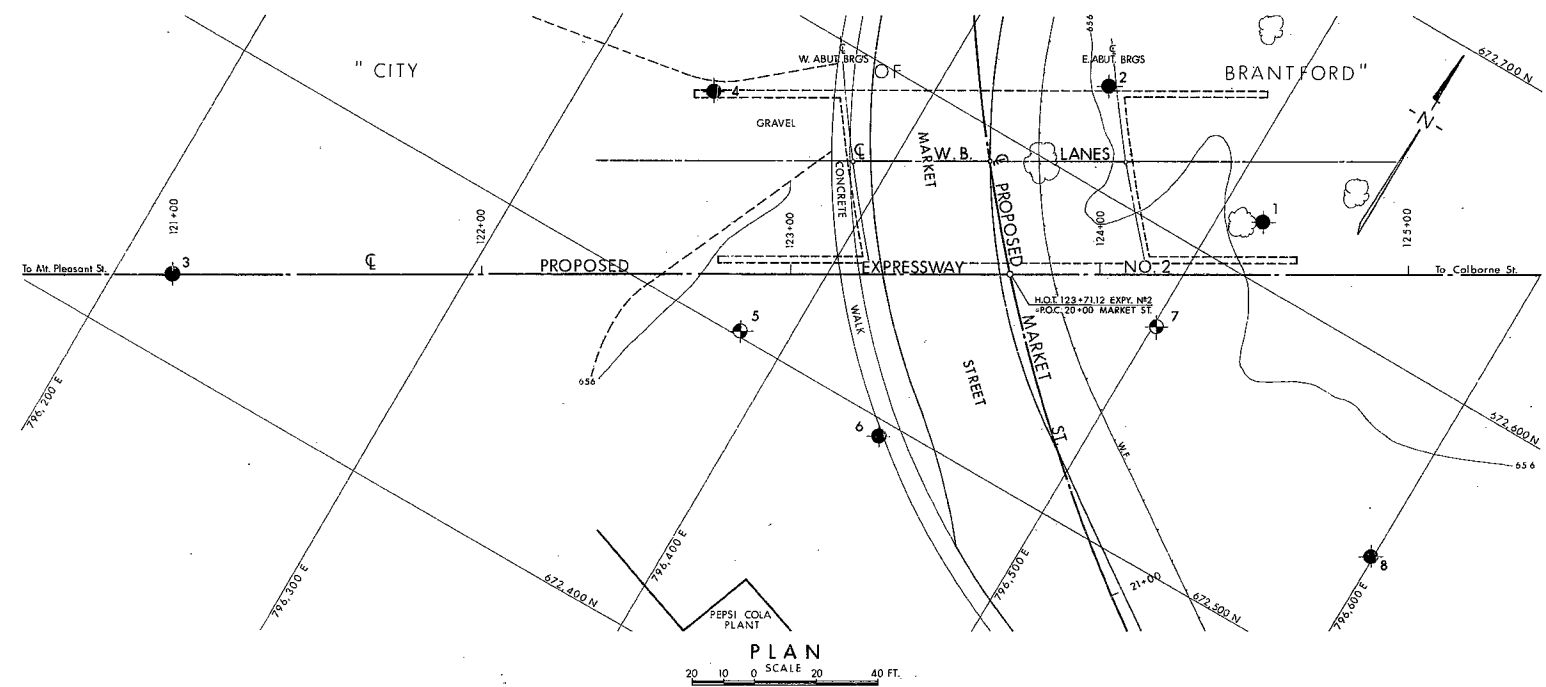
NOTE:
THIS DRAWING TO BE READ
IN CONJUNCTION WITH D-6852-4.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
 BRIDGE OFFICE
MARKET STREET OVERPASS
 (WEST BOUND LANES)
 CITY OF BRANTFORD
 KING'S HIGHWAY No. BRANTFORD EXPRESSWAY*2 DIST. No. 4
 CO. OF BRANT
 CITY OF BRANTFORD LOT CON.
SITE LAYOUT & FOOTING LAYOUT PLAN
 APPROVED: _____ SITE No. 1-170 W.P. No. 70-6803
 DESIGN: R.P. CHECK: K.Z.S. CONTRACT: _____
 DRAWING: ZK CHECK: R.P. DRAWING: _____
 DATE: DEC. 70 LOADING: H520-44 D-6852-3

FOR REDUCED PLAN





LEGEND

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

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	655.8	672,618	796,514
2	655.8	672,631	796,448
3	653.8	672,426	796,217
4	654.7	672,575	796,338
5	656.7	672,502	796,385
6	657.0	672,495	796,441
7	656.2	672,571	796,501
8	656.8	672,542	796,599

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

NO.	DATE	BY	DESCRIPTION

GECCRES N° 40P1-44

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

MARKET STREET

KING'S HIGHWAY NO. EXPRESSWAY 2 DIST. NO. 4
CO. BRANT CITY OF BRANTFORD
TWP. BRANTFORD LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBM. A. B. CHECKED	W.F. NO. 70-68-03	M.T. DRAWING NO.
DRAWN S.O. CHECKED	JOB NO. 69-F-116	69-F-116A
DATE 19 FEB. 1970	SITE NO.	BRIDGE DRAWING NO.
APPROVED	DESIGNER	CONT. NO.

GECCRES N° 40P1-44

NOTE: The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the HAMILTON District Office.

REF. NO. E-4831-1

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. McCorbie

DATE: February 16, 1970

OUR FILE REF.

IN REPLY TO

FEB 27 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Market Street Overpass
On
Brantford Expressway #2
City of Brantford, Ont.
District No. 4 (Hamilton)
W.J. 62-F-116 - W.P. 70-68-03

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 feel free to contact our Office.

AGS/adeF
Attach.

cc: Messrs. B. R. Davis
H. A. Tregaskes
D. W. Farren
W. Zonnenberg
H. Greenland
A. P. Watt (2)
J. Roy
B. A. Singh

Foundations Files ✓
Gen Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

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 3. FIELD AND LABORATORY INVESTIGATIONS.
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 - 4.3) Sand and Sandy Gravels.
 - 4.4) Silts, Clayey Silts and Silty Clays.
 - 4.5) Clayey Silt (Glacial Till).
 - 4.6) Bedrock.
 5. GROUNDWATER CONDITIONS.
 6. DISCUSSION AND RECOMMENDATIONS:
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 - 6.2) Structure Foundations.
 - 6.3) Foundations at the Vicinity of Utilities.
 - 6.4) Approach Embankments.
 7. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Market Street Overpass
On
Brantford Expressway #2
City of Brantford, Ont.
District No. 4 (Hamilton)
W.J. 69-F-116 - W.P. 70-68-03

1. INTRODUCTION:

In a memo dated December 3, 1969, Mr. A. P. Watt, Regional Bridge Planning Engineer, Southwestern Region, requested a foundation investigation at the site of the Market Street overpass of the proposed Brantford Expressway #2.

A preliminary foundation investigation had already been carried out along the proposed expressway in 1963, the results of which were reported under the job number W.J. 68-F-64. At that time, however, only one borehole was placed at this crossing, and even this boring was rather far from the proposed footing locations. In view of this, the preliminary boring is not incorporated in this report.

In the following paragraphs a description of the site and soil conditions is given, together with recommendations for the structure foundations and approach embankment stability.

2. DESCRIPTION OF THE SITE:

The site of the proposed crossing is flat. At Market St. the centre-line of the future expressway crosses vacant lands and a baseball field. Numerous underground utilities are located near the future footings - i.e., gas lines, storm and sanitary sewers and a watermain.

Geologically the area lies somewhere at the border of the physiographic regions known as the "Norfolk Sand Plain" and the "Horseshoe Moraines". The beds of silts and sands are

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

considered to be deltaic in glacial lakes Whittlesey and Warren. The varved silts and clayey silts were also deposited by Lake Warren during a recession of the Wisconsin glacier.

3. FIELD AND LABORATORY INVESTIGATIONS:

A total of 8 boreholes and one cone penetration test was carried out at the proposed footing locations, as shown on Drawing #69-F-116A. The estimated soil stratigraphy is based on the boreholes.

The overburden was penetrated by means of a continuous hollow stem auger, while bedrock was proved by using a conventional diamond drill. Split-spoon and "undisturbed" Shelby tube samples were taken at regular intervals. The split-spoon sampler was advanced by performing standard penetration tests. Penetration 'N' values (blows per ft.) were recorded on the attached borelog sheets, together with the laboratory test results.

Upon arrival in the laboratory, each soil sample was visually examined and identified. Laboratory tests were performed for further identification purposes and, also, to determine the undrained shear strength and consolidation characteristics of the cohesive deposits.

4. SOIL CONDITIONS:

4.1) General:

The overburden at the proposed crossing was found to consist of layers of organic and mixed fill, followed by sandy gravel, irregular seams of silt, clayey silt and silty clay, and by clayey silt glacial till. Dolomite bedrock underlies the approx. 50-ft. thick overburden.

A brief description of the various layers follows.

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

4.2) Mixed Fill:

The uppermost layer at every borehole location was found to be a recently deposited mixed fill. The main component of the fill is cinders, but various other waste and organic materials were also noted. The depth of the fill ranges from 10 ft. to 20 ft., the relative density from very loose to compact. On account of the organic content and of the lack of compaction, this upper layer has no engineering value.

4.3) Sand and Sandy Gravels:

Underlying the fill a granular stratum of sand and sandy gravel was encountered, having a thickness of 3 ft. to 9 ft. The relative density of the deposit varies between compact and very dense, corresponding to penetration 'N' values of 14 blows per ft. to 60 blows per ft. Laboratory grain-size analyses revealed that the layer had very little fines, averaging roughly 4% - 7% of silt and clay size grains. The amount of gravel size particles ranges from 28% to 66%, rendering the material rather coarse and permeable.

4.4) Silts, Clayey Silts and Silty Clays:

Between El. 633 ft. and 640 ft. a cohesive deposit was observed, extending to El. 614 ft. - 620 ft., a total thickness of 15 ft. - 20 ft. The material is stratified in a somewhat random order. Within the stratum irregular seams of silts, clayey silts and silty clays were recorded. The various seams are grey, grayish-brown and red; the thickness of the seams ranges from 1/16 of an inch to several inches. Atterberg limit tests carried out on individual seams resulted in average values as listed in the following table:

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

4.4) Silts, Clayey Silts and Silty Clays: (cont'd.) ...

Average Atterberg Limits	Clayey Silt	Silty Clay
	Seams	
Plastic Limit (W_p)	18	22
Liquid Limit (W_L)	23	44

Laboratory unconfined compression and quick triaxial tests were performed in order to obtain values of undrained shear strengths of the overall deposit. Due to the erratic stratification, shear strengths were rather scattered. For estimating purposes an undrained shear strength of 1500 PSF was assigned along the full depth of this deposit, with an average bulk density of $\gamma = 125$ PCF.

At the location of the east abutment (B.H. #3) a three-ft. thick layer of sand with some silt was found, following the stratified deposit. This granular layer was not observed in the rest of the boreholes.

4.5) Clayey Silt (Glacial Till):

At around El. 614 ft. - 620 ft. a grey clayey silt deposit was encountered. The hard consistency - corresponding to penetration resistances of 60 blows per ft. and over - is indicative of the glacial origin of this material. The average plastic limit of the till may be taken to be 15%; the liquid limit 22%, with natural moisture contents usually below the plastic limits. The overall thickness of the stratum ranges from 10 ft. to 15 ft.

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

4.6) Bedrock:

Bedrock was hit at El. 603.3 ft. in Borehole #8 at the proposed east abutment, and at El. 605.4 ft. in Borehole #3, below the proposed west approach fill. A 5 - 6 ft. depth of rock was proved by means of diamond drilling, using an AXT size core barrel. The drilling yielded some 80 - 90% rock core recovery, which was identified to be sound dolomite of the Lockport formation.

5. GROUNDWATER CONDITIONS:

The groundwater level was established at El. 642 - 643 ft., within the fill or within the sandy gravel material. It is assumed that the depth of the water table at this crossing is a function of the Grand River level, thus will fluctuate according to the elevation of the river.

A second perched water level was noted in Borehole #8 at El. 629 ft. within the sand layer. No artesian condition existed during the time of the field investigation.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct 3-span twin structures for the Market St. overpass of the Brantford Expressway. From the plan and profile, it seems likely that spill-through type abutments are contemplated.

Subsoils at the site consist of an approx. 50-ft. thick overburden of fill, sandy gravel and clayey silt, underlain by dolomite bedrock.

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

6.2) Structure Foundations:

a) Piers:

Piers might be supported on spread footings within or right above the sandy gravel layer. If this type of foundation is adopted, it is suggested that the bottom of the footings be placed at El. 643.5 ft., at which elevation safe design loads of 2 TSK may be used. Such footings will be just above the normal groundwater level, and the excavations could be achieved in the dry. In the case of high water level of the Grand River, however, the excavation bottoms might be below the groundwater. In this event, a dewatering scheme will be necessary in order to prevent the excavation bottoms from 'boiling'. The most economical dewatering may be the one utilizing interlocking sheet piles, driven to a depth below the bottom of the excavations equal to or greater than the head of water above it.

One - two inches of settlement might occur under the spread footings over a long-term period, on account of the compressible nature of the laminated clayey silts.

Placing the footings higher than El. 643.5 ft. is not recommended in view of the loose relative density and the unpredictable engineering behavior of the partly contaminated mixed fill.

Piers may also be supported on end-bearing piles driven to refusal on bedrock. Bedrock was established at El. 603.3 ft. at the location of the proposed east abutment, and at El. 605.4 ft. at the west approach fill. Refusal of pile driving may be obtained, therefore, between El. 603 ft. and 605.5 ft. Either steel H- or steel tubular piles may be employed, utilizing the full structural strength of the particular piles, provided they are driven to refusal on bedrock. In adopting piled foundations the pile caps should be placed at some four ft. below finished ground level

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

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

a) Piers: (cont'd.) ...

for effective frost protection. It will be advantageous to place a concrete working slab or granular pad under the pile caps on account of the loose organic fill.

b) Abutments:

Piled foundations are suggested for the abutments, piles being driven to refusal on sound bedrock. In the case of constructing perched abutments, pile caps may be formed within the approach fill, which, at the abutment locations, should be devoid of bouldery material. Comments given in the foregoing paragraph for the piers supported on piles, are also applicable for the abutment footings.

6.3) Foundations at the Vicinity of Utilities:

As was mentioned earlier, several underground utilities exist near the proposed footings.

Where piles are to be driven adjacent to existing utilities, special precautions must be taken to ensure that no damage results. We suggest that the following procedure be adopted:

a) Where piles will be 12 ft. or more from the edge of a utility, no special precaution need be taken.

b) All piles closer than 12 ft. from the utility should be prebored to a depth of 6 ft. below the pipe bottom. The size of the augered hole need only be slightly larger than the pile section.

c) Where holes are augered in non-cohesive subsoil, casing may be required to prevent the hole from caving in.

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

6.4) Approach Embankments:

According to the proposed grade of the expressway, approach embankments will be roughly 25 - 26 ft. high. The shear strength of the cohesive layers indicates that no stability problems will be experienced under such embankments, provided they are built with slopes of 2 horizontal to 1 vertical. Settlements will, however, occur under the imposed embankment loads. Settlements, due to the compression of the granular layers, will take place during construction. Further long-term settlements will occur on account of the consolidation of the cohesive layers. The latter portion of the settlements is estimated to be 3 - 6".

It is suggested that the organic fill material be removed and replaced by acceptable soils under the approach embankments. The extent of the organic matter should be determined by the Soil Section, during the course of the regular soils investigation.

7. MISCELLANEOUS:

The field work was carried out during the period December 16, 1969 - January 8, 1970.

Equipment used was owned and operated by P.V.Kruistum, Drilling Co. Ltd.

The supervision and the preparation of this report were undertaken by Mr. A. K. Barsvary, Senior Foundation Engineer. Mr. K. G. Selby, Supervising Foundation Engineer, reviewed the report.

February, 1970

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-P-116

LOCATION Co-ords 672,618 N; 796,514 E.

ORIGINATED BY AKB

W.P. 70-68-03

BORING DATE Jan. 8, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE Auger

CHECKED BY

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		SUN Y DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOW/FT	ELEV	BLOW/FT	PLASTIC LIMIT		
655.8	Ground Level						WATER CONTENT %		
							10 20 30		
0.0	Cinder & mixed fill	1	SS	32					
	Compact to dense				650				
	Black & Brown	2	SS	19					
642.8	Sandy gravel	3	SS	40					54 39 (7)
13.0	Traces of silt	4	SS	32					28 66 (6)
	Dense								
633.3	Clayey silt with seams	5	SS	18					
22.5	of silt & silty clay				630				
	Firm. Grey & Red	6	SS	10					
					620				
613.8	Clayey silt (Till)	7	SS	72					
44.0	End of Borehole								

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-116	LOCATION	Co-ords 672,631 N; 796,448 E.	ORIGINATED BY	AKB
WP 70-68-03	BORING DATE	Jan. 6, 1970	COMPILED BY	AKB
DATUM Geodetic	BOREHOLE TYPE	Auger	CHECKED BY	

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. DEPTH	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS
		NUMBER	TYPE		1000	2000	W	P	L		
655.8	Ground Level										
0.0	Cinder & mixed fill	1	SS	7							
	Loose										
	Black & Brown	2	SS	7							
643.3	Sandy gravel	3	SS	58							66 30 (4)
	Traces of silt										
635.3	Dense	4	SS	38							
20.5	Clayey silt, seams of silt & silty clay.	5	SS	15							
	Stiff	6	TW	PH							
	Grey & Red	7	TW	PH							
		8	SS	21							
615.3	Clayey silt. Hard	9	SS	70							
	(Glacial Till)										
606.8		10	SS	129							
49.0	End of Borehole										

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 69-F-116

LOCATION

Co-ords 672,426 N; 796,217 E.

ORIGINATED BY

AKB

WP 70-68-03

BORING DATE

January 7, 1970

COMPILED BY

AKB

DATUM Geodetic

BOREHOLE TYPE

Auger & Diamond Drilling

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			BULK DENSITY PCF	REMARKS	
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE		SHEAR STRENGTH (PSF)		WATER CONTENT %					
653.8	Ground Level				1000	2000		10	20	30		GR, SA, SI, CL
0.0	Cinders & mixed fill	1	SS	8	650							
	Loose											
643.8	Black & Brown	2	SS	4								
10.0	Sandy gravel											
640.3	Loose	3	SS	7	640							
13.5	Irregular seams of silt, clayey silt & silty clay	4	TW	PH							129	
	Stiff to very stiff	5	SS	14	630							
	Grey & Red	6	TW	PH		3800					136	
619.8		7	SS	38	620							
34.0	Clayey silt											
	Hard. Greyish Brown	8	SS	69								
	(Glacial Till)				610							
605.4		9	SS	60 1/2"								
48.4	Dolomite											
	Bedrock	10	RC	80%								
600.0												
23.8	End of Borehole											

DEPARTMENT OF HIGHWAYS - ONTARIO		RECORD OF BOREHOLE No. 4		FOUNDATION SECTION	
MATERIALS & TESTING OFFICE					
JOB 69-F-116	LOCATION	Co-ords 672,575 N; 796,338 E.		ORIGINATED BY AKB	
W.P. 70-68-03	BORING DATE	Dec. 19, 1969		COMPILED BY AKE	
DATUM Geodetic	BOREHOLE TYPE	Auger		CHECKED BY	

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH	W. %	P. %	W. %		
654.7	Ground Level										
0.0	Cinder, gravel, refuse, mixed fill										
	Loose										
643.7		1	SS		8						
11.0	Sandy gravel										
638.7	Very dense	2	SS		58						
16.0	Irregular seams of silt & clayey silt.										
633.7	Stiff	3	SS		10						
		4	TW		PM						
21.0	End of Borehole										

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 69-F-116

LOCATION

Co-ords. 672,502 N; 796,385 E.

ORIGINATED BY

AKB

W.P. 70-68-03

BORING DATE

Dec. 16 - 17, 1969

COMPILED BY

AKB

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

AKB

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	PIPE	BOREHOLE TYPE	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS FOOT					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			REMARKS
						20	40	60	80	100	10	20	30	
656.7	Ground Level													
0.0	Gravelly sand, Backfill of sewer Loose to compact	1	SS	27										27 61 (12)
645.7		2	SS	8										
11.0	Sandy gravel Dense	3	SS	38										
640.2		4	SS	20										
16.5	Irregular seams of silt, clayey silt & silty clay. Stiff to very stiff	5	SS	27										
		6	TW	PH										122 121
619.9	Grey & Red	7	TW	PH										136 138
36.8	Clayey silt Greyish Brown Hard	8	SS	71										
		9	SS	112										
607.2	(Glacial Till	10	SS	52										
49.5	End of Borehole													

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-F-116

LOCATION

Co-ords. 672,495 N; 796,441 E.

ORIGINATED BY

AKB

W.P. 70-68-03

BORING DATE

December 18, 1969

COMPILED BY

AKB

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT	FEET SCALE	PLASTIC LIMIT	WATER CONTENT		
						WATER CONTENT %			
						10 20 30			
657.0	Ground Level								
0.0	Mixed fill of gravel, sand, wood, cinder.								
	Very loose	1	SS	4	650				
644.5	Black & Brown								
12.5	Sandy gravel	2	SS	55/6"	640				
	Very dense								
638.0									
19.0	Irregular seams of silt, clayey silt & silty clay.	3	SS	21	630				
	Stiff to very stiff								
	Grey & Red	4	TV	21					
620.0		5	SS	25	620				
37.0	Clayey silt to silt.								
	Hard. Greyish Brown	6	SS	121	610				
	(Glacial Till)								
607.5		7	SS	112					
49.5	End of Borehole								

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 69-F-116

LOCATION

Co-ords. 672,571 N; 796,501 E.

ORIGINATED BY AKB

W.P. 10-68-03

BORING DATE

Jan. 7 - 8, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE

Auger

CHECKED BY

SOIL PROFILE		SAMPLE		DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	20	40	60	80	100	WATER CONTENT %				
656.2	Ground Level												
0.0	Cinder & mixed fill.	1	SS	24									20 58 (22)
	Loose to compact	2	SS	6									
642.2		3	SS	42									
14.0	Sandy gravel	4	SS	13									
	Compact to dense												
634.2		5	SS	14									
22.0	Irregular seams of silt, clayey silt & silty clay.	6	TW	PH									126
	Stiff	7	TW	PR									123
	Gray & Red												
617.2		8	TW	PH									129
39.0	Silt to clayey silt.												133
	Hard. (Glacial Till)												
612.2		9	SS	96									
44.0	End of Borehole												

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 69-F-116

LOCATION

Co-ords. 672,542 N; 796,599 E.

ORIGINATED BY AKB

W.P. 70-68-03

BORING DATE

Jan. 5 - 7, 1970

COMPILED BY AKB

DATUM Geodetic

BOREHOLE TYPE

Auger & Diamond Drilling

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT	LIQUID LIMIT ——— * _L PLASTIC LIMIT ——— * _p WATER CONTENT ——— w		BULK DENSITY Y P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE			SHEAR STRENGTH P.S.F.				WATER CONTENT %
					1000	2000	10	20	30	
656.8	Ground Level									GR, SA, SI, CL
0.0										
	Cinder & mixed fill	1	SS	20						
		2	SS	11						
	Loose black & brown	3	SS	6						
636.8		4	SS	5						
20.0	Medium sand									
633.0	Compact	5	SS	14						0 96 (4)
23.8	Irregular seams of silt, clayey silt & silty clay. Stiff.	6	SS	17						
	Grey & Red	7	TW	PH						120 123
619.8										0 86 (14)
37.0	Sand with some silt.	8	SS	36						
616.8										
40.0	Clayey silt	9	SS	68						
	Hard. Greyish Brown									
	(Glacial Till)	10	SS	103						
603.3										
53.5	Dolomite	11	RC	90%						
597.3	Bedrock									
59.5	End of Borehole									

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TYPE OF SAMPLE

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

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	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
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

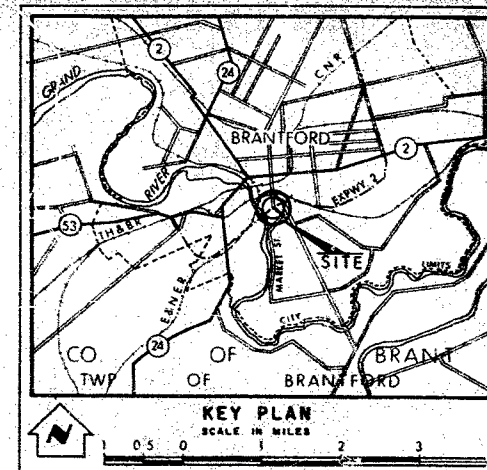
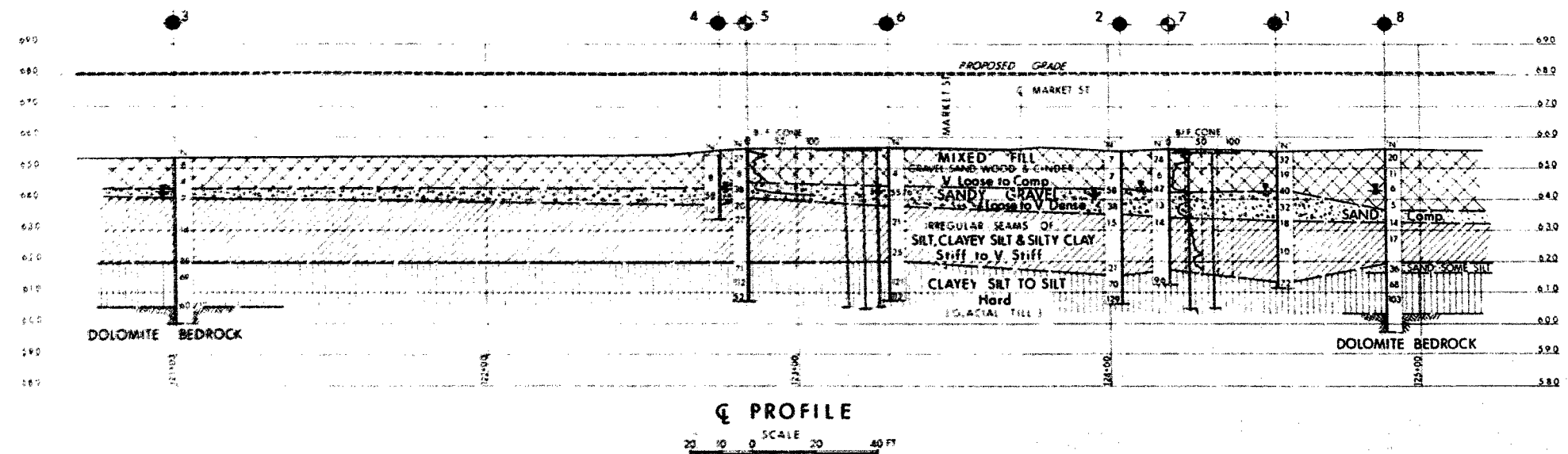
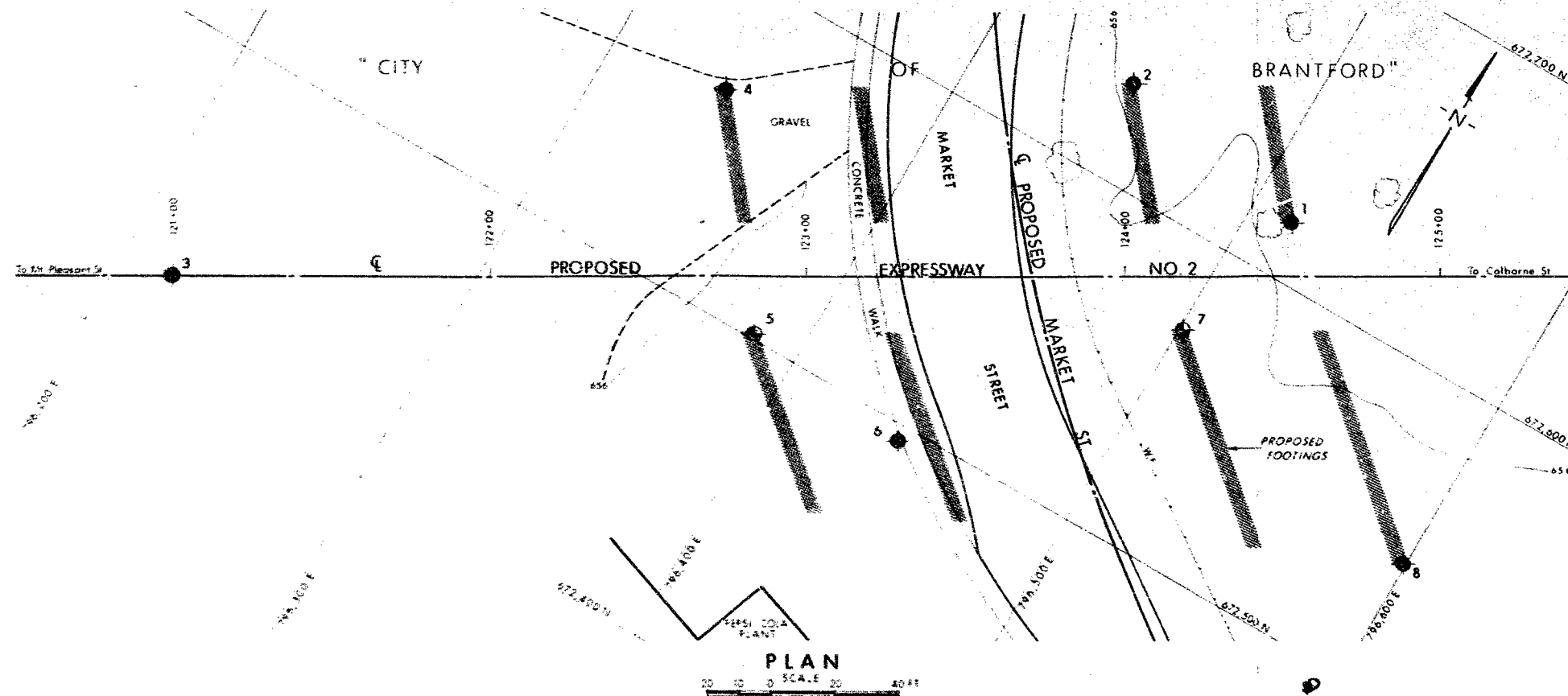
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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
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, JAN 1970		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	655.8	672,618	796,514
2	655.8	672,631	796,448
3	653.8	672,426	796,217
4	654.7	672,575	796,338
5	656.7	672,502	796,385
6	657.0	672,495	796,441
7	656.2	672,571	796,501
8	656.8	672,542	796,599

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

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

MARKET STREET

KING'S HIGHWAY NO. EXPRESSWAY 2 DIST. NO. 4
CO. BRANT CITY OF BRANTFORD
TWP. BRANTFORD LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTAL A. B	CHECKED <i>[Signature]</i>	W.P. NO. 70-68-03	W.S.T. DRAWING NO.
DESIGN S.O.	CHECKED	JOB NO. 69-F-116	69-F-116A
DATE 19 FEB 1970		SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>		CONT. NO.	

SUMMARY OF PILE DRIVING RECORDS

W.O. 69-F-116 W.P. 70-68-03 CONT. 71-77 DIST. 4

SITE MARKET ST. OVERPASS ON BRANTFORD EXPRESSWAY #2

DATE DRIVEN SEP 2-9/71 WEIGHT OF ANVIL 1100 lb

HAMMER TYPE DELMAR D-22 WEIGHT 10755 lb ENERGY 39000 FT/lb.

[illegible]

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST. OVERPASS
 CONTRACTOR BERMINGHAM CO LTD DESIGN LOAD OF PILE 95 TON
 HAMMER DETAILS: TYPE DELMAG D-22 WEIGHT 10755 HEIGHT OF FALL OR ENERGY 39000 FT LBS
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP 1100
 PILE DETAILS H PILE 12BP74 VERTICAL PILE
 PILE NO. 5 LOCATION WEST ABT MARKET ST. OVERPASS DATE DRIVEN SEPT 9/71

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'	1	1	30'	26	15	54'	51	36	BED ROCK	76	
	2	2		27	13		52			77	
	3	3		28	12		53			78	
	4	4		29	11		54			79	
	5	5		30	12		55			80	
	6	3	54'	31	11		56			81	
	7	5		32	11		57			82	
	8	7		33	11		58			83	
	9	9		34	12		59			84	
	10	7		35	12		60			85	
	11	4		36	13		61			86	
	12	10		37	17		62			87	
	13	12		38	23		63			88	
	14	16		39	25		64			89	
	15	14		40	29		65			90	
	16	12		41	29		66			91	
	17	10		42	31		67			92	
	18	8		43	34		68			93	
	19	10		44	33		69			94	
	20	11		45	35		70			95	
	21	10		46	39		71			96	
	22	11		47	39		72			97	
	23	12		48	39		73			98	
	24	13		49	43		74			99	
	25	13		50	45		75			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	51.167			FINAL CUT OFF ELEVATION 656.00		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED G. McKenzie
 NAME (PRINT) G. MCKENZIE
 DATE SEPT 9/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

656.0
 51.2
 604.8

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

CONTRACT NO. _____ DISTRICT NO. _____
 CONTRACTOR'S NAME _____
 TYPE OF PILE _____
 TYPE OF SOIL _____
 PILE DETAILS _____
 PILE NO. _____

PILE NO.	TYPE OF PILE	TYPE OF SOIL	PILE DETAILS	PILE NO.	TYPE OF PILE	TYPE OF SOIL	PILE DETAILS
1	STEEL TUBE	CLAY	12" x 1/2"	1	STEEL TUBE	CLAY	12" x 1/2"
2	STEEL TUBE	CLAY	12" x 1/2"	2	STEEL TUBE	CLAY	12" x 1/2"
3	STEEL TUBE	CLAY	12" x 1/2"	3	STEEL TUBE	CLAY	12" x 1/2"
4	STEEL TUBE	CLAY	12" x 1/2"	4	STEEL TUBE	CLAY	12" x 1/2"
5	STEEL TUBE	CLAY	12" x 1/2"	5	STEEL TUBE	CLAY	12" x 1/2"
6	STEEL TUBE	CLAY	12" x 1/2"	6	STEEL TUBE	CLAY	12" x 1/2"
7	STEEL TUBE	CLAY	12" x 1/2"	7	STEEL TUBE	CLAY	12" x 1/2"
8	STEEL TUBE	CLAY	12" x 1/2"	8	STEEL TUBE	CLAY	12" x 1/2"
9	STEEL TUBE	CLAY	12" x 1/2"	9	STEEL TUBE	CLAY	12" x 1/2"
10	STEEL TUBE	CLAY	12" x 1/2"	10	STEEL TUBE	CLAY	12" x 1/2"

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. 12" O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12" x 1/2" 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.

RECORD OF PILE DRIVING

DATE OF RECORDING

NAME OF ENGINEER

NAME OF SURVEYOR

NAME OF ASSISTANT

NAME OF DRIVER

NAME OF ASSISTANT

NAME OF DRIVER

NAME OF ASSISTANT

NAME OF DRIVER

NAME OF ASSISTANT

OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTIONWP 70-68-03
NO 69-F-116

BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST OVERPASS
 CONTRACTOR BIRMINGHAM CO. LTD. DESIGN LOAD OF PILE 95 T.
 HAMMER DETAILS: TYPE DELMAR D-22 WEIGHT 10755 HEIGHT OF FALL OR ENERGY 39000 FT. LBS.
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP 1100
 PILE DETAILS H PILE 12BP74 RATTER 1:3
 PILE NO. 25 LOCATION WEST ABT MARKET ST OVERPASS DATE DRIVEN SEPT 8/31

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'	1	1	30'	26	15	57'	31	52		76	
	2	2		27	13		32	53		77	
	3	3		28	13		33	55		78	
	4	4		29	14		34	55	14	RED ROCK	79
	5	5		30	14		35	55		80	
	6	5	57'	31	13		36	56		81	
	7	5		32	13		37	57		82	
	8	5		33	13		38	58		83	
	9	5		34	14		39	59		84	
	10	6		35	14		40	60		85	
	11	5		36	15		41	61		86	
	12	5		37	13		42	62		87	
	13	13		38	13		43	63		88	
	14	15		39	14		44	64		89	
	15	16		40	16		45	65		90	
	16	12		41	21		46	66		91	
	17	9		42	26		47	67		92	
	18	10		43	31		48	68		93	
	19	11		44	32		49	69		94	
	20	12		45	33		50	70		95	
	21	13		46	36		51	71		96	
	22	12		47	38		52	72		97	
	23	14		48	40		53	73		98	
	24	13		49	43		54	74		99	
	25	15		50	50		55	75		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	54.375			FINAL CUT OFF ELEVATION		
				556.00		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED [Signature]
 NAME (PRINT) G. MCKENZIE
 DATE SEPT 8/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

556.0
 54.4
 501.6
 556.0
 52.5
 503.5

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 71-77
STRUCTURE A-1000
DESIGN LOAD OF 120 TONS
CONTRACTOR
HAMMER DETAILS TYPE OF ANVIL OR CAP
PILE DETAILS

PILE NO.	LOCATION	TYPE	SIZE	WEIGHT	TYPE OF ANVIL OR CAP	TYPE OF HAMMER	TYPE OF DRIVE	TYPE OF SOIL	TYPE OF PILE	TYPE OF SHOE	TYPE OF SLOPE	TYPE OF BATTER	TYPE OF PENETRATION	TYPE OF RECORD	TYPE OF MEASUREMENT	TYPE OF REBOUND	TYPE OF FINAL CUT	TYPE OF ELEVATION	TYPE OF PENETRATION	TYPE OF RECORD	TYPE OF MEASUREMENT	TYPE OF REBOUND	TYPE OF FINAL CUT	TYPE OF ELEVATION
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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.

File Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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.

OVER

WP 70-68-03
WO 69-F-116

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST. OVERPASS
 CONTRACTOR BERMINGHAM CO. LTD. DESIGN LOAD OF PILE 95 T.
 HAMMER DETAILS: TYPE DELMAG D-22 WEIGHT 10755 HEIGHT OF FALL OR ENERGY 3900 FT. LBS
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP 1100
 PILE DETAILS H PILE 12BP74 VERTICAL
 PILE NO. 26 LOCATION WEST ABUT MARKET ST. OVERPASS DATE DRIVEN SEPT 9/71

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'	1	1	30'	26	8	54'	51	21	Bedrock	76	
	2	2		27	8		52			77	
	3	3		28	8		53			78	
	4	4		29	9		54			79	
	5	2	54'	30	10		55			80	
	6	3		31	10		56			81	
	7	1		32	10		57			82	
	8	2		33	10		58			83	
	9	3		34	11		59			84	
	10	3		35	11		60			85	
	11	2		36	11		61			86	
	12	7		37	13		62			87	
	13	10		38	20		63			88	
	14	9		39	22		64			89	
	15	9		40	26		65			90	
	16	6		41	27		66			91	
	17	4		42	29		67			92	
	18	5		43	34		68			93	
	19	6		44	32		69			94	
	20	7		45	37		70			95	
	21	6		46	38		71			96	
	22	6		47	43		72			97	
	23	7		48	47		73			98	
	24	9		49	52		74			99	
	25	9		50	54		75			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 <u>51.583</u>	FINAL CUT OFF ELEVATION <u>656.00</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED JE McKenzie
 NAME (PRINT) JE MCKENZIE
 DATE SEPT 9/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

656.0

51.6

604.4

[illegible]

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.

File Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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.



OVER

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTIONWP 70-68-03
WO 69-F-116

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST. OVERPASS
 CONTRACTOR BERMINGHAM C. LTD DESIGN LOAD OF PILE 95 Ton
 HAMMER DETAILS: TYPE B-225 BIRMINGHAM WEIGHT 6800 HEIGHT OF FALL OR ENERGY 25000 FT LBS
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP 1100
 PILE DETAILS H. PILE 12BP24 RATTER 1:3
 PILE NO. 7 LOCATION EAST ABT MARKET ST OVERPASS DATE DRIVEN AUG 31/71

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'	1	1	30'	26	18	55'	51	129		76	
	2	3		27	17		52	80	Bedrock	77	
	3	6		28	17		53			78	
	4	9		29	19		54			79	
	5	9		30	24		55			80	
	6	16	55'	31	23		56			81	
	7	13		32	18		57			82	
	8	9		33	20		58			83	
	9	6		34	19		59			84	
	10	4		35	23		60			85	
	11	12		36	25		61			86	
	12	14		37	22		62			87	
	13	14		38	27		63			88	
	14	16		39	32		64			89	
	15	16		40	47		65			90	
	16	13		41	56		66			91	
	17	9		42	64		67			92	
	18	9		43	67		68			93	
	19	12		44	75		69			94	
	20	13		45	80		70			95	
	21	15		46	95		71			96	
	22	15		47	89		72			97	
	23	16		48	93		73			98	
	24	15		49	110		74			99	
	25	16		50	117		75			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 <u>52.167</u>	FINAL CUT OFF ELEVATION <u>654.00</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED G. McKenzie
 NAME (PRINT) G. MCKENZIE
 DATE AUG 31/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

554.0
 52.2
 5010
 1:3
 654.0
 495
 6045

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

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. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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.

OVER

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTIONWD 70-62-03
NO 69-F-116

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST OVERPASS
 CONTRACTOR BERMINGHAM C.LTD DESIGN LOAD OF PILE 95 TON
 HAMMER DETAILS: TYPE DEL MAG D-22 WEIGHT 10755 HEIGHT OF FALL OR ENERGY 39000 FT LBS
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP 1100
 PILE DETAILS H PILE 12 BP 74 BATTER 1:3
 PILE NO. 19 LOCATION EAST ABOUT MARKET ST OVERPASS DATE DRIVEN SEPT 2/71

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'	1	1	30'	20	12	55'	31	80		76	
	2	2		27	13		52	76		77	
	3	4		28	14		53	61 (16) ^{Rock}		78	
	4	5		29	13		54			79	
	5	6		30	12		55			80	
	6	6	55'	31	17		56			81	
	7	7		32	14		57			82	
	8	2		33	14		58			83	
	9	2		34	13		59			84	
	10	2		35	14		60			85	
	11	11		36	14		61			86	
	12	13		37	15		62			87	
	13	14		38	16		63			88	
	14	11		39	19		64			89	
	15	11		40	28		65			90	
	16	12		41	30		66			91	
	17	13		42	40		67			92	
	18	10		43	44		68			93	
	19	10		44	46		69			94	
	20	10		45	43		70			95	
	21	11		46	72		71			96	
	22	10		47	77		72			97	
	23	11		48	80		73			98	
	24	12		49	75		74			99	
	25	12		50	75		75			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	52.833			FINAL CUT OFF ELEVATION 654.00		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED [Signature]
 NAME (PRINT): EMCKENZIE
 DATE SEPT 2/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

554.0
 52.8
 501.2
 654.0
 50.0
 604.0

[illegible]

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

OVER

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS & TESTING DIVISION
FOUNDATION SECTIONWP 70-68-03
NO 69-F 116

BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 71-77 STRUCTURE MARKET ST. OVERPASS
 CONTRACTOR BERMINGHAM CO. LTD. DESIGN LOAD OF PILE 95 TON
 HAMMER DETAILS: TYPE DELMAR D-22 WEIGHT 10755 HEIGHT OF FALL OR ENERGY 39000 FT. LBS
 TYPE OF ANVIL OR CAP H PILE CAP WEIGHT OF ANVIL OR CAP _____
 PILE DETAILS H PILE 12BP74 BATTER 1:3
 PILE NO. 19 LOCATION EAST ABUT MARKET ST. OVERPASS DATE DRIVEN SEPT 2/71

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'	1	1	30'	26	12	55'	51	80		76	
	2	2		27	13		52	76		77	
	3	4		28	14		53	71		78	
	4	5		29	13		54			79	
	5	6		30	12		55			80	
	6	6	55'	31	17		56			81	
	7	7		32	14		57			82	
	8	2		33	14		58			83	
	9	2		34	13		59			84	
	10	2		35	14		60			85	
	11	11		36	14		61			86	
	12	13		37	15		62			87	
	13	13		38	16		63			88	
	14	14		39	19		64			89	
	15	11		40	28		65			90	
	16	11		41	30		66			91	
	17	12		42	40		67			92	
	18	13		43	44		68			93	
	19	10		44	46		69			94	
	20	10		45	63		70			95	
	21	10		46	72		71			96	
	22	10		47	77		72			97	
	23	11		48	80		73			98	
	24	12		49	75		74			99	
	25	12		50	75		75			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	52.833			FINAL CUT OFF ELEVATION		
				654.00		

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED L. D. McKenzie
 NAME (PRINT) G. MCKENZIE
 DATE SEPT 2/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1:3
 554.0
 50.0
 604.0

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 12
 STRUCTURE NO. 12
 DESIGN LOAD OF PILE
 CONTRACTOR'S NAME
 NAME OF PILE
 TYPE OF PILE
 TYPE OF ANVIL OR CAP
 PILE NO.

Notes:-

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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.

Mr. C. Robertson,
District Engineer,
Hamilton.

Selby
Materials and Testing,
London.

Mr. D. Waller.

August 13, 1971.

- Contract 71-77, Brantford South Expressway,
Mt. Pleasant Avenue to Market Street,
District #4.

70-68-21, 22, 23

69-F-116

Last week Mr. T. Davis requested some information re the installation of the settlement plates in the deep fill sections on the above project.

I have discussed this with Mr. K. Selby of the Foundation Section with the following result. The plates will be installed by Materials and Testing, London Region after the surcharge in the above mentioned fills has been placed, i.e. after the rolling surcharge has been completed. These plates will be placed about 3' to 4' into the surcharge fill in pairs about 15' apart (i.e. the plates will be under the area of the proposed asphalt pavement) at 100'+- intervals along the fills. It is requested that the District personnel measure the progress of the settlement at intervals to be decided later.

It would be appreciated that you advise us when the contract is reaching the above surcharge stage so that we can have the settlement plates constructed and available in good time.

I would be pleased to discuss this further with you if you so desire.

J. G. Forster
J. G. FORSTER,
SENIOR SOILS ENGINEER.

JGF:hp.

C.C. - G. A. Wong,
✓ K. Selby,
✓ A. Lapham,
File.

MEMORANDUM

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

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: January 13, 1971

OUR FILE REF.


IN REPLY TO

SUBJECT: Market Street Overpass
(Westbound Lanes)
W.P. 70-68-03, Site No. 1-170
Brantford Expressway, District No. 4

69-F-116

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

15. JAN. 71

NO COMMENTS

A.K.B.

K.L.S.


50/6/71

D-6852-2

MEMORANDUM

69-E-116

TO: Mr. A. G. Stermac,
Princ. Foundation Engineer,
Materials & Testing Office,
Lab Building,
ATTENTION: DOWNSVIEW, Ontario.

FROM: A. P. Watt,
Reg. Bridge Planning Engr.,
London Regional Office.

DATE: December 3rd, 1969.

OUR FILE REF.


IN REPLY TO

SUBJECT:

RE: W.P. 70-68-03, Bridge Site 1-170
Market Street Overpass, Eastbound
and Westbound Lanes, City of
Brantford, Brantford Expressway #2
District #4, Hamilton

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed two copies of the bridge site plan number E-4831-1 with the probable footing locations marked in red.

As the geometrics of the Eastbound Lane Structure and Westbound Lane Structure will be different, the Program Office will be contacted to assign separate work project numbers.



A. P. Watt,
Regional Bridge Planning Engr.,
London.

APW/la
c.c.--S. McCombie
A. Crowley
Encl.

MARCH 4th

40 P1-44

GROCKES No.

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. Hanks,
Sup. Foundation Lab.

From: Chemical Section,
Materials & Testing Office.

ATTENTION:

DATE: January 15, 1970.

OUR FILE REF. 11-7-5

IN REPLY TO

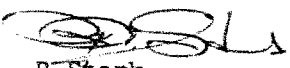
SUBJECT:

Water Sample

At your request a sample of water with the designation Job. No. 69-F-116, B.H. #2, Sample #1, 14 ft. depth, has been completely analyzed. The test results were as follows:

<u>Chem. Lab. No.</u>	70-S-9659
<u>ppm Chloride (Cl^+)</u>	127
<u>ppm Bi-carbonate (HCO_3^+)</u>	716
<u>ppm Carbonate (CO_3^{++})</u>	NIL
<u>ppm Sulphate (SO_3)</u>	97 (Negligible)
<u>ppm Calcium (Ca^{++})</u>	236
<u>ppm Magnesium (MgO)</u>	118
<u>ppm Iron (Fe)</u>	0.4
<u>pH</u>	7.4
<u>Appearance</u>	contained silt

RS/mm
c.c. Files


R. Sterk,
Chemical Engineer.

40 P1-44

CONT 71-077