

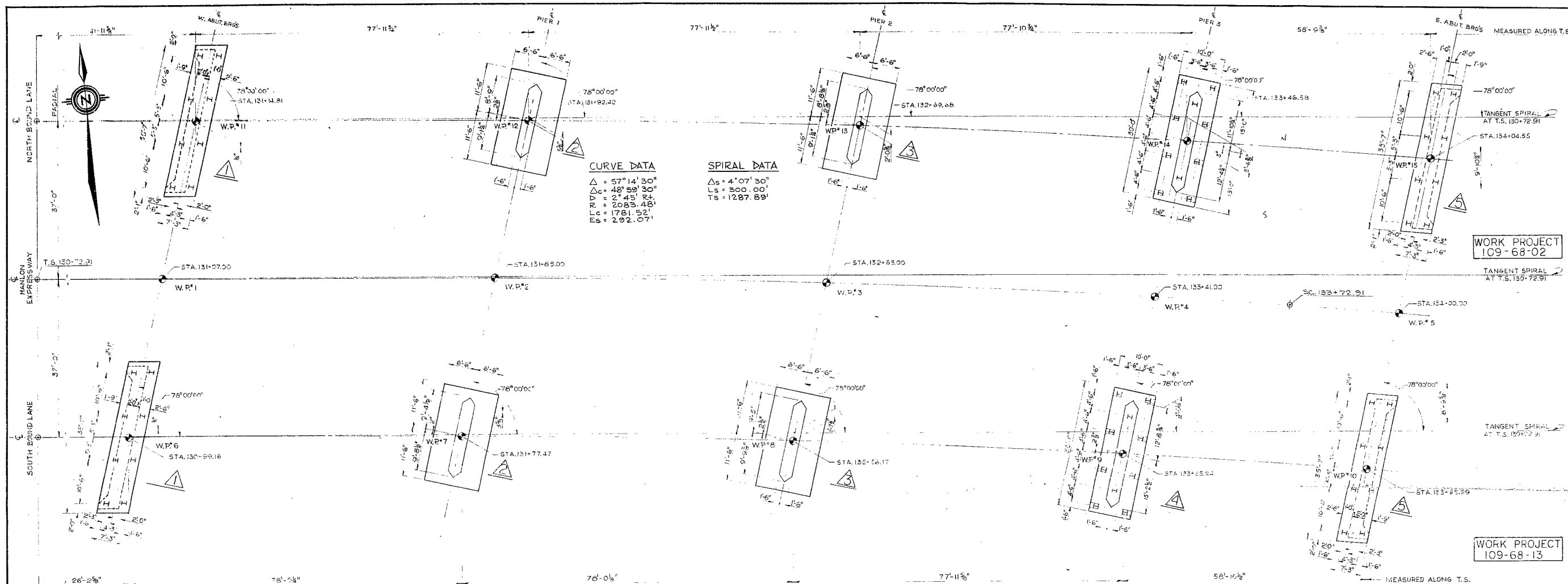
69-F-87

W.P. 109-68-02

HANLON EXPRESSWAY

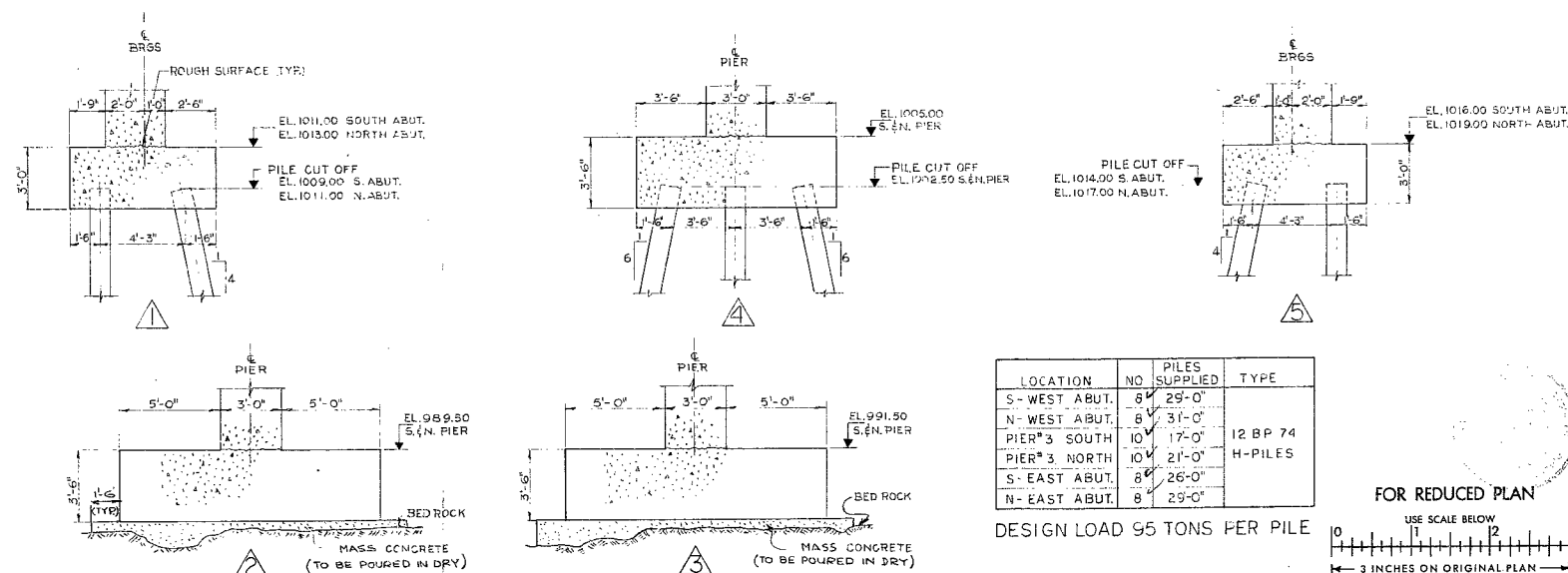
SPEED RIVER BRIDGES

(E.B.L. AND W.B.L.)



FOOTING LAYOUT

| W.P. | STATIONS | CO-ORD'S | |
|------|----------------------------------|---------------|------------|
| | | NORTH | EAST |
| 1 | 131+07.00 @ H.EXP WY | 15,816,328.47 | 798,041.83 |
| 2 | 131+85.00 @ H.EXP WY | 15,816,319.77 | 798,119.35 |
| 3 | 132+63.00 @ H.EXP WY | 15,816,309.99 | 798,196.73 |
| 4 | 133+41.00 @ H.EXP WY | 15,816,298.38 | 798,273.86 |
| 5 | 134+00.00 @ H.EXP WY | 15,816,287.93 | 798,331.92 |
| 6 | 130+99.16 @ H.EXP WY (37'-0" RT) | 15,816,292.52 | 798,030.06 |
| 7 | 131+77.47 @ H.EXP WY (37'-0" RT) | 15,816,283.89 | 798,107.60 |
| 8 | 132+56.17 @ H.EXP WY (37'-0" RT) | 15,816,274.24 | 798,185.02 |
| 9 | 133+35.24 @ H.EXP WY (37'-0" RT) | 15,816,262.80 | 798,262.21 |
| 10 | 133+95.29 @ H.EXP WY (37'-0" RT) | 15,816,252.49 | 798,320.32 |
| 11 | 131+14.81 @ H.EXP WY (37'-0" LT) | 15,816,364.41 | 798,053.60 |
| 12 | 131+92.42 @ H.EXP WY (37'-0" LT) | 15,816,355.64 | 798,131.09 |
| 13 | 132+69.68 @ H.EXP WY (37'-0" LT) | 15,816,345.73 | 798,208.43 |
| 14 | 133+46.58 @ H.EXP WY (37'-0" LT) | 15,816,335.94 | 798,285.51 |
| 15 | 134+04.55 @ H.EXP WY (37'-0" LT) | 15,816,323.36 | 798,343.53 |



SCALE: $\frac{1}{4}" = 1'-0"$ OR AS NOTED.

[illegible]

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

69-F-87

SPEED RIVER BRIDGES

HANLON EXPRESSWAY IN THE CITY OF GUELPH

| | | |
|--------------------------------------|-----------------------------|-------------------|
| KING'S HIGHWAY No. HANLON EXPRESSWAY | | DIST. No. 3 |
| CO. WELLINGTON | BROKEN FRONT LOT 4 DIV. "G" | |
| CITY OF GUELPH | LOT 20 | CON. DIVISION "A" |

FOOTING LAYOUT

| | | | | | | |
|-----------------------------------|-------------|---------|-----------------|--|----------------------|--|
| APPROVED _____ BRIDGE ENGINEER | | | SITE No. 35-404 | | W.F. No. 109-68-02-1 | |
| | | | CONTRACT No. | | DRAWING No. D-6778-3 | |
| DESIGN | JK | CHECK | K.Z.S. | | | |
| DRAWING | ZK | CHECK | JK | | | |
| DATE | AUG 17 1964 | LOADING | H.S. 20 | | | |

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

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

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

ATTENTION: Mr. S. McCombie

DATE: November 28, 1969

OUR FILE REF.

IN REPLY TO DEC 3 1969

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Speed River Bridge
(Eastbound and Westbound Lane)
Hanlon Expressway
City of Guelph
District No. 3 (Stratford)
W.J. 69-F-87 -- W.P. 109-68-02

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

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

AGS/MdeF
Attach.

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

Foundations Files
Gen. Files

A. S. Stermac
A. S. Stermac
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. DESCRIPTION OF THE SITE.
 3. FIELD INVESTIGATION PROCEDURE.
 4. LABORATORY TESTS.
 5. SOIL TYPES AND SOIL CONDITIONS:
 - 5.1) General.
 - 5.2) Gravel with some Sand.
 - 5.3) Fill Material.
 - 5.4) Sandy Silt with traces of Organics and Occasional Gravel.
 - 5.5) Gravel with some Sand and Fines.
 - 5.6) Bedrock.
 6. GROUNDWATER ELEVATIONS.
 7. DISCUSSION AND RECOMMENDATIONS.
 8. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Speed River Bridge
(Eastbound and Westbound Lane)
Hanlon Expressway
City of Guelph
District No. 3 (Stratford)
W.J. 69-F-87 -- W.P. 109-68-02

1. INTRODUCTION:

A request for a foundation investigation at the site of the proposed structure mentioned above, was received from Mr. A. P. Watt, Regional Bridge Planning Engineer, in a memo dated September 9, 1969.

A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the location of the proposed structure. Presented in this report are the results of this investigation, together with recommendations for the future structure foundations.

2. DESCRIPTION OF THE SITE:

The site is located on the outskirts of Guelph, 1/4 mile south-east of the intersection of Silvercreek Parkway and Silvercreek Rd.

The Speed River flows north-south and the proposed crossing runs east-west; at the time of the investigation the river was some 160 ft. wide and 3 ft. deep.

The West bank of the river was only some 2 feet above the river level at the time of the investigation, and the topography rises very slowly. The area can be described as 'waste ground' with occasional patches of bush.

The East bank is initially at the same elevation as the West but, after some 20 feet, it rises sharply 11 feet or so, then follows a gradual upward slope. This sharp rise seems to

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

indicate a fill area as Ontario Hydro have a high voltage line carried on 60-ft. high pylons running along the bank, and the grade was probably raised to prevent flooding.

Again, the area on this side can be described as waste ground with occasional patches of bush, though only 300 feet away, the edge of the quarry belonging to Canadian Gypsum Co. begins.

The West bank has a dirt road running to its edge, from a nearby gravel road; the East bank can be reached by means of the Quarry Access Rd.

3. FIELD INVESTIGATION PROCEDURE:

A total of seventeen boreholes and six dynamic cone penetration tests were carried out during the course of the field work; of the former, eight were undertaken from the raft and nine from land.

Due to the fact that the proposed structure is a 'twin' bridge, and also that there are two suggested schemes:

- (1) spanning the river and the Quarry Access Rd.
- (2) spanning the river, only,

it should be noted that:

B.H.'s 1A & B, 3A & B, 5A & B, and 7A & B, refer to Scheme 1

B.H.'s 1A & B, 2A & B, 4A & B, and 6A & B, refer to Scheme 2

The suffixes 'A' and 'B' denote Westbound and Eastbound lanes, respectively. Suffix 'C' denotes extra boreholes put down for additional information.

Each of the boreholes was undertaken at the locations of the footings apart from B.H. #4B (Scheme #2, East Pier, Eastbound lane) where the exact location could not be reached.

3. FIELD INVESTIGATION PROCEDURE: (cont'd.) ...

Boring was achieved by means of a diamond drill adapted for soil sampling purposes. Samples were recovered using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test.

4. LABORATORY TESTS:

Laboratory tests were carried out on selected samples to determine natural moisture contents and grain-size distribution. The results of these tests are summarized on the Record of Borehole sheets in the Appendix.

5. SOIL TYPES AND SOIL CONDITIONS:

5.1) General:

On the West bank and across the bed of the river, the subsoil consists of gravel with some sand overlying dolomitic limestone bedrock.

On the East bank there exists a fill area consisting of a mixture of clayey silt, sand and gravel overlying a mixture of sand, gravel and silt; this, in turn, overlies original ground. The subsoil in this area consists of sandy silt with traces of organics and occasional gravel overlying gravel with some sand and traces of fines, the latter stratum overlying dolomite limestone bedrock.

5.2) Gravel with some Sand:

This material was found in all boreholes undertaken on the river and on the West bank. 'N' values ranged from 24 to over 100 blows/ft., indicating a compact to very dense consistency, but generally were dense.

Physical properties of the deposit are as follows:

Moisture Content: 5% to 37%

Average Grain-size Distribution:

Gravel : 42%

Sand : 41%

Silt and Clay : 17%

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.3) Fill Material:

This was found on the East bank only, in B.H.'s 7A & B and 6A, and was some 12 feet in height above the original ground level.

It consists of a mixture of clayey silt, sand and gravel of around 6 feet thick overlying a mixture of sand, gravel and silt of an equal depth.

Mixture of Clayey Silt, Sand and Gravel

The 'N' values ranged from 9 to 22, indicating a stiff to very stiff consistency.

Mixture of Sand, Gravel and Silt

The 'N' values ranged from 7 to 21 blows/ft., indicating a loose to compact material.

Physical properties of the material were found to be as follows:

Moisture Content: 2% to 24%

Grain-size Distribution:

| | | |
|--------|---|-----|
| Gravel | : | 51% |
| Sand | : | 27% |
| Silt | : | 20% |
| Clay | : | 2% |

5.4) Sandy Silt with traces of Organics and Occasional Gravel:

This deposit was found on the East bank only, in B.H.'s 5A & B and 6A, B, C, and 7A & B underneath the topsoil, and varying in thickness from 3 to 7 feet. The 'N' values ranged from 11 to over 20 blows/ft., indicating a compact to very dense material, but in general, compact.

Moisture Content: 6% to 22%

Grain-size Distribution:

| | | |
|-------------|---|-----|
| Gravel | : | 0% |
| Sand | : | 51% |
| Silt & Clay | : | 49% |

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.5) Gravel with some Sand and Fines:

This deposit was found on the East bank in B.H.'s 5A & B, 6A & 6C, varying in thickness from 3 to 6 feet and overlying the bedrock. The 'N' values ranged from 43 to over 100 blows/ft., indicating a dense to very dense material.

The physical properties of the material were found to be as follows:

Moisture Content: 5% to 10%

Grain-size Distribution:

| | | |
|---------------|---|-----|
| Gravel | : | 57% |
| Sand | : | 30% |
| Silt and Clay | : | 13% |

5.6) Bedrock:

A total of 13 rock cores were taken; these were inspected by Mr. B. K. Glassford, Geologist, D.H.O. Laboratory. The following is his report:

"The cores from the drill holes of line 'A' and line 'B' of this proposed bridge site show a dolomitic limestone rock type with some sections having severely weathered characteristics. The dolomite is a light creamy-buff colour, aphanitic, medium to irregularly bedded, soft and with some bituminous material present. Also some sedimentary inclusions of sulphides along with some sulphate minerals were noticed in the cores. This dolomite is classified as the Erasoma beds of the Amabel (Lockport) formation.

Line 'A'

The depth of the gravel-sand overburden or fill material above the bedrock surface and below the water level of the river varies between 11 feet and 3 feet in holes No. 2 and No. 3 respectively. The approximate depths to sound bedrock in the bore holes on this line are given below.

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.6) Bedrock: (cont'd.) ...

Report by Mr. B. K. Glassford, Geologist - (cont'd.) ...

| <u>Hole</u> | <u>Core - Bedrock Depth</u> | <u>Elevation</u> |
|-------------|-----------------------------|------------------|
| 1 | 15.0 feet approximately | 983.3 feet |
| 2 | 15.0 " " | 982.4 " |
| 3 | 7.4 " " | 990.2 " |
| 4 | 9.6 " " | 988.5 " |
| 5 | 8.8 " " | 988.0 " |
| 6 | probably at 20.5 feet | 983.9 " |
| 7 | 16.0 feet approximately | 990.6 " |

Line 'B'

Similar overburden coverage is present over bedrock on line 'B'. The approximate depths to sound bedrock in the bore holes on this line are given below.

| <u>Hole</u> | <u>Core - Bedrock Depth</u> | <u>Elevation</u> |
|-------------|-----------------------------|------------------|
| 1 | 17.5 feet approximately | 980.5 feet |
| 2 | 13.7 " " | 983.9 " |
| 3 | 7.5 " " | 990.0 " |
| 4 | 8.0 " " | 989.7 " |
| 5 | 12.0 " " | 984.9 " |
| 6 | 6.5 " " | 991.4 " |
| 7 | 16.8 " " | 991.9 " |

"Holes No. 2 and No. 4 on this line show intermittent core recovery with either lost core or cavities in these bore hole locations. Rock recovery above these missing spaces could be from either large loose blocks of dolomite (boulders) or from in situ bedrock. Footings however should be taken to the elevations given where solid bedrock is encountered.

"The difference in sound bedrock elevations between bore holes suggests a reef-type structure to the dolomite beds. This condition is further observed in the rock face and floor of the adjacent quarry operated by the Canadian Gypsum Co.

5. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

5.6) Bedrock: (cont'd.) ...

Report by Mr. B. K. Glassford, Geologist - (cont'd.) ...

"There should be no trouble encountered with driving sheet piling into the top portion of this soft dolomite rock. It may be possible to excavate the top weathered portion of the dolomite by ripping. However, blasting of the rock would appear to be the most practical method. Sound bedrock should give the required strength characteristics for bearing capacities. It should be brought to the attention of the Materials and Testing concrete engineer of the presence of sulphate minerals in the bedrock in this area, as this would probably necessitate the use of a special cement type for the footings."

6. GROUNDWATER ELEVATIONS:

The water levels in the boreholes at the completion of field operations, were found to be as follows:

| | | | | |
|----------|-------|----|-------|-----------------------------|
| B.H. 1A | 995.9 | 1B | 995.5 | |
| 2A, 2B) | | | | |
| 3A, 3B) | | | | |
| 4A, 4B) | | | | |
| | | | | Speed River elevation 996.2 |
| 5A | 995.3 | 5B | 995.6 | |
| 6A | 996.0 | 6B | 995.1 | 6C 995.8 |
| 7A | 993.0 | 7B | 993.7 | |

7. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a twin structure at this site to carry the future Hanlon Expressway over the Speed River. Two schemes are under consideration at the present time: Scheme No. 1 which would be twin three-span structures of total length about 290 ft. spanning the Speed River and the Quarry Access Rd. on the East bank, and Scheme No. 2 which would be twin three-span

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

structures of total length about 215 ft. spanning the speed River only. In both cases the proposed grade is such that approach embankments of maximum height about 22 ft., would be required.

Subsoil at the site consists of from zero to about 20 ft. of granular type overburden followed by dolomitic limestone bedrock. Generally speaking, the bedrock is sound from the surface downward, though at some few locations, extensive weathering is present in the upper 1 to 2 ft. In view of these facts, it is recommended that the various footings for the proposed structures be founded either on spread footings constructed within sound bedrock, or on steel H-piles driven to bedrock, depending of course on the depth of overburden at the particular footing location. The most economical method of support should be selected. In the event that a piled foundation is selected for some footings, the safe load per pile may be the maximum allowable load for the particular steel section used. For spread footings founded within the sound bedrock, a safe pressure of up to 15 t.s.f. may be assumed for the design. The elevations of the sound bedrock may be obtained from the attached Drawing #67-F-87A.

As an alternative method of structure support, concrete caissons should be considered, since it is believed that these could well prove to be more economical than spread footing type foundations. Caissons should be socketed 6 feet or more into the sound bedrock in which case, a safe capacity of up to 70 tons per sq. ft. of base area may be assumed for design purposes.

For spread footings or pile caps constructed below the ground or river water level, a dewatering scheme will be required since the subsoil consists of permeable granular type material which will permit the free flow of water. It should be noted that the bedrock may contain fissures, particularly near the surface, which will also permit free flow of water. Appropriate

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

measures, therefore, involving the use of steel sheet piling and/or the construction of sumps, must be taken to ensure the placing of concrete in the dry.

Footings and pile caps constructed within the overburden must be at a sufficient depth for frost protection - i.e., at least 4 ft. below the ground surface or lowest river water level. This does not apply to footings placed directly on bedrock.

Depths of footings should be reviewed by the Bridge Hydrology Section to ensure that hydrological requirements are complied with.

No stability problems are anticipated with regard to the proposed approach embankments, provided 2:1 slopes are constructed. Forward slopes and side slopes should be rip-rapped up to high water level in order to prevent scour.

As mentioned in the Geologist's report, the presence of sulphate minerals in the bedrock indicates a need for sulphate-resisting cement to be used in the concrete for the structure foundations.

8. MISCELLANEOUS:

The field work for this project was carried out between October 8 and 25, 1969.

Equipment used was owned by P.V.K. & Sons, Ltd.

Supervision of the field work was carried out by Mr. G. Allen, Project Foundation Engineer.

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

November 1969

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1A

FOUNDATION SECTION

 JOB 69-F-87 LOCATION Hanlon Expressway Sta. 131+21 37' Lt.
 W.P. 109-68-02 BORING DATE October 9, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing

 ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *HT*

| SOIL PROFILE | | SAMPLES | | | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE | LIQUID LIMIT ——— w_L | | BULK DENSITY γ | REMARKS | |
|---------------|--|------------|--------|------|------------|---|------------------------|-------------------------|--------------------------|--------------------------|-----------------------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | | BLOWS / FOOT | BLOWS / FOOT | PLASTIC LIMIT ——— w_p | | | WATER CONTENT ——— w |
| | | | | | | | 20 | 40 | | | 60 |
| | | | | | | SHEAR STRENGTH P.S.F. | | WATER CONTENT % | | | |
| | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE | | 10 20 30 | | | |
| 998.3 | | | | | | | | | P.C.F. | GR. SA. SI. CL. | |
| 0.0 | Gravel with some sand Dense to Very Dense | | 1 | SS | 34 | | | | | W.L. 995.9 36 45 (19) | |
| | | | 2 | SS | 42 | | | | | | |
| | | | 3 | SS | 69 | | | | | | |
| | | | 4 | SS | 110/6" | | 100/8" | | | | |
| 983.3 | | | | | | | | | | | |
| 15.0 | Limestone Bedrock | | 5 | RC | 95% | 980 | | | | | |
| 977.0 | Dolomitic | | 6 | RC | 95% | | | | | | |
| 21.3 | End of Borehole | | | | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1B

FOUNDATION SECTION

JOB 69-F-37 LOCATION Hanlon Expressway Sta. 131+09 37' Rt
 W.P. 109-68-02 BORING DATE October 8, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *GA*

| SOIL PROFILE | | SAMPLES | | DYNAMIC PENETRATION RESISTANCE | | | | | LIQUID LIMIT ——— % PLASTIC LIMIT ——— % WATER CONTENT ——— % | | | BULK DENSITY | REMARKS | | | | | | |
|---------------|--|---------------|----------------|--------------------------------|---------------|--|--|--|--|--|-----------------------------------|-----------------|---------|--|---------------|--|--|--|------------|
| ELEV DEPTH | DESCRIPTION | STRAT ELEV | NUMBER TYPE | BLOWS/FOOT | ELEV SCALE | BLOWS / FOOT 20 40 60 80 100 | | | | | WATER CONTENT % 10 20 30 | | | | | | | | |
| 998.0 | | | | | | SHEAR STRENGTH ——— pcf | | | | | * ——— * | | | | | | | | |
| 0.0 | | | | | | ○ UNCONFINED * FIELD VANE ● QUICK TRIAXIAL * LAB VANE | | | | | WATER CONTENT % | | | | | | | | |
| | Gravel with some sand Loose to Very Dense | | 1 SS 6 | | | | | | | | | | | | W.L. 995.5 | | | | |
| | | | 2 SS 30 | | | | | | | | | | | | | | | | |
| | | | 3 SS 87 | 990 | | | | | | | | | | | | | | | 56 34 (10) |
| | | | 4 SS 70 | | | | | | | | | | | | | | | | |
| 980.5 | | | 5 SS 59 | | | | | | | | | | | | | | | | |
| 17.5 | Limestone Bedrock | | 6 RC 98% | 980 | | | | | | | | | | | | | | | |
| | | | 7 RC 98% | | | | | | | | | | | | | | | | |
| 972.4 | Dolomitic | | 8 RC 95% | | | | | | | | | | | | | | | | |
| 25.6 | End of Borehole | | | | | | | | | | | | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2 A

FOUNDATION SECTION

JOB 69-F-87 LOCATION - Hanlon Expressway Sta. 131+76 37' Lt.
 W.P. 109-68-02 BORING DATE October 16 & 17, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY

| SOIL PROFILE | | SAMPLES | | DYNAMIC PENETRATION RESISTANCE | | LIQUID LIMIT — w_L | | BULK DENSITY | REMARKS |
|--------------|-------|-------------------|--------|--------------------------------|------------|----------------------|-------|--------------|---------|
| ELEV | DEPTH | DESCRIPTION | NUMBER | TYPE | BLOWS/FOOT | ELEV | SCALE | | |
| 997.4 | | Raft Deck | | | | | | | |
| 996.2 | 1.2 | | | | | | | | |
| 993.6 | 3.8 | Speed River | 1 | SS | 24 | | | | |
| | | Gravel with | 2 | SS | 69 | 990 | | | |
| | | some sand | 3 | SS | 106 | | | | |
| | | Compact to | | | | | | | |
| 982.4 | | Occ. Boulders | 4 | SS | 152/62 | | | | |
| 15.0 | | Dolomitic | | | | | | | |
| | | Sound | | | | | | | |
| 977.6 | | Limestone Bedrock | 5 | RC | 97% | 980 | | | |
| 19.8 | | End of Borehole | | | | | | | |

52 39 (19)

FOUNDATION SECTION

CHECKED BY *[Signature]*

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3A

FOUNDATION SECTION

JOB 69-F-87 LOCATION Hanlon Expressway Sta. 132+15 37' Lt.
 W P 109-68-02 BORING DATE October 17th, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *LL*

| SOIL PROFILE | | SIRAT PLOT | SAMPLES | | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE | LIQUID LIMIT — w_L | | BULK DENSITY | REMARKS |
|--------------|---------------------------------------|------------|---------|------|------------|--------------------------------|----------------------|-----------------------|--------------|---------|
| ELEV DEPTH | DESCRIPTION | | NUMBER | TYPE | | BLOWS / FOOT | BLOWS / FOOT | PLASTIC LIMIT — w_p | | |
| 997.6 | Raft Deck | | | | | | | | | |
| 996.2 | Speed River | | | | | | | | | |
| 993.8 | Gravel with some sand | | 1 | SS | 22 | | | | | |
| 991.1 | compact occ. boulders | | | | | | | | | |
| 989.5 | weathered Dolomitic Limestone Bedrock | | 2 | RC | 95% | | | | | |
| 980.8 | | | 3 | RC | - | | | | | |
| 16.8 | End of Borehole | | | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4A

FOUNDATION SECTION

JOB 69-P-87 LOCATION Hanlon Expressway STA. 132+74 37' Lt.
 M P 109-68-02 BORING DATE October 20, 21, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, BX Casing

ORIGINATED BY GA

COMPILED BY GA

CHECKED BY *HL*

| SOIL PROFILE | | SAMPLES | | | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — % | BULK DENSITY Y P C F | REMARKS |
|---------------|-----------------------|---------|--------------|--------------|------------|---|--|----------------------------|------------|
| ELEV DEPTH | DESCRIPTION | NUMBER | TYPE | BLOWS / FOOT | | SHEAR STRENGTH P S F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL * LAB VANE | WATER CONTENT % 10 20 30 | | |
| 998.1 | Raft Deck | | | | | | | | |
| 0.0 | 966.2 | | | | | | | | |
| 994.9 | 1.9 Speed River | 1 | SS 50/2" | | | | | | |
| 3.2 | Occ. Boulders | | | | | | | | |
| | Gravel with some sand | | | | | | | | |
| 988.5 | Compact to V. Dense | 2 | SS 27 | | | | | | |
| 9.6 | Dolomitic | 3 | SS 65/2" 990 | | | | | | 20 51 (20) |
| | Sound Limestone | | | | | | | | |
| 983.9 | Bedrock | 4 | RC 98% | | | | | | |
| 14.2 | End of Borehole | | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4B

FOUNDATION SECTION

JOB 69-F-87 LOCATION Hanlon Expressway Sta. 132+54 35' Rt.
 W.P. 109-68-02 BORING DATE October 15, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX, BX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *AK*

| SOIL PROFILE | | SAMPLES | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — % | BULK DENSITY Y P. F. | REMARKS |
|----------------|---------------------------|---------|---------|-------------|--|--|-------------------------------|---------|
| ELEV. DEPTH | DESCRIPTION | NUMBER | TYPE | | SHEAR STRENGTH P.S.F. ○ UNCONFINED — FIELD VANE ● QUICK TRIAXIAL — LAB. VANE | WATER CONTENT % 10 20 30 | | |
| 997.7 | Raft Deck | | | | | | | |
| 996.2 | | | | | | | | |
| 994.5 | 1.5 Speed River | | | | | | | |
| 3.2 | Gravel with some sand | 1 | SS 1140 | | | | | |
| 989.7 | V. Dense Boulders | 2 | RC 98% | 990 | | | | |
| 8.0 | Dolomitic Sound Limestone | 3 | RC 97% | | | | | |
| 984.8 | Bedrock | | | | | | | |
| 12.9 | End of Borehole | | | | | | | |

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 4c

FOUNDATION SECTION

JOB 69-F-87 LOCATION Hanlon Expressway Sta. 132+50 33' Rt.
 W.P. 109-68-02 BORING DATE October 23, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *GA*

| SOIL PROFILE | | SAMPLES | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE | LIQUID LIMIT | BULK DENSITY | REMARKS |
|--------------|---|---------|------|-------------|--------------------------------|--------------|--------------|---------|
| ELEV. DEPTH | DESCRIPTION | NUMBER | TYPE | | BLOWS / FOOT | BLOWS / FOOT | | |
| 997.3 | Raft Deck | | | | | | | |
| 0.0 996.2 | | | | | | | | |
| 994.2 | 1.1 Speed River | | | | | | | |
| 3.1 | Gravel with some sand | | | | | | | |
| 988.8 | | | | 990 | | | | |
| 8.5 | Hammer bouncing possibly bedrock End of Borehole | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5A

FOUNDATION SECTION

JOB 69-P-87 LOCATION Hanlon Expressway Sta. 133+14 37' Lt.
W.P. 109-68-02 BORING DATE October 20, 1969
DATUM Geodetic BOREHOLE TYPE Washboring, BX Casing

ORIGINATED BY CA

COMPILED BY CA

CHECKED BY *EL*

| LOG PROFILE | | SAMPLES | | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — % | BULK DENSITY Y P.C.F. | REMARKS |
|----------------|--|---------|---------|-------------|--|--|--------------------------------|---------------------------------|
| ELEV. DEPTH | DESCRIPTION | NUMBER | TYPE | | SHEAR STRENGTH PSF ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE | WATER CONTENT % 10 20 30 | | |
| 996.8 | | | | | | | | |
| 0.0 | Sandy Silt with trace of organics & occ gravel | 1 | SS 2h | | | | | GR. S. & S. CL W.L. 995.3 |
| 990.8 | Compact | | | | | | | |
| 6.0 | Gravel with some sand | 2 | SS 4h | 990 | | | | |
| 988.0 | & traces Pines Dense | | | | | | | |
| 8.8 | Dolomitic | 3 | RC 100% | | | | | |
| | Sound Limestone | | | | | | | |
| 983.0 | Bedrock | 4 | DC 100% | | | | | |
| 13.8 | End of Borehole | | | | | | | |

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 5B

FOUNDATION SECTION

JOB 69-F-87 LOCATION Hanlon Expressway Sta. 132+98 37' Rt.
 W.P. 109-68-02 BORING DATE October 16 & 17, 1969
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY GA
 COMPILED BY GA
 CHECKED BY *GA*

| SOIL PROFILE | | STRAT PLOT | SAMPLES | | BLOWS / FOOT | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE | | LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — % | | BULK DENSITY | REMARKS |
|---------------|--|------------|---------|------|--------------|------------|---|----------------------------|--|--|--------------|------------|
| ELEV DEPTH | DESCRIPTION | | NUMBER | TYPE | | | SHEAR STRENGTH PSF | | WATER CONTENT % | | | |
| 996.9 | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB. VANE | *p — *w — *n — 10 20 30 | | | | |
| 0.0 | Sandy silt with traces of organics & occ. gravel | | 1 | SS | 34 | | | | | | | W.L. 995.6 |
| 990.9 | Dense | | 2 | SS | 101/8" | 990 | | | | | | 58 30 (12) |
| 6.0 | Gravel with some sand & traces Fines | | 3 | SS | 200 | | | | | | | |
| 985.1 | V. Dense | | | | | | | | | | | |
| 11.8 | weathered | | 4 | RC | 96% | | | | | | | |
| | Sound dolomitic Limestone | | 5 | RC | 98% | 980 | | | | | | |
| | Bedrock | | 6 | RC | 99% | | | | | | | |
| 975.6 | | | | | | | | | | | | |
| 21.3 | End of Borehole | | | | | | | | | | | |

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6A

FOUNDATION SECTION

JOB 69-F-87 LOCATION Hanlon Expressway Sta 133+34 32' Lt.

ORIGINATED BY GA

W.P. 109-68-02 BORING DATE October 22 & 23, 1969

COMPILED BY GA

DATUM Geodetic BOREHOLE TYPE Washboring

CHECKED BY

| ELEV DEPTH | SOIL PROFILE DESCRIPTION | STRAT NO. | SAMPLES | | | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE | | LIQUID LIMIT — % | | | BULK DENSITY Y | REMARKS |
|---------------|--|-----------|---------|------|------------|------------|--------------------------------|---|-------------------|-------------------|-----------------|----------------------|---------|
| | | | NUMBER | TYPE | BLOWS/FOOT | | BLOWS / FOOT | RESISTANCE | PLASTIC LIMIT — % | WATER CONTENT — % | WATER CONTENT % | | |
| | | | | | | | | SHEAR STRENGTH PS F | | | | | |
| | | | | | | | | ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE | | | | | |
| 1004.5 | | | | | | | | | | | | | |
| 0.0 | Mixture of Sand, gravel & silt (Probably Fill) | | 1 | SS | 14 | 1000 | | | | | | | |
| 997.0 | | | 2 | SS | 7 | | | | | | | | |
| 7.5 | Sandy Silt with traces of organics & occ. gravel | | 3 | SS | 21 | | | | | | | | |
| 990.0 | Compact to V. Dense | | 4 | SS | 58 | 990 | | | | | | | |
| 14.5 | Gravel with some Sand & Fines | | 5 | SS | 84/9" | | | | | | | | |
| 984.4 | V. Dense | | 6 | SS | 106/7" | | | | | | | | |
| 20.1 | Hammer bouncing Possibly Bedrock End of Borehole | | | | | | | | | | | | |

P.C.F. GR. SA. SI. CL.

WL. 996.0

56 30 (151)

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 6 B

FOUNDATION SECTION

| | | | | | |
|-------|-----------|---------------|---------------------------------------|---------------|----|
| JOB | 69-F-87 | LOCATION | Hanlon Expressway Sta. 133+20 36' Rt. | ORIGINATED BY | GA |
| W.P. | 109-68-02 | BORING DATE | October 15, 1969 | COMPILED BY | GA |
| DATUM | Geodetic | BOREHOLE TYPE | Washboring & NX Casing | CHECKED BY | 11 |

[illegible]

FOUNDATION SECTION

ORIGINATED BY GA
COMPILED BY GA
CHECKED BY

| SOIL PROFILE | | SAMPLES | | | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT | LIQUID LIMIT _____ PLASTIC LIMIT _____ WATER CONTENT _____ | BULK DENSITY | REMARKS |
|---------------|--|------------|--------|------|--|---|-----------------------------|---------|
| ELEV DEPTH | DESCRIPTION | STRAT PLOT | NUMBER | TYPE | BLOWS/FOOT | SHEAR STRENGTH PS F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE | WATER CONTENT % 10 20 30 | |
| 997.6 | | | | | | | | |
| 0.0 | Sandy Silt with traces of organics & occ. gravel | | 1 | S | 82 | | | 995.8 |
| 990.0 | V. Dense | | 2 | SS | 82 | | | |
| 7.6 | Gravel with some sand | | | | | | | |
| 987.6 | & tr. Fines V. Dense | | 3 | SS | 70 1/4" | | | |
| 10.0 | Hammer bouncing possibly bedrock | | | | | | | |
| | End of Borehole | | | | | | | |

FOUNDATION SECTION

| | | | | | |
|-------|-----------|---------------|--------------------------------------|---------------|----|
| JOB | 69-F-87 | LOCATION | Hanlon Expressway Sta. 133+94 41 Rt. | ORIGINATED BY | GA |
| W.P. | 109-68-02 | BORING DATE | October 14 & 15, 1969 | COMPILED BY | GA |
| DATUM | Geodetic | BOREHOLE TYPE | Washboring, NX Casing | CHECKED BY | 48 |

[illegible]

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_i | SENSITIVITY |

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

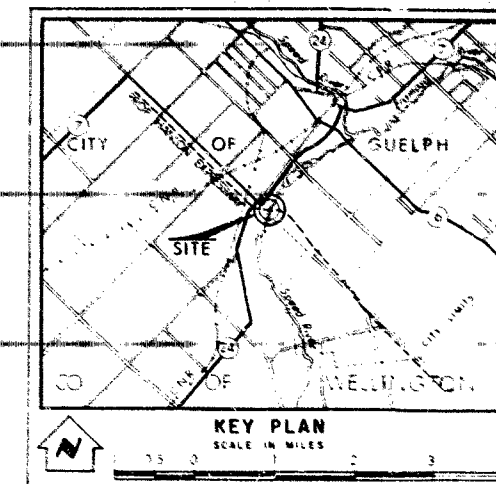
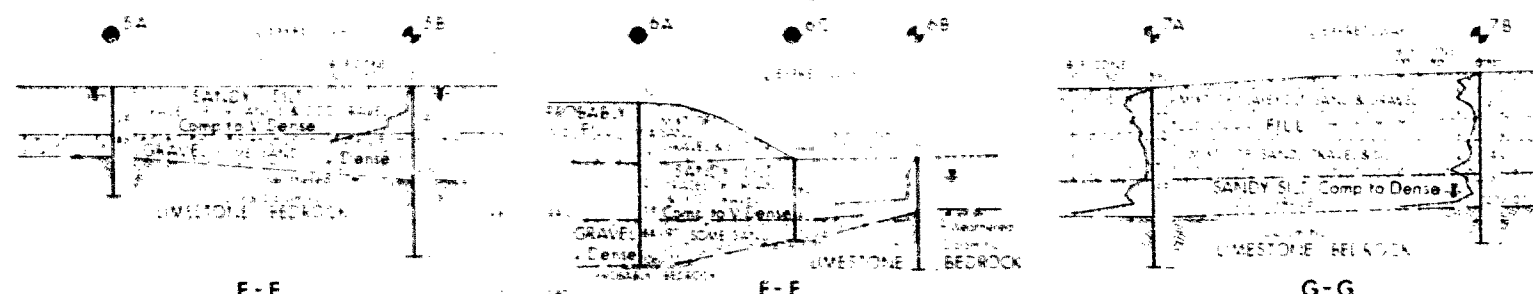
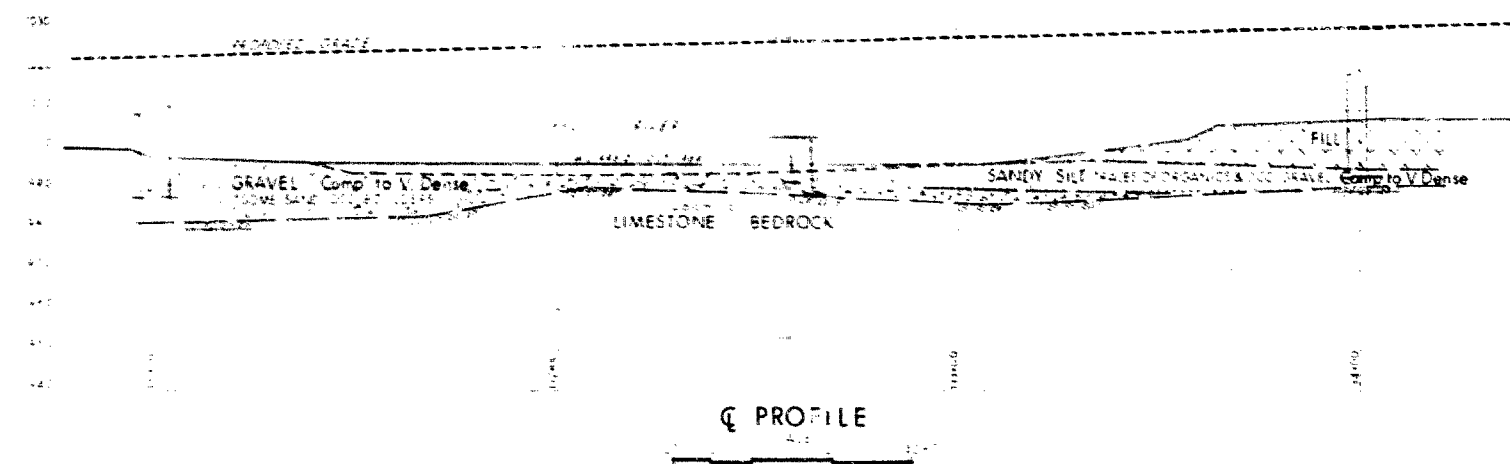
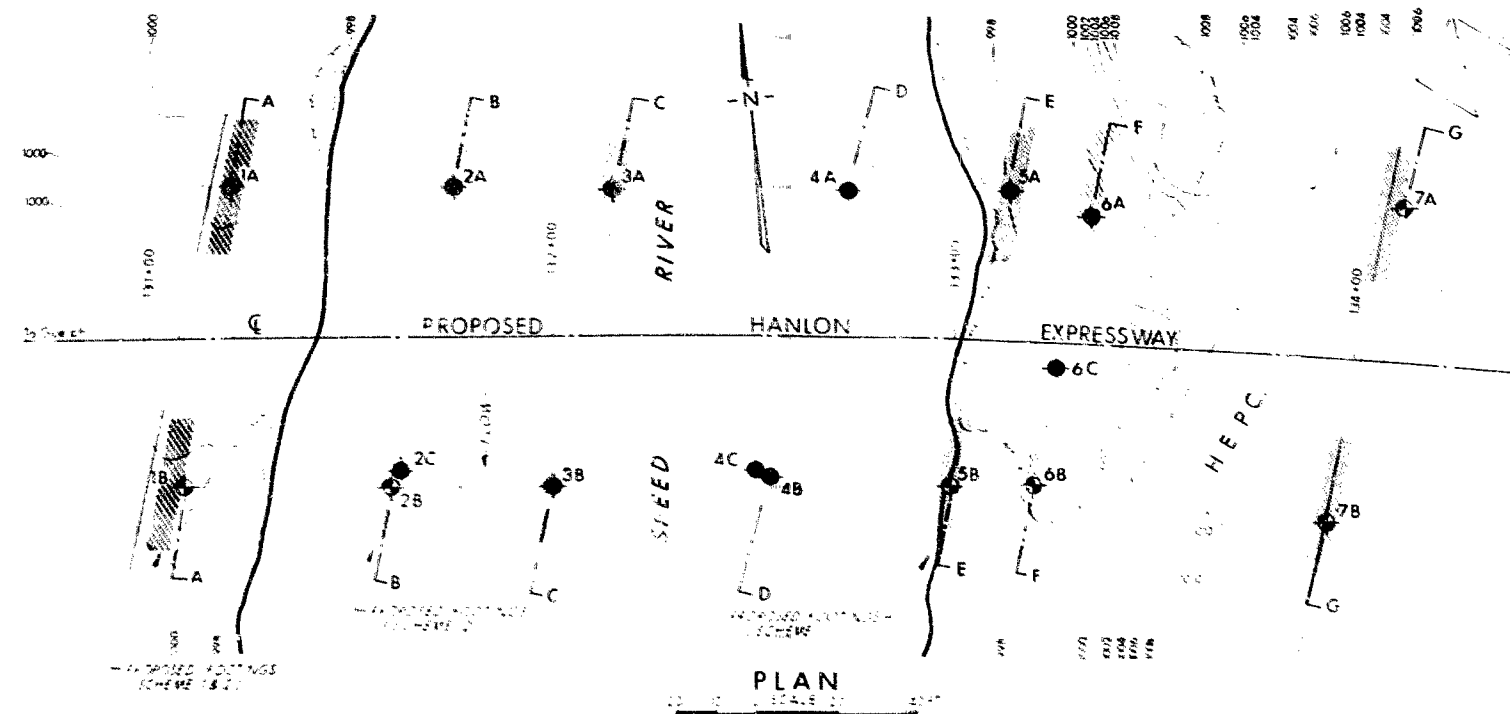
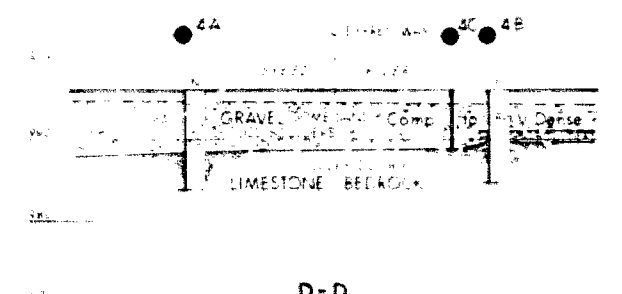
| | |
|----------|---|
| d | DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE |
| δ | ANGLE OF WALL FRICTION |
| K | DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS |
| K_0 | COEFFICIENT OF EARTH PRESSURE AT REST |

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 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 | | |

| NO | ELEVATION | STATION | OFFSET |
|-----|-----------|---------|--------|
| 1 | 10.0 | 100 | 0.0 |
| 2 | 10.0 | 100 | 0.0 |
| 3 | 10.0 | 100 | 0.0 |
| 4 | 10.0 | 100 | 0.0 |
| 5 | 10.0 | 100 | 0.0 |
| 6 | 10.0 | 100 | 0.0 |
| 7 | 10.0 | 100 | 0.0 |
| 8 | 10.0 | 100 | 0.0 |
| 9 | 10.0 | 100 | 0.0 |
| 10 | 10.0 | 100 | 0.0 |
| 11 | 10.0 | 100 | 0.0 |
| 12 | 10.0 | 100 | 0.0 |
| 13 | 10.0 | 100 | 0.0 |
| 14 | 10.0 | 100 | 0.0 |
| 15 | 10.0 | 100 | 0.0 |
| 16 | 10.0 | 100 | 0.0 |
| 17 | 10.0 | 100 | 0.0 |
| 18 | 10.0 | 100 | 0.0 |
| 19 | 10.0 | 100 | 0.0 |
| 20 | 10.0 | 100 | 0.0 |
| 21 | 10.0 | 100 | 0.0 |
| 22 | 10.0 | 100 | 0.0 |
| 23 | 10.0 | 100 | 0.0 |
| 24 | 10.0 | 100 | 0.0 |
| 25 | 10.0 | 100 | 0.0 |
| 26 | 10.0 | 100 | 0.0 |
| 27 | 10.0 | 100 | 0.0 |
| 28 | 10.0 | 100 | 0.0 |
| 29 | 10.0 | 100 | 0.0 |
| 30 | 10.0 | 100 | 0.0 |
| 31 | 10.0 | 100 | 0.0 |
| 32 | 10.0 | 100 | 0.0 |
| 33 | 10.0 | 100 | 0.0 |
| 34 | 10.0 | 100 | 0.0 |
| 35 | 10.0 | 100 | 0.0 |
| 36 | 10.0 | 100 | 0.0 |
| 37 | 10.0 | 100 | 0.0 |
| 38 | 10.0 | 100 | 0.0 |
| 39 | 10.0 | 100 | 0.0 |
| 40 | 10.0 | 100 | 0.0 |
| 41 | 10.0 | 100 | 0.0 |
| 42 | 10.0 | 100 | 0.0 |
| 43 | 10.0 | 100 | 0.0 |
| 44 | 10.0 | 100 | 0.0 |
| 45 | 10.0 | 100 | 0.0 |
| 46 | 10.0 | 100 | 0.0 |
| 47 | 10.0 | 100 | 0.0 |
| 48 | 10.0 | 100 | 0.0 |
| 49 | 10.0 | 100 | 0.0 |
| 50 | 10.0 | 100 | 0.0 |
| 51 | 10.0 | 100 | 0.0 |
| 52 | 10.0 | 100 | 0.0 |
| 53 | 10.0 | 100 | 0.0 |
| 54 | 10.0 | 100 | 0.0 |
| 55 | 10.0 | 100 | 0.0 |
| 56 | 10.0 | 100 | 0.0 |
| 57 | 10.0 | 100 | 0.0 |
| 58 | 10.0 | 100 | 0.0 |
| 59 | 10.0 | 100 | 0.0 |
| 60 | 10.0 | 100 | 0.0 |
| 61 | 10.0 | 100 | 0.0 |
| 62 | 10.0 | 100 | 0.0 |
| 63 | 10.0 | 100 | 0.0 |
| 64 | 10.0 | 100 | 0.0 |
| 65 | 10.0 | 100 | 0.0 |
| 66 | 10.0 | 100 | 0.0 |
| 67 | 10.0 | 100 | 0.0 |
| 68 | 10.0 | 100 | 0.0 |
| 69 | 10.0 | 100 | 0.0 |
| 70 | 10.0 | 100 | 0.0 |
| 71 | 10.0 | 100 | 0.0 |
| 72 | 10.0 | 100 | 0.0 |
| 73 | 10.0 | 100 | 0.0 |
| 74 | 10.0 | 100 | 0.0 |
| 75 | 10.0 | 100 | 0.0 |
| 76 | 10.0 | 100 | 0.0 |
| 77 | 10.0 | 100 | 0.0 |
| 78 | 10.0 | 100 | 0.0 |
| 79 | 10.0 | 100 | 0.0 |
| 80 | 10.0 | 100 | 0.0 |
| 81 | 10.0 | 100 | 0.0 |
| 82 | 10.0 | 100 | 0.0 |
| 83 | 10.0 | 100 | 0.0 |
| 84 | 10.0 | 100 | 0.0 |
| 85 | 10.0 | 100 | 0.0 |
| 86 | 10.0 | 100 | 0.0 |
| 87 | 10.0 | 100 | 0.0 |
| 88 | 10.0 | 100 | 0.0 |
| 89 | 10.0 | 100 | 0.0 |
| 90 | 10.0 | 100 | 0.0 |
| 91 | 10.0 | 100 | 0.0 |
| 92 | 10.0 | 100 | 0.0 |
| 93 | 10.0 | 100 | 0.0 |
| 94 | 10.0 | 100 | 0.0 |
| 95 | 10.0 | 100 | 0.0 |
| 96 | 10.0 | 100 | 0.0 |
| 97 | 10.0 | 100 | 0.0 |
| 98 | 10.0 | 100 | 0.0 |
| 99 | 10.0 | 100 | 0.0 |
| 100 | 10.0 | 100 | 0.0 |

- 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.

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

SPEED RIVER

KING'S HIGHWAY NO. HANLON EXPRESSWAY DIST NO. 3
CO. WELLINGTON CITY OF GUELPH
TWP. _____ LOT _____ CON. _____

BORE HOLE LOCATIONS & SOIL STRAT

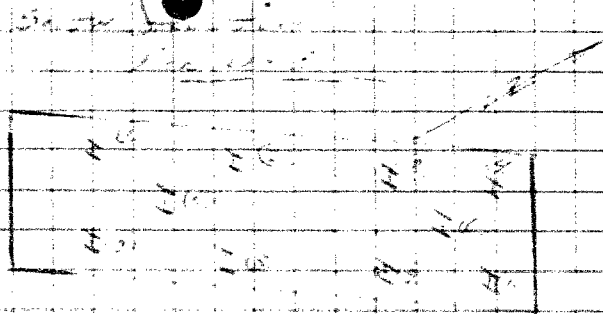
| | | | |
|-----------------------------|---------|-------------------|----------------|
| SUBNO 14 | CHECKED | W/F NO 17-68-21 | W/F DRAWING NO |
| DRAWN 50 | CHECKED | JCB NO 59-F-87 | 69-F-87 |
| DATE 18 NOV 1969 | TYPE NO | ON ONE DRAWING NO | |
| APPROVED <i>[Signature]</i> | ENT NO | | |

SUMMARY OF PILE DRIVING RECORDS

W.O. 69-1087 W.P. 109-68-02-13 CONT. 71-01 DIST. 3
SITE SPEED RIV. BRIDGES - HANLON EXPOS. - CITY OF GUELPH
DATE DRIVEN MAY 17-29 / 73 WEIGHT OF ANVIL 754 LB
HAMMER TYPE DELMAR D-12 WEIGHT 5 732 LB ENERGY _____

[illegible]

CONTIN



OVER

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
FOUNDATION SECTION

H.G. STEINER

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 71-01 STRUCTURE Speed River Bridges
CONTRACTOR Down Construction DESIGN LOAD OF PILE 95 Tons To Pile
HAMMER DETAILS: TYPE Vel-Mag-D-12 WEIGHT 5,732 HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 754
PILE DETAILS STRAIGHT-12 R.P.C. H₂ PILES - STEEL PLATE SHIRTS
PILE NO. 6 LOCATION Pier 3 Footings DATE DRIVEN May 17/71

| 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. |
|------------------------------|---------------------|--------------------------|------------------------------|---------------------|--------------------------|------------------------------|---------------------|--------------------------|------------------------------|---------------------|--------------------------|
| 17 | 1 | 1 | 26 | | | 51 | | | 76 | | |
| | 2 | 1 | 27 | | | 52 | | | 77 | | |
| 18 | 3 | 1 | 28 | | | 53 | | | 78 | | |
| | 4 | 2 | 29 | | | 54 | | | 79 | | |
| 19 | 5 | 3 | 30 | | | 55 | | | 80 | | |
| | 6 | 8 | 31 | | | 56 | | | 81 | | |
| 20 | 7 | 35 | 32 | | | 57 | | | 82 | | |
| | 8 | 60 | 33 | | | 58 | | | 83 | | |
| 21 | 9 | 350 | 34 | | | 59 | | | 84 | | |
| | 10 | 420 | 35 | | | 60 | | | 85 | | |
| 22 | 11 | | 36 | | | 61 | | | 86 | | |
| | 12 | | 37 | | | 62 | | | 87 | | |
| 23 | 13 | | 38 | | | 63 | | | 88 | | |
| | 14 | | 39 | | | 64 | | | 89 | | |
| 24 | 15 | | 40 | | | 65 | | | 90 | | |
| | 16 | | 41 | | | 66 | | | 91 | | |
| 25 | 17 | | 42 | | | 67 | | | 92 | | |
| | 18 | | 43 | | | 68 | | | 93 | | |
| 26 | 19 | | 44 | | | 69 | | | 94 | | |
| | 20 | | 45 | | | 70 | | | 95 | | |
| 27 | 21 | | 46 | | | 71 | | | 96 | | |
| | 22 | | 47 | | | 72 | | | 97 | | |
| 28 | 23 | | 48 | | | 73 | | | 98 | | |
| | 24 | | 49 | | | 74 | | | 99 | | |
| 29 | 25 | | 50 | | | 75 | | | 100 | | |

| DETAILS FOR FINAL SIX INCHES OF PENETRATION | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-----|----|----|----|----|---------------------------------|
| BLOWS PER INCH | 35 | 32 | 35 | 32 | 35 | 32 |
| MEASURED REBOUND IN INCHES | ✓ | | | | | |
| FINAL LENGTH OF PILE | 7-2 | | | | | FINAL CUT OFF ELEVATION 1002.50 |

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) N. J. DRUMM
DATE May 17/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1002.5
76
992.9

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. $12\frac{3}{4}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. $12\frac{3}{4}$ " 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.

"Same Day Delivery Service" The Foundation Caring People

OVER

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 5 CONTRACT NO. 70-11 STRUCTURE Speed River Bridges

CONTRACTOR Don Construction DESIGN LOAD OF PILE 26 tons to pile

HAMMER DETAILS: TYPE Malvern D-12 WEIGHT 1740 HEIGHT OF FALL OR ENERGY

TYPE OF ANVIL OR CAP WEIGHT OF ANVIL OR CAP 200

PILE DETAILS 3" dia. - 12 ft. pile

PILE NO. 5 LOCATION near 9.5 mi. S. of St. Catharines DATE DRIVEN Apr 1970

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

| DETAILS FOR FINAL SIX INCHES OF PENETRATION | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-------------------------|----|----|----|----|----|
| BLOWS PER INCH | 20 | 20 | 20 | 20 | 20 | 20 |
| MEASURED REBOUND IN INCHES | | | | | | |
| FINAL LENGTH OF PILE | FINAL CUT OFF ELEVATION | | | | | |

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) C. J. DEWITT
DATE Apr 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1002.5
12.8
989.7

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.

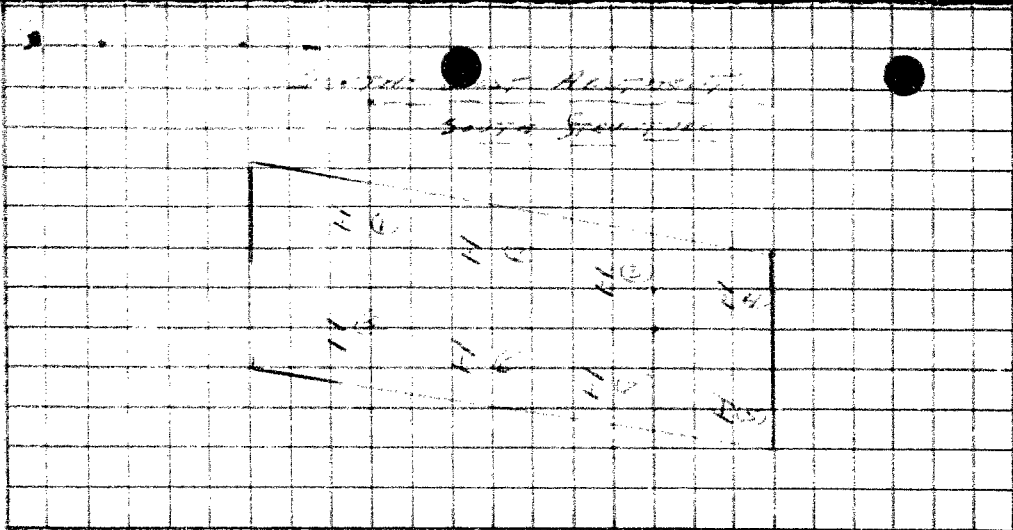
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

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.



10M Pods - 12-70-RE. **"Same Day Delivery Service" "The Foundation Coating People"**

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 71-01 STRUCTURE Speed Line Bridges
CONTRACTOR Davis Construction DESIGN LOAD OF PILE 75 Tons To pile
HAMMER DETAILS: TYPE Belting 0-12 WEIGHT 5732 HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 754
PILE DETAILS Vertical 12" x 12" x 12" H. piles 12' long 12" dia.
PILE NO. 2 LOCATION South-west of Highway 101 DATE DRIVEN May 1971

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

| DETAILS FOR FINAL SIX INCHES OF PENETRATION | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-------------------------|-----|-----|-----|-----|--------|
| BLOWS PER INCH | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| MEASURED REBOUND IN INCHES | | | | | | |
| FINAL LENGTH OF PILE | FINAL CUT OFF ELEVATION | | | | | 100.00 |

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) J. J. [Name]
DATE May 1971

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1009.00
20.8
988.2

NOV 1964

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.

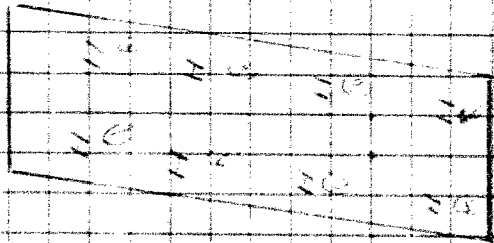
The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

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.

SOUTH EAST ALIEMENT

South East Aliement



OVER

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 71-01 STRUCTURE Spice River Bridges
CONTRACTOR Dunn Construction DESIGN LOAD OF PILE 95 Tons To pier
HAMMER DETAILS: TYPE Delmag D-12 WEIGHT 5,200 HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 250
PILE DETAILS Straight 12 in. @ 74 H. 100-100-100
PILE NO. 7 LOCATION S.E. P.R. 51.74 Victoria DATE DRIVEN May 21/71

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

| DETAILS FOR FINAL SIX INCHES OF PENETRATION | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-------|----|----|----|----|--------------------------------|
| BLOWS PER INCH | 70 | 50 | 40 | 30 | 20 | 10 |
| MEASURED REBOUND IN INCHES | | | | | | |
| FINAL LENGTH OF PILE | 25.00 | | | | | FINAL CUT OFF ELEVATION 100.00 |

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) W. J. McNeill
DATE May 21/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1016-0
222
9938

OVER

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.

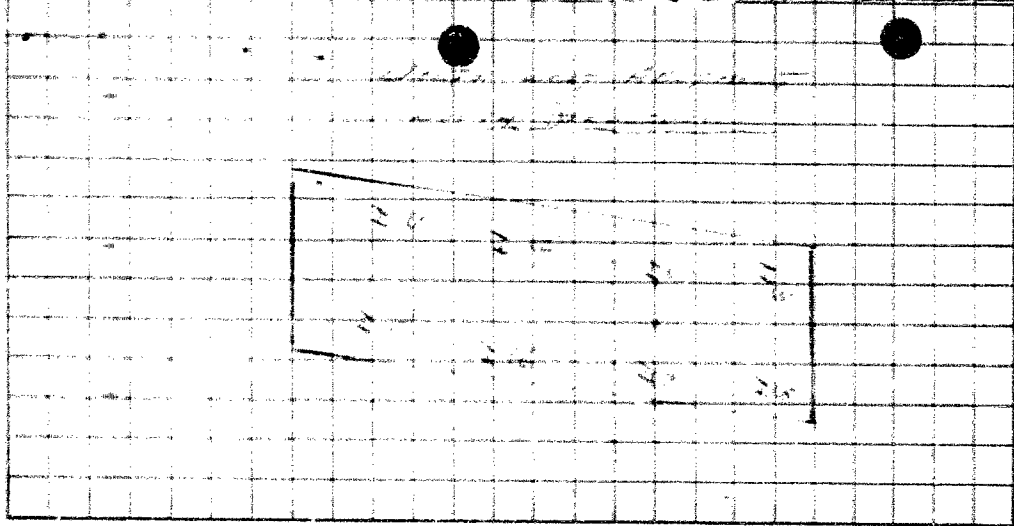
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

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.



10M Page - 12 - 3 - 8

"Same Day Delivery Service" "The Foundation Coating People"

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

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) W. J. DEWEE
DATE Nov 25/80

ATTACH SKETCH OF PILE NUMBERING SYSTEM

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.

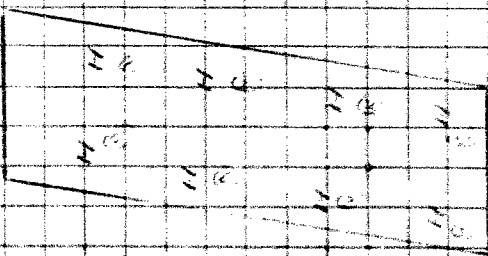
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x $\frac{1}{2}$ " steel plate shoe.

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.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 3 CONTRACT NO. 71-01 STRUCTURE SPEED RIVER BRIDGES
CONTRACTOR Dona Construction DESIGN LOAD OF PILE 95 Ton to pile
HAMMER DETAILS: TYPE Delmag D-12 WEIGHT 5732 HEIGHT OF FALL OR ENERGY
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 754
PILE DETAILS Vertical - 12" P.D. @ 20" H. Piles - Steel plate 5400
PILE NO. 5 LOCATION N.E. BRIDGE NORTH SIDE DATE DRIVEN MAY 26/71

| 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. |
|------------------------------|---------------------|----------------------------|------------------------------|---------------------|----------------------------|------------------------------|---------------------|----------------------------|------------------------------|---------------------|----------------------------|
| 29.0 | 1 | 1 | 29.0 | 26 | 384 | | 51 | | | 76 | |
| | 2 | 1 | | 27 | | | 52 | | | 77 | |
| | 3 | 1 | | 28 | | | 53 | | | 78 | |
| | 4 | 1 | | 29 | | | 54 | | | 79 | |
| | 5 | 1 | | 30 | | | 55 | | | 80 | |
| | 6 | 2 | | 31 | | | 56 | | | 81 | |
| | 7 | 3 | | 32 | | | 57 | | | 82 | |
| | 8 | 4 | | 33 | | | 58 | | | 83 | |
| | 9 | 5 | | 34 | | | 59 | | | 84 | |
| | 10 | 5 | | 35 | | | 60 | | | 85 | |
| | 11 | 5 | | 36 | | | 61 | | | 86 | |
| | 12 | 5 | | 37 | | | 62 | | | 87 | |
| | 13 | 5 | | 38 | | | 63 | | | 88 | |
| | 14 | 5 | | 39 | | | 64 | | | 89 | |
| | 15 | 10 | | 40 | | | 65 | | | 90 | |
| | 16 | 10 | | 41 | | | 66 | | | 91 | |
| | 17 | 10 | | 42 | | | 67 | | | 92 | |
| | 18 | 10 | | 43 | | | 68 | | | 93 | |
| | 19 | 10 | | 44 | | | 69 | | | 94 | |
| | 20 | 10 | | 45 | | | 70 | | | 95 | |
| | 21 | 10 | | 46 | | | 71 | | | 96 | |
| | 22 | 10 | | 47 | | | 72 | | | 97 | |
| | 23 | 10 | | 48 | | | 73 | | | 98 | |
| | 24 | 10 | | 49 | | | 74 | | | 99 | |
| | 25 | 10 | | 50 | | | 75 | | | 100 | |

| DETAILS FOR FINAL SIX INCHES OF PENETRATION | 1 | 2 | 3 | 4 | 5 | 6 |
|---|--------|----|----|----|----|----|
| BLOWS PER INCH | 20 | 21 | 30 | 31 | 32 | 32 |
| MEASURED REBOUND IN INCHES | | | | | | |
| FINAL LENGTH OF PILE | 25.9 | | | | | |
| FINAL CUT OFF ELEVATION | 1515.0 | | | | | |

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & RESEARCH DIVISION
DEPARTMENT OF HIGHWAYS
PARLIAMENT BUILDINGS
TORONTO, ONTARIO

SIGNED [Signature]
NAME (PRINT) W. J. Deane
DATE MAY 26/71

ATTACH SKETCH OF PILE NUMBERING SYSTEM

1019.0
25.9
993.1

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.

69-F-087

Mr. W. Neillpovitz,
District Engineer,
Stratford.

Materials and Testing Office,
London.

Mr. P. Peaceck.

August 21, 1973.

Contract 71-01, Hanton Expressway,
Speed River Bridge Approaches.

Attached is a memo from the Foundation Section concerning the treatment at the above approaches.

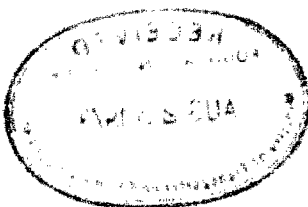
Item 4 I understand has been taken care of and the shallow slips have been repaired with native material. If these slips reappear I would suggest treatment as outlined in the attached letter depending upon the amount of seepage present.

The approach settlements should be patched. Where the approach fills have sloughed and cracks have developed, these areas should be retrimmed, the cracks filled and the banks resodded where necessary.

JGF:hp.
ATT'D.
c.c. -

A. Starnoc, ✓
G. A. Wong,
R. Mapham,
File.

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



MEMORANDUM

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

FROM: C.S. Grebski,
Bridge Office

ATTENTION:

DATE: August 31, 1970

OUR FILE REF.

IN REPLY TO


SUBJECT: Speed River Bridges
Hanlon Expressway in the City of Guelph
W.P. 109-68-02 & -13, Site 35-404
District No. 3

69-F-87

Attached herewith we are submitting the final
bridge drawings which show the foundation design for
these structures.

Kindly give us your comments at your earliest
convenience.

CSG:rd


C.S. Grebski,
Bridge Design Engineer

Attach.

c.c. Foundation Office

No COMMENTS.

SEP. 16/70.

PP
(1422)

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Building

From: J.L. Keen,
Bridge Office

Attention: Mr. K.G. Selby,
Supervising Foundation Engineer

Date: May 6, 1970

Our File Ref.

IN REPLY TO

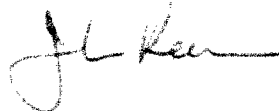
SUBJECT: Speed River Bridges
W.P. 109-68-02 and -13, Site 35-404
Hanlon Expressway, District 3
W.J. 69-F-87

Would you kindly review the footing elevations for Piers #1 and #2 for both structures. The footings for these piers are intended to be spread footings on bedrock.

Pier #1 is approximately halfway between boreholes 2A, 2C, 2B and holes 3A and 3B. The elevation of sound bedrock varies from about elevation 982. at hole 2A to about elevation 990. at holes 3A and 3B.

In view of the large variation in rock elevation and the absence of borehole information immediately at the location of Pier #1 footings, do you consider additional borings advisable in order to more accurately define the line of sound bedrock? Also we would appreciate your comments and recommendations concerning the footing elevations for Piers #1 and #2.

Enclosed for your convenience is a copy of the Preliminary Plan.



J.L. Keen,
Regional Bridge Design Engineer

JLK:rd

c.c. A.F. Watt
K. Stolarski

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

*file with report
also*

To: Mr. W. B. Bennett,
Principal Materials Engineer,
Materials Section,
Lab. Bldg.

ATTENTION: Mr. P. Wilson,
Materials Engr. (Concrete)

Our File Ref.

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

DATE: March 3, 1970

IN REPLY TO

SUBJECT:

Speed River Bridge, Hanlon Expressway
City of Guelph, District #3 (Stratford)
W.P. 109-68-02, Site 35-404, W.J. 69-P-87

Further to our discussion on February 28, 1970,
we enclose a copy of the results of chemical tests carried
out on rock samples recovered during our foundation investi-
gation for the Speed River Bridge.

As you will note from the results, there appears
to be no danger of sulphate attack on the concrete foundations
for the new bridge.

If we can be of any further assistance in this matter,
please contact this Office.

AGS/SLP
Attn.

cc: Messrs. J. Keen
M. C. Dornier
J. Roy
A. P. Watt

Foundations Files ✓
Gen. Files

H. L. Selby
A. G. Selby,
SUPERVISING FOUNDATION ENGR.
For:
A. G. Sterzac,
PRINCIPAL FOUNDATION ENGR.

MEMORANDUM

To: Mr. K. Selby,
Supervising Foundation Engineer.

From: Chemical Section,
Materials & Testing Office.

ATTENTION:

DATE: March 2, 1970.

OUR FILE REF. 11-15-1

IN REPLY TO

SUBJECT:

Limestone Samples

At your request two samples of powdered limestone have been tested for their sulphate contents. The test results showed that water soluble and acid soluble sulphates were not present.

The samples were identified as follows:

1. 69-F-87, BH # 1A, Depth 14.6 - 15.1 ft.
2. 69-F-87, BH # 7B, Depth 16.6 - 16.9 ft.

RS/mm


R. Sterk,
Chemical Engineer.

MEMORANDUM

To: Mr. K. Selby
Foundation Engineer

From: B. K. Glassford

ATTENTION:

DATE: October 31, 1969

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 109-68-02

Speed River Bridge, Guelph, Ont.

Hwy.: Hanlon Expressway, Foundations 69-F-87

The cores from the drill holes of line 'A' and line 'B' of this proposed bridge site show a dolomitic limestone rock type with some sections having severely weathered characteristics. The dolomite is a light creamy-buff colour, aphanitic, medium to irregularly bedded, soft and with some bituminous material present. Also some sedimentary inclusions of sulphides along with some sulphate minerals were noticed in the cores. This dolomite is classified as the Erasoma beds of the Amabel (Lockport) formation.

Line 'A'

The depth of the gravel-sand overburden or fill material above the bedrock surface and below the water level of the river varies between 11 feet and 3 feet in holes No. 2 and No. 3 respectively. The approximate depths to sound bedrock in the bore holes on this line are given below.

| <u>Hole</u> | <u>Core - Bedrock Depth</u> | <u>Elevation</u> |
|-------------|-----------------------------|-------------------------|
| 1 | 15.0 feet approximately | 983.0 ³ feet |
| 2 | 15.0 " " | 982.2 ² " |
| 3 | 7.4 " " | 990.2 ² " |
| 4 | 9.6 " " | 988.6 " |
| 5 | 8.8 " " | 988.6 " |
| 6 | probably at 20.5 feet | 982.5 " |
| 7 | 16.0 feet approximately | 990.6 " |

Line 'B'

Similar overburden coverage is present over bedrock on line 'B'. The approximate depths to sound bedrock in the bore holes on this line are given below.

| <u>Hole</u> | <u>Core - Bedrock Depth</u> | <u>Elevation</u> |
|-------------|-----------------------------|------------------|
| 1 | 17.5 feet approximately | 980.5 feet |
| 2 | 13.7 " " | 984.4 " |
| 3 | 7.5 " " | 990.5 " |
| 4 | 8.0 " " | 989.4 " |
| 5 | 12.0 " " | 985.0 " |
| 6 | 6.5 " " | 991.4 " |
| 7 | 16.8 " " | 997.0 " |

Holes No. 2 and No. 4 on this line show intermittent core recovery with either lost core or cavities in these bore hole locations. Rock recovery above these missing spaces could be from either large loose blocks of dolomite (boulders) or from in situ bedrock. Footings however should be taken to the elevations given where solid bedrock is encountered.

The difference in sound bedrock elevations between bore holes suggests a reef-type structure to the dolomite beds. This condition is further observed in the rock face and floor of the adjacent quarry operated by the Canadian Gypsum Co.

There should be no trouble encountered with driving sheet piling into the top portion of this soft dolomite rock. It may be possible to excavate the top weathered portion of the dolomite by ripping. However, blasting of the rock would appear to be the most practical method. Sound bedrock should give the required strength characteristics for bearing capacities. It should be brought to the attention of the Materials and Testing concrete engineer of the presence of sulphate minerals in the bedrock in this area, as this would probably necessitate the use of a special cement type for the footings.

B. K. Glassford

B. K. Glassford
Geologist

BKG:nm

c.c.: W. R. Bennett
G. P. Wilson
Z. Katona
B.K.G.

MEMORANDUM

To: Mr. A.G. Stermac,
Prin. Foundation Engr.,
Mat. & Testing, Lab Bldg.,
DOWNSVIEW, Ontario.

From: A.P. Watt,
Reg. Br. Planning Engr.,
London Regional Office.

ATTENTION

DATE: September 9th, 1969.

OUR FILE REF

IN REPLY TO

SUBJECT:

W.P. 109-68-02, Site 35-404,
Speed River Bridge (Eastbound & Westbound Lane),
Hanton Expressway,
City of Guelph,
District 3 - Stratford.

Please arrange for a foundation investigation at the Speed River Crossing. We would appreciate if we could have the foundation report by November 7th, 1969, in order to meet the Bridge Design completion date.

Enclosed please find 2 prints of site plan E-4842-1 for the above-mentioned bridge. This plan shows the probable footing locations for two schemes as presently proposed. The footing location for the west abutment is the same for both schemes. The footings shaded in red are for a design spanning the river and the Quarry Access Road with one structure. The footings shaded in blue are for a design spanning the river only.

The B-Plan for this area is B-153-21.

There is a possibility that in the future these structures may be widened by one lane on each side to provide for a speed change lane and one additional through traffic lane in each direction.

Enclosed please find a Field Reconnaissance Report.

SJ/rs
Atch.

S. JANTS
For: A.P. Watt,
Reg. Bridge Planning Engineer,
London Regional Office.

C.C. S. McCombie.
A. Crowley.