

62-F-70

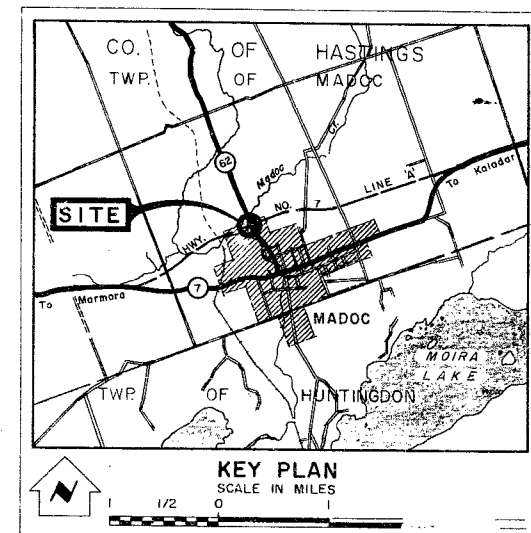
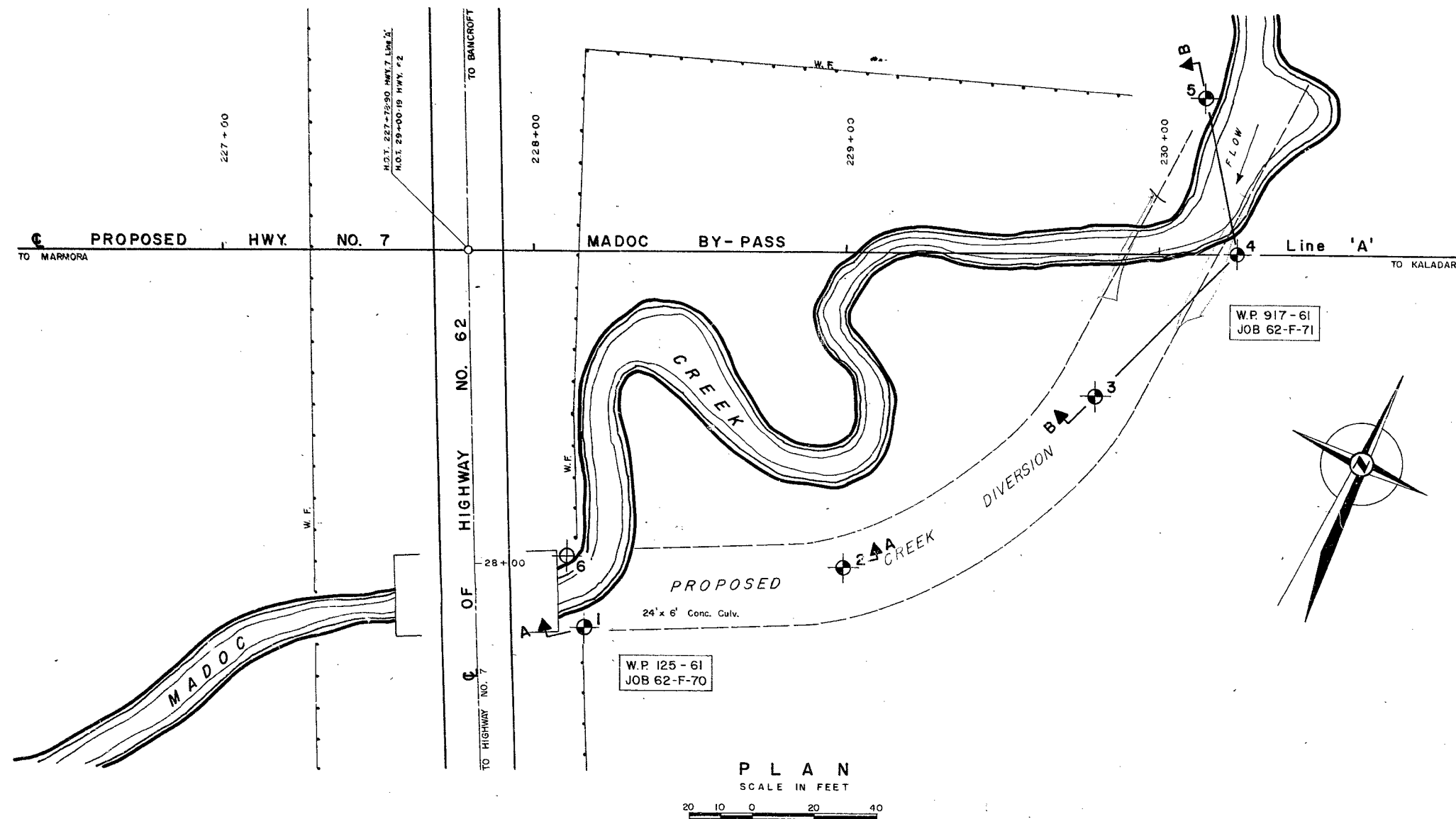
62-F-71

W.P. # 917-61

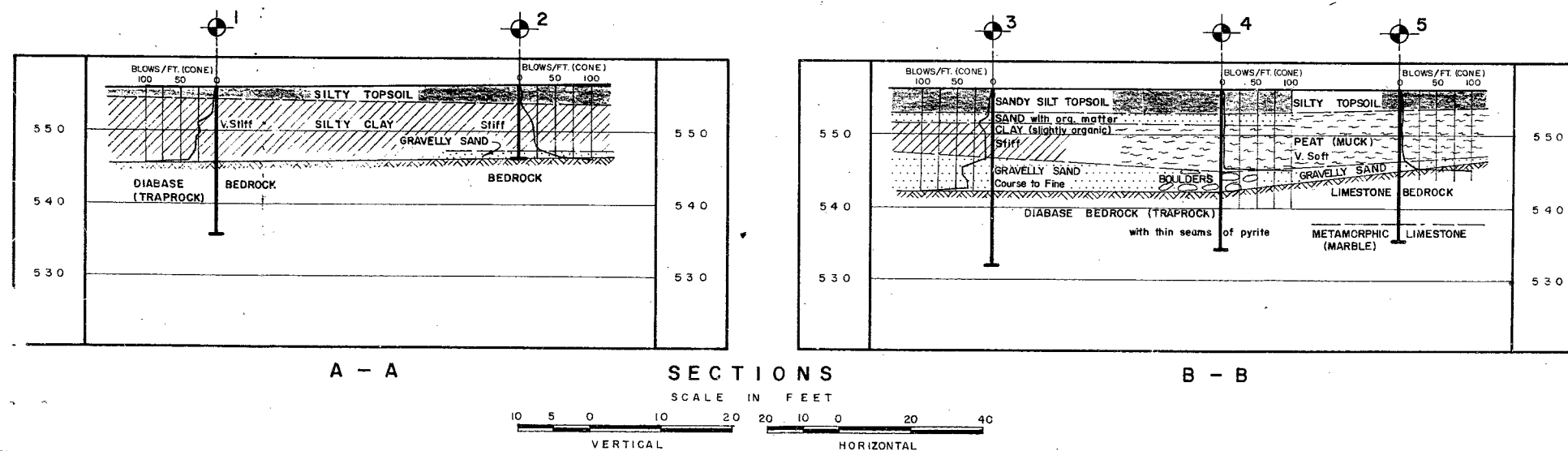
W.P. # 125-61 (NEW)

Hwy # 62 & Hwy # 7
AT

MADOC CREEK



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. (June 1962)		
NO.	ELEVATION	STATION	OFFSET
1	556.2	228+17	120' RT.
2	556.5	229+00	100' RT.
3	556.5	229+80	45' RT.
4	556.5	230+25	0
5	556.5	230+15	50' LT.
6	555.0	228+12	97' RT.

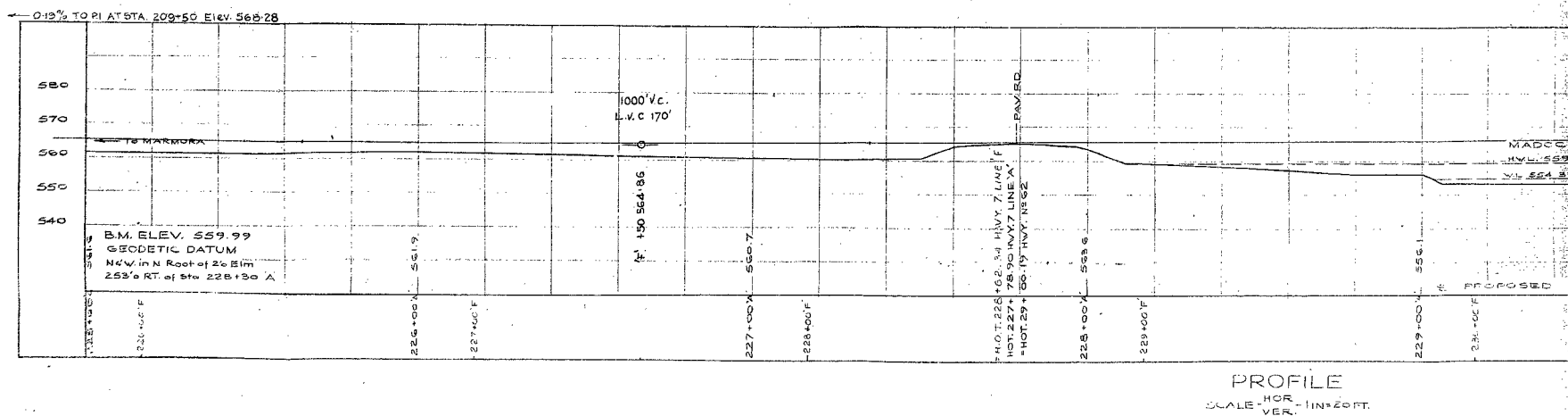


- NOTE -
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

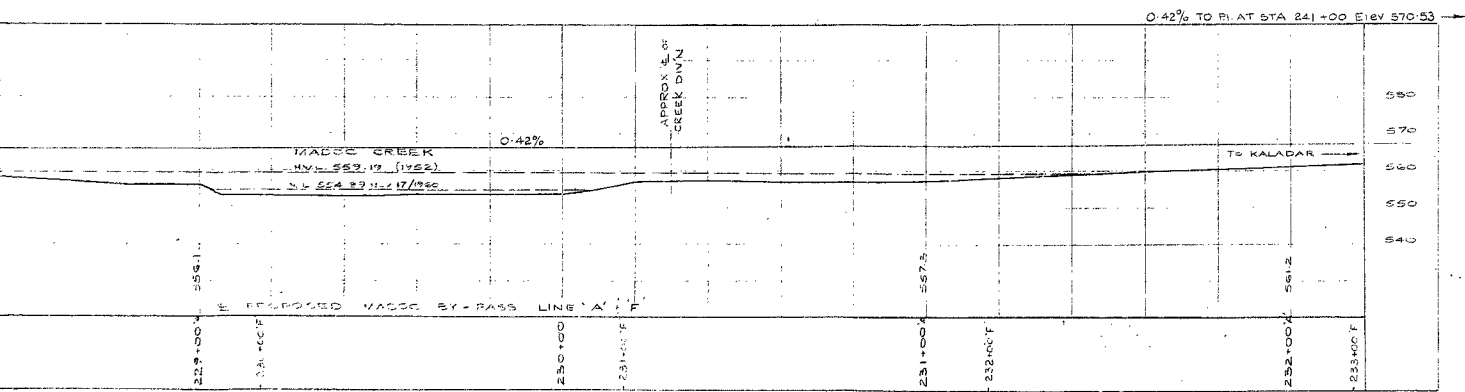
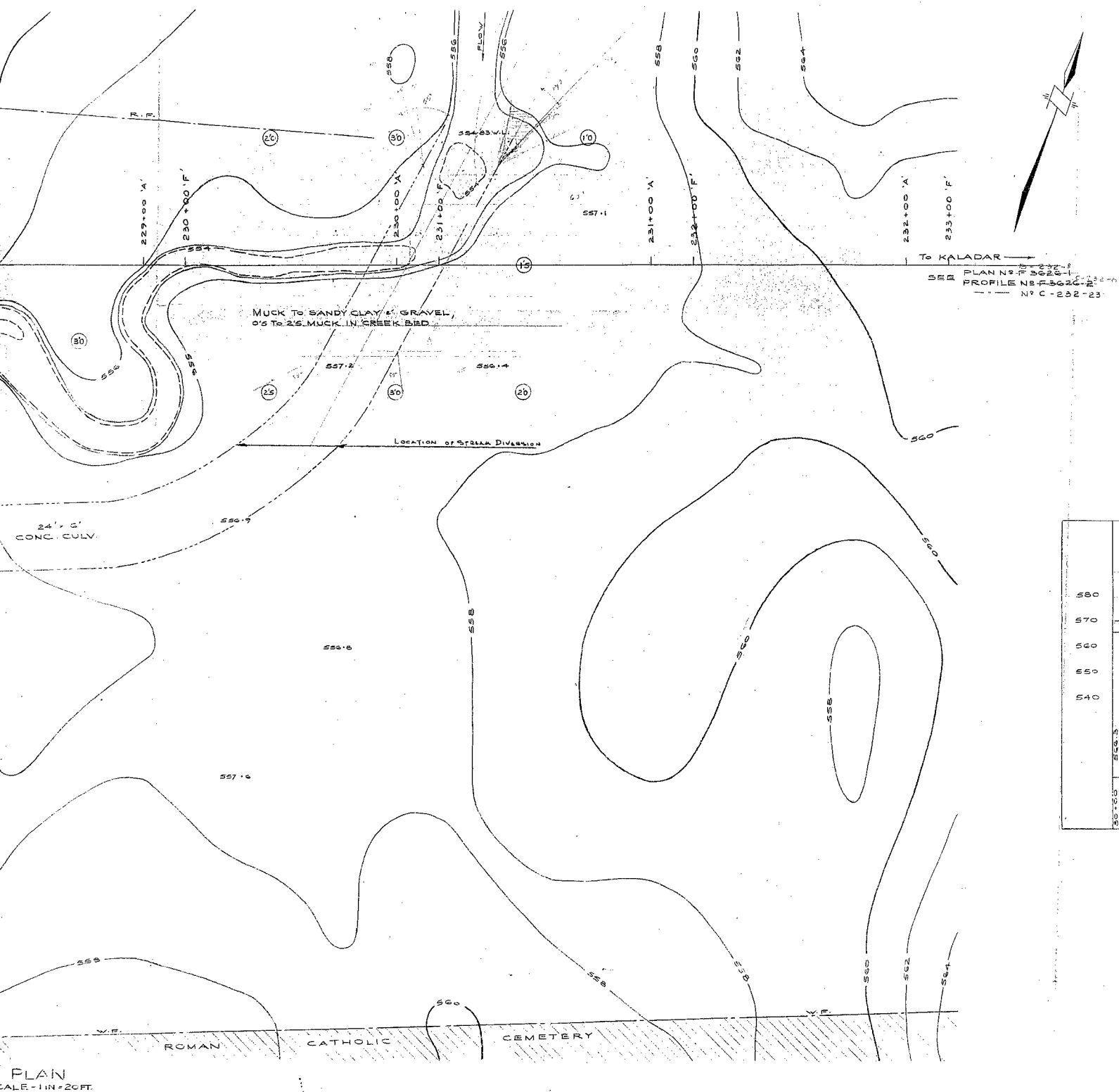
REVISION
Work Project Numbers corrected on plan. (August 9, 1961)

DEPARTMENT OF HIGHWAYS - ONTARIO		
MATERIALS & RESEARCH SECTION		
MADOC CREEK DIVERSION AT HIGHWAY NO. 62 & HIGHWAY NO. 7 LINE 'A' (MADOC BY-PASS)		
ORIGINATED A. BARSVARY	DISTRICT NO. 8	DATE 2 AUGUST 1962
DRAWN D. MUMFORD	W.P. NO. 317-61 & 125-61	JOB NO. 62-F-70 & 71
CHECKED <i>[Signature]</i>	CONTRACT NO.	DRAWING NO.
APPROVED <i>[Signature]</i>		62-F-70 & 71A

E-4008-1

[illegible]

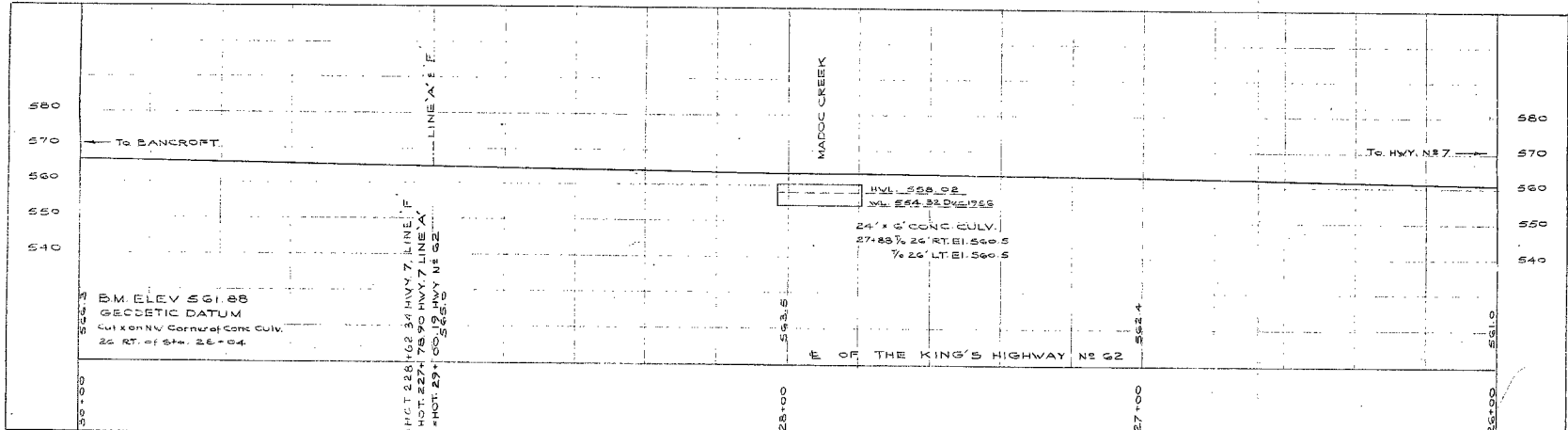
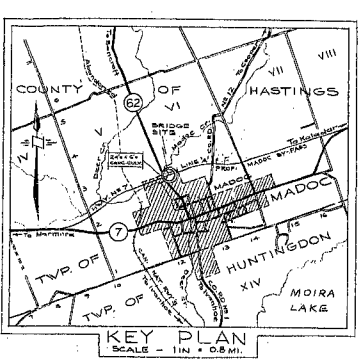
OF HASTINGS
SHIP OF MADOC
GE OF MADOC



580					
570					
560					
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490					
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20					
10					
0					

PROFILE

833+00 F.
To KALADAR
PLAN N° 232-1
SEE PROFILE N° 232-2
N° C-232-23



PROFILE OF THE KING'S HIGHWAY N° 62
SCALE - HOR. 1 in. = 20 ft.
VER. 1 in. = 20 ft.

GB.M. N° 179-G, ELEV. 587.144
IVANHOE: C.P.R. Bridge over C.N.R. Madoc branch,
1 mile east of station. South face of concrete coping of
balustrade on east abutment. Ball set horizontally.

VP 917-61

DATE	REMARKS	BY
JAN 1961	Line 'F' corrected to Line 'A' Added	F. Bouchard
Jan 9/61	LOCATION OF STREAM DIVERSION CHANGED	J. Curtis
Feb 2/61	THIS PLAN SUPERSEDES E 2033-1	J. Curtis

DEPARTMENT OF HIGHWAYS - ONTARIO
PLANNING & DESIGN BRANCH
DISTRICT N° 8

PROPOSED CROSSING
AT
MADOC CREEK
AND
THE KING'S HIGHWAY N° 7
PROPOSED MADOC BY-PASS, LINE 'A'
IN THE VILLAGE OF MADOC
TOWNSHIP OF MADOC COUNTY OF HASTINGS

BRIDGE SITE

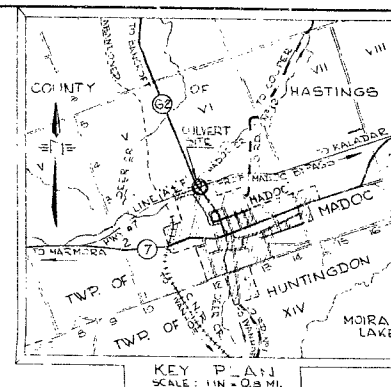
SURVEY BY		APPROVED
CHIEF OF PARTY - A. KORCHUK	SUPERVISOR - A. BOUCHER	Director of Planning & Design
DRAWN BY		SCALE - AS SHOWN
DRAFTSMAN - V. NIKODIM	SUPERVISOR - G. BROWN	DATE OF SURVEY - NOV 1960
CHECKED BY		DATE OF PLAN - JULY 1961
DRAFTSMAN - V. NIKODIM	SUPERVISOR - G. BROWN	W2134-61-G4 X-INGNS
		PLAN E-4008-1

SKEW 23°
 SIN 0.43947
 COS 0.83235
 TAN 0.53171

HWY #62

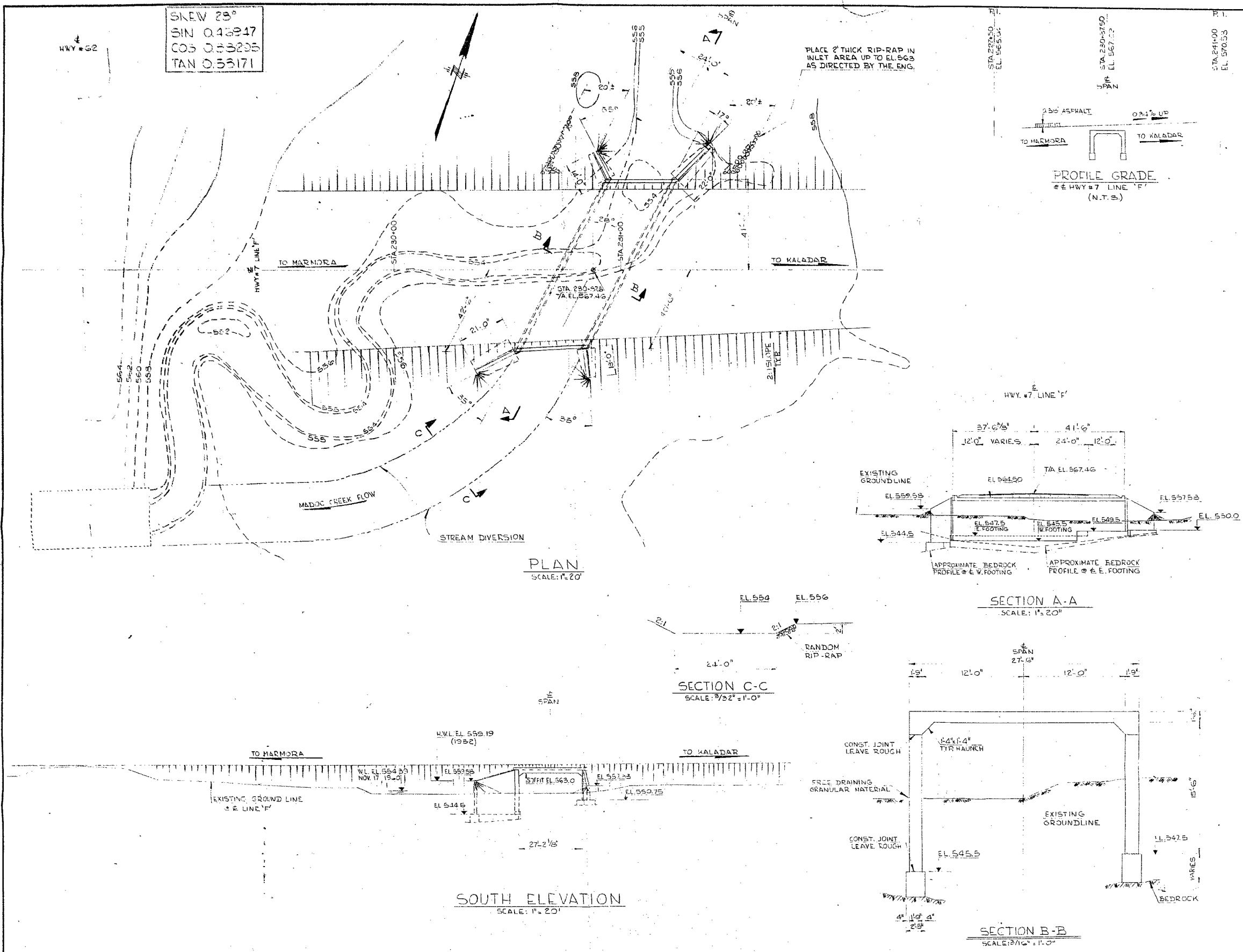
PLACE 2" THICK RIP-RAP IN
 INLET AREA UP TO EL. 563
 AS DIRECTED BY THE ENG.

PROFILE GRADE
 @ HWY #7 LINE 'F'
 (N.T.S.)



G.B.M. N°179-G, ELEV. 587.144
 IVANHOE C.P.R. BRIDGE OVER C.N.R. MADOC BRANCH
 1 MILE EAST OF STATION, SOUTH FACE OF CONCRETE
 COPING OF BALLAST WALL ON EAST ABUTMENT.
 BOLT SET HORIZONTALLY.

NOTES
 TO ENGINEER:
 CONCRETE WORK FOR THIS STRUCTURE MUST NOT BE
 COMMENCED UNTIL MONUMENTS TO FIX CONTROL POINTS
 HAVE BEEN ERECTED AND CHECKED BY THE ENGINEER.
 TO CONTRACTOR:
 STRUCTURE TO BE BUILT IN ACCORDANCE WITH FORM N°9
 AND THE SPECIAL PROVISIONS EXTRA COPIES OF WHICH
 MAY BE OBTAINED FROM THE ENGINEER.
 CONCRETE MIX:
 MIN. STRENGTH OF CONCRETE @ 28 DAYS: 3000 P.S.I.
 APPROVED ADMIXTURES SUPPLIED BY THE CONTRACTOR
 WILL BE ADDED TO ALL CONCRETE AS SPECIFIED BY THE
 ENGINEER.
 BORING DATA:
 THE COMPLETE SOIL INVESTIGATION REPORT FOR THIS
 STRUCTURE MAY BE EXAMINED AT THE BRIDGE OFFICE
 AND FOUNDATION OFFICE, DOWNSVIEW AND AT THE
 KINGSTON DISTRICT OFFICE.
 CLEAR COVER ON REINFORCING STEEL:
 3" UNLESS OTHERWISE NOTED.
 CONSTRUCTION NOTES:
 ALL EXPOSED EDGES TO BE CHAMFERED 1"X1" EXCEPT AS NOTED
 ALL CONSTRUCTION JOINTS MUST BE APPROVED BY THE
 ENGINEER.



PRINT RECORD		
No.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION			
MADOC CREEK STRUCTURE			
MADOC BY-PASS @ HWY. N° 62			
KING'S HIGHWAY No. T.C.H. 7		DIST. No. 8	
CO. OF HASTINGS		VILLAGE OF MADOC	
TWP. OF MADOC		LOT CON.	
PRELIMINARY PLAN			
APPROVED	BRIDGE ENGINEER	SITE No.	12-248
DESIGN	G.P. CHECK	W.P. No.	917-G1
DRAWING	G.P. CHECK	CONTRACT	NGL
DATE	DEC. 1963	LOADING	H20-516
DRAWING No.		D-3353-P2	

MEMORANDUM

TO: Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Attention: Mr. A. Watt

FROM: Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

DATE: August 6, 1963

OUR FILE REF.

IN REPLY TO

SUBJECT:

Proposed Madoc Creek Extension at Hwy. #62,
Madoc By-Pass, District #8, Kingston, Ont.
W.P. 917-61 -- W.J. 62-F-70

125-61

Further to our discussion by phone on August 6, 1963,
this is to advise you that the above culvert extension, if constructed as a box section, may be founded at or about el. 552.0 using a safe net pressure of 2 t.s.f.

KGS/MdeF

cc: Foundations Office
Gen. Files

K. G. Selby
K. G. Selby
SENIOR FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

Jim McDruggall
Kingston

Ledoc Creek
N of Ledoc

Excavate in muskeg
backfill with rock

Good cushion

Don't storm

Contr. No. 65-114

W.P. 925-61 62-F-76 ✓

125-61 62-F-71

917-61 62-F-70

~~907-61~~ —

De



BA 1482

Memo to Mr. A. M. Toye, Date July 24, 1962.
Bridge Engineer. Subject D.H.O. FOUNDATION INVESTIGATION
REPORT
From Materials & Research Division, W.J.62-F-70 & 71 - W.P. 917-61 & 125-61.
(Foundation Section)
Attention: Mr. S. McCombie.

Re: Proposed Madoc Creek Culvert Extension at Hwy. #62,
and Proposed New Culvert at Madoc Creek and Hwy. #7,
Madoc By-Pass, District #8, Kingston, Ontario.

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

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

AGS/MdeF
Attach.

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E. A. Cash
J. E. Gruspier
T. J. Kovich
J. Roy
E. R. Saint
F. Norman
A. Watt
Foundations Office
Gen. Files.

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 - 7.2) New Culvert at the Crossing of Hwy. #7,
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-

FOUNDATION INVESTIGATION

For

Proposed Madoc Creek Culvert Extension at Hwy. #62,
and Proposed New Culvert at Madoc Creek and Hwy. #7,
Madoc By-Pass, District #8, Kingston, Ontario.
W.J. 62-F-70 & 71 -- W.P. 917-61 & 125-61

1. INTRODUCTION:

A memo from the Bridge Location Section, dated January 31, 1962, was received, requesting a foundation investigation at the site of the proposed culvert extension at the crossing of Hwy. #62 and Madoc Creek. The same memo requested a foundation and soils investigation at the site of the proposed new crossing at Madoc By-Pass (Hwy. #7) and Madoc Creek diversion. A field investigation was subsequently carried out by this Section to determine the subsoil conditions existing at the afore-mentioned locations.

Presented in this report are the results of this investigation, together with recommendations pertaining to the design of the proposed foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site is located on the north side of the Village of Madoc, east of Hwy. #62. The area adjacent to Madoc Creek is flat, partly grass and weed covered and partly swampy. Exposed bedrock on the surface is visible about 100' south of the site. Madoc Creek is some 10 - 15' wide, 0.5 - 1.0' deep and has a meandering course. The elevation of the prevailing water level of the creek was established at El. 554.5.

cont'd. /2 ...

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

The present structure at the crossing of Hwy. #62 and Madoc Creek is a 24' x 6' concrete culvert, in slightly poor condition. Attempts to locate the base of the footings of the culvert were not successful.

Physiographically, the site is situated on the border between the Canadian Shield and Dummer Moraines geological region. The moraines of this area are characterized by angular fragments and blocks of limestone with many Precambrian rocks also present. The underlying bedrocks are sedimentary limestones, mostly of the Black River group although including some of the overlying Trenton.

3. FIELD INVESTIGATION PROCEDURE:

A total of 5 boreholes and 6 dynamic cone penetration tests was carried out during the course of the field investigation. Boring was achieved by means of conventional diamond drilling equipment adapted for soil sampling purposes. Undisturbed soil samples were obtained by means of 2-inch I.D. Shelby tubes, which were either pushed into the soil by hand, or hammered by means of a 140-lb. hammer. Disturbed samples were recovered by means of a standard split-spoon sampler. The dimensions of the split-spoon sampler and the energy used in driving it, conform to the requirements of the "Standard Penetration Test". AXT core barrels were used for acquiring rock core samples. Driving energy of the dynamic cone penetration tests was 350 ft. lbs. per blow.

cont'd. /3 ...

3. FIELD INVESTIGATION PROCEDURE:

Ground water level observations were carried out during the field work.

The locations and elevations of all boreholes are shown on Drawing #62-F-70 - 71A, which is attached to this report.

4. LABORATORY TESTS:

Samples were visually examined and identified in the field prior to being transported to the laboratory. Upon receipt in the laboratory, tests were carried out on various representative samples to determine the natural moisture content, Atterberg limits and the content of organic impurities of the deposits. Additional tests on undisturbed cohesive samples were performed to define the unconfined shear strength, density and sensitivity of the samples.

Laboratory and field test results are included under Appendix I of this report.

5. SOIL TYPES AND SOIL CONDITIONS:

5.1) General:

Subsoil at the site, indicated by the boreholes, consists of 10.0 - 14.0' of overburden, under which bedrock was encountered. The boundaries of the various strata of the overburden, together with the bedrock, are shown on the attached borelog sheets. The estimated stratigraphical profiles shown on Drawing #62-F-70 - 71A, are based upon this information.

A description of the various layers encountered, is as follows:

cont'd. /4 ...

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

5.2) Topsoil:

The upper 2.0 - 3.5' of each borehole was found to be topsoil. This material is either silt or sand, highly contaminated with organic and vegetable matter, soft, and without any engineering value. The layer is dark brown or black in colour when wet.

5.3) Silty Clay to Clay:

Underlying the topsoil in B.H. #1 and #2, a silty clay deposit was observed down to elevation 546.0 - 547.0. The same material was separated from the topsoil by a 1.5' thick sand layer in B.H. #3. The consistency of the stratum in B.H. #1 was "very stiff", and in B.H. #2 and #3, "stiff", corresponding to average standard penetration 'N' values of 23 and 10, respectively.

The shear strength of undisturbed samples taken in B.H. #1, based on laboratory unconfined compression tests, was found to be approximately 3000 p.s.f. The sensitivity of the deposit was calculated by performing the laboratory unconfined compression tests on undisturbed and remolded soil samples, and was found to be 2.5. The natural moisture content of the stratum varied between 20% and 30%. The average plastic and liquid limits, 20% and 42%, respectively. The value of the bulk density can be taken as 125.0 p.c.f.

5.4) Sand with Organic Matter:

Underlying the topsoil in B.H. #3 and #4, a 1.5' thick layer of organic contaminated sand deposit was encountered, extending from El. 553.0 down to El. 551.5. In B.H. #3 it was found

cont'd. /5 ...

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

5.4) Sand with Organic Matter: (cont'd.) ...

to have "compact" relative density, while in B.H. #4 its relative density was "very loose". The dark colour and the slightly plastic nature of the deposit was indicative of the presence of organic matter.

5.5) Peat (Muck):

This material was observed in B.H. #4 at elevation 551.5 extending to El. 545.0 and in B.H. #5 from El. 553.5 down to El. 546.5. The stratum is highly organic and black in colour with a natural moisture content above 100%. The very low penetration 'N' values (1 blow per foot) indicate a "very soft" consistency of the deposit. The layer has high plasticity, the values of liquid limit being near or above 100%, and those of the plastic limit between 70 and 80%. The average content of organic impurities, determined by laboratory tests, was found to be about 10% by weight.

5.6) Gravelly Sand and Boulders:

Overlying the bedrock in B.H. 2, 3, 4, & 5, a coarse grained deposit was found, its thickness varying from 1.0' to 5.0'. The predominant constituent materials of the layer are gravel and sand with occasional boulders.

5.7) Bedrock:

At approximate elevations varying from 546.5 - 542.0, bedrock was observed in each borehole. In B.H. #1, 2, 3 and 4, the bedrock was found to be Diabase (Traprock). It is a very fine

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

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

grained intrusive igneous rock, having a very hard nature; its colour is dark grey. In some places, it was intersected with very thin seams of pyrite. In B.H. #5 limestone bedrock was encountered at El. 545.5. From El. 538.0 downward, the limestone appeared to change to metamorphic limestone (marble). It is a fine grained stone, dark grey in colour and belongs to the Black River formation.

6. GROUND WATER CONDITIONS:

Ground water level observations were carried out during the field investigation. The ground water level in every borehole was found to be 2.0 - 2.5' below the ground level at El. 554.0, which is the approximate elevation of the creek water level.

7. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a 10' - 20' culvert extension on the east side of the existing one, at the crossing of Hwy. #62 and Madoc Creek. It is also proposed to build a new culvert at the crossing of Hwy. #7, Madoc By-Pass and Madoc Creek diversion. The length of the proposed creek diversion is about 220'.

Subsoil at the site of the culvert extension consists of a very stiff silty clay deposit underlain by hard Diabase bedrock.

The overburden at the site of the proposed new culvert consists of layers of organic topsoil, sand with organic matter, organic clay and peat (muck). The above very soft deposits are

cont'd. /7 ...

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

underlain by Diabase and Limestone bedrock. The bedrock was proved by drilling 10 ft. core samples. Recommendations as to the foundation of the proposed structures are given below:

7.1) Culvert Extension on Hwy. #62:

Spread footings are recommended for the culvert extension. The base of the footings should be placed on sound bedrock, at approximate elevation 546.0. As mentioned above, it was not possible to locate the base of the existing culvert. This should be done prior to the construction of the extension. If the existing culvert is founded on the bedrock, the extension may be connected to the existing structure by means of a rigid joint. However, if the present footings of the culvert are founded in the clay deposit, the extension should be built as an independent unit, with a vertical expansion joint between them, to minimize the effect of possible differential settlement. The estimated net safe bearing capacity of the bedrock may be taken to be 10 T/sq.ft.

7.2) New Culvert at the Crossing of Hwy. #7, Madoc By-Pass and Madoc Creek:

A spread footing type foundation is recommended for the new culvert. The base of the footings should be placed on sound bedrock. At this site, the elevation of the upper surface of the bedrock varies between 542.0 and 545.5. The exact elevation of the proposed base of footings cannot be decided therefore, but it should be on the sound rock along the entire length of the structure.

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

7.2) New Culvert at the Crossing of Hwy. #7, Madoc By-Pass and Madoc Creek: (Cont'd.) ...

The net safe bearing pressure can be taken as 10 T/sq.ft.

No major dewatering problems are anticipated during the excavations. Any seepage into the excavations should be controlled by open pumping.

All organic material should be excavated under the approach fills and be replaced with acceptable fill material. The embankments then should be constructed with side slopes of 2 horizontal to 1 vertical to eliminate any stability problems.

8. SUMMARY:

It is proposed to construct a 10' - 20' extension on the east side of the existing culvert at the crossing of Hwy. #62 and Madoc Creek. It is also proposed to build a new culvert at the crossing of Hwy. #7, Madoc By-Pass and Madoc Creek.

Subsoil at the site consists of 10' - 14' of mostly organic overburden followed by Diabase and Limestone bedrock.

Recommendations pertaining to the foundation of the proposed structures are as follows:-

- (1) Spread footing type foundations are recommended for both structures.
- (2) The base of the footings should be placed on sound bedrock.
- (3) The safe net bearing capacity of the bedrock is estimated to be 10 T/sq.ft.

8. SUMMARY: (cont'd.) ...

- (4) All organic material should be excavated under the approach fills and replaced with suitable fill material. The embankments should be constructed with side slopes of 2 horizontal to 1 vertical, to eliminate stability problems.
- (5) No dewatering problems are anticipated. Any seepage into the excavations should be controlled by open pumping.

9. MISCELLANEOUS:

The field work, performed during the period from June 25th to July 4th, 1962, together with the preparation of this report, was undertaken by Mr. A. K. Barsvary. The investigation was carried out under the general supervision of Mr. K. G. Selby, who also reviewed this report.

Equipment used was owned and operated by the Canadian Longyear Co., Ltd. of North Bay.

July 1962.

APPENDIX I.

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

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

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

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

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCoshie

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

August 15, 1963.

D.H.C. FOUNDATION INVESTIGATION REPORT --
Madoc Creek Diversion at Hwy. 62 & Hwy. 7,
Line 'A' (Madoc By-Pass), District 3, Kingston.
W.P. 125-61 -- W.J. 62-F-70
W.P. 917-61 W.J. 62-F-71

REVISION TO DRAWING 62-F-70 & 71A (Work Project Numbers corrected)

Would you kindly delete present Drawing No.
62-F-70 & 71A from your copy(s) of the above report, and replace
with attached revised drawing.

Thank you.

/MieF

Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E. A. Cash
J. E. Gruspier
A. Watt

Foundations Office
Gen. Files.


A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

*Re: proposed Madoc
Creek Extensions.
Hwy 62.*

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Attention: Mr. A. Watt

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

August 6, 1963

Proposed Madoc Creek Extension at Hwy. #62,
Madoc By-Pass, District #8, Kingston, Ont.

W.P. 917-61

-- W.J. 62-P-70

W.P. 125-61

Further to our discussion by phone on August 6, 1963,
this is to advise you that the above culvert extension, if con-
structed as a box section, may be founded at or about el. 552.0
using a safe net pressure of 2 t.s.f.

KGS/MdeF

cc: Foundations Office
Gen. Files

K. G. Selby
K. G. Selby
SENIOR FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

62

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Attention: Mr. A. Watt

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

August 6, 1963

Proposed Madoc Creek Extension at Hwy. #62,
Madoc By-Pass, District #8, Kingston, Ont.
W.P. 917-61 -- W.J. 62-F-70

125-61

Further to our discussion by phone on August 6, 1963,
this is to advise you that the above culvert extension, if constructed as a box section, may be founded at or about el. 552.0 using a safe net pressure of 2 t.s.f.

KGS/MdeF

cc: Foundations Office
Gen. Files

K. G. Selby
K. G. Selby
SENIOR FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

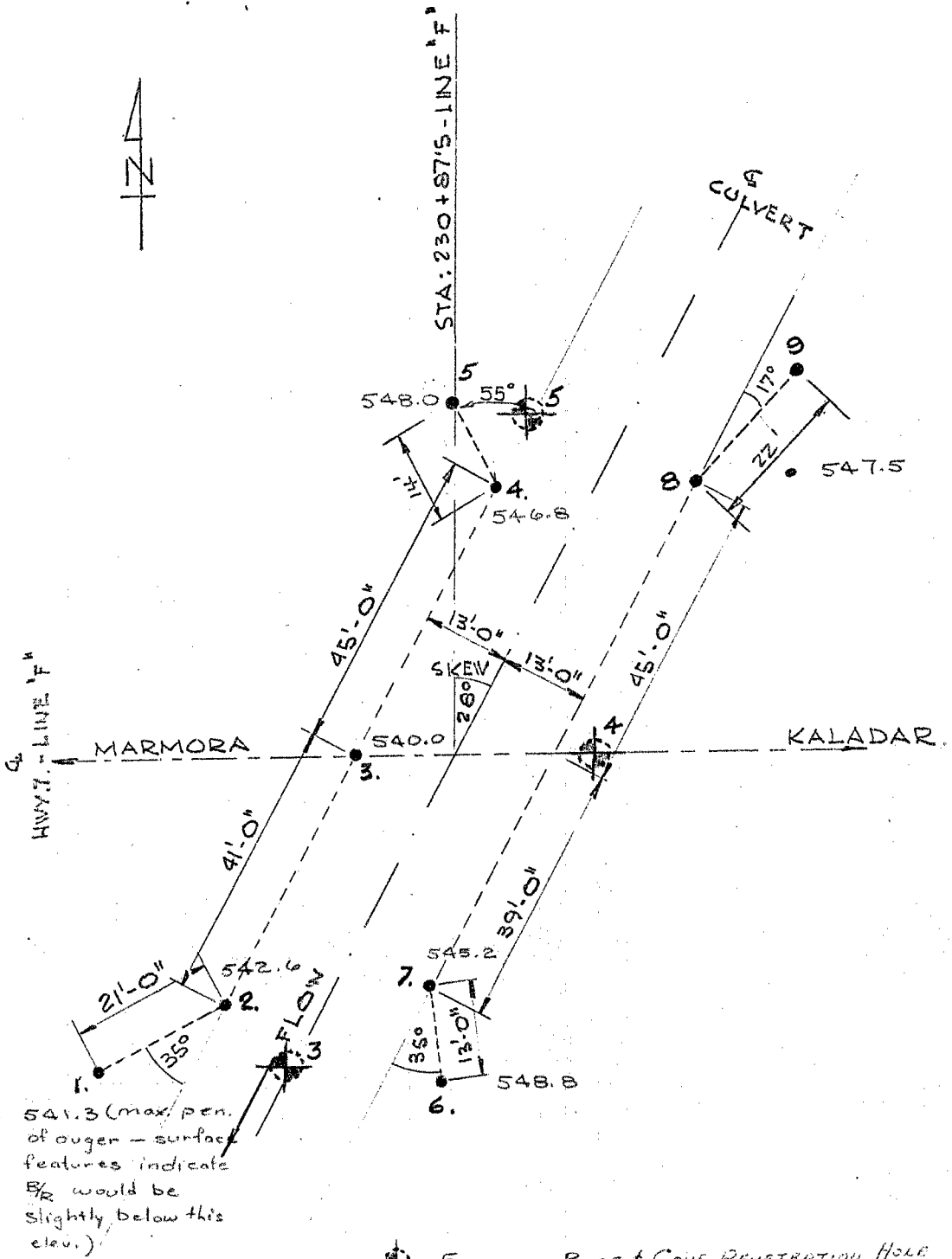
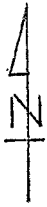
August 19, 1963

Bill Flashburne

Q: Can a box type culvert be used at Hwy 7 crossing?
If so, at what elevation should be the slab?
What is the allowable bearing capacity at this elevation?

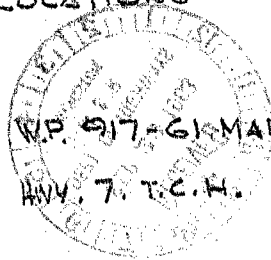
A: Box culvert should not be used because of the very bad and soft ground it is recommended that spread footings should be taken down to bedrock.

A. Stermac



EXISTING BORE / CONE PENETRATION HOLE

- BEDROCK ELEVATION REQUIRED, 9 LOCATIONS



W.P. 917-61 MADOCIE CK. CULVERT

HWY. 7. T.C.H. DISTRICT. 8.


SEPT. 3. 63. N. ZOLTAY.

ONTARIO
DEPARTMENT OF HIGHWAYS

Memo to Mr. T. Stermac Date Sept. 27, 1963
Principal Foundation Engineer Subject Re: Hwy. 7, W.P. 917-61,
From M. & R. Division, Kingston Madoc Creek Culvert

As requested a foundation investigation has been carried out at the above site using a 12" Stirling power auger. Bedrock, the elevation of which is indicated on the attached sketch, was located in all locations with the exception of #1. At this position the boring was carried to a depth of 15½', the maximum penetration of the auger, without encountering bedrock. An attempt was made to advance the boring using a hand auger but this was impeded by the density of the local till. Since bedrock appears on the surface in this area, it is assumed that it would be located within a few feet of the end of the boring.

In the vicinity of locations 8 and 9, borings could not be carried out due to a soft surface layer that prevented access with the power auger. A boring was carried out to bedrock, however, at a point approximately 10' from these locations as indicated on that attached sketch.


T.G. Smith

for J.E. Cruspier
Regional Materials Engineer

/ec

2 COPIES OF THIS REPORT
HAVE BEEN SENT TO A NATT
ON OCT. 1ST 1963



MEMORANDUM

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

FROM: A. P. Watt

DATE: December 30, 1963.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 917-61 Bridge Site #12-249
Madoc Creek Structure
Madoc By-Pass at Hwy. 62
T.C.H. 7 District #8

62-F-70

Enclosed please find one copy of the preliminary plan D 5353-P2 for the above structure.

Would you kindly review the structure foundations proposed and inform us if they are satisfactory.

APW/es



A. P. Watt,
Bridge Location Engineer.

cc. J. Walter



DEPARTMENT OF MINES AND TECHNICAL SURVEYS

GEOLOGICAL SURVEY OF CANADA
601 Booth St.
Ottawa

April 21, 1964

Mr. A. Rutka
Materials & Research Engineer
Ontario Dept. of Highways
Downsview, Ontario

Dear Alex:

I am returning with many thanks the two soils profiles (#7D10 and #7D14) which I found most useful in locating several sites for my studies of fossil pollen and Pleistocene chronology of the Kaladar area.

The two other reports on soils, one for the Madoc By-Pass and the other for a site east of Kaladar will be returned under separate cover.

I wish again to thank you for this kind and helpful co-operation.

Yours sincerely,


J. Terasmae

*Report belongs to Fdn Section
After review & conc*

MEMORANDUM

Please file this
M. Devata

To: Mr. A.G. Stermac,
Principal Foundations Engr.,
M.&T. Division, Downsview.

FROM: M.&T. Division, Kingston.

ATTENTION: Mr. M. Devata.

DATE: December 22, 1965.

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Hwy. 7. Contract 65-114. Deer Creek Structure Site.

Please find enclosed six photos taken by the District Construction Engineer at the above site. These pictures were taken on a dull day and an error was apparently made in setting exposure time on the camera.

RDG:cdr
Encl.

R.D. Gerow
R. D. Gerow

for J. E. Gruspier
Regional Materials Engineer

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. A. Rutka,
Materials & Testing Engineer,
Materials & Testing Division.

ATTENTION: Mr. A. Stermac,
Principal Foundation Engineer.
OUR FILE REF.

FROM: J. W. MacDougall

DATE: March 5, 1969

IN REPLY TO

SUBJECT:

Claim on Contract 65-114
Bailey Construction Company Limited

On December 20, 1965, Bailey Construction submitted a claim for excavating sand cushion and backfilling with crushed stone the foundation at Structure No. 7. The claim was some \$1,670.07.

The original design called for the excavation of the muskeg, backfill the muskeg excavation to within one foot of the bottom of the concrete box culvert with rock fill, and place sand cushion between the rock fill and the bottom of the culvert. During construction, the contractor encountered extra water which was, I believe, due to a rain storm on October 1, 1967. The compacted sand cushion was loosened and compaction lost, as well as the water submerging the sand cushion. The contractor requested that he be allowed to excavate this sand cushion, backfill the excavated sand cushion with additional rock fill and raise the grade a half foot placing crushed stone in the raised portion. The District and the Bridge Office agreed to this raise.

The contractor now contends that the Department's original design was inadequate, the Department approved of the sand cushion to be placed on top of the rock fill and this material also turned out to be inadequate, a further artesian condition developed and the contractor's pumps could not dispense all the water coming through the sand cushion.

I would draw your attention to his letter dated February 11, 1967. He further contends that the Department requested this modification

to the work and, therefore, have accepted the responsibility of paying for these extra costs. This, of course, is disputed by the District and a further meeting was held and each side is stating that they are correct.


I am forwarding this to you as the contractor is contending that he was going to unwater this by placing pumps in the rock fill lower than the sand cushion thus allowing the horizontal flow of water through this material. He contends that this material was impervious and, therefore, this is the Department's responsibility.

The contractor was advised of the Department's responsibility in this case on May 26, 1967 in which we were going to pay for the two inch crushed stone required in the half foot grade raise at the sand cushion price in the contract. This amounted to some \$209.09. Actually, the Department should not be paying anything in this case but the District forces have committed us to this payment. I have felt that this is entirely an unwatering problem and the responsibility is that of the contractor.

In any case, could you please advise me what your feelings are regarding the artesian conditions the contractor contends have arisen and is this practical.

I am enclosing the entire file for your perusal.

Encl.
JWM/wm


J. W. MacDougall
Claims Engineer.

Mr. J. W. MacDougall,
Claims Engineer,
Claims Engineers Section,
Admin. Bldg.

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

March 6, 1969

Claim on Contract 65-114
Bailey Construction Company Ltd.

With reference to your memorandum of March 5, 1969, and the information contained in the attached file dealing with the above subject, we herewith submit our comments for your consideration:

(1) Artesian water is basically defined as water which, when encountered at a certain depth below the existing ground level, rises above this level. (The aforementioned encounter generally refers to a borehole.) This rise can be anywhere from a fraction of an inch to many feet. When such conditions are encountered, they are always recorded and referred to as "artesian conditions". When artesian pressure is quoted, it always refers to the water pressure above the ground level existing at the time of the investigation.

No artesian conditions were encountered during the subsoil investigation of which the findings and conclusions are contained in the report dated July 24, 1962.

(2) When a sheeted excavation is carried out in a permeable soil with a high water table, and water is being pumped out from the bottom of the excavation, an ever increasing unbalanced hydraulic head is being created at the bottom of the excavation as it is being deepened. The unbalanced head is equal to the distance of the water table outside the sheeting and the water level inside the sheeting from which pumping is being carried out times the unit weight of water. This head, divided by the distance water has to travel - (water has to travel while pumping is going on), is called the hydraulic gradient. Once this gradient exceeds a certain value - (around one), the soil particles become buoyant and we speak of "quicksand" or "boiling of the bottom of the excavation". It is evident from the above explanation that this phenomenon is not a characteristic but, rather, a condition of the soil - in this particular case - created by pumping.

The damming up of the excavation at the Medoc Creek structure site can be roughly compared with a sheeted excavation.

Mr. J. W. MacDougall,
Claims Engineer,
Claims Engineers Section,
Admin. Bldg.

2

March 6, 1969

It appears that the Contractor was successfully dewatering the excavation until October 1, 1965, when a heavy and prolonged rainstorm occurred. Due to the heavy rain, the water in the diverted creek behind the dams outside the excavation, rose and thus increased the unbalanced hydraulic head inside the excavation. The distance the water had to travel though, remained the same. This then led to a considerable increase of the hydraulic gradient and, since the rate of flow is proportional to the hydraulic gradient, the rate of flow in this instance also increased.

It appears that the Contractor's pumping facilities were unable to handle satisfactorily this increased quantity of water and consequently the water level in the excavation started to rise. While rising through the granular pad, it loosened it and thus made it unacceptable to the Department's representative on the site.

This, in the opinion of the undersigned, is the explanation of the events that took place at the site during the first days of October, 1965. If this explanation is accepted as valid, all events and actions that took place later, have to be regarded as consequential.

If we can be of further assistance to you in this matter, please do not hesitate to call on us.

AGS/WdeF

Aftermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

cc: Foundations Files
Gen. Files

MADOC CREEK

GRANULAR PAD	EL. 549.08	SEPT 30, 1965
RAIN		OCT 1
DEWATERING TRIED UNSUCCESSFULLY		OCT 5
GRAN. PAD REMOVED		OCT 6/65
ROCK PLACED TO EL 549.08		OCT 6/65
REQUESTING RAISE OF 0.5 FT BY CONTRACTOR		OCT 7/65
[149.35 TONS USED]		

	549.08
	▽
GRANULAR PAD	548.08
	▽
ROCK FILL	

WATER EL. AT THE TEMPORARY DAM

NORTH OF CULVERT 557.6 [X. WESTERLY MAR. 17/66]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-70 & 71

LOCATION Hwy. #62 Sta. 27+75 35' Rt. of E

ORIGINATED BY A.B.

W.P. 917-61 & 125-61

BORING DATE June 26, 1962.

COMPILED BY A.B.

DATUM G.S.C.

BOREHOLE TYPE Washboring NX & BX Casing.

CHECKED BY A.B.

SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	10	20	30	40	50	W _p			W _L
							SHEAR STRENGTH P.S.F.					WATER CONTENT %			
							Undisturbed					10 20 30			
							• Remoulded								
							1000 2000 3000								
556.5	Groundlevel														
0.0	Silty topsoil														
554.5															
2.0															
	Silty clay		1	SS	20										
	very stiff														
	grey coloured														
			2	TW	27	550									
			3	TW	23										
546.0															
10.5															
	Diabase														
	Bedrock		4	RC											
	(Traprock)														
						540									
536.0															
20.5	End of borehole.														

WL IN
BH.
554.0

126.0

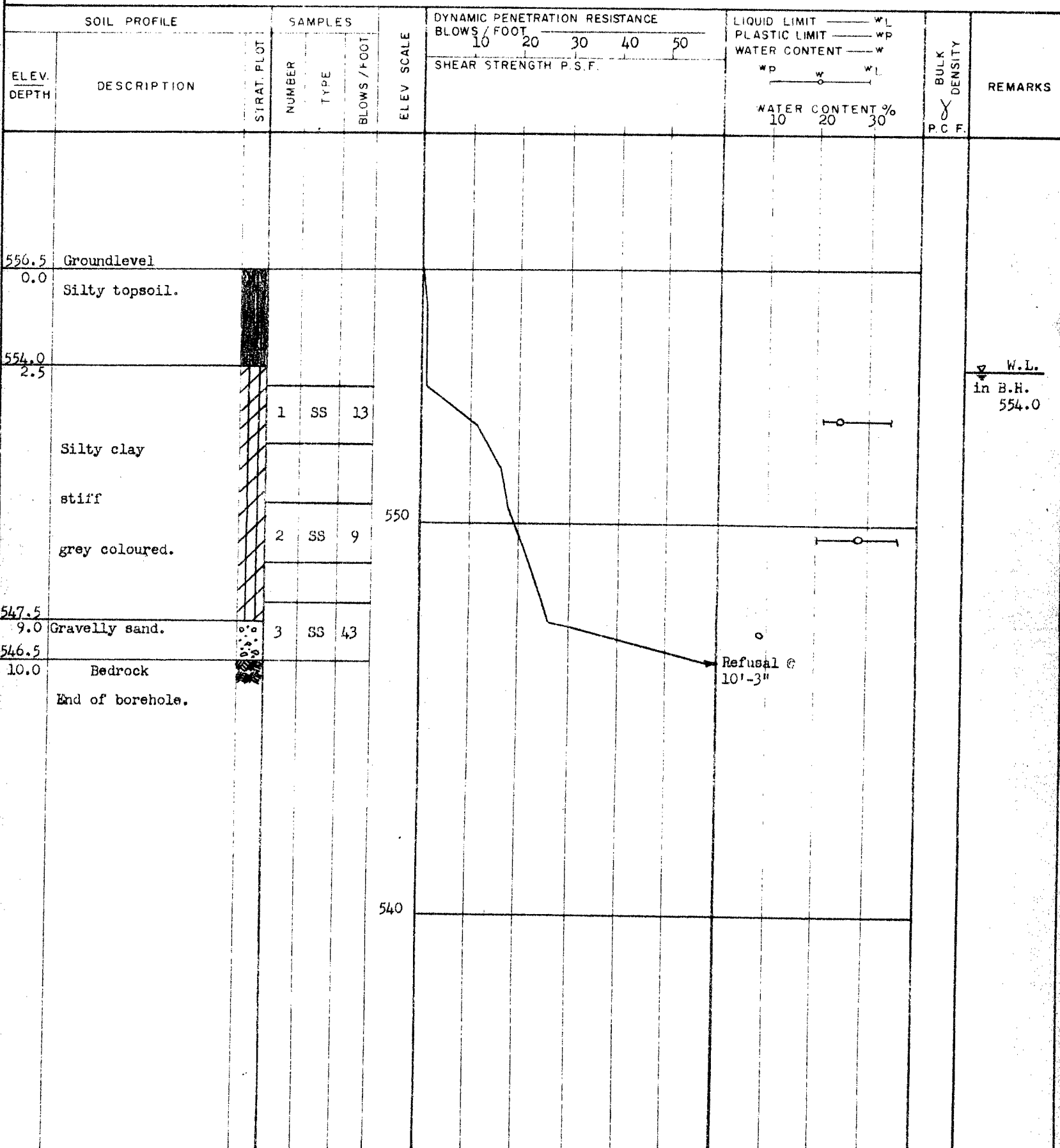
125.0

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB <u>62-F-70 & 71</u>	LOCATION <u>Madoc Bypass Line 'A' Sta. 229+00 100' Rt. of C</u>	ORIGINATED BY <u>A.B.</u>
W. P. <u>917-61 & 125-61</u>	BORING DATE <u>June 29, 1962.</u>	COMPILED BY <u>A.B.</u>
DATUM <u>G.S.C.</u>	BOREHOLE TYPE <u>Washboring NX & BX Casing.</u>	CHECKED BY <u>A.B.</u>



FOUNDATION SECTION

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— % PLASTIC LIMIT ——— % WATER CONTENT ——— %	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.			
56.5 0.0	Groundlevel							
	Sandy silt Topsoil							
53.0 3.5	Sand with organic matter.		1 SS 14					
51.5 5.0	Compact. Clay							
	Stiff (Slightly Organic) Grey coloured.		2 SS 10					
47.0 9.5	Gravelly coarse to fine sand. Dense.		3 TW 15					
			4 SS 24					
42.0 14.5								
	Diabase Bedrock (Traprock)		5 RC					
32.0 24.5	End of borehole.							

RECORD OF BOREHOLE NO. 4

JOB 62-F-70 & 71 LOCATION Madoc Bypass Line 'A' Sta. 230/25 E ORIGINATED BY A.B.
W.P. 917-61 & 125-61 BORING DATE June 27, 1962. COMPILED BY A.B.
DATUM G.S.C. BOREHOLE TYPE Washboring NX & BX Casing. CHECKED BY A.B.

[illegible]

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH DIVISION			RECORD OF BOREHOLE NO. 5				FOUNDATION SECTION		
JOB <u>62-F-70 & 71</u>		LOCATION <u>Madoc Bypass Line 'A' Sta. 230+15 50' Lt. of E</u>		ORIGINATED BY <u>A.B.</u>					
W.P. <u>917-61 & 125-61</u>		BORING DATE <u>July 3, 1962.</u>		COMPILED BY <u>A.B.</u>					
DATUM <u>G.S.C.</u>		BOREHOLE TYPE <u>Washboring NX & BX Casing.</u>		CHECKED BY <u>A.B.</u>					
SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER TYPE	BLOWS / FOOT	ELEV SCALE	10 20 30 40 50	W _P ——— W _L WATER CONTENT % 20 40 60 80 100		
556.5	Groundlevel								
0.0	Silty Topsoil								
553.5									
3.0	Peat (Muck) Very soft Black coloured		1 SS 1						
			2 SS 1		550				
546.5			3 SS 10						
10.0	Gravelly sand								
545.5	Firm								
11.0									
	Limestone Bedrock		4 RC		540				
538.0									
18.5	Metamorphic limestone (Marble)								
535.5									
21.0	End of borehole.								

W.L. in BH.

554.0

FOUNDATION SECTION

[illegible]