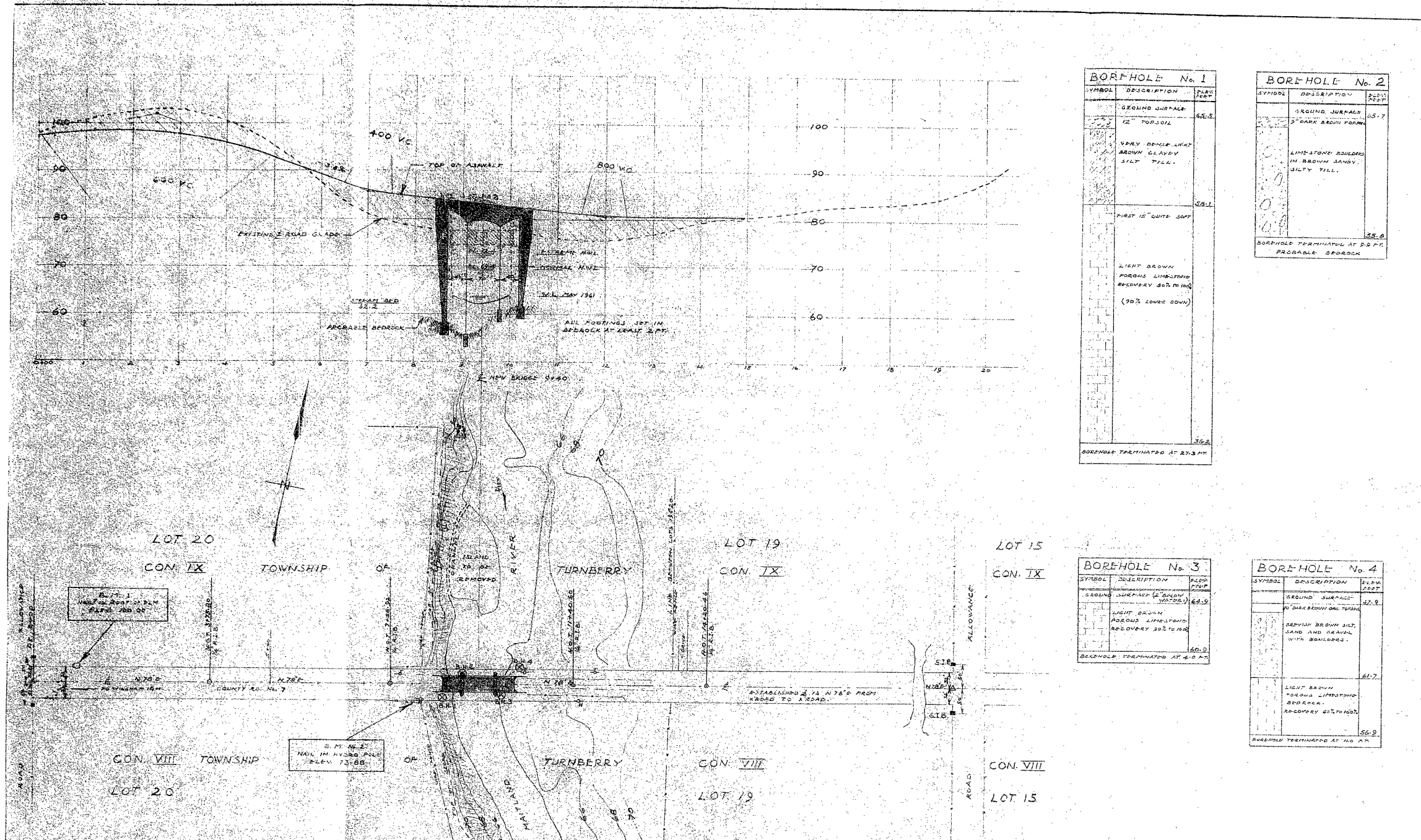


61-F-245M  
BRIDGE 34  
MAITLAND RIVER  
LOT 20, CON. 8+9

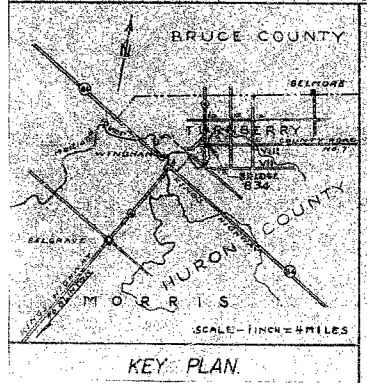


BOREHOLE No. 1		
SYMBOL	DESCRIPTION	ELEV. FEET
	GROUND SURFACE	65.8
	12" TOPSOIL	
	VERY DARK LIGHT BROWN CLAYEY SILT FILL	
	FIRST 15" QUITE SOFT	
	LIGHT BROWN POROUS LIMESTONE RECOVERY 80% TO 100% (20% LOWER DOWN)	
	BOREHOLE TERMINATED AT 27.3 FT	

BOREHOLE No. 2		
SYMBOL	DESCRIPTION	ELEV. FEET
	GROUND SURFACE	65.7
	3" DARK BROWN FILL	
	LIME STONE BOULDERS IN BROWN SANDY SILTY FILL	
	BOREHOLE TERMINATED AT 25 FT PROBABLE BEDROCK	

BOREHOLE No. 3		
SYMBOL	DESCRIPTION	ELEV. FEET
	GROUND SURFACE	64.0
	12" TOPSOIL	
	LIGHT BROWN POROUS LIMESTONE RECOVERY 80% TO 100%	
	BOREHOLE TERMINATED AT 61.0 FT	

BOREHOLE No. 4		
SYMBOL	DESCRIPTION	ELEV. FEET
	GROUND SURFACE	62.9
	12" DARK BROWN SILT	
	SEMI BROWN SILT SAND AND GRAVEL WITH BOULDERS	
	LIGHT BROWN POROUS LIMESTONE BEDROCK RECOVERY 80% TO 100%	
	BOREHOLE TERMINATED AT 61.0 FT	



FOLLOW SEPARATE INSTRUCTIONS FOR PREPARATION OF BRIDGE SITE PLAN WHEN MAKING BRIDGE SURVEY.

DATA

1. SPECIAL FEATURES: WATERFALLS, DAMS, EXCEPTIONAL FLOODS, ICE, DRIFTWOOD, SLIDING BANKS, ETC. UPSTREAM ISLAND TO BE REMOVED.

2. (A) UPSTREAM & DOWNSTREAM BRIDGES (GIVE LOCATION, LENGTH, HEIGHT ABOVE N.H.W.L., NET CROSS-SECTIONAL AREA, AT HIGH WATER & ESTIMATED AGE).

UPSTREAM BRIDGE - 1000' L.G.T., 12' HIGH, 10' WIDE, 1910'S.

DOWNSTREAM BRIDGE - 2340' L.G.T., 12' HIGH, 10' WIDE, 1910'S.

(B) REASONS WHY THESE Y DOGS ARE, OR ARE NOT, FAIR INDICATIONS OF SIZE OF PROPOSED BRIDGE.

3. REASONS FOR CHANGES IN WIDTH OR LENGTH FROM THAT OF OLD BRIDGE.

ACCORDING TO D.N. HYDROLOGY DEPT. LETTER FROM J.D. HARRIS DEC. 21, 1961 - V.C. 324-81-118 3 W. SP.

DATA (contd.)

4. IS 'DITCH, STREAM, OR RIVER GRADIENT' LIABLE TO BE LOWERED? NO

5. NAVIGATION CLEARANCES REQUIRED, IF ANY? N/A

6. RAILWAY CLEARANCE REQUIRED, IF ANY? N/A

7. IF STRUCTURE IS OVER OR UNDER A RAILWAY HAS APPROVAL BEEN OBTAINED?

(A) FROM RAILWAY CO. N/A

(B) FROM BOARD OF TRANSPORT COMMISSIONERS N/A

8. HAS APPROVAL BEEN OBTAINED UNDER NAVIGABLE WATERS PROTECTION ACT? N/A

9. IS A TEMPORARY DETOUR REQUIRED? YES

WHO WILL BUILD IT? HURON COUNTY

WHO WILL MAINTAIN IT? HURON COUNTY

10. INFORMATION AND EVIDENCE OF EXTREME FLOODING WAS OBTAINED FROM LOCAL RESIDENTS AND REFLECTS HIGHEST WATER ELEVATION IN THE AREA OF THIS CONSTRUCTION TO BE 72.00 AND THE LOWEST WATER ELEVATION TO BE 63.00

11. ROAD DESIGN INFORMATION:

ESTIMATED L.D. 400-1000

DESIGN SPEED 30

STOPPING SIGHT DISTANCE 300

STRUCTURE DATA

1. NET SPAN LENGTH AND TYPE OF BRIDGE: 20'-0" - 40' CONTINUOUS CONC. SLAB

2. ROADWAY WIDTH ON BRIDGE: 28'-0"

3. NUMBER & WIDTH OF SIDEWALKS, & SAFETY CURBS: 2 SAFETY CURBS

4. SKEW ANGLE: 0° 00'

5. TOTAL LENGTH & TYPE OF PILING:

6. APPROX. VOLUME OF CONCRETE: 1100 CU. YDS.

7. APPROX. HEIGHT OF STR. STEEL: 1000

8. APPROX. HEIGHT OF REINFORCEMENT: 7.6 INCHES

9. APPROX. VOLUME OF APPROACH FILL: 2000 CU. YDS.

10. DRAINAGE AREA: 2.03 SQ. MI.

FIELD INVESTIGATION MADE JAN 12, 1962 BY J.W. BRITNELL SURVEY ENGINEER.

**B-34**

OWNER HURON COUNTY MUNICIPAL DIST. No. 3

CO. HURON ROAD No. 7

TWP TURNBERRY LOT 20 CON. VIII/IX

**SITE PLAN**

JAN 12, 1962 DATE

J.W. BRITNELL DESIGN ENGINEER

LOADING H2C G16 BRIDGE No. B-34 DWS No. 1

SOME DEFECTS IN NEGATIVE DUE TO CONDITION OF ORIGINAL DOCUMENTS

OFFICE LOCATION -  
DOWNSVIEW AVE.,  
KEELE ST. - HIGHWAY 401  
TORONTO, ONTARIO.



ONTARIO  
DEPARTMENT OF HIGHWAYS

POSTAL ADDRESS -  
DEPARTMENT OF HIGHWAYS  
PARLIAMENT BUILDINGS,  
TORONTO 5, ONTARIO.

Bridge Division,  
January 22, 1962.

MEMORANDUM TO:

Mr. A. Stermac,  
Principal Foundation Eng.,  
Department of Highways,  
Materials & Research Section,  
Room 107, Lab. Building,  
DOWNSVIEW, Ontario.

RE: County of Huron  
Proposed Bridge @ Lot 20  
Con. VIII/IX  
Tuenberry Twp.

We are enclosing herewith a copy of the  
Foundation Report, by Racey, McCallum and Associates,  
for your information.

We have approved of the preliminary design by  
Mr. J. W. Britnell, P. Eng. which is a three span  
continuous concrete structure with 150 feet clear-  
ance abutment to abutment. The footings will be  
placed directly into the bedrock.

GCEB/ea

*G. C. E. Burkhardt*  
G. C. E. Burkhardt,  
for K. L. Kleinsteinber,  
Municipal Bridge Liaison Engineer.

*P.S. One site-plan attached for your information. J.B.H.*

BA 1336

RACEY, MacCALLUM AND ASSOCIATES  
LIMITED

A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers  
AND ASSOCIATED STAFF

MONTREAL



OTTAWA

TORONTO

DONALD C. MACCALLUM, B.ENG., M.E.I.C., P.ENG.  
H. JOHN RACEY, B.S.C., M.E.I.C., P.ENG.  
GEORGE L. HOUGHTON, A.M.I. MECH.E., M.E.I.C., P.ENG.

TORONTO DIVISION  
59 CURLEW DRIVE  
DON MILLS, ONT.

Reference: S-763/T-3435  
- Report -

12th December, 1961

County of Huron,  
Highways Department,  
Court House,  
Coderich, Ontario.

61-F-245M

Attention Mr. J. W. Britnell

FOUNDATION INVESTIGATION,  
BRIDGE NO. 34 OVER MAITLAND RIVER,  
WINGHAM, ONTARIO.

Dear Sirs:

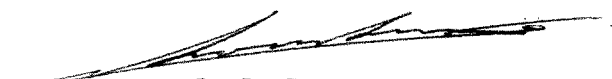
The enclosed report presents the results of our soil investigation at the above location.

We hope the report is satisfactory to you; if you have any questions about it please do not hesitate to get in touch with us.

Thank you for this opportunity of being of service to you.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LIMITED

  
J. J. Schoustra, P.Eng.,  
Divisional Soil Engineer.

JJS/HK

County of Huron,  
Highways Department,  
Court House,  
Goderich, Ontario.

FOUNDATION INVESTIGATION,  
BRIDGE NO. 34 OVER MAITLAND RIVER,  
WINGHAM, ONTARIO.

Reference: S-763/T-3435  
- Report -

Racey, MacCallum and Associates  
Limited

12th December 1961.

# RACEY, MacCALLUM AND ASSOCIATES

LIMITED

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M. JOHN RACEY, B.SC., M.E.I.C., P.ENG.

GEORGE L. HOUGHTON, A.M.I.MECH.E., M.E.I.C., P.ENG.

TORONTO DIVISION  
27 CARLTON STREET

Reference: S-763/T-3435

- Report -

12th December, 1961.

FOUNDATION INVESTIGATION,  
BRIDGE NO. 34 OVER MAITLAND RIVER,  
WINGHAM, ONTARIO.

## INTRODUCTION :

Preliminary to the replacement of the 125 ft. span bridge carrying No. 7 County Road over the Maitland River just north of Wingham, an investigation was carried out to establish soil conditions in the area of the abutments of the new bridge.

Four boreholes were put down: two in the vicinity of each abutment of the existing bridge and also spaced out longitudinally with respect to the road near the probable locations of the piers of a multi-span bridge.

This report gives the results of the investigation and presents recommendations for design and construction.

## FIELD WORK :

The locations of the boreholes are shown on the accompanying site plan (Enclosure No. 1).

Elevations quoted in the report were derived from a temporary bench mark on a nail in a hydro pole just west of the bridge and south of County Road No. 7. The elevation of the nail was given by the Client as 73.88.

Although it is normal practice to precede each borehole with a dynamic cone probe, the proximity of rock and boulders to the surface made this only possible or advantageous in Borehole No. 1. A two-inch diameter steel cone with an apex angle of sixty degrees was driven by a 140 lb. weight falling a distance of 30 inches. The number of blows required to drive the cone each foot into the ground provides a

Reference: S-763/T-3435  
- Report -

12th December, 1961.

continuous comparison of the densities of the soils through which the cone passes. These values are plotted on the data sheet for Borehole No. 1 (Enclosure No. 2).

The boreholes were carried out by wash boring methods using a skid mounted diamond drill rig.

Several split spoon samples were taken in the overburden above bedrock but the number of hammer blows per foot required to drive the split spoon sampler are not truly representative of soil density because of the high incidence of boulders and stones in the soil.

#### DISCUSSION OF RESULTS :

The most important feature of the site was the shallow depth of the top surface of the bedrock below the ground surface. In fact, at Borehole No. 3, bedrock was exposed and the borehole started directly into it.

The bedrock was drilled by means of an AX diameter diamond bit which produced a  $1\frac{1}{4}$ -inch diameter core. Generally the runs were only of about two feet at a time and the recovery was mainly in sections two or three inches long.

Bedrock was a light brown limestone containing many large pores, giving it a "honeycombed" appearance. As far as could be deduced from visual inspection, the breaks between the sections of core occurred as a result of stress during drilling and were not initiated by faults or fissures. The limestone is part of the Detroit River Formation which is known to have thicknesses of around 300 feet.

The meaning of this is that although the limestone has a moderately low breaking stress it generally is in a massive state, with few faults, etc. A compression test, similar to that used for concrete cylinders, was carried out in our laboratories on a piece of the limestone core. The compressive strength was 3,115 lb./sq.in.

The levels of the bedrock on the east side of the River were a few feet higher than on the west side (see data sheets for details).

The greatest depth of overburden above bedrock was at Borehole No. 1 where the rock was overlain by 7'-5" of light brown clayey silt glacial till.

Reference: S-763/T-3435

- Report -

12th December, 1961.

RECOMMENDATIONS :

The simplest procedure, and the one which will most likely be adopted, would be to construct the footings of the abutments and piers directly on the limestone bedrock. The nature of the bedrock is such as to permit bearing pressures of up to 20,000 lb./sq.ft.

Only in Borehole No. 1 was the surface of sound bedrock disguised by softer material but, before construction of the abutments starts, the surface of the exposed rock on which the foundations are to be placed should be inspected for soundness. There should be no danger of scour by the current.

Settlements of foundations constructed on the bedrock would be small enough to permit the use of a statically indeterminate type of structure if this is desired.

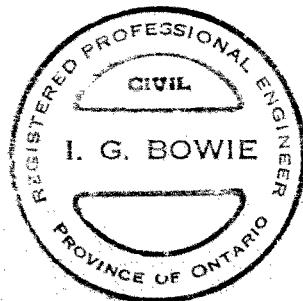
As the level of the river is a few feet above the rock in places, there may be some difficulty in maintaining a dry excavation. One method which may be suggested is to construct an earth dam or dyke of impermeable material around the area being excavated. This is usually quite satisfactory for a normal period of construction.

CONCLUSIONS :

The main results of this report are summarized below:

1. Limestone bedrock is close to the surface throughout the site area.
2. A permissible bearing stress of 20,000 lb./sq.ft. may be used for foundations constructed on bedrock.
3. Settlements would be small enough to permit the use of a statically indeterminate type of structure.
4. The excavations to sound rock may be kept dry by means of an impermeable earth dyke.

IGB, HK



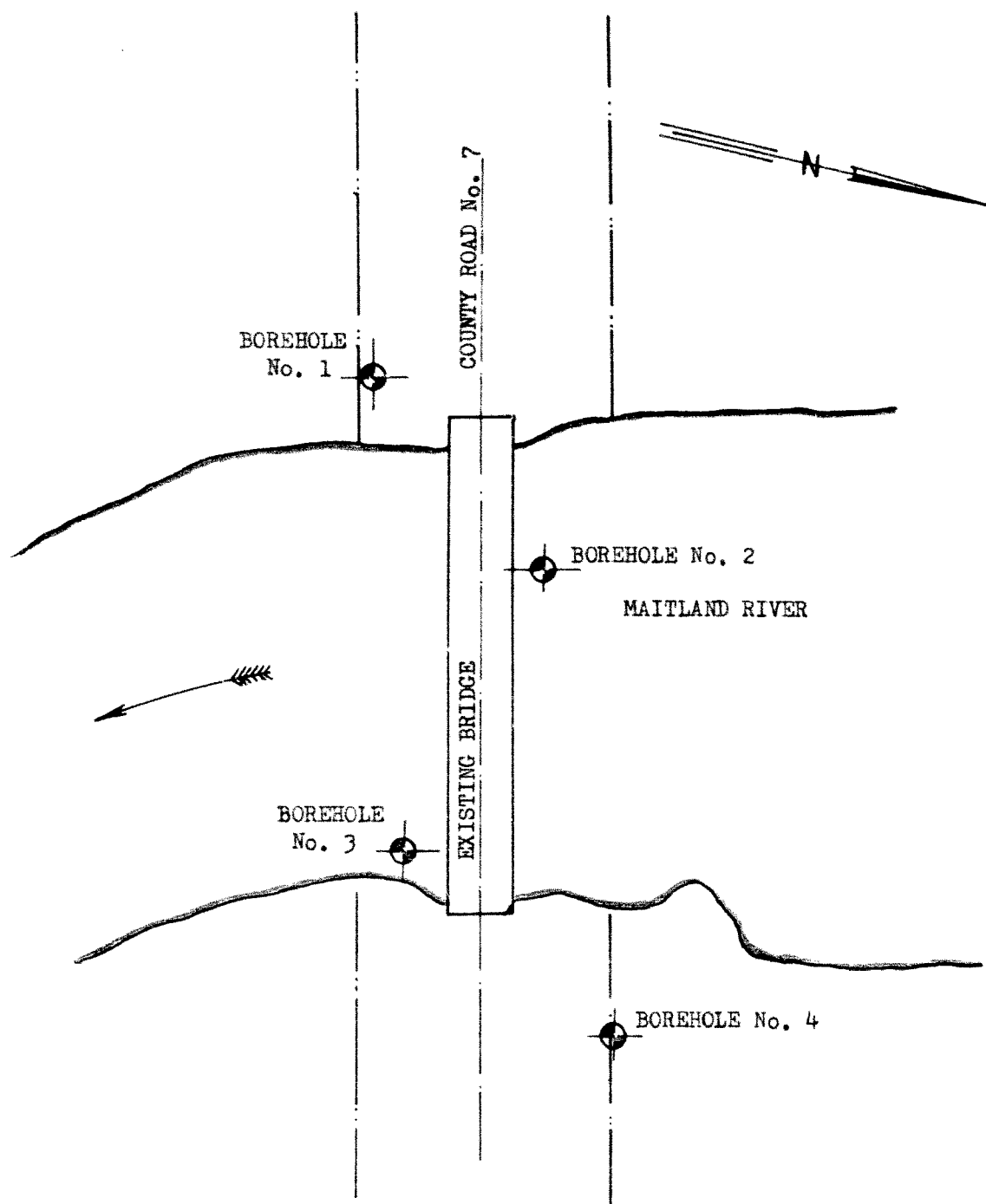
*I. G. Bowie*  
I. G. Bowie, P.Eng.,  
Project Engineer.



Order No. S-763/T-3435

Enclosure No. 1

Prep. By I.G.B.



BRIDGE No. 34 OVER MAITLAND RIVER,  
WINGHAM, ONTARIO,  
LOCATIONS OF TEST BORINGS.

**RACEY MacCALLUM AND ASSOCIATES LTD.**

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1

Project: BRIDGE OVER MAITLAND RIVER,  
 Location: WINGHAM, ONTARIO,  
 Hole Location: See Enclosure No. 1  
 Hole Elevation and Datum: 65.5  
 Field Supervisor: J. McG. Prep.: I.G.B.  
 Driller: R.R. Checked: I.G.B. Date: 13/11/'61.

**LEGEND**

Shear Strength (C)

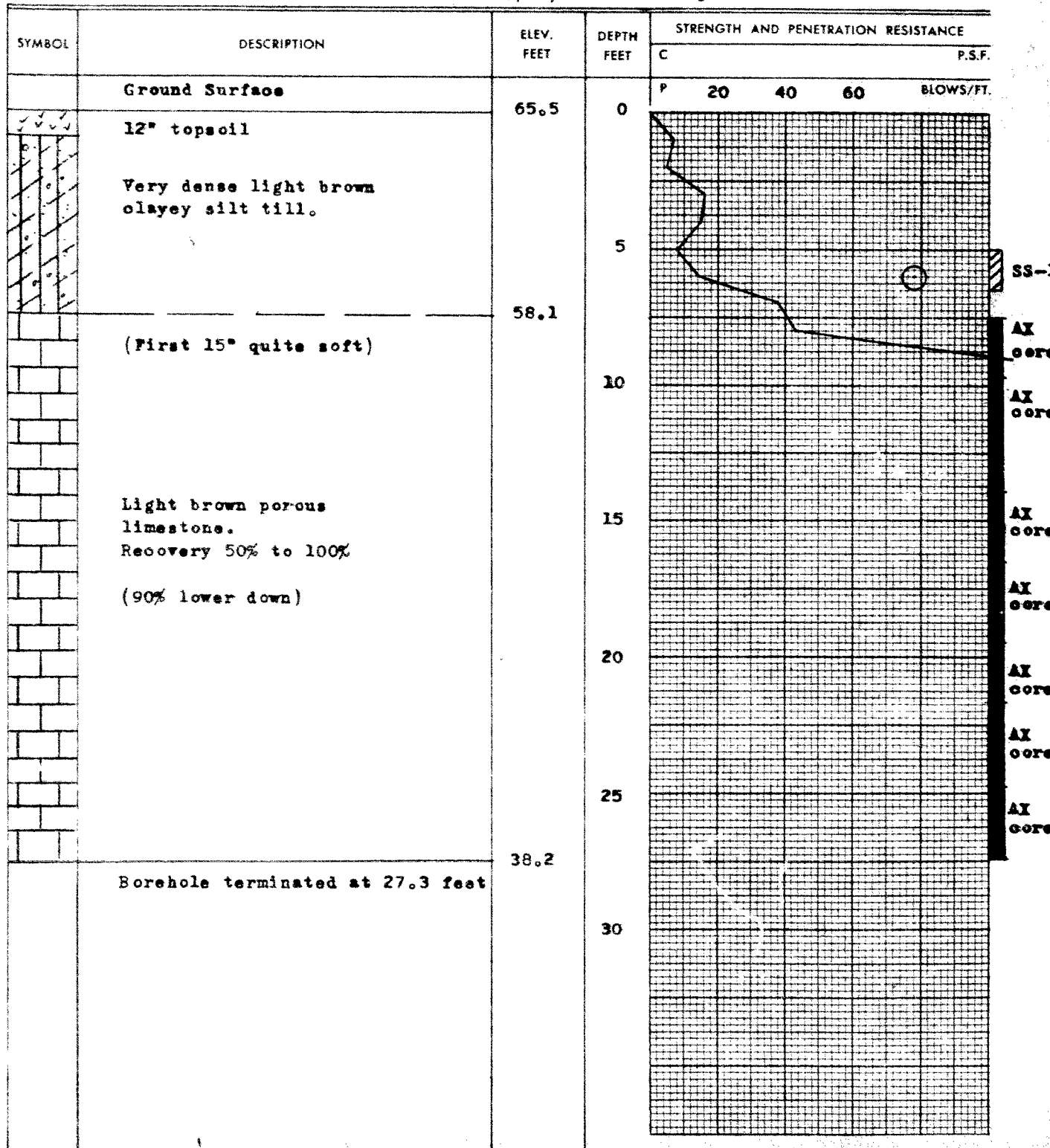
 Unconfined compression  
 Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕  
4"

**RACEY MacCALLUM AND ASSOCIATES LTD.**

Foundation Engineering Division

Engineering Data Sheet for Borehole: **2**

Project: **BRIDGE OVER MAITLAND RIVER,**  
Location: **WINGHAM, ONTARIO,**  
Hole Location: **See Enclosure No. 1**  
Hole Elevation and Datum: **65.7**  
Field Supervisor: **J. McG.** Prep.: **I.G.B.**  
Driller: **R.R.** Checked: **I.G.B.** Date: **16/11/'61.**

**LEGEND**

Shear Strength (C)

Unconfined compression

Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing



SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				C	P.S.F.		
				P	20	40	60
	Ground Surface		0				
	9" dark brown silty topsoil	65.7	0				
	Limestone boulders in brown sandy, silty till.		5				
			10				
	Borehole terminated at 9.9 feet Probable bedrock.						

AX  
core

SS-1

SS-2

**RACEY MacCALLUM AND ASSOCIATES LTD.**

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3

Project: BRIDGE OVER MAITLAND RIVER,

Location: WINCHAM, ONTARIO,

Hole Location: See Enclosure No. 1

Hole Elevation and Datum: 64.9

Field Supervisor: J. McG. Prep.: I.G.B.

Driller: R.R. Checked: I.G.B. Date: 15/11/'61.

**LEGEND**

Shear Strength (C)

Unconfined compression

Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕  
+<sup>5</sup>

⊕ ⊕ ⊕

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				C	P.S.F.		
	Ground Surface (2" below River Level)			P	20	40	60
		64.9	0				
	Light brown porous limestone.						
	Recovery: 90% to 100%						
		60.9					
	Borehole terminated at 4.0 feet.		5				

AX  
core

**RACEY MacCALLUM AND ASSOCIATES LTD.**

Foundation Engineering Division

Engineering Data Sheet for Borehole: 4

Project: BRIDGE OVER MAITLAND RIVER,  
 Location: WINGHAM, ONTARIO,  
 Hole Location: See Enclosure No. 1  
 Hole Elevation and Datum: 67.9  
 Field Supervisor: J. McG. Prop.: I.G.B.  
 Driller: R.R. Checked: I.G.B. Date: 15/11/'61.

**LEGEND**

Shear Strength (C)

 Unconfined compression  
 Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕  
+3⊕  
⊕

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				C	P.S.F.		
	Ground Surface			P	20	40	60
	10" dark brown organic topsoil	67.9	0				
	Greyish brown silt, sand and gravel with boulders. <u>G.W.T.</u>	64.8					
		61.7	5				
	Light brown porous limestone bedrock. Recovery: 60% to 100 %		10				
	Borehole terminated at 11.0 feet	56.9	15				

SS-1

AX-

cores