

G.I.-30 SEPT. 1976

GEOCRES No. 31E-145DIST. 52 REGION _____W.P. No. 291-97-00

CONT. No. _____

W. O. No. _____

STR. SITE No. _____

HWY. No. 69LOCATION Concrete Weir at Beaver
Dam Pond. Horseshoe LakeNo. of PAGES - fd. Extension

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: _____

DRAFT
FOUNDATION INVESTIGATION REPORT
CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
G.W.P. 291-97-00, SITE 00-000
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

"Site No. will be added to final report when number is assigned"

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Job No. 98TF010

February, 1999

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DRAFT
FOUNDATION INVESTIGATION REPORT

Concrete Weir At Beaver Dam Pond
Horseshoe Lake Road Extension
G.W.P. 291-97-00, Site 00-000
Highway 69, District 52, Huntsville

INTRODUCTION

This report summarizes the results of the foundation investigation carried out for construction of a concrete weir at the beaver dam located on the east side of the proposed Horseshoe Lake Road Extension (between Station 20+340 and 20+380, Horseshoe Lake Road chainage) to be constructed as part of the Highway 69 upgrading.

SITE DESCRIPTION

The site is located about 14 km south of Parry Sound on the east side of the Horseshoe Lake Road Extension (formerly East Service Road). The weir will run approximately northwest-southeast (north-south for the purposes of this report).

The weir is located in a swamp.

The site is located in the Precambrian Laurentian peneplane. The topography is irregular in detail with many small lakes separated by ridges of Precambrian bedrock. The surface in general is relatively flat. The overburden in the region is typically shallow but can vary substantially in thickness over short distances. Swamp environments have developed in areas of poor drainage.

INVESTIGATION PROCEDURES

The fieldwork was carried out on September 24, 1998 and January 26, 1999 and comprised 12 testholes (S15-1 to S15-12) drilled at the locations shown on Drawing 1.

Testholes S15-1 to S15-6 were drilled on September 24, 1998. The remaining testholes were drilled on January 26, 1999. During the investigation work in September 1998, a raft was used for transportation and as working platform in the swamp.

The testholes were drilled to refusal on inferred bedrock at depths of 0.3 to 6.3 m, or 0 to 4.7 m below the swamp bed level.

The testhole locations were established relative to stations along the centreline of pavement of Horseshoe Lake Road Extension staked by Stantec Consulting Ltd. Elevations were established relative to the top of the swamp/water (elevation 233.31, dated September 24, provided by Stantec Consulting Ltd., on November 1998) or ground surface at Station 20+ 385 C/L (elevation 235.50, provided by Stantec Consulting Ltd., on January 1999)

The testholes were advanced by members of our engineering staff, using hand augers. Soils were identified visually in the field in accordance with MTO Soil Classification procedures. Field vane tests were also carried out at selected locations to assess the strength characteristics of the strata. Groundwater observations were documented.

All recovered soil samples were returned to our laboratory for detailed visual examination and classification.

One groundwater sample and one soil sample were retrieved and submitted to Maxxam Analytics Inc. laboratories for pH value and sulphate content determinations. The certificate of the analysis is attached.

SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Testhole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy and groundwater observations. Stratigraphic profiles prepared from the testhole data are presented on Drawings 2, 3 and 4.

For ease of reference, information for testhole S15-13 drilled on the proposed Horseshoe Lake Road Extension is also provided in this report.

The subsurface stratigraphy revealed at the weir site comprised a surficial peat deposit overlying sand, silt and/or clay mantling bedrock. The strata encountered are summarized below.

Water

At the time of the investigation, the pond water was about 0.3 to 3.0 m deep at the tested locations.

Topsoil

A 0.4 m thick surficial topsoil layer was encountered in testhole S15-8.

Peat

A 0.1 to 1.5 m thick brown amorphous peat layer was encountered surficially in testholes S15-2 to S15-5, S15-9, S15-10 and S15-11. The peat was saturated, with a moisture content of 323 percent.

Sand

A 0.2 to 2.8 m thick silty sand to silt and sand layer was contacted at ground surface in testhole S15-1, S15-6 and S15-7, and below the peat in testholes S15-3, S15-4, S15-5 and S15-10. A basal sand layer, about 0.6 to 0.9 m thick was identified below the clay in testholes S15-2 and S15-5.

Silt

A 0.1 to 1.1 m thick silt with sand layer was identified below the peat in testholes S15-9 and S15-11 at depths of 1.2 and 1.6 m and extended to depths of 1.3 and 2.7 m, respectively. The silt was loose and saturated.

Clay

A 0.3 to 2.6 m thick clayey silt to clay layer was encountered below the water in testhole S15-13, the peat in testhole S15-2 and the sand in testholes S15-1, S15-3, S15-4, S15-5 and S15-10. Field vane tests carried out in the clay layer in testholes S15-2, S15-3 and S15-11 measured undrained shear strength values of 11 and 20 kPa, respectively. Sensitivity numbers of the clay ranged from 3 to 10.

Bedrock

Exposed bedrock was encountered below the water in testhole S15-12, at a depth of 0.3 m. Inferred bedrock was contacted below the topsoil in testhole S15-8 at a depth of 0.4 m and the sand or clay in the remaining testholes at depths of 1.5 to 6.3 m.

Groundwater

Upon completion of augering, free water was observed in all testholes at the pond surface.

FINDINGS OF CHEMICAL ANALYSES

The results of pH value and sulphate content determinations are summarized below:

<u>Sample I.D.</u>	<u>Sample Location</u>	<u>Sample Type</u>	<u>pH</u>	<u>Sulphate</u>	<u>Units</u>
1	Sta. 20+350 C/L, Horseshoe Lake Rd. Extension	Groundwater	6.66	3.2	mg/L
2	Sta. 20+367 15 m LT C/L, Horseshoe Lake Rd. Extension, Depth: 4.5 – 5.0 m	Clay	5.66	25	ug/g

CLOSURE

The fieldwork was carried out under the supervision of Darren Ridley and direction of Doug MacRae, P.Eng.

The report was written by Edward B.H. Wong, P.Eng. and reviewed by Dennis W. Kerr, P.Eng., Manager of Geotechnical and Geo-Environmental Services, Hamilton.

Yours very truly

Peto MacCallum Ltd.

Dennis W. Kerr, M.Eng., P.Eng.
Manager Geotechnical and
Geo-Environmental Services

Brian R. Gray, M.Eng., P.Eng.
Vice-President
Geotechnical and
Geo-Environmental Services

EW:mna

ABBREVIATIONS FOR BORING AND TEST DATA

Accep	Acceptable	Gry	Grey	Psty	Polystyrene
Agg	Aggregate	H	Heavy	Poss	Possible
Amor	Amorphous	Hi	Highly	PST	Prime & Surface Treated
Asph	Asphalt	HP	High Plasticity	Quant	Quantity
BR	Bedrock	HM	Hot Mix	Reinf	Reinforced
Blk	Black	Lt	Light	RSS	Remoulded Shear Strength
Bl	Blue	Liq	Liquid	RF	Rock Fill
BH	Borehole	WL	Liquid Limit	Sa	Sand
Bld (y)	Boulder (y)	Lo	Loom	Sat	Saturated
Blds	Boulders	L	Loose	SH	Shale
BU	Break Up	Mrl	Marl	St	Sensitivity
Br	Brown	Matl	Material	SSM	Select Subgrade Material
CF	Channel Face	Max	Maximum	Sh Rk	Shot Rock
Cl	Clay	MDD	Maximum Dry Density	Sl (y)	Silt (y)
Co	Coarse	MWD	Maximum Wet Density	Sl (y)	Slight (ly)
Cob	Cobbles	Med	Medium	SP	Slight Plasticity
Comp	Compact	MP	Medium Plasticity	Stn (y)	Stoney
Conc	Concrete	Mod	Moderate	DR	Relative Density
Contam	Contaminated	Mott	Mottled	Stks	Streaks
Cord	Corduroy	Mul	Mulch	Surf	Surface
Cr	Crushed	NFP	No Further Progress	Temp	Temperature
Dk	Dark	NFP (Blds)	No Further Progress (Boulders)	TH	Test Hole
Decomp	Decomposed	Num	Numerous	TP	Test Pit
D	Dense	OCC	Occasional	Tps	Topsoli
E	Earth	Wopt	Optimum Moisture Content	Tr	Trace
Fib	Fibrous	Ora	Orange	USS	Undisturbed Shear Strength
w	Field Moisture Content	Org	Organic	Unreinf	Unreinforced
F	Fine	Org M	Organic Matter	Varv	Varved
Fr Wat	Free Water	Ob	Overburden	VF	Very Fine
FB	Frost Boll	Pavt	Pavement	WT	Water Table
FH	Frost Heave	Pedo	Pedological	Weath	Weathered
Gran	Granular	Pen Mac	Penetration Macadam	W	With
Gr	Gravel (ly)	Wp	Plastic Limit	Wd (y)	Wood (y)
Grn	Green	Ip	Plasticity Index	Yel	Yellow

ONTARIO PROVINCIAL STANDARD DRAWING

ABBREVIATIONS GEOTECHNICAL

Date 1986 07 18 Rev

Date

OPSD - 100.06

SUSCEPTIBILITY TO FROST HEAVING

HSFH - High
MSFH - Medium
LSFH - Low

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N', - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 0.3m INTO THE SUBSOIL, DRIVEN BY MEANS OF A 63.5kg HAMMER FALLING FREELY A DISTANCE OF 0.76m.

DYNAMIC PENETRATION RESISTANCE : - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 51mm, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 0.3m INTO THE SUBSOIL, THE DRIVING ENERGY BEING 475 J 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/0.3 m</u>	<u>kPa</u>	<u>DENSENESS</u>	<u>'N' BLOWS/0.3 m</u>
VERY SOFT	0 - 2	0 - 12	VERY LOOSE	0 - 4
SOFT	2 - 4	12 - 25	LOOSE	4 - 10
FIRM	4 - 8	25 - 50	COMPACT	10 - 30
STIFF	8 - 15	50 - 100	DENSE	30 - 50
VERY STIFF	15 - 30	100 - 200	VERY DENSE	> 50
HARD	> 30	> 200		

W.T.P.L. WETTER THAN PLASTIC LIMIT

D.T.P.L. DRIER THAN PLASTIC LIMIT

A.P.L. ABOUT PLASTIC LIMIT

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		

▲, Δ - Undisturbed and remoulded shear strength determined from in situ vane test.

■ - Undrained shear strength determined from pocket penetrometer test.

Concrete Weir

GWP 291-97-00 Highway 69

District 52, Huntsville

Station 20+340 - 20+380

Horseshoe Lake Road Extension/Twp. of Seguin

Datum Centre Line

S15-1 20+342 12.0 LT EL. 233.31
 0-700 Fr Wat
 700-1.90 Gry Sa And Si Sat
 1.90-2.20 Mott Br And Gry Cl(y) Si
 2.20 NFP BR

S15-4 20+357 12.0 LT EL. 233.31
 0-1.40 Fr Wat
 1.40-2.00 Br Amor Peat
 2.00-3.10 Gry Si(y) Sa Sat
 3.10-5.10 Gry Cl
 5.10 NFP BR

S15-5 20+362 12.0 LT EL. 233.31
 0-1.30 Fr Wat
 1.30-1.90 Br Amor Peat
 1.90-4.65 Gry Si(y) Sa W Si Seams Sat
 4.65-5.15 Mott Br And Gry Cl(y) Si
 5.15-6.00 Gry Sa Sat
 6.00 NFP BR

S15-6 20+367 12.0 LT EL. 233.31
 0-1.10 Fr Wat
 1.10-1.50 Gry Med-Co Sa And Si Sat
 1.50 NFP BR

S15-7 20+373 12.0 LT EL. 233.15
 0-1.20 Fr Wat
 1.20-2.00 Gry Si(y) Sa Tr Gr Sat
 2.00 NFP BR

S15-8 20+380 12.0 LT EL. 233.48
 0-400 Blk Si Tps
 400 NFP BR

S15-9 20+347 15.0 LT EL. 233.15
 0-1.10 Fr Wat
 1.10-1.20 Br Amor Peat
 1.20-1.30 Gry Si W Sa Sat
 1.30-1.90 Soft Mott Br And Gry Cl(y) Si
 1.90 NFP BR

S15-10 20+357 15.0 LT EL. 233.15
 0-1.60 Fr Wat
 1.60-3.10 Br Amor Peat
 3.10-4.10 Gry Si(y) Sa Sat
 4.10-5.20 Soft Gry Cl
 5.20 NFP BR

S15-12 20+377 15.0 LT EL. 233.15
 0-300 Fr Wat
 300 NFP BR

S15-13 20+360 C/L EL. 233.31
 0-2.40 Fr Wat
 2.40-2.75 Gry Cl
 2.75 NFP BR

PetoMacCallum Ltd.

CONSULTING ENGINEERS

LOG OF BOREHOLE NO. S15-2

N 5 018 412
E 273 956

PROJECT Concrete Weir G.W.P. 291-97-00

OUR PROJECT 98TF010

LOCATION Station 20+367 15.0 m Lt C/L, Horseshoe Lake Rd., Extension, Twp. of Seguin

ENGINEER E. W.

BORING METHOD Hand Augers/ Vane Test

BORING DATE 98.09.24

TECHNICIAN D. R.

SOIL PROFILE				SAMPLES				SHEAR STRENGTH C_u (kPa) +				LIQUID LIMIT W_L				GROUNDWATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS (0.3m) N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST •				PLASTIC LIMIT W_P					
							BLOWS/0.3M				WATER CONTENT %					
							20	40	60	80	10	20	30			
	GROUND ELEVATION 233.31															
0.80	Peat Amorphous, Trace Sand Brown, Saturated		233											Upon completion of augering, free water at ground surface.		
	Clay Grey, W.T.P.L. Soft		232													
			231													
3.40			230													
4.00	Sand Grey, Saturated Loose		229													
	End Of Borehole Auger Refusal Probable Bedrock															

NOTES:

1. +3 Number refers to sensitivity

CHECKED BY: E.W.

LOG OF BOREHOLE NO. S15-3

N 5 018 408
E 273 958

PROJECT Concrete Weir G.W.P. 291-97-00

OUR PROJECT 98TF010

LOCATION Station 20+352 12.0 m Lt C/L, Horseshoe Lake Rd., Extension, Twp. of Seguin

ENGINEER E. W.

BORING METHOD Hand Augers/ Vane Test

BORING DATE 98.09.24

TECHNICIAN D. R.

SOIL PROFILE				SAMPLES		SHEAR STRENGTH C_u (kPa) +				LIQUID LIMIT W_L			GROUNDWATER OBSERVATIONS AND REMARKS	
DEPTH in METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	DYNAMIC CONE PENETRATION x STANDARD PENETRATION TEST *				PLASTIC LIMIT W_P			
							BLOWS/0.3M				WATER CONTENT %			
							20	40	60	80	10	20		30
0	GROUND ELEVATION 233.31												Upon completion of augering, free water at 0.30 m.	
	Water		233											
			232											
1.5			231											
2.95	Peat													
3.30	Amorphous,		230											
3.50	Brown, Saturated													
3.90	Silty Sand													
4.5	Grey, Saturated Loose		229											
6.0	Clay													
	Grey, Saturated, Soft													
	End Of Borehole Auger Refusal Probable Bedrock													
7.5														
9.0														
10.5														
12.0														
13.5														
15.0														
16.5														

NOTES:

1. +⁷ Number refers to sensitivity.

CHECKED BY: E.W.

E 273 968

OUR PROJECT 98TF010

ENGINEER E. W.

BORING DATE 98.09.24

TECHNICIAN D. R.

Diagram of a borehole log for Borehole No. 1. The log shows depth in feet on the left (0 to 10) and a corresponding log scale on the right. The log is divided into sections: 0-2.5 ft is 'Top of Borehole', 2.5-6.30 ft is 'Auger Refusal', and 6.30-10 ft is 'Probable Bedrock'. A large 'R' is drawn over the log, indicating a refusal at 6.30 ft.

1. ⁺³ Number refers to sensitivity

CHECKED BY: E.W.

TESTHOLE	LOCATION	ELEVATION
S15-1	N5 018 417 E 273 954	233.31
S15-2	N5 018 412 E 273 956	233.31
S15-3	N5 018 408 E 273 958	233.31
S15-4	N5 018 403 E 273 961	233.31
S15-5	N5 018 399 E 273 963	233.31
S15-6	N5 018 395 E 273 966	233.31
S15-7	N5 018 391 E 273 969	233.15
S15-8	N5 018 385 E 273 973	233.48
S15-9	N5 018 414 E 273 958	233.15
S15-10	N5 018 404 E 273 963	233.15
S15-11	N5 018 397 E 273 968	233.15
S15-12	N5 018 390 E 293 972	233.15
S15-13	N5 018 396 E 273 951	235.75

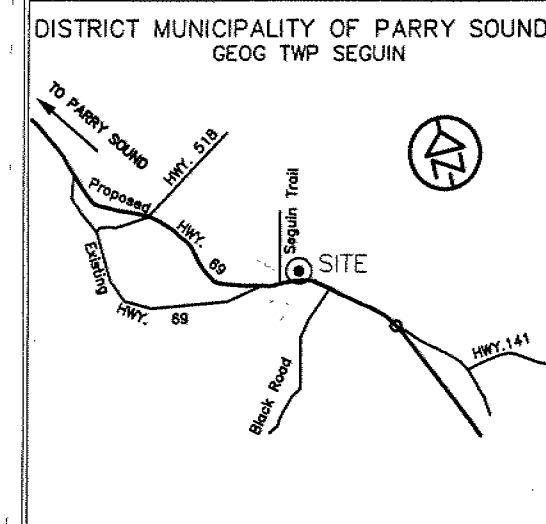
METRIC

PLATE No
PLATE No
CONT No
GWP No 291-97-00



SHEET

STA TO STA
Survey SURVEYED Revised REVISED



KEY PLAN

SCALE NTS

LEGEND



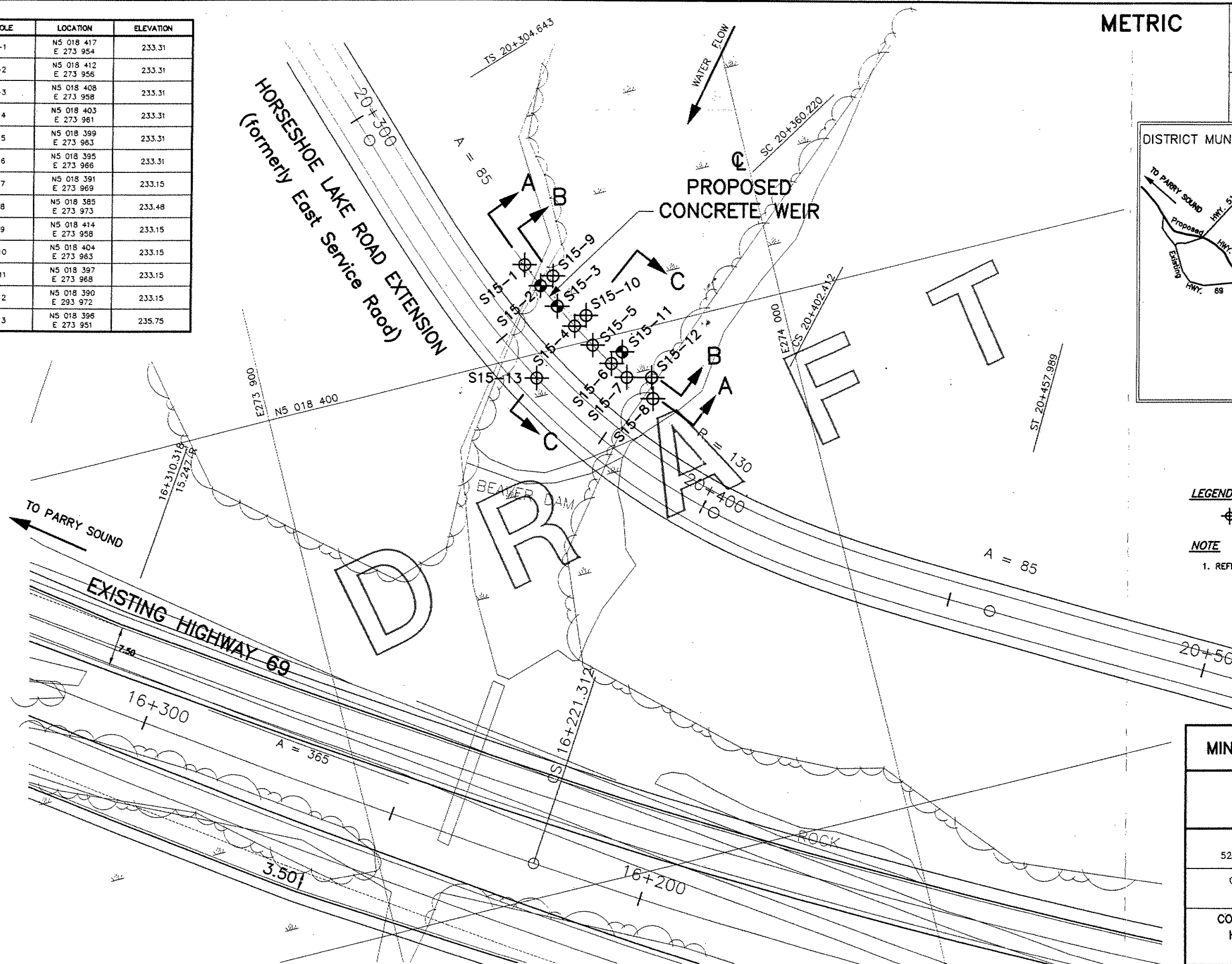
PROBEHOLE



BOREHOLE

NOTE

1. REFER TO DRAWINGS 2, 3 AND 4 FOR SOIL PROFILES.



TESTHOLE LOCATION PLAN

SCALE 1:750



MINISTRY OF TRANSPORTATION

KING'S HIGHWAY 69

DISTRICT
52 HUNTSVILLE

REGION
NORTHERN

GEOG. TWP.
SEGUIN

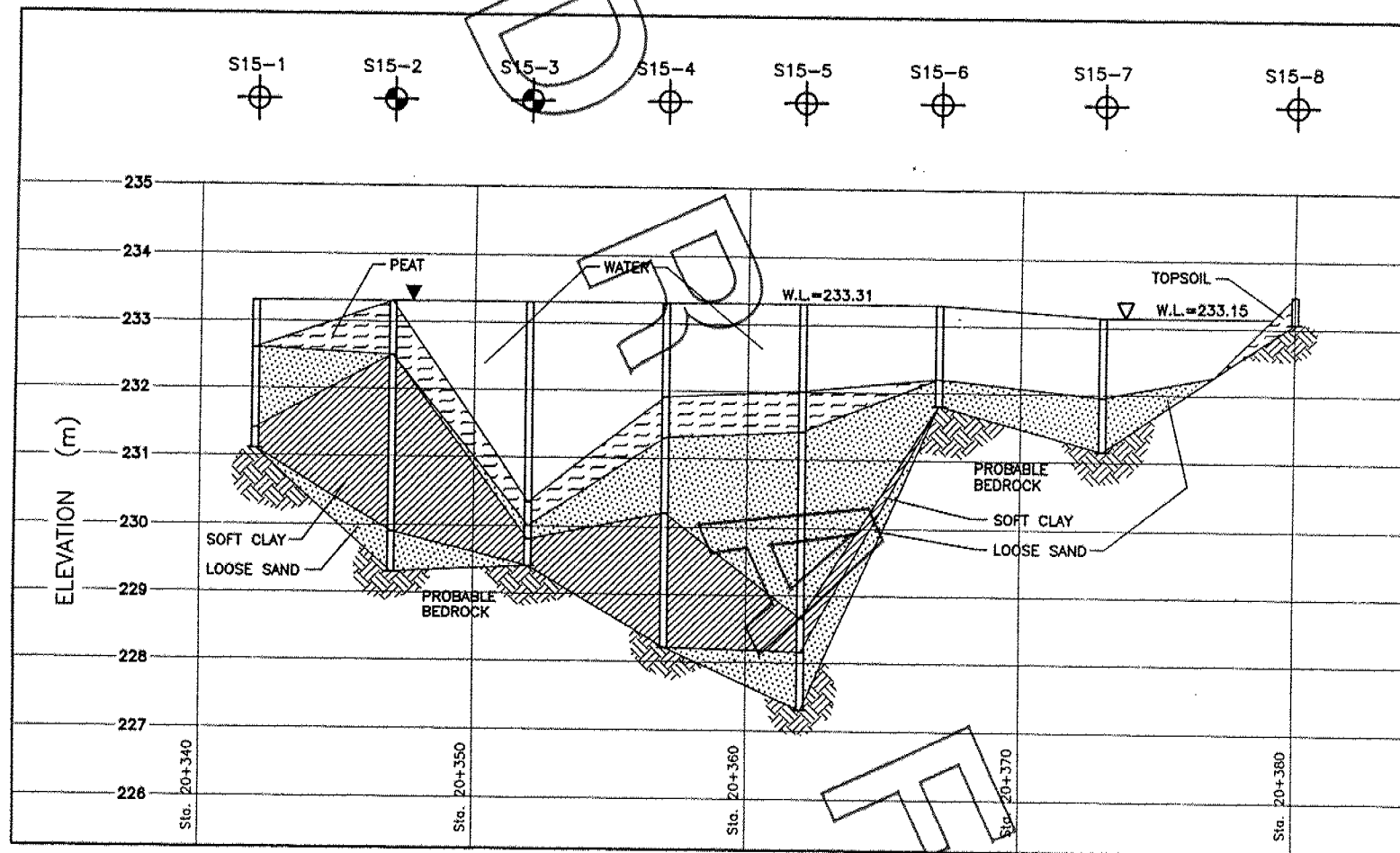
DISTRICT MUNICIPALITY
PARRY SOUND

CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
TESTHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

45 BURNFORD ROAD, HAMILTON, ONTARIO L8E 3C8

DRAWN JS	DATE	SCALE	JOB NO.	DRAWING NO.
CHECKED EW	NOV. 1998	AS SHOWN	98TF010	1
APPROVED DWK				



LEGEND

	PROBEHOLE		BOREHOLE
	SAND		W.L. WATER LEVEL
	PEAT/TOPSOIL		BEDROCK (INFERRED)
	CLAY		OBSERVED WATER LEVEL, DATED SEPTEMBER 24, 1998 (PROVIDED BY STANTEC CONSULTING LTD.)
	WATER		OBSERVED WATER LEVEL, DATED JANUARY 26, 1999

NOTE

1. REFER TO DRAWING NO. 1 FOR TESTHOLE AND SECTION LOCATIONS.
2. REFER TO LOG OF TESTHOLE SHEETS FOR DETAILED SUBSURFACE CONDITIONS.
3. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT TESTHOLE LOCATIONS. BETWEEN TESTHOLES, BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

SECTION A-A

SCALE VERTICAL 1:100
HORIZONTAL 1:250

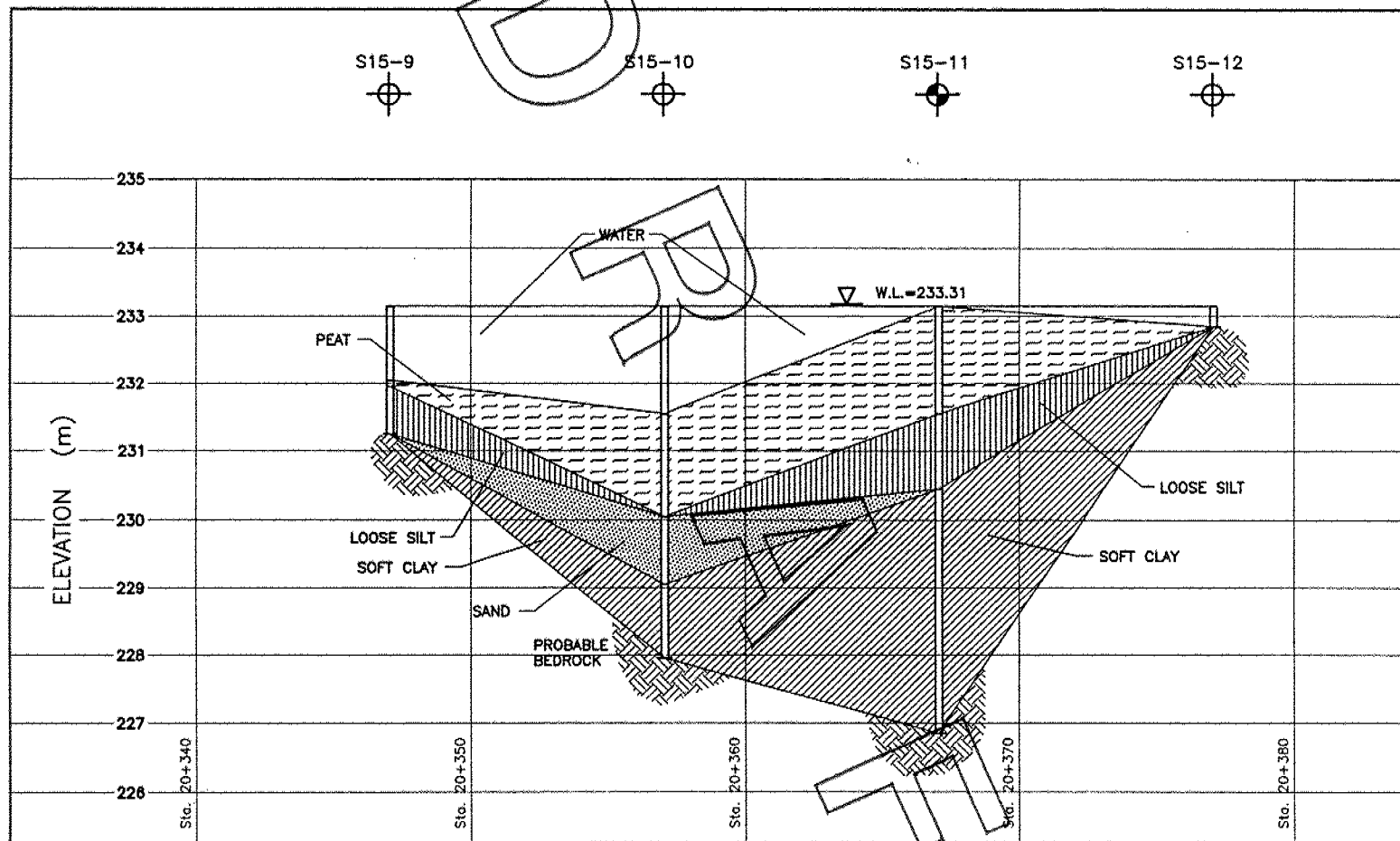
G.W.P. 291-97-00, HIGHWAY 69
CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
DISTRICT 52, HUNTSVILLE, ONTARIO

SOIL PROFILES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3C6
Tel: (905) 581-2231 Fax: (905) 581-6363

DATE	SCALE	JOB NO.	DRAWING NO.
FEB. 1999	AS SHOWN	98TF010	2



LEGEND

	PROBEHOLE		BOREHOLE
	SAND		W.L. WATER LEVEL
	PEAT/TOPSOIL		BEDROCK (INFERRED)
	CLAY		OBSERVED WATER LEVEL, DATED SEPTEMBER 24, 1998 (PROVIDED BY STANTEC CONSULTING LTD.)
	WATER		OBSERVED WATER LEVEL, DATED JANUARY 26, 1999

NOTE

1. REFER TO DRAWING NO. 1 FOR TESTHOLE AND SECTION LOCATIONS.
2. REFER TO LOG OF TESTHOLE SHEETS FOR DETAILED SUBSURFACE CONDITIONS.
3. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT TESTHOLE LOCATIONS. BETWEEN TESTHOLES, BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

SECTION B-B

SCALE VERTICAL 1:100
HORIZONTAL 1:250

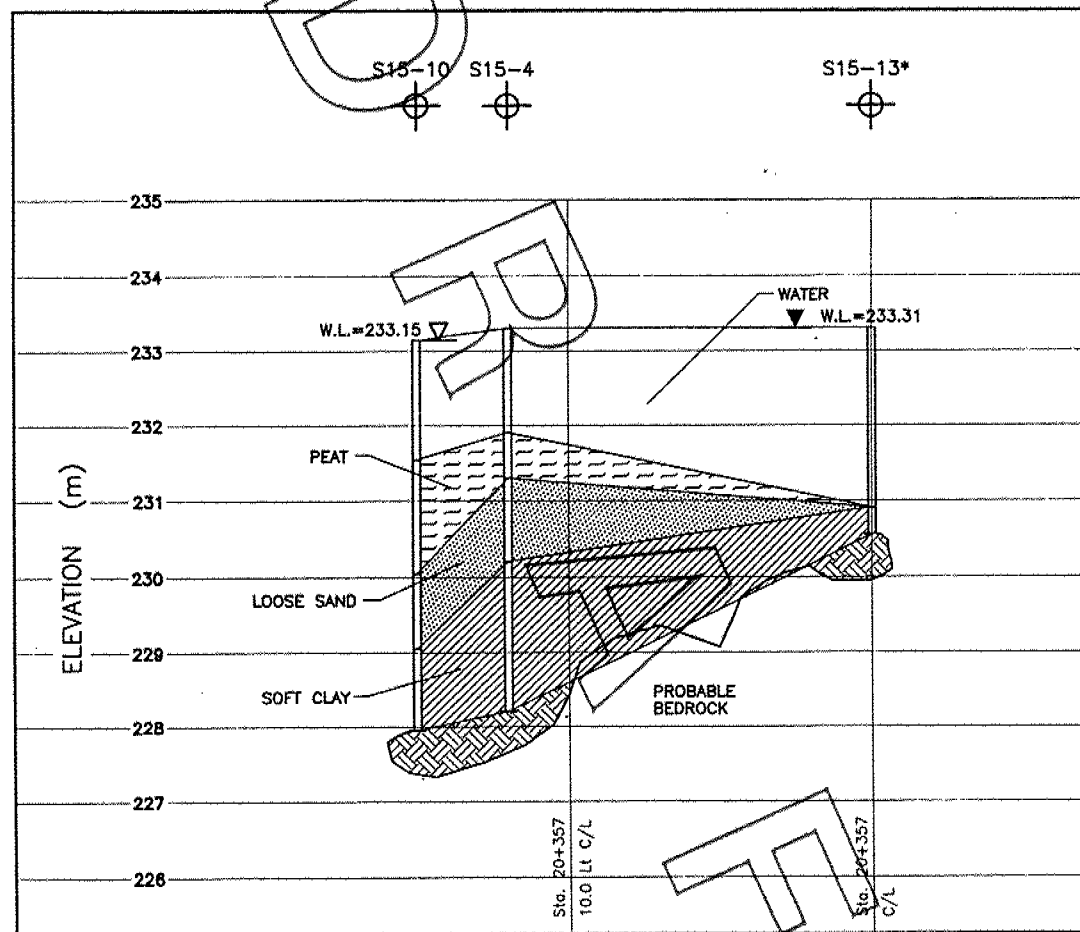
G.W.P. 291-97-00, HIGHWAY 68
CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
DISTRICT 52, HUNTSVILLE, ONTARIO

SOIL PROFILES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

45 BURFORD ROAD, HAMILTON, ONTARIO L8E 3G8
Tel: (905) 561-2231 Fax: (905) 561-6363

DATE	SCALE	JOB NO.	DRAWING NO.
FEB. 1999	AS SHOWN	98TF010	3



LEGEND

	PROBEHOLE		BOREHOLE
	SAND		W.L. WATER LEVEL
	PEAT/TOPSOIL		BEDROCK (INFERRED)
	CLAY		OBSERVED WATER LEVEL, DATED SEPTEMBER 24, 1998 (PROVIDED BY STANTEC CONSULTING LTD.)
	WATER		OBSERVED WATER LEVEL, DATED JANUARY 26, 1999

NOTE

1. REFER TO DRAWING NO. 1 FOR TESTHOLE AND SECTION LOCATIONS.
2. REFER TO LOG OF TESTHOLE SHEETS FOR DETAILED SUBSURFACE CONDITIONS.
3. THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT TESTHOLE LOCATIONS. BETWEEN TESTHOLES, BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE.
4. * PROBEHOLE DRILLED AT STA. 20+360 C/L.

G.W.P. 291-97-00, HIGHWAY 69
CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
DISTRICT 52, HUNTSVILLE, ONTARIO

SOIL PROFILES

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CONSULTING ENGINEERS

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Tel: (905) 561-2231 Fax: (905) 561-8363

DATE	SCALE	JOB NO.	DRAWING NO.
FEB. 1999	AS SHOWN	98TF010	4

Peto MacCallum Ltd
25 Sixth Ave
Kitchener, ON
CANADA N2C 1P9

Attention: Peter Mann

Report Date: 98/10/16

Invoice #: NO-986903

YOUR PROJECT #: 98TF10

ANALYTICAL REPORT

MAXXAM JOB #: 9808340, Received: 98/10/08, 15:23

Sample Matrix: LIQUID, # Samples Received: 1

Analyses

ANIONS

pH

	Date	Date	
Quantity	Extracted	Analyzed	Laboratory Method
1	N/A	98/10/09	EPA 300.0
1	N/A	98/10/08	APHA 4500H

Analytical Method

Ion Chromatography

PH METER

Sample Matrix: SOLID, # Samples Received: 2

Analyses

ANIONS

PH

	Date	Date	
Quantity	Extracted	Analyzed	Laboratory Method
2	98/10/15	98/10/15	EPA 300.0
2	98/10/09	98/10/09	APHA 4500H

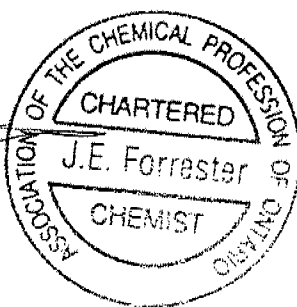
Analytical Method

Ion Chromatography

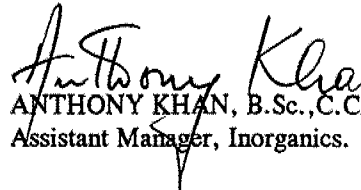
PH METER

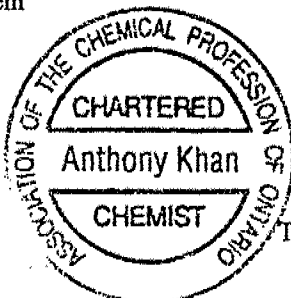
MAXXAM ANALYTICS INC.


JIM FORRESTER, C.Chem
Manager, Inorganics.



NOTE: Tests 2 and 3 not
used for report since
not along Wier


ANTHONY KHAN, B.Sc., C.Chem
Assistant Manager, Inorganics.



JF/all
encl.

Total pages: 1

REPORT DATE: 98/10/16

PROJECT #: 98TF10
MAXXAM JOB #: 9808340

RESULTS OF CHEMICAL ANALYSES OF LIQUID

Maxxam ID		200045				
Sampling Date		98/10/05				
Parameter	Units	SAMPLE 1	MDL	METHOD BLANK	MATRIX SPIKE %REC	QC %REC
Sulfates (SO ₄)	mg/L	3.2	0.5	<0.5	105	101
pH	pH	6.66	0.01	N/A	N/A	100

N/A = Not Applicable
MDL = Method Detection Limit
QC = QC Standard

D R A F T

Peto MacCallum Ltd
165 Cartwright Ave
Toronto ON M6A 1V5
Canada

Report Date: 1999/02/08
Invoice #: NO-990815

Attention: Edward Wong

Your P.O. #: 98TF010
Your Project #: HIGHWAY 69
Site: BADGER RD.

ANALYTICAL REPORT

MAXXAM JOB #: 9900809, Received: 1999/02/01, 16:19

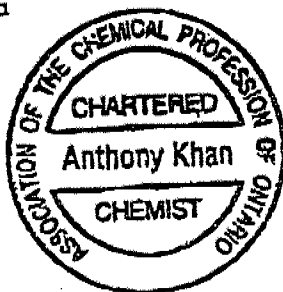
Sample Matrix: SOLID, # Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Analytical Method	Method Reference
ANIONS	1	1999/02/03	1999/02/03	EPA 300.0	Ion Chromatography
PH	1	1999/02/02	1999/02/02	APHA 4500H	PH METER

MAXXAM ANALYTICS INC.

Anthony Khan
ANTHONY KHAN, B.Sc., C.Chem
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AK/all
encl.



Total pages: 1

REPORT DATE: 1999/02/08

PROJECT NAME: BADGER RD.
PROJECT #: HIGHWAY 69
MAXXAM JOB #: 8900809

RESULTS OF CHEMICAL ANALYSES OF SOLID

Maxxam ID					224719					
Sampling Date					1999/01/28					
Parameter	Units	A	B	C	SAMPLE 2	MDL	METHOD BLANK	MATRIX SPIKE %REC	QC %REC	
Sulfates (SD4)	ug/g	-	-	-	25	10	<10	88	104	
pH	pH	5.0-9.0	5.0-9.0	5.0-11.0	6.66	0.01	N/A	N/A	100	

N/A = Not Applicable

MDL = METHOD DETECTION LIMIT

QC = QC Standard

A, B, C = GUIDELINE FOR USE AT CONTAMINATED SITES IN ONTARIO-TABLE A,B, AND D
RESPECTIVELY

-- This parameter is not part of the characterization policy of contaminated sites.

D R A F T

DRAFT
FOUNDATION DESIGN REPORT
CONCRETE WEIR AT BEAVER DAM POND
HORSESHOE LAKE ROAD EXTENSION
G.W.P. 291-97-00, SITE 00-000
HIGHWAY 69, DISTRICT 52
HUNTSVILLE, ONTARIO

"Site No. will be added to final report when number is assigned"

Distribution:

6cc: Ministry of Transportation
1cc: Stantec Consulting Ltd.
1 cc: PML Hamilton
1 cc: PML Toronto
1 cc: PML Kitchener

Job No. 98TF010

February, 1999

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D R A F T

DRAFT
FOUNDATION DESIGN REPORT
Concrete Weir At Beaver Dam Pond
Horseshoe Lake Road Extension
G.W.P. 291-97-00, Site 00-000
Highway 69, District 52, Huntsville

INTRODUCTION

This report provides geotechnical comments and recommendations regarding design and construction of foundations for the proposed weir to be constructed on the east side of the proposed Horseshoe Lake Road Extension (between Station 20+340 and 20+380, Horseshoe Lake Road chainage).

The conceptual design of the weir shown on the preliminary drawing (untitled, undated) provided by Stantec Consulting Ltd. on October 27, 1998 calls for construction of a concrete weir supported by strip footings. The top of the concrete weir shown on the drawing is elevation 233.45. The water flows westerly.

The weir is located in a swamp. The subsurface stratigraphy revealed at the weir site generally comprised a surficial peat deposit overlying sand, silt and/or clay mantling bedrock. Inferred bedrock was contacted at depths of 0.3 to 6.3 m below the swamp/water, or 0 to 4.7 m below the swamp bed level.

FOUNDATIONS

Strip Footings

Based on the testhole information, it is considered that the structure may be supported on conventional strip footings founded on bedrock contacted at depths of 0.3 to 6.3 m below the swamp/water at the time of the investigation or 0 to 4.7 m below the swamp bed level, at about elevation 226.9 to 233.1.

Foundations bearing on the sound bedrock may be designed using a factored bearing resistance of 10,000 kPa at the ultimate limit states.

The capacity at serviceability limit states normally allows for 25 mm of compression of the founding medium. Considering the bedrock to be non-yielding, the design is not expected to be governed by settlement since the loading required to produce deformation will be much larger than the factored capacity at ULS.

Construction of the footing directly on the bedrock surface is considered to be feasible along the length of most of the weir. At the south end (between S15-5 and S15-6) the bedrock surface should be benched.

Prior to placement of structural concrete, all foundation excavations should be examined by qualified geotechnical personnel to verify the competency of the founding materials, the bedrock surface is clean of overburden soils and all loose rock removed.

WEIR WALL

Based on preliminary grade information (Drawing provided by Stantec Consulting Ltd., undated, titled East Service Road profile) and existing ground surface elevations determined at the test locations, the grade on Horseshoe Lake Road Extension will be 2 to 3 m above existing grade. The existing swamp materials will be excavated and replaced with rockfill in accordance with OPSD 203.010 (Our Report 98TF010 dated October 26, 1998).

Due to the close proximity of the new embankment, the rockfill may extend beyond the proposed concrete weir alignment. It is important that the contractor is aware of this when scheduling construction of the embankment fill and weir.

The weir wall should be designed to resist the unbalanced earth pressure imposed by the rockfill on the downstream side of the weir and the earth pressure on the upstream side of the weir as well as the hydrostatic and ice pressures on each side of the wall. The lateral earth pressure, p , may be computed using the following equation, assuming a triangular pressure distribution:

$$p = K (\gamma h + q)$$

where K = coefficient of lateral earth pressure

γ = bulk unit weight above the water level (kN/m^3)

OR

γ = submerged unit weight below the water level (bulk unit weight – 9.8 kN/m^3)

h = depth below final grade (m)

q = surcharge load (kPa), if present

Free draining granular material should be used to backfill the wall; the rockfill used to construct the adjacent embankment could be placed adjacent to the downstream side to the weir. The geotechnical parameters employed to design the wall will be dictated by the type of material employed as backfill:

	Rockfill or Clear Stone	Granular "B"
Angle of Internal Friction (degrees)	35	32
Unit Weight (kN/m^3)	18.0	21.2
Active Earth Pressure Coefficient (K_a)	0.27	0.31
At Rest Earth Pressure Coefficient (K_o)	0.43	0.47
Passive Earth Pressure Coefficient (K_p)	3.69	3.25

The unbalanced hydrostatic pressure that exists on each side of the weir (triangular distribution) as well as the potential ice pressure that may be exerted on the weir must be added to the earth pressures acting on the wall.

If Granular "B" is placed between the weir and rockfill embankment, a geosynthetic filter fabric should be placed on the surface of the Granular "B" to prevent the loss of particles into the rockfill. The filter fabric should comprise a Class II, non-woven geotextile with a FOS in the range of 105 to 210.

Since the concrete weir is located in a swamp, installation of a weeping tile system behind the wall is not required.

The horizontal force will be resisted by the embankment rockfill and the friction force developed between the underside of strip footing and the bedrock. An unfactored friction factor of 0.6 is recommended for assessing sliding resistance for footings on bedrock or mass concrete. The bedrock surface should be roughened before placement of structural concrete (± 25 mm groves).

If additional resistance is required to resist the horizontal force, rock anchors could be installed into bedrock to increase the vertical pressure developed at the interface between the footing and rock. A factored rock-grout bond stress of 1.4 MPa at the ultimate limit states (resistance factor of 0.4 applied) is recommended for design of rock anchors. The anchors should extend a minimum 30 bar diameters into sound bedrock.

EXCAVATION AND GROUNDWATER CONTROL

Excavation of about 0.4 to 4.7 m of surficial peat and overburden soils will be required for construction of the weir. Due to the relatively low strength of these materials and the high water level, it will be necessary to:

- lower the water level in the construction area to the bedrock surface.
- adopt relatively flat slopes during excavation for construction of the weir.

The stable inclination of temporary cut slopes through the peat and the native soils will be governed to a large part by the effectiveness of the groundwater control system implemented. It is recommended that temporary cut slopes be inclined at 4 horizontal to 1 vertical. If effective groundwater control is not provided well in advance of excavation (at least one week), the side slopes are likely to slough in and result in a much flatter inclination.

Subject to effective groundwater control, excavation of the peat and overburden should be relatively straightforward using conventional equipment. The presence of boulders within the overburden should not be overlooked.

Groundwater control in the swamp environment is likely to be difficult. A specialist dewatering contractor experienced with working in swamp environments should be employed. Use of steel sheeting, a perimeter berm in conjunction with a cut off trench and sump pumps or other similar measures will be required. The volume of water to be handled will be dictated by the flow in the creek at the time of construction, which will be subject to seasonal fluctuation.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local/MTO regulations.

SUBSURFACE CONCRETE

The results of pH value and sulphate content determination carried out on the groundwater and clay sample indicate negligible degree of sulphate attack on submerged concrete structures. For information regarding the type of cement required, reference is made to Canadian Standard Association C.S.A. A.23.

CLOSURE


This report was written by Edward B.H. Wong, P.Eng., Project Engineer and reviewed by Dennis W. Kerr, P.Eng., Manager of Geotechnical and Geo-Environmental Services, Hamilton.

Yours very truly

Peto MacCallum Ltd.



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Manager Geotechnical and
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Vice-President
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EW:mmma

D R A F T