

G.I.-30 SEPT. 1976

GEOCRES No. 30M3-198

DIST. 4 REGION

W.P. No. 335-89-00

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. Q.E.W.

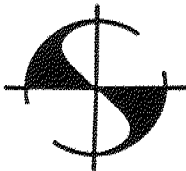
LOCATION Q.E.W. Design Build,
Casablanca Blvd. to Victoria Ave.

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:



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FOUNDATION INVESTIGATION REPORT

W.P. 80-76-00, Dist. 4, Burlington, Central Region
Queen Elizabeth Way, Ontario St. to Victoria Ave.

Proposed Culvert Extensions and Retaining Walls

WP 335-89-00

Date of submission: 1994 03 31

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30M3-198
GEOCRES No.

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FOUNDATION INVESTIGATION REPORT
W.P. 80-76-00, Dist. 4, Burlington, Central Region
Queen Elizabeth Way, Ontario St. to Victoria Ave.
Proposed Culvert Extensions and Retaining Walls at Victoria Ave

1.0 INTRODUCTION

Strata Engineering Corporation has been retained by the Foundation Design Section of the Ministry of Transportation, Ontario, under Consultant Agreement No. 4540-9193-089, to provide geotechnical services comprising the drilling and sampling of boreholes to depths of 6 m close to the future extremities of proposed culvert extensions within the existing right-of-way of the Queen Elizabeth Way (QEW), to accommodate the future 6-laning of the QEW. The terms of reference were to drill and sample one hole at each culvert end nearest to the right of way fences on the north and south sides of the QEW, each hole to be accompanied by a dynamic cone penetration resistance test. The culverts investigated under this assignment extend from Ontario Street in the west to Victoria Avenue in the east and are numbered WC 137-08 to WC 138-01 inclusive plus an unnumbered culvert below Ramp E-NSR just east of Victoria Avenue. At Victoria Avenue, four holes were drilled, two on the north side and two on the south side of the QEW, for the design of foundations of proposed retaining walls which will help to accommodate the future widening of the QEW without having to widen the existing grade separation structure.

The terms of reference indicated that this report should provide only the factual data, comprising logs of all holes drilled, with laboratory test results plotted on them, as well as to show the borehole locations on supplied plans, with calculated north and east coordinates. Laboratory test results were not to be plotted or included in this report.

This report presents the factual data obtained from this investigation. The Ministry of Transportation, Ontario, is expected to provide in its contract a disclaimer to the effect that any representations in tender documents have been furnished merely for the general information of bidders and are not in any way warranted or guaranteed by or on behalf of the Ministry or its consultants and subconsultants, or the consultants' and subconsultants' employees, and neither the Ministry nor its consultants' or its employees shall be liable for any representations negligent or otherwise contained in the documents.

This report has been prepared solely for use by the Foundation Design Section of the Ministry of Transportation, Ontario with whom we have entered into a contract and there are no representations of any kind made by us to any party with whom we have not entered into a contract.

2.0 SITE AND GEOLOGY

The project is located between Ontario Street and Victoria Avenue in the Town of Lincoln. The terrain through the project limit is flat. The geology of the area consists of Queenston Shale of Upper Ordovician age overlain by glacial deposits consisting of both cohesive and non-cohesive tills.

3.0 FIELD AND LABORATORY WORK

The field work commenced on 1994 02 15 and was completed on 1994 03 12. A total of 54 boreholes, each accompanied by a dynamic cone penetration resistance test, was put down at locations as shown on appended Plates C3-17 to C3-22 inclusive. All drilling was performed using a bombardier mounted CME 55 drill rig. The hole locations were tied in to the existing culvert ends either below the QEW, or where these were not accessible due to snow accumulation, by reference to culvert ends visible below the north and south service roads. Burlington District forces provided traffic protection for the holes drilled on the north side of the QEW at Victoria Avenue. At all other hole locations, traffic protection was not required since there was sufficient space between the end of the existing culvert and the right of way fence on both the north and sides of the QEW. At the time of drilling, snow accumulations of up to 900 mm were encountered in some locations. All elevations shown on the log sheets were obtained by reference to the existing centreline profile grade of the east and west bound lanes of the QEW, and have an accuracy of ± 200 mm. The hole locations have an accuracy of ± 1.5 m. The hole coordinate locations were calculated from plots on large scale Plates supplied to us by the Ministry.

At each hole location, topsoil thicknesses were determined by augering 0.5 m below ground level, withdrawing the auger, and examining the inside of the hole. Samples were obtained at 0.75 m intervals of depth below ground surface to depths of 3.0 m, and thereafter at intervals of 1.5 m to the maximum depths drilled. Groundwater conditions were noted at time of drilling including observing tell-tale signs of wetness as the split-barrel sampler was removed from the hollow stem augers. All sampling was conducted in the Standard Penetration Test, the accompanying N values being noted in blows/0.3 m. Where refusal to penetration was suspected to have been met on a boulder, the rig was moved a metre or so and the hole re-drilled. Dynamic cone penetration tests were conducted within 1.5 m distance of each sampled hole. Upon completion of sampling, the groundwater conditions were noted with a depth sounder. In some cases, sub-artesian conditions were encountered once an upper confining layer was penetrated. In some cases, the holes remained dry before backfilling. Each borehole was backfilled with native soil cuttings, which were placed in each hole and then packed in with the auger. Each site was restored to its original condition as much as feasible before starting a new hole.

In cohesive strata, attempts were made to measure the undrained shear strength using an MTO size A vane. The pebbly nature of most cohesive deposits precluded the use of 50 mm or 75 mm thin walled tube sampling, and therefore all samples were obtained in the split-barrel sampler.

Bedrock was not cored. It was either sampled in the Standard Penetration Test or determined from auger cuttings. All holes were advanced to the 6+ m depth, with few exceptions.

Recovered samples were kept from freezing during the day and at each visit to the office, returned to our Don Mills Laboratory for visual examination and assignment of index property testing. Index property testing consisted of the determination of natural moisture content, Atterberg Limits, and grain size distribution. Grain size distribution testing consisted of dry sieving for obviously sandy materials to wet sieving for siltier soils and hydrometer analyses for mixed soils. All Atterberg Limits and grain sizes were then plotted to enable proper soil classification according to the Unified and MTO Soil Classification System. The results of all laboratory tests are plotted on the appended Borehole log sheets, with the grain size distribution percentages shown in the Remarks column.

The samples obtained from this investigation will be stored for a minimum period of three months, and longer if so requested. After the agreed to period of time, they will be discarded.

4.0 SUMMARIZED SUBSURFACE CONDITIONS

The subsurface conditions encountered at each culvert location are summarized in the appendix. Generally, the soil stratigraphy consists of a clayey silt glacial till overlying a less cohesive glacial till overlying shale bedrock of a weathered and friable nature. With few exceptions, N values indicate a very stiff to hard consistency for the cohesive glacial tills and a dense to very dense state for the non-cohesive tills.

In some holes, a sub-artesian groundwater condition was observed, where the hole remained dry to a certain depth and after which the water level rose rapidly after the hole had been deepened into a less cohesive stratum below. Although this type of coheive over non-cohesive stratigraphy was encountered in most holes, sub-artesian conditions were observed only in a few holes, and are indicated on the log sheets under the Groundwater Conditions column as "sub-art" conditions.

Reference should be made to the appended log sheets and short descriptions following the log sheets for further details of subsurface conditions encountered at each drilled location.

5.0 CLOSURE

The drilling equipment and crew was supplied by London Soil Test of London, Ontario. The field work was supervised by Mr. Perm Manickavasagar with a short replacement by Mr. Akhtar Khan. Ms. Andrea Abel provided technical guidance for the field work, and ensured the quality of drilling and sampling met our standards and those expected by the MTO. She also conducted visual examinations on all recovered samples and helped with the preparation of the log sheets. Mr. Bernard D'Souza, helped by Mr. Manickavasagar, plotted the borehole locations on half-size reductions of the large scale supplied plans and also drafted up the log sheets.

We are grateful for the opportunity given to us to have been of service to the Foundation Design Section, and are prepared to answer any questions which may arise from the presentation of the factual data in this report.

Respectfully submitted:

STRATA ENGINEERING CORPORATION

C. Mirza, P. Eng.
Project Manager



APPENDIX

Explanation of Terms Used in Report

Key Plan

Logs of Boreholes 1 to 54

Summary of Subsurface Conditions

Plates C3-17 to 22 inclusive (showing borehole locations and coordinates)

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{\min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{\max} - e}{e_{\max} - e_{\min}}$
ρ_w	kg/m^3	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kN/m^3	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m^3	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kN/m^3	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m^3	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m^3/s	RATE OF DISCHARGE
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL	e_{\max}	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m^2	SEEPAGE FORCE
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL						



QEW CULVERTS
W.P. 80-76-00
Strata No: S-94-374

KEY PLAN



RECORD OF BOREHOLE No 1

METRIC

W P 80-76-00 LOCATION N: 4 782 983; E 307 060 Culvert WC 137-08 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 15 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		Wp W Wl				
								SHEAR STRENGTH kPa		WATER CONTENT (%)				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
83.7	Ground Surface									10	20	30		
0.0	150 mm Topsoil					*								
	Clayey Silt to Silt trace Sand occ. Gravel (Glacial Till)		1	SS	28		83.0							
			2	SS	47		82.0							
	Very Stiff to Hard		3	SS	76		81.0							
			4	SS	130/20cm		80.0							
	Brown to Grey													
78.5			5	SS	162/20cm		79.0							
5.2	Sandy Silt some Clay occ. Gravel (Glacial Till)						78.0							
77.2	Very Dense Brown		6	SS	168/20cm									4 26 54 16
6.5	End Of Borehole * Borehole dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 2

METRIC

W P 80-76-00 LOCATION N: 4 782 982 : E: 307 218 Culvert WC 137-09 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 15 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.9	Ground Surface										
0.0	100mm Topsoil					*					
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	36						
			2	SS	70						
	Hard		3	SS	119/20cm						
			4	SS	100/8cm						
80.0	Brown to Grey		5	SS	80/5cm						
3.9	End of Borehole * Borehole Dry Upon Completion										Auger Refusal Probable Boulder

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 3

METRIC

W P 80-76-00 LOCATION N: 4 782 969 : E: 307 471 Culvert WC 137-10 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 15 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.2	Ground Surface													
0.0	200mm Topsoil					*								
82.1	Clayey Silt with Sand occ. Gravel (Fill)		1A	SS	8		83.0							20 23 30 27
1.1	Firm Grey-brown		1B				82.0							
	Clayey Silt with Sand occ. Gravel (Glacial Till)		2	SS	56		81.0							
	Firm to Hard		3	SS	72		80.0							5 30 36 29
79.8	Brown to Grey		4A	SS	27		79.0							
3.4	Clayey Silt		4B				78.0							
79.2	Very Stiff Grey													
4.0	Silt some Sand occ. Gravel trace Clay (Glacial Till)		5	SS	140/13cm									
	Very Dense													
77.0	Red - Brown		6	SS	110/15cm									
6.2	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 4

METRIC

W P 80-76-00 LOCATION N: 4 782 970; E: 307 537 Culvert WC 137-11 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 15 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
84.1	Ground Surface					*	84.0								
0.0	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	33		83.0								
	Hard		2	SS	78		82.0								
	Brown		3	SS	71		81.0								
	Boulder		4	SS	53		80.0								
	Grey						79.0								
79.2			5	SS	108		78.0								
4.9	Sandy Silt with Gravel trace Clay (Glacial Till)														
	Very Dense Brown		6	SS	100/10cm										
77.7															
6.4	End of Boreholes * Borehole Dry upon Completion														

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 5

METRIC

W P 80-76-00 LOCATION N: 4 782 946; E: 308 062, Culvert WC 137-12 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 16 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100							SHEAR STRENGTH kPa	WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE							
82.2	Ground Surface													GR SA SI CL		
0.0	200mm Topsoil						82.0									
	Silt with Sand some Clay occ. Gravel (Glacial Till)		1	SS	13		81.0							W.L. on 1994 02 16		
	Compact to Very Dense		2	SS	110/	3cm	Sub Art. Head							10 27 46 17		
			3	SS	100/	10cm										
	Brown		4	SS	185/2	20cm										
							79.0									
							78.0									
							77.0							2 14 63 21		
76.9	Grey		5	SS	138											
5.3	Silty Sand with Gravel trace Clay (Glacial Till)						76.0									
75.6	Very Dense Red - Brown		6	SS	52		Sub Art. Encount.							33 34 25 8		
6.6	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 6

METRIC

W P 80-76-00 LOCATION N: 4 782 933 ; E 308 367 Culvert WC 137-13 ORIGINATED BY PM
DIST 4 HWY OEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 16 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.8	Ground Surface													GR SA SI CL
0.0	200 mm Topsoil													
	Clayey Silt to Silt with Sand occ. Gravel (Glacial Till)		1	SS	42		83.0							
	Hard		2	SS	162/20cm		82.0	120	15cm					W. L. on 1994 02 16
	Brown		3	SS	145		81.0							3 27 45 25
	Grey		4	SS	150/18cm		80.0							
78.6			5	SS	175		79.0							
5.2	Sandy Silt with Gravel (Glacial Till)						78.0							
	Very Dense													
77.2	Grey		6	SS	124									28 29 (43)
6.6	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 7

METRIC

W P 80-76-00 LOCATION N: 4 782 912; E: 308 850 Culvert WC 137-14 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 16 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.4	Ground Surface										
0.0	180 mm Topsoil										
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	27						
	Very Stiff to Hard		2	SS	74						
			3	SS	120						
81.0	Brown		4A	SS	143						
3.4	Sandy Silt trace Clay occ. Gravel (Glacial Till)		4B	SS	143						
	Very Dense		5	SS	170/10cm						
	Brown										
78.2			6	SS	115/10cm						
6.2	End of Borehole * Borehole Dry upon Completion										8 33 49 10

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 8

METRIC

W P 80-76-00 LOCATION N: 4 782 905; E:309 040 , Culvert WC 137-15 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 16 & 1994 02 17 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100							SHEAR STRENGTH kPa	WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE							
83.6	Ground Surface													GR SA SI CL		
0.0	150 mm Topsoil					*										
	Sandy Silt to Silty Sand trace Clay some Gravel (Glacial Till)		1	SS	37		83.0									
			2	SS	100/10cm		82.0									
	Dense to Very Dense		3	SS	155/18cm		81.0									
			4	SS	168/23cm		80.0							17 31 41 11		
	Brown		5	SS	155/20cm		79.0									
							78.0									
77.4	Shale Bedrock		6A													
6.2	Weathered Red Brown		6B	SS	159/20cm											
6.3	End of Borehole * Borehole Dry upon Completion															

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 9

METRIC

W P 80-76-00 LOCATION N: 4 782 887 ; E: 309 426 Culvert WC 137-16 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 17 CHECKED BY CM

SOIL PROFILE		STRAT PLOT	SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
84.3	Ground Surface												
0.0	180 mm Topsoil												
	Clayey Silt												
	trace Sand occ. Gravel (Glacial Till)		1	SS	34								
	Hard		2	SS	62								
82.2	Brown												
2.1	Sandy Silt to Silty Sand		3	SS	120/	10cm							
	occ. Gravel (Glacial Till)		4	SS	100/	0cm							
	Very Dense												
	Brown												
79.4			5	SS	150/	18cm							
4.9	End of Borehole												
	* Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 10

METRIC

W P 80-76-00 LOCATION N: 4 782 877; E: 309 682, Culvert WC 137-17 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 17 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
83.8	Ground Surface											
0.0	150 mm Topsoil											
	Sandy Silt occ. Gravel some Clay (Glacial Till)		1	SS	107							
			2	SS	137/15cm							
	Very Dense		3	SS	135/15cm							
			4	SS	125/15cm							
	Brown		5	SS	105/15cm							
			6	SS	108/15cm							
78.0	Clayey Silt to Silt with Sand occ. Gravel (Glacial Till) Hard Brown		7	SS	105/15cm							
5.8												
77.6												
6.2	End of Borehole Borehole Dry upon Completion											

RECORD OF BOREHOLE No 11

METRIC

W P 80-76-00 LOCATION N: 4 782 866; E: 309 933 Culvert WC 137-18 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 17 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
84.0	Ground Surface													
0.0	200 mm Topsoil					*								
	Silty Sand to Sandy Silt some Gravel (Glacial Till)		1	SS	158		83.0							
			2	SS	105	15cm	82.0							
			3	SS	127	15cm	81.0							
			4	SS	60	0cm	80.0							
	Very Dense													
	Brown													
79.4			5	CS	-									
4.6	End of Borehole * Borehole Dry upon Completion													Auger Refusal

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 12

METRIC

W P 80-76-00 LOCATION N: 4 782 844; E: 310 445, Culvert WC 137-19 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 18 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
83.8	Ground Surface																GR SA SI CL
0.0	Heterogenous Mixture of Topsoil and Silty Clay (Fill)					*											
82.8	Stiff Dark Brown		1A	SS	9		83.0										11 30 (59)
1.0	Loose Sandy Silt		1B														
	some Clay. occ. Gravel (Glacial Till)		2	SS	61		82.0										
	Very Dense		3	SS	120/8cm												
			4	SS	102/10cm		81.0										4 29 51 16
79.9	Brown						80.0										
3.9	Shale Bedrock																
78.8	Weathered Red Brown		5	SS	145/23cm		79.0										
5.0	End of Borehole * Borehole Dry upon Completion																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 13

METRIC

W P 80-76-00 LOCATION N: 4 782 828; E: 310 836 , Culvert WC 137-20 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 18 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
84.5	Ground Surface													GR SA SI CL
0.0	180 mm Topsoil					*								
	Sandy Silt		1	SS	23									
	occ. Gravel trace Clay (Glacial Till)		2	SS	85									
	Compact to Very Dense		3	SS	100/8cm									
			4	SS	125/15cm									
	Brown		5	SS	110/15cm									
78.3			6	SS	104/15cm									
6.2	End of Borehole * Borehole Dry upon Completion													

+³, x⁵: Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 14

METRIC

W P 80-76-00 LOCATION N: 4 782 808 ; E: 311 357 Culvert WC 137-21 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 21 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa						
81.4	Ground Surface													
0.0	225 mm Topsoil					*								
	Clayey Silt to Silt trace Sand occ. Gravel (Glacial Till)		1	SS	40									
			2	SS	157/20cm									
	Hard		3	SS	151/25cm									
			4	SS	125/20cm									
	Brown to Grey		5	SS	100/15cm									
75.9														
5.5	Sandy Silt trace Clay occ. Gravel (Glacial Till)													
	Very Dense Brown		6	SS	100/10cm									
74.5														9 23 (68)
6.9	End of Borehole * Borehole Dry upon Completion													

+3, x⁵: Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 15

METRIC

W P 80-76-00 LOCATION N: 4 782 800 ; E: 311 467 Culvert WC 137-22 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger COMPILED BY BD
DATUM Geodetic DATE 1994 02 21 CHECKED BY CM

[illegible]

+3, x5 : Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 16

METRIC

W P 80-76-00 LOCATION N:4 782 796; E: 311 559 Culvert WC 137-23 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 21 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES									
84.2	Ground Surface													
0.0	150mm Topsoil						84.0							
	Clayey Silt to Silt with Sand occ. Gravel (Glacial Till)		1	SS	7		83.0							W. L. on 1994 02 21
			2	SS	25		82.0							
	Firm to Hard Brown		3	SS	65		81.0							
			4	SS	80/13cm		80.0							
80.5	Silty Sand some Clay occ. Gravel (Glacial Till)		5	SS	124/18cm		79.0							8 40 35 17
3.7	Very Dense Grey						78.0							34 64 (2)
78.4	Gravelly Sand Dense Grey		6	SS	31									
5.8														
77.3	End of Borehole Probable Bedrock													Auger Refusal
6.9														

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 17

METRIC

W P 80-76-00 LOCATION N: 4 782 790; E: 311 694, Culvert WC 137-24 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 21 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.9	Ground Surface													
0.0	150 mm Topsoil					*								
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	94		83.0							
			2	SS	100/23cm		82.0							
	Hard		3	SS	128/23cm		81.0							
	Brown		4	SS	127/40cm		80.0							
	Grey		5	SS	121		79.0							
78.1							78.0							
5.8	Sandy Silt occ. Gravel (Glacial Till)													
77.0	Very Dense Brown		6	SS	122/18cm									
6.9	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 18

METRIC

W P 80-76-00 LOCATION N: 4 782 774 ; E: 312 100 , Culvert WC 137-25 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 22 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20	40	60						80
84.3	Ground Surface															
0.0	200mm Topsoil					*										
83.7	Clayey Silt w. Gravel (Glacial Till)															
0.6	Hard Brown		1	SS	97											
	Shale Bedrock		2	SS	105/7	10cm										
	Weathered		3	SS	127/	18cm										
	Red Brown		4	SS	87/6cm											
81.2	End of Borehole Borehole Dry upon Completion															
3.1																

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 19

METRIC

W P 80-76-00 LOCATION N: 4 782 764; E: 312 312 Culvert WC 137-26 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 22 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
85.2	Ground Surface												
0.0	200 mm Topsoil					*	85.0						
84.6	Clayey Silt w. Gravel (Glacial Till)												
0.6	Hard Brown		1	SS	37		84.0						
	Shale Bedrock		2	SS	85		83.0						
	Weathered		3	SS	72/	15cm							
81.8	Red Brown		4	SS	75/23	cm	82.0						
3.4	End of Borehole * Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 20

METRIC

W P 80-76-00 LOCATION N: 4 782 754; E: 312 516 , Culvert 137-27 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 22 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
85.1	Ground Surface													
0.0	150 mm Topsoil						85.0							
84.6	Clayey Silt w. Gravel (Glacial Till)													
0.5	Hard Brown		1	SS	61		84.0							
	Shale Bedrock		2	SS	81									
	Weathered						83.0							
	Red - Brown		3	SS	75/	15cm								
82.0			4	SS	100/	10cm	82.0							
3.1	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 21

METRIC

W P 80-76-00 LOCATION N: 4 782 743 ; E: 312 883 , Culvert WC 137-28 ORIGINATED BY PM
DIST 4 HWY OEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 22 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.9	Ground Surface							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						GR SA SI CL
0.0	25 mm Topsoil					*								
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	11		83.0							
	Stiff to Hard		2	SS	46		82.0							
	Brown		3	SS	35		81.0							
			4	SS	95									8 29 48 15
80.2	Shale Bedrock						80.0							
3.7	Weathered		5	SS	115/23cm		79.0							
	Red Brown						78.0							
77.8			6	SS	80/5cm									
6.1	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 22

METRIC

W P 80-76-00 LOCATION N: 4 782 706; E: 313 164, Culvert WC 137-29 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Hollow Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 25 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
81.8	Ground Surface							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						GR SA SI CL
0.0	Clayey Silt to Silt with Topsoil and Sand mixture (Fill) Stiff to Hard Black Brown		1	SS	9									W. L. on 1994 02 25
78.1			2	SS	82									
3.7	Sandy Silt tr. Gravel (Glacial Till) Very Dense Brown		3	SS	110/20cm									2 23 (75)
76.6			4	SS	109/20cm									
5.2	Shale Bedrock Weathered Red Brown		5	SS	108/18cm									
74.0				6	SS	100/7cm								
7.8	End of Borehole		7	SS	100/15cm									

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 23

METRIC

W P 80-76-00 LOCATION N: 4 782 718 ; E: 313 419 Culvert WC 137-30 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 22 & 1994 02 24 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
82.9	Ground Surface							○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE	10	20	30		GR SA SI CL
0.0	100 mm Topsoil													
	Het. Mix. of Sand, Silt and Gravel (Fill)		1	SS	13		82.0							*W. L. on 1994 02 24
81.5	Compact Brown													
1.4	Clayey Silt some Sand (Glacial Till)		2	SS	47		81.0							
	Hard Brown		3	SS	75		80.0							
			4	SS	41		79.0							
	Grey		5	SS	75/15cm		78.0							
77.5							77.0							
5.4	Shale Bedrock Weathered		6	SS	127/20cm		76.0							
75.7	Red Brown		7	SS	120									
7.2	End of Borehole * Water Level likely due to runoff from snowstorm on 94 02 23													

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 24

METRIC

W P 80-76-00 LOCATION N: 4 782 738; E: 313 909 Culvert WC 138-01 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 24 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100	20 40 60 80 100					
82.6	Ground Surface												
0.0	150 mm Topsoil				*								
	Clayey Silt some Sand (Glacial Till)		1	SS		82.0							
	Firm to Very Stiff												
	Brown		2	SS		81.0							
80.5													
2.1	Clayey Silt to Silt trace Sand (Glacial Till)		3	SS		80.0							
	Very Stiff to Hard		4	SS									
78.7						79.0							
	Brown												
3.9													
	Clayey Silt some Sand occ. Gravel (Glacial Till)		5	SS		78.0							
	Very Stiff												
	Grey		6	SS		77.0							
	Hard												
	Grey		7	SS		76.0							
						75.0							
						74.0							
73.0			8	SS		73.0							
9.6	End of Borehole * Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 25

METRIC

W P 80-76-00 LOCATION N: 4 782 934; E: 313 432 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 25 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
82.5	Ground Surface										
0.0	200mm Topsoil					*					
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	38						
	Hard Brown		2	SS	60						
	V. Stiff to Hard		3	SS	26						
			4	SS	37						
	Grey		5	SS	111/33cm						
75.9			5	SS	80						15 30 (55)
6.6	End of Borehole * Borehole Dry upon Completion										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 26

METRIC

W P 80-76-00 LOCATION N: 4 782 954; E: 313 440 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 26 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p W W _L	WATER CONTENT (%)				
82.2	Ground Surface													
0.0	150 mm Topsoil													
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	26									
	Very Stiff to Hard		2	SS	32									
	Brown		3	SS	35									
	Hard		4	SS	49									
	Grey		5	SS	108/10cm									
75.7			6	SS	93									
6.5	End of Borehole													

RECORD OF BOREHOLE No 27

METRIC

W P 80-76-00 LOCATION N: 4 782 782; E: 313 904 Culvert WC 138-01 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 02 28 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100					
82.8	Ground Surface												
0.0	150 mm Topsoil					*							
	Clayey Silt some Sand (Glacial Till)		1	SS	9		82.0						
	Stiff to Very Stiff		2	SS	29		81.0						
	Brown		3	SS	20		80.0						
			4	SS	23		79.0						
	Firm to Very Stiff		5	SS	7		78.0						
	Grey		6	SS	19		77.0	1.8					
							76.0						
	Hard						75.0						
74.7	Grey		7	SS	40								
8.1	End of Borehole * Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 28

METRIC

W P 80-76-00 LOCATION N: 4 782 780 ; E: 313 416 , Culvert WC 137-30 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 28 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.0	Ground Surface													
0.0	Het. Mix. of Silt, Sand and Topsoil (Fill)					*								
82.2	Firm Brown													
0.8	Clayey Silt some Sand (Glacial Till)		1	SS	12									
	Hard to Stiff		2	SS	60									
	Brown		3	SS	26									
	Stiff		4	SS	8									
	Grey		5	SS	13									
78.7	Shale Bedrock		6	SS	90/20cm									
4.3	Weathered													
	Red Brown		7	SS	75/10cm									
76.8	End of Borehole													
6.2	* Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 29

METRIC

W P 80-76-00 LOCATION N: 4 782 774 ; E: 313 147 Culvert WC 137-29 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 02 28 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
80.9	Ground Surface													
0.0	150 mm Topsoil					*								
	Sandy Silt tr. Gravel (Glacial Till)													
	Very Dense		1	SS	97/20	cm								
78.4	Brown		2A											
2.5	Shale Bedrock		2B	SS	78/12	cm								
	Weathered		3	SS	75/13	cm								
77.0	Red Brown		4	SS	62/10	cm								
3.9	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 30

METRIC

W P 80-76-00 LOCATION N: 4 782 780; E: 312 888 Culvert WC 137-28 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 01 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
82.3	Ground Surface													
0.0	150 mm Topsoil					*	82.0							
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	17		81.0							
	Very Stiff to Hard		2	SS	56		80.0							
79.9	Brown		3	SS	108/25cm		79.0							
2.4	Sandy Silt occ. Gravel trace Clay (Glacial Till)		4	SS	80/10cm		78.0							
78.8	Very Dense Brown		5	SS	105/23cm		77.0							
3.5	Shale Bedrock		6	SS	82/15cm									
	Weathered													
	Red Brown													
76.1	End of Borehole		7	SS	75/10cm									
6.2	* Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 31

METRIC

W P 80-76-00 LOCATION N:4 782 795; E: 312 512 Culvert WC 137-27 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 01 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100					
85.6	Ground Surface												GR SA SI CL
0.0	150 mm Topsoil					*							42 24 (34)
	Clayey Silt to Silt with Gravel some Sand (Glacial Till)		1	SS	37								
	Hard		2	SS	105								
	Brown		3A										
83.0			3B	SS	64								
2.6	Shale Bedrock												
	Weathered		4	SS	65/	15cm							
81.7	Red Brown												
3.9	End of Borehole												Auger Refusal
	* Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION

+3, x5 : Numbers refer to
Sensitivity

20
15 \div 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 32

METRIC

W P 80-76-00 LOCATION N: 4 782 804; E: 312 307, Culvert WC 137-26 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 01 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60					
85.5	Ground Surface														
0.0	100 mm Topsoil					*									
84.7	Clayey Silt w. Gravel (Glacial Till)														
0.8	Hard Brown		1	SS	67										
	Shale Bedrock		2	SS	71										
	Very Weathered		3	SS	59										
	Red Brown		4	SS	65 / 13cm										
81.7	End of Borehole														
3.8	Borehole Dry upon Completion														

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 33

METRIC

W P 80-76-00 LOCATION N: 4 782 814; E: 312 096, Culvert WC 137-25 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 01 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
85.3	Ground Surface													
0.0	100 mm Topsoil					*								
	Clayey Silt w. Gravel (Glacial Till)		1	SS	54									
	Hard		2	SS	43									
	Brown		3A	SS	120									
82.7			3B	SS	120									
2.6	Shale Bedrock		4	SS	78/15 cm									
	Weathered													
81.4	Red Brown		5	SS	72/18 cm									
3.9	End of Borehole													
	* Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 34

METRIC

W P 80-76-00 LOCATION N: 4 782 830 E: 311 692 Culvert WC 137-24 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 02 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
84.2	Ground Surface													
0.0	100 mm Topsoil													
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	39									
	Hard		2	SS	106/25cm									
	Brown		3	SS	105/23cm									
	-----		4	SS	107/23cm									
	Grey		5	SS	92									
			6	SS	103									
78.4														
5.8	Sandy Silt occ. Gravel (Glacial Till)		7	SS	97									
	Very Dense													
	Brown													
76.4	Shale Bedrock													
7.8	Weathered Red Brown		8	SS	72/8cm									
7.9	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 35

METRIC

W P 80-76-00 LOCATION N: 4 782 850; E: 311 552, Culvert WC137-23 ORIGINATED BY AA
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 02 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
84.0	Ground Surface													GR SA SI CL
0.0	Clayey Silt to Silt with Sand occ. Gravel (Glacial Till)		1	SS	18									
	Very Stiff to Hard		2	SS	56									
	Brown		3	SS	86									
80.4			4	SS	104	13cm								
3.6	Silty Sand some Clay occ. Gravel (Glacial Till)		5	SS	85	8cm								
	Very Dense		6	SS	78	8cm								
	Grey		7	SS	110	13cm								
77.2	Shale Bedrock													
6.8	Weathered													
76.1	Red Brown		8	SS	104	10cm								
7.9	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 36

METRIC

W P 80-76-00 LOCATION N: 4 782 849; E: 311 468, Culvert WC 137-22 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Tests COMPILED BY BD
 DATUM Geodetic DATE 1994 03 02 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
83.6	Ground Surface							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
								WATER CONTENT (%)						
								W _p W W _L						
0.0	Clayey Silt some Sand occ. Gravel (Glacial Till) Very Stiff to Hard Brown Hard Grey													
			1	SS	28		83.0							
			2	SS	57		82.0							
			3	SS	60/5cm		81.0							
			4	SS	48		80.0							
			5	SS	55		79.0							
			6	SS	63		78.0							
78.1							77.0							
5.5	Clayey Sand and Gravel Very Dense Grey													
			7	SS	100/25cm									
76.9														
6.7	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 37

METRIC

W P 80-76-00 LOCATION N: 4 782 850; E: 311 363 , Culvert WC 137-21 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 02 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR 5A 5I CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.9	Ground Surface										
0.0	Clayey Silt trace Sand occ. Gravel (Glacial Till) Soft Very Stiff Brown		1	SS	3						
			2	SS	21						
			3	SS	99						
	Hard		4	SS	117/28cm						
	Grey		5	SS	95						
			6	SS	92						
78.0 77.8	Shale Bedrock Weathered Red Brown		7	SS	40/0cm						
6.1	End of Borehole *Borehole Dry upon Completion										Auger Refusal

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 39

METRIC

W P 80-76-00 LOCATION N: 4 782 883; E: 310 438 Culvert WC 137-19 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 03 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
84.0	Ground Surface													
0.0	300 mm Topsoil					*								
82.6	Clayey Silt to Silt some Gravel some Sand (Glacial Till)		1	SS	17		83.0							
1.4	Very Stiff													
	Brown		2	SS	120/20cm		82.0							
	Sandy Silt some Clay occ. Gravel (Glacial Till)		3	SS	110/20cm									
			4	SS	100/20cm		81.0							
	Very Dense		5	SS	100/20cm		80.0							
	Brown to Grey		6	SS	165		79.0							
77.8			7	SS	100/20cm		78.0							
6.2	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15 ± 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 38

METRIC

W P 80-76-00 LOCATION N: 4 782 865; E: 310 838, Culvert WC 137-20 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 03 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
84.3	Ground Surface																
0.0	150 mm Topsoil						84.0										
	Sandy Silt occ. Gravel trace Clay (Glacial Till)		1	SS	51		83.0										W. L. on 1994 03 03
	Very Dense		2	SS	105/23cm		82.0										10 32 (58)
	Brown		3	SS	100/12cm		81.0										
			4	SS	110/10cm		80.0										
	Grey		5	SS	100/14cm		79.0										8 27 (65)
78.9							78.0										
5.4	Clayey Silt to Silt occ. Gravel (Glacial Till)																
78.0	Hard Red Brown		6	SS	100/10cm												
6.3	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 40

METRIC

W P 80-76-00 LOCATION N: 4 782 904 ; E: 309 943 , Culvert WC 137-18 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 03 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
83.8	Ground Surface												
0.0	100 mm Topsoil												
	Silty Sand to Sandy Silt some Gravel (Glacial Till)	1	SS	135/28	14cm								
		2	SS	100/7	14cm								
	Very Dense	3	SS	100/7	13cm								
	Brown	4	SS	180/7	13cm								
79.1		5	SS	100/7	14cm								
4.7	Shale Bedrock												
	Weathered												
77.7	Red Brown												
6.1	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 41

METRIC

W P 80-76-00 LOCATION N:4 782 913; E: 309 682, Culvert WC 137-17 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 03 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
84.3	Ground Surface											
0.0	150 mm Topsoil					*	84.0					
	Sandy Silt occ. Gravel some Clay (Glacial Till)		1	SS	47		83.0					
			2	SS	100/	13cm						
	Dense to Very Dense		3	SS	120/	13cm						
			4	SS	120/	13cm						
80.2	Brown						81.0					
4.1	Shale Bedrock Weathered Red Brown to Grey		5	SS	125/	14cm	80.0					
78.1			6	SS	120/	13cm	79.0					
6.2	End of Borehole * Borehole Dry upon Completion											

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 42

METRIC

W P 80-76-00 LOCATION N: 4 782 924 ; E: 309 414 Culvert WC 137-16 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger , Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 04 & 1994 03 04 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH kPa					
84.2	Ground Surface												
0.0	150 mm Topsoil												
	Clayey Silt trace Sand occ. Gravel (Glacial Till)		1	SS	46								
	Hard		2	SS	40								
82.1	Brown												
2.1	Sandy Silt to Silty Sand occ. Gravel (Glacial Till)		3	SS	100/13cm								9 28 (63)
			4	SS	100/13cm								
	Very Dense												
			5	SS	75/3cm								8 46 (46)
	Brown												
78.5													
5.7	Shale Bedrock												
77.7	Weathered Red Brown		6	SS	180/23cm								
6.5	End of Borehole * Borehole Dry upon Completion												

RECORD OF BOREHOLE No 43

METRIC

W P 80-76-00 LOCATION N: 4 782 942 ; E: 309 028 , Culvert WC 137-15 ORIGINATED BY AK
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 03 04 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	10 20 30					
84.6	Ground Surface													
0.0	100 mm Topsoil													
	Clayey Silt w. Gravel (Glacial Till)													
83.2	Stiff Brown		1	SS	9		84.0							W. L. on 1994 03 04
1.4	Sandy Silt to Silty Sand trace Clay occ. Gravel (Glacial Till)		2	SS	12		83.0							
	Compact to Very Dense		3	SS	85		82.0							
			4	SS	100/	13cm	81.0							
	Brown		5	SS	120/	13cm	80.0							
			6	SS	110/	13cm	79.0							
	Grey						78.0							
77.4							77.0							
7.2	Shale Bedrock		7	SS	100/	13cm								
76.6	Weathered Red Brown													
8.0	End of Borehole													

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 44

METRIC

W P 80-76-00 LOCATION N: 4 782 950; E: 308 850 Culvert WC 137-14 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 04 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
84.5	Ground Surface												
0.0	100 mm Topsoil												
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	19								
	Very Stiff to Hard		2	SS	63								
	Brown		3	SS	210/25cm								
	Grey		4	SS	107								
80.6	Sandy Silt trace Clay occ. Gravel (Glacial Till)		5	SS	110/13cm								
3.9	Very Dense												
78.1	Brown		6	SS	120/13cm								
6.4	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 45

METRIC

W P 80-76-00 LOCATION N: 4 782 970 ; E: 308 370 , Culvert WC 137-13 ORIGINATED BY AK
 DIST 4 HWY OEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 07 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p W W _L	WATER CONTENT (%)				
83.5	Ground Surface									10 20 30			GR SA SI CL	
0.0	150 mm Topsoil													
	Clayey Silt to Silt with Sand occ. Gravel (Glacial Till)		1	SS	56		83.0	Sub Art. Head						W. L. on 1994 03 07
	Hard Brown		2	SS	124		82.0			120/18cm				
			3	SS	110		81.0							
	Grey		4	SS	170/23cm		80.0							
							79.0							
78.5			5	SS	180		78.0	Sub Art. Encount.						
5.0	Sandy Silt with Gravel (Glacial Till)						77.0							
	Very Dense		6	SS	100/0cm									
76.7	Brown													
6.6	Shale Bedrock													
75.8	Weathered Red Brown		7	SS	120/8cm		76.0							
7.7	End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 46

METRIC

W P 80-76-00 LOCATION N: 4 782 985 ; E: 308 041 , Culvert WC 137-12 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 07 CHECKED BY CM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
82.7	Ground Surface												
0.0	150 mm Topsoil					Sub Art. Head							W. L. on 1994 03 07
	Silt with Sand some Clay occ. Gravel (Glacial Till)	1	SS	67		82.0							
	Very Dense	2	SS	120/8cm		81.0							
	Brown	3	SS	120/14cm		80.0							
		4	SS	185/25cm		79.0							
78.7	Shale Bedrock					Sub Art. Encount.							
4.0	Weathered Red Brown	5	SS	120/10cm		78.0							
						77.0							
76.4		6	SS	120/8cm									
6.3	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 47

METRIC

W P 80-76-00 LOCATION N: 4 783 003 ; E: 307 540 , Culvert WC 137-11 ORIGINATED BY AK
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 03 07 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
83.7	Ground Surface											
0.0	180 mm Topsoil											
	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		1	SS	28							W. L. on 1994 03 07
	Very Stiff to Hard		2	SS	84							7 31 (62)
	Brown		3	SS	117							
	Hard Grey		4	SS	80							
79.5	Sand and Gravel Very Dense Grey		5A	SS	153/28cm							49 40 (11)
4.3	Clayey Silt to Silt some Sand occ. Gravel (Glacial Till)		5B									
79.0	Hard Grey											
4.8	Shale Bedrock Weathered Red Brown		6	SS	120/3cm							
78.1												
5.6												
77.5												
6.2	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 48

METRIC

W P 80-76-00 LOCATION N: 4 783 012 ; E: 307 464 , Culvert WC 137-10 ORIGINATED BY AK
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 07 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.3	Ground Surface										
0.0	100 mm Topsoil										
	Clayey Silt with Sand occ. Gravel (Glacial Till) Very Stiff to Hard Brown		1	SS	29						
			2	SS	98						
			3	SS	71						
81.4											
2.9	Silt some Sand occ. Gravel trace Clay (Glacial Till) Very Dense Grey		4	SS	72						
			5	SS	78						
			6	SS	62						
77.4											
6.9	Shale Bedrock Weathered Red Brown		7	SS	120/6cm						
76.6											
7.7	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 49

METRIC

W P 80-76-00 LOCATION N: 4 783 027 ; E: 307 225 , Culvert WC 137-09 ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 03 12 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
83.3	Ground Surface												
0.0	200 mm Topsoil					*	83.0						
	Clayey Silt to Silt some Sand occ Gravel (Glacial Till)		1	SS	39		82.0						
	Hard		2	SS	112		81.0						
			3	SS	132/20cm		80.0						
	Brown		4	SS	100/10cm		79.0						
			5	SS	123/15cm		78.0						
77.8													
5.5	Shale Bedrock Weathered Grey		6	SS	112/15cm								
77.1													
6.2	End of Borehole * Borehole Dry upon Completion												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 50

METRIC

W P 80-76-00 LOCATION N: 4 783 048 ; E: 307 074 , Culvert WC 137-08 ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 12 CHECKED BY CM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
84.0	Ground Surface													
0.0	100 mm Topsoil					*								
	Clayey Silt to Silt trace Sand occ. Gravel (Glacial Till)		1	SS	45									
	Hard		2	SS	117									
	Brown		3	SS	138/18cm									
	Grey		4	SS	138/23cm									
			5	SS	57									
78.3														
5.7	Sandy Silt some Clay occ. Gravel (Glacial Till)													
77.5	Very Dense Brown		6	SS	152/25cm									
6.5	Shale Bedrock Weathered													
76.3	Red Brown		7	SS	82/8cm									
7.7	End of Borehole * Borehole Dry upon Completion													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5; Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



METRIC

W P 80-76-00 LOCATION N: 4 782 766 ; E: 313 344, North Retaining Wall ORIGINATED BY PM
DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
DATUM Geodetic DATE 1994 03 08 CHECKED BY CM

[illegible]

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 52

METRIC

W P 80-76-00 LOCATION N: 4 782 766 ; E: 313 316 , North Retaining Wall ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 08 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			20 40 60 80 100						
84.2	Ground Surface												GR SA SI CL
0.0	100 mm Topsoil				*	84.0							
	Silt trace Sand												
	Compact		1	SS	17								
	Brown to Grey		2	SS	28								
82.0						82.0							
2.2	Clayey Silt		3	SS	20								
	some Sand occ. Gravel (Glacial Till)												
	Very Stiff		4	SS	18								
80.0						80.0							
4.2	Sandy Silt		5	SS	63/3cm								
	occ. Gravel trace Clay (Glacial Till)												
	Very Dense												
	Brown		6	SS	100/10cm								
77.8						78.0							5 32 (63)
6.4	Shale Bedrock					77.0							
	Weathered		7	SS	138/20cm								
	Red Brown					76.0							
75.0			8	SS	100/3cm	75.0							
9.2	End of Borehole * Borehole Dry upon Completion												

+³, x⁵: Numbers refer to Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 53

METRIC

W P 80-76-00 LOCATION N: 4 782 714 ; E: 313 319 , South Retaining Wall ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 08 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40						60	80	100						
								SHEAR STRENGTH kPo							WATER CONTENT (%)								
								○ UNCONFINED	+ FIELD VANE						● QUICK TRIAXIAL	x LAB VANE	10	20	30				
84.0	Ground Surface					*																	
0.0	100 mm Topsoil																						
	Clayey Silt to Silt trace Sand (Glacial Till)		1	SS	21		83.0																
	Very Stiff to Hard Brown		2	SS	74		82.0																
	Very Stiff to Stiff		3	SS	23		81.0																
	Grey		4	SS	13		80.0																
79.4			5	SS	105/23cm		79.0																
4.6	Silt some Gravel trace Sand (Glacial Till)																						
	Very Dense		6	SS	112/15cm		78.0																
	Brown																						
			7	SS	122/15cm		77.0																
75.5							76.0																
8.5	Shale Bedrock						75.0																
	Weathered		8	SS	105/15cm		74.0																
	Red Brown																						
73.2			9	SS	75/8cm																		
10.8	End of Borehole * Borehole Dry upon Completion																						

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 54

METRIC

W P 80-76-00 LOCATION N: 4 782 716 ; E: 313 346 , South Retaining Wall ORIGINATED BY PM
 DIST 4 HWY QEW BOREHOLE TYPE Solid Stem Auger, Dynamic Cone Penetration Test COMPILED BY BD
 DATUM Geodetic DATE 1994 03 08 CHECKED BY CM

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
84.0	Ground Surface													
0.0	150 mm Topsoil					*								
	Clayey Silt trace Sand (Glacial Till) Stiff to Hard Brown		1	SS	14		83.0							
			2	SS	49		82.0							
	Very Stiff		3	SS	20		81.0							
	Grey		4	SS	20		80.0							
79.7							79.0							
4.3	Silt some Gravel trace Sand (Glacial Till)		5	SS	100/10cm		78.0							
	Very Dense		6	SS	100/10cm		77.0							
	Brown						76.0							
76.1			7	SS	136/20cm		75.0							
7.9	Shale Bedrock						74.0							
	Weathered		8	SS	149/23cm									
	Red Brown													
73.2			9	SS	97/8cm									
10.8	End of Borehole * Borehole Dry upon Completion													

+3, x5: Numbers refer to
Sensitivity

20
15 - 5 (%) STRAIN AT FAILURE
10

W.P. 80-76-00, Dist. 4, Burlington, Central Region
Subsurface Conditions at Specific Culvert Sites
Queen Elizabeth Way, from Ontario Street to Victoria Avenue

Culvert W.C. 137-08

Borehole 1

Below 150 mm of topsoil, 5.1 m of very stiff to hard clayey silt to silt glacial till (N values 28 - > 100 blows/0.3 m; moisture content 15 to 8 %), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.5 m (N values >100 blows/0.3 m). The borehole was dry upon completion.

Borehole 50

Below 100 mm of topsoil, 5.6 m of hard clayey silt to silt glacial till (N values 45 - >100 blows/0.3 m; moisture content 8 to 13 %), overlying 0.8 m of very dense sandy silt glacial till (N values >100 blows/0.3 m; moisture content 8%), overlying weathered shale bedrock to the maximum depth drilled of 7.7 m. The borehole was dry upon completion.

Culvert W.C. 137-09

Borehole 2

Below 100 mm of topsoil, 3.8 m of hard clayey silt to silt glacial till to the maximum depth drilled of 3.9 m (N values 36 - >100 blows/0.3 m; moisture content 13 to 8 %). The borehole was dry upon completion, and could not be advanced below the 3.9 m depth, even after moving the drill rig a few metres away.

Borehole 49

Below 200 mm of topsoil, 5.3 m of hard clayey silt to silt glacial till (N values 39 - > 100 blows/0.3; moisture content 5 to 8 %), overlying weathered shale bedrock to the maximum depth drilled of 6.2 m. The borehole was dry upon completion.

Culvert W.C. 137-10

Borehole 3

Below 200 mm of topsoil, 0.9 m of fill material (stiff clayey silt with sand, one N value of 8 blows/0.3 m; moisture content 17 %), overlying 2.3 m of stiff to hard clayey silt glacial till (N values 8 - 72 blows/0.3 m; moisture content 10%), overlying 0.6 m of very stiff clayey silt (one N value of 27 blows/0.3 m; moisture content 15%), overlying very dense silt glacial till to the maximum depth drilled of 6.2 m (N values >100 blows /0.3 m; moisture content 10 %). The borehole was dry upon completion.

Culvert W.C. 137-10 (continued)

Borehole 48

Below 100 mm of topsoil, 2.8 m of very stiff to hard clayey silt glacial till (N values 21 - 98 blows/0.3; moisture content 13 to 9 %), overlying 4.0 m of very dense silt glacial till (N values 78 - 62 blows/0.3 m; moisture content 8 %), overlying weathered shale bedrock to the maximum depth drilled to 7.7 m. The ground water level was at elev. 82.5 m some 1.8 m below ground level.

Culvert W.C. 137-11

Borehole 4

Below 200 mm of topsoil, 4.7 m of hard clayey silt to silt glacial till (N values 33 -78 blows/0.3 m; moisture content 13 to 8%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.4 m (N values >100 blows/0.3 m; moisture content 10%). The borehole was dry upon completion.

Borehole 47

Below 100 mm of topsoil, 4.2 m of very stiff to hard clayey silt to silt glacial till (N values 28 - >100 blows/0.3; moisture content 8 to 11%), overlying 0.5 m of very dense sand and gravel (N values >100 blows/0.3 m), overlying 0.8 m of hard clayey silt to silt glacial till (N values >100 blows/0.3 m), overlying shale bedrock to the maximum depth drilled of 6.2 m. Groundwater under sub-artesian pressure in the sand and gravel deposit rose to elev. 82.7 m, some 1.0 m below ground level.

Culvert W.C. 137-12

Borehole 5

Below 200 mm of topsoil, 5.1 m of compact to very dense silt glacial till (N values 13 - >100 blows/0.3 m; moisture content 10 to 7%), overlying very dense silty sand glacial till to the maximum depth drilled of 6.6 m (one N value of 52 blows/0.3 m; moisture content 9%). The groundwater level was at elev. 80.7 m, some 1.5 m below ground level.

Borehole 46

Below 150 mm of topsoil, 3.8 m of very dense silt glacial till (N values 67 - >100 blows/0.3 m; moisture content 11 to 7%), overlying weathered shale bedrock to the maximum depth drilled of 6.3 m. Groundwater under sub-artesian pressure just above the bedrock rose to elev. 82.6 m, some 0.1 m below ground level.

Culvert W.C. 137-13

Borehole 6

Below 200 mm of topsoil, 5.0 m of hard clayey silt to silt glacial till (N values 42 - >100 blows/0.3 m; moisture content 10 to 7%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.6 m (one N value of 124 blows/0.3 m; moisture content 18 %). Groundwater under sub-artesian pressure in the sandy silt deposit rose to elev. 82.1 m, some 1.7 m below ground level.

Borehole 45

Below 150 mm of topsoil, 4.8 m of hard clayey silt to silt glacial till (N values 56 - >100 blows/0.3 m; moisture content 8 to 17%), overlying 1.8 m of very dense sandy silt glacial till (N values >100 blows/0.3 m), overlying weathered shale bedrock to the maximum depth drilled of 7.7 m. Groundwater under sub-artesian pressure in the sandy silt deposit rose to elev. 82.8 m, some 0.7 m below ground level.

Culvert W.C. 137-14

Borehole 7

Below 180 mm of topsoil, 3.2 m of very stiff to hard clayey silt to silt glacial till (N values 27 - >100 blows/0.3 m; moisture content 10 to 11%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.2 m (N values >100 blows/0.3 m; moisture content 19 to 10 %). The borehole was dry upon completion.

Borehole 44

Below 100 mm of topsoil, 3.8 m of very stiff to hard clayey silt to silt glacial till (N values 19 - >100 blows/0.3 m; moisture content 14 to 8%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.4 m (N values >100 blows/0.3 m; moisture content 8%). The groundwater level was at elev. 79.2 m, some 5.5 m below ground level.

Culvert W.C. 137-15

Borehole 8

Below 150 mm of topsoil, 6.1 m of dense to very dense sandy silt to silty sand glacial till (N values 37 - >100 blows/0.3 m; moisture content 9 to 13%), overlying weathered shale bedrock to the maximum depth drilled of 6.3 m. The borehole was dry upon completion.

Borehole 43

Below 100 mm of topsoil, 1.3 m of stiff clayey silt glacial till (one N value of 9 blows/0.3 m), overlying 5.8 m of compact to very dense sandy silt to silty sand glacial till (N values 12 - >100 blows/0.3 m; moisture content 21 to 9%), overlying weathered shale bedrock to the maximum depth drilled of 8.0 m. The groundwater level was at elev. 84.1 m, some 0.5 m below ground level.

Culvert W.C. 137-16

Borehole 9

Below 180 mm of topsoil, 1.9 m of hard clayey silt glacial till (N values 34 - 60 blows/0.3 m; moisture content 9%), overlying very dense sandy silt to silty sand glacial till to the maximum depth drilled of 4.9 m (N values > 100 blows/0.3 m; moisture content 7 to 9%). The borehole was dry upon completion.

Borehole 42

Below 150 mm of topsoil, about 2 m of hard clayey silt glacial till (N values 40 - 46 blows/0.3 m; moisture content 7 to 12%), overlying 3.6 m of very dense sandy silt to silty sand glacial till (N values >100 blows/0.3 m; moisture content 11 to 8%), overlying weathered shale bedrock to the maximum depth drilled of 6.5 m. The borehole was dry upon completion.

Culvert W.C. 137-17

Borehole 10

Below 150 mm of topsoil, 5.6 m of very dense sandy silt glacial till (N values >100 blows/0.3 m; moisture content 7 to 12%), overlying clayey silt to silt glacial till to the maximum depth drilled of 6.2 m (N values >100 blows/0.3 m; moisture content 8%). The borehole was dry upon completion.

Borehole 41

Below 150 mm of topsoil, 3.9 m of dense to very dense sandy silt glacial till (N values 47 - >100 blows/0.3 m; moisture content 9 to 11%), overlying weathered shale bedrock to the maximum depth drilled of 6.2 m. The borehole was dry upon completion.

Culvert W.C. 137-18

Borehole 11

Below 200 mm of topsoil, very dense sandy silt to silty sand glacial till (N values >100 blows/0.3 m; moisture content 10 to 11%), to the maximum depth drilled of 4.6 m. The borehole was dry upon completion.

Borehole 40

Below 100 mm of topsoil, 4.6 m of very dense sandy silt to silty sand glacial till (N values >100 blows/0.3; moisture content 13 to 7%), overlying weathered shale bedrock to the maximum depth drilled of 6.1 m. The groundwater level was at elev. 82.8 m, some 1.0 m below ground level.

Culvert W.C. 137-19**Borehole 12**

There was 1.0 m of a mixture of silty clay and topsoil fill (one N value of 9 blows/0.3 m; moisture content 10 to 11%), overlying 2.9 m of loose to very dense sandy silt glacial till (N values 9 - >6100 blows/0.3 m), overlying weathered shale bedrock to the maximum depth drilled of 5.0 m. The borehole was dry upon completion.

Borehole 39

Below 300 mm of topsoil, 1.1 m of very stiff clayey silt to silt glacial till (one N value of 17 blows/0.3 m; moisture content approximately 20%), overlying sandy silt glacial till to the maximum depth drilled of 6.2 m (N values >100 blows/0.3 m; moisture content 13 to 5%). The borehole was dry upon completion.

Culvert W.C. 137-20**Borehole 13**

Below 180 mm of topsoil, compact to very dense sandy silt glacial till (N values 23 - >100 blows/0.3 m; moisture content 8 to 11%), to the maximum depth drilled of 6.2 m. The borehole was dry upon completion.

Borehole 38

Below 150 mm of topsoil, 5.2 m of very dense sandy silt glacial till (N values 50 - >100 blows/0.3; moisture content 14 to 8%), overlying clayey silt to silt glacial till to the maximum depth drilled of 6.3 m (moisture content 8%). The groundwater level was at elev. 83.3 m, some 1.0 m below ground level.

Culvert W.C. 137-21**Borehole 14**

Below 225 mm of topsoil, 5.3 m of hard clayey silt to silt glacial till (N values 40 - >100 blows/0.3 m; moisture content 8 to 9%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.9 m (moisture content 12%). The borehole was dry upon completion.

Borehole 37

There was 5.9 m of soft to hard clayey silt to silt glacial till (N values 3 - >100 blows/0.3; moisture content 13 to 8%), overlying shale bedrock to the maximum depth drilled of 6.1 m. The borehole was dry upon completion.

Culvert W.C. 137-22

Borehole 15

Below 150 mm of topsoil, hard clayey silt glacial till (N values 34 - >100 blows/0.3 m; moisture content 10 to 7%), to the maximum depth drilled of 7.9 m. The borehole was dry upon completion.

Borehole 36

There was 5.5 m of very stiff to hard clayey silt glacial till (N values 28 - >100 blows/0.3; moisture content 18 to 10%), overlying very dense clayey sand and gravel to the maximum depth drilled of 6.7 m (N values of >100 blows/0.3 m). Groundwater under sub-artesian pressure in the clayey sand and gravel deposit rose to elev. 80.6 m, some 3.0 m below ground level.

Culvert W.C. 137-23

Borehole 16

Below 150 mm of topsoil, 3.6 m of firm to hard clayey silt to silt glacial till (N values 7 - 80 blows/0.3 m; moisture content 14%), overlying 2.1 m of very dense silty sand glacial till (N values >100 blows/0.3 m; moisture content 5%), overlying dense gravelly sand to the maximum depth drilled of 6.9 m (one N value of 31 blows/0.3 m). Groundwater under sub-artesian pressure in the gravelly sand deposit rose to elev. 82.9 m, some 1.3 m below ground level.

Borehole 35

There was 3.6 m of very stiff to hard clayey silt to silt (N values 18 to >100 blows/0.3 m; moisture content 10 to 5%), overlying 3.2 m of very dense silty sand glacial till (N values 78 - >100 blows/0.3 m; moisture content 7%), overlying weathered shale bedrock to the maximum depth drilled of 7.9 m. The borehole was dry upon completion.

Culvert W.C. 137-24

Borehole 17

Below 150 mm of topsoil, 5.6 m of hard clayey silt to silt glacial till (N values 94 - >100 blows/0.3 m; moisture content 7%), overlying very dense sandy silt glacial till to the maximum depth drilled of 6.9 m (N values of >100 blows/0.3 m; moisture content 16%). The borehole was dry upon completion.

Borehole 34

Below 100 mm of topsoil, 5.7 m of hard clayey silt to silt glacial till (N values 39 - >100 blows/0.3 m; moisture content 10 to 7%), overlying 2.0 m of very dense sandy silt glacial till (one N value of 97 blows/0.3 m; moisture content 8%), overlying weathered shale bedrock to the maximum depth drilled of 7.9 m. The groundwater level was at elev. 80.3 m, some 3.9 m below ground level.

Culvert W.C. 137-25

Borehole 18

Below 200 mm of topsoil, 0.4 m of hard clayey silt to silt, overlying weathered shale bedrock to the maximum depth drilled of 3.1 m (moisture content 10 to 8%). The borehole was dry upon completion.

Borehole 33

Below 100 mm of topsoil, 2.5 m of clayey silt glacial till (N values 43 - 54 blows/0.3 m; moisture content 17 to 12%), overlying weathered shale bedrock to the maximum depth drilled of 3.9 m. The borehole was dry upon completion.

Culvert W.C. 137-26

Borehole 19

Below 200 mm of topsoil, 0.4 m of hard clayey silt glacial till, overlying weathered shale bedrock to the maximum depth drilled of 3.4 m (N values of 37 - 85 blows/0.3 m). The borehole was dry upon completion.

Borehole 32

Below 100 mm of topsoil, 0.7 m of hard clayey silt glacial till, overlying weathered shale bedrock to the maximum depth drilled of 3.8 m (N values of 59 - 71 blows/0.3 m). The borehole was dry upon completion.

Culvert W.C. 137-27

Borehole 20

Below 150 mm of topsoil, 0.4 m of hard clayey silt glacial till, overlying weathered shale bedrock to the maximum depth drilled of 3.1 m (N values of 61 - >100 blows/0.3 m). The borehole was dry upon completion.

Borehole 31

Below 150 mm of topsoil, 2.4 m of hard clayey silt to silt glacial till (N values 37 - >100 blows/0.3 m), overlying weathered shale bedrock to the maximum depth drilled of 3.9 m (N values of 64 - >100 blows/0.3 m). The borehole was dry upon completion.

Culvert W.C. 137-28

Borehole 21

Below 25 mm of topsoil, 3.7 m of stiff to hard clayey silt to silt glacial till (N values 11 - 95 blows/0.3 m; moisture content 11 to 9%), overlying weathered shale bedrock to the maximum depth drilled of 6.1 m (moisture content 7 %). The borehole was dry upon completion.

Culvert W.C. 137-28 (continued)

Borehole 30

Below 150 mm of topsoil, 2.2 m of very stiff to hard clayey silt to silt glacial till (N values 17 - 56 blows/0.3 m; moisture content 12%), overlying 1.1 m of very dense sandy silt glacial till (N values 80 - >100 blows/0.3 m; moisture content 6%), overlying weathered shale bedrock to the maximum depth drilled of 6.4 m. The borehole was dry upon completion.

Culvert W.C. 137-29

Borehole 22

Fill material of 3.7 m thickness and comprising clayey silt to silt and topsoil mixture (N values 9 - 82 blows/0.3 m; moisture content 22%), overlies 1.5 m of very dense sandy silt glacial till (N values >100 blows/0.3 m; moisture content 9%), over weathered shale bedrock to the maximum depth drilled of 7.8 m. The groundwater level was at elev. 79.6 m, some 2.2 m below ground level.

Borehole 29

Below 150 mm of topsoil, 2.4 m of very dense sandy silt glacial till (one N value of 97 blows/0.3 m; moisture content 9%), overlying weathered shale bedrock to the maximum depth drilled of 3.9 m (one N value of >68 blows/0.3 m). The borehole was dry upon completion.

Culvert W.C. 137-30

Borehole 23

Below 100 mm of topsoil, 1.3 m of a compact heterogenous mixture of sand, silt and gravel fill material (one N value of 13 blows/0.3 m; moisture content 13%), overlying 4.0 m of hard clayey silt to silt glacial till (N values 41 - >75 blows/0.3 m; moisture content 13 to 14%), overlying weathered shale bedrock to the maximum depth drilled of 7.2 m. The groundwater level was at elev. 82.0 m, some 0.9 m below ground level.

Borehole 28

There was 0.8 m of a mixture of topsoil, silt and sand, overlying 3.5 m of hard to stiff clayey silt to silt glacial till (N values decreasing with depth from about 60 to 8 blows/0.3 m; moisture content 18 to 20%), overlying weathered shale bedrock to the maximum depth drilled of 6.2 m. The borehole was dry upon completion.

Culvert W.C. 138-01**Borehole 24**

Below 150 mm of topsoil, about 2 m of firm to very stiff clayey silt glacial till (N values 8 - 22 blows/0.3 m; moisture content 19%), overlying 1.8 m of very stiff to hard clayey silt to silt glacial till (N values 23 - 35 blows/0.3 m; moisture content 18%), overlying very stiff to hard clayey silt glacial till to the maximum depth drilled of 9.6 m (N values 18 - 80 blows/0.3 m; moisture content 12%). The borehole was dry upon completion.

Borehole 27

Below 150 mm of topsoil, firm to hard clayey silt glacial till to the maximum depth drilled of 8.1 m (N values of 7 - 40 blows/0.3 m; moisture content 19 to 15%). The borehole was dry upon completion.

Culvert, Ramp E-NSR**Borehole 25**

Below 200 mm of topsoil, clayey silt glacial till to the maximum depth drilled of 6.6 m (N values of 26 - >100 blows/0.3 m; moisture content 17 to 8%). The borehole was dry upon completion.

Borehole 26

Below 150 mm of topsoil, clayey silt glacial till to the maximum depth drilled of 6.6 m (N values of 26 - >100 blows/0.3 m; moisture content 19 to 8%). The groundwater level was at elev. 79.7 m, some 2.5 m below ground level.

North Retaining Wall at Victoria Avenue**Borehole 51**

Below 150 mm of topsoil, 2.8 m of compact to dense silt (N values 26 - 65 blows/0.3 m; moisture content 15 to 18%), overlying 2.3 m of very stiff to hard clayey silt glacial till (N values 24 - 89 blows/0.3 m; moisture content 7%), overlying weathered shale bedrock to the maximum depth drilled of 7.8 m. The borehole was dry upon completion.

Borehole 52

Below 100 mm of topsoil, 2.1 m of compact silt (N values 17 - 28 blows/0.3 m; moisture content 18%), overlying 2.0 m of very stiff clayey silt glacial till (N values 20 - 18 blows/0.3 m; moisture content 14%), overlying very dense sandy silt glacial till (N values 63 - >100 blows/0.3 m; moisture content 8%), overlying weathered shale bedrock to the maximum depth drilled of 9.2 m. The borehole was dry upon completion.

South Retaining Wall at Victoria Avenue

Borehole 53

Below 100 mm of topsoil, 4.4 m of hard to stiff clayey silt to silt glacial till (N values 74 - 13 blows/0.3 m; moisture content 29 to 13%), overlying 3.9 m of very dense silt glacial till (N values >100 blows/0.3 m; moisture content 7%), overlying weathered shale bedrock to the maximum depth drilled of 10.8 m. The borehole was dry upon completion.

Borehole 54

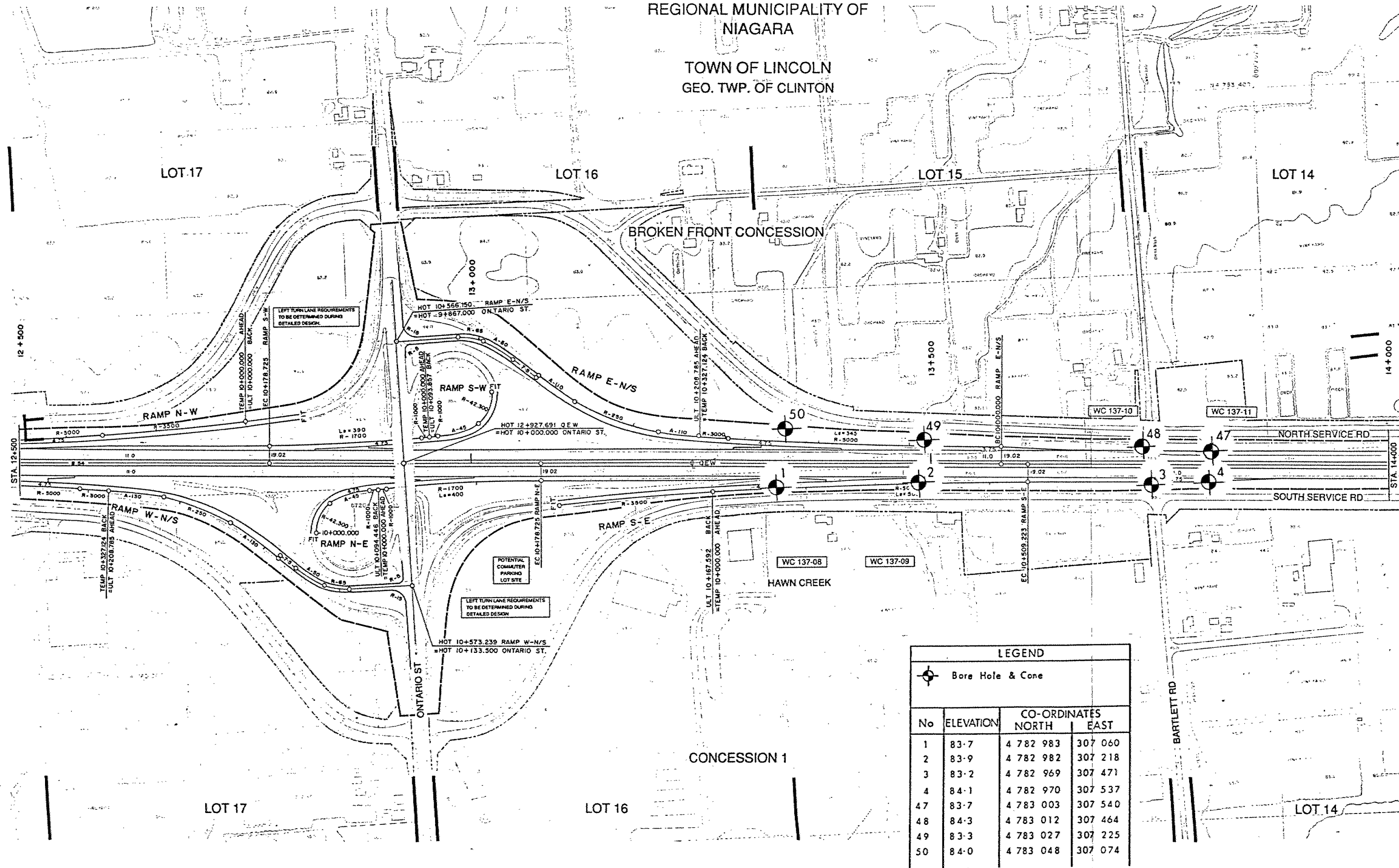
Below 150 mm of topsoil, 4.2 m of hard to very stiff clayey silt to silt glacial till (N values 49 - 20 blows/0.3 m; moisture content 17 to 19%), overlying 3.6 m of very dense silt glacial till (N values >100 blows/0.3 m; moisture content 7 to 11%), overlying weathered shale bedrock to the maximum depth drilled of 10.8 m. The borehole was dry upon completion.

Details of the stratigraphic column at each borehole location, along with N values, moisture contents and the results of Atterberg Limits and grain size distribution tests are shown on the individual Borehole log sheets.

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This descriptive account forms part of the report submitted to the
Foundation Design Section for W.P. 80-76-00, QEW, Ontario
Street to Victoria Avenue

REGIONAL MUNICIPALITY OF
NIAGARA
TOWN OF LINCOLN
GEO. TWP. OF CLINTON



LEGEND			
Bore Hole & Cone			
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	83.7	4 782 983	307 060
2	83.9	4 782 982	307 218
3	83.2	4 782 969	307 471
4	84.1	4 782 970	307 537
47	83.7	4 783 003	307 540
48	84.3	4 783 012	307 464
49	83.3	4 783 027	307 225
50	84.0	4 783 048	307 074

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF LINCOLN
GEO. TWP. OF CLINTON

BROKEN FRONT CONCESSION

CONCESSION 1

LEGEND

⊕ Bore Hole & Cone

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
5	82.2	4 782 946	308 062
6	83.8	4 782 933	308 367
7	84.4	4 782 912	308 850
8	83.6	4 782 905	309 040
43	84.6	4 782 942	309 028
44	84.5	4 782 950	308 850
45	83.5	4 782 970	308 370
46	82.7	4 782 985	308 041

LEGEND

--- FLOODPLAIN LINE
 --- FILL LINE
 --- EXISTING PROPERTY
 --- PROPOSED CAH
 PROPERTY ACQUISITION

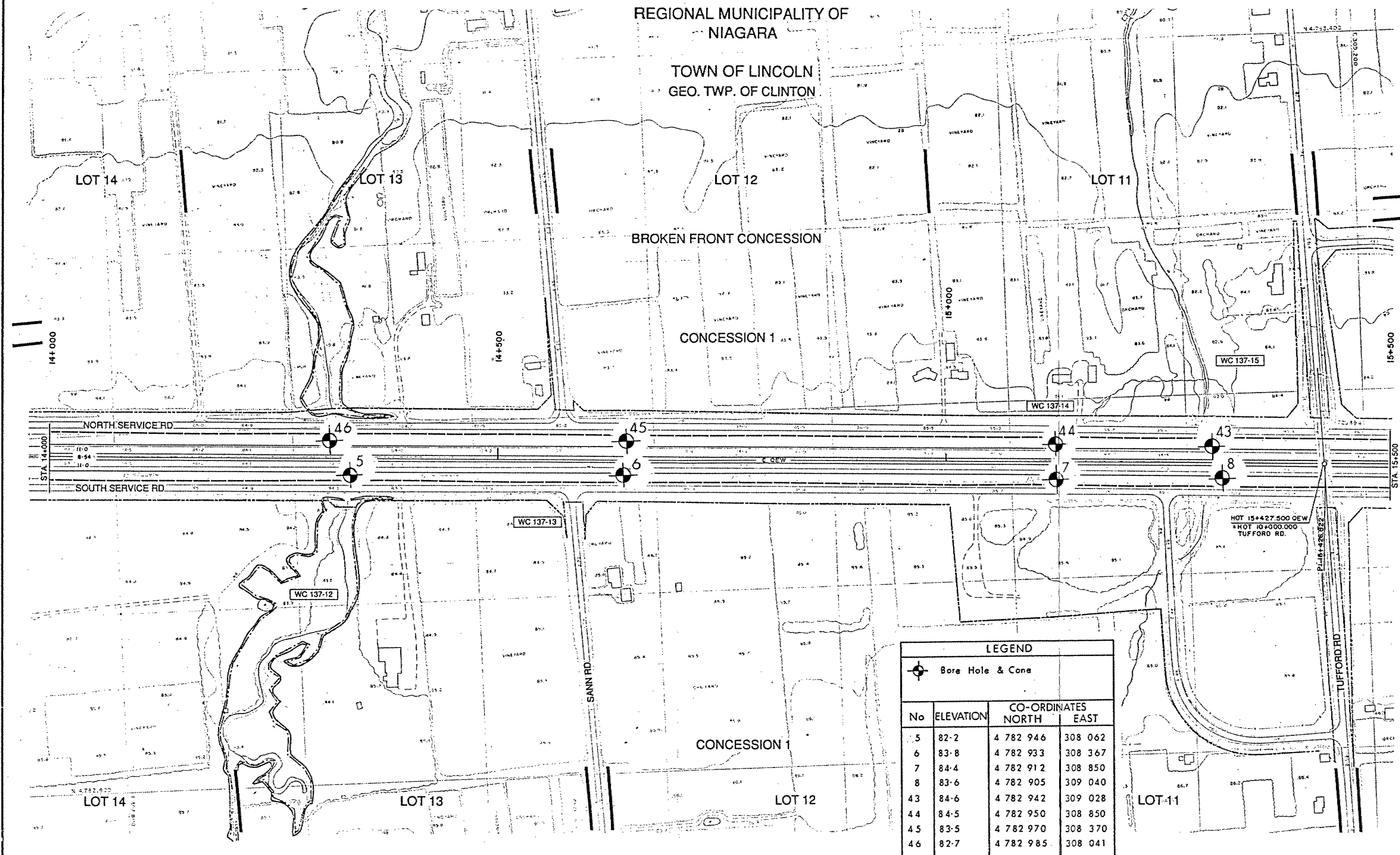


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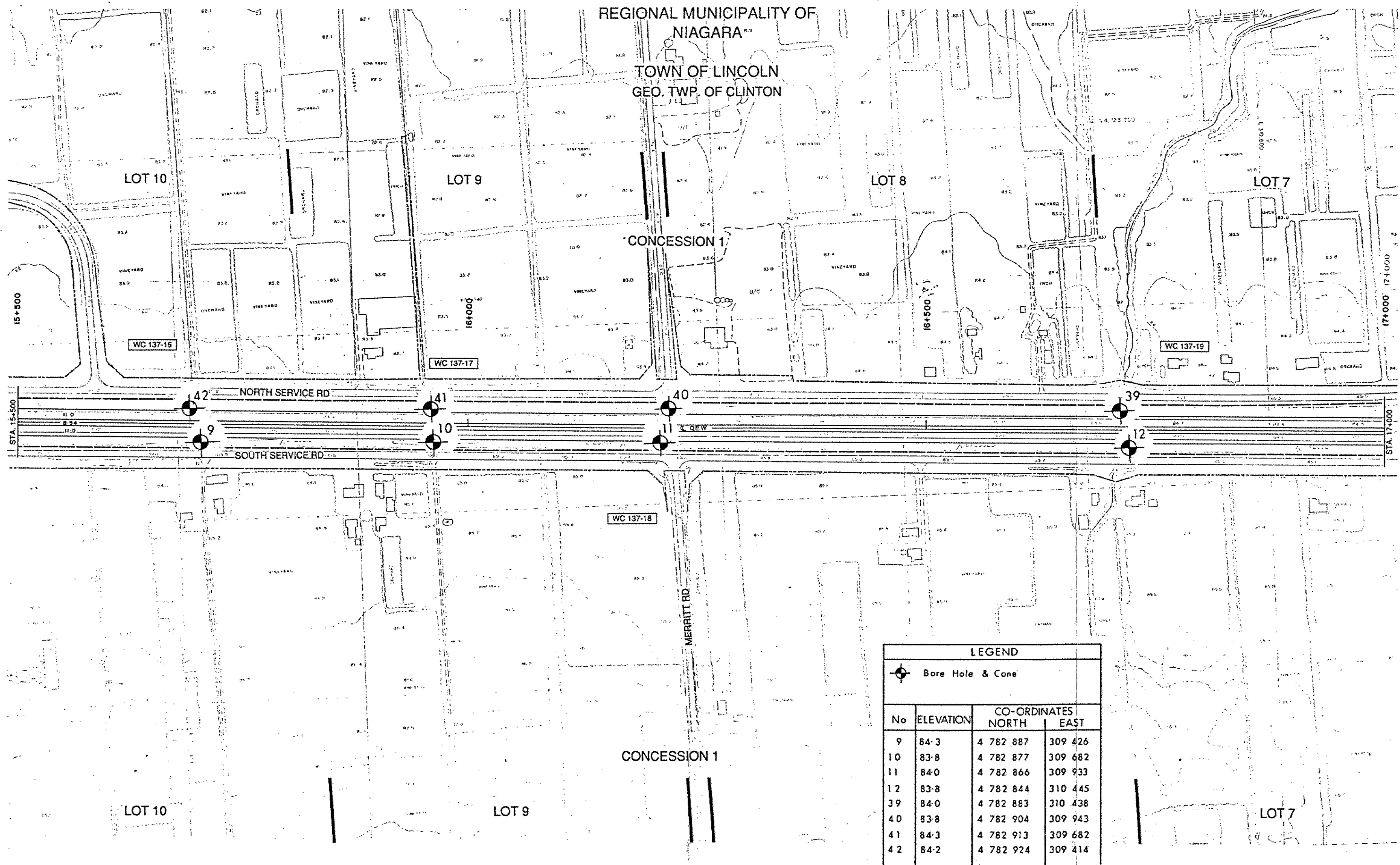
PLATE
C3-18

INITIAL PHASE
 STA. 14+000 TO STA. 15+500

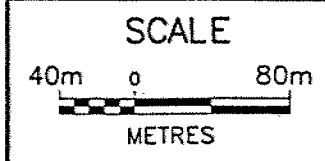
QUEEN ELIZABETH WAY
 PRELIMINARY DESIGN STUDY
 W.P. 80-76-00



REGIONAL MUNICIPALITY OF
NIAGARA
TOWN OF LINCOLN
GEO. TWP. OF CLINTON



LEGEND			
Bore Hole & Cone			
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
9	84.3	4 782 887	309 426
10	83.8	4 782 877	309 682
11	84.0	4 782 866	309 933
12	83.8	4 782 844	310 445
39	84.0	4 782 883	310 438
40	83.8	4 782 904	309 943
41	84.3	4 782 913	309 682
42	84.2	4 782 924	309 414



LEGEND	
	FLOODPLAIN LINE
	FILL LINE
	EXISTING PROPERTY
	PROPOSED CAH
	PROPERTY ACQUISITION

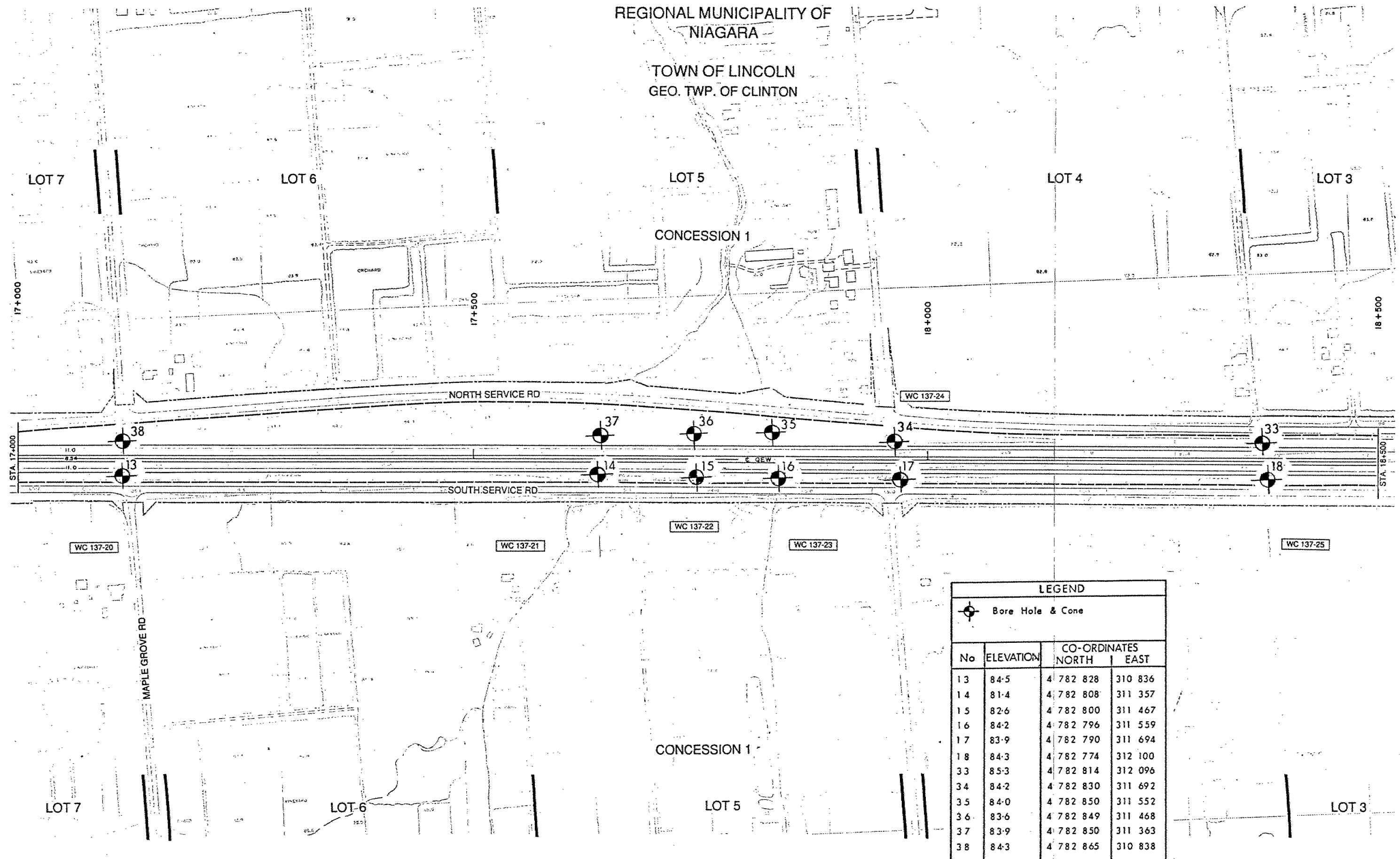
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W.P. 80-76-00

INITIAL PHASE
STA. 15+500 TO STA. 17+000

PLATE
C3-19

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF LINCOLN
GEO. TWP. OF CLINTON



LEGEND			
Bore Hole & Cone			
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
13	84.5	4 782 828	310 836
14	81.4	4 782 808	311 357
15	82.6	4 782 800	311 467
16	84.2	4 782 796	311 559
17	83.9	4 782 790	311 694
18	84.3	4 782 774	312 100
33	85.3	4 782 814	312 096
34	84.2	4 782 830	311 692
35	84.0	4 782 850	311 552
36	83.6	4 782 849	311 468
37	83.9	4 782 850	311 363
38	84.3	4 782 865	310 838

PLATE
C3-20

INITIAL PHASE
STA. 17+000 TO STA. 18+500

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W.P. 80-76-00

LEGEND

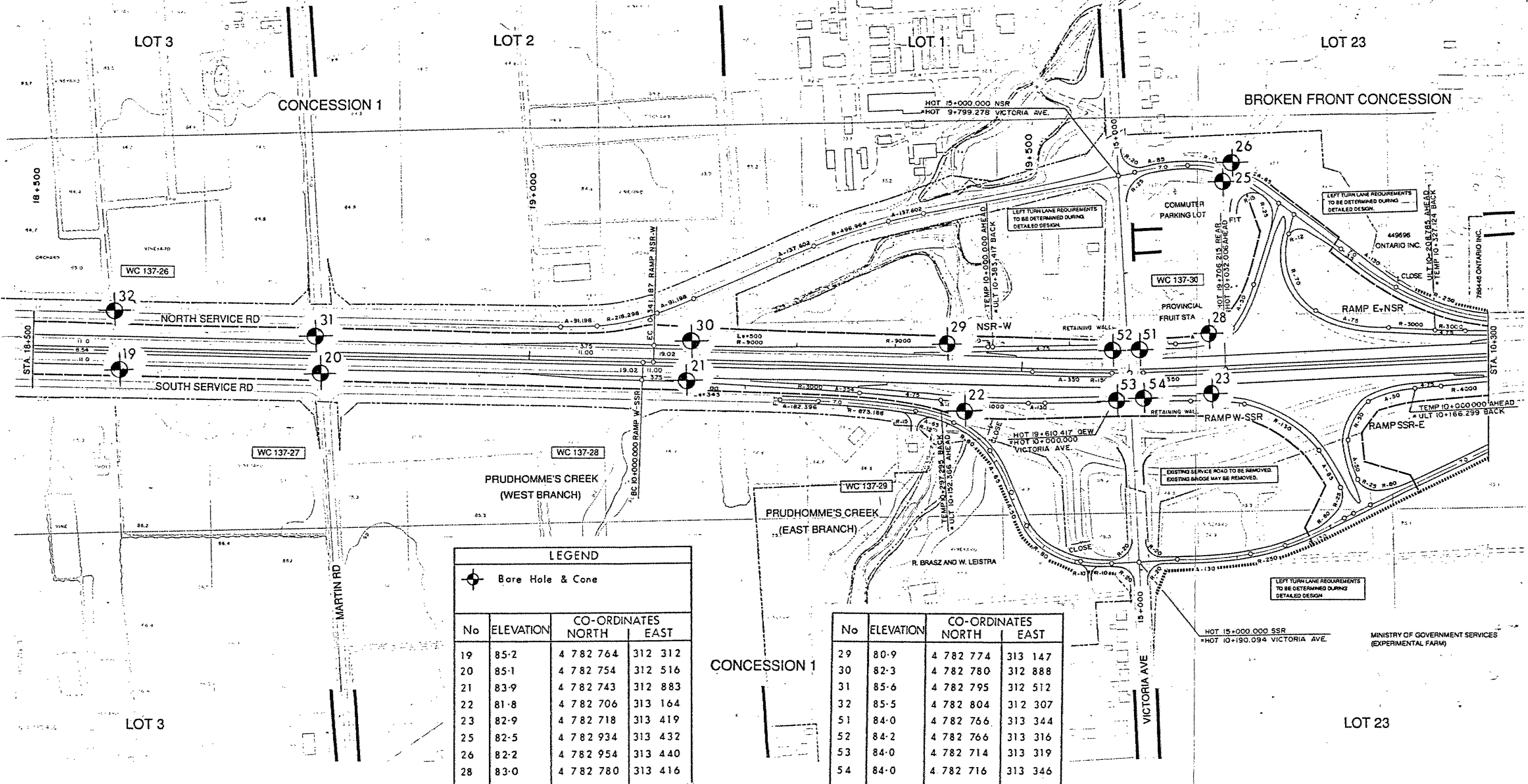
- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION



SCALE
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METRES

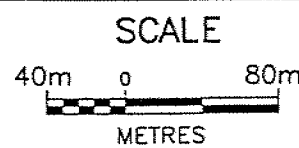
REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF LINCOLN
GEO. TWP. OF LOUTH



LEGEND			
Bore Hole & Cone			
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
19	85.2	4 782 764	312 312
20	85.1	4 782 754	312 516
21	83.9	4 782 743	312 883
22	81.8	4 782 706	313 164
23	82.9	4 782 718	313 419
25	82.5	4 782 934	313 432
26	82.2	4 782 954	313 440
28	83.0	4 782 780	313 416

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
29	80.9	4 782 774	313 147
30	82.3	4 782 780	312 888
31	85.6	4 782 795	312 512
32	85.5	4 782 804	312 307
51	84.0	4 782 766	313 344
52	84.2	4 782 766	313 316
53	84.0	4 782 714	313 319
54	84.0	4 782 716	313 346



LEGEND

- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION

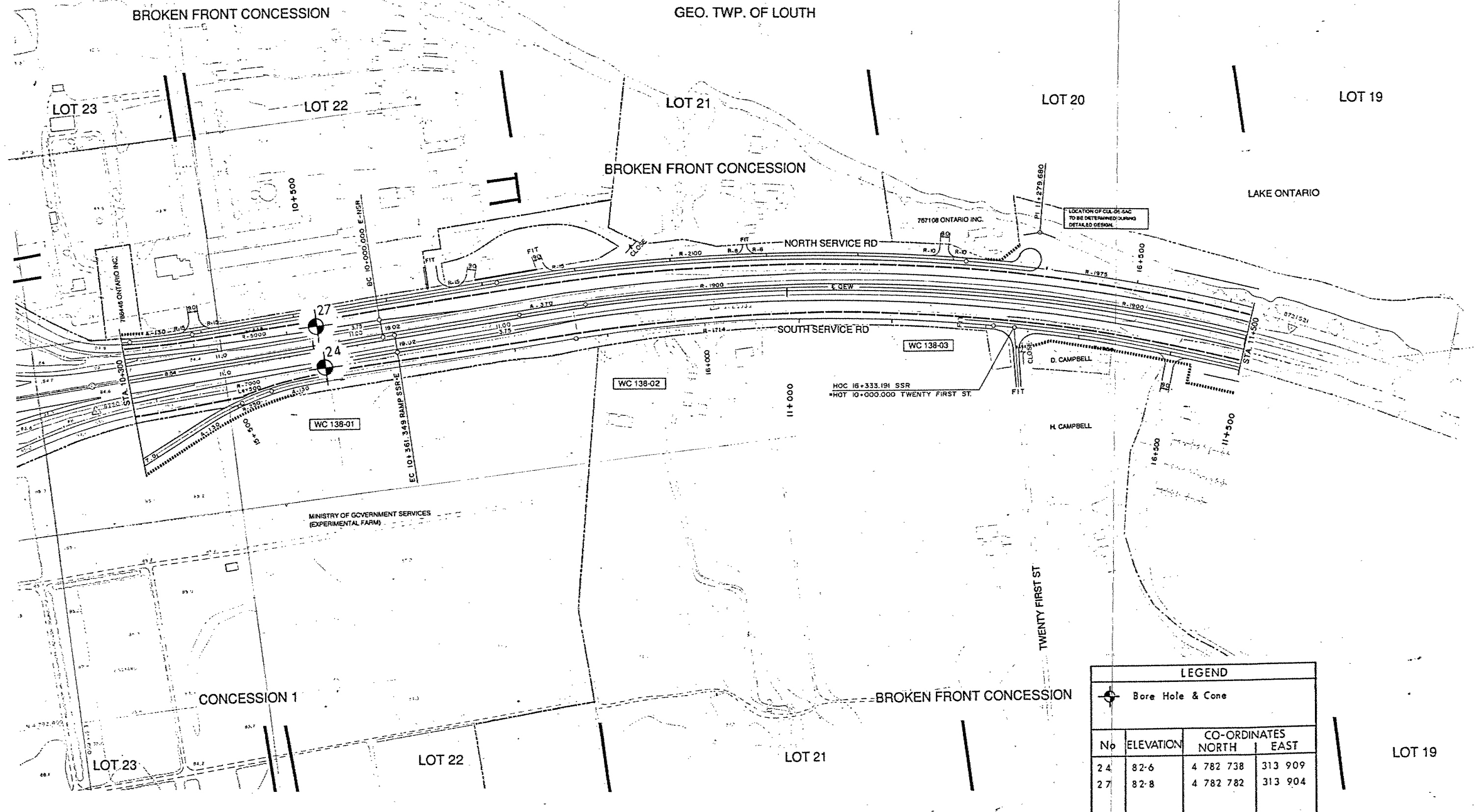
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PRELIMINARY DESIGN STUDY
W.P. 80-76-00

INITIAL PHASE
STA. 18+500 TO STA. 10+300

PLATE
C3-21

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF LINCOLN
GEO. TWP. OF LOUTH



LEGEND			
Bore Hole & Cone			
No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
24	82.6	4 782 738	313 909
27	82.8	4 782 782	313 904

PLATE
C3-22

INITIAL PHASE
STA. 10+300 TO STA. 11+500

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

LEGEND

- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION



SCALE
40m 0 80m
METRES