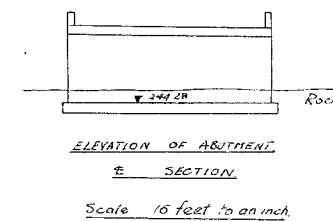
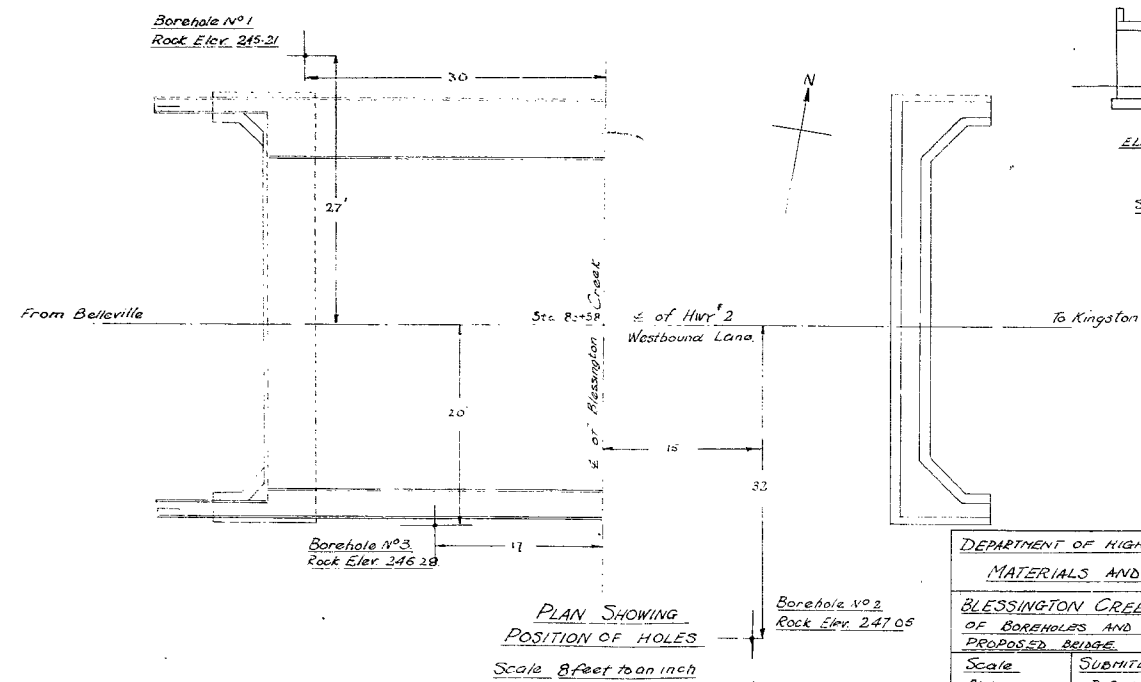
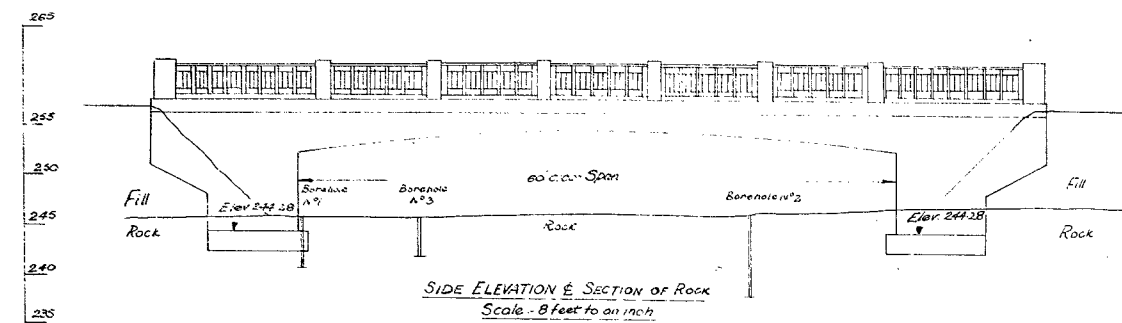


54-F-21

HWY. #2

BLESSINGTON CREEK

BELLEVILLE



DEPARTMENT OF HIGHWAYS		ONTARIO
MATERIALS AND RESEARCH BRANCH		
BLESSINGTON CREEK: - PLAN SHOWING POSITIONS OF BOREHOLES AND BEDROCK IN RELATION TO PROPOSED BRIDGE		
Scale 8 ft to an inch	SUBMITTED BY P. B. La Motta	Date Dec 16/54
Drawn and traced P. B. La Motta	APPROVED BY	Drawing No 54-F-21/A

MATERIALS LABORATORY-DEPARTMENT OF HIGHWAYS - OILTA
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG _____ C984 2044 "3"
CASING _____ (STANDARD SAMPLERS TO FIT UNLESS NOTED)
SAMPLER HAMMER WT _____ # _____ DROP _____ INCHES

JOB 34-F-21
 DATUM 8-17-05
 COMPILED BY PL CHECKED BY

BORING NO. 2
DATE REPORT
BORING DATE Nov 18/54

SAMPLE CONDITION



SAMPLE TYPES

CS - CHUNK
DO - DRIVE OPEN
DF - DRIVE FOOT VALVE
TS - THIN WALLED OPEN
VS - WASHED SAMPLE
RC - ROCK CORE

ABBREVIATIONS

ABBREVIATIONS

V-INSITU VANE SHEAR TEST	γ UNIT WEIGHT
M-MECHANICAL ANALYSIS	K - PERMEABILITY
U-UNCONFINED COMPRESSION	C- CONSOLIDATION
Qc- TRIAXIAL CONSOLIDATED QUICK	CA - CASING
Q - TRIAXIAL QUICK	WL - WATER LEVEL IN CASING
S - TRIAXIAL SLOW	WT - WATER TABLE IN SOIL

SOIL PROFILE

[illegible]

MATERIALS LABORATORY-DEPARTMENT OF HIGHWAYS - ONTARIO
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG - CORE DRILL # 2

CASING (STANDARD SAMPLERS TO FIT UNLESS NOTED)

SAMPLER HAMMER NT

JOB 54-A-21 @ BELLEVILLE

DATUM 24891

COMPILED BY PL CHECKED BY PL

BORING NO.

DATE RECORDED

BOILING DATE 1/10/68

SAMPLE CONDITION



CS - CHUCK
DO - DRIVE OPEN
DF - DRIVE FOOT VALVE
TO - THIN WALLED OPEN

SAMPLE TYPES

W.S - WASHED SAMPLE
R.C - ROCK CORE

ABBREVIATIONS

V-INHITS VNE, SHEAR TEST V-UNIT WEIGHT
M-MECHANICAL ANALYSIS K-PERMEABILITY
U-UNCONFINED COMPRESSION C-CONSOLIDATION
Q-TRIAXIAL CONSOLIDATED QUICK CA-CASING
Q-TRIAXIAL QUICK WL-WATER LEVEL IN CASING
S-TRIAXIAL SLOW WT-WATER TABLE IN SOIL

SOIL PROFILE

[illegible]



ONTARIO

DEPARTMENT OF HIGHWAYS

Memo To Mr. H. Lamont, Date January 19, 1955.
Bridge Engineer. Subject Re: Foundation Investigation
From Mr. F. C. Brownridge, Mat. Laboratory. Highway #2 - Blessington Creek.

Attached herewith is one copy of our report for the above Bridge Foundation Investigation.

Since bedrock was relatively close to the surface this investigation did not present any problem and concluding investigation was quite simple.

One of the copies of this report has already been given to Mr. L. Lock at De Havilland.

A handwritten signature in cursive script, appearing to read 'F. C. Brownridge'.

F. C. Brownridge
Materials & Research Engineer.

FCB:GD

Encls.

cc: Mr. J. Walter, Const. Eng.
Mr. L. Walker, Div. Eng.
Mr. G. Farantatos. ✓

INDEX

	<u>Page</u>
Introduction	1
Procedure	1
Soil Conditions	1
Water Condition	1
Analysis Of Testing and Recommendation	2
Conclusion	2

Report of
Foundation Investigation
Highway #2
at Blessington Creek,
Belleville, Ontario.

Copies to: Mr. H. Lamont,
Bridge Engineer (2)

Project No. F-54-21

Mr. J. Walter
Construction Engineer (1)

L. Walker
Division Engineer (1)

Mr. G. Parantatos (1)

File (1)

INTRODUCTION

The following is a report on an investigation for the foundation of the proposed renewal of a bridge carrying the westbound lane of highway #2 over Blessington Creek, near Belleville.

The existing structure, a concrete arch is in a deteriorated condition and it is proposed to reconstruct using a rigid frame bridge.

The object of this investigation was to explore the ground conditions and recommend a bearing pressure and foundation level for the new structure.

PROCEDURE

The site is located approximately 5 miles east of Belleville, near the eastern limit of the four lane highway. Physiographically the region is known as the Napanee plane, which is characterized by shallow topsoil over limestone bedrock. Three holes were put down between the period, November 17 and November 20, 1954.

Locations and elevations of boreholes are shown in plan 54-F-21A and Appendix I.

SOIL CONDITIONS

It was found that hard limestone bedrock underlay a shallow layer of clay topsoil between two and four feet deep, except for the creek which flows on bedrock.

WATER CONDITION

An artesian head was released in B.H.#2; this was apparent when the core barrel was withdrawn. A jet of water issued from the hole rippling the surface of the stream, and it would appear that it originated from a small fissure in the rock approx. 6' deep.

ANALYSIS OF TESTING AND RECOMMENDATION

An AXT core barrel was used for sampling the rock. The AXT core barrel samples cores 1 1/8" in diameter.

From the samples six sections were selected and tested in compression and the weakest of these supported a load of 5,000 pounds, from which it has been calculated to give an allowable pressure of 25 tons/sq.ft.

The standard code of practice for similar rock gives a bearing value of 10 tons/sq.ft.

The proposed elevation for the bottom of the footings of 244.28 brings the foundation of the bridge in the bedrock. It is suggested that the structure should be dowelled on the bedrock.

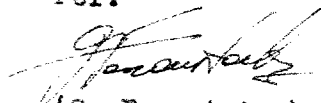
CONCLUSION

The proposed level of the footings occur in the bedrock and it is therefore concluded that this elevation will be satisfactory.

A safe bearing pressure of 10 tons/sq.ft. is recommended for this type of bedrock in standard code of practice.

F. C. Brownridge,
Materials & Research Engr.

Per.


(G. Farantatos)

GF:JH

ARGENTIA I

REPORT ON FOUNDATION INVESTIGATION
FOR
PROPOSED CROSSING OF HIGHWAY NO. 41
DIVERSION LINE "G"
AT THE
SELBY CREEK - SELBY, ONTARIO

for the

DEPARTMENT OF HIGHWAYS - ONTARIO

by the



Engineering Division
HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED
Toronto, Ontario

July, 1959

ORDER OF CONTENTS

<u>Section</u>		<u>Page</u>
1.1	PURPOSE OF REPORT	
	1.11 General	1
1.2	DISCUSSION OF PROCEDURES	
	1.21 Location of Boreholes	2
	1.22 Subsurface Drilling and Sampling	2
1.3	DISCUSSION OF SITE	
	1.31 Geographic Location	4
	1.32 Site Geology	4
	1.33 Water Conditions	4
	1.34 Soil Conditions	5
	1.35 Bedrock Conditions	5
1.4	FOUNDATION OF BRIDGE STRUCTURE	6
1.5	PERSONNEL	8
1.6	APPENDICES	
	1.61 General Plan of Site and Subsurface Sections	
	1.62 Office Logs of Boreholes	
	1.63 Photos of Site	

Section 1.1

PURPOSE OF REPORT

1.11 General

The purpose of this report is to present the results of a sub-surface soil investigation on the site of the proposed crossing of Highway No. 41 Diversion Line "G" at Selby Creek in the Township of Richmond, County of Lennox and Addington, and to offer recommendations regarding a safe foundation for the new structure.

Section 1.2

DISCUSSION OF PROCEDURES

1.21 Location of Boreholes

The field location of the site for this investigation was established by Department of Highways surveyors. The actual borehole locations were established in the field by the Hunting Technical and Exploration Services Limited engineer by chaining to all boreholes from the intersection of the western boundary line with the fence line immediately north of Selby Creek. This reference point and borehole locations are shown on the plan in Appendix 1.61. Approximate elevations for all boreholes were established relative to the water level (June, 1959) of Selby Creek which in turn was established from B. M. E.L. 384.62 located on the southeast corner of the south abutment of the existing bridge over Selby Creek. At the completion of the work, each borehole was marked with a large stake denoting the hole number for future reference.

1.22 Subsurface Drilling and Sampling

A primary program as specified by the client, of 4 soil borings was carried out in the vicinity of the proposed site of the new Selby bridge.

One skid-mounted Longyear Pioneer hydraulic head diamond drilling rig was used on this project. All boring and sampling operations were completed by an experienced soil sampling crew under

the supervision of engineering personnel experienced in soil sampling procedures.

Soil borings were performed by using a 2 inch O. D. standard split spoon sampler. The standard penetration test using a 140 lb. hammer falling 30 inches was recorded for each foot of sampler penetration. All samples were visually examined and classified on the site, then placed in jars and forwarded to the engineering office.

Bedrock core samples were obtained by diamond drilling techniques and were visually examined and classified on site. Representative samples were chosen and forwarded to the engineering office.

Section 1.3

DISCUSSION OF SITE

1.31 Geographic Location

The proposed bridge site is located west of the King's Highway No. 41 at the proposed new crossing of Selby Creek on Diversion Line "C" in the village of Selby. The site is in the County of Lennox and Addington, Township of Richmond on Lot 21, Concession IV.

1.32 Site Geology

Physiographically the site lies in the area known as the Napanee plain which is a flat to undulating plain of limestone from which glaciers have stripped most of the overburden. The area is based mainly on a bedrock of Black River limestone.

The underlying bedrock encountered at approximately EL. 375.5 is a limestone.

1.33 Water Conditions

At the time of this investigation the water table in the boreholes had an average EL. 376.1 and the approximate water level of the creek was at EL. 377.2.

1.34 Soil Conditions

The material encountered at the site consisted generally of one structural type overlying the bedrock. This is composed of a soft brown-grey organic topsoil with clay. The stratum appears homogenous throughout and varies in depth from 2.6 feet on the south bank to 3.0 feet on the north bank. As it approaches bedrock the soil changes from brown to grey in colour and the strength slightly increases. On the south bank of the creek there exists a thin stratum (2 to 3 inches) of coarse sand and fine gravel overlying the bedrock. In general, the entire depth of soil material overlying the bedrock is considered compressible and as having little or no structural value for construction purposes.

1.35 Bedrock Conditions

Limestone bedrock was encountered at approximately EL. 375.5 at the site. This is believed to be medium hard rock capable of providing an allowable bearing capacity of about 20 tons per square foot.

Recovery of rock core from all boreholes was close to 100%. Although this indicates that the rock is quite solid in composition, slight defects due to weathering along the surface are possible.

Contact with the rock in each of the four boreholes indicates that the bedrock surface is relatively flat-lying in the immediate area.

Section 1.4

FOUNDATION OF BRIDGE STRUCTURE

In view of the very shallow depth of overburden soil at the site, we consider bedrock should provide the most suitable seat for the footings of the bridge abutments.

Flat-lying bedrock should exist at more or less EL. 375.5 in the vicinities of the boreholes. In our opinion the abutments may be safely located on such bedrock within about 40 feet from either shoreline along the centre line of Diversion Line "C".

Spread footings on the bedrock may be designed using a bearing capacity of 20 tons/sq. foot.

As some weathering at bedrock surface may occur, it would seem advisable to seat footings into at least 6 inches cut beyond the surface of the bedrock. If the gradeline is higher than as proposed, the possibility of using dowels properly embedded into bedrock should be investigated. This will prevent any lateral movement of the footings as a result of high approach fills.

Where wing-walls or retaining walls are required, such footings may be designed in accordance with those for abutments.

We do not envisage any stability problems in connection with the heights of approach fills provided that the highly compressible organic material is removed. The overburden soil at locations immediate

to the abutments should be totally removed.

The approach embankments may be constructed on a slope of 2 horizontal to 1 vertical. Rip-rap or other appropriate material should be provided at the upstream toe of the embankment in order to protect against erosive action of the creek during high flooding.

Excavations to bedrock should present little problem unless they are performed during wet seasons. The flow in the creek is very slow during the dry season, and therefore the possibility of temporarily damming off or diverting the creek upstream at the time of construction may be worth investigating.

Section 1.5

PERSONNEL

Mr. A. B. MacArthur, P. Eng. performed the field work for this project and prepared this report under the general supervision of Mr. W. W. F. Wong, P. Eng.

Section 1.6

APPENDICES

1.61 General Plan of Site and Subsurface Sections

1.62 Office Logs of Boreholes





S.S. --- split spoon C --- consolidation test
ST --- Shelby tube M --- mechanical analysis
TWP --- thin walled piston T --- triaxial shear
D.B. --- diamond bit -rock core P --- permeability
U --- unconfined compression

LABORATORY TESTS

FIELD TESTS													LABORATORY TESTS					
SCALE	DEPTH	ELEV	WATER OBSERVATION	LOG	DESCRIPTION	SHEAR STRENGTH (TONS PER SQUARE FOOT)		SAMPLES						ATTENBERG		REMARKS		
						1/2	1/2	N	COND.	DEPTH		TYPE	RECOVERY	PENETRATION	LIMITS		WATER CONTENT	
FT	FT	FT				STANDARD PENETRATION TEST (BLOWS PER FOOT)				FROM	TO		LENGTH REC DIST DRV	RESISTANCE (BLOWS PER FOOT)	mp	y	(w)	
0	0.0	378.0			Ground Surface	20	40	60										
	2.3	375.7	W.L.		ORGANIC TOPSOIL				1	0.0	1.5	S.S.	8/18	7				
	2.8	375.2																
5									2	2.8	4.3	D.B.	17/17					
									3	4.3	9.3	D.B.	60/60					
10					LIMESTONE				4	9.3	14.3	D.B.	60/60					
					BEDROCK													
15									5	14.3	19.3	D.B.	60/60					
	19.3	358.7			(End of Boring)													
20																		

BOREHOLE No. **2**

SAMPLE CONDITION

	undisturbed
	disturbed but represent.
	fair
	lost

SS ... split spoon
ST ... Shelby tube
TWP ... thin walled piston
D.B ... diamond bit **-rock core**

C --- consolidation test
M --- mechanical analysis
T --- triaxial shear
Perk --- permeability
U --- unconfined compression





FIELD TESTS

LABORATORY TESTS

[illegible]

RIG No 1 TYPE Longyear Pioneer

BONEHOLE No. 3.

	undisturbed
	disturbed but represent.
	fair
	lost

SS	split spoon	C	consolidation test
ST	shear tube	M	mechanical analysis
TWR	thin walled piston	T	triaxial shear
DB	diamond bit -rock core	K	permeability
		U	unconfined compression

BORING LOG

FIELD TESTS

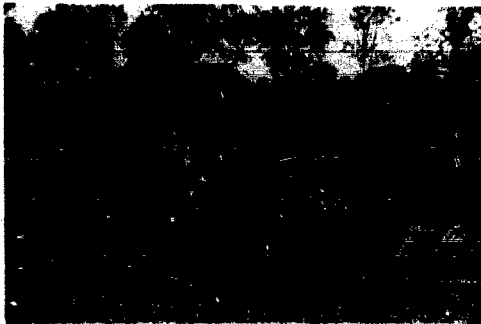
LABORATORY TESTS

						FIELD TESTS										LABORATORY TESTS		TESTS	
SCALE	DEPTH	ELEV.	WATER OBSERVATION	LOG	DESCRIPTION	SHEAR STRENGTH (TONS PER SQUARE FOOT)			N	COND.	DEPTH		TYPE	RECOVERY LENGTH REC DIST DRIV	PENETRATION RESISTANCE (BLOWS PER FOOT)	ATTENBERG			REMARKS
						1/2	1/2	FROM			TO	LIMITS				WP %	WL %		
FT	FT	FT				STANDARD PENETRATION TEST (BLOWS PER FOOT)					Ft.	Ft.							
0	0.0	378.5			Ground Surface														
	2.3	376.2	W.L.		ORGANIC TOPSOIL				1		0	1.5	S.S.	8/18	6				
	2.9	375.6																	
5									2		2.9	4.9	D.B.	24/24					
									3		4.9	9.9	D.B.	60/60					
10					LIMESTONE BEDROCK				4		9.9	14.9	D.B.	60/60					
									5		14.9	19.9	D.B.	60/60					
	2019.9	358.6			(End of Boring)														

1.63 Photos of Site



General View of Site Looking
West from Existing Selby Bridge



View of Site Looking Northwest
Along Centre Line



View of Site Looking East
Across Centre Line



General View of Site Looking
West from Existing Selby Bridge



View of Site Looking Northwest
Along Centre Line

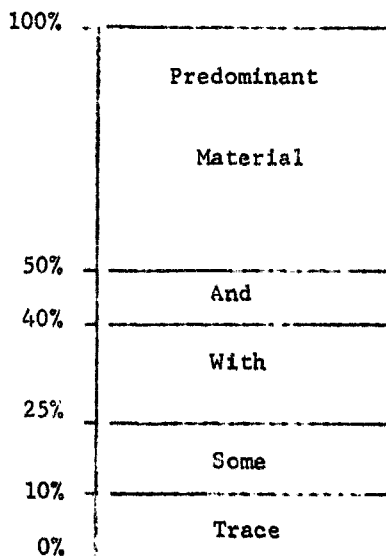


View of Site Looking East
Across Centre Line

HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED
1450 O'Connor Drive
Toronto, Ontario

SOIL TYPES

The following system was used in classifying the various soils by name:



Example:

Medium dense grey silt with fine sand
(Penet. resist.) (colour) (pred. type) (25%-40%) (other type)
or relative density

Unless believed to have a significant effect on the soil characteristics the minor soil types (i.e. traces) present are disregarded in the name used on the boring log and cross-sections. The complete classification is given with the gradation analysis.

In all cases the strength characteristics (e.g. penetration resistance) is quoted first, followed by the colour and finally the descriptive name based on the mechanical analysis.

HUNTING TECHNICAL AND EXPLORATION SERVICES LIMITED
1450 O'Connor Drive Toronto, Ontario

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

Soils encountered in sub surface exploration for engineering purposes are composed of organic or inorganic materials, water, air and dissolved salts. The water and air are generally considered to be uniform so that identification is primarily in the nature of organic or inorganic (mineral grains) and dissolved salts.

In the field a soil is generally identified in terms of grain size characteristics, color and mineral content -- properties of the mineral grains. Occasionally, the origin of a soil is included in the identification.

The systems used to describe soils in terms of engineering properties are called classification systems. In the system described below, the soils are first identified and then classified in terms of strength characteristics which are of prime importance in utilizing the soil boring data in designing a safe and economical foundation.

Penetration measured by dropping 140 lb. hammer 30" on 2" O.D. split spoon sampler.

Identification (Soil Type)	Classification	Classification Criteria	
		Unconfined Compressive Strength	
Clay	Soft	Less than 0.50 Tons/Sq. Ft.	
	Medium	0.50 to 1.00 Tons/Sq. Ft.	
	Stiff	1.00 to 2.00 Tons/Sq. Ft.	
	Very Stiff	2.00 to 4.00 Tons/Sq. Ft.	
	Hard	Greater than 4.00 Tons/Sq. Ft.	
Silt		<u>Density</u>	
	Loose	Less than 80 lbs./Cu. Ft.	
	Medium Dense	80 to 95 lbs./Cu. Ft.	
	Dense	Greater than 95 lbs./Cu. Ft.	
Sand		<u>Relative Density</u>	<u>Penetration Resist.</u>
	Loose	0 - 30%	0 - 10 Blows/Ft.
	Medium Dense	30 - 60%	10 - 30 Blows/Ft.
	Dense	60 - 90%	30 - 50 Blows/Ft.
	Very Dense	90 -100%	Over 50 Blows/Ft.
Gravel		<u>Penetration Resist.</u>	
	Loose	Less than 30 Blows	
	Dense	Over 30 Blows/Ft.	
Hardpan		Cemented or partially cemented sandy gravels, sands, gravels with or without some clay and silt and having unconfined compression strength greater than 5 tons/sq. ft.	
Fill	Organic	Very Loose	0 - 4 Blows/Ft.
		Loose	4 - 10 Blows/Ft.
		Medium	10 - 30 Blows/Ft.
	Inorganic	Dense	30 - 50 Blows/Ft.
		Very Dense	Over 50 Blows/Ft.
			<u>Unconfined Compressive Strength</u>
Peat	Very Soft	Less than 0.30 Tons/Sq. Ft.	
	Soft	0.30 to 0.60 Tons/Sq. Ft.	
	Stiff	Greater than 0.60 Tons/Sq. Ft.	
Organic Silt (Muck)		<u>Density</u>	
	Loose	Less than 30 lbs./Cu. Ft.	
	Medium Dense	Greater than 80 lbs./Cu. Ft.	