

71-84-01

**Peto MacCallum Ltd.**  
CONSULTING ENGINEERS

November 7, 1995

Our Ref: 95TF056

Corporation of the Town of Pickering  
c/o Mr. M.G. Shallhorn, P.Eng.  
Totten Sims Hubicki Associaes  
300 Water Street  
Whitby, Ontario  
L1N 9J2

Dear Mr. Shallhorn

Preliminary Recommendations  
Bicycle/Pedestrian Crossing  
Highway 401, East of Liverpool Road  
Pickering, Ontario

We are pleased to present our preliminary recommendations regarding foundation design for the above-noted project. Three of the seven proposed boreholes were completed on November 1, 1995. The borehole logs for these three boreholes are appended.

Borehole Nos. 1, 2 and 3 were put down adjacent to the proposed locations of Pier Nos. 2 and 3, and the North Abutment, respectively. The stratigraphy encountered in the boreholes generally comprised granular fill overlying very soft to stiff clay and very loose silt strata, which in turn were underlain by compact sand, hard silt till and weathered shale bedrock.

Based on the information revealed in the boreholes drilled at the site to date, it is considered that the shallow native soils are not entirely suitable for the use of conventional spread and strip footings. Therefore, the following bearing resistances are subject to revision following completion of the remaining boreholes and review of the design load and founding level information. For preliminary design purposes, the bearing resistance at Ultimate Limit States (ULS) is 160 kPa for footings founded on the surface of the native silty clay stratum. The factored ULS bearing resistance is 80 kPa. The bearing resistance at Serviceability Limit States (SLS) is estimated at 50 kPa. Hence, it will likely be necessary to adopt an alternative support system. ||?

A driven pile foundation appears to be the preferred means of supporting the proposed bridge structure. It is considered that concrete filled closed end pipe piles, driven into the underlying hard silt till stratum or weathered shale will be most practical to support the proposed bridge.

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M.G. Shallhorn, November 7, 1995, P.2

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For estimating purposes, a 310 mm diameter steel pipe pile driven to practical refusal in the hard silt till or weathered shale at depths of about 10 to 12 m below existing grade should have a bearing resistance at ULS of 2,200 kN (250T). The factored ULS resistance is 890 kN (100T). The capacity at SLS is estimated at 620 kN (70T).

Pre-augering or clearing of the surficial fills may be required locally in order to facilitate driving. The piles should be driven to adequate set considering the pile driving equipment chosen. A pile load test on a prototype pile using the pile driving hammer proposed for construction is required to confirm and refine the pile driving criteria and available capacity.

All pile driving and load testing should be carried out with the supervision of Peto MacCallum Ltd. personnel to be assured that the work fulfils the geotechnical requirements of the Plans and Specifications.

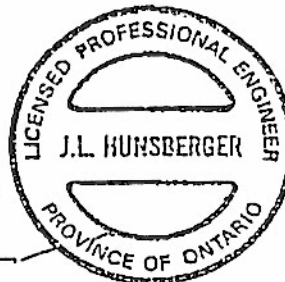
We trust this is sufficient for your present requirements. Please do not hesitate to contact us should there be any questions.

Sincerely

Peto MacCallum Ltd.



Jeff Hunsberger, P.Eng.  
Project Engineer



Alastair E. Gorman, P.Eng.  
Chief Geotechnical Engineer

JH/AEG:mi

- 2 cc: Client c/o Totten Sims Hubicki Associates  
✓ 1 cc: PML Toronto

Enclosures

List of Abbreviations  
Log of Borehole Sheets

**PetoMacCallum Ltd.**  
CONSULTING ENGINEERS

November 15, 1995

Our Ref: 95TF056

Corporation of the Town of Pickering  
c/o Mr. M.G. Shallhorn, P.Eng.  
Totten Sims Hubicki Associates  
300 Water Street  
Whitby, Ontario  
L1N 9J2

Dear Mr. Shallhorn

File Foundations  
Bicycle/Pedestrian Crossing  
Highway 401, East of Liverpool Road  
Pickering, Ontario

We understand that consideration is being given to the use of driven steel "H" piles at the above-noted site, instead of the concrete-filled steel pipe piles identified in our letter of November 7, 1995.

Driven steel "H" piles may be used to support the proposed bridge structure. It should be noted however that "H" piles will typically penetrate significantly deeper than pipe piles and will only likely obtain refusal in the shale bedrock. The capacities given in our letter of November 7, 1995 would still apply for steel "H" piles of suitable strength.

We trust this is sufficient for your present requirements.

Sincerely

Peto MacCallum Ltd.



Jeff Hunsberger, P. Eng.  
Project Engineer



Alastair E. Gorman, P.Eng.  
Chief Geotechnical Engineer

AEG/JH:lr

165 Cartwright Avenue, Toronto, Ontario M6A 1V5  
Tel: (416) 785-5110 Fax: (416) 785-5120  
AURORA, BARRIE, BRAMPTON, HAMILTON, KITCHENER, OSHAWA, TORONTO

TOTAL P.02

**Peto MacCallum Ltd.**  
CONSULTING ENGINEERS

November 24, 1995

Our Ref: 95TF056

Corporation of the Town of Pickering  
c/o Mr. M.G. Shallhorn, P.Eng.  
Totten Sims Hubicki Associates  
300 Water Street  
Whitby, Ontario  
L2N 9J2

Dear Mr. Shallhorn

Pile Foundations  
Bicycle/Pedestrian Crossing  
Highway 401, East of Liverpool Road  
Pickering, Ontario

Further to our letters of November 7 and 15, 1995, and subsequent telephone conversations with your office, we offer the following comments regarding the design of a driven steel "H" pile foundation for the above-noted project.

The geotechnical bearing resistance at Ultimate Limit States (ULS) is 2,200 kN (250T) for a 310 mm steel "H" pile driven to practical refusal in the shale bedrock. The factored ULS resistance may be taken as 1,300 kN (150T), provided a full scale load test is carried out on a prototype pile installed using the pile driving hammer proposed for construction. For a steel pile founded in the shale bedrock, the bearing resistance at Serviceability Limit States (SLS) may also be taken as 1,300 kN (150T) since the load required to induce 25 mm of settlement in the shale bedrock would exceed the factored ULS resistance. 3) 10 x 110.

For estimating purposes, the pile lengths in the area of boreholes 1 and 2 (Pier Nos. 2 and 3) is expected to be about 12.0 to 12.5 m below existing grade. At borehole 3 (north abutment) the pile length is expected to be about 10.2 to 10.7 m below existing grade. The piles should be fitted with rock points.

**Peto MacCallum Ltd.**  
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M.G. Shallhorn, November 24, 1995, P.2

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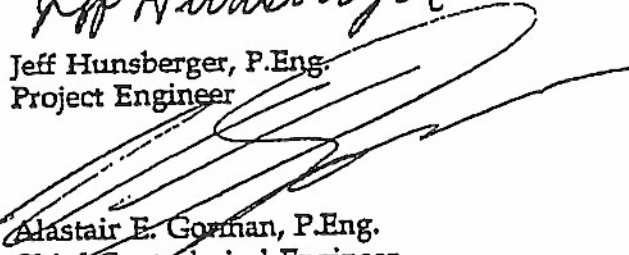
We trust this is sufficient for your present requirements. Please do not hesitate to contact us should there be any questions.

Sincerely

Peto MacCallum Ltd.



Jeff Hunsberger, P.Eng.  
Project Engineer



Alastair E. Gorman, P.Eng.  
Chief Geotechnical Engineer

AEG:mi

- 1 cc: Client c/o Totten Sims Hubicki Associates
- 1 cc: PML Toronto

**PetoMacCallum Ltd.**  
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LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

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

DYNAMIC PENETRATION RESISTANCE: - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 51mm, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 0.3m INTO THE SUBSOIL. THE DRIVING ENERGY BEING 475J PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS/0.3m</u>	<u>ckPa</u>	<u>DENSENESS</u>	<u>'N' BLOWS/0.3m</u>
VERY SOFT	0 - 2	0 - 12	VERY LOOSE	0 - 4
SOFT	2 - 4	12 - 25	LOOSE	4 - 10
FIRM	4 - 8	25 - 50	COMPACT	10 - 30
STIFF	8 - 15	50 - 100	DENSE	30 - 50
VERY STIFF	15 - 30	100 - 200	VERY DENSE	> 50
HARD	> 30	> 200		
W.T.P.L.	WETTER THAN PLASTIC LIMIT		D.T.P.L.	DRIER THAN PLASTIC LIMIT
		A.P.L.	ABOUT PLASTIC LIMIT	

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

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

**Peto MacCallum Ltd**  
CONSULTING ENGINEERS

## LOG OF BOREHOLE NO. 1

PROJECT PROPOSED BICYCLE/PEDESTRIAN CROSSING

OUR PROJECT NO. 95TF056

LOCATION Highway 401, East of Liverpool Road, Pickering, Ontario

BOARING DATE November 1, 1995

ENGINEER J.H.

BOHRING METHOD Continuous Flight Solid Stem Augers

TECHNICIAN E.E.

SOIL PROFILE			SAMPLES			SHEAR STRENGTH $C_u$ (kPa)				LIQUID LIMIT $W_L$				GROUND WATER OBSERVATIONS AND REMARKS
DEPTH METRES	DESCRIPTION	LEGEND	ELEVATION	NUMBER	TYPE	DYNAMIC CONE PENETRATION - STANDARD PENETRATION TEST				WATER CONTENT %				
						50 100 150 200				10 20 30				
						ALWAYS 24				10 20 30				
	GROUND ELEVATION 86.10													
	FILL: brown gravelly sand, some silt, scattered clay and silt inclusions, moist		85	1	SS	29								
1.50			85	2	SS	23								
	CLAY: stiff to soft brown silty clay, trace to some sand, scattered wet silt and sand seams, APL to WTPL		84	3	SS	9								
				4	SS	7								
3.0			83	5	SS	4								
4.5	becoming very soft, gray		82											
				6	SS	3								
6.0	SILT: very loose gray sandy silt, trace clay, scattered clay seams, saturated		80	7	SS	3								
			79											
7.5			78	8	SS	2								
	becoming very soft gray clayey silt, some sand, trace gravel, WTPL		77											
9.0				9	SS	2								
10.5	SAND: very loose gray silty sand, trace to some gravel, saturated		76											
12.0	SILT TILL: hard gray clayey silt some sand, trace gravel, numerous shale fragments, DTPL		75	10	SS	53								
12.25	SHALE: weathered dark gray shale, moist		74	11	SS	50/75 mm								
	BOREHOLE TERMINATED AT 12.25 m		73											
12.5														
13.0														
13.5														
14.0														
14.5														
15.0														
15.5														
16.0														
16.5														

NOTES:

After sample 7, wet cave at 3.35 m

Upon completion of augering, wet cave at 1.80 m

CHECKED BY: JTH

# Peto MacCallum Ltd.

CONSULTING ENGINEERS

## LOG OF BOREHOLE NO. 2

PROJECT PROPOSED BICYCLE/PEDESTRIAN CROSSING

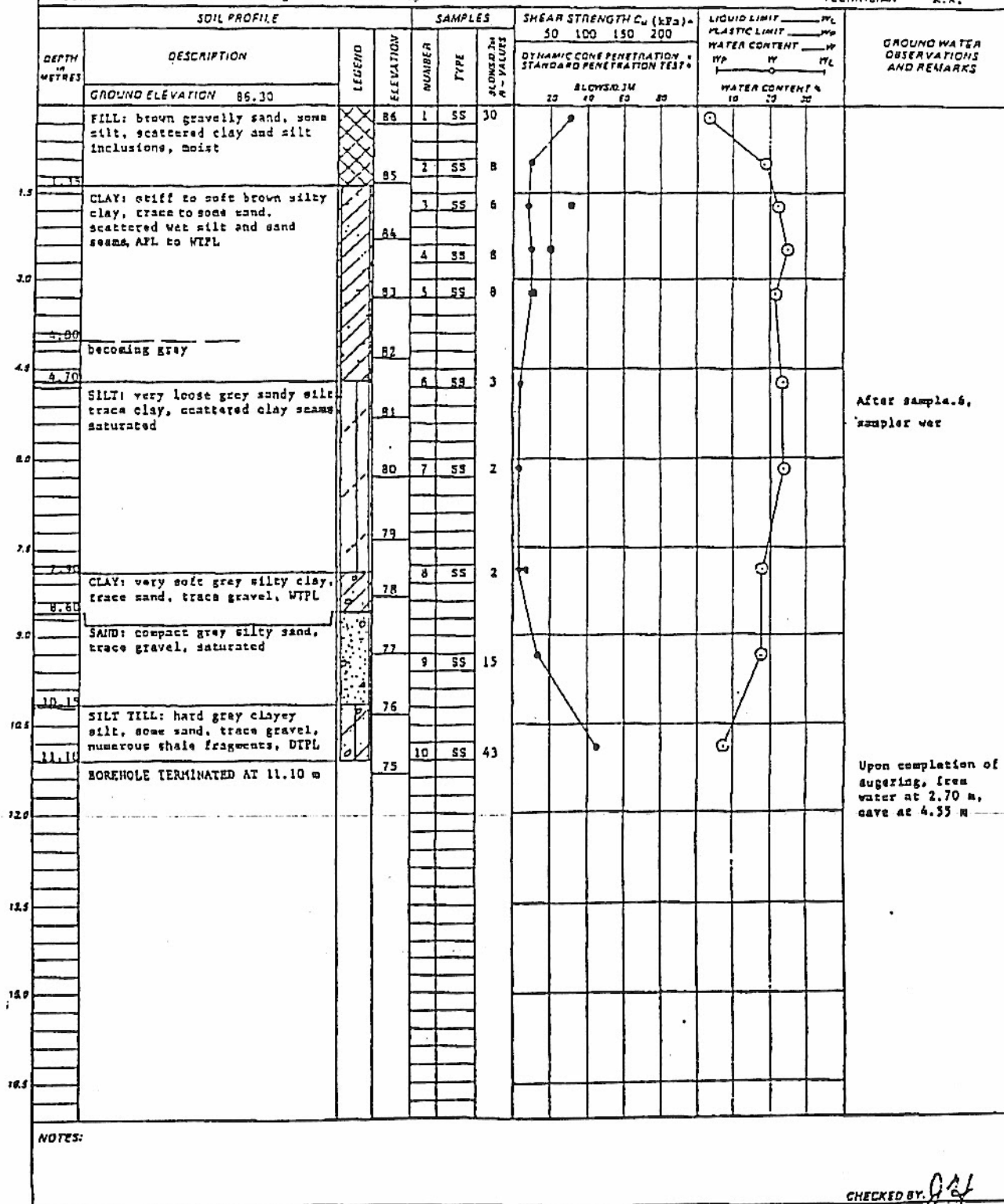
OUR PROJECT NO 95IT036

LOCATION Highway 401, East of Liverpool Road, Pickering, Ontario

BORING DATE November 1, 1995 ENGINEER J.H.

BORING METHOD Continuous Flight Solid Stem Augers

TECHNICIAN K.X.





# PetoMacCallum Ltd.

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## LOG OF BOREHOLE NO. 3

PROJECT PROPOSED BICYCLE/PEDESTALIAN CROSSING

OUR PROJECT NO. 93TF036

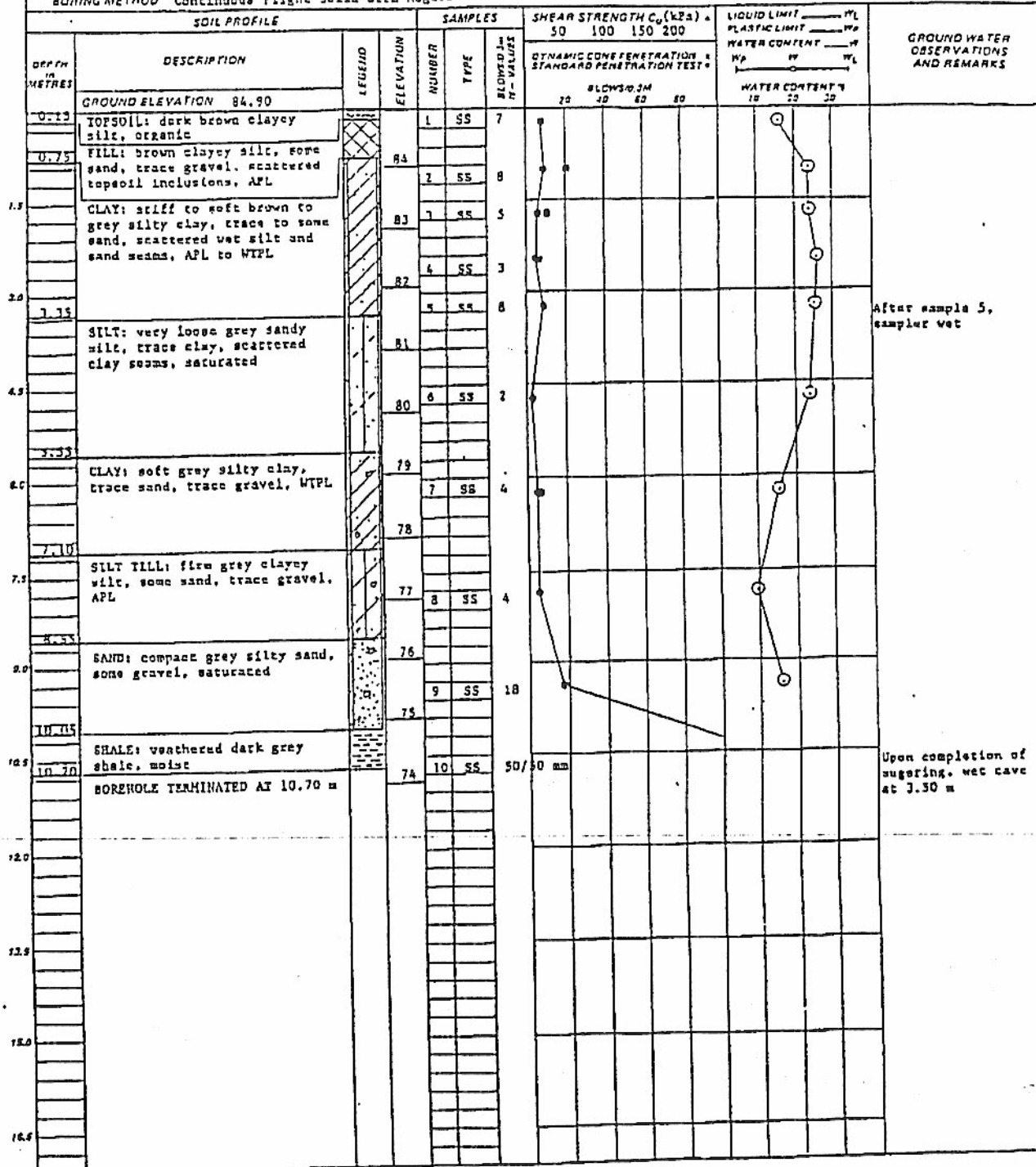
LOCATION Highway 401, East of Liverpool Road, Pickering, Ontario

BORING DATE November 1, 1993

ENGINEER J.H.

BORING METHOD Continuous Flight Solid Stem Augers

TECHNICIAN K.K.



NOTES:

CHECKED BY: *[Signature]*

TOTAL P.07