

64-F-264 M

BRIDGE # 19

ROAD BETWEEN

LOT 11, CON IV V

BIDDULPH

TWP.

BA 1971

19-19

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COUNTY BUILDINGS
LONDON ONTARIO

64-11-264M

Report on
SOIL INVESTIGATION
for
BRIDGE NO. 19
ROAD BETWEEN LOT 11, CONCESSION IV
AND CONCESSION V
TOWNSHIP OF BIDDULPH

by
DOMINION SOIL INVESTIGATION LIMITED
363 Queens Avenue
LONDON ONTARIO
Reference No. 4-11-L4
December 2nd, 1964

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SUMMARY

The strata consist of 3 feet to 4 feet 9 inches of topsoil overlying cohesive glacial till which increases in strength from firm to very stiff with depth.

It is recommended that the structure should be supported on spread footings at El. 86.0 and that the maximum net soil pressure should not exceed 4,000 pounds per square foot. The estimated consolidation settlement is 1.0 inch and no appreciable differential settlement is expected.

No unusual construction problems are anticipated.

I INTRODUCTION

The Township of Biddulp propose to replace Bridge 19 on Lot 11 of the Township with a new structure. A letter of authorization dated November 5th, 1964 was given by the Middlesex County Engineer's office to carry out a soil investigation. The purpose of this investigation was to reveal subsurface conditions at the site and to determine the relevant soil properties for the design and construction of the new foundations.

II FIELD WORK

Two boreholes were put down to a maximum depth of 25 feet during the period November 19th and 20th, 1964. The holes were advanced by washboring and lined with Bx casing.

Standard penetration tests were performed at frequent intervals of depth to determine the consistency or relative density of the soil and to recover representative samples. The results are plotted as 'N' values on the geotechnical data sheet for each borehole at the depths to which they refer.

Dynamic cone penetration tests were performed adjacent to each borehole.

The locations of the boreholes and cone penetration tests are shown on the site plan, enclosure 2. Elevations have been referred to Bench Mark 3 (6" spike in root of tree Lt. 29 + 49.6, El. 105.67).

III SUBSURFACE CONDITIONS

Detailed descriptions of the strata encountered at each borehole are shown on enclosure 3 and a general picture of soil stratigraphy is given in the form of a section on enclosure 2.

The general soil profile consists of 3 feet to 4 feet 9 inches of topsoil overlying a clay till deposit which was penetrated to a maximum depth of 20 feet. The clay till is generally sandy, very silty and contains gravel, and the consistency changes from firm to very stiff with depth.

IV GROUND WATER CONDITIONS

From observations of the water levels taken in the boreholes it would appear that the ground water table is about El. 93.0 at their respective positions. The level of the water in the river at the time of the field work was about El. 91.7.

DISCUSSION

The soil profile at each abutment is generally similar and consists of 3 feet to 4 feet 9 inches of topsoil, overlying the clay glacial till deposit.

The bed of the river extends to El. 90.1 and allowing for scour it is recommended that the footings bear at El. 86.0. This level lies within the very stiff clay till stratum and on the basis of the field observations a nett allowable soil pressure of 4,000 pounds per square foot would be appropriate for the design of footings. The estimated total consolidation settlement for a 5 foot wide footing under the above loading will not exceed 1 inch, and in view of the very similar conditions encountered in the two boreholes the differential settlement between the abutments will be very small. When the excavations for the footings are complete the formation level should be inspected and any soft areas removed and replaced by suitable granular fill.

The coefficient of friction between the footings and the clay till should be taken as 0.35 and the factor of safety against horizontal sliding of the abutments should be at least 1.5.

The permeability of the clay is very low and it is anticipated that the discharge of groundwater into the excavation will be easily controlled by pumping from a sump. The excavation in the clay till can be made with vertical sides which will require a minimum of bracing.

Yours very truly

DOMINION SOIL INVESTIGATION LIMITED



C. J. W. Atkinson, M. Sc.,
Project Engineer.

CA/sg

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
		COARSE	FINE	COARSE	MEDIUM	FINE						
Ø	> 8"	3"	3/4"	4.76mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
U.S. Standard Sieve Size:				No. 4	No. 10	No. 40	No. 200					

SAMPLE TYPES.

AS	Auger sample	RC	Rock core	TP	Piston, thin walled tube sample
CS	Sample from casing	%	Recovery	TW	Open, thin walled tube sample
ChS	Chunk sample	SS	Split spoon sample	WS	Wash sample
SAMPLER ADVANCED BY		static weight	: w	OBSERVATIONS	
"		pressure	: p	MADE WHILE	
"		tapping	: t	CORING	

	Steady pressure
	No pressure
	Intermittent pressure

	Washwater returns
	Washwater lost

PENETRATION RESISTANCES.

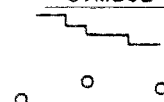
DYNAMIC PENETRATION RESISTANCE - to drive a 2" ϕ , 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot

STANDARD PENETRATION RESISTANCE, -N- - to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL:



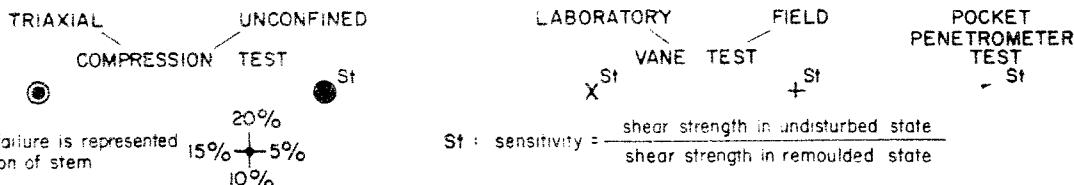
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SOIL PROPERTIES.

W %	Water content	γ	Natural bulk density (unit weight)	k	Coeff. of permeability
LL %	Liquid limit	e	Void ratio	C	Shear strength
PL %	Plastic limit	RD	Relative density	ϕ	Angle of int friction
PI %	Plasticity index	C _v	Coeff. of consolidation	C'	Cohesion
Li	Liquidity index	m _v	Coeff. of volume compressibility	ϕ'	Angle of int friction

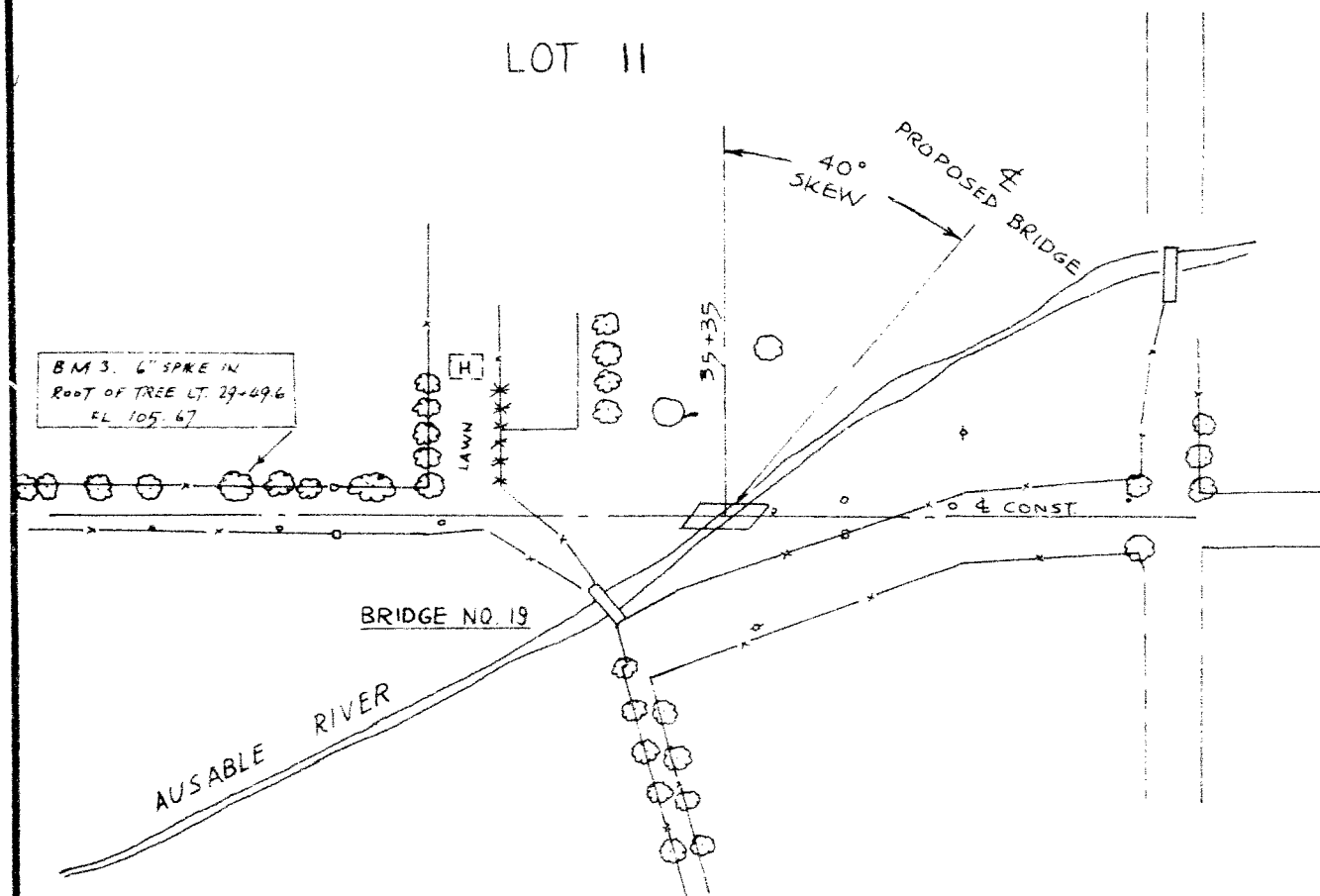
UNDRAINED SHEAR STRENGTH.

- DERIVED FROM -

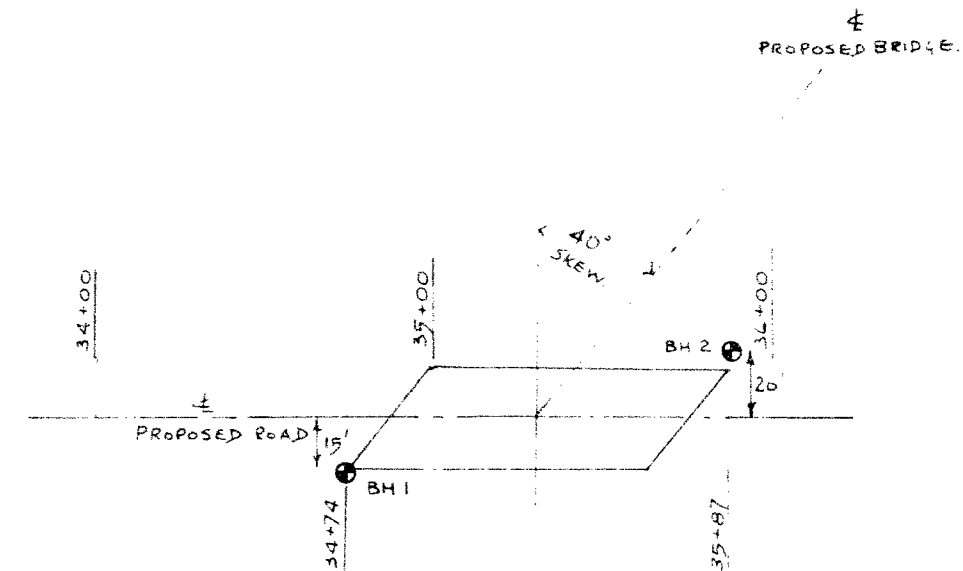


SOIL DESCRIPTION.

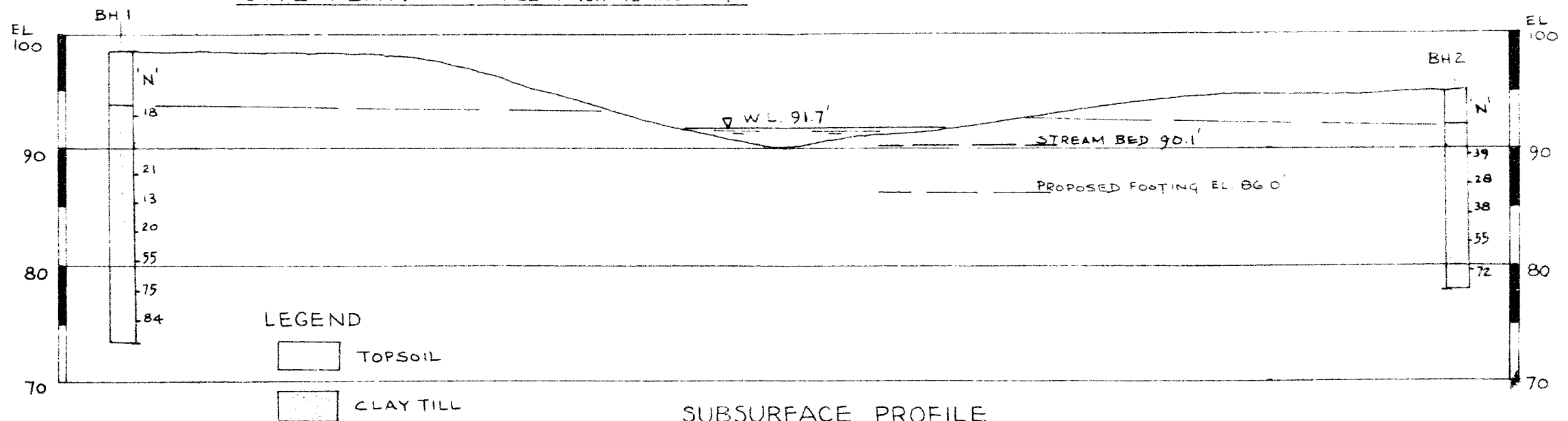
COHESIONLESS SOILS	RD :	COHESIVE SOILS :	C lbs/sq ft.
Very loose	0 - 15 %	Very soft	less than 250
Loose	15 - 35 %	Soft	250 - 500
Compact	35 - 65 %	Firm	500 - 1000
Dense	65 - 85 %	Stiff	1000 - 2000
Very dense	85 - 100 %	Very stiff	2000 - 4000
		Hard	over 4000



SITE PLAN SCALE 1 INCH TO 200 FEET.



BOREHOLE LOCATION PLAN
SCALE 1 INCH TO 50 FEET.



SUBSURFACE PROFILE
SCALE 1 INCH TO 10 FEET

GEOTECHNICAL DATA SHEET FOR BOREHOLES. 1. & 2.

OUR REFERENCE NO. 4-11-L4

CLIENT: County of Middlesex

PROJECT: Bridge No. 19

LOCATION: Lot 11, Township of Biddulph

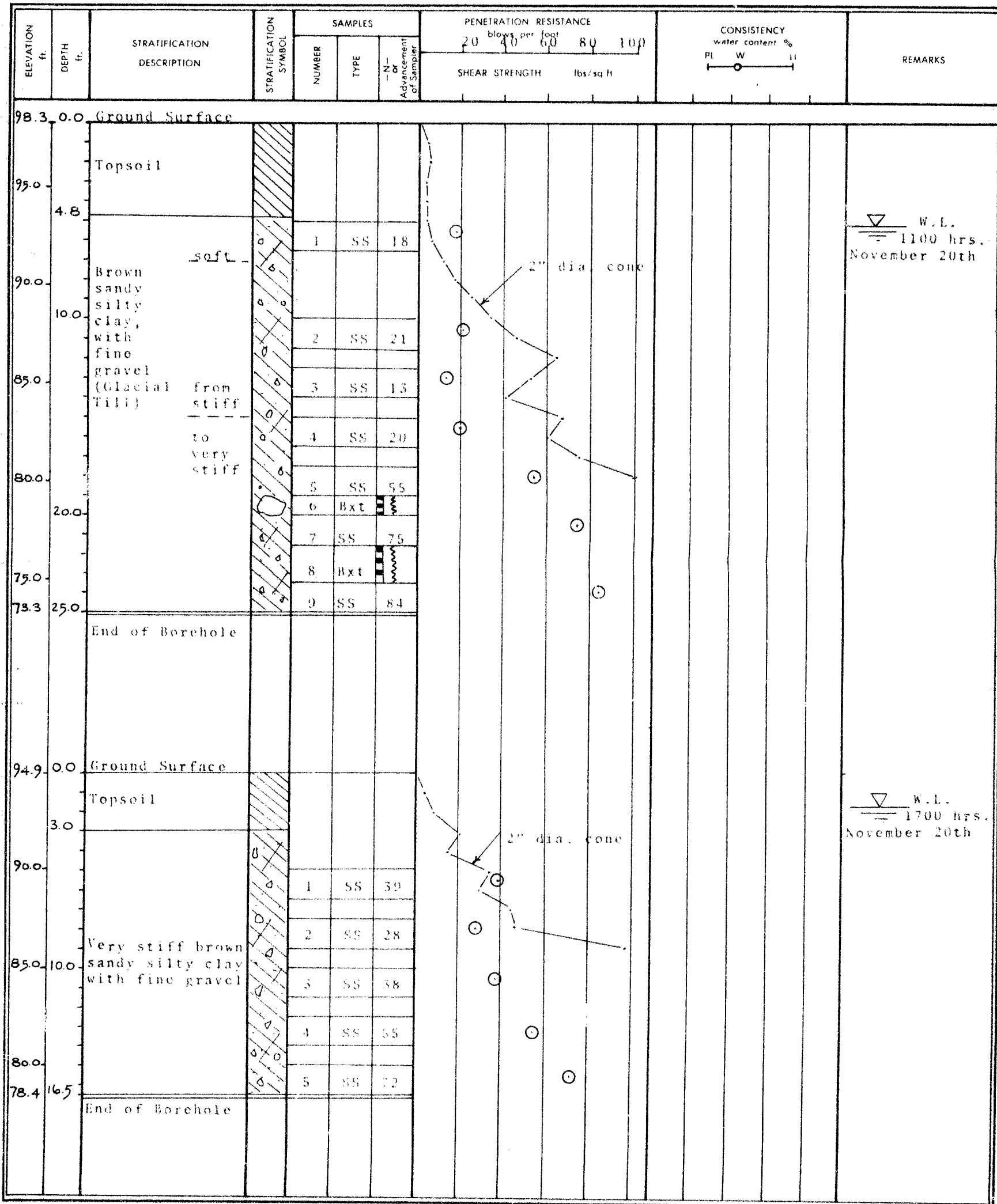
DATUM ELEVATION: 105.67 feet B.M. 3

METHOD OF BORING: Washboring

DIAMETER OF BOREHOLE: Bx (3-inch)

ENCLOSURE NO. 3

DATE: November 19th & 20th, 1964



VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE

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