

58-F-311M

FRANKLIN - CANADIAN SITE

GALT.

MESSRS. PAGE & STEEL
72 ST. CLAIR AVE.W.,
TORONTO, ONTARIO.

FOUNDATION INVESTIGATION
FRANKLIN-CANADIAN SITE, GALT, ONT.

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TROW, SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS
AND
SOIL MECHANICS CONSULTATION

Plot: 28-4

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ST. 8-5921

Project: C125/J190

March 24, 1958.

58-F-311M

Messrs. Page & Steele,
Architects,
72 St. Clair Ave. W.,
Toronto, Ont.

Attention: Mr. R. Marsh

Foundation Investigation
Franklin-Canadian Site, Galt, Ont.

Dear Sirs:

Attached hereto is our report on a subsoil investigation recently completed at the above described site. Details of the soil types encountered and our evaluation of safe permissible bearing pressures are contained in the body of the report. For your convenience, the principal comments are repeated as follows:

(1) The proposed structure is underlain at shallow depths by a dense stratum of oxidized sandy glacial till. This material is competent to support the spread footings proposed at this site and a safe allowable bearing capacity of $2\frac{1}{2}$ Tons/sq.ft. is recommended. This value can be used for both the strip and square footing sizes. A minimum depth of $2\frac{1}{2}$ feet is required for interior footings and at least 3 feet for perimeter footings.

(2) The sandy till evidenced in the boreholes put down is considered ideally suited as fill under the proposed floor slab on grade. Existing sandy topsoil should first be removed and selected fill placed in 9-inch loose layers and compacted with 6 to 8 complete passes of a crawler tractor of D-4 size equivalent. Hand compaction should be specified in restricted areas.

(3) No ground water table was encountered within the depth of borings carried out and construction difficulties resulting from ground seepage are not anticipated.

We are pleased to have been of service to you on this occasion. If we can be of further assistance in connection with the resolving of foundation problems at this site, do not hesitate to call.

Yours very truly,

L. G. Soderman

Lawrence G. Soderman (P.Eng.)

LGS/lt
Encl.

FOUNDATION INVESTIGATION
FRANKLIN-CANADIAN SITE, GALT, ONT.

This report contains the results of a recently completed subsoil investigation at the above noted industrial plant location. Details of the boring results are presented on the individual borehole profiles appended. Our comments on subsoil conditions and evaluation of safe allowable bearing pressures are given under subsequent paragraphs.

Location and Description of Site

The proposed industrial building is located on Lot No.5, Concession 11, Waterloo County, in the City of Galt. The structure is positioned in the north central portion of the property and the north wall parallels the C.P.R. right-of-way, approximately 150 feet distant from the track centre line. Access to the property is gained by means of a level crossing located opposite the north-west corner of the building area.

The northern half of the area appears to be very well drained and the surface topography is described as gently rolling. The area is part of an undulating till plain extending in a north-easterly direction from Galt. A local depression occurs in the north-west quarter of the area covered by the proposed structure. The minimum elevation in this location is approximately 10 feet below the elevation of the north-east corner of the building. No indication of this elevation difference is given by the contour shown on drawing SK619A supplied by M.S. Yolles & Assoc. A general outline of the low lying area is shown on the borehole plan appended to this report. The property is cleared and presently under cultivation.

Description of Field Work

Borings were carried out at locations shown on drawing number 1 and to depths shown on the borehole profiles included in this report. These locations and depths are in accordance with items enumerated in the schedule of investigation requirements prepared by M. S. Yolles & Assoc. The boreholes were put down by means of a power operated continuous flight auger. This machine makes a 5-inch diameter borehole without the use of wash water; this feature allows the continuous inspection of material at its natural moisture condition during the borehole advance. In addition, more positive ground water conditions are obtained during the boring.

The subsoil encountered at this site was a non-cohesive composite of silt, sand, gravel and stones. Sampling was carried out at selected depth intervals using a 2-inch diameter split spoon sampler. The dimensions of the sampler used, and the sampling procedure followed, conforms to the specifications of the Standard Penetration Test used almost universally in evaluating the bearing capacity of cohesionless fine grained soils. Test results, reported as number of blows (N) per foot of sampling spoon penetration, are given on the borehole profiles appended.

Three borings were left open overnight to check on water table elevations, but no water was encountered within the depths investigated.

The boreholes were laid out using a steel tape and measurements were made from the existing track centre line and the fence lines between lots 4 and 5 on the east and lots 5 and 6 on the west. Distances were scaled from the Consulting Engineer's drawing No. SK619A. Borehole elevations were obtained by means of a sight hand level and referenced to rail elevation 956.30 shown 40 feet east of mile post 56.

The field work was directed and supervised by the author who remained on the site and assisted with the drilling and sampling.

Soil Types Encountered

Reference to the borehole logs presented as drawings Nos. 2 to 6, shows that the building site is underlain by a competent granular composite of sand, gravel and silt materials. The percentages of each of the above materials present varied with depth and borehole location. The relative density and free draining characteristics were, however, sensibly constant over the site. A surface mantle of sandy topsoil and crop roots covered the area to an average depth of one foot. Immediately below this, the brown oxidized till deposit was contacted and proven to a depth of 23 feet at hole No. Pl.

Penetration test results and observations during the field work indicate that the upper 3 feet of subsoil exhibits varying relative density values. Below this upper active zone, the penetration tests show a consistently high value and because of this, a minimum footing depth of three feet below existing ground surface is recommended.

Engineering properties of the granular subsoil applicable in bearing capacity evaluation are as follows:

- N = average penetration resistance = 30 blows/ft.
- C = apparent cohesion = 0.
- ϕ = apparent angle of shearing resistance = 36° .
- γ = natural unit weight = 125 p.c.f.
- N_γ = 46
- N_q = 43

where N_γ and N_q are bearing capacity factors which are primarily a function of the relative density of the granular soil type.

Bearing Capacity Evaluation

The bearing capacity of essentially granular materials is derived from two sources: (a) friction due to the weight of material below the footing level, and (b) friction due to the weight of surrounding backfill or surcharge. The theoretical expression summing the above two components and giving the ultimate bearing capacity is as follows:

$$q_d = \frac{1}{2} B \gamma N_\gamma + \gamma D_f N_q$$

- where q_d = total pressure that can be applied at footing level.
- B = footing width.
- D_f = depth of footing below surrounding fill.
- γ = unit weight of soil.
- N_γ & N_q = are bearing capacity factors dependent upon relative density of supporting soil type.

The above expression gives a value of bearing capacity based upon strength consideration only. Settlement consequent upon load application must also be considered. Consideration must be given to footing depths, footing sizes and tolerable structure deformations. Terzaghi* has published a conservative relationship giving safe permissible bearing pressures for given footing widths and specific Standard Penetration Test (N) values. This tabulation is based upon a limiting settlement of one inch and can be used directly with footings having a least dimension equal to 5 feet or larger. For smaller footing widths shear usually governs, and allowable pressures should be checked by the bearing capacity equation given above.

A minimum footing depth of $2\frac{1}{2}$ feet below existing ground surface will ensure an N value = 30 blows/ft. For a footing width of 5 feet, the safe permissible bearing pressure based on a limiting settlement of one inch is $3\frac{1}{2}$ tons/sq.ft.

For the 18" strip footing proposed the ultimate bearing capacity assuming a surrounding surcharge depth of $2\frac{1}{2}$ feet is found as follows:

$$\begin{aligned}
 q &= \frac{0.5 \times 1.5 \times 125 \times 46}{2000} + \frac{125 \times 2.5 \times 43}{2000} \\
 &= 2.16 + 6.75 \\
 &= 9 \text{ Tons/sq.ft.}
 \end{aligned}$$

Using a safety factor of 3 on above value gives a safe allowable bearing pressure of 3 tons/sq.ft. This value is slightly below the value found based on settlement limitation.

In order to allow for the possibility of minor local variation in relative density not evidenced in the five borings carried out, an overall safe allowable bearing pressure of $2\frac{1}{2}$ tons/sq.ft., to be used for both the square and strip footings proposed, is recommended.

Use of Subsoil as Fill Material

The sandy till encountered in the boreholes generally contained a small percentage of silt and exhibited well-graded characteristics, ranging from the fine sand to coarse gravel sizes. This material is considered ideally suited for fill, provided proper placement procedures are followed. It is recommended that inspection of excavated material be made to ensure the exclusion of organic topsoil and to avoid materials with a concentration of one-size particles (e.g. layers of coarse gravel were encountered in bore holes). Fill should be placed in 9-inch loose layers and compacted with a crawler tractor of D-4 size, or equivalent, making 6 to 8 passes per layer of fill placed. In restricted areas, i.e., around the edges of the proposed slab, compaction using hand equipment should be specified.

* Peck Hanson and Thornburn - 'Foundation Engineering'

Summary and Comments

(1) The proposed industrial building is underlain by a dense competent deposit of granular glacial till. Safe allowable bearing capacities for the proposed 5-foot square and 1.5 foot strip footings, if founded at a depth of $2\frac{1}{2}$ feet below existing ground surface, have been determined as $3\frac{1}{2}$ tons/sq.ft. and 3 tons/sq.ft. respectively.

A general design value of $2\frac{1}{2}$ tons/sq.ft. is recommended for the footing sizes proposed. Settlements resulting from the above footing pressure will be negligible.

(2) The sandy till evidenced in the boreholes put down is considered ideally suited as fill under the proposed floor slab on grade. Existing sandy topsoil should first be removed and selected fill placed in 9-inch loose layers and compacted with 6 to 8 complete passes of a crawler tractor of D-4 size equivalent. Hand compaction should be specified in restricted areas.

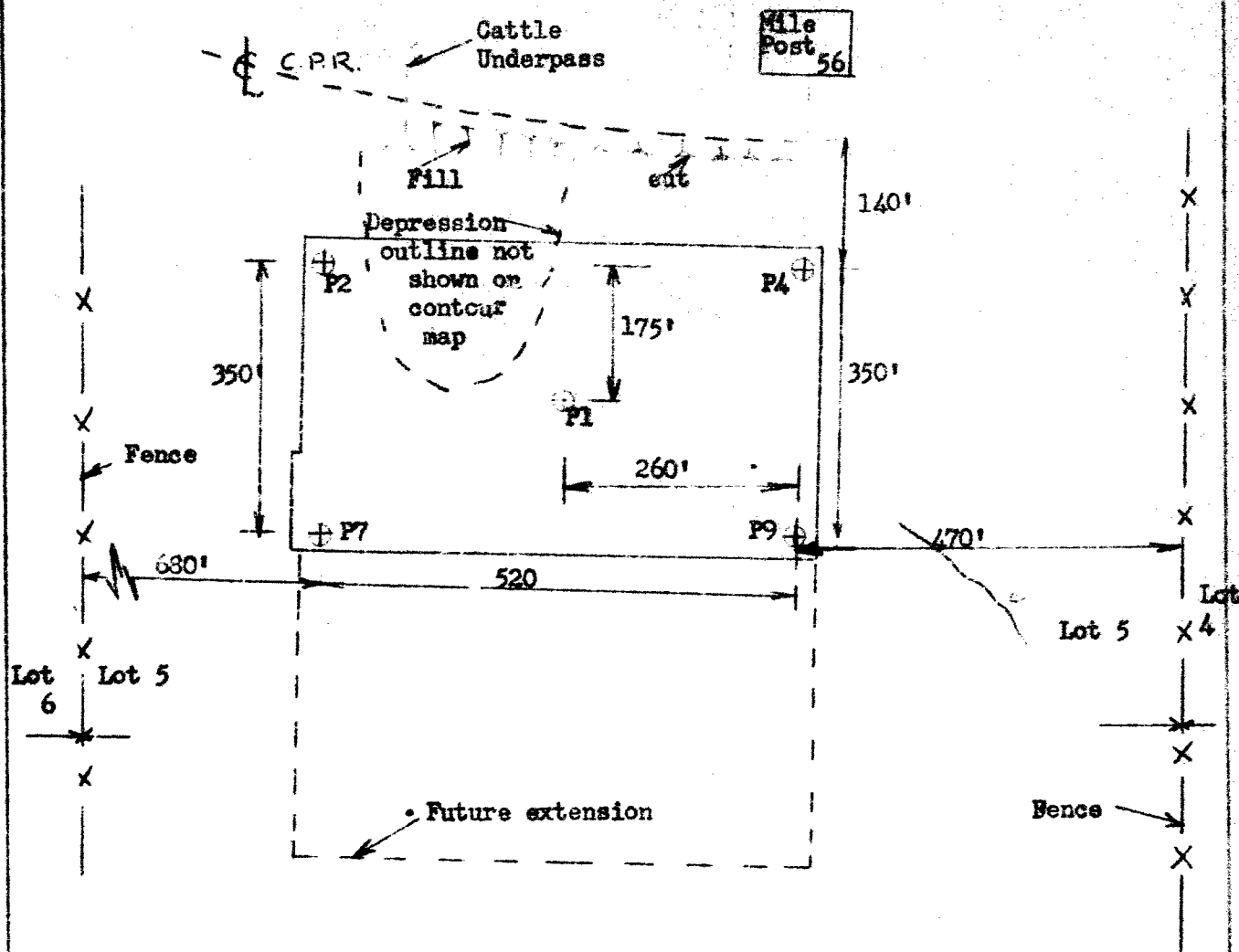
(3) No ground water was encountered within the depths of borings carried out.

L. G. Soderman

LGS/lt
March 24, 1958.
C125/J190

Lawrence G. Soderman (P. Eng.)





BOREHOLE LOCATION PLAN

Dimensions taken from drawing
#SK619-A, supplied by M.S.Yolles
and Assoc.

PROJECT NO.

C125/J190

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DRAWING NO.

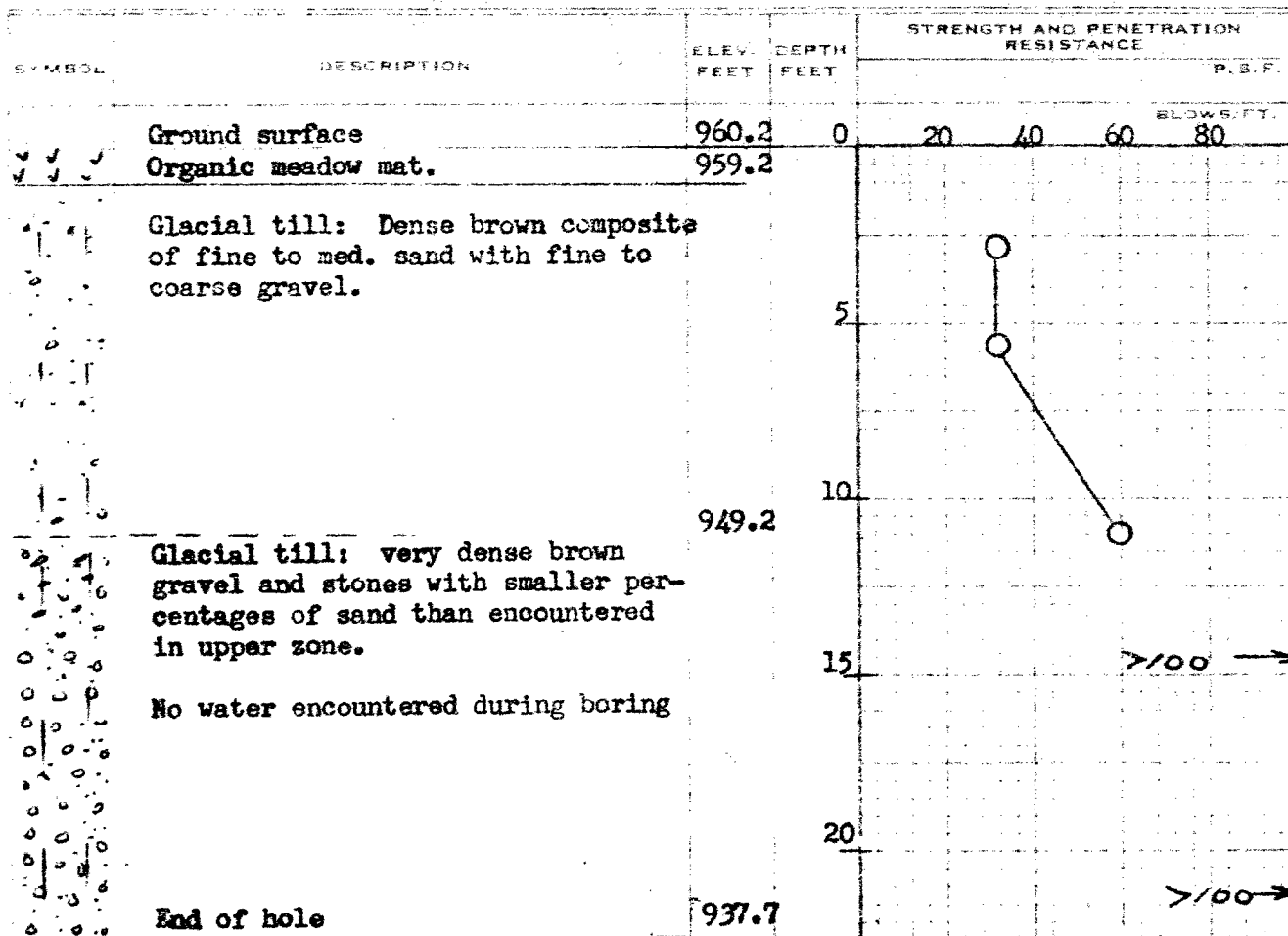
2

PROJECT **Franklin Canadian Site.**
 LOCATION **Galt, Ont.**
 HOLE LOCATION **As on plan**
 HOLE ELEVATION AND DATUM **960.2**

BOREHOLE NO. **P1**
 FIELD SUPERVISOR **LS**
 DRILLER **PV**
 PREP. **LS**

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION (Q_u)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



CONSISTENCY	NATURAL
MOIST. CONTENT & DRY WT.	SAMPLE UNIT WT. P.C.F.
	SS1
	SS2
	SS3
	SS4
	SS5

PROJECT NO. 0125J190

TROW SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

PROJECT Franklin Canadian Site.
 LOCATION Galt, Ont.
 HOLE LOCATION As on plan
 HOLE ELEVATION AND DATUM 954.2

BOREHOLE NO. P2
 FIELD SUPERVISOR LS
 DRILLER PV
 PREP. LS

DRAWING NO. 3

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION (Qu)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE			
				P. S. F.			
	↓ Ground surface	954.2	0	20	40	60	80
V V V	Organic meadow mat.	953.2					
	Glacial till: Dense brown composite of sand, gravel and some silt.						
	Very silty.		5				
	Gravel sizes change from mostly fine to coarse below 9 feet.		10				
	No water encountered during hole advance.		15				
	↓ End of hole	936.2	20				
	Hole dry overnight.						

CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT- % DRY WT.			
		SS1	
		SS2	
		SS3	
		SS4	

TROW SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

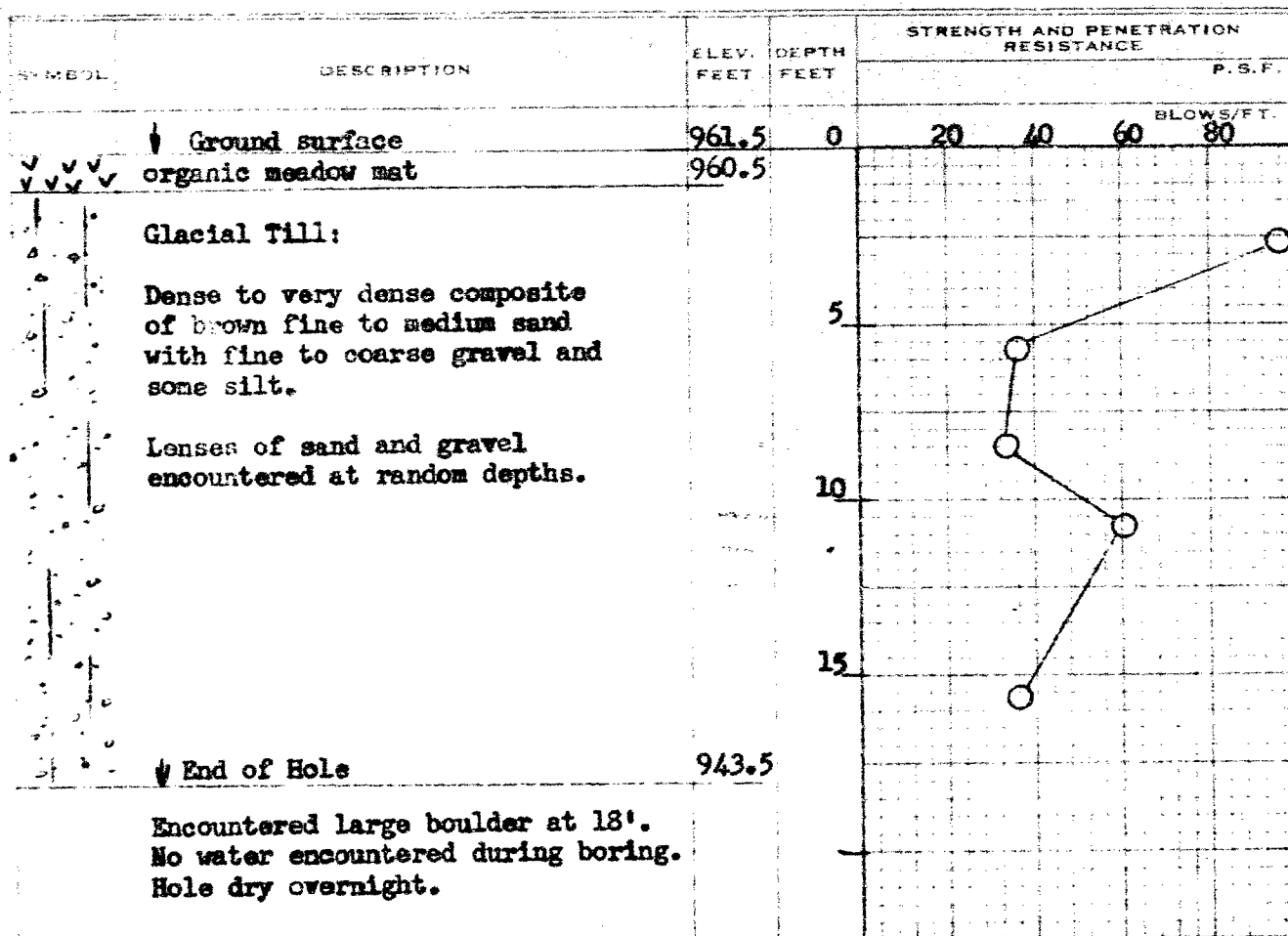
PROJECT **Franklin Canadian Site**
 LOCATION **Galt, Ont.**
 HOLE LOCATION **As on plan**
 HOLE ELEVATION AND DATUM **961.5**

BOREHOLE NO. **P4**
 FIELD SUPERVISOR **LS**
 DRILLER **PY**
 PREP. **LS**

DRAWING NO. **4**

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION [Qu]
 VANE TEST [C] AND SENSITIVITY [S]
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.		
	SS1	
	SS2	
	SS3	
	SS4	
	SS5	

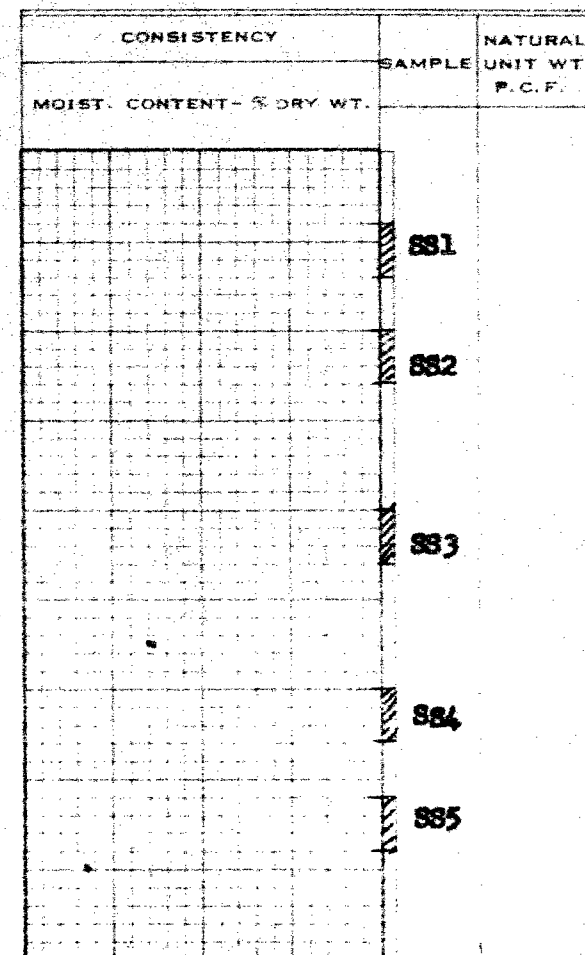
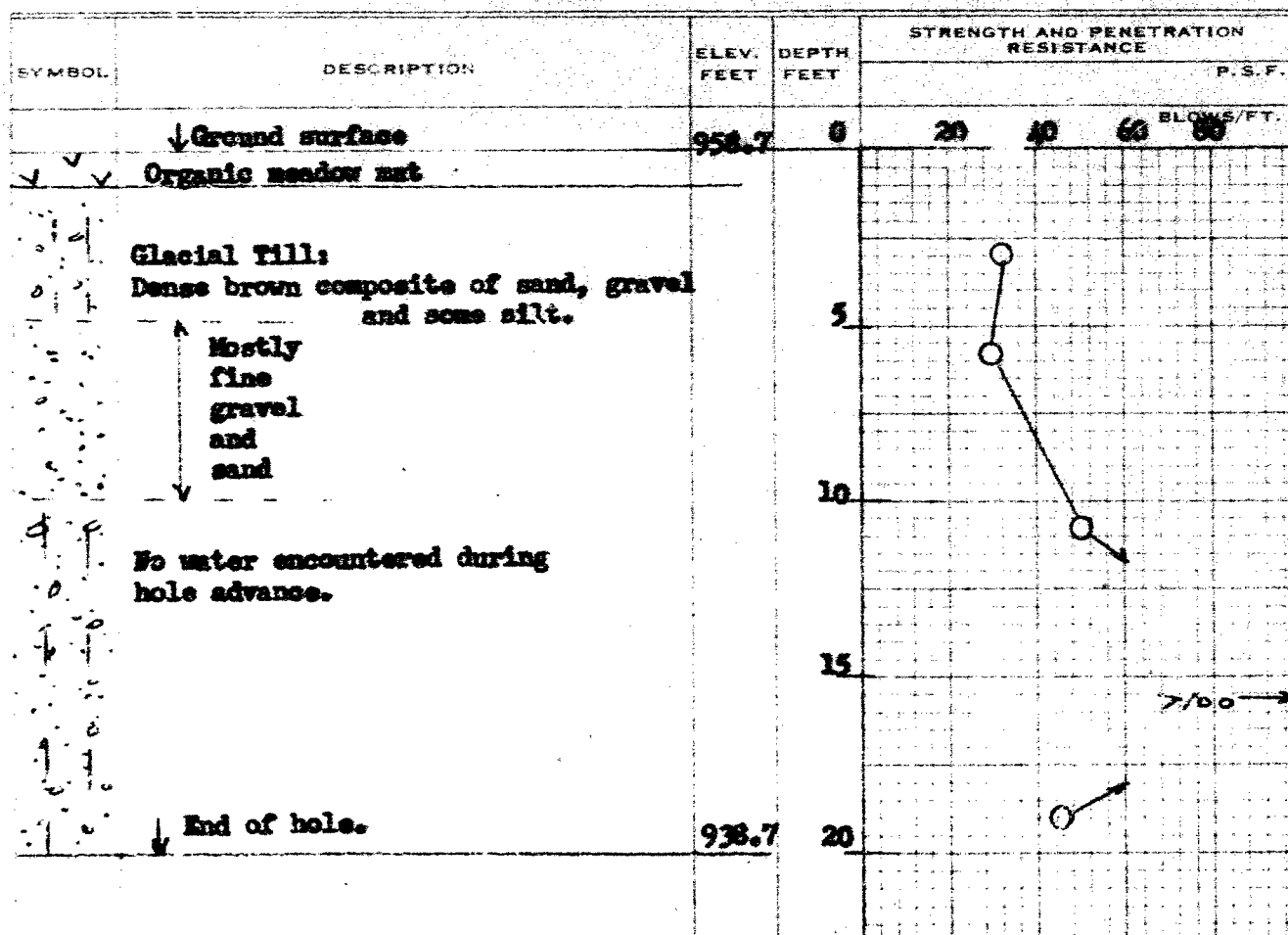
PROJECT NO. **6125/J190****TROW SODERMAN AND ASSOCIATES**

SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

PROJECT **Franklin Canadian Site.**LOCATION **Galt, Ont.**HOLE LOCATION **As on plan.**HOLE ELEVATION AND DATUM **958.7**BOREHOLE NO. **P7**FIELD SUPERVISOR **LS**DRILLER **P7**PREP. **LS**DRAWING NO. **5**

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION (Qu)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



PROJECT NO. C125/J190

TROW SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

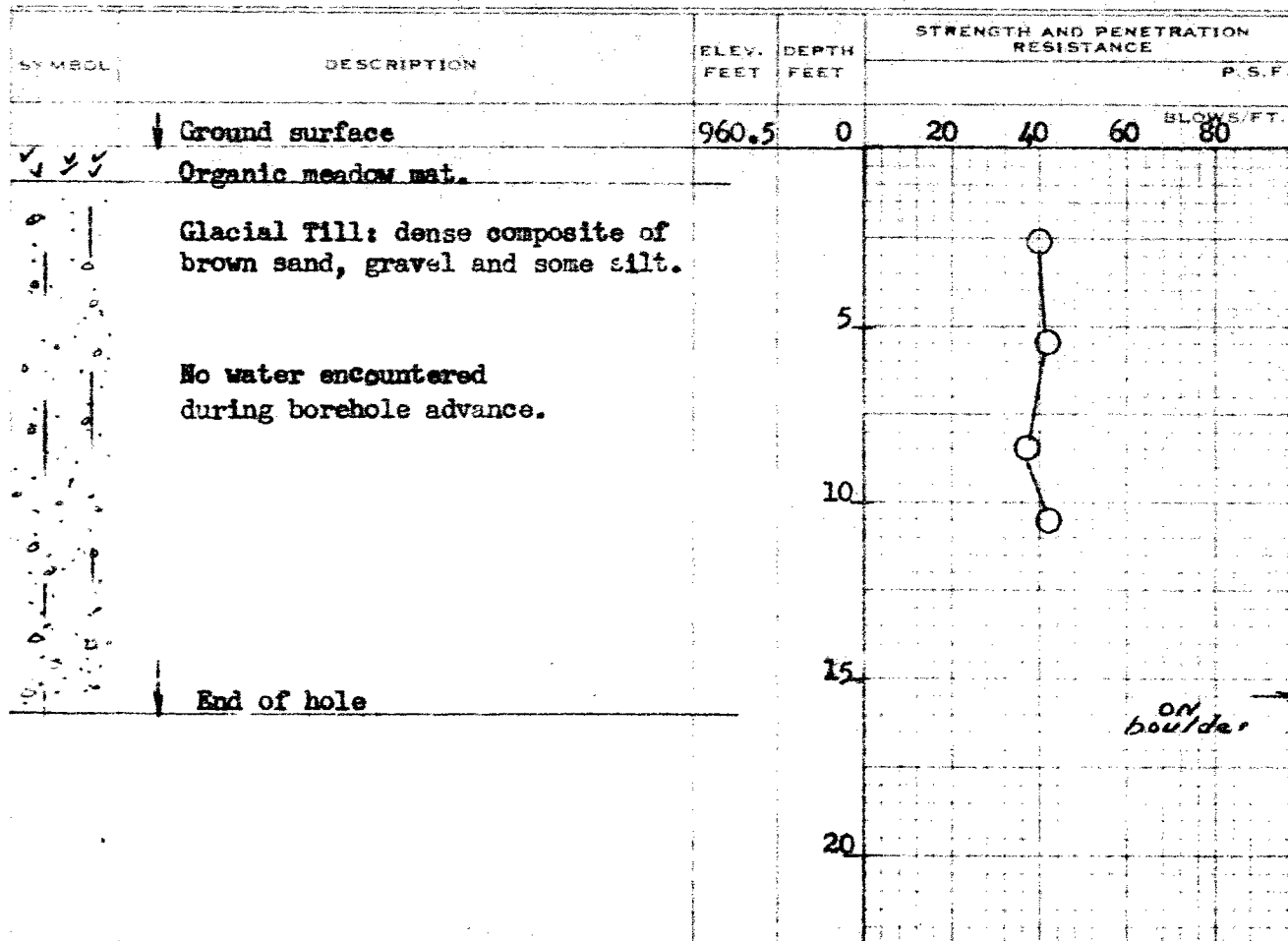
PROJECT **Franklin Canadian Site.**
 LOCATION **Galt Ont.**
 HOLE LOCATION **As on plan**
 HOLE ELEVATION AND DATUM **960.5**

BOREHOLE NO. **P9**
 FIELD SUPERVISOR **LS**
 DRILLER **PV**
 PREP. **LS**

DRAWING NO. **6**

LEGEND

2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION (Qu)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT



CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
MOIST. CONTENT - % DRY WT.		
	SS1	
	SS2	
	SS3	
	SS4	
	SS5	