

#59-F-244-C

GREENWAY

OVER THE AUX

SABLES RIVER

R. C. Dunn and Associates Ltd.

CONSULTING ENGINEERS

London, Ont.

MUNICIPAL SANITARY INDUSTRIAL STRUCTURAL MECHANICAL

April 15th, 1959

Department of Highways, Ontario
Soils Laboratory,
Downsview, Ontario

Attention: Mr. B. Sauterman.

Dear Sir:-

Re: Tri-County Bridge, County of
Middlesex, Soil Investigation.

Further to our discussion of April 14th, 1959, regarding the above Tri-County Bridge. As requested we are enclosing copies of preliminary plans submitted to Mr. Kleinsteinber and Mr. Nowski of Donald Inspection. The estimated loadings in connection with the proposed structure are as follows:-

- 1) - Abutment: 630 Kips vertical,
100 Kips horizontal.
- 2) - Pier: - 915 Kips vertical,
13 Kips horizontal, parallel with bridge,
26 Kips horizontal, perpendicular with bridge.

It should be further noted that the design of the bridge and its span provides only for the required waterway and does not take into consideration the effects to the bridge structure resulting from the consolidation and settlement of the existing soil brought about by the approach loadings.

It was necessary to prepare these plans in order that Donald Inspection could ascertain the effects on the structure resulting from consolidation and settlement of the sub-soil.

It is evident that if the sub-soil conditions are as Donald Inspection indicate in their reports then the span will have to be increased to some extent and therefore the loads as previously noted will be increased a corresponding amount.

Yours very truly,


R. C. Dunn, P. Eng.

RCB/s.
Encl.

May 27, 1959.

R. C. Dunn and Associates, Ltd.,
Consulting Engineers,
410 Third St. at Dundas St. E.,
LONDON, Ontario.

Attention: Mr. R.C. Dunn, P.Eng.

Dear Sir:-

Re: Tri-County Bridge,
Soil Investigation.

With reference to your letter dated May 20th, we had recently forwarded copies of Dominion Soil Investigation, Ltd.'s report regarding the above noted structure site, to our Bridge Office, for distribution.

However, as you have not, as yet, received this report, we are enclosing herewith, a copy of same for your use, and hope that you have not been caused too much inconvenience by the delay.

Yours very truly,

LGS/MdeF
Encl. (1)

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATION ENGINEER.

R. C. Dunn and Associates Ltd.

CONSULTING ENGINEERS

London, Ont.

MUNICIPAL SANITARY INDUSTRIAL STRUCTURAL MECHANICAL

May 20th, 1959

Mr. L. G. Soderman,
Principal Soils & Foundation Engineer,
Dominion Soil Investigation Ltd.,
229 Yonge Street,
Toronto, Ontario

Dear Sir :-


Re: Tri-County Bridge,
Soil Investigation.

Some time ago we received a telephone conversation from your office indicating in general the results of Dominion Soil Investigation Ltd. regarding Tri-County bridge. We were advised at that time that the full report would be forthcoming very shortly.

To date we have not received this report and we would like to get the information as soon as possible in order that we may proceed with the design.

Yours very truly,

RCD/s.


R. C. Dunn, P. Eng.

RECEIVED
MAY 27 1959

DOMINION SOIL INVESTIGATION LTD.

TEST BORING • DIAMOND DRILLING
FOUNDATION DETERMINATION • SOIL MECHANICS

TORONTO 12, ONTARIO

May 19, 1959.

Ontario Department of Highways,
Materials and Research Section,
Downsview Avenue,
TORONTO, Ontario.

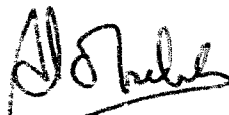
Attn: Mr. L.G.Soderman

Dear Sir:-

Please find enclosed five(5) copies of the
report on the Tri-County bridge, as requested.

Yours very truly,

DOMINION SOIL INVESTIGATION LTD.


A. Kobelak P.Eng.

Mr. J. V. Ludgate,
Municipal Engineer,
Materials & Research Section.

May 15, 1959.

Re: Dominion Soil Investigation, Limited,
Soil Investigation for Tri-County
Bridge near Greenway, Over the Aux
Sables River, County of Middlesex.

Enclosed, for your use, is a copy of the
above-noted soils investigation report, carried
out at our request.

LGS/MdeF
Encl. (1)

L. G. Soderman,
PRINCIPAL SOILS & FOUNDATION ENGR.

Mr. A. M. Toye,

May 14, 1959.

Bridge Engineer.

Materials & Research Section.

Attention: Mr. S. McCombie.

Re: Dominion Soil Investigation, Ltd.,
Soil Investigation for Tri-County
Bridge near Greenway over the
Aux Sables River, Cty. of Middlesex.

Enclosed herewith are two copies of a foundation investigation carried out at the above site. You will recall that the initial investigation was carried out at this bridge site by Donald Inspection, Ltd., and the results of their report, as well as the conclusions arrived at, did not fit in with our general knowledge of subsoil conditions in this area. Because of this, we have retained Dominion Soil Investigation, Ltd. to put down additional sampled borings.

Your attention is drawn to the conclusions pertaining to foundation conditions that are based upon Dominion Soil Investigation's report. Spread footings, loaded with an intensity of 2 1/2 tons/sq.ft., can be used provided that they are founded at a depth of 12 to 14 feet below existing ground surface. Conclusions based upon data provided by Donald Inspection, Ltd., indicated piles would be necessary; this conclusion has proved to be invalid.

The Consulting Engineers designing this structure, are R. C. Dunn and Associates, in London. We have not discussed the data or conclusions contained in Dominion Soil's investigation report - I trust he will be getting in contact with you for a copy of their report. If he would like to discuss the soil conditions in more detail, we will be pleased to meet with him at our office, at his convenience.

LGS/MdeF
Encls. (2)

L. G. Soderman
L. G. Soderman,
PRINCIPAL SOILS & FOUNDATION ENGINEER.

DOMINION SOIL INVESTIGATION LTD.

TEST BORING • DIAMOND DRILLING
FOUNDATION DETERMINATION • SOIL MECHANICS

TORONTO 12, ONTARIO

May 13, 1959.

Ontario Department of Highway,
Materials and Research Section,
Downsview Avenue,
Toronto, Ontario.

Attention: Mr. L. G. Soderman, F.Eng.

Dear Mr. Soderman:

Soil Investigation
Tri-County Bridge near
Greenway, Ontario.

Enclosed are five (5) copies of the report
on the soil investigation for the Tri-county bridge.

Also enclosed, under separate cover, are
bridge plans obtained from your office.

Yours very truly,

DOMINION SOIL INVESTIGATION LTD.,



A. Nobelak, F.Eng.

Ah/ep.

April 21, 1959.

F. C. Dunn, Limited,
Consulting Engineers,
LONDON, Ontario.

Attention: Mr. F. C. Dunn

Re: Additional Subsoil Investigation,
Tri-County Bridge - Cty. of Middlesex.

Dear Sir:-

This letter is to confirm the points discussed in our telephone conversation of April 20th.

At the Tri-County bridge site the two borings carried out in August, 1958, were at the existing bridge. However, since then, the proposed bridge location has been changed approximately 400 ft. In addition to the change in structure location which may give rise to a variation in soil conditions from that reported to be in existence at the site investigated, we are of the opinion that the subsoil properties presented in the Consultant's report include appreciable errors due to sampling disturbance. Because of these two facts, we deem it necessary to carry out at least one additional detailed sampled boring at the now confirmed structure location. A minimum of one boring and possibly two, should be adequate.

Arrangements are being made for the additional investigation to be carried out. We shall advise you of the results immediately they are available.

cc: Messrs. L. McCombie
R. D. Smith
T. J. Kovich
Files

Yours very truly,
L.G. SODERMAN,
PRINCIPAL SOILS & FOUNDATION ENGR.
per:

F. de Lory
(F. de Lory)
FOUNDATION ENGR.

FdeL/MdeF

23-2

Department of Highways of Ontario
Materials and Research Section
Downsview Avenue
Toronto Ontario

59-244

REPORT ON SOIL INVESTIGATION FOR
TRI-COUNTY BRIDGE NEAR GREENWAY
OVER THE AUX SABLES RIVER
COUNTY OF MIDDLESEX

Submitted by:

DOMINION SOIL INVESTIGATION LTD.
88 Eglinton Ave. East
Toronto 12 Ontario

May 13, 1959

DOMINION SOIL INVESTIGATION LTD.TEST BORING • DIAMOND DRILLING
FOUNDATION DETERMINATION • SOIL MECHANICS

TORONTO 12, ONTARIO

**SOIL INVESTIGATION FOR
TRI-COUNTY BRIDGE NEAR
GREENWAY ONTARIO OVER
THE AUX SABLES RIVER****1. INTRODUCTION:**

A soil investigation was requested by the Materials and Research Section of the Department of Highways to determine the foundation conditions at the above-mentioned site. A new bridge over the Aux Sables River is proposed to replace the damaged structure.

The purpose of the report is to present the results of the investigation, the results of laboratory soil tests, and provide recommendations for a suitable foundation for the proposed bridge. Consideration is given to the stability of embankments and the amount of settlement predicted for the approach fill and foundations.

2. LOCATION AND DESCRIPTION OF SITE:

The site is located 3 miles west of Greenway, Ontario, at the intersection of the Counties of Middlesex, Lambton and Huron. Presently a temporary Bailey bridge carries traffic over the Aux Sables River. A new section of road, crossing the river about 375 ft north of the existing crossing, will eliminate the sharp turn and ease the steep approach at the old bridge. Enclosure No. 1 shows the site location and the new line with respect to the existing crossing.

Photographs on the following page provide a view of the site and the surrounding area. The lower photograph shows the temporary bridge.

The Aux Sables River is a man-made channel, in the vicinity of the site, that was constructed to eliminate a large meandering section of the river. The terrain is almost flat cultivated farm land. It rises very gradually to the east and extends for about a mile to the west before any relief was noted. A glaciofluvial outwash of granular soil and an esker appear to form the westerly boundary of the lake deposits found at the site.

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ENGINEERING DATA SHEETS

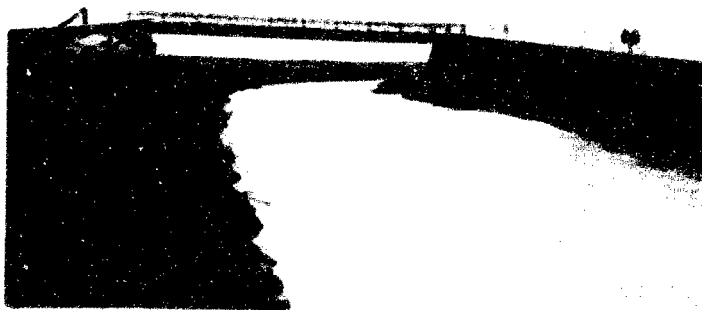
Key Plan and Location of Boreholes - - - -	Encl. No. 1
Borehole Logs - - - - -	Encls. Nos. 2 to 5
Excavation around Abutments - - - - -	Encl. No. 6

LOCATION AND DESCRIPTION OF SITE (cont'd)

During the investigation the water level in the river rose sharply by about 1.3 ft after a 24 hour rainfall. The highest water level recorded was 89.5 on April 28, 1959.



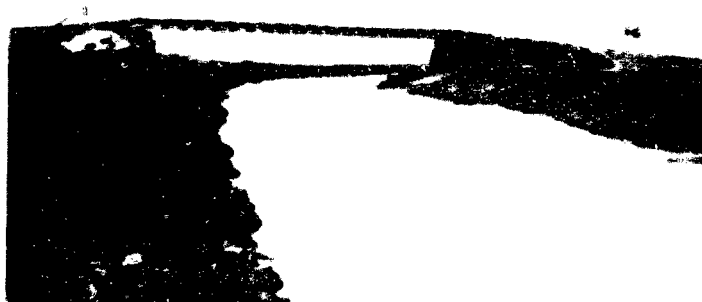
AUX SABLES RIVER LOOKING
NORTH FROM TEMPORARY BRIDGE



TEMPORARY BRIDGE

LOCATION AND DESCRIPTION OF SITE (cont'd)

During the investigation the water level in the river rose sharply by about 1.3 ft after a 24 hour rainfall. The highest water level recorded was 89.5 on April 28, 1959.



3. DRILLING AND FIELD TESTING PROGRAMME:

Field work was started on April 24, 1959, and was completed on April 30, 1959. Borehole 1 drilled on the east bank, was extended to a depth of 122 ft and borehole 2 to a depth of 61.5 ft. The location of boreholes is shown in Enclosure No. 1 at the back of the report.

The wash boring method was used in drilling the holes. Borehole 1A was made by hand auger to verify the strata in the top 11 ft and to conduct insitu vane shear test at closer intervals than was possible in borehole 1. Undisturbed samples were recovered by 2" I.D. thin-walled tubes at intervals of 5 ft to a depth of 40 ft and thereafter at 10 ft intervals in borehole 1.

Vane shear tests were made following each thin-walled sample and at intervals where a change was noted or suspected. Smaller (hand equipment) vanes were used to a depth of 20 ft. The remoulded shear strength was taken after 10 complete rotations of the vane. A torquemeter having a mechanical accuracy of 2 ft lbs ($c_u = 120$ psf on 2" vane) measured to insitu torque. The values shown on the borehole logs have been corrected for skin friction on the vane shaft and friction of thrust bearing.

Following a discussion of the vane shear test results from borehole 1 with a representative of the Materials & Research Section, borehole 2 was drilled on the west bank to 61.5 ft with samples and vane tests taken at about 10 ft intervals. Drill rods were jettied down from 61.5 ft to 122 ft to verify the depth of the very stiff strata encountered in borehole 1.

An assumed datum of 100.0 used by the Structural Consultants was used for the elevation of boreholes.

4. SOIL DESCRIPTION:

The soil encountered in the two boreholes was similar as could be expected from knowledge of the method by which the soil was deposited. Enclosures Nos. 2 to 5 inclusive give a detailed description of the soil encountered. The following is a brief outline:

From the ground surface (elev. 95.4 to elev. 96.0) to a depth of 11 ft, the soil is a multi-layered formation of silty clay followed by a fat clay, then organic silt, peat and grey silt and clayey silt in that order. Vane shear tests range from 1200 psf at 3 ft to as low as 450 psf in the fat clay and increase to 700 psf in the clayey silt. Water content of the fat clay is 40.9% and the unit weight is 113.0 pcf. The organic silt strata (water content 24-28% and unit

SOIL DESCRIPTION (cont'd)

weight 124 pcf) contains many shells and other calcareous and organic deposits.

At elev. 84.5 a very stiff grey silty clay with traces of fine to coarse sand was encountered. The top portion of this strata shows some fissuring. Vane shear strengths of up to 6500 psf were recorded at depths of 12 ft to 15 ft. There is a gradual reduction in shear strength to about 2000 psf at a depth of 25 ft. Water contents of 14% to 21% and unit weights of 140 to 149 pcf were found from laboratory tests on samples from the strata.

From 25 ft to 120 ft the soil is classified as a stiff grey silty clay with some trace of sand and gravel. At 105 ft the color became slightly brownish and the soil contained more silt with pockets of fine sand and silt.

Vane tests gave shear strengths from 1980 to 3000 psf and the sensitivity was generally between 1.5 and 2.0. Natural water contents are reasonably close to 22% to a depth of 105 ft with the unit weights between 140 pcf and 146 pcf. The plasticity index is in the small range from 14.4% to 17.5%. Within the brownish-grey clayey silt strata below 105 ft the water content is about 15%.

At a depth of 119.5 ft in borehole 1 a very stiff brownish-grey silty clay was encountered. Vane shear strengths increased sharply to 3600 psf. The water content on one sample was 17.7% and the unit weight on the same sample was 149.4 pcf.

Ground water table recorded daily over a period of 4 days in borehole 1A (near borehole 1) gave the highest water level at elev. 91.0 following the extended rainfall. From the proximity of the boreholes to the river it may be expected that the water level in the boreholes is influenced by the river water level.

5. LABORATORY SOIL TESTS:

Following a discussion with the Materials Section on the soil conditions it was decided to limit the soil testing to classification and consistency tests. Natural water content was determined on most samples with the unit weight obtained on samples at specific depths. Several plasticity indices were determined in the more compressible silty clay strata. The results of laboratory tests are plotted on the borehole logs.

Four samples from depths of 15, 20, 35 and 45 ft are stored for future reference or tests. The remaining samples will be disposed of after a period of six weeks.

6. FOUNDATION CONDITIONS:

The soft deposits above elev. 84.4 are inadequate to support foundations of the proposed structure. It is possible to support spread footings on the very stiff silty clay strata. This strata, with vane shear strengths up to 6500 psf, has a thickness of 12 ft. The underlying stiff silty clay has lower shear strengths and is more compressible. However, the very stiff strata will act as a "mat" to distribute footing loads so that the excess pressure on the underlying soil will be greatly reduced.

Pier footings within the river should be established a minimum of 4.5 ft below the final channel grade at the bridge site. The suggested pier footing elevation is 81⁺ which would be about 3.5 ft in the very stiff silty clay strata. Abutment footings may be established at elevation 83 or lower. The safe bearing capacity of the soil for footings at those depths is 2.5 tons per sq ft.

Using a design value of 2.5 tons per sq ft, the dead load pressure under the abutment and pier footings is estimated to be about 1.75 tons per sq ft. At that pressure the predicted settlement is about 2-3 inches based on estimated values of compressibility of the subsoil. Consolidation of the clay will extend over a long period of time (20-30 years) which means that the structure will adjust itself to the gradual settlement. Foundations designed for about the same dead load pressures and having the same footing widths will result in small differential settlement. A simply supported structure is however recommended.

An embankment stability analysis was made for granular fill approaches extending to elev. 108.0 placed directly on the existing ground. Side slopes of 2:1 were considered. A factor of safety against failure in excess of 1.5 was realized. The critical strata is the soft fat clay with vane shear strengths of 425 to 450 psf. The behaviour of the fat clay strata under a 12 ft embankment is questionable. With an open type or a gravity abutment resting on the very stiff silty clay mat and the backfill placed directly on the existing ground, there is the strong possibility that the fat clay, over a long period of time, will "creep" towards the river thus endangering the stability of the abutment and the embankment. Stability problems created by plastic flow of similar soils have developed at another bridge site on the Aux Sables river. The deposits above elev. 84.5⁺ are also compressible which under the embankment weight will result in settlement of possibly 0.5 to 1.0 ft within this strata alone. It is therefore recommended that the soft deposits down to elev. 84.5⁺ be removed from a distance of 50 ft behind the abutments to the river bank. Details of the extent of excavation recommended are shown in Enclosure No. 6 at the back of the report.

FOUNDATION CONDITIONS (cont'd)

Scour protection for the pier footings is required. If possible the pier footings should be cast directly against the very stiff silty clay. Using this method, a minimum of scour protection is necessary. Back-fill material round footings containing some clay binder in the granular soil when well compacted in six inch lifts is generally adequate. Some rip-rap stones covering the back-fill are also suggested.

The elevation of the river water level during construction will determine the procedure required to excavate for the footings and cast the foundations. With regard to excavation for footings, it was noted during drilling that water entered the boreholes at elevation 84.5 to 87.0. The loose silt and peat layers are permeable. A cofferdam may be required to reduce the ingress of water into the excavation.

7. CONCLUSIONS:

The presence of a 12 to 13 ft layer of very stiff silty clay below elev. 84.5[±] makes it possible to support the proposed structure on spread footings. The safe bearing pressure of 2.5 tons per sq ft may be used for footings established within the very stiff silty clay. Recommended footing elevations are 81[±] for piers and 83[±] for abutments.

Settlement will extend over a long period of time whereby the structure will adjust itself to the gradual settlement. Although small differential settlements are anticipated, a simply supported structure is recommended.

An embankment stability analysis using 2:1 slopes and the grade at elev. 108 revealed that the factor of safety against failure is over 1.5. It was assumed that compacted granular fill was placed directly on the existing ground.

The fat clay strata encountered at elev. 89.5[±] may in time "creep" plastically under the weight of the embankment fill, thus endangering the stability of the abutments and the embankment. It is recommended that the soft deposits are removed around the abutments to elev. 84.5[±] as shown in Enclosure No. 6. The excavated volume should be backfilled with granular fill material.

Pier footings are suggested to be cast against undisturbed soil, particularly that portion within the very stiff silty clay. A minimum amount of scour protection is then required.

CONCLUSIONS (cont'd)

The silt and peat layers between elev. 87 and 84.5 are permeable. A cofferdam may be necessary to excavate for the foundations depending to some extent on the river level during construction.



DOMINION SOIL INVESTIGATION LTD.

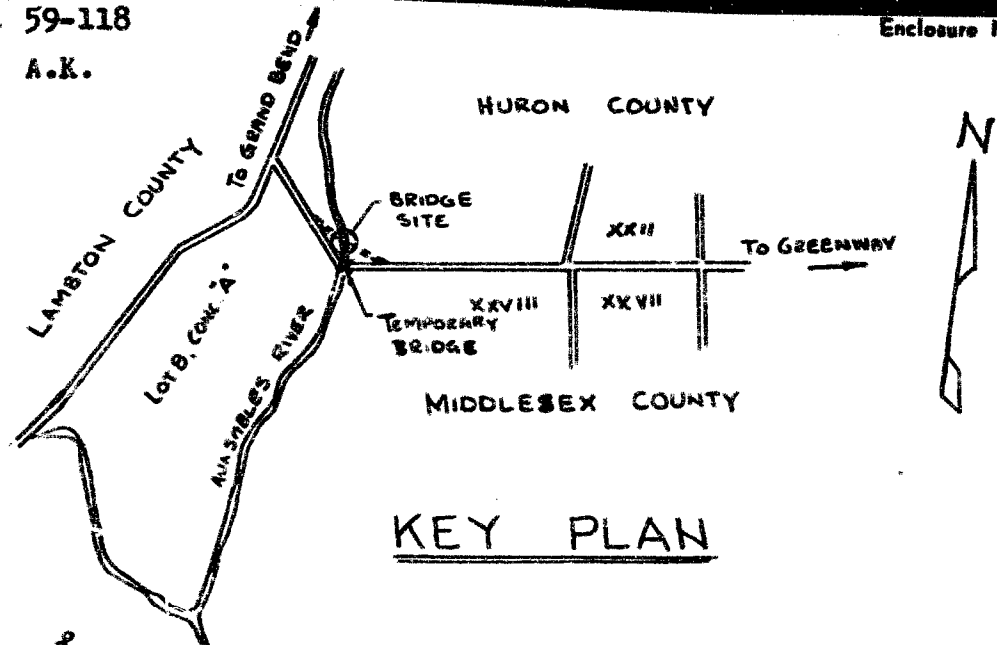
A. Kobelak

A. Kobelak, P. Eng.

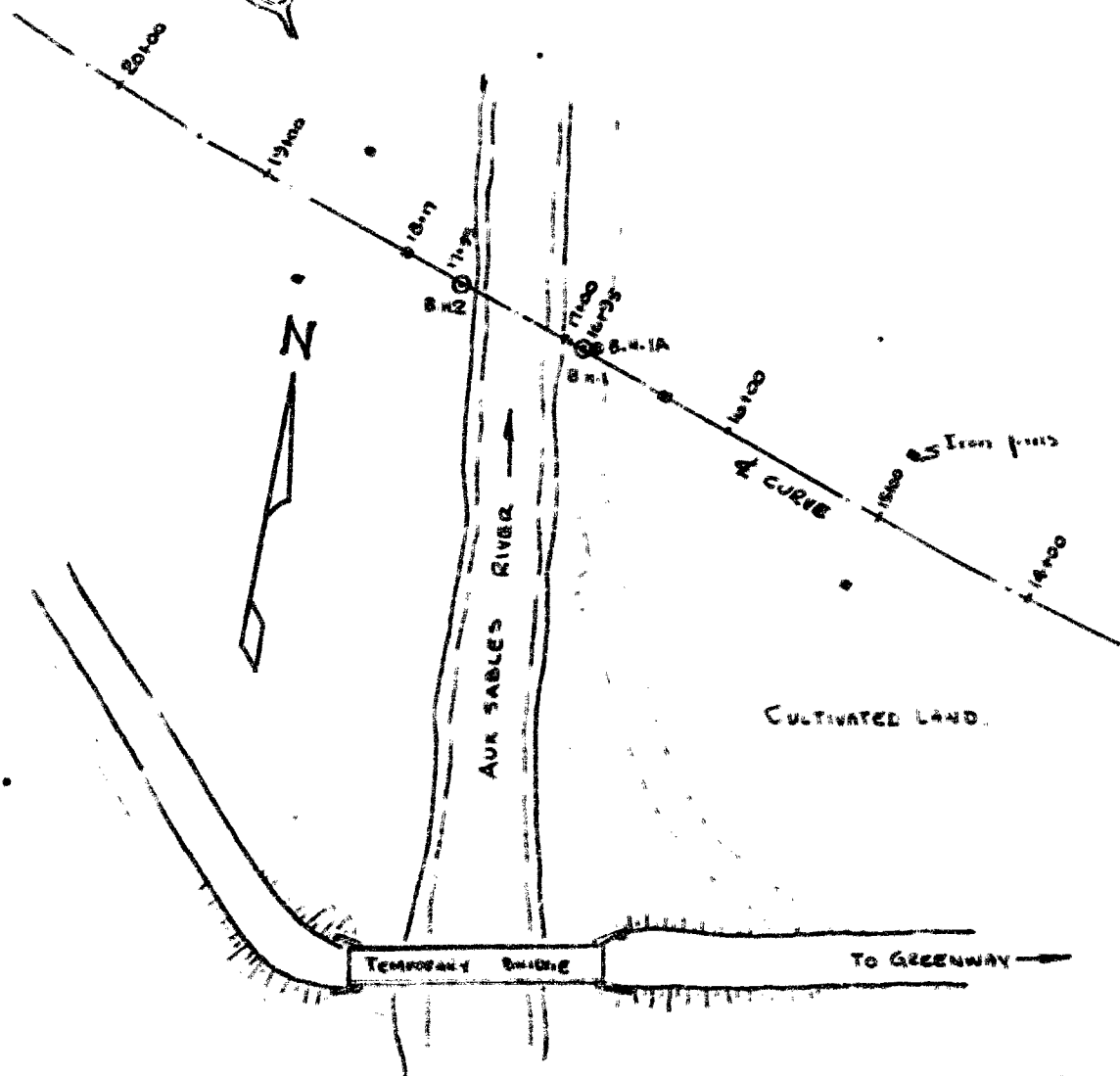
ENGINEERING DATA SHEETS

Key Plan and Location of Boreholes - - - Encl. No. 1
Borehole Logs - - - - - Encls. Nos. 2 to 5
Excavation around Abutments - - - - - Encl. No. 6

Prep. By A.K.



KEY PLAN



LOCATION OF BOREHOLES

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1A

Date: 6-5-59

Project: Tri-County Bridge
 Location: 3mi. West of Greenway
 Hole Location: See Enclosure No.1
 Hole Elevation and Datum: 95.4
 Field Supervisor: AK Prep.: AK
 Driller: JK Checked:

LEGEND

Shear Strength (C)

Unconfined compression
 Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Coating



Sampling Method

2" Dia. split tube

2" Shelby tube

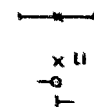
Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1A

LEGEND

Consistency

Natural moisture and
 Liquid limit (LL)
 Plastic limit



Sampling Method

2" Dia. split tube

2" Shelby tube

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE					CONSISTENCY		SAMPLE	NATURAL UNIT WT. P.C.F.	REMARKS
				0	500	1000	1500	2000	MOISTURE CONTENT % DRY WEIGHT	FLUIDITY			
	Ground surface	95.4	0.0						0	10			
	Silty loam topsoil	93.6											
	Soft light grey silty clay traces of calc. deposits thin lenses of white silt	91.0	5.0										
	Soft yellow-grey clay traces of calc. deposits (high plasticity)	89.3											
	Loose organic silt, numerous shell, some organic matter	87.4											
	Dark brown peat layer												
	Grey silt, organic pockets	85.0	10.0										
	Very stiff grey silty clay traces of fine to med. sand (slightly fissured)	84.4											
			15.0										

Borehole 1A drilled near borehole 1 with hand auger.

Samples stored in jars.

Strata change in sample
Liquid limit 65.6%Vane tests made with hand
vanes in auger boring.Borehole 1A terminated
in very stiff silty clay
strata.

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1

Project: Tri-County Bridge
 Location: 3mi. West of Greenway
 Hole Location: See Enclosure No. 1
 Hole Elevation and Datum: 95.4 (assumed)
 Field Supervisor: AK Prep.: AK
 Driller: JK Checked:

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

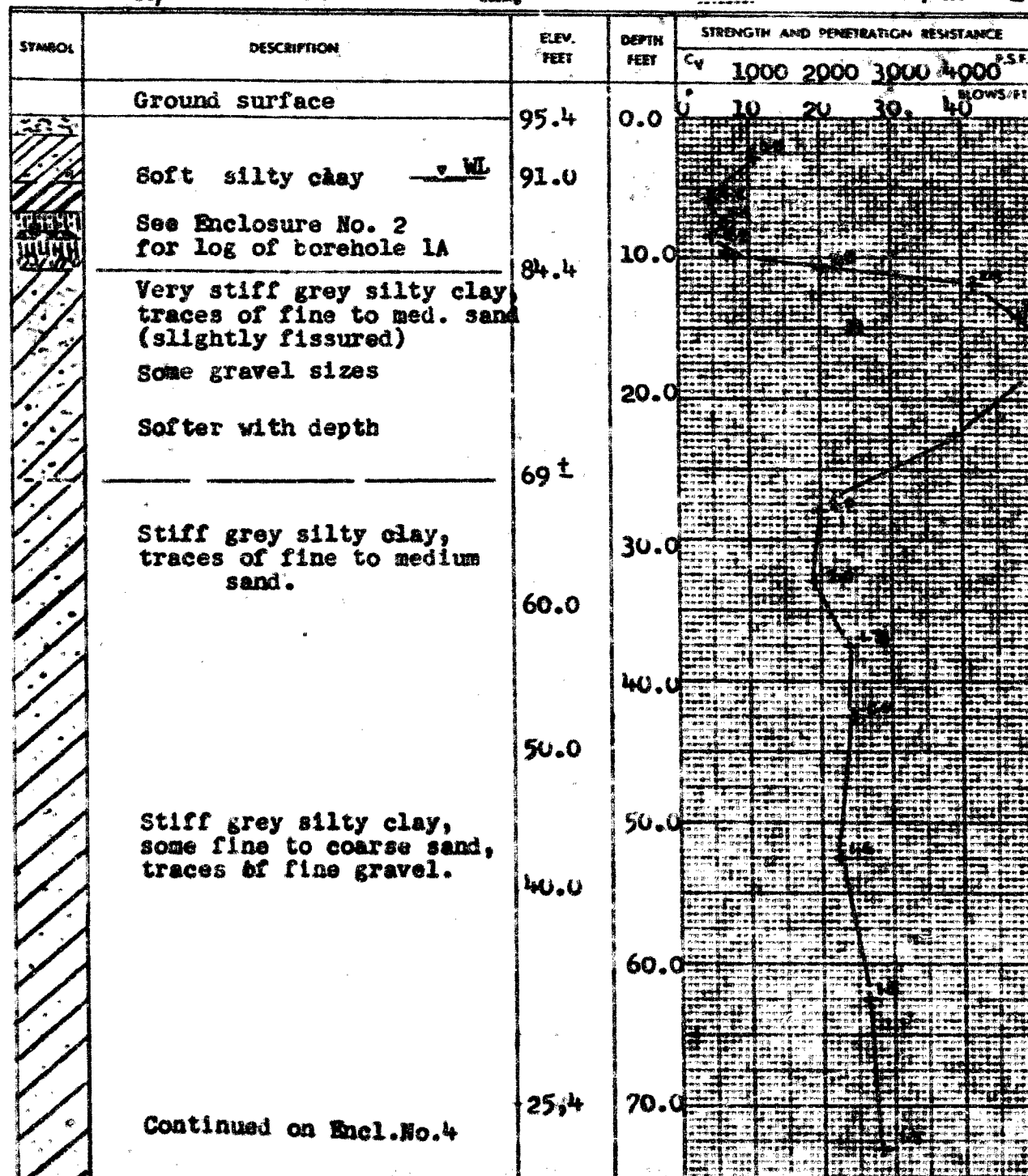
Casing

Date: 6-5-59

Sampling Method

2" Dia. split tube

2" Shelby tube



Continued on Encl. No. 4

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1

LEGEND

Consistency

Natural moisture and

Liquid Limit (LL)

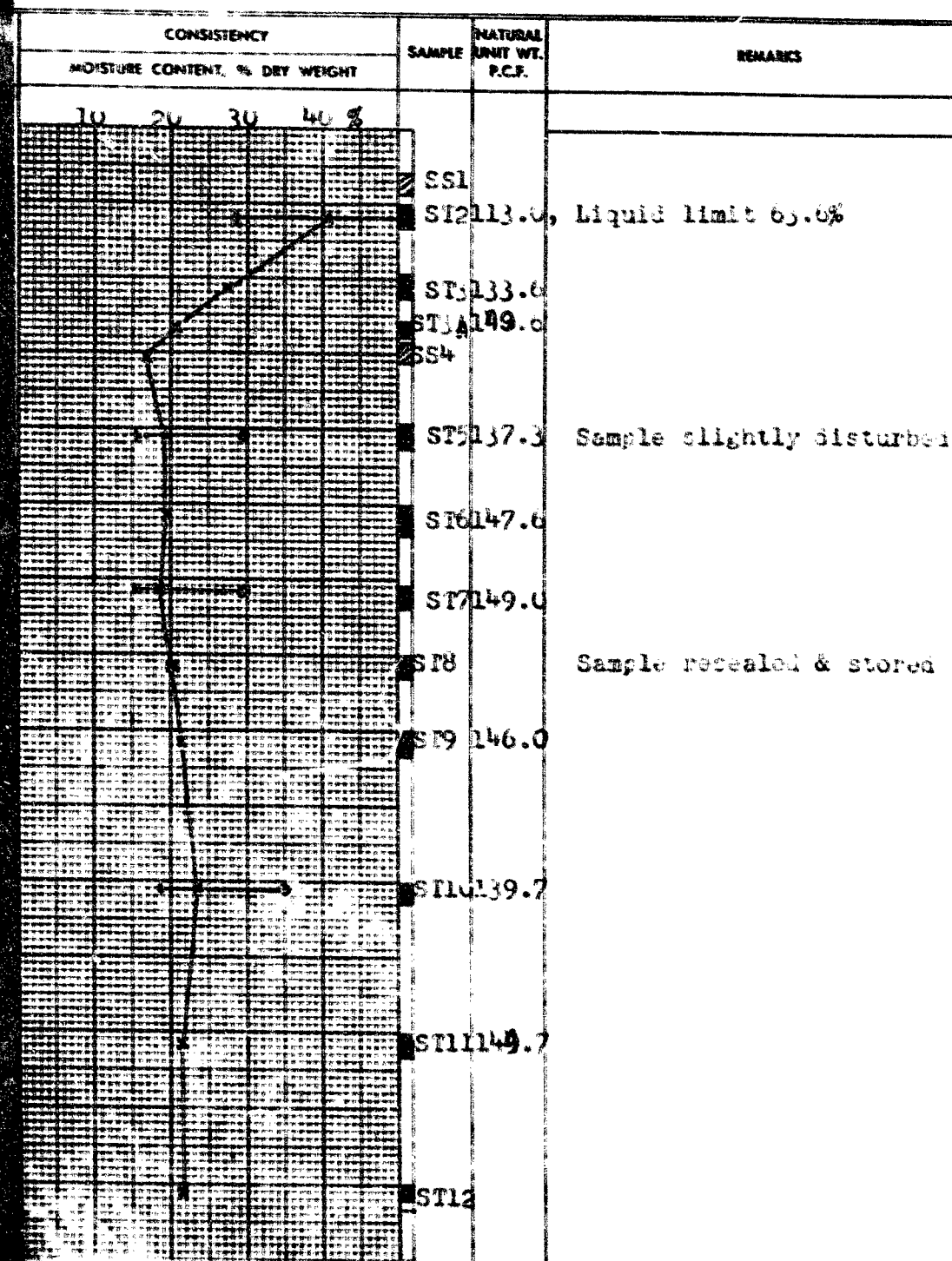
Liquid Limit

Plastic Limit

Sampling Method

2" Dia. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1

Date: 6-5-59

Project: Tri-County Bridge
 Location: 3mi. West of Greenway
 Hole Location: See Enclosure No.1
 Hole Elevation and Datum: 95.4 (assumed)
 Field Supervisor: AK Prep.: AK
 Driller: JK Checked:

LEGEND

Shear Strength: C

Unconfined compression
 Vane test and sensitivity is

Penetration Resistance: P

2" Split tube

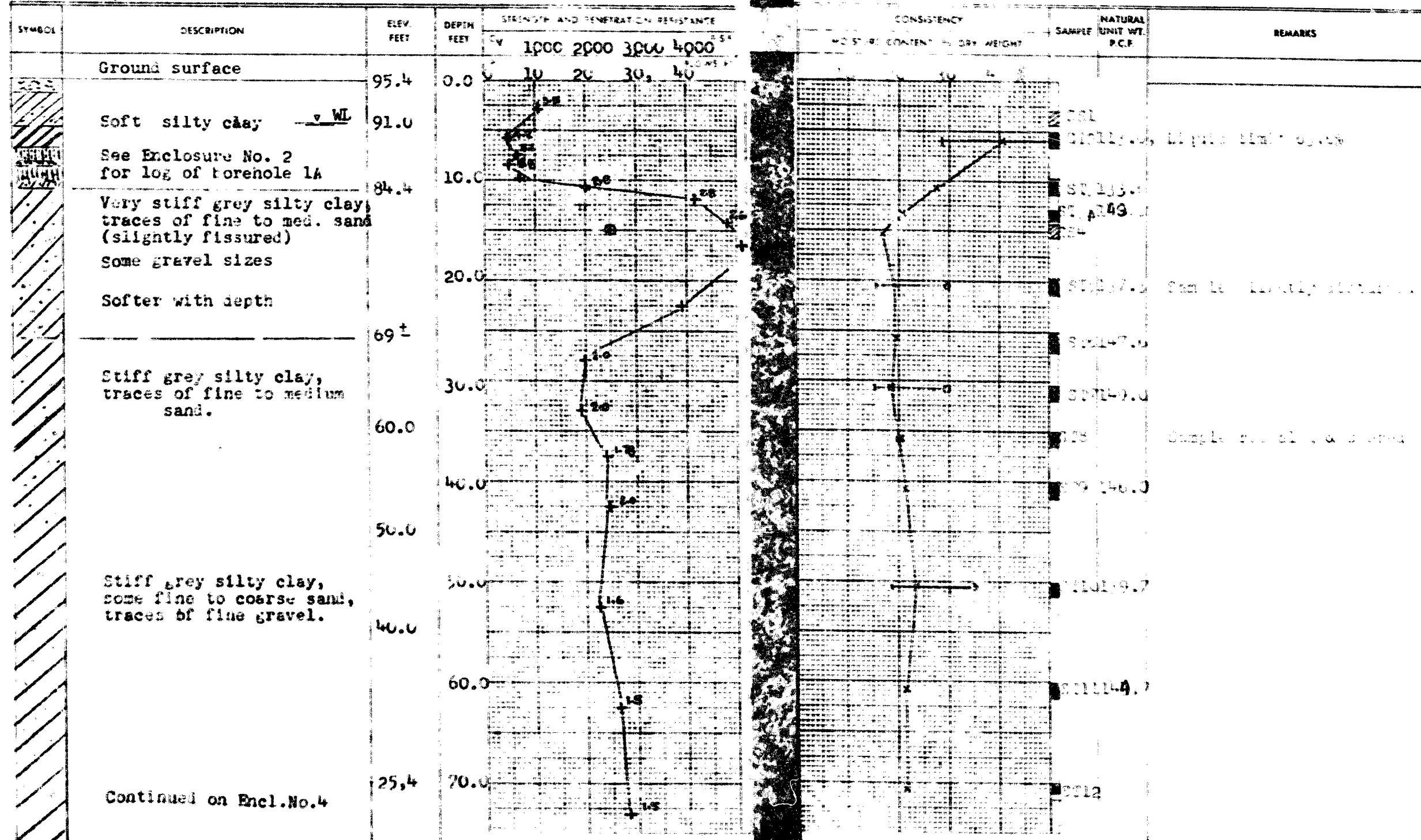
2" Dis. Cone

Casing

Sampling Method

2" Dis. split tube

2" Shelby tube



Continued on Encl.No.4

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1

LEGEND

Consistency

Natural moisture and

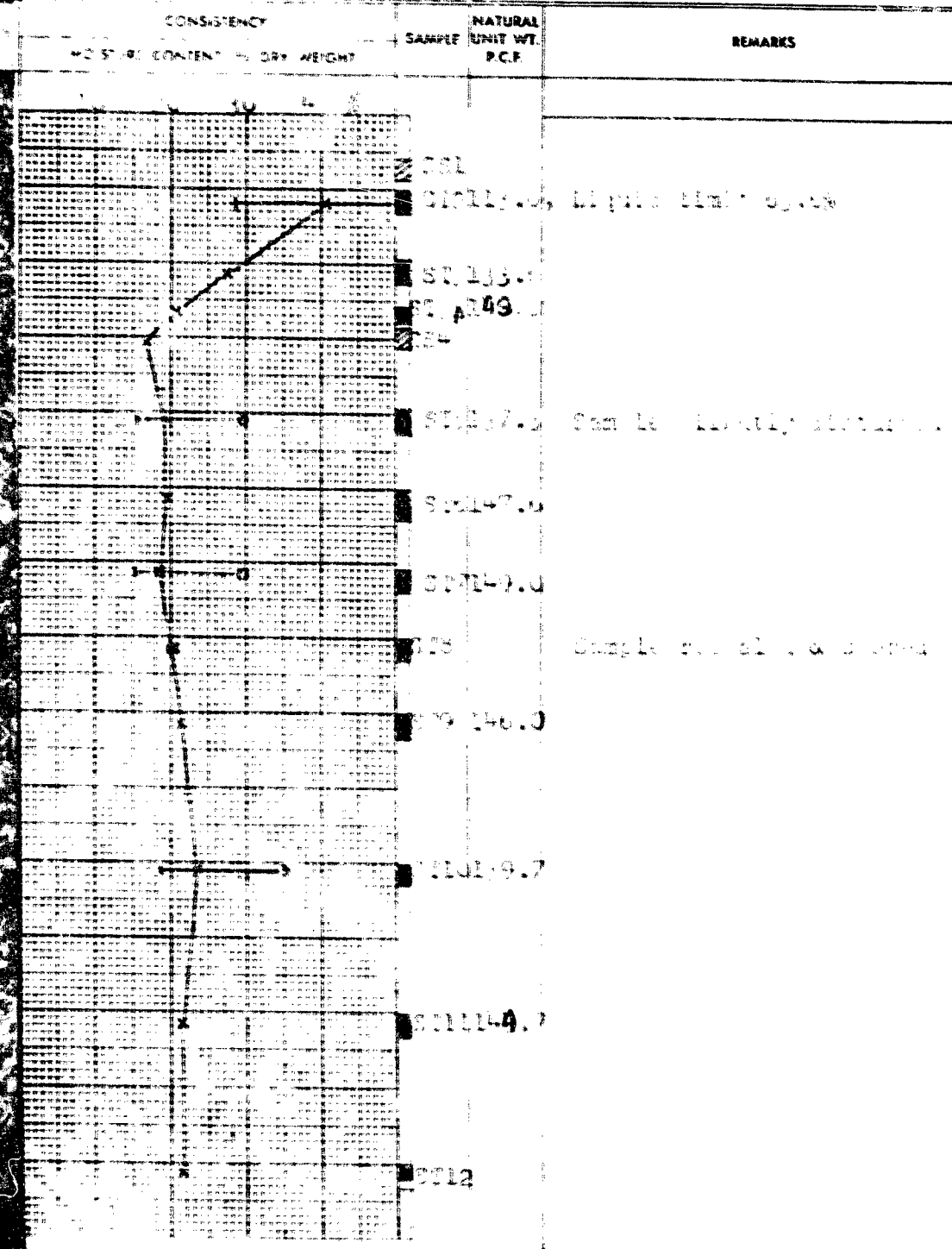
Liquid limit

Plastic limit

Sampling Method

2" Dis. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1 cont'd.

Project: Tri-County Bridge
 Location: 3mi. West of Greenway
 Hole Location: See Enclosure No.1
 Hole Elevation and Datum: 95.4 (assumed)
 Field Supervisor: AK Prep.: AK
 Driller: JK Checked:

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

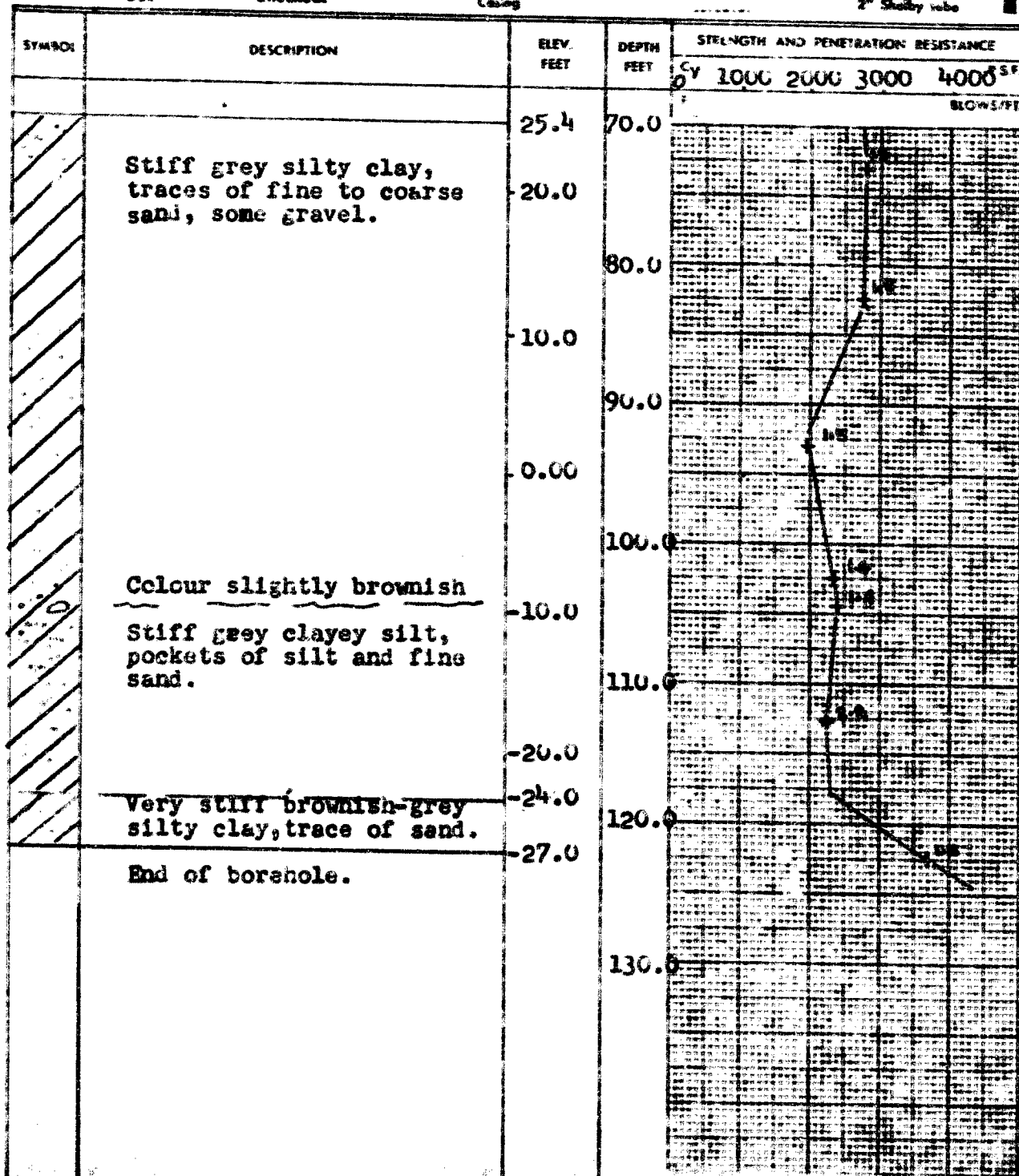
Casing

Date: 6-5-59

Sampling Method

2" Dia. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1 cont'd.

LEGEND

Consistency

Natural moisture and

Liquidity Index (LI)

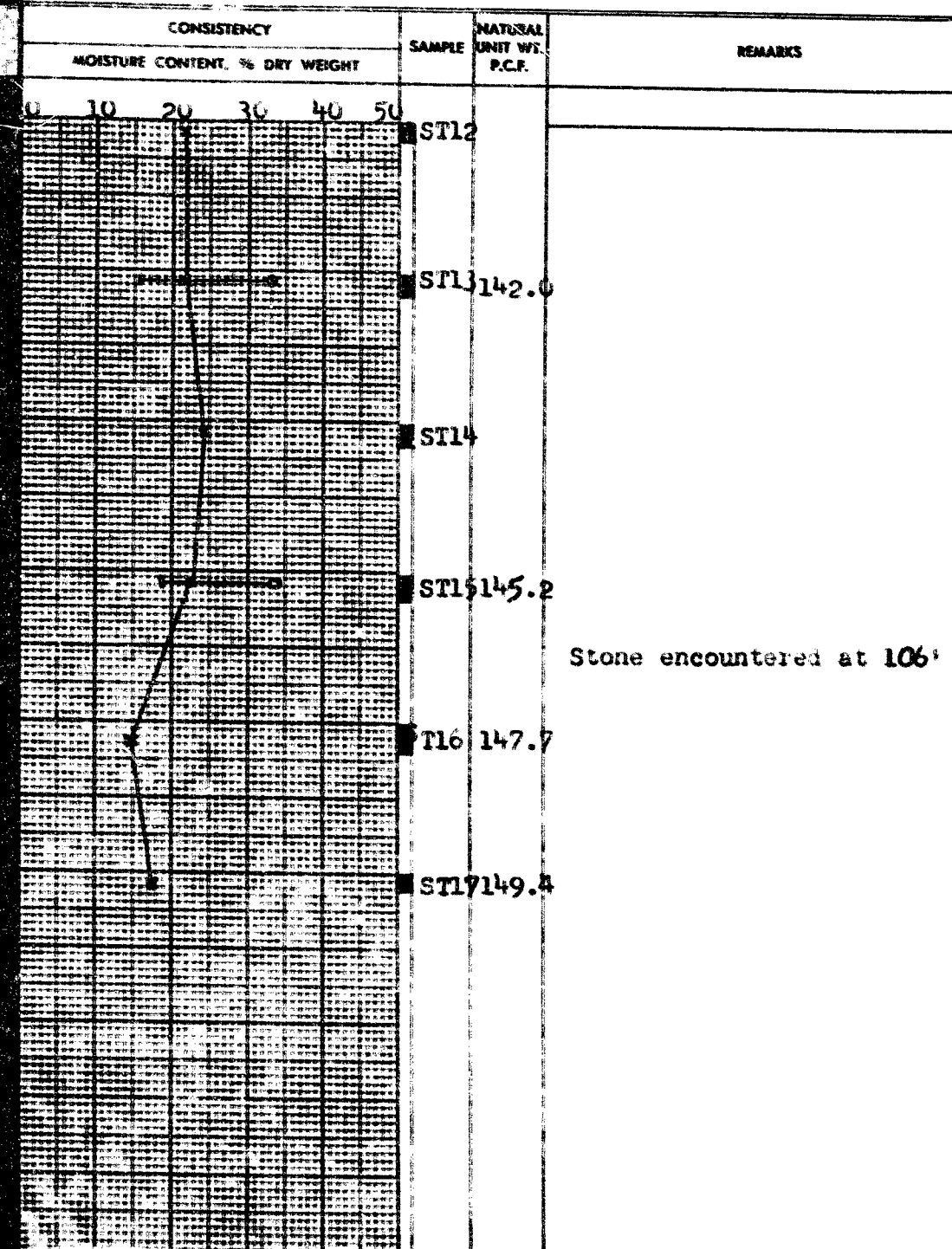
Liquid limit

Plastic limit

Sampling Method

2" Dia. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 2

Engineering Data Sheet for Borehole: 2

Date: 7-5-59

Project: Tri-County Bridge
Location: 3mi. West of Greenway
Hole Location: See Enclosure No.1
Hole Elevation and Datum: 96.0' (assumed)
Field Supervisor: AK Prep.: AK
Driller: JK Checked:

LEGEND

Shear Strength (G)

Uncoiffined compression
Vane test and sensitivity (S)

Frictional Resistance of

2000 2001 2002

2nd Div. Comm
Foster

100

Sampling Method

20 Dec 1944

2000

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LEGEND

1998

Natural moisture and

Urgency Index (U

Liquid Back
Plastic Back

100

Sampling Method

2" Dia. split tube

2002-2003

2- Steady state

[illegible]

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 2

Sampling Method

2" Dia. split tube

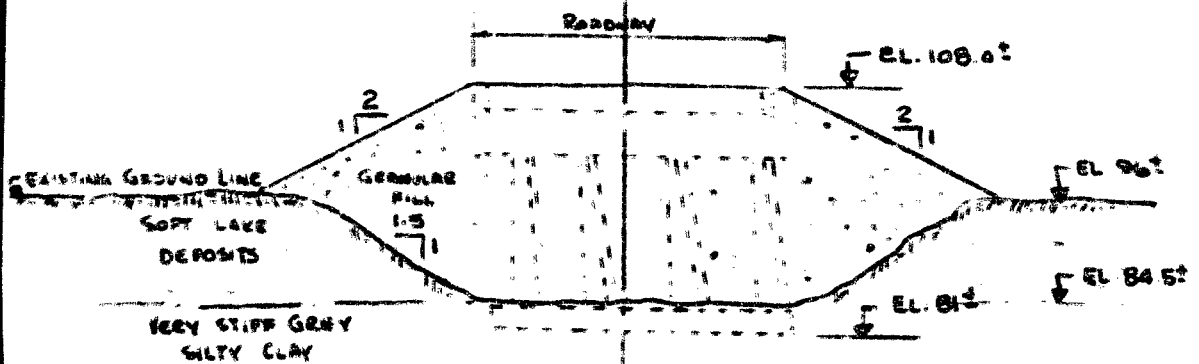
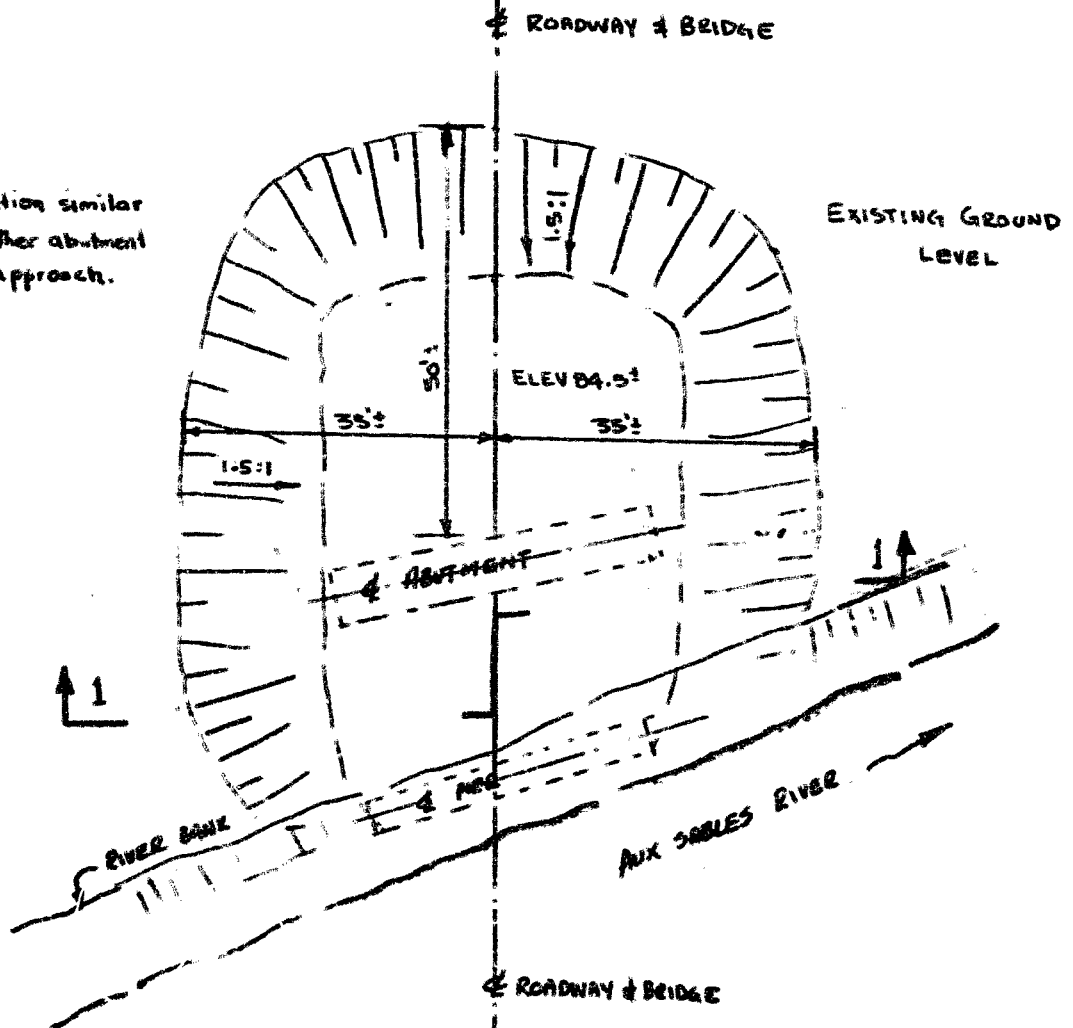
2" Shelby tube

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE					CONSISTENCY				SAMPLE	NATURAL UNIT WT. P.C.F.	REMARKS
				Cv	1000	2000	3000	4000 ^{P.S.F.}	MOISTURE CONTENT, % DRY WEIGHT						
	Ground surface														
	Topsoli	96.0	0.0							10	20	30	40		
	Soft grey silty clay													AS1	
	Soft grey fat clay	89.8												AS2	
	Organic silt and peat	88.7												ST1	123.8
	Clayey silt, some sand	87.0												ST4	
		84.9	10.0												
	Very stiff grey silty clay, traces of coarse sand and fine gravel. Pockets of silt. Slightly fissured at top of strata.													SM2	Sample resealed & stored
		71±	20.0												
	Stiff grey silty clay,some fine to coarse sand and fine gravel.													ST1	144.4
		-60.0	30.0												
														ST4	145.8
		-50.0	40.0												
	Stiff grey silty clay, numerous fine to coarse sand and gravel sizes.													ST9	Sample resealed & stored.
		-40.0	50.0												
	End of borehole													ESR	
		34.5	60.0												
	Jetted down to 122ft. Stiffer soil at 115ft. Very stiff from 121 to 122'														

Prep. By AK

Note:

Excavation similar
for other abutment
and approach.

SECTION I-IEXCAVATION AROUND ABUTMENTS

Scale 1" = 20'-0"