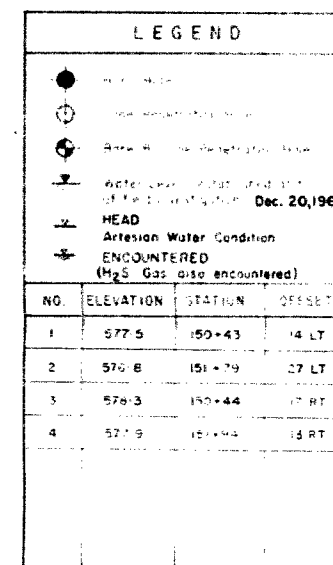
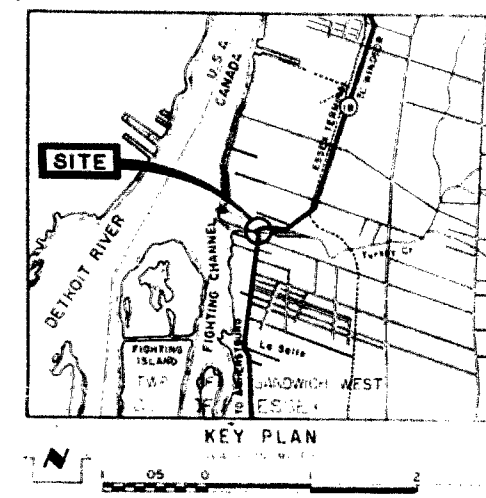
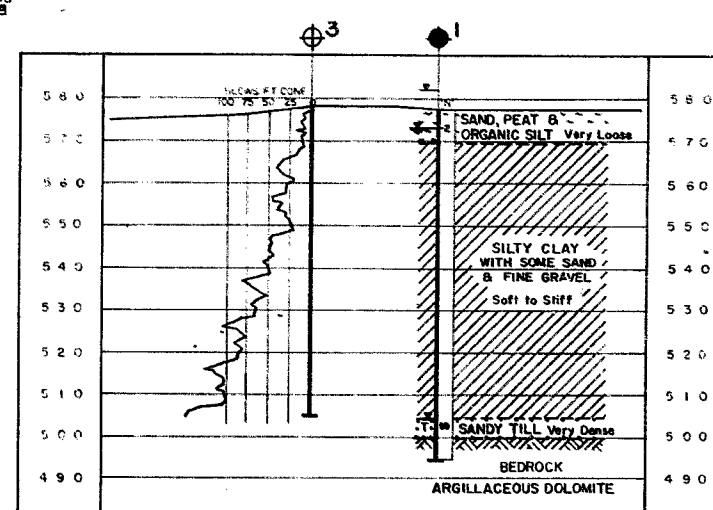


#64-F-212C
W.P. #139-60
HWY #18
TURKEY CREEK



- NOTE -

The boundaries between soil strata have been established only at Bare Hole locations. Between Bare Holes the boundaries are assumed from geological evidence and may be subject to considerable error.



B-B

SECTIONS
SCALE IN FEET
20 10 0 20 40

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

TURKEY CREEK

KING'S HIGHWAY NO. 18 LINE "E" REVISION DIST NO. 1
CO. ESSEX VILLAGE OF LA SALLE
TWP. SANDWICH WEST LOT 35 & 36 CON I

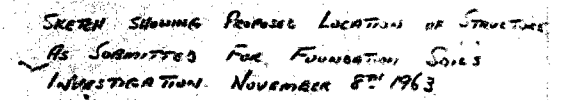
BORE HOLE LOCATIONS & SOIL STRATA

GEOCON LTD

DRAWING NO.

SUBMIT DBO	CHECKED F.J.H.	WP NO - 139 - 60	YEAR 1964
DRAWN A.E.L.	CHECKED DBO	JOB NO	
DATE JANUARY 13, 1964	SITE NO	BRIDGE DRAWING NO.	
APPROVED, <i>Red Creative</i>	CONT NO		

LOT 35 / LOT 36



G.B.M. NPMINOXIX Elev. 57613.4

These are the same four tanks, each of a separate design for military, scientific and civilian use. Each tank of each separate category and its crew and cargo, is fed directly from space and its tank and fuel are used in different ways. All GEMs to be built in a batch.

DATE REVISIONS / ADDITIONS BY: JCH/KD

DEPARTMENT OF HIGHWAYS - ONTARIO
PLANNING & DESIGN BRANCH
SOUTH-WESTERN REGION
DISTRICT NO. 1

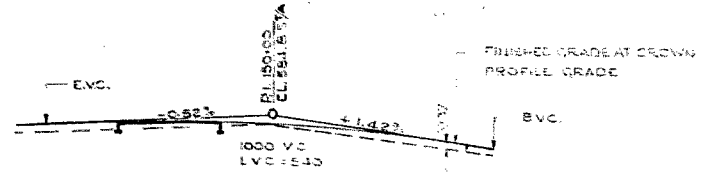
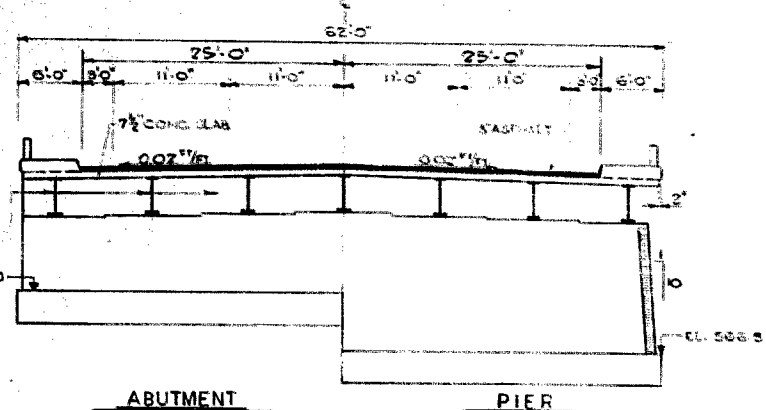
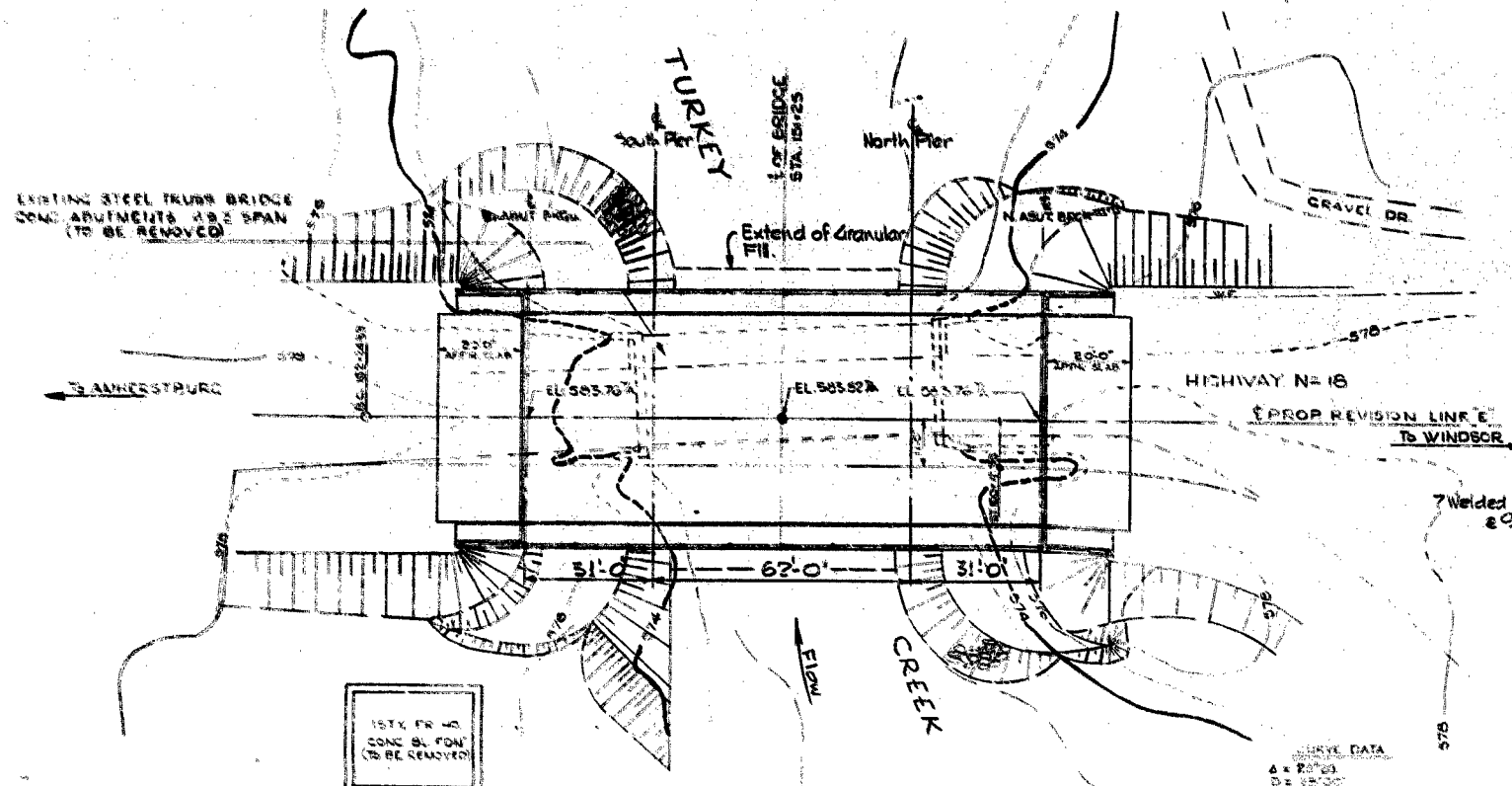
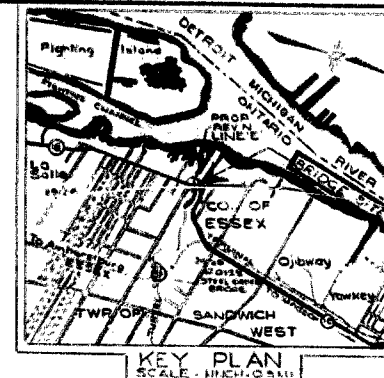
PROPOSED CROSSING
TURKEY CREEK

THE KING'S HWY N.B. PROP. REV. LINE E.
 LOTS 25 & 26 CON.
 TOWNSHIP OF SANDWICH WEST, COUNTY OF ESSEX

BRIDGE SITE

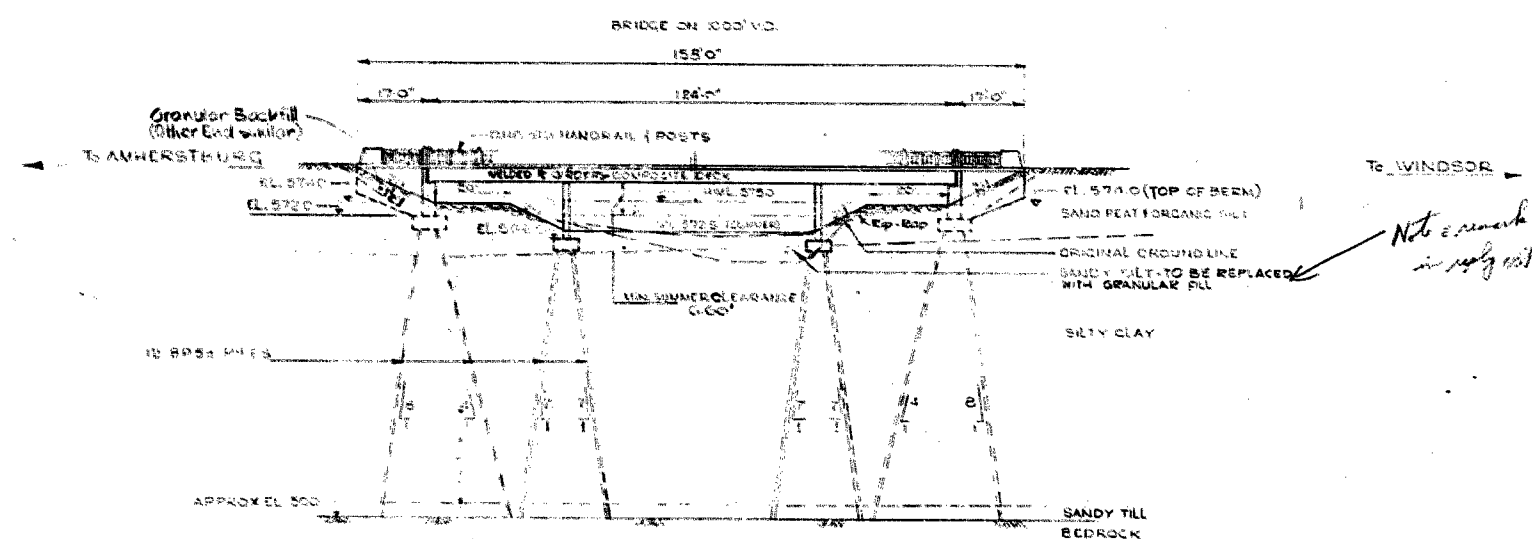
SURV. CHIEF OF PARTY SUPERVISOR	BY M J M LEAN W WINTYR	REMOVED
DRAFTSMAN SUPERVISOR	BY P WILHE SCAMILLERI	SCALE HAS BEEN DATE OF ORDER FOR DATE SUPPLIES
CHECKER SUPERVISOR	BY JACOBSON CAMILLERI	WORKING ON DESIGN CAN E-4300-I

WP 139-60



SPRUE DATA
 Δ = 25° 00'
 D = 35.00'
 R = 100.00'
 T = 30.00'
 L = 20.00'
 TS = 20.00'

SPIRAL CURVE DATA
 Ls = 150'
 Δs = 25° 00'
 LT = 101.95'
 ST = 51.21'



REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

TURKEY CREEK BRIDGE
AT LA SALLE

KING'S HIGHWAY No. 18 DIST. No. 1
CO. ESSEX
TWP. SANDWICH WEST LOT 35 & 36 CON. 1

PRELIMINARY PLAN

APPROVED _____ SITE No. 2-53 W.P. No. 139-60

DESIGN FG. CHECK _____ CONTRACT No. _____
 DRAWING R.J.H. CHECK _____ DRAWING No. D-5312-PC
 DATE AUG 64 LOADING 10/20/66



Reference Plans
 Site Plan E4300-1
 Location Plan 12B119
 Profile C1048-2
 Soil Report BA1575-A

PRINT RECORD	NO.	FOR	DATE

BA 1575A
WP 129-60

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. G. Scott,
Bridge Location Engr.

September 24, 1964

-- Extent of Subexcavation -- 6-59
Turkey Creek, Hwy. 18, Village of La Salle,
Twp. of Sandwich West, Co. of Essex, Lot
35 & 36, Con. I, District 1, Chatham, Ont.

Attached, please find the sketch showing in cross section, the measures that we would suggest be carried out in order to make the proposed bridge stable and safe.

The shaded area on the drawing represents placed fill material. The placement of the part of this material below the present ground line will require excavating and removing the original material. In plan, this excavation should extend under the entire area of the berms and under a small part of the approach embankment. We are presently not aware whether the road design calls for the removal of the peaty material under the rest of the approach embankments.

It is recommended that only the part of the berms and embankments that will be under the water table during construction be built of granular material. The remaining portions can be built of any acceptable fill material using standard compaction equipment and techniques. It is also recommended that the slopes below H.W.L. be protected with rip-rap.

The suggested 1:1 slope at the far ends of the excavations may prove to be too steep and flatter slopes should then be made.

The boundary line between the silty clay and the overlying sand, peat and organic silt may differ from the one shown on the drawing. If and when such deviations are encountered, the depth of excavation should be modified accordingly.

We believe that the bottom of the creek bed can be at elev. 564.5 without endangering the proposed structure.

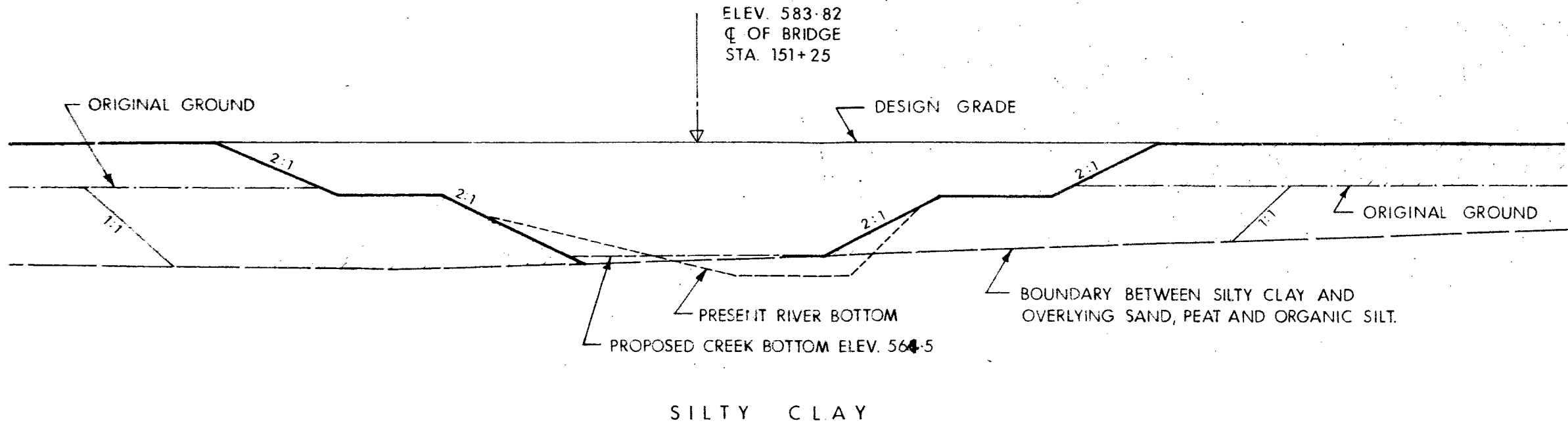
Should any additional explanations be required, please feel free to contact our Office.

AGS/MdeF
Attach.

cc: Foundations Office
Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

TURKEY CREEK



NOTE:

THIS DRAWING TO BE INTERPRETED IN CONJUNCTION
WITH DRAWING D-5318-P2

HIGHWAY NO. 18
TURKEY CREEK BRIDGE
AT LA SALLE

BA
6-59
BA1575A

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

FROM: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. G. Scott

DATE: September 22, 1964

OUR FILE REF.

IN REPLY TO Your Memo - Sept. 21/64

SUBJECT:

W.P. 139-60,
Bridge Site 6-59,
Turkey Creek Bridge,
Hwy. 18 - Dist. 1.

We have reviewed the Preliminary Plan D-5318-P2 for the above-mentioned structure and herewith, submit our comments for your consideration:

In the report dealing with the soil conditions, the Consultant, Geocon, Ltd., has recommended that the layer of organic silt, sand and peat be excavated and replaced with granular material. It was also suggested that the extent of this layer be checked with additional hand or power auger holes so that the limits of the material removal and replacement could be more precisely determined. As far as we are aware of, this has not been done.

It is therefore our recommendation that this be done as soon as possible. The fact that the exact location and bridge length are known, will pinpoint the area to be investigated quite precisely. We feel that this work could be best carried out by the Regional forces.

Once this information becomes available, an accurate plan can be prepared showing the boundaries and details of the excavation.

AGS/MdeF

cc: Mr. J. Roy

Foundations Office
Gen. Files

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

Materials and Research Division

December 13, 1963

Geoson, Limited,
Consulting Engineers,
14 Hans Road,
Bramale, Ontario.

Attention: Mr. F. Heffernan

Re: W.P. 139-60, Hwy. 18, Turkey Creek,
District #1, Chatham, Ontario.

Dear Sir:

Please consider this your authority to carry out a foundation investigation at the above site. Plans and profiles were provided to your representative on December 11, 1963.

It is understood that a qualified Soils Engineer will be in charge of the field work at all times.

Ten copies of the completed foundation report with one additional copy of each subsoil profile, should be submitted to the Foundation Section prior to January 22, 1964. Previous requirements as to preliminary borehole information and laboratory testing program, should be followed.

Because the drawing accompanying the foundation report, showing the location of borings, the inferred subsoil conditions, etc., is to become one of the contract drawings, you are requested to prepare it in accordance with the D.H.C. standards. To enable you to do this, we are supplying you with a sample drawing with all the necessary explanations, together with a linen sheet for your drawing. You are also requested to provide the D.H.C. with a Cronaflex copy of the drawing.

Charges for the work performed will be in accordance with your Schedule of Rates, dated February 17, 1959, and invoice to be addressed to the attention of the undersigned.

cc: Messrs. S. McCombie
A. Gater

G. U. Howell

J. Roy

N.D. Smith(2)

Mrs. T. Tate

Foundations Office
Gen. Files

Yours very truly,

cel

A. Dutka

MATERIALS & RESEARCH ENGINEER

NDS/wief

Mr. A. M. Teye,
Bridge Engineer,
Bridge Division.

Mr. A. G. Sternac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.

attention: Mr. J. McConchie

January 31, 1964

FOUNDATION INVESTIGATION REPORT BY:
Geocon, Limited, Consulting Engineers.
Proposed Turkey Creek Bridge, Hwy. 18,
La Salle, Ontario, District No. 1.
W.P. 139-60.

Attached, we are forwarding to you the above-mentioned report submitted by the Consultant, Geocon, Ltd. of Toronto.

We have reviewed the report and have found the factual data well presented and adequately analyzed. We are also in agreement with the conclusions and recommendations contained in the report.

Your attention is drawn to the fact that on the crenaflex copy of the Drawing T-7569-1, the initially planned grade elevation of 535.7 is shown. The Consultant has, in his report, recommended that this elevation be lowered by 2.5 feet and if this elevation is finally adopted, the necessary corrections on the drawing should also be made.

We believe that enough information is provided for your future work. Should there, however, be any additional problems that you would like to have analyzed or discussed, please feel free to call on our office.

A.G./WLF
attach.

cc: Messrs. A. M. Teye (2)
H. A. Tregaskes
E. C. McMillan
A. Gater
G. U. Howell
J. Joy
A. Watt

Foundations Office ✓
Gen. Files

A. G. Sternac
A. G. Sternac,
PRINCIPAL FOUNDATION ENGINEER

GEOCON LTD

HEAD OFFICE

420 MICHEL JASMIN, DORVAL, QUEBEC

TELEPHONE 631-9827

DISTRICT OFFICES

14 HAAS ROAD
REXDALE, TORONTO, ONT.
TEL. 244-6476

1425 WEST PENDER ST.
VANCOUVER 5, B.C.
TEL. MU. 1-8926

January 30, 1964.

Attention: Mr. A.G. Stermac, P.Eng.

The attached cronaflex copy of Drawing T-7569-1 shows the proposed grade at the abutments to be at elevation 585.7 as initially planned. It is our recommendation that this should be reduced by 2.5 feet as discussed in the report and that the Drawing should be corrected after final approval by the Department of Highways, Ontario.

D.B. Oates

D.B. Oates.

Note:

Stability problem away from
crossing?

Check thickness of organic layer
by auger holes.

If conditions comparable to
those at investigated locations
— no problem

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundations Engineer,
Room 107, Lab. Bldg.,
DOWNSVIEW.

FROM: Gavin Scott

DATE: November 8, 1963.

OUR FILE REF.

IN REPLY TO

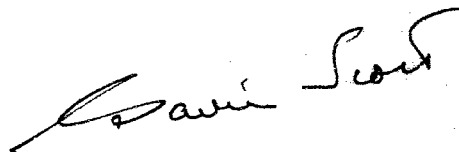
SUBJECT: Bridge Site #6-59 - W.P. #139-60
Turkey Creek Bridge, Line "E"
Hwy. #18 - District #1

Attached herewith please find 2 prints of site plan E 4300-1 showing the proposed location of the above structure.

Line "E" is located some 50 feet downstream from a previous line "D" for which report Job No. 62F-133 has already been issued.

May we have your views as to whether you consider it necessary to proceed with additional borings for this site, also as to when we might expect your recommendations regarding Foundation conditions for Line "E".

Please note the profile grade as shown (586 at centre of bridge and 585.7 at the proposed abutments) could possibly be reduced by some 2.5 feet, if this is of any significance please comment.



Gavin Scott,
Bridge Location Engineer

GS/bm

c.c. S. McCombie
N. D. Smith
R. Fitzgibbon

GEOCON LTD

HEAD OFFICE

420 MICHEL JASMIN, DORVAL, QUEBEC
TELEPHONE 631-9827

Rexdale, Ontario.
January 28th, 1964.

DISTRICT OFFICES

14 HAAS ROAD
REXDALE, TORONTO, ONT.
TEL. 244-6476

1425 WEST PENDER ST.
VANCOUVER 5, B.C.
TEL. MU. 1-8926

Department of Highways, Ontario.
Materials and Research Division,
Downsview, Ontario.

W.P. 139-60

Attention: Mr. A. G. Stermac, P. Eng.,
Principal Foundation Engineer.

Re: Soil Conditions and Foundations,
Proposed Turkey Creek Bridge,
La Salle, Ontario.

Dear Sirs:

This letter accompanies our detailed report on the above soil investigation.

We find that the area investigated is covered by up to 12 feet of very loose sand, peat and organic silt followed by an average thickness of 63 feet of soft to firm silty clay then sandy till followed by bedrock.

The strength of the clay which is the significant soil stratum at the site is not sufficiently high or consistent across the site to permit the use of spread footings and it is recommended that the latter be carried on end bearing piles as discussed in the report. From stability considerations it is recommended that the sand, peat and organic silt stratum be removed from beneath the approach fills and that berms be provided at the ends of the embankments to the dimensions given in the report.

We believe that our report contains the information required from this investigation. We are at your disposal should you require further information or wish to discuss any aspect of this report.

Yours very truly,

GEOCON LTD

M. A. J. Matich for J.M.
M. A. J. Matich, P. Eng.,
Vice-President and Chief Engineer.

MAJM/reb
T7569
Enc.

ST. JOHN'S

HALIFAX

MONTREAL

TORONTO

VANCOUVER

T7569
REPORT
TO
DEPARTMENT OF HIGHWAYS, ONTARIO
ON
SOIL CONDITIONS AND FOUNDATIONS
PROPOSED TURKEY CREEK BRIDGE
LA SALLE ONTARIO

W.P. 139-60

Distribution:

- 14 copies - Department of Highways, Ontario,
Downsview, Ontario.
- 3 copies - Geocon Ltd,
Rexdale, Ontario.

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I N D E X

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INTRODUCTION

Geocon Ltd has been retained by the Department of Highways, Ontario by letter dated December 13th, 1963 to carry out a soil investigation at the site of the proposed Turkey Creek bridge. Previous investigations have been carried out for the proposed bridge in the area located east of the existing single-span structure. This investigation was carried out along the proposed Line "E" which is located on the line of the existing structure.

The purpose of the investigation was to determine the soil conditions along the proposed line "E" as required for the foundation design of the proposed structure.

SUMMARIZED SOIL CONDITIONS

The overburden at the site consists of up to 12 feet of sand, peat and organic silt. This stratum is generally of very loose relative density and is underlain by an extensive deposit of soft to firm silty clay. The silty clay has an average thickness of 63 feet. Underlying the silty clay and overlying directly the bedrock surface is about 5 feet of very dense sandy till. The upper surface of the till is at about elevation 504.

DISCUSSION

General

It is understood that it is proposed to construct a new bridge to carry Highway 18 over Turkey Creek and that the proposed alignment, Line "E", is at the approximate location of the existing single-span structure. It is further understood that the proposed bridge will be a three-

DISCUSSION (continued)

2.

General (continued)

span structure with four lanes. The proposed profile grade at the bridge crossing is elevation 586.0 at the centre of the bridge and 585.7 at the abutments. It is understood that this profile grade could be reduced by some 2.5 feet.

The results of this investigation indicate that the soil conditions along the proposed Line "E" are similar to those encountered by the Department of Highways in their investigation of Line "D" during December 1962.

The shear strength profile obtained in borehole 2 indicates that the consistency of the clay is soft to firm and that no significant desiccated crust exists at this location. Similar strength profiles were encountered in some of the previous boreholes put down at adjoining sites by the Department of Highways, Ontario.

Bridge Foundations

The desiccated crust of the clay as encountered at borehole 1 does not persist across the site and therefore the crust is not considered significant from a foundation viewpoint. In view of the generally low shear strength of the clay, and its compressibility, the site is therefore not considered suitable for the use of spread footings.

It is recommended that the bridge be founded on end-bearing piles driven to refusal in the very dense till, or bedrock. Depending on the pile type chosen, refusal

Bridge Foundations (continued)

would occur either on the surface of bedrock or within the sandy till stratum between elevations 504 and 499. A variety of pile types would be suitable. However, in view of the pile length involved, the most suitable type would probably be a non-displacement pile such as a steel H pile.

All pile caps should be protected by at least 4 feet of earth cover for frost protection purposes.

In the design of the piles the lateral earth pressures from the embankment should be taken into account. This could probably be best be accommodated at the abutments by the provision of batter piles. Since some consolidation of the clay around the abutment piles will occur under the weight of the embankment, negative skin friction should also be allowed.

It is recommended, as good practice, that a representative pile be driven and test loaded.

Approach Embankments

It is understood that the proposed grade at the abutments as presently planned, is 585.7 but that this could be reduced by 2.5 feet if necessary. This would therefore involve embankment heights of up to 10 feet above present ground level. The immediate foundation stratum is the very loose to loose sand, peat and organic silt. As such this material is not a suitable foundation because of its high and irregular compressibility and low

Approach Embankments (continued)

natural shear strength. Special measures are therefore required and because of the limited thickness of the stratum, 12 feet or less, experience indicates that the most economical approach would be to remove the organic material down to the clay stratum for the full width of the embankments. Because of the reinforcing affect of the sand layers within the sand, peat and organic silt stratum it is not considered feasible to remove the material by displacement concurrently with construction of the embankments, even with prior blasting of the peat. It is believed that removal by excavation would be required.

Calculations have been carried out to determine the stability of the embankments having a profile grade of 585.7 and standard slopes of 1 vertical to 2 horizontal. In the calculations, the base of the embankments have been taken as 565. The calculations using the design line on Figure 1 in Appendix II indicate that the factor of safety of the side slopes against base failure is less than the desirable minimum value of 1.3. It is recommended therefore that the profile elevation be reduced by 2.5 feet to elevation 583.2. The stability of the side slopes of the embankments is then satisfactory provided the contours of the existing ground surface within the limits of the excavated area required for removal of the compressible organic material, is restored. It is recommended that inorganic backfill be used and that the elevation of ground level immediately adjacent to the embankment cross-section should not be lower than 574. The factor of safety against base failure would then be in excess of 1.3.

Approach Embankments (continued)

Calculations investigating the stability of the front slopes of the approach embankments indicate that a berm must be provided to provide a factor of safety of 1.3 against base failure. The berm should be constructed of select fill material and have a top elevation of 574 and a top width of 20 feet. The front slopes of the embankment and of the berm would be 1 vertical to 2 horizontal. This berm size however, using the proposed dimensions of the bridge would restrict the creek and from a meeting held at the offices of the Department of Highways, Ontario on January 23rd, 1964 it is understood that this restriction would not be acceptable from an hydrology point of view. It was agreed therefore that to satisfy the hydrology of the area the bridge should be widened by 20 feet. This would necessitate widening the centre span or the two outer spans; however, in either event the result would be a relocation of each abutment by 10 feet.

Construction of the approach fills and berms will probably need to be carried out by end dumping select fill to a foot or two above ground level after removal of the organic surface stratum and then compacting in the case of the approaches the remainder of the fill to grade. However, it is very likely that the excavation can be dewatered by providing a cut-off at the river bank and pumping, thus enabling the embankment and berms to be compacted for the full height. It is recommended that the approach embankment and the berms be constructed simultaneously.

Approach Embankments (continued)

The berms at the ends of the approach embankments will probably be constructed in advance of the piers. If construction of the latter should involve temporary removal of some of the berm, such removal should be accompanied by simultaneous removal of the equivalent weight from the top of the embankment at the end.

Computations based on the consolidation characteristics of similar clays in the area indicate that the maximum total settlement beneath the embankment will be about 6 inches. It is estimated that about 50 percent of the consolidation will take place during the first year. It is suggested therefore, that final paving of the road be delayed for one year after construction.

The slopes of the embankment and berm together with the adjacent creek banks should be protected from erosion by providing rip-rap up to high water level. Since the elevation of high water level is higher than the berm, rip-rap should also be provided to prevent erosion of the top of the berm.

The computations mentioned above show that the approach embankments with a maximum elevation of 583.2 have adequate factor of safety against failure of the side slopes provided that all of the organic material removed is replaced with suitable fill up to original ground level concurrently with raising of the embankment. The investigation however has only covered the area in the immediate vicinity of the bridge. It is recommended that the alignment of the approach embankments be further investigated

DISCUSSION (continued)

7.

Approach Embankments (continued)

by a series of augerholes to establish the depth of the organic stratum elsewhere. This data could then be examined together with the ground and embankment profiles to determine whether less favourable stability conditions exist in the areas not thus far investigated.

CONCLUSIONS AND RECOMMENDATIONS

- 1) The site is covered by up to 12 feet of very loose sand, peat and organic silt. This organic stratum is underlain by an average thickness of 63 feet of soft to firm silty clay, about 5 feet of very dense sandy till then bedrock.
- 2) The ground water table was observed between elevations 572 and 573. An artesian condition exists within the till and bedrock. The artesian water level ranged between elevations 582 and 583.
- 3) It is recommended that the bridge be carried on end bearing piles as discussed in the report.
- 4) It is recommended that for stability reasons, berms be provided at the ends of the approach embankments, as discussed. This will necessitate lengthening the bridge by about 20 feet beyond its presently proposed length.
- 5) It is recommended that the extent of the organic stratum along the alignments of the approach embankments be further investigated as discussed in the report.

PERSONNEL

8.

The field work for this investigation was carried out under the supervision of Mr. D. B. Oates. This report was written by Mr. D. B. Oates, checked by Mr. F. J. Hefferman and reviewed by Mr. M. A. J. Matich.

DBO/reb
T7569

D. B. Oates.

D. B. Oates, P. Eng.,
Senior Soils Engineer.



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APPENDIX I

PROCEDURE

SITE AND GEOLOGY

SOIL CONDITIONS

WATER CONDITIONS

OFFICE REPORTS ON SOIL EXPLORATION

GEOCON

PROCEDURE

The field work was carried out between December 16th and 22nd, 1963. Two boreholes and two dynamic penetration tests were put down using a mobile power auger. Two inch Shelby tube samples were taken in the silty clay stratum together with in-situ vane shear tests in the upper 20 feet of the clay stratum in borehole 2.

Detailed logs of the boreholes are presented on the Office Reports on Soil Exploration in this Appendix. The locations of the boreholes together with the inferred soil stratigraphy are shown on Drawing T7569-1 located in the pocket at the rear of the report.

The laboratory testing of soil samples was carried out in the Soil Mechanics Laboratory of Geocon Ltd in Toronto. The results are plotted on the Office Reports in this Appendix. The samples remaining after testing will be stored until August 1st, 1964, at which time you will be contacted for instructions regarding their disposal.

All elevations given in this report are referred to Geodetic datum. The bench mark used is No. MMMDXLIX and has an elevation of 576.321. The location of this bench mark is described on the Department of Highways, Ontario, Drawing E-4300-1.

SITE AND GEOLOGY

The bridge site investigated is located at the crossing of Turkey Creek by Highway 18 in La Salle, Ontario. The soil conditions were investigated on the proposed Revision Line "E" which approximates to the location of the existing two lane bridge. The ground level in the

GEOCON

SITE AND GEOLOGY (continued)

II

general area is generally at about elevation 576 and about 4 feet above creek level.

Geological information and previous work in the area indicates that the site is situated in the St. Clair Clay Plains. The overburden consists of alluvial deposits having high organic content overlying an extensive deposit of glacial lake clay. The clay is underlain by a thin stratum of glacial till which mantles the bedrock. The bedrock, which is known to be relatively flat lying, is argillaceous dolomite.

SOIL CONDITIONS

The principal soil strata encountered in this investigation are as follows:

Topsoil

The general area of the site, adjacent to Highway 18, is covered by a thin layer of topsoil.

Very Loose to Loose Dark Brown Sand, Peat and Organic Silt

Underlying the topsoil is a stratum containing principally sand, peat and organic silt. The thickness of this stratum in the boreholes was 8 and 12 feet. In borehole 2 the upper 4 feet was composed mainly of sand with only a trace of organic material; the remaining 8 feet being composed mainly of organic silt with some peat and wood. Underlying the topsoil at the location of borehole 1 this stratum was found to be composed of sands and silts with a high organic content. In both cases this stratum was penetrated by augering without the use of casing. This stratum is believed to vary however in composition over the general site area.

GEOCON

Very Loose to Loose Dark Brown Sand, Peat and
Organic Silt (continued)

Standard penetration tests in this stratum gave "N" values of 2, 4 and 5 indicating that the relative density of the silt ranges from very loose to loose.

Soft to Firm Grey Brown to Grey Silty Clay

A stratum of grey brown to grey silty clay was encountered underlying the organic silt stratum. The thickness of this stratum, as encountered in the boreholes, ranged from 60 to 66 feet. Visual inspection of the samples recovered indicates that the silty clay contains some sand and gravel. The sand and gravel content is more predominant below approximate elevation 555 than in the upper 10 to 15 feet. This change within the stratum is further indicated by the results of the Atterberg limit tests and unit weight determinations described below.

Atterberg limit tests were carried out on a series of samples from borehole 2 and the results plotted on the Office Reports in this Appendix. The results indicate that with the exception of the sample tested from the upper surface of the stratum and which had high plasticity, the stratum is composed of clay of medium plasticity with average values of liquid and plastic limits of 34 and 17 respectively. The corresponding average natural moisture content is 27 percent.

A series of wet unit weight determinations gave values ranging from 113 to 131 pounds per cubic foot with an average value of 120 pounds per cubic foot above elevation 555. Below elevation 555 the values ranged from 130

Soft to Firm Grey Brown to Grey Silty Clay (continued)

to 144 with an average value of 136 pounds per cubic foot.

The in-situ shear strength, within the upper 20 feet of this stratum at borehole 2 range from about 300 pounds per square foot to a maximum of about 700 pounds per square foot. This maximum value was obtained five feet below the surface of the stratum.

A series of undrained triaxial compression tests were carried out to obtain a shear strength profile throughout the full depth of this stratum. The results are plotted on the Office Reports in this Appendix. The results are also shown on Figure 1 of Appendix II together with the vane test results and the field and laboratory results obtained by the Department of Highways, Ontario in their investigation of the adjacent site. The results indicate that significant desiccation does not persist across the entire site. At borehole 2 the desiccation is not very pronounced and occurs only to a shallow depth. The average shear strength throughout the depth of the stratum measured at this location is about 360 pounds per square foot. The results at borehole 1 indicate the presence of a thin desiccated crust having a maximum measured shear strength of about 1900 pounds per square foot.

Very Dense Grey Sandy Till

Underlying the silty clay stratum and overlying the bedrock directly is a stratum of grey sandy till. The upper surface of this stratum, in the boreholes, was at about elevation 504. The thickness of the till ranged from 4 to 5 feet.

SOIL CONDITIONS (continued)

V

Very Dense Grey Sandy Till (continued)

A standard penetration test carried out in this stratum gave an "N" value of 89 blows per foot indicating that the relative density is very dense.

Bedrock

The bedrock was cored in AXT size for depths of 6 and 6.5 feet. Previous work in the immediate area had shown that the bedrock was flat lying and ranged between elevations 495 and 498. The two boreholes put down in this investigation encountered the surface of bedrock at about elevation 499. The bedrock is thinly bedded argillaceous dolomite and the core recovery was relatively high.

WATER CONDITIONS

The water level, taken in the open boreholes and within the organic surface layer was observed between elevations 572 and 573. An artesian condition exists in the till and bedrock. The flow resulting from the artesian pressure was more predominant after penetrating the bedrock. The artesian water level was at about elevation 852 in borehole 1 and at about elevation 583 in borehole 2. A piezometer was installed in borehole 1. Subsequent readings in the piezometer indicated the water level to be at elevation 578.3 or 9 inches above ground level. It is believed however, that this observation was affected by the artesian pressure in the till and bedrock due to a partial failure in the bentonite seal below the piezometer.

Hydrogen sulphide gas was encountered within the till and bedrock.

EXPLANATION OF THE FORM "OFFICE REPORT ON SOIL EXPLORATION"

The object of this form is to enable a comprehensive study of the soil to be made by combining on one sheet all of the information obtained from the boring. An explanation of the various columns of the report follows.

ELEVATION AND DEPTH

This column gives the elevation and depth of boundaries between the various soil strata. The elevation is referred to the datum shown in the general heading.

WATER CONDITIONS

In this column the water level in the casing at the time of boring or the water table in the ground, determined by a series of observations in a piezometer or standpipe, is indicated to scale by a horizontal line with the symbol W.L. or W.T. above the line. A notation of any complicated groundwater conditions will be made in this column.

DESCRIPTION

A description of the soil, using standard terminology, is contained in this column. The consistency of cohesive soils and the relative density of non-cohesive soils are described by the following terms:

<u>Consistency</u>	<u>U-Strength Tons/sq. ft.</u>	<u>Relative Density</u>	<u>Standard Penetration Resistance, Blows/ft.</u>
Very soft	0.03 to 0.25	Very loose	0 to 4
Soft	0.25 to 0.5	Loose	4 to 10
Firm	0.5 to 1.0	Compact	10 to 30
Stiff	1.0 to 2.0	Dense	30 to 50
Very stiff	2.0 to 4.0	Very dense	over 50
Hard	over 4.0		

STRATIGRAPHIC PLOT

The stratigraphic plot follows the standard symbols of the National Research Council, Canada.

ELEVATION SCALE

The information in all columns is plotted to a true elevation scale which is shown in this column.

GRAPHS

The main body of the report forms a graph which is used to plot to correct elevation the important soil properties which are obtained through field and laboratory tests. The scales and symbols for the plotting are shown at the head of the column.

OTHER TESTS

In this column are shown, by symbol, the other field or laboratory tests which have been performed on the soil and for which the results have not been plotted on the above graph.

SAMPLES

The first three columns describe the condition, type and number of each sample obtained from the boring. The location and extent of each sample is plotted to scale.

In the last column is shown the penetration resistance in blows of 4200 inch-pounds required to drive one foot of the sampler into the ground. When a 2 inch Drive Sampler is used the result obtained is termed the "Standard Penetration Resistance".

GEOCON

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T7569 BORING # 1 DATUM GEODETIC CASING
 BORING DATE DEC-16-18, 1963 REPORT DATE DEC. 23, 1963 COMPILED BY AEL. CHECKED BY DSO
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

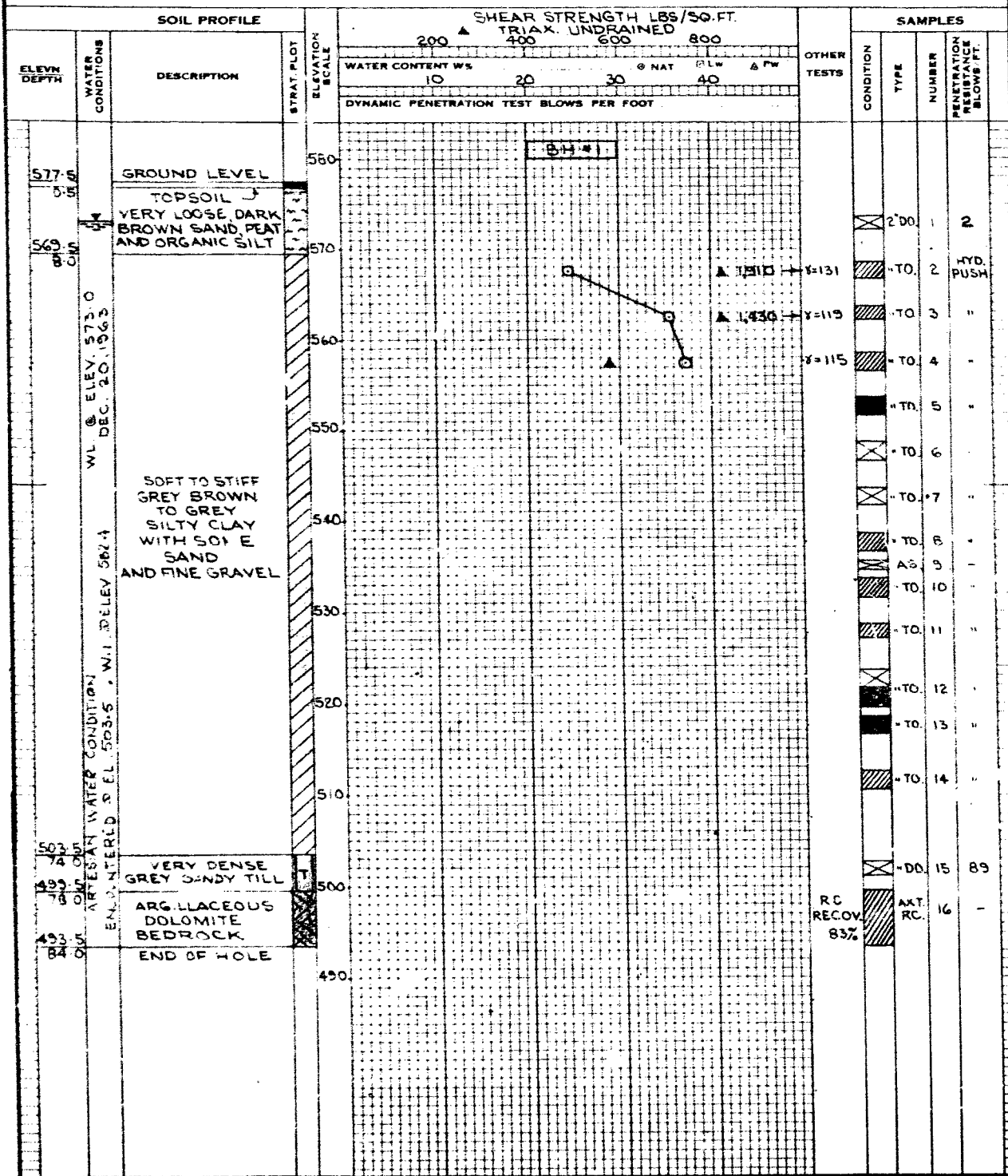
[] DISTURBED
 [] FAIR
 [] GOOD
 [] LOST

SAMPLE TYPES

A.S. AUGER SAMPLE
 S.T. SLOTTED TUBE
 W.S. WASHED SAMPLE
 D.O. DRIVE-OPEN
 D.F. DRIVE-FOOT VALVE
 C.S. CHUNK SAMPLE
 F.S. FOIL SAMPLE
 S.O. SLEEVE-OPEN
 S.F. SLEEVE-FOOT VALVE
 T.O. THIN WALLED OPEN
 R.C. ROCK CORE

ABBREVIATIONS

V. IN-SITU VANE TEST
 M. MECHANICAL ANALYSIS
 U. UNCONFINED COMPRESSION
 OC. TRIAXIAL CONSOLIDATED UNDRAINED
 Q. TRIAXIAL UNDRAINED
 S. TRIAXIAL DRAINED
 J. WET UNIT WEIGHT
 K. PERMEABILITY
 C. CONSOLIDATION
 WL. WATER LEVEL IN CASING
 WT. WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 77563 BORING # 2 DATUM GEODETIC CASING
 BORING DATE DEC. 20, 1963 REPORT DATE DEC. 23, 1963 COMPILED BY AEL CHECKED BY D.B.G.
 SAMPLER HAMMER WT 140 LBS DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN. LBS. ENERGY)

SAMPLE CONDITION



AS - AUGER SAMPLE
 ST - SLOTTED TUBE
 WS - WASHED SAMPLE
 DO - DRIVE-OPEN
 DF - DRIVE-FOOT VALVE
 CS - CHUNK SAMPLE

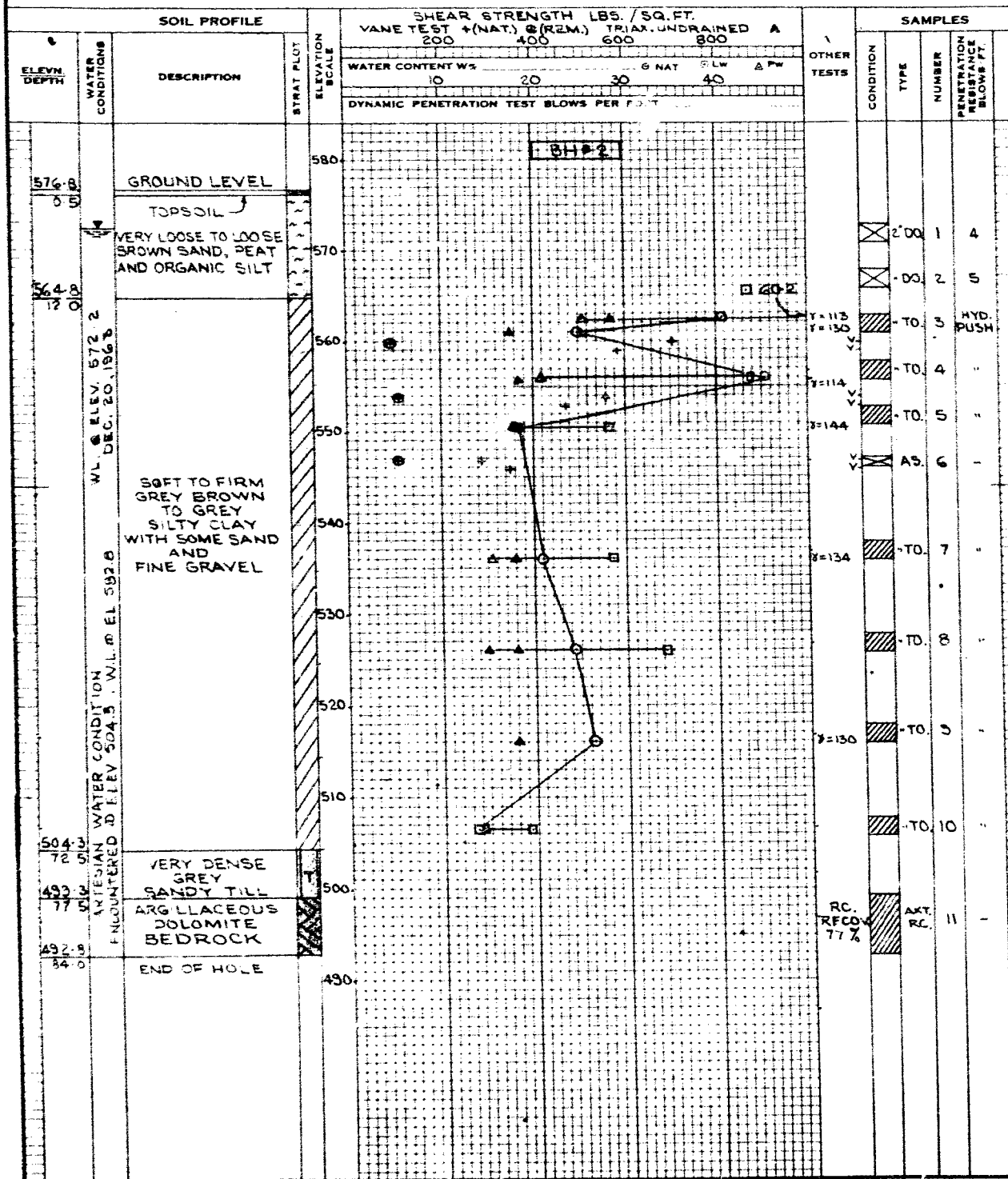
SAMPLE TYPES

FS - FOIL SAMPLE
 SO - SLEEVE-OPEN
 SF - SLEEVE-FOOT VALVE
 TO - THIN WALLED OPEN
 RC - ROCK CORE

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED UNDRAINED
 O - TRIAXIAL UNDRAINED
 F - TRIAXIAL DRAINED

ABBREVIATIONS

γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT T7569 PEN. TEST 3 DATUM GEODETIC CASING
 BORING DATE DEC. 19, 1963 REPORT DATE DEC. 23, 1963 COMPILED BY AEL CHECKED BY JBO
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

☐ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

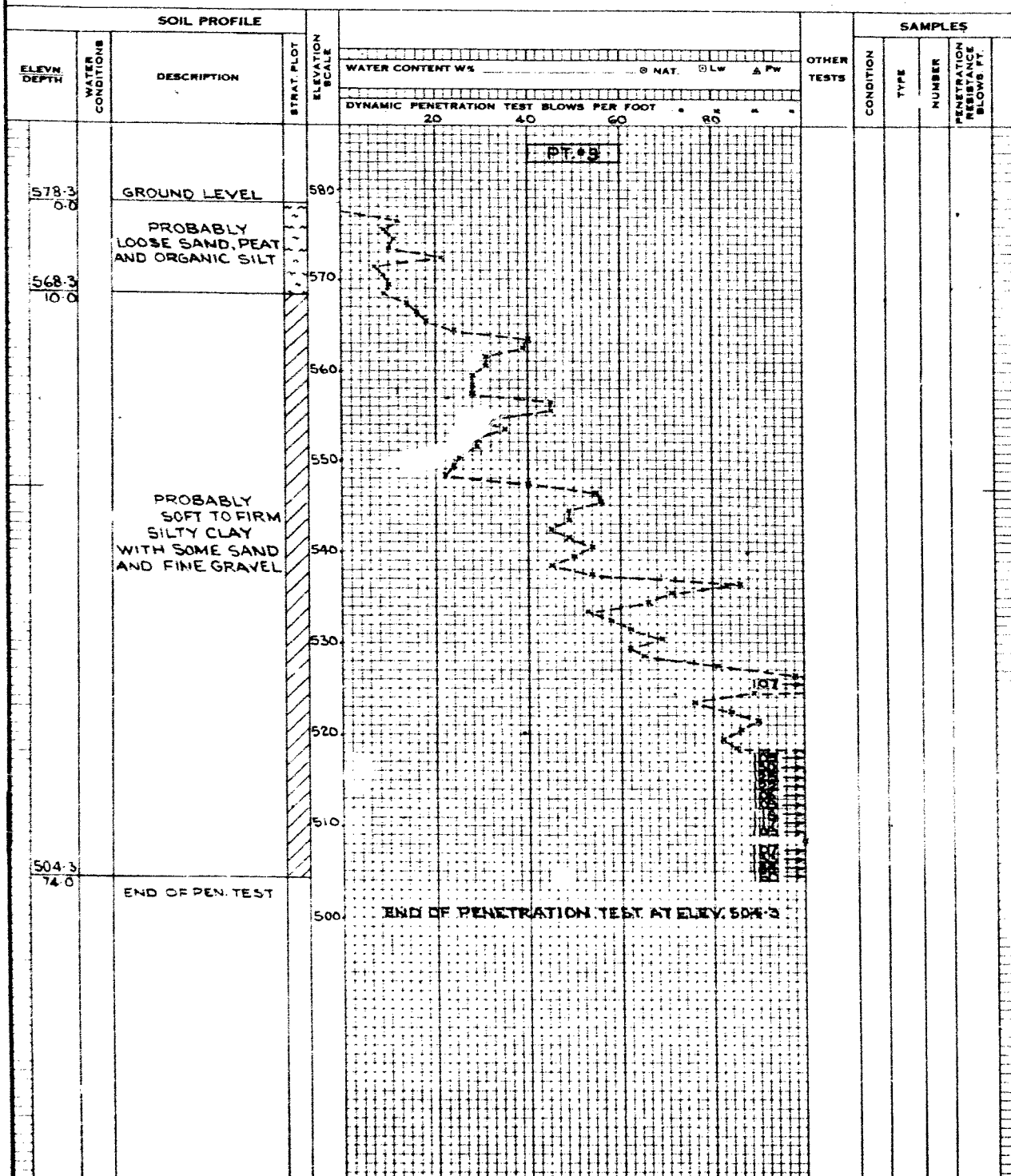
SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED UNDRAINED
 Q - TRIAXIAL UNDRAINED
 S - TRIAXIAL DRAINED
 γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 77569 PEN TEST 4 DATUM GEODETIC CASING -
 BORING DATE DEC. 20, 1963 REPORT DATE DEC. 23, 1963 COMPILED BY AEL. CHECKED BY DBO
 SAMPLER HAMMER WT 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION

☐ DISTURBED
☐ FAIR
☐ GOOD
☐ LOST

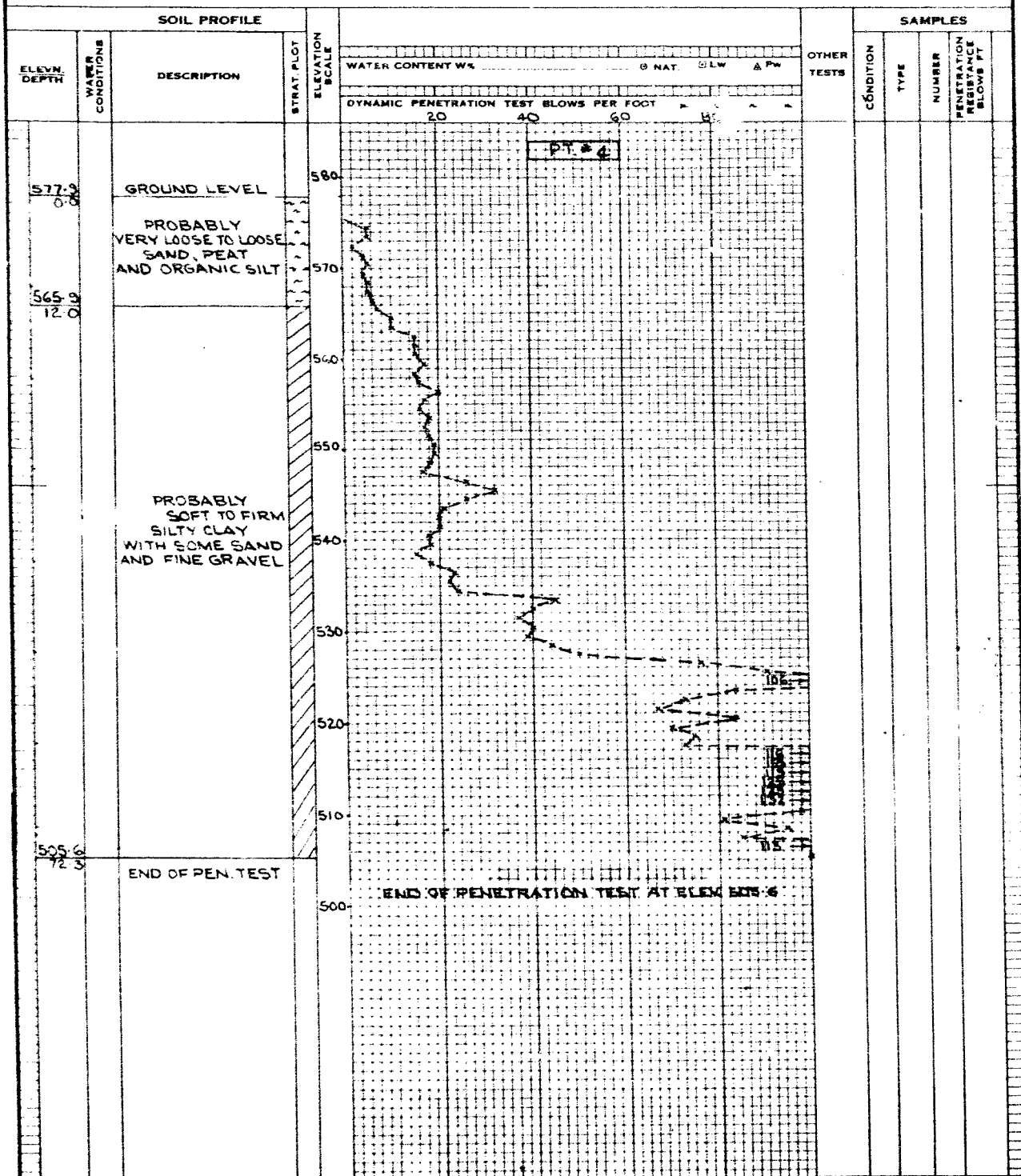
SAMPLE TYPES

A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 DC - TRIAXIAL CONSOLIDATED UNDRAINED
 Q - TRIAXIAL UNDRAINED
 S - TRIAXIAL DRAINED
 T - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



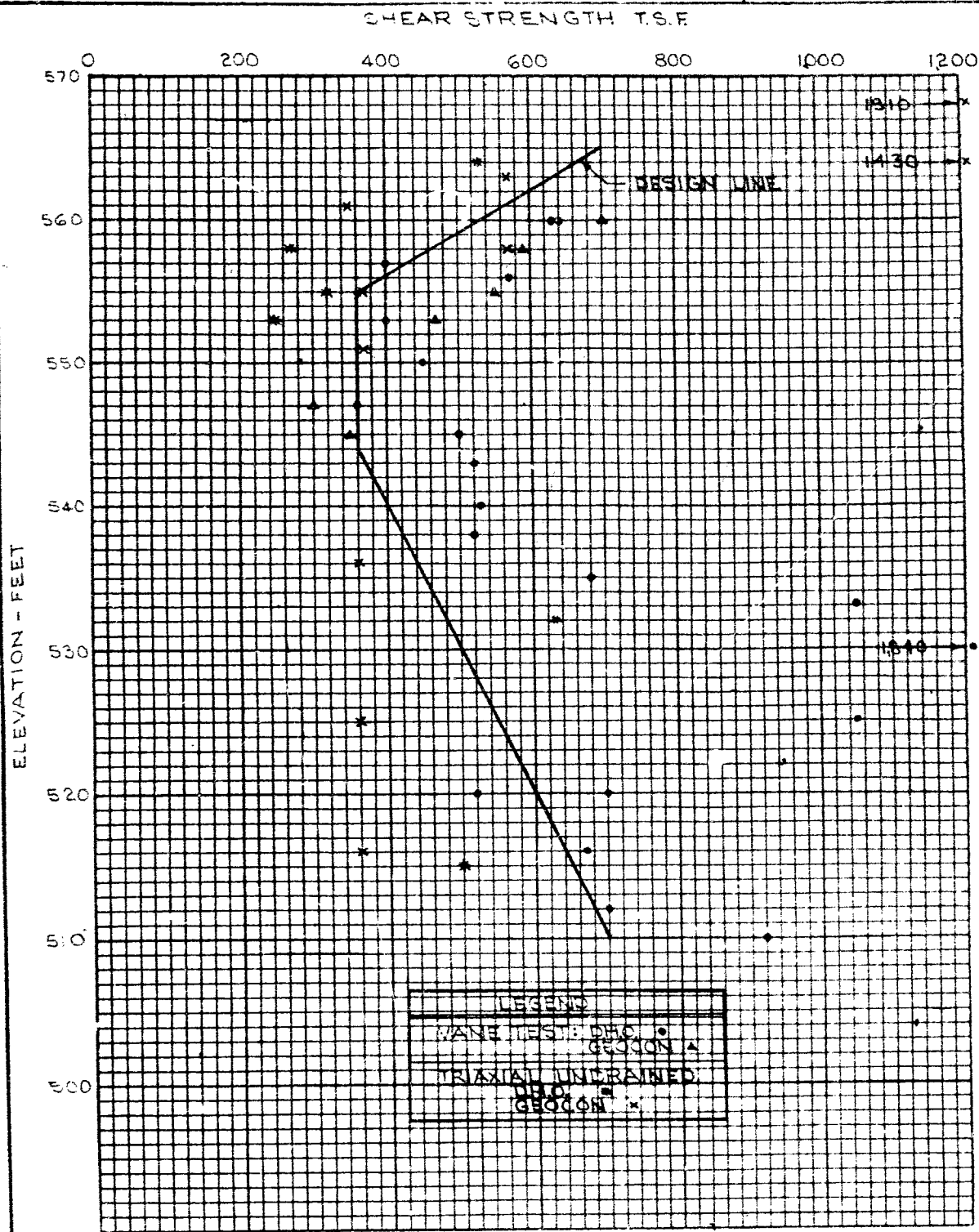
APPENDIX II

Figures - Laboratory Testing

GEOCON

SHEAR STRENGTH vs. ELEVATION

APPENDIX II
FIGURE 1
PROJECT T7569



GEOCON

Mr. G. Scott,
Bridge Office,
Downsview.

District 1, Chatham

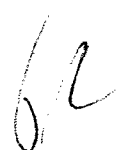
September 18, 1964

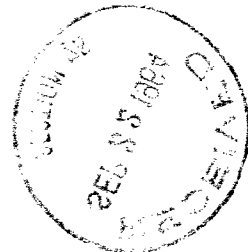
W.P. #139-60, Bridge Site #6-59, Turkey Creek at La Salle,
----- Highway #18, District #1 -----

Thank you for your memo of September 18.

The district do not desire to raise this matter again in view of the urgency of getting on with this job. It was felt at the time that an investigation of the costs of these various schemes should be investigated. This having been done we are satisfied that the proposed line should be proceeded with.

As already mentioned to you, the district feel it desirable that our proposals should be discussed with the township and that their approval of the proposed scheme should be obtained as soon as possible.


P. H. Peacock,
for
F. C. Brown,
District Engineer.



PHF:sm

cc Mr. S. Mc Combie, Bridge Planning, Downsview
Mr. A. Stermac, Foundations, Downsview ✓
Mr. A. Gater, Design, London Region
Mr. S.M. Kinnear, Planning, London Region

59
Mr. F. C. Brown,
District Engineer,
Chatham.

Bridge Office

att: Mr. F. H. Peacock

September 18, 1964

W.P. #139-60, Bridge Site #6-59, Turkey Creek at La Salle,
----- Highway #18. District #1 -----

We regret the delay in replying to your teletype, also your letter of September 10th; however, we have recently been processing several projects which, together with this one, are on an urgent schedule for design.

The following reappraised structure cost estimates allow for the presently proposed 62' centre span and the 20' berms on the approach embankments. The use of the berms for the three lines has been approved by the Principal Foundations Engineer.

- (1) Line 1 as presently proposed -- Skew 0°
Structure cost 7440 x 17 \$126,480
- (2) Diversion Line (Dwg. 62F133A) - Skew 24°
Structure cost \$160 x 17.5 \$142,800
- (3) Line proposed by district July 1963 -- Skew 49°
Structure cost 11340 x 18 \$204,120

The present bailey detour plans are being revised to provide 90' of bailey crossing and our estimate for this would be:

Bailey Structures (incl. cribs)	\$14,000
Approaches	<u>5,000</u>
Total	\$19,000

Comparison of items (1) and (3) can be made by substituting these costs in the table prepared by Functional Planning in September 1963 and would confirm the conclusions reached at that time.

....2

Mr. F. C. Brown
W.P. 139-60 Cont'd.

-2-

September 18, 1964

We do not have approach costs for the diversion line, however, a comparison based on the structure and detour costs shows only a small difference (\$2,280) in favour of the diversion line. We believe the difference was offset by reasons of preference for the interchange design. The square design of the presently proposed structure is also preferable.

Our programme calls for the bridge design and D4 for this project being completed December 10th, 1964 and we would appreciate having your approval of the present plans in order that this programme may be met.

C. Scott,
Regional Bridge Location Engineer.

CS:sm

cc Mr. S. Mc Combie, Bridge Planning, Downsview
Mr. A. Stermac, Foundations, Downsview
Mr. A. Gater, Design, London Region
Mr. J. R. Kinnear, Planning, London Region

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. G. Scott,
Bridge Location Engr.

September 24, 1964

-- Extent of Subexcavation --
Turkey Creek, Hwy. 18, Village of La Salle,
Twp. of Sandwich West, Co. of Essex, Lot
35 & 36, Con. 1, District 1, Chatham, Ont.

Attached, please find the sketch showing in cross section, the measures that we would suggest be carried out in order to make the proposed bridge stable and safe.

The shaded area on the drawing represents placed fill material. The placement of the part of this material below the present ground line will require excavating and removing the original material. In plan, this excavation should extend under the entire area of the berms and under a small part of the approach embankment. We are presently not aware whether the road design calls for the removal of the peaty material under the rest of the approach embankments.

It is recommended that only the part of the berms and embankments that will be under the water table during construction be built of granular material. The remaining portions can be built of any acceptable fill material using standard compaction equipment and techniques. It is also recommended that the slopes below H.W.L. be protected with rip-rap.

The suggested 1:1 slope at the far ends of the excavations may prove to be too steep and flatter slopes should then be made.

The boundary line between the silty clay and the overlying sand, peat and organic silt may differ from the one shown on the drawing. If and when such deviations are encountered, the depth of excavation should be modified accordingly.

We believe that the bottom of the creek bed can be at elev. 567.5 without endangering the proposed structure.

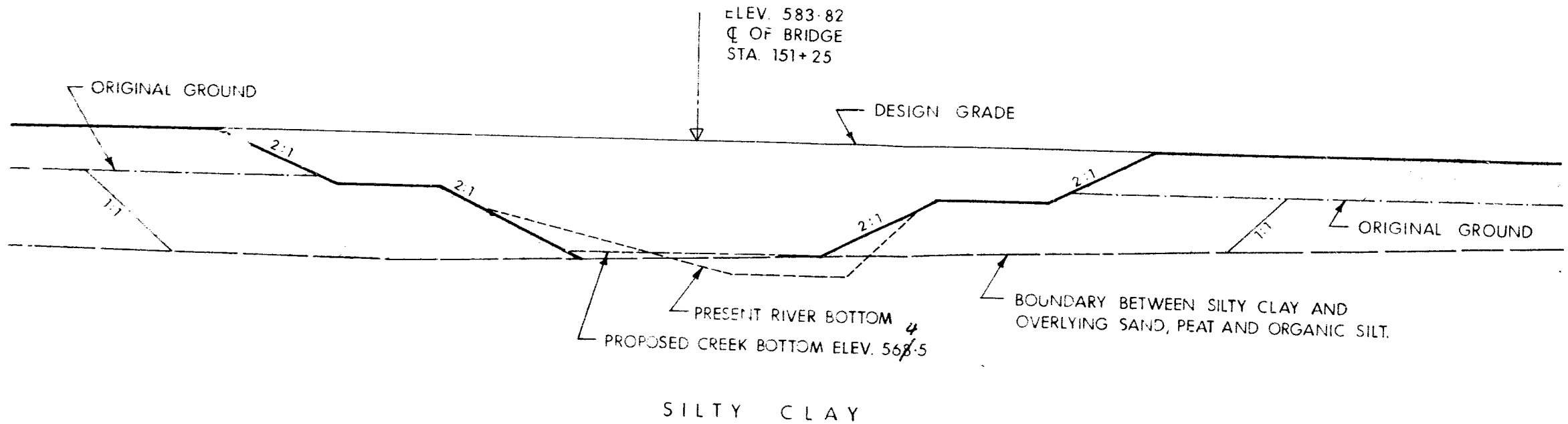
^{4 as per}
Should any additional explanations be required, please feel free to contact our office.

AGS/MdeF
Attach.

cc: Foundations Office
Gen. Files

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

TURKEY CREEK



NOTE:

THIS DRAWING TO BE INTERPRETED IN CONJUNCTION
WITH DRAWING D-5318-P2

HIGHWAY NO. 18
TURKEY CREEK BRIDGE
AT LA SALLE

Mr. S. McCombie,
Bridge Planning Engr.,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. G. Scott

September 22, 1964

Your Memo - Sept. 21/64

W.P. 139-60,
Bridge Site 6-59,
Turkey Creek Bridge,
Ewy. 18 - Dist. 1.

We have reviewed the Preliminary Plan D-5318-P2 for the above-mentioned structure and herewith, submit our comments for your consideration:

In the report dealing with the soil conditions, the Consultant, Geocon, Ltd., has recommended that the layer of organic silt, sand and peat be excavated and replaced with granular material. It was also suggested that the extent of this layer be checked with additional hand or power auger holes so that the limits of the material removal and replacement could be more precisely determined. As far as we are aware of, this has not been done.

It is therefore our recommendation that this be done as soon as possible. The fact that the exact location and bridge length are known, will pinpoint the area to be investigated quite precisely. We feel that this work could be best carried out by the Regional forces.

Once this information becomes available, an accurate plan can be prepared showing the boundaries and details of the excavation.

GJ/deF

cc: Mr. J. Boy

Foundations Office ✓
Gen. Files

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

McCOMBIE

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

11711
52077
TO: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: Bridge Division,
Downsview, Ontario.

DATE: September 21, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 139-60
Br. Site 6-59
Turkey Creek Bridge
Hwy. 18 - Dist. 1

60-1-70
62-1-133
60-1-133

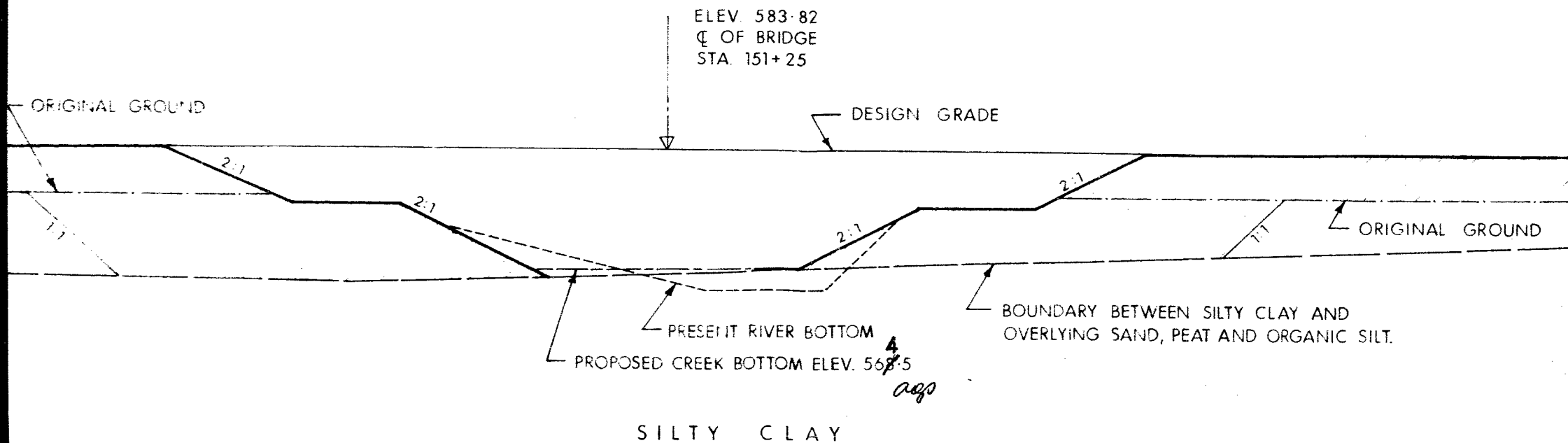
We are sending to you herewith two prints of
Preliminary Plan D-5318-P-2 of the above structure.

Would you please let us have your written
comments.

N. Zoltay

NZ/sp
cc. S. McCombie
G. Scott Regional Bridge Location Engineer
N. D. Smith
N. Zoltay,
for G. Scott,

TURKEY CREEK



NOTE:

THIS DRAWING TO BE INTERPRETED IN CONJUNCTION
WITH DRAWING D-5318-P2

HIGHWAY NO. 18
TURKEY CREEK BRIDGE
AT LA SALLE