

#62-F-209-C

W.P. #101-61

HWY. #42 &

BEVERLEY

CREEK

H. A. Doye,
 Bridge Engineer.
 Materials & Research Division,

May 9, 1962.

FOUNDATION INVESTIGATION REPORT
 By: Dominion Soil Investigation
 Ltd. -- W.F. 101-61

(Foundation section).

Attention: Mr. L. McInnis.

Re: Proposed Bridge at the Crossing of Hwy. 742
 and Beverley Creek, Volta, Ont., District Rd.

Attached, we are forwarding to you the above-mentioned report prepared by the Consultant, Dominion Soil Investigation, Ltd. of Toronto.

We have reviewed the report and are in agreement with the recommendations pertaining to the foundations of the proposed structure. In his report, the Consultant recommends the use of steel sheet piles for enclosing the excavation. The presence of boulders is mentioned but their size is not given. If the boulders are of appreciable size, refusal to driving can be met before bedrock is reached. In such a case excavation under water within the sheet pile enclosure will have to be carried out in order to remove the boulders. It is our opinion that this should be brought to the attention of prospective bidders.

We believe that enough information is now provided for you to continue with the design work. Should there be any additional information that you would require, please do not hesitate to contact our office.

C. J. G.
 Attach.

cc: Messrs. H. A. Doye (2)
 H. A. Irwin
 H. E. McMillan
 J. Ford
 J. A. Cash
 J. A. Crispier
 J. J. Kovich
 J. Roy
 J. L. Gint
 F. A. Ryan
 A. Watt

W. G. Sterner
 W. G. Sterner,
 PRINCIPAL FOUNDATION ENGINEER

Foundations Office --

Gen. Files.



ONTARIO

DEPARTMENT OF HIGHWAYS

Don. Sore 61

no to Mr. A. Stermac Date July 13, 1962
Principal Foundation Engineer Subject Re: Hwy. 42, W.P. 101-61,
M. & R. Division, Kingston Beverley Creek in Delta

As requested, attached is a sketch showing the location of hand auger borings recently carried out by this office in an effort to determine bedrock elevations for proposed retaining walls.

The depths to bedrock are tabulated opposite the hole numbers shown on the sketch. In some instances boulders were encountered and the depths to boulders are noted. In one or two instances it could not be determined whether bedrock or boulders were encountered and these are marked as "boulders (?)".

It should be pointed out that the accuracy of the information is limited because of the difficulty in determining with a hand auger whether large boulders or bedrock is encountered. Some of the results, therefore, may be in error. If bedrock was noted on the surface, it has been shown as hatched on the sketch.

The elevations of bedrock or boulders encountered at each hole is tied in to the top of the arch (inside of the culvert) at either end of the present culvert. Holes 1 - 8 are tied in to the west end and holes 9 - 17 to the east end. The elevation of the top of the arch is shown on the profile as about 311.5'.


J. E. Gruspier
Regional Soils Engineer

Encl.
JEG/jfj

c.c. J. Curtis
G. A. Wrong

File

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundation Eng.
Room 107, Lab. Bldg.

FROM: J. B. Curtis

DATE: September 12, 1962.

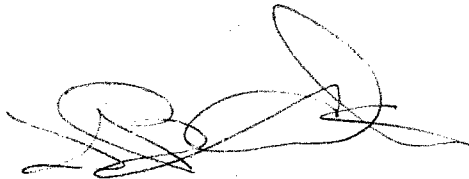
OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 101-61
Hwy. 42
Beverly Creek in the Town of Delta
District 8

Enclosed find one copy of the preliminary plan
for the structure proposed at the above location.

The structure is to be founded directly on
bedrock as recommended in the foundation report.



JBC/et

J. B. Curtis,
Bridge Location Engineer.

cc. N. D. Smith

ONTARIO
DEPARTMENT OF HIGHWAYS
MATERIALS AND RESEARCH DIVISION

REPORT ON
FOUNDATION INVESTIGATION
FOR
PROPOSED BRIDGE AT THE CROSSING OF
HIGHWAY #42 AND BEVERLEY CREEK
IN DELTA, ONTARIO
DISTRICT #8 - W.P. 101-61

Submitted by

DOMINION SOIL INVESTIGATION LIMITED
77 Crockford Boulevard
SCARBOROUGH - ONTARIO

OUR REFERENCE: 2-4-1

April 1962

C O N T E N T S

	<u>Page</u>
INTRODUCTION	1
SUMMARY	2
I. DESCRIPTION OF SITE AND GEOLOGY.....	3
II. FIELD AND LABORATORY WORK.....	4
III. SUBSURFACE CONDITIONS	5
IV. DISCUSSION AND RECOMMENDATIONS	5
V. REFERENCES	6

E N C L O S U R E S

LOCATION OF BOREHOLES AND SUBSURFACE PROFILE	Encl. #1
GEOTECHNICAL DATA SHEETS.....	Encls. #2 & #3

I N T R O D U C T I O N

A letter of authorization dated April 13th, 1962 was received from the Ontario Department of Highways, Material and Research Division to conduct a foundation investigation at the site of a proposed bridge in Delta, Ontario. The structure will replace an existing stone arch culvert which at present carries Highway No. 42 above the Beverley Creek.

The proposed project will most probably be a one-span structure, either a simple beam on two supports or a rigid frame.

The site and the boreholes were located with the aid of a plan (No. E 4070-1) provided to us.

The purpose of the investigation was to reveal the subsurface conditions and determine the necessary soil properties for the design and construction of foundations.

S U M M A R Y

- (1) THE BEDROCK LIES WITHIN 10 TO 13 FEET DEPTH FROM SURFACE.
- (2) THE FOOTINGS SHOULD REST UPON THE SURFACE OF THE CLEAN, UNWEATHERED BEDROCK.
- (3) SURFACE WATERS SHOULD BE DIVERTED AND THE EXCAVATION SHOULD BE ENCLOSED BY STEEL SHEET PILES. SEEPAGE WATER CAN BE REMOVED FROM WITHIN THE WALLS BY PUMPING.

I. DESCRIPTION OF SITE AND GEOLOGY

Delta is a small village located in Leeds County about 20 miles west of Brockville. It is accessible by Highway No. 42. The population is less than 400 who make their living principally of farming. Owing to the presence of numerous scenic lakes abundant in fish, the people of the village enjoy a considerable income from tourism in certain seasons of the year.

Upper Beverley Lake (to the east) and Lower Beverley Lake (to the west) are connected by a creek. In Delta, the energy of the running water has been used in the past to drive a flour mill. A new dam being designed by the Ontario Department of Public Works is to be built not far away upstream from the proposed bridge site. The existing stone arch culvert will be replaced by the new structure which will satisfy the requirements of modern traffic.

The geographical position of Delta is particularly interesting from the point of view of geology of bedrock formations. The area is close to the intersection of the following three different deposits:

- (1) Precambrian rocks (mostly of the sedimentary and derived metamorphic type containing some narrow bands of volcanics);
- (2) Sedimentary rocks (predominantly sandstone) deposited in the cambrian period; and
- (3) Sedimentary rocks (sandstone, limestone, shale, etc.) deposited in the devonian period.

This geological fact is probably the explanation of the non-uniform bedrock stratification at the site as revealed by the borings.

II. FIELD AND LABORATORY WORK

Field work was carried out on April 19th, 1962 and comprised two boreholes at the locations shown on Enclosure #1. The position of the test holes was set out on the site with the drawing referred to in the Introduction. Elevations were measured relative to the top of pavement at the centreline of Highway No. 42, station 83 + 63 (i.e. the centre of the new structure) - which was taken as el. 314.80 obtained from the profile also presented on the previously mentioned drawing.

The boreholes were of 2 7/8 in. diameter. They were lined with Bx casing advanced by driving and washing or drilling.

Standard penetration tests were made whenever practicable at frequent intervals using a 2 in. outside diameter split spoon driven into the bottom of the clean borehole by a constant driving energy (140 pound hammer dropping 30 inches). This test also provided disturbed samples of the substrata indicating their relative density.

Where bedrock or boulder was encountered, the holes were advanced by diamond drilling. Axt size core was recovered.

The samples were shipped to our laboratory where they were thoroughly examined and classified. The results of this analysis together with all data and observations obtained in the field comprise the basis on which the geotechnical properties of the substrata are being evaluated.

III. SUBSURFACE CONDITIONS

The boreholes were located close to the abutments of the existing structure. Therefore, the backfill and road fill consisting of gravel-sand and containing numerous cobbles, boulders and traces of organics were encountered first.

The bedrock - sandstones of various colours and hardness - at the site lies within 10 to 13 feet depth from the ground level and owing to the sedimentary nature of the deposit, its surface may be assumed to be fairly flat.

The ground water level corresponds to that in the creek.

IV. DISCUSSION AND RECOMMENDATIONS

The foundations of the proposed structure should rest upon the clean, unweathered bedrock surface and an allowable bearing pressure of 20,000 pounds per square foot is recommended. No measurable settlements are anticipated.

The construction of the footings will involve the problem of dewatering. The water of the creek should be diverted and the enclosing of the excavation by sheet piles is recommended which would also secure the stability of the sides. The use of steel sheet piles is advisable because driving difficulties may be expected in the fill containing boulders. Seepage water can be removed by pumping.

Yours very truly,

DOMINION SOIL INVESTIGATION LIMITED

L. R. Szalatnay

L. R. Szalatnay, P. Eng.,
Senior Soils Engineer.

LRS/oed

Encs.

V. REFERENCES

- (1) Procedures for Testing Soils - ASTM, April 1958, pp 186 to 198. (Unified Soil Classification System - by A. A. Wagner).
- (2) The Physiography of Southern Ontario by L.J.Chapman and D. F. Putnam of the Ontario Research Foundation, University of Toronto Press 1951.
- (3) Principles of Engineering Geology and Geotechnics by D. P. Krynine and W. R. Judd. McGraw Hill Book Co., 1957.
- (4) Geology for Engineers - Third Edition - F.G.H. Blyth. E. Arnold & Co., London, England.
- (5) The National Building Code of Canada.

Enclosures

GEOTECHNICAL DATA SHEET FOR BOREHOLE

OUR REFERENCE NO. 2-4-II

CLIENT: DEPARTMENT OF HIGHWAYS, ONTARIO
PROJECT: PROP. CROSSING HWY 42 & BEVERLEY CREEK
LOCATION: DELTA, ONT.
DATUM ELEVATION: 314.6

METHODE OF BORING: WAGNBORING
DIAMETER OF BOREHOLE: 2 7/8"
DATE: APRIL 19, 1962.

ENCLOSURE NO. 2

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot						CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N- or Advancement of Sampler	SHEAR STRENGTH lbs/sq ft						PL	W	LI	
314.6	0	PAVEMENT														DENOTES WATER LEVEL
				1	Ch S	-										DENOTES CAVE-IN
310	5	REDDISH GRAVEL - SAND FILL WITH BOULDERS AND COBBLES		2	Ch S	-										Ch S CHUNK SAMPLE
305	10			3	Akt CORE	-										W S WASH SAMPLE
				4	WS	-										
300	15	RED, EASILY ABRADABLE, FERRUGINOUS SANDSTONE		5	Akt CORE 80% RECOVERY	STEADY PRESSURE THROUGHOUT NO LOSS OF RET. J. WATER										Bx CASING WAS DRILLED FROM 0 TO 13'-6" DEPTH
295	20	BUFF, SOMEWHAT HARDER SANDSTONE		6	Akt CORE 93% RECOVERY											PENETRATION TESTS WERE NOT PRACTICABLE IN THIS HOLE
290	25	HARD, GREYISH, CALICHEOUS SANDSTONE														

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: *Len* CH'D: *Ray*

OUR REFERENCE NO. 2-4-11

GEOTECHNICAL DATA SHEET FOR BOREHOLE 2

CLIENT: DEPARTMENT OF HIGHWAYS, ONTARIO
PROJECT: PROP. CROSSING HWY 42 & BEVERLEY CREEK
LOCATION: DELTA, ONT.
DATUM ELEVATION: 314.0

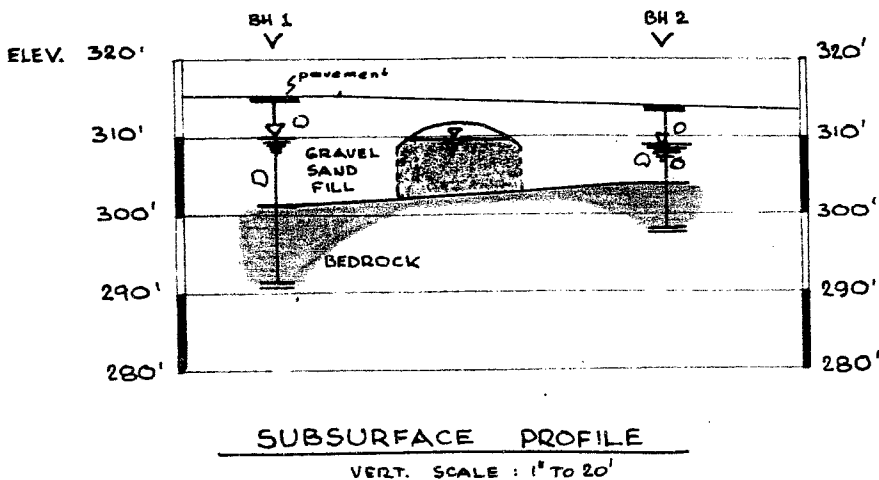
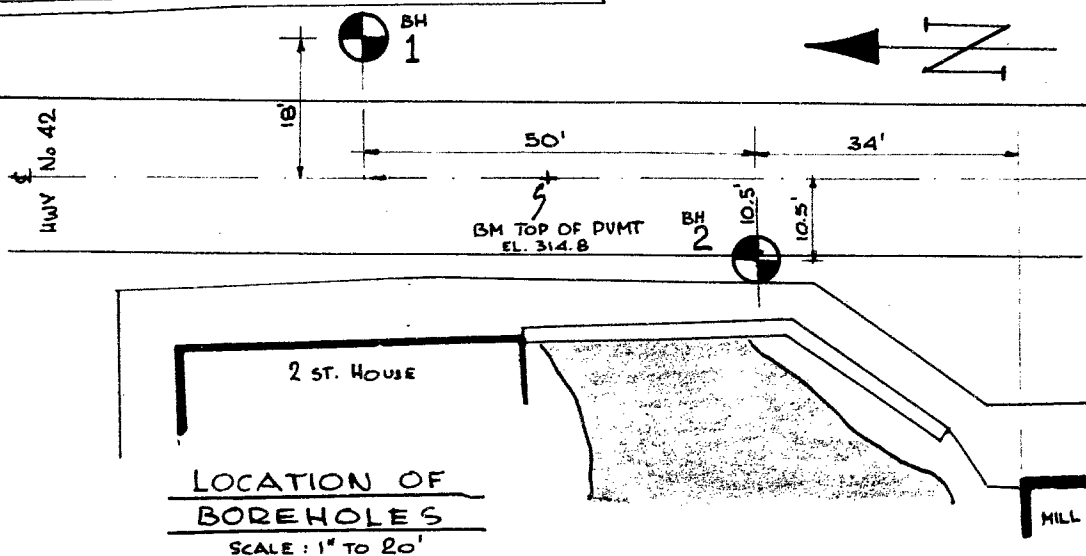
METHODE OF BORING: WASHBORING
DIAMETER OF BOREHOLE: 2 7/8"
DATE: APRIL 19, 1962.

ENCLOSURE NO. 3

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %		REMARKS	
				NUMBER	TYPE	N- or Advancement of Sampler	0	20	40	60	80	100	PL		W
							SHEAR STRENGTH lbs/sq ft								
314.0	0	PAVEMENT													SS DENOTES SPLIT SPOON SAMPLE
				1	SS	31									
310	5	REDDISH GRAVEL-SAND FILL WITH BOULDERS AND COBBLES		2	SS	5	0								O DENOTES STANDARD PENETRATION RESISTANCE
305	10														
		BEIGE AND GREYISH CALCAREOUS, HARD SANDSTONE		3	ACT CORE	90% RECOVERY									Bx CASING WAS DRILLED FROM 0 TO 9'8" DEPTH (IT COULD NOT BE ADVANCED TO BEDROCK SURFACE, THIS IS THE REASON OF LOSS OF RETURNING WASHWATER)
300	15	WHITE CRYSTALLINE LIMESTONE WITH BLACK SPECKLES													
15.5															

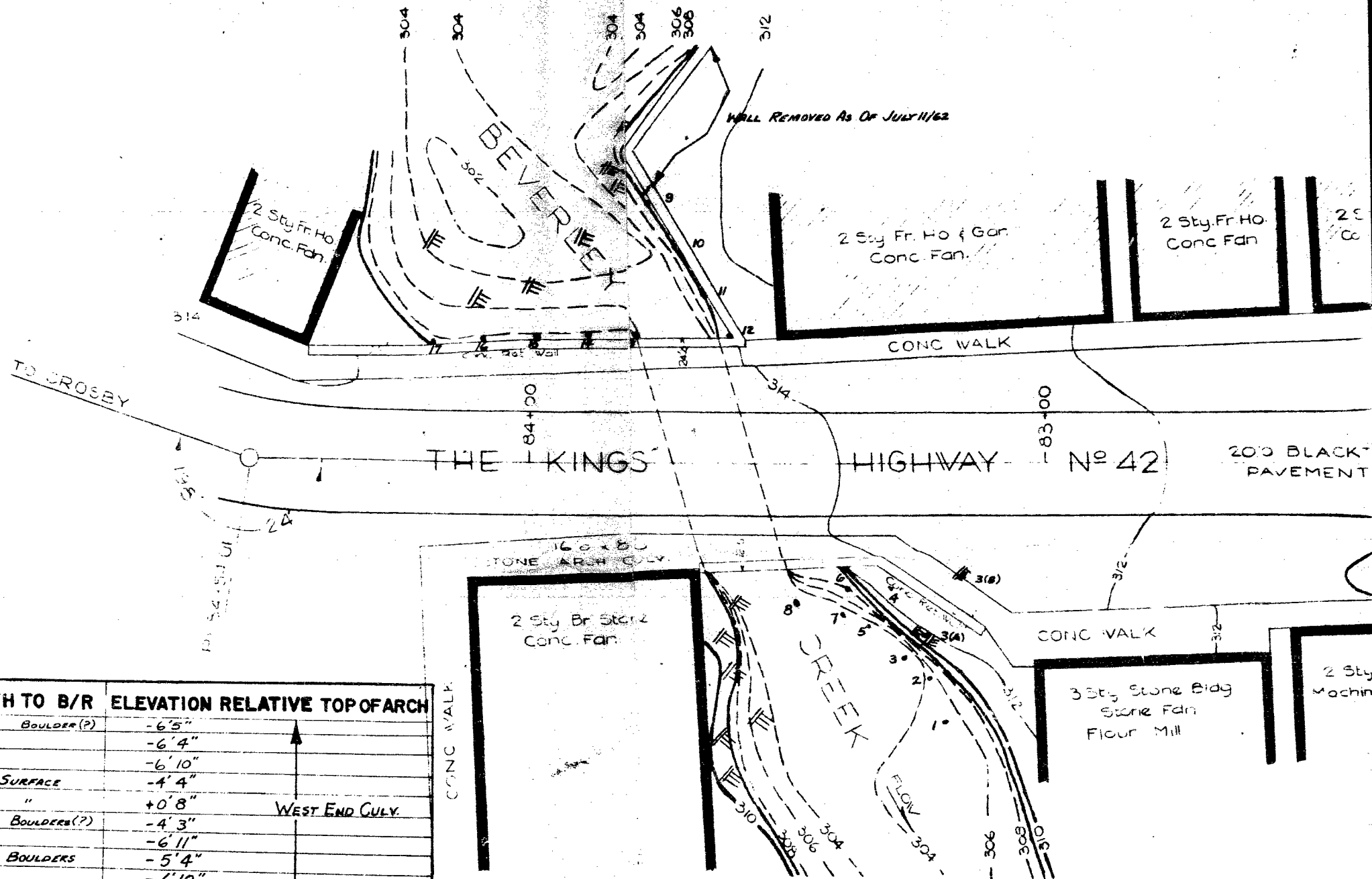
Prep. By 

2 ST. HOUSE



NOTE: FOR DETAILED STRATIGRAPHY OF BEDROCK SEE THE GEOTECHNICAL DATA SHEETS FOR THE INDIVIDUAL BOREHOLES

COUNTY OF LEE
TOWNSHIP OF BASTARD
LOT 23 CON. IX



HOLE NO.	DEPTH TO B/R	ELEVATION RELATIVE TO TOP OF ARCH	
1	12" BOULDER(?)	-6'5"	WEST END CULV.
2	8"	-6'4"	
3	8"	-6'10"	
3(A)	AT SURFACE	-4'4"	
3(B)	" "	+0'8"	
4	8" BOULDER(?)	-4'3"	
5	8"	-6'11"	
6	3" BOULDER	-5'4"	
7	10"	-6'10"	EAST END CULV.
8	18"	-7'1"	
9	VISIBLE	-5'9"	
10	"	-8'7"	
11	"	-7'4"	
12	"	-6'11"	
13	12" BOULDER(?)	-7'6"	
14	30"	-7'0"	
15	8"	-4'0"	
16	13"	-2'6"	

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT