

Mr. A. Tye,

Bridge Engineer,

F. C. Brownridge,

Materials and Research Engineer,

October 27, 1955

Re: Bridge Foundation Report
Rwy. 401 at South Raisin River,
Cornwall Township, Sta. 417+00
Site plan E 2894-1

We are forwarding herewith the foundation report for the above noted structure. While the alignment has not yet been finalized through Cornwall Township, this work was undertaken because core drilling equipment was available in the Cornwall area this past summer and further that reasonable assurance was received that this line would be the one used. There is no grading contract proposed for this section of Rwy. 401 in the immediate future to our knowledge.

The subsoil consists of very soft clay, then till over bedrock. The soft clay cannot support a spread footing foundation consequently piles are recommended.

For slope stability purposes the approach fills must be built to a 3:1 slope and the height not to exceed 10 feet for the first stage. The profile (line 'C' P 3165-6) indicates a fill of 11' - 14'. It is the practice on all Rwy. 401 contracts to call the grading jobs separate from the granular base contracts in which case the subgrade would automatically be kept approximately 2' below profile grade over this particular soil type. It is however recommended that the fills not exceed 10' for the approaches and that the remaining fill or granular be placed under the granular base and paving contract.

F. C. Brownridge
Materials and Research Engineer

AM/SE.

per:

A.R.

(A. Irvine)

Copies to:

Mr. A. Tye - 2
Mr. J. Walter - 1
Mr. E. Trogaskes - 1
Mr. J. Wilkes - 1
Mr. C. Farantatos - 1
File

55-19

B.A. 457

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F. C. Brownridge
Materials and Research Engineer

AR/HK.

per:
A. Rutka
(A. Rutka)

Copies to:

Mr. A. Toye - 2 ✓
Mr. J. Walter - 1
Mr. H. Tregaskes - 1
Mr. J. Wilkes - 1
Mr. G. Farantatos - 1
File

REPORT OF FOUNDATION INVESTIGATION
FOR THE BRIDGE
ON HIGHWAY NO. 401 OVER SOUTH RAISING RIVER
AT CORNWALL
BRIDGE SITE PLAN - E - 2894-1

Copies to:

Mr. A. Dye, Bridge Engineer (2)
Mr. J. Walter, Design Engineer (1)
Mr. H. Tregaskes, Const. Engineer (1)
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INTRODUCTION

A new bridge is to be built to carry Highway No. 401 over the South Raisin River at approximately 2 miles North of Cornwall.

Subsoil investigation was therefore made on the above site to decide the best type of foundation for the bridge structure.

PROCEDURE

Subsoil exploration on this job was done with the aid of a core-drill machine mounted on truck.

Altogether six dynamic cone penetration tests and four boring tests are made on the site. The boreholes were made two on each side of the river.

The locations and elevations of the penetration and bore holes are shown in Drawing F-55-19A.

The logs of the boreholes are to be found in Appendix I.

SOIL CONDITIONS

According to the borehole logs the topmost layer of soil is soft gray clay. Underlying this clay layer is sandy - till (very stony in composition), and then limestone bedrock. This soil profile exists on both sides of the river bank.

The clay extends to a greater depth on the East bank region than West, i.e. to depths about 31 feet and 20 feet respectively. The shearing strength of the clay averages about 200 lbs. per square foot according to the various laboratory unconfined compression tests. This clay has a high degree of sensitivity and for this reason a value as high as 300 lbs. per square foot or even much more might have been obtained if the clay were tested in situ by a vane apparatus.

SOIL CONDITIONS (continued)

The sandy-till is a comparatively smaller layer on the East bank but bedrock was found to exist at the same elevation of 143.0 approximately.

The approximate positions of the layers of soil and the bedrock are clearly shown in the section - drawings in Drawing No. F-55-19A.

WATER CONDITION

The water table varied from about 1 foot to 3 feet below ground surface at the time of exploration.

However, it was observed in both B.H. # 1 and B.H. # 6 that water flowed up the holes after the casings were withdrawn. This flow might have been due to hydrostatic head created either in the more sandy and stony regions of the till layer or, in the boundary regions between till and bedrock surface or clay. There is a possibility that the flow might have come from fissures within the limestone bedrock punctured by drilling.

The clay is very soft in characteristic with its water content and liquid limit both very close to 75%. It is thought that the existed water table was probably due to the inflow of the water from the excessively saturated clay.

The water levels in the river showed a maximum variation of about 7.0 ft., with the highest water level found at elevation 135.4. Scouring effect due to this variation could reach down to an elevation of 150.0, i.e. 23 ft., below the river bed. ^{??} Also there will likely be the possibility of erosion of the river banks due to the soft clay. These may require sheet piles or other appropriate means for protection.

ANALYSIS OF TEST RESULTS AND DISCUSSIONS BRIDGE FOUNDATION

Both the dynamic cone penetration tests and unconfined compression tests indicate that the clay is too soft and has very poor shearing strength. For these reasons, spread footing foundation for the new bridge is entirely rejected. Under such soil condition the foundation of the bridge should be made on piles. It is thought that either concrete cast-in-place piles or steel H-piles could be the most appropriate types of piles because of the limited depths of the sandy-till and the bedrock.

CAST-IN-PLACE CONCRETE PILE FOUNDATION

The sandy-till layer is excellent seat for bearing concrete cast-in-place piles. Cased concrete piles, cast-in-place, with compressed base section should provide about 100 tons per pile.

Settlement due to such piles is often small or even negligible because of the high compaction of the immediately adjacent soil around the base or toe. This could, however, be verified by actual loading tests if necessary. Cast-in-place concrete piles would require about 24 ft. in lengths to reach the till layer.

STEEL H-PILE FOUNDATION

If steel H-piles could be driven to refusal in the till layer or on to bedrock they should be able to support up to 50 tons or more per pile depending on where the piles bear.

STEEL H-PILE FOUNDATION (continued)

It might be difficult to drive the piles to bedrock because of the large stones and boulders in the till layer. Under such condition the piles should be reinforced by welding plates at the points.

STABILITY OF APPROACH FILLS

According to the Bridge Site Plan-S-2894-1 about 11 ft. to 14 ft. of fills are required on both the approaches to make up the present proposed grade.

However, slope stability analysis indicates that the ground can support only 10 ft. of fill and no more, to be installed on 1:3 slope. This analysis assumes the same soil conditions as that under the footings to exist under the approaches. The value of cohesion used in the calculation is 300 lbs. per square foot.

To put the fill up to a maximum of 14 ft. the best approach to this problem is to make the fill in stages. Firstly, 10 ft. of fill is to be made, allowing one to two years for the underlying clay to consolidate and increase its shearing strength. Then, finally, the fill can be brought to the required height.

Both the amount and rate of settlement are estimated from knowledge of liquid limits of the clay. If the average liquid limit is assumed at 75%, the compression index and the coefficient of consolidation may be taken to be 0.59 and 0.000-sq. cm./sec. respectively.

On the East approach, under a fill of 10ft., the ultimate settlement due to the clay is expected to be about 20 inches, which would take about 12 to 15 years to reach 90% consolidation.

STABILITY OF APPROACH FILLS (continued)

Due to smaller depth of clay, the West approach is expected to settle about 16 inches ultimately, 90% of which would take about 7 to 10 years to reach.

RECOMMENDATIONS:

BRIDGE FOUNDATION:

Spread footings for the new bridge are rejected because of the very low shearing strength of the clay. Under such condition the foundations should be supported on piles.

We recommend the use of steel H-piles. Such piles driven down to refusal in the till layer or on to bedrock should provide up to 50 tons per pile. The piles should be reinforced by welding plates at the points to protect against hard driving through stony or bouldery regions in the till layer.

Alternatively, cast-in-place concrete piles formed with compressed base or toe in the till layer could be used. If properly chosen they should be able to provide 100 tons ~~or more~~ per pile. Companies such as Reynold Pile Co., Franki Pile Co., or Spencer, White & Prentiss could be asked to perform the foundation work.

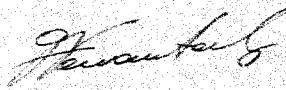
CONCLUSIONS: (continued)

STABILITY OF APPROACH FILLS.

The fills on the approaches can only be made to a height of 10 ft. and no more, on 1:3 slope.

To bring the fills up to a maximum height of 14 ft. we suggest that they be brought up in stages slowly. The allowable fill of 10 ft. could be first installed allowing a period from one to two years for the underlying clay to gain shearing strength. The fills can then be brought up to the required height.

It is advisable to have the approaches first brought up to the required height before the construction of the bridge structure.


G. H. Farantatos
Foundation Engineer

GRAPH OF CONE PENETRATION TEST

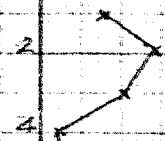
NO BLOWS AT STD. LN=4200 LB. IN

0 10 20 30 40

DATUM: STA. 417+21 E

EL. = 184.4

DEPTH - FEET
PUSHED



2

4

6

8

10

12

14

16

18

20

22

24

26

28

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32

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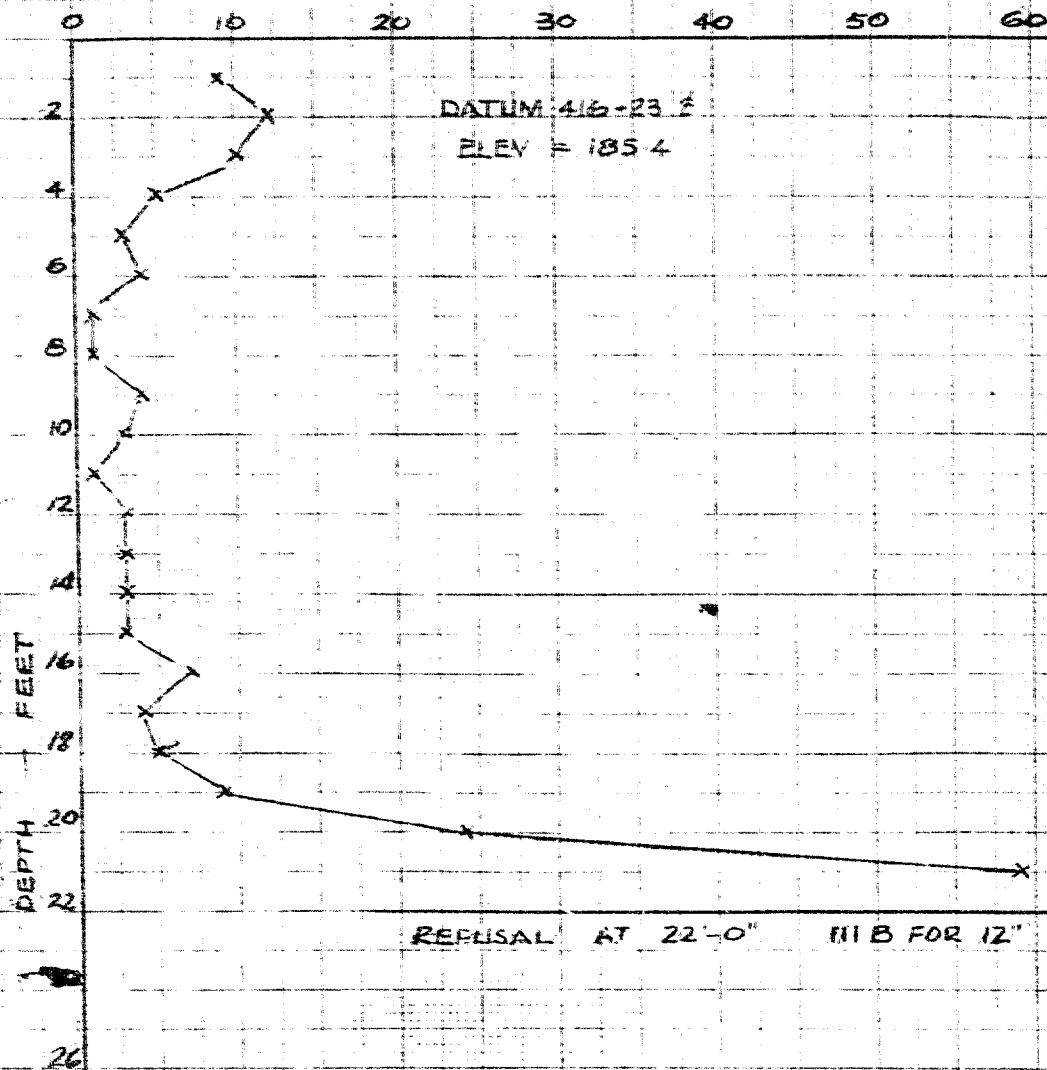
REFUSAL AT 33'-10" 33 B FOR 10"

JOB #55-F-19

B.H.#5

GRAPH OF CONE PENETRATION TEST

NO BLOWS AT STD. EN. = 4200 LB. IN.



55-F-19
Hwy. # 401
OVER S. RAISIN
RIVER AT
CORNWALL

EDITED
FOR MICROFILMING
BY *K.T.* DATE *2/2/68*

TL 123

MATERIALS LABORATORY DEPARTMENT OF HIGHWAYS - ONTARIO OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG - 4056 DRILL #4
CASING - (STANDARD SAMPLERS TO FIT UNLESS NOTED)
SAMPLER HAMMER WT - 350 DROP - 18 INCHES

JOB 95.17.19, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 26

MATERIALS LABORATORY-DEPARTMENT OF HIGHWAYS - OREGON												
OFFICE REPORT ON SOIL EXPLORATION												
DRILL RIG <u>CORE</u> <u>OSILL</u> <u>#4</u> CASING <u>BY</u> (STANDARD SAMPLERS TO FIT UNLESS NOTED) SAMPLER <u>HAMMER</u> <u>WT</u> <u>250</u> <u>#</u> <u>DROP</u> <u>INCHES</u>			JOB <u>25-F-12 SOUTH OREGON ROAD LUNY 401</u> BORING <u>N° 3</u> DATUM <u>37.47</u> <u>21.55</u> <u>AT</u> <u>1000'</u> DATE REPORT _____ COMPILED BY <u>RM</u> CHECKED BY <u>W. W. WING</u> BORING DATE <u>JULY 2, 1955</u>									
SAMPLE CONDITION			SAMPLE TYPES			ABBREVIATIONS						
<div style="display: flex; align-items: center;"> <div style="width: 20px; height: 20px; border: 1px solid black; margin-right: 5px;"></div> <div> DISTURBED GOOD LOST </div> </div>			CS - CHUNK DO - DRIVE OPEN DF - DRIVE FOOT VALVE T.O. - THIN WALLED OPEN			V - VIBRATORY SHEAR TEST M - MECHANICAL ANALYSIS U - UNCONFINED COMPRESSION Q - TRIAXIAL CONSOLIDATED QUICK Q - TRIAXIAL QUICK S - TRIAXIAL SLOW γ - UNIT WEIGHT K - PERMEABILITY C - CONSOLIDATION CA - CASING WL - WATER LEVEL IN CASING WT - WATER TABLE IN SOIL						
SOIL PROFILE			SHEAR STRENGTH TONS/SQ. FT. OR Q _u /2			WATER CONTENT V %		SAMPLES				
ELEVATION DEPTH	WATER CONDITIONS	DESCRIPTION	PENETRATION TEST RESISTANCE BLOWS PER FOOT			DPW	Δ LV	OTHER TESTS	CONDITION TYPE	N°	PENETRATION RESISTANCE	ELEV. RECOVER.
184.3			0.50 0.1 0.2 0.3			20	100					
182.9	V	WL July 8 th SANDY TILL (STONY)	0.50 0.1 0.2 0.3									
182.0			0.50 0.1 0.2 0.3									
181.0			0.50 0.1 0.2 0.3									
180.0			0.50 0.1 0.2 0.3									
179.0			0.50 0.1 0.2 0.3									
178.0			0.50 0.1 0.2 0.3									
177.0			0.50 0.1 0.2 0.3									
176.0			0.50 0.1 0.2 0.3									
175.0			0.50 0.1 0.2 0.3									
174.0			0.50 0.1 0.2 0.3									
173.0			0.50 0.1 0.2 0.3									
172.0			0.50 0.1 0.2 0.3									
171.0			0.50 0.1 0.2 0.3									
170.0			0.50 0.1 0.2 0.3									
169.0			0.50 0.1 0.2 0.3									
168.0			0.50 0.1 0.2 0.3									
167.0			0.50 0.1 0.2 0.3									
166.0			0.50 0.1 0.2 0.3									
165.0			0.50 0.1 0.2 0.3									
164.0			0.50 0.1 0.2 0.3									
163.0			0.50 0.1 0.2 0.3									
162.0			0.50 0.1 0.2 0.3									
161.0			0.50 0.1 0.2 0.3									
160.0			0.50 0.1 0.2 0.3									
159.0			0.50 0.1 0.2 0.3									
158.0			0.50 0.1 0.2 0.3									
157.0			0.50 0.1 0.2 0.3									
156.0			0.50 0.1 0.2 0.3									
155.0			0.50 0.1 0.2 0.3									
154.0			0.50 0.1 0.2 0.3									
153.0			0.50 0.1 0.2 0.3									
152.0			0.50 0.1 0.2 0.3									
151.0			0.50 0.1 0.2 0.3									
150.0			0.50 0.1 0.2 0.3									
149.0			0.50 0.1 0.2 0.3									

43
54.90

MATERIALS LABORATORY-DEPARTMENT OF HIGHWAYS - OHIO RIG
OFFICE REPORT ON SOIL EXPLORATION

HWY 401 BRIDGE AT CORNWALL
 BORING NO. 4
 DATE REPORT
 BORING DATE JULY 14TH 1955

DRILL RIG CORZ DILL #4
 CASING 3A (STANDARD SAMPLERS TO FIT UNLESS NOTED)
 SAMPLER HAMMER WT 350 DROP 1 INCHES

JOB 55-4-9 AT SOUTH RAINBOW RIVER
 DATUM STA 416+23 AT 55 AT 131ST 00
 COMPILED BY E.T. CHECKED BY W. WONG

DATE REPORT
 BORING DATE JULY 14TH 1955

SAMPLE CONDITION

	DISTURBED
	GOOD
	LOST

SAMPLE TYPES

CS - CHUNK
 DO - DRIVE OPEN
 DF - DRIVE FOOT VALVE
 TO - THIN WALLED OPEN

WS - WASHED SAMPLE
 RC - ROCK CORE

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 Q_c - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

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

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLCT	ELEVATION SCALE	SHEAR STRENGTH TONS/SQ FT. OR Q _u /2		WATER CONTENT W %		OTHER TESTS	CONDITION	TYPE	NR	PENETRATION RESISTANCE	ELEV. RECOVER.
					PENETRATION TEST RESISTANCE BLOWS PER FOOT		Δ PV Δ LV							
					10	20	30	40						
185.4				0	STO. EN = 4200 LB IN.									96
182.4 3.0	W.L. JULY 20 TH	SOFT GRAY CLAY		4										151.2
				8										172.4
				12										173.4
				16										149.4
164.9 20.5		SAND: FILL (STONY)		20										167.4
				24	REFUSAL AT 22'-6"									161.4
				28	LIMIT OF BX CASING AT 22'-6"									157.4
152.0 33.4				32										
				36										
				40										
				44										
				48										
				52										
				56										
				60										

END OF BEEHOLE AT 55-5 EL 152.0

N.B. BEDROCK WAS PROBABLY FOUND IN FINAL 2 FT BUT AX DIAMOND BIT WAS TOO WORN TO CONTINUE FURTHER TO VERIFY THIS.

TL 129

MATERIALS LABORATORY - DEPARTMENT OF HIGHWAYS - ONTARIO
OFFICE REPORT ON SOIL EXPLORATION

DRILL RIG --- COREDRILL # 4
CASING --- BX --- (STANDARD SAMPLERS TO FIT UNLESS NOTED)
SAMPLER HAMMER WT --- 250 --- * DROP --- INCHES

JOB --- 55-F-19, SOUTH RAISIN BRIDGE AT CORNWALL
DATE --- 5/16/27 --- LT. SS. AT 47' 2"
COMPILED BY --- D.B. CHECKED BY W. KING BORING DATE JULY 13TH, 1925

SAMPLE CONDITION

DISTURBED
GOOD
LOST

SAMPLE TYPES

C.S. - CHUNK
D.O. - DRIVE OPEN
D.F. - DRIVE FOOT VALVE
T.O. - THIN WALLED OPEN

WS - WASHED SAMPLE
RC - ROCK CORE

ABBREVIATIONS

V - INSITU VANE SHEAR TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
Qc - TRIAXIAL CONSOLIDATED QUICK CA - CASING
Q - TRIAXIAL QUICK WL - WATER LEVEL IN CASING
S - TRIAXIAL SLOW WT - WATER TABLE IN SOIL
γ - UNIT WEIGHT
K - PERMEABILITY
C - CONSOLIDATION

SOIL PROFILE

ELEV. & DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT
185.6		WATER FLOWED FROM SURFACE DURING DRILLING AND WAS STILL FLOWING ON JULY 20 TH	
165.6 20.0		SOFT GRAY CLAY (SLIGHTLY STONY)	
143.1 42.5		SANDY TILL (STONY)	
138.6 47.0		VERY STONY WITH BOULDERS IN THIS SECTION	
		ROCK	

⊗ SHEAR STRENGTH TONS/SQ. FT. OR Q_u/2

* WATER CONTENT %

X CONE PENETRATION TEST RESISTANCE BLOVS PER FOOT

STD EN 4200 LB IN

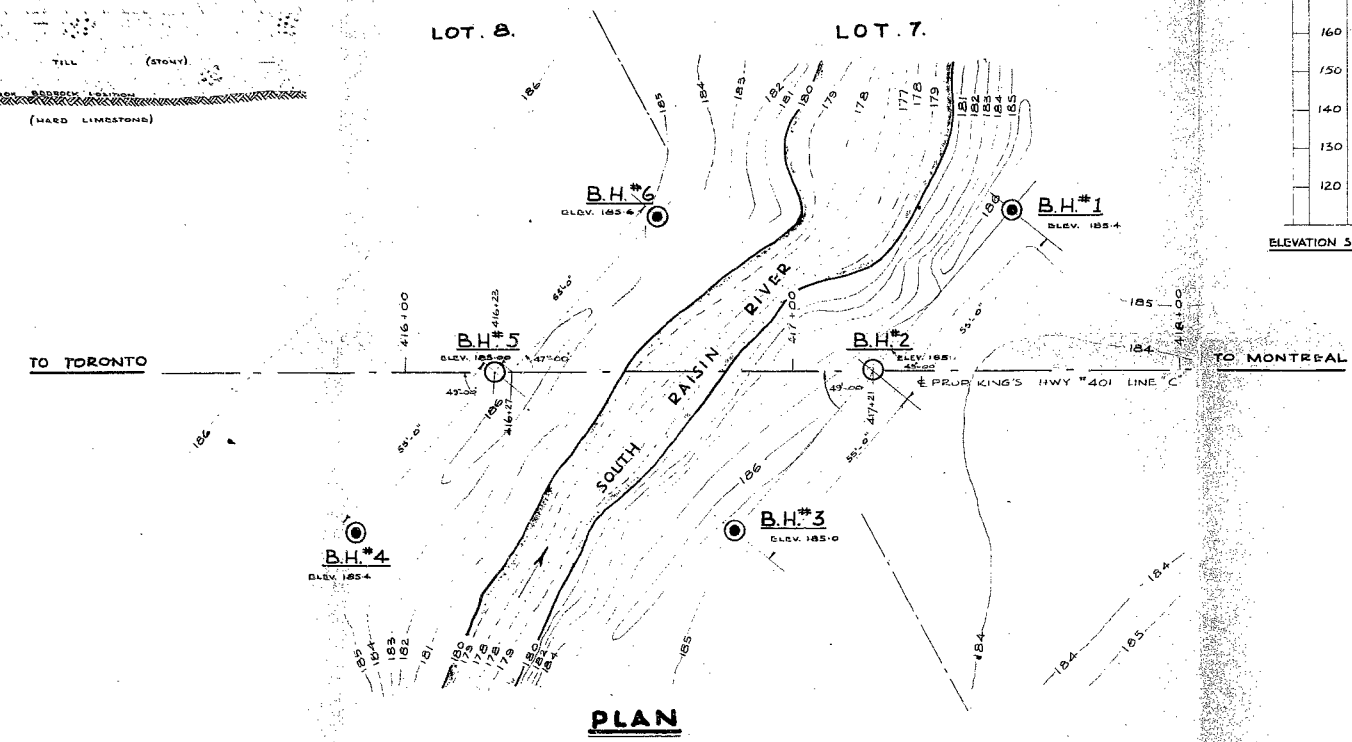
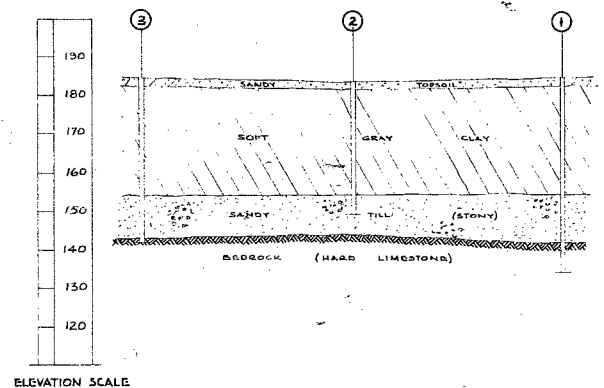
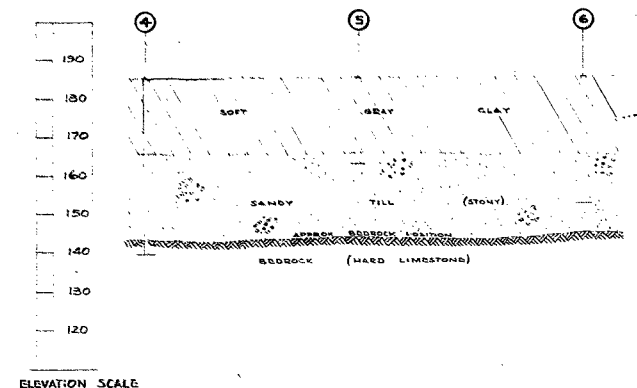
Refusal at 37.0 ft

LIMIT OF BX CASING AT 44'-4"

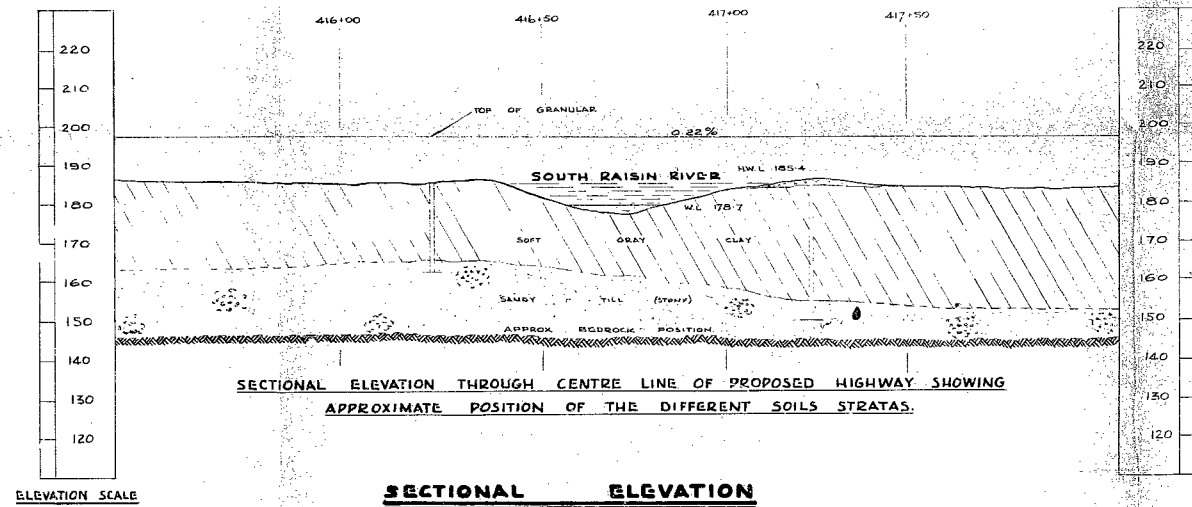
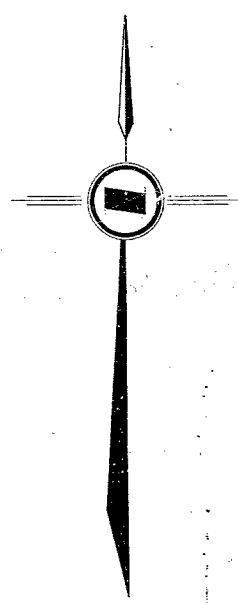
END OF BORING AT 47.0 FT

SAMPLES

OTHER TESTS	CONDITION	TYPE	Nº	PENETRATION RESISTANCE	ELEV. RECOVER.
	T.O.	2"	1	22	181.6 50
1/100	T.O.	2"	2	3	177.6 50
1/94	T.O.	2"	3	18/24"	173.6
	T.O.	2"	4	14/14"	169.6 100
	D.O.		5	379/12"	165.6 LOST
	D.O.		6	84/12"	161.6 8
	D.O.		7	348/12"	157.6 LOST
	D.O.		8	328/12"	153.6 47
	D.O.		9	140/12"	147.6
				PIECES OF BROKEN SAMPLE RECOVERED	143.3
				4 FT OF BROKEN ROCK CORE RECOVERED	



SCALE 1IN = 20 FT



LEGEND
 ○ PENETRATION HOLES
 ● PENETRATION & BORE HOLES

PRINT RECORD		
NO.	FOR	DATE

DEPARTMENT OF HIGHWAYS-ONTARIO- MATERIALS LABORATORY -TORONTO			
BRIDGE SITE			
PROPOSED CROSSING AT		SOUTH RAISIN RIVER	
THE KING'S HIGHWAY No. 401		DIV. No. 9	
CO. STORMONT		TWP. CORNWALL	
LOT 7 & 8		CON. III	
LOCATION OF BOREHOLES AND PENETRATION HOLES			
APPROVED			
CHIEF BRIDGE ENGINEER		CHIEF ENGINEER	
DESIGN	CHECK	CONTRACT	NUMBERS
DRAWING	D.J.D. CHECK	LOADING	DRAWING
TRACING	CHECK	DATE	NUMBER
F-55-19A			

REVISIONS	DATE	BY	DESCRIPTION