

54-F-224C

HWY. 401

LONDON

54-F-224C

RACEY, MACCALLUM AND ASSOCIATES LIMITED

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A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers AND ASSOCIATED STAFF



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Affiliations:

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IRVING F. KRICK, PH.D.,
METEOROLOGIST
JACQUES POULIN,
QUEBEC LAND SURVEYOR
THE VIBRATION ENGINEERING COMPANY

Montreal, Quebec.
November 18, 1954.

Report No. S-500/505/54/T-32/1

Ontario Department of Highways,
c/o C. C. Parker and Associates Limited,
795 Main Street, West,
Hamilton, Ontario.

RE: Soil Investigations, Proposed Westminster Town-
ship bridge No. 8, Highway 401, London, Ontario.

Dear Sirs:

In accordance with your instructions we have carried out a foundation investigation at the subject site and we are now pleased to report as follows.

Prior to any drilling operations, it had been suggested that four boreholes be put down as shown on the attached sketches. Drilling operations commenced on October 28th, 1954 at the site of borehole No. 2 and were continued without any interruptions until November 6th. At this time, the resident engineer, finding a very great similarity between all the boreholes, reported that sufficient information was at hand to describe the foundation conditions adequately and consequently suggested the elimination of the fourth borehole. This matter was discussed with yourselves and it was jointly agreed that there would be no need to carry out drilling of the fourth borehole which in this instance would be numbered borehole No. 1.

As will be seen on the attached engineering data sheet, the soil from the surface down to elevation 807 or 808 is predominately a brown, calcareous, sandy clay, of low plasticity, and very stiff. Some layers of coarse silt to fine sand are noted between elevations 830 and 835. In the case of borehole No. 2, this formation was composed of mostly medium to coarse sand, very compact. At elevation 807 to 808, the soil changed from the clay to a very compact, very fine sand with coarse silt. This formation was approximately 16 feet deep and rested in turn on a stiff silty clay of low plasticity. Operations were suspended at borehole No. 2 at a depth of 70 feet or elevation 786.1, at borehole No. 4 at 65 feet or elevation 791.1, and at borehole No. 3 at 47½ feet or elevation 808 in the formation of very fine sand with coarse silt.

Report No. S-500-505/54/T-32/1

The samples from borehole No. 2 were submitted to laboratory analysis for identification purposes. The information is given in tabular form at the end of this report and is also repeated on the engineering data sheets. With the exception of sample No. 5 taken at 30 feet, the water content is appreciably lower than the liquid limit but higher than the plastic limit. In the case of Sample No. 5, the water content is somewhat closer to the liquid limit than in the other cases but is not sufficiently close to indicate sensitivity.

From the penetration diagram, it is seen that the bearing capacity of the clay based on a possible shear failure would be at least 3.5 tons per square foot, under square footings of reasonable dimensions, and of approximately 2.5 tons per square foot under long footings. This shear strength falls between 25 and 50 feet and reaches a minimum value between 35 and 40. At that depth the basic bearing capacity would be of the order of 1 ton per square foot under square footings and 3/4 ton per square foot under long narrow footings. However, this value does not take into consideration the depth of the footing and the confining effect of the soil which, for a depth of 25 feet or more, is much greater than the intrinsic bearing capacity as calculated for a shallow footing.

In view of the low water content and the low plasticity of the material, it is also felt that settlements will be minimal and if such were to occur at all, they would be uniform and of no consequence whatsoever.

The material, being highly impervious, water table measurements are to be taken with caution. Seepage, either in or out of the borehole would be so small that it is probable that the water table inside the borehole may not correspond at all to the true water table of the soil. Similarly, during construction, excavation could conceivably progress under the water table without hindrance due to the low seepage factor.

Yours very truly,

RACEY, MACCALLUM AND ASSOCIATES LIMITED



Robert Quintal

Director Foundation Engineering Division

RQ/st
In triplicate
Encls.

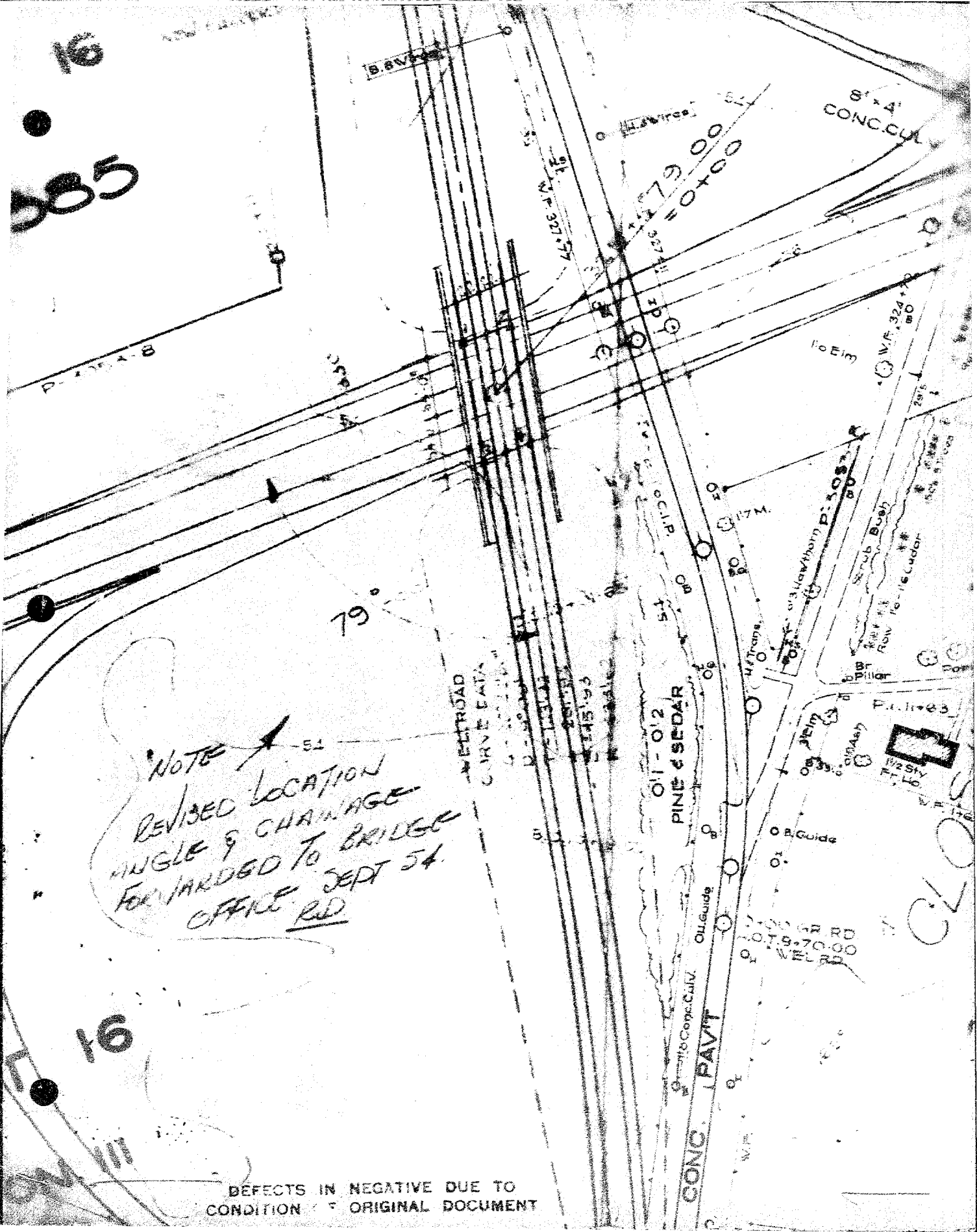
Report No. S-500-505/54/T-32/1

LABORATORY TESTSProposed Westminster TWP. Bridge # 8, London, OntarioAll Tests Referring to Samples (Split Spoon) from Borehole No. 2

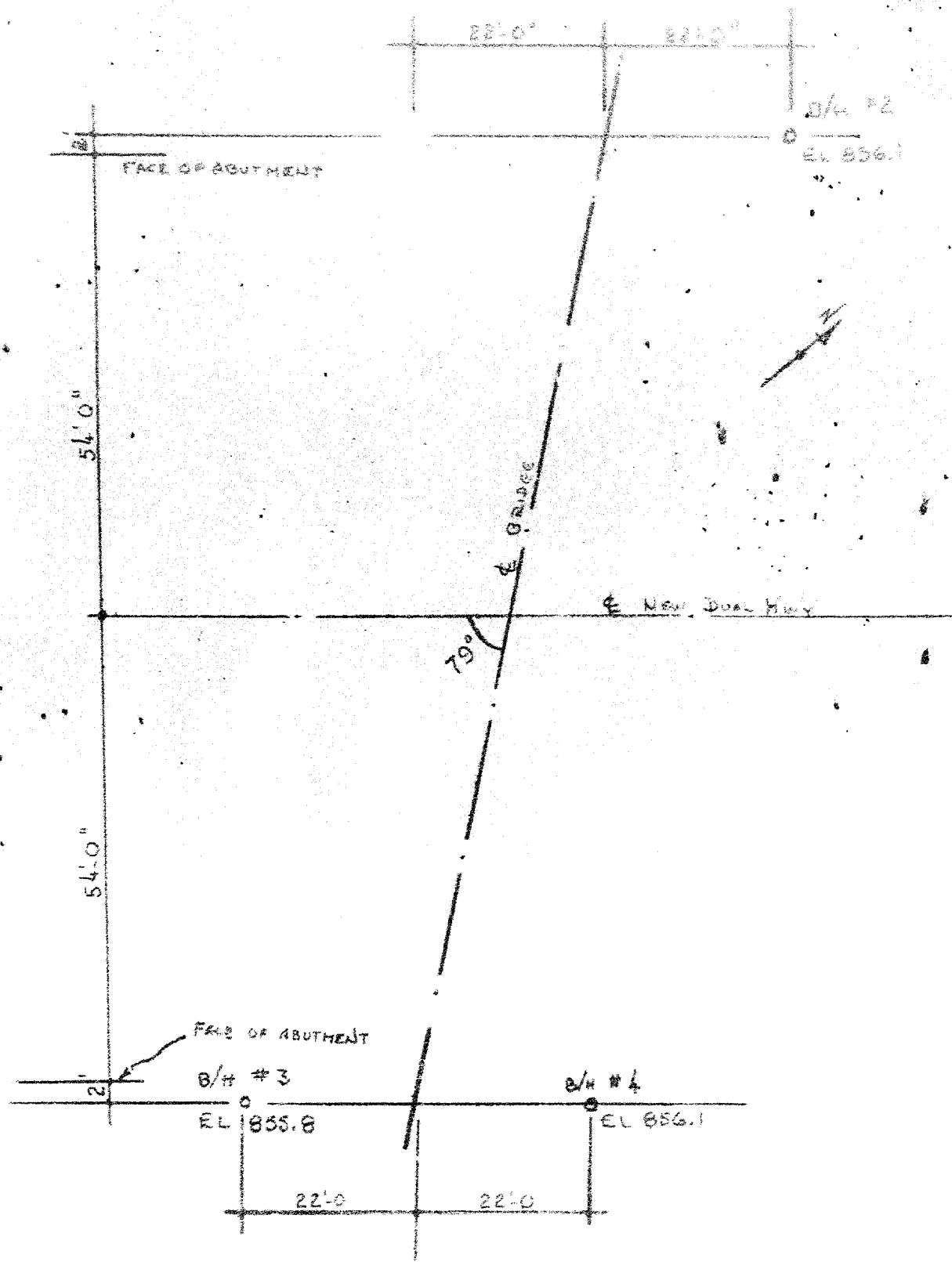
<u>Specimen</u>	<u>W</u>	<u>L_w</u>	<u>P_w</u>	<u>I_w</u>	
S/S-1; 5'-6'	14.4%	27.1%	13.9%	13.2%	Very stiff, brown, calcareous clay of low plasticity, some sand and gravel.
S/S-2; 10'-11'	15.7%	26.4%	13.2%	13.2%	Very stiff, brown slightly calcareous clay of low plasticity, silty.
S/S-3; 15'-16'	15.8%	26.6%	15.7%	10.9%	Very stiff, brown, calcareous, silty clay of low plasticity, some sand, some pebbles.
S/S-4; 20'-21'	19.3%	29.4%	13.2%	16.2%	Very stiff, brown clay of low plasticity.
S/S-5; 30'-31'	21.1%	24.5%	13.7%	10.8%	Stiff clay of low plasticity.
S/S-6; 35'-36'	24.7%	32.6%	15.4%	17.2%	Medium stiff clay, calcareous, of medium plasticity.
S/S-7; 40'-41'	24.5%	34.1%	16.4%	17.7%	Medium stiff clay, calcareous, of medium plasticity.
S/S-10; 69'-70'	14.3%	22.5%	10.6%	11.9%	Stiff, silty clay of low plasticity.

W = Water content (%)
 L_w = Liquid Limit (%)
 P_w = Plastic limit (%)
 I_w = Plasticity Index (L_w - P_w)

16
585



NOTE
REVISED LOCATION
ANGLE & CHAINAGE
FORWARDED TO BRIDGE
OFFICE SEPT 54.
OFFICE RD



Day _____ Month _____ Year _____ Foundation Engineering Division

Hole Begun 3/11/54

M. CHEVRIER

Hole Ended 6/11/54

Engineering Data Sheet for Borehole 3

Bellevue

Job Name: SOIL INVESTIGATIONS -
PROPOSED WESTMINSTER TWP. BRIDGE #8, LONDON, ONT.

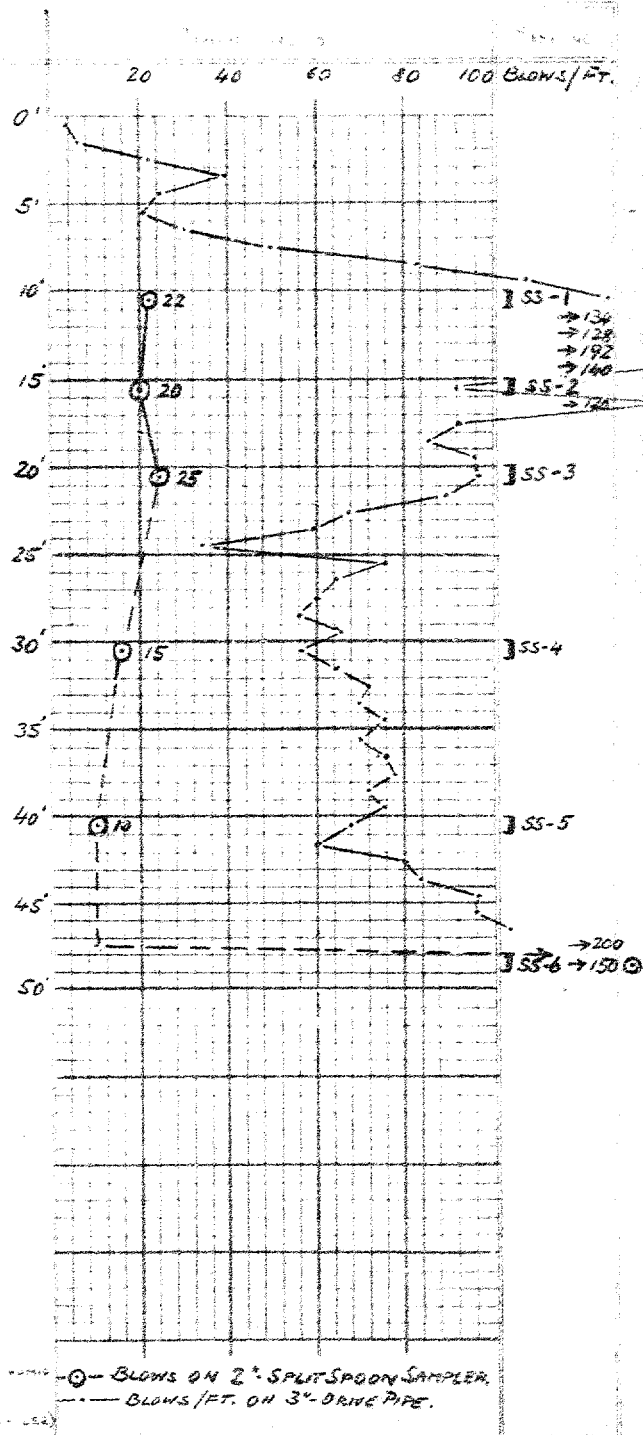
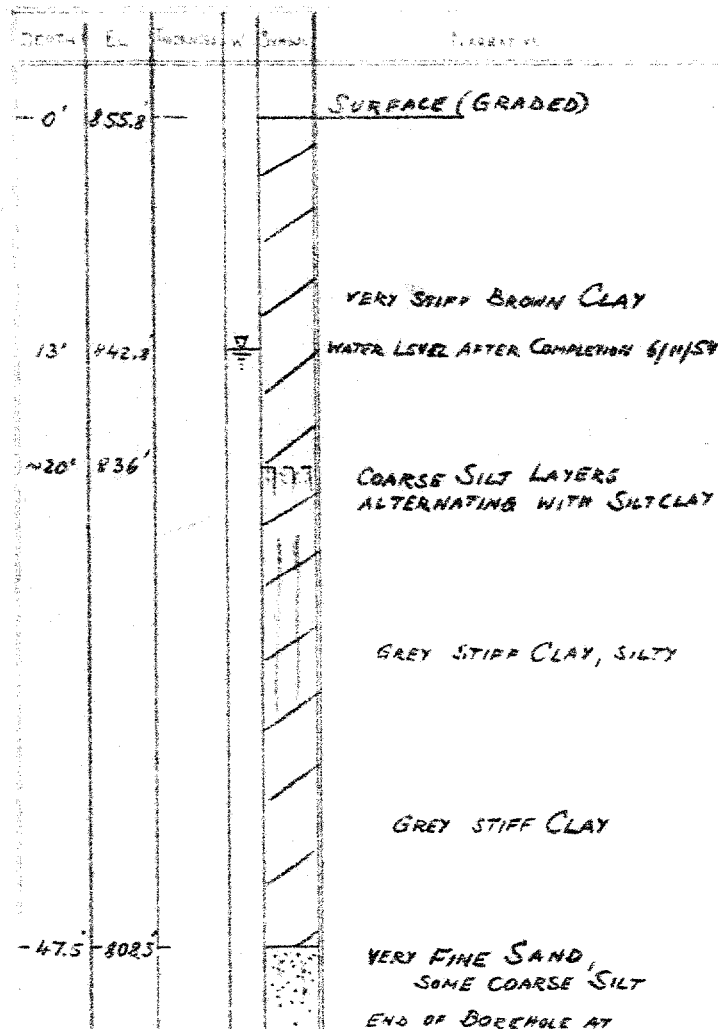
K. TUBBSING

Job Located: SOUTH OF LONDON, WELLINGTON RD. - HIGHWAY #401 INTERSECTION

Hole Located: AS SHOWN ON ATTACHED SKETCH

Hole Elevation: 855.8' Datum: M.S.L.

8/11/54



AGREEMENT
ON WATER & SATURATION OF SOILS
ON DRY
ON SOIL SAMPLES TAKEN FROM BOREHOLE

--- BLOWS ON 2" SPLIT SPOON SAMPLER
--- BLOWS/FT. ON 3" DRIVE PIPE

Foundation Engineering Division

M. CHEVRIER
Helper

DATE 1/11/54
DATE 3/11/54

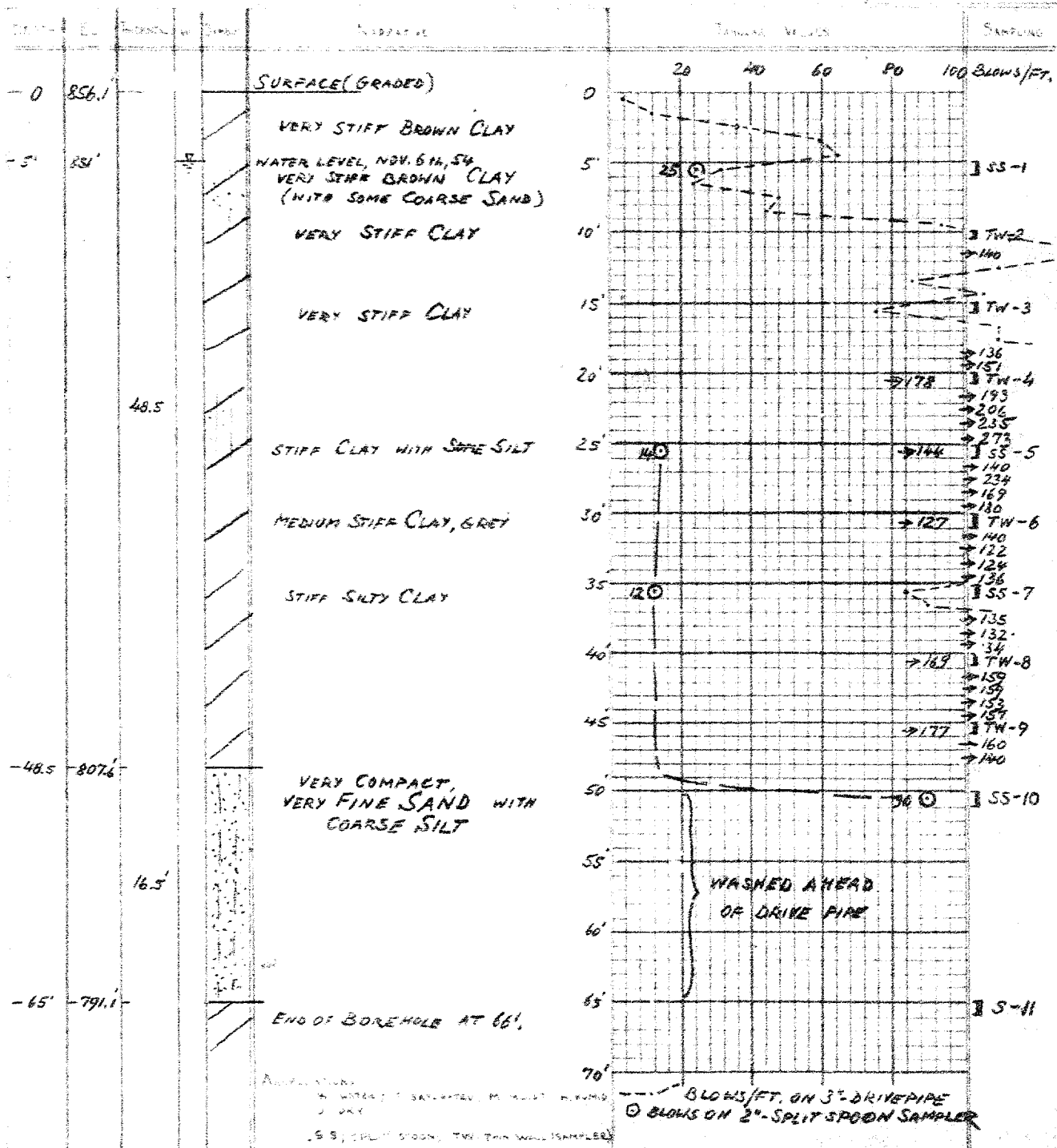
Engineering Data Sheet for Bore hole: 4

K. TUBBESING
Checked by

SOIL INVESTIGATIONS,
PROPOSED WESTMINSTER TIER BRIDGE #8, LONDON, ONT.
SOUTH OF LONDON, WELLINGTON RD. - AIRWAY #40 INTERSECTION
AS SHOWN ON ATTACHED SECTIONS
ELEVATION 856.1' DATUM M.S.L.

3/11/54

Day Month Year



Page No. 1 of 2
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCALLUM AND ASSOCIATES
LIMITED

DRILLER'S DAILY FIELD REPORT

Weather Fair to cloudy
Temperature: cool & windy
Hours work: 8
Hours delay: 2 1/2
10 a.m. - 6 p.m.

Date: 28 10 54
(day month year)

Contract No. S-500-505/54/T-32

Client's file:

Client: C.C. Parker, O. D. H.

Borehole No.: 2 Elevation: Location:

Job Location: Bridge at London, Ontario.

Job Name:

..... Check here if equipment and personnel is the same as on last report.

Drill Make Corlaix Size: Chuck Size: Type of head:
Pump Make: Boyles Size: 700 Length/Water Line: ft. Diam:
Drivepipe: 3 inches; Casing: ; Drivehammer 350 lbs. X 20 inches d. op
Samplers: 2 inches; Bit AXT ; Samplehammer 350 lbs. X 12 inches drop

Contractor: ; Driller F. Lusk Recorder:
Helpers: M. Chevrier ; Visitors:

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.		Elev.
0		1	Drove 3" drive pipe in stiff brown slightly	5			
1		2	gravelly clay	41			
2		3		70			
3		4		67			
4		5		63			
			Washed 3" pipe				
5		6	Drove 2" split spoon sampler in very stiff	39	S/S	1	
			slightly gravelly clay, brown				
5		6	Drove 3" drive pipe	39			
6		7		50			
7		8		60			
8		9		80			
9		10		120			
			Washed 3" pipe				
10		11	Drove 2" split spoon sampler in brown very	26	S/S	2	
			stiff silt clay, No gravel				
10		11	Drove 3" drive pipe	80			
11		12	" "	72			
12		13	" "	65			
13		14	" "	85			

Weather:
Temperature:
Hours work:
Hours delay:

DRILLER'S DAILY FIELD REPORT

Date: 28 10 54
(day month year)

Contract No. S-500-505/54/T-32

Client's file: Client:

Borehole No.: 2 Elevation: 856.1 Location:

Job Location:

Job Name: Bridge at London, Ontario.

*.....Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: inches; Casing:; Drivehammer lbs. X inches drop

Samplers: _____ inches Bit _____ Sample hammer _____ lbs. X _____ inches drop

Contractor: X Driller: _____ Recorder: _____

Helpers: **Visitors:**

[illegible]

Page No. 1 of
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCALLUM AND ASSOCIATES
LIMITED

Weather: Rainy
Temperature: Cool
Hours work: 10
Hours delay:

DRILLER'S DAILY FIELD REPORT

Date: 29 10 54
(day month year)

Contract No.: S-500-505/54/T-32

Client's file: Client:

Borehole No.: 2 Elevation: Location:
Job Location:
Job Name: Bridge at London, Ontario

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:
Pump Make: Size: Length Water Line: ft. Diam:
Drivepipe: inches, Casing: ; Drivehammer: lbs. X inches drop
Samplers: inches; Bit: ; Samplehammer: lbs. X inches drop

Contractor: ; Driller: Recorder:
Helpers: ; Visitors:

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.		Elev.
			Washed 3" pipe				
20		21	Drove 2" split spoon sampler in brown clay	40	S/S	4	
			very stiff running into medium grey sand				
20		21	Drove 3" pipe in sand	211			
21		22		230			
22		23		226			
23		24		250			
24		25		200			
	25		Washed 3" pipe; transition zone to grey				
			fairly stiff clay				
25		26	Drove 2" split spoon sampler in stiff sandy	36			Lost
			and gravelly grey clay				
25		26	Drove 3" pipe	89			
26		27		90			
27		28		90			
28		29		80			
29		30		94			
			Washed 3" pipe				
30		31	Drove split spoon sampler in brown clay	13	S/S	5	
			slightly softer				

Weather:
 Temperature:
 Hours work:
 Hours delay: 10

DRILLER'S DAILY FIELD REPORT

Date 29 10 54
(day month year)

Contract No.: ~~S-520~~ 505/54/T-32.....

Client's file:

Client:

Borehole No.: 2 Elevation: _____ Location: _____

Job Location:

Job Name: _____

X Check here if equipment and personnel is the same as on last report.

Drill Make: _____ Size: _____ Chuck Size: _____ Type of head: _____

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Driven pipe: _____ inches. Casing: _____ : Drive hammer _____ lbs. X _____ inches drop

Samplers: _____ inches: Bit _____ : Sample hammer _____ lbs. X _____ inches drop

Contractor: ☒ Driller: Recorder:

Helpers: _____ Visitors: _____

[illegible]

Weather Cloudy; showers
Temperature: Cool
Hours work: 9
Hours of rest: 1

DRILLER'S DAILY FIELD REPORT

Client's file: _____ Client: _____

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Samplers: _____ inches; Bit _____; Samplehammer _____ lbs. X _____ inches drop

Home: : Visitors:

[illegible]

Page No. 2 of 3
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCALLUM AND ASSOCIATES
LIMITED

DRILLER'S DAILY FIELD REPORT

Weather:
Temperature:
Hours work:
Hours delay:

Date: 5 11 54
(day month year)

Contract No.:

Client's file: Client:

Borehole No.: 3 Elevation: Location:

Job Location:

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:

Pump Make: Size: Length/Water Line: ft. Diam:

Drivepipe: inches; Casing:; Drivehammer: lbs. X inches drop

Samplers: inches; Bit:; Samplehammer: lbs. X inches drop

Contractor: ☒ ; Driller: Recorder:

Helpers:; Visitors:

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.		Elev.
20		21	Drove 3" pipe	97			
21		22		90			
22		23		67			
23		24		49			
24		25		34			
25		26		76			
26		27		65			
27		28		60			
28		29		56			
29		30		66			
			Washed drive pipe				
30		31	Took sample split spoon in silty grey clay	15	s/s	4	
30		31	Drove pipe	57			
31		32		65			
32		33		74			
33		34		70			
34		35		75			
35		36		70			
36		37		76			

Weather:.....
Temperature:.....
Hours work:.....
Hours delay:.....

DRILLER'S DAILY FIELD REPORT

Date: 5 11 54
(day month year)

Contract No.: S-500-505/54/T-32

Client's file:

Client:

Borehole No.: 3 Elevation: Location:

Job Location: _____

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:

Jump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: _____ inches, Casing: _____; Drivehammer _____ lbs. X _____ inches drop

Samplers: _____ inches; Bit: _____; Samplehammer _____ lbs. X _____ inches drop

Contractor: X; Driller _____ Recorder: _____

Helpers: _____; Visitors: _____

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.	Elev.
37		38		78		
38		39		72		
39		40		75		
			Washed drive-pipe			
40		41	Took sample in clay; very little silt	10	S/S 5	
40		41	Drove 3" pipe	68		
41		42		60		
42		43		80		
43		44		83		
44		45		97		
45		46		96		
46		47		103		
47		48	Hit sand at 47.6"	200		
48		49	Drove split spoon sampler in sand and coarse silt; pulled out pipe	150	S/S 6	

Weather: Fair
Temperature:
Hours work: 1
Hours delay:

DRILLER'S DAILY FIELD REPORT

Date: 6 11 54
(day month year)

Contract No.:.....S-500-505/54/T-32

Client's file:

Client:

Borehole No.: Elevation: Location:

Job Location: ..

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: inches. Casing: ; Drivehammer lbs. X inches drop

Samplers: _____ inches; Bit _____; Sample hammer _____ lbs. X _____ inches drop

Contractor: X ; Driller: _____ Recorder: _____

Helpers: _____; Visitors: _____

[illegible]

Page No. 1 of 3
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCALLUM AND ASSOCIATES
LIMITED

Weather Cloudy; wet
Temperature: cool
Hours work: 10
Hours delay: _____

DRILLER'S DAILY FIELD REPORT

Date: 1 11 54
(day month year)

Contract No.: S-500-505/54/T-32

Client's file: _____

Client: _____

Borehole No.: h Elevation: _____ Location: _____

Job Location: _____

Job Name: _____

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: _____ Size: _____ Chuck Size: _____ Type of head: _____

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: _____ inches; Casing: _____; Drivehammer _____ lbs. X _____ inches drop

Samplers: _____ inches; Bit _____; Samplehammer _____ lbs. X _____ inches drop

Contractor: X; Driller: _____ Recorder: _____

Helpers: _____; Visitors: _____

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.		Elev.
			Set up machine and tripod				
0		1	Drove 3" pipe in very stiff clay	3			
1		2		11			
2		3		36			
3		4		59			
4		5		65			
			Washed out pipe				
5		6	Bent shelby sampler; clay too stiff (some coarse sand in clay) Drove split spoon sampler	25	S/S	1	
5		6	Drove 3" pipe in very stiff clay	31			
6		7		23			
7		8		48			
8		9		45			
9		10		94			
			Washed pipe				
10		10'6	Drove TW sampler in very stiff clay	5" 2	TW	2	
10		11	Drove 3" pipe	113			
11		12		140			
12		13		105			

Page No. 2 of 3
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCAI 'LUM AND ASSOCIATES
LIMITED

DRILLER'S DAILY FIELD REPORT

Weather:
Temperature:
Hours work:
Hours delay:

Date: 1 11 54
(day month year)

Contract No. S-500-505/54/T-32
Client's file:

Client:

Borehole No.: 4 Elevation: Location:
Job Location:
Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:
Pump Make: Size: Length/Water Line: ft. Diam:
Drive pipe: inches; Casing:; Drivehammer lbs. X inches drop
Samplers: inches; Bit:; Samplehammer lbs. X inches drop

Contractor: ☒ ; Driller: Recorder:
Helpers:; Visitors:

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.		Elev.
13		14	Drove 3" pipe	86			
14		15		106			
15		15'7	Drove TW sampler in a very stiff grey clay. Edge of sampler slightly bent	7" 3	TW	3	
15		16		75			
16		17		105			
17		18		105			
18		19		136			
19		20		151			
			Washed 3" pipe				
20		20'7	Drove TW sampler in stiff grey clay. Edge of sampler slightly bent	7" 4	TW	4	
20		21	Drove 3" drive pipe	178			
21		22		193			
22		23		206			
23		24		235			
24		25		273			
			WASHED PIPE				

Weather:
 Temperature:
 Furs work:
 Hours delay:

DRILLER'S DAILY FIELD REPORT

Date: 1 11 54
(day month year)

Contract No.: S-560-505/54/T-32

Client's file:

Client:

Borehole No.: 4 Elevation: Location:

Job Location:

Job Name:

.....Check here if equipment and per. are the same as on last report.

Drill Make: _____ Size: _____ Chuck Size: _____ Type of head: _____

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: inches; Casing:; Drivehammer lbs. X inches drop

Samplers: inches; **Bit** ; **Samplehammer** lbs. X inches drop

Contractor: _____; Driller: _____ Recorder: _____

Helpers: : Visitors:

[illegible]

Page No. 2 of 2,
(do not put more than one
day or one borehole per
sheet)

RACEY, MACCALLUM AND ASSOCIATES
LIMITED

Weather:.....
 Temperature:.....
 Hours work:.....
 Hours delay:.....

DRILLER'S DAILY FIELD REPORT

Date: 2 11 54
(day month year)

Contract No. S-500-505/54/T-32

Client's file: Client:

Borehole No.: 4 Elevation: _____ Location: _____

Job Location: _____

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Size: Type of head:

Pump Make: Size: Length/Water Line: ft. Diam:

Drivepipe: inches; Casing:; Drivehammer lbs. X inches drop

Samplers: _____ inches; Bit _____; Samplehammer _____ lbs. X _____ inches drop

Contractor: I ; Driller Recorder:

Helpers: _____; Visitors: _____

[illegible]

DRILLER'S DAILY FIELD REPORT

Date: November 3rd, 1954

Contract No.: S 500/505/54/T32

(day month year)

Client's file:

Client: Ont. Department of Highways

Borehole No.: 4 Elevation: Location: London, Ontario.

Job Location:

Job Name:

☒ Check here if equipment and personnel is the same as on last report.

Drill Make: X Size: Chuck Size: E Type of head: Screw

Pump Make: Boyles Size: Length/Water Line: ft. Diam:

Drivepipe: 3 inches, Casing:; Drivehammer: 350 lbs. X 20 inches drop

Samplers: 2 inches; Bit: AXT; Samplehammer: 350 lbs. X 12 inches drop

Contractor:; Driller: Recorder:

Helpers:; Visitors:

Depth, feet From At To			Comments: Soil description, water measurements; daily incidents, etc.	Blows per ft.	Samples Type No.	Elev.
40	40.9		Take T.W. Sample in hard and silty clay	By Lever 6" 2	TW 8	
40	41		Drove 3" Pipe	169		
41	42			159		
42	43			159		
43	44			153		
44	45			157		
			Washed Pipe			
45	45.9		Took T.W. Sample with lever (1 Elow) in hard silty clay	1	TW 9	
45	46		Drove Pipe	177		
46	47			160		
47	48			140		
48	49			270		
48.6			Hit silty very fine sand			
49	50			275		
			Washed Drive Pipe			
50	51		Drove 2" Split Spoon in sand and coarse silt	90	SS 10	

Weather:
 Temperature:
 Hours work:
 Hours delay:

Client's file: Client:

Borehole No.: 4 Elevation: _____ Location: _____

Job Location:

Job Name:

X Check here if equipment and personnel is the same as on last report.

Drill Make: Size: Chuck Size: Type of head:

Pump Make: _____ Size: _____ Length/Water Line: _____ ft. Diam: _____

Drivepipe: inches, Casing: Drivehammer lbs. X inches drop

Samplers: inches; Bit; Samplehammer lbs. X inches drop

X Contractor: _____; Driller: _____ Recorder: _____

Helpers: **Visitors:**

[illegible]