

**CORRESPONDENCE/MEMORANDUM**

**State of Wisconsin**

**DATE:** February 28, 1995

**TO:** Richard Pauser  
Construction and Materials Supervisor  
Transportation District 6

**FROM:** Dennis G. Althaus  
Geologist

**SUBJECT:** Site Investigation Report  
Project I.D. 7200-04-00  
Structure B-55-165  
STH 35 Tower Rd.  
River Falls to I-94 (Hudson)  
ST. Croix County

Attached is the Site Investigation Report for the above project.

DGA:\

Attachments

cc: District 6 (orig. +3)  
C.O. Bridge (2)  
C.O. Files  
C.O. Design  
J.E. Haverberg  
Geotechnical File

# **SITE INVESTIGATION REPORT**

**Project I.D. 7200-04-00**

**Structure B-55-165**

**River Falls to I-94 (Hudson)**

**ST. Croix county**

## **1. GENERAL**

Three borings were made for a proposed two span bridge to carry Tower Road over relocated STH 35 at about station 44+36. The site is located 1.5 miles south of I-94, about 800 feet west of existing STH 35 and 100 feet north of Tower Road in a present flat farm field. The proposed structure will be about 210 feet long by 30 feet wide. The surface soil is a sandy silt.

## **2. SUBSURFACE CONDITION**

Three borings conforming to AASHTO Method T-206, Standard Penetration Test, to estimate relative density, fix presumptive bearing capacity, investigate soil properties to select suitable pile types with their support values, make a cursory review of alternate foundation possibilities, and recover samples for soil textural identification and classification. Soil textures in the borings logs are field identifications made by the drillers and were later verified in the C.O. Geotechnical Lab.

Boring 1 was taken at station 45+44 15 feet right of the proposed centerline. Boring 1 was logged as the following; elevation 912.3 to 910.3 black topsoil, 910.3 to 887 loose brown sand, 887 to 852 firm brown sand with a little gravel and a trace of silt, 852 to 837 dense brown sand with some gravel and a trace of silt, 837 to 827 firm brown sand and gravel, 827 to 824.5 very dense sandstone, 824.5 to 818.5 light brown limestone (cored 5' 95% recovery RQD 47%).

Boring 2 was taken at station 44+36 on the proposed centerline. Boring 2 was logged as the following; elevation 912.9 to 911.5 black topsoil, 911.5 to 911 brown silt, 911 to 888 loose brown sand with a trace of gravel, 888 to 862.5 firm brown sand, 862.5 to 838 dense to very dense brown sand with some gravel, 838 to 830 firm brown sand and gravel, 830 to 828 sandstone.

Boring 3 was taken at station 43+34 15 feet left of the proposed centerline. Boring 3 was logged as the following; elevation 912.4 to 911 black topsoil, 911 to 910 brown silt, 910 to 887.5 loose brown sand with a trace of gravel, 887.5 to 832.5 firm to dense brown sand with a little gravel, 832.5 to 829.5 very dense brown sand and gravel, 829.5 sandstone.

The ground water elevation at the time the borings were taken was about 845.

The topsoil and very loose silt layer varied from 2 to 2.5 feet.

#### Rock Elevations

<u>Structure Unit</u>	<u>Station</u>	<u>Rock</u>
West Abutment, Boring 3	43+34	829.5
Pier, Boring 2	44+36	830
East Abutment, Boring 1	45+44	827

### 3. BEARING CAPACITY

The subsurface soils within a practical footing depth have insufficient bearing capacity to support spread footings for this structure.

### 4. PILES

A cursory review indicates that the soils above rock/weathered rock would not be adequate to support friction/displacement piles at practical load levels.

H-piles or oil field pipe piles however could be driven to 9000 psi load in the steel section if driven to rock at elevation 827.

### 5. ALTERNATIVE FOUNDATION TYPE

Drilled caissons could be used here but the cost would be more. Dynamic and vibratory methods could not be used effectively here.

### 6. LATERAL EARTH PRESSURE

Grade 1 granular backfill will exert an equivalent fluid pressure of 30 to 35 psf, silty sands 45 psf, silts 65 psf, silty clays and clays 85 psf or more.

### 7. CONSTRUCTION PROBLEMS

Remove the 2 to 2.5 feet of black topsoil and very loose brown silt from under neath the approach fills before the fills are to be placed. The new approach fills will be about 25 feet high.

## **8. RECOMMENDATIONS**

A) Use H-piles or oil field pipe piles driven to rock at 9000 psi load in the steel section. The rock elevation is about 827. There are some very dense blow counts shown on the borings, however these blow counts appear falsely produced by gravel in the sand soils being sampled.

B) Remove the topsoil and the very loose brown silt before placing the approach fills. There should be 2 to 2.5 feet of topsoil and silt to be removed. This material could later be placed on the side slopes of the approach fills.

C) Use a grade 1 sand as fill material for the approach fills and as backfill for the abutments and other earth retaining structures.

D) The approach fill and back-filled areas around the abutments should set at least 3 to 4 months from the time the fills are finished till the time the approaches are paved to allow for settlement due to and within the proposed 25 foot approach fills.

If you have any questions, please contact the Geotechnical Unit.

Tower Rd over STH 35, River Falls to Hudson I-94 Rd, St. Croix County

STATE PROJECT NUMBER SHEET NO.

ABBREVIATIONS	
F—Fine	Coarse
M—Medium	S—Sound
MATERIAL SYMBOLS	
Topsoil	Sandstone
Sand	Gravel
Clay	Limestone
Igneous Rock	

LEGEND OF PROBING	
95/100 Blows for 0' Penetration	7 Average Blows Per Foot
Penetration	350' Blows
Falling 18' on a 2' S.D. Point	Refusal 95/6

LEGEND OF BORING	
Unconfined Strength— $\frac{1}{2} \times 7$	Sandy Gravel
Blows Per Foot Using 140' Mt. Falling 38'	Wash Sample
Shelby Tube—S.T.	Ground Water Elevation
No Ground Water Observed Above This Elevation	Silty Clay
Unless otherwise specified the blow per foot at the locations indicated are based on driving a 2" O.D. x 14" I.D. split spoon sampler with a 140' hammer having a free fall of 38'. The blow count is taken in undisturbed soil immediately below a closed or open hole eliminating side friction on the drive pin.	

**SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDERS INFORMATION**

To obtain relative data concerning the character of material in and upon which the foundation might be built, borings and/or soundings were made at points approximately as indicated on this drawing. The data presented herein represents the findings of the subsurface explorations made. However, because the depths investigated are limited and the area of the borings and/or soundings is very small in relation to the entire area, the Division of Highways does not warrant conditions below the depths investigated or that the classification of material encountered in these investigations is necessarily typical of the entire area.

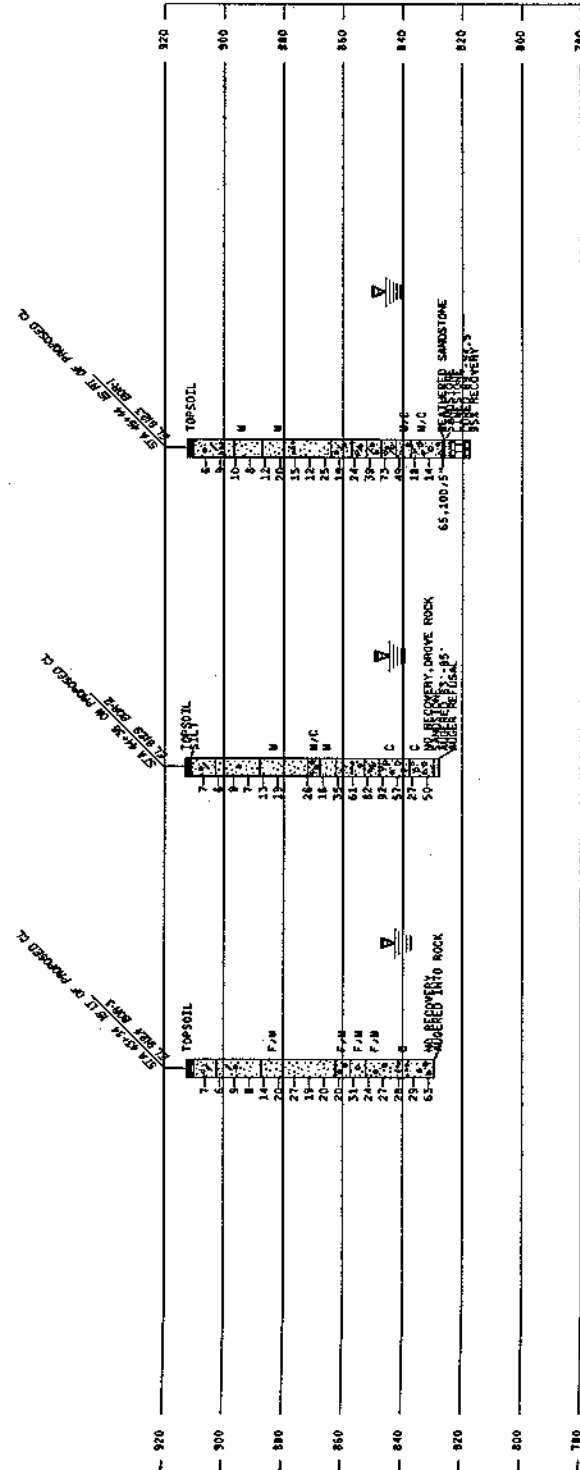
NO.	DATE	REVISION	BY
1	1986	1	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS			
STRUCTURE B-55-165			
SUBSURFACE EXPLORATION			
SHEET 1 OF 1			

TOWER RD PROPOSED E

BOR-1

BOR-3

VERTICAL SCALE : 1" = 20'



FIELD BORING LOG

Boring No.

1

Structure

B-55-165

County

St Croix

Sheet

1 of 3

Project

7200-04-00

Road

~~STH 35~~ Tower Rd over STH 35

Station

45+44

Offset

15' Rt proposed

Surface Elevation

912.3

While drilling

66.5'

Time after drilling

Before casing removal

Depth to water

After Boring Completed

Depth to cave-in

Cave In

GROUND WATER OBSERVATIONS

25

Water Notes

MOISTURE

D = Damp

M = Moist

W = Wet

HS = Hollowstem

WA = Washahead

RB = Rockbit

ST = Shelby tube

SS = Split spoon

DM = Drilling mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start

1-24-95

Unit

3

Finish

1-27-95

Chief

Horstman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size		
					BI TOPSOIL						HS
					loose Br. SAND to fine gravel to silt						
1	D	2	3								
		3	4								
2	D	3	3		Thin layer gravel						
		6	6								
3	D	3	4		Loose Br med SAND						
		6	5								
4	D	3	3								
		5	6								
5	D	5	6		Firm Br. med SAND						
		6	6								
6	D	8	11								
		9	8								
7	D	6	8		Thin layer gravel						
		7	17								
8	D	6	6								
		6	9								

Checked by

Final

Boring No.

1

# FIELD BORING LOG

Boring No. 1 Structure B-55-165 EL3(S) 385 State of Wisconsin/Department of Transportation County St Croix Sheet 2 of 3

Project 7200-04-00 Road Tower Rd over STH 35  
 Station 45+44 Offset 15' Rt proposed Surface Elevation 912.3

While drilling 66.5 GROUND WATER OBSERVATIONS  
 Before casing removal Time after drilling  
 After Boring Completed Depth to water  
 Cave In Depth to cave-in  
 Water Notes

MOISTURE D = Damp M = Moist W = Wet  
 HS = Hollowstem WA = Washhead RB = Rockbit  
 ST = Shelby tube SS = Split spoon DM = Drilling mud  
 A = Auger C = Coring W = Wash  
 E = Easy M = Medium H = Hard  
 Start 1-24-95 Unit 3  
 Finish Chief Horsbman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size	Size	
8	D	6	6	40	Firm Br. med SAND	40					HS
		6	9								
9	D	5	9	45		45					
		16	17								
					Firm Br. SAND Some gravel or silt						
10	M	5	9	50		50					
		10	11								
11	M	8	10	55	Firm Br. SAND little gravel	55					
		14	16		" silt						
12	M	11	22	60	Dense Br. SAND little gravel	60					
		17	31		or silt						
13	M	13	33	65	V. Dense Br. SAND some gravel	65					
		40	33		to sand						
14	W	17	22	70	Dense - V. Dense med. coarse SAND	70					
		27	29		Some gravel						
15	W	6	8	75	Firm med. coarse SAND & GRAVEL	75					
		10	12								
16	W	6	6	80		80					
		8	17								

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 1

FIELD BORING LOG

Project	7200-04-00	Road	Tower Rd over STH 35
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145. GROUND WATER OBSERVATIONS

Before casing removal	Depth to water					
After casing completed	Depth to cave-in					

<b>MOISTURE</b> D = Damp	<b>DRILLING METHOD</b> HS = Hollowstem    ST = Shelby tube    A = Auger    E = Easy				Start <u>1-24-95</u> Unit <u>3</u>
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No.	Blows on	and	Blows on	Blows on
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Sample	Moist	0/6	6/12	Sample Recc'd	Visual Description	Unclassified Strength	Bond	Cast	Size	Prob	Size	Drill Met
				73								

[illegible][illegible]

17 15 ~~85~~ ~~more weathered SANDSTONE~~ ~~85~~ ↓  
W1

V		100/15"	<del>100/15"</del>	<u>100/15"</u>	<u>100/15"</u>	100/15"
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12 R. LIMESTONE

Cored 89'-94.5'

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93% recovery

[illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible][illegible]

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# FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure B-55-165 County 52 Cro. & Sheet 1 of 3  
 Project 7200-04-00 Road Tower Rd over STH 35  
 Station 44+36 Offset on proposed L Surface Elevation 912.9

While drilling 68.5 +/- Time after drilling \_\_\_\_\_  
 Before casing removal 68.4 Depth to water \_\_\_\_\_  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In 41 Water Notes \_\_\_\_\_

MOISTURE  
 D = Damp  
 M = Moist  
 W = Wet

DRILLING METHOD  
 HS = Hollowstem  
 WA = Washhead  
 RB = Rockbit  
 ST = Shelby tube  
 SS = Split spoon  
 DM = Drilling mud  
 A = Auger  
 C = Coring  
 W = Wash  
 E = Easy  
 M = Medium  
 H = Hard

Start 1-3093 Unit 3  
 Finish \_\_\_\_\_ Chief Horstman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
					<u>Br. SILT</u>					<u>HS</u>
					<u>Loose Br. SAND to gravel to silt</u>					
<u>1</u>	<u>D</u>	<u>3</u>	<u>3</u>	<u>5</u>						
		<u>4</u>	<u>4</u>							
<u>2</u>	<u>D</u>	<u>3</u>	<u>3</u>	<u>10</u>	<u>Loose Br. SAND to fine gravel</u>					
		<u>3</u>	<u>3</u>							
<u>3</u>	<u>D</u>	<u>3</u>	<u>3</u>	<u>15</u>						
		<u>6</u>	<u>5</u>							
<u>4</u>	<u>D</u>	<u>2</u>	<u>3</u>	<u>20</u>						
		<u>4</u>	<u>3</u>							
<u>5</u>	<u>D</u>	<u>5</u>	<u>6</u>	<u>25</u>	<u>Firm Br. med SAND</u>					
		<u>7</u>	<u>6</u>							
<u>6</u>	<u>D</u>	<u>7</u>	<u>10</u>	<u>30</u>						
		<u>9</u>	<u>7</u>							
<u>7</u>	<u>D</u>	<u>4</u>	<u>9</u>	<u>40</u>	<u>Br. med-coarse SAND + GRAVEL</u>					
		<u>17</u>	<u>17</u>							

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 2

# FIELD BORING LOG

Boring No. 2 Structure B-55-165 County 52 Croix Sheet 2 of 3  
 Project 7200-04-00 Road Tower Rd over STH 35  
 Station 44+36 Offset On proposed E Surface Elevation 912.9  
 While drilling 68.5 +/- Time after drilling \_\_\_\_\_  
 Before casing removal 68.4' Depth to water \_\_\_\_\_  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In 41' Water Notes \_\_\_\_\_

## GROUND WATER OBSERVATIONS

Time after drilling \_\_\_\_\_

Depth to water \_\_\_\_\_

Depth to cave-in \_\_\_\_\_

Water Notes \_\_\_\_\_

### MOISTURE

D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Washhead  
RB = Rockbit

ST = Shelby tube  
SS = Split spoon  
DM = Drilling mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start 1-30-95 Unit 3

Finish \_\_\_\_\_ Chief Horstman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
7	D	4	9		40 Firm Br. med SAND	40				HS
		17	17		Dense Br. med. coarse SAND + GRAVEL					
8	D	3	7		45 Firm Br. med SAND	45				
		9	10							
9	D	12	16		50 Dense Br. SAND little gravel	50				
		19	28		tr silt					
10	D	33	33		55 Layer gravel	55				
		28	22		V. Dense					
11	D	18	43		60 V. Dense Br. SAND some gravel	60				
		39	27		tr silt					
12	D	39	66		65 V. Dense Br. coarse SAND + GRAVEL	65				
		26	20							
13	W	46	22		70	70				
		35	33		16-22					
		35	33							
14	W	8	12		75 Firm-Dense Br. coarse SAND + GRAVEL	75				
		13	17							
		20	24		80 No recovery drove rock	80				
		26	30							

Checked by \_\_\_\_\_

Final \_\_\_\_\_

Boring No. 2



FIELD BORING LOG

Boring No. 3 Structure B-55-165 EL3(S) 385 State of Wisconsin/Department of Transportation  
 Project 7200-04-00 Road Tower Rd over STM 35 County St Croix Sheet 1 of 3  
 Station 43+34 Offset 15 ft proposed Surface Elevation 912.4

GROUND WATER OBSERVATIONS

While drilling \_\_\_\_\_ Time after drilling \_\_\_\_\_  
 Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE

D = Damp  
 M = Moist  
 W = Wet

HS = Hollowstem  
 WA = Washhead  
 RB = Rockbit

DRILLING METHOD

ST = Shelby tube  
 SS = Split spoon  
 DM = Drilling mud

A = Auger  
 C = Coring  
 W = Wash

E = Easy  
 M = Medium  
 H = Hard

Start 02-01-95 Unit 3  
 Finish \_\_\_\_\_ Chief Anderson

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size		
					BLK TOPSOIL						HS
					BRN SILT						
1	D	2 3	4 4		LOOSE BRN SAND TR GRAVEL TR SILT						
2	D	2 3	3 3		LOOSE BRN SAND TR GRAVEL TR SILT						
3	D	2 5	4 5		LOOSE						
4	D	3 5	3 4		LOOSE						
5	D	5 7	7 7		FIRM BRN FINE → MED SAND						
6	D	6 11	9 10		FIRM						
7	D	6 18	9 17		FIRM						
8	D	4 10	9 12		FIRM						

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 3

FIELD Boring LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 3

Structure B-55-165

County ST CROIX

Sheet 2 of 3

Project 7200-04-00

Road TOWER RD OVER STN "35"

Station 43+34

Offset 15' LT of Proposed

Surface Elevation 912.4

GROUND WATER OBSERVATIONS

While drilling

Time after drilling

Before casing removal

Depth to water

After Boring Completed

Depth to cave-in

Cave in

Water Notes

MOISTURE

D = Damp

M = Moist

W = Wet

HS = Hollowstem

WA = Washhead

RB = Rockbit

ST = Shelby tube

SS = Split spoon

DM = Drilling mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start 02-01-95

Unit 3

Finish 02-02-95

Chief ANDERSON

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size		
8	D	4	9	40	FIRM BRN MED → FINE SAND						HS
		10	12								
9	D	4	10	45	FIRM						
		10	10								
10	D	6	10	50	FIRM BRN MED → FINE SAND						
		10	9		SOME GRAVEL						
11	D	9	15	55	DENSE BRN MED-FINE SAND						
		16	16		TO GRAVEL						
12	D	7	12	60	FIRM BRN MED-FINE SAND						
		12	13		LITTLE GRAVEL						
13	D	8	13	65	FIRM						
		14	14								
14	W	8	12	70	FIRM → DENSE COARSE BRN SAND						
		16	16		LAYERS OF GRAVEL						
					GRAVEL						
15	W	8	13	75							
		16	15								
16		13	29	80	No RECOVERY V. DENSE						
		29	35								

Checked by

Final

Boring No. 3

