

CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

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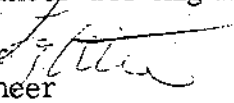
To: Mr. Fred Ross, District Transportation Director
ATTN: Mr. Bruce Eastenson, District Materials Engineer

From: Mr. G.C. Whited, State Materials Engineer for Highways

Subject: MATERIALS
SOILS
SITE INVESTIGATION REPORT
Project ID 1050-03-01
STH 29 over C&NW RR - I-94 to Chippewa Falls Road
Structure B-17-116
Dunn County

We are attaching copies of a Site Investigation Report for the project noted above.

Gary C. Whited
State Materials Engineer for Highways

By Clyde N. Laughter 
Chief Soils Engineer

cc: District 6 (orig. + 3)
Bridge (2)
C.O. Design
GCW
MOF
Soils File

SITE INVESTIGATION REPORT
Project ID 1050-03-01
STH 29 over C&NW RR - I-94 to Chippewa Falls Road
Structure B-17-116
Dunn County

1. General

This is a report of subsurface conditions with accompanying bridge foundation studies for the proposed replacement structure carrying STH 29, station 12+25, over the C&NW railroad. The site is about 1 mile northwest of Elk Mound near the junction of STH 29, USH 12 and STH 40. There are approach fill of some 5 feet at the west abutment and 10 feet at the east with additional cut to provide clearance. The existing concrete deck bridge, built in 1931, has 7 spans. The general area is rolling open farmland with no boulders or marsh evident. It appears the existing bridge is supported by footings resting on sandstone bedrock.

2. Subsurface Conditions

Four borings and 4 probes were made on the site. The borings, made in compliance with AASHTO Method T-206, Standard Penetration Test, were made to estimate relative soil density, fix presumptive bearings, check parameters for pile type selection and support, locate rock line, and lift samples for soil textural classification. NX rock cores were cut in all borings.

The probes were driven solely to locate the rock surface.

Soil textures noted are driller's field identification with a follow-up check in the central soils office.

The area can be categorized as shallow sands over sandstone bedrock. At the west abutment, Boring 1 and Probe 4, there is 3 to 6 feet of sand over sandstone. For Pier 1, Boring 2 and Probe 2, there is about 3 to 5 feet of sands with organic inclusions over sandstone. At Pier 2, Boring 3 and Probe 1, there is 3 to 5 feet of sand over bedrock. The east abutment has deeper sands, possibly fill over sandstone bedrock.

The sandstone was remarkably hard and competent with 74 to 90% recovery on NX cores whereas ordinary sandstone is normally regarded as impossible to core with conventional tools.

3. Bearing Capacity

The following table can be used to proportion footings:

<u>Structure Unit</u>	<u>Elevation</u>	<u>Bearing Capacity</u>	
		(psf)	(SF=3)
West Abutment	Surface to 940	2,000	
	940 [±] to 935 [±]	6,000*	
	Below 935 [±]	20,000	
Pier 1	Surface to 917 [±]	21,000	
	Below 917 [±]	20,000	
Pier 2	Surface to 918 [±]	2,000	
	918 [±] to 915 [±]	6,000*	
	Below 915 [±]	20,000	
East Abutment	Surface to 932	2,000	
	932 [±] to 916 [±]	6,000*	
	Below 916 [±]	20,000	

* Increase 250 psf for each foot of embedment but not exceeding 10,000.

4. Piles

Piles would not achieve the required 10 foot minimum penetration without pre-boring into rock. If pile points are used, it is extremely doubtful driving would be successful and lateral support could be impaired by the shattering of the sandstone as the tip goes down.

5. Alternate Foundation Types

Caissons or shafts socketed 5 feet into hard competent rock could be designed for 40 tsf on the shaft base. With a limited size of project and no locally available drilled shaft contractors, this approach is not attractive.

Vibratory methods or dynamic approaches will do little to improve bearing capacity over the in situ state.

6. Lateral Earth Pressure

The locally abundant sands will create a lateral earth pressure (equivalent fluid) of 30-33 psf on abutment backwalls or other earth retaining structures. This presumes adequate compaction and thorough drainage will occur. With similar placement, a silt will exert 50-55 psf. A clay will give 80-85 psf regardless of placement or drainage. If drainage is not effected, the minimum pressure must be 63 psf.

7. Construction Problems

No especially difficult foundation construction problems are foreseen. The upper surface of the sandstone bedrock may vary in hardness or degree of weathering causing some inconvenience in excavation and problems for

judgement in depth of removal.

8. Recommendations

Piles will not achieve adequate penetration without pre-boring into rock. Pile points are not a suitable approach to get the required 10 foot depth into natural ground.

Therefore, spread footings are the most suited foundation for this structure. Footings keyed into the rock some 12 inches and designed to the values in section 3, Bearing Capacity above should perform well.

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure NW RR Over Pass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STA. 29"

Station	11 + 48	Offset	29' Rt	Surface Elevation	944.6
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GROUND WATER OBSERVATIONS

While drilling Dry Time after drilling _____

Before casing removal _____ Depth to water _____

After Boring Completed Dry Depth to cave-in _____

Cave In	Water Notes
MOISTURE	DRILLING METHOD

MOISTURE

D = Damp
M = Moist

W = Moist
W = Wet

HS = Hollowstem
W/O = Woodhead

WA = Washhead
RB = Rockbit

Blouse on

DRILLING METHOD

ST = Shelby tube
SC = Split core

SS = Split spoon
DM = Drilling mu

100

A = Auger

C = Coring
W = Wash

E = Easy
M = Med

M = Med
H = Harc

100

Start 5/18/87

Unit D

Finish 5/18/87

Chief Meyers

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	
					Topsoil					
					Br Fine to Med SAND					A
1	10	16	27		V. Dense Yellow and White weathered SANDSTONE			2		
								3		
								4		
					Hard SANDSTONE - SHALE			8		
					Cored 5' Recovery 80 %			15		
					N.V. Bar.					
					E.B.					

Checked by

Final

Boring No.

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FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure NW RR-Over Pass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STH "29"

Station	11+98 11+98	Offset	10' Lt	Surface Elevation	947.1
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GROUND WATER OBSERVATIONS

While drilling dry Time after drilling _____

Before casing removal _____ Depth to water _____

After Boring Completed	<u>11.5</u>	Depth to cave-in	_____	_____	_____	_____	_____	
Cave In	_____	Water Notes	_____					

MOISTURE

D = Damp
M = Moist

W = Wet

HS = Hollowstem
WA = Washahead

RB = Rockbit

Blows on

DRILLING METHOD

ST = Shelby tube
SS = Split spoon

DM = Drilling mu

... ..

A = Auger
C = Corina

C = Colling
W = Wash

E = Easy
M = Med

H = Harc

Trial	Control	MCI	AD
1	95	85	75
2	95	85	75
3	95	80	70
4	95	78	68
5	95	75	65

Start 5/19/87 Unit CT

Finish 21 22 23 Chief Meyers

[illegible]

Checked by	Final	Boring No.
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Final

Boring No.

2.

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 4 Structure N.W. R.R. Overpass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STH "29"

Station	12 + 96	Offset	25' L of E	Surface Elevation	936.7
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GROUND WATER OBSERVATIONS

While drilling Dry Time after drilling 1 min

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
WLF = Whitefish Lake

WA = Washhead
RB = Rockbit

Blows on pu

DRILLING METHOD

ST = Shelby tube
 SS = Split spoon

DM = Drilling mu

100

A = Auger
C = Corina

W = Wash

100

E = Easy
M = Med

H = Harc

10

Start 5/20/87 Unit II

Finish 4/27/49 Chief Meyers

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	
					Gray silty Topsoil					
					Louise Bn Fine SAND					
1	M	17	16		Dense Yellow. weathered SAND STONE					
		18	20							
					SS. Refusal.					
					Cone 5' 90% Recovery.					
					SAND STONE and SHALE					
					NU. Barred					
					EB					

Checked by	Final	Boring No.
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Final

Boring No

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. Probe #1 Structure NW RR Overpass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STH "29"

Station 12+42 Offset 9' 4" E Surface Elevation 947.1

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	
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HS = Hollowstem
WA = Washhead

WA = Washhead
RB = Rockbit

Blows on

DRILLING METHOD

ST = Shelby tube
SS = Split spoon

SS = split spoon
DM = Drilling mud

A = Auger
C = Coring

C = Coring
W = Wash

.....

E = Easy
M = Med

H = Hard

Condition	Control (%)	MCI (%)	AD (%)
A	~95	~85	~75
B	~90	~80	~70
C	~85	~75	~65
D	~80	~75	~70

Start 5/20/87 Unit II

Finish ¹¹ ¹¹ ¹¹ Chief *Meyers*

[illegible]

Checked by		Final		Boring No.	
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Final

Entry No.

Page # 1

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. Probe #2 Structure NW. RR. Overpass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STH 29

Station	12+15	Offset	9' R+L	Surface Elevation	947.1
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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	DRILLING METHOD		

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 5/20/87 Unit II

Finish *11 11 4* Chief *Mayors*

[illegible]

Checked by	Final	Boring No.
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Final

Boring No.

Probe # 2

FIELD BORING LOG

EL3(S) 385.

State of Wisconsin/Department of Transportation

Bearing No. Probe #4 Structure N.W. R.R. Overpass County Dunn Sheet 1 of 1

Project 1050-03-01 Road STA. "29"

Station	11+18	Offset	25' Lt E	Surface Elevation	946.3
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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 5/20/87 Unit II

Finish 4 12 4 Chief Meyers

[illegible]

Checked by	Final	Boring No.
		206-4