

**CORRESPONDENCE/MEMORANDUM**\_\_\_\_\_ **State of Wisconsin**

**DATE:** 31 October 2001

**TO:** Mike Perkins  
District Soils Engineer  
Transportation District #6

**FROM:** Jan G. Kinar, P.E.  
Geotechnical Engineer

**SUBJECT:** Site Investigation Report  
***Project ID: 1559-08-01***  
***Structure B-55-181***  
STH 64 under WCL Railroad  
Houlton to New Richmond Road  
St. Croix County

Attached is the Site Investigation Report for the above project.

JGK:u:\sir\_brid\b55\_181STH64UnderWCLRailroad  
Attachments

cc: District 6 (3)  
Bridge Office  
Design Files  
Geotechnical Files

**SITE INVESTIGATION REPORT**  
**Project ID 1559-08-01**  
**Structure B-55-181**  
**STH 64 Under WCL Railroad**  
**Houlton to New Richmond Road, St. Croix County**

**1. GENERAL**

The proposed structure is located at the Wisconsin Central Ltd. Railroad tracks on the proposed new alignment for STH 64, southeast of Somerset, east of CTH I and north of 170<sup>th</sup> Street. The new structure will have two spans, approximately 80 feet in length. The new highway will be in a cut section, approximately 20 to 30 feet, and the tracks will remain at their present elevation. The site is located in gentle rolling open grassland and cultivated farm fields. Exposed bedrock and boulders are not present.

**2. SUBSURFACE CONDITIONS**

Three borings for the structure conforming to AASHTO T-206, Standard Penetration Test, were made to determine subsurface conditions at the site. Soil textures in the boring logs are field identifications made by the drilling crew chief. In October 2001, the groundwater elevation was 903.1± ft. A typical boring at this site consisted of layers of very loose silty sands and sands over firm sand layers w/little to some gravel overlying weathered sandstone.

<b>TABLE 1: Soil Borings for Structures B-55-181, STH 64 Under the WCL Railroad</b>					
<b>B #1—Northeast Abutment of B-55-181</b>			<b>B #2—Pier of B-55-181</b>		
<b>Station 103+77, 40' LT of Railroad Tracks CL</b>			<b>Station 104+57, 40' LT of Railroad Tracks CL</b>		
<b>Elevation</b>	<b>Soil Description</b>	<b>Blow Count</b>	<b>Elevation</b>	<b>Soil Description</b>	<b>Blow Count</b>
927.6-922.1	Dark Brown Silt & Brown Silt	7	927.7-924.2	6" of Sand & Light Brown Silt	---
922.1-912.6	Brown Silty Sand; Some Gravel	17	924.2-918.2	Brown Silty Sand	58
912.6-905.1	Brown Silty Sand; Layers of Gravel	57	918.2-903.7	Brown F/M Silty Sand	27, 23, 15
905.1-877.6	Brown Silty Sand; Some Gravel	27	903.7-879.7	Brown Silty Sand; Some Gravel	22
877.6-872.1	Brown F/C Sand	56	879.7-874.7	Brown F/M Sand	48
872.1-860.6	Brown F/M Sand	44	874.7-862.2	Brown F/C Sand; Trace Gravel	36, 66
860.6-846.6	Weathered Sandstone (EOB)	100/5"	862.2-855.7	Sandstone	100/1"
			855.7-847.7	Gm/Brn Fine Sand; Some Silt	80
			847.7-847.2	Sand (EOB)	100/2"

<b>B #3—Southwest Abutment Corner of B-55-181</b>		
<b>Station 105+35, 35' RT of Railroad Tracks CL</b>		
<b>Elevation</b>	<b>Soil Description</b>	<b>Blow Count</b>
926.9 – 914.9	Brown Silty Sand	7, 13
914.9 – 878.9	Brn F/C Sand; Some Gravel; Trace of Silt— <i>Boulders Encountered</i>	22
878.9 – 873.9	Brown F/M Sand	51
873.9 – 866.4	Brown Weathered Sandstone	145
866.4 – 865.9	Seam of Brown F/C Sand	29
865.9 – 857.9	Weathered Sandstone: Cored from 65-69'; RQD=9% (EOB)	100/0"

A rock core was taken at the bottom of Boring #3 from 65 to 69 feet below the ground's surface. Seventy-seven percent of the sandstone core was recovered and it had a rock quality designation index of 9%, indicating that the sandstone is of very poor quality.

### 3. BEARING CAPACITY

Soils within a practical depth have insufficient bearing capacity to support spread footings for the proposed structures.

### 4. PILES

Table 2 below provides design values for piles. The end bearing values for H-piles were reduced by a safety factor of 2.0.

TABLE 2a: PILE DESIGN PARAMETERS: NE Abutment of B-55-181 (B#1)			
Elevation, ft	Skin Friction, Psf (FS = 2.0)	End Bearing, psf (FS = 2.0)	
		10½" CIP	H10x42
893 – 877.5	60	---	---
877.5- 872	220	---	---
872 – 860.5	400	25,000	12,500
860.5 – 846.5	1100	187,000	93,500

TABLE 2b: PILE DESIGN PARAMETERS: Pier of B-55-181 (B#2)			
Elevation, ft	Skin Friction, Psf (FS = 2.0)	End Bearing, psf (FS = 2.0)	
		10½" CIP	H10x42
889 – 879.5	50	---	---
879.5 – 874.5	150	---	---
874.5 – 862	300	22,000	11,000
862 – 855.5	700	158,000	79,000
855.5 – 847.5	1000	86,000	43,000

TABLE 2c: PILE DESIGN PARAMETERS: SW Abutment of B-55-181 (B#3)			
Elevation, ft	Skin Friction, psf (FS = 2.0)	End Bearing, psf (FS = 2.0)	
		10½" CIP	H10x42
897.5 – 879	80	---	---
879 – 874	300	---	---
874 – 866.5	700	97,000	48,500
866.5 – 866	300	22,000	11,000
866 – 858	1000	143,000	71,500

## **5. ALTERNATE FOUNDATION TYPES**

Drilled caissons do not offer any economic or engineering benefit at this site. Dynamic consolidation and vibratory techniques do not offer any economic or engineering benefits either at this site.

## **6. LATERAL EARTH PRESSURE**

Grade 1 Granular Backfill is recommended behind the abutments. With proper drainage and compaction, clean granular backfill will exert an equivalent fluid pressure of about 33 psf. If drainage is provided, silts create 50-55 psf of fluid pressure on structures. If drainage is not provided, use 65 psf for silts, as a minimum.

## **7. CONSTRUCTION PROBLEMS & RECOMMENDATIONS**

Boulders and cobbles were encountered while drilling for this site. Boulders may cause the piles to stop at erratic lengths. H-piles may drive better through the layers of gravel and cobbles than cast-in-place piles.

Settlement of the structure embankments is not expected since the railroad tracks will remain at the same grade and STH 64 will be under the railroad line.

Groundwater was encountered at approximately 903 feet. The elevations at the base of the proposed footings are 893.0, 889.2 and 897.5 feet, and the proposed gradeline of STH 64 will vary from 899.5 to 896.6 feet underneath the new railway structure. Hence some problems with groundwater can be anticipated and steps should be taken to ensure that the new pavement structure remains dry. These measures include:

- Install interceptor drains in both right and left ditches and in the median. Keep water a minimum of 4 feet beneath the highway's finished grade.
- Install subdrains to intercept sideslope seepage (see Figure 1 of FDM Procedure 13-40-1). A "U" configuration is needed, 4 feet below top of pavement, at where the highway grade intercepts the present groundwater elevation.
- Construct deep ditches, and identify the area into which the deeper ditches can drain. Before construction begins in this area, build a trench into which the draining water can flow (or be directed).

No other unusual or difficult construction problems are expected at this site.

## **8. SUMMARY**

We recommend that H-piles driven to the weathered sandstone be used to support proposed structure B-55-181. Allowable design stresses for H-piles should be limited to 9000 psi. Estimated pile tip elevations are provided below.

Estimated Pile Tip Elevations for B-55-181	
Substructure Unit	Elevation, feet
West Abutment	855±
Pier	858±
East Abutment	865±

We recommend that Grade 1 Granular Backfill be used behind the abutments.

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

JGK:u:\sir\_brid\b55\_181STH64UnderWCLRailroad

STH 64 UNDER WCL RAILROAD  
HOULTON- NEW RICHMOND ROAD, ST CROIX COUNTY

R EB LANE  
STH 64

WICENTRAL LTD

BOR-1

BOR-2

BOR-3

103+00

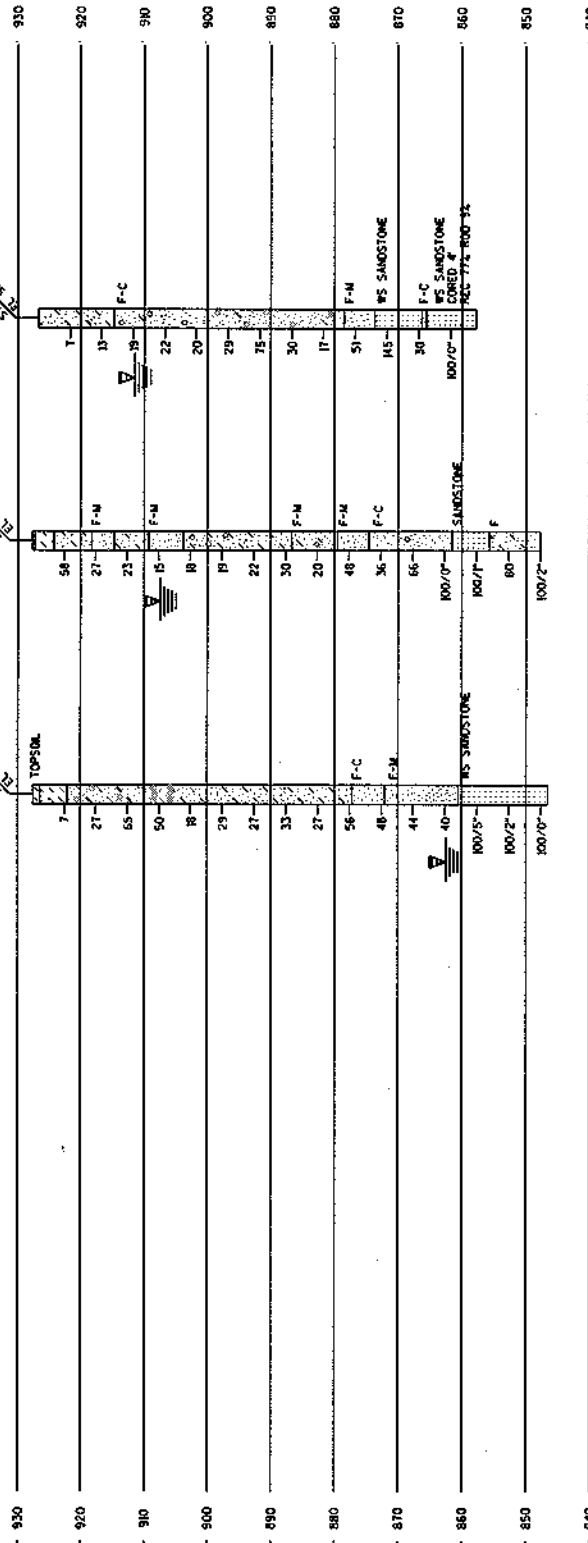
104+00

105+00

STA 103+77.60 FT OF RB CL  
DL 827.00 BORE

STA 104+77.60 FT OF RB CL  
DL 827.00 BORE

STA 105+77.60 FT OF RB CL  
DL 827.00 BORE



STATE PROJECT NUMBER

SHEET NO. 8

ABBREVIATIONS

F—FINE M—MEDIUM C—COARSE

WS—WEATHERED SO—SOUND

MATERIAL SYMBOLS

TOPSOIL SILT SANDSTONE

SAND PEAT LIMESTONE

GRAVEL CLAY IGNEOUS ROCK

LEGEND OF PROBING

PROBING NO. STA. ELEVATION

55/6-95 BLOWS FOR 6" PENETRATION

PROBING TAKEN WITH A 350-WT. FALLING 30" ON A 2" O.D. POINT.

LEGEND OF BORING

ELEV. STA. ELEVATION

UNCONFINED STRENGTH—7.7 T. SANDY GRAVEL

BLOWS PER FT. USING 140-WT. FALLING 30"

WASH SAMPLE

SHELBY TUBE—S.T. SAND

GROUND WATER ELEVATION

NO GROUND WATER OBSERVED ABOVE THIS ELEVATION

BOULDERS OR COBBLES

SILTY CLAY

LIMESTONE

UNLESS OTHERWISE SPECIFIED, THE BLOWS PER FOOT AT THE LOCATIONS INDICATED ARE BASED ON DRIVING A 0.0321" I.D. SPLIT SPION SAMPLER WITH A 140-WT. HAMMER HAVING A FREE FALL OF 30". THE BLOW COUNT IS TAKEN IN UNDISTURBED SOIL IMMEDIATELY BELOW A CASED OR OPEN HOLE ELIMINATING SIDE FRICTION ON THE DRIVE PIPE.

SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND ORDERS INFORMATION

TO OBTAIN RELATIVE DATA CONCERNING THE CHARACTER OF MATERIAL IN AND UPON WHICH THE FOUNDATION MIGHT BE BUILT, BOREHOLE 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 BOREHOLE AND/OR SOUNDINGS IS VERY SMALL IN RELATION TO THE ENTIRE AREAS OF INVESTIGATION, THE DATA DOES NOT WARRANT CONSIDERATION OF THE BOREHOLE INVESTIGATION OR THAT THE CLASSIFICATION OF MATERIAL ENCOUNTERED IN THESE INVESTIGATIONS IS NECESSARILY TYPICAL OF THE ENTIRE SITE.

NO. DATE REGION BY

STATE OF WISCONSIN

DEPARTMENT OF TRANSPORTATION

STRUCTURES DESIGN SECTION

STRUCTURE B-55-B1

DATE: 1996 BY: S.J.J. FOR: 100

SHEET 1

SUBSURFACE EXPLORATION

Boring No. 1

Structure B55-181

County ST JOSEPH

Sheet 1 of 2

Project 1559 08 01

Road STATE HIGHWAY 64 UNDER WEL RAILROAD

Station 103+77

Offset 40.0' LT of C/L

Surface Elevation 927.60

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_

Water Elev. \_\_\_\_\_

Top of Well Elev. \_\_\_\_\_

Time After Drilling \_\_\_\_\_

STA N-S

Depth to Water \_\_\_\_\_

MOISTURE

D = Damp

M = Moist

W = Wet

HS = Hollowstem

WA = Wash Ahead

RB = Rockbit

DRILLING METHOD

ST = Shelby Tube

SS = Splitspoon

DM = Drilling Mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start 10-2-01

Unit 7

Finish 10-3-01

Chief C. J. ARK

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0/6	6/12							
						NE ABOUT				
						DRK BR SILT Top Soil			WA	3" CASING
						SILT BR			RB	
									SS	
									DM	
1	D	2	2	7	5					
		5				SAND SILTY SOME GRAVEL				
						BR				
2	D	12	12	27	10	FIRM				
		15								
3	D	11	40	65	15	DENSE				
		25								
						LAYERS GRAVEL				
4	D	12	25	50	20	DENSE				
		25								
5	D	8	9	18	25					
		9								
6	D	14	15	29	30	FIRM				
		14								
7	D	10	12	27	35	FIRM				
		15								
8	D	12	17	33	40	DENSE				
		14								

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

Final \_\_\_\_\_

Boring No. 1

Boring No.1

StructureB 55-181

CountyST Croix

Sheet2 of 2

Project1559-08 01

Road40' 40"

Station1034 77

Offset319' LT 3 1/4"

Surface Elevation927.60

GROUND WATER OBSERVATIONS

Streambed Elev.

Time After Drilling

Water Elev.

Top of Well Elev.

Depth to Water

MOISTURE

D = Damp

M = Moist

W = Wet

HS = Hollowstem

WA = Wash Ahead

RB = Rockbit

DRILLING METHOD

ST = Shelby Tube

SS = Splitspoon

DM = Drilling Mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start10-2-01

Unit7

Finish10-3-01

Chick

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0/6	6/12							
						N.E. ASUT				
						40 DENSE SAND SILTY				
9	D/M	8	12		27	45 FIRM	45		E	
10	D/M	17	26		56	50 DENSE SAND F-C BR	50			
11	D/M	13	18		48	55 DENSE SAND F-M BR	15		M	
12	M	10	17		44	60 DENSE	20			
13	M/W	12	15		40	65 DENSE	25		M/H	
14	D	12	15		30	70 DENSE SAND STONE WEATHERED	30			
15	D	10	12		35	75 DENSE	35			
16	D	15	18		40	80 DENSE	40			



## FIELD BORING LOG

Boring No. 2 Structure 1355-181 County ST CROIX Sheet 1 of 2  
 Project 1559 08 21 Road STH 64  
 Station 104 + 57 Offset 40' ~~10'~~ LT of CL of RR tracks Surface Elevation 927.70  
 10-18-01 24'

## GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling 10-11-01 23.5  
 Water Elev. \_\_\_\_\_  
 Top of Well Elev. \_\_\_\_\_ Depth to Water 10-15-01 23.  
10-16-01 23

## MOISTURE

D = Damp  
 M = Moist  
 W = Wet

HS = Hollowstem  
 WA = Wash Ahead  
 RB = Rockbit

## DRILLING METHOD

ST = Shelby Tube  
 SS = Splitspoon  
 DM = Drilling Mud

A = Auger  
 C = Coring  
 W = Wash

E = Easy  
 M = Medium  
 H = Hard

Start 10-3-01 Unit 7

Finish 10-9-01 Chief CLARK

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	PIER WATER		Visual Field Classification and Remarks	Well	Boulders	Drilling Method	Probe Blows
		0/8	6/12									
								SAND				
								SILT L.T BR			WA	3' CAS
											RB	
											SS	
											DM	
1	D	5	30	58	5			SAND SILTY BR	5			
		8										
2	D	11	12	23	10			SAND F-M BR	10			
		15										
3	D	14	11	25	15			SAND SILTY BR	15			
		12						SOME GRAVEL				
4	W	5	6	11	20			SAND F-M BR	20			
		9										
5	W	13	10	23	25			SAND SILTY SOME GRAVEL	25			
		8						BR				
6	W	8	9	17	30				30			
		10										
7	W	9	10	19	35				35			
		12										
		11	13	24	40			FIRM NO RECOVERY	40			
		17						ROCK IN SHOES				

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

Final \_\_\_\_\_

Boring No. 2

Boring No.2StructureB55-181CountyST CROIXSheet2 of 2

Project1559 08 01RoadSTW 64

Station104+55.57Offset402.9' LT - OF TRACKS Surface Elevation927.70

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling \_\_\_\_\_

Water Elev. \_\_\_\_\_

Top of Well Elev. \_\_\_\_\_ Depth to Water \_\_\_\_\_

MOISTURE

D = Damp HS = Hollowstem ST = Shelby Tube A = Auger E = Easy

M = Moist WA = Wash Ahead SS = Splitspoon C = Coring M = Medium

W = Wet RB = Rockbit DM = Drilling Mud W = Wash H = Hard

Start10-3-01Unit7

Finish10-9-01ChiefCLARK

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	PIER	VISUAL FIELD CLASSIFICATION AND REMARKS	Undisturbed Strength	Boulders	Drilling Method	Probe Blows
		0/6	6/12								
							90 Firm No Rec				
							SAND F-M LITTLE SILT TR GRAVEL				
8	W	7	11	25	45		Firm				
9	D	16	18	48	1050		DENSE SAND F-M BR			M	
10	W	8	14	36	1555		DENSE SAND F-C BR TR GRAVEL				
11	W	18	22	44	2060		V DENSE			MH	
					2565		V DENSE NO RECOVERY			H	
12	D	100%			3070		SAND STONE V DENSE				
13	D	24	26	80	3575		SAND FINE GREEN BR SOME SILT V DENSE			E MH	
14	D	100%			4080		SAND EOB# 2 80' V DENSE			EM	

Boring No.3StructureB55-181CountyST CROIXSheet1 of

Project1559 08 01RoadSTH 64 UNDER WEL RAILROAD

Station105135Offset35' RT OF Q OF RRSurface Elevation926.90

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling \_\_\_\_\_

Water Elev. \_\_\_\_\_

Top of Well Elev. \_\_\_\_\_ Depth to Water \_\_\_\_\_

MOISTURE









D = DampHS = HollowstemST = Shelby TubeA = AugerE = Easy

M = MoistWA = Wash AheadSS = SplitspoonC = CoringM = Medium

W = WetRB = RockbitDM = Drilling MudW = WashH = Hard

Start10-9-01Unit7

FinishChiefCLARK

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0/6	6/12							
									WA	3'
									RB	
									SS	
									DM	
1	D	3	3		7	5 Loose Sand Silty Br	5			↓
2	D	3	6		13	10 Firm	10			↓
3	M	5	6		19	15 Firm Sand F.L. Br Some GRAVEL TA SILTY	15			
4	W	5	9		22	20 Firm LAYER GRAVEL	20			
5	D	8	10		20	25 Firm	25			
6	D	9	11		29	30 Firm LAYER GRAVEL	30			
7	D	10	15		25	35 VDENSE	35			
8	D	14	15		30	40 Firm	40			

## FIELD BORING LOG

Wisconsin Department of Transportation

Boring No.	3	Structure	B55-181	County	ST CORIX	Sheet	2 of 2
Project	1559 08 01	Road	STH 64 UNDER W.C.	RAILROAD			
Station	105435	Offset	35' RT OF R.R.C.	Surface Elevation	976.90		

## GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling \_\_\_\_\_  
Water Elev. \_\_\_\_\_  
Top of Well Elev. \_\_\_\_\_ Depth to Water \_\_\_\_\_

## MOISTURE

D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Wash Ahead  
RB = Rockbit

## DRILLING METHOD

ST = Shelby Tube  
SS = Splitspoon  
DM = Drilling Mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start	10-9-01	Unit	7
Finish	10-10-01	Chief	CLARK

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0/6	6/12							
						40 SAND F.C. SAND GRAVEL				
9	M W	10 8	9	17	45	F.I.M.	45			
10	M	19 25	26	45	50	SAND F.M. BR DENSE	50			
11	D	22 100%	45	67	55	SAND STONE WEATHERED BR DENSE	55			
12	M W	70 14	15	85	60	SAND F.C. BR	60			
15	100% CORE					25-65 REFUSE! Spoon 65'-69' 85%-90%	65			
						30-70 EOB#3 69'	70			
						35-75	75			
						40-80	80			

Boring No.1 SF

StructureShoe Fly

CountyST Croix

Sheet2 of 2

Project1559-082-01

RoadSTH 44

Station101+00

Offset

Surface Elevation931.8

GROUND WATER OBSERVATIONS

Streambed Elev.

Time After Drilling

Water Elev.

Top of Well Elev.

Depth to Water

MOISTURE

D = Damp  
M = Moist  
W = Wet

DRILLING METHOD

HS = Hollowstem  
WA = Wash Ahead  
RB = Rockbit

ST = Shelby Tube  
SS = Splitspoon  
DM = Drilling Mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start10-11-01

Unit7

Finish

ChiefClark

Sample No.	Moisture	Blows on Sampler	Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS		Unconfined Strength	Boulders	Drilling Method	Probe Blows
									A	
	M				1'	SAND SILTY BR LITTLE GRAVEL				
					2'					
					3'					
	D				4'	SAND F-m BR SOME GRAVEL				
					5'					
					6'					
					7'					
					8'					
					9'					
					10'					
1	D	6			11'	Firm				
		9			12'					
		5			13'					
		4			14'					
2	D	4								
		3				Loose				
		4								
		5								

Checked by

Final

Boring No. #1 SF

Boring No.*5F*Structure *Shoe Fly*County *ST Croix*Sheet *2* of *2*

Project *1559 08 01*Road *STH 64*

Station *101+00*Offset *5/c*Surface Elevation *931.8*

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_Time After Drilling \_\_\_\_\_

Water Elev. \_\_\_\_\_

Top of Well Elev. \_\_\_\_\_Depth to Water \_\_\_\_\_

MOISTURE

D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Wash Ahead  
RB = Rockbit

DRILLING METHOD

ST = Shelby Tube  
SS = Splitspoon  
DM = Drilling Mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start *10-11-01* Unit *7*

Finish *10-11-01* Chief *Clark*

Sample No.	Moisture	Blows on Sampler	Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS		Unconfined Strength	Boulders	Drilling Method	Probe Blows
					<i>SAND F-M BR SOME GRAVEL</i>					
		<i>4</i>			<i>1'4</i>	<i>14</i>				
<i>3</i>		<i>4</i>			<i>Firm SAND F-C BR TR GRAVEL</i>	<i>2'5</i>				
		<i>7</i>				<i>2'15</i>				
		<i>8</i>				<i>2'16</i>				
					<i>E O B #1</i>					
					<i>16'</i>	<i>4'</i>				
					<i>5'</i>	<i>5'</i>				
					<i>6'</i>	<i>6'</i>				
					<i>7'</i>	<i>7'</i>				
					<i>8'</i>	<i>8'</i>				
					<i>9'</i>	<i>9'</i>				
					<i>10'</i>	<i>10'</i>				
					<i>11'</i>	<i>11'</i>				
					<i>12'</i>	<i>12'</i>				
					<i>13'</i>	<i>13'</i>				
					<i>14'</i>	<i>14'</i>				

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

Final \_\_\_\_\_

Boring No. *#1 SF*

Boring No.2 SFStructureShoe FlyCountyST CroixSheet1 of 1

Project1559 08 01RoadSTH 64

Station104+00Offset23' 6"Surface Elevation924.3

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling \_\_\_\_\_

Water Elev. \_\_\_\_\_

Top of Well Elev. \_\_\_\_\_ Depth to Water \_\_\_\_\_

MOISTURE

D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Wash Ahead  
RB = Rockbit

DRILLING METHOD

ST = Shelby Tube  
SS = Splitspoon  
DM = Drilling Mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start10-11-01Unit7

Finish10-11-01ChiefClark

Sample No.	Moisture	Blows on Sampler	Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS		Unconfined Strength	Boulders	Drilling Method	Probe Blows
	D				SILT Sandy Br				A	
					1'	1'				
					2'	2'				
					3'	3'				
					4'	4'				
		2								
1	D	3			Loose	SAND F.M Br				
		3			5'	SOME GRAVEL				
		6			6'					
		4								
2	D	5			7'					
		7								
		9			8'					
					9'					
					10'					
					11'					
					12'					
					13'					
					14'					

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

Final \_\_\_\_\_

Boring No. #2 SF

Boring No. 3 SF Structure Shoe Fly County ST Croix Sheet 1 of 1  
Project 1559 08 01 Road STH 64  
Station 108+00 Offset \_\_\_\_\_ Surface Elevation 928.0

GROUND WATER OBSERVATIONS

Streambed Elev. \_\_\_\_\_ Time After Drilling \_\_\_\_\_  
Water Elev. \_\_\_\_\_  
Top of Well Elev. \_\_\_\_\_ Depth to Water \_\_\_\_\_

MOISTURE		DRILLING METHOD						Start <u>10-11-01</u> Unit <u>7</u>	
D = Damp	HS = Hollowstem	ST = Shelby Tube	A = Auger	E = Easy				Finish <u>10-11-01</u> Chief <u>C/ARK</u>	
M = Moist	WA = Wash Ahead	SS = Splitspoon	C = Coring	M = Medium					
W = Wet	RB = Rockbit	DM = Drilling Mud	W = Wash	H = Hard					

Sample No.	Moisture	Blows on Sampler	Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS		Unconfined Strength	Boulders	Drilling Method	Probe Blows
	<u>MD</u>				<u>SAND F-M SILTY</u> <u>SOME GRAVEL</u>	1'			<u>A</u>	
						2'				
						3'				
						4'				
						5'				
<u>1 D</u>		<u>5</u>			<u>Pen</u>	6'				
		<u>7</u>				7'				
		<u>4</u>				8'				
		<u>5</u>				9'				
		<u>4</u>				10'				
<u>2 D</u>		<u>4</u>			<u>EOBH</u> <u>3</u> <u>9'</u>	11'				
		<u>5</u>				12'				
		<u>5</u>				13'				
						14'				

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