

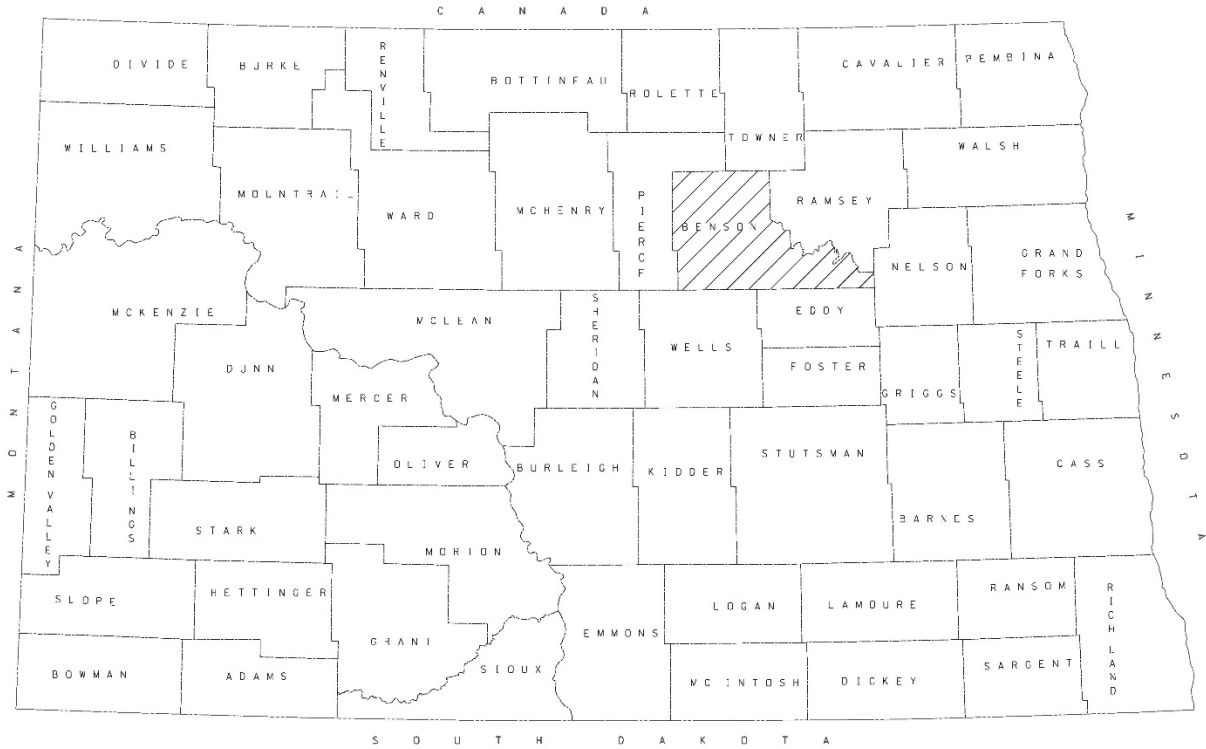
Borrow Site Report

PROJECT NO. NH-3-281(130)148

PCN 21506

COUNTY Benson

US Highway 281 From RP 148.879 to RP 154.817



PREPARED BY: Jordan M. Nehls, P.E.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

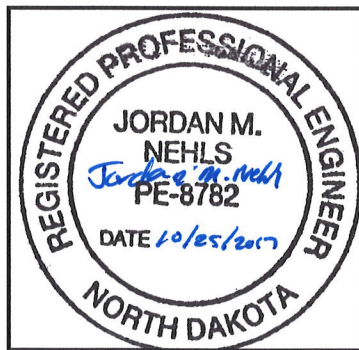
October 2017

NH-3-281(130)148

Highway 281 from near Junction Highway 57 to New Highway 281

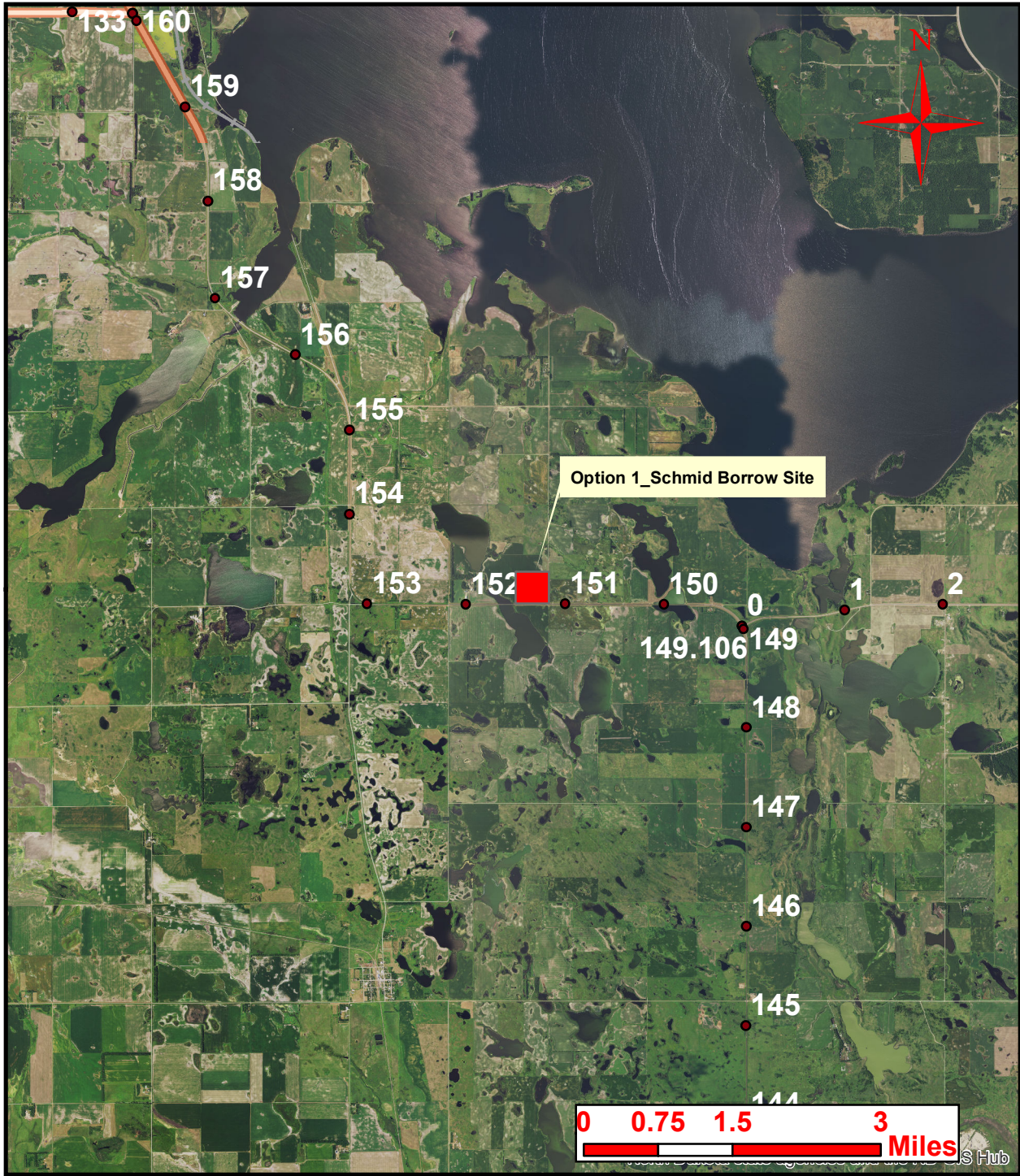
CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of North Dakota. This document was originally issued and sealed by Jordan M. Nehls, Registration number PE-8782 on 10/25/2017 and the original document is stored at the North Dakota Department of Transportation.



Jordan M. Nehls
Jordan M. Nehls, P.E.

10/25/2017
Date



Borrow Site Investigation
 Project: NH-3-281(073)236
 PCN: 21506
 Scope: Full Depth Reclamation, Widening, Curve Realignment, Intersection Improvements
 Length: 5.94 Miles
 Location: Highway 281 From near Junction Highway 57 to New Highway 281

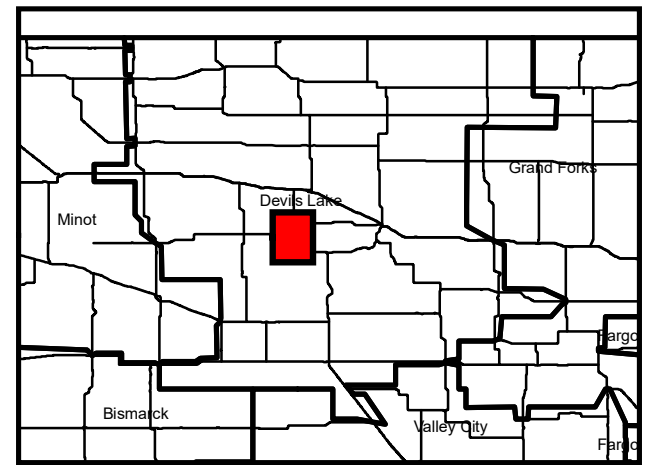


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Introduction

This report includes the investigation of the borrow site on project NH-3-281(130)148. The field and subsurface investigation was conducted on 9/5/2017 in order to develop this report.

Sampling and Testing Procedures:

Borings were conducted with a six inch solid flight auger. Soil samples were taken at each boring location. Borings that had significant changes in soil type were split into separate samples. Moisture content samples were taken at 1 foot intervals.

The samples were submitted to the laboratory for determination of AASHTO classification, moisture content, dry density, sieve analysis, and Atterberg limits.

Option 1 Schmid Borrow Site

This borrow site was drilled on 9/5/2017. A total of 23 borings were conducted at this location. A summary of the boring data is shown in Table 1. Detailed data is in Appendix B.

Table 1 - Summary of Option1_Schmid Borrow Site

Boring Number	Lab Number	Depth of Sample (feet)	AASHTO Class	USCS Class	Average In Place Moisture Content (%)	Optimum Moisture Content T-180 (%)	Max Dry Density (lb/ft ³)
1	758	0.6-10.0	A-6(6)	CL	18.8	12.6	119.6
2	759	1.5-10.0	A-6(8)	CL	17.1	13.1	121.4
3	760	0.8-5.0	A-6(8)	CL	19.6	15.2	112.9
4	761	1.8-10.0	A-6(8)	CL	19.0	14.0	116.9
5	762	0.6-10.0	A-6(6)	CL	18.5	13.9	117.0
6	763	0.6-10.0	A-6(7)	CL	21.8	14.8	115.9
7	764	0.6-10.0	A-6(8)	CL	18.4	14.0	116.7
8	765	1.0-10.0	A-4(0)	ML	17.7	14.4	115.2
9	766	0.6-10.0	A-6(6)	CL	17.9	14.8	114.7
10	767	1.0-10.0	A-6(10)	CL	18.7	14.6	115.4
11	768	0.4-10.0	A-6(7)	CL	16.8	13.7	116.7
12	769	1.0-10.0	A-6(5)	CL	15.2	13.5	117.7
13	770	1.0-10.0	A-6(7)	CL	15.0	13.4	120.3
14	771	3.5-10.0	A-6(7)	CL	15.9	13.8	117.0
15	772	0.5-11.0	A-6(6)	CL	18.7	12.9	119.1
15	773	11.0-25.0	A-2-4(0)	SM	11.5	9.9	125.2
16	774	0.2-15.0	A-6(6)	CL	19.3	13.6	117.1
17	775	0.2-9.0	A-6(4)	CL	14.9	13.2	118.9
17	776	9.0-15.0	A-4(0)	SM	11.7	11.3	122.1
18	777	0.4-6.0	A-4(3)	CL	16.3	12.4	119.6
18	778	6.0-15.0	A-1-b(0)	SM	7.1	9.1	130.3
19	780	0.4-5.0	A-2-6(1)	SC	12.3	11.8	121.6
19	781	5.0-10.0	A-7-6(6)	SC	22.1	18.1	103.6

Boring Number	Lab Number	Depth of Sample (feet)	AASHTO Class	USCS Class	Average In Place Moisture Content (%)	Optimum Moisture Content T-180 (%)	Max Dry Density (lb/ft ³)
20	782	0.6-10.0	A-6(3)	CL	8.7	10.5	126.4
21	784	1.0-6.0	A-6(9)	CL	16.3	13.6	117.6
21	785	6.0-10.0	A-6(4)	SC	16.1	14.2	117.5
22	786	0.5-10.0	A-6(4)	CL	15.8	13.2	118.1
23	787	0.7-10.0	A-6(5)	CL	23.4	15.4	113.8

Summary and Recommendations

Option 1 Schmid Borrow Site Recommendation

A majority of the soils encountered in the Option 1_Schmid Borrow Site down to 6'-7' were sandy lean clays that classified as A-6 soils with low swell potential and low group index on average. The soils in this range generally have a moisture content 0-6% over optimum.

The soils below 6'-7' are generally silty or clayey sands classified from an A-2-4 to A-6 and are generally non-plastic with low swell potential and low group index. The soils in this range generally have a moisture contents near or just over optimum.

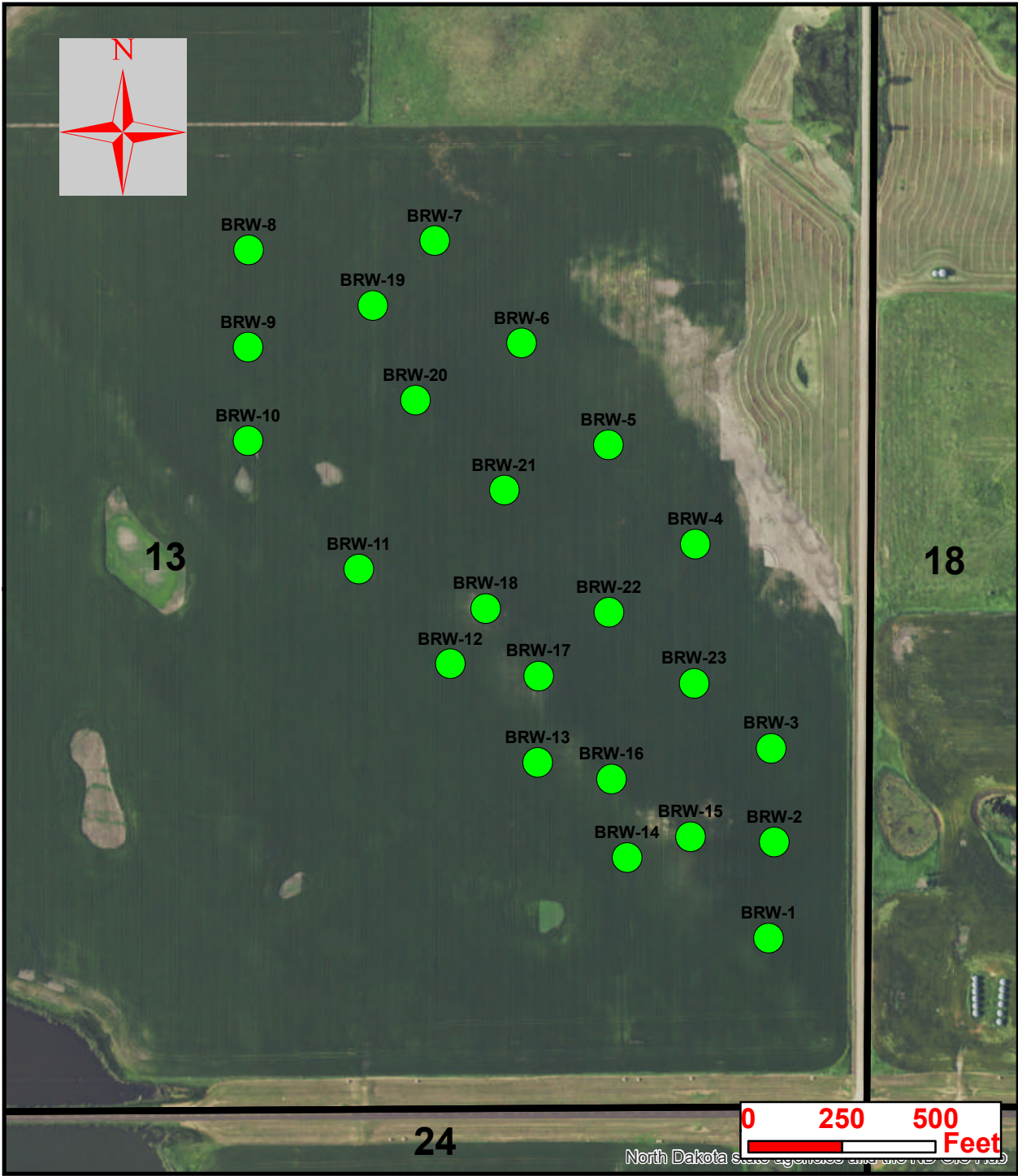
The material in this borrow site will perform adequately as subgrade material.

Moisture and Density Controls

Moisture and Density for all borrow material shall be in accordance with AASHTO T-180.

APPENDIX A

Map of Boring Locations



Option1_Schmid Borrow Site

Project: NH-3-281(130)148

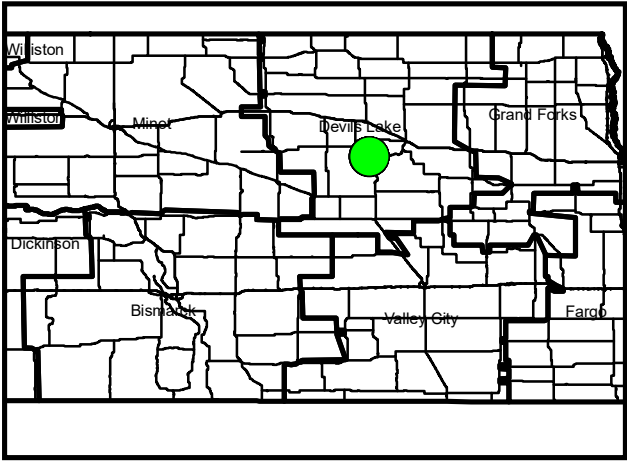
PCN: 21506

Location: SE 1/4

Sec13, T.152N, R.67W

Legend

- Boring Locations
- Reference Points



APPENDIX B

Summary and Lab Results For Option1_Schmid Borrow Site



SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 1	1.0	36	19	17	25	53	A-6 (6)	CL	19.4			
BRW - 1	2.0								16.9			
BRW - 1	3.0								11.2			
BRW - 1	4.0								17.6			
BRW - 1	5.0								16.1			
BRW - 1	6.0								17.1			
BRW - 1	7.0								19.5			
BRW - 1	8.0								19.5			
BRW - 1	9.0								24.5			
BRW - 1	10.0								25.7			
BRW - 2	1.0	34	19	15	25	65	A-6 (8)	CL	18.4			
BRW - 2	2.0								7.8			
BRW - 2	3.0								12.9			
BRW - 2	4.0								14.1			
BRW - 2	5.0								17.1			
BRW - 2	6.0								20.0			
BRW - 2	7.0								17.3			
BRW - 2	8.0								21.0			
BRW - 2	9.0								20.0			
BRW - 2	10.0								22.2			
BRW - 3	1.0	38	22	16	25	63	A-6 (8)	CL	24.4			
BRW - 3	2.0								13.1			
BRW - 3	3.0								17.4			
BRW - 3	4.0								24.8			
BRW - 3	5.0								18.5			
BRW - 4	1.0	40	20	20	25	54	A-6 (8)	CL	19.4			
BRW - 4	2.0								14.0			
BRW - 4	3.0								16.7			
BRW - 4	4.0								13.3			
BRW - 4	5.0								20.3			
BRW - 4	6.0								18.0			
BRW - 4	7.0								21.1			
BRW - 4	8.0								21.1			
BRW - 4	9.0								23.4			
BRW - 4	10.0								22.4			
BRW - 5	1.0	38	20	18	25	53	A-6 (6)	CL	20.6			
BRW - 5	2.0								10.2			
BRW - 5	3.0								13.2			
BRW - 5	4.0								16.6			
BRW - 5	5.0								19.2			
BRW - 5	6.0								17.2			
BRW - 5	7.0								22.0			
BRW - 5	8.0								20.3			

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SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 5	9.0								20.3			
BRW - 5	10.0								24.9			
BRW - 6	1.0	37	20	17	25	56	A-6 (7)	CL	24.9			
BRW - 6	2.0								12.7			
BRW - 6	3.0								14.6			
BRW - 6	4.0								18.6			
BRW - 6	5.0								22.0			
BRW - 6	6.0								41.7			
BRW - 6	7.0								20.9			
BRW - 6	8.0								20.4			
BRW - 6	9.0								21.1			
BRW - 6	10.0								20.8			
BRW - 7	1.0	37	19	18	25	58	A-6 (8)	CL	12.5			
BRW - 7	2.0								15.3			
BRW - 7	3.0								16.8			
BRW - 7	4.0								19.9			
BRW - 7	5.0								22.6			
BRW - 7	6.0								19.7			
BRW - 7	7.0								18.7			
BRW - 7	8.0								19.5			
BRW - 7	9.0								19.0			
BRW - 7	10.0								19.6			
BRW - 8	1.0	37	NP	NP	25	58	A-4 (0)	ML	24.4			
BRW - 8	2.0								10.3			
BRW - 8	3.0								11.0			
BRW - 8	4.0								16.7			
BRW - 8	5.0								17.0			
BRW - 8	6.0								19.0			
BRW - 8	7.0								20.5			
BRW - 8	8.0								19.2			
BRW - 8	9.0								19.7			
BRW - 8	10.0								19.5			
BRW - 9	1.0	36	20	16	25	55	A-6 (6)	CL	23.5			
BRW - 9	2.0								11.3			
BRW - 9	3.0								18.1			
BRW - 9	4.0								17.0			
BRW - 9	5.0								17.7			
BRW - 9	6.0								11.2			
BRW - 9	7.0								18.2			
BRW - 9	8.0								21.6			
BRW - 9	9.0								22.3			
BRW - 9	10.0								18.0			
BRW - 10	1.0	39	19	20	25	63	A-6 (10)	CL	25.4			

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SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 10	2.0								12.5			
BRW - 10	3.0								12.3			
BRW - 10	4.0								15.2			
BRW - 10	5.0								19.4			
BRW - 10	6.0								16.1			
BRW - 10	7.0								16.6			
BRW - 10	8.0								22.7			
BRW - 10	9.0								25.1			
BRW - 10	10.0								21.3			
BRW - 11	1.0	36	19	17	25	56	A-6 (7)	CL	17.2			
BRW - 11	2.0								15.8			
BRW - 11	3.0								18.8			
BRW - 11	4.0								16.0			
BRW - 11	5.0								13.5			
BRW - 11	6.0								16.7			
BRW - 11	7.0								15.6			
BRW - 11	8.0								16.9			
BRW - 11	9.0								19.2			
BRW - 11	10.0								18.5			
BRW - 12	1.0	35	20	15	25	52	A-6 (5)	CL	17.2			
BRW - 12	2.0								10.4			
BRW - 12	3.0								13.3			
BRW - 12	4.0								13.9			
BRW - 12	5.0								12.7			
BRW - 12	6.0								15.4			
BRW - 12	7.0								17.6			
BRW - 12	8.0								16.9			
BRW - 12	9.0								16.1			
BRW - 12	10.0								18.9			
BRW - 13	1.0	35	18	17	25	59	A-6 (7)	CL	19.7			
BRW - 13	2.0								8.3			
BRW - 13	3.0								8.0			
BRW - 13	4.0								12.6			
BRW - 13	5.0								13.2			
BRW - 13	6.0								21.7			
BRW - 13	7.0								18.6			
BRW - 13	8.0								18.5			
BRW - 13	9.0								13.2			
BRW - 13	10.0								15.8			
BRW - 14	1.0	36	19	17	25	59	A-6 (7)	CL	16.3			
BRW - 14	2.0								14.4			
BRW - 14	3.0								13.1			
BRW - 14	4.0								13.7			

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SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 14	5.0								9.3			
BRW - 14	6.0								15.9			
BRW - 14	7.0								15.2			
BRW - 14	8.0								19.9			
BRW - 14	9.0								20.4			
BRW - 14	10.0								20.7			
BRW - 15	1.0	32	18	14	25	59	A-6 (6)	CL	17.4			
BRW - 15	2.0								18.8			
BRW - 15	3.0								19.3			
BRW - 15	4.0								14.5			
BRW - 15	5.0								16.1			
BRW - 15	6.0								19.5			
BRW - 15	7.0								21.0			
BRW - 15	8.0								22.5			
BRW - 15	9.0								20.7			
BRW - 15	10.0								22.6			
BRW - 15	11.0								13.5			
BRW - 15	12.0	NP	NP	NP	25	29	A-2-4 (0)	SM	11.8			
BRW - 15	13.0								4.8			
BRW - 15	14.0								3.5			
BRW - 15	15.0								10.9			
BRW - 15	16.0								7.6			
BRW - 15	17.0								10.3			
BRW - 15	18.0								13.1			
BRW - 15	19.0								9.4			
BRW - 15	20.0								11.1			
BRW - 15	21.0								11.2			
BRW - 15	22.0								14.6			
BRW - 15	23.0								14.4			
BRW - 15	24.0								19.3			
BRW - 15	25.0								18.7			
BRW - 16	1.0	37	21	16	25	53	A-6 (6)	CL	20.0			
BRW - 16	2.0								17.0			
BRW - 16	3.0								17.5			
BRW - 16	4.0								19.7			
BRW - 16	5.0								18.1			
BRW - 16	6.0								17.6			
BRW - 16	7.0								20.7			
BRW - 16	8.0								19.0			
BRW - 16	9.0								20.3			
BRW - 16	10.0								20.7			
BRW - 16	11.0								20.2			
BRW - 16	12.0								21.0			

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SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 16	13.0								17.7			
BRW - 16	14.0								20.4			
BRW - 16	15.0								19.3			
BRW - 17	1.0	32	17	15	25	51	A-6 (4)	CL	14.7			
BRW - 17	2.0								9.7			
BRW - 17	3.0								10.3			
BRW - 17	4.0								14.3			
BRW - 17	5.0								16.5			
BRW - 17	6.0								20.5			
BRW - 17	7.0								21.6			
BRW - 17	8.0								17.9			
BRW - 17	9.0								8.3			
BRW - 17	10.0	NP	NP	NP	25	41	A-4 (0)	SM	9.0			
BRW - 17	11.0								11.1			
BRW - 17	12.0								13.7			
BRW - 17	13.0								13.2			
BRW - 17	14.0								11.6			
BRW - 17	15.0								11.8			
BRW - 18	1.0	29	19	10	25	54	A-4 (3)	CL	16.4			
BRW - 18	2.0								19.0			
BRW - 18	3.0								17.6			
BRW - 18	4.0								11.5			
BRW - 18	5.0								21.1			
BRW - 18	6.0								12.5			
BRW - 18	7.0	NP	NP	NP	25	14	A-1-b (0)	SM	8.8			
BRW - 18	8.0								8.3			
BRW - 18	9.0								6.8			
BRW - 18	10.0								12.3			
BRW - 18	11.0								4.8			
BRW - 18	12.0								5.6			
BRW - 18	13.0								5.1			
BRW - 18	14.0								6.1			
BRW - 18	15.0								5.9			
BRW - 19	1.0	32	19	13	25	33	A-2-6 (1)	SC	23.0			
BRW - 19	2.0								13.1			
BRW - 19	3.0								9.3			
BRW - 19	4.0								8.9			
BRW - 19	5.0								7.2			
BRW - 19	6.0	43	25	18	25	49	A-7-6 (6)	SC	14.3			
BRW - 19	7.0								21.6			
BRW - 19	8.0								24.0			
BRW - 19	9.0								23.7			
BRW - 19	10.0								26.7			

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SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
BRW - 20	1.0	27	16	11	25	57	A-6 (3)	CL	17.6			
BRW - 20	2.0								6.8			
BRW - 20	3.0								6.0			
BRW - 20	4.0								10.0			
BRW - 20	5.0								13.3			
BRW - 20	6.0								8.3			
BRW - 20	7.0								8.3			
BRW - 20	8.0								1.5			
BRW - 20	9.0								7.3			
BRW - 20	10.0								8.0			
BRW - 21	1.0	39	20	19	25	60	A-6 (9)	CL	26.6			
BRW - 21	2.0								15.1			
BRW - 21	3.0								15.1			
BRW - 21	4.0								15.6			
BRW - 21	5.0								12.4			
BRW - 21	6.0								13.1			
BRW - 21	7.0	34	19	15	25	48	A-6 (4)	SC	15.0			
BRW - 21	8.0								14.2			
BRW - 21	9.0								16.8			
BRW - 21	10.0								18.6			
BRW - 22	1.0	32	19	13	25	52	A-6 (4)	CL	15.7			
BRW - 22	2.0								7.2			
BRW - 22	3.0								20.7			
BRW - 22	4.0								18.6			
BRW - 22	5.0								20.3			
BRW - 22	6.0								15.8			
BRW - 22	7.0								17.6			
BRW - 22	8.0								14.9			
BRW - 22	9.0								13.6			
BRW - 22	10.0								13.2			
BRW - 23	1.0	35	20	15	25	51	A-6 (5)	CL	57.9			
BRW - 23	2.0								18.4			
BRW - 23	3.0								21.4			
BRW - 23	4.0								19.3			
BRW - 23	5.0								18.7			
BRW - 23	6.0								15.4			
BRW - 23	7.0								18.9			
BRW - 23	8.0								20.4			
BRW - 23	9.0								21.7			
BRW - 23	10.0								22.1			

LAB SUMMARY - ND DOT.GDT - 10/17/17 17:12 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

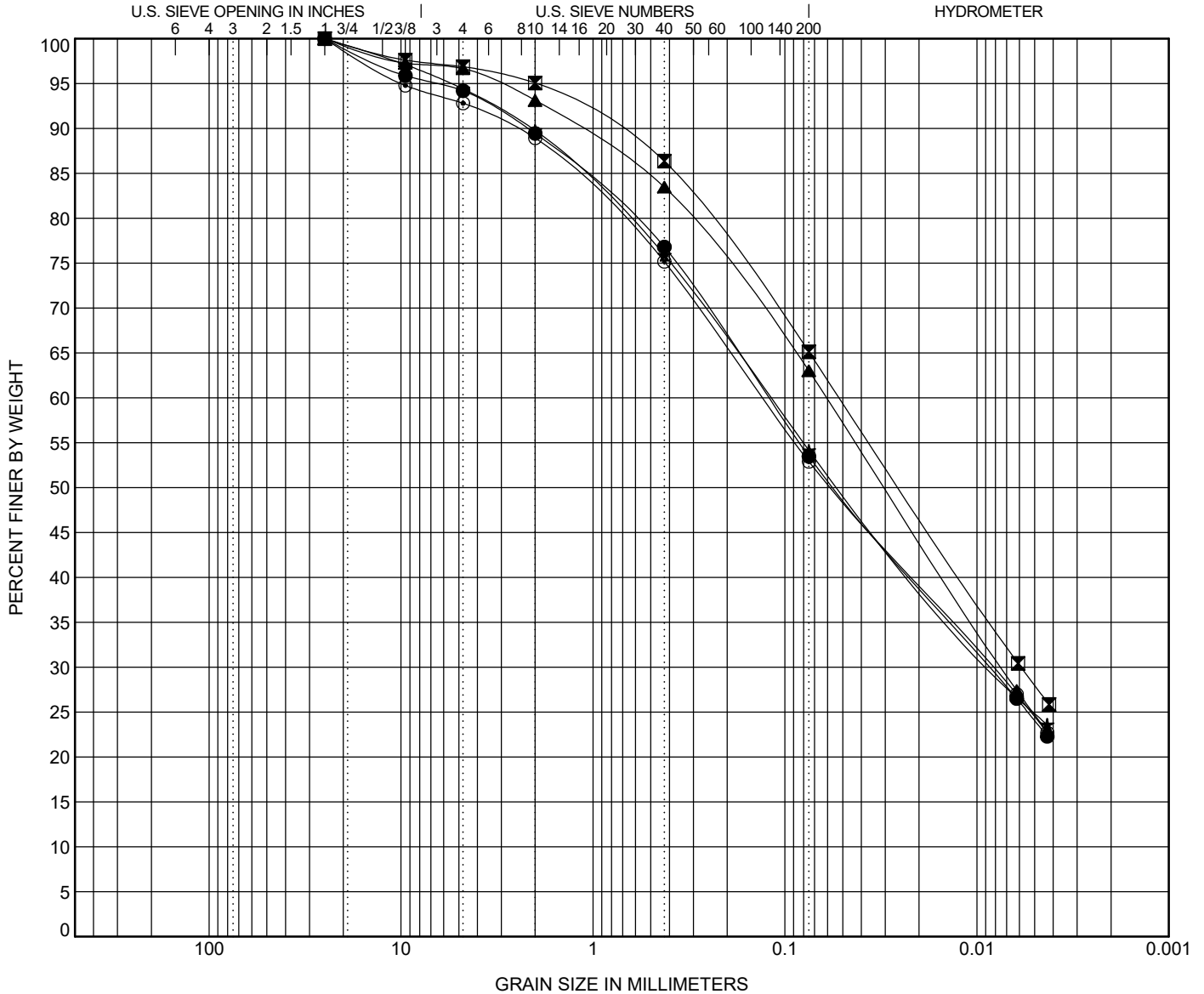


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification		LL	PL	PI	Cc	Cu
● BRW - 1	1.0	A-6 (6)	CL		36	19	17		
☒ BRW - 2	1.0	A-6 (8)	CL		34	19	15		
▲ BRW - 3	1.0	A-6 (8)	CL		38	22	16		
★ BRW - 4	1.0	A-6 (8)	CL		40	20	20		
◎ BRW - 5	1.0	A-6 (6)	CL		38	20	18		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 1	1.0	25	0.122	0.009		5.8	40.7	29.4	24.0
☒ BRW - 2	1.0	25	0.052	0.006		3.1	31.7	37.1	28.0
▲ BRW - 3	1.0	25	0.061	0.007		3.3	33.7	38.3	24.7
★ BRW - 4	1.0	25	0.12	0.008		5.6	40.3	29.3	24.8
◎ BRW - 5	1.0	25	0.13	0.008		7.2	39.9	28.4	24.5

GRAIN SIZE - ND.DOT.GDT - 10/17/17 17:13 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

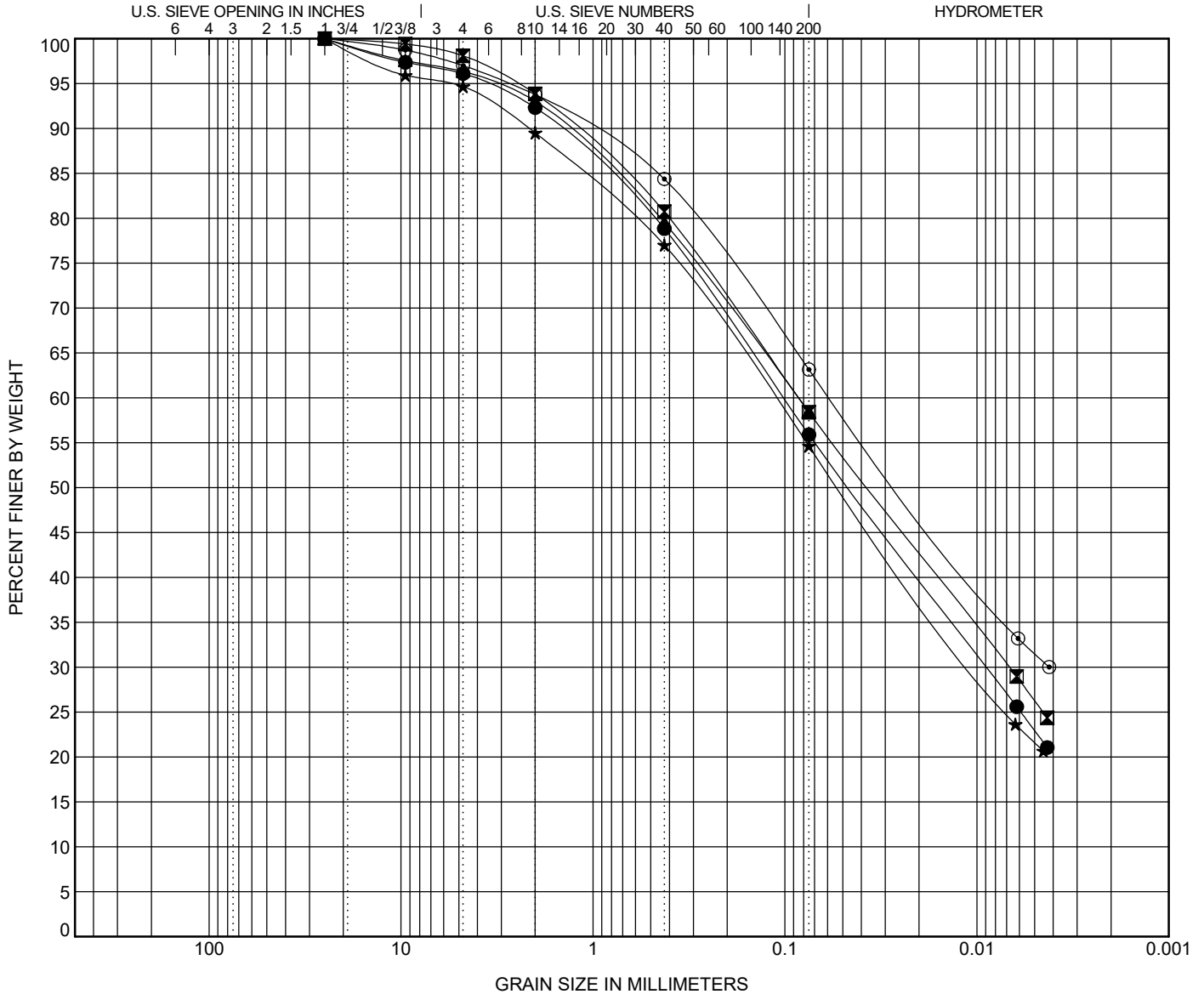


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● BRW - 6	1.0	A-6 (7)	CL			37	20	17		
▣ BRW - 7	1.0	A-6 (8)	CL			37	19	18		
▲ BRW - 8	1.0	A-4 (0)	ML			37	NP	NP		
★ BRW - 9	1.0	A-6 (6)	CL			36	20	16		
◎ BRW - 10	1.0	A-6 (10)	CL			39	19	20		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 6	1.0	25	0.102	0.009		3.9	40.2	33.0	22.9
▣ BRW - 7	1.0	25	0.085	0.007		1.9	39.7	32.1	26.3
▲ BRW - 8	1.0	25	0.085			3.7	37.9	58.4	
★ BRW - 9	1.0	25	0.114	0.01		5.3	40.0	33.0	21.6
◎ BRW - 10	1.0	25	0.058			3.0	33.9	31.6	31.5

GRAIN SIZE - ND.DOT.GDT - 10/17/17 17:13 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ



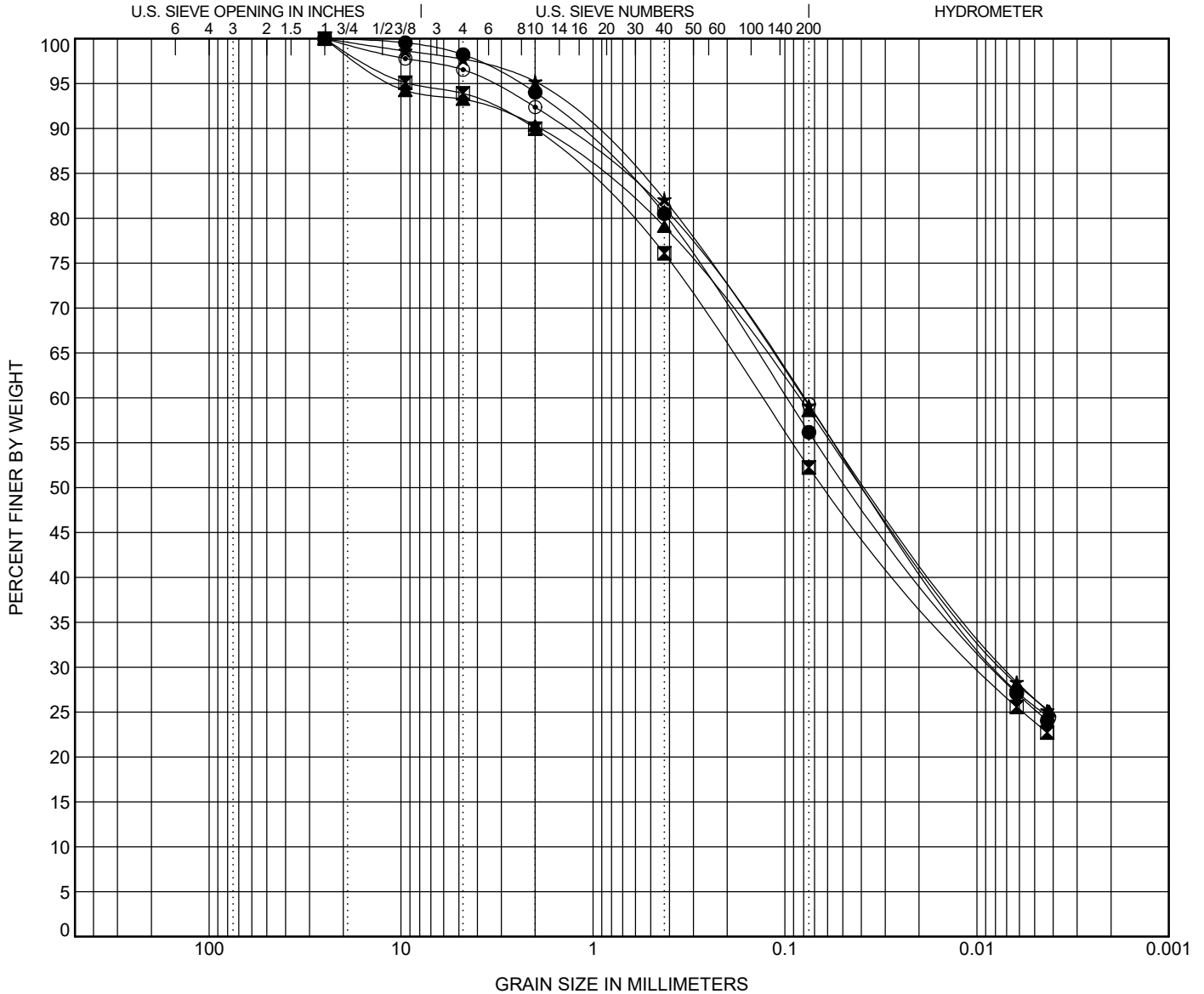
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification		LL	PL	PI	Cc	Cu
● BRW - 11	1.0	A-6 (7)	CL		36	19	17		
☒ BRW - 12	1.0	A-6 (5)	CL		35	20	15		
▲ BRW - 13	1.0	A-6 (7)	CL		35	18	17		
★ BRW - 14	1.0	A-6 (7)	CL		36	19	17		
◎ BRW - 15	1.0	A-6 (6)	CL		32	18	14		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 11	1.0	25	0.099	0.008		1.8	42.1	30.9	25.3
☒ BRW - 12	1.0	25	0.132	0.009		6.1	41.7	28.3	23.9
▲ BRW - 13	1.0	25	0.085	0.007		6.8	34.7	32.1	26.5
★ BRW - 14	1.0	25	0.08	0.007		2.3	38.6	32.7	26.5
◎ BRW - 15	1.0	25	0.079	0.008		3.5	37.3	33.6	25.7

GRAIN SIZE - ND.DOT.GDT - 10/17/17 17:13 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

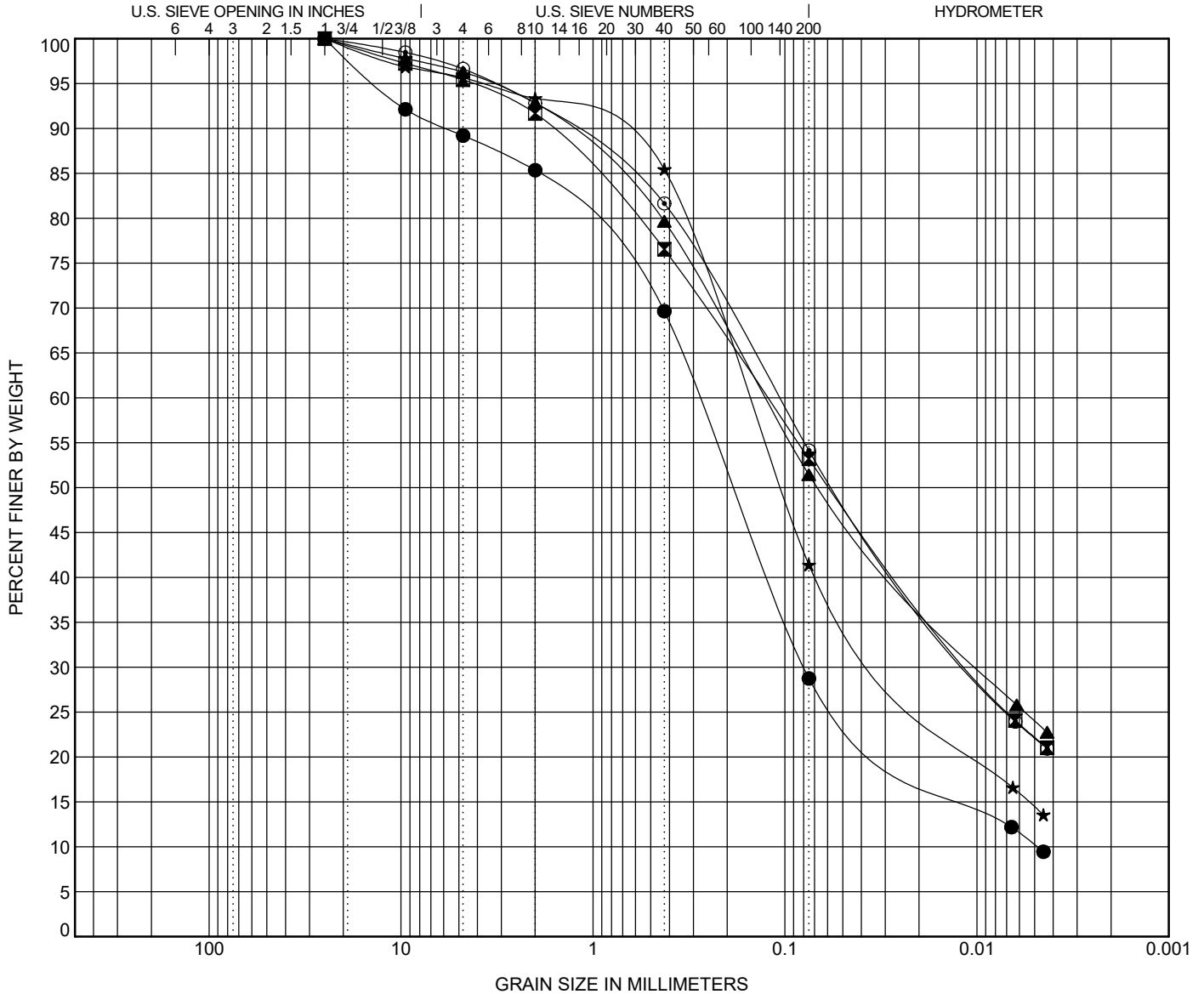


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● BRW - 15	12.0	A-2-4 (0)	SM			NP	NP	NP	4.56	58.09
☒ BRW - 16	1.0	A-6 (6)	CL			37	21	16		
▲ BRW - 17	1.0	A-6 (4)	CL			32	17	15		
★ BRW - 17	10.0	A-4 (0)	SM			NP	NP	NP		
◎ BRW - 18	1.0	A-4 (3)	CL			29	19	10		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 15	12.0	25	0.282	0.079	0.005	10.8	60.5	18.5	10.2
☒ BRW - 16	1.0	25	0.124	0.01		4.6	42.2	31.0	22.2
▲ BRW - 17	1.0	25	0.127	0.009		3.7	44.8	27.4	24.0
★ BRW - 17	10.0	25	0.156	0.024		4.3	54.3	27.0	14.4
◎ BRW - 18	1.0	25	0.109	0.01		3.4	42.5	32.0	22.1

GRAIN SIZE - ND.DOT.GDT - 10/17/17 17:13 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

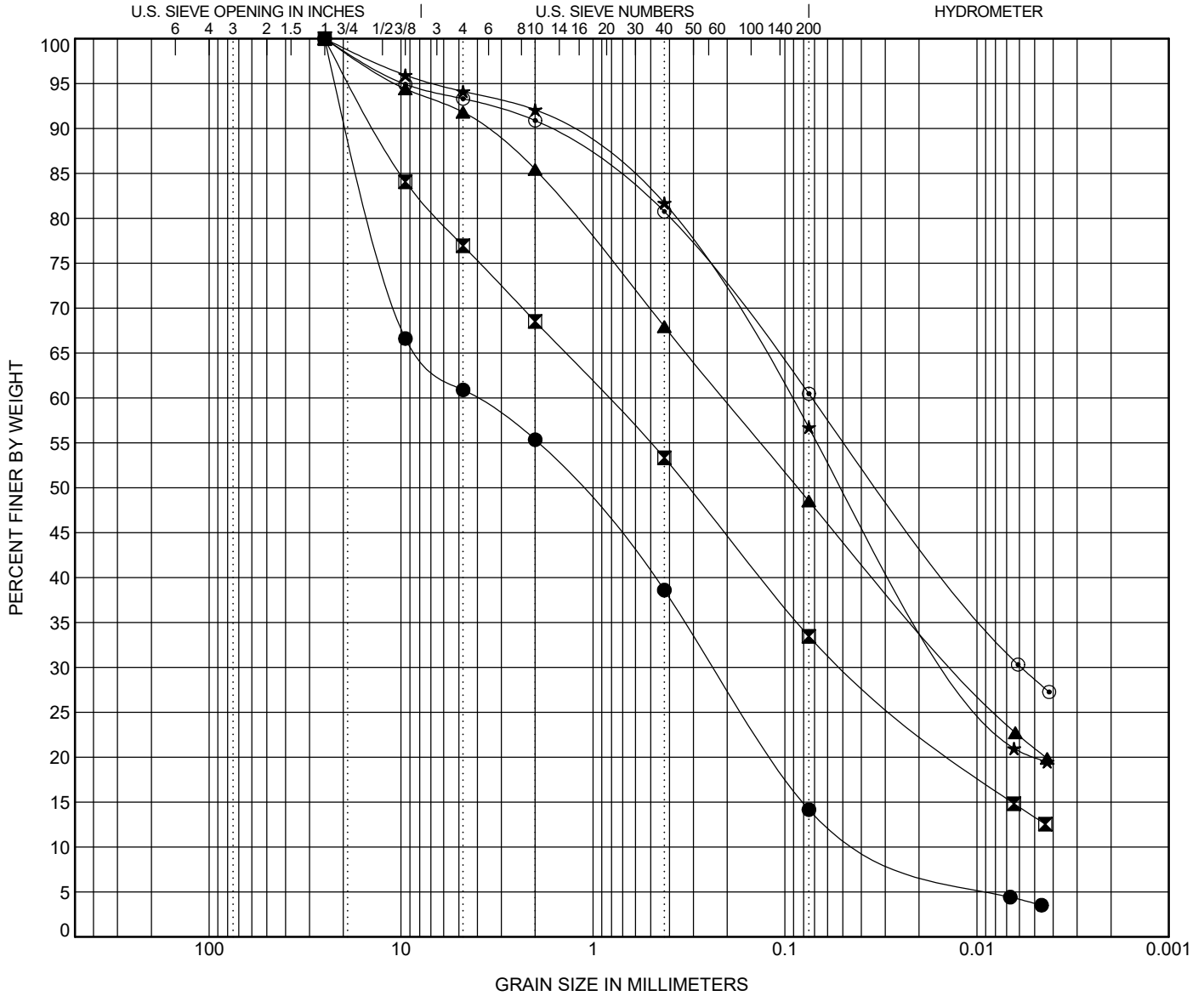


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification			LL	PL	PI	Cc	Cu
● BRW - 18	7.0	A-1-b (0)	SM			NP	NP	NP	0.48	154.72
☒ BRW - 19	1.0	A-2-6 (1)	SC			32	19	13		
▲ BRW - 19	6.0	A-7-6 (6)	SC			43	25	18		
★ BRW - 20	1.0	A-6 (3)	CL			27	16	11		
◎ BRW - 21	1.0	A-6 (9)	CL			39	20	19		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 18	7.0	25	4.133	0.231	0.027	39.1	46.7	10.4	3.7
☒ BRW - 19	1.0	25	0.839	0.047		23.1	43.5	20.2	13.3
▲ BRW - 19	6.0	25	0.209	0.013		8.2	43.3	27.5	21.0
★ BRW - 20	1.0	25	0.094	0.012		5.9	37.4	36.7	20.0
◎ BRW - 21	1.0	25	0.072	0.006		6.7	32.8	31.8	28.7

GRAIN SIZE - ND.DOT.GDT - 10/17/17 17:13 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

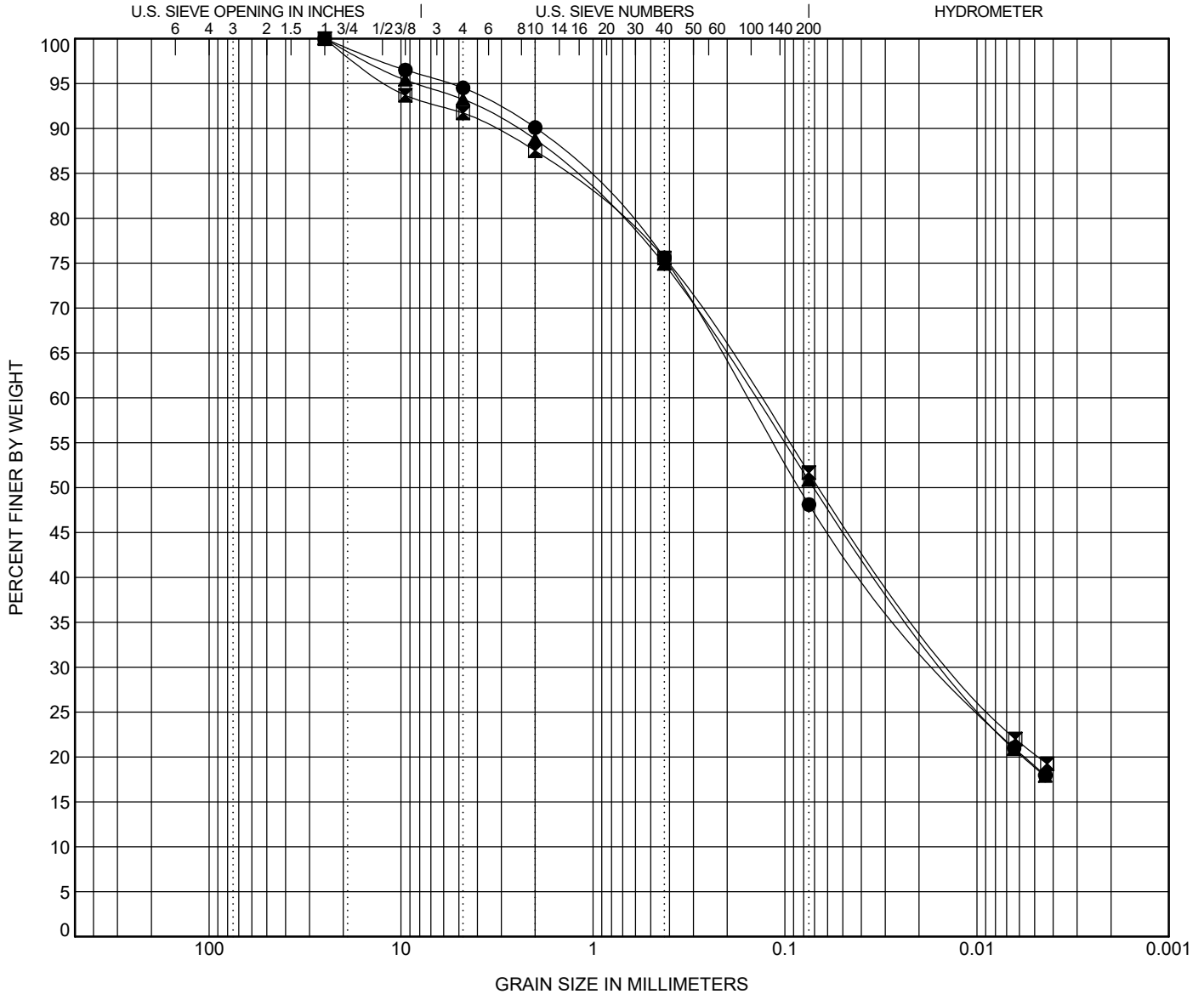


GRAIN SIZE DISTRIBUTION

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification	USCS Classification	LL	PL	PI	Cc	Cu
● BRW - 21	7.0	A-6 (4)	SC	34	19	15		
■ BRW - 22	1.0	A-6 (4)	CL	32	19	13		
▲ BRW - 23	1.0	A-6 (5)	CL	35	20	15		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BRW - 21	7.0	25	0.159	0.014		5.5	46.4	29.1	19.0
■ BRW - 22	1.0	25	0.137	0.012		8.3	40.1	31.3	20.3
▲ BRW - 23	1.0	25	0.146	0.014		6.8	42.4	31.9	18.9

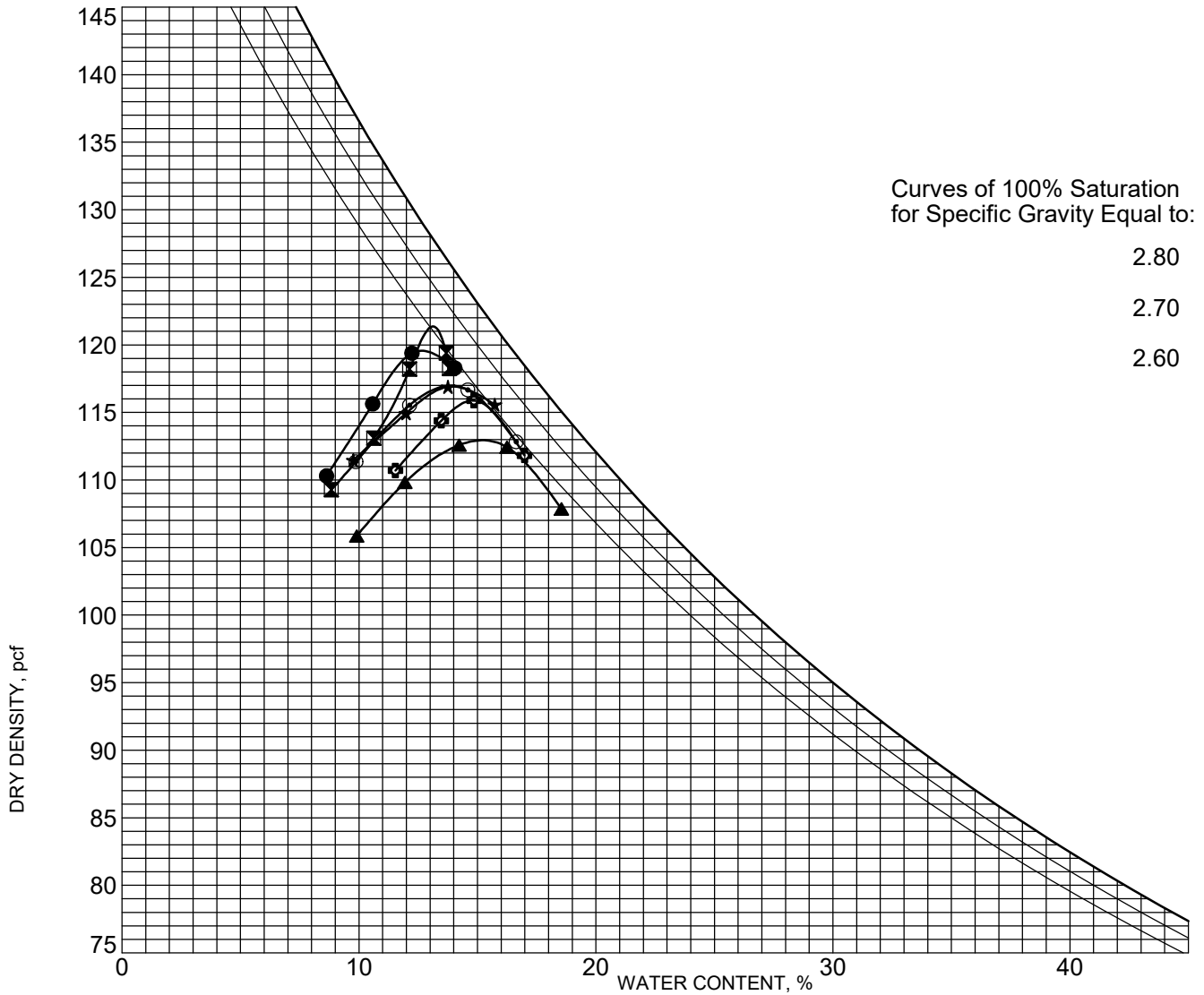


MOISTURE-DENSITY RELATIONSHIP

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● BRW - 1	1.0	A-6 (6)	SANDY LEAN CLAY(CL)
☒ BRW - 2	1.0	A-6 (8)	SANDY LEAN CLAY(CL)
▲ BRW - 3	1.0	A-6 (8)	SANDY LEAN CLAY(CL)
★ BRW - 4	1.0	A-6 (8)	SANDY LEAN CLAY(CL)
⊙ BRW - 5	1.0	A-6 (6)	SANDY LEAN CLAY(CL)
⊕ BRW - 6	1.0	A-6 (7)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● BRW - 1	1.0	AASHTO T-180 Method A	36	19	17	119.6 PCF	12.6 %
☒ BRW - 2	1.0	AASHTO T-180 Method A	34	19	15	121.4 PCF	13.1 %
▲ BRW - 3	1.0	AASHTO T-180 Method A	38	22	16	112.9 PCF	15.2 %
★ BRW - 4	1.0	AASHTO T-180 Method A	40	20	20	116.9 PCF	14.0 %
⊙ BRW - 5	1.0	AASHTO T-180 Method A	38	20	18	117.0 PCF	13.9 %
⊕ BRW - 6	1.0	AASHTO T-180 Method A	37	20	17	115.9 PCF	14.8 %

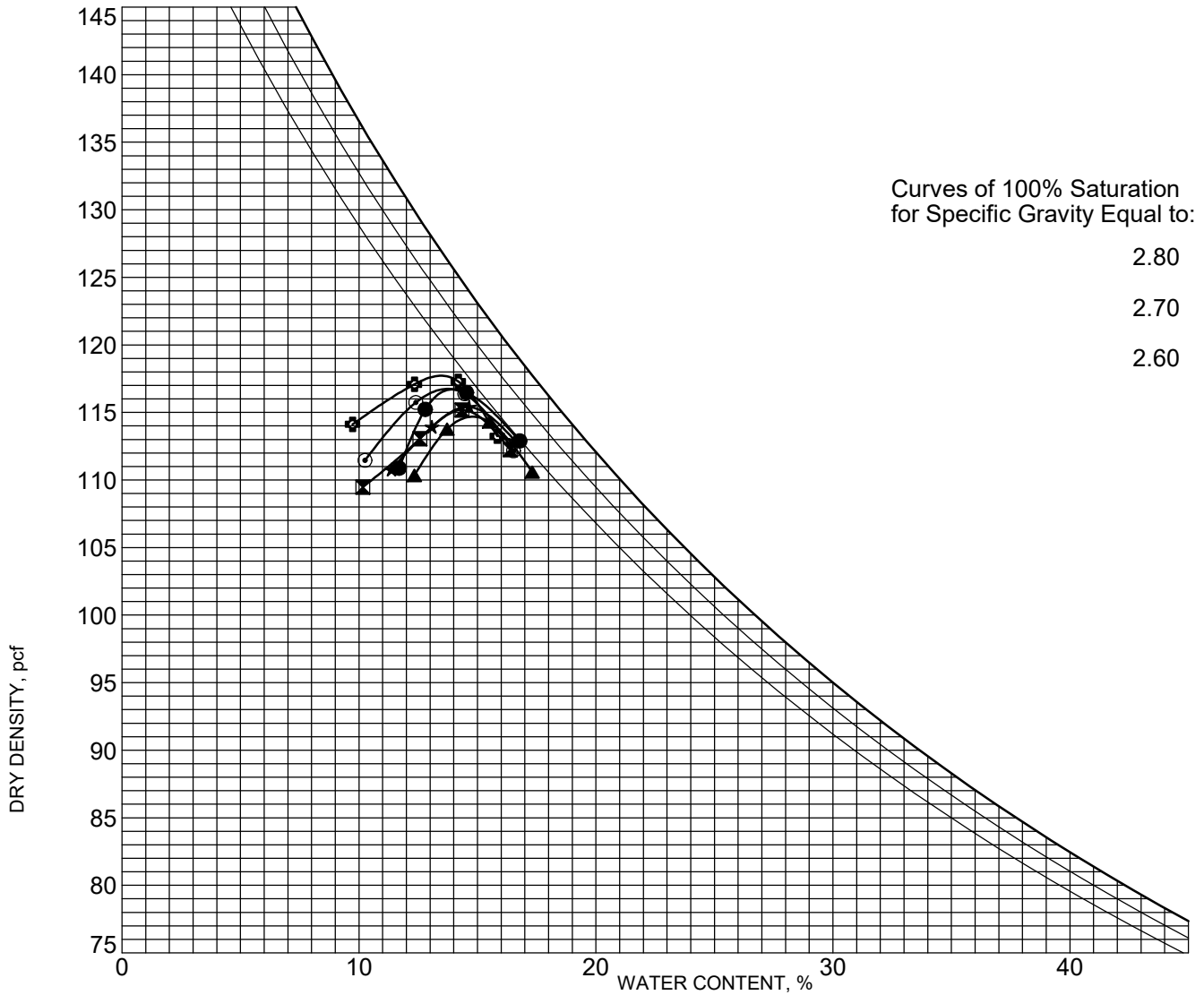


MOISTURE-DENSITY RELATIONSHIP

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COMPACTION (MULTIPLE CURVES) - ND DOT.GDT - 10/17/17 17:12 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● BRW - 7	1.0	A-6 (8)	SANDY LEAN CLAY(CL)
☒ BRW - 8	1.0	A-4 (0)	SANDY SILT(ML)
▲ BRW - 9	1.0	A-6 (6)	SANDY LEAN CLAY(CL)
★ BRW - 10	1.0	A-6 (10)	SANDY LEAN CLAY(CL)
⊙ BRW - 11	1.0	A-6 (7)	SANDY LEAN CLAY(CL)
⊕ BRW - 12	1.0	A-6 (5)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● BRW - 7	1.0	AASHTO T-180 Method A	37	19	18	116.7 PCF	14.0 %
☒ BRW - 8	1.0	AASHTO T-180 Method A	37	NP	NP	115.2 PCF	14.4 %
▲ BRW - 9	1.0	AASHTO T-180 Method A	36	20	16	114.7 PCF	14.8 %
★ BRW - 10	1.0	AASHTO T-180 Method A	39	19	20	115.4 PCF	14.6 %
⊙ BRW - 11	1.0	AASHTO T-180 Method A	36	19	17	116.7 PCF	13.7 %
⊕ BRW - 12	1.0	AASHTO T-180 Method A	35	20	15	117.7 PCF	13.5 %

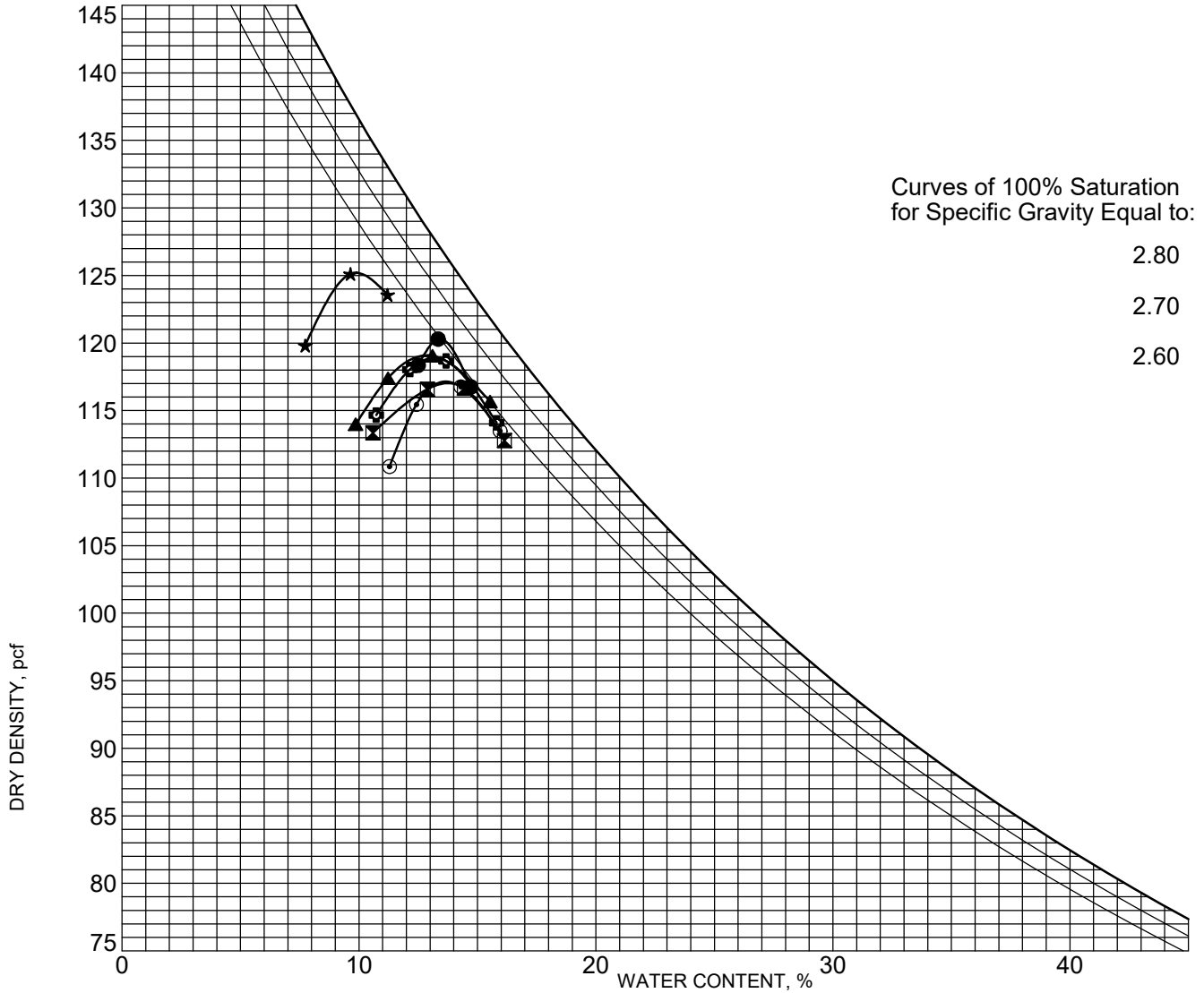


MOISTURE-DENSITY RELATIONSHIP

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COMPACTION (MULTIPLE CURVES) - ND DOT.GDT - 10/17/17 17:12 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● BRW - 13	1.0	A-6 (7)	SANDY LEAN CLAY(CL)
▣ BRW - 14	1.0	A-6 (7)	SANDY LEAN CLAY(CL)
▲ BRW - 15	1.0	A-6 (6)	SANDY LEAN CLAY(CL)
★ BRW - 15	12.0	A-2-4 (0)	SILTY SAND(SM)
⊙ BRW - 16	1.0	A-6 (6)	SANDY LEAN CLAY(CL)
⊕ BRW - 17	1.0	A-6 (4)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● BRW - 13	1.0	AASHTO T-180 Method A	35	18	17	120.3 PCF	13.4 %
▣ BRW - 14	1.0	AASHTO T-180 Method A	36	19	17	117.0 PCF	13.8 %
▲ BRW - 15	1.0	AASHTO T-180 Method A	32	18	14	119.1 PCF	12.9 %
★ BRW - 15	12.0	AASHTO T-180 Method A	NP	NP	NP	125.2 PCF	9.9 %
⊙ BRW - 16	1.0	AASHTO T-180 Method A	37	21	16	117.1 PCF	13.6 %
⊕ BRW - 17	1.0	AASHTO T-180 Method A	32	17	15	118.9 PCF	13.2 %

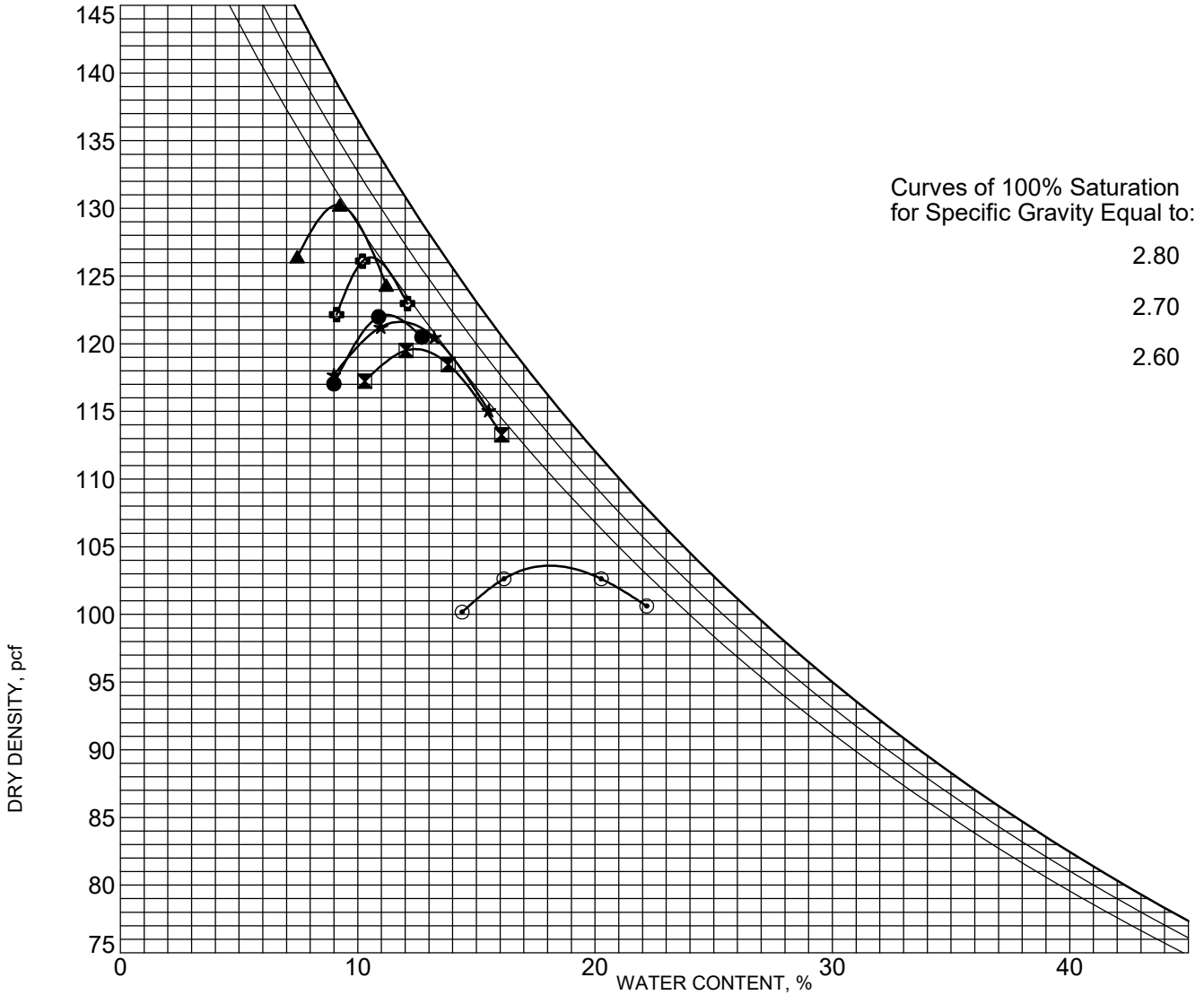


MOISTURE-DENSITY RELATIONSHIP

PROJECT NUMBER NH-3-281(130)148

LOCATION Benson County

PCN 21506



COMPACTION (MULTIPLE CURVES) - ND DOT.GDT - 10/17/17 17:12 - F:\LAB\PROJECTS\GINT\NH-3-281(130)148.GPJ

BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● BRW - 17	10.0	A-4 (0)	SILTY SAND(SM)
☒ BRW - 18	1.0	A-4 (3)	SANDY LEAN CLAY(CL)
▲ BRW - 18	7.0	A-1-b (0)	SILTY SAND with GRAVEL(SM)
★ BRW - 19	1.0	A-2-6 (1)	CLAYEY SAND with GRAVEL(SC)
⊙ BRW - 19	6.0	A-7-6 (6)	CLAYEY SAND(SC)
⊕ BRW - 20	1.0	A-6 (3)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● BRW - 17	10.0	AASHTO T-180 Method A	NP	NP	NP	122.1 PCF	11.3 %
☒ BRW - 18	1.0	AASHTO T-180 Method A	29	19	10	119.6 PCF	12.4 %
▲ BRW - 18	7.0	AASHTO T-180 Method A	NP	NP	NP	130.3 PCF	9.1 %
★ BRW - 19	1.0	AASHTO T-180 Method A	32	19	13	121.6 PCF	11.8 %
⊙ BRW - 19	6.0	AASHTO T-180 Method A	43	25	18	103.6 PCF	18.1 %
⊕ BRW - 20	1.0	AASHTO T-180 Method A	27	16	11	126.4 PCF	10.5 %

APPENDIX C

NDDOT Material Source Certificate of Approvals

NDDOT Material Source Certificate of Approval



Expires December 31st

2020

BE-1131

Pit Name: Option 1_Schmid

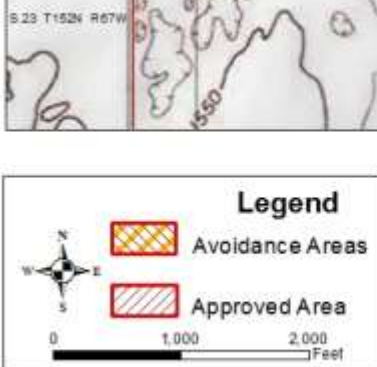
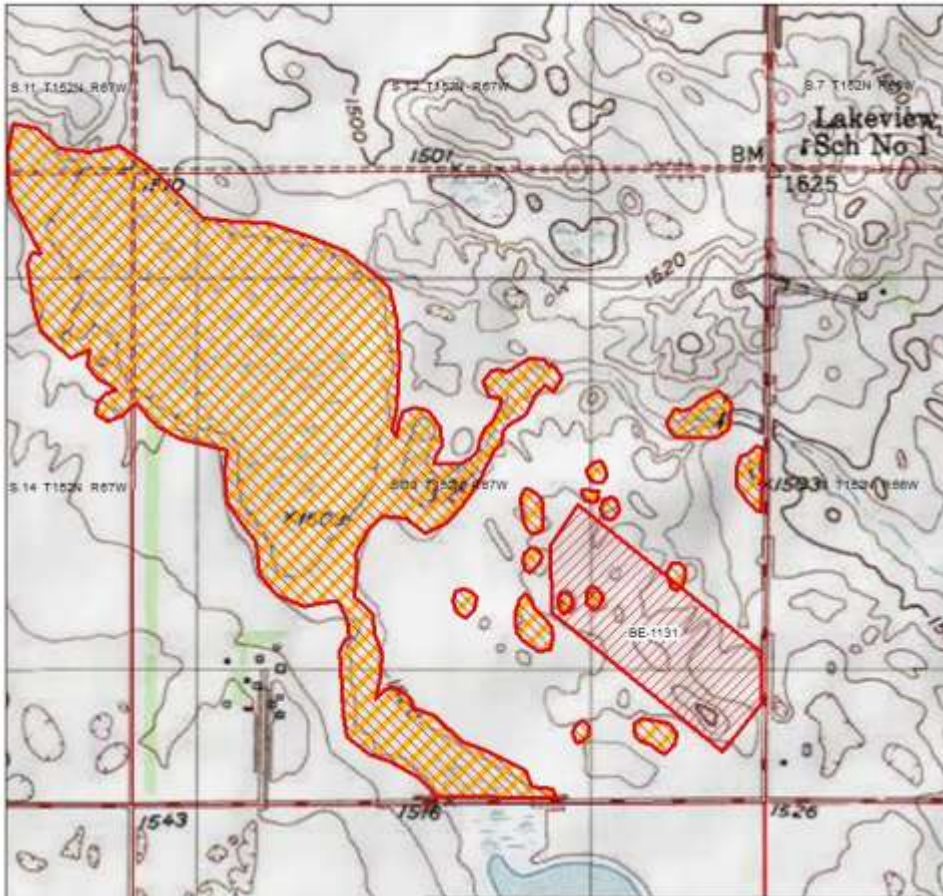
SE1/4

S. 13 T. 152 N, R 67 W

County:

Benson

Conditions:



This location is approved for use, provided all avoidance areas shown on the map are avoided and all Conditions listed above and below are complied with.

NDDOT advises that all applicants (contractors or their representatives) may be subject to meeting certain legal responsibilities pursuant to one or more of the following authorities administered by the USFWS: Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.); Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.); and Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250). It is the responsibility of the applicants and/or any individual conducting activities at any approved site to fulfill the requirements of these Acts. The contractor will be responsible obtaining all applicable permits outlined in Section 107 of the Standard Specifications for Road and Bridge Construction (SSRBC). Additionally, contractor will be responsible for any impacts to wetlands, including permitting those impacts and mitigating the loss of the wetlands. As with all projects, if cultural artifacts and/or features (e.g., stone tools, fire hearths, stone circles, burials) are encountered, provisions outlined in Section 107.06 of SSRBC shall be followed.

This approval does not imply landowner permission to acquire material at this location. An agreement with the landowner is still necessary. If you have any questions regarding material sources please email materialsourc@nd.gov