

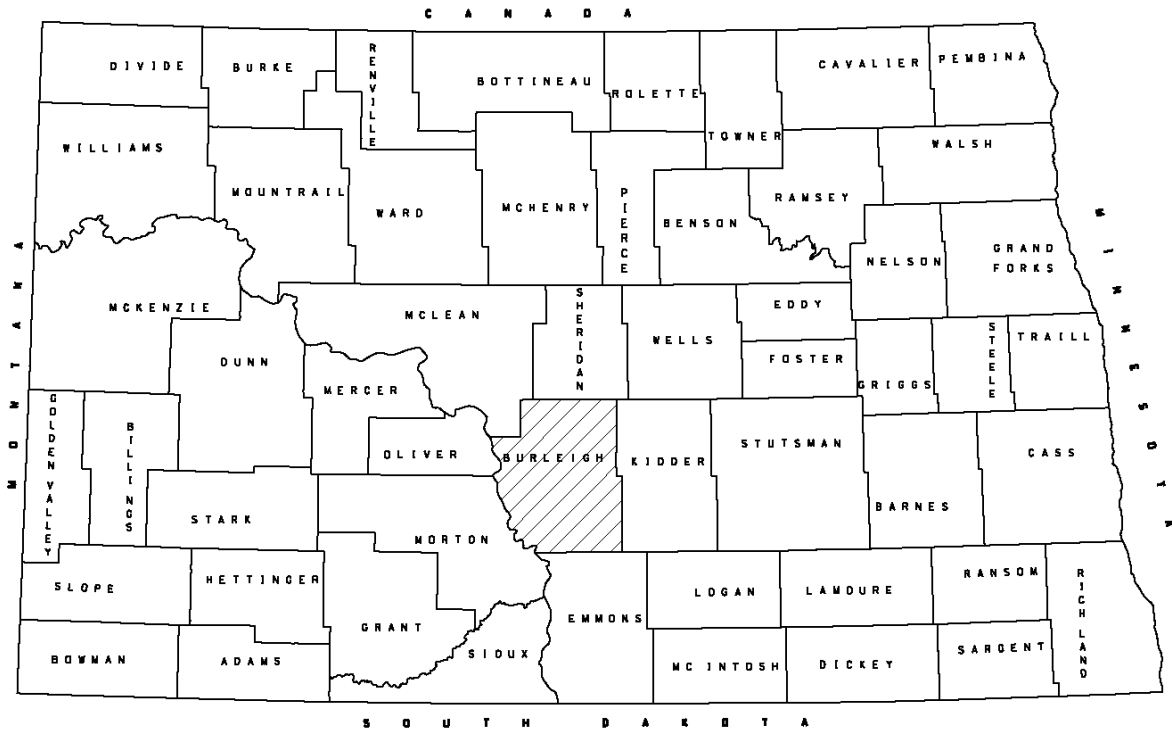
LINEAR SOILS SURVEY AND RECOMMENDATIONS

PROJECT NO. IM-X-1-094(214)162

PCN 22957

COUNTY Burleigh

EB I-94, RP 162.36 to 172.126



PREPARED BY: Riley McAdoo-Roesler

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

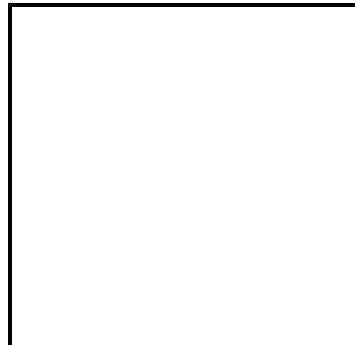
December 2021

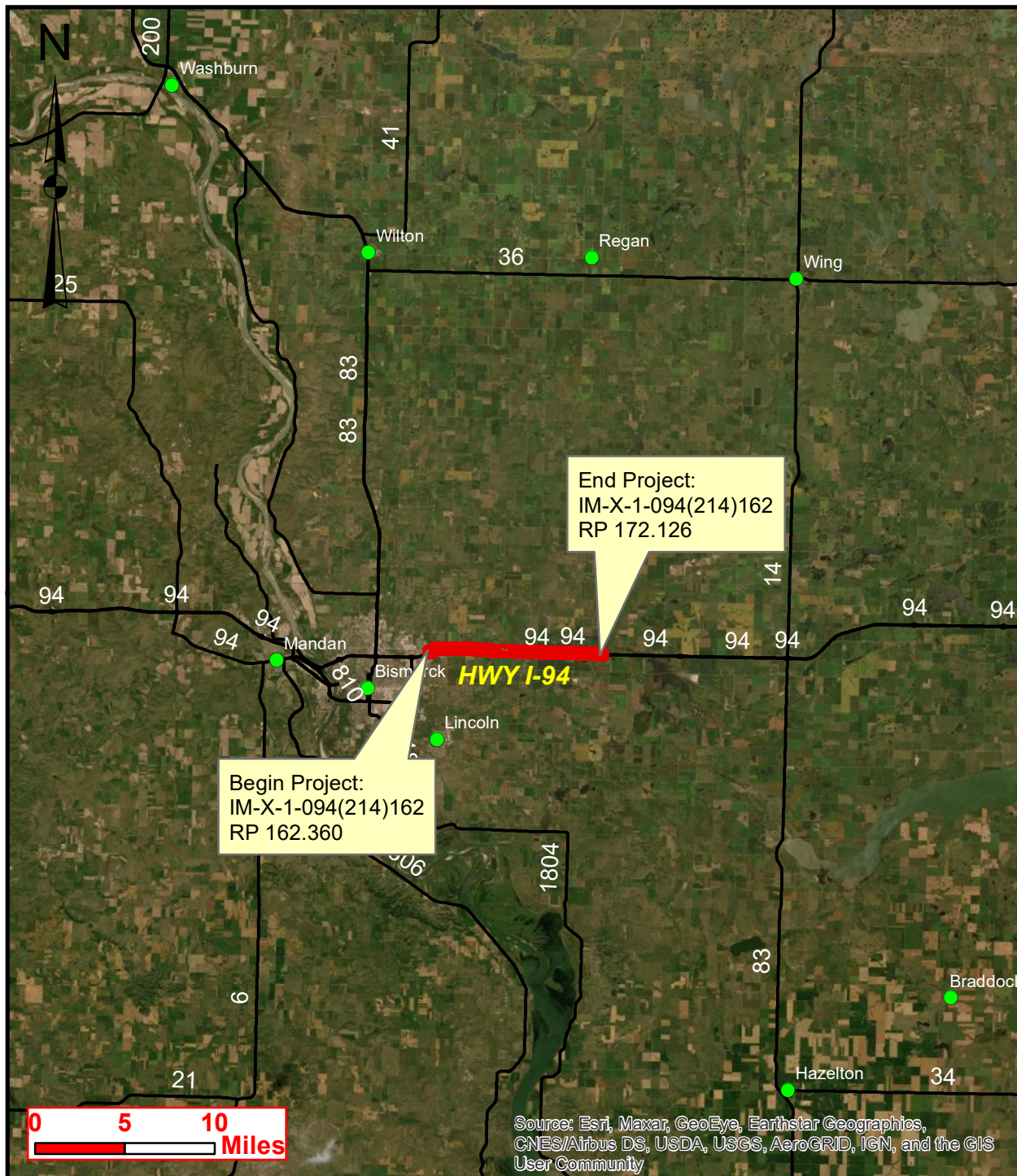
IM-X-1-094(214)162

E Bis Intr. E to E of Menoken Intr.- EB

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 Jared J. Loegering, Registration number PE-10931 on 12/29/2021 and the original document is stored at the North Dakota Department of Transportation.





Project Location

Project: IM-X-1-094(214)162
PCN: 22958
Scope: Reconstruction
Location: EB, RP 162.360 to RP 172.126

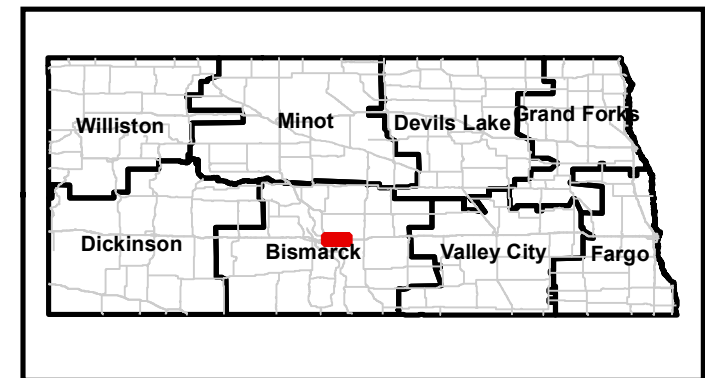


Table of Contents

Introduction	2
Maintenance Review	2
Summary of Soil Investigation	3
Summary of Soil Analysis	3
Soil Sample Distribution	3
Design Recommendations	5
Design Information	5
Plan Notes	5

List of Figures

Figure 1 - Soil Sample Distribution	4
---	---

List of Tables

Table 1 – Identified Maintenance Areas	2
Table 2 – Boring Locations Summary	3

Appendices

Appendix A – Soil Classification	
Appendix B – Maintenance Review and Subsurface Investigation Scope	
Appendix C – Boring Locations	
Appendix D – Summary of Soils Analysis	
Appendix E – Lab Results	

Introduction

Location: I-94, East Bismarck intr. E to east of Menoken intr.- EB

Reference Points: 162.36 to 172.126

Project Length: 9.7690 Miles

Proposed Project Scope: Reconstruction

Investigation Scope: 1000' Intervals and Identified Maintenance Areas

Maintenance Review

Date of Maintenance Review: 03/25/2021

Materials and Research Person Conducting the Review: Jamie Naumann

Maintenance Person Conducting Review: Cory Bohne

Table 1 – Identified Maintenance Areas

Location RP + Feet	Distress Identified	Maintenance Comments	Drilling Required
162+4700	Broken Slab	Blowout every year. Dura-patch yearly. Major issue.	No
163+1783	Broken Slab	Fix yearly	No
163+3850	Broken Slab	Fix yearly	No
163+4532	Broken Slab	Fix yearly	No
163+5270	Broken Slab	Fix yearly	No
164+0450	Broken Slab	Fix yearly	No
164+0593	Broken Slab	Fix yearly	No
164+1991	Broken Slab	Fix yearly	No
164+3076	Broken Slab	Blowout fixed 6 months ago	No
164+5168	Broken Slab	Fix yearly	No
168+1014 to 168+1460 (Ramp)	Broken Slab	Fix yearly	Yes

Summary of Soil Investigation

The soil investigation was completed on 6/15/2015. The investigation consisted of 51 borings.

Table 2 – Boring Locations Summary

Boring Location	Pavement Distress	Justification for Boring	Boring Depth	Boring Locations/Comments
162+2000 to 172+0000	N/A	Reconstruction	5 feet	Conduct borings at 1000' intervals along the project limits (taking into account previous borings, do not redrill). A total number of approximately 48 borings.
168+0916 to 168+1581 (RAMP)	Broken slab	Identified Maintenance Area	10 feet	Conduct 1 borings in distressed area and one boring on either side approximately 100 feet away. A total number of 3 borings.

Maps of the boring locations are shown in Appendix C. The lab results are included in Appendix E.

Summary of Soil Analysis

Project Limits – 162+2000 to 172+0000: The majority of soils within the project limits fat and lean clays with AASHTO classifications of A-6 and A-7-6. These soils have on average a maximum dry density of approximately 120.01 lb/ft³ and an optimum water content of approximately 12.9%. The in-place moistures of the soils that are comprised mainly of clay are on average 8% to 15% over optimum.

Identified Maintenance Area – 168+0916 to 168+1581: The soils within the identified maintenance area are lean clays with AASHTO classifications of A-6. These soils have on average a maximum dry density of approximately 121.5 lb/ft³ and an optimum water content of approximately 12%. The in-place moistures of the soils are on average 11% to 14% over optimum.

Existing Underdrains – 162+4013 to 164+1003: The soils in the area are fat clays with an AASHTO classification of A-7-6. These soils have on average a maximum dry density of approximately 112.54 lb/ft³ and an optimum water content of approximately 16%. The in-place moistures of the soils are on average 15% over optimum.

Soil Sample Distribution

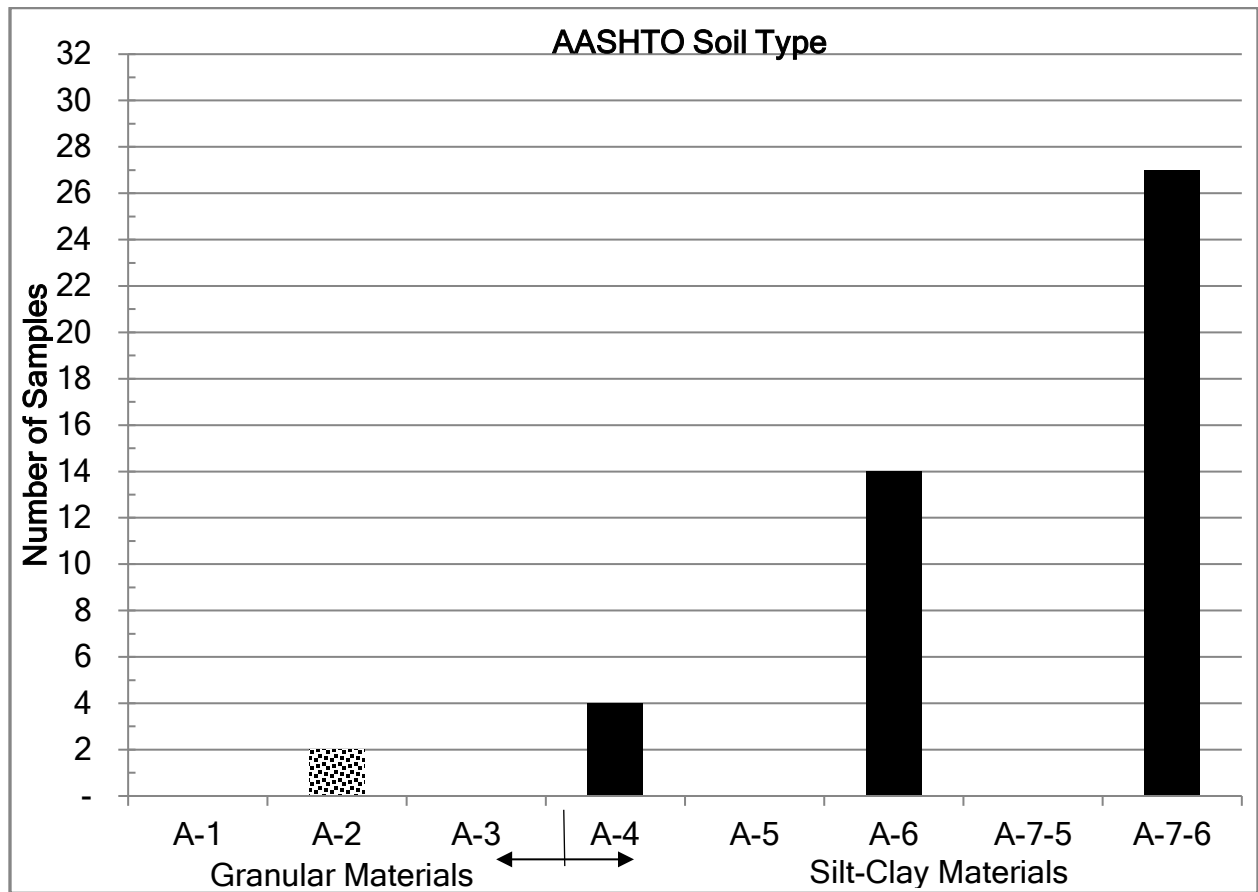


Figure 1 - Soil Sample Distribution

Design Recommendations

Project Limits – 162+1901 to 172+0665: Place Geosynthetic Geogrid (Type G) on top of the existing subgrade without disturbing or scarifying the subgrade. Place a minimum of 8 inches of base material over the geogrid prior to compacting the base material. This deviates from the minimum of 10 inches required in the Standard Specifications due to the proposed pavement design requiring 8 inches of base material.

Identified Maintenance Area – 168+1014 to 168+1460: The existing soils in this area are lean clays. The in-place moistures of the soils are on average 11% to 14% over optimum. The soils throughout the maintenance area are similar to the soils found through the project. There are no changes in soil type or water content that would indicate the subgrade is causing roadway distress at this location. There are no design recommendations at this time.

Underdrains: There are existing underdrains from 162+4013 to 164+1003 in the roadbed. The in-place moisture for this soil is approximately 15% over optimum compared to the 8% average over optimum for the rest of the project. Therefore, it is recommended to remove the existing underdrains and install new underdrains from RP 162+4000 to 164+3000.

Design Information

Pipe Replacement: None

Compaction Method: T-180

Subgrade Prep: None

Subcut Recommendations: None

Drainage: Install underdrains from RP 162+4000 to 164+3000.

Plan Notes

None

The recommendations in this report are based on the scope specified in the Introduction. If the scope of work, vertical profile or horizontal alignment is changed, in either the conceptual phase or the design phase, the Geotechnical Engineer must be notified as soon as possible to ensure that there is adequate geotechnical information addressing these areas.

APPENDIX A

SOIL CLASSIFICATION

AASHTO Classification System

Table 5.1. AASHTO Classification System

General Classification	Granular materials (35% or less passing No. 200 Sieve (0.075 mm))							Silt-clay Materials More than 35% passing No. 200 Sieve (0.075 mm)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
(a) Sieve Analysis: Percent Passing											
(i) 2.00 mm (No. 10)	50 max										
(ii) 0.425 mm (No. 40)	30 max	50 max	51 min								
(iii) 0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
(b) Characteristics of fraction passing 0.425 mm (No. 40)											
(i) Liquid limit				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
(ii) Plasticity index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min*
(c) Usual types of significant Constituent materials	Stone Fragments Gravel and sand		Fine Sand	Silty or Clayey Gravel Sand				Silty Soils		Clayey Soils	
(d) General rating as subgrade.	Excellent to Good							Fair to Poor			

* If plasticity index is equal to or less than (Liquid Limit—30), the soil is A—7—5 (i.e. PL > 30%)
If plasticity index is greater than (Liquid Limit—30), the soil is A—7—6 (i.e. PL < 30%)

Unified Soil Classification System, USCS

Table 5.2 Unified Soil Classification System (Based on Material Passing 76.2-mm Sieve)

Criteria for assigning group symbols				Group symbol
Coarse-grained soils More than 50% of retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels	$C_u \geq 4$ and $1 \leq C_c \leq 3^c$	GW
		Less than 5% fines ^a	$C_u < 4$ and/or $1 > C_c > 3^c$	GP
		Gravels with Fines	$PI < 4$ or plots below "A" line (Figure 5.3)	GM
		More than 12% fines ^{a,d}	$PI > 7$ and plots on or above "A" line (Figure 5.3)	GC
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands	$C_u \geq 6$ and $1 \leq C_c \leq 3^c$	SW
		Less than 5% fines ^b	$C_u < 6$ and/or $1 > C_c > 3^c$	SP
		Sands with Fines	$PI < 4$ or plots below "A" line (Figure 5.3)	SM
		More than 12% fines ^{b,d}	$PI > 7$ and plots on or above "A" line (Figure 5.3)	SC
Fine-grained soils 50% or more passes No. 200 sieve	Sils and clays Liquid limit less than 50	Inorganic	$PI > 7$ and plots on or above "A" line (Figure 5.3) ^e	CL
			$PI < 4$ or plots below "A" line (Figure 5.3) ^e	ML
		Organic	Liquid limit — oven dried	OL
			Liquid limit — not dried < 0.75 ; see Figure 5.3; OL zone	
	Sils and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line (Figure 5.3)	CH
			PI plots below "A" line (Figure 5.3)	MH
		Organic	Liquid limit — oven dried	OH
			Liquid limit — not dried < 0.75 ; see Figure 5.3; OH zone	
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor			Pt

^aGravels with 5 to 12% fine require dual symbols: GW-GM, GW-GC, GP-GM, GP-GC.

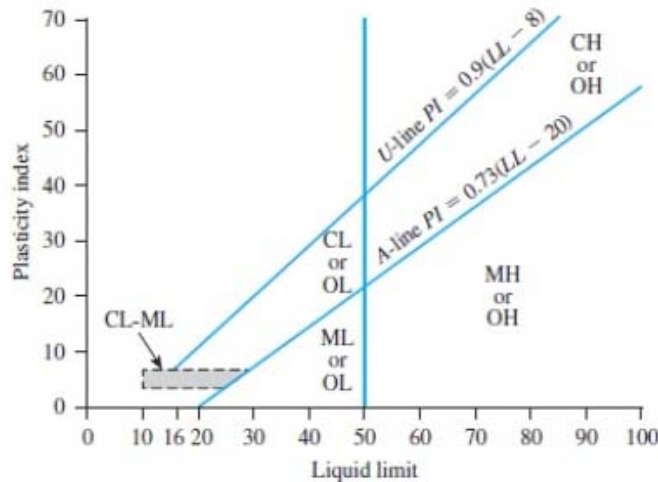
^bSands with 5 to 12% fines require dual symbols: SW-SM, SW-SC, SP-SM, SP-SC.

$$^c C_u = \frac{D_{60}}{D_{10}}; \quad C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}}$$

^dIf $4 \leq PI \leq 7$ and plots in the hatched area in Figure 5.3, use dual symbol GC-GM or SC-SM.

^eIf $4 \leq PI \leq 7$ and plots in the hatched area in Figure 5.3, use dual symbol CL-ML.

Plasticity Chart :



APPENDIX B

MAINTENANCE REVIEW AND SUBSURFACE INVESTIGATION SCOPE

PAVEMENT EVALUATION LOG FOR LINEAR SOIL SURVEY

North Dakota Department of Transportation, Materials & Research
SFN 60472 (6-2017)

Sheet

1 of 2

Project Number IM-X-1-094(214)162	PCN 22957	Date of Survey 03/25/2021
Section Maintenance Contact Cory Bohne		Completed By Jamie Naumann

Highway Reference Points 162+1901 to 172+0665		Surface Types Concrete			
Location	Pavement Distress	Description	Maintenance Comment	Picture Number	Drilling Required
162+4700	Broken Slab	Broken slab.	Blowout every year. Durapatch yearly. Major issue.	1	No
163+1783	Broken Slab	Broken slab in eastbound passing lane.	Fix yearly.	2	No
163+3850	Broken Slab	Broken slab in eastbound passing lane.	Fix yearly.	N/A	No
163+4532	Broken Slab	Broken slab in both lanes eastbound.	Fix yearly.	3	No
163+5270	Broken Slab	Broken slab in eastbound passing lane.	Fix yearly.	N/A	No
164+0450	Broken Slab	Broken slab in eastbound driving lane.	Fix yearly.	N/A	No
164+0593	Broken Slab	Broken slab in eastbound passing lane.	Fix yearly.	4	No
164+1991	Broken Slab	Broken slab in eastbound passing lane.	Fix yearly.	5	No
164+3076	Broken Slab	Broken slab in both lanes eastbound.	Blowout fixed 6 months ago.	6	No

Comments
Concrete overlaid with asphalt.

PAVEMENT EVALUATION LOG FOR LINEAR SOIL SURVEY

North Dakota Department of Transportation, Materials & Research

SFN 60472 (6-2017)

Sheet
2 of 2

Project Number IM-X-1-094(214)162	PCN 22957	Date of Survey 03/25/2021
Section Maintenance Contact Cory Bohne		Completed By Jamie Naumann

Highway Reference Points 162+1901 to 172+0665	Surface Types Concrete	
--	---------------------------	--

Location	Pavement Distress	Description	Maintenance Comment	Picture Number	Drilling Required
164+5168	Broken Slab	Broken slab in both lanes eastbound.	Fix yearly.	7	No
168+1014 to 168+1460 (RAMP)	Broken Slab	Broken slab on ramp to rest area.	Fix yearly.	8-10	Yes

Comments
Concrete overlaid with asphalt.



1
162+4700



2
163+1783



3
163+4532



4
164+0593



5
164+1991



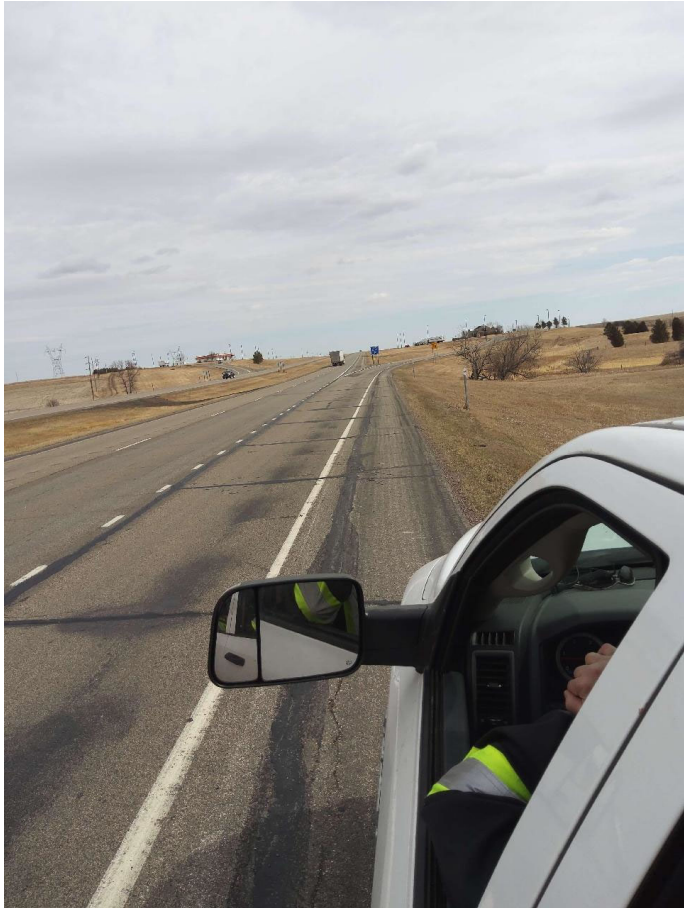
6
164+3076



7
164+5168



8
168+1014 to 168+1460



9

168+1014 to 168+1460

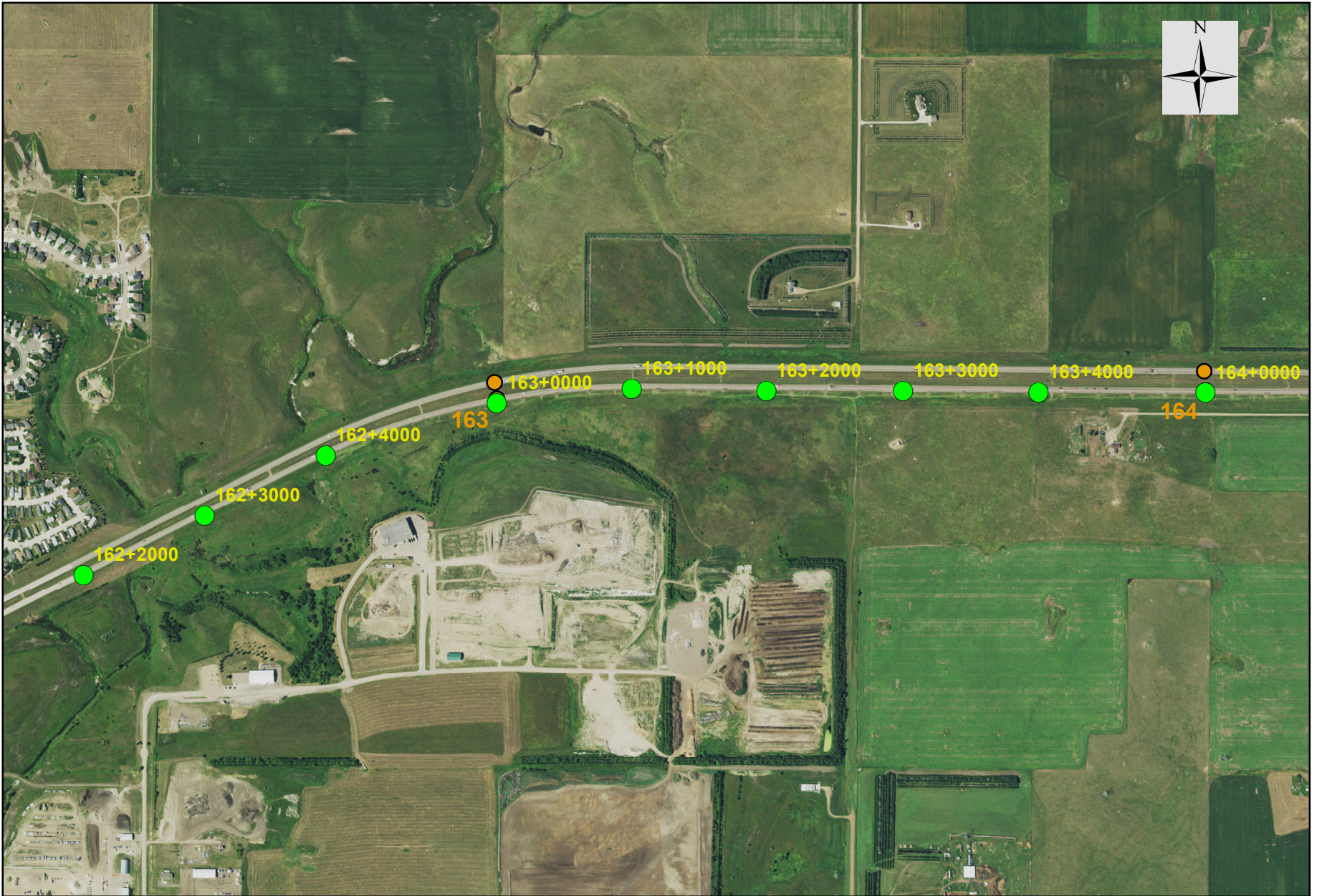


10

168+1014 to 168+1460

APPENDIX C

BORING LOCATIONS

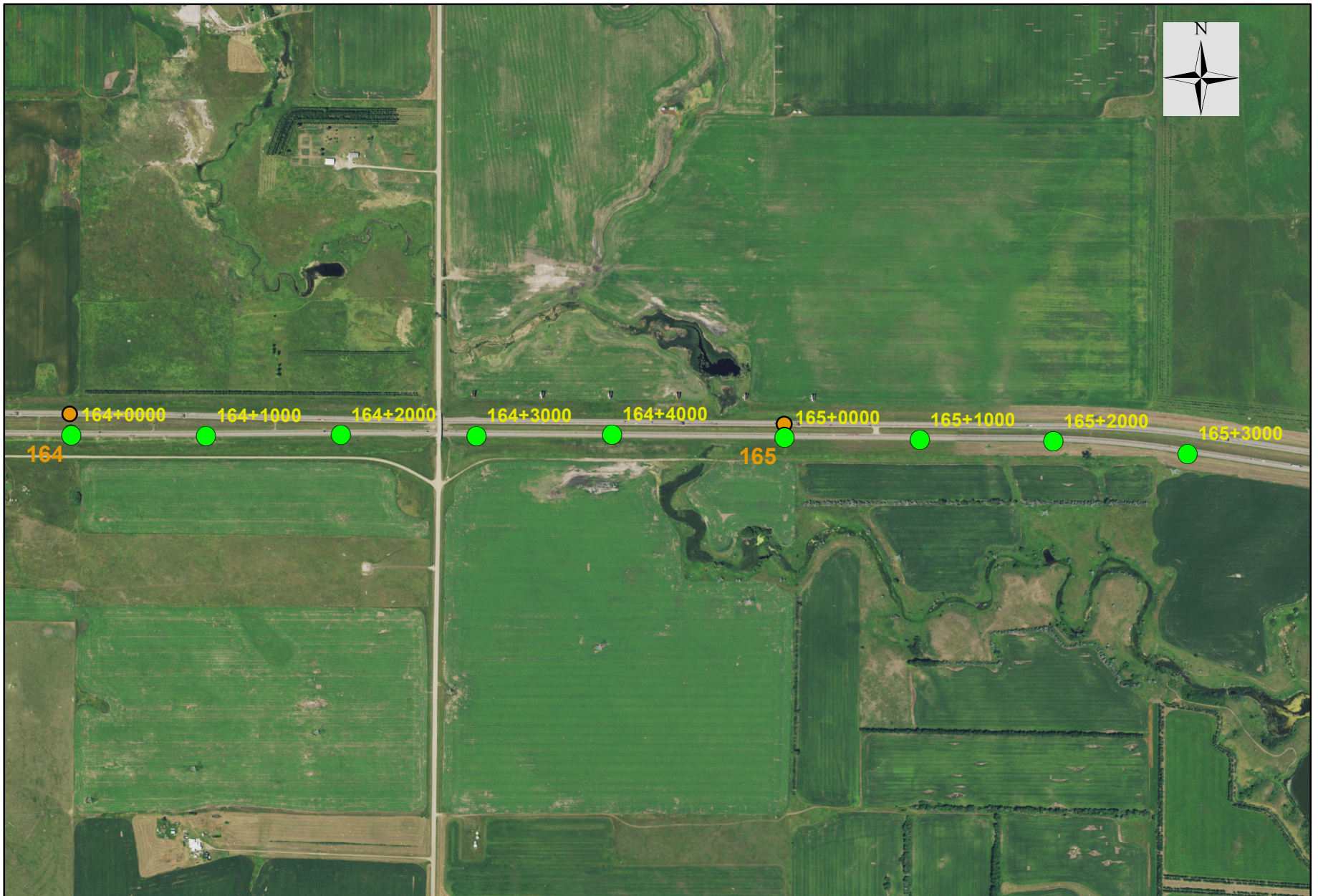


Legend

- Reference Point
- Boring locations

0 1,800 3,600
Feet

Project Number: IM-X-1-094(214)162

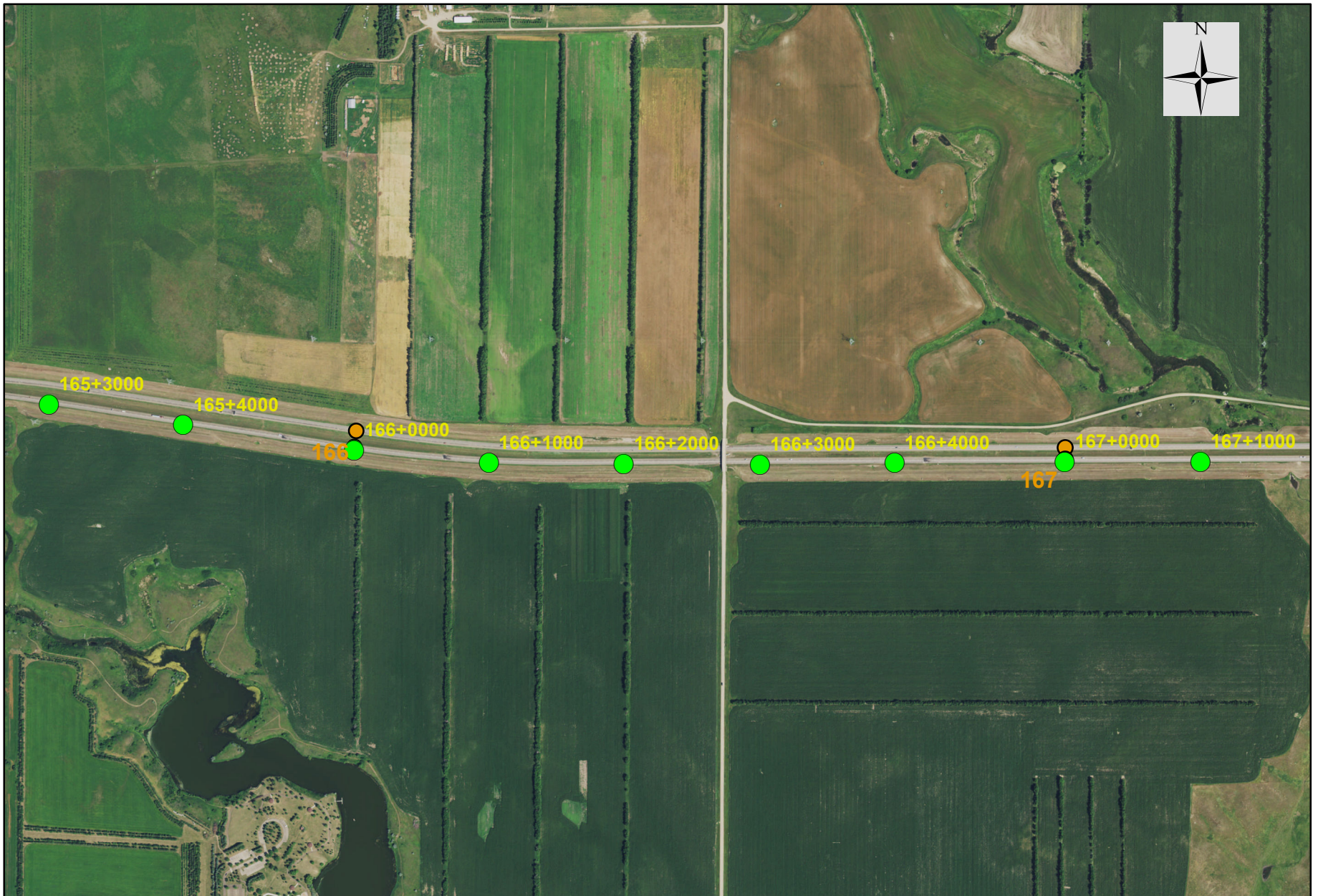


Legend

- Reference Point
- Boring locations

0 1,800 3,600
Feet

Project Number: IM-X-1-094(214)162

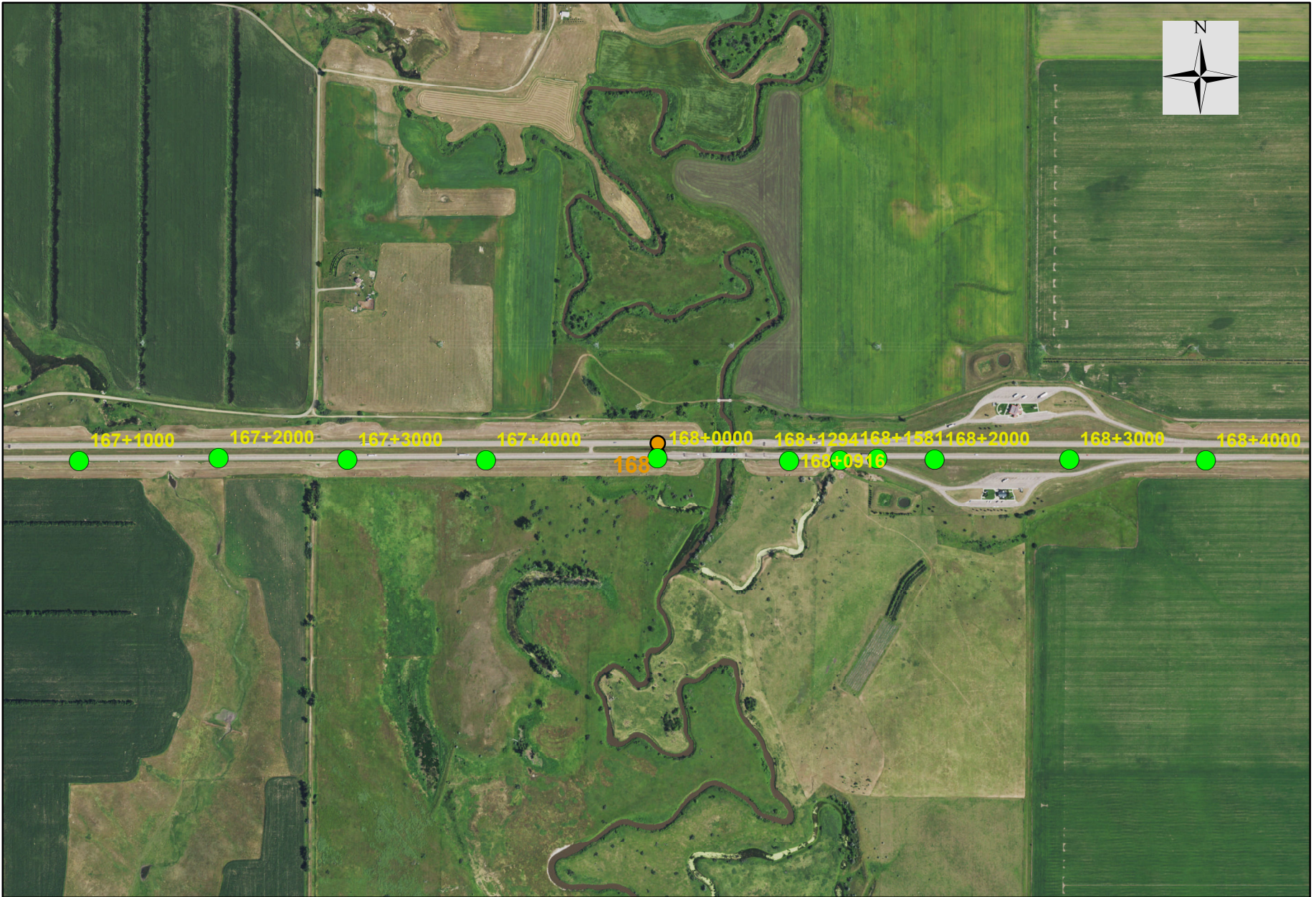


Legend

- Reference Point
- Boring locations



Project Number: IM-X-1-094(214)162

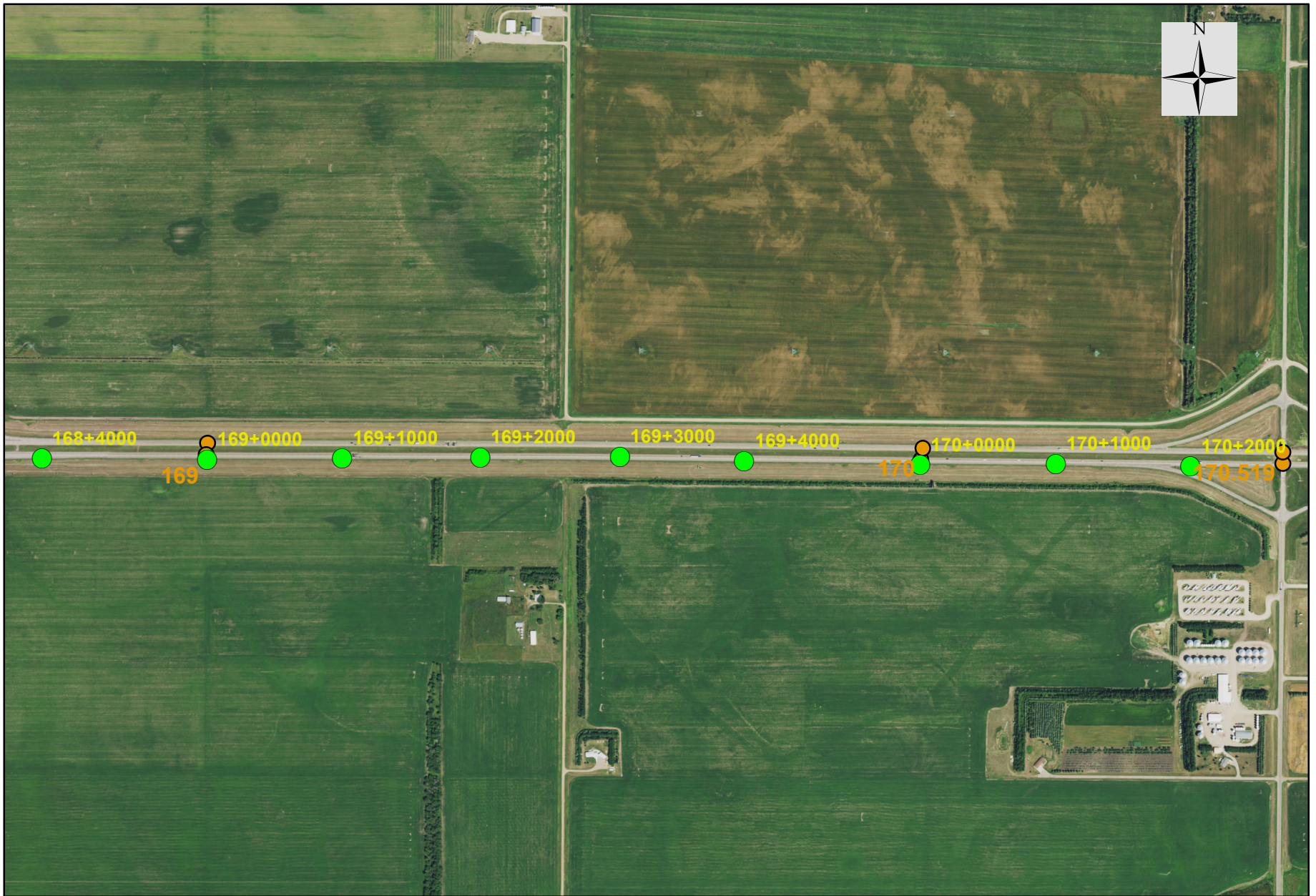


Legend

- Reference Point
- Boring locations

0 1,800 3,600 Feet

Project Number: IM-X-1-094(214)162

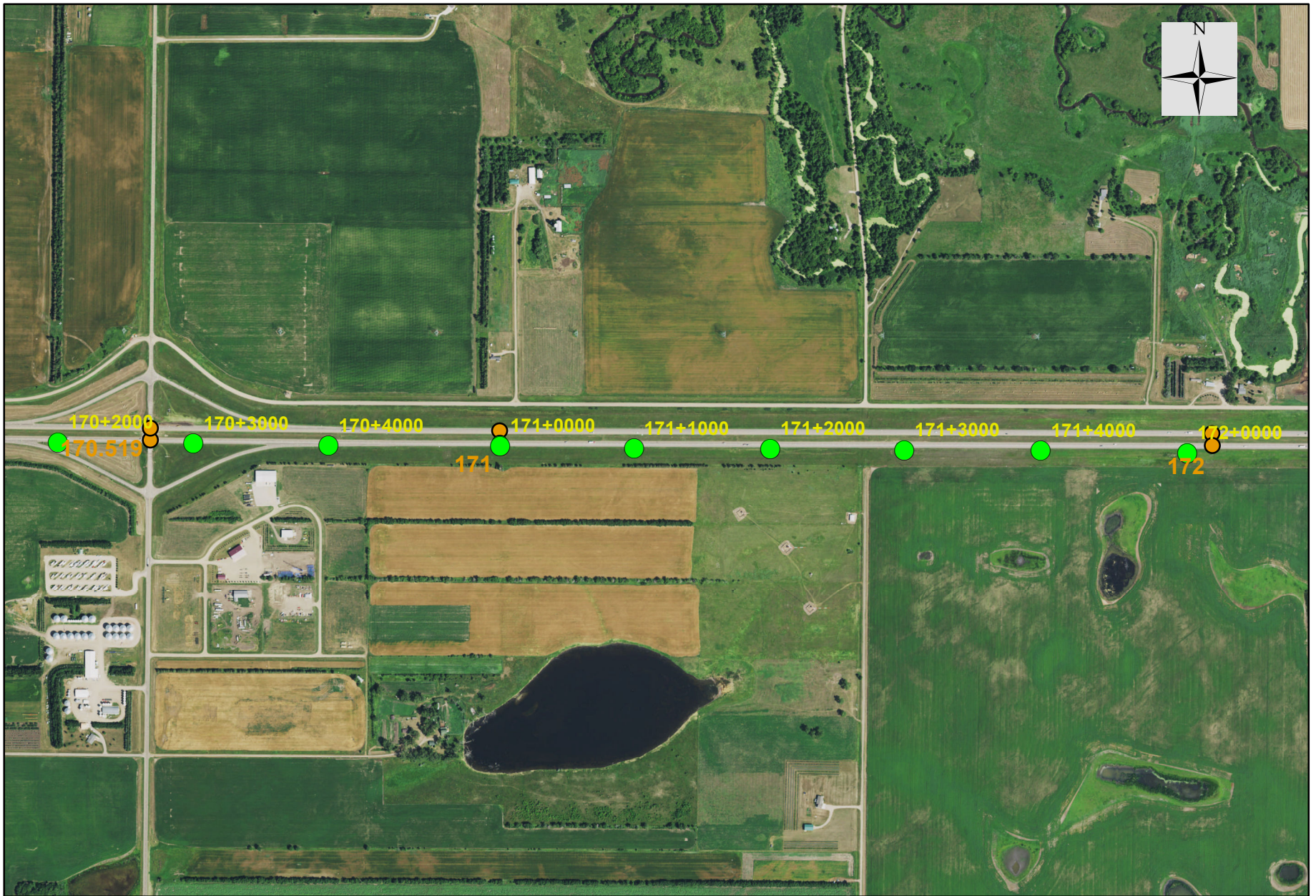


Legend

- Reference Point
- Boring locations

0 1,800 3,600
Feet

Project Number: IM-X-1-094(214)162



Legend

- Reference Point
- Boring locations

0 1,800 3,600 Feet

Project Number: IM-X-1-094(214)162

APPENDIX D

SUMMARY OF SOILS ANALYSIS

NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:39 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

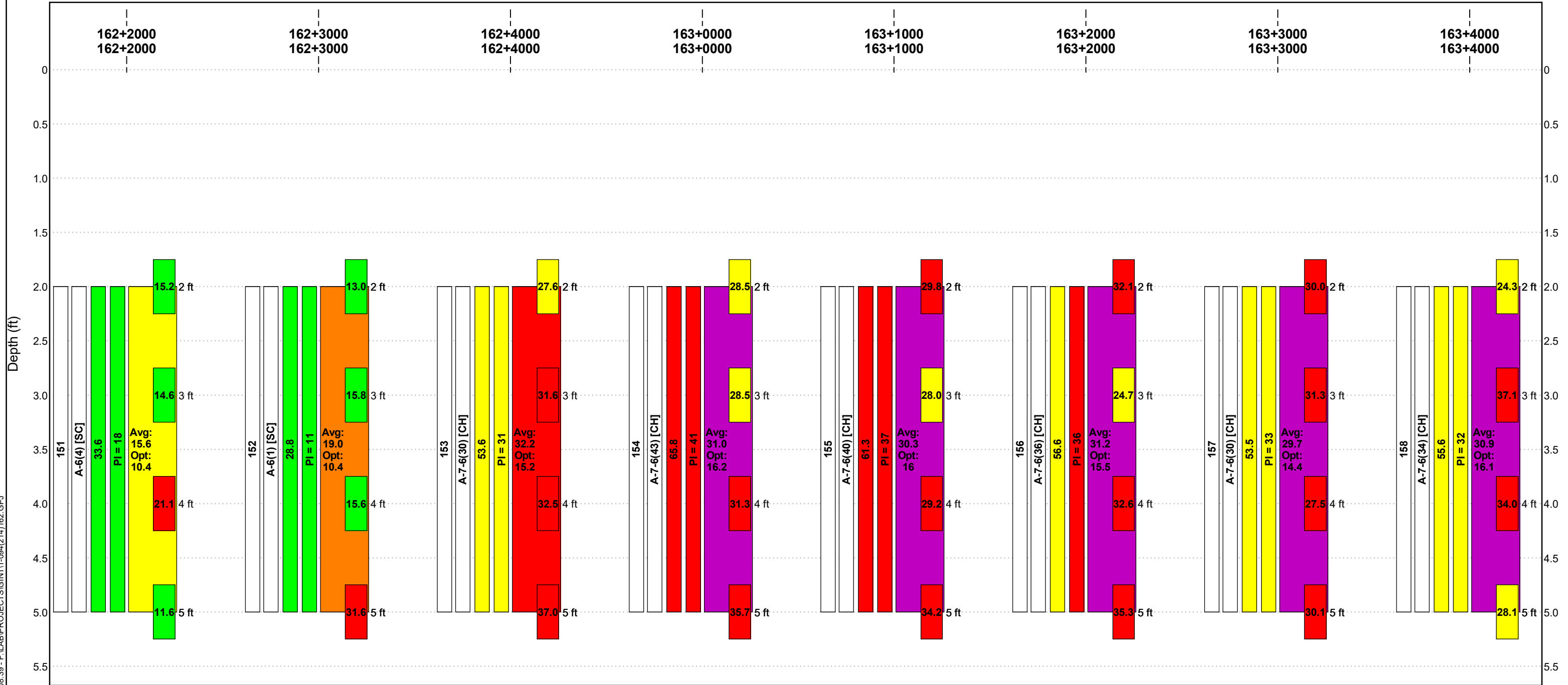


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

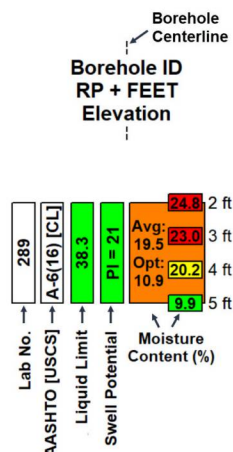
PCN 22957

LOCATION Burleigh County



Boreholes Equally Spaced (0 to 2200 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:40 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

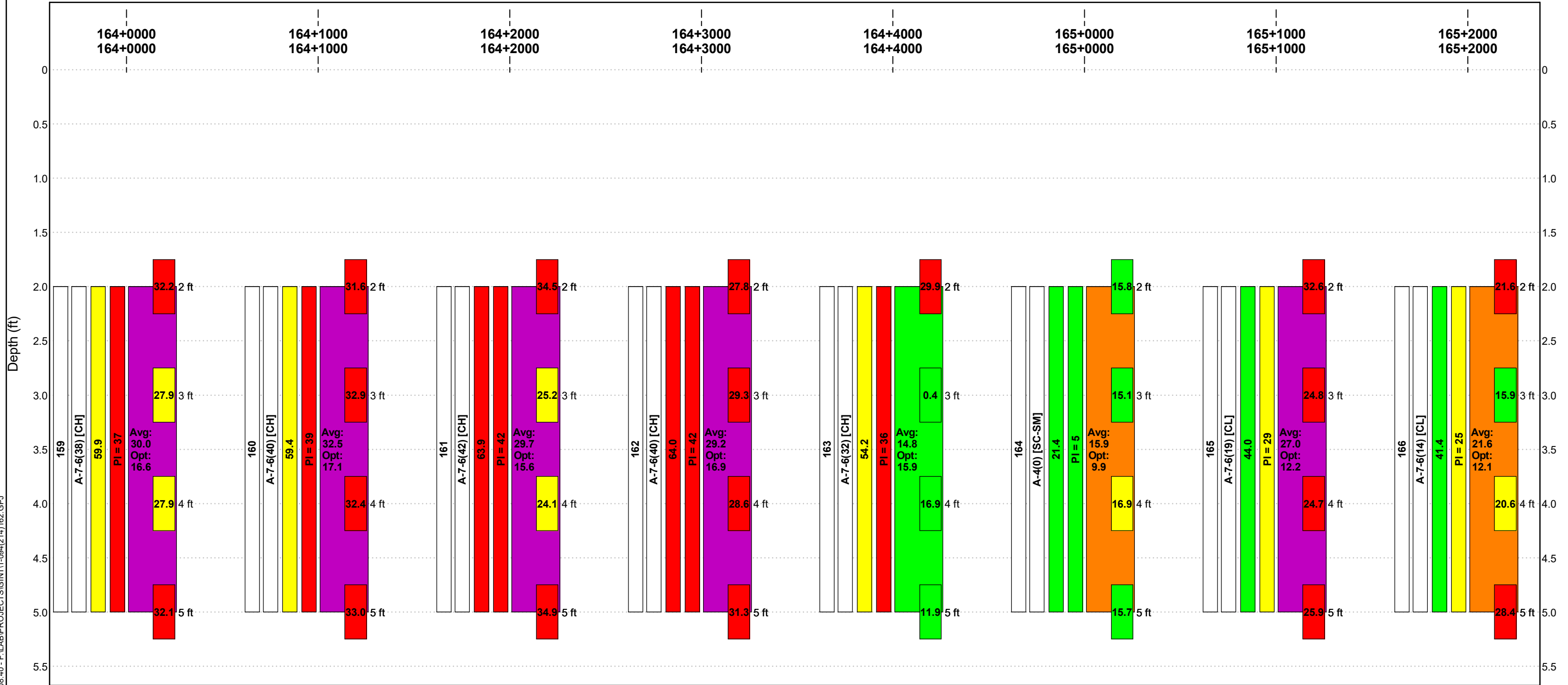


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

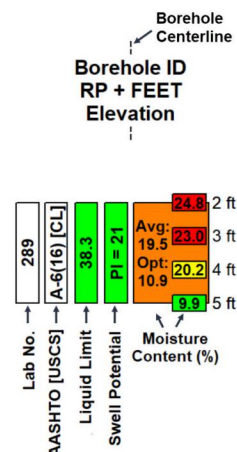
PCN 22957

LOCATION Burleigh County

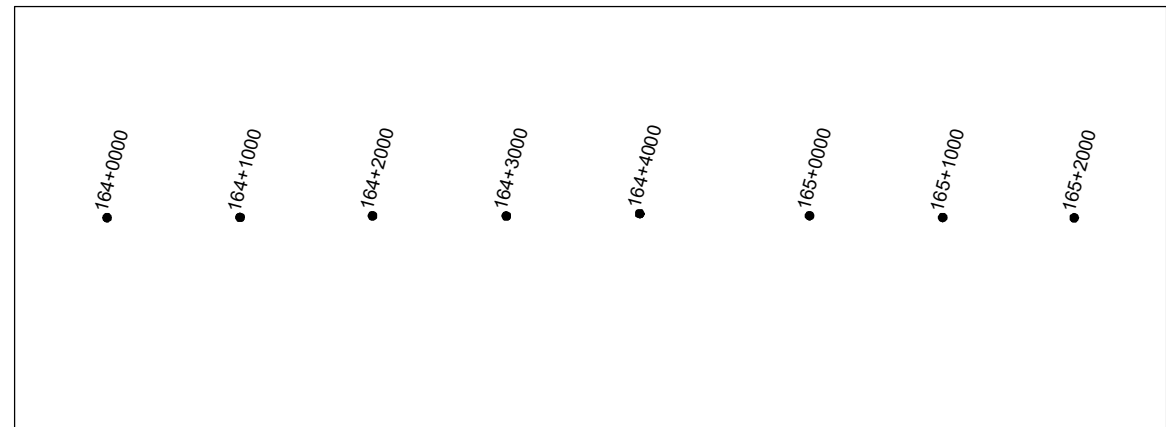


Boreholes Equally Spaced (0 to 2400 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:41 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

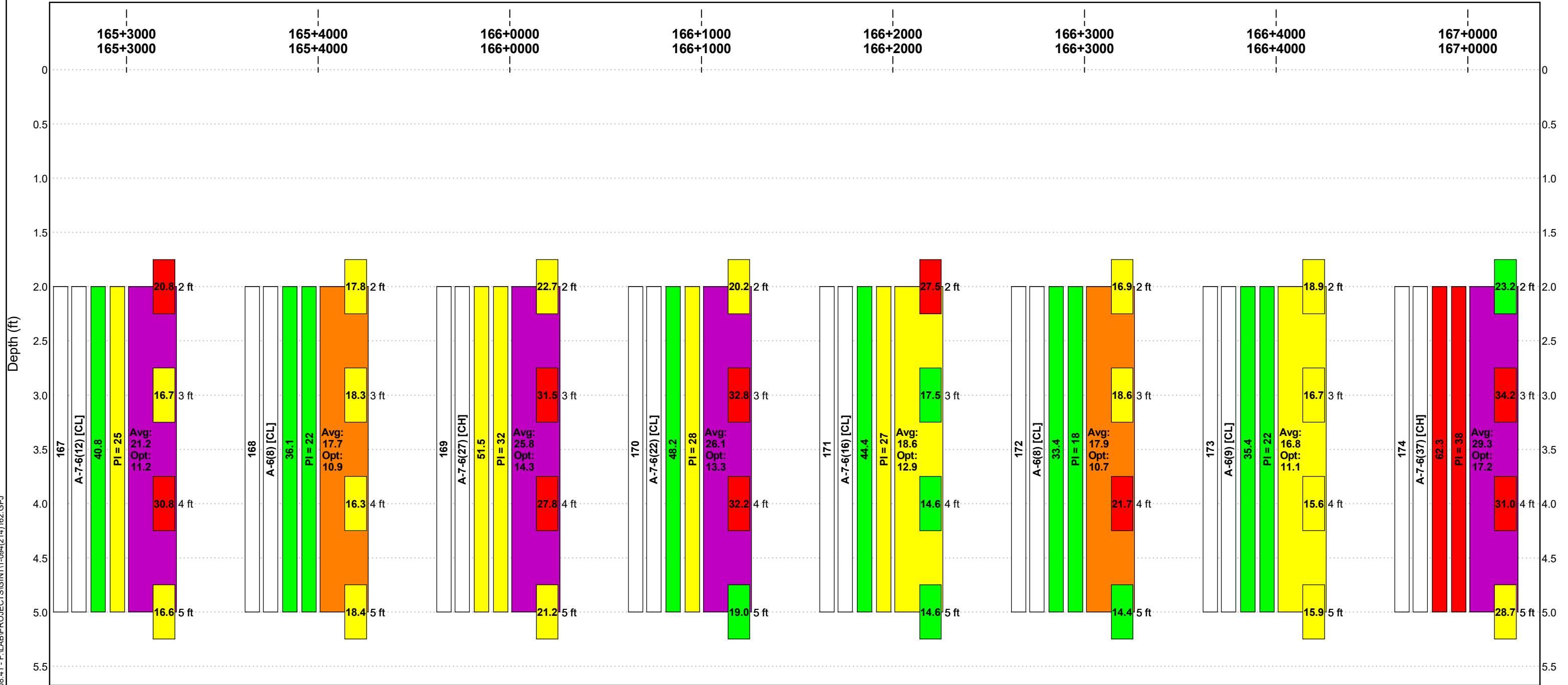


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

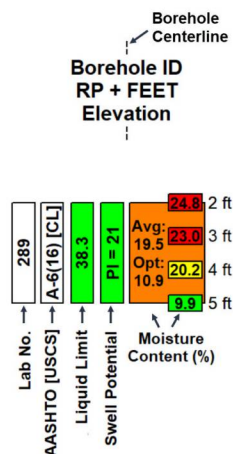
PCN 22957

LOCATION Burleigh County

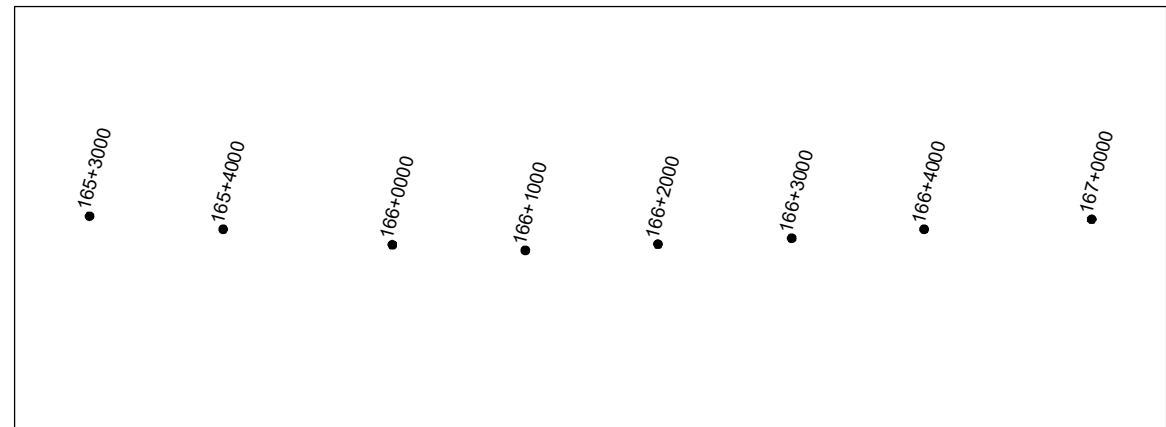


Boreholes Equally Spaced (0 to 2400 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:43 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

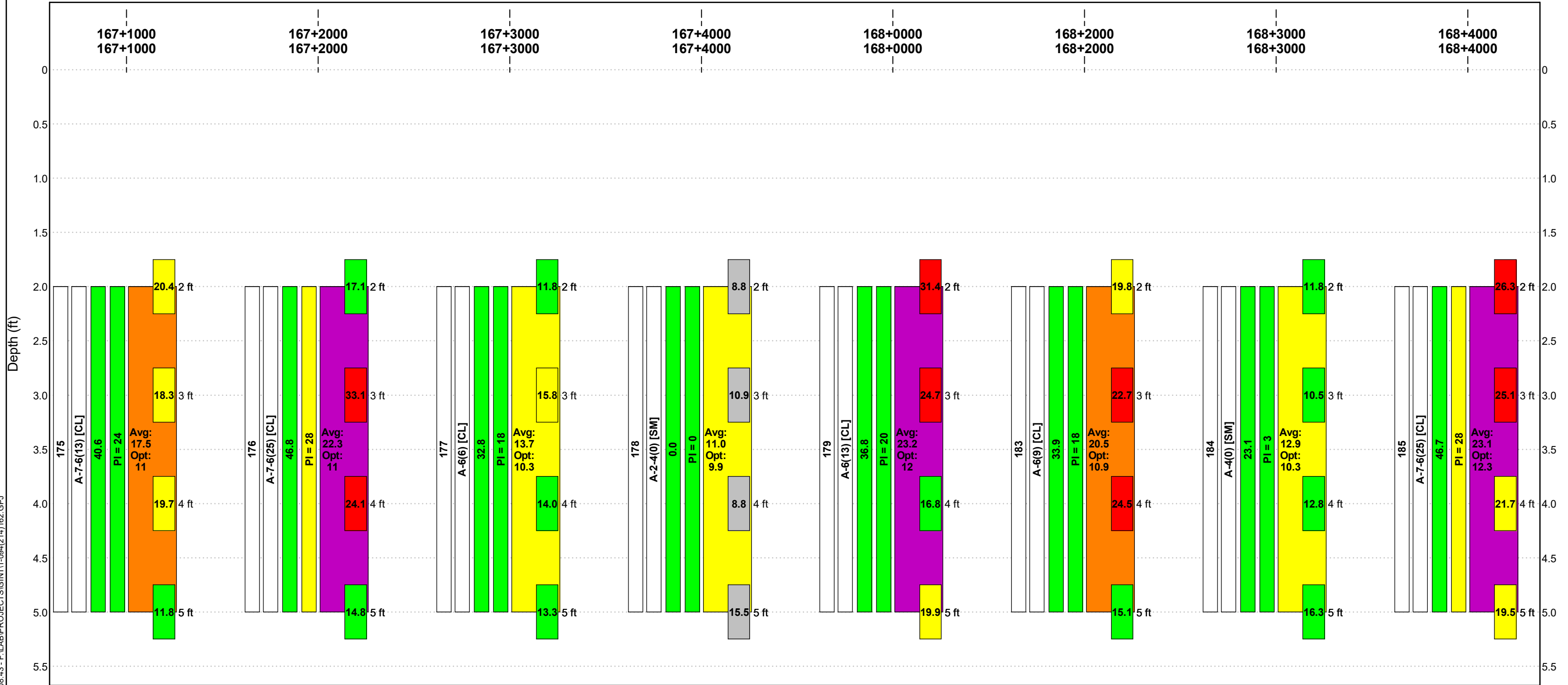


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

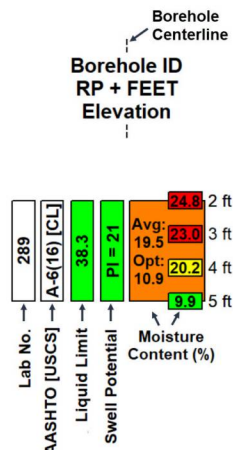
PCN 22957

LOCATION Burleigh County

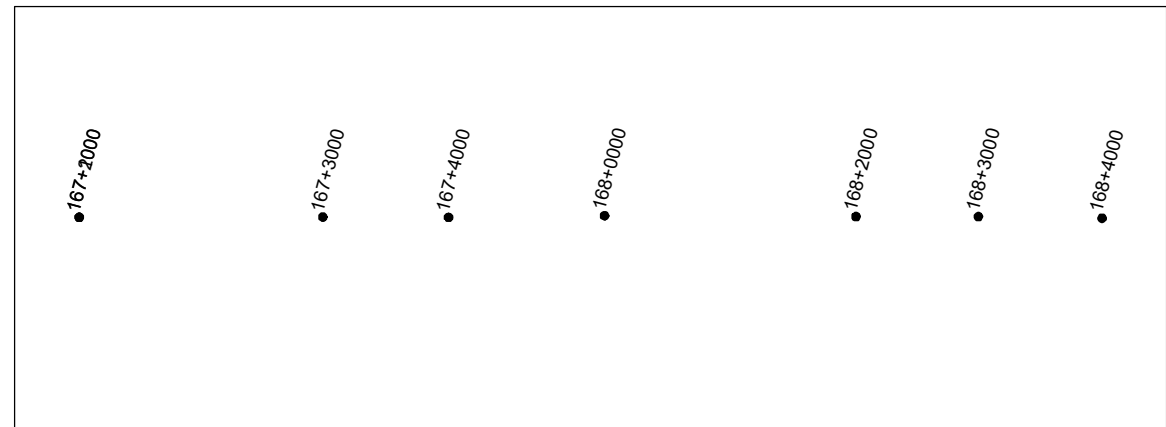


Boreholes Equally Spaced (0 to 2600 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:43 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

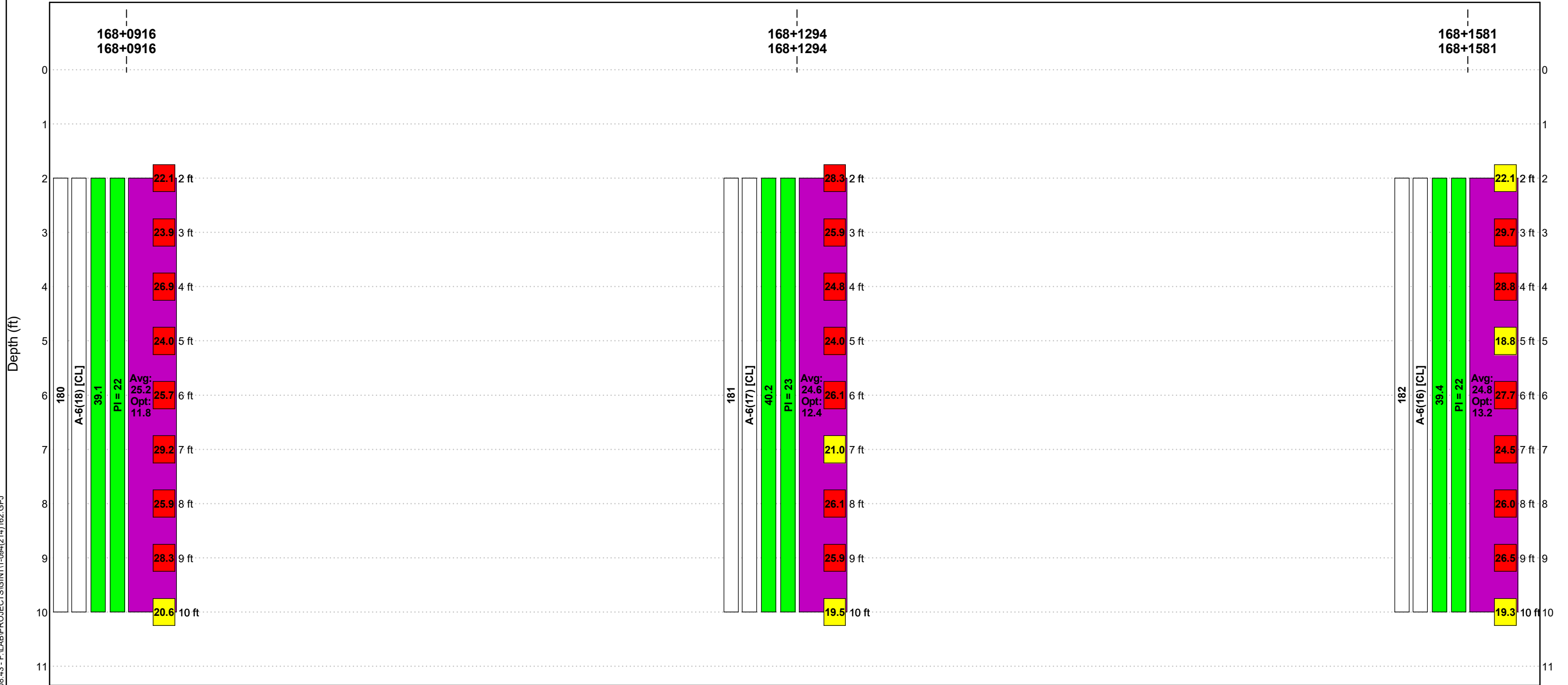


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

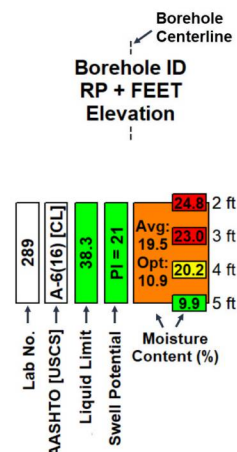
PCN 22957

LOCATION Burleigh County

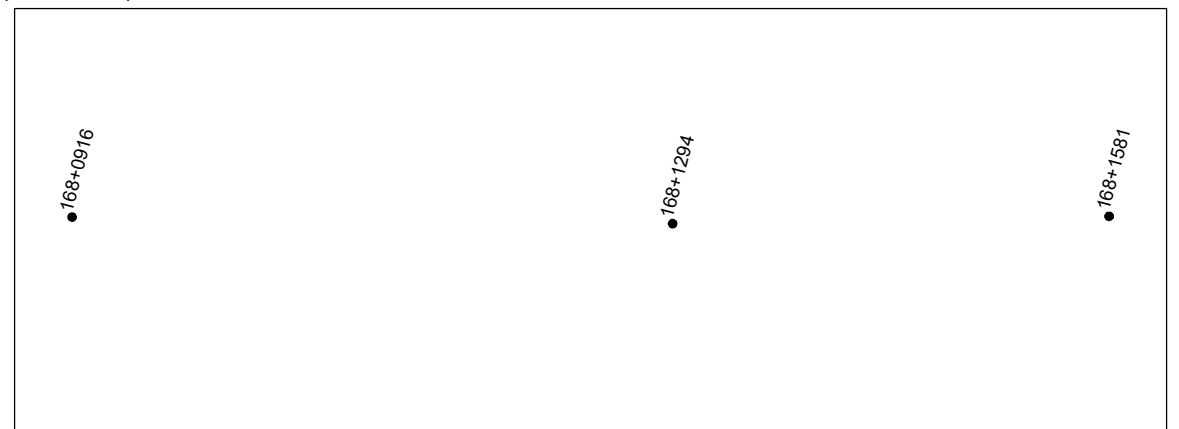


Boreholes Equally Spaced (0 to 200 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:44 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

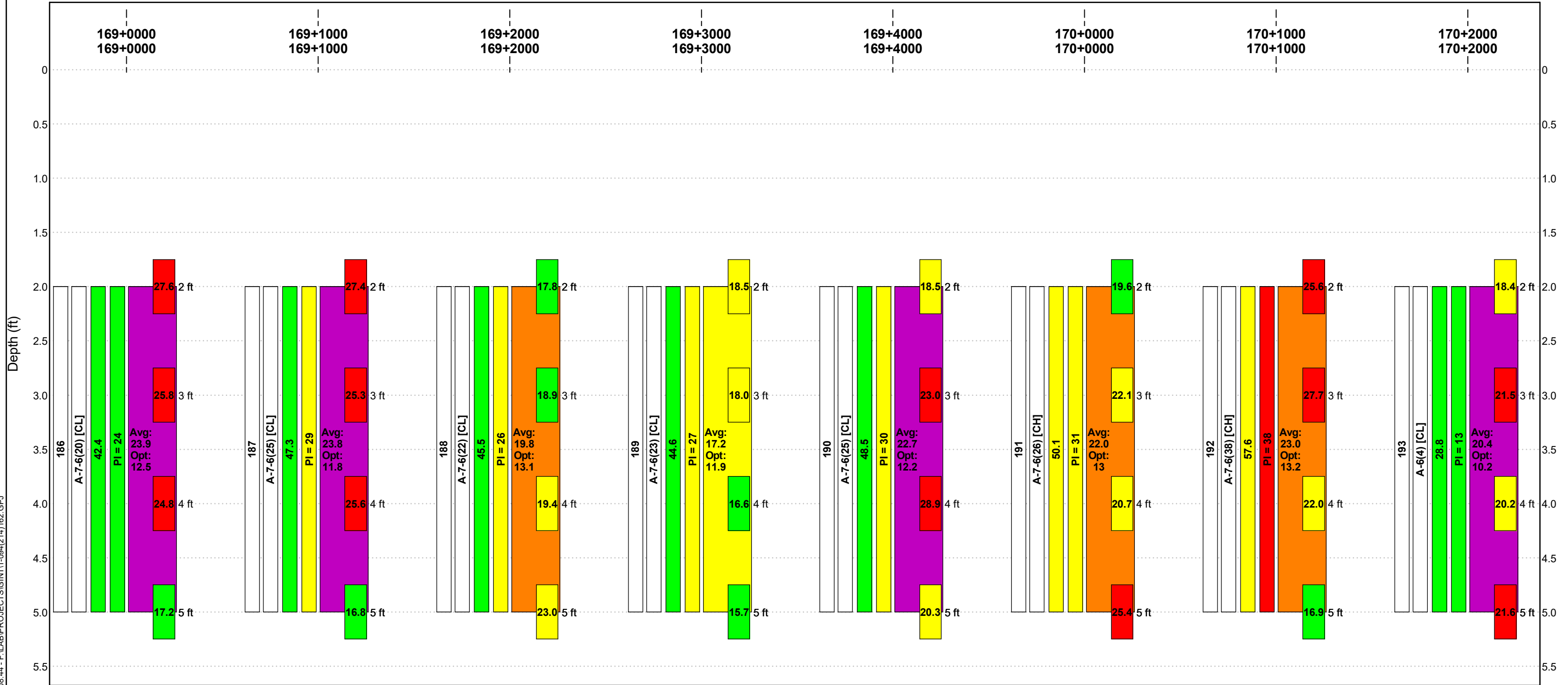


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

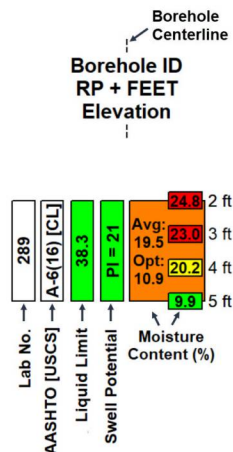
PCN 22957

LOCATION Burleigh County

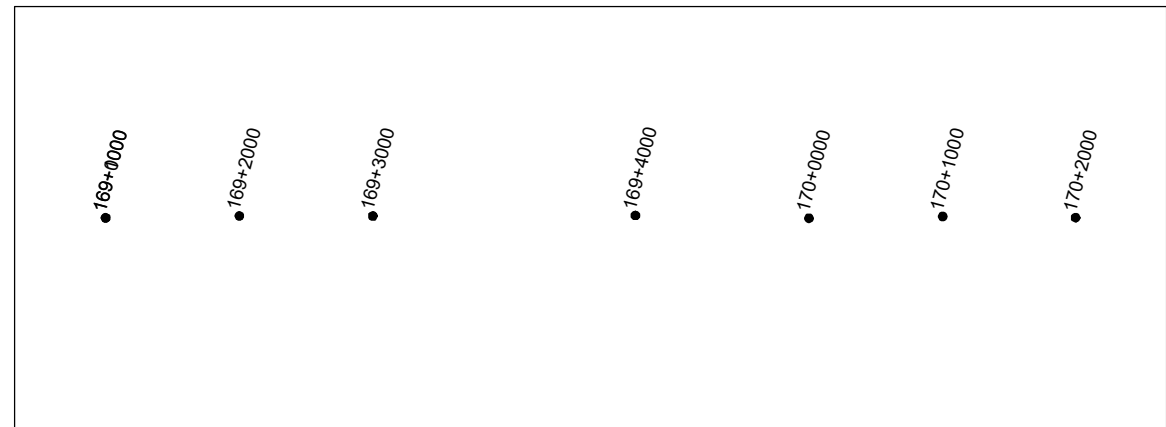


Boreholes Equally Spaced (0 to 2400 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



NDDOT_LINEARCOLORFENCE_DEPTH - 20171219.GDT - 10/12/21 08:45 - F:\LAB\PROJECTS\GINT\1-094(214)162.GPJ

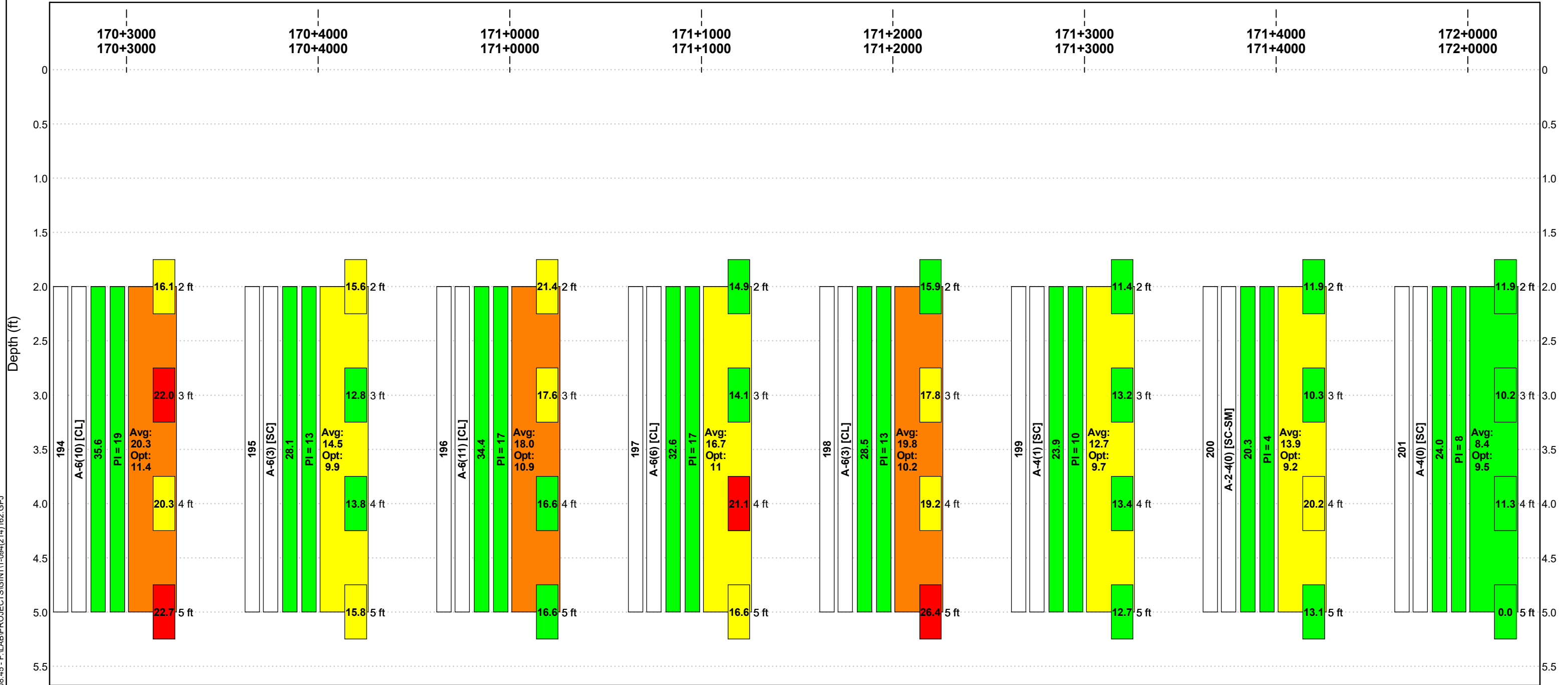


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

PROJECT NUMBER IM-X-1-094(214)162

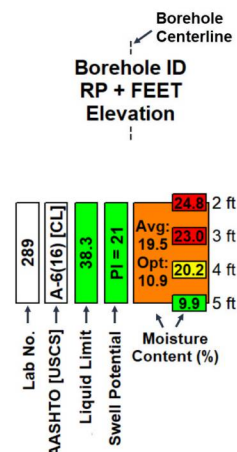
PCN 22957

LOCATION Burleigh County

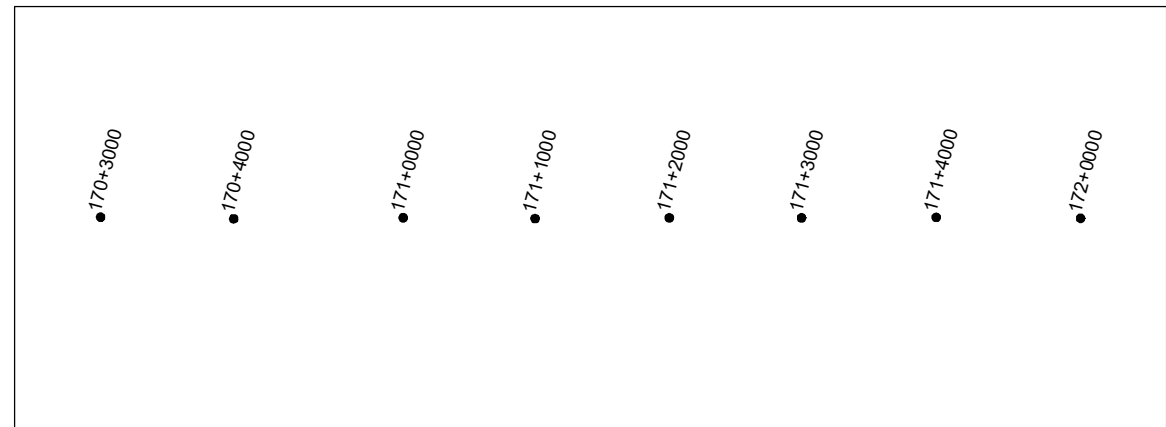


Boreholes Equally Spaced (0 to 2400 ft)

LEGEND



Liquid Limit	LL<50	50<=LL<60	LL>=60		
Swell Potential	Low	Marginal	High		
Moisture Content	Below PL	0-5% Over PL	>5% Over PL	Non-Plastic	
Avg. In-Place Moisture Content	MC < Opt	0<=MC<6% Over Opt	6<=MC<10% Over Opt	10<=MC<16% Over Opt	MC>16% Over Opt



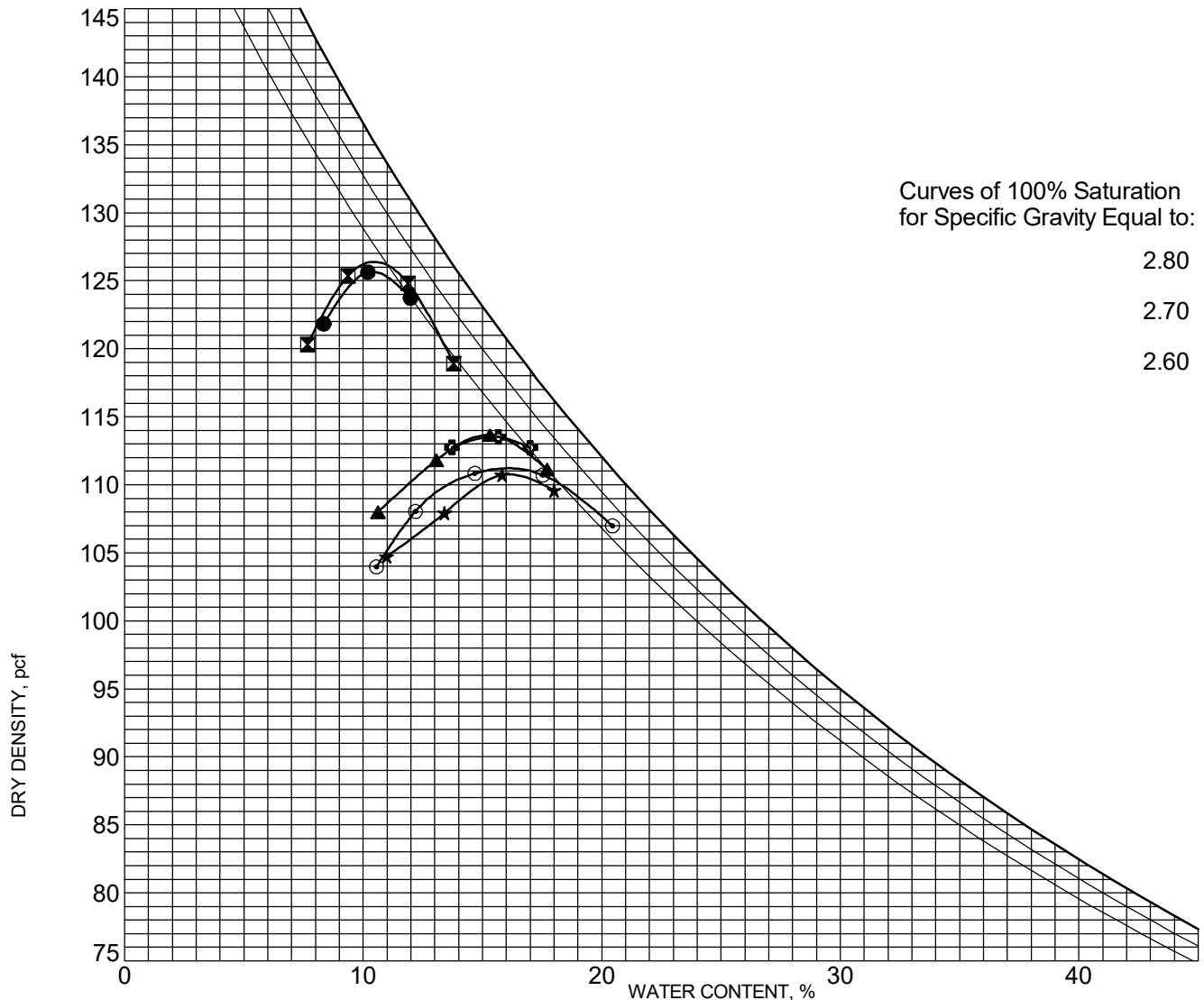
APPENDIX E

LAB RESULTS

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



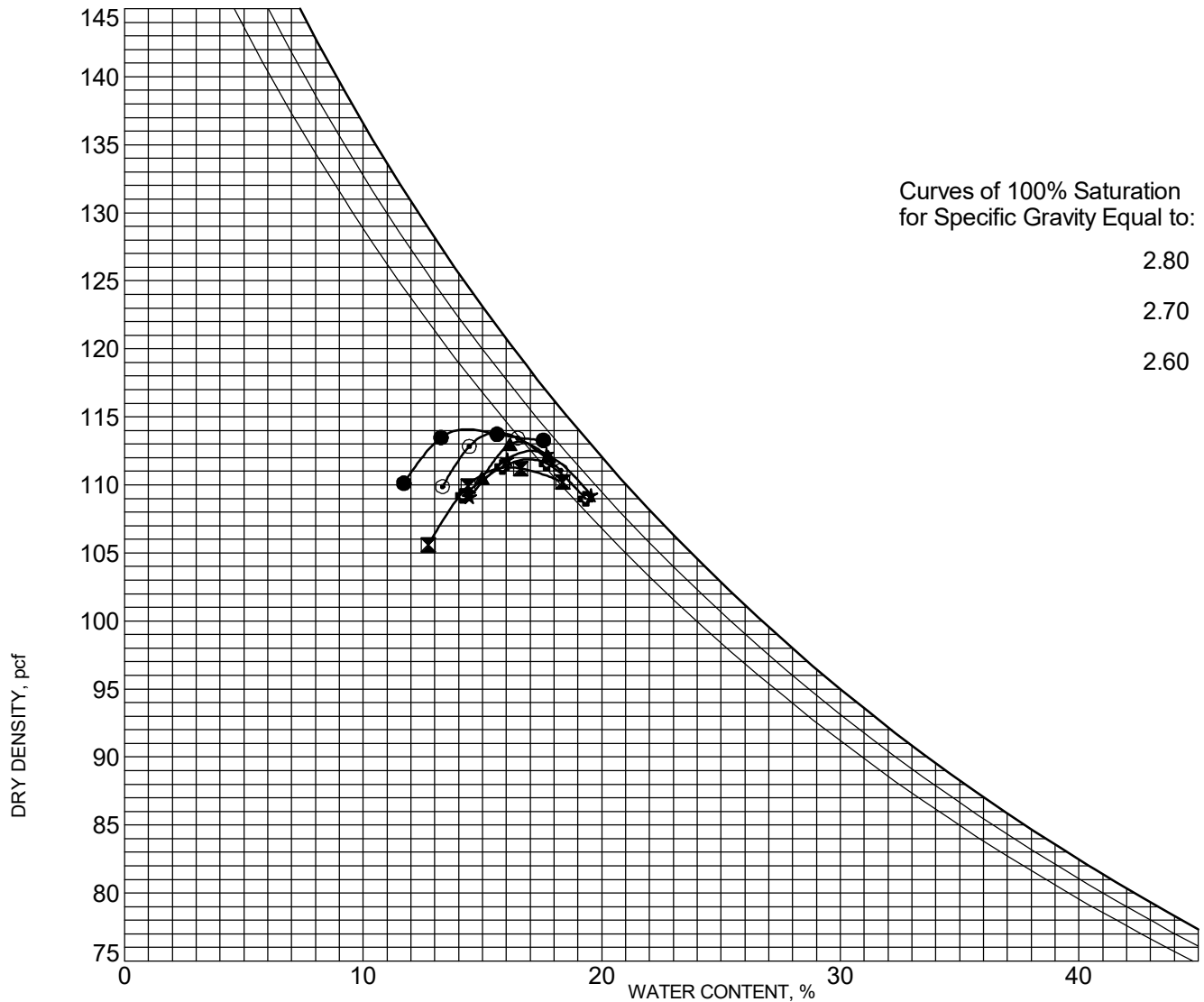
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 162+2000	2.0	A-6 (4)	CLAYEY SAND(SC)
⊠ 162+3000	2.0	A-6 (1)	CLAYEY SAND(SC)
▲ 162+4000	2.0	A-7-6 (30)	FAT CLAY(CH)
★ 163+0000	2.0	A-7-6 (43)	FAT CLAY(CH)
⊙ 163+1000	2.0	A-7-6 (40)	FAT CLAY(CH)
⊕ 163+2000	2.0	A-7-6 (36)	FAT CLAY(CH)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 162+2000	2.0	AASHTO T-180 Method A	34	16	18	125.7 PCF	10.4 %
⊠ 162+3000	2.0	AASHTO T-180 Method A	29	18	11	126.4 PCF	10.4 %
▲ 162+4000	2.0	AASHTO T-180 Method A	54	23	31	113.7 PCF	15.2 %
★ 163+0000	2.0	AASHTO T-180 Method A	66	25	41	110.8 PCF	16.2 %
⊙ 163+1000	2.0	AASHTO T-180 Method A	61	24	37	111.2 PCF	16.0 %
⊕ 163+2000	2.0	AASHTO T-180 Method A	57	20	37	113.5 PCF	15.5 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



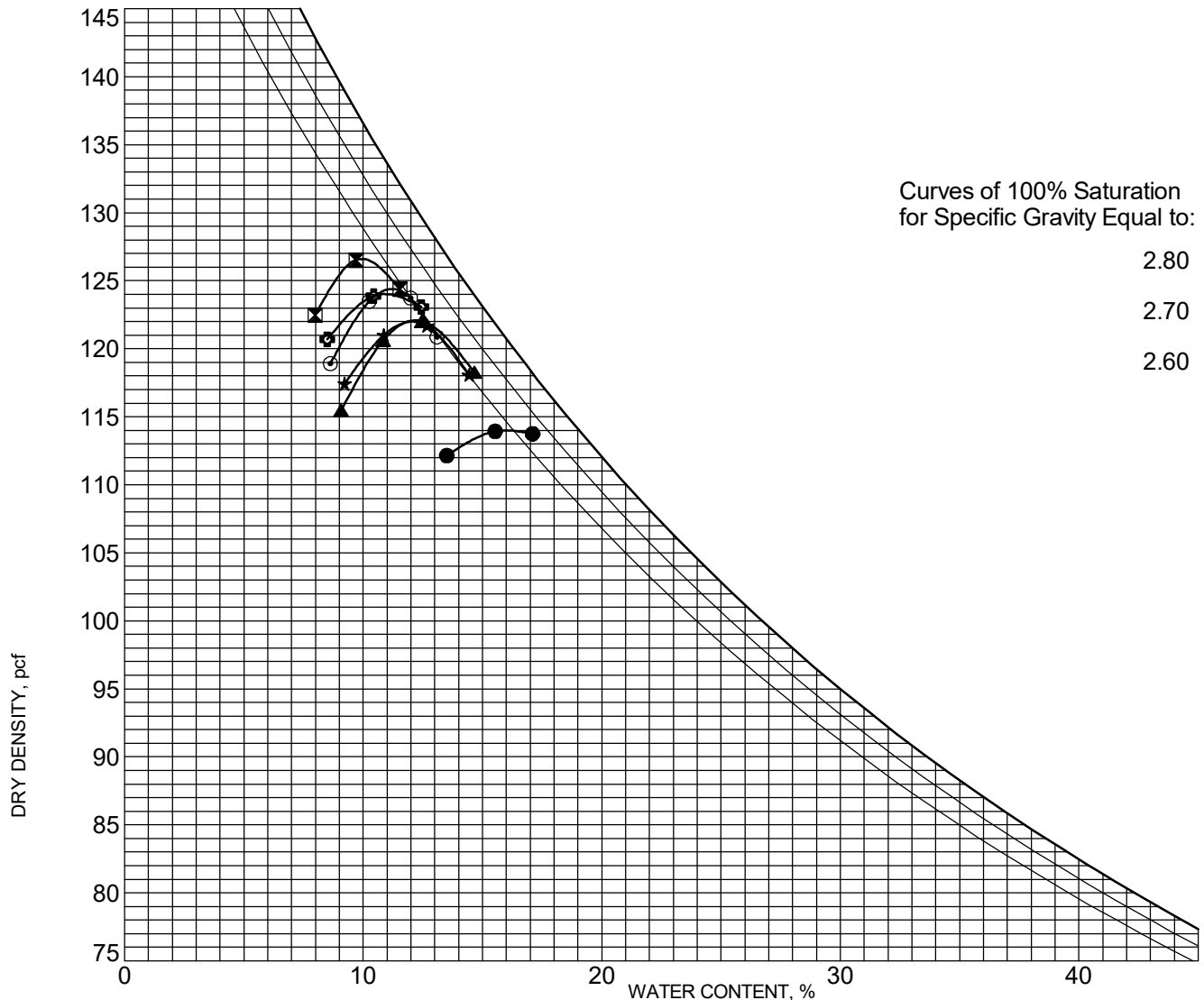
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 163+3000	2.0	A-7-6 (30)	FAT CLAY(CH)
⊠ 163+4000	2.0	A-7-6 (34)	FAT CLAY(CH)
▲ 164+0000	2.0	A-7-6 (38)	FAT CLAY(CH)
★ 164+1000	2.0	A-7-6 (40)	FAT CLAY(CH)
⊙ 164+2000	2.0	A-7-6 (42)	FAT CLAY(CH)
⊕ 164+3000	2.0	A-7-6 (40)	FAT CLAY(CH)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 163+3000	2.0	AASHTO T-180 Method A	53	21	32	114.1 PCF	14.4 %
⊠ 163+4000	2.0	AASHTO T-180 Method A	56	24	32	111.3 PCF	16.1 %
▲ 164+0000	2.0	AASHTO T-180 Method A	60	23	37	113.2 PCF	16.6 %
★ 164+1000	2.0	AASHTO T-180 Method A	59	20	39	112.5 PCF	17.1 %
⊙ 164+2000	2.0	AASHTO T-180 Method A	64	22	42	113.9 PCF	15.6 %
⊕ 164+3000	2.0	AASHTO T-180 Method A	64	22	42	111.9 PCF	16.9 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



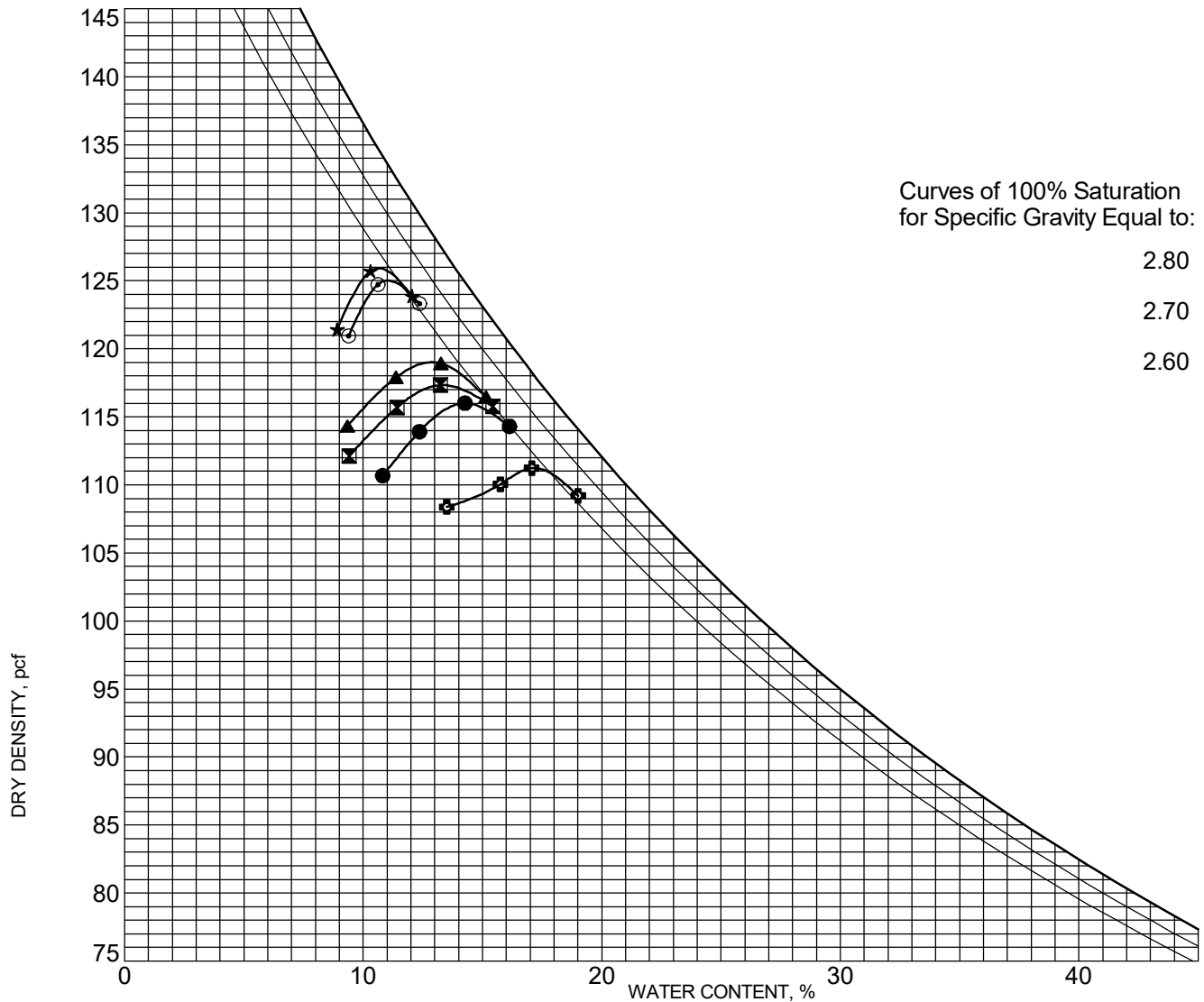
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 164+4000	2.0	A-7-6 (32)	FAT CLAY(CH)
⊠ 165+0000	2.0	A-4 (0)	SILTY, CLAYEY SAND(SC-SM)
▲ 165+1000	2.0	A-7-6 (19)	LEAN CLAY with SAND(CL)
★ 165+2000	2.0	A-7-6 (14)	SANDY LEAN CLAY(CL)
⊙ 165+3000	2.0	A-7-6 (12)	SANDY LEAN CLAY(CL)
⊕ 165+4000	2.0	A-6 (8)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 164+4000	2.0	AASHTO T-180 Method A	54	18	36	114.0 PCF	15.9 %
⊠ 165+0000	2.0	AASHTO T-180 Method A	21	16	5	126.6 PCF	9.9 %
▲ 165+1000	2.0	AASHTO T-180 Method A	44	15	29	122.1 PCF	12.2 %
★ 165+2000	2.0	AASHTO T-180 Method A	41	16	25	122.0 PCF	12.1 %
⊙ 165+3000	2.0	AASHTO T-180 Method A	41	15	26	124.4 PCF	11.2 %
⊕ 165+4000	2.0	AASHTO T-180 Method A	36	14	22	124.0 PCF	10.9 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



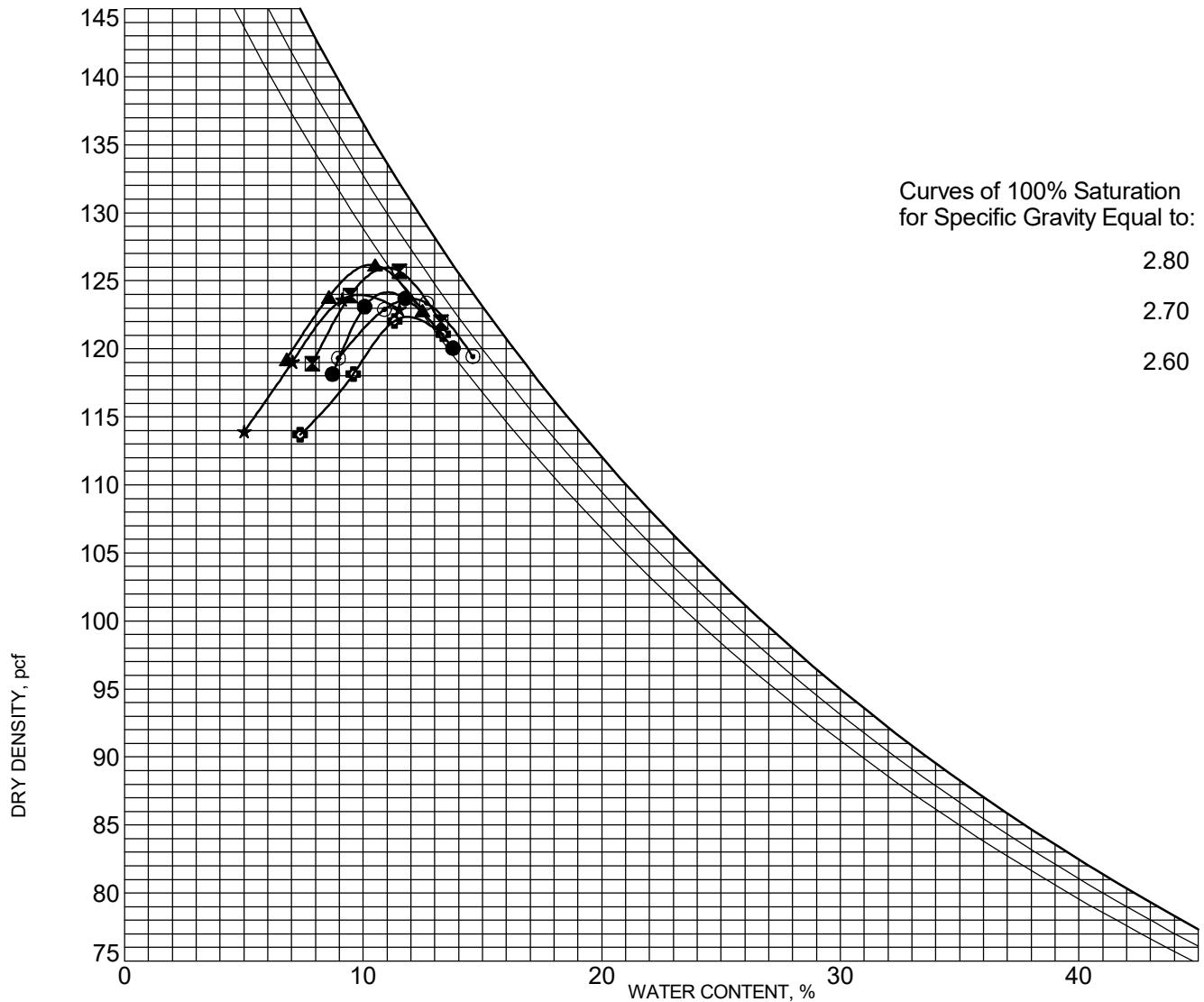
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 166+0000	2.0	A-7-6 (27)	FAT CLAY with SAND(CH)
⊠ 166+1000	2.0	A-7-6 (22)	LEAN CLAY with SAND(CL)
▲ 166+2000	2.0	A-7-6 (16)	SANDY LEAN CLAY(CL)
★ 166+3000	2.0	A-6 (8)	SANDY LEAN CLAY(CL)
⊙ 166+4000	2.0	A-6 (9)	SANDY LEAN CLAY(CL)
⊕ 167+0000	2.0	A-7-6 (37)	FAT CLAY(CH)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 166+0000	2.0	AASHTO T-180 Method A	51	19	32	116.0 PCF	14.3 %
⊠ 166+1000	2.0	AASHTO T-180 Method A	48	20	28	117.3 PCF	13.3 %
▲ 166+2000	2.0	AASHTO T-180 Method A	44	18	26	119.0 PCF	12.9 %
★ 166+3000	2.0	AASHTO T-180 Method A	33	15	18	125.9 PCF	10.7 %
⊙ 166+4000	2.0	AASHTO T-180 Method A	35	14	21	125.0 PCF	11.1 %
⊕ 167+0000	2.0	AASHTO T-180 Method A	62	24	38	111.2 PCF	17.2 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



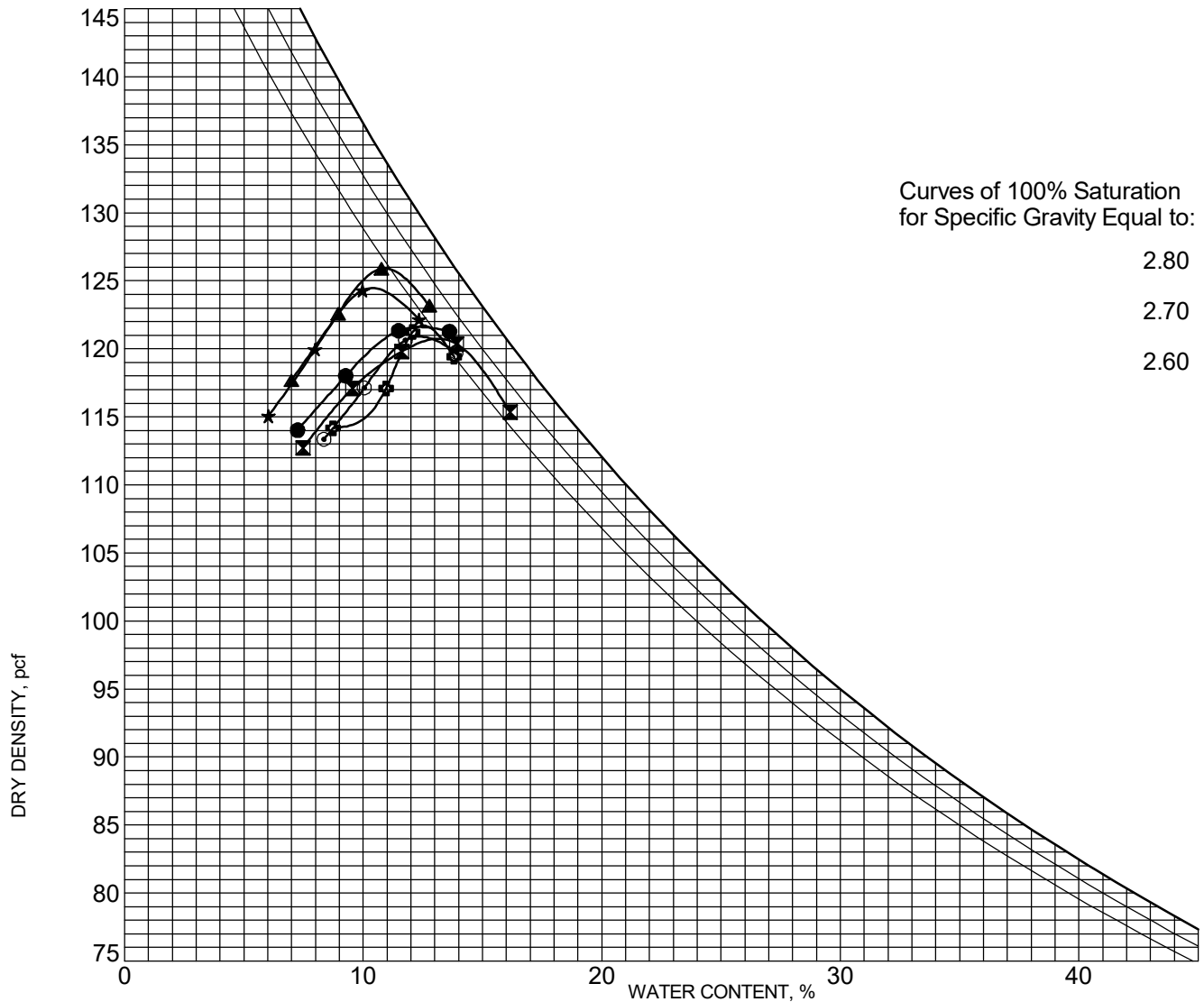
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 167+1000	2.0	A-7-6 (13)	SANDY LEAN CLAY(CL)
⊠ 167+2000	2.0	A-7-6 (25)	LEAN CLAY(CL)
▲ 167+3000	2.0	A-6 (6)	SANDY LEAN CLAY(CL)
★ 167+4000	2.0	A-2-4 (0)	SILTY SAND(SM)
⊙ 168+0000	2.0	A-6 (13)	LEAN CLAY with SAND(CL)
⊕ 168+0916	2.0	A-6 (18)	LEAN CLAY with SAND(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 167+1000	2.0	AASHTO T-180 Method A	41	17	24	124.2 PCF	11.0 %
⊠ 167+2000	2.0	AASHTO T-180 Method A	47	19	28	125.9 PCF	11.0 %
▲ 167+3000	2.0	AASHTO T-180 Method A	33	15	18	126.2 PCF	10.3 %
★ 167+4000	2.0	AASHTO T-180 Method A	NP	NP	NP	124.0 PCF	9.9 %
⊙ 168+0000	2.0	AASHTO T-180 Method A	37	17	20	123.7 PCF	12.0 %
⊕ 168+0916	2.0	AASHTO T-180 Method A	39	17	22	122.3 PCF	11.8 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



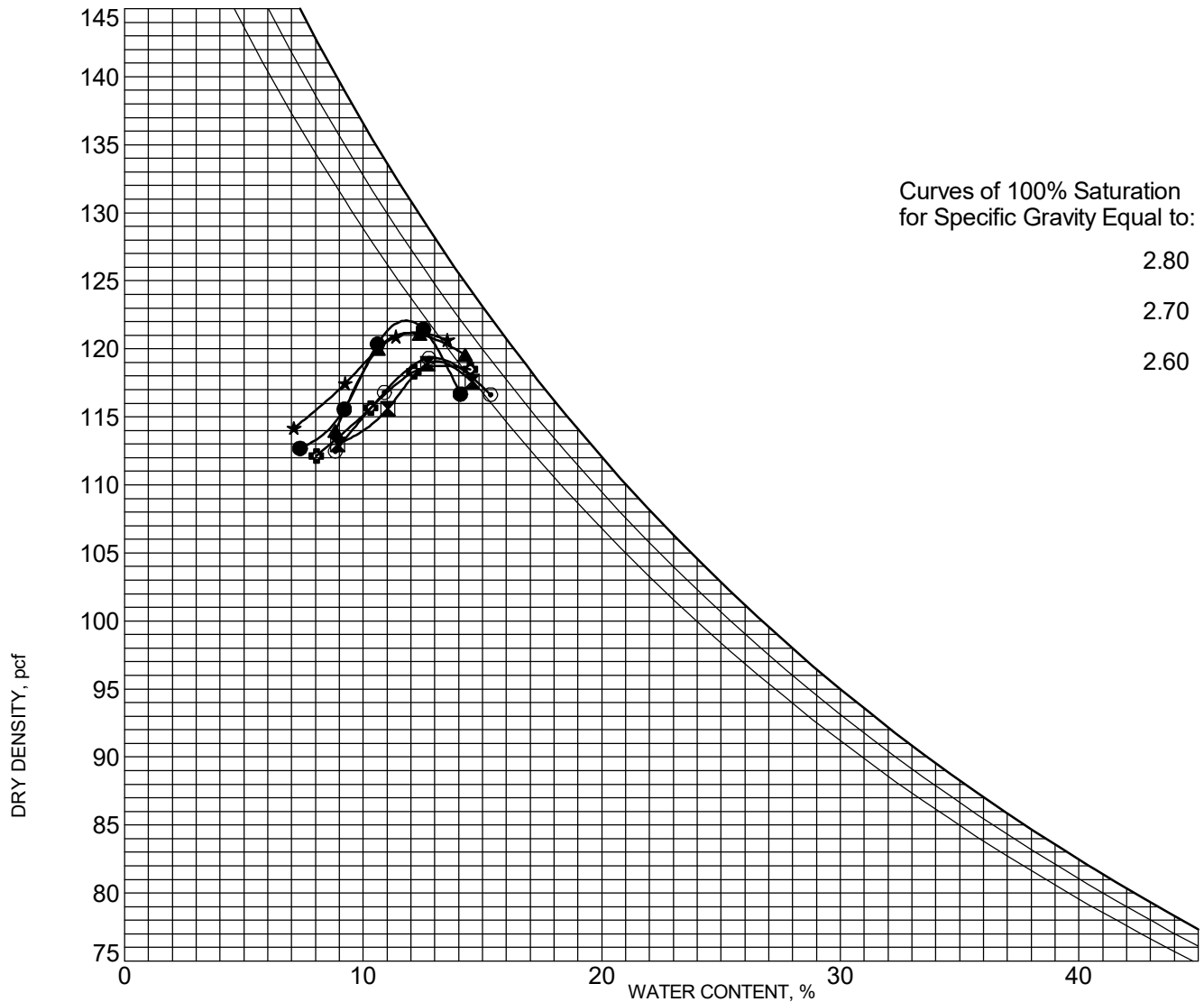
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 168+1294	2.0	A-6 (17)	LEAN CLAY with SAND(CL)
⊠ 168+1581	2.0	A-6 (16)	LEAN CLAY with SAND(CL)
▲ 168+2000	2.0	A-6 (9)	SANDY LEAN CLAY(CL)
★ 168+3000	2.0	A-4 (0)	SILTY SAND(SM)
⊙ 168+4000	2.0	A-7-6 (25)	LEAN CLAY(CL)
⊕ 169+0000	2.0	A-7-6 (20)	LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 168+1294	2.0	AASHTO T-180 Method A	40	17	23	121.6 PCF	12.4 %
⊠ 168+1581	2.0	AASHTO T-180 Method A	39	18	21	120.7 PCF	13.2 %
▲ 168+2000	2.0	AASHTO T-180 Method A	34	16	18	125.9 PCF	10.9 %
★ 168+3000	2.0	AASHTO T-180 Method A	23	21	2	124.5 PCF	10.3 %
⊙ 168+4000	2.0	AASHTO T-180 Method A	47	19	28	120.9 PCF	12.3 %
⊕ 169+0000	2.0	AASHTO T-180 Method A	42	19	23	121.7 PCF	12.5 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



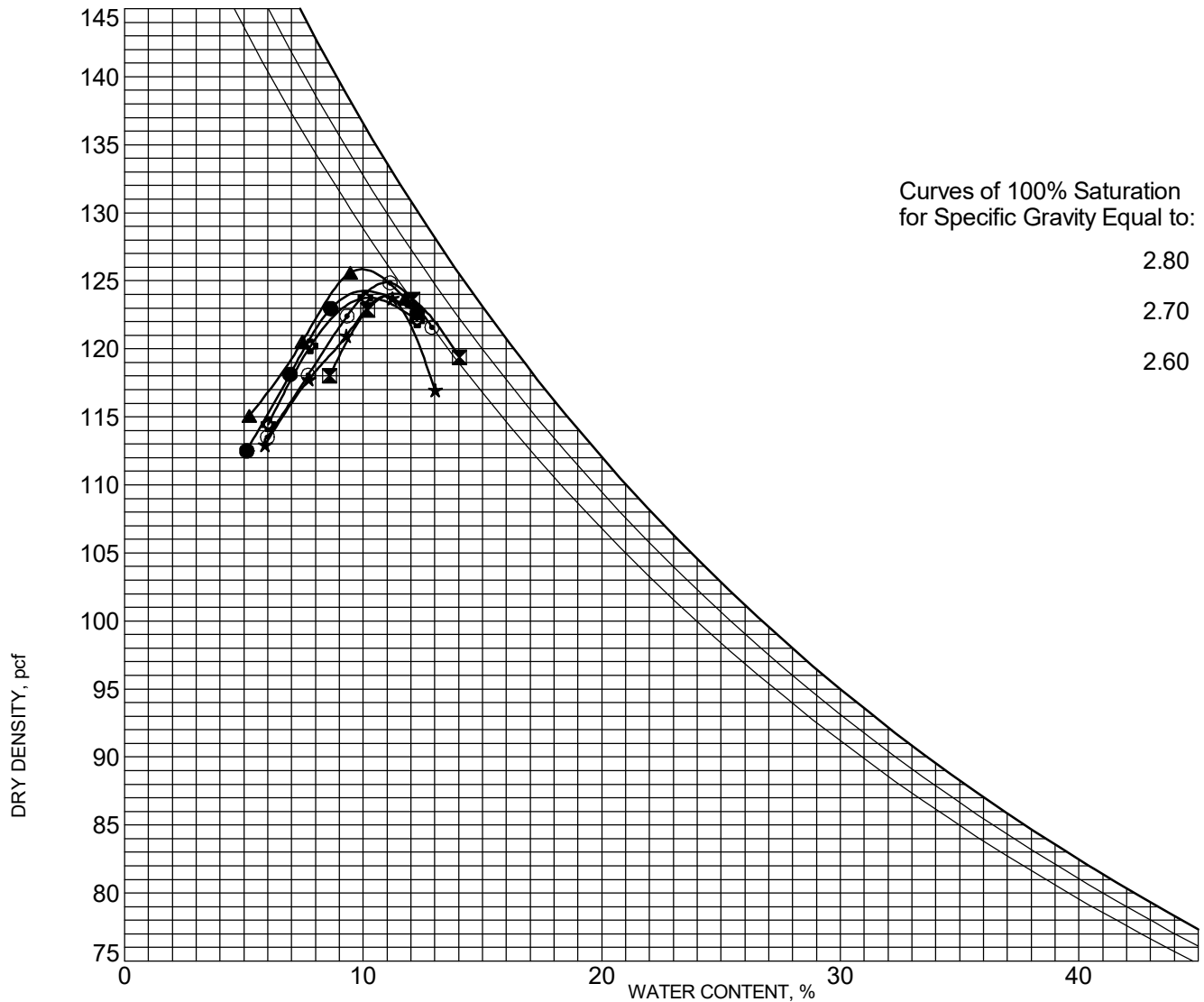
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 169+1000	2.0	A-7-6 (25)	LEAN CLAY with SAND(CL)
☒ 169+2000	2.0	A-7-6 (22)	LEAN CLAY with SAND(CL)
▲ 169+3000	2.0	A-7-6 (23)	LEAN CLAY with SAND(CL)
★ 169+4000	2.0	A-7-6 (25)	LEAN CLAY with SAND(CL)
⊙ 170+0000	2.0	A-7-6 (26)	FAT CLAY with SAND(CH)
⊕ 170+1000	2.0	A-7-6 (38)	FAT CLAY(CH)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 169+1000	2.0	AASHTO T-180 Method A	47	18	29	122.1 PCF	11.8 %
☒ 169+2000	2.0	AASHTO T-180 Method A	45	19	26	119.1 PCF	13.1 %
▲ 169+3000	2.0	AASHTO T-180 Method A	45	17	28	121.2 PCF	11.9 %
★ 169+4000	2.0	AASHTO T-180 Method A	49	18	31	121.2 PCF	12.2 %
⊙ 170+0000	2.0	AASHTO T-180 Method A	50	20	30	119.3 PCF	13.0 %
⊕ 170+1000	2.0	AASHTO T-180 Method A	58	20	38	118.8 PCF	13.2 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



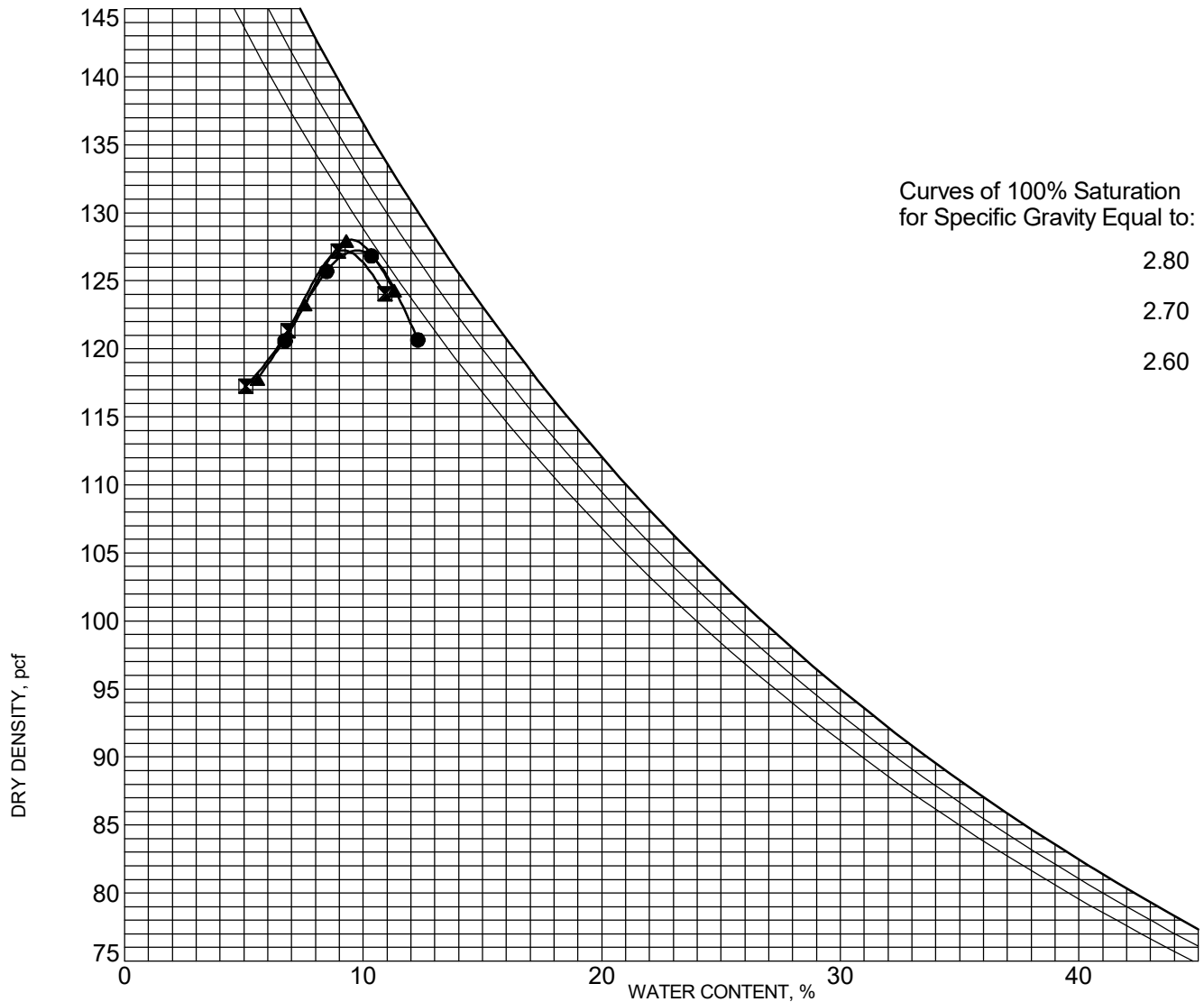
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 170+2000	2.0	A-6 (4)	SANDY LEAN CLAY(CL)
⊠ 170+3000	2.0	A-6 (10)	SANDY LEAN CLAY(CL)
▲ 170+4000	2.0	A-6 (3)	CLAYEY SAND(SC)
★ 171+0000	2.0	A-6 (11)	LEAN CLAY with SAND(CL)
⊙ 171+1000	2.0	A-6 (6)	SANDY LEAN CLAY(CL)
⊕ 171+2000	2.0	A-6 (3)	SANDY LEAN CLAY(CL)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 170+2000	2.0	AASHTO T-180 Method A	29	16	13	124.2 PCF	10.2 %
⊠ 170+3000	2.0	AASHTO T-180 Method A	36	16	20	124.0 PCF	11.4 %
▲ 170+4000	2.0	AASHTO T-180 Method A	28	15	13	125.9 PCF	9.9 %
★ 171+0000	2.0	AASHTO T-180 Method A	34	17	17	123.9 PCF	10.9 %
⊙ 171+1000	2.0	AASHTO T-180 Method A	33	16	17	124.9 PCF	11.0 %
⊕ 171+2000	2.0	AASHTO T-180 Method A	28	16	12	123.8 PCF	10.2 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



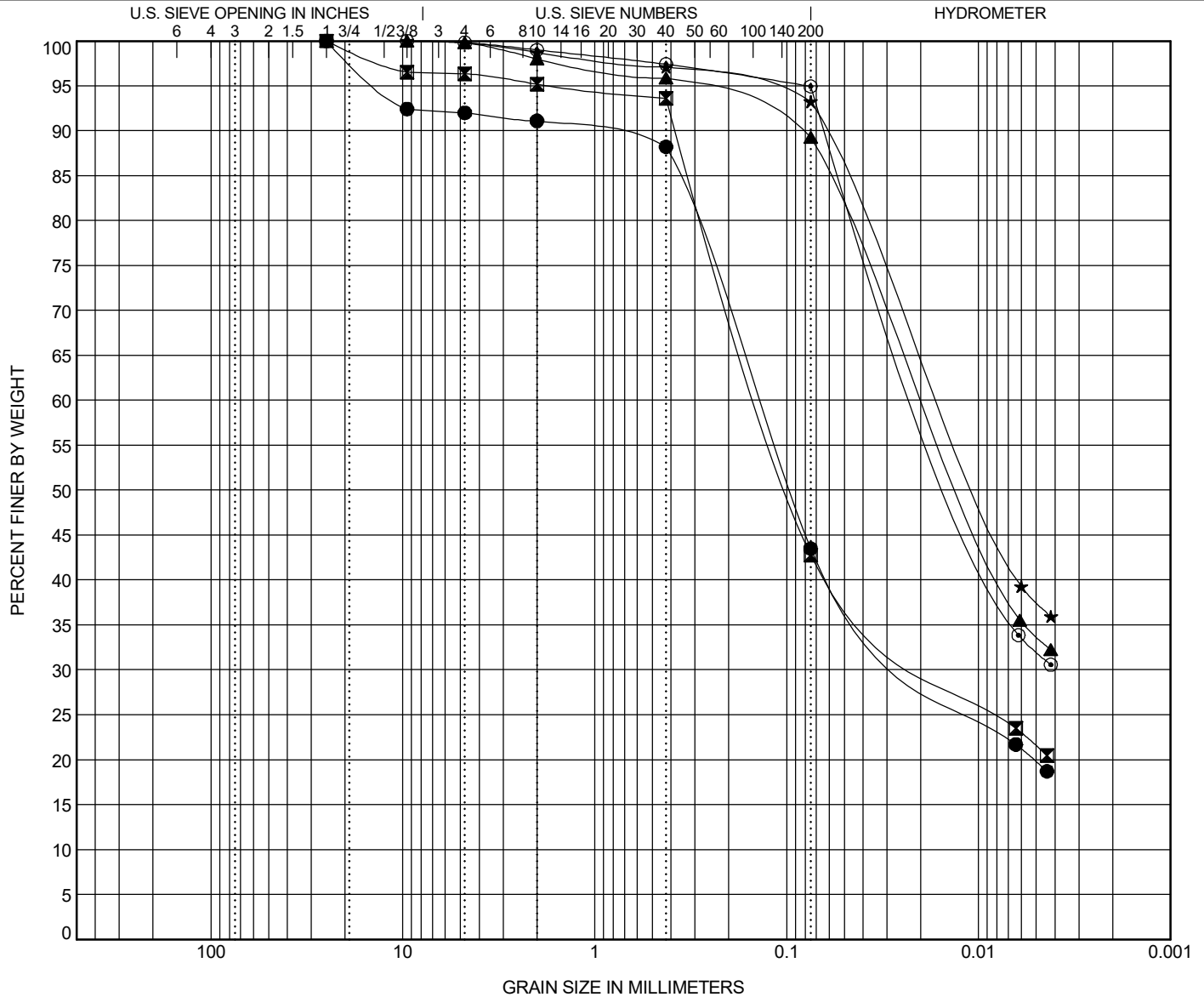
BOREHOLE	DEPTH	AASHTO Classification	USCS Description
● 171+3000	2.0	A-4 (1)	CLAYEY SAND(SC)
☒ 171+4000	2.0	A-2-4 (0)	SILTY, CLAYEY SAND(SC-SM)
▲ 172+0000	2.0	A-4 (0)	CLAYEY SAND(SC)

BOREHOLE	DEPTH	Test Method	LL	PL	PI	Max DD	Optimum WC
● 171+3000	2.0	AASHTO T-180 Method A	24	14	10	127.2 PCF	9.7 %
☒ 171+4000	2.0	AASHTO T-180 Method A	20	16	4	127.2 PCF	9.2 %
▲ 172+0000	2.0	AASHTO T-180 Method A	24	16	8	128.0 PCF	9.5 %

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

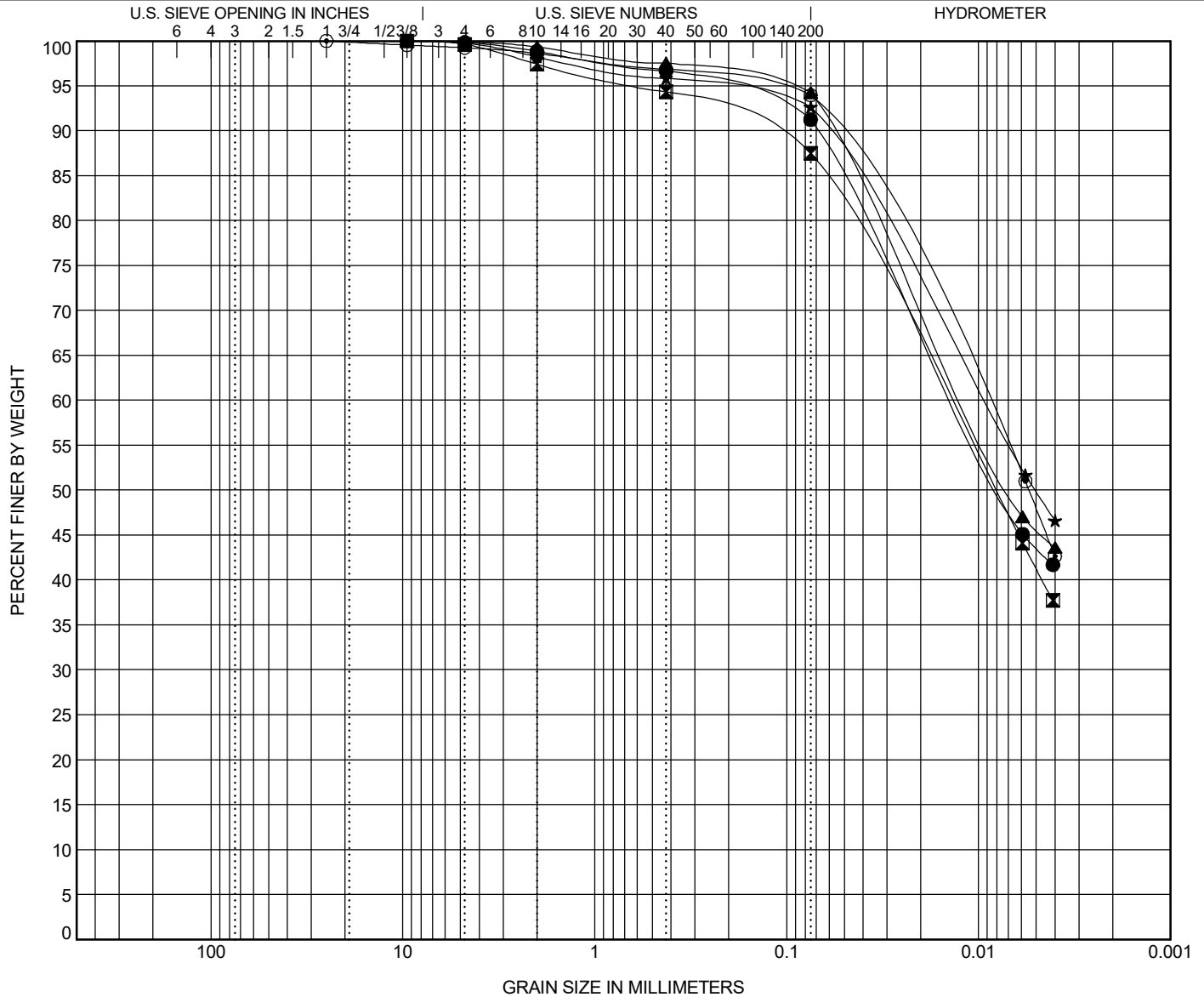


BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● 162+2000	2.0	A-6 (4)		SC		34	16	18		
☒ 162+3000	2.0	A-6 (1)		SC		29	18	11		
▲ 162+4000	2.0	A-7-6 (30)		CH		54	23	31		
★ 163+0000	2.0	A-7-6 (43)		CH		66	25	41		
◎ 163+1000	2.0	A-7-6 (40)		CH		61	24	37		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● 162+2000	2.0	25	0.142	0.016		8.0	48.5	43.5		
☒ 162+3000	2.0	25	0.135	0.015		3.7	53.6	42.8		
▲ 162+4000	2.0	9.5	0.019			0.2	10.5	89.3		
★ 163+0000	2.0	9.5	0.016			0.2	6.5	93.3		
◎ 163+1000	2.0	9.5	0.018			0.2	4.9	94.9		

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



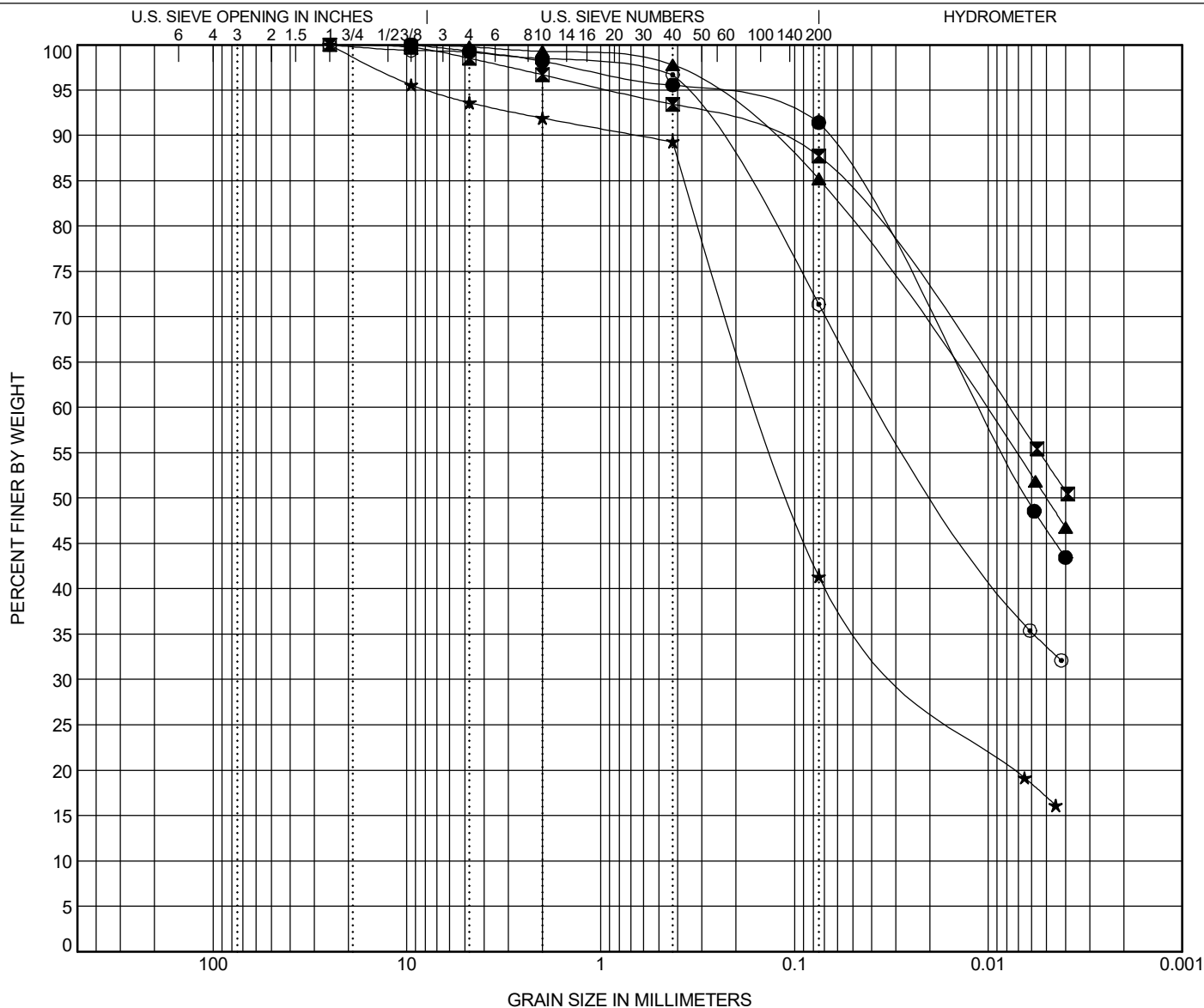
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification			LL	PL	PI	Cc	Cu
● 163+2000	2.0	A-7-6 (36)		CH			57	20	37		
☒ 163+3000	2.0	A-7-6 (30)		CH			53	21	32		
▲ 163+4000	2.0	A-7-6 (34)		CH			56	24	32		
★ 164+0000	2.0	A-7-6 (38)		CH			60	23	37		
◎ 164+1000	2.0	A-7-6 (40)		CH			59	20	39		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● 163+2000	2.0	9.5	0.013			0.2	8.6	91.2			
☒ 163+3000	2.0	9.5	0.015			0.4	12.1	87.5			
▲ 163+4000	2.0	9.5	0.012			0.1	5.6	94.3			
★ 164+0000	2.0	9.5	0.01			0.2	7.1	92.7			
◎ 164+1000	2.0	25	0.01			0.7	5.3	94.0			

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

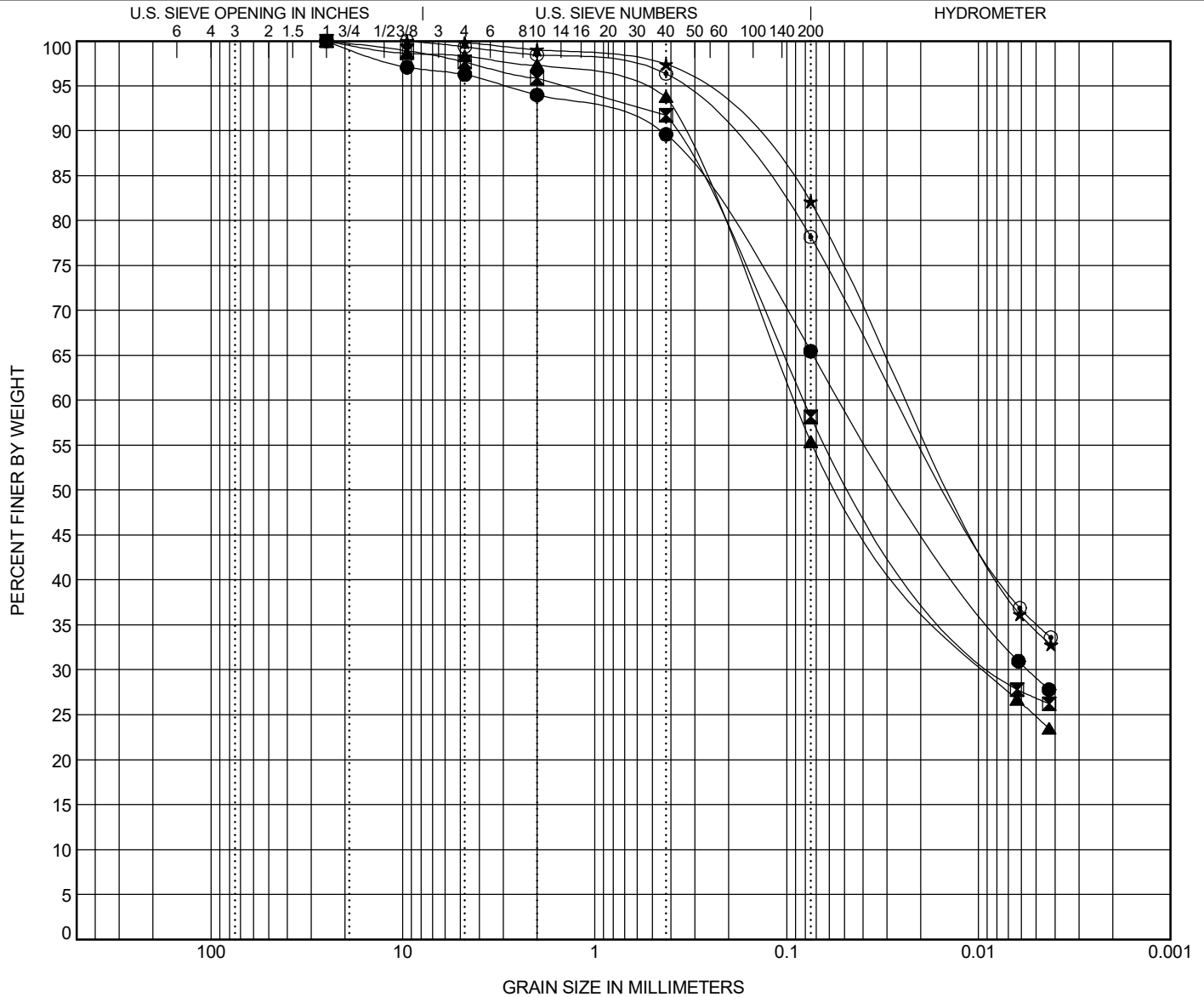
PCN 22957



PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



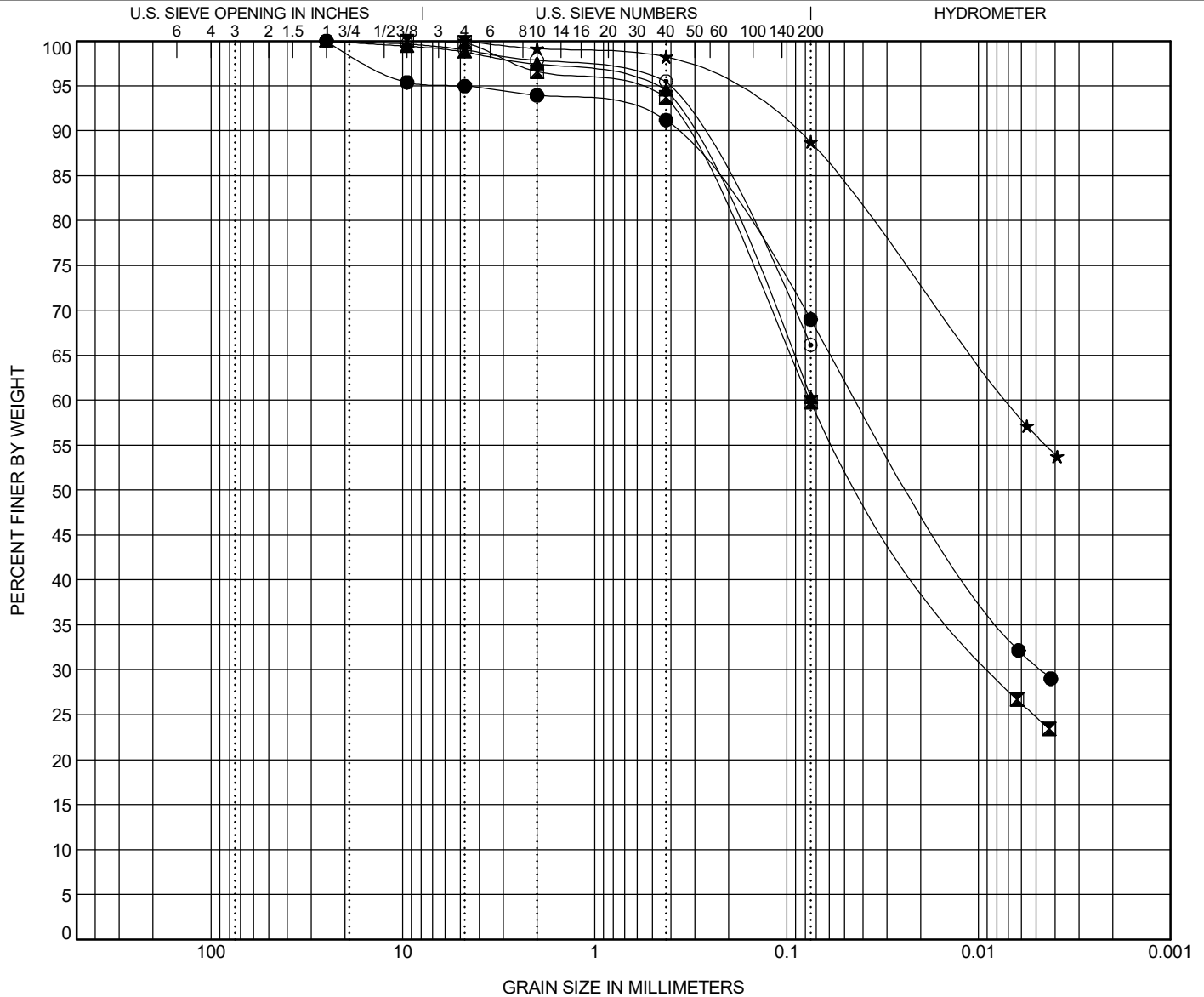
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● 165+2000	2.0	A-7-6 (14)		CL		41	16	25		
☒ 165+3000	2.0	A-7-6 (12)		CL		41	15	26		
▲ 165+4000	2.0	A-6 (8)		CL		36	14	22		
★ 166+0000	2.0	A-7-6 (27)		CH		51	19	32		
◎ 166+1000	2.0	A-7-6 (22)		CL		48	20	28		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● 165+2000	2.0	25	0.051	0.006		3.8	30.8	65.5		
☒ 165+3000	2.0	25	0.082	0.008		2.4	39.5	58.2		
▲ 165+4000	2.0	25	0.092	0.008		1.7	42.9	55.4		
★ 166+0000	2.0	9.5	0.022			0.2	17.7	82.1		
◎ 166+1000	2.0	9.5	0.025			0.6	21.2	78.2		

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



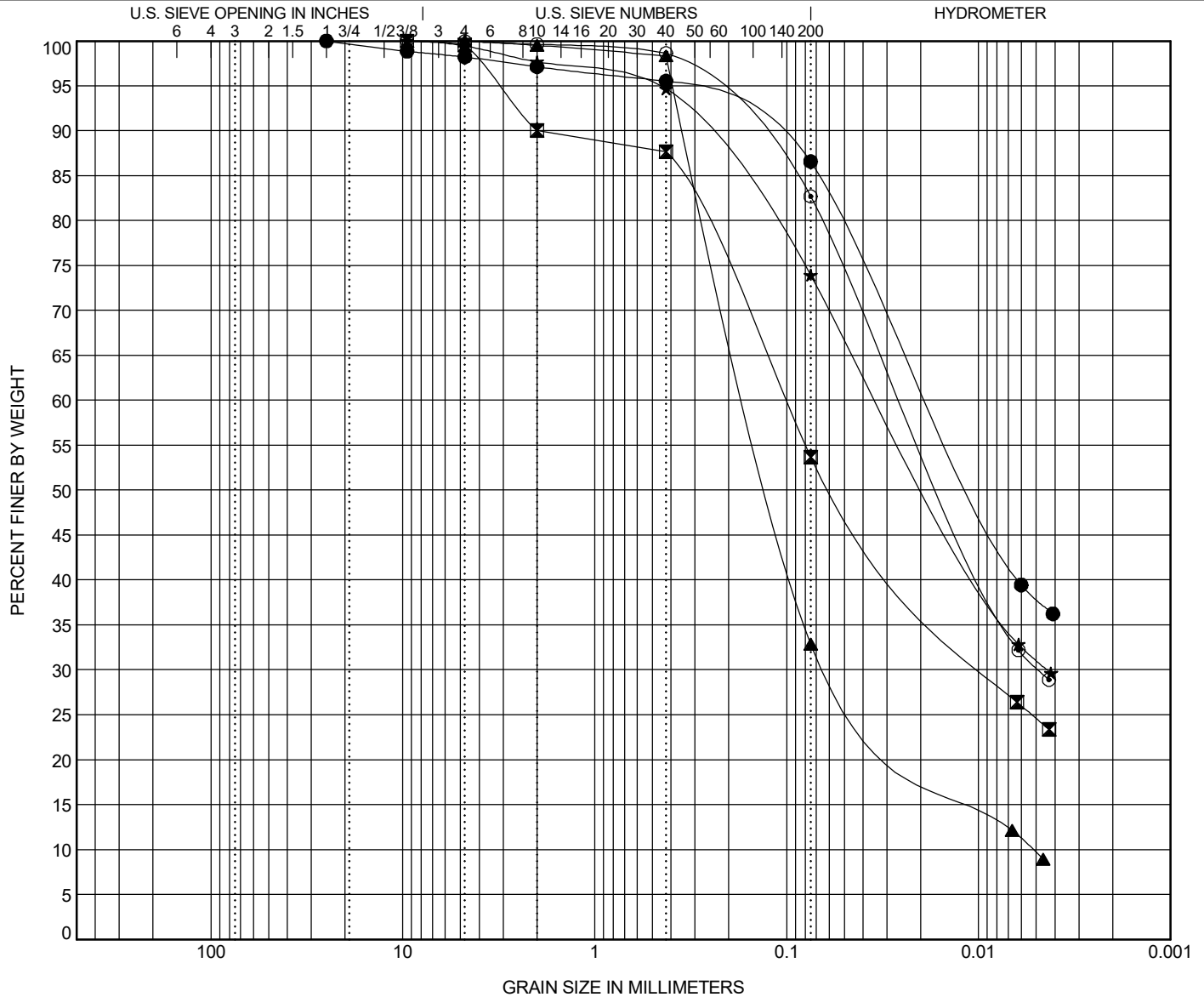
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● 166+2000	2.0	A-7-6 (16)		CL		44	18	26		
☒ 166+3000	2.0	A-6 (8)		CL		33	15	18		
▲ 166+4000	2.0	A-6 (9)		CL		35	14	21		
★ 167+0000	2.0	A-7-6 (37)		CH		62	24	38		
◎ 167+1000	2.0	A-7-6 (13)		CL		41	17	24		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● 166+2000	2.0	25	0.041	0.005		5.0	26.0	69.0		
☒ 166+3000	2.0	9.5	0.076	0.008		0.2	40.1	59.8		
▲ 166+4000	2.0	25				1.2	38.4	60.3		
★ 167+0000	2.0	4.75	0.007			0.0	11.3	88.7		
◎ 167+1000	2.0	25				1.0	32.8	66.2		

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

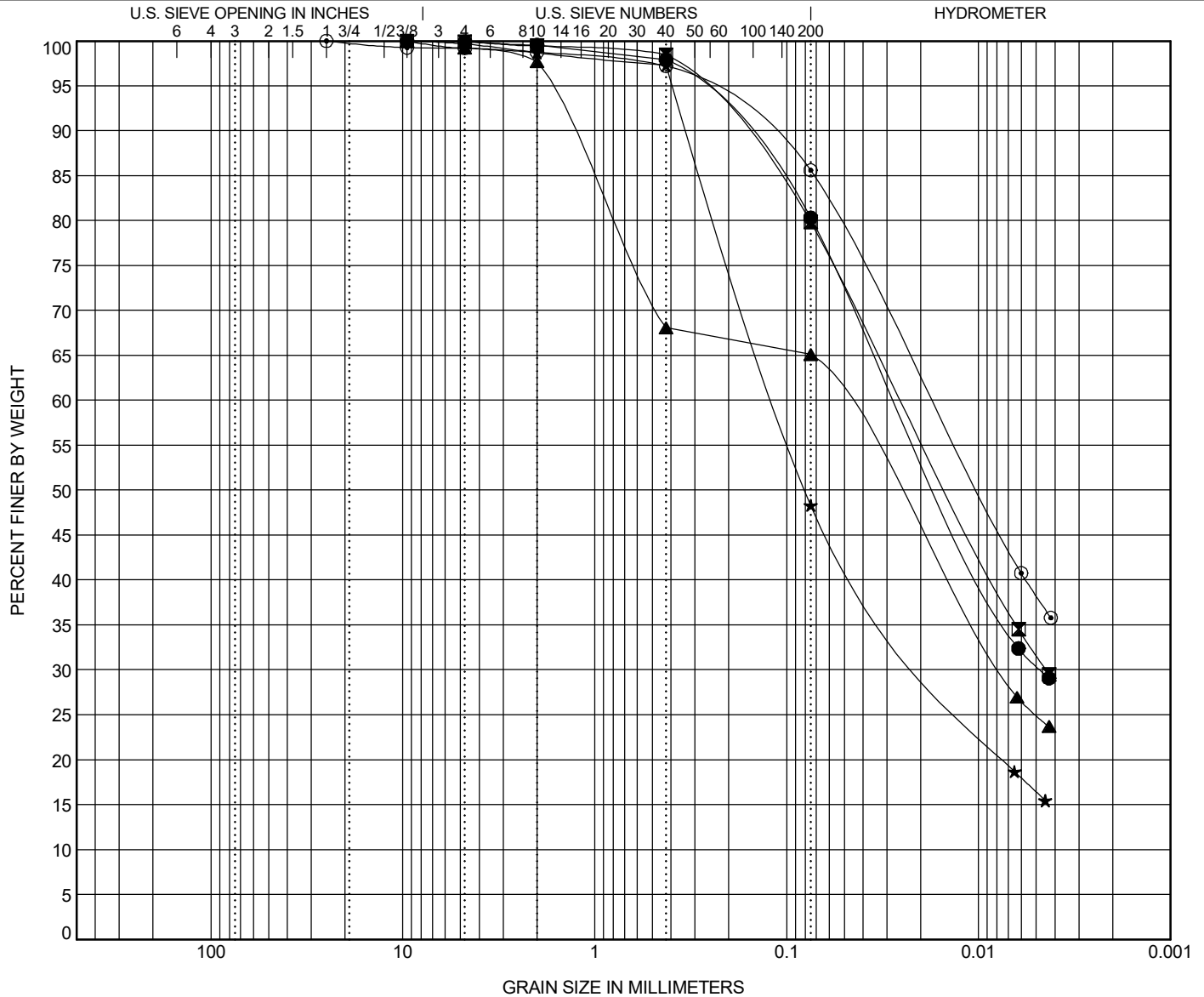


COBBLES		GRAVEL		SAND			SILT OR CLAY				
		coarse	fine	coarse	medium	fine					
BOREHOLE	DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
● 167+2000	2.0	A-7-6 (25)			CL		47	19	28		
▣ 167+3000	2.0	A-6 (6)			CL		33	15	18		
▲ 167+4000	2.0	A-2-4 (0)			SM		NP	NP	NP	3.61	29.53
★ 168+0000	2.0	A-6 (13)			CL		37	17	20		
⊙ 168+0916	2.0	A-6 (18)			CL		39	17	22		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
● 167+2000	2.0	25	0.018			1.8	11.6	86.6			
▣ 167+3000	2.0	9.5	0.104	0.009		0.4	45.9	53.7			
▲ 167+4000	2.0	4.75	0.154	0.054	0.005	0.0	67.2	32.8			
★ 168+0000	2.0	9.5	0.032	0.004		0.5	25.5	73.9			
⊙ 168+0916	2.0	9.5	0.024	0.005		0.0	17.3	82.7			

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



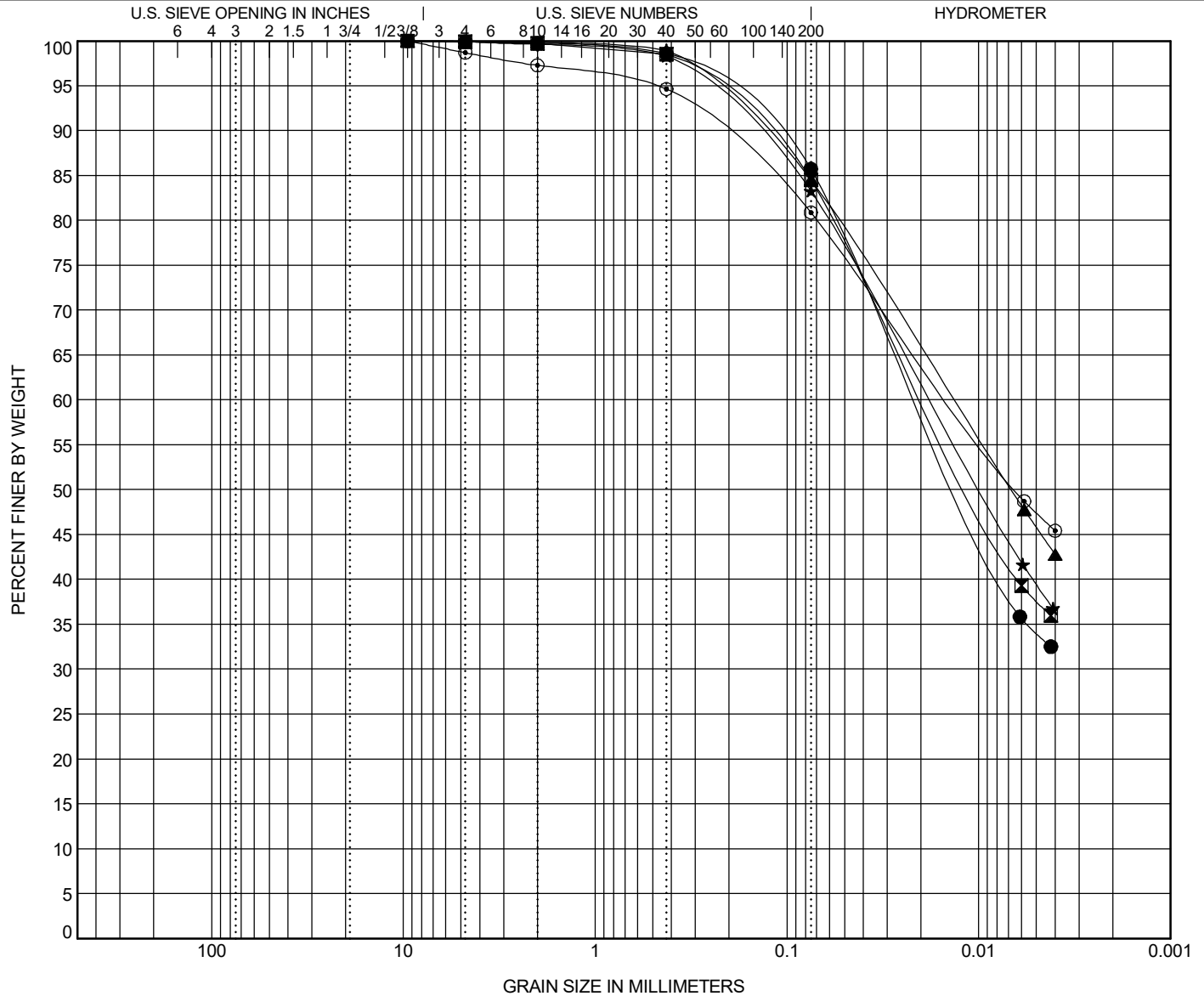
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● 168+1294	2.0	A-6 (17)		CL		40	17	23		
■ 168+1581	2.0	A-6 (16)		CL		39	18	21		
▲ 168+2000	2.0	A-6 (9)		CL		34	16	18		
★ 168+3000	2.0	A-4 (0)		SM		23	21	2		
⊙ 168+4000	2.0	A-7-6 (25)		CL		47	19	28		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● 168+1294	2.0	9.5	0.026	0.005		0.1	19.6	80.3		
■ 168+1581	2.0	9.5	0.025	0.004		0.1	20.1	79.8		
▲ 168+2000	2.0	9.5	0.054	0.008		0.8	34.1	65.1		
★ 168+3000	2.0	9.5	0.114	0.017		0.3	51.4	48.3		
⊙ 168+4000	2.0	25	0.018			0.8	13.6	85.6		

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

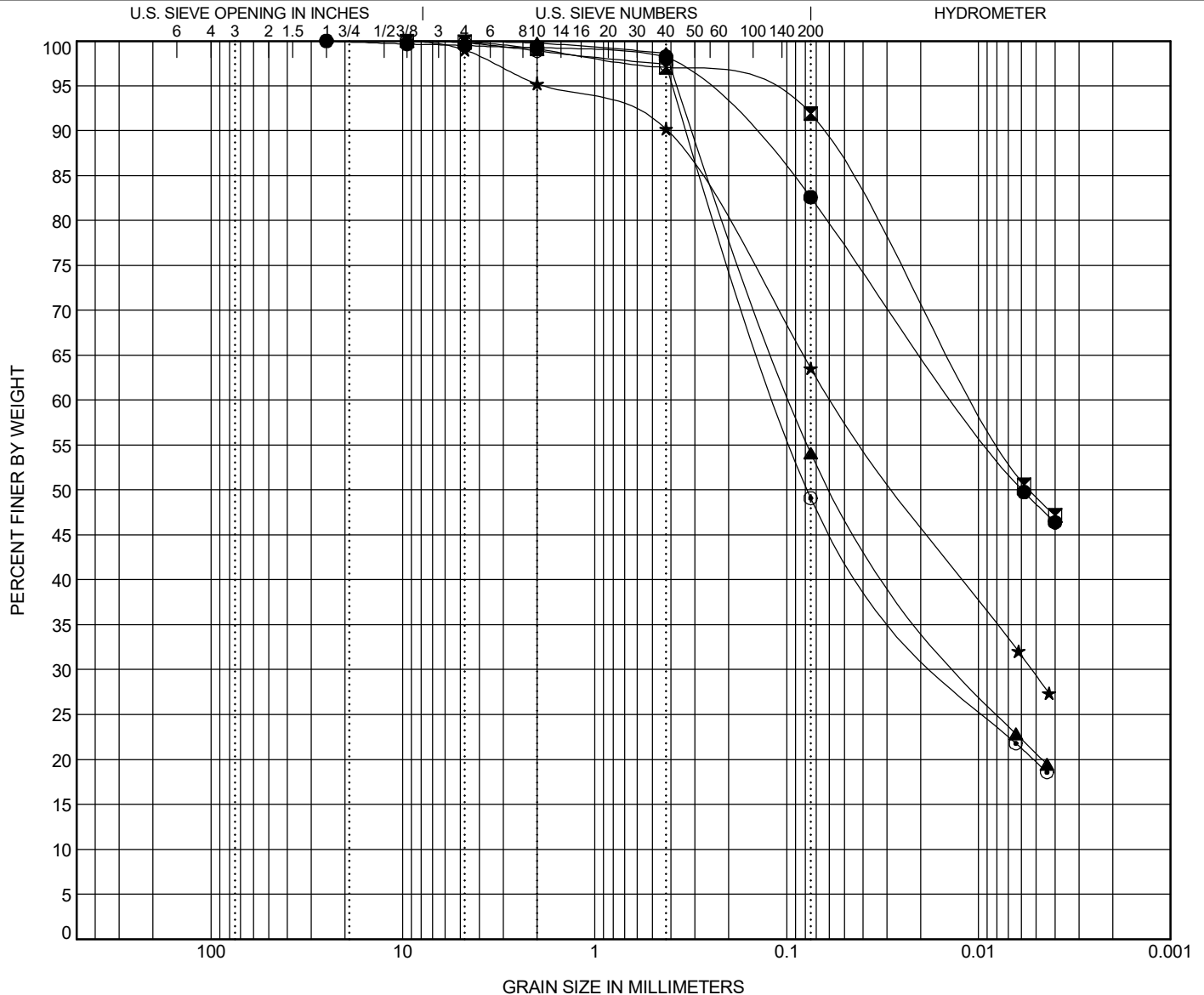
PCN 22957



PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



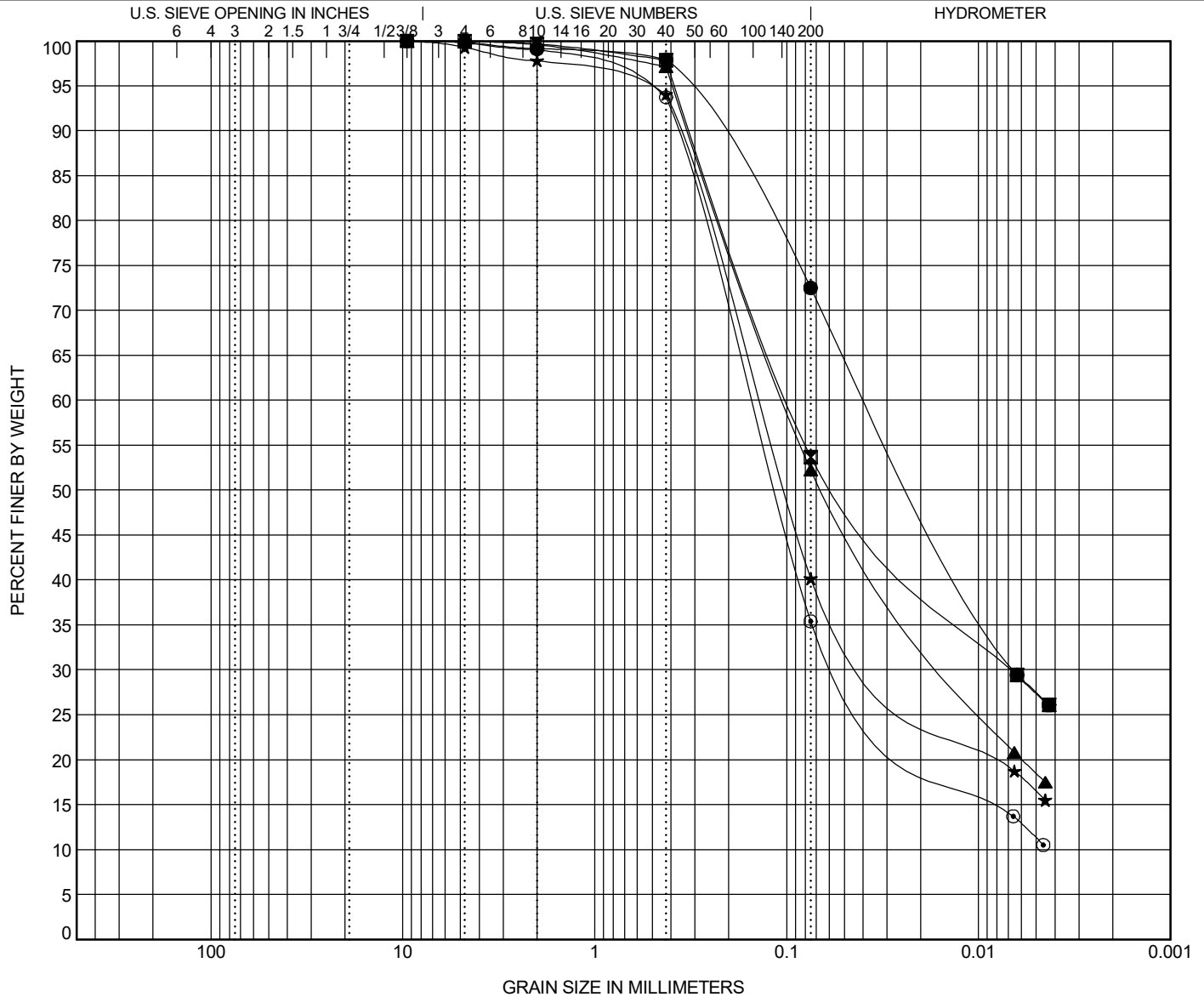
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	AASHTO Classification		USCS Classification		LL	PL	PI	Cc	Cu
● 170+0000	2.0	A-7-6 (26)		CH		50	20	30		
☒ 170+1000	2.0	A-7-6 (38)		CH		58	20	38		
▲ 170+2000	2.0	A-6 (4)		CL		29	16	13		
★ 170+3000	2.0	A-6 (10)		CL		36	16	20		
◎ 170+4000	2.0	A-6 (3)		SC		28	15	13		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
● 170+0000	2.0	25	0.013			0.5	16.9	82.6		
☒ 170+1000	2.0	9.5	0.01			0.1	7.9	91.9		
▲ 170+2000	2.0	9.5	0.094	0.011		0.1	45.9	54.1		
★ 170+3000	2.0	9.5	0.057	0.005		1.0	35.5	63.5		
◎ 170+4000	2.0	9.5	0.111	0.013		0.2	50.7	49.1		

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



BOREHOLE	DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	171+0000	2.0	A-6 (11)			CL	34	17	17		
■	171+1000	2.0	A-6 (6)			CL	33	16	17		
▲	171+2000	2.0	A-6 (3)			CL	28	16	12		
★	171+3000	2.0	A-4 (1)			SC	24	14	10		
⊙	171+4000	2.0	A-2-4 (0)			SC-SM	20	16	4		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
●	171+0000	2.0	9.5	0.037	0.007	0.1	27.4	72.5			
■	171+1000	2.0	9.5	0.096	0.007	0.0	46.3	53.7			
▲	171+2000	2.0	9.5	0.101	0.013	0.0	47.7	52.2			
★	171+3000	2.0	9.5	0.142	0.024	0.7	59.1	40.2			
⊙	171+4000	2.0	9.5	0.156	0.041	0.2	64.4	35.4			



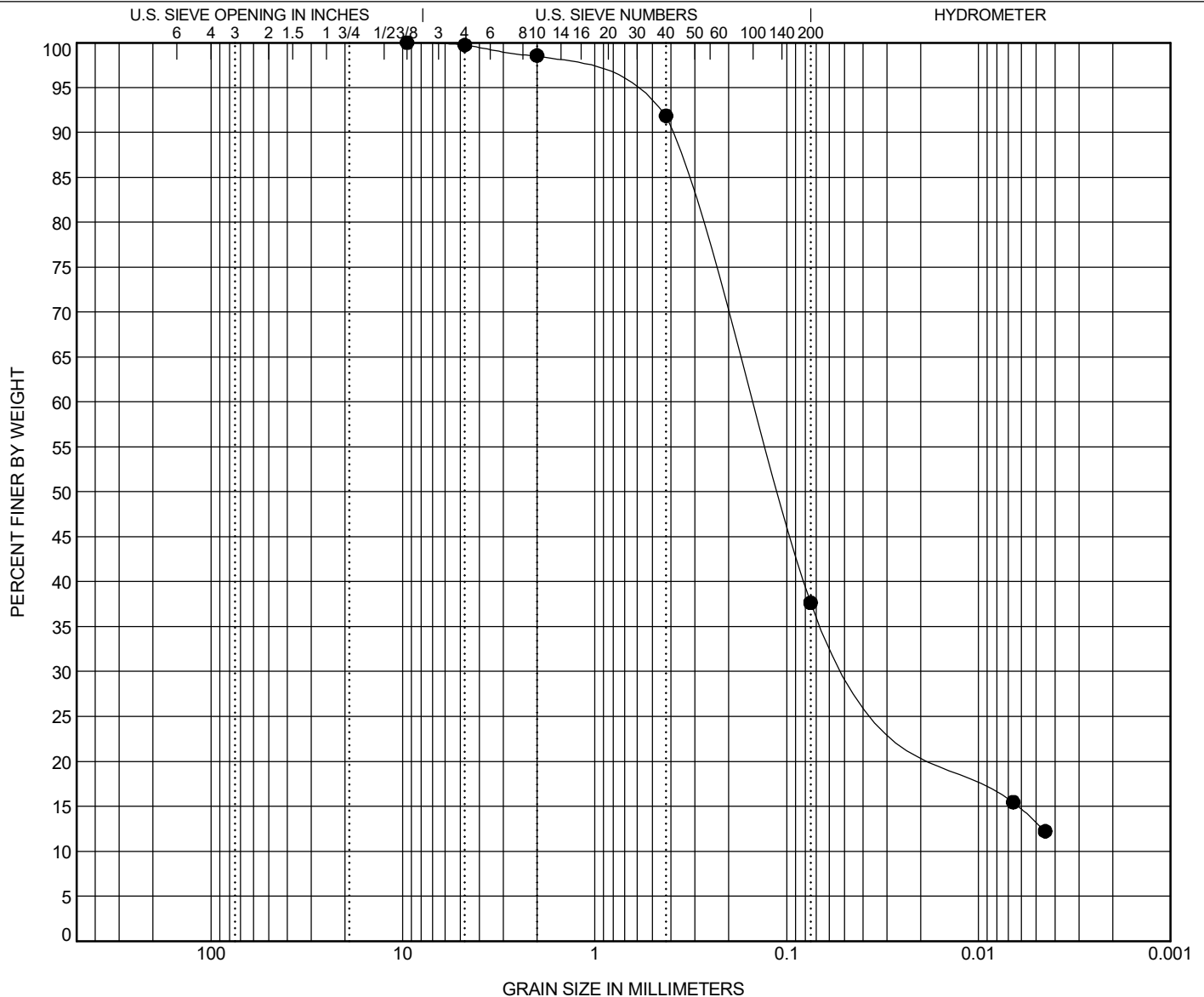
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
300 AIRPORT ROAD
BISMARCK, ND 58504

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE		DEPTH	AASHTO Classification			USCS Classification		LL	PL	PI	Cc	Cu
●	172+0000	2.0	A-4 (0)			SC		24	16	8		
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
●	172+0000	2.0	9.5	0.153	0.032		0.3	62.1	37.6			

GRAIN SIZE - 20171219.GDT - 11/9/21 07:34 - F:\LAB\PROJECTS\GINT1-094(214)162.GPJ

SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
162+2000	2.0	34	16	18	25	43	A-6 (4)	SC	11.2	15.5			
162+2000	3.0								15.2	15.5			
162+2000	4.0								14.6	15.5			
162+2000	5.0								21.1	15.5			
162+3000	2.0	29	18	11	25	43	A-6 (1)	SC	11.6	14.0			
162+3000	3.0								13.0	14.0			
162+3000	4.0								15.8	14.0			
162+3000	5.0								15.6	14.0			
162+4000	2.0	54	23	31	9.5	89	A-7-6 (30)	CH	31.6	30.8			
162+4000	3.0								27.6	30.8			
162+4000	4.0								31.6	30.8			
162+4000	5.0								32.5	30.8			
163+0000	2.0	66	25	41	9.5	93	A-7-6 (43)	CH	37.0	31.3			
163+0000	3.0								28.5	31.3			
163+0000	4.0								28.5	31.3			
163+0000	5.0								31.3	31.3			
163+1000	2.0	61	24	37	9.5	95	A-7-6 (40)	CH	35.7	30.7			
163+1000	3.0								29.8	30.7			
163+1000	4.0								28.0	30.7			
163+1000	5.0								29.2	30.7			
163+2000	2.0	57	20	37	9.5	91	A-7-6 (36)	CH	34.2	30.9			
163+2000	3.0								32.1	30.9			
163+2000	4.0								24.7	30.9			
163+2000	5.0								32.6	30.9			
163+3000	2.0	53	21	32	9.5	87	A-7-6 (30)	CH	35.3	31.0			
163+3000	3.0								30.0	31.0			
163+3000	4.0								31.3	31.0			
163+3000	5.0								27.5	31.0			
163+4000	2.0	56	24	32	9.5	94	A-7-6 (34)	CH	30.1	31.3			
163+4000	3.0								24.3	31.3			
163+4000	4.0								37.1	31.3			
163+4000	5.0								34.0	31.3			
164+0000	2.0	60	23	37	9.5	93	A-7-6 (38)	CH	28.1	29.0			
164+0000	3.0								32.2	29.0			
164+0000	4.0								27.9	29.0			
164+0000	5.0								27.9	29.0			
164+1000	2.0	59	20	39	25	94	A-7-6 (40)	CH	32.1	32.2			
164+1000	3.0								31.6	32.2			
164+1000	4.0								32.9	32.2			
164+1000	5.0								32.4	32.2			
164+2000	2.0	64	22	42	9.5	91	A-7-6 (42)	CH	33.0	29.2			
164+2000	3.0								34.5	29.2			
164+2000	4.0								25.2	29.2			

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
164+2000	5.0								24.1	29.2			
164+3000	2.0	64	22	42	25	88	A-7-6 (40)	CH	34.9	30.1			
164+3000	3.0								27.8	30.1			
164+3000	4.0								29.3	30.1			
164+3000	5.0								28.6	30.1			
164+4000	2.0	54	18	36	9.5	85	A-7-6 (32)	CH	31.3	19.6			
164+4000	3.0								29.9	19.6			
164+4000	4.0								0.4	19.6			
164+4000	5.0								16.9	19.6			
165+0000	2.0	21	16	5	25	41	A-4 (0)	SC-SM	11.9	14.9			
165+0000	3.0								15.8	14.9			
165+0000	4.0								15.1	14.9			
165+0000	5.0								16.9	14.9			
165+1000	2.0	44	15	29	25	71	A-7-6 (19)	CL	15.7	24.5			
165+1000	3.0								32.6	24.5			
165+1000	4.0								24.8	24.5			
165+1000	5.0								24.7	24.5			
165+2000	2.0	41	16	25	25	65	A-7-6 (14)	CL	25.9	21.0			
165+2000	3.0								21.6	21.0			
165+2000	4.0								15.9	21.0			
165+2000	5.0								20.6	21.0			
165+3000	2.0	41	15	26	25	58	A-7-6 (12)	CL	28.4	24.2			
165+3000	3.0								20.8	24.2			
165+3000	4.0								16.7	24.2			
165+3000	5.0								30.8	24.2			
165+4000	2.0	36	14	22	25	55	A-6 (8)	CL	16.6	17.3			
165+4000	3.0								17.8	17.3			
165+4000	4.0								18.3	17.3			
165+4000	5.0								16.3	17.3			
166+0000	2.0	51	19	32	9.5	82	A-7-6 (27)	CH	18.4	25.1			
166+0000	3.0								22.7	25.1			
166+0000	4.0								31.5	25.1			
166+0000	5.0								27.8	25.1			
166+1000	2.0	48	20	28	9.5	78	A-7-6 (22)	CL	21.2	26.6			
166+1000	3.0								20.2	26.6			
166+1000	4.0								32.8	26.6			
166+1000	5.0								32.2	26.6			
166+2000	2.0	44	18	26	25	69	A-7-6 (16)	CL	19.0	19.7			
166+2000	3.0								27.5	19.7			
166+2000	4.0								17.5	19.7			
166+2000	5.0								14.6	19.7			
166+3000	2.0	33	15	18	9.5	60	A-6 (8)	CL	14.6	17.9			
166+3000	3.0								16.9	17.9			

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
166+3000	4.0								18.6	17.9			
166+3000	5.0								21.7	17.9			
166+4000	2.0	35	14	21	25	60	A-6 (9)	CL	14.4	16.4			
166+4000	3.0								18.9	16.4			
166+4000	4.0								16.7	16.4			
166+4000	5.0								15.6	16.4			
167+0000	2.0	62	24	38	4.75	89	A-7-6 (37)	CH	16.1	26.1			
167+0000	3.0								23.2	26.1			
167+0000	4.0								34.2	26.1			
167+0000	5.0								31.0	26.1			
167+1000	2.0	41	17	24	25	66	A-7-6 (13)	CL	28.7	21.7			
167+1000	3.0								20.4	21.7			
167+1000	4.0								18.3	21.7			
167+1000	5.0								19.7	21.7			
167+2000	2.0	47	19	28	25	87	A-7-6 (25)	CL	11.8	21.5			
167+2000	3.0								17.1	21.5			
167+2000	4.0								33.1	21.5			
167+2000	5.0								24.1	21.5			
167+3000	2.0	33	15	18	9.5	54	A-6 (6)	CL	14.8	14.1			
167+3000	3.0								11.8	14.1			
167+3000	4.0								15.8	14.1			
167+3000	5.0								14.0	14.1			
167+4000	2.0	NP	NP	NP	4.75	33	A-2-4 (0)	SM	13.3	10.5			
167+4000	3.0								8.8	10.5			
167+4000	4.0								10.9	10.5			
167+4000	5.0								8.8	10.5			
168+0000	2.0	37	17	20	9.5	74	A-6 (13)	CL	15.5	22.1			
168+0000	3.0								31.4	22.1			
168+0000	4.0								24.7	22.1			
168+0000	5.0								16.8	22.1			
168+0916	2.0	39	17	22	9.5	83	A-6 (18)	CL	19.9	25.1			
168+0916	3.0								22.1	25.1			
168+0916	4.0								23.9	25.1			
168+0916	5.0								26.9	25.1			
168+0916	6.0								24.0	25.1			
168+0916	7.0								25.7	25.1			
168+0916	8.0								29.2	25.1			
168+0916	9.0								25.9	25.1			
168+0916	10.0								28.3	25.1			
168+1294	2.0	40	17	23	9.5	80	A-6 (17)	CL	20.6	24.8			
168+1294	3.0								28.3	24.8			
168+1294	4.0								25.9	24.8			
168+1294	5.0								24.8	24.8			

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
168+1294	6.0								24.0	24.8			
168+1294	7.0								26.1	24.8			
168+1294	8.0								21.0	24.8			
168+1294	9.0								26.1	24.8			
168+1294	10.0								25.9	24.8			
168+1581	2.0	39	18	21	9.5	80	A-6 (16)	CL	19.5	24.8			
168+1581	3.0								22.1	24.8			
168+1581	4.0								29.7	24.8			
168+1581	5.0								28.8	24.8			
168+1581	6.0								18.8	24.8			
168+1581	7.0								27.7	24.8			
168+1581	8.0								24.5	24.8			
168+1581	9.0								26.0	24.8			
168+1581	10.0								26.5	24.8			
168+2000	2.0	34	16	18	9.5	65	A-6 (9)	CL	19.3	21.6			
168+2000	3.0								19.8	21.6			
168+2000	4.0								22.7	21.6			
168+2000	5.0								24.5	21.6			
168+3000	2.0	23	21	2	9.5	48	A-4 (0)	SM	15.1	12.6			
168+3000	3.0								11.8	12.6			
168+3000	4.0								10.5	12.6			
168+3000	5.0								12.8	12.6			
168+4000	2.0	47	19	28	25	86	A-7-6 (25)	CL	16.3	22.4			
168+4000	3.0								26.3	22.4			
168+4000	4.0								25.1	22.4			
168+4000	5.0								21.7	22.4			
169+0000	2.0	42	19	23	9.5	86	A-7-6 (20)	CL	19.5	24.4			
169+0000	3.0								27.6	24.4			
169+0000	4.0								25.8	24.4			
169+0000	5.0								24.8	24.4			
169+1000	2.0	47	18	29	9.5	85	A-7-6 (25)	CL	17.2	23.9			
169+1000	3.0								27.4	23.9			
169+1000	4.0								25.3	23.9			
169+1000	5.0								25.6	23.9			
169+2000	2.0	45	19	26	9.5	85	A-7-6 (22)	CL	16.8	18.2			
169+2000	3.0								17.8	18.2			
169+2000	4.0								18.9	18.2			
169+2000	5.0								19.4	18.2			
169+3000	2.0	45	17	28	9.5	83	A-7-6 (23)	CL	23.0	19.0			
169+3000	3.0								18.5	19.0			
169+3000	4.0								18.0	19.0			
169+3000	5.0								16.6	19.0			
169+4000	2.0	49	18	31	9.5	81	A-7-6 (25)	CL	15.7	21.6			

SUMMARY OF LABORATORY RESULTS

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
169+4000	3.0								18.5	21.6			
169+4000	4.0								23.0	21.6			
169+4000	5.0								28.9	21.6			
170+0000	2.0	50	20	30	25	83	A-7-6 (26)	CH	20.3	20.7			
170+0000	3.0								19.6	20.7			
170+0000	4.0								22.1	20.7			
170+0000	5.0								20.7	20.7			
170+1000	2.0	58	20	38	9.5	92	A-7-6 (38)	CH	25.4	25.2			
170+1000	3.0								25.6	25.2			
170+1000	4.0								27.7	25.2			
170+1000	5.0								22.0	25.2			
170+2000	2.0	29	16	13	9.5	54	A-6 (4)	CL	16.9	19.3			
170+2000	3.0								18.4	19.3			
170+2000	4.0								21.5	19.3			
170+2000	5.0								20.2	19.3			
170+3000	2.0	36	16	20	9.5	64	A-6 (10)	CL	21.6	20.0			
170+3000	3.0								16.1	20.0			
170+3000	4.0								22.0	20.0			
170+3000	5.0								20.3	20.0			
170+4000	2.0	28	15	13	9.5	49	A-6 (3)	SC	22.7	16.2			
170+4000	3.0								15.6	16.2			
170+4000	4.0								12.8	16.2			
170+4000	5.0								13.8	16.2			
171+0000	2.0	34	17	17	9.5	73	A-6 (11)	CL	15.8	17.8			
171+0000	3.0								21.4	17.8			
171+0000	4.0								17.6	17.8			
171+0000	5.0								16.6	17.8			
171+1000	2.0	33	16	17	9.5	54	A-6 (6)	CL	16.6	16.7			
171+1000	3.0								14.9	16.7			
171+1000	4.0								14.1	16.7			
171+1000	5.0								21.1	16.7			
171+2000	2.0	28	16	12	9.5	52	A-6 (3)	CL	16.6	17.4			
171+2000	3.0								15.9	17.4			
171+2000	4.0								17.8	17.4			
171+2000	5.0								19.2	17.4			
171+3000	2.0	24	14	10	9.5	40	A-4 (1)	SC	26.4	16.1			
171+3000	3.0								11.4	16.1			
171+3000	4.0								13.2	16.1			
171+3000	5.0								13.4	16.1			
171+4000	2.0	20	16	4	9.5	35	A-2-4 (0)	SC-SM	12.7	13.8			
171+4000	3.0								11.9	13.8			
171+4000	4.0								10.3	13.8			
171+4000	5.0								20.2	13.8			



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

SUMMARY OF LABORATORY RESULTS

PAGE 6 OF 6

PROJECT NUMBER IM-X-1-094(214)162

LOCATION Burleigh County

PCN 22957

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
172+0000	2.0	24	16	8	9.5	38	A-4 (0)	SC	13.1	11.6			
172+0000	3.0								11.9	11.6			
172+0000	4.0								10.2	11.6			
172+0000	5.0								11.3	11.6			