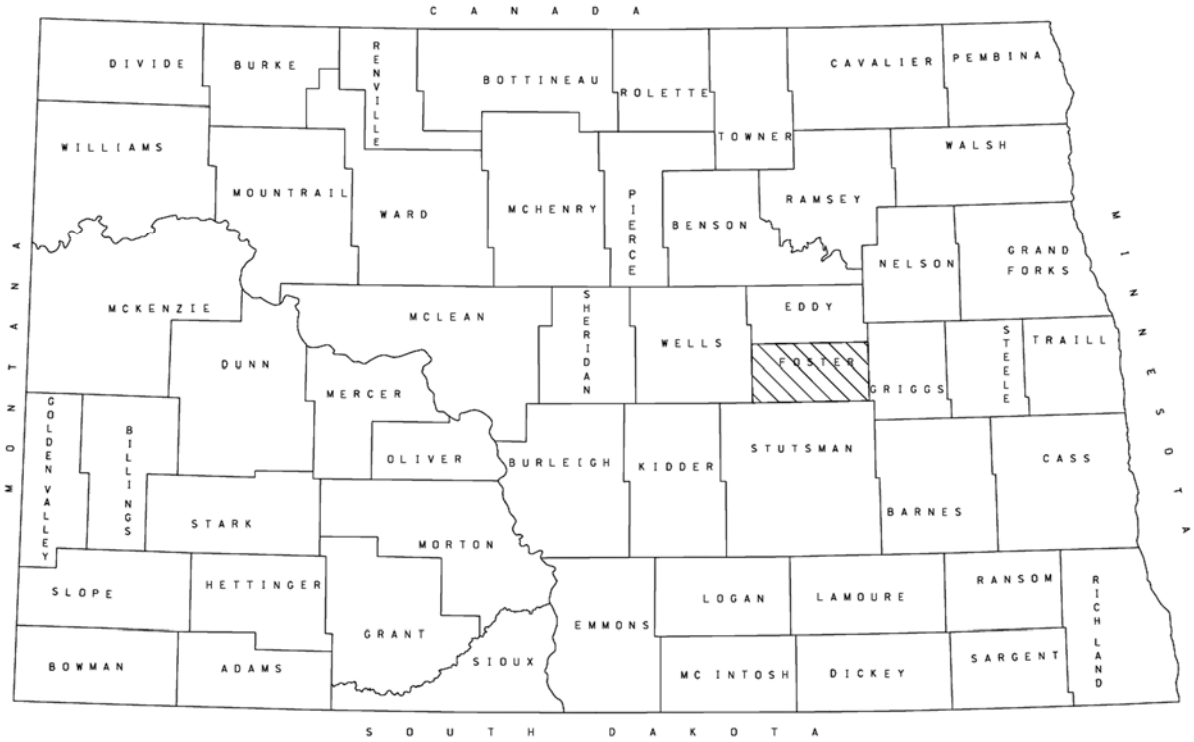
# LINEAR SOILS SURVEY AND RECOMMENDATIONS

## PROJECT NO. NH-3-052(049)222

## PCN 21918

## COUNTY Foster

## US Highway 52, RP 222.719 to 223.403





**PREPARED BY: Jared Loegering, PE**

**NORTH DAKOTA DEPARTMENT OF TRANSPORTATION**
**MATERIALS AND RESEARCH DIVISION**


**May 2018**

# NH-3-052(059)222

US Highway 52, Jct. ND 200/US 281 to 7th St. S

# *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 05/10/2018 and the original document is stored at the North Dakota Department of Transportation.

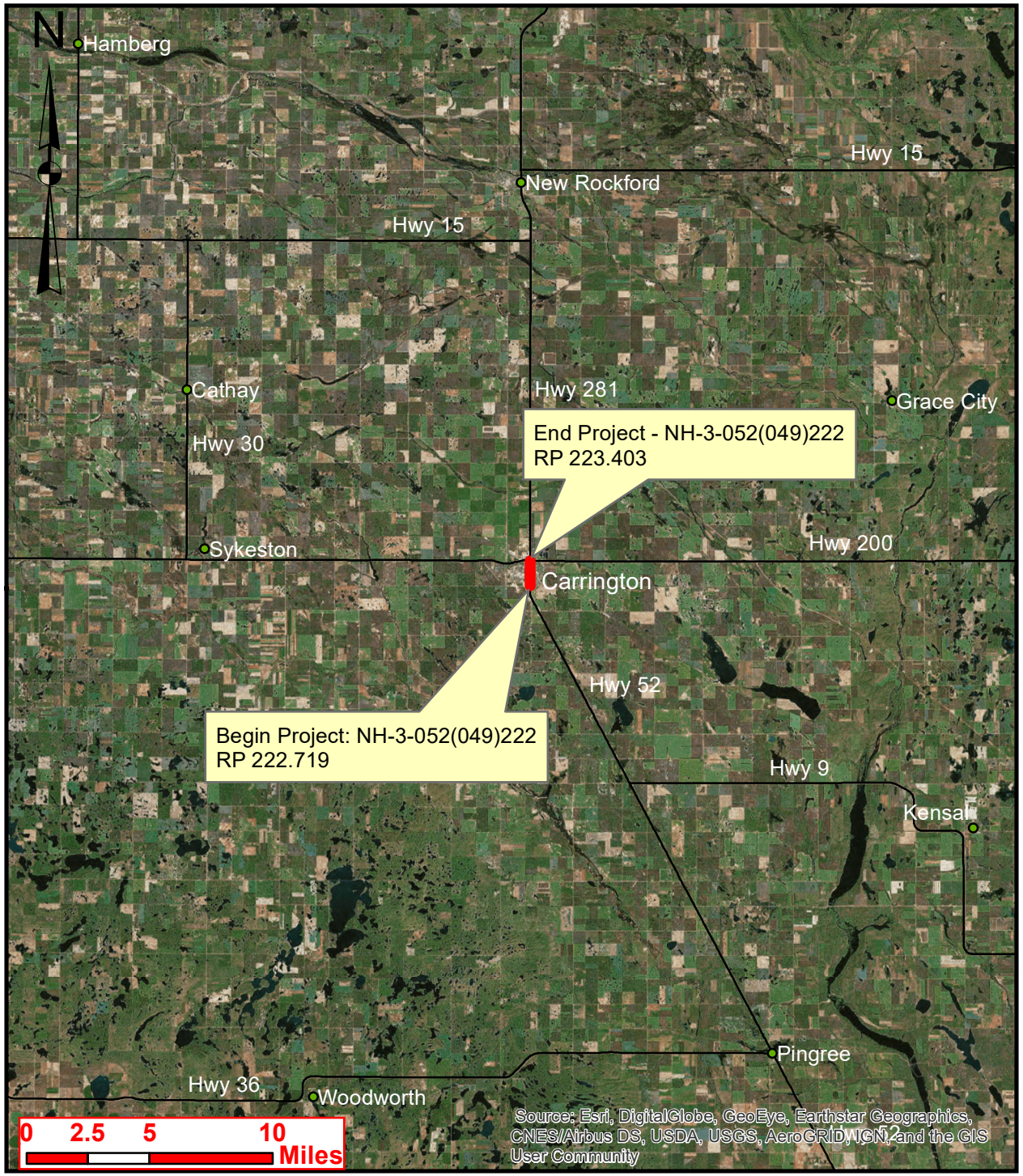
REGISTERED PROFESSIONAL ENGINEER
JARED J. LOEGERING
PE-10931
DATE 05/10/2018
NORTH DAKOTA

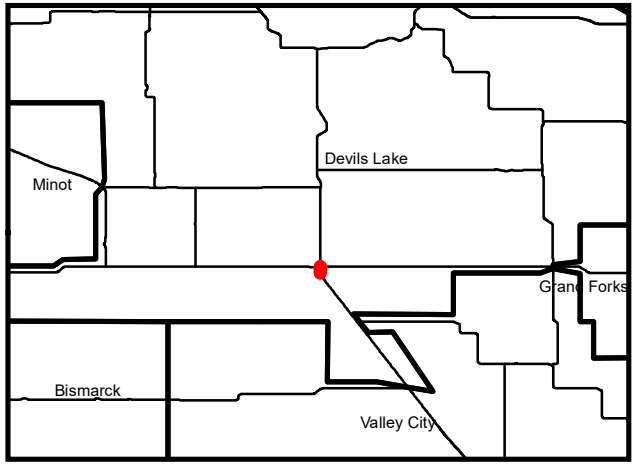
Jared J. Loegering, P.E.

05/10/2018
Date

# Linear Soils Survey and Recommendations

**Project: NH-3-052(049)222**
**PCN: 21918**
**Scope: Major Rehabilitation - PCC**
**Length: 1.003 Miles**
**Location: Jct ND 200/US 281 to 7th St. S**



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Appendix B – Pavement Evaluation Log
Appendix C – Boring Locations
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Appendix E – Lab Results

## Introduction

Location: US Highway 52, Jct. ND 200/US 281 to 7th St. S
Reference Points: 222.719 to 223.403
Project Length: 1.003
Proposed Project Scope: PCC Major Rehabilitation
Investigation Scope: 250' Intervals

## Maintenance Review

Date of Maintenance Review: 5/30/2017
Materials and Research Person Conducting the Review: Jamie Naumann
District Maintenance Person Conducting Review: Keith Idland – Carrington Maintenance Section

The summary of the identified maintenance areas are shown in the following table. The pavement evaluation log can be found in Appendix B.

Table 1 - Identified Maintenance Areas

| Location RP + Feet | Distress Identified | Maintenance Comments | Drilling Required |
|---|---|---|---|
| 222+3796 to 223+2127 | Rutting | Both wheel paths. 0.75' deep. NB and SB. Slurry seal in 2010. Crack spacing approximately 40.0'. | Yes |
| 222+3796 to 223+2127 | Longitudinal Cracks | Right wheel path mostly. NB and SB. | Yes |
| 222+3796 to 223+2127 | Alligator Cracking | Both wheel paths. SB lane appears to be worse than NB. Couple of miscellaneous hand patches. Whole road surface is failing. Dumped up to 20-5 gallon buckets of Permisoil into the Main St. intersection because of the soft material under the road surface. The soft gray material was removed and Permisoil added 6 years ago. | Yes |

## Summary of Soil Investigation

The investigation consisted of 18 borings to a depth of 10' along the project limits. Maps of the boring locations are shown in Appendix C. The lab results are included in Appendix E.

## Summary of Soil Analysis

The majority of the soils are lean clays with AASHTO classifications of A-6. These soils have on average a maximum dry density of approximately 128.5 lb/ft$^3$ and an optimum water content of approximately 9.5%. The in-place moistures of the soils are on average 0% to 16% over optimum.

### Soil Sample Distribution

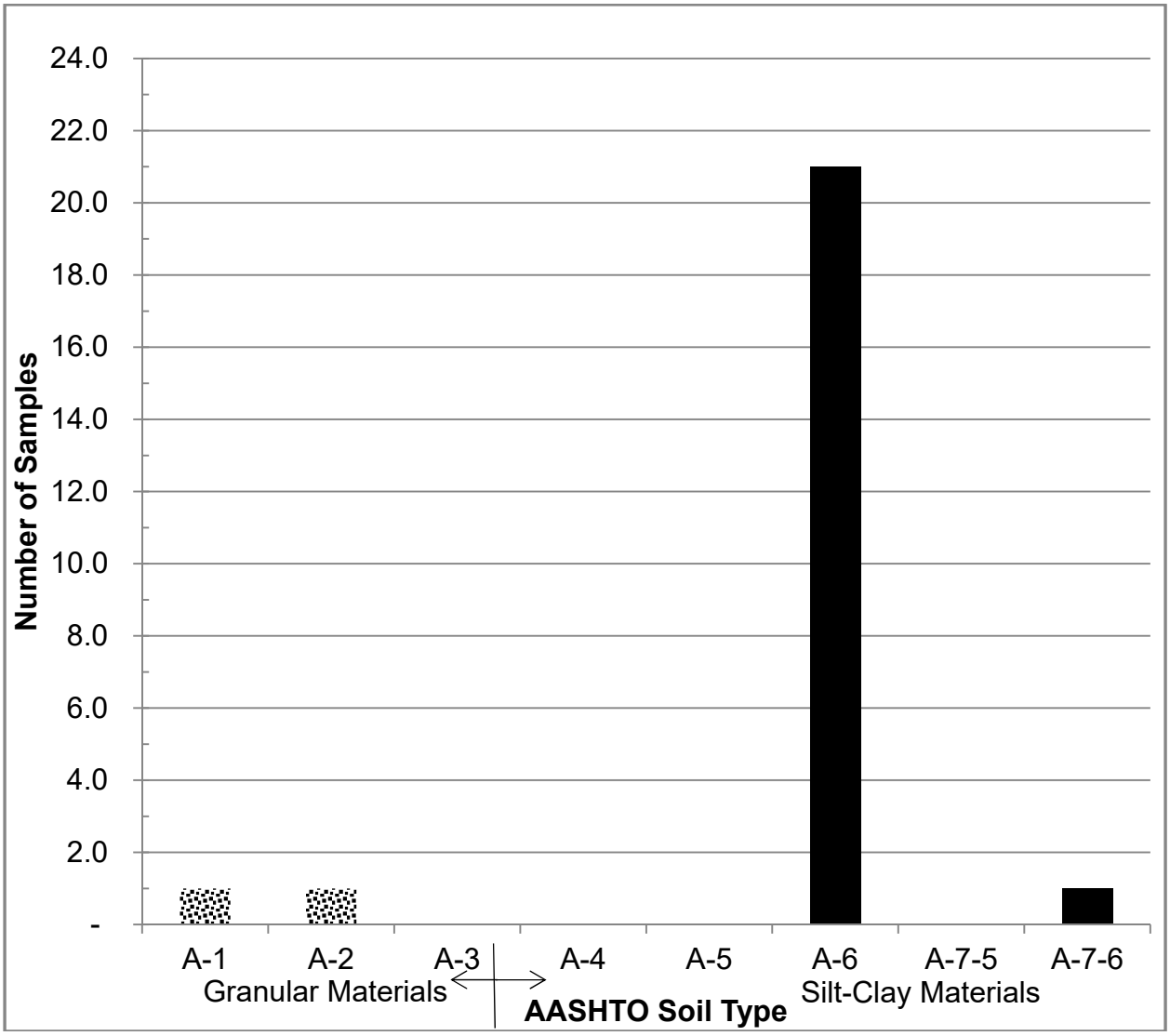



Figure 1 - Soil Sample Distribution

## Design Recommendations

**Project Limits – 222+3796 to 223+2127:** The existing asphalt pavement is rutting and has alligator and longitudinal cracking. The proposed project scope of PCC major rehabilitation should improve these issues.

## Design Information

**Compaction Method:** T-180

**Subgrade Prep:** The signed documented CATEX states the proposed project will not disturb the existing subgrade thus subgrade preparation is not recommended.

**Subcut:** None

**Drainage:** None

## 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 AND FROST SUSCEPTIBILITY

## AASHTO Soil 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%)

## Frost Susceptibility Index (Bases on US Army Corps of Engineers)

| Frost Class | Frost Susceptibility | Soil Type | Percent Finer than 0.02 mm by weight % |
|---|---|---|---|
| F1 | Negligible to Low | • Gravely Soils | 3 – 10 |
| F2 | Low to Medium | • Gravely Soils<br>• Sands | 10 – 20<br>3 – 15 |
| F3 | High | • Gravelly Soils<br>• Sands, except very fine silty sands<br>• Clays, PI > 12 | Greater than 20<br>Greater than 15<br>--- |
| F4 | Very High | • All Silts<br>• Very Fine Silty Sands<br>• Clays, PI > 12<br>• Varved Clays and other fine-grained banded sediments | ---<br>Greater than 15<br>---<br>--- |

# APPENDIX B

# PAVEMENT EVALUATION LOG

# PAVEMENT EVALUATION LOG FOR LINEAR SOIL SURVEY

North Dakota Department of Transportation, Materials & Research
SFN 60472 (9-2013)

Sheet 1 of 1

| Project Number | PCN | Date of Survey |
|---|---|---|
| NH-3-052(049)222 | 21918 | 5/30/2017 |

| Section Maintenance Contact | Completed By |
|---|---|
| Keith Idland | Jamie Naumann |

| Highway Reference Points | Surface Type |
|---|---|
| 222+3796 to 223+2127 | Asphalt |

| Location | Pavement Distress | Description | Maintenance Comment | Picture Number | Drilling Required |
|---|---|---|---|---|---|
| 222+3796 to 223+2127 | Rutting | Both wheel paths. 0.75' deep. NB and SB. | Slurry seal in 2010. Crack spacing approximately 40.0'. | 1-12 | Yes |
| 222+3796 to 223+2127 | Longitude Cracks | Right wheel path mostly. NB and SB. | | 1-12 | Yes |
| 222+3796 to 223+2127 | Aligator Cracking | Both wheel paths. SB lane appears to be worse than NB. Couple of miscellaneous hand patches. Pics 6 abd 8. | See comments for additional information. | 1-12 | Yes |
| | Select One | | | | Select One |
| | Select One | | | | Select One |
| | Select One | | | | Select One |
| | Select One | | | | Select One |
| | Select One | | | | Select One |
| | Select One | | | | Select One |

Comments

Met with Kieth Idland and he indicated the whole road surface is failing. Dumping up to 20 5 gallon buckets of Permisoil into the Main St. intersection because of the soft material under the road surface. The soft gray material was removed and Permisiol added several 6 years ago.

**Photo 1**

**Photo 2**

**Photo 3**

**Photo 4**

**Photo 5**

**Photo 6**

**Photo 7**

**Photo 8**

**Photo 9**

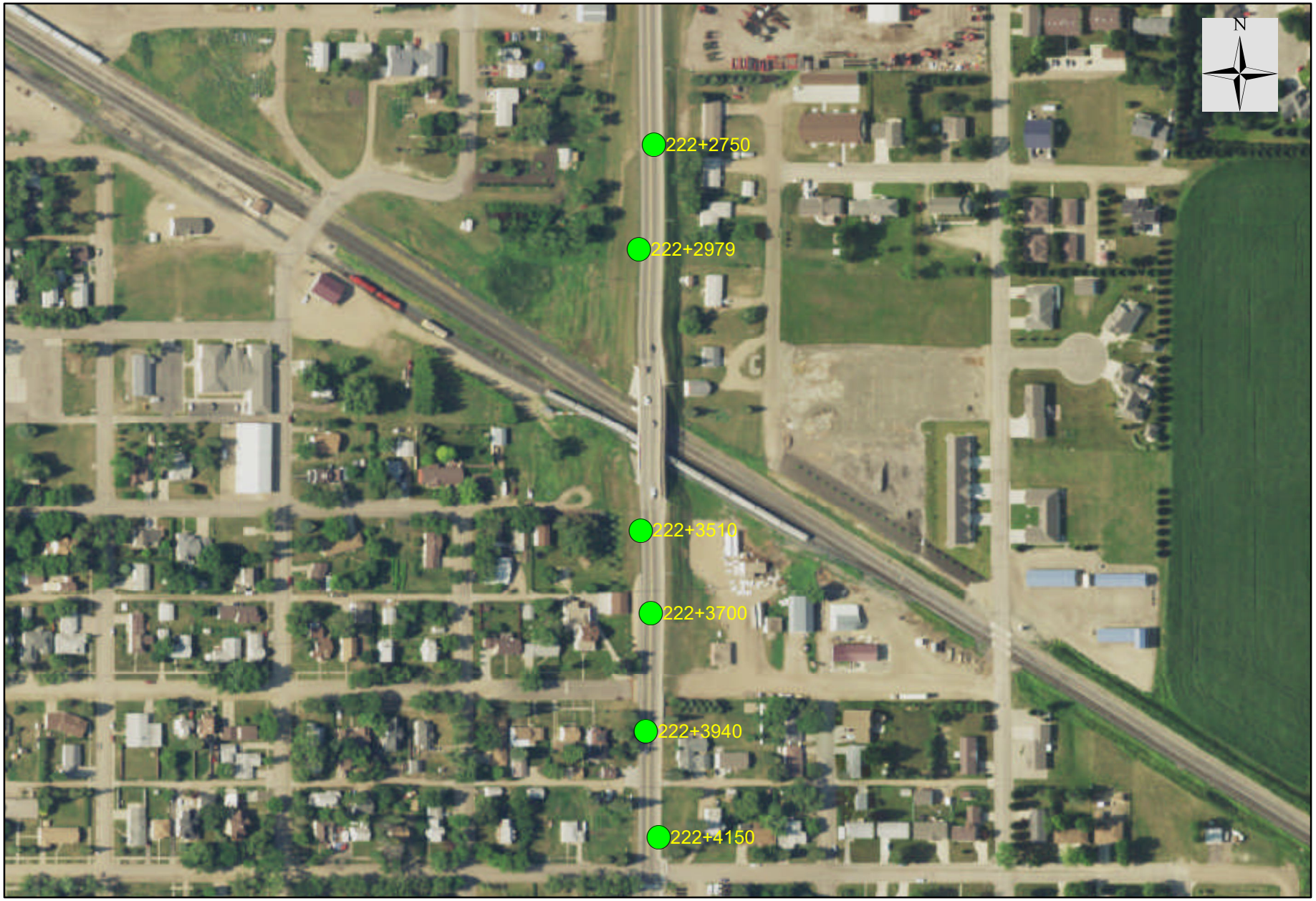
**Photo 10**

**Photo 11**

**Photo 12**

# APPENDIX C

# BORING LOCATIONS

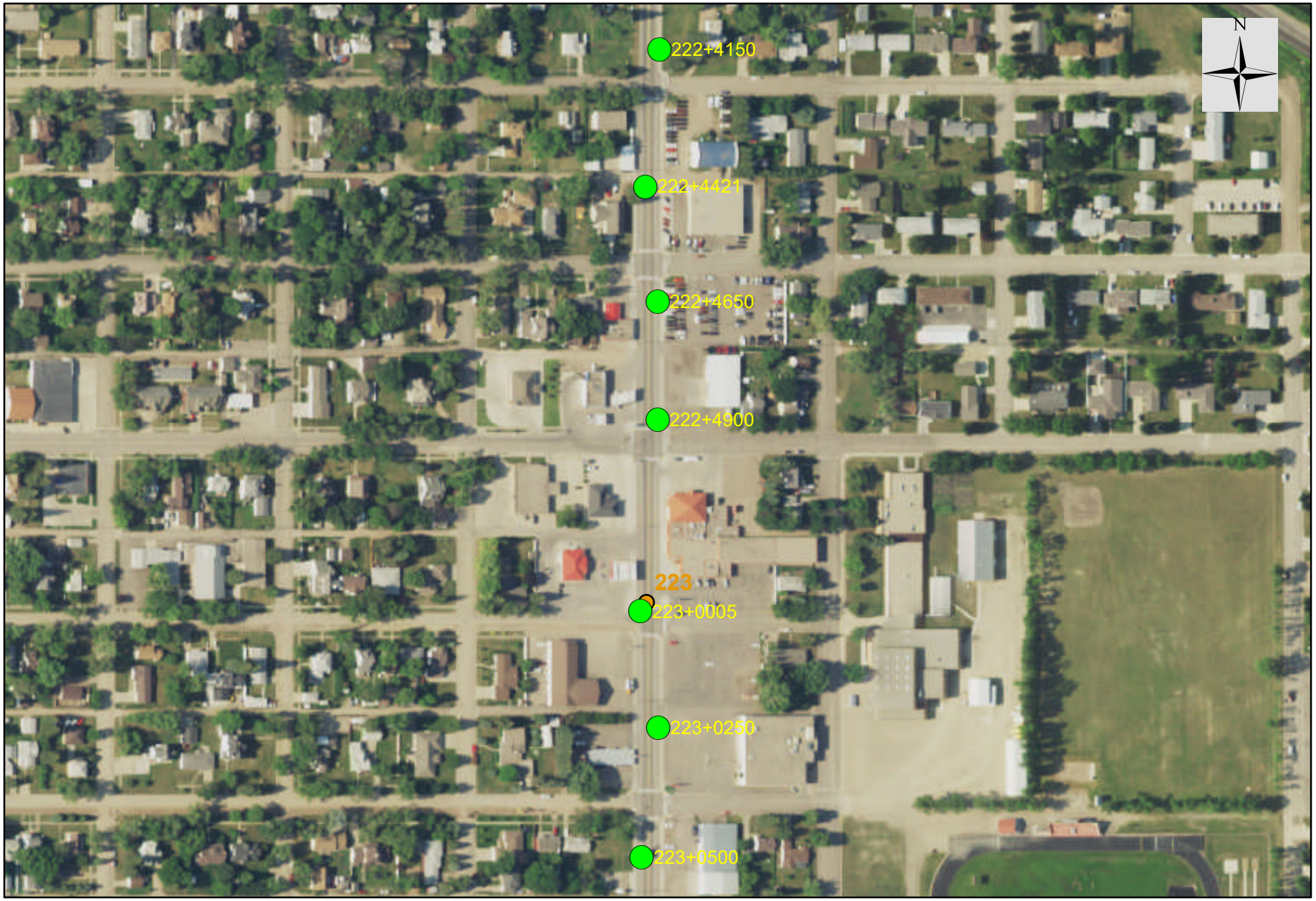



0 500 1,000 Feet

**Legend**

- Reference Point
- Boring Locations

Project Number: NH-3-052(049)222

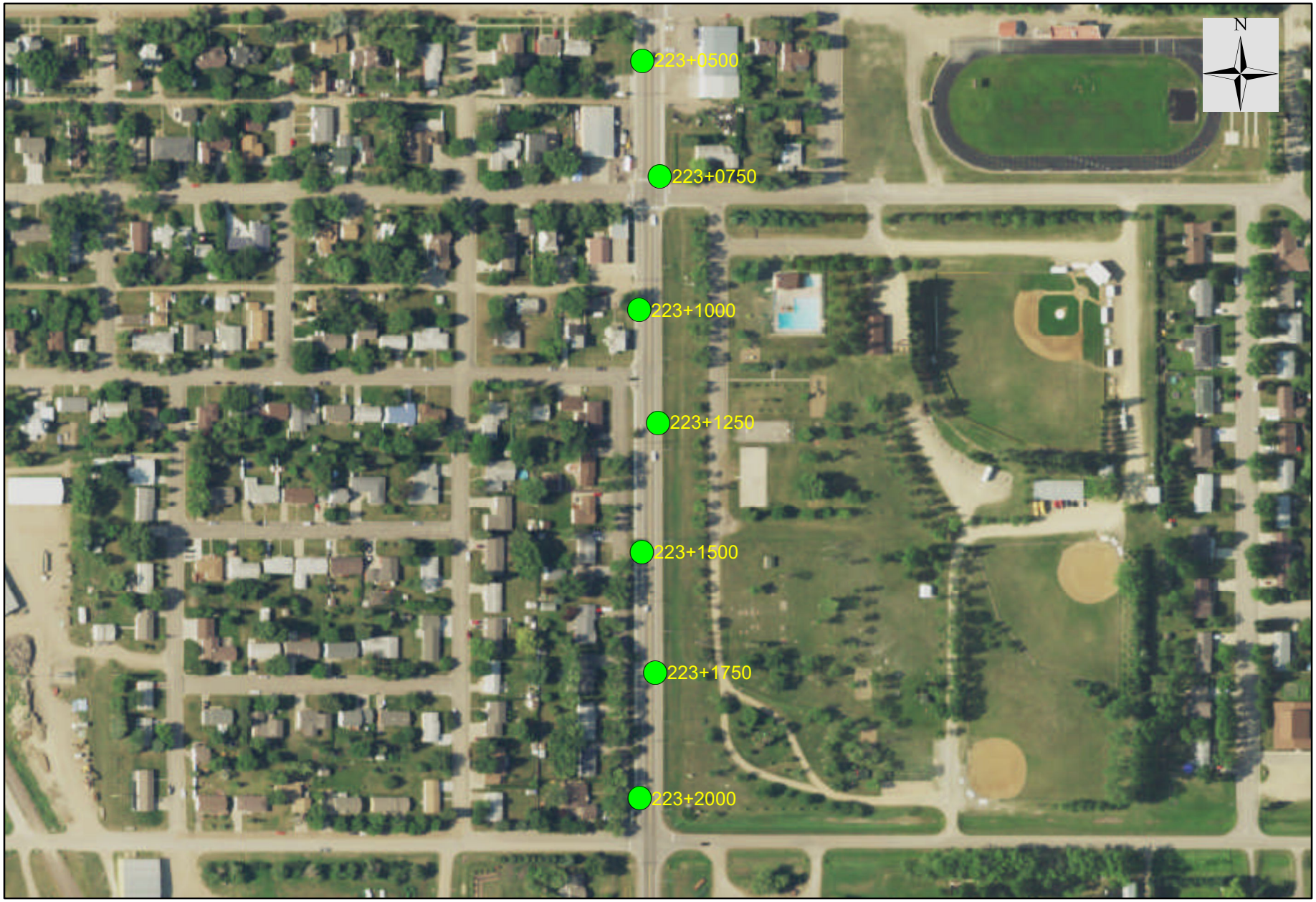



0 500 1,000 Feet

## Legend

- Reference Point
- Boring Locations

Project Number: NH-3-052(049)222




**Legend**

- Reference Point
- Boring Locations

0 500 1,000 Feet

Project Number: NH-3-052(049)222

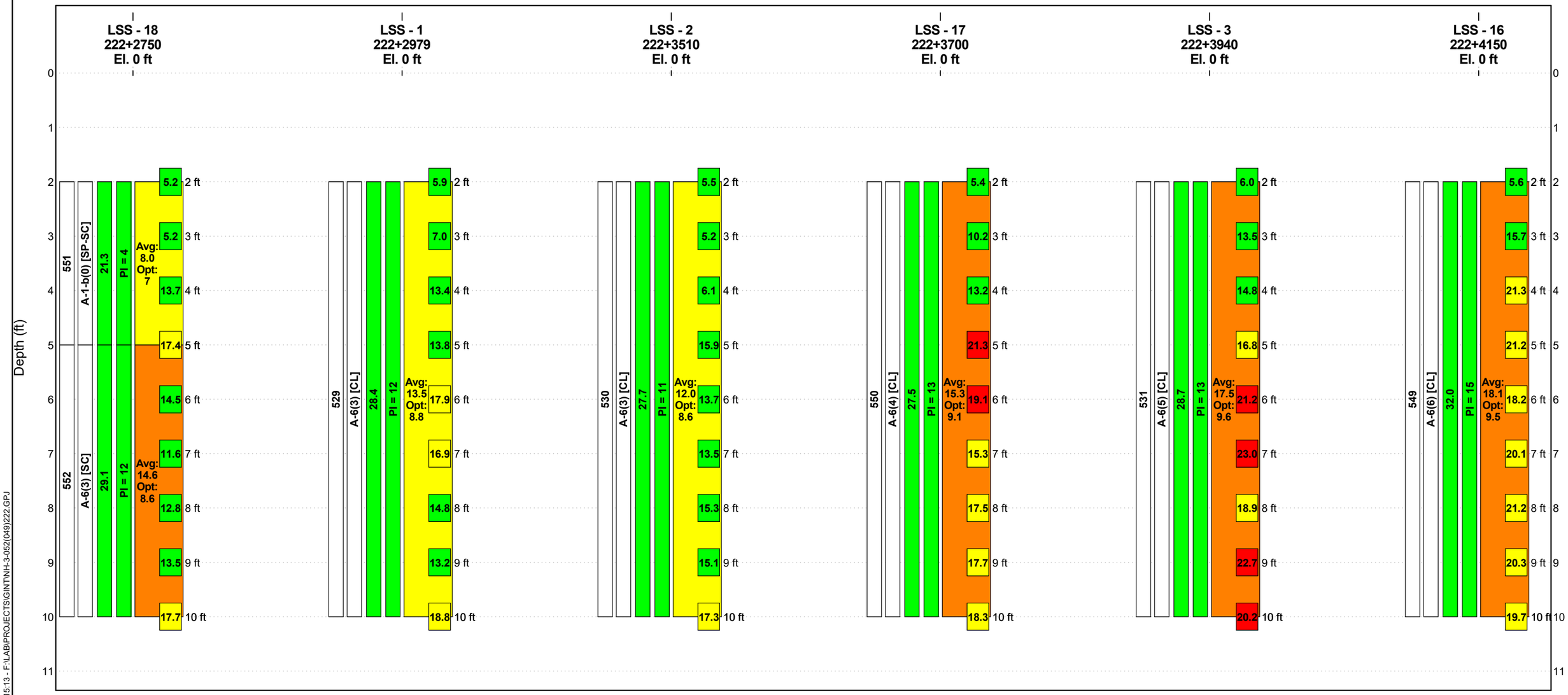
# APPENDIX D

# SUMMARY OF SOILS ANALYSIS

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

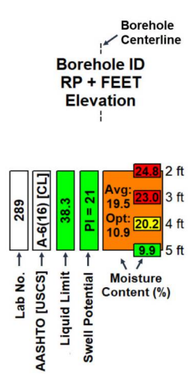
**PROJECT NUMBER** NH-3-052(049)222 **PCN** 21918

**LOCATION** Foster County

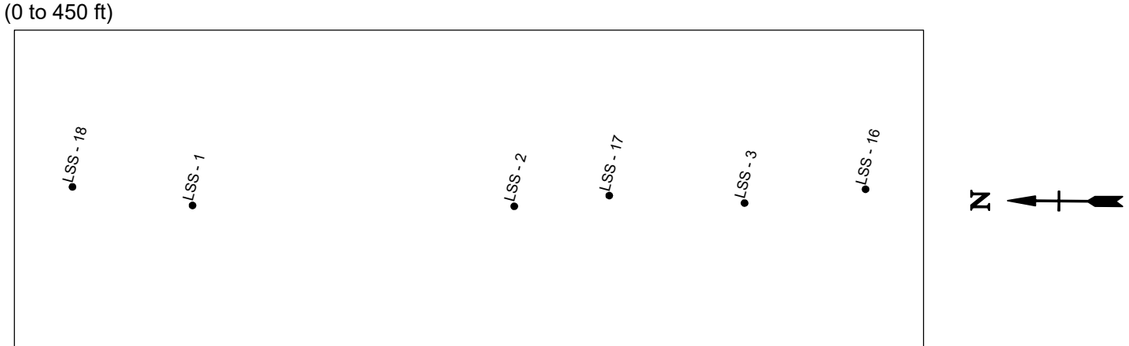



Boreholes Equally Spaced (0 to 450 ft)

## 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 |

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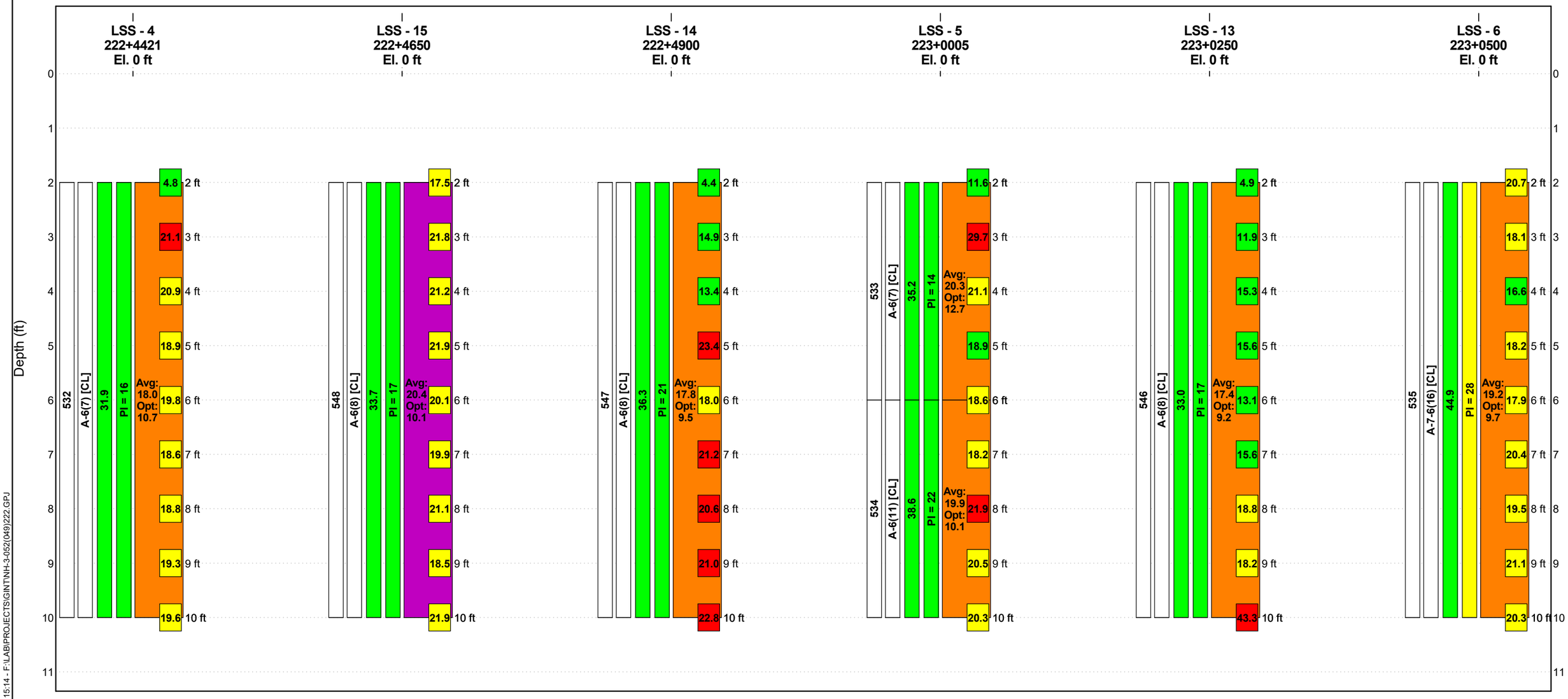
NORTH DAKOTA DEPARTMENT OF TRANSPORATION
300 AIRPORT ROAD
BISMARCK, ND 58504

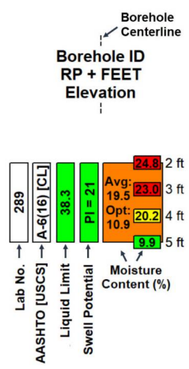
**PROJECT NUMBER** NH-3-052(049)222 **PCN** 21918

**LOCATION** Foster County

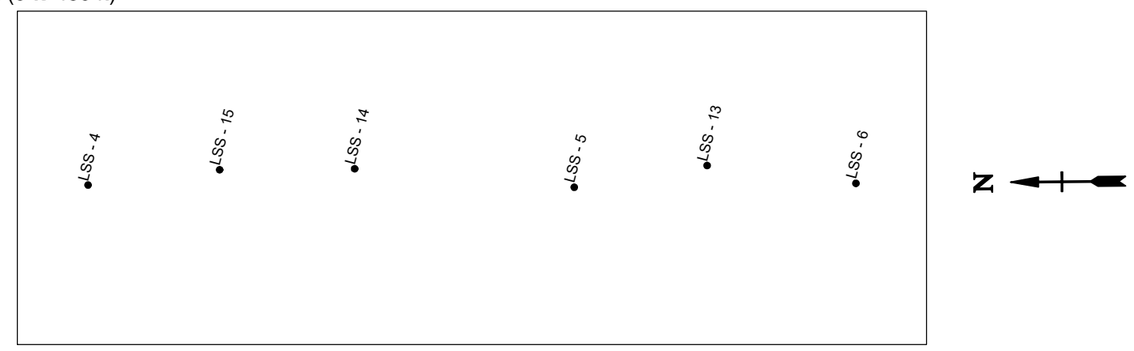



Boreholes Equally Spaced (0 to 450 ft)

## 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 |

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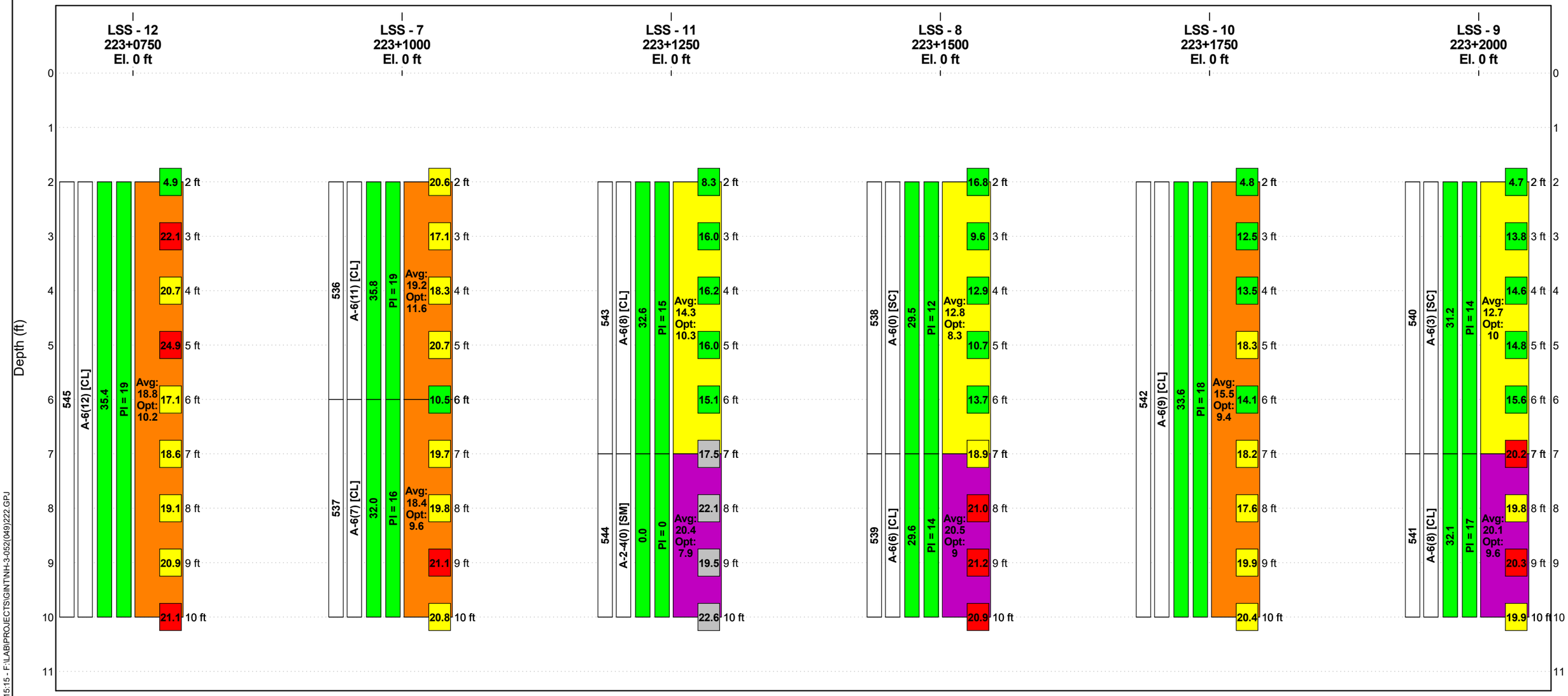
NORTH DAKOTA DEPARTMENT OF TRANSPORATION
300 AIRPORT ROAD
BISMARCK, ND 58504

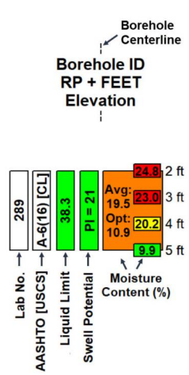
**PROJECT NUMBER** NH-3-052(049)222 **PCN** 21918

**LOCATION** Foster County

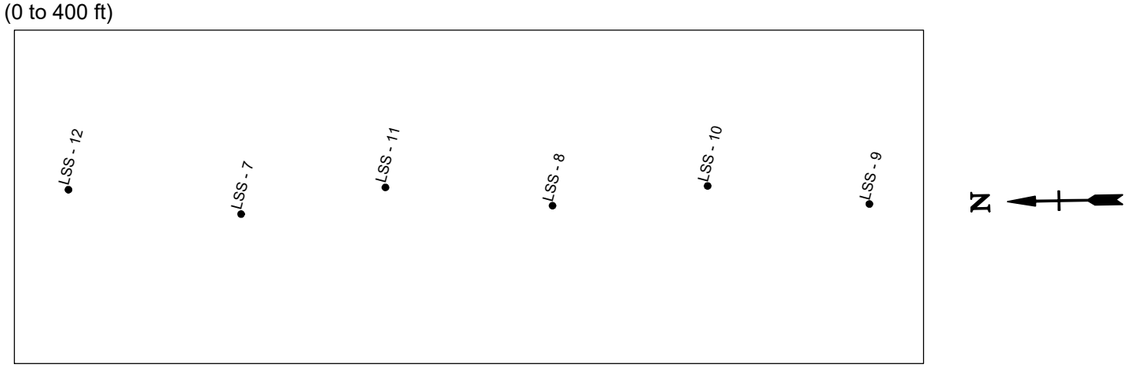



Boreholes Equally Spaced (0 to 400 ft)

## 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 |

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# APPENDIX E

# LAB RESULTS

# SUMMARY OF LABORATORY RESULTS



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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918

| Borehole | Depth | Liquid Limit | Plastic Limit | Plasticity Index | Maximum Size (mm) | %<#200 Sieve | AASHTO Classification | USCS Class-ification | Water Content (%) | Avg. Water Content (%) | Dry Density (pcf) | Satur-ation (%) | Void Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSS - 1 | 2.0 | 28 | 16 | 12 | 25 | 53 | A-6 (3) | CL | 5.9 | 13.5 | | | |
| LSS - 1 | 3.0 | | | | | | | | 7.0 | 13.5 | | | |
| LSS - 1 | 4.0 | | | | | | | | 13.4 | 13.5 | | | |
| LSS - 1 | 5.0 | | | | | | | | 13.8 | 13.5 | | | |
| LSS - 1 | 6.0 | | | | | | | | 17.9 | 13.5 | | | |
| LSS - 1 | 7.0 | | | | | | | | 16.9 | 13.5 | | | |
| LSS - 1 | 8.0 | | | | | | | | 14.8 | 13.5 | | | |
| LSS - 1 | 9.0 | | | | | | | | 13.2 | 13.5 | | | |
| LSS - 1 | 10.0 | | | | | | | | 18.8 | 13.5 | | | |
| LSS - 2 | 2.0 | 28 | 17 | 11 | 9.5 | 53 | A-6 (3) | CL | 5.5 | 12.0 | | | |
| LSS - 2 | 3.0 | | | | | | | | 5.2 | 12.0 | | | |
| LSS - 2 | 4.0 | | | | | | | | 6.1 | 12.0 | | | |
| LSS - 2 | 5.0 | | | | | | | | 15.9 | 12.0 | | | |
| LSS - 2 | 6.0 | | | | | | | | 13.7 | 12.0 | | | |
| LSS - 2 | 7.0 | | | | | | | | 13.5 | 12.0 | | | |
| LSS - 2 | 8.0 | | | | | | | | 15.3 | 12.0 | | | |
| LSS - 2 | 9.0 | | | | | | | | 15.1 | 12.0 | | | |
| LSS - 2 | 10.0 | | | | | | | | 17.3 | 12.0 | | | |
| LSS - 3 | 2.0 | 29 | 15 | 14 | 9.5 | 59 | A-6 (5) | CL | 6.0 | 17.5 | | | |
| LSS - 3 | 3.0 | | | | | | | | 13.5 | 17.5 | | | |
| LSS - 3 | 4.0 | | | | | | | | 14.8 | 17.5 | | | |
| LSS - 3 | 5.0 | | | | | | | | 16.8 | 17.5 | | | |
| LSS - 3 | 6.0 | | | | | | | | 21.2 | 17.5 | | | |
| LSS - 3 | 7.0 | | | | | | | | 23.0 | 17.5 | | | |
| LSS - 3 | 8.0 | | | | | | | | 18.9 | 17.5 | | | |
| LSS - 3 | 9.0 | | | | | | | | 22.7 | 17.5 | | | |
| LSS - 3 | 10.0 | | | | | | | | 20.2 | 17.5 | | | |
| LSS - 4 | 2.0 | 32 | 16 | 16 | 9.5 | 61 | A-6 (7) | CL | 4.8 | 18.0 | | | |
| LSS - 4 | 3.0 | | | | | | | | 21.1 | 18.0 | | | |
| LSS - 4 | 4.0 | | | | | | | | 20.9 | 18.0 | | | |
| LSS - 4 | 5.0 | | | | | | | | 18.9 | 18.0 | | | |
| LSS - 4 | 6.0 | | | | | | | | 19.8 | 18.0 | | | |
| LSS - 4 | 7.0 | | | | | | | | 18.6 | 18.0 | | | |
| LSS - 4 | 8.0 | | | | | | | | 18.8 | 18.0 | | | |
| LSS - 4 | 9.0 | | | | | | | | 19.3 | 18.0 | | | |
| LSS - 4 | 10.0 | | | | | | | | 19.6 | 18.0 | | | |
| LSS - 5 | 2.0 | 35 | 21 | 14 | 25 | 66 | A-6 (7) | CL | 11.6 | 20.3 | | | |
| LSS - 5 | 3.0 | | | | | | | | 29.7 | 20.3 | | | |
| LSS - 5 | 4.0 | | | | | | | | 21.1 | 20.3 | | | |
| LSS - 5 | 5.0 | | | | | | | | 18.9 | 20.3 | | | |
| LSS - 5 | 6.0 | 39 | 16 | 23 | 9.5 | 62 | A-6 (11) | CL | 18.6 | 19.9 | | | |
| LSS - 5 | 7.0 | | | | | | | | 18.2 | 19.9 | | | |
| LSS - 5 | 8.0 | | | | | | | | 21.9 | 19.9 | | | |

# SUMMARY OF LABORATORY RESULTS



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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918

| Borehole | Depth | Liquid Limit | Plastic Limit | Plasticity Index | Maximum Size (mm) | %<#200 Sieve | AASHTO Classification | USCS Class-ification | Water Content (%) | Avg. Water Content (%) | Dry Density (pcf) | Satur-ation (%) | Void Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSS - 5 | 9.0 | | | | | | | | 20.5 | 19.9 | | | |
| LSS - 5 | 10.0 | | | | | | | | 20.3 | 19.9 | | | |
| LSS - 6 | 2.0 | 45 | 17 | 28 | 25 | 65 | A-7-6 (16) | CL | 20.7 | 19.2 | | | |
| LSS - 6 | 3.0 | | | | | | | | 18.1 | 19.2 | | | |
| LSS - 6 | 4.0 | | | | | | | | 16.6 | 19.2 | | | |
| LSS - 6 | 5.0 | | | | | | | | 18.2 | 19.2 | | | |
| LSS - 6 | 6.0 | | | | | | | | 17.9 | 19.2 | | | |
| LSS - 6 | 7.0 | | | | | | | | 20.4 | 19.2 | | | |
| LSS - 6 | 8.0 | | | | | | | | 19.5 | 19.2 | | | |
| LSS - 6 | 9.0 | | | | | | | | 21.1 | 19.2 | | | |
| LSS - 6 | 10.0 | | | | | | | | 20.3 | 19.2 | | | |
| LSS - 7 | 2.0 | 36 | 17 | 19 | 9.5 | 68 | A-6 (11) | CL | 20.6 | 19.2 | | | |
| LSS - 7 | 3.0 | | | | | | | | 17.1 | 19.2 | | | |
| LSS - 7 | 4.0 | | | | | | | | 18.3 | 19.2 | | | |
| LSS - 7 | 5.0 | | | | | | | | 20.7 | 19.2 | | | |
| LSS - 7 | 6.0 | 32 | 16 | 16 | 9.5 | 63 | A-6 (7) | CL | 10.5 | 18.4 | | | |
| LSS - 7 | 7.0 | | | | | | | | 19.7 | 18.4 | | | |
| LSS - 7 | 8.0 | | | | | | | | 19.8 | 18.4 | | | |
| LSS - 7 | 9.0 | | | | | | | | 21.1 | 18.4 | | | |
| LSS - 7 | 10.0 | | | | | | | | 20.8 | 18.4 | | | |
| LSS - 8 | 2.0 | 29 | 18 | 11 | 25 | 36 | A-6 (0) | SC | 16.8 | 12.8 | | | |
| LSS - 8 | 3.0 | | | | | | | | 9.6 | 12.8 | | | |
| LSS - 8 | 4.0 | | | | | | | | 12.9 | 12.8 | | | |
| LSS - 8 | 5.0 | | | | | | | | 10.7 | 12.8 | | | |
| LSS - 8 | 6.0 | | | | | | | | 13.7 | 12.8 | | | |
| LSS - 8 | 7.0 | 30 | 15 | 15 | 25 | 60 | A-6 (6) | CL | 18.9 | 20.5 | | | |
| LSS - 8 | 8.0 | | | | | | | | 21.0 | 20.5 | | | |
| LSS - 8 | 9.0 | | | | | | | | 21.2 | 20.5 | | | |
| LSS - 8 | 10.0 | | | | | | | | 20.9 | 20.5 | | | |
| LSS - 9 | 2.0 | 31 | 17 | 14 | 25 | 47 | A-6 (3) | SC | 4.7 | 12.7 | | | |
| LSS - 9 | 3.0 | | | | | | | | 13.8 | 12.7 | | | |
| LSS - 9 | 4.0 | | | | | | | | 14.6 | 12.7 | | | |
| LSS - 9 | 5.0 | | | | | | | | 14.8 | 12.7 | | | |
| LSS - 9 | 6.0 | | | | | | | | 15.6 | 12.7 | | | |
| LSS - 9 | 7.0 | 32 | 15 | 17 | 9.5 | 63 | A-6 (8) | CL | 20.2 | 20.1 | | | |
| LSS - 9 | 8.0 | | | | | | | | 19.8 | 20.1 | | | |
| LSS - 9 | 9.0 | | | | | | | | 20.3 | 20.1 | | | |
| LSS - 9 | 10.0 | | | | | | | | 19.9 | 20.1 | | | |
| LSS - 10 | 2.0 | 34 | 16 | 18 | 25 | 65 | A-6 (9) | CL | 4.8 | 15.5 | | | |
| LSS - 10 | 3.0 | | | | | | | | 12.5 | 15.5 | | | |
| LSS - 10 | 4.0 | | | | | | | | 13.5 | 15.5 | | | |
| LSS - 10 | 5.0 | | | | | | | | 18.3 | 15.5 | | | |
| LSS - 10 | 6.0 | | | | | | | | 14.1 | 15.5 | | | |

# SUMMARY OF LABORATORY RESULTS



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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918

| Borehole | Depth | Liquid Limit | Plastic Limit | Plasticity Index | Maximum Size (mm) | %<#200 Sieve | AASHTO Classification | USCS Class-ification | Water Content (%) | Avg. Water Content (%) | Dry Density (pcf) | Satur-ation (%) | Void Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSS - 10 | 7.0 | | | | | | | | 18.2 | 15.5 | | | |
| LSS - 10 | 8.0 | | | | | | | | 17.6 | 15.5 | | | |
| LSS - 10 | 9.0 | | | | | | | | 19.9 | 15.5 | | | |
| LSS - 10 | 10.0 | | | | | | | | 20.4 | 15.5 | | | |
| LSS - 11 | 2.0 | 33 | 18 | 15 | 9.5 | 68 | A-6 (8) | CL | 8.3 | 14.3 | | | |
| LSS - 11 | 3.0 | | | | | | | | 16.0 | 14.3 | | | |
| LSS - 11 | 4.0 | | | | | | | | 16.2 | 14.3 | | | |
| LSS - 11 | 5.0 | | | | | | | | 16.0 | 14.3 | | | |
| LSS - 11 | 6.0 | | | | | | | | 15.1 | 14.3 | | | |
| LSS - 11 | 7.0 | NP | NP | NP | 9.5 | 35 | A-2-4 (0) | SM | 17.5 | 20.4 | | | |
| LSS - 11 | 8.0 | | | | | | | | 22.1 | 20.4 | | | |
| LSS - 11 | 9.0 | | | | | | | | 19.5 | 20.4 | | | |
| LSS - 11 | 10.0 | | | | | | | | 22.6 | 20.4 | | | |
| LSS - 12 | 2.0 | 35 | 16 | 19 | 9.5 | 72 | A-6 (12) | CL | 4.9 | 18.8 | | | |
| LSS - 12 | 3.0 | | | | | | | | 22.1 | 18.8 | | | |
| LSS - 12 | 4.0 | | | | | | | | 20.7 | 18.8 | | | |
| LSS - 12 | 5.0 | | | | | | | | 24.9 | 18.8 | | | |
| LSS - 12 | 6.0 | | | | | | | | 17.1 | 18.8 | | | |
| LSS - 12 | 7.0 | | | | | | | | 18.6 | 18.8 | | | |
| LSS - 12 | 8.0 | | | | | | | | 19.1 | 18.8 | | | |
| LSS - 12 | 9.0 | | | | | | | | 20.9 | 18.8 | | | |
| LSS - 12 | 10.0 | | | | | | | | 21.1 | 18.8 | | | |
| LSS - 13 | 2.0 | 33 | 16 | 17 | 9.5 | 61 | A-6 (8) | CL | 4.9 | 17.4 | | | |
| LSS - 13 | 3.0 | | | | | | | | 11.9 | 17.4 | | | |
| LSS - 13 | 4.0 | | | | | | | | 15.3 | 17.4 | | | |
| LSS - 13 | 5.0 | | | | | | | | 15.6 | 17.4 | | | |
| LSS - 13 | 6.0 | | | | | | | | 13.1 | 17.4 | | | |
| LSS - 13 | 7.0 | | | | | | | | 15.6 | 17.4 | | | |
| LSS - 13 | 8.0 | | | | | | | | 18.8 | 17.4 | | | |
| LSS - 13 | 9.0 | | | | | | | | 18.2 | 17.4 | | | |
| LSS - 13 | 10.0 | | | | | | | | 43.3 | 17.4 | | | |
| LSS - 14 | 2.0 | 36 | 15 | 21 | 9.5 | 55 | A-6 (8) | CL | 4.4 | 17.8 | | | |
| LSS - 14 | 3.0 | | | | | | | | 14.9 | 17.8 | | | |
| LSS - 14 | 4.0 | | | | | | | | 13.4 | 17.8 | | | |
| LSS - 14 | 5.0 | | | | | | | | 23.4 | 17.8 | | | |
| LSS - 14 | 6.0 | | | | | | | | 18.0 | 17.8 | | | |
| LSS - 14 | 7.0 | | | | | | | | 21.2 | 17.8 | | | |
| LSS - 14 | 8.0 | | | | | | | | 20.6 | 17.8 | | | |
| LSS - 14 | 9.0 | | | | | | | | 21.0 | 17.8 | | | |
| LSS - 14 | 10.0 | | | | | | | | 22.8 | 17.8 | | | |
| LSS - 15 | 2.0 | 34 | 17 | 17 | 9.5 | 62 | A-6 (8) | CL | 17.5 | 20.4 | | | |
| LSS - 15 | 3.0 | | | | | | | | 21.8 | 20.4 | | | |
| LSS - 15 | 4.0 | | | | | | | | 21.2 | 20.4 | | | |

# SUMMARY OF LABORATORY RESULTS



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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918

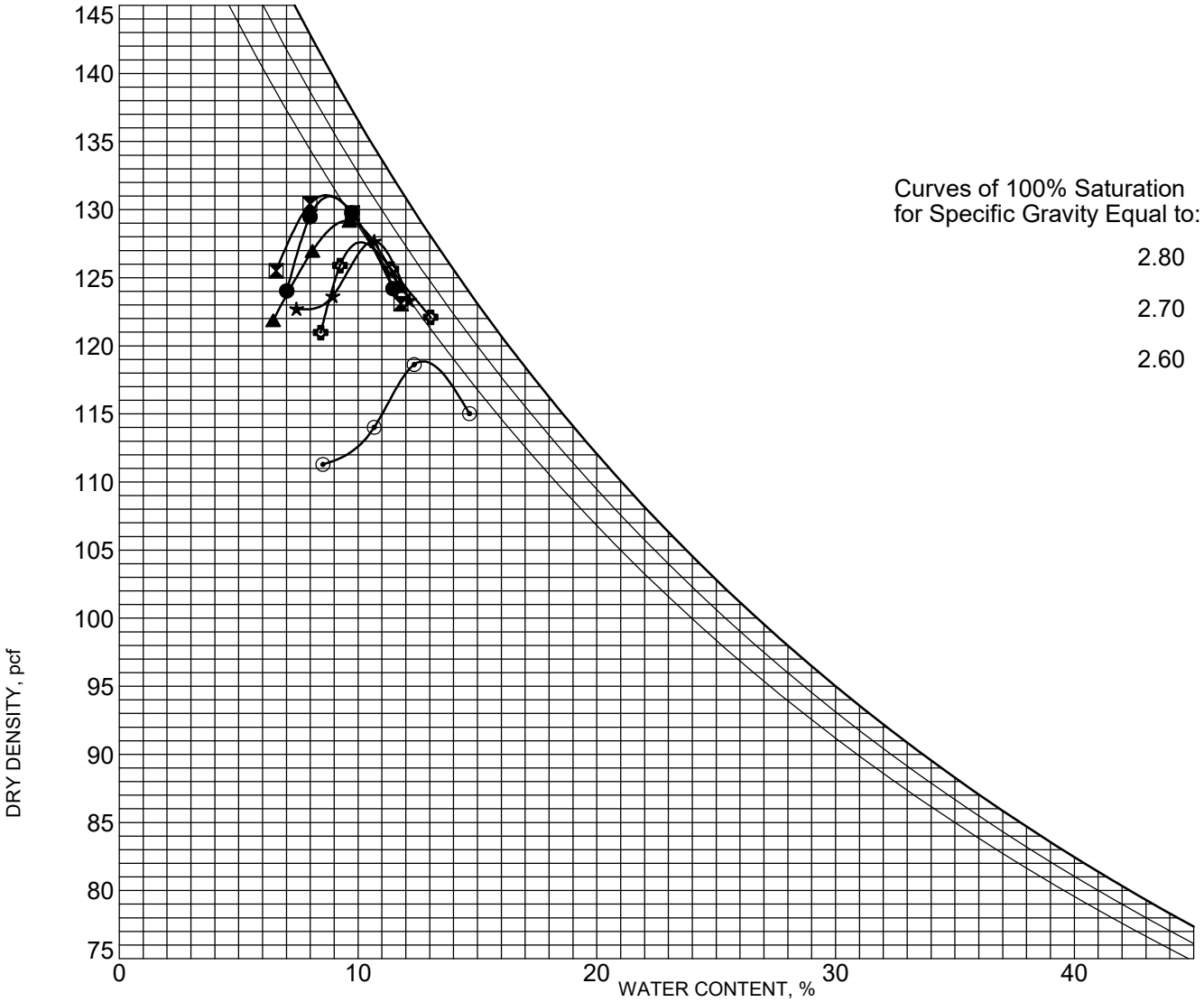
| Borehole | Depth | Liquid Limit | Plastic Limit | Plasticity Index | Maximum Size (mm) | %<#200 Sieve | AASHTO Classification | USCS Class-ification | Water Content (%) | Avg. Water Content (%) | Dry Density (pcf) | Satur-ation (%) | Void Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSS - 15 | 5.0 | | | | | | | | 21.9 | 20.4 | | | |
| LSS - 15 | 6.0 | | | | | | | | 20.1 | 20.4 | | | |
| LSS - 15 | 7.0 | | | | | | | | 19.9 | 20.4 | | | |
| LSS - 15 | 8.0 | | | | | | | | 21.1 | 20.4 | | | |
| LSS - 15 | 9.0 | | | | | | | | 18.5 | 20.4 | | | |
| LSS - 15 | 10.0 | | | | | | | | 21.9 | 20.4 | | | |
| LSS - 16 | 2.0 | 32 | 17 | 15 | 9.5 | 61 | A-6 (6) | CL | 5.6 | 18.1 | | | |
| LSS - 16 | 3.0 | | | | | | | | 15.7 | 18.1 | | | |
| LSS - 16 | 4.0 | | | | | | | | 21.3 | 18.1 | | | |
| LSS - 16 | 5.0 | | | | | | | | 21.2 | 18.1 | | | |
| LSS - 16 | 6.0 | | | | | | | | 18.2 | 18.1 | | | |
| LSS - 16 | 7.0 | | | | | | | | 20.1 | 18.1 | | | |
| LSS - 16 | 8.0 | | | | | | | | 21.2 | 18.1 | | | |
| LSS - 16 | 9.0 | | | | | | | | 20.3 | 18.1 | | | |
| LSS - 16 | 10.0 | | | | | | | | 19.7 | 18.1 | | | |
| LSS - 17 | 2.0 | 27 | 14 | 13 | 25 | 57 | A-6 (4) | CL | 5.4 | 15.3 | | | |
| LSS - 17 | 3.0 | | | | | | | | 10.2 | 15.3 | | | |
| LSS - 17 | 4.0 | | | | | | | | 13.2 | 15.3 | | | |
| LSS - 17 | 5.0 | | | | | | | | 21.3 | 15.3 | | | |
| LSS - 17 | 6.0 | | | | | | | | 19.1 | 15.3 | | | |
| LSS - 17 | 7.0 | | | | | | | | 15.3 | 15.3 | | | |
| LSS - 17 | 8.0 | | | | | | | | 17.5 | 15.3 | | | |
| LSS - 17 | 9.0 | | | | | | | | 17.7 | 15.3 | | | |
| LSS - 17 | 10.0 | | | | | | | | 18.3 | 15.3 | | | |
| LSS - 18 | 2.0 | 21 | 17 | 4 | 25 | 12 | A-1-b (0) | SP-SC | 5.2 | 8.0 | | | |
| LSS - 18 | 3.0 | | | | | | | | 5.2 | 8.0 | | | |
| LSS - 18 | 4.0 | | | | | | | | 13.7 | 8.0 | | | |
| LSS - 18 | 5.0 | 29 | 17 | 12 | 9.5 | 49 | A-6 (3) | SC | 17.4 | 14.6 | | | |
| LSS - 18 | 6.0 | | | | | | | | 14.5 | 14.6 | | | |
| LSS - 18 | 7.0 | | | | | | | | 11.6 | 14.6 | | | |
| LSS - 18 | 8.0 | | | | | | | | 12.8 | 14.6 | | | |
| LSS - 18 | 9.0 | | | | | | | | 13.5 | 14.6 | | | |
| LSS - 18 | 10.0 | | | | | | | | 17.7 | 14.6 | | | |

# MOISTURE-DENSITY RELATIONSHIP

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| | BOREHOLE | DEPTH | AASHTO Classification | USCS Description |
|---|---|---|---|---|
| ● | **LSS - 1** | **2.0** | **A-6 (3)** | **SANDY LEAN CLAY(CL)** |
| ⊠ | **LSS - 2** | **2.0** | **A-6 (3)** | **SANDY LEAN CLAY(CL)** |
| ▲ | **LSS - 3** | **2.0** | **A-6 (5)** | **SANDY LEAN CLAY(CL)** |
| ★ | **LSS - 4** | **2.0** | **A-6 (7)** | **SANDY LEAN CLAY(CL)** |
| ⊙ | **LSS - 5** | **2.0** | **A-6 (7)** | **SANDY LEAN CLAY(CL)** |
| ✿ | **LSS - 5** | **6.0** | **A-6 (11)** | **SANDY LEAN CLAY(CL)** |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 1** | **2.0** | **AASHTO T-180 Method A** | **28** | **16** | **12** | **131.0 PCF** | **8.8 %** |
| ⊠ | **LSS - 2** | **2.0** | **AASHTO T-180 Method A** | **28** | **17** | **11** | **131.1 PCF** | **8.6 %** |
| ▲ | **LSS - 3** | **2.0** | **AASHTO T-180 Method A** | **29** | **15** | **14** | **129.2 PCF** | **9.6 %** |
| ★ | **LSS - 4** | **2.0** | **AASHTO T-180 Method A** | **32** | **16** | **16** | **127.7 PCF** | **10.7 %** |
| ⊙ | **LSS - 5** | **2.0** | **AASHTO T-180 Method A** | **35** | **21** | **14** | **118.9 PCF** | **12.7 %** |
| ✿ | **LSS - 5** | **6.0** | **AASHTO T-180 Method A** | **39** | **16** | **23** | **127.6 PCF** | **10.1 %** |

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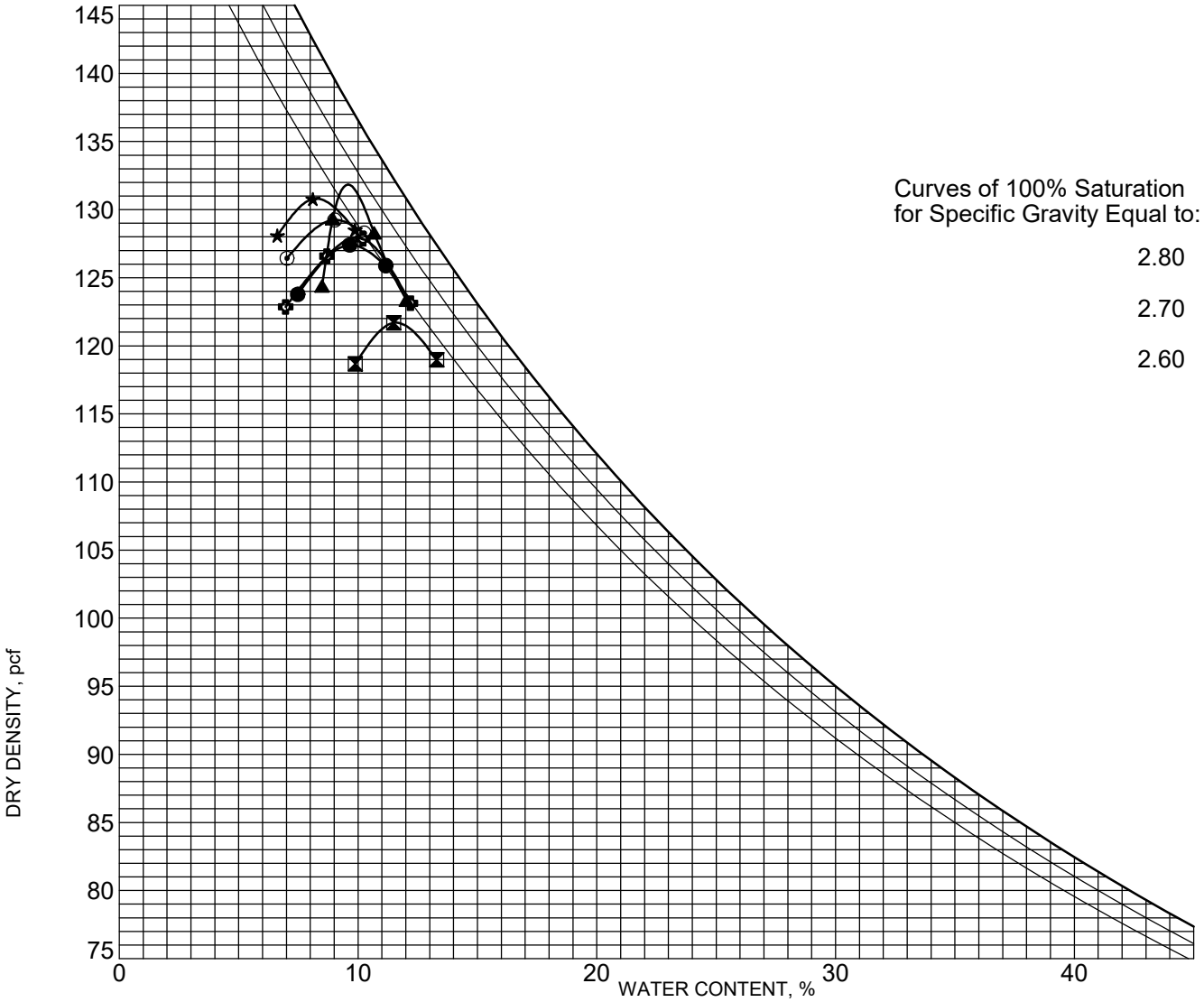
# MOISTURE-DENSITY RELATIONSHIP

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| | BOREHOLE | DEPTH | AASHTO Classification | USCS Description |
|---|---|---|---|---|
| ● | **LSS - 6** | **2.0** | **A-7-6 (16)** | **SANDY LEAN CLAY(CL)** |
| ⊠ | **LSS - 7** | **2.0** | **A-6 (11)** | **SANDY LEAN CLAY(CL)** |
| ▲ | **LSS - 7** | **6.0** | **A-6 (7)** | **SANDY LEAN CLAY(CL)** |
| ★ | **LSS - 8** | **2.0** | **A-6 (0)** | **CLAYEY SAND(SC)** |
| ⊙ | **LSS - 8** | **7.0** | **A-6 (6)** | **SANDY LEAN CLAY(CL)** |
| ✿ | **LSS - 9** | **2.0** | **A-6 (3)** | **CLAYEY SAND(SC)** |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 6** | **2.0** | **AASHTO T-180 Method A** | **45** | **17** | **28** | **127.4 PCF** | **9.7 %** |
| ⊠ | **LSS - 7** | **2.0** | **AASHTO T-180 Method A** | **36** | **17** | **19** | **121.7 PCF** | **11.6 %** |
| ▲ | **LSS - 7** | **6.0** | **AASHTO T-180 Method A** | **32** | **16** | **16** | **131.8 PCF** | **9.6 %** |
| ★ | **LSS - 8** | **2.0** | **AASHTO T-180 Method A** | **29** | **18** | **11** | **130.8 PCF** | **8.3 %** |
| ⊙ | **LSS - 8** | **7.0** | **AASHTO T-180 Method A** | **30** | **15** | **15** | **129.2 PCF** | **9.0 %** |
| ✿ | **LSS - 9** | **2.0** | **AASHTO T-180 Method A** | **31** | **17** | **14** | **127.9 PCF** | **10.0 %** |

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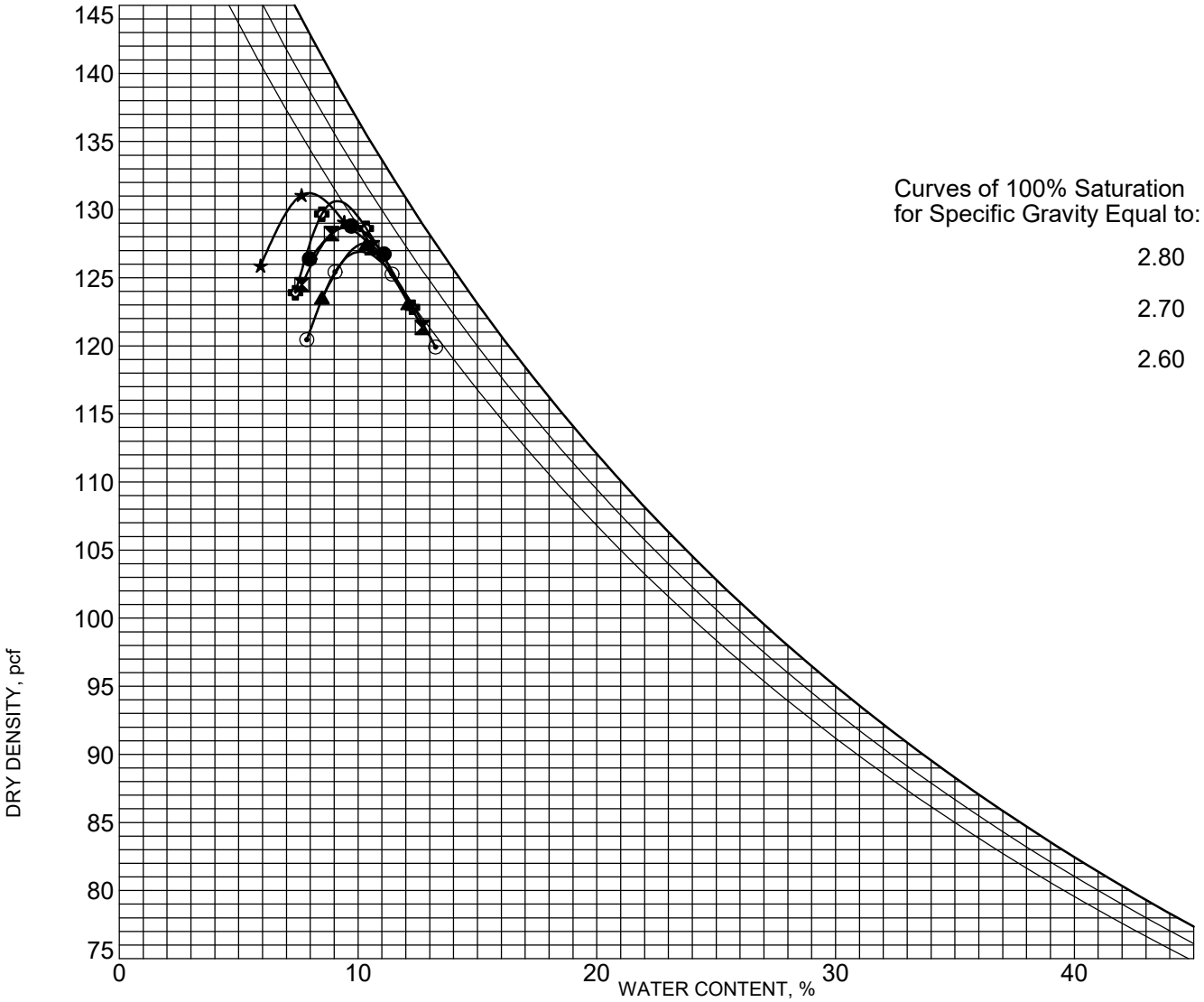
# MOISTURE-DENSITY RELATIONSHIP

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| | BOREHOLE | DEPTH | AASHTO Classification | USCS Description |
|---|---|---|---|---|
| ● | **LSS - 9** | **7.0** | **A-6 (8)** | **SANDY LEAN CLAY(CL)** |
| ⊠ | **LSS - 10** | **2.0** | **A-6 (9)** | **SANDY LEAN CLAY(CL)** |
| ▲ | **LSS - 11** | **2.0** | **A-6 (8)** | **SANDY LEAN CLAY(CL)** |
| ★ | **LSS - 11** | **7.0** | **A-2-4 (0)** | **SILTY SAND(SM)** |
| ⊙ | **LSS - 12** | **2.0** | **A-6 (12)** | **LEAN CLAY with SAND(CL)** |
| ✿ | **LSS - 13** | **2.0** | **A-6 (8)** | **SANDY LEAN CLAY(CL)** |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 9** | **7.0** | **AASHTO T-180 Method A** | **32** | **15** | **17** | **128.8 PCF** | **9.6 %** |
| ⊠ | **LSS - 10** | **2.0** | **AASHTO T-180 Method A** | **34** | **16** | **18** | **128.7 PCF** | **9.4 %** |
| ▲ | **LSS - 11** | **2.0** | **AASHTO T-180 Method A** | **33** | **18** | **15** | **127.5 PCF** | **10.3 %** |
| ★ | **LSS - 11** | **7.0** | **AASHTO T-180 Method A** | **NP** | **NP** | **NP** | **131.2 PCF** | **7.9 %** |
| ⊙ | **LSS - 12** | **2.0** | **AASHTO T-180 Method A** | **35** | **16** | **19** | **126.9 PCF** | **10.2 %** |
| ✿ | **LSS - 13** | **2.0** | **AASHTO T-180 Method A** | **33** | **16** | **17** | **130.6 PCF** | **9.2 %** |

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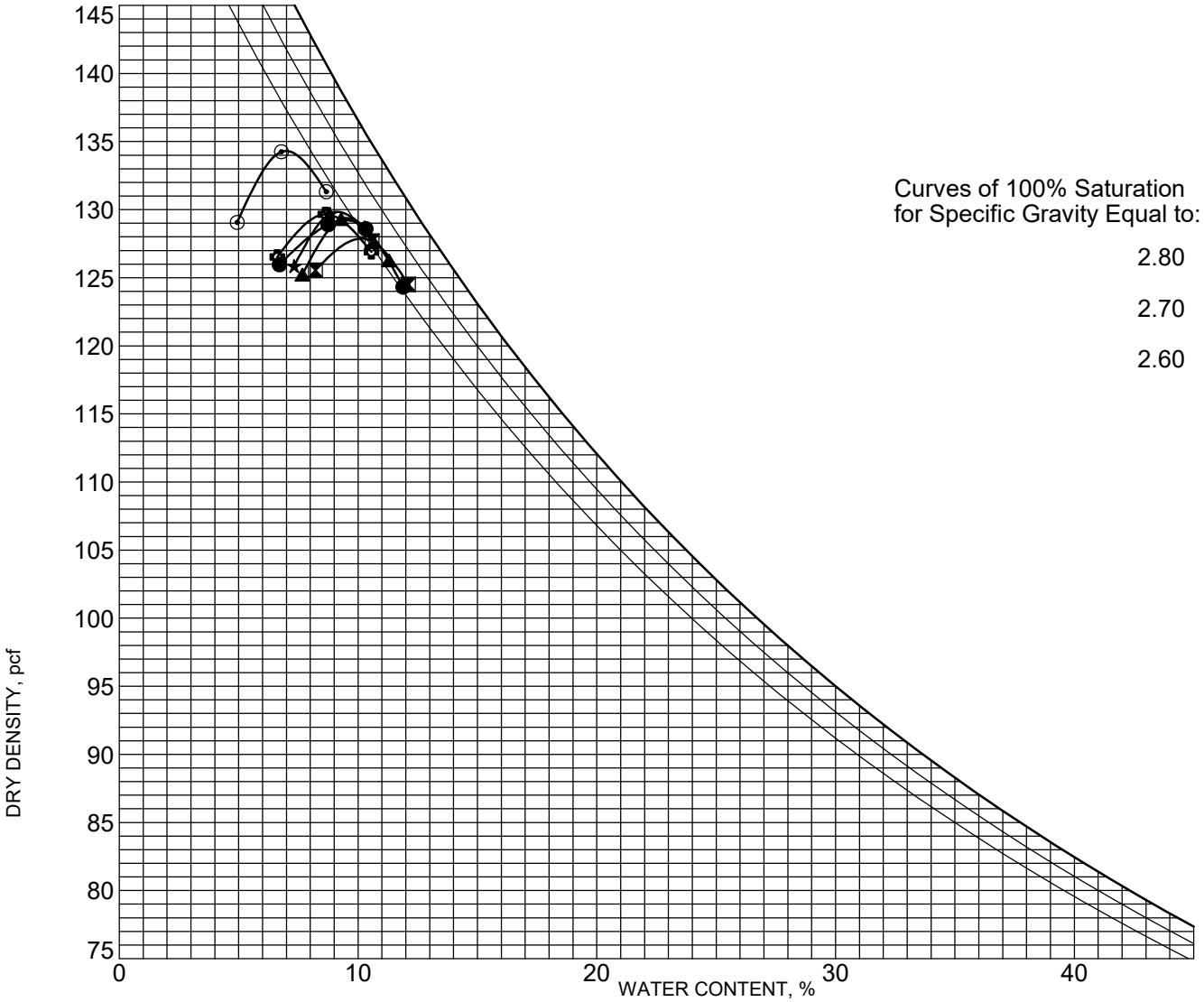
# MOISTURE-DENSITY RELATIONSHIP

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| | BOREHOLE | DEPTH | AASHTO Classification | USCS Description |
|---|---|---|---|---|
| ● | **LSS - 14** | **2.0** | **A-6 (8)** | **SANDY LEAN CLAY(CL)** |
| ⊠ | **LSS - 15** | **2.0** | **A-6 (8)** | **SANDY LEAN CLAY(CL)** |
| ▲ | **LSS - 16** | **2.0** | **A-6 (6)** | **SANDY LEAN CLAY(CL)** |
| ★ | **LSS - 17** | **2.0** | **A-6 (4)** | **SANDY LEAN CLAY(CL)** |
| ⊙ | **LSS - 18** | **2.0** | **A-1-b (0)** | **POORLY GRADED SAND with SILTY CLAY and GRAVEL(SP-SC)** |
| ✿ | **LSS - 18** | **5.0** | **A-6 (3)** | **CLAYEY SAND(SC)** |

| | BOREHOLE | DEPTH | Test Method | LL | PL | PI | Max DD | Optimum WC |
|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 14** | **2.0** | **AASHTO T-180 Method A** | **36** | **15** | **21** | **129.2 PCF** | **9.5 %** |
| ⊠ | **LSS - 15** | **2.0** | **AASHTO T-180 Method A** | **34** | **17** | **17** | **127.9 PCF** | **10.1 %** |
| ▲ | **LSS - 16** | **2.0** | **AASHTO T-180 Method A** | **32** | **17** | **15** | **129.4 PCF** | **9.5 %** |
| ★ | **LSS - 17** | **2.0** | **AASHTO T-180 Method A** | **27** | **14** | **13** | **129.8 PCF** | **9.1 %** |
| ⊙ | **LSS - 18** | **2.0** | **AASHTO T-180 Method A** | **21** | **17** | **4** | **134.3 PCF** | **7.0 %** |
| ✿ | **LSS - 18** | **5.0** | **AASHTO T-180 Method A** | **29** | **17** | **12** | **129.7 PCF** | **8.6 %** |

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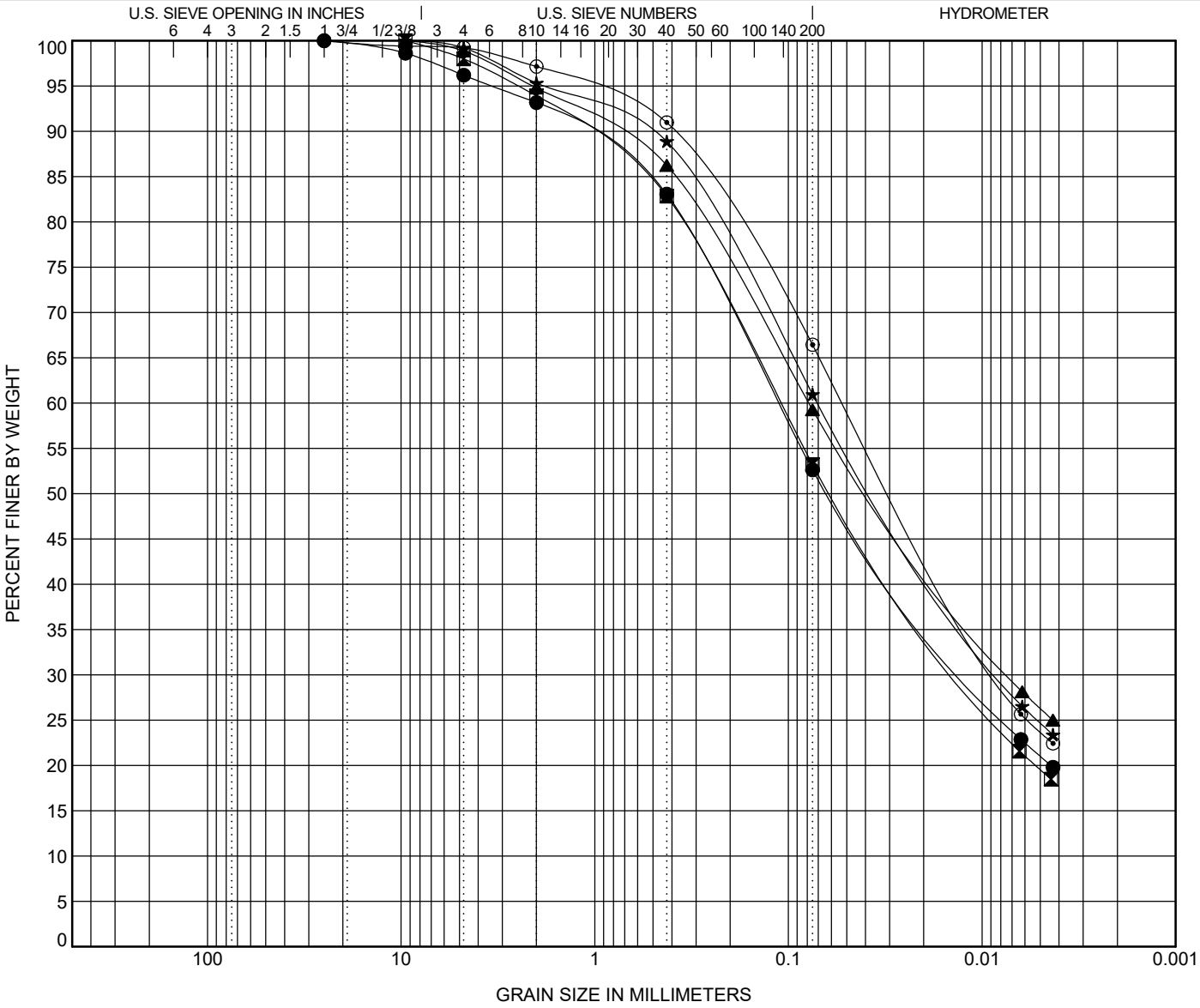
# GRAIN SIZE DISTRIBUTION

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | AASHTO Classification | USCS Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 1** | **2.0** | **A-6 (3)** | **CL** | **28** | **16** | **12** | | |
| ⊠ | **LSS - 2** | **2.0** | **A-6 (3)** | **CL** | **28** | **17** | **11** | | |
| ▲ | **LSS - 3** | **2.0** | **A-6 (5)** | **CL** | **29** | **15** | **14** | | |
| ★ | **LSS - 4** | **2.0** | **A-6 (7)** | **CL** | **32** | **16** | **16** | | |
| ⊙ | **LSS - 5** | **2.0** | **A-6 (7)** | **CL** | **35** | **21** | **14** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 1** | **2.0** | **25** | **0.114** | **0.011** | | **3.8** | **43.6** | **31.6** | **21.0** |
| ⊠ | **LSS - 2** | **2.0** | **9.5** | **0.112** | **0.012** | | **2.0** | **44.8** | **33.7** | **19.5** |
| ▲ | **LSS - 3** | **2.0** | **9.5** | **0.079** | **0.007** | | **1.1** | **39.6** | **33.0** | **26.3** |
| ★ | **LSS - 4** | **2.0** | **9.5** | **0.07** | **0.008** | | **0.8** | **38.2** | **36.3** | **24.7** |
| ⊙ | **LSS - 5** | **2.0** | **25** | **0.051** | **0.008** | | **0.8** | **32.8** | **42.7** | **23.7** |

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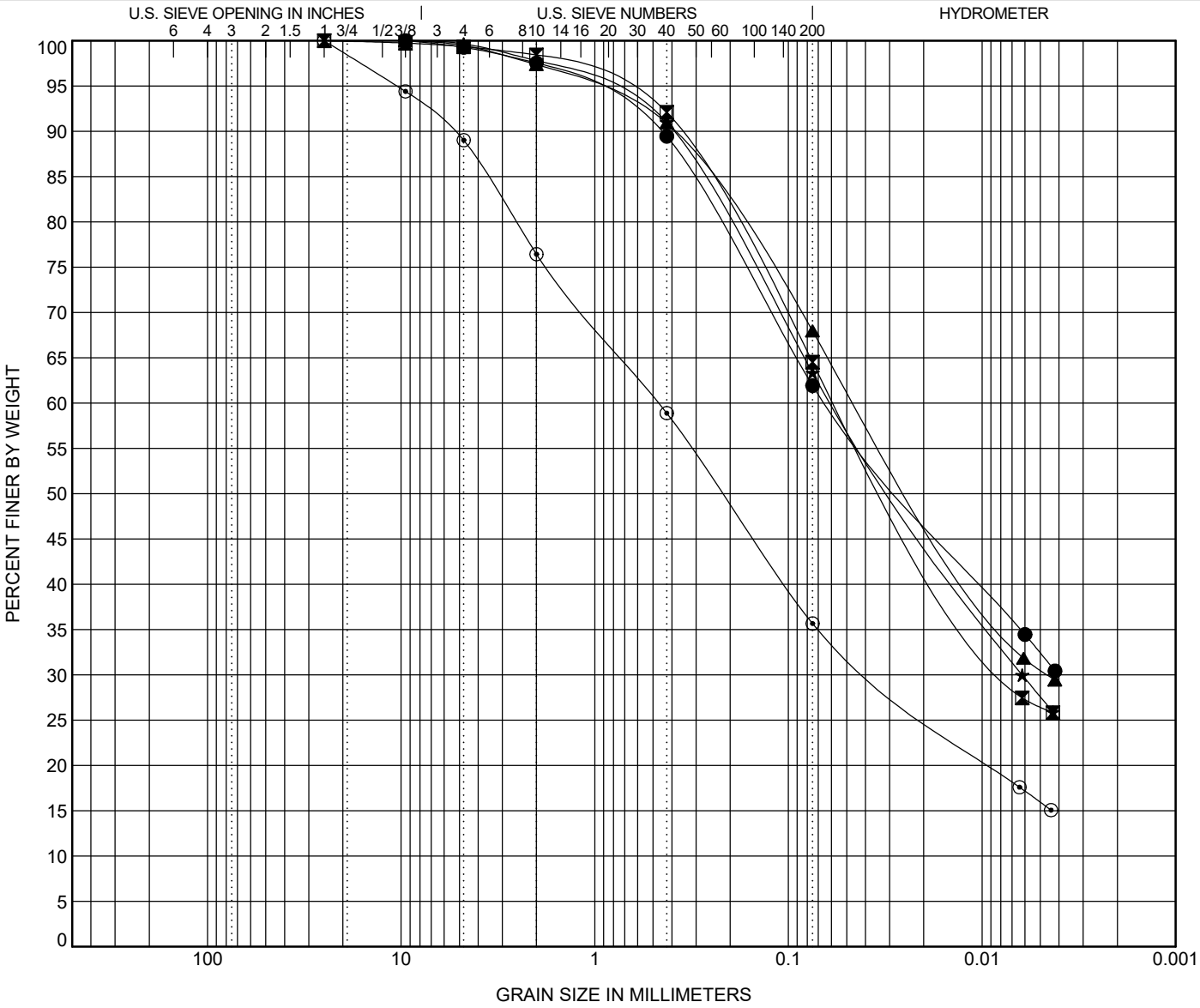
# GRAIN SIZE DISTRIBUTION

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | AASHTO Classification | USCS Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 5** | **6.0** | **A-6 (11)** | **CL** | **39** | **16** | **23** | | |
| ⊠ | **LSS - 6** | **2.0** | **A-7-6 (16)** | **CL** | **45** | **17** | **28** | | |
| ▲ | **LSS - 7** | **2.0** | **A-6 (11)** | **CL** | **36** | **17** | **19** | | |
| ★ | **LSS - 7** | **6.0** | **A-6 (7)** | **CL** | **32** | **16** | **16** | | |
| ⊙ | **LSS - 8** | **2.0** | **A-6 (0)** | **SC** | **29** | **18** | **11** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 5** | **6.0** | **9.5** | **0.063** | | | **0.7** | **37.3** | **29.5** | **32.4** |
| ⊠ | **LSS - 6** | **2.0** | **25** | **0.055** | **0.007** | | **0.7** | **34.8** | **38.0** | **26.5** |
| ▲ | **LSS - 7** | **2.0** | **9.5** | **0.043** | **0.005** | | **0.5** | **31.5** | **37.4** | **30.6** |
| ★ | **LSS - 7** | **6.0** | **9.5** | **0.058** | **0.006** | | **0.3** | **36.3** | **35.8** | **27.6** |
| ⊙ | **LSS - 8** | **2.0** | **25** | **0.469** | **0.035** | | **11.0** | **53.4** | **19.7** | **15.9** |

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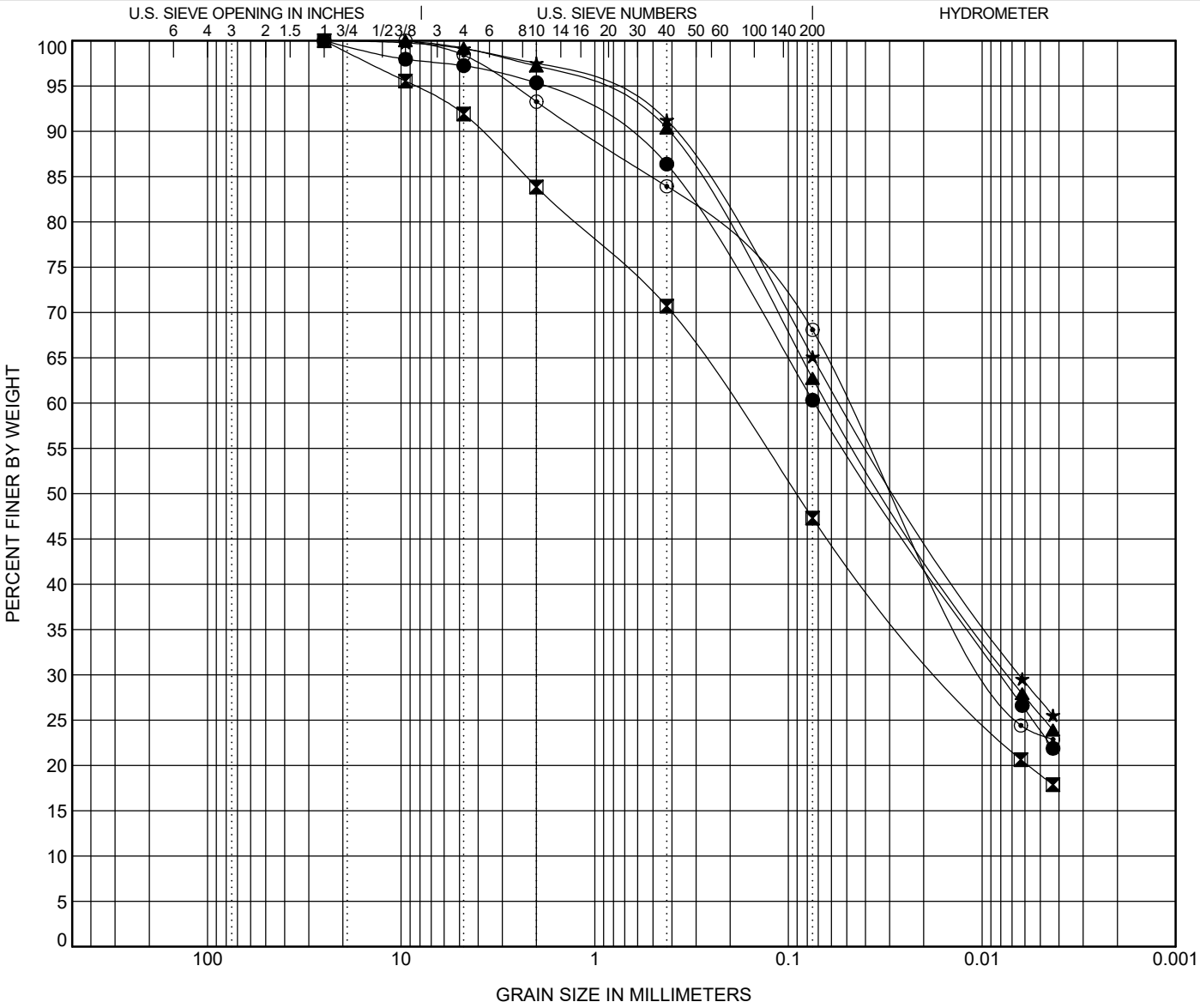
# GRAIN SIZE DISTRIBUTION

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | AASHTO Classification | USCS Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 8** | **7.0** | **A-6 (6)** | **CL** | **30** | **15** | **15** | | |
| ⊠ | **LSS - 9** | **2.0** | **A-6 (3)** | **SC** | **31** | **17** | **14** | | |
| ▲ | **LSS - 9** | **7.0** | **A-6 (8)** | **CL** | **32** | **15** | **17** | | |
| ★ | **LSS - 10** | **2.0** | **A-6 (9)** | **CL** | **34** | **16** | **18** | | |
| ⊙ | **LSS - 11** | **2.0** | **A-6 (8)** | **CL** | **33** | **18** | **15** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 8** | **7.0** | **25** | **0.073** | **0.008** | | **2.8** | **36.9** | **36.5** | **23.8** |
| ⊠ | **LSS - 9** | **2.0** | **25** | **0.192** | **0.015** | | **8.1** | **44.6** | **28.3** | **19.0** |
| ▲ | **LSS - 9** | **7.0** | **9.5** | **0.062** | **0.007** | | **0.8** | **36.4** | **37.2** | **25.6** |
| ★ | **LSS - 10** | **2.0** | **25** | **0.052** | **0.006** | | **0.9** | **34.0** | **37.9** | **27.2** |
| ⊙ | **LSS - 11** | **2.0** | **9.5** | **0.047** | **0.009** | | **1.6** | **30.3** | **44.6** | **23.5** |

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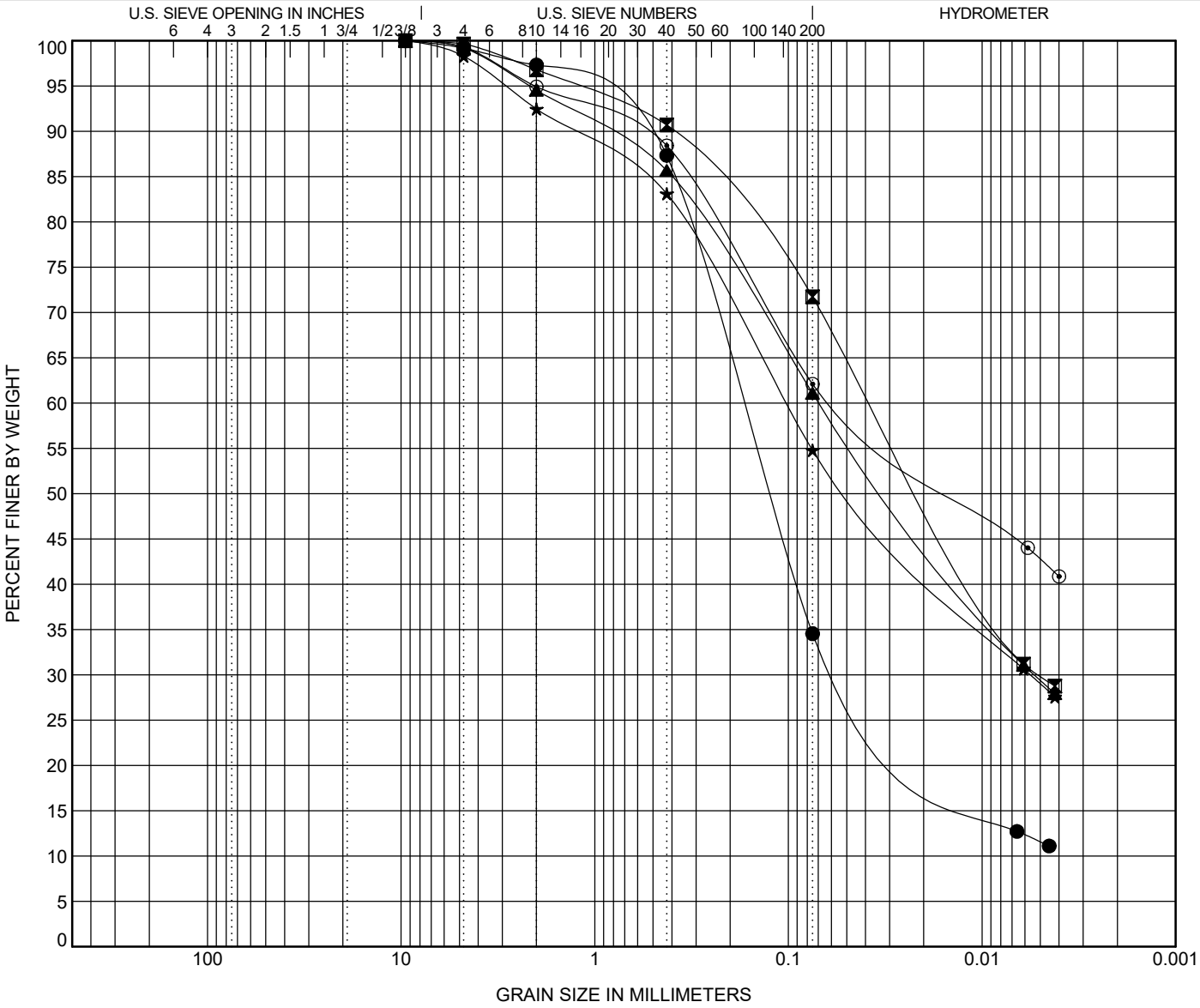
# GRAIN SIZE DISTRIBUTION

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | AASHTO Classification | USCS Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 11** | **7.0** | **A-2-4 (0)** | **SM** | **NP** | **NP** | **NP** | | |
| ⊠ | **LSS - 12** | **2.0** | **A-6 (12)** | **CL** | **35** | **16** | **19** | | |
| ▲ | **LSS - 13** | **2.0** | **A-6 (8)** | **CL** | **33** | **16** | **17** | | |
| ★ | **LSS - 14** | **2.0** | **A-6 (8)** | **CL** | **36** | **15** | **21** | | |
| ⊙ | **LSS - 15** | **2.0** | **A-6 (8)** | **CL** | **34** | **17** | **17** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 11** | **7.0** | **9.5** | **0.173** | **0.045** | | **0.8** | **64.6** | **23.0** | **11.5** |
| ⊠ | **LSS - 12** | **2.0** | **9.5** | **0.036** | **0.005** | | **0.4** | **27.9** | **41.8** | **29.9** |
| ▲ | **LSS - 13** | **2.0** | **9.5** | **0.068** | **0.005** | | **0.8** | **38.1** | **31.7** | **29.4** |
| ★ | **LSS - 14** | **2.0** | **9.5** | **0.103** | **0.006** | | **1.7** | **43.5** | **25.8** | **29.0** |
| ⊙ | **LSS - 15** | **2.0** | **9.5** | **0.056** | | | **0.7** | **37.2** | **19.3** | **42.8** |

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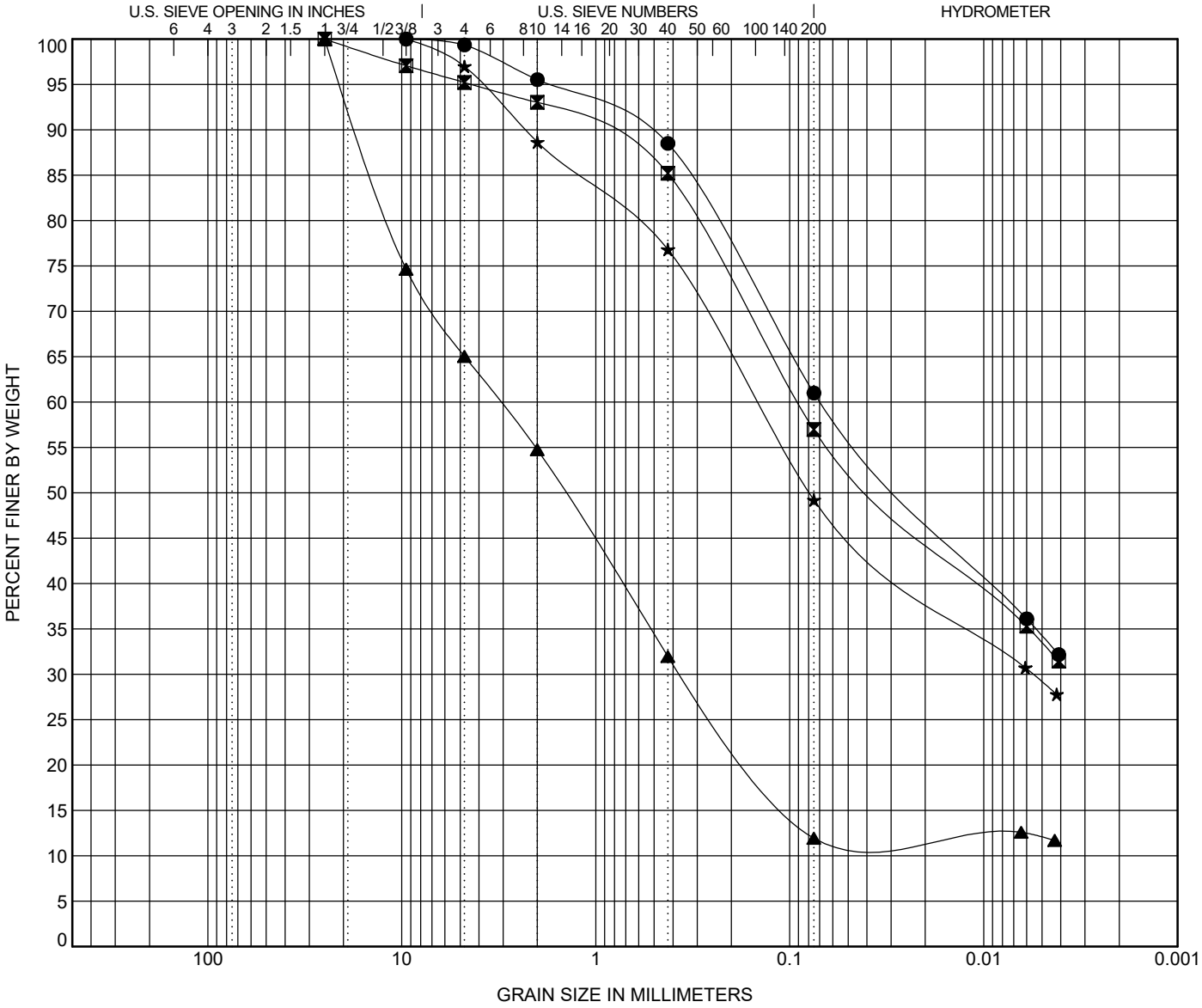
# GRAIN SIZE DISTRIBUTION

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

**PROJECT NUMBER** NH-3-052(049)222 **LOCATION** Foster County

**PCN** 21918




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | BOREHOLE | DEPTH | AASHTO Classification | USCS Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 16** | **2.0** | **A-6 (6)** | **CL** | **32** | **17** | **15** | | |
| ⊠ | **LSS - 17** | **2.0** | **A-6 (4)** | **CL** | **27** | **14** | **13** | | |
| ▲ | **LSS - 18** | **2.0** | **A-1-b (0)** | **SP-SC** | **21** | **17** | **4** | | |
| ★ | **LSS - 18** | **5.0** | **A-6 (3)** | **SC** | **29** | **17** | **12** | | |

| | BOREHOLE | DEPTH | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **LSS - 16** | **2.0** | **9.5** | **0.068** | | | **0.6** | **38.4** | **26.8** | **34.2** |
| ⊠ | **LSS - 17** | **2.0** | **25** | **0.09** | | | **4.8** | **38.3** | **23.5** | **33.4** |
| ▲ | **LSS - 18** | **2.0** | **25** | **3.111** | **0.278** | | **35.0** | **53.1** | **-0.1** | **12.0** |
| ★ | **LSS - 18** | **5.0** | **9.5** | **0.148** | **0.006** | | **3.0** | **47.8** | **20.0** | **29.2** |

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