Geotechnical Evaluation Report

County Ditch 25A Repair
Section 31, Walnut Lake Township
North of Bricelyn, Minnesota

Prepared for

Faribault County

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Mar 27 2020 12:34 PM

Mar 27 2020 12:34 PM

Philip E. Bailey, PE
Business Unit Leader, Senior Engineer
License Number: 47539
March 27, 2020

Project B1912472

Braun Intertec Corporation

BRAUN INTERTEC
The Science You Build On.

Braun Intertec Corporation
2120 Howard Drive West, Suite B
North Mankato, MN 56003

Phone: 507.594.3000
Fax: 507.345.5042
Web: braunintertec.com

March 27, 2020 Project B1912472

Mr. William Groskreutz
Faribault County
PO Box 325
Blue Earth, MN 56013

Re: Geotechnical Evaluation
County Ditch 25A Repair
Section 31, Walnut Lake Township
North of Bricelyn, Minnesota

Dear Mr. Groskreutz:

We are pleased to present this Geotechnical Evaluation Report for the proposed County Ditch 25A repair.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Philip Bailey at 507.995.2788 or pbailey@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Mar 27 2020 12:35 PM

Philip E. Bailey, PE
Business Unit Leader, Senior Engineer

Ray A. Huber, PE
Vice President, Principal Engineer

Table of Contents

Description **Page**

Appendix

BRAUN INTERTEC

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed design and construction of the County Ditch 25A Repair, located within Section 31 of Walnut Lake Township, north of Bricelyn, Minnesota. We understand that a large agricultural field has been inundated by water due to failure of an existing draintile line. The project will include the construction of a new draintile line connecting a low area of agricultural land to an open-cut drainage ditch to the south for the purpose of draining the low area. Table 1 provides project details.

Table 1. Site Aspects and Grading Description

Aspect	Description
Existing surface elevations along proposed route, ft	1112 to 1103 (Provided)
Proposed Length, ft	~800 (Provided)
Proposed Invert elevation, ft	1097.10 to 1094.48 (Provided)
Proposed depth from ground surface to invert, ft	7 to 16 (Provided)

The figures below show an illustration of the project location and proposed installation.

Figure 1. Project Location

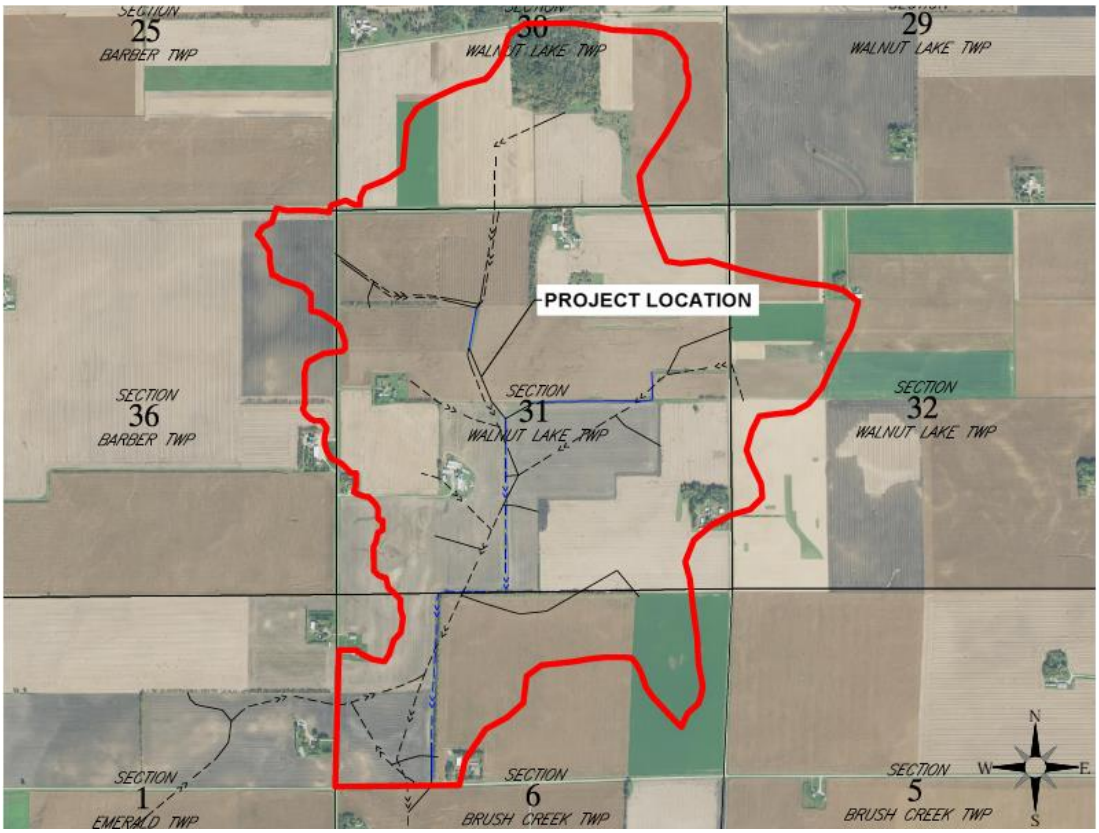


Figure provided by ISG, Inc., not dated.

Figure 2. Plan View

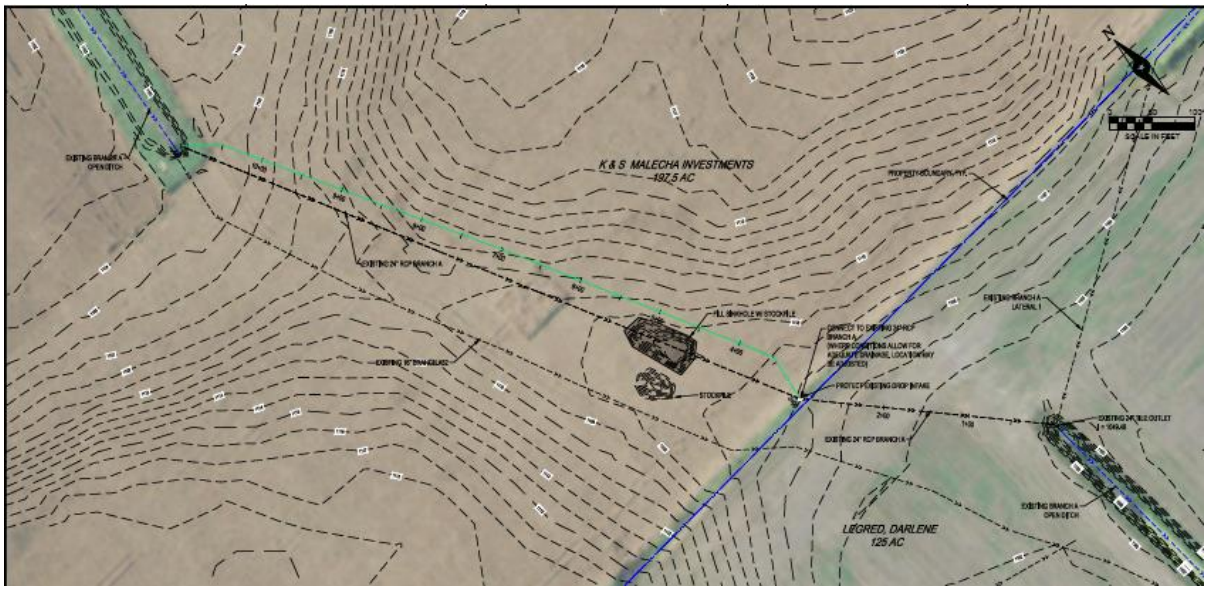


Figure provided by ISG, Inc., not dated.

Figure 2. Profile View

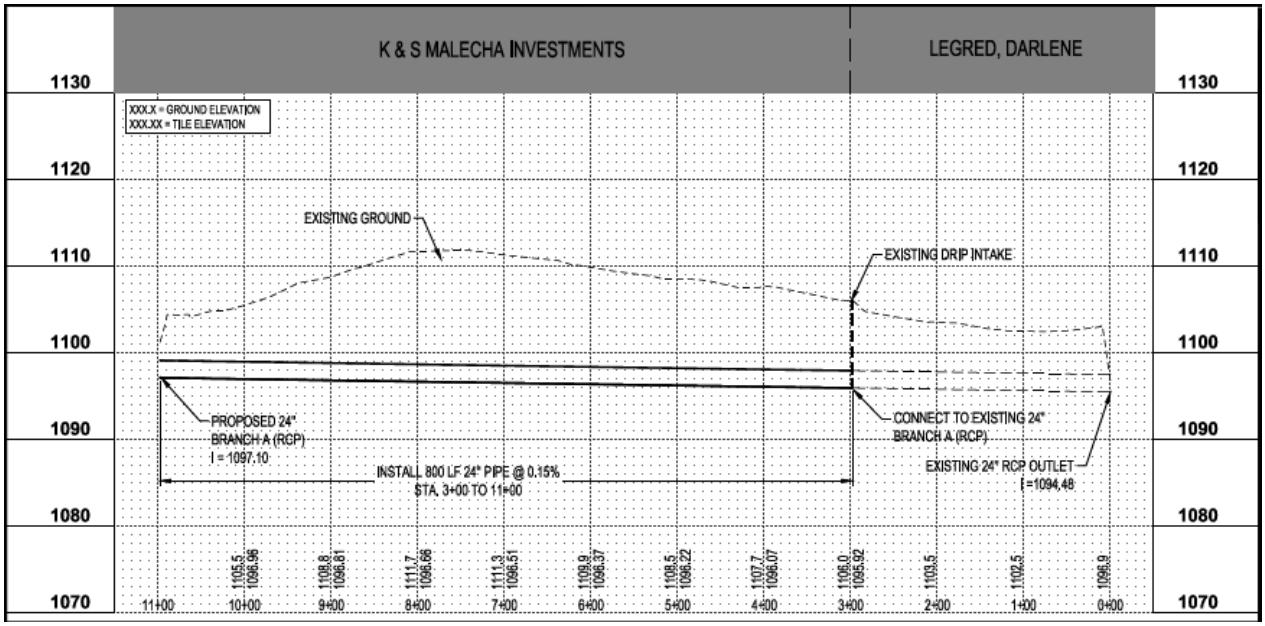


Figure provided by ISG, Inc., not dated.

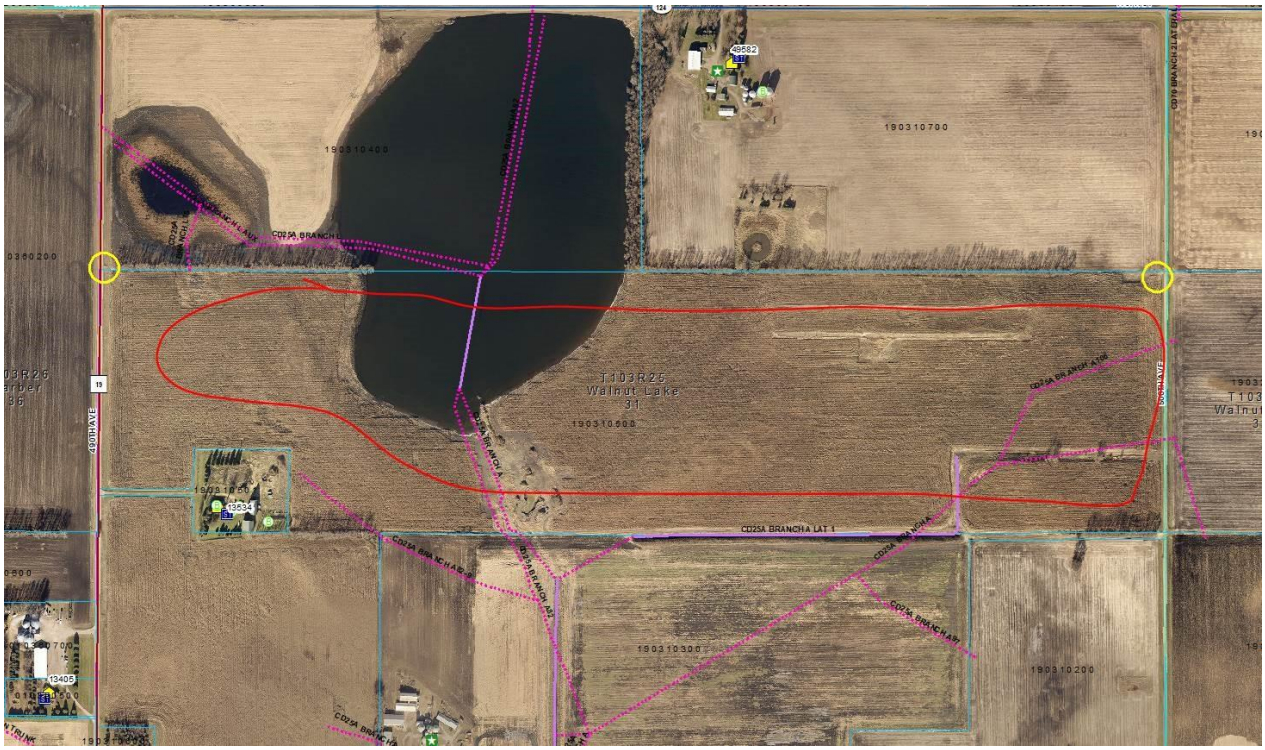
A.2. Site Conditions and History

Currently, the site exists as agricultural land. The site is relatively flat but slope downward overall towards the south, with the exception of an area that is slightly higher, which results in standing water with the northern portion of the site.

Historically, the land has been drained, but an existing draintile has failed and the area no longer drains.

Photograph 1 below notes the area with standing water.

Photograph 1. Aerial Photograph of the Site



Photograph provided by ISG, Inc.

A.3. Purpose

The purpose of our geotechnical evaluation is to characterize subsurface geologic conditions at selected exploration locations and evaluate their impact on the design and construction of the proposed draintile.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Construction plans prepared by ISG, Inc., not dated.
- Communications with Mr. Chuck Brandel of ISG, Inc. regarding the purpose of the project and project history.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions

based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal to Mr. Chuck Brandel of ISG, Inc., dated October 29, 2019, and authorized by Mr. William Groskreutz of Faribault County on November 5, 2019. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. ISG, Inc. selected, staked and provided surface elevations at the new exploration locations. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.
- Performing nine standard penetration test (SPT) borings, denoted as SB-1 to SB-9, to nominal depths of 40 feet below grade across the site. We completed Borings SB-4, 5, 7, 8, and 9 in late November of 2019. During our initial mobilization, soft surface conditions prevented us from completing the remaining borings, so we remobilized to the site in early March of 2020 to finish the borings while the ground was frozen.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.
- Preparing this report containing:
  - A CAD sketch showing project components, limits, and exploration locations.
  - Logs of the borings describing the materials encountered and presenting the results of our groundwater measurements and laboratory tests.
  - A summary of the subsurface profile and groundwater conditions.

- Discussion identifying the site conditions that will impact utility design and performance, qualifying the nature of their impact, and outlining alternatives for mitigating their impact.

- Discussion regarding the reuse of on-site materials during construction and the impact of groundwater on construction.

- Recommendations for preparing utility subgrades, including excavation support, if applicable, and the selection, placement and compaction of excavation backfill and other structural fill.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

B. Results

B.1. Geologic Overview

The site geology consists of topsoil over glacial soils.

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Boring Results

Table 2 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 2.

Table 2. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil	CL, SC, SM	--	▪ Predominantly CL. ▪ Dark brown to black. ▪ Thicknesses at boring locations varied from 1 to 2 feet. ▪ Moisture condition generally wet.
Glacial deposits	SP, SP-SM, SM, ML	Weight of Rod to 22 BPF	▪ Brown to gray in color. ▪ Moist to wet. ▪ Variable amounts of gravel; may contain cobbles and boulders. ▪ General penetration resistance of 4 to 8 BPF in the upper portion and 9 to 15 BPF in the lower portion of the borings, indicating the cohesionless sands and silts were generally very loose to loose in the upper portion and loose to medium dense in relative density at depth while the clays were soft to medium in consistency. ▪ Moisture condition generally (dry, moist or wet).
	SC, CL	4 to 5 BPF	

*Abbreviations defined in the attached Descriptive Terminology sheets.

B.3. Groundwater

Table 3 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details.

Table 3. Groundwater Summary

Location	Surface Elevation	Date	Measured or Estimated Depth to Groundwater (ft)	Corresponding Groundwater Elevation (ft)
SB-1	1104.7	March 4, 2020	12 ½	1092 ½
SB-2	1108.5	March 2, 2020	12 ½	1096
SB-3	1110.4	March 2, 2020	10	1100 ½
SB-4	1106.9	November 25, 2019	3	1104
SB-5	1115.3	November 26, 2019	5 ½	1110
SB-6	1111.7	March 3, 2020	10	1102
SB-7	1112.5	November 25, 2019	8 ½	1104
SB-8	1115.7	November 26, 2019	10	1106
SB-9	1117.1	November 26, 2019	9	1108 ½

At the time of our drilling in November of 2019, the groundwater surface elevation ranged from about 1104 to 1110 feet, while at the time of our drilling in March of 2020, the groundwater surface elevation ranged from about 1092 ½ to 1102 feet. Given the measurements from March of 2020 were taken while the ground was frozen, there was likely less surface infiltration that would be anticipated while the ground is not frozen. Groundwater levels during non-frozen conditions such as those measured in November of 2019 will likely be higher and should be anticipated. Additionally, the water level of standing water nearby will influence the groundwater elevation and the groundwater elevation should be expected to fluctuate in relation to the nearby standing water.

B.4. Laboratory Test Results

The boring logs show the results of moisture content and sieve analysis testing we performed, next to the tested sample depth. The Appendix contains the results of the sieve analysis tests.

The moisture content of the onsite sands and silts varied from approximately 21 to 30 percent, indicating that the material was well above its probable optimum moisture content.

Our mechanical analyses indicated that the soils tested contained 8.8 to 94 percent silt and clay by weight.

Table 4 presents the results of our laboratory tests.

Table 4. Laboratory Classification Test Results

Location	Sample Depth (ft)	Classification	Moisture Content (w, %)	Percent Passing a #200 Sieve	Percent Sand	Percent Gravel
SB-1	12.5	Silty Sand	26	13	--	--
SB-2	15	Silt	--	94	6	0
SB-3	12.5	Poorly Graded Sand with Silt	28	9.3	--	--
SB-4	15	Silt with Sand	30	85	--	--
SB-5	20	Silty Sand	24	35	--	--
SB-5	30	Silty Sand	--	25	75	0
SB-6	15	Sandy Silt	--	72	28	0
SB-7	15	Silt	29	91	--	--
SB-7	20	Silty Sand	27	27	--	--
SB-8	25	Poorly Graded Sand with Silt	21	8.8	--	--
SB-9	25	Silty Sand	--	40	60	0

C. Recommendations

C.1. Design and Construction Discussion

Based on our understanding of the project, it is our opinion that installation of the proposed draintile can be completed, though the following considerations must be accounted for in design and construction:

- The soils at the site are fine-grained and the excavation sidewalls and bottoms will be highly susceptible to disturbance. We recommend excavations be completed with a smooth-bladed backhoe bucket to limit disturbance of the excavation bottom.
- Measured groundwater elevations ranged from about 1092 ½ to 1110 feet while the proposed utility invert elevation ranges from about 1094 ½ to 1097 feet. The presence of groundwater will make the installation difficult and the soils at the base of the excavations will likely liquefy and heave resulting in unstable conditions for support of the draintile. Given the presence of standing water to the north of the installation, shallow groundwater should be expected and dewatering will be required within the excavations for the draintile.
- The silts and sands at the proposed draintile invert are generally very loose to loose and will provide limited support for the pipe. We recommend subexcavating below the proposed draintile to allow for placement of clean crushed, gravel wrapped in geotextile filter fabric.
- The contractor should note the on-site soils are highly susceptible to disturbance from construction traffic. Disturbance of these soils may cause areas that were previously prepared, or that were suitable for pavement or structure support, to become unstable and require moisture conditioning and compaction. Subcutting and replacing the disturbed material with crushed, coarse gravel, free of fines is also an alternative. The contractor should use means and methods to limit disturbance of the soils.

C.2. Draintile Installation

C.2.a. Draintile Route

We understand there are 3 potential routes that are being considered for the installation, including a west (Borings SB-1 to SB-3), a central (SB-4 to SB-6) and east (SB-8 and SB-9) route. Based on the results of the borings, it appears that the soils at the proposed draintile invert for the central route consist primarily of silts that would be unstable and provide limited support, thus making this route less preferred. The soils anticipated at the east and west invert elevations are generally more sandy and would provide a more stable subgrade. Additionally, dewatering of the sandy soils would likely be more

successful. Given the installation depth along the west route is shallowest, this would likely be the preferred route.

C.2.b. Excavation Dewatering

To facilitate installation of the draintile and provide a more stable subgrade for installation of the draintile, we recommend dewatering along the proposed route 1 to 2 weeks prior to installation of the tile. We recommend dewatering to an elevation of 7 to 10 feet below the proposed invert. We anticipate this could be completed with a number of deep wells extending to the glacial outwash at depth or potentially a series of well-points advanced into the underlying cleaner sands. Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow. A well contractor experienced with these conditions should develop a dewatering plan; the design team should review this plan. We recommend dewatering be continued until the excavations are completely backfilled.

C.2.c. Subgrade Stabilization

To facilitate support of the draintile, we recommend subexcavating below the pipe to a depth of about 3 to 5 feet. The sub excavation should be widened to a minimum of 3 feet or the depth the subexcavation on either side of the pipe, whichever is greater. We recommend the subexcavation be backfilled with 1 ½ to 2 ½-inch clean, crushed rock fully wrapped in geotextile filter fabric. Wrapping the crushed rock in filter fabric will serve to limit the loss of rock into the underlying soils. It should be noted that the amount of subexcavation will be dependent upon the condition of the subgrade at the time of construction.

C.2.d. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist of soft and loose to very loose glacial soils. These soils are typically considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 ½H:1V. Slopes constructed in this manner may still exhibit surface sloughing, especially given the presence of shallow groundwater. Due to the low strength of the onsite soils and presence of shallow groundwater, unsupported excavations will likely slope back to between 2:1 to 4:1 (horizontal:vertical). OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.e. Engineered Fill Materials and Compaction

Table 5 below contains our recommendations for engineered fill materials.

Table 5. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
Utility Support	Crushed Rock	GP, GW	100% passing 3-inch sieve < 25% passing 1 ½-inch sieve < 5% passing ¾-inch sieve	< 2% OC
Utility trench backfill, below agricultural areas, where subsidence is not a concern	Non-structural fill	Onsite soils	100% passing 6-inch sieve	< 10% OC

We recommend spreading engineered fill in loose lifts of approximately 12 to 18 inches thick. We recommend compacting the backfill using a large, self-propelled static roller to at 85 to 90 percent of its maximum dry density as determined by a standard Proctor (ASTM D698). Topsoil placed as backfill should be placed in a loose condition as specified by the plans.

The project documents should not allow the contractor to use frozen material as backfill or to place backfill on frozen material.

We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.3. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support, or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge, such as buried utilities. We can assist you in this evaluation.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings with a flotation tire-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2- or 5-foot intervals in general accordance to ASTM D1586. We collected thin-walled tube samples in general accordance with ASTM D1587 at selected depths. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Minnesota Department of Health (MDH) Environmental Borehole criteria with an MDH-approved grout. We will forward/forwarded a sealing record for those boreholes to the Minnesota Department of Health Well Management Section.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance tests performed. The logs also present the results of laboratory tests performed on penetration test samples, and groundwater measurements. The Appendix also include Fence Diagrams intended to provide summarized cross-sectional views of the soil profile across the site.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM or AASHTO procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such

variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix

FRANK L CUSICK FAMILY TRUST

GENE P BORRIS DISCLAIMER TRUST

DOYLE,KERRY & ANGELA K

GENE P BORRIS DISCLAIMER TRUST

BORRIS,CHARLENE L

DOYLE,KERRY & ANGELA K

Faribault County

K & S MALECHA INVESTMENTS

MCCARTY,MICHAEL H & DEBRA L

LEGRED,DARLENE

KILLION,LEO

1110 1105 1115 1120 1125

1 2 3 4 5 6 7 8 9

ISG

Soil Borings

County Ditch No. 25

Faribault County, Minnesota

Thursday, February 27, 2020

Legend

- Proposed Soil Borings
- Proposed Tile
- Minor Contour
- Major Contour
- Main Tile
- Open Ditch
- Water

PN: 08-11558

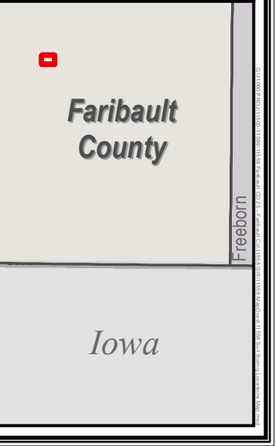
Source:

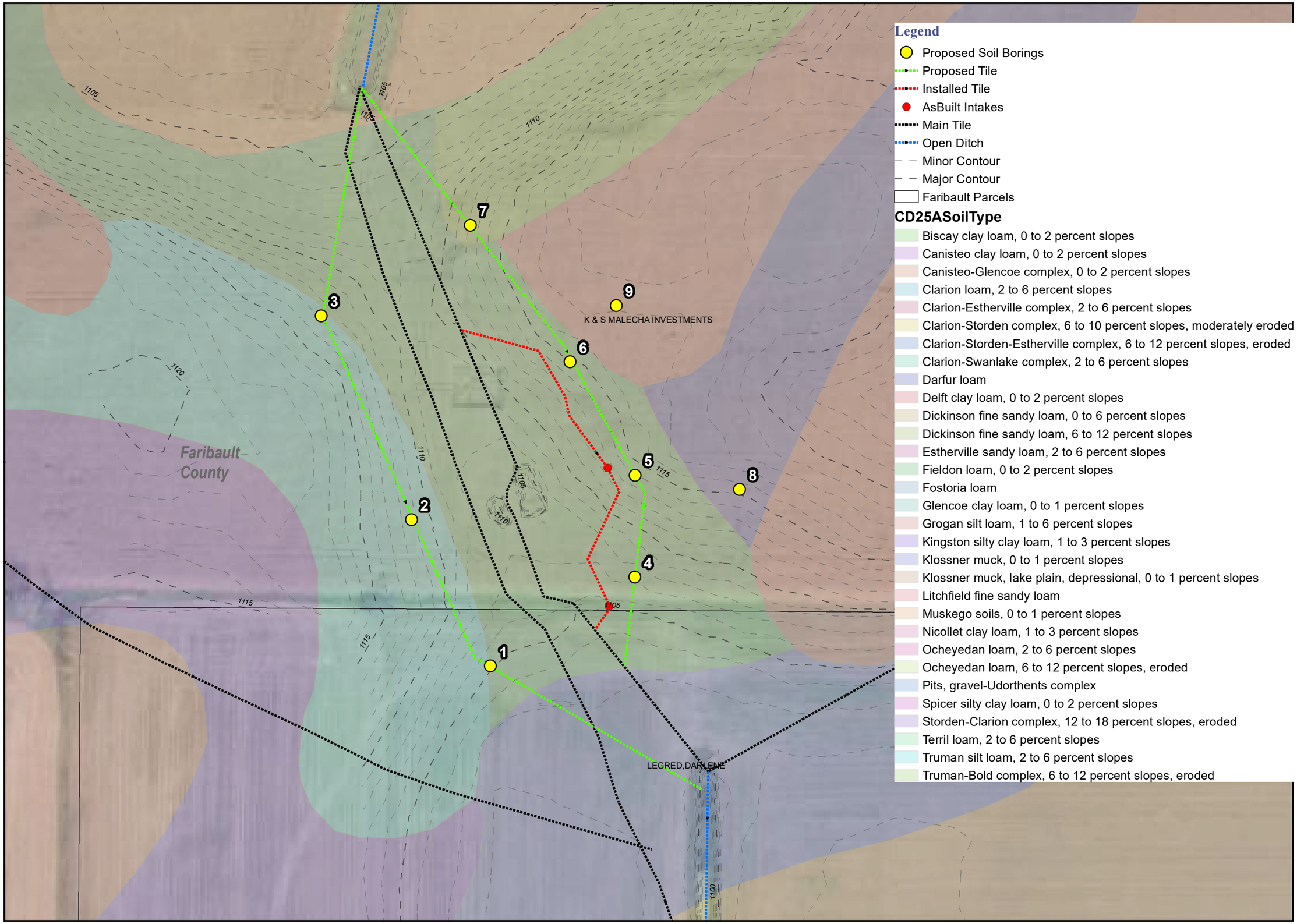
Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (XX County, 12/16/2016)
Parcels (XX County, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 65 130 260 Feet

1 inch = 292 feet





Legend

- Proposed Soil Borings
- Proposed Tile
- Installed Tile
- AsBuilt Intakes
- Main Tile
- Open Ditch
- Minor Contour
- Major Contour
- Faribault Parcels

CD25ASoilType

- Biscay clay loam, 0 to 2 percent slopes
- Canisteo clay loam, 0 to 2 percent slopes
- Canisteo-Glencoe complex, 0 to 2 percent slopes
- Clarion loam, 2 to 6 percent slopes
- Clarion-Estherville complex, 2 to 6 percent slopes
- Clarion-Storden complex, 6 to 10 percent slopes, moderately eroded
- Clarion-Storden-Estherville complex, 6 to 12 percent slopes, eroded
- Clarion-Swanlake complex, 2 to 6 percent slopes
- Darfur loam
- Delft clay loam, 0 to 2 percent slopes
- Dickinson fine sandy loam, 0 to 6 percent slopes
- Dickinson fine sandy loam, 6 to 12 percent slopes
- Estherville sandy loam, 2 to 6 percent slopes
- Fieldon loam, 0 to 2 percent slopes
- Fostoria loam
- Glencoe clay loam, 0 to 1 percent slopes
- Grogan silt loam, 1 to 6 percent slopes
- Kingston silty clay loam, 1 to 3 percent slopes
- Klossner muck, 0 to 1 percent slopes
- Klossner muck, lake plain, depressional, 0 to 1 percent slopes
- Litchfield fine sandy loam
- Muskego soils, 0 to 1 percent slopes
- Nicollet clay loam, 1 to 3 percent slopes
- Ocheyedan loam, 2 to 6 percent slopes
- Ocheyedan loam, 6 to 12 percent slopes, eroded
- Pits, gravel-Udorthents complex
- Spicer silty clay loam, 0 to 2 percent slopes
- Storden-Clarion complex, 12 to 18 percent slopes, eroded
- Terril loam, 2 to 6 percent slopes
- Truman silt loam, 2 to 6 percent slopes
- Truman-Bold complex, 6 to 12 percent slopes, eroded

ISG

Soil Borings Map

Countyl Ditch No 25A

Faribault County, Minnesota

Wednesday, November 6, 2019

PN: 14-11558

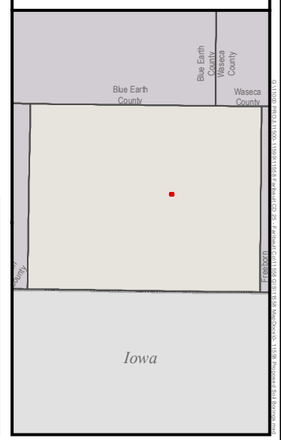
Source:

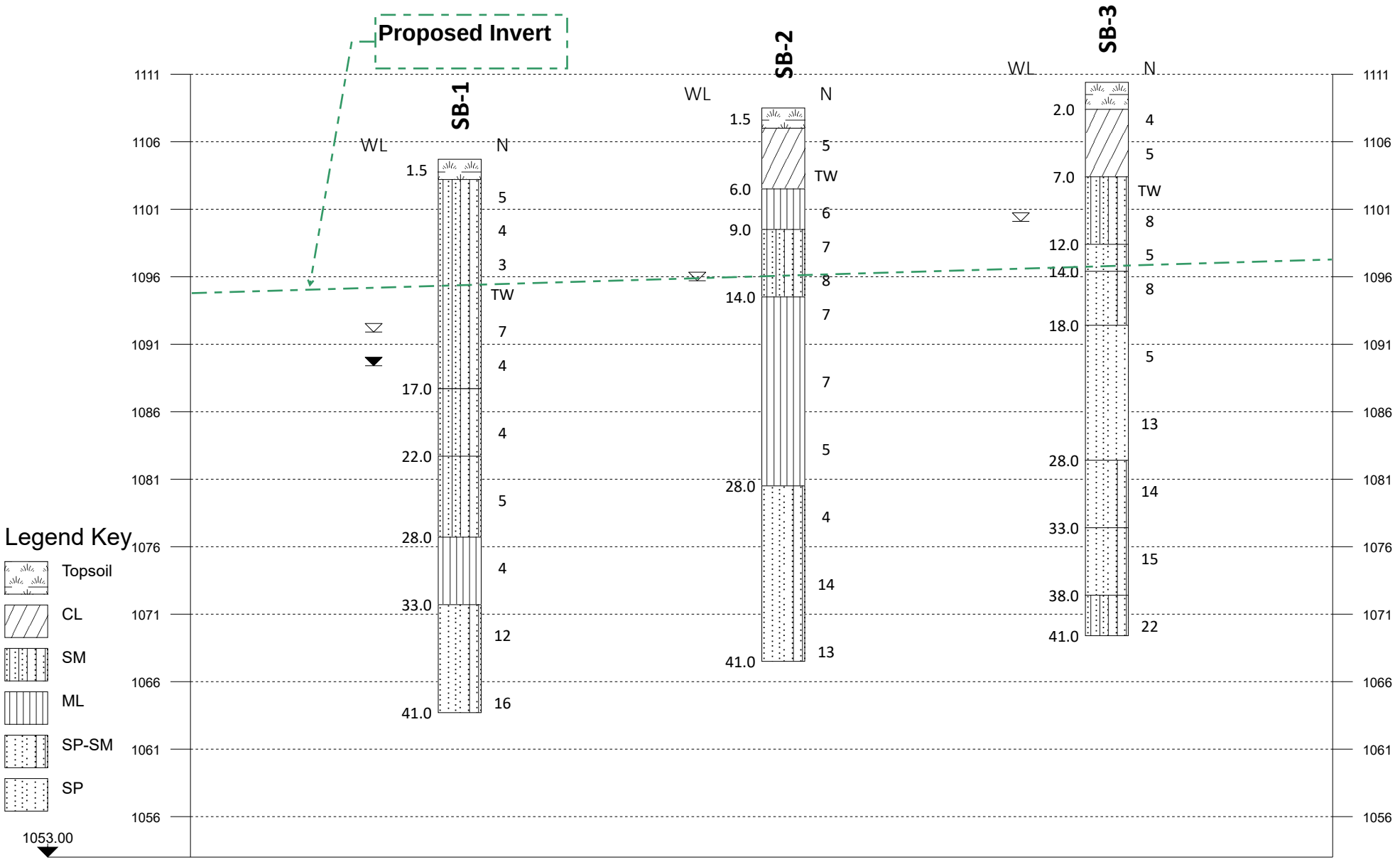
Orthophotograph (MnGeo WMS, 2015)
Tile/Ditch (XX County, 12/16/2016)
Parcels (XX County, 12/16/2016)
Lakes (MN DNR, July, 2008)
Major Stream (MN DNR, July 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

N W E S

0 25 50 100 Feet

1 inch = 125 feet

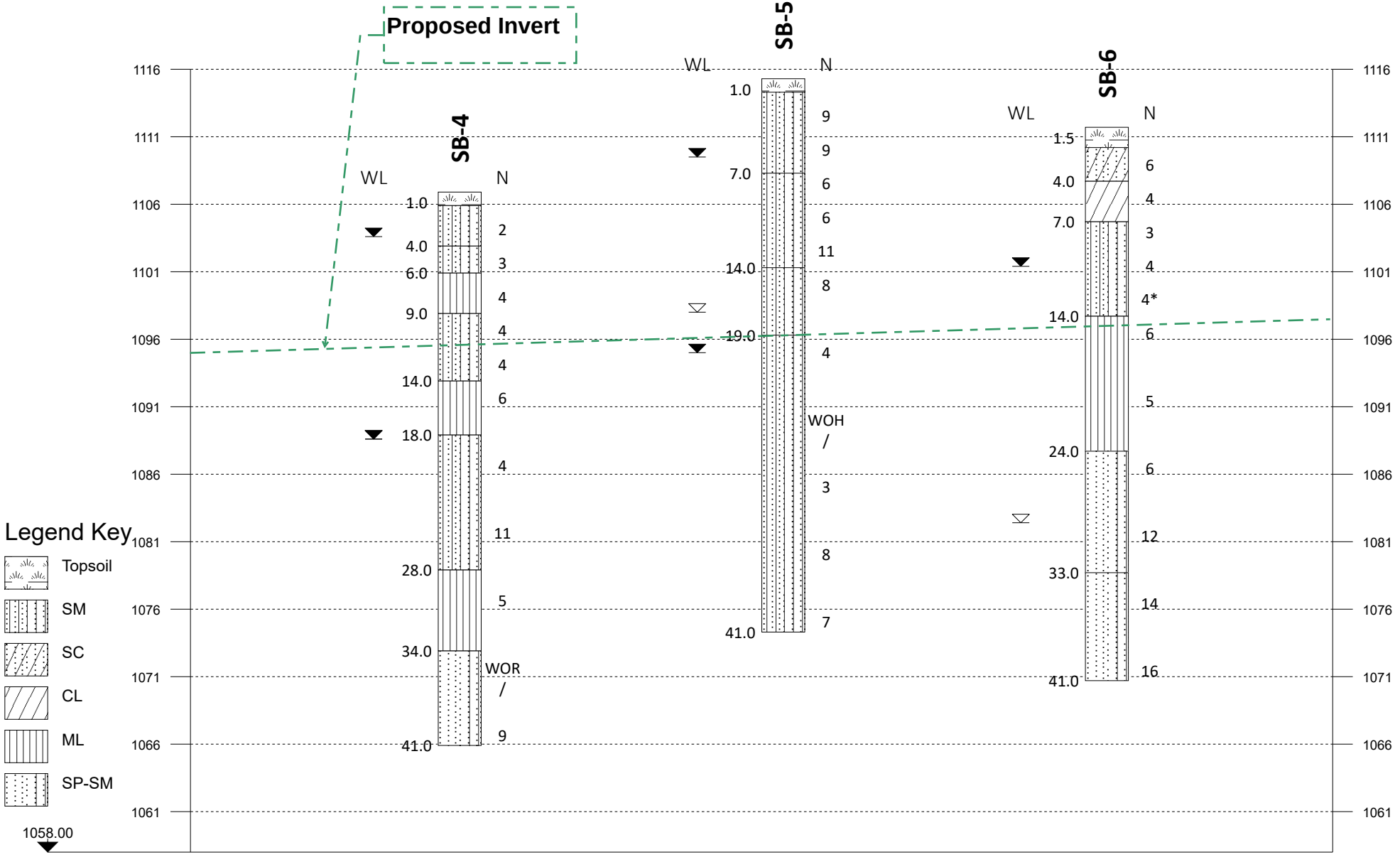




West Route
Fence Diagram
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

Project ID: B1912472
Vert. Scale: 1"= 10'
Hor. Scale: NTS
Date: 03-27-2020

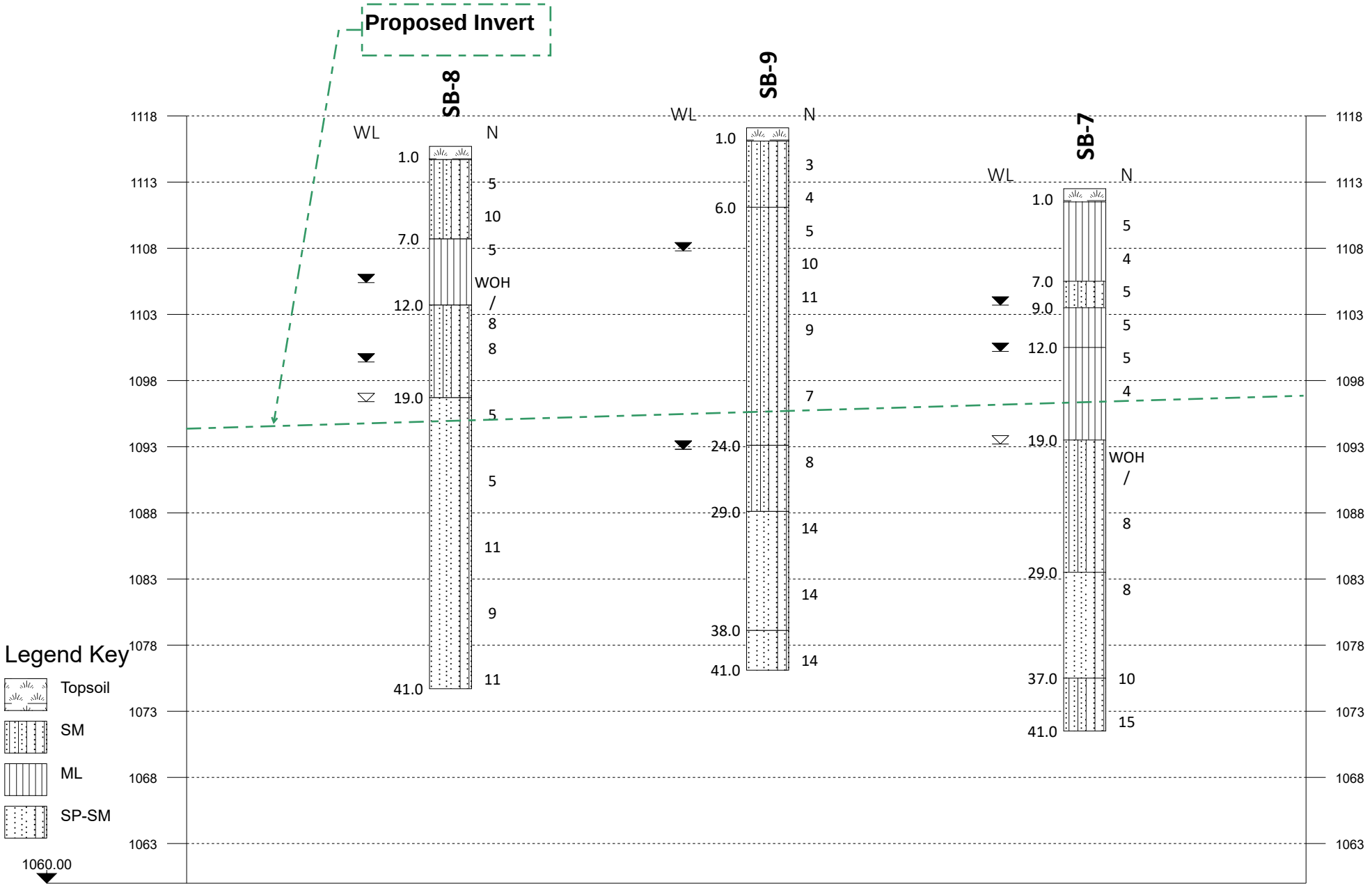
BRAUN INTERTEC
The Science You Build On.



Central Route
Fence Diagram
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

Project ID: B1912472
Vert. Scale: 1"= 10'
Hor. Scale: NTS
Date: 03-27-2020

BRAUN INTERTEC
The Science You Build On.



East Route
Fence Diagram
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

Project ID: B1912472
Vert. Scale: 1"= 10'
Hor. Scale: NTS
Date: 03-27-2020

BRAUN INTERTEC
The Science You Build On.

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-1**
LOCATION: See attached sketch
NORTHING: 165860 EASTING: 518553
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/04/20 END DATE: 03/04/20
SURFACE ELEVATION: 1104.7 ft RIG: 7506 METHOD: SURFACING: Field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1103.2		CLAYEY SAND (SC), slightly organic, black, wet (TOPSOIL)					
1.5		SILTY SAND (SM), fine-grained Sand, dark brown to gray, wet, loose to very loose (GLACIOFLUVIUM)		2-2-3 (5) 18"			
			5	1-2-2 (4) 18"			
				1-1-2 (3) 18"			
			10	TW 24"			No recovery
	▽			2-3-4 (7) 18"		26	P200=13%
			15	2-2-2 (4) 18"			
1087.7							
17.0		SILTY SAND (SM), fine-grained Sand, contains lenses of Silt, and coarse Sand, gray, wet, very loose (GLACIOFLUVIUM)	20	2-2-2 (4) 18"			
1082.7							
22.0		SILTY SAND (SM), fine-grained Sand, gray, wet, loose (GLACIOFLUVIUM)	25	2-2-3 (5) 18"			
1076.7							
28.0		SANDY SILT (ML), gray, wet, very loose (GLACIOFLUVIUM)	30	1-2-2 (4) 8"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-1**
LOCATION: See attached sketch
NORTHING: 165860 EASTING: 518553
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/04/20 END DATE: 03/04/20
SURFACE ELEVATION: 1104.7 ft RIG: 7506 METHOD: SURFACING: Field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1071.7		SANDY SILT (ML), gray, wet, very loose (GLACIOFLUVIUM)					
33.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, medium dense (GLACIAL OUTWASH)					
35				5-5-7 (12) 18"			
40				7-7-9 (16) 18"			
1063.7							
41.0		END OF BORING Boring then grouted					Water observed at 12.5 feet while drilling. Water observed at 15.0 feet with 39.5 feet of tooling in the ground at end of drilling.
45							
50							
55							
60							

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-2**
LOCATION: See attached sketch
NORTHING: 166066 EASTING: 518439
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/02/20 END DATE: 03/02/20
SURFACE ELEVATION: 1108.5 ft RIG: 7506 METHOD: SURFACING: Corn field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1107.0		SANDY LEAN CLAY (CL), slightly organic, black, wet (TOPSOIL)					
1.5		SANDY LEAN CLAY (CL), gray and brown, moist, medium (GLACIOFLUVIUM)		1-2-3 (5) 18"			
1102.5			5	TW 24"			
6.0		SANDY SILT (ML), brown and gray, moist, loose (GLACIOFLUVIUM)		1-2-4 (6) 18"			
1099.5							
9.0	▽	SILTY SAND (SM), fine-grained Sand, gray, wet, loose (GLACIOFLUVIUM)	10	2-3-4 (7) 18"			
				2-3-5 (8) 18"			
1094.5							
14.0		SILT (ML), gray, wet, loose (GLACIOFLUVIUM)	15	3-3-4 (7) 18"			P200=94%
			20	2-3-4 (7) 18"			
			25	2-2-3 (5) 18"			
1080.5							
28.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, very loose to medium dense (GLACIAL OUTWASH)	30	1-1-3 (4) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-2**
LOCATION: See attached sketch
NORTHING: 166066 EASTING: 518439
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/02/20 END DATE: 03/02/20
SURFACE ELEVATION: 1108.5 ft RIG: 7506 METHOD: SURFACING: Corn field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, very loose to medium dense (GLACIAL OUTWASH)					
			35	5-6-8 (14) 18"			Jetted at 35 feet with water
			40	6-6-7 (13) 18"			
1067.5							
41.0		END OF BORING					Water observed at 12.5 feet while drilling.
		Boring then grouted					
			45				
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-3**
LOCATION: See attached sketch
NORTHING: 166354 EASTING: 518308
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/02/20 END DATE: 03/02/20
SURFACE ELEVATION: 1110.4 ft RIG: 7506 METHOD: SURFACING: Corn field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1108.4		SANDY LEAN CLAY (CL), slightly organic, black, wet (TOPSOIL)					
2.0		LEAN CLAY with SAND (CL), contains lenses of Sand, and Silt, brown and gray, moist, soft to medium (GLACIOFLUVIUM)		3-2-2 (4) 16"			
1103.4			5	3-2-3 (5) 18"			
7.0	▽	SILTY SAND (SM), fine-grained Sand, brown, wet, loose (GLACIOFLUVIUM)		TW 24"			
1098.4			10	3-4-4 (8) 14"			
12.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, loose (GLACIAL OUTWASH)		2-2-3 (5) 18"		28	P200=9%
1096.4							
14.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, contains lenses of Silty Sand, gray, wet, loose (GLACIAL OUTWASH)	15	2-4-4 (8) 14"			Jetted at 15 feet with water
1092.4							
18.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, gray, wet, loose to medium dense (GLACIAL OUTWASH)	20	2-1-4 (5) 18"			
		Trace coarse Sand at 25 feet	25	5-5-8 (13) 18"			Jetted at 25 feet with water
1082.4							
28.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace coarse Sand, gray, wet, medium dense (GLACIAL OUTWASH)	30	10-8-6 (14) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-3**
LOCATION: See attached sketch
NORTHING: 166354 EASTING: 518308
DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/02/20 END DATE: 03/02/20
SURFACE ELEVATION: 1110.4 ft RIG: 7506 METHOD: SURFACING: Corn field WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1077.4		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace coarse Sand, gray, wet, medium dense (GLACIAL OUTWASH)					
33.0		POORLY GRADED SAND with SILT (SP-SM), fine to coarse-grained Sand, trace Silty Sand, gray, wet, medium dense (GLACIAL OUTWASH)	35	5-6-9 (15) 18"			
1072.4							
38.0		SILTY SAND (SM), fine to coarse-grained Sand, trace Gravel, gray, wet, medium dense (GLACIAL TILL)	40	12-11-11 (22) 18"			
1069.4							
41.0		END OF BORING Boring then grouted					Water observed at 10.0 feet with 9.5 feet of tooling in the ground while drilling.
			45				
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-4**
LOCATION: See attached sketch
NORTHING: 165989 EASTING: 518756
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/25/19 END DATE: 11/25/19
SURFACE ELEVATION: 1106.9 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1105.9		LEAN CLAY (CL), black, moist (TOPSOIL)					
1.0		SILTY SAND (SM), fine-grained Sand, trace organic, with Sand lenses, dark brown, moist, very loose (GLACIOFLUVIUM)		1-1-1 (2) 18"			
1102.9	▼						
4.0		SILTY SAND (SM), fine-grained Sand, gray and brown, wet, very loose (GLACIOFLUVIUM)	5	1-1-2 (3) 17"			
1100.9							
6.0		SANDY SILT (ML), gray and brown, wet, loose (GLACIOFLUVIUM)		1-2-2 (4) 18"			
1097.9							
9.0		SILTY SAND (SM), fine-grained Sand, with Silt lenses, gray, wet, loose (GLACIAL OUTWASH)	10	1-1-3 (4) 18"			
				2-2-2 (4) 18"			
1092.9							
14.0		SILT with SAND (ML), with Sand lenses, gray, wet, loose (GLACIAL OUTWASH)	15	1-3-3 (6) 18"		30	P200=85%
1088.9	▼						
18.0		SILTY SAND (SM), fine-grained Sand, gray, wet, loose (GLACIAL OUTWASH)	20	1-2-2 (4) 16"			
			25	2-5-6 (11) 18"			
1078.9							
28.0		SANDY SILT (ML), gray, wet, loose (GLACIAL TILL)	30	1-2-3 (5) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-4**
LOCATION: See attached sketch
NORTHING: 165989 EASTING: 518756
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/25/19 END DATE: 11/25/19
SURFACE ELEVATION: 1106.9 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1072.9		SANDY SILT (ML), gray, wet, loose (GLACIAL TILL)					
34.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, very loose to loose (GLACIAL OUTWASH)	35	WOR/ 15"			
1065.9			40	3-4-5 (9) 18"			
41.0		END OF BORING Boring then grouted					Water observed at 18.0 feet with 20.0 feet of tooling in the ground while drilling. Water observed at 18.0 feet with 40.0 feet of tooling in the ground at end of drilling. Water observed at 3.0 feet with a cave-in depth of 19.0 feet immediately after withdrawal of auger.
			45				
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-5**
LOCATION: See attached sketch
NORTHING: 166133 EASTING: 518755
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/26/19 END DATE: 11/26/19
SURFACE ELEVATION: 1115.3 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Clouds

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1114.3		SILTY SAND (SM), fine-grained Sand, trace fibers, dark brown, moist (TOPSOIL)					
1.0		SILTY SAND (SM), fine-grained Sand, light brown, moist, loose (GLACIAL TILL)		2-4-5 (9) 17"			
	▼		5	3-4-5 (9) 18"			
1108.3							
7.0		SILTY SAND (SM), fine-grained Sand, with Silt lenses, brown, wet, loose (GLACIOFLUVIUM)		2-3-3 (6) 17"			
			10	2-3-3 (6) 18"			
1101.3				2-5-6 (11) 18"			
14.0		SILTY SAND (SM), fine-grained Sand, gray, wet, loose (GLACIAL OUTWASH)	15	4-4-4 (8) 17"			
	▽						
1096.3							
19.0		SILTY SAND (SM), fine-grained Sand, loose to very loose (GLACIAL OUTWASH)	20	1-1-3 (4) 18"		24	P200=35%
	▼		25	WOH/ 18"			
			30	1-1-2 (3) 18"			P200=25%

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-5**
LOCATION: See attached sketch
NORTHING: 166133 EASTING: 518755
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/26/19 END DATE: 11/26/19
SURFACE ELEVATION: 1115.3 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Clouds

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		SILTY SAND (SM), fine-grained Sand, loose to very loose (GLACIAL OUTWASH)					
			35	2-3-5 (8) 18"			
			40	2-3-4 (7) 18"			
1074.3							
41.0		END OF BORING					Water observed at 17.0 feet with 20.0 feet of tooling in the ground while drilling.
		Boring then grouted					Water observed at 20.0 feet with 40.0 feet of tooling in the ground at end of drilling.
			45				Water observed at 5.5 feet with a cave-in depth of 18.0 feet immediately after withdrawal of auger.
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-6**

LOCATION: Boring offset 14 feet west of staked location due to mud elevation about 3 feet higher. See attached sketch.

NORTHING: 166293 EASTING: 518661

DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/03/20 END DATE: 03/03/20

SURFACE ELEVATION: 1111.7 ft RIG: 7506 METHOD: SURFACING: Grass/mud WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1110.2		LEAN CLAY (CL), black, wet (TOPSOIL)					
1.5		CLAYEY SAND (SC), brown, moist, medium (GLACIAL TILL)		2-3-3 (6) 16"			
1107.7							
4.0		LEAN CLAY (CL), contains lenses of Silt, brown and gray, moist, soft (GLACIOFLUVIUM)	5	2-2-2 (4) 14"			
1104.7							
7.0		SILTY SAND (SM), fine-grained Sand, gray and brown, wet, very loose (GLACIOFLUVIUM)		1-1-2 (3) 18"			
	▼		10	1-2-2 (4) 18"			
				2-2-2 (4*) 0"			*No recovery at 12 1/2 feet
1097.7							
14.0		SANDY SILT (ML), contains lenses of Silt, gray, wet, loose (GLACIOFLUVIUM)	15	2-2-4 (6) 18"			P200=72%
			20	2-2-3 (5) 18"			
1087.7							
24.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, trace Gravel, gray, wet, loose to medium dense (GLACIAL OUTWASH)	25	2-2-4 (6) 18"			
	⊠						
		Clay lens at 30 feet	30	4-6-6 (12) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-6**

LOCATION: Boring offset 14 feet west of staked location due to mud elevation about 3 feet higher. See attached sketch.

NORTHING: 166293 EASTING: 518661

DRILLER: B. Oldenberg LOGGED BY: P. Bailey START DATE: 03/03/20 END DATE: 03/03/20

SURFACE ELEVATION: 1111.7 ft RIG: 7506 METHOD: SURFACING: Grass/mud WEATHER:

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1078.7		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, trace Gravel, gray, wet, loose to medium dense (GLACIAL OUTWASH)					
33.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, trace coarse Sand, gray, wet, medium dense (GLACIAL TILL)	35	3-4-10 (14) 18"			
			40	4-4-12 (16) 18"			
1070.7							
41.0		END OF BORING Boring then grouted					Water observed at 29.0 feet while drilling. Water observed at 10.0 feet with 39.5 feet of tooling in the ground at end of drilling.
			45				
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-7**
LOCATION: See attached sketch
NORTHING: 166485 EASTING: 518518
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/25/19 END DATE: 11/25/19
SURFACE ELEVATION: 1112.5 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1111.5		CLAYEY SAND (SC), with roots, dark brown, wet (TOPSOIL)					
1.0		SANDY SILT (ML), brown, moist, loose (GLACIOFLUVIUM)		2-2-3 (5) 18"			
			5	3-2-2 (4) 18"			
1105.5							
7.0		SILTY SAND (SM), fine-grained Sand, brown and gray, wet, loose (GLACIOFLUVIUM)		1-2-3 (5) 18"			
1103.5	▼						
9.0		SANDY SILT (ML), brown and gray, wet, loose (GLACIOFLUVIUM)	10	2-2-3 (5) 18"			
1100.5	▼						
12.0		SILT (ML), brown and gray, wet, loose (GLACIOFLUVIUM)		2-2-3 (5) 18"			
			15	1-2-2 (4) 18"			P200=91%
1093.5							
19.0	▽	SILTY SAND (SM), fine-grained Sand, gray, wet, very loose (GLACIAL OUTWASH)	20	WOH/ 14"		27	P200=17%
			25	2-4-4 (8) 18"			
1083.5							
29.0		POORLY GRADED SAND with SILT (SP-SM), gray, wet, loose (GLACIAL OUTWASH)	30	3-4-4 (8) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-7**

LOCATION: See attached sketch

NORTHING: 166485 EASTING: 518518

DRILLER: B. Kammermeier | LOGGED BY: P. Bailey | START DATE: 11/25/19 | END DATE: 11/25/19

SURFACE ELEVATION: 1112.5 ft | RIG: 7506 | METHOD: | SURFACING: Mud | WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1075.5		POORLY GRADED SAND with SILT (SP-SM), gray, wet, loose (GLACIAL OUTWASH)		2-4-6 (10) 18"			
37.0		SILTY SAND (SM), fine to medium-grained Sand, gray, wet, medium dense (GLACIAL OUTWASH)		4-7-8 (15) 18"			
1071.5							
41.0		END OF BORING Boring then grouted					Water observed at 19.0 feet with 20.0 feet of tooling in the ground while drilling. Water observed at 12.0 feet with 40.0 feet of tooling in the ground at end of drilling. Water observed at 8.5 feet with a cave-in depth of 19.0 feet immediately after withdrawal of auger.

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-8**

LOCATION: See attached sketch

NORTHING: 166115 EASTING: 518904

DRILLER: B. Kammermeier | LOGGED BY: P. Bailey | START DATE: 11/26/19 | END DATE: 11/26/19

SURFACE ELEVATION: 1115.7 ft | RIG: 7506 | METHOD: | SURFACING: Mud | WEATHER: Clouds

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1114.7		CLAYEY SAND (SC) (TOPSOIL)					
1.0		SILTY SAND (SM), fine-grained Sand, brown, moist, loose (GLACIAL TILL)		1-2-3 (5) 16"			
			5	3-4-6 (10) 18"			
1108.7							
7.0		SILT (ML), with Sand lenses, brown, wet, very loose to loose (GLACIOFLUVIUM)		3-3-2 (5) 18"			
	▼		10	WOH/ 18"			
1103.7							
12.0		SILTY SAND (SM), fine-grained Sand, gray and brown, wet, loose (GLACIAL TILL)		2-3-5 (8) 18"			
	▼		15	2-4-4 (8) 17"			
1096.7	▽						
19.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, loose to medium dense (GLACIAL OUTWASH)	20	1-2-3 (5) 18"			
			25	1-2-3 (5) 18"		21	P200=9%
			30	4-5-6 (11) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-8**

LOCATION: See attached sketch

NORTHING: 166115 EASTING: 518904

DRILLER: B. Kammermeier | LOGGED BY: P. Bailey | START DATE: 11/26/19 | END DATE: 11/26/19

SURFACE ELEVATION: 1115.7 ft | RIG: 7506 | METHOD: | SURFACING: Mud | WEATHER: Clouds

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, loose to medium dense (GLACIAL OUTWASH)					
			35	1-4-5 (9) 18"			
			40	2-5-6 (11) 18"			
1074.7 41.0		END OF BORING Boring then grouted					Water observed at 19.0 feet with 20.0 feet of tooling in the ground while drilling. Water observed at 16.0 feet with 40.0 feet of tooling in the ground at end of drilling. Water observed at 10.0 feet with a cave-in depth of 22.0 feet immediately after withdrawal of auger.
			45				
			50				
			55				
			60				

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-9**
LOCATION: See attached sketch
NORTHING: 166373 EASTING: 518726
DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/26/19 END DATE: 11/26/19
SURFACE ELEVATION: 1117.1 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
1116.1		LEAN CLAY (CL), with fibers, dark brown, moist (TOPSOIL)					
1.0		SILTY SAND (SM), fine-grained Sand, trace medium to coarse Sand, brown (GLACIOFLUVIUM)		1-1-2 (3) 15"			
			5	3-2-2 (4) 17"			
1111.1							
6.0		SILTY SAND (SM), with Silt lenses, wet, loose (GLACIOFLUVIUM)		2-2-3 (5) 18"			
	▼		10	3-4-6 (10) 18"			
				4-5-6 (11) 18"			
		Brown to 15 feet, then gray	15	3-4-5 (9) 18"			
			20	1-2-5 (7) 18"			
1093.1	▼						
24.0		SILTY SAND (SM), fine-grained Sand, gray, wet, loose (GLACIOFLUVIUM)	25	2-4-4 (8) 17"			P200=40%
1088.1							
29.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, medium dense (GLACIOFLUVIUM)	30	3-6-8 (14) 18"			

Continued on next page

BRAUN INTERTEC
The Science You Build On

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1912472
Geotechnical Evaluation
County Ditch No. 25A Repair
Section 31-Walnut Lake Township
Bricelyn, Minnesota

BORING: **SB-9**

LOCATION: See attached sketch

NORTHING: 166373 EASTING: 518726

DRILLER: B. Kammermeier LOGGED BY: P. Bailey START DATE: 11/26/19 END DATE: 11/26/19

SURFACE ELEVATION: 1117.1 ft RIG: 7506 METHOD: SURFACING: Mud WEATHER: Sun

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND with SILT (SP-SM), fine-grained Sand, gray, wet, medium dense (GLACIOFLUVIUM)	35	3-7-7 (14) 18"			
1079.1 38.0		POORLY GRADED SAND with SILT (SP-SM), trace Gravel, gray, wet, medium dense (GLACIAL OUTWASH)	40	3-7-7 (14) 18"			
1076.1 41.0		END OF BORING Boring then grouted	45 50 55 60				Water observed at 24.0 feet with 25.0 feet of tooling in the ground while drilling. Water observed at 24.0 feet with 40.0 feet of tooling in the ground at end of drilling. Water observed at 9.0 feet with a cave-in depth of 20.0 feet immediately after withdrawal of auger.

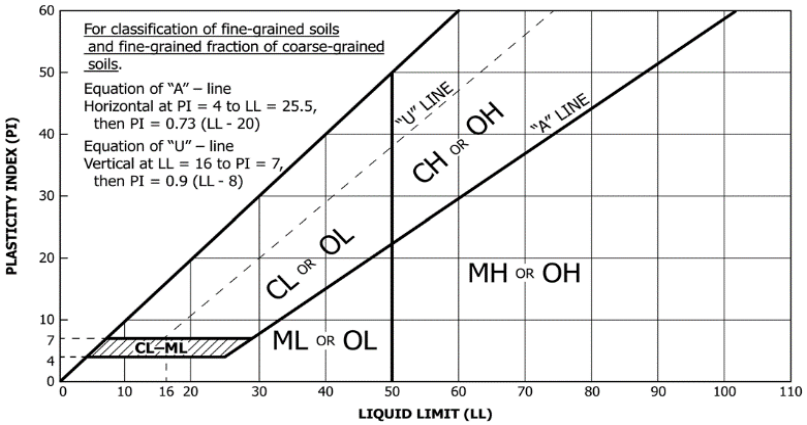
BRAUN INTERTEC
The Science You Build On.

Descriptive Terminology of Soil

Based on Standards ASTM D 2487-11/2488-09a
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 1/4 tsf
Soft	2 to 4 BPF	1/4 to 1/2 tsf
Medium	5 to 8 BPF	1/2 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6 inches into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6-inch increments, and added to get BPF.

Partial Penetration: If the sampler cannot be driven the full 12 inches beyond the initial 6-inch set, the number of blows for that partial penetration is shown as "No./X" (i.e., 50/2"). If the sampler cannot be advanced beyond the initial 6-inch set, the depth of penetration will be recorded in the Notes column as "No. to set X" (i.e., 50 to set 4").

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

WL: WL indicates the water level measured by the drillers either while drilling or following drilling.

Laboratory Tests

DD	Dry Density, pcf	**OC**	Organic content, %	**PL**	Plastic limit
WD	Wet Density, pcf	**q_p**	Pocket penetrometer strength, tsf	**LL**	Liquid limit
P200	% Passing #200 sieve	**MC**	Moisture conent, %	**PI**	Plasticity Index

Sieve Analysis Of Soil

ASTM D6913

3/26/2020

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Faribault County
PO Box 325
Blue Earth, MN 56013

Project:

B1912472
County Ditch No. 25A Repair
Section 31Walnut Lake Township
Bricelyn, MN

Sample Information

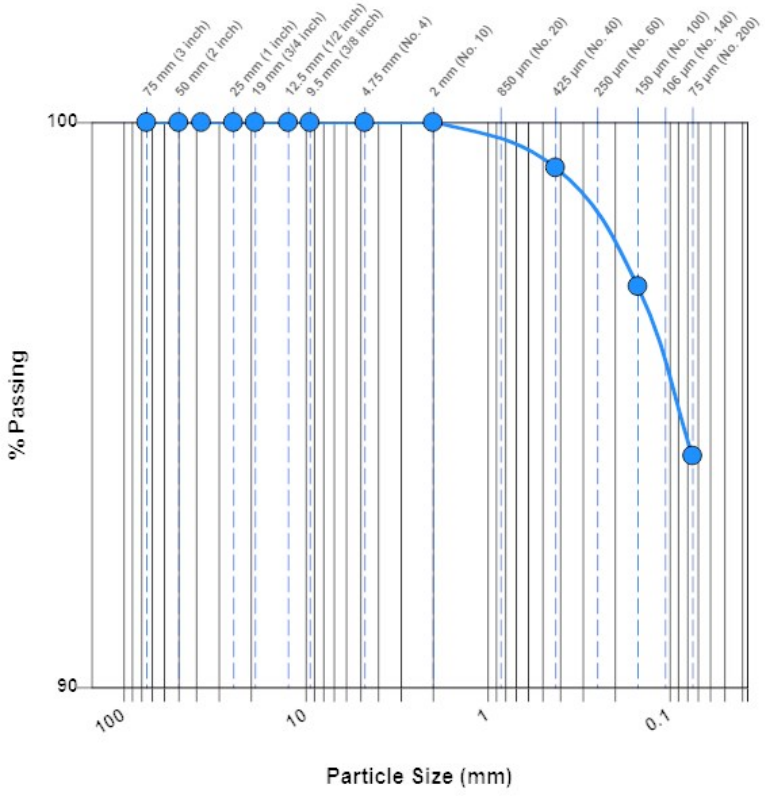
Sample Number:	299519	**Depth (ft):**	15
Boring Number:	SB-2	**Sampled By:**	Drill Crew
Sample Date:	03/26/2020		
Received Date:	03/26/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	03/26/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve Size	Passing (%)	Specification
75 mm (3 inch)	100.0	
50 mm (2 inch)	100.0	
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	100.0	
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
425 µm (No. 40)	99.2	
150 µm (No. 100)	97.1	
75 µm (No. 200)	94.1	

Sand (%) 5.9

Silt & Clay (%) 94.1



General

Results: The test is for informational purposes.

Remarks:

BRAUN INTERTEC
The Science You Build On.

Sieve Analysis Of Soil

ASTM D6913

3/26/2020

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Faribault County
PO Box 325
Blue Earth, MN 56013

Project:

B1912472
County Ditch No. 25A Repair
Section 31Walnut Lake Township
Bricelyn, MN

Sample Information

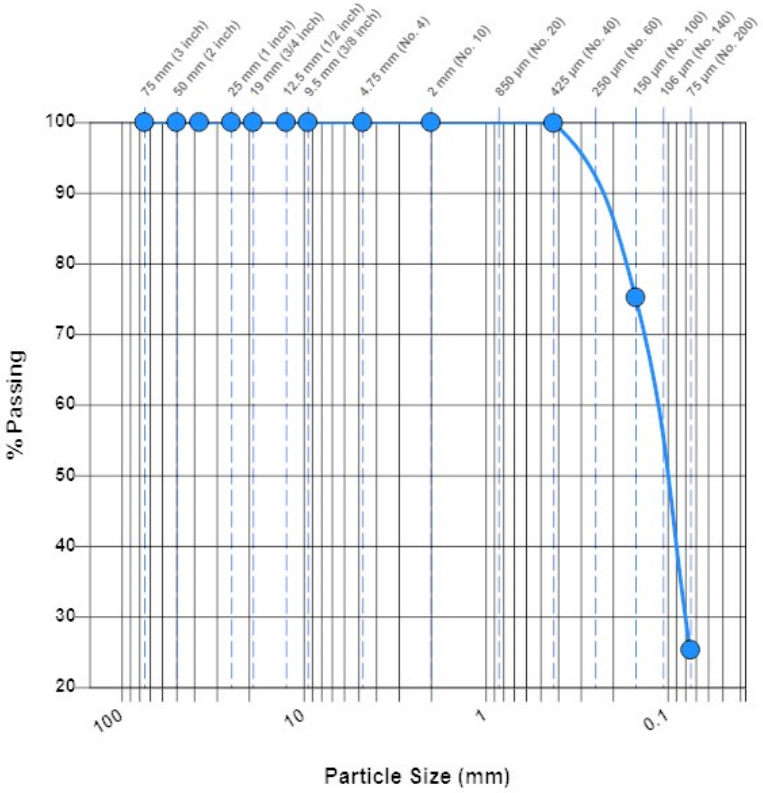
Sample Number:	299518	**Depth (ft):**	30
Boring Number:	SB-5	**Sampled By:**	Drill Crew
Sample Date:	03/26/2020		
Received Date:	03/26/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	03/26/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve Size	Passing (%)	Specification
75 mm (3 inch)	100.0	
50 mm (2 inch)	100.0	
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	100.0	
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
425 µm (No. 40)	99.9	
150 µm (No. 100)	75.2	
75 µm (No. 200)	25.3	

Sand (%)	Silt & Clay (%)
74.7	25.3

D30	D60
0.078	0.097



General

Results: The test is for informational purposes.

Remarks:

Sieve Analysis Of Soil

ASTM D6913

3/26/2020

BRAUN INTERTEC
The Science You Build On.

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Faribault County
PO Box 325
Blue Earth, MN 56013

Project:

B1912472
County Ditch No. 25A Repair
Section 31Walnut Lake Township
Bricelyn, MN

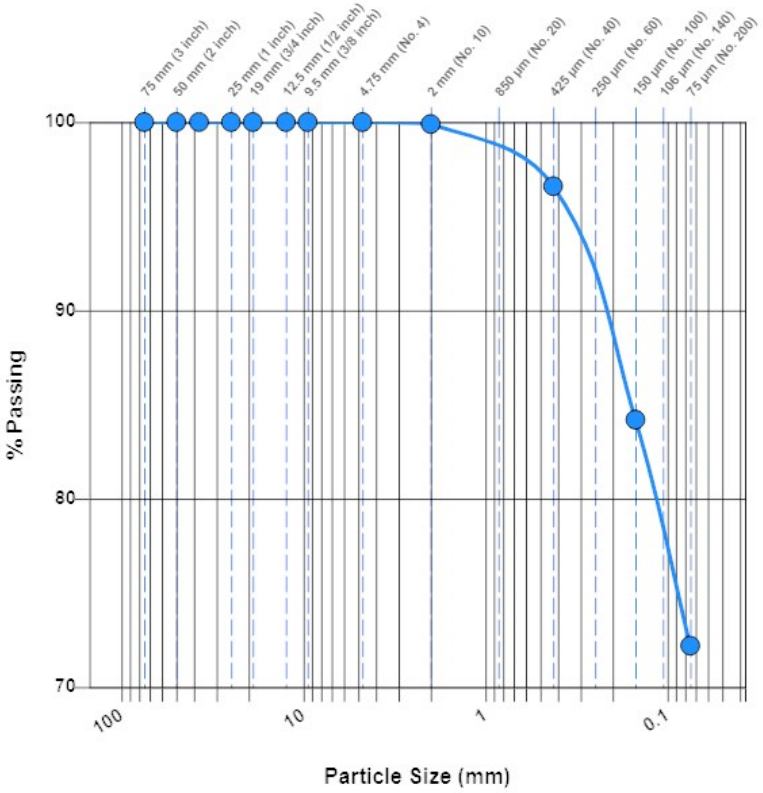
Sample Information

Sample Number:	299520	**Depth (ft):**	15
Boring Number:	SB-6	**Sampled By:**	Drill Crew
Sample Date:	03/26/2020		
Received Date:	03/26/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	03/26/2020	**Tested By:**	Streier, Jim

Laboratory Data

Sieve Size	Passing (%)	Specification
75 mm (3 inch)	100.0	
50 mm (2 inch)	100.0	
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	100.0	
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	99.9	
425 µm (No. 40)	96.6	
150 µm (No. 100)	84.2	
75 µm (No. 200)	72.2	

Sand (%)	Silt & Clay (%)
27.8	72.2



General

Results: The test is for informational purposes.

Remarks:

Sieve Analysis Of Soil

ASTM D6913

3/26/2020

BRAUN INTERTEC
The Science You Build On.

11001 Hampshire Avenue S
Minneapolis, MN 55438
Phone: 952-995-2000

Client:

Faribault County
PO Box 325
Blue Earth, MN 56013

Project:

B1912472
County Ditch No. 25A Repair
Section 31Walnut Lake Township
Bricelyn, MN

Sample Information

Sample Number:	299517	**Depth (ft):**	25
Boring Number:	SB-9	**Sampled By:**	Drill Crew
Sample Date:	03/26/2020		
Received Date:	03/26/2020	**Lab:**	11001 Hampshire Ave S, Bloomington, MN
Tested Date:	03/26/2020	**Tested By:**	Streier, Jim

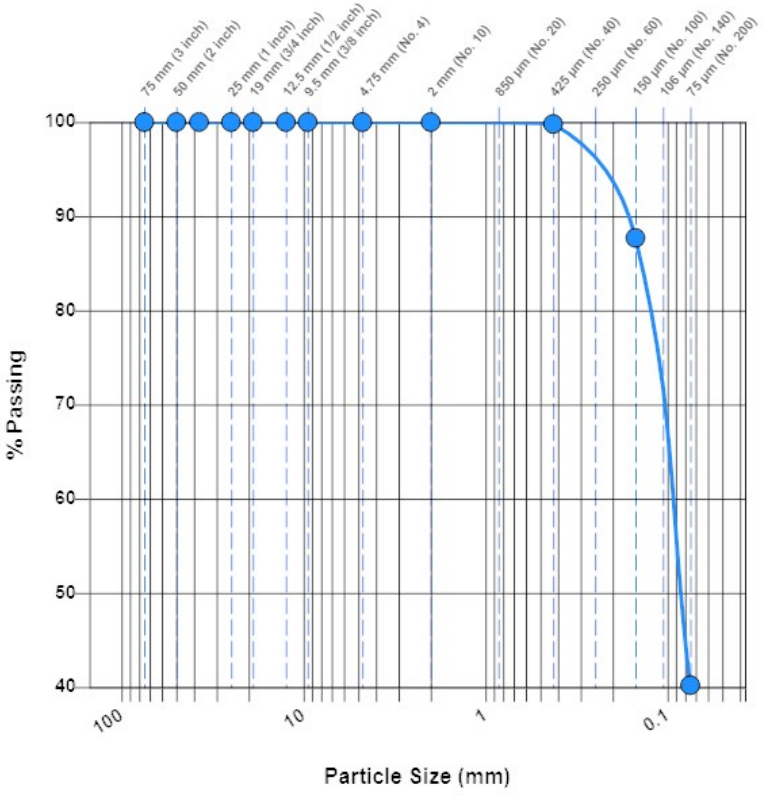
Laboratory Data

Sieve Size	Passing (%)	Specification
75 mm (3 inch)	100.0	
50 mm (2 inch)	100.0	
37.5 mm (1.5 inch)	100.0	
25 mm (1 inch)	100.0	
19 mm (3/4 inch)	100.0	
12.5 mm (1/2 inch)	100.0	
9.5 mm (3/8 inch)	100.0	
4.75 mm (No. 4)	100.0	
2 mm (No. 10)	100.0	
425 µm (No. 40)	99.8	
150 µm (No. 100)	87.7	
75 µm (No. 200)	40.2	

Sand (%)
59.8

Silt & Clay (%)
40.2

D60
0.088



General

Results: The test is for informational purposes.

Remarks: