

Geotechnical Evaluation Report

ND State Prison Fuel Tank Relocation

3100 Railroad Avenue
Bismarck, North Dakota

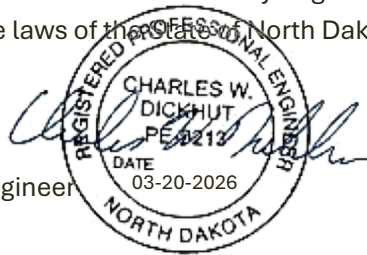
Prepared for

ND Department of Corrections and Rehabilitation

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 Registered Professional Engineer under the laws of the State of North Dakota.

Charles (Wes) Dickhut, MS, PE
Associate Director, Principal Engineer
Registration Number PE-9213
March 20, 2026



Braun Intertec Corporation

Project 10004978_001

March 20, 2026

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Zach Heinert
ND Department of Corrections and Rehabilitation
3100 Railroad Avenue
Bismarck, ND 58501

Re: Geotechnical Evaluation Report
ND State Prison Fuel Tank Relocation
3100 Railroad Avenue
Bismarck, North Dakota

Dear Mr. Heinert:

We are pleased to present this geotechnical evaluation report for the North Dakota State Penitentiary (NDSP) Fuel Tank Relocation project. Our explorations encountered existing fill, a layered soil profile, and shallow groundwater. Our report addresses these conditions for the planned removals and new construction.

Thank you for making Braun Intertec Corporation (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 Ian Becket at 612.750.2758.

Sincerely,

Braun Intertec Corporation

Jessica Anderson for

Ian C. Becket, EI
Staff Engineer

Charles W. Dickhut

Charles (Wes) Dickhut, MS, PE
Associate Director, Principal Engineer

c: Al Fitterer, Al Fitterer Architect PC



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1.0 Introduction

1.1 Project Description

This geotechnical evaluation report addresses the proposed design and construction of the NDSP Tank Relocation project, located around the existing physical plant at the North Dakota State Penitentiary in Bismarck, North Dakota. The project will include the following items we will address: Removal of three 500 gallon underground storage tanks (UST), removal of one 14,500 gallon UST, construction of a retaining wall and new foundation for a new 15,000 gallon above ground storage tank (AST), and new pavements.

The provided drawings indicate the new slab at the AST will be approximately 1664.2 feet; the wall will retain as much as 4 feet of soil.

1.2 Site Conditions and History

Currently, the site is the physical plant for the North Dakota State Penitentiary.

We reviewed aerial photographs dated back to 1938. Structures have been present at the project site prior to the earliest available aerial photographs, though the site configuration has changed several times.

We performed explorations for the nearby secure facility perimeter fence and encountered shallow groundwater that would be troublesome for any excavations nearby.

1.3 Purpose

The purpose of our geotechnical evaluation was to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for the design and construction of the tank removals and new tank, retaining wall, and pavement construction.

1.4 Background Information and Reference Documents

We reviewed the following information:

- Existing Conditions Survey, prepared by Swenson, Hagen, & Company PC, dated November 14, 2025
- Architectural Plans, prepared by Ciavarella Design Architects, dated March 9, 2025
- Aerial images obtained from Google Earth Pro and ND Aerial Photography Dissemination Mapservice
- Surface Geology, Menoken SW Quadrangle, North Dakota, prepared by K.J.R Mitchell, 2014



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.

1.5 Scope of Services

We performed our scope of services for the project in accordance with our Revised Proposal 10004978, dated January 20, 2026 and authorized on January 29, 2026. 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. We staked the soil borings after communication with the project team regarding boring location versus planned and existing structure locations. We collected the boring locations and elevations with our Trimble Catalyst GPS. The Soil Boring Location Sketch included in the [Appendix](#) shows the approximate locations of the borings.
- Performing 3 standard penetration test (SPT) borings, denoted as ST-01 to ST-03 to nominal depths of 15 to 40 feet below grade across the site.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.
- Perform engineering analysis including settlement, bearing capacity, and lateral earth pressure calculations.
- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation and the design of foundations, exterior slabs, and pavements.

We performed this geotechnical evaluation concurrently with a Phase II Environmental Assessment (ESA) which we will submit separately. The project team should review the Phase II ESA report in conjunction with this geotechnical evaluation report to understand both the geotechnical and environmental aspects of the site and how they may impact one another.

2.0 Results

2.1 Geologic Overview

Based on the reviewed surface geology maps, the site is underlain by alluvial terrace deposits, associated with the flooding of the historical Missouri River. These deposits are typically sandy, containing gravel and



cobbles. Older deposits encountered at depth in the boring consist of alternating beds of silt and clay alluvium.

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.

2.2 Boring Results

Table 2-1 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 the table below.

Table 2-1. Subsurface Profile Summary*

Strata	Soil Type -ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil fill	SM, SC, CL	N/A	<ul style="list-style-type: none"> Predominantly dark brown lean clay containing vegetation and roots Thicknesses encountered at the boring locations vary from about 7 to 10 inches Moisture condition generally moist
Fill	SC, CL, CH	9 to 14 blows per foot (BPF)	<ul style="list-style-type: none"> Moisture condition generally moist Thicknesses at boring locations varied from about 4 to 7 feet. Highly variable, soils intermixed.
Alluvial	SP-SM, SM, SC, CL, CH, ML	4 to 61 BPF	<ul style="list-style-type: none"> The majority of alluvial soils were wet and below the water table Soils intermixed, containing lenses, seams, and layers of sand, silt and clay Clay soils soft to medium, becoming very stiff at depth Sands encountered by borings ST-01 and ST-02 may contain cobbles or boulders based on the high penetration resistances recorded

We did not perform gradation analysis on the apparent aggregate base material encountered as part of the pavement section, in accordance with our scope of work. Therefore, we cannot conclusively determine if the encountered material satisfies a particular specification, and it should not be assumed it is suitable for reuse.

For simplicity in this report, we define existing fill to mean existing, uncontrolled, or undocumented fill.



2.3 Groundwater

Table 2-3 summarizes the highest depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details. A record of groundwater readings collected in two piezometers installed in borings ST-02 and ST-03 is also included in the Appendix.

Table 2-2. Groundwater Summary

Locations	Surface Elevation (ft MSL)	Measured Depth to Highest Observed Groundwater (ft)	Corresponding Groundwater Elevation (ft)
ST-01	1664.2	7	1657 ½
ST-02	1664.6	7.8	1657 ½
ST-03	1665.9	7.4	1658 ½

Groundwater elevations were rounded up to the nearest ½ foot.

At the time of our observation, the groundwater surface elevation varied between 1658 feet at the north end of the project area to 1657 feet at the southern end. The soil borings indicate a layered soil profile that is conducive for encountering perched water conditions. Project planning should expect groundwater will fluctuate in relation to annual and seasonal fluctuations.

2.4 Laboratory Test Results

The boring logs show the results of moisture content (ASTM D2216), mechanical analysis through the #200 sieve (ASTM D1140), and Atterberg Limits (ASTM D4318) testing we performed, next to the tested sample depth. We also performed Sieve Hydrometer testing. The Appendix contains the results of these tests.

The moisture content of the near surface materials above the water table vary between 14 and 35 percent. These materials are near to well above their estimated optimum moisture contents.

Our mechanical analyses indicated that the tested sand materials contained 7 to 41 percent silt and clay by weight.

Atterberg Limit testing performed on various samples resulted in classifications of lean clay and silt.

3.0 Recommendations

3.1 Design and Construction Discussion



Tank removal at the project site will be impacted by the high groundwater table. Excavations below the groundwater table will require dewatering, though soil type in the excavation will dictate methods of controlling groundwater.

The new site structures can be supported on natural soils or engineered fill. We expect portions of the retaining wall footings may not penetrate through the existing fill. In these areas, overexcavation and replacement of the fill is appropriate and can provide adequate bearing capacity for foundation support.

3.1.1 Groundwater and Tank Removals

Groundwater levels vary across the project site by about a foot based on our piezometer readings. We observed groundwater near the existing 14,500 UST around elevation 1658 within a clay profile. Based on the expected size of this tank, removal excavations will likely require excavating below the water table. Because of the clay profile encountered in this area, we expect groundwater can likely be controlled by sumps and pumps during tank removal and backfill. We expect that the site would benefit from pumping from a sump at least 2 feet below the working surface to provide a stable surface.

Groundwater was observed around elevation 1657 feet near the three 500-gallon USTs at the southern end of the project. We expect these tanks to be smaller diameter, and excavations may not require penetrating the groundwater table. We caution this area does contain a sandy profile and excavations will be unstable if advanced below the groundwater surface without dewatering. The contractor should provide a dewatering plan for review and approval prior to starting excavations for the tanks.

We note tank removals should be documented by our environmental personnel at the time of excavation. We should be provided notice prior to tank removals for our scheduling staff to observe, test, and sample materials from the tank excavations.

3.1.2 Foundation Support

Per the provided drawings, we understand the retaining wall surrounding the new AST is planned to be supported on spread footings. This is appropriate if the footings bear on natural materials, though we expect portions of the footing subgrade will consist of existing fill. Where encountered, fill should be removed below footings until natural soils are exposed. Based on the fill depths encountered in the borings, some removals may expose the groundwater surface, requiring additional consideration for fill placement for footing support. Wet subgrades can be supplemented by placing a layer of clear gravel (no fines) wrapped in fabric to provide a stable subgrade.

Based on the boring results near the planned retaining wall, it would be prudent to estimate approximately half of the retaining wall footings will require a two-foot-deep fabric wrapped rock section. The section should be oversized at least one foot wider on each side of the footing for oversizing.

The tank may be supported on conventional frost depth footings or be embedded to frost depth provided fill is removed below the tank and its oversized areas. If the preferred method of support is a slab on grade/mat foundation, it would be prudent to plan for a non-frost susceptible layer of imported sand or gravel below the tank.



3.1.3 Reuse of On-Site Soils

Onsite, debris free, non-organic soils can be reused for slab and pavement support, though additional considerations are required for frost protection, as the onsite soils are susceptible to frost heave. Based on the moisture content testing we performed, we anticipate most of the onsite soils are above to well above their estimated optimum moisture contents. The contractor should expect soils will require drying to facilitate reuse.

3.1.4 Construction Disturbance

Onsite clay soils are highly susceptible to disturbance, especially when wet. Care should be taken during excavation and construction to not disturb saturated clays soils as these materials can become unsuitable for support once disturbed, requiring drying and recompaction or removal and replacement.

3.2 Site Grading and Subgrade Preparation

3.2.1 Foundation Support

We recommend removing fill, soft clays, disturbed materials and other unsuitable soils below new foundations for the retaining wall and tank and their oversize areas. Based on the boring results, we estimate fill depths of 4 to 7 feet below existing grades in the tank and retaining wall footprint.

After fill removal, the excavation subgrade should be observed and approved by a geotechnical representative.

Where removals of unsuitable materials expose the groundwater surface, we recommend placing a geotextile fabric-wrapped layer of clear gravel to the footing subgrade.

3.2.2 Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See [Figure 3-1](#) for an illustration of excavation oversizing.



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. If excavations must extend below the groundwater surface for removals or construction in the southern project extents, a well contractor should develop a dewatering plan; the design team should review this plan.

3.2.5 Pavement and Exterior Slab Subgrade Preparation

We recommend the following steps for pavement and exterior slab subgrade preparation, understanding the site will have minimal grade changes from existing. Note that project planning may require additional subcuts to limit frost heave.

1. Strip unsuitable soils consisting of topsoil, organic soils, peat, vegetation, existing structures, and pavements from the area, within 2 feet of the surface of the proposed pavement grade.
2. Have a geotechnical representative observe the excavated subgrade to evaluate if additional subgrade improvements are necessary.
3. Scarify, moisture condition and surface compact the subgrade to meet the earthwork requirements below in [Section 3.2.7](#)
4. Place pavement engineered fill to grade and compact in accordance with [Section 3.2.7](#) to bottom of pavement and exterior slab section. See [Section 3.4](#) for additional considerations related to frost heave.
5. Proofroll the pavement or exterior slab subgrade as described in [Section 3.2.6](#).

Note, we recommend sloping subgrade soils to promote drainage and removal of accumulated water.

3.2.6 Pavement Subgrade Proofroll

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend proofrolling the subgrade soils with a fully loaded tandem-axle truck. We also recommend having a geotechnical representative observe the proof-roll. Areas that fail the proofroll likely indicate soft or weak areas that will require additional soil correction work to support pavements.

The contractor should correct areas that display excessive yielding or rutting during the proofroll, as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and recompaction, subcutting and replacement with soil or crushed aggregate, chemical stabilization, and/or geotextiles. We recommend performing a second proofroll after the aggregate base material is in place, and prior to placing bituminous or concrete pavement.

3.2.7 Engineered Fill Materials and Compaction

[Table 3-2](#) below contains our recommendations for engineered fill materials.



Table 3-1. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
<ul style="list-style-type: none"> ■ Below foundations ■ Drainage layer 	Clear gravel	GP, GW	100% passing 2-inch sieve <20% passing #4 sieve <5% passing #200 sieve	< 2% Organic Content (OC)
<ul style="list-style-type: none"> ■ Non-frost-susceptible 	<ul style="list-style-type: none"> ■ Non-frost-susceptible fill 	GP, GW, SP, SW	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve	< 2% OC
Behind below-grade walls, beyond drainage layer	Retained fill	CL, SC, SM, SP-SM, SP	100% passing 3-inch sieve	< 2% OC Plasticity Index (PI) < 25%
Pavements	Pavement fill	CL, SC, SM, SP-SM, SP	100% passing 3-inch sieve	< 2% OC PI < 25%
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	Any	100% passing 6-inch sieve	< 10% OC

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

For large self-propelled compactors, we recommend spreading engineered fill in loose lifts of no more than 12 inches thick. For walk-behind compactors, we recommend spreading engineered fill in loose lifts of no more than 6 inches thick. We recommend compacting engineered fill in accordance with the criteria presented below in [Table 3-3](#). The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 3-2. Compaction Recommendations Summary

Reference	Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points		
		< 12% Passing #200 Sieve (SP, SP-SM)	> 12% to <50% Passing #200 Sieve (SC, SM)	>50% Passing #200 Sieve (CL)
Below foundations and oversizing zones	N/A*	As needed to facilitate compaction	N/A	N/A
Below exterior pavements, slabs, and retained fill	95	As needed to facilitate compaction	±3	±3
Below landscaped surfaces	90	As needed to facilitate compaction	±5	±4

*No testing required if clear gravel is used for foundation support



The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

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

3.2.8 Soil Observations and Testing

We recommend that we be retained to perform observations for the retaining wall and tank foundation excavations. We should be contacted to observe the excavation prior to fill or foundation placement. We recommend that retaining wall backfill be tested for conformance with the project specifications with a minimum rate of 1 test per 50 linear feet per 2 vertical feet of fill. Other fill for pavement and slab support should be tested at a rate of one test per 2,500 square feet per 2 vertical feet of fill. We additionally recommend that we be consulted to observe subgrade proofrolls prior to placement of the pavement section.

3.3 Retaining Walls

3.3.1 Drainage

Drainage behind the walls is critical. Unless a drainage composite is placed against the backs of the retaining walls, we recommend that fill placed within 2 horizontal feet of the walls consist of clear gravel. If “clear” gravel only is used for drainage, a fabric separator may be needed to keep sand from washing into the gravel. Water within this zone should be removed and routed away from the wall and its foundation zone.

Wall fill not capped with slabs or pavement should be capped with a low-permeability soil to limit the infiltration of surface drainage into the fill. Grades should also be sloped to divert water away from the walls and the reinforced zone. We recommend the wall designer be consulted if water is introduced to the area of the wall.

3.3.2 Foundation Embedment and Net Allowable Bearing Pressure

We expect the retaining wall footings will bear on natural sands or imported clear gravel where overexcavations are required. For wall design purposes, we recommend retaining wall foundations be designed for a maximum allowable bearing pressure of 2,000 PSF, this includes a factor of safety of at least 3 against bearing capacity failure.

As much of the retaining wall system will result in a net cut into the hillside, we expect little new settlement from the new retaining wall footings.

To resist uplift from frost, we recommend embedding footings for retaining walls 60 inches below grade.



3.3.3 Configuring and Resisting Lateral Loads

We expect the retaining walls can be designed for the active lateral earth pressure case, given they can tolerate a slight rotation. We estimate the onsite soils, compacted as recommended [Section 3.2.7](#), will have a friction angle of 26 degrees, and a wet unit weight of 125 PCF. This given, we recommend designing the retaining walls to resist onsite soils with an equivalent drained active fluid pressure of 50 PCF.

Resistance to lateral earth pressures will be provided by passive resistance along the base of the wall and reinforced zone, and by sliding resistance along the bottoms of the wall footings. We recommend assuming a sliding coefficient equal to 0.4. These values are un-factored.

3.4 Tank Support

Based on the tank capacity and sizing, we estimate the tank will exert a contact pressure of about 1,000 PSF over an assumed diameter of 13 feet. Based on this, we estimate the tank, whether supported on new, non-frost susceptible fill at the planned surface grade, or embedded to frost depth of 5 feet, will settle by less than one inch. If a ring wall is required for tanks sides and room support, a maximum net allowable bearing stress of 1,500 psf may be used without additional corrections. If a higher bearing capacity is more practical, we would be pleased to provide additional site preparation or ground improvement recommendations.

3.5 Frost Protection

3.5.1 General

Clayey and silty sands will underlie exterior slabs, as well as pavements. We consider these soils to be highly frost susceptible. Soils of this type can retain moisture and heave upon freezing. In general, this characteristic is not an issue unless these soils become saturated, due to surface runoff or infiltration, or are excessively wet in-situ. Once frozen, unfavorable amounts of general and isolated heaving of the soils and the surface structures supported on them could develop. This type of heaving could affect design drainage patterns and the performance of exterior slabs and pavements, as well as any isolated exterior footings and piers.

Note that general runoff and infiltration from precipitation are not the only sources of water that can saturate subgrade soils and contribute to frost heave. Roof drainage and irrigation of landscaped areas in close proximity to exterior slabs, pavements, and isolated footings and piers, contribute as well.

3.5.2 Frost Heave Mitigation

To address most of the heave related issues, we recommend setting general site grades and grades for exterior surface features to direct surface drainage away from buildings, across large, paved areas and away from walkways. Such grading will limit the potential for saturation of the subgrade and subsequent heaving. General grades should also have enough “slope” to tolerate potential larger areas of heave, which may not fully settle after thawing.



Even small amounts of frost-related differential movement at walkway joints or cracks can create tripping hazards. Project planning can explore several subgrade improvement options to address this condition.

One of the more conservative subgrade improvement options to mitigate potential heave is removing any frost-susceptible soils present below the exterior slab areas down to a minimum depth of 5 feet below subgrade elevations. We recommend filling the resulting excavation with non-frost-susceptible fill. We recommend providing drainage at the base of the subcut, as well as gradual transitions from this subcut (3H:1V or flatter gradient). We also recommend sloping the bottom of the excavation toward one or more collection points to remove any water entering the engineered fill. This approach will not be effective in controlling frost heave without removing the water.

An important geometric aspect of the excavation and replacement approach described above is sloping the banks of the excavations to create a more gradual transition between the unexcavated soils considered frost susceptible and the engineered fill in the excavated area, which is not frost susceptible. The slope allows attenuation of differential movement that may occur along the excavation boundary. We recommend slopes that are 3H:1V, or flatter, along transitions between frost-susceptible and non-frost-susceptible soils.

Figure 3-4 shows an illustration summarizing some of the recommendations.

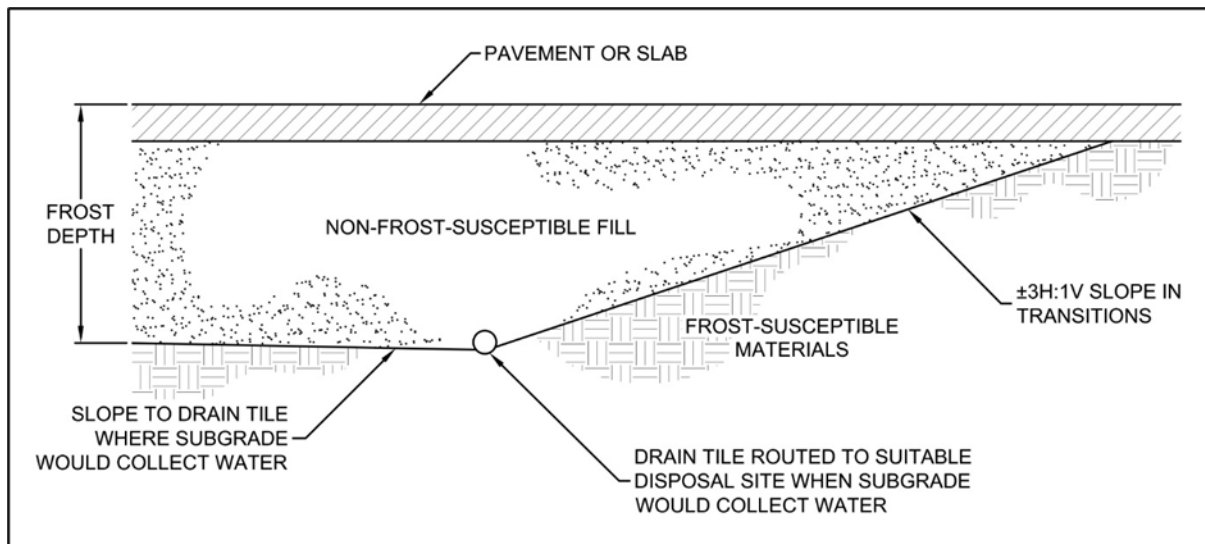


Figure 3-2. Frost Protection Geometry Illustration

Another option is to limit frost heave in critical areas, such as doorways and entrances, via frost-depth footings or localized excavations with sloped transitions between frost-susceptible and non-frost-susceptible soils, as described above.

Over the life of slabs and pavements, cracks will develop, and joints will open up, which will expose the subgrade and allow water to enter from the surface and either saturate or perch atop the subgrade soils. This water intrusion increases the potential for frost heave or moisture-related distress near the crack or joint. Therefore, we recommend implementing a detailed maintenance program to seal and/or fill any cracks and



joints. The maintenance program should give special attention to areas where dissimilar materials abut one another, where construction joints occur and where shrinkage cracks develop.

3.6 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, scaffolding, 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 – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

4.0 Procedures

4.1 Penetration Test Borings

We drilled the penetration test borings with a CME 75 truck-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 with ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

4.2 Exploration Logs

4.2.1 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 and other in-situ tests performed. The logs also present the results of organic vapor screening, laboratory tests performed on penetration test samples, and groundwater measurements. The [Appendix](#) also includes a Fence Diagram intended to provide a summarized cross-sectional view 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.

4.2.2 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 and other in-situ 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 .

4.3 Material Classification and Testing

4.3.1 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.

4.3.2 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 procedures.

4.4 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. We returned to the site twice after completing the borings and installation of temporary piezometers to read the water levels in the piezometers.

5.0 Qualifications

5.1 Variations in Subsurface Conditions

5.1.1 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 re-evaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.



5.1.2 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.

5.2 Continuity of Professional Responsibility

5.2.1 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.

5.2.2 Construction Observations and Testing

We recommend retaining Braun Intertec 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.

5.3 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.

5.4 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

Soil Boring Location Sketch

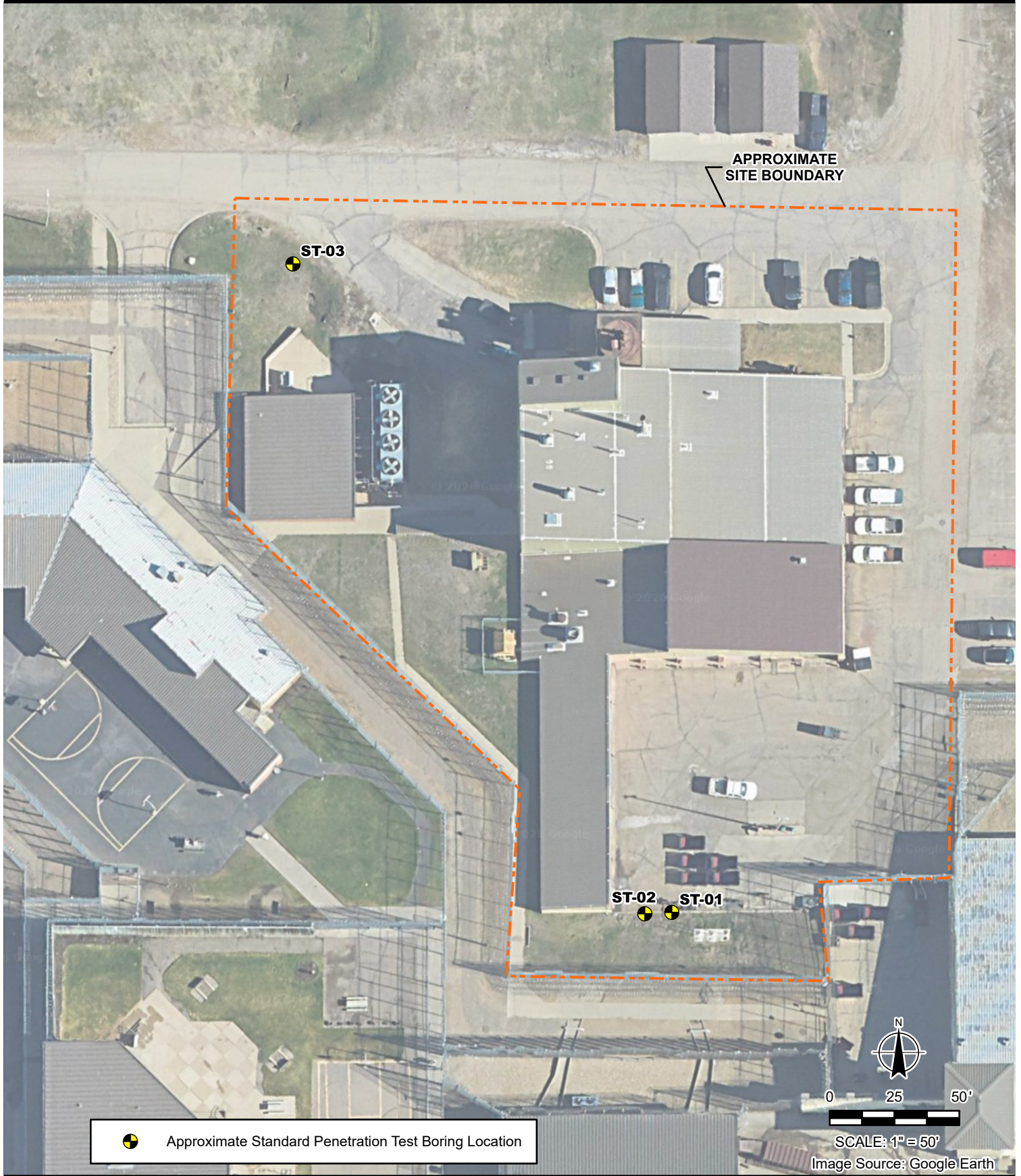
Fence Diagram


Log of Boring Sheets ST-01 to ST-03

Sieve Hydrometer Test Results

Descriptive Terminology of Soil

Piezometer Readings




 Approximate Standard Penetration Test Boring Location

**BRAUN
INTERTEC**

the science you build on

2908 Morrison Avenue, Suite 3
Bismarck, ND 58504
701.255.7180
braunintertec.com

Project No:
10004978_001

Drawing No:
BoringLocs

Drawn By: SL
 Date Drawn: 3/9/2026
 Checked By: IB
 Last Modified: 3/20/2026

NDSP Fuel Tank Relocation







3100 Railroad Ave

Bismarck, North Dakota

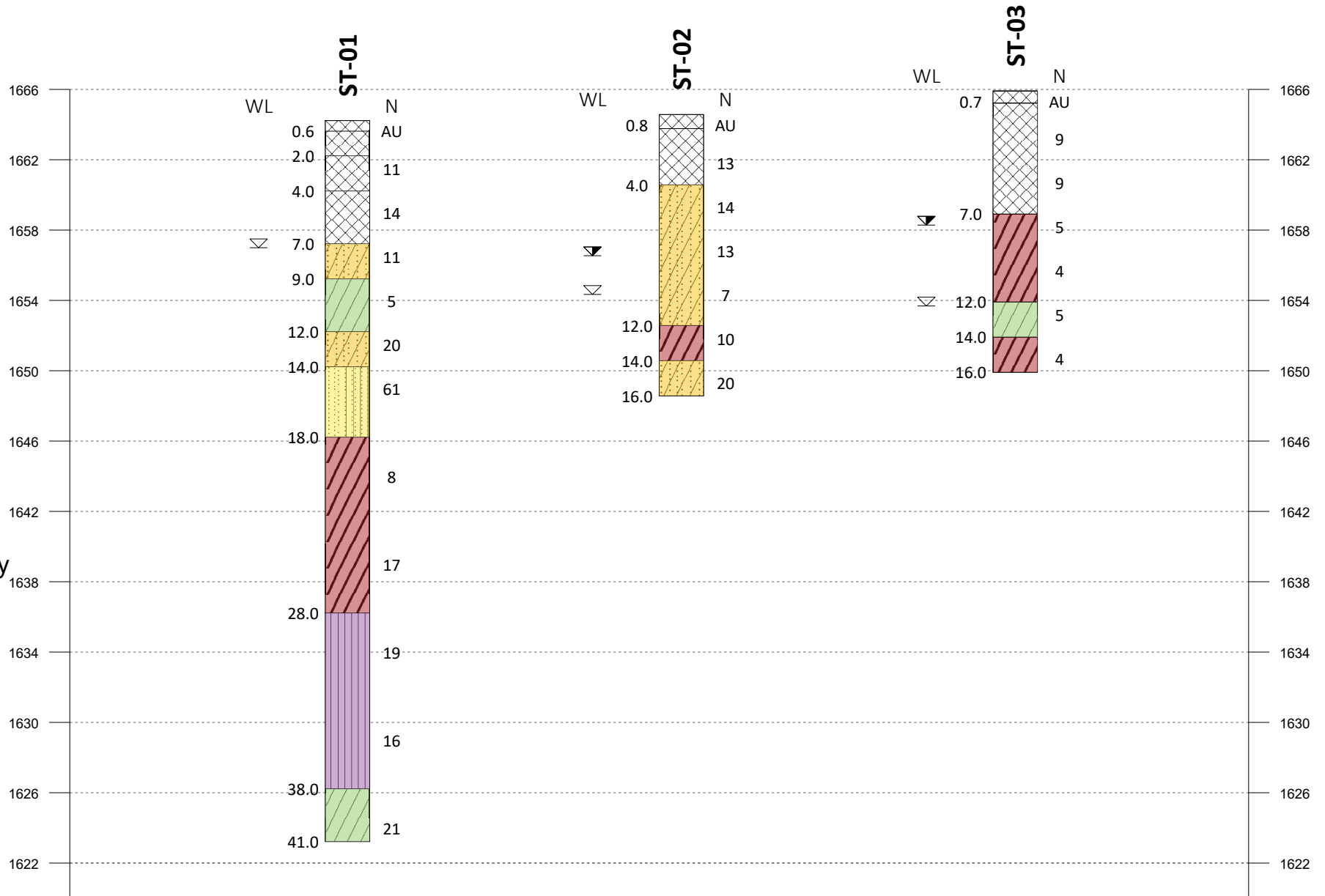
**Boring Location
Sketch**



Legend Key

-  Fill
-  SC
-  CH
-  CL
-  SP-SM
-  ML

1620.00



SECTION LINE 1

Fence Diagram

Geotechnical Evaluation
 NDSP Fuel Tank Relocation
 3100 Railroad Ave
 Bismarck, North Dakota

Project ID: 10004978_001 GEO
 Vert. Scale: 1"= 8'
 Hor. Scale: NTS
 Date: 03/20/2026

See Descriptive Terminology sheet for explanation of abbreviations

Project Number 10004978_001 GEO					BORING: ST-01		
Geotechnical Evaluation					LOCATION: Captured with RTK GPS.		
NDSP Fuel Tank Relocation					DATUM: WGS 84		
3100 Railroad Ave					LATITUDE: 46.801042	LONGITUDE: -100.742110	
Bismarck, North Dakota					START DATE: 03/02/26	END DATE: 03/02/26	
DRILLER: B.Hatle		LOGGED BY: I.Becket		SURFACING: Grass		WEATHER: Clear	
SURFACE ELEVATION: 1664.2 ft		RIG: 7520		METHOD: 3 1/4" HSA			
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
1663.6		SANDY LEAN CLAY (CL), trace Gravel, trace roots, dark brown, moist (TOPSOIL FILL)		AU			
0.6		FILL: SANDY LEAN CLAY (CL), trace Gravel, brown, moist		6-4-7			
1662.2		FILL: FAT CLAY (CH), trace Sand lenses, brown, moist		(11)	2.5	36	
2.0				10"			
1660.2		FILL: SANDY LEAN CLAY (CL), with Sand seams, trace Gravel, brown, moist	5	5-7-7		18	LL=29, PL=14, PI=15
4.0				(14)			See attached Sieve
1657.2		CLAYEY SAND (SC), medium to coarse-grained, brown, wet, medium dense (ALLUVIUM)		4-5-6			Hydrometer
7.0				(11)			P200=13%
1655.2		LEAN CLAY (CL), trace Silt seams, trace Gravel, brown, moist, medium (ALLUVIUM)	10	2-3-2		38	LL=44, PL=17, PI=27
9.0				(5)			
1652.2		CLAYEY SAND with GRAVEL (SC), medium to coarse-grained, with Clay seams, brown, moist, medium dense (ALLUVIUM)		3-8-12		15	P200=26%
12.0				(20)			
1650.2		POORLY GRADED SAND with SILT (SP-SM), medium to coarse-grained, brown, wet, very dense (ALLUVIUM)	15	15-33-28		14	P200=7%
14.0				(61)			
1646.2		FAT CLAY (CH), trace Silt lenses, brown, moist, medium to very stiff (ALLUVIUM)	20	3-2-6		23	
18.0		<i>Iron oxide staining at 20 feet</i>		(8)			
				12"			
		<i>Gray below 24 feet</i>	25	3-7-10	3	25	
				(17)			
				14"			
1636.2		SILT (ML), gray, wet, medium dense (ALLUVIUM)	30	2-7-12		32	LL=33, PL=25, PI=8
28.0				(19)			
				16"			

Continued on next page

See Descriptive Terminology sheet for explanation of abbreviations

Project Number 10004978_001 GEO				BORING: ST-01	
Geotechnical Evaluation				LOCATION: Captured with RTK GPS.	
NDSP Fuel Tank Relocation				DATUM: WGS 84	
3100 Railroad Ave				LATITUDE: 46.801042	LONGITUDE: -100.742110
Bismarck, North Dakota				START DATE: 03/02/26	END DATE: 03/02/26
DRILLER: B.Hatle	LOGGED BY: I.Becket		SURFACING: Grass		WEATHER: Clear
SURFACE ELEVATION: 1664.2 ft	RIG: 7520	METHOD: 3 1/4" HSA			

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
		SILT (ML), gray, wet, medium dense (ALLUVIUM)		4-6-10 (16) 10"			
1626.2			35				
38.0		LEAN CLAY (CL), gray, wet to moist, very stiff (ALLUVIUM)		5-8-13 (21) 13"	4	26	
1623.2			40				
41.0		END OF BORING					
		Boring then backfilled with auger cuttings					Water observed at 7.0 feet while drilling.
			45				
			50				
			55				
			60				

See Descriptive Terminology sheet for explanation of abbreviations

Project Number 10004978_001 GEO					BORING: ST-02		
Geotechnical Evaluation					LOCATION: Captured with RTK GPS.		
NDSP Fuel Tank Relocation					DATUM: WGS 84		
3100 Railroad Ave					LATITUDE: 46.801040	LONGITUDE: -100.742151	
Bismarck, North Dakota					START DATE: 03/02/26	END DATE: 03/02/26	
DRILLER: B.Hatle	LOGGED BY: I.Becket		SURFACE ELEVATION: 1664.6 ft		RIG: 7520	METHOD: 3 1/4" HSA	
			SURFACING: Grass		WEATHER: Clear		
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
1663.8 0.8		CLAYEY SAND (SC), trace Gravel, trace roots, dark brown, frozen (moist when thawed) (TOPSOIL FILL)		AU			
1660.6 4.0		FILL: CLAYEY SAND with GRAVEL (SC), fine to coarse-grained, brown, moist		5-7-6 (13) 8"			
		CLAYEY SAND (SC), fine to medium-grained, with Silt and Clay seams, brown, moist to wet, medium dense to loose (ALLUVIUM)	5	4-6-8 (14) 10"		15	P200=41%
				5-7-6 (13) 9"			See attached Sieve Hydrometer P200=35%
1652.6 12.0		FAT CLAY (CH), trace Gravel, brown, moist, stiff (ALLUVIUM)		1-3-4 (7) 10"			
1650.6 14.0				2-4-6 (10) 7"	1.5	36	Temporary piezometer installed with screen set to 10 feet
1648.6 16.0		CLAYEY SAND with GRAVEL (SC), fine to coarse-grained, brown, wet, medium dense (ALLUVIUM)	15	4-9-11 (20) 8"			Water observed at 10.0 feet while drilling.
		END OF BORING					
		Boring then backfilled with auger cuttings					Water observed at 7.8 feet in temporary piezometer when rechecked on 03/09/2026.
			20				
			25				
			30				

See Descriptive Terminology sheet for explanation of abbreviations

Project Number 10004978_001 GEO					BORING: ST-03		
Geotechnical Evaluation					LOCATION: Captured with RTK GPS.		
NDSP Fuel Tank Relocation					DATUM: WGS 84		
3100 Railroad Ave					LATITUDE: 46.801726	LONGITUDE: -100.742696	
Bismarck, North Dakota					START DATE: 03/02/26	END DATE: 03/02/26	
DRILLER: B.Hatle	LOGGED BY: I.Becket		SURFACE ELEVATION: 1665.9 ft		RIG: 7520	METHOD: 3 1/4" HSA	
			SURFACING: Grass		WEATHER: Clear		
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
1665.2 0.7		SANDY LEAN CLAY (CL), trace Gravel, dark brown, moist (TOPSOIL FILL) FILL: CLAYEY SAND (SC), fine to medium-grained, trace Gravel, dark brown, moist		AU 6-5-4 (9) 10"			
1658.9 7.0		FAT CLAY (CH), brown to gray, moist, medium to soft (ALLUVIUM)	5	4-4-5 (9) 8"		14	P200=27%
1653.9 12.0		SANDY LEAN CLAY (CL), trace Gravel, gray, wet, medium (ALLUVIUM)	10	2-2-3 (5) 9"	2.5	33	
1651.9 14.0		FAT CLAY (CH), grayish brown, moist, soft (ALLUVIUM)	15	2-2-2 (4) 13"	2.5		Temporary piezometer installed with screen set to 15 feet
1649.9 16.0		END OF BORING		1-1-3 (4) 12"			Water observed at 12.0 feet while drilling.
		Boring then backfilled with auger cuttings					Water observed at 7.4 feet in temporary piezometer when rechecked on 03/09/2026.
			20				
			25				
			30				

Client:

ND Department of Corrections and Rehabilitation
DOCR-Power Plant Facility
PO Box 5521 3100 Railroad Avenue
Bismarck, ND 58506

Project:

10004978_001.00.02
NDSP Fuel Tank Relocation
3100 Railroad Ave
Bismarck, ND 58501

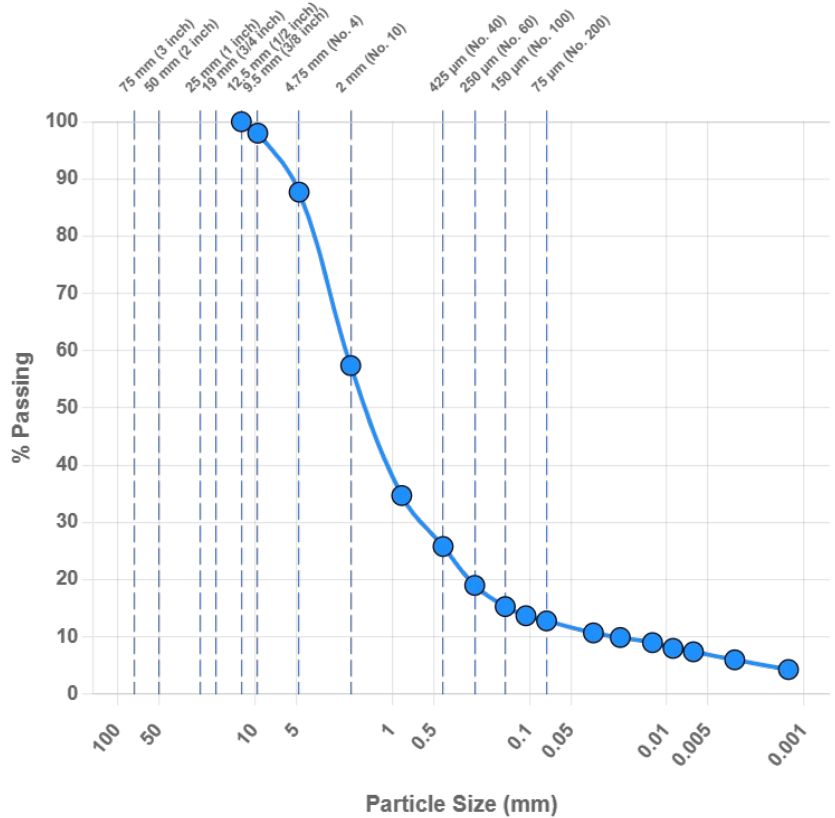
Sample Information

Sample Number: 717476 **Alternate ID:** 50
Sampling Method: Penetration Boring ASTM D1586 **Depth (ft):** 7-8.5
Boring Number: ST-01 **Sampled By:** Drill Crew
Location: Native Soil
Location Details: ST-01, 7-8.5'
Sample Date: 03/02/2026
Received Date: 03/06/2026 **Lab:** 2908 Morrison Ave. Suite 3, Bismarck, ND
Tested Date: 03/17/2026 **Tested By:** Austin, Jon

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
12.5 mm (1/2 inch)	100	-
9.5 mm (3/8 inch)	98	-
4.75 mm (No. 4)	87.7	-
2 mm (No. 10)	57.4	-
850 µm (No. 20)	34.7	-
425 µm (No. 40)	25.8	-
250 µm (No. 60)	19	-
150 µm (No. 100)	15.3	-
106 µm (No. 140)	13.7	-
75 µm (No. 200)	12.8	-
34.2 (µm)	10.7	-
21.8 (µm)	9.9	-
12.7 (µm)	9	-
9 (µm)	8	-
6.4 (µm)	7.4	-
3.2 (µm)	6	-
1.3 (µm)	4.3	-



Soil Classification: SC Clayey sand

Gravel (%): 12.3 **Sand (%):** 74.9 **Silt (%):** 6 **Clay (%):** 6.8
D₆₀ (µm): 2236.0 **D₃₀ (µm):** 625.6 **D₁₀ (µm):** 23.4 **C_u:** 95.56 **C_c:** 7.48

General

Client:

ND Department of Corrections and Rehabilitation
DOCR-Power Plant Facility
PO Box 5521 3100 Railroad Avenue
Bismarck, ND 58506

Project:

10004978_001.00.02
NDSP Fuel Tank Relocation
3100 Railroad Ave
Bismarck, ND 58501

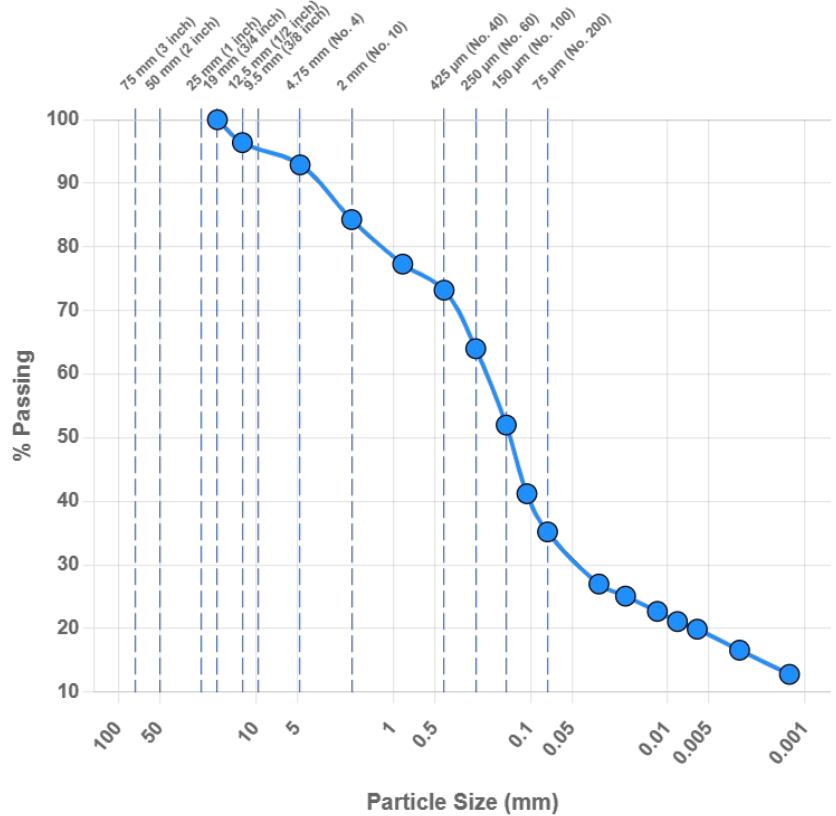
Sample Information

Sample Number: 717477 **Alternate ID:** 63
Sampling Method: Penetration Boring ASTM D1586 **Depth (ft):** 9.5-11
Boring Number: ST-02 **Sampled By:** Drill Crew
Location: Native Soil
Location Details: ST-02, 9.5-11'
Sample Date: 03/02/2026
Received Date: 03/06/2026 **Lab:** 2908 Morrison Ave. Suite 3, Bismarck, ND
Tested Date: 03/17/2026 **Tested By:** Austin, Jon

Laboratory Data

Sieve-Hydrometer Analysis

Particle Size	% Passing	Specification
19 mm (3/4 inch)	100	-
12.5 mm (1/2 inch)	96.4	-
4.75 mm (No. 4)	92.9	-
2 mm (No. 10)	84.3	-
850 µm (No. 20)	77.3	-
425 µm (No. 40)	73.2	-
250 µm (No. 60)	64	-
150 µm (No. 100)	52	-
106 µm (No. 140)	41.2	-
75 µm (No. 200)	35.2	-
31.7 (µm)	27	-
20.3 (µm)	25.1	-
11.9 (µm)	22.7	-
8.5 (µm)	21.1	-
6.1 (µm)	19.9	-
3 (µm)	16.6	-
1.3 (µm)	12.8	-



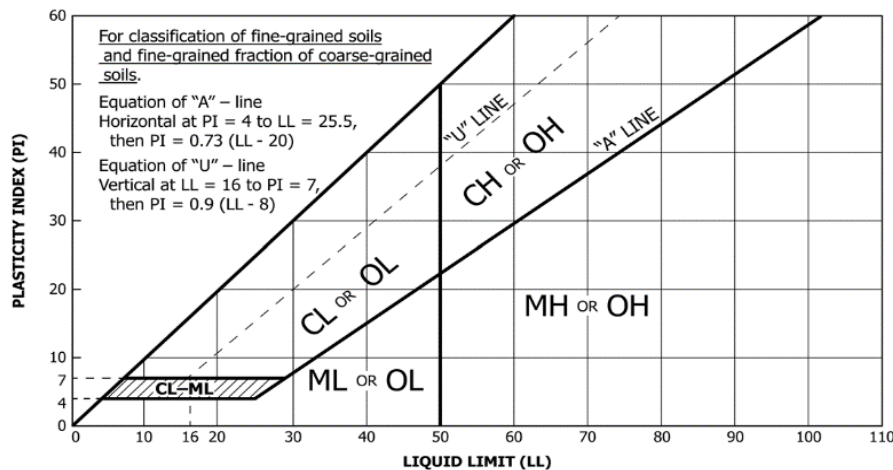
Soil Classification: SM Silty sand

Gravel (%): 7.1 **Sand (%):** 57.7 **Silt (%):** 16.5 **Clay (%):** 18.7
D₆₀ (µm): 216.7 **D₃₀ (µm):** 47.5

General

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	
		Gravels with Fines (More than 12% fines ^C)	$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$) ^D	GP	Poorly graded gravel ^E	
		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
			Sands with Fines (More than 12% fines ^H)	$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$) ^D	SP	Poorly graded sand ^I
	Fine-grained Soils (50% or more passes the No. 200 sieve)	Silt and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{KLM}
				PI < 4 or plots below "A" line ^J	ML	Silt ^{KLM}
			Organic	Liquid Limit – oven dried < 0.75	OL	Organic clay ^{KLMN}
				Liquid Limit – not dried < 0.75	OH	Organic silt ^{KLMO}
Silt and Clays (Liquid limit 50 or more)		Inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}	
			PI plots below "A" line	MH	Elastic silt ^{KLM}	
		Organic	Liquid Limit – oven dried < 0.75	OH	Organic clay ^{KLMP}	
			Liquid Limit – not dried < 0.75	OL	Organic silt ^{KLMQ}	
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 $\geq 15\%$ 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 $\geq 15\%$ 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 $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- M. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- N. $PI \geq 4$ 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.



Laboratory Tests			
DD	Dry density, pcf	q_p	Pocket penetrometer strength, tsf
WD	Wet density, pcf	q_u	Unconfined compression test, tsf
P200	% Passing #200 sieve	LL	Liquid limit
MC	Moisture content, %	PL	Plastic limit
OC	Organic content, %	PI	Plasticity index

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..... $\geq 15\%$

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 Per Foot Blows Approximate Unconfined Compressive Strength

- Very soft..... 0 to 1 BPF..... < 0.25 tsf
- Soft..... 2 to 4 BPF..... 0.25 to 0.5 tsf
- Medium..... 5 to 8 BPF 0.5 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:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

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

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

Water Level: Indicates the water level measured by the drillers either while drilling (☒), at the end of drilling (☑), or at some time after drilling (☒).

Sample Symbols

☒	Standard Penetration Test	☐	Rock Core
☒	Modified California (MC)	☐	Thinwall (TW)/Shelby Tube (SH)
☒	Auger	☒	Texas Cone Penetrometer
☒	Grab Sample	☒	Dynamic Cone Penetrometer

