Report of Geotechnical Exploration Williston US 2/26th Street/2nd Avenue Intersection 7-002(178)020, PCN 23335

Williston, North Dakota

AET Project No. P-0023731

Date:
October 6, 2023

Prepared for:

Civil Science
531 West Villard Street, Suite 1
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October 6, 2023

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Attn: Mr. Jeremy Easum, PE

RE: Report of Geotechnical Exploration
Williston US 2/26th Street/2nd Avenue Intersection
7-002(178)020, PCN 23335
Williston, North Dakota
AET Report No. P-0023731

Greetings Mr. Easum,

American Engineering Testing (AET) has completed the enclosed report of the linear soil survey evaluation for the use in the planning, design, and engineering of the above referenced project. This service was performed in accordance with our subconsultant agreement dated April 22,2023.

We appreciate the opportunity to have been of service to you on this project. If you have any questions regarding the information presented in this report or if we can be of additional assistance, please contact me.

Sincerely,
American Engineering Testing

Harvey Fitzgerald

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SIGNATURE PAGE

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1.0 INTRODUCTION

The project consists of realignment, reconstruction, and intersection improvements of the intersection of US 2, 26th Street, and 2nd Avenue in Williston, North Dakota. To assist with planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a Linear Soil Survey at the site, including soil laboratory testing. This report presents the results of the above services and provides our engineering recommendations based on this data.

2.0 SCOPE OF SERVICES

AET performed their services according to our subconsultant agreement dated April 22, 2023. The authorized scope consists of the following.

- 15 penetration test borings to depths ranging from 6 to 16 feet
- Soil laboratory testing
- Geotechnical engineering review based on the data and preparation of this report

These services are intended for geotechnical purposes only. The scope is not intended to explore for the presence or extent of environmental contamination in the soil or groundwater or the presence of abandoned mines.

3.0 PROJECT INFORMATION

The project consists of realignment, reconstruction, and intersection improvements of the intersection of US 2, 26th Street, and 2nd Avenue in Williston, North Dakota. We understand the NDDOT has selected Alternative B – Modified Split Intersection, which will consist of moving the intersection north northwest of the existing intersection, as shown in the figure below.

Alternative B – Modified Split Intersection

Figure 4: Alternative B – Modified Split Intersection

The proposed new alignment will run through previously developed property that was previously used as a warehouse facility, and along the current frontage road along US 2 and 26th Street West. Based on the existing grades, we anticipate up to 6 feet of fill will be required to match the existing roadway elevations. The existing box culvert east of the proposed traffic signal at the intersection of US 2 and 2nd Ave W will be removed and replaced.

The above-stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

4.0 SUBSURFACE EXPLORATION AND TESTING

4.1 FIELD EXPLORATION PROGRAM

The subsurface exploration program conducted for the project consisted of 15 penetration test borings along the existing and proposed alignments. Borings B-12 through B-14 were not advanced at the request of Mr. Joel Wilt, PE, a representative of the North Dakota Department of Transportation, due to safety concerns of advancing the borings near the traffic light.

AET personnel chose the boring locations, the number of borings and staked the borings in the field. The logs of the borings and details of the methods used appear in Appendix A. We obtained soil samples by Standard Penetration Test (SPT) split spoon samplers and bulk samples from auger cuttings. The logs contain information concerning soil layering, soil classification, geologic origins, and moisture conditions. A density description or consistency is also noted for the natural soils, which is based on penetration resistance.

Borings B-01, B-04, B-06, B-08, and B-09 were advanced on the shoulders of US Highway 2, Borings B-05 and B-07 were advanced on the western half of the existing frontage road, and Borings B-02, B-03, B-10, and B-11 were advanced northwest of the intersection within the proposed right of way. Boring B-15 was advanced north of the existing box culvert on the eastern existing frontage road. The boring locations are shown in Appendix A.

4.2 LABORATORY TESTING

The laboratory testing program included natural moisture contents (AASHTO T-265), particle size analyses (AASHTO T-88), Atterberg limits tests (AASHTO T-89 & 90), and moisture-density relationship tests (AASHTO T-180). We present a summary of the laboratory testing on the bulk samples recovered in the table below.

Table 4.2-1 Bulk Sample Laboratory Testing Summary

Boring	Liquid Limit (%)	Plasticity Index (%)	Percent passing the No. 200 sieve (%)	AASHTO Classification (USCS)	Maximum Dry Density (pcf)*	Optimum Moisture Content (%)*
B-01	33	18	37.6	A-6 (SC)	135.4	7.1
B-02	33	19	47.4	A-6 (SC)	132.5	7.3
B-03	23	10	19.6	A-2-4 (SC)	141.8	6.0

Boring	Liquid Limit (%)	Plasticity Index (%)	Percent passing the No. 200 sieve (%)	AASHTO Classification (USCS)	Maximum Dry Density (pcf)*	Optimum Moisture Content (%)*
B-04	33	19	43.7	A-6 (SC)	129.8	8.2
B-05	22	10	41.0	A-4 (SC)	133.0	7.7
B-06	32	19	44.7	A-6 (SC)	129.5	7.9
B-07	33	19	60.0	A-6 (CL)	123.1	11.1
B-08	31	18	42.2	A-6 (SC)	130.6	7.9
B-09	29	15	54.2	A-6 (CL)	128.4	8.9
B-10	21	7	39.3	A-4 (SC)	135.3	7.1
B-11	28	14	40.8	A-6 (SC)	126.5	9.8
B-15	40	25	72.7	A-6 (CL)	116.7	12.8

*As determined by AASTHO T180

Please note the bulk samples were obtained from auger cuttings from below the asphalt pavement or gravel surfacing section or the topsoil layer encountered in the borings. The test results appear in Appendix A on the individual boring logs adjacent to the samples upon which they were performed or on the data sheets following the logs.

5.0 SITE CONDITIONS

5.1 SURFACE OBSERVATIONS

The existing roadway generally consists of a 4-lane divided highway surfaced with asphaltic concrete pavement. The proposed intersection will realign the roadways northwest of the existing intersection and will cross commercial property and the former Sloulin Field International Airport property. North of the existing intersection, the 4 lanes will be shifted to the west, with the proposed southbound lanes situated where the existing western frontage road is located and the northbound lanes located at the existing southbound lanes. Borings B-02 and B-03 were located at an industrial lot that is surfaced with gravel. Borings B-10 and B-11 were located in the southeast corner of the former airfield, which was surfaced with native grasses.

5.2 SUBSURFACE SOILS/GEOLOGY

The measured asphaltic concrete pavement thickness ranged from 4.25 to 6 inches, and the aggregate base course thickness ranged from 5.25 to 10 inches. Below the pavement section, we encountered mixed alluvium and glacial till soils. The mixed alluvium consisted of varying layers of lean clay, sandy lean clay, silty sand, clayey sand, and well graded sand. The relative consistency of the cohesive alluvium ranged from very soft to very stiff, as indicated by the N-values ranging between 2 and 17 blows per foot. The relative density of the non-cohesive alluvium ranged from very loose to medium dense, as indicated by the N-values ranging from 1 to 20 blows per foot. The AASHTO classifications for the alluvial soils ranged from A-1-b, A-2-4, A-2-6, and A-6.

The glacial till soils consisted of sandy lean clay with laminations of sand and trace gravel. The relative consistency of the cohesive soils ranged from very soft to very stiff, as indicated by the N-values ranging from 1 to 20. The glacial till soils had an AASHTO classification of A-6.

During our subsurface exploration, we encountered hydrocarbon staining and odor in Boring B-03 at a depth of five feet below existing grade. Our scope of services did not include environmental services.

We present detailed subsurface conditions for each boring location on the individual subsurface boring logs in Appendix A of this report.

5.3 GROUNDWATER

We encountered groundwater in Borings B-02, B-04, and B-15 at depths of 4.0, 9.0, and 9.0 feet below existing grade, respectively. Please note that our exploration in this area occurred in June, and groundwater elevations fluctuate due to varying seasonal and annual rainfall, snowmelt amounts, and locally heavy precipitation events. The evaluation of these factors is beyond the scope of this report.

6.0 RECOMMENDATIONS

6.1 APPROACH DISCUSSION

The following geotechnical recommendations are presented to assist the planning, design, and construction of the Williston US 2, 26th Street, and 2nd Avenue Intersection project in Williston, North Dakota. Our recommendations are based on the results of our boring-based field exploration, field and laboratory testing, our experience in the area with similar soil conditions, and our understanding of the proposed construction. We specifically outline geotechnical design criteria, opinions, and recommendations regarding the soil conditions encountered. We also rely on geotechnical continuity, communication between all project team members specific to risk- and cost-based decisions, and good construction practices to achieve the desired project outcome for Civil Science and the North Dakota Department of Transportation. Therefore, our recommendations must be reviewed at the time civil and construction plans are finalized to verify their applicability to the proposed project.

Exploration only allows for observation of a small portion of the site's subsurface conditions. Subsurface variations are possible between exploration locations and may not be apparent until construction. Where such variations exist, they may impact the opinions and recommendations presented in this report, as well as construction timing and costs. If design plans change, or if the subsurface conditions encountered during construction vary from those observed during our field evaluation, we must be notified to review the report recommendations and make necessary revisions.

6.2 SUBGRADE PREPARATION

We anticipate varying depths of cuts and fills of less than 10 feet will be required to obtain the final subgrade elevations along the existing alignment. Earthwork for the project will include widening the existing embankment for the 4-lane roadway west of 2nd Avenue and new embankment construction northwest of the existing intersection, across the existing commercial property. We recommend removing the existing building and foundations in their entirety, prior to performing subgrade preparation and placing embankment fill.

We recommend 12 inches of subgrade preparation for this project in cut areas and for fill areas with less than 18 inches of fill. Subgrade preparation should comply with the North Dakota Department of Transportation's *Standard Specifications for Road and Bridge Construction, 2022* (NDDOT) Specification 230.04 Part D. If the subgrade soils are unstable, scarification and drying or over-excavation and replacement of the unsuitable soils could be considered. Compaction control should be in accordance with AASHTO T-180 and NDDOT Specification 203.04 E.2.a, ND T 180 Type A.

6.3 SUBCUTTING & UNSUITABLE MATERIALS

The surface conditions encountered at the boring locations also indicate the presence of frost susceptible and saturated soils near the surface and the potential for subsurface water within 4 vertical feet of existing grade, near Boring B-02. This provides the conditions necessary for frost heaving. We understand complete replacement of the frost susceptible soils to reduce pavement distress would be cost-prohibitive for initial project costs.

The subgrade soils primarily consisted of silty sands, clayey sand, poorly graded sands, and lean clay. We encountered soft subgrade soils in the upper 5 feet of Borings B-02 and B-03, with an N-values ranging from 1 to 2 blows per foot. Earthwork construction in this area may be difficult and will likely require stabilization methods, such as over-excavation and replacement of soft soils with granular fill mechanically and uniformly supported using a reinforcing (structural/woven) geosynthetic. We recommend over-excavating a minimum of 18 inches near

Borings B-02 and B-03, placing a reinforcing geosynthetic on the over-excavation subgrade soils, and placing granular structural fill, such as a Class 5 Aggregate, in uniform level lifts not exceeding 8 inches in loose thickness.

6.4 EMBANKMENT SLOPES

Fill heights are generally expected to be 5 feet or less in height along the existing alignment and up to 10 feet for the new alignment. We recommend a shrinkage factor of 20 to 30 percent be used in estimating cut and fill balances. The magnitude of expected settlement within fill areas will be a function of the depth of fill (fill weight), the depth/thickness of site clays below the embankments, and the strength and compressibility of the underlying soils.

We highly recommend that fill sections be constructed as early as possible within the construction period to allow for settlements to occur before the placement of paving. The use of heavy compacting equipment will likely reduce the settlement time.

Permanent cut slopes should be planned no steeper than 3H:1V, and permanent fill slopes and embankments should be planned no steeper than 3H:1V. At the recommended maximum slopes, the cuts and fill are anticipated to be relatively stable. Flatter slopes may be desirable for establishing vegetation and reducing maintenance costs caused by erosion.

Where fill placement against existing slopes is required, the engineered fill should be placed starting at the toe of the slope. Subsequent fill should be benched into the exposed soils. Wherever existing slopes that are steeper than 4H:1V will be covered by fill, the existing slope should be benched with a maximum bench height of 5 feet. Benches should be wide enough to accommodate compaction and earth-moving equipment and to allow placement of horizontal lifts of fill. All fill slopes and benches should be constructed across the entire width of the slope and tied into the existing contours. The reconstructed slopes should be re-vegetated once construction is complete to reduce erosion damage to slope faces.

6.5 BOX CULVERT FOUNDATION DISCUSSION

We understand the existing box culvert near Boring B-15 will be removed and replaced during construction. The subsurface soils encountered near the box culvert consisted of 10 feet of soft to firm clay overlying silty and clayey sands to a depth of 15 feet. We encountered groundwater approximately 9 feet below existing grade. The strength of the clay was weaker near the interface of the groundwater.

Depending on the subgrade elevation of the proposed culvert and the time of year, dewatering the groundwater may be necessary to complete construction of the culvert. The earthwork contractor should review the boring logs, be prepared to encounter groundwater, and have the necessary equipment to lower and maintain groundwater a minimum of 2 feet below the bottom of the excavation.

To support the culvert, we recommend placing a geosynthetic Geogrid meeting the requirements of Type G in NDDOT Specification 709 on the undisturbed subgrade soil then placing a minimum of 12 inches of granular structural fill below the culvert.

6.6 PAVEMENT MAINTENANCE

Perform crack and surface maintenance on all pavement surfaces every 3 to 5 years to reduce the potential for surface water infiltration into the underlying pavement subgrade. Surface and subgrade, crushed surfacing, and asphalt surfaces shall slope at no less than 2% to an appropriate stormwater disposal system or other appropriate locations that do not impact adjacent properties. The pavement's life will be dependent on achieving adequate drainage throughout the section and especially at the subgrade. Water that ponds at the pavement subgrade surface can induce heaving during the freeze-thaw process, which can readily damage the pavement. Never allow inverted crowns at the subgrade or pavement surfaces without center concrete gutters designed to have an asphalt overlap.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 POTENTIAL DIFFICULTIES

7.1.1 RUNOFF WATER IN EXCAVATION

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction.

7.1.2 DISTURBANCE OF SOILS

The on-site soils can be disturbed under construction traffic, especially if the soils are wet. If soils become disturbed, they should be over-excavated to the underlying undisturbed soils. The over-excavated soils can then be dried and recompacted back into place, or they should be removed and replaced with drier imported fill.

7.4 OBSERVATION AND TESTING

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed in order to document that project specifications for compaction have been satisfied.

8.0 ASTM STANDARDS

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

9.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, express or implied, is intended.

Important information regarding risk management and proper use of this report is given in Appendix B, entitled “Geotechnical Report Limitations and Guidelines for Use.”

Standard Data Sheets

EARTHWORK QUALITY CONTROL INFORMATION

EXCAVATION BASE ELEVATION

Judgments of supporting soils are based on soils exposed, and on local samples of soils retrieved by hand auguring and probing. Because conditions in the subsurface are hidden, it is not possible to fully characterize the subsurface conditions. Therefore, the client must accept that our judgments are limited to those soils which are directly observable to us.

As soil conditions may be variable at depth, it is best that excavation base observation be aided by deeper exploratory test borings (usually done prior to construction). Although these deeper borings may not totally reveal what is in the surface, they greatly reduce the risk of deeper poor soils going undetected.

The presence of ground water within the excavation can also limit the supporting soil evaluation process. Also, if standing ground water is present, there is a risk to the client that soft or loose compressible soils may not be observed and that these soft or loose compressible may potentially remain beneath the water during excavation. The compressible materials can become trapped beneath or within the subsequently placed fill; thus, allowing adverse movements to occur in structures and fill materials placed over these materials.

FILLING

Structural fill placement is commonly monitored by performing local compaction tests, which entails comparing a field density test to a laboratory Proctor test to arrive at a percent compaction. Field Density tests of fill only provide the compaction level of the fill at the location and elevation of the test. As many factors control compaction, such as fill lift thickness, moisture content, material type and compactive effort, compaction variation within fill materials can exist that may not be represented by the tests. Field Density (compaction) tests are considered representative when used in a conscientious program of controlled fill placement, where the factors influencing compaction are closely monitored. Conclusions about fill suitability to support structural loadings from the results of a limited number of compaction tests includes increased risk, unless the individual drawing the conclusions has complete knowledge of the afore-mentioned variables during placement. For this reason, part-time testing on a "trip" basis includes more risk to the client than "full-time" monitoring/testing.

OVERSIZING

Structural elements also exert loadings laterally; and because of this, the excavation and subsequent fill system needs to be oversized to accommodate these loadings. The extent of lateral oversizing is normally associated with the movement sensitivity of the structure and the strength/compressibility properties of the soils remaining along the excavation sidewalls. Oversizing on the order of 1H (horizontal):1V (vertical) is typically provided for foundations in "normal" conditions. However, oversizing on the order of 12H:1V or more is oftentimes needed in highly compressible situations such as swamp deposits.

AET does not practice in the field of surveying and must rely on location and elevation staking of proposed construction by the client or their representative. Our measurements in the field are made in relation to those stakes or other location and elevation information provided to us. The reliability of AET's opinions, conclusions and recommendations based on those measurements is dependent on the accuracy of the staking or information provided by the client or their representative.

FREEZING WEATHER

Soils that are allowed to freeze will heave & lose density. Upon thawing, these soils will not regain their full original strength & density. The extent of heave and density/strength loss depends on the soil type and moisture condition; and is usually more pronounced in finer grained soils, and particularly silty soils. Foundations, slabs, and other improvements affected by such frost movements should be protected from frost intrusion during freezing weather. If filling takes place during freezing weather, all frozen soils, snow and ice should be stripped from all areas to be filled prior to new fill placement; and the new fill should not be allowed to freeze during or after placement. For this reason, it is usually more beneficial to perform excavate/refill operations during freezing weather in smaller plan areas where grade can be attained quickly rather than working larger areas where a large amount of frost stripping is needed.

STRUCTURAL SUPPORT ON UNCONSTROLLED FILL

Risks are associated with supporting structures on fill which has not been placed in a controlled and well documented manner. Even where existing fill appears to be well compacted (including when soil borings have been performed), hidden poorer or looser soils can potentially exist below or within the fill; or previous excavation and extension of the compacted fill may have been provided with sufficient oversize in all directions to accommodate the new lateral loadings. Risks can be reduced by means of increasing the amount of testing and observations.

FREEZING WEATHER EFFECTS ON BUILDING CONSTRUCTION

GENERAL

Because water expands upon freezing and soils contain water, soils which are allowed to freeze will heave and lose density. Upon thawing, these soils will not regain their original strength and density. The extent of heave and density/strength loss depends on the soil type and moisture condition. Heave is greater in soils with higher percentages of fines (silts/clays). High silt content soils are most susceptible, due to their high capillary rise potential which can create ice lenses. Fine grained soils generally heave about 1/4" to 3/8" for each foot of frost penetration. This can translate to 1" to 2" of total frost heave. This total amount can be significantly greater if ice lensing occurs.

DESIGN CONSIDERATIONS

Clayey and silty soils can be used as perimeter backfill, although the effect of their poor drainage and frost properties should be considered. Basement areas will have special drainage and lateral load requirements which are not discussed here. Frost heave may be critical in doorway areas. Stoops or sidewalks adjacent to doorways could be designed as structural slabs supported on frost footings with void spaces below. With this design, movements may then occur between the structural slab and the adjacent on-grade slabs. Non-frost susceptible sands (with less than 12% passing a #200 sieve) can be used below such areas. Depending on the function of surrounding areas, the sand layer may need a thickness transition away from the area where movement is critical. With sand placement over slower draining soils, subsurface drainage would be needed for the sand layer. High density extruded insulation could be used within the sand to reduce frost penetration, thereby reducing the sand thickness needed. We caution that insulation placed near the surface can increase the potential for ice glazing of the surface.

The possible effects of adfreezing should be considered if clayey or silty soils are used as backfill. Adfreezing occurs when backfill adheres to rough surfaced foundation walls and lifts the wall as it freezes and heaves. This occurrence is most common with masonry block walls, unheated or poorly heated building situations and clay backfill. The potential is also increased where backfill soils are poorly compacted and become saturated. The risk of adfreezing can be decreased by placing a low friction separating layer between the wall and backfill.

Adfreezing can occur on exterior piers (such as deck, fence, or other similar pier footings), even if a smooth surface is provided. This is more likely in poor drainage situations where soils become saturated. Additional footing embedment and/or widened footings below the frost zones (which include tensile reinforcement) can be used to resist uplift forces. Specific designs would require individual analysis.

CONSTRUCTION CONSIDERATIONS

Foundations, slabs, and other improvements which may be affected by frost movements should be insulated from frost penetration during freezing weather. If filling takes place during freezing weather, all frozen soils, snow, and ice should be stripped from areas to be filled prior to new fill placement. The new fill should not be allowed to freeze during transit, placement, or compaction. This should be considered in the project scheduling, budgeting and quantity estimating. It is usually beneficial to perform cold weather earthwork operations in small areas where grade can be attained quickly rather than working larger areas where a greater amount of frost stripping may be needed. If slab subgrade areas freeze, we recommend the subgrade be thawed prior to floor slab placement. The frost action may also require reworking and recompaction of the thawed subgrade.

Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Figure 1 – Site Location Map
Figure 2 – Boring Location Map
Subsurface Boring Logs
Material Test Reports
Proctor Test Reports
Laboratory Testing Results Summary

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling 12 penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS)

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as “DS” or “SU” on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of “topsoil” layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under “Water Level Measurements” on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests

Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.5.2 Atterberg Limits Tests

Conducted per AET Procedure 01-LAB-030, which is performed in general accordance with ASTM: D4318 and AASHTO: T89, T90.

A.5.3 Particle Size Analysis of Soils (with hydrometer)

Conducted per AET Procedure 01-LAB-050, which is performed in general conformance with ASTM: D422 and AASHTO: T88.

A.5.4 Modified Proctor Test

Conducted per AET Procedure 20-SOI-012, which is performed in general conformance with ASTM: D1557 and AASHTO: T180.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
B,H,N:	Size of flush-joint casing
CA:	Crew Assistant (initials)
CAS:	Pipe casing, number indicates nominal diameter in inches
CC:	Crew Chief (initials)
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RD:	Rotary drilling with fluid and roller or drag bit
REC:	In split-spoon (see notes) and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
REV:	Revert drilling fluid
SS:	Standard split-spoon sampler (steel; 1d" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after Afalling@ through drilling fluid
WH:	Sampler advanced by static weight of drill rod and 140-pound hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designator in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remoulded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

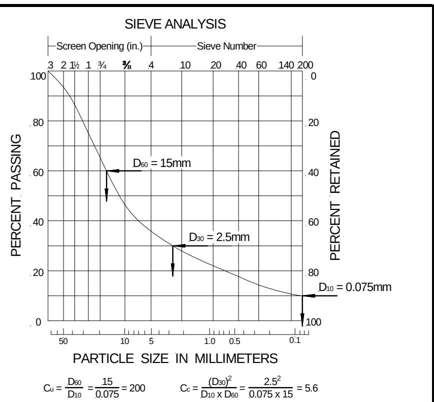
STANDARD PENETRATION TEST NOTES

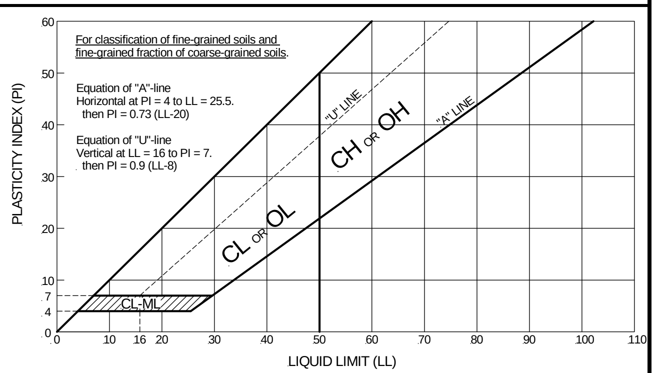
The standard penetration test consists of driving the sampler with a 140 pound hammer and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM:D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM:D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel[F.G.H]
			Fines classify as CL or CH	GC	Clayey gravel[F.G.H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and $1 > Cc > 3$[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand[G.H.I]
			Fines classify as CL or CH	SC	Clayey sand[G.H.I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	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** <0.75 Liquid limit – not dried	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** <0.75 Liquid limit – not dried	OH	Organic clay[K.L.M.P] Organic silt[K.L.M.Q]
Highly organic soil			Primarily organic matter, dark in color, and in organic in odor	PT	Peat[R]





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (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]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

[E]$Cu = D_{60}/D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains $\geq$15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains $\geq$15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.

[K]If soil contains 15 to 29% 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.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	**N-Value, BPF**
Very Loose	**0 - 4**
Loose	**5 - 10**
Medium Dense	**11 - 30**
Dense	**31 - 50**
Very Dense	**Greater than 50**

Moisture/Frost Condition

	(MC Column)
D (Dry):	Absense of moisture, dusty, dry to touch.
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing):	Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
F (Frozen):	Soil frozen

Layering Notes

Laminations:	Layers less than ½" thick of differing material or color.
Lenses:	Pockets or layers greater than ½" thick of differing material or color.

Fiber Content of Peat

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic/Roots Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the soil properties. *Slightly organic* used for borderline cases.

With roots:	Judged to have sufficient quantity of roots to influence the soil properties.
Trace roots:	Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

AASHTO SOIL CLASSIFICATION SYSTEM

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

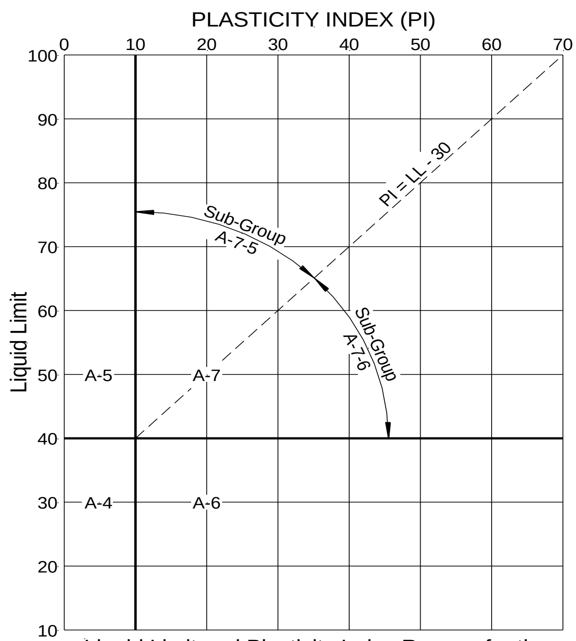
Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35% or less passing No. 200 sieve)							Silt-Clay Materials (More than 35% passing No. 200 sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve Analysis, Percent passing:											
No. 10 (2.00 mm)	50 max.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 40 (0.425 mm)	30 max.	50 max.	51 min.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 200 (0.075 mm)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of Fraction Passing No. 40 (0.425 mm)											
Liquid limit	. . . .		. . . .	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils		Clayey Soils	
General Ratings as Subgrade	Excellent to Good							Fair to Poor			

The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

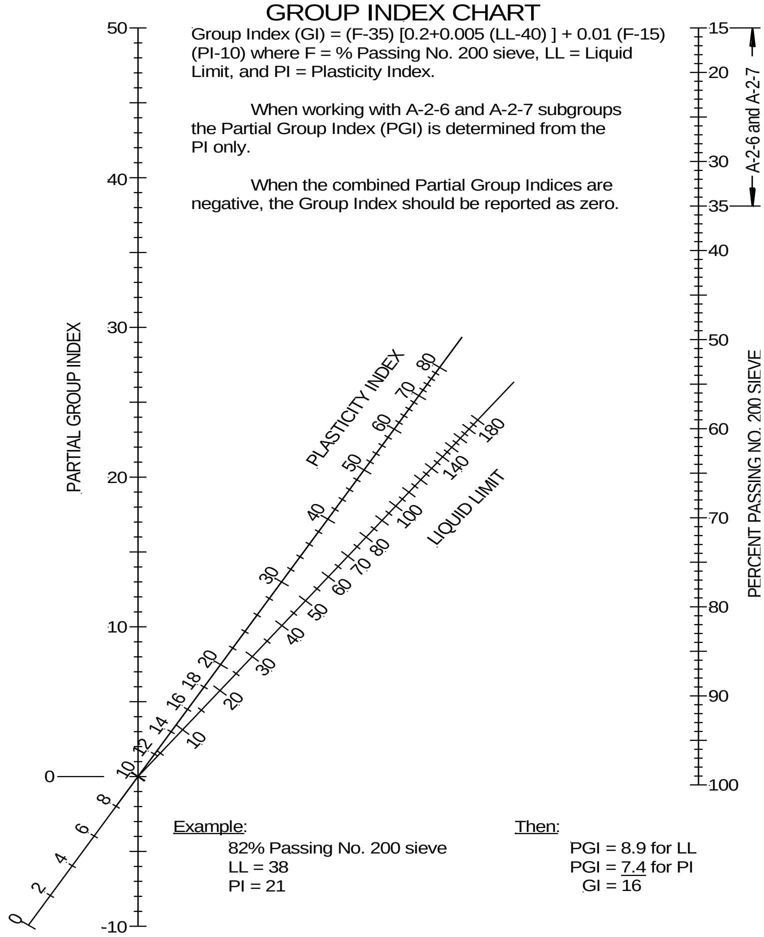
Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

Group A-8 soils are organic clays or peat with organic content >5%.



Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups

GROUP INDEX CHART



Definitions of Gravel, Sand and Silt-Clay

The terms "gravel", "coarse sand", "fine sand" and "silt-clay", as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions are defined as follows:

GRAVEL - Material passing sieve with 3-in. square openings and retained on the No. 10 sieve.

COARSE SAND - Material passing the No. 10 sieve and retained on the No. 40 sieve.

FINE SAND - Material passing the No. 40 sieve and retained on the No. 200 sieve.

COMBINED SILT AND CLAY - Material passing the No. 200 sieve

BOULDERS (retained on 3-in. sieve) should be excluded from the portion of the sample to which the classificaiton is applied, but the percentage of such material, if any, in the sample should be recorded.

The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.

AMERICAN ENGINEERING TESTING

PROJECT: Williston US 2/26th Street/2nd Avenue Intersection			PROJECT NO.: P-0023731
SUBJECT: Figure 1 - Site Vicinity Map			DATE: 9/11/2023
SCALE: As Shown		DRAWN BY: HTF	REVIEWED BY: JCH

AMERICAN ENGINEERING TESTING

PROJECT: Williston US 2/26th Street/2nd Avenue Intersection	PROJECT NO.: P-0023731
SUBJECT: Figure 2 - Boring Location Map	DATE: 9/11/2023
SCALE: As Shown; DRAWN BY: HTF	REVIEWED BY: JCH

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-01 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.16846799** LONGITUDE: **-103.63047379**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	ASPHALTIC CONCRETE PAVEMENT (4.25")	PAVEMENT									
	FILL, aggregate base course, silty sand with gravel, brown, moist (5.25")[A-2-4]	FILL					12				
1	SANDY LEAN CLAY, stiff, brown, moist (CL)[A-6]	MIXED ALLUVIUM	11	M	SS	17					
							19				
2											
							15				
3			9	M	SS	20					
							12				
4	SILTY SAND, trace gravel, loose, brown, moist (SM)[A-2-4]										
	SANDY LEAN CLAY, trace gravel, very stiff, brown, moist (CL)[A-6]						12				
5			17	M	SS	13					
6	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/3/23**		**6.0**	**4.0**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-02 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.16899109** LONGITUDE: **-103.62830232**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–2	FILL, aggregate base course, silty sand with gravel, brown, moist (2')[A-2-4]	FILL	11	M	SS	18	3, 15				
2–5	SANDY LEAN CLAY, very soft, trace sand, brown, moist to wet (CL)[A-6]	MIXED ALLUVIUM	2	M	SS	10	21, 32				
			1	M	SS	10	26, 33				
5–6	CLAYEY SAND, trace gravel, very loose, brown, moist (SC)[A-2-6]										
6–10	SILTY SAND, trace gravel, loose to medium dense, brown, water-bearing (SM)[A-2-4]		20	WB	SS	NR					
			8	WB	SS	NR					
10	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-6'	3.25" HSA	6/3/23		10.0	6.0	NA	NA	4.0

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

SUBSURFACE BORING LOG

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-03 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ______ LATITUDE: **48.17032394** LONGITUDE: **-103.62746868**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–2.25	FILL, aggregate base course, silty sand with gravel, moist (2.25')[A-2-4]	FILL					7				
1			6	M	SS	5					
							6				
2.25–5	SANDY LEAN CLAY, stiff, brown, moist (CL)[A-6]	TILL									
3			8	M	SS	2					
							11				
							15				
5–8	SANDY LEAN CLAY, very soft, gray/brown, hydrocarbon staining/odor, moist (CL)[A-6]		2	M	SS	12					
							18				
							14				
7			1	M	SS	20					
							12				
8–10	SANDY LEAN CLAY, firm, brown, hydrocarbon staining/odor, moist (CL)[A-6]						11				
9			6	M	SS	14					
							10				
10	END OF BORING										

DEPTH:	DRILLING METHOD
0-8'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/3/23		10.0	8.0	NA	NA	None

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **CM** Rig: **100**

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-04 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.17161945** LONGITUDE: **-103.62610709**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	ASPHALTIC CONCRETE PAVEMENT (4.5")	PAVEMENT									
	FILL, aggregate base course, silty sand with gravel, brown, moist (10.5")[A-2-4]	FILL					2				
1			17	M	SS	17					
	SANDY LEAN CLAY, very stiff, trace gravel and lignite, brown, moist (CL)[A-6]	MIXED ALLUVIUM					15				
2											
	LEAN CLAY, firm, brown, moist (CL)[A-6]						17				
3			6	M	SS	22					
							25				
4											
							17				
5	SILTY SAND, loose, brown/light brown, very moist (SM)[A-2-4]		5	M/VM	SS	21					
							19				
6	CLAYEY SAND, loose, trace gravel, brown, very moist (SC)[A-2-6]						18				
7			8	VM	SS	10					
8							12				
9	SANDY LEAN CLAY, firm, brown, water-bearing (CL)[A-6]		6	VM/WB	SS	23					
							13				
10	END OF BORING										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-9'	**3.25" HSA**	**6/3/23**		**10.0**	**8.0**	**NA**	**NA**	**9.0**

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-05 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.1725626** LONGITUDE: **-103.6263939**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	FILL, aggregate base course, silty sand with gravel, brown, moist (7")[A-2-4]	FILL					12				
1	SILTY SAND, lenses of clay, loose, brown, moist (SM)[A-2-4]	MIXED ALLUVIUM	7	M	SS	22	18				
2	SANDY LEAN CLAY, lenses of sand with trace gravel, stiff, brown, moist (CL)[A-6]	TILL					26				
3			9	M	SS	19	10				
4	SANDY LEAN CLAY, trace gravel, lenses of silty sand, stiff, brown (CL)[A-6]						15				
5			13	M	SS	23	10				
6							12				
7			15	M	SS	19	11				
8							11				
9			14	M	SS	24	16				
10	END OF BORING										

DEPTH:	DRILLING METHOD
0-4'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/3/23		10.0	4.0	NA	NA	None

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-06 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ______ LATITUDE: **48.17448036** LONGITUDE: **-103.6260989**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	ASPHALTIC CONCRETE PAVEMENT (6.25")	PAVEMENT									
	SILTY SAND, trace gravel, loose, brown, moist (SM)[A-2-4]	FILL					4				
1	LEAN CLAY, firm to stiff, brown, very moist (CL)[A-6]	MIXED ALLUVIUM	11	M	SS	19					
							14				
2											
							14				
3			5	M	SS	20					
							27				
4											
							22				
5			5	M	SS	24					
	SILTY SAND, loose, brown, very moist (SM)[A-2-4]										
6	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-5.5'	**3.25" HSA**	**6/3/23**		**6.0**	**5.5**	**NA**	**NA**	**None**

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-07 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.175490** LONGITUDE: **-103.626371**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0	FILL, aggregate base course, silty sand with gravel, brown, moist (3")[A-2-4]	FILL									
	SANDY LEAN CLAY, trace organics, firm to stiff, dark brown, moist (CL)[A-6]	MIXED ALLUVIUM					8				
1			10	M	SS	20					
							12				
2											
							22				
3			6	M	SS	23					
							19				
4											
	LEAN CLAY, firm, brown, moist (CL)[A-6]						19				
5			5	M	SS	19					
							26				
6											
	WELL-GRADED SAND, lenses of clay 8-9', loose, brown, very moist (SW)[A-1-b]						26				
7			6	M/VM	SS	16					
							11				
8											
							24				
9	WELL-GRADED SAND, loose, dark brown, water-bearing (SW)[A-1-b]		17	VM/WB	SS	12					
							12				
10	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-9'	**3.25" HSA**	**6/4/23**		**10.0**	**9.0**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/4/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-08 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.17685012** LONGITUDE: **-103.62568493**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0	FILL, aggregate base course, silty sand with gravel, brown, moist (10")[A-2-4]	FILL									
0.5							7				
1	SILTY SAND, trace gravel, medium dense, brown, moist (SM)[A-2-4]	MIXED ALLUVIUM	11	M	SS	13					
1.5	SANDY LEAN CLAY, trace sand and gravel, stiff, dark brown, moist (CL)[A-6]						9				
2.5							14				
3	SILTY SAND, trace gravel, medium dense, brown, moist (SM)[A-2-4]		11	M	SS	22					
3.5							6				
4	SANDY LEAN CLAY, firm to stiff, dark brown/black, moist (CL)[A-6]										
4.5							20				
5			7	M	SS	20					
5.5							25				
6.5							24				
7			10	M	SS	23					
7.5							26				
8	SANDY LEAN CLAY, trace silt, firm, dark brown, moist (CL)[A-6]										
8.5							23				
9			5	M	SS	14					
9.5							26				
10	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-8'	**3.25" HSA**	**6/3/23**		**10.0**	**8.0**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-09 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ______ LATITUDE: **48.17748476** LONGITUDE: **-103.62608529**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	ASPHALTIC CONCRETE PAVEMENT (6")	PAVEMENT									
	FILL, aggregate base course, silty sand with gravel, brown, moist (6")[A-2-4]	FILL									
1	FILL, silty sand, trace gravel, brown, moist (SM)[A-2-4]		12	M	SS	19	2				
	FILL, sandy lean clay, brown, moist (CL)[A-6]						9				
2											
							16				
3			5	M	SS	20					
							21				
4	CLAYEY SAND, loose, dark brown, moist (SC)[A-2-6]	MIXED ALLUVIUM									
							28				
5			5	M	SS	19					
6	END OF BORING										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-4'	**3.25" HSA**	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		6/2/23		**6.0**	**4.0**	**NA**	**NA**	**None**	
BORING COMPLETED:	**6/2/23**								
DR: **KM** LG: **AA** Rig: **100**									

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.1714766** LONGITUDE: **-103.62822762**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	SILTY SAND, trace organics and gravel, clay inclusions, loose to medium dense, brown, moist (SM)[A-2-4]	MIXED ALLUVIUM					8				
1			11	M	SS	23					
							7				
2											
							15				
3			5	M	SS	21					
							11				
4	CLAYEY SAND, loose, brown, very moist (SC)[A-2-6]										
							11				
5	SANDY LEAN CLAY, trace gravel, laminations of silty sand, stiff to very stiff, brown, moist to very moist (CL)[A-6]	TILL	9	VM	SS	23					
							12				
6											
							10				
7			8	M/VM	SS	24					
							11				
8											
							11				
9			20	M	SS	24					
							10				
10	END OF BORING										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-5'	**3.25" HSA**	**6/3/23**		**10.0**	**5.0**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

AMERICAN
ENGINEERING TESTING

SUBSURFACE BORING LOG

AET JOB NO: **P-0023731** LOG OF BORING NO. **B-11 (p. 1 of 1)**

PROJECT: **Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota**

SURFACE ELEVATION: ________ LATITUDE: **48.1704109** LONGITUDE: **-103.626755**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	FIELD & LABORATORY TESTS: WC	DEN	LL	PL	%-#200
0	FILL, aggregate base course, silty sand, trace gravel, brown, moist (6")[A-2-4]	FILL									
0.5	SANDY LEAN CLAY, stiff, brown to dark brown, moist (CL)[A-6]	MIXED ALLUVIUM					7				
1			8	M	SS	18					
1.5							12				
2											
2.5							17				
3			8	M	SS	24					
3.5							20				
4											
4.5							25				
5	SANDY LEAN CLAY, trace gravel, laminations of sand, firm to stiff, light brown, very moist (CL)[A-6]	TILL	8	M/VM	SS	20					
5.5							12				
6											
6.5							12				
7			4	VM	SS	22					
7.5							11				
8											
8.5							12				
9			8	VM	SS	21					
9.5							11				
10	END OF BORING										

DEPTH:	DRILLING METHOD
0-5'	**3.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/3/23		**10.0**	**5.0**	**NA**	**NA**	**None**

BORING COMPLETED: **6/3/23**

DR: **KM** LG: **AA** Rig: **100**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET JOB NO:	P-0023731
LOG OF BORING NO.	B-15 (p. 1 of 1)
PROJECT:	Williston US 2/26th Street/2nd Avenue Intersection; Williston, North Dakota
SURFACE ELEVATION:	
LATITUDE:	48.17066480
LONGITUDE:	-103.62554929

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	ASPHALTIC CONCRETE PAVEMENT (4.25")	PAVEMENT					16				
1	FILL, aggregate base course, silty sand with gravel, brown, moist (5.25")[A-2-4]	FILL	4	M	SS	22					
	SANDY LEAN CLAY, trace gravel, firm to stiff, brown, moist (CL)[A-6]	TILL					25				
2							27				
3			4	M	SS	20	33				
4							26				
5			6	M	SS	20	26				
6							27				
7			8	M	SS	22	27				
8							25				
9	LEAN CLAY, firm, light brown to white, very moist (CL)[A-6]	MIXED ALLUVIUM	5	M/WB	SS	22					
	SANDY LEAN CLAY, stiff, brown to light brown, water-bearing (CL)[A-6]						22				
10	SILTY SAND, loose, brown, water-bearing (SM)[A-1-b]										
11			8	WB	SS	NR					
12							27				
13			8	WB	SS	22	11				
14	CLAYEY SAND, lenses of silty sand with gravel, loose, brown, water-bearing (SC)[A-2-6]						14				
15			5	WB	SS	24					
16	END OF BORING										

DEPTH:	DRILLING METHOD
0-14'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/3/23		16.0	9.0	NA	NA	9.0

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

BORING COMPLETED: 6/3/23

DR: KM LG: AA Rig: 100

AET_CORP W-LAT-LONG P-0023731 LOGS.GPJ AET+CPT+WELL.GDT 9/12/23

AMERICAN ENGINEERING TESTING

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S1
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S1
Field Sample ID	B-1, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-1, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	135.4	
Corrected Maximum Dry Density (lb/ft³)		135.4	
Optimum Moisture Content (%)		7.1	
Corrected Optimum Moisture Content (%)		7.1	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape		Flat	
Hardness		medium to firm	
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	33	
Plastic Limit (%)	AASHTO T 90	15	
Plasticity Index	AASHTO T 90	18	
Date Tested		8/1/2023	

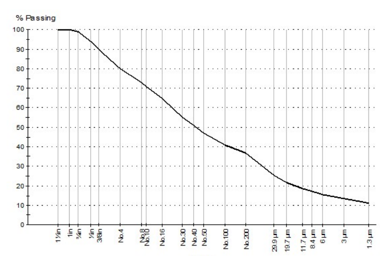
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1½in	100.0	
1in	99.8	
¾in	99.3	
½in	94.1	
3/8in	89.5	
No.4	80.3	
No.8	72.8	
No.10	71.3	
No.16	65.2	
No.30	55.3	
No.40	51.2	
No.50	47.2	
No.100	40.8	
No.200	36.7	
29.9 µm	25.3	
19.7 µm	21.6	
11.7 µm	18.6	
8.4 µm	17.1	
6.0 µm	15.6	
3.0 µm	13.4	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S1
Issue No: 2

Client:	Civil Science, Inc	**CC:**	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND		
Job No:	P-0023731		

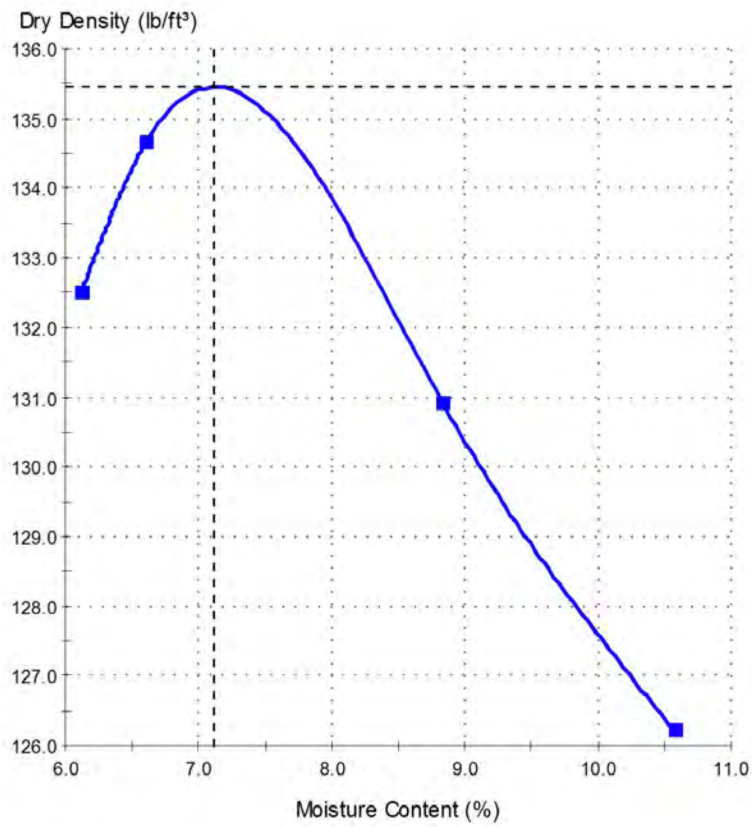
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S1	**Field ID:**	B-1, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-1, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180	
Maximum Dry Density (lb/ft³):	**135.4**
Optimum Moisture Content (%):	**7.1**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90	
Liquid Limit (%):	**33**
Plastic Limit (%):	**15**
Plasticity Index (%):	**18**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S2
Issue No: 2

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND
Job No:	P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S2
Field Sample ID	B-2, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-2, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	132.5	
Corrected Maximum Dry Density (lb/ft³)		132.5	
Optimum Moisture Content (%)		7.3	
Corrected Optimum Moisture Content (%)		7.3	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	33	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	19	
Date Tested		8/1/2023	

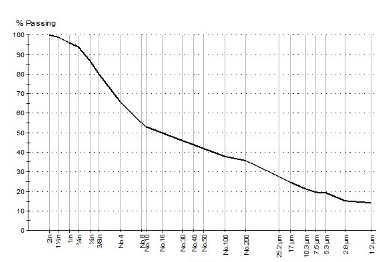
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
2in	100.0	
1½in	98.8	
1in	96.0	
¾in	93.7	
½in	86.3	
3/8in	80.3	
No.4	66.1	
No.8	54.8	
No.10	52.8	
No.16	49.7	
No.30	45.9	
No.40	44.1	
No.50	42.3	
No.100	38.1	
No.200	35.8	
25.2 µm	27.8	
17.0 µm	24.5	
10.3 µm	21.2	
7.5 µm	19.6	
5.3 µm	19.1	

Chart



Comments

N/A

American Engineering Testing, Inc.
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Report No: PTR:AET-117524-S2
Issue No: 1

Proctor Report

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
	Williston ND
Job No:	P-0023731

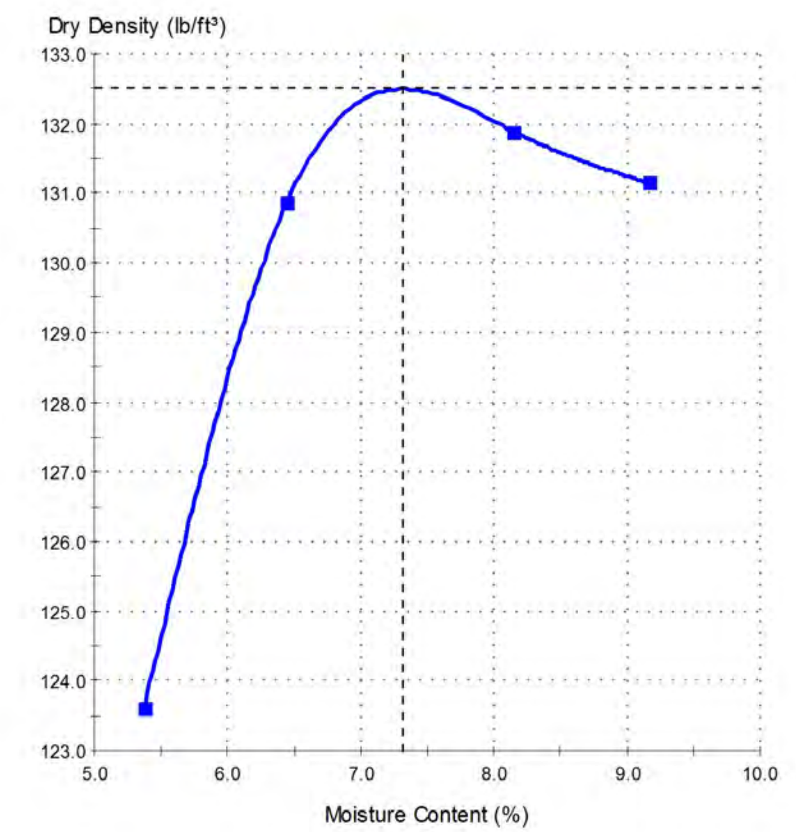
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S2	**Field ID:**	B-2, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-2, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**132.5**
Optimum Moisture Content (%):	**7.3**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**33**
Plastic Limit (%):	**14**
Plasticity Index (%):	**19**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S3
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S3
Field Sample ID	B-3, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-2-4)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-3, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	141.8	
Corrected Maximum Dry Density (lb/ft³)		141.8	
Optimum Moisture Content (%)		6.0	
Corrected Optimum Moisture Content (%)		6.0	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	23	
Plastic Limit (%)	AASHTO T 90	13	
Plasticity Index	AASHTO T 90	10	
Date Tested		8/1/2023	

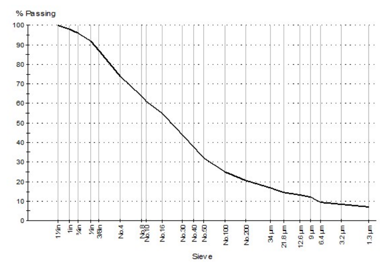
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1½in	100.0	
1in	98.0	
¾in	96.0	
½in	91.6	
3/8in	87.1	
No.4	73.9	
No.8	63.5	
No.10	61.4	
No.16	54.8	
No.30	43.7	
No.40	37.6	
No.50	32.4	
No.100	25.4	
No.200	20.7	
34.0 µm	16.9	
21.8 µm	14.5	
12.6 µm	13.2	
9.0 µm	12.0	
6.4 µm	9.6	
3.2 µm	8.4	

Chart



Comments

N/A

American Engineering Testing, Inc.
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Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S3
Issue No: 1

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
	Williston ND
Job No:	P-0023731

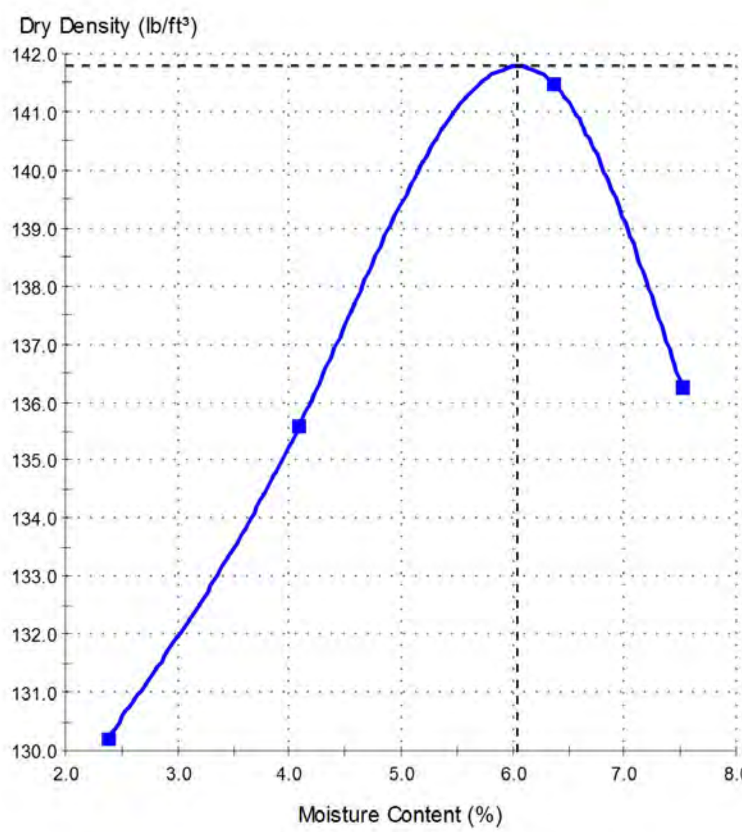
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S3	**Field ID:**	B-3, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-2-4)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-3, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**141.8**
Optimum Moisture Content (%):	**6.0**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**23**
Plastic Limit (%):	**13**
Plasticity Index (%):	**10**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
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1225 Bean Drive
Williston, ND 58801
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www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S4
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S4
Field Sample ID	B-4, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-4, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	129.8	
Corrected Maximum Dry Density (lb/ft³)		129.8	
Optimum Moisture Content (%)		8.2	
Corrected Optimum Moisture Content (%)		8.2	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	33	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	19	
Date Tested		8/1/2023	

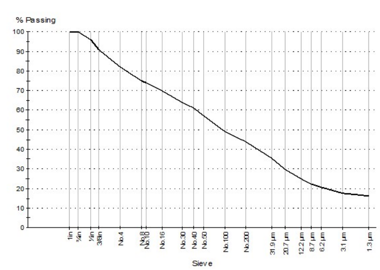
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1in	100.0	
¾in	99.7	
½in	95.7	
3/8in	91.1	
No.4	82.5	
No.8	75.3	
No.10	73.9	
No.16	70.1	
No.30	64.4	
No.40	60.9	
No.50	56.9	
No.100	48.6	
No.200	44.0	
31.9 µm	35.5	
20.7 µm	29.6	
12.2 µm	25.1	
8.7 µm	22.2	
6.2 µm	20.7	
3.1 µm	17.7	
1.3 µm	16.3	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S4
Issue No: 1

Client:	Civil Science, Inc	**CC:**	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND		
Job No:	P-0023731		

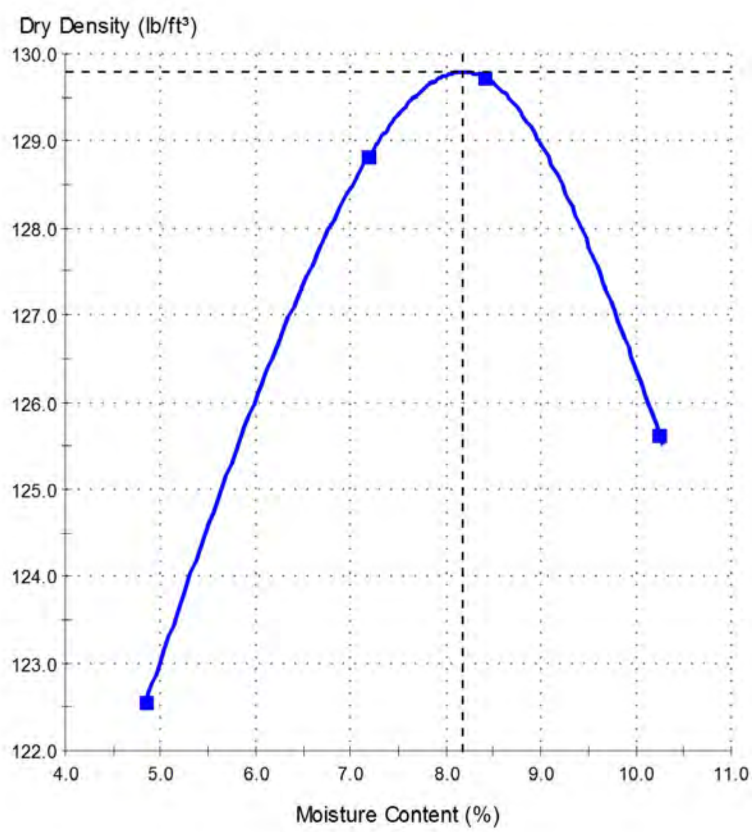
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S4	**Field ID:**	B-4, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-4, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**129.8**
Optimum Moisture Content (%):	**8.2**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**33**
Plastic Limit (%):	**14**
Plasticity Index (%):	**19**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

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(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S7
Issue No: 2

Client: Civil Science, Inc
CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

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Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S7
Field Sample ID	B-5, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-4)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-5, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	133.0	
Corrected Maximum Dry Density (lb/ft³)		133.0	
Optimum Moisture Content (%)		7.7	
Corrected Optimum Moisture Content (%)		7.7	
Method		A	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	22	
Plastic Limit (%)	AASHTO T 90	12	
Plasticity Index	AASHTO T 90	10	
Date Tested		8/1/2023	

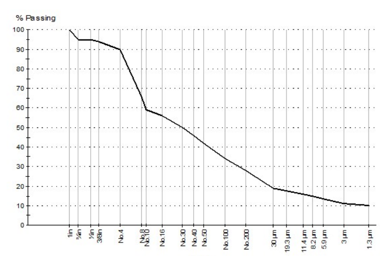
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1in	100.0	
¾in	95.2	
½in	94.9	
3/8in	94.4	
No.4	90.5	
No.8	66.2	
No.10	59.3	
No.16	56.5	
No.30	50.2	
No.40	46.3	
No.50	41.6	
No.100	33.6	
No.200	28.0	
30.0 µm	18.9	
19.3 µm	17.7	
11.4 µm	16.0	
8.2 µm	14.8	
5.9 µm	13.6	
3.0 µm	11.2	
1.3 µm	10.1	

Chart



Comments

N/A

American Engineering Testing, Inc.
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(701) 572-3324
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Proctor Report

Report No: PTR:AET-117524-S7
Issue No: 1

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
	Williston ND
Job No:	P-0023731

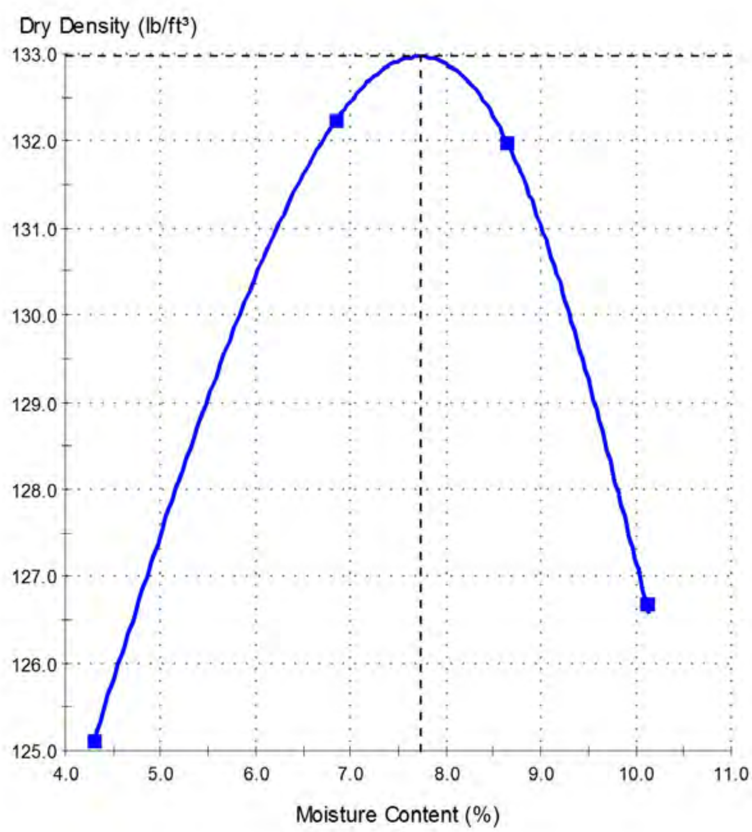
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S7	**Field ID:**	B-5, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-4)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-5, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft^3):	**133.0**
Optimum Moisture Content (%):	**7.7**
Method:	A
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**22**
Plastic Limit (%):	**12**
Plasticity Index (%):	**10**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

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Williston, ND 58801
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Material Test Report

Report No: MAT:AET-117524-S5
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

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Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S5
Field Sample ID	B-6, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-6, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	129.5	
Corrected Maximum Dry Density (lb/ft³)		129.5	
Optimum Moisture Content (%)		7.9	
Corrected Optimum Moisture Content (%)		7.9	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	32	
Plastic Limit (%)	AASHTO T 90	13	
Plasticity Index	AASHTO T 90	19	
Date Tested		8/1/2023	

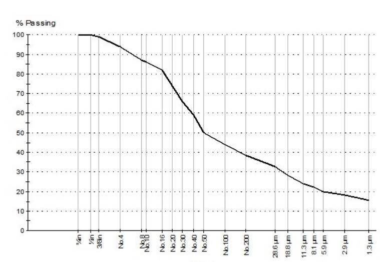
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
¾in	100.0	
½in	99.6	
3/8in	98.7	
No.4	93.8	
No.8	87.1	
No.10	85.8	
No.16	81.8	
No.20	73.5	
No.30	66.3	
No.40	59.0	
No.50	49.5	
No.100	43.9	
No.200	38.4	
28.6 µm	32.7	
18.8 µm	28.4	
11.3 µm	24.1	
8.1 µm	22.4	
5.9 µm	19.8	
2.9 µm	18.1	
1.3 µm	15.5	

Chart



Comments

N/A

American Engineering Testing, Inc.
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Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S5
Issue No: 1

Client:	Civil Science, Inc	**CC:**	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND		
Job No:	P-0023731		

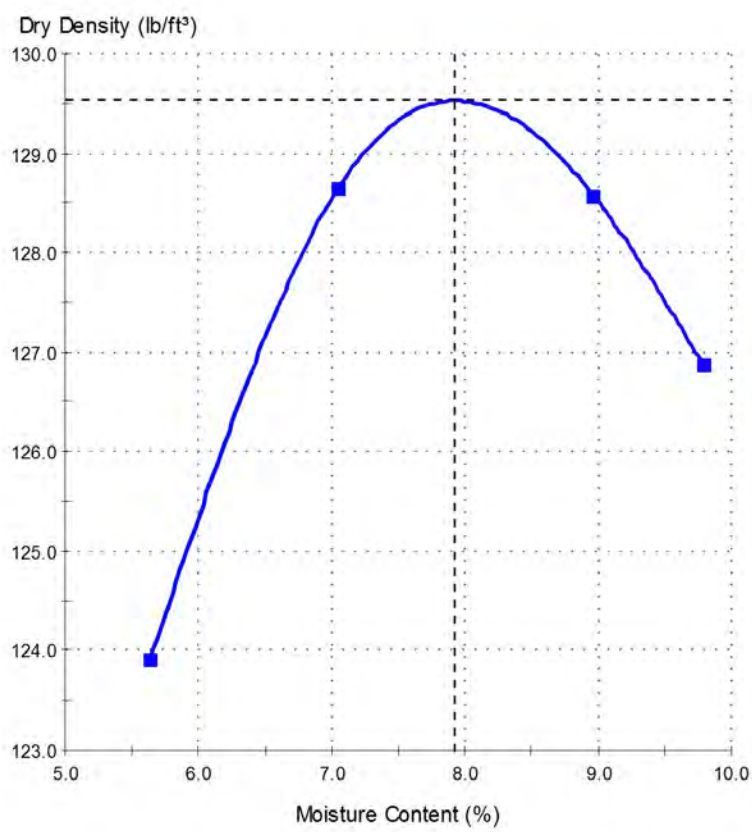
Harvey Fitzgerald

Date of Issue: 9/13/2023
Reviewed By: Harvey Fitzgerald
Engineer II

Sample Details

Sample ID:	AET-117524-S5	**Field ID:**	B-6, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-6, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**129.5**
Optimum Moisture Content (%):	**7.9**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**32**
Plastic Limit (%):	**13**
Plasticity Index (%):	**19**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
Williston
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Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S8
Issue No: 2

Client:	Civil Science, Inc	**CC:**	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND		
Job No:	P-0023731		

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S8
Field Sample ID	B-7, 1-5'
Date Sampled	6/4/2023
Source	
Material	Sandy Lean Clay (CL)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-7, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	123.1	
Corrected Maximum Dry Density (lb/ft³)		123.1	
Optimum Moisture Content (%)		11.1	
Corrected Optimum Moisture Content (%)		11.1	
Method		A	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	33	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	19	
Date Tested		8/1/2023	

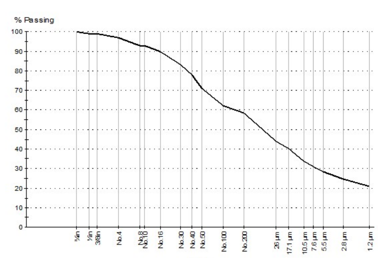
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
¾in	100.0	
½in	99.4	
3/8in	98.9	
No.4	96.6	
No.8	93.4	
No.10	92.6	
No.16	89.9	
No.30	83.4	
No.40	78.1	
No.50	71.4	
No.100	62.4	
No.200	58.3	
26.0 µm	43.9	
17.1 µm	40.2	
10.5 µm	33.8	
7.6 µm	31.1	
5.5 µm	28.3	
2.8 µm	24.7	
1.2 µm	21.0	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S8
Issue No: 1

Client: Civil Science, Inc **CC:**

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

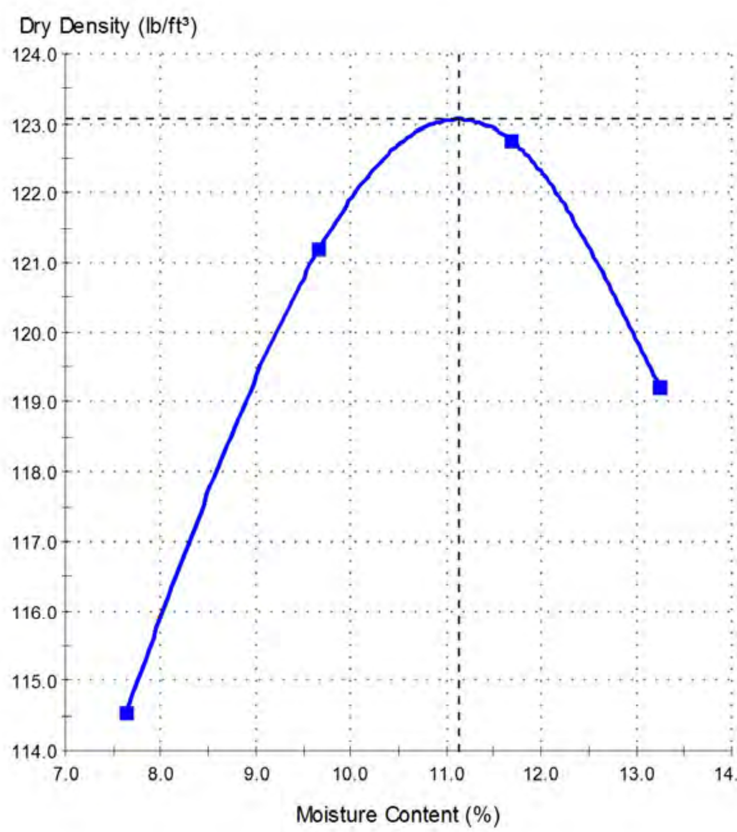
Harvey Fitzgerald

Date of Issue: 9/13/2023
Reviewed By: Harvey Fitzgerald
Engineer II

Sample Details

Sample ID:	AET-117524-S8	**Field ID:**	B-7, 1-5'
Date Sampled:	6/4/2023		
Sampling Method:	Cuttings		
Material:	Sandy Lean Clay (CL)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-7, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**123.1**
Optimum Moisture Content (%):	**11.1**
Method:	A
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**33**
Plastic Limit (%):	**14**
Plasticity Index (%):	**19**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S6
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S6
Field Sample ID	B-8, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-8, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	130.6	
Corrected Maximum Dry Density (lb/ft³)		130.6	
Optimum Moisture Content (%)		7.9	
Corrected Optimum Moisture Content (%)		7.9	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/1/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	31	
Plastic Limit (%)	AASHTO T 90	13	
Plasticity Index	AASHTO T 90	18	
Date Tested		8/1/2023	

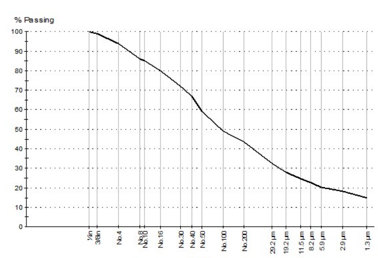
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
½in	100.0	
3/8in	99.1	
No.4	93.5	
No.8	86.2	
No.10	84.8	
No.16	80.3	
No.30	72.3	
No.40	66.6	
No.50	59.2	
No.100	49.3	
No.200	43.7	
29.2 µm	32.4	
19.2 µm	28.1	
11.5 µm	24.6	
8.2 µm	22.8	
5.9 µm	20.2	
2.9 µm	18.4	
1.3 µm	14.9	

Chart



Comments

N/A

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Williston, ND 58801
(701) 572-3324
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Proctor Report

Report No: PTR:AET-117524-S6
Issue No: 1

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
	Williston ND
Job No:	P-0023731

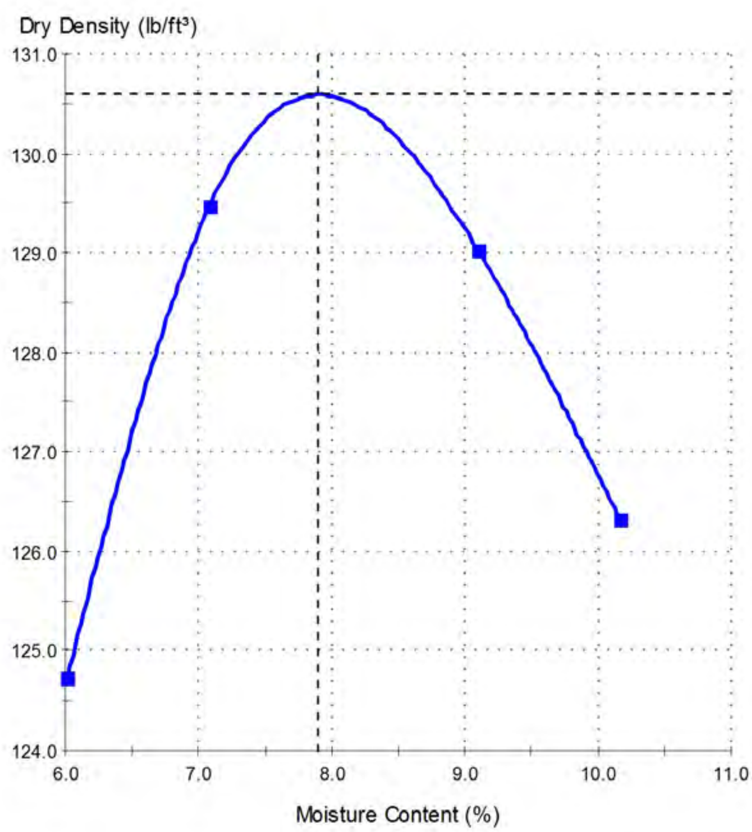
Harvey Fitzgerald

Date of Issue: 9/13/2023
Reviewed By: Harvey Fitzgerald
Engineer II

Sample Details

Sample ID:	AET-117524-S6	**Field ID:**	B-8, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-8, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**130.6**
Optimum Moisture Content (%):	**7.9**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/1/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**31**
Plastic Limit (%):	**13**
Plasticity Index (%):	**18**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

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Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S12
Issue No: 2

Client: Civil Science, Inc **CC:**

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

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Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S12
Field Sample ID	B-9, 1-5'
Date Sampled	6/2/2023
Source	
Material	Sandy Lean Clay (CL)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-9, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	128.4	
Corrected Maximum Dry Density (lb/ft³)		128.4	
Optimum Moisture Content (%)		8.9	
Corrected Optimum Moisture Content (%)		8.9	
Method		D	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88		
Shape			
Hardness			
Dispersion Device		Dispersant by hand	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	29	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	15	
Date Tested		8/1/2023	

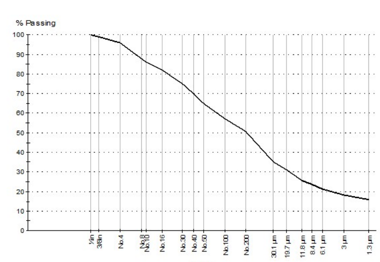
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
½in	100.0	
3/8in	98.8	
No.4	95.7	
No.8	88.1	
No.10	86.4	
No.16	82.2	
No.30	74.6	
No.40	70.0	
No.50	64.9	
No.100	56.6	
No.200	50.6	
30.1 µm	35.2	
19.7 µm	31.0	
11.8 µm	25.6	
8.4 µm	23.5	
6.1 µm	21.4	
3.0 µm	18.2	
1.3 µm	16.0	

Chart



Comments

N/A

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1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S12
Issue No: 1

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
	Williston ND
Job No:	P-0023731

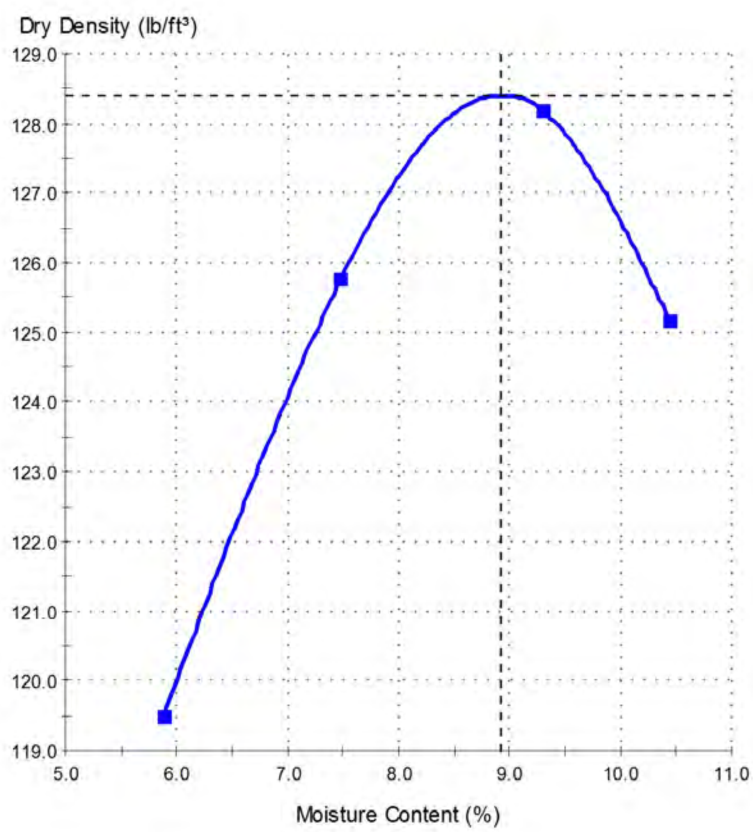
Harvey Fitzgerald

Date of Issue: 9/13/2023
Reviewed By: Harvey Fitzgerald
Engineer II

Sample Details

Sample ID:	AET-117524-S12	**Field ID:**	B-9, 1-5'
Date Sampled:	6/2/2023		
Sampling Method:	Cuttings		
Material:	Sandy Lean Clay (CL)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-9, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**128.4**
Optimum Moisture Content (%):	**8.9**
Method:	D
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**29**
Plastic Limit (%):	**14**
Plasticity Index (%):	**15**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

AMERICAN ENGINEERING TESTING

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S9
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S9
Field Sample ID	B-10, 1-5'
Date Sampled	6/3/2023
Source	
Material	Sandy Lean Clay (CL)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-10, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	135.3	
Corrected Maximum Dry Density (lb/ft³)		135.3	
Optimum Moisture Content (%)		7.1	
Corrected Optimum Moisture Content (%)		7.1	
Method		A	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	21	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	7	
Date Tested		8/1/2023	

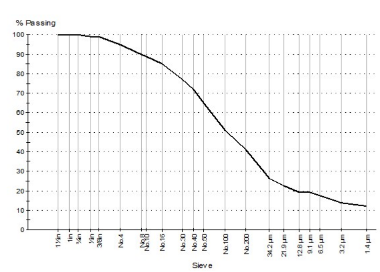
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1½in	100.0	
1in	99.8	
¾in	99.8	
½in	99.4	
3/8in	98.8	
No.4	95.3	
No.8	90.4	
No.10	89.1	
No.16	85.1	
No.30	76.9	
No.40	71.8	
No.50	65.2	
No.100	51.2	
No.200	41.1	
34.2 µm	26.2	
21.9 µm	22.7	
12.8 µm	19.2	
9.1 µm	19.2	
6.5 µm	17.5	
3.2 µm	14.0	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S9
Issue No: 1

Client:	Civil Science, Inc
CC:	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND
Job No:	P-0023731

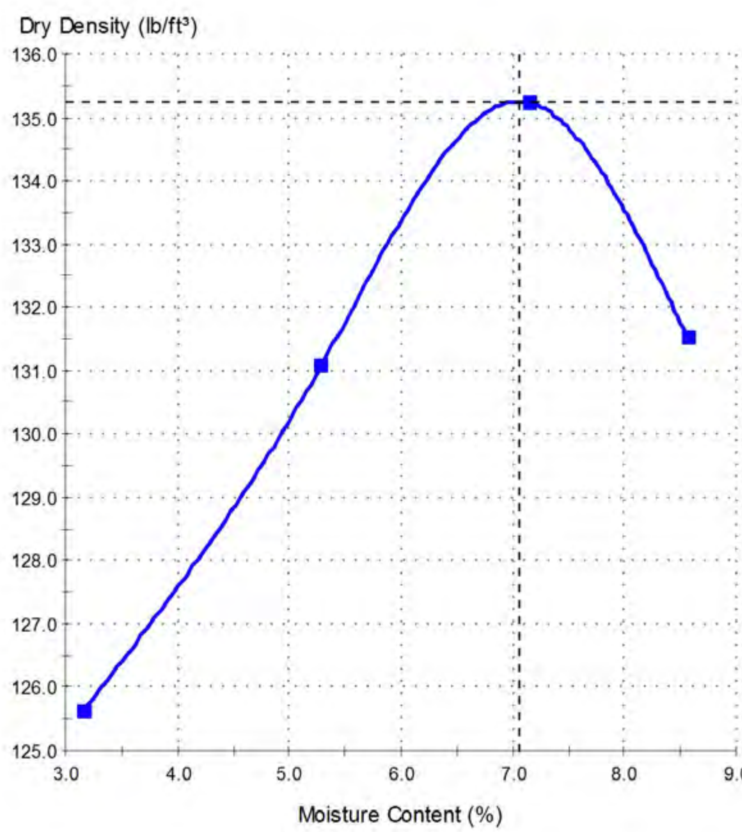
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S9	**Field ID:**	B-10, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Sandy Lean Clay (CL)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-10, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**135.3**
Optimum Moisture Content (%):	**7.1**
Method:	A
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**21**
Plastic Limit (%):	**14**
Plasticity Index (%):	**7**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

AMERICAN
ENGINEERING TESTING

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S10
Issue No: 2

Client: Civil Science, Inc

CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S10
Field Sample ID	B-11, 1-5'
Date Sampled	6/3/2023
Source	
Material	Clayey Sand (SC)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-11, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	126.5	
Corrected Maximum Dry Density (lb/ft³)		126.5	
Optimum Moisture Content (%)		9.8	
Corrected Optimum Moisture Content (%)		9.8	
Method		A	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	28	
Plastic Limit (%)	AASHTO T 90	14	
Plasticity Index	AASHTO T 90	14	
Date Tested		8/1/2023	

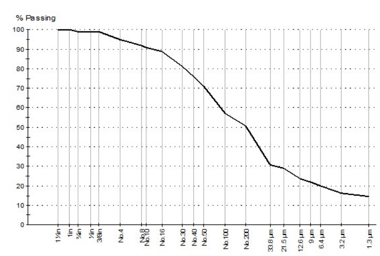
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
1½in	100.0	
1in	99.6	
¾in	99.4	
½in	99.1	
3/8in	98.8	
No.4	95.3	
No.8	92.0	
No.10	91.0	
No.16	88.5	
No.30	81.4	
No.40	76.3	
No.50	70.7	
No.100	56.9	
No.200	50.6	
33.8 µm	30.8	
21.5 µm	29.0	
12.6 µm	23.6	
9.0 µm	21.8	
6.4 µm	19.9	
3.2 µm	16.3	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Report No: PTR:AET-117524-S10
Issue No: 1

Proctor Report

Client: Civil Science, Inc
CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

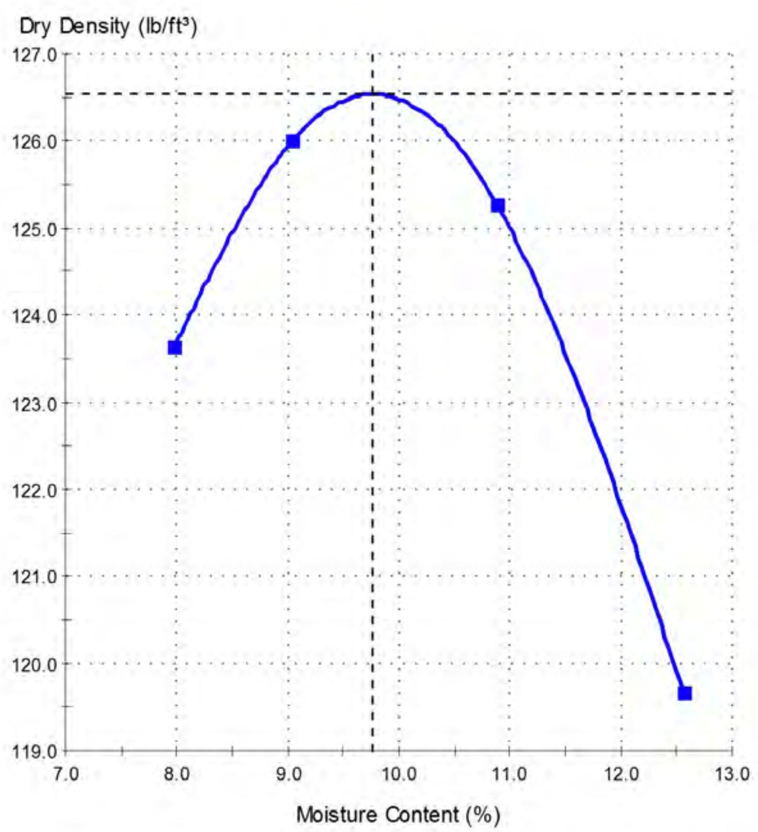
Job No: P-0023731

Date of Issue: 9/13/2023
Reviewed By: Harvey Fitzgerald
Engineer II

Sample Details

Sample ID:	AET-117524-S10	**Field ID:**	B-11, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Clayey Sand (SC)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-11, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180

Maximum Dry Density (lb/ft³):	**126.5**
Optimum Moisture Content (%):	**9.8**
Method:	A
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90

Liquid Limit (%):	**28**
Plastic Limit (%):	**14**
Plasticity Index (%):	**14**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Material Test Report

Report No: MAT:AET-117524-S11
Issue No: 2

Client: Civil Science, Inc
CC:

Project: 7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection

Williston ND

Job No: P-0023731

Date of Issue: 10/19/2023
Reviewed By: Alec Hovick
Dickinson Manager

Sample Details

Sample ID	AET-117524-S11
Field Sample ID	B-15, 1-5'
Date Sampled	6/3/2023
Source	
Material	Sandy Lean Clay (CL)(A-6)
Specification	No Spec. Gradation
Sampling Method	Cuttings
General Location	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection
Location	B-15, 1-5'
Date Submitted	

Other Test Results

Description	Method	Result	Limits
Maximum Dry Density (lb/ft³)	AASHTO T 180	116.7	
Corrected Maximum Dry Density (lb/ft³)		116.7	
Optimum Moisture Content (%)		12.8	
Corrected Optimum Moisture Content (%)		12.8	
Method		A	
Oversize Specific Gravity		2.6	
Date Tested		7/10/2023	
Dispersion Period (mins)	AASHTO T 88	1	
Shape			
Hardness			
Dispersion Device		Dispersant by mixer	
Sand Gravel Description			
Liquid Limit (%)	AASHTO T 89	40	
Plastic Limit (%)	AASHTO T 90	15	
Plasticity Index	AASHTO T 90	25	
Date Tested		8/1/2023	

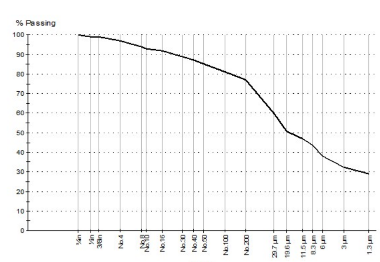
Particle Size Distribution

Method: AASHTO T 88

Date Tested: 7/24/2023
Tested By: Tristan Lloyd

Sieve Size	% Passing	Limits
¾in	100.0	
½in	99.4	
3/8in	98.7	
No.4	96.7	
No.8	94.0	
No.10	93.4	
No.16	91.6	
No.30	89.0	
No.40	87.4	
No.50	85.2	
No.100	80.9	
No.200	76.9	
29.7 µm	59.8	
19.6 µm	50.8	
11.5 µm	47.1	
8.3 µm	43.5	
6.0 µm	38.1	
3.0 µm	32.6	
1.3 µm	29.0	

Chart



Comments

N/A

American Engineering Testing, Inc.
Williston
1225 Bean Drive
Williston, ND 58801
(701) 572-3324
www.teamAET.com

Proctor Report

Report No: PTR:AET-117524-S11
Issue No: 1

Client:	Civil Science, Inc	**CC:**	
Project:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection Williston ND		
Job No:	P-0023731		

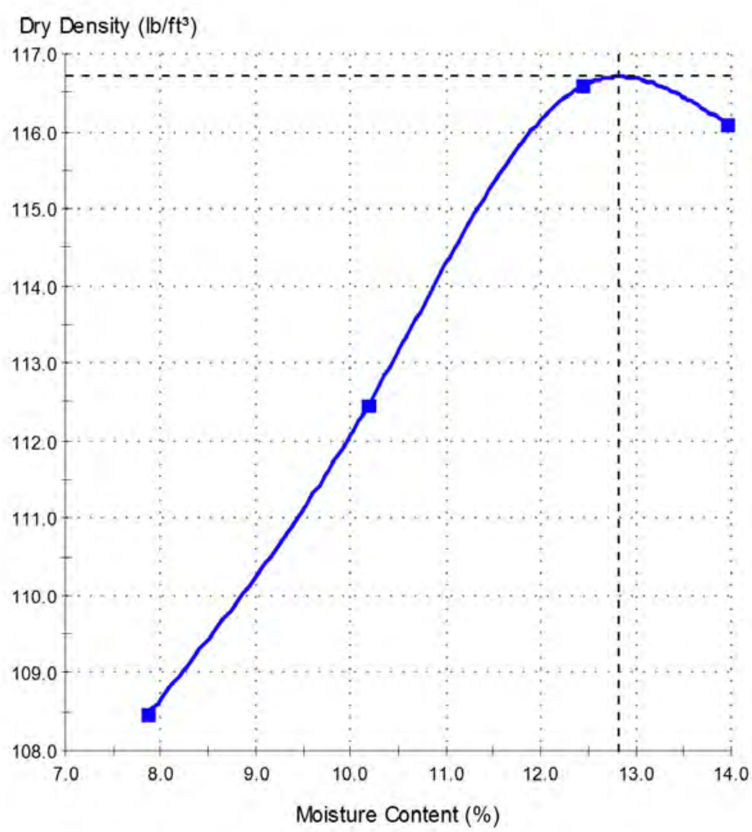
Harvey Fitzgerald

Date of Issue:	9/13/2023
Reviewed By:	Harvey Fitzgerald Engineer II

Sample Details

Sample ID:	AET-117524-S11	**Field ID:**	B-15, 1-5'
Date Sampled:	6/3/2023		
Sampling Method:	Cuttings		
Material:	Sandy Lean Clay (CL)(A-6)		
Specification:	No Spec. Gradation		
General Location:	7-002(178)020 PCN 23335 US 2/26th St/2nd Ave Intersection		
Location:	B-15, 1-5'		
Sampled By:	Williston		

Dry Density - Moisture Content Relationship



Test Results

AASHTO T 180	
Maximum Dry Density (lb/ft³):	**116.7**
Optimum Moisture Content (%):	**12.8**
Method:	A
Tested By:	**Tristan Lloyd**
Date Tested:	**7/10/2023**

AASHTO T 89/T 90	
Liquid Limit (%):	**40**
Plastic Limit (%):	**15**
Plasticity Index (%):	**25**
Tested By:	**Tristan Lloyd**
Date Tested:	**8/1/2023**

Comments

Appendix B
Geotechnical Report Limitations and Guidelines for Use
Report No. P-0023731

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA[1], of which, we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do <u>not</u> rely on this report if your geotechnical engineer prepared it:

- for a different client
- for a different project or purpose
- for a different site (that may or may not include all or a portion of the original site) or
- before important events occurred at the site or adjacent to it, e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

1 Geoprofessional Business Association, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org, 2019

LABORATORY TESTING RESULTS SUMMARY

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Max Dry Density	Optimum Moisture	In-Place Moisture vs. Optimum	Average MC vs Optimum MC
B-01	6"-1.5'								12.0				4.9	
B-01	1.5'-2.5'								19.0				11.9	
B-01	2.5'-3.5'								15.0				7.9	
B-01	3.5'-4.5'								12.0				4.9	
B-01	4.5'-5.5'								12.0				4.9	
B-01 Composite		33	15	18	25	37.6	A-6	SC		14.0	135.4	7.1		6.90
B-02	6"-1.5'								3.0				-4.3	
B-02	1.5'-2.5'								15.0				7.7	
B-02	2.5'-3.5'								21.0				13.7	
B-02	3.5'-4.5'								32.0				24.7	
B-02	4.5'-5.5'								26.0				18.7	
B-02 Composite		33	14	19	50	47.4	A-6	SC		19.4	132.5	7.3		12.10
B-03	6"-1.5'								7.0				1	
B-03	1.5'-2.5'								6.0				0	
B-03	2.5'-3.5'								-				#VALUE!	
B-03	3.5'-4.5'								11.0				5	
B-03	4.5'-5.5'								15.0				9	
B-03 Composite		23	13	10	38	19.6	A-2-4	SC		9.8	141.8	6		3.75
B-04	6"-1.5'								2.0				-6.2	
B-04	1.5'-2.5'								15.0				6.8	
B-04	2.5'-3.5'								17.0				8.8	
B-04	3.5'-4.5'								25.0				16.8	
B-04	4.5'-5.5'								17.0				8.8	
B-04 Composite		33	14	19	25	43.7	A-6	SC		15.2	129.8	8.2		7.00
B-05	6"-1.5'								12.0				4.3	
B-05	1.5'-2.5'								18.0				10.3	
B-05	2.5'-3.5'								26.0				18.3	
B-05	3.5'-4.5'								10.0				2.3	
B-05	4.5'-5.5'								15.0				7.3	
B-05 Composite		22	12	10	19	41	A-4	SC		16.2	133	7.7		8.50
B-06	6"-1.5'								4.0				-3.9	
B-06	1.5'-2.5'								14.0				6.1	
B-06	2.5'-3.5'								14.0				6.1	
B-06	3.5'-4.5'								27.0				19.1	
B-06	4.5'-5.5'								22.0				14.1	
B-06 Composite		32	13	19	19	44.7	A-6	SC		16.2	129.5	7.9		8.30
B-07	6"-1.5'								8.0				-3.1	
B-07	1.5'-2.5'								12.0				0.9	
B-07	2.5'-3.5'								22.0				10.9	
B-07	3.5'-4.5'								19.0				7.9	
B-07	4.5'-5.5'								19.0				7.9	
B-07 Composite		33	14	19	19	60	A-6	CL		16.0	123.1	11.1		4.90

LABORATORY TESTING RESULTS SUMMARY

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	AASHTO Classification	USCS Classification	Water Content (%)	Avg. Water Content (%)	Max Dry Density	Optimum Moisture	In-Place Moisture vs. Optimum	Average MC vs Optimum MC
B-08	6"-1.5'								7.0				-0.9	
B-08	1.5'-2.5'								9.0				1.1	
B-08	2.5'-3.5'								14.0				6.1	
B-08	3.5'-4.5'								6.0				-1.9	
B-08	4.5'-5.5'								20.0				12.1	
B-08 Composite		31	13	18	12.5	42.2	A-6	SC		11.2	130.6	7.9		3.30
B-09	6"-1.5'								2.0				-6.9	
B-09	1.5'-2.5'								9.0				0.1	
B-09	2.5'-3.5'								16.0				7.1	
B-09	3.5'-4.5'								21.0				12.1	
B-09	4.5'-5.5'								28.0				19.1	
B-09 Composite		29	14	15	12.5	54.2	A-6	CL		15.2	128.4	8.9		6.30
B-10	6"-1.5'								8.0				0.9	
B-10	1.5'-2.5'								7.0				-0.1	
B-10	2.5-3.5'								15.0				7.9	
B-10	3.5-4.5'								11				3.9	
B10	4.5-5.5'								11				3.9	
B-10 Composite		21	14	7	38	39.3	A-4	SC		10.4	135.3	7.1		3.30
B-11	6"-1.5'								7.0				-2.8	
B-11	1.5'-2.5'								12.0				2.2	
B-11	2.5'-3.5'								17.0				7.2	
B-11	3.5'-4.5'								20.0				10.2	
B-11	4.5'-5.5'								25.0				15.2	
B-11 Composite		28	14	14	38	40.8	A-6	SC		16.2	126.5	9.8		6.40
B-15	6"-1.5'								22.0				9.2	
B-15	2.5'-3.5'								20.0				7.2	
B-15	3.5'-4.5'								20.0				7.2	
B-15	4.5'-5.5'								22.0				9.2	
B-15 Composite		40	15	25	19	72.7	A-6	CL		21.0	116.7	12.8		8.20

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

Appendix B

Geotechnical Report Limitations and Guidelines for Use

B.2.3 Read the Full Report
Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

B.2.4 You Need to Inform Your Geotechnical Engineer About Change
Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria
- the composition of the design team or
- project ownership.

As a general rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

B.2.5 Most of the "Findings" Related in This Report Are Professional Opinions
Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

B.2.6 This Report's Recommendations Are Confirmation-Dependent
The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

B.2.7 This Report Could Be Misinterpreted
Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members
- help develop specifications
- review pertinent elements of other design professionals' plans and specifications and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

B.2.8 Give Constructors a Complete Report and Guidance
Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious

problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they can perform their own studies if they want to and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

B.2.9 Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.10 Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations, e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.