SOILS & STRUCTURES

REPORT OF GEOTECHNICAL INVESTIGATION FOR TRACTOR SUPPLY - BELLEVILLE

VAN BUREN CHARTER TOWNSHIP
WAYNE COUNTY
MICHIGAN

FEBRUARY 8, 2024

CBE, LLC
221 West Webster Avenue, Suite 507
Muskegon, Michigan 49440

Project No. 2023.2100

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February 8, 2024

CBE, LLC
221 West Webster Avenue, Suite 507
Muskegon, Michigan 49440

Attention: Mr. Derek Marine

Regarding: Tractor Supply - Belleville
Geotechnical Report
Van Buren Charter Township, Wayne County, Michigan
Project No. 2023.2100

Dear Mr. Marine:

Soils & Structures is pleased to present this geotechnical investigation report for the Tractor Supply - Belleville project located on the southeast corner of the Hull Road and Sumpter Road intersection in Van Buren Charter Township, Wayne County, Michigan.

The investigation included fifteen (15) test borings drilled to depths of 10.0, 15.0, and 20.0 feet, and three (3) hand augers extended to depths ranging from 4.5 to 6.0 feet. The test borings and hand augers were conducted in accordance with ASTM D 1586 and ASTM D 1452 procedures, respectively.

The report, test boring location plan, and test boring logs are enclosed. The report provides recommendations for site preparation, foundations, fill, floors, and pavement.

We appreciate the opportunity to provide engineering services to CBE, LLC. If you have any questions regarding this report, please contact our office.

Sincerely,
Soils & Structures, Inc.

Vincent O. Oderah, P.E.
VOO/vo

Reviewed by:

Michael J. Partenio, P.E.

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- Test Boring Location Plan
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Location of Soil Investigation

The soil investigation was conducted at the site located on the southeast corner of the Hull Road and Sumpter Road intersection in Section 34 of Van Buren Charter Township, Wayne County, Michigan.

Purpose of Investigation

The purpose of this investigation is to provide geotechnical engineering recommendations for the proposed building and pavement.

Design Information

The proposed building is a single-story structure with a slab on grade floor. The planned area of the building is 21,930 square feet. The project will also include a fenced outdoor display area and a garden center with planned areas of 11,920 and 3,744 square feet, respectively. A stormwater detention pond will be constructed on the eastern portion of the site. Pavement for this project will include new parking lots and driveways.

The maximum column and wall loads are anticipated to be less than 150,000 pounds and 10,000 pounds per linear foot respectively. Allowable settlements of 0.6 inches for total settlement and 0.4 inches for differential settlement are assumed. If the actual loads are significantly greater than the anticipated loads listed in this report, then Soils & Structures should be contacted so that the recommendations included in this report may be reviewed and revised if necessary.

The finished floor elevation of the building will be 676.5 feet. The existing surface elevation of the site ranges from 673.9 to 674.9 feet. Fill and excavation will be required to achieve the desired grade in the construction areas. The thickness of fill required to achieve the desired grade is anticipated to be less than 2.0 feet. Fill for this project will also include backfill over foundations and utilities. The thickness of backfill over foundations and utilities is anticipated to be less than 4.0 feet. Groundwater controls and dewatering will probably be necessary to construct foundations and utilities.

An equivalent single axle load (ESAL) of 250,000 was assumed for the design of the recommended pavement section. Pavement for this project is assumed to be subjected to automobile and occasional truck traffic. A service life of twenty years was assumed for the pavement subgrade recommendations. The subgrade is assumed to be prepared as recommended in this report. The final pavement design should be based on site-specific traffic conditions.

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Tests Performed

The investigation included fifteen (15) test borings drilled to depths of 10.0, 15.0, and 20.0 feet, and three (3) hand augers extended to depths ranging from 4.5 to 6.0 feet. The test borings are designated as Test Boring One (TB-01) through Test Boring Fifteen (TB-15). The hand augers are designated as Hand Auger One (HA-01) through Hand Auger Three (HA-03). The locations were determined by Nederveld. Soils & Structures reviewed the locations for accessibility and revised as necessary. The test borings and hand augers were conducted in accordance with ASTM D 1586 and ASTM D 1452 procedures, respectively. The ASTM D 1586 standard describes the procedure for sampling and testing soil using the Standard Penetration Test. An automatic hammer was used to obtain the soil samples. The ASTM D 1452 standard describes the procedure for sampling and testing soil using a hand auger.

The surface elevations at the test boring locations and additional points of reference were obtained with a Global Navigation Satellite System (GNSS) Receiver. The receiver was connected to the local MDOT CORS base station. Through this system, vertical measurements are obtained and referenced to the North American Vertical Datum (NAVD88). Horizontal measurements are also obtained at the test boring locations which are referenced to the Michigan State Plane Coordinate System. Both the vertical and horizontal measurements typically have an accuracy of approximately 0.5 inches. The measured test boring locations and surface elevations are represented in Table 1.

Table 1: Measured Test Boring and Points of Reference Locations and Surface Elevations

Test Boring / Location	Elevation (feet)	Northing (feet)	Easting (feet)	Surface Cover
Test Boring One	674.7	252661.4	13362928.7	Topsoil
Test Boring Two	674.1	252617.9	13362849.9	Topsoil
Test Boring Three	674.8	252624.9	13363011.6	Topsoil
Test Boring Four	674.5	252556.9	13362789.4	Topsoil
Test Boring Five	674.0	252558.8	13362929.4	Topsoil
Test Boring Six	674.9	252574.8	13363125.6	Topsoil
Test Boring Seven	674.2	252495.0	13362854.8	Topsoil
Test Boring Eight	674.4	252501.1	13363012.4	Topsoil
Test Boring Nine	674.2	252440.1	13362792.3	Topsoil
Test Boring Ten	674.6	252438.2	13362930.3	Topsoil
Test Boring Eleven	674.4	252416.4	13363129.5	Topsoil
Test Boring Twelve	673.9	252384.0	13362859.5	Topsoil

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Table 1(cont.): Measured Test Boring and Points of Reference Locations and Surface Elevations

Test Boring / Location	Elevation (feet)	Northing (feet)	Easting (feet)	Surface Cover
Test Boring Thirteen	674.0	252384.3	13363014.7	Topsoil
Test Boring Fourteen	674.3	252346.0	13362793.6	Topsoil
Test Boring Fifteen	673.9	252344.3	13362931.4	Topsoil
Center O.H.E Pole	675.3	252439.8	13362965.3	-
Base Setup	728.3	268864.5	13346743.9	-

Soil samples were classified according to the Unified Soil Classification System. This method is a standardized system for classifying soil according to its engineering properties. Please refer to the appendix of this report for the Unified Classification System Chart. The classification is shown in the "Material Description" column of the test boring logs.

The soil strength and the allowable soil bearing value were evaluated using the "N" value. The "N" value is the number of blows required to drive a soil sampler one foot with a standard 140-pound drop hammer. The sampler is driven a distance of 18.0 inches. The number of blows for each 6.0-inch increment is recorded. The sum of the second and third intervals is the "N" value. The number of blows for each 6.0-inch interval is shown on the test boring logs under the column labeled "Blow Count." The "N" value for each sample is shown in the adjacent column.

Laboratory testing consisted of natural moisture content (ASTM D 2216) and particle size (sieve) analysis (ASTM D 6913). The tests were performed in accordance with the ASTM standards listed above. The tests were performed on representative soil samples. The moisture content documents the presence of groundwater in a soil sample. The sieve analysis determines the particle distribution which is used to classify the soil and estimate its properties.

The U.S. Geological Survey Topographic map and the Quaternary Geology map of Michigan were reviewed. These maps provide general geological information about the region. Publicly available well logs were reviewed to determine the depth of bedrock.

Description of Soil

The general soil profile consists of a layer of sand which extends to depths of 18.0 to over 20.0 feet overlying a layer of clay and silt which extends to a depth of at least 20.0 feet. The sand layer is a deposit of lacustrine sand. Lacustrine deposits are deposits near lakes formed by glacial activity and typically formed layered strata.

Topsoil is present at the surface of the site. The topsoil thickness ranges from 9.0 to 19.0 inches. The average topsoil thickness is 14.0 inches.

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The upper portion of the sand layer consists of brown, fine to coarse sand and extends to depths of 4.0 to 9.5 feet. The "N" values of the upper portion of the sand layer range from 6 to 28, indicating the sand is in a slightly compact to very compact state. The majority of the upper portion of the sand layer is in a compact state. The "N" values correspond to an internal friction angle ranging from 28 to 33 degrees.

The middle portion of the sand layer predominantly consists of brown, fine sand and extends to depths of 8.5 to 18.0 feet. This portion of the sand layer contains silty sand in the areas of Test Boring Five and Test Boring Six. The "N" values of the middle portion of the sand layer range from 19 to 46, indicating the sand is in a compact to very compact state. The "N" values correspond to an internal friction angle ranging from 33 to 38 degrees.

The lower portion of the sand layer consists of brown, fine to medium sand with trace amounts of silt and extends to depths of 18.0 to over 20.0 feet. The "N" values of the lower portion of the sand layer range from 21 to over 50, indicating the sand is in a compact to extremely compact state. The "N" values correspond to an internal friction angle ranging from 33 to 38 degrees.

A layer of gray and brown clayey and sandy silt underlies the sand layer in the areas of Test Boring Two and Test Boring Seven. The "N" values of the silt layer range from 9 to 19, indicating the silt is in a stiff state. The internal friction angle of the silt is 15 degrees.

A layer of gray silty clay underlies the sand layer in the area of Test Boring Eight. The "N" value of the clay layer is 11, indicating the clay is in a stiff state. The internal friction angle of the clay is between 0 and 5 degrees.

Bedrock is present below a depth of approximately 113.0 feet. The bedrock consists of gray limestone formed during the Middle Devonian Period. The bedrock is part of the Traverse Group Formation.

Description of Groundwater Conditions

Groundwater was encountered at depths ranging from 2.0 to 3.5 feet. These depths correspond to elevations ranging from 670.9 to 672.5 feet. Long-term groundwater monitoring was not performed as part of this investigation.

Description of Site

The site is located on the southeast corner of the Hull Road and Sumpter Road intersection in Van Buren Charter Township, Wayne County, Michigan. The site is a vacant agricultural parcel. The proposed building will be situated on the northwest portion of the parcel. The site is bordered to the north by Hull Road. The site is bordered to the south and east by agricultural land. The west side of the site is bordered by Sumpter Road. The surface elevation of the site ranges from 673.9 to 674.9 feet. Photographs #1 and #2 show the site at the time of the investigation.

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Photograph #1: Northern portion of the site. View is to the east. (Project No. 2023.2100, Tractor Supply - Belleville, Van Buren Charter Township, Wayne County, Michigan, December 2023)

Photograph #2: Central portion of the site. View is to the south. (Project No. 2023.2100, Tractor Supply - Belleville, Van Buren Charter Township, Wayne County, Michigan, December 2023)

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Recommendations

Site & Subgrade Preparation

Trees and vegetation in the construction area should be cleared and removed as part of subgrade preparation. The topsoil should be removed to the extent that all soil with an organic content of 3.0 percent or greater is removed. Soil containing roots should be removed to the extent that the root content by volume is 5.0 percent or less. All roots over 0.5 inches in diameter should be removed. The average amount of topsoil anticipated to be removed is 14.0 inches.

Fill and excavation may be required to achieve the desired grade. Excavation and backfill will be required for construction of foundations and utilities. Excavated sand may be retained for use as fill. Fill should be placed in accordance with the recommendations in the "Fill" section of this report. The fill should be compacted to 95.0 percent of its maximum density to its full depth. In-situ sand should be compacted to 95.0 percent of its maximum density prior to placement of fill. Compaction tests should be performed to verify these levels of compaction.

The pavement subgrade, subbase, and aggregate base should be proof-rolled using a fully loaded tri-axle dump truck prior to construction. The proof roll should consist of single, overlapping passes. Areas that experience yielding during the proof roll should be recompacted. Areas that continue to experience yielding following recompaction may require undercutting or the placement of a geogrid to stabilize the subgrade.

Soil brought to the site for fill should be clean sand meeting MDOT Class II specifications. Fill should be placed in accordance with the "Fill" section of this report. The fill should be compacted to 95.0 percent of its maximum density, as determined by the modified proctor method per the ASTM D 1557 standard. The soil which will be used for fill should be kept free of topsoil and other organic materials. Compaction tests are recommended to check the compaction of the new fill.

Foundations

Conventional spread foundations are recommended to support the building provided the subgrade is prepared as discussed in this section as well as the "Site & Subgrade Preparation" and "Fill" sections of this report including compaction. The foundations are anticipated to be supported on the in-situ sand or compacted fill following site preparation.

Fill below the buildings should be compacted to a density of 95.0 percent of the soil's maximum density to its full depth. In-situ sand below the foundations should be compacted to 95.0 percent of the sand's maximum density at footing grade using a vibratory compactor or hoe-pack. Compaction tests should be performed in the foundation subgrade to verify these levels of compaction. Soils not exceeding the minimum density should be recompacted.

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The recommended minimum cover over the bottom of exterior foundations is 42 inches for protection against frost heave. Foundations should not be constructed on frozen soil. During cold weather construction, the foundation subgrade and foundations should be protected from freezing with insulated blankets until backfill is placed over both sides of the foundation. Foundations that are damaged by frost heave should be replaced.

The soil profile consists of primarily sand characterized by an average "N" value between 15 and 50, indicating the site classification for seismic design is "D" based on ASCE-7 Table 20.3-1 and the Michigan Building Code. The soil strata at greater depths are assumed to be similarly compact. The site has a peak ground acceleration of 0.115g with a 2.0 percent probability of exceedance in 50 years. The final seismic parameters including the seismic design category of the structure should be verified by the structural engineer on record.

Foundations may be designed using allowable soil bearing values of 3,000 pounds per square foot for isolated columns and 2,500 pounds per square foot for wall foundations provided the recommendations for subgrade preparation in the previous section are followed including compaction. A minimum width of 16.0 inches is recommended for new foundations. The allowable bearing values may be increased by 25.0 percent when considering transient loads such as earthquakes and wind.

Settlement

The maximum settlement of the building is anticipated to be less than 0.4 inches provided the recommendations in this report are observed including compaction. Differential settlement will be approximately one half of the maximum value. These levels of settlement are within the recommended acceptable limits of 0.6 inches of total settlement and 0.4 inches of differential settlement.

Floors

A slab on grade is recommended for the floor. A modulus of subgrade reaction of 150 pounds per cubic inch is recommended for the design of slabs on grade.

A base of 6.0 inches of clean sand is recommended under the floors. The sand should meet MDOT Class II specifications. Fill under floors should be compacted as specified in the "Fill" section of this report. The in-situ soil is suitable for use as a base.

Lateral Earth Pressure

Foundation walls with different soil levels on either side should be designed as retaining walls. Sand should be used as backfill behind retaining and foundation walls. The sand should meet MDOT Class II specifications. The walls should be designed using a soil density of 120 pounds per cubic foot, a coefficient of active earth pressure of 0.33 for level sand backfill and a coefficient of at-rest earth pressure of 0.45 for level sand backfill. The effects of any surcharge or sloping backfill should also be included in the design. A coefficient of passive earth pressure of 3.0 may be used for the in-situ sand.

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Excavations

The in-situ soils are OSHA "C" soils. Excavations that will be entered by personnel should be based on OSHA requirements for type "C" soil. Based on OSHA requirements, a maximum allowable side slope of 34 degrees (1.5H:1V) is recommended for excavations 4.0 to 20.0 feet deep. Excavations less than 4.0 feet deep may have vertical side slopes. Excavations adjacent to property lines, or structures may require temporary shoring.

Fill

Fill, including the aggregate layers under pavement, should be compacted to a density of 95.0 percent of its maximum density to its full depth. The maximum density should be determined in accordance with the ASTM D 1557 standard. A maximum thickness per layer of 6.0 inches is recommended for compaction. The lift thickness may be increased to 12.0 inches if a vibratory roller or hoe-pack is used for compaction. Compaction tests are recommended to confirm that the fill is compacted to the required density.

Excavated sand may be used as fill. Soil brought to the site for structural fill should be sand meeting MDOT Class II requirements or ASTM requirements for an SP or SW which are the designations for clean sand. Excavated sand may be used as structural fill. If the amount of fill required to establish the final grade exceeds the amount of material available on site, additional material will have to be imported.

Fill should not be placed over frozen ground, snow, or ice. Soil which contains frozen material should not be used as fill. During winter construction, removal of frozen ground may be necessary prior to placing fill.

Groundwater Management

Groundwater controls and dewatering will probably be necessary for the construction of the foundations and utilities. Groundwater is present at depths as shallow as 2.0 feet below existing grade. Excavations will encounter groundwater. If excavations encounter groundwater, the excavation bottom may be stabilized by placing a 6.0 to 8.0-inch layer of porous stone over the bottom of the excavation. The stone will stabilize the bottom of the excavation. Temporary sumps should be used to dewater excavations extending below the water table as necessary.

A vapor barrier is recommended under the floor in areas that will be enclosed and heated. The vapor barrier should consist of a 10-mil polyethylene sheet and should be located immediately below the floor slab. The vapor barrier may be omitted in portions of the building that will not be heated.

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Infiltration testing was conducted at depths ranging from 2.9 to 3.5 feet in the proposed location of the stormwater detention pond. The soil profile in this area consists of a layer of sand which extends to a depth of at least 15.0 feet. The infiltration rate of the in-situ sand in this area ranges from 3.0 to 18.0 inches per hour, which should be sufficient for internal drainage of the site. However, due to the shallow water table, stormwater will only infiltrate to the elevation of the water table.

While the in-situ sand meets the exception for drains in Section 1805.4 of the Michigan Building Code, drains around the exterior foundations are recommended due to the proximity of the water table. Additional drains below the floor may be required. The drains should consist of a 4.0-inch diameter slotted plastic pipe wrapped in filter fabric. Pea gravel should be used for backfill within a 6.0-inch circumference of the drain. The drains should be connected to a storm sewer or have an outlet a minimum of 30.0 inches below the lowest floor elevation.

Drains below the pavement are not required but may extend the pavement lifespan. The recommended spacing under the pavement is 50.0 feet. The drain invert should be a minimum depth of 30.0 inches below the pavement surface. Pavement areas should be properly drained to minimize the effects of frost heaving and the loss of subgrade due to water infiltration. The parking areas should be sloped towards low points with catch basins or curb inlets.

Hot Mix Asphalt (HMA) Pavement

The recommended preliminary HMA pavement sections listed in Table 2 were developed based on the discussions and assumptions included in this report and the design procedures outlined in the "AASHTO Guide for Design of Pavement Structures." The subgrade should be prepared as described in the "Site & Subgrade Preparation" and "Fill" sections of this report. The recommended pavement section materials listed in Table 2 refer to and should comply with the standard material designations included in applicable MDOT specifications and guidelines including the 2020 MDOT "Standard Specifications for Construction." The final pavement design should be based on site specific traffic loading.

The following recommendations assume that maintenance repairs such as joint sealing, patching, and overlays are regularly performed throughout the lifespan of the pavement and that proper drainage has been established throughout the site. Proper drainage includes the installation of stormwater controls, underdrains, and establishing positive drainage in the subgrade and pavement layers.

Table 2: Recommended Pavement Sections

Pavement Cross Section Materials	Standard Duty		Heavy Duty	
	Material	Thickness (in)	Material	Thickness (in)
HMA Wearing Course	4EML	2.0	4EML	2.5
HMA Base Course	4EML	2.0	4EML	2.5
Aggregate Base	21AA Crushed Limestone	8.0	21AA Crushed Limestone	10.0
Sand Subbase	Class II	12.0	Class II	12.0

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The recommended asphaltic binder is PG 64-28 for "E" mixes. Tier 1 recycled asphalt (RAP) specifications may be used in combination with the PG 64-28 binder for the wearing course. Tier 2 RAP may be used for the base course. A softer binder may be necessary to achieve desired performance characteristics when utilizing Tier 2 RAP contents, per the MDOT Special Provision for Recycled Asphalt Pavement. The compacted asphalt should be between 94.0 and 97.0 percent of the Theoretical Maximum Density, as determined via the Superpave "Rice" Method. The target void content should be 3.5 percent for both the base and wearing course. A tack or "bond coat" of SS-1h emulsion shall be applied between the base and wearing course layers at a rate of 0.1 gallons per square yard.

The paving contractor should submit the proposed mix design to the owner for review and approval prior to placement. The HMA pavement should be placed in at least two lifts. The pavement section should be constructed in accordance with MDOT guidelines and specifications as well as applicable state and local requirements.

Paved areas that display poor workmanship, which may include segregation, "cold screed scrapes", wearing courses not flush with curbs or rims, roller marks, shoving, smearing, or tearing of the mat, flushing, or excessive cold joints should be repaired or replaced by the contractor immediately.

Pavement subgrade, subbase, and aggregate base should be proof rolled using a fully-loaded tri-axle dump truck prior to aggregate base and pavement placement. The in-situ soil is suitable for use as a subbase material.

The pavement section should be constructed in accordance with MDOT guidelines and specifications as well as applicable state and local requirements. Support conditions and compaction should be assessed during construction in accordance with the "Quality Control and Testing" section of this report. This assessment should occur prior to the installation of individual pavement layers.

Portland Cement Concrete (PCC) Pavement

The subgrade should be prepared in accordance with the "Site & Subgrade Preparation" and "Fill" sections of this report.

A base of 12.0 inches of clean sand or aggregate that meets MDOT Class II or 21AA specifications respectively is recommended under the slab on grade concrete pavement. The in-situ soil is suitable for use as a base. The minimum base thickness may be reduced to 6.0 inches for sidewalk slabs. A minimum slab on grade concrete pavement thickness of 4.0 to 6.0 inches is recommended for standard and heavy-duty concrete pavement. In the areas of dumpster pads and loading docks, the pavement thickness should be increased to 8.0 inches. The pavement and reinforcement, if required, should be designed based on site-specific loading conditions. The recommended minimum concrete pavement thickness is 4.0 inches for sidewalks surrounded by greenbelt and 5.0 inches for revealed-face slabs.

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A modulus of subgrade reaction of 150 pounds per cubic inch is recommended for the design of concrete pavement provided the recommendations in this report are observed. The paving contractor should submit the proposed mix design to the owner for review and approval prior to concrete placement.

Quality Control Testing

Compaction tests as per ASTM D 6938 are recommended to confirm that fill in the construction areas is compacted to the specified density. While fill is being placed, compaction tests should be performed at the rate of one test per 400 cubic yards of fill and throughout the depth of the fill with a minimum of five tests at each 1.0-foot elevation interval. Full-time inspection is recommended while sand and fill are compacted in the building area. Compaction tests should be performed under foundations at the rate of one test per 50 linear feet for wall foundations and one test per column foundation. The recommended testing frequency in the floor and pavement subgrade is one test per 2500 square feet. Tests should also be performed in the backfill over foundations and utilities. The maximum density should be determined in accordance with ASTM D 1557 or ASTM D 4253 procedures.

Unless otherwise specified in the design documents or project plans, the following testing procedures and frequencies should be observed for HMA and slab on grade concrete. Both asphalt and concrete quality testing should adhere to the 2020 MDOT Standards for Construction.

Asphalt temperatures during placement should be at least 275 degrees Fahrenheit; material that arrives at temperatures below 250 degrees Fahrenheit shall be rejected. Asphalt density testing should be performed with a nuclear density gauge at a minimum rate of one test per 500 square feet of pavement. At least five total verification cores in each course are recommended to assess relative compaction, calibrate the nuclear density gauge, and evaluate thickness. A minimum of two loose mix samples per mix per day should be taken at the plant and delivered to the quality-assurance firm's laboratory for vacuum extraction-gradations. The asphalt contractor should provide a minimum of two (2) theoretical maximum density verifications per day.

Concrete testing should be performed by a certified concrete technician (MCA Michigan Level I or II). One set of concrete tests should be performed for every fifty (50) cubic yards of concrete placed. Concrete should be sampled in accordance with ASTM C172. A set of concrete tests should consist of a concrete slump, air content, and concrete temperature. Slump testing should be performed in accordance with ASTM C143. Air content testing should be performed in accordance with ASTM C231. Concrete temperature testing should be performed in accordance with ASTM C1064. Air temperature should also be recorded at the time of testing. A set of test cylinders should be molded at the time of testing. A minimum of two (2) test cylinders should be molded per cylinder set for 28-day compressive strength testing. Test cylinders should be prepared in accordance with ASTM C31 and tested in accordance with ASTM C39.

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A smooth 0.5-to-0.75-inch diameter rod should be used in conjunction with compaction tests to probe for loose areas under foundations, in fill, and under floors. A dynamic cone should not be substituted for compaction tests for evaluating fill. Testing should be performed by technicians supervised by a registered geotechnical engineer.

General Conditions & Reliance

The report was prepared in accordance with generally accepted practices of the geotechnical engineering profession. The scope of work consisted of performing fifteen (15) test borings and three (3) hand augers and providing soil related recommendations for the design and construction of the proposed building and pavement. The scope of work did not include an environmental study or wetland determination.

The report and the associated test borings were prepared specifically for the previously described project and site. Soils & Structures should be consulted if a significant change in the scope of the project is made.

The test borings represent point information and may not have encountered all of the soil types and materials present on this site. This report does not constitute a guarantee of the soil or groundwater conditions or that the test borings are an exact representation of the soil or groundwater conditions at all points on this site.

The descriptions and recommendations contained in this report are based on an interpretation of the test borings and laboratory tests. The test borings should not be used independently of the report. If soil conditions are encountered which are significantly different from the test borings, Soils & Structures should be consulted for additional recommendations.

The report and test borings may be relied upon by CBE, LLC, a Michigan limited liability company, Tractor Supply Company, a Delaware corporation, and Tractor Supply Co. of Michigan, LLC, a Michigan limited liability company for the design, construction, permitting, and financing associated with the construction of the Tractor Supply - Belleville project in Van Buren Charter Township, Wayne County, Michigan. The use of the report and test borings by third parties not associated with this project or for other sites has not been agreed upon by Soils & Structures. Soils & Structures does not recommend or consent to third party use or reliance of the report or test borings unless allowed to review the proposed use of these materials. Unless obtained in writing, consent to third-party use should not be assumed. Third parties using the report or test boring logs do so at their own risk and are offered no guarantee or promise of indemnity.

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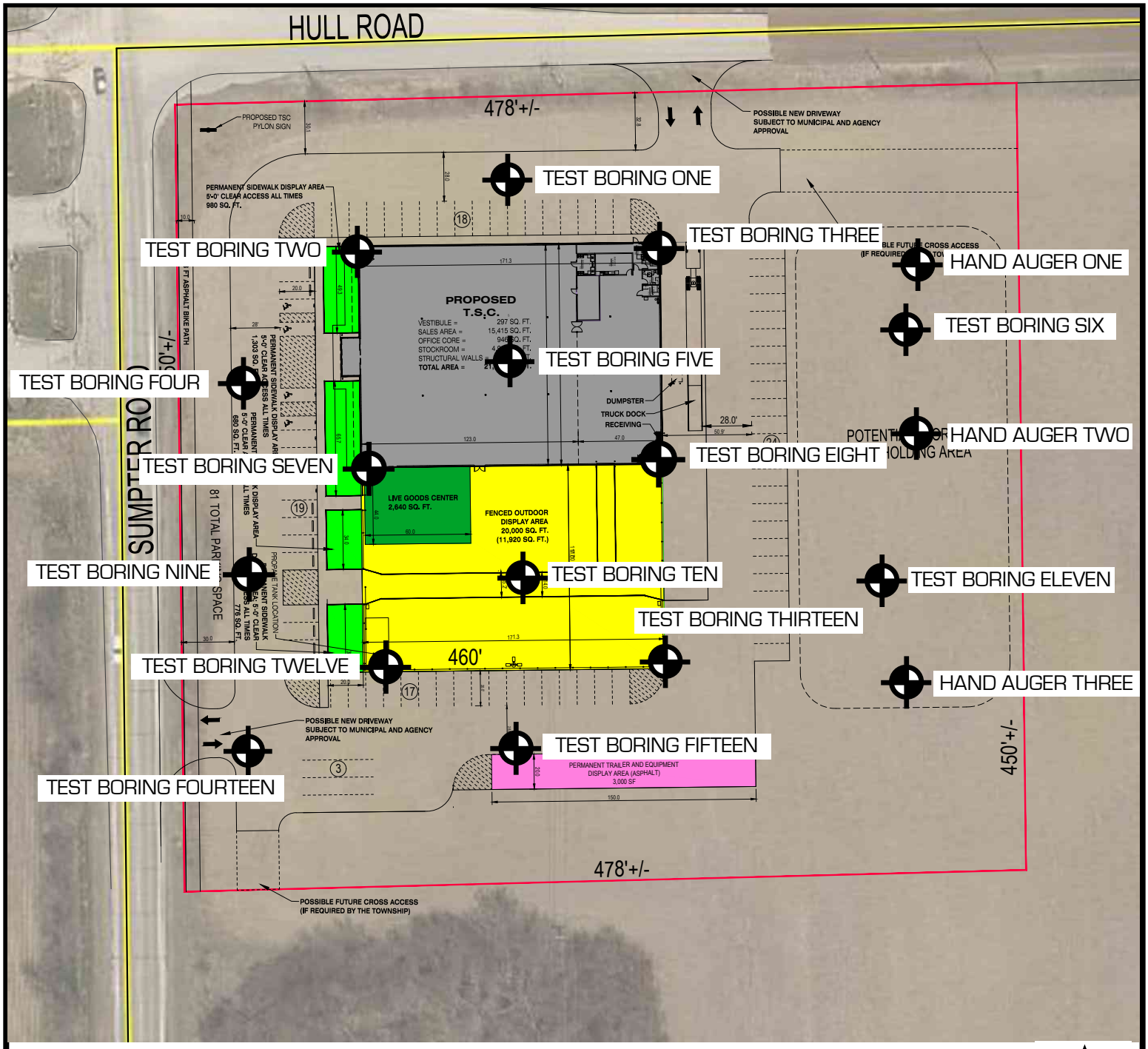
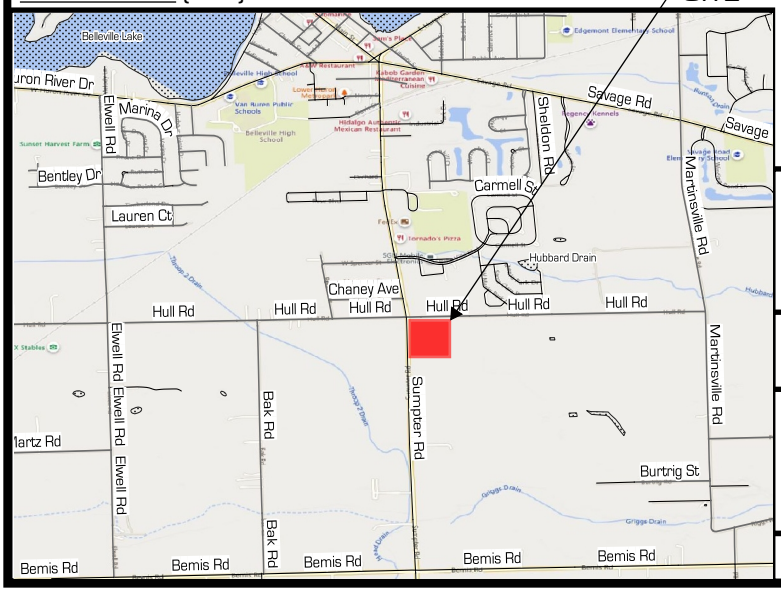
Appendix

Test Boring Location Plan
General Soil Profile
Test Boring Logs
Laboratory Tests
General Soil Information



VICINITY MAP (NTS)



TEST BORING LOCATION PLAN

NTS

Note: The background of the test boring plan is a portion of an aerial photograph from Google Earth.

Tractor Supply - Belleville

Van Buren Township, Wayne County, Michigan

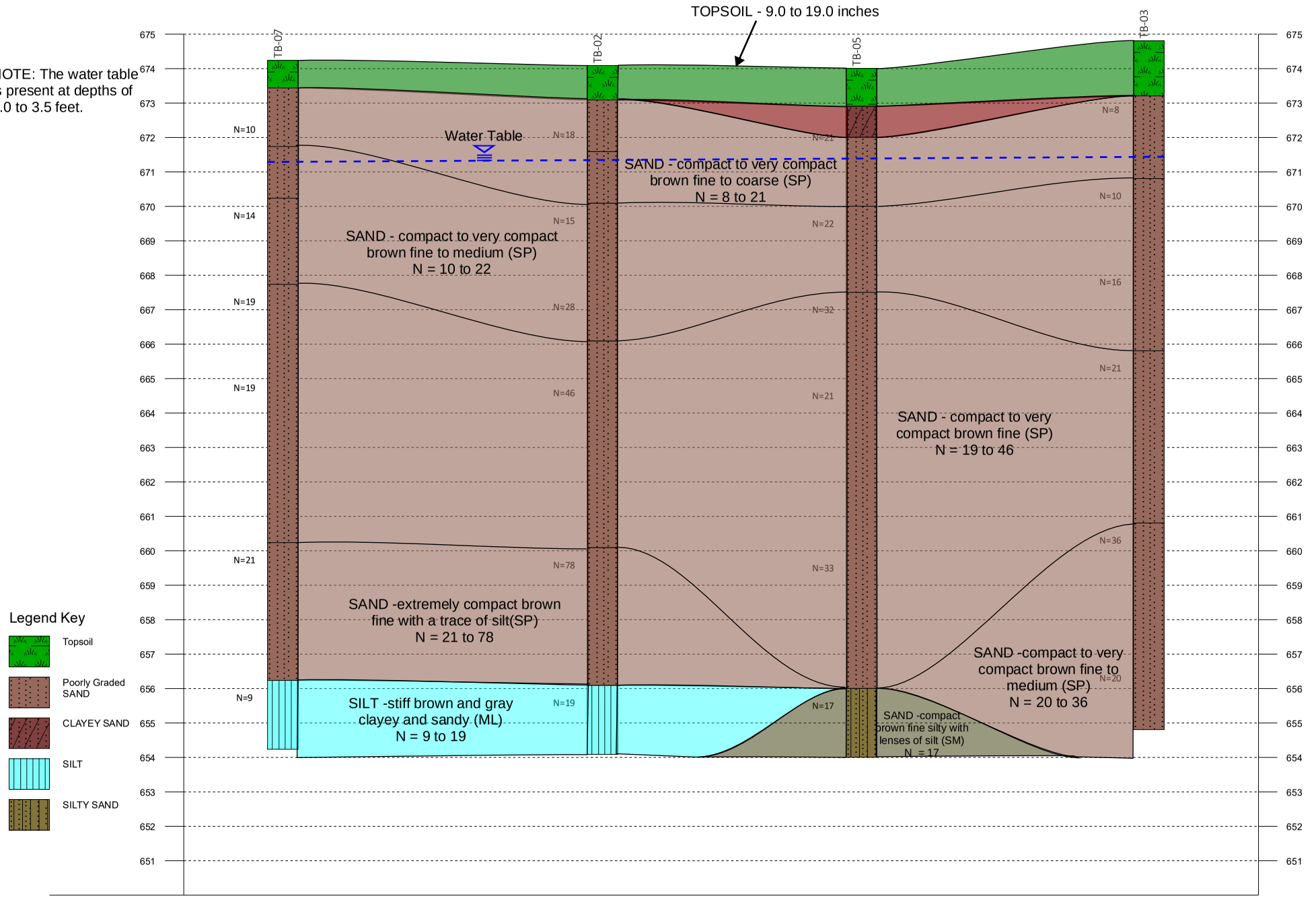
Soils & Structures, Inc.
6480 Grand Haven Road
Muskegon, Michigan 49441

JOB NO.: 2023.2100 DATE: 02-05-2024

Project Id:	2023.2100	Title:	Section line 1
Project Title:	Tractor Supply - Belleville	Vertical Scale:	1:45
Location:	Belleville, Michigan	Horizontal Scale:	1:587
Client:	CBE, LLC	Engineer:	Vincent Oderah, P.E.

GENERAL SOIL PROFILE

NOTE: The water table is present at depths of 2.0 to 3.5 feet.



SOILS & STRUCTURES

Hand Auger ID: HA - 01

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: E.Burt
Reviewed By: J.Veeneman
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 4.50
Date Started: Nov 21 2023
Completed: Nov 21 2023
Northing:
Easting:
Elevation:
Drilling Method: Hand Auger
Frost Depth
Notes: TB 1 - N end of proposed retention pond.

Ground Water Levels

End of Drilling — 3.40 ' on Nov 21 2023

Depth	Graphic	Material Description	Moisture Content	Hand Penetrometer	Blow Counts	DCP 5 10 15 20 25 30 35 40 45	USCS
0		TOPSOIL - dark brown sandy (12.0")					
1		SAND - brown fine to coarse					
3		SAND - gray fine with coarse ***Infiltration test run at 3.5 feet below grade - 18 inches per hour.***					

SOILS & STRUCTURES

Hand Auger ID: HA - 02

Sheet 1 of 1

Project Name:	Tractor Supply - Belleville	**Project Number:**	2023.2100
Project Location:	Belleville, Michigan	**Logged By:**	E.Burt
Reviewed By:	J.Veeneman		
Client:	CBE, LLC	**Survey Datum:**	NAD 1983 StatePlane Michigan South
Hole Depth:	5.00		
Date Started:	Nov 21 2023	**Completed:**	Nov 21 2023
Northing:		**Easting:**	
Elevation:			
Drilling Method:	Hand Auger	**Frost Depth**	
Notes:	TB 2 - Middle of proposed retention pond.	**Ground Water Levels**	
		End of Drilling	3.40 ' on Nov 21 2023

Depth	Graphic	Material Description	Moisture Content	Hand Penetrometer	Blow Counts	DCP 5 10 15 20 25 30 35 40 45	USCS
0		TOPSOIL - dark brown sandy (12.0")					
1		SAND - brown fine to coarse ***Infiltration test run at 2.8 feet below grade - 3 inches per hour***					
3		SAND - light brown fine to coarse					
4		SAND - brown fine to coarse					
5							

SOILS & STRUCTURES

Hand Auger ID: HA - 03

Sheet 1 of 1

Project Name:	Tractor Supply - Belleville	**Project Number:**	2023.2100
Project Location:	Belleville, Michigan	**Logged By:**	E.Burt
Reviewed By:	J.Veeneman		
Client:	CBE, LLC	**Survey Datum:**	NAD 1983 StatePlane Michigan South
Hole Depth:	6.00		
Date Started:	Nov 21 2023	**Completed:**	Nov 21 2023
Northing:		**Easting:**	
Elevation:			
Drilling Method:	Hand Auger	**Frost Depth**	
Notes:	TB 3 - S end of proposed retention pond.	**Ground Water Levels**	
		End of Drilling	3.40 ' on Nov 21 2023

Depth	Graphic	Material Description	Moisture Content	Hand Penetrometer	Blow Counts	DCP 5 10 15 20 25 30 35 40 45	USCS
0		TOPSOIL - dark brown sandy (18.0")					
1							
2		SAND - brown fine to medium					
3		SAND - light brown fine to medium ***Infiltration test run at 2.9 feet below grade - 9 inches per hour.*** SAND - gray fine to medium					
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

SOILS & STRUCTURES

Borehole ID: TB-01

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 17 2024
Completed: Jan 17 2024
Northing: 252661.4
Easting: 13362928.7
Elevation: 674.67
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 17 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1	TOPSOIL - dark brown sandy (18.0")												
2	SAND - slightly compact brown fine to medium with a trace of clay												
3			SPT-A	80	2-3-4	7			19.6				SP
4	SAND - slightly compact to compact brown fine to medium												
5			SPT-B	87	4-6-6	12			17.2				SP
6													
7			SPT-C	87	3-4-7	11							SP
8													
9	SAND - very compact brown fine to medium		SPT-D	100	6-11-20	31			19.8				SP
10	SAND - very compact brown fine												
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-02

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 20.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252617.9
Easting: 13362849.9
Elevation: 674.09
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy (12.0")												
1	SAND - compact brown fine to medium with a trace of clay and gravel												
2													
3	SAND - compact brown fine to coarse		SPT-A	100	5-9-9	18			14.7				SP
4													
5	SAND - compact to very compact brown fine to medium		SPT-B	80	4-7-8	15							SP
6													
7			SPT-C	100	4-10-18	28			20.4				SP
8	SAND - very compact brown fine												
9													
10			SPT-D	100	8-18-28	46			18.3				SP
11													
12													
13													
14	SAND - extremely compact brown fine with a trace of silt												
15			SPT-E	67	19-28-50	78							SP
16													
17													
18	SILT - stiff brown sandy												
19			SPT-F	80	9-11-8	19			20.1				ML
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-03

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 20.00
Date Started: Jan 17 2024
Completed: Jan 17 2024
Northing: 252624.9
Easting: 13363011.6
Elevation: 674.81
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 17 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1	TOPSOIL - dark brown sandy (19.0")												
2	SAND - compact brown fine to coarse												
3		SS	SPT-A	73	2-4-4	8			17.0				SP
4	SAND - compact brown fine to medium												
5		SS	SPT-B	80	3-4-6	10			24.2				SP
6													
7		SS	SPT-C	100	6-8-8	16							SP
8													
9	SAND - very compact brown fine												
10		SS	SPT-D	87	5-9-12	21							SP
11													
12													
13													
14	SAND - compact to very compact brown fine to medium												
15		SS	SPT-E	100	11-16-20	36			20.2				SP
16													
17													
18													
19		SS	SPT-F	100	9-10-10	20							SP
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-04

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252556.9
Easting: 13362789.4
Elevation: 674.48
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 2.00' on Jan 18 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0		TOPSOIL - dark brown sandy (13.0")												
2		SAND - slightly compact brown fine to coarse												
3		SAND - slightly compact to compact brown fine to medium		SPT-A	80	3-3-4	7			19.6				SP
5				SPT-B	87	5-7-8	15							SP
7		SAND - very compact brown fine with a trace of silt		SPT-C	87	9-14-17	31							SP
9				SPT-D	87	5-9-13	22			20.4				SP

SOILS & STRUCTURES

Borehole ID: TB-05

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 20.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252558.8
Easting: 13362929.4
Elevation: 674.00
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy (13.0")												
2	SAND - brown fine to medium clayey with a trace of gravel												
3	SAND - very compact brown fine to coarse		SPT-A	80	8-10-11	21			13.4				SP
5	SAND - very compact brown fine to medium		SPT-B	100	7-9-13	22							SP
7	SAND - very compact brown fine		SPT-C	100	9-14-18	32			23.9				SP
10			SPT-D	100	4-8-13	21							SP
15			SPT-E	100	11-15-18	33			28.9				SP
18	SAND - compact brown fine silty with lenses of silt		SPT-F	80	8-8-9	17			20.4				SM

SOILS & STRUCTURES

Borehole ID: TB-06

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 15.00
Date Started: Jan 17 2024
Completed: Jan 17 2024
Northing: 252574.8
Easting: 13363125.6
Elevation: 674.90
Drilling Method: 2-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 17 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1		TOPSOIL - dark brown sandy (13.0")												
2		SAND - very compact brown fine to coarse with clay silt and gravel												
3				SPT-A	47	8-11-14	25			11.7				SW-SC
4		SAND - compact brown fine to medium with a trace of clay and silt												
5				SPT-B	67	2-5-10	15							SP
6		***Infiltration at 5.0 feet = 0.1 in/hr***												
7		SAND - very compact brown fine												
8				SPT-C	100	6-12-16	28							SP
9		SAND - compact brown fine silty												
10				SPT-D	67	5-8-11	19			23.5				SM
11														
12														
13														
14		SAND - very compact brown fine with a trace of silt		SPT-E	47	8-11-14	25							SM
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

SOILS & STRUCTURES

Borehole ID: TB-07

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 20.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252495.0
Easting: 13362854.8
Elevation: 674.24
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy (10.0")												
1	SAND - compact brown fine to medium with a trace of clay and gravel												
2													
3	SAND - compact brown fine to coarse		SPT-A	73	1-3-7	10							SP
4													
5	SAND - compact brown fine to medium		SPT-B	80	5-6-8	14			22.8				SP
6													
7	SAND - compact brown fine		SPT-C	67	6-8-11	19			23.9				SP
8													
9													
10			SPT-D	87	4-8-11	19							SP
11													
12													
13													
14	SAND - very compact brown fine with a trace of silt												
15			SPT-E	80	5-9-12	21			26.7				SP
16													
17													
18	SILT - stiff gray clayey with a trace of sand												
19			SPT-F	80	3-4-5	9			26.7				ML
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-08

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 20.00
Date Started: Jan 17 2024
Completed: Jan 17 2024
Northing: 252501.1
Easting: 13363012.4
Elevation: 674.43
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 17 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1	TOPSOIL - dark brown sandy (19.0")												
2	SAND - slightly compact brown fine to medium with a trace of silt												
3			SPT-A	80	3-2-4	6			19.2				SP
4	SAND - compact brown fine												
5			SPT-B	80	4-5-5	10							SP
6													
7			SPT-C	87	7-8-10	18							SP
8													
9													
10			SPT-D	80	3-7-8	15			26.9				SP
11													
12													
13													
14	SAND - very compact brown fine with a trace of silt												
15			SPT-E	80	8-14-14	28			25.8				SP
16													
17													
18	CLAY - stiff gray silty												
19			SPT-F	47	4-4-7	11			17.8				CL
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-09

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252440.1
Easting: 13362792.3
Elevation: 674.19
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 2.00' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy (9.0")												
1	SAND - brown fine to medium with a trace of clay												
2													
3	SAND - compact brown fine to coarse		SPT-A	53	2-2-6	8			18.8				SP
4													
5			SPT-B	80	5-8-9	17							SP
6													
7	SAND - compact brown fine with a trace of silt		SPT-C	80	7-8-9	17							SP
8													
9	SAND - very compact brown fine		SPT-D	87	8-11-15	26			24.6				SP
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-10

Sheet 1 of 1

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252438.2
Easting: 13362930.3
Elevation: 674.60
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0		TOPSOIL - dark brown sandy (11.0")												
1		SAND - compact brown fine to medium with a trace of clay and gravel												
2														
3		SAND - compact brown fine to medium		SPT-A	80	2-3-5	8							SP
4		SAND - compact brown fine												
5				SPT-B	87	2-5-7	12			25.3				SP
6														
7														
8				SPT-C	73	4-8-9	17			26.7				SP
9		SAND - very compact brown fine with a trace of silt		SPT-D	87	7-9-14	23							SP
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

SOILS & STRUCTURES

Borehole ID: TB-11

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher **Reviewed By:** K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South **Hole Depth:** 15.00
Date Started: Jan 17 2024 **Completed:** Jan 17 2024
Northing: 252416.4 **Easting:** 13363129.5 **Elevation:** 674.37
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.50' on Jan 17 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1		TOPSOIL - dark brown sandy (19.0")												
2		SAND - compact brown fine to medium												
3				SPT-A	67	3-5-8	13			15.4				SP
4		SAND - compact brown fine with a trace of clay and silt												
5				SPT-B	80	2-4-7	11			23.6				SP
6		***Infiltration at 5.0 feet = 3.3 in/hr***												
7		SAND - compact brown fine												
8				SPT-C	100	6-8-10	18							SP
9														
10				SPT-D	100	2-3-7	10			24.0				SP
11														
12														
13														
14				SPT-E	100	2-6-11	17							SP
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

SOILS & STRUCTURES

Borehole ID: TB-12

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252384.0
Easting: 13362859.5
Elevation: 673.94
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0		TOPSOIL - dark brown sandy (11.0")												
1		SAND - brown fine to medium with a trace of clay and gravel												
2														
3		SAND - slightly compact to compact brown fine to medium		SPT-A	73	1-2-5	7							SP
4														
5				SPT-B	87	6-7-8	15			17.6				SP
6														
7		SAND - very compact brown fine												
8				SPT-C	80	8-10-14	24							SP
9				SPT-D	87	5-9-13	22			20.8				SP
10														
11														
12														
13														
14														
15														
16														
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28														
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30														

SOILS & STRUCTURES

Borehole ID: TB-13

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 17 2024
Completed: Jan 17 2024
Northing: 252384.3
Easting: 13363014.7
Elevation: 674.01
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 17 2024

Depth	Graphic	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
1		TOPSOIL - dark brown sandy (18.0")												
2		SAND - slightly compact to compact brown fine to medium												
3				SPT-A	87	2-3-3	6			23.5				SP
4														
5				SPT-B	100	3-6-9	15			16.0				SP
6														
7		SAND - compact brown fine												
8				SPT-C	87	5-8-9	17							SP
9				SPT-D	73	1-5-7	12			27.7				SP
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														

SOILS & STRUCTURES

Borehole ID: TB-14

Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252346.0
Easting: 13362793.6
Elevation: 674.28
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 2.50' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy (10.0")												
1	SAND - compact brown fine to medium with a trace of clay and gravel												
2													
3			SPT-A	87	1-3-6	9			21.0				SP
4	SAND - compact brown fine												
5	SAND - compact brown fine to coarse		SPT-B	87	7-7-8	15							SP
6													
7	SAND - compact to very compact brown fine to medium												
8			SPT-C	80	6-8-10	18			19.3				SP
9			SPT-D	100	5-8-15	23							SP
10	SAND - very compact brown fine												
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													

SOILS & STRUCTURES

Borehole ID: TB-15

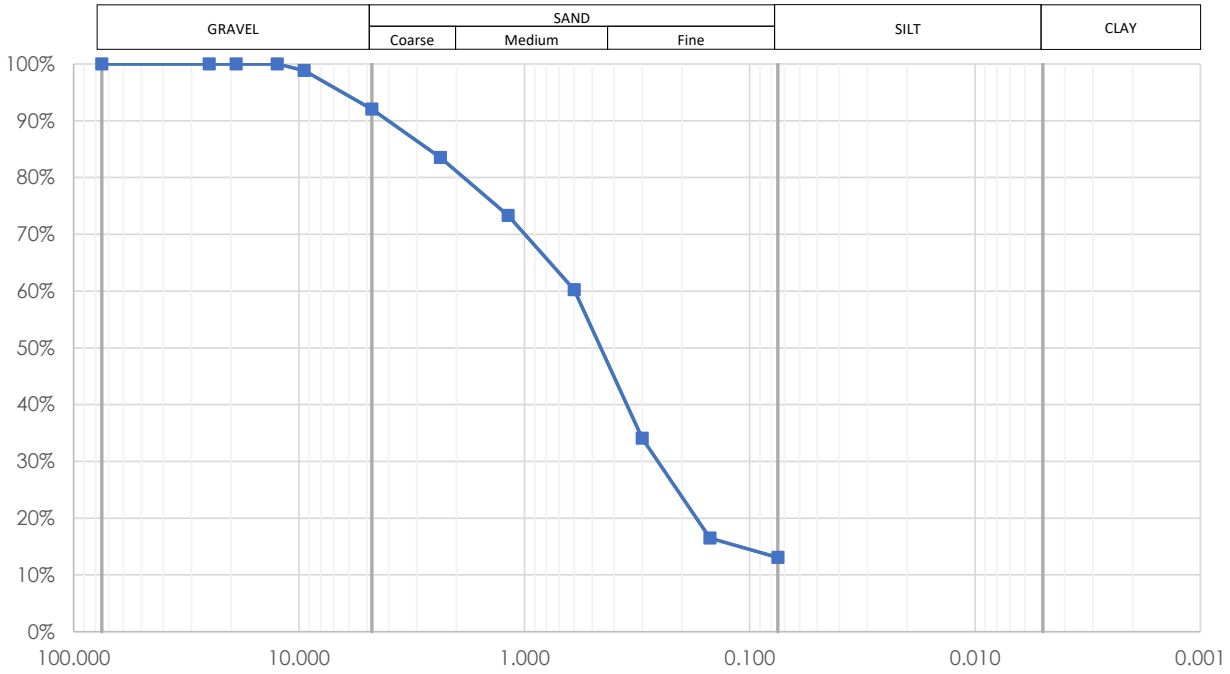
Project Name: Tractor Supply - Belleville
Project Number: 2023.2100
Project Location: Belleville, Michigan
Logged By: J Christopher
Reviewed By: K Martella
Client: CBE, LLC
Survey Datum: NAD 1983 StatePlane Michigan South
Hole Depth: 10.00
Date Started: Jan 18 2024
Completed: Jan 18 2024
Northing: 252344.3
Easting: 13362931.4
Elevation: 673.94
Drilling Method: 3-1/4" Hollow Stem Auger
Frost Depth
Equipment: Diedrich D-25
Ground Water Levels
Hammer Type: Automatic Hammer
Notes:
End of Drilling 3.00' on Jan 18 2024

Depth	Material Description	Sample Type	Number	Recovery % RQD	Blow Counts	N-Value	Pocket Pen (tsf)	Shear Strength (tsf)	Moisture Content (%)	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	USCS
0	TOPSOIL - dark brown sandy gravelly (10.0")												
1	SAND - compact brown fine to medium with a trace of clay												
2													
3	SAND - compact brown fine to medium		SPT-A	67	1-5-7	12			19.4				SP
4													
5	SAND - compact brown fine		SPT-B	80	6-8-11	19							SP
6													
7													
8			SPT-C	80	7-8-10	18			24.8				SP
9			SPT-D	67	3-5-8	13							SP
10													

SOILS & STRUCTURES

Particle Size Distribution Report

Project Name	Tractor Supply - Belleville				
Project Number	2023.2100				
Client	CBE, LLC				
Date	1/30/2024				
Sample Location	TB-06	Sample ID	A	Depth (ft)	2.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	0.0%	8.0%	11.6%	35.4%	31.9%	0.0%	0.0%
D85	**D60**	**D50**	**D30**	**D15**	**D10**	**Loss By Wash**	
2.7743	0.5974	0.4826	0.2652	0.1175	0.0574	13.1%	

Particle Size	
Sieve	**% Passing**
3 in.	100%
1 in.	100%
3/4 in.	100%
1/2 in.	100%
3/8 in.	99%
No. 4	92%
No. 8	84%
No. 16	73%
No. 30	60%
No. 50	34%
No. 100	16%
No. 200	13.1%

Hydrometer	
Particle Size (mm)	**% Passing**

Material Description
SAND - fine to coarse with clay silt and gravel (SW-SC)

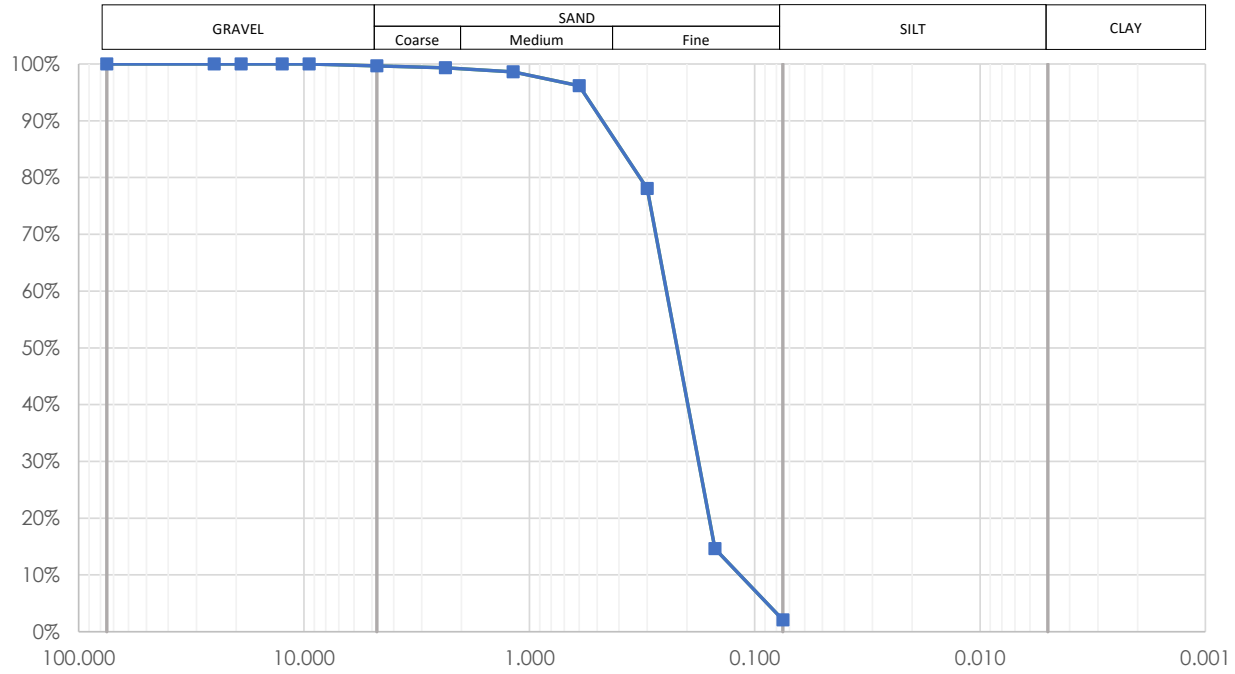
Remarks
Well graded

Technician	Checked	Approved
kmartella	kmartella	kmartella

SOILS & STRUCTURES

Particle Size Distribution Report

Project Name	Tractor Supply - Belleville				
Project Number	2023.2100				
Client	CBE, LLC				
Date	1/30/2024				
Sample Location	TB-03	Sample ID	C	Depth (ft)	7.0



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	0.0%	0.3%	0.6%	13.5%	83.5%	0.0%	0.0%
D85	**D60**	**D50**	**D30**	**D15**	**D10**	**Loss By Wash**	
0.4151	0.2573	0.2337	0.1863	0.1509	0.1223	2.1%	

Particle Size	
Sieve	**% Passing**
3 in.	100%
1 in.	100%
3/4 in.	100%
1/2 in.	100%
3/8 in.	100%
No. 4	100%
No. 8	99%
No. 16	99%
No. 30	96%
No. 50	78%
No. 100	15%
No. 200	2.1%

Hydrometer	
Particle Size (mm)	**% Passing**

Material Description
SAND - fine to medium (SP)

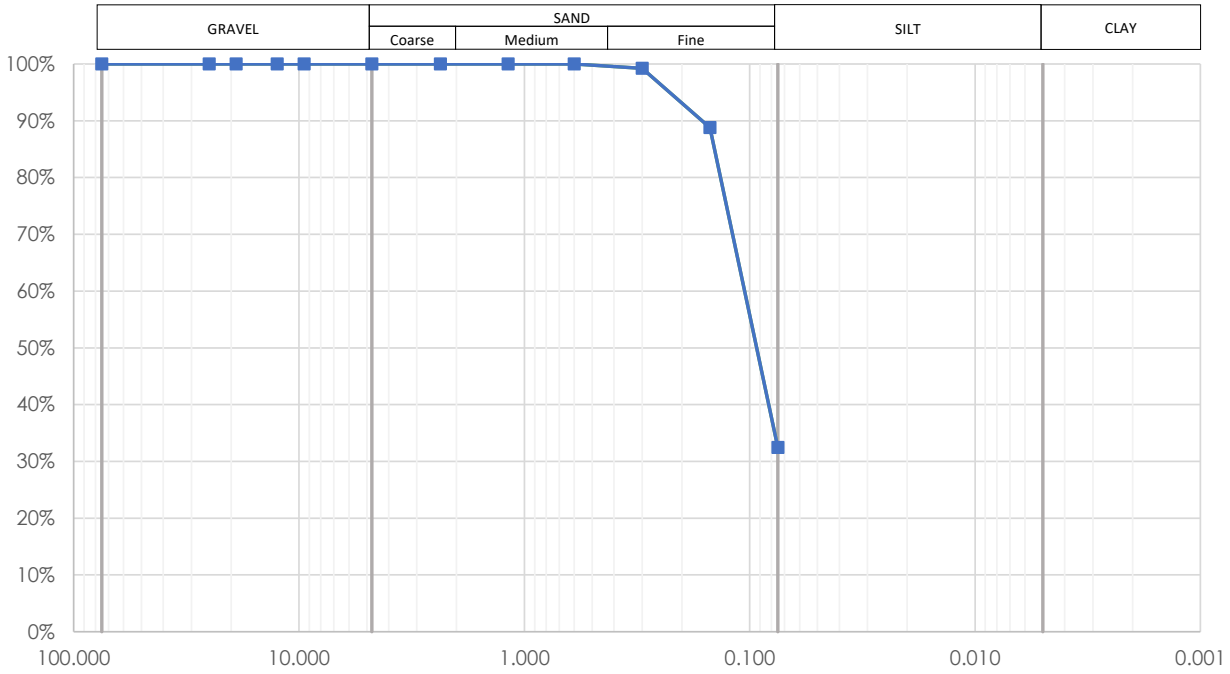
Remarks

Technician	Checked	Approved
kmartella	kmartella	kmartella

SOILS & STRUCTURES

Particle Size Distribution Report

Project Name	Tractor Supply - Belleville				
Project Number	2023.2100				
Client	CBE, LLC				
Date	1/30/2024				
Sample Location	TB-06	Sample ID	D	Depth (ft)	9.5



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	0.0%	0.0%	0.0%	0.5%	67.1%	0.0%	0.0%
D85	**D60**	**D50**	**D30**	**D15**	**D10**	**Loss By Wash**	
0.1449	0.1117	0.0984	0.0694	0.0347	0.0231	32.4%	

Particle Size	
Sieve	**% Passing**
3 in.	100%
1 in.	100%
3/4 in.	100%
1/2 in.	100%
3/8 in.	100%
No. 4	100%
No. 8	100%
No. 16	100%
No. 30	100%
No. 50	99%
No. 100	89%
No. 200	32.4%

Hydrometer	
Particle Size (mm)	**% Passing**

Material Description
SAND - fine silty (SM)

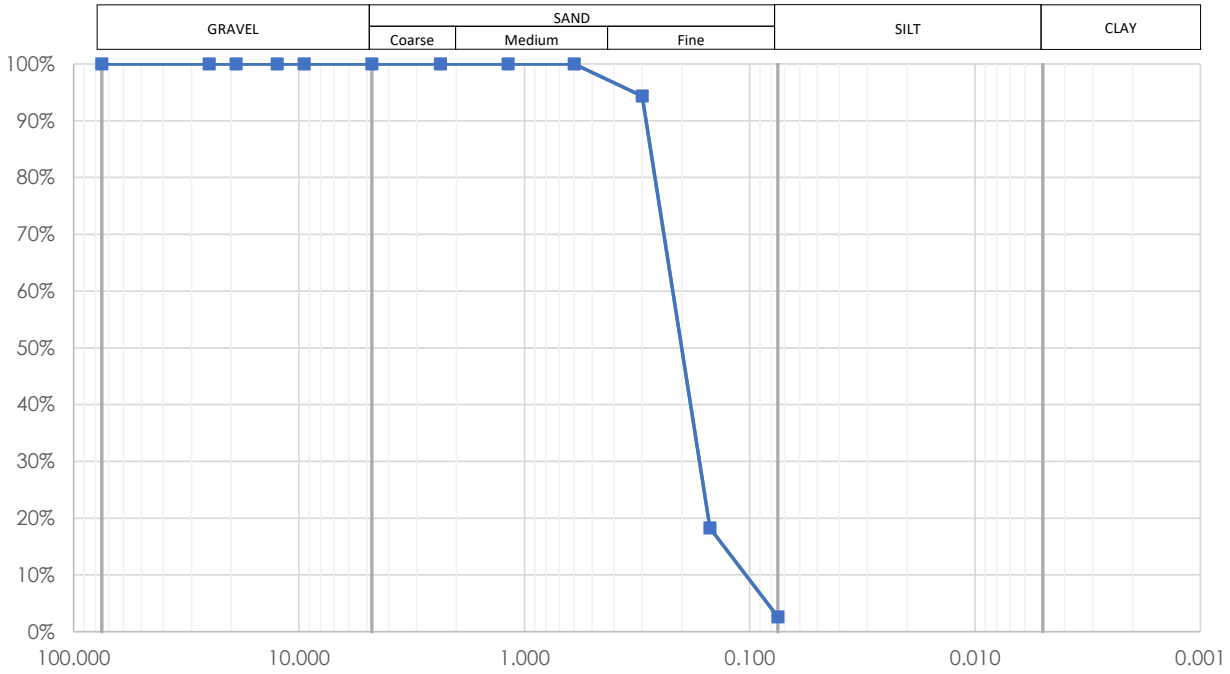
Remarks

Technician	Checked	Approved
kmartella	kmartella	kmartella

SOILS & STRUCTURES

Particle Size Distribution Report

Project Name	Tractor Supply - Belleville				
Project Number	2023.2100				
Client	CBE, LLC				
Date	1/30/2024				
Sample Location	TB-07	Sample ID	D	Depth (ft)	9.5



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	0.0%	0.0%	0.0%	3.3%	94.1%	0.0%	0.0%
D85	**D60**	**D50**	**D30**	**D15**	**D10**	**Loss By Wash**	
0.2816	0.2323	0.2126	0.1731	0.1344	0.1104	2.6%	

Particle Size	
Sieve	**% Passing**
3 in.	100%
1 in.	100%
3/4 in.	100%
1/2 in.	100%
3/8 in.	100%
No. 4	100%
No. 8	100%
No. 16	100%
No. 30	100%
No. 50	94%
No. 100	18%
No. 200	2.6%

Hydrometer	
Particle Size (mm)	**% Passing**

Material Description
SAND - fine (SP)

Remarks

Technician	Checked	Approved
kmartella	kmartella	kmartella

SOILS & STRUCTURES

Determination of Water Content (Moisture) of Soil and Rock by Mass

(ASTM D2216)

Project Name	Tractor Supply - Belleville
Project Number	2023.21
Client	CBE, LLC
Date	1/30/2024

Sample Location		TB-02	TB-03	TB-01	TB-04	TB-05
Sample ID		A	A	A	A	A
Depth	ft	2.0	2.0	2.0	2.0	2.0
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.52	10.42	10.49	10.48	10.54
Mass of Wet Soil and Container	g	81.11	81.41	81.62	81.62	81.45
Accepted Dry mass + container	g	72.08	71.07	69.96	69.96	73.06
Water Content	%	14.7	17.0	19.6	19.6	13.4
Remarks						

Sample Location		TB-08	TB-06	TB-09	TB-11	TB-13
Sample ID		A	A	A	A	A
Depth	ft	2.0	2.0	2.0	2.0	2.0
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.54	300.60	10.57	10.52	10.70
Mass of Wet Soil and Container	g	81.17	496.70	81.15	81.62	81.33
Accepted Dry mass + container	g	69.77	476.20	69.99	72.13	67.89
Water Content	%	19.2	11.7	18.8	15.4	23.5
Remarks						

Sample Location		TB-14	TB-15	TB-13	TB-12	TB-11
Sample ID		A	A	B	B	B
Depth	ft	2.0	2.0	4.5	4.5	4.5
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.62	10.67	10.53	10.52	10.56
Mass of Wet Soil and Container	g	81.74	81.44	81.84	81.38	81.29
Accepted Dry mass + container	g	69.42	69.95	72.03	70.76	67.77
Water Content	%	21.0	19.4	16.0	17.6	23.6
Remarks						

Technician	Checked	Approved
mvanweelden	kmartella	kmartella

SOILS & STRUCTURES

Determination of Water Content (Moisture) of Soil and Rock by Mass

(ASTM D2216)

Project Name	Tractor Supply - Belleville
Project Number	2023.21
Client	CBE, LLC
Date	1/30/2024

Sample Location		TB-10	TB-07	TB-01	TB-03	TB-02
Sample ID		B	B	B	B	C
Depth	ft	4.5	4.5	4.5	4.5	7.0
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.64	10.50	10.69	10.60	10.38
Mass of Wet Soil and Container	g	81.80	81.48	81.80	81.25	81.11
Accepted Dry mass + container	g	67.41	68.31	71.37	67.47	69.11
Water Content	%	25.3	22.8	17.2	24.2	20.4
Remarks						

Sample Location		TB-05	TB-07	TB-10	TB-15	TB-14
Sample ID		C	C	C	C	C
Depth	ft	7.0	7.0	7.0	7.0	7.0
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.55	10.48	10.42	10.52	10.59
Mass of Wet Soil and Container	g	81.39	81.61	81.92	81.12	81.41
Accepted Dry mass + container	g	67.71	67.89	66.85	67.11	69.94
Water Content	%	23.9	23.9	26.7	24.8	19.3
Remarks						

Sample Location		TB-12	TB-13	TB-09	TB-01	TB-04
Sample ID		D	D	D	D	D
Depth	ft	8.5	8.5	8.5	8.5	8.5
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	10.48	10.51	10.58	10.54	19.82
Mass of Wet Soil and Container	g	81.30	81.66	81.60	81.28	94.53
Accepted Dry mass + container	g	69.12	66.23	67.58	69.58	81.86
Water Content	%	20.8	27.7	24.6	19.8	20.4
Remarks						

Technician	Checked	Approved
mvanweelden	kmartella	kmartella

SOILS & STRUCTURES

Determination of Water Content (Moisture) of Soil and Rock by Mass

(ASTM D2216)

Project Name	Tractor Supply - Belleville
Project Number	2023.21
Client	CBE, LLC
Date	1/30/2024

Sample Location		TB-02	TB-06	TB-11	TB-08	TB-08
Sample ID		D	D	D	D	E
Depth	ft	9.5	9.5	9.5	9.5	14.5
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	21.10	302.50	19.57	19.78	21.12
Mass of Wet Soil and Container	g	94.73	622.70	94.93	94.67	94.39
Accepted Dry mass + container	g	83.35	561.70	80.36	78.81	79.35
Water Content	%	18.3	23.5	24.0	26.9	25.8
Remarks						

Sample Location		TB-07	TB-03	TB-05	TB-05	TB-02
Sample ID		E	E	E	F	F
Depth	ft	14.5	14.5	14.5	18.5	18.5
Sample Type		SPT	SPT	SPT	SPT	SPT
Mass of Container	g	19.51	19.70	19.52	21.04	19.67
Mass of Wet Soil and Container	g	94.66	94.60	94.10	94.33	94.65
Accepted Dry mass + container	g	78.84	82.00	77.36	81.92	82.09
Water Content	%	26.7	20.2	28.9	20.4	20.1
Remarks						

Sample Location		TB-07	TB-08			
Sample ID		F	F			
Depth	ft	18.5	18.5			
Sample Type		SPT	SPT			
Mass of Container	g	19.69	19.42			
Mass of Wet Soil and Container	g	94.14	94.29			
Accepted Dry mass + container	g	78.45	83.00			
Water Content	%	26.7	17.8			
Remarks						

Technician	Checked	Approved
mvanweelden	kmartella	kmartella

SOILS & STRUCTURES

General Information for Method of Field Investigation

The soil investigation was performed in accordance with the American Society of Testing and Materials method ASTM D 1586, which is the "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". Samples of compressible clays or organic soils are obtained in accordance with ASTM D 1587, which is the "Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes." Rock may be cored in conjunction with the above methods as specified in ASTM D 2113 which is the "Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation."

Field Testing

Standard Penetration Tests (SPT) in accordance with ASTM D 1586 were generally performed at depths of 2.0', 4.5', 7.0', 9.5' and 5.0' intervals thereafter.

Laboratory Testing

Samples obtained from the Standard Penetration Test, ASTM D 1586 or thin walled tube method, ASTM D 1587, were tested in the laboratory for the moisture content and density and/or particle size, where applicable. When soils sampled possessed sufficient cohesive properties, it was tested for its compressive strength in the unconfined state.

Natural Percent Moisture content (N.P.M.) of the soil is the percentage by weight of water contained in the soil sample compared to the dry weight of the solids of which the soil is composed. The NPM of select samples is determined in accordance with ASTM D 2216.

Natural Density (N.D.) of soil as reported on the appended boring logs is the natural wet density of the soils expressed in pounds per cubic foot.

The unconfined compressive strength of cohesive soils is determined in the laboratory on "undisturbed" select samples in accordance with ASTM D 2166. This test determines the maximum load required at a specified rate to deform the cohesive soil specimen length twenty (20%) percent. The primary purpose of the unconfined compression test is to obtain approximate quantitative values of the compressive strength of soils possessing sufficient coherence to permit testing in the unconfined state. The shear strength of the cohesive soil can be calculated from the results of the unconfined compressive strength test.

Color

When the color of the soils is uniform throughout, the color recorded will be such as brown, gray, and black and may be modified by adjectives such as light and dark. If the soils predominant color is shaded by secondary color, the secondary color precedes the primary color, such as gray-brown, or yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled; such as mottled brown and gray.

Water Observations

Depth of water recorded in the test boring is measured from the ground surface to the water surface. Initial depth indicates water level during boring, completing depth indicates water level immediately after boring, and depth after "X" number of hours indicates water level after allowing the groundwater rise or fall over a period of time. Water observations in pervious soils are considered reliable groundwater levels for accurate groundwater measurements at the time the test borings were performed unless records are made over several days' time. Factors such as weather, soils porosity, etc., will cause the groundwater level to fluctuate for both pervious and impervious soils.

SOILS & STRUCTURES

Sample Type

If not otherwise indicated, the sample is a split-barrel liner sample ASTM D 1586.

"S.T.' – Shelby tube sample, ASTM D 1587
"A" – disturbed augered sample
"C" – rock core sampled ASTM D 2113
N.P.M. – Natural Percent Moisture of in-situ soils sample
N.D. – Natural Density of in-situ soils sample in pcf.
S.S. – Shear Strength of cohesive soils samples as determined by the Unconfined Compression tests in ksf.

Classification Data – Laboratory data to assist in classification of soils and classification of soils characteristics; i.e., plastic limit or liquid limit

Test Boring Logs

Particle Size	**Visual**
Boulders	Larger than 12" (300 mm)
Cobbles	12" to 3" (300 to 75 mm)
Gravel - Coarse	3" to ¾ " (75 to 19 mm)
Gravel – Fine	19.0 to 4.75 mm
Sand- Coarse	4.75 to 2.0 mm
Sand - Medium	2.0 to 0.425 mm
Sand - Fine	0.425 to 0.075 mm
Silt	0.075 to 0.002 mm
Clay	0.002 mm and smaller

Soils Components

Major Component	**Minor Component**
Gravel	Trace (1 - 10%)
Sand	Some (11 - 35%)
Silt/Clay	And (36 - 50%)

Condition of Soil Relative to Compactness

Granular Material	**"N" Value**
Loose	0 - 4
Slightly Compact	5 - 7
Compact	8 - 20
Very Compact	21 - 50
Extremely Compact	51 and above

Cohesive Material	**"N" Value**
Soft	0 - 4
Firm	5 - 7
Stiff	8 - 20
Very Stiff	21 - 50
Extremely Stiff	51 and above

"N" values in clay soils are not to be used as a measure of shear strength. However, they may be used as a general indication of strength.

SOILS & STRUCTURES

Unified Soil Classification System Chart

Major Divisions			Letter Symbol	Typical Descriptions
Coarse Grained Soils More than 50% of material is larger than No. 200 sieve size	Gravel – Gravelly Soils more than 50% of coarse fraction retained on No. 4 sieve	Clean gravels (little or no fines)	GW	Well-Graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-Graded gravels, gravel-sand mixtures, little or no fines
		Gravel with Fines (appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand and Sandy Soils More than 50% of coarse fraction passing No. 4 sieve	Clean Sand (little or no fines)	SW	Well-Graded sands, gravelly sands, little or no fines
			SP	Poorly-Graded sands, gravelly sands, little or no fines
		Sand with Fines (appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine Grained Soils More than 50% of material is smaller than No. 200 sieve size	Silts and Clays Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays or low plasticity
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays or medium to high plasticity, organic silts
	Highly organic soils		PT	Peat, humus, swamp soils with high organic contents

For Laboratory Classification of Fine Grained Soil
Plasticity Chart