**MANAGEMENT SERVICES DEPARTMENT**
**PURCHASING DIVISION**
241 W. South Street
Kalamazoo, Michigan 49007-4796
Telephone (269) 337-8020
cokpurchasing@kalamazoocity.org

# ADDENDUM #1
**June 25, 2026**

**TO:** **ALL Mandatory Bidders**
**PROJECT:** **Treatment Plant NO 25 Electrical Reliability**
**BID REFERENCE#:** **91359-007.0**
**BID OPENING DATE/TIME:** **July 01, 2026 @ 3:00 p.m. Local Time**
***Electronic Bids Will Not Be Accepted.***

The purpose of this addendum is to clarify and/or modify the Drawings and/or Specifications for this project. All work affected is subject to all applicable terms and conditions of the Bidding and Contract Documents.

1. **QUESTION 1:** 08710 Door Hardware Specifications: 3.07 Door Hardware Schedule has incomplete Hardware Model Numbers. We need complete correct Model Numbers to ensure proper pricing as well as to allow you to be able to accurately compare any competitive pricing.

   **ANSWER 1:** Complete Model Numbers:
   **A.** Continuous Hinge – Pemko FM is incomplete (i.e. CFM83HD) FM100-C
   **B.** Rim Exit Device with Entrance Function – Schlage L Series. Schlage L Series is a Mortise Lockset – Not Rim Exit (i.e. Von Dupring 98.LNL) 98-L-NL-626 is acceptable
   **C.** Electric Strike – Von Duprin 6100 Series is incomplete (i.e. 6111) 6111x630
   **D.** Cylinder – No Manufacturer/Model Number provided. Best cylinders (confirm with Owner)
   **E.** Sweep – Pemko 308 is incomplete (i.e. 308APK) 308 APK is acceptable
   **F.** Threshold – Pemko 651 is incomplete (i.e. 651A) 651A is acceptable
   **G.** Weatherstrip = Pemko 303 is incomplete (i.e. 303APK) 303APK is acceptable
   **H.** Drip Strip – No Manufacturer/Model number provided National Guard Products 16A

2. **QUESTION 2:** Who is supplying PLC or chlorine pacing equipment?

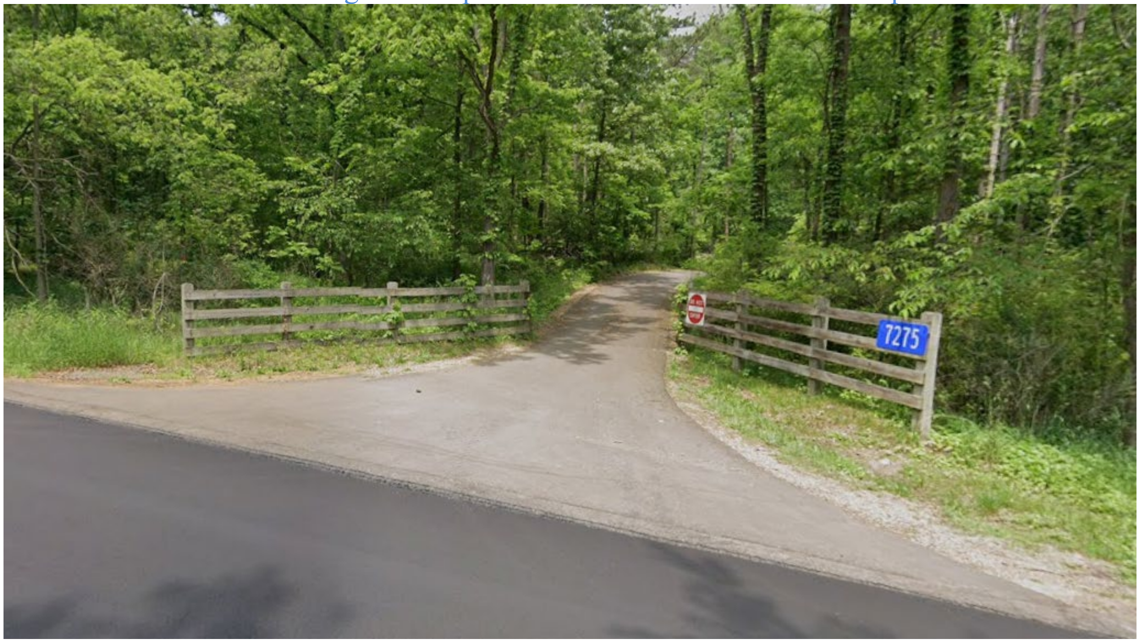
   **ANSWER 2:** All equipment detailed in the bid document shall be provided by the Contractor. In addition to the PLC and chlorine pacing equipment, Contractor is also providing: pumps, VFDs, MCC, and ATS. The allowance is written to indicate that the Contractor is supplying the equipment and costs shall be included in other major items of work.

3. **QUESTION 3:** May the Contractor use the crane inside the station for the project?

   **ANSWER 3:** Yes, a 3-ton crane is available for the Contractor's use and is pictured below.

4. **QUESTION 4:** Please provide details for the wood fence at the entry of the drive.

   **ANSWER 4:** Match Existing and use pressure treated lumber – see below picture.



5. **QUESTION 5:** Details D/S102 and E/S102 conflict with details 2/A301 and 4/A301 for joist install and CMU at parapet. Please clarify

   **ANSWER 5**: Parapet CMU should be 12" block as shown on the structural drawings. Construct parapet CMU and install bar joists per structural drawings.

6. **QUESTION 6:** Specification 01450 Quality Control Services, note 1.02.G calls for the contractor to furnish concrete and geotechnical testing services. Foundations Note 1 of sheet S001 indicates that a report dated August 29, 2025 has already been completed. Please clarify and provide the report.

   **ANSWER 6:** Foundation Note 1 references the Geotechnical Investigation Report dated August 29, 2025, which was used as the basis for design. A copy of the report is attached for reference. The requirements of Specification Section 01450, Paragraph 1.02.G remain unchanged and require the Contractor to furnish concrete and geotechnical testing services during construction.

7. **QUESTION 7:** Please clarify the requirements of specification 01320 Audiovisual Coverage. Notes 3.02 J and K require engineering input prior to performing the Work of the specification.

   **ANSWER 7**: Paragraphs 3.02.J and 3.02.K of Section 01320 require ENGINEER approval only when GPS is proposed in lieu of stationing or when alternative methods are proposed for audiovisual coverage in areas inaccessible to conventional wheeled vehicles. No additional engineering services are required.

8. **QUESTION 8:** Drawing E-307 states MCC is in NEMA 4 area, but MCC is specified as NEMA 12 on E-105, E-106

   **ANSWER 8:** MCC enclosure is NEMA 12. The area is classified as NEMA 4 so watertight hubs are provided on all raceways. We want watertight hubs and watertight construction on the raceways in the electrical room for additional protection.

9. **QUESTION 9:** Neutral bus specified. Fully rated same as horizontal power bus (800A) or half rated? Any neutral loads fed from MCC? If so should neutral connection plates be in top or bottom of sections? Ethernet switches may restrict mounting location.

   **ANSWER 9**: Neutral bus is to be fully rated as shown on the drawings. MCC is to be supplied as a 4-wire system with a fully rated neutral. This is not a smart MCC, there are no Ethernet switches in the MCC besides the one for the power monitor.

10. **QUESTION 10:** E-105 states smaller feeder breakers shall be grouped two per compartment. What current rating is considered a smaller feeder breaker? Which buckets specifically should be grouped together?

    **ANSWER 10:** That is to be coordinated with the MCC manufacturer. Typically, those have been associated with feeder breakers 50A or smaller.

11. **QUESTION 11:** Maintenance switch specified on MCC breaker. Is maintenance mode okay?

    **ANSWER 11:** That is an arc fault reduction switch, and needs to comply with NEC-240-87

12. **QUESTION 12:** Ethernet switch specified are all starter overloads to be E300 for ethernet communication?

    **ANSWER 12:** That is not required, this is not a smart MCC.

13. **QUESTION 13:** Input phase monitors specified on starters. Any specification on the input phase monitor itself? Brand, type, etc?

    **ANSWER 13**: Time Mark C259 series for VFDs and starters or manufacturer equivalent.

14. **QUESTION 14:** Please provide an elevation of the precast concrete wall. Sheet C105 notes the elevation as "from 0.5' to 3'."

    **ANSWER 14:** The retaining wall shown on Sheet C105 is a Contractor-designed system. The wall height varies from approximately 0.5 feet to 3 feet as indicated on the plans. Contractor shall be responsible for the design and preparation of shop drawings in accordance with the Contract Documents.

15. **QUESTION 15:** The HMA cross-section shows 3" of 5EL for base and 3" of 3EL for top. 3EL should be used for a base and 5EL for the top, however, 5EL shouldn't be placed that thick. Can further clarification be provided for this?

    **ANSWER 15:** The HMA pavement section shall consist of 3 inches of 3EL base course and 3 inches of 5EL top course. The 5EL top course shall be placed in two lifts in accordance with MDOT requirements and the manufacturer's recommendations.

Questions related to this addendum may be addressed to Anna Crandall at crandalla@kalamazoocity.org. The Addendum can be viewed and downloaded from the City's website at https://www.kalamazoocity.org/bidopportunities.

**In order for a bid to be responsive, this signed and dated addendum must be returned with your bid.** If you have already submitted your bid, acknowledge receipt and acceptance of this addendum by signing in the place provided and returning it to the undersigned and it shall be incorporated in your bid. Please identify your return envelope with the bid reference number and project description.

Sincerely,

**Michelle Emig**
Purchasing Division Manager

c: Anna Crandall, PE, Asst City Engineer, Water Resources

FIRM: ______________________________ SIGNED: ______________________________

NAME: ______________________________ DATE: ______________________________

# Addendum #1 - Attachment

## *Question #6*

# Treatment Plant No. 25
# Electrical Reliability Project

## Bid Reference #: 91359-007.0

## June 2026

# GEOTECHNICAL EVALUATION REPORT

KALAMAZOO WATER STATION NO. 25 IMPROVEMENTS
COMSTOCK TOWNSHIP, MICHIGAN

SME Project Number: 099702.00
August 29, 2025

SME®

3301 Tech Circle Drive
Kalamazoo, MI 49008-5611

T (269) 323-3555

**www.sme-usa.com**

August 29, 2025

Mr. Victor Cooperwasser, PE
Tetra Tech
1136 Oak Valley Drive, Suite 100
Ann Arbor, Michigan 48108

Via E-mail: victor.cooperwasser@tetratech.com

RE: Geotechnical Evaluation Report
Kalamazoo Water Station No. 25 Improvements
7275 East H Avenue
Comstock Township, Michigan 49048
SME Project No. 099702.00

Dear Mr. Cooperwasser:

We have completed our geotechnical evaluation for the subject project. This report presents the results of our observations and analyses, and our geotechnical engineering recommendations based on the information disclosed by the borings.

We appreciate this opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

**SME**

Aaron J. Reed, PE
Senior Consultant/Project Manager

Enclosure: SME Geotechnical Evaluation Report; Dated August 29, 2025

# TABLE OF CONTENTS

# 1. INTRODUCTION

This report presents the results of the geotechnical evaluation performed by SME for the proposed Kalamazoo Water Station No. 25 improvements located in Comstock Township, Michigan. SME conducted services to complete the evaluation and prepare recommendations in general accordance with the scope outlined in SME Proposal No. P01135.25, dated July 3, 2025. The City of Kalamazoo authorized our services for this evaluation.

SME reviewed A marked-up PDF file of a drawing titled “Station No. 25 Underground Site Layout”, Sheet 7-A, prepared by City Utilities of Kalamazoo. Mark-ups include proposed structure footprints, drives, and boring locations.

## 1.1 SITE CONDITIONS AND PROJECT DESCRIPTION

The project site is located at 7275 East H Avenue in Comstock Township, Michigan. The location of the site is depicted on the Location Map inset on the Boring Location Diagram (Figure No. 1) included in Appendix A.

An approximate 0.25-mile-long asphalt paved drive connects the existing Water Station No. 25 to East H Avenue. The site consists of an existing single-story structure and steel communication pole, south and north of the existing asphalt pavement drive, respectively (see Image 1). An overgrown field exists north of the drive. Based on the measured ground surface elevation at the boring locations, existing site elevations decrease from south to north, with approximate elevations of 844.5 feet near the existing structure and 840.5 feet in the overgrown field. Comstock Creek is located just east of the site.

**IMAGE 1: Existing site conditions looking east.**

The project consists of the design and construction of a 40-feet by 50-feet, single-story, slab-on-grade building that will house electrical equipment. The building will abut a portion of the north wall of the existing building. The location and general layout of the proposed building is depicted on Figure No. 1. The proposed finished floor elevation (FFE) of the building is assumed to match the FFE of the existing structure, around 844 feet. Based on the measured ground surface elevation at the boring locations, we expect site grades to be raised as much as 0.5 feet to 4.0 feet, from south to north to establish the final building subgrade elevation. We anticipate structural loads for the proposed building will include maximum column loads of 40 kips to 80 kips and maximum wall loads of 4 kips per linear foot.

The referenced plan indicates additional improvements (e,g. pavements and possibly additional structures). However, SME was not requested to provide recommendations for the additional improvements.

# 2. EVALUATION PROCEDURES

## 2.1 FIELD EXPLORATION

SME completed three borings (B1 through B3) at the site on July 22, 2025. Borings B1 and B2 extended 25 feet below the existing surface and boring B3 extended 15 feet below the existing surface. The approximate locations of the borings are depicted on Figure No. 1.

SME, Tetra Tech, and the City of Kalamazoo jointly determined the planned number, depths, and locations of the borings. Existing ground surface elevations at the borings were measured by SME using a Leica GPS unit with a vertical accuracy of about 0.1 feet.

The borings were drilled using a truck mounted rotary drill rig and were advanced to the sampling depths using continuous-flight, hollow-stem augers. These borings included soil sampling based upon the Split-Barrel Sampling procedure. Recovered split-barrel samples were sealed in glass jars by the driller.

Groundwater observations were recorded during and immediately after completion of drilling. The boreholes were backfilled with auger cuttings after completion and collection of groundwater observations. Therefore, long-term groundwater levels are not available from the borings.

Soil samples recovered from the field exploration were returned to the SME laboratory for further observation and testing.

## 2.2 LABORATORY TESTING

The laboratory testing program consisted of performing visual soil classification on recovered samples in general accordance with ASTM D-2488. Moisture content and hand penetrometer or Torvane shear strength tests were performed on selected clay samples. The Laboratory Testing Procedures in Appendix B provides descriptions of laboratory tests referenced above. Based on the laboratory testing, we assigned a group symbol to the various soil strata encountered based on the Unified Soil Classification System (USCS).

Upon completion of the laboratory testing, we prepared boring logs that include the soil descriptions, penetration resistances, pertinent field observations, and the results of the laboratory testing. The existing ground surface measured by SME are also provided on the boring logs. The boring logs are included in Appendix A. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A.

The Standard Penetration Test (SPT) resistances (N-values) plotted on the boring logs represent a modified N-value based on the correlation between the recorded SPT value and the measured hammer efficiency of the testing equipment (also shown on the boring log). Specifically, the plotted N-values have been normalized to a 60 percent hammer efficiency ($N_{60}$).

Soil samples are normally retained in our laboratory for 60 days and are then disposed of, unless instructed otherwise.

# 3. SUBSURFACE CONDITIONS

## 3.1 SOIL CONDITIONS

The soil conditions encountered at the borings generally consisted of about 4 inches of surface topsoil or sand and gravel overlying existing fill or natural clay with varying amounts of sand, underlain by natural sands that extended to the explored depths of the borings.

Below the sand and gravel, existing fill was encountered to depth of 2.0 feet at boring B1, near the existing structure.  The fill consisted predominantly of silty sand, (USCS Group Symbol “SM”) containing sandy clay layers.  The sand fill was found to be in a medium dense condition.

Below the fill at boring B1, natural silty sands with frequent sandy clay layers extended to a depth of around 11.0 feet.  Below the topsoil at boring B2 and B3, natural sandy lean clay (CL) or silty clay (CL/ML) with varying amounts of silt and sand and occasional sand seams or layers extended to depths around 6.8 feet and 8.0 feet, respectively.  The relative density of the natural sand in borings B1 and B2 was found to be loose.  Natural clay encountered at each boring was found to have a soft to medium consistency.

Fine to coarse graded natural sand (SP) extended below the silty sand or clays to the termination of each boring.  The relative density of natural sand was found to be loose to medium dense and generally increased with depth.

The soil profile described above and included on the appended boring logs is a generalized description of the conditions encountered.  The stratification depths described above and shown on the boring logs are intended to indicate a zone of transition from one soil type to another.  They are not intended to show exact depths of change from one soil type to another.  The soil descriptions are based on visual classification of the soils encountered.  Soil conditions may vary between or away from the boring locations from those conditions noted on the logs.  Please refer to the boring logs for the soil conditions at the specific boring locations.

Thickness measurements of surficial materials (such as topsoil) reported on the boring logs should be considered approximate since mixing of these materials with the underlying subgrade can occur while advancing the augers, and it is difficult to measure the thickness of surface materials in small-diameter boreholes.  Therefore, if accurate thickness measurements are required for inclusion in bid documents or for quantity estimates, additional evaluations, such as shallow test pits or hand augers, should be performed in topsoil areas.

## 3.2 GROUNDWATER CONDITIONS

Groundwater was observed during drilling between depths of about 11.0 feet and 18.5 feet, or between approximate elevations 830.9 feet and 824.9 feet at the borings.  Based on the relatively permeable nature of the granular soils encountered in the borings, we believe the groundwater observations during drilling are indicative of the site groundwater levels at the time of the field exploration.

Hydrostatic groundwater levels, perched groundwater conditions, and the potential rate of groundwater seepage into excavations should be expected to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, the surface water level of the nearby Comstock Creek, and other factors.  The groundwater levels indicated by the borings represent conditions at the time the readings were taken.  Groundwater levels at other times, such as during construction, may vary from those conditions recorded on the boring logs.

# 4. ANALYSIS AND RECOMMENDATIONS

## 4.1 SITE PREPARATION AND EARTHWORK

### 4.1.1 EXISTING FILL CONSIDERATIONS

The existing fill encountered at the boring B1 is considered to be undocumented. There are inherent risks of greater than typical settlement and poor structural performance associated with constructing structures over undocumented and uncontrolled fills. We believe the risks of poor structural performance associated with constructing the building over the existing fill at this site could include greater than typical total and differential settlements for foundations and a risk of cracking and differential movements of floor slabs and foundations. These added risks can be eliminated by completely removing the existing fill from the project area and replacing it with engineered fill.

We do not recommend supporting foundations for the proposed building addition over the existing fill. However, based on the boring information, we anticipate conventional, frost depth footings will extend below the existing fill. Interior columns designed to bear at high elevations (if any) should not bear on existing fill.

The existing fill can be considered for support of floor slabs, provided the subgrade soils are evaluated by SME at the time of construction, and prepared as described below, prior to floor slab construction. Subgrade improvements including compaction in-place and/or removal of unsuitable materials and replacement with engineered fill could be necessary to achieve suitable subgrade conditions.

There are inherent risks of greater than typical settlement and poor structural performance associated with constructing floor slabs over undocumented fills. We believe the associated risks at this site could include visible cracking and differential movements of floor slabs on-grade. These risks can be significantly reduced by removing the fill from beneath floor slabs and replacing it with engineered fill.

The incidence and severity of cracking and movements associated with constructing the proposed floor slabs over the existing fill at this site can be reduced, but not eliminated, by thoroughly evaluating the condition of the fill during construction, remediating unsuitable materials that are identified, and improving the subgrade as recommended in the following report sections.

Evaluation of the existing fill during construction must be conducted by SME and may include probing the existing fill areas with a hand auger, testing several feet below the subgrade surface using a cone penetrometer, observing the condition of the fill in shallow test pits and in foundation excavations, and observing the response of the surface of the fill when subjected to a proofroll. Further evaluate suspect materials observed during the evaluation and testing processes. The contractor needs to be prepared to assist SME by excavating test pits, as needed. Unsuitable fills must be remediated as recommended in the report sections below.

The following report sections are based on the assumption that the Owner is willing to accept the increased risks described above, and that footings will not bear on or above the existing fills , and the existing fill will generally remain in-place and be used to support the floor slab. If the owner does not accept the stated risks, then undercut the existing fill from beneath the entire building footprint and replace it with engineered fill per the requirements outlined in Section 2.1.4 of this report.

### 4.1.2 GENERAL SITE SUBGRADE PREPARATION

The proposed building area and areas to receive engineered fill, should be cleared of existing surface topsoil, vegetation, pavement, unsuitable fill, and other deleterious materials. We recommend the clearing and stripping extend a minimum of 5 feet beyond the building area and areas to receive engineered fill. Based on the boring information, we anticipate the exposed subgrade soils after any required clearing and stripping will consist of the either natural clays or undocumented sand fill.

Any exposed clay soils are prone to disturbance when the areas are trafficked with equipment, especially considering the soft to medium consistency of the clay. To protect areas of exposed subgrade from disturbance and to provide reliable temporary access routes and material laydown areas during construction, placement of crushed aggregate or crushed concrete, possibly with a geotextile for separation, could be required. At a minimum, engineered fill should be on site and ready to be placed shortly after the site is stripped and the subgrade is approved. The contractor should avoid trafficking any exposed clayey subgrade as much as possible until engineered fill is placed on the exposed subgrade.

Existing below-grade utilities should be re-routed around the proposed building area and abandoned utilities should be removed from the site. Excavations to remove existing utilities should be backfilled to the design subgrade level with granular engineered fill. See Section 4.1.4 of this report for materials and compaction requirements for engineered fill.

After site stripping but prior to filling, we recommend the exposed subgrade be proofrolled in the presence of a representative from SME. The purpose of the proofroll is to locate areas of unsuitably loose or disturbed subgrade. Proofrolling should be performed with a fully-loaded, tandem-axle dump truck or other similar pneumatic-tire construction equipment. Areas of unsuitable (i.e., overly loose) subgrade revealed during proofrolling should be mechanically improved (moisture conditioned and compacted) in-place. Soils that cannot be improved in-place must be removed and replaced with engineered fill.

After the exposed subgrade is proofrolled and unsuitable areas are compacted or improved, as needed, engineered fill may be placed on the prepared subgrade to establish final design subgrade levels. See Section 4.1.4 of this report for materials and compaction requirements for engineered fill.

### 4.1.3 SUBGRADE PREPARATION FOR FLOOR SLABS

Based on an assumed FFE of about 844 feet, we anticipate the final floor subgrade for the buildings will generally consist of existing fill or engineered fill placed over suitable natural clays. These soils are considered suitable for floor slab support, provided the subgrade is properly prepared, as described in Sections 4.1.1 and 4.1.2, unsuitable existing fill is properly improved or removed, and any engineered fill is properly placed and compacted as discussed in Section 4.1.4.

Prior to concrete placement for floor slabs, SME should observe and test the building pad subgrades to identify areas that were disturbed during construction activities and to verify the final subgrade conditions are suitable for floor slab support. Unsuitable subgrade identified by SME should be recompacted or removed and replaced with engineered fill. Final subgrade areas that are accessible with large equipment should be proofrolled, and areas inaccessible to proofrolling equipment should be evaluated with hand-operated equipment, such as cone penetrometers, hand auger probes, and density gauges.

The top 6 inches of the slab subbase should consist of an approved MDOT Class II granular material to provide a leveling surface for construction of the slab and a moisture capillary break between the slab and the underlying soils. If Class II granular material is used as engineered fill material to backfill undercuts of existing fill and to raise grades in the building areas, then the Class II granular material used as engineered fill can also serve as the recommended leveling surface. Alternately, an approved crushed aggregate material, such as MDOT 21AA dense-graded aggregate, can be used in lieu of a granular leveling surface to provide a more stable working platform for construction of the slab and improved protection to subgrade disturbance.  The thickness of aggregate needed to provide a stable subgrade will depend on the condition of subgrade soils during construction, the specific aggregate used, and the type of construction equipment to traffic the prepared subgrade.  The granular leveling material, or the aggregate material if used, should be compacted per the requirements in Section 4.1.4 of this report.

A vapor retarder should be provided below floor slabs that are to receive an impermeable floor finish/seal or a floor covering which would retard vapor transmission.  The location of the vapor retarder (relative to the subbase) should be determined by the design Architect/Engineer based on the intended floor usage, planned finishes, and ACI recommendations.

Floor slabs should be separated by isolation joints from structural walls and columns to permit relative movement.  A minimum of 6 inches of engineered fill should be placed between the bottom of the slab and the top of the shallow foundation below.

The slab-on-grade subgrade soils should be protected from frost action during winter construction. Frozen soils must be thawed and compacted, or removed and replaced prior to slab-on-grade construction.

### 4.1.4 ENGINEERED FILL REQUIREMENTS

Any fill placed within structural areas, including utility trench backfill, should be an approved material, free of frozen soil, excessive organics, over-sized materials, or other deleterious materials.  Fill placed in structural areas should be compacted to a minimum of 95 percent of the maximum dry density determined in accordance with the Modified Proctor test.  Sand fill should be compacted with a smooth drum vibratory roller or vibratory plate compactors, including either walk-behind types, or plate compactors mounted on a backhoe or excavator (hoe-pacs).  Clay fill should be compacted using a sheepsfoot roller, or a pneumatic type compactor, at a moisture content ranging from the optimum moisture content to about two percent below optimum.  Lifts of fill should not exceed the thickness that can be completely compacted to the specified density by the equipment being used for compaction.

Based on the information from the borings, the existing sand fill, and natural site sands and clays encountered at the boring locations are generally considered suitable for reuse as general site engineered fill, provided the material meets the requirements in the previous paragraph and the soil is at a suitable moisture content for proper compaction.  However, the contractor will need to segregate portions of suitable fill from unsuitable fill, and should segregate sands from clays.  Clays and sands containing significant fines (e.g. with USCS Group Symbols “SM” and “SC”, and in some cases “SP-SM”) are difficult to compact in confined areas and should only be reused in open areas where large compaction equipment can operate.  Moisture conditioning (i.e., discing and drying) of the existing subgrade soils will be required to achieve suitable moisture levels to properly compact the site clays.  The successful reuse of the on-site clays and silty or clayey sands for engineered fill will depend on the time of year and the care the earthwork contractor uses during construction.  During cold and wet periods of the year, the subgrade soils can become saturated and disturbed, and the silty or clayey soils can be difficult to dry.  If drying of the existing subgrade cannot be accomplished due to weather or schedule considerations, it may be necessary to import an approved granular material or to treat the subgrade with chemical additives (e.g., lime, cement).

Where use of on-site soils for engineered fill is not feasible, and/or if additional engineered fill material is required for import to the site, we recommend the import material meet the requirements of MDOT Class II sand.

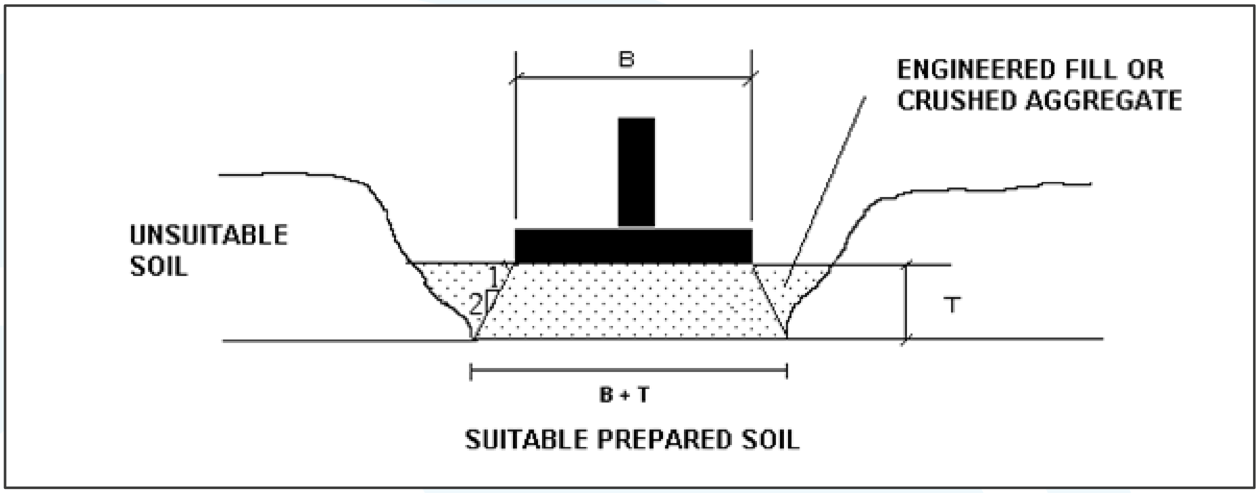
In utility trenches or foundation excavations, and in other areas where compaction is accomplished primarily by smaller plate compaction equipment, an approved granular material containing relatively low amounts of silt or clay, such as MDOT Class II granular material, should be used as backfill.  Thinner lift sizes may be required to achieve the required dry density in areas where smaller compaction equipment is used.  Based on the boring information, the cleaner sands with USCS designations of “SP”, and possibly “SP-SM”, could meet MDOT Class II gradational requirements. However, gradational tests should be performed during construction to verify on-site sands planned for reuse in drainage areas meet MDOT Class II requirements. MDOT Class II granular material should also be used in areas requiring drainage or where the fill will serve as a capillary break between the grade slabs and the underlying subgrade.

Coarse crushed aggregate used to backfill the base of undercuts or to stabilize subgrades should consist of a well graded, crushed natural aggregate or crushed concrete ranging from 1 inch to 3 inches in nominal size with no more than seven percent by weight passing the No. 200 sieve. In cases where granular engineered fill will be placed over the coarse crushed material, the surface of the coarse crushed material should be choked with a layer of at least 6 inches of MDOT 21AA dense-graded aggregate or a suitable non-woven geotextile to prevent migration of the sand into the coarser crushed material.

## 4.2 FOUNDATIONS

Shallow spread foundations are recommended for support of the proposed building. Unsuitable clays and existing fills should be undercut to expose suitable natural sands below footings. We recommend using a maximum net allowable soil bearing pressure of 2,000 pounds per square-foot (psf) to design foundations bearing on suitable natural sands or bearing on engineered fill placed over suitable natural sands. Suitable natural sands were encountered at the building boring locations beginning below the surficial topsoil and the undocumented sand fill or unsuitable clay (where present) at approximate elevations 838.6 feet to 842.4 feet.

Foundation subgrades should be evaluated and tested by SME during construction. If the foundation subgrade verification by SME encounters soils that are not suitable for the design bearing pressure, the unsuitable soils must be either mechanically improved by compaction in-place, or removed (i.e., undercut) to encounter suitable bearing soils below. Undercut excavations should then be backfilled to reestablish the design foundation bearing level using engineered fill or crushed aggregates placed as described in Section 4.1.4. The zone of undercut and backfill should extend laterally on a two vertical to one horizontal slope from the edge of the foundation, as illustrated on the following Typical Foundation Undercutting Diagram:



**TYPICAL FOUNDATION UNDERCUTTING DIAGRAM**

Foundations along exterior walls and foundations in any unheated areas should be situated a minimum of 42 inches below final site grade for protection against frost action during normal winters. Interior foundations in heated areas can be constructed at shallower levels on suitable soils just below the floor slab. However, the foundations and proposed bearing soils should be protected from freezing during construction if work occurs in the winter months.

New footings adjacent to existing footings should be constructed at the same bearing level as existing footings to reduce the potential of transmitting additional loads to the existing footings, assuming suitable bearing soil is encountered at that level.  If the new footings have to be extended deeper than the bearing level of the existing footings, the project structural engineer should evaluate the design and make appropriate modifications to the new footings.  Bearing levels for new footings can be established at certain distances from the existing building, depending on the distance between the two bearing levels. As a guideline, the new footing level should be at a level either above or below the existing footing no higher than its horizontal distance from the existing footing, i.e., a 1 to 1 slope between the edges of the two footings.  For reasons of constructability, we recommend limiting vertical “steps” to 1 foot for every 3 horizontal feet.

Foundation excavations are anticipated to expose sandy soils that are susceptible to sloughing and caving.  Therefore, the sides of foundation excavations should be sloped back and the sides of foundations vertically formed to maintain vertical foundation sidewalls and reduce the risk of frost movements associated with foundation sides that “mushroom out” near the top.  Caved soils should be removed from the foundation bearing surfaces before placing concrete.  Foundation concrete should be placed as soon as foundation excavations have been completed, and the design bearing pressure verified, to reduce the potential for disturbance of the foundation subgrade.

For bearing capacity and settlement considerations, continuous (wall) foundations should have a minimum width of 18 inches, and isolated (column) foundations should have a minimum width of 30 inches.  In cases of relatively light structural loads, the minimum foundation size criterion may govern the size of the foundation, and not the allowable soil bearing pressure.

Total settlements for shallow spread foundations bearing on suitable natural sands, or on engineered fill placed over suitable natural sands, are estimated to be 1-inch or less, and differential settlements between similarly loaded foundations are estimated to be less than one-half of the total settlement. However, differential settlement between new and adjacent existing footings could approach 1-inch.  We base the settlement estimates on the available boring information, the estimated structural loads discussed in Section 1.1, our experience with similar structures and soil conditions, and field verification of suitable bearing soils by SME.

## 4.3 SEISMIC SITE CLASS

Based on the subsurface information obtained from the borings to a maximum depth of 25 feet, and on our geotechnical experience in the project area, seismic site Class D applies to this site in accordance with the 2015 Michigan Building Code (MBC), referencing Table 20.3-1 in ASCE Standard ASCE/SEI 7-10.

## 4.4 CONSTRUCTION CONSIDERATIONS

Excavations for new foundations should not extend below existing foundations without first properly underpinning or shoring the existing foundations.  Underpinning or shoring should be properly designed by a qualified professional engineer and installed by a contractor experienced with construction of underpinning or shoring systems.

Significant groundwater seepage is not expected to be encountered in shallow excavations within the building area that do not extend below approximate elevation 828 feet.  However, some accumulation from precipitation events, surface run-off, or seepage from perched groundwater sources could be encountered at shallower depths.  We anticipate standard sump pit and pumping procedures should be adequate to control these accumulations on a localized basis.  For deeper excavations that extend below the site groundwater level in sands, more aggressive dewatering techniques, such as well points or pumps in slotted casings will be required to control seepage.  In excavation areas where groundwater accumulates, a working surface of crushed aggregate or crushed concrete may be required to protect the subgrade from disturbance.

The contractor should remove ponded surface water and prevent run-off from reaching foundation excavations and areas of prepared subgrade.  We recommend the contractor establish positive surface drainage at the onset of construction to mitigate the potential for subgrade disturbance.  The contractor should plan equipment access, construction staging, and material storage to minimize disturbance of subgrades in the proposed building areas.  Placement of crushed concrete or crushed aggregate on the subgrade, possibly with a geotextile fabric for separation, to establish suitable access routes and material laydown areas, may facilitate construction activities and mitigate the potential for subgrade disturbance.

The contractor must take precautions to protect the nearby existing structure, pavements, and utilities during construction of the proposed building.  Care must be exercised during the excavating and compacting operations so that excessive vibrations do not cause settlement of the nearby existing structure, pavement, and utilities, and to avoid undermining existing utilities during site excavations.  Where sufficient space or setback from existing utilities or structure exists, we anticipate the sides of the excavation can be temporarily sloped back in accordance with applicable regulations.  However, in areas where sufficient setback cannot be maintained, temporary earth retention systems will be required during construction.  Underpinning, shoring, and earth retention systems should be designed by a qualified professional engineer and installed by a contractor experienced with construction of these systems.

The contractor must provide a safely sloped excavation or an adequately constructed and braced shoring system in accordance with federal, state, and local safety regulations for individuals working in an excavation that may expose them to the danger of moving ground.  If material is stored or heavy equipment is operated near an excavation, appropriate shoring must be used to resist the extra pressure due to the superimposed loads.

Handling, transportation, and disposal of excavated materials and groundwater should be performed in accordance with applicable environmental regulatory requirements.

# 5. SIGNATURES

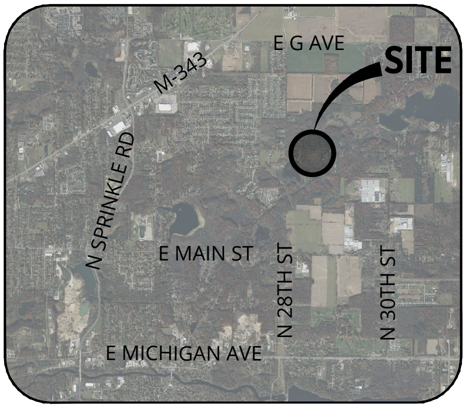
| **PREPARED BY:** | **REVIEWED BY:** |
|---|---|
| Quinten C. Prieur, EIT<br>Senior Staff Engineer | Paul E. Anderson, PE<br>Senior Project Engineer |

# APPENDIX A

## BORING LOCATION DIAGRAM (FIGURE NO. 1)

## BORING LOG TERMINOLOGY

## BORING LOGS (B1 THROUGH B3)



## LOCATION MAP

NOT TO SCALE

## LEGEND

⌖ APPROXIMATE BORING LOCATION

NOTES:

1. AERIAL IMAGE TAKEN FROM GOOGLE EARTH PRO WITH AN IMAGE DATE OF 06/15/2022.
2. BASE DRAWING INFORMATION TAKEN FROM A MARKED UP PDF FILE OF A DRAWING TITLED "STATION NO. 25 UNDERGROUND SITE LAYOUT", SHEET 7-A, PREPARED BY CITY UTILITIES OF KALAMAZOO

GRAPHIC SCALE: 1" = 60'

| No. | Revision Date | Date | 08-15-2025 |
|---|---|---|---|
| | | CADD | T. VERLEYE |
| | | Designer | Q. PRIEUR |
| | | Project No. | 099702.00 |

DRAWING NOTE: SCALE DEPICTED IS MEANT FOR 8.5"x11" AND WILL SCALE INCORRECTLY IF PRINTED ON ANY OTHER SIZE MEDIA

# BORING LOCATION DIAGRAM
# KALAMAZOO WATER STATION NO. 25 IMPROVEMENTS
# COMSTOCK TOWNSHIP, MICHIGAN

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# BORING LOG TERMINOLOGY

## UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

| | | | |
|---|---|---|---|
| COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.) | | | |
| | Clean Gravel (Less than 5% fines) | | |
| **GRAVEL** More than 50% of coarse fraction larger than No. 4 sieve size | ▨ | GW | Well-graded gravel; gravel-sand mixtures, little or no fines |
| | ▨ | GP | Poorly-graded gravel; gravel-sand mixtures, little or no fines |
| | Gravel with fines (More than 12% fines) | | |
| | ▨ | GM | Silty gravel; gravel-sand-silt mixtures |
| | ▨ | GC | Clayey gravel; gravel-sand-clay mixtures |
| | Clean Sand (Less than 5% fines) | | |
| **SAND** 50% or more of coarse fraction smaller than No. 4 sieve size | ▨ | SW | Well-graded sand; sand-gravel mixtures, little or no fines |
| | ▨ | SP | Poorly graded sand; sand-gravel mixtures, little or no fines |
| | Sand with fines (More than 12% fines) | | |
| | ▨ | SM | Silty sand; sand-silt-gravel mixtures |
| | ▨ | SC | Clayey sand; sand–clay-gravel mixtures |
| FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size) | | | |
| **SILT AND CLAY** Liquid limit less than 50% | ▨ | ML | Inorganic silt; sandy silt or gravelly silt with slight plasticity |
| | ▨ | CL | Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay |
| | 🟩 | OL | Organic silt and organic clay of low plasticity |
| **SILT AND CLAY** Liquid limit 50% or greater | ▨ | MH | Inorganic silt of high plasticity, elastic silt |
| | ▨ | CH | Inorganic clay of high plasticity, fat clay |
| | ▨ | OH | Organic silt and organic clay of high plasticity |
| **HIGHLY ORGANIC SOIL** | ▨ | PT | Peat and other highly organic soil |

## OTHER MATERIAL SYMBOLS

- ■ Topsoil
- □ Void
- ▨ Sandstone
- ▨ Asphalt Concrete
- ▨ Glacial Till
- ▨ Siltstone
- ▨ Aggregate Base
- ▨ Coal
- ▨ Limestone
- ▨ Portland Cement Concrete
- ▨ Shale
- ▨ Fill

## LABORATORY CLASSIFICATION CRITERIA

| | | |
|---|---|---|
| GW | $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{{D_{30}}^{2}}{D_{10} \times D_{60}}$ between 1 and 3 | |
| GP | Not meeting all gradation requirements for GW | |
| GM | Atterberg limits below "A" line or PI less than 4 | Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols |
| GC | Atterberg limits above "A" line with PI greater than 7 | |
| SW | $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{{D_{30}}^{2}}{D_{10} \times D_{60}}$ between 1 and 3 | |
| SP | Not meeting all gradation requirements for SW | |
| SM | Atterberg limits below "A" line or PI less than 4 | Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols |
| SC | Atterberg limits above "A" line with PI greater than 7 | |

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent……………………….…….....GW, GP, SW, SP
More than 12 percent………………………..…..GM, GC, SM, SC
5 to 12 percent…………….…..……..Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

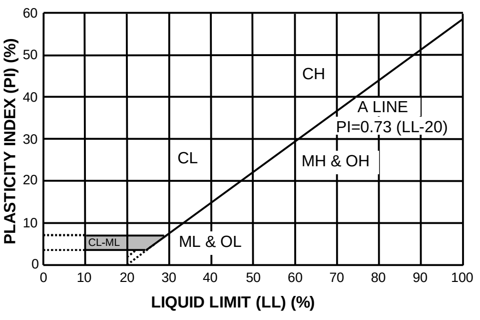
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)

## PARTICLE SIZES

| | | | |
|---|---|---|---|
| Boulders | | - | Greater than 12 inches |
| Cobbles | | - | 3 inches to 12 inches |
| Gravel- | Coarse | - | 3/4 inches to 3 inches |
| | Fine | - | No. 4 to 3/4 inches |
| Sand- | Coarse | - | No. 10 to No. 4 |
| | Medium | - | No. 40 to No. 10 |
| | Fine | - | No. 200 to No. 40 |
| Silt and Clay | | - | Less than (0.074 mm) |

## PLASTICITY CHART



## VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)

## DRILLING AND SAMPLING ABBREVIATIONS

| | | |
|---|---|---|
| 2ST | – | Shelby Tube – 2" O.D. |
| 3ST | – | Shelby Tube – 3" O.D. |
| AS | – | Auger Sample |
| GS | – | Grab Sample |
| LS | – | Liner Sample |
| NR | – | No Recovery |
| PM | – | Pressuremeter |
| RC | – | Rock Core diamond bit. NX size, except where noted |
| SB | – | Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted |
| VS | – | Vane Shear |
| WS | – | Wash Sample |

## OTHER ABBREVIATIONS

| | | |
|---|---|---|
| WOH | – | Weight of Hammer |
| WOR | – | Weight of Rods |
| SP | – | Soil Probe |
| PID | – | Photo Ionization Device |
| FID | – | Flame Ionization Device |

## DEPOSITIONAL FEATURES

| | | |
|---|---|---|
| Parting | – | as much as 1/16 inch thick |
| Seam | – | 1/16 inch to 1/2 inch thick |
| Layer | – | 1/2 inch to 12 inches thick |
| Stratum | – | greater than 12 inches thick |
| Pocket | – | deposit of limited lateral extent |
| Lens | – | lenticular deposit |
| Hardpan/Till | – | an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely |
| Lacustrine | – | soil deposited by lake water |
| Mottled | – | soil irregularly marked with spots of different colors that vary in number and size |
| Varved | – | alternating partings or seams of silt and/or clay |
| Occasional | – | one or less per foot of thickness |
| Frequent | – | more than one per foot of thickness |
| Interbedded | – | strata of soil or beds of rock lying between or alternating with other strata of a different nature |

## DESCRIPTION OF RELATIVE QUANTITIES

The visual-manual procedure uses the following terms to describe the relative quantities of notable foreign materials, gravel, sand or fines:

| | | |
|---|---|---|
| Trace | – | particles are present but estimated to be less than 5% |
| Few | – | 5 to 10% |
| Little | – | 15 to 25% |
| Some | – | 30 to 45% |
| Mostly | – | 50 to 100% |

## CLASSIFICATION TERMINOLOGY AND CORRELATIONS

**Cohesionless Soils**

| **Relative Density** | **$N_{60}$ (N-Value) (Blows per foot)** |
|---|---|
| Very Loose | 0 to 4 |
| Loose | 5 to 10 |
| Medium Dense | 11 to 30 |
| Dense | 31 to 50 |
| Very Dense | 51 to 80 |
| Extremely Dense | Over 81 |

**Cohesive Soils**

| **Consistency** | **$N_{60}$ (N-Value) (Blows per foot)** | **Undrained Shear Strength (kips/ft$^2$)** |
|---|---|---|
| Very Soft | <2 | 0.25 or less |
| Soft | 2 - 4 | > 0.25 to 0.50 |
| Medium | 5 - 8 | > 0.50 to 1.0 |
| Stiff | 9 - 15 | > 1.0 to 2.0 |
| Very Stiff | 16 - 30 | > 2.0 to 4.0 |
| Hard | > 30 | > 4.0 or greater |

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted. N60 values as reported on boring logs represent raw N-values corrected for hammer efficiency only.

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# BORING B 1

PAGE 1 OF 1

BORING DEPTH: 25 FEET

**PROJECT NAME:** Kalamazoo Water Station No. 25 Improvements **PROJECT NUMBER:** 099702.00

**CLIENT:** Tetra Tech **PROJECT LOCATION:** Comstock Township, Michigan

**DATE STARTED:** 7/22/25 **COMPLETED:** 7/22/25 **BORING METHOD:** Hollow-stem Augers

**DRILLER:** JRN/AJK **RIG NO.:** 526-CME55-TRK **LOGGED BY:** DAC **CHECKED BY:** QCP/AJR

ELEVATION: 844.4± FT

**PROFILE DESCRIPTION**

0.3 TOPSOIL 844.1

2.0 FILL- Fine to Medium SILTY SAND with Gravel- Occasional Sandy Clay Layers- Brown- Moist- Medium Dense (SM) 842.4

Fine to Medium SILTY SAND- Frequent Sandy Clay Layers- Brown- Moist- Loose (SM)

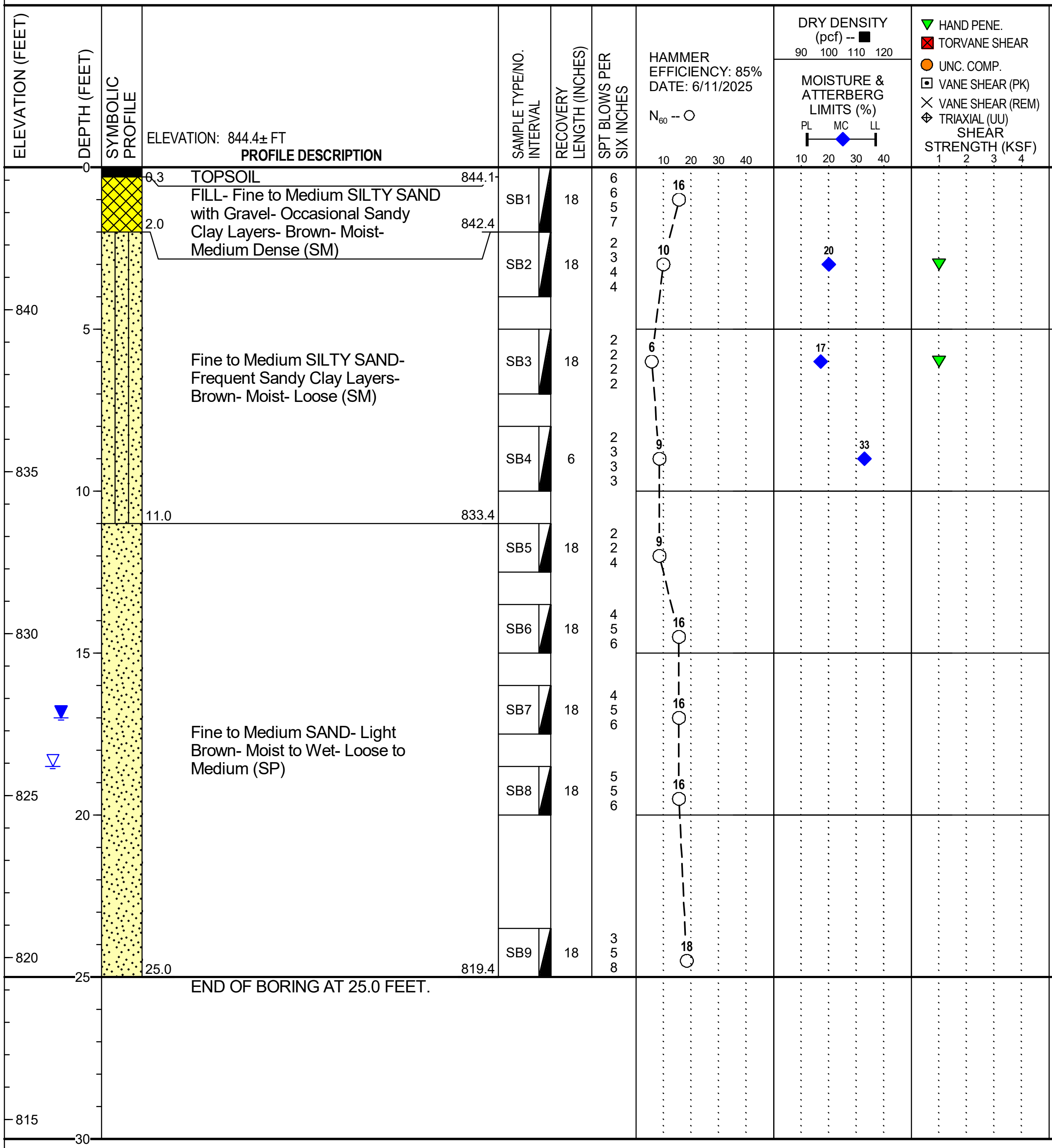
11.0 833.4

Fine to Medium SAND- Light Brown- Moist to Wet- Loose to Medium (SP)

25.0 819.4

END OF BORING AT 25.0 FEET.

| SAMPLE TYPE/NO. INTERVAL | RECOVERY LENGTH (INCHES) | SPT BLOWS PER SIX INCHES | $N_{60}$ | MC (%) |
|---|---|---|---|---|
| SB1 | 18 | 6<br>6<br>5<br>7 | 16 | |
| SB2 | 18 | 2<br>3<br>4<br>4 | 10 | 20 |
| SB3 | 18 | 2<br>2<br>2<br>2 | 6 | 17 |
| SB4 | 6 | 2<br>3<br>3<br>3 | 9 | 33 |
| SB5 | 18 | 2<br>2<br>4 | 9 | |
| SB6 | 18 | 4<br>5<br>6 | 16 | |
| SB7 | 18 | 4<br>5<br>6 | 16 | |
| SB8 | 18 | 5<br>5<br>6 | 16 | |
| SB9 | 18 | 3<br>5<br>8 | 18 | |



REMARKS

Shear strength tests and/or mosture contents performed on clay layers from samples SB2, SB3, and SB4.

**GROUNDWATER & BACKFILL INFORMATION**

| | DEPTH (FT) | ELEV (FT) |
|---|---|---|
| ▽ **DURING BORING:** | 18.5 | 825.9 |
| ▼ **AT END OF BORING:** | 17.0 | 827.4 |

**BACKFILL METHOD:** Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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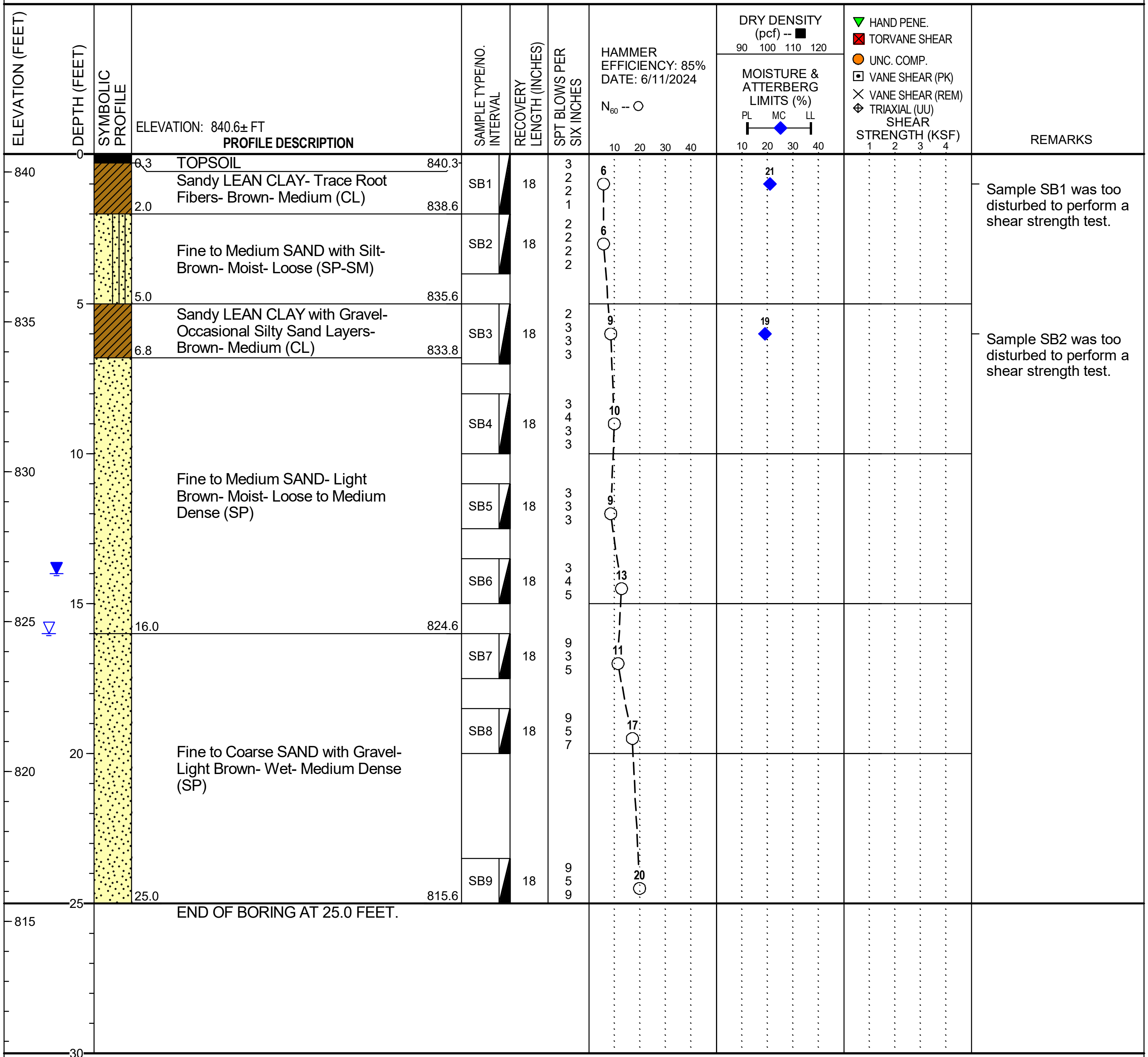
# BORING B 2

PAGE 1 OF 1

BORING DEPTH: 25 FEET

**PROJECT NAME:** Kalamazoo Water Station No. 25 Improvements
**PROJECT NUMBER:** 099702.00
**CLIENT:** Tetra Tech
**PROJECT LOCATION:** Comstock Township, Michigan
**DATE STARTED:** 7/22/25
**COMPLETED:** 7/22/25
**BORING METHOD:** Hollow-stem Augers
**DRILLER:** JRN/AJK
**RIG NO.:** 526-CME55-TRK
**LOGGED BY:** DAC
**CHECKED BY:** QCP/AJR



ELEVATION: 840.6± FT

| DEPTH (FT) | PROFILE DESCRIPTION | ELEV (FT) |
|---|---|---|
| 0.3 | TOPSOIL | 840.3 |
| 2.0 | Sandy LEAN CLAY- Trace Root Fibers- Brown- Medium (CL) | 838.6 |
| 5.0 | Fine to Medium SAND with Silt- Brown- Moist- Loose (SP-SM) | 835.6 |
| 6.8 | Sandy LEAN CLAY with Gravel- Occasional Silty Sand Layers- Brown- Medium (CL) | 833.8 |
| 16.0 | Fine to Medium SAND- Light Brown- Moist- Loose to Medium Dense (SP) | 824.6 |
| 25.0 | Fine to Coarse SAND with Gravel- Light Brown- Wet- Medium Dense (SP) | 815.6 |

END OF BORING AT 25.0 FEET.

| SAMPLE TYPE/NO. INTERVAL | RECOVERY LENGTH (INCHES) | SPT BLOWS PER SIX INCHES | N60 | MC (%) |
|---|---|---|---|---|
| SB1 | 18 | 3<br>2<br>2<br>1 | 6 | 21 |
| SB2 | 18 | 2<br>2<br>2<br>2 | 6 | |
| SB3 | 18 | 2<br>3<br>3<br>3 | 9 | 19 |
| SB4 | 18 | 3<br>4<br>3<br>3 | 10 | |
| SB5 | 18 | 3<br>3<br>3 | 9 | |
| SB6 | 18 | 3<br>4<br>5 | 13 | |
| SB7 | 18 | 9<br>3<br>5 | 11 | |
| SB8 | 18 | 9<br>5<br>7 | 17 | |
| SB9 | 18 | 9<br>5<br>9 | 20 | |

REMARKS

Sample SB1 was too disturbed to perform a shear strength test.

Sample SB2 was too disturbed to perform a shear strength test.

**GROUNDWATER & BACKFILL INFORMATION**

| | DEPTH (FT) | ELEV (FT) |
|---|---|---|
| ▽ **DURING BORING:** | 16.0 | 824.6 |
| ▼ **AT END OF BORING:** | 14.0 | 826.6 |

**BACKFILL METHOD:** Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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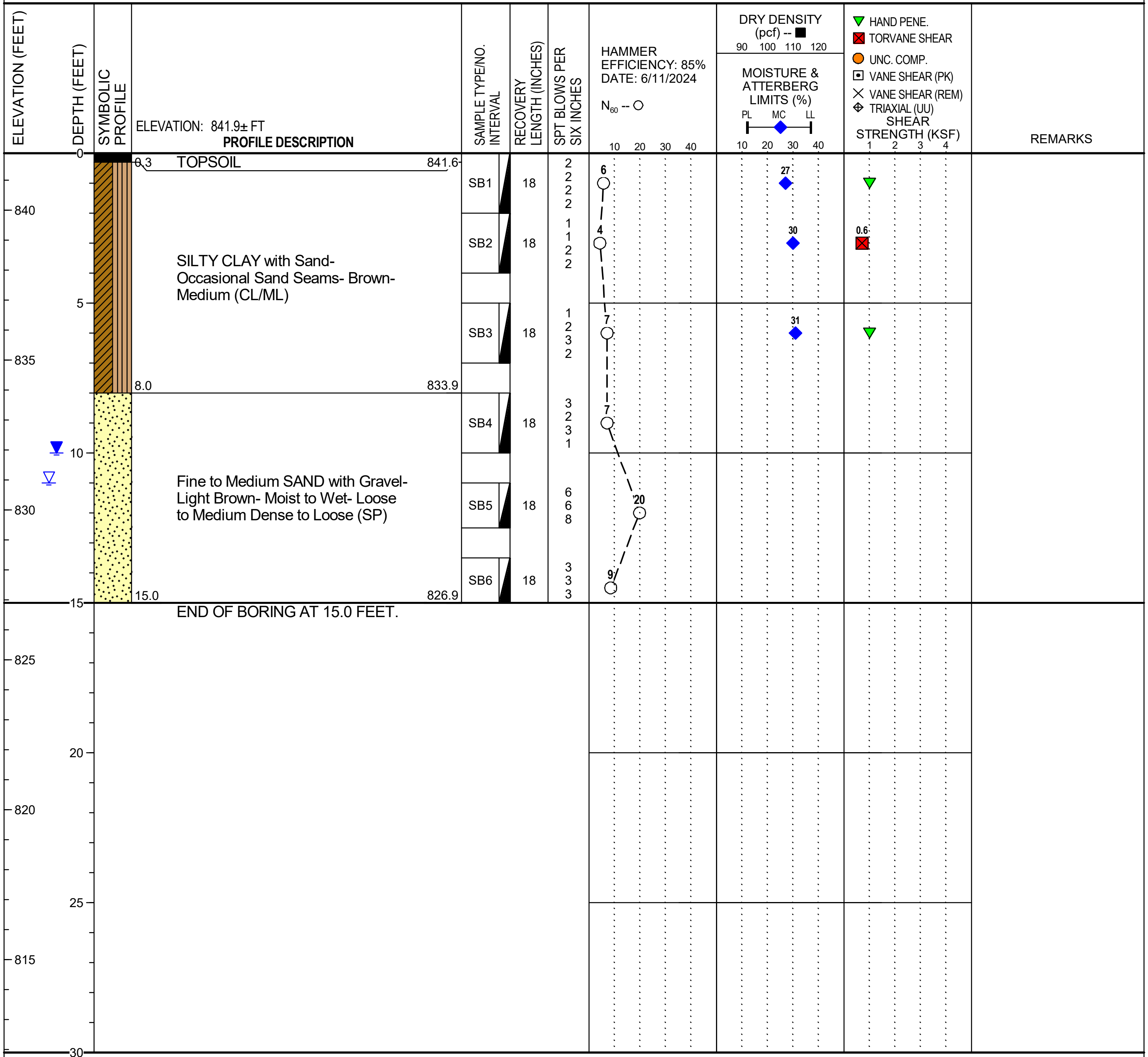
# BORING B 3

PAGE 1 OF 1

BORING DEPTH: 15 FEET

**PROJECT NAME:** Kalamazoo Water Station No. 25 Improvements
**PROJECT NUMBER:** 099702.00
**CLIENT:** Tetra Tech
**PROJECT LOCATION:** Comstock Township, Michigan
**DATE STARTED:** 7/22/25
**COMPLETED:** 7/22/25
**BORING METHOD:** Hollow-stem Augers
**DRILLER:** JRN/AJK
**RIG NO.:** 526-CME55-TRK
**LOGGED BY:** DAC
**CHECKED BY:** QCP/AJR



| Depth (ft) | Elevation (ft) | Profile Description | Sample | Recovery (in) | SPT Blows | N60 | MC (%) | Shear Strength (ksf) |
|---|---|---|---|---|---|---|---|---|
| 0.3 | 841.6 | TOPSOIL | | | | | | |
| | | SILTY CLAY with Sand- Occasional Sand Seams- Brown- Medium (CL/ML) | SB1 | 18 | 2<br>2<br>2<br>2 | 6 | 27 | ▼ |
| | | | SB2 | 18 | 1<br>1<br>2<br>2 | 4 | 30 | ☒ 0.6 |
| 8.0 | 833.9 | | SB3 | 18 | 1<br>2<br>3<br>2 | 7 | 31 | ▼ |
| | | Fine to Medium SAND with Gravel- Light Brown- Moist to Wet- Loose to Medium Dense to Loose (SP) | SB4 | 18 | 3<br>2<br>3<br>1 | 7 | | |
| | | | SB5 | 18 | 6<br>6<br>8 | 20 | | |
| 15.0 | 826.9 | | SB6 | 18 | 3<br>3<br>3 | 9 | | |

END OF BORING AT 15.0 FEET.

**GROUNDWATER & BACKFILL INFORMATION**

| | DEPTH (FT) | ELEV (FT) |
|---|---|---|
| ▽ **DURING BORING:** | 11.0 | 830.9 |
| ▼ **AT END OF BORING:** | 10.0 | 831.9 |

**BACKFILL METHOD:** Auger Cuttings

NOTES:
1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

# APPENDIX B

## IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

## GENERAL COMMENTS

## LABORATORY TESTING PROCEDURES

# Important Information about This

# Geotechnical-Engineering Report

**Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.**

**While you cannot eliminate all such risks, you can manage them. The following information is provided to help.**

**The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.**

## Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs 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. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

## Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

## You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project 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.*

## This Report May Not Be Reliable

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- 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, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been 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 your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

## Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment 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 from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

## 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 judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed 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.*

## 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 full-time 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 on hand quickly 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 observation.

## 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 informational 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, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. 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 may 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.

## 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. 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.

## 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 relate any 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 yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

## 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, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled 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.***

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# GENERAL COMMENTS

## BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and/or other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing.

The discussions and recommendations contained in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME must be contacted to reevaluate the recommendations of this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of geotechnical engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs.

The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

## REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

Retain SME to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

## REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so the issues are understood and applied in a manner consistent with the owner’s budget, tolerance of risk, and expectations for performance and maintenance.

## FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME needs to be retained to continue our services through construction so we may observe and evaluate the actual subsurface conditions relative to the recommendations made in this report, and so we can verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

## PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site needs to be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor needs to promptly describe the nature and extent of the differing conditions in writing and SME needs to be notified so we can verify those conditions. The construction contract needs to include provisions for dealing with differing conditions, and contingency funds for potential problems during earthwork and foundation construction. We would be pleased to assist with the development of contract provisions based on our experience.

The contractor needs to be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site need to be made available for review by bidders and the successful contractor.

## THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.

# LABORATORY TESTING PROCEDURES

## VISUAL ENGINEERING CLASSIFICATION

Visual classification was performed on recovered samples. The appended General Notes and Unified Soil Classification System (USCS) sheets include a brief summary of the general method used visually classify the soil and assign an appropriate USCS group symbol. The estimated group symbol, according to the USCS, is shown in parentheses following the textural description of the various strata on the boring logs appended to this report. The soil descriptions developed from visual classifications are sometimes modified to reflect the results of laboratory testing.

## MOISTURE CONTENT

Moisture content tests were performed by weighing samples from the field at their in-situ moisture condition. These samples were then dried at a constant temperature (approximately 110° C) overnight in an oven. After drying, the samples were weighed to determine the dry weight of the sample and the weight of the water that was expelled during drying. The moisture content of the specimen is expressed as a percent and is the weight of the water compared to the dry weight of the specimen.

## HAND PENETROMETER TESTS

In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). Theoretically, the undrained shear strength of the cohesive sample is one-half the unconfined compressive strength. The undrained shear strength (based on the hand penetrometer test) presented on the boring logs is reported in units of kips per square-foot (ksf).

## TORVANE SHEAR TESTS

In the Torvane test, the shear strength of a low strength, cohesive soil sample is estimated by measuring the resistance of the sample to a torque applied through vanes inserted into the sample. The undrained shear strength of the samples is measured from the maximum torque required to shear the sample and is reported in units of kips per square-foot (ksf).

## LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

Loss-on-ignition (LOI) tests are conducted by first weighing the sample and then heating the sample to dry the moisture from the sample (in the same manner as determining the moisture content of the soil). The sample is then re-weighed to determine the dry weight and then heated for four hours in a muffle furnace at a high temperature (approximately 440° C). After cooling, the sample is re-weighed to calculate the amount of ash remaining, which in turn is used to determine the amount of organic matter burned from the original dry sample. The organic matter content of the specimen is expressed as a percent compared to the dry weight of the sample.

## ATTERBERG LIMITS TESTS

Atterberg limits tests consist of two components. The plastic limit of a cohesive sample is determined by rolling the sample into a thread and the plastic limit is the moisture content where a 1/8-inch thread begins to crumble. The liquid limit is determined by placing a 1/2-inch-thick soil pat into the liquid limits cup and using a grooving tool to divide the soil pat in half. The cup is then tapped on the base of the liquid limits device using a crank handle. The number of drops of the cup to close the gap formed by the grooving tool 1/2 inch is recorded along with the corresponding moisture content of the sample. This procedure is repeated several times at different moisture contents and a graph of moisture content, and the corresponding number of blows is plotted. The liquid limit is defined as the moisture content at a nominal 25 drops of the cup. From this test, the plasticity index can be determined by subtracting the plastic limit from the liquid limit.

*Passionate People Building
and Revitalizing our World*

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