Geotechnical Engineering Report

Bentonville Water Resource Recovery Facility Improvements

1901 Northeast A Street
Bentonville, Arkansas
GTS Project No. 23-15134

February 9, 2024

Prepared For:

Hawkins-Weir Engineers, Inc.
438 East Millsap Road
Fayetteville, Arkansas

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February 9, 2024

Hawkins-Weir Engineers, Inc.
438 East Millsap Road
Fayetteville, Arkansas 72703

Attention: Mr. Craig Hardin, P.E.

RE: Geotechnical Engineering Report
Bentonville Water Resource Recovery Facility Improvements
1901 Northeast A Street
Bentonville, Benton County, Arkansas
GTS Project No. 23-15134

Mr. Hardin:

This report provides the results of the subsurface exploration, laboratory testing, and geotechnical engineering analysis performed for the planned improvements detailed herein. The property evaluated by this report is located at the existing Bentonville Water Resource Recovery Facility located at 1901 Northeast A Street in Bentonville, Arkansas. The approximate boundaries of the project site are shown in Figure 1 within this report.

We appreciate the opportunity to be of assistance to you on this project. We encourage retaining GTS, Inc. to be involved in any pre-bid and pre-construction meetings to allow us to discuss the following findings and recommendations.

Please contact us if further explanation or clarification is required for portions of the report.

Sincerely,

GTS, Inc.
Geotechnical & Testing Services

Certificate of Authorization No. 1251, expires 12/31/2025

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PROJECT DESCRIPTION and INFORMATION

Introduction

Our services were performed in accordance with GTS, Inc. (GTS) Proposal No. GTS123061-R1, authorized by Mr. Brett D. Peters, President and CEO of Hawkins-Weir Engineers, Inc. (HWEI), on November 16, 2023. The intent of the authorized scope of services was to explore the subsurface soil/rock conditions at the project site in order to prepare recommendations for designing and constructing the planned building foundations, floor slabs, mass grading, and pavement section alternatives.

The Scope of Work (SOW) provided in this report pertains to the evaluation of 24 new structures, including structure replacements, building additions, and completely new structures. Our currently authorized scope of services included evaluating the subsurface conditions at 26 boring locations, identified as Borings B-1 through B-26, to depths of about 10 to 40 feet below existing grades. It should be noted that each boring was performed in accordance with the request for proposal (RFP) document provided to GTS and referenced below, except for Borings B-7 and B-25. Boring B-7 was cancelled due to access constraints and B-25 was cancelled due to the presence of buried utilities. Both Borings were canceled at the direction of HWEI.

- **Request for Proposal, titled "Geotechnical Investigation and Report – Bentonville Water Resource Recovery Facility Improvements – HWEI Project No. 2021037", prepared by Hawkins-Weir Engineers, Inc and dated October 5, 2023.**

Additionally, GTS performed two (2) additional borings not included in the original SOW (B-27 and B-28). These borings were performed on either side of a planned bridge for the proposed Secondary Access Drive at the north end of the project site. Borings B-27 and B-28 were both extended to 30 feet below existing grades as requested via an email from Mr. Craig Hardin, P.E. (HWEI) on December 21, 2023.

Finally, a temporary piezometer was installed at both Borings B-5 and B-15 upon completion of those borings

Our currently authorized scope of geotechnical engineering services will be concluded with the issuance of this Geotechnical Engineering Report.

Project Site

The project site is within the existing Bentonville Water Resource Recovery Facility (Bentonville WRRF) located at 1901 Northeast A Street in Bentonville, Arkansas. Improvements to the existing facility are planned throughout the facility and will surround the existing structures on site. These improvements are discussed in more detail below.

The general boundary of the planned structures is shown in yellow in Figure 1 below.

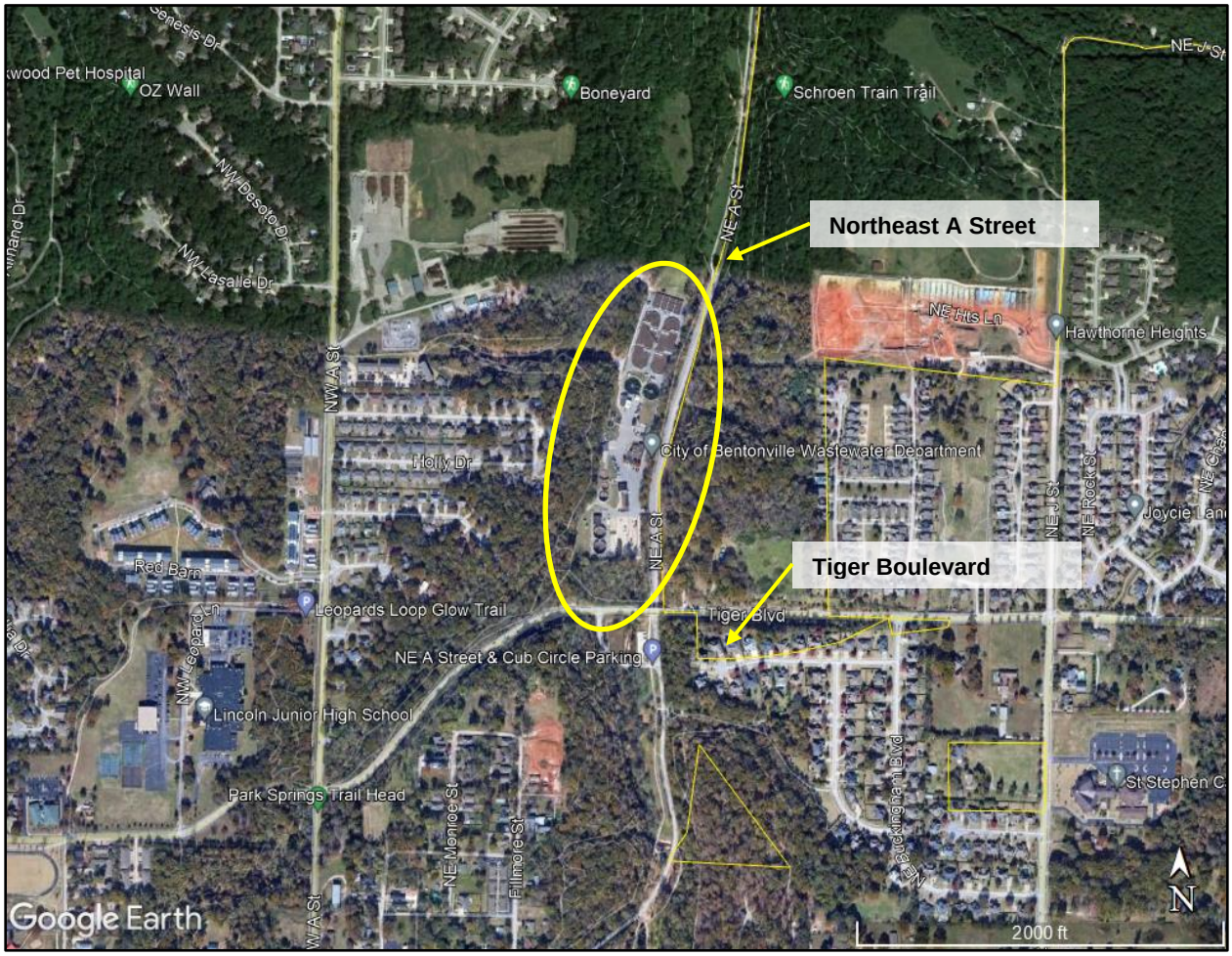


Figure 1 - General Boundary of the Project Site

Background Information

Improvements to the existing Bentonville WRRF have previously been performed in 1960, 1982, 1999, and 2002. We were provided with the drawings, referenced on the following page, that include drawings from the previous improvements. These drawings show that two (2) previously existing lagoons were located on the north end of the project site. The South Lagoon was situated within the facility now occupied by the Final Clarifier No. 1 and 2 structures and extended to the northern extent of the current Aeration Basin No. 1 and No. 2 structures. The North Lagoon extended from the approximate footprint of the existing Anoxic Basins and extended into the field north of the basins. See Figure 2 for the approximate boundaries of the previously existing lagoons (outlined in yellow) and Figure 3 for an excerpt of the 1960 drawings of the existing facility. The lagoons had bottom elevations ranging from 1118 and 1123 feet above Mean Sea Elevation (MSE).

Additionally, GTS was informed that the existing Clarifiers No. 1 and No. 2, Sludge Pump

Station, Clarifier Division Box, and Aeration Basins were constructed as part of the 1982 improvements project. As part of the 1999 improvements, the North Lagoon was filled in and the Anoxic Basins were constructed north of the Aeration Basins within the footprint of the North Lagoon. Finally, we understand that the improvements in 2002 included the construction of asphalt pavements in various places within the facility as well as adding or modifying structures to the existing layout of the facility.

- **Sheets 12 and 16 of 25, titled "Sewerage Improvements Treatment Plant and Sewers – Bentonville, Arkansas", dated January 1960, and prepared by L.M. McGoodwin Consulting Engineer.** More specifically, GTS was provided with drawings of the improvements that took place in 1960.
- **Sheet 4 of 66, titled "Wastewater Interceptor and Treatment Facilities – Bentonville, Ark. – Contract Section I", dated January 1982, and prepared by McGoodwin, Williams and Yates, Inc.** More specifically, GTS was provided with drawings of the improvements that took place in 1982.
- **Sheet L19, titled "Upgrading Wastewater Collection, Transport and Treatment Facilities", dated November 1992, and prepared by McGoodwin, Williams and Yates, Inc.** More specifically, GTS was provided with an aerial image of the site from 1992.
- **Sheet C1, titled "Upgrading Wastewater Collection, Transport and Treatment Facilities", dated August 16, 2002, and prepared by McGoodwin, Williams and Yates, Inc.** More specifically, GTS was provided with drawings of the improvements that took place in 1982.

Figure 2 - General Boundary of Previous Lagoons

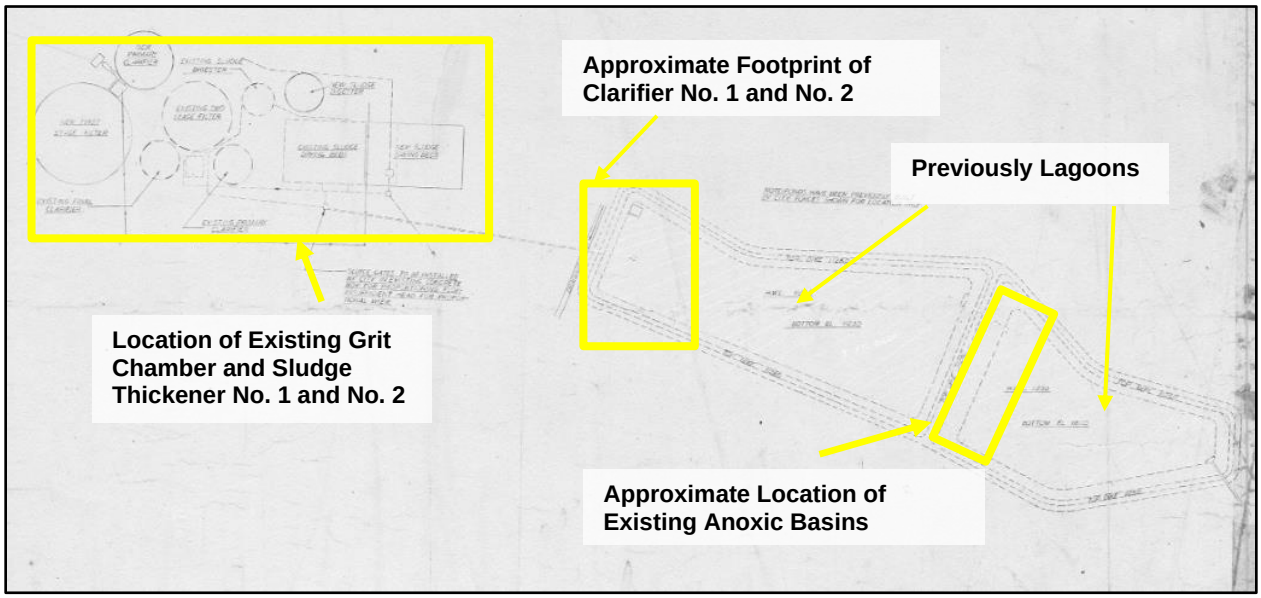


Figure 3 – Excerpt from the referenced plant drawings dated January 1960

Planned Structures

As stated in the introduction, our current understanding of the project is based on the RFP document received from HWEI, dated October 5, 2023, requesting geotechnical engineering services for the planned WRRF improvements as well as the referenced email on December 21, 2023, requesting additional services for the planned bridge on the north end of the project site. The information contained within the RFP as well as further email communication between GTS, Inc. (GTS) and HWEI on December 1, 2021, was used to prepare this report.

Briefly, it is our understanding that the planned improvements will include the improvements/additions of the structures included in Table 1.

Table 1: Summary of Anticipated Planned Improvements

Building(s)	Slab FFE (Feet)	Cut (-)/ Fill (+) Estimates (Feet)	Description
Influent Meter Vault	1127.0	-12 to -11	Below grade, reinforced concrete structure
Headworks	1120.7 and 1138.0	-21.5 to +6	Below grade, reinforced concrete structure with an enclosed building above
Headworks Odor Control	1133.0	-7 to +3	Slab on grade equipment area, with a retaining wall along the west and south perimeter
Headworks Electrical Building	1133.5	+3 to +4	Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade
Lift Station No. 3	1111.0 and 1124.0	-16 to -3	Reinforced concrete wet well and valve vault, below grade
Anoxic Basins	1124.0	-6 to -2	Reinforced concrete structure, partially below grade
Plant Influent Meter Vault	1123.0	-13 to -11	Reinforced concrete structure, below grade
Flow Diversion Structure	1131.0	-5 to -3	Reinforced concrete structure, partially below grade
Wet Weather Meter Vault	1123.0	-13 to -11	Reinforced concrete structure, below grade
Chemical Feed Building and Tank Pad	1133.5	-2.5 to -0.5	Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade

Building(s)	Slab FFE (Feet)	Cut (-)/ Fill (+) Estimates (Feet)	Description
Surface Wasting Pump Station	1119.0 and 1124.0	-14 to -7	Reinforced concrete wet well and valve vault, below grade
Secondary Clarifier Distribution Box	1122.0	-12 to -10	Reinforced concrete structure, below grade; to be constructed following demolition of portion of existing box
Secondary Clarifier No.1 and No. 3	1115.6 and 1119.3	-16.5 to -11	Reinforced concrete structure, below grade, center pier, Clarifier No. 1 to be constructed after demo of existing 90-ft diameter clarifier
RAS Pump Station No. 2	1115.5	-18.5 to -16.5	Reinforced concrete wet well structure, partially below grade
Wasting Meter Vault	1125.5	-9.5 to -7.5	Reinforced concrete structure, below grade
Tertiary Treatment and UV	1117	-17 to -15	Reinforced concrete structure, with steel framed canopy roof, below grade, north half of the structure
Post-Aeration	1108.5	-25.5 to -23.5	Reinforced concrete structure, with steel framed canopy roof, below grade, south half of the structure
Parshall Flume Structure	1114.8	-19 to -17	Reinforced concrete structure, with steel framed canopy roof, below grade, southeast corner of the structure
Post-Aeration Blower Building	1133.5	-0.5 to +1.5	Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade
Effluent Pump Station	1108.0	-26 to -24	Reinforced concrete structure, below grade
Electrical Building	1133.5	-0.5 to +1.5	Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade
Administration/Lab Building Additions	1334	-1 to +1	North side – Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade, matching existing grades West side – Covered patio area
Blower Building Valve Vault	1127.7 and 1136.5	-10.5 to +0.5	Reinforced concrete structure, below grade, valve vault adjacent to existing blower building
Digester No. 4 & No. 5 Valve Vaults	1125.3 and 1129.5	-14 to -7.5	Reinforced concrete structure, below grade, constructed adjacent to existing digesters with top of footing elevation of 1129.5 ft

Building(s)	Slab FFE (Feet)	Cut (-)/ Fill (+) Estimates (Feet)	Description
Vehicle Storage Building and Equipment Storage Buildings	1133.5	-4.5 to -2.5	Reinforced concrete masonry with brick veneer, continuous foundation, stem wall with interior slab on grade

Additionally, we understand that two (2) retaining walls will be constructed for the Headworks Odor Control equipment and the drive that wraps to the west of the planned Tertiary Filter building. Finally, as discussed previously, we understand that a new access drive will be constructed connecting the north end of the WRRF to Northeast A Street and that a new bridge will be constructed that crosses Town Branch Creek.

No structural loading information is currently available for these structures; Once loading information is available, GTS should be provided this information and allowed to amend the recommendations outlined in this report, if necessary.

It is our understanding that total long-term settlement for the new structures should be limited to 1 inch and that allowable differential settlement should be limited to ½ inch across any planned structure footprint.

It should be noted that proposed improvements related to the installation of retaining walls are currently outside our scope of services, other than providing lateral earth pressures for any below-grade walls.

Planned Pavements

Prior to the issuance of this report, GTS has not been provided with any traffic loading design information. Therefore, in lieu of project specific loading, we have necessarily assumed traffic loading to calculate the pavement sections shown in this report. The assumed traffic loading values should be evaluated by the design team prior to use of the pavement sections provided in this report.

Planned Site Grading

Topographically, the project site is relatively flat (approximately 18 feet of topographic relief in 1,700 linear feet), with the site sloping downward from south to north. We understand that final grading is not available prior to the issuance of this report. However, preliminary FFEs were provided in the referenced RFP document. Utilizing the preliminary FFEs as well as 2-foot contours provided by Benton County, we were able to determine the preliminary cut and fill estimates presented in Table 1. Once final grading information is available, GTS should be provided with this information for review and to amend the recommendations outlined in this report, if necessary.

SUMMARY of SUBSURFACE FINDINGS

Geology

Based on the available geologic maps, the project site is located in the geologic unit mapped as the Boone Formation (Mb). The following description of this unit was obtained from the Stratigraphic Summary of Arkansas (Arkansas Geological Commission IC-36, 2004):

The Boone consists of gray fine to coarse grained fossiliferous limestone interbedded with chert. Some sections may be predominantly limestone or chert. The cherts tend to be dark in color in the lower part of the sequence and light in color in the upper part of the section. The quantity of chert varies considerably both vertically and horizontally. The Boone is well known for dissolutional features such as sinkholes, caves, and enlarged fissures. The thickness of the Boone is 300 to 350 feet in most of northern Arkansas.

Residual soils resulting from weathering of the Boone Formation typically consist of lean clays, lean to fat clays, and fat clay soils with varying amounts of chert gravel. Deeper soils usually classify as clayey gravel soils due to the increased chert content of the soil with depth. The subsurface conditions encountered at the boring locations is consistent with the Boone Formation overburden soils.

The subsurface soil and rock conditions encountered at the boring locations are consistent with the Boone Formation.

Surface

At the time of the field exploration, the boring locations were performed in areas of grass cover, asphalt pavement, and gravel cover. The surface type and thickness of the surface materials are identified on the boring logs provided in Appendix A of this report.

Subsurface Conditions

Existing Fill

Existing/possible fill materials were encountered at 19 of 26 performed boring locations. The locations where the fill was encountered, depths to which it extended, and the Standard Penetration Test (SPT) N-values recorded within the fill are summarized in Table 2. The boring locations where Existing/Possible Fill materials were not encountered are omitted from Table 2. Generally, the fill materials consisted of a combination of silt, clay, sand, and gravel soils having low to high (generally moderate) shear strength. SPT N-values ranged from 2 to 60 blows per foot (bpf) where encountered. The fill was identified as such due to discoloration of the material as well as a generally “jumbled” appearance.

Table 2: Existing Fill Material Locations

Boring Number	Depths/Elevation to bottom of Existing Fill (feet below existing grade)	Range of SPT N-Value (Blows Per Foot)
B-4	2 / 1124.0	31
B-5	13 ½ / 1115.5	17 to 60
B-6	5 ½ / 1122.5	17 to 24
B-8	8 ½ / 1125.5	10 to 26
B-9	8 ½ / 1123.5	7 to 14
B-10	9 ½ / 1122.5	9 to 16
B-11	3 ½ / 1128.5	9 to 12
B-12	10 / 1128	7 to 32
B-13	5 / 1128	14 to 20
B-14	5 / 1128	2 to 11
B-15	4 / 1129	8 to 10
B-16	4 ½ / 1128.5	8 to 17
B-17	8 ½ / 1124.5	7 to 15
B-18	2 / 1130.0	13
B-19	2 / 1130.0	18
B-20	2 / 1129.0	22
B-21	1 ½ / 1132.5	No full N-value recorded
B-24	13 ½ / 1124.5	2 to 5
B-26	11 ½ / 1126.5	11 to 22

Stratum I – Silts, Clays, Sands, and Gravels

A relatively thin stratum of native, interbedded, fine-grained and coarse-grained soils was typically present beneath the site surface or the existing fill, where encountered. Stratum I materials were not encountered at Borings B-12, B-24, or B-26. These native soils were found to be highly variable in terms of both composition and shear strength. The fine-grained soils included lean clays, fat clays, and silts, all with varying amounts of sand and gravel. The coarse-grained soils included sands and gravels with varying amounts of silt and clay. These soils were derived from the in-place weathering of interbedded chert and limestone associated with the Boone Formation

as well as being deposited by Town Branch Creek that flows south to north on the eastern boundary of the project site.

The native soils extended to approximate depths of 11 to 24 feet below existing grades, at which depths a bedrock stratum was encountered, except for Borings B-1, B-3, B-5, B-21, and B-22 where the soils extended to the terminal depths of the borings.

As noted above, the Stratum I soils had variable shear strength during drilling and sampling ranging from very low to moderate, but were generally moderate. N-values ranged from 2 to 47 bpf for these soils. Additionally, hard chert seams, layers, and possibly boulders were intermittently encountered within the Stratum I soils having SPT N-values of 50 per 2 to 4 inches of penetration.

Stratum II – Limestone

Limestone bedrock was encountered directly underlying the Stratum I soils and possible fill materials at 20 of the 26 performed boring locations. The borings were extended into the limestone to termination depths of about 15 to 40 feet below existing grades. The limestone bedrock was intensely to moderately weathered and soft to very hard where encountered.

At 18 of the 26 performed boring locations, auger refusal materials were encountered and then continuously sampled for about 2 ½ to 23 feet with an NQ-sized, double-barrel wireline coring assembly and a diamond-impregnated core bit. The auger refusal materials consisted of limestone bedrock. The rock cores had recoveries ranging from 45 to 100 percent. The Rock Quality Designation (RQD) of the rock cores ranged from 0 to 75 percent. No discernable voids were encountered during rock coring.

A laboratory compressive strength test was performed on relatively intact samples approximately every 5 feet of rock core recovered, where possible. The compressive strength of the tested core specimens is reported in Table 3 as well as on the boring logs located in Appendix A of this report.

Table 3: Limestone Bedrock

Boring Number	Depth/Elevation Encountered (feet below existing grade)	Termination Depth/Elevation (feet below existing grade)	Compressive Strength Range (psi)
B-2	11 / 1119.0	26 / 1104.0	7,950 to 23,670
B-4	21 ½ / 1104.5	31 / 1094.5	15,210 to 18,950
B-6	18 ½ / 1109.5	23 ½ / 1104.3	N/A
B-8	18 / 1116.0	19 / 1115.3	N/A
B-9	18 ½ / 1113.5	35 / 1097.0	5,080 to 21,150
B-10	19 / 1113.3	37 / 1095.0	3,910 to 10,090

Boring Number	Depth/Elevation Encountered (feet below existing grade)	Termination Depth/Elevation (feet below existing grade)	Compressive Strength Range (psi)
B-11	19 / 1113.0	36 / 1096.0	9,430 to 10,630
B-13	17 ½ / 1116.5	40 / 1093.0	8,440 to 31,880
B-14	18 ½ / 1114.5	40 / 1093.0	4,580 to 17,800
B-15	17 ½ / 1115.5	40 / 1093.0	6,702 to 12,288
B-16	17 ½ / 1114.5	40 / 1093.0	5,995 to 7,334
B-17	17 / 1116.0	40 / 1093.0	9,120 to 25,370
B-18	16 / 1116.0	35 / 1097.0	7,780 to 16,050
B-19	13 ½ / 1118.5	36 / 1096.0	6,505 to 17,420
B-20	13 ½ / 1117.5	36 / 1095.0	2,040 to 22,410
B-23	13 ½ / 1124.5	20 / 1118.0	3,888
B-24	13 ½ / 1124.5	20 / 1118.0	Sample Disturbed
B-26	13 ½ / 1126.5	15 / 1123.0	3,507
B-27	13 ½ / 1104.5	30 / 1088	9,153
B-28	19 / 1101	30 / 1090	3,350 to 8,476

Auger Refusal/Hard Drilling Conditions

Hard drilling and auger refusal conditions were generally encountered near the upper extents of the Stratum II bedrock. Additionally, hard drilling conditions were encountered periodically within the existing fill materials and Stratum I soils on hard seams or layers of chert as well as possible boulders. Hard drilling conditions were encountered at depths as shallow as about 1 ½ feet below existing grades. Hard drilling conditions were also encountered at depths as deep as 19 feet below existing grades.

Auger refusal material was encountered at most boring locations. Where auger refusal occurred, it occurred at depths of about 6 to 40 feet below existing grade.

The depths to hard drilling conditions and the depths to auger refusal at the performed boring locations are summarized in Table 4.

Table 4: Depths to Hard Drilling Conditions and Auger Refusal Material

Boring Number	Depths/Elevation to Hard Drilling Conditions (feet below existing grade)	Depths/Elevation to Auger Refusal Material (feet below existing grade)
B-1	14 / 1119.5	Not Encountered Above 20 Feet
B-2	4 ½ / 1125.5	11 / 119.0
B-3	13 ½ / 1116.5	Not Encountered Above15 Feet
B-4	18 ½ / 1108.5	21 ½ / 1104.5
B-5	3 ½ / 1125.5	Not Encountered Above 25 Feet
B-6	2 / 1126	Not Encountered Above 25 Feet
B-8	18 ½ / 1116.5	19 / 1115.3
B-9	18 ½ / 1113.5	18 ½ / 1113.5
B-10	19 / 1113.3	19 / 1113.3
B-11	19 / 1113.0	19 / 1113.0
B-12	Not Encountered Above 10 Feet	Not Encountered Above 10 Feet
B-13	17 ½ / 1116.5	17 ½ / 1116.5
B-14	18 ½ / 1114.5	18 ½ / 1114.5
B-15	17 ½ / 1115.5	17 ½ / 1115.5
B-16	17 ½ / 1114.5	17 ½ / 1114.5
B-17	17 / 1116.0	17 / 1116.0
B-18	16 / 1116.0	16 / 1116.0
B-19	13 ½ / 1118.5	15 / 1117.0
B-20	5 / 1126.0	16 / 1115.0
B-21	1 ½ / 1132.5	Not Encountered Above 15 Feet
B-22	Not Encountered Above 15 Feet	Not Encountered Above 15 Feet
B-23	13 ½ / 1124.5	15 / 1123.0
B-24	13 ½ / 1124.5	14 / 1124
B-26	13 ½ / 1126.5	13 ½ / 1126.5
B-27	13 ½ / 1104.5	15 / 1103
B-28	19 / 1101	19 / 1101

Water Measurements

Water observations were made by the drill crew during drilling and immediately after completion of drilling. The observations are shown in Table 5. This information is also displayed at the bottom of each boring log. Free ground water was not encountered during or at the completion of drilling at the boring locations omitted from Table 5. It should be noted that water was injected into the boreholes while coring and that most of the boreholes were dry after completion.

The depths to water are intended as isolated measurements of groundwater levels at the time of drilling. The installation and periodic measurement of monitoring wells would be required to establish seasonal piezometric surfaces below this project site. For this reason, a temporary piezometer was installed at Borings B-5 and B-15, as requested by HWEI; however, GTS is not responsible for taking future water measurements. A description of the piezometer is provided in the Subsurface Exploration and Procedures section of this report.

Table 5: Water Depth Measurements

Boring Number	Water Depth Measurements (feet below existing grades)	
	During Drilling	After Boring Completion
B-2	3	Dry
B-5	14	20
B-6	14	Dry
B-8	13 ½	Dry
B-11	19 ½	Dry
B-14	15	Dry
B-15	13	Dry
B-17	14	Dry
B-21	13 ½	Dry
B-23	12	Dry
B-24	8	Dry
B-27	9	Dry
B-28	9	Dry

GEOTECHNICAL ENGINEERING ANALYSIS

Geotechnical Considerations

Existing Fill

As stated previously, existing/possible fill materials were encountered immediately below the surface materials at 19 of 26 performed boring locations, as shown in Table 2. From this point forward, “possible fill” will be referred to as “existing fill”. Existing fill material extended to depths of about 1 ½ to 13 ½ feet below existing grades, where encountered. GTS assumes that the existing fill materials encountered at the boring locations were placed during construction of the various improvements that the site has undergone.

It is our experience that properties with previously existing structures, especially where mass grading has occurred, have a higher potential for encountering unknown conditions during mass grading and construction. These conditions include backfilled excavations, trash pits (buried debris), concrete foundations as well as underground utilities associated with the previous/existing structures.

Other than our assumptions, GTS has no information regarding the placement and compaction history of the existing fill. Compressible fill and/or deleterious and unsuitable materials might be buried within or by the existing fill. There is a potential risk of unpredictable settlement and performance by supporting foundations, floor slabs-on-grade, and pavements above the existing fill. This risk cannot be eliminated unless the existing fill is removed and replaced full depth with new fill. However, the risk can be mitigated through thorough testing and further investigation during construction. Existing fill materials should be evaluated on a case-by-case basis, and recommendations should be given in the field by GTS regarding whether or not the existing fills are suitable to remain in place.

Low Shear Strength Soils

Low shear strength soils (N-value of 6 or less) were encountered at 10 of the 26 performed boring locations. Table 6 summarizes the locations and depths where low strength soils were encountered:

Table 6: Location and Depth of Low Shear Strength Soils

Boring Number - Location	Depth of Low Shear Strength Soils (feet below existing grade)	N Values
B-4 Lift Station No. 3	2 to 3 ½	6
B-13 Tertiary	13 ½ to 17 ½	3
B-14 Tertiary	2 to 8 ½	2 and 5
B-15 Tertiary	5 to 8 ½	4
B-17 Electrical Building	8 ½ to 13 ½	4
B-20 Secondary Clarifier No.3	3 ½ to 5	5
B-23 Blower Building Vault	0 to 13 ½	5
B-24 Digester No. 5 Valve Vault	0 to 13 ½	2 to 5
B-27 East end of Planned Bridge	0 to 5	6, 5, and 3
B-28 East end of Planned Bridge	0 to 19	2 to 6

These low strength soils are not suitable for directly supporting footing foundations, slabs-on-grade, or new fills in their current condition. We recommend full depth removal and replacement of the low strength soils within the footprint areas of the planned structures. At each of the borings included in Table 6, excluding Borings B-17, we anticipate that the low shear strength soils will be removed during required excavations to achieve finished subgrade elevations. If low shear strength soils are exposed at the completion of required excavations, they should be removed full depth to expose stable native soils or limestone bedrock.

Special testing, observation, and mitigation recommendations are provided in the Mass Grading Recommendations section of this report that addresses this scenario.

Differential Bearing Materials – Shallow Rock

Based on our understanding of planned grades, the variable depth of bedrock across the project site, as well as the settlement criteria assumed in this report, there is a **slight** risk of the structures being partially supported on rock and partially on soil. This scenario would cause significant differential settlement across the planned structure footprints. As such, where both rock and soil are encountered at the planned subgrade elevation for either foundations or grade-supported slabs, the in-situ rock should be overexcavated such that a minimum of 1-foot of soil fill is constructed between the bottom of the planned footing foundations and floor slabs and the intact rock.

If bedrock is encountered across the entire footprint of a structure's foundations or grade-supported slab, there is no need to over-excavate the exposed rock.

Footing/Mat Foundation Recommendations

Bearing Materials

The subgrade beneath each of the structures should be prepared as recommended in the Mass Grading Recommendations section of this report, including full depth overexcavation and replacement of the existing fill as well as any low strength soils with new select fill.

Based on performing the recommended overexcavation and replacement, we expect that the foundations for these structures will bear within a combination of tested and approved, native soils and tested and approved, new, select fill or entirely on intact limestone bedrock.

Footing and mat foundations may be designed using the information provided in Table 7 on the following page.

Table 7: Footing Foundation Recommendations

Maximum Net Allowable Bearing Pressure (psf)	Bearing Soils Description	Depth to Bearing Soils
2,500 (Isolated, Column Footings)	Tested and Approved, Native Soils and Compacted and Tested, Select Fill Material [1]	Anticipated within 18 inches below Finished Subgrade, provided mass grading recommendations are followed
2,000 (Continuous, Strip Footings/Mat Foundations)		
10,000 (Column and Continuous Footings/Mat Foundations)	Tested and Approved Exposed Limestone Bedrock[2]	Anticipated if excavations extend to the depth/elevation of limestone bedrock provided in Table 3.

1) The recommended bearing soils should be relatively undisturbed, stable, and have moderate shear strength. Foundations may also be supported on flowable fill placed above the recommended bearing material.
2) Bedrock should be exposed the entire structure footprint and should be evaluated by GTS before the construction of planned foundations.

We recommend an ultimate coefficient of sliding friction of 0.32 for the interaction between the foundation base and tested and approved, select fill bearing materials and native soils.

We recommend an ultimate coefficient of sliding friction of 0.45 for the interaction between the foundation base and intact limestone bedrock.

An allowable passive pressure of 750 psf may be used for foundations cast directly against near-vertical sides in tested and approved, native soils and select fill or select fill compacted against the vertical footing face. An allowable passive pressure of 6,000 psf may be used for the portion of the foundations cast directly against near-vertical limestone. Passive resistance for exterior footings should be neglected in the upper 2 feet of the soil profile unless pavement or sidewalks are constructed directly against the structure exterior.

If a Winkler-type subgrade modulus model is used to model the mat response to load, a vertical modulus of subgrade reaction (k) of 100 pci (soil) or 200 pci (rock) can be used for designing a mat foundation bearing in tested and approved, stable soils or rock. A long-term modulus of subgrade reaction (ks) of 13.0 pci (soil) or 69.0 pci (rock) may be used for the modeling of elastic settlement and long-term consolidation settlement for mats supported on tested and approved soils or rock. The recommended Winkler subgrade modulus values are for a 30-inch round diameter plate and is based on correlation with soil type and consistency. The long-term modulus of subgrade reaction (defined as 'ks' in Foundation Analysis and Design, 5th Edition, page 548, by Bowles) considers both immediate elastic settlement and long-term consolidation settlement.

The mat foundations can provide uplift resistance for those structures subjected to wind or other induced structural loading. The uplift resistance of a mat foundation may be computed using the effective weight of the soil above the foundation along with the weight of the foundation and structure. A soil unit weight of 110 pcf may be assumed for the on-site soils placed above the foundation, provided the fill is properly compacted. If this value is critical to the design, the soil unit weight value should be further defined after the type of fill material is known and moisture-density relationship tests have been performed.

We estimate total long-term and differential settlement of foundations bearing in approved materials, designed and constructed as recommended in this report and per the Mass Grading Recommendations section of this report, should be less than 1 inch and ½ inch in 50 feet, respectively.

The foundations can provide uplift resistance for those structures subjected to wind or other induced structural loading. The uplift resistance of a foundation may be computed using the effective weight of the soil above the foundation along with the weight of the foundation and structure. A soil unit weight of 110 pcf may be assumed for the on-site soils placed above the foundation, provided the fill is properly compacted. If this value is critical to the design, the soil unit weight value can be further refined after the type of fill material is known and moisture-density relationship tests have been performed.

Footing Foundation Construction Recommendations

General Dimensions

Continuous formed and isolated column foundations should have minimum widths of 18 inches and 30 inches, respectively. Footings should be designed with a minimum foundation depth of 18 inches below lowest adjoining grade.

Allowable Backfill Materials

Soil fill material or aggregate base may be used to backfill foundation over-excavations. Additionally, a controlled low strength material (flowable fill) may be used to backfill foundation over-excavations. Specifications regarding these materials are shown in the Geotechnical Report Requirements and Specifications section of this report.

If both bedrock and soil are exposed at bottom of foundation elevations and rock is over-excavated a depth of 1 foot as recommended in the Differential Bearing Materials section of this report, soil fill material should be used as backfill material. Aggregate base and flowable fill should not be used as backfill material if rock is over-excavated a depth of 1 foot as recommended in the Differential Bearing Materials section of this report.

Finally, if foundations are designed to bear directly on intact bedrock, flowable fill should be used to backfill foundation over-excavations. To be clear soil fill material or aggregate base should not be used as backfill material if foundations are designed to bear directly on intact bedrock.

Construction Guidelines

Foundation excavations should be cleaned of loose soils, rock, debris, and water. The bottom of all footing foundation excavations should be tested and evaluated by GTS to evaluate the bearing materials prior to placement of new fill, reinforcing bar, and concrete.

After following the mass grading recommendations provided in this report, the recommended bearing materials are anticipated to be encountered at plan bottom of foundation elevations throughout the building footprints.

If unsuitable bearing materials are encountered at the base of the planned footing excavation, the excavation should be overexcavated to reach suitable bearing materials. The footing could be extended deeper to bear directly on the approved bearing materials or the overexcavation could be backfilled with flowable fill or compacted select soil fill or aggregate base course.

Additionally, as discussed previously, if a combination of limestone bedrock and native soils is exposed at bottom of foundations elevations, the limestone bedrock should be over-excavated to a

depth of 1 foot below the design bearing elevation to allow for the placement and compaction of select soil fill materials.

If select soil fill or aggregate base course materials are used to backfill foundation overexcavations for footings designed to bear on soil materials, the overexcavation should extend at least 8 inches beyond the footing perimeter for every 12 inches of depth below the bottom of footing, per Figure 4 on the following page. Select soil fill or aggregate base course materials should be placed and compacted as recommended in the Geotechnical Report Requirements and Specifications of this report. We recommend the select soil fill and aggregate base course, if used to backfill foundation excavations, be field tested for in-place density each lift and again immediately before the placement reinforcing bar and concrete.

If flowable fill is used to backfill foundation excavations, the excavations do not need to be widened as shown in Figure 4 below. The flowable fill should be placed as soon as possible after foundation overexcavations are completed and have been evaluated for bearing suitability. Flowable fill should be field sampled and laboratory tested for strength every day of placement.

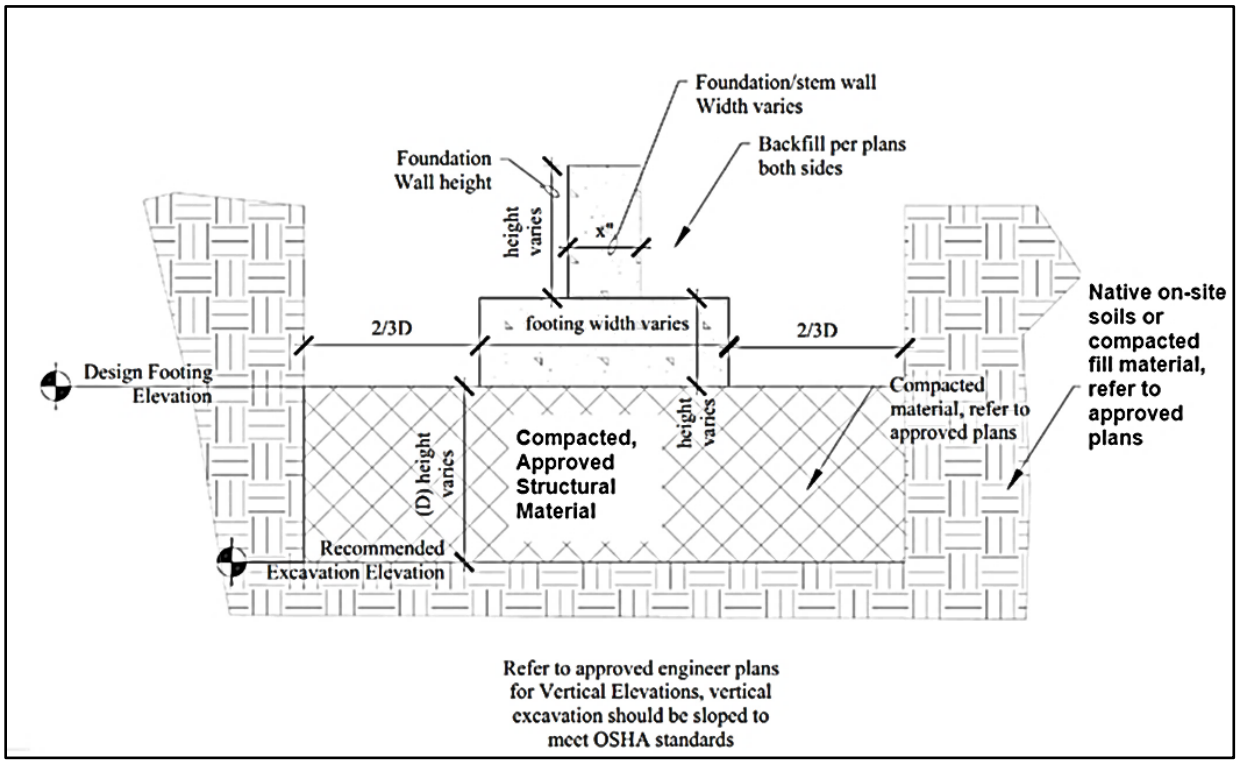


Figure 4: Foundation Trench Backfill Detail for Select Soil or Aggregate Base Course Fill

Stress and Bearing Interactions with Existing Building Foundations

Care should be taken during any excavation adjacent to existing slabs-on-grade or foundations, so as not to disturb any existing slab or foundation bearing materials. Excavations that extend below the level of the existing slabs or foundations should be backfilled the same day they are

excavated. Where this is impractical, shoring or underpinning of existing slabs and foundations may be required.

The contractor is responsible for the means and methods of safe excavations, protection of existing structures and protection of all personnel entering the excavation. However, shoring and bracing should be expected to be required if large excavations are required near the existing building footprint.

If there will be underground piping between a new structure and an existing structure, the piping should be designed with flexible couplings and/or utility knockouts in foundation walls should be oversized, so minor deflections in alignment do not results in distress or breakage.

Drilled Pier Foundation Recommendations (Planned Bridge)

Drilled Pier Design Recommendation

Based on the subsurface conditions encountered at the two bridge borings, we recommend that a deep foundation system consisting of cast-in-place, straight-shaft, concrete drilled piers support the planned bridge structure. The recommended limestone bearing material was encountered at depths of about 13 ½ feet and 19 feet, respectively, at Borings B-27 and B-28. The drilled piers should be designed to bear a minimum of one pier diameter into the competent limestone bedrock as defined by this report. The piers may be designed using the geotechnical parameters shown in Table 8.

The design soil and rock parameters shown in Table 8 were calculated using a factor of safety of approximately 3 for end bearing and 2 for side friction. For the purposes of this project, compressive axial loads on pier foundations should only be resisted by end bearing at the base of the shaft, while uplift loads should be resisted by skin friction along the shaft and by the weight of the shaft. Due to strain compatibility, skin friction in soils should only be used to resist uplift force, not axial compressive loads.

We recommend a minimum shaft diameter of 24 inches. Drilled piers should have a minimum (center-to-center) spacing of 3 pier diameters. The minimum spacing should be maintained to prevent the pile group compression load capacity from being significantly less than the summation of individual pile capacities. Closer spacing may require a reduction in axial load capacity.

Table 8: Drilled Pier Foundation Design Recommendations

Depth Below Existing Ground Surface (ft.)	Soil/Rock Description	LPile Soil Type	Effective Unit Weight γ' (pcf)	Friction Angle φ (°)	Cohesion c' (psf)	Allowable Skin Friction (psf)	Horizontal Modulus of Soil Reaction K_f (pci)	Strain at 50% of Ultimate Compression γ_{50}	Net Allowable End Bearing Pressure q_{all} (psf)
0 to 3	Generally Existing Fill	NA	110	The top 3 feet of soils should be ignored in design					
3 to top of competent limestone bedrock (Varies, See Table 3)	Existing Fill and Native Soils	Stiff Clay without Free Water (Reese)	110	0°	500	125 Uplift Only	13	0.015	NR[A]
15 to 19 (See Table 3)	Competent Limestone Bedrock	Strong Rock	140	0°	500[B]	7,500	75,000[C]	0.0005	50,000[D]

[A] NR = Not recommended
[B] Uniaxial Compressive Strength (psi)
[C] Mass modulus of weak rock (psi)
[D] The drilled piers should be embedded a minimum distance of 1D into the recommended bedrock.

Drilled piers should have a minimum length to diameter ratio (L:D) of 3:1. Drilled shaft lengths of about 17 to 21 feet below existing grade (or more) are anticipated to be required, to satisfy the recommended minimum rock penetration assuming a 24-inch diameter pier (2-foot embedment into the underlying competent limestone).

A reduction in the lateral resistance of the shadowed shaft in a foundation designed with a shaft group should be considered when the shaft spacing in the direction of loading is less than 6 shaft diameters. Group action can be evaluated by reducing the lateral resistance of the shadowed shafts in the direction of loading as a function of the shaft spacing as follows in Table 9.

Table 9: Drilled Pier Group Action

Pier Spacing (center-to-center, diameters)	3D	4D	5D	≥6D
Lead Row	0.7	0.85	1.0	1.0
2nd Row	0.5	0.65	0.85	1.0
3rd Row and higher	0.35	0.5	0.7	1.0

Total long-term and differential settlement of drilled pier foundations, designed and constructed as recommended in this report, are estimated to be less than ½ inch for total and differential settlement between isolated piers.

Construction Guidelines

All drilled pier excavations should be evaluated for suitable bearing material by GTS prior to placement of reinforcing bar and concrete. Additionally, the drilled pier excavations should be cleaned of loose soil/rock, debris and water prior to reinforcing bar and concrete placement.

Concrete should be placed directly down the center of the foundation reinforcing. This can be accomplished with a tremie pipe to place the concrete to the bottom of the foundation. This can be accomplished with moderate success by inverting the back chute of the concrete redi-mix truck and directing the concrete discharge into the center of the drilled pier reinforcing. The preferred method, however, is to use a tremie pipe to place the concrete to the bottom of the pier excavation.

Drilling shafts in uncontrolled fill could be problematic if construction debris or other deleterious material is encountered within the fill mass. Additionally, because of the varying depths of low strength soils, the presence of existing fill, and the potential for perched water to be encountered near the soil-rock interface, temporary casing may be required to allow construction of the drilled piers. Temporary casing should be made available to prevent the influx of soil and water into the foundation excavation. The contractor should determine if temporary steel casing is required based on subsurface conditions encountered during construction.

If water is encountered in pier excavations, we anticipate that water can be removed by using suction pumps for pier depths less than 20 feet. If water cannot be removed in the excavations by pumping, the concrete should be tremied completely to the bottom of the excavation with a closed-end tremie.

If temporary casing is used, the concrete used in the foundations should have a slump of 5 to 7 inches to reduce the likelihood of honeycombing within the foundation and to provide a positive pressure against the earth-formed sides of the foundation excavation. Therefore, the concrete mix design used in the foundations should have a demonstrated history of meeting the specified strength when placed at a higher-than-normal slump.

Finally, a heavy-duty drill rig equipped with a coring barrel will be needed to penetrate the limestone bedrock.

GTS should observe all drilled pier excavations to evaluate the suitability of the bearing materials and to confirm that conditions in the drilled pier excavations are consistent with those encountered in the borings.

Conventional Slab-on-Grade Design

The following recommendations are provided for conventional slab-on-grade design. The subgrade should be prepared as recommended in the Mass Grading Recommendations section

of this report, including overexcavating and replacing any low-strength soils and existing fill full depth with new select fill.

Slabs-on-grade supported on tested and approved, native Stratum I soils and/or select fill, prepared as recommended in this report, can be designed using a modulus of subgrade reaction (k) value of 100 pounds per square inch, per inch. We recommend that a minimum of 4 inches of free draining gravel or sand be placed beneath the slab-on-grade to act as a capillary break. This layer is termed a “subbase” layer.

To be effective as a capillary break, the subbase should have a maximum of 5 percent by dry weight passing the No. 200 sieve. The modulus of subgrade reaction value applies to the top of the subbase layer. The top of the subbase should be compacted using a vibratory plate.

If rutting of the subbase layer is a concern for concrete placement, the subbase layer may be topped with an additional 2 to 4 inches of gravel or sand having sufficient fines to allow compaction. The optional topping layer is termed the “base” layer. The base layer, if used, should be compacted to a minimum of 95 percent Modified Proctor maximum dry density (ASTM D1557) at a workable moisture content that allows the density to be achieved. The base layer should have a percent passing the No. 100 sieve ranging from 10 to 30 percent by dry weight. ARDOT Class 7 Aggregate Base Course material is acceptable to use in the base layer.

A vapor barrier having a minimum thickness of 10 mil is recommended immediately below the concrete unless otherwise recommended by the finished flooring manufacturer or other members of the design team.

The general components of a floor slab, inclusive of the optional base course, are shown in Figure 5 below. The shown reinforcing steel location provides general guidance only. The location and composition of reinforcing steel should be determined by a structural engineer.

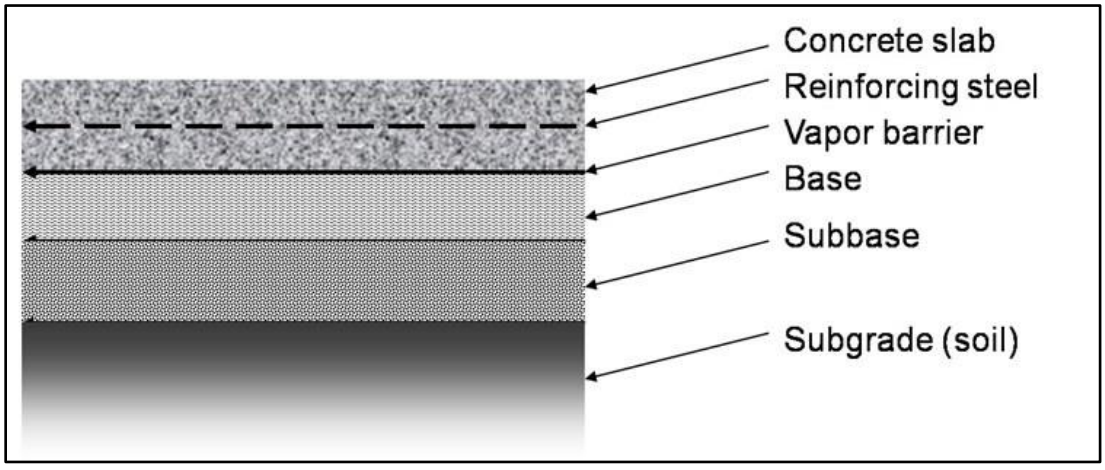


Figure 5: General Floor Slab-on-Grade Section

IBC Site Classification

Based on our knowledge of the regional geology, and the subsurface conditions encountered at the boring location, the subsurface conditions at this project site are consistent with a Site Class C per the International Building Code (IBC), 2021 Edition.

The borings performed at this site were extended to a maximum depth of approximately 40 feet below the existing ground surface. The subsurface conditions below the boring termination depth to 100 feet were estimated based on our knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depths.

The following mapped acceleration parameters may be used in design in accordance with 2021 IBC (ASCE7-16):

- Seismic Site Class: C
- S_s: 0.153 g
- S_1: 0.089 g
- F_a: 1.3
- F_v: 1.5
- S_{DS}: 0.132 g
- S_{D1}: 0.089 g
- PGA_M: 0.094 g

These values were obtained using on-line seismic tools provided by the USGS (https://seismicmaps.org) at the site location coordinates of Latitude: 36.39174917 °, Longitude: -94.20393362 °.

MASS GRADING RECOMMENDATIONS

The following recommendations are provided for preparing the subgrade soils for supporting new pavements and other grade-supported structures.

Stripping of Surface Materials

Mass grading should extend a minimum of 5 feet outside of the structure footprints and 2 feet beyond the back of curb in all directions in pavement areas. Surface organics, gravel, debris, and any surface or subsurface structures from previous site use should be removed from the areas of planned new construction. The topsoil material (if any) may be stockpiled and reused for landscaping, at the discretion of the design team.

Additionally, as previously discussed, we recommend full-depth removal and replacement of the existing fill and any low shear strength soils with new select fill. We recommend budgeting for a minimum undercut depth of 2 feet within the footprints of the planned structures. Furthermore, the existing fill materials were encountered to depths of about 1 ½ to 13 ½ feet below existing grades at 19 of the 26 borings drilled. The locations and depths of the existing fill materials are summarized in Table 2.

Regarding the existing fill, as stated previously, the excavation of the existing fill materials can be evaluated during construction on a case-by-case basis to determine if the existing fill materials need to be excavated or are suitable to remain in place.

General Mass Grading

After stripping surface materials, completing cuts necessary for grading, and completing the recommended undercut to remove any existing fill and low strength soils, and before placing new fill, the exposed soils should be evaluated by GTS.

The exposed soils in the planned structure footprints should be evaluated for stability through proofrolling with a loaded, tandem-axle dump truck weighing at least 25 tons. Provided the subgrade soils are stable, the exposed soils are suitable to directly support the placement and compaction of new approved fill material.

If the excavations for the planned structures will be too steep and inaccessible to proofrolling equipment, GTS should test and evaluate the exposed soils by using hand probes, cone penetrometer tests, and dynamic cone penetrometer tests.

Where unstable soils are identified by proofrolling/testing in the planned structure areas remaining near existing grade, they should be scarified, moisture conditioned, and compacted, or removed and replaced full depth with new select fill.

If the prepared subgrade should become saturated, desiccated, frozen, or otherwise damaged prior to construction of the slabs-on-grade, the affected subgrade material should be scarified,

moisture-conditioned and compacted prior to placing the aggregate base course. Final conditioning of the finished subgrade should be performed immediately prior to placement of the slab-on-grade aggregate base course material.

Weather and Instability Considerations

Soil stability is directly related to the moisture within and below the exposed soils. If the on-site existing fill and native (Stratum I) soils are moist to wet or have undergone freeze-thaw cycles after mass grading and/or placement and compaction, we anticipate that the near-surface soils will likely be unstable.

If the exposed subgrade soils are unstable but otherwise suitable to remain in-place based on their classification or depth below plan finish grades, they may be scarified and allowed to dry to achieve stability if the construction timeframe and prevailing weather conditions allow. Alternatively, the unstable soils could be undercut and replaced full depth with new select fill. For budgeting purposes, an average undercut depth of 2 feet below existing grade is anticipated when the on-site soils are wet.

Other ground improvement methods could be provided during construction based on the actual site conditions at that time. The appropriate method of improvement, if required, would depend on factors such as schedule, weather, the size of area to be improved, and the nature of the instability. Performing site grading operations during extended periods of warm, dry weather would help reduce the amount of subgrade stabilization required.

Fill Placement

Lifts of fill material required to reach plan finished subgrade elevation should be composed of tested and approved fill material and placed per the specifications shown in this report. Fill should be placed in near-horizontal lifts beginning in areas requiring the deepest amount of fill. The fill should be benched into the existing fill and native soils each lift. Fill should not be placed on frozen, saturated, desiccated, or unstable soils.

The requirements to meet for select fill material, aggregate base course material and, flowable fill are provided in the Geotechnical Report Requirements and Specifications section of this report.

Re-Use of On-Site Soils as Fill

Based on the variability of the existing fill and native soils, we recommend importing select fill materials for the planned project. The on-site native soils could be re-used as general fill in non-structural areas. Larger, bulk samples of the on-site soils proposed for use as fill by the contractor should be sampled by GTS during mass grading and laboratory tested to confirm the apparent classification of these soils prior to re-use as fill.

Imported soil fill for use as select fill should be tested and approved prior to use as fill on this site. Imported soil fill containing rock will need to be crushed into pieces no greater than 3 inches in any dimension prior to use.

Utility Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Utility trenches are a common source of water infiltration and migration. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Grading and Drainage

During construction, grades should be developed to direct surface water flow away from or around the site. Exposed subgrades should be sloped to provide positive drainage so that saturation of the subgrade is avoided. Surface water should not be permitted to accumulate on the site to reduce the potential for strength loss of the subgrade soils.

Final grades should be sloped away from the structures on all sides to promote effective drainage and prevent water from ponding. Downspouts, if used, should discharge water a minimum of 10 feet beyond the footprint of the building structures. This can be accomplished by using splash-blocks and downspout extensions.

If water develops in excavations, we anticipate that sump pits and suction pumps could be used to alleviate the water seepage. The need for dewatering and dewatering system design should be based on the actual subsurface water conditions encountered at the time of construction.

Difficult Excavation Potential

Based on the subsurface conditions encountered at the boring locations, we expect that the existing fill materials and native soils (Strata I) can be excavated using conventional excavation equipment. Rock excavation means and methods are expected to be required to penetrate seams, layers, and boulders of chert as well as possibly bedrock beginning at the hard drilling depths provided in Table 4.

In general, track hoes and dozers with rock excavation attachments are expected to be required below the depths where we encountered hard drilling. The use of hydraulic or pneumatic hammers, rock breakers, rock saws and controlled blasting could be required near and below the depths where we encountered competent rock and auger refusal. Greater rock excavation effort is expected in limited access excavations, such as for foundations and utility trenches.

Temporary Earth Slopes and Excavations

Temporary earth slopes will be constructed during development of the project site. The recommended maximum temporary slopes for overburden soils are 2 H:1 V (Horizontal:Vertical) and for the deeper, hard limestone is nearly vertical. Alternatively, local construction practices allow for benched excavations (4 feet vertical followed by 4 feet horizontal) with an effective slope of 1H:1V.

The contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom. All excavations should comply with applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards.

LATERAL LOADING CONDITIONS

Walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those defined in the below diagram and indicated in the table on the following page. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement/rotation at the top of the wall. The "at-rest" condition assumes the wall is structurally restrained from movement at the top and should be used for basement walls.

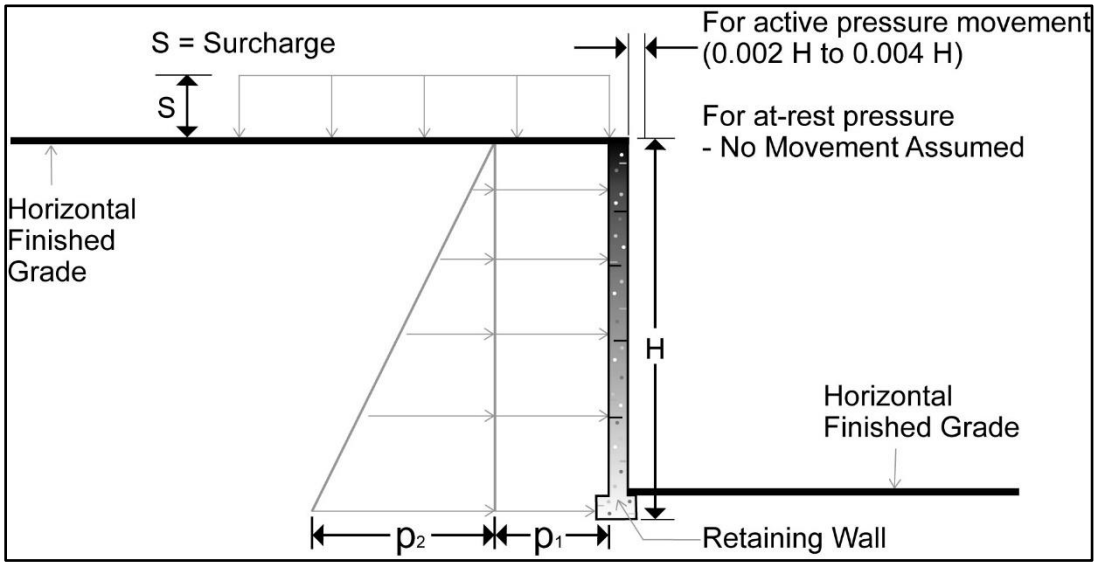


Figure 6: Lateral Earth Pressure Diagram

The recommended design lateral earth pressures shown in Table 10 on the following page do not include a factor of safety and are based on a drained soil condition behind the wall.

Backfill placed against structures should consist of granular soils or low plasticity clay soils. For the granular fill material values to be valid, the granular fill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, values of 0.32 or 0.45 should be used as the ultimate coefficient of friction between the retaining wall foundation and the underlying tested and approved, select fill/native soils or rock, respectively.

Table 10: Design Lateral Earth Pressure Parameters

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (Ka)	Granular - 0.33	40	(0.33)S	(40)H
	Clay - 0.42	50	(0.42)S	(50)H
At-Rest (Ko)	Granular - 0.50	60	(0.50)S	(60)H
	Clay - 0.59	70	(0.59)S	(70)H
Passive (Kp)	Granular - 3.0	360	---	---
	Clay - 2.4	288	---	---

The values shown in Table 10 require the following:

- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 H to 0.004 H, where H is wall height
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance.
- Uniform surcharge, where S is surcharge pressure
- In-situ soil or placed and compacted soil backfill with a maximum weight of 120 pcf
- Backfill placed near horizontal, compacted to a minimum of 95 percent of standard Proctor maximum dry density
- Loading associated with backfill operations and construction not included in the recommended design values
- A drained soil condition exists behind the wall
- No dynamic loading acting above the wall
- No safety factor included in soil parameters
- Ignore passive pressure in frost zone

To reduce hydrostatic pressure behind the wall (i.e., a “drained” soil condition) we recommend that a minimum 12-inch-wide chimney drain be installed continuously on the back side of the retaining structure, with a collection pipe installed at the top of the foundation. The collection pipe should be rigid, perforated pipe and should be designed to discharge to a water collection system, such as a sump pit and pump.

If constructing drainage behind the retaining wall is not feasible (i.e., an “undrained” soil condition), a combined hydrostatic and lateral earth pressures should be calculated for lean clay backfill using an equivalent fluid pressure of 90 and 100 pcf for active and at-rest conditions, respectively. For granular backfill, an equivalent fluid pressure of 85 and 90 pcf should be used for active and at-rest, respectively.

These pressures do not include the influence of surcharge, foundation, equipment, or floor loading which should be added. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than provided.

We anticipate that below-grade walls (if any) could be exposed to seasonal fluctuations in long-term water levels. The below-grade walls should be waterproofed, and keyways and water stops should be provided at all construction joints.

The upper 2 feet of backfill placed adjacent to the walls should consist of a compacted, relatively impermeable, material to limit the downward flow of surface water along the walls. As an alternative, the surface within 5 feet adjacent to the walls could be sealed with pavement or sidewalks. Soil fill should be placed following the recommendations provided in this report. Also, positive surface drainage should be developed and maintained around the walls to prevent the ponding of water and to divert drainage away from the walls.

Dynamic Design Parameters

We recommend that retaining walls be designed for a seismic earth pressure determined using the Mononobe-Okabe method. For seismic loading on retaining walls with level backfill, new research[1] indicates that the seismic load is to be applied at 1/3 H of the wall measured from the base, where H is the height of the wall. We recommend that a Mononobe-Okabe earthquake thrust per linear foot of 2.6 H^2 be applied for Granular backfill, applied at 1/3 H up from the base of the wall, where H is the height of the wall measured in feet, and 3.0*H^2 be applied for Clay backfill.

[1] Lew, M., et al (2010). "Seismic Earth Pressures on Deep Building Basements," SEAOC 2010 Convention Proceedings, Indian Wells, CA.

PAVEMENTS

Pavement Support Recommendations

New pavements should be supported on a minimum of 1 foot of select fill material having a minimum laboratory California Bearing Ratio (CBR) value of 8.0, placed and compacted atop stable onsite soils.

Specific recommendations concerning construction of the pavement subgrade, including the potential need for additional select fill to stabilize unstable subgrade soils, are provided in the Mass Grading Recommendations section of this report.

Pavement Design Recommendations

No pavement loading design guidance has been provided to GTS by the design team. Therefore, the pavement sections provided in this report are based on a low-volume traffic design consisting of light-duty pavement sections for automobile-only traffic areas, medium-duty pavement sections for drive lanes and fire lanes, and heavy-duty pavement sections for delivery/garbage truck traffic and dumpster areas.

A CBR of 4 was used for the design of flexible pavements (average of 1 foot of CBR 8 material and the worst case scenario of onsite soils having a CBR value of 1.0). A modulus of subgrade reaction (k) of 100 pounds per square inch, per inch, was used for the design of the rigid pavements. Pavement design recommendations assume rapid drainage away from the pavement section will be provided during and after construction.

To prevent early depreciation of the new flexible pavements, we recommend that all areas where heavy traffic make frequent starts and stops consist of rigid pavement. The following flexible and rigid pavement sections provided in Tables 11 and 12 on the following page are recommended.

Table 11: Flexible Pavement Section Recommendations

Flexible Pavement Section:	Asphalt Course		Class 7 Aggregate Base Course	Design Traffic
	Surface Course (½" [12.5 mm])	Binder Course (1" [25 mm])		
Light-Duty	2 inches	-	8 inches	parking areas for car and passenger truck
Medium-Duty	3 inches	-	9 inches	drive lanes for passenger cars and light trucks and fire lanes
Heavy-Duty	2 inches	2 ½ inches	8 inches	light semi-truck traffic
Specification[1]	*Section 407-1 PG 70-22 75 Gyrations*	*Section 406-1 PG 70-22 75 Gyrations*	*Section 303*	

[1] Standard Specification for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2014.

Table 12: Unreinforced Rigid Pavement Section Recommendations

Rigid Pavement Section Alternative:	4,000 psi Portland Cement Concrete Pavement	Base Course (Class 7)	Design Traffic
Light-Duty	5 inches	4 inches	car and passenger truck
Medium-Duty	6 inches	4 inches	drive lanes for passenger cars and light trucks and fire lanes
Heavy-Duty	8 inches	4 inches	light semi-truck traffic and dumpster areas
Specification[1]	*Section 501*	*Section 303*	

[1] Standard Specification for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2014.

GEOTECHNICAL REPORT REQUIREMENTS and SPECIFICATIONS

Unless otherwise stated in this report, the recommendations contained in this report are based on the compaction specifications and material types noted in Table 13, Table 14, and the paragraphs on the following page.

Table 13: Compaction Criteria

Type of Material	Moisture-Density Specification	Minimum Dry Density (percentage of Proctor)	Range from Optimum Moisture Content (%)
Select Fill Material – Beneath Planned Structures, Buildings and Pavements	ASTM D698 (Standard Proctor)	95	-1 to +3
General Fill Material – Outside of the Structural Areas	ASTM D698 (Standard Proctor)	92	-1 to +3
ARDOT Class 7 Aggregate Base Course	ASTM D1557 (Modified Proctor)	95	Adequate to Achieve Compaction
Flowable Fill Material	ARDOT Section 206	Not applicable	Flowable Fill Material

Table 14: Soil Fill Material Requirements

Type of Soil Fill	Location/Use	Maximum LL	Maximum PI	USCS Classifications
Select	All Areas	40	18	CL, SC, GC
General	Non-Structural Areas	45	20	CL, SC, SM, GC, GM,

Fill material should have a maximum nominal aggregate size of 3 inches or less after placement and compaction.

Fill needed for site grading should be placed in loose lifts not exceeding 9 inches in thickness (compacted lift thickness of approximately 6 to 7 inches). We recommend the fill be tested for density every lift during site grading, with a minimum of one test every 2,500 square feet of the structure area and 10,000 square feet in pavement areas. The recommended moisture content and compaction of the fill should be maintained until fills are completed and slabs-on-grade are constructed. Select fill should be tested each lift, at each column location, and every 25 linear feet of continuous foundation. Additionally, we recommend that the new fill material is tested for in-place density immediately before placement of reinforcing bar and concrete.

SUBSURFACE EXPLORATION and PROCEDURES

The subsurface exploration consisted of evaluating and sampling a total of 26 sample boring locations, identified as Borings B-1 through B-6, B-8 through B-24, and B-26 through B-28. Each boring was drilled and sampled to the depths required in the provided RFP document.

The boring locations were established in the field by a HWEI survey prior to the commencement of field operations.

The borings were drilled with a buggy-mounted CME-550X drill rig and a truck-mounted Geoprobe 3100 GT drill rig. Disturbed samples and estimates of the in-situ shear strengths of the existing fill, natural soils, and weathered rock were obtained using an automatic-hammer-driven split-barrel sampler in general accordance with the Standard Penetration Test (SPT) at the boring locations. Rock samples were obtained using an NQ-sized double-barrel wireline coring assembly and a diamond-impregnated core bit.

An automatic SPT-hammer was used to advance the split-barrel sampler in the boreholes. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the SPT-N value. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Temporary piezometers were installed to a depth of about 24 feet below existing grade in the borehole at Boring B-5 and a depth of about 17 feet below existing grade in the borehole at Boring B-15. Two-inch diameter, slotted PVC casing was used in the bottom 5 feet, and 2-inch diameter, solid PVC casing was installed above the casing to a height of about 4 feet above the ground surface. The annulus was backfilled with clean filter sand from the bottom of the boring to a depth of about 2 feet above the slotted PVC casing section at both locations. Bentonite chips were placed in the annulus above the sand for the following 2 to 3 feet of depth. The uppermost section of annulus was backfilled with grout (1-foot minimum). PVC caps were used on the top and bottom of the piezometer.

The soil and rock samples obtained in the field were sealed to reduce moisture loss and taken to the GTS soil laboratory for further examination, testing, and classification. The results of laboratory tests on select samples are shown on the boring logs and are attached to this report.

Field logs were prepared during the drilling and sampling of the borings. These logs report sampling methods, sampling intervals, soil, rock, and groundwater conditions, and notes regarding soil, rock, and drilling conditions observed between sample depths. The final boring logs, included in this report, have been prepared based on the field logs and have been modified, where appropriate, based on the results of the laboratory observation.

LABORATORY TESTING and PROCEDURES

The soil samples were examined in the laboratory by an experienced geotechnical engineer and classified based on the soil's texture and plasticity, in accordance with the Unified Soil Classification System. The estimated Unified Soil Classification System group symbols are shown on the boring logs.

The laboratory testing was performed by GTS, Inc. in general accordance with the American Society for Testing and Materials (ASTM) test designations shown in the table below:

Table 15: Laboratory Test Method Designations

Laboratory Test	Test Designation	Method (if applicable)
Moisture Content of Soil	ASTM D2216-10	Method A
Visual Classification of Soil Types	ASTM D2488	
USCS Classification	ASTM D2487	
Atterberg Limits	ASTM D4318	Method A
Sieve Analysis	ASTM D6913	Method A
Compressive Strength of Rock Cores	ASTM D7012	Method C

The results of the classification tests are presented on the boring logs and in Appendix B.

GEOTECHNICAL REPORT LIMITATIONS

The recommendations contained in this report are based on our interpretation of subsurface conditions encountered at the discrete boring locations. Variations between the subsurface conditions anticipated in this report and actual project site conditions may occur away from the boring locations.

If significant differences between the findings of the borings and site conditions are observed, GTS, Inc. should be contacted to assess the variation and, if necessary, reevaluate the recommendations contained in this report.

ENVIRONMENTAL EXCLUSION

A Geotechnical Engineering Report assesses the engineering properties of soil and rock. No environmental assessment of a project site is performed during a geotechnical exploration. If the owner is concerned about the potential for environmental hazards at the project site, additional studies should be performed by GTS, Inc.

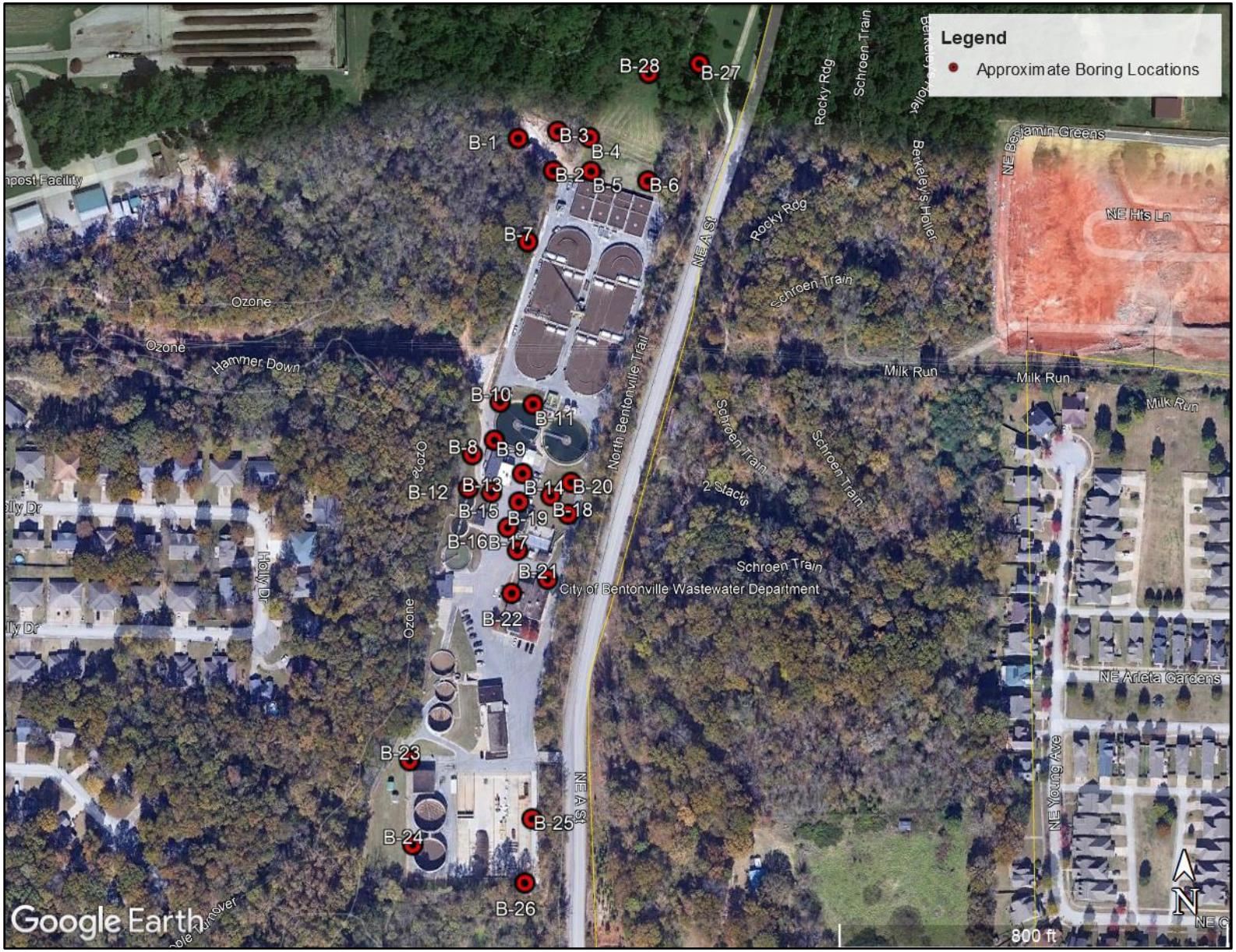
APPENDIX A

Boring Location Diagrams

Boring Logs

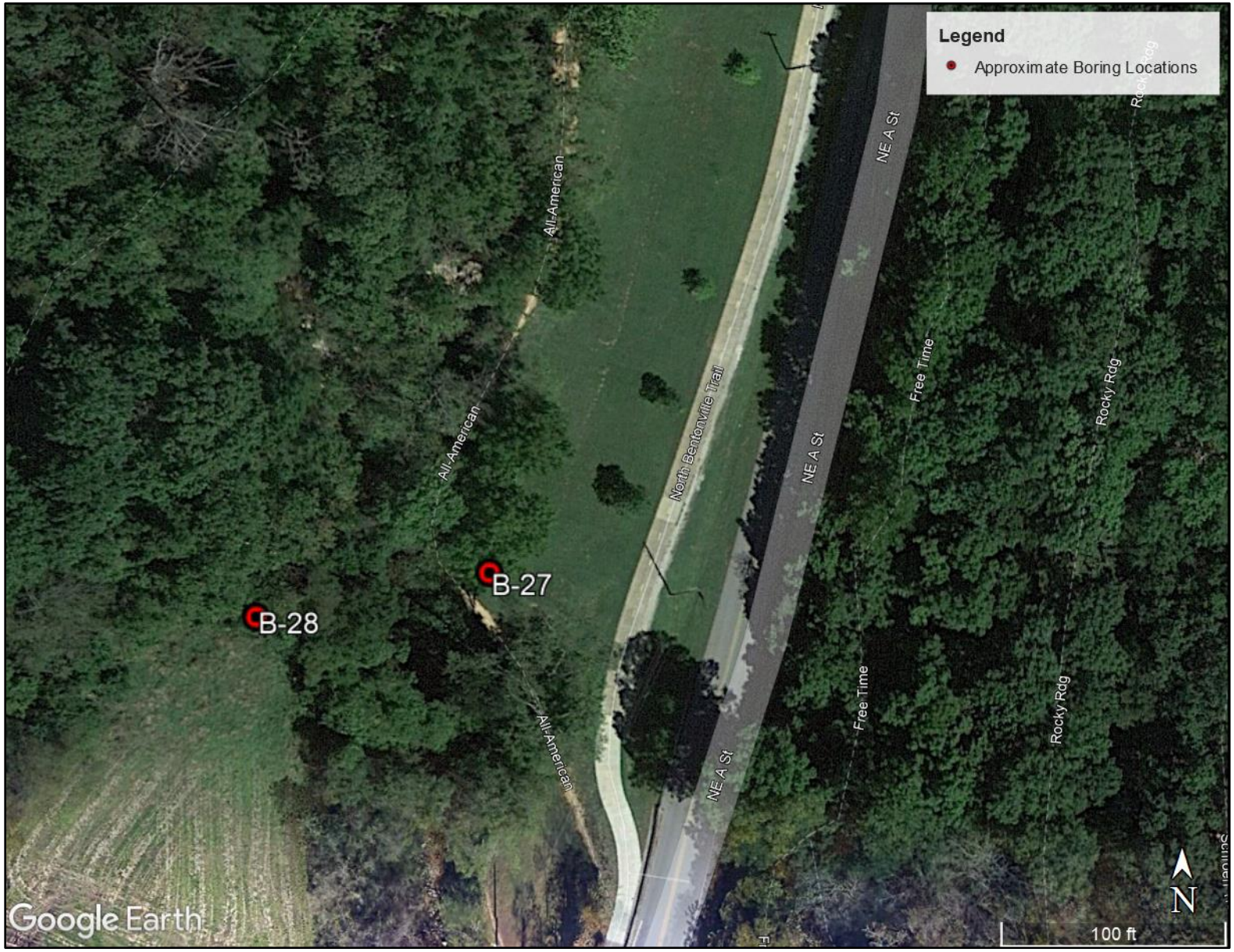
Soil Classification Legend

Rock Classification Legend



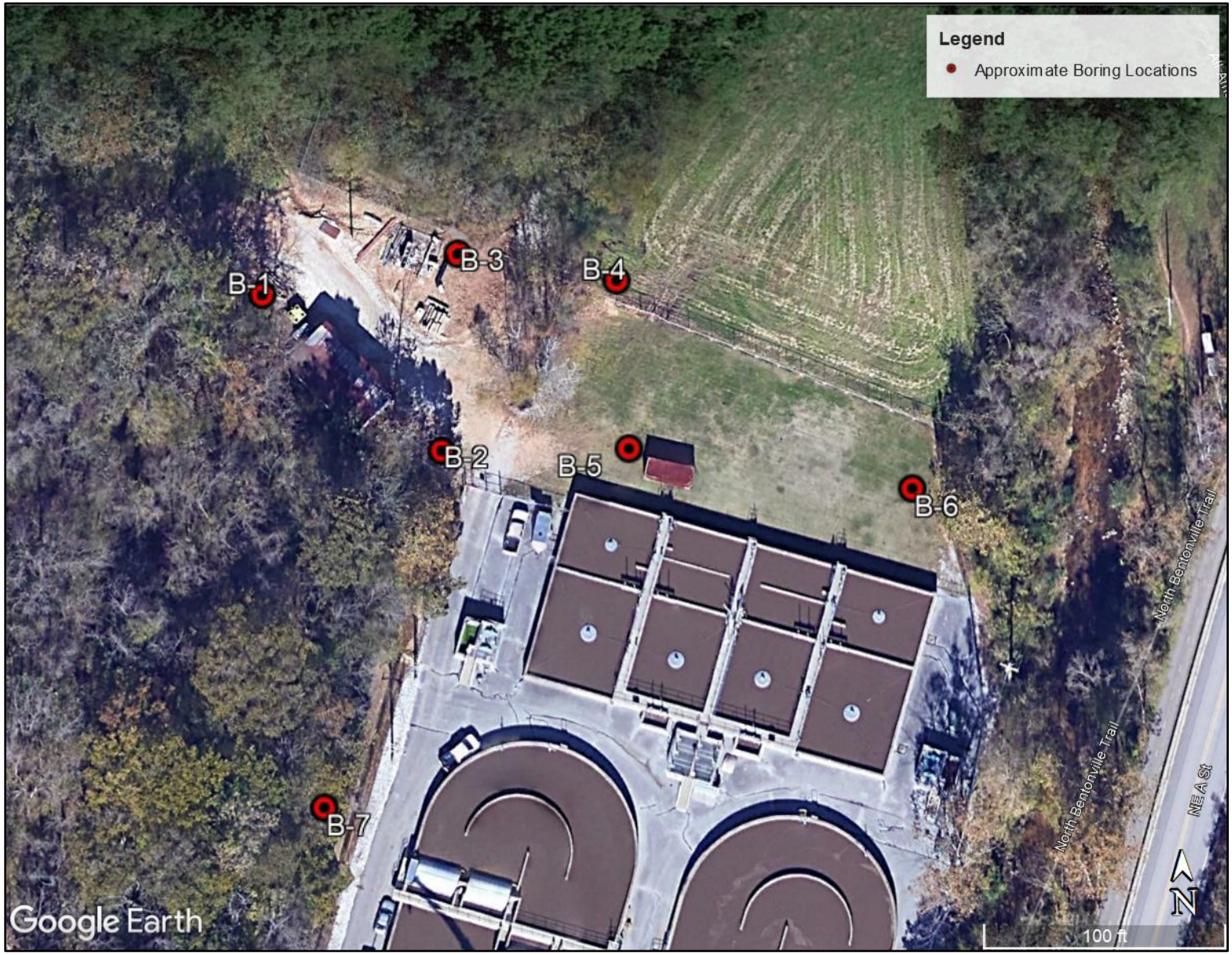
Boring Location Diagram 1 - Existing Conditions

Boring Location Diagram 2 - Site Plan Overlay

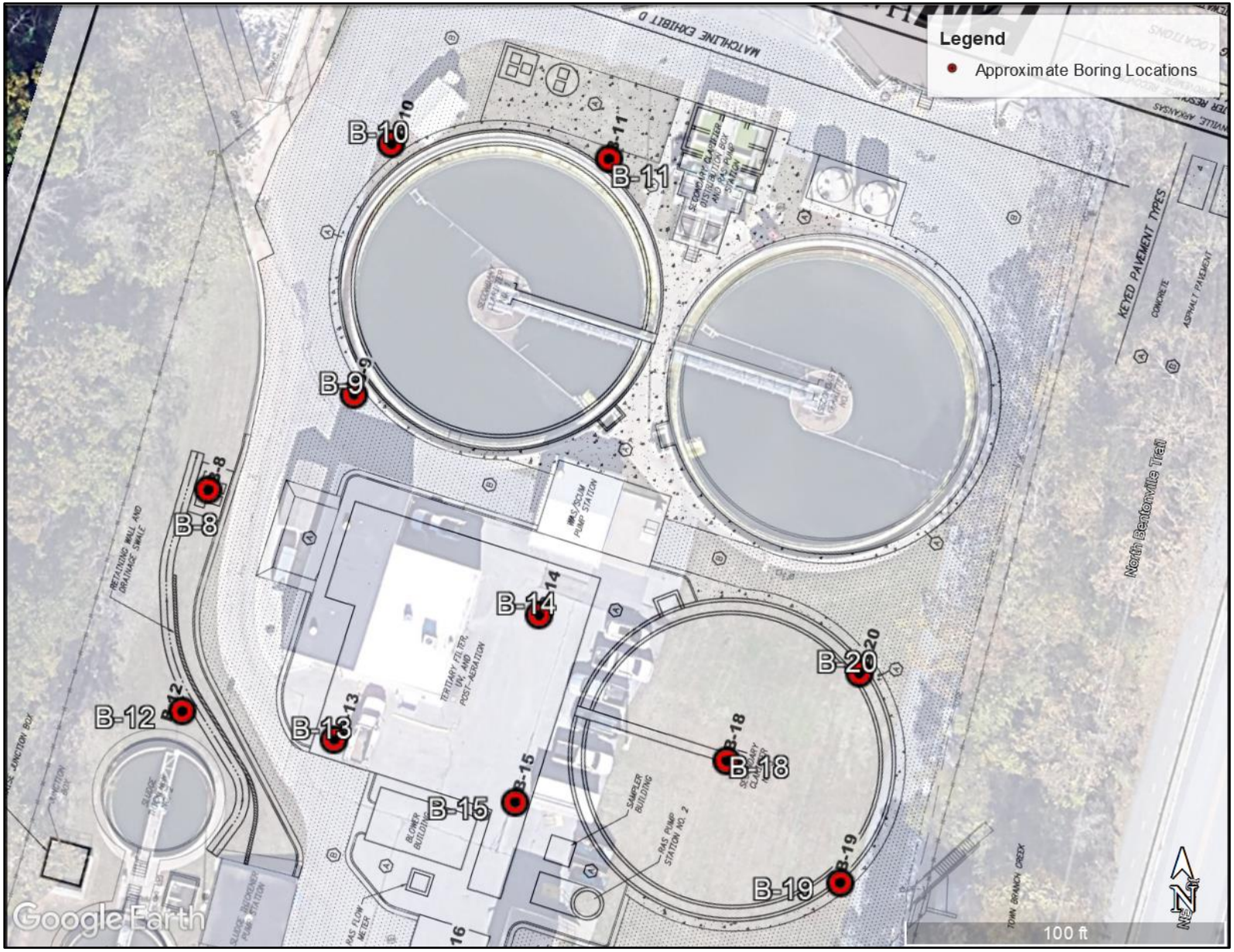


Boring Location Diagram 2 - Existing Conditions

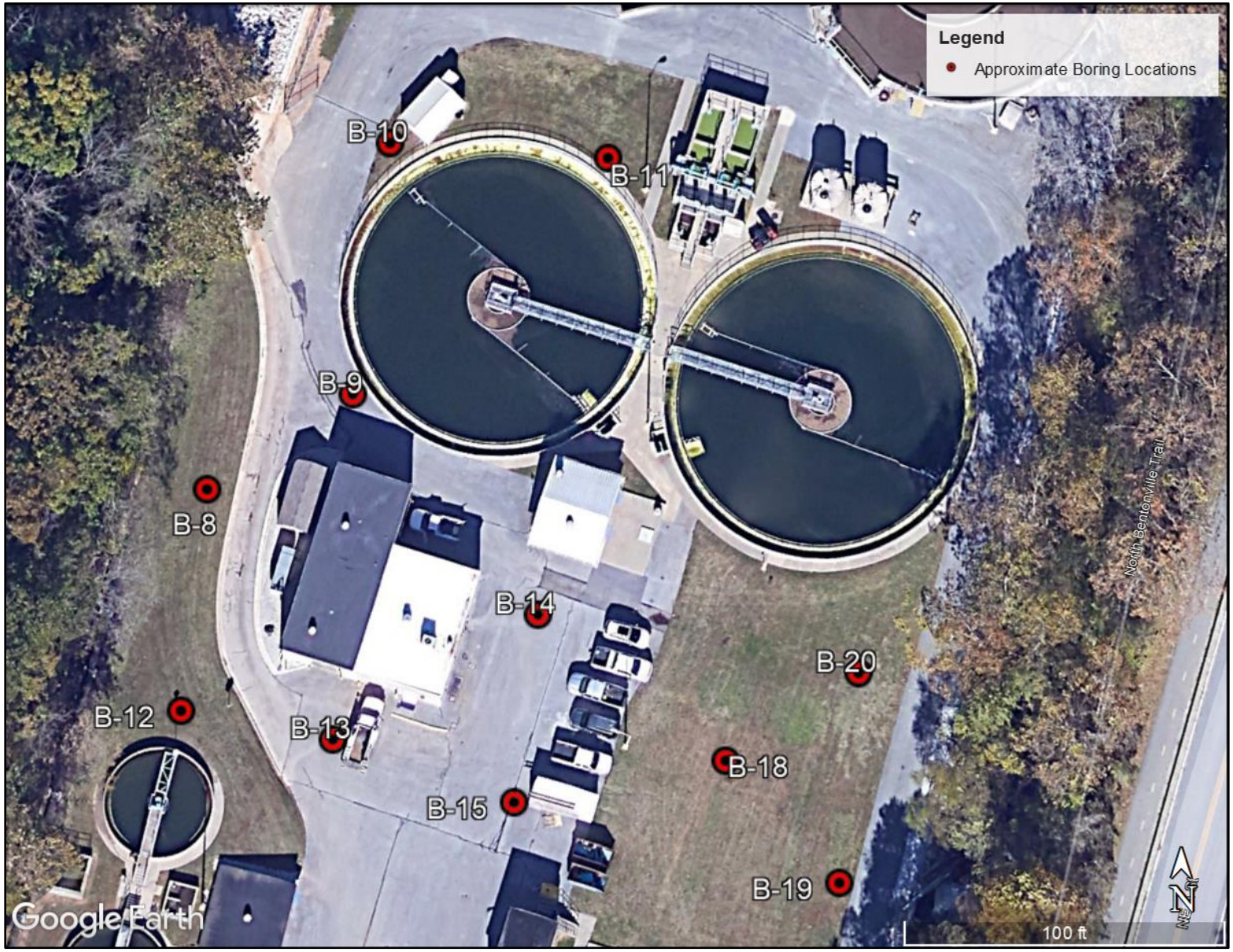
Boring Location Diagram 3 - Site Plan Overlay



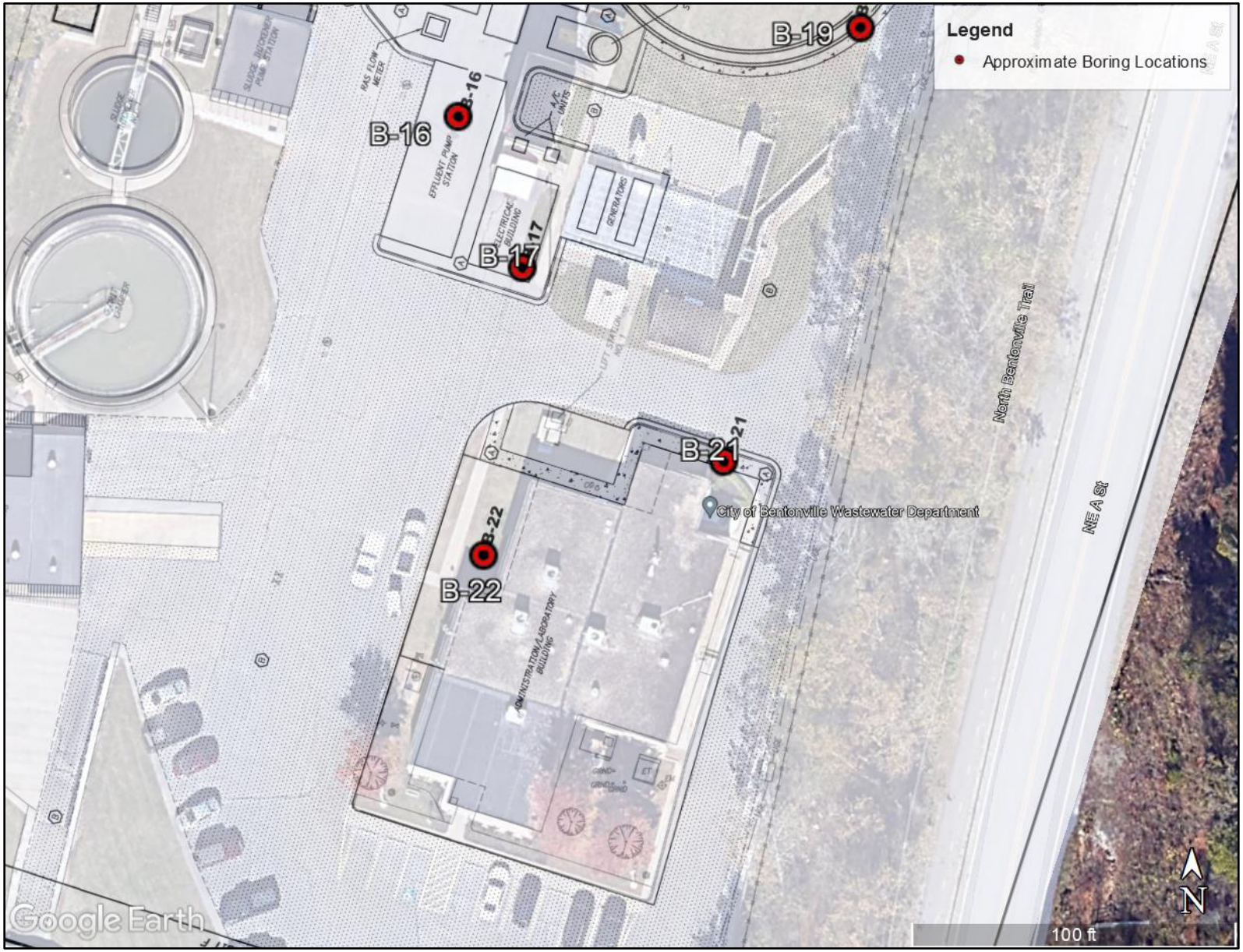
Boring Location Diagram 3 - Existing Conditions



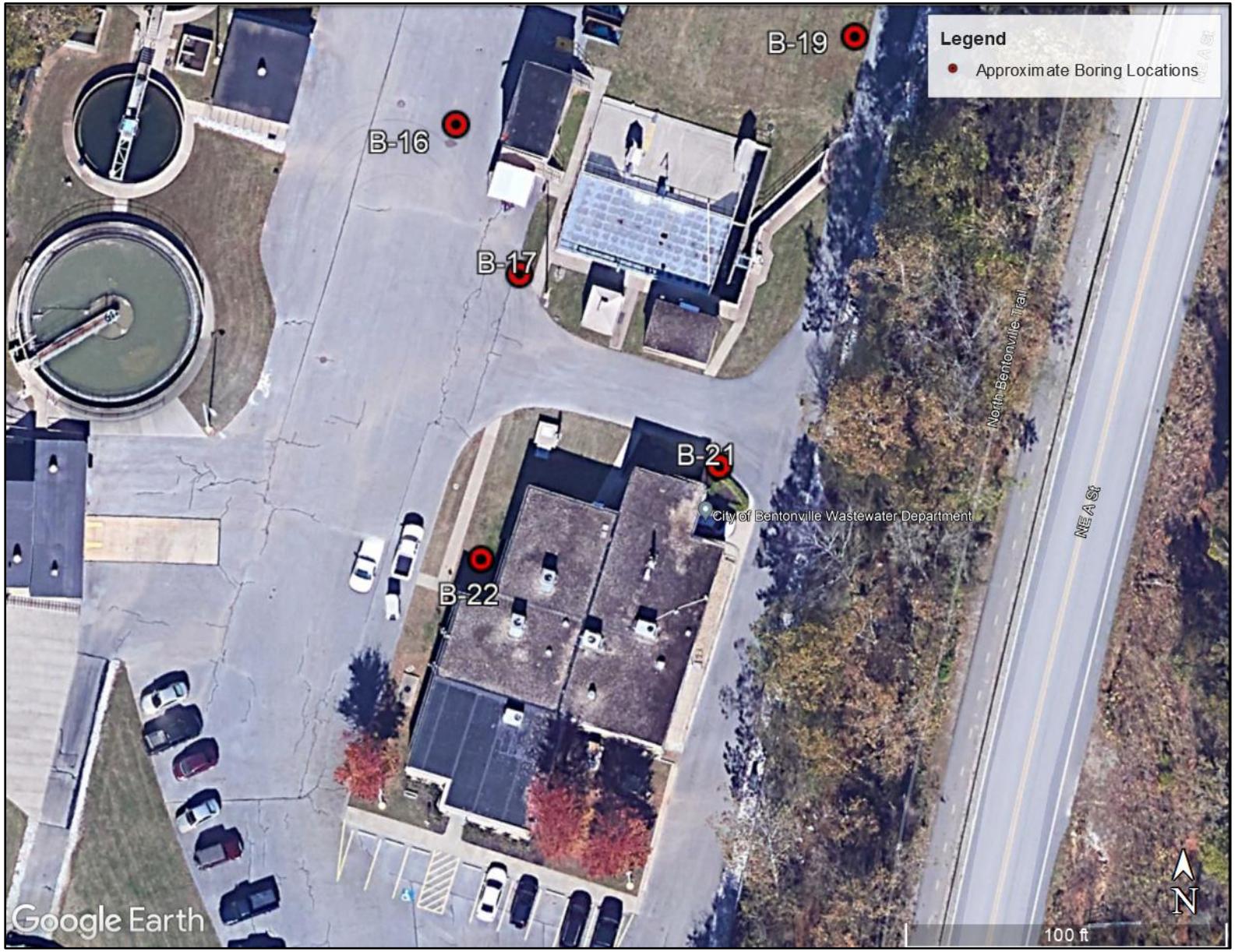
Boring Location Diagram 4 - Site Plan Overlay



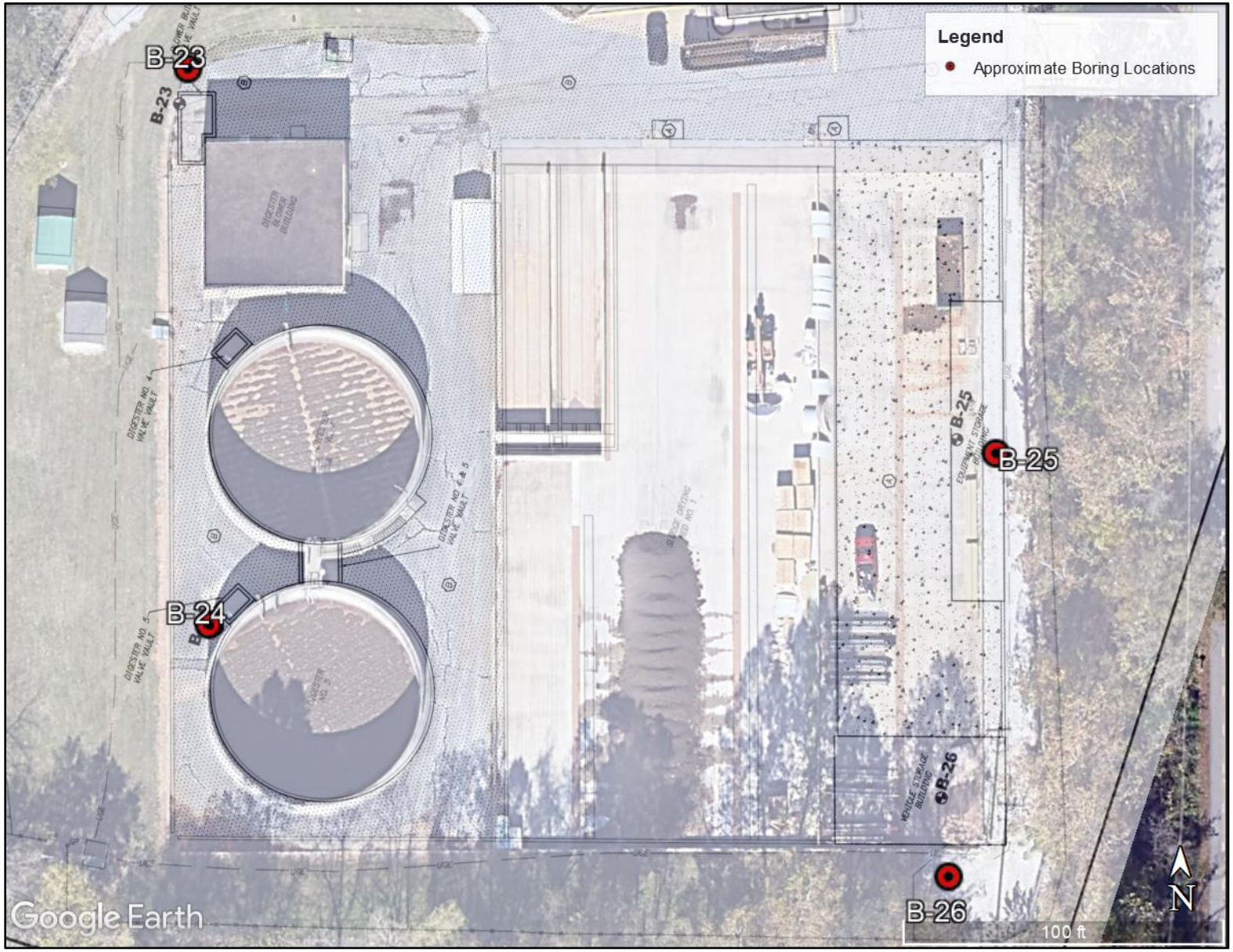
Boring Location Diagram 4 - Existing Conditions



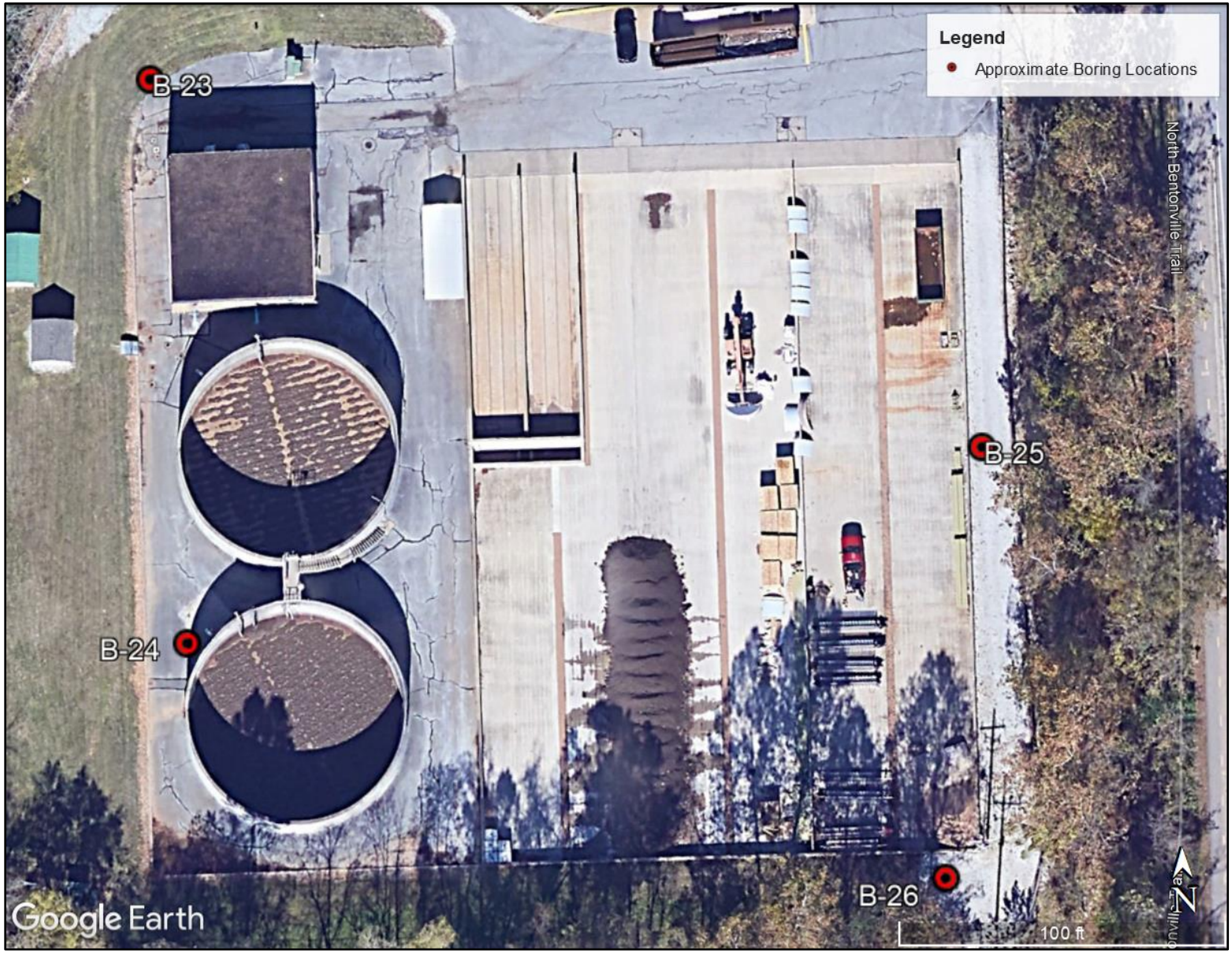
Boring Location Diagram - 5 Site Plan Overlay



Boring Location Diagram 5 - Existing Conditions



Boring Location Diagram 6 - Site Plan Overlay



Boring Location Diagram 6 - Site Plan Overlay

LOG OF BORING NO.B-1

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Crushed Gravel El.=1134.0				
			1	18	GRAVELLY SILT, with sand dense, brown and red, with lean clay pockets and chert fragments	ML			30
2.5					El.=1132.0				
			2	7	GRAVELLY LEAN CLAY very stiff, brown and red, with chert and limestone fragments	CL			26
					El.=1130.0				
			3	8	SANDY LEAN CLAY, with gravel stiff to very stiff, brown and red, with lean clay pockets, chert and limestone fragments				14
5									
			4	10			59		9
7.5									
			5	16		CL			13
10									
12.5									
			6	14	El.=1120.0				28, 50/2"
15					CLAYEY GRAVEL medium dense to very dense, white and light gray, with chert nodules	GC			
17.5									

COMPLETION DEPTH: 18.83 ft.
DATE: 12-12-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-1

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					El.=1116.0				
					CLAYEY GRAVEL (continued)	GC			
			7	4				●	50/4"
					El.=1115.2				
					BOTTOM OF BORING AT ABOUT 19 FEET				
20									
22.5									
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-2

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Gravel Cover = 1 inches				
					El.=1130.0 SILTY GRAVEL, with sand very stiff, brown and tan, with limestone fragments	GM			
			1	18			26	●	26
					El.=1128.0 CLAYEY GRAVEL, with sand medium dense, brown, red, and gray, with limestone and chert fragments				
2.5			2	18			30	● ■	7
			3	16				● ■	8, 50/4"
					- very dense below about 4 ½ feet				
5			4	1				●	50/3"
						GC			
7.5									
			5	1					50/3"
10									
					El.=1119.0 LIMESTONE moderately weathered, very hard to hard, light gray				
12.5									
			R1		Recovery = 100% RQD = 39% UCS = 23,670 psi @ 14 ½ feet				
15									
17.5									

COMPLETION DEPTH: 26 ft.
DATE: 12-12-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 3 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-2

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
					El.=1112.0				
			R2		LIMESTONE (continued) moderately weathered, hard, light gray Recovery = 91% RQD = 56% UCS = 8,350 psi @ 20 feet				
20									
						ROCK			
22.5			R3		Recovery = 100% RQD = 30% UCS = 7,950 psi @ 24 feet				
25									
					El.=1104.0				
					AUGER REFUSAL AT ABOUT 11 FEET BOTTOM OF BORING AT ABOUT 26 FEET				
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-3

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 3 inches El.=1130.0				
			1	18	GRAVELLY LEAN CLAY stiff, red, brown, and dark gray, with silt seams, chert fragments, and limestone fragments	CL			10
					El.=1128.0				
2.5			2	16	CLAYEY GRAVEL, with sand medium dense, brown, with limestone and chert fragments		37		9
			3	16			43		13
5			4	18					29
7.5									
			5	16		GC			15
10									
12.5									
			6	8	- very dense below about 13 ½ feet				50/2"
15					El.=1115.0				
					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 12-12-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-4

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 2 inches El.=1126.0				
			1	16	FILL -predominantly 9 inches of brown silt atop brown, dark gray and red gravelly lean clay with limestone and chert fragments	FILL		■ 2.5	31
2.5					El.=1124.0				
			2	18	SILT, with gravel loose, brown and orange, with lean clay pockets and limestone fragments	ML			6
					El.=1122.5				
			3	12	CLAYEY GRAVEL, with sand medium dense to dense, brown and orange, with lean clay pockets and limestone fragments		45		22
5			4	6					47
7.5									
			5	2					30
10						GC			
12.5									
			6	6					27
15									
17.5									

COMPLETION DEPTH: 31.5 ft.
DATE: 12-13-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-4

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					El.=1108.0 CLAYEY GRAVEL, with sand (continued) very dense, brown and orange, with lean clay pockets and limestone fragments	GC			
			7	5				●	50/3"
20									
					El.=1104.5 LIMESTONE moderately to intensely weathered, very hard, light gray				
22.5									
			R1		Recovery = 96% RQD = 32% UCS = 18,950 psi @ 22 ½ feet				
25						ROCK			
27.5									
			R2		Recovery = 100% RQD = 52% UCS = 15,210 psi @ 29 feet				
30									
					El.=1094.5 AUGER REFUSAL AT ABOUT 21 ½ FEET BOTTOM OF BORING AT ABOUT 31 ½ FEET				
32.5									
35									

LOG OF BORING NO.B-5

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					El.=1129.0 Surface Description= Grass Cover Rootmat = 1 inches				
			1	18	POSSIBLE FILL - predominantly interbedded layers fat clay and clayey gravel, brown and red, with chert and limestone fragments			2.75	14
2.5			2	18					43
			3	18					60
5			4	16			46		22
7.5						FILL			
			5	18					17
10									
12.5									
			6	10	El.=1115.5 SILT, with gravel medium dense, brown and red, with lean clay pockets				9
15						ML			
17.5									

COMPLETION DEPTH: 24.25 ft.
DATE: 12-13-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 14 ft.
AT COMPLETION: 20 ft.
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-5

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ 0.4 0.8 1.2 1.6 / WATER CONTENT, % ● PL LL 20 40 60 80	BLOWS PER FT
					SILT, with gravel (continued) dense, brown and red, with lean clay pockets				
			7	16				●	45
					El.=1109.5				
20					CLAYEY GRAVEL very dense, white and light gray				
						GC			
22.5									
			8	7				●	50/3"
					El.=1104.8				
25					BOTTOM OF BORING AT ABOUT 24 FEET TEMPORARY PIEZOMETER INSTALLED AT ABOUT 24 FEET Type: 2-inch, PVC pipe. Screen: slotted from about 25 to 30 feet. Annulus: about 10 feet of sand, backfilled with bentonite grout to the ground surface				
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-6

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1128.0 POSSIBLE FILL - predominantly interbedded layers lean clay and clayey gravel, brown and red, with chert and limestone fragments				
			1	18				■	17
2.5			2	15		FILL			62
			3	12					24
5			4	16	El.=1122.5 CLAYEY GRAVEL, with sand dense, red and brown, with limestone layers		33		32
7.5					- medium dense below about 8 ½ feet				
			5	18					23
10						GC			
12.5									
			6	2	▽				15
15									
17.5									

COMPLETION DEPTH: 23.75 ft.
DATE: 12-13-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 14 ft. ▽
AT COMPLETION: Dry ▽
AT 24 HOURS: Backfilled ▽

LOG OF BORING NO.B-6

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					CLAYEY GRAVEL, with sand (continued)				
			7	3	dense, red and brown, with limestone layers				50/4"
					El.=1109.5				
20					LIMESTONE				
					moderately weathered, soft, light gray	ROCK			
22.5									
			8	3	El.=1104.3				50/3"
					BOTTOM OF BORING AT ABOUT 23 ½ FEET				
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-8

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					El.=1134.0 Surface Description= Grass Cover Rootmat = 1 inches				
			1	18	POSSIBLE FILL - predominantly 1 foot of brown sandy silt, atop interbedded layers of lean clay and clayey sand containing varying amounts of chert and limestone fragments			3.5	10
2.5			2	14					16
			3	18		FILL		4.0	20
5			4	12					26
7.5									
			5	10	El.=1125.5 CLAYEY SAND, with gravel dense, brown and gray, with chert fragments		47		41
10									
12.5						SC			
			6	16					30
15									
17.5									

COMPLETION DEPTH: 18.75 ft.
DATE: 12-14-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 13.5
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-8

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					El.=1116.0				
			7	3	LIMESTONE intensely weathered, soft, light gray	ROCK		●	50/3"
					El.=1115.3				
					BOTTOM OF BORING AT ABOUT 19 FEET				
20									
22.5									
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-9

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1132.0				
					ASPHALT = 4 inches El.=1131.8				
			1	14	CRUSHED AGGREGATE = 3 inches El.=1130.0			■ 3.0	9
2.5			2	11	FILL - predominantly fat clay, with gravel, stiff, red, with chert and limestone fragments				14
			3	10	- predominantly medium stiff to stiff, orange, brown, and gray, gravelly lean clay with silt seams, chert fragments, and limestone fragments below 3 feet			■ 2.5	7
5			4	7		FILL			9
7.5					El.=1123.5				
			5	6	CLAYEY GRAVEL, with sand loose, brown				8
10									
12.5									
			6	6	- medium dense below about 13 ½ feet	GC	20		10
15									
17.5									

COMPLETION DEPTH: 35 ft.
DATE: 12-27-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-9

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					CLAYEY GRAVEL, with sand (continued)				
					El.=1113.5				
			R1		LIMESTONE moderately weathered, hard to very hard, light gray Recovery = 48% RQD = 0%				
20									
22.5			R2		Recovery = 93% RQD = 8% UCS = 5,080 psi @ 24 feet				
25						ROCK			
27.5			R3		Recovery = 96% RQD = 25% UCS = 21,150 psi @ 25 ½ feet				
30									
32.5			R4		Recovery = 93% RQD = 28% UCS = 11,520 psi @ 32 feet				
35					El.=1097.0				
					AUGER REFUSAL AT ABOUT 18 ½ FEET BOTTOM OF BORING AT ABOUT 35 FEET				

LOG OF BORING NO.B-10

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1132.0				
			1	18	FILL - predominantly 1 foot of silt atop gravelly fat clay red and brown, with limestone and chert fragments				9
2.5			2	4				3.5 ■	15
			3	4					14
5			4	8	- predominantly medium dense, brown silt, with lean clay pockets below 5 feet	FILL			16
7.5									
			5	18					15
10					El.=1122.5 CLAYEY GRAVEL, with sand dense, dark brown, with limestone fragments				
12.5									
			6	10		GC	41		38
15									
17.5									

COMPLETION DEPTH: 37 ft.
DATE: 12-14-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-10

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					CLAYEY GRAVEL, with sand (continued)				
			7	6	El.=1113.3				50/3"
					LIMESTONE moderately weathered, hard to moderately hard, white and light gray				
20			R1		Recovery = 91% RQD = 38%				
22.5			R2		Recovery = 100% RQD = 41% UCS = 10,090 psi @ 26 feet				
25									
27.5						ROCK			
			R3		Recovery = 100% RQD = 68% UCS = 3,910 psi @ 28 feet				
30									
32.5									
			R4		Recovery = 100% RQD = 33% UCS = 5,880 psi @ 36 ½ feet				
35									

LOG OF BORING NO.B-10

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					El.=1095.0				
37.5					AUGER REFUSAL AT ABOUT 19 ½ FEET BOTTOM OF BORING AT ABOUT 37 FEET				
40									
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-11

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1132.0 POSSIBLE FILL - predominantly gravelly fat clay and clayey gravel, brown and red, with chert fragments				
			1	18				4.0	12
2.5			2	16					9
			3	16					20
5			4	10					10
7.5						FILL			
			5	10					13
10									
12.5									
			6	16	El.=1118.5 CLAYEY GRAVEL, with sand medium dense, white and light gray, with chert nodules and limestone fragments	GC	35		11
15									
17.5									

COMPLETION DEPTH: 36 ft.
DATE: 12-14-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 19.5 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-11

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					CLAYEY GRAVEL, with sand (continued)				
			7	11	El.=1113.0				50/5"
20					LIMESTONE moderately weathered, moderately hard to hard, light gray				
22.5									
			R1		Recovery = 91% RQD = 53% UCS = 9,430 psi @ 26 feet				
25									
27.5						ROCK			
			R2		Recovery = 98% RQD = 75%				
30									
32.5									
			R3		Recovery = 100% RQD = 38% UCS = 10,630 psi @ 33 feet				
35					AUGER REFUSAL AT ABOUT 23 FEET BOTTOM OF BORING AT ABOUT 36 FEET				
					El.=1096.0				

LOG OF BORING NO.B-12

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description=Grass Cover Rootmat = 1 inches El.=1138.0 POSSIBLE FILL - predominantly 6 inches of brown sandy silt atop interbedded layers of silt, sand and clay with chert and limestone fragments				
			1	18					7
2.5			2	10					16
			3	12			52		18
5			4	12		FILL		■ 3	21
7.5									
			5	16					32
10					El.=1128.0 BOTTOM OF BORING AT ABOUT 10 FEET				
12.5									
15									
17.5									

COMPLETION DEPTH: 10 ft.
DATE: 12-14-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-13

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement Base = 2 inches El.=1133.0				
					ASPHALT = 4 INCHES El.=1132.7				
			1	15	POSSIBLE FILL - predominantly interbedded layers of brown, gray, and tan, clayey sand, fat clay and gravel, with chert, limestone, and sandstone fragments			■	14
2.5			2	12		FILL		■	12
			3	16				3.0 ■→	20
5					El.=1128.0				
			4	9	GRAVELLY SILT, with sand medium dense to very loose, brown and dark gray, with chert fragments				11
7.5									
			5	7					7
10						ML			
12.5									
			6	1					3
15									
17.5					El.=1115.5				

COMPLETION DEPTH: 40 ft.
DATE: 12-20-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 8 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-13

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES / SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
20		R1		LIMESTONE moderately weathered, hard to very hard, light gray Recovery = 83% RQD = 24%	ROCK			
22.5		R2		Recovery = 90% RQD = 35% UCS = 15,440 psi @ 21 ½ feet				
25								
27.5		R3		Recovery = 93% RQD = 52% UCS = 8,440 psi @ 28 ½ feet				
30								
32.5		R4		Recovery = 96% RQD = 28% UCS = 31,880 psi @ 33 feet				
35								

LOG OF BORING NO.B-13

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
37.5			R5		LIMESTONE (continued) moderately weathered, hard to very hard, light gray Recovery = 96% RQD = 29% UCS = 15,590 psi @ 39 ½ feet				
40					El.=1093.0 AUGER REFUSAL AT ABOUT 17 ½ FEET BOTTOM OF BORING AT ABOUT 40 FEET				
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-14

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1133.0				
					ASPHALT = 4 inches El.=1132.8				
			1	13	CRUSHED AGGREGATE = 3 inches El.=1132.0			3.0	8
2.5			2	10	FILL - predominantly gravelly lean clay, brown and red, with chert and limestone fragments	FILL			2
			3	12					11
5					El.=1128.0				
			4	9	SILT, with gravel loose, dark brown	ML			5
7.5									
					El.=1124.5				
			5	7	CLAYEY GRAVEL, with sand dense to medium dense, brown	GC			37
10									
12.5									
			6	7					12
15									
17.5									

COMPLETION DEPTH: 40 ft.
DATE: 12-18-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 15 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-14

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					CLAYEY GRAVEL, with sand (continued)				
			7	1				●	50/1"
					El.=1114.5				
					LIMESTONE				
20			R1		moderately weathered, moderately hard to very hard, light gray Recovery = 81% RQD = 36%				
22.5			R2		Recovery = 100% RQD = 60% UCS = 11,680 psi @ 22 ½ feet				
25									
27.5			R3		Recovery = 100% RQD = 46% UCS = 17,800 psi @ 28 ½ feet	ROCK			
30									
32.5			R4		Recovery = 100% RQD = 45% UCS = 4,580 psi @ 33 ½ feet				
35									

LOG OF BORING NO.B-14

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
37.5			R5		LIMESTONE (continued) oderately weathered, moderately hard to very hard, light gray Recovery = 95% RQD = 49% UCS = 11,890 psi @ 38 ½ feet				
40					El.=1093.0 AUGER REFUSAL AT ABOUT 18 ½ FEET BOTTOM OF BORING AT ABOUT 40 FEET				
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-15

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1133.0				
					ASPHALT = 4 inches El.=1132.7				
			1	18	FILL - predominantly gravelly fat clay, red and dark brown, with silt seams, chert fragments, and limestone fragments	FILL		2.5 ■ →	10
2.5			2	14					8
			3	18	El.=1129.0 GRAVELLY SILT, with sand medium dense to loose, brown and gray			3.5 ■ →	10
5			4	18	- lean clay seams between about 5 and 6 ½ feet	ML			4
7.5									
			5	18	El.=1123.8 CLAYEY GRAVEL, with sand medium dense, tan, orange, and brown, with chert and limestone fragments				19
10									
12.5					▽	GC			
			6	12					29
15									
17.5					El.=1115.5				

COMPLETION DEPTH: 40 ft.
DATE: 12-19-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 13 ft. ▽
AT COMPLETION: Dry ▽
AT 24 HOURS: Backfilled ▽

LOG OF BORING NO.B-15

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
			R1		LIMESTONE intensely to moderately weathered, moderately hard to hard, light gray Recovery = 48% RQD= 0%	ROCK			
20									
			R2		Recovery = 83% RQD = 9% UCS = 6,700 psi @ 22 feet				
22.5									
25			R3		Recovery = 80% RQD = 20% UCS = 9,760 psi @ 26 feet				
27.5									
30			R4		Recovery = 90% RQD = 0%				
32.5									
35									

LOG OF BORING NO.B-15

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
37.5			R5		LIMESTONE (continued) Recovery = 100% RQD = 10% UCS = 12,290 psi @ 37 ½ feet				
40					El.=1093.0 AUGER REFUSAL AT ABOUT 17 ½ FEET BOTTOM OF THE BORING AT ABOUT 40 FEET TEMPORARY PIEZOMETER INSTALLED AT ABOUT 17 FEET Type: 2-inch, PVC pipe. Screen: slotted from about 25 to 30 feet. Annulus: about 10 feet of sand, backfilled with bentonite grout to the ground surface				
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-16

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4 0.8 1.2 1.6) / WATER CONTENT, % ● (PL — LL, 20 40 60 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1133.0 ASPHALT = 4 inches El.=1132.8				
			1	8	CRUSHED AGGREGATE = 3 inches El.=1132.0 FILL - predominantly gravelly lean clay, red and brown, with chert and limestone fragments				17
2.5			2	12		FILL		■ 3.0	8
			3	12	El.=1128.5				15
5			4	12	GRAVELLY SILTY CLAY, with sand very stiff, brown and dark gray, with chert and limestone fragments	CL-ML			12
7.5					El.=1124.5				
			5	18	SILT, with sand medium dense, dark brown, with lean clay pockets	ML			11
10									
12.5					El.=1119.5				
			6	8	GRAVELLY SILT, with sand loose, brown	ML			7
15									
17.5									

COMPLETION DEPTH: 40 ft.
DATE: 12-21-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-16

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
					El.=1115.0				
			R1		LIMESTONE intensely weathered to moderately weathered, moderately hard, light gray Recovery = 73% RQD= 18%				
20									
			R2		Recovery = 61% RQD= 29% UCS = 7,330 psi @ 20 ½ feet				
22.5									
25			R3		Recovery = 84% RQD= 30% UCS = 6,160 psi @ 27 ½ feet	ROCK			
27.5									
30			R4		Recovery = 98% RQD= 30% UCS = 6,920 psi @ 32 ½ feet				
32.5									
35									

LOG OF BORING NO.B-16

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
37.5			R5		LIMESTONE (continued) Recovery = 93% RQD= 43% UCS = 6,000 psi @ 38 feet				
40					El.=1093.0 AUGER REFUSAL AT ABOUT 17 ½ FEET BOTTOM OF BORING AT ABOUT 40 FEET				
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-17

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	BLOWS PER FT
0			Surface Description= Asphalt Pavement El.=1133.0			
			ASPAHLT = 4 INCHES			
			El.=1132.7			
	1	15	CRUSHED AGGREGATE El.=1132.0		35	7
2.5	2	8	POSSIBLE FILL, predominantly red and gray clayey gravel, with sand, chert fragments, and limestone fragments			10
	3	16		FILL	27	10
5	4	9				15
7.5						
			El.=1124.5			
	5	5	SANDY SILT, with gravel loose to medium dense, brown			4
10						
12.5				ML		
	6	7				11
15						
			El.=1116.0			
17.5						

HAND PENETROMETER, TSF ■
LAB. COHESION, TSF ▲
0.4 0.8 1.2 1.6
WATER CONTENT, % ●
PL LL
20 40 60 80

COMPLETION DEPTH: 40 ft.
DATE: 12-21-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 14 ft
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-17

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
			R1		LIMESTONE moderately weathered, hard to very hard, light gray Recovery = 92% RQD = 39% UCS = 9,120 psi @ 19 ½ feet				
20									
			R2		Recovery = 90% RQD = 11% UCS = 11,420 psi @ 22 feet				
22.5									
25			R3		Recovery = 95% RQD = 29% UCS = 23,680 psi @ 26 ½ feet				
27.5									
30			R4		Recovery = 95% RQD = 20% UCS = 25,370 psi @ 33 feet				
32.5									
35									

LOG OF BORING NO.B-17

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
37.5			R5		LIMESTONE (continued) Recovery = 83% RQD = 20% USC = 18,790 psi @ 38 ½ feet				
40					El.=1093.0 AUGER REFUSAL AT ABOUT 17 FEET BOTTOM OF BORING AT ABOUT 40 FEET				
42.5									
45									
47.5									
50									
52.5									
55									

LOG OF BORING NO.B-18

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1132.0				
			1	18	POSSIBLE FILL - predominantly gravelly fat clay, brown, red, and dark gray, with limestone fragments	FILL		● ■	13
2.5			2	16	El.=1130.0 CLAYEY GRAVEL, with sand stiff to very stiff, brown, red, and gray, with silt seams, chert fragments and limestone fragments			●	10
			3	14				●	14
5			4	8				●	8
7.5									
			5	8		GC		●	18
10									
12.5									
			6	16			32.7	●	25
15									
					El.=1116.0 LIMESTONE moderately weathered, hard, light gray				
17.5									

COMPLETION DEPTH: 35 ft.
DATE: 12-15-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-18

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
			R1		LIMESTONE (continued) moderately weathered, hard, light gray Recovery = 79% RQD = 64%				
20									
22.5			R2		Recovery = 100% RQD = 60% UCS = 7,780 psi @ 22 feet				
25						ROCK			
27.5			R3		Recovery = 100% RQD = 19% UCS = 16,050 psi @ 26 ½ feet				
30									
32.5			R4		Recovery = 100% RQD = 43% UCS = 13,200 psi @ 32 feet				
35					El.=1097.0 AUGER REFUSAL AT ABOUT 16 FEET BOTTOM OF BORING AT ABOUT 35 FEET				

LOG OF BORING NO.B-19

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1132.0 POSSIBLE FILL - predominantly 1 foot of brown silt, with rootlets and gravel atop red gravelly fat clay	FILL			
			1	18				■ 3	18
					El.=1130.0 CLAYEY GRAVEL, with sand loose to medium dense, brown, red, and dark gray, with lean clay pockets, with limestone and chert fragments				
2.5			2	7				●	14
			3	10			55	●	8
5			4	4				●	25
7.5						GC			
			5	8				●	17
10									
12.5									
			6	3	El.=1118.5 LIMESTONE moderately weathered, moderately hard to very hard, light gray and gray			●	50/3"
15			R1		Recovery = 83% RQD = 40%	ROCK			
17.5									

COMPLETION DEPTH: 36 ft.
DATE: 12-15-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-19

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					El.=1114.0				
			R2		LIMESTONE (continued) moderately weathered, hard to very hard, light gray and gray Recovery = 92% RQD = 38% UCS = 6,510 psi @ 17 ½ feet				
20									
22.5			R3		Recovery = 100% RQD = 56% UCS = 15,350 psi @ 24 feet				
25									
27.5			R4		Recovery = 99% RQD = 42% UCS = 7,680 psi @ 27 ½ feet				
30									
32.5			R5		Recovery = 100% RQD = 46% UCS = 17,420 psi @ 35 ½ feet				
35					AUGER REFUSAL AT ABOUT 15 FEET BOTTOM OF BORING AT ABOUT 36 FEET				
					El.=1096.0				

LOG OF BORING NO.B-20

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1131.0				
			1	14	POSSIBLE FILL - predominantly gravelly lean clay, brown and red, with chert and limestone fragments, with rootlets and organics	FILL		●	22
2.5					El.=1129.0				
			2	1	SANDY SILT medium dense to loose, brown, red, and dark gray, with lean clay pockets, chert fragments, and limestone fragments				16
			3	6				●	5
5			4	1	- very dense chert seam or boulder at about 5 feet	ML		●	50/2"
7.5									
			5	18				●	12
10					El.=1121.5				
					GRAVELLY LEAN CLAY stiff, brown and red, with limestone fragments	CL			
12.5									
			6	5	El.=1117.5			●	50/5"
15					LIMESTONE moderately weathered, moderately hard to very hard, light gray and tan				
17.5									

COMPLETION DEPTH: 36 ft.
DATE: 12-15-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-20

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
			R1		LIMESTONE (continued) moderately weathered, moderately hard to very hard, light gray and tan Recovery = 99% RQD = 52% UCS = 22,410 psi @ 18 ½ feet				
20									
22.5			R2		Recovery = 100% RQD = 53% UCS = 19,440 psi @ 23 ½ feet	ROCK			
25									
27.5			R3		Recovery = 100% RQD = 39% UCS = 2,040 psi @ 26 feet				
30									
32.5			R4		Recovery = 100% RQD = 33% UCS = 9,630 psi @ 31 ½ feet				
35					AUGER REFUSAL AT ABOUT 16 FEET BOTTOM OF BORING AT ABOUT 36 FEET El.=1095.0				

LOG OF BORING NO.B-21

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Mulch Cover Cover = 2 inches El.=1134.0				
			1	18	POSSIBLE FILL - predominantly gray sandy gravel	FILL		2.5 ■	72
					El.=1132.5				
2.5			2	18	LEAN CLAY, with sand very stiff to hard, red and brown, with limestone fragments		71	3.5 ■	21
			3	18	- silt seams starting below about 3 ½ feet	CL		3.0 ■	30
5			4	14					17
7.5					El.=1125.5				
			5	12	SILT, with gravel medium dense, dark brown, with lean clay pockets	ML			24
10									
12.5									
			6	10					23
15					El.=1119.0				
					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 12-18-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 13.5 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-22

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 1 inches El.=1134.0				
			1	18	GRAVELLY LEAN CLAY very stiff, red and brown, with silt seams, limestone fragments and chert fragments	CL		■ 2.5	14
2.5					El.=1132.0				
			2	14	CLAYEY GRAVEL, with sand medium dense, dark brown, red, and tan, with lean clay pockets, with limestone and chert fragments	GC	28		22
					El.=1130.5				
			3	14	CLAYEY SAND, with gravel medium stiff, brown, red, and gray, with chert and limestone fragments	SC	35		13
5					El.=1129.0				
			4	10	GRAVELLY SILT, with sand medium dense to dense, brown, red and tan, with lean clay pockets, limestone fragments, and chert fragments				11
7.5									
			5	8		ML			31
10									
12.5									
			6	8					24
15					El.=1119.0				
					BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 12-18-2023
RIG: CME-550X, Buggy-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-23

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 2 inches El.=1138.0 CLAYEY GRAVEL, with sand - hand auger techniques utilized in the top 5 feet to ensure no buried utilities at boring location				
2.5									
5					- medium stiff and brown below about 5 feet				
			4			GC			
7.5									
			5	6					5
10									
12.5									
			6	5	El.=1124.5 LIMESTONE intensely weathered, moderately hard, light gray				50/1"
15					Recovery = 96% RQD = 17% UCS = 3,888 psi @ 19 ½ feet				
						ROCK			
17.5			R1						

COMPLETION DEPTH: 20 ft.
DATE: 1-4-2024
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 12 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-23

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					LIMESTONE (continued) intensely weathered, moderately hard, light gray	ROCK			
20					El.=1118.0 AUGER REFUASL AT ABOUT 15 FEET BOTTOM OF BORING AT ABOUT 20 FEET				
22.5									
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-24

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Asphalt Pavement El.=1138.0				
					ASPHALT = 4 inches El.=1137.7				
			1	9	CRUSHED AGGREGATE = 2 inches El.=1137.0				5
2.5			2	6	POSSIBLE FILL - predominantly brown gravelly silt, with sand, with chert, sandstone, and limestone fragments				2
			3	6					4
5			4	5					2
7.5						FILL			
			5	7					3
10									
12.5									
			6	2	El.=1124.5				50/2"
15			R1		LIMESTONE moderately to intensely weathered, moderately hard, light gray Recovery = 100% RQD = 0%	ROCK			
17.5			R2						

COMPLETION DEPTH: 20 ft.
DATE: 12-28-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 8 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-24

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					El.=1120.0 LIMESTONE (continued) Recovery = 45% RQD = 0%				
20					El.=1118.0 AUGER REFUSAL AT ABOUT 14 FEET BOTTOM OF BORING AT ABOUT 20 FEET				
22.5									
25									
27.5									
30									
32.5									
35									

LOG OF BORING NO.B-26

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL, 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Crushed Gravel = 3 inches El.=1138.0				
			1	18	POSSIBLE FILL - predominantly brown, dark gray, and light tan, silty sandy gravel, with chert and limestone fragments				20
2.5			2	11	- predominantly brown silt, with sand and gravel, with chert and sandstone fragments				18
			3	8					11
5			4	8	- predominantly brown clayey gravel, with sandstone and chert fragments	FILL			13
7.5									
			5	7	- predominantly dark brown, light gray, and orange clayey gravel gravel, with limestone and sandstone fragments		19		22
10									
					El.=1126.5				
12.5			R1		LIMESTONE moderately weathered, moderately hard, light gray and gray Recovery = 76% RQD = 13% UCS = 3,507 psi @ 13 feet	ROCK			
15					El.=1123.0				
					AUGER REFUSAL AT ABOUT 11 ½ FEET BOTTOM OF BORING AT ABOUT 15 FEET				
17.5									

COMPLETION DEPTH: 15 ft.
DATE: 12-29-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: Dry
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-27

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL — LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 2 inches El.=1120.0 ALLUVIAL DEPOSITS interbedded layers of silt, sand and clay, with sandstone and chert fragments, very loose to medium dense, brown, orange and dark gray				
			1	12					6
2.5			2	7					5
			3	13					3
5			4	12					8
7.5						ML			
			5	10					8
10									
12.5									
			6	2	El.=1106.5 LIMESTONE moderately weathered, hard, light gray				50/2"
15			R1		Recovery = 100% RQD = 0%				
17.5									

COMPLETION DEPTH: 30 ft.
DATE: 1-02-2023
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 9 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-27

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
20			R2		LIMESTONE (continued) moderately weathered, hard, light gray Recovery = 100% RQD = 26% UCS = 9,153 psi @ 18 feet	ROCK			
22.5			R3		Recovery = 100% RQD = 0%				
25									
27.5			R4		Recovery = 100% RQD = 0%				
30					El.=1090.0 AUGER REFUSAL AT ABOUT 15 FEET BOTTOM OF BORING AT ABOUT 30 FEET				
32.5									
35									

LOG OF BORING NO.B-28

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● (PL, LL; 20, 40, 60, 80)	BLOWS PER FT
0					Surface Description= Grass Cover Rootmat = 3 inches El.=1118.0 ALLUVIAL DEPOSITS interbedded layers of silt, sand and clay, with sandstone and chert fragments, very loose to medium dense, brown, orange and dark gray				
			1	12					2
2.5			2	8					11
			3	6					4
5			4	9					3
7.5									
			5	8		ML			3
10									
12.5									
			6	6					6
15									
17.5									

COMPLETION DEPTH: 30 ft.
DATE: 1-03-2024
RIG: Geoprobe 3100GT, Truck-Mounted, Auto Hammer Assisted

DEPTH TO WATER: DURING DRILLING: 9 ft.
AT COMPLETION: Dry
AT 24 HOURS: Backfilled

LOG OF BORING NO.B-28

Bentonville Water Resource Recovery Facility Improvements
Bentonville, Benton County, Arkansas

GTS, Inc.
Geotechnical & Testing Services
Fayetteville, AR

Project No.: 23-15134 Location: Shown on attached Boring Location Diagram

DEPTH, FT	SYMBOL	SAMPLES	SAMPLE No.	RECOVERY (in.)	DESCRIPTION OF MATERIAL	USCS	%<#200	HAND PENETROMETER, TSF ■ / LAB. COHESION, TSF ▲ (0.4, 0.8, 1.2, 1.6) / WATER CONTENT, % ● PL — LL (20, 40, 60, 80)	BLOWS PER FT
					ALLUVIAL DEPOSITS (continued) interbedded layers of silt, sand and clay, with sandstone and chert fragments, very loose to medium dense, brown, orange and dark gray				
20			R1		El.=1099.0 LIMESTONE moderately weathered, hard to soft, light gray Recovery = 85% RQD = 29%				
22.5			R2		Recovery = 98% RQD = 31% UCS = 8,476 psi @ 23 ½ feet	ROCK			
25									
27.5			R3		Recovery = 99% RQD = 18% UCS = 3,350 psi @ 28 feet				
30					El.=1088.0 AUGER REFUSAL AT ABOUT 19 FEET BOTTOM OF BORING AT ABOUT 30 FEET				
32.5									
35									

SOIL CLASSIFICATION LEGEND

APPARENT CONSISTENCY OF COHESIVE SOILS (PECK, HANSON & THORNBURN 1974, AASHTO 1988)				
Descriptor	**SPT N_{60} (blows/foot)***	**Pocket Penetrometer, Qp (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 2	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	2 – 4	0.25 – 0.50	0.12 – 0.25	Easily penetrated several inches by thumb
Medium Stiff	5 – 7	0.50 – 1.0	0.25 – 0.50	Penetrated several inches by thumb w/moderate effort
Stiff	8 – 12	1.0 – 2.0	0.50 – 1.0	Readily indented by thumbnail
Very Stiff	12 – 30	2.0 – 4.0	1.0 – 2.0	Indented by thumb but penetrated only with great effort
Hard	> 30	> 4.0	> 2.0	Indented by thumbnail with difficulty

* Using SPT N_{60} is considered a crude approximation for cohesive soils.

APPARENT DENSITY OF COHESIONLESS SOILS (AASHTO 1988)	
Descriptor	**SPT N_{60} Value (blows/foot)**
Very Loose	0 – 3
Loose	4 – 8
Medium Dense	9 – 29
Dense	30 – 49
Very Dense	$\geq$ 50

MOISTURE (ASTM D2488-06)	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch, well below optimum moisture content (per ASTM D698 or D1557)
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table, well above optimum moisture content (per ASTM D698 or D1557)

PERCENT OR PROPORTION OF SOILS (ASTM D2488-06)	
Descriptor	**Criteria**
Trace	Particles are present but estimated < 5%
Few	5 – 10%
Little	15 – 25%
Some	30 – 45%
Mostly	50 – 100%
Percentages are estimated to nearest 5% in the field. Use "about" unless percentages are based on laboratory testing.	

SOIL PARTICLE SIZE (ASTM D2488-06)	
Descriptor	**Size**
Boulder	> 12 inches
Cobble	3 to 12 inches
Gravel - Coarse Fine	¾ inch to 3 inches No. 4 sieve to ¾ inch
Sand - Coarse Medium Fine	No. 10 to No. 4 sieve (4.75mm) No. 40 to No. 10 sieve (2mm) No. 200 to No. 40 sieve (.425mm)
Silt and Clay ("fines")	Passing No. 200 sieve (0.075mm)

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2488)				
Major Division			**Group Symbol**	**Description**
Coarse Grained Soils (more than 50% retained on #200 sieve)	**Gravel** (50% or more retained on No. 4 sieve)	Clean Gravel	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	Sand (> 50% passing No. 4 sieve)	Clean sand	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly-graded sands and gravelly sands, little or no fines
		Sand with fines	SM	Silty sands and sand-silt mixtures
			SC	Clayey sands and sand-clay mixtures
Fine Grained Soils (50% or more passing #200 sieve)	**Silt and Clay** (liquid limit < 50)		ML	Inorganic silts, rock flour and clayey silts
			CL	Inorganic clays of low-medium plasticity, gravelly, sandy & lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silt and Clay (liquid limit > 50)		MH	Inorganic silts and clayey silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

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GRAPHIC SYMBOL LEGEND		
SPT		Standard Penetration Test (2" OD), ASTM D1586
GRAB		Grab Sample
ST		Shelby Tube, ASTM D1587 (pushed)
AUGER		Boring Advanced Through Drilling
CORE		Rock coring

ROCK CLASSIFICATION LEGEND

WEATHERING DESCRIPTORS FOR INTACT ROCK (USBR, 2001)						
Descriptor	**Chemical Weathering-Discoloration-Oxidation**		**Mechanical Weathering and Grain Boundary Conditions**	**Texture and Solutioning**		**General Characteristics**
	Body of Rock	**Fracture Surfaces**		**Texture**	**Solutioning**	
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck
Slightly Weathered	Discoloration or oxidation limited to surface or short distance from fractures; some feldspar crystals are dull	Minor or complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck; body of rock not weakened
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty," feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck; body of rock is slightly weakened
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent or chemical alteration produces in-situ disaggregation	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation; rock is friable; granitics are disaggregated in semi-arid conditions	Altered by chemical disaggregation such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow; rock is significantly weakened
Decomposed	Discolored or oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregation)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand; resistant minerals such as quartz may be present as "stringers" or "dikes"

RELATIVE STRENGTH OF INTACT ROCK	
Descriptor	**Uniaxial Compressive Strength (psi)**
Extremely Hard	> 30,000
Very Hard	14,500 – 30,000
Hard	7,000 – 14,500
Moderately Hard	3,500 – 7,000
Soft	700 – 3,500
Very Soft	150 – 700
Extremely Soft	< 150

BEDDING SPACING (modified USBR, 2001)	
Descriptor	**Thickness or Spacing**
Massive	> 10 feet
Very thickly bedded	3 to 10 feet
Thickly bedded	1 to 3 feet
Moderately bedded	3-5/8 inches to 1 foot
Thinly Bedded	1-1/4 inches to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

CORE RECOVERY CALCULATION (%)

$$= \frac{\text{length of recovered core pieces}}{\text{total length of core run}} \times 100\%$$

RQD CALCULATION (%)

$$= \frac{\text{length of intact core pieces} > 4 \text{ in}}{\text{total length of core run (inches)}} \times 100\%$$

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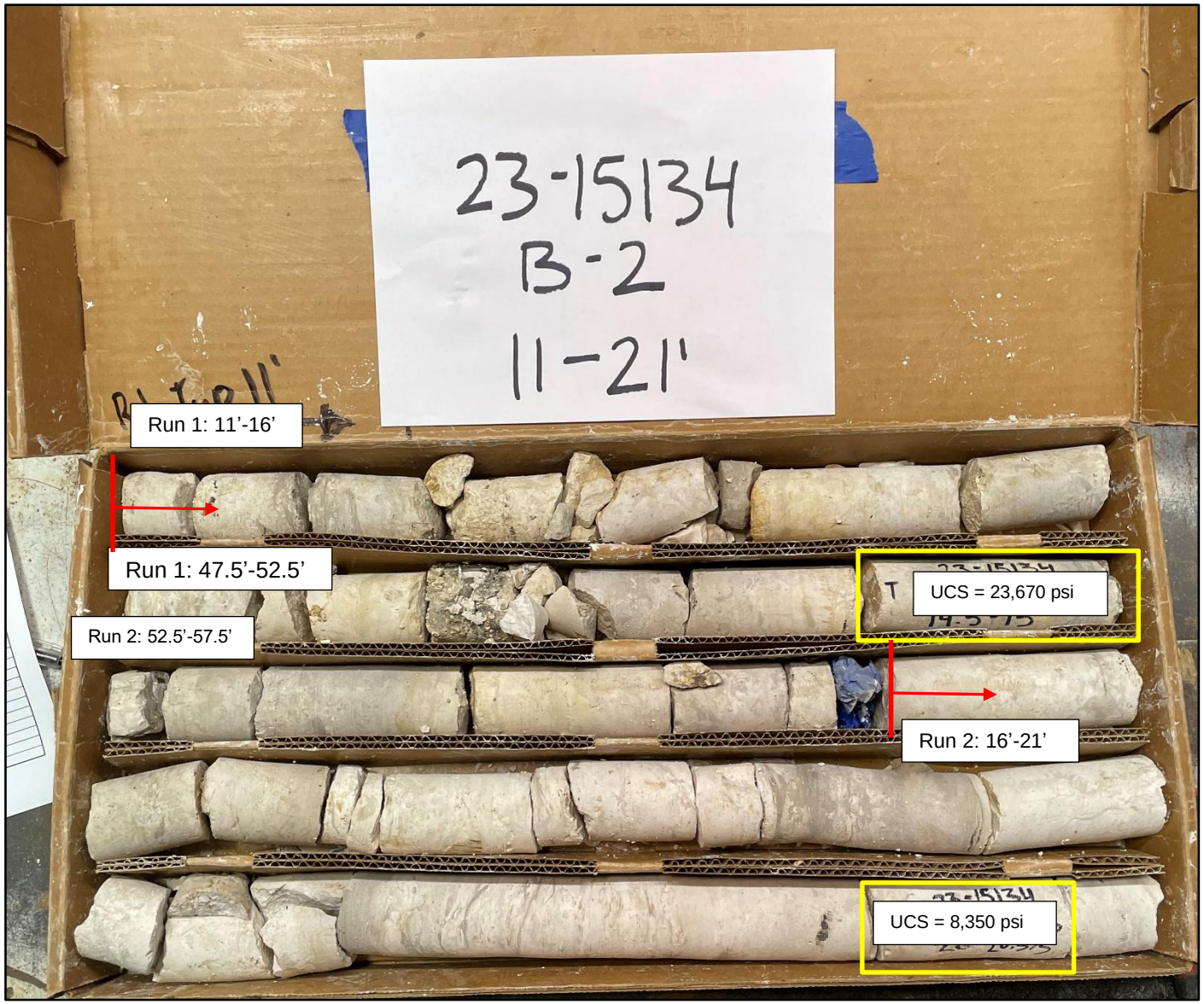
ROCK HARDNESS (modified USBR, 2001)	
Descriptor	**Criteria**
Extremely hard	Cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Can be scratched with pocket knife or sharp pick with heavy pressure, heavy hammer blows required to break specimen
Moderately hard	Can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately soft	Can be grooved 1/16 inch with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Can be grooved or gouged with pocket knife or sharp pick with light pressure; breaks with light to moderate hand pressure
Very soft	Can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

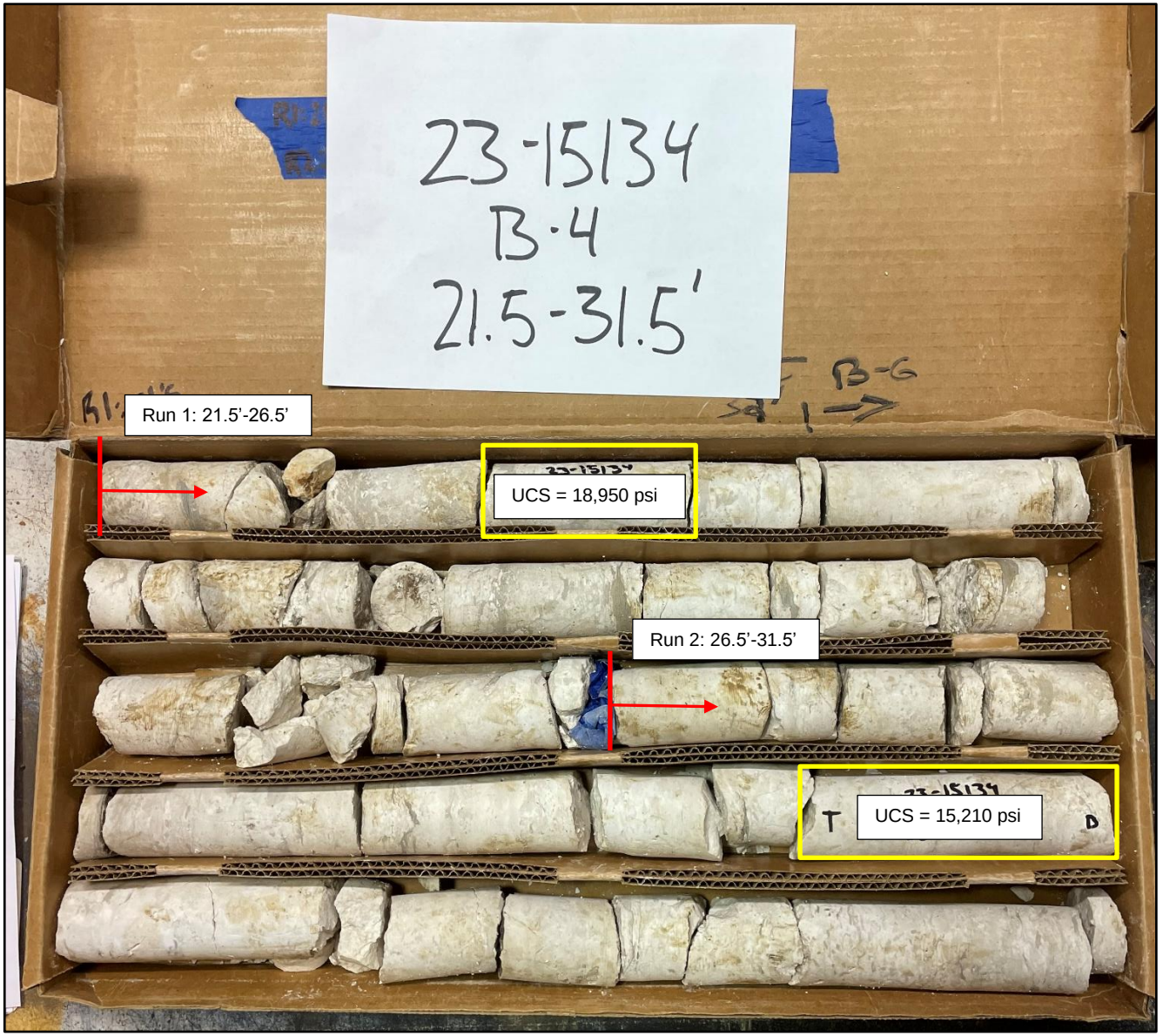
APPENDIX B

Rock Core Photo Logs



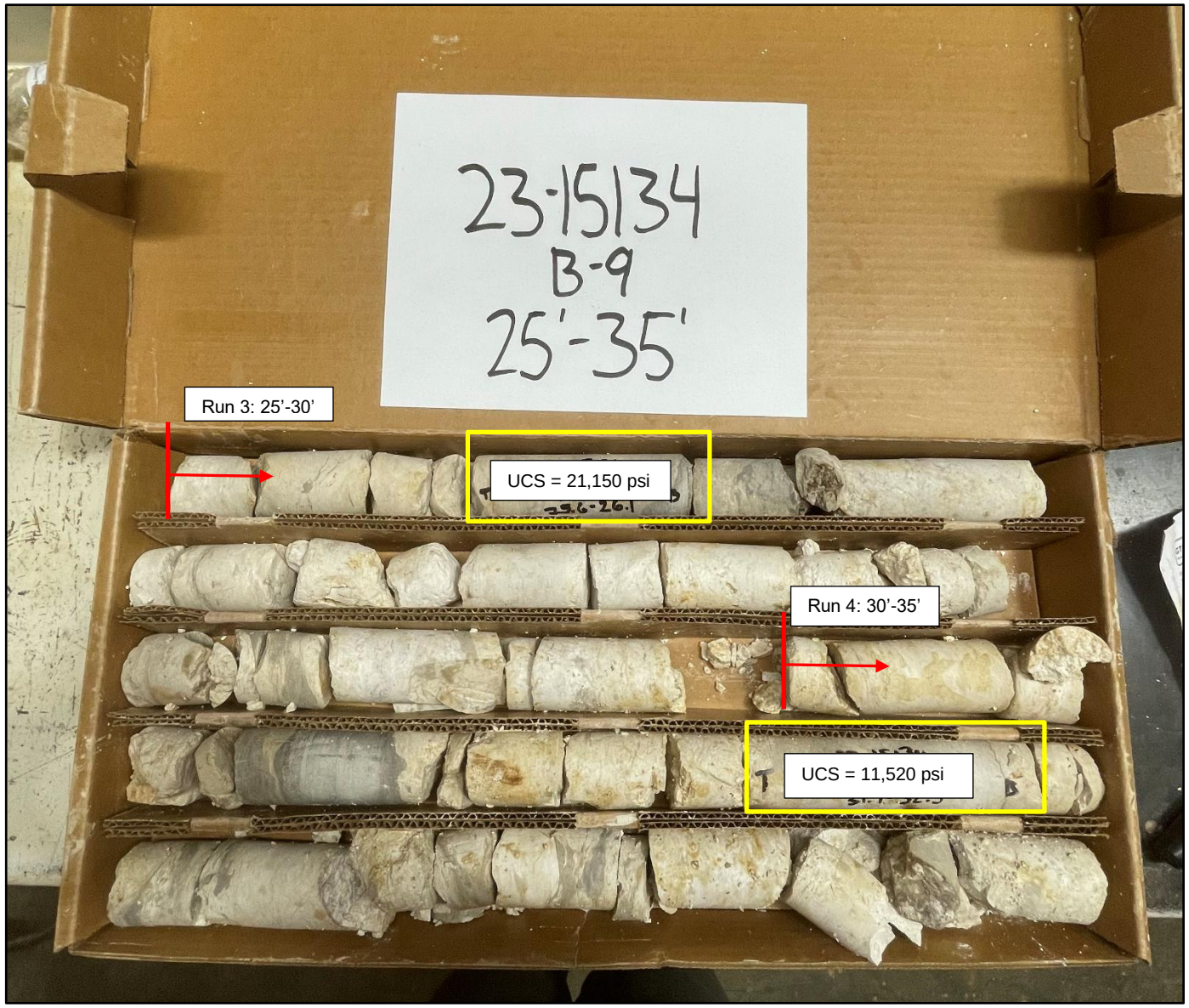
Boring B-2
Run 1: 11 to 16 feet: REC = 100%, RQD = 39%
Run 2: 16 to 21 feet: REC = 91%, RQD = 56%

Boring B-2
Run 1: 21 to 26 feet: REC = 100%, RQD = 30%

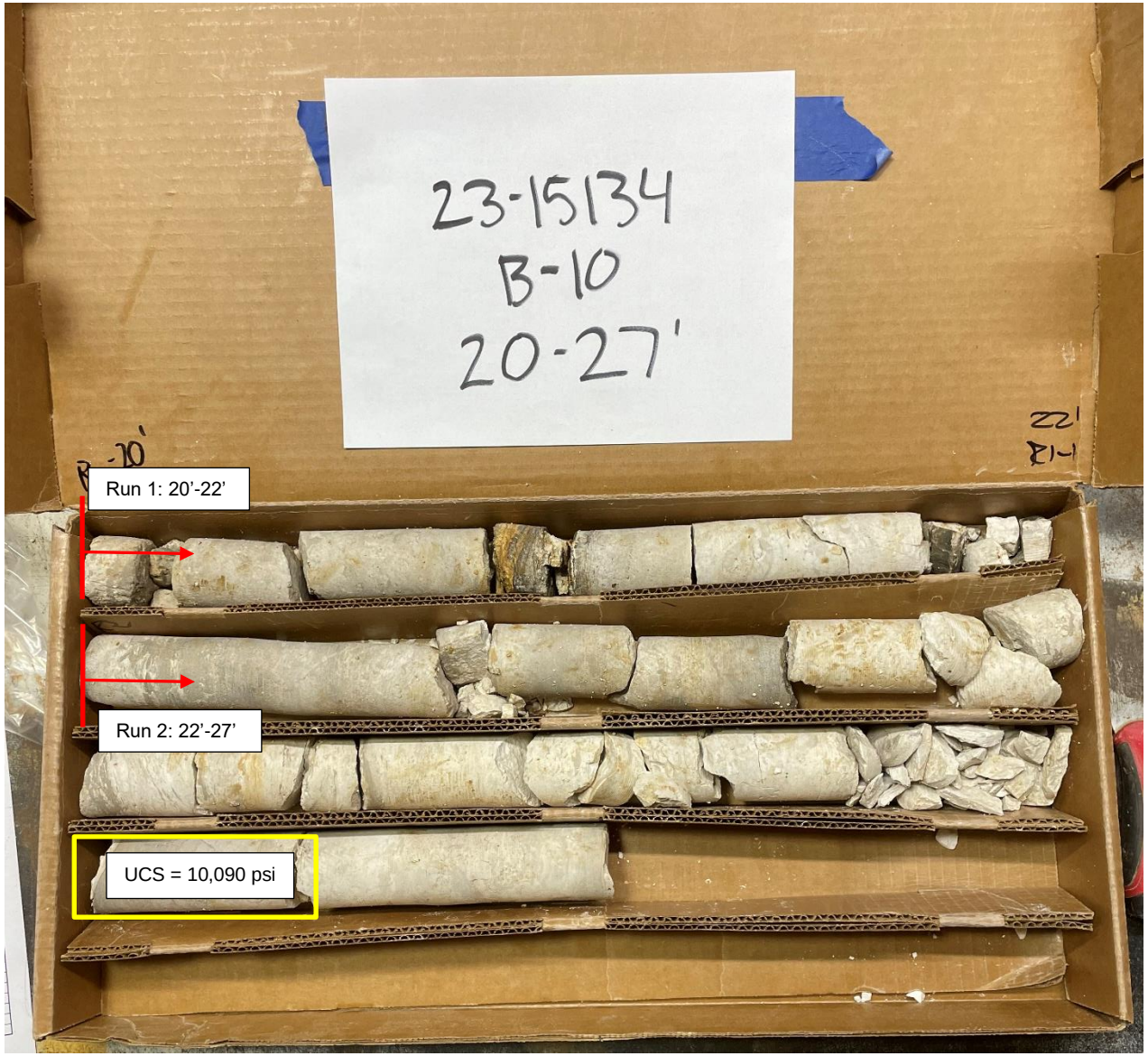


Boring B-4
Run 1: 21.5 to 26.5 feet: REC = 96%, RQD = 32%
Run 2: 26.5 to 31.5 feet: REC = 100%, RQD = 52%

Boring B-9
Run 1: 18.5 to 20 feet: REC = 48%, RQD = 0%
Run 2: 20 to 25 feet: REC = 93%, RQD = 8%



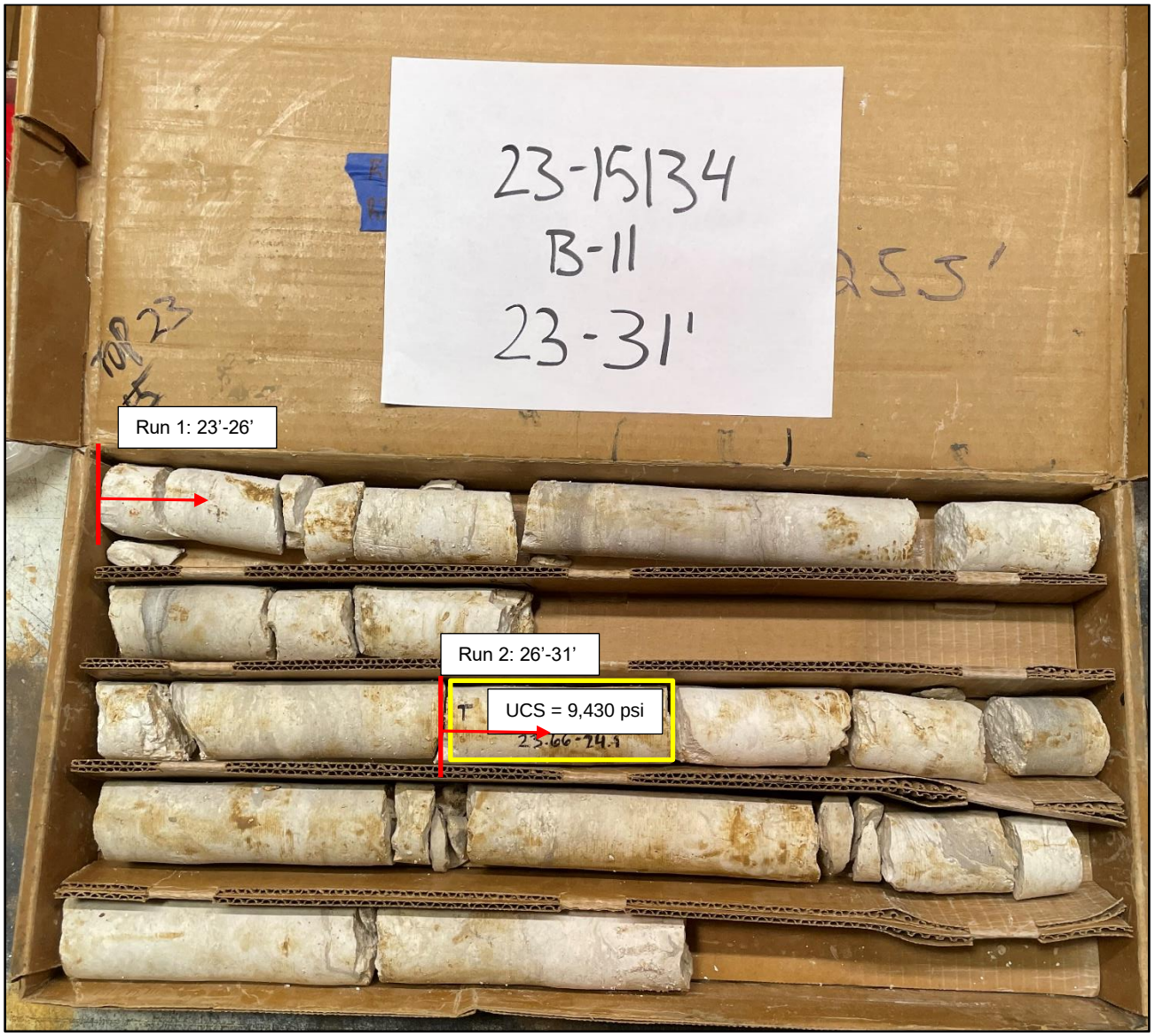
Boring B-9
Run 3: 25 to 30 feet: REC = 96%, RQD = 25%
Run 4: 30 to 35 feet: REC = 93%, RQD = 28%



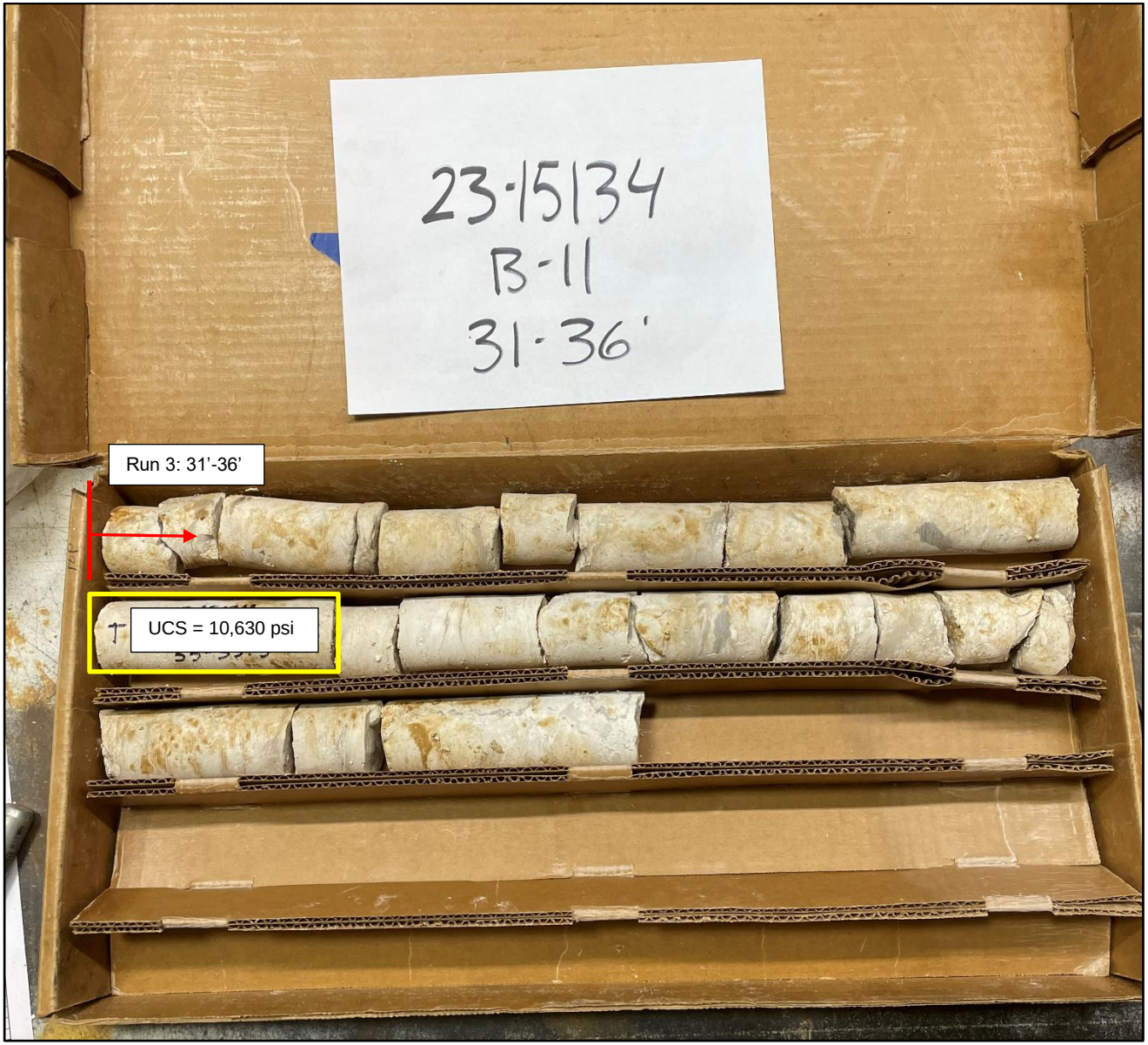
Boring B-10
Run 1: 20 to 22 feet: REC = 91%, RQD = 38%
Run 2: 22 to 27 feet: REC = 100%, RQD = 41%

C

Boring B-10
Run 3: 27 to 32 feet: REC = 100%, RQD = 68%
Run 4: 32 to 37 feet: REC = 100%, RQD = 33%



Boring B-11
Run 1: 23 to 26 feet: REC = 91%, RQD = 53%
Run 2: 26 to 31 feet: REC = 98%, RQD = 75%



Boring B-11
Run 3: 31 to 36 feet: REC = 100%, RQD = 38%

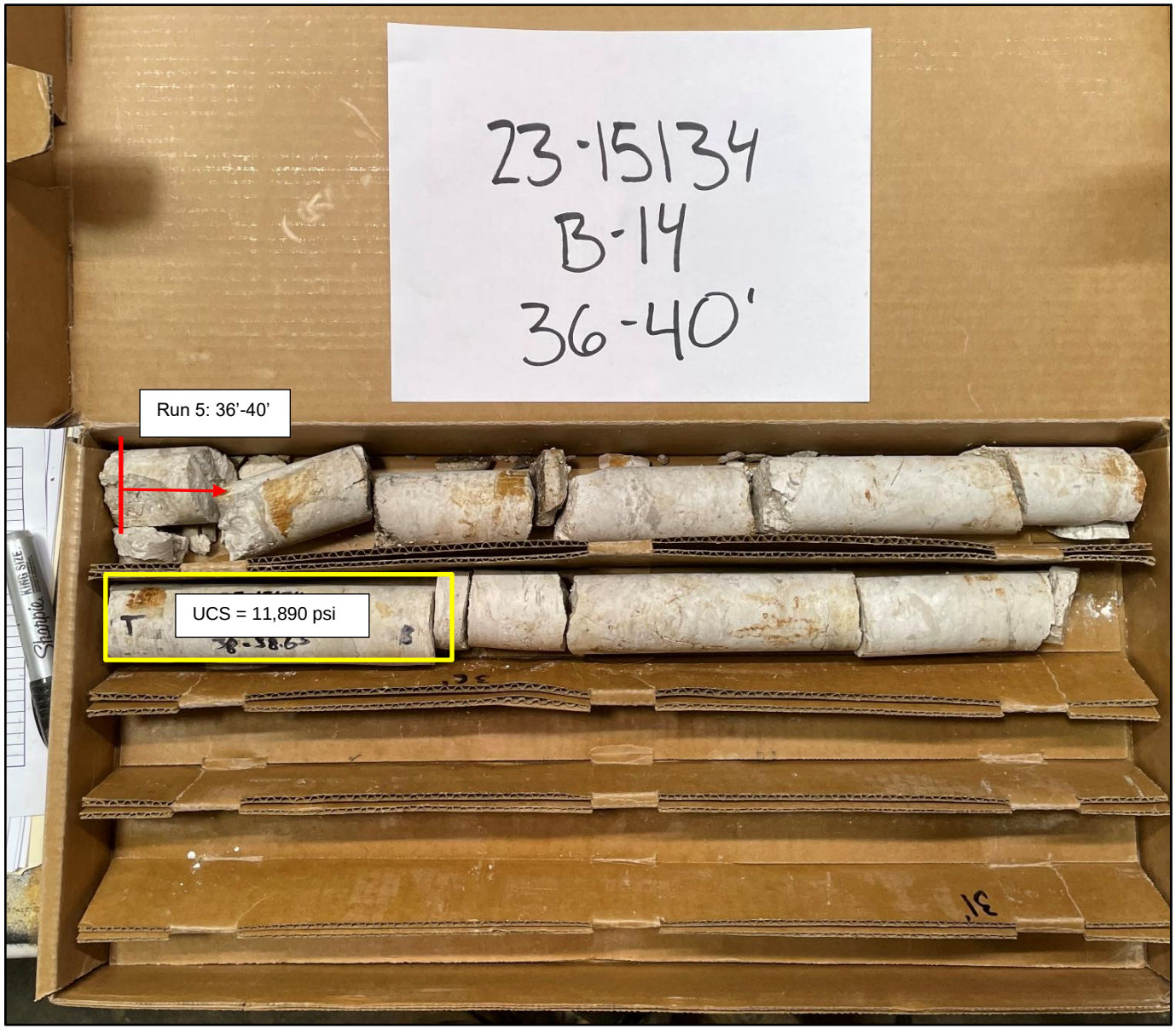
Boring B-13
Run 1: 17.5 to 20 feet: REC = 83%, RQD = 24%
Run 2: 20 to 25 feet: REC = 90%, RQD = 35%

Boring B-13
Run 3: 25 to 30 feet: REC = 93%, RQD = 52%
Run 4: 30 to 35 feet: REC = 96%, RQD = 28%

Boring B-13
Run 5: 35 to 40 feet: REC = 96%, RQD = 29%

Boring B-14
Run 1: 19 to 21 feet: REC = 81%, RQD = 36%
Run 2: 21 to 26 feet: REC = 100%, RQD = 60%

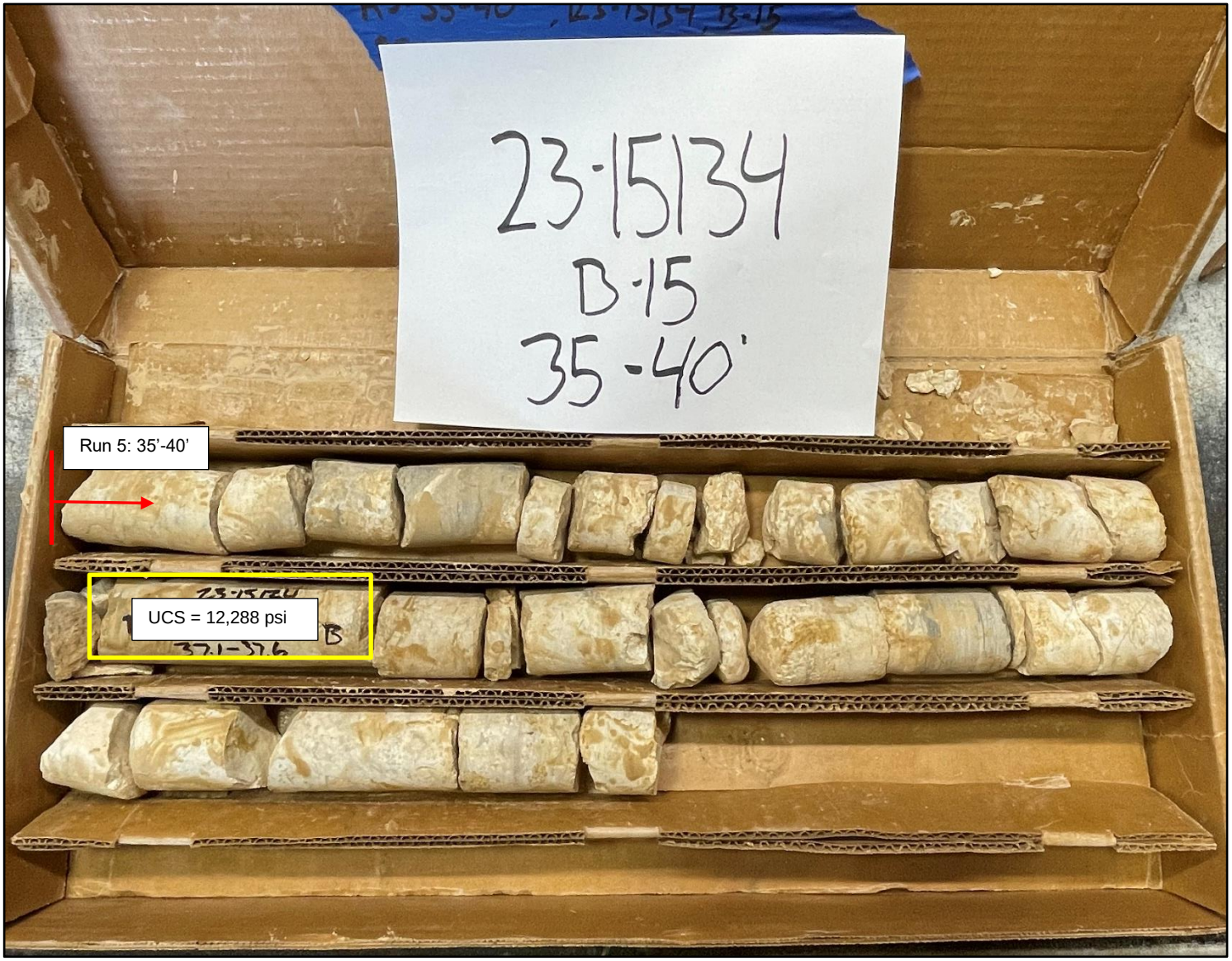
Boring B-14
Run 3: 26 to 31 feet: REC = 100%, RQD = 46%
Run 4: 31 to 36 feet: REC = 100%, RQD = 45%



Boring B-14
Run 5: 36 to 40 feet: REC = 95%, RQD = 49%

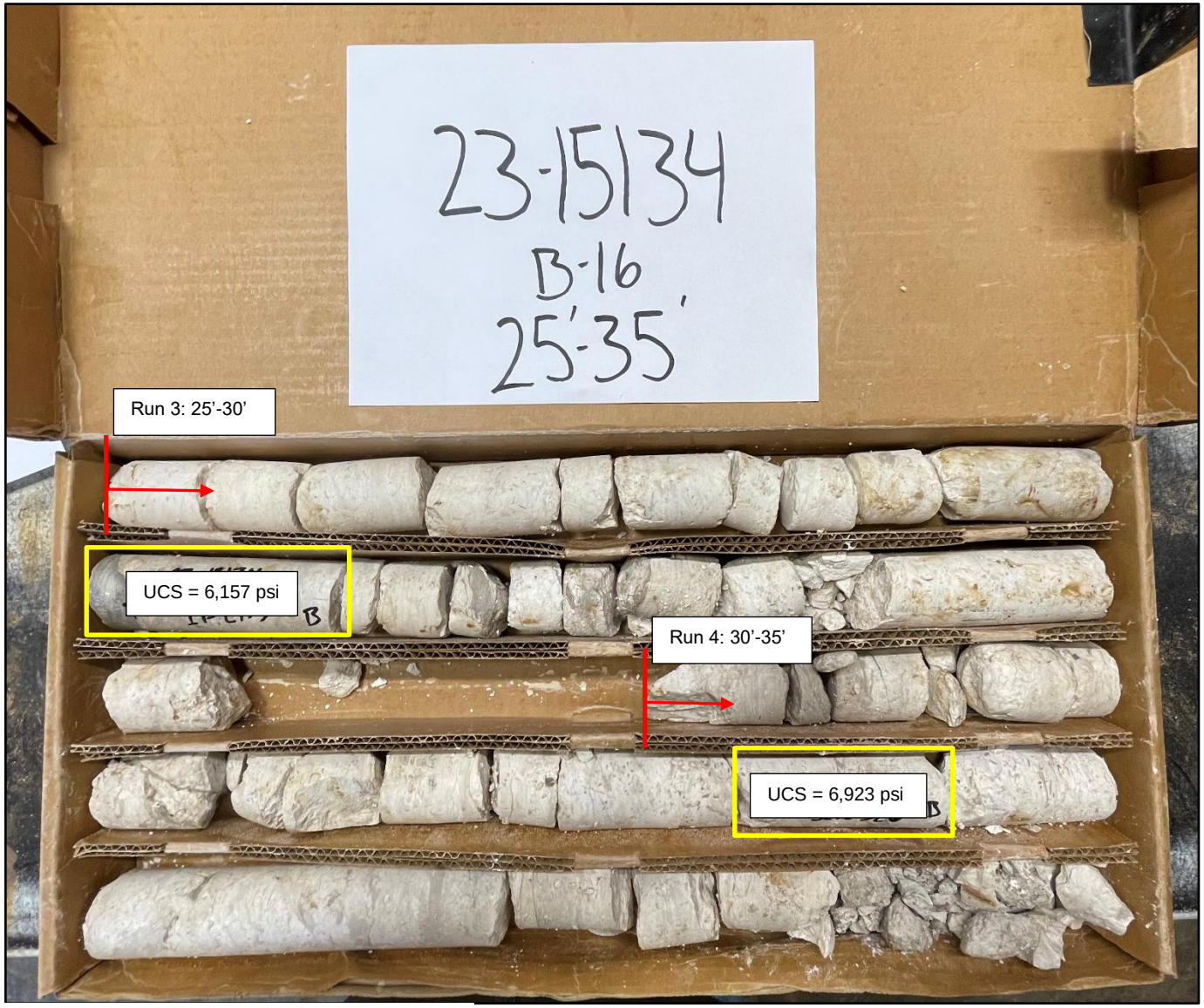
Boring B-15
Run 1: 17.5 to 20 feet: REC = 48%, RQD = 0%
Run 2: 20 to 25 feet: REC = 83%, RQD = 9%

Boring B-15
Run 3: 25 to 30 feet: REC = 80%, RQD = 20%
Run 4: 30 to 35 feet: REC = 90%, RQD = 0%

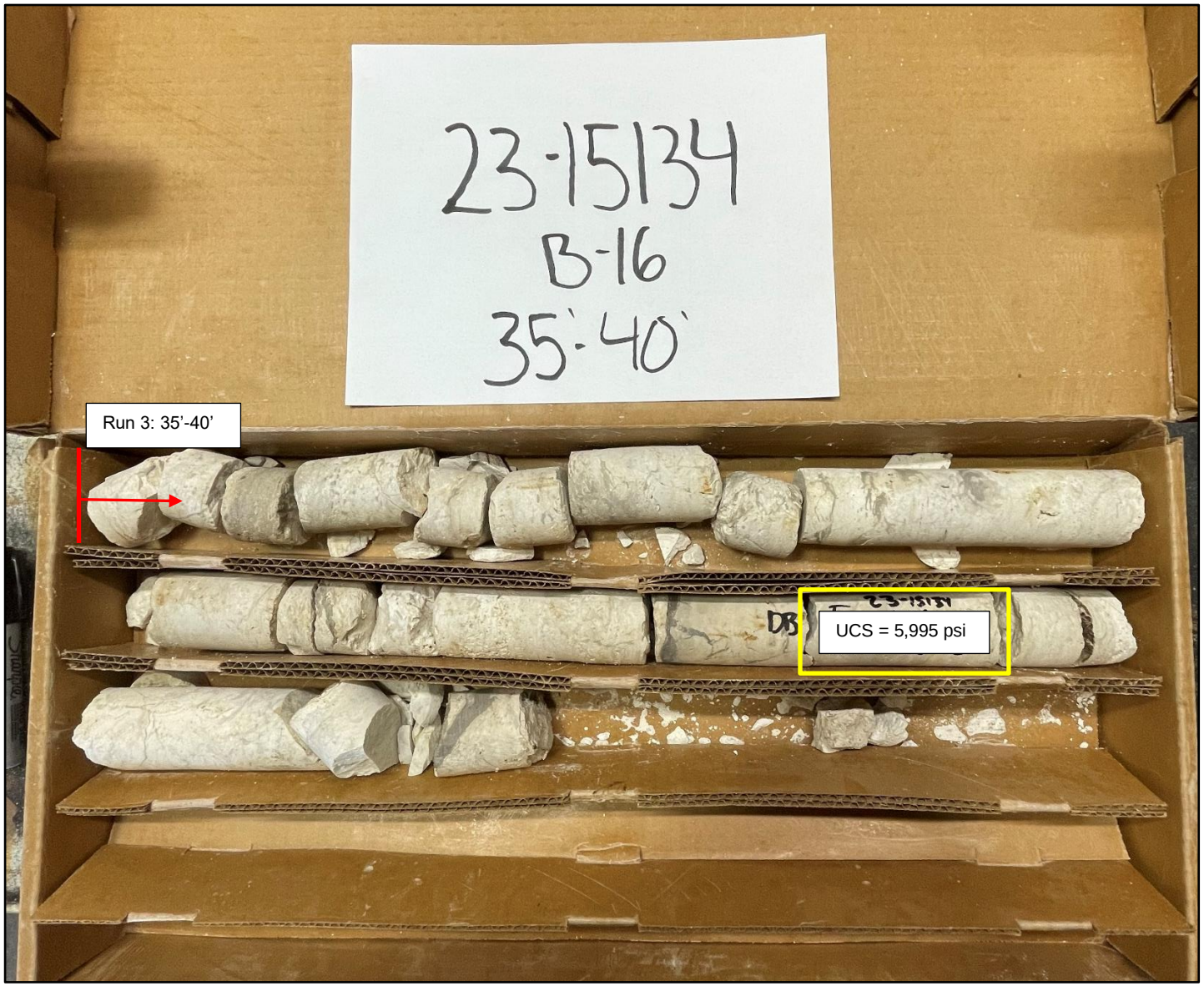


Boring B-15
Run 5: 35 to 40 feet: REC = 100%, RQD = 10%

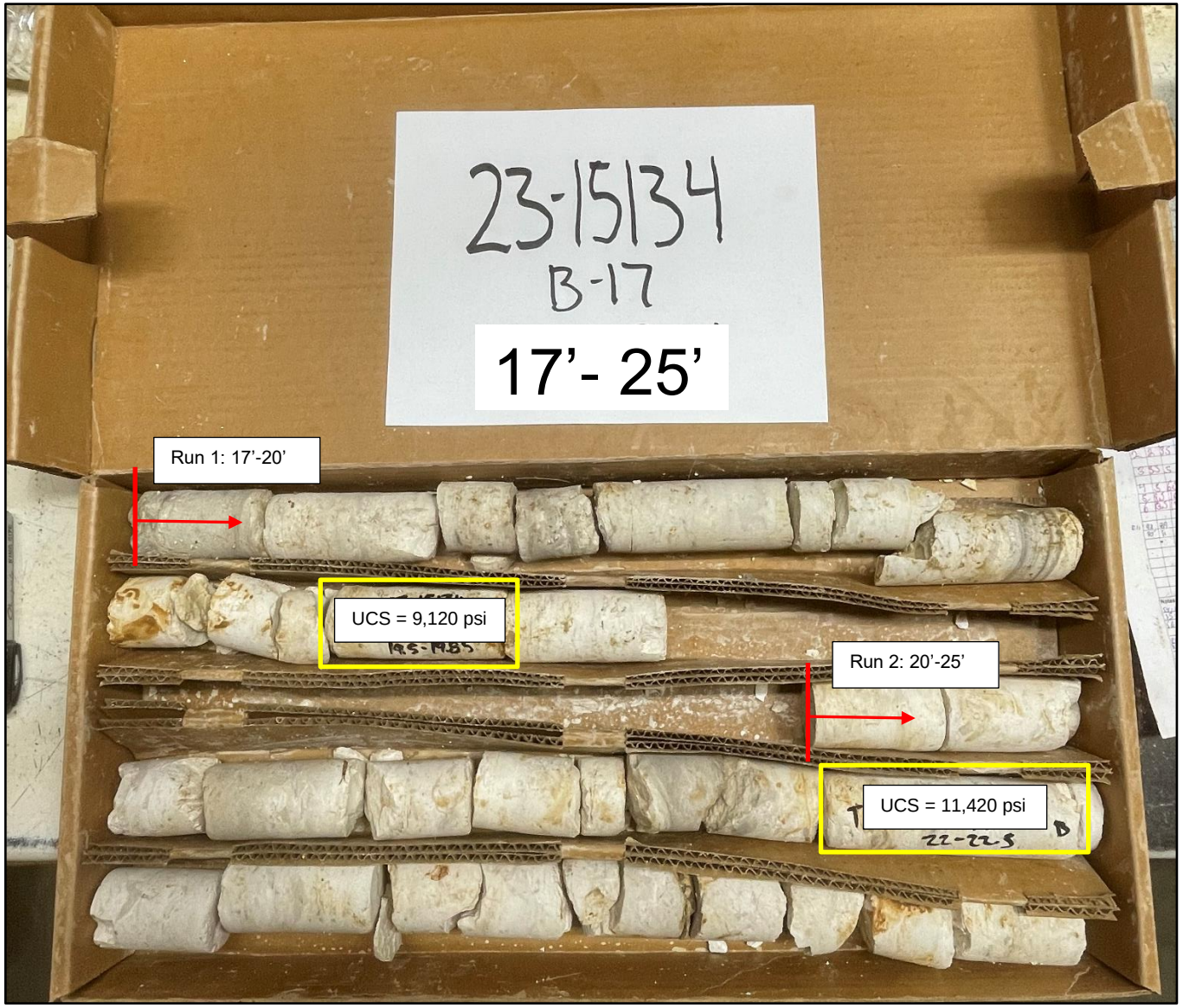
Boring B-16
Run 1: 17.5 to 20 feet: REC = 73%, RQD = 18%
Run 2: 20 to 25 feet: REC = 61%, RQD = 29%



Boring B-16
Run 3: 25 to 30 feet: REC = 84%, RQD = 30%
Run 4: 30 to 35 feet: REC = 98%, RQD = 30%

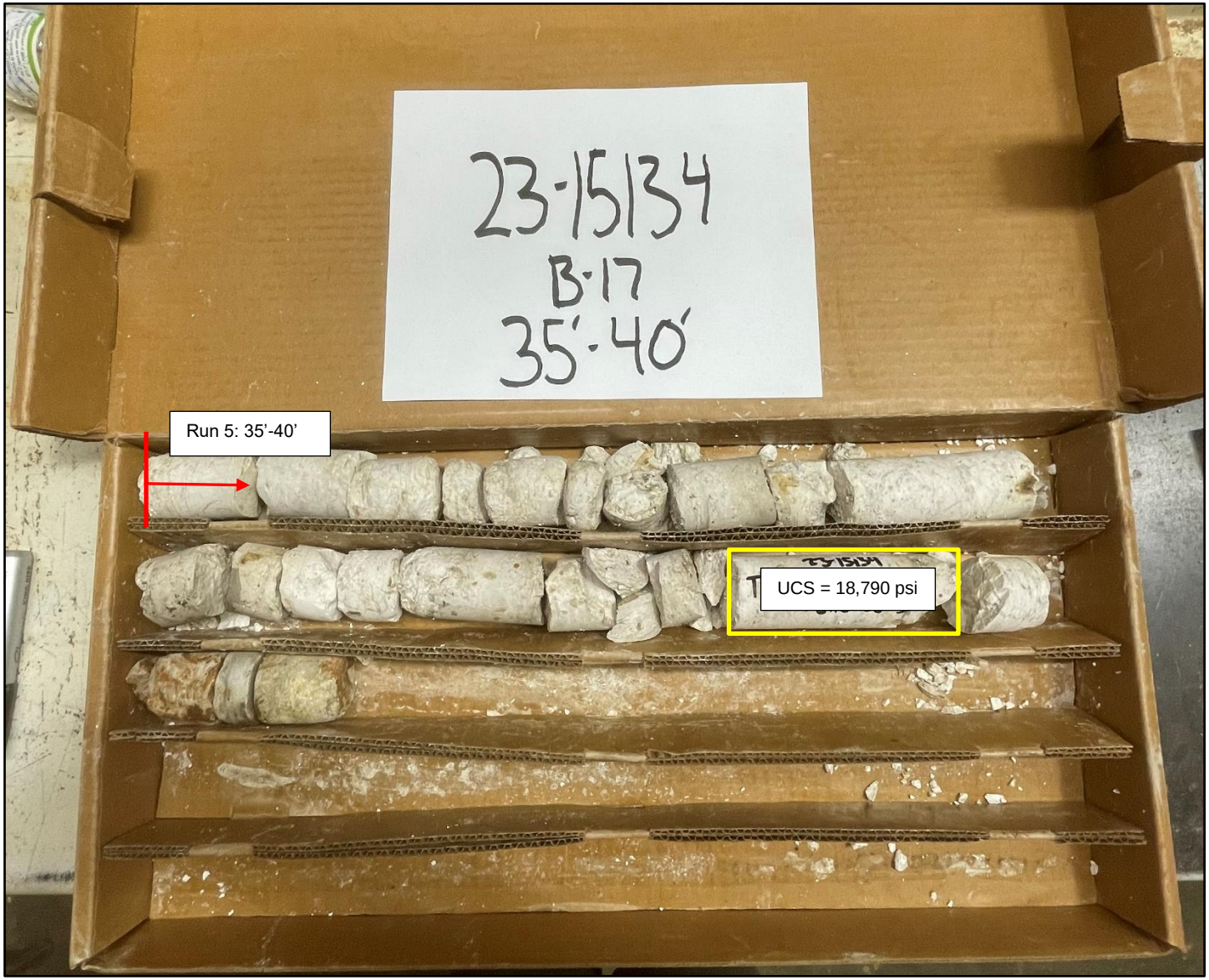


Boring B-16
Run 5: 35 to 40 feet: REC = 93%, RQD = 43%

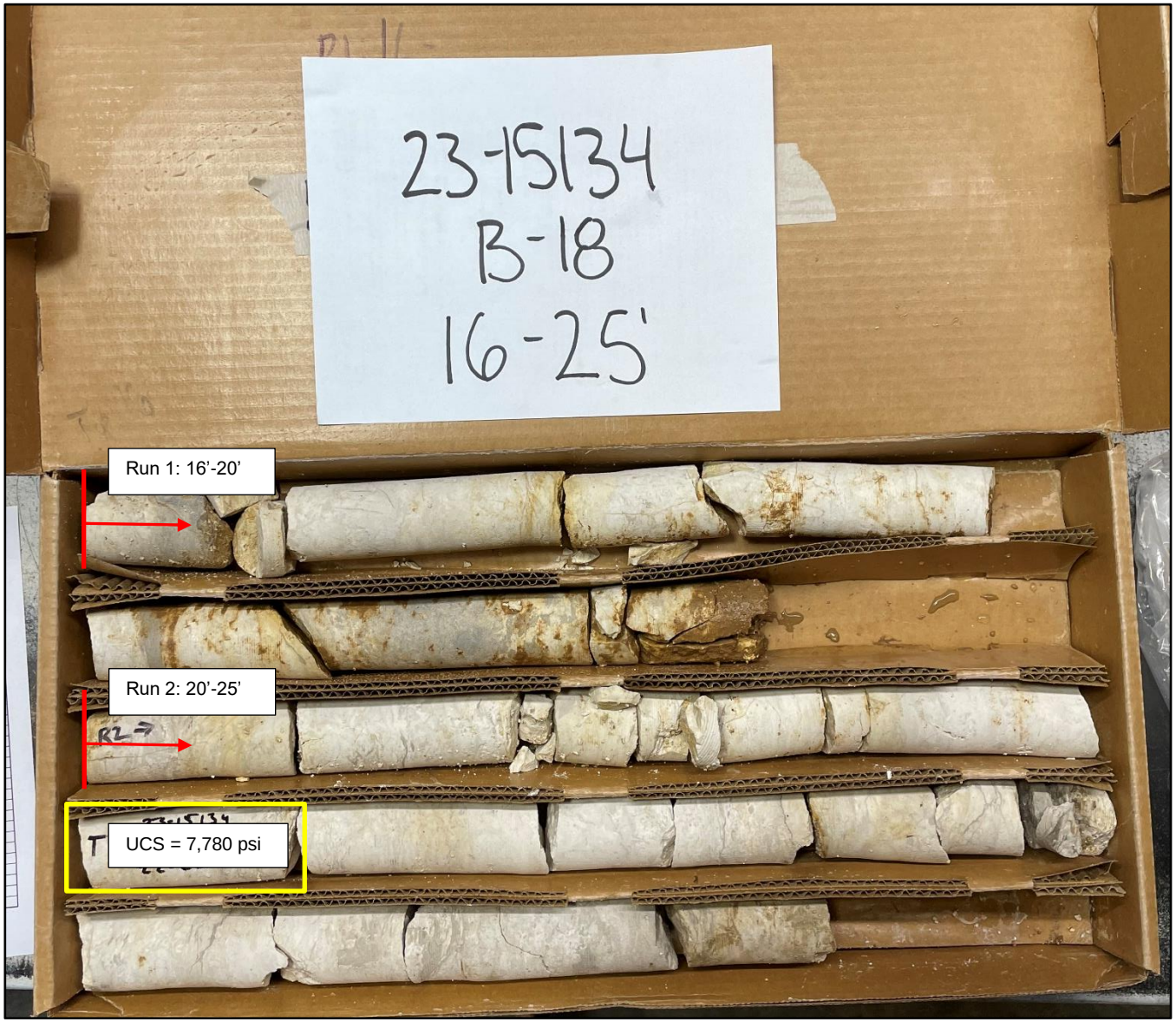


Boring B-17
Run 1: 17 to 20 feet: REC = 92%, RQD = 39%
Run 2: 20 to 25 feet: REC = 90%, RQD = 11%

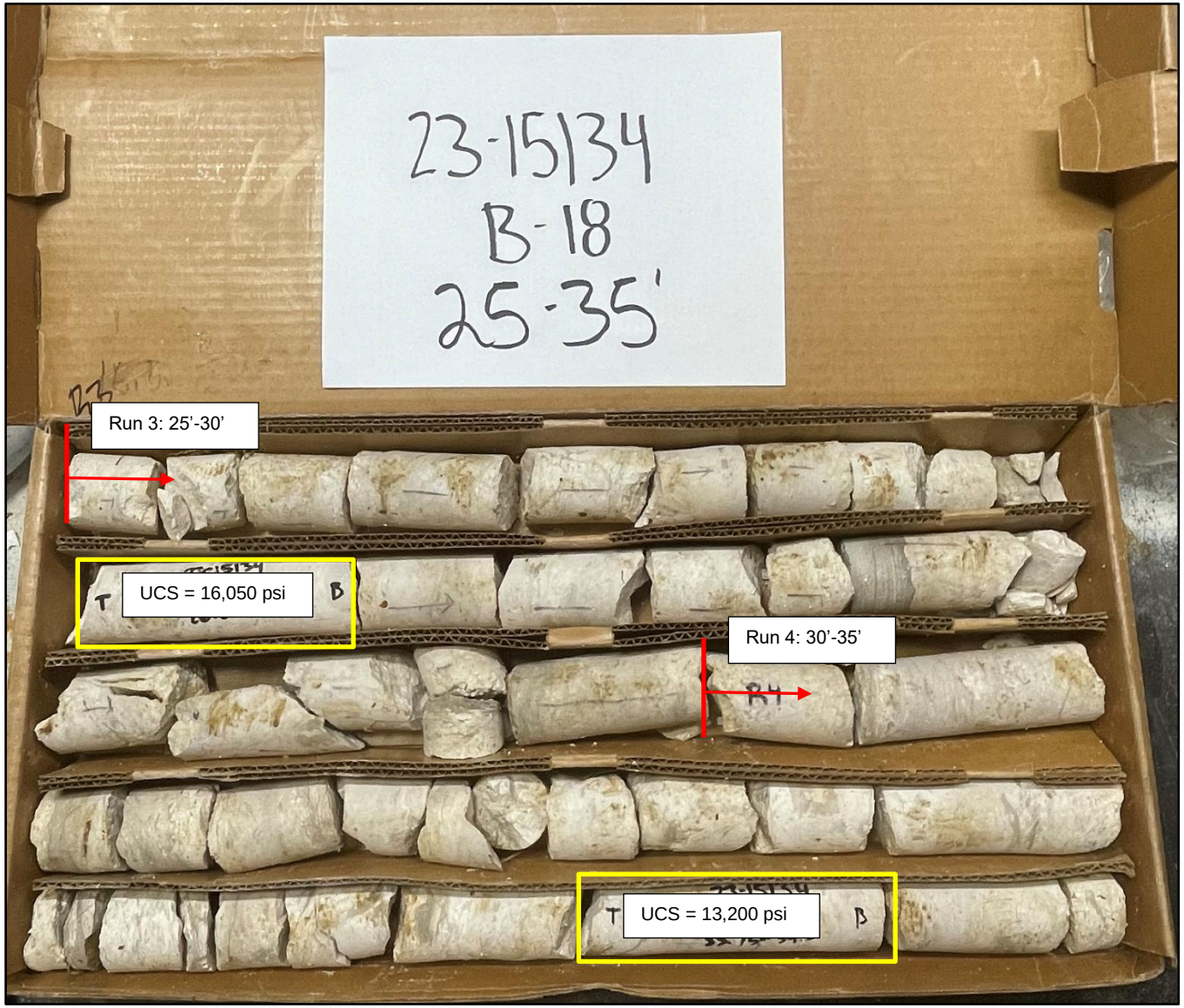
Boring B-17
Run 3: 25 to 30 feet: REC = 95%, RQD = 29%
Run 4: 30 to 35 feet: REC = 95%, RQD = 20%



Boring B-17
Run 5: 35 to 40 feet: REC = 83%, RQD = 20%

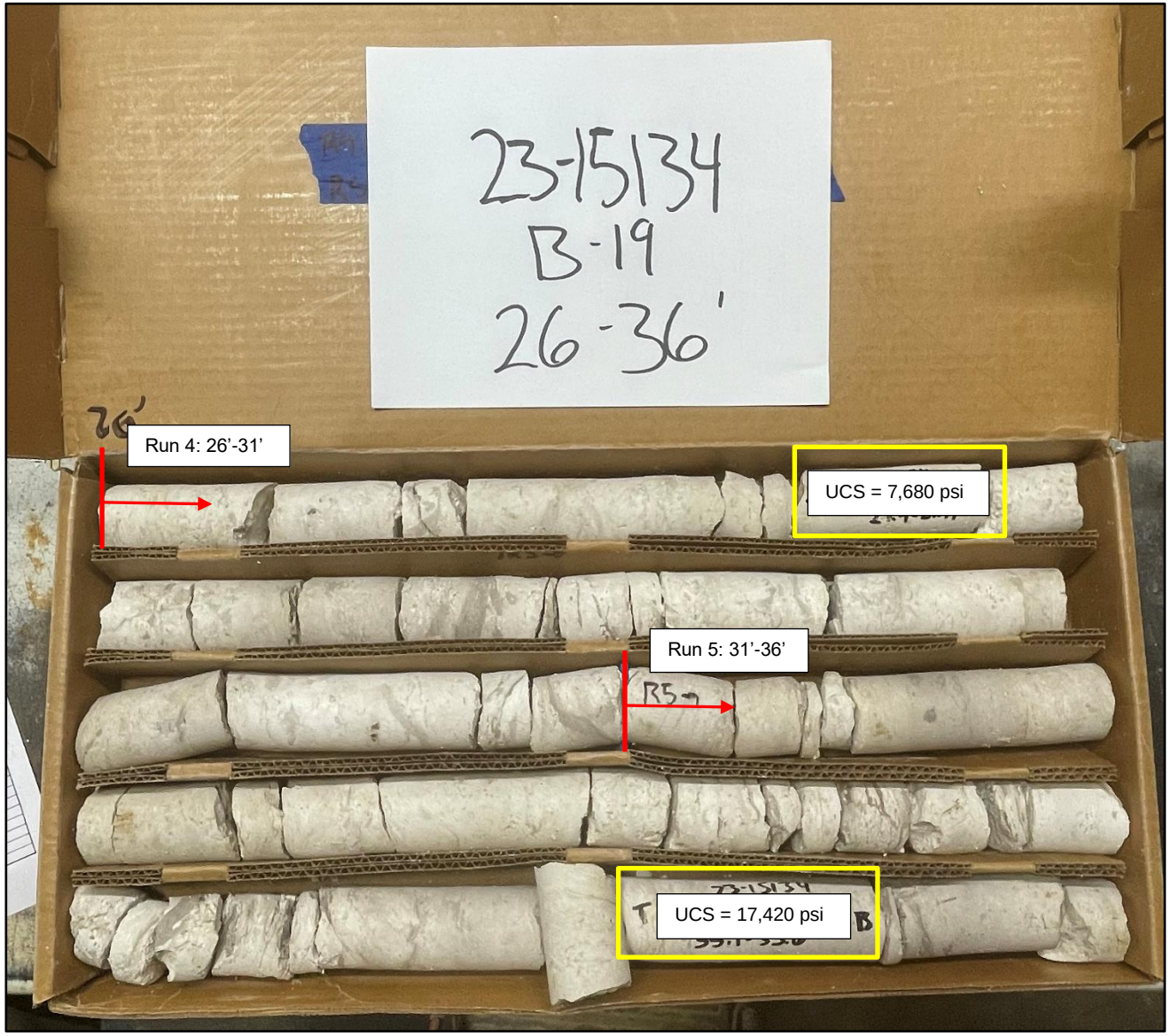


Boring B-18
Run 1: 16 to 20 feet: REC = 79%, RQD = 64%
Run 2: 20 to 25 feet: REC = 100%, RQD = 60%

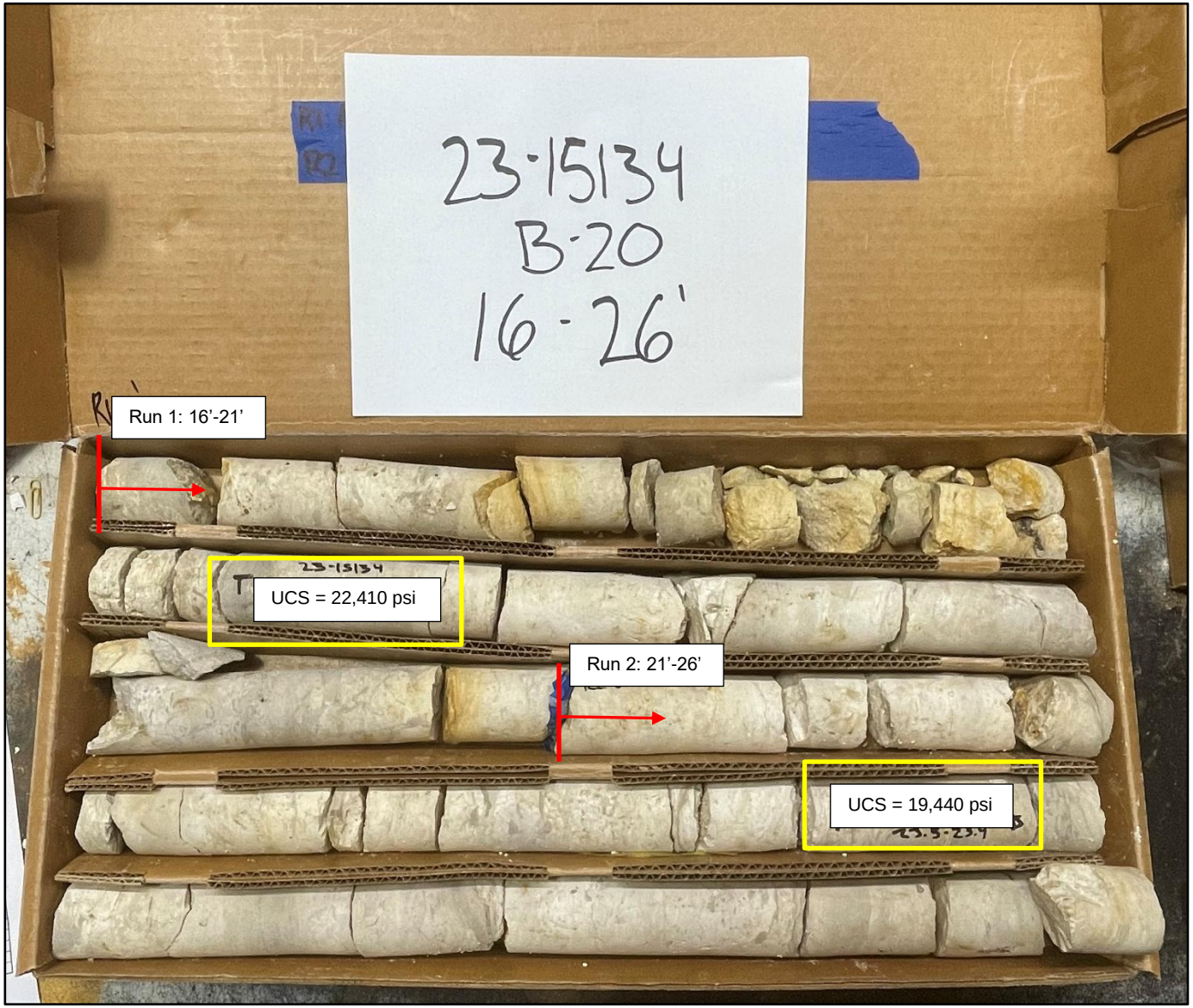


Boring B-18
Run 3: 25 to 30 feet: REC = 100%, RQD = 19%
Run 4: 30 to 35 feet: REC = 100%, RQD = 43%

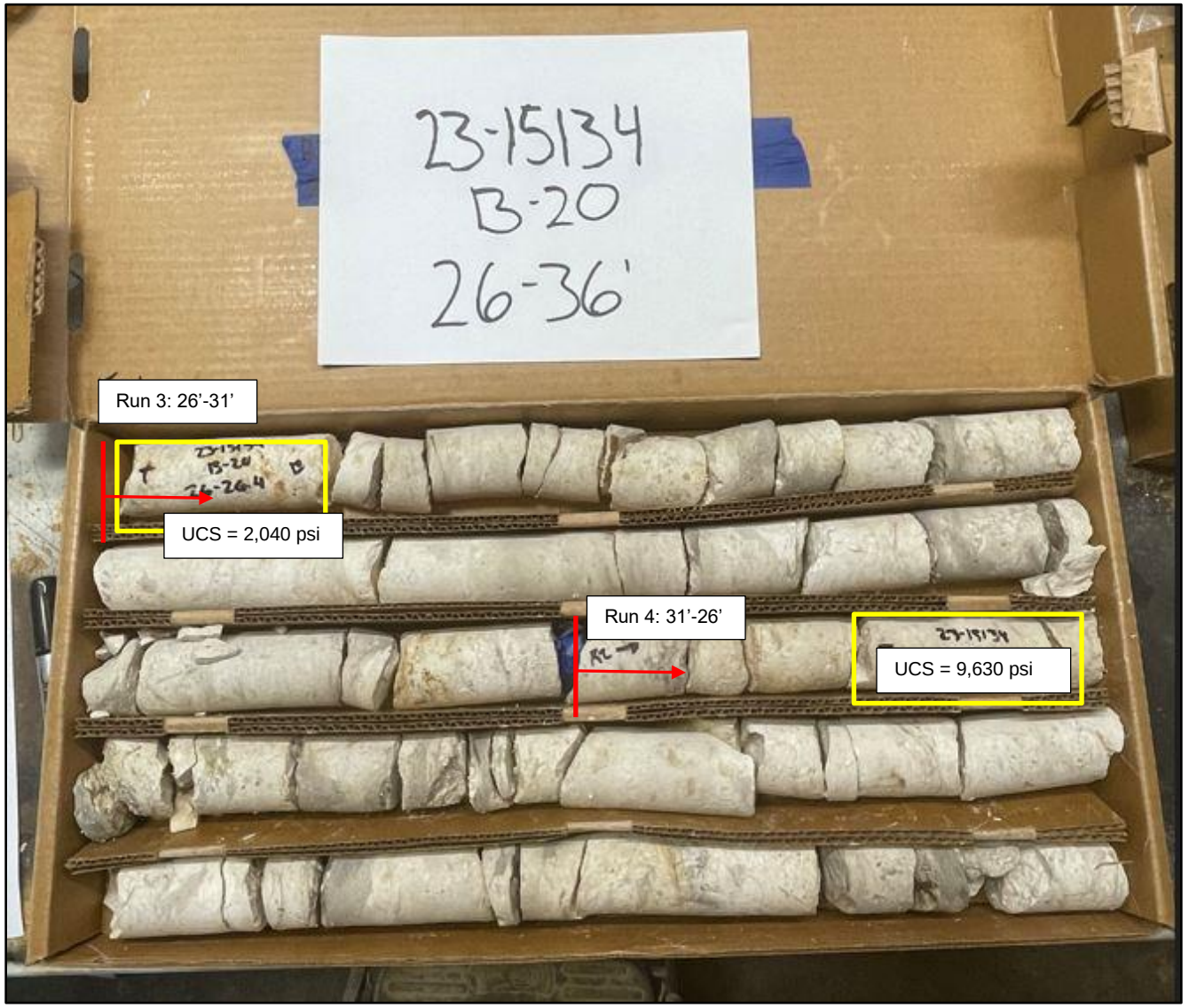
Boring B-19
Run 1: 15 to 16 feet: REC = 83%, RQD = 40%
Run 2: 16 to 21 feet: REC = 92%, RQD = 38%
Run 3: 21 to 26 feet: REC = 100%, RQD = 56%



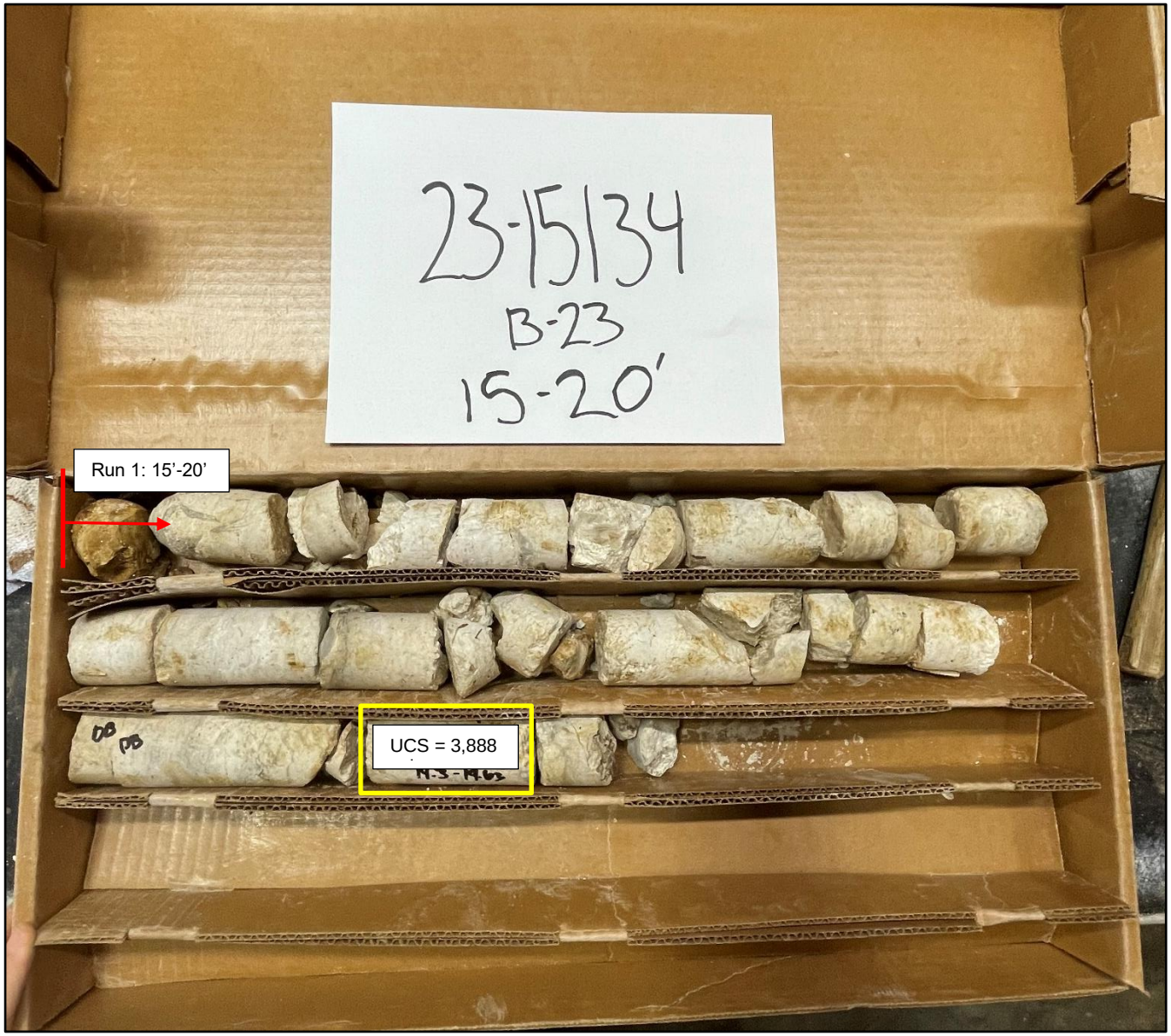
Boring B-19
Run 4: 26 to 31 feet: REC = 99%, RQD = 42%
Run 5: 31 to 36 feet: REC = 100%, RQD = 46%



Boring B-20
Run 1: 16 to 21 feet: REC = 99%, RQD = 52%
Run 2: 21 to 26 feet: REC = 100%, RQD = 53%

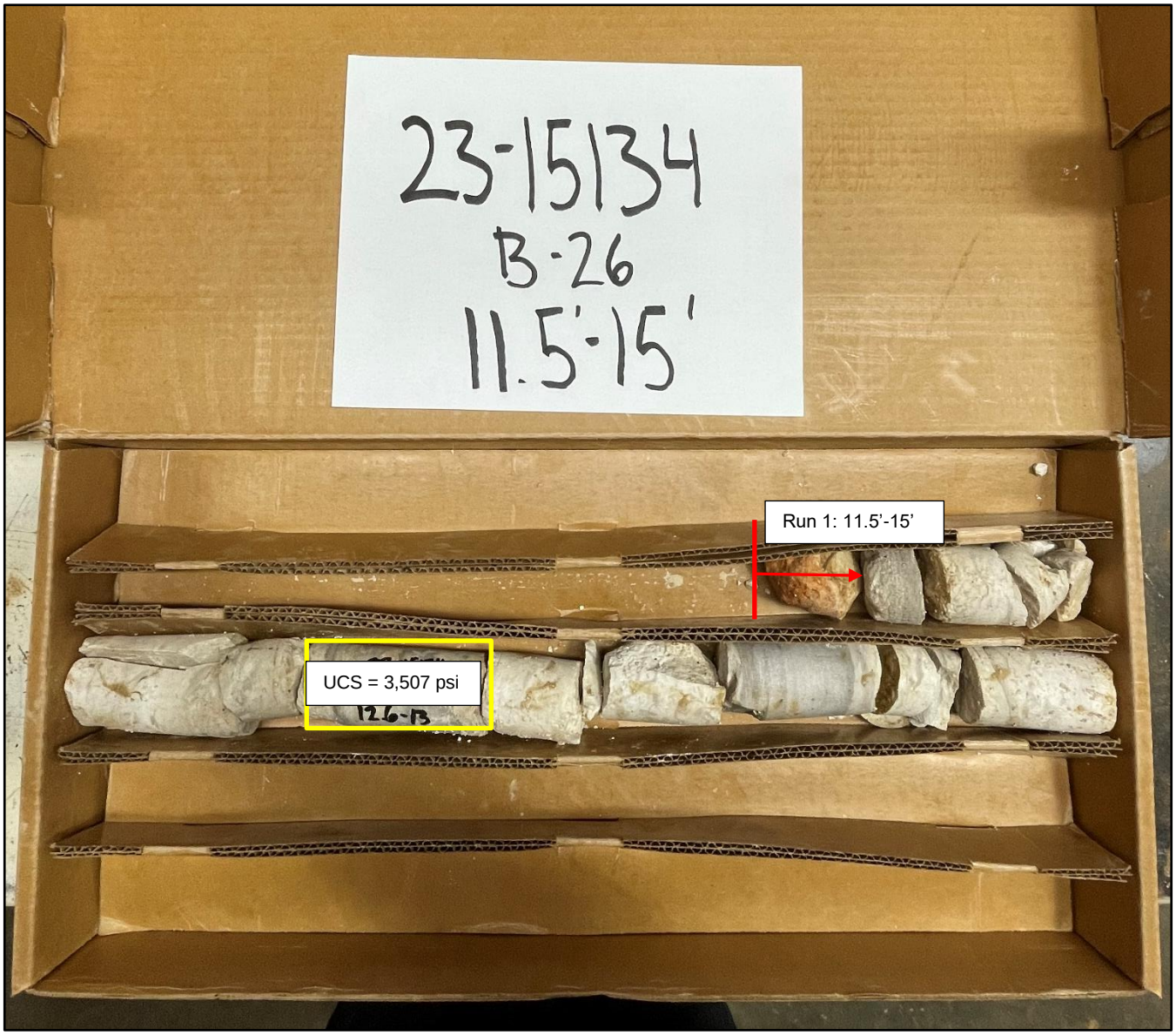


Boring B-20
Run 3: 26 to 31 feet: REC = 100%, RQD = 39%
Run 4: 31 to 36 feet: REC = 100%, RQD = 33%



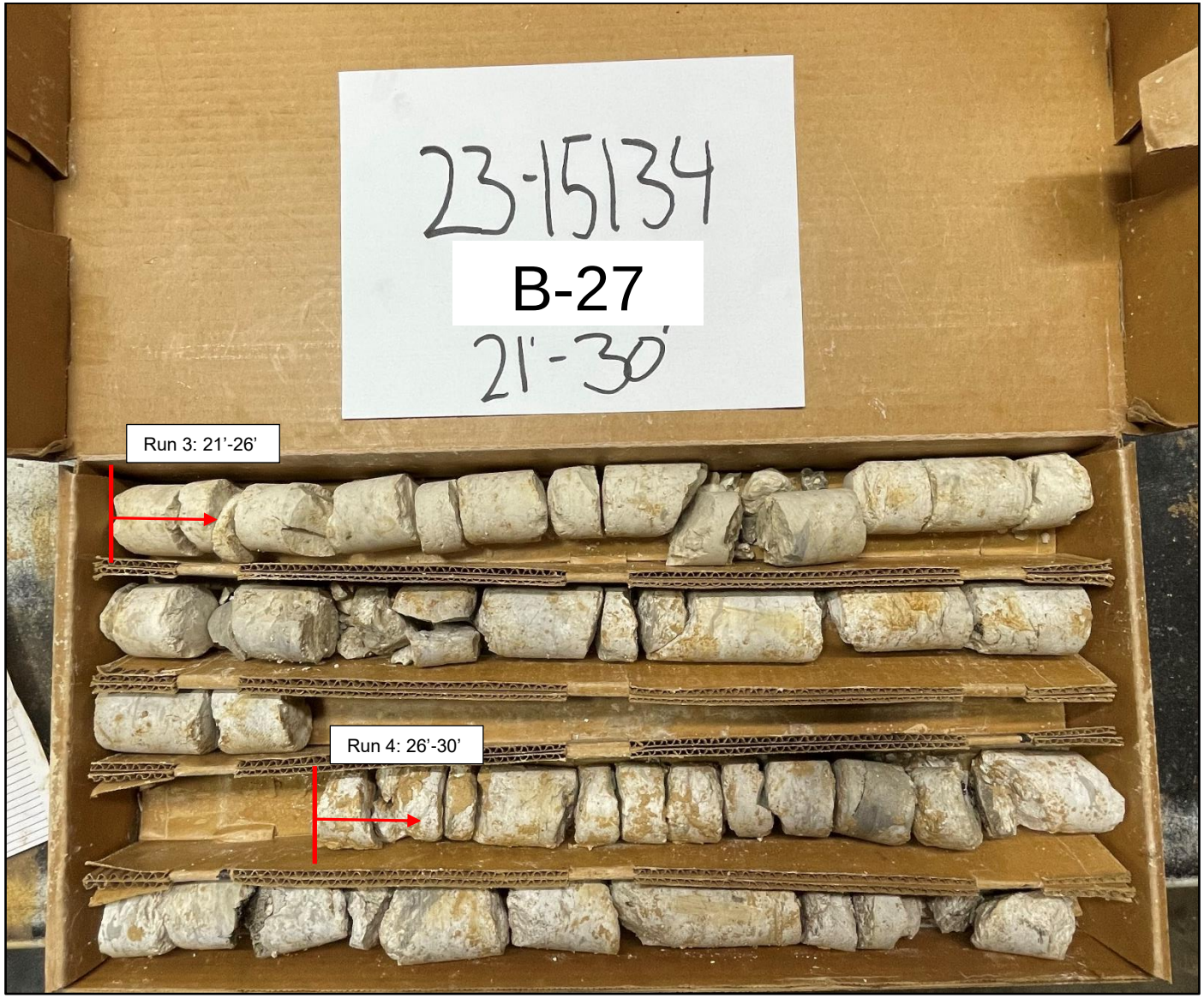
Boring B-23
Run 1: 15 to 20 feet: REC = 96%, RQD = 17%

Boring B-24
Run 1: 14 to 15 feet: REC = 100%, RQD = 0%
Run 2: 15 to 20 feet: REC = 45%, RQD = 0%



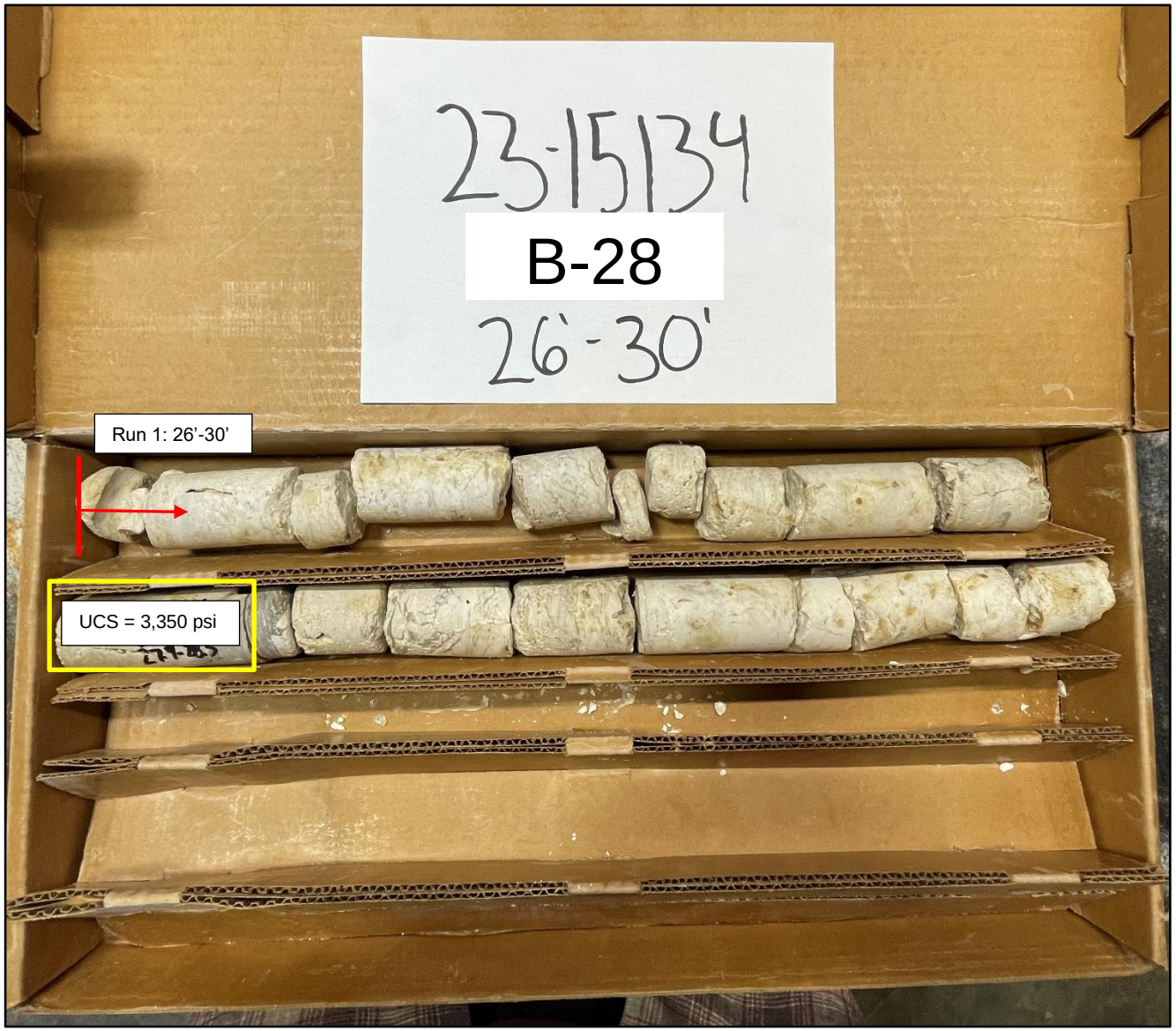
Boring B-26
Run 1: 11.5 to 15 feet: REC = 76%, RQD = 13%

Boring B-27
Run 1: 15 to 16 feet: REC = 100%, RQD = 0%
Run 2: 16 to 21 feet: REC = 100%, RQD = 26%



Boring B-27
Run 3: 21 to 26 feet: REC = 100%, RQD = 0%
Run 4: 26 to 30 feet: REC = 100%, RQD = 0%

Boring B-28
Run 1: 19 to 21 feet: REC = 85%, RQD = 29%
Run 2: 21 to 26 feet: REC = 98%, RQD = 31%



Boring B-28
Run 1: 26 to 30 feet: REC = 99%, RQD = 18%

APPENDIX C

Laboratory Testing Results

GTS, Inc.
Geotechnical & Testing Services

1915 North Shiloh Drive
Fayetteville, Arkansas 72704

Office: (479) 521-7645

Office Locations

Fayetteville, Arkansas
Little Rock, Arkansas
Fort Smith, Arkansas
Tulsa, Oklahoma
Dallas, Texas

PROJECT: Bentonville Water Resources Recovery Facility Improvements

DATE: 1/31/2024

JOB NO: 23-15134

BORING NO.	B-1
SAMPLE NO.	S-4
DEPTH (FT)	5-6.5
PLASTIC LIMIT	19
LIQUID LIMIT	46
PLASTICITY INDEX	27

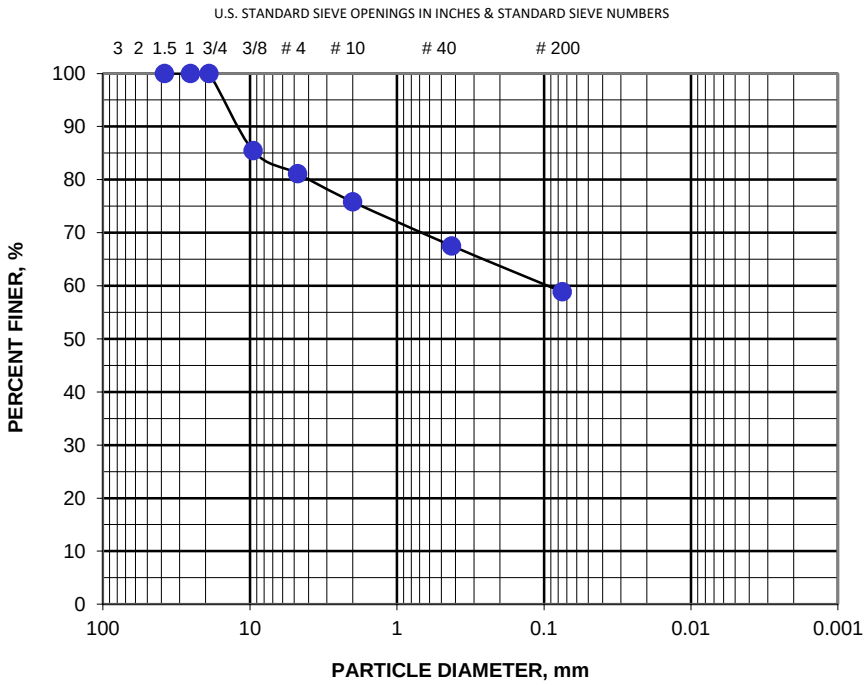
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	85.5%
No. 4	81.1%
No. 10	75.8%
No. 40	67.5%
No. 200	58.9%

MOISTURE CONTENT (%) 24.0

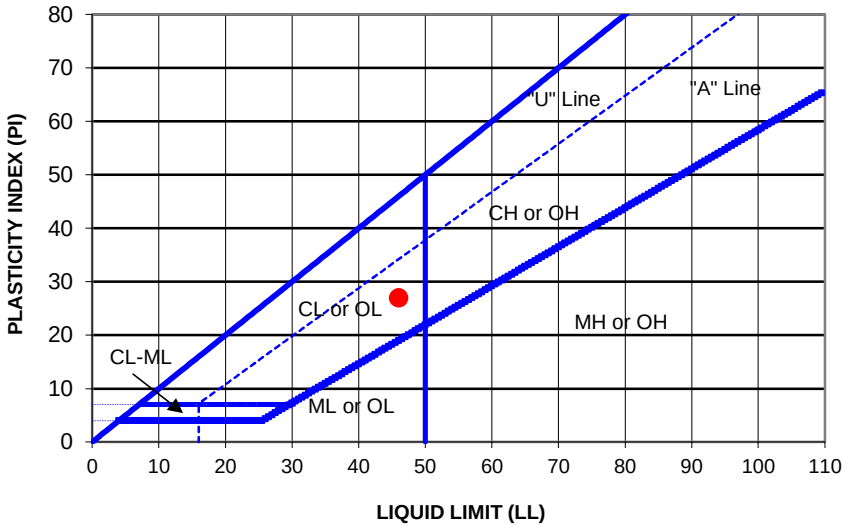
VISUAL DESCRIPTION	brown and red

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Sandy Lean Clay with Gravel, CL	**A-7-6**	**13**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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Tulsa, Oklahoma
Dallas, Texas

PROJECT: Bentonville Water Resources Recovery Facility Improvements

DATE: 1/31/2024

JOB NO: 23-15134

BORING NO.	B-2
SAMPLE NO.	S-1
DEPTH (FT)	0.5-2
PLASTIC LIMIT	24
LIQUID LIMIT	32
PLASTICITY INDEX	8

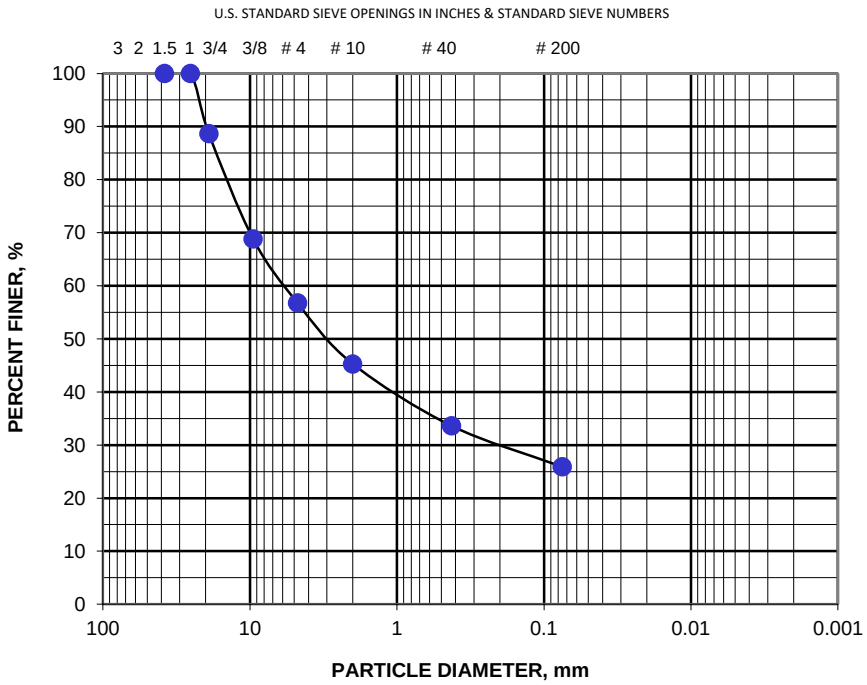
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	88.7%
3/8"	68.8%
No. 4	56.8%
No. 10	45.3%
No. 40	33.6%
No. 200	25.9%

MOISTURE CONTENT (%) 20.2

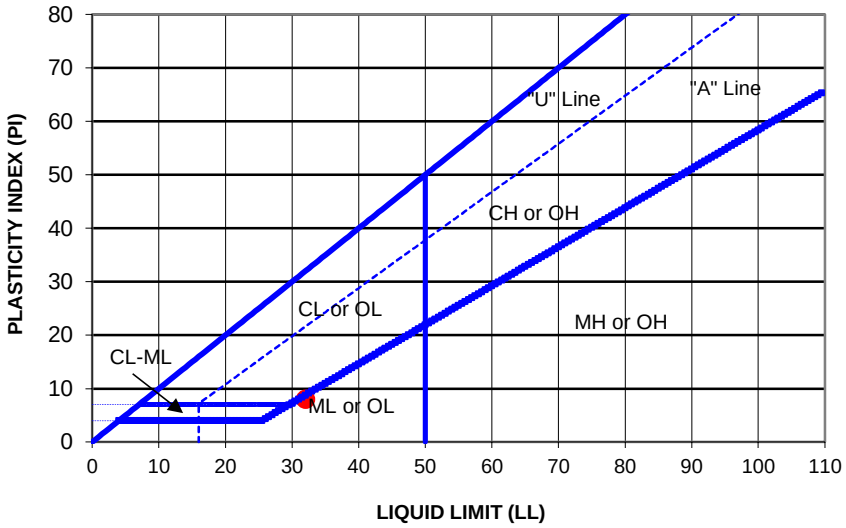
VISUAL DESCRIPTION	brown and tan

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Silty Gravel with Sand, GM	**A-2-4**	**0**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-2
SAMPLE NO.	S-2
DEPTH (FT)	2-3.5
PLASTIC LIMIT	20
LIQUID LIMIT	31
PLASTICITY INDEX	11

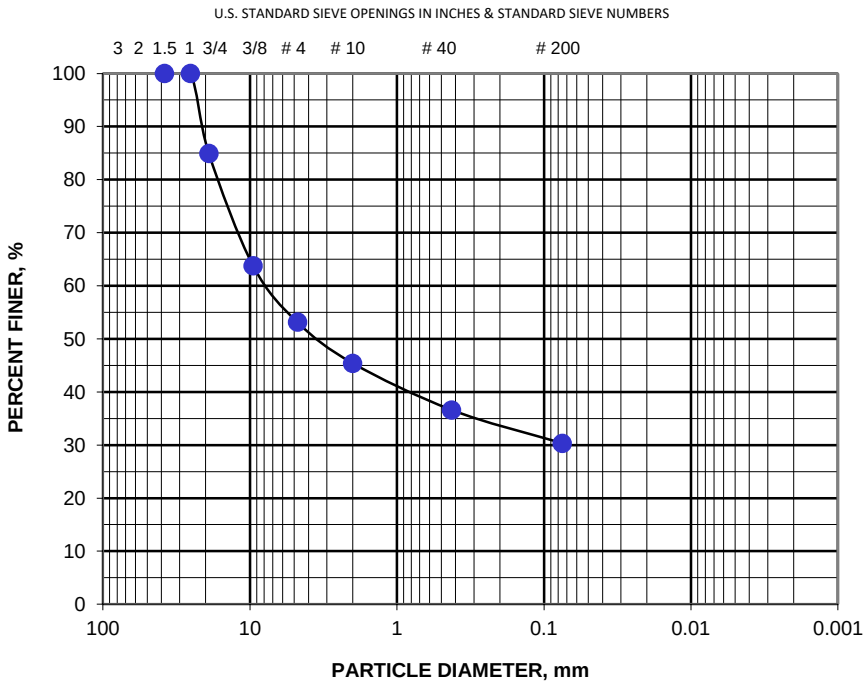
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	85.0%
3/8"	63.8%
No. 4	53.2%
No. 10	45.4%
No. 40	36.6%
No. 200	30.3%

MOISTURE CONTENT (%) 18.5

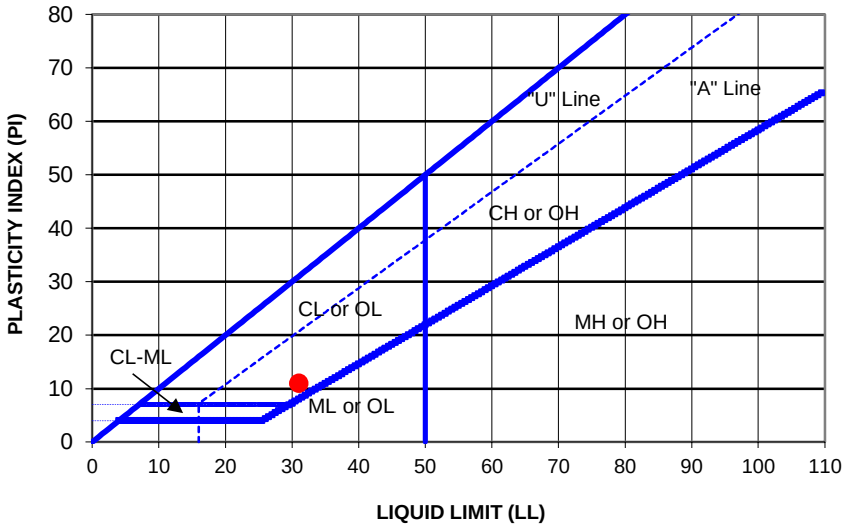
VISUAL DESCRIPTION	brown, red and gray

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-2-6**	**0**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-3
SAMPLE NO.	S-2
DEPTH (FT)	2-3.5
PLASTIC LIMIT	20
LIQUID LIMIT	46
PLASTICITY INDEX	26

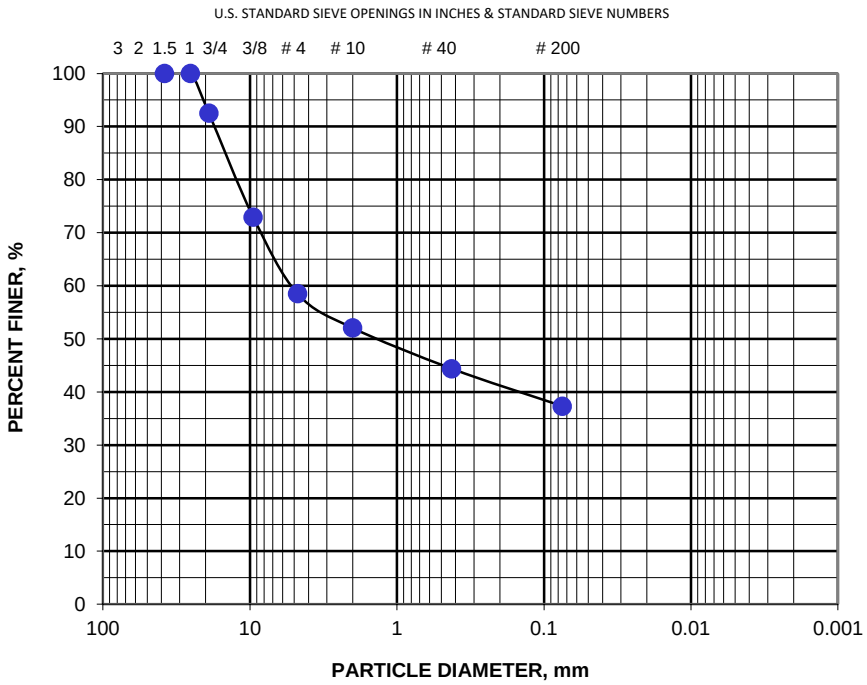
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	92.6%
3/8"	73.0%
No. 4	58.6%
No. 10	52.1%
No. 40	44.4%
No. 200	37.3%

MOISTURE CONTENT (%) 19.6

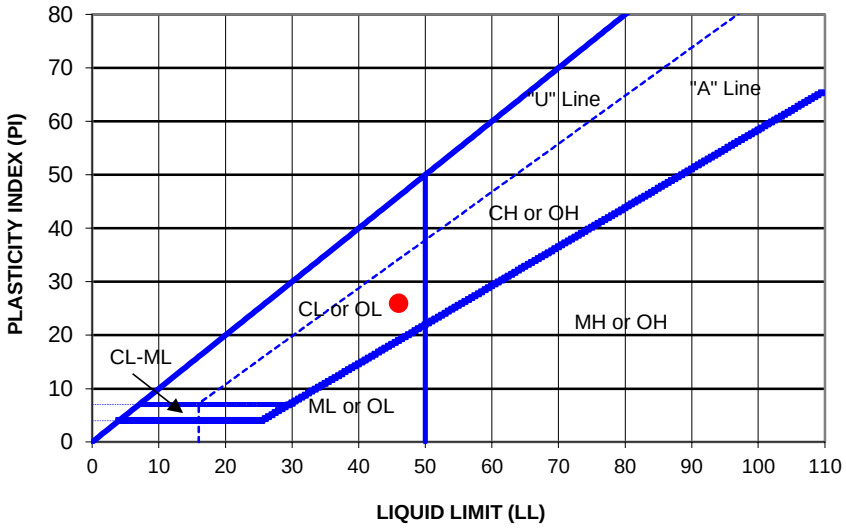
VISUAL DESCRIPTION	brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-7-6**	**4**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-3
SAMPLE NO.	S-3
DEPTH (FT)	3.5-5
PLASTIC LIMIT	19
LIQUID LIMIT	42
PLASTICITY INDEX	23

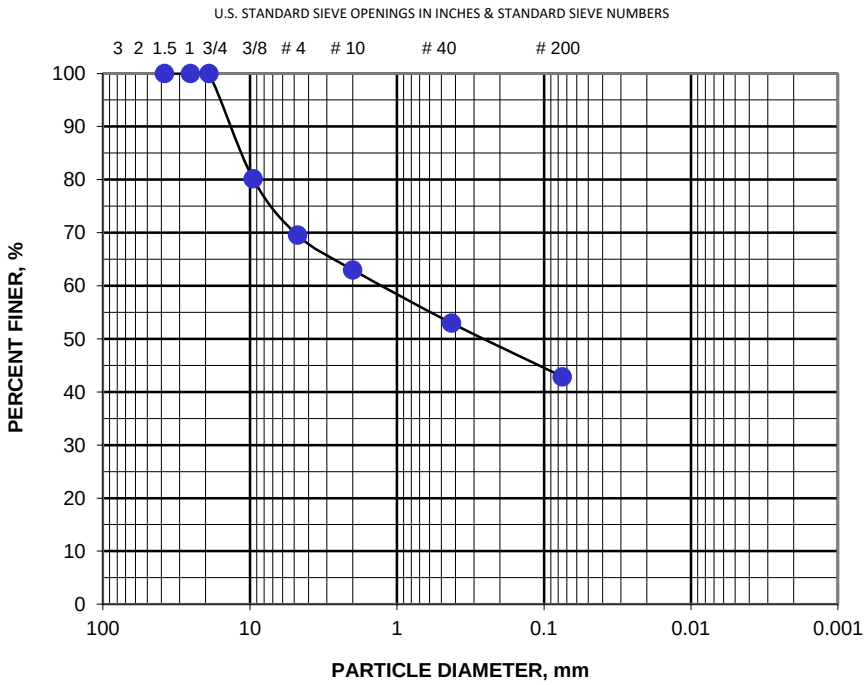
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	80.2%
No. 4	69.6%
No. 10	63.0%
No. 40	53.0%
No. 200	42.9%

MOISTURE CONTENT (%)	21.9

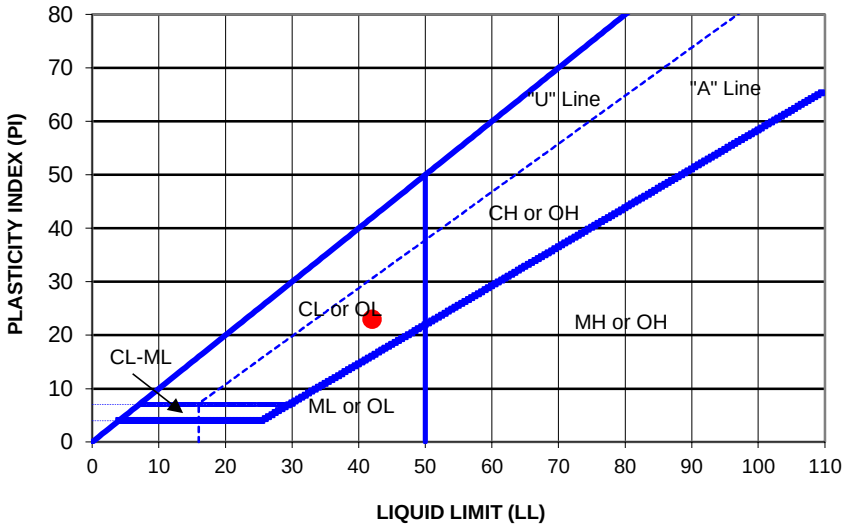
VISUAL DESCRIPTION	brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-7-6**	**5**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-5
SAMPLE NO.	S-5
DEPTH (FT)	8.5-10
PLASTIC LIMIT	23
LIQUID LIMIT	44
PLASTICITY INDEX	21

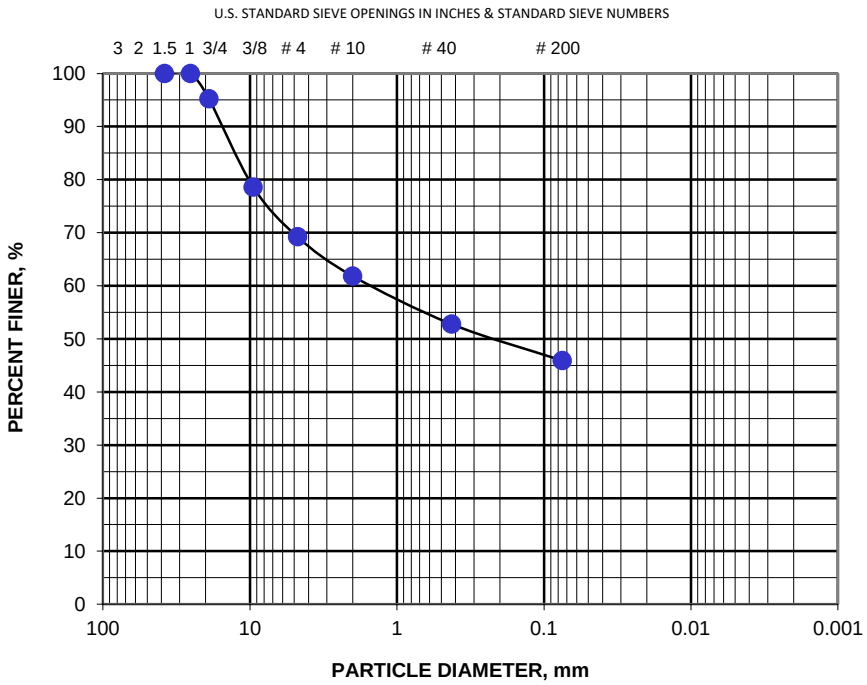
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	95.3%
3/8"	78.6%
No. 4	69.3%
No. 10	61.8%
No. 40	52.8%
No. 200	45.9%

MOISTURE CONTENT (%)	26.0

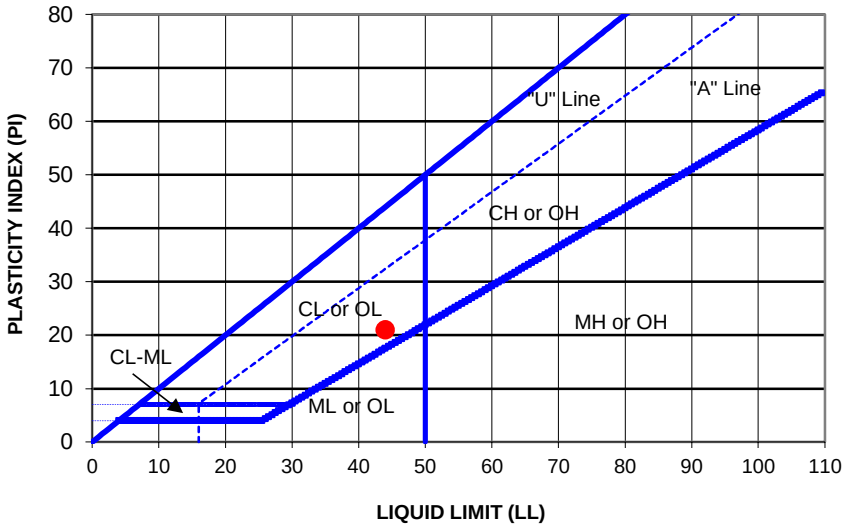
VISUAL DESCRIPTION	red and brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-7-6**	**6**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-6
SAMPLE NO.	S-4
DEPTH (FT)	5-6.5
PLASTIC LIMIT	27
LIQUID LIMIT	36
PLASTICITY INDEX	9

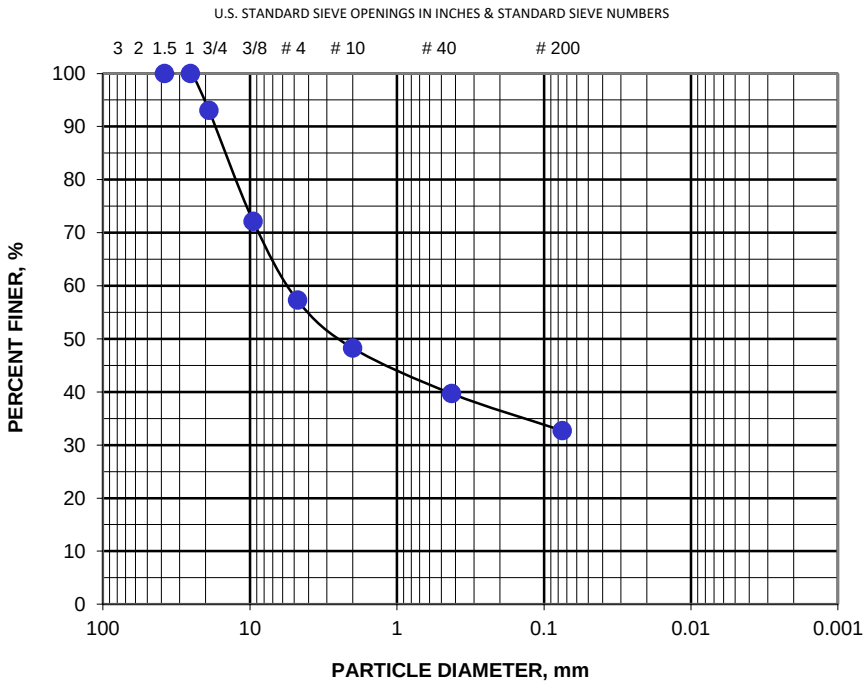
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	93.1%
3/8"	72.2%
No. 4	57.3%
No. 10	48.3%
No. 40	39.7%
No. 200	32.7%

MOISTURE CONTENT (%) 30.9

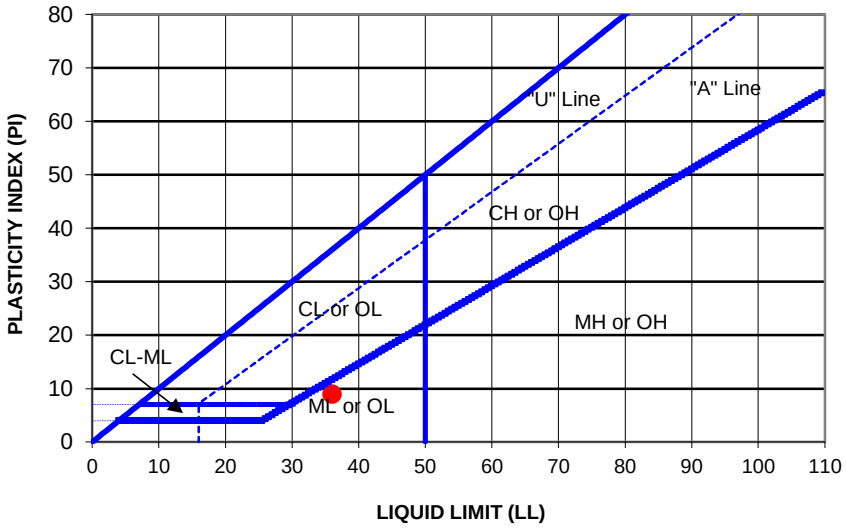
VISUAL DESCRIPTION	red and brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Silty Gravel with Sand, GM	**A-2-4**	**0**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-17
SAMPLE NO.	S-1
DEPTH (FT)	0.5-2
PLASTIC LIMIT	19
LIQUID LIMIT	31
PLASTICITY INDEX	12

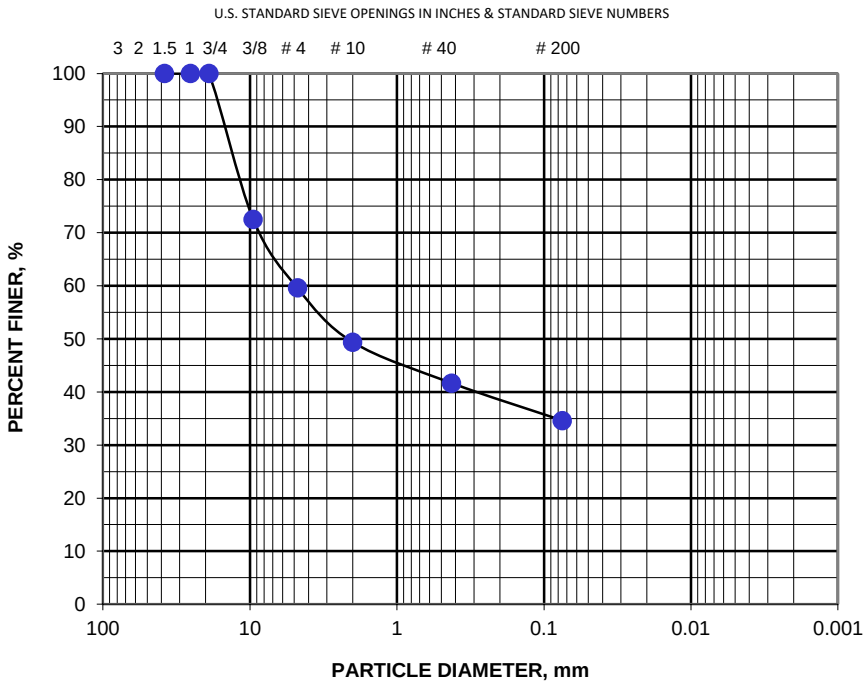
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	72.5%
No. 4	59.6%
No. 10	49.4%
No. 40	41.7%
No. 200	34.6%

MOISTURE CONTENT (%) 18.0

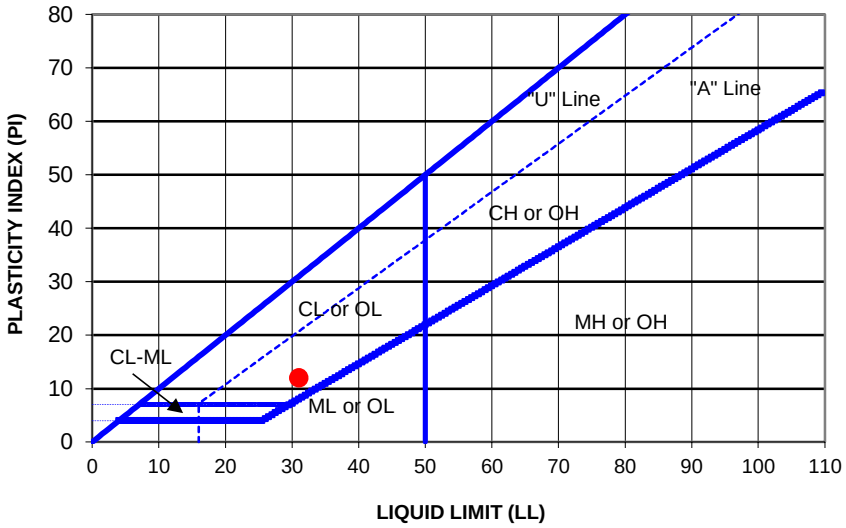
VISUAL DESCRIPTION	red and gray

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-2-6**	**0**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-17
SAMPLE NO.	S-3
DEPTH (FT)	3.5-5
PLASTIC LIMIT	17
LIQUID LIMIT	37
PLASTICITY INDEX	20

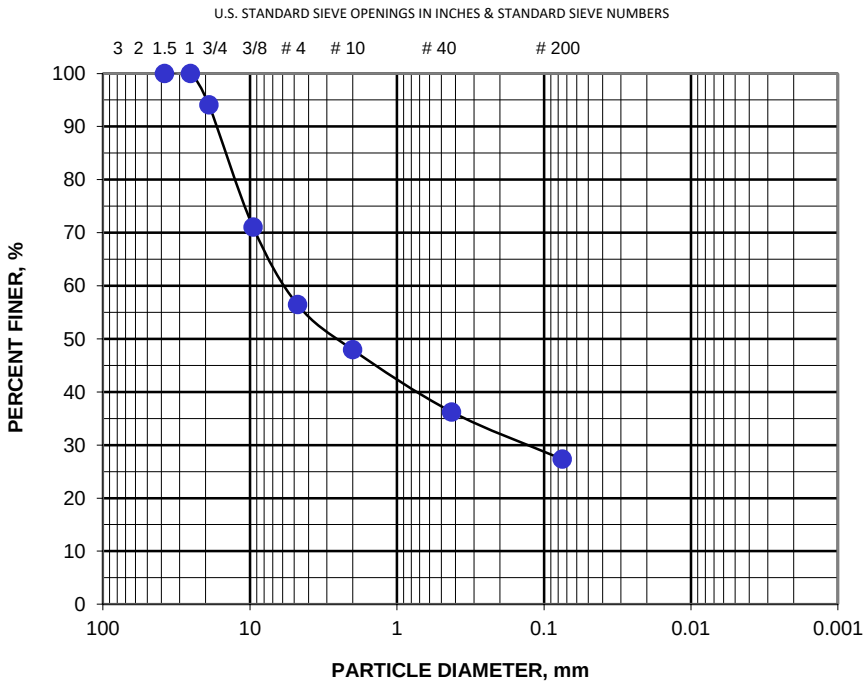
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	94.1%
3/8"	71.1%
No. 4	56.5%
No. 10	48.0%
No. 40	36.2%
No. 200	27.3%

MOISTURE CONTENT (%)	15.0

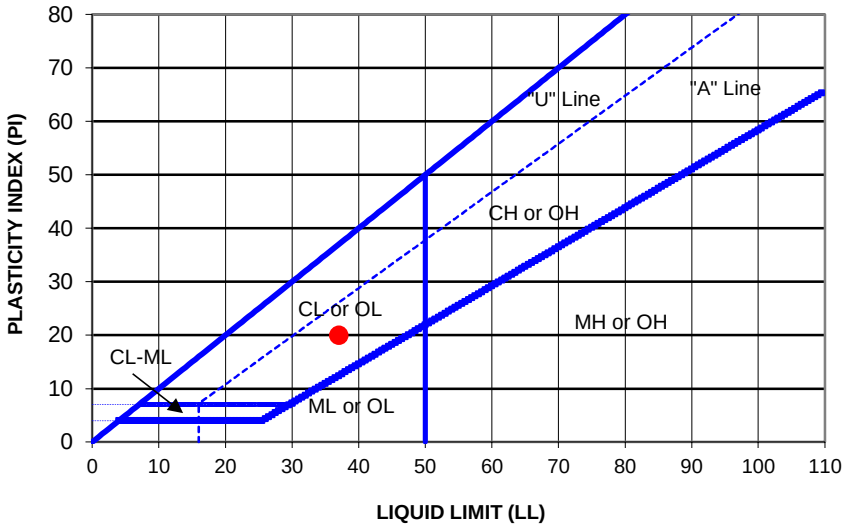
VISUAL DESCRIPTION	red and gray

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-2-6**	**1**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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JOB NO: 23-15134

BORING NO.	B-21
SAMPLE NO.	S-2
DEPTH (FT)	2-3.5
PLASTIC LIMIT	19
LIQUID LIMIT	44
PLASTICITY INDEX	25

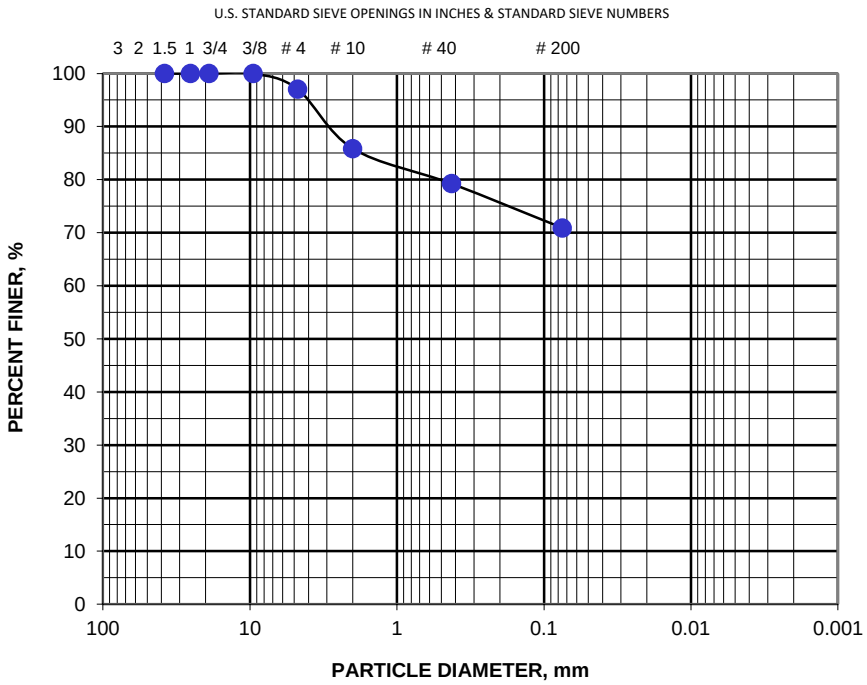
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	100.0%
3/8"	100.0%
No. 4	97.1%
No. 10	85.9%
No. 40	79.3%
No. 200	70.9%

MOISTURE CONTENT (%) 19.6

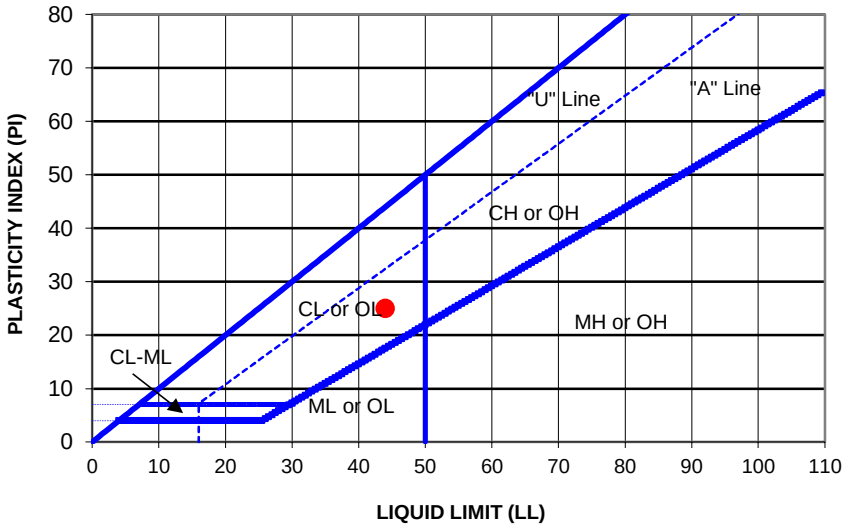
VISUAL DESCRIPTION	red and brown

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Lean Clay with Sand, CL	**A-7-6**	**16**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-26
SAMPLE NO.	S-5
DEPTH (FT)	8.5-10
PLASTIC LIMIT	18
LIQUID LIMIT	42
PLASTICITY INDEX	24

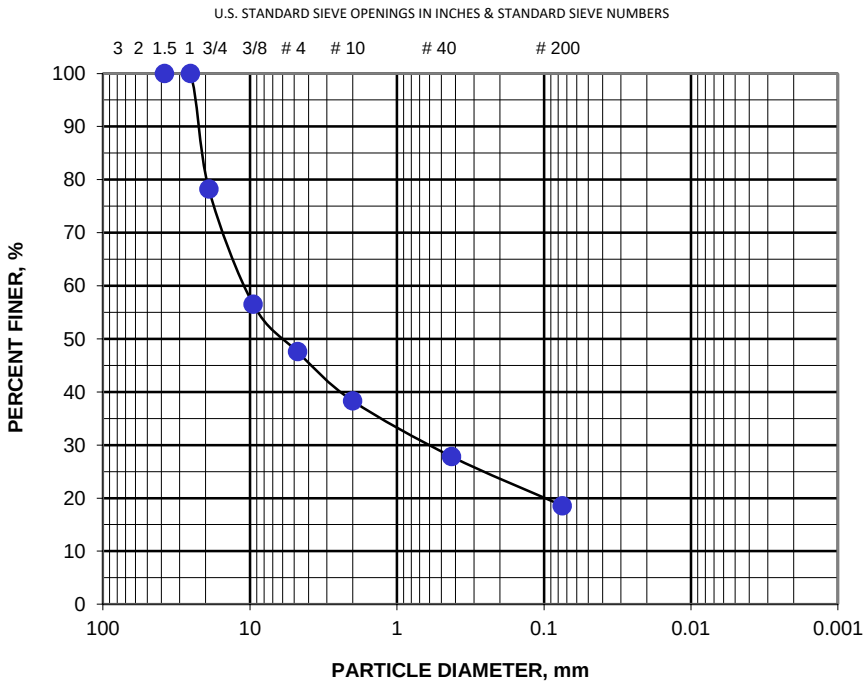
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	78.3%
3/8"	56.5%
No. 4	47.6%
No. 10	38.3%
No. 40	27.8%
No. 200	18.6%

MOISTURE CONTENT (%)	12.5

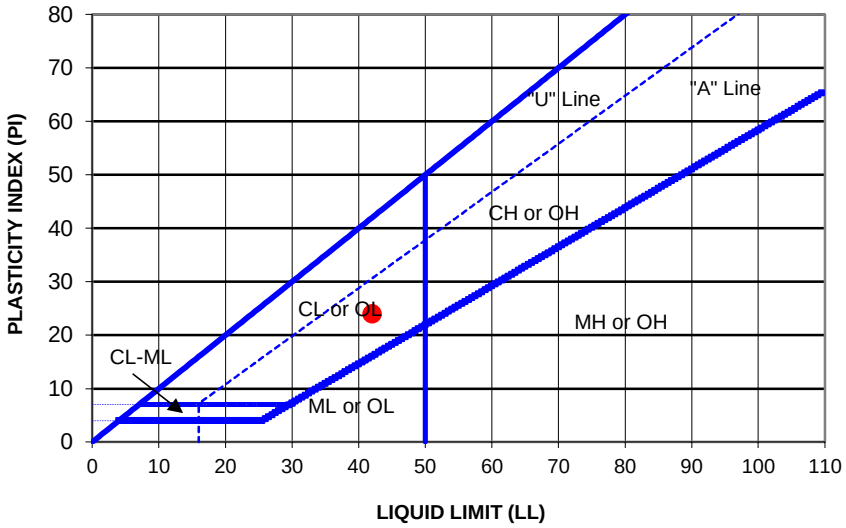
VISUAL DESCRIPTION	gray, brown, and red

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Gravel with Sand, GC	**A-2-7**	**1**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART



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BORING NO.	B-22
SAMPLE NO.	S-3
DEPTH (FT)	3.5-5
PLASTIC LIMIT	18
LIQUID LIMIT	35
PLASTICITY INDEX	17

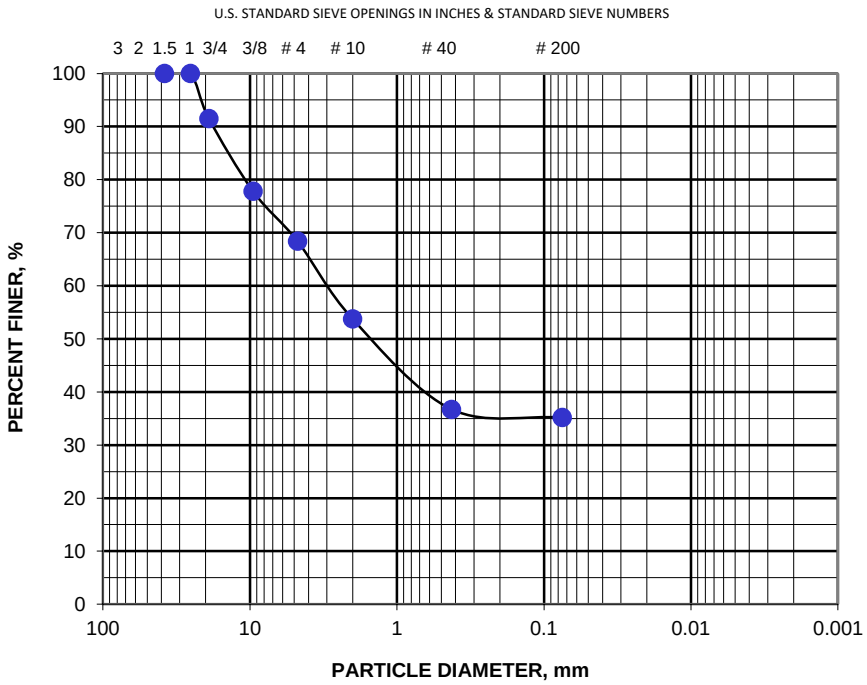
SIEVE SIZE	PERCENT PASSING
3.00"	100.0%
1.50"	100.0%
1.00"	100.0%
3/4"	91.5%
3/8"	77.8%
No. 4	68.4%
No. 10	53.8%
No. 40	36.7%
No. 200	35.2%

MOISTURE CONTENT (%)	20.8

VISUAL DESCRIPTION	red and gray

ASTM DESCRIPTION	AASHTO CLASSIFICATION	AASHTO GI
Clayey Sand with Gravel, SC	**A-6**	**1**

GRAIN SIZE DISTRIBUTION CURVE



PLASTICITY CHART