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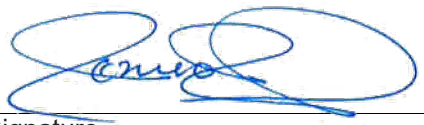
Project Manager:  07/20/2023

Signature Date

FINAL GEOTECHNICAL INVESTIGATION REPORT

Cherrystone Creek Watershed Dam No. 2A
Pittsylvania County
Chatham, Virginia

Schnabel Reference # 22210031.100
July 20, 2023

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FINAL GEOTECHNICAL INVESTIGATION REPORT

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FINAL GEOTECHNICAL INVESTIGATION REPORT
CHERRYSTONE CREEK WATERSHED DAM NO. 2A
PITTSYLVANIA COUNTY
CHATHAM, VIRGINIA

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1.1 Project Overview

1.1.1 General

This Geotechnical Investigation Report was prepared by **Schnabel Engineering, LLC** (Schnabel) in support of the Rehabilitation Design of Cherrystone Creek Watershed Dam No. 2A (Dam 2A). This report includes tables, figures, and appendices with relevant data collected during the investigation. The investigation was performed in accordance with the approved *Geotechnical Investigation Work Plan* (Work Plan) dated December 16, 2022. The organization of this report follows the Geological Investigation Report outline presented in NEH Part 631.0205(e) to the extent practical.

1.1.2 Site Location

Dam 2A is located approximately 2.7-miles northwest of Chatham, Virginia, on Roaring Fork Creek. The latitude and longitude of the approximate midpoint of the embankment centerline are 38.8473° N and 79.4327° W, respectively. A Project Vicinity Map is included as Figure 1. The downstream toe of the Dam 2A embankment can be accessed from a dirt road located at approximately 660 Cherrystone Lake Road. The auxiliary spillway and embankment crest for Dam 2A can be accessed from a dirt road located at about 1645 Cherrystone Lake Road. Both dirt roads will be on your left as you travel north on Cherrystone Lake Road.

To access the dam from the U.S. Post Office located in the Town of Chatham, head west on Depot Street / VA-57 for about 3 miles and then turn right on Cherrystone Lake Road / VA-793 and drive for 1.4 miles. The gravel road and gate access to the left abutment and the gate to access the toe of the dam are both located on the left side (west) of Cherrystone Lake Road before the intersection of Hodnetts Mill Road and Cherrystone Lake Road.

1.1.3 Elevation Datum and Terminology

Elevations for this project are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88). The horizontal control is referenced to the North American Datum of 1983 (NAD83) Virginia State Plane – South Zone. The abbreviation “EL” represents elevation.

Descriptive nomenclature for dams is based upon one looking downstream. The terms “right” and “left” are used herein accordingly. The reservoir side is known as the upstream slope with the opposite side referred to as the downstream slope.

1.1.4 Objective and Scope of Services

The objective of our subsurface investigation was to characterize the materials and conditions in the dam and its foundation in support of development of the dam rehabilitation design. The information obtained during the investigation will be used to supplement the data from the 2016 geotechnical investigations and to support and refine the geotechnical engineering analyses required in accordance with Technical Release No. 210-60, Earth Dams and Reservoirs (USDA-NRCS, 2019). To accomplish this objective, we performed the following scope of services:

- Coordinated with Natural Resources Conservation Service (NRCS) and a drilling subcontractor to perform drilling and in situ testing,
- Drilled four borings and three auger probes,
- Installed two permanent open standpipe piezometers with one piezometer screened in the embankment and one piezometer screened in the foundation soils,
- Observed and logged the drilling of the borings and auger probes, and the installation of piezometers,
- Retained soil and rock samples from the borings,
- Measured ground water levels in the borings and piezometers,
- Performed rock permeability (packer) tests in the dam foundation bedrock,
- Performed soil permeability (slug) tests in piezometers installed in the dam embankment and foundation soils,
- Performed laboratory testing on selected soil and rock samples obtained from the test borings, and
- Prepared this Geotechnical Investigation Report.

These services were performed under the supervision of a Professional Engineer licensed in the Commonwealth of Virginia.

1.1.5 Site Description

Dam 2A is a zoned earthen embankment dam constructed along Roaring Fork about 600 feet upstream of its confluence with Cherrystone Creek and about 400 feet upstream of Cherrystone Lake Road (Route 793). The dam impounds an approximately 16.5-acre reservoir at normal pool, controlled by the low-stage weir at EL 674.5. The earthen embankment has a crest length of about 400 feet and a top width of 20 feet. The dam has a maximum design height of 60 feet and a downstream slope of 2.5 feet horizontal to 1 foot vertical (2.5H:1V). The upstream slope of the dam is 2.5H:1V above an approximately 10-foot-wide bench located at about EL 676 and 3H:1V below the bench. Both slopes appear to be generally uniform. A small slough was observed along the ditch at the downstream right abutment contact. This slough was also noted during our visual inspection of the dam performed on October 21, 2022 and reported in our Site Reconnaissance Letter Report dated November 22, 2022 (Schnabel, 2022). During our geotechnical investigation soft, wet soils were observed at the downstream toe of the embankment.

Based on survey information gathered in 2014 and provided by NRCS in September of 2022, the minimum crest elevation of the dam is approximately EL 706.8 which provides 32.7 feet of freeboard above the normal pool elevation. The principal spillway consists of a two-stage, Dx3D, reinforced concrete riser and a 36-inch diameter reinforced concrete conduit. The conduit extends beneath the dam, perpendicular to the dam baseline alignment at approximately Station 13+00, and outlets into a

riprap lined plunge pool before it discharges into Roaring Fork. The foundation trench drain includes two 8-inch diameter corrugated metal pipes (CMP), one on each side of the principal spillway conduit, which extend from each abutment along the toe of the dam and then turn and run along each side of the principal spillway conduit and outlet within the plunge pool.

The auxiliary spillway at Dam 2A is a vegetated earthen spillway located to the left of the dam's left abutment. The auxiliary spillway discharges across Cherrystone Lake Road into a natural drainage feature before it flows into Cherrystone Creek at about 600 feet upstream of the confluence between Cherrystone Creek and Roaring Fork Creek. The auxiliary spillway has a left to right bottom width of 200 feet, a 30-foot wide (upstream to downstream) control section at EL 699.8, and side slopes of 3H:1V. The constructed inlet or approach channel of the auxiliary spillway slopes from the control section back toward the reservoir at about a 2% grade. The auxiliary spillway constructed exit channel slopes approximately 3% downstream away from the control section and that slope increases significantly downstream of the constructed exit channel. Due to the existing site topography downstream of the auxiliary spillway, flows from the auxiliary spillway would likely concentrate in a low area/channel that is about 80 feet wide downstream of the constructed outlet channel. Based on conversations with Pittsylvania County (Sponsor) and the Town of Chatham (Sponsor), it is our understanding that the auxiliary spillway has never activated.

Cherrystone Dam 2A is classified as a high hazard dam by NRCS and the Virginia Department of Conservation and Recreation (VA DCR) Dam Safety.

1.1.6 Previous Subsurface Explorations

1965-1966 Investigation by US Soil Conservation Service (SCS)

Numerous test pits, test borings, and resistivitor surveys were performed across the site in 1966 to support the original design of the dam. Results and findings are summarized in the Geology Report dated December 1966, and the Design Report in the Embankment and Foundation Analysis dated July 1967. Test pit and test boring logs were shown on the 1967 As-Built Drawings. Select As-Built Drawings that include results of these investigations are included in Appendix A. In 1994, Congress changed SCS to NRCS to reflect the broadened scope of the agency.

2016 Investigation by GSFW Engineering JV (GSFW JV)

Four test borings were drilled in the embankment to support an evaluation of the existing embankment materials for the Plan- Environmental Assessment (Plan-EA). Eleven test borings were drilled in the auxiliary spillway channel and the proposed auxiliary spillway expansion area to support an evaluation of the existing auxiliary spillway integrity. Borings were advanced with hollow-stem augers and NQ2 rock coring. Sampling was performed at selected depths in the soil. Continuous sampling was performed in the rock. Results and findings of the 2016 investigation are summarized in the Geotechnical Data Report dated January 24, 2017.

1.1.7 2023 Geotechnical Investigation Program

Schnabel performed a geotechnical investigation and field-testing program between January 9 and January 26, 2023, to further characterize the subsurface conditions at the site in support of the rehabilitation design. This program included subsurface drilling, disturbed and undisturbed soil sampling,

rock coring, permeability testing, and laboratory testing. The investigation was generally performed in accordance with our Work Plan. Significant schedule delays were incurred due to unfavorable site conditions, weather delays, and subcontractor personnel and equipment issues. A field modification was made to the Work Plan due to the encountered site conditions. The piezometer planned in the offset boring B-651A was eliminated because groundwater was not encountered within the embankment materials in boring B-651. The subsurface investigation methods are presented in the subsections below, and the investigation results are discussed in Section 2.0.

Prior to beginning the subsurface exploration, Schnabel presented the proposed exploration and field-testing approach and procedures in the Work Plan. This plan was reviewed and approved by the NRCS and finalized on December 16, 2022.

Schnabel's drilling subcontractor, Connelly and Associates, Inc. (C&A) of Fredrick. Maryland performed subsurface drilling. Drilling was completed using a track-mounted Diedrich D-70 drill rig and a track-mounted Acker Rebel XL drill rig. The drilling, sampling, and in situ testing were performed using current, applicable ASTM procedures, as described below.

The approved geotechnical investigation program, including field modifications to the program approved by NRCS are summarized below:

- One boring located at the crest of the dam to target embankment Zones 1 and 2 embankment fill, and foundation materials (Boring B-51).
- One auger probe located at the crest of the dam to collect undisturbed samples and for piezometer installation (B-51A).
- One boring located at approximately the middle of the downstream slope (B-651) to characterize Zones 2 and 3 embankment fill, and foundation materials, to collect undisturbed samples, to determine depth to rock, and for piezometer installation.
- Two auger probes located at approximately the middle of the downstream slope to collect undisturbed samples (B-651A and B-651B). Installation of a piezometer in Zone 3 embankment fill materials was planned within auger probe B-651A. The piezometer was not installed due to the water table not being encountered in the embankment material during drilling.
- One boring located at the downstream toe (B-652) to characterize the foundation materials.
- One boring located on the upstream bench (B-751) of the dam to characterize Zone 2 embankment fill, foundation materials, and to determine depth to rock.

A borrow area investigation was not performed during the January 2023 investigation. Following the completion of the Preliminary Design, a desktop study and investigation of potential borrow sites may be performed if additional borrow sources are needed to complete the design.

Test borings are identified based on the following convention:

- Centerline of embankment: B-5x
- Downstream embankment slope and toe: B-65x
- Upstream embankment slope: B-75x

The locations, depths, and termination information for the borings are summarized in Table 1.

Schnabel personnel observed the drilling and sampling and performed the borehole logging. Additional Schnabel and NRCS off-site support personnel (assisting with investigation planning and response to field conditions) included experienced geotechnical engineers and professional geologists.

Soil drilling was performed using 3-¼ and 4-¼-inch inside diameter (ID) hollow-stem augers (HSAs). Soil samples were obtained with either a 2-inch outside diameter (OD) split-barrel sampler, or 3-inch ID Shelby tube sampler.

Auger Probes B-51A, B-651A and B-651B were generally performed by drilling with the HSAs without sampling, except for Shelby tube sampling at specific intervals, until auger refusal using 3-¼ or 4¼-inch ID HSAs. Sampling intervals and information on the piezometer installation and screen intervals in auger probes are included in the drilling logs and piezometer completion forms in Appendix B and Appendix C, respectively.

Borings in which rock coring was planned were performed using 4-¼-inch ID HSAs. Temporary HQ casing was installed through the HSAs to the refusal depth and seated several inches into the rock surface. Drilling was performed through the HSAs to protect the embankment and foundation materials from uncontrolled interactions with the drill fluid. Rock coring and sampling were performed using an NQ double-tube wireline system. Drillers circulated water between the barrels and across the bit face to provide cooling and to flush away cuttings.

Boring backfill material consisted of a cement/bentonite grout that was mixed at a ratio of about 30 gallons of water to one bag (94 pounds) of Type I/II Portland cement and about 25 pounds of bentonite powder. This material was selected to reduce the potential for vertical movement of water along the borehole sidewalls and to reduce the potential for settlement at the top of the test boring. The grout was placed by tremie pipe from the bottom of borings. After allowing time for the backfill materials to settle (typically one day or more), the test borings were topped off, as necessary, with additional grout or bentonite chips. Backfill methods for each test boring are shown on the test boring logs and borehole backfill records that are included in Appendix B.

Schnabel personnel logged the borings and described the materials using ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) and Schnabel's Descriptive Criteria for Rock (Appendix B). Rock Quality Designation (RQD) and Recovery (REC) for each rock core run were recorded prior to sample transport (ASTM D6032).

Appendix B includes additional details on subsurface exploration procedures, sampling protocols, soil identification, rock core descriptions, test boring logs, undisturbed sampling records, and rock core photographs.

C&A installed two permanent open-standpipe piezometers at the site. A third planned permanent piezometer, to be screened in the embankment material in B-651A, was eliminated because groundwater was not encountered within the embankment materials in boring B-651. One piezometer was installed in Boring B-51A in the core trench in Zone 1 embankment fill material, and one piezometer was installed in Boring B-651 in foundation soils beneath the embankment fill. Each piezometer was constructed with 2-inch diameter Schedule 40 PVC pipe. The piezometers had 10-ft (B-51A) and 5-ft (B-651) of 0.010-inch opening slotted well screen. The piezometers were developed by bailing until the observed water was

clear or at least 9 well volumes had been removed. Details of piezometer installation and development are included in Appendix C.

Schnabel field staff measured water levels in the test borings using an electronic water level meter. Water levels were typically measured several times in each boring, including during drilling, after completion of drilling, at the beginning and end of each day, and immediately prior to grouting. Water levels in permanent piezometers were measured multiple times after the completion of piezometer installation. Select water level observations are included on the test boring logs in Appendix B, and all water level observations are included in Table 2. Additional discussion on the water level observations is included in Section 2.

C&A performed the SPTs in soil using a 24-inch long, 2-inch OD split-spoon sampler to collect soil samples and to measure the relative penetration resistance of soils (ASTM D1586). Samples taken from the embankment and foundation were collected continuously during drilling. The number of blows required to drive the split-spoon sampler four consecutive 6-inch increments using a 140-pound hammer falling 30 inches was recorded. The SPT hammers on each drill rig were automatic-trip hammers. The SPT N-values, which are shown on the test boring logs in Appendix B, are defined as the sum of the second and third 6-inch blow count intervals. The SPT N-values in this report and logs are uncorrected field values. Additional details on the SPTs are provided in Appendix B.

Hydraulic conductivity testing of soil (slug testing) was completed in the piezometers in Boring B-51A and B-651. Slug tests included both falling head and rising head tests. Approximately 2.2 feet of what appeared to be silty material was observed in the bottom of the piezometer in B-651. The material was encountered at a depth of approximately 40.8 feet below ground surface (bgs) and could not be removed by the methods attempted while bailing the well. The slug testing was performed on the 3 foot (37.8 to 40.8 feet bgs) exposed portion of the piezometer screen interval in B-651. Permeability for B-651 was analyzed for both the 3-foot and 5-foot screen interval since flow could have occurred through the filter pack around the clogged portion of the piezometer screen. The calculated permeabilities for B-651 were $1.7x10^{-03}$ cm/sec (3-foot interval) and $1.3x10^{-03}$ cm/sec (5-foot interval). A summary of the results is included in Section 2. Additional details and test results are included in Appendix D.

Hydraulic conductivity testing in rock included packer testing in the crest and downstream toe borings. Methods for packer testing are presented and summarized in Section 2. Additional details and test results are included in Appendix E.

1.2 Surface Geology and Physiography

1.2.1 Physiographic Area

The project site is located in the Piedmont physiographic province, located in the central region of Virginia and is bounded by the Coastal Plain Province to the east and the Blue Ridge Mountains to the west. The Piedmont Province is about 40 to 175 miles wide and extends into adjacent states with elevations ranging from 300 feet above mean sea level at its eastern boundary to about 1,000 feet along its western margin. Remnants of ancient mountains that have resisted erosion are now scattered across the region and stand from 500 to 1,500 feet above the mean terrain. The topography of the Piedmont is characterized by gently rolling hills and valleys and close networks of perennial stream systems (Heath, 1984).

1.2.2 Topography

According to the April 2014 topographic survey performed by NRCS, the natural slopes of the left and right abutments of the dam generally range from approximately 2H:1V to 4H. The natural floodplain is about 400-ft wide downstream of the grading associated with the dam.

1.2.3 Geological Formations and Surficial Deposits

Soil Survey Mapping

The portion of the NRCS Soil Survey Map of Pittsylvania County and the City of Danville, Virginia, within the vicinity of the site is shown on Figure 2. According to this map, a large portion of the project site is located within the Cecil Series (C), particularly in the higher elevations. The Cecil Series sandy loam and sandy clay loam are residual soils formed from the chemical weathering of granitic and gneissic rocks. As shown on the Geologic Map of the site (Figure 3) the parent rocks in the area are granite (lg), garnetiferous mica schist (fm), and biotite gneiss (fg). The Cecil sandy loam (4C) and the Cecil sandy clay loam (5C3) consist of 7 to 15% slopes, which are well-drained and found on hillslopes.

The Madison Series has been mapped along the edges of the reservoir. The Madison Series consists of well-drained soils found on hillslopes that are residuum from the chemical weathering of mixed mafic rocks. The Geologic Map of the site indicates that these rocks are likely biotite gneiss (fg), and garnetiferous mica schists (fm). The Madison Series soils are comprised of two units of fine sandy loam which are differentiated by slope, 25 to 45% for map unit 21E and 15 to 25% for map unit 21D.

Floodplain soils have been identified as Chenneby-Toccoa Complex soils with 0 to 2% slopes. These soils are alluvial loams and silty clay loams that are somewhat poorly drained. An additional soil type in the vicinity of the dam is Udorthents, loamy (map unit 39). Udorthents represent disturbed areas where upper layers of soils have been removed.

Regional Geology

The following geologic maps of the Pittsville, Chatham, and Danville Quadrangles, Virginia were referenced for the project site:

- Marr, J.D. (1984). Geologic Map of the Pittsville and Chatham Quadrangles, Virginia. Department of Conservation and Economic Development, Virginia Division of Mineral Resources, Publication 49, scale 1:24,000 (Figure 3).
- Henika, W.S. (2002). Geologic Map of the Virginia Portion of the Danville 30 X 60 minute quadrangle, Virginia Division of Mineral Resources, Publication 166, scale 1:100,000.

The underlying regional geology in the vicinity of the project is described below using geological formation names from the geological maps listed above. The regional geology consists of Proterozoic to Ordovician-aged metamorphic rocks with igneous intrusions. The rock formations shown in the vicinity of the site are listed below, from youngest to oldest.

- Diabase Dikes: Described as dark gray to black, fine to medium-grained rock with mineralogy consisting of plagioclase, clinopyroxene, olivine, hornblende, epidote, chlorite, and magnetite.

- Rich Acres Formation: This formation consists of Diorite and Gabbro (ra), described as dark gray to greenish-gray, non-foliated, medium to coarse-grained, porphyritic, present as sill-like to elongate intrusions.
- Leatherwood Granite: This formation consists of leucogneiss (lg) consisting of dikes, sills, and irregular-shaped plutons of light gray, coarse-grained, porphyritic rock composed of mineral assemblages that includes quartz, microcline, plagioclase, biotite, and muscovite.
- Fork Mountain Formation: This formation consists of two primary units and two subunits, listed below.
    - Primary Units
        - Upper garnetiferous mica schist (fm): described as light silvery gray, medium-grained, strongly foliated, with mineralogy consisting of garnet, staurolite, and sillimanite.
        - Lower biotite gneiss (fg): described as light to dark gray, moderately foliated, medium to coarse-grained, with alternating quarto-feldspathic and dark biotite schist layers. Biotite schist layers are light to dark silvery dray and medium to coarse-grained with an abundance of biotite and muscovite.
    - Secondary (Interlayered) Units
        - Ferrugionous quartzite (fg): described as light to dark gray to tan, fine-grained, present as discontinuous lenses and beds.
        - Quartz-epidote fels (feg): described as light greenish-gray, present as lenses and boudins.

Site Geology

According to previous investigations and the regional geological maps, the Leatherwood Granite leucogneiss (lg) unit has been mapped both upstream and downstream of the dam on the left abutment. Diabase has been mapped (Figure 3) along the Cherrystone Lake Road alignment on the right abutment and it appears that Cherrystone Creek generally follows the alignment of this diabase dike from north-northwest to south-southeast.

1.2.4 Structure

The rock units and geologic structure in the Piedmont generally trend northeast-southwest due to large scale tectonism. Conforming to regional trends, the Smith River Allochthon is structurally bound to the northwest and southeast. The Bowen's Creek Fault, located approximately 13 miles northwest of the site is a low angle thrust fault that serves as the divide between the Piedmont and Blue Ridge provinces (Henika, 2002). Approximately 5 miles to the southeast, the Smith River Allochthon is bound by the Chatham Fault Zone and the Brookneal Shear Zone (Marr, 1984 and Henika, 2002). These two interrelated structures divide the Smith River Allochthon from Triassic-aged rocks of the Danville Basin. The Chatham Fault Zone and Brookneal Shear Zone are comprised of a high-angled shear zone with intersecting normal faults (Marr, 1984). Near vertical diabase dikes of Triassic age cut across these rocks at a north/northwest-south/southeast orientation.

Aside from the major faults bounding the Smith River Allochthon, several other structures have been identified in the site vicinity (Henika, 2002). The Gretna Antiform has been identified about one mile northwest of the site. The structure consists of a northeast-southwest trending recumbent anticline. About one mile southeast of the site an unnamed recumbent syncline has been identified with the same general orientation (Henika, 2002).

Structural measurements taken by both Marr (1984) and Henika (2002) indicate a predominantly east dipping schistosity (i.e., geological foliation with medium to large-grained minerals in a preferred sheet-like orientation) with wide ranging dip angles.

1.2.5 Evidence of Landslides, Seepage, Springs, or Mining

No evidence of landslides, natural springs, or mining has been observed or documented at the site. The toe of the dam is wet and the source of water is likely due to seepage through and under the dam as well as abutment stormwater run-off.

1.2.6 Sediment and Erosion

An evaluation of reservoir sedimentation and erosion was not included in this geotechnical investigation. According to the Plan-EA prepared by NRCS and dated August 2019, there is adequate submerged sediment storage capacity to accommodate a 50-year service life after completion of the rehabilitation.

1.2.7 Downstream Channel Stability

An evaluation of the downstream channel was not included in this investigation. No changes in the hydraulic discharge characteristics of the structure are being considered. Based on the Site Reconnaissance Letter Report for Cherrystone Creek Watershed Dam No. 2A prepared by Schnabel and dated November 22, 2022, the plunge pool was observed to be in satisfactory condition and no riprap displacement or erosion was observed along the rim of the plunge pool. No obvious erosion or instability was noted along the banks of the downstream channel.

1.2.8 Seismicity

Virginia lies within the North American Plate, which encompasses both continental and oceanic sections. The seismicity at Dam 1 is typical of the Central and Eastern United States (CEUS). The CEUS is a stable, intraplate region that is not nearly as active as the Western United States (WUS) that borders a plate boundary; however, much less attenuation occurs with CEUS earthquakes compared to those in the WUS because of the thick, denser crust in the CEUS. Therefore, earthquakes of similar magnitude will impact a much larger region in the CEUS (USGS, 2018). A seismicity map is included as Figure 4.

Historically, earthquakes in Virginia have been more common in: (a) the Central Virginia Seismic Zone (CVSZ), which extends around Charlottesville and Richmond (Wheeler, 1998); and (b) the Giles County Seismic Zone (GCSZ), which is located between Radford and the West Virginia border (Bollinger, 1988). The current state of knowledge of seismic sources in Virginia and nearby regions is limited; consequently, the potential for earthquake occurrence is not associated with mapped faults but is quantified and associated with areas of relatively higher seismicity (e.g., CVSZ and GCSZ) or lower seismicity (e.g., Coastal Plain areas). In general, it is assumed that the entire Commonwealth is subject to earthquake occurrence.

One of the largest earthquakes in Virginia took place on May 31, 1897 in Pearisburg, Giles County. It had an estimated Richter magnitude (M) of M 5.8 and a moment magnitude (Mw) of 6.1. This event is the second largest recorded earthquake in the southeastern United States (Stover and Coffman, 1993). This event produced a foreshock on May 3, 1897 near Pulaski, Radford, and Roanoke, Virginia. The main shock of May 31, 1897 was felt over an approximately 280,000-square mile area, which extended from Georgia to Pennsylvania and from the Atlantic Coast to Indiana and Kentucky. Significant damage was caused near the epicenter, where a Modified Mercalli Intensity (MMI) of VIII was felt.

The most recent noteworthy earthquake in Virginia was the M 5.8 event on August 23, 2011. This event was the result of reverse faulting on a north or northeast-striking plane within the CVSZ. Moderately heavy damage (MMI VIII) occurred in a rural region of Louisa County southwest of the town of Mineral. Minor damage was reported as far away as Delaware, southeastern Pennsylvania, and southern New Jersey. The earthquake was felt throughout the eastern United States from central Georgia to central Maine and west to Detroit, Michigan, and Chicago, Illinois, and was also felt in many parts of southeastern Canada from Montreal to Windsor (USGS, 2023a).

A M 5.1 earthquake occurred near Sparta, North Carolina on August 9, 2020. This event was the result of oblique-reverse faulting in the upper crust of the North American Plate. The maximum intensity was Very strong (MMI VII). The earthquake was felt mainly in Virginia and North Carolina and some minor damage to structures was reported in Sparta, North Carolina. (USGS, 2023b).

2.0 SUBSURFACE GEOLOGY

2.1 Overview

Several geologic material strata have been identified at the site. The strata are described below to characterize the subsurface stratigraphy at the dam site. These informal, project-specific strata names have distinct characteristics that are identified based on visual descriptions, field testing, drilling observations, laboratory test results, and engineering properties. The selected strata delineations may not necessarily reflect actual stratifications or the extent or continuity of strata at the site, although an effort was made to recognize the depositional history of the site. Each stratum is listed below. The soil classifications noted in this report are visual-manual classifications. The strata and specific information for each borehole are presented on the borings logs in Appendix B. A boring location plan is included as Figure 5.

The subsurface materials encountered in the borings at the site are characterized as follows:

- Topsoil/Surficial Materials
- Fill material placed during construction of the dam (Stratum F)
- Alluvial material transported by the stream, and deposited in and near the former stream channel (possibly including some colluvial material deposited directly in the valley by gravity) (Stratum A)
- Residual soil formed from chemical weathering of in-place rock (Stratum B)
- Disintegrated Rock formed by the near-complete weathering of in-place rock, but still maintaining a relatively high density and the relic structure of the parent rock (Stratum C)
- Bedrock encountered below SPT refusal or auger refusal – (Stratum D)

The characteristics of the geologic materials encountered in the test borings are discussed in the following sections. Detailed descriptions of these materials and strata designations are also included on the test boring logs in Appendix B. The Standard Penetration Test results (N-values) listed below and on the test borings logs are the values recorded in the field.

The test boring logs included in this report are considered final logs. The field classifications were revised, as applicable, based on laboratory test results. Select laboratory test results are also included on the final boring logs. The revised subsurface section of the embankment is included as Figure 6.

2.2 Embankment and Foundation

2.2.1 Test Borings and Auger Probes

Boring B-51 was drilled vertically from the embankment crest. The boring was drilled 65.7 feet through the embankment fill and then through the foundation soils 6.9 feet before encountering bedrock. The boring was then advanced 25.0 feet into rock for a total depth of 97.6 feet. In addition, one vertical auger probe, B-51A, was drilled to the right of B-51 for installation of an open standpipe piezometer in the embankment fill within the cutoff trench. A piezometer was installed in B-51A and was screened in the core trench materials from a depth of 52.8 to 62.8 feet.

Boring B-651 was drilled vertically at the middle of the downstream slope of the embankment. The boring was drilled 36.0 feet through the embankment fill and then 12.1 feet through the foundation soils before encountering bedrock. The total depth of the boring was 48.1 feet. A piezometer was installed in B-651

and screened within the foundation materials from a depth of 38.0 to 43.0 feet. In addition, two vertical auger probes, B-651A and B-651B were drilled to the right of B-651 for undisturbed sampling in the embankment fill materials.

Boring B-652 was drilled vertically at the downstream toe of the embankment. The boring was drilled through 6.0 feet of embankment fill and then 31.6 feet through the foundation soils before encountering bedrock. The boring was advanced 25.0 feet into rock. The total depth of the boring was 62.6 feet.

Boring B-751 was drilled vertically near the normal pool elevation on the upstream slope. The boring was drilled 33.0 feet through embankment fill and then 1.1 feet through foundation soils before encountering bedrock. The total depth of the boring was 34.1 feet.

2.2.2 Generalized Subsurface Stratigraphy

Fill (Strata F1 and F2)

These soils included fill placed for the embankment and cutoff trench. The As-Built Drawings (1967) show that the embankment fill was divided into 3 zones. A summary of the material requirements for each zone from the As-Builts is included in Table 2.1 below.

Table 2.1: As-Built Earth Fill Requirements

Embankment Zone	Material Requirements*	Compaction Requirement
Zone 1	"Inorganic silts and very fine sands (ML&MH) represented by TP 204 from 1.0' to 5.5' and TP 153 from 1.0' to 9.5' selected from the emergency spillway and Borrow Area B at the entrance to the emergency spillway."	Class A – Compact to 95% of ASTM D698 Method A at Optimum Moisture to +2% of Optimum moisture. Lift height = 9". Max Particle Size = 6"
Zone 2	"Silty sands (SM) represented by TP 207 from 5.0' to 19.0' and TP 206 from 5.4 to 10.3 selected from emergency spillway."	Class A – Compact to 95% of ASTM D698 Method A at -2 to +2% of Optimum Moisture. Lift height = 9". Max Particle Size = 6"
Zone 3	"Weathered mica phyllite (SM) from emergency spillway."	Class A – Compact to 95% of ASTM D698 Method A at -2 to +3% of Optimum Moisture. Lift height = 9". Max Particle Size = 6"

* The text within quotation marks is from the table on Sheet 8 of the As-Built Drawings. The term "emergency spillway" refers to the auxiliary spillway of the dam.

The crest borings were positioned to intersect Zones 1 and 2. The mid-slope boring was positioned to intersect Zones 2 and 3. Fill materials were encountered in all borings. The fill materials encountered in the 2023 borings were divided into two units based on the percent passing the No. 200 sieve from field estimates and laboratory testing.

F1 Fine-Grained Fill: Material with greater than or equal to 50% fines

This material based on field observations, quality assurance (QA) review of field classifications, and laboratory test results was classified as Silt (ML) and Lean Clay (CL) with varying amounts of sand and gravel (15 to 45% fine to coarse-grained sand and up to 25% fine to coarse-grained gravel). The material was typically grayish brown to reddish brown in color, moist to wet, low to medium plasticity, and

contained some rock fragments. This material was encountered in borings B-51, B-651, and B-751 within the embankment fill. Uncorrected SPT N-values ranged from 5 to 23 blows per foot (bpf) in these materials with an average of 12 bpf.

F2 Coarse-Grained Fill: Material with greater than or equal to 50% sand and/or gravel

This material based on field observations, QA review of field classifications, and laboratory test results was classified as Silty Sand (SM) and Clayey Sand (SC) (estimated 15 to 45% fines), Silty Gravel (GM) (estimated 15 to 25% fines) and Poorly Graded Sand with Silt (SP-SM) (5 to 10% fines). This material was varying shades of brown and gray, fine to coarse-grained sands and gravels, moist to wet, and contained rock fragments. Coarse-grained fill was encountered in all the borings performed at the site. All fill materials in the toe boring (B-652), were visually classified as coarse-grained. This material was encountered intermittently with strata F1 in the remaining borings. Uncorrected SPT N-values ranged from 2 to 34 blows per foot (bpf) in these materials with an average of 9 bpf.

Alluvium (Stratum A2)

Alluvial soils were encountered below the embankment fill soils in test borings B-651 and B-652. The alluvium soils were divided into two units based on the percent passing the No. 200 sieve from field estimates and laboratory testing.

A1 Fine-Grained Alluvium: Material with greater than or equal to 50% fines

A two-foot-thick layer of material was field classified as Silt (ML). Upon performance of QA review and based on the results of the laboratory testing the material was classified as Silty Sand (SM). No fine-grained alluvium soils were encountered at Dam 2A.

A2 Coarse-Grained Alluvium: Material with greater than or equal to 50% sand and/or gravel

This material based on field observations, QA review of field classifications, and laboratory test results was classified as Silty Sand (SM) that was moist to moist to wet and orangish brown and gray. The material consisted of predominately fine to coarse-grained sand with 15-45% fines. Coarse-grained alluvium was encountered beneath embankment soils and was 2 to 6 feet thick. The uncorrected SPT N-values for the coarse-grained alluvial soils ranged from 2 to 30 bpf with an average of 11 bpf.

Residual Soils (Stratum B2)

Residual soils were encountered beneath embankment fill or alluvium soils in all borings. The residual soils were divided into two units based on the percent passing the No. 200 sieve from field estimates and laboratory testing.

B1 Fine-Grained Residuum: Material with greater than or equal to 50% fines

No fine-grained residual soils were encountered at Dam 2A.

B2 Coarse-Grained Residuum: Material with greater than or equal to 50% sand and/or gravel

These materials were encountered in all the borings and based on field observations, QA review of field classifications, and laboratory test results were classified as Silty Sand (SM), Silty Gravel with Sand (GM), Poorly Graded Sand with Silt (SP-SM), Poorly Graded Gravel with Silt (GP-GM), and Well Graded Gravel with Silt (GW-GM). The material typically contained 5 to 45% fines with varying amounts of gravel, was moist to wet, and generally brown and gray. This stratum ranged from 1.1 feet to 10.0 feet thick. The uncorrected SPT N-values for the coarse-grained residual soils ranged from 15 to 57 bpf with an average of 35 bpf.

Disintegrated Rock (Stratum C)

The boundary between soil and rock is typically not sharply defined. A transitional zone of disintegrated rock material is normally found overlying bedrock and is a product of in-place weathering of the parent material. The material in this zone typically retains the texture and structure of the parent rock. Disintegrated Rock is defined as residual material with an SPT N-value between 60 blows per foot and refusal (50 blows for less than 1" of penetration).

These materials were encountered in all borings, except B-751, and based on field observations, QA review of field classifications, and laboratory test results were classified as Silty Sand (SM), Poorly Graded Sand with Silt (SP-SM), Poorly Graded Sand with Gravel (SP), and Silty Gravel (GM). The material exhibited relic rock structure. The material typically contained 5 to 45% fines and was moist to wet with varying amounts of brown and gray. In boring B-51 a 2 feet thick layer (70 feet to 72 feet) of residual soils was noted interbedded within the disintegrated rock. The disintegrated rock strata ranged from 2 feet to 15.6 feet thick.

Rock (Strata D1 and D2)

The rock units encountered in borings B-51 and B-652 consisted of schist and gneiss. The rock has been divided into two engineering geologic units based upon rock type, strength, weathering, and fracture spacing.

D1 Schist

Schist generally described as fresh to highly weathered, weak to very strong, highly to intensely fractured, and was strongly foliated. The color of the rock was observed to be light gray, dark gray, and black.

D2 Gneiss

Gneiss generally described as fresh to slightly weathered, strong to very strong, very slightly to moderately fractured, light and dark gray, and poorly to strongly foliated.

2.2.3 Hydrogeologic Conditions

Several water level readings were recorded in the open boreholes during the field investigation. Recorded water levels are presented in Table 2, and select water level measurements are shown on the test boring logs in Appendix B. The water level readings in the embankment borings were generally as expected (expected levels were based on the embankment geometry and normal headwater and tailwater elevations). Multiple water level readings were taken in the piezometers installed in offset auger probe B-51A and boring B-651 during the remaining field work.

Reported water levels should not be considered globally representative. It is anticipated that the observed water levels could have been affected by drilling procedures and would be expected to fluctuate due to variations in precipitation, surface runoff, reservoir levels, and other factors.

Hydraulic conductivity testing (slug testing) of soil surrounding the screened section of piezometers B-51A and B-651 was performed to estimate the hydraulic conductivity of the different subsurface stratigraphy. The slug testing performed in B-51A estimated the hydraulic conductivity to be $6.4x10^{-5}$ cm/sec. The slug testing performed in B-651 estimated the hydraulic conductivity to be between $1.3x10^{-3}$ and $1.7x10^{-3}$ cm/sec. The fill (presumed to be the core trench) surrounding the screened interval as described in B-51A is predominantly a Clayey Sand (SC) underlain by a Silty Gravel (GM) and Lean Clay (CL) while the alluvial and disintegrated rock/residual materials surrounding the screen in B-651 (presumed to be foundation material) are described as a Sandy Silt (ML) underlain by a Poorly Graded Sand with Gravel (SP). These values estimated from slug testing are consistent with published values for a Clayey Sand (10^{-4} to 10^{-6} cm/sec), and a poorly graded sand (10^{-1} to 10^{-3} cm/sec) (Fetter, 1988; Freeze and Cherry, 1979). Details of the hydraulic conductivity testing and test results are presented in Appendix D and summarized in Table 3. This method of testing provides an approximation of the in-situ hydraulic conductivity at the select location and variations are to be expected.

Hydraulic conductivity (packer) tests of rock were performed. Details of packer testing in rock and test results are presented in Appendix E and a summary of hydraulic conductivities are listed in Table 3. This test method provides an approximation of the in situ hydraulic conductivity at selected locations and variations are to be expected.

Calculations were performed to estimate the average hydraulic conductivity in each test section, in centimeters per second (cm/s), using the method described in the US Bureau of Reclamation (1995) and for transmissivity, in Lugeons, using the method described in Houlsby (1990). Hydraulic conductivity and transmissivity values for the test interval were typically selected from the pressure step that returned the highest value. Flow rates into test intervals at varied test pressures indicate subsurface conditions including, turbulent flow through fractures, washing out of fracture fill material, and filling or clogging of fractures during tests.

The field hydraulic conductivity values were calculated using the methods described above. The calculated transmissivity values were 3 and 15 Lugeons in boring B-652 and 55 and 92 Lugeons in Boring B-51. The maximum calculated transmissivity value of 92 Lugeons was recorded in a test performed in the rock section between 77.6 and 87.6 feet below the ground surface at B-51. Material encountered over this interval was described as slightly to moderately weathered, slightly to moderately fractured Gneiss (RQD from 31% to 100%).

2.3 Auxiliary Spillway

An investigation of the auxiliary spillway was excluded from this program. Eight borings (DH-225 to DH-231 and DH-235) were drilled in the auxiliary spillway during the 2016 investigation by GSFW JV. Based on the profiles included in the report the auxiliary spillway control section was located at approximately STA 7+00 to 7+30 along the centerline alignment. Borings DH-227, DH-228, and DH-225 were located at the toe of the right side slope at approximately STA 7+00, STA 8+40, and STA 9+70, respectively. Borings DH-231, DH-230 and DH-229 were located at the toe of the left side slope at approximately STA 7+00, STA 8+30, and STA 9+75, respectively. Boring DH-226 was located along the auxiliary spillway

centerline alignment at approximately STA 11+00. Boring DH-235 was located about 70 feet left of the auxiliary spillway centerline alignment at approximately STA 12+00. A summary of the generalized subsurface stratigraphy for the auxiliary spillway provided in the GSFW JV report (GSFW JV, 2017) is provided in Table 2.2 below.

Table 2.2: Summary of Auxiliary Spillway Subsurface Stratigraphy from GSFW JV Report

Strata	Material Description and Strata details
Fill	Stratum F1 "Cohesive Soil" was encountered in boring DH-235 from beneath the surface cover to a depth of 4.5 feet. The material consisted of Silty Sand (SM), fine to medium grained sand, slightly micaceous, medium plasticity. The samples were brown with mottles of black. Stratum F2 "Cohesionless Soil" was encountered in boring DH-226 from beneath the surface cover to a depth of 6.7 feet. The material consisted of Silty Sand with gravel (SM), fine to coarse sand, slightly micaceous. The samples were predominately brown and orangish brown.
Residual	Strata B1 "Cohesionless, N-value less than 30" and B2 "Cohesionless, N-value 30 to 50/6" were encountered in all borings except DH-235. The materials were encountered beneath the topsoil (DH-227, DH-229, DH-230, and DH-231) and Fill (DH-226) and B3 "Cohesive, N-value less than 30" (DH-225 and DH-228). The material consisted of Silty Sand (SM) and Silty Sand with Gravel, predominately fine to coarse sand, slightly micaceous, the samples were predominately orangish brown, reddish brown, and grayish brown. Layers of B1 and B2 soils were also encountered interbedded within C/D1 "Transition Zone" materials in DH-225, DH-228, and DH-231. Stratum B3 "Cohesive, N-value less than 30" were encountered in DH-225 and DH-228 beneath topsoil. The material encountered in DH-225 and DH-228 consisted of Sandy Silt (ML), fine grained sand, medium plasticity and the samples were grayish brown and reddish orange. The B3 material was also encountered in DH-235 beneath Fill and interbedded with D2d "Diabase" and C/D1 "Transition Zone" materials. The material encountered in DH-235 consisted of Elastic Silt (MH), fine grained sand, medium to high plasticity and the samples were orangish brown and brownish orange.
Transition Zone	According to the report stratum C/D1 "Transition Zone" is defined as materials that could be considered either "very dense" soil or "very soft rock or hard, soil-like material", as defined by NRCS. Stratum C/D1 soils were encountered in DH-225, DH-227, DH-228, DH-230, DH-231, and DH-235. The material was classified as Silty Sand (SM) and Silty Sand with Gravel (SM), fine to coarse sand, non-plastic, containing varying amounts of rock fragments exhibiting relic rock structure, and were generally reddish brown, grayish brown, and brown in color. This material was encountered beneath residual soils in each boring and was generally interlayered with residual soils and rock.
Rock (Schist)	Stratum D2 "Schist described as highly weathered, weak, highly to intensely fractured, grayish brown, and strongly foliated" was only encountered in DH-230 interlayered within C/D1 soils. Stratum D2b "Diabase described as fresh, very strong, moderately fractured, greenish gray, and non-foliated" was only encountered in DH-235 and was interpreted to be boulders of diabase within Elastic Silt (MH) formed from the weathering of the parent diabase material.

2.4 Borrow Area

A potential borrow area investigation was excluded from this program. The scope of a borrow area investigation program will be evaluated as needed later during the final design phases.

2.5 Toe Drain

Investigation of the existing toe drain was excluded from this program. Toe drain material was not encountered in the test borings. The existing toe drain system will be removed or abandoned in-place (by properly grouting the interior of the pipe drain system)and a new embankment drainage system will be installed as part of the rehabilitation design.

2.6 Water Supply

The reservoir is used by the Sponsors as a supplemental water supply to augment stream flow during periods of extended dry weather. Water is released from the reservoir through the primary spillway and picked up by the water treatment plant intake located downstream of the structure.

An evaluation of reservoir water quality was excluded from this program.

2.7 Wetlands

Wetlands delineation was performed for Cherrystone Dam 2A by Wetland Studies and Solutions, Inc. (WSSI). The results of that study are detailed in the Waters of the U.S (including Wetlands) Delineation for Cherrystone Creek Dam 2A report by WSSI dated December 8, 2022. According to the report wetlands were observed within the study area. The observed wetlands were not located within the preliminary limits of disturbance for the project.

3.0 LOGS

Boring logs, including select soils laboratory testing data, from the geotechnical investigation are provided in Appendix B.

4.0 LABORATORY TESTING PROGRAM

4.1 Overview

Schnabel performed laboratory tests, in general accordance with the Work Plan, on soil samples collected during the geotechnical investigation. The testing will aid in characterization of the embankment fill and foundation materials and provide data for use in the final design. The soils laboratory testing was performed by the Geotechnics of Raleigh, North Carolina certified laboratory in accordance with applicable ASTM standards. Rock laboratory testing was not performed due to the depth at which rock was encountered. The results of the soil laboratory testing are provided in Appendix F. Laboratory test results interpretations and conclusions, and a summary of test results will be provided separately in our Geotechnical Engineering Report.

4.2 Soils Laboratory Testing

The following soil laboratory tests were performed:

Index Testing

- 22 water content tests
- 13 Atterberg Limits tests
- 6 particle size distribution tests (with and without hydrometer)
- 6 specific gravity tests

Strength, Compressibility, and Dispersion Testing

- 3 three-specimen consolidated undrained triaxial compression (CU') tests with pore pressure measurements (on intact tube samples)
- 1 one-dimensional consolidation tests (on intact tube samples)
- 1 pinhole dispersion test

4.3 Assignment Revisions

The final totals of laboratory testing performed differs from the anticipated totals submitted in the Work Plan. The difference in the planned testing and the testing performed is due to the inability to obtain Shelby tubes for consolidation testing in the foundation materials and redistribution of laboratory testing budget to perform more materials classification testing.

4.4 Testing Standards

The laboratory tests were performed in accordance with the latest versions of the following ASTM standards, as appropriate:

- Moisture Content (ASTM D2216)
- Atterberg Limits (ASTM D4318)
- Particle Size Distribution Test without Hydrometer (ASTM D6913)
- Particle Size Distribution Test with Hydrometer (ASTM D7928)
- Specific Gravity (ASTM D854)
- Pinhole Dispersion (ASTM D4647, Method A)
- Consolidated-Undrained (CU') Triaxial Compression (ASTM D4767)
- One-Dimensional Incremental Stress Consolidation (ASTM D2435, Method A)

5.0 INTERPRETATIONS AND CONCLUSIONS (FOR IN SERVICE USE ONLY)

5.1 Embankment Geometry

Based on our subsurface investigation, we were able to generally confirm the geometry of the dam as shown on the As-Built Drawings. The As-Built Drawings indicate that the core trench should extend to the top of rock with a minimum bottom width of 30 feet. In boring B-51, we observed approximately 6.9-foot-thick layer of residual soil and disintegrated rock between the bottom of fill and the top of rock. The SPT N-values of the layer ranged from 28 bpf to 50/2" and the layer directly beneath the fill had an N-value of 49.

5.2 Embankment Materials

The 1967 "Soils Report" (USDA-SCS, 1967c) describes the embankment borrow materials planned for construction as Silt (ML), Elastic Silt (MH), and Silty Sand (SM). The encountered embankment soils were generally classified Sandy Silt (ML), Silty Sand (SM), and Clayey Sand (SC) with some Silty Gravel (GM), Poorly Graded Sand with Silt (SP-SM), and Sandy Lean Clay (CL). These observations generally agree with the soil types described in the Soils Report. The report recommended placement of the fine-grained materials (ML and MH) in the center section of the embankment to form an impervious core section and placement of SM materials in the outer sections to provide better drainage characteristics in the embankment. The fine-grained soils encountered at the site were generally observed in the center "core" section of the embankment. However, coarse-grained soils were also observed layered within the fine-grained soils in the center of the embankment.

5.3 Filter Compatibility

As discussed above, the existing toe drain was not encountered during our investigation or the 2016 investigation. Filter compatibility analyses of the existing drain material should reference the gradations shown on the record drawings. A new toe drain will be installed as a part of the rehabilitation design. The design of the filters and drains will be performed in accordance with NRCS design guidelines and will consider the soil gradations observed in the lab test results from this and previous investigations.

5.4 Seepage

We did not observe artesian conditions during our subsurface exploration. However, standing water and saturated soils were observed in the area downstream of the toe of the dam. No flow was observed from the existing toe drain outlets during our inspection or the geotechnical investigation. Seepage modeling will be performed to evaluate the embankment seepage with consideration given to the observed water levels and in-situ hydraulic conductivity testing results. A new toe drain designed to intercept, filter, and collect seepage will be included as part of the rehabilitation design.

6.0 LIMITATIONS

This report has been prepared to aid in the evaluation of this site and to assist in the design of the project. It is intended for use concerning this specific project. Actual subsurface conditions between borings may differ than those shown on soil profiles and sections.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended, and no warranty or guarantee is included or intended in this report or other instrument of service.

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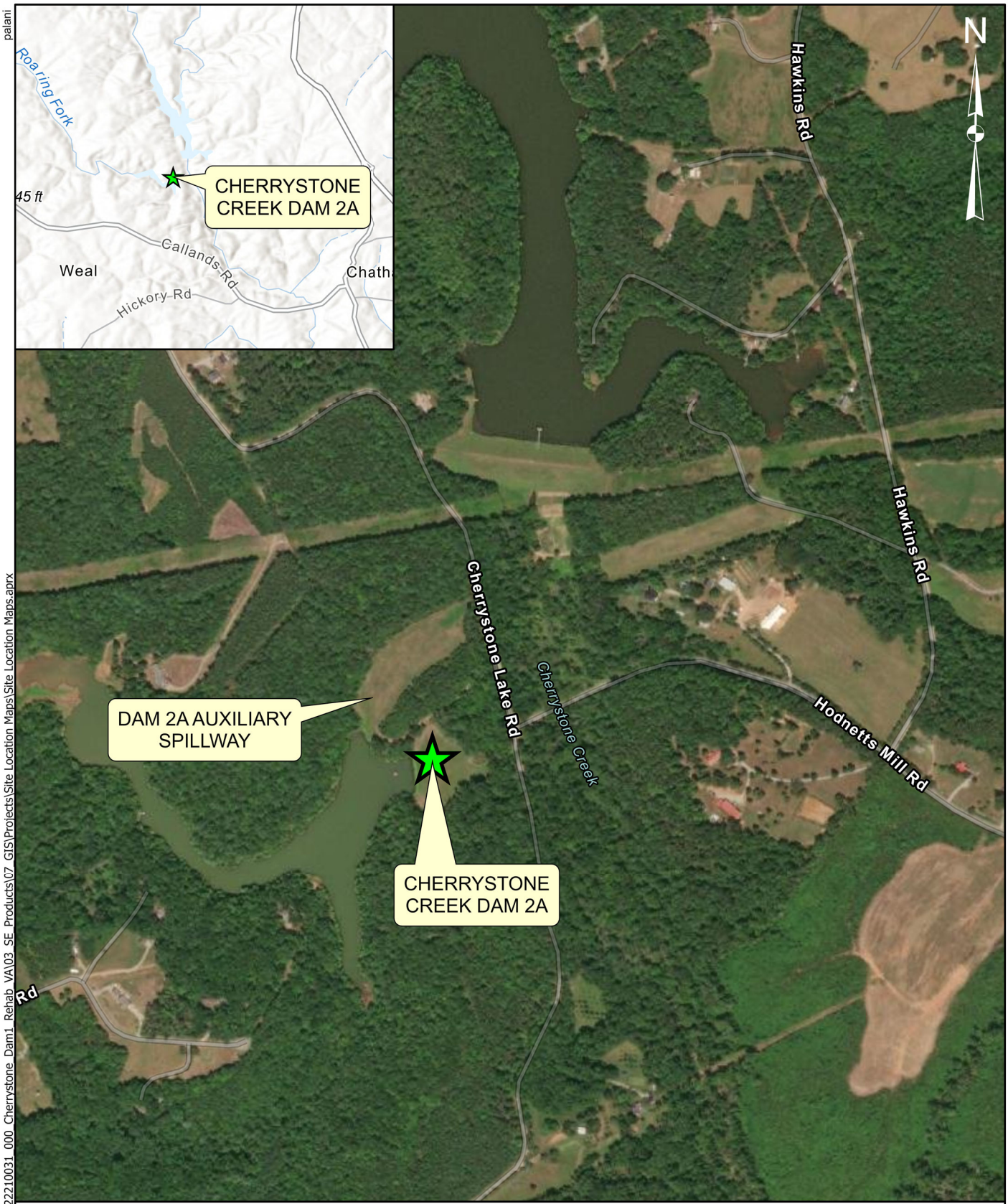
FIGURES



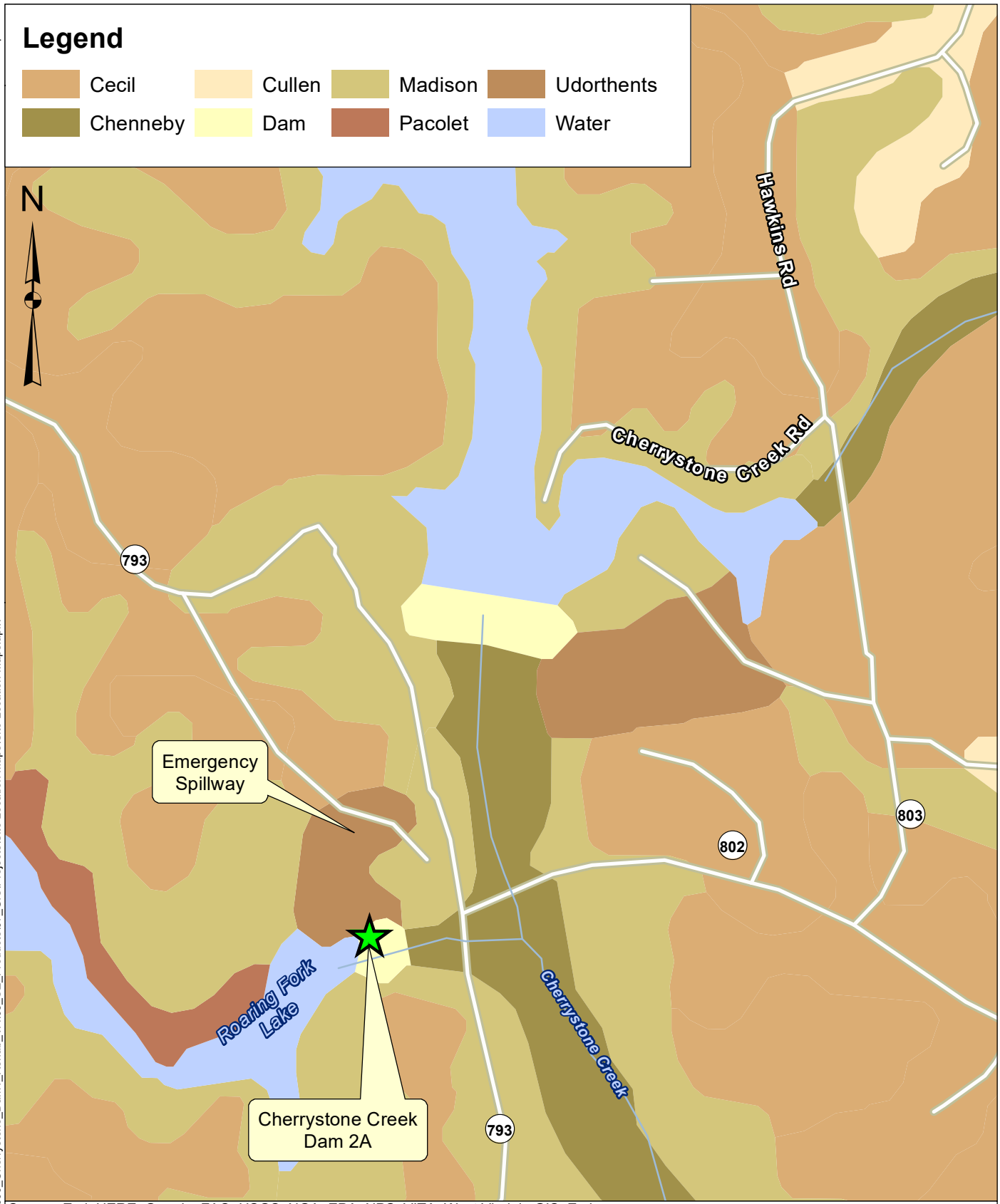
Source: Esri Community Maps Contributors, VGIN, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Esri, NASA, NGA, USGS, CGIAR, USGS, VGIN, Esri, HERE, Garmin, SafeGraph, GeoTechnoloechnologies, Inc, METI/NASA, USGS, EPA, USDA
Spatial Reference: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

0 325 650 1,300 US Feet
Scale: 1:7,800

Schnabel ENGINEERING

CHERRYSTONE CREEK WATERSHED
DAM NO. 2A
PITTSYLVANIA COUNTY
PROJECT NO. 22210031.100

PROJECT
VICINITY MAP
FIGURE 1



Source: Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS, VITA, West Virginia GIS, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA

Spatial Reference: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

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Scale: 1:7,200

Schnabel ENGINEERING

CHERRYSTONE CREEK WATERSHED
DAM NO. 2A
PITTSYLVANIA COUNTY
PROJECT NO. 22210031.100

SOILS MAP

FIGURE 2

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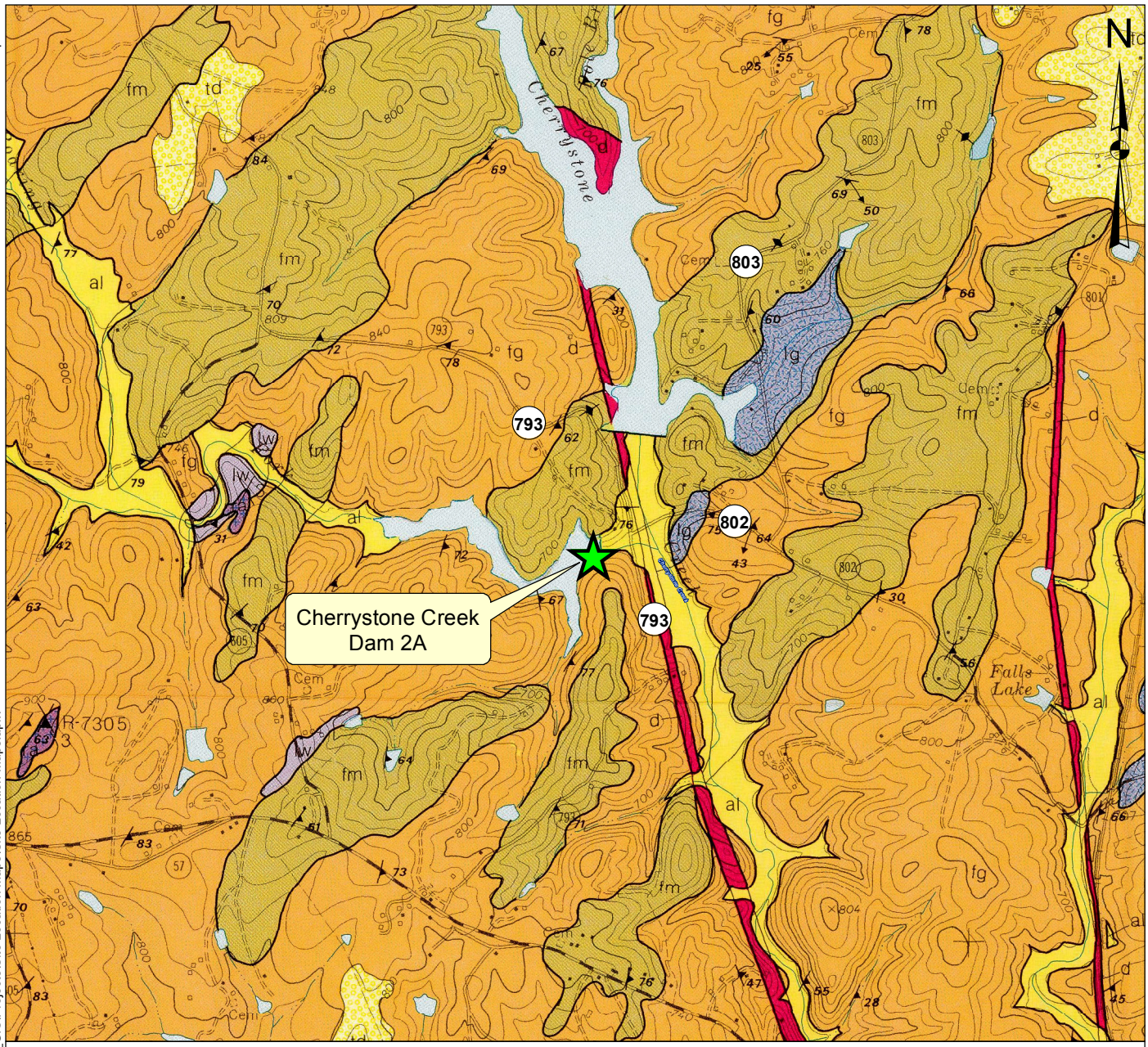

QUATERNARY
- al — **Alluvium**: *Silt, sand and gravel*
- td — **Terrace Deposit**: *Rounded pebbles and cobbles in a sandy-clay matrix*

TRIASSIC
- d — **Diabase Dike**: *fine to medium-grained, black diabase*

ORDOVICIAN
- ra, lw, fg — **Rich Acres Formation**: *ra, medium to coarse-grained gabbro and norite*
  Leatherwood Granite: *lw, coarse-grained granite; lg, leucogneiss*

EARLY PALEOZOIC
- fm, fg, feq, fg — **Fork Mountain Formation**: *fm, garnetiferous mica schist and fg, biotite gneiss with interlayered fq, ferruginous quartzites and feq, quartz-epidote fels*

Source: , Geological Map of the Pittsville and Chatham Quadrangles, Virginia - John D. Marr, Jr - 1984

Spatial Reference: NAD 1983 StatePlane Virginia South FIPS 4502 Feet

2,000 1,000 0 2,000 US Feet

Scale: 1:24,000

Schnabel ENGINEERING

CHERRYSTONE CREEK WATERSHED
DAM NO. 2A
PITTSYLVANIA COUNTY, VIRGINIA
PROJECT NO. 22210031.100

GEOLOGIC MAP

FIGURE 3

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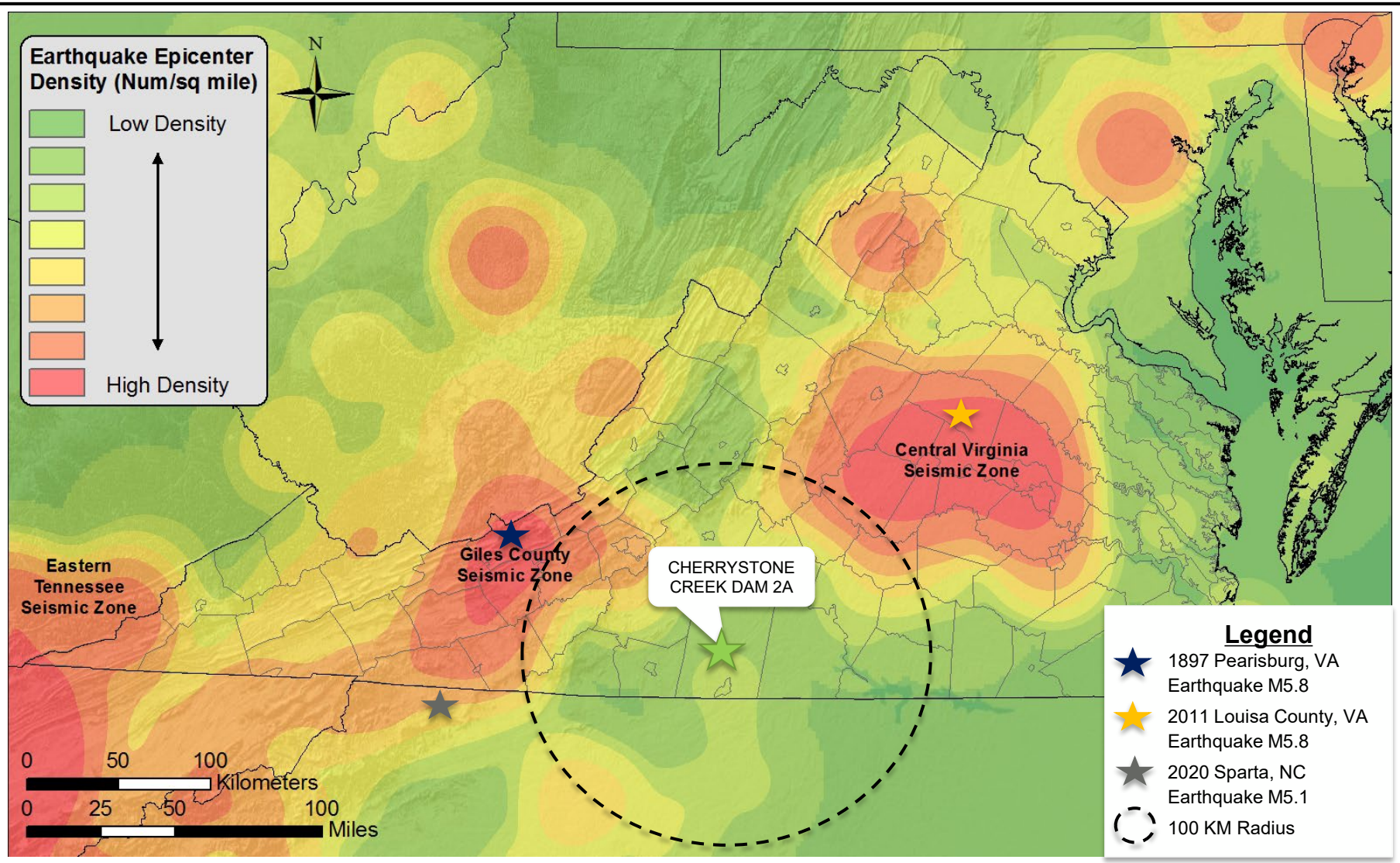


Source: Virginia Geology and Mineral Resources (2021). Earthquake Hazard Mapping. Virginia Energy. https://energy.virginia.gov/geology/EQHazardMapping.shtml (3/6/2023)

Schnabel ENGINEERING	CHERRYSYONE CREEK WATERSHED DAM NO. 2A PITTSYLVANIA COUNTY PROJECT NO. 22210031.100	SEISMICITY MAP FIGURE 4

LEGEND

- DH-1 2016 GSFW JV BORING
- B-51 2023 SCHNABEL BORING
- B-51A 2023 SCHNABEL PIEZOMETER/OFFSET BORING

1 BORING LOCATION PLAN

SCALE: 1"=80'

0 80' 160'

FLOW

NOTES:

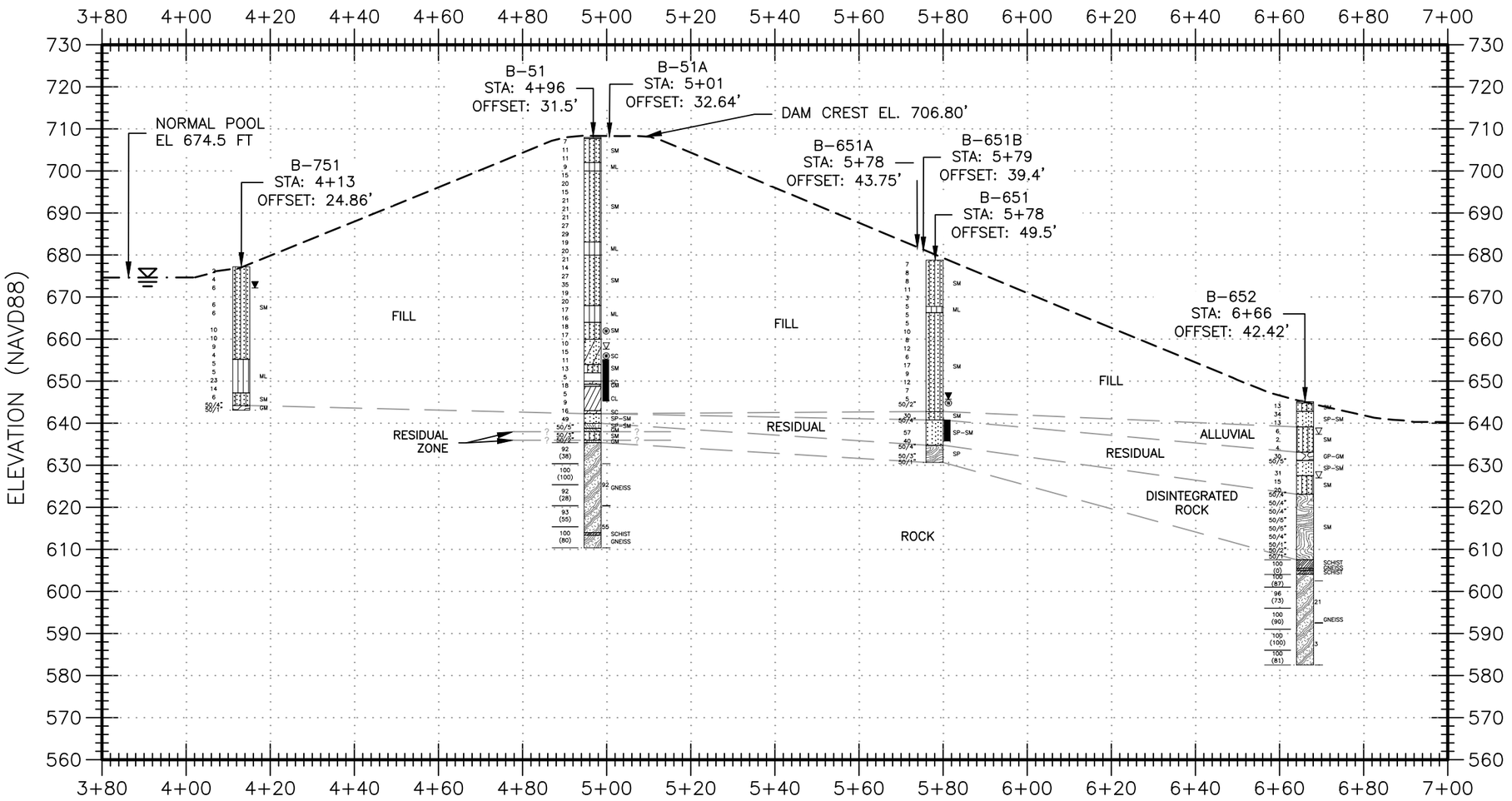
1. EXISTING TOPOGRAPHY BASED ON SURVEY PERFORMED IN 2014, PROVIDED BY THE NRCS.
2. HORIZONTAL LOCATIONS OF CONTOURS AND SITE FEATURES ARE PLOTTED IN U.S. SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83) AND THE VIRGINIA SOUTH ZONE STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE REPORTED IN U.S. SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. BORING LOCATIONS BASED ON SURVEY PERFORMED BY CRUTCHFIELD & ASSOCIATES INC. IN MARCH, 2023.

Schnabel ENGINEERING

CHERRYSTONE CREEK WATERSHED
DAM NO. 2A
PITTSYLVANIA COUNTY
PROJECT NO. 22210031.100

BORING LOCATION PLAN

FIGURE 5



NOTE: SECTION STATIONING REFERENCES PRIMARY SPILLWAY ALIGNMENT

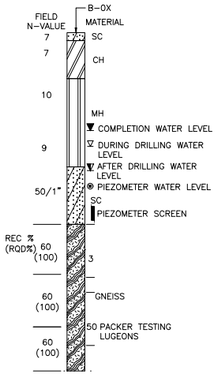
STATION

1 EMBANKMENT SECTION AT STATION 13+00

FLOW

SCALE: 1"=30'

0 30' 60'



LEGEND		
	CH	FAT CLAY
	CL	LEAN CLAY
	GC	CLAYEY GRAVEL
	GM	SILTY GRAVEL
	GP–GM	POORLY GRADED GRAVEL WITH SILT
	GW–GM	WELL GRADED GRAVEL WITH SAND
	MH	ELASTIC SILT
	ML	SILT
	GNEISS	GNEISS
	SCHIST	SCHIST
	SC	CLAYEY SAND
	SM	SILTY SAND
	SP	POORLY GRADED SAND
	SP–SM	POORLY GRADED SAND WITH SILT
	DR	DISINTEGRATED ROCK

NOTES:

1. EXISTING TOPOGRAPHY BASED ON SURVEY PERFORMED IN 2014, PROVIDED BY THE NRCS.
2. HORIZONTAL LOCATIONS OF CONTOURS AND SITE FEATURES ARE PLOTTED IN U.S. SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83) AND THE VIRGINIA SOUTH ZONE STATE PLANE COORDINATE SYSTEM. ELEVATIONS ARE REPORTED IN U.S. SURVEY FEET WITH RESPECT TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. USCS CLASSIFICATIONS BASED ON FIELD INTERPRETATIONS (TO BE UPDATED WITH LAB RESULTS).

Schnabel ENGINEERING

CHERRYSTONE CREEK WATERSHED
DAM NO. 2A
PITTSYLVANIA COUNTY
PROJECT NO. 22210031.100

GEOLOGICAL SECTION

FIGURE 6

TABLES

Table 1: Summary of Boring Locations, Depths, and Termination Information

Boring ID	Northing (ft)	Easting (ft)	General Location	Ground Surface Elevation (ft)	Total Depth (ft)	Bottom Elevation (ft)	Depth to Rock (ft)	Elevation of Top of Rock (ft)	Reason For Termination
B-51	3469256.38	11210013.97	Embankment Crest Right of Primary Spillway	708.4	97.6	610.8	72.6	635.8	Boring terminated at selected depth.
B-51A	3469255.97	11210018.59	Embankment Crest Right of Primary Spillway	708.9	63.2	645.7	--	--	Boring terminated at selected depth.
B-651	3469250.79	11210097.06	D/S Mid-Slope	679.0	48.1	630.9	--	--	Boring terminated at selected depth.
B-651A	3469256.4	11210096.03	D/S Mid-Slope	679.0	34	645.0	--	--	Boring terminated at selected depth.
B-651B	3469260.9	11210096.72	D/S Mid-Slope	679.0	18	661.0	--	--	Boring terminated at auger refusal.
B-652	3469270.86	11210183.12	U/S Mid-Slope	645.4	62.6	582.8	37.6	607.8	Boring terminated at selected depth.
B-751	3469250.56	11209930.39	D/S Embankment Toe	677.5	34.1	643.4	--	--	Boring terminated at selected depth.

Notes

1) Elevations are recorded in North American Vertical Datum NAVD88

2) Elevations based on survey performed by Crutchfield & Associates Inc. in March, 2023.

Table 2: Summary of Water Level Measurements

Boring ID	Ground Surface Elevation (ft)	Boring Depth (ft.bgs)	Depth to Water (ft.bgs)	Elevation of Water (ft)	Date of Water Level Reading	Time of Water Level Reading	Date of Boring Completion	Event
B-51	708.4	97.6	52.0	656.4	1/10/23	12:55:00 PM	1/19/2023	Encountered
B-51	708.4	97.6	50.3	658.1	1/10/23	3:05:02 PM	1/19/2023	End of Day
B-51	708.4	97.6	49.6	658.8	1/11/23	3:41:55 PM	1/19/2023	During Drilling
B-51	708.4	97.6	44.2	664.2	1/11/23	9:38:55 AM	1/19/2023	Start of Day
B-51A	708.9	63.2	46.0	662.9	1/20/23	12:00:00 PM	1/18/2023	Observation Well
B-51A	708.9	63.2	53.4	655.5	3/4/23	2:30:00 PM	1/18/2023	Observation Well
B-651	679.0	48.1	32.3	646.7	1/11/23	3:38:00 PM	1/11/2023	Completion
B-651	679.0	48.1	34.0	645.0	3/4/23	2:45:00 PM	1/11/2023	Observation Well
B-651A	679.0	34.0	Dry	--	--	--	1/16/2023	Completion
B-651B	679.0	18.0	Dry	--	--	--	1/16/2023	Completion
B-652	645.4	62.6	7.0	638.4	1/23/23	4:25:00 PM	1/24/2023	During Drilling
B-652	645.4	62.6	17.4	628.0	1/24/23	11:12:00 AM	1/24/2023	During Drilling
B-751	677.5	34.1	4.3	673.2	1/10/23	8:21:00 AM	1/10/2023	Completion

Notes

1) Elevations are recorded in North American Vertical Datum NAVD88
2) Elevations based on survey performed by Crutchfield & Associates Inc. in March, 2023.
3) Water level measurements may not be representative of stabilized water levels.

Table 3: Summary of Hydraulic Conductivity Testing Results in Rock and Soil

Packer Testing (in Rock)

Boring ID	Ground Surface Elevation	Depth (ft bgs)		Elevation (ft)		Water Level Before Test (ft bgs)	Test Type	Lugeons	Permeability		Maximum Effective Pressure (psi)	Test Interpretation	Description of Test Section
		Top	Bottom	Top	Bottom				ft/sec	cm/sec			
B-51	708.4	77.6	87.6	630.8	620.8	46.0	Packer	92	3.6E-05	1.1E-03	42	Turbulent	D2, Gneiss, slightly to moderately weathered, slightly to moderately fractured, RQD %: 31 to 100, REC %: 92 to 100
B-51	708.4	87.6	97.6	620.8	610.8	46.0	Packer	55	2.1E-05	6.3E-04	48	Wash Out	D1/D2, Gneiss, Schist, slightly to moderately weathered, slightly to moderately fractured, RQD %: 55 to 80, REC %: 93 to 100
B-51	645.4	42.6	118.5	602.8	526.9	36.0	Packer	15	6.0E-06	1.8E-04	25	Turbulent	D2, Gneiss, fresh to slightly weathered, slightly to moderately fractured, RQD %: 73 to 90, REC %: 96 to 100
B-652	645.4	52.6	118.5	592.8	526.9	36.0	Packer	3	1.0E-06	3.1E-05	33	Fracture Filling	D2, Gneiss, fresh to slightly weathered, slightly to moderately fractured, RQD %: 81 to 100, REC %: 100 to 100

Slug Testing (in Soil)

Boring ID	Ground Surface Elevation	Screened Interval (ft bgs)		Screened Interval Elevation (ft)		Water Level Before Test (ft bgs)	Test Type	Bouwer & Rice (cm/sec)	KGS Model (cm/sec)	Geometric Mean (cm/sec)	Description of Test Section
		Top	Bottom	Top	Bottom						
B-51A	708.9	52.7	62.7	656.2	646.2	45.3	Falling Head	8.7E-05	1.0E-04	6.4E-05	52.7-56' Fill, sampled as Clayey Sand (SC), 15 -25% fines, estimated 5-10% fine to coarse gravel, 56-58.7' Fill, sampled as Clayey Sand (SC), fine to coarse sand, wet, reddish brown, estimated 15-25% fines, 58.7-59.2' Fill, sampled as Silty Gravel (GM), 15-25% fines, 59.2-62.7' Fill, sampled as Sandy Lean Clay, 30-45% fine to coarse sand, 5-10% fine to coarse gravel
							Rising Head	3.6E-05	5.1E-05		
B-651A*	679.0	37.8	40.8	641.2	638.2	34.3	Falling Head	2.3E-03	1.5E-03	1.7E-03	37.8-38' Alluvial, sampled as Sandy Silt (ML), 30-45% fine to coarse sand, contains wood, 38-40.8' Resiudal, sampled as Poorly Graded Sand with Gravel (SP), 15-25% fine to coarse gravel, contains weather rock fragments.
							Rising Head	1.4E-03	1.8E-03		
B-651A*	679.0	37.8	42.8	641.2	636.2	34.3	Falling Head	1.9E-03	1.1E-03	1.3E-03	37.8-38' Alluvial, sampled as Sandy Silt (ML), 30-45% fine to coarse sand, contains wood, 38-42.8' Resiudal, sampled as Poorly Graded Sand with Gravel (SP), 15-25% fine to coarse gravel, contains weather rock fragments.
							Rising Head	1.0E-03	1.5E-03		

Notes:
1) RQD is based on the rock in its condition immediately after coring. RQD may decrease upon exposure.
2) Description of Test Section for Slug Testing (in Soil) is based field classifications from boring B-51 and B-651.
3) Elevations are recorded in North American Vertical Datum NAVD88.
* See Monitoring Well Installation Sketch for comments regarding bottom of screen interval. Permeability was calculated for both the measured open screen interval and the entire screen interval.

APPENDIX A

SELECTED 1967 AS-BUILT DRAWINGS

MAG. NORTH

Road 802

Existing road to house

Walnut trees

House

Shed

Well

℄ 18' ACCESS AND MAINTENANCE ROAD

Access and Maintenance Road

℄ Pipe

N60°20'E

Stream

PLUNGE POOL DETAILS SH. 11

DRAINAGE DETAILS SH. 10.

Riprap Gutters

Work Limits and CLEARING AND GRUBBING LIMITS

Elev 694.1

Elev 697.1

S=0.03

3:1 Slope

SCS MARKER - ELEV. 707.0 STA. 10+00 ℄ DAM

Top of dam elev. 706.7
Top width = 30'

Working Limits and CLEARING AND GRUBBING Limits

SCS MARKER - ELEV. 717.02 STA. 18+57 ℄ DAM

S 1°40'E

Elev 676.0

Elev 673.0

Berm

DO NOT EXCAVATE

RISER DETAILS SH. 12

Level Section Elev. 700.1

150.78' R

S=0.02

Elev 698.1

Elev 696.0

Access Road Baseline

BORROW AREA B
ROCK DISPOSAL AREA

Work Limits and CLEARING AND GRUBBING Limits

N13°E

N9°W

Sediment Pool Elev. 674.5

N43°E

N50°50'E

Design High Water Elev. 704.0

Emergency Spillway Crest Elev. 700.1

Slope

TYPICAL SECTION
RIPRAP GUTTER

Riprap to be well graded from 18" to 6".

"AS BUILT"

0 50 100
Scale in feet

LEGEND

- contour
- Stream
- ⊕ Temporary Bench Mark
- ○ Test pit
- ● Soil test pit disturbed or undisturbed Sample

Emergency Spillway Curve Data

D = 38°00'
Δ = 19°00'

R = 150.78'

Station	Deflection Δ	Chord
PC=6+50	—	—
6+75	4°45'	24.97'
PT=7+00	9°30'	24.97'

DAM NO. 2A ROARING FORK CHERRYSTONE CREEK WATERSHED PITTSYLVANIA COUNTY, VIRGINIA

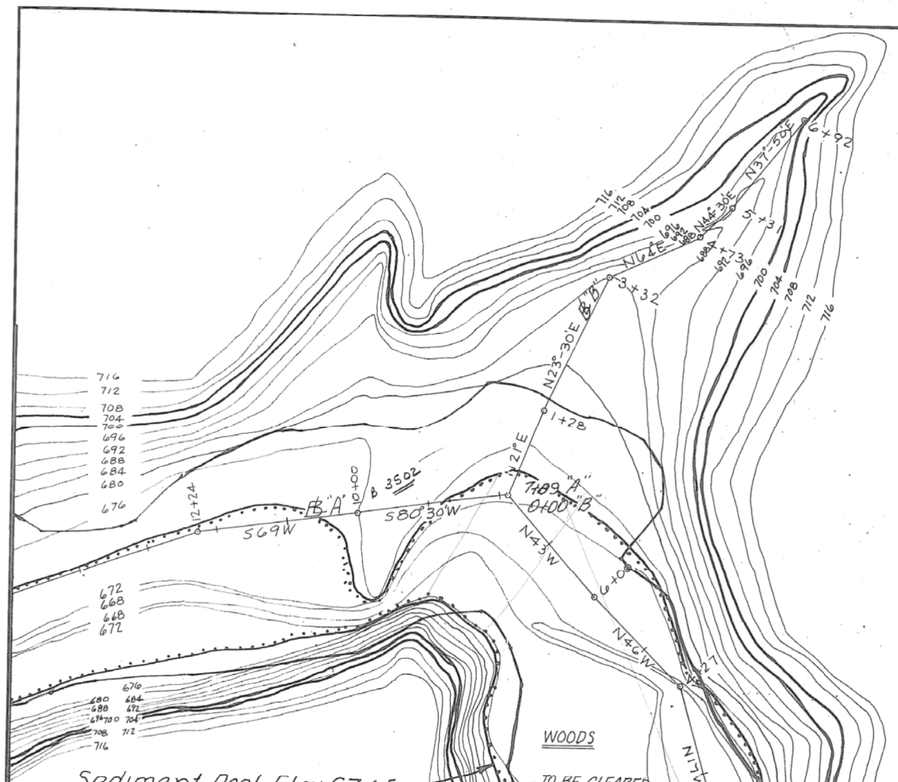
PLAN OF DAM & EMERGENCY SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

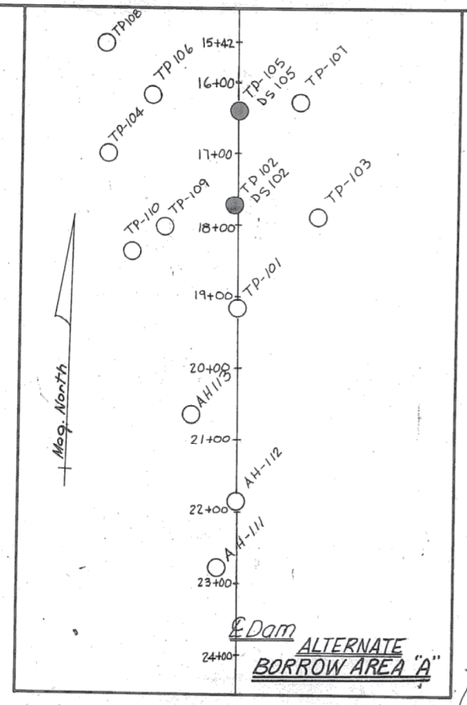
Designed	N.W.Wilson, L.S.Coffman	2/67	Approved by
Drawn	L.S.Coffman, S.D.Jones	2/67	Title
Traced			Title
Checked	CJT	10/67	Sheet No. 3 of 22 — Drawing No. VA-537-P

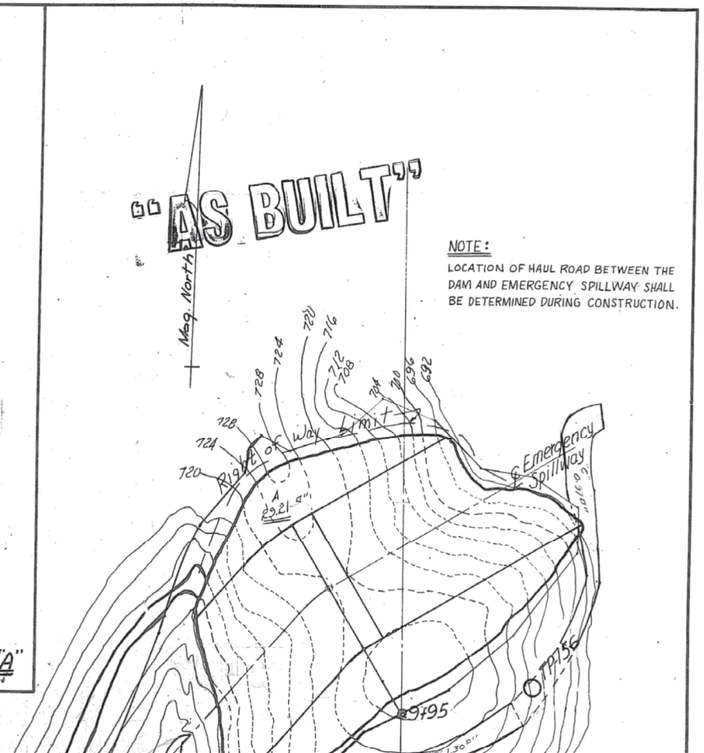
SCS-313 (9-64) –C

U.S. GOVERNMENT PRINTING OFFICE: 1965 OP-793-804



NOTE:
SEE SHT. 3 FOR WORK LIMITS AROUND DAM AND EM. SPWY. AND LIMITS OF BORROW AREA "B".





Match Line no. 1

DAM NO. 2A, ROARING FORK
CHEATHAM STONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
SITE LOCATION MAP

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	N.W. WILSON, R.A. GALLO	Date 2/67	Approved by
Drawn	L.J. COFFMAN	2/67	Title
	P.N. HOWEY		Title
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Checked	C.V.T.	10/67	Drawing No. VA-537-P

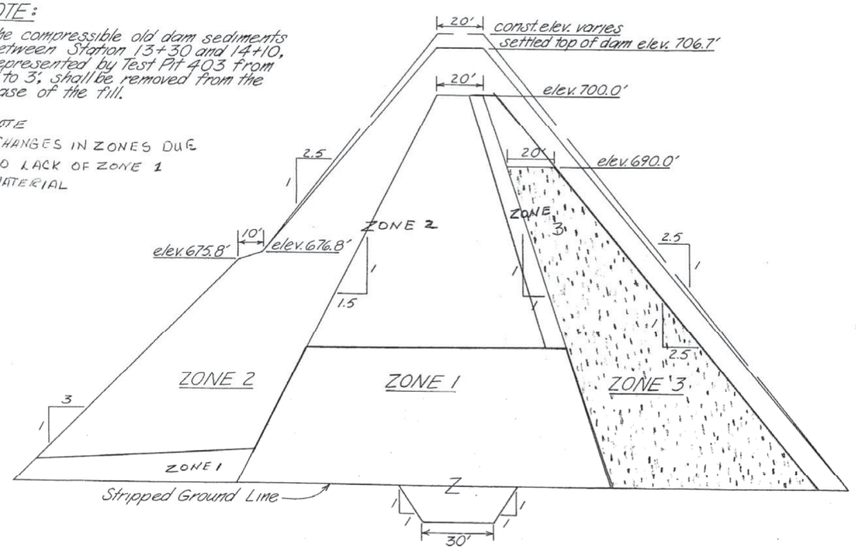
U.S. GOVERNMENT PRINTING OFFICE: 1965 O—752-928

SCS-313 (9-64) -C

NOTE:

The compressible old dam sediments between Station 13+30 and 14+10, represented by Test Pit 403 from 2' to 3', shall be removed from the base of the fill.

NOTE
CHANGES IN ZONES DUE TO LACK OF ZONE 1 MATERIAL



TYPICAL SECTION OF COMPACTED FILL

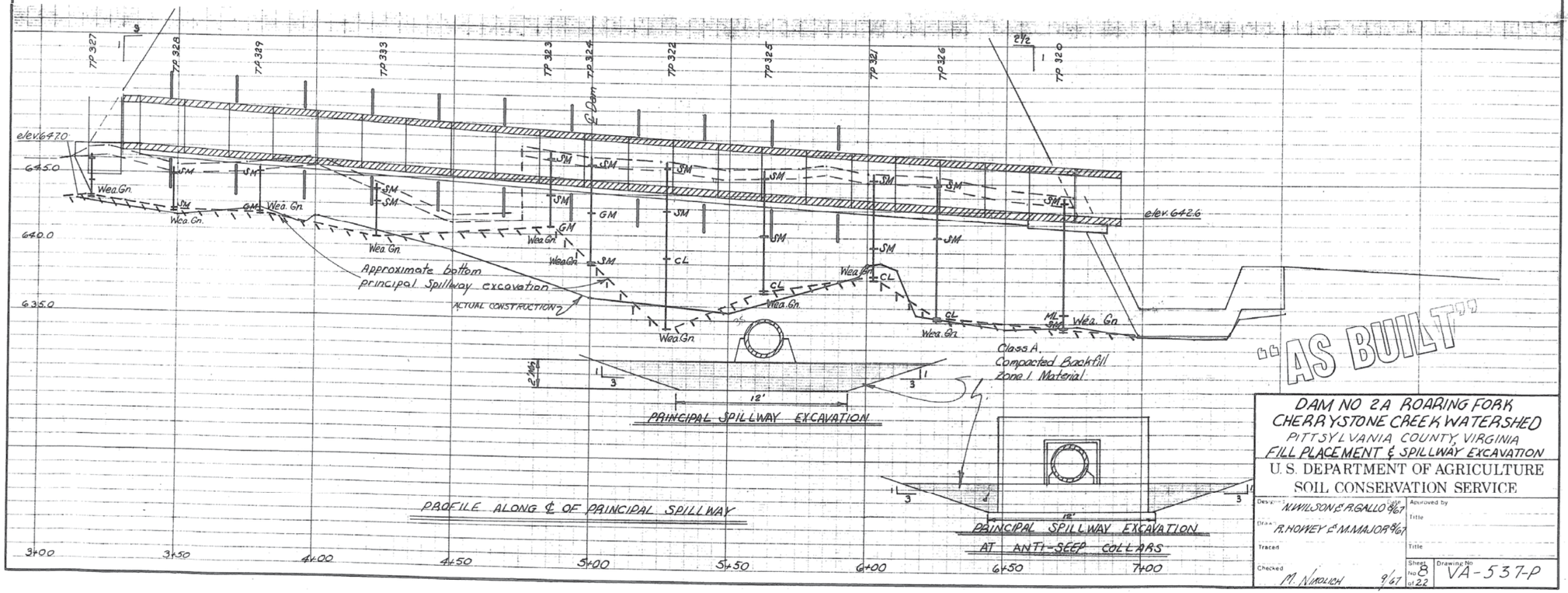
EARTH FILL REQUIREMENTS

ZONE	MATERIAL	MAX. ROCK SIZE	MAX. LIFT THICKNESS	REQUIRED WATER CONTENT	COMPACTION CLASS	COMPACTION DEFINITION
1	Inorganic silts and very fine sands (ML&MH) represented by TP 204 from 1.0' to 5.5' and TP 153 from 1.0' to 9.5' selected from the emergency spillway and Borrow Area B at the entrance to emergency spillway.	6"	9"	from optimum to +3% of optimum	A	95% of max. density ASTM D698 Method A
2	Silty sands (SM) represented by TP 207 from 5.0' to 19.0' and TP 206 from 5.4 to 10.3 selected from emergency spillway.	6"	9"	from -2% to +2% of optimum	A	95% of max density ASTM D698 Method A
3	Weathered mica phyllite (SM) from emergency spillway.	6"	9"	from -2% to +2% of optimum	A	95% of max. density ASTM D698 Method A

The maximum lift thickness is measured prior to compaction. For typical compaction curves refer to sheet 21.

The foundation surface throughout the base area of the dam shall be scarified to a depth of 6" and compacted prior to placement of compacted fill.

See sheets 19 to 21 for logs of test holes.

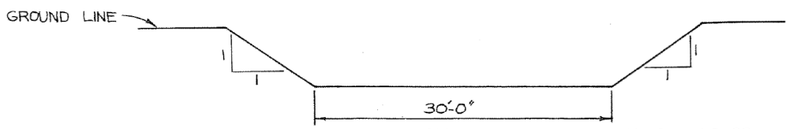


"AS BUILT"

DAM NO 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
FILL PLACEMENT & SPILLWAY EXCAVATION
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

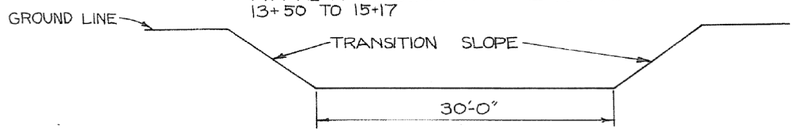
Design	W.WILSON & F.GALLO 8/67	Approved by	
Drawn	R.HOWEY & M.MAJOR 8/67	Title	
Traced		Title	
Checked	M. NIKOLICH 9/67	Sheet No 8 of 22	Drawing No VA-537-P

U.S. GOVERNMENT PRINTING OFFICE : 1967 O - 256237



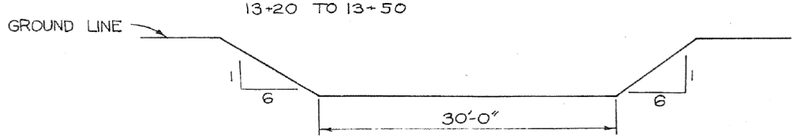
SECTION THROUGH CUTOFF TRENCH STA. 12+00

TYPICAL FROM STA. 11+17 TO 12+75 AND 13+50 TO 15+17



SECTION THROUGH CUTOFF TRENCH STA. 13+30

TYPICAL FROM STA. 12+75 TO 13+10 AND 13+20 TO 13+50



SECTION THROUGH CUTOFF TRENCH STA. 13+15

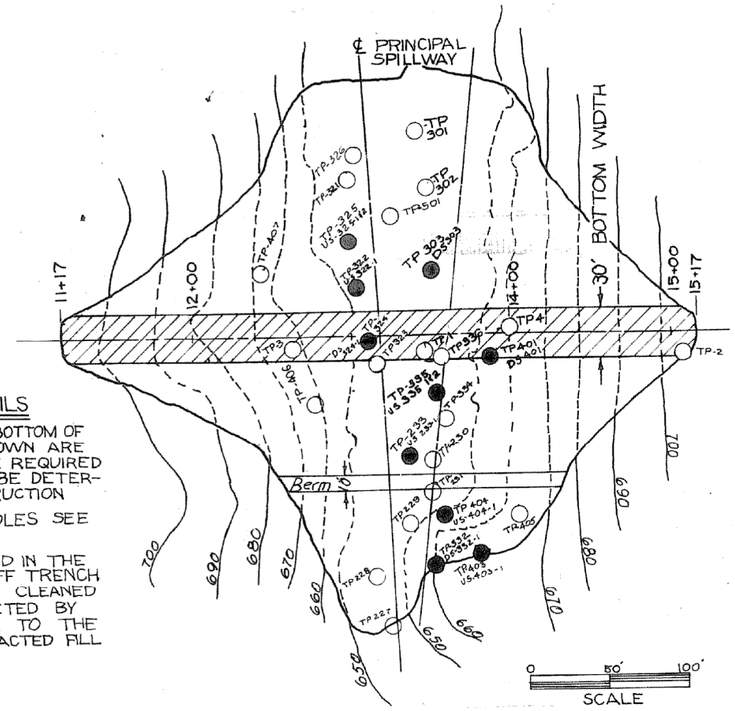
TYPICAL FROM STA. 13+10 TO 13+20

CONSTRUCTION DETAILS

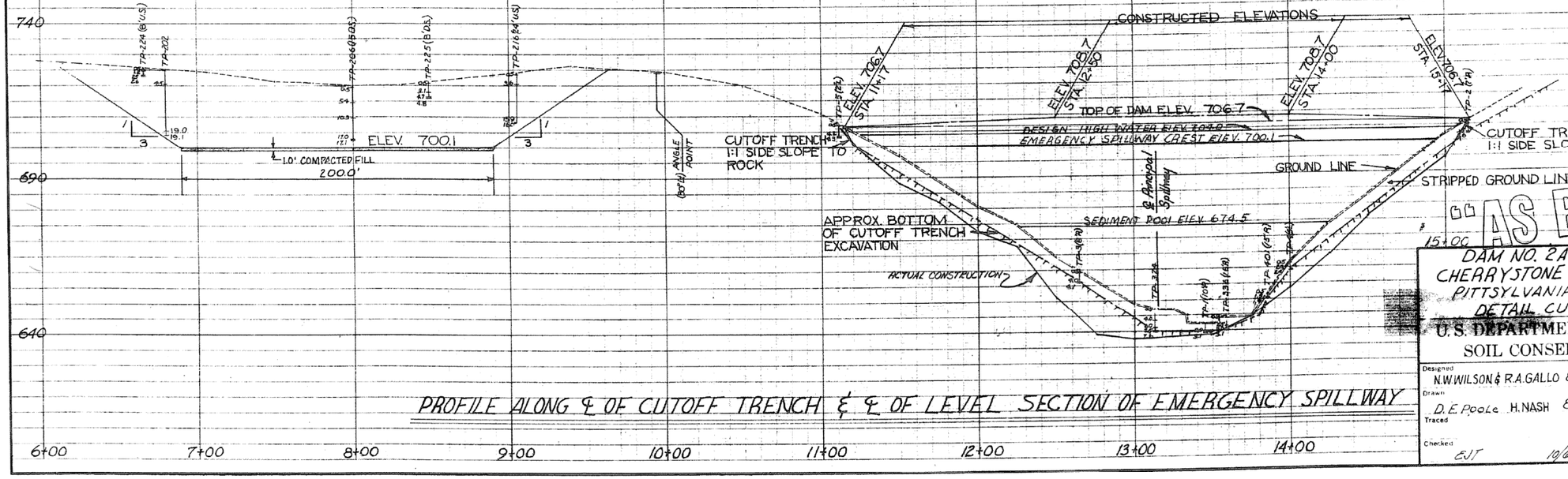
THE PROFILES OF THE BOTTOM OF ALL EXCAVATIONS AS SHOWN ARE ONLY APPROXIMATE. THE REQUIRED FINISHED GRADES WILL BE DETERMINED DURING CONSTRUCTION

FOR LOGS OF TEST HOLES SEE SHEETS 19 TO 21.

ALL THE ROCK EXPOSED IN THE BOTTOM OF THE CUTOFF TRENCH SHALL BE THOROUGHLY CLEANED AND SHALL BE INSPECTED BY THE ENGINEER PRIOR TO THE PLACEMENT OF COMPACTED FILL MATERIAL.



PLAN VIEW OF CUTOFF TRENCH



PROFILE ALONG ℄ OF CUTOFF TRENCH & ℄ OF LEVEL SECTION OF EMERGENCY SPILLWAY

"AS BUILT"

DAM NO. 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
DETAIL CUTOFF TRENCH

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed N.W.WILSON & R.A.GALLO 8/67	Date	Approved by	Title
Drawn D.E.POOLE H.NASH 8/67			Title
Traced			
Checked EJT 10/67		Sheet No 9 of 22	Drawing No VA-537-P

Form SCS-317 (November 1955)

TEST PITS (BACKHOE)

TP 1, 10'R STA. 13+46 C/L DAM, ELEV. 643.6
TM 12-6-66

0.0	3.0	Cobbles and gravels - hard sub-angular gray gneiss (+4 80% est by wt) w/sand, silty - brown - wet w/creek - 1.4 loose	(GM)
3.0	3.1	Gneiss - backhoe refusal.	

TP 2, 7'R STA. 15+14 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - residual	(ML)
0.5	3.5	Clay, silty w/cobbles (+4 35% est) yellow red - hard - moist - dry hole	(CL)
3.5	3.6	Weathered gneiss - backhow refusal	

TP 3, 8'R STA. 12+63 C/L DAM, ELEV. 658.9
TM 12-7-66

0.0	0.5	Topsoil - resudual	(ML)
0.5	4.0	Weathered fractured gneiss - salt and pepper and red yellow - hard - dry hole	
4.0	4.1	Gneiss - backhoe refusal	

TP 4, 5'L STA. 14+00 C/L DAM, ELEV. 663.9
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	2.3	Clay, silty - brown red - hard - moist - dry hole	(CL)
2.3	2.4	Mica feldspar gneiss - dozer refusal	

TP 5, 2'L STA. 11+11 C/L DAM, ELEV. 707.3
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	4.2	Silt, clayey - red brown to 3.0 yellow red to 4.2 - hard - moist - dry hole - few cobbles and spines gneiss	(ML)
4.2	4.3	Biotite feldspar gneiss - backhoe refusal	

TP 101, STA. 19+13 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna Series	(ML)
0.5	3.5	Clay, silty - bright yellow red - hard - moist - dry hole	(CL)
3.5	3.6	Weathered gneiss - backhoe refusal	

TP 102, 05'R STA. 17+69 C/L DAM,
TM 12-7-66

.0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	4.7	Clay, silty - bright yellow red - hard - moist - dry hole	(CL)
		DS 102-1 1.0-4.7	ML
4.7	7.1	Silt, sandy - red - hard - moist - dry hole	(ML)
7.1	7.2	Highly weathered olive gneiss - weak backhoe refusal	

TP 103, 110'L STA. 17+88 C/L DAM
TM 12-7-66

0.0	0.6	Topsoil - Fluvanna Series	(ML)
0.6	2.6	Clay silty w/cobbles - bright yellow red - hard - moist - dry hole	(CL)
2.6	2.7	Weathered hornblend gneiss - backhoe refusal	

TP 104, 180'R STA. 16+98 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	4.5	Clay, silty - bright yellow red - hard - moist - dry hole	(CL)
4.5	4.6	Weathered gneiss - backhoe refusal	

TP 105, STA. 16+38 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna Series	(ML)
0.5	4.4	Clay, silty - yellow red - hard - moist - dry hole	(CL)
4.4	5.5	Silt, clayey w/sand - red - hard - moist	(ML)
		DS 105-1 4.4-5.5	MH
5.5	5.6	Highly weathered gneiss - backhoe refusal	

TP 106, 120'R STA. 16+17 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	5.6	Clay silty - bright yellow red - hard moist	(CL)
5.6	7.2	Silt, sandy w/clay - red - hard - moist - dry hole - some spines weathered gneiss to 3.0 feet	(ML)
7.2	7.3	Weathered gneiss - weak backhoe refusal	

TP 107, 85'L STA. 16+28 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	3.8	Silt, clayey w/cobbles - yellow red and yellow brown - hard moist - dry hole	(ML)
3.8	3.9	Weathered gneiss - backhoe refusal	

TP 108, 184'R STA. 15+42 C/L DAM
TM 12-7-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	3.0	Silt, clayey red w/cobbles gneiss - hard - moist - dry hole	(ML)
3.0	3.1	Weathered gneiss - backhoe refusal	

TP 109, 100'R STA. 18+00 C/L DAM
TM 12-12-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	4.5	Clay silty - red - hard - moist	(CL)
4.5	8.4	Silt, sandy - red yellow - hard - moist - dry hole	(ML)
8.4	8.5	Hornblende gneiss - backhoe refusal	

TP 110, 147'R STA. 18+31 C/L DAM
TM 12-12-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	3.4	Silt, clayey - brown to yellow red - hard - moist - 25% est angular amphibolite and horn-blende gneiss cobbles - dry hole	(ML)
3.4	3.5	Hornblende gneiss - backhoe refusal	

TP 150, 291'R STA. 11+95 C/L DAM, ELEV. 667.6
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.0	Clay silty - red - hard - moist	(CL)
5.0	8.0	Silt, clayey - red - hard - moist - dry hole	(ML)
8.0	8.2	Sand, silty - white - hard - weathered pegmatite	

TP 151, 418'R STA. 12+54 C/L DAM, ELEV. 667.4
TM 12-8-66

0.0	0.5	Topsoil - Seneca series	(ML)
0.5	9.5	Silt, clayey w/sand - yellow red - hard - moist - dry hole	(ML)
		DS 151-1 1.0-9.5	SM
9.5	9.6	Mica phyllite - backhoe refusal	

TP 152, 263'R STA. 13+04 C/L DAM, ELEV. 662.6
TM 12-8-66

0.0	0.5	Topsoil - dam sediment	(ML)
0.5	7.2	Silt, clayey brown w/red brown layers and mottles - hard - moist	(ML)
7.2	9.0+	Sand, silty - brown - medium moist - dry hole	(SM)

TP 153, 318'R STA. 14+29 C/L DAM, ELEV. 663.8
TM 12-8-66

0.0	0.5	Topsoil - dam sediment	(ML)
0.5	9.5+	Silt, clayey - brown w/few mottles - few lenses - sand, silty - hard to medium - moist - dry hole - seismic velocity - 5000 ft/sec at 17.6 ft.	(ML)
		DS 153-1 1.0-9.5	ML

TP 154, 360'R STA. 13+77 C/L DAM, ELEV. 663.6
TM 12-8-66

0.0	0.5	Topsoil dam sediment	(ML)
0.5	9.5+	Silt, sandy w/clay - sand in pockets and lenses that range to 2' thick (+200 30% est) medium - moist - dry hole	(ML)

TP 155, 507'R STA. 14+54 C/L DAM, ELEV. 669.8
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	6.5	Clay, silty - yellow red - hard - moist - dry hole	(CL)
6.5	6.6	Weathered gneiss backhoe refusal	

TP 156, 180'L STA. 9+56 C/L DAM, ELEV. 710.5

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	3.0	Clay silty - yellow red - hard - moist	(CL)
3.0	4.6	Sand, silty - red yellow - hard - moist - dry hole	(SM)
4.6	4.7	Weathered mica phyllite - backhoe refusal	

TP 201, 187'R STA. 7+50 C/L DAM, ELEV. 717.9
TM 12-7-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	2.3	Silt, clayey - yellow red - hard - moist	(ML)
2.3	4.0	Sand, silty - red - micaceous - hard - moist	(SM)
4.0	10.5	Silt, clayey - red - hard - moist - dry hole	(ML)
10.5	14.0	Sand, silty - yellow brown - micaceous - hard - moist - dry hole	(SM)
14.0	14.1	Weathered mica phyllite - gray - bucket auger refusal	

TP 202, 158'R STA. 7+34 C/L DAM, ELEV. 724.5
TM 12-7-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	4.5	Silt, clayey - yellow red - hard - moist - wavy lower boundary	(ML)
4.5	19.0	Sand silty - brown yellow - very hard - micaceous - digs very hard - moist - dry hole	(SM)
19.0	19.1	Weathered mica phyllite - palered and olive gray - bucket auger refusal - seismic velocity 5000 ft/sec at 24.0 ft.	

TP 203, 81'R STA. 6+90 C/L DAM, ELEV. 720.8
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	3.9	Silt, clayey - yellow red - hard - moist	(ML)
3.9	14.8	Sand, silty - brown yellow - damp - very hard - digs hole	(SM)
14.8	14.9	Weathered mica phyllite - bucket auger refusal - seismic velocity 5000 ft/sec at 18.1 ft.	

TP 204, 31'R STA. 6+61 C/L DAM, ELEV. 712.8
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.5	Clay, silty - yellow red - hard - moist	(CL)
		DS 204-1 1.0-5.5	MH
5.5	14.3+	Sand, silty - brown red - micaceous - hard - moist - dry hole	(SM)

TP 205, 19'L STA. 6+35 C/L DAM, ELEV. 703.3
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	6.0	Silt, clayey - yellow red - hard - moist	(ML)
6.0	8.5+	Sand, silty - brown yellow - hard - moist - dry hole	(SM)

TP 206, 81'R STA. 8+22 C/L DAM, ELEV. 719.8
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.4	Clay silty - yellow red - hard - moist	(CL)
5.4	10.3	Sand, silty - pale yellow white - hard - damp - weathered pegmatite dike	(SM)
		DS 206-1 5.4-10.3	SM
10.3	17.0	Sand, silty yellow brown - micaceous - hard - moist - dry hole	(SM)
17.0	17.1	Gray phyllite - bucket auger refusal	

TP 207, 7'R STA. 7+68 C/L DAM, ELEV. 713.5
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.0	Silt, clayey - yellow red - hard - moist	(ML or CL)
5.0	19.0+	Sand silty - yellow brown - hard - moist - micaceous - dry hole	(SM)
		DS 207-1 5.0-19.0	SM

TP 208, 59'L STA. 7+29 C/L DAM, ELEV. 702.8
TM 12-8-66

0.0	0.5	Topsoil	(ML)
0.5	3.0	Silt, clayey - yellow red - hard - moist	(ML)
3.0	12.5	Sand, silty - micaceous - yellow brown - hard - moist - dry hole	(SM)
12.5	12.6	Gray phyllite bucket auger refusal	

TP 209, 119'L STA. 6+94 C/L DAM, ELEV. 691.1
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	4.0	Clay, silty - brown red - hard - moist	(CL)
4.0	7.3	Sand, silty - gray and yellow brown - hard to very hard - moist - saprolite from phyllite - dry hole	(SM)
7.3	7.4	Weathered phyllite - backhoe refusal	

TP 210, 145'R STA. 8+48 C/L DAM, ELEV. 716.0
TM 12-8-66

0.0	0.5	Topsoil Tatum series	(ML)
0.5	5.0	Clay, silty - yellow red - hard - moist	(CL)
5.0	16.5+	Sand, silty - yellow brown - micaceous - hard - moist - dry hole	(SM)

TP 211, 186'R STA. 8+03 C/L DAM, ELEV. 711.8
TM 12-8-66

0.0	0.5	Topsoil Tatum series	(ML)
0.5	4.0	Silt, clayey - yellow red - hard - moist	(ML)
4.0	10.0+	Sand, silty - micaceous - yellow brown - hard - moist - dry hole	(SM)

TP 212, 105'L STA. 7+99 C/L DAM, ELEV. 706.9
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	6.0	Silt, clayey - yellow red - hard - moist - dry hole	(ML)
6.0	6.1	Weathered mica phyllite - hard - backhoe refusal	

TP 213, 104'L STA. 8+25 C/L DAM, ELEV. 712.5
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	3.5	Clay, silty - yellow red - hard - moist	(CL)
3.5	6.1	Sand, silty - yellow brown - hard - moist w/weathered gray phyllite	(SM)
6.1	8.7	Sand, silty - pale yellow white - hard - weathered pegmatite - dry hole	(SM)
8.7	8.8	Weathered phyllite - backhoe refusal - seismic velocity 10,000 ft sec at 33 ft.	

TP 214, 70'L STA. 8+81 C/L DAM, ELEV. 719.3
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	4.2	Clay, silty - yellow red - hard - moist	(CL)
4.2	6.4	Sand, silty w/angular phyllite gravels - hard - sapprolite from mixed phyllite and pegmatite - dry hole	(SM)
6.4	6.5	Weathered phyllite - backhoe refusal	

TP 215, 14'R STA. 9+09 C/L DAM, ELEV. 723.8
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	2.7	Clay, silty - yellow red - hard - moist	(CL)
2.7	5.7	Sand, silty - white - hard - moist - weathered phyllite	(SM)
5.7	10.2	Sand, silty - gray - very hard - moist - saprolite from phyllite - dry hole	(SM)
10.2	10.3	Weathered phyllite bucket auger refusal - seismic velocity 5000 ft/sec at 15.4 ft.	

TP 216, 65'R STA. 9+29 C/L DAM, ELEV. 721.9
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	3.6	Clay, silty - yellow red - hard - moist	(CL)
3.6	15.9	Sand, silty - yellow brown - micaceous - hard - moist to damp - dry hole	(SM)
15.9	16.0	Mica phyllite - gray - bucket auger refusal	

TP 217, 115'R STA. 9+50 C/L DAM, ELEV. 716.5
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.0	Clay, silty - yellow red - hard - moist	(CL)
5.0	12.0	Sand, silty - yellow brown and white - hard - moist - mixed weathered mica phyllite and peg-matite - dry hole	(SM)
12.0	12.1	Biotite phyllite - bucket auger refusal	

DAM NO. 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: T.Mack C.W.Toney	Approved by: [illegible]
Title Geologist & Civil	Title State Conservation Engineer
Checked by: Engineer	Title
Title Geologist	Sheet No. 19 of 22
	Drawing No. VA-537-P

SCS-313 C (9-64)

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TP 218, 185'R STA. 10+09 C/L DAM, ELEV. 706.5
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	4.3	Clay, silty - yellow red w/ some gray weathered phyllite stringers - hard - moist	(CL)
4.3	11.0+	Silt, sandy - yellow brown - hard - moist - dry hole	(ML)

TP 219, 356'R STA. 10+27 C/L DAM, ELEV. 690.5
TM 12-8-66

0.0	0.4	Topsoil - Tatum series	(ML)
0.4	6.4	Clay, silty - yellow red - hard - moist	(CL)
6.4	8.5+	Sand, silty - yellow brown - some mica - hard - moist - dry hole	(SM)

TP 220, 357'R STA. 9+28 C/L DAM, ELEV. 693.5
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	5.0	Clay, silty - yellow red - hard - moist	(CL)
5.0	8.5+	Sand, silty - yellow brown - hard - moist - dry hole	(SM)

TP 221, 21'R STA. 5+75 C/L DAM, ELEV. 702.3
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	4.3	Silt, clayey - yellow red - hard - moist	(ML)
4.3	6.0	Sand, silty - yellow brown - micaceous - very hard - moist - dry hole	(SM)
6.0	6.1	Mica phyllite - backhoe refusal	

TP 222, 40'R STA. 6+05 C/L DAM, ELEV. 709.9
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	4.1	Silt, clayey - yellow red - hard - moist	(ML)
4.1	6.6	Sand, silty - yellow brown - micaceous - very hard - moist - dry hole	(SM)
6.6	6.7	Mica phyllite - backhoe refusal	

TP 223, 100'R STA. 6+64 C/L DAM, ELEV. 720.8
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	3.0	Silt, clayey - yellow red - hard - moist	(ML)
3.0	5.4	Sand, silty - yellow brown - micaceous - hard - moist - dry hole	(SM)
5.4	5.5	Mica phyllite - backhoe refusal	

TP 224, 170'R STA. 7+15 C/L DAM, ELEV. 724.3
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	1.2	Silt, clayey - yellow red - hard - moist	(ML)
1.2	2.5	Sand, silty - yellow brown - micaceous - hard - moist - dry hole	(SM)
2.5	2.6	Mica phyllite - backhoe refusal	

TP 225, 67'R STA. 8+63 C/L DAM, ELEV. 721.5
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	3.1	Clay, silty - yellow red - hard - moist	(CL)
3.1	4.7	Sand, silty - yellow brown - highly weathered mica schist - hard - moist - dry hole	(SM)
4.7	4.8	Mica phyllite - backhoe refusal	

TP 226, 124'R STA. 10+28 C/L DAM, ELEV. 715.4
TM 12-12-66

0.0	0.5	Topsoil	(ML)
0.5	2.0	Silt, clayey - brown red - hard - moist	(ML)
2.0	4.2	Weathered gneiss w/gneiss cobbles - hard - dry hole	
4.2	4.3	Slightly weathered gneiss - w/feldspar & muscovite - backhoe refusal	

TP 227, 322'R STA. 8+50 C/L DAM, ELEV. 700.3
TM 12-8-66

0.0	0.5	Topsoil - Tatum series	(ML)
0.5	6.0	Clay silty - red and yellow red - hard - moist	(CL)
6.0	7.4	Sand, silty - micaceous - hard - moist - dry hole	(SM)
7.4	7.5	Mica phyllite - backhoe refusal	

TP 301, 128'L STA. 13+41 C/L DAM, ELEV. 643.3
TM 12-6-66

0.0	1.0	Sand, silty - brown stream bank (left side) - alluvial	(SM)
1.0	6.3	Cobbles and boulders - gray - angular hard gneiss (+4 80% est by wt) w/sand silty - brown - wet w/water in creek - 1.0 loose	(GM)
6.3	6.4	Weathered gneiss - backhoe refusal	

TP 302, 93'L STA. 13+48 C/L DAM, ELEV. 643.5
TM 12-6-66

0.0	1.5	Sand, silty - brown - loose - stream bank - (left) - alluvial	(SM)
1.5	5.5	Cobbles and gravels w/boulders ranging to 2x2x2 ft. - hard gray angular to subangular gneiss (+4 80% est by wt) w/sand silty wet w/creek 1.5 - brown - loose	(GM)
5.5	5.6	Weathered gneiss - backhoe refusal	

TP 303, 41'L STA. 13+51 C/L DAM, ELEV. 642.6
TM 12-6-66

0.0	1.8	Sand, silty - brown - stream bank - alluvial	(SM)
1.8	6.3	Cobbles, gravels, and boulders - hard - angular gray gneiss (+4 80% est by wt) w/sand, silty - gray brown - loose - wet w/ creek 1.5	
		DS 303-1 1.8-6.3	(GM) SP-SM
6.3	6.4	Weathered gneiss - backhoe refusal	

Field Gradation 1.8-6.3

Size Inches	Weight lbs	No. Parts	Percent
12-18	131	4	15.2
9-12	111	6	13.0
6-9	81	10	9.5
3-6	122	64	14.3
Less than 3	410		48.1 to lab
Total	855		100.2

Note: Wet weight -3" = 485 lbs w/ 18.2% on #4 moisture = 410 dry weight - assume +3" dry

TP 320, 166'L STA. 12+85 C/L DAM, ELEV. 644.6
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	2.0	Sand, silty w/some SP - brown loose - moist	(SM)
2.0	8.5	Silt, clayey - yellow red and gray - medium - moist to wet w/ water 7.0 w/increasing cobbles w/depth (+3 inch 30% est)	(ML)
8.5	9.5	Sand, silty - gray brown - loose - wet	(SM)
9.5	9.6	Weathered gneiss - backhoe refusal	

TP 321, 99'L STA. 12+98 C/L DAM, ELEV. 644.7
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	5.3	Sand, silty - brown - medium - pp 1.7 - moist - dd 79.3 pcf, m 19.7% at 2.0 ft	(SM)
5.3	7.5	Clay, sandy - grey - soft - pp 0.7 - moist to wet w/water 6.0 - dd 77.8 m 31.7 at 6.0 ft	(CL)
7.5	7.6	Weathered gneiss - backhoe refusal	

TP 322, 28'L STA. 13+03 C/L DAM, ELEV. 644.5
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	3.5	Sand, silty w/cobbles angular gneiss - brown - loose - moist	(SM)
3.5	7.0	Clay, silty - yellow red - medium - moist - pp 1.2	(CL)
		US 322-1 4.0-5.0	SM
7.0	12.0	Clay, silty - mottled yellow brown and gray - soft to medium - pp 0.8 - wet w/water 9.6 - dd 85.5 pcf, m 29.4% at 9.0 ft.	(CL)
		DS 322-1 7.0-12.0	SM
12.0	12.1	Weathered gneiss - backhoe refusal	

TP 323, 16'R STA. 13+13 C/L DAM, ELEV. 647.1
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	3.0	Sand, silty - brown - loose - moist - pp 1.0	(SM)
3.0	5.4	Cobbles and gravels - hard - gray - quartz and gneiss loose moist to wet w/water from creek 3.0	(GM)
5.4	5.5	Weathered gneiss backhoe refusal	

TP 324, 02'R STA. 13+11 C/L DAM, ELEV. 646.1
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	4.0	Gravel, sandy - subrounded - hard quartz - loose - moist	(GM)
		DS 324-1 1.0-4.0	GW-GM
4.0	7.5	Sand silty w/45% est angular hard gneiss cobbles and boulders - loose - moist to wet w/water 6.0	(SM)
7.5	7.6	Gneiss - weathered - backhoe refusal	

TP 325, 60'L STA. 12+98 C/L DAM, ELEV. 644.9
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	4.6	Sand, silty w/gravels quartz - brown - medium - moist - pp 1.3 - dd 85.4, m 9.1% at 2.0 ft	(SM)
		US 325-1 1.0-2.0	SM
4.6	8.7	Clay, cobbley w/sand - gray - soft pp 1.0 - moist to wet w/ water 6.5	(CL)
		US 325-2 5.0-5.5	Non Plastic SM
8.7	8.8	Weathered gneiss - backhoe refusal	

TP 326, 114'L STA. 13+01 C/L DAM, ELEV. 644.5
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	4.3	Sand, silty - brown - medium to loose - moist	(SM)
4.3	10.0	Clay, silty w/cobbles - gray - soft - moist to wet w/water 8.0	(CL)
10.0	10.1	Weathered gneiss - backhoe refusal	

TP 327, 181'R STA. 13+25 C/L DAM, ELEV. 646.2
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	2.0	Sand, gravelly - brown - loose - moist	(SM)
2.0	3.0	Sand, clayey - gray - hard - moist to wet w/water 2.5	(SC)
3.0	3.1	Weathered hornblende gneiss - backhoe refusal	

TP 328, 152'R STA. 13+17 C/L DAM, ELEV. 645.6
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	3.0	Sand, silty w/50% angular hard gneiss cobbles and gravels - brown - loose to hard - moist to wet w/water 2.5	(SM)
3.0	3.1	Weathered gneiss - backhoe refusal	

TP 329, 119'R STA. 13+37 C/L DAM, ELEV. 645.6
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	3.4	Cobbles and boulders - angular hard gneiss rock (+4 80% est) w/sand silty - brown hard wet w/water 2.4	(GM)
3.4	3.5	Weathered gneiss - backhoe refusal	

TP 330, 78'R STA. 13+50 C/L DAM, ELEV. 644.9
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	3.5	Sand silty w/50% est angular hard gneiss cobbles - medium - pp 2.3 - moist - brown some boulders range to 1x2x3 feet - w/some 8"x8"x10 foot beams from old dam	(SM)
3.5	4.5	Sand, clayey w/cobbles - wet - w/water 3.4 - soft pp 1.0	(SC)
4.5	4.6	Weathered gneiss - backhoe refusal	

TP 331, 100'R STA. 13+50 C/L DAM, ELEV. 644.9
TM 12-6-66

0.0	2.0	Gravel w/sand - brown - gray - wet w/creek 1.0	(GM)
2.0	2.1	Weathered gneiss - backhoe refusal	

TP 332, 142'R STA. 13+50 C/L DAM, ELEV. ~~650.3~~ 664.3
TM 12-6-66

0.0	0.5	Topsoil - dam sediment	(SM)
0.5	13.0	Silt, w/clay - red brown and gray layered - very hard - pp 4.5 - damp dd 75.7 pcf, m 16.3% at 12.0 ft.	(ML)
13.0	15.0	Sand - poorly graded - white - very loose - moist - dd 98.5 pcf, m 0.6% at 14.0 ft	(SP)
		DS 332-1 13.0-15.0	SP-SM
15.0	17.0	Cobbles w/silt and sand - angular hard gray gneiss - cobbles and gravels 60% est w/silt clayey - brown - hard - moist - dry hole	(GM)
17.0	17.1	Weathered gneiss - backhoe refusal	

TP 333, 76'R STA. 13+36 C/L DAM, ELEV. 644.7
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	1.4	Sand, silty - brown - loose - moist	(SM)
1.4	4.0	Sand, coarse - poorly graded - brown gray - wet w/water in creek 1.4	(SP)
		DS 333-1 1.4-4.0	SP
4.0	4.1	Weathered gneiss - backhoe refusal	

TP 334, 54'R STA. 13+54 C/L DAM, ELEV. 644.8
TM 12-6-66

0.0	0.4	Topsoil - alluvial	(SM)
0.4	6.5	Sand, gravelly - w/35% angular cobbles and boulders - hard gneiss - brown - loose - caves - pp 1.0 moist to wet w/water 3.2	(SM)
6.5	6.6	Weathered gneiss - backhoe refusal	

TP 335, 36'R STA. 13+54 C/L DAM, ELEV. 645.1
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	2.3	Sand, poorly graded - brown - w/silt loose - pp 1.2	(SM)
		US 335-1 1.0-2.0	SP-SM
2.3	3.0	Silt, clayey w/sand - gray - medium - pp 1.5 - moist-dry hole	(ML)
		US 335-2 2.0-3.0	Non Plastic SM
3.0	3.1	Weathered gneiss - backhoe refusal	

TP 336, 16'R STA. 13+57 C/L DAM, ELEV. 645.3
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	2.5	Sand, silty - brown - loose - moist - pp 0.7 - dd 96.0 pcf, m 6.9% at 1.0 ft	(SM)
2.5	4.6	Sand, silty - gray - medium - moist to wet w/water 3.0 - pp 1.5 - dd 91.6 pcf, m 27.1% at 3.0 ft	(SM)
4.6	4.7	Weathered gneiss - backhoe refusal	

TP 401, 15'R STA. 13+86 C/L DAM, ELEV. 652.7
TM 12-6-66

0.0	0.5	Topsoil - alluvial	(ML)
0.5	1.3	Clay, silty - yellow red - hard - moist - dry hole	(CL)
		DS 401-1 1.0-1.3	SM
1.3	1.4	Gneiss - hard - backhoe refusal	

TP 402, 192'R STA. 13+87 C/L DAM, ELEV. 663.0
TM 12-7-66

0.0	0.5	Topsoil - dam sediment	(ML)
0.5	1.0	Silt, clayey - brown - medium - moist - dry hole	(ML)
1.0	1.1	Hard hornblende gneiss - strong backhoe refusal spine	

TP 403, 138'R STA. 13+80 C/L DAM, ELEV. 661.3
TM 12-7-66

0.0	0.5	Topsoil - dam sediment	(ML)
0.5	10.0+	Silt, fine sandy w/clay - brown w/some gray - hard - damp - dry hole - dd 82.7 pcf, m 29.6% at 3.0 ft	(ML)
		US 403-1 3.0-4.0	ML

TP 404, 114'R STA. 13+59 C/L DAM, ELEV. 661.2
TM 12-7-66

0.0	0.5	Topsoil - dam sediment	(ML)
0.5	10.0+	Silt, clayey - yellow brown and brown w/area yellow red 3.0-5.0 - very hard - pp 4.5+ damp - dry hole - dd 76.0 pcf, m 31.4% of 3.0 ft	(ML)
		US 404-1 2.0-3.0	ML

TP 405, 113'R STA. 14+05 C/L DAM, ELEV. 662.8
TM 12-7-66

0.0	0.5	Topsoil - residual	(ML)
0.5	2.5	Clay, silty - yellow red - hard - moist - dry hole	(CL)
2.5	2.6	Weathered gneiss - backhoe refusal	

TP 406, 43'R STA. 12+77 C/L DAM, ELEV. 659.9
TM 12-7-66

0.0	0.5	Topsoil - residual	(ML)
0.5	1.0	Clay, silty - red - hard - moist - dry hole	(CL)
1.0	1.1	Weathered gneiss - backhoe refusal	

"AS BUILT"

DAM NO. 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: T.Mack C.W.Toney — Date	Approved by: A. A. Button, Jr.
Title Geologist & Civil Engineer	Title State Conservation Engineer
Checked by: Engineer	Title
Title Geologist	Sheet No 20 of 22 — Drawing No. VA-537-P

SCS-313 C (9-64)

TP 407, 40'L STA. 12+44 C/L DAM, ELEV. 659.7
TM 12-7-66

0.0	0.5	Topsoil - colluvial in old quarry pit	
0.5	6.0	Silt, sandy - brown and yellow brown - hard moist - dry hole	(ML)
		DS 407-1 1.0-6.0 Non Plastic	SM
6.0	6.1	Weathered gneiss - backhoe refusal	

TP 501, 75'L STA. 13+25 C/L DAM, ELEV. 645.0
TM 12-7-66

0.0	0.5	Topsoil - alluvial	(SM)
0.5	4.0	Cobbles and gravels angular hard gray gneiss - (+4 70% est) w/sand w/silt - medium - moist - debris cobbles from old dam	(GM)
4.0	8.0	Sand, poorly graded - brown - loose - caves	(SP)
		DS 501-1 4.0-8.0	SP-SM
8.0	10.5	Sand, silty - gray - loose - medium grained - wet w/water 8.0	(SM)
10.5	10.6	Weathered gneiss - backhoe refusal	

TP 601, 216'L STA. 13+53 C/L DAM, ELEV. 643.4
TM 12-6-66

0.0	0.5	Topsoil, sand - alluvial	(SM)
0.5	6.0	Sand, poorly graded - loose - brown - moist	(SP)
		DS 601-1 1.0-6.0	SP-SM
6.0	8.0+	Sandy silty - gray - soft - loose - wet w/water 6.4	(SW)

* Continued from TP 110

AH 111, 26'L STA. 22+75 C/L DAM
TM 12-14-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	9.0+	Silt, clayey - red - hard - moist - dry hole	(ML)

AH 112, STA. 21+81 C/L DAM
TM 12-14-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	6.0	Silt, clayey - red - hard - moist	(ML)
6.0	9.0+	Sand, silty - yellow brown - micaceous - hard - moist - dry hole	(SM)

AH 113, 37'R STA. 20+62 C/L DAM
TM 12-14-66

0.0	0.5	Topsoil - Fluvanna series	(ML)
0.5	6.0+	Silt, clayey - red - hard - moist - dry hole	(ML)

AH 128, 548'R STA. 20+05 C/L DAM
TM 12-14-66

0.0	0.5	Topsoil - dam sediment	(SM)
0.5	8.0+	Sand, silty - brown - medium - moist w/water 8.0	(SM)

AH 129, 594'R STA. 17+35 C/L DAM
TM 12-14-66

0.0	0.5	Topsoil - dam sediment over Fluvanna series	(SM)
0.5	4.5	Silt, sandy - light gray - brown - medium - moist	(ML)
4.5	7.0	Silt, clayey - red - hard - moist - dry hole	(ML)
7.0	7.1	Gneiss - auger refusal	

AH 130, 669'R STA. 17+11 C/L DAM
TM 12-14-66

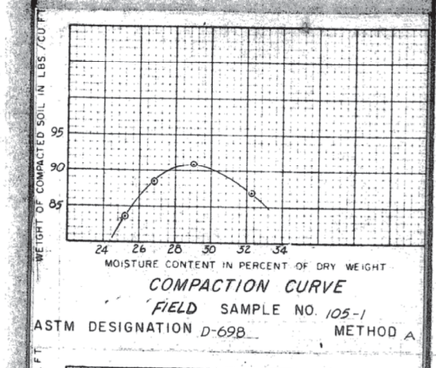
0.0	0.5	Topsoil - dam sediment	(SM)
0.5	8.0	Sand, silty - brown - medium moist - dry hole	(SM)
8.0	8.1	Gneiss - auger refusal	

AH 131, 530'R STA. 16+84 C/L DAM
TM 12-14-66

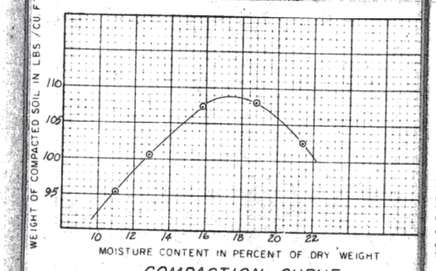
0.0	0.5	Topsoil - dam sediment	(SM)
0.5	2.0	Sand, silty w/silt, sandy - brown - medium - moist	(SM)
2.0	6.0	Silt, sandy - gray yellow - medium -moist	(ML)
6.0	6.5	Sand, silty - gray yellow - medium - moist	(SM)
6.5	9.0	Silt, sandy - gray yellow - medium - moist - dry hole	(ML)
9.0	9.1	Gneiss - auger refusal	

AH 132, 514'R STA. 19+06 C/L DAM
TM 12-14-66

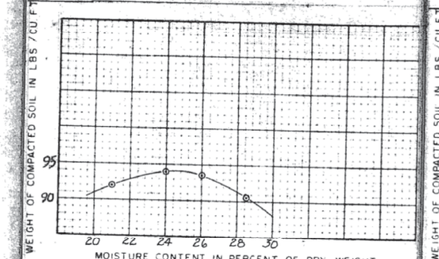
0.0	0.5	Topsoil - dam sediment	(SM)
0.5	1.5	Sand, silty - brown - medium - moist	(SM)
1.5	3.0	Silt, sandy - brown - medium - moist - dry hole	(ML)
3.0	3.1	Gneiss - auger refusal	



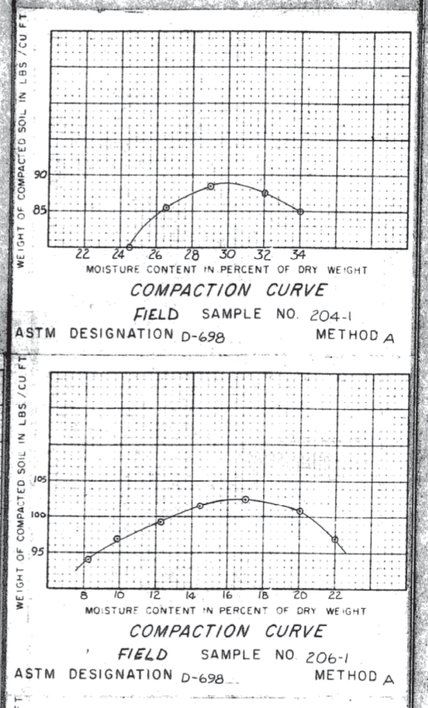
COMPACTION CURVE
FIELD SAMPLE NO. 105-1
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE
FIELD SAMPLE NO. 151-1
ASTM DESIGNATION D-698 METHOD A

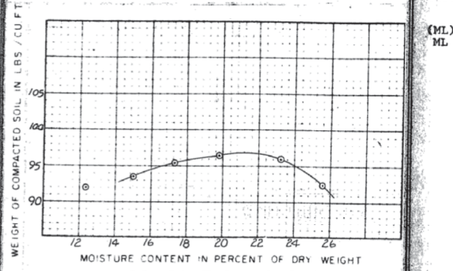


COMPACTION CURVE
FIELD SAMPLE NO. 153-1
ASTM DESIGNATION D-698 METHOD A

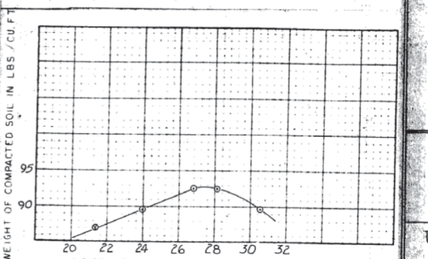


COMPACTION CURVE
FIELD SAMPLE NO. 204-1
ASTM DESIGNATION D-698 METHOD A

COMPACTION CURVE
FIELD SAMPLE NO. 206-1
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE
FIELD SAMPLE NO. 207-1
ASTM DESIGNATION D-698 METHOD A



COMPACTION CURVE
FIELD SAMPLE NO. 102-1
ASIM DESIGNATION D-698 METHOD A

U.S. GOVERNMENT PRINTING OFFICE : 1966 O-746-546

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Foundation	401 - 499
Toe drain	501 - 599

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silty mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands; sand-silt mixtures
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, v. fine sands; sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity; fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity

SYMBOLS

AH	Auger hole
TP	Test pit
DS	Disturbed sample
US	Undisturbed sample
pp	Packet penetrometer reading in tons/sq. ft.
dd	dry density
m	moisture
pcf	pounds/cubic feet
ft/sec	feet/seconds

Ground water levels in test pits were determined from December 6, 1966 to December 14, 1966. Moisture conditions during the investigation were normal.

List of precipitation:

Dec. 13 - approx 2" rain

All soil and rock descriptions and classification were determined by visual examination.

(ML) - Soil classification by bisual inspection
ML - Unified classification by soils laboratory

"AS BUILT"

DAM NO. 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: T. Mack C.W.Toney	Date	Approved by:	
Title: Geologist & Civil		Title: State Conservation Engineer	
Checked by: Engineer		Title:	
Title: Geologist		Sheet No. 21 of 22	Drawing No. VA-537-P

SCS-313 C (9-64)

DRILL HOLES

DH 21, STA. 13+29.5 C/L DAM, ELEV. 646.72
TM 12/19/67

0.0	0.4	Topsoil - leaf litter & weed roots - alluvial	(SM)
0.4	3.5	Sand, silty w/11% est. qtz. subangular gravels - hard to medium - moist - brown	(SM)
3.5	8.9	Sand, silty - coarse w/09% est. qtz. and gneiss gravels - brown - hard to loose - wet w/water 3.9	(SM)
8.9	10.5	Cobbles, sandy w/gravel (+4 75% est. hard angular quartz pegmatite and garnet, gneiss and hornblende gneiss) w/sand - wet - medium - (cobbles 55% est.)	(SM)
10.5	11.0	Weathered gneiss - fractured to 2 inch pieces - w/Fe and Mn stain - quartz, feldspar & muscovite - low recovery - gray brown- cased to 11.3	
11.0	12.0	Gneiss - high feldspar w/quartz & some muscovite - hard - unweathered - light gray - 45° fracture w/iron stain 11.9-12.0 - broken in 1 foot pieces	
12.0	13.5	Gneiss - gray & white - contact metamorphic - hard - hornblende - feldspar quartz - garnets - pyrite w/sulfides - 45° fractures 12.2-12.3, 12.4-12.5, 12.6-12.7 w/red clay in seams - horizontal fracture 13.1 - broken in 3 inch to matchbox size pieces - possible 1/2 foot core loss	
13.5	14.5	Gneiss - gray & white - hard gneissocity dip = 70° feldspar, hornblende quartz - broken in 1/2 foot pieces	
14.5	16.6	Amphibolite - gray salt & pepper color - hard - feldspar & hornblende - broken in 6 inch to 2 inch pieces	
16.6	20.2	Gneiss - hard - gray & white - feldspar, quartz, biotite w/some hornblende & garnets - 45° fractures 16.7-16.3, 19.5-19.6, 19.7-19.8 - fracture zone 19.5-20.1 - iron stain in fractures - broken in 9 inch to matchbox size pieces - drills fast 19.5-20.0 - lost little water 19.8	
20.2	20.9	Quartz & feldspar pegmatite w/some biotite - white - hard - broken in 2 inch pieces	
20.9	46.7	Gneiss - hard - gray & white w/narrow dark gray bands - feldspar, biotite quartz, hornblende w/garnets - 45° fractures 23.4-23.5, 26.0-26.1, 37.3-37.4, 40.3-40.5 w/Fe stain 30.6-30.8 (w/Fe stain & some weathering) - horizontal fracture w/Fe stain 29.6, 38.3 - pink feldspar w/epidote 38.4 to 39.0 (unakite) - broken zones w/some weathering & phlogopite mica 30.7-30.8, 31.4-32.5 (broken down to matchbox size pieces) - some pieces range up to 1½ ft - lost water w/return 23.5 - no fractures 40.5 to 46.7 - core broken on gneissic planes w/muscovite & garnets - water passes zones 23.4-23.5, (large), 30.6-30.8, 31.6-32.3 - some water passes 37.3-37.4, 39.3, 40.3-40.5	

Blow count with standard equipment

Depth	Blows
2.0 - 3.0	21
3.5 - 4.5	22
7.0 - 8.0	13

Recovery

8.0 - 10.5 =	28%
10.5 - 12.0 =	93%
12.0 - 16.5 =	89%
16.5 - 21.5 =	76%
21.5 - 26.2 =	96%
26.2 - 31.2 =	100%
31.2 - 36.2 =	100%
36.2 - 41.5 =	100%
41.5 - 46.7 =	100%

12 foot of drive pipe was driven to 11.3 into the gneiss rock.

Constant Head Permeability Tests

Depth	Dia. pipe	Dia. hole	Length pipe	gpm	k ft/day
5.0	3.75		6.0	4.2	93.5
10.0	3.75		12.0	21.0	191.0
11.3 - 16.5		NX	12.0	9.0	13.8
16.5 - 21.5		NX	12.0	1.0	1.1
21.5 - 26.2		NX	12.0	3.0	2.7
26.2 - 31.2		NX	12.0	0	0
31.2 - 36.2		NX	12	0.3	0.27

Note - Water stands in hole after overnight measurement at 3.9. On drilling runs casing is sufficiently tight for water not to stand in hole above 25.0. Thus, 3.9 is considered creek water and was not used as h to obtain k to 26.2 feet. For 31.2-36.2 25.0 was used as h.

Pressure Tests w/Top of Gage 1.0' above Top of NX Hole

11.5 - 16.5 =	17.0	gpm at 10 psi
	22.5	gpm at 15 psi
	16.3	gpm at 10 psi
13.5 - 18.5 =	6.8	gpm at 10 psi
	9.0	gpm at 15 psi
	6.5	gpm at 10 psi
15.0 - 20.0 =	0	gpm at 15 psi
	0	gpm at 30 psi
20.0 - 25.0 =	21.5	gpm at 15 psi
	30.5	gpm at 30 psi
	21.5	gpm at 15 psi
24.0 - 29.0 =	0	gpm at 15 psi
	0	gpm at 30 psi
25.0 - 30.0 =	0	gpm at 15 psi
	0	gpm at 30 psi
30.0 - 36.2 =	1.0	gpm at 15 psi
	3.6	gpm at 30 psi
	1.0	gpm at 15 psi
33.0 - 38.0 =	0.25	gpm at 15 psi
	0.50	gpm at 30 psi
	0.25	gpm at 15 psi
33.0 - 46.7 =	0.5	gpm at 15 psi
	1.5	gpm at 30 psi
	0.5	gpm at 15 psi
36.0 - 41.0 =	0.5	gpm at 15 psi
	1.25	gpm at 30 psi
	0.5	gpm at 15 psi
37.0 - 42.0 =	0.33	gpm at 15 psi
	1.25	gpm at 30 psi
	0.33	gpm at 15 psi
37.0 - 46.7 =	0.5	gpm at 15 psi
	1.5	gpm at 30 psi
	0.5	gpm at 15 psi
41.0 - 46.7 =	0	gpm at 15 psi
	0	gpm at 30 psi

DH 22, STA. 12+25 C/L DAM, ELEV. 675.3
TM 12/21/67

0.0	0.5	Topsoil - roots - residual	(SM)
0.5	2.5	Sand, clayey w/angular gravel - yellow red - hard - moist - dry hole	(SC)
2.5	8.2	Gneiss - gray w/some white in narrow bands - hard - unweathered - feldspar, biotite, quartz, muscovite, hornblende 45° fractures 3.3-3.5, 4.5-4.7, 6.7-6.8, 7.0-7.1, 7.4-7.5 - red clay w/slight Mn stain on fractures	
8.2	8.5	Clay, silty - bright yellow red w/40% est. weathered gneiss	(CL)
8.5	22.7	Gneiss - gray & white w/olive brown - slightly weathered - feldspar, muscovite, biotite, phlogopite w/garnets in zone 20.9-22.7 - 45° fractures 9.2-9.4, 10.6-10.7, 11.8-12.0, 12.3-12.5, 12.9-13.1, 13.2-13.4, 13.5-13.7, 16.4-16.6, 16.6-16.8, 16.9-17.1, 17.3-17.5, 17.6-17.7, 17.9-18.2, 20.8-20.9, 21.0-21.1, 22.1-22.3 - Mn stain on fractures w/some red clay 12.5 - 30° fractures 9.0, 18.5, 22.4 w/Mn stain on fractures - broken in 1½ foot to matchbox size pieces	
22.7	31.7	Phyllite - dark gray w/stringers white feldspar, sericite, graphite, feldspar & muscovite - low recovery w/loss of sericite in wash water w/ gray wash water - fractured approx. every 5 inches w/60° and 30° fractures - Mn stain w/some Fe stain on fractures - water stands 29.5	
31.7	45.0	Gneiss - hard - gray & gray white - feldspar, muscovite, phlogopite, quartz, garnets 30° fractures 31.6, 31.8, 32.1, 32.2, 32.8, 33.8, 34.0 34.5, 35.1, 36.1, 36.4, 37.0 45° fractures 33.2-33.4, 35.8-36.0 broken in matchbox to 8 inch size pieces - breaks often 0 occur on phlogopite & garnet gneissic layers that range from ½ inch to 1-1/3 inches thick	

Recovery

2.5 - 4.0 =	100%
4.0 - 7.5 =	100%
7.5 - 12.5 =	100%
12.5 - 17.5 =	58%
17.5 - 22.5 =	78%
22.5 - 27.5 =	20%
27.5 - 30.0 =	20%
30.0 - 32.5 =	40%
32.5 - 36.5 =	95%
36.5 - 41.5 =	98%
41.5 - 45.0 =	100%

Constant Head Permeability Tests

Depth	Dia. hole	Length pipe	gpm	k ft/day
2.5 - 7.5	NX	3.0	0.08	0.33
7.5 - 12.5	NX	3.0	0.132	0.28
12.5 - 17.5	NX	3.0	0.072	0.10
17.5 - 22.5	NX	3.0	0	0
22.5 - 27.5	NX	3.0	0.51	0.45
27.5 - 32.5	NX	3.0	0.30	0.22
32.5 - 36.5	NX	3.0	0	0
36.5 - 41.5	NX	3.0	0	0

Water stands 28.5

Pressure Tests w/Top of Gage 2.0' above Top of NX Hole

2.5 - 7.5 =	0.2	gpm at 5 psi
	7.8	gpm at 10 psi
	3.3	gpm at 5 psi
5.0 - 10.0 =	1.0	gpm at 5 psi
	1.2	gpm at 10 psi
	0.3	gpm at 5 psi
10.0 - 15.0 =	0	gpm at 5 psi
	0.4	gpm at 10 psi
	0	gpm at 5 psi
13.0 - 18.0 =	0.6	gpm at 5 psi
	4.2	gpm at 10 psi
		water returns around top packer at 5 psi
18.0 - 23.0 =	0.4	gpm at 5 psi
	5.5	gpm at 10 psi
	4.3	gpm at 5 psi
22.0 - 27.0 =	0.5	gpm at 5 psi
	0.5	gpm at 10 psi
	0.5	gpm at 5 psi
27.0 - 33.0 =	0	gpm at 5 psi
	0	gpm at 10 psi
33.0 - 45.0 =	0	gpm at 5 psi
	0	gpm at 10 psi

DH 23, STA. 14+25 C/L DAM, ELEV. 674.6
TM 12/27/67

0.0	0.5	Topsoil - clay, sandy - red yellow - hard - moist - some roots - dry - residual	(CL)
0.5	18.3	Gneiss - hard - weathered to 5.0 - dark gray w/white gneissic bands - hornblende, feldspar, muscovite, quartz & garnets - low recovery to 5.0 & 15.0-18.3 - highly fractured w/45° fractures 0.5-5.0, 15.0-18.3 - vertical fractures 0.5 to 5.5, 6.0-7.0, 70° fractures (on gneissic planes) 8.1-8.8, 11.9-12.7, 13.0-13.6 45° fractures 5.4-5.5, 5.6-5.7, 6.1-6.2, 6.4-6.5, 7.7-7.8, 7.9-8.0, 8.1-8.2, 9.5-9.6, 14.3-14.4 - Mn & red clay on fracture planes	
18.3	21.8	Pegmatite - white & light gray - feldspar quartz, muscovite w/trace of biotite - vertical fracture 18.3-21.7 - broken by 45° fractures in 1 inch to matchbox size pieces - Mn & some red clay on fractures - low recovery	
21.8	23.8	Aplite dikes in hornblende gneiss - aplite w/feldspar quartz & muscovite - gneiss w/hornblende & feldspar - aplite crystal growth from gneiss - white aplite in gray salt & pepper colored hornblende gneiss - vertical fracture 21.8-23.8 - broken in 3 inch to matchbox size pieces by 45° fractures - red clay w/some Mn on fractures - low recovery	
23.8	25.0	Gneiss - dark gray banded salt & pepper colored - hard - feldspar, hornblende, garnets & some biotite - 45° fractures 23.8-24.0, 24.0-24.2, 24.3-24.5 - Mn w/some red clay in fractures	
25.0	28.9	Pegmatite - white & light gray w/ feldspar & quartz - highly fractured w/pieces that range from 2 inches to matchbox size - Mn stain on fractures - low recovery	
28.9	45.9	Gneiss - hard - banded salt & pepper colored - feldspar, hornblende w/some biotite - aplite dikes 29.9-30.3, 30.6-30.7 45° fractures 34.7-34.9, 35.1-35.2, 35.2-35.3, 35.5-35.6, 35.7-35.8, 37.0-37.2 30° fractures 29.5, 30.0, 30.2, 36.5, 36.7 - core barrel dropped fairly fast 30.0-33.0 - broken in 2 inch to 2½ foot pieces - 37.0-45.9 unfractured core - highly fractured core 30.0-33.0 - hole had to be cased to 29.5 - BX uncased hole below - water stands 33.5	

Recovery

0.5 - 2.0 =	53%
2.0 - 4.0 =	45%
4.0 - 5.0 =	40%
5.0 - 10.0 =	100%
10.0 - 15.0 =	64%
15.0 - 16.5 =	27%
16.5 - 19.0 =	40%
19.0 - 21.5 =	28%
21.5 - 24.5 =	47%
24.5 - 29.5 =	18%
29.5 - 35.0 =	31%
35.0 - 40.0 =	100%
40.0 - 45.9 =	100%

Constant Head Permeability Tests w/Head held at 0.5 (top of rock w/no pipe in hole)

Depth	Dia. Hole	gpm	k
0.5 - 5.0	NX	0.031	0.41
5.0 - 10.0	NX	0.092	0.294
10.0 - 15.0	NX	0.55	1.03
15.0 - 19.0	NX	1.53	2.46
19.0 - 24.0	NX	0	0
24.0 - 29.5	NX	4.5	3.63
29.5 - 35.0	BX	2.2	1.56
35.0 - 40.0	BX	0	0

NX hole w/BX casing to 29.5
29.5 to 45.9 BX hole

Pressure Tests w/Top of Gage 1.5 below Top of BX Hole

30.0 - 35.0 =	1.5	gpm at 5 psi
	3.5	gpm at 10 psi
	2.5	gpm at 5 psi
32.0 - 37.0 =	1.3	gpm at 5 psi
	4.0	gpm at 10 psi
	2.5	gpm at 5 psi
37.0 - 45.9 =	0	gpm at 5 psi
	0	gpm at 10 psi

"AS BUILT"

DAM NO. 2A ROARING FORK
CHERRYSTONE CREEK WATERSHED
PITTSYLVANIA COUNTY, VIRGINIA
LOGS OF DRILL HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Investigated by: T. Mack C. W. Tomey — Date
Title: Geologist - Civil Engineer
Checked by: J. Mack
Title: Geologist

Approved by: A. A. Carlton, Jr.
Title: State Construction Engineer
Title
Sheet No. 22 of 22
Drawing No. VA-537-P

SCS-313 (9-64)

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APPENDIX B

SUBSURFACE EXPLORATION DATA

Subsurface Exploration Procedures
General Notes for Subsurface Exploration Logs
Identification of Soil
Descriptive Criteria for Rock Core Logging
Supplemental Rock Descriptive Terms
Boring Logs, B-51 through B-751
Borehole Backfill Records
Undisturbed Sampling Records
Rock Core Box Photographs

SUBSURFACE EXPLORATION PROCEDURES

Test Borings – Hollow Stem Augers

The borings are advanced by turning an auger with a center opening of 3¼ or 4¼ inches. A plug device blocks off the center opening while augers are advanced. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hollow stem auger by standard methods after removal of the plug. Usually, no water is introduced into the boring using this procedure.

Test Borings – Temporary Casing

Temporary casing was installed in borings prior to rock coring. Temporary NQ casing (fitted with casing bit) was installed after auger refusal against rock. Casing is then lowered to the bottom of the boring through the augers, and advanced 6 to12 inches into rock. The installation of temporary casing served to protect embankment and foundation materials from interacting with drill water added to support rock coring and in situ hydraulic conductivity testing of rock.

Standard Penetration Test Results

The Standard Penetration Test (SPT) is performed in the borings at regular depth intervals to collect soil samples. The numbers in the Sampling Data column of the boring logs represent SPT results. Each number represents the blows needed to drive a 2-inch O.D., 1⅜-inch I.D. split-spoon sampler 6 inches, using a 140-pound hammer falling 30 inches. The sampler is typically driven a total of 24 inches. The first 6 inches are considered a seating interval. The total of the number of blows for the second and third 6-inch intervals is the SPT “N-value.” The Standard Penetration Test is performed according to ASTM D1586.

The SPT samples were obtained using a hydraulically driven automatic trip hammer (ATH). Most correlations with SPT data are based on N-values collected with a safety hammer. The energy applied to the split-spoon sampler using the ATH is about 33 percent greater than that applied using the safety hammer, resulting in lower N-values. The hammer blows shown on the boring logs are uncorrected for the higher energy. However, we correct SPT N-values for the higher energy when using N-values in our analyses.

Soil Classification Criteria

The group symbols on the logs represent the Unified Soil Classification System Group Symbols (ASTM D2487) based on visual observation and limited laboratory testing of the samples. Criteria for visual identification of soil samples are included in this appendix. Some variation can be expected between samples visually classified, and samples classified in the laboratory.

Disintegrated rock is defined as residual material with SPT N-values between 60 blows per foot and refusal. Refusal is defined as an N-value of 50 blows for a penetration of one inch or less.

Pocket Penetrometer Results

The values following “PP=” in the sampling data column of the logs represent pocket penetrometer readings. Pocket penetrometer readings provide an estimate of the unconfined compressive strength of fine-grained soils.

Rock Core Drilling

The drillers core drilled rock using special core bits set with carbide steel or diamond, depending upon the rock texture. The bit was fitted onto a double-tube, swivel-type core barrel in which an exterior tube and bit rotate, and an interior barrel remains stationary to receive the rock core. Drillers circulated water between the barrels and across the bit face to provide cooling and to flush away cuttings. The size of bits is indicated on individual boring logs.

The length of rock core recovered expressed as a percentage of the total length cored is shown on the logs. Rock Quality Designation (RQD) is also given for rock core drilled with N-size core drilling equipment. RQD is defined as the total length of N-size rock fragments recovered that are greater than 4 inches in length, discounting drilling breaks, expressed as a percentage of the total length cored.

Piezometers

An open standpipe piezometer was installed in designated boring, as noted on the logs, by placing slotted well screen and unslotted riser pipe into the boring, backfilling the screened interval with sand, then placing bentonite chips and cement/bentonite grout above the sand.

Boring Locations and Elevations

Boring locations and ground surface elevations were surveyed using a Topcon HiPer VR GNSS Reciever with sub-centimeter accuracy by Crutchfield and Associates, Inc. of Halifax, Virginia and are indicated on the boring logs. Locations and elevations should be considered no more accurate than the methods used to determine them.

GENERAL NOTES FOR SUBSURFACE EXPLORATION LOGS

1. Numbers in sampling data column next to Standard Penetration Test (SPT) symbols indicate blows required to drive a 2-inch O.D., 1⅜-inch I.D. sampling spoon 6 inches using a 140 pound hammer falling 30 inches. The Standard Penetration Test (SPT) N-value is the number of blows required to drive the sampler 12 inches, after a 6-inch seating interval. The Standard Penetration Test is performed in general accordance with ASTM D1586.
2. Visual classification of soil is in accordance with terminology set forth in “Identification of Soil.” The ASTM D2487 group symbols (e.g., CL) shown in the classification column are based on our field visual observations and laboratory testing.
3. Estimated water levels indicated on the logs are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, and other factors.
4. Refusal at the surface of rock, boulder, or other obstruction is defined as an SPT resistance of 50 blows for 1 inch or less of penetration.
5. The logs and related information depict subsurface conditions only at the specific locations and at the particular time when drilled or excavated. Soil conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in a change in the subsurface soil and water level conditions at the subsurface exploration location.
6. The stratification lines represent the approximate boundary between soil and rock types as obtained from the subsurface exploration. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on these logs have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.

7. Key to symbols and abbreviations:

SPT	Standard Penetration Test
S-01, 24 in	Sample No., Sample Length
0.0-2.0 ft	Sampling Interval

UD	Shelby Tube Sample
UD-01, 24 in	Sample No., Sample Length
0.0-2.0 ft	Sampling Interval

CORE	Rock Core Sample
C-01, 60 in	Run No., Sample Length
0.0-5.0 ft	Sampling Interval

Rec	Sample recovery (inches and percent)
MC	Moisture Content (percent)
LL	Liquid Limit
PL	Plastic Limit
<#200	Percent by weight passing a No. 200 Sieve
RQD	Rock Quality Designation (percent)

IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES (ASTM D2487)

			SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean Gravels Less than 5% fines	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		Gravels with fines More than 12% fines	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	Sands – 50% or more of coarse Fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		Sands with fines More than 12% fines	SM	SILTY SAND
			SC	CLAYEY SAND
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL	LEAN CLAY
			ML	SILT
		Organic	OL	ORGANIC CLAY
				ORGANIC SILT
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH	FAT CLAY
			MH	ELASTIC SILT
		Organic	OH	ORGANIC CLAY
				ORGANIC SILT
Highly Organic Soils	Primarily organic matter, dark in color and organic odor		PT	PEAT

II. DEFINITION OF SOIL COMPONENT PROPORTIONS (ASTM D2487)

			Examples
Adjective Form	GRAVELLY SANDY	>30% to <50% coarse grained component in a fine-grained soil	GRAVELLY LEAN CLAY
	CLAYEY SILTY	>12% to <50% fine grained component in a coarse-grained soil	SILTY SAND
"With"	WITH GRAVEL WITH SAND	>15% to <30% coarse grained component in a fine-grained soil	FAT CLAY WITH GRAVEL
	WITH GRAVEL WITH SAND	>15% to <50% coarse grained component in a coarse-grained soil	POORLY GRADED GRAVEL WITH SAND
	WITH SILT WITH CLAY	>5% to <12% fine grained component in a coarse-grained soil	POORLY GRADED SAND WITH SILT

III. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS ..... Unified Soil Classification Symbols are shown above as group symbols. A dual symbol "-" indicates the soil belongs to two groups. A borderline symbol "/" indicates the soil belongs to two possible groups.

FILL ..... Man-made deposit containing soil, rock and often foreign matter.

PROBABLE FILL ..... Soils that contain no visually detected foreign matter but which are suspect with regard to origin.

DISINTEGRATED ROCK (DR) ..... Residual materials with a standard penetration resistance (SPT) between 60 blows per foot and refusal. Refusal is defined as an SPT of 100 blows for 2" or less penetration.

PARTIALLY WEATHERED ROCK (PWR)..... Residual materials with a standard penetration resistance (SPT) between 100 blows per foot and refusal. Refusal is defined as an SPT of 100 blows for 2" or less penetration.

BOULDERS & COBBLES..... Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12-inch size.

LENSES..... 0 to ½-inch seam within a material in a test pit.

LAYERS ..... ½ to 12-inch seam within a material in a test pit.

POCKET ..... Discontinuous body within a material in a test pit.

MOISTURE CONDITIONS..... Wet, moist or dry to indicate visual appearance of specimen.

COLOR..... Overall color, with modifiers such as light to dark or variation in coloration.

DESCRIPTIVE CRITERIA FOR ROCK CORE LOGGING

Rock is defined as natural subsurface material yielding SPT blow counts of N ≥ 100/2 inches (Martin, 1977). Rock descriptions may include the following descriptive elements, as applicable, generally in the order indicated. Supplemental descriptors may also be used, depending on project performance objectives and available information.

ROCK TYPE, strength, weathering, fracturing, color, recovery, RQD

Rock Type General terms are used following the NRCS (2001) rock type classification chart based on visual identification. Some of the NRCS rock types common to our geographic area of practice are listed below. Mineralogical modifiers may be added where they help define distinct units (e.g., Garnet-Muscovite Schist).

Sedimentary:	Conglomerate, Sandstone, Mudstone, Siltstone, Claystone, Shale, Limestone, Dolomite, Coal, Chert
Igneous:	Pegmatite, Granite, Diorite, Gabbro, Diabase, Rhyolite, Monzonite, Andesite, Basalt
Metamorphic:	Gneiss, Schist, Phyllite, Slate, Quartzite, Marble, Amphibolite, Hornfels

Strength (modified from Hoek, 2001) The estimated Uniaxial Compressive Strength associated with each rock strength term is based on the field strength index test for intact rock samples as follows.

• Extremely Strong	>36,000 psi	Specimen can only be chipped with a geological hammer.
• Very Strong	15,000 - 36,000 psi	Specimen requires many blows of a geological hammer to fracture it.
• Strong	7,500 - 15,000 psi	Specimen requires more than one blow of a geological hammer to fracture it.
• Medium Strong	3,500 - 7,500 psi	Specimen cannot be peeled with a pocket knife; can be fractured with one blow from a geological hammer.
• Weak	700 - 3,500 psi	Specimen can be peeled with a pocket knife with difficulty; shallow indentation made by firm blow with point of a geological hammer.
• Very Weak	150 - 700 psi	Material crumbles under firm blows with point of a geological hammer; can be peeled with a pocket knife.

Weathering (modified from ACOE, 1994; and USBR, 2001)

• Fresh	Mineral crystals appear bright and show no discoloration. Fractures show little or no staining on their surfaces. Discoloration does not extend into intact rock.
• Slightly Weathered	Rock is generally fresh except along fractures. Some fractures are stained and discoloration may extend up to 0.5 inches into rock.
• Moderately Weathered	Significant portions of rock appear dull and discolored. Rock may be significantly weaker than in its fresh state near fractures. Soil zones of limited extent may occur along some fractures.
• Highly Weathered	Rock appears dull and discolored throughout. Majority of rock mass is significantly weaker than in its fresh state. Isolated zones of stronger rock and/or soil may occur throughout.
• Severely Weathered	Significant portions of rock mass essentially weathered to soil. Rock fabric may still be discernable (i.e., saprolite). Isolated zones of stronger rock may occur locally. Quartz may be present as hard, fractured dikes or veins.

Fracturing (from ACOE, 1994)

Very Slightly Fractured	> 6.5 ft
Slightly Fractured	2 ft - 6.5 ft
Moderately Fractured	8 inch - 2 ft
Highly Fractured	2.5 inch - 8 in
Intensely Fractured	< 2.5 in

Color (from Munsell Color System; and GSA, 1995) Color descriptions include a primary color and up to two shade or secondary color modifiers, and may also include a color pattern term to define the relationship between multiple colors.

Shade: Light, Dark

Secondary: Blackish, Brownish, Grayish, Greenish, Reddish, Yellowish, Orangeish

Primary: Black, Brown, Gray, Green, Red, Yellow, Orange, White

Pattern: and, to, with mottles of, with speckles of, with streaks of, with bands of

- **Recovery** is defined as the total length of recovered core in a core run divided by the total length of the core run, times 100 percent. A core run may be any depth interval of concern. Only natural fractures are considered for determining the length of core pieces. Mechanical breaks formed during or after coring do not count against the length determination. The length of recovered core pieces is measured along the core axis, between fracture midpoints.
- **RQD** (ASTM D6032, Deere & Deere, 1988, 1989) is defined as the total length of core pieces at least four inches long recovered from a core run divided by the total length of the core run, times 100 percent. A core run may be any depth interval of concern. Only natural fractures are considered for determining the length of core pieces. Mechanical breaks formed during or after coring do not count against the length determination. The length of recovered core pieces should be measured along the core axis, between fracture midpoints. Core pieces that are highly to severely weathered, very weak, or contain numerous pores should not count toward RQD.

SUPPLEMENTAL ROCK DESCRIPTIVE TERMS

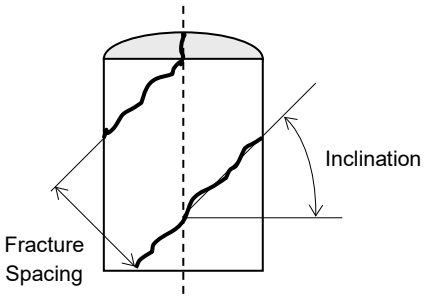
In addition to the basic rock descriptive elements provided on the preceding Descriptive Criteria for Rock Core Logging sheet, rock descriptions may include the following supplemental descriptive elements depending on project performance objectives and available information.

Bedding Thickness & Inclination Bedding is defined as the layered arrangement of sediment deposits in sedimentary rock. Bedding thickness is the average perpendicular distance between bedding surfaces. Bedding thickness intervals follow Bieniawski (1989). Inclination is measured in degrees from a plane perpendicular to the core axis (see Inclination Measurement Figure shown below).

Very Thickly Bedded	> 6.5 ft
Thickly Bedded	2 ft - 6.5 ft
Medium Bedded	8 inch - 2 ft
Thinly Bedded	2.5 inch - 8 inch
Very Thinly Bedded	< 2.5 inch

Foliation Character & Inclination Foliation is defined as the planar arrangement of textural features in metamorphic rock. Inclination is measured in degrees from a plane perpendicular to the core axis (see Inclination Measurement Figure).

Strongly Foliated	Foliation is easily discernable throughout.
Moderately Foliated	Foliation is discernable with some difficulty.
Poorly Foliated	Foliation is generally not discernable.



Inclination Measurement Figure

Fracture Set Data Individual fractures or fracture sets may be characterized by the following descriptive elements, when applicable and discernable: fracture type, inclination (as per Inclination Measurement Figure above), average spacing, roughness and infilling condition. An example fracture set data description for an individual stratum is: *4 joints at 80-90°, moderately spaced, slightly rough, with spotty iron staining and partially filled with pyrite*. If fractures are rare, they can be described individually by listing the depth, followed by the descriptive terms in this section.

FRACTURE TYPE

Fracture	Any natural break in rock; 'Fracture' is the general term used for individual breaks that do not fall into any of the following fracture-type categories
Joint	A relatively planar fracture without shear displacement; occurs with other similarly oriented joints generally at regularly spaced intervals
Shear	A fracture along which differential movement has taken place parallel to the surface (i.e., shear displacement) sufficient to produce slickensides or polishing
Fault	A major fracture along which there has been appreciable shear displacement accompanied by gouge and/or a severely fractured zone
Bedding Fracture	A fracture along a bedding plane
Foliation Fracture	A fracture along a foliation plane
Vein Fracture	A fracture along the contact of an intrusive vein

Average Spacing (NRCS, 2001)

Very Widely Spaced	> 6.5 ft
Widely Spaced	2 ft - 6.5 ft
Moderately Spaced	8 inch - 2 ft
Closely Spaced	2.5 inch - 8 inch
Very Closely Spaced	< 2.5 inch

Infilling Condition

Coverage	*Type*
Spotty Filling of (≤ 50% coverage)	Calcite
Partially Filled with (50 to 100% coverage)	Chlorite
Filled with (100% coverage)	Clay
	Gypsum
	Iron Staining
	Manganese
	Mica
	Pyrite
	Quartz
	Talc

Roughness (Bieniawski, 1989)

Very Rough	- Most surface asperities extend > 2 mm from the average planar surface.
Rough	- Most surface asperities extend 0.5 to 2 mm from the average planar surface.
Slightly rough	- Most surface asperities extend < 0.5 mm from the average planar surface.
Smooth	- Generally smooth to touch with few surface asperities.
Slickensided	- Infilling material contains slickensides.

References for Rock Descriptive Terms:

ASTM D6032, Standard Test Method for Determining Rock Quality Designation of Rock Core

Banks, B.K. (2005). Material Unit-Based Rock Core Logging for Geotechnical Applications. *GeoFrontiers Proceedings*

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USBR *Engineering Geology Field Manua*l. (2001). http://www.usbr.gov/pmts/geology/

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BORING LOGS, B-51 THROUGH B-751

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-51** Contract Number: 22210031.100

Contractor: Connelly & Associates	**Date Started:** 01/09/2023	**Groundwater Levels**	
Contractor Foreman: J. Martinez	**Date Ended:** 01/19/2023	**During Drilling:** 01/11/23 03:41	49.6 ft
Schnabel Representative: E. Unobe	**Coordinate System:** VA State Plane South	**Completion:**	
Equipment: Diedrich D-70 (Track)	**X:** 11210014.0 ft **Y:** 3469256.4 ft	**After Drilling:**	
Method: 4-1/4" ID Hollow Stem Auger NQ Double Barrel	**Plunge, Bearing:** 90°, NA **Hole Elevation:** 708.4 ft	**Observation Well:**	
Hammer Type: Auto Hammer (140 lb)	**Total Depth:** 97.6 ft		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
0	708	0.0 - 0.3 ft: Topsoil, 3 inches											
		0.3 - 6.0 ft: FILL, sampled as SILTY SAND, moderately micaceous, fine to coarse sand, moist, reddish brown, estimated 30 - 45% fines, estimated 5 - 10% fine to coarse gravel	SM		F2	S-01, 24 in 0.0-2.0 ft	16 (67)	3-3-4-5 N=7	22			49	
1	707												
2	706					S-02, 24 in 2.0-4.0 ft	14 (58)	2-5-6-8 N=11					
3	705												
4	704	4.0 ft: <5% fine to coarse gravel				S-03, 24 in 4.0-6.0 ft	16 (67)	5-5-6-6 N=11					
5	703												
6	702	6.0 - 8.0 ft: FILL, sampled as SANDY SILT, highly micaceous, fine to coarse sand, moist, grayish brown to reddish brown, estimated 30 - 45% fine to coarse grained sand, estimated <5% fine to coarse gravel, low plasticity	ML		F1	S-04, 24 in 6.0-8.0 ft	22 (92)	3-4-5-7 N=9					
7	701												
8	700	8.0 - 24.9 ft: FILL, sampled as SILTY SAND, highly micaceous, fine to coarse sand, moist, reddish brown to grayish brown, estimated 15 - 25% fines, estimated 5 - 10% fine to coarse gravel			F2	S-05, 24 in 8.0-10.0 ft	21 (88)	4-6-9 10 N=15					
9	699												

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
11	698		SM		F2	S-06, 24 in 10.0-12.0 ft	15 (62)	5-10-10 12 N=20					
12	697	12.0 ft: 30-45% fines				S-07, 24 in 12.0-14.0 ft	16 (67)	5-7-8 11 N=15					
13	696					S-08, 24 in 14.0-16.0 ft	15 (62)	8-10-11 13 N=21					
14	695	14.0 ft: slightly micaceous				S-09, 24 in 16.0-18.0 ft	14 (58)	7-11-10 16 N=21					
15	694					S-10, 24 in 18.0-20.0 ft	20 (83)	12-10-11 12 N=21					
16	693												
17	692												
18	691	17.9 ft: contains rock fragments											
19	690												
	689												

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
21	688					S-11, 24 in 20.0-22.0 ft	15 (62)	8-12-15 16 N=27					
22	687												
23	686				F2	S-12, 24 in 22.0-24.0 ft	21 (88)	11-14-15 15 N=29					
24	685												
25	684	24.8 ft: quartz gravel bed 24.9 - 28.0 ft: FILL, sampled as SANDY SILT, slightly micaceous, fine to coarse sand, moist, grayish brown to reddish brown, estimated 30 - 45% fine to coarse grained sand, estimated <5% fine to coarse gravel, low plasticity, gravels are rock fragments				S-13, 24 in 24.0-26.0 ft	20 (83)	7-9-10 13 N=19					
26	683		ML		F1								
27	682					S-14, 24 in 26.0-28.0 ft	24 (100)	5-9-11 10 N=20					
28	681												
29	680	28.0 - 40.0 ft: FILL, sampled as SILTY SAND, highly micaceous, fine to coarse sand, moist, reddish brown to grayish brown, estimated 15 - 25% fines, estimated 5 - 10% fine to coarse gravel, contains rock fragments, plagioclase feldspar			F2	S-15, 24 in 28.0-30.0 ft	22 (92)	10-9-12 13 N=21					
	679												

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
31	678		SM		F2	S-16, 24 in 30.0-32.0 ft	21 (88)	5-6-8 10 N=14					
32	677												
33	676					S-17, 24 in 32.0-34.0 ft	19 (79)	8-9-18 20 N=27					
34	675												
35	674					S-18, 24 in 34.0-36.0 ft	22 (92)	15-16-19 21 N=35					
36	673	36.0 ft: no rock fragments, 30 - 45% fines, <5% fine to coarse gravel											
37	672					S-19, 24 in 36.0-38.0 ft	16 (67)	3-5-14 10 N=19	13			37	
38	671												
39	670					S-20, 24 in 38.0-40.0 ft	24 (100)	9-10-10 11 N=20					
	669												

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

▽	During Drilling:	01/11/23 03:41	49.6 ft
▼	Completion:		
◪	After Drilling:		
Ⓦ	Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
41	668	40.0 - 44.0 ft: FILL, sampled as SANDY SILT, moderately micaceous, fine to coarse sand, moist, orangish brown to reddish brown, estimated 30 - 45% fine to coarse grained sand, estimated <5% fine to coarse gravel, low plasticity	ML		F1	S-21, 24 in 40.0-42.0 ft	19 (79)	5-8-9 11 N=17					
42	667												42.0 - 44.0 ft: Exterior of S-22 carries trace amounts of free moisture.
43	666					S-22, 24 in 42.0-44.0 ft	24 (100)	4-6-10 10 N=16					
44	665												
45	664	44.0 - 48.0 ft: FILL, sampled as SILTY SAND, highly micaceous, fine to coarse sand, moist, reddish brown to orangish brown, estimated 30 - 45% fines, estimated 5 - 10% fine to coarse gravel	SM		F2	S-23, 24 in 44.0-46.0 ft	18 (75)	5-8-10-9 N=18					
46	663	44.0 ft: perched water table											
47	662					S-24, 24 in 46.0-48.0 ft	22 (92)	5-8-9 11 N=17	18			42	
48	661	47.8 - 48.0 ft: organic odor											
49	660	48.0 - 54.0 ft: FILL, sampled as CLAYEY SAND, slightly micaceous, fine to coarse sand, moist, dark greenish gray, estimated 15 - 25% fines, estimated 5 - 10% fine to coarse gravel, organic odor				S-25, 24 in 48.0-50.0 ft	24 (100)	6-5-5 12 N=10	28				
	659				▽								

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
51	658					S-26, 24 in 50.0-52.0 ft	20 (83)	6-7-8-9 N=15	19				
52	657	52.0 ft: wet	SC										
53	656					S-27, 24 in 52.0-54.0 ft	12 (50)	4-5-6-7 N=11	23				
54	655	54.0 - 56.0 ft: FILL, sampled as SILTY SAND, slightly micaceous, fine to coarse sand, moist, reddish brown, estimated 30 - 45% fines, estimated <5% fine to coarse gravel	SM		F2	S-28, 24 in 54.0-56.0 ft	24 (100)	7-7-6-6 N=13	27	40	10	49	54.0 ft: Drilling resumes _ 01/11/23
55	654												
56	653	56.0 - 58.0 ft: No recovery				S-29, 24 in 56.0-58.0 ft	0 (0)	5-3-2-2 N=5					
57	652	58.0 - 58.7 ft: FILL, sampled as CLAYEY SAND, fine to coarse sand, wet, reddish brown, estimated 15 - 25% fines											
58	651	58.7 - 59.2 ft: FILL, sampled as SILTY GRAVEL, fine to coarse grained gravel, grayish white and reddish brown, estimated 15 - 25% fines	SC										
59	650	59.2 - 65.0 ft: FILL, sampled as SANDY LEAN CLAY, moist to wet, reddish brown, estimated 30 - 45% fine to coarse grained sand, estimated 5 - 10% fine to coarse gravel, medium plasticity	GM			S-30, 24 in 58.0-60.0 ft	24 (100)	11-10-8-9 N=18					
	649				F1								

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
61	648		CL		F1	S-31, 24 in 60.0-62.0 ft	22 (92)	1-2-3-3 N=5					
62	647												
63	646					S-32, 24 in 62.0-64.0 ft	14 (58)	3-4-5-5 N=9					
64	645												
65	644					S-33, 24 in 64.0-66.0 ft	24 (100)	2-3-13 32 N=16					
66	643	65.0 - 65.7 ft: FILL, sampled as CLAYEY SAND, slightly micaceous, fine to coarse sand, wet, reddish brown, estimated 30 - 45% fines, estimated <5% fine to coarse gravel	SC		F2								
67	642	65.7 - 68.0 ft: POORLY GRADED SAND WITH SILT, fine to coarse sand, wet, grayish brown to gray, estimated 5 - 10% fines, contains rock fragments, residual	SP-SM		B2	S-34, 24 in 66.0-68.0 ft	21 (88)	12-23-26 18 N=49	7			14	
68	641												
69	640	68.0 - 69.2 ft: DISINTEGRATED ROCK, sampled as POORLY GRADED SAND WITH SILT, fine to coarse sand, wet, brown, estimated 5 - 10% fines	SP-SM		C	S-35, 23 in 68.0-69.9 ft	22 (95)	12-42-41 50/5" N=83					
	639	69.2 - 70.0 ft: DISINTEGRATED ROCK, sampled as SILTY GRAVEL, fine to coarse grained gravel, wet, grayish brown to greenish gray, estimated 15 - 25% fines, contains rock fragments	GM										

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

During Drilling:	01/11/23 03:41	49.6 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
71	638	70.0 - 72.0 ft: SILTY SAND WITH GRAVEL, fine to coarse sand, wet, reddish brown to grayish brown, estimated 15 - 25% fines, estimated 15 - 25% fine to coarse gravel, residual	SM		B2	S-36, 21 in 70.0-71.8 ft	12 (57)	12-10-18 50/3" N=28					
72	637												
	636	72.0 - 72.6 ft: DISINTEGRATED ROCK, sampled as SILTY GRAVEL, wet, reddish brown, estimated 15 - 25% fines	GM		C	S-37, 2 in 72.0-72.2 ft		50/2" N=100					
73	635	72.6 - 94.0 ft: GNEISS, strong to very strong, slightly weathered to fresh, moderately fractured (8 in - 2 ft) to slightly fractured (2 - 6.5 ft), dark gray to white, strongly foliated, biotite, hornblend, feldspar, quartz, garnet, fine to coarse grained											72.6 ft: Temporary NW casing seated into rock.
74	634	72.6 - 73.4 ft: intensely to highly fractured, highly to moderately weathered, medium strong 73.4 - 74.8 ft: highly to moderately fractured											*74.2 - 74.8 ft: Joint, 75°, filled (100%), iron-oxide staining, slightly rough, planar*
75	633					CORE C-01, 60 in 72.6-77.6 ft	55 (92)	23 (38)	3.2				
76	632												*76.3 ft: Joint, 30°, partial (50 - 100%), iron-oxide staining, slightly rough, planar*
77	631												
78	630												72.6 - 82.6 ft: 100% return water.
79	629												
							REC(%)	RQD(%)	DRILL RATE	LUGEON			

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-51** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

▽	During Drilling:	01/11/23 03:41	49.6 ft
▼	Completion:		
◥	After Drilling:		
Ⓦ	Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	RQD in. (%)	DRILL RATE (min/ft)	PACKER Lugeons	REMARKS DISCONTINUITIES
81	628				CORE C-02, 60 in 77.6-82.6 ft	60 (100)	60 (100)	1.8		*81.9 ft: Mechanical break, 50°, broken along foliation*
82	627									
83	626	82.6 - 83.8 ft: intensely fractured, highly to moderately weathered, medium strong to strong							92	
84	625									*83.9 ft: Joint, 50°, filled (100%), iron-oxide staining, slightly rough, planar, slightly weathered*
85	624			D2	CORE C-03, 60 in 82.6-87.6 ft	55 (92)	17 (28)	1.7		*84.5 ft: Joint, 20°, filled (100%), iron-oxide staining, very rough, planar*
86	623									82.6 - 87.6 ft: 50% return water.
87	622									*85.7 ft: Joint, 15°, filled (100%), iron-oxide staining, rough, planar*
88	621									*86.7 ft: Foliation joint, 65°, filled (100%), iron-oxide staining, slightly rough, planar, moderately weathered*
89	620	88.6 - 94.0 ft: slightly to very slightly fractured, slightly weathered to fresh, very strong								*87.6 - 88.2 ft: Foliation joint, 75°, partial (50 - 100%), iron-oxide staining, slightly rough, planar*
	619									

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-51** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: J. Martinez
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" ID Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/19/2023
Coordinate System: VA State Plane South
X: 11210014.0 ft **Y:** 3469256.4 ft
Plunge, Bearing: 90°, NA
Hole Elevation: 708.4 ft
Total Depth: 97.6 ft

Groundwater Levels

▽	During Drilling:	01/11/23 03:41	49.6 ft
▼	Completion:		
◥	After Drilling:		
Ⓦ	Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	RQD in. (%)	DRILL RATE (min/ft)	PACKER Lugeons	REMARKS DISCONTINUITIES
91	618				CORE C-04, 60 in 87.6-92.6 ft	56 (93)	33 (55)	3.3		*90.8 - 91.0 ft: Foliation joint, 60°, filled (100%), iron-oxide staining, slightly rough, planar*
92	617									
93	616								55	87.6 - 97.6 ft: No return water.
94	615									
95	614	94.0 - 94.6 ft: SCHIST, weak to medium strong, highly weathered, intensely fractured (<2.5 in), black to dark gray, strongly foliated, biotite, quartz, feldspar		D1						*94.0 ft: Contact joint, 70°, spotty (<50%), iron-oxide staining, slightly rough, planar*
96	613	94.6 - 97.6 ft: GNEISS, very strong, slightly weathered to fresh, very slightly fractured (> 6.5 ft), black with streaked white, strongly foliated, biotite, quartz, feldspar		D2	CORE C-05, 60 in 92.6-97.6 ft	60 (100)	48 (80)	2.3		*94.2 ft: Joint, 20°, filled (100%), iron-oxide staining, slightly rough, planar, moderately weathered*
97	612									
98	611									
99	610									
	609									

Bottom of boring at 97.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: **B-51A**
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
Hammer Type: NA

Date Started: 01/16/2023
Date Ended: 01/18/2023
Coordinate System: VA State Plane South
X: 11210018.6 ft **Y:** 3469256.0 ft
Plunge, Bearing:
Hole Elevation: 708.9 ft
Total Depth: 63.2 ft

Groundwater Levels

	During Drilling:		
	Completion:		
	After Drilling:		
W	Observation Well:	03/04/23 02:30	53.4 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
1	708	0.0 - 63.2 ft: See Boring B-51 for Soil Material Descriptions.											0.0 - 63.2 ft: Auger Probe with no SPT sampling. Flush Mount Piezometer installed.
2	707												
3	706												
4	705												
5	704												
6	703												
7	702												
8	701												
9	700												
10	699												
11	698					UD-01, 24 in 10.0-12.0 ft	24 (100)		16	35	4	38	
12	697												
13	696					UD-02, 24 in 12.0-14.0 ft	24 (100)						
14	695												
15	694												
16	693												
17	692												
18	691												
19	690												
20	689												
21	688												

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-51A
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
Hammer Type: NA

Date Started: 01/16/2023
Date Ended: 01/18/2023
Coordinate System: VA State Plane South
X: 11210018.6 ft **Y:** 3469256.0 ft
Plunge, Bearing:
Hole Elevation: 708.9 ft
Total Depth: 63.2 ft

Groundwater Levels

	During Drilling:		
	Completion:		
	After Drilling:		
W	Observation Well:	03/04/23 02:30	53.4 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
23	686	0.0 - 63.2 ft: See Boring B-51 for Soil Material Descriptions.											
24	685												
25	684												
26	683												
27	682												
28	681												
29	680												
30	679												
31	678												
32	677												
33	676												
34	675												
35	674												
36	673												
37	672												
38	671												
39	670												
40	669												
41	668												
42	667												
43	666												

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: **B-51A**
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: E. Unobe
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
Hammer Type: NA

Date Started: 01/16/2023
Date Ended: 01/18/2023
Coordinate System: VA State Plane South
X: 11210018.6 ft **Y:** 3469256.0 ft
Plunge, Bearing:
Hole Elevation: 708.9 ft
Total Depth: 63.2 ft

Groundwater Levels

	During Drilling:		
	Completion:		
	After Drilling:		
W	Observation Well:	03/04/23 02:30	53.4 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
45	664	0.0 - 63.2 ft: See Boring B-51 for Soil Material Descriptions.											
46	663			W									
47	662												
48	661												
49	660												
50	659												
51	658												
52	657												
53	656												
54	655												
55	654												
56	653												
57	652					UD-03, 24 in 56.0-58.0 ft	18 (75)		22	34	9	45	52.8 - 62.8 ft: Piezometer Screen.
58	651												
59	650					UD-04, 24 in 58.0-60.0 ft	9 (38)						
60	649												
61	648												
62	647												
63	646												
64	645												
65	644												

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-651
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/11/2023
Date Ended: 01/11/2023
Coordinate System: VA State Plane South
X: 11210097.1 ft **Y:** 3469250.8 ft
Plunge, Bearing:
Hole Elevation: 679.0 ft
Total Depth: 48.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/11/23 03:38	32.3 ft
After Drilling:		
Observation Well:	03/04/23 02:45	34.0 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
0	679	0.0 - 0.2 ft: Topsoil											0.0 - 46.0 ft: Flush Mount Piezometer installed.
		0.2 - 11.0 ft: FILL, sampled as SILTY SAND, slightly micaceous, fine to coarse sand, moist to dry, reddish brown, estimated 30 -45% fines, contains weathered rock fragments											
1	678					S-01, 24 in 0.0-2.0 ft	24 (100)	1-2-5-3 N=7					
2	677												
3	676					S-02, 24 in 2.0-4.0 ft	24 (100)	3-5-3-3 N=8					
4	675												
5	674		SM		F2	S-03, 24 in 4.0-6.0 ft	24 (100)	3-3-5-6 N=8					
6	673												
7	672					S-04, 24 in 6.0-8.0 ft	22 (92)	2-5-6-3 N=11	22			47	
8	671												
9	670					S-05, 24 in 8.0-10.0 ft	23 (96)	3-1-2-3 N=3					

Bottom of boring at 48.1 ft. Boring terminated at auger refusal.
Piezometer installed upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-651
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/11/2023
Date Ended: 01/11/2023
Coordinate System: VA State Plane South
X: 11210097.1 ft **Y:** 3469250.8 ft
Plunge, Bearing:
Hole Elevation: 679.0 ft
Total Depth: 48.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/11/23 03:38	32.3 ft
After Drilling:		
Observation Well:	03/04/23 02:45	34.0 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
11	668	11.0 - 12.5 ft: FILL, sampled as SILT WITH SAND, moist to dry, gray, estimated 15 - 25% fine grained sand, contains organics, low plasticity	ML		F1	S-06, 24 in 10.0-12.0 ft	24 (100)	2-3-2-4 N=5					
12	667												
13	666	12.5 - 22.0 ft: FILL, sampled as SILTY SAND, moderately micaceous, fine to coarse sand, moist, whiteish brown, estimated 30 - 45% fines, contains weathered rock fragments	SM		F2	S-07, 24 in 12.0-14.0 ft	24 (100)	2-2-3-6 N=5					
14	665												
15	664					S-08, 24 in 14.0-16.0 ft	24 (100)	2-2-3-4 N=5					
16	663												
17	662					S-09, 24 in 16.0-18.0 ft	18 (75)	2-4-6-5 N=10					
18	661												
19	660					S-10, 24 in 18.0-20.0 ft	24 (100)	2-5-3-3 N=8					

Bottom of boring at 48.1 ft. Boring terminated at auger refusal.
Piezometer installed upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-651
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/11/2023
Date Ended: 01/11/2023
Coordinate System: VA State Plane South
X: 11210097.1 ft **Y:** 3469250.8 ft
Plunge, Bearing:
Hole Elevation: 679.0 ft
Total Depth: 48.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/11/23 03:38	32.3 ft
After Drilling:		
Observation Well:	03/04/23 02:45	34.0 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
21	658					S-11, 24 in 20.0-22.0 ft	24 (100)	3-5-7-5 N=12					
22	657	22.0 - 36.0 ft: FILL, sampled as SANDY SILT, slightly micaceous, moist, whiteish brown, estimated 30 - 45% fine to medium sand, contains weathered rock fragments, low plasticity	ML		F2	S-12, 24 in 22.0-24.0 ft	24 (100)	2-2-4-5 N=6	31	43	14	66	
23	656												
24	655					S-13, 24 in 24.0-26.0 ft	18 (75)	4-3-14-7 N=17					
25	654												
26	653					S-14, 24 in 26.0-28.0 ft	16 (66)	11-6-3-4 N=9					
27	652												
28	651					S-15, 24 in 28.0-30.0 ft	24 (100)	2-3-9-4 N=12					
29	650												

Bottom of boring at 48.1 ft. Boring terminated at auger refusal.
Piezometer installed upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-651
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/11/2023
Date Ended: 01/11/2023
Coordinate System: VA State Plane South
X: 11210097.1 ft **Y:** 3469250.8 ft
Plunge, Bearing:
Hole Elevation: 679.0 ft
Total Depth: 48.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/11/23 03:38	32.3 ft
After Drilling:		
Observation Well:	03/04/23 02:45	34.0 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
31	648		ML		F2	S-16, 24 in 30.0-32.0 ft	24 (100)	4-3-4-5 N=7					
32	647												
33	646					S-17, 24 in 32.0-34.0 ft	24 (100)	3-2-3-4 N=5					
34	645												34.0 ft: Sampler refusal on suspected cobble.
35	644					S-18, 8 in 34.0-34.7 ft	8 (99)	3-50/2" N=100					
36	643	36.0 - 38.0 ft: SILTY SAND, slightly micaceous, fine to coarse sand, moist, gray, estimated 30 - 45% fines, contains wood, alluvial	SM		A2	S-19, 24 in 36.0-38.0 ft	24 (100)	20-11-19 20 N=30	61			41	
37	642												
38	641	38.0 - 44.0 ft: POORLY GRADED SAND WITH SILT, fine to coarse sand, moist to wet, gray to reddish brown, estimated 5 - 10% fines, estimated 5 - 10% fine to coarse gravel, contains weathered rock fragments, residual				S-20, 4 in 38.0-38.3 ft	4 (99)	50/4" N=100					38.0 - 43.0 ft: Piezometer Screen.
39	640				B2								39.0 ft: Groundwater encountered.

Bottom of boring at 48.1 ft. Boring terminated at auger refusal.
Piezometer installed upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-651
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/11/2023
Date Ended: 01/11/2023
Coordinate System: VA State Plane South
X: 11210097.1 ft **Y:** 3469250.8 ft
Plunge, Bearing:
Hole Elevation: 679.0 ft
Total Depth: 48.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/11/23 03:38	32.3 ft
After Drilling:		
Observation Well:	03/04/23 02:45	34.0 ft

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
41	638		SP-SM		B2	S-21, 24 in 40.0-42.0 ft	16 (66)	34-40-17 16 N=57					
42	637												42.0 ft: Augers grinding/ scraping.
43	636					S-22, 24 in 42.0-44.0 ft	18 (75)	21-24-16 11 N=40	9			14	
44	635	44.0 - 48.1 ft: DISINTEGRATED ROCK, sampled as POORLY GRADED SAND WITH GRAVEL, fine to coarse sand, wet, gray to whiteish brown, estimated 15 - 25% fine to coarse gravel											
45	634					S-23, 10 in 44.0-44.8 ft	10 (100)	28-50/4" N=75					
46	633		SP		C								
47	632					S-24, 15 in 46.0-47.2 ft	10 (66)	23-7 -50/3" N=100					
48	631					S-25, 1 in 48.0-48.1 ft	1 (83)	50/1" N=100					
49	630												

Bottom of boring at 48.1 ft. Boring terminated at auger refusal.
Piezometer installed upon completion.

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: **B-651A**
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/16/2023
Date Ended: 01/16/2023
Coordinate System: VA State Plane South
X: 11210096.0 ft **Y:** 3469256.4 ft
Plunge, Bearing:
Hole Elevation: Existing Ground Surface
Total Depth: 34.0 ft

Groundwater Levels

	During Drilling:		
	Completion:	01/16/23 12:00	Dry
	After Drilling:		
W	**Observation Well:**		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
1	678	0.0 - 34.0 ft: See Boring B-651 for Soil Material Descriptions.											0.0 - 34.0 ft: Auger Probe with no SPT sampling.
2	677												
3	676												
4	675												
5	674												
6	673												
7	672												
8	671												
9	670												
10	669												
11	668												
12	667												
13	666												
14	665												
15	664												
16	663												
17	662												
18	661												
19	660												

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: **B-651A**
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/16/2023
Date Ended: 01/16/2023
Coordinate System: VA State Plane South
X: 11210096.0 ft **Y:** 3469256.4 ft
Plunge, Bearing:
Hole Elevation: Existing Ground Surface
Total Depth: 34.0 ft

Groundwater Levels

	During Drilling:		
▼	Completion:	01/16/23 12:00	Dry
▽	After Drilling:		
(W)	Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
21	658	0.0 - 34.0 ft: See Boring B-651 for Soil Material Descriptions.											
22	657												
23	656												
24	655												
25	654												
26	653												
27	652												
28	651												
29	650					UD-01, 24 in 28.0-30.0 ft	18 (75)		19	44	9	50	
30	649												
31	648					UD-02, 24 in 30.0-32.0 ft	3 (12)						
32	647												
33	646												
34	645												
35	644												
36	643												
37	642												
38	641												
39	640												

Schnabel ENGINEERING

AUGER PROBE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: **B-651B**
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/16/2023
Date Ended: 01/16/2023
Coordinate System: VA State Plane South
X: 11210096.7 ft **Y:** 3469260.9 ft
Plunge, Bearing:
Hole Elevation: Existing Ground Surface
Total Depth: 18.0 ft

Groundwater Levels

During Drilling:		
Completion:	01/16/23 09:32	Dry
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
1	678	0.0 - 18.0 ft: See Boring B-651 for Soil Material Descriptions.											0.0 - 18.0 ft: Auger Probe with no SPT sampling.
2	677												
3	676												
4	675												
5	674												
6	673												
7	672												
8	671												
9	670												
10	669												
11	668												
12	667												
13	666												
14	665												
15	664					UD-01, 24 in 14.0-16.0 ft	20 (83)						
16	663												
17	662					UD-02, 24 in 16.0-18.0 ft	23 (96)		17		NP	45	
18	661												
19	660												

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-652
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
0	645	0.0 - 0.3 ft: Topsoil											
		0.3 - 2.3 ft: FILL, sampled as SILTY SAND WITH GRAVEL, moderately micaceous, fine grained sand, moist, orangeish brown to brown, estimated 15 - 25% fines, estimated 15 - 25% fine to coarse gravel	SM			S-01, 24 in 0.0-2.0 ft	22 (92)	3-3-10 10 N=13					
1	644												
2	643	2.3 - 6.0 ft: FILL, sampled as POORLY GRADED SAND WITH SILT, moderately micaceous, fine to coarse sand, moist, gray to white, estimated 5 - 10% fines, contains rock fragments	SP-SM		F2	S-02, 24 in 2.0-4.0 ft	20 (84)	14-19-15 10 N=34					
3	642												
4	641					S-03, 24 in 4.0-6.0 ft	24 (100)	5-7-6 12 N=13					
5	640												
6	639	6.0 - 12.0 ft: SILTY SAND, slightly micaceous, fine to coarse sand, moist to wet, orangish brown to gray, estimated 15 - 25% fines, estimated <5% fine gravel, alluvial	SM		A2	S-04, 24 in 6.0-8.0 ft	16 (66)	5-3-3-3 N=6					
7	638												
8	637					S-05, 24 in 8.0-10.0 ft	24 (100)	2-1-1-6 N=2	27			17	
9	636												

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-652
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
11	635				A2	S-06, 24 in 10.0-12.0 ft	24 (100)	1-1-3-9 N=4					
12	634	12.0 - 14.0 ft: POORLY GRADED GRAVEL WITH SILT, fine - coarse gravel, subangular to subrounded particles; moist, orangeish brown to gray, estimated 5 - 10% fines, residual	GP-GM			S-07, 24 in 12.0-14.0 ft	20 (84)	16-16-14 22 N=30					
13	633												
14	632	14.0 - 17.6 ft: POORLY GRADED SAND WITH SILT, moderately micaceous, fine to coarse sand, moist to wet, brown, estimated 5 - 10% fines, residual	SP-SM		B2	S-08, 5 in 14.0-14.4 ft	5 (100)	50/5" N=60					
15	631												
16	630					S-09, 24 in 16.0-18.0 ft	14 (58)	10-15-16 16 N=31					
17	629												
18	628	17.6 - 22.0 ft: SILTY SAND, highly micaceous, fine to coarse sand, moist, orangeish brown, estimated 15 - 25% fines, estimated <5% fine gravel, residual	SM			S-10, 24 in 18.0-20.0 ft	24 (100)	6-9-6-7 N=15	25			20	
19	627												
	626												

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-652** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
21	625				B2	S-11, 24 in 20.0-22.0 ft	20 (84)	3-4-16 23 N=20					
22	624	22.0 - 37.6 ft: DISINTEGRATED ROCK, sampled as SILTY SAND, highly micaceous, fine to coarse sand, moist, orangeish brown to mottled gray, estimated 30 - 45% fines				S-12, 4 in 22.0-22.3 ft	4 (100)	50/4" N=100					
23	623												
24	622					S-13, 4 in 24.0-24.3 ft	4 (100)	50/4" N=100					
25	621												
26	620		SM		C	S-14, 4 in 26.0-26.3 ft	4 (100)	50/4" N=100					
27	619												
28	618					S-15, 5 in 28.0-28.4 ft	5 (100)	50/5" N=100					
29	617												
	616												

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-652** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
31	615				C	S-16, 5 in 30.0-30.4 ft	5 (100)	50/5" N=100					
32	614												
33	613					S-17, 4 in 32.0-32.3 ft	4 (100)	50/4" N=100					
34	612												
35	611					S-18, 1 in 34.0-34.1 ft	1 (100)	50/1" N=100					
36	610												
37	609					S-19, 2 in 36.0-36.2 ft	2 (100)	50/2" N=100					
38	608					S-20, 1 in 37.5-37.6 ft	1 (100)	50/1" N=100					
39	607	37.6 - 39.6 ft: SCHIST, strong, fresh, intensely fractured (<2.5 in) to highly fractured (2.5 - 8 in), light gray to dark gray, strongly foliated, garnet, muscovite, biotite, fine to coarse grained, speckles of red minerals			D1	CORE C-01, 18 in 37.6-39.1 ft	18 (100)	0 (0)					37.6 ft: Temporary NW casing seated into rock. *38.5 ft: Foliation joint, 10°, smooth, planar, freshly weathered* *38.9 ft: Foliation joint, 20°, partial (50 - 100%), iron-oxide staining, slightly rough, planar*
	606	39.6 - 40.1 ft: GNEISS, very strong, fresh, light gray			D2								
							REC(%)	RQD(%)	DRILL RATE	LUGEON			

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-652
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	RQD in. (%)	DRILL RATE (min/ft)	PACKER Lugeons	REMARKS DISCONTINUITIES
41	605	40.1 - 41.0 ft: SCHIST, strong to very strong, fresh, intensely fractured (<2.5 in) to highly fractured (2.5 - 8 in), light gray to dark gray, strongly foliated, garnet, muscovite, biotite, fine to coarse grained		D1						*39.2 ft: Foliation joint, 0°, partial (50 - 100%), iron-oxide staining, slightly rough, planar*
	604	41.0 - 62.6 ft: GNEISS, strong to very strong, slightly weathered to fresh, moderately fractured (8 in - 2 ft) to slightly fractured (2 - 6.5 ft), white to dark gray, poorly to moderately foliated, feldspar, quartz, biotite, hornblende, garnet,, medium to coarse grained								*39.7 ft: Joint, 40°, spotty (<50%), black minerals infilling, slightly rough, planar*
42					CORE C-02, 60 in 39.1-44.1 ft	60 (100)	52 (87)			*41.4 ft: Joint, 30°, spotty (<50%), iron-oxide staining, smooth, curved*
	603									
43										
	602									
44										
	601									
45										
	600									
46										
	599				CORE C-03, 60 in 44.1-49.1 ft	58 (96)	44 (73)		21	*46.7 ft: Joint, 30°, spotty (<50%), iron-oxide staining, rough, undulating*
47										*46.9 ft: Joint, 30°, spotty (<50%), iron-oxide staining, rough, planar*
	598									*47.3 ft: Joint, 30°, partial (50 - 100%), iron-oxide staining, rough, planar*
48										*48.5 ft: Joint, 5°, spotty (<50%), iron-oxide staining, rough, planar*
	597									
49										
	596									

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-652** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	RQD in. (%)	DRILL RATE (min/ft)	PACKER Lugeons	REMARKS DISCONTINUITIES
51	595									*49.4 ft: Joint, 30°, spotty (<50%), iron-oxide staining, slightly rough, planar*
52	594				CORE C-04, 60 in 49.1-54.1 ft	60 (100)	54 (90)			*50.8 ft: Joint, 20°, partial (50 - 100%), iron-oxide staining, slightly rough, planar*
53	593									
54	592									
55	591			D2						
56	590									*55.9 ft: Joint, 30°*
57	589				CORE C-05, 60 in 54.1-59.1 ft	60 (100)	60 (100)			*57.0 ft: Foliation joint, 50°*
58	588								3	
59	587									
	586									*59.8 ft: Vein joint, 0°,*

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING	BOREHOLE LOG	Project: Cherrystone Creek Watershed Dam 2A Client: Pittsylvania County Location: Chatham, VA	Boring Number: **B-652** Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: C. Gudiel
Schnabel Representative: A. Spencer
Equipment: Diedrich D-70 (Track)
Method: 4-1/4" I.D. Hollow Stem Auger
NQ Double Barrel
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/23/2023
Date Ended: 01/24/2023
Coordinate System: VA State Plane South
X: 11210183.1 ft **Y:** 3469270.9 ft
Plunge, Bearing:
Hole Elevation: 645.4 ft
Total Depth: 62.6 ft

Groundwater Levels

During Drilling:	01/23/23 04:25	7.0 ft
Completion:		
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	RQD in. (%)	DRILL RATE (min/ft)	PACKER Lugeons	REMARKS DISCONTINUITIES
61	585				CORE C-06, 42 in 59.1-62.6 ft	42 (100)	34 (81)			*partial (50 - 100%), iron-oxide staining, rough, planar, slightly weathered, <1/4" thick quartz vein*
62	584									*60.4 - 60.9 ft: Joint, 70°, broken during drilling*
63	583									
64	582									
65	581									
66	580									
67	579									
68	578									
69	577									
	576									

Bottom of boring at 62.6 ft. Boring terminated at selected depth.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-751
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/10/2023
Coordinate System: VA State Plane South
X: 11209930.4 ft **Y:** 3469250.6 ft
Plunge, Bearing:
Hole Elevation: 677.4 ft
Total Depth: 34.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/10/23 08:21	4.3 ft
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
0	677	0.0 - 0.3 ft: Topsoil											
		0.3 - 22.0 ft: FILL, sampled as SILTY SAND, fine to coarse sand, moist, gray, estimated 30 - 45% fines, estimated 5 - 10% fine gravel, contains organics, organic odor				S-01, 24 in 0.0-2.0 ft	16 (66)	0-1-1-1 N=2					
1													
2	676					S-02, 24 in 2.0-4.0 ft	22 (92)	1-2-2-4 N=4					
3	675												
4	674					S-03, 24 in 4.0-6.0 ft	22 (92)	3-3-3-3 N=6	19			31	
5	673				F2								
6	672												6.0 ft: Groundwater encountered.
7	671					UD-01, 24 in 6.0-8.0 ft	12 (50)						
8	670	8.0 - 9.0 ft: rock fragments.											
9	669					S-04, 24 in 8.0-10.0 ft	22 (92)	3-3-3-4 N=6					
	668												

Bottom of boring at 34.1 ft. Boring terminated at auger refusal.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-751
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/10/2023
Coordinate System: VA State Plane South
X: 11209930.4 ft **Y:** 3469250.6 ft
Plunge, Bearing:
Hole Elevation: 677.4 ft
Total Depth: 34.1 ft

Groundwater Levels

	During Drilling:		
	Completion:	01/10/23 08:21	4.3 ft
	After Drilling:		
W	Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	SAMPLE DATA REC in. (%)	SAMPLE DATA BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
11	667		SM		F2	S-05, 24 in 10.0-12.0 ft	18 (75)	2-3-3-2 N=6	13		NP	31	
12	666												
13	665					UD-02, 24 in 12.0-14.0 ft	24 (100)						
14	664												
15	663					S-06, 24 in 14.0-16.0 ft	24 (100)	4-5-5-9 N=10					
16	662												
17	661					S-07, 24 in 16.0-18.0 ft	24 (100)	4-5-5-8 N=10					
18	660												
19	659					S-08, 24 in 18.0-20.0 ft	11 (46)	5-4-5-5 N=9					
	658												

Bottom of boring at 34.1 ft. Boring terminated at auger refusal.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-751
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/10/2023
Coordinate System: VA State Plane South
X: 11209930.4 ft **Y:** 3469250.6 ft
Plunge, Bearing:
Hole Elevation: 677.4 ft
Total Depth: 34.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/10/23 08:21	4.3 ft
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
21	657				F2	S-09, 24 in 20.0-22.0 ft	18 (75)	3-2-2-3 N=4					
22	656	22.0 - 30.0 ft: FILL, sampled as SANDY SILT, moist to wet, brown, estimated 15 - 25% fine to coarse grained sand, estimated 5 - 10% fine to coarse gravel, contains weathered rock fragments, low plasticity				S-10, 24 in 22.0-24.0 ft	18 (75)	3-2-3-2 N=5					
23	655												
24	654					S-11, 24 in 24.0-26.0 ft	24 (100)	2-2-3-5 N=5	25			64	
25	653												
26	652	26.0 ft: 15-25% fine to coarse gravel	ML		F1	S-12, 24 in 26.0-28.0 ft	12 (50)	3-10-13 10 N=23					
27	651												
28	650					S-13, 24 in 28.0-30.0 ft	24 (100)	5-6-8-9 N=14					
29	649												
	648												

Bottom of boring at 34.1 ft. Boring terminated at auger refusal.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

Schnabel ENGINEERING

BOREHOLE LOG

Project: Cherrystone Creek Watershed Dam 2A
Client: Pittsylvania County
Location: Chatham, VA

Boring Number: B-751
Contract Number: 22210031.100

Contractor: Connelly & Associates
Contractor Foreman: B. Mullendore
Schnabel Representative: P. Alani
Equipment: Acker Rebel XL
Method: 3-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)

Date Started: 01/09/2023
Date Ended: 01/10/2023
Coordinate System: VA State Plane South
X: 11209930.4 ft **Y:** 3469250.6 ft
Plunge, Bearing:
Hole Elevation: 677.4 ft
Total Depth: 34.1 ft

Groundwater Levels

During Drilling:		
Completion:	01/10/23 08:21	4.3 ft
After Drilling:		
Observation Well:		

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	STRATUM USCS	STRATUM SYMBOL	STRATUM UNIT	SAMPLE DATA DESCRIPTION	REC in. (%)	BLOW COUNTS	MC	LL	PI	< #200 (%)	REMARKS
31	647	30.0 - 33.0 ft: FILL, sampled as SILTY SAND, moist to wet, brown, estimated 30 - 45% fines, nonplastic to low plasticity	SM		F2	S-14, 24 in 30.0-32.0 ft	24 (100)	3-3-3-6 N=6	20		NP	42	
32	646												
33	645					S-15, 24 in 32.0-34.0 ft	22 (100)	3-7-11 -50/4" N=18					
34	644	33.0 - 34.1 ft: SILTY GRAVEL WITH SAND, slightly micaceous, fine to coarse grained gravel, angular to subangular particles; moist, light reddish gray, estimated 30 - 45% fines, estimated 15 - 25% fine to coarse grained sand, residual	GM		B2								
35	643					S-16, 1 in 34.0-34.1 ft	1 (100)	50/1" N=100					
36	642												
37	641												
38	640												
39	639												
	638												

Bottom of boring at 34.1 ft. Boring terminated at auger refusal.
Boring backfilled with cement/bentonite grout through tremie pipe upon completion.

BOREHOLE BACKFILL RECORDS

Schnabel ENGINEERING

BOREHOLE BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-51
Location:	Chatham, VA	**Date:**	1/18/2023
Schnabel Project No:	22210031.100	**By:**	ARS **Date:** 1/23/2023
Client Name:	Pittsylvania County	**Checked:**	PWA **Date:** 3/28/2023

Drilling and Borehole Volume Information			
Method(s) of Drilling:	4-1/4" HSA & NQ2 Core	Diameter of Borehole (inches) (A):	8.25" & 3"
Completion Date of Drilling:	1/23/2023	Total Depth of Borehole After Drilling (ft):	97.6
Depth of Borehole at Start of Backfilling (ft) (B):	97.6	Depth of Water at Start of Backfilling (ft):	45.4
Calculated Volume of Borehole [0.041 * A^2 * B] =	**212.2** gal * 0.134 =	**28.4**	feet^3

Backfill Record for Solid Materials

Method: ☐ **Alternating Layers** ☐ **Single Material Type**

Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):
Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):

Backfill Record for Liquid Materials (Grout)

Grout Mix Components (per batch):	Portland Cement (# of bags): 1	Weight of bag (lb): 94	Water (gal): 30
	Bentonite (lb): 25	Grout Mixing Method: Moyno Pump & Shovel	

Grout backfilled with tremie method? (Yes) / No

Placement Volumes

Grouting	Date/Time	Start Depth (feet)	Tremie Depth (feet)	Calculated Volume to be Placed (gal)	Estimated Volume Placed (gal)
Initial Filling	1-23-2023 / 12:30-2:00 PM	97.6	97.5	212.2	180
Top Off #1	1-27-2023 / 11:30 AM	30			85
Top Off #2	2-7-2023 / 1:00 PM				20
Top Off #3					
Top Off #4					
				Total Estimated Volume Placed (gal):	285

Was a stake placed and labeled to indicate boring location and ID after backfill was completed? (Yes) / No

Comments:

Schnabel ENGINEERING

PIEZOMETER BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-51A
Location:	Chatham, VA	**Date:**	1/16/2023
Schnabel Project No:	22210031.100	**By:** ECU	**Date:** 1/18/2023
Client Name:	Pittsylvania County	**Checked:** PWA	**Date:** 3/28/2023

Drilling and Borehole Volume Information					
Method(s) of Drilling:	4-1/4" Hollow Stem Augers	Diameter of Borehole (inches) (A):	8.3		
Completion Date of Drilling:	1/16/2023	OD Diameter of Piezometer Pipe (inches) (B):	2.3		
Depth of Borehole at Start of Backfilling (ft):	63.2	Depth of Water at Start of Backfilling (ft):	60.2		
Calculated Per Foot Volume of Borehole [0.041 * A^2] =		2.8	gal * 0.134 =	0.38	$feet^3$
Calculated Per Foot Volume of Piezometer Pipe [0.041 * B^2] =		0.2	gal * 0.134 =	0.03	$feet^3$
Calculated Per Foot Volume of Borehole with Installed Pipe =		2.6	gal * 0.134 =	0.35	$feet^3$

Solid Components (per container)		
Material Type and Brand	Weight (lb)	Volume (gal)
3/8" - 1/4" Bentonite Chips, Enviroplug Medium	50	5.3
Gravel Sand	50	3.7
Concrete, Quikrete	60	3.8

Grout Mix Components (per batch)			
Grout Mix	Portland Cement (# of bags): 1	Weight of bag (lb): 94	Water (gal): 30
	Bentonite (lb): 25	Grout Mixing Method: Circulate through Moyno pump	
Volume of mixed components (gal):	180		
Grout backfilled with tremie method?	**YES**		

Placement Volumes

Backfill Material	Date/Time	Backfill Depth Bottom (feet)	Backfill Depth Top (feet)	Tremie Depth (feet)	Interval Height (feet)	Calculated Volume (gallons)	Estimated Vol Placed (gallons)	Ratio of Placed/Calc Vols
Well Gravel Pack	01-16-23 / 3:00 PM	63.2	51.8	-	11.4	29.6	31.5	1.1
Bentonite Chips	01-16-23 / 3:00 PM	52.0	50.0	-	2.0	5.2	5.3	1.0
Grout	01-17-23 / 12:30 PM	50.0	10.0	49.0	40.0	104.0	105.0	1.0
Grout	01-18-23 / 09:10 AM	28.0			28.0	72.8	35.0	
Grout	01-27-23 / 11:30 AM						25.0	
Grout	02-07-23 / 1:00 PM						15.0	1.0
Concrete								
					Totals:	211.6	216.8	1.0

Comments: * = below bottom of piezometer

1) Bottom depth of backfill is measured prior to backfilling, with top depth measured after backfilling. If grout settles then the bottom depth of the next backfill layer may be deeper than the top measured depth of the previous grout backfill.

2) See Piezometer Installation Sketch for details.

Schnabel ENGINEERING

PIEZOMETER BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-651
Location:	Chatham, VA	**Date:**	1/11/2023
Schnabel Project No:	22210031.100	**By:** PWA	**Date:** 1/11/2023
Client Name:	Pittsylvania County	**Checked:** ECU	**Date:** 3/29/2023

Drilling and Borehole Volume Information			
Method(s) of Drilling:	3-1/4" Hollow Stem Augers	Diameter of Borehole (inches) (A):	7.3
Completion Date of Drilling:	1/16/2023	OD Diameter of Piezometer Pipe (inches) (B):	2.3
Depth of Borehole at Start of Backfilling (ft):	48.1	Depth of Water at Start of Backfilling (ft):	32.3

Calculated Per Foot Volume of Borehole [0.041 * A^2] =	2.2	gal * 0.134 =	0.38	$feet^3$
Calculated Per Foot Volume of Piezometer Pipe [0.041 * B^2] =	0.2	gal * 0.134 =	0.03	$feet^3$
Calculated Per Foot Volume of Borehole with Installed Pipe =	2.0	gal * 0.134 =	0.35	$feet^3$

Solid Components (per container)		
Material Type and Brand	Weight (lb)	Volume (gal)
3/8" - 1/4" Bentonite Chips, Enviroplug Medium	50	14.3
Gravel Sand	50	3.7
Concrete, Quikrete	60	3.8

Grout Mix Components (per batch)			
Grout Mix	Portland Cement (# of bags): 1	Weight of bag (lb): 94	Water (gal): 30
	Bentonite (lb): 25	Grout Mixing Method: Circulate through Moyno pump	
Volume of mixed components (gal):	105		
Grout backfilled with tremie method?	**YES**		

Placement Volumes								
Backfill Material	Date/Time	Backfill Depth Bottom (feet)	Backfill Depth Top (feet)	Tremie Depth (feet)	Interval Height (feet)	Calculated Volume (gallons)	Estimated Vol Placed (gallons)	Ratio of Placed/Calc Vols
Bentonite Chips	01-16-23 / 2:00 PM	48.1	44.0	-	4.1	8.2	9.0	1.1
Well Gravel Pack	01-16-23 / 3:00 PM	44.0	37.0	-	7.0	14.0	31.5	2.2
Bentonite Chips	01-16-23 / 3:00 PM	37.0	35.0	-	2.0	4.0	14.3	3.6
Grout	01-17-23 / 12:30 PM	35.0	5.0	-	30.0	60.0	75.0	1.3
Grout	01-18-23 / 09:10 AM	30.0			30.0	60.0	30.0	0.5
Concrete								
					Totals:	138.0	150.8	1.1

Comments: * = below bottom of piezometer

1) Bottom depth of backfill is measured prior to backfilling, with top depth measured after backfilling. If grout settles then the bottom depth of the next backfill layer may be deeper than the top measured depth of the previous grout backfill.

2) See Piezometer Installation Sketch for details.

BOREHOLE BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-651A
Location:	Chatham, VA	**Date:**	1/16/2023
Schnabel Project No:	22210031.1	**By:**	PWA **Date:** 1/16/2023
Client Name:	Pittsylvania County	**Checked:**	ECU **Date:** 3/29/2023

Drilling and Borehole Volume Information

Method(s) of Drilling:	**3-1/4" HSA**	Diameter of Borehole (inches) (A):	**7.3**
Completion Date of Drilling:	**1/16/2023**	Total Depth of Borehole After Drilling (ft):	**34**
Depth of Borehole at Start of Backfilling (ft) (B):	**34**	Depth of Water at Start of Backfilling (ft):	**Dry**
Calculated Volume of Borehole [0.041 * A^2 * B] =	**74.3** gal * 0.134 =	**10.0**	$feet^3$

Backfill Record for Solid Materials

Method: ☐ **Alternating Layers** ☐ **Single Material Type**

Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):
Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):

Backfill Record for Liquid Materials (Grout)

Grout Mix Components (per batch):	Portland Cement (# of bags): **1**	Weight of bag (lb): **94**	Water (gal): **30**
	Bentonite (lb): **25**	Grout Mixing Method:	**Bucket**

Grout backfilled with tremie method? (Yes) / No

Placement Volumes

Grouting	Date/Time	Start Depth (feet)	Tremie Depth (feet)	Calculated Volume to be Placed (gal)	Estimated Volume Placed (gal)
Initial Filling	1-16-2023 / 2:30 PM	34	33	74.3	80
Top Off #1					
Top Off #2					
Top Off #3					
Top Off #4					
			Total Estimated Volume Placed (gal):		55

Was a stake placed and labeled to indicate boring location and ID after backfill was completed? (Yes) / No

Comments:

Schnabel ENGINEERING

BOREHOLE BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-651B
Location:	Chatham, VA	**Date:**	1/16/2023
Schnabel Project No:	22210031.1	**By:**	PWA **Date:** 1/17/2023
Client Name:	Pittsylvania County	**Checked:**	ECU **Date:** 3/29/2023

Drilling and Borehole Volume Information

Method(s) of Drilling:	**3-1/4" HSA**	Diameter of Borehole (inches) (A):	**7.3**
Completion Date of Drilling:	**1/16/2023**	Total Depth of Borehole After Drilling (ft):	**14**
Depth of Borehole at Start of Backfilling (ft) (B):	**18**	Depth of Water at Start of Backfilling (ft):	**Dry**

Calculated Volume of Borehole [0.041 * A^2 * B] = **39.3** gal * 0.134 = **5.3** $feet^3$

Backfill Record for Solid Materials

Method: ☐ **Alternating Layers** ☐ **Single Material Type**

Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):
Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):

Backfill Record for Liquid Materials (Grout)

Grout Mix Components (per batch):	Portland Cement (# of bags): **1**	Weight of bag (lb): **94**	Water (gal): **30**
	Bentonite (lb): **25**	Grout Mixing Method: **Bucket**	

Grout backfilled with tremie method? Yes / (No)

Placement Volumes

Grouting	Date/Time	Start Depth (feet)	Tremie Depth (feet)	Calculated Volume to be Placed (gal)	Estimated Volume Placed (gal)
Initial Filling	1-18-2023 / 10:00 AM	18	-	39.3	42
Top Off #1					
Top Off #2					
Top Off #3					
Top Off #4					
				Total Estimated Volume Placed (gal):	42

Was a stake placed and labeled to indicate boring location and ID after backfill was completed? (Yes) / No

Comments: Two 24" undisturbed samples were taken below the 14 foot drilled depth which increased the total backfill depth to 18 feet.

Schnabel ENGINEERING

BOREHOLE BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-652
Location:	Chatham, VA	**Date:**	1/26/2023
Schnabel Project No:	22210031.100	**By:**	ECU **Date:** 1/26/2023
Client Name:	Pittsylvania County	**Checked:**	PWA **Date:** 3/28/2023

Drilling and Borehole Volume Information

Method(s) of Drilling: 4-1/4" HSA & NQ2 Wireline Coring	Diameter of Borehole (inches) (A): 8.3 & 3
Completion Date of Drilling: 1/25/2023	Total Depth of Borehole After Drilling (ft): 62.6
Depth of Borehole at Start of Backfilling (ft) (B): 62.6	Depth of Water at Start of Backfilling (ft): Dry

Calculated Volume of Borehole [0.041 * A^2 * B] = **114.1** gal * 0.134 = **15.3** $feet^3$

Backfill Record for Solid Materials

Method: ☐ **Alternating Layers** ☐ **Single Material Type**

Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):
Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):

Backfill Record for Liquid Materials (Grout)

Grout Mix Components (per batch):	Portland Cement (# of bags): 1	Weight of bag (lb): 94	Water (gal): 30
	Bentonite (lb): 25	Grout Mixing Method: Circulate through Moyno pump	

Grout backfilled with tremie method? (Yes) / No

Placement Volumes

Grouting	Date/Time	Start Depth (feet)	Tremie Depth (feet)	Calculated Volume to be Placed (gal)	Estimated Volume Placed (gal)
Initial Filling	01-26-2023 / 4:30 PM	62.6	62	114.1	120
Top Off #1	01-27-2023 / 4:30 PM	11			35
Top Off #2					
Top Off #3					
Top Off #4					
				Total Estimated Volume Placed (gal):	155

Was a stake placed and labeled to indicate boring location and ID after backfill was completed? (Yes) / No

Comments:

Schnabel ENGINEERING

BOREHOLE BACKFILL FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	B-751
Location:	Chatham, VA	**Date:**	1/10/2023
Schnabel Project No:	22210031.1	**By:**	PWA **Date:** 1/10/2023
Client Name:	Pittsylvania County	**Checked:**	ECU **Date:** 3/29/2023

Drilling and Borehole Volume Information

Method(s) of Drilling:	**3-1/4" HSA**	Diameter of Borehole (inches) (A):	**7.3**
Completion Date of Drilling:	**1/10/2023**	Total Depth of Borehole After Drilling (ft):	**34.1**
Depth of Borehole at Start of Backfilling (ft) (B):	**34.1**	Depth of Water at Start of Backfilling (ft):	**4.3**

Calculated Volume of Borehole [0.041 * A^2 * B] = **74.5** gal * 0.134 = **10.0** $feet^3$

Backfill Record for Solid Materials

Method: ☐ **Alternating Layers** ☐ **Single Material Type**

Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):
Type:	Size:	# of Bags:	Bag Wt (lb):	Total Vol Placed (ft^3):
			Bag Vol (ft^3):	Est Thickness / Layer (ft):

Backfill Record for Liquid Materials (Grout)

Grout Mix Components (per batch):	Portland Cement (# of bags): **1**	Weight of bag (lb): **94**	Water (gal): **30**
	Bentonite (lb): **25**	Grout Mixing Method:	**Bucket**

Grout backfilled with tremie method? (Yes) / No

Placement Volumes

Grouting	Date/Time	Start Depth (feet)	Tremie Depth (feet)	Calculated Volume to be Placed (gal)	Estimated Volume Placed (gal)
Initial Filling	1-10-2023 / 10:45 AM	34	34	74.5	50
Top Off #1	1-27-2023 / 11:30 AM				30
Top Off #2	2-7-2023 / 1:30 PM				6
Top Off #3					
Top Off #4					
				Total Estimated Volume Placed (gal):	86

Was a stake placed and labeled to indicate boring location and ID after backfill was completed? (Yes) / No

Comments:

UNDISTURBED SAMPLING RECORDS

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-51A**
Location:	Chatham, VA	**Sample ID:**	**UD-1**
Schnabel Project No.:	22210031.100	**By:** EU **Date:**	1/16/2023
Client Name:	Pittsylvania County	**Checked:** PWA **Date:**	3/28/2023

Sampler advanced from _____10_____ feet below ground surface to _____12____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**4-1/4" HSA**	Type of Casing:	**None**
Diameter of Borehole (inches):	**8-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? (Yes) / No
Comments:

2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? (Yes) / No
Comments: **100 - 400 psi**

3) Was the sample collected at, above, or below the static water table? **Above**
Comments:

4) Was water added to the borehole? Yes / (No)
Comments:

5) Was sample driven? If yes, record weight and fall of the hammer in comments. Yes / (No)
Comments:

6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? (Yes) / No
Comments (record rest time): **15 Minutes**

7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Yes / (No)
Comments (record number of rotations or amount of rotation):

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**24**

Sample Length Preserved in Tube (after bottom ~1" removed) (inches): **23**

Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc): **Undamanged**

Sample Description: **Silty Sand (SM), fine to coarse sand, 15-25% fines, 5-10% fine to coarse gravel, contains mica, reddish brown, moist**

8) Were both ends of exposed soil sample sealed? (Yes) / No
Comments (type of seal): **Wax**

9) Was packing material placed between sealed sample and ends of tube? (Yes) / No
Comments (type of material used): **Gravel Sand**

10) Were both ends of tube capped and taped? (Yes) / No
Comments and type of capping: **Plastic Cap / Duct Tape**

11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample? (Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-51A**
Location:	Chatham, VA	**Sample ID:**	**UD-2**
Schnabel Project No.:	22210031.100	**By:** EU **Date:**	1/16/2023
Client Name:	Pittsylvania County	**Checked:** PWA **Date:**	3/28/2023

Sampler advanced from _____12_____ feet below ground surface to _____14____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**4-1/4" HSA**	Type of Casing:	**None**
Diameter of Borehole (inches):	**8-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: 3**00 - 400 psi**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Above**
4) Was water added to the borehole? Comments:	Yes / (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes / (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **10 Minutes**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	Yes / (No)

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**24**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):		**23**	
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):		**Undamanged**	

Sample Description: **Silty Sand (SM), fine to coarse sand, 15-25% fines, 5-10% fine to coarse gravel, contains mica, reddish brown, moist**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Gravel Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Plastic Cap / Duct Tape**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-51A**
Location:	Chatham, VA	**Sample ID:**	**UD-3**
Schnabel Project No.:	22210031.100	**By:** EU **Date:**	1/16/2023
Client Name:	Pittsylvania County	**Checked:** PWA **Date:**	3/28/2023

Sampler advanced from _____56_____ feet below ground surface to _____58____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**4-1/4" HSA**	Type of Casing:	**None**
Diameter of Borehole (inches):	**8-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: 1**00 - 350 psi**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Below**
4) Was water added to the borehole? Comments:	Yes / (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes / (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **30 Minutes**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	Yes / (No)

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**18**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):		**17**	
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):		**Bent**	

Sample Description: **Clayey Sand (SC), fine to coarse sand, 15-25% fines, 5-10% fine to coarse gravel, contains mica, reddish brown, moist**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Gravel Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Plastic Cap / Duct Tape**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-51A**
Location:	Chatham, VA	**Sample ID:**	**UD-4**
Schnabel Project No.:	22210031.100	**By:** EU **Date:**	1/16/2023
Client Name:	Pittsylvania County	**Checked:** PWA **Date:**	3/28/2023

Sampler advanced from _____58_____ feet below ground surface to _____60____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**4-1/4" HSA**	Type of Casing:	**None**
Diameter of Borehole (inches):	**8-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **300 psi**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Below**
4) Was water added to the borehole? Comments:	Yes / (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes / (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **10 Minutes**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	Yes / (No)

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**9**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):			**9**
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):			**Undamaged**

Sample Description: **Clayey Sand (SC), fine to coarse sand, 15-25% fines, 5-10% fine to coarse gravel, contains mica, reddish brown, moist**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Gravel Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Plastic Cap / Duct Tape**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-651A**
Location:	Chatham, VA	**Sample ID:**	**UD-01**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/16/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____28_____ feet below ground surface to ____30_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **700 psi down pressure**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Above**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **10 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**18**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):		**17**	
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):		**Bent after retrieval**	

Sample Description: **Reddish brown, Silt with Sand, 15% fine-grained sand, low plasticity**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments: **Had to push with 700 psi down pressure; only able to drive 18"**

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-651A**
Location:	Chatham, VA	**Sample ID:**	**UD-02**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/16/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____30_____ feet below ground surface to ____32_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **700 psi down pressure**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Above**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **15 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**7**	Sample Recovery (inches):	**3**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):			**2.5**
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):			**Undamaged**

Sample Description: **Reddish brown, Silt, low plasticity**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments: **Had to push with 700 psi down pressure; only able to drive 3", but returned 7" recovery. Material suspected to have fallen into tube. Sample bagged.**

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-651B**
Location:	Chatham, VA	**Sample ID:**	**UD-01**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/16/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____14_____ feet below ground surface to ____16_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **600 psi down pressure**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Above**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **12 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**20**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):			**19**
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):			**Undamaged**

Sample Description: **Reddish brown, Silt, low plasticity**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-651B**
Location:	Chatham, VA	**Sample ID:**	**UD-02**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/16/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____16_____ feet below ground surface to ____18_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **750 psi down pressure**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Above**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **12 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**23**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):			**22**
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):			**Undamaged**

Sample Description: **Reddish brown, Silt, low plasticity**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-751**
Location:	Chatham, VA	**Sample ID:**	**UD-01**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/9/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____6_____ feet below ground surface to ____8_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: **700 psi down pressure**	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments:	**Below**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **10 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**12**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):			**11**
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):			**Undamaged**

Sample Description: **Grayish bown, Sandy Silt with Gravel, 30% medium-grained sand, contains rock fragments**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

Schnabel ENGINEERING

UNDISTURBED SAMPLING FIELD FORM

Project:	Cherrystone Creek Watershed Dam 2A	**Boring ID:**	**B-751**
Location:	Chatham, VA	**Sample ID:**	**UD-02**
Schnabel Project No.:	22210031.1	**By:** PWA	**Date:** 1/9/2023
Client Name:	Pittsylvania County	**Checked:** EU	**Date:** 3/28/2023

Sampler advanced from _____12_____ feet below ground surface to ____14_____ feet bgs

Sampler Information

Tube Material:	**Galvanized Steel**	Type of coating on Tube:	**Zinc**
Tube Diameter and Length (inches):	**3"x30"**	Condition of Tube Before Use:	**Good**

Drilling Information

Method of Drilling:	**3-1/4" Hollow Stem Auger**	Type of Casing:	**None**
Diameter of Borehole (inches):	**7-1/4"**	Drilling Fluid:	**None**

Sampling Checklist (Not applicable for Pitcher Sampler)

1) Was sampler advanced in one uniform, continuous push without rotation? Comments:	(Yes) / No
2) Was downward force provided through the drill rods using the hydraulic drive mechanism on the drill rig? Comments: 700 psi down pressure	(Yes) / No
3) Was the sample collected at, above, or below the static water table? Comments: **Water at 6' below GSE**	**Below**
4) Was water added to the borehole? Comments:	Yes (No)
5) Was sample driven? If yes, record weight and fall of the hammer in comments. Comments:	Yes (No)
6) Was the withdrawl of the sampler delayed a minimum of 5 minutes after push? Comments (record rest time): **10 mins**	(Yes) / No
7) Was the tube slowly rotated to shear the material at the end of the tube prior to extraction? Comments (record number of rotations or amount of rotation):	(Yes) / No

Sample Measurement, Sealing and Labeling

Sampler Penentration (inches):	**24**	Sample Recovery (inches):	**24**
Sample Length Preserved in Tube (after bottom ~1" removed) (inches):		**23**	
Sample Tube Tip Condition (undamaged, bent, nicked, crimped, etc):		**Undamaged**	

Sample Description: G**rayish bown, Sandy Silt with Gravel, 30% medium-grained sand, contains rock fragments**

8) Were both ends of exposed soil sample sealed? Comments (type of seal): **Wax**	(Yes) / No
9) Was packing material placed between sealed sample and ends of tube? Comments (type of material used): **Sand**	(Yes) / No
10) Were both ends of tube capped and taped? Comments and type of capping: **Red Plastic Cap**	(Yes) / No
11) Was the tube and cap appropriately labeled with project name, boring number, sample number, sample depth interval, sample recovery, date sample was taken? Was an arrow with "TOP" labeled on the side of the sample?	(Yes) / No

Supplemental Comments:

ROCK CORE BOX PHOTOGRAPHS

PHOTO 1

DATE TAKEN: 01/18/2023 to 1/19/2023

LOCATION:

Boring B-51

COMMENTS:

Core C-01 to C-04, 72.60 to 92.6 feet

PHOTO 2

DATE TAKEN: 01/19/2023

LOCATION:

Boring B-51

COMMENTS:

Core C-05, 92.6 to 97.6 feet

PHOTO 3

DATE TAKEN: 01/23/2023

LOCATION:

Boring B-652

COMMENTS:

Core C-01 to C-04, 37.6 to 54.1 feet

PHOTO 4

DATE TAKEN: 01/24/2023

LOCATION:

Boring B-652

COMMENTS:

Core C-05 to C-06, 54.1 to 62.6 feet

APPENDIX C

PIEZOMETER INSTALLATION SKETCHES AND DEVELOPMENT RECORDS

MONITORING WELL INSTALLATION SKETCH

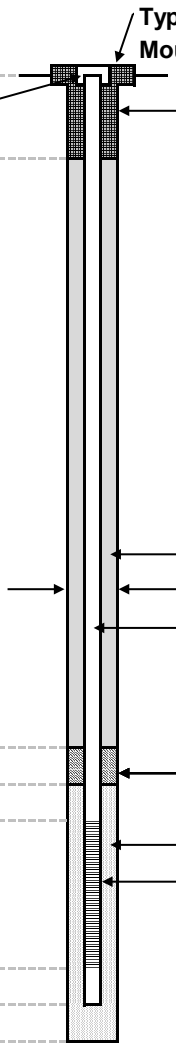
Project:	Cherrystone Creek Watershed Dam 2A	**Piezometer ID:**	B-51A		
Location:	Chatham, VA	**Date of Installation:**			
Schnabel Project No.:	22210031.100	**By:**	EU	**Date:**	1/18/2023
Client Name:	Pittsylvania County	**Checked:**	PWA	**Date:**	3/28/2023
Subcontractor:	Connelly & Associates, Inc.	**Station:**		**Offset:**	

Elev of Top of Open Riser Pipe (Reference El. for water level measurements,ft): 708.86

Depth to Bottom of Well from Top of Open Riser Pipe (ft): -62.90

Horizontal Location (ft): **Northing:** 3,469,255.97 **Easting:** 11,210,018.59

Elevation (ft, M.S.L.)	Depth or Height (ft) from: Top of Open Riser	Ground Surface
709.0	0.1	0.0
708.9	0.0	-0.1
707.5	-1.4	-1.5
659.1	-49.7	-49.8
657.1	-51.7	-51.8
656.1	-52.7	-52.8
646.2	-62.7	-62.8
646.0	-62.9	-63.0
645.8	-63.1	-63.2



Type of Flush Mount Box	Steel Flush Mount
Type of Surface Seal	Concrete
Type of Backfill	Cement-bentonite grout
Diameter of Borehole	8-1/4 inch
I.D. of Riser Pipe	2 inch
Riser Pipe Material	Schedule 40 PVC
Type of Seal	3/8" Bentonite Chips
Size of Filter Sand	Sand and Gravel
I.D. of Screen	2 inch
Screen Opening	0.010 inch
Screen Material	Schedule 40 PVC
Slot Type	Machine-slotted

Diagram Not to Scale

Comments:

MONITORING WELL INSTALLATION SKETCH

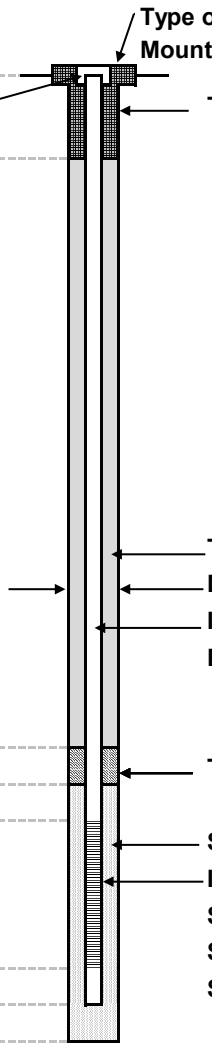
Project:	Cherrystone Creek Watershed Dam 2A	**Piezometer ID:**	B-651		
Location:	Chatham, VA	**Date of Installation:**			1/11/2023
Schnabel Project No.:	22210031.1	**By:**	PWA	**Date:**	1/11/2023
Client Name:	Pittsylvania County	**Checked:**	ARS	**Date:**	3/27/2023
Subcontractor:	Connelley & Associates	**Station:**		**Offset:**	

Elev of Top of Open Riser Pipe (Reference El. for water level measurements,ft): **679.01**

Depth to Bottom of Well from Top of Open Riser Pipe (ft): **-43.00**

Horizontal Location (ft): **Northing:** **3,469,250.79** **Easting:** **11,210,097.06**

Elevation (ft, M.S.L.)	Depth or Height (ft) from: Top of Open Riser	Ground Surface
679.2	0.2	0.0
679.0	0.0	-0.2
677.7	-1.3	-1.5
644.0	-34.8	-35.0
642.0	-36.8	-37.0
641.0	-37.8	-38.0
636.2	-42.8	-43.0
636.0	-43.0	-43.2
635.2	-43.8	-44.0



Type of Flush Mount Box	Steel Flush Mount
Type of Surface Seal	Concrete
Type of Backfill	Cement-bentonite grout
Diameter of Borehole	8-1/4 inch
I.D. of Riser Pipe	2 inch
Riser Pipe Material	Schedule 40 PVC
Type of Seal	3/8" Bentonite Chips
Size of Filter Sand	Sand and Gravel
I.D. of Screen	2 inch
Screen Opening	0.010 inch
Screen Material	Schedule 40 PVC
Slot Type	Machine Slotted

Diagram Not to Scale

Comments: Bentonite chips placed to create seal from bottom of boring at 48ft up to 44 ft. Silty material buildup at bottom of piezometer from 40.8 to 43 feet (observed with optical scope on 3/28/2023).

MONITORING WELL DEVELOPMENT FIELD FORM

Project:	**Cherrystone Creek Watershed Dam 2A**		**Well ID:**	B-51A	
Location:	**Chatham, VA**		**Date(s):**	3/4/2023	
Schnabel Project No.:	**22210031.1**	**Time Started:**	2:30 PM	**Time Ended:**	6:00 PM
Client Name:	**Pittsylvania County**	**Weather Conditions:**	Cloudy/Rainy, 60s		
Field Personnel:	**PWA**	**Checked By:**	ARS	**Date:**	3/28/2023

Water Level measured from TOC (d_{swl}, feet):	**53.4**	Riser Pipe Diameter (r_c, inches):	**2**
Well Depth measured from TOC (d_w, feet):	**63**	Well Volume (gal) $V=0.041\ (r_c)^2\ (d_w-d_{swl})$:	**2.97**
Screened Interval from TOC (feet):	**52.8-62.8**	Note: TOC = Top of Open Riser Pipe	

Comments on Well Condition (riser pipe type, outer casing, lock, etc):

PVC riser, 5' screen, developed with stick up but cut below ground surface before installing and closing well cover.

Purge Information

Purging Method:	____Stainless Steel Bailer ____ Peristalic Pump ____ Grundfos Pump __X__ Bailer					
(put an **X** by one)	____Polyethylene Bailer ____ Bladder Pump ____ DC Pump ____ Other:					
Purge Equipment/Serial No:	Whale Pump					
Monitoring Instrument(s)/Serial No:	Not needed					
Purge Flow Rate (gpm):	Variable		Well Purged Dry (circle one):	Yes or (No)		
5	**Test 1**	**Test 2**	**Test 3**	**Test 4**	**Test 5**	**Test 6**
Date	3/4/2023					
Time (of day, hr:min)	2:30 PM					
Volume Purged (Gal): (Cumulative) or Per Test (**circle one**)	35 gal					
Water Level (ft from TOC) After Purging	53					
Temperature (°C)	NR					
pH (s.u.)	NR					
Conductivity (µS/cm)	NR					
Turbidity (NTU)	NR					
Sheen/Color	Brown					
Odor	NR					

Note: Fill in columns as appropriate based on project requirements. NR = Not Recorded; NA = Not Applicable.

Comments:

MONITORING WELL DEVELOPMENT FIELD FORM

Project:	**Cherrystone Creek Watershed Dam 2A**		**Well ID:**	B-651	
Location:	**Chatham, VA**		**Date(s):**	3/4/2023	
Schnabel Project No.:	**22210031.1**	**Time Started:**	2:30 PM	**Time Ended:**	6:00 PM
Client Name:	**Pittsylvania County**	**Weather Conditions:**	Cloudy/Rainy, 60s		
Field Personnel:	**PWA**	**Checked By:**	ARS	**Date:**	3/28/2023

Water Level measured from TOC (d_{swl}, feet):	**34**	Riser Pipe Diameter (r_c, inches):	**2**
Well Depth measured from TOC (d_w, feet):	**43.2**	Well Volume (gal) V=0.041 $(r_c)^2$ (d_w-d_{swl}):	**1.5**
Screened Interval from TOC (feet):	**38-43**	Note: TOC = Top of Open Riser Pipe	

Comments on Well Condition (riser pipe type, outer casing, lock, etc):

PVC riser, 5' screen, developed with stick up but cut below ground surface before installing and closing well cover.

Purge Information

Purging Method:	___Stainless Steel Bailer ____ Peristalic Pump ____ Grundfos Pump __X__ Bailer
(put an **X** by one)	___Polyethylene Bailer ____ Bladder Pump ____ DC Pump ____ Other:
Purge Equipment/Serial No:	Whale Pump
Monitoring Instrument(s)/Serial No:	Not needed
Purge Flow Rate (gpm): Variable	Well Purged Dry (circle one): Yes or (No)

Test Information	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Date	3/4/2023					
Time (of day, hr:min)	3:30 PM					
Volume Purged (Gal): (Cumulative) or Per Test (**circle one**)	20 gal					
Water Level (ft from TOC) After Purging	34					
Temperature (°C)	NR					
pH (s.u.)	NR					
Conductivity (µS/cm)	NR					
Turbidity (NTU)	NR					
Sheen/Color	Brown					
Odor	NR					

Note: Fill in columns as appropriate based on project requirements. NR = Not Recorded; NA = Not Applicable.

Comments: Unable to dislodge silty material buildup at bottom of piezometer from 40.8 to 43 feet (observed with optical scope on 3/28/2023).

APPENDIX D
RESULTS OF HYDRAULIC CONDUCTIVITY TESTING IN SOIL

Soil Hydraulic Conductivity Test Methods
Soil Hydraulic Conductivity Test Results

HYDRAULIC CONDUCTIVITY (SLUG) TESTING IN SOIL

Brief Description of the Soil Hydraulic Conductivity Test Methods

Hydraulic conductivity tests of soil were performed in piezometers using the slug test method by Schnabel personnel. The test equipment included an In-situ Level TROLL 700 transducer, wireless TROLL communication datalogger, with the computer software Win situ 5 for data monitoring, a two-foot-long, 1-inch-diameter stainless steel slug, and a 100-foot long Rugged Poly Cable. Each piezometer was developed prior to slug testing using a Whale high flow pump and graduated 5-gallon bucket for measurement of purged well volumes. Prior to each test, the static water level and total depth of the piezometer were measured.

For piezometers with water levels above the screened interval, rising and falling head hydraulic conductivity tests were performed using the slug-in and slug-out test method. Falling head tests were performed on piezometers with water levels within the screened interval prior to the test.

Test data was evaluated using the software program Aqtesolv Pro (Version 4.5). Two analytical methods were applied in evaluating test results, the Bouwer and Rice Method (Bouwer and Rice, 1976; Bouwer, 1989a, 1989b) and the KGS Model (Hyder et al., 1994). The Bouwer and Rice Method was considered when the data did not fit well with the KGS Model.

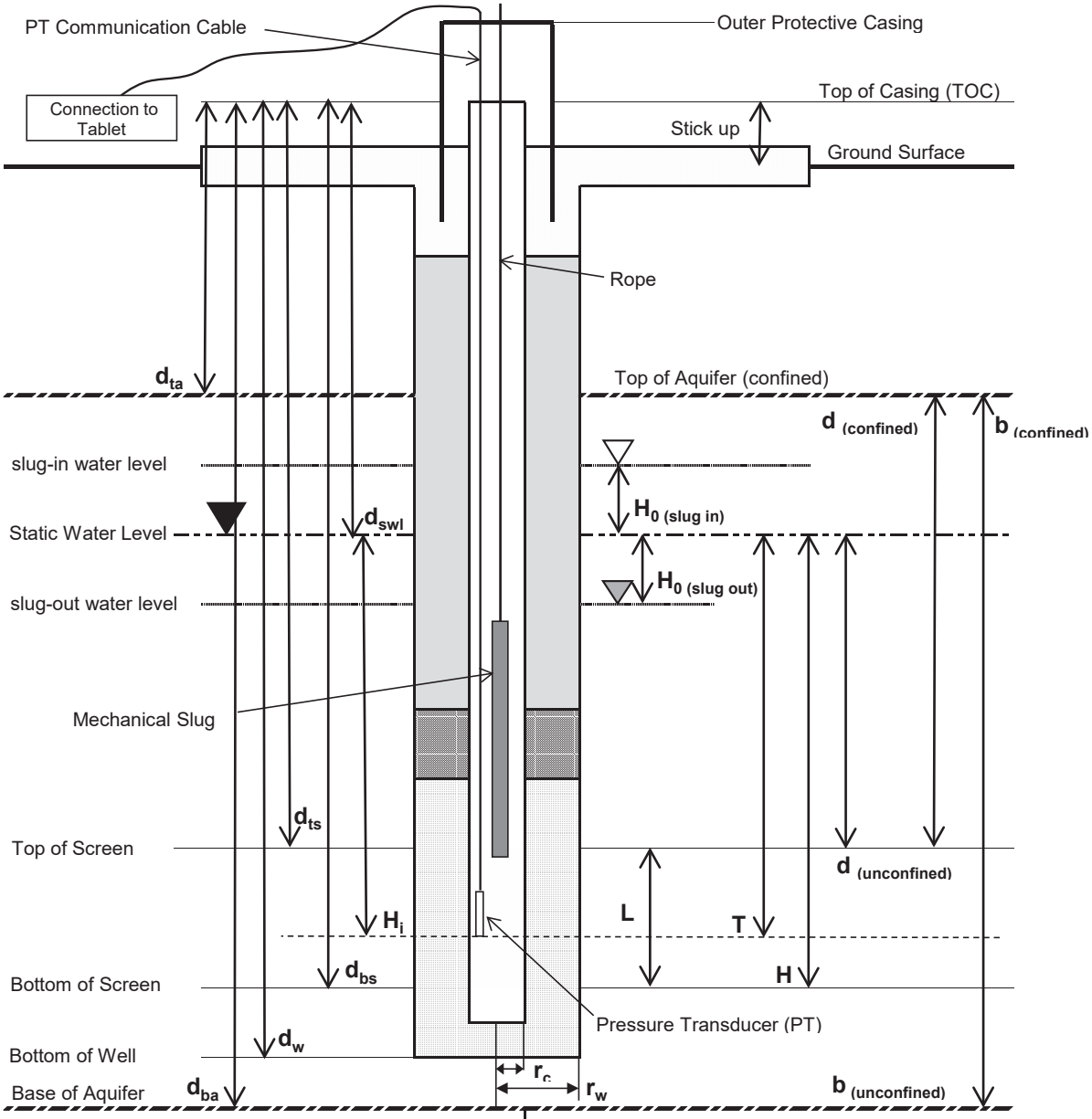
Soil Hydraulic Conductivity Test Results

Calculated hydraulic conductivities for in situ soil using the Bouwer and Rice Method and KGS Model for the tested piezometers are presented in Table 3. Aqtesolv data analyses output sheets are included in this appendix.

This testing is only an approximation of the in situ hydraulic conductivity at selected locations and variations are to be expected.

WELL DIMENSIONS AND INPUT DATA FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-51A		
Location:	Chatham, VA	**Date:**	3/7/2023		
Schnabel No.:	22210031.100	**By:**	SGA	**Date:**	3/19/2023
Client:	Pittsylvania County	**Checked:**	SMB	**Date:**	3/29/2023



Field Measurements

From Boring Log (add stick-up if needed):

45.3	d_{ta} Depth to top of aquifer from TOC (ft)
200	d_{ba} Depth to bottom of aquifer from TOC (ft)

From Well Construction Sketch:

1.0	r_c Radius of well casing (I.D. = in)
4.13	r_w Radius of well (screen and sand pack) (in)
52.7	d_{ts} Depth to top of screen from TOC (ft)
62.7	d_{bs} Depth to bottom of screen from TOC (ft)

Measured Immediately Prior to Test

45.3	d_{swl} Depth to static water level from TOC (ft)
62.9	d_w Depth from TOC to bottom of well (ft)
8.9	H_i Height of water over transducer (ft)

AQTESOLV Variables

H_0 Observed Initial Displacement Recorded in Data File (ft)
L Length of Well Screen (d_{bs} - d_{ts}) (ft)
T Transducer Depth from Static Water Level (H_i) (ft)
H Static Water Column Height ($H = d_{bs} - d_{swl}$) (ft)
d Depth to Top of Well Screen (ft), confined ($d = d_{ts} - d_{ta}$), use 0 if well screen extends into the upper confining layer.
d Depth to Top of Well Screen (ft), unconfined ($d = d_{ts} - d_{swl}$), use 0 if well is screened across the water table.
d Depth to Top of Well Screen (ft), use 0 for fully penetrating wells
b Saturated Thickness of Aquifer, confined ($b = d_{ba} - d_{ta}$) (ft)
b Saturated Thickness of Aquifer, unconfined ($b = d_{ba} - d_{swl}$) (ft)
r_c Inside Radius of Well Casing (in)
r_w Radius of Well (well casing plus filter pack) (in)

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-51A
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or Rising Head Test**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	52.7 ft	Well Casing Radius (r_c):	1.0 in	0.08 ft
Depth to Bottom of Screen from TOC (d_{bs}):	62.7 ft	Well Screen Radius (r_w):	4.1 in	0.34 ft
Screen Length (L):	10 ft	Depth to Top of Aquifer from TOC (d_{ta}):	45.3 ft	
Depth to Static Water Level from TOC (d_{swl}):	45.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft	
Initial head on pressure transducer (H_i)	8.9 ft	(as read from datalogger prior to testing)		

Is Aquifer Confined or Unconfined (enter "c" or "u"):	U	UNCONFINED
Is Well Partially of Fully Penetrating (enter "p" or "f"):	P	PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0)	1.1 ft	(Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).
Static Water Column Height (H)	17.4 ft	$H = d_{bs} - d_{swl}$
Well Coordinates	Latitude / Northing	(optional for a single slug test analysis or when installation sketch is not attached)
	Longitude / Easting	

Aquifer Data

Saturated Thickness of Aquifer (b):	ft	for a confined aquifer (d_{ba}-d_{ta})
	154.7 ft	for an unconfined aquifer (d_{ba}-d_{swl})
Hydraulic Conductivity Anisotropy Ratio (K_v/K_h):		(use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d)	ft	depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)
	7.4 ft	depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)
Length of Well Screen (L)	10 ft	d_{bs}-d_{ts}
Transducer Depth from Static Water Level (T)	8.9 ft	H_i

Radius Data

Inside Radius of Well Casing (r_c)	0.08 ft	assume well screen = r_c
Radius of Downhole Equipment (r_{eq})	ft	assume 0.0 ft for pressure transducer and slug alone
Inside Radius of Packer (r_p)	ft	use 0.0 ft if packer was not used
Radius of Well (r_w)	0.34 ft	well casing plus filter pack
Outer Radius of Well Skin (r_{sk})	0.34 ft	assume $r_{sk} = r_w$ unless known

Well Corrections

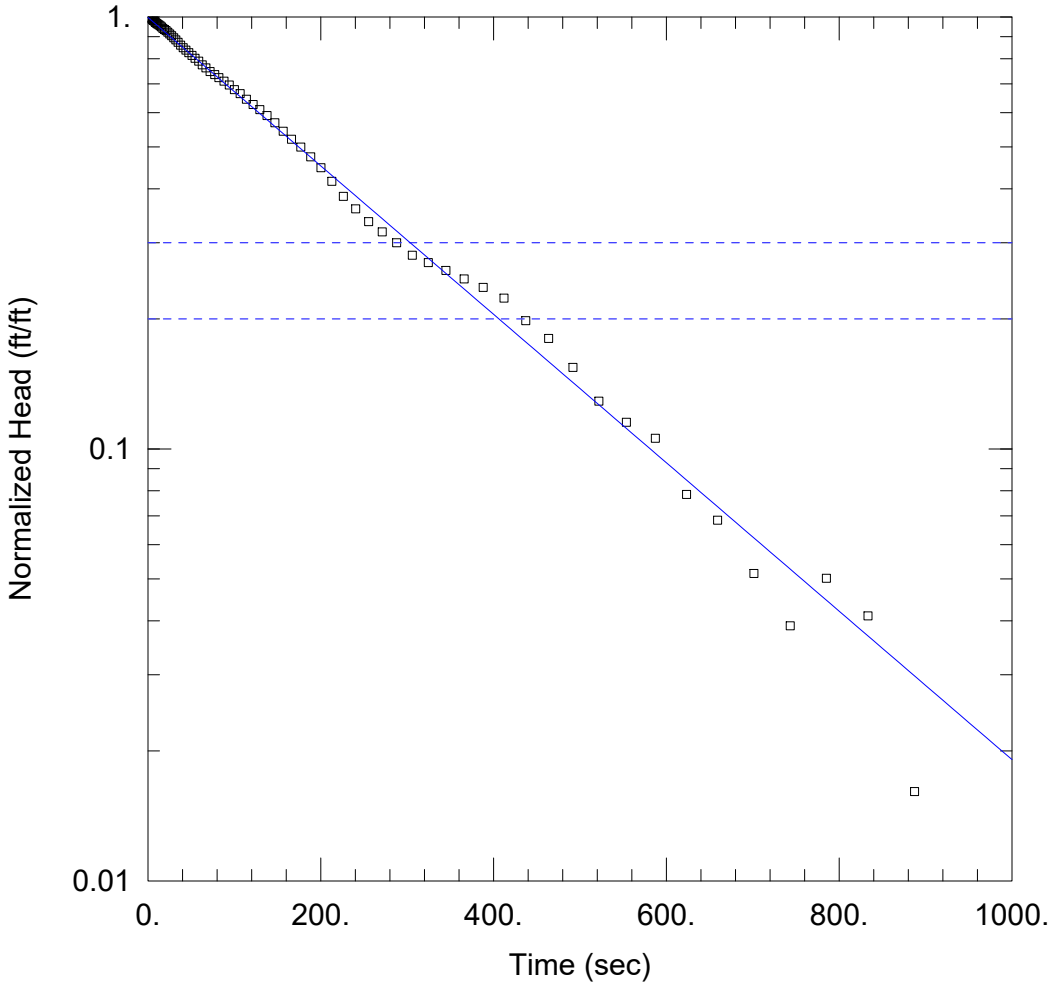
Was correction applied for effective casing radius? Yes / (No)

If so, Method: _____ n(e): _____ H(0)*: _____

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: _____ m^2/sec Gravitational acceleration: _____ m/sec^2

Comments: _____



B-51A - FALLING HEAD - BR

Data Set: G:\...\Falling Head B-51 - BR.aqt
Date: 03/29/23 Time: 09:00:17

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-51A
Test Date: 03/07/2023

AQUIFER DATA

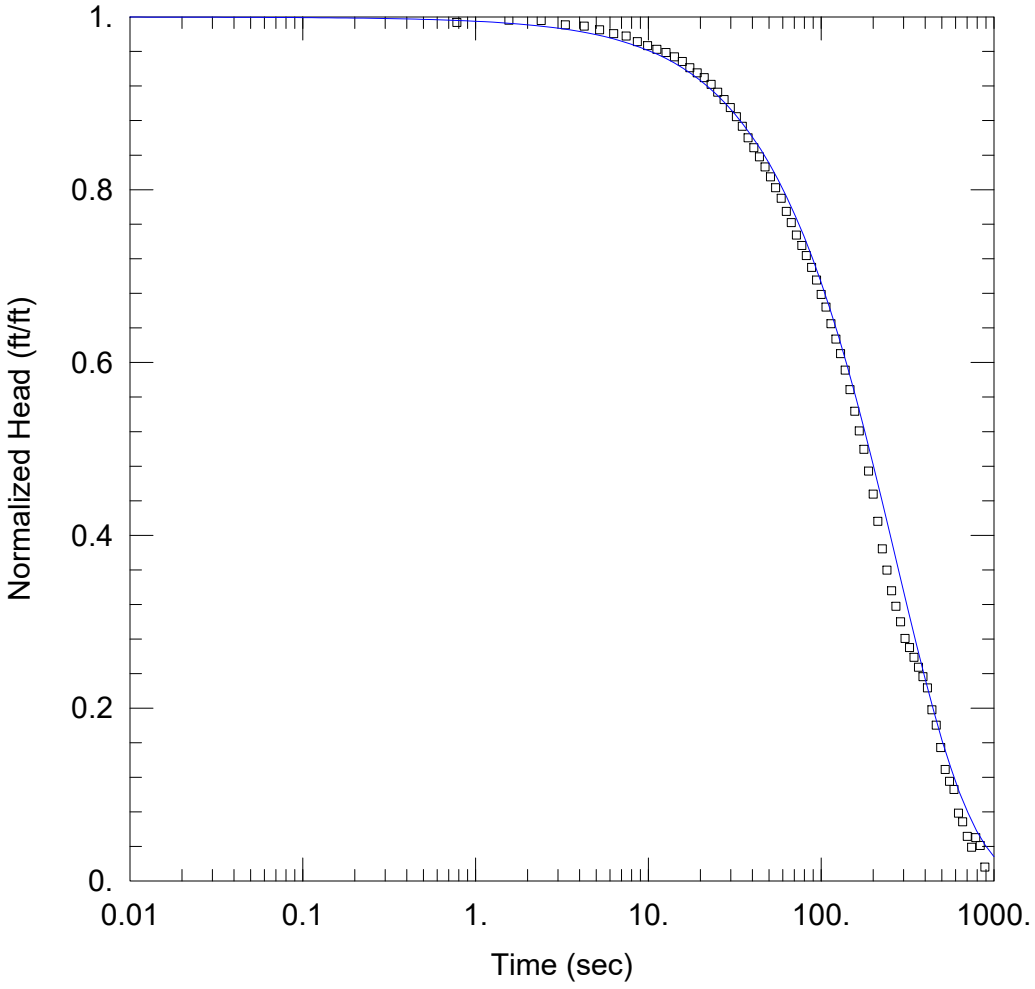
Saturated Thickness: 154.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-51A)

Initial Displacement: 1.071 ft
Total Well Penetration Depth: 17.36 ft
Casing Radius: 0.08 ft
Static Water Column Height: 17.46 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 8.718E-5 cm/sec
y0 = 1.067 ft



B-51A - FALLING HEAD - KGS

Data Set: G:\...\Falling Head B-51 - KGS.aqt
Date: 03/29/23 Time: 09:00:19

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-51A
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 154.7 ft

WELL DATA (B-51A)

Initial Displacement: 1.071 ft
Total Well Penetration Depth: 17.36 ft
Casing Radius: 0.08 ft
Static Water Column Height: 17.46 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model
Kr = 0.000104 cm/sec
Kz/Kr = 1.
Ss = 2.348E-7 ft^{-1}

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-51A
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or (Rising Head Test)**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	52.7 ft	Well Casing Radius (r_c):	1.0 in	0.08 ft
Depth to Bottom of Screen from TOC (d_{bs}):	62.7 ft	Well Screen Radius (r_w):	4.1 in	0.34 ft
Screen Length (L):	10 ft	Depth to Top of Aquifer from TOC (d_{ta}):	45.3 ft	
Depth to Static Water Level from TOC (d_{swl}):	45.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft	
Initial head on pressure transducer (H_i)	8.9 ft	(as read from datalogger prior to testing)		

Is Aquifer Confined or Unconfined (enter "c" or "u"):	U	UNCONFINED
Is Well Partially of Fully Penetrating (enter "p" or "f"):	P	PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0)	-1.3 ft	(Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).
Static Water Column Height (H)	17.4 ft	$H = d_{bs} - d_{swl}$
Well Coordinates	Latitude / Northing	(optional for a single slug test analysis or when installation sketch is not attached)
	Longitude / Easting	

Aquifer Data

Saturated Thickness of Aquifer (b):	ft	for a confined aquifer (d_{ba}-d_{ta})
	154.7 ft	for an unconfined aquifer (d_{ba}-d_{swl})
Hydraulic Conductivity Anisotropy Ratio (K_v/K_h):		(use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d)	ft	depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)
	7.4 ft	depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)
Length of Well Screen (L)	10 ft	d_{bs}-d_{ts}
Transducer Depth from Static Water Level (T)	8.9 ft	H_i

Radius Data

Inside Radius of Well Casing (r_c)	0.08 ft	assume well screen = r_c
Radius of Downhole Equipment (r_{eq})	ft	assume 0.0 ft for pressure transducer and slug alone
Inside Radius of Packer (r_p)	ft	use 0.0 ft if packer was not used
Radius of Well (r_w)	0.34 ft	well casing plus filter pack
Outer Radius of Well Skin (r_{sk})	0.34 ft	assume $r_{sk} = r_w$ unless known

Well Corrections

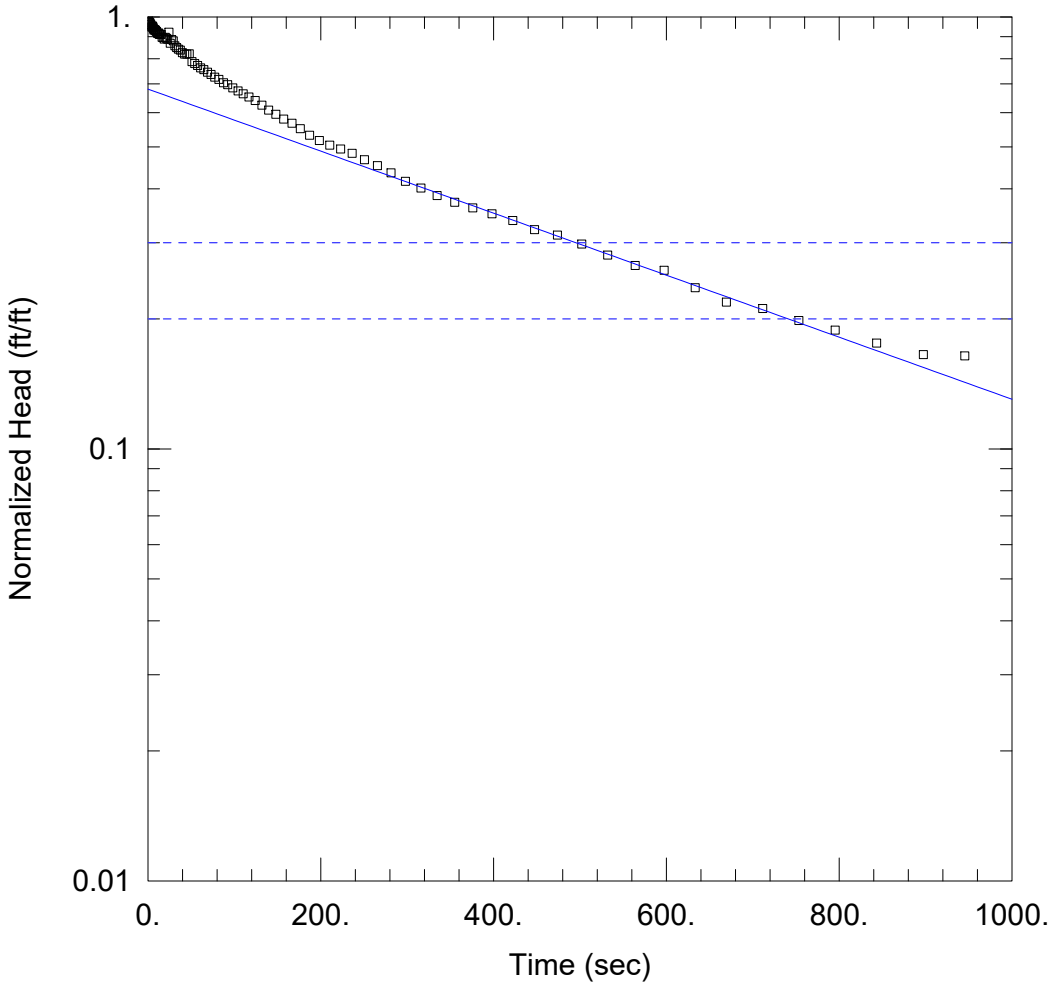
Was correction applied for effective casing radius? Yes / (No)

If so, Method: _____ n(e): _____ H(0)*: _____

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: _____ m^2/sec Gravitational acceleration: _____ m/sec^2

Comments: _____



B-51A - RISING HEAD - BR

Data Set: G:\...\Rising Head B-51 - BR.aqt
Date: 03/29/23 Time: 09:00:21

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-51A
Test Date: 03/07/2023

AQUIFER DATA

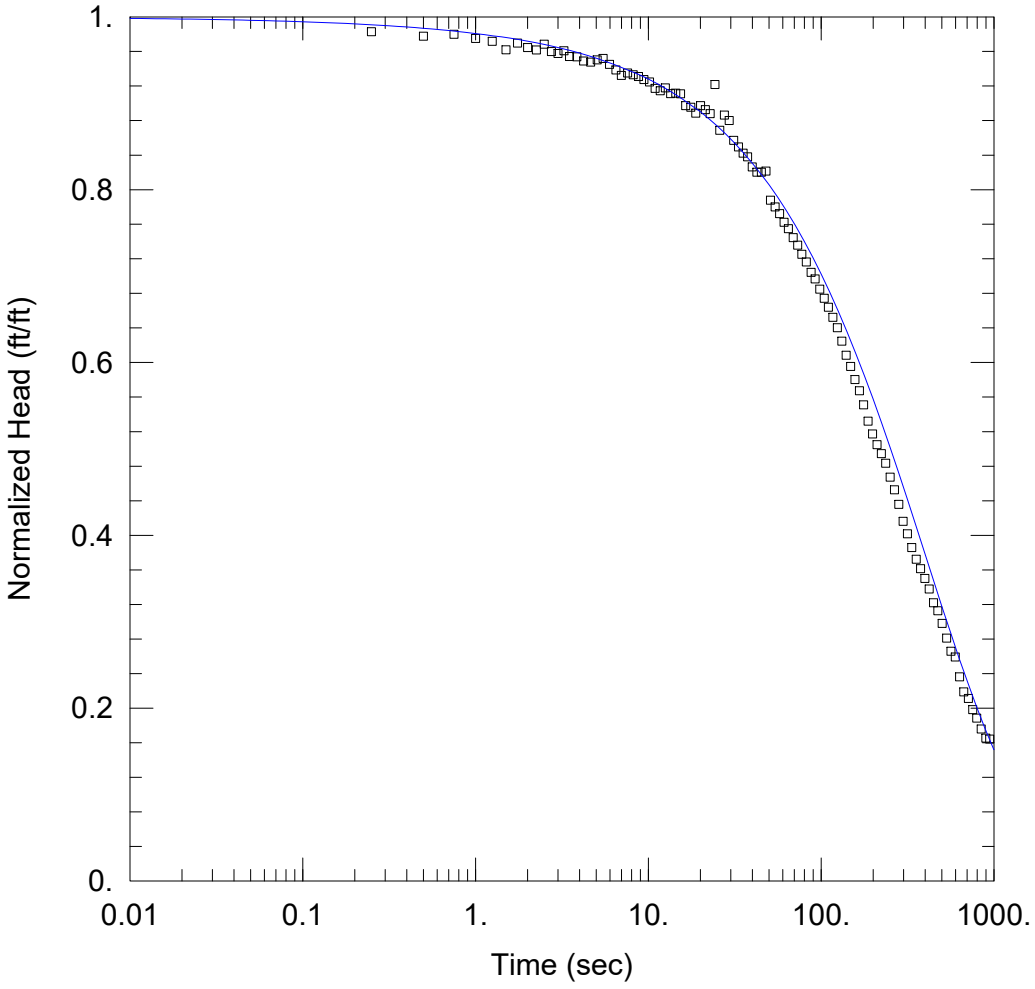
Saturated Thickness: 154.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-51A)

Initial Displacement: -1.303 ft
Total Well Penetration Depth: 17.36 ft
Casing Radius: 0.08 ft
Static Water Column Height: 17.36 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.643E-5 cm/sec
y0 = -0.8868 ft



B-51A - RISING HEAD - KGS

Data Set: G:\...\Rising Head B-51 - KGS.aqt
Date: 03/29/23 Time: 09:00:22

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-51A
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 154.7 ft

WELL DATA (B-51A)

Initial Displacement: -1.303 ft
Total Well Penetration Depth: 17.36 ft
Casing Radius: 0.08 ft
Static Water Column Height: 17.36 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

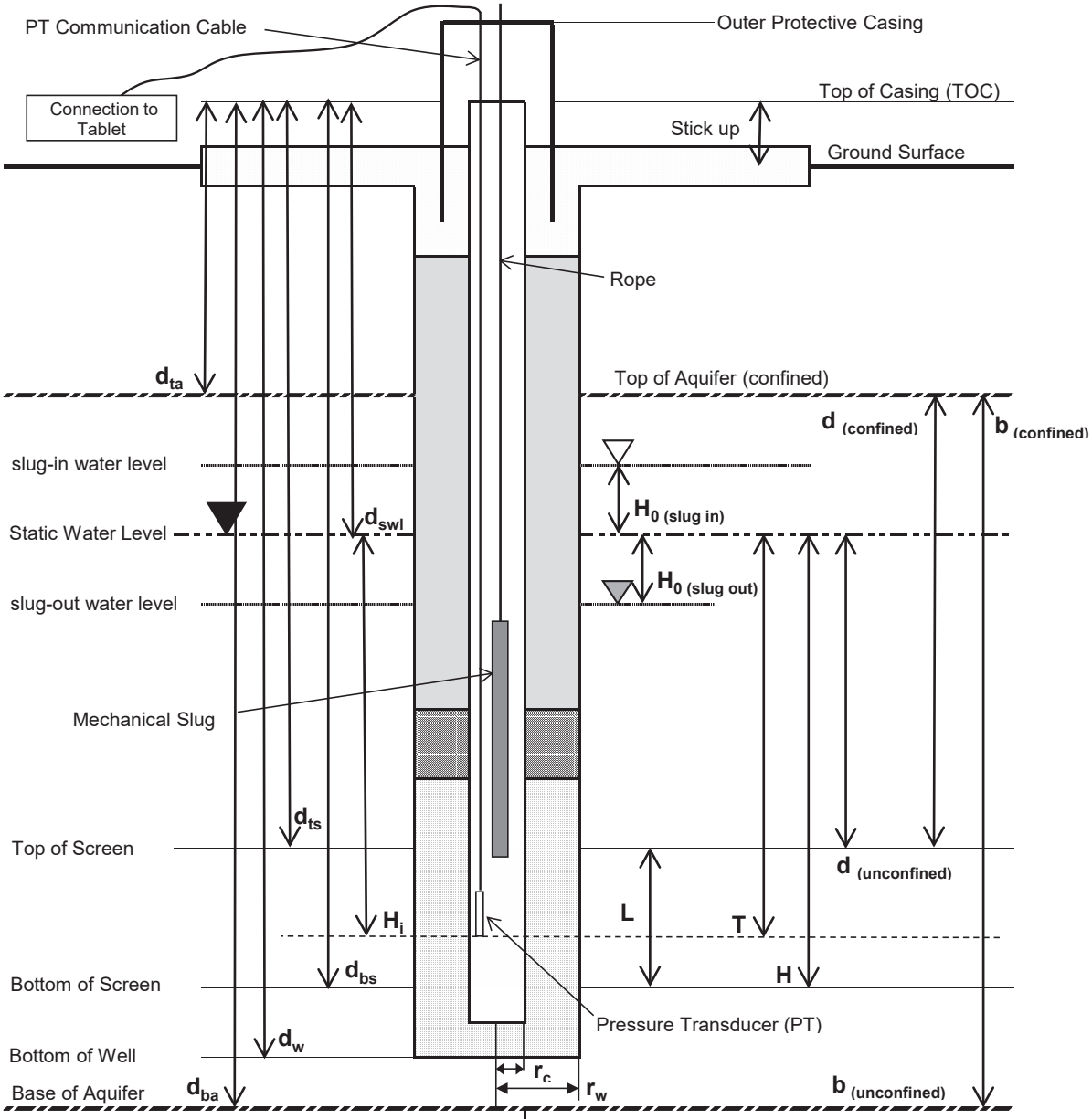
SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 5.085E-5 cm/sec
Kz/Kr = 1.
Ss = 0.0001061 ft^{-1}

WELL DIMENSIONS AND INPUT DATA FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651		
Location:	Chatham, VA	**Date:**	3/7/2023		
Schnabel No.:	22210031.100	**By:**	SGA	**Date:**	3/19/2023
Client:	Pittsylvania County	**Checked:**	SMB	**Date:**	3/29/2023



Field Measurements

From Boring Log (add stick-up if needed):

34.3	d_{ta} Depth to top of aquifer from TOC (ft)
200	d_{ba} Depth to bottom of aquifer from TOC (ft)

From Well Construction Sketch:

1.0	r_c Radius of well casing (I.D. = in)
3.5	r_w Radius of well (screen and sand pack) (in)
37.8	d_{ts} Depth to top of screen from TOC (ft)
40.8	d_{bs} Depth to bottom of screen from TOC (ft)

Measured Immediately Prior to Test

34.3	d_{swl} Depth to static water level from TOC (ft)
43.0	d_w Depth from TOC to bottom of well (ft)
4.2	H_i Height of water over transducer (ft)

AQTESOLV Variables

H_0 Observed Initial Displacement Recorded in Data File (ft)
L Length of Well Screen (d_{bs} - d_{ts}) (ft)
T Transducer Depth from Static Water Level (H_i) (ft)
H Static Water Column Height ($H = d_{bs} - d_{swl}$) (ft)
d Depth to Top of Well Screen (ft), confined ($d = d_{ts} - d_{ta}$), use 0 if well screen extends into the upper confining layer.
d Depth to Top of Well Screen (ft), unconfined ($d = d_{ts} - d_{swl}$), use 0 if well is screened across the water table.
d Depth to Top of Well Screen (ft), use 0 for fully penetrating wells
b Saturated Thickness of Aquifer, confined ($b = d_{ba} - d_{ta}$) (ft)
b Saturated Thickness of Aquifer, unconfined ($b = d_{ba} - d_{swl}$) (ft)
r_c Inside Radius of Well Casing (in)
r_w Radius of Well (well casing plus filter pack) (in)

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or Rising Head Test**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	37.8 ft	Well Casing Radius (r_c):	1.0 in	0.1 ft	
Depth to Bottom of Screen from TOC (d_{bs}):	40.8 ft	Well Screen Radius (r_w):	3.5 in	0.3 ft	
Screen Length (L):	3 ft	Depth to Top of Aquifer from TOC (d_{ta}):	34.29 ft		
Depth to Static Water Level from TOC (d_{swl}):	34.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft		
Initial head on pressure transducer (H_i)	4.17 ft	(as read from datalogger prior to testing)			

Is Aquifer Confined or Unconfined (enter "c" or "u"): U — UNCONFINED

Is Well Partially of Fully Penetrating (enter "p" or "f"): P — PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0)	1.7 ft	(Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).
Static Water Column Height (H)	6.5 ft	$H = d_{bs} - d_{swl}$
Well Coordinates	Latitude / Northing	(optional for a single slug test analysis or when installation sketch is not attached)
	Longitude / Easting	

Aquifer Data

Saturated Thickness of Aquifer (b):	ft	for a confined aquifer (d_{ba}-d_{ta})
	165.7 ft	for an unconfined aquifer (d_{ba}-d_{swl})
Hydraulic Conductivity Anisotropy Ratio (K_v/K_h):		(use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d)	ft	depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)
	3.5 ft	depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)
Length of Well Screen (L)	3 ft	d_{bs}-d_{ts}
Transducer Depth from Static Water Level (T)	4.2 ft	H_i

Radius Data

Inside Radius of Well Casing (r_c)	0.08 ft	assume well screen = r_c
Radius of Downhole Equipment (r_{eq})	ft	assume 0.0 ft for pressure transducer and slug alone
Inside Radius of Packer (r_p)	ft	use 0.0 ft if packer was not used
Radius of Well (r_w)	0.29 ft	well casing plus filter pack
Outer Radius of Well Skin (r_{sk})	0.29 ft	assume $r_{sk} = r_w$ unless known

Well Corrections

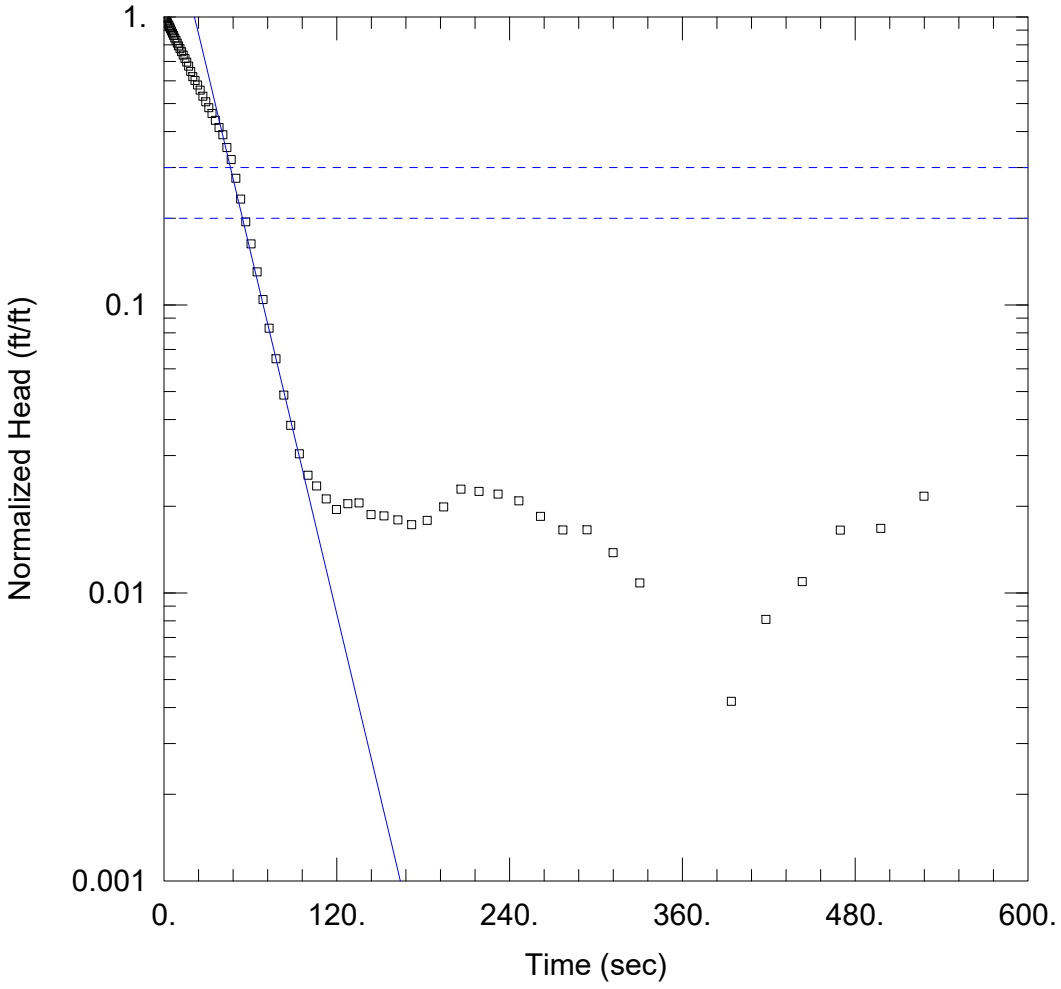
Was correction applied for effective casing radius? Yes / (No)

If so, Method: _____ n(e): _____ H(0)*: _____

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: _____ m^2/sec Gravitational acceleration: _____ m/sec^2

Comments: Silty material buildup at bottom of piezometer from 43.0 to 40.8 feet.



B-651 - FALLING HEAD - BR

Data Set: G:\...\B-651 FH - BR.aqt
Date: 03/29/23 Time: 09:28:23

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

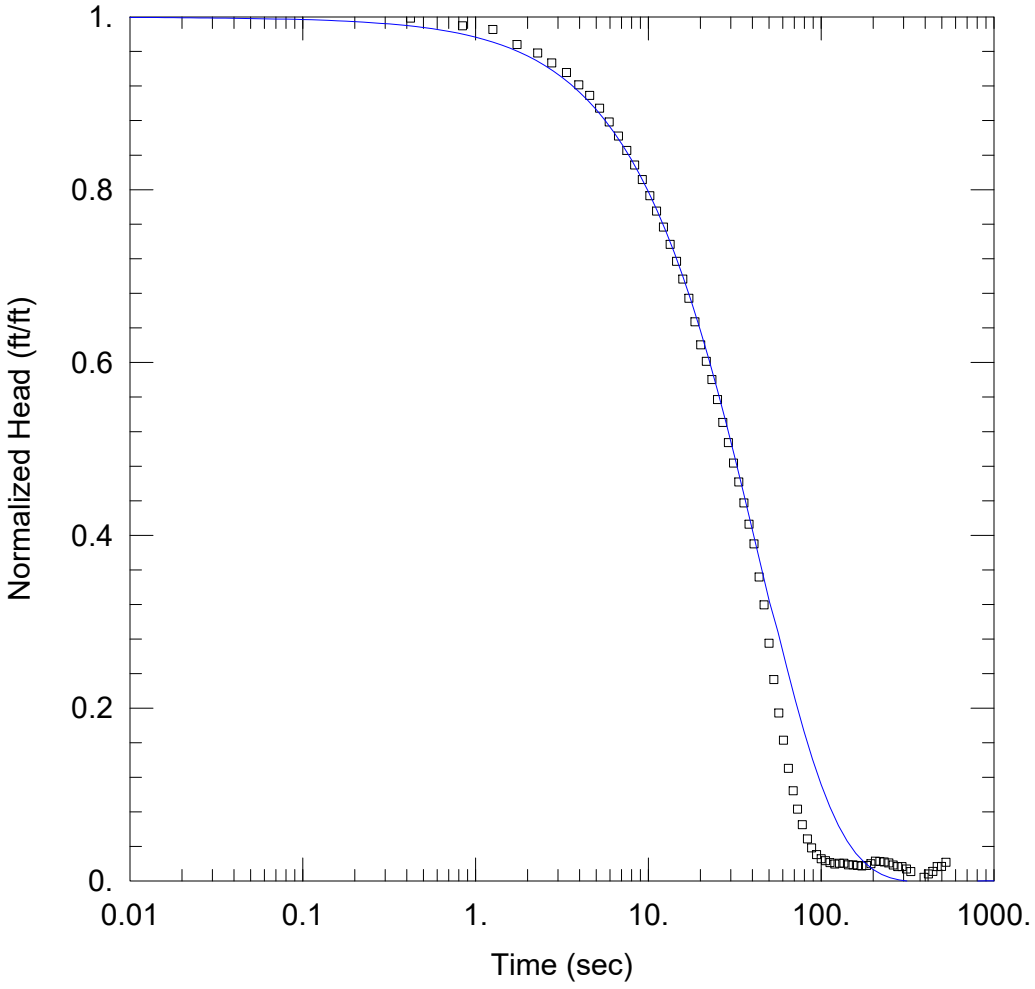
Saturated Thickness: 165.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-651)

Initial Displacement: 1.735 ft
Total Well Penetration Depth: 6.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 6.51 ft
Screen Length: 3. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00227 cm/sec
y0 = 4.835 ft



B-651 - FALLING HEAD - KGS

Data Set: G:\...\B-651 FH - KGS.aqt
Date: 03/29/23 Time: 09:28:25

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 165.7 ft

WELL DATA (B-651)

Initial Displacement: 1.735 ft
Total Well Penetration Depth: 6.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 6.51 ft
Screen Length: 3. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.001466 cm/sec
Kz/Kr = 1.
Ss = 1.15E-6 ft^{-1}

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or (Rising Head Test)**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	37.8 ft	Well Casing Radius (r_c):	1.0 in	0.1 ft	
Depth to Bottom of Screen from TOC (d_{bs}):	40.8 ft	Well Screen Radius (r_w):	3.5 in	0.3 ft	
Screen Length (L):	3 ft	Depth to Top of Aquifer from TOC (d_{ta}):	34.3 ft		
Depth to Static Water Level from TOC (d_{swl}):	34.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft		
Initial head on pressure transducer (H_i)	4.2 ft	(as read from datalogger prior to testing)			

Is Aquifer Confined or Unconfined (enter "c" or "u"):	U	UNCONFINED
Is Well Partially of Fully Penetrating (enter "p" or "f"):	P	PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0)	-1.7 ft	(Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).
Static Water Column Height (H)	6.5 ft	$H = d_{bs} - d_{swl}$
Well Coordinates	Latitude / Northing	(optional for a single slug test analysis or when installation sketch is not attached)
	Longitude / Easting	

Aquifer Data

Saturated Thickness of Aquifer (b):	ft	for a confined aquifer (d_{ba}-d_{ta})
	165.7 ft	for an unconfined aquifer (d_{ba}-d_{swl})
Hydraulic Conductivity Anisotropy Ratio (K_v/K_h):		(use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d)	ft	depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)
	3.5 ft	depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)
Length of Well Screen (L)	3 ft	d_{bs}-d_{ts}
Transducer Depth from Static Water Level (T)	4.2 ft	H_i

Radius Data

Inside Radius of Well Casing (r_c)	0.08 ft	assume well screen = r_c
Radius of Downhole Equipment (r_{eq})	ft	assume 0.0 ft for pressure transducer and slug alone
Inside Radius of Packer (r_p)	ft	use 0.0 ft if packer was not used
Radius of Well (r_w)	0.29 ft	well casing plus filter pack
Outer Radius of Well Skin (r_{sk})	0.29 ft	assume $r_{sk} = r_w$ unless known

Well Corrections

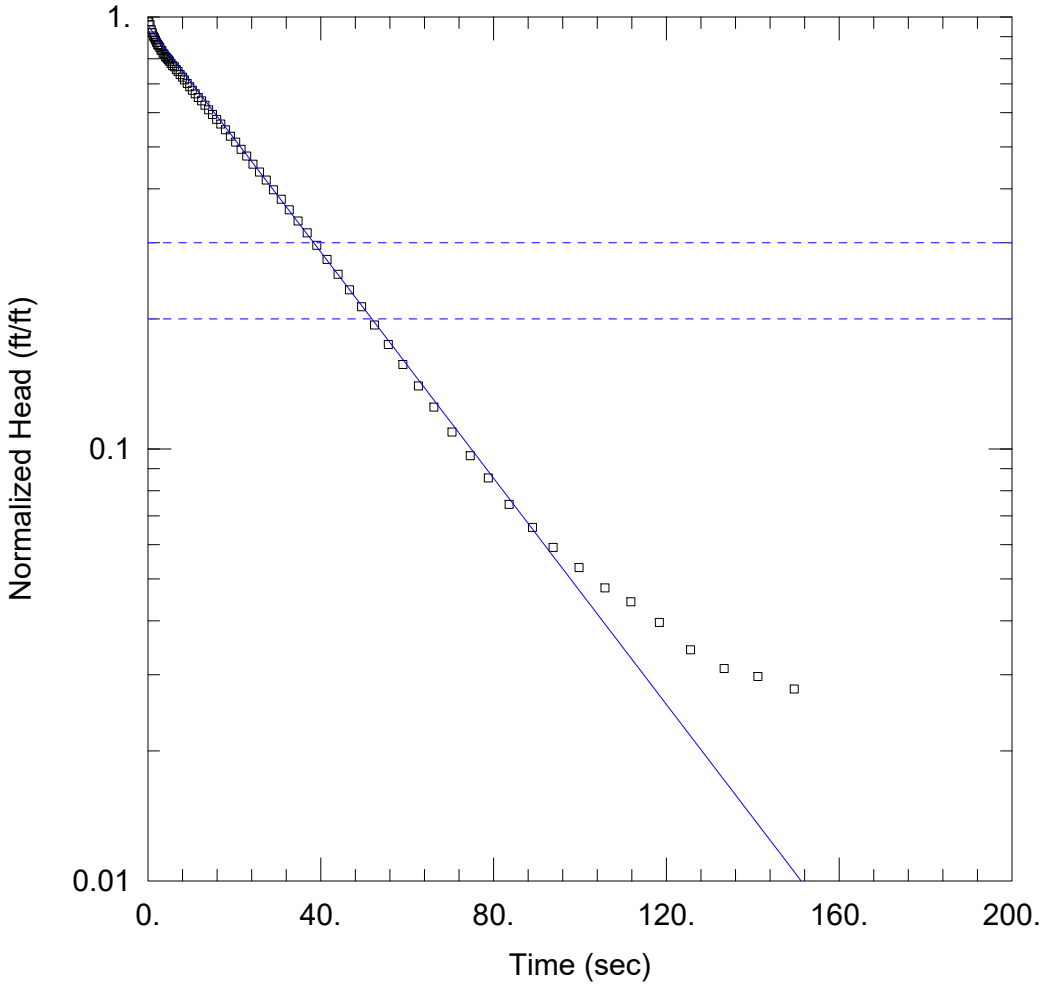
Was correction applied for effective casing radius? Yes / (No)

If so, Method: _____ n(e): _____ H(0)*: _____

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: _____ m^2/sec Gravitational acceleration: _____ m/sec^2

Comments: Silty material buildup at bottom of piezometer from 43.0 to 40.8 feet.



B-651 - RISING HEAD - BR

Data Set: G:\...\B-651 RH - BR.aqt
Date: 03/29/23 Time: 09:28:27

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

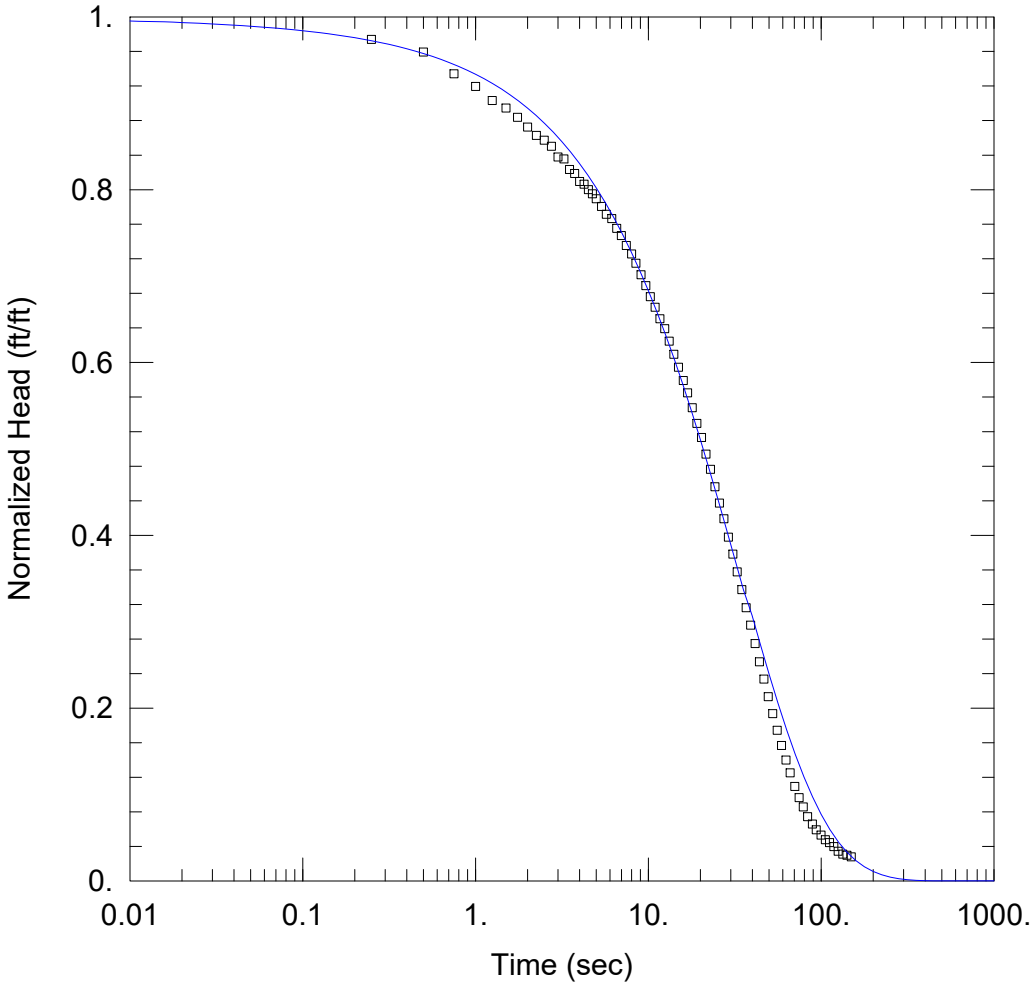
Saturated Thickness: 165.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-651)

Initial Displacement: -1.737 ft
Total Well Penetration Depth: 6.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 6.51 ft
Screen Length: 3. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001416 cm/sec
y0 = -1.657 ft



B-651 - RISING HEAD - BR

Data Set: G:\...\B-651 RH - KGS.aqt
Date: 03/29/23 Time: 09:28:28

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 165.7 ft

WELL DATA (B-651)

Initial Displacement: -1.737 ft
Total Well Penetration Depth: 6.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 6.51 ft
Screen Length: 3. ft
Well Radius: 0.29 ft

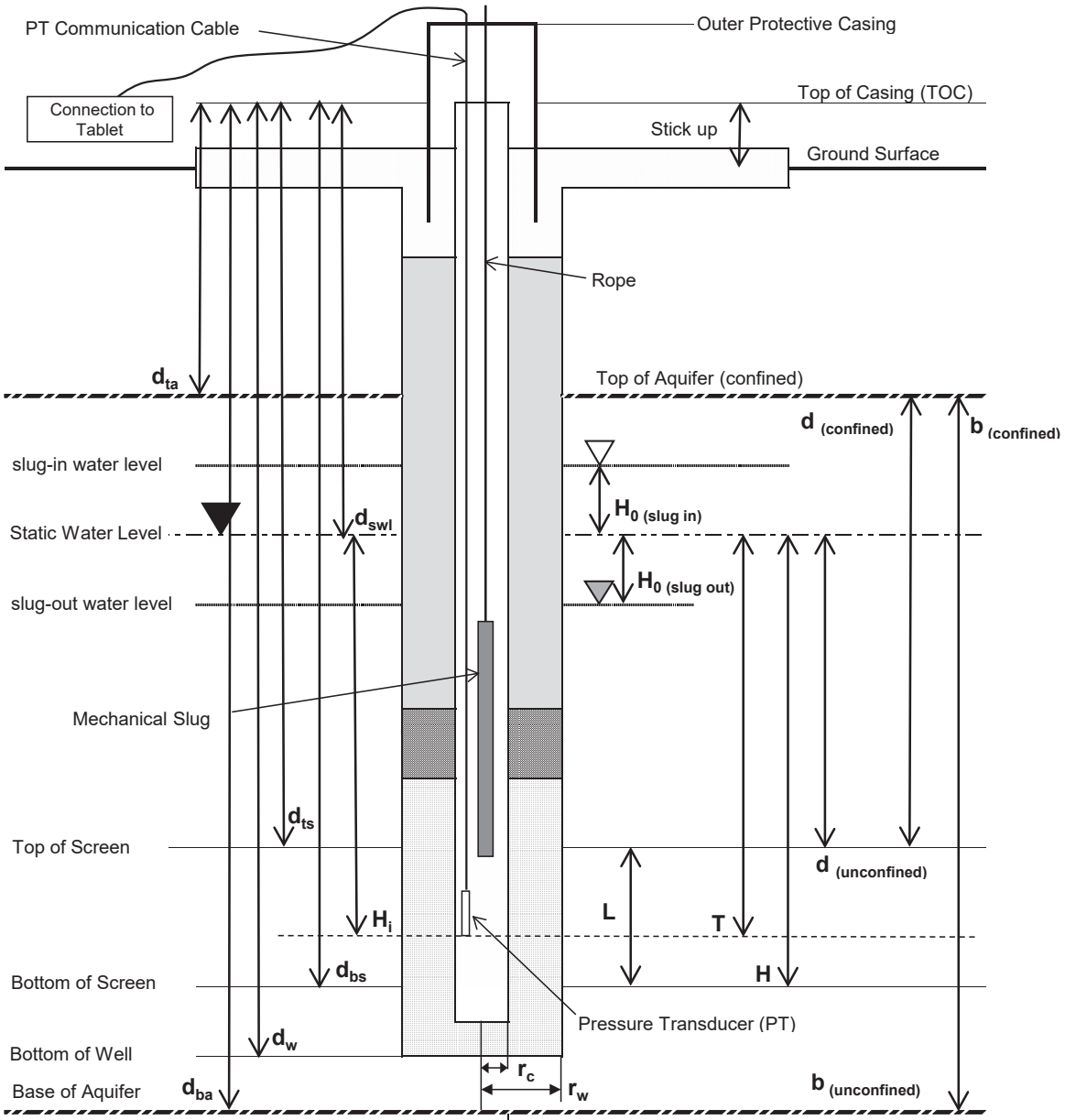
SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.001843 cm/sec
Kz/Kr = 1.
Ss = 0.0002516 ft^{-1}

WELL DIMENSIONS AND INPUT DATA FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651		
Location:	Chatham, VA	**Date:**	3/7/2023		
Schnabel No.:	22210031.100	**By:**	SGA	**Date:**	3/19/2023
Client:	Pittsylvania County	**Checked:**	SMB	**Date:**	3/29/2023



Field Measurements

From Boring Log (add stick-up if needed):

34.3	d_{ta} Depth to top of aquifer from TOC (ft)
200	d_{ba} Depth to bottom of aquifer from TOC (ft)

From Well Construction Sketch:

1.0	r_c Radius of well casing (I.D. = in)
3.5	r_w Radius of well (screen and sand pack) (in)
37.8	d_{ts} Depth to top of screen from TOC (ft)
42.8	d_{bs} Depth to bottom of screen from TOC (ft)

Measured Immediately Prior to Test

34.3	d_{swl} Depth to static water level from TOC (ft)
43.0	d_w Depth from TOC to bottom of well (ft)
4.2	H_i Height of water over transducer (ft)

AQTESOLV Variables

H_0 Observed Initial Displacement Recorded in Data File (ft)

L Length of Well Screen (d_{bs} - d_{ts}) (ft)

T Transducer Depth from Static Water Level (H_i) (ft)

H Static Water Column Height ($H = d_{bs} - d_{swl}$) (ft)

d Depth to Top of Well Screen (ft), confined ($d = d_{ts} - d_{ta}$), use 0 if well screen extends into the upper confining layer.

d Depth to Top of Well Screen (ft), unconfined ($d = d_{ts} - d_{swl}$), use 0 if well is screened across the water table.

d Depth to Top of Well Screen (ft), use 0 for fully penetrating wells

b Saturated Thickness of Aquifer, confined ($b = d_{ba} - d_{ta}$) (ft)

b Saturated Thickness of Aquifer, unconfined ($b = d_{ba} - d_{swl}$) (ft)

r_c Inside Radius of Well Casing (in)

r_w Radius of Well (well casing plus filter pack) (in)

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or Rising Head Test**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	37.8 ft	Well Casing Radius (r_c):	1.0 in	0.1 ft
Depth to Bottom of Screen from TOC (d_{bs}):	42.8 ft	Well Screen Radius (r_w):	3.5 in	0.3 ft
Screen Length (L):	5 ft	Depth to Top of Aquifer from TOC (d_{ta}):	34.29 ft	
Depth to Static Water Level from TOC (d_{swl}):	34.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft	
Initial head on pressure transducer (H_i)	4.17 ft	(as read from datalogger prior to testing)		

Is Aquifer Confined or Unconfined (enter "c" or "u"): U — UNCONFINED

Is Well Partially of Fully Penetrating (enter "p" or "f"): P — PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0): 1.7 ft (Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).

Static Water Column Height (H): 8.5 ft $H = d_{bs} - d_{swl}$

Well Coordinates: Latitude / Northing; Longitude / Easting (optional for a single slug test analysis or when installation sketch is not attached)

Aquifer Data

Saturated Thickness of Aquifer (b):

ft for a confined aquifer (d_{ba}-d_{ta})

165.7 ft for an unconfined aquifer (d_{ba}-d_{swl})

Hydraulic Conductivity Anisotropy Ratio (K_v/K_h): (use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d): ft depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)

3.5 ft depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)

Length of Well Screen (L): 5 ft d_{bs}-d_{ts}

Transducer Depth from Static Water Level (T): 4.2 ft H_i

Radius Data

Inside Radius of Well Casing (r_c): 0.08 ft assume well screen = r_c

Radius of Downhole Equipment (r_{eq}): ft assume 0.0 ft for pressure transducer and slug alone

Inside Radius of Packer (r_p): ft use 0.0 ft if packer was not used

Radius of Well (r_w): 0.29 ft well casing plus filter pack

Outer Radius of Well Skin (r_{sk}): 0.29 ft assume $r_{sk} = r_w$ unless known

Well Corrections

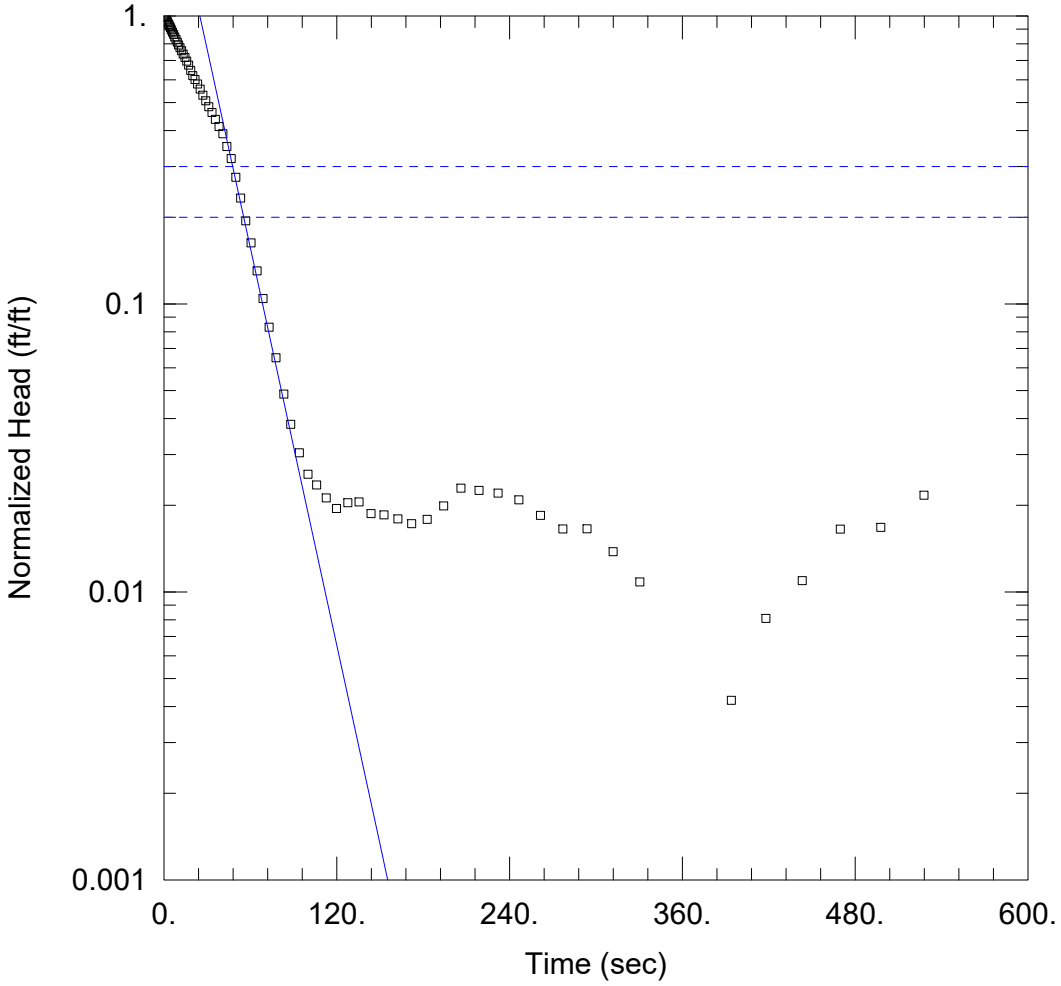
Was correction applied for effective casing radius? Yes / (No)

If so, Method: n(e): H(0)*:

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: m^2/sec Gravitational acceleration: m/sec^2

Comments: Silty material buildup at bottom of piezometer from 43.0 to 40.8 feet. Assumed flow into filter pack around clogged section.



B-651 - FALLING HEAD - BR (5 FT SCREEN)

Data Set: G:\...\B-651 FH - BR 5ft.aqt
Date: 04/07/23 Time: 11:32:49

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

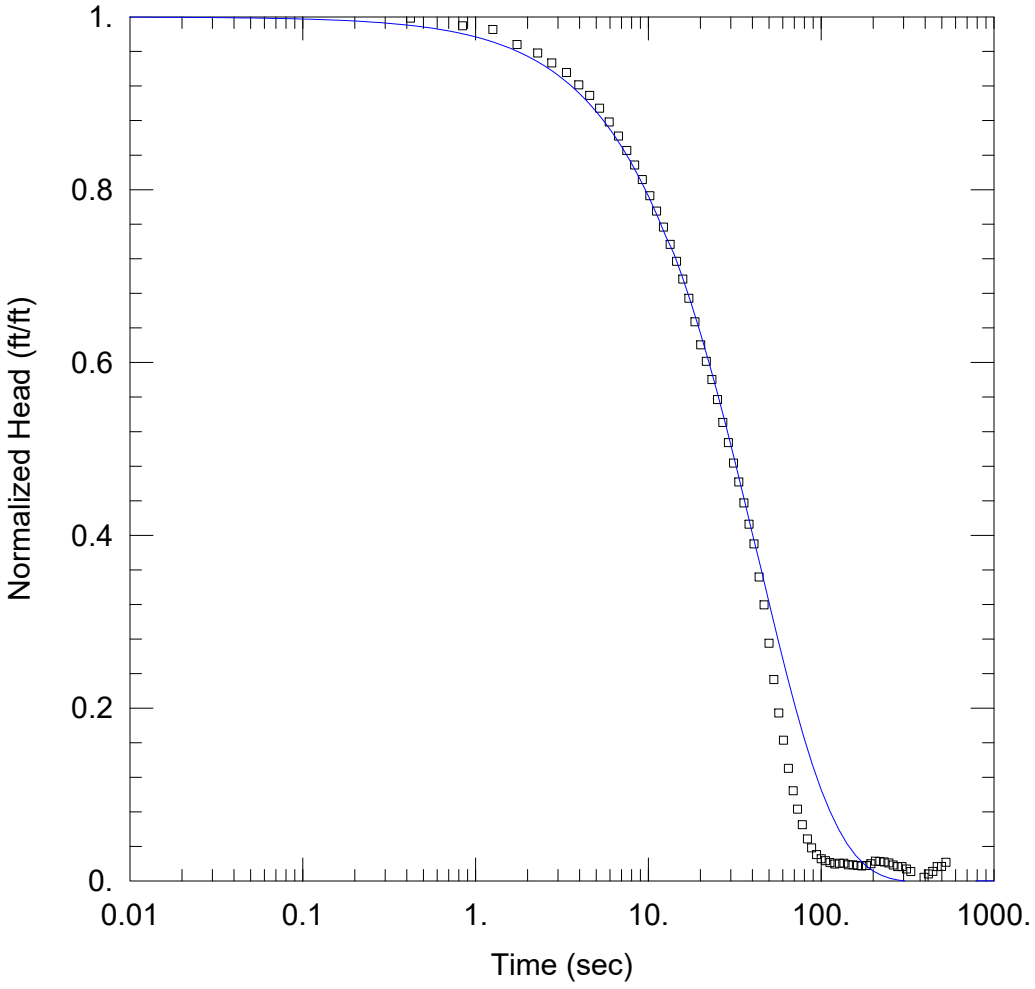
Saturated Thickness: 165.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-651)

Initial Displacement: 1.735 ft
Total Well Penetration Depth: 8.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 8.5 ft
Screen Length: 5. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001855 cm/sec
y0 = 6.497 ft



B-651 - FALLING HEAD - BR (5 FT SCREEN)

Data Set: G:\...\B-651 FH - KGS 5ft.aqt
Date: 04/07/23 Time: 11:33:00

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 165.7 ft

WELL DATA (B-651)

Initial Displacement: 1.735 ft
Total Well Penetration Depth: 8.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 8.5 ft
Screen Length: 5. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.001073 cm/sec
Kz/Kr = 1.
Ss = 4.175E-8 ft^{-1}

Schnabel ENGINEERING

AQTESOLV DATA ENTRY FORM FOR HYDRAULIC CONDUCTIVITY (SLUG TESTS)

Project:	Cherrystone Creek Watershed Dam 2A	**Well ID:**	B-651
Location:	Chatham, VA	**Date of Test:**	3/7/2023
Schnabel No.:	22210031.100	**Test Type (circle one):**	**Falling Head Test or Rising Head Test**
Client:	Pittsylvania County	**By:** SGA	**Date:** 3/19/2023
		Checked: SMB	**Date:** 3/29/2023

Well Construction Details (obtain data from boring logs and well installation sketch)

Depth Reference (Depth = 0.00 ft): from Top of Casing (TOC)

All depths listed below should be measured from the same reference point, typically the top of the open casing (TOC).

Depth to Top of Screen from TOC (d_{ts}):	37.8 ft	Well Casing Radius (r_c):	1.0 in	0.1 ft	
Depth to Bottom of Screen from TOC (d_{bs}):	42.8 ft	Well Screen Radius (r_w):	3.5 in	0.3 ft	
Screen Length (L):	5 ft	Depth to Top of Aquifer from TOC (d_{ta}):	34.3 ft		
Depth to Static Water Level from TOC (d_{swl}):	34.3 ft	Depth to Bottom of Aquifer from TOC (d_{ba}):	200 ft		
Initial head on pressure transducer (H_i)	4.2 ft	(as read from datalogger prior to testing)			

Is Aquifer Confined or Unconfined (enter "c" or "u"):	U	UNCONFINED
Is Well Partially of Fully Penetrating (enter "p" or "f"):	P	PARTIALLY

General

Observed Initial Displacement Recorded in Data File (H_0)	-1.7 ft	(Change in water level from static, use exact number from datalogger file. Value is negative for rising head (slug out) test).
Static Water Column Height (H)	8.5 ft	$H = d_{bs} - d_{swl}$
Well Coordinates	Latitude / Northing	(optional for a single slug test analysis or when installation sketch is not attached)
	Longitude / Easting	

Aquifer Data

Saturated Thickness of Aquifer (b):	ft	for a confined aquifer (d_{ba}-d_{ta})
	165.7 ft	for an unconfined aquifer (d_{ba}-d_{swl})
Hydraulic Conductivity Anisotropy Ratio (K_v/K_h):		(use 1, unless detailed information is available)

Construction

Depth to Top of Well Screen (d)	ft	depth from bottom of confining layer for a confined aquifer (d_{ts}-d_{ta}) (input 0 if well screen extends to or into the upper confining layer)
	3.5 ft	depth from top of water table for an unconfined aquifer (d_{ts}-d_{swl}) (input 0 if well is screened across the water table)
Length of Well Screen (L)	5 ft	d_{bs}-d_{ts}
Transducer Depth from Static Water Level (T)	4.2 ft	H_i

Radius Data

Inside Radius of Well Casing (r_c)	0.08 ft	assume well screen = r_c
Radius of Downhole Equipment (r_{eq})	ft	assume 0.0 ft for pressure transducer and slug alone
Inside Radius of Packer (r_p)	ft	use 0.0 ft if packer was not used
Radius of Well (r_w)	0.29 ft	well casing plus filter pack
Outer Radius of Well Skin (r_{sk})	0.29 ft	assume $r_{sk} = r_w$ unless known

Well Corrections

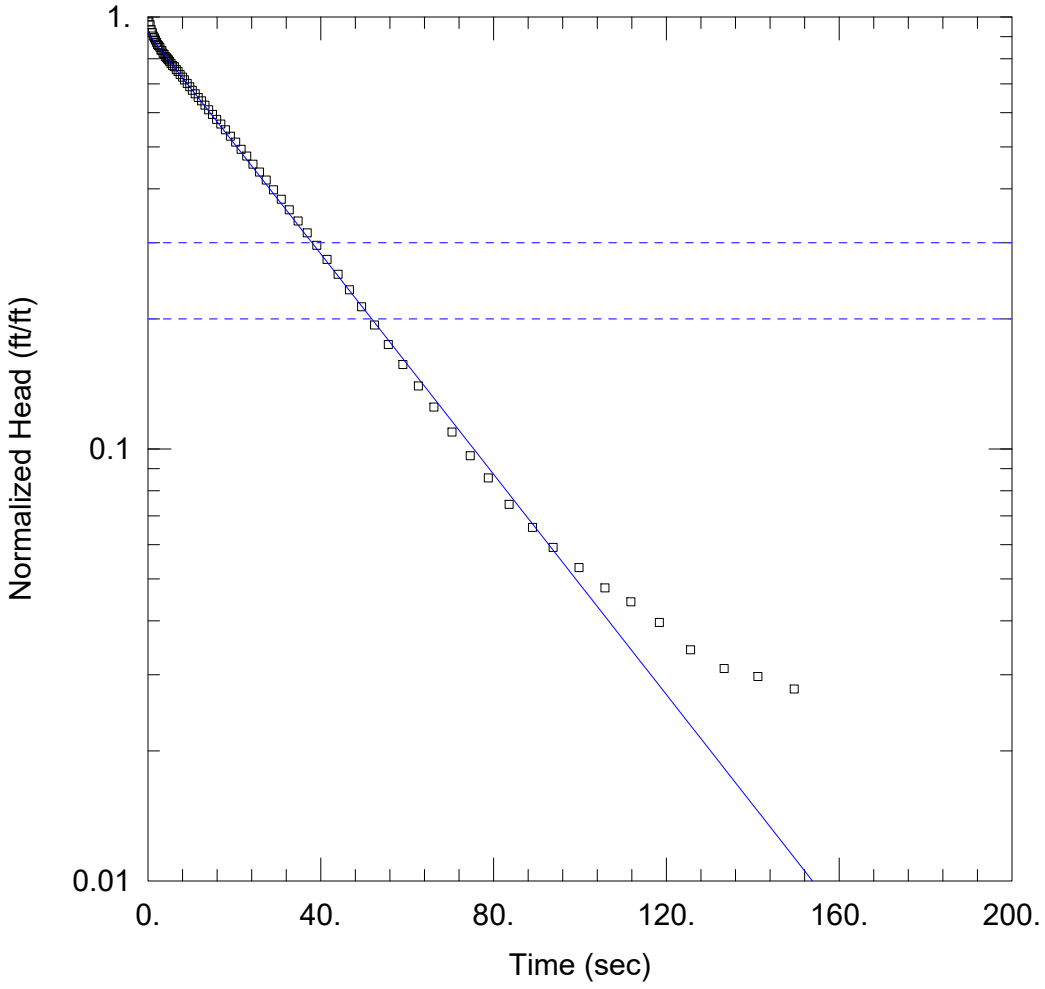
Was correction applied for effective casing radius? Yes / (No)

If so, Method: _____ n(e): _____ H(0)*: _____

Was correction applied for frictional well log? Yes / (No)

If so, Kinematic viscosity: _____ m^2/sec Gravitational acceleration: _____ m/sec^2

Comments: Silty material buildup at bottom of piezometer from 43.0 to 40.8 feet. Assumed flow into filter pack around clogged section.



B-651 - RISING HEAD - BR (5 FT SCREEN)

Data Set: G:\...\B-651 RH - BR 5 ft.aqt
Date: 04/07/23 Time: 11:33:13

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

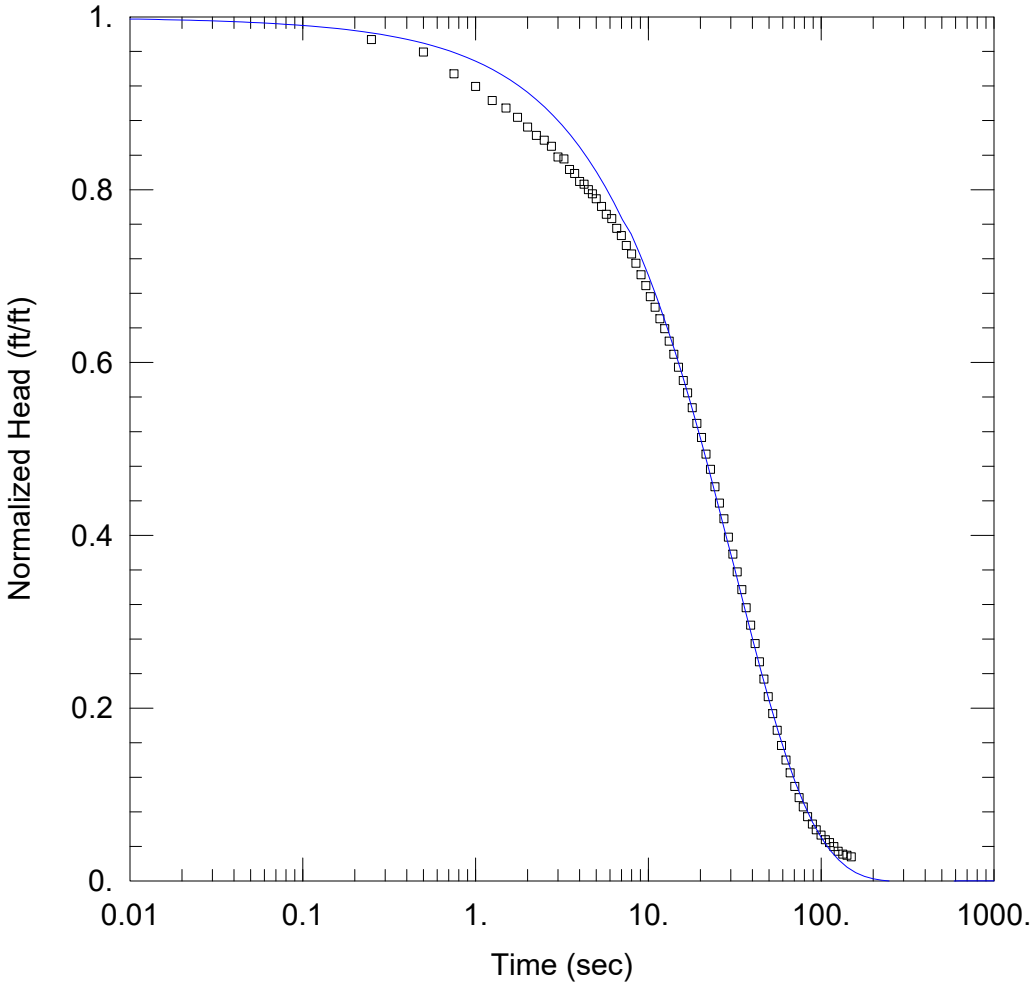
Saturated Thickness: 165.7 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B-651)

Initial Displacement: -1.737 ft
Total Well Penetration Depth: 8.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 8.5 ft
Screen Length: 5. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001029 cm/sec
y0 = -1.589 ft



B-651 - RISING HEAD - BR (5 FT SCREEN)

Data Set: G:\...\B-651 RH - Kgs 5 ft.aqt
Date: 04/07/23 Time: 11:33:25

PROJECT INFORMATION

Company: Schnabel Engineering
Client: Pittsylvania County
Project: 22210031.1
Location: Chatham, VA
Test Well: B-651
Test Date: 03/07/2023

AQUIFER DATA

Saturated Thickness: 165.7 ft

WELL DATA (B-651)

Initial Displacement: -1.737 ft
Total Well Penetration Depth: 8.51 ft
Casing Radius: 0.08 ft
Static Water Column Height: 8.5 ft
Screen Length: 5. ft
Well Radius: 0.29 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.001494 cm/sec
Kz/Kr = 1.
Ss = 2.574E-5 ft^{-1}

APPENDIX E

RESULTS OF HYDRAULIC CONDUCTIVITY TESTING IN ROCK

Rock Hydraulic Conductivity Test Methods
Rock Hydraulic Conductivity Test Results

HYDRAULIC CONDUCTIVITY TESTING IN ROCK

Brief Description of Packer Testing

Hydraulic conductivity of the rock was measured at various depth intervals in borings using the method described in the US Bureau of Reclamation Ground Water Manual (1995). Hydraulic conductivity testing was performed using either a single or double-packer assembly. The single-packer assembly provided a test interval equal to the distance between the bottom of the pneumatic packer and the bottom of the boring while the double-packer assembly provided a test interval of approximately 10 feet between two pneumatic packers. Test depth intervals, or stages, were selected in the field. Tests were typically run under five pressures with the first three steps increasing in pressure and Steps 4 and 5 decreasing in pressure. Steps 4 and 5 may not have been run if the test interval was not taking water at the maximum pressure (Step 3).

The minimum pressure applied during the test (typically Steps 1 and 5) was selected so that it exceeded the hydrostatic pressure that exists under non-pumping conditions at the test interval due to the water column in the boring. The maximum pressure applied during the test (typically Step 3) was selected so that it did not exceed the total vertical stress at the test interval to minimize the potential for hydrofracturing the formation.

Results of Packer Testing

Calculations were performed using the field test data to estimate the average hydraulic conductivity in the test section, in centimeters per second (cm/s), using the method described in the US Bureau of Reclamation (1995) and for transmissivity, in Lugeons, using the method described in Houlsby (1990). Hydraulic conductivity and transmissivity values for the test interval were typically selected from the pressure step that returned the highest value. Flow rates into the test interval at different test pressures can be interpreted using published methods (USBR, 1995; Houlsby, 1990) and suggests a dilation of fractures during the tests. A summary of the transmissivity (Lugeons) and the average hydraulic conductivity (cm/s) is presented in Table 3. Details on each test are included on the test data and calculation sheets provided in this appendix.

This testing is only an approximation of the in situ hydraulic conductivity at selected locations and variations are to be expected

Schnabel ENGINEERING

WATER PRESSURE TEST (PACKER TEST)
SHEET 1, FIELD DATA

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-51			
Location:	Chatham, VA	Hole Angle:	0	degrees from vertical		
Schnabel Project No.:	22210031.1	Test Interval:	77.6	to	87.6	ft, in hole
Client Name:	Pittsylvania County	Test Interval:	77.6	to	87.6	ft, bgs
		Test Interval:	630.6	to	620.6	EL, ft
Ground Elevation (ft msl):	708.2	Test Date:	1/20/2023			
Northing:	3469256.4	By:	ARS	Date:	1/20/2023	
Easting:	11210014.0	Checked:	SMB	Date:	3/24/2023	

TEST METHOD: Single or Double Packer Method using Multiple Pressure Tests Calc Sheet Version: 2018-08-06a

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10

TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

Rock Type:	Gneiss		Rock Unit:	D2			
Rock Weathering:	slightly to moderately weathered		RQD %:	31	to	100	
Rock Fracturing:	slightly to moderately fractured		REC %:	92	to	100	
Source of test water and clarity:		Reservoir					
Method of cleaning hole prior to testing:		Flushed with water					
Method of checking flow meter accuracy prior to test:		Calibrated with 5 gallon bucket					
Drilling Fluid (water or type of drilling mud):		Water					
Packer Brand:	AARDVARC	Packer Model:	H				
Packer Inflation Pressure:	Start of testing:	200	psi	End:	200	psi	
Packer Length (length of black rubber bladder):		2.1	feet				
Method: Single (1) or double (2) packer (Enter 1 or 2):		2					
Interval below base of packer, Method 1 (single packer test), A_1:			feet				
Interval between packers, Method 2 (double packer test), A_2:		10.0	feet				
Depth of hole at time of test:		97.6	vertical ft below ground surface				
Depth to top of rock (thickness of soil interval), R_d:		72.6	vertical feet below ground surface				
Diameter of borehole, d:		3.0	inches	0.25	feet		
Radius of the borehole, r:		0.13	feet				
Depth to water table (thickness of unsaturated material above water table), U:		46.0	feet	19.9	psi		
Depth to top of impermeable zone:		200.0	feet				
Estimated porosity of test section:		10%					
Thickness of saturated material above a relatively impermeable bed, S:		154.0	feet				
Depth to top of test section (bottom of upper packer), h_t:		77.6	feet bgs	33.6	psi		
Depth to bottom of test section (top of lower packer if double packer used, bottom of hole for a single packer, D):		87.6	feet bgs				
Is test section above or below water table?		below					
For tests above water table determine h_1, the distance from gauge to bottom of test interval:			feet		psi		
For tests below the water table determine h_1, the distance between the gauge and the water table:		47.4	feet	20.5	psi		
Friction Loss Parameters							
Length of pipe over which head loss occurs (distance from gauge to the bottom of the top packer):		99.0	feet				
Height of pressure gauge above the ground surface at boring:		1.4	feet ags				
Length of pipe/hose from pressure gauge to top of pipe in boring:		20.0	feet				
Number of 90° Elbows downstream of pressure gauge:		4					
Number of 45° elbows downstream of pressure gauge:		0					
Pipe Material (iron, steel, pvc, rubber hose, black plastic):		steel					
Pipe Outside Diameter (measured with Caliper):		2.75	inches				
Pipe Inside Diameter (measured with Caliper):		2.380	inches				
Pipe Nominal Diameter (approx inside diameter):		2.00	inches				
Pipe Schedule:		NQ Rods					
Approximate Water Temperature		40	°F				

Schnabel ENGINEERING

WATER PRESSURE TEST (PACKER TEST)
SHEET 1b, FIELD TEST PARAMETERS

TEST LIMITATIONS

Have the limitations of the test and calculation been met?

The value of S must be greater or equal to 5A	True
The value A/d must be less than 5.	True
Packer length must be >=10r for double packer setup	True

CALCULATE WATER INJECTION PRESSURES TO BE APPLIED DURING THE TEST

Estimated Confining Pressure, per foot of material

Maximum pressure per foot of rock, p_{Rmax}:	1	psi/ft	2.3	ft of water
Maximum allowable pressure per foot of soil, p_{Smax}:	0.5	psi/ft	1.2	ft of water
For reference, the pressure at the center of the test interval applied by the head of water standing in pipe:	36.4	psi	84.0	ft of water

Target maximum effective pressure for this test ($P_{t\,max}$):

$(R_d * P_{Smax}) + [(h_t - R_d)*P_{Rmax})]$	46.3	psi	46.3	psi

Maximum Allowable Water Injection Gauge Pressure (pressure at gauge during test)

Estimated maximum flow for this test:	1	gpm		
Estimated frictional pressure loss (P_L) for this test:	0.0	psi	0.0	ft of water
Maximum Allowable Gauge Pressure for this test: Ptmax - h_1	26	psi	25.8	psi
Percent of Maximum Allowable Pressure to be Applied	80%			

Summary of Target Water Injection Pressures - Suggested Values for GAUGE Pressure

Step 1, Minimum Pressure, approx 33% of maximum	7	psi	
Step 2, approx 67% of maximum	14	psi	
Step 3, Maximum Pressure	21	psi	
Step 4, approx 67% of maximum	14	psi	
Step 5, approx 33% of maximum	7	psi	
Proposed **Packer Inflation Pressure** at tank gauge (for gas):	126	psi	
Maximum **Packer Inflation Pressure** at tank gauge (for gas):	564	psi	**DO NOT EXCEED**

Summary of Target Water Injection Pressures - Suggested Values for EFFECTIVE Pressure

Step 1, approx 33% of maximum	12	psi	
Step 2, approx 67% of maximum	25	psi	
Step 3, Maximum Effective Pressure	37	psi	
Step 4, approx 67% of maximum	25	psi	
Step 5, approx 33% of maximum	12	psi	44.00

AARDVARK, QSP, & ~~GEOPRO BIMBAR~~ PACKERS - MAX. PACKER INFLATION PRESSURE TO BE APPLIED

USE GEOPRO CALCULATION (factors in water level)

Calculated Packer Inflation Pressure for test: G = [(Dp x psi/foot of water) + Sp + Pp] * 1.1	**126**	psi
Unconfined packer pressure rating (**Sp**) for the borehole size (see chart, refs tab):	60	psi
Dp = Depth to top of test section or bottom of top packer (feet)	77.6	ft
Pp = Injection pump pressure (psi) or maximum proposed gauge pressure	21	psi
Confined pressure rating for borehole size (from chart, references tab):	550	psi
Max packer inflation pressure (Confined packer pressure + [(Dp - Dw) * 0.433])	564	psi
Dw = Depth to static water level in borehole (feet)	46	ft
Does calculated packer inflation pressure (G) exceed calculated max packer inflation pressure?		NO

If yes, then packer may fail during test.

Schnabel ENGINEERING

WATER PRESSURE (PACKER) TEST
SHEET 2, FIELD DATA

Project:	Cherrystone Creek Dam 2A		Boring No.:	B-51			
Location:	Chatham, VA		Test Interval:	77.6	to	87.6	bgs
Schnabel Project No.:	22210031.10		Test Interval:	630.6	to	620.6	EL
Client Name:	Pittsylvania County		Test Date:	1/20/2023			
By:	ARS	Date: 1/20/2023	Checked:	SMB		Date: 3/24/2023	

Time at start of setup:	8:00 AM	Time at end of tear down:	11:00 AM
Time at start of test:	8:50 AM	Time at end of test:	9:35 AM

Step 1 Start Time: 8:50 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
8	0		17832	--
8	1		17849	17.0
8	2		17866	17.0
8	3		17883	17.0
8	4		17900	17.0
8	5		17918	18.0
8	6			
8	7			
8	8			
8	9			
8	10			
8	11			
8	12			
8	13			
8	14			
8	15			
		Average		17.2
		Selected stabilized flow rate		17.0
		Selected pressure for calculations		15

Step 2 Start Time: 9:05 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
15	0		17944.0	--
15	1		17960.0	16.0
15	2		17978.0	18.0
15	3		17997.0	19.0
15	4		18015.0	18.0
15	5		18031.0	16.0
15	6		18047.0	16.0
15	7		18064.0	17.0
15	8			
15	9			
15	10			
15	11			
15	12			
15	13			
15	14			
15	15			
		Average		17.1
		Selected stabilized flow rate		17.0
		Selected pressure for calculations		18

Step 3 Start Time: 9:15 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
22	0		18073.0	--
22	1		18091.0	18.0
22	2		18109.0	18.0
22	3		18127.0	18.0
22	4		18145.0	18.0
22	5		18163.0	18.0
22	6			
22	7			
22	8			
22	9			
22	10			
22	11			
22	12			
22	13			
22	14			
22	15			
		Average		18.0
		Selected stabilized flow rate		18.0
		Selected pressure for calculations		22

Step 4 Start Time: 9:27 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
15	0		18181.0	--
15	1		18196.0	15.0
15	2		18212.0	16.0
15	3		18227.0	15.0
15	4		18242.0	15.0
15	5			
		Average		15.3
		Selected stabilized flow rate		15.5
		Selected pressure for calculations		15

Step 5 Start Time: 9:35 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
8	0		18248.0	--
8	1		18263.0	15.0
8	2		18277.0	14.0
8	3		18292.0	15.0
8	4		18306.0	14.0
8	5			
		Average		14.5
		Selected stabilized flow rate		14.5
		Selected pressure for calculations		8

Comments:

Boring Log remark from 82.6 to 87.6 feet: "50% drilling return water."

WATER PRESSURE TEST (PACKER TEST)
SHEET 3, CALCULATIONS

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-51		
Location:	Chatham, VA	Test Interval:	77.6	to	87.6 ft, bgs
Schnabel Project No.:	22210031.1	Test Interval:	630.6	to	620.6 EL, ft
Client Name:	Pittsylvania County	Test Date:	1/20/2023		
		By:	ARS		
Ground Elevation (ft msl):	708.2	Checked:	SMB		
Northing:	3469256.4				
Easting:	11210014.0				

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10
TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

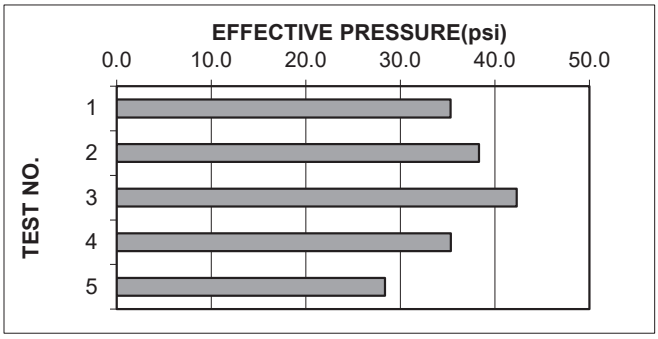
Results of Permeability Calculations
Multiple Step Test

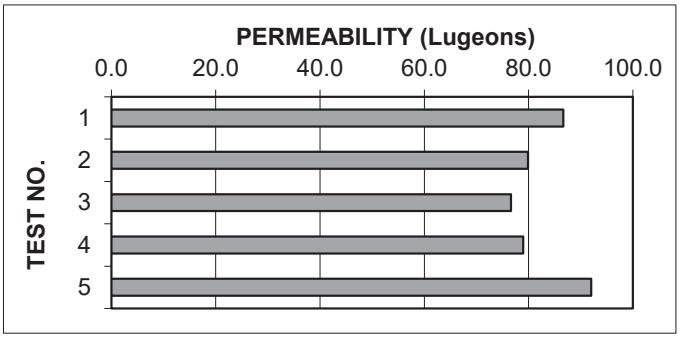
Step	Flow, Q (gpm)	Pressure (psi)		Lugeons	Hydraulic Conductivity (ft/sec)	Hydraulic Conductivity (cm/sec)
		Gauge	Effective			
1	17	15	35	87	3.4E-05	1.0E-03
2	17	18	38	80	3.1E-05	9.5E-04
3	18	22	42	77	3.0E-05	9.1E-04
4	16	15	35	79	3.1E-05	9.4E-04
5	15	8	28	92	3.6E-05	1.1E-03
AVERAGE	16	16	36	83	3.2E-05	9.8E-04
VALUE (Maximum*)	18	22	42	92	3.6E-05	1.1E-03

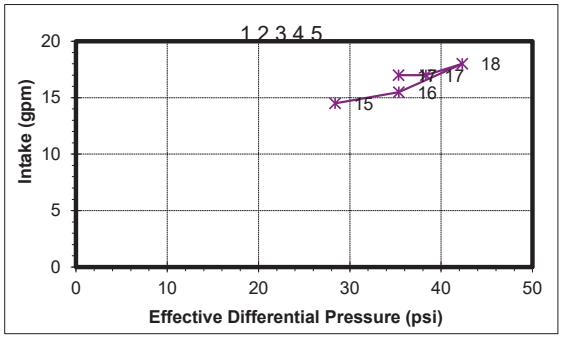
*Unless otherwise selected

Rock Description of Tested Interval:
D2, Gneiss, slightly to moderately weathered, slightly to moderately fractured, RQD %: 31 to 100, REC %: 92 to 100

Test Interpretation Turbulent
Turbulent flow through fractures, likely the result of fast moving water through wider fractures. Selected permeability is from the step with maximum permeability.







Schnabel ENGINEERING

WATER PRESSURE TEST (PACKER TEST)
SHEET 1, FIELD DATA

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-51			
Location:	Chatham, VA	Hole Angle:	0	degrees from vertical		
Schnabel Project No.:	22210031.1	Test Interval:	87.6	to	97.6	ft, in hole
Client Name:	Pittsylvania County	Test Interval:	87.6	to	97.6	ft, bgs
		Test Interval:	620.6	to	610.6	EL, ft
Ground Elevation (ft msl):	708.2	Test Date:	1/20/2023			
Northing:	3469256.4	By:	PWA	Date:	1/20/2023	
Easting:	11210014.0	Checked:	SMB	Date:	3/24/2023	

TEST METHOD: Single or Double Packer Method using Multiple Pressure Tests — Calc Sheet Version: 2018-08-06a

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10

TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

Rock Type:	Gneiss, Schist		Rock Unit:	D1/D2		
Rock Weathering:	slightly to moderately weathered		RQD %:	55	to	80
Rock Fracturing:	slightly to moderately fractured		REC %:	93	to	100

Source of test water and clarity:	Reservoir, clear			
Method of cleaning hole prior to testing:	Flushed with water			
Method of checking flow meter accuracy prior to test:	Calibrated with 5 gallon bucket			
Drilling Fluid (water or type of drilling mud):	Water			
Packer Brand:	AARDVARC	Packer Model:	H	
Packer Inflation Pressure: Start of testing:	200	psi	End: 200	psi
Packer Length (length of black rubber bladder):	2.1	feet		
Method: Single (1) or double (2) packer (Enter 1 or 2):	1			
Interval below base of packer, Method 1 (single packer test), A_1:	10.0	feet		
Interval between packers, Method 2 (double packer test), A_2:		feet		
Depth of hole at time of test:	97.6	vertical ft below ground surface		
Depth to top of rock (thickness of soil interval), R_d:	72.6	vertical feet below ground surface		
Diameter of borehole, d:	3.0	inches	0.25	feet
Radius of the borehole, r:	0.13	feet		
Depth to water table (thickness of unsaturated material above water table), U:	46.0	feet	19.9	psi
Depth to top of impermeable zone:	200.0	feet		
Estimated porosity of test section:	10%			
Thickness of saturated material above a relatively impermeable bed, S:	154.0	feet		
Depth to top of test section (bottom of upper packer), h_t:	87.6	feet bgs	37.9	psi
Depth to bottom of test section (top of lower packer if double packer used, bottom of hole for a single packer, D):	97.6	feet bgs		
Is test section above or below water table?	below			
For tests above water table determine h_1, the distance from gauge to bottom of test interval:		feet		psi
For tests below the water table determine h_1, the distance between the gauge and the water table:	47.4	feet	20.5	psi

Friction Loss Parameters

Length of pipe over which head loss occurs (distance from gauge to the bottom of the top packer):	109.0	feet
Height of pressure gauge above the ground surface at boring:	1.4	feet ags
Length of pipe/hose from pressure gauge to top of pipe in boring:	20.0	feet
Number of 90° Elbows downstream of pressure gauge:	4	
Number of 45° elbows downstream of pressure gauge:	0	
Pipe Material (iron, steel, pvc, rubber hose, black plastic):	steel	
Pipe Outside Diameter (measured with Caliper):	2.75	inches
Pipe Inside Diameter (measured with Caliper):	2.380	inches
Pipe Nominal Diameter (approx inside diameter):	2.00	inches
Pipe Schedule:	NQ Rods	
Approximate Water Temperature	40	°F

WATER PRESSURE TEST (PACKER TEST)
SHEET 1b, FIELD TEST PARAMETERS

TEST LIMITATIONS

Have the limitations of the test and calculation been met?

The value of S must be greater or equal to 5A	True
The value A/d must be less than 5.	True
Packer length must be >=10r for double packer setup	-

CALCULATE WATER INJECTION PRESSURES TO BE APPLIED DURING THE TEST

Estimated Confining Pressure, per foot of material

Maximum pressure per foot of rock, p_{Rmax}:	1	psi/ft	2.3	ft of water
Maximum allowable pressure per foot of soil, p_{Smax}:	0.5	psi/ft	1.2	ft of water
For reference, the pressure at the center of the test interval applied by the head of water standing in pipe:	40.7	psi	94.0	ft of water

Target maximum effective pressure for this test ($P_{t\,max}$):

$(R_d * P_{Smax}) + [(h_t - R_d)*P_{Rmax})]$	56.3	psi	56.3	psi

Maximum Allowable Water Injection Gauge Pressure (pressure at gauge during test)

Estimated maximum flow for this test:	1	gpm		
Estimated frictional pressure loss (P_L) for this test:	0.0	psi	0.0	ft of water
Maximum Allowable Gauge Pressure for this test: Ptmax - h_1	36	psi	35.8	psi
Percent of Maximum Allowable Pressure to be Applied	80%			

Summary of Target Water Injection Pressures - Suggested Values for GAUGE Pressure

Step 1, Minimum Pressure, approx 33% of maximum	9	psi	
Step 2, approx 67% of maximum	19	psi	
Step 3, Maximum Pressure	29	psi	
Step 4, approx 67% of maximum	19	psi	
Step 5, approx 33% of maximum	9	psi	
Proposed **Packer Inflation Pressure** at tank gauge (for gas):	140	psi	
Maximum **Packer Inflation Pressure** at tank gauge (for gas):	568	psi	**DO NOT EXCEED**

Summary of Target Water Injection Pressures - Suggested Values for EFFECTIVE Pressure

Step 1, approx 33% of maximum	15	psi	
Step 2, approx 67% of maximum	30	psi	
Step 3, Maximum Effective Pressure	45	psi	
Step 4, approx 67% of maximum	30	psi	
Step 5, approx 33% of maximum	15	psi	44.00

AARDVARK, QSP, & ~~GEOPRO BIMBAR~~ PACKERS - MAX. PACKER INFLATION PRESSURE TO BE APPLIED

USE GEOPRO CALCULATION (factors in water level)

Calculated Packer Inflation Pressure for test: G = [(Dp x psi/foot of water) + Sp + Pp] * 1.1	**140**	psi
Unconfined packer pressure rating (**Sp**) for the borehole size (see chart, refs tab):	60	psi
Dp = Depth to top of test section or bottom of top packer (feet)	87.6	ft
Pp = Injection pump pressure (psi) or maximum proposed gauge pressure	29	psi
Confined pressure rating for borehole size (from chart, references tab):	550	psi
Max packer inflation pressure (Confined packer pressure + [(Dp - Dw) * 0.433])	568	psi
Dw = Depth to static water level in borehole (feet)	46	ft
Does calculated packer inflation pressure (G) exceed calculated max packer inflation pressure?		NO

If yes, then packer may fail during test.

WATER PRESSURE (PACKER) TEST
SHEET 2, FIELD DATA

Schnabel ENGINEERING

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-51			
Location:	Chatham, VA	Test Interval:	87.6	to	97.6	bgs
Schnabel Project No.:	22210031.10	Test Interval:	620.6	to	610.6	EL
Client Name:	Pittsylvania County	Test Date:	1/20/2023			
By: PWA	Date: 1/20/2023	Checked: SMB		Date:	3/24/2023	

Time at start of setup:	12:00 PM	Time at end of tear down:	2:30 PM
Time at start of test:	1:15 PM	Time at end of test:	2:45 PM

Step 1 Start Time: 1:15 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
9	0		17334	--
9	1		17339.3	5.3
9	2		17345.5	6.2
9	3		17349.6	4.1
9	4		17354.7	5.1
9	5		17359.7	5.0
9	6		17364.8	5.1
9	7		17369.7	4.9
9	8		17374.7	5.0
9	9		17379.8	5.1
9	10		17385.1	5.3
9	11		17389.9	4.8
9	12		17395.1	5.2
9	13		17400	4.9
9	14		17406	6.0
9	15		17410.7	4.7
		Average		5.1
		Selected stabilized flow rate		5.0
		Selected pressure for calculations		9

Step 2 Start Time: 1:30 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
19	0		17436.0	--
19	1		17442.5	6.5
19	2		17450.0	7.5
19	3		17457.8	7.8
19	4		17465.4	7.6
19	5		17473.0	7.6
19	6		17482.0	9.0
19	7		17488.6	6.6
19	8		17496.4	7.8
19	9		17504.2	7.8
19	10		17512.3	8.1
19	11			
19	12			
19	13			
19	14			
19	15			
		Average		7.6
		Selected stabilized flow rate		7.5
		Selected pressure for calculations		19

Step 3 Start Time: 2:10 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
28	0		17542.7	--
28	1		17553.4	10.7
28	2		17566.6	13.2
28	3		17577.3	10.7
28	4		17589.5	12.2
28	5		17602.0	12.5
28	6		17614.3	12.3
28	7		17627.5	13.2
28	8		17640.0	12.5
28	9		17653.0	13.0
28	10		17665.8	12.8
28	11			
28	12			
28	13			
28	14			
28	15			
		Average		12.3
		Selected stabilized flow rate		12.3
		Selected pressure for calculations		28

Step 4 Start Time: 2:20 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
19	0		17675.0	--
19	1		17687.1	12.1
19	2		17697.8	10.7
19	3		17709.2	11.4
19	4		17719.8	10.6
19	5		17731.0	11.2
		Average		11.2
		Selected stabilized flow rate		11.2
		Selected pressure for calculations		19

Step 5 Start Time: 2:25 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
9	0		17736.0	--
9	1		17746.0	10.0
9	2		17755.4	9.4
9	3		17765.1	9.7
9	4		17774.3	9.2
9	5		17781.0	6.7
		Average		9.0
		Selected stabilized flow rate		9.0
		Selected pressure for calculations		9

Comments:

Boring log remark from 87.6 to 97.6 feet: "No drilling return water."

WATER PRESSURE TEST (PACKER TEST)
SHEET 3, CALCULATIONS

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-51		
Location:	Chatham, VA	Test Interval:	87.6	to	97.6 ft, bgs
Schnabel Project No.:	22210031.1	Test Interval:	620.6	to	610.6 EL, ft
Client Name:	Pittsylvania County	Test Date:	1/20/2023		
		By:	PWA		
Ground Elevation (ft msl):	708.2	Checked:	SMB		
Northing:	3469256.4				
Easting:	11210014.0				

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10
TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

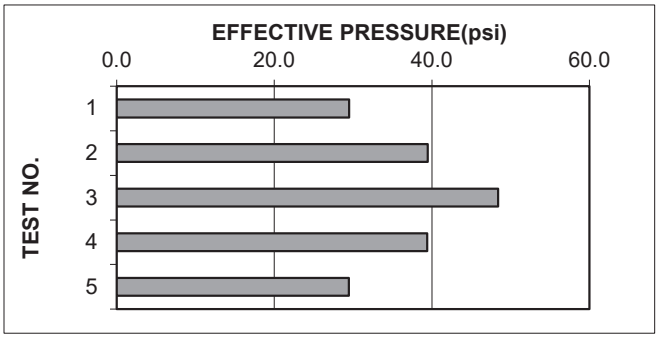
Results of Permeability Calculations
Multiple Step Test

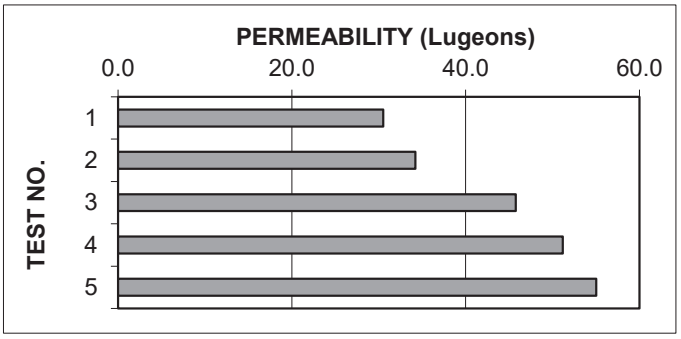
Step	Flow, Q (gpm)	Pressure (psi)		Lugeons	Hydraulic Conductivity (ft/sec)	Hydraulic Conductivity (cm/sec)
		Gauge	Effective			
1	5	9	29	31	1.1E-05	3.5E-04
2	8	19	39	34	1.3E-05	3.9E-04
3	12	28	48	46	1.7E-05	5.2E-04
4	11	19	39	51	1.9E-05	5.9E-04
5	9	9	29	55	2.1E-05	6.3E-04
AVERAGE	9	17	37	43	1.6E-05	5.0E-04
VALUE (Maximum*)	12	28	48	55	2.1E-05	6.3E-04

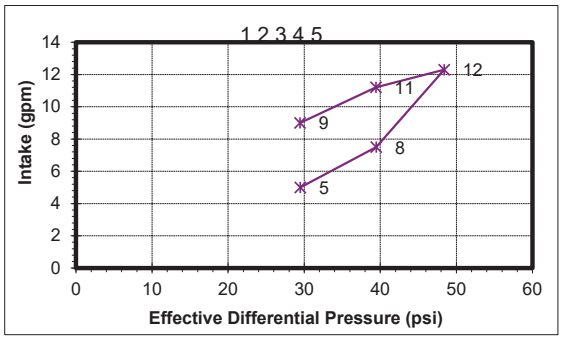
*Unless otherwise selected

Rock Description of Tested Interval:
D1/D2, Gneiss, Schist, slightly to moderately weathered, slightly to moderately fractured, RQD %: 55 to 80, REC %: 93 to 100

Test Interpretation Wash Out
Fracture filling washed out or fractures dilated and were propped open during test. Selected permeability is from the step with maximum permeability.







Schnabel ENGINEERING

WATER PRESSURE TEST (PACKER TEST)
SHEET 1, FIELD DATA

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-652			
Location:	Chatham, VA	Hole Angle:	0	degrees from vertical		
Schnabel Project No.:	22210031.100	Test Interval:	42.6	to	52.6	ft, in hole
Client Name:	Pittsylvania County	Test Interval:	42.6	to	52.6	ft, bgs
		Test Interval:	602.8	to	592.8	EL, ft
Ground Elevation (ft msl):	645.4	Test Date:	1/26/2023			
Northing:	3469270.9	By:	EU	Date:	1/26/2023	
Easting:	11210183.1	Checked:	SMB	Date:	3/24/2023	

TEST METHOD: Single or Double Packer Method using Multiple Pressure Tests Calc Sheet Version: 2018-08-06a

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10

TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

Rock Type:	Gneiss		Rock Unit:	D2		
Rock Weathering:	fresh to slightly weathered		RQD %:	73	to	90
Rock Fracturing:	slightly to moderately fractured		REC %:	96	to	100

Source of test water and clarity:	Cherrystone Creek, Clear				
Method of cleaning hole prior to testing:	Flushed from bottom				
Method of checking flow meter accuracy prior to test:	5 gallon bucket				
Drilling Fluid (water or type of drilling mud):	Water				
Packer Brand:	Aaardvark Wireline Packer	Packer Model:	H		
Packer Inflation Pressure: Start of testing:	200	psi	End:	200	psi
Packer Length (length of black rubber bladder):	2.1	feet			
Method: Single (1) or double (2) packer (Enter 1 or 2):	2				
Interval below base of packer, Method 1 (single packer test), A_1:		feet			
Interval between packers, Method 2 (double packer test), A_2:	10.0	feet			
Depth of hole at time of test:	62.6	vertical ft below ground surface			
Depth to top of rock (thickness of soil interval), R_d:	37.6	vertical feet below ground surface			
Diameter of borehole, d:	3.0	inches	0.25	feet	
Radius of the borehole, r:	0.13	feet			
Depth to water table (thickness of unsaturated material above water table), U:	7.0	feet	3.0	psi	
Depth to top of impermeable zone:	200.0	feet			
Estimated porosity of test section:	5%				
Thickness of saturated material above a relatively impermeable bed, S:	193.0	feet			
Depth to top of test section (bottom of upper packer), h_t:	42.6	feet bgs	18.4	psi	
Depth to bottom of test section (top of lower packer if double packer used, bottom of hole for a single packer, D):	52.6	feet bgs			
Is test section above or below water table?	below				
For tests above water table determine h_1, the distance from gauge to bottom of test interval:		feet		psi	
For tests below the water table determine h_1, the distance between the gauge and the water table:	8.0	feet	3.5	psi	

Friction Loss Parameters

Length of pipe over which head loss occurs (distance from gauge to the bottom of the top packer):	68.6	feet
Height of pressure gauge above the ground surface at boring:	1.0	feet ags
Length of pipe/hose from pressure gauge to top of pipe in boring:	25.0	feet
Number of 90° Elbows downstream of pressure gauge:	1	
Number of 45° elbows downstream of pressure gauge:	0	
Pipe Material (iron, steel, pvc, rubber hose, black plastic):	steel	
Pipe Outside Diameter (measured with Caliper):	2.75	inches
Pipe Inside Diameter (measured with Caliper):	2.380	inches
Pipe Nominal Diameter (approx inside diameter):	2.00	inches
Pipe Schedule:	NQ Rods	
Approximate Water Temperature	40	°F

Schnabel ENGINEERING

WATER PRESSURE TEST (PACKER TEST)
SHEET 1b, FIELD TEST PARAMETERS

TEST LIMITATIONS

Have the limitations of the test and calculation been met?

The value of S must be greater or equal to 5A	True
The value A/d must be less than 5.	True
Packer length must be >=10r for double packer setup	True

CALCULATE WATER INJECTION PRESSURES TO BE APPLIED DURING THE TEST

Estimated Confining Pressure, per foot of material

Maximum pressure per foot of rock, p_{Rmax}:	1	psi/ft	2.3	ft of water
Maximum allowable pressure per foot of soil, p_{Smax}:	0.5	psi/ft	1.2	ft of water
For reference, the pressure at the center of the test interval applied by the head of water standing in pipe:	21.0	psi	48.6	ft of water

Target maximum effective pressure for this test ($P_{t\,max}$):

$(R_d * P_{Smax}) + [(h_t - R_d)*P_{Rmax})]$	28.8	psi	28.8	psi

Maximum Allowable Water Injection Gauge Pressure (pressure at gauge during test)

Estimated maximum flow for this test:	1	gpm		
Estimated frictional pressure loss (P_L) for this test:	0.0	psi	0.0	ft of water
Maximum Allowable Gauge Pressure for this test: Ptmax - h_1	25	psi	25.3	psi
Percent of Maximum Allowable Pressure to be Applied	80%			

Summary of Target Water Injection Pressures - Suggested Values for GAUGE Pressure

Step 1, Minimum Pressure, approx 33% of maximum	7	psi	
Step 2, approx 67% of maximum	14	psi	
Step 3, Maximum Pressure	20	psi	
Step 4, approx 67% of maximum	14	psi	
Step 5, approx 33% of maximum	7	psi	
Proposed **Packer Inflation Pressure** at tank gauge (for gas):	109	psi	
Maximum **Packer Inflation Pressure** at tank gauge (for gas):	565	psi	**DO NOT EXCEED**

Summary of Target Water Injection Pressures - Suggested Values for EFFECTIVE Pressure

Step 1, approx 33% of maximum	8	psi	
Step 2, approx 67% of maximum	15	psi	
Step 3, Maximum Effective Pressure	23	psi	
Step 4, approx 67% of maximum	15	psi	
Step 5, approx 33% of maximum	8	psi	44.00

AARDVARK, QSP, & ~~GEOPRO BIMBAR~~ PACKERS - MAX. PACKER INFLATION PRESSURE TO BE APPLIED

USE GEOPRO CALCULATION (factors in water level)

Calculated Packer Inflation Pressure for test: G = [(Dp x psi/foot of water) + Sp + Pp] * 1.1	**109**	psi
Unconfined packer pressure rating (**Sp**) for the borehole size (see chart, refs tab):	60	psi
Dp = Depth to top of test section or bottom of top packer (feet)	42.6	ft
Pp = Injection pump pressure (psi) or maximum proposed gauge pressure	20	psi
Confined pressure rating for borehole size (from chart, references tab):	550	psi
Max packer inflation pressure (Confined packer pressure + [(Dp - Dw) * 0.433])	565	psi
Dw = Depth to static water level in borehole (feet)	7	ft
Does calculated packer inflation pressure (G) exceed calculated max packer inflation pressure?		NO

If yes, then packer may fail during test.

WATER PRESSURE (PACKER) TEST
SHEET 2, FIELD DATA

Schnabel ENGINEERING

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-652			
Location:	Chatham, VA	Test Interval:	42.6	to	52.6	bgs
Schnabel Project No.:	22210031.10	Test Interval:	602.8	to	592.8	EL
Client Name:	Pittsylvania County	Test Date:	1/26/2023			
By: EU	Date: 1/26/2023	Checked: SMB		Date: 3/24/2023		

Time at start of setup:	11:00 AM	Time at end of tear down:	1:00 PM
Time at start of test:	12:06 PM	Time at end of test:	12:50 PM

Step 1 Start Time: 12:15 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
7	0		338.9	--
7	1		339.77	0.9
7	2		340.7	1.0
7	3		341.7	1.0
7	4		342.5	0.8
7	5		343.6	1.0
7	6		344.3	0.8
7	7		345.28	1.0
7	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
			Average	0.9
			Selected stabilized flow rate	0.9
			Selected pressure for calculations	7

Step 2 Start Time: 12:24 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
15	0		346.91	--
15	1		348.15	1.2
15	2		349.27	1.1
15	3		350.38	1.1
15	4		351.49	1.1
15	5		352.67	1.2
15	6		353.8	1.1
15	7		354.9	1.1
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
			Average	1.1
			Selected stabilized flow rate	1.1
			Selected pressure for calculations	15

Step 3 Start Time: 12:33 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
22	0		356.6	--
22	1		358.21	1.6
22	2		359.79	1.6
22	3		361.35	1.6
22	4		362.82	1.5
22	5		364.32	1.5
22	6		365.8	1.5
22	7		367.3	1.5
22	8			
22	9			
22	10			
22	11			
22	12			
	13			
	14			
	15			
			Average	1.5
			Selected stabilized flow rate	1.5
			Selected pressure for calculations	22

Step 4 Start Time: 12:41 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
15	0		369.3	--
15	1		370.52	1.2
15	2		371.65	1.1
15	3		372.81	1.2
15	4		374	1.2
15	5		375.2	1.2
			Average	1.2
			Selected stabilized flow rate	1.2
			Selected pressure for calculations	15

Step 5 Start Time: 12:47 PM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
7	0		376.85	--
7	1		377.81	1.0
7	2		378.74	0.9
7	3		379.58	0.8
7	4		380.53	0.9
7	5		381.45	0.9
			Average	0.9
			Selected stabilized flow rate	0.9
			Selected pressure for calculations	7

Comments:

WATER PRESSURE TEST (PACKER TEST)
SHEET 3, CALCULATIONS

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-652		
Location:	Chatham, VA	Test Interval:	42.6	to	52.6 ft, bgs
Schnabel Project No.:	22210031.1	Test Interval:	602.8	to	592.8 EL, ft
Client Name:	Pittsylvania County	Test Date:	1/26/2023		
		By:	EU		
Ground Elevation (ft msl):	645.4	Checked:	SMB		
Northing:	3469270.855				
Easting:	11210183.119				

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10
TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

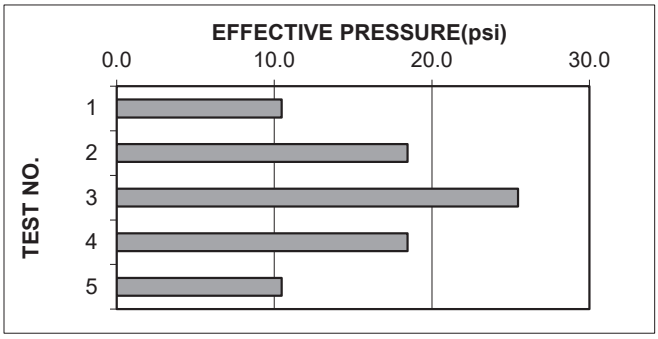
Results of Permeability Calculations
Multiple Step Test

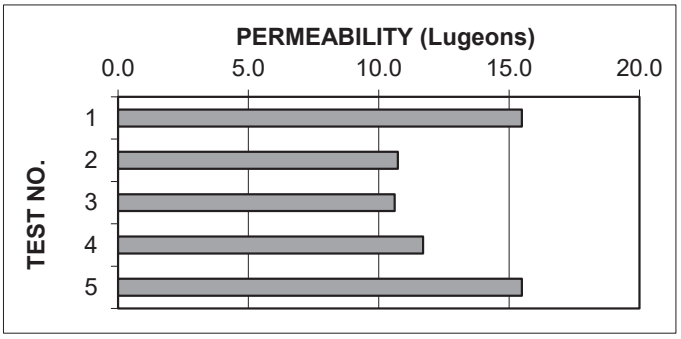
Step	Flow, Q (gpm)	Pressure (psi)		Lugeons	Hydraulic Conductivity (ft/sec)	Hydraulic Conductivity (cm/sec)
		Gauge	Effective			
1	0.9	7	10	15	6.0E-06	1.8E-04
2	1.1	15	18	11	4.2E-06	1.3E-04
3	1.5	22	25	11	4.1E-06	1.3E-04
4	1.2	15	18	12	4.6E-06	1.4E-04
5	0.9	7	10	15	6.0E-06	1.8E-04
AVERAGE	1.12	13	17	13	5.0E-06	1.5E-04
VALUE (Maximum*)	1.5	22	25	15	6.0E-06	1.8E-04

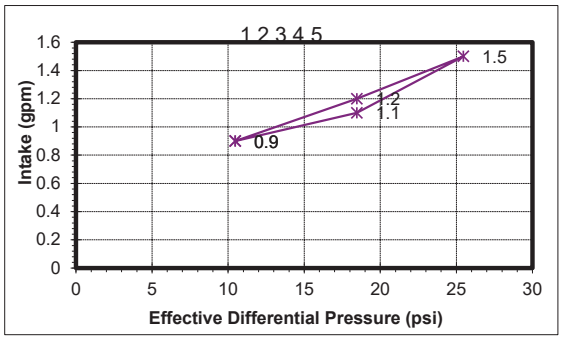
*Unless otherwise selected

Rock Description of Tested Interval:
D2, Gneiss, fresh to slightly weathered, slightly to moderately fractured, RQD %: 73 to 90, REC %: 96 to 100

Test Interpretation Turbulent
Turbulent flow through fractures, likely the result of fast moving water through wider fractures. Selected permeability is from the step with maximum permeability.







WATER PRESSURE TEST (PACKER TEST)
SHEET 1, FIELD DATA

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-652			
Location:	Chatham, VA	Hole Angle:	0	degrees from vertical		
Schnabel Project No.:	22210031.100	Test Interval:	52.6	to	62.6	ft, in hole
Client Name:	Pittsylvania County	Test Interval:	52.6	to	62.6	ft, bgs
		Test Interval:	592.8	to	582.8	EL, ft
Ground Elevation (ft msl):	645.4	Test Date:	1/26/2023			
Northing:	3469270.9	By:	EU	Date:	1/26/2023	
Easting:	11210183.1	Checked:	SMB	Date:	3/24/2023	

TEST METHOD: Single or Double Packer Method using Multiple Pressure Tests Calc Sheet Version: 2018-08-06a

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10

TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

Rock Type:	Gneiss			Rock Unit:	D2		
Rock Weathering:	fresh to slightly weathered			RQD %:	81	to	100
Rock Fracturing:	slightly to moderately fractured			REC %:	100	to	100
Source of test water and clarity:		Cherrystone Creek, Clear					
Method of cleaning hole prior to testing:		Flushed from bottom					
Method of checking flow meter accuracy prior to test:		5 gallon bucket					
Drilling Fluid (water or type of drilling mud):		Water					
Packer Brand:	Aaardvark Wireline Packer	Packer Model:	H				
Packer Inflation Pressure:	Start of testing:	200	psi	End:	200	psi	
Packer Length (length of black rubber bladder):		2.1	feet				
Method: Single (1) or double (2) packer (Enter 1 or 2):		1					
Interval below base of packer, Method 1 (single packer test), A_1:		10.0	feet				
Interval between packers, Method 2 (double packer test), A_2:			feet				
Depth of hole at time of test:		62.6	vertical ft below ground surface				
Depth to top of rock (thickness of soil interval), R_d:		37.6	vertical feet below ground surface				
Diameter of borehole, d:		3.0	inches	0.25	feet		
Radius of the borehole, r:		0.13	feet				
Depth to water table (thickness of unsaturated material above water table), U:		7.0	feet	3.0	psi		
Depth to top of impermeable zone:		200.0	feet				
Estimated porosity of test section:		5%					
Thickness of saturated material above a relatively impermeable bed, S:		193.0	feet				
Depth to top of test section (bottom of upper packer), h_t:		52.6	feet bgs	22.8	psi		
Depth to bottom of test section (top of lower packer if double packer used, bottom of hole for a single packer, D):		62.6	feet bgs				
Is test section above or below water table?		below					
For tests above water table determine h_1, the distance from gauge to bottom of test interval:			feet		psi		
For tests below the water table determine h_1, the distance between the gauge and the water table:		8.0	feet	3.5	psi		
Friction Loss Parameters							
Length of pipe over which head loss occurs (distance from gauge to the bottom of the top packer):		78.6	feet				
Height of pressure gauge above the ground surface at boring:		1.0	feet ags				
Length of pipe/hose from pressure gauge to top of pipe in boring:		25.0	feet				
Number of 90° Elbows downstream of pressure gauge:		1					
Number of 45° elbows downstream of pressure gauge:		0					
Pipe Material (iron, steel, pvc, rubber hose, black plastic):		steel					
Pipe Outside Diameter (measured with Caliper):		2.75	inches				
Pipe Inside Diameter (measured with Caliper):		2.380	inches				
Pipe Nominal Diameter (approx inside diameter):		2.00	inches				
Pipe Schedule:		NQ Rods					
Approximate Water Temperature		40	°F				

WATER PRESSURE TEST (PACKER TEST)
SHEET 1b, FIELD TEST PARAMETERS

TEST LIMITATIONS

Have the limitations of the test and calculation been met?

The value of S must be greater or equal to 5A	True
The value A/d must be less than 5.	True
Packer length must be >=10r for double packer setup	-

CALCULATE WATER INJECTION PRESSURES TO BE APPLIED DURING THE TEST

Estimated Confining Pressure, per foot of material

Maximum pressure per foot of rock, p_{Rmax}:	1	psi/ft	2.3	ft of water
Maximum allowable pressure per foot of soil, p_{Smax}:	0.5	psi/ft	1.2	ft of water
For reference, the pressure at the center of the test interval applied by the head of water standing in pipe:	25.4	psi	58.6	ft of water

Target maximum effective pressure for this test ($P_{t\,max}$):

$(R_d * P_{Smax}) + [(h_t - R_d)*P_{Rmax})]$	38.8	psi	38.8	psi

Maximum Allowable Water Injection Gauge Pressure (pressure at gauge during test)

Estimated maximum flow for this test:	1	gpm		
Estimated frictional pressure loss (P_L) for this test:	0.0	psi	0.0	ft of water
Maximum Allowable Gauge Pressure for this test: Ptmax - h_1	35	psi	35.3	psi
Percent of Maximum Allowable Pressure to be Applied	80%			

Summary of Target Water Injection Pressures - Suggested Values for GAUGE Pressure

Step 1, Minimum Pressure, approx 33% of maximum	9	psi	
Step 2, approx 67% of maximum	19	psi	
Step 3, Maximum Pressure	28	psi	
Step 4, approx 67% of maximum	19	psi	
Step 5, approx 33% of maximum	9	psi	
Proposed **Packer Inflation Pressure** at tank gauge (for gas):	123	psi	
Maximum **Packer Inflation Pressure** at tank gauge (for gas):	570	psi	**DO NOT EXCEED**

Summary of Target Water Injection Pressures - Suggested Values for EFFECTIVE Pressure

Step 1, approx 33% of maximum	10	psi	
Step 2, approx 67% of maximum	21	psi	
Step 3, Maximum Effective Pressure	31	psi	
Step 4, approx 67% of maximum	21	psi	
Step 5, approx 33% of maximum	10	psi	44.00

AARDVARK, QSP, & ~~GEOPRO BIMBAR~~ PACKERS - MAX. PACKER INFLATION PRESSURE TO BE APPLIED

USE GEOPRO CALCULATION (factors in water level)

Calculated Packer Inflation Pressure for test: G = [(Dp x psi/foot of water) + Sp + Pp] * 1.1	**123**	psi
Unconfined packer pressure rating (**Sp**) for the borehole size (see chart, refs tab):	60	psi
Dp = Depth to top of test section or bottom of top packer (feet)	52.6	ft
Pp = Injection pump pressure (psi) or maximum proposed gauge pressure	28	psi
Confined pressure rating for borehole size (from chart, references tab):	550	psi
Max packer inflation pressure (Confined packer pressure + [(Dp - Dw) * 0.433])	570	psi
Dw = Depth to static water level in borehole (feet)	7	ft
Does calculated packer inflation pressure (G) exceed calculated max packer inflation pressure?		NO

If yes, then packer may fail during test.

WATER PRESSURE (PACKER) TEST
SHEET 2, FIELD DATA

Schnabel ENGINEERING

Project:	Cherrystone Creek Dam 2A		Boring No.:	B-652		
Location:	Chatham, VA		Test Interval:	52.6	to 62.6	bgs
Schnabel Project No.:	22210031.10		Test Interval:	592.8	to 582.8	EL
Client Name:	Pittsylvania County		Test Date:	1/26/2023		
By:	EU	Date: 1/26/2023	Checked:	SMB	Date: 3/24/2023	

Time at start of setup:	8:40 AM	Time at end of tear down:	11:00 AM
Time at start of test:	10:25 AM	Time at end of test:	10:52 AM

Step 1 Start Time: 10:25 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
10	0		323.5	--
10	1		323.76	0.3
10	2		323.91	0.2
10	3		324.09	0.2
10	4		324.3	0.2
10	5		324.48	0.2
10	6			
10	7			
10	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
			Average	0.2
			Selected stabilized flow rate	0.2
			Selected pressure for calculations	10

Step 2 Start Time: 10:32 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
20	0		324.99	--
20	1		325.33	0.3
20	2		325.52	0.2
20	3		325.85	0.3
20	4		326.12	0.3
20	5		326.37	0.3
20	6			
20	7			
	8			
	9			
	10			
	11			
	12			
	13			
	14			
	15			
			Average	0.3
			Selected stabilized flow rate	0.3
			Selected pressure for calculations	20

Step 3 Start Time: 10:38 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
30	0		326.6	--
30	1		326.85	0.3
30	2		327.1	0.3
30	3		327.39	0.3
30	4		327.65	0.3
30	5		327.92	0.3
30	6			
30	7			
30	8			
30	9			
30	10			
30	11			
30	12			
	13			
	14			
	15			
			Average	0.3
			Selected stabilized flow rate	0.3
			Selected pressure for calculations	30

Step 4 Start Time: 10:44 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
20	0		328.05	--
20	1		328.25	0.2
20	2		328.46	0.2
20	3		328.71	0.3
20	4			
20	5			
			Average	0.2
			Selected stabilized flow rate	0.2
			Selected pressure for calculations	20

Step 5 Start Time: 10:47 AM

Gauge Pressure (h_2, psi)	Elapsed Time (min)	Flow Rate at Gauge (gpm)	Flow Vol at Gauge (gal)	Flow Rate (gpm)
10	0		328.73	--
10	1		328.9	0.2
10	2		329.04	0.1
10	3		329.3	0.3
10	4		329.39	0.1
10	5		329.44	0.1
			Average	0.1
			Selected stabilized flow rate	0.1
			Selected pressure for calculations	10

Comments:

WATER PRESSURE TEST (PACKER TEST)
SHEET 3, CALCULATIONS

Project:	Cherrystone Creek Dam 2A	Boring No.:	B-652		
Location:	Chatham, VA	Test Interval:	52.6	to	62.6 ft, bgs
Schnabel Project No.:	22210031.1	Test Interval:	592.8	to	582.8 EL, ft
Client Name:	Pittsylvania County	Test Date:	1/26/2023		
		By:	EU		
Ground Elevation (ft msl):	645.4	Checked:	SMB		
Northing:	3469270.855				
Easting:	11210183.119				

METHOD REFERENCE: Ground Water Manual, US Bureau of Reclamation, 1995, Chapter 10
TEST DATA (Enter data in shaded, underlined cells. Other cells are calculated from data cells):

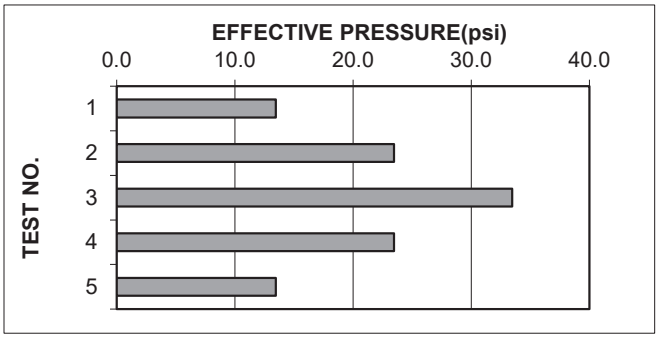
Results of Permeability Calculations
Multiple Step Test

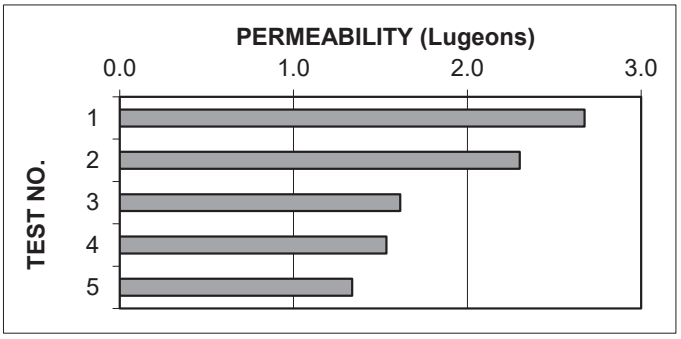
Step	Flow, Q (gpm)	Pressure (psi)		Lugeons	Hydraulic Conductivity (ft/sec)	Hydraulic Conductivity (cm/sec)
		Gauge	Effective			
1	0.2	10	13	3	1.0E-06	3.1E-05
2	0.3	20	23	2	8.7E-07	2.6E-05
3	0.3	30	33	2	6.1E-07	1.8E-05
4	0.2	20	23	2	5.8E-07	1.8E-05
5	0.1	10	13	1	5.0E-07	1.5E-05
AVERAGE	0.2	18	21	2	7.1E-07	2.2E-05
VALUE (Maximum*)	0.3	30	33	3	1.0E-06	3.1E-05

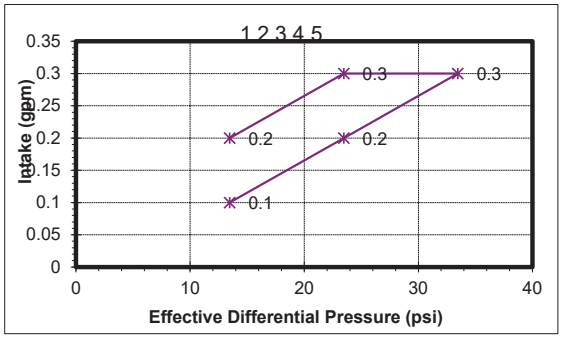
*Unless otherwise selected

Rock Description of Tested Interval:
D2, Gneiss, fresh to slightly weathered, slightly to moderately fractured, RQD %: 81 to 100, REC %: 100 to 100

Test Interpretation Fracture Filling
Fractures are being filled and clogged. Selected permeability is from the step with maximum permeability.







APPENDIX F

SOIL LABORATORY TEST DATA

MOISTURE CONTENT

ASTM D 2216-19

Client: Schnabel Engineering, Inc.
Client Reference: Cherrystone Dam 2A
Project No.: R-2023-070-001

Lab ID:	001	002	003	004	005
Boring No.:	B-51A	B-51A	B651B	B-651A	B-751
Depth (ft):	10-12	56-58	16-18	28-30	12-14
Sample No.:	UD-01	UD-03	UD-02	UD-01	UD-02
Tare Number	908	446	404	440	458
Wt. of Tare & Wet Sample (g)	297.05	453.28	423.68	315.56	501.44
Wt. of Tare & Dry Sample (g)	270.75	390.52	383.55	280.71	461.35
Weight of Tare (g)	102.07	99.11	143.05	99.40	145.92
Weight of Water (g)	26.30	62.76	40.13	34.85	40.09
Weight of Dry Sample (g)	168.68	291.41	240.50	181.31	315.43
Water Content (%)	**15.6**	**21.5**	**16.7**	**19.2**	**12.7**

Lab ID	006	007	008	009	010
Boring No.	B-51	B-51	B-51	B-51	B-51
Depth (ft)	4-6	36-38	46-48	48-50	50-52
Sample No.	S-03	S-19	S-24	S-25	S-26
Tare Number	709	443	432	AM	B2
Wt. of Tare & Wet Sample (g)	288.73	349.13	411.81	64.30	67.51
Wt. of Tare & Dry Sample (g)	253.26	319.78	363.51	53.50	59.36
Weight of Tare (g)	90.58	99.22	99.30	15.33	15.41
Weight of Water (g)	35.47	29.35	48.30	10.80	8.15
Weight of Dry Sample (g)	162.68	220.56	264.21	38.17	43.95
Water Content (%)	**21.8**	**13.3**	**18.3**	**28.3**	**18.5**

Notes :

Tested By RFF *Date* 3/7/23 *Checked By* AES *Date* 3/7/23

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MOISTURE CONTENT

ASTM D 2216-19

Client: Schnabel Engineering, Inc.
Client Reference: Cherrystone Dam 2A
Project No.: R-2023-070-001

Lab ID:	011	012	013	014	015
Boring No.:	B-51	B-51	B-51	B-651	B-651
Depth (ft):	52-54	54-56	66-68	6-8	22-24
Sample No.:	S-27	S-28	S-34	S-04	S-12
Tare Number	V2	466	477	723	745
Wt. of Tare & Wet Sample (g)	70.31	210.92	433.70	270.50	300.91
Wt. of Tare & Dry Sample (g)	59.97	196.80	411.93	238.12	263.14
Weight of Tare (g)	15.60	143.87	99.56	90.10	141.96
Weight of Water (g)	10.34	14.12	21.77	32.38	37.77
Weight of Dry Sample (g)	44.37	52.93	312.37	148.02	121.18
Water Content (%)	**23.3**	**26.7**	**7.0**	**21.9**	**31.2**

Lab ID	016	017	018	019	020
Boring No.	B-651	B-651	B-652	B-652	B-751
Depth (ft)	36-38	42-44	8-10	18-20	4-6
Sample No.	S-19	S-22	S-05	S-10	S-03
Tare Number	426	483	704	430	494
Wt. of Tare & Wet Sample (g)	239.26	329.61	400.24	363.72	371.80
Wt. of Tare & Dry Sample (g)	186.21	310.22	333.89	310.65	327.88
Weight of Tare (g)	99.32	97.75	89.60	99.78	99.06
Weight of Water (g)	53.05	19.39	66.35	53.07	43.92
Weight of Dry Sample (g)	86.89	212.47	244.29	210.87	228.82
Water Content (%)	**61.1**	**9.1**	**27.2**	**25.2**	**19.2**

Notes :

Tested By *RFF* *Date* *3/7/23* *Checked By* *AES* *Date* *3/7/23*

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MOISTURE CONTENT

ASTM D 2216-19

Client:	Schnabel Engineering, Inc.
Client Reference:	Cherrystone Dam 2A
Project No.:	R-2023-070-001

Lab ID:	021	022
Boring No.:	B-751	B-751
Depth (ft):	24-26	30-32
Sample No.:	S-11	S-14
Tare Number	474	368
Wt. of Tare & Wet Sample (g)	357.52	263.52
Wt. of Tare & Dry Sample (g)	306.28	238.29
Weight of Tare (g)	98.41	110.83
Weight of Water (g)	51.24	25.23
Weight of Dry Sample (g)	207.87	127.46
Water Content (%)	**24.7**	**19.8**

Notes :

Tested By RFF *Date* 3/7/23 *Checked By* AES *Date* 3/7/23

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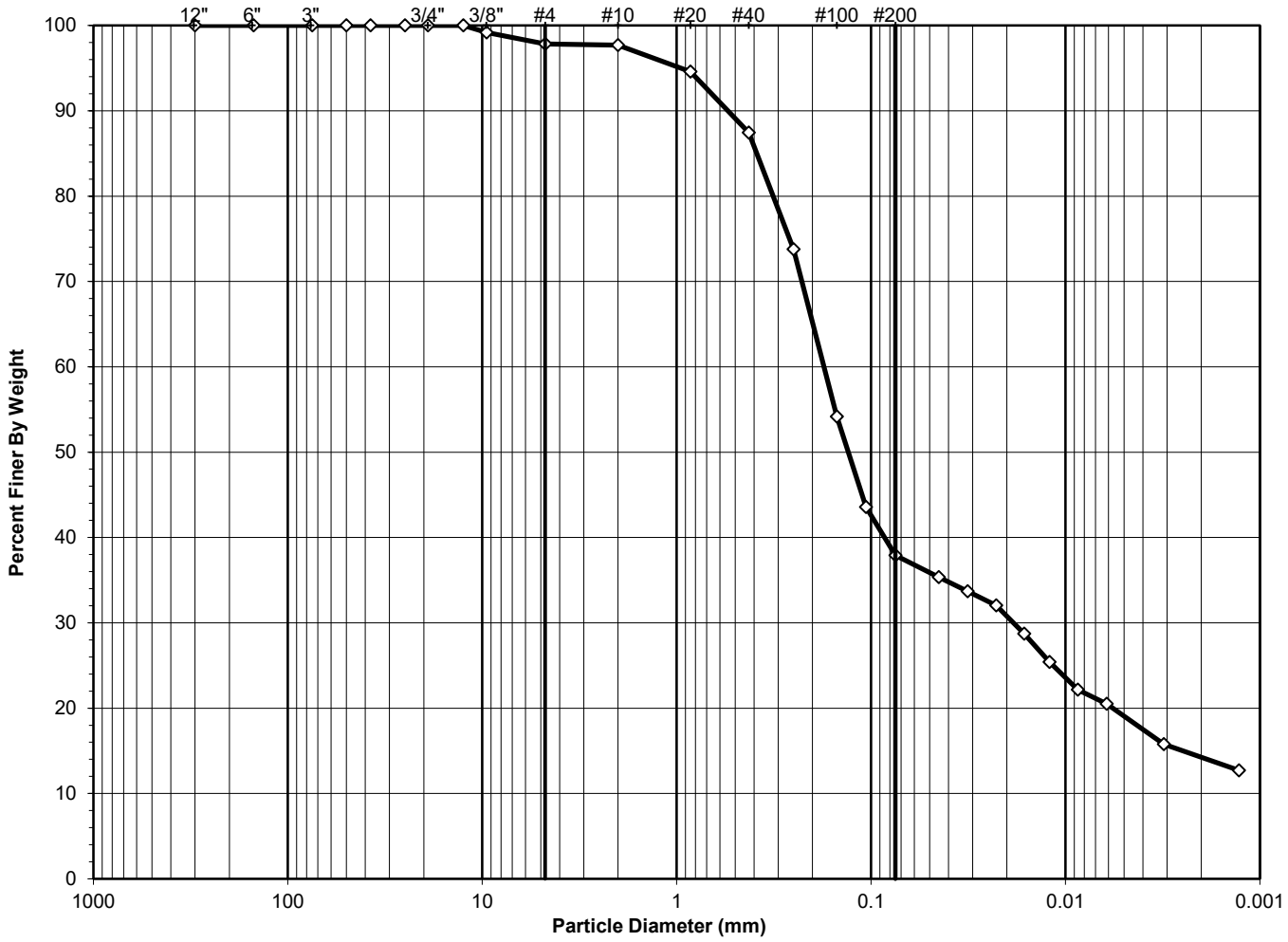
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001	Soil Color:	Orange Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.13

USCS Classification:
SILTY SAND

Tested By RFF Date 4/3/23 Checked By AES Date 4/3/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001	Soil Color:	Orange Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	908	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	297.05	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	270.75	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	102.07	Weight of Tare (g):	NA
Weight of Water (g):	26.30	Weight of Water (g):	NA
Weight of Dry Soil (g):	168.68	Weight of Dry Soil (g):	NA
Moisture Content (%):	**15.6**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	168.68
Tare No. (Sub-Specimen)	908	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	297.05	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	102.07	Dry Weight of - 3/4" Sample (g):	168.68
Sub-Specimen Wet Weight (g):	194.98	Dry Weight -3/4" +3/8" Sample (g):	1.41
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	167.27
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	1.41		0.84	0.84	99.16	**99**
#4	4.75	2.27		1.35	2.18	97.82	**98**
#10	2	0.24		0.14	2.32	97.68	**98**
#20	0.85	5.21	(**)	3.09	5.41	94.59	**95**
#40	0.425	12.04		7.14	12.55	87.45	**87**
#60	0.25	23.05		13.66	26.22	73.78	**74**
#100	0.15	33.08		19.61	45.83	54.17	**54**
#140	0.106	17.87		10.59	56.42	43.58	**44**
#200	0.075	9.58		5.68	62.10	37.90	**38**
Pan	-	63.93		37.90	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By RFF Date 4/3/23 Checked By AES Date 4/3/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001	Soil Color:	Orange Brown

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	24.0	22.7	2.67	12.3	0.0448	93.3	35.4
2	23.0	22.7	2.67	12.5	0.0319	88.9	33.7
4	22.0	22.7	2.67	12.7	0.0227	84.5	32.0
8	20.0	22.7	2.67	13.0	0.0163	75.8	28.7
15	18.0	22.7	2.67	13.4	0.0121	67.0	25.4
30	16.0	22.8	2.64	13.8	0.0086	58.4	22.2
60	15.0	22.8	2.64	13.9	0.0061	54.1	20.5
240	12.0	23.2	2.49	14.5	0.0031	41.6	15.8
1440	10.0	23.6	2.33	14.8	0.0013	33.5	12.7

Soil Specimen Data

Tare No.:	14	Percent Finer than # 200:	37.90
Wt. of Tare & Dry Material (g):	369.94		
Weight of Tare (g):	342.84	Specific Gravity:	2.81 Measured
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	22.10		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 696
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/24/23 Checked By AES Date 3/27/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001	Soil Description:	ORANGE BROWN SILT

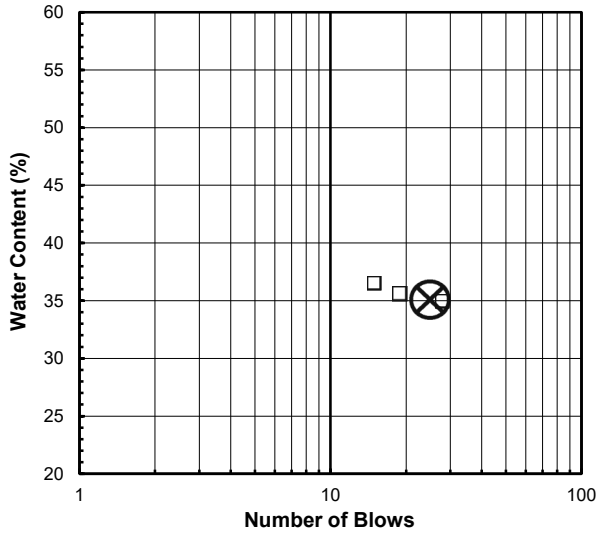
Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Wet Prep.)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	908	W	B	A-L	U
Wt. of Tare & Wet Sample (g):	297.05	29.28	25.59	30.79	L
Wt. of Tare & Dry Sample (g):	270.75	25.60	22.84	26.70	T
Weight of Tare (g):	102.07	15.05	15.10	15.48	I
Weight of Water (g):	26.3	3.7	2.8	4.1	P
Weight of Dry Sample (g):	168.7	10.6	7.7	11.2	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**15.6**	**34.9**	**35.5**	**36.5**	N
Number of Blows:		**28**	**19**	**15**	T

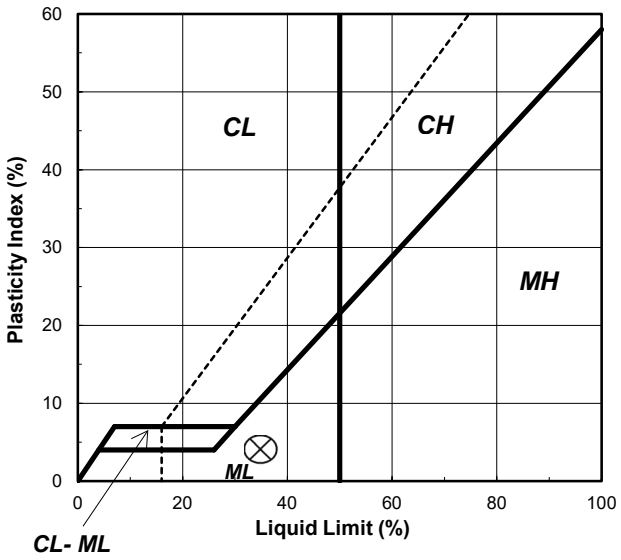
Plastic Limit Test	1	2	Range	
Tare Number:	E	B4		
Wt. of Tare & Wet Sample (g):	22.34	23.78		
Wt. of Tare & Dry Sample (g):	20.65	21.82		
Weight of Tare (g):	15.18	15.42		
Weight of Water (g):	1.7	2.0		
Weight of Dry Sample (g):	5.5	6.4		
Moisture Content (%):	**30.9**	**30.6**	**0.3**	
Note: The acceptable range of the two Moisture Contents is ±				0.84

Test Results	
Liquid Limit (%):	**35**
Plastic Limit (%):	**31**
Plasticity Index (%):	**4**
USCS Symbol:	**ML**

Flow Curve



Plasticity Chart



Tested By MPS *Date* 4/1/23 *Checked By* AES *Date* 4/3/23

 DCN: CTS4B, DATE: 5/22/18 REVISION: 8

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-069-001	Sample No.:	UD-01
Lab ID:	R-2023-069-001-001	Visual Description:	Orange Brown Silty Sand

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 716	R 717
Weight of Pycnometer & Soil & Water (g):	687.96	686.49
Temperature (^{o}C):	24.2	24.1
Weight of Pycnometer & Water (g):	652.07	650.68
Tare Number:	716	717
Weight of Tare & Dry Soil (g):	209.87	208.45
Weight of Tare (g):	154.2	152.76
Weight of Dry Soil (g):	55.67	55.69
Specific Gravity of Soil @ Measured Temperature:	2.815	2.802
Specific Gravity of Water @ Measured Temperature:	0.99725	0.99727
Conversion Factor for Measured Temperature:	0.99905	0.99907
Specific Gravity @ 20^{o} Celsius:	2.817	2.804

Average Specific Gravity @ 20^{o} Celsius	2.81

Tested By *RFF* *Date* *4/3/23* *Checked By* *GEM* *Date* *4/3/23*

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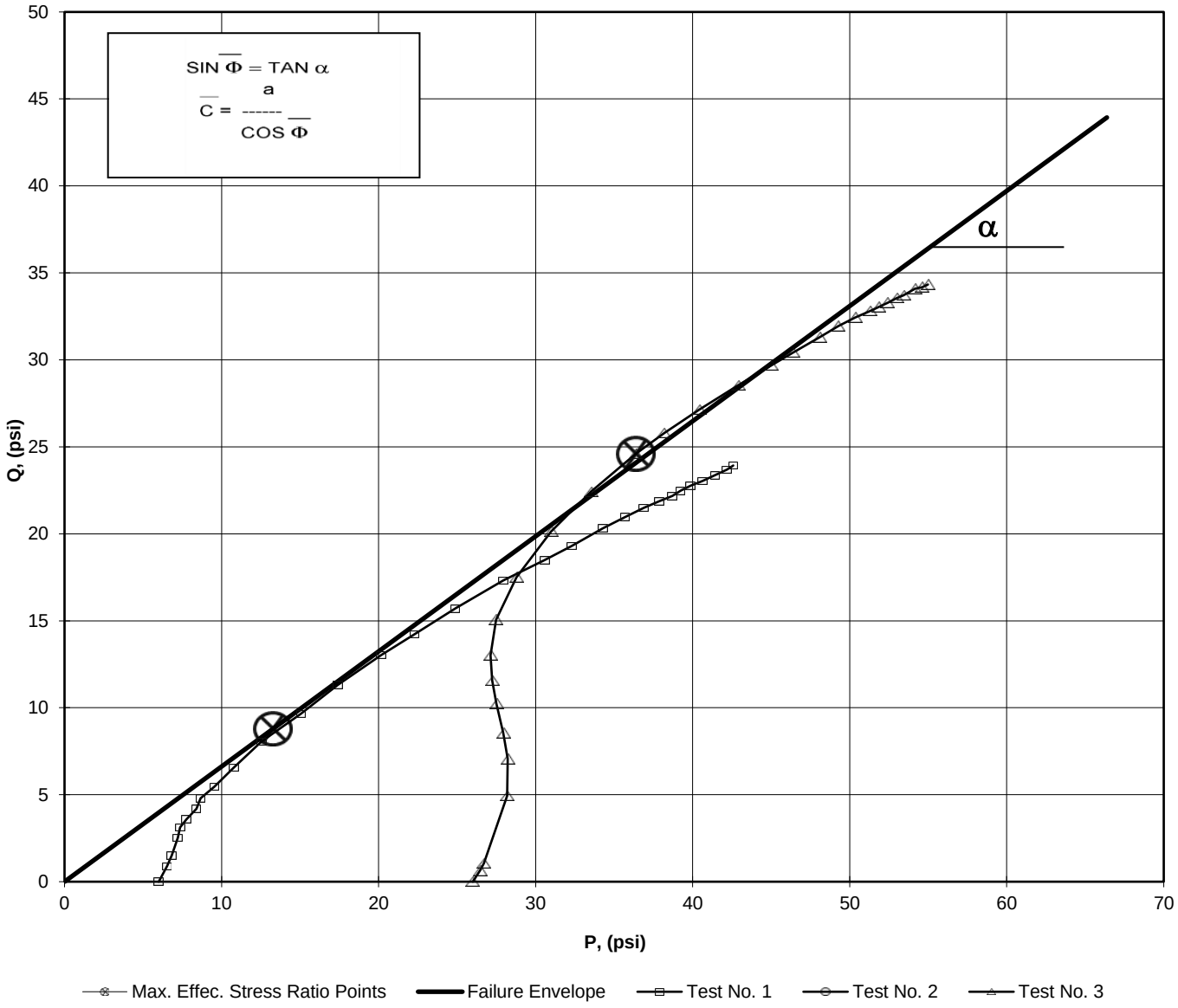
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\bar{C}$	=	**0.00**
α	=	**33.5**	$\bar{\Phi}$	=	**41.44**

Tested By: MY Date: 3/31/23 Approved By: NJM Date: 4/3/23

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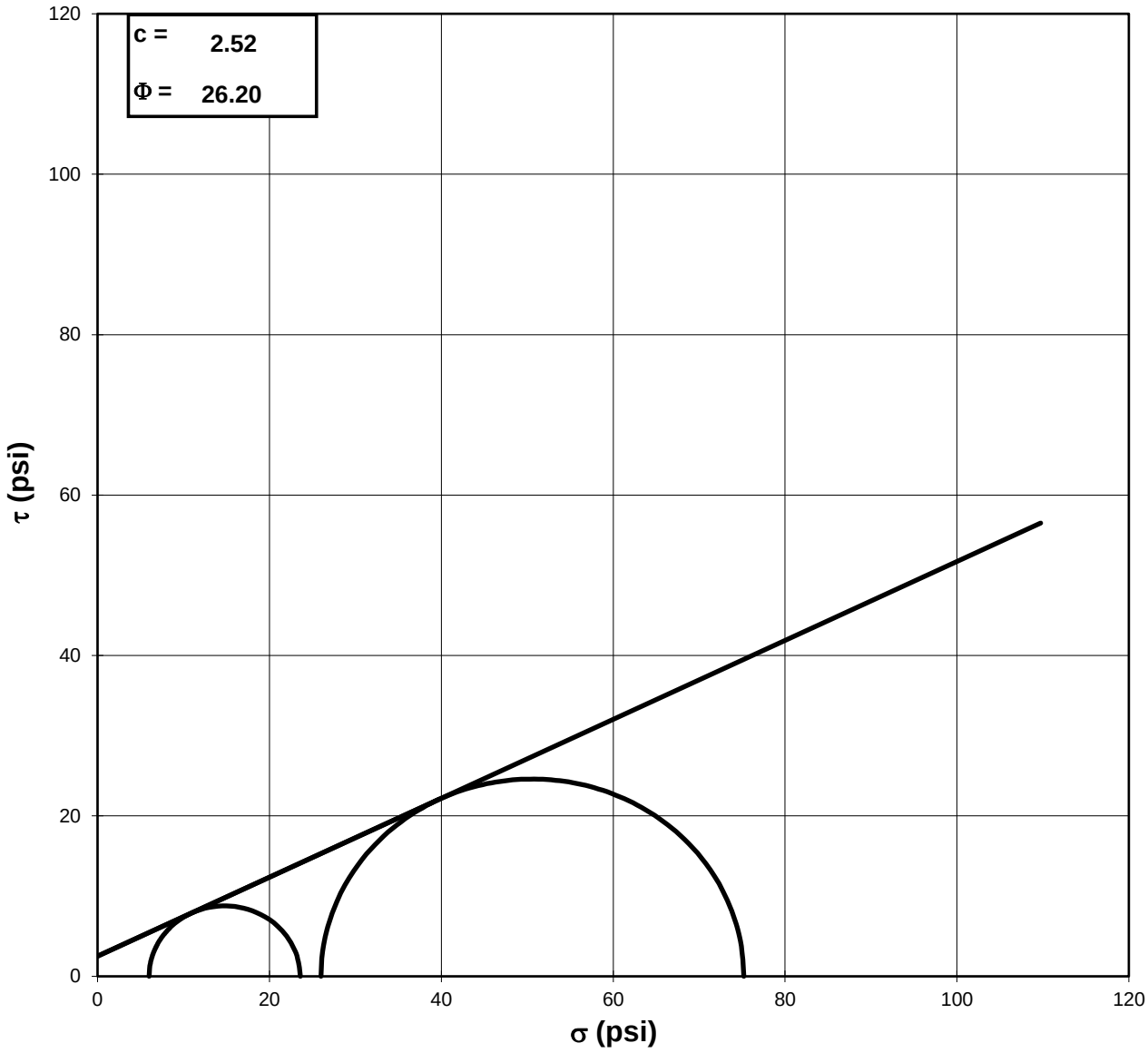
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		
Visual Description:	Orange Brown Silt (Undisturbed)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: MY *Date:* 3/31/23 *Approved By:* NJM *Date:* 4/3/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		

Visual Description: Orange Brown Silt (Undisturbed)

Stage No.	0
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	66.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	6.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	13.27
Q	=	8.78

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.949	Diameter 1:	2.810
Length 2:	5.966	Diameter 2:	2.820
Length 3:	6.004	Diameter 3:	2.845
Avg. Length:	5.973	*Avg. Diam.:*	2.825

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	15.7
Final Change (ml)	8.3
Initial Dial Reading (mil)	232
Dial Reading After Saturation (mil)	231
Dial Reading After Consolidation (mil)	265

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
22.8	0.000	60.0
34.0	0.001	60.4
41.7	0.002	60.7
54.3	0.009	61.3
61.8	0.015	61.8
67.5	0.021	61.8
75.3	0.030	61.8
82.8	0.039	62.1
91.3	0.051	61.9
105.5	0.072	61.8
124.9	0.102	61.5
145.7	0.137	60.6
167.7	0.172	59.9
191.1	0.214	58.9
207.4	0.245	57.9
228.1	0.287	56.8
251.4	0.344	55.4
269.7	0.403	53.9
282.8	0.449	53.0
299.1	0.509	52.0
310.4	0.554	51.3
320.3	0.599	50.6
327.9	0.643	50.0
334.0	0.673	49.5
340.0	0.703	49.2
345.9	0.733	48.9
351.6	0.764	48.4
359.4	0.809	47.9
367.1	0.854	47.5
372.5	0.884	47.3
377.2	0.914	47.2

Tested By: MY Date: 3/31/23 Input Checked By: GEM Date: 4/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		

Visual Description: Orange Brown Silt (Undisturbed)

Effective Confining Pressure (psi)	6.0	*Stage No.*	0
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	5.97
Initial Sample Diameter (in)	2.83
Initial Sample Area (in^2)	6.27
Initial Sample Volume (in^3)	37.44

VOLUME CHANGE

Volume After Consolidation (in^3)	36.95
Length After Consolidation (in)	5.94
Area After Consolidation (in^2)	6.221

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	1.80	0.37	7.43	5.6	1.319	0.21	6.53	0.90
0.04	3.04	0.69	8.35	5.3	1.573	0.23	6.83	1.52
0.15	5.06	1.30	9.75	4.7	2.077	0.26	7.22	2.53
0.24	6.25	1.76	10.49	4.2	2.471	0.29	7.37	3.12
0.35	7.16	1.81	11.36	4.2	2.709	0.26	7.77	3.58
0.50	8.39	1.80	12.59	4.2	2.998	0.22	8.39	4.19
0.66	9.58	2.12	13.46	3.9	3.469	0.23	8.67	4.79
0.85	10.92	1.92	15.00	4.1	3.677	0.18	9.54	5.46
1.21	13.14	1.78	17.36	4.2	4.113	0.14	10.79	6.57
1.72	16.13	1.51	20.62	4.5	4.595	0.10	12.55	8.07
2.30	19.30	0.60	24.71	5.4	4.573	0.03	15.06	9.65
2.90	22.62	-0.10	28.71	6.1	4.710	0.00	17.41	11.31
3.60	26.08	-1.13	33.21	7.1	4.657	-0.04	20.17	13.04
4.12	28.44	-2.06	36.51	8.1	4.528	-0.07	22.29	14.22
4.84	31.41	-3.18	40.60	9.2	4.420	-0.10	24.89	15.71
5.79	34.62	-4.62	45.24	10.6	4.260	-0.14	27.93	17.31
6.79	36.99	-6.09	49.08	12.1	4.060	-0.17	30.58	18.50
7.55	38.63	-6.99	51.63	13.0	3.973	-0.18	32.31	19.32
8.56	40.61	-7.96	54.58	14.0	3.909	-0.20	34.27	20.31
9.32	41.92	-8.74	56.66	14.7	3.843	-0.21	35.70	20.96
10.08	43.00	-9.39	58.39	15.4	3.793	-0.22	36.89	21.50
10.83	43.74	-10.00	59.74	16.0	3.733	-0.23	37.87	21.87
11.33	44.35	-10.53	60.88	16.5	3.684	-0.24	38.70	22.18
11.84	44.96	-10.76	61.72	16.8	3.682	-0.24	39.24	22.48
12.34	45.53	-11.10	62.63	17.1	3.662	-0.25	39.87	22.76
12.86	46.06	-11.60	63.66	17.6	3.617	-0.26	40.63	23.03
13.62	46.73	-12.06	64.80	18.1	3.587	-0.26	41.43	23.37
14.38	47.39	-12.48	65.87	18.5	3.564	-0.27	42.18	23.70
14.88	47.85	-12.66	66.51	18.7	3.564	-0.27	42.58	23.93
15.38	48.21	-12.85	67.06	18.8	3.558	-0.27	42.95	24.11

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		

Visual Description: Orange Brown Silt (Undisturbed)

Stage No.	0
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	86.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	26.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	36.38
Q	=	24.59

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.104	Diameter 1:	2.739
Length 2:	6.006	Diameter 2:	2.740
Length 3:	6.039	Diameter 3:	2.740
Avg. Length:	6.050	*Avg. Diam.:*	2.740

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	23.8
Final Change (ml)	24.2

Initial Dial Reading (mil)	304
Dial Reading After Saturation (mil)	360
Dial Reading After Consolidation (mil)	404

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
16.9	0.000	60.0
24.0	0.001	60.2
28.7	0.003	60.3
72.0	0.009	62.7
95.8	0.015	64.8
112.5	0.020	66.6
131.8	0.029	68.8
146.8	0.038	70.3
163.4	0.050	71.9
186.8	0.070	73.6
215.5	0.101	74.7
246.8	0.136	75.1
274.5	0.172	74.9
301.5	0.213	74.2
317.0	0.244	73.6
335.1	0.286	72.7
354.7	0.343	71.6
372.1	0.403	70.7
383.9	0.448	70.0
398.9	0.508	69.2
409.8	0.553	68.7
419.3	0.598	68.1
427.1	0.643	67.5
432.6	0.673	67.2
438.0	0.703	66.9
443.9	0.733	66.5
448.5	0.763	66.3
457.2	0.809	65.9
462.0	0.854	65.6
466.7	0.884	65.3
470.8	0.914	65.2

Tested By: MY Date: 3/31/23 Input Checked By: GEM Date: 4/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		

Visual Description: Orange Brown Silt (Undisturbed)

Effective Confining Pressure (psi)	26.0	*Stage No.*	0
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	6.05
Initial Sample Diameter (in)	2.74
Initial Sample Area (in^2)	5.90
Initial Sample Volume (in^3)	35.66

VOLUME CHANGE

Volume After Consolidation (in^3)	33.20
Length After Consolidation (in)	5.95
Area After Consolidation (in^2)	5.579

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	1.27	0.18	27.09	25.8	1.049	0.15	26.45	0.64
0.05	2.12	0.35	27.77	25.7	1.083	0.17	26.71	1.06
0.15	9.88	2.75	33.13	23.3	1.425	0.28	28.19	4.94
0.24	14.11	4.83	35.27	21.2	1.666	0.35	28.22	7.05
0.34	17.09	6.60	36.48	19.4	1.881	0.39	27.94	8.54
0.49	20.49	8.75	37.74	17.2	2.188	0.44	27.50	10.25
0.64	23.13	10.33	38.80	15.7	2.477	0.46	27.23	11.57
0.84	26.04	11.89	40.15	14.1	2.845	0.47	27.13	13.02
1.18	30.10	13.56	42.54	12.4	3.420	0.46	27.49	15.05
1.69	35.00	14.72	46.28	11.3	4.104	0.43	28.78	17.50
2.29	40.27	15.14	51.13	10.9	4.708	0.38	30.99	20.13
2.89	44.85	14.91	55.94	11.1	5.044	0.34	33.51	22.42
3.58	49.19	14.22	60.97	11.8	5.175	0.29	36.38	24.59
4.10	51.59	13.60	63.99	12.4	5.160	0.27	38.20	25.80
4.80	54.29	12.71	67.58	13.3	5.086	0.24	40.44	27.15
5.76	57.07	11.64	71.43	14.4	4.975	0.21	42.90	28.54
6.77	59.36	10.66	74.69	15.3	4.870	0.18	45.01	29.68
7.53	60.84	10.03	76.80	16.0	4.810	0.17	46.39	30.42
8.54	62.62	9.22	79.40	16.8	4.732	0.15	48.09	31.31
9.30	63.88	8.66	81.21	17.3	4.685	0.14	49.27	31.94
10.05	64.88	8.09	82.79	17.9	4.623	0.13	50.35	32.44
10.80	65.59	7.51	84.08	18.5	4.547	0.12	51.29	32.80
11.31	66.08	7.19	84.89	18.8	4.513	0.11	51.85	33.04
11.81	66.57	6.86	85.71	19.1	4.478	0.11	52.43	33.28
12.32	67.11	6.55	86.56	19.5	4.450	0.10	53.01	33.56
12.83	67.43	6.29	87.15	19.7	4.421	0.10	53.43	33.72
13.59	68.19	5.93	88.26	20.1	4.397	0.09	54.17	34.09
14.35	68.33	5.56	88.77	20.4	4.343	0.08	54.61	34.17
14.85	68.66	5.35	89.31	20.7	4.325	0.08	54.98	34.33
15.36	68.87	5.17	89.69	20.8	4.307	0.08	55.26	34.43

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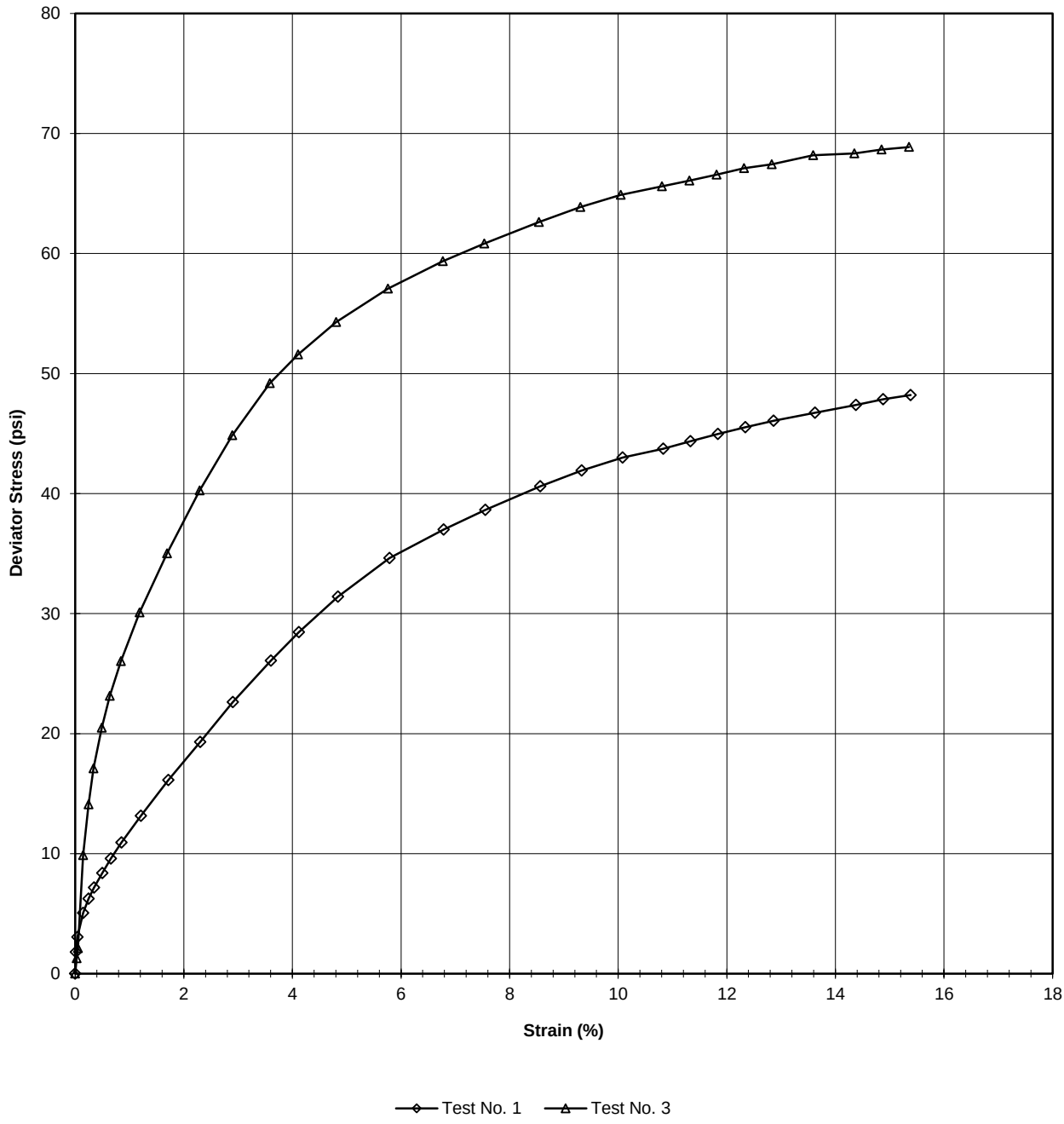
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	10-12
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-001		
Visual Description:	Orange Brown Silt (Undisturbed)		



Tested By: MY Date: 3/31/23 Approved By: NJM Date: 4/3/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.		
Client Reference:	Cherrystone Dam 2A		
Project No.:	R-2023-070-001		
Lab ID:	R-2023-070-001-001	Specific Gravity (Measured)	2.81
Visual Description:	Orange Brown Silt (Undisturbed)		

SAMPLE CONDITION SUMMARY

Boring No.:	B-51A	B-51A
Depth (ft):	10-12	10-12
Sample No.:	UD-01	UD-01
Test No.	T1	T3
Deformation Rate (in/min)	0.002	0.002
Back Pressure (psi)	60.0	60.0
Consolidation Time (days)	1	1
Moisture Content (%) (INITIAL)	15.6	15.6
Total Unit Weight (pcf)	121.3	130.5
Dry Unit Weight (pcf)	104.9	112.9
Moisture Content (%) (FINAL)	24.7	19.1
Initial State Void Ratio,e	0.672	0.554
Void Ratio at Shear, e	0.650	0.446

Tested By: MY Date: 3/31/23 Input Checked By: GEM Date: 4/3/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS

ASTM D4767-11

MOISTURE CONTENT

	T1	T3
Tare Number	908	908
Weight of Tare & Wet Sample (g)	297.05	297.05
Weight of Tare & Dry Sample (g)	270.75	270.75
Weight of Tare (g)	102.07	102.07
Moisture Content (%) (INITIAL)	15.59	15.59
Tare Number	746	403
Weight of Tare & Wet Sample (g)	1366.03	1431.34
Weight of Tare & Dry Sample (g)	1123.41	1225
Weight of Tare (g)	140.56	142.35
Moisture Content (%) (FINAL)	24.69	19.06

UNIT WEIGHT

Weight of Tube & Wet Sample (g)		1192.01	1221.59
Weight of Tube (g)		0	0
Weight of Wet Sample (g)		1192.01	1221.59
Length 1 (in)		5.949	6.104
Length 2 (in)		5.966	6.006
Length 3 (in)		6.004	6.039
Top Diameter (in)		2.81	2.739
Middle Diameter (in)		2.82	2.74
Bottom Diameter (in)		2.845	2.74
Average Length (in)		5.973	6.049667
Average Area (in)		6.268	5.895
Sample Volume (cm^3)		613.51	584.41
Unit Wet Weight (g/cm^3)		1.94	2.09
Unit Wet Weight (pcf)		121.30	130.50
Unit Dry Weight (pcf)		104.94	112.89
Unit Dry Weight (g/cm^3)		1.68	1.81
Initial Burette Reading		**24**	**48**
Final Burette Reading		**15.7**	**23.8**
Initial Dial Reading		**232**	**304**
Dial Reading After Saturation		**231**	**360**
Dial Reading After Consolidation		**265**	**404**
Volume Change during Consolidation		8.3	24.2
Volume Change during Saturation		-0.31	16.23
Volume at Shear (cm^3)	*These	605.52	543.98
Volume of Solids (cm^3)	measurements	366.98	376.09
Volume of Voids (cm^3)	are all	238.53	167.89
Volume of Water (cm^3)	at	254.56	201.42
Void Ratio, e	shear	0.650	0.446

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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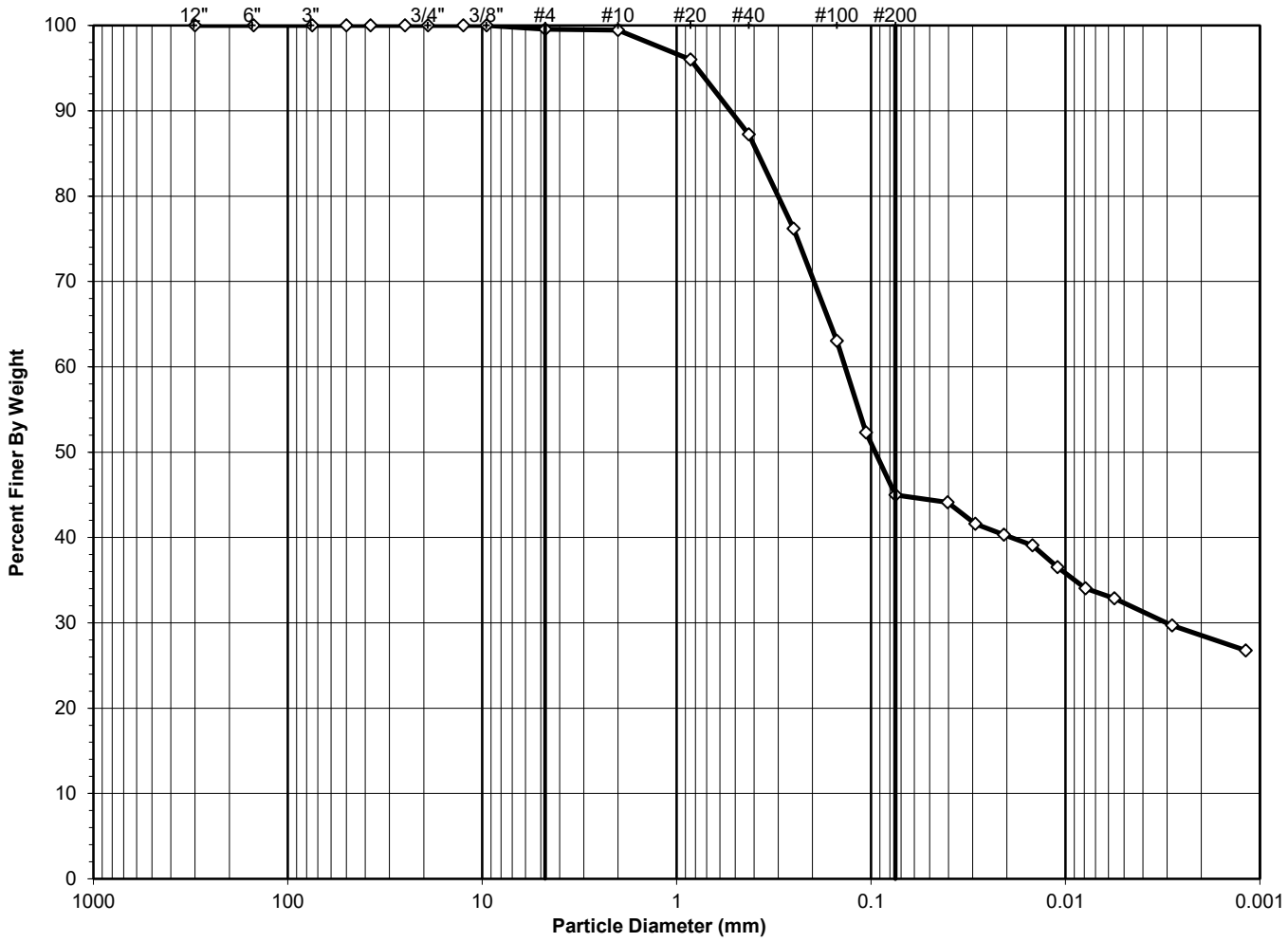
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 1A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Soil Color:	Orange Red

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.10

USCS Classification:
SILTY SAND

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 1A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Soil Color:	Orange Red

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	446	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	453.28	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	390.52	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.11	Weight of Tare (g):	NA
Weight of Water (g):	62.76	Weight of Water (g):	NA
Weight of Dry Soil (g):	291.41	Weight of Dry Soil (g):	NA
Moisture Content (%):	**21.5**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	291.41
Tare No. (Sub-Specimen)	446	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	453.28	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.11	Dry Weight of - 3/4" Sample (g):	291.41
Sub-Specimen Wet Weight (g):	354.17	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	291.41
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	1.34		0.46	0.46	99.54	**99.5**
#10	2	0.25		0.09	0.55	99.45	**99.5**
#20	0.85	10.09	(**)	3.46	4.01	95.99	**96.0**
#40	0.425	25.50		8.75	12.76	87.24	**87.2**
#60	0.25	32.21		11.05	23.81	76.19	**76.2**
#100	0.15	38.37		13.17	36.98	63.02	**63.0**
#140	0.106	31.25		10.72	47.70	52.30	**52.3**
#200	0.075	21.37		7.33	55.04	44.96	**45.0**
Pan	-	131.03		44.96	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 1A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Soil Color:	Orange Red

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	38.0	21.4	3.15	9.8	0.0404	98.1	44.1
2	36.0	21.4	3.15	10.2	0.0291	92.5	41.6
4	35.0	21.4	3.15	10.3	0.0208	89.7	40.3
8	34.0	21.4	3.15	10.5	0.0148	86.9	39.1
15	32.0	21.4	3.15	10.9	0.0110	81.2	36.5
30	30.0	21.5	3.11	11.2	0.0079	75.7	34.0
60	29.0	21.7	3.04	11.4	0.0056	73.1	32.9
240	26.0	23.0	2.56	12.0	0.0028	66.0	29.7
1440	24.0	22.2	2.86	12.3	0.0012	59.5	26.8

Soil Specimen Data

Tare No.:	7	Percent Finer than # 200:	44.96
Wt. of Tare & Dry Material (g):	363.85		
Weight of Tare (g):	324.59	Specific Gravity:	2.82 Measured
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	34.26		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 700
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/16/23 Checked By AES Date 3/26/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Soil Description:	ORANGE RED SILT

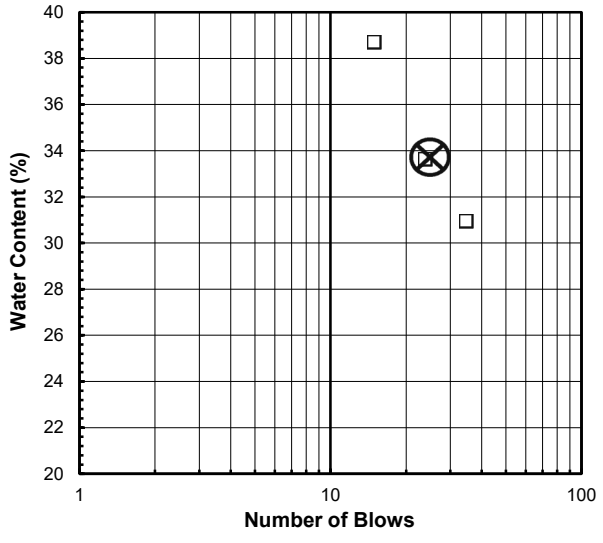
Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Wet Prep.)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	446	W	B4	W-2	U
Wt. of Tare & Wet Sample (g):	453.28	26.56	24.92	25.42	L
Wt. of Tare & Dry Sample (g):	390.52	23.85	22.53	22.74	T
Weight of Tare (g):	99.11	15.08	15.42	15.81	I
Weight of Water (g):	62.8	2.7	2.4	2.7	P
Weight of Dry Sample (g):	291.4	8.8	7.1	6.9	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**21.5**	**30.9**	**33.6**	**38.7**	N
Number of Blows:		**35**	**24**	**15**	T

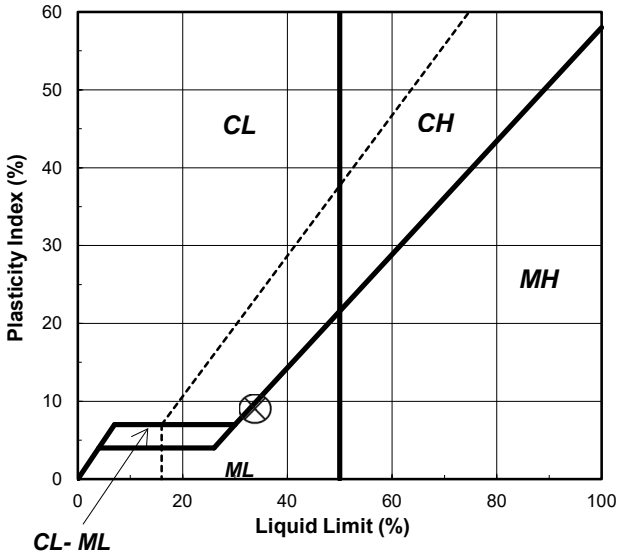
Plastic Limit Test	1	2	Range
Tare Number:	B	A-Q	
Wt. of Tare & Wet Sample (g):	22.48	22.19	
Wt. of Tare & Dry Sample (g):	21.03	20.85	
Weight of Tare (g):	15.15	15.45	
Weight of Water (g):	1.5	1.3	
Weight of Dry Sample (g):	5.9	5.4	
Moisture Content (%):	**24.7**	**24.8**	**-0.2**
Note: The acceptable range of the two Moisture Contents is ±			0.84

Test Results	
Liquid Limit (%):	**34**
Plastic Limit (%):	**25**
Plasticity Index (%):	**9**
USCS Symbol:	**ML**

Flow Curve



Plasticity Chart



Tested By CFD *Date* 3/22/23 *Checked By* AES *Date* 3/24/23

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-069-001	Sample No.:	UD-03
Lab ID:	R-2023-069-001-002	Visual Description:	Orange Red Silty Sand

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 716	R 717
Weight of Pycnometer & Soil & Water (g):	686.13	684.83
Temperature (^{o}C):	23.1	23.1
Weight of Pycnometer & Water (g):	652.20	650.80
Tare Number:	716	717
Weight of Tare & Dry Soil (g):	206.9	205.48
Weight of Tare (g):	154.21	152.77
Weight of Dry Soil (g):	52.69	52.71
Specific Gravity of Soil @ Measured Temperature:	2.808	2.822
Specific Gravity of Water @ Measured Temperature:	0.99752	0.99752
Conversion Factor for Measured Temperature:	0.99931	0.99931
Specific Gravity @ 20^{o} Celsius:	2.810	2.823

Average Specific Gravity @ 20^{o} Celsius	2.82

Tested By *RFF* *Date* *3/17/23* *Checked By* *AES* *Date* *3/17/23*

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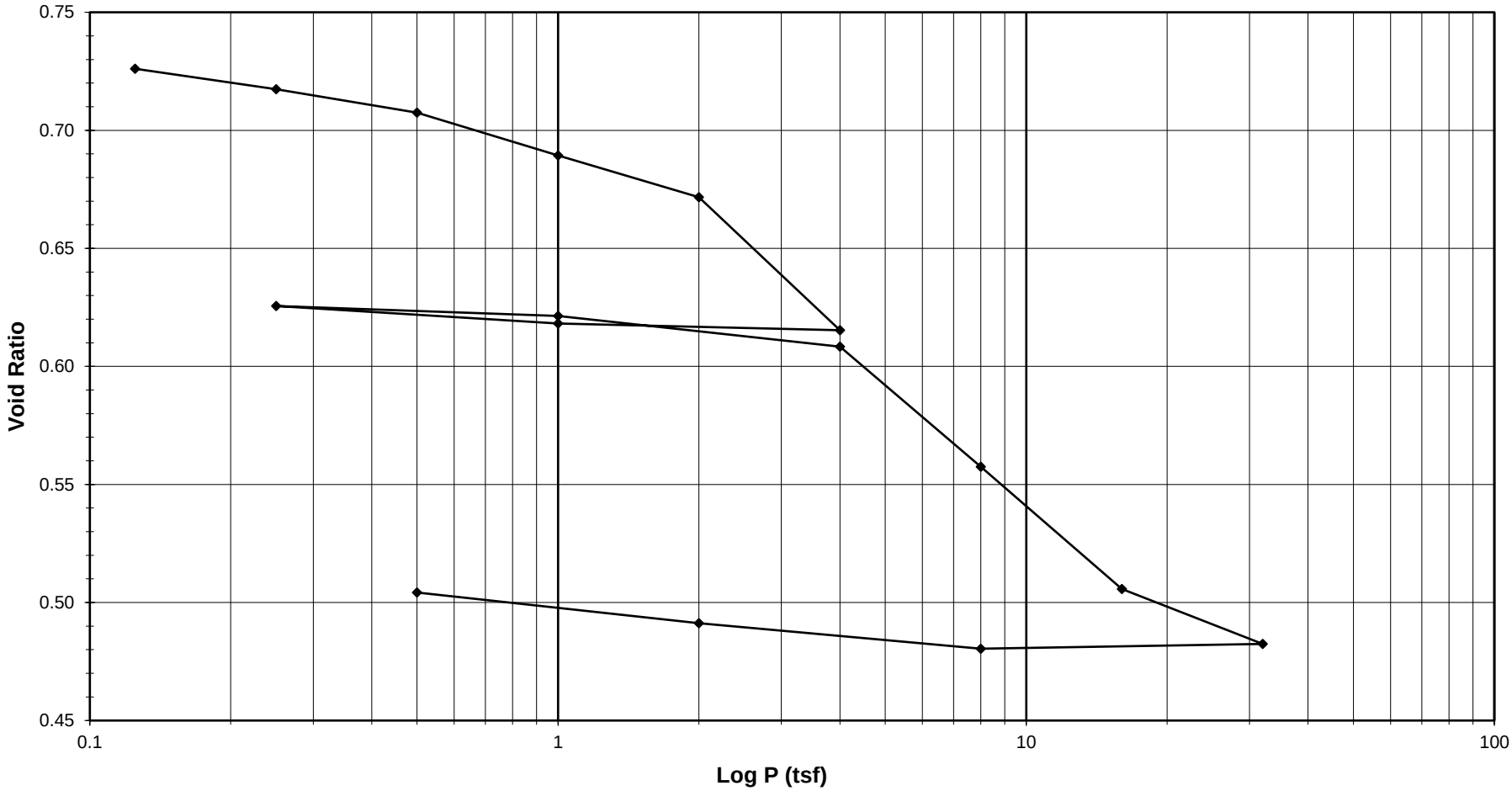
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained



Tested By MY *Date* 3/9/23 *Approved By* MPS *Date* 4/3/23

DCN: CT-24E Date: 8/15/12 Revision: 2

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ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	446	491
Wt. of Tare & WS (g)	453.28	254.69
Wt. of Tare & DS (g)	390.52	231.49
Wt. of Water (g)	62.76	23.20
Wt. of Tare (g)	99.11	100.44
Wt. of DS (g)	291.41	131.05
Water Content (%)	21.54	17.70
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.8683
Sample Volume (cm^3)	80.44	69.84
Wt. of Wet Sample + Ring (g)	373.81	368.79
Wt. of Ring (g)	214.67	214.67
Wt. of Wet Sample (g)	159.14	154.12
Wet Density (pcf)	123.45	137.69
Wet Density (g/cm^3)	1.98	2.21
Water Content (%)	21.54	17.70
Wt. of Dry Sample (g)	130.94	130.94
Dry Density (pcf)	101.57	116.98
Dry Density (g/cm^3)	1.63	1.87
Void Ratio	0.7324	0.5042
Saturation (%)	82.92	99.01
Specific Gravity	2.82	*Measured*

Test Data Summary

Applied Pressure (tsf)	Final Dial Reading (div)	Machine Deflection (div)	Corrected Reading (div)	Height of Sample (mm)	Volume (cm^3)	Dry Density (g/cm^3)	Void Ratio
Seating	0	0	0	25.400	80.440	1.62780	**0.73240**
0.125	45.2	8.7	36.5	25.307	80.146	1.63376	**0.72608**
0.25	101.7	15.0	86.7	25.180	79.742	1.64204	**0.71738**
0.5	170.1	26.1	144.0	25.034	79.282	1.65158	**0.70746**
1	290.7	42.3	248.4	24.769	78.441	1.66927	**0.68936**
2	429.0	78.2	350.8	24.509	77.618	1.68698	**0.67163**
4	768.2	92.4	675.8	23.683	75.003	1.74579	**0.61532**
1	721.4	62.2	659.2	23.726	75.138	1.74267	**0.61821**
0.25	652.1	35.8	616.4	23.834	75.482	1.73472	**0.62562**
1	695.3	54.7	640.6	23.773	75.286	1.73922	**0.62141**
4	806.7	90.8	715.9	23.582	74.681	1.75332	**0.60838**
8	1127.3	118.0	1009.3	22.836	72.321	1.81053	**0.55755**
16	1466.6	158.2	1308.4	22.077	69.915	1.87285	**0.50572**
32	1671.4	228.4	1443.0	21.735	68.833	1.90230	**0.48242**
8	1579.9	125.4	1454.5	21.706	68.740	1.90485	**0.48043**
2	1481.8	90.0	1391.8	21.865	69.244	1.89100	**0.49128**
0.5	1375.6	58.4	1317.2	22.054	69.844	1.87474	**0.50421**

Tested By *MY* *Date* *3/9/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2

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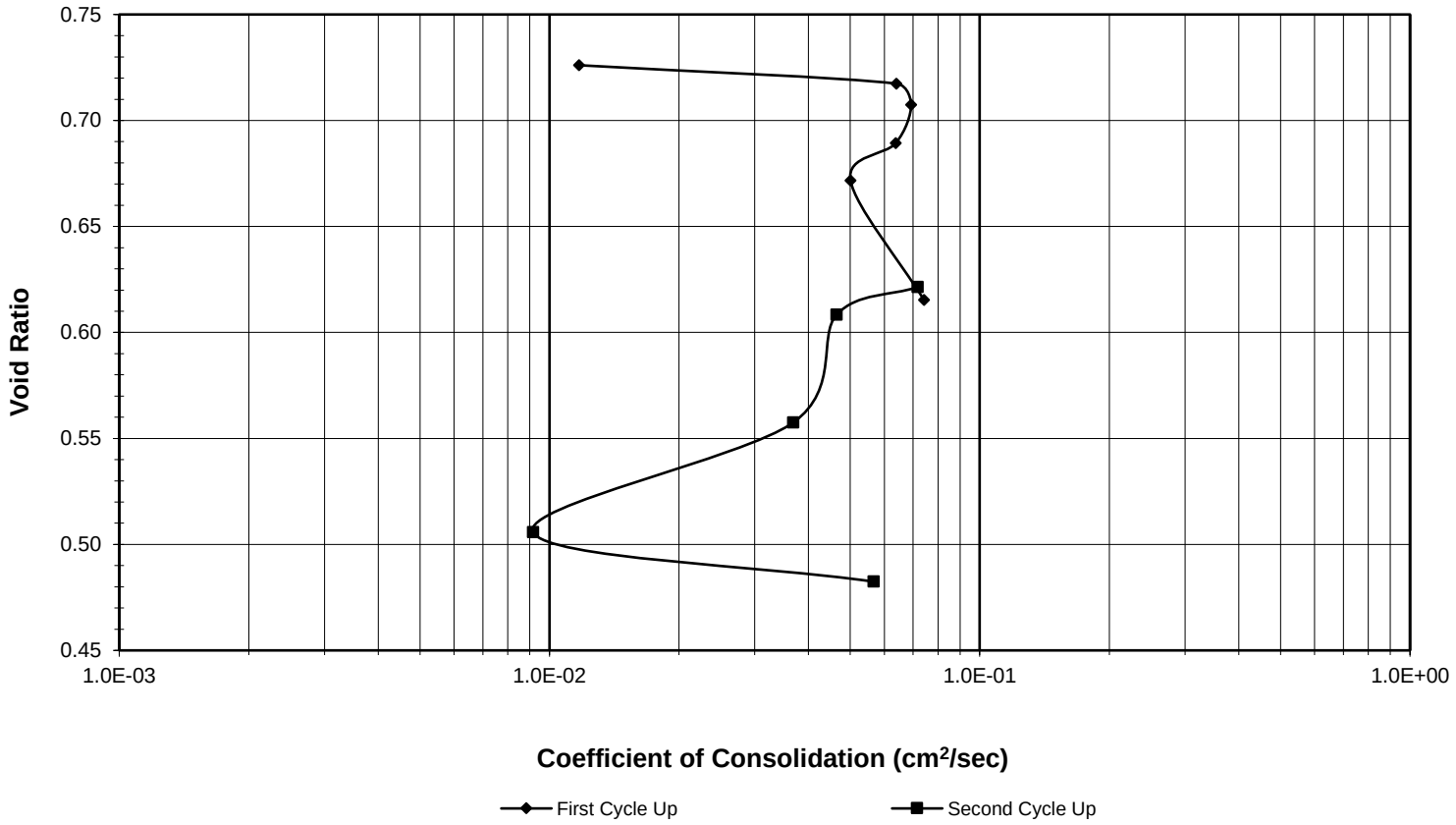
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained



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ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained
Consolidometer No. R409
1 Division = 0.0001 (in.)

Sample Properties	**Initial**	**Final**
Water Content		
Tare Number	446	491
Wt. of Tare & WS (g)	453.28	254.69
Wt. of Tare & DS (g)	390.52	231.49
Wt. of Water (g)	62.76	23.20
Wt. of Tare (g)	99.11	100.44
Wt. of DS (g)	291.41	131.05
Water Content (%)	21.54	17.70
Sample Parameters		
Sample Diameter (in)	2.5	2.5
Sample Height (in)	1.0000	0.8683
Sample Volume (cm^3)	80.44	69.84
Wt. of Wet Sample + Ring (g)	373.81	368.79
Wt. of Ring (g)	214.67	214.67
Wt. of Wet Sample (g)	159.14	154.12
Wet Density (pcf)	123.45	137.69
Wet Density (g/cm^3)	1.98	2.21
Water Content (%)	21.54	17.70
Wt. of Dry Sample (g)	130.94	130.94
Dry Density (pcf)	101.57	116.98
Dry Density (g/cm^3)	1.63	1.87
Void Ratio	0.7324	0.5042
Saturation (%)	82.92	99.01
Specific Gravity	2.82	*Measured*

C_v Test Data Summary

Load Increment	**Dial Reading @ t_{50}**	**Machine Deflection**	**Corrected Dial Reading @ t_{50}**	**Sample Height @ t_{50}**	**Time t_{50}**	**C_v**
(tsf)	(div)	(div)	(div)	(cm)	(min.)	**(cm^2/sec)**
0 - 0.125	31.0	8.7	22.3	2.534	**0.45**	**0.0117**
0.125 - 0.25	58.1	15.0	43.1	2.529	**0.08**	**0.0640**
0.25 - 0.5	120.4	26.1	94.3	2.516	**0.08**	**0.0693**
0.5 - 1	222.0	42.3	179.7	2.494	**0.08**	**0.0638**
1 - 2	352.5	78.2	274.3	2.470	**0.10**	**0.0501**
2 - 4	549.3	92.4	456.9	2.424	**0.07**	**0.0742**
4 - 1	NA	NA	NA	NA	**NA**	**NA**
1 - 0.25	NA	NA	NA	NA	**NA**	**NA**
0.25 - 1	671.2	54.7	616.5	2.383	**0.07**	**0.0717**
1 - 4	766.9	90.8	676.1	2.368	**0.10**	**0.0465**
4 - 8	975.7	118.0	857.7	2.322	**0.12**	**0.0369**
8 - 16	1336.3	158.2	1178.1	2.241	**0.45**	**0.0092**
16 - 32	1632.6	228.4	1404.2	2.183	**0.07**	**0.0567**
32 - 8	NA	NA	NA	NA	**NA**	**NA**
8 - 2	NA	NA	NA	NA	**NA**	**NA**
2 - 0.5	NA	NA	NA	NA	**NA**	**NA**

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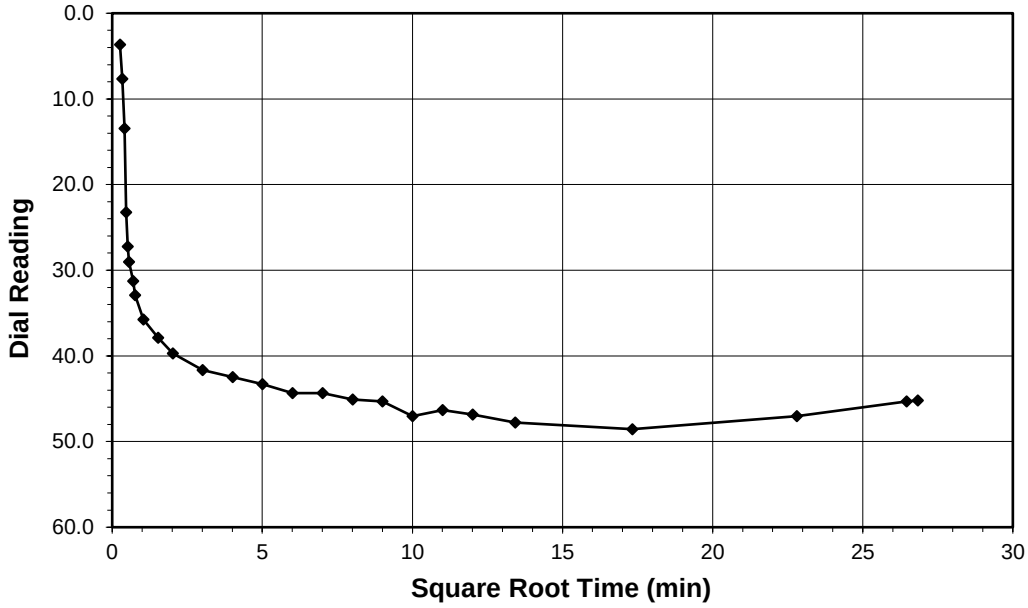
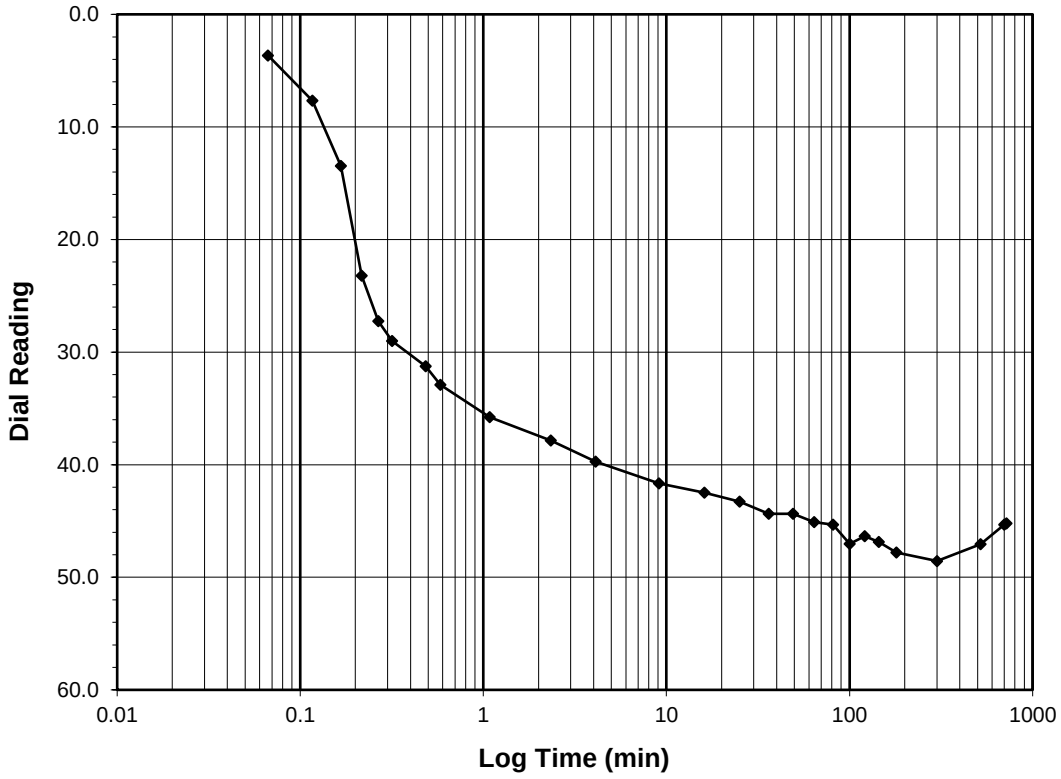
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**0 - 0.125**
Final Reading	**(div)**	**45.2**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/9/2023
Start Time		13:47:23

Elapsed Time (min)	Dial Reading (div)
Initial	**0.0**
0.07	3.6
0.12	7.7
0.17	13.5
0.22	23.2
0.27	27.2
0.32	29.0
0.48	31.3
0.58	32.9
1.08	35.8
2.33	37.9
4.10	39.7
9.10	41.7
16.10	42.5
25.10	43.3
36.12	44.3
49.12	44.3
64.12	45.1
81.12	45.3
100.13	47.0
121.13	46.3
144.15	46.9
180.15	47.8
300.15	48.6
520.15	47.0
700.15	45.3
720.05	45.2

Tested By *MY* *Date* *3/9/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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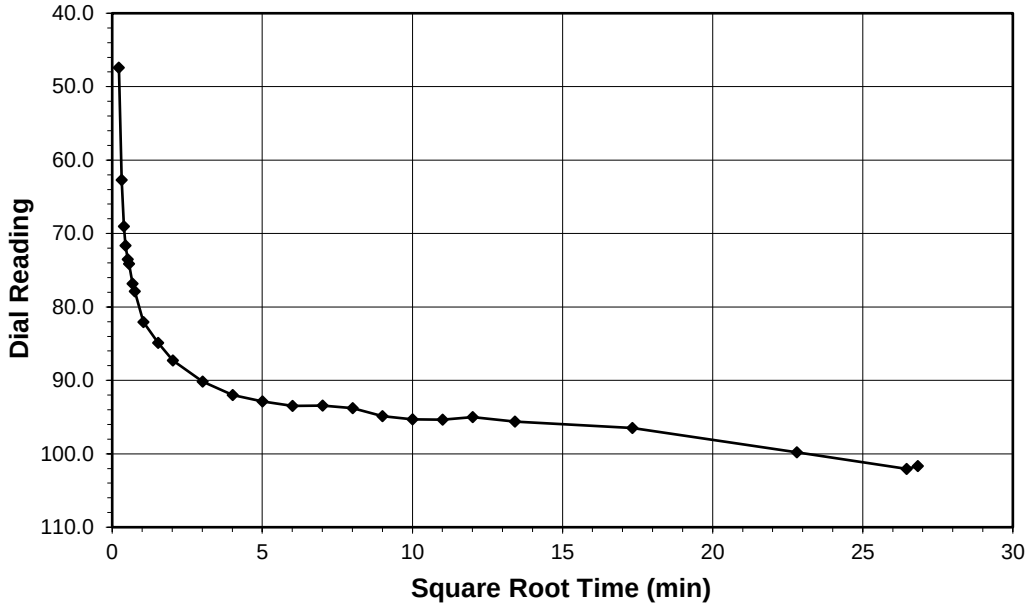
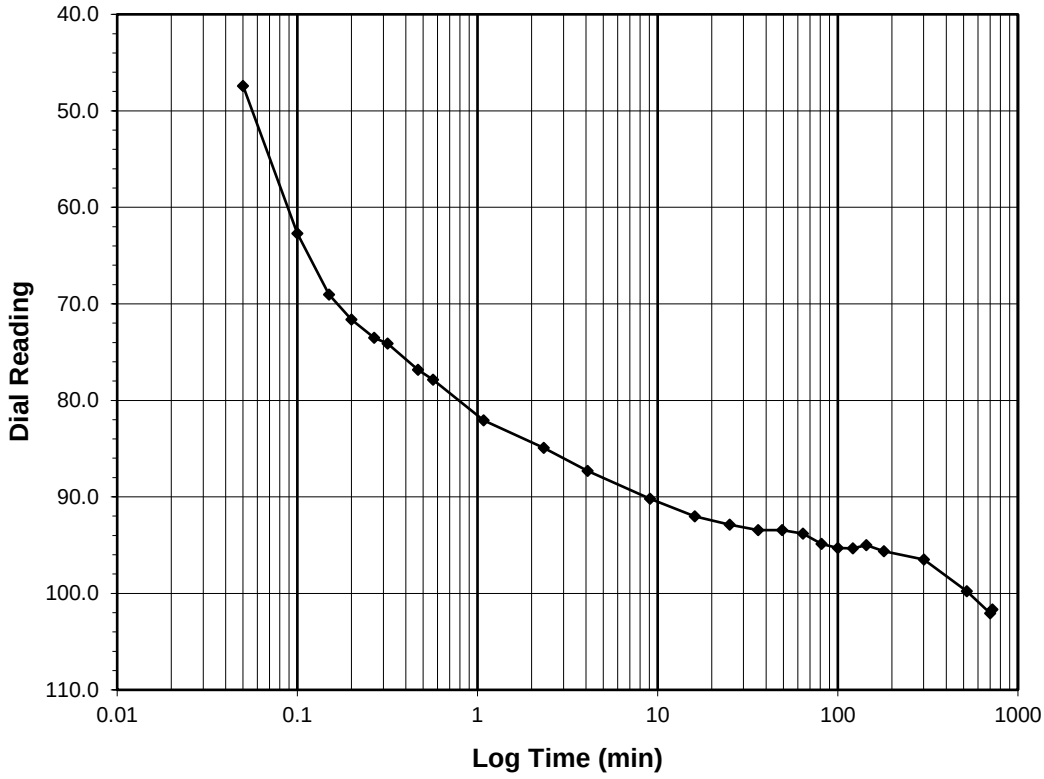
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**0.125 - 0.25**
Final Reading	**(div)**	**101.7**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/10/2023
Start Time		1:47:25

Elapsed Time (min)	Dial Reading (div)
Initial	**45.2**
0.05	47.4
0.10	62.7
0.15	69.0
0.20	71.6
0.27	73.5
0.32	74.1
0.47	76.8
0.57	77.9
1.08	82.1
2.33	84.9
4.08	87.3
9.08	90.2
16.08	92.0
25.08	92.9
36.08	93.5
49.10	93.5
64.10	93.8
81.10	94.9
100.10	95.3
121.10	95.3
144.10	95.0
180.12	95.6
300.12	96.5
520.12	99.8
700.12	102.1
720.37	101.7

Tested By *MY* *Date* *3/10/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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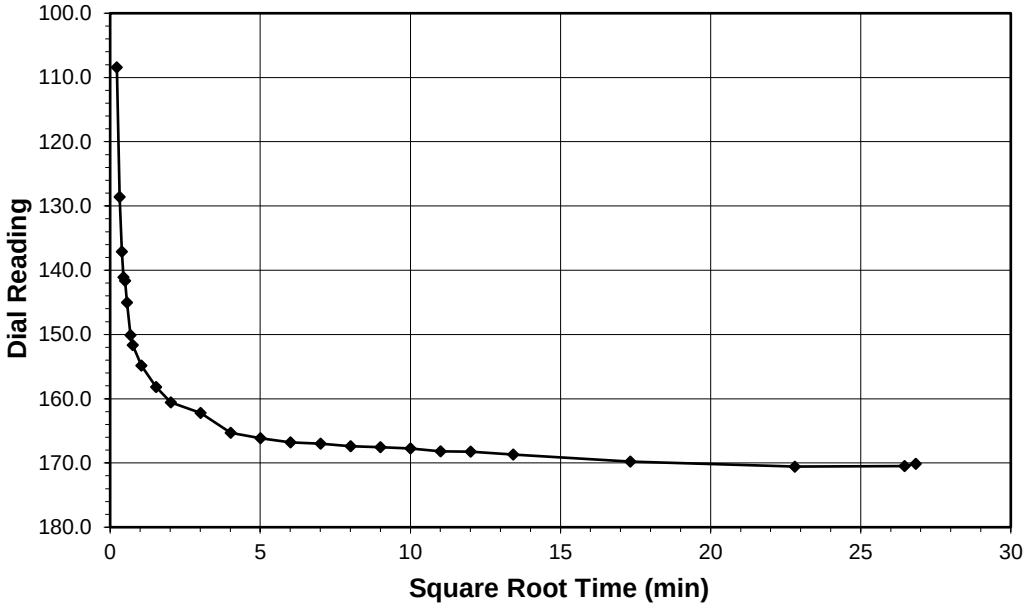
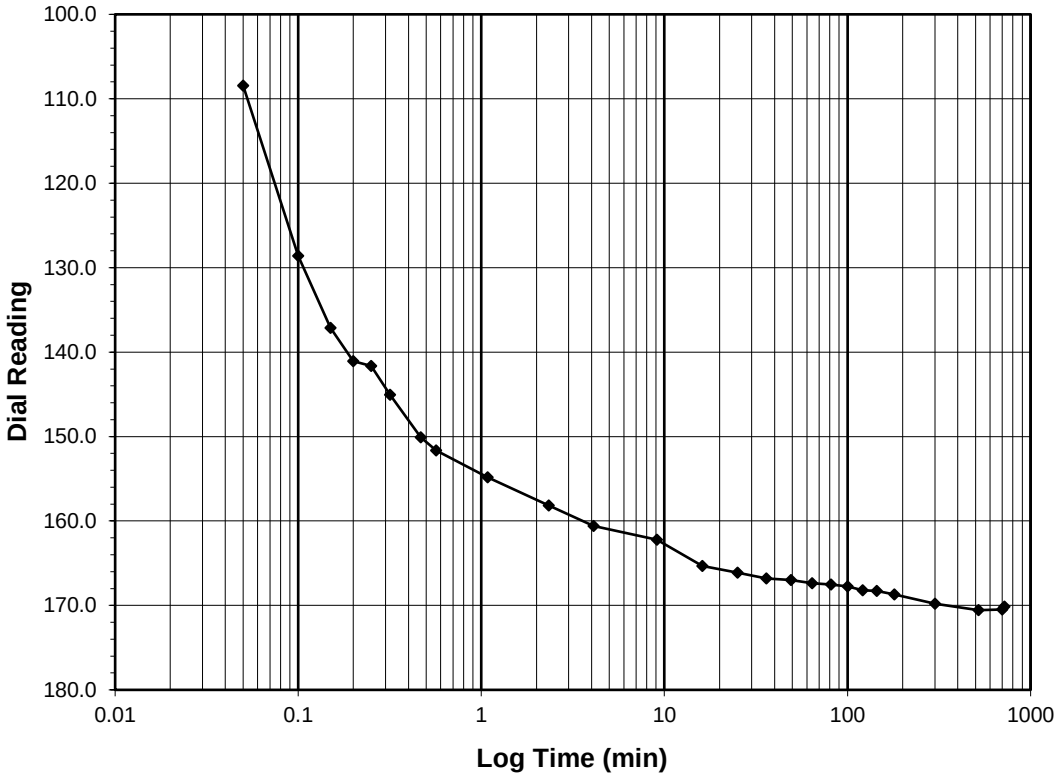
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**0.25 - 0.5**
Final Reading	**(div)**	**170.1**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/10/2023
Start Time		13:47:47

Elapsed Time (min)	Dial Reading (div)
Initial	**101.7**
0.05	108.4
0.10	128.6
0.15	137.1
0.20	141.1
0.25	141.7
0.32	145.1
0.47	150.1
0.57	151.7
1.08	154.8
2.33	158.2
4.10	160.6
9.10	162.2
16.10	165.3
25.10	166.1
36.10	166.8
49.12	167.0
64.12	167.4
81.12	167.5
100.12	167.8
121.12	168.2
144.13	168.3
180.13	168.7
300.13	169.8
520.15	170.6
700.15	170.5
720.22	170.1

Tested By *MY* *Date* *3/10/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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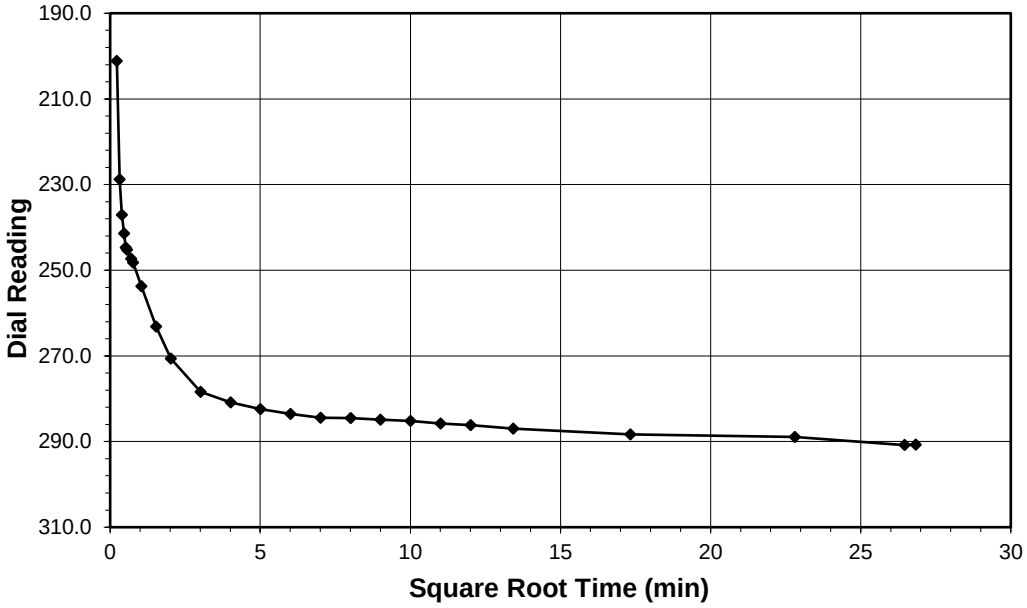
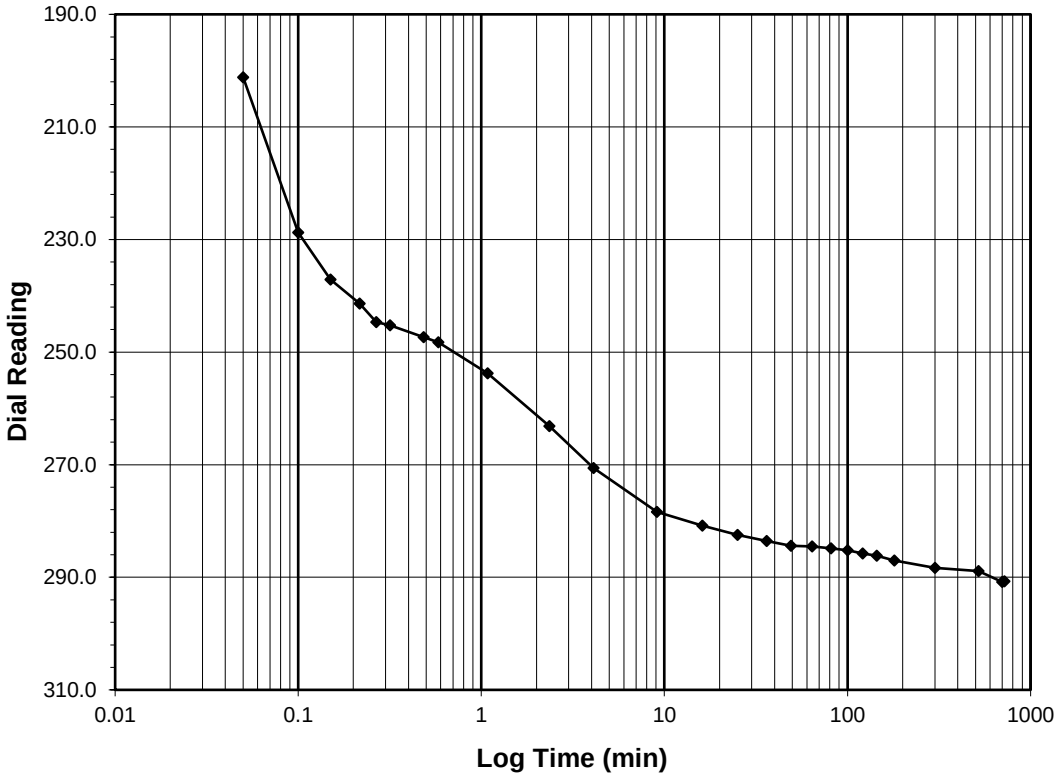
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**0.5 - 1**
Final Reading	**(div)**	**290.7**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/11/2023
Start Time		1:48:00

Elapsed Time (min)	Dial Reading (div)
Initial	**170.1**
0.05	201.2
0.10	228.8
0.15	237.1
0.22	241.4
0.27	244.7
0.32	245.3
0.48	247.3
0.58	248.2
1.08	253.8
2.35	263.1
4.10	270.6
9.10	278.4
16.10	280.8
25.10	282.5
36.12	283.5
49.12	284.4
64.13	284.5
81.13	284.9
100.13	285.2
121.13	285.8
144.13	286.2
180.13	287.0
300.15	288.3
520.15	288.9
700.15	290.8
720.38	290.7

Tested By *MY* *Date* *3/11/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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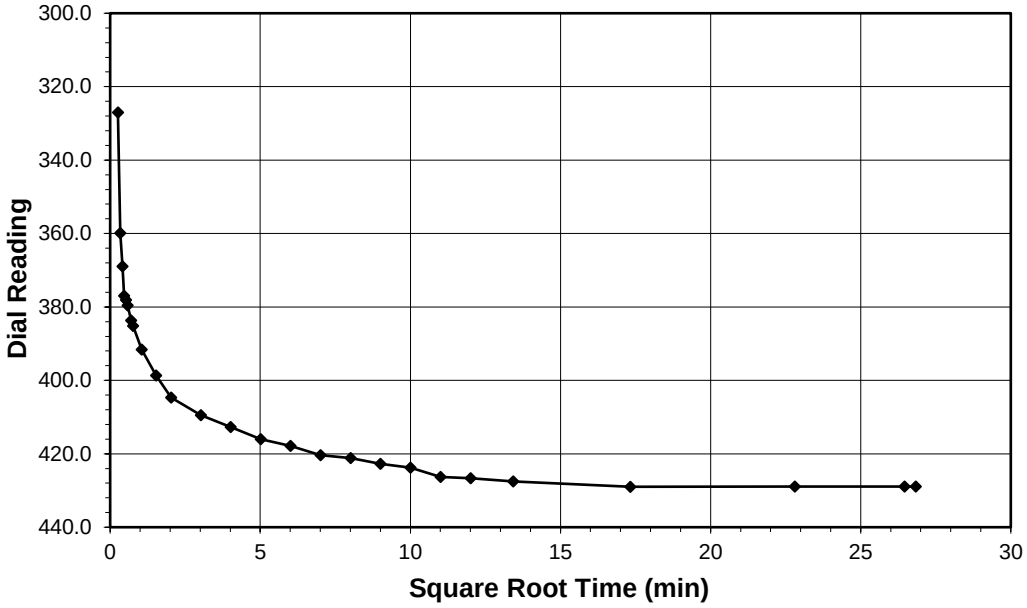
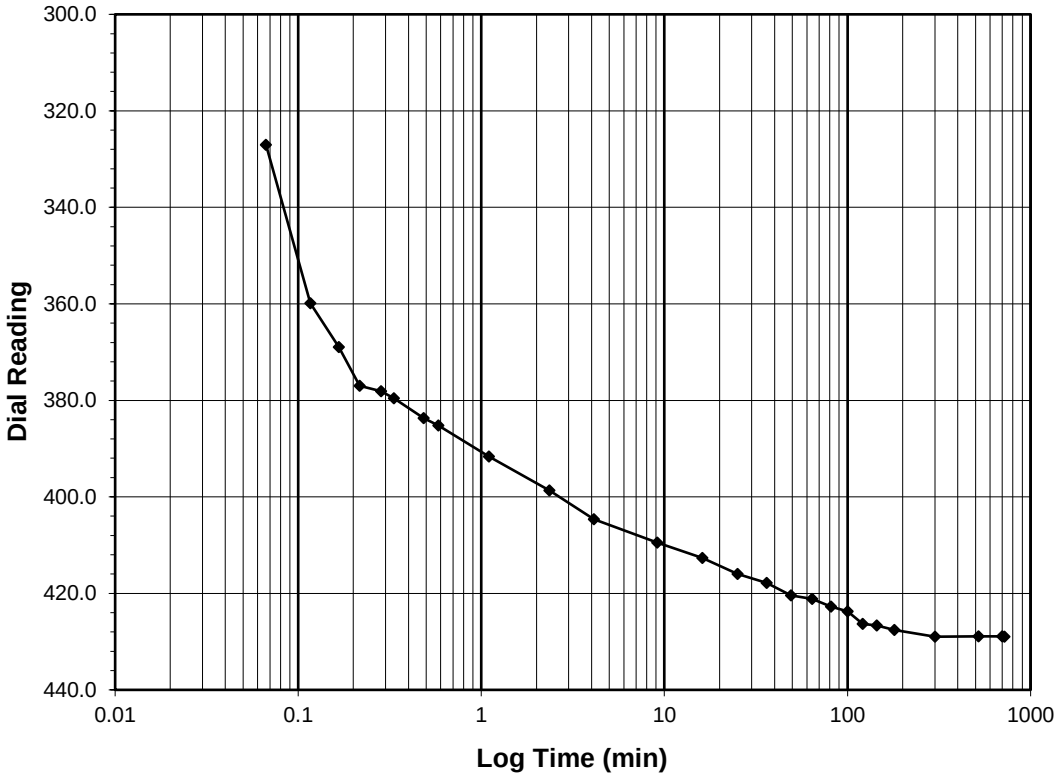
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**1 - 2**
Final Reading	**(div)**	**429.0**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/11/2023
Start Time		13:48:24

Elapsed Time (min)	Dial Reading (div)
Initial	**290.7**
0.07	327.0
0.12	359.9
0.17	369.0
0.22	377.0
0.28	378.1
0.33	379.6
0.48	383.7
0.58	385.2
1.10	391.7
2.35	398.7
4.12	404.7
9.12	409.5
16.12	412.7
25.12	416.0
36.12	417.8
49.12	420.4
64.13	421.1
81.13	422.7
100.13	423.8
121.13	426.3
144.15	426.7
180.15	427.6
300.15	429.0
520.17	428.9
700.17	428.9
720.13	429.0

Tested By *MY* *Date* *3/11/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2

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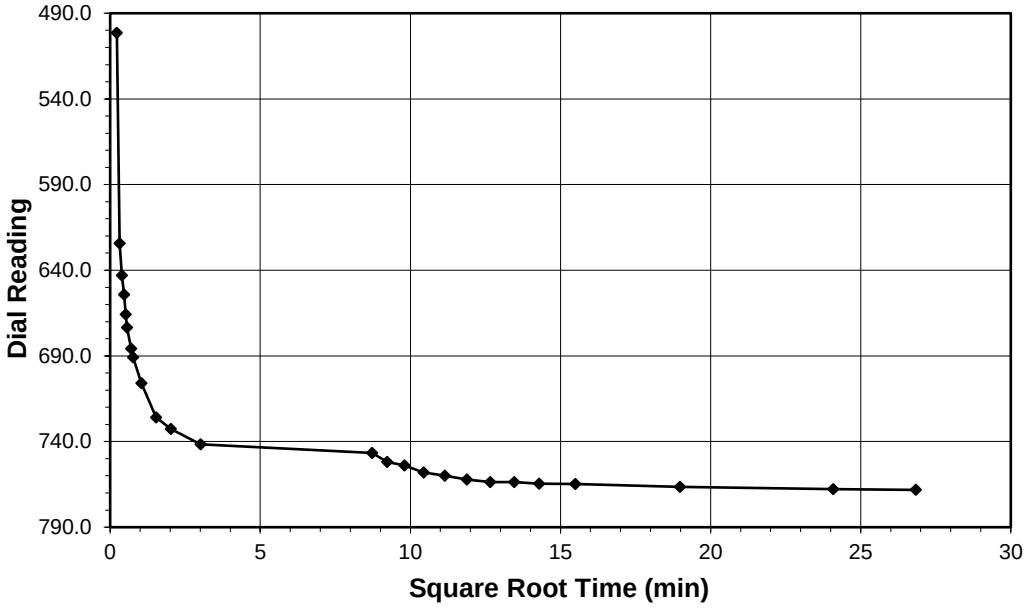
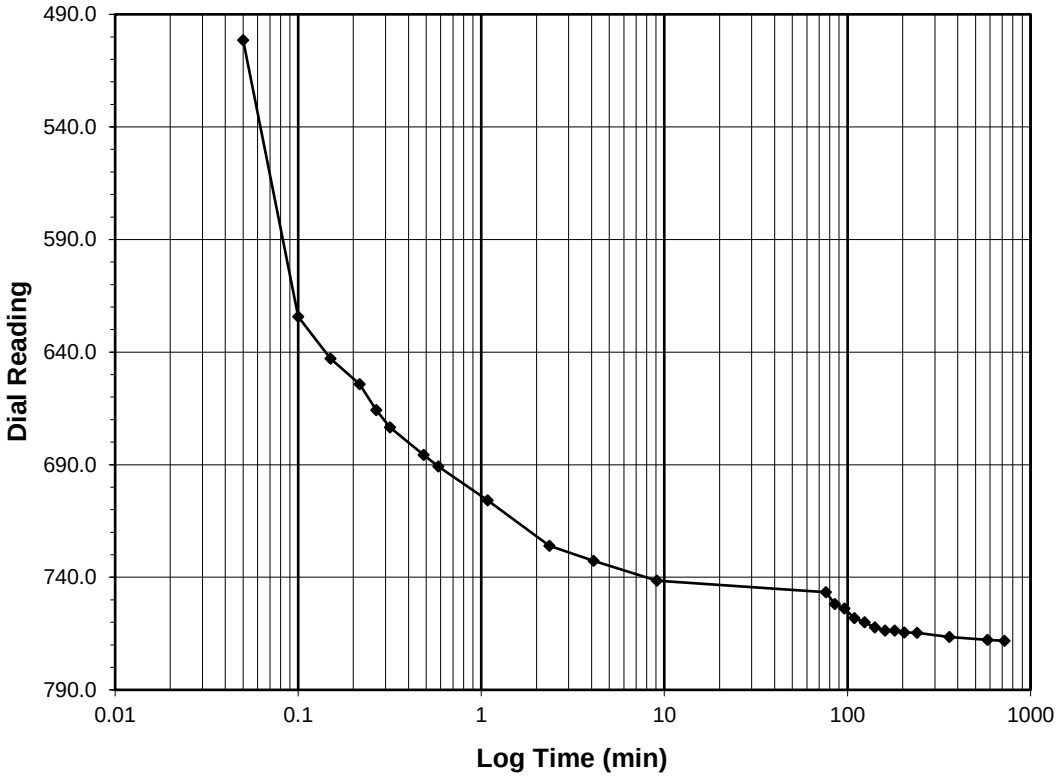
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**2 - 4**
Final Reading	**(div)**	**768.2**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/12/2023
Start Time		1:48:31

Elapsed Time (min)	Dial Reading (div)
Initial	**429.0**
0.05	501.4
0.10	624.2
0.15	642.9
0.22	654.2
0.27	665.8
0.32	673.5
0.48	685.7
0.58	690.8
1.08	705.9
2.35	726.0
4.10	732.7
9.10	741.5
76.12	746.6
85.12	751.8
96.12	753.9
109.12	758.1
124.13	760.0
141.13	762.2
160.13	763.6
181.15	763.7
204.15	764.5
240.15	764.7
360.17	766.5
580.17	767.8
720.12	768.2

Tested By *MY* *Date* *3/12/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2

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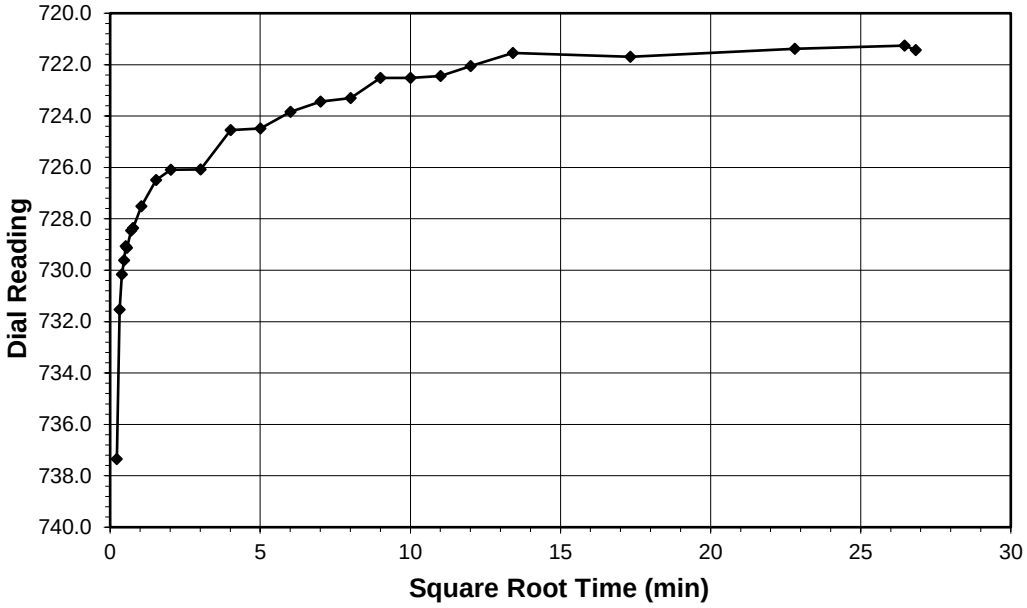
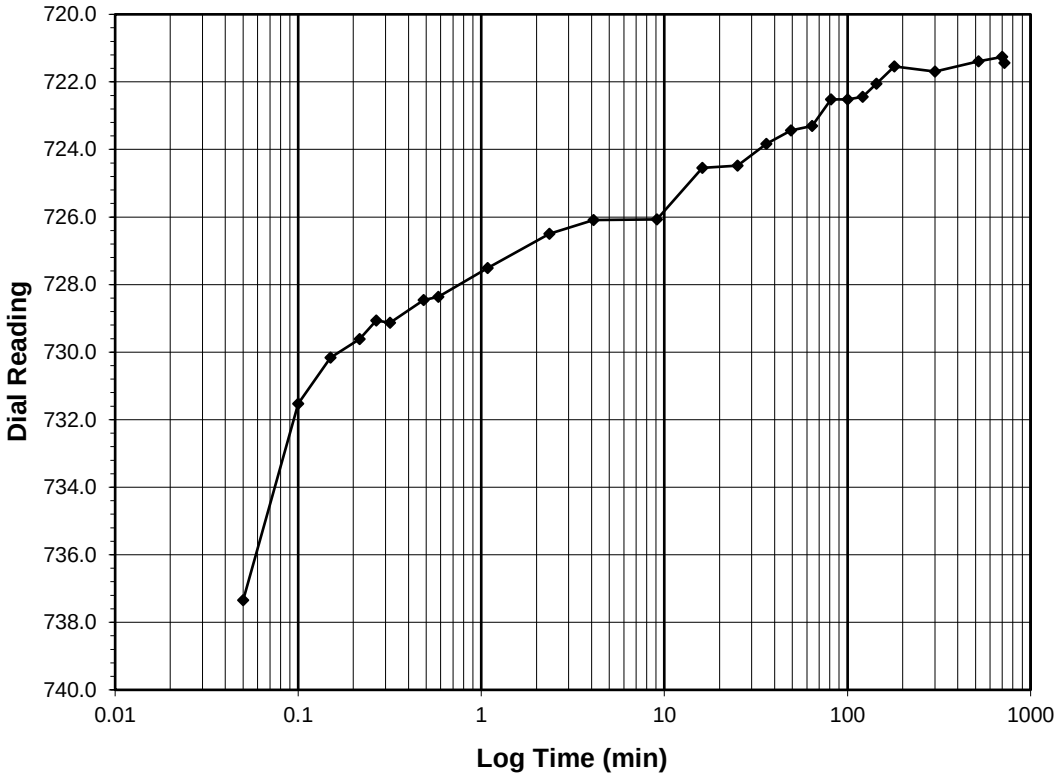
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**4 - 1**
Final Reading	**(div)**	**721.4**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/12/2023
Start Time		13:48:38

Elapsed Time (min)	Dial Reading (div)
Initial	**768.2**
0.05	737.3
0.10	731.5
0.15	730.2
0.22	729.6
0.27	729.1
0.32	729.1
0.48	728.5
0.58	728.4
1.08	727.5
2.35	726.5
4.10	726.1
9.10	726.1
16.10	724.5
25.10	724.5
36.10	723.8
49.10	723.4
64.10	723.3
81.12	722.5
100.12	722.5
121.12	722.4
144.12	722.1
180.12	721.5
300.12	721.7
520.12	721.4
700.12	721.3
720.07	721.4

Tested By *MY* *Date* *3/12/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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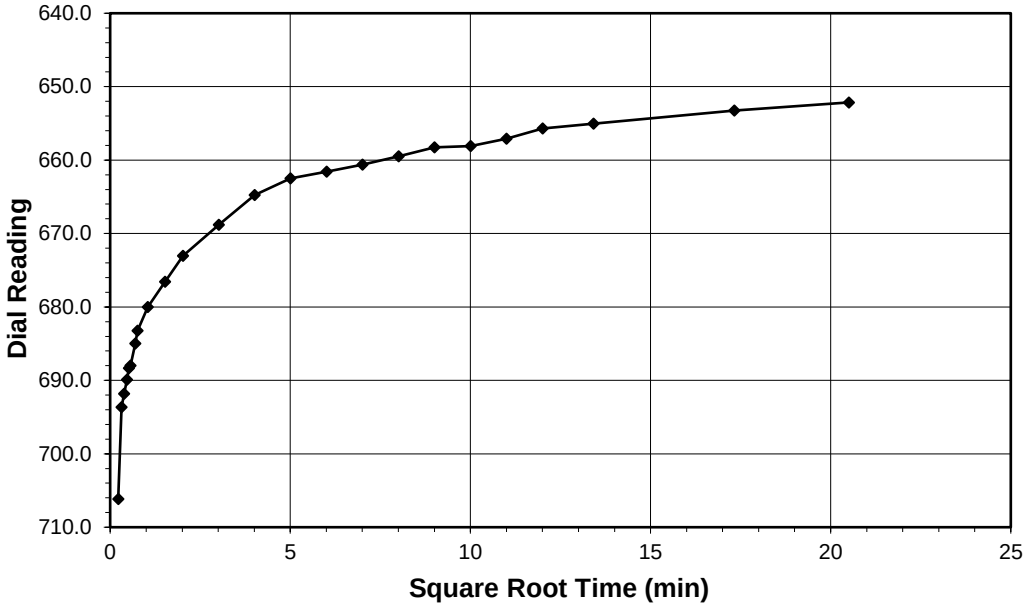
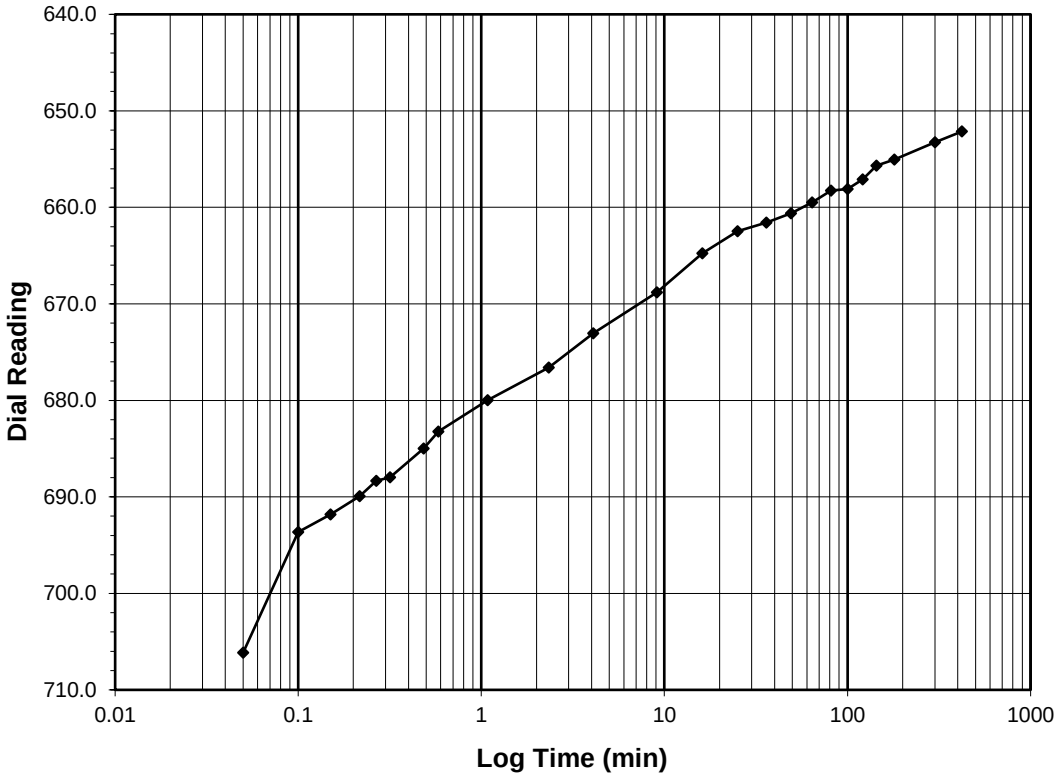
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**1 - 0.25**
Final Reading	**(div)**	**652.1**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/13/2023
Start Time		1:48:42

Elapsed Time (min)	Dial Reading (div)
Initial	**721.4**
0.05	706.1
0.10	693.6
0.15	691.8
0.22	689.9
0.27	688.3
0.32	688.0
0.48	685.0
0.58	683.2
1.08	680.0
2.33	676.6
4.08	673.1
9.08	668.8
16.10	664.8
25.10	662.5
36.10	661.6
49.10	660.6
64.10	659.5
81.12	658.2
100.12	658.1
121.12	657.1
144.12	655.7
180.13	655.1
300.13	653.2
420.47	652.1

Tested By *MY* *Date* *3/13/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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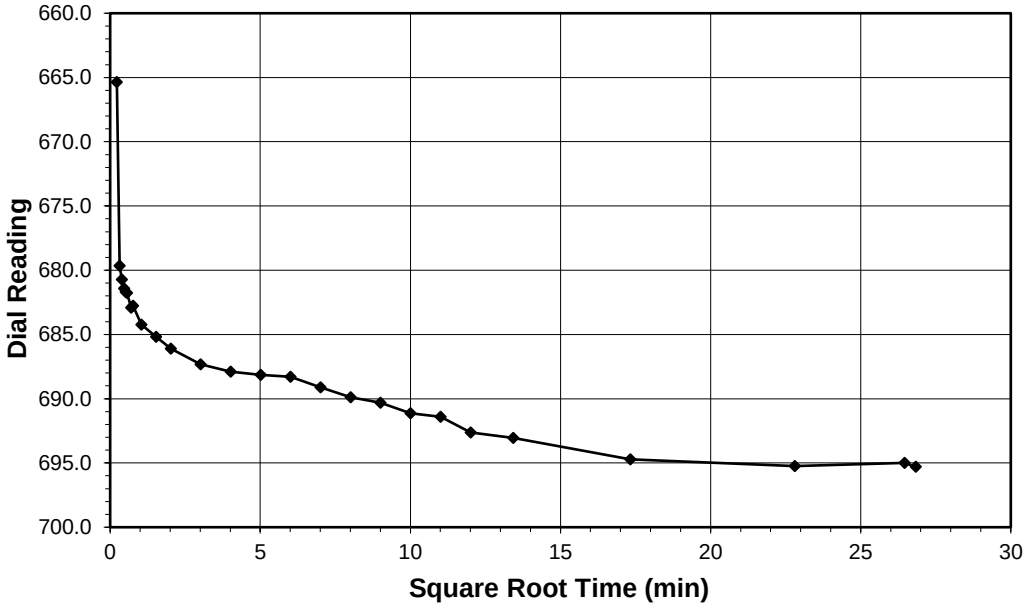
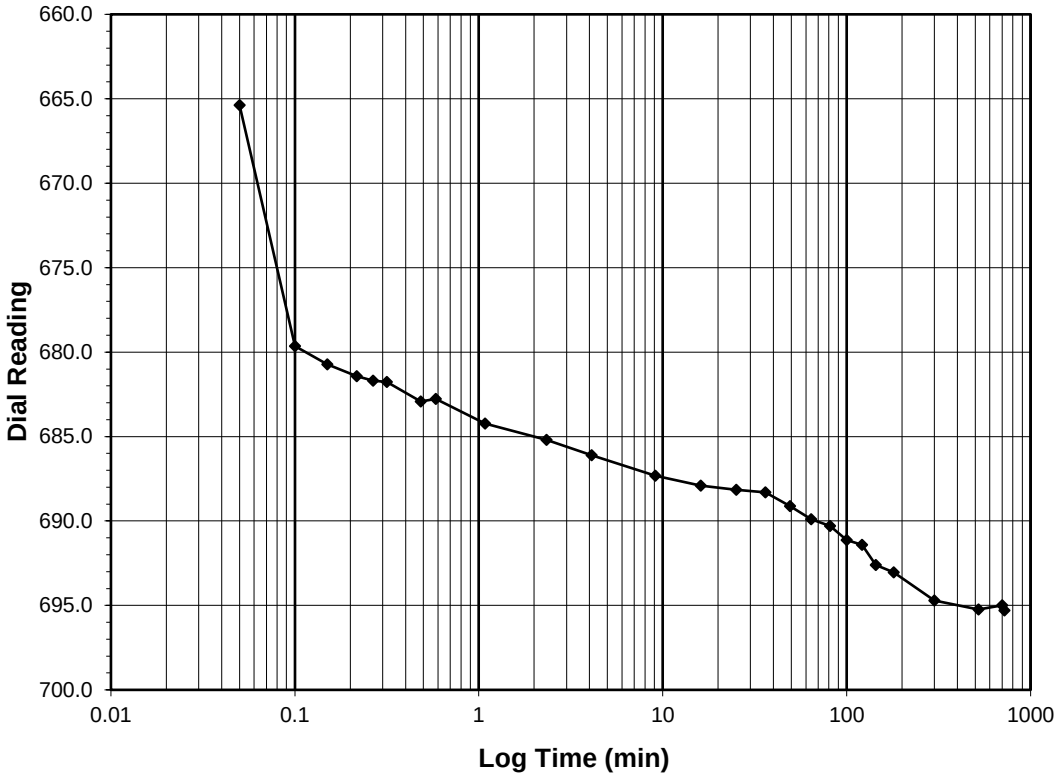
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**0.25 - 1**
Final Reading	**(div)**	**695.3**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/13/2023
Start Time		8:49:10

Elapsed Time (min)	Dial Reading (div)
Initial	**652.1**
0.05	665.4
0.10	679.7
0.15	680.7
0.22	681.4
0.27	681.7
0.32	681.8
0.48	682.9
0.58	682.8
1.08	684.2
2.33	685.2
4.10	686.1
9.10	687.3
16.10	687.9
25.12	688.2
36.12	688.3
49.12	689.1
64.12	689.9
81.13	690.3
100.13	691.1
121.13	691.4
144.15	692.6
180.15	693.0
300.15	694.7
520.15	695.2
700.15	695.0
720.07	695.3

Tested By *MY* *Date* *3/13/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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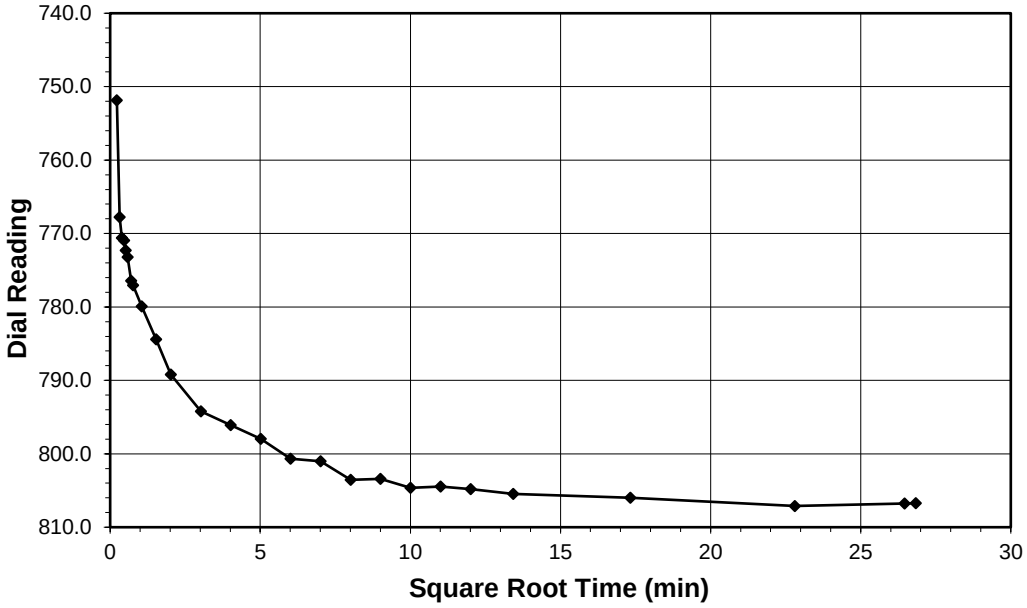
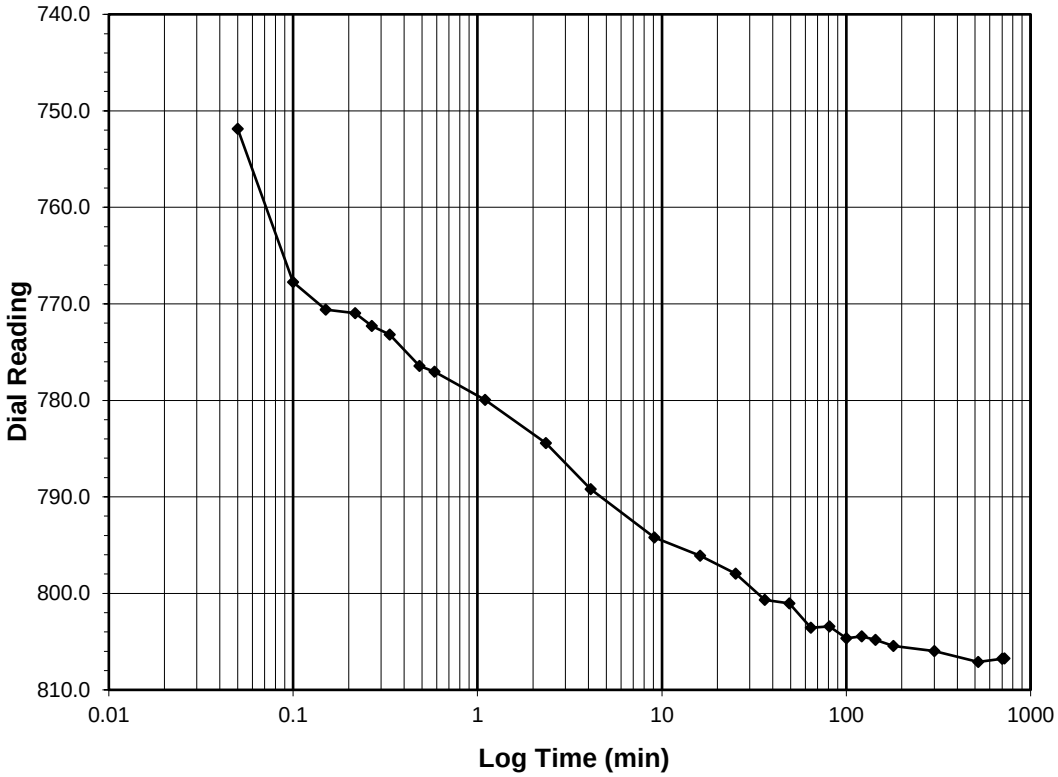
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**1 - 4**
Final Reading	**(div)**	**806.7**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/13/2023
Start Time		20:49:14

Elapsed Time (min)	Dial Reading (div)
Initial	**695.3**
0.05	751.9
0.10	767.8
0.15	770.6
0.22	771.0
0.27	772.3
0.33	773.2
0.48	776.4
0.58	777.0
1.10	779.9
2.35	784.4
4.10	789.2
9.12	794.2
16.12	796.1
25.12	798.0
36.12	800.7
49.12	801.0
64.12	803.6
81.12	803.4
100.13	804.6
121.13	804.5
144.13	804.8
180.13	805.5
300.15	806.0
520.15	807.1
700.15	806.8
720.38	806.7

Tested By *MY* *Date* *3/13/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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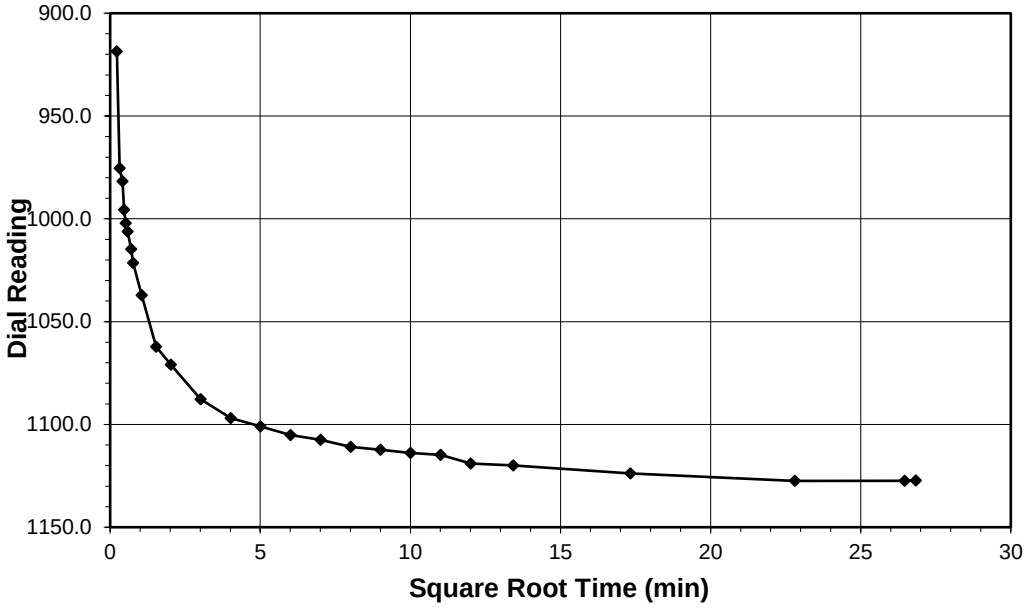
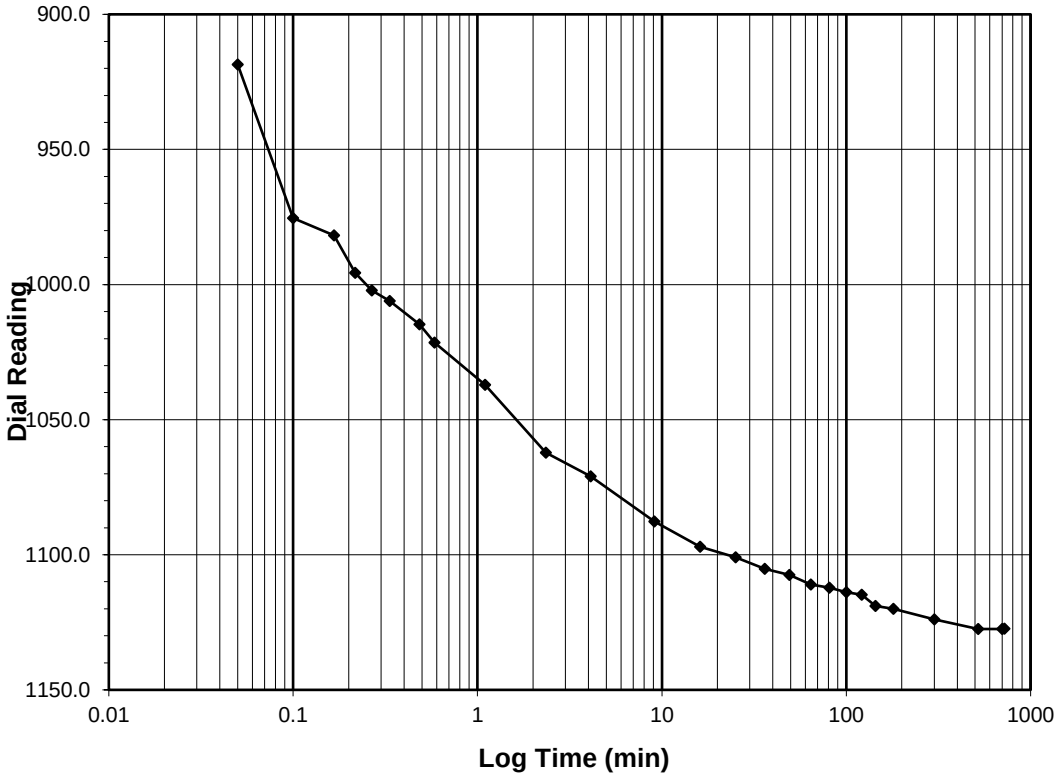
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**4 - 8**
Final Reading	**(div)**	**1127.3**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/14/2023
Start Time		8:49:37

Elapsed Time (min)	Dial Reading (div)
Initial	**806.7**
0.05	918.5
0.10	975.4
0.17	981.8
0.22	995.6
0.27	1002.1
0.33	1006.1
0.48	1014.8
0.58	1021.4
1.10	1037.1
2.35	1062.2
4.10	1070.9
9.10	1087.7
16.10	1097.0
25.10	1101.0
36.12	1105.2
49.13	1107.4
64.13	1111.0
81.13	1112.2
100.13	1113.9
121.15	1114.8
144.15	1118.9
180.15	1120.0
300.17	1123.9
520.17	1127.5
700.17	1127.4
720.27	1127.3

Tested By *MY* *Date* *3/14/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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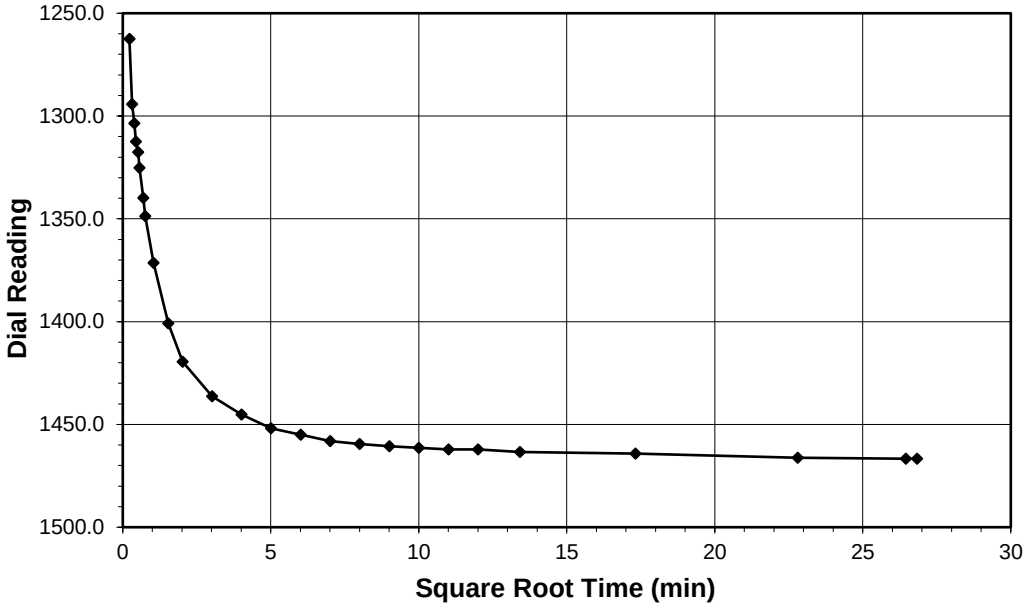
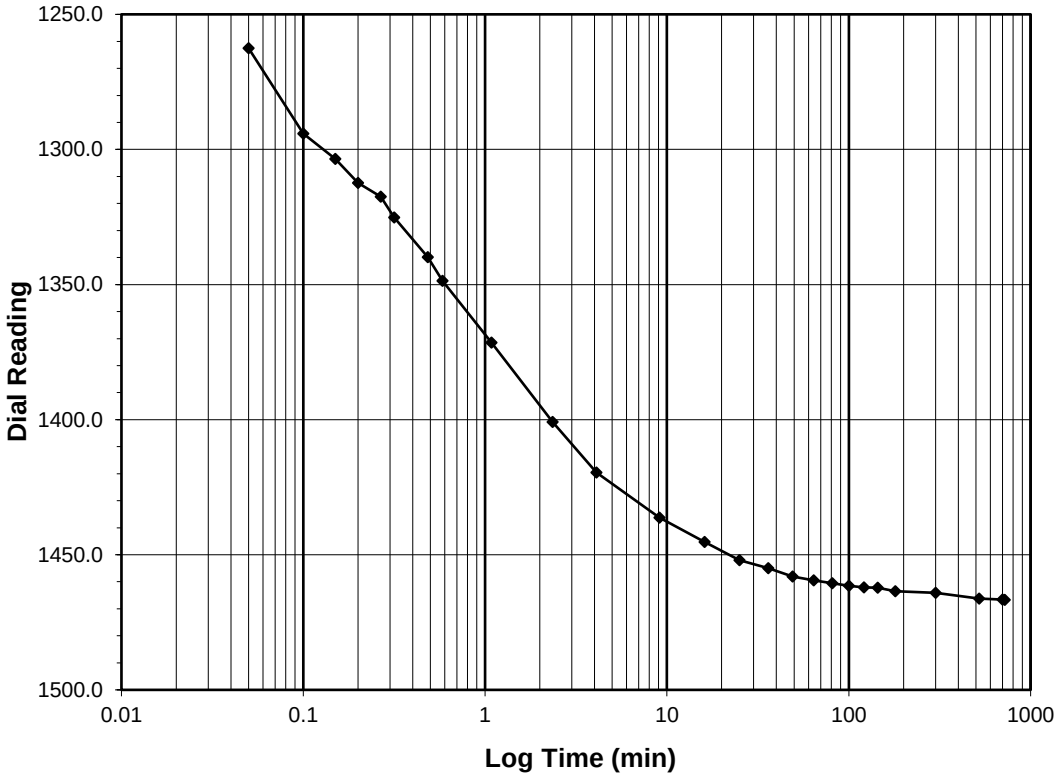
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**8 - 16**
Final Reading	**(div)**	**1466.6**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/14/2023
Start Time		20:49:53

Elapsed Time (min)	Dial Reading (div)
Initial	**1127.3**
0.05	1262.5
0.10	1294.2
0.15	1303.5
0.20	1312.4
0.27	1317.5
0.32	1325.1
0.48	1339.8
0.58	1348.6
1.08	1371.4
2.35	1400.8
4.10	1419.6
9.10	1436.3
16.10	1445.2
25.10	1452.0
36.10	1454.9
49.10	1458.1
64.10	1459.5
81.10	1460.6
100.10	1461.4
121.10	1462.1
144.10	1462.2
180.12	1463.5
300.12	1464.1
520.13	1466.3
700.13	1466.6
720.15	1466.6

Tested By *MY* *Date* *3/14/23* *Checked By* *MPS* *Date* *4/3/23*

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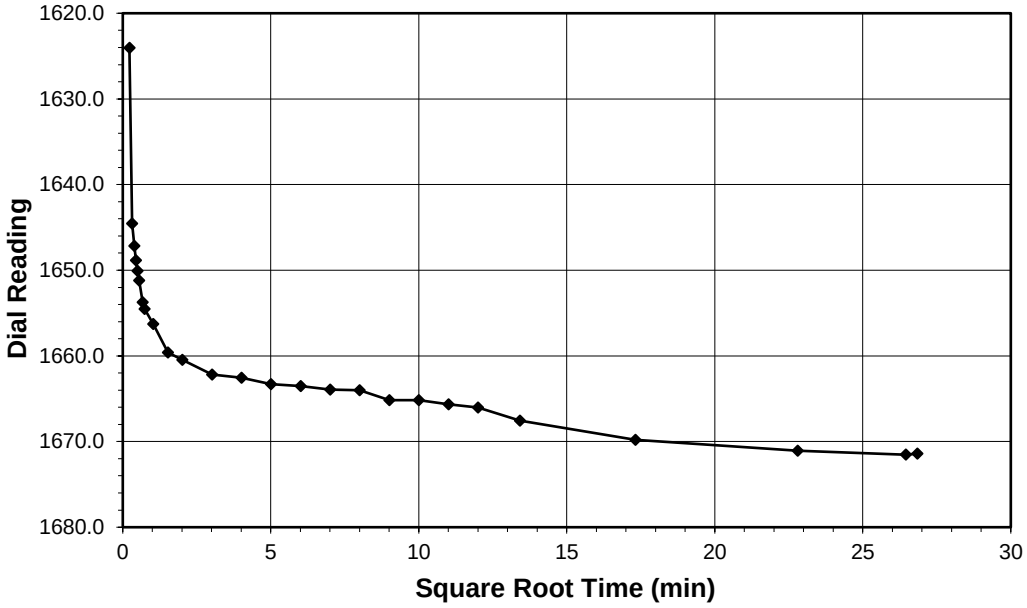
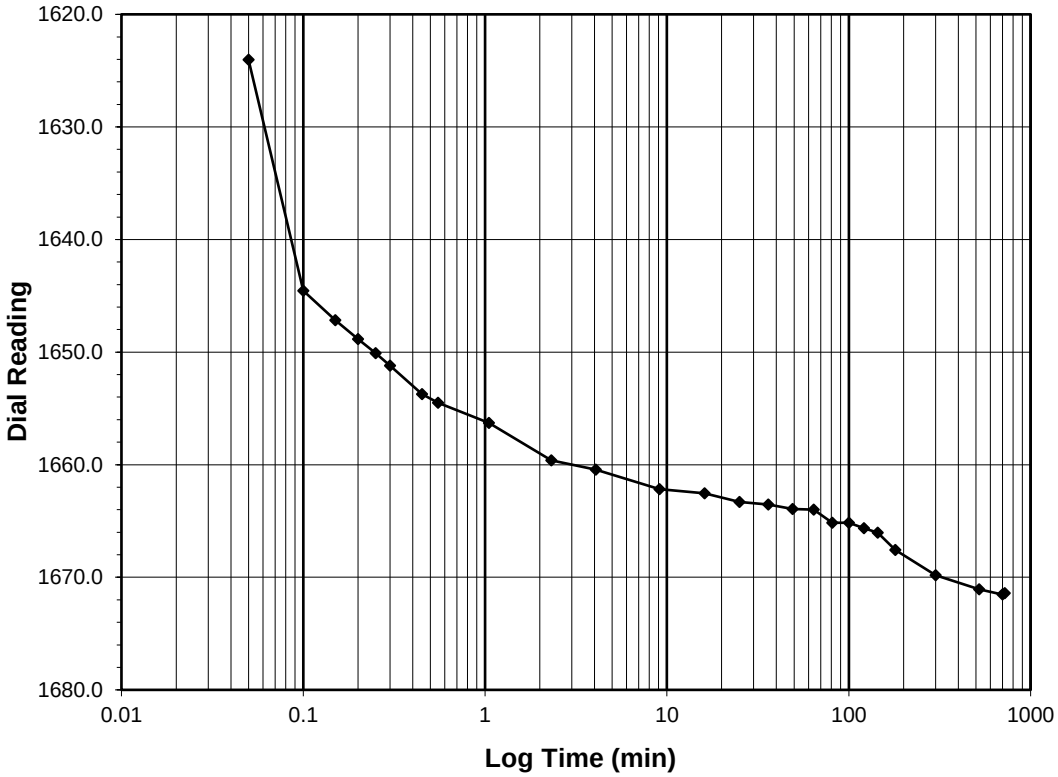
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**16 - 32**
Final Reading	**(div)**	**1671.4**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/15/2023
Start Time		8:50:03

Elapsed Time (min)	Dial Reading (div)
Initial	**1466.6**
0.05	1624.0
0.10	1644.5
0.15	1647.2
0.20	1648.9
0.25	1650.1
0.30	1651.2
0.45	1653.7
0.55	1654.5
1.05	1656.3
2.32	1659.6
4.07	1660.4
9.08	1662.2
16.08	1662.6
25.08	1663.3
36.08	1663.5
49.08	1663.9
64.10	1664.0
81.10	1665.2
100.10	1665.2
121.10	1665.6
144.10	1666.0
180.12	1667.6
300.12	1669.8
520.13	1671.1
700.13	1671.5
720.45	1671.4

Tested By *MY* *Date* *3/15/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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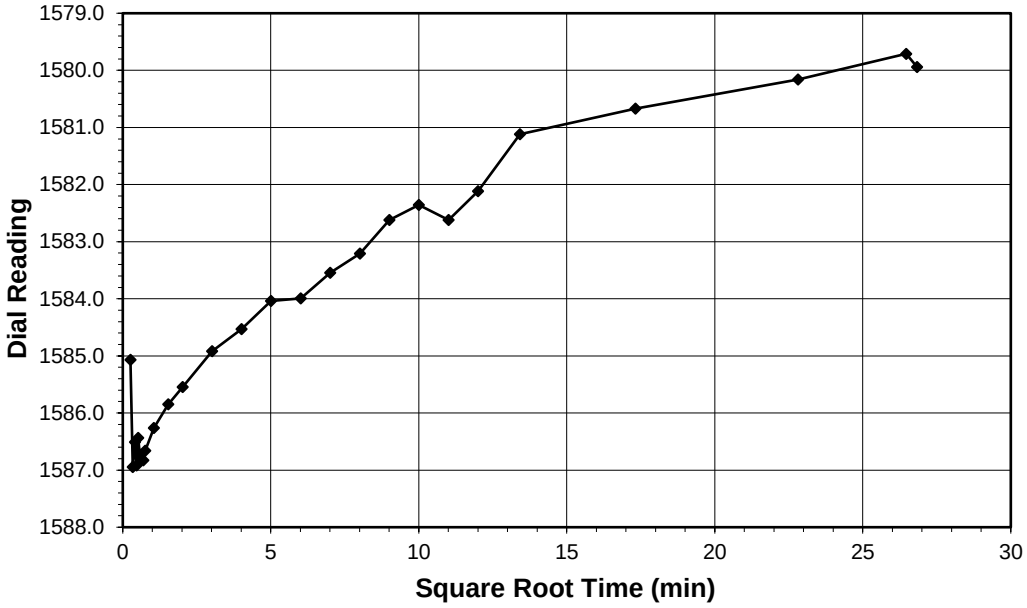
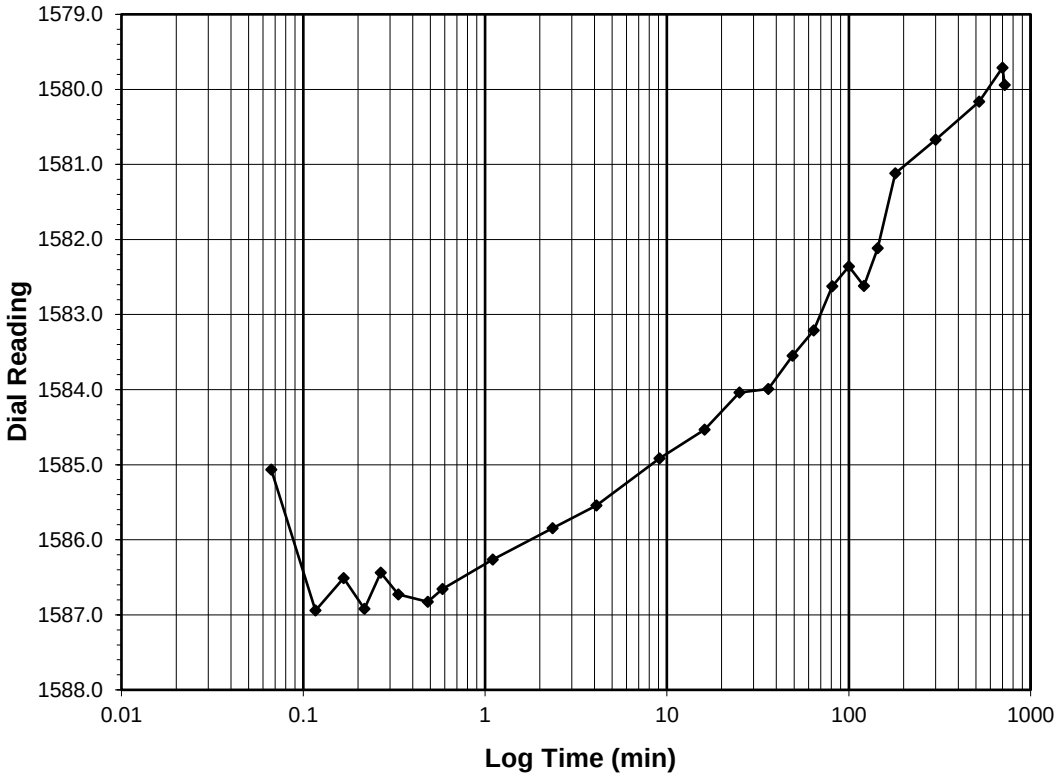
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**32 - 8**
Final Reading	**(div)**	**1579.9**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/15/2023
Start Time		20:50:31

Elapsed Time (min)	Dial Reading (div)
Initial	**1671.4**
0.07	1585.1
0.12	1586.9
0.17	1586.5
0.22	1586.9
0.27	1586.4
0.33	1586.7
0.48	1586.8
0.58	1586.7
1.10	1586.3
2.35	1585.8
4.10	1585.5
9.10	1584.9
16.10	1584.5
25.10	1584.0
36.10	1584.0
49.12	1583.5
64.12	1583.2
81.12	1582.6
100.12	1582.4
121.13	1582.6
144.13	1582.1
180.15	1581.1
300.15	1580.7
520.17	1580.2
700.17	1579.7
720.02	1579.9

Tested By *MY* *Date* *3/15/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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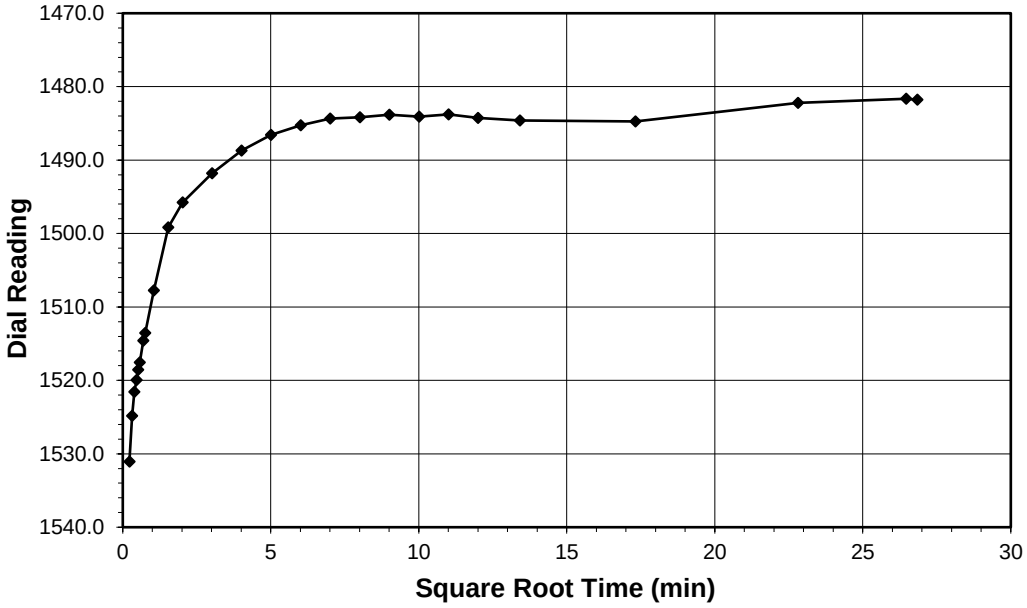
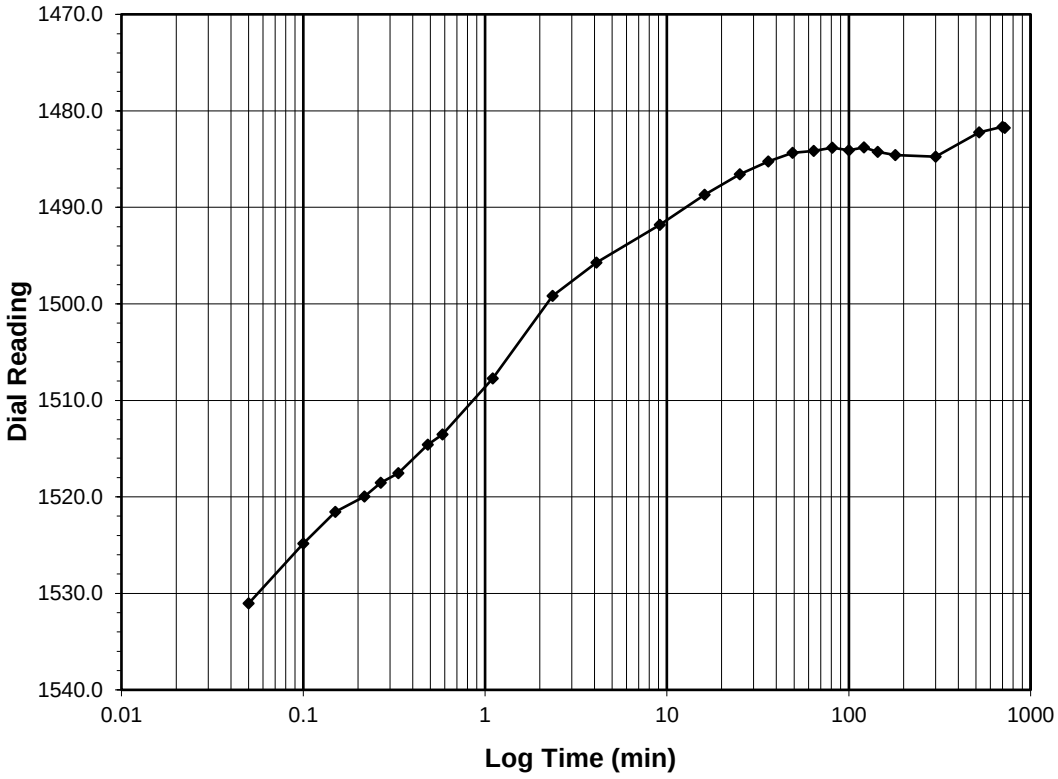
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24A)

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**8 - 2**
Final Reading	**(div)**	**1481.8**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/16/2023
Start Time		8:50:31

Elapsed Time (min)	Dial Reading (div)
Initial	**1579.9**
0.05	1531.1
0.10	1524.8
0.15	1521.5
0.22	1519.9
0.27	1518.5
0.33	1517.6
0.48	1514.6
0.58	1513.5
1.10	1507.7
2.35	1499.2
4.10	1495.7
9.12	1491.8
16.12	1488.7
25.12	1486.6
36.12	1485.2
49.12	1484.3
64.13	1484.2
81.13	1483.8
100.15	1484.1
121.15	1483.8
144.15	1484.3
180.15	1484.6
300.17	1484.7
520.17	1482.2
700.17	1481.6
720.47	1481.8

Tested By *MY* *Date* *3/16/23* *Checked By* *MPS* *Date* *4/3/23*

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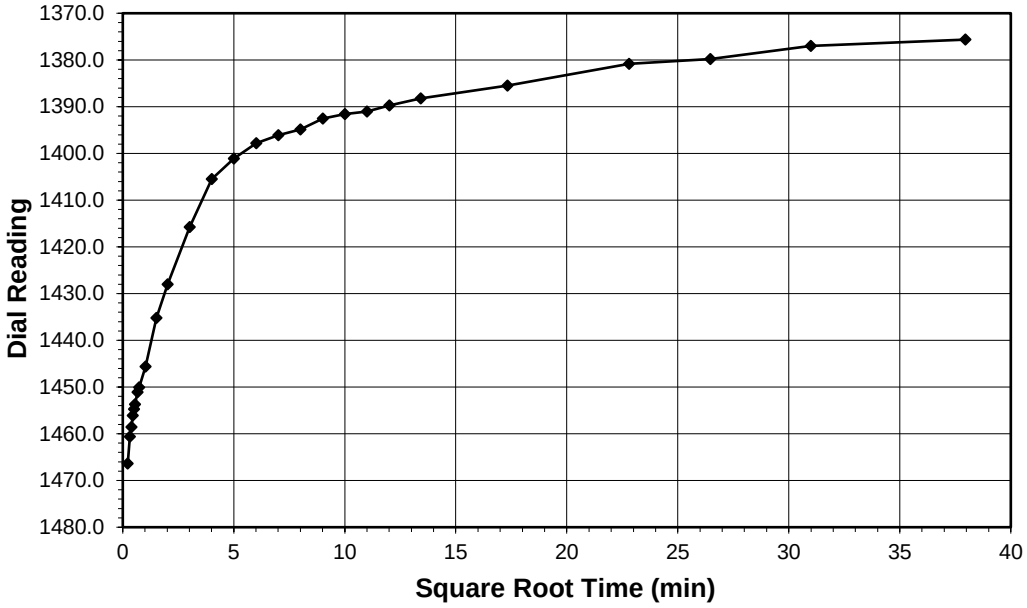
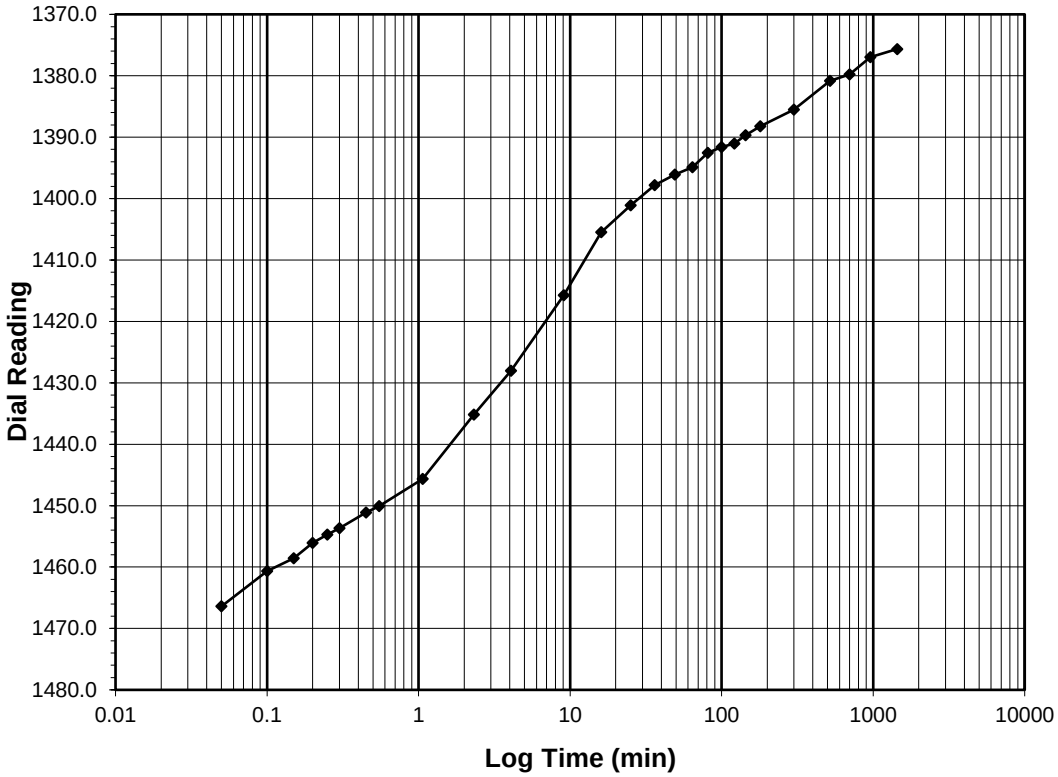
ONE DIMENSIONAL CONSOLIDATION

ASTM D2435 / D2435M-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51A
Client Project:	Cherrystone Dam 2A	Depth (ft):	56-58
Project No.:	R-2023-070-001	Sample No.:	UD-03
Lab ID:	R-2023-070-001-002	Visual Description:	Orange Red Silty Sand

Sample Conditions: Undisturbed, Inundated, Double Drained





Test Load	**(tsf)**	**2 - 0.5**
Final Reading	**(div)**	**1375.6**
Consolidometer No.		**R409**
1 Division	(in)	0.0001
Start Date		3/16/2023
Start Time		20:51:00

Elapsed Time (min)	Dial Reading (div)
Initial	**1481.8**
0.05	1466.4
0.10	1460.6
0.15	1458.6
0.20	1456.1
0.25	1454.7
0.30	1453.7
0.45	1451.1
0.55	1450.1
1.07	1445.6
2.32	1435.2
4.07	1428.0
9.07	1415.7
16.07	1405.5
25.08	1401.1
36.08	1397.8
49.08	1396.1
64.10	1394.9
81.10	1392.5
100.10	1391.6
121.10	1391.1
144.10	1389.7
180.10	1388.2
300.12	1385.5
520.12	1380.8
700.12	1379.8
960.12	1377.0
1440.13	1375.6

Tested By *MY* *Date* *3/16/23* *Checked By* *MPS* *Date* *4/3/23*

DCN: CT-24E Date: 8/15/12 Revision: 2 GeoJac-16tsf.xlt

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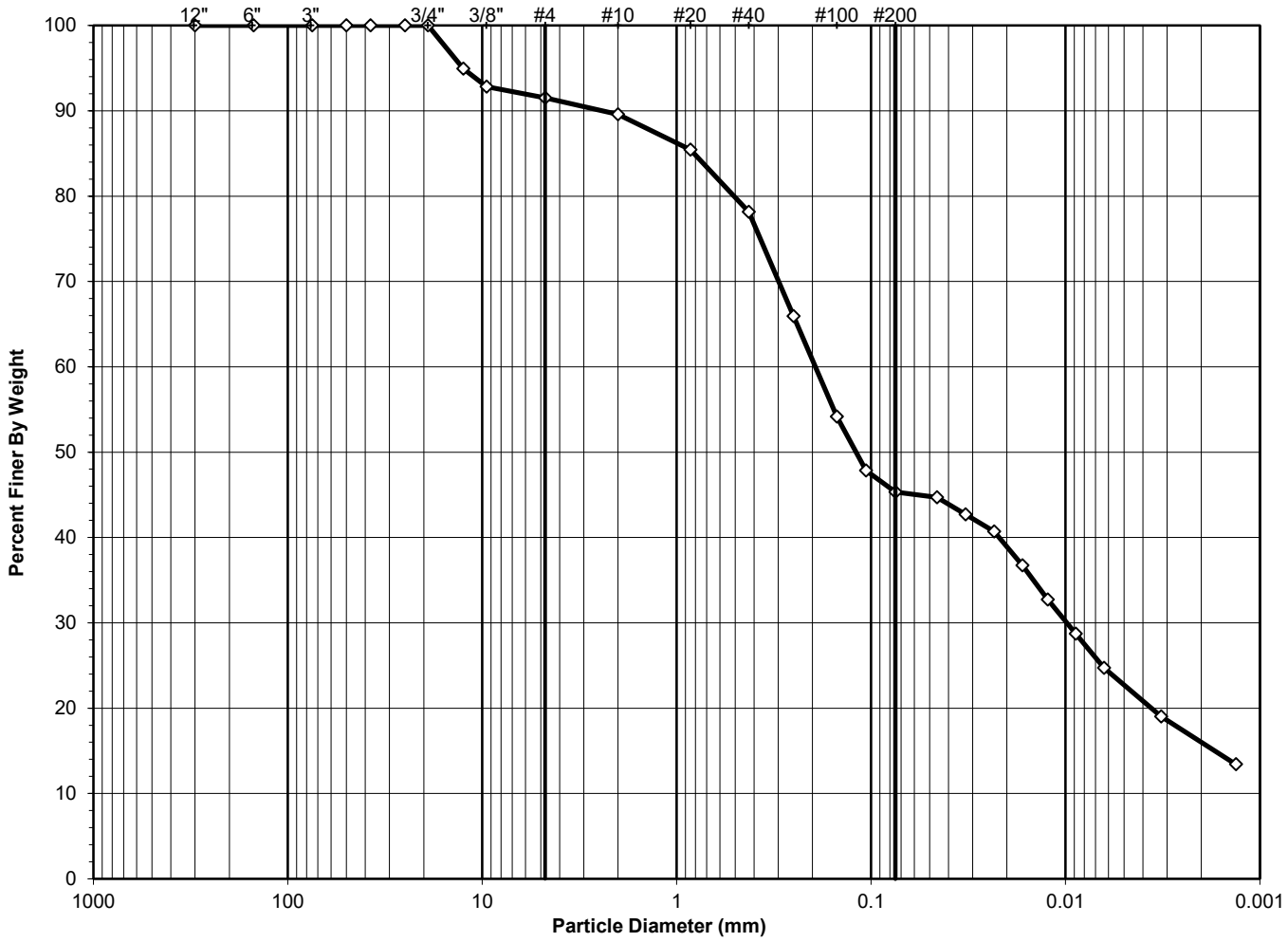
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003	Soil Color:	Orange

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.12

USCS Classification:
SILTY SAND
(NON-PLASTIC FINES)

Tested By RFF Date 4/3/23 Checked By AES Date 4/3/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003	Soil Color:	Orange

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	404	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	423.68	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	383.55	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	143.05	Weight of Tare (g):	NA
Weight of Water (g):	40.13	Weight of Water (g):	NA
Weight of Dry Soil (g):	240.50	Weight of Dry Soil (g):	NA
Moisture Content (%):	**16.7**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	240.50
Tare No. (Sub-Specimen)	404	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	423.68	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	143.05	Dry Weight of - 3/4" Sample (g):	240.50
Sub-Specimen Wet Weight (g):	280.63	Dry Weight -3/4" +3/8" Sample (g):	17.23
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	223.27
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	12.20	(**)	5.07	5.07	94.93	**95**
3/8"	9.5	5.03		2.09	7.16	92.84	**93**
#4	4.75	3.20		1.33	8.49	91.51	**92**
#10	2	4.59		1.91	10.40	89.60	**90**
#20	0.85	9.98	(**)	4.15	14.55	85.45	**85**
#40	0.425	17.53		7.29	21.84	78.16	**78**
#60	0.25	29.37		12.21	34.05	65.95	**66**
#100	0.15	28.35		11.79	45.84	54.16	**54**
#140	0.106	15.20		6.32	52.16	47.84	**48**
#200	0.075	6.08		2.53	54.69	45.31	**45**
Pan	-	108.97		45.31	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By RFF Date 4/3/23 Checked By AES Date 4/3/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003	Soil Color:	Orange

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	25.0	22.8	2.64	12.1	0.0458	98.7	44.7
2	24.0	22.8	2.64	12.3	0.0326	94.3	42.7
4	23.0	22.8	2.64	12.5	0.0232	89.9	40.7
8	21.0	22.8	2.64	12.9	0.0167	81.0	36.7
15	19.0	22.8	2.64	13.2	0.0123	72.2	32.7
30	17.0	22.8	2.64	13.6	0.0088	63.4	28.7
60	15.0	22.8	2.64	13.9	0.0063	54.6	24.7
240	12.0	23.2	2.49	14.5	0.0032	42.0	19.0
1440	9.0	23.7	2.29	15.0	0.0013	29.6	13.4

Soil Specimen Data

Tare No.:	5	Percent Finer than # 200:	45.31
Wt. of Tare & Dry Material (g):	350.47		
Weight of Tare (g):	323.06	Specific Gravity:	2.70 Assumed
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	22.41		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 697
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/24/23 Checked By AES Date 3/27/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003	Color:	Orange

(MInus No. 40 sieve material,Wet Prep.)

As Received
Water Content

Tare Number	404
Wt. of Tare & Wet Sample (g)	423.68
Wt. of Tare & Dry Sample (g)	383.55
Weight of Tare (g)	143.05
Weight of Water (g)	40.13
Weight of Dry Sample (g)	240.50
Water Content (%)	**16.7**

NON - PLASTIC MATERIAL

Tested By SS *Date* 3/23/23 *Checked By* AES *Date* 3/26/23

 DCN: CT-S4C, DATE: 4/27/17, REVISION : 4e

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003	Visual Description:	Orange Silty Sand

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 543	R 544
Weight of Pycnometer & Soil & Water (g):	695.88	698.51
Temperature (°C):	23.7	23.7
Weight of Pycnometer & Water (g):	661.21	663.68
Tare Number:	543	544
Weight of Tare & Dry Soil (g):	217.89	220.53
Weight of Tare (g):	163.18	165.86
Weight of Dry Soil (g):	54.71	54.67
Specific Gravity of Soil @ Measured Temperature:	2.730	2.756
Specific Gravity of Water @ Measured Temperature:	0.99738	0.99738
Conversion Factor for Measured Temperature:	0.99917	0.99917
Specific Gravity @ 20° Celsius:	2.732	2.758

Average Specific Gravity @ 20° Celsius	2.75

Tested By RFF *Date* 4/4/23 *Checked By* GEM *Date* 4/4/23

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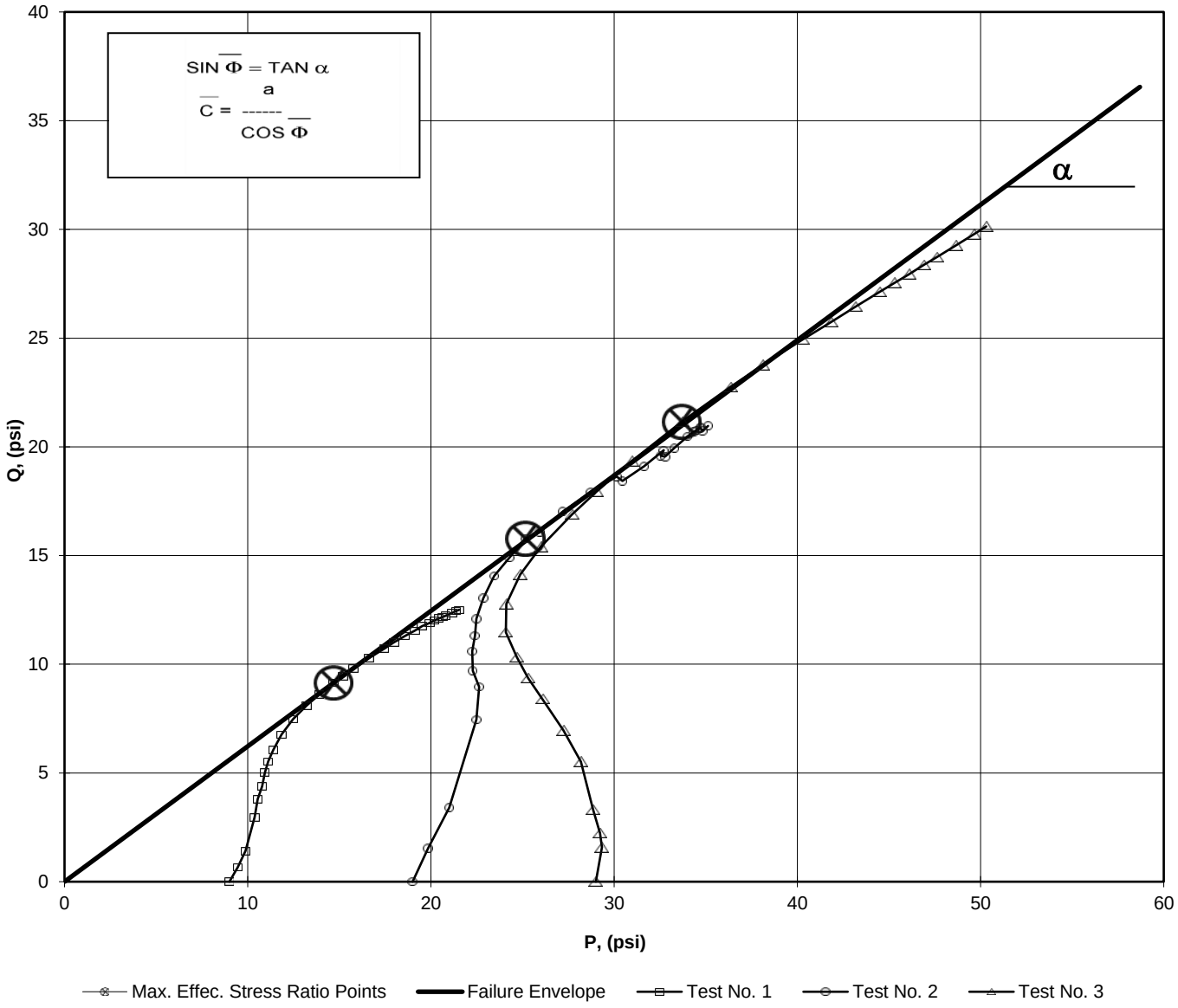
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\bar{C}$	=	**0.00**
α	=	**31.9**	$\bar{\Phi}$	=	**38.51**

Tested By: MY Date: 3/22/23 Approved By: MPS Date: 3/30/23

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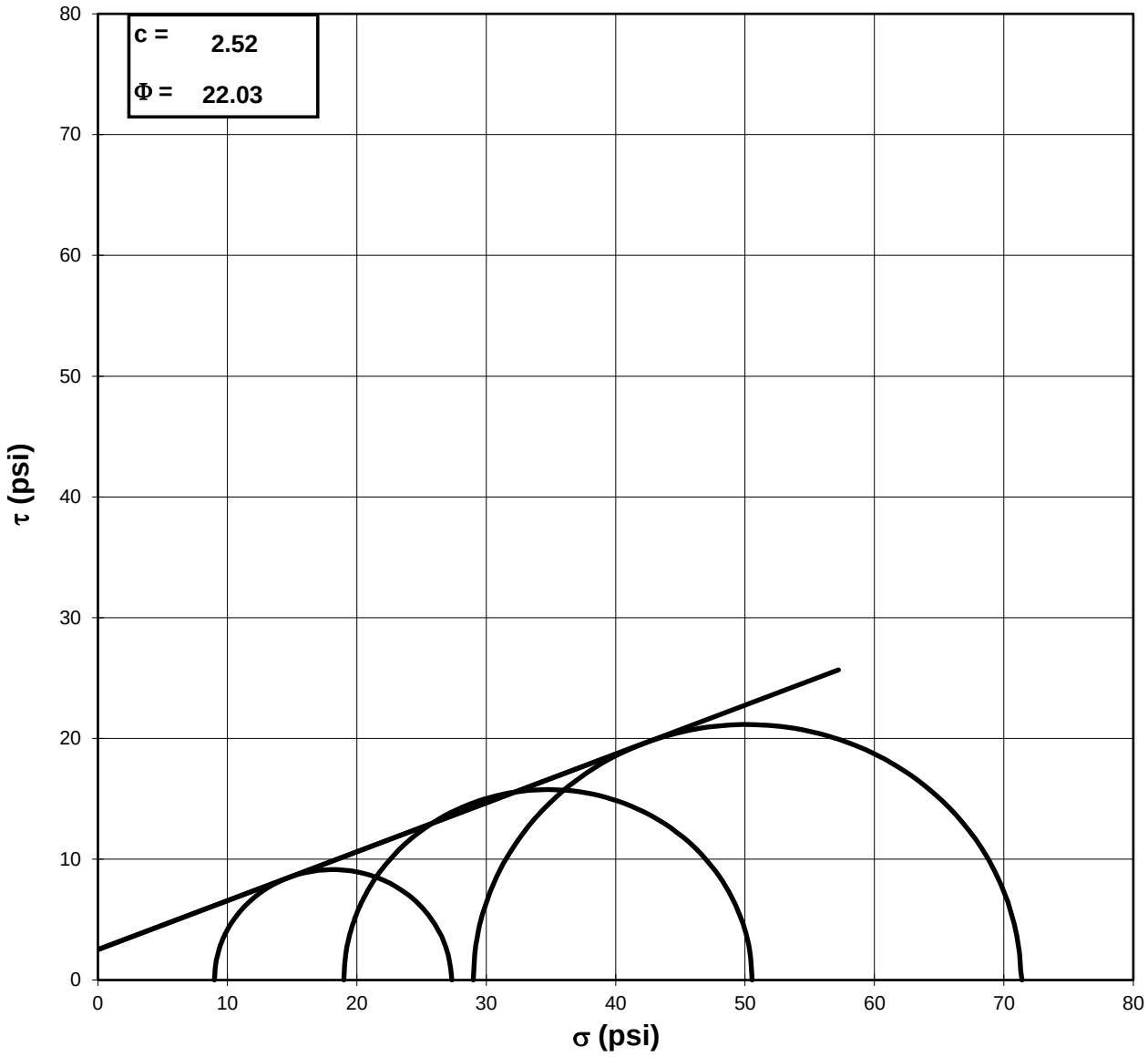
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		
Visual Description:	Orange Silt (Undisturbed)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: MY *Date:* 3/22/23 *Approved By:* MPS *Date:* 3/30/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Stage No.	0
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	69.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	9.0
Pore Pressure Response (%)	97

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	14.69
Q	=	9.15

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.154	Diameter 1:	2.841
Length 2:	6.091	Diameter 2:	2.836
Length 3:	6.100	Diameter 3:	2.834
Avg. Length:	6.115	*Avg. Diam.:*	2.837

VOLUME CHANGE

Initial Burette Reading (ml)	24.0
Final Burette Reading (ml)	7.1
Final Change (ml)	16.9
Initial Dial Reading (mil)	320
Dial Reading After Saturation (mil)	372
Dial Reading After Consolidation (mil)	387

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
14.3	0.000	60.0
22.3	0.001	60.2
31.5	0.003	60.5
50.3	0.008	61.6
60.5	0.014	62.3
67.7	0.020	62.6
75.5	0.030	63.1
81.7	0.039	63.4
88.2	0.051	63.7
97.3	0.072	63.9
106.5	0.103	64.0
114.9	0.139	63.9
121.8	0.176	63.7
129.3	0.219	63.5
133.7	0.249	63.2
139.0	0.291	63.0
146.5	0.350	62.7
153.6	0.411	62.3
158.6	0.456	62.0
164.0	0.518	61.7
168.6	0.564	61.4
172.6	0.609	61.2
176.1	0.655	61.0
178.5	0.685	60.8
180.8	0.716	60.7
182.6	0.746	60.5
184.3	0.777	60.4
187.6	0.823	60.2
190.5	0.869	60.1
192.3	0.900	60.0
194.0	0.931	59.9

Tested By: MY Date: 3/22/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Effective Confining Pressure (psi)	9.0	*Stage No.*	0
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	6.12
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.32
Initial Sample Volume (in^3)	38.65

VOLUME CHANGE

Volume After Consolidation (in^3)	36.64
Length After Consolidation (in)	6.05
Area After Consolidation (in^2)	6.058

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	1.31	0.20	10.12	8.8	1.149	0.15	9.46	0.66
0.04	2.84	0.54	11.30	8.5	1.336	0.20	9.88	1.42
0.14	5.94	1.59	13.35	7.4	1.801	0.28	10.38	2.97
0.24	7.61	2.26	14.34	6.7	2.129	0.31	10.54	3.80
0.34	8.78	2.60	15.18	6.4	2.373	0.31	10.79	4.39
0.49	10.05	3.08	15.97	5.9	2.698	0.32	10.94	5.02
0.65	11.05	3.42	16.64	5.6	2.980	0.32	11.11	5.53
0.84	12.10	3.67	17.44	5.3	3.269	0.31	11.39	6.05
1.19	13.53	3.92	18.61	5.1	3.665	0.30	11.84	6.76
1.70	14.96	3.99	19.97	5.0	3.986	0.28	12.49	7.48
2.30	16.22	3.89	21.33	5.1	4.177	0.25	13.22	8.11
2.91	17.22	3.70	22.53	5.3	4.248	0.22	13.91	8.61
3.61	18.30	3.46	23.84	5.5	4.300	0.19	14.69	9.15
4.11	18.89	3.23	24.66	5.8	4.273	0.18	15.22	9.45
4.82	19.59	3.01	25.58	6.0	4.274	0.16	15.78	9.80
5.79	20.56	2.65	26.91	6.3	4.239	0.13	16.63	10.28
6.79	21.44	2.26	28.18	6.7	4.181	0.11	17.46	10.72
7.55	22.02	2.02	29.00	7.0	4.157	0.09	17.99	11.01
8.56	22.60	1.70	29.90	7.3	4.097	0.08	18.60	11.30
9.32	23.10	1.42	30.68	7.6	4.049	0.06	19.13	11.55
10.08	23.50	1.23	31.27	7.8	4.025	0.05	19.52	11.75
10.84	23.81	0.97	31.85	8.0	3.964	0.04	19.94	11.91
11.33	24.03	0.82	32.21	8.2	3.938	0.04	20.19	12.01
11.84	24.22	0.68	32.54	8.3	3.912	0.03	20.43	12.11
12.34	24.35	0.55	32.81	8.5	3.881	0.02	20.63	12.18
12.85	24.46	0.42	33.04	8.6	3.851	0.02	20.81	12.23
13.61	24.72	0.19	33.53	8.8	3.806	0.01	21.17	12.36
14.37	24.90	0.07	33.83	8.9	3.789	0.00	21.38	12.45
14.88	25.01	-0.04	34.05	9.0	3.766	0.00	21.54	12.50
15.39	25.10	-0.14	34.24	9.1	3.746	-0.01	21.69	12.55

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Stage No.	0
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	79.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	19.0
Pore Pressure Response (%)	95

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	25.16
Q	=	15.77

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.183	Diameter 1:	2.844
Length 2:	6.124	Diameter 2:	2.787
Length 3:	6.198	Diameter 3:	2.893
Avg. Length	6.168	*Avg. Diam.:*	2.841

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	20.1
Final Change (ml)	27.9

Initial Dial Reading (mil)	292
Dial Reading After Saturation (mil)	378
Dial Reading After Consolidation (mil)	420

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
19.5	0.000	60.0
37.8	0.000	60.7
59.9	0.002	61.4
108.0	0.007	64.0
125.8	0.013	65.3
134.7	0.019	66.4
145.7	0.029	67.3
154.3	0.037	67.9
163.8	0.049	68.6
175.8	0.070	69.2
188.9	0.101	69.6
200.0	0.137	69.6
211.9	0.174	69.6
216.9	0.217	69.1
229.8	0.248	68.8
242.5	0.291	68.2
253.7	0.348	67.5
253.6	0.409	67.0
264.2	0.455	66.5
276.5	0.516	66.1
275.4	0.563	66.1
276.9	0.608	65.8
284.4	0.653	65.7
292.9	0.684	65.5
297.4	0.714	65.4
300.1	0.746	65.3
303.4	0.776	65.2
305.6	0.822	65.2
306.3	0.867	64.9
311.1	0.897	64.8
316.4	0.928	64.8

Tested By: MY Date: 3/22/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Effective Confining Pressure (psi)	19.0	*Stage No.*	0
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	6.17
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.34
Initial Sample Volume (in^3)	39.11

VOLUME CHANGE

Volume After Consolidation (in^3)	35.77
Length After Consolidation (in)	6.04
Area After Consolidation (in^2)	5.922

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	3.10	0.70	21.40	18.3	1.169	0.24	19.85	1.55
0.03	6.82	1.41	24.41	17.6	1.387	0.22	21.00	3.41
0.12	14.92	3.98	29.94	15.0	1.993	0.28	22.48	7.46
0.21	17.92	5.33	31.59	13.7	2.310	0.31	22.63	8.96
0.32	19.40	6.41	31.99	12.6	2.541	0.35	22.29	9.70
0.47	21.22	7.35	32.87	11.7	2.821	0.36	22.26	10.61
0.62	22.63	7.91	33.71	11.1	3.040	0.37	22.40	11.31
0.81	24.18	8.60	34.58	10.4	3.325	0.37	22.49	12.09
1.16	26.09	9.18	35.90	9.8	3.658	0.37	22.86	13.04
1.66	28.13	9.62	37.51	9.4	3.998	0.36	23.44	14.06
2.27	29.79	9.62	39.18	9.4	4.175	0.34	24.28	14.90
2.89	31.55	9.61	40.94	9.4	4.360	0.32	25.16	15.77
3.58	32.15	9.14	42.01	9.9	4.259	0.30	25.94	16.07
4.11	34.06	8.82	44.24	10.2	4.345	0.27	27.21	17.03
4.82	35.84	8.19	46.65	10.8	4.317	0.24	28.73	17.92
5.77	37.26	7.50	48.76	11.5	4.241	0.21	30.13	18.63
6.76	36.86	6.97	48.89	12.0	4.064	0.20	30.46	18.43
7.53	38.21	6.47	50.74	12.5	4.050	0.18	31.63	19.10
8.55	39.69	6.14	52.55	12.9	4.087	0.16	32.70	19.85
9.32	39.19	6.06	52.14	12.9	4.028	0.16	32.54	19.60
10.06	39.09	5.76	52.33	13.2	3.953	0.16	32.78	19.55
10.81	39.89	5.66	53.23	13.3	3.991	0.15	33.28	19.95
11.32	40.94	5.48	54.46	13.5	4.028	0.14	33.99	20.47
11.82	41.39	5.35	55.03	13.6	4.033	0.14	34.34	20.69
12.34	41.54	5.26	55.28	13.7	4.023	0.13	34.51	20.77
12.85	41.78	5.17	55.61	13.8	4.020	0.13	34.72	20.89
13.61	41.74	5.17	55.57	13.8	4.017	0.13	34.70	20.87
14.36	41.48	4.92	55.56	14.1	3.946	0.12	34.82	20.74
14.85	41.92	4.83	56.09	14.2	3.959	0.12	35.13	20.96
15.37	42.43	4.76	56.67	14.2	3.979	0.12	35.46	21.21

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Stage No.	0
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	89.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	29.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	33.70
Q	=	21.16

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.172	Diameter 1:	2.859
Length 2:	6.136	Diameter 2:	2.841
Length 3:	6.159	Diameter 3:	2.848
Avg. Length:	6.156	*Avg. Diam.:*	2.849

VOLUME CHANGE

Initial Burette Reading (ml)	72.0
Final Burette Reading (ml)	0.6
Final Change (ml)	71.4
Initial Dial Reading (mil)	286
Dial Reading After Saturation (mil)	308
Dial Reading After Consolidation (mil)	365

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
12.3	0.000	60.0
30.1	0.001	61.2
37.6	0.003	62.0
49.9	0.009	63.5
75.0	0.014	66.3
91.5	0.021	68.7
108.0	0.030	71.3
119.1	0.038	73.0
130.3	0.050	74.6
144.0	0.072	76.4
159.6	0.101	77.7
176.2	0.137	78.2
192.1	0.173	78.4
211.0	0.214	78.2
224.4	0.245	77.9
242.7	0.287	77.4
266.7	0.344	76.5
288.7	0.403	75.4
303.5	0.448	74.6
321.0	0.508	73.6
333.5	0.553	72.9
345.0	0.597	72.3
356.5	0.642	71.6
363.7	0.673	71.2
370.8	0.703	70.8
378.2	0.733	70.5
384.9	0.763	70.1
395.2	0.808	69.6
405.4	0.853	69.1
412.3	0.883	68.8
418.0	0.913	68.5

Tested By: MY Date: 3/22/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		

Visual Description: Orange Silt (Undisturbed)

Effective Confining Pressure (psi)	29.0	*Stage No.*	0
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	6.16
Initial Sample Diameter (in)	2.85
Initial Sample Area (in^2)	6.38
Initial Sample Volume (in^3)	39.25

VOLUME CHANGE

Volume After Consolidation (in^3)	34.47
Length After Consolidation (in)	6.08
Area After Consolidation (in^2)	5.673

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	3.15	1.24	30.91	27.8	1.114	0.40	29.33	1.58
0.05	4.46	2.00	31.46	27.0	1.165	0.45	29.23	2.23
0.14	6.62	3.46	32.16	25.5	1.259	0.53	28.85	3.31
0.24	11.03	6.34	33.70	22.7	1.487	0.58	28.18	5.52
0.34	13.93	8.73	34.20	20.3	1.687	0.63	27.23	6.96
0.49	16.79	11.31	34.49	17.7	1.949	0.68	26.09	8.40
0.63	18.72	13.05	34.67	16.0	2.174	0.70	25.31	9.36
0.82	20.64	14.63	35.01	14.4	2.436	0.72	24.69	10.32
1.18	22.95	16.38	35.56	12.6	2.819	0.72	24.09	11.47
1.66	25.54	17.66	36.88	11.3	3.253	0.70	24.11	12.77
2.25	28.25	18.25	39.00	10.8	3.628	0.65	24.88	14.13
2.84	30.80	18.40	41.40	10.6	3.907	0.60	26.00	15.40
3.52	33.80	18.19	44.62	10.8	4.126	0.54	27.72	16.90
4.03	35.89	17.90	46.99	11.1	4.234	0.50	29.04	17.94
4.72	38.71	17.39	50.32	11.6	4.334	0.45	30.96	19.35
5.65	42.31	16.46	54.85	12.5	4.374	0.39	33.70	21.16
6.64	45.50	15.41	59.09	13.6	4.347	0.34	36.34	22.75
7.37	47.55	14.64	61.90	14.4	4.312	0.31	38.13	23.77
8.35	49.88	13.64	65.24	15.4	4.248	0.28	40.30	24.94
9.09	51.48	12.91	67.56	16.1	4.200	0.25	41.83	25.74
9.83	52.89	12.27	69.62	16.7	4.161	0.23	43.18	26.45
10.57	54.26	11.63	71.64	17.4	4.124	0.22	44.51	27.13
11.07	55.09	11.23	72.86	17.8	4.101	0.21	45.31	27.54
11.57	55.88	10.85	74.04	18.2	4.078	0.20	46.10	27.94
12.06	56.72	10.47	75.25	18.5	4.062	0.19	46.89	28.36
12.55	57.44	10.13	76.31	18.9	4.045	0.18	47.59	28.72
13.30	58.53	9.61	77.92	19.4	4.018	0.17	48.66	29.26
14.04	59.58	9.13	79.44	19.9	3.999	0.15	49.66	29.79
14.53	60.27	8.83	80.44	20.2	3.988	0.15	50.31	30.13
15.02	60.78	8.52	81.26	20.5	3.968	0.14	50.87	30.39

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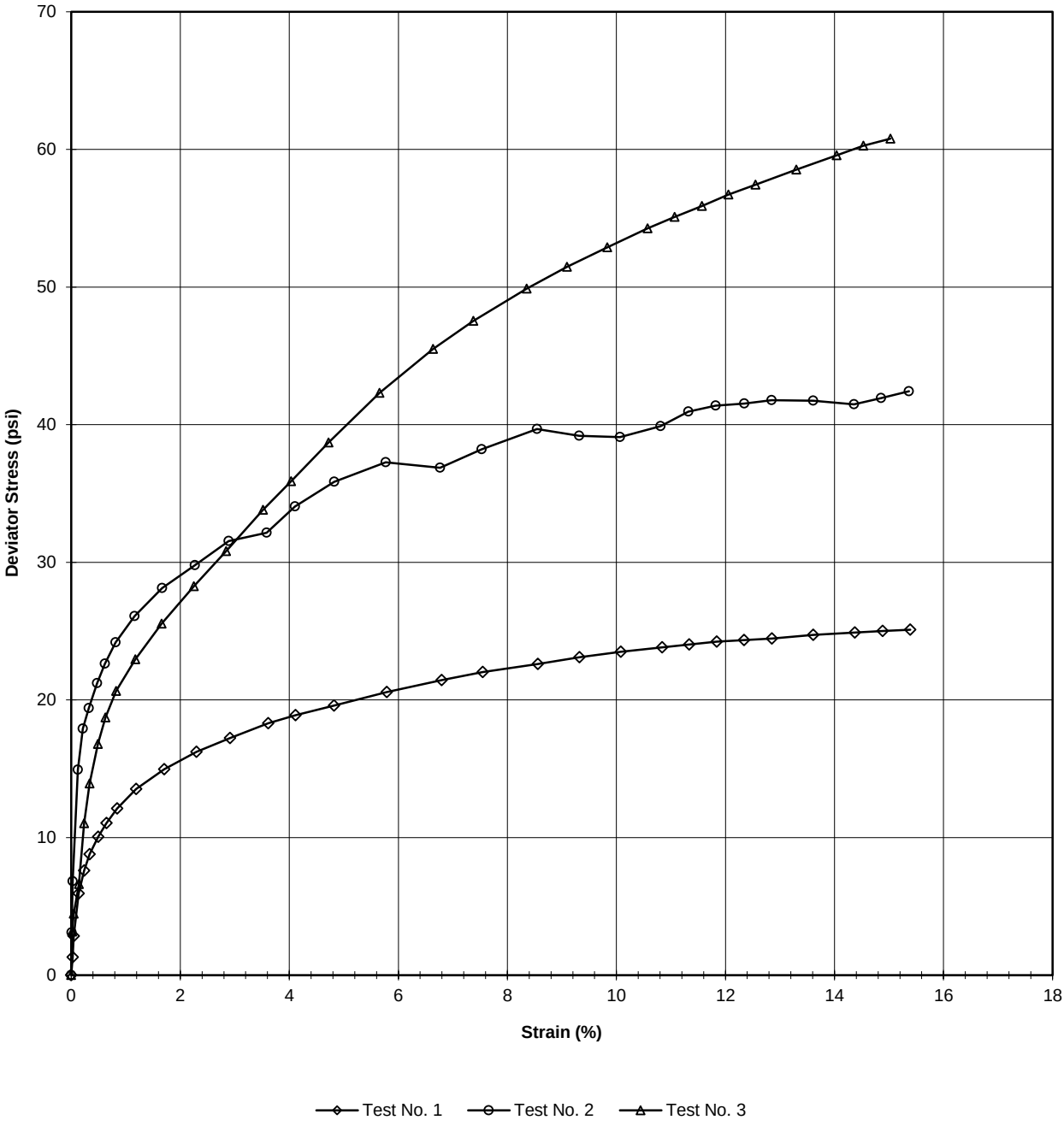
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651B
Client Reference:	Cherrystone Dam 2A	Depth (ft):	16-18
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-003		
Visual Description:	Orange Silt (Undisturbed)		



Tested By: MY Date: 3/22/23 Approved By: MPS Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.		
Client Reference:	Cherrystone Dam 2A		
Project No.:	R-2023-070-001		
Lab ID:	R-2023-070-001-003	Specific Gravity (Assumed)	2.7
Visual Description:	Orange Silt (Undisturbed)		

SAMPLE CONDITION SUMMARY

Boring No.:	B-651B	B-651B	B-651B
Depth (ft):	16-18	16-18	16-18
Sample No.:	UD-02	UD-02	UD-02
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.002	0.002	0.002
Back Pressure (psi)	60.0	60.0	60.0
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	16.7	16.7	16.7
Total Unit Weight (pcf)	122.3	126.4	127.1
Dry Unit Weight (pcf)	104.8	108.3	108.9
Moisture Content (%) (FINAL)	21.2	20.1	17.9
Initial State Void Ratio,e	0.608	0.556	0.547
Void Ratio at Shear, e	0.524	0.423	0.359



Tested By: MY Date: 3/22/23 Input Checked By: GEM Date: 3/30/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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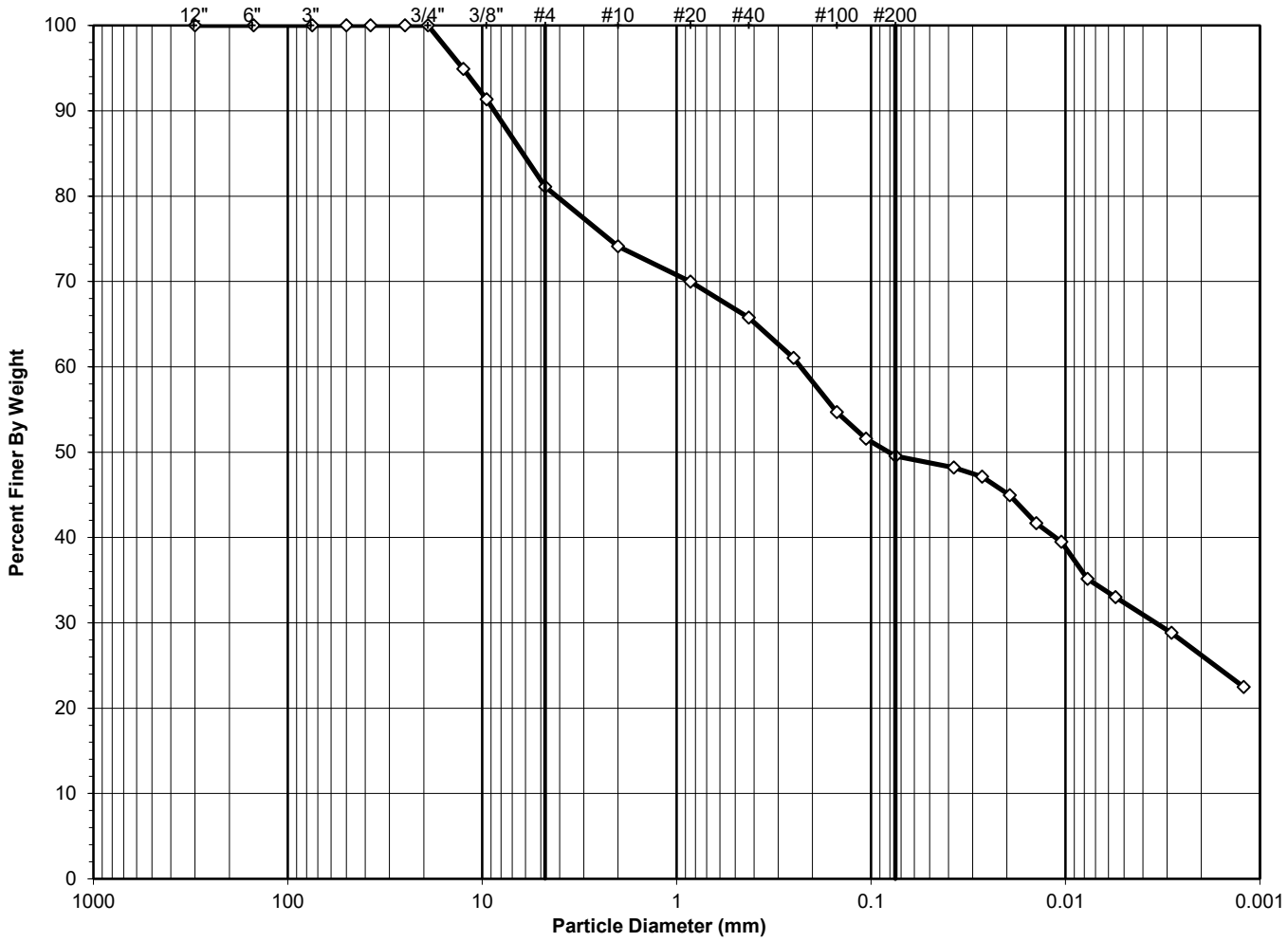
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	28-30
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-004	Soil Color:	Orange Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.08

USCS Classification:
SILTY SAND WITH GRAVEL

Tested By RFF Date 4/3/23 Checked By AES Date 4/4/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	28-30
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-004	Soil Color:	Orange Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	473	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	301.64	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	270.60	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	97.82	Weight of Tare (g):	NA
Weight of Water (g):	31.04	Weight of Water (g):	NA
Weight of Dry Soil (g):	172.78	Weight of Dry Soil (g):	NA
Moisture Content (%):	**18.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	172.78
Tare No. (Sub-Specimen)	473	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	301.64	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	97.82	Dry Weight of - 3/4" Sample (g):	172.78
Sub-Specimen Wet Weight (g):	203.82	Dry Weight -3/4" +3/8" Sample (g):	14.96
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	157.82
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	8.79	(**)	5.09	5.09	94.91	**95**
3/8"	9.5	6.17		3.57	8.66	91.34	**91**
#4	4.75	17.70		10.24	18.90	81.10	**81**
#10	2	12.04		6.97	25.87	74.13	**74**
#20	0.85	7.19	(**)	4.16	30.03	69.97	**70**
#40	0.425	7.25		4.20	34.23	65.77	**66**
#60	0.25	8.19		4.74	38.97	61.03	**61**
#100	0.15	10.96		6.34	45.31	54.69	**55**
#140	0.106	5.41		3.13	48.44	51.56	**52**
#200	0.075	3.50		2.03	50.47	49.53	**50**
Pan	-	85.58		49.53	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	RFF	Date	4/3/23	Checked By	AES	Date	4/4/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	28-30
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-004	Soil Color:	Orange Brown

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	47.0	22.7	2.67	8.2	0.0375	97.3	48.2
2	46.0	22.7	2.67	8.4	0.0268	95.1	47.1
4	44.0	22.7	2.67	8.7	0.0194	90.7	44.9
8	41.0	22.7	2.67	9.3	0.0141	84.1	41.7
15	39.0	22.7	2.67	9.6	0.0105	79.7	39.5
30	35.0	22.7	2.67	10.3	0.0077	71.0	35.1
60	33.0	22.8	2.64	10.7	0.0055	66.7	33.0
240	29.0	23.2	2.49	11.4	0.0028	58.2	28.8
1440	23.0	23.6	2.33	12.5	0.0012	45.4	22.5

Soil Specimen Data

Tare No.:	7	Percent Finer than # 200:	49.53
Wt. of Tare & Dry Material (g):	381.07		
Weight of Tare (g):	331.12	Specific Gravity:	2.71 Measured
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	44.95		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 691
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/24/23 Checked By AES Date 3/27/23

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ATTERBERG LIMITS

ASTM D 4318-17

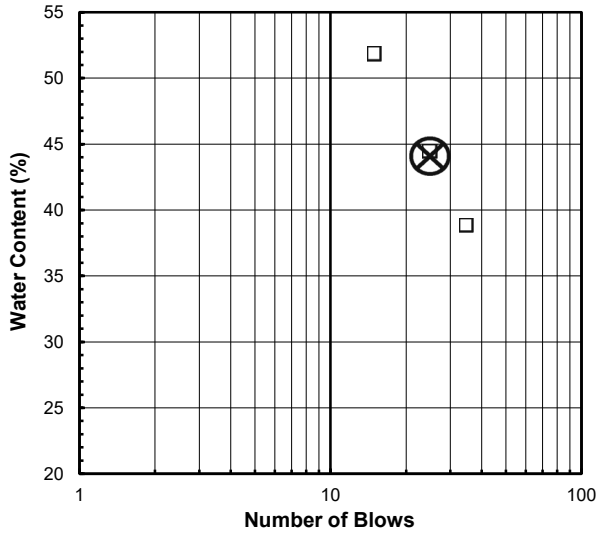
Client:	Schnabel Engineering, Inc.	Boring No.:	B-651A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	28-30
Project No.:	R-2023-070-001	Sample No.:	UD-01
Lab ID:	R-2023-070-001-004	Soil Description:	ORANGE BROWN SILT

Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Wet Prep.)

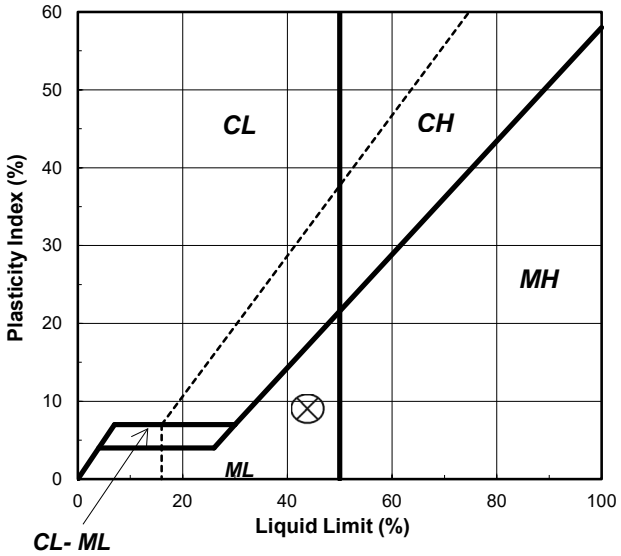
As Received Moisture Content ASTM D2216-19		**Liquid Limit Test** 1	2	3	M
Tare Number:	440	I-7	I	G	U
Wt. of Tare & Wet Sample (g):	315.56	25.74	27.39	24.68	L
Wt. of Tare & Dry Sample (g):	280.71	22.87	23.66	21.37	T
Weight of Tare (g):	99.40	15.47	15.26	14.98	I
Weight of Water (g):	34.9	2.9	3.7	3.3	P
Weight of Dry Sample (g):	181.3	7.4	8.4	6.4	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**19.2**	**38.8**	**44.4**	**51.8**	N
Number of Blows:		**35**	**25**	**15**	T

Plastic Limit Test	**1**	**2**	**Range**		**Test Results**	
Tare Number:	D-1	O				
Wt. of Tare & Wet Sample (g):	21.63	21.60				
Wt. of Tare & Dry Sample (g):	19.97	19.93			**Liquid Limit (%):**	**44**
Weight of Tare (g):	15.19	15.12				
Weight of Water (g):	1.7	1.7			**Plastic Limit (%):**	**35**
Weight of Dry Sample (g):	4.8	4.8				
					Plasticity Index (%):	**9**
Moisture Content (%):	**34.7**	**34.7**	**0.0**			
Note: The acceptable range of the two Moisture Contents is ±				0.84	**USCS Symbol:**	**ML**

Flow Curve



Plasticity Chart



Tested By CFD *Date* 3/24/23 *Checked By* AES *Date* 3/27/23

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651A
Client Reference:	Cherrystone Dam 2A	Depth (ft):	28-30
Project No.:	R-2023-069-001	Sample No.:	UD-01
Lab ID:	R-2023-069-001-004	Visual Description:	Orange Brown Silty Sand with Gravel

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 543	R 544
Weight of Pycnometer & Soil & Water (g):	695.07	697.64
Temperature (^{o}C):	23.3	23.4
Weight of Pycnometer & Water (g):	661.26	663.72
Tare Number:	543	544
Weight of Tare & Dry Soil (g):	216.82	219.54
Weight of Tare (g):	163.19	165.86
Weight of Dry Soil (g):	53.63	53.68
Specific Gravity of Soil @ Measured Temperature:	2.706	2.717
Specific Gravity of Water @ Measured Temperature:	0.99747	0.99745
Conversion Factor for Measured Temperature:	0.99926	0.99924
Specific Gravity @ 20^{o} Celsius:	2.708	2.719

Average Specific Gravity @ 20^{o} Celsius	2.71

Tested By RFF *Date* 4/3/23 *Checked By* GEM *Date* 4/3/23

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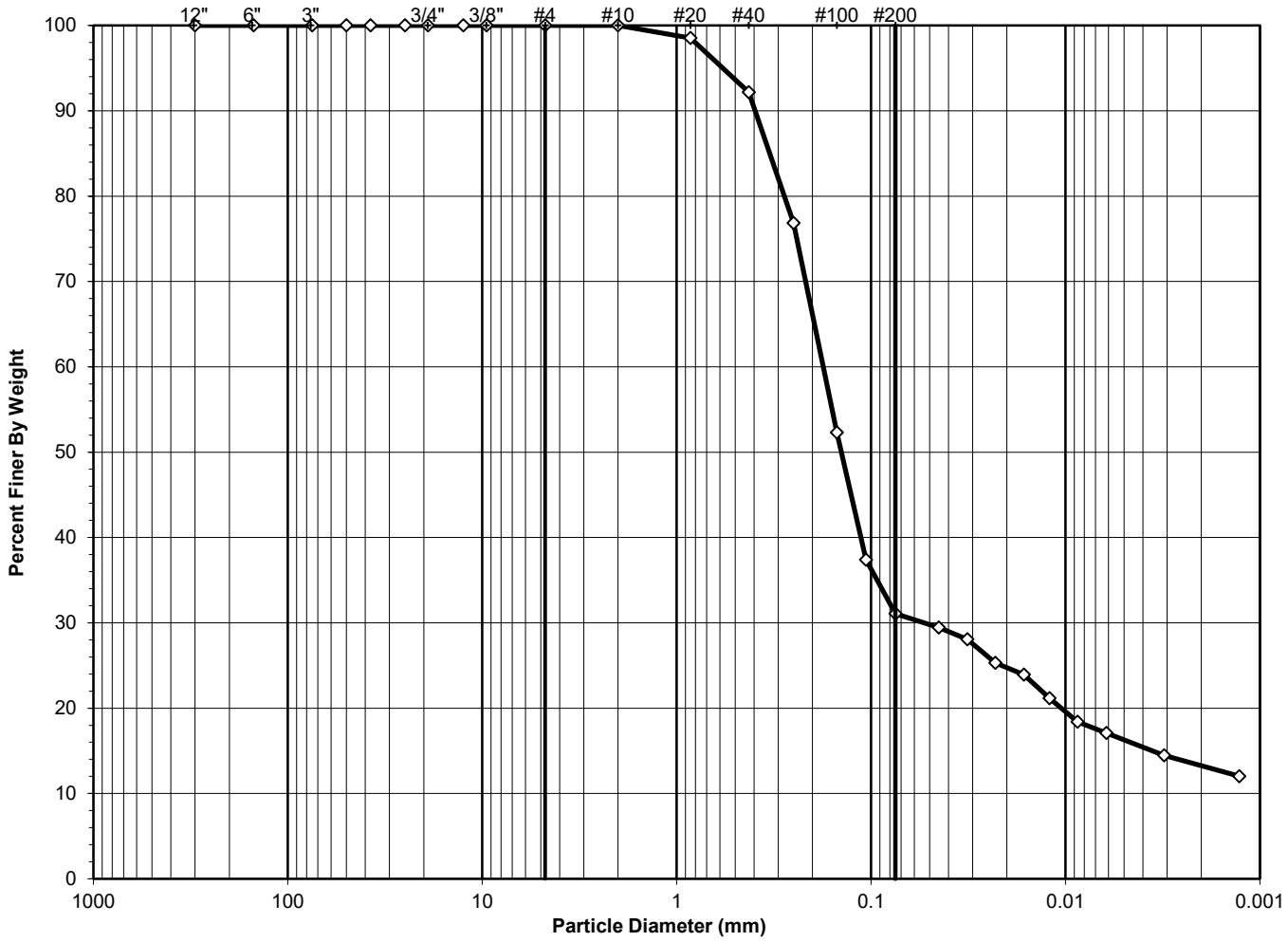
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.14

USCS Classification:
SILTY SAND
(NON-PLASTIC FINES)

Tested By RFF Date 4/3/23 Checked By AES Date 4/4/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	458	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	501.44	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	461.35	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.92	Weight of Tare (g):	NA
Weight of Water (g):	40.09	Weight of Water (g):	NA
Weight of Dry Soil (g):	315.43	Weight of Dry Soil (g):	NA
Moisture Content (%):	**12.7**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	315.43
Tare No. (Sub-Specimen)	458	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	501.44	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	145.92	Dry Weight of - 3/4" Sample (g):	315.43
Sub-Specimen Wet Weight (g):	355.52	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	315.43
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.00		0.00	0.00	100.00	**100.0**
#10	2	0.02		0.01	0.01	99.99	**100.0**
#20	0.85	4.66	(**)	1.48	1.48	98.52	**98.5**
#40	0.425	19.98		6.33	7.82	92.18	**92.2**
#60	0.25	48.44		15.36	23.17	76.83	**76.8**
#100	0.15	77.35		24.52	47.70	52.30	**52.3**
#140	0.106	47.10		14.93	62.63	37.37	**37.4**
#200	0.075	19.89		6.31	68.93	31.07	**31.1**
Pan	-	97.99		31.07	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By RFF Date 4/3/23 Checked By AES Date 4/4/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005	Soil Color:	Brown

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	24.0	22.7	2.67	12.3	0.0449	94.8	29.5
2	23.0	22.7	2.67	12.5	0.0320	90.4	28.1
4	21.0	22.7	2.67	12.9	0.0229	81.5	25.3
8	20.0	22.7	2.67	13.1	0.0163	77.0	23.9
15	18.0	22.7	2.67	13.4	0.0121	68.2	21.2
30	16.0	22.7	2.67	13.8	0.0087	59.3	18.4
60	15.0	22.8	2.64	14.0	0.0062	55.0	17.1
240	13.0	23.1	2.52	14.3	0.0031	46.6	14.5
1440	11.0	23.7	2.29	14.7	0.0013	38.7	12.0

Soil Specimen Data

Tare No.:	10	Percent Finer than # 200:	31.07
Wt. of Tare & Dry Material (g):	360.67		
Weight of Tare (g):	333.89	Specific Gravity:	2.80 Measured
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	21.78		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 690
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/24/23 Checked By AES Date 3/27/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005	Color:	Brown

(MInus No. 40 sieve material,Wet Prep.)

As Received
Water Content

Tare Number	458
Wt. of Tare & Wet Sample (g)	501.44
Wt. of Tare & Dry Sample (g)	461.35
Weight of Tare (g)	145.92
Weight of Water (g)	40.09
Weight of Dry Sample (g)	315.43
Water Content (%)	**12.7**

NON - PLASTIC MATERIAL

Tested By *CFD* *Date* *3/24/23* *Checked By* *AES* *Date* *3/26/23*

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-069-001	Sample No.:	UD-02
Lab ID:	R-2023-069-001-005	Visual Description:	Brown Silty Sand

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 711	R 714
Weight of Pycnometer & Soil & Water (g):	681.43	679.25
Temperature (°C):	24.1	24.1
Weight of Pycnometer & Water (g):	646.46	644.27
Tare Number:	711	714
Weight of Tare & Dry Soil (g):	202.97	200.67
Weight of Tare (g):	148.53	146.32
Weight of Dry Soil (g):	54.44	54.35
Specific Gravity of Soil @ Measured Temperature:	2.796	2.806
Specific Gravity of Water @ Measured Temperature:	0.99728	0.99728
Conversion Factor for Measured Temperature:	0.99907	0.99907
Specific Gravity @ 20° Celsius:	2.799	2.808

Average Specific Gravity @ 20° Celsius	2.80

Tested By RFF *Date* 4/3/23 *Checked By* GEM *Date* 4/3/23

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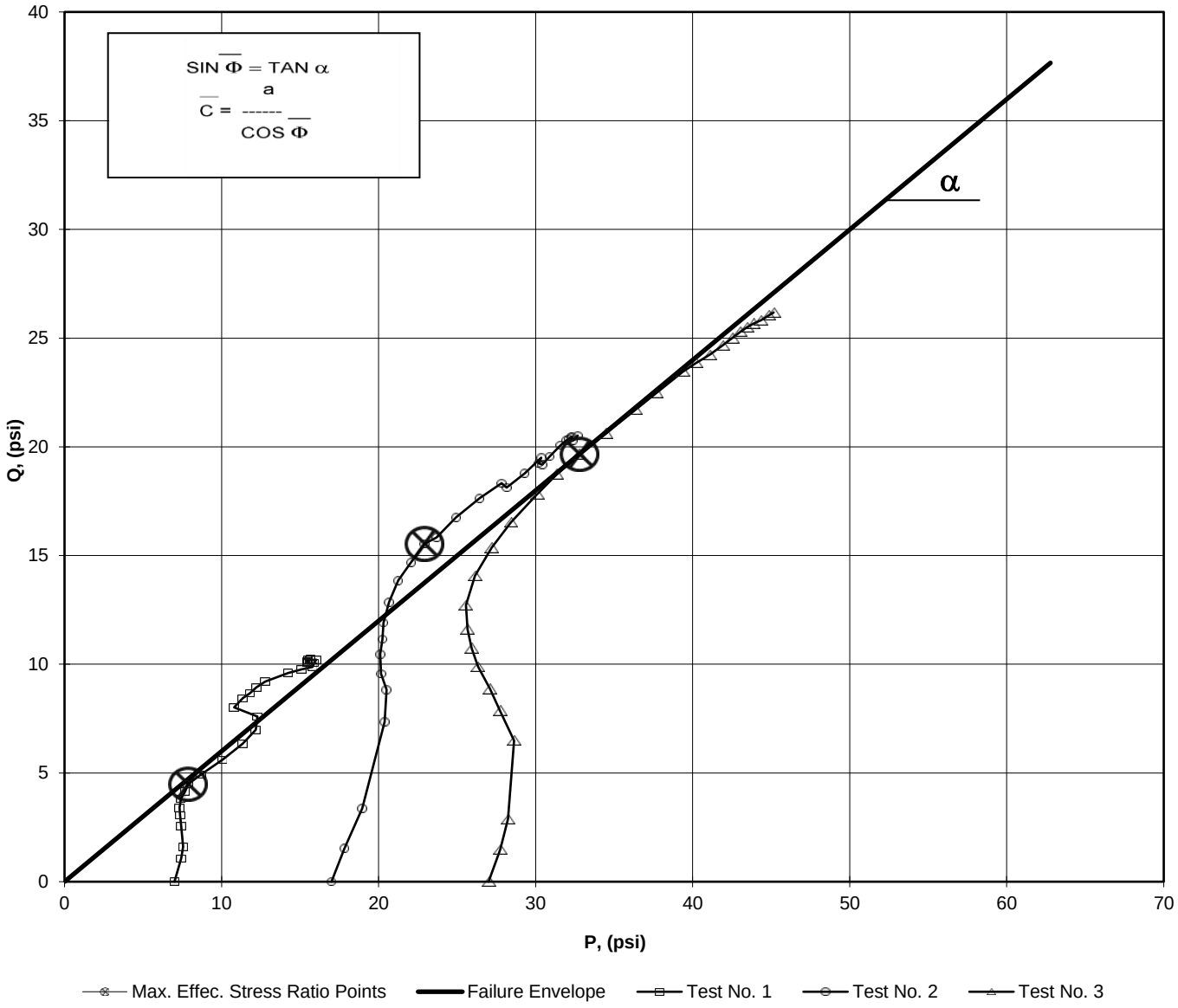
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Consolidated Undrained Triaxial Test with Pore Pressure



a	=	**0.00**	$\overline{C}$	=	**0.00**
α	=	**31.0**	$\overline{\Phi}$	=	**36.86**

Tested By: MY Date: 3/23/23 Approved By: MPS Date: 3/30/23

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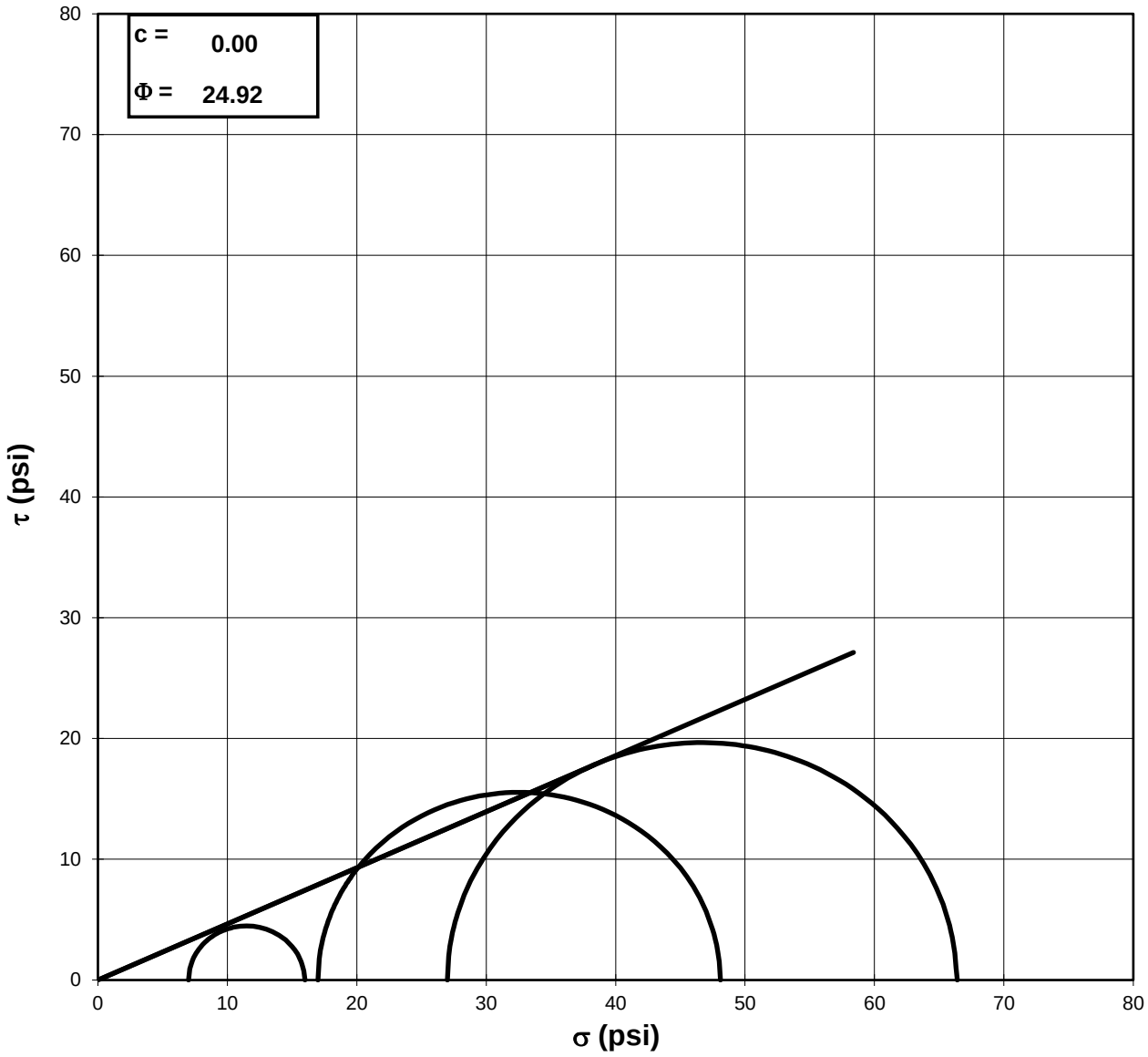
MOHR TOTAL STRENGTH ENVELOPE

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		
Visual Description:	Brown Sandy Silt (Undisturbed)		



Failure Based on Maximum Effective Principal Stress Ratio

NOTE: GRAPH NOT TO SCALE

Tested By: MY *Date:* 3/23/23 *Approved By:* MPS *Date:* 3/30/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS

ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Stage No.	0
Test No.	1

PRESSURES (psi)

Cell Pressure (psi)	67.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	7.0
Pore Pressure Response (%)	98

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	7.87
Q	=	4.48

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.202	Diameter 1:	2.835
Length 2:	6.158	Diameter 2:	2.838
Length 3:	6.148	Diameter 3:	2.852
Avg. Length:	6.169	*Avg. Diam.:*	2.842

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	17.8
Final Change (ml)	30.2
Initial Dial Reading (mil)	239
Dial Reading After Saturation (mil)	244
Dial Reading After Consolidation (mil)	262

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
15.0	0.000	60.0
28.1	0.002	60.6
34.5	0.003	61.0
45.9	0.008	62.1
52.2	0.014	62.7
56.4	0.021	63.1
61.3	0.030	63.4
65.4	0.038	63.5
69.7	0.050	63.6
75.4	0.071	63.2
84.1	0.101	62.6
93.7	0.138	62.0
102.1	0.175	61.8
110.4	0.216	62.3
116.1	0.246	64.2
122.1	0.287	64.1
126.2	0.344	63.9
130.8	0.404	63.7
135.2	0.449	63.4
141.7	0.509	62.4
144.8	0.554	61.7
147.5	0.599	61.1
151.2	0.645	61.2
153.7	0.675	61.2
154.4	0.704	61.5
155.9	0.734	61.6
156.1	0.765	61.7
156.1	0.809	61.7
156.5	0.854	61.6
158.0	0.884	61.6
159.4	0.914	61.6

Tested By: MY Date: 3/23/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Effective Confining Pressure (psi)	7.0	*Stage No.*	0
		Test No	1

INITIAL DIMENSIONS

Initial Sample Length (in)	6.17
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.34
Initial Sample Volume (in^3)	39.13

VOLUME CHANGE

Volume After Consolidation (in^3)	37.19
Length After Consolidation (in)	6.15
Area After Consolidation (in^2)	6.051

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	2.15	0.64	8.51	6.4	1.338	0.30	7.44	1.08
0.05	3.21	1.05	9.16	6.0	1.539	0.33	7.56	1.60
0.13	5.09	2.11	9.98	4.9	2.042	0.42	7.44	2.55
0.23	6.12	2.71	10.41	4.3	2.426	0.45	7.35	3.06
0.34	6.81	3.09	10.72	3.9	2.743	0.46	7.32	3.41
0.48	7.61	3.39	11.22	3.6	3.111	0.46	7.41	3.81
0.62	8.27	3.45	11.82	3.5	3.331	0.43	7.69	4.14
0.81	8.96	3.61	12.35	3.4	3.648	0.41	7.87	4.48
1.15	9.86	3.23	13.62	3.8	3.618	0.33	8.69	4.93
1.64	11.23	2.56	15.67	4.4	3.530	0.23	10.05	5.61
2.25	12.70	2.00	17.70	5.0	3.541	0.16	11.35	6.35
2.85	13.97	1.81	19.17	5.2	3.690	0.13	12.18	6.99
3.52	15.20	2.31	19.88	4.7	4.243	0.16	12.28	7.60
4.00	16.03	4.21	18.82	2.8	6.752	0.27	10.80	8.02
4.67	16.87	4.09	19.78	2.9	6.791	0.25	11.35	8.43
5.59	17.34	3.87	20.47	3.1	6.532	0.23	11.80	8.67
6.57	17.87	3.72	21.14	3.3	6.455	0.21	12.21	8.93
7.31	18.41	3.43	21.98	3.6	6.161	0.19	12.77	9.21
8.28	19.20	2.35	23.84	4.6	5.133	0.13	14.24	9.60
9.01	19.52	1.66	24.85	5.3	4.658	0.09	15.09	9.76
9.75	19.76	1.08	25.67	5.9	4.339	0.06	15.80	9.88
10.49	20.14	1.17	25.96	5.8	4.457	0.06	15.89	10.07
10.98	20.41	1.17	26.23	5.8	4.502	0.06	16.03	10.20
11.46	20.40	1.55	25.85	5.5	4.741	0.08	15.65	10.20
11.95	20.50	1.58	25.91	5.4	4.783	0.08	15.67	10.25
12.45	20.41	1.71	25.70	5.3	4.858	0.09	15.50	10.20
13.17	20.24	1.66	25.58	5.3	4.790	0.08	15.46	10.12
13.90	20.13	1.60	25.53	5.4	4.730	0.08	15.46	10.07
14.38	20.22	1.59	25.63	5.4	4.739	0.08	15.52	10.11
14.87	20.31	1.59	25.73	5.4	4.751	0.08	15.57	10.16

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Stage No.	0
Test No.	2

PRESSURES (psi)

Cell Pressure (psi)	77.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	17.0
Pore Pressure Response (%)	100

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	22.93
Q	=	15.54

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	5.800	Diameter 1:	2.814
Length 2:	5.853	Diameter 2:	2.839
Length 3:	5.858	Diameter 3:	2.853
Avg. Length	5.837	*Avg. Diam.:*	2.835

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	11.3
Final Change (ml)	36.7

Initial Dial Reading (mil)	341
Dial Reading After Saturation (mil)	332
Dial Reading After Consolidation (mil)	385

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
19.5	0.000	60.0
37.8	0.000	60.7
59.9	0.002	61.4
108.0	0.007	64.0
125.8	0.013	65.3
134.7	0.019	66.4
145.7	0.029	67.3
154.3	0.037	67.9
163.8	0.049	68.6
175.8	0.070	69.2
188.9	0.101	69.6
200.0	0.137	69.6
211.9	0.174	69.6
216.9	0.217	69.1
229.8	0.248	68.8
242.5	0.291	68.2
253.7	0.348	67.5
253.6	0.409	67.0
264.2	0.455	66.5
276.5	0.516	66.1
275.4	0.563	66.1
276.9	0.608	65.8
284.4	0.653	65.7
292.9	0.684	65.5
297.4	0.714	65.4
300.1	0.746	65.3
303.4	0.776	65.2
305.6	0.822	65.2
306.3	0.867	64.9
311.1	0.897	64.8
316.4	0.928	64.8

Tested By: MY Date: 3/23/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Effective Confining Pressure (psi)	17.0	*Stage No.*	0
		Test No	2

INITIAL DIMENSIONS

Initial Sample Length (in)	5.84
Initial Sample Diameter (in)	2.84
Initial Sample Area (in^2)	6.31
Initial Sample Volume (in^3)	36.85

VOLUME CHANGE

Volume After Consolidation (in^3)	34.79
Length After Consolidation (in)	5.79
Area After Consolidation (in^2)	6.005

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.01	3.05	0.70	19.35	16.3	1.187	0.23	17.83	1.53
0.03	6.72	1.41	22.32	15.6	1.431	0.21	18.96	3.36
0.13	14.72	3.98	27.74	13.0	2.130	0.27	20.38	7.36
0.22	17.67	5.33	29.34	11.7	2.513	0.30	20.51	8.83
0.33	19.13	6.41	29.72	10.6	2.807	0.34	20.15	9.57
0.49	20.92	7.35	30.57	9.7	3.168	0.35	20.11	10.46
0.64	22.31	7.91	31.40	9.1	3.455	0.35	20.24	11.15
0.85	23.84	8.60	32.24	8.4	3.839	0.36	20.32	11.92
1.21	25.72	9.18	33.53	7.8	4.291	0.36	20.67	12.86
1.74	27.72	9.62	35.10	7.4	4.756	0.35	21.24	13.86
2.37	29.36	9.62	36.74	7.4	4.976	0.33	22.06	14.68
3.01	31.08	9.61	38.47	7.4	5.205	0.31	22.93	15.54
3.74	31.66	9.14	39.52	7.9	5.025	0.29	23.69	15.83
4.28	33.53	8.82	41.71	8.2	5.099	0.26	24.94	16.76
5.03	35.28	8.19	44.08	8.8	5.006	0.23	26.44	17.64
6.01	36.65	7.50	46.15	9.5	4.859	0.20	27.83	18.33
7.05	36.24	6.97	46.27	10.0	4.614	0.19	28.15	18.12
7.85	37.55	6.47	48.08	10.5	4.568	0.17	29.30	18.78
8.91	38.99	6.14	49.85	10.9	4.591	0.16	30.35	19.49
9.71	38.48	6.06	49.43	10.9	4.516	0.16	30.19	19.24
10.49	38.37	5.76	49.61	11.2	4.415	0.15	30.42	19.19
11.27	39.14	5.66	50.48	11.3	4.452	0.14	30.91	19.57
11.80	40.16	5.48	51.68	11.5	4.486	0.14	31.60	20.08
12.32	40.58	5.35	52.23	11.6	4.485	0.13	31.94	20.29
12.87	40.72	5.26	52.46	11.7	4.468	0.13	32.10	20.36
13.40	40.95	5.17	52.78	11.8	4.460	0.13	32.31	20.47
14.19	40.89	5.17	52.72	11.8	4.455	0.13	32.28	20.44
14.97	40.62	4.92	52.70	12.1	4.362	0.12	32.39	20.31
15.49	41.04	4.83	53.20	12.2	4.373	0.12	32.69	20.52
16.02	41.52	4.76	53.77	12.2	4.391	0.11	33.01	20.76

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Stage No.	0
Test No.	3

PRESSURES (psi)

Cell Pressure (psi)	87.0
Back Pressure (psi)	60.0
Eff. Conf. Pressure (psi)	27.0
Pore Pressure Response (%)	99

MAXIMUM OBLIQUITY POINTS

$\overline{P}$	=	32.78
Q	=	19.66

INITIAL SAMPLE DIMENSIONS (in)

Length 1:	6.264	Diameter 1:	2.861
Length 2:	6.162	Diameter 2:	2.856
Length 3:	6.232	Diameter 3:	2.875
Avg. Length:	6.219	*Avg. Diam.:*	2.864

VOLUME CHANGE

Initial Burette Reading (ml)	48.0
Final Burette Reading (ml)	22.1
Final Change (ml)	25.9

Initial Dial Reading (mil)	115
Dial Reading After Saturation (mil)	138
Dial Reading After Consolidation (mil)	188

LOAD (LB)	DEFORMATION (IN)	PORE PRESSURE (PSI)
18.0	0.000	60.0
36.3	0.002	60.7
53.7	0.003	61.6
98.5	0.009	64.9
115.6	0.015	67.1
128.1	0.021	68.8
141.1	0.030	70.6
151.8	0.039	71.8
163.0	0.052	73.0
177.4	0.073	74.2
195.3	0.104	74.9
212.6	0.141	75.2
228.8	0.179	75.1
246.8	0.222	74.7
259.8	0.253	74.4
273.7	0.296	73.9
288.9	0.355	73.1
306.2	0.417	72.4
319.1	0.463	71.8
335.6	0.525	71.1
343.7	0.572	70.6
351.4	0.618	70.2
360.4	0.664	69.8
367.0	0.696	69.5
373.0	0.727	69.3
378.1	0.758	69.0
382.5	0.788	68.8
387.9	0.836	68.5
394.6	0.882	68.2
398.6	0.913	68.0
401.8	0.944	67.9

Tested By: MY Date: 3/23/23 Input Checked By: GEM Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		

Visual Description: Brown Sandy Silt (Undisturbed)

Effective Confining Pressure (psi)	27.0	*Stage No.*	0
		Test No	3

INITIAL DIMENSIONS

Initial Sample Length (in)	6.22
Initial Sample Diameter (in)	2.86
Initial Sample Area (in^2)	6.44
Initial Sample Volume (in^3)	40.07

VOLUME CHANGE

Volume After Consolidation (in^3)	38.04
Length After Consolidation (in)	6.15
Area After Consolidation (in^2)	6.189

Strain (%)	Deviator Stress PSI	ΔU	$\overline{\sigma_1}$	$\overline{\sigma_3}$	Effective Principal Stress Ratio	$\overline{A}$	$\overline{P}$	Q
0.02	2.96	0.74	29.22	26.3	1.113	0.25	27.74	1.48
0.05	5.77	1.64	31.13	25.4	1.228	0.29	28.24	2.88
0.14	12.98	4.86	35.12	22.1	1.586	0.38	28.63	6.49
0.24	15.72	7.14	35.58	19.9	1.792	0.46	27.72	7.86
0.34	17.73	8.76	35.97	18.2	1.972	0.50	27.10	8.87
0.49	19.79	10.57	36.22	16.4	2.204	0.54	26.33	9.90
0.64	21.47	11.81	36.66	15.2	2.413	0.56	25.93	10.74
0.85	23.23	12.96	37.27	14.0	2.654	0.56	25.66	11.61
1.19	25.44	14.16	38.28	12.8	2.981	0.56	25.56	12.72
1.69	28.15	14.94	40.21	12.1	3.334	0.54	26.14	14.08
2.30	30.72	15.16	42.56	11.8	3.595	0.50	27.20	15.36
2.91	33.06	15.10	44.97	11.9	3.777	0.46	28.43	16.53
3.61	35.63	14.72	47.91	12.3	3.902	0.42	30.09	17.82
4.12	37.46	14.39	50.07	12.6	3.971	0.39	31.34	18.73
4.82	39.33	13.88	52.45	13.1	3.998	0.36	32.78	19.66
5.77	41.24	13.13	55.11	13.9	3.973	0.32	34.49	20.62
6.78	43.40	12.35	58.05	14.6	3.963	0.29	36.35	21.70
7.54	44.98	11.79	60.19	15.2	3.957	0.26	37.70	22.49
8.54	46.93	11.08	62.85	15.9	3.947	0.24	39.39	23.46
9.30	47.73	10.64	64.09	16.4	3.917	0.23	40.23	23.86
10.06	48.45	10.16	65.30	16.8	3.876	0.21	41.07	24.23
10.81	49.33	9.77	66.56	17.2	3.863	0.20	41.89	24.67
11.32	50.00	9.50	67.49	17.5	3.857	0.19	42.50	25.00
11.82	50.57	9.26	68.31	17.7	3.850	0.18	43.02	25.28
12.33	51.01	9.02	68.98	18.0	3.837	0.18	43.48	25.50
12.83	51.33	8.79	69.54	18.2	3.819	0.17	43.88	25.67
13.60	51.64	8.47	70.17	18.5	3.786	0.17	44.35	25.82
14.35	52.11	8.19	70.92	18.8	3.770	0.16	44.87	26.06
14.85	52.36	8.02	71.34	19.0	3.759	0.15	45.16	26.18
15.36	52.48	7.86	71.62	19.1	3.742	0.15	45.38	26.24

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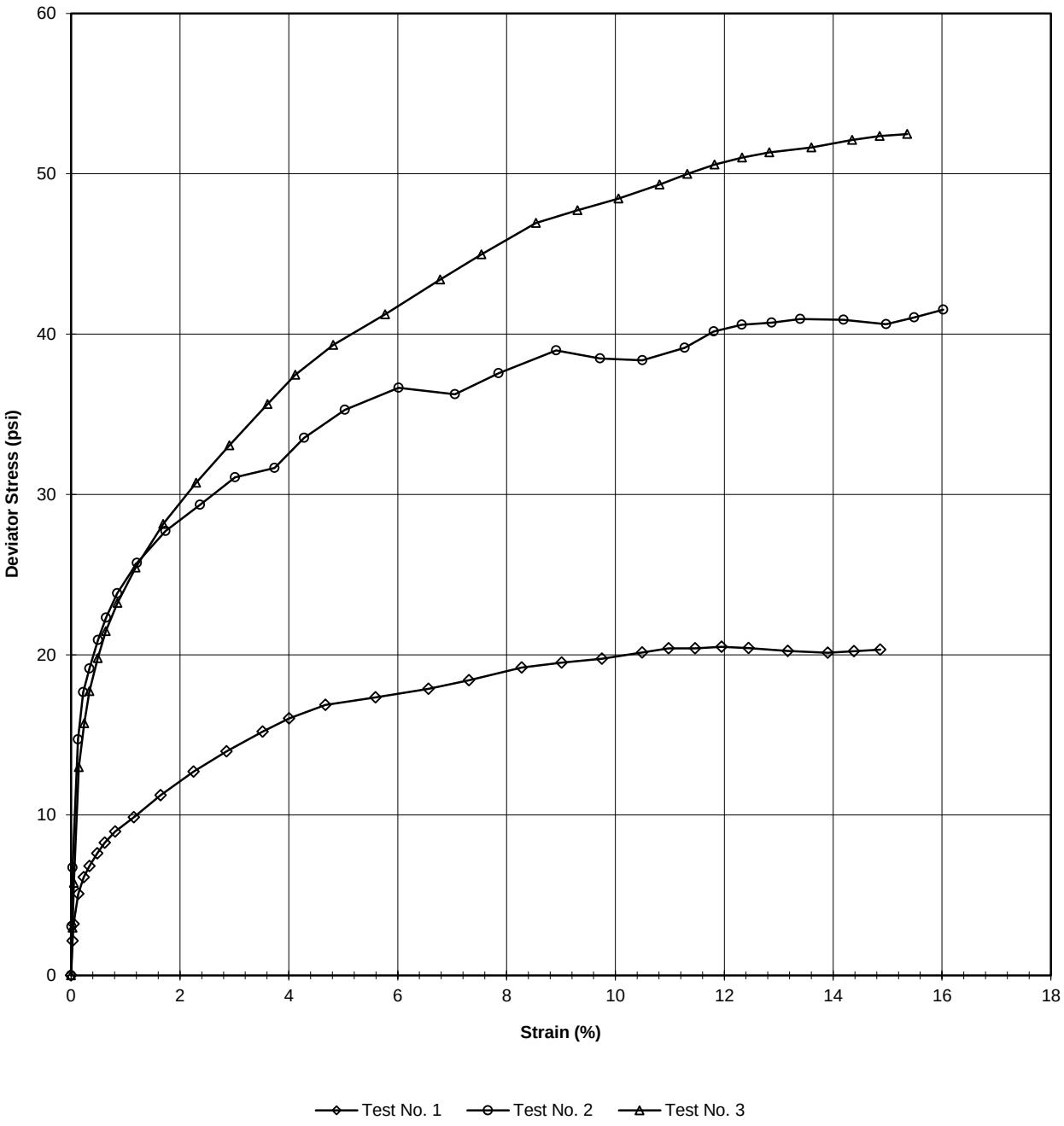
CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	12-14
Project No.:	R-2023-070-001	Sample No.:	UD-02
Lab ID:	R-2023-070-001-005		
Visual Description:	Brown Sandy Silt (Undisturbed)		



Tested By: MY Date: 3/23/23 Approved By: MPS Date: 3/30/23

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CONSOLIDATED UNDRAINED TRIAXIAL TEST
WITH PORE PRESSURE READINGS
ASTM D4767-11

Client:	Schnabel Engineering, Inc.		
Client Reference:	Cherrystone Dam 2A		
Project No.:	R-2023-070-001		
Lab ID:	R-2023-070-001-005	Specific Gravity (Assumed)	2.7
Visual Description:	Brown Sandy Silt (Undisturbed)		

SAMPLE CONDITION SUMMARY

Boring No.:	B-751	B-751	B-751
Depth (ft):	12-14	12-14	12-14
Sample No.:	UD-02	UD-02	UD-02
Test No.	T1	T2	T3
Deformation Rate (in/min)	0.002	0.002	0.002
Back Pressure (psi)	60.0	60.0	60.0
Consolidation Time (days)	1	1	1
Moisture Content (%) (INITIAL)	12.7	12.7	12.7
Total Unit Weight (pcf)	121.9	122.4	128.4
Dry Unit Weight (pcf)	108.2	108.6	113.9
Moisture Content (%) (FINAL)	29.0	28.8	19.3
Initial State Void Ratio,e	0.558	0.552	0.480
Void Ratio at Shear, e	0.481	0.465	0.405



Tested By: MY Date: 3/23/23 Input Checked By: GEM Date: 3/30/23

DCN: CT-S28 DATE: 4/12/13 REVISION: 3

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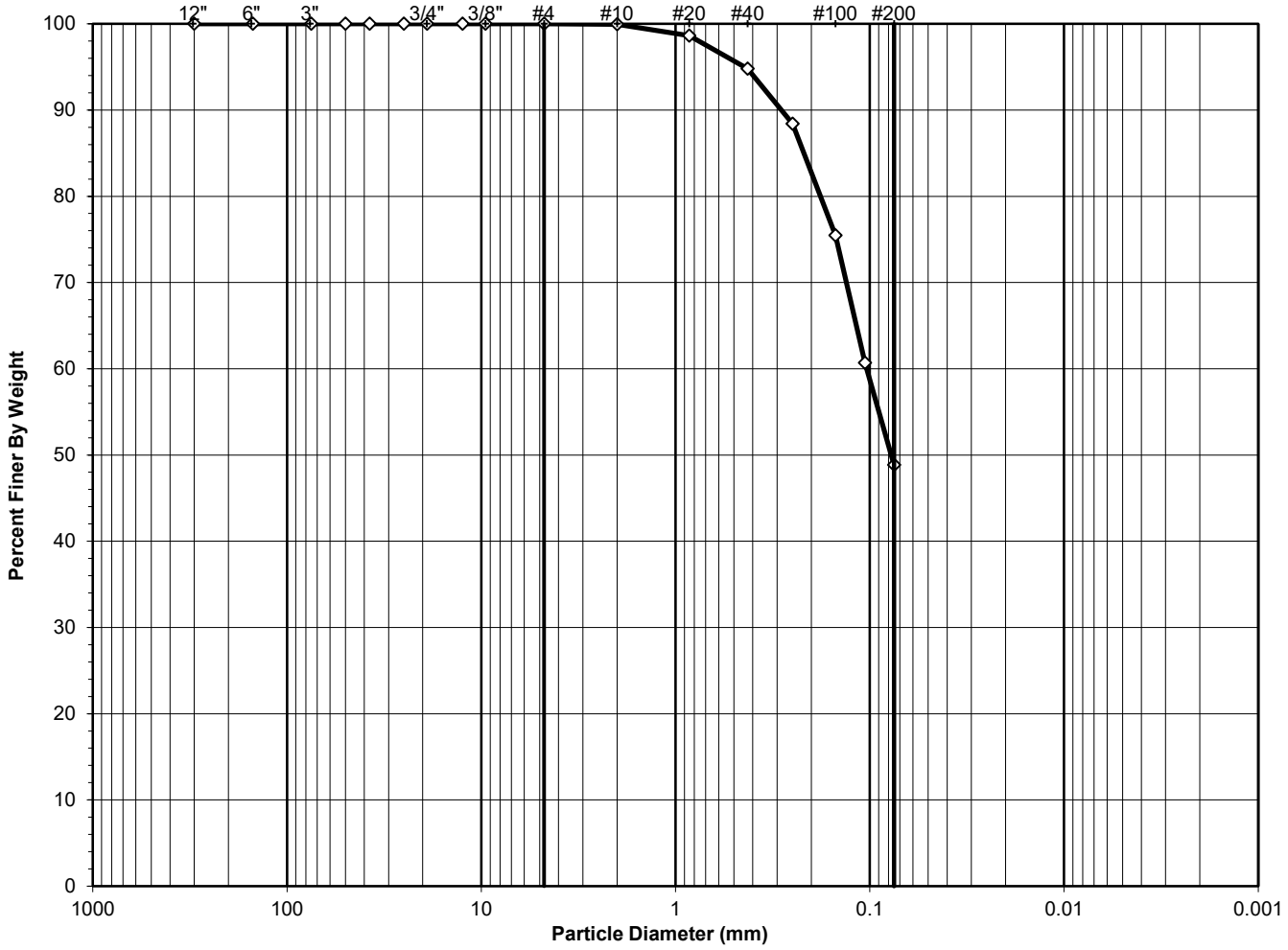
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	4-6
Project No.:	R-2023-070-001	Sample No.:	S-03
Lab ID:	R-2023-070-001-006	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.08

USCS Classification:
SILTY SAND

Tested By AA Date 3/20/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	4-6
Project No.:	R-2023-070-001	Sample No.:	S-03
Lab ID:	R-2023-070-001-006	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	709	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	286.73	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	253.26	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	90.58	Weight of Tare (g):	NA
Weight of Water (g):	33.47	Weight of Water (g):	NA
Weight of Dry Soil (g):	162.68	Weight of Dry Soil (g):	NA
Moisture Content (%):	**20.6**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	162.68
Tare No. (Sub-Specimen)	709	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	286.73	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	90.58	Dry Weight of - 3/4" Sample (g):	162.68
Sub-Specimen Wet Weight (g):	196.15	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	162.68
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.00		0.00	0.00	100.00	**100.0**
#10	2	0.08		0.05	0.05	99.95	**100.0**
#20	0.85	2.15	(**)	1.32	1.37	98.63	**98.6**
#40	0.425	6.24		3.84	5.21	94.79	**94.8**
#60	0.25	10.38		6.38	11.59	88.41	**88.4**
#100	0.15	21.06		12.95	24.53	75.47	**75.5**
#140	0.106	24.05		14.78	39.32	60.68	**60.7**
#200	0.075	19.28		11.85	51.17	48.83	**48.8**
Pan	-	79.44		48.83	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/20/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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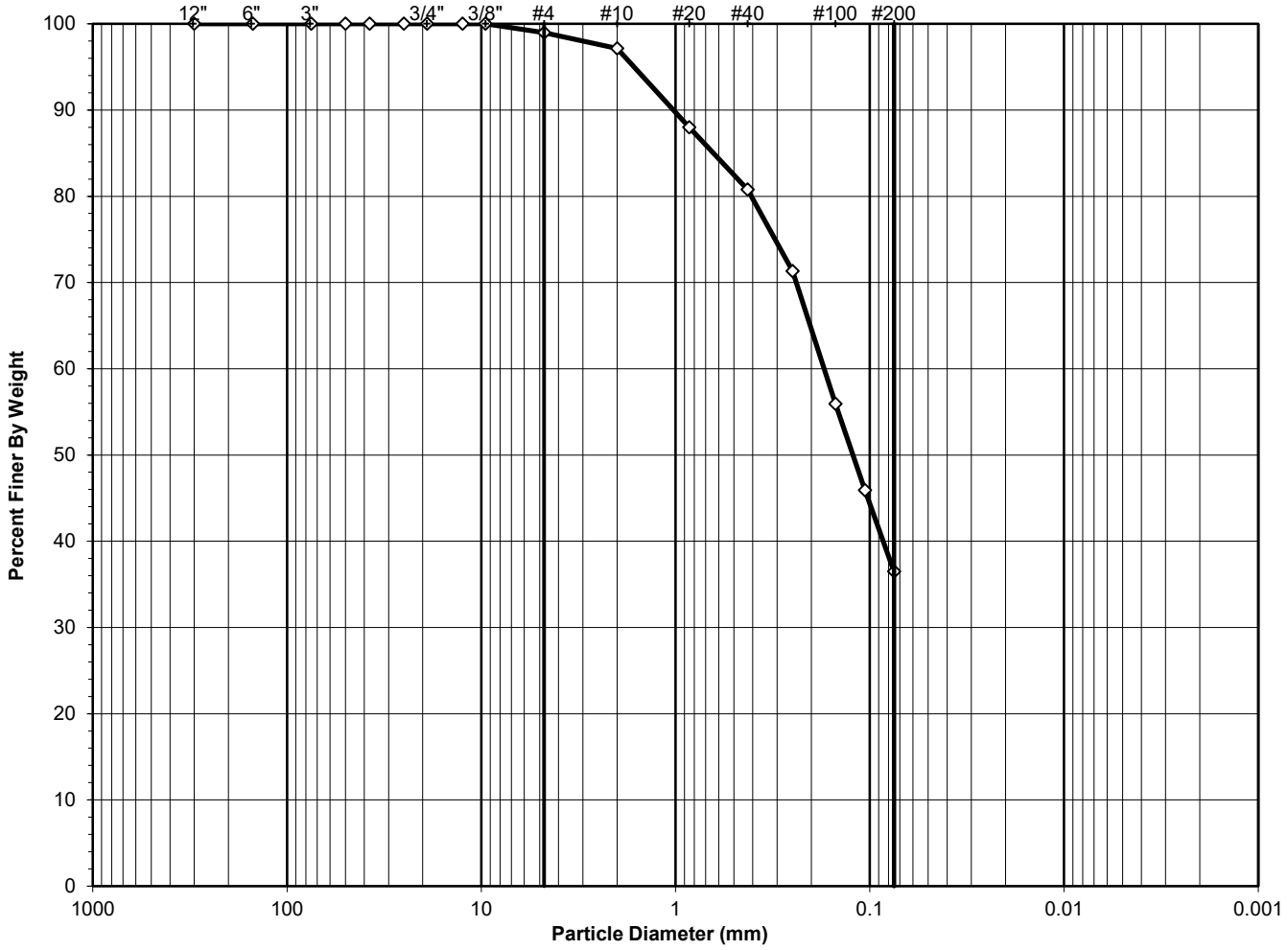
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	36-38
Project No.:	R-2023-070-001	Sample No.:	S-19
Lab ID:	R-2023-070-001-007	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.12

USCS Classification:
SILTY SAND

Tested By DO Date 3/16/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	36-38
Project No.:	R-2023-070-001	Sample No.:	S-19
Lab ID:	R-2023-070-001-007	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	443	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	349.13	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	319.78	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.22	Weight of Tare (g):	NA
Weight of Water (g):	29.35	Weight of Water (g):	NA
Weight of Dry Soil (g):	220.56	Weight of Dry Soil (g):	NA
Moisture Content (%):	**13.3**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	220.56
Tare No. (Sub-Specimen)	443	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	349.13	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.22	Dry Weight of - 3/4" Sample (g):	220.56
Sub-Specimen Wet Weight (g):	249.91	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	220.56
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	0.00		0.00	0.00	100.00	**100**
#4	4.75	2.30		1.04	1.04	98.96	**99**
#10	2	3.99		1.81	2.85	97.15	**97**
#20	0.85	20.18	(**)	9.15	12.00	88.00	**88**
#40	0.425	15.89		7.20	19.21	80.79	**81**
#60	0.25	20.91		9.48	28.69	71.31	**71**
#100	0.15	33.94		15.39	44.07	55.93	**56**
#140	0.106	22.09		10.02	54.09	45.91	**46**
#200	0.075	20.82		9.44	63.53	36.47	**36**
Pan	-	80.44		36.47	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By DO Date 3/16/23 Checked By AES Date 3/20/23

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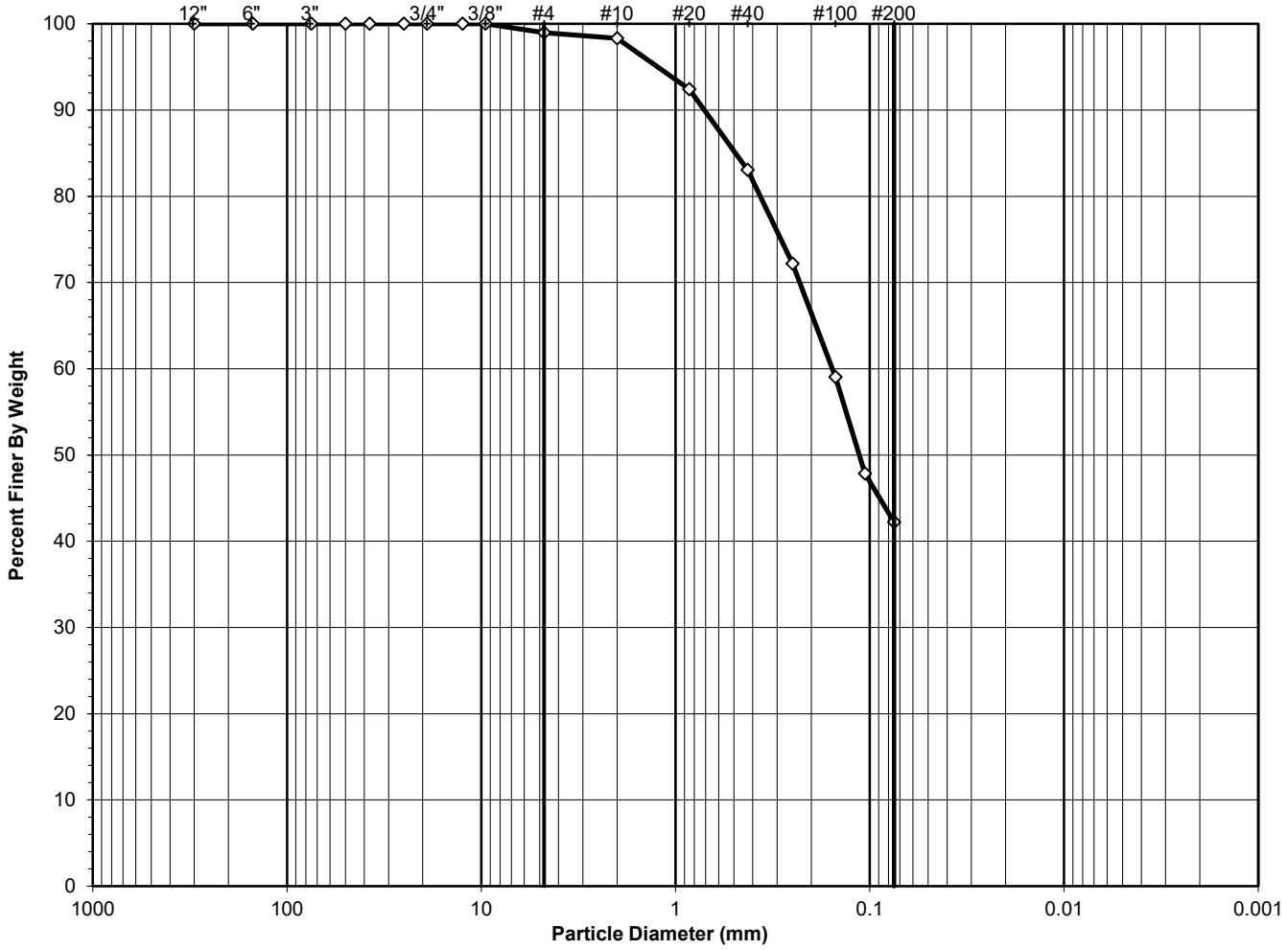
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	46-48
Project No.:	R-2023-070-001	Sample No.:	S-24
Lab ID:	R-2023-070-001-008	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.11

USCS Classification:
SILTY SAND

Tested By DO Date 3/16/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	46-48
Project No.:	R-2023-070-001	Sample No.:	S-24
Lab ID:	R-2023-070-001-008	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	432	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	411.81	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	363.51	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.30	Weight of Tare (g):	NA
Weight of Water (g):	48.30	Weight of Water (g):	NA
Weight of Dry Soil (g):	264.21	Weight of Dry Soil (g):	NA
Moisture Content (%):	**18.3**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	264.21
Tare No. (Sub-Specimen)	432	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	411.81	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.30	Dry Weight of - 3/4" Sample (g):	264.21
Sub-Specimen Wet Weight (g):	312.51	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	264.21
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	0.00		0.00	0.00	100.00	**100**
#4	4.75	2.71		1.03	1.03	98.97	**99**
#10	2	1.71		0.65	1.67	98.33	**98**
#20	0.85	15.63	(**)	5.92	7.59	92.41	**92**
#40	0.425	24.75		9.37	16.96	83.04	**83**
#60	0.25	28.71		10.87	27.82	72.18	**72**
#100	0.15	34.73		13.14	40.97	59.03	**59**
#140	0.106	29.52		11.17	52.14	47.86	**48**
#200	0.075	14.90		5.64	57.78	42.22	**42**
Pan	-	111.55		42.22	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By DO Date 3/16/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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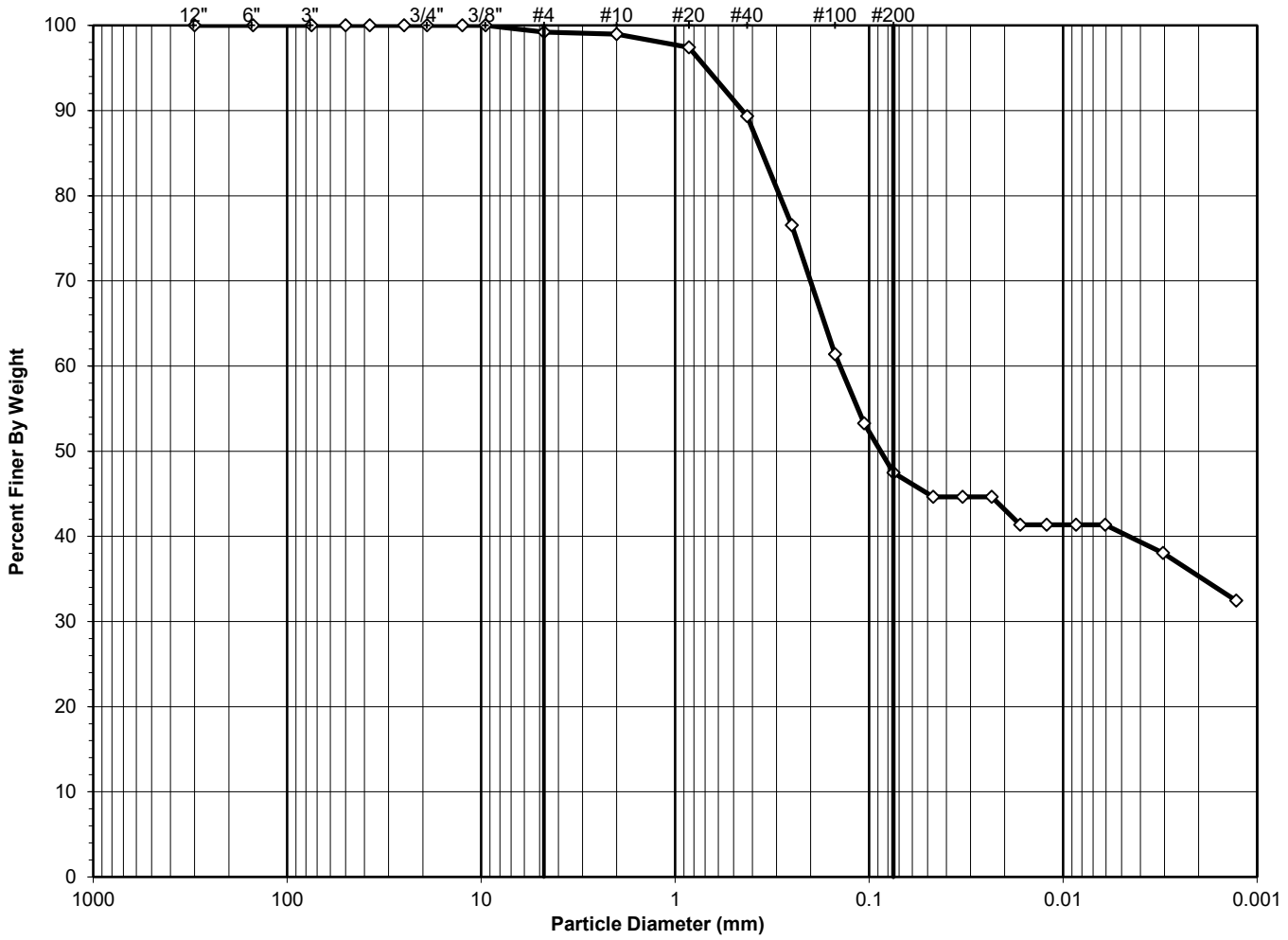
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 1A	Depth (ft):	54-56
Project No.:	R-2023-070-001	Sample No.:	S-28
Lab ID:	R-2023-070-001-012	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.09

USCS Classification:
SILTY SAND

Tested By CFD Date 3/6/23 Checked By AES Date 3/7/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 1A	Depth (ft):	54-56
Project No.:	R-2023-070-001	Sample No.:	S-28
Lab ID:	R-2023-070-001-012	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	466	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	210.92	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	196.80	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	143.87	Weight of Tare (g):	NA
Weight of Water (g):	14.12	Weight of Water (g):	NA
Weight of Dry Soil (g):	52.93	Weight of Dry Soil (g):	NA
Moisture Content (%):	**26.7**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	52.93
Tare No. (Sub-Specimen)	466	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	210.92	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	143.87	Dry Weight of - 3/4" Sample (g):	52.93
Sub-Specimen Wet Weight (g):	67.05	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	52.93
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.41		0.77	0.77	99.23	**99.2**
#10	2	0.14		0.26	1.04	98.96	**99.0**
#20	0.85	0.81	(**)	1.53	2.57	97.43	**97.4**
#40	0.425	4.28		8.09	10.66	89.34	**89.3**
#60	0.25	6.79		12.83	23.48	76.52	**76.5**
#100	0.15	8.02		15.15	38.64	61.36	**61.4**
#140	0.106	4.28		8.09	46.72	53.28	**53.3**
#200	0.075	3.07		5.80	52.52	47.48	**47.5**
Pan	-	25.13		47.48	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By CFD Date 3/6/23 Checked By AES Date 3/7/23

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HYDROMETER ANALYSIS

ASTM D7928-21

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 1A	Depth (ft):	54-56
Project No.:	R-2023-070-001	Sample No.:	S-28
Lab ID:	R-2023-070-001-012	Soil Color:	Brown

Elapsed Time (min)	Reading rm	Temp. (C°)	Offset rd,m	Effective Depth, Hm (cm)	D (mm)	Mass Percent (%) Finer, Nm	Mass Percent (%) Finer, Nm'
0	NA	NA	NA	NA	NA	NA	NA
1	16.0	23.3	2.45	13.8	0.0467	94.0	44.6
2	16.0	23.3	2.45	13.8	0.0330	94.0	44.6
4	16.0	23.3	2.45	13.8	0.0234	94.0	44.6
8	15.0	23.3	2.45	13.9	0.0166	87.1	41.3
15	15.0	23.3	2.45	13.9	0.0121	87.1	41.3
30	15.0	23.3	2.45	13.9	0.0086	87.1	41.3
60	15.0	23.3	2.45	13.9	0.0061	87.1	41.3
240	14.0	23.3	2.45	14.1	0.0031	80.1	38.0
1440	13.0	21.4	3.15	14.3	0.0013	68.4	32.5

Soil Specimen Data

Tare No.:	8	Percent Finer than # 200:	47.48
Wt. of Tare & Dry Material (g):	351.24		
Weight of Tare (g):	332.36	Specific Gravity:	2.83 Measured
Weight of Deflocculant (g):	5.0		
Weight of Dry Material (g):	13.88		

Notes: Hydrometer test is performed on - # 200 sieve material.

Hydrometer - 152H	R- 481
Cylinder	R- 692
Thermometer	R- 350
Balance	R- 279
#200 Sieve	R- 632
Foam Inhibitor Used	No

Tested By RFF Date 3/6/23 Checked By AES Date 3/7/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 1A	Depth (ft):	54-56
Project No.:	R-2023-070-001	Sample No.:	S-28
Lab ID:	R-2023-070-001-012	Soil Description:	BROWN SILT

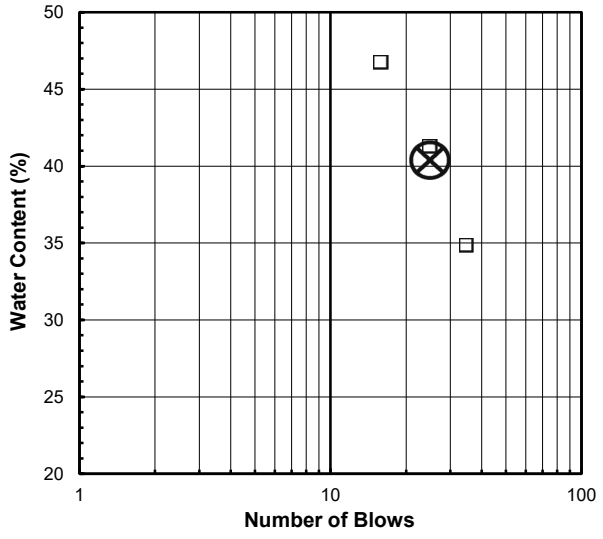
Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Wet Prep.)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	466	U	1M	A-H	U
Wt. of Tare & Wet Sample (g):	210.92	22.96	27.42	24.15	L
Wt. of Tare & Dry Sample (g):	196.80	20.93	24.02	21.39	T
Weight of Tare (g):	143.87	15.10	15.78	15.48	I
Weight of Water (g):	14.1	2.0	3.4	2.8	P
Weight of Dry Sample (g):	52.9	5.8	8.2	5.9	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**26.7**	**34.8**	**41.3**	**46.7**	N
Number of Blows:		**35**	**25**	**16**	T

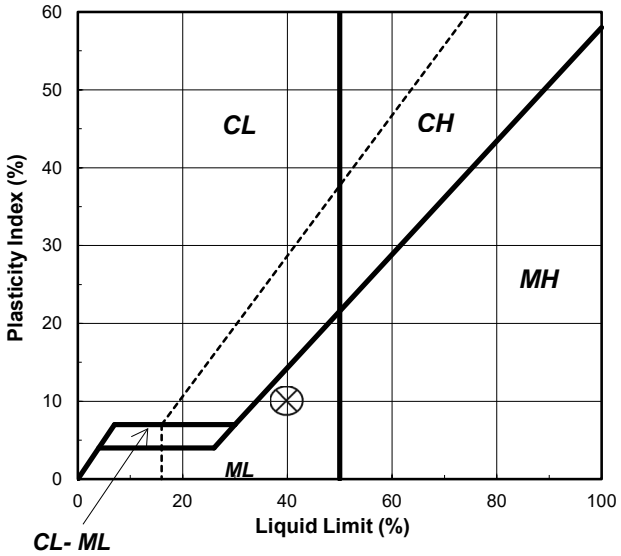
Plastic Limit Test	1	2	Range
Tare Number:	3	J	
Wt. of Tare & Wet Sample (g):	21.61	21.61	
Wt. of Tare & Dry Sample (g):	20.15	20.09	
Weight of Tare (g):	15.36	15.06	
Weight of Water (g):	1.5	1.5	
Weight of Dry Sample (g):	4.8	5.0	
Moisture Content (%):	**30.5**	**30.2**	**0.3**
Note: The acceptable range of the two Moisture Contents is ±			0.84

Test Results	
Liquid Limit (%):	**40**
Plastic Limit (%):	**30**
Plasticity Index (%):	**10**
USCS Symbol:	**ML**

Flow Curve



Plasticity Chart



Tested By CFD *Date* 3/10/23 *Checked By* AES *Date* 3/13/23

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SPECIFIC GRAVITY

AASHTO T-100-15

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	54-56
Project No.:	R-2023-070-001	Sample No.:	S-28
Lab ID:	R-2023-070-001-012	Visual Description:	Brown Clay

(MInus No.4 sieve material,oven dried)

Replicate Number	**1**	**2**
Pycnometer ID:	R 543	R 544
Weight of Pycnometer & Soil & Water (g):	680.98	683.64
Temperature (°C):	22.6	22.7
Weight of Pycnometer & Water (g):	661.34	663.80
Tare Number:	543	544
Weight of Tare & Dry Soil (g):	193.73	196.39
Weight of Tare (g):	163.2	165.87
Weight of Dry Soil (g):	30.53	30.52
Specific Gravity of Soil @ Measured Temperature:	2.804	2.858
Specific Gravity of Water @ Measured Temperature:	0.99764	0.99761
Conversion Factor for Measured Temperature:	0.99943	0.99941
Specific Gravity @ 20° Celsius:	2.805	2.860

Average Specific Gravity @ 20° Celsius	2.83

Tested By *RFF* *Date* *3/6/23* *Checked By* *AES* *Date* *3/7/23*

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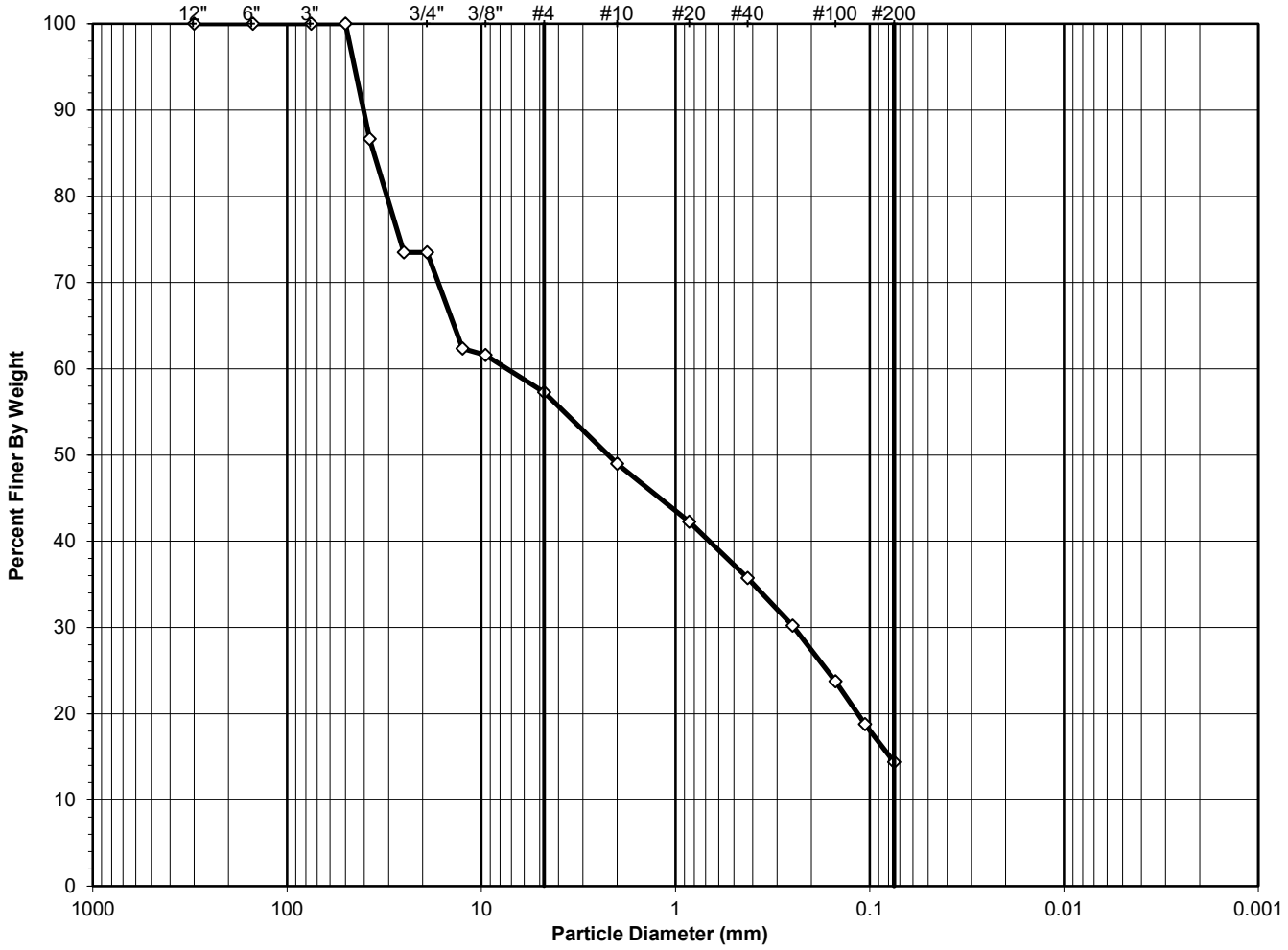
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	66-68
Project No.:	R-2023-070-001	Sample No.:	S-34
Lab ID:	R-2023-070-001-013	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 2.23

USCS Classification:
SILTY SAND WITH GRAVEL

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-51
Client Reference:	Cherrystone Dam 2A	Depth (ft):	66-68
Project No.:	R-2023-070-001	Sample No.:	S-34
Lab ID:	R-2023-070-001-013	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	477	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	433.70	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	411.93	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.56	Weight of Tare (g):	NA
Weight of Water (g):	21.77	Weight of Water (g):	NA
Weight of Dry Soil (g):	312.37	Weight of Dry Soil (g):	NA
Moisture Content (%):	**7.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	312.37
Tare No. (Sub-Specimen)	477	Wet Weight of +3/4" Sample (g):	88.61
Wt. of Tare & Wet Sub-Specimen (g):	433.70	Dry Weight of + 3/4" Sample (g):	82.84
Weight of Tare (g):	99.56	Dry Weight of - 3/4" Sample (g):	229.53
Sub-Specimen Wet Weight (g):	334.14	Dry Weight -3/4" +3/8" Sample (g):	37.13
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	192.40
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	41.70		13.35	13.35	86.65	**87**
1"	25	41.14		13.17	26.52	73.48	**73**
3/4"	19	0.00		0.00	26.52	73.48	**73**
1/2"	12.5	34.78	(**)	11.13	37.65	62.35	**62**
3/8"	9.5	2.35		0.75	38.41	61.59	**62**
#4	4.75	13.55		4.34	42.74	57.26	**57**
#10	2	25.89		8.29	51.03	48.97	**49**
#20	0.85	21.00	(**)	6.72	57.76	42.24	**42**
#40	0.425	20.35		6.51	64.27	35.73	**36**
#60	0.25	17.22		5.51	69.78	30.22	**30**
#100	0.15	20.19		6.46	76.25	23.75	**24**
#140	0.106	15.52		4.97	81.21	18.79	**19**
#200	0.075	13.72		4.39	85.61	14.39	**14**
Pan	-	44.96		14.39	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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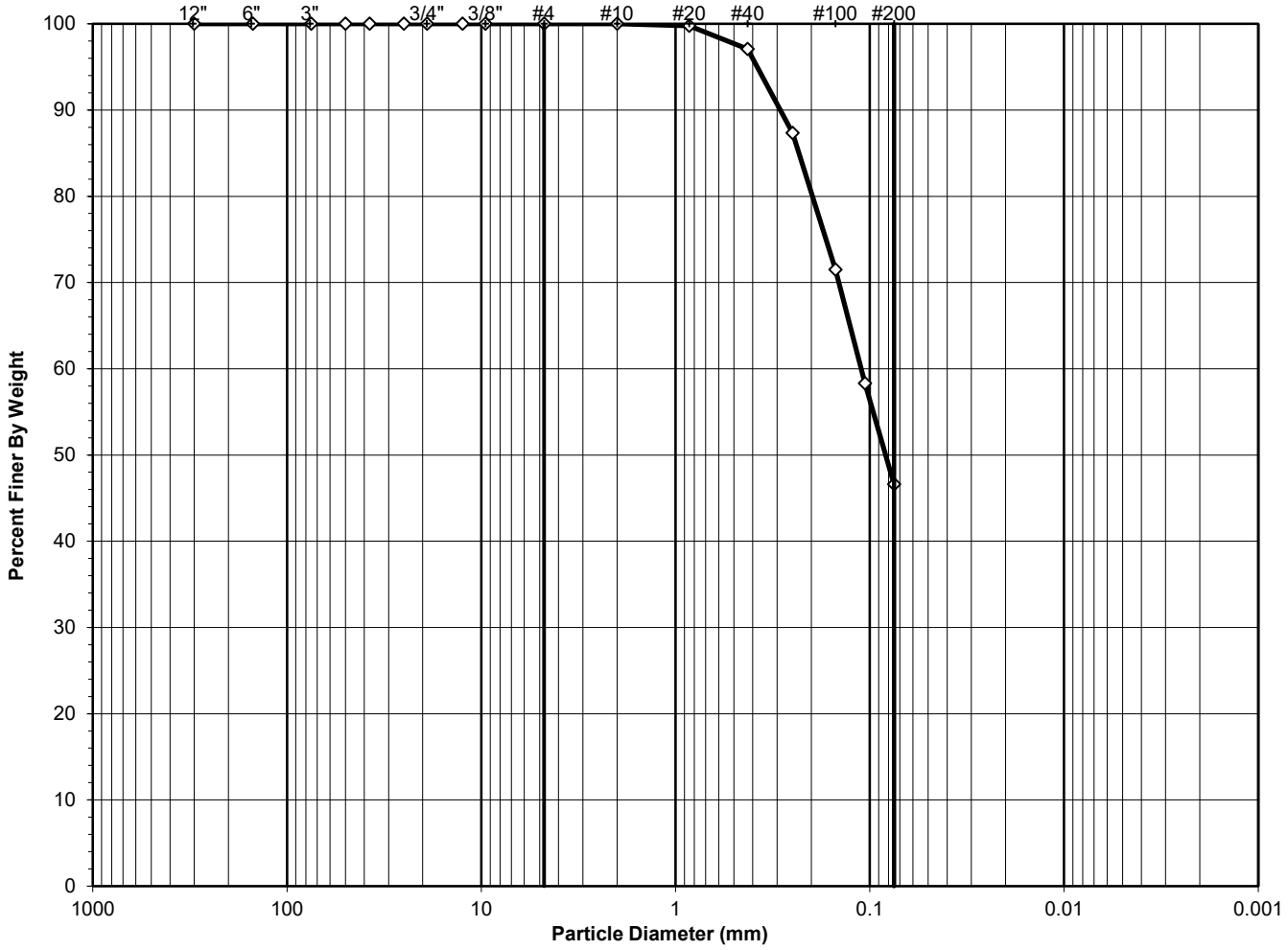
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	6-8
Project No.:	R-2023-070-001	Sample No.:	S-04
Lab ID:	R-2023-070-001-014	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.08

USCS Classification:
SILTY SAND

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	6-8
Project No.:	R-2023-070-001	Sample No.:	S-04
Lab ID:	R-2023-070-001-014	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	723	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	270.50	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	238.12	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	90.10	Weight of Tare (g):	NA
Weight of Water (g):	32.38	Weight of Water (g):	NA
Weight of Dry Soil (g):	148.02	Weight of Dry Soil (g):	NA
Moisture Content (%):	**21.9**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	148.02
Tare No. (Sub-Specimen)	723	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	270.50	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	90.10	Dry Weight of - 3/4" Sample (g):	148.02
Sub-Specimen Wet Weight (g):	180.40	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	148.02
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.00		0.00	0.00	100.00	**100.0**
#10	2	0.00		0.00	0.00	100.00	**100.0**
#20	0.85	0.35	(**)	0.24	0.24	99.76	**99.8**
#40	0.425	4.01		2.71	2.95	97.05	**97.1**
#60	0.25	14.39		9.72	12.67	87.33	**87.3**
#100	0.15	23.44		15.84	28.50	71.50	**71.5**
#140	0.106	19.51		13.18	41.68	58.32	**58.3**
#200	0.075	17.35		11.72	53.40	46.60	**46.6**
Pan	-	68.97		46.60	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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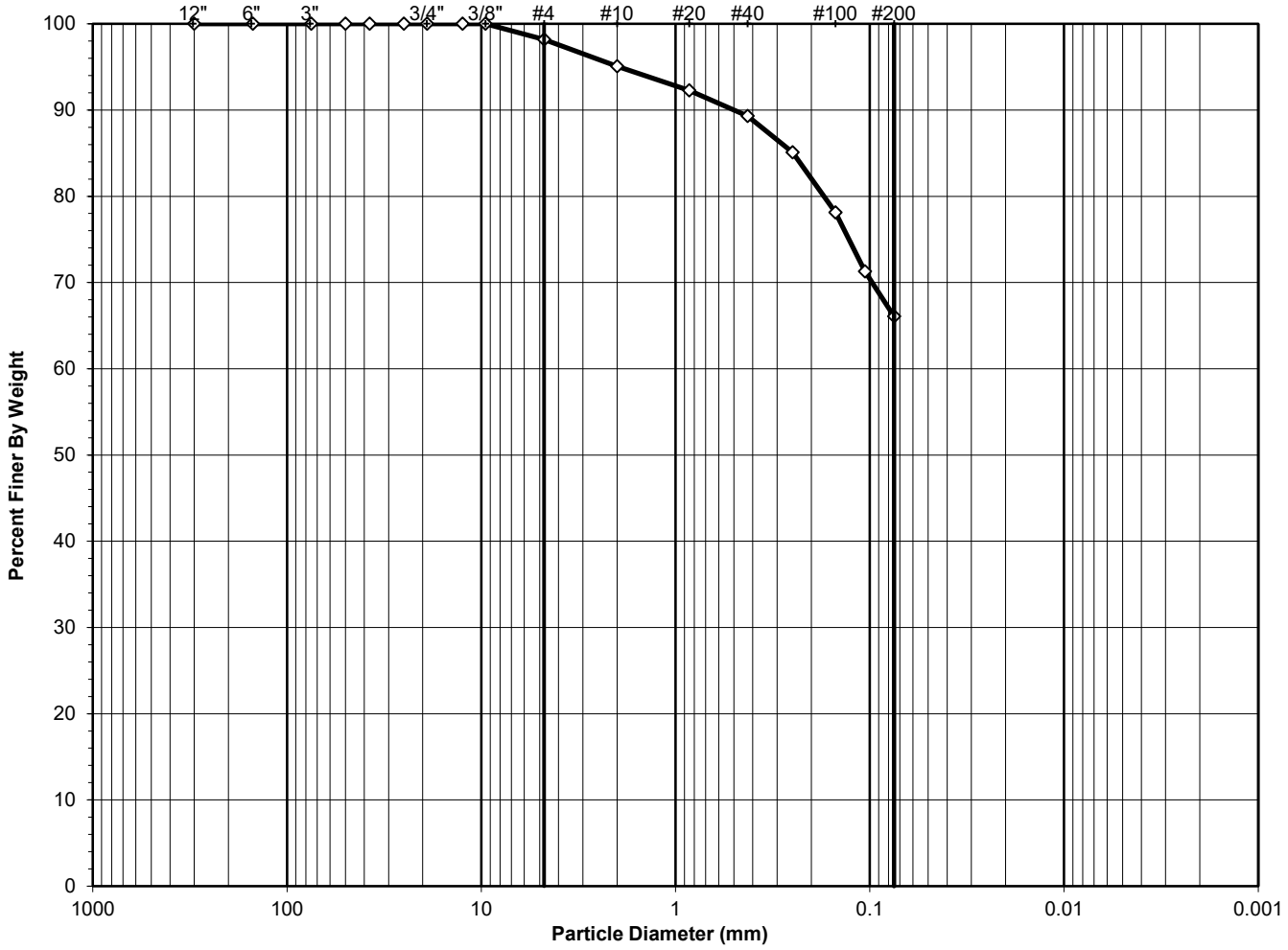
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	22-24
Project No.:	R-2023-070-001	Sample No.:	S-12
Lab ID:	R-2023-070-001-015	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
ML, TESTED

USCS Classification:
SANDY SILT

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	22-24
Project No.:	R-2023-070-001	Sample No.:	S-12
Lab ID:	R-2023-070-001-015	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	745	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	300.91	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	263.14	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	141.96	Weight of Tare (g):	NA
Weight of Water (g):	37.77	Weight of Water (g):	NA
Weight of Dry Soil (g):	121.18	Weight of Dry Soil (g):	NA
Moisture Content (%):	**31.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	121.18
Tare No. (Sub-Specimen)	745	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	300.91	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	141.96	Dry Weight of - 3/4" Sample (g):	121.18
Sub-Specimen Wet Weight (g):	158.95	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	121.18
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	0.00		0.00	0.00	100.00	**100**
#4	4.75	2.23		1.84	1.84	98.16	**98**
#10	2	3.75		3.09	4.93	95.07	**95**
#20	0.85	3.40	(**)	2.81	7.74	92.26	**92**
#40	0.425	3.59		2.96	10.70	89.30	**89**
#60	0.25	5.11		4.22	14.92	85.08	**85**
#100	0.15	8.42		6.95	21.87	78.13	**78**
#140	0.106	8.29		6.84	28.71	71.29	**71**
#200	0.075	6.33		5.22	33.93	66.07	**66**
Pan	-	80.06		66.07	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 1A	Depth (ft):	22-24
Project No.:	R-2023-070-001	Sample No.:	S-12
Lab ID:	R-2023-070-001-015	Soil Description:	BROWN SILT

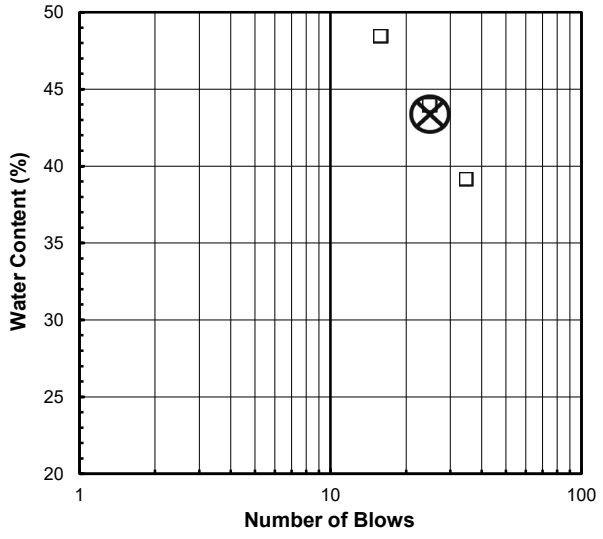
Note: The* USCS *symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus #40 sieve material, Wet Prep.)

As Received Moisture Content		Liquid Limit Test			
ASTM D2216-19		1	2	3	M
Tare Number:	745	X-9	A-D	A	U
Wt. of Tare & Wet Sample (g):	300.91	24.34	23.58	24.97	L
Wt. of Tare & Dry Sample (g):	263.14	21.88	21.05	21.76	T
Weight of Tare (g):	141.96	15.59	15.29	15.13	I
Weight of Water (g):	37.8	2.5	2.5	3.2	P
Weight of Dry Sample (g):	121.2	6.3	5.8	6.6	O
Was As Received MC Preserved:	**Yes**				I
Moisture Content (%):	**31.2**	**39.1**	**43.9**	**48.4**	N
Number of Blows:		**35**	**25**	**16**	T

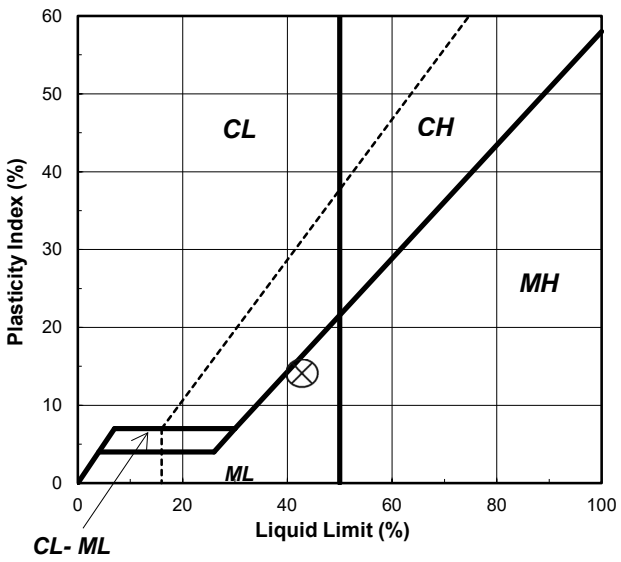
Plastic Limit Test	1	2	Range
Tare Number:	V	V-2	
Wt. of Tare & Wet Sample (g):	21.44	21.84	
Wt. of Tare & Dry Sample (g):	20.01	20.43	
Weight of Tare (g):	15.19	15.57	
Weight of Water (g):	1.4	1.4	
Weight of Dry Sample (g):	4.8	4.9	
Moisture Content (%):	**29.7**	**29.0**	**0.7**
Note: The acceptable range of the two Moisture Contents is ±			0.84

Test Results	
Liquid Limit (%):	**43**
Plastic Limit (%):	**29**
Plasticity Index (%):	**14**
USCS Symbol:	**ML**

Flow Curve



Plasticity Chart



Tested By DO *Date* 3/13/23 *Checked By* AES *Date* 3/14/23

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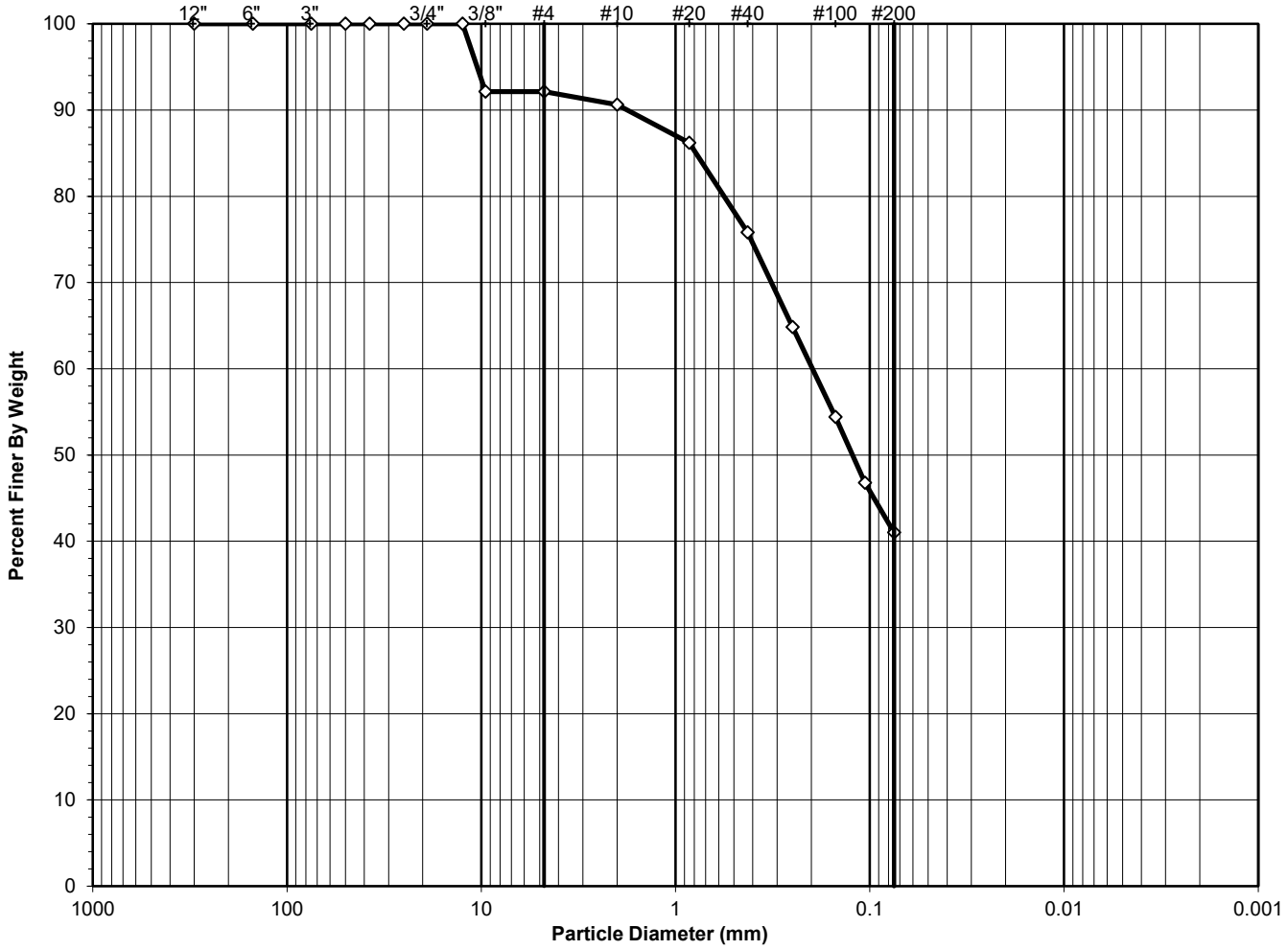
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	36-38
Project No.:	R-2023-070-001	Sample No.:	S-19
Lab ID:	R-2023-070-001-016	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.12

USCS Classification:
SILTY SAND

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	36-38
Project No.:	R-2023-070-001	Sample No.:	S-19
Lab ID:	R-2023-070-001-016	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	426	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	239.26	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	186.21	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.32	Weight of Tare (g):	NA
Weight of Water (g):	53.05	Weight of Water (g):	NA
Weight of Dry Soil (g):	86.89	Weight of Dry Soil (g):	NA
Moisture Content (%):	**61.1**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	86.89
Tare No. (Sub-Specimen)	426	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	239.26	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.32	Dry Weight of - 3/4" Sample (g):	86.89
Sub-Specimen Wet Weight (g):	139.94	Dry Weight -3/4" +3/8" Sample (g):	6.82
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	80.07
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	6.82		7.85	7.85	92.15	**92**
#4	4.75	0.00		0.00	7.85	92.15	**92**
#10	2	1.34		1.54	9.39	90.61	**91**
#20	0.85	3.83	(**)	4.41	13.80	86.20	**86**
#40	0.425	9.03		10.39	24.19	75.81	**76**
#60	0.25	9.54		10.98	35.17	64.83	**65**
#100	0.15	9.05		10.42	45.59	54.41	**54**
#140	0.106	6.63		7.63	53.22	46.78	**47**
#200	0.075	5.02		5.78	58.99	41.01	**41**
Pan	-	35.63		41.01	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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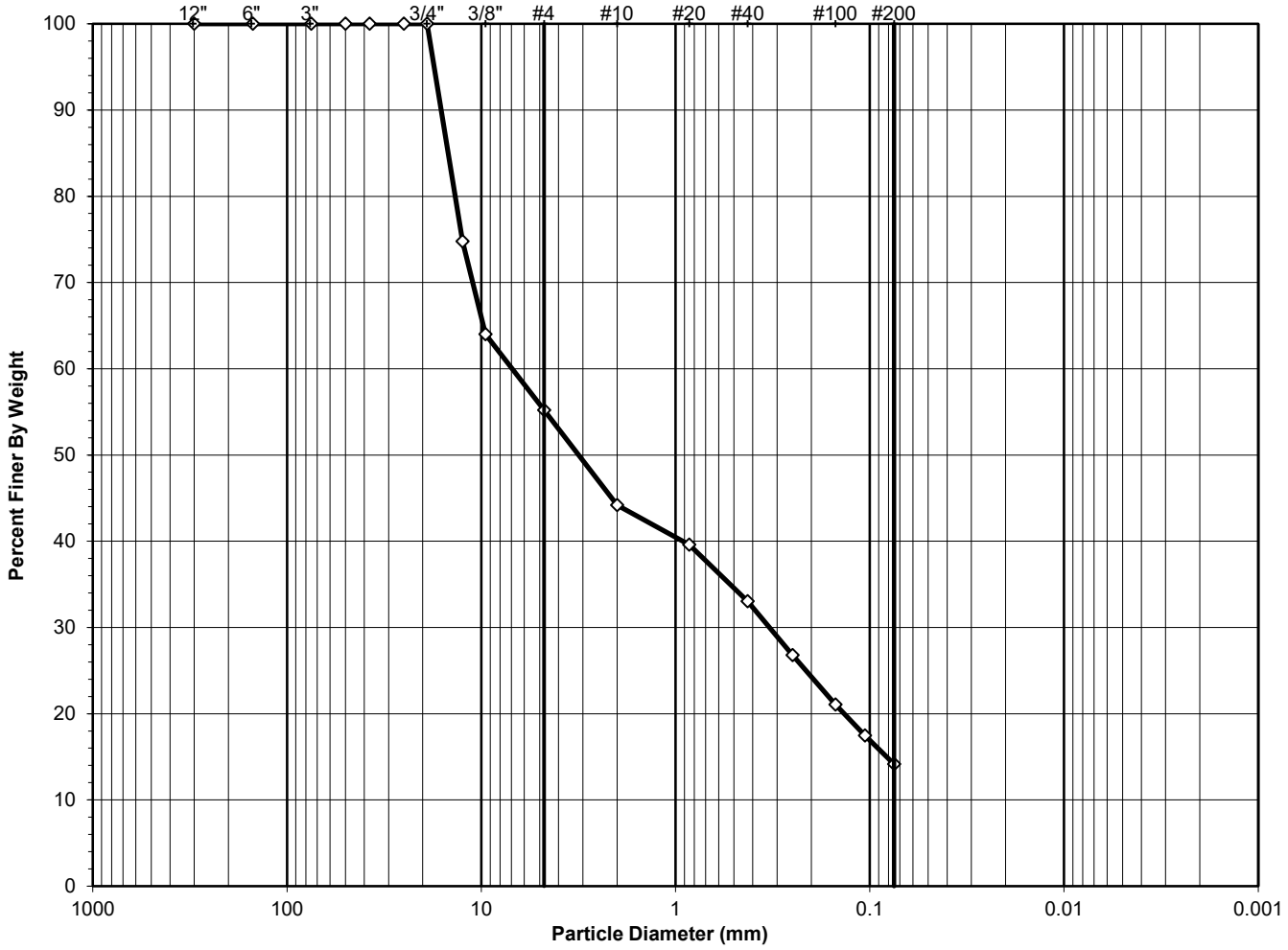
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	42-44
Project No.:	R-2023-070-001	Sample No.:	S-22
Lab ID:	R-2023-070-001-017	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.11

USCS Classification:
SILTY SAND

Tested By AA Date 3/20/23 Checked By AES Date 3/20/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-651
Client Reference:	Cherrystone Dam 2A	Depth (ft):	42-44
Project No.:	R-2023-070-001	Sample No.:	S-22
Lab ID:	R-2023-070-001-017	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	483	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	329.61	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	310.22	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	97.75	Weight of Tare (g):	NA
Weight of Water (g):	19.39	Weight of Water (g):	NA
Weight of Dry Soil (g):	212.47	Weight of Dry Soil (g):	NA
Moisture Content (%):	**9.1**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	212.47
Tare No. (Sub-Specimen)	483	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	329.61	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	97.75	Dry Weight of - 3/4" Sample (g):	212.47
Sub-Specimen Wet Weight (g):	231.86	Dry Weight -3/4" +3/8" Sample (g):	76.49
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	135.98
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	53.61	(**)	25.23	25.23	74.77	**75**
3/8"	9.5	22.88		10.77	36.00	64.00	**64**
#4	4.75	18.68		8.79	44.79	55.21	**55**
#10	2	23.40		11.01	55.81	44.19	**44**
#20	0.85	9.80	(**)	4.61	60.42	39.58	**40**
#40	0.425	13.91		6.55	66.96	33.04	**33**
#60	0.25	13.30		6.26	73.22	26.78	**27**
#100	0.15	12.18		5.73	78.96	21.04	**21**
#140	0.106	7.63		3.59	82.55	17.45	**17**
#200	0.075	7.00		3.29	85.84	14.16	**14**
Pan	-	30.08		14.16	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

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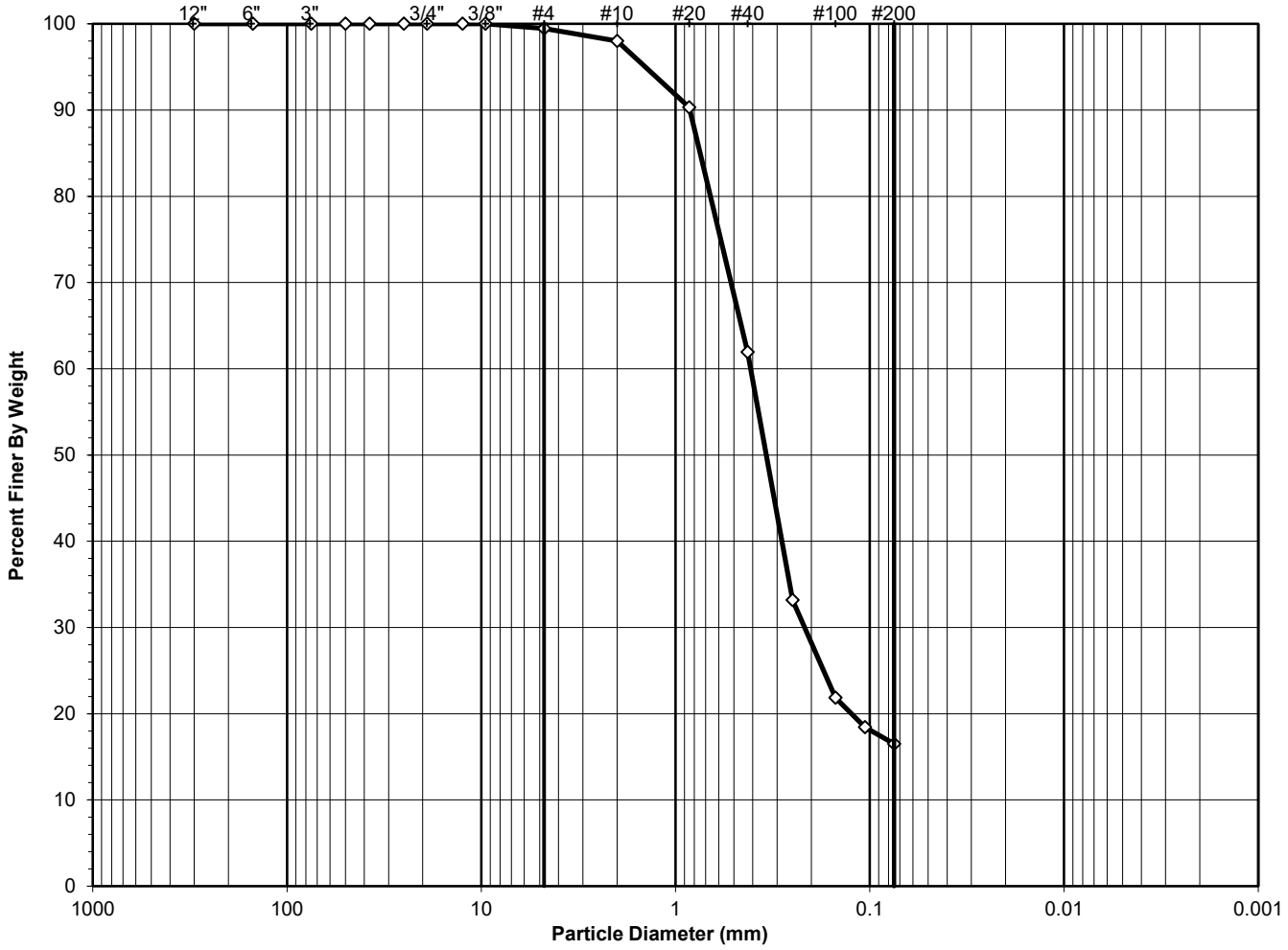
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-652
Client Reference:	Cherrystone Dam 2A	Depth (ft):	8-10
Project No.:	R-2023-070-001	Sample No.:	S-05
Lab ID:	R-2023-070-001-018	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.34

USCS Classification:
SILTY SAND

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-652
Client Reference:	Cherrystone Dam 2A	Depth (ft):	8-10
Project No.:	R-2023-070-001	Sample No.:	S-05
Lab ID:	R-2023-070-001-018	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	704	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	400.24	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	333.89	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	89.60	Weight of Tare (g):	NA
Weight of Water (g):	66.35	Weight of Water (g):	NA
Weight of Dry Soil (g):	244.29	Weight of Dry Soil (g):	NA
Moisture Content (%):	**27.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	244.29
Tare No. (Sub-Specimen)	704	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	400.24	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	89.60	Dry Weight of - 3/4" Sample (g):	244.29
Sub-Specimen Wet Weight (g):	310.64	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	244.29
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	1.37		0.56	0.56	99.44	**99.4**
#10	2	3.52		1.44	2.00	98.00	**98.0**
#20	0.85	18.82	(**)	7.70	9.71	90.29	**90.3**
#40	0.425	69.27		28.36	38.06	61.94	**61.9**
#60	0.25	70.30		28.78	66.84	33.16	**33.2**
#100	0.15	27.62		11.31	78.14	21.86	**21.9**
#140	0.106	8.39		3.43	81.58	18.42	**18.4**
#200	0.075	4.67		1.91	83.49	16.51	**16.5**
Pan	-	40.33		16.51	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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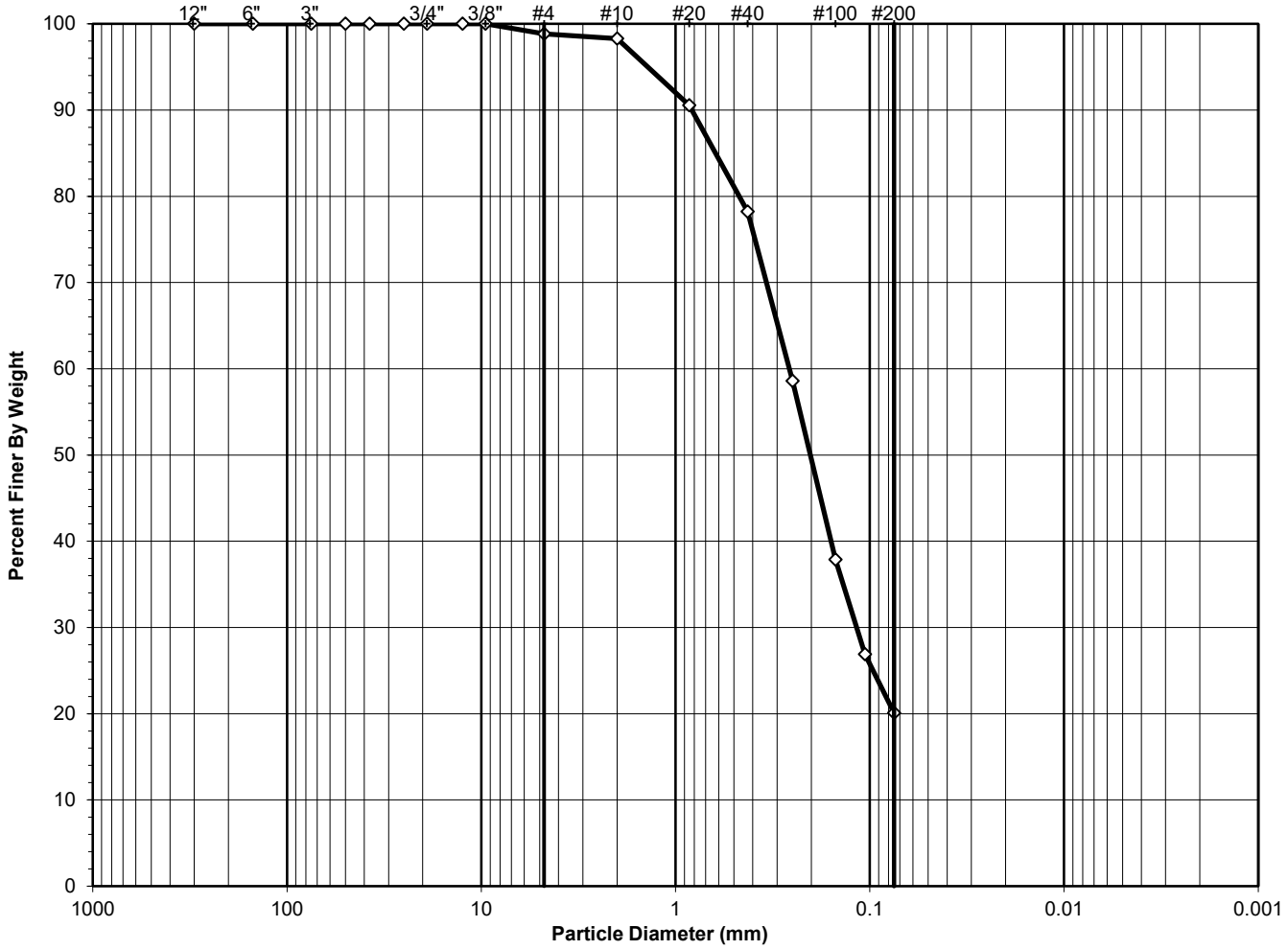
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-652
Client Reference:	Cherrystone Dam 2A	Depth (ft):	18-20
Project No.:	R-2023-070-001	Sample No.:	S-10
Lab ID:	R-2023-070-001-019	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.20

USCS Classification:
SILTY SAND

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-652
Client Reference:	Cherrystone Dam 2A	Depth (ft):	18-20
Project No.:	R-2023-070-001	Sample No.:	S-10
Lab ID:	R-2023-070-001-019	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	430	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	363.72	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	310.65	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.78	Weight of Tare (g):	NA
Weight of Water (g):	53.07	Weight of Water (g):	NA
Weight of Dry Soil (g):	210.87	Weight of Dry Soil (g):	NA
Moisture Content (%):	**25.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	210.87
Tare No. (Sub-Specimen)	430	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	363.72	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.78	Dry Weight of - 3/4" Sample (g):	210.87
Sub-Specimen Wet Weight (g):	263.94	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	210.87
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	0.00		0.00	0.00	100.00	**100**
#4	4.75	2.47		1.17	1.17	98.83	**99**
#10	2	1.18		0.56	1.73	98.27	**98**
#20	0.85	16.28	(**)	7.72	9.45	90.55	**91**
#40	0.425	25.97		12.32	21.77	78.23	**78**
#60	0.25	41.45		19.66	41.42	58.58	**59**
#100	0.15	43.66		20.70	62.13	37.87	**38**
#140	0.106	23.19		11.00	73.13	26.87	**27**
#200	0.075	14.31		6.79	79.91	20.09	**20**
Pan	-	42.36		20.09	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

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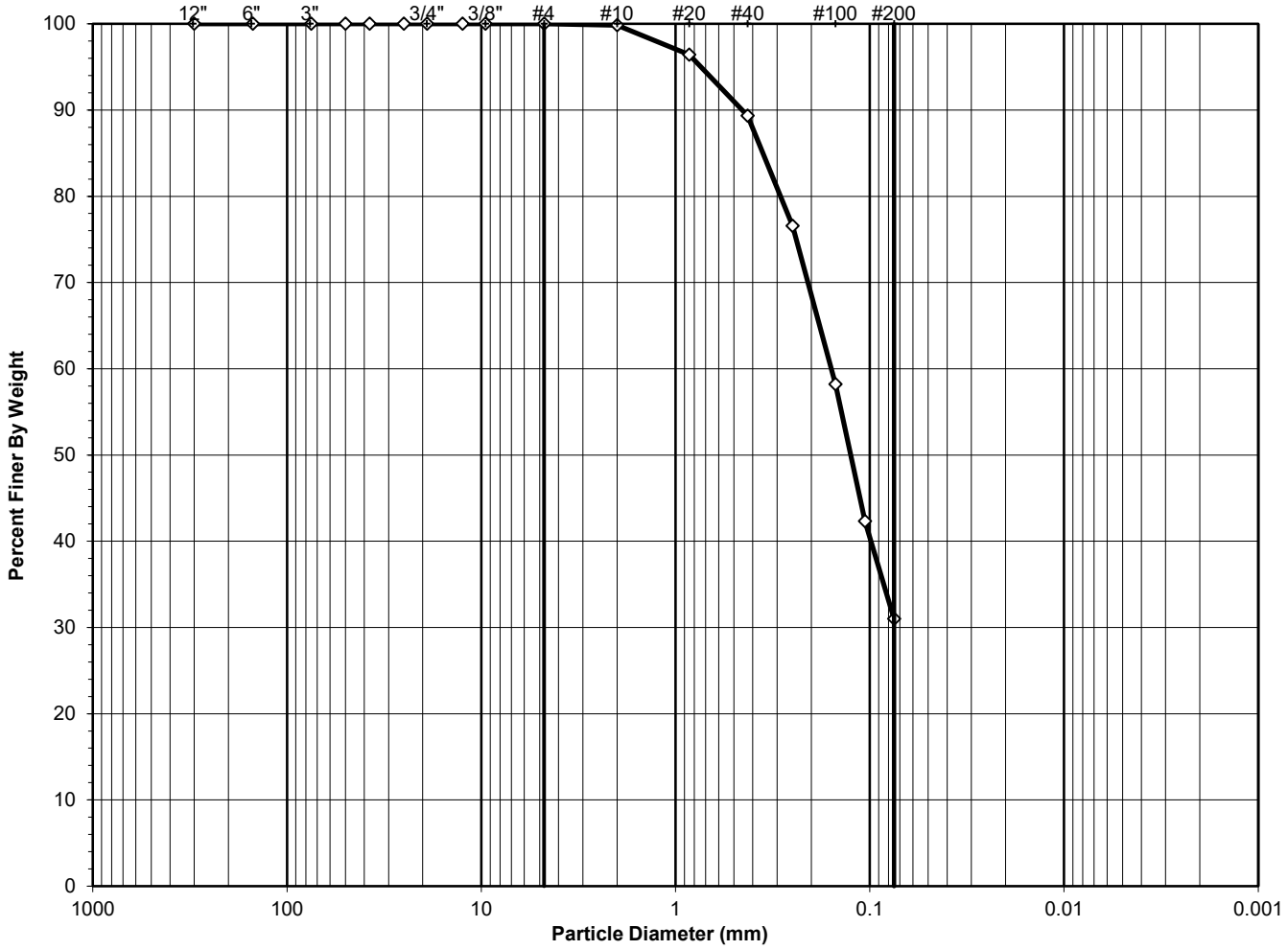
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	4-6
Project No.:	R-2023-070-001	Sample No.:	S-03
Lab ID:	R-2023-070-001-020	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
sm, ASSUMED

D50 = 0.13

USCS Classification:
SILTY SAND

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	4-6
Project No.:	R-2023-070-001	Sample No.:	S-03
Lab ID:	R-2023-070-001-020	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	494	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	371.80	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	327.88	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	99.06	Weight of Tare (g):	NA
Weight of Water (g):	43.92	Weight of Water (g):	NA
Weight of Dry Soil (g):	228.82	Weight of Dry Soil (g):	NA
Moisture Content (%):	**19.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	228.82
Tare No. (Sub-Specimen)	494	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	371.80	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	99.06	Dry Weight of - 3/4" Sample (g):	228.82
Sub-Specimen Wet Weight (g):	272.74	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	228.82
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.00		0.00	0.00	100.00	**100.0**
#10	2	0.41		0.18	0.18	99.82	**99.8**
#20	0.85	7.78	(**)	3.40	3.58	96.42	**96.4**
#40	0.425	16.23		7.09	10.67	89.33	**89.3**
#60	0.25	29.20		12.76	23.43	76.57	**76.6**
#100	0.15	42.06		18.38	41.81	58.19	**58.2**
#140	0.106	36.28		15.86	57.67	42.33	**42.3**
#200	0.075	25.96		11.35	69.01	30.99	**31.0**
Pan	-	70.90		30.99	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

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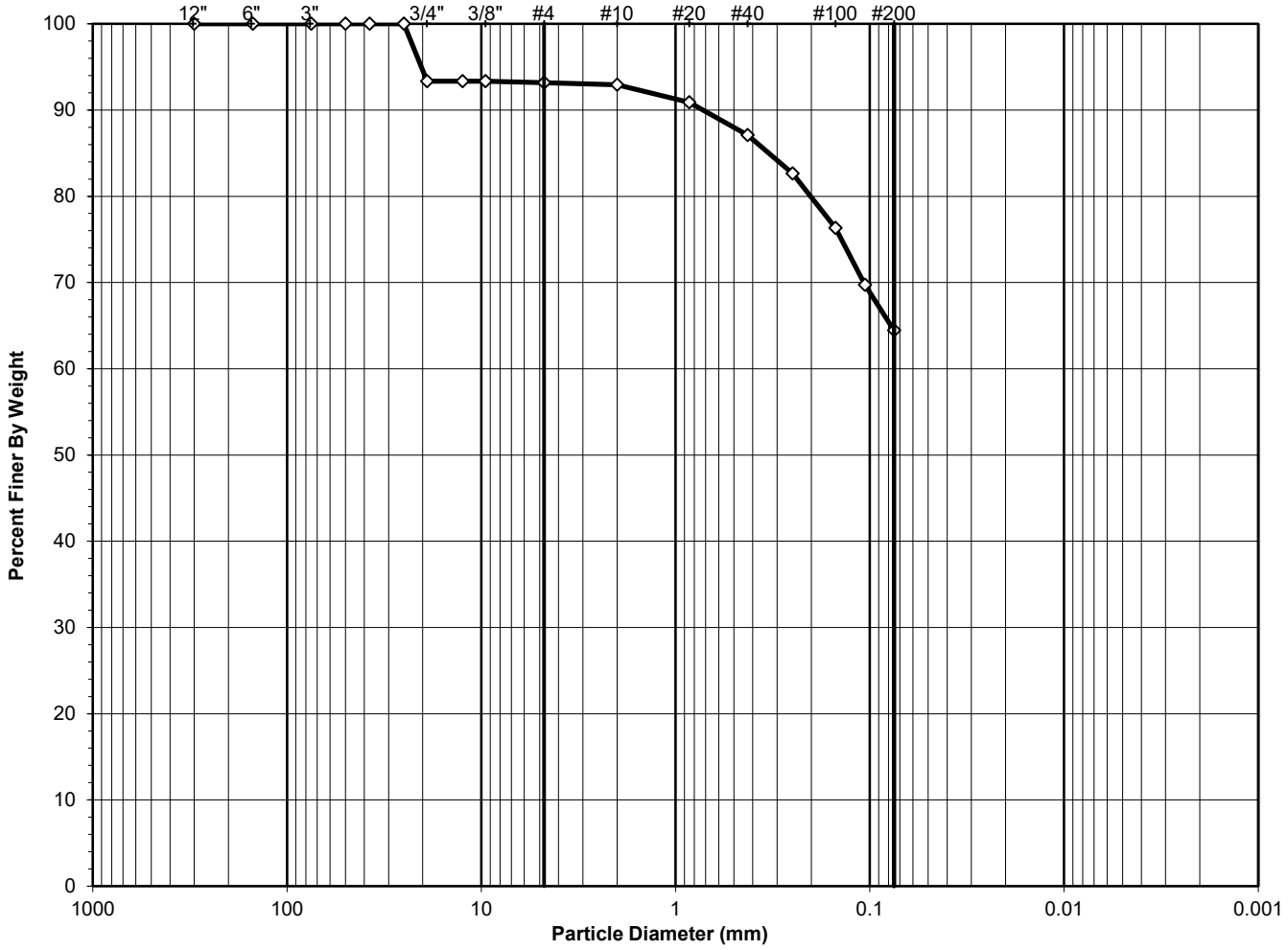
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	24-26
Project No.:	R-2023-070-001	Sample No.:	S-11
Lab ID:	R-2023-070-001-021	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
ml, ASSUMED

USCS Classification:
SANDY SILT

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	24-26
Project No.:	R-2023-070-001	Sample No.:	S-11
Lab ID:	R-2023-070-001-021	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	474	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	357.52	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	306.28	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	98.41	Weight of Tare (g):	NA
Weight of Water (g):	51.24	Weight of Water (g):	NA
Weight of Dry Soil (g):	207.87	Weight of Dry Soil (g):	NA
Moisture Content (%):	**24.7**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	207.87
Tare No. (Sub-Specimen)	474	Wet Weight of +3/4" Sample (g):	17.29
Wt. of Tare & Wet Sub-Specimen (g):	357.52	Dry Weight of + 3/4" Sample (g):	13.87
Weight of Tare (g):	98.41	Dry Weight of - 3/4" Sample (g):	194.00
Sub-Specimen Wet Weight (g):	259.11	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	194.00
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	13.87		6.67	6.67	93.33	**93**
1/2"	12.5	0.00	(**)	0.00	6.67	93.33	**93**
3/8"	9.5	0.00		0.00	6.67	93.33	**93**
#4	4.75	0.32		0.15	6.83	93.17	**93**
#10	2	0.49		0.24	7.06	92.94	**93**
#20	0.85	4.28	(**)	2.06	9.12	90.88	**91**
#40	0.425	7.87		3.79	12.91	87.09	**87**
#60	0.25	9.24		4.45	17.35	82.65	**83**
#100	0.15	13.14		6.32	23.67	76.33	**76**
#140	0.106	13.73		6.61	30.28	69.72	**70**
#200	0.075	10.98		5.28	35.56	64.44	**64**
Pan	-	133.95		64.44	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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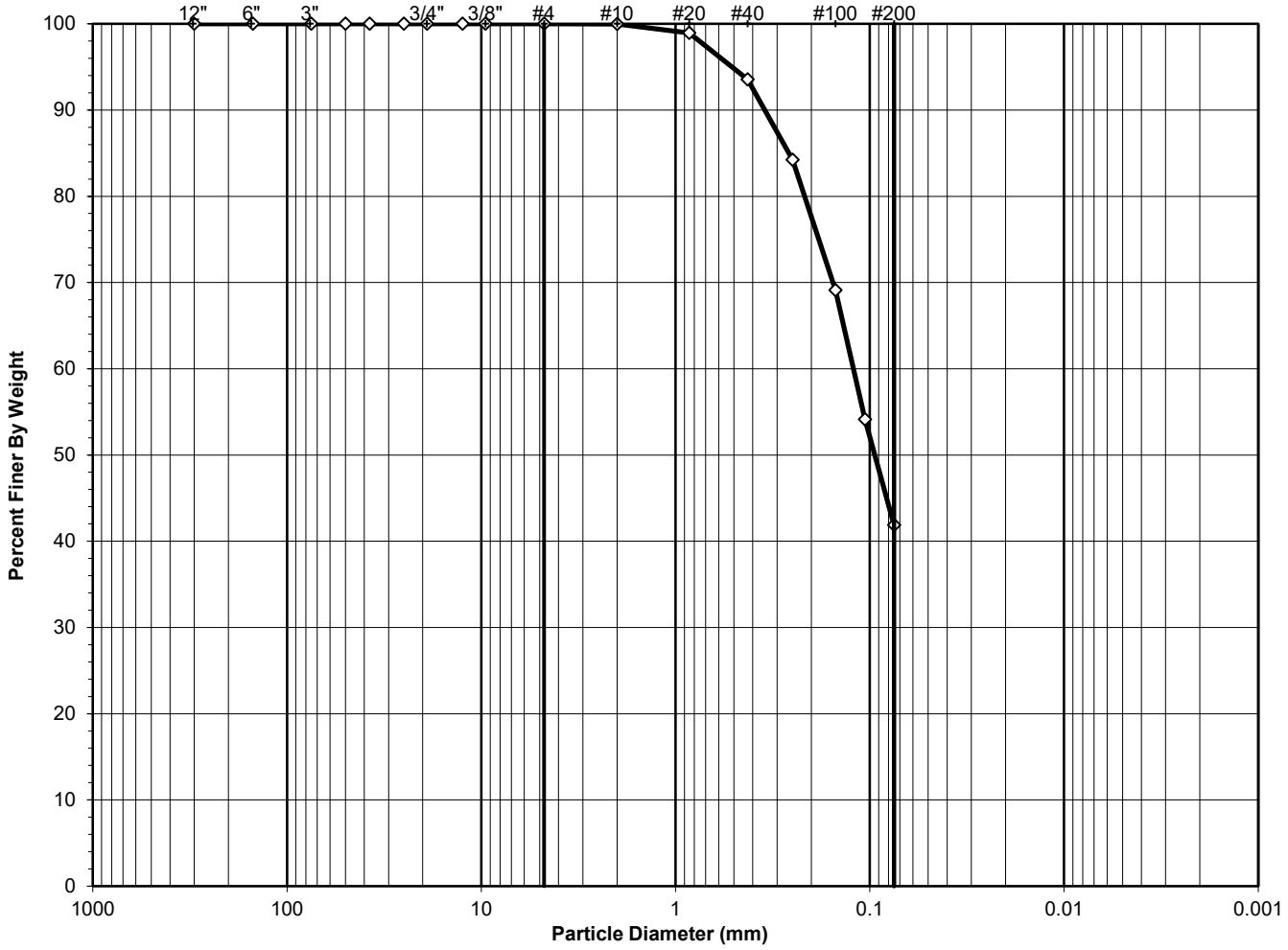
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	30-32
Project No.:	R-2023-070-001	Sample No.:	S-14
Lab ID:	R-2023-070-001-022	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol:
SM, TESTED

D50 = 0.09

USCS Classification:
SILTY SAND
(NON-PLASTIC FINES)

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	30-32
Project No.:	R-2023-070-001	Sample No.:	S-14
Lab ID:	R-2023-070-001-022	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	368	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	263.52	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	238.29	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	110.83	Weight of Tare (g):	NA
Weight of Water (g):	25.23	Weight of Water (g):	NA
Weight of Dry Soil (g):	127.46	Weight of Dry Soil (g):	NA
Moisture Content (%):	**19.8**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	127.46
Tare No. (Sub-Specimen)	368	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	263.52	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	110.83	Dry Weight of - 3/4" Sample (g):	127.46
Sub-Specimen Wet Weight (g):	152.69	Dry Weight -3/4" +3/8" Sample (g):	0.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	127.46
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100.0**
6"	150	0.00		0.00	0.00	100.00	**100.0**
3"	75	0.00		0.00	0.00	100.00	**100.0**
2"	50	0.00	(*)	0.00	0.00	100.00	**100.0**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100.0**
1"	25	0.00		0.00	0.00	100.00	**100.0**
3/4"	19	0.00		0.00	0.00	100.00	**100.0**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100.0**
3/8"	9.5	0.00		0.00	0.00	100.00	**100.0**
#4	4.75	0.00		0.00	0.00	100.00	**100.0**
#10	2	0.02		0.02	0.02	99.98	**100.0**
#20	0.85	1.34	(**)	1.05	1.07	98.93	**98.9**
#40	0.425	6.88		5.40	6.46	93.54	**93.5**
#60	0.25	11.87		9.31	15.78	84.22	**84.2**
#100	0.15	19.28		15.13	30.90	69.10	**69.1**
#140	0.106	19.09		14.98	45.88	54.12	**54.1**
#200	0.075	15.62		12.25	58.14	41.86	**41.9**
Pan	-	53.36		41.86	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By AA Date 3/24/23 Checked By AES Date 3/26/23

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ATTERBERG LIMITS

ASTM D 4318-17

Client:	Schnabel Engineering, Inc.	Boring No.:	B-751
Client Reference:	Cherrystone Dam 2A	Depth (ft):	30-32
Project No.:	R-2023-070-001	Sample No.:	S-14
Lab ID:	R-2023-070-001-022	Color:	Brown
			(MInus No. 40 sieve material)

As Received
Water Content

Tare Number	368
Wt. of Tare & Wet Sample (g)	263.52
Wt. of Tare & Dry Sample (g)	238.29
Weight of Tare (g)	110.83
Weight of Water (g)	25.23
Weight of Dry Sample (g)	127.46
Water Content (%)	**19.8**

NON - PLASTIC MATERIAL

Tested By *DO* *Date* *3/14/23* *Checked By* *AES* *Date* *3/15/23*

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PINHOLE DISPERSION TEST

ASTM D4647-13

Client	Schnabel Engineering, Inc.	Boring No.	B-651
Client Reference	Cherrystone Dam 2A	Depth (ft)	22-24
Project No.	R-2023-070-002	Sample No.	S-12
Lab ID	R-2023-070-002-001	Visual	Red Sandy Clay

Tare No.	3032
Wgt.Tare + Wet Specimen (gm)	22.12
Wgt.Tare + Dry Specimen (gm)	20.13
Weight of Tare (gm)	8.16
Weight of Water (gm)	1.99
Weight of Dry Specimen (gm)	11.97
Water Content (%)	16.6
Dry Density (pcf)	108.7
Final Hole Diam (mm)	1.0
Classification	ND2

Turbidity
VD - Very Dark
D - Dark
MD - Moderately Dark
SD - Slightly Dark
BV - Barely Visible
CC - Completely Clear

Method A

Clock Time	Head	Flow (ml)	(sec)	Flow Rate (ml/sec)	Turbidity from Side	Turbidity from Top	Remarks
16:00	2"	11.5	30	0.383	BV	CC	
16:05	2"	11.5	30	0.383	CC	CC	Slight Change - Run to 10 Minutes
16:10	2"	9.5	30	0.317	CC	CC	No Change - Increase Head
16:11	7"	10.5	10	1.050	MD	MD	
16:15	7"	10.5	10	1.050	CC	CC	Slightly Lighter - Increase Head
16:16	15"	18	10	1.800	SD	SD	
16:20	15"	17.5	10	1.750	CC	CC	Slightly Lighter - Increase Head
16:21	40"	19	5	3.800	BV	BV	
16:25	40"	20	5	4.000	BV	BV	No Change - End Test

Note: For complete description of classification criteria, please refer to ASTM D4647.

Tested By: JG Date: 5/30/23 Checked By: KC Date: 5/31/23

DCN: