DISCOVER 200 1824–2024 | ALACHUA COUNTY BICENTENNIAL

Alachua County
Board of County Commissioners

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Anna Prizzia, Vice Chair
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Charles S. Chestnut, IV
Marihelen Wheeler

Administration
Michele L. Lieberman
County Manager

November 13, 2025

Wa_welch@cityofalachua.org
The Honorable Walter Welch
City of Alachua
15100 NW 142 Terrace
Alachua, FL 32615

RE: Tara April Special Exception

Dear Mayor Welch,

The Alachua County Board of County Commissioners appreciate the City of Alachua's continued dedication to sound planning and protection of our community's shared water resources. In furtherance of these shared goals, the County has serious concerns regarding stormwater management of the proposed Tara Forest April, Tara Forest West, and Tara Phoenicia projects and requests affected party status and opposes the Special Exception and proposed expansion of the stormwater system at Tara April, which is intended to accommodate the development of the Tara Phoenicia site.

The County is a substantially affected party due to its receivership and operation of the public water utility named the Santa Fe Hills Water System and its status as the beneficial holder of a conservation easement covering approximately 198 acres of Camp Kulaqua in northwestern Alachua County. In 2005 and 2006, a dye trace study was performed in the Mill Creek Sink area and demonstrated the direct hydrological connection between Mill Creek Sink and the Santa Fe Hills Water System, as well as Camp Kulaqua. Water quality impacts to the Mill Creek Sink associated with the proposed Tara April development could more directly or more significantly harm the County's property interests when compared to the general impacts on the public at large. A copy of the dye trace study has already been provided to the City of Alachua.

A site assessment of Tara Forest, Tara Phoenicia, and Tara Baywood performed by Wood in 2021 identified areas downslope (to the West) of the 75-foot contour elevation likely to be experiencing active subsidence. Wood recommended site-specific engineering and geological studies to determine if there is evidence of ground loss since the 1960's and if there is an unacceptable likelihood of future subsidence or of the potential for sinkhole development. Wood additionally recommended avoiding development in areas shown to have an unacceptable likelihood of continuing ground loss or sinkhole formation. The geotechnical portion of this report and an email follow up from the geotechnical engineer has been attached to this letter (Attachment A).

Wood performed these recommended geotechnical and geophysical studies during the design and development of the Mill Creek Sink WQ Improvement project, which is adjacent to the Tara April Site and near the Tara Phoenicia development. The Mill Creek Sink WQ Improvement project illuminated the very active nature of continued karst formation in the area. As a result of these studies, the facility was redesigned and moved away from existing infrastructure to minimize the potential effects that it could have on adjacent properties. Wood's geotechnical report and G3's "Report of Geophysical Exploration Using the MERIT System" for Mill Creek Sink Water Quality Improvement Project from January 2020 have been attached to this letter (Attachment B).

During construction of the Mill Creek Sink Water Quality Improvement Project, a chimney opened onsite. A chimney is a surficial expression of subsurface subsidence, a "warning sign" for sinkhole formation. Evidence of this can be found in construction oversight logs and the subsequent geotechnical analysis in Attachment B.

The National Speleological Society has performed extensive mapping of the Mill Creek Cave System and has shared the mapped extents with Alachua County. A figure is attached to this letter showing the extent of the proposed Tara Phoenicia development with relation to that 75-foot contour and the mapped cave system (Attachment C). This mapped cave system captures areas large enough for a diver to fit. It is very likely that this cave system is much more extensive and complex and extended by smaller conduits that do not allow human passage, but do allow the movement of water and any contaminants.

The 1977 Bureau of Geology's "The Geology of the Western Part of Alachua County, Florida" delineates what is known as the cross-county fracture zone, which can be seen in Attachment D. This cross-county fracture zone is described as follows, "This linear trend of solution features is considered to be a direct result of an extensively fractured zone both in the Crystal River and the Hawthorne Formations. Preferential solution occurred along this fractured zone in the Crystal River Formation. This was accentuated by downward percolation of ground water along joints and fractures in the Hawthorne Formation." This explains why there are so many subterranean voids in this area and such a short travel time to the Santa Fe River & Springs. Preferential solution/groundwater flow could result in the formation of much larger voids compared to other parts of Alachua County. The entirety of both the Tara April and Tara Phoenicia sites fall within the cross-county fracture zone.

Alachua County strongly encourages the City of Alachua to require the applicant to perform further geophysical investigation via Electrical Resistivity Imaging (ERI) surveys prior to commencement of construction activities and prior to approval of site design expansion, as recommended by Wood's site assessment report and geotechnical engineer. Because of the mapped Mill Creek Cave system, a significant geological feature as defined by the City's Comprehensive Plan, and the known nature of active karst formation in the area, it is irresponsible to perform any significant land development and earth moving activities without thorough subsurface exploration. While sinkhole formation is a common consideration for land development within Alachua County, these known characteristics for this area warrant this additional data gathering to best protect public health and safety and requesting this analysis and investigation is consistent with Objective 1.7 *Geological Resources* of the Conservation and Open Space Element of the City's Comprehensive Plan, which states the City shall identify, protect and conserve significant geological resources and their natural functions.

If you have any questions, please contact me or Stephen Hofstetter, Director of our Environmental Protection Department. I look forward to hearing from you and working together to preserve our community and protect our water resources.

Sincerely,

Ken Cornell, Chair
Alachua County Commission
Chr26.005

Enclosures (4)

cc: Board of County Commissioners
Michele L. Lieberman, County Manager
Sylvia Torres, County Attorney
Sandy Burgess, City Planning & Zoning Board Chair
Rodolfo Valladares, City Manager
Scott Walker, City Attorney
Stephen Hofstetter, County Environmental Protection Department Director

Attachment A

3.0 Geological Assessment

Creative Environmental Solutions' report indicated "No significant Geological Features (caves, springs, sinkholes, etc.) were observed on the site". They also indicated there were no surface features observed that indicated a direct connection to the Floridan aquifer.

According to Butt et al. (2006), the Mill Creek Sink Cave is located along the southern perimeter of the project site (**Figure 5**) and is a direct connection to the Floridan Aquifer.

The entire study area is known to be underlain with an extensive cave network and to have active karst features such as sinkholes, swallets (sinking streams), and areas that have experienced substantial subsidence. The sink noted just off the southwest corner of the property in the Creative Environmental Solutions report and shown in (**Figure 5**) is the Mill Creek Sink and is a very large water-filled sinkhole providing direct diver access to a large tunnel network in the upper Florida Aquifer.

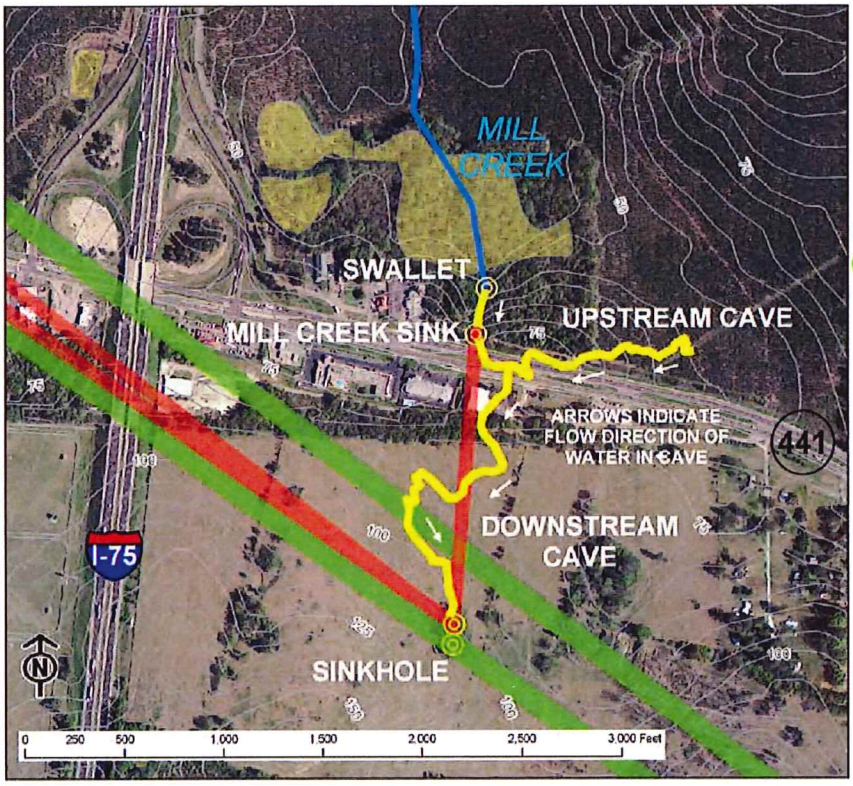
Based on a comparison of the site topographic information since 1962 (USGS), the entire western boundary of the property (<75ft elevation) appears to be an area potentially experiencing active ground subsidence. Based on the 1962 topographic map there are sinkholes present at multiple locations along this western boundary. The historical topographic maps (USGS), also indicate the presence of a sinkhole in the northwestern portion of the site and in the general vicinity of the northern portion of the eastern boundary (**Figure 6**).

The Mill Creek Sink is directly connected to the Upper Floridan Aquifer and there at least two features shown on the 1962 topographic map along Mill Creek stream valley that appear to be swallets; one immediately adjacent to the western boundary of the property (in the lower 1/3rd of the property boundary) and the other on the western side of Mill Creek immediately south and west of the first one) (**Figure 6**). There are isolated locations along the northern and eastern portion of the property and in at least one stream valley cutting diagonally across the property that appear to be exhibiting ground subsidence consistent with the formation and development of sinkholes. Whether or not these types of features are directly connected to the Floridan Aquifer would need to be demonstrated in the field.

3.1 Avoidance Areas and Recommendations

In general, within the lower Mill Creek Valley (elevation < 75 ft contour, western portion of the property), may be susceptible to subsidence, and development in these areas should consider the possibility of subsidence or sinkhole formation. Further, the depressional areas and stream valleys identified in **Figure 6**, and the Mill Creek Sink Cave shown in **Figure 5**, may experience more settlement over time, with potential for sink hole formation.

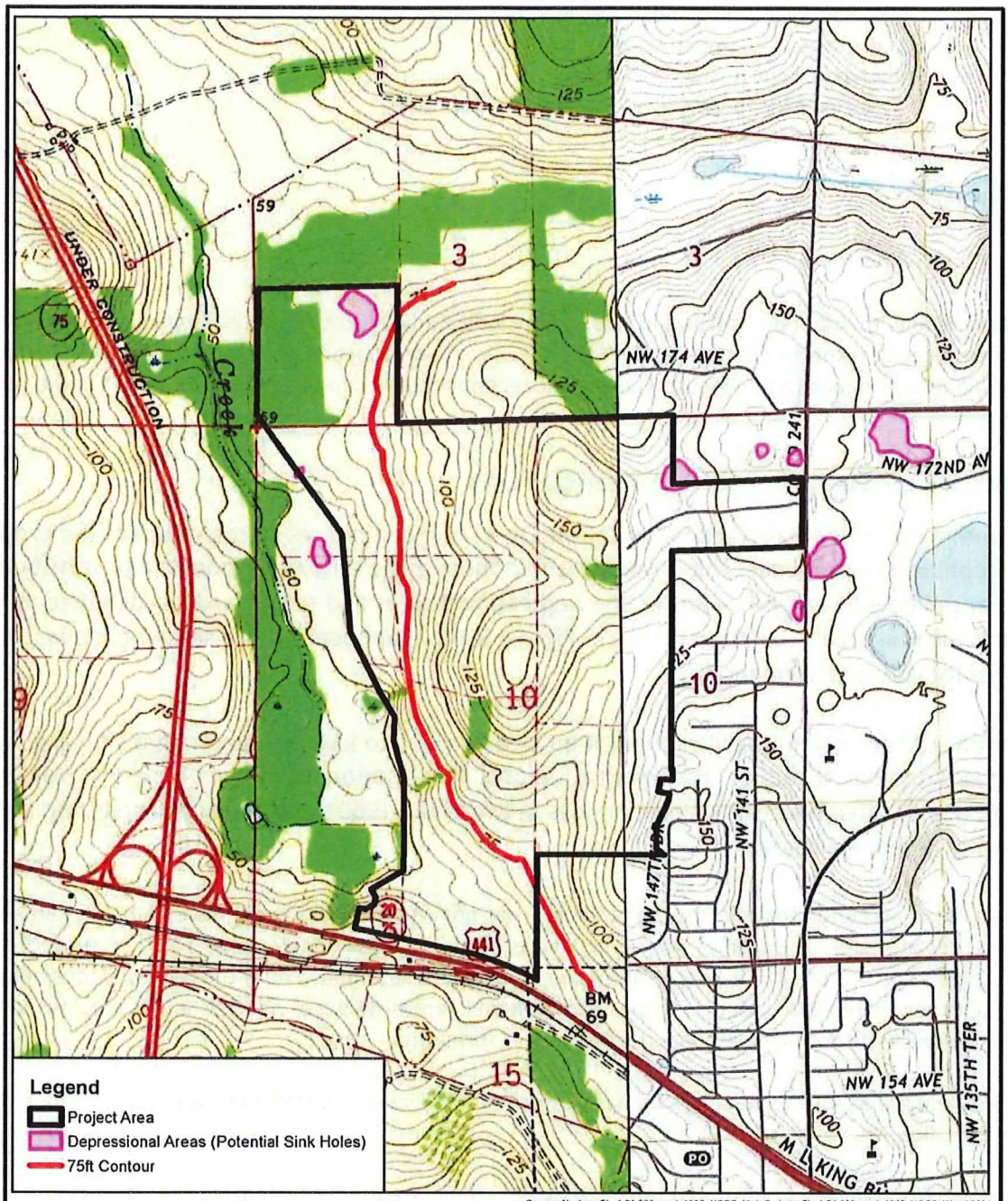
Wood recommends evaluating the likelihood of ground loss due to karst by performing site-specific engineering and geological studies. Following additional investigation, Wood recommends avoiding development in areas that have shown ground loss between the 1960's and today and selecting areas for development at higher elevations.



Source: Karst Environmental Solutions, Inc. 2005

City of Alachua Tara Forest, Tara Phoenicia, and Tara Baywood Site		
Mill Creek & Lee Sinks Dye Trace Study Map		
Gainesville Florida Project No. 2402210028	wood.	Figure 5

Path: \\GNV-FS1\projects\EAT\0_Projects\City_of_Alachua\TaraForest_Environmental Review_2402210028\13 GIS\13.2_MXD\Report\Figure 5 Mill Creek & Lee Sinks Dye Trace Study Map.mxd nichole.panko Date Saved: 12/15/2021 10:16:44 AM


Legend
Project Area
Depressional Areas (Potential Sink Holes)
75ft Contour
NW 174 AVE
NW 172ND AV
NW 154 AVE
NW 135TH TER
NW 141 ST
NW 147TH TER
M L KING
UNDER CONSTRUCTION
Creek
BM 69
441
N
0 625 1,250 2,500 Feet
Source: Alachua, FL, 1:24,000 quad, 1956, USGS; High Springs, FL, 1:24,000 quad, 1962, USGS; Wood 2021
City of Alachua Tara Forest, Tara Phoenicia, and Tara Baywood Site
Geological Review Map
Drawn | Date | NFP | 12/17/2021
Checked | Date | SEM | 12/17/2021
Gainesville Florida Project No. 2402210028
wood.
Figure 6
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Mary Szoka

From: Andersen, Glen <glen.andersen@woodplc.com>
Sent: Wednesday, September 21, 2022 9:03 AM
To: Adam Hall; McMorrow, Shannon E
Subject: RE: Reviews for Tara Forest West and Schmidt Farms

Hi Adam and Shannon:

Tomorrow at 11 am works for me.

During our discussion with Adam Boukari and his team, they indicated concern about the language contained in our independent review with respect to recommending site specific engineering and geological studies in areas that appear to be susceptible to subsidence (ground loss). The specific recommendation in question is contained in the section of our report below.

3.1 Avoidance Areas and Recommendations

In general, within the lower Mill Creek Valley (elevation < 75 ft contour, western portion of the property), may be susceptible to subsidence, and development in these areas should consider the possibility of subsidence or sinkhole formation. Further, the depressional areas and stream valleys identified in **Figure 6**, and the Mill Creek Sink Cave shown in **Figure 5**, may experience more settlement over time, with potential for sink hole formation.

Wood recommends evaluating the likelihood of ground loss due to karst by performing site-specific engineering and geological studies. Following additional investigation, Wood recommends avoiding development in areas that have shown ground loss between the 1960's and today and selecting areas for development at higher elevations.

During our discussion we stated that our recommendation was not intended to prevent development in areas below El 75 ft. We simply recommend site-specific engineering and geological studies to determine if there is evidence of ground loss since the 1960's and if there an unacceptable likelihood of future subsidence or of the potential for sinkhole development. Further we recommended avoiding development in areas shown as a result of these studies to have an unacceptable likelihood of continuing ground loss or sinkhole formation.

It is our understanding that Adam's design team has geotechnical engineers on staff that can oversee and perform these recommended studies.

As you may know, Wood recently performed the design of a wetland treatment system for the City just north and west of the Mill Creek Sink. A portion of that work involved geotechnical and geophysical studies (just as we recommended in our report) and led us to understand the very active nature of the continued karst formation in this general area. As a result of these studies, we redesigned the facility and moved it as far north as possible to minimize the potential effects that it could have on adjacent properties.

We are simply recommending the same course of action for other developments in the general vicinity.

Hopefully, the above will help you to understand the nature of our concern for development near the Mill Creek Sink.

Glen

Glen R. Andersen, Sc.D., P.E.
Principal Geotechnical Engineer
Direct: (813) 636-1509
Mobile: (813) 326-9766
www.woodplc.com

From: Adam Hall
Sent: Wednesday, September 21, 2022 8:14 AM
To: McMorrow, Shannon E
Cc: Andersen, Glen
Subject: Re: Reviews for Tara Forest West and Schmidt Farms

Shannon, Unfortunately, I have a conflict for today at 2 PM, but I am available for tomorrow at 11 AM.

Thank you,

Adam Hall

From: "shannon mcmorrow" <shannon.mcmorrow@woodplc.com>
To: "Adam Hall" <ad_hall@cityofalachua.org>
Cc: "Andersen, Glen" <glen.andersen@woodplc.com>
Sent: Wednesday, September 21, 2022 8:12:49 AM
Subject: RE: Reviews for Tara Forest West and Schmidt Farms

Hi Adam,
We did have a chat with Adam Boukari and his team a few weeks ago. His team wanted a better understanding of the recommendations we made in our independent review.
Glen Andersen is our geotechnical lead, so I'd like to include him on any discussions.

Glen and Adam would you be available for a call today at 2PM or tomorrow at 11AM?

Thank you!

***Note: As of May 23, 2022 our office has moved.**
The new address is:
3701 NW 98th Street
Gainesville, FL 32606-5004

Shannon McMorrow, PWS
Senior Ecologist
Mobile: 352-284-7094
New Work: 352-559-0490
www.woodplc.com

From: Adam Hall <ad_hall@cityofalachua.org>
Sent: Tuesday, September 20, 2022 5:44 PM
To: McMorrow, Shannon E <shannon.mcmorrow@woodplc.com>
Subject: Re: Reviews for Tara Forest West and Schmidt Farms

Good evening, Shannon,

I had a conversation with Adam Boukari this afternoon, who had mentioned that his client's engineering team had been in contact with you all regarding an independent review that you all completed for the City for Tara Forest West.

Can we schedule a time to discuss later this week (tomorrow or Thursday) or later next week (Wednesday or Thursday)?

If those don't work, can you let me know a good time that would work on your end?

Thank you!

Adam Hall
City of Alachua

From: "shannon mcmorrow" <shannon.mcmorrow@woodplc.com>
To: "Adam Hall" <ad_hall@cityofalachua.org>
Sent: Monday, December 20, 2021 11:52:31 AM
Subject: RE: Reviews for Tara Forest West and Schmidt Farms

Adam,
Please find the attached ERA review reports.
Please let me know if you have any questions.
Have a very happy holiday!

Thanks,

Shannon McMorrow, PWS
Senior Ecologist
Direct: 352-333-3634
Mobile: 352-284-7094
www.woodplc.com

From: Adam Hall <ad_hall@cityofalachua.org>
Sent: Wednesday, December 15, 2021 8:37 AM
To: McMorrow, Shannon E <shannon.mcmorrow@woodplc.com>
Subject: Re: Reviews for Tara Forest West and Schmidt Farms

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Shannon,

Thanks for update! No worries. I know we also had some hang ups on our end with the procurement process.

Adam Hall
City of Alachua

From: "shannon mcmorrow" <shannon.mcmorrow@woodplc.com>
To: "Adam Hall" <ad_hall@cityofalachua.org>
Sent: Tuesday, December 14, 2021 2:26:53 PM
Subject: RE: Reviews for Tara Forest West and Schmidt Farms

Hi Adam,
I actually just got back in the office from doing the field review at the Tara Forest West Site.
We reviewed Schmidt last week.
I am waiting on the review from our geotechnical experts but hope to have both reports to you by the end of the week.
Generally the Schmidt report was very thorough and we don't have very many comments.
The Tara Forest West report was a bit slimmer and did not address the concerns regarding the cave system along the southern portion of the property, so that report will include a bit more information.

I apologize for the delay, with the Thanksgiving holiday and access restrictions at Tara we got a little behind.

Thanks

Shannon McMorrow, PWS
Senior Ecologist
Direct: 352-333-3634
Mobile: 352-284-7094
www.woodplc.com

From: Adam Hall <ad_hall@cityofalachua.org>
Sent: Tuesday, December 14, 2021 2:17 PM

To: McMorrow, Shannon E <shannon.mcmorrow@woodplc.com>
Subject: Reviews for Tara Forest West and Schmidt Farms

Good afternoon, Shannon,

Hope you are doing well!

I was writing to check status on the Tara Forest and Schmidt Farms projects, if you could provide an update at your earliest convenience.
Please feel free to call if easier.

Thank you,

--
Adam Hall, AICP | Principal Planner | Office of Planning and Community Development
City of Alachua | ahall@cityofalachua.com | 386-418-6100 ext. 1603

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REPORT OF GEOTECHNICAL EXPLORATION

Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida

Prepared for:

City of Alachua
15100 NW 142 Terrace
Alachua, Florida 32615

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, Florida 32258
(904) 396-5173

August 6, 2020

Wood Project No. 6063-18-0300.01.2

August 6, 2020

Wood Environment & Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, Florida 32258
Phone: 904.396.5173 ● Fax: 904.396.5703
www.woodplc.com

Mr. Rodolfo Valladares
Public Services Director
City of Alachua
15100 NW 142 Terrace
Alachua, Florida 32615

Subject: **Report of Geotechnical Exploration**
Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida
Wood Project No. 6063-18-0300.01.2

Dear Mr. Valladares:

Wood Environment & Infrastructure Solutions, Inc. (Wood), previously known as Amec Foster Wheeler, has performed a geotechnical exploration for the subject project in general accordance with Exhibit A, Detailed Services and Tasks for Mill Creek Sink Water Quality Improvement Project Task 1, Section 1.2 Geotechnical Testing.

In summary, the subsurface conditions encountered in the proposed construction areas generally consisted of very loose to very dense fine sands, fine to medium sands with silt, fine sands with clay, silty fine to medium sands, and clayey fine sands; very soft to firm clays to sandy clays; and limestone to the maximum depth explored of 52 feet below the existing ground surface. Some of these layers were highly weathered dissolutioned limestone with varying contents of limestone fragments. Two very loose zones originally identified as probable voids were encountered in the central portion of the site with thicknesses ranging from approximately 8.5 to 24 feet thick. However, based on the results of a subsequent geophysical study presented to the City of Alachua (City) in a report dated January 13, 2020 and entitled "Report of Geophysical Exploration Using the MERIT System", these loose zones are not voids, but are attributed to active sinkhole development. The groundwater table in these borings was encountered at depths ranging from 1.3 to 10 feet existing grade at the time of drilling. The estimated seasonal high groundwater table ranges from approximately 0.3 feet above existing grade to 2.5 feet below existing grade.

We consider the subsurface conditions in the explored areas to be adaptable for support of the planned drainage structures on shallow foundations and associated berm construction, following the recommended site and footing bearing surface preparation. General site preparation for the structures and berm will consist of stripping of vegetation and topsoils; providing for adequate

construction site drainage by implementing surface water and groundwater control; surficial soil compacting by with a vibratory compactor; and placing structural fill and compacting in controlled lifts.

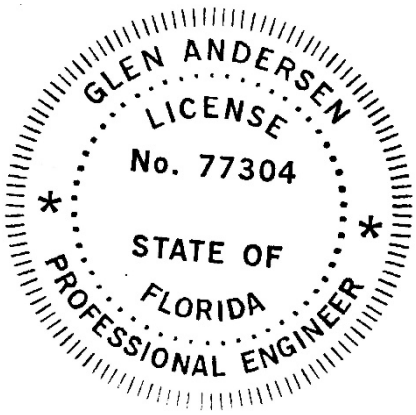
We note the presence of active sinkhole development in the area and consider it possible that one or more sinkholes could express themselves at the surface either during or following construction. As such, provisions must be in place to rapidly secure the site and prevent persons and equipment from entering without a detailed subsurface exploration if the surficial manifestation occurs at ground surface.

Detailed recommendations for containment berm and shallow foundation design and construction and site preparation are presented in the Recommendations section of this report. Recommendations are also provided for berm subgrade preparation.

We have enjoyed assisting you and look forward to serving as your geotechnical consultant on the remainder of this project and on future projects. If you have any questions concerning this report, please contact us.

Sincerely,

Wood Environment & Infrastructure Solutions, Inc.



THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY

ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS, INC.
1101 CHANNELSIDE DRIVE, SUITE 200
TAMPA, FLORIDA 32258
REGISTRY NO. 5392
GLEN ANDERSEN, P.E. NO. 77304

August 6, 2020

Corey T. Chascin, E.I.
Project Geotechnical Engineer

Glen Andersen, Sc.D., P.E.
Principal Geotechnical Engineer
Florida License No. 77304

Distribution: City of Alachua – Mr. Rodolfo Valladares (email)
Suwannee River Water Management District – (email)
Alachua County – (email)
File (1)

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TABLES

APPENDIX A

APPENDIX B

In Situ Hydraulic Conductivity Tests

APPENDIX C

Seepage and Slope Stability Analyses

1.0 PROJECT INFORMATION

1.1 General

The purpose of this geotechnical subsurface exploration was to develop information concerning the site and subsurface conditions to evaluate site preparation requirements and foundation support alternatives for the proposed berms and drainage structures in Alachua, Florida. This report briefly describes the field and laboratory testing activities and presents the findings. The enclosed guideline recommendations for foundation design, site preparation and foundation construction represent approaches we feel would be appropriate for the planned construction.

1.2 Project Information

As shown on the Site Location Map in Appendix A, the Mill Creek Sink is located on the north side of Martin Luther King Boulevard (U.S. 441) and east of Interstate 75 in Alachua, Florida. On approximately 8.58 acres, the Mill Creek Sink and a small amount of land surrounding it, including Mill Creek Swallet, comprise the National Speleological Society's Mill Creek Sink Nature Preserve. The adjoining and nearby parcels to the north, east, and west are forested or in silviculture with commercial restaurants and businesses along U.S. 441. The project site is located along the northern boundary of the existing commercial businesses.

The primary objective of the project is to improve water quality recharging the Upper Floridan aquifer at Mill Creek Swallet and to preserve and protect the Mill Creek Sink and Mill Cave System. Improved stormwater management, as well as conservation of the areas surrounding Mill Creek and Mill Creek Swallet, will enhance the water quality recharging the Upper Floridan aquifer that feeds the Santa Fe River and springs. This will also protect valuable floodplain areas necessary for water storage within the 22 square mile Mill Creek watershed (reducing flooding potential).

In general, the proposed construction will consist of site grading for drainage and the construction of lined swales for the conveyance of runoff water, pre-treatment basins (0.2 and 0.5 acres), and a wetland treatment area (1.2 acres). This wetland treatment system will drain into an existing wetland area to the north that in turn drains into the Mill Creek Swallet.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

To explore the subsurface conditions in the areas of the proposed berm construction, 10 Standard Penetration Test (SPT) borings and seven hand-auger borings were drilled to depths of approximately 25 to 52 feet and approximately 4 to 6 feet, respectively. The approximate boring locations are shown on the Field Exploration Plan in Appendix A. The boring layout was chosen by Wood geotechnical engineers. The borings were staked in the field by our Tampa office personnel using a hand-held GPS device, which has an accuracy of about 30 feet when used without a differential correction.

The SPT borings were drilled during the period of November 26-29, 2018, by Independent Drilling, Inc. (IDI) working under subcontract to Wood. All standard penetration tests were performed using an automatic SPT hammer having a calibrated efficiency of 94 percent. The auger borings were drilled on June 1, 2020, by a geotechnical engineer from the Wood Tampa office. Ground surface elevations were estimated to the nearest half-foot based on the furnished topographic map and should be considered as approximate.

A geotechnical engineering technician from the Wood Tampa office returned to the site on November 30, 2019 to perform field hydraulic conductivity tests. The results of the hydraulic conductivity tests are presented on the Summary of Field Hydraulic Conductivity Test Result sheets in Appendix B.

The Soil Test Boring Records in Appendix A graphically show the penetration resistances and present the soil descriptions and groundwater levels for each SPT boring. The Auger Boring Records, also in Appendix A, present the soil descriptions for each soil type encountered in the hand-auger borings. The stratification lines and depth designations on the boring records represent the approximate boundaries between soil types. In some instances, the transition between soil types may be gradual. Brief descriptions of the exploratory drilling, testing, and sampling techniques used are presented in the Field and Laboratory Procedures section of Appendix A.

2.2 Laboratory Testing

In order to aid in classifying the soils and to help quantify and correlate engineering properties, laboratory index property and classification tests were performed on representative soil samples obtained from the borings. The laboratory testing included the following:

- 25 water content tests
- 15 fines content (percentage of soil particles finer than the No. 200 mesh sieve) tests
- 9 grain size distribution tests
- 4 hydrometer analysis tests
- 9 organic content (loss on ignition) tests
- 10 Atterberg Limits (plasticity) tests

The results of these tests are presented on the Summary of Laboratory Classification Test Results and Grain Size Distribution Report sheets in Appendix A. Brief descriptions of the laboratory test procedures used are presented in the Field and Laboratory Procedures section in Appendix A.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 General Area Geomorphology and Geology

The area of the subject is located along the Cody Scarp in the San Felasco Hammock physiographic province on the Northern Peninsual Slopes within the Ocala Uplift District. It is also immediately adjacent to the Haile Limestone Plain physiographic province on the Northern Peninsual Plains. This is an area where the Floridan Aquifer System transitions from a confined aquifer on the east to an unconfined aquifer on the west. At this location, naturally acidic surface water flows directly into existing fractures in the underlying limestone and actively dissolves it. As a result of these processes, the Cody Scarp is noted for extensive and very active sinkhole activity with deep fractures, multiple sink holes, swallets, and other karst features. Infiltration of acidic surface water and dissolution of the underlying limestone is the process that formed the Mill Creek Sink and associated caverns within a few hundred feet to the east of the project site.

3.2 Site Conditions

The existing site conditions were observed by a senior engineering technician from the Wood Jacksonville office during the period of November 26-29, 2018 and a geotechnical engineer from the Wood Tampa office on June 1, 2020. In general, the proposed site was heavily vegetated with pine trees, oak trees, palmettos, and vines. Vegetation was cleared in various areas for site access. Evidence of past dumping of construction debris, old tires, and transient trash and camps were observed in some areas of the site. The topography encountered across the subject site slopes downward towards the north. Standing water was observed throughout the site. The surface soils, where exposed, generally consisted of brown and gray fine sands to silty fine sands.

3.3 Subsurface Conditions

3.3.1 General

A pictorial representation of the subsurface conditions encountered in the proposed construction area is shown on the Generalized Subsurface Profile presented in Appendix A for the SPT borings. The profile and the subsurface conditions outlined below highlight the major subsurface stratification. The Soil Test Boring Records and Auger Boring Records, in Appendix A should be consulted for detailed descriptions of the subsurface conditions encountered at each boring location. When reviewing the boring records and the subsurface profile, it should be understood that soil conditions may vary between and away from the boring locations.

3.3.2 Soils

From the existing ground surface, very loose to very dense fine sands (Unified Soil Classification System symbol: SP), fine to medium sands with silt (SP-SM), fine sands with clay (SP-SC), silty fine to medium sands (SM), and clayey fine sands (SC); very soft to firm clays to sandy clays (CH); and limestone to the maximum depth explored of 52 feet below the existing ground surface. Some of these layers were highly weathered dissolutioned limestone with varying amounts of limestone fragments. The upper 1 to 2 feet of the subsurface profile consisted of soils with organic contents ranging from approximately 1.0 to 3.7 percent by weight.

Two zones identified as "probable voids" on the boring logs and ranging from approximately 8.5 to 24 feet thick were encountered in the central portion of the site. These are most likely very loose and very high moisture content soils that are the product of the loss of overburden materials in an active karst environment into underlying sinkholes and fractures and are probably not actual voids.

3.3.3 Groundwater

The groundwater table was encountered at depths ranging from 1.3 to 10 feet below existing grade at the time of drilling. The estimated seasonal high groundwater table for the subject property ranges from approximately 0.3 feet above existing grade to 2.5 feet below existing grade. The at- or above-grade estimated seasonal high groundwater levels are encountered in the north central portion of the subject site and adjacent to a wetland area. Fluctuation in groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors. Groundwater may also perch on near-surface clayey soils during or following periods of intense or prolonged rainfall. Since groundwater level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur.

4.0 BERM STABILITY ANALYSIS

4.1 Analysis Methodology

Slope stability and seepage analysis for the proposed berms were performed using the programs *Slope/W* and *Seep/W* (GeoStudio, 2016). The following two cross sections were analyzed:

- Cross Section XS-1 through the western portion of the proposed berm. The subsurface profile was generalized based on data from SPT Borings 1, 2, 3, and 5 and Hand Auger Borings HA-1 and 2.
- Cross Section XS-2 through the eastern portion of the proposed berm near the spillway. The subsurface profile was generalized based on data from SPT Borings 4 and 7 and Hand Auger Borings HA-3 and 4.

Material parameters for analysis and the general subsurface stratigraphy are provided in the following table. These properties are considered to be conservative and were selected based on the results of our subsurface exploration, established correlations in the literature, and experience with similar soils. The field hydraulic conductivity tests reported in Appendix B were taken below the clayey sand confining layer and are therefore not considered relevant to these particular seepage calculations involving the surficial soils above this confining layer.

Table 4-1: Material Properties for Seepage and Stability Analysis

Material	Unit Weight	Effective Stress Friction Angle	Hydraulic Conductivity
Proposed berm and undercutting/replacement fill – SP-SM	120 pcf	31 degrees	$3x10^{-5}$ ft/sec
Toe drain – GP	110 pcf	36 degrees	0.03 ft/sec
Soil 1 – SP-SM	120 pcf	31 degrees	$3x10^{-5}$ ft/sec
Soil 2 – SC and SC with limestone fragments	110 pcf	26 degrees	$3x10^{-7}$ ft/sec

Hydraulic boundary conditions for the seepage analyses were selected as follows:

- Maximum pool elevation at 1 foot below the top of the containment berm
- No flow boundary along the bottom of the model
- Far field downstream phreatic surface at 1 foot below ground surface

4.2 Results

Results of the stability and seepage analyses are presented in attached Figures 1A, 1B, and 1C for XS-1 and Figures 2A, 2B, and 2C for XS-2. The cases presented are:

- A (XS-1A, XS-2A) – These are seepage analyses for a uniform berm without a toe drain. These results show seepage exiting along the downstream slope of the berm above the toe which will likely lead to erosion at the toe. This configuration is not recommended for construction.
- B (XS-1B, XS-2B): These are seepage analyses for a uniform berm with a gravel/riprap toe drain. These results show that the phreatic surface in the berm is below its surface. This configuration is recommended.
- C (XS-1C, XS-2C): Slope stability analysis based on the results of seepage analysis case B. Global stability factor of safety is FS≥1.5 for both cross sections. This is considered acceptable for design.

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 General

Recommendations for cut/fill slopes, site preparation, and berm/embankment fill materials follow. We note for the on-site soils that are expected to be used as fill for berm construction, a rock toe drain with a geosynthetic filter fabric will be required to control erosion on the downstream berm faces as a result of seepage.

5.2 Cut and Fill Slopes

Cut and fill slopes can be constructed on 4H:1V slopes provided they are suitably vegetated for erosion control. We note that trees or large shrubs should not be allowed to become established on the berms/embankments and cut slopes. Where slopes will be subjected to significant flow velocity, riprap armoring should be employed for erosion protection.

5.3 Site Preparation

In preparation for construction, areas that will potentially be impacted by construction or additional loads due to construction and the associated construction equipment should be cleared of utilities. Utilities that have the potential to be impacted or damaged during construction should be relocated or otherwise protected. We note that it is our understanding that no utilities are present within the construction site.

Where the berms or additional fill will be placed, trees should be removed and vegetation, topsoil, and organics should be stripped from the construction footprint and extending a minimum of 5 feet beyond. Any trees whose root balls extend to within 15 feet of the toe of the proposed exterior berm should be removed, including the root balls. Based on observations of topsoil and organic soil thickness in auger borings, we estimate that stripping will be on the order of about 12 inches. After removal of trees and stripping, the same areas should be checked for unsuitable materials, and any unsuitable material should be undercut and not used as fill. Unsuitable materials are those that will not provide sufficient bearing capacity or will be prone to degradation, such as construction debris and excessively wet, soft/loose, or highly organic soil. Undercutting excavations should be backfilled with compacted material as specified below.

After initial stripping and undercutting (if required), the exposed subgrade should be thoroughly compacted prior to fill placement. A target density of 92 percent of the material's standard Proctor (ASTM D689) maximum dry density should be used for the upper 6 inches of the subgrade.

5.4 Embankment and Fill Materials

The on-site soils will be suitable for the berm and for general fill; however, organic soils removed as part of stripping and undercutting should not be used as berm fill. Imported fill should meet the following requirements, unless otherwise approved by the Geotechnical Engineer:

1) Be free of debris and organic matter;
2) Have a maximum particle size of less than 2 inches;
3) Have a maximum dry density of at least 100 pcf (pound per cubic foot) as determined by ASTM D698 (standard Proctor test); and
4) Have a USCS (Unified Soil Classification System) classification of SP-SM, SM, or SC.

Fill should be placed in lifts up to 9 inches loose measure at within -1 to +3 percent of the standard Proctor optimum moisture content and be compacted to at least 95 percent of the standard Proctor maximum dry density.

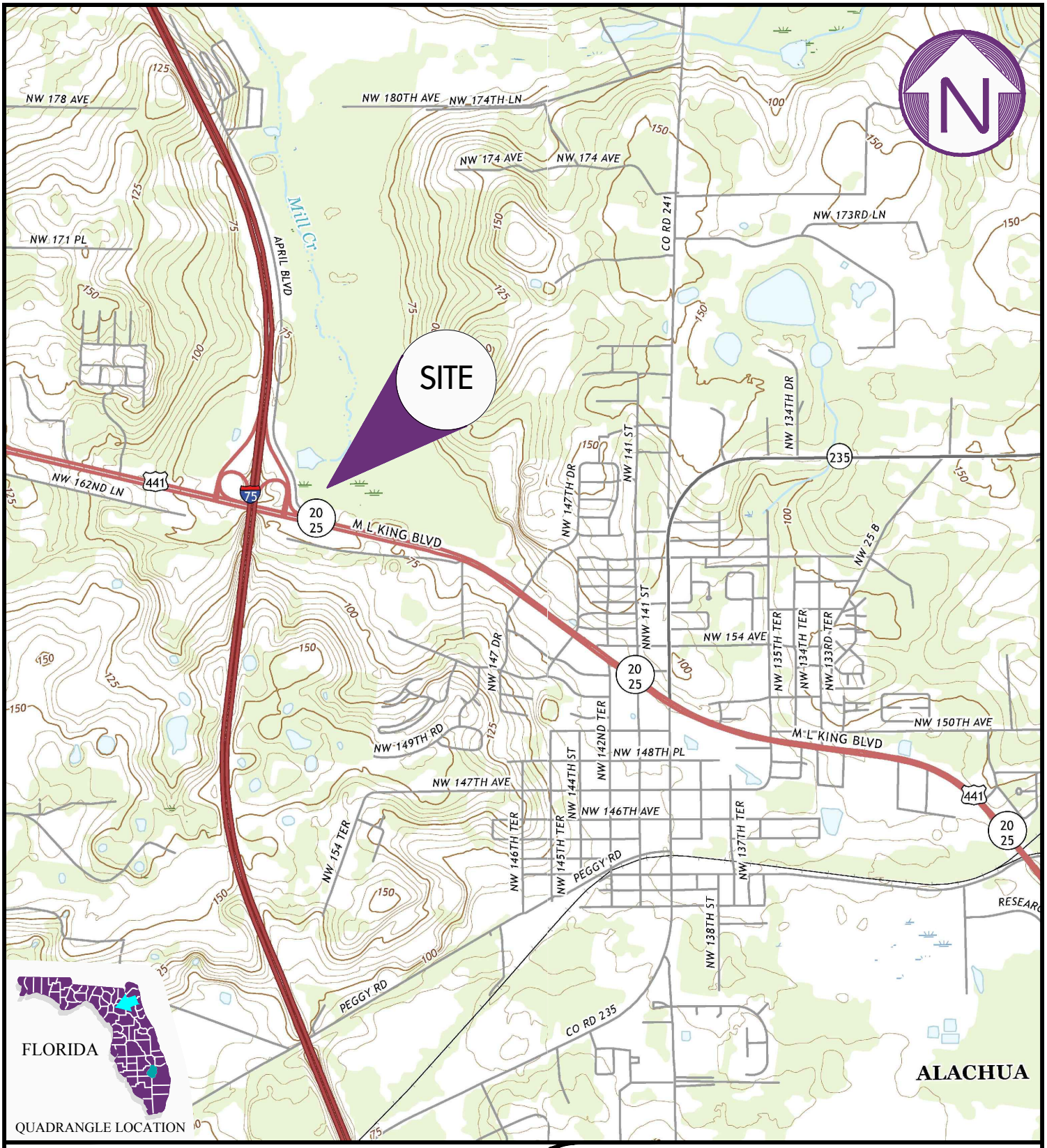
To control erosion of at the toe of the berms as a result of seepage, the downstream toe of the berms should include a rock or gravel toe drain. The toe drain should extend to a minimum of 2 feet above the toe of the berm and be composed of freely-draining aggregate (such as FDOT #57 or #67 coarse aggregate), with a separation geotextile filter fabric between the aggregate and the berm fill and underlying soils. Wood should review the selected filter fabric for compatibility with the expected berm materials.

5.5 Construction Plans and Specifications Review

We recommend that this office be provided the opportunity to make a general review of the foundation and earthwork plans and specifications prepared from the recommendations presented in this report. We would then suggest any modifications such that our recommendations are properly interpreted and implemented. Our report has been written in a guideline recommendation format and is not appropriate for use as a specification without in-part being reworded into a specification-type format. We recommend that this report be included with the contract documents. It should be understood by prospective constructors, however, that this report is included for informational purposes only. In the event of a conflict between the project specifications and this report, it should be clear in the contract documents that the specifications will govern.

The evaluation of conditions that may be encountered in construction requires engineering judgment and interpretation. For this reason, we recommend that Wood remain involved with this project during the construction operations. If we are not retained during construction, we cannot assume responsibility for misinterpretation of our recommendations, or for unfavorable facility performance as a result of judgments rendered by others.

APPENDIX A



0 1000' 2000'

GRAPHIC SCALE

REFERENCE: Topographic Map; Jacksonville, Florida
U.S. Geological Survey
Dated: 2015

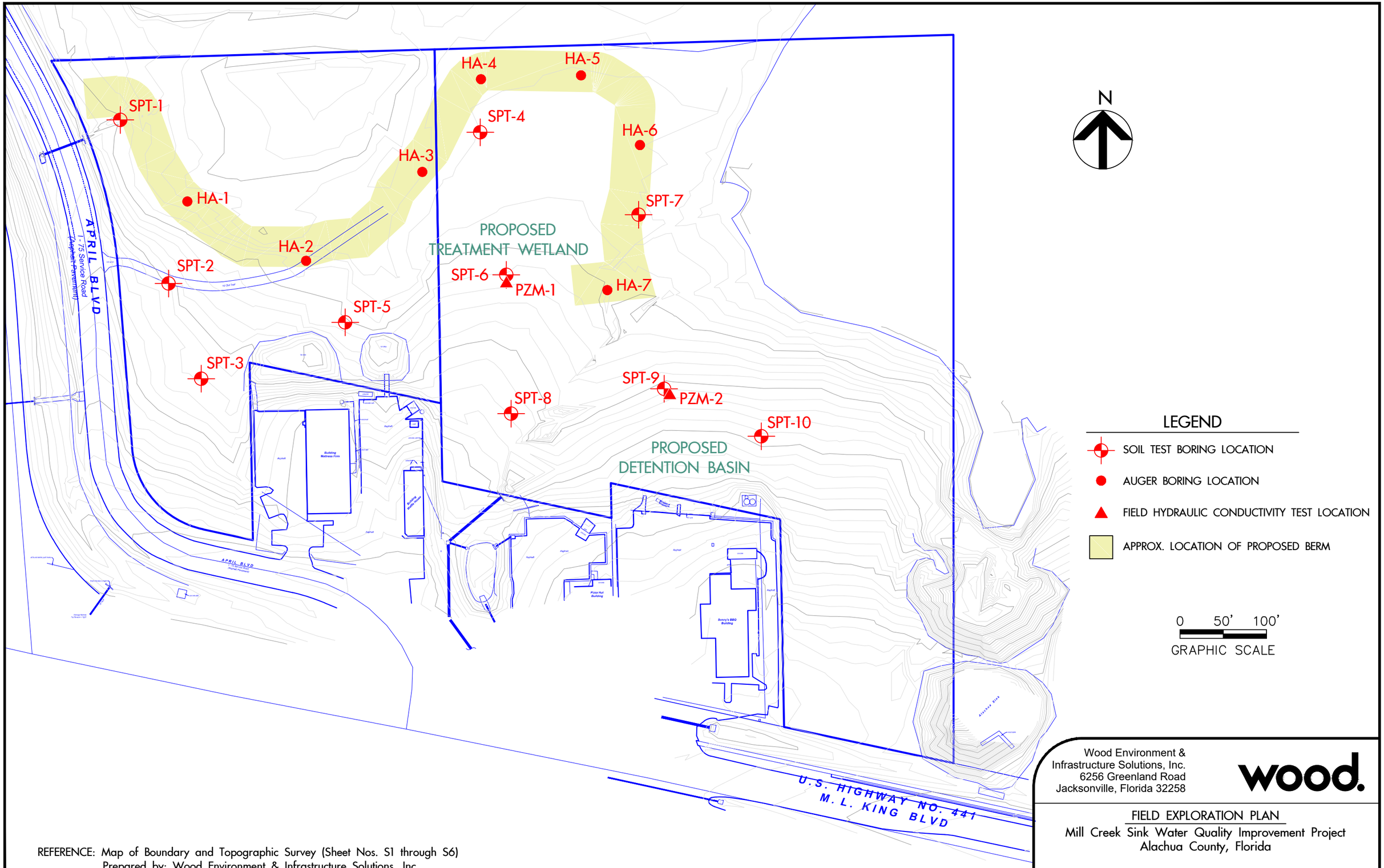
Wood Environment & Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, Florida 32258

wood.

SITE LOCATION MAP

Mill Creek Sink Water Quality Improvement Project
Alachua County, Florida

DRAWN: JP	DATE: 12/7/18	SCALE: 1"=2000'	
CHECKED: MBW	PROJ. NO. 6063-18-0300.01.2	APPROX.	



REFERENCE: Map of Boundary and Topographic Survey (Sheet Nos. S1 through S6)
Prepared by: Wood Environment & Infrastructure Solutions, Inc.
Drawing Dated: September 21, 2018

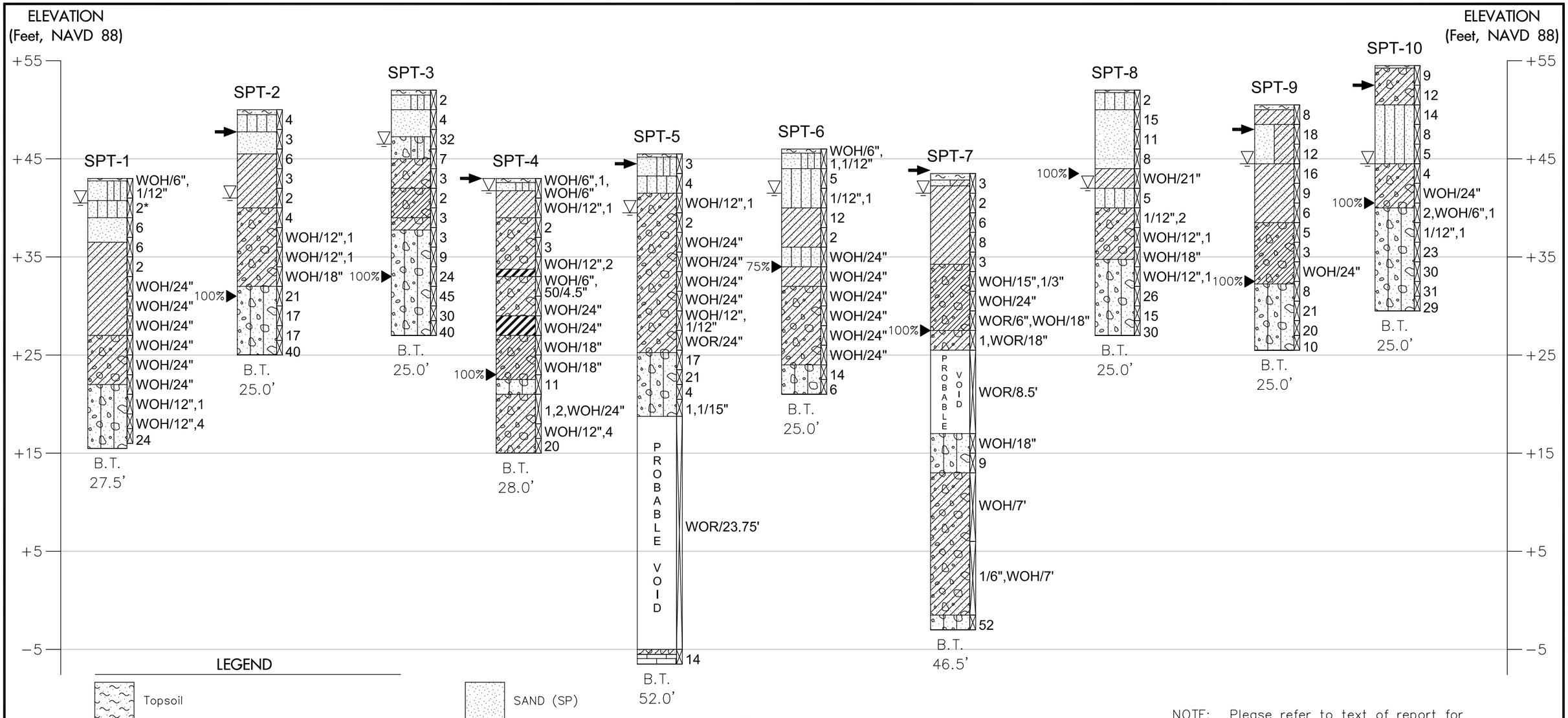
Wood Environment &
Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, Florida 32258

wood.

FIELD EXPLORATION PLAN

Mill Creek Sink Water Quality Improvement Project
Alachua County, Florida

DRAWN: JP	DATE: 7/15/20	SCALE: 1"=100'
CHECKED: MBW	PROJ. NO. 6063-18-0300.02.7	APPROX.



LEGEND

- Topsoil
- SAND With Silt (SP–SM)
- SAND With Silt (SP–SM) With Limestone Fragments (Dissolutioned Limestone)
- Silty SAND (SM) With Limestone Fragments (Dissolutioned Limestone)
- Clayey SAND (SC) With Limestone Fragments (Dissolutioned Limestone)
- CLAY (CH) With Limestone Fragments (Dissolutioned Limestone)
- SAND (SP) With Limestone Fragments (Dissolutioned Limestone)
- SAND (SP)
- SAND With Clay (SP–SC)
- Silty SAND (SM)
- Clayey SAND (SC)
- CLAY (CH)
- LIMESTONE

⊠	Standard Penetration Test Sample
*	Standard Penetration Resistance (Blows/ft.) Measured Using an Automatic Hammer System
▽	Groundwater Level @ Time of Drilling
➡	Estimated Seasonal High Groundwater Level
WOH	Weight of Hammer and Drill Rods
WOR	Weight of Drill Rods
100%▶	Percent Loss of Drilling Fluid
B.T.	Boring Terminated
27.5'	Depth Terminated

NOTE: Please refer to text of report for additional information relative to groundwater conditions and potential fluctuations which could occur.

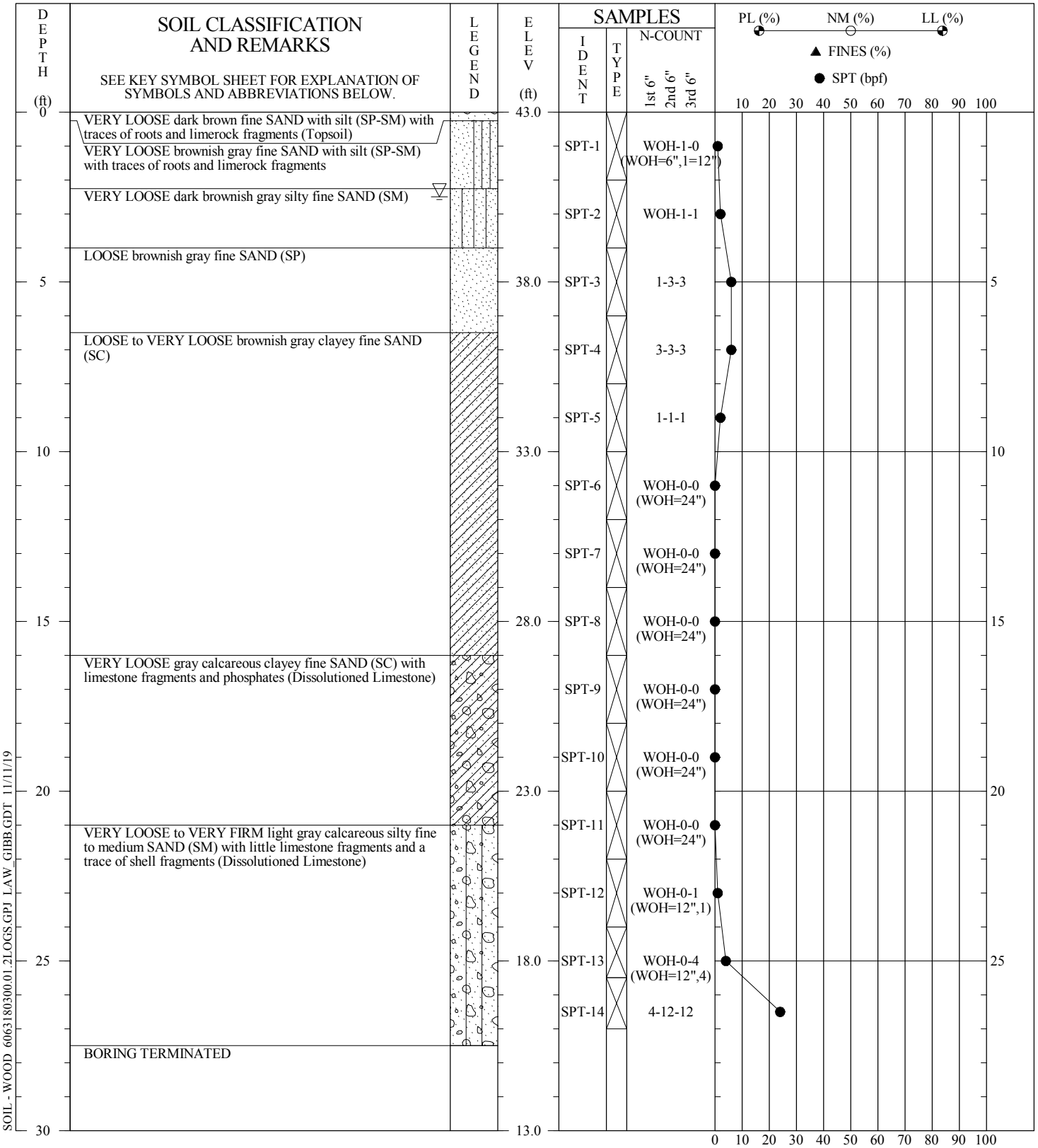
Wood Environment & Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, Florida 32258

wood.

GENERALIZED SUBSURFACE PROFILE

Mill Creek Sink Water Quality Improvement Project
Alachua County, Florida

DRAWN: JP	DATE: 12/7/18	SCALE: AS SHOWN
CHECKED: MBW	PROJ. NO. 6063-18-0300.01.2	



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	

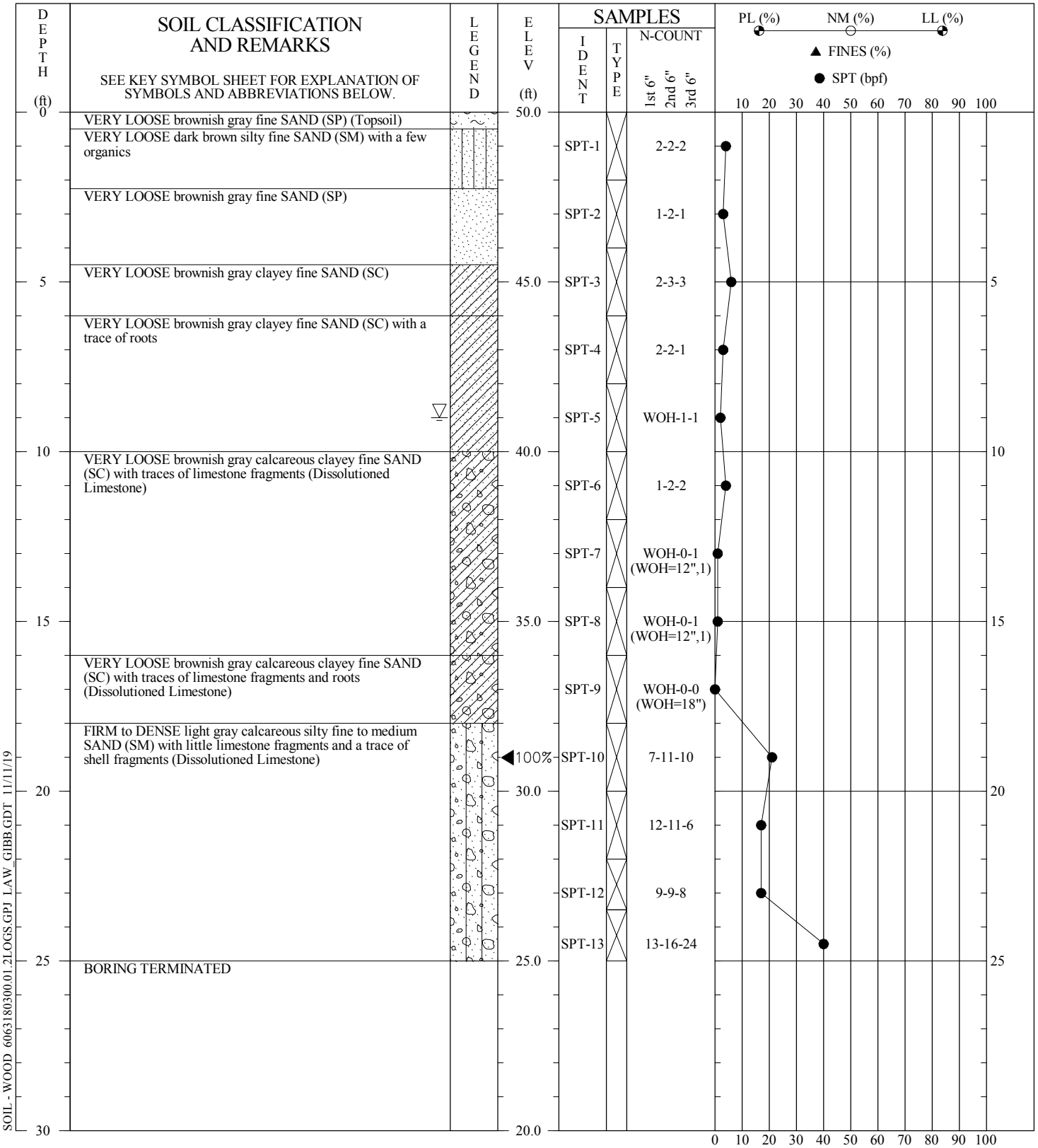
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297538.72
Coord E:	2599073.92
Drilled:	November 26, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-1
Checked By: MBW

wood.



CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 2.25' below ground surface.

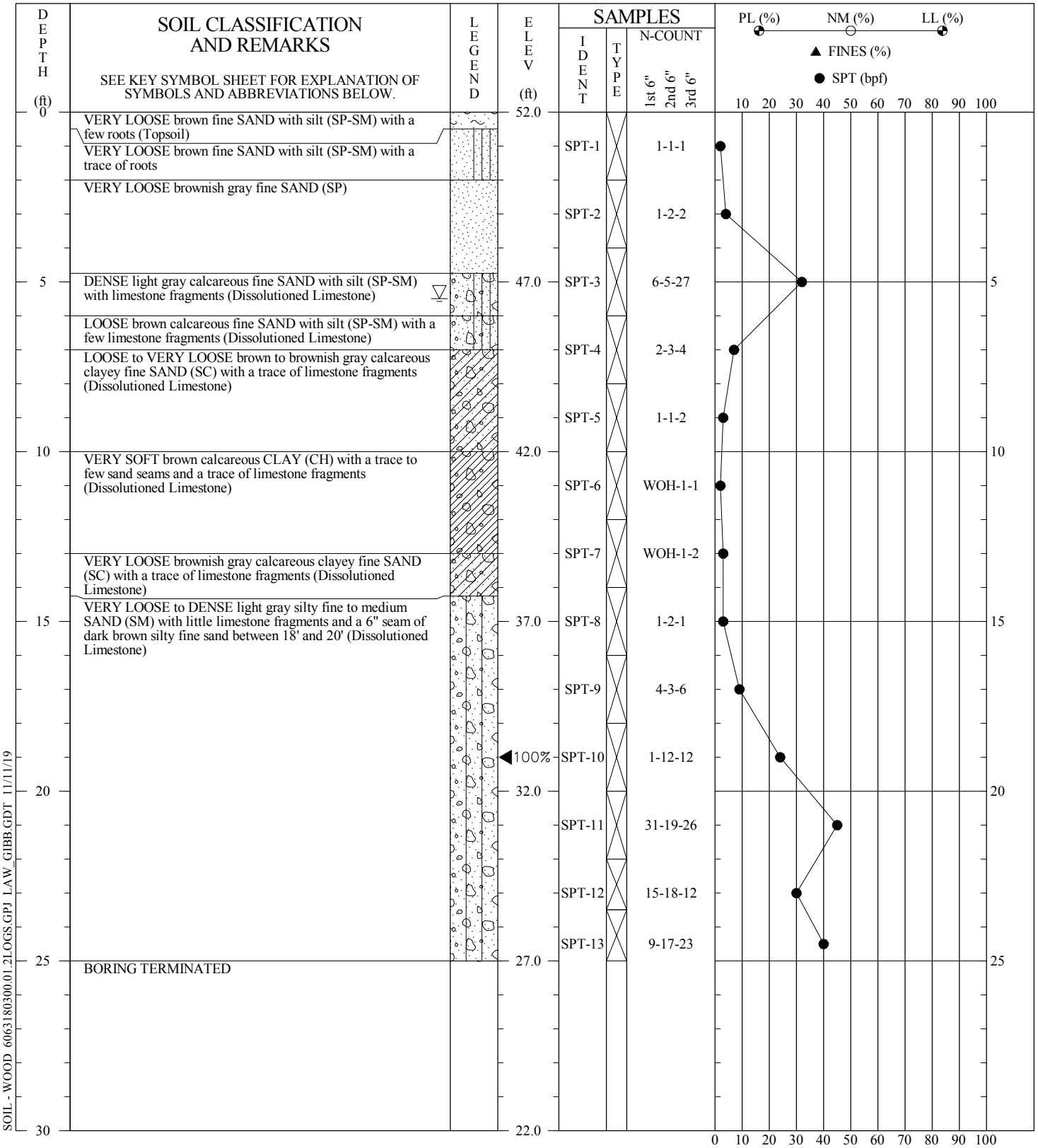
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Alachua County Mill Creek Sink
Coord N: 297349.51
Coord E: 2599129.78
Drilled: November 27, 2018
Proj. No.: 6063-18-0300.01.2

Boring No.: SPT-2
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	

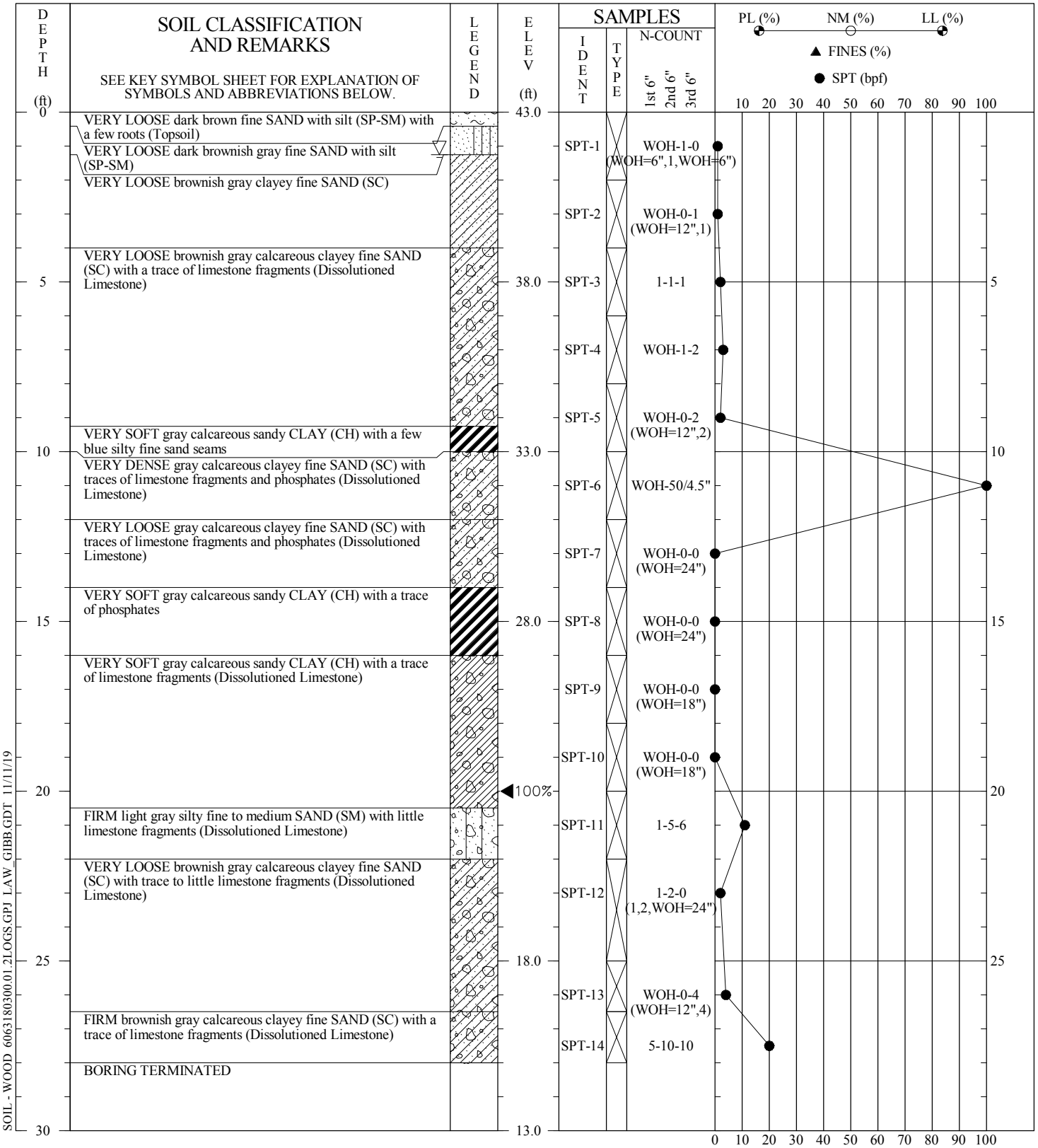
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297239.41
Coord E:	2599167.56
Drilled:	November 28, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-3
Checked By: MBW

wood.



CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 0' below ground surface.

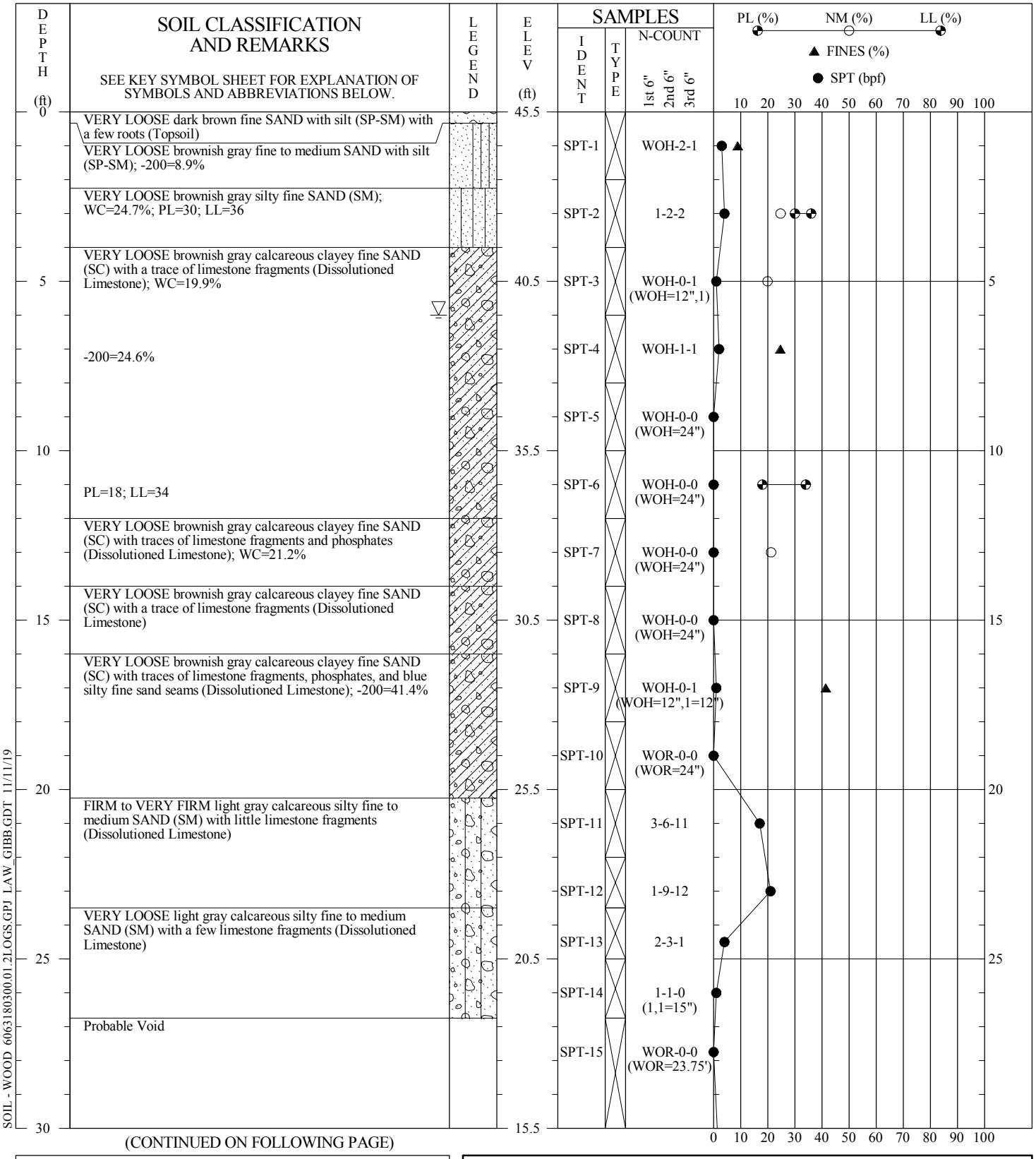
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Alachua County Mill Creek Sink
Coord N: 297524.38
Coord E: 2599490.24
Drilled: November 28, 2018
Proj. No.: 6063-18-0300.01.2

Boring No.: SPT-4
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

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CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 1.0' below ground surface.

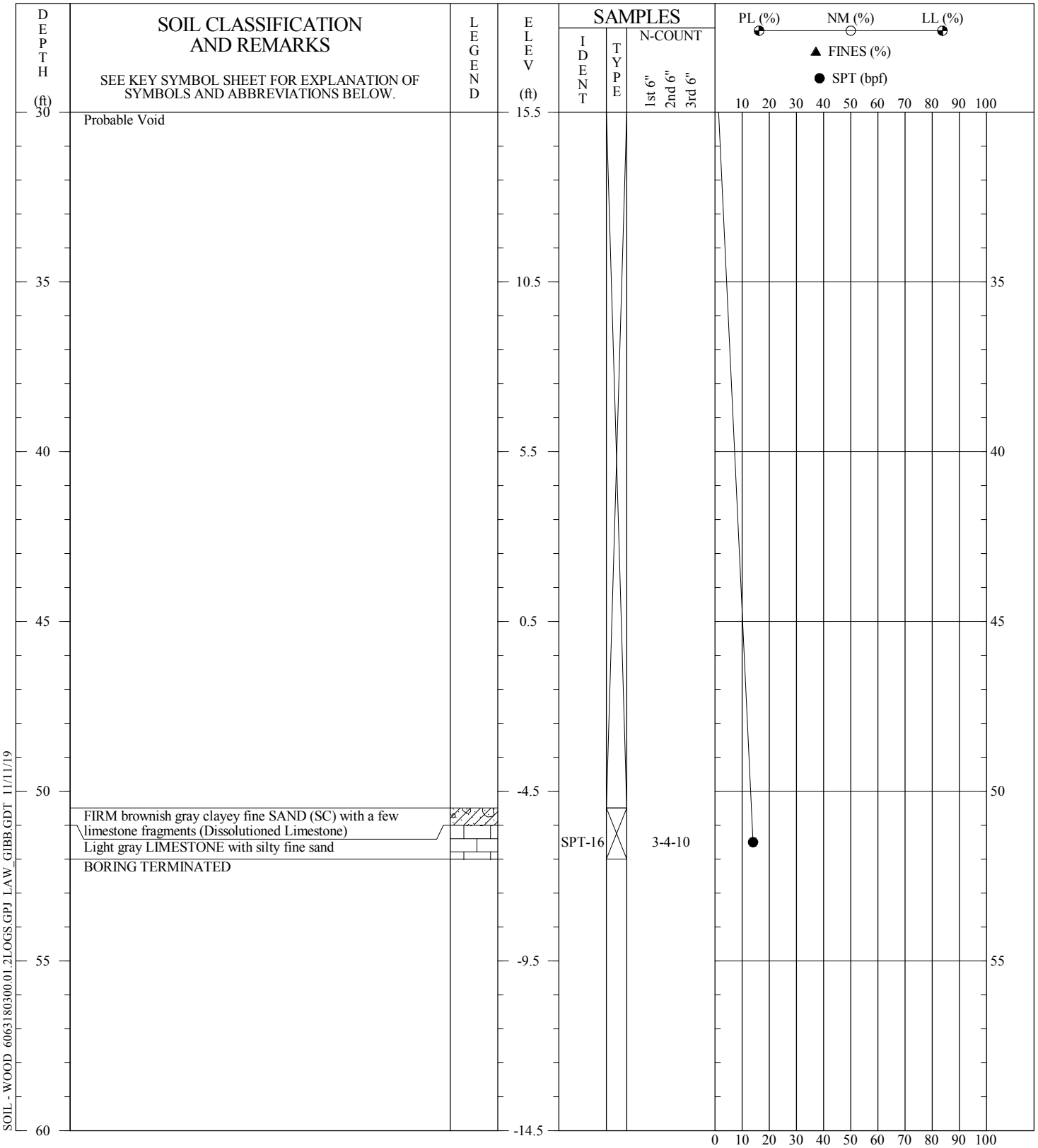
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Alachua County Mill Creek Sink
Coord N: 297304.58
Coord E: 2599334.02
Drilled: November 28, 2018
Proj. No.: 6063-18-0300.01.2

Boring No.: SPT-5
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 1.0' below ground surface.

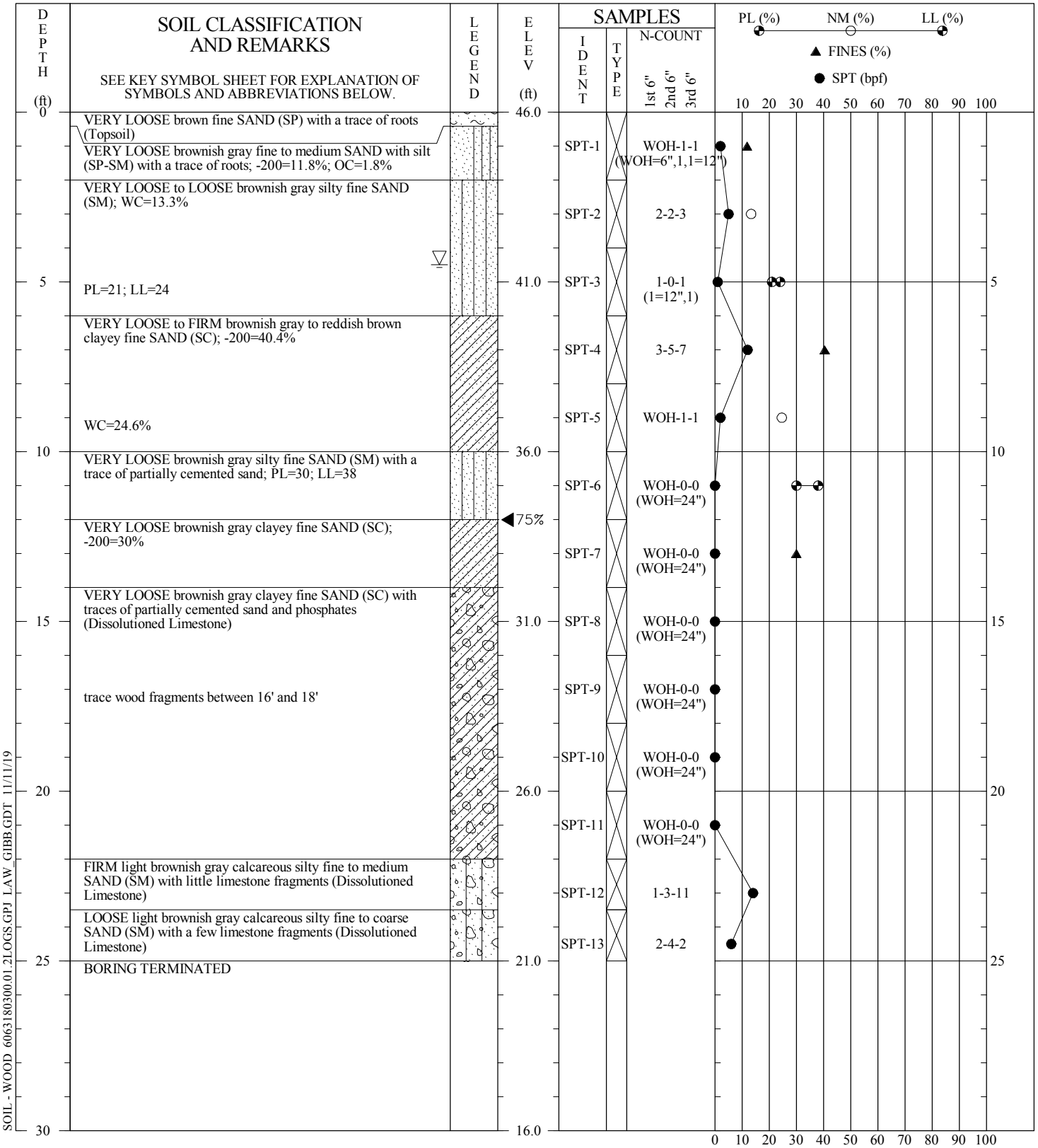
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Alachua County Mill Creek Sink
Coord N: 297304.58
Coord E: 2599334.02
Drilled: November 28, 2018
Proj. No.: 6063-18-0300.01.2

Boring No.: SPT-5
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

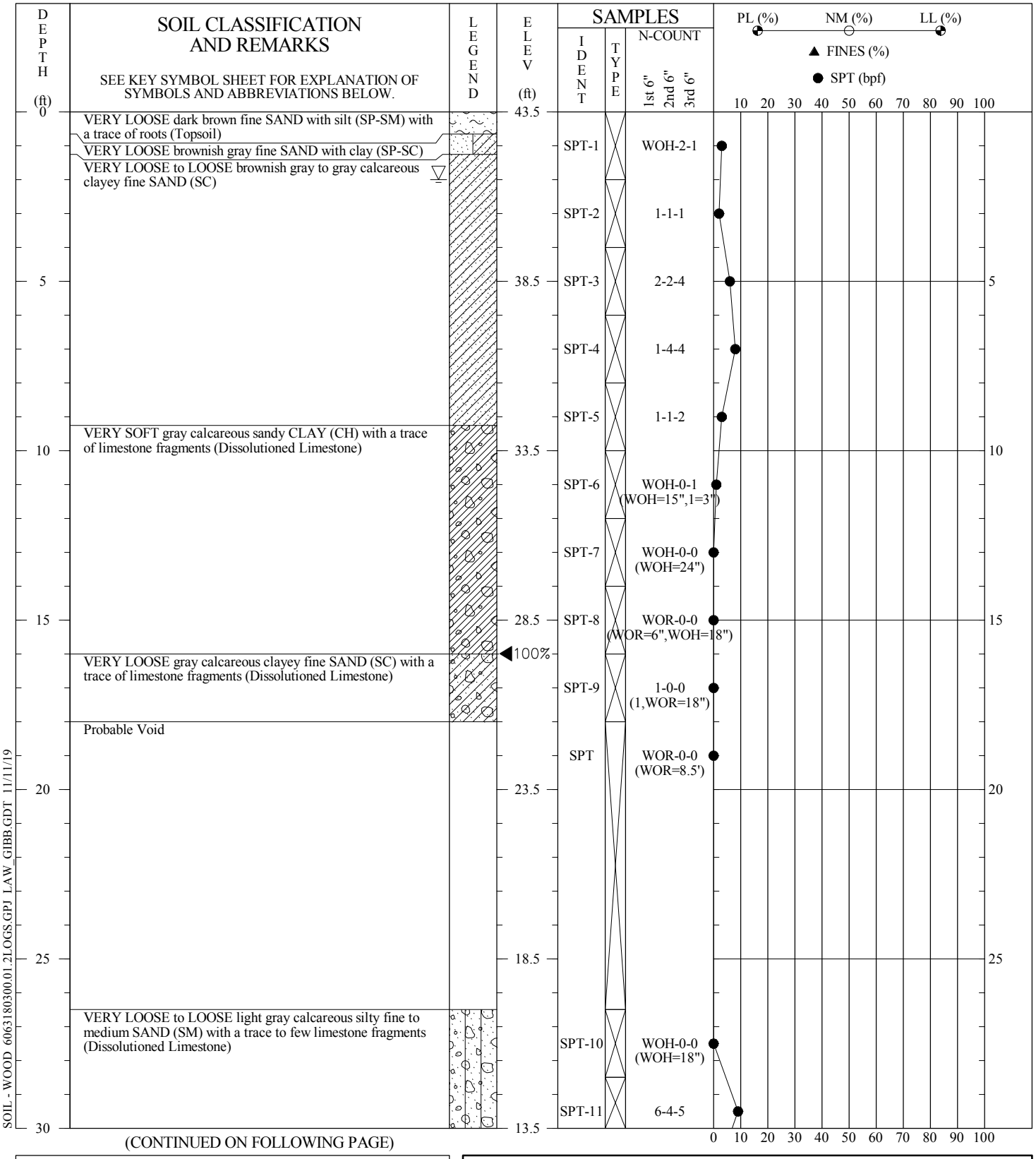
SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297359.50
Coord E:	2599520.34
Drilled:	November 29, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-6

Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

(CONTINUED ON FOLLOWING PAGE)

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 0.33' above ground surface.

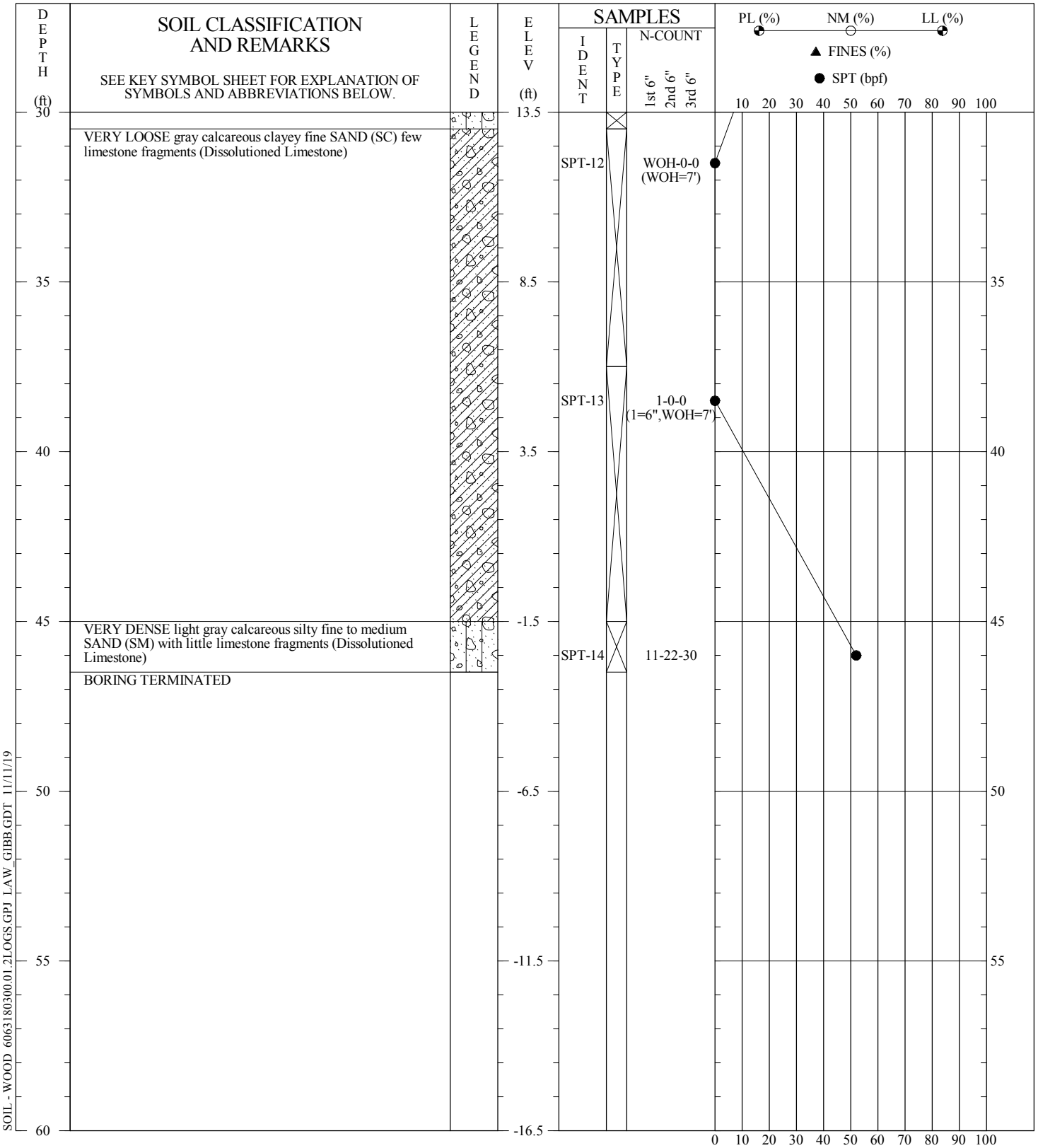
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297429.08
Coord E:	2599673.30
Drilled:	November 29, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-7
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 0.33' above ground surface.

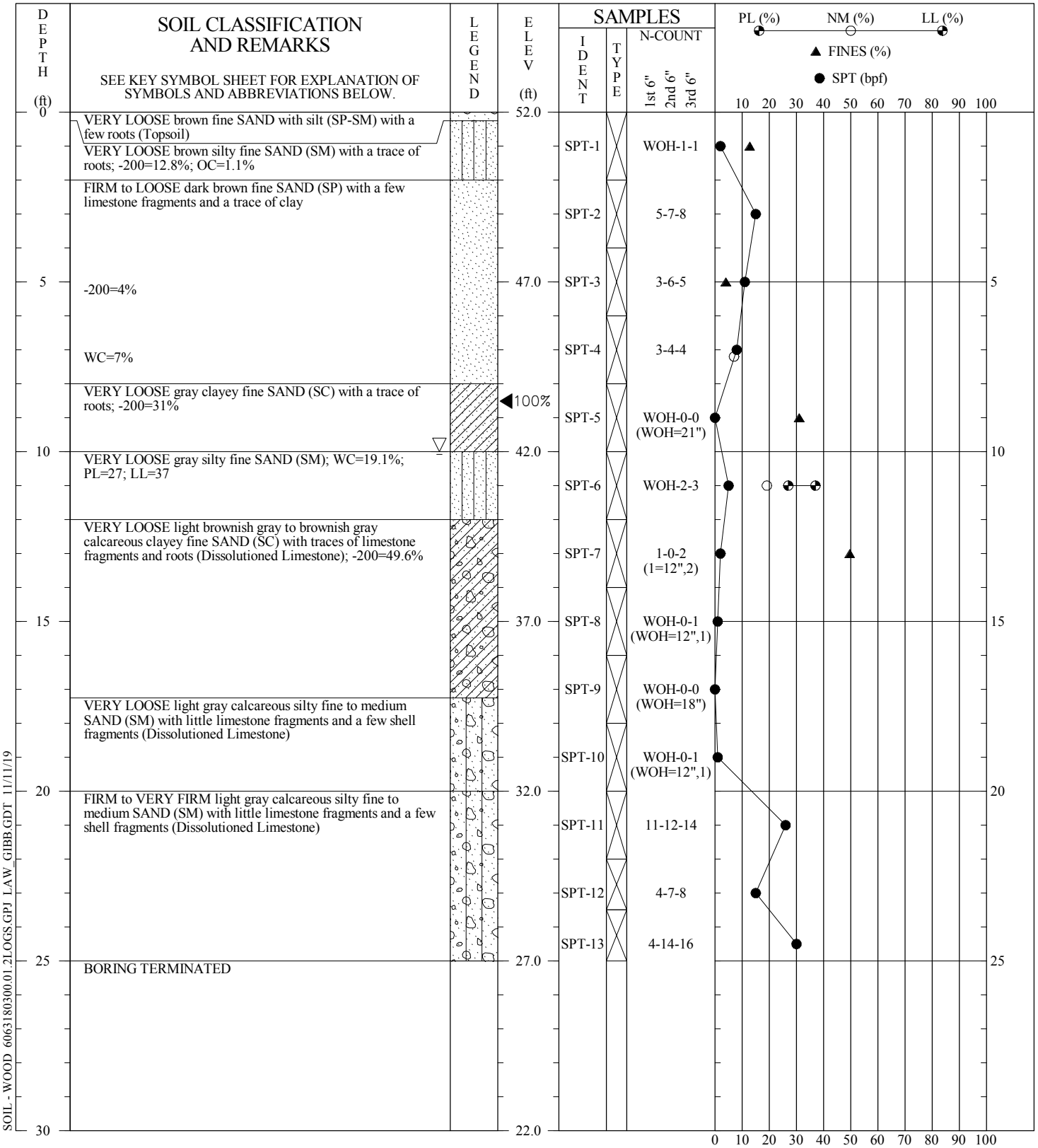
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project: Alachua County Mill Creek Sink
Coord N: 297429.08
Coord E: 2599673.30
Drilled: November 29, 2018
Proj. No.: 6063-18-0300.01.2

Boring No.: SPT-7
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	

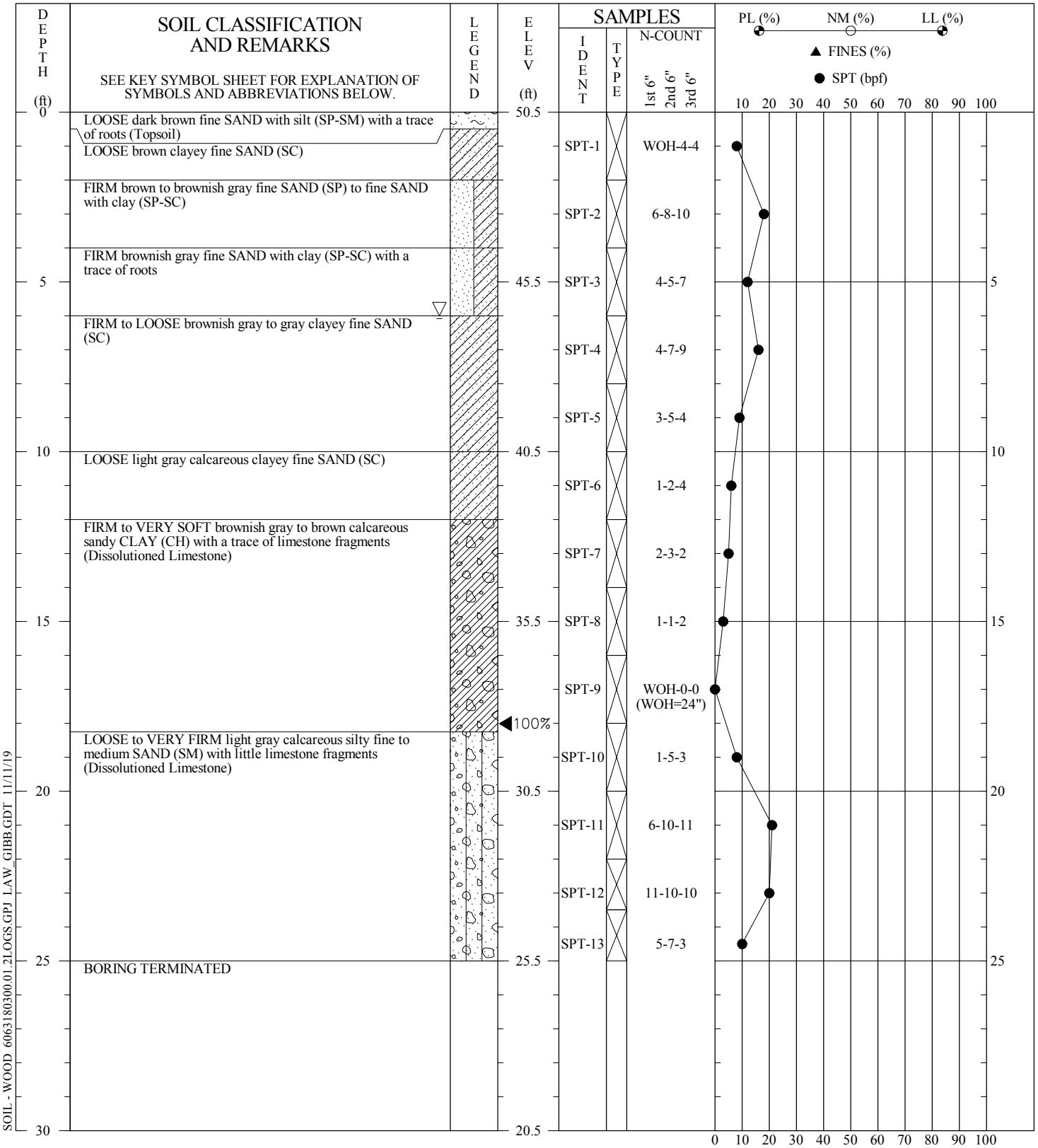
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297199.00
Coord E:	2599525.86
Drilled:	November 29, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-8
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/1/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 2.5' below ground surface.

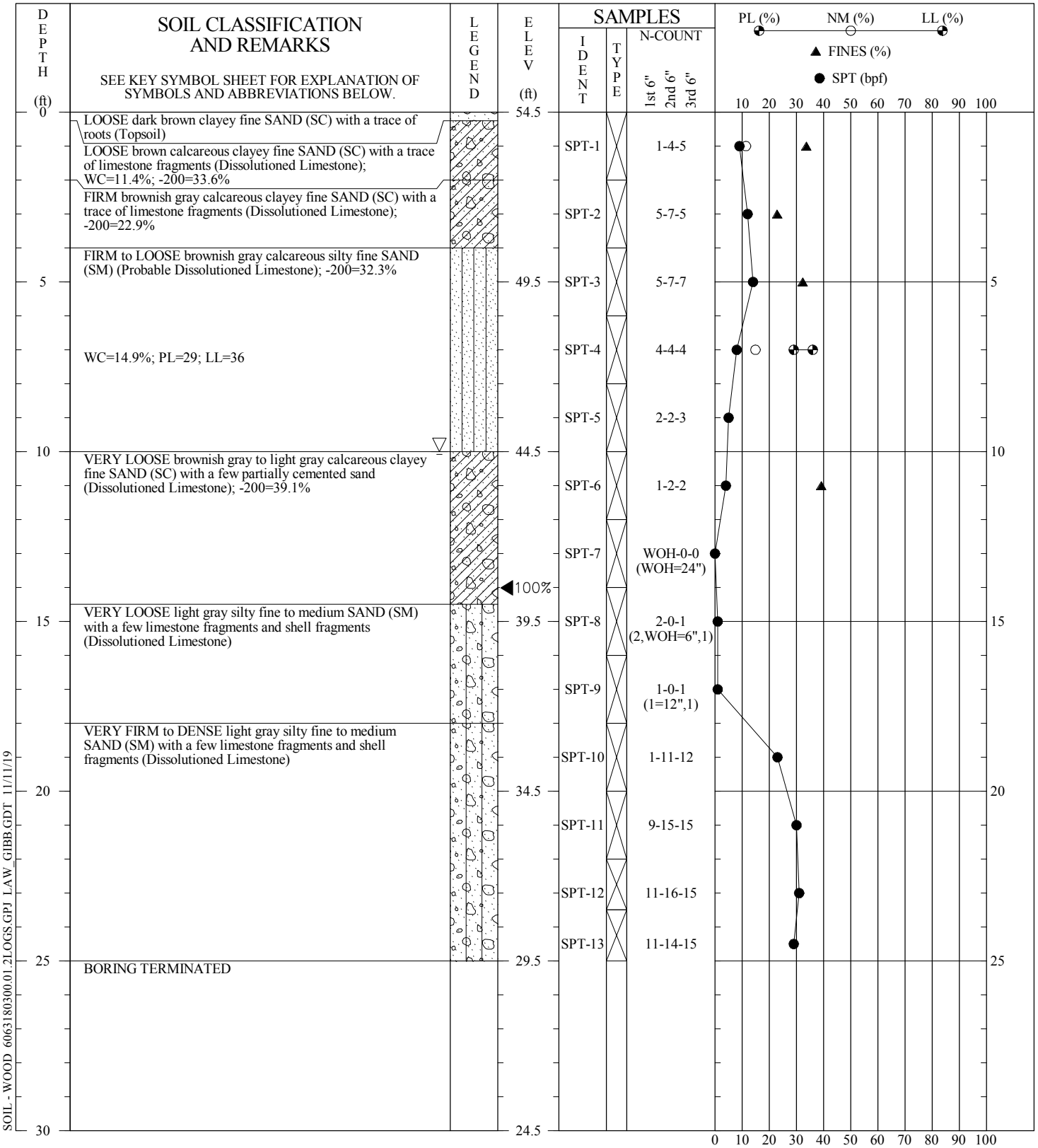
THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297227.78
Coord E:	2599702.78
Drilled:	November 29, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-9
Checked By: MBW

wood.



SOIL - WOOD 6063180300.01.2LOGS.GPJ LAW_GIBB.GDT 11/11/19

CONTRACTOR:	Independent Drilling, Inc.
DRILLER:	L. Watson (Wood E&IS Field Rep.: J. Teague)
EQUIPMENT:	Go Track (Marooka) - Automatic Hammer
METHOD:	Auger/Mud Rotary
HOLE DIA.:	4"
REMARKS:	Estimated seasonal high groundwater level at 2.0' below ground surface.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

Project:	Alachua County Mill Creek Sink
Coord N:	297172.80
Coord E:	2599815.26
Drilled:	November 29, 2018
Proj. No.:	6063-18-0300.01.2

Boring No.: SPT-10
Checked By: MBW

wood.

AUGER BORING RECORDS

Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida
Wood Project No. 6063-18-0300
Date Performed: June 1, 2020

Auger Boring No.	Depth (feet)	Material Description
HA-1	0.0 - 2.0 2.0 - 6.0 A.B.T.[1]	Brownish gray fine SAND with silt (SP-SM) with a trace of organics Brownish gray fine SAND with silt (SP-SM) GWL[2]: Not encountered at TOD[3] ESHGWL[4]: 1 foot
HA-2	0.0 - 2.0 2.0 - 6.0 A.B.T.	Brownish gray fine SAND with silt (SP-SM) with a trace of organics Brownish gray fine SAND with silt (SP-SM) GWL: Not encountered at TOD ESHGWL: 1 foot
HA-3	0.0 - 1.0 1.0 - 3.0 3.0 - 6.0 A.B.T.	Gray silty fine SAND (SM) with a trace of organics Gray silty fine SAND (SM) Light brown to gray clayey fine SAND (SC) GWL: Not encountered at TOD ESHGWL: 0 foot
HA-4	0.0 - 1.0 1.0 - 6.0 A.B.T.	Dark brown fine SAND with silt (SP-SM) with a trace of organics Gray clayey fine SAND (SC) GWL: Not encountered at TOD ESHGWL: 1 foot
HA-5	0.0 - 2.0 2.0 - 6.0 A.B.T.	Dark brownish gray fine SAND with silt (SP-SM) with a trace of organics Gray clayey fine SAND (SC) GWL: Not encountered at TOD ESHGWL: 1.5 feet
HA-6	0.0 - 2.0 2.0 - 5.0 A.B.T.	Dark grayish brown silty fine SAND (SM) with a trace of organics Gray clayey fine SAND (SC) GWL: 5 feet at TOD ESHGWL: 1.5 feet
HA-7	0.0 - 2.0 2.0 - 4.0 A.B.T.	Dark grayish brown slightly organic fine SAND with silt (SP-SM) Dark grayish brown silty fine SAND (SM) GWL: 4 feet at TOD ESHGWL: 0 foot

Reviewed by:	MBW
Date:	7/2/20

Notes:
[1]A.B.T. - Auger Boring Terminated
[2]GWL - Groundwater Level (depth below existing ground surface)
[3]TOD - Time of Drilling
[4]ESHGWL - Estimated Seasonal High Groundwater Level (depth below existing ground surface)

TABLE A-1: SUMMARY OF LABORATORY CLASSIFICATION TEST RESULTS

Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida

Boring No.	Sample No.	Depth Range (ft)	Unified Soil Classification System Symbol	Water Content W_n (%)	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index PI (%)	Liquidity Index I_L	Organic Content (%)	Grain Size		
										Gravel (%)	Sand (%)	Fines (%)
SPT-5	1A	0.3 / 2.0	SP-SM							0.0	91.1	8.9
	2	2.0 / 4.0	SM	24.7	36	30	6	-0.9				
	3	4.0 / 6.0	SC	19.9								
	4	6.0 / 8.0	SC									24.6
	6	10.0 / 12.0	SC		34	18	16					
	7	12.0 / 14.0	SC	21.2								
	9	16.0 / 18.0	SC									41.4
SPT-6	1A	0.4 / 2.0	SP-SM						1.8	0.1	88.1	11.8
	2	2.0 / 4.0	SM	13.3								
	3	4.0 / 6.0	SM		24	21	3					
	4	6.0 / 8.0	SC									40.4
	5	8.0 / 10.0	SC	24.6								
	6	10.0 / 12.0	SM		38	30	8					
	7	12.0 / 14.0	SC									30.0
SPT-8	1A	0.3 / 2.0	SM						1.1	0.3	86.9	12.8
	3	4.0 / 6.0	SP							7.2	88.8	4.0
	4	6.0 / 8.0	SP	7.0								
	5	8.0 / 10.0	SC									31.0
	6	10.0 / 12.0	SM	19.1	37	27	10	-0.8				
	7	12.0 / 14.0	SC									49.6
SPT-10	1A	0.3 / 2.0	SC	11.4								33.6
	2	2.0 / 4.0	SC							0.7	76.4	22.9
	3	4.0 / 6.0	SM									32.3
	4	6.0 / 8.0	SM	14.9	36	29	7	-2.0				
	6	10.0 / 12.0	SC									39.1

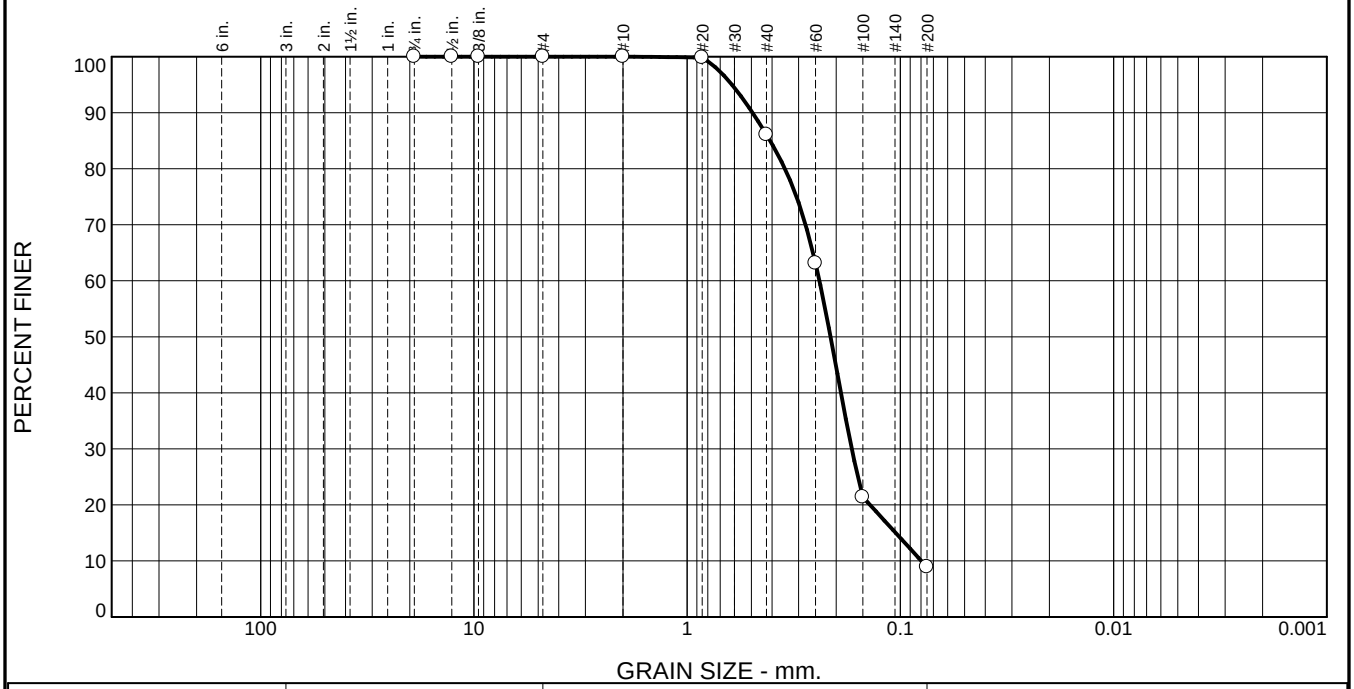
TABLE A-1: SUMMARY OF LABORATORY CLASSIFICATION TEST RESULTS

Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida

Boring No.	Sample No.	Depth Range (ft)	Unified Soil Classification System Symbol	Water Content W_n (%)	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index PI (%)	Liquidity Index I_L	Organic Content (%)	Grain Size		
										Gravel (%)	Sand (%)	Fines (%)
HA-1	1-2	0.0 2.0	SP-SM	8.5					1.0	0.1	89.2	10.7
	5	4.0 5.0	SP-SM	4.6								11.0
HA-2	1-2	0.0 2.0	SP-SM	8.8					1.1			8.8
	3	2.0 3.0	SP-SM	9.5								
	4	3.0 4.0	SP-SM	9.2								
HA-3	1	0.0 1.0	SM	27.6					2.7			
	2-3	1.0 3.0	SM	32.6	59	32	27	0.0		0.1	51.9	48.0
HA-4	1	0.0 1.0	SP-SM	10.8					1.6			
	5-6	4.0 6.0	SC	20.8	38	20	18	0.0		0.0	70.4	29.6
HA-5	1	0.0 1.0	SP-SM	17.0					2.7			
	4-5	3.0 5.0	SC	26.4	45	20	25	0.3				16.3
HA-6	1	0.0 1.0	SM	15.4					2.4			
	2	1.0 2.0	SM	14.5								12.5
	4-5	3.0 5.0	SC	27.2	48	19	29	0.3				15.8
HA-7	1-2	0.0 2.0	SP-SM	26.9					3.7			11.0
	3-4	2.0 4.0	SM	29.7						0.0	76.7	23.3

Reviewed By: MBW Date: 7/2/20

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	13.9	77.2	8.9	

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	86.1		
#60	63.1		
#100	21.4		
#200	8.9		

* (no specification provided)

Material Description

Brownish gray fine to medium SAND with silt

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=**

Coefficients

D_{90}= 0.4938 D_{85}= 0.4087 D_{60}= 0.2397
D_{50}= 0.2127 D_{30}= 0.1690 D_{15}= 0.1052
D_{10}= 0.0797 C_u= 3.01 C_c= 1.50

Remarks

Date Received: 9/23/19 **Date Tested:** 9/27/19

Tested By: C. Rivers

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Location: SPT-5
Sample Number: 1A **Depth:** 0.3'- 2.0'

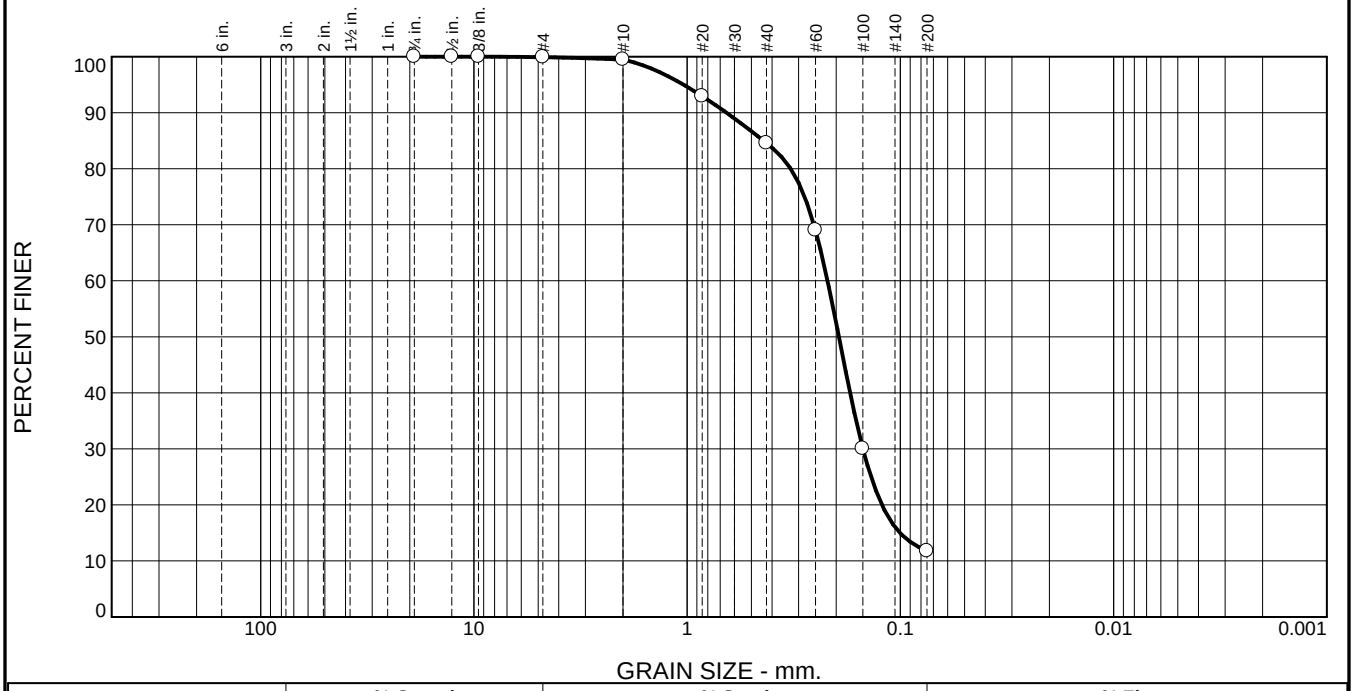
Date Sampled: 11/28/18

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300 **Figure**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.4	14.9	72.8	11.8	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.5		
#20	92.9		
#40	84.6		
#60	69.0		
#100	30.0		
#200	11.8		

* (no specification provided)

Material Description

Brownish gray fine to medium SAND with silt with a trace of roots

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=**

Coefficients

D_{90}= 0.6540 D_{85}= 0.4391 D_{60}= 0.2197
D_{50}= 0.1943 D_{30}= 0.1499 D_{15}= 0.1005
D_{10}= C_u= C_c=

Remarks

Organic Content: 1.8%

Date Received: 9/23/19 **Date Tested:** 9/27/19

Tested By: C. Rivers

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Location: SPT-6
Sample Number: 1A **Depth:** 0.4'-2.0'

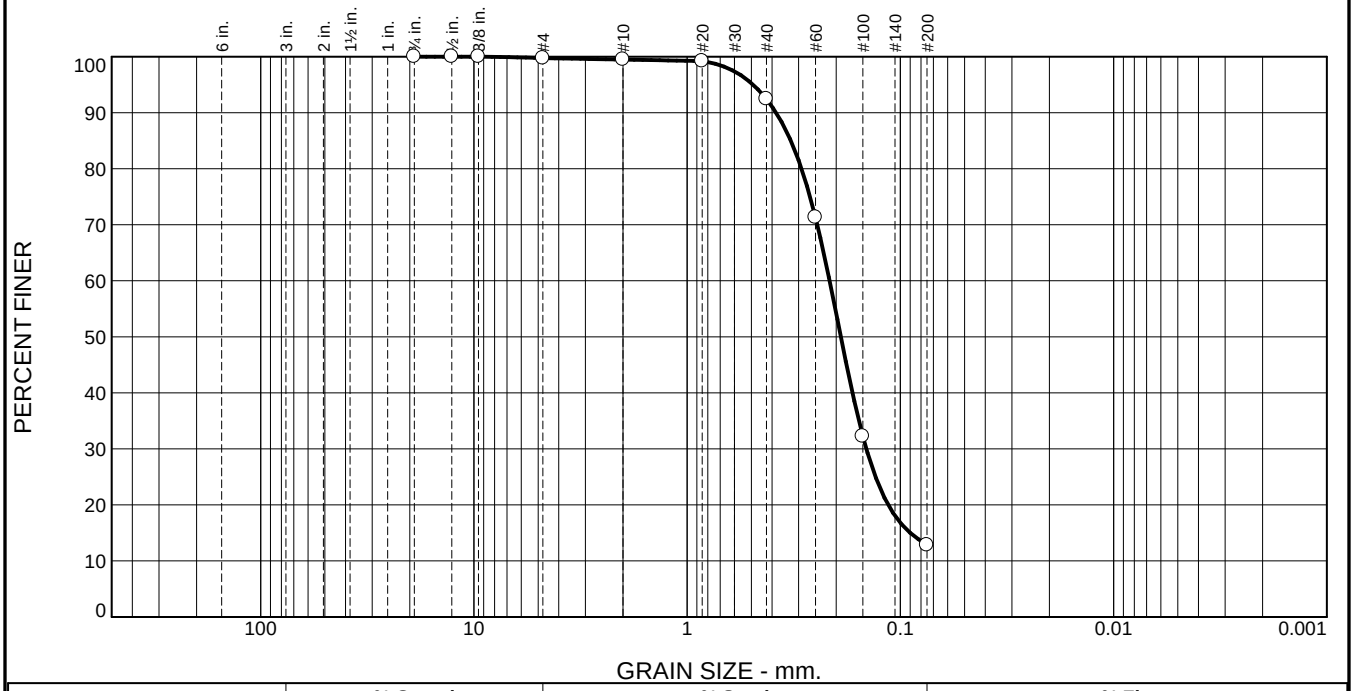
Date Sampled: 11/29/18

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300 **Figure**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.2	7.1	79.6	12.8	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.7		
#10	99.5		
#20	99.2		
#40	92.4		
#60	71.3		
#100	32.2		
#200	12.8		

* (no specification provided)

Material Description

Brown silty fine SAND with a trace of roots

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=**

Coefficients

D_{90}= 0.3827 D_{85}= 0.3266 D_{60}= 0.2149
D_{50}= 0.1902 D_{30}= 0.1445 D_{15}= 0.0899
D_{10}= C_u= C_c=

Remarks

Organic Content: 1.1%

Date Received: 9/23/19 **Date Tested:** 9/27/19

Tested By: C. Rivers

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

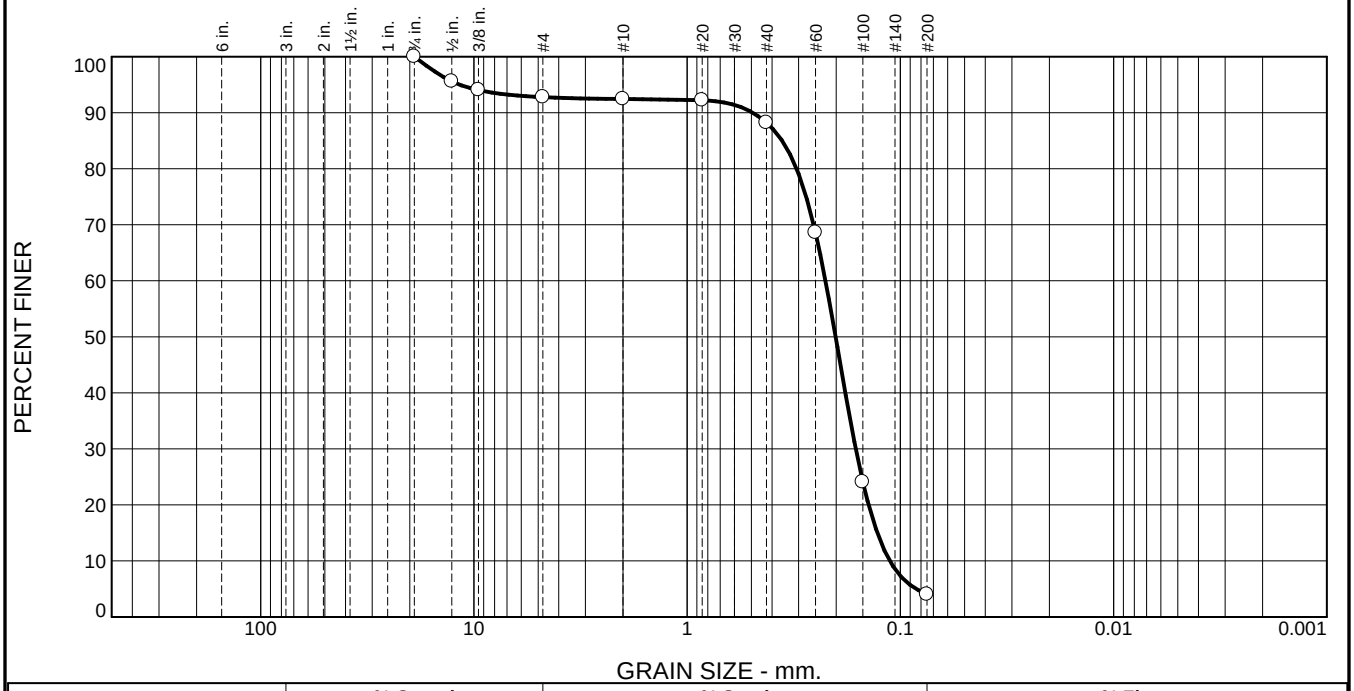
Location: SPT-8 **Date Sampled:** 11/29/19
Sample Number: 1A **Depth:** 0.3'-2.0'

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300 **Figure**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.2	0.3	4.3	84.2	4.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	95.6		
3/8"	94.0		
#4	92.8		
#10	92.5		
#20	92.2		
#40	88.2		
#60	68.6		
#100	24.1		
#200	4.0		

* (no specification provided)

Material Description

Dark brown fine SAND with a few limestone fragments and a trace of clay

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 0.4929 D_{85}= 0.3586 D_{60}= 0.2246
D_{50}= 0.2014 D_{30}= 0.1619 D_{15}= 0.1283
D_{10}= 0.1121 C_u= 2.00 C_c= 1.04

Remarks

Date Received: 9/23/19 **Date Tested:** 9/27/19

Tested By: C. Rivers

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Location: SPT-8
Sample Number: 3 **Depth:** 4.0'-6.0'

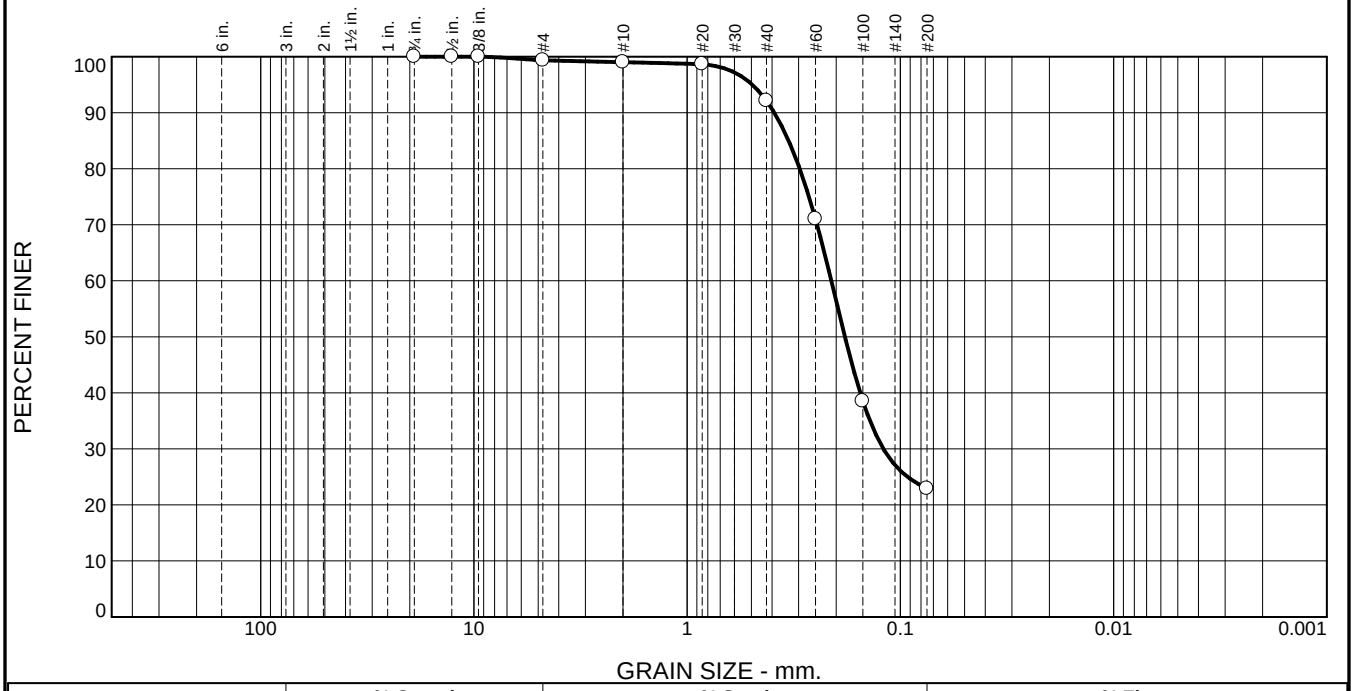
Date Sampled: 11/29/19

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300 **Figure**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.3	6.9	69.2	22.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.3		
#10	99.0		
#20	98.7		
#40	92.1		
#60	71.0		
#100	38.5		
#200	22.9		

* (no specification provided)

Material Description

Brownish gray calcareous clayey fine SAND with a trace of limestone fragments (Dissolutioned Limestone)

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SC **AASHTO (M 145)=**

Coefficients

D_{90}= 0.3904 D_{85}= 0.3345 D_{60}= 0.2109
D_{50}= 0.1819 D_{30}= 0.1201 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 9/23/19 **Date Tested:** 9/27/19

Tested By: C. Rivers

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Location: SPT-10
Sample Number: 2 **Depth:** 2.0'-4.0'

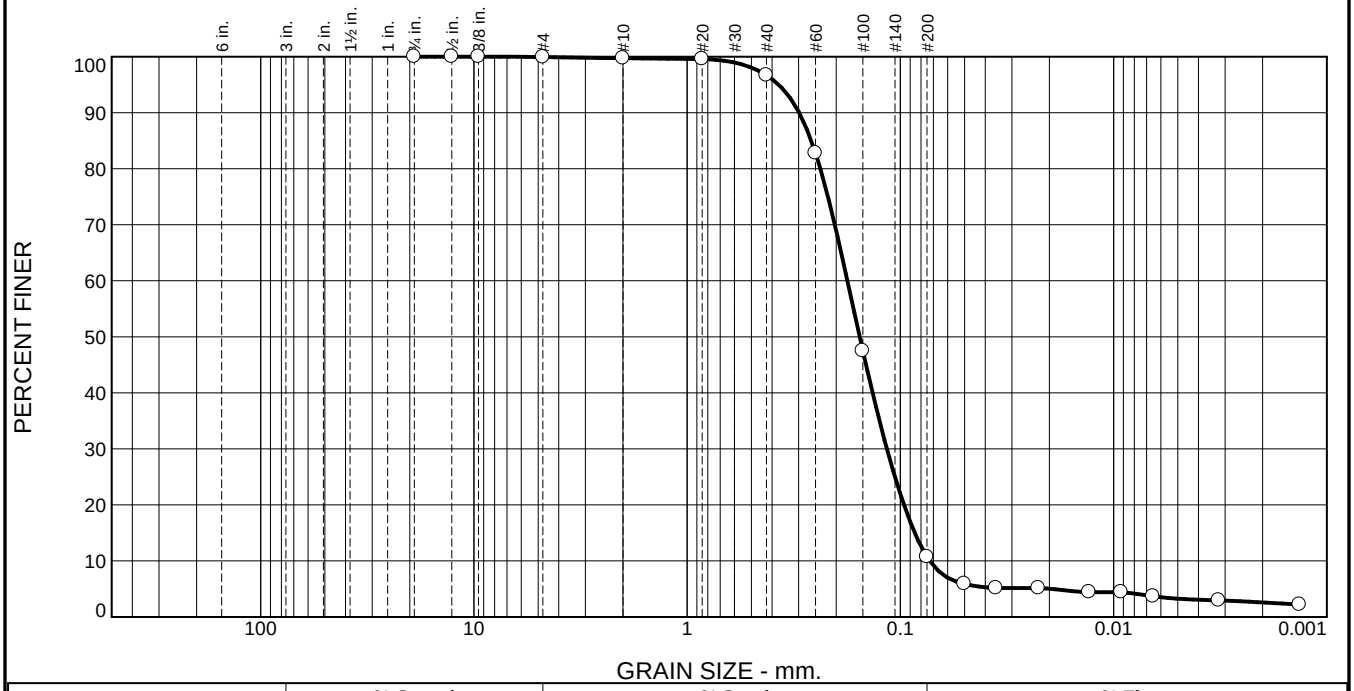
Date Sampled: 11/29/18

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300 **Figure**

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.2	3.0	86.0	7.4	3.3

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.7		
#20	99.6		
#40	96.7		
#60	82.8		
#100	47.5		
#200	10.7		
0.0502 mm.	5.9		
0.0356 mm.	5.2		
0.0225 mm.	5.2		
0.0130 mm.	4.4		
0.0092 mm.	4.4		
0.0065 mm.	3.7		
0.0032 mm.	3.0		
0.0013 mm.	2.2		

* (no specification provided)

Material Description

Brownish gray fine SAND with silt with a trace of organics

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP-SM **AASHTO (M 145)=**

Coefficients

D_{90}= 0.2985 D_{85}= 0.2617 D_{60}= 0.1772
D_{50}= 0.1552 D_{30}= 0.1157 D_{15}= 0.0856
D_{10}= 0.0728 C_u= 2.43 C_c= 1.04

Remarks

Moisture Content: 8.5%
Organic Content: 1.0%

Date Received: 6/11/20 **Date Tested:** 6/17/20

Tested By: C. Martin / V. Gradel

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Source of Sample: HA-1 **Depth:** 0.0'-2.0'
Sample Number: 1-2

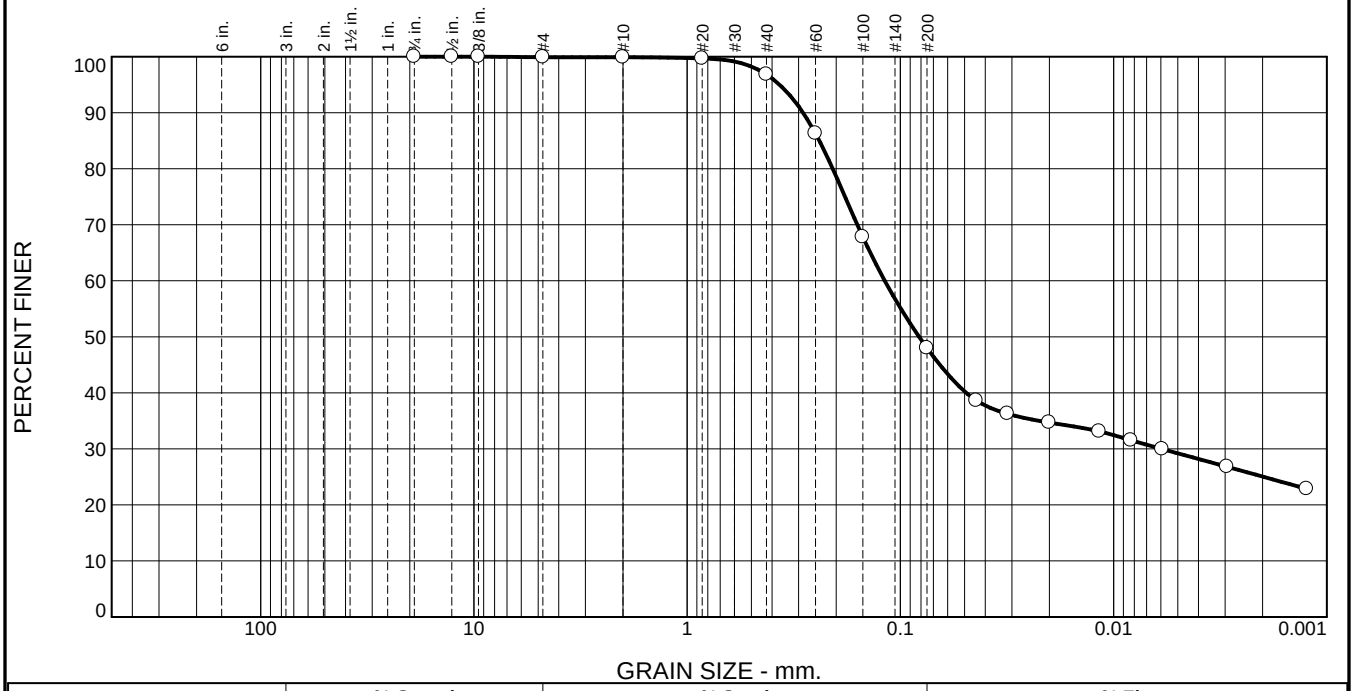
Date Sampled: 6/1/20

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	3.1	48.8	18.8	29.2

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	99.9		
#10	99.9		
#20	99.7		
#40	96.8		
#60	86.3		
#100	67.8		
#200	48.0		
0.0440 mm.	38.6		
0.0315 mm.	36.3		
0.0201 mm.	34.7		
0.0117 mm.	33.1		
0.0083 mm.	31.5		
0.0059 mm.	30.0		
0.0029 mm.	26.8		
0.0012 mm.	22.9		

* (no specification provided)

Material Description

Gray silty fine SAND

Atterberg Limits (ASTM D 4318)

PL= 32 **LL=** 59 **PI=** 27

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-7-5(9)

Coefficients

D_{90}= 0.2861 D_{85}= 0.2400 D_{60}= 0.1184
D_{50}= 0.0817 D_{30}= 0.0060 D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture Content: 32.6%

Date Received: 6/11/20 **Date Tested:** 6/17/20

Tested By: V. Gradel

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Source of Sample: HA-3 **Depth:** 1.0'-3.0'
Sample Number: 2-3

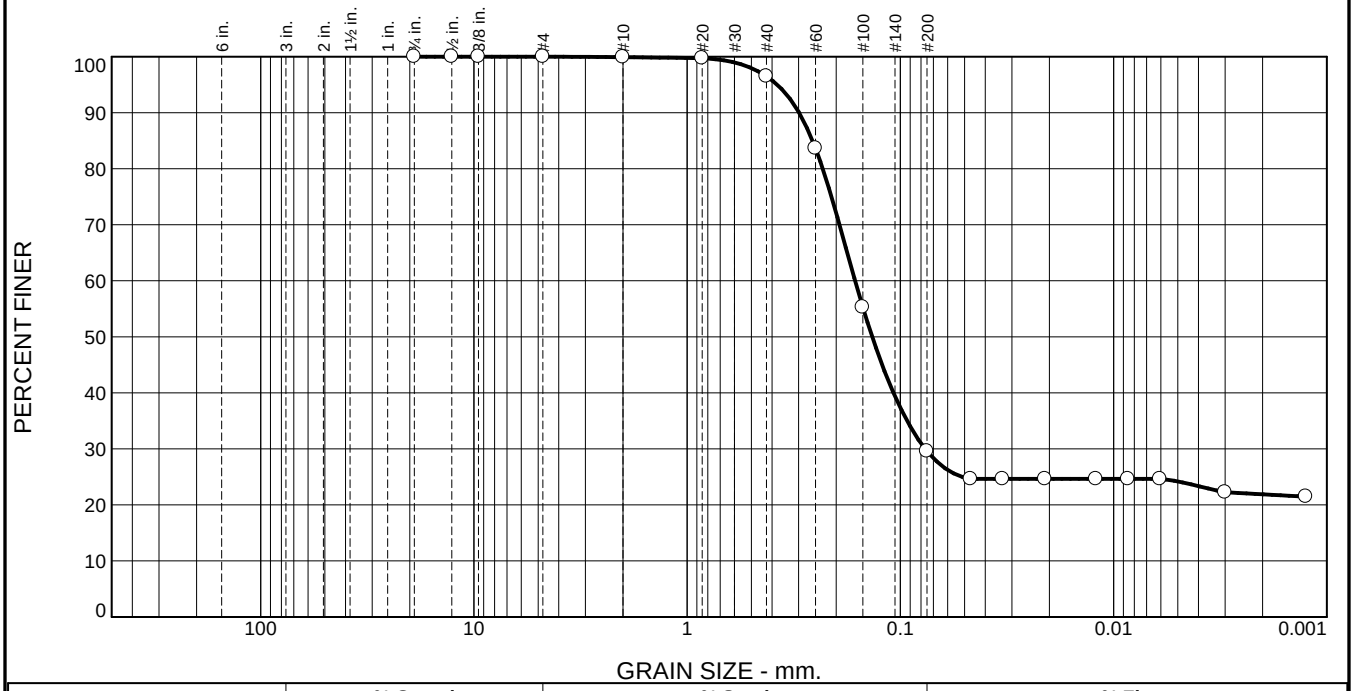
Date Sampled: 6/1/20

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.4	66.9	5.4	24.2

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.9		
#20	99.7		
#40	96.5		
#60	83.7		
#100	55.3		
#200	29.6		
0.0468 mm.	24.6		
0.0331 mm.	24.6		
0.0210 mm.	24.6		
0.0121 mm.	24.6		
0.0086 mm.	24.6		
0.0061 mm.	24.6		
0.0030 mm.	22.3		
0.0013 mm.	21.5		

* (no specification provided)

Material Description

Gray clayey fine SAND

Atterberg Limits (ASTM D 4318)

PL= 20 **LL=** 38 **PI=** 18

Classification

USCS (D 2487)= SC **AASHTO (M 145)=** A-2-6(1)

Coefficients

D_{90}= 0.2986 D_{85}= 0.2581 D_{60}= 0.1631
D_{50}= 0.1356 D_{30}= 0.0765 D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture Content: 20.8%

Date Received: 6/11/20 **Date Tested:** 6/17/20

Tested By: C. Martin / V. Gradel

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Source of Sample: HA-4 **Depth:** 4.0'-6.0'
Sample Number: 5-6

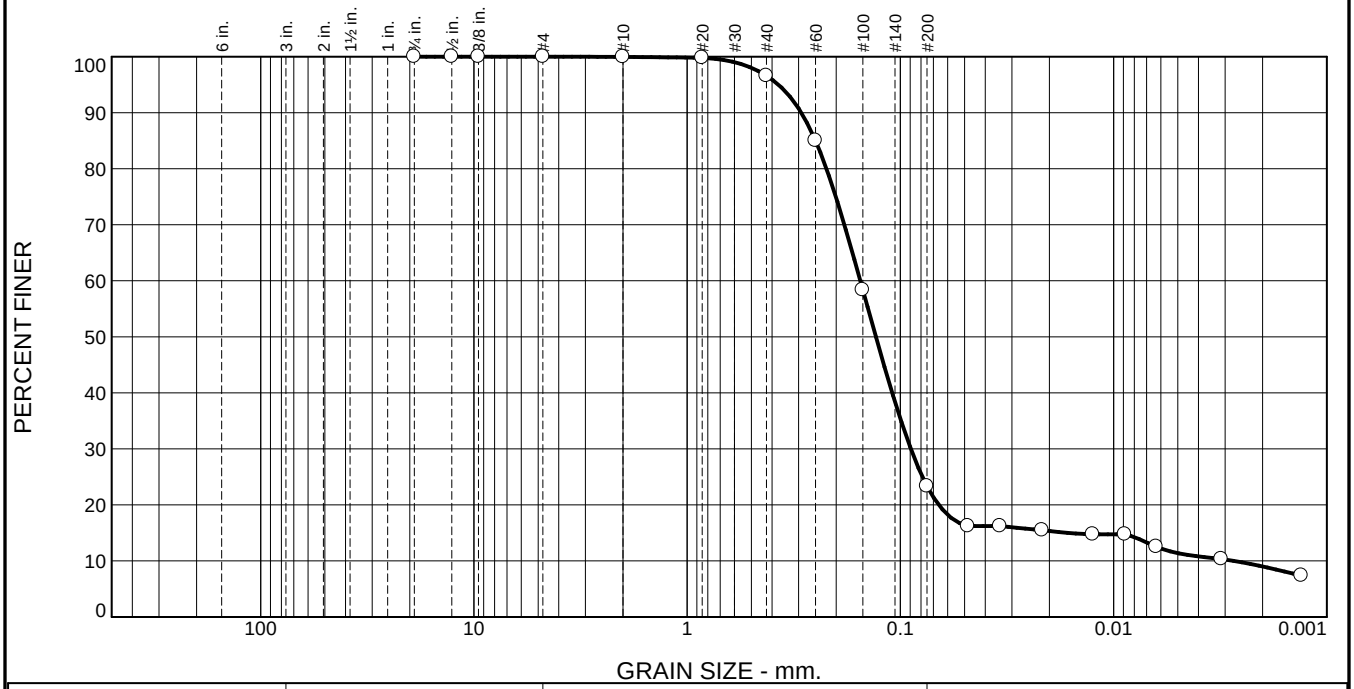
Date Sampled: 6/1/20

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	3.4	73.3	11.9	11.4

Test Results (ASTM D6913 & ASTM D1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	96.6		
#60	85.0		
#100	58.4		
#200	23.3		
0.0482 mm.	16.2		
0.0341 mm.	16.2		
0.0216 mm.	15.5		
0.0125 mm.	14.7		
0.0088 mm.	14.7		
0.0063 mm.	12.5		
0.0031 mm.	10.3		
0.0013 mm.	7.4		

* (no specification provided)

Material Description

Dark gray silty fine SAND

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SM **AASHTO (M 145)=**

Coefficients

D_{90}= 0.2916 D_{85}= 0.2500 D_{60}= 0.1542
D_{50}= 0.1303 D_{30}= 0.0893 D_{15}= 0.0164
D_{10}= 0.0027 C_u= 56.39 C_c= 18.92

Remarks

Moisture Content: 29.7%

Date Received: 6/11/20 **Date Tested:** 6/17/20

Tested By: C. Martin / V. Gradel

Checked By: Corey T. Chascin, E.I.

Title: Project Engineer

Source of Sample: HA-7 **Depth:** 2.0'-4.0'
Sample Number: 3-4

Date Sampled: 6/1/20

Wood E&I

Jacksonville, Florida

Client: City of Alachua
Project: Mill Creek Sink
Water Quality Improvement Project
Project No: 6063180300

FIELD AND LABORATORY PROCEDURES

Field Procedures

Soil Test Borings - The soil test borings were performed in accordance with ASTM D1586, "Penetration Test and Split-Barrel Sampling of Soils." The borings were initially advanced by augering. A rotary drilling process was subsequently used and bentonite drilling fluid was circulated in the borehole to stabilize the sides and flush the cuttings. At regular intervals, the drilling tools were removed and soil samples were obtained with a standard 1.4-inch I.D., 2.0-inch O.D., split-tube sampler. An internal liner was not utilized in the sampler. The sampler was first seated 6 inches and then driven an additional foot with blows of a 140-pound automatically tripped hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot is designated the "Penetration Resistance." The penetration resistance, when properly interpreted, is an index to the soil and rock strength and density.

Representative portions of the soil samples, obtained from the sampler, were placed in plastic jars and transported to our laboratory. The samples were then examined by a geotechnical engineer in order to confirm the field classifications.

Auger Boring (Manual) - The auger borings were advanced manually by the use of a bucket-type hand auger. The soils encountered were identified, in the field, from cuttings brought to the surface by the augering process. Representative soil samples were placed in glass jars and transported to the Wood Jacksonville office for laboratory testing. The borings were performed in accordance with ASTM D1452.

Seasonal High Groundwater Level Estimation - The position of the seasonal high groundwater level was estimated by closely observing the soil cuttings for changes in root and organic content, soil stratification and subtle changes in soil coloration or mottling or the presence of a polychromatic matrix (two or more colors arranged in a splotchy pattern) which are indicative of the seasonal high water table. The method used to estimate the seasonal high groundwater level is similar to that prescribed by the United States Department of Agriculture Soil Conservation Service. It should be noted that this methodology does not consider recent or future site drainage improvements or man-induced activities which may impact the groundwater level at the site.

Hydraulic Conductivity Testing – The hydraulic conductivity of the near surface soils was estimated through field testing by using an open standpipe piezometer with a falling head procedure in general accordance with ASTM D6391-11.

Laboratory Procedures

Water Content - The water content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test was conducted in accordance with ASTM D2216.

Fines Content - In this test, the sample is dried and then washed over a No. 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in accordance with ASTM D1140.

Grain Size Distribution - The grain size distribution tests were performed to determine the particle size and distribution of each sample tested. The distribution of particle sizes larger than 75 µm (retained on the No. 200 sieve) is determined by sieving, while the distribution of particle sizes smaller than 75 µm (passing the No. 200 sieve) is determined by a sedimentation process, using a hydrometer. The samples were dried, weighed, and washed over a No. 200 mesh sieve. The dried samples were then passed through a standard set of nested sieves to determine the grain size distribution of the soil particles coarser than the No. 200 sieve. For some of the samples, materials passing the No. 4 mesh sieve were suspended in water in a hydrometer test cylinder and the grain size distribution was measured by the rate of settlement of the soil particles. These tests were conducted in accordance with ASTM D422.

Organic Content (Organic Loss on Ignition) - The amount of organic material in a sample is determined in this test. The sample is first dried and weighed, then ignited and reweighed. The amount of organic material is expressed as a percentage of the total dry weight of the sample prior to ignition. This test was conducted in general accordance with ASTM D2974.

Atterberg Limits (Plasticity) - A soil's Plasticity Index (PI) is the numerical difference between the Liquid Limit (LL) and the Plastic Limit (PL). The LL is the moisture content at which the soil will flow as a heavy viscous fluid and is determined in general accordance with ASTM D4318. The PL is the moisture content at which the soil begins to crumble when rolled into a small thread and is also determined in general accordance with ASTM D4318.

The Liquidity Index (LI) was computed from the above test data. This ratio is an expression which compares the relative natural moisture state of the soil with its liquid and plastic limits and is an indicator of various other physical properties such as strength, sensitivity, compressibility, and preconsolidation characteristics.

MAJOR DIVISIONS			GROUP SYMBOLS		TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)		GW	Well graded gravels, gravel - sand mixtures, little or no fines.
				GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)		GM	Silty gravels, gravel - sand - silt mixtures.
				GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)		SW	Well graded sands, gravelly sands, little or no fines.
				SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)		SM	Silty sands, sand - silt mixtures
				SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity.
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)			MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

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KEY TO SYMBOLS AND DESCRIPTIONS

Undisturbed Sample (UD)	Auger Cuttings
Split Spoon Sample (SS)	Bulk Sample
Rock Core (RC)	
▽ Water Table at time of drilling	▼ Water Table after 24 hours
WOH - Weight of Hammer	◀100% - Percent Loss of Drilling Fluid
WOR - Weight of Drill Rods	Su - undrained shear strength estimated from pocket penetrometer
SCP - Static Cone Penetrometer Tip Resistance (kg/sq. cm)	qu - unconfined compressive strength estimated from pocket penetrometer

Correlation of Penetration Resistance (N) with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
0 - 4	Very Loose	0 - 2	Very Soft
5 - 10	Loose	3 - 4	Soft
11 - 20	Firm	5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
Over 50	Very Dense	31- 50	Hard
		Over 50	Very Hard

Modifiers

These Modifiers Provide Our Estimate of The Amount of Fines (Silt or Clay Size Particles) in The Soil Sample

APPROX. FINES CONTENT	MODIFIERS	UNIFIED SOIL CLASSIFICATION SYMBOL
5% TO 12%	WITH SILT / WITH CLAY	SP-SM OR SP-SC
12% TO 30%	SILTY / CLAYEY	SM OR SC
30% TO 50%	VERY SILTY / VERY CLAYEY	SM OR SC

These Modifiers Provide Our Estimate of Shell, Rock Fragments, or Roots in The Soil Sample

APPROXIMATE CONTENT, BY WEIGHT	MODIFIERS
1% TO 5%	TRACE
5% TO 10%	FEW
15% TO 25%	LITTLE
30% TO 45%	SOME
50% TO 100%	MOSTLY

These Modifiers Provide Our Estimate of Organic Content in The Soil Sample

ORGANIC CONTENT	MODIFIERS
1% TO 3%	TRACE
3% TO 5%	SLIGHTLY ORGANIC
5% TO 30%	ORGANIC
> 30%	PEAT

APPENDIX B

TABLE B-1: SUMMARY OF IN-SITU HYDRAULIC CONDUCTIVITY TEST RESULTS

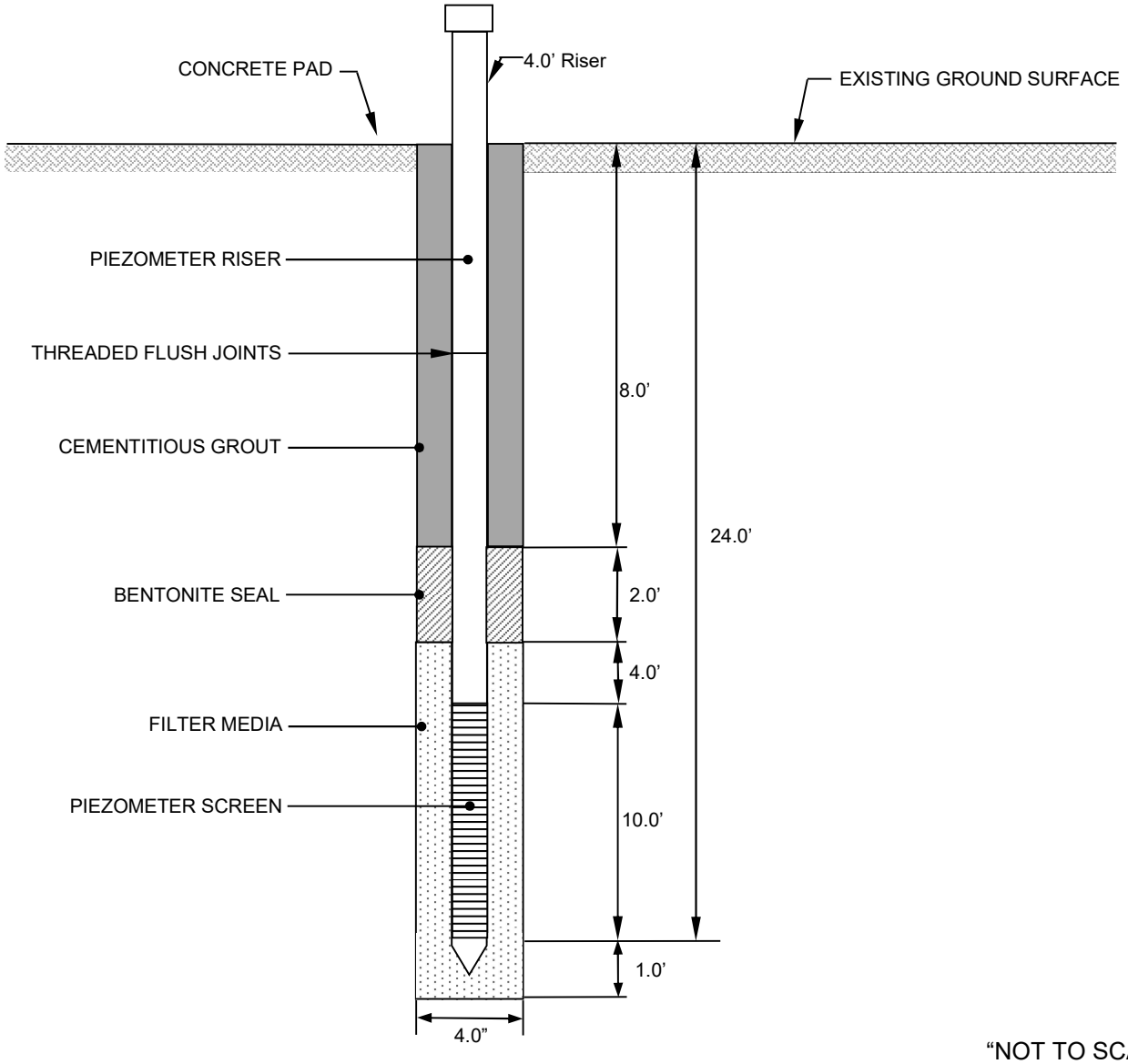
Mill Creek Sink
Water Quality Improvement Project
Alachua County, Florida
Wood Project No. 6063-18-0300

Piezometer ID	Subsurface Material at Test Depth Interval [Filter Zone]	Borehole Diameter (in)	Piezometer Diameter (in)	Test Depth Interval[1] [Filter Zone] (ft)	Groundwater Level[1] (ft)	In-situ Falling Head Hydraulic Conductivity, k_h	
						cm/sec	ft/sec
PZM-1	Brownish gray to brown to light gray silty sands (SM) and clayey sands (SC) with limestone fragments	4.0	2.0	14.0 - 24.0	10.7	1.4E-02	4.7E-04
PZM-2	Light brownish gray silty sands (SM) and clayey sands (SC) with limestone fragments	4.0	2.0	14.0 - 24.0	8.8	2.2E-02	7.1E-04

Note:
[1]BGS - Below Ground Surface

PIEZOMETER INSTALLATION RECORD

JOB NAME	**Mill Creek**	JOB NUMBER	**6063180300.02.1B**
PIEZOMETER#	**MW-1**	INSTALLATION DATE	**9/25/2019**
LOCATION (STATE PLANE)	**297227.777ft N 2599702.783ft E**	GROUND SURFACE ELEVATION* (NGVD)	
FILTER MATERIAL:	**20/30 Silica Sand**	SLOT SIZE	**0.01 inches**
SCREEN MATERIAL	**Sch 40 PVC**	SCREEN DIAMETER	**2 inches**
RISER MATERIAL	**Sch 40 PVC**	RISER DIAMETER	**2 inches**
DRILLING TECHNIQUE	**Mud Rotary**	DRILLING CONTRACTOR	**Amdrill**
BOREHOLE DIAMETER	**4 inches**	WOOD FIELD REPRESENTATIVE	**SCJ**



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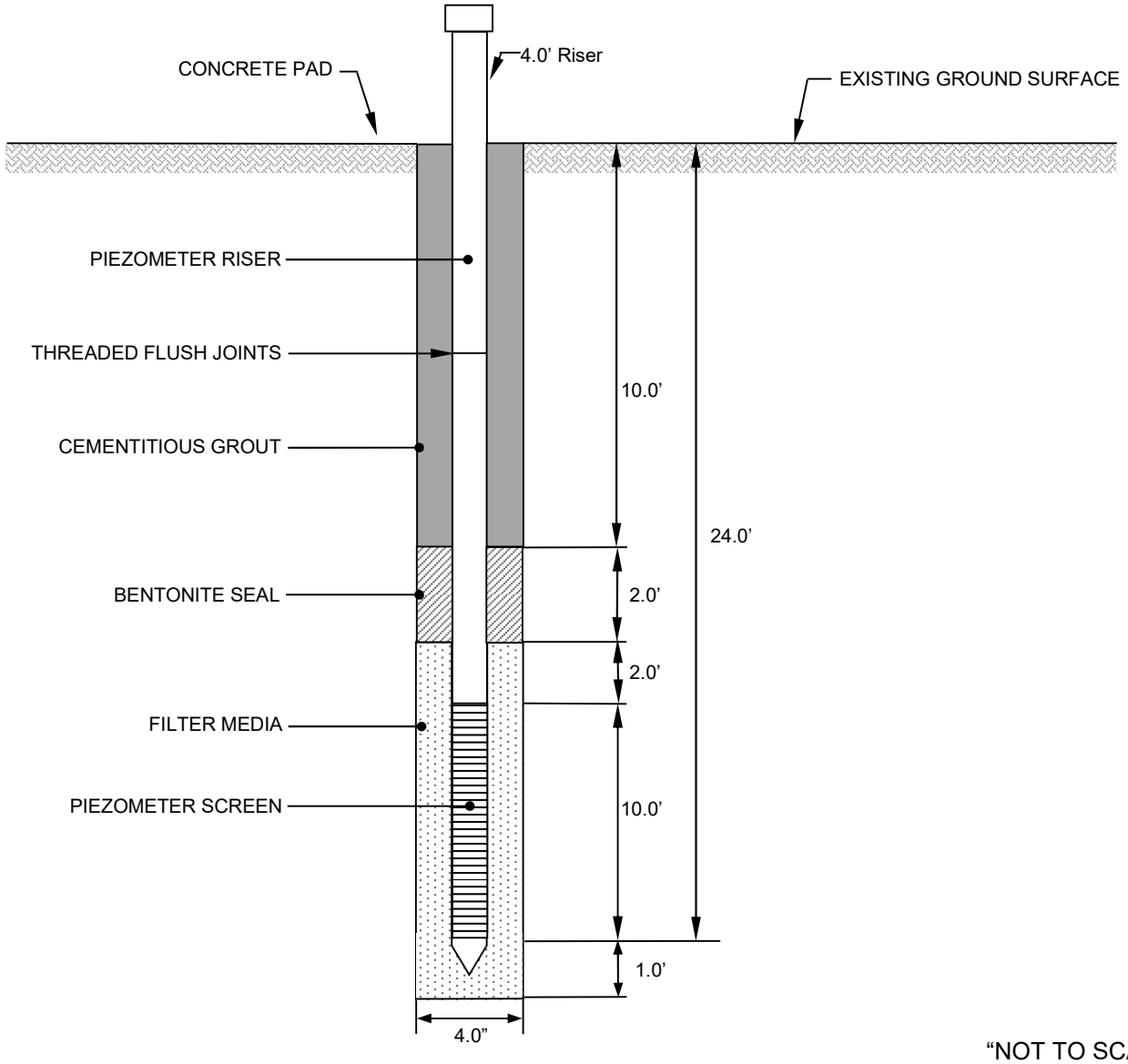
PIEZOMETER INSTALLATION RECORD

PIEZOMETER INSTALLATION RECORD

JOB NAME	**Mill Creek**	JOB NUMBER	**6063180300.02.1B**
PIEZOMETER#	**MW-2**	INSTALLATION DATE	**9/25/2019**
LOCATION (STATE PLANE)	**297359.504ft N 2599520.336ft E**	GROUND SURFACE ELEVATION* (NGVD)	
FILTER MATERIAL:	**20/30 Silica Sand**	SLOT SIZE	**0.01 inches**
SCREEN MATERIAL	**Sch 40 PVC**	SCREEN DIAMETER	**2 inches**
RISER MATERIAL	**Sch 40 PVC**	RISER DIAMETER	**2 inches**
DRILLING TECHNIQUE	**Mud Rotary**	DRILLING CONTRACTOR	**Amdrill**
BOREHOLE DIAMETER	**4 inches**	WOOD FIELD REPRESENTATIVE	**SCJ**



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PIEZOMETER INSTALLATION RECORD

Field Hydraulic Conductivity Test - Falling Head Permeability Test

Client: Alachua County
Date: 10/30/2019
Project #: 6063180300.02.1B
Project Name: Mill Creek Sink Water Quality Improvement Project

Well ID: PZM-1
Test #: 1
Technician: Casey Suarez
Location: Approximately 10 ft south of SPT-9

Elapsed Time (Sec)	Elapsed Time (Min)	Depth To Water from Top of Casing (ft)	"h" (ft)	h/h_o
0.00	0.00	0.00	14.51	1.00
1.00	0.02	4.71	9.80	0.68
2.00	0.03	9.43	5.08	0.35
3.00	0.05	14.14	0.37	0.03
4.00	0.07	14.15	0.36	0.03
5.00	0.08	14.15	0.36	0.02
6.00	0.10	14.16	0.35	0.02
7.00	0.12	14.17	0.34	0.02
8.00	0.13	14.17	0.34	0.02
9.00	0.15	14.18	0.33	0.02
10.00	0.17	14.19	0.32	0.02
11.00	0.18	14.19	0.32	0.02
12.00	0.20	14.20	0.31	0.02
13.00	0.22	14.20	0.31	0.02
14.00	0.23	14.21	0.30	0.02
15.00	0.25	14.22	0.29	0.02
16.00	0.27	14.22	0.29	0.02
17.00	0.28	14.23	0.28	0.02
Data truncated for reporting purposes				
402.00	6.70	14.45	0.06	0.00
403.00	6.72	14.45	0.06	0.00
404.00	6.73	14.45	0.06	0.00
405.00	6.75	14.45	0.06	0.00
406.00	6.77	14.45	0.06	0.00
407.00	6.78	14.45	0.06	0.00
408.00	6.80	14.45	0.06	0.00
409.00	6.82	14.45	0.06	0.00
410.00	6.83	14.45	0.06	0.00
411.00	6.85	14.45	0.06	0.00
412.00	6.87	14.45	0.06	0.00
413.00	6.88	14.45	0.06	0.00
414.00	6.90	14.45	0.06	0.00
415.00	6.92	14.45	0.06	0.00
416.00	6.93	14.45	0.06	0.00
417.00	6.95	14.45	0.06	0.00
418.00	6.97	14.45	0.06	0.00
419.00	6.98	14.45	0.06	0.00
420.00	7.00	14.45	0.06	0.00
421.00	7.02	14.45	0.06	0.00
422.00	7.03	14.45	0.06	0.00
423.00	7.05	14.45	0.06	0.00
424.00	7.07	14.45	0.06	0.00
425.00	7.08	14.45	0.06	0.00
426.00	7.10	14.45	0.06	0.00
427.00	7.12	14.45	0.06	0.00
428.00	7.13	14.45	0.06	0.00
429.00	7.15	14.45	0.06	0.00
430.00	7.17	14.45	0.06	0.00
431.00	7.18	14.45	0.06	0.00
432.00	7.20	14.45	0.06	0.00
433.00	7.22	14.45	0.06	0.00
434.00	7.23	14.45	0.06	0.00
435.00	7.25	14.45	0.06	0.00
436.00	7.27	14.45	0.06	0.00
437.00	7.28	14.45	0.06	0.00
438.00	7.30	14.45	0.06	0.00
439.00	7.32	14.45	0.06	0.00
440.00	7.33	14.45	0.06	0.00

Well Depth (btoc):	24	feet
Stickup:	3.8	feet
Initial DTW (btoc):	14.51	feet
Radius of standpipe, r:	1	inch
Radius of well, R:	2	inch
Screen Length, L_e:	10	feet
Time at $0.37h/h_o$, T_o:	0.05	min

$$K_H = \frac{r^2 \ln(\frac{L_e}{R})}{2L_eT_o}$$

Calculated Value:

K_h =	0.0057	in/sec
K_h =	0.00047	ft/sec
K_h =	0.014	cm/sec

Notes:
DTW = Depth to water Table
*btoc - Below Top of Casing

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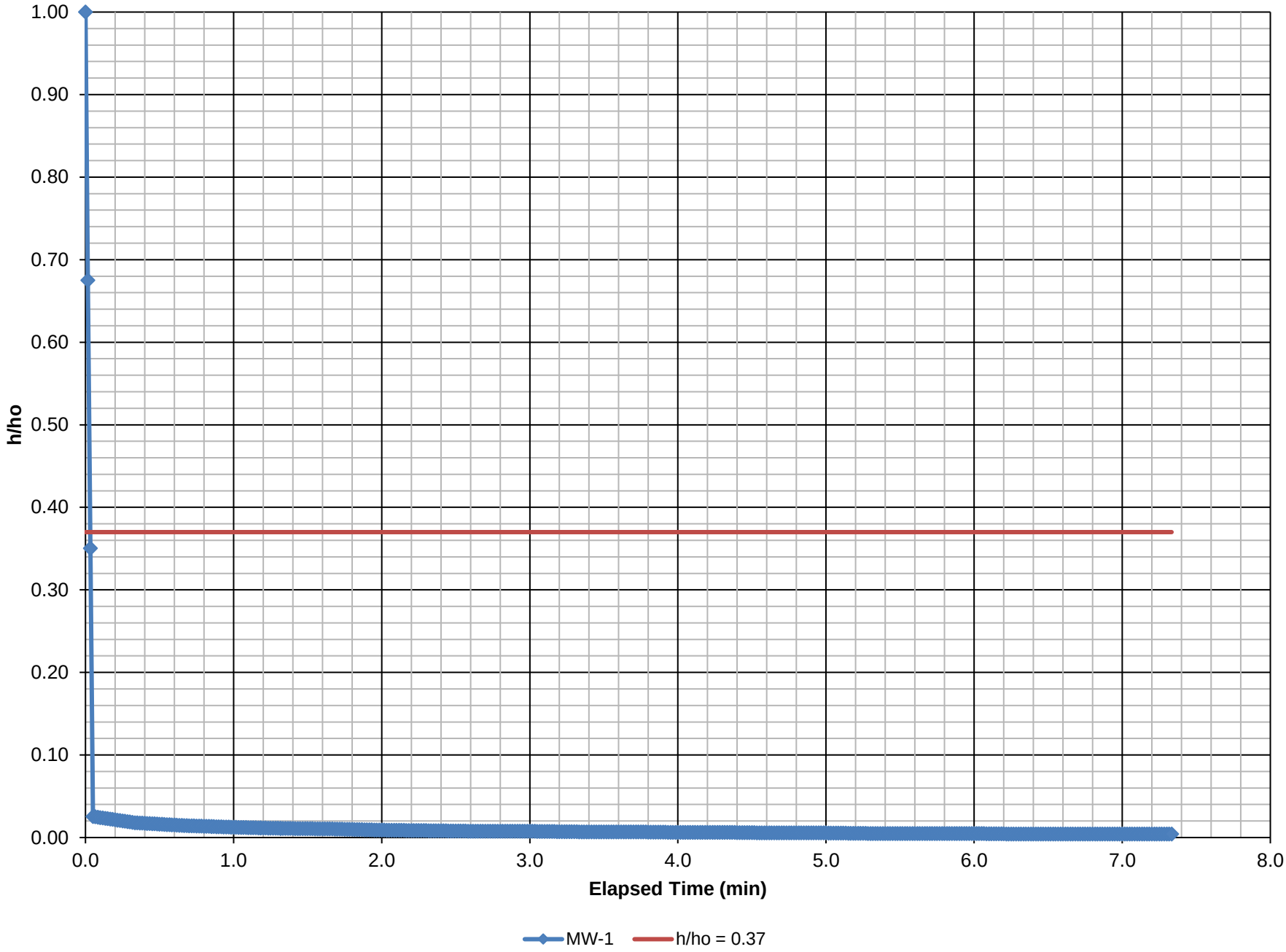
PZM-1 - Falling Head Permeability Test



wood.

Field Hydraulic Conductivity Test - Falling Head Permeability Test

Client: Alachua County
Date: 10/30/2019
Project #: 6063180300.02.1B
Project Name: Mill Creek Sink Water Quality Improvement Project

Well ID: PZM-2
Test #: 2
Technician: Casey Suarez
Location: Approximately 10 ft south-east of SPT-6

Elapsed Time (Sec)	Elapsed Time (Min)	Depth To Water from Top of Casing (ft)	"h" (ft)	h/h_o
0.00	0.00	0.00	12.56	1.00
1.00	0.02	3.88	8.68	0.69
2.00	0.03	7.76	4.80	0.38
3.00	0.05	11.64	0.92	0.07
4.00	0.07	11.66	0.90	0.07
5.00	0.08	11.68	0.88	0.07
6.00	0.10	11.70	0.86	0.07
7.00	0.12	11.72	0.84	0.07
8.00	0.13	11.73	0.83	0.07
9.00	0.15	11.75	0.81	0.06
10.00	0.17	11.77	0.79	0.06
11.00	0.18	11.79	0.77	0.06
12.00	0.20	11.81	0.75	0.06
13.00	0.22	11.83	0.73	0.06
14.00	0.23	11.85	0.71	0.06
15.00	0.25	11.87	0.69	0.06
16.00	0.27	11.88	0.68	0.05
17.00	0.28	11.90	0.66	0.05
18.00	0.30	11.92	0.64	0.05
Data truncated for reporting purposes				
181.00	3.02	12.53	0.03	0.00
182.00	3.03	12.53	0.03	0.00
183.00	3.05	12.53	0.03	0.00
184.00	3.07	12.53	0.03	0.00
185.00	3.08	12.53	0.03	0.00
186.00	3.10	12.53	0.03	0.00
187.00	3.12	12.53	0.03	0.00
188.00	3.13	12.53	0.03	0.00
189.00	3.15	12.53	0.03	0.00
190.00	3.17	12.53	0.03	0.00
191.00	3.18	12.53	0.03	0.00
192.00	3.20	12.53	0.03	0.00
193.00	3.22	12.53	0.03	0.00
194.00	3.23	12.53	0.03	0.00
195.00	3.25	12.53	0.03	0.00
196.00	3.27	12.53	0.03	0.00
197.00	3.28	12.53	0.03	0.00
198.00	3.30	12.53	0.03	0.00
199.00	3.32	12.53	0.03	0.00
200.00	3.33	12.53	0.03	0.00
201.00	3.35	12.53	0.03	0.00
202.00	3.37	12.53	0.03	0.00
203.00	3.38	12.53	0.03	0.00
204.00	3.40	12.53	0.03	0.00
205.00	3.42	12.53	0.03	0.00
206.00	3.43	12.53	0.03	0.00
207.00	3.45	12.53	0.03	0.00
208.00	3.47	12.53	0.03	0.00
209.00	3.48	12.53	0.03	0.00
210.00	3.50	12.53	0.03	0.00
211.00	3.52	12.53	0.03	0.00
212.00	3.53	12.53	0.03	0.00
213.00	3.55	12.53	0.03	0.00
214.00	3.57	12.53	0.03	0.00
215.00	3.58	12.53	0.03	0.00
216.00	3.60	12.53	0.03	0.00
217.00	3.62	12.53	0.03	0.00
218.00	3.63	12.53	0.03	0.00
219.00	3.65	12.53	0.03	0.00

Well Depth (btoc):	24	feet
Stickup:	3.8	feet
Initial DTW (btoc):	12.56	feet
Radius of standpipe, r:	1	inch
Radius of well, R:	2	inch
Screen Length, L_e:	10	feet
Time at $0.37h/h_o$, T_o:	0.03	min

$$K_H = \frac{r^2 \ln(\frac{L_e}{R})}{2L_e T_o}$$

Calculated Value:

K_h =	0.0085	in/sec
K_h =	0.00071	ft/sec
K_h =	0.022	cm/sec

Notes:
DTW = Depth to water Table
*btoc - Below Top of Casing

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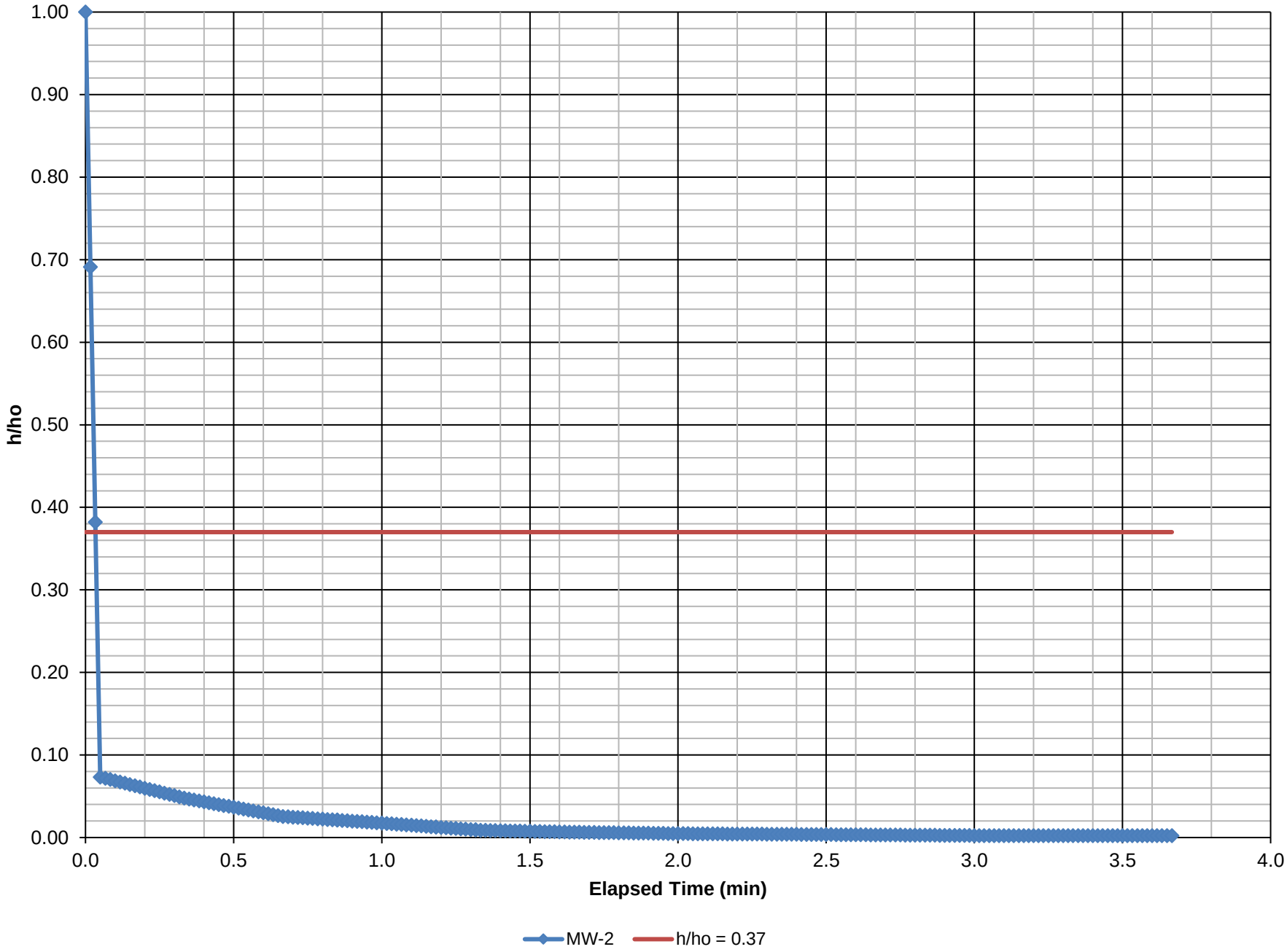
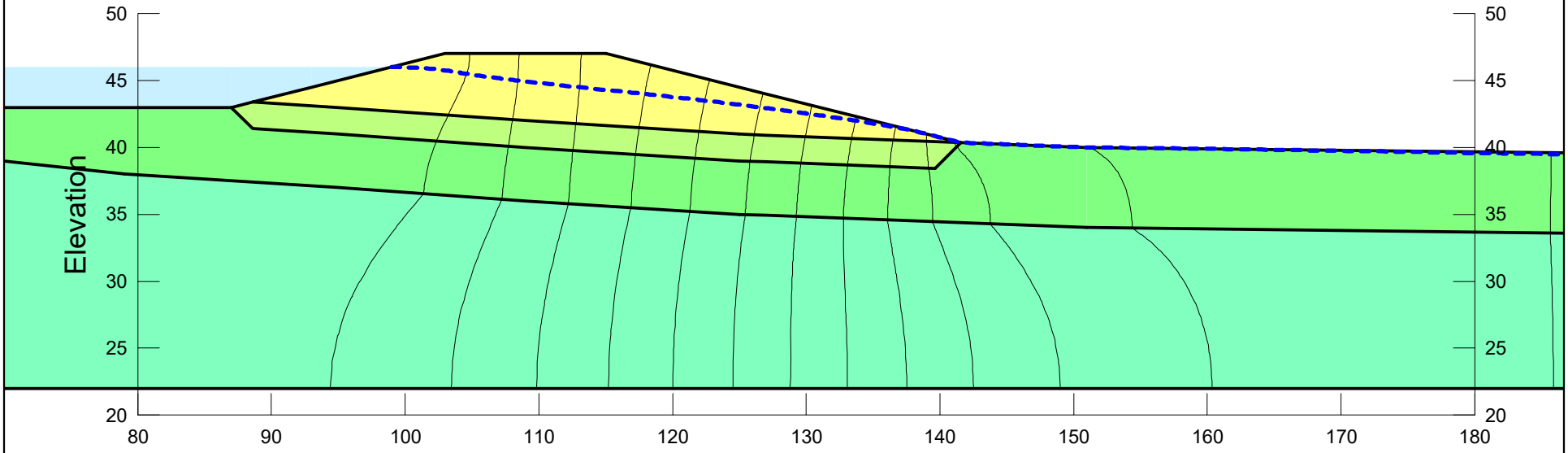
MW-2 - Falling Head Permeability Test



APPENDIX C

Figure 1A
Seepage Analysis - Cross Section XS-1
Pool Elev. 46 feet

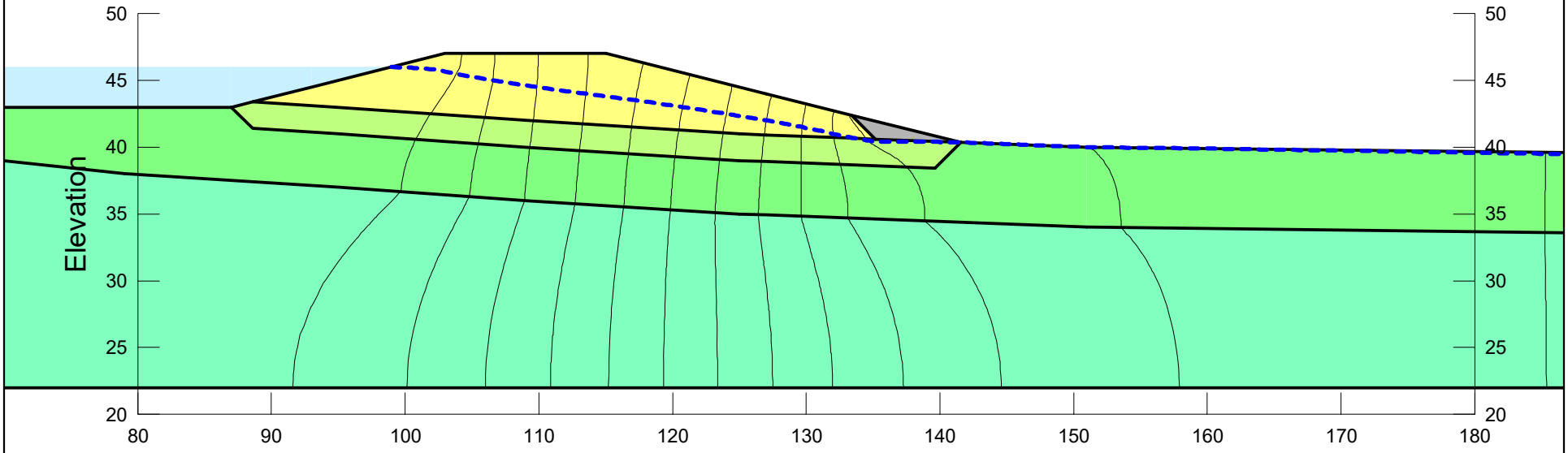
Color	Name	Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio
	Berm - SP-SM	Saturated Only	3e-005	1
	Soil 1 - SP-SM	Saturated Only	3e-005	1
	Soil 2 - SC and SC with Limestone Fragments	Saturated Only	3e-007	1
	Undercutting/Replacement - SP-SM	Saturated Only	3e-005	1



Mill Creek Sink Water Quality Improvement Project	
XS-1_A.gsz	
7/15/2020	1:140

Figure 1B
Seepage Analysis - Cross Section XS-1, with toe drain
Pool Elev. 46 feet

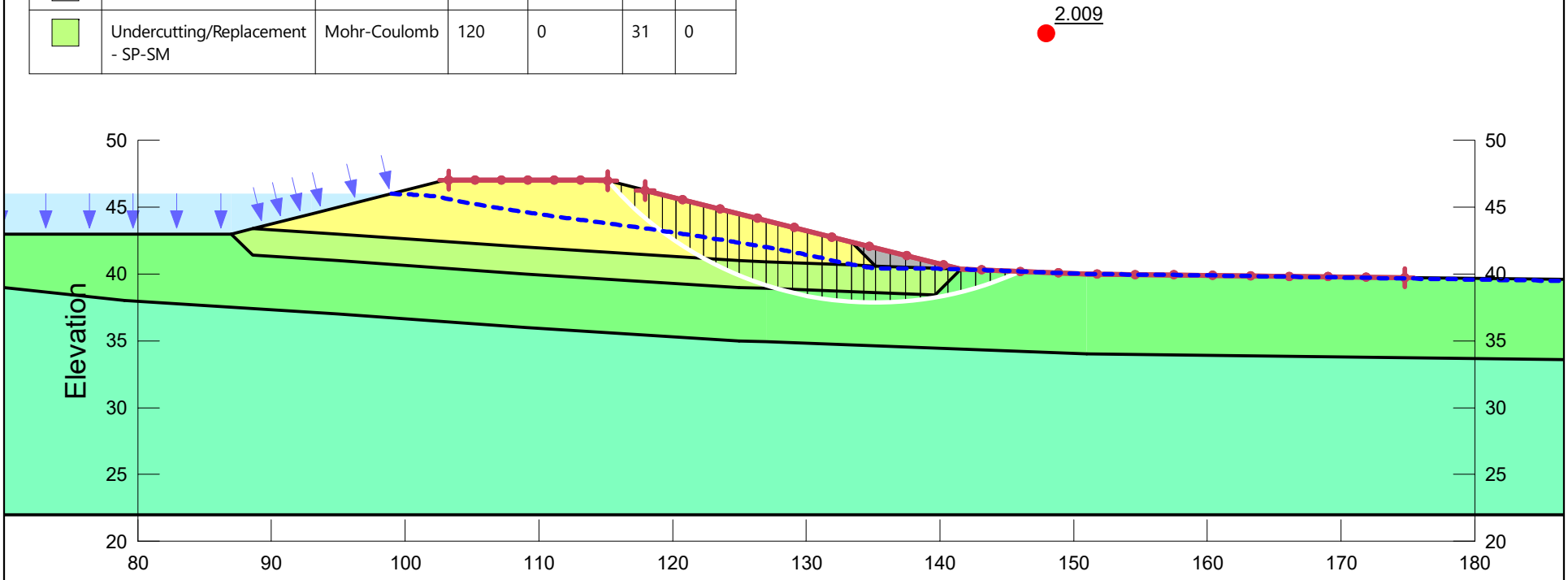
Color	Name	Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio
	Berm - SP-SM	Saturated Only	3e-005	1
	Soil 1 - SP-SM	Saturated Only	3e-005	1
	Soil 2 - SC and SC with Limestone Fragments	Saturated Only	3e-007	1
	Toe Drain - GP	Saturated Only	0.03	1
	Undercutting/Replacement - SP-SM	Saturated Only	3e-005	1



Mill Creek Sink Water Quality Improvement Project	
XS-1_B.gsz	
7/15/2020	1:140

Figure 1C
Stability Analysis - Cross Section XS-1, with toe drain
Pool Elev. 46 feet

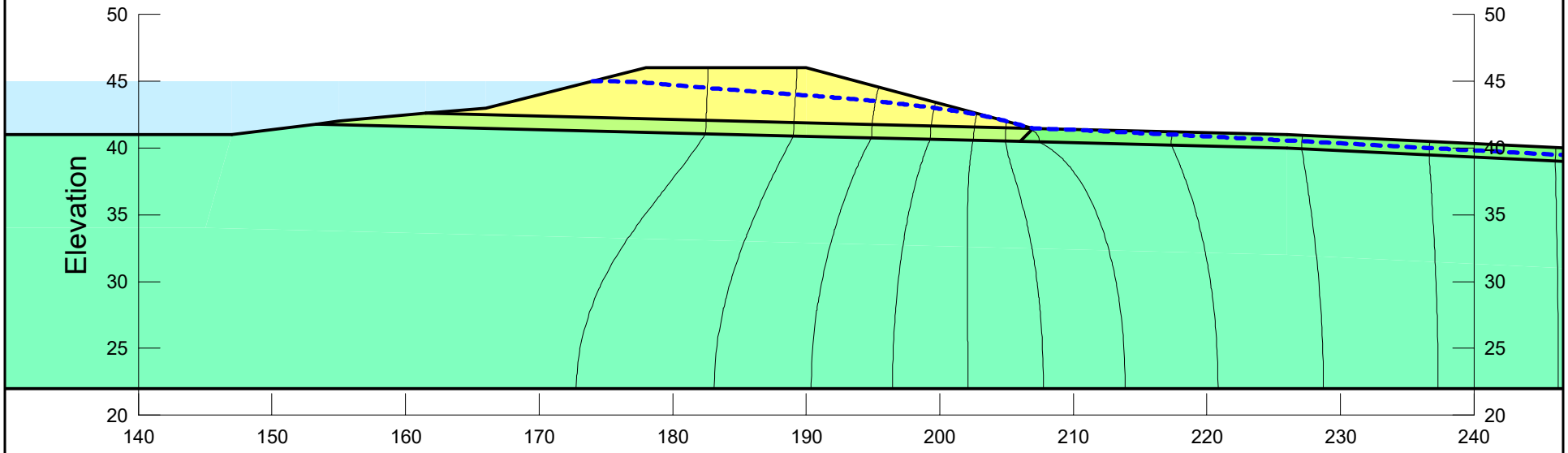
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Berm - SP-SM	Mohr-Coulomb	120	0	31	0
	Soil 1 - SP-SM	Mohr-Coulomb	120	0	31	0
	Soil 2 - SC and SC with Limestone Fragments	Mohr-Coulomb	110	0	26	0
	Toe Drain - GP	Mohr-Coulomb	110	0	36	0
	Undercutting/Replacement - SP-SM	Mohr-Coulomb	120	0	31	0



Slope Stability	
XS-1_B.gsz	
8/5/2020	1:140

Figure 2A
Seepage Analysis - Cross Section XS-2
Pool Elev. 45 feet

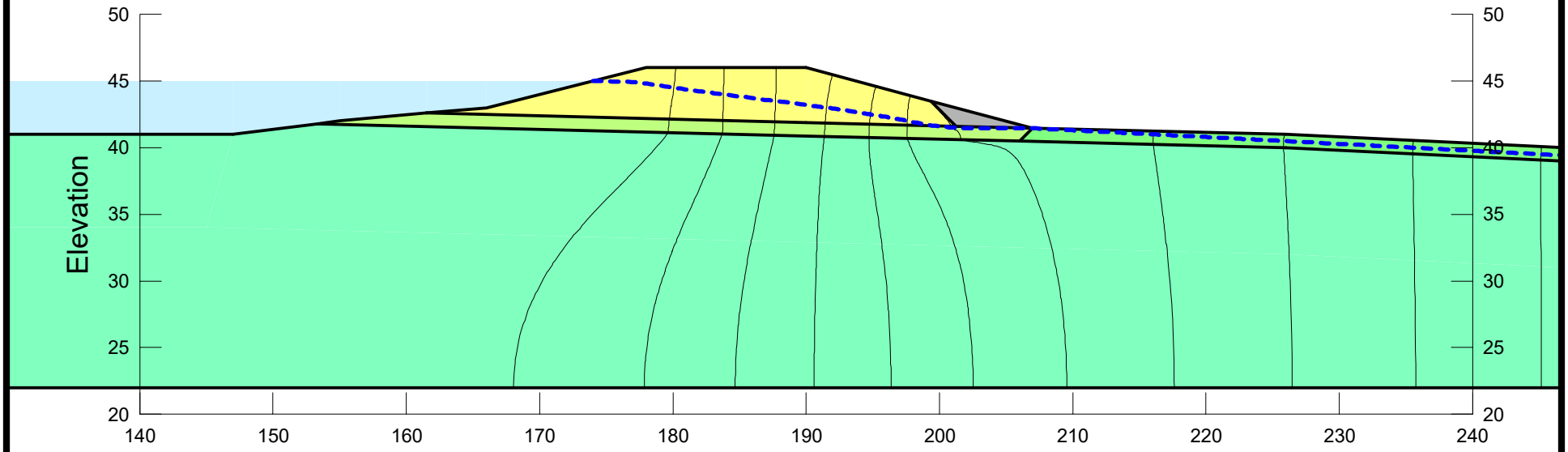
Color	Name	Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio
	Berm - SP-SM	Saturated Only	3e-005	1
	Soil 1 - SP-SM	Saturated Only	3e-005	1
	Soil 2 - SC and SC with Limestone Fragments	Saturated Only	3e-007	1
	Undercutting/Replacement - SP-SM	Saturated Only	3e-005	1



Mill Creek Sink Water Quality Improvement Project	
XS-2_A.gsz	
7/15/2020	1:140

Figure 2A
Seepage Analysis - Cross Section XS-2
Pool Elev. 45 feet

Color	Name	Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio
	Berm - SP-SM	Saturated Only	3e-005	1
	Soil 1 - SP-SM	Saturated Only	3e-005	1
	Soil 2 - SC and SC with Limestone Fragments	Saturated Only	3e-007	1
	Toe Drain - GP	Saturated Only	0.03	1
	Undercutting/Replacement - SP-SM	Saturated Only	3e-005	1



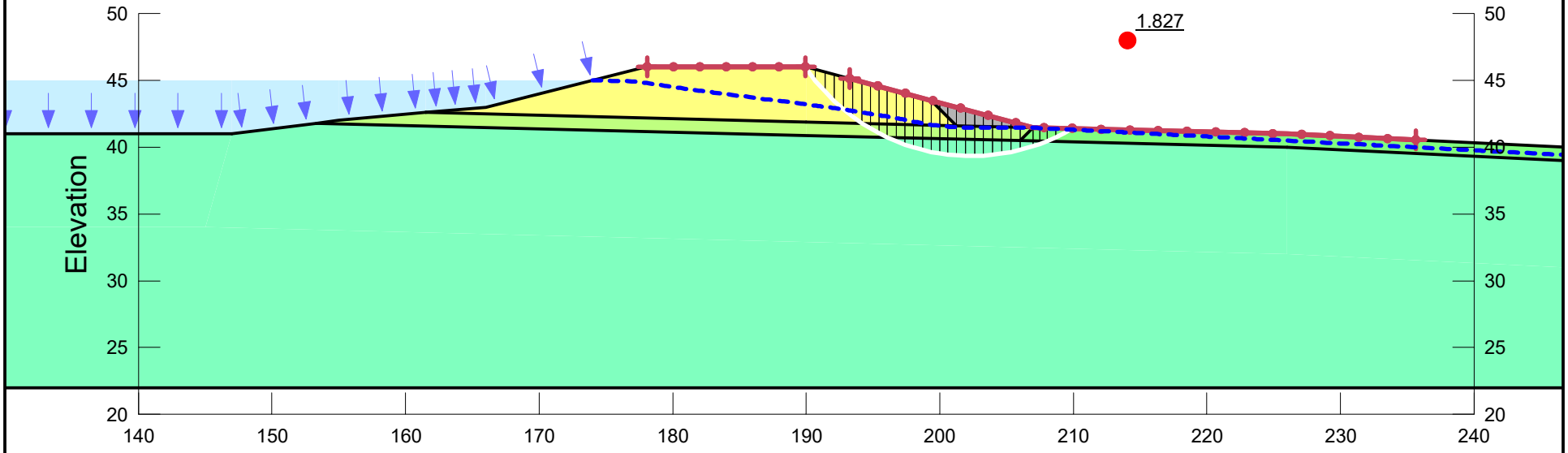
Mill Creek Sink Water Quality Improvement Project

XS-2_B.gsz

7/15/2020 1:140

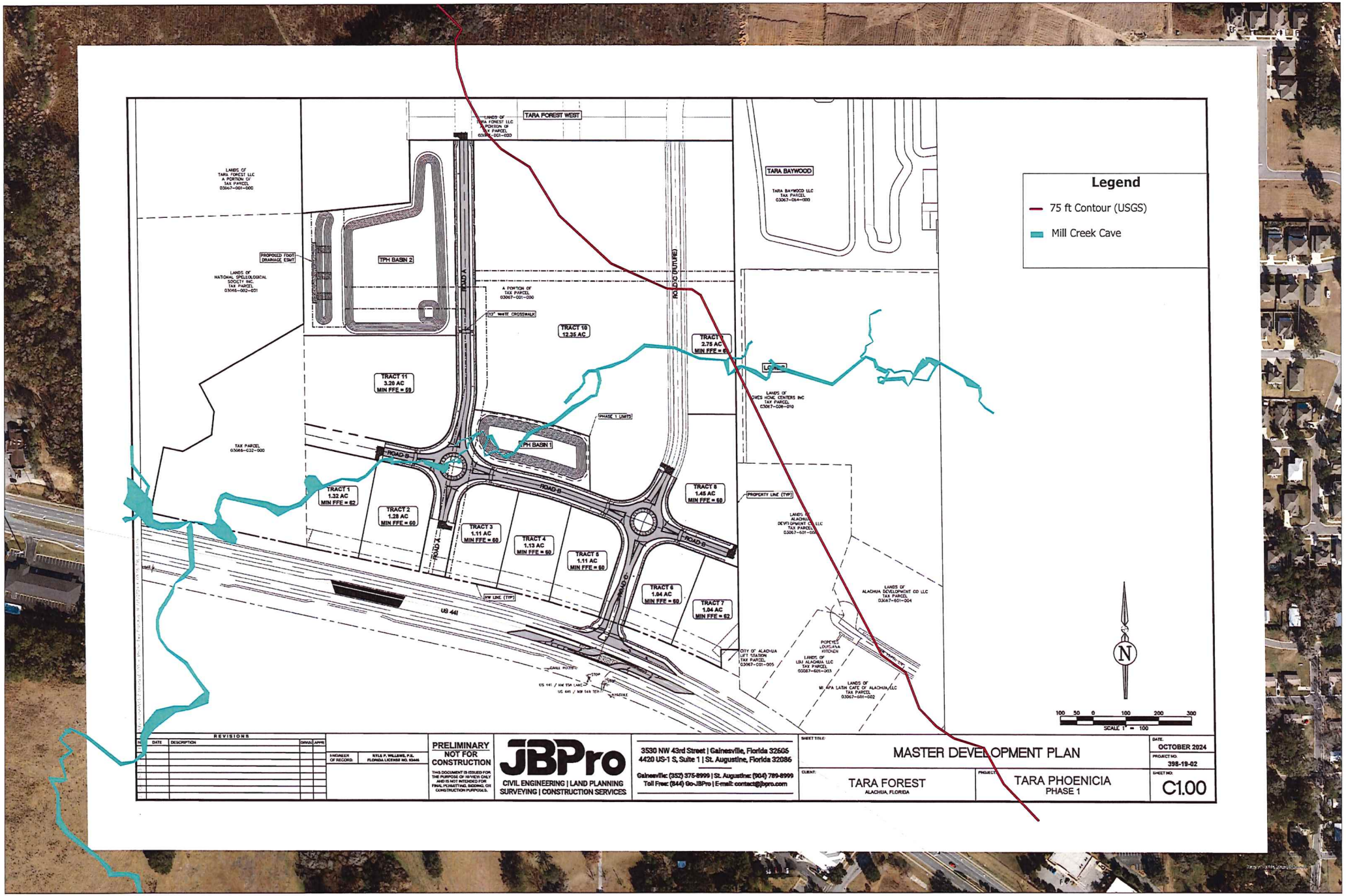
Figure 2C
Stability Analysis - Cross Section XS-2, with toe drain
Pool Elev. 45 feet

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)	Phi-B (°)
	Berm - SP-SM	Mohr-Coulomb	120	0	31	0
	Soil 1 - SP-SM	Mohr-Coulomb	120	0	31	0
	Soil 2 - SC and SC with Limestone Fragments	Mohr-Coulomb	120	0	26	0
	Toe Drain - GP	Mohr-Coulomb	110	0	36	0
	Undercutting/Replacement - SP-SM	Mohr-Coulomb	120	0	31	0



Slope Stability	
XS-2_B.gsz	
8/5/2020	1:140

Attachment C



REVISIONS

NO.	DATE	DESCRIPTION	DRWN	APPR

ENGINEER OF RECORD: KYLE P. WILLIAMS, P.E. FLORIDA LICENSE NO. 93446

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SHEET TITLE: MASTER DEVELOPMENT PLAN

CLIENT: TARA FOREST
ALACHUA, FLORIDA

PROJECT: TARA PHOENICIA
PHASE 1

DATE: OCTOBER 2024
PROJECT NO.: 398-19-02
SHEET NO.: C1.00

Attachment D

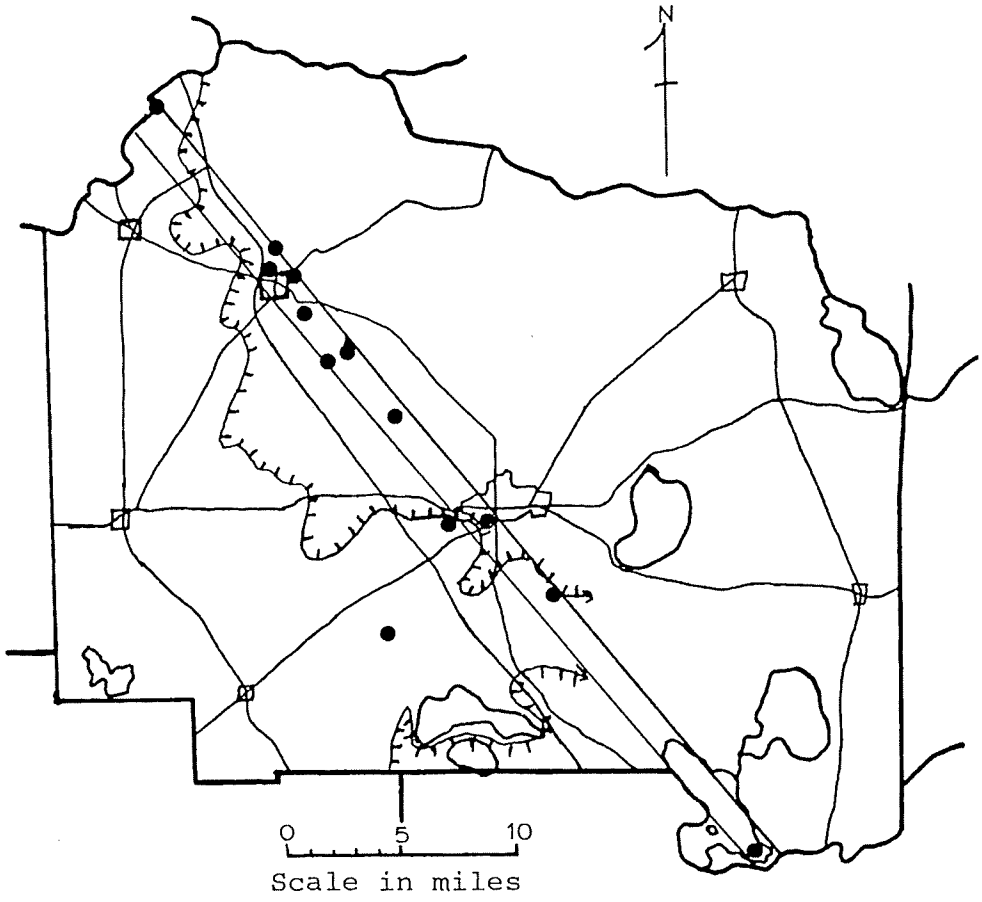

Figure 10. Cross-County Fracture Zone.