APPENDIX B:

SOIL BORINGS

Soils & Engineering Services, Inc.

December 9, 2019 Project 13300.31 R01

Ms. Sarah Lerner, LEED AP, RLA
City of Madison Parks Division
City-County Building, Room 104
210 Martin Luther King, Jr. Boulevard
Madison, Wisconsin 53703-3342

Subject: Preliminary Geotechnical Exploration and Analyses Report
Site Fill
Eagle Trace Park
10321 White Fox Lane
City of Madison
Dane County, Wisconsin

Dear Ms. Lerner:

We have completed the requested exploration consisting of the performance of one soil boring and associated laboratory testing. The purpose of this boring was to obtain information about the soil, bedrock, and water conditions at the boring location. We present our findings and preliminary comments and recommendations in the enclosed *Preliminary Geotechnical Exploration and Analyses Report* for the subject project.

Respectfully submitted,

SOILS & ENGINEERING SERVICES, INC.

Craig M. Bower

Craig M. Bower, P.E.

CMB:DER:cmb

Enclosure

Delivered by email: Slerner@cityofmadison.com

1102 Stewart Street
Madison, WI 53713-4648
Phone: 608-274-7600
888-866-7645
Fax: 608-274-7511
www.soils.ws
soils@soils.ws

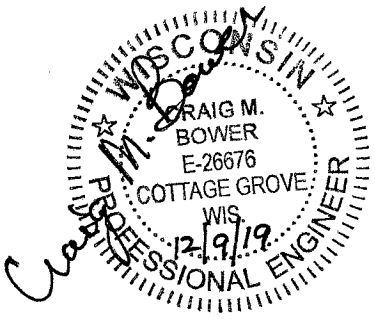
PRELIMINARY GEOTECHNICAL EXPLORATION AND ANALYSES REPORT

SITE FILL
EAGLE TRACE PARK
10321 WHITE FOX LANE
CITY OF MADISON
DANE COUNTY, WISCONSIN
SES Project Number 13300.31

Prepared By

Soils & Engineering Services, Inc.
1102 Stewart Street
Madison, Wisconsin 53713-4648
phone: (608) 274-7600
e-mail: soils@soils.ws

Craig M. Bower, P.E.



Submitted To

City of Madison Parks Division
City-County Building, Room 104
210 Martin Luther King, Jr. Boulevard
Madison, Wisconsin 53703-3342
Phone: (608) 261-4281

Ms. Sarah Lerner, LEED AP, RLA

December 9, 2019

TABLE OF CONTENTS

LIST OF REPORT SECTIONS

TABLE OF CONTENTS

LIST OF APPENDICES

I. INTRODUCTION

This *Preliminary Geotechnical Exploration and Analyses Report* summarizes the findings of the geotechnical exploration and laboratory tests performed for providing comments and recommendations regarding the filling of the Eagle Trace Park site located at 10321 White Fox Lane in the City of Madison in Dane County, Wisconsin. We completed this work under the general direction of City of Madison Parks Division who established the general scope of the work.

The intent of this preliminary report is to: (1) convey the geotechnical information obtained from one soil boring; (2) present the results of laboratory and field tests; (3) present our comments and recommendations for site filling; and (4) present preliminary structure comments. We recommend City of Madison Parks Division employ Soils & Engineering Services, Inc. to make observations and perform tests at the time of excavation and construction of the proposed improvements to verify the subsurface conditions encountered by the exploration performed, and to validate our comments, analyses, and recommendations presented in this report for the subject improvements.

II. PROJECT DESCRIPTION

The Eagle Trace Park site is currently being developed. We understand the development plans call for raising the grade at the park site by several feet. On November 18, 2019, you requested Soils & Engineering Services, Inc. to provide geotechnical recommendations on the placement of the fill in the park site.

III. GEOTECHNICAL EXPLORATION

The geotechnical field exploration consisted of the performance of one soil boring (designated Boring 1).

A. Boring Location

We located Boring 1 in the general vicinity that you requested. We show the boring location on the Location Sketch, Drawing 13300.31-1, enclosed in Appendix A.

B. Boring Elevations

We did not determine the ground surface elevation at the boring location after completion of the drilling and sampling. We set the ground surface at 0 feet of depth

for the soil boring on the Boring Log Record enclosed in Appendix A. We plotted the Boring Log Record with depth scales for reference.

C. Drilling and Sampling Procedures

The exploration plan was to complete Boring 1 to a depth of 15 feet below existing grade. We drilled and sampled the boring to the planned depth.

We used 2¼-inch-inside-diameter hollow-stem augers (HSA) for the boring to maintain an open borehole as we advanced the boring to the termination depth. As we advanced the borehole of this boring, we obtained soil samples at 2½-foot intervals starting at a depth of 1-foot below the ground surface and continued to a depth of 10 feet. We increased the sampling interval to 5 feet from a depth of 10 feet to the boring termination depth. We performed this sampling using a 2-inch-outside-diameter split-barrel sampler according to ASTM Designation D1586. We visually identified the recovered soils in general compliance with the Unified Soil Classification System (USCS) identification procedures as defined in ASTM Designation D2488.

Please refer to the Boring Log Record enclosed in Appendix A for additional information regarding the drilling and sampling of this boring. We provide information pertinent to the Boring Log Record on the Notes and Legend Record enclosed in Appendix A.

D. Subsurface Stratigraphy

In general terms, we characterize the soil stratigraphy encountered at Boring 1 as fill material overlying native soil strata. This boring encountered bedrock within the depth drilled.

Boring 1 encountered 7 inches of very dark brown LEAN CLAY FILL TOPSOIL over 17 inches of brown fine SILTY SAND (SM) FILL over 24 inches of brown LEAN CLAY (CL) FILL over 12 inches of red and black fine to coarse POORLY-GRADED GRAVEL (GP) FILL.

Below the fill material, Boring 1 encountered a native soil strata consisting of brown fine SILTY SAND (SM) over brown LEAN CLAY (CL).

Below the native soil stratification, Boring 1 encountered yellowish-brown and orange highly-weathered SANDSTONE bedrock.

Please refer to the Boring Log Record enclosed in Appendix A for a further description of the fill material, native soil strata, and bedrock encountered at the location of Boring 1.

E. Subsurface Water

Our drilling crew found the borehole of the boring performed to be dry and caved at a depth of 12.5 feet at the completion of the drilling and sampling at this boring.

We expect the subsurface (groundwater) level to fluctuate as influenced by precipitation, snowmelt, surface water runoff, and other hydrological and hydrogeological factors. The groundwater level at the time of construction of the subject project may be higher or lower than the groundwater level encountered on the day that we performed the boring.

IV. LABORATORY AND FIELD TESTS

A. Laboratory Tests

We performed laboratory tests on a portion of selected split-barrel soil samples to determine the physical properties of the fill material and underlying native soil strata encountered at the boring location. The laboratory tests on the selected material from the split-barrel soil samples consisted of determining the moisture content (MC), Atterberg limits (liquid limit [LL] and plastic limit [PL]), and the percentage of soil particles passing the No. 200-mesh sieve (P_{200}). In addition to the above tests, we tested some of the cohesive soils for approximate unconfined compressive strength (q_p) using a spring penetrometer.

We include the laboratory test results obtained for this report on the Boring Log Record and Laboratory Test Result Record (Figure 1) enclosed in Appendix A. We used the results from the Atterberg limits and P_{200} tests to confirm or modify the USCS soil identifications in general compliance with USCS classification procedures as defined in ASTM Designation D2487.

B. Field Tests

The field tests consisted of the performance of the standard penetration resistance test (SPT) for Boring 1. We performed the SPT during the sampling procedure at this boring. It consists of driving the split-barrel sampler up to 18 inches with a 140-pound hammer weight falling 30 inches. From the SPT, we obtain the N-value which

is the sum of the number of blows required to drive the split-barrel sampler the last 12 inches or portion thereof as noted on the Soil Boring Records.

We include the N-value results obtained for this report on the Boring Log Record enclosed in Appendix A.

C. Test Results Discussion

The laboratory and field tests indicated the following:

- The brown fine SILTY SAND (SM) FILL is in a moist relative moisture condition and in a medium dense state of relative density.
- The brown LEAN CLAY (CL) FILL is in a moist relative moisture condition and of stiff consistency.
- The red and black fine to coarse POORLY-GRADED GRAVEL (GP) FILL is in a moist relative moisture condition and in a very dense state of relative density.
- The brown fine SILTY SAND (SM) is in a moist relative moisture condition and in a very loose state of relative density.
- The brown LEAN CLAY (CL) is in a moist relative moisture condition and of very soft to soft consistency.
- The yellowish-brown and orange highly-weathered SANDSTONE bedrock is in a moist relative moisture condition and in a medium dense state of relative density.

We utilized the laboratory and field test results in our evaluation of the soils to provide comments and recommendations for the filling of the subject site.

V. CONCLUSIONS

We offer the following general comments regarding the soils encountered by the boring:

- The boring encountered 7 inches of topsoil.
- Below the topsoil, Boring 1 encountered 41 inches of moderate to high strength fill soil.

- Below the fill soil, Boring 1 encounter low strength native granular soil over very low to low strength native cohesive soil.

- Below the native soil strata, Boring 1 encountered moderate strength bedrock within the depth drilled.

Based on the soil information obtained, placement of fill material to raise the grade for the proposed park is feasible. Due to the very low to low strength native soil strata, we recommend additional soil borings at the location of specific park structures for the purposes of determining a suitable foundation support system for said structures. Depending upon the bearing capacity required for said structures, a deep foundation system, such as helical piers, may be needed to transfer the structure loads to the moderate strength bedrock below.

VI. COMMENTS AND RECOMMENDATIONS

Based on the soil boring information and laboratory tests performed, we offer the following comments and recommendations regarding the site filling of Eagle Trace Park located on White Fox Lane in the City of Madison, Dane County, Wisconsin.

A. Building Support

As stated above, Boring 1 encountered very low to low strength native soil strata which will be susceptible to consolidation under the proposed site filling and under any proposed building. Consolidation of soils results in settlement of the ground surface and any improvements. The degree of settlement is a function of the additional load that is imposed on the very low to low strength native soil encountered. The higher the load, the higher the settlement. Therefore, we recommend additional soil borings be completed at the location of specific improvements to obtain information regarding the type and strength of the subsurface materials present at each improvement.

B. Initial Site Preparation

Initial site preparations should include removing existing topsoil and vegetation (including trees and tree roots). The boring found the surficial topsoil to be 7 inches in thickness. The thickness of the topsoil encountered elsewhere on the project site could be more or less than what was encountered by our soil boring. The topsoil could be stockpiled for reuse in landscaped areas.

We expect the selected earthwork contractor can accomplish removal of the above surficial materials with normal earth-moving equipment.

After completion of these site preparations and prior to placement of any fill material to raise the grade, we recommend exposed granular material be thoroughly compacted and that exposed cohesive material be proof-rolled as follows:

- We recommend thorough compaction be performed using a large self-propelled vibratory, steel-drum compactor. Exposed granular soil should be compacted to a density of at least 95 percent of the maximum dry density determined for the soil according to ASTM Designation D 1557 for a minimum depth of 18 inches below the excavation surface. Below designated landscaped areas, the minimum soil compaction requirement can be reduced to achieve 90 percent.

  The compacted native soil should be tested by Soils & Engineering Services, Inc. personnel to verify that the minimum density is achieved before placing any new fill material. If the exposed granular soils cannot be compacted, excavation undercut may be necessary. New fill material, as specified herein, can then be placed to reach the proposed finished grades.

- We recommend proof-rolling be performed using a heavily-loaded triaxle truck or similar heavy pneumatic rubber-tire construction equipment. The proof-rolling procedure should be observed by Soils & Engineering Services, Inc. The purpose of proof-rolling is to identify and delineate low-strength and unstable subgrade soil that may be present as evidenced by rutting, yielding, or pumping of the subgrade surface. If unstable subgrade areas are encountered, the unstable soil should be undercut to firm, competent subgrade soil. Granular fill material or crushed stone placed and compacted should be used to replace the unstable soil.

  Following acceptance of the exposed excavation surface, new fill material, as specified herein, can be placed to raise the grade to reach the proposed finished grades.

C. Landscaped Area Fill

We recommend the material used to raise the grade below landscaped areas consist of "Fill" as described in Article 202.2(a) of the 2019 City of Madison *Standard Specifications for Public Works Construction* (SSPWC). We recommend the material be placed and compacted in accordance with the specifications described as "Standard Compaction" as specified in Article 202.3(b) of the 2019 Madison SSPWC. Standard Compaction specifications require that the fill material

should be placed in maximum 12-inch-thick lifts with each lift compacted until no further appreciable consolidation is evidenced under the action of the compaction equipment.

Improper or poor densification of the fill material placed in landscaped areas could result in settlement of the soils and subsequent depressions in the landscaped area surface. Additionally, compaction of material that is too dry could result in settlement of the soils after the moisture content of the material increases due to surface water permeation, and material that is spongy or rutting under the travel of the construction equipment should be disced and dried to lower the moisture content of the material. We recommend the fill material placed in landscaped areas be placed with the moisture content of the material within 3 percent of the optimum moisture content of the material. The optimum moisture content of the fill material should be obtained in accordance with ASTM Designation D1557.

D. Structure/Paved Area Fill

We recommend the material used to raise the grade below proposed building areas or other structures and proposed paved areas consist of "Select Fill" as described in Article 202.2(b) of the 2019 Madison SSPWC. We recommend the material be placed and compacted in accordance with the specifications described as "Special Compaction" as specified in Article 202.3(c) of the 2019 Madison SSPWC. Special Compaction specifications require that the granular fill material should be placed in maximum 12-inch-thick lifts with each lift compacted to a density of at least 95 percent of the maximum density for the upper 6 feet of the embankment and to a density of at least 90 percent of the maximum density below 6 feet. The maximum density of the granular fill material should be obtained in accordance with ASTM Designation D1557.

The above percent compaction specifications are appropriate for paved areas. For under building areas, we recommend that the material be compacted to 95 percent of the maximum density for the entire depth of the fill placement.

We recommend that the Select Fill placed below areas prepared for structures and paved areas extend horizontally outward from the anticipate maximum exterior extents of the proposed improvement at least 1 foot for every vertical foot of fill placed.

E. Coarse Crushed Stone

If needed due to site conditions at the time of construction, a coarse crushed stone may be needed to stabilize the exposed soils. Placement of a separation-type

geotextile may also be needed dependant upon the type and strength of material disturbed. We recommend the coarse crushed stone consist of breaker run as described in Article 202.2(b) of the 2019 Madison SSPWC and the separation-type geotextile meet the specifications for Type SAS geotextile as described in Article 201.3(b) of the Madison SSPWC.

F. Fill Material Monitoring

We recommend the compactive effort of the Landscaped Area Fill, Structure/Paved Area Fill, and Coarse Crushed Stone be monitored during construction by Soils & Engineering Services, Inc. personnel at regular depths and intervals to verify that the minimum density has been achieved, especially during initial placement of the fill material. Any compacted lift that does not meet the specified density should receive additional compactive effort and then be retested until the required density has been achieved. Subsequent lifts should not be placed until the specified minimum density has been achieved on the preceding lift.

G. Cold Weather Fill Material Placement

During cold weather conditions, Landscaped Area Fill, Structure/Paved Area Fill, and Coarse Crushed Stone used to backfill any excavation or to raise the grade should not be deposited over frozen soil, either frozen native soil or frozen fill material. Also, any of the fill materials to be placed and compacted should not be frozen or contain snow or ice.

H. Suitability of On-Site Soils

The existing fill/native topsoil and native cohesive soil are not suitable to use as fill material beneath proposed structures or pavements, or as material to be placed to backfill the below-grade section of foundation elements. Excavated fill/native topsoil could be stockpiled for use in landscaped areas only.

Existing granular native soil could be used as backfill material as long as the moisture content of the soil is in the proper range to obtain the required density at the time of compaction.

I. Site Grading Recommendations

Surface water from precipitation runoff if allowed to accumulate within the construction area can cause problems with construction. The contractor should grade the site to drain surface water away from the construction areas. Water accumulations in the construction area should be promptly removed. Any soil

softened, loosened or disturbed by water should be excavated, removed and replaced with compacted granular fill material or coarse crushed stone. Temporary surface water diversion structures, such as ditches and berms, could be constructed in areas where surface water drainage into the work area is encountered.

J. Project Safety

Safety precautions, such as those required by OSHA and the Wisconsin Department of Safety and Professional Services, should be followed throughout the entire construction of the proposed project. They include, but are not limited to, the proper sloping and/or support of excavation sidewalls and adjacent embankments, roadways, access ramps, sidewalks, utility lines, towers, and/or buildings.

VII. CLOSING COMMENTS

Soils & Engineering Services, Inc. prepared this report for the exclusive use of the City of Madison Parks Division to aid in the filling of the Eagle Trace Park site located at 10321 White Fox Lane in the City of Madison in Dane County, Wisconsin. The recommendations in this report are based on the project information provided to our office. Soils & Engineering Services, Inc. should review any changes in the nature, design, or location of the proposed improvements after submittal of this *Preliminary Geotechnical Exploration and Analyses Report* to revise the recommendations in the report, if necessary. The nature and extent of soil or groundwater variations may not become evident until the time of excavation or construction of the subject project. If soil or groundwater variations are evident at the time of excavation or construction, it will be necessary for Soils & Engineering Services, Inc. to re-evaluate the soil and groundwater, and other site conditions, which may result in the revision of our recommendations in this report.

Please read the *Important Information about This Geotechnical-Engineering Report* advisory sheet enclosed in Appendix B which provides comments about how to interpret and use this *Preliminary Geotechnical Exploration and Analyses Report* for the Site Fill project.

Soils & Engineering Services, Inc. should review the final design and specification documents for this project to verify that our recommendations regarding the proposed improvements are interpreted correctly and implemented in the design of the subject project as they are intended. We recommend that Soils & Engineering Services, Inc. be present at the time of construction to observe compliance with the design concept and specifications, and to provide recommendations to modify the design if subsurface conditions differ from those anticipated prior to construction. It is important that the exposed soil strength, degree of compaction, and other soil properties required be

confirmed and/or determined at the time of excavation and construction activities for the subject project.

The recommendations provided in this report are based on our identification/classification and interpretation of the soils and information given on the Boring Log Record, and may not be based solely on the contents of the driller's field log.

Soils & Engineering Services, Inc. prepared this report for the subject project in accordance with generally accepted geotechnical engineering practices at this time. Soils & Engineering Services, Inc. offers no other expressed or implied warranty.

Soils & Engineering Services, Inc. will store the soil samples obtained from the soil boring performed for this project for a period of 60 calendar days after the date of this report. Please advise us if we should extend this period.

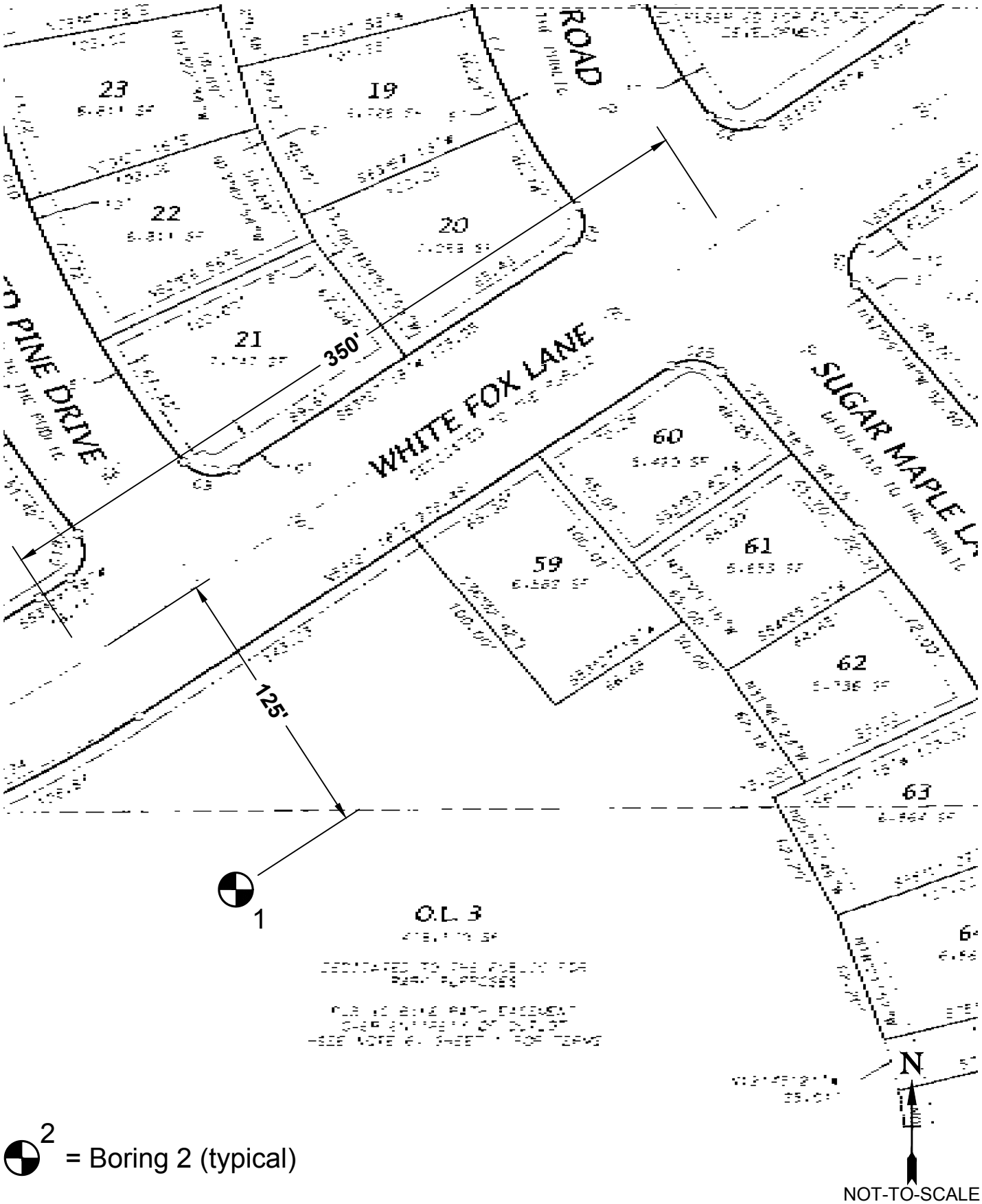
We recommend that this *Preliminary Geotechnical Exploration and Analyses Report*, in its entirety, be made available to bidding contractors or subcontractors for information purposes. The Appendices, Boring Log Record, and/or other attachments referenced in this report should not be separated from the text of this report. This report should be considered invalid if used for purposes other than those described herein.

Soils & Engineering Services, Inc. respectfully submits this *Preliminary Geotechnical Exploration and Analyses Report*, dated December 9, 2019, to the **City of Madison Parks Division**.

APPENDIX A

Appendix A Contents

- Location Sketch, Drawing 13300.31-1
- Notes and Legend Record for Boring Log Record
- Boring Log Record for Boring 1
- Laboratory Test Result Records, Figure 1



Base drawing is page 1 of Exhibit 2 of the Eagle Trace Park Master Plan prepared by the City of Madison Parks Division and dated June 12, 2019.

2 = Boring 2 (typical)

NOT-TO-SCALE

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

LOCATION SKETCH
Eagle Trace Park
10321 White Fox Land
City of Madison, Dane County, Wisconsin

DRAWING 13300.19-1

Created on 11/15/2019 Revised on

NOTES

1. The boundary lines between different soil strata, as shown on the Boring Log Record, are approximate and may be gradual.

2. The boring field log contains a description of the soil conditions between samples based on the equipment performance and the soil cuttings. The Boring Log Record contains the description of the soil conditions as interpreted by a geotechnical engineer and/or a geologist after review of the boring field logs and soil samples and/or laboratory test results.

3. We define "Caved Level" as the depth below the existing ground surface at a boring location where the soils have collapsed into the borehole following removal of the drilling tools.

4. We define "Water Level" as the depth below the existing ground surface at a boring location to the level of water in the open borehole at the time indicated unless otherwise defined on the Boring Log Record.

5. We define "at completion" for a boring as being the time when our drilling crew has completed the removal of all drilling tools from the borehole.

6. The Notes and Legend Record and the Boring Log Record are a part of the geotechnical report. The geotechnical report should be included in the bidding or reference documents.

RELATIVE PERCENTAGE TERMS

no	0%
trace	<5%
few	5 to <10%
little	10 to <30%
some	30 to < 50%

TEST RESULTS LEGEND

q_p = Penetrometer reading, $^{ton}/_{ft^2}$
MC = Moisture Content, % moisture by weight
LL = Liquid Limit, % moisture by weight
PL = Plastic Limit, % moisture by weight
PI = Plasticity Index, % moisture by weight
P_{200} = % Passing the No. 200-mesh Sieve

RELATIVE MOISTURE TERMS AT TIME OF SAMPLING

Frozen or F = Frozen material
Dry = Dusty, dry to touch, absence of moisture
Moist or M = Damp to touch, no visible water
Wet or W = Visible free water

DRILLING METHODS LEGEND

HSA = Continuous flight hollow-stem augers

N-VALUE LEGEND

DS = Drove Stone

SAMPLER TYPE LEGEND

Grab sample

2-inch-outside-diameter, split-barrel sampler

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

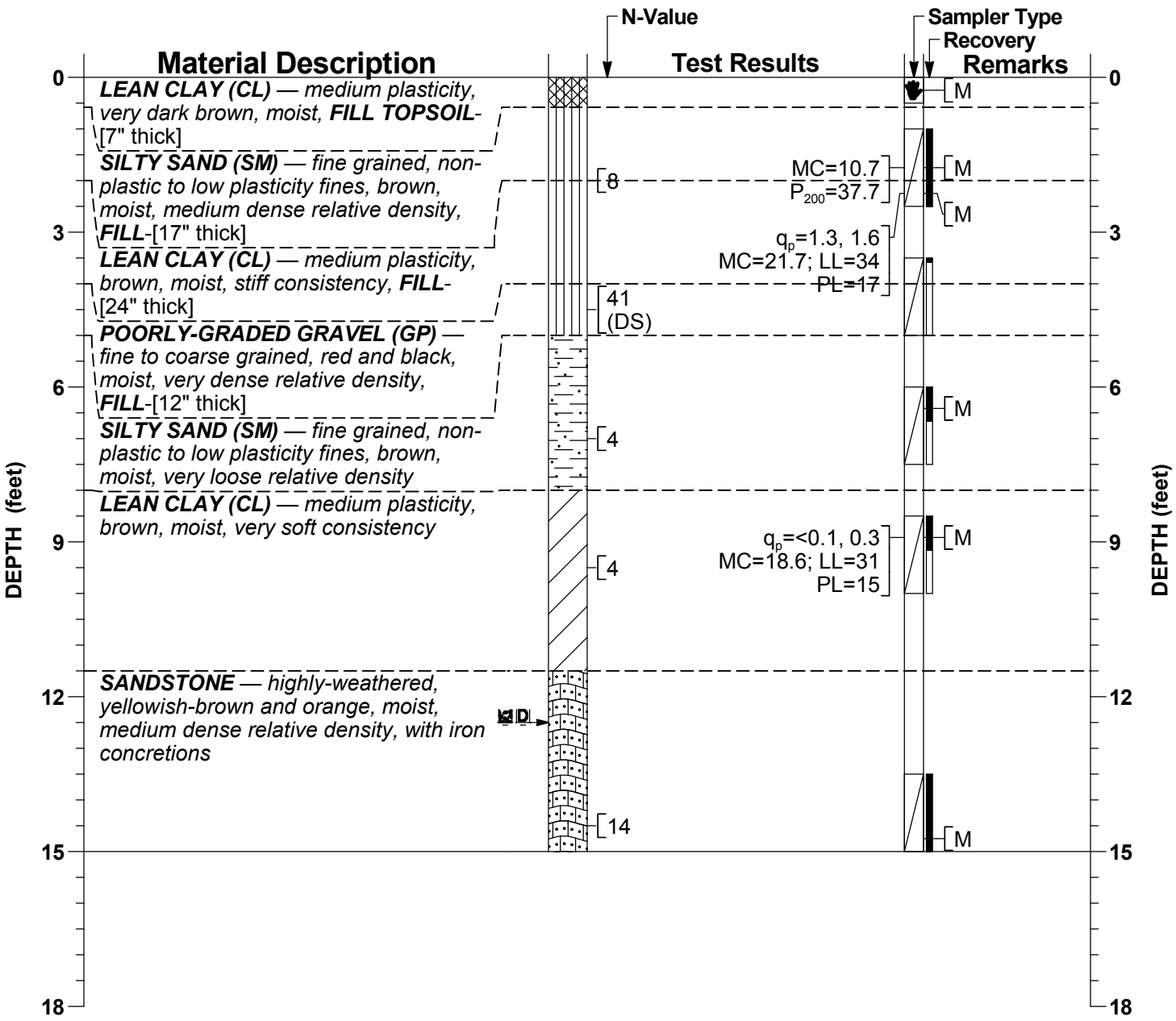
NOTES AND LEGEND RECORD
Eagle Trace Park
10321 White Fox Lane
City of Madison, Dane County, Wisconsin

13300.19

General Location:

Boring 1

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	20	RRR	CME 550X	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Middleton) 7 N	NE	CMB	Automatic	15'-0"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	8 E	SE	CMB	11/15/2019	11/15/2019



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
ID 12'-6" Dry at completion	12'-6" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	15'-0"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Bentonite Chips, Caved Soil

The Notes and Legend Record is considered a part of this Boring Log Record.

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

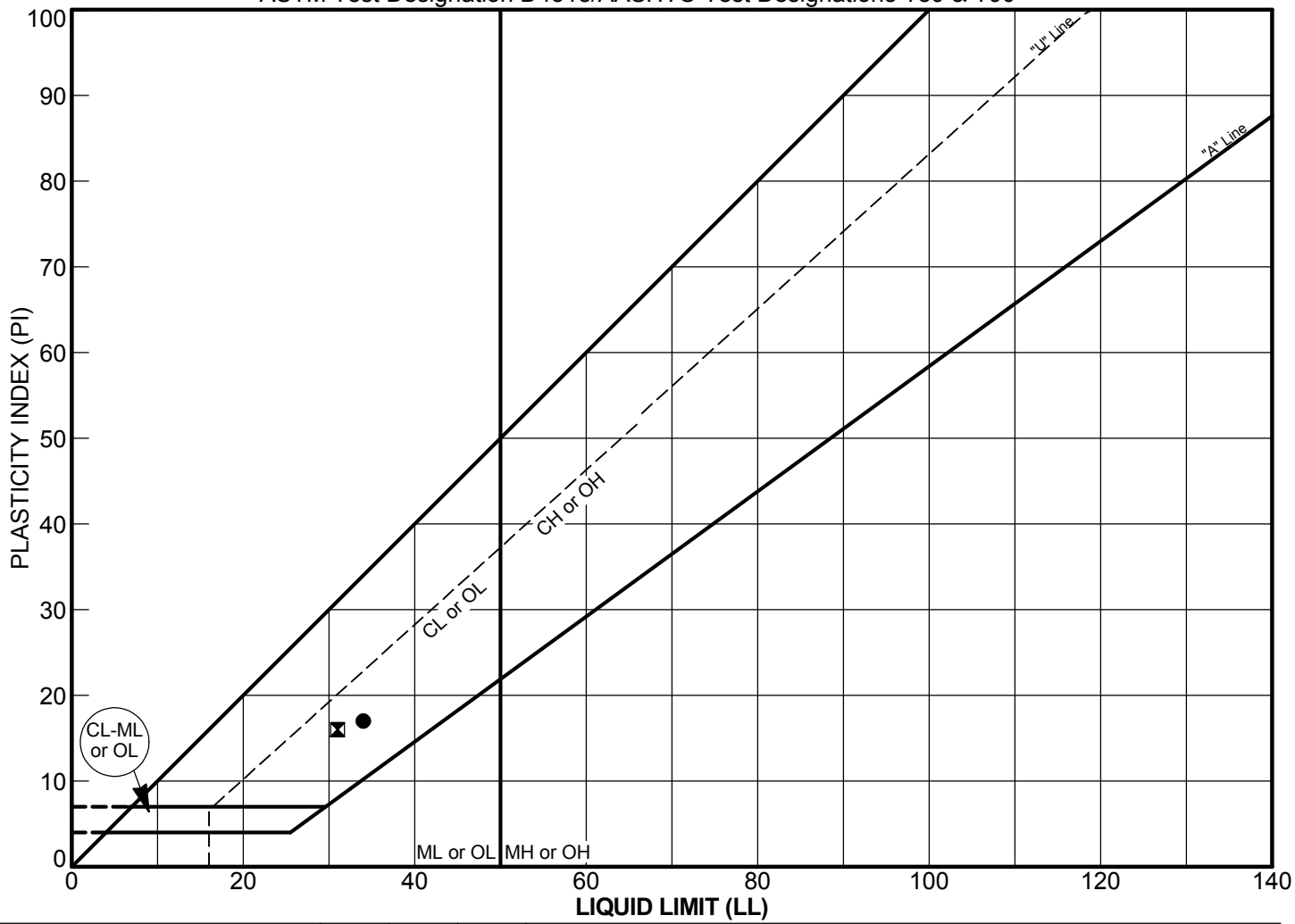
BORING LOG RECORD
Eagle Trace Park
10321 White Fox Lane
City of Madison, Dane County, Wisconsin

13300.19

Printed on 12/4/2019

ATTERBERG LIMITS TEST REPORT

ASTM Test Designation D4318/AASHTO Test Designations T89 & T90



	Specimen Identification	LL	PL	PI	Sample Classification
●	**Boring 1, 2'-3" Depth**	**34**	**17**	**17**	***LEAN CLAY (CL)*** *— medium plasticity, dark brown, moist, stiff consistency,* ***FILL***
⊠	**Boring 1, 8'-11" Depth**	**31**	**15**	**16**	***LEAN CLAY (CL)*** *— medium plasticity, grayish-brown, moist, very soft to soft consistency*

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

LABORATORY TEST RESULT RECORD
Eagle Trace Park
10321 White Fox Lane
City of Madison, Dane County, Wisconsin

13300.19 FIGURE 1

Printed on 12/4/2019

APPENDIX B

Appendix B Contents

- *Important Information about This Geotechnical-Engineering Report* advisory

Important Information about This

Geotechnical-Engineering Report

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

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

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

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

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

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

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

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

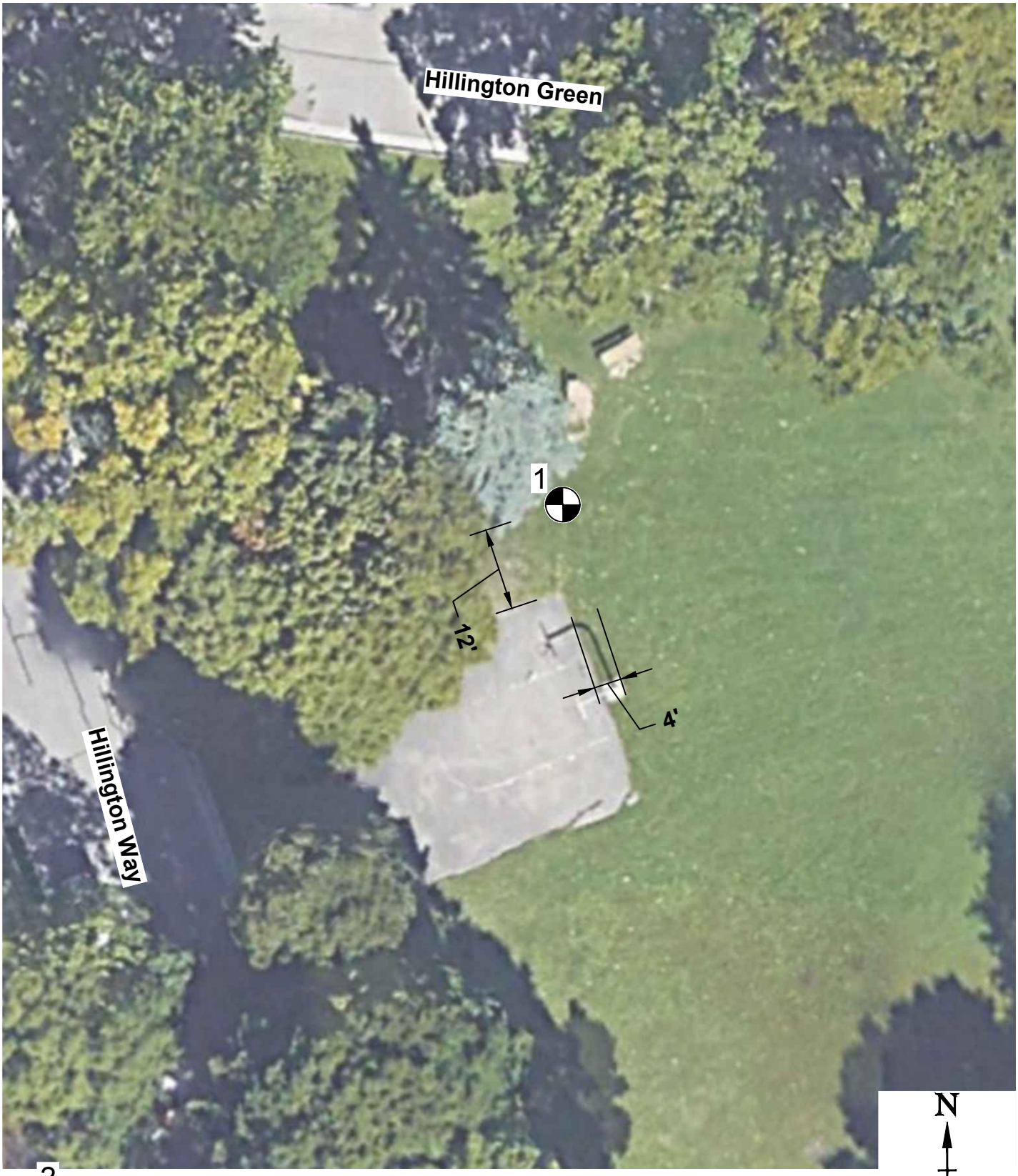
The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org



Map Source: "Hillington Green Park, Madison, WI." Google Earth September 2014 Aerial. Accessed December 16, 2019.

2 = Boring 2 (typical)

N

NOT-TO-SCALE

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws

CONSULTING CIVIL ENGINEERS SINCE 1966

LOCATION SKETCH
Hillington Green Park
435 Hillington Way
City of Madison, Dane County, Wisconsin

DRAWING 13300.21-1

Created on 12/16/2019 Revised on

NOTES

1. The boundary lines between different soil strata, as shown on the Boring Log Record, are approximate and may be gradual.

2. The boring field log contains a description of the soil conditions between samples based on the equipment performance and the soil cuttings. The Boring Log Record contains the description of the soil conditions as interpreted by a geotechnical engineer and/or a geologist after review of the boring field logs and soil samples and/or laboratory test results.

3. We define "Caved Level" as the depth below the existing ground surface at a boring location where the soils have collapsed into the borehole following removal of the drilling tools.

4. We define "Water Level" as the depth below the existing ground surface at a boring location to the level of water in the open borehole at the time indicated unless otherwise defined on the Boring Log Record.

5. We define "at completion" for a boring as being the time when our drilling crew has completed the removal of all drilling tools from the borehole.

6. The Notes and Legend Record and the Boring Log Record should not be separated.

RELATIVE PERCENTAGE TERMS

no	0%
trace	<5%
few	5 to <10%
little	10 to <30%
some	30 to < 50%

TEST RESULTS LEGEND

q_p = Penetrometer reading, $^{ton}/_{ft^2}$

RELATIVE MOISTURE TERMS AT TIME OF SAMPLING

Frozen or F = Frozen material
Dry = Dusty, dry to touch, absence of moisture
Moist or M = Damp to touch, no visible water
Wet or W = Visible free water

DRILLING METHODS LEGEND

HSA = Continuous flight hollow-stem augers

SAMPLER TYPE LEGEND

Grab sample

2-inch-outside-diameter, split-barrel sampler

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws

CONSULTING CIVIL ENGINEERS SINCE 1966

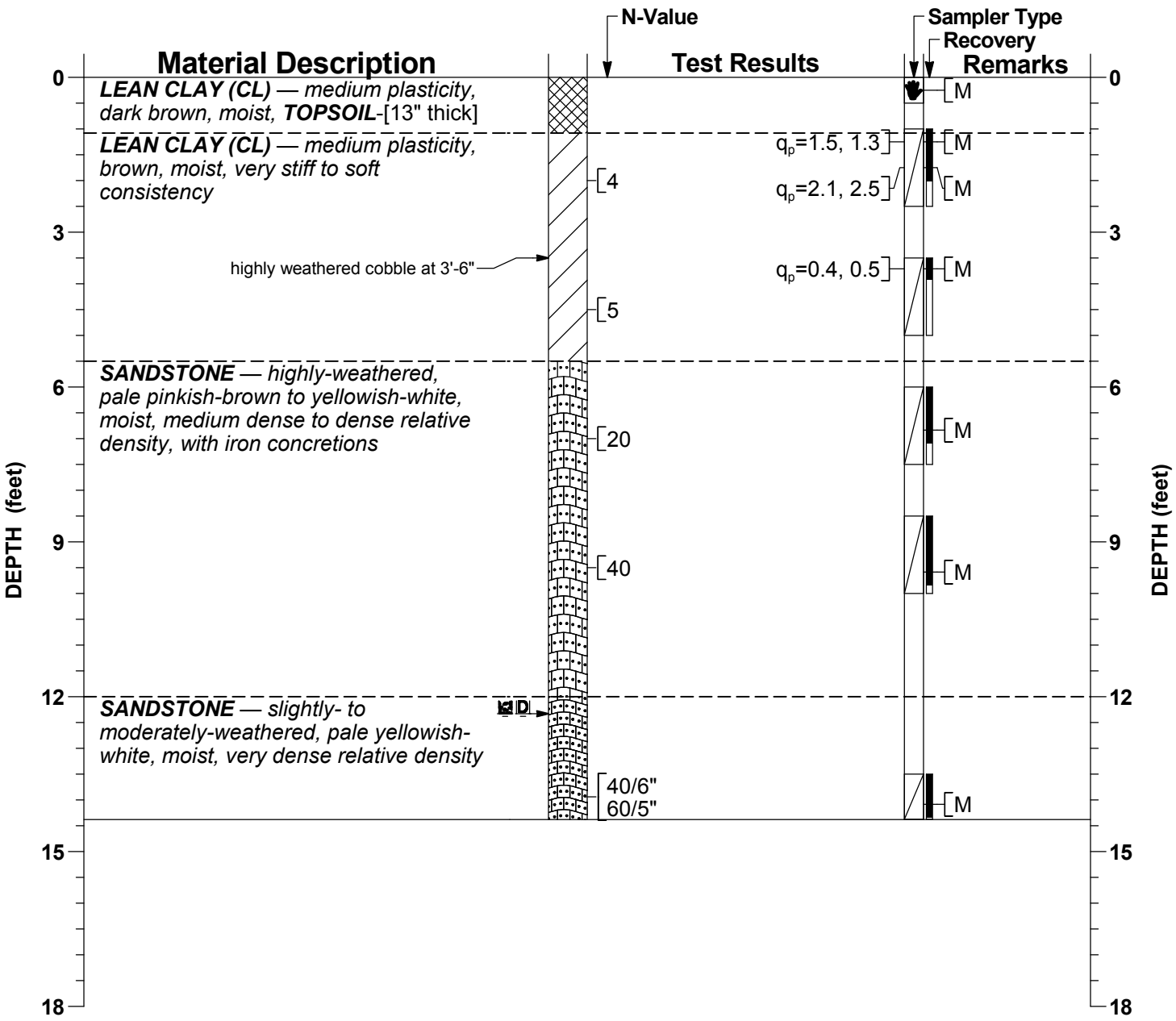
NOTES AND LEGEND RECORD
Hillington Green Park
435 Hillington Way
City of Madison, Dane County, Wisconsin

13300.21

General Location:

Boring 1

LATITUDE: —	LONGITUDE: —	COUNTY: Dane	SECTION: 21	CREW CHIEF: SJH	DRILL RIG: CME 550X	PAGE: 1 of 1
NORTHING: —	EASTING: —	TOWNSHIP: (Madison) 7 N	¼: SE	LOG REVIEW: CMB	HAMMER TYPE: Automatic (80%)	TOTAL DEPTH: 14'-4 1/2"
STATION: —	OFFSET: —	RANGE: 9 E	¼ ¼: SE	LOG QC: CMB	DATE STARTED: 12/10/2019	DATE COMPLETED: 12/10/2019



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
D 12'-4" Dry at completion	12'-4" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	2 1/4"	—	None	0'-0"	14'-4 1/2"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Bentonite Chips, Caved Soil

The Notes and Legend Record is considered a part of this Boring Log Record.

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

BORING LOG RECORD
Hillington Green Park
435 Hillington Way
City of Madison, Dane County, Wisconsin

13300.21

Printed on 12/19/2019

Map Source: "824 Knickerbocker Street, Madison, WI." Google Earth. October 2018 Aerial. Accessed December 17, 2019.

2 = Boring 2 (typical)

N

NOT-TO-SCALE

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

LOCATION SKETCH
Wingra Park
824 Knickerbocker Street
City of Madison, Dane County, Wisconsin

DRAWING 13300.30-1

Created on 12/17/2019 Revised on

NOTES

1. The boundary lines between different soil strata, as shown on the Boring Log Record, are approximate and may be gradual.

2. The boring field log contains a description of the soil conditions between samples based on the equipment performance and the soil cuttings. The Boring Log Record contains the description of the soil conditions as interpreted by a geotechnical engineer and/or a geologist after review of the boring field logs and soil samples and/or laboratory test results.

3. We define "Caved Level" as the depth below the existing ground surface at a boring location where the soils have collapsed into the borehole following removal of the drilling tools.

4. We define "Water Level" as the depth below the existing ground surface at a boring location to the level of water in the open borehole at the time indicated unless otherwise defined on the Boring Log Record.

5. We define "at completion" for a boring as being the time when our drilling crew has completed the removal of all drilling tools from the borehole.

6. The Notes and Legend Record and the Boring Log Record should not be separated.

RELATIVE PERCENTAGE TERMS

no	0%
trace	<5%
few	5 to <10%
little	10 to <30%
some	30 to < 50%

TEST RESULTS LEGEND

q_p = Penetrometer reading, $^{ton}/_{ft^2}$

RELATIVE MOISTURE TERMS AT TIME OF SAMPLING

Frozen or F = Frozen material
Dry = Dusty, dry to touch, absence of moisture
Moist or M = Damp to touch, no visible water
Wet or W = Visible free water

DRILLING METHODS LEGEND

HSA = Continuous flight hollow-stem augers

SAMPLER TYPE LEGEND


Grab sample


2-inch-outside-diameter, split-barrel sampler

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

NOTES AND LEGEND RECORD
Wingra Park
824 Knickerbocker Street
City of Madison, Dane County, Wisconsin

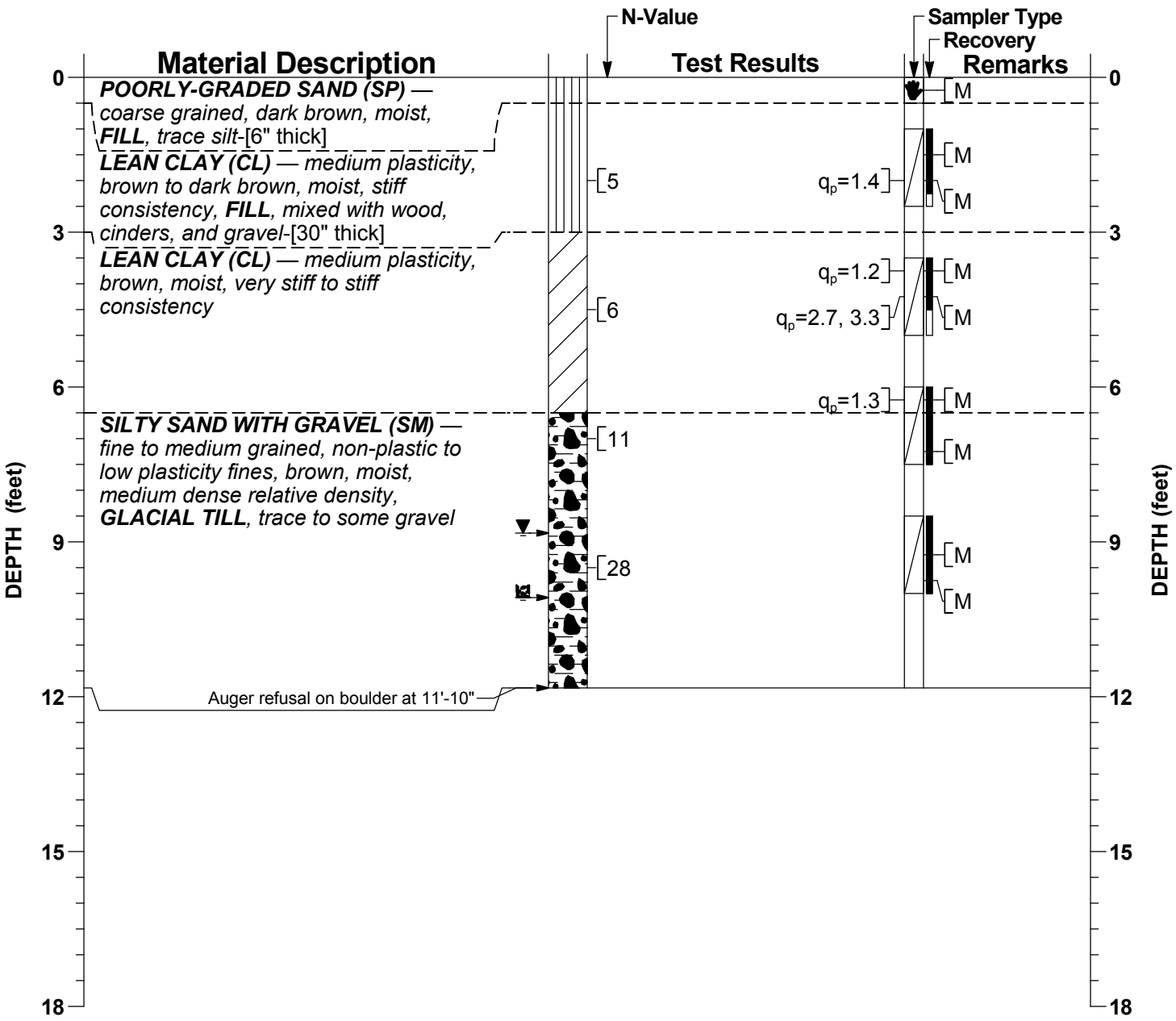
13300.30

Printed on 12/19/2019

General Location:

Boring 1

LATITUDE:	LONGITUDE:	COUNTY:	SECTION:	CREW CHIEF:	DRILL RIG:	PAGE:
—	—	Dane	28	SWK	Geoprobe 7822DT	1 of 1
NORTHING:	EASTING:	TOWNSHIP:	¼:	LOG REVIEW:	HAMMER TYPE:	TOTAL DEPTH:
—	—	(Madison) 7 N	NE	CMB	Automatic (80%)	11'-10"
STATION:	OFFSET:	RANGE:	¼ ¼:	LOG QC:	DATE STARTED:	DATE COMPLETED:
—	—	9 E	NE	CMB	12/06/2019	12/06/2019



WATER LEVEL LEGEND	OTHER LEVEL LEGEND
▼ 8'-10" at completion	10'-1" Caved at completion

DRILL METHOD	TOOL SIZE	CASING SIZE	DRILL FLUID	DEPTH FROM	DEPTH TO	HOLE DIA
HSA	$2^1/_4$"	—	None	0'-0"	11'-10"	6.3"

SAMPLING METHOD(S): ASTM D1586

SURFACE PATCH: —

BACKFILL: Auger Cuttings, Bentonite Chips, Caved Soil

The Notes and Legend Record is considered a part of this Boring Log Record.

Soils & Engineering Services, Inc.
1102 STEWART STREET • MADISON, WISCONSIN 53713
Phone: 608-274-7600 • 888-866-SOIL (7645)
Fax: 608-274-7511 • Email: soils@soils.ws
CONSULTING CIVIL ENGINEERS SINCE 1966

BORING LOG RECORD
Wingra Park
824 Knickerbocker Street
City of Madison, Dane County, Wisconsin

13300.30

Printed on 12/19/2019