PRELIMINARY GEOTECHNICAL REPORT

HENNEPIN COUNTY MEDICAL EXAMINERS SITE

BLOOMINGTON, MN

DECEMBER 19, 2016

Prepared for:
Hennepin County Public Works
701 Fourth Avenue South, Suite700
Minneapolis, MN 55415

WSB PROJECT NO. 03392-010

PRELIMINARY GEOTECHNICAL REPORT

PROPOSED HENNEPIN COUNTY MEDICAL EXAMINERS BUILDING
6701 WEST 78TH STREET
BLOOMINGTON, MINNESOTA

FOR
HENNEPIN COUNTY

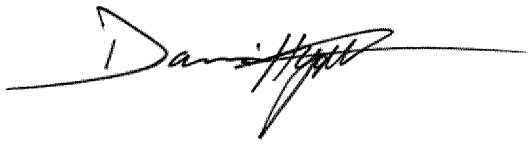
December 19, 2016

Prepared by:

WSB & Associates, Inc.
540 Gateway Boulevard
Burnsville, MN 55337
(952)-737-4660

CERTIFICATION

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Darin E. Hyatt, PE

Date: December 19, 2016 Lic. No. 41316

WSB

540 Gateway Boulevard | Suite 100 | Burnsville, MN 55337 | (952) 737-4660

December 19, 2016

Ms. Brianna D. Boos
Hennepin County Public Works
Environment and Energy Department
Land and Water, Contaminated Lands Unit
701 Fourth Avenue South, Suite 700
Minneapolis, MN 55415-1842

Re: Preliminary Geotechnical Report
Hennepin County Medical Examiners Site
6701 West 78th Street
Bloomington, MN
WSB Project No. 03392-010

Dear Ms. Boos:

We have conducted a preliminary geotechnical subsurface exploration program for the above referenced project. This report contains our soil boring logs, an evaluation of the conditions encountered in the borings and our preliminary recommendations for suitable foundation type, a range of allowable soil bearing pressures for footing design, and other geotechnical related design and construction considerations.

If you have any questions concerning this report or our preliminary recommendations please call us at (952) 737-4660.

Sincerely,

WSB & Associates, Inc.

Darin Hyatt, PE
Senior Geotechnical Engineer

Joe Carlson, EIT
Graduate Geotechnical Engineer

Attachment
Preliminary Geotechnical Report

DEH/tmw

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Project Location

This site is located at 6701 West 78th Street in Bloomington, Minnesota. The boring locations can be seen on the map in ***Appendix A***.

The area was a vacant lot at the time of drilling with sporadic shrubs throughout. Nine Mile Creek runs along the western end of the site and there is a pond located at the south end of the site. It is our understanding that a structure that previously occupied this land was demolished and removed from the site.

1.2 Project Description

Very little design information is available at this time, however, we understand the building at this site will generally be less than three (3) stories, slab-on-grade structure with a finished floor elevation within about two feet (2') of existing grades. We have assumed wall loads will be less than 12 kips per linear foot and column loads will be less than 250 kips each. It is also assumed, underground utilities will have invert elevations within fifteen feet (15') of existing grades.

WSB has developed preliminary foundation recommendations for this project. When the architect and/or structural engineer develops additional information about final design column loadings, building configuration, or other significant factors, the recommendations presented herein may no longer apply. We anticipate that additional soil borings and a final geotechnical report will be completed when the final design information is completed. We recommend the additional soil borings be performed within the planned building and pavement areas to better characterize the subsurface conditions at this site.

1.3 Purpose and Project Scope of Services

Ms. Brianna Boos with the Hennepin County Public Works authorized our proposal. In order to assist the City in evaluating this site for potential development, we have completed a subsurface exploration program and prepared a preliminary geotechnical report for the referenced site. This stated purpose was a significant factor in determining the scope and level of service provided. Should the purpose of the report change the report immediately ceases to be valid and use of it without WSB's prior review and written authorization shall be at the user's sole risk.

Our authorized scope of work has been limited to:

1. Mobilization / Demobilization of a Truck Mounted Drill Rig.
2. Clearing underground utilities utilizing the Gopher State One Call.
3. Drilling 22 standard penetration borings to depths of about 25 feet.
4. Sealing the borings per Minnesota Department of Health procedures.
5. Perform soil classification and analysis.
6. Review of readily available project information and geologic data.
7. Providing this preliminary geotechnical report containing:
    - A. Summary of our initial findings.
    - B. Discussion of subsurface soil and groundwater conditions and how they may affect potential future construction.
    - C. Estimated range of allowable bearing capacities of the soils.
    - D. Preliminary recommendations for foundations.
    - E. A discussion of soils for use as structural fill and site fill.

2. PROCEDURES

2.1 Boring Layout and Soil Sampling Procedures

Hennepin County Public Works requested we complete 22 soil borings at this site, recommended the boring depths and selected the desired locations. The boring locations were staked using existing site features as guides and elevated by our drilling crew. Bore hole elevations were referenced to the top of the top nut of a hydrant located on West 78th Street near the western entrance to the site. The elevation of that benchmark was indicated as 842.73 on a site plan provided to us.

We drilled the borings on November 17, 18, 21 and 22, 2016, with a truck-mounted CME-55 drill rig operated by a two-person crew. The drill crew advanced the borings using continuous hollow stem augers. Drilling methods, crew chief, depths, sampling interval, casing usage, groundwater observations, test data and other drilling information are indicated on the boring logs.

Generally, the drill crew sampled the soil in advance of the auger tip at two and one-half (2½) foot intervals of depth to fifteen feet (15') and at five foot (5') intervals thereafter. The soil samples were obtained using a split-barrel sampler which was driven into the ground during standard penetration tests in accordance with ASTM D 1586, Standard Method of Penetration Test and Split-Barrel Sampling of Soils.

The materials encountered were described on field logs and representative samples were containerized, and transported to our laboratory for further examination and testing.

The samples were visually examined to estimate the distribution of grain sizes, plasticity, consistency, moisture condition, color, presence of lenses and seams, and apparent geologic origin. We classified the soils according to type using the Unified Soil Classification System (USCS). A chart describing the Unified Soil Classification System is included in ***Appendix A***.

2.2 Groundwater Measurements and Borehole Abandonment

The drill crew observed the borings for free groundwater while drilling and after completion. These observations and measurements are noted on the boring logs. The crew backfilled the borings with soil cuttings; to comply with Minnesota Department of Health regulations.

2.3 Boring Log Procedures and Qualifications

The subsurface conditions encountered by the test borings are illustrated on the attached boring logs. Similar soils were grouped into the strata shown on the boring logs, and the appropriate estimated USCS classification symbols were also added. The depths and thickness of the subsurface strata indicated on the boring logs were estimated from the drilling results.

The transition between materials (horizontal and vertical) is approximate and is usually far more gradual than shown. Information on actual subsurface conditions exists only at the specific locations indicated and is relevant only to the time exploration was performed. Subsurface conditions and groundwater levels at other locations may differ from conditions found at the indicated locations. The nature and extent of which would not become evident until exposed by construction excavation. These stratification lines were used for our analytical purposes and, due to the aforementioned limitations, should not be used as a basis of design or construction cost estimates.

3. EXPLORATION RESULTS

3.1 Site and Geology

At the time of drilling, the site was an undeveloped lot with sporadic shrubs.

Based on review of online topographic maps, this site appears to gently slope to the southeast. Nine Mile Creek traverses the western side of the site.

The Hennepin County Geologic Atlas indicates the surficial geology of the area is mostly organic deposits much of which have been drained and filled.

3.2 Subsurface Soil and Groundwater Conditions

Soil Borings

The boring profile generally consisted of fill overlying alluvial and glacially deposited soils.

The fills encountered ranged from about 2 to 12 feet below grade and consisted of a mixture of lean clay, silty sand and sands. Below the fill in Boring PB-15, buried topsoil was encountered to a depth of about 5 feet.

Below the fills and buried topsoil, we encountered deposits consisting of sands and silty sands, lean clays and to a lesser extent fat clays. These soils were generally brown to gray in color and ranged from moist to saturated or waterbearing.

The soils encountered were generally similar to the soils described in the Geologic Atlas.

Test Pits

Six test pits were excavated to better evaluate environmental contamination concerns. Similar to the soil borings the test pits encountered fill soils consisting of silty sand and sand to depths of about 2 to 7 ½ feet. It should be noted that the native soils below the fill in test pit 1 was dark in color. An organic test on that material indicated it had about 3 percent organic material classifying it as slightly organic. Underlying the fill naturally deposited soils consisting of silty sand, sand and silt were encountered.

3.3 Strength Characteristics

The penetration resistance N-values of the materials encountered were recorded during drilling and are indicated as blows per foot (BPF). Those values provide an indication of soil strength characteristics and are located on the boring log sheets. Also, visual-manual classification techniques and apparent moisture contents were also utilized to make an engineering judgment of the consistency of the materials. The following table presents a summary of the penetration resistances in the soils and remarks regarding the material strengths of the soils.

Table 1: Penetration Resistances

Soil Type	Classification	Penetration Resistances	Remarks
Fill	Mixed Soils	3 - 28 BPF, average 13 BPF	Variable compaction
Coarse Alluvium	SP, SM	3 to 20 BPF	Very loose to medium dense
Fine Alluvium	CL, CH	1 to 12 BPF	Very soft to firm
Till	CL	6 to 22 BPF	Soft to hard

The preceding is a generalized description of soil conditions at this site. Variations from the generalized profile exist and should be assessed from the boring logs, the normal geologic character of the deposits, and the soils uncovered during site excavation.

3.4 Groundwater Conditions

WSB took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of the report. Note that groundwater levels may fluctuate due to seasonal variations, e.g. precipitation, snowmelt and rainfall, and/or other factors not evident at the time of measurement.

Our borings were only left open for a short period of time; as such, groundwater levels may not have had sufficient time to stabilize at their hydrostatic level.

Table 2 below is a summary of the estimated water levels at our borings.

Table 2: Groundwater Measurements

Boring No.	Ground Surface Elevation	Depth to Groundwater after Drilling	Estimated Groundwater Elevation
PB-1	839.4	15	824 ½
PB-2	831.6	23	809
PB-3	829.6	23	807
PB-4	826.4	NE	---
PB-5	825.9	8	818
PB-6	832.2	18 ½	814
PB-7	830.8	15	816
PB-8	828.8	22	807
PB-9	826.1	25	801 ½
PB-10	825.1	9	816 ½
PB-11	830.9	18 ½	812 ½
PB-12	829.8	12	818
PB-13	828.0	8	820
PB-14	825.7	8	818
PB-15	825.4	9	816 ½
PB-16	828.1	15 ½	813
PB-17	826.8	9 ½	817 ½
PB-18	825.9	11 ½	814 ½
PB-19	824.3	22	802 ½
PB-20	825.7	18	808
PB-21	825.1	11	814 ½
PB-22	824.4	19	805 ½

Groundwater Depths and Elevations are rounded to the highest ½ foot. NE – indicates groundwater not encountered during drilling and sampling.

As can be seen in the table above, water levels observed during drilling varied widely from about elevation 801 ½ to 824 1/2. Piezometers would allow for a more long term monitoring of water levels. Piezometer installation was beyond the scope of this evaluation. Based on information provided on a survey provided to us, the pond on the south side of the site had a water elevation of 820.5 feet in July of 2014. That same survey indicated a delineated wetland adjacent to Nine Mile Creek had a limit of about 820 feet in July of 2014. It is our opinion that the hydrostatic water level at this site will be near that of the pond and Nine Mile Creek.

4. PRELIMINARY ENGINEERING ANALYSIS AND RECOMMENDATIONS

The existing fills were mostly composed of sands with silt and silty sands and in a few instances clayey soils were noted. In some of the fill we noted pieces of wood, limestone, cobbles, and pieces of concrete or bituminous. It is likely these fills were placed following removal of organic soils. With the exception of Boring PB-15, the borings did not encounter any materials containing appreciable organic matter within or beneath the fill. Given the site was occupied by a previous structure it is possible that some of the fill, at least within previous building footprints was placed as a structural fill. However, it is unknown what occurred during and following demolition of the previous structure. Variable blows per foot (BPF) were also encountered within the fill, we are uncertain of the exact footprint of previous buildings or the magnitude of previous structural loadings, no observation or compaction testing documentation was made available to us and in one boring buried topsoil was encountered. As such, the existing fill is considered undocumented. It is our opinion, placing a building of the magnitude proposed on or within the existing fill would have a high risk of detrimental settlement.

Flexible (bituminous paved) parking lots are lightly loaded and more tolerant of movement compared to a building. Therefore consideration can be given to leaving the existing fill in place beneath proposed parking lots. However, with this approach the owner would need to accept a slight risk of increased long-term settlement.

In general, the native soils underlying the fill appear suitable for support of potential structures but they too would need to be further evaluated, especially where very soft and soft clayey soils exist.

Consideration could also be given to supporting proposed structures on deep or intermediate foundations such as driven pile or Geopiers®. These options would not require the removal of the existing fill.

It is our opinion that groundwater could be encountered by excavations at this site. Dewatering should be anticipated.

4.1 Preliminary Building Area Preparation

Unless information regarding the placement and compaction of the existing fill is provided to us for evaluation, we recommend the existing fill be removed from beneath the new building and an appropriate oversize area, and be replaced with compacted backfill.

Table 3 indicates the approximate minimum excavation depths to remove existing fill soils based on the findings of our soil borings. Excavation depths and bottom elevations were rounded to the lowest 1/2 foot/elevation. Those depths will likely vary and should be observed and adjusted during construction. Furthermore, it may be necessary to extend excavations to include partial removal of the soft natural clays depending on footing elevations, structural loads and condition of the clays at the time of construction.

Table 3. Approximate Minimum Excavation Depths at the Boring Locations

Boring	Ground Surface Elevation	Approximate Min. Excavation Depth*, feet	Approximate Bottom Elevation
PB-1	839.4	12	827
PB-2	831.6	7	824
PB-3	829.6	7	822 ½
PB-4	826.8	9	817 ½
PB-5	825.9	7	818 ½
PB-6	832.2	7	825
PB-7	830.8	9	821 ½
PB-8	828.8	10	818 ½
PB-9	826.6	11	815 ½
PB-10	825.1	7	818
PB-11	830.9	12	818 ½
PB-12	829.8	9	820 ½
PB-13	828.0	7	821
PB-14	825.7	7	818 ½
PB-15	825.4	5	821
PB-16	828.1	7 ½	820 ½
PB-17	826.8	9	817 ½
PB-18	825.9	7	818 ½
PB-19	824.3	9	815
PB-20	825.7	7	818 ½
PB-21	825.1	7	818
PB-22	824.1	5	819

* - Excavation depths may vary depending on the condition of the exposed soils at the time of construction and on final design grades and loads.

4.2 Preliminary Foundation Recommendations

It is our opinion that the buildings may be supported on conventional spread footings bearing on naturally occurring firm clays or medium dense sands or structural fill if it is determined to have been engineered. It is our opinion the footings throughout may be designed for net allowable soil bearing pressures ranging from 2,000 to 3,500 pounds per square foot (psf), depending on building plans and site preparation.

4.3 Preliminary Pavement Recommendations

We recommend any organic soils be removed from within 3 feet of the top of subgrade elevation. Surface compaction of the pavement areas should then be completed. The surface compaction should be observed and tested.

4.3 Additional Soil Borings and Recommendations

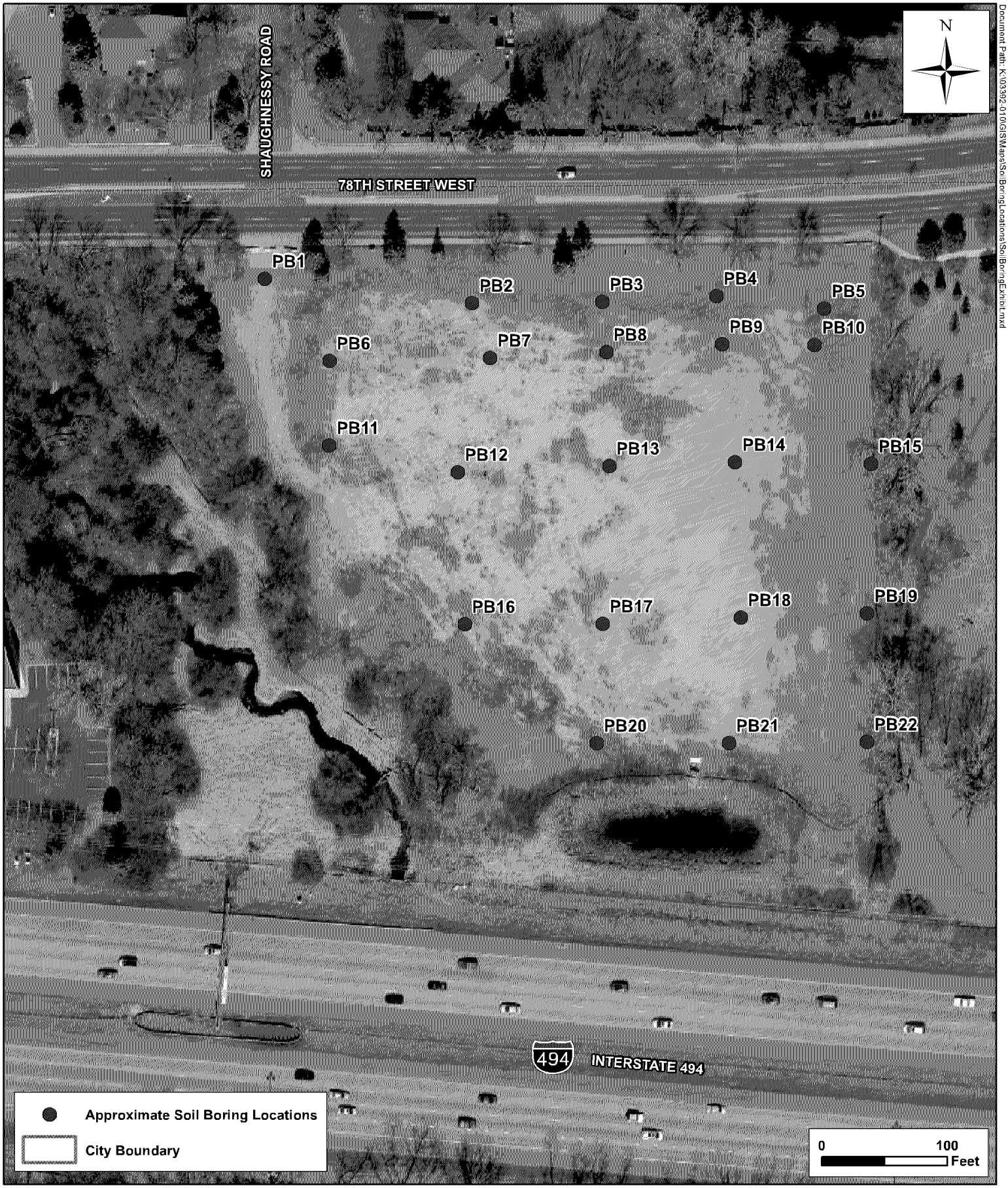
Given the size of the site, the spacing of our borings and the lack of specific design information, we recommend additional soil borings be performed once building locations and structural loadings have been established, to further evaluate the site. When a final geotechnical report is prepared, we will provide more detailed recommendations and discuss other geotechnical related items including construction safety, field observations and testing, and plan review and remarks.

5. STANDARD OF CARE

The preliminary recommendations and opinions contained in this report are based on our professional judgment. The soil testing and geotechnical engineering services performed for this project have been performed with the level of skill and diligence ordinarily exercised by reputable members of the same profession under similar circumstances, at the same time and in the same or a similar locale. No warranty, either express or implied, is made.

APPENDIX A

Boring Location Map
Test Pit Map
Logs of Penetration Test Borings
Symbols and Terminology on Test Boring Log
Notice to Report Users Boring Log Information
Unified Soil Classification Sheet (USCS)



Soil Boring Location Sketch
Preliminary Geotechnical Report
Proposed Hennepin County Medical Examiners Building
6701 W. 78th Street
Bloomington, MN

WSB

Document Path: K:\03392-010\GIS\Maps\Limited Phase II ESA\Figure3_TestPitLocation.mxd

Hennepin

Test Pit Location
Preliminary Geotechnical Report
Proposed Hennepin County Medical Examiners Building
6701 West 78th Street
Bloomington, MN 55439

WSB

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 839.4 ft

BORING NUMBER PB 1
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
		CRUSHED ROCK 0 - 4"		Fill								
1	838	CLAYEY SAND WITH A LITTLE GRAVEL, brown, moist, firm to hard to firm to hard	SC	Fill			1	HSA				
2	837											
3	836				14		2	SB				
4	835											
5	834											
6	833				19		3	SB				
7	832											
8	831				14		4	SB				
9	830											
10	829											
11	828				21		5	SB				
12	827	LEAN CLAY WITH SAND AND LITTLE GRAVEL, brown, moist, firm	CL	Glacial Till								
13	826				9		6	SB				
14	825	SAND, fine grained, brown, water bearing, medium dense	SP	Coarse Alluvium		▽						
15	824											
16	823				18		7	SB				
17	822											
18	821											
19	820	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, medium dense to loose	SP	Coarse Alluvium								
20	819											
21	818				18		8	SB				
22	817											
23	816											
24	815											
25	814				7		9	SB				
		End of Boring 25.0 ft.										
26	813											

WATER LEVEL MEASUREMENTS — START: 11/17/2016 — END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/17/2016	10:00 am	25	24.5		14.6	824.8	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 831.6 ft

BORING NUMBER PB 2
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
1	831	FILL, mostly Silty Sand, a little Lean Clay, brown, dark brown		Fill			1	HSA				
2	830											
3	829				13		2	SB				
4	828											
5	827				28		3	SB				
6	826											
7	825	SAND WITH GRAVEL, fine to medium grained, brown, moist, medium dense	SP	Coarse Alluvium								
8	824				18		4	SB				
9	823											
10	822				16		5	SB				
11	821											
12	820											
13	819						6	SB				
14	818											
15	817	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm to hard, a few lenses of water bearing sand	CL	Glacial Till	12		7	SB				
16	816											
17	815											
18	814											
19	813											
20	812				14		8	SB				
21	811											
22	810											
23	809					▽						
24	808											
25	807				22		9	SB				
		End of Boring 25.0 ft.										
26	806											

WATER LEVEL MEASUREMENTS — START: 11/22/2016 — END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	11:45 am	25	24.5		23.0	808.6	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 829.6 ft

BORING NUMBER PB 3
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	829	FILL, mostly Silty Sand, a little Sand and Gravel, brown, a few Cobbles		Fill			1	HSA				
2	828											
3	827				4		2	SB				
4	826											
5	825											
6	824				50/.3		3	SB				
7	823	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, brown, moist, soft	CL	Glacial Till								
8	822				7		4	SB				
9	821											
10	820	SAND WITH GRAVEL, fine to medium grained, brown, moist to water bearing at 23', loose	SP	Coarse Alluvium								
11	819				7		5	SB				
12	818											
13	817				6		6	SB				
14	816											
15	815											
16	814				8		7	SB				
17	813											
18	812											
19	811											
20	810											
21	809				6		8	SB				
22	808											
23	807					▽						
24	806											
25	805	End of Boring 25.0 ft.			8		9	SB				
26	804											

WATER LEVEL MEASUREMENTS

START: 11/22/2016 END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	1:30 pm	25	24.5		23.0	806.6	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 826.8 ft

BORING NUMBER PB 4
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
1	826	FILL, mostly Sand, a little Silty Sand and Gravel, dark brown, brown		Fill			1	HSA				
2	825											
3	824				9		2	SB				
4	823											
5	822											
6	821				8		3	SB				
7	820											
8	819				9		4	SB				
9	818	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm to soft to firm	CL	Glacial Till								
10	817											
11	816				11		5	SB				
12	815											
13	814						6	SB				
14	813											
15	812											
16	811				7		7	SB				
17	810											
18	809											
19	808											
20	807											
21	806				9		8	SB				
22	805											
23	804	SAND, fine grained, gray, wet, loose	SP	Coarse Alluvium								
24	803											
25	802				7		9	SB				
26	801	End of Boring 25.0 ft.										

WATER LEVEL MEASUREMENTS — START: 11/22/2016 — END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	11:00 am	25	24.5		None		3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.9 ft

BORING NUMBER PB 5
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
0	825	FILL, mostly Sand, a little Gravel, dark brown, brown		Fill			1	HSA				
3	823				18		2	SB				
5	821				14		3	SB				
7	819	SAND WITH GRAVEL, medium to fine grained, brown, wet to water bearing at 8', loose to medium dense	SP	Coarse Alluvium								
8	818				10	▽	4	SB				
10	816				14		5	SB				
13	813				20		6	SB				
15	811	SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium	16		7	SB				
19	807	SAND WITH GRAVEL, medium to fine grained, brown, water bearing, medium dense	SP	Coarse Alluvium								
20	806				16		8	SB				
24	802	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, firm	CL	Glacial Till								
25	801	End of Boring 25.0 ft.			9		9	SB				
26	800											

WATER LEVEL MEASUREMENTS — START: 11/22/2016 — END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	2:15 pm	25	24.5		8.0	817.9	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 832.2 ft

BORING NUMBER PB 6
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB MC (%)	LAB DD (pcf)	LAB LL (%)	LAB PL (%)
0	832	CRUSHED LIMESTONE 0 - 4"		Fill								
1	831	FILL, a mixture of Sand, Silty Sand, a little Gravel		Fill			1	HSA				
2	830											
3	829				15		2	SB				
4	828											
5	827				17		3	SB				
6	826											
7	825	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, brown, moist, soft	CL	Glacial Till								
8	824				6		4	SB	11	121		
9	823											
10	822	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, wet, firm to soft to firm	CL	Glacial Till	9		5	SB				
11	821											
12	820											
13	819				7		6	SB				
14	818											
15	817				9		7	SB				
16	816											
17	815											
18	814					▽						
19	813											
20	812											
21	811				10		8	SB				
22	810											
23	809											
24	808	SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing, medium dense	SP	Coarse Alluvium								
25	807	End of Boring 25.0 ft.			14		9	SB				
26	806											

WATER LEVEL MEASUREMENTS — START: 11/17/2016 — END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/17/2016	12:05 pm	25	24.5		18.5	813.7	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 830.8 ft

BORING NUMBER PB 7
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	830	FILL, mostly Sand, a little Silty Sand, a little Lean Clay, brown, dark brown, a few Cobbles		Fill			1	HSA				
2	829											
3	828				14		2	SB				
4	827											
5	826											
6	825				11		3	SB				
7	824											
8	823				24		4	SB				
9	822	SAND WITH GRAVEL, fine to medium grained, brown, moist, loose to medium dense	SP	Coarse Alluvium								
10	821				9		5	SB				
11	820											
12	819											
13	818				12		6	SB				
14	817											
15	816	SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium		▽						
16	815				13		7	SB				
17	814											
18	813											
19	812	SAND WITH GRAVEL, fine to medium grained, brown, water bearing, loose	SP	Coarse Alluvium								
20	811											
21	810				7		8	SB				
22	809	SANDY LEAN CLAY WITH SAND AND A LITTLE GRAVEL, gray, wet, soft	CL	Glacial Till								
23	808											
24	807											
25	806				8		9	SB				
		End of Boring 25.0 ft.										
26	805											

WATER LEVEL MEASUREMENTS — START: 11/22/2016 — END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	9:45 am	25	24.5		15.0	815.8	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828.8 ft

BORING NUMBER PB 8
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
1	828	FILL, mostly Sand with Gravel, a little Silty Sand, brown		Fill			1	HSA				
2	827											
3	826				16		2	SB				
4	825											
5	824											
6	823				18		3	SB				
7	822											
8	821				18		4	SB				
9	820											
10	819	LEAN CLAY, gray, moist, firm	CL	Fine Alluvium	12		5	SB				
11	818											
12	817	SAND WITH GRAVEL, fine to medium grained, brown, wet, loose	SP	Coarse Alluvium								
13	816				10		6	SB				
14	815											
15	814	LEAN CLAY, dark gray, wet, soft	CL	Fine Alluvium	6		7	SB				
16	813											
17	812	SAND WITH GRAVEL, fine to medium grained, brown, wet to water bearing at 22', medium dense	SP	Coarse Alluvium								
18	811											
19	810											
20	809				20		8	SB				
21	808											
22	807					▽						
23	806											
24	805											
25	804				16		9	SB				
		End of Boring 25.0 ft.										
26	803											

WATER LEVEL MEASUREMENTS — START: 11/22/2016 — END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	8:05 am	25	24.5		22.0	806.8	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 826.1 ft

BORING NUMBER PB 9
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
0	826	FILL, mostly Sand, Sand with Gravel, brown		Fill								
1	825						1	HSA				
2	824											
3	823				12		2	SB				
4	822											
5	821											
6	820				14		3	SB				
7	819											
8	818				12		4	SB				
9	817											
10	816											
11	815				10		5	SB				
12	814	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist to wet, firm to hard to firm to soft	CL	Glacial Till								
13	813				14		6	SB				
14	812											
15	811											
16	810				16		7	SB				
17	809											
18	808											
19	807											
20	806											
21	805				9		8	SB				
22	804											
23	803											
24	802											
25	801				8	▽	9	SB				
		End of Boring 25.0 ft.										
26	800											

WATER LEVEL MEASUREMENTS

START: 11/22/2016 END: 11/22/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/22/2016	8:50 am	25	24.5		25.0	801.1	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.1 ft

BORING NUMBER PB 10
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
0	825	FILL, a mixture of Sand, Sand with Silt and Gravel, brown, dark brown		Fill								
1	824						1	HSA				
2	823											
3	822				27		2	SB				
4	821											
5	820											
6	819				28		3	SB				
7	818	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing at 9', medium dense	SP	Coarse Alluvium								
8	817				12		4	SB				
9	816					▽						
10	815											
11	814				12		5	SB				
12	813											
13	812				16		6	SB				
14	811											
15	810											
16	809				14		7	SB				
17	808											
18	807											
19	806											
20	805	LEAN CLAY WITH SAND AND A LITTLE GRAVEL, dark gray, moist, hard	CL	Glacial Till								
21	804				18		8	SB				
22	803											
23	802											
24	801											
25	800				18		9	SB				
25	800	End of Boring 25.0 ft.										
26	799											

WATER LEVEL MEASUREMENTS — START: 11/21/2016 — END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	2:00 pm	25	24.5		9.0	816.1	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 830.9 ft

BORING NUMBER PB 11
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
0	830.9	CRUSHED LIMESTONE 0 - 13"		Fill								
1	830	FILL, a mixture of Silty Sand, Lean Clay, a few pieces of Limestone, a few pieces of Wood		Fill			1	HSA				
2	829											
3	828				14		2	SB				
4	827											
5	826											
6	825				3		3	SB				
7	824											
8	823				7		4	SB				
9	822											
10	821											
11	820				4		5	SB				
12	819	LEAN CLAY, gray, wet, very soft	CL	Fine Alluvium								
13	818				1		6	SB				
14	817											
15	816	FAT CLAY, dark gray, saturated, very soft	CH	Fine Alluvium								
16	815				2		7	SB				
17	814											
18	813					▽						
19	812											
20	811	LEAN CLAY, dark gray, wet, very soft	CL	Fine Alluvium								
21	810				3		8	SB				
22	809											
23	808											
24	807	SAND WITH A LITTLE GRAVEL, brown, water bearing, loose	SP	Coarse Alluvium								
25	806	End of Boring 25.0 ft.			9		9	SB				
26	805											

WATER LEVEL MEASUREMENTS

START: 11/17/2016 END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/17/2016	1:35 pm	25	24.5		18.5	812.4	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 829.8 ft

BORING NUMBER PB 12
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
1	829	FILL, a mostly Sand with Gravel, a few pieces of Limestone, brown, dark brown		Fill			1	HSA				
2	828											
3	827				8		2	SB				
4	826											
5	825											
6	824				12		3	SB				
7	823											
8	822				9		4	SB				
9	821	LEAN CLAY, gray, moist to wet, soft	CL	Fine Alluvium								
10	820											
11	819				8		5	SB				
12	818					▽						
13	817				5		6	SB				
14	816	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, loose	SP	Coarse Alluvium								
15	815											
16	814				6		7	SB				
17	813											
18	812											
19	811											
20	810											
21	809				7		8	SB				
22	808											
23	807											
24	806	SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing, loose	SP	Coarse Alluvium								
25	805	End of Boring 25.0 ft.			9		9	SB				
26	804											

WATER LEVEL MEASUREMENTS — START: 11/21/2016 — END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	11:20 am	25	24.5		12.0	817.8	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828 ft

BORING NUMBER PB 13
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	827	FILL, a mixture of Sand, Sand with Silt, a little Gravel, brown		Fill			1	HSA				
2	826											
3	825				10		2	SB				
4	824											
5	823				9		3	SB				
6	822											
7	821	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing, very loose to loose	SP	Coarse Alluvium								
8	820				3	▽	4	SB				
9	819											
10	818				9		5	SB				
11	817											
12	816											
13	815				7		6	SB				
14	814											
15	813	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, loose	SP	Coarse Alluvium								
16	812				8		7	SB				
17	811											
18	810											
19	809											
20	808	SANDY LEAN CLAY WITH A LITTLE GRAVEL, gray, wet, firm	CL	Glacial Till								
21	807				11		8	SB				
22	806											
23	805											
24	804	SAND, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium								
25	803	End of Boring 25.0 ft.			20		9	SB				
26	802											

WATER LEVEL MEASUREMENTS

START: 11/21/2016 END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	1:00 pm	25	24.5		8.0	820	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.7 ft

BORING NUMBER PB 14
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	825	FILL, a mixture of Sand, Sand with Silt, a little Gravel, brown		Fill			1	HSA				
2	824											
3	823				16		2	SB				
4	822											
5	821				20		3	SB				
6	820											
7	819	SAND, fine to medium grained, brown, wet to water bearing at 8', loose	SP	Coarse Alluvium								
8	818				8	▽	4	SB				
9	817											
10	816				7		5	SB				
11	815											
12	814	SAND WITH A LITTLE GRAVEL, medium to fine grained, brown, water bearing, very loose	SP	Coarse Alluvium								
13	813				2		6	SB				
14	812											
15	811	SAND, fine to medium grained, brown, water bearing, loose to medium dense	SP	Coarse Alluvium								
16	810				6		7	SB				
17	809											
18	808											
19	807											
20	806				20		8	SB				
21	805											
22	804											
23	803	SAND WITH GRAVEL, fine to medium grained, brown, water bearing, medium dense	SP	Coarse Alluvium								
24	802											
25	801	End of Boring 25.0 ft.			12		9	SB				
26	800											

WATER LEVEL MEASUREMENTS — START: 11/21/2016 — END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	2:00 pm	25	24.5		8.0	817.7	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.4 ft

BORING NUMBER PB 15
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	824	FILL, mostly Silty Sand with Gravel, brown, moist		Fill			1	HSA				
2	823	ORGANIC CLAY, black, a few Roots, moist, firm	OL	Topsoil								
3	822				10		2	SB				
4	821											
5	820	SILTY SAND WITH A LITTLE GRAVEL, gray, wet, loose	SM	Coarse Alluvium								
6	819				7		3	SB				
7	818											
8	817	SAND, fine to medium grained, brown, wet to water bearing, loose	SP	Coarse Alluvium	10		4	SB				
9	816					▽						
10	815	SAND WITH GRAVEL, medium to coarse grained, brown, water bearing, medium dense to loose to medium dense	SP	Coarse Alluvium								
11	814				11		5	SB				
12	813											
13	812				7		6	SB				
14	811											
15	810											
16	809				10		7	SB				
17	808											
18	807											
19	806											
20	805											
21	804				12		8	SB				
22	803											
23	802											
24	801											
25	800	End of Boring 25.0 ft.			12		9	SB				
26	799											

WATER LEVEL MEASUREMENTS

START: 11/21/2016 END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	3:00 pm	25	24.5		8.8	816.6	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 828.1 ft

BORING NUMBER PB 16
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	827	FILL, mostly Silty Sand, crushed Limstone at grade, gray, brown		Fill			1	HSA				
2	826											
3	825				12		2	SB				
4	824											
5	823											
6	822				9		3	SB				
7	821											
8	820	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet, very loose to loose	SP	Coarse Alluvium	3		4	SB				
9	819											
10	818											
11	817				6		5	SB				
12	816											
13	815	SILTY SAND WITH A LITTLE GRAVEL, gray, wet, loose	SM	Coarse Alluvium	7		6	SB				
14	814											
15	813	SAND WITH A LITTLE GRAVEL, fine to medium grained, gray, water bearing 15 1/2', loose to very loose to loose	SP	Coarse Alluvium								
16	812				5	▽	7	SB				
17	811											
18	810											
19	809											
20	808											
21	807				4		8	SB				
22	806											
23	805											
24	804											
25	803	End of Boring 25.0 ft.			9		9	SB				
26	802											

WATER LEVEL MEASUREMENTS

START: 11/17/2016 END: 11/17/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/17/2016	2:45 pm	25	24.5		15.5	812.6	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 826.8 ft

BORING NUMBER PB 17
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	826	FILL, mostly Sand, a little Sand with Silt, a little Gravel, brown		Fill			1	HSA				
2	825											
3	824				14		2	SB				
4	823											
5	822											
6	821				14		3	SB				
7	820											
8	819				12		4	SB				
9	818	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, water bearing at 9.5', loose	SP	Coarse Alluvium		▽						
10	817				7		5	SB				
11	816											
12	815											
13	814				8		6	SB				
14	813											
15	812	SAND, fine to medium grained, brown, water bearing, loose	SP	Coarse Alluvium								
16	811				5		7	SB				
17	810											
18	809											
19	808											
20	807											
21	806				12		8	SB				
22	805											
23	804											
24	803											
25	802				14		9	SB				
		End of Boring 25.0 ft.										
26	801											

WATER LEVEL MEASUREMENTS

START: 11/21/2016 END: 11/21/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/21/2016	10:30 am	25	24.5		9.5	817.3	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.9 ft

BORING NUMBER PB 18
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	825	FILL, mostly Silty Sand, a few pieces of Limstone, brown		Fill			1	HSA				
2	824											
3	823				12		2	SB				
4	822											
5	821											
6	820				9		3	SB				
7	819	SAND WITH A LITTLE GRAVEL, fine to medium grained, brown, wet to water bearing at 11.5', loose	SP	Coarse Alluvium								
8	818				6		4	SB				
9	817											
10	816											
11	815				7	▽	5	SB				
12	814											
13	813				7		6	SB				
14	812											
15	811	SILTY SAND WITH GRAVEL, gray, water bearing, medium dense	SM	Coarse Alluvium								
16	810				9		7	SB				
17	809											
18	808											
19	807											
20	806											
21	805				16		8	SB				
22	804											
23	803											
24	802											
25	801				14		9	SB				
		End of Boring 25.0 ft.										
26	800											

WATER LEVEL MEASUREMENTS — START: 11/18/2016 — END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/18/2016	2:30 pm	25	24.5		11.5	814.4	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 824.3 ft

BORING NUMBER PB 19
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	823	FILL, a mixture of Sand, Silty Sand, a little Gravel, a few pieces of Limestone		Fill			1	HSA				
2	822											
3	821				8		2	SB				
4	820											
5	819				10		3	SB				
6	818											
7	817											
8	816				12		4	SB				
9	815	SAND WITH GRAVEL, fine to medium grained, brown, wet, medium dense to very loose	SP	Coarse Alluvium								
10	814				12		5	SB				
11	813											
12	812											
13	811				12		6	SB				
14	810											
15	809											
16	808				4		7	SB				
17	807											
18	806											
19	805	SAND WITH GRAVEL, fine to medium grained, gray, wet to water bearing at 22', loose	SP	Coarse Alluvium								
20	804											
21	803				5		8	SB				
22	802					▽						
23	801											
24	800	SILTY SAND, brown, water bearing, loose	SP	Coarse Alluvium								
25	799	End of Boring 25.0 ft.			6		9	SB				
26	798											

WATER LEVEL MEASUREMENTS

START: 11/18/2016 END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/18/2016	1:45 pm	25	24.5		22.0	802.3	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.7 ft

BORING NUMBER PB 20
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	825	FILL, a mixture of Silty Sand, Sand, a little Gravel, a few pieces of Limestone, dark brown, brown		Fill			1	HSA				
2	824											
3	823				8		2	SB				
4	822											
5	821											
6	820				4		3	SB				
7	819	LEAN CLAY, gray, wet, very soft	CL	Fine Alluvium								
8	818				2		4	SB	21	91		
9	817											
10	816				2		5	SB				
11	815											
12	814											
13	813				2		6	SB				
14	812	FAT CLAY, gray, wet, soft	CH	Fine Alluvium								
15	811											
16	810				6		7	SB				
17	809											
18	808					▽						
19	807	SILTY SAND WITH A LITTLE GRAVEL, gray, water bearing, loose, a few lenses of Clay	SP	Coarse Alluvium								
20	806											
21	805				5		8	SB				
22	804											
23	803											
24	802											
25	801				8		9	SB				
26	800	End of Boring 25.0 ft.										

WATER LEVEL MEASUREMENTS

START: 11/18/2016 END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/18/2016	9:45 am	25	24.5		18.0	807.7	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 825.1 ft

BORING NUMBER PB 21
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LABORATORY TESTS MC (%)	DD (pcf)	LL (%)	PL (%)
1	824	FILL, a mixture of Sand, Silty Sand, Sand with Silt, a little Gravel, a few pieces of Limestone, brown		Fill			1	HSA				
2	823											
3	822				13		2	SB				
4	821											
5	820											
6	819				4		3	SB				
7	818	FAT CLAY, dark gray, wet, very soft	CH	Fine Alluvium								
8	817				3		4	SB	23	95		
9	816											
10	815	SAND WITH SILT, fine to medium grained, gray, water bearing, loose	SP-SM	Coarse Alluvium	7	▽	5	SB				
11	814											
12	813	FAT CLAY, dark gray, wet, firm	CH	Fine Alluvium								
13	812				10		6	SB				
14	811											
15	810	SAND WITH GRAVEL, fine to medium grained, gray, water bearing, loose	SP	Coarse Alluvium								
16	809				8		7	SB				
17	808											
18	807											
19	806											
20	805											
21	804				10		8	SB				
22	803											
23	802											
24	801	SAND WITH GRAVEL, fine grained, brown, water bearing, loose	SP	Coarse Alluvium								
25	800	End of Boring 25.0 ft.			7		9	SB				
26	799											

WATER LEVEL MEASUREMENTS

START: 11/18/2016 END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/18/2016	11:45 am	25	24.5		11.0	814.1	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

PL2023-193 PL202300193

WSB & Associates, Inc.

LOG OF TEST BORING

PROJECT NAME: HCPW - 6701 W 78th Street
CLIENT/WSB #: 03392-010
PROJECT LOCATION: Bloomington, MN
SURFACE ELEVATION: 824.4 ft

BORING NUMBER PB 22
PAGE 1 OF 1

DEPTH (ft)	ELEV. (ft)	DESCRIPTION OF MATERIAL	USCS	GEOLOGIC ORIGIN	N	WL	SAMPLE No.	SAMPLE TYPE	LAB: MC (%)	LAB: DD (pcf)	LAB: LL (%)	LAB: PL (%)
1	823	FILL, a mixture of Sand with Silt, Silty Sand, a little Gravel, a few pieces of Limestone		Fill			1	HSA				
2	822											
3	821				16		2	SB				
4	820											
5	819	SAND WITH SILT AND A LITTLE GRAVEL, brown, wet, loose	SP-SM	Coarse Alluvium	8		3	SB				
6	818											
7	817											
8	816				8		4	SB				
9	815											
10	814	LEAN CLAY, dark gray, wet, soft	CL	Fine Alluvium	6		5	SB				
11	813											
12	812	FAT CLAY, dark gray, wet to saturated at 19', very soft	CH	Fine Alluvium								
13	811				2		6	SB				
14	810											
15	809						7	SB				
16	808											
17	807											
18	806											
19	805					▽						
20	804											
21	803				2		8	SB				
22	802											
23	801											
24	800											
25	799				2		9	SB				
26	798	End of Boring 25.0 ft.										

WATER LEVEL MEASUREMENTS

START: 11/18/2016 END: 11/18/2016

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER DEPTH	WATER ELEVATION	METHOD	Crew Chief:	Logged By:
								J. Tatro	DAJ
11/18/2016	12:30 pm	25	24.5		19.0	805.4	3 1/4" HSA 0' - 24.5'	Notes:	

WSB BORING LOG - WSB.GDT - 12/7/16 08:00 - K:\03392-010\GEOTECH-CMT\HCPW - 6701 W 78TH ST, BLOOMINGTON MN.GPJ

WSB & Associates, Inc.

SYMBOLS AND TERMINOLOGOY ON TEST BORING LOG

SYMBOLS

Drilling and Sampling

Symbol	Description
HSA	3-1/4" I.D. Hollow stem auger
_FA	4", 6" or 10" diameter flight auger
_HA	2", 4", or 6" hand auger
_DC	2-1/2", 4", 5", or 6" steel drive casing
_RC	Size A, B or N rotary casing
PD	Pipe drill or cleanout tube
CS	Continuous split barrel sampling
DM	Drilling mud
JW	Jetting water
SB	2" O.D. split barrel sampling
_L	2-1/2" or 3-1/2" O.D. SB liner sampler
_T	2" or 3" thin walled tube sample
3TP	3" thin walled tube using pitcher sampler
_TO	2" or 3" thin walled tube using Osterberg sampler
W	Wash sample
B	Bag sample
P	Test pit sample
_Q	BQ, NQ, or PQ wire line system
_X	AX, BX, or NX double tube barrel
N	Standard penetration test, blows per foot
CR	Core recovery, percent
WL	Water level
▼	Water level
NMR	No measurement recorded, primarily due to presence of drilling or coring fluid.

Laboratory Testing

Symbol	Description
W	Water content, % (ASTM** D2216)
D	Dry density, pcf
LL	Liquid limit (ASTM D4318)
PL	Plastic limit (ASTM D4318)
	-Inserts in last column (Qu or RQD)-
Qu	Unconfined compressive strength, psf (ASTM D2166)
Pq	Penetrometer reading, tsf (ASTM D1558)
Ts	Torvane reading, tsf
G	Specific gravity (ASTM D854)
SL	Shrinkage limits (ASTM D427)
OC	Organic content-combustion method (ASTM D2974)
SP	Swell pressure, tsf (ASTM D4546)
PS	Percent swell under pressure (ASTM D4546)
FS	Free swell, % (ASTM D4546)
SS	Shrink swell, % (ASTM D4546)
pH	Hydrogen ion content-Meter Method (ASTM D4972)
SC	Sulfate content, parts/million or mg/l
CC	Chloride content, parts/million or mg/l
C*	One dimensional consolidation (ASTM D2435)
Qc*	Triaxial compression (ASSTM D2850 and D4767)
D.S.*	Direct Shear (ASTM D3080)
K*	Coefficient of permeability, cm/sec (ASTM D2434)
P*	Pinhole test (ASTM D4647)
DH*	Double hydrometer (ASTM D4221)
MA*	Particle size analysis (ASTM D422)
R	Laboratory electrical resistivity, ohm-cm (ASTM G57)
E*	Pressuremeter deformation modulus, tsf (ASTM D4719)
PM*	Pressuremeter test (ASTM D4719)
VS*	Field vane shear (ASTM D2573)
IR*	Infiltrometer test (ASTM D3385)
RQD	Rock quality designation, percent

*Results shown on attached data sheet or graph

**ASTM designates American Society for Testing and Materials

TERMINOLOGY

Particle Sizes

Type	Size Range
Boulders	> 12"
Cobbles	3" – 12"
Coarse gravel	3/4" – 3"
Fine gravel	#4 sieve – 3/4"
Coarse sand	#4 - #10 sieve
Medium sand	#10-#40 sieve
Fine sand	#40-#200 sieve
Silt	100% passing #200 sieve and > 0.005mm
Clay	100% passing #200 sieve and < 0.005mm

Soil layering and Moisture

Term	Visual Observation
Lamination	Up to 1/4" thick stratum
Varved	Altering laminations of any combination of clay, silt, fine sand, or colors
Lenses	Small pockets of different soils in a soil mass
Stratified	Altering layers of varying materials or colors
Layer	1/4" to 12" thick stratum
Dry	Powdery, no noticeable water
Moist	Damp, below saturation
Waterbearing	Pervious soil below water
Wet	Saturated, above liquid limit

Gravel Content

Coarse-Grained Soils

% Gravel	Description
2-15	A little gravel
16-49	With gravel

Fine-Grained Soils

% Gravel	Description
< 5	Trace of gravel
5-15	A little gravel
16-30	With gravel
31-49	Gravelly

Standard Penetration Resistance

Cohesionless Soils

N-Value	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
> 50	Very dense

Cohesive Soils

N-Value	Consistency
0-4	Very soft
5-8	Soft
9-15	Firm
16-30	Hard
> 30	Very hard

WSB & Associates, Inc.

NOTICE TO REPORT USERS BORING LOG INFORMATION

Subsurface Profiles

The subsurface stratification lines on the graphic representation of the test borings show an approximate boundary between soil types or rock. The transition between materials is approximate and is usually far more gradual than shown. Estimating excavation depths, soil volumes and other computations relying on the subsurface strata may not be possible to any degree of accuracy.

Water Level

WSB & Associates, Inc. took groundwater level readings in the exploratory borings, reviewed the data obtained, and discussed its interpretation of the data in the text of this report. The groundwater level may fluctuate due to seasonal variations caused by precipitation, snowmelt, rainfalls, construction or remediation activities, and/or other factors not evident at the time of measurement.

The actual determination of the subsurface water level is an interpretative process. Subsurface water level may not be accurately depicted by the levels indicated on the boring logs. Normally, a subsurface exploration obtains general information regarding subsurface features for design purposes. An accurate determination of subsurface water levels is not possible with a typical scope of work. The use of the subsurface water level information provided for estimating purposes or other site review can present a moderate to high risk of error.

The following information is obtained in the field and noted under "Water Level Measurements" at the bottom of the log.

Sampled Depth: The lowest depth of soil sampling at the time a water level measurement is taken.

Casing Depth: The depth to the bottom of the casing or hollow-stem auger at the time of water level measurement.

Cave-In Depth: The depth at which the measuring tape stops in the bore hole.

Water Level: The point in the bore hole at which free-standing water is encountered by a measuring tape dropped from the surface inside the casing.

Drilling Fluid Level: Similar to the water level, except the liquid in the bore hole is a drilling fluid.

Obstruction Depths

Obstructions and/or obstruction depths may be noted on the boring logs. Obstruction indicates the sampling equipment encountered resistance to penetration. It must be realized that continuation of drilling, the use of other drilling equipment or further exploration may provide information other than that depicted on the logs. The correlation of obstruction depths on the log with construction features such as rock excavation, foundation depths, or buried debris cannot normally be determined with any degree of accuracy. For example, penetration of weathered rock by soil sampling equipment may not correlate with removal by certain types of construction equipment. Using this information for estimating purposes often results in a high degree of misinterpretation.

Accurately identifying the obstruction or estimating depths where hard rock is present over the site requires a scope of service beyond the normal geotechnical exploration program. The risk of using the information noted on the boring logs for estimating purposes must be understood.

WSB & Associates, Inc.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more 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 of clayey fine sands or clayey silts 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 50% or greater		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

LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

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

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

PLASTICITY CHART