Independent Testing Technologies, Inc.

MARCH 18, 2015

PROJECT 15-015
REPORT OF GEOTECHNICAL EXPLORATIONS

For

PERIMETER SECURITY SYSTEM
MINNESOTA CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

Prepared For:

MINNESOTA DEPARTMENT OF ADMINISTRATION
REAL ESTATE & CONSTRUCTION SERVICES
PROJECT 78SH0025

Level K

C15 - 0016

Consultant's Report

337 31st Avenue South • Waite Park, MN 56387
Phone: 320-253-4338 • Fax: 320-253-4547 • Email: info@independenttestingtech.com • www.independenttestingtech.com

Independent Testing Technologies, Inc.

March 18, 2015

Mr. Glen Heino, Senior Project Manager
Minnesota Department of Administration
Real Estate & Construction Services
309 Administration Building
50 Sherburne Avenue
St. Paul, MN 55155

RE: 15-015 Report of Geotechnical Exploration
Recs Project ID: 78SH0025
Perimeter Security System
MCF-Shakopee, Minnesota

Dear Mr. Heino:

Independent Testing Technologies, Inc. is pleased to submit the results of our subsurface investigation program for this project in Shakopee, Minnesota. This report represents our work for this project as authorized by you. An electronic copy is provided.

The soils on this site are well suited for the proposed improvements. The majority of the soils encountered consisted of silty sand (SM) topsoil overlying native, silty sands (SM), poorly graded sands with silt (SP-SM), poorly graded sands (SP) with gravel and cobbles and poorly graded gravel (GP). Large amounts of gravel and cobbles were encountered in all of the borings. Groundwater was not observed in the borings during our investigation.

Mr. Heino, it has been our pleasure to work with you on this project. Please contact Patrick Johnson if you have any questions regarding this report. Please contact Daryl Dhein if you would like a proposal for the materials testing services that will be needed during the construction phase.

Sincerely,

Patrick A. Johnson, P.E.
Geotechnical Division Manager

Kevin T. Keller
Vice President

Cc: Mr. Courtney Cooper, BWBR Architects
Legislative Reference Library

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CERTIFICATION

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

Patrick A. Johnson

Date: March 18, 2015 Registration No.: 22037

TABLE OF CONTENTS

GEOTECHNICAL EXPLORATIONS
PERIMETER SECURITY SYSTEM
MINNESOTA CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA
RECS PROJECT ID: 78SH0025

A. Introduction

This report is being prepared for use by our client on this specific project. We intend to present this report and our findings in the same logical manner that led us to arrive at our recommendations. This report is based on some general assumptions regarding the anticipated construction based on experience with similar projects. These assumptions and the entire report should be reviewed immediately upon receipt.

Purpose:

The purpose of our investigation was to evaluate the existing soil and water conditions on this site for suitability to construct a new perimeter fence with intermittent masonry columns and a continuous concrete mow strip. A vehicle sally port and guard shack will also be constructed near the northeast facility entrance and new pole mounted lighting and video cameras along the inside of the fence. Some site grading and utility installation consisting of electrical and fiber optic lines for the lighting and camera will be incidental to the project. The fence will run the entire perimeter of the facility. In accordance with your written authorization, we have conducted a subsurface exploration program for the proposed project.

Scope of Services:

Our authorized scope of services included the following:

1. To investigate the subsurface soil and water conditions encountered at five (5) split-spoon soil boring locations within the anticipated building addition. The borings were planned to be twenty (20) feet deep at each location. The borings were conducted at locations indicated to us as shown on the boring location plan in Appendix 1.
2. To provide a report of our findings including the results of our subsurface investigation and recommendations regarding earthwork, fill and compaction,

foundation design, subgrade modulus for concrete slabs on grade, estimated settlements and soil bearing capacities.

General Site Conditions:

The site is located between 6th Avenue West and 10th Avenue West, east of Adams Street South in Shakopee, Minnesota. The site is currently open grassy areas surrounding the existing prison. The site is gently sloping to the north with slopes of 0-2 percent.

Available Subsurface Information:

According to the Geologic Map of Minnesota, Quaternary Geology, prepared by Howard C. Hobbs and Joseph E. Goebel (1982, Minnesota Geological Survey), this site lies within terrace deposits of Holocene to Pleistocene age. These are remnants of former channels and floodplains above the levels of present floodplains but below the levels of adjacent moraine and outwash surfaces. These deposits generally consist of sand and gravel outwash with some finer material in tributaries to the Mississippi River.

B. Exploration Program

Five (5) split-spoon soil borings were conducted on this project. The borings were advanced to 7 to 20 feet deep using a 3 ¼ inch I.D. hollow stem auger. Samples were obtained every 2 ½ feet for the first ten feet and every five feet thereafter, using a 2-inch O.D. split spoon sampler in accordance with the American Society for Testing and Materials (ASTM D1586). Standard penetration values (N-values) were obtained at each sample interval by driving the sampler into the soil using a 140-pound hammer falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler 12 inches is known as the standard penetration resistance or N-value. Where the sampler can not be driven at least 6 inches by 50 blows of the hammer, the total number of blows as well as the distance driven is reported on the boring logs.

Groundwater levels were noted during drilling and immediately after completion. The holes were backfilled with the auger cuttings. Some settlement of the bore holes may be expected. All of the borings were conducted with a truck mounted drill rig. The boring locations were indicated to us by you.

Exploration Results:

The borings were conducted in open areas of the site. Boring B-1 was conducted at the proposed guard shack area just east of the vehicle entrance onto the secure area. Borings B-2 through B-5

were conducted at each corner of the facility. The borings encountered silty sand (SM) topsoil at the surface to depths of 4 to 18 inches.

Below the topsoil, boring B-1 encountered native, fine grained, silty sand (SM) with gravel to 3.5 feet, followed by poorly graded sand with silt (SP-SM) with gravel to termination at 20.0 feet. Below the topsoil, boring B-2 encountered poorly graded sand with silt (SP-SM) fill to 3.5 feet, followed by native, poorly graded sand with silt (SP-SM) with gravel to 6.5 feet, silty sand (SM) to 12.0 feet, silty clayey sand (SC-SM) to 16.0 feet and then poorly graded sand (SP) to termination at 20.0 feet. Below the topsoil, boring B-3 encountered fine grained, silty sand (SM) fill with gravel to 3.0 feet, followed by poorly graded gravel (GP) to refusal at 16.0 feet. Below the topsoil, boring B-4 encountered fine grained, silty sand (SM) fill with gravel to 4.0 feet, followed by native poorly graded sand with silt (SP-SM) with gravel and cobbles to refusal at 8.5 feet. Below the topsoil, boring B-5 encountered fine grained, silty sand (SM) fill with gravel to 4.0 feet, followed by native silty sand (SM) with gravel and cobbles to refusal at 7.0 feet.

Penetration Test Results:

The standard penetration blow counts in the native sand soils ranged from 12 to more than 50, which are moderate to high, indicating that they are in a medium to very dense condition. Refusal of the spoon occurred in all of the borings at various sample intervals, except B-2. Refusal was encountered in cobbles in borings B-3, B-4 and B-5 prior to reaching planned depth. Drilling was relatively very difficult in the borings.

Water Level Observations:

Observations of the subsurface water conditions were made during drilling operations. Groundwater was not encountered in any of the borings during our investigation. The water levels were observed over a very short period of time. However, we feel they are an accurate representation of the true water levels on this site at the time of our exploration because of the high permeability of the native sandy and gravelly soils on this site.

Fluctuations in the level of the groundwater can occur due to variations in rainfall, temperature,

spring thaw and other factors not evident at the time of our investigation. Mottled soils were not observed. Mottled native soils are a historical indication of a temporarily or seasonally saturated soil condition. Grey soils were also not observed. Grey native soils are an indication of a permanently saturated soil condition.

C. Engineering Review

Discussion:

Based on our findings, the site appears to be fairly well suited for the proposed construction. The native, inorganic soils observed in all of the borings are considered excellent for structural support.

We understand the perimeter fence will consist of a 12-foot ornamental iron security fence supported by a combination of intermittent column structures and cast-in-place concrete piers on 6-8 foot centers. A concrete mow strip will also be constructed under the fence. New pole mounted lighting and video cameras will be installed along the inside of the fence. Some site grading and utility installation consisting of electrical and fiber optic lines for the lighting and camera will be incidental to the project.

A new guard shack will also be constructed near the vehicle entrance to the secure area on the east side of the facility. We understand the guard shack will be a small, wood framed structure on standard cast-in-place concrete spread footings.

There was some fill observed in our borings. However, it appears the foundations for the perimeter fence will be below the depth of fill observed in each boring. We recommend the existing topsoil be completely removed from beneath the mow strip and be replaced with properly compacted structural fill.

The amount of cobbles present in the native soils may make excavation difficult. Normal excavation equipment, such as a backhoe, can generally excavate to the depths that our drill rig can drill. However, boring and larger diameter drilling equipment may have difficulty. We assume the excavations for the column structures would and could be accomplished with a backhoe. The

excavations for the cast-in-place concrete piers would likely be accomplished by an auger. This may be difficult to accomplish with the amount of gravel and cobbles present.

D. Recommendations

The following recommendations are based on our understanding of the proposed project. If our understanding of the project is not accurate, or if changes are made to the project scope, please inform us so that our recommendations can be amended, if necessary. We have included recommendations regarding earthwork and construction that may help in cost estimates and aid in design. We should be allowed to review the proposed construction plans to provide further detailed recommendations, if necessary. Without the opportunity to review the final construction plans, the recommendations made in this report may no longer be valid.

Guard Shack:

We recommend that the existing topsoil material be removed from the proposed building. We estimate that this will require an excavation of approximately 6 inches over the building area. We recommend the topsoil be removed from the site or re-used as landscaping material. We also recommend removal of any bituminous pavement and aggregate base. There were a lot of utilities in the area of our boring, including a gas line, electrical line and water line. There is always a possibility that unsuitable soils may be present, especially as backfill over utility lines in green areas. Soils can change dramatically over short horizontal distances. Therefore these depths should be used as a guide.

We recommend the bottom of the excavation be observed by a soils engineer or a qualified technician to verify that native, competent material has been reached. We recommend the exposed soils be surface compacted with at least three passes of a heavy roller to compact the loose soils near the surface prior to placing any fill.

We recommend the excavation be oversized one foot for every foot of fill required to reach planned grade (1:1 oversizing). We recommend that observations be conducted continuously during earthwork to identify any additional poor soils. After removal of any topsoil, pavement, aggregate base and any other unsuitable soils, we recommend clean, mineral fill, meeting the requirements of structural fill, be placed and compacted to bring the building areas to grade.

The N-values recorded in the penetration borings indicate that the existing native sandy soils on this site are in a medium to very dense condition capable of supporting the proposed structures. Structural fill placed and compacted in accordance with the following recommendations will also be suitable for support of the proposed structure.

Any footings placed on native soils or on properly compacted fill should be proportioned for a maximum net allowable soil bearing pressure of 3500 psf. We recommend all exterior foundations in heated buildings bear at least 42 inches below exterior finished grade to provide protection from frost. In unheated buildings, we recommend foundations bear at least 60 inches below finished grade. We recommend compaction tests be taken on any fill below the footings at a rate of one test per 50 linear feet for wall footings and one test per column footing. We recommend compaction tests be taken immediately prior to pouring the footings.

The recommended bearing pressure is a net value and represents the actual loads that may be transmitted to the soil independent of overburden pressures. We estimate total settlement to be less than ½ inch with differential settlement about half of this if the recommendations in this report are followed.

We recommend a minimum of 6 inches of clean, free draining washed sand with less than 5% passing a No. 200 sieve be placed beneath the concrete slabs-on-grade. This will provide a capillary break and a uniform level subgrade for the floor slabs. We recommend the floor slab be designed using a modulus of subgrade reaction of 350 pounds per cubic inch.

Perimeter Security Fence

The perimeter fence will be supported by intermittent columns on cast-in-place concrete footings along with supports every 6 to 8 foot on center installed in cast-in-place concrete piers. The columns will be either concrete or CMU block construction on spread footings. We assume the spread footings will be excavated with a backhoe to allow for forming the footing. We assume the concrete piers for the supports will be excavated using an auger.

There was a significant amount of cobbles observed in the borings. Excavation of the cobbles beneath the columns may cause some over excavation. We recommend any over excavation be filled in with granular material with less than 5% passing a number 200 sieve. We recommend the fill be watered and compacted prior to placing the concrete for the footing.

Based on the result of our boring, it is our opinion that the native sand soils are capable of supporting a structure designed using a net allowable soil bearing pressure of 3500 pounds per square foot (psf).

The recommended bearing pressure is a net value and represents the actual loads that may be transmitted to the soil independent of overburden pressures. We estimate total settlement to be less than 1/2 inch with differential settlement about half of this if the recommendations in this report are followed.

The supports will be placed in 16-inch diameter, cast-in-place concrete piers at depths of 5 feet. The excavation will likely be accomplished with and auger drill. Cobbles may be encountered. The excavations will likely be able to stay open, however the presence of cobbles may create excess voids in the pier walls. We recommend that sleeves be avoided as much as possible. If sleeves are necessary because of excess voids or the holes not standing open on their own, we recommend backfilling the voids with clean coarse sand with less than 5% passing a number 200 sieve.

We recommend all topsoil be removed from beneath the proposed mow strip. We recommend a minimum of 4 inches of compacted aggregate base be placed beneath the concrete mow strip. We recommend the aggregate fill be watered and compacted prior to placing the concrete mow strip.

Structural Fill:

The on-site soils consisting of poorly graded sands (SP) are considered excellent material for use as structural fill. These soils are relatively easy to compact using vibratory compaction equipment when at or near optimum moisture.

We recommend that any imported fill consist of mineral soils meeting the following requirements. No organic soils, roots, stumps, logs, brush, etc. should be used as structural fill below any foundation or pavement section. We recommend that all fill material be free of soft, wet or frozen soils, highly expansive soils, rubble, debris and rocks in excess of 6 inches in diameter. The fill should be as uniform as possible both in composition and moisture content.

We recommend all fill placed be compacted in 12-inch loose lifts. All fill should be compacted at a moisture content within plus or minus 2% of the optimum moisture as determined by a standard proctor. We recommend compaction tests be taken on any fill in the pavement areas at a rate of one test per vertical foot per 2500 square foot area.

We recommend all fill be compacted to the minimum relative density levels shown in the table below:

Location	Recommended Compaction Level (percent of Std. Proctor ASTM D698)
Below Foundations	100 %
Below Interior Floor Slabs and Load Bearing Wall Footings, Interior Wall Backfill	98%
Below Pavements, deeper than 3 feet from finished subgrade, Exterior Wall Backfill	95%
Below Pavements within 3 feet of finished subgrade	100%
Below Exterior Sidewalks and Concrete Slabs	95%
Landscape Areas	90%

E. Closing

Our work was performed for geotechnical purposes only and not to document the presence or extent of any contamination on the site. We can note that our crew did not detect any obvious contamination by sight or smell during drilling operations. However, human senses are limited in terms of contamination detection and, therefore, the lack of detection through human sensing does not preclude the possibility of the presence of contamination of the site.

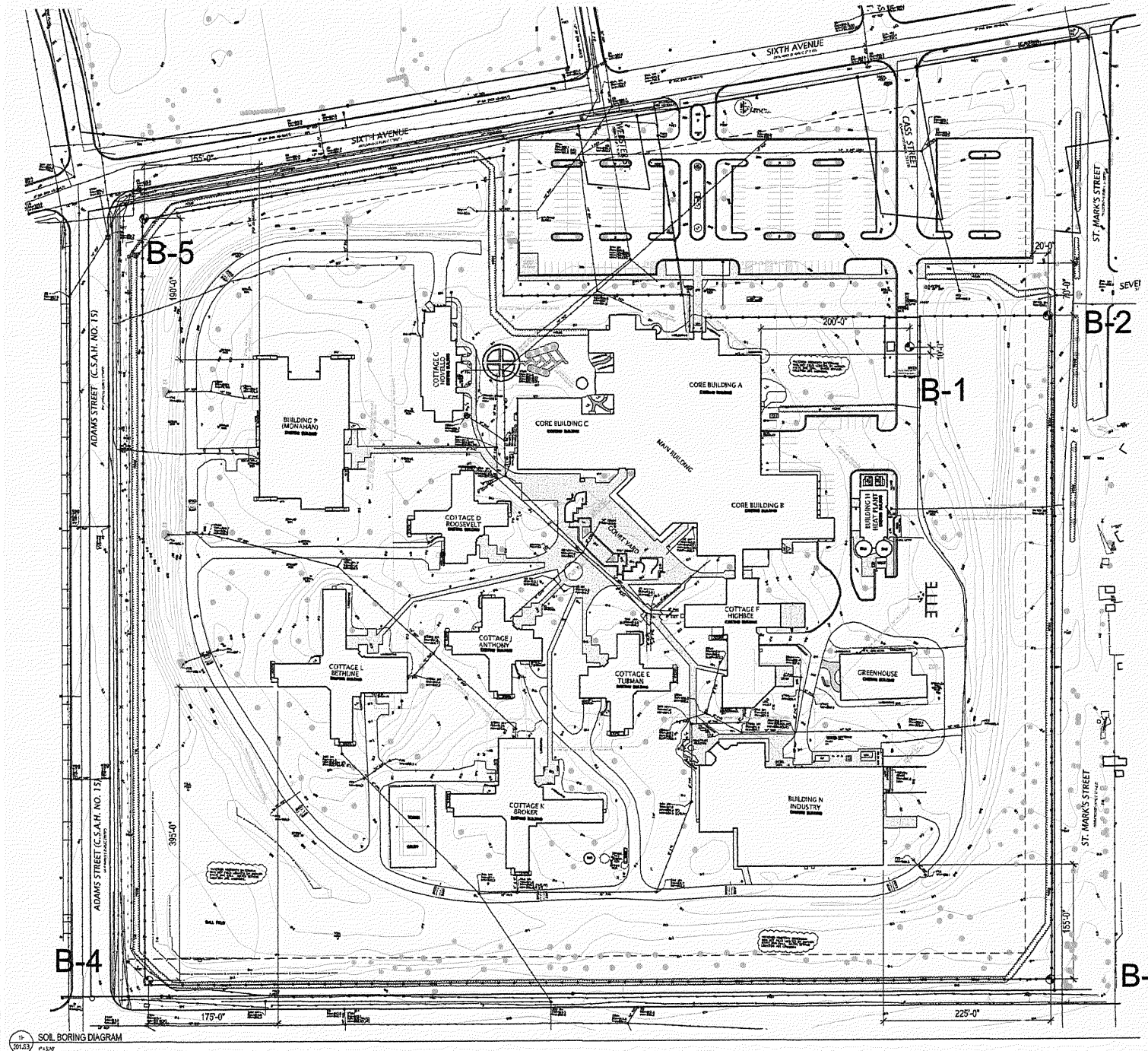
This report represents the result of our subsurface investigation and is based on information gathered at specific locations. Subsurface conditions can change a great deal over short horizontal distances. Also, the actual interface between strata will likely be a gradual transition rather than an abrupt change as represented on the boring logs.

Geotechnical engineering is based extensively on opinion. Therefore, the data contained in this report should be used as a guide, and we recommend that construction monitoring be performed by a qualified geotechnical engineer or technician. Any changes in the subsurface conditions from those found during this geotechnical investigation should be brought to the attention of a soils engineer.

c:b15015-rpt

APPENDIX 1

BORING LOCATION PLAN



LEGEND

- LOCATION OF SOIL BORING

SOIL BORING DIAGRAM

PERIMETER SECURITY SYSTEM

MINNESOTA CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA
BWBR PROJECT NO. 2019.03

B|W|B|R

380 St. Peter Street, Ste. 800
Saint Paul, MN 55102
651.223.5790
bwbr.com

Name

Date 03/13/2025 Proj. No.

Issued For

Item	Date

Comm. No. 2019.03.00

Drawn CC

Sheet Title

SOIL BORING DIAGRAM

Sheet No.

201.SB

APPENDIX 2

SOIL BORING LOGS

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **15-015** **MINNESOTA DEPT. OF ADMINISTRATION**
PERIMETER SECURITY SYSTEM
MN CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

DATE: **2/19/15** *BORING #:* **B-1**
START TIME: **11:08** *END TIME:* **12:08**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **DB/ VB**

LOCATION: **Guard Shack Area**
ELEVATION: **808.1**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
6"	SM	SILTY CLAYEY SAND, fine grained, black, TOPSOIL.				
	SM	SILTY SAND, fine grained, w/ GRAVEL, brown.				
			1	*	3.7	* Frozen
3.5						
	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ GRAVEL, brown.				
5.0			2	25	4.6	
			3	50*		* 50 blows for 4 inches
			4	50*		* 50 blows for 4 inches. No Recovery
10.0						
			5	50*		* 50 blows for 4 inches. No Recovery
15.0						
			6	50*	3.7	* 50 blows for 5 inches.
20.0						
		Boring complete to 20 feet. Water was not encountered during drilling. No water measured to cave-in at 8'2" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **15-015** **MINNESOTA DEPT. OF ADMINISTRATION**
PERIMETER SECURITY SYSTEM
MN CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

DATE: **2/19/15** *BORING #:* **B-2**
START TIME: **12:58** *END TIME:* **1:38**
METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **DB/ VB**
LOCATION: **Northeast Corner of Proposed Perimeter Fence**
ELEVATION: **807.4** **Page 1 of 1**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
6"	SM	SILTY CLAYEY SAND, fine grained, black, TOPSOIL.				
3.5	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, dark brown. FILL	1	*		* Frozen
5.0	SP-SM	POORLY GRADED SAND w/ SILT, fine grained, w/ GRAVEL, brown.	2	13	2.6	
6.5						
	SM	SILTY SAND, fine to medium grained, w/ a trace of GRAVEL, brown.	3	34	2.8	
10.0			4	30	9.6	
12.0						
	SC-SM	SILTY CLAYEY SAND, fine grained, w/ a trace of GRAVEL, brown.				
15.0			5	39	14.2	
16.0						
	SP	POORLY GRADED SAND, fine to medium grained, w/ GRAVEL, brown.				
20.0			6	28	11.5	* 50 blows for 5 inches.
		Boring complete to 20 feet. Water was encountered at 10.0 feet during drilling. No water measured to cave-in at 9'4" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **15-015** **MINNESOTA DEPT. OF ADMINISTRATION**
PERIMETER SECURITY SYSTEM
MN CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

DATE: **2/19/15** *BORING #:* **B-3**
START TIME: **1:45** *END TIME:* **2:40**

METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **DB/ VB**

LOCATION: **Southeast Corner of Proposed Perimeter Fence**
ELEVATION: **814.8**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
4"	SM	SILTY CLAYEY SAND, fine grained, black, TOPSOIL.				
	SM	SILTY SAND, fine grained, w/ GRAVEL, dark brown. FILL	1	*	19.7	* Frozen
3.0	GP	POORLY GRADED GRAVEL, w/ cobbles, brown.				
5.0			2	19	23.5	* No Recovery
			3	36	14.9	* No Recovery
10.0			4	50*	29.3	* 50 blows fo 0 inches. * No Recovery
15.0			5	50*		* 50 blows fo 0 inches. * No Recovery
16.0		Refusal encountered at 16.0 feet on cobbles. Water was not encountered during drilling. No water measured to cave-in at 6'2" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **15-015** **MINNESOTA DEPT. OF ADMINISTRATION**
PERIMETER SECURITY SYSTEM
MN CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

DATE: **2/24/15** *BORING #:* **B-4**
START TIME: **9:44** *END TIME:* **10:19**
METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **DB/ RK**
LOCATION: **Southwest Corner of Proposed Perimeter Fence**
ELEVATION: **813.3** **Page 1 of 1**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
6"	SM	SILTY CLAYEY SAND, fine grained, black, TOPSOIL.				
	SM	SILTY SAND, fine grained, w/ GRAVEL, dark brown. FILL	1	*	12.5	* Frozen
4.0						
5.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/. GRAVEL and COBBLES, brown.	2	12	3.1	
			3	50*		* 50 blows fo 0 inches. * No Recovery
8.5						
		Refusal encountered at 8.5 feet on cobbles. Water was not encountered during drilling. No water measured to cave-in at 4'2" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: **15-015** **MINNESOTA DEPT. OF ADMINISTRATION**
PERIMETER SECURITY SYSTEM
MN CORRECTIONAL FACILITY
SHAKOPEE, MINNESOTA

DATE: **2/24/15** *BORING #:* **B-5**
START TIME: **10:28** *END TIME:* **11:02**
METHOD: **3 ¼" I.D. Hollow Stem Auger**
CREW: **DB/ RK**
LOCATION: **Northwest Corner of Proposed Perimeter Fence** *ELEVATION:* **807.8**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W_n	Notes
18"	SM	SILTY SAND, fine grained, black, TOPSOIL.				
4.0	SM	SILTY SAND, fine grained, w/ GRAVEL, dark brown. FILL	1	*	6.4	* Frozen
5.0	SM	SILTY SAND, medium to coarse grained, w/ GRAVEL, brown.	2	35	2.2	
7.0		w/ GRAVEL and COBBLES				
		Refusal encountered at 7.0 feet on cobbles. Water was not encountered during drilling. No water measured to cave-in at 3'8" after completion.				

Unified Soil Classification (USC) System (from ASTM D 2487)

Major Divisions			Group Symbol	Typical Names
Course-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	**Gravels** 50% or more of course fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of course fraction passes the 4.75 (No. 4) sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	**Silts and Clays** Liquid Limit 50% or less		ML	Inorganic silts, very fine sands, rock four, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic
Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%