



**GEOTEK ENGINEERING
& TESTING SERVICES, INC.**
909 East 50th Street North
Sioux Falls, South Dakota 57104
605-335-5512 Fax 605-335-0773

July 12, 2017

Brandon Development Foundation
c/o Sayre Associates, Attn: Monty Miller

Subj: Preliminary Geotechnical Exploration
Proposed Rovang Industrial Park
Corson, SD
GeoTek #17-483

Introduction

This correspondence presents our reporting of the recent test borings for the industrial park expansion in Corson, SD. Previous correspondence is dated June 5 & 14, 2017. This work was done in accordance with the Brandon Development Foundation approval on May 1, 2017.

Field Data

The site is located in the southwest quarter of section 23 and northeast of the intersection of 481st Avenue and Hemlock Boulevard (260 Street). The property slopes mostly from the west to the east and has been in agricultural use.

A site sketch is attached showing the relative locations of the soil borings. Surface elevations at the boring locations were referenced to the top of a fire hydrant near the intersection of Hemlock Boulevard and 1st Avenue. An elevation of 1372.63' was used for the referenced data.

Eight borings were initially put down for the project with two additional borings, 9 and 10, completed on the easterly half of the property. The logs of the test holes are attached.

The test borings indicated a soil profile that consists of virtually all clay soil. The borings are paired into three groups with the first group consisting of only boring 1 in which the clay soil are of a favorable water content and stiffness. The second group consists of borings 2 through 8 in which silty clay soils are found and become soft and wet at a depth of about 5'.

The final group would be borings 9 and 10 in which fat clay soils were found in the upper 10' of the profile.

Groundwater

Groundwater measurements were made at the boring locations and data is recorded on the boring logs. Multiple groundwater measurements were made at borings 1, 2, 3 and 4 and therefore that data has a degree of reliability. The other borings in which the groundwater measurements were made upon immediate completion of the borings are less reliable as accurate indications of the water table elevation.

Analysis

As a generalization, the development park expansion on the north side of Hemlock will be similar to the existing park on the south side of Hemlock in that more favorable soils are found in the higher elevations of the two properties. As one moves to the east and ground elevations are lower, more challenging soil conditions are found. As characterized earlier in the report, the second category of borings (2 through 8) encountered elevated water content in the soil beginning at about the 5' level. Depending upon earthwork cut and fill and final grade levels these elevated water content of the soil and resulting soft condition of the soil may have an impact on utility construction, pavements and buildings.

The fat clay encountered in borings 9 and 10 will require significant site preparation (soil correction) if building construction occurs in this area.

On other project development sites, the planting of high water demand crops such as alfalfa has resulted in a favorable reduction of water content of the subgrade soils to significant depths which would be beneficial to a large portion of the site.

Standard of Care

The recommendations and opinions presented in this report are in accordance with current engineering practices for this time and area. Other than this, no express or implied warranty is intended.

Because the area of the borings is small in relation to the entire site, and for other reasons, GeoTek does not guarantee continuity or warrant conditions between the soil borings.

This report is for the exclusive use of the addressee and its representatives for the use in design of the proposed project described herein and preparation of construction documents. Without written approval, we assume no responsibility to other parties regarding this report.

Our conclusions, opinions and recommendations may not be appropriate for other parties or project.

Remarks

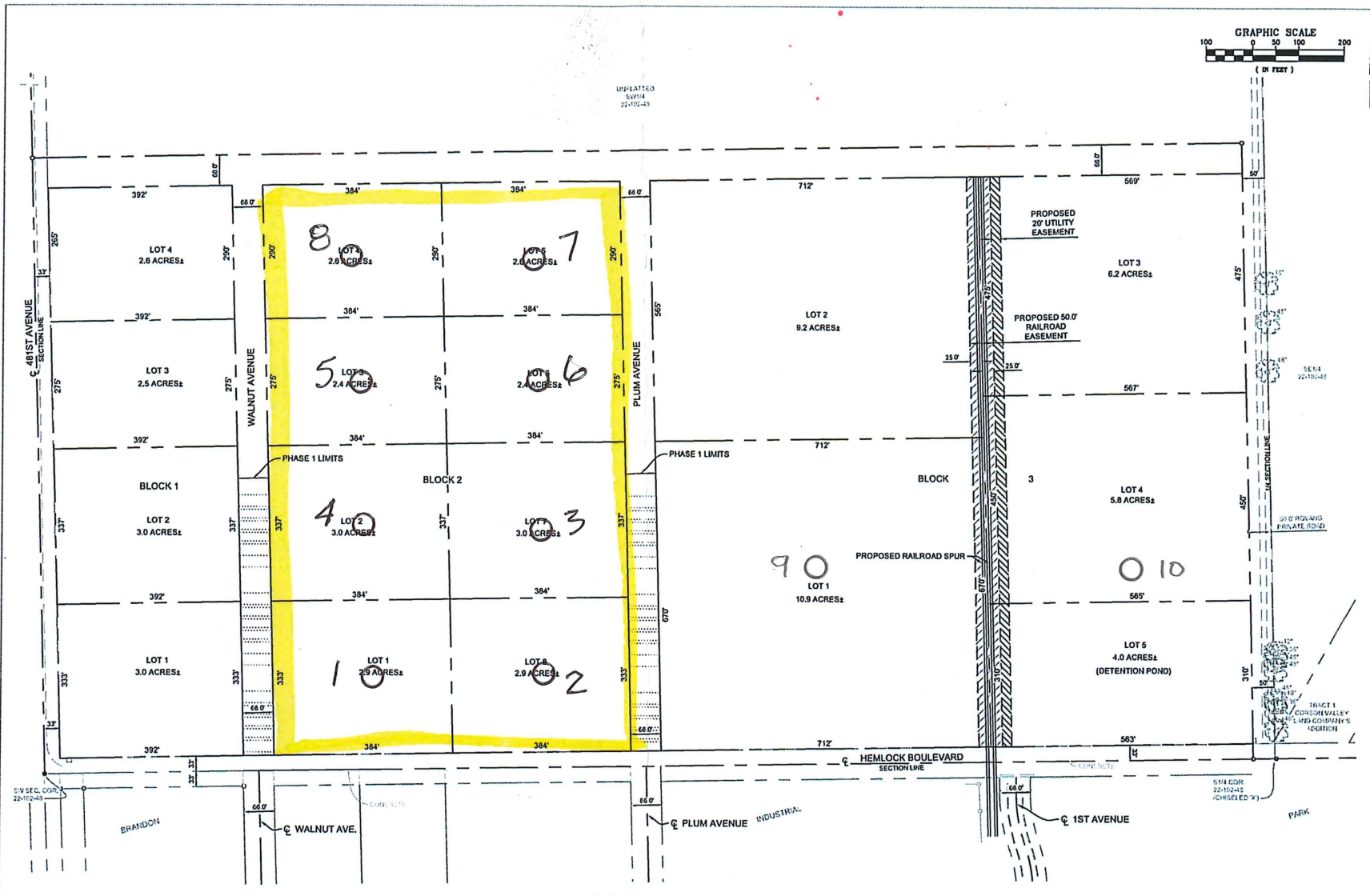
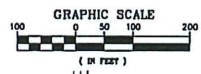
The collected soil samples will be retained in our office for a period of thirty days after the date of this report and will then be discarded unless we are notified otherwise.

We trust that this report provides you with the necessary information for the project. Should you have any comments or questions, please feel free to contact our office.

GeoTek Engineering & Testing Services, Inc.

Ralph E. Lindner

Ralph E. Lindner, PE
Project Engineer



UNPLATTED SW/4 22-102-48

Engineering Solutions

Sayre Associates
 PROFESSIONAL ENGINEERS
 PHONE: (605) 335-2111 FAX: (605) 335-2122

ROYANG INDUSTRIAL PARK
 ROYANG INDUSTRIAL PARK
 SOUTHWEST QUARTER OF SECTION 22-102-48
 BRANDON, MINNEHAHA COUNTY, SOUTH DAKOTA

BENCHMARK NO. 1: NAIL IN POWER POLE ON EAST SIDE OF 48161 AVENUE ELEV. = 1413.95 (88 DATUM)	BENCHMARK NO. 2: TOP NUT OF FIRE HYDRANT ON NORTHEAST CORNER OF 48161 AVENUE & HEMLOCK BOULEVARD ELEV. = 1434.83 (88 DATUM)	BENCHMARK NO. 3: TOP NUT OF FIRE HYDRANT ON SOUTH SIDE OF HEMLOCK BOULEVARD ELEV. = 1411.78 (88 DATUM)	BENCHMARK NO. 4: TOP NUT OF FIRE HYDRANT ON SOUTH SIDE OF HEMLOCK BOULEVARD ELEV. = 1372.63 (88 DATUM)
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PROPOSED ZONING: I4 (HEAVY INDUSTRIAL)
 LEGAL DESCRIPTION:
 TRACT 1, ROYANG INDUSTRIAL PARK IN THE SOUTHWEST QUARTER (SW/4) OF SECTION 22, TOWNSHIP 102 NORTH, RANGE 48 WEST OF THE 50 P.M., MINNEHAHA COUNTY, SOUTH DAKOTA

BY: DDJ, 21092-PP-P.dwg, LOT LAYOUT, REV DATE: , PRINT DATE: Mar 20, 2017

PROJECT NO.:	21092
SURVEYED BY:	JHC
CREATED BY:	DDJ
APPROVED BY:	JHC
REVISION DATE:	
LOT LAYOUT PLAN	



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GEOTECHNICAL TEST BORING LOG

GEOTEK # 17-483

BORING NO. 1 (1 of 1)

PROJECT Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD

DEPTH in FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS							
					NO.	TYPE	WC	D	LL	PL	QU			
	SURFACE ELEVATION <u>1404.3 ft</u> LEAN CLAY: brown, moist, a 3" layer of topsoil at the surface (CL)	MIXED ALLUVIUM				1	HSA							
			8			2	SPT	20						
						3	SPT	22						
13	LEAN CLAY WITH SAND: a little gravel, brown, moist, firm to stiff, (CL)	TILL				4	SPT							
			13			5	SPT							
21	Bottom of borehole at 21 feet.		16											

WATER LEVEL MEASUREMENTS

START 5-30-17 COMPLETE 5-30-17 1:40 pm

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD
5-30-17	1:40 pm	21	--	19	--	3.25" ID Hollow Stem Auger
6-6-17	11:00 am	21	--	--	▼ 9.0	
--	--	--	--	--	--	
--	--	--	--	--	--	CREW CHIEF Roy Hanson

GEOTECHNICAL TEST BORING 17-483.GPJ GEOTEKENG.GDT 7/12/17



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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>2 (1 of 1)</u>											
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																	
DEPTH in FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>1388.3 ft</u>					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS						
									NO.	TYPE	WC	D	LL	PL	QU		
4½	SILTY CLAY: brown, moist, a 11" layer of topsoil at the surface (CL)					LOESS			1	HSA							
9½	SILTY CLAY: brown and gray, moist, soft, (CL)					LOESS	4		2	SPT	30						
14	SILTY CLAY: grayish brown, moist, firm, (CL)					LOESS	5		3	SPT	27						
19	LEAN CLAY WITH SAND: a little gravel, brown, moist, stiff to very stiff, (CL)					TILL	9		4	SPT							
21	Bottom of borehole at 21 feet.						19		5	SPT							
WATER LEVEL MEASUREMENTS						START <u>5-30-17</u> COMPLETE <u>5-30-17 12:05 pm</u>											
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD											
5-30-17	12:05 pm	21	--	18	14.0	3.25" ID Hollow Stem Auger											
6-6-17	11:09 am	21	--	--	7.9												
--	--	--	--	--	--												
--	--	--	--	--	--	CREW CHIEF Roy Hanson											

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GEOTECHNICAL TEST BORING LOG

GEOTEK # 17-483

BORING NO. 3 (1 of 1)

PROJECT Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD

DEPTH in FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS								
					NO.	TYPE	WC	D	LL	PL	QU				
	↓ SURFACE ELEVATION <u>1388.3 ft</u>														
6	SILTY CLAY: brown, moist, firm, a 11" layer of topsoil at the surface (CL)	LOESS	7		1	HSA									
					2	SPT	24								
	SILTY CLAY: brown and gray, moist, soft to firm, (CL)	LOESS	4	▼	3	SPT	30								
			5		4	SPT	30								
18	LEAN CLAY WITH SAND: a little gravel, brown, moist, stiff, (CL)	TILL	11		5	SPT									
21	Bottom of borehole at 21 feet.														

WATER LEVEL MEASUREMENTS

START 5-30-17 COMPLETE 5-30-17 11:20 am

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD
5-30-17	11:20 am	21	--	17.5	8.5	3.25" ID Hollow Stem Auger
6-6-17	11:07 am	21	--	--	▼ 7.6	
--	--	--	--	--	--	
--	--	--	--	--	--	CREW CHIEF Roy Hanson

GEOTECHNICAL TEST BORING 17-483.GPJ GEOTEKENG.GDT 7/12/17



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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>4 (1 of 1)</u>											
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																	
DEPTH in FEET	DESCRIPTION OF MATERIAL ↓ SURFACE ELEVATION <u>1386.1 ft</u>					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS						
									NO.	TYPE	WC	D	LL	PL	QU		
4½	SILTY CLAY: brown, moist, a 8" layer of topsoil at the surface (CL)					LOESS			1	HSA							
9½	SILTY CLAY: brown and gray, moist, firm, (CL)					LOESS	7		2	SPT	24						
14½	SILTY CLAY: grayish brown, moist, soft, (CL)					LOESS	3		3	SPT	28						
18	LEAN CLAY WITH SAND: a little gravel, brown, moist, stiff to very stiff, (CL)					TILL	9		4	SPT							
21	Bottom of borehole at 21 feet.						18		5	SPT							
WATER LEVEL MEASUREMENTS							START	<u>5-30-17</u>		COMPLETE	<u>5-30-17 2:25 pm</u>						
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD											
5-30-17	2:25 pm	21	--	17.5	9.5	3.25" ID Hollow Stem Auger											
6-6-17	11:05 am	21	--	--	8.5												
--	--	--	--	--	--												
--	--	--	--	--	--	CREW CHIEF Roy Hanson											

GEOTECHNICAL TEST BORING 17-483.GPJ GEOTEKENG.GDT 7/12/17



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GEOTECHNICAL TEST BORING LOG

GEOTEK # 17-483

BORING NO. 5 (1 of 1)

PROJECT Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD

DEPTH in FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS								
					NO.	TYPE	WC	D	LL	PL	QU				
	↓ SURFACE ELEVATION <u>1397.2 ft</u>														
4½	SILTY CLAY: brown, moist, a 8" layer of topsoil at the surface (CL)	LOESS			1	HSA									
	SILTY CLAY: brown and gray, moist, soft, (CL)	LOESS	3		2	SPT	30								
9½	LEAN CLAY WITH SAND: a little gravel, brown, moist, firm to very stiff, (CL)	TILL	7		3	SPT	18	113	36	14	1800				
			19		4	SPT									
			27		5	SPT									
21	Bottom of borehole at 21 feet.														

WATER LEVEL MEASUREMENTS

START 5-30-17 COMPLETE 5-30-17 3:15 pm

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD
5-30-17	3:15 pm	21	--	19	▼ 16.0	3.25" ID Hollow Stem Auger
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--	--	--	--	--	--	
--	--	--	--	--	--	CREW CHIEF Roy Hanson

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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>6 (1 of 1)</u>												
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																		
DEPTH in FEET	DESCRIPTION OF MATERIAL					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS							
									NO.	TYPE	WC	D	LL	PL	QU			
	SURFACE ELEVATION <u>1394.4 ft</u>																	
	SILTY CLAY: brown, moist, firm, a 10" layer of topsoil at the surface (CL)					LOESS			1	HSA								
							5		2	SPT	22							
9½	SILTY CLAY: grayish brown, moist, firm, (CL)					LOESS			3	SPT	29							
14½	SILTY CLAY: brown and gray, moist, soft, (CL)					LOESS			4	SPT								
18	LEAN CLAY WITH SAND: a little gravel, brown, moist, stiff, (CL)					TILL			5	SPT								
21	Bottom of borehole at 21 feet.																	
WATER LEVEL MEASUREMENTS							START	<u>5-30-17</u>	COMPLETE	<u>5-30-17 9:45 am</u>								
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD												
5-30-17	9:45 am	21	--	17	▼ 8.0	3.25" ID Hollow Stem Auger												
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GEOTECHNICAL TEST BORING 17-483.GPJ - GEOTEKENG.GDT 7/12/17



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GEOTECHNICAL TEST BORING LOG

GEOTEK # 17-483

BORING NO. 7 (1 of 1)

PROJECT Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD

DEPTH in FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS								
					NO.	TYPE	WC	D	LL	PL	QU				
	↓ SURFACE ELEVATION <u>1385.0 ft</u>														
	SILTY CLAY: brown, moist, firm, a 4" layer of topsoil at the surface (CL)	LOESS				1	HSA								
			6			2	SPT	27							
9½	SILTY CLAY: brown and gray, moist, soft, (CL)	LOESS	3	▼		3	SPT								
14	SANDY LEAN CLAY: brown, moist, very stiff, (CL)	MIXED ALLUVIUM	26			4	SPT	19							
19	SAND: fine grained, brown, waterbearing, dense, (SP)	COARSE ALLUVIUM	29			5	SPT								
21	Bottom of borehole at 21 feet.														

WATER LEVEL MEASUREMENTS

START 5-30-17 COMPLETE 5-30-17 10:40 am

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD
5-30-17	10:40 am	21	--	12	▼ 11.0	3.25" ID Hollow Stem Auger
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--	--	--	--	--	--	CREW CHIEF Roy Hanson

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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>8 (1 of 1)</u>											
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																	
DEPTH in FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION <u>1387.9 ft</u>					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS						
									NO.	TYPE	WC	D	LL	PL	QU		
4 1/2	SILTY CLAY: brown, moist, a 11" layer of topsoil at the surface (CL)					LOESS			1	HSA							
9 1/2	SILTY CLAY: brown and gray, moist, soft, (CL)					LOESS	3		2	SPT	25						
14 1/2	SILTY CLAY: grayish brown, moist, soft, (CL)					LOESS	3		3	SPT	32						
16	SILTY CLAY: brown and gray, moist, soft, (CL)					LOESS	4		4	SPT	30						
21	LEAN CLAY WITH SAND: a little gravel, brown, moist, stiff, (CL)					TILL	12		5	SPT							
	Bottom of borehole at 21 feet.																
WATER LEVEL MEASUREMENTS							START	<u>5-30-17</u>	COMPLETE	<u>5-30-17 4:05 pm</u>							
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD											
5-30-17	4:05 pm	21	--	15	7.5	3.25" ID Hollow Stem Auger											
--	--	--	--	--	--												
--	--	--	--	--	--												
--	--	--	--	--	--	CREW CHIEF	Roy Hanson										

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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>9 (1 of 1)</u>												
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																		
DEPTH in FEET	DESCRIPTION OF MATERIAL					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS							
									NO.	TYPE	WC	D	LL	PL	QU			
	SURFACE ELEVATION <u>1375.3 ft</u>																	
	FAT CLAY: brown, moist, firm, a 8" layer of topsoil at the surface (CH)					FINE ALLUVIUM			1	HSA								
							8		2	SPT	33							
9½	SILTY CLAY: brown, moist, firm, (CL)					FINE ALLUVIUM	6		3	SPT	20							
							5		4	SPT	25							
18	SANDY LEAN CLAY: a little gravel, brown, moist, very stiff, (CL)					MIXED ALLUVIUM												
21	Bottom of borehole at 21 feet.						16		5	SPT								
WATER LEVEL MEASUREMENTS							START	<u>6-9-17</u>	COMPLETE	<u>6-9-17 8:35 am</u>								
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD												
6-9-17	8:35 am	21	--	19	--	3.25" ID Hollow Stem Auger												
--	--	--	--	--	--													
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--	--	--	--	--	--	CREW CHIEF Roy Hanson												

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GEOTECHNICAL TEST BORING LOG

GEOTEK # <u>17-483</u>						BORING NO. <u>10 (1 of 1)</u>												
PROJECT <u>Preliminary Geotechnical Exploration, Proposed Rovang Industrial Park, Corson, SD</u>																		
DEPTH in FEET	DESCRIPTION OF MATERIAL					GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS							
									NO.	TYPE	WC	D	LL	PL	QU			
	SURFACE ELEVATION <u>1365.7 ft</u>																	
	FAT CLAY: brown, moist, firm, a 8" layer of topsoil at the surface (CH)					FINE ALLUVIUM			1	HSA								
							8		2	SPT	32	89	97	27	3800			
9½	SILTY CLAY: brown and gray, moist, firm, (CL)					FINE ALLUVIUM	5		3	SPT	28							
14½	SILTY CLAY: brown, moist, firm, (CL)					MIXED ALLUVIUM	7		4	SPT	27							
22	SAND: fine to medium grained, brown, moist, dense, (SP)					COARSE ALLUVIUM	6		5	SPT	25							
26	Bottom of borehole at 26 feet.						18		6	SPT								
WATER LEVEL MEASUREMENTS							START	<u>6-9-17</u>		COMPLETE	<u>6-9-17 9:30 am</u>							
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	WATER LEVEL	METHOD												
6-9-17	9:30 am	26	--	22	--	3.25" ID Hollow Stem Auger												
--	--	--	--	--	--													
--	--	--	--	--	--													
--	--	--	--	--	--	CREW CHIEF Roy Hanson												

GEOTECHNICAL TEST BORING 17-483.GPJ - GEOTEKENG.GDT 7/12/17

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPH	LETTER		
<p>COARSE GRAINED SOILS</p> <p>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE</p>	<p>GRAVEL AND GRAVELLY SOILS</p> <p>(LITTLE OR NO FINES)</p>	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES	
		<p>MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE</p>	GRAVELS WITH FINES		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			(APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		<p>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE</p>	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	<p>SAND AND SANDY SOILS</p> <p>(LITTLE OR NO FINES)</p>		CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		<p>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE</p>	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
			SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		<p>(APPRECIABLE AMOUNT OF FINES)</p>	(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
	<p>FINE GRAINED SOILS</p> <p>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE</p>		<p>SILTS AND CLAYS</p> <p>LIQUID LIMIT LESS THAN 50</p>		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR 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		
<p>SILTS AND CLAYS</p> <p>LIQUID LIMIT GREATER THAN 50</p>			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS		
			CH	INORGANIC CLAYS OF HIGH PLASTICITY		
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
<p>HIGHLY ORGANIC SOILS</p>				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS AND DESCRIPTIVE TERMINOLOGY

SYMBOLS FOR DRILLING AND SAMPLING

<u>Symbol</u>	<u>Definition</u>
Bag	Bag sample
CS	Continuous split-spoon sampling
DM	Drilling mud
FA	Flight auger; number indicates outside diameter in inches
HA	Hand auger; number indicates outside diameter in inches
HSA	Hollow stem auger; number indicates inside diameter in inches
LS	Liner sample; number indicates outside diameter of liner sample
N	Standard penetration resistance (N-value) in blows per foot
NMR	No water level measurement recorded, primarily due to presence of drilling fluid
NSR	No sample retrieved; classification is based on action of drilling equipment and/or material noted in drilling fluid or on sampling bit
SH	Shelby tube sample; 3-inch outside diameter
SPT	Standard penetration test (N-value) using standard split-spoon sampler
SS	Split-spoon sample; 2-inch outside diameter unless otherwise noted
WL	Water level directly measured in boring
▼	Water level symbol

SYMBOLS FOR LABORATORY TESTS

<u>Symbol</u>	<u>Definition</u>
WC	Water content, percent of dry weight; ASTM:D2216
D	Dry density, pounds per cubic foot
LL	Liquid limit; ASTM:D4318
PL	Plastic limit; ASTM:D4318
QU	Unconfined compressive strength, pounds per square foot; ASTM:D2166

DENSITY/CONSISTENCY TERMINOLOGY

<u>Density</u>	<u>N-Value</u>	<u>Consistency</u>
<u>Term</u>		<u>Term</u>
Very Loose	0-4	Soft
Loose	5-8	Firm
Medium Dense	9-15	Stiff
Dense	16-30	Very Stiff
Very Dense	Over 30	Hard

PARTICLE SIZES

<u>Term</u>	<u>Particle Size</u>
Boulder	Over 12"
Cobble	3" – 12"
Gravel	#4 – 3"
Coarse Sand	#10 – #4
Medium Sand	#40 – #10
Fine Sand	#200 – #40
Silt and Clay	passes #200 sieve

DESCRIPTIVE TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Dry	Absence of moisture, powdery
Frozen	Frozen soil
Moist	Damp, below saturation
Waterbearing	Pervious soil below water
Wet	Saturated, above liquid limit
Lamination	Up to ½" thick stratum
Layer	½" to 6" thick stratum
Lens	½" to 6" discontinuous stratum

GRAVEL PERCENTAGES

<u>Term</u>	<u>Range</u>
A trace of gravel	2-4%
A little gravel	5-15%
With gravel	16-50%