



## **SOIL INVESTIGATION REPORT**

**EMERALD SKY DAIRY, LLC  
TOWN OF EMERALD  
ST. CROIX COUNTY, WISCONSIN**

**Prepared by:**  
Williams Engineering Services, LLC  
E14910 Bears Grass Road  
Augusta, WI 54722  
715-829-3231

August of 2017

# TABLE OF CONTENTS

---

INTRODUCTION.....	1
SOIL INVESTIGATION.....	2
SOIL CONDITIONS.....	3
TEST PIT & SOIL TESTING COVERAGE.....	4-5

ATTACHMENT 1	SOIL INVESTIGATION DRAWINGS
ATTACHMENT 2	TABLES
ATTACHMENT 3	TEST PIT LOGS
ATTACHMENT 4	MAPS

## INTRODUCTION

---

This report details the subsurface investigation for the proposed expansion to Emerald Sky Dairy, LLC site located south of County Highway G and bordered by 250<sup>th</sup> to the east in the Town of Emerald, St. Croix County, Wisconsin. The dairy is more specifically located in NE ¼ of NE ¼ of T30N, R16W of Section 22. The site's physical address is 2487 County Road G Emerald, WI 54013.

Currently, the dairy consists of three freestall barns, a parlor, feed pad, one covered HDPE lined waste storage facility, calf shed and drainage pond. Generally, the site naturally grades to the south. The current dairy facility drains to an existing drainage pond via swales and constructed embankments. The agricultural fields west of the facility drain into a wooded wetland. Currently, the surrounding area is comprised of agricultural fields and residential homes.

Ronnie Williams, P.E. of Williams Engineering Services, LLC (WES) has designed the expansion to Emerald Sky Dairy, LLC. The dairy expansion will consist of the following structures: two waste storage facilities (WSF), a stacking pad, concrete feed pad and runoff collection, calf hutch lot area and runoff collection, runoff collection at existing feed pad, and runoff collection at existing heifer lot area.

This report provides a summary of subsurface soil and groundwater conditions at the site and discusses how the conditions observed affect the design of the Emerald Sky Dairy waste, feed, and solids storage facilities. The information in this report was concluded by observing excavated test pits. The locations of excavations were predetermined and staked in the field. The testing of collected soil samples according to ASTM Standards was performed by WES personnel. The information assembled in this report is representative of the subsoil conditions across the site.

Attachment 1 contains the site layout drawing, a drawing depicting the location of the test pits and the subsoil cross section drawings.

Attachment 2 contains Table 1-*Test Pit Summary*, a summary of all the test pit findings which are grouped by the various components of the designed dairy, Table 2-*Summary of Soil Testing Results*, a summary of the results of the laboratory testing conducted by WES.

Attachment 3 contains Soil Investigation Test Pit Log Summary detailing all the delineated layers with corresponding depths.

Attachment 4 contains soil maps and a wetland delineation map.

## SOIL INVESTIGATION

---

A soil investigation was conducted to determine the subsurface soil and groundwater conditions at the site. A total of 69 test pit excavations were dug throughout the site using a track mounted hoe excavator within the footprint of the proposed dairy facility components. The soil investigation work was completed based on the design requirements of each component. Excavation of test pits for the proposed dairy facility components was carried out in January, February and June of 2016, and July 2017 by Ronnie Williams, PE, and staff of Williams Engineering Services, LLC. All soil samples were collected during the test pit excavations. The samples were sent to the WES Office and were evaluated for moisture content, grain size and Atterberg limits. All the samples were transported, stored and tested according to ASTM Standards.



## SOIL CONDITIONS

---

According to the United States Department of Agriculture Natural Resource Conservation Service (USDA-NRCS) web soil survey website, the main soil series at the proposed location is Santiago silt loam (SaB 2-6 percent slopes) comprising approximately 85 percent of the approximately 22 acre site. The site also consists of approximately 10 percent of Magnor silt loam (MaB, 0-4 percent slopes), approximately 5 percent of Freeon silt loam (FnB, 2-6 percent slopes).

The subsurface soil was regularly sandy clay material containing stones with an exception of a few sand pockets. This material was collected and tested according to ASTM Standards to determine the suitability of the earthen materials that will be later used for construction of various structures. After oven drying and separating the material finer than the #40 sieve, the test results concluded that the borrow material was acceptable for WSF sub liner material. Bedrock was not observed in any of the test pits, with the deepest test pit being 24.5 feet below existing ground surface. After 24 hours, groundwater was observed in 1 of the 69 test pits at a depth of 7.5 feet below existing ground surface. There were no karst or sinkhole features located during field observation, or upon review of available geological maps and GIS maps produced by WES utilizing current Wisconsin Department of Natural Resources (WDNR) and St. Croix County ArcGIS layers. The subsurface soil material properties, volumes, and moisture content were considered while designing the proposed additions layout.

## TEST PIT & SOIL TESTING COVERAGE

WI NRCS-313 (Waste Storage Facility) requires compliance with the following:

- One test pit or boring per 15,000 square feet of waste storage facility footprint. The standard also requires all test pits or boring must be within 100 feet of the footprint.

WI NRCS-300 (Clay Liner) requires compliance with the following:

- One Percent Fines (ASTM D1140) and One Atterberg Limits (ASTM 4318) Test per 5,000 cubic yards of estimated sub liner borrow material.
- One Percent Fines (ASTM D1140) and One Atterberg Limits (ASTM 4318) Test per 2,000 cubic yards of in-place clay sub liner.

The table below details each WSF with the needed requirements and how the standards were met.

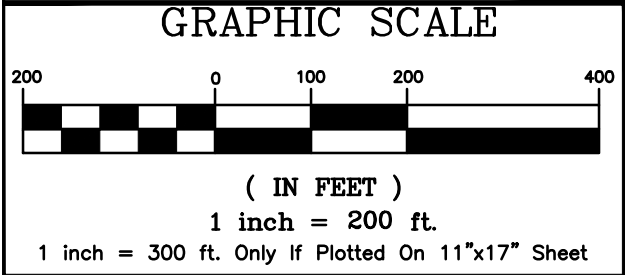
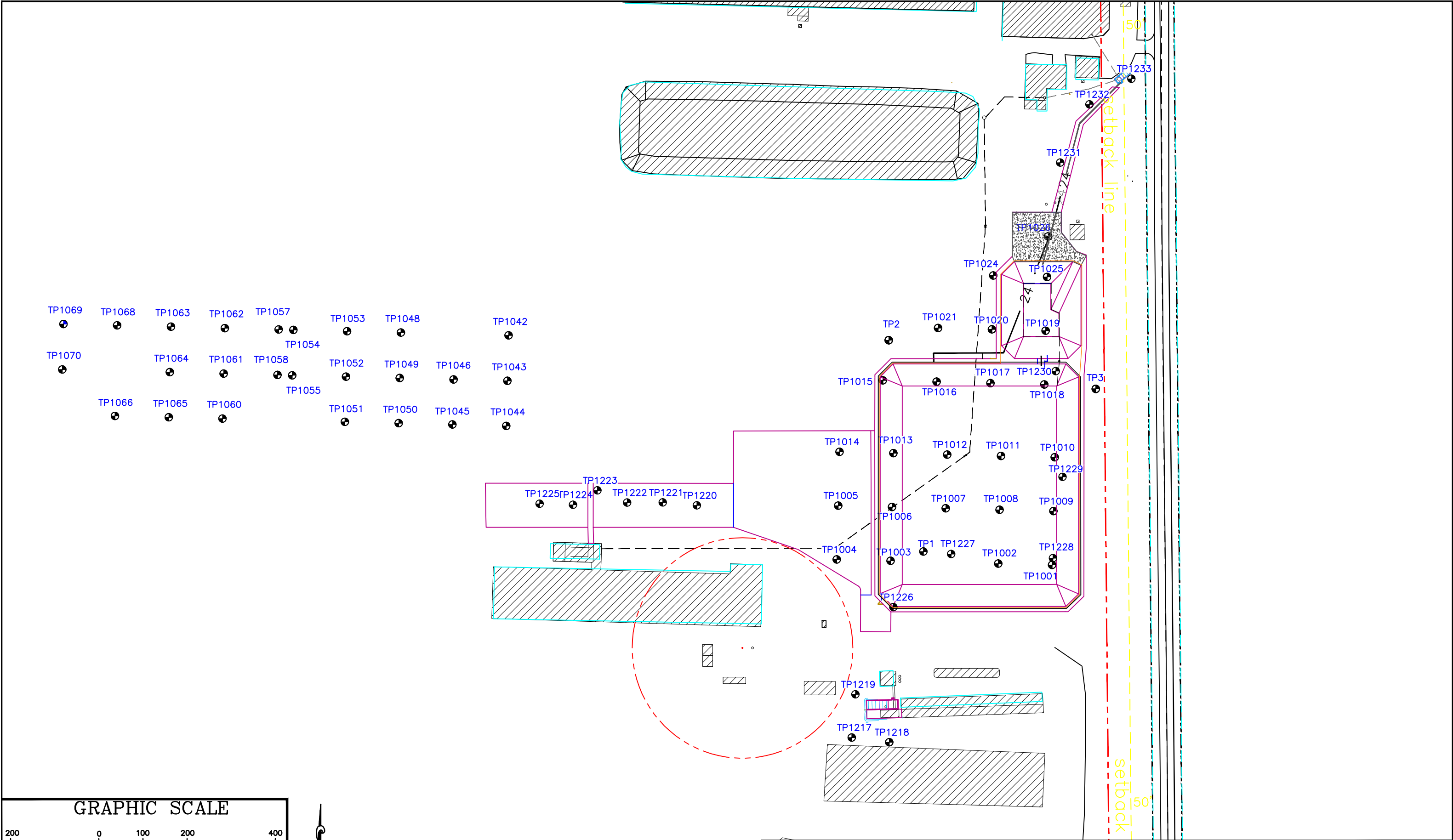
Emerald Sky Dairy WSF Footprint				
	Existing WSF	WSF #1	WSF #2	
Liner Type	60 Mil HDPE	Concrete w/Waterstop	60 Mil HDPE	
Top Area of WSF (ft <sup>2</sup> )	167,289	39,297	245,778	
Required Test Pits Per WI NRCS-313	N/A	3	17	
Test Pits Conducted	N/A	4	24	
3ft Cohesive Subliner (yd <sup>3</sup> ) + 30% Extra Fill for Compaction	N/A	1,841*	35,501	
Required Soil Tests Per WI NRCS-300 Borrow Material	N/A	1	8	
Soil Test Conducted	N/A	13	13	

\*Concrete WSF will only have 1 foot soil subliner

Emerald Sky Dairy Feedpad, Stack Area & Calf Hutch Area				
	Feedpad	Stacking Area	Calf Hutch Area	
Liner Type	Concrete w/ Waterstop	Concrete w/ Waterstop	Concrete w/ Waterstop	
Top Area of Structure	88,993	14,382	56,149	
Required Test Pits Per WI NRCS-313	6	1	4	
Test Pits Conducted Within 100 Feet of Structure	7	3	6	
2ft Cohesive Subliner (yd <sup>3</sup> ) + 30% Extra Fill for Compaction	N/A	N/A	N/A	
Required Soil Tests Per WI NRCS-300 Borrow Material	N/A	N/A	N/A	
Soil Test Conducted	N/A	N/A	N/A	

Emerald Sky Dairy Runoff Collection & Transfer Pipe				
	Feedpad Collection Tank	Heifer Lot Collection Tank	Transfer Pipes (5 Total)	
Liner Type	Concrete	Concrete	N/A	
Top Area of Structure	529	3158	N/A	
Required Test Pits	2	2	N/A	
Test Pits Conducted Within 100 Feet of Structure	2	3	12	
2ft Cohesive Subliner (yd <sup>3</sup> ) + 30% Extra Fill for Compaction	N/A	N/A	N/A	
Required Soil Tests Per WI NRCS-300 Borrow Material	N/A	N/A	N/A	
Soil Test Conducted	N/A	N/A	N/A	

ATTACHMENT 1  
SOIL INVESTIGATION DRAWINGS

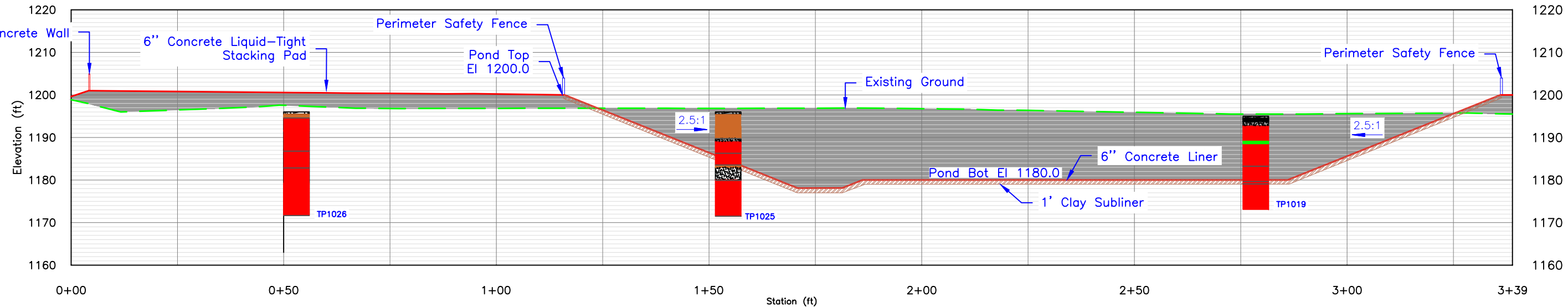


<b>WES</b> PROFESSIONAL ENGINEERING	WILLIAMS ENGINEERING SERVICES, LLC E14910 BEARS GRASS RD AUGUSTA WI WES@CHIPVALLEY.COM 715-829-3231	Site Plan		
		Site Test Pit Locations		8/10/2017
		Emerald Sky Dairy, LLC		9 of 96

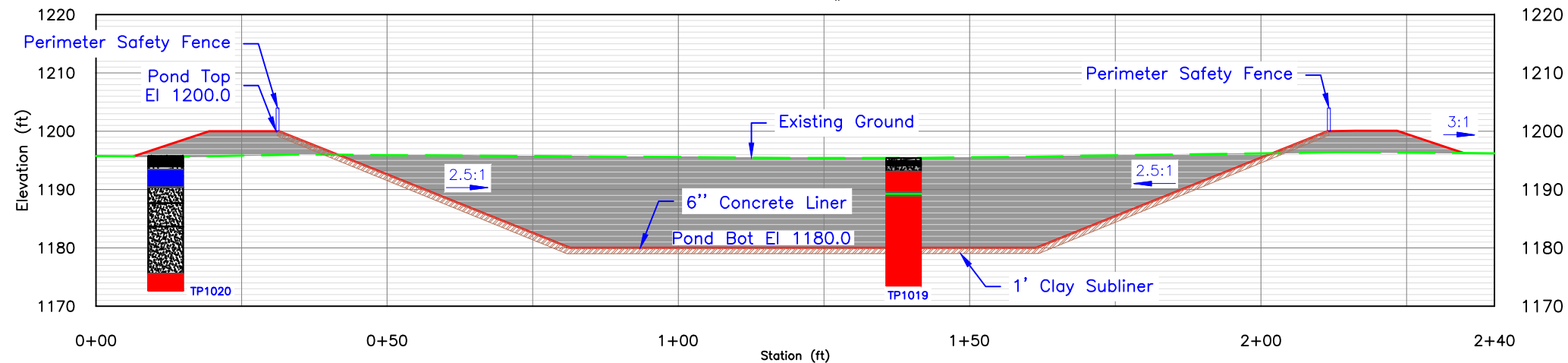




Concrete WSF and Stacking Pad Cross Section #1 – North To South



Concrete WSF Cross Section #2 – West To East



- Topsoil
- Disturbed
- ML
- CL
- GP
- SM
- SC
- SP

### GRAPHIC SCALE



( IN FEET )

1 inch = 25 ft.

1 inch = 25 ft. Only If Plotted On 11"x17" Sheet

1 inch = 25 ft Only if Plotted on 11"x17" Sheet

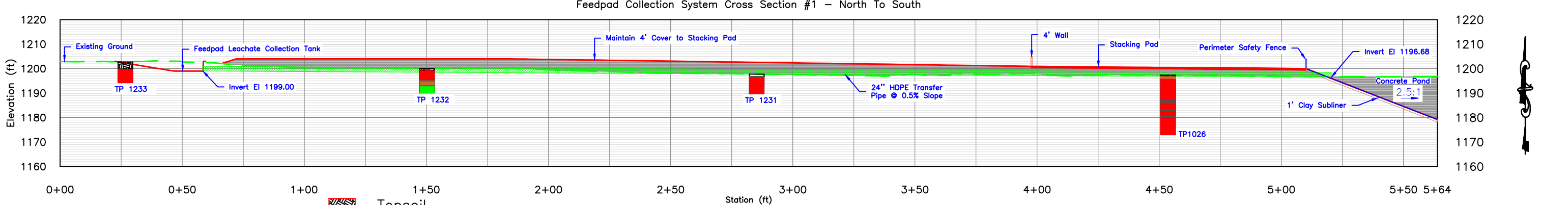
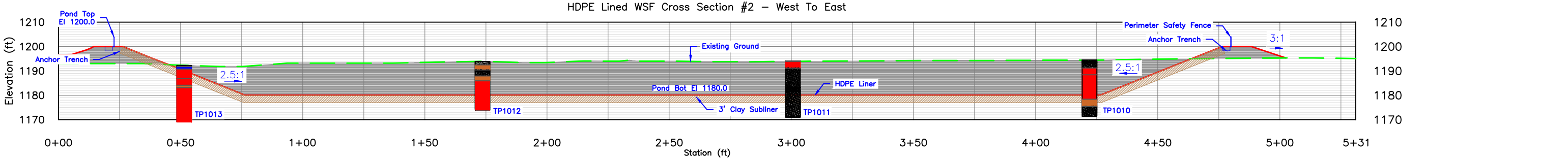
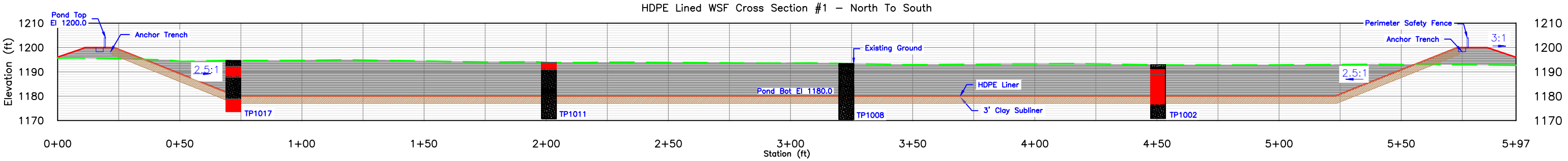
**WES**  
PROFESSIONAL  
ENGINEERING

WILLIAMS ENGINEERING SERVICES, LLC  
E14910 BEARS GRASS RD  
AUGUSTA WI  
WES@CHIPVALLEY.COM  
715-829-3231

Concrete Lined WSF  
Cross Sections

Emerald Sky Dairy, LLC

8/10/2017



#### GRAPHIC SCALE

( IN FEET )  
1 inch = 40 ft.  
1 inch = 40 ft. Only If Plotted On 11"x17" Sheet

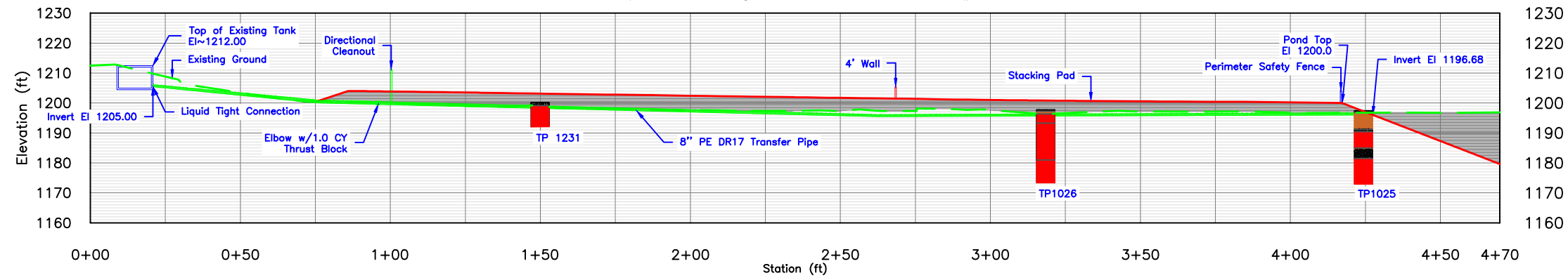
	Topsoil
	Disturbed
	ML
	CL
	GP
	SM
	SC
	SP

1 inch = 40 ft Only if Plotted on 11"x17" Sheet

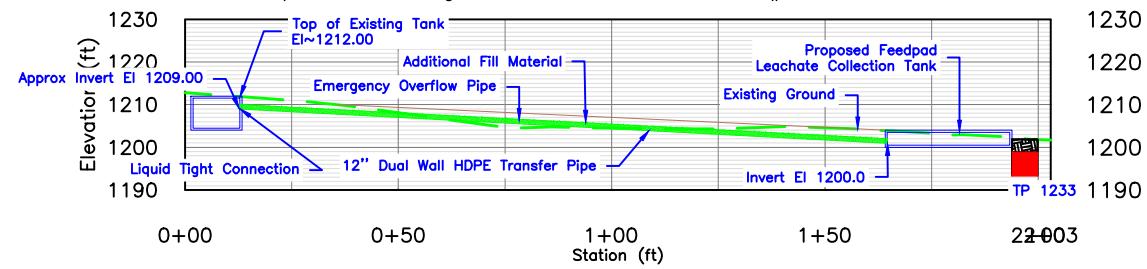
 <b>WES</b> PROFESSIONAL ENGINEERING	WILLIAMS ENGINEERING SERVICES, LLC E14910 BEARS GRASS RD AUGUSTA WI WES@CHIPVALLEY.COM 715-829-3231	HDPE Lined Cross Sections Feedpad Collection System Cross Section	8/10/2017
		Emerald Sky Dairy, LLC	



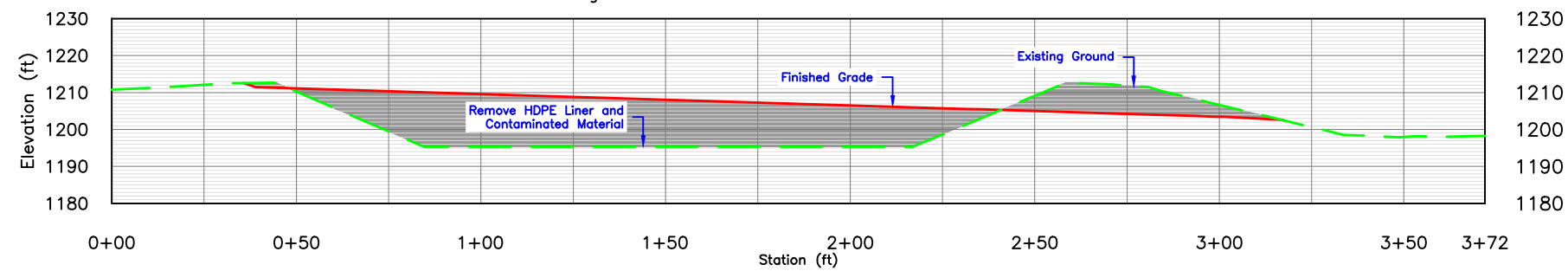
Separation Building 8" Transfer Cross Section #1



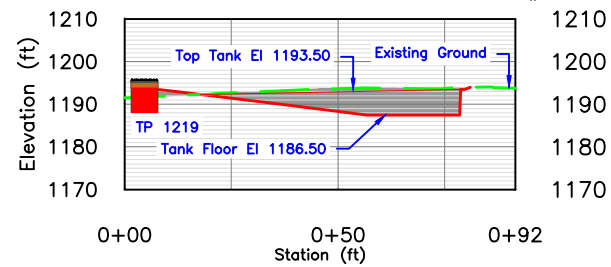
Separation Building 12" Transfer Cross Section #1 - West To East



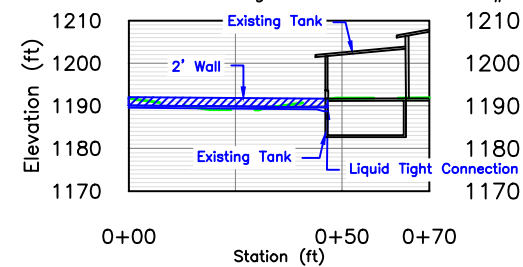
Existing HDPE Lined WSF Abandonment - North To South



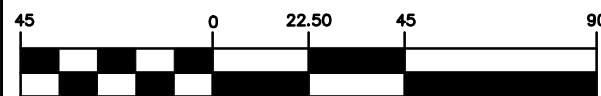
Heifer Lot Collection Tank Cross Section #1



Calf Lot Into Existing Tank Cross Section #1



## GRAPHIC SCALE



( IN FEET )

1 inch = 45 ft.

1 inch = 45 ft. Only If Plotted On 11"x17" Sheet

1 inch = 45 ft Only if Plotted on 11"x17" Sheet

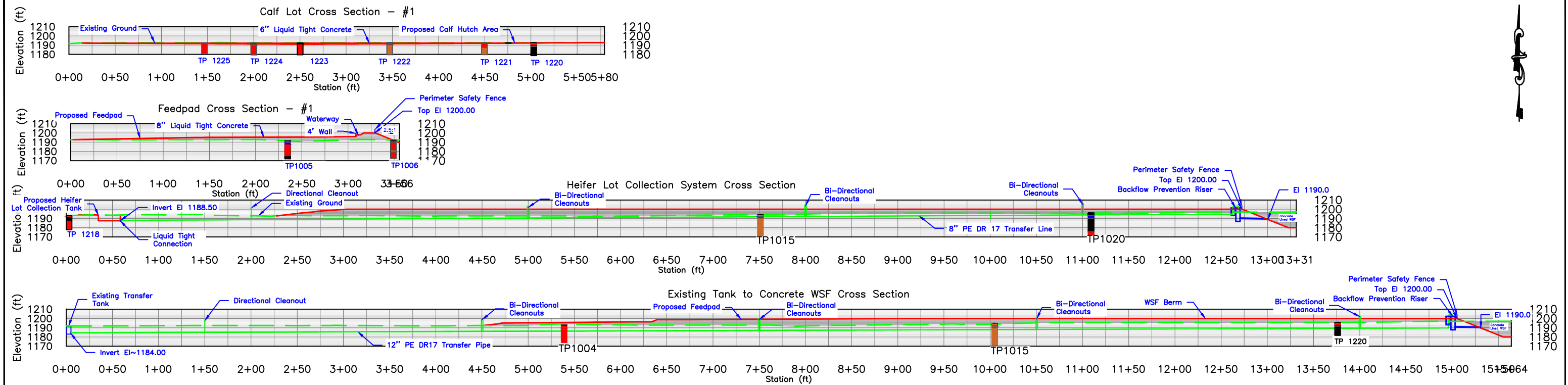
**WES**  
PROFESSIONAL  
ENGINEERING

WILLIAMS ENGINEERING SERVICES, LLC  
E14910 BEARS GRASS RD  
AUGUSTA WI  
WES@CHIPVALLEY.COM  
715-829-3231

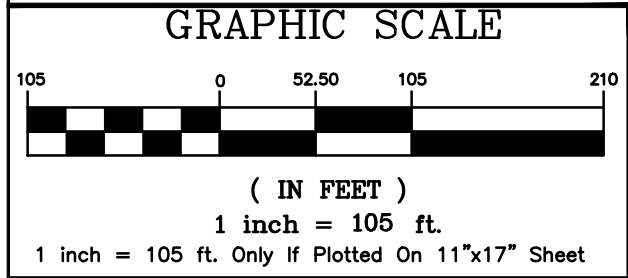
Misc Cross Sections 1

Emerald Sky Dairy, LLC

8/9/2017



- Topsoil
- Disturbed
- ML
- CL
- GP
- SM
- SC
- SP



1 inch = 105 ft Only if Plotted on 11"x17" Sheet

<div> <div>WES</div> <div>PROFESSIONAL ENGINEERING</div> </div>	<div> <div>WILLIAMS ENGINEERING SERVICES, LLC</div> <div>E14910 BEARS GRASS RD</div> <div>AUGUSTA WI</div> <div>WES@CHIPVALLEY.COM</div> <div>715-829-3231</div> </div>	<div> <div>Misc Cross Sections 2</div> <div>Emerald Sky Dairy, LLC</div> </div>	
			8/10/2017

ATTACHMENT 2  
TABLES

## Table 1 - Test Pit Summary:

ID:	Nearest Structure:	Existing Ground Elevation:	Structure Bottom Elevation:	Required Hole Depth Below Structure:	Minimum Hole Depth:	Excavated Depth:	Extra Depth:	Elevation of Standing Water (After 24 hrs):
*TP 1	WSF #2	1192.9	1180.0	4 Ft	16.9 Ft	23.0 Ft	6.1 Ft	N/A
*TP 2	WSF #2	1196.1	1180.0	4 Ft	20.1 Ft	21.5 Ft	1.4 Ft	N/A
*TP 3	WSF #2	1195.8	1180.0	4 Ft	19.8 Ft	22.0 Ft	2.2 Ft	N/A
TP 1001	WSF #2	1192.8	1180.0	4 Ft	16.8 Ft	22.0 Ft	5.2 Ft	N/A
TP 1002	WSF #2	1192.7	1180.0	4 Ft	16.7 Ft	22.0 Ft	5.3 Ft	N/A
TP 1003	WSF #2	1192.4	1180.0	4 Ft	16.4 Ft	22.0 Ft	5.6 Ft	N/A
TP 1004	Feedpad	1193.4	1196.1	2 Ft	0.7 Ft	19.5 Ft	21.2 Ft	N/A
TP 1005	Feedpad	1190.9	1195.5	2 Ft	2.7 Ft	19.5 Ft	22.2 Ft	N/A
TP 1006	WSF #2	1192.5	1180.0	4 Ft	16.5 Ft	18.5 Ft	2.0 Ft	N/A
TP 1007	WSF #2	1192.8	1180.0	4 Ft	16.8 Ft	23.0 Ft	6.2 Ft	N/A
TP 1008	WSF #2	1193.1	1180.0	4 Ft	17.1 Ft	23.0 Ft	5.9 Ft	N/A
TP 1009	WSF #2	1193.6	1180.0	4 Ft	17.6 Ft	23.0 Ft	5.4 Ft	N/A
TP 1010	WSF #2	1194.2	1180.0	4 Ft	18.2 Ft	23.0 Ft	4.8 Ft	N/A
TP 1011	WSF #2	1193.9	1180.0	4 Ft	17.9 Ft	23.0 Ft	5.1 Ft	N/A
TP 1012	WSF #2	1193.6	1180.0	4 Ft	17.6 Ft	20.0 Ft	2.4 Ft	N/A
TP 1013	WSF #2	1191.3	1180.0	4 Ft	15.3 Ft	23.0 Ft	7.7 Ft	N/A
TP 1014	Feedpad	1190.2	1196.0	2 Ft	-3.78 Ft	19.5 Ft	23.3 Ft	N/A
TP 1015	WSF #2	1194.7	1180.0	4 Ft	18.7 Ft	22.5 Ft	3.8 Ft	1186.9 Ft
TP 1016	WSF #2	1194.8	1180.0	4 Ft	18.8 Ft	23.0 Ft	4.2 Ft	N/A
TP 1017	WSF #2	1194.2	1180.0	4 Ft	18.2 Ft	21.0 Ft	2.8 Ft	N/A
TP 1018	WSF #2	1194.3	1180.0	4 Ft	18.3 Ft	24.5 Ft	6.2 Ft	N/A
TP 1019	WSF #1	1195.3	1180.0	2 Ft	17.3 Ft	22.0 Ft	4.7 Ft	N/A
TP 1020	WSF #1	1195.8	1180.0	2 Ft	17.8 Ft	23.0 Ft	5.2 Ft	N/A
TP 1021	WSF #2	1196.2	1180.0	4 Ft	20.2 Ft	23.0 Ft	2.8 Ft	N/A
TP 1024	WSF #1	1196.8	1180.0	2 Ft	18.8 Ft	23.0 Ft	4.2 Ft	N/A
TP 1025	WSF #1	1196.6	1180.0	2 Ft	18.6 Ft	24.5 Ft	5.9 Ft	N/A
TP 1026	Stacking Pad	1196.8	1200.5	2 Ft	-1.68 Ft	24.5 Ft	26.2 Ft	N/A
TP 1042	Borrow Area	1187.3	N/A	N/A	N/A	23.5 Ft	N/A	N/A
TP 1043	Borrow Area	1184.9	N/A	N/A	N/A	14.5 Ft	N/A	N/A
TP 1044	Borrow Area	1186.7	N/A	N/A	N/A	17.0 Ft	N/A	N/A
TP 1045	Borrow Area	1185.4	N/A	N/A	N/A	17.0 Ft	N/A	N/A
TP 1046	Borrow Area	1184.9	N/A	N/A	N/A	18.0 Ft	N/A	N/A
TP 1048	Borrow Area	1179.9	N/A	N/A	N/A	18.5 Ft	N/A	N/A
TP 1049	Borrow Area	1180.3	N/A	N/A	N/A	13.0 Ft	N/A	N/A
TP 1050	Borrow Area	1181.4	N/A	N/A	N/A	13.5 Ft	N/A	N/A
TP 1051	Borrow Area	1178.5	N/A	N/A	N/A	14.5 Ft	N/A	N/A
TP 1052	Borrow Area	1178.4	N/A	N/A	N/A	14.0 Ft	N/A	N/A
TP 1053	Borrow Area	1179.9	N/A	N/A	N/A	18.0 Ft	N/A	N/A
TP 1054	Borrow Area	1177.0	N/A	N/A	N/A	24.0 Ft	N/A	N/A
TP 1055	Borrow Area	1174.4	N/A	N/A	N/A	14.0 Ft	N/A	N/A
TP 1057	Borrow Area	1179.4	N/A	N/A	N/A	25.0 Ft	N/A	N/A
TP 1058	Borrow Area	1175.5	N/A	N/A	N/A	14.0 Ft	N/A	N/A
TP 1060	Borrow Area	1174.3	N/A	N/A	N/A	7.0 Ft	N/A	N/A
TP 1061	Borrow Area	1175.1	N/A	N/A	N/A	9.5 Ft	N/A	N/A

## Table 1 - Test Pit Summary:

ID:	Nearest Structure:	Existing Ground Elevation:	Structure Bottom Elevation:	Required Hole Depth Below Structure:	Minimum Hole Depth:	Excavated Depth:	Extra Depth:	Elevation of Standing Water (After 24 hrs):
TP 1062	Borrow Area	1177.5	N/A	N/A	N/A	16.0 Ft	N/A	N/A
TP 1063	Borrow Area	1175.7	N/A	N/A	N/A	14.5 Ft	N/A	N/A
TP 1064	Borrow Area	1175.2	N/A	N/A	N/A	8.5 Ft	N/A	N/A
TP 1065	Borrow Area	1174.6	N/A	N/A	N/A	6.0 Ft	N/A	N/A
TP 1066	Borrow Area	1171.8	N/A	N/A	N/A	4.0 Ft	N/A	N/A
TP 1068	Borrow Area	1176.8	N/A	N/A	N/A	13.0 Ft	N/A	N/A
TP 1069	Borrow Area	1175.7	N/A	N/A	N/A	13.0 Ft	N/A	N/A
TP 1070	Borrow Area	1174.7	N/A	N/A	N/A	4.0 Ft	N/A	N/A
TP 1217	Heifer Collection Tank	1188.8	1187.5	2 Ft	3.3	15.0 Ft	11.7 Ft	N/A
TP 1218	Heifer Collection Tank	1190.4	1187.5	2 Ft	4.9	15.0 Ft	10.1 Ft	N/A
TP 1219	Heifer Collection Tank	1190.6	1187.5	2 Ft	5.1	8.0 Ft	2.9 Ft	N/A
TP 1220	Calf Hutch Lot Area	1193.3	1192.2	2 Ft	3.11	14.0 Ft	10.9 Ft	N/A
TP 1221	Calf Hutch Lot Area	1192.7	1191.8	2 Ft	2.87	13.0 Ft	10.1 Ft	N/A
TP 1222	Calf Hutch Lot Area	1192.2	1191.4	2 Ft	2.79	13.0 Ft	10.2 Ft	N/A
TP 1223	Calf Hutch Lot Area	1192.7	1191.2	2 Ft	3.49	13.0 Ft	9.5 Ft	N/A
TP 1224	Calf Hutch Lot Area	1192.5	1191.2	2 Ft	3.33	13.0 Ft	9.7 Ft	N/A
TP 1225	Calf Hutch Lot Area	1192.8	1191.6	2 Ft	3.23	11.5 Ft	8.3 Ft	N/A
TP 1226	WSF #2	1193.2	1180.0	4 Ft	17.2	23.0 Ft	5.8 Ft	N/A
TP 1227	WSF #2	1192.8	1180.0	4 Ft	16.8	22.0 Ft	5.2 Ft	N/A
TP 1228	WSF #2	1193	1180.0	4 Ft	17	24.0 Ft	7.0 Ft	N/A
TP 1229	WSF #2	1194	1180.0	4 Ft	18	24.0 Ft	6.0 Ft	N/A
TP 1230	WSF #2	1195.3	1180.0	4 Ft	19.3	24.0 Ft	4.7 Ft	N/A
TP 1231	24" Gravity Transfer	1199.7	1198.0	0.5	2.2	8.0 Ft	5.8 Ft	N/A
TP 1232	24" Gravity Transfer	1200.9	1198.6	0.5	2.8	10.0 Ft	7.2 Ft	N/A
TP 1233	Feedpad Collection Tank	1201.6	1199.0	2 Ft	4.6	8.5 Ft	3.9 Ft	N/A

\* Initial Exploratory Holes Dug on 1/8/16

## Table 2 - Summary of Soil Testing Results:

Test Pit	Sample Depth (ft)	Nearest Structure	Soil Series	Laboratory Testing				
				Atterberg Limits <sup>(1)</sup>			Sieve <sup>(2)</sup>	Moisture Content <sup>(3)</sup>
				Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	% Passing No. 200 Sieve (P200)	
2	8.0	HDPE Lined Pond	Magnor	44.0	16.5	<b>27.5</b>	95.6%	28.5%
1001	17.0	HDPE Lined Pond	Santiago	18.1	12.9	<b>5.2</b>	33.0%	11.4%
1002	13.0	HDPE Lined Pond	Santiago	20.3	12.9	<b>7.4</b>	27.2%	9.2%
1003	2.5	HDPE Lined Pond	Santiago	22.1	13.2	<b>8.9</b>	31.0%	8.0%
1004	9.5	HDPE Lined Pond	Santiago	22.7	15.0	<b>7.7</b>	25.0%	10.0%
1007	3.5	HDPE Lined Pond	Santiago	19.6	12.3	<b>7.3</b>	25.5%	11.2%
1009	18.0	HDPE Lined Pond	Santiago	19.4	12.4	<b>7.0</b>	33.0%	11.1%
1010	5.0	HDPE Lined Pond	Santiago	19.8	12.0	<b>7.8</b>	24.0%	7.2%
1012	9.0	HDPE Lined Pond	Santiago	19.5	12.6	<b>6.9</b>	30.3%	9.3%
1014	8.0	HDPE Lined Pond	Santiago	20.2	12.5	<b>7.7</b>	21.1%	11.2%
1015	3.0	HDPE Lined Pond	Magnor	24.9	13.9	<b>11.0</b>	82.1%	20.8%
1017	4.0	HDPE Lined Pond	Santiago	24.1	14.0	<b>10.1</b>	29.2%	8.7%
1018	4.0	HDPE Lined Pond	Santiago	19.1	9.9	<b>9.2</b>	17.5%	8.4%
1021	2.0	HDPE Lined Pond	Magnor	19.8	11.2	<b>8.6</b>	25.5%	11.5%
1021	4.0	HDPE Lined Pond	Magnor	33.6	16.9	<b>16.7</b>	42.8%	14.7%
1025	3.0	Concrete Lined Pond	Santiago	17.2	10.9	<b>6.3</b>	36.8%	8.3%
1026	2.5	Concrete Lined Pond	Santiago	17.9	11.5	<b>6.4</b>	28.9%	8.9%
1042	2.5	Borrow Area	Santiago	44.6	15.9	<b>28.7</b>	85.6%	18.6%
1048	3.5	Borrow Area	Santiago	29.8	18.2	<b>11.6</b>	86.9%	16.4%
1051	5.0	Borrow Area	Santiago	26.3	15.4	<b>10.9</b>	56.3%	7.9%
1052	2.0	Borrow Area	Santiago	23.1	15.6	<b>7.5</b>	32.6%	10.7%
1053	2.5	Borrow Area	Santiago	25.9	14.8	<b>11.1</b>	45.2%	12.0%
1054	2.0	Borrow Area	Santiago	27.3	14.8	<b>12.5</b>	47.1%	18.5%
1055	2.0	Borrow Area	Santiago	27.9	14.1	<b>13.8</b>	66.1%	15.7%
1058	1.3	Borrow Area	Santiago	28.9	15.8	<b>13.1</b>	69.9%	14.9%
1060	1.5	Borrow Area	Santiago	28.4	17.9	<b>10.5</b>	86.9%	20.0%
1062	1.5	Borrow Area	Magnor	24.1	12.9	<b>11.2</b>	56.4%	15.3%
1063	5.0	Borrow Area	Magnor	49.4	25.7	<b>23.7</b>	66.6%	46.0%
1068	4.5	Borrow Area	Magnor	33.5	15.0	<b>18.5</b>	82.0%	24.0%
1069	8.0	Borrow Area	Magnor	21.4	11.4	<b>10.0</b>	36.4%	12.7%
Average				<b>25.8</b>	<b>14.3</b>	<b>11.5</b>	<b>47.5%</b>	<b>14.7%</b>
Total				30 Tests				

(1) ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soil

(2) ASTM D1140 Amount of Material in Soils Finer than No. 200 Sieve

(3) ASTM D2216 Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

### Notes:

All soil samples were preserved and transported according to ASTM D4220

All soil samples were oven dried.

Material that was greater than #40 Sieve was removed prior to Atterberg Limit Testing.

ATTACHMENT 3  
TEST PIT LOGS





(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/8/2016
Hole Number:	2
Elevation:	1196.1
Total Depth:	21.5
Sample Depths:	~8'

Soil Name:	Magnor Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_  
Type: N/A

[illegible]

General Comments: No Non-Red Sand



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/8/2016
Hole Number:	3
Elevation:	1195.8
Total Depth:	22.0
Sample Depths:	N/A

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/28/2016
Hole Number:	1001
Elevation:	1192.8
Total Depth:	22.0
Sample Depths:	5', 14', 17', 19'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments: Disturbed Area



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/28/2016
Hole Number:	1002
Elevation:	1192.7
Total Depth:	22.0
Sample Depths:	2.5', 5', 13', 17'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments: Disturbed Area



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1003	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1192.4	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	22.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	2.5', 16'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry moist wet	Matrix	abundance size contrast	grade type size		distinc- tiveness	topo- graphy		
(elevation)			Mottle							
0.0 - 0.8	Topsoil	dry	10YR 3/1	(none)	weak, granular, fine (1-2 mm)	Soft	clear	smooth	-	
1192.4 - 1191.6										
0.8 - 2.0	Disturbed	dry	10YR 3/3	(none)	structureless	Soft	clear	smooth	-	
1191.6 - 1190.4										
2.0 - 3.5	SC	dry	10YR 5/3	(none)	weak, subangular, fine (5-10 mm)	Sli. Hard	gradual	smooth	2.5'	Stones
1190.4 - 1188.9										
3.5 - 8.0	SC	dry	10YR 5/4	(none)	moderate, subangular, medium (10-20 mm)	Hard	gradual	smooth	-	Stones
1188.9 - 1184.4										
8.0 - 18.0	SC	dry	10YR 5/4	(none)	moderate, subangular, medium (10-20 mm)	Loose	gradual	smooth	16'	Stones
1184.4 - 1174.4										
18.0 - 22.0	Fine Sand	dry	7.5YR 5/6	(none)	structureless	Loose	clear	smooth	-	Stones
1174.4 - 1170.4										

General Comments:



Williams Engineering Services, LLC  
 Ronnie Williams, PE  
 E14910 Bears Grass Road  
 Augusta, WI 54722  
 (715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	2/1/2016	Soil Name:	Santiago Silt Loam		
Legal Description:	Sec 22 T30N R16W	Hole Number:	1005	Position in Landscape:	Excavated Field		
County:	St Croix	Elevation:	1190.9	Observed Water Depth:	N/A		
Logged by:	Ronnie Williams, PE	Total Depth:	19.5	Est. HGW Depth:	N/A	Type:	N/A
Practice:	NRCS 313	Sample Depths:		Depth to Bedrock:	N/A	Type:	N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinc-	topo-		
(elevation)		moist	Mottle	size	type		tiveness	graphy		
		wet		contrast	size					
0.0 - 1.0	Topsoil	dry	10YR 3/3	(none)	moderate, granular, fine (1-2 mm)	Soft	clear	smooth	-	
1190.9 - 1189.9										
1.0 - 2.0	SM	dry	5YR 4/6	(none)	moderate, subangular, medium (2-5 mm)	Soft	clear	smooth	-	Red, Stones
1189.9 - 1188.9										
2.0 - 3.5	ML	dry	10YR 4/4	(none)	moderate, subangular, medium (2-5 mm)	Sli. Hard	clear	smooth	-	Sand, Stones
1188.9 - 1187.4										
3.5 - 11.0	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (2-5 mm)	Sli. Hard	gradual	smooth	-	Red
1187.4 - 1179.9										
11.0 - 17.5	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (2-5 mm)	Sli. Hard	gradual	smooth	-	Stones
1179.9 - 1173.4										
17.5 - 19.5	Sand	dry	10YR 6/8	(none)	structureless	Loose	gradual	smooth	-	Yellow
1173.4 - 1171.4										

General Comments:



Williams Engineering Services, LLC  
 Ronnie Williams, PE  
 E14910 Bears Grass Road  
 Augusta, WI 54722  
 (715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1007	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1192.8	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	3.5', 14.5', 17'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinc-	topo-		
(elevation)		moist	Mottle	size	type		tiveness	graphy		
		wet		contrast	size					
0.0 - 0.5	Topsoil	dry	10YR 3/2	(none)	weak, angular, medium (10-20 mm)	Soft	abrupt	smooth	-	
1192.8 - 1192.3										
0.5 - 1.2	Fill	dry	10YR 3/3	(none)	structureless	Soft	abrupt	smooth	-	
1192.3 - 1191.6										
1.2 - 2.7	SC	dry	5YR 4/3	(none)	weak, angular, fine (5-10 mm)	Sli. Hard	gradual	smooth	-	
1191.6 - 1190.1										
2.7 - 5.1	SC	dry	5YR 4/3	(none)	weak, angular, fine (5-10 mm)	Sli. Hard	clear	smooth	3.5'	
1190.1 - 1187.7										
5.1 - 6.0	Sand	dry	10YR 6/6	(none)	structureless	Loose	clear	smooth	-	Yellow
1187.7 - 1186.8										
6.0 - 15.0	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Hard	clear	smooth	14.5'	Red
1186.8 - 1177.8										
15.0 - 23.0	Sand	dry	10YR 6/8	(none)	structureless	Loose	clear	smooth	17'	Yellow, Some Stones
1177.8 - 1169.8										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/28/2016
Hole Number:	1008
Elevation:	1193.1
Total Depth:	23.0
Sample Depths:	2', 4', 8', 12'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1009	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1193.6	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	2', 3', 18'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topography		
(elevation)		moist	Mottle	size	type					
		wet		contrast	size					
0.0 - 0.6	Topsoil	dry	10YR 3/2	(none)	weak, angular, fine (1-2 mm)	Soft	abrupt	smooth	-	
1193.6 - 1193.0										
0.6 - 1.5	Disturbed	dry	10YR 3/4	(none)	weak, granular, v. fine (< 1 mm)	Soft	abrupt	wavy	-	
1193.0 - 1192.1										
1.5 - 3.5	SC	dry	7.5YR 4/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	2', 3'	2.3-2.8 Sand Band
1192.1 - 1190.1										
3.5 - 7.5	SC	dry	7.5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	Stones & Cobbles
1190.1 - 1186.1										
7.5 - 17.0	SC	dry	7.5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	More Sand
1186.1 - 1176.6										
17.0 - 18.5	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	18'	More Clay
1176.6 - 1175.1										
18.5 - 23.0	Fine Sand	dry	7.5YR 5/4	(none)	structureless	Loose	clear	smooth	-	
1175.1 - 1170.6										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1010	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1194.2	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	3', 5', 17'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topo-		
(elevation)		moist	Mottle	size	type			graphy		
		wet		contrast	size					
0.0 - 0.5	Topsoil	dry	10YR 3/1	(none)	weak, granular, fine (1-2 mm)	Soft	abrupt	smooth	-	
1194.2 - 1193.7										
0.5 - 1.2	Fill	dry	10YR 3/3	(none)	structureless	Soft	abrupt	smooth	-	
1193.7 - 1193.0										
1.2 - 3.2	Sandy Bands	dry	10YR 3/4	(none)	weak, subangular, fine (5-10 mm)	Firm & Loose	gradual	smooth	3'	
1193.0 - 1191.0										
3.2 - 6.0	SC	dry	5YR 3/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	5'	Some Stones
1191.0 - 1188.2										
6.0 - 16.0	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Very Hard	gradual	smooth	-	Some Stones
1188.2 - 1178.2										
16.0 - 19.0	SM	moist	5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	17'	
1178.2 - 1175.2										
19.0 - 23.0	Sand	moist	10YR 4/4	(none)	structureless	Loose	clear	smooth	-	
1175.2 - 1171.2										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231







**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner: <u>Todd Tuls</u>	Date: <u>2/16/2016</u>	Soil Name: <u>Santiago Silt Loam</u>	
Legal Description: <u>Sec 22 T30N R16W</u>	Hole Number: <u>1012</u>	Position in Landscape: <u>Excavated Field</u>	
County: <u>St Croix</u>	Elevation: <u>1193.6</u>	Observed Water Depth: <u>N/A</u>	
Logged by: <u>Ronnie Williams, PE</u>	Total Depth: <u>20.0</u>	Est. HGW Depth: <u>N/A</u>	Type: _____
Practice: <u>NRCS 313</u>	Sample Depths: <u>3', 9'</u>	Depth to Bedrock: <u>N/A</u>	Type: _____

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topo-graphy		
(elevation)		moist	Mottle	size	type					
		wet		contrast	size					
0.0 - 1.5	Topsoil	dry	10YR 3/3	(none)	weak, angular, fine (5-10 mm)	soft	clear	smooth	-	
1193.6 - 1192.1										
1.5 - 3.5	SM	dry	10YR 3/4	(none)	weak, subangular, fine (5-10 mm)	soft	clear	smooth	3'	Stones
1192.1 - 1190.1										
3.5 - 4.0	Sand	dry	10YR 4/4	(none)	structureless	sli. hard	clear	smooth	-	Stones/Gravel
1190.1 - 1189.6										
4.0 - 6.0	Sand	dry	7.5YR 4/6	(none)	structureless	sli. hard	clear	smooth	-	Red, Stones
1189.6 - 1187.6										
6.0 - 8.0	SM	dry	7.5YR 4/4	(none)	weak, subangular, medium (10-20 mm)	sli. hard	gradual	smooth	-	Sandy
1187.6 - 1185.6										
8.0 - 20.0	SC	dry	7.5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	sli. hard	gradual	smooth	9'	
1185.6 - 1173.6										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

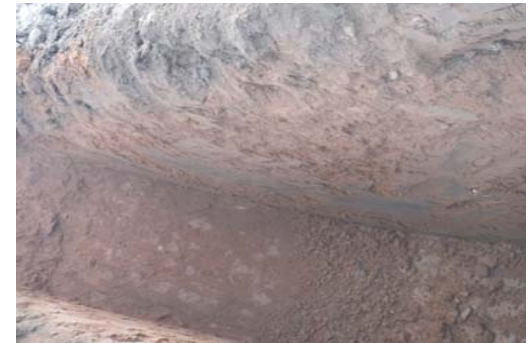
Landowner:	Todd Tuls	Date:	2/1/2016	Soil Name:	Santiago Silt Loam		
Legal Description:	Sec 22 T30N R16W	Hole Number:	1013	Position in Landscape:	Excavated Field		
County:	St Croix	Elevation:	1191.3	Observed Water Depth:	N/A		
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type:	N/A
Practice:	NRCS 313	Sample Depths:		Depth to Bedrock:	N/A	Type:	N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topo-		
(elevation)		moist	Mottle	size	type			graphy		
		wet		contrast	size					
0.0 - 0.5	Topsoil	dry	10YR 3/2	(none)	weak, subangular, fine (5-10 mm)	Soft	abrupt	smooth	-	
1191.3 - 1190.8										
0.5 - 1.5	ML	dry	10YR 3/4	(none)	weak, subangular, fine (5-10 mm)	Soft	gradual	smooth	-	Sandy
1190.8 - 1189.8										
1.5 - 5.5	SC	dry	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Soft	gradual	smooth	-	Red, Sand Vains
1189.8 - 1185.8										
5.5 - 8.0	SC	moist	5YR 4/4	common, fine (< 5 mm), distinct	moderate, subangular, medium (10-20 mm)	Firm	gradual	smooth	-	More Sand, Stones, Mottles
1185.8 - 1183.3										
8.0 - 9.0	SM	dry	5YR 3/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	Stones
1183.3 - 1182.3										
9.0 - 23.0	SC	moist	2.5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Firm	gradual	smooth	-	Red, Little Moist
1182.3 - 1168.3										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	2/1/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1014	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1190.8	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	19.5	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	8'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topography		
(elevation)		moist	Mottle	size	type					
		wet		contrast	size					
0.0 - 1.0	Topsoil	dry	10YR 3/1	(none)	weak, granular, fine (1-2 mm)	Soft	abrupt	smooth	-	
1190.8 - 1189.8										
1.0 - 5.0	SM	dry	10YR 3/3	(none)	weak, subangular, fine (5-10 mm)	Very Hard	gradual	smooth	-	Red, Stones
1189.8 - 1185.8										
5.0 - 8.0	SM	dry	10YR 3/3	(none)	moderate, subangular, medium (10-20 mm)	Very Hard	gradual	smooth	-	Red, Larger Stones
1185.8 - 1182.8										
8.0 - 10.0	SC	dry	10YR 3/4	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	8'	Stones
1182.8 - 1180.8										
10.0 - 15.0	SM	dry	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	Red, Stones
1180.8 - 1175.8										
15.0 - 19.5	SC	moist	5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Firm	gradual	smooth	-	Red, Stones
1175.8 - 1171.3										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/29/2016
Hole Number:	1015
Elevation:	1194.7
Total Depth:	22.5
Sample Depths:	3'

Soil Name:	Magnor Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	22'
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Practice: NRCS 313

Sample Depths:

Depth to Bedrock: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/28/2016
Hole Number:	1018
Elevation:	1194.3
Total Depth:	24.5
Sample Depths:	1', 4', 10'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	1/28/2016
Hole Number:	1019
Elevation:	1195.3
Total Depth:	22.0
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Excavated Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1020	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1195.8	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:		Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry moist wet	Matrix	abundance size contrast	grade type size		distinctiveness	topo- graphy		
(elevation)			Mottle							
0.0 - 1.8	Fill	dry	10YR 3/4	(none)	weak, granular, fine (1-2 mm)	Soft	clear	smooth	-	
1195.8 - 1194.0										
1.8 - 2.2	Buried Topsoil	dry	10YR 3/1	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	
1194.0 - 1193.6										
2.2 - 3.3	ML	dry	10YR 3/3	(none)	weak, subangular, fine (5-10 mm)	Sli. Hard	gradual	smooth	-	
1193.6 - 1192.5										
3.3 - 5.2	ML	dry	7.5YR 3/3	common, fine (< 5 mm), faint	weak, subangular, fine (5-10 mm)	Sli. Hard	abrupt	smooth	-	Mottles, Coarse Sand
1192.5 - 1190.6										
5.2 - 8.0	Sand	dry	7.5YR 4/3	(none)	structureless	Loose	gradual	smooth	-	Coarse Sand, Seep
1190.6 - 1187.8										
8.0 - 12.0	Sand	dry	5YR 4/3	(none)	structureless	Loose	gradual	smooth	-	
1187.8 - 1183.8										
12.0 - 20.0	Sand	dry	5YR 4/4	(none)	structureless	Loose	abrupt	smooth	-	Stones & Cobbles
1183.8 - 1175.8										
20.0 - 23.0	SC	dry	5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Very Hard	abrupt	smooth	-	Stones
1175.8 - 1172.8										

General Comments: Still Seeping @ 48hrs



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/29/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1021	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1196.2	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	23.0	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	2', 4'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinc-	topo-		
(elevation)		moist	Mottle	size	type		tiveness	graphy		
		wet		contrast	size					
0.0 - 0.5	Topsoil	dry	10YR 3/2	(none)	weak, angular, fine (1-2 mm)	Soft	clear	smooth	-	
1196.2 - 1195.7										
0.5 - 1.5	Fill	dry	10YR 3/3	(none)	weak, granular, v. fine (< 1 mm)	Soft	clear	smooth	-	
1195.7 - 1194.7										
1.5 - 3.0	SC	moist	7.5YR 3/4	(none)	moderate, subangular, medium (10-20 mm)	Firm	gradual	smooth	2'	Stones
1194.7 - 1193.2										
3.0 - 6.0	SC	moist	7.5YR 4/4	(none)	moderate, subangular, medium (10-20 mm)	Firm	abrupt	smooth	4'	More Clay, Larger Stones, Dark Bands of ML/CL
1193.2 - 1190.2										
6.0 - 7.0	Sand	dry	7.5YR 5/6	many, coarse (> 15 mm), prominent	structureless	Loose	gradual	smooth	-	Mottles
1190.2 - 1189.2										
7.0 - 23.0	Sand	dry	5YR 4/6	(none)	structureless	Loose	gradual	smooth	-	Red
1189.2 - 1173.2										

General Comments: Small Seep @ 6', Seep @ 7' @ 24hrs



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231







**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	1/28/2016	Soil Name:	Santiago Silt Loam	
Legal Description:	Sec 22 T30N R16W	Hole Number:	1025	Position in Landscape:	Excavated Field	
County:	St Croix	Elevation:	1196.6	Observed Water Depth:	N/A	
Logged by:	Ronnie Williams, PE	Total Depth:	24.5	Est. HGW Depth:	N/A	Type: N/A
Practice:	NRCS 313	Sample Depths:	3', 6', 12.5'-13'	Depth to Bedrock:	N/A	Type: N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topo-		
(elevation)		moist	Mottle	size	type			graphy		
		wet		contrast	size					
0.0 - 0.5	Topsoil	dry	10YR 3/2	(none)	weak, granular, fine (1-2 mm)	Soft	abrupt	smooth	-	
1196.6 - 1196.1										
0.5 - 1.8	SM	dry	10YR 3/4	(none)	weak, angular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	Grey
1196.1 - 1194.8										
1.8 - 3.3	SM	dry	5YR 4/6	(none)	weak, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	3'	Red
1194.8 - 1193.3										
3.3 - 6.2	SM	dry	5YR 4/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	abrupt	smooth	6'	Red/Brown
1193.3 - 1190.4										
6.2 - 7.0	Sand	dry	7.5YR 6/6	(none)	structureless	Loose	abrupt	smooth	-	Orange, Some Stones
1190.4 - 1189.6										
7.0 - 12.5	SC	dry	5YR 3/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	
1189.6 - 1184.1										
12.5 - 13.0	SM	moist	5YR 3/4	(none)	moderate, subangular, medium (10-20 mm)	Firm	abrupt	smooth	12.5'-13'	
1184.1 - 1183.6										
13.0 - 16.0	Sand	dry	5YR 4/6	(none)	structureless	Loose	abrupt	smooth	-	
1183.6 - 1180.6										
16.0 - 24.5	SC	dry	5YR 4/3	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	
1180.6 - 1172.1										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner:	Todd Tuls	Date:	2/1/2016	Soil Name:	Santiago Silt Loam		
Legal Description:	Sec 22 T30N R16W	Hole Number:	1042	Position in Landscape:	Field		
County:	St Croix	Elevation:	1187.3	Observed Water Depth:	N/A		
Logged by:	Ronnie Williams, PE	Total Depth:	23.5	Est. HGW Depth:	N/A	Type:	N/A
Practice:	NRCS 313	Sample Depths:	2.5'	Depth to Bedrock:	N/A	Type:	N/A

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinc-	topo-		
(elevation)		moist	Mottle	size	type		tiveness	graphy		
		wet		contrast	size					
0.0 - 1.0	Topsoil	dry	10YR 3/1	(none)	weak, granular, fine (1-2 mm)	Soft	gradual	smooth	-	
1187.3 - 1186.3										
1.0 - 2.5	ML/CL	dry	10YR 3/2	(none)	moderate, subangular, fine (5-10 mm)	Sli. Hard	abrupt	smooth	2.5'	
1186.3 - 1184.8										
2.5 - 7.0	Sand	dry	5YR 4/4	(none)	structureless	Sli. Hard	abrupt	smooth	-	Red, Lots of Stones/Gravel
1184.8 - 1180.3										
7.0 - 9.0	SM	dry	5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	Red, Stones
1180.3 - 1178.3										
9.0 - 11.5	SC	dry	2.5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	Red, Stones
1178.3 - 1175.8										
11.5 - 17.0	SM	dry	2.5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	clear	smooth	-	Red
1175.8 - 1170.3										
17.0 - 23.5	SM	dry	2.5YR 4/6	(none)	moderate, subangular, medium (10-20 mm)	Sli. Hard	gradual	smooth	-	Red, Stones
1170.3 - 1163.8										

General Comments: Seep @ 10'



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/1/2016
Hole Number:	1044
Elevation:	1186.7
Total Depth:	17.0
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Disturbed Area
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/1/2016
Hole Number:	1045
Elevation:	1185.4
Total Depth:	17.0
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Disturbed Area
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Landowner: Todd Tuls

Legal Description: Sec 22 T30N R16W

County: St Croix

Logged by: Ronnie Williams, PE

Practice: NRCS 313

Date: 2/1/2016

Hole Number: 1046

Elevation: 1184.9

Total Depth: 18.0

Sample Depths:

Soil Name: Santiago Silt Loam

Position in Landscape:                      Distrubed Area

Observed Water Depth: N/A

Est. HGW Depth: N/A

Depth to Bedrock: N/A

Type: N/A

Type: N/A

[illegible]

General Comments: Seeps @ 6' & 8' & 12', Cave in Both Sides



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/1/2016
Hole Number:	1049
Elevation:	1180.3
Total Depth:	13.0
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments: Seep @ 8.5'



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/1/2016
Hole Number:	1050
Elevation:	1181.4
Total Depth:	13.5
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1052
Elevation:	1178.4
Total Depth:	14.0
Sample Depths:	2', 12'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Landowner: Todd Tuls

Legal Description: Sec 22 T30N R16W

County: St Croix

Logged by: Ronnie Williams, PE

Practice: NRCS 313

Date: 2/15/2016

Hole Number: 1053

Elevation: 1179.9

Total Depth: 18.0

Sample Depths: 1.8', 30"

Soil Name: Santiago Silt Loam

Position in Landscape: Field

Observed Water Depth: N/A

Est. HGW Depth: N/A

Depth to Bedrock: N/A

Type:

Type:

[illegible]

General Comments: Few Large Boulders



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1054
Elevation:	1177.0
Total Depth:	24.0
Sample Depths:	2', 4', 22'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments: Located in Waterway



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1055
Elevation:	1174.4
Total Depth:	14.0
Sample Depths:	2', 3', 4'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1057
Elevation:	1179.4
Total Depth:	25.0
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1058
Elevation:	1175.5
Total Depth:	14.0
Sample Depths:	1.3'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments: Near Waterway



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1061
Elevation:	1175.1
Total Depth:	9.5
Sample Depths:	

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231









## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	2/15/2016
Hole Number:	1063
Elevation:	1175.7
Total Depth:	14.5
Sample Depths:	5'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Field
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: \_\_\_\_\_

Type: \_\_\_\_\_

[illegible]

General Comments: Fill/Disturbed Area



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231













**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner: <u>Todd Tuls</u>	Date: <u>2/15/2016</u>	Soil Name: <u>Santiago Silt Loam</u>
Legal Description: <u>Sec 22 T30N R16W</u>	Hole Number: <u>1069</u>	Position in Landscape: <u>Field</u>
County: <u>St Croix</u>	Elevation: <u>1175.7</u>	Observed Water Depth: <u>N/A</u>
Logged by: <u>Ronnie Williams, PE</u>	Total Depth: <u>13.0</u>	Est. HGW Depth: <u>N/A</u> Type: _____
Practice: <u>NRCS 313</u>	Sample Depths: <u>8'</u>	Depth to Bedrock: <u>N/A</u> Type: _____

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinc-	topo-		
(elevation)		moist	Mottle	size	type		tiveness	graphy		
		wet		contrast	size					
0.0 - 1.0	Topsoil	dry	10YR 3/2	(none)	weak, granular, fine (1-2 mm)	soft	clear	smooth	-	
1175.7 - 1174.7										
1.0 - 2.5	SM	dry	10YR 3/3	(none)	weak, subangular, fine (1-2 mm)	sli. hard	clear	smooth	-	Stones
1174.7 - 1173.2										
2.5 - 6.0	ML	dry	10YR 3/3	many, medium (5-15 mm), prominent	moderate, subangular, fine (1-2 mm)	sli. hard	clear	smooth	-	Brown, Stones, Mottles
1173.2 - 1169.7										
6.0 - 8.0	SM	dry	7.5YR 3/4	(none)	moderate, subangular, medium (10-20 mm)	soft	clear	smooth	-	Brown, Stones
1169.7 - 1167.7										
8.0 - 9.0	CL	dry	5YR 4/3	(none)	moderate, subangular, medium (10-20 mm)	sli. hard	gradual	smooth	8'	Sandy
1167.7 - 1166.7										
9.0 - 13.0	ML	dry	10YR 6/3	(none)	moderate, subangular, medium (10-20 mm)	sli. hard	gradual	smooth	-	Light Grey, Very Dry
1166.7 - 1162.7										

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner: Todd Tuls

Legal Description: Sec 22 T30N R16W

County: St Croix

Logged by: Ronnie Williams, PE

Practice: NRCS 313

Date: 2/15/2016

Hole Number: 1070

Elevation: 1174.7

Total Depth: 4.0

Sample Depths:

Soil Name: Magnor Silt Loam

Position in Landscape: Field

Observed Water Depth: N/A

Est. HGW Depth: N/A

Depth to Bedrock: N/A

Type:

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Side Slope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1218
Elevation:	1190.4
Total Depth:	15.0
Sample Depths:	-

Soil Name:	Santiago Silt Loam
Position in Landscape:	Toe Slope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Date:	7/19/2017
Hole Number:	1219
Elevation:	1190.6
Total Depth:	8.0
Sample Depths:	-

Soil Name:	Santiago Silt Loam
Position in Landscape:	Side Slope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Ronnie Williams, PE
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1221
Elevation:	1192.7
Total Depth:	13.0
Sample Depths:	4.5'

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1223
Elevation:	1192.7
Total Depth:	13.0
Sample Depths:	-

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1224
Elevation:	1192.5
Total Depth:	13.0
Sample Depths:	-

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Magnor Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1226
Elevation:	1193.2
Total Depth:	23.0
Sample Depths:	-

Soil Name:	Magnor Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1227
Elevation:	1192.8
Total Depth:	22.0
Sample Depths:	-

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type:	N/A
Type:	N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





**SOIL INVESTIGATION LOG**  
(For Waste Storage Facilities)

Landowner: <u>Todd Tuls</u>	Date: <u>7/19/2017</u>	Soil Name: <u>Santiago Silt Loam</u>
Legal Description: <u>Sec 22 T30N R16W</u>	Hole Number: <u>1228</u>	Position in Landscape: <u>Shoulder</u>
County: <u>St Croix</u>	Elevation: <u>1193.0</u>	Observed Water Depth: <u>N/A</u>
Logged by: <u>Cody Overgard</u>	Total Depth: <u>24.0</u>	Est. HGW Depth: <u>N/A</u> Type: <u>N/A</u>
Practice: <u>NRCS 313</u>	Sample Depths: <u>-</u>	Depth to Bedrock: <u>N/A</u> Type: <u>N/A</u>

Depth	USCS	Moisture	Munsell Color	Mottle	Structure	Consistency	Boundary		Sample Number	Comments
(feet)		dry	Matrix	abundance	grade		distinctiveness	topo-		
(elevation)		moist	Mottle	size	type			graphy		
		wet		contrast	size					
0.0 - 2.0	Topsoil	dry	10YR 3/2	(none)	weak, granular, medium (2-5 mm)	friable	abrupt	smooth	-	
1193.0 - 1191.0										
2.0 - 3.0	SC	dry	10YR 4/3	(none)	weak, subangular, fine (5-10 mm)	sli. hard	clear	smooth	-	Yellow Sand Bands
1191.0 - 1190.0										
3.0 - 8.0	SM	dry	7.5YR 4/3	(none)	structureless	sli. hard	clear	smooth	-	Cobbles
1190.0 - 1185.0										
8.0 - 9.0	SP	dry	7.5YR 7/3	(none)	structureless	sli. hard	clear	smooth	-	Tan Sand
1185.0 - 1184.0										
9.0 - 21.0	SC	dry	7.5YR 4/4	(none)	structureless	soft	clear	smooth	-	Boulders
1184.0 - 1172.0										
21.0 - 24.0	SP	dry	7.5YR 7/3	(none)	structureless	sli. hard	clear	smooth	-	Tan Sand
1172.0 - 1169.0										

General Comments:



Williams Engineering Services, LLC  
 Ronnie Williams, PE  
 E14910 Bears Grass Road  
 Augusta, WI 54722  
 (715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



## SOIL INVESTIGATION LOG

(For Waste Storage Facilities)

Landowner:	Todd Tuls
Legal Description:	Sec 22 T30N R16W
County:	St Croix
Logged by:	Cody Overgard
Practice:	NRCS 313

Date:	7/19/2017
Hole Number:	1230
Elevation:	1195.3
Total Depth:	24.0
Sample Depths:	2.0

Soil Name:	Santiago Silt Loam
Position in Landscape:	Shoulder
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231





(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Sideslope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Santiago Silt Loam
Position in Landscape:	Side Slope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



(For Waste Storage Facilities)

Soil Name:	Freeon Silt Loam
Position in Landscape:	Side Slope
Observed Water Depth:	N/A
Est. HGW Depth:	N/A
Depth to Bedrock:	N/A

Type: N/A

Type: N/A

[illegible]

General Comments:



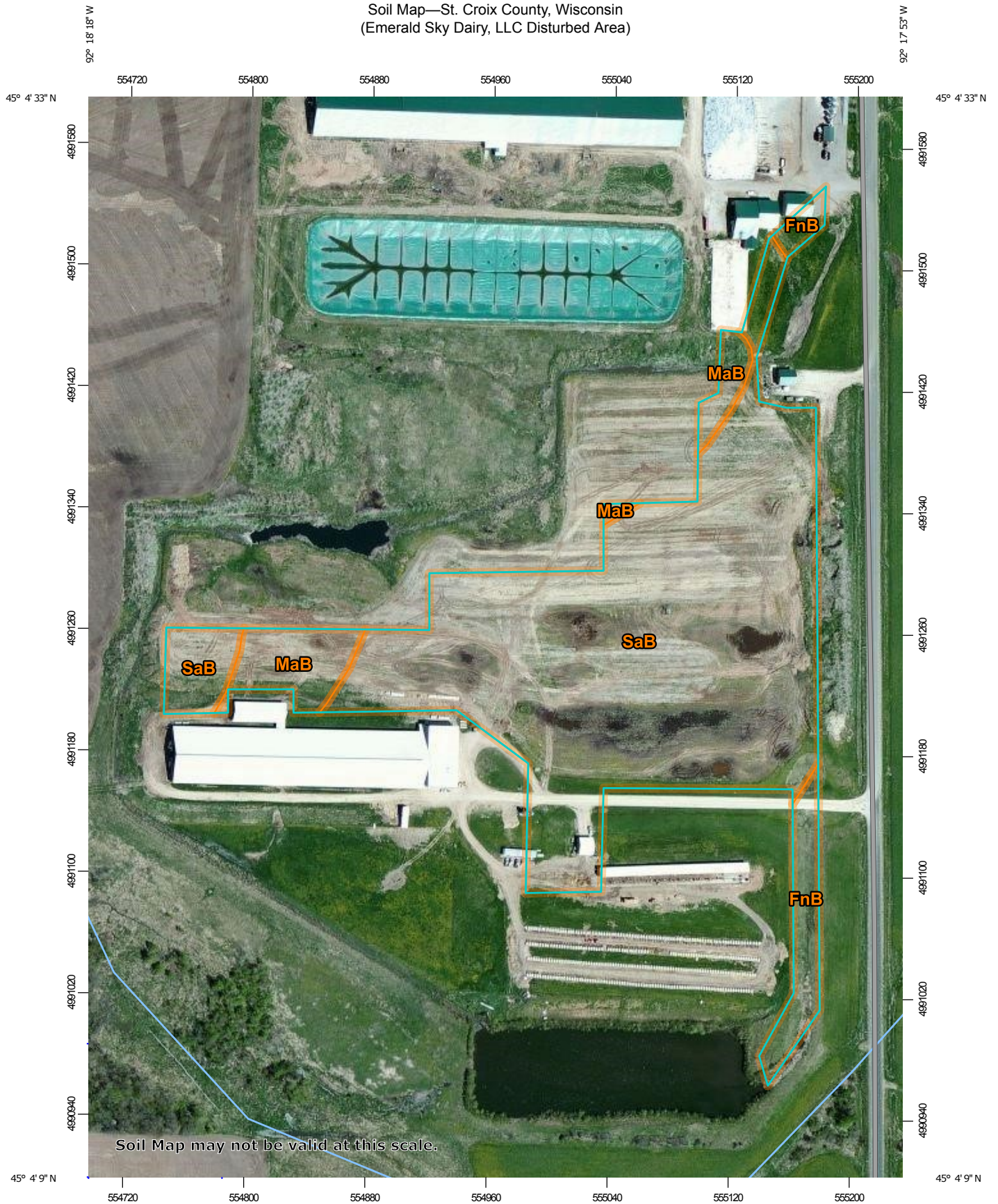
Williams Engineering Services, LLC  
Ronnie Williams, PE  
E14910 Bears Grass Road  
Augusta, WI 54722  
(715) 829-3231



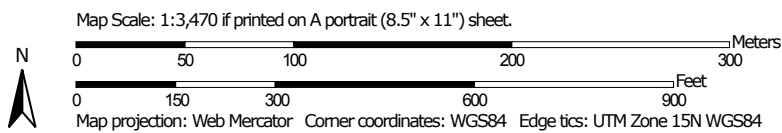
ATTACHMENT 4  
MAPS



Soil Map—St. Croix County, Wisconsin  
(Emerald Sky Dairy, LLC Disturbed Area)



Soil Map may not be valid at this scale.



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: St. Croix County, Wisconsin

Survey Area Data: Version 12, Sep 27, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2010—Jun 6, 2016

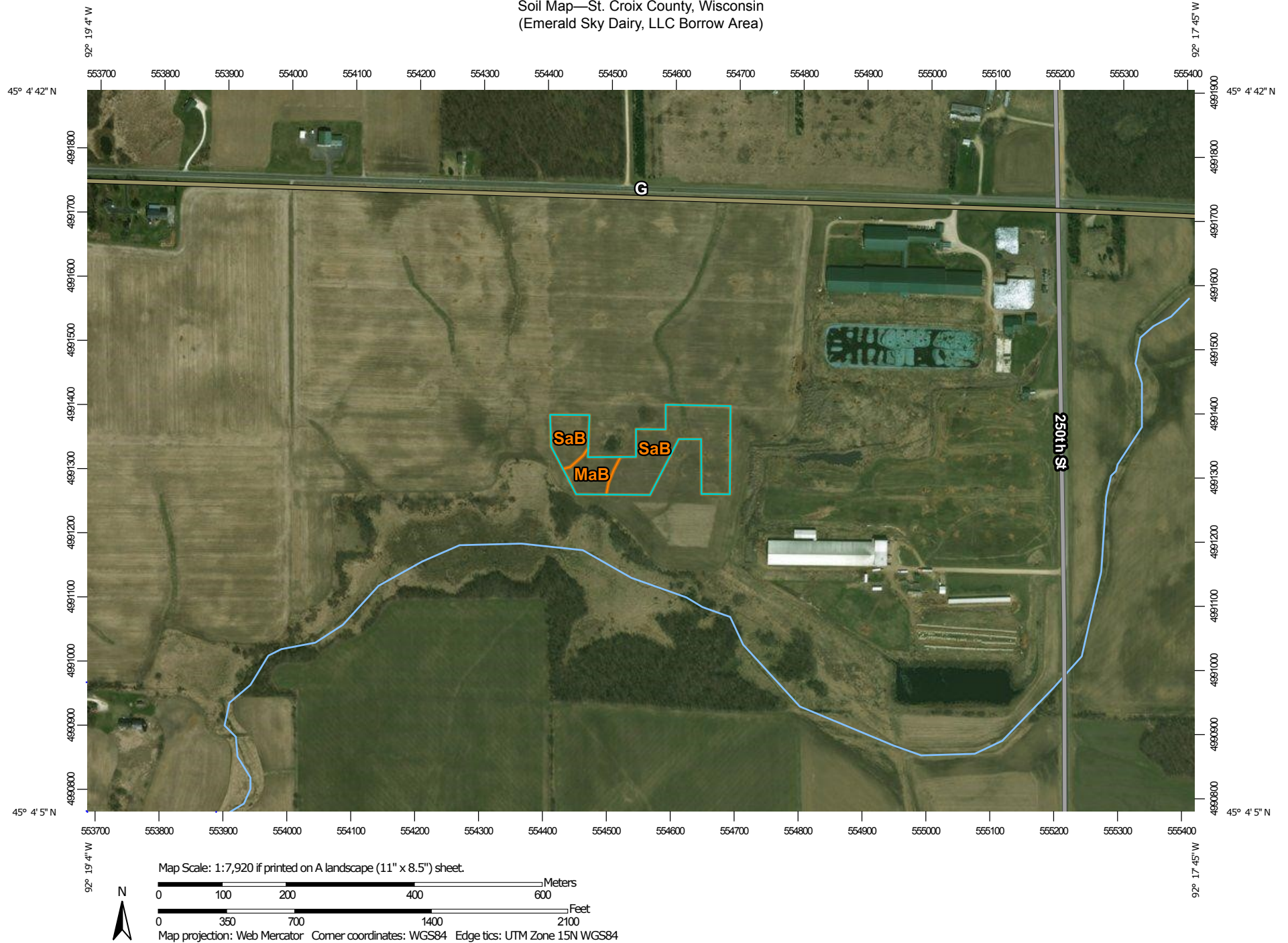
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

St. Croix County, Wisconsin (WI109)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FnB	Freeon silt loam, 2 to 6 percent slopes	1.0	6.4%
MaB	Magnor silt loam, 0 to 4 percent slopes	1.2	7.7%
SaB	Santiago silt loam, 2 to 6 percent slopes	13.6	85.8%
<b>Totals for Area of Interest</b>		<b>15.9</b>	<b>100.0%</b>



Soil Map—St. Croix County, Wisconsin  
(Emerald Sky Dairy, LLC Borrow Area)



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

8/9/2017 93 of 96  
Page 1 of 3

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: St. Croix County, Wisconsin

Survey Area Data: Version 12, Sep 27, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 4, 2010—Jun 6, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

St. Croix County, Wisconsin (WI109)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MaB	Magnor silt loam, 0 to 4 percent slopes	0.9	15.8%
SaB	Santiago silt loam, 2 to 6 percent slopes	5.0	84.2%
<b>Totals for Area of Interest</b>		<b>5.9</b>	<b>100.0%</b>



