SAND CREEK CONSULTANTS, Inc.
Environmental and Geological Scientists and Engineers
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TECHNICAL MEMORANDUM

To: **Attorney Ashley Lehocky/Silton, Seifert, Carlson SC**

From: **David Ozsvath, PhD, PG/Sand Creek Consultants, Inc.**

Pete Arntsen, MS, PH, PG/Sand Creek Consultants, Inc.

Referenced: **Town of Greenville – Unnamed Navigable Stream and Reported Karst Structures**

Subject: **Geologic Field Investigations**

Date: **August 21, 2017**

PURPOSE

The purpose of this Technical Memorandum is to describe the actions that were implemented to investigate the geologic nature of reported karst-like features present near an unnamed navigable stream located west of State Trunk Highway (STH) 76 (Municipal Drive) and north of STH 96 (Wisconsin Avenue) in the Town of Greenville, Outagamie County, Wisconsin.

OBJECTIVE

The objective of the investigation was to evaluate the presence of a reported cave, sinkhole, and other karst-like features present near the unnamed navigable stream, and to evaluate the threat of stormwater runoff infiltrating through preferential migration pathways deep into the subsurface and potentially impacting potable water wells.

BACKGROUND

One or more surface features near the above-referenced navigable stream reportedly have been observed to allow preferential movement of stormwater runoff from the surface to the subsurface. Observations include “swirlpools” in areas subject to flooding during periods of high water. The features are referred to as karst by local residents and Town officials. Portions of the stream also “disappear” during certain times of the year. Because there are potable wells (both private and public) in the area of the reported karst-like features, there is concern that surface water intrusion could adversely impact drinking water supplies. To better define the near-surface geologic conditions and better understand potential threats to groundwater supplies, intrusive investigations of the karst-like features and nearby areas were conducted using an excavator.

SITE LOCATION

The portion of interest of the unnamed stream is located in the south half of the northeast quarter of Section 22, Township 21 North, Range 16 East, (S ½, NE ¼, Sec 22, T 21N, R 16E).

The location of the stream is indicated on **Figure 1**. An airphoto of the investigation area is included as **Figure 2**.

METHODS

On August 8, 2017, a Deere 135D excavator was used to dig test pits that extended from the ground surface to the underlying limestone/dolostone bedrock at six locations on the south side of the unnamed stream. The excavated materials were characterized in the field by Pete Arntsen/Sand Creek and the descriptions recorded on field logs. Selected samples were retained for more detailed analysis of soil texture and color. Photographs were taken of the excavated material and the exposed geologic profile.

The test pits were dug beginning on the western (downstream) side of the investigation area and generally followed the unnamed stream to the east over a distance of around 1,200 feet. At each location, a pit was excavated to a depth of 4 to 5 feet to allow inspection of the soil profile; then the pit was excavated until rock was encountered, and the rock was removed to the extent of the excavator's capabilities. After the geologic evaluations were completed, the material was returned to the excavation in general inverse order of removal. The disturbed areas were seeded with oats and rye and covered with straw erosion-control fabric. The work was completed in one day.

RESULTS

The locations of the six test pits are indicated on **Figure 3**. **Geologic logs** of the test pits and a **photolog** of the investigation are attached.

At each location, the topsoil was a dark grey silt loam, ranging in thickness from at least 12 inches to over 30 inches. The subsoil varied in thickness and texture but generally included a layer of clay accumulation beneath the topsoil and silty, very fine sand at greater depths (closer to bedrock). Layers of gravel and cobble were also encountered in the subsoil and with clast size generally increasing (both size and frequency) with depth.

When rock was first encountered, it came out in gravel and small cobble-sized clasts coated in the silty, very fine sand. As excavation continued, the digging became harder, and the rock fragments increased in size to large blocky chunks (e.g., 6" x 6" x 6") and then to larger pieces shaped like flagstones (e.g., 2' x 1' x 4"). The rock was considered competent when it could no longer be removed by the excavator. The maximum depth of excavation into rock was about 2 feet. The depth to rock increased at each successive test pit (from west to east), roughly corresponding to the rise in land surface topography. The geologic profile for each test pit is summarized below:

- TP-01: Topsoil, a dark grey silt loam (clayey, sandy silt), extended approximately 16 inches into the subsurface. The subsoil consisted of grey-brown silt loam, with clay coatings occurring at depth. Weathered dolostone was encountered at about 3.5 feet, and competent dolostone at about 5 feet.
- TP-02: Topsoil is the same as TP-01 to a depth of 10 inches. Subsoil is similar to TP-01 near the surface, but with an accumulation of sub-rounded to sub-angular gravel and cobbles at a depth of about 2 feet that was underlain by an uneven layer of yellow-brown clean, silty, very fine sand approximately 6 inches thick. Weathered dolostone was encountered at roughly 4 feet, and competent dolostone at about 6 feet.

- TP-03: Topsoil is the same to a depth of 14 inches. The subsoil has a higher clay content, and sub-rounded to sub-angular gravel and cobbles appear at around 3 feet. The profile then grades to a brown loamy sand, followed by silty, very fine sand above the rock. Weathered dolostone was encountered at about 6.5 feet, and competent dolostone at about 8.5 feet. In addition to the blocks and flagstones, rock fragments removed from TP-03 included one block with a highly polished surface, one with a drusey vug (a void containing small (calcite?) crystals), another with a chalk-filled vug, and a smooth, egg-sized cobble that appeared to have been rounded by water transport (see Photo No. 22).
- TP-04: This was the location of a hole of uncertain origin about 1 foot deep with lateral side passages less than a foot long. Topsoil is the same to a depth of 12 inches. The upper subsoil included a 1.5-foot thick layer of sandy loam with gravel and small cobbles. Beneath this layer, the coarse fraction decreased and clay fraction increased, ending in a layer of mottled reddish-brown clay loam at around 4 feet. This deeper subsoil included what appeared to be a boulder that was weathered to near total disintegration, as evidenced by the dark sand particles that were easily scraped off but could not be chipped off. Beneath the clay loam and "boulder," the material was a brown sandy loam that graded to a gravelly, cobbly, silty, very fine sand atop rock. Weathered dolostone was encountered at about 8 feet, and competent dolostone at about 10 feet.
- TP-05: This is a location where cobbles appeared piled on the land surface and is reportedly one of the "swirlpool" locations. The test pit encountered a distinct column of poorly sorted, sub-rounded to sub-angular cobbles that extended to a depth of approximately 5 feet. This was underlain by a layer of reddish-brown clay loam (sandy, silty clay), which, in turn, was underlain by the yellow-brown silty very fine sand (see Photo No. 35). The dark grey silty loam topsoil followed the cobbles down to a depth of approximately 20 inches, as compared to a depth of 12 inches in the rest of the pit. A layer of reddish-brown clay loam was also encountered at roughly 9 feet, which was underlain by silty, very fine sand atop weathered dolostone, encountered at a depth of approximately 10.5 feet. The excavator could not remove the flagstone-sized pieces due to lack of reach and confines of the location.
- TP-06: Topsoil was the same as elsewhere but to a depth of more than 30 inches. Beneath this was a horizon of higher clay content, followed by a "varved" layer inches thick composed of very thin lenses (a few millimeters thick) of alternating lighter and darker sediments. A layer of poorly sorted, sub-rounded to sub-angular gravel and cobble was present at about 6 feet; and this material graded into rock-contact sediments (i.e., gravelly, cobbly, silty, very fine sand) that extended another 4 feet into the subsurface. Weathered dolostone was encountered at about 11 feet, and flagstones were removed to about 12 feet.

EVALUATIONS

Each of the test pits except for TP-01 encountered horizons where the materials exhibited characteristics of sediments that have been transported and deposited by flowing water (e.g., the silty, very fine sand layers). Although the smooth, egg-sized cobble found in TP-03 suggests considerable rounding by fluvial processes, most of the sediment included in this category reflects only minimal

transport by a low-energy stream. The variations in fluvial sediment thickness and type from one pit to another are expected for deposits left by a meandering stream that experienced variations in discharge. It appears, then, that the subsurface materials beneath the present drainageway contain buried deposits of fluvial sediments which were deposited by the ancestral stream in this area.

Water-sorted sediments occur mostly at depth, just above the weathered dolostone bedrock, but in some pits these sediments grade into a zone of unconsolidated materials derived from weathered rock. The topsoil has a fairly uniform composition across the site, although its thickness varies from one pit to the next. The contact between topsoil and water-sorted sediments is generally gradational, but it does not appear that the topsoil is derived directly from the underlying sediments. A more likely source of the topsoil is slope wash from areas adjacent toward the lower elevations occupied by the present day drainageway.

CONCLUSIONS

The goal of this investigation was to determine if subsurface karst features (e.g., solution cavities or sinkholes) had developed in the dolostone bedrock, as have been found in other parts of Wisconsin. Evidence gathered from six test pits positioned adjacent to the stream does not indicate that karst features are present. It is the unconsolidated materials that provide zones of preferential water flow through discontinuous layers of fluvial sediments that exist near the contact with weathered bedrock. These sediments were apparently deposited by ancestral streamflow during the early post-glacial period and have been buried by soils derived from adjacent areas via slope wash. Although the fluvial sand and gravel present beneath the modern drainageway reflect deposition by relatively low-energy streamflow, they are permeable enough to influence water movement through the subsurface. The “swirlpools” and disappearing streamflow reported by local residents mark locations where surface water infiltrates rapidly downward to reach buried lenses of higher permeability.

The findings of this investigation have important implications to the local residents who rely on private wells for their domestic water supplies. Because the unusual drainage features observed in the study area are not the result of solution cavities in the underlying dolostone, the potential for surface water to infiltrate down into the bedrock without first passing slowly through the soil profile is restricted to a relatively small zone beneath the present day drainageway. Given the depths at which most private wells are screened within the bedrock, it is unlikely that they draw groundwater that is affected by water quality in this stream. Rather, the relationship between land use activities and the underlying groundwater quality is no different here than in other parts of Greenville.

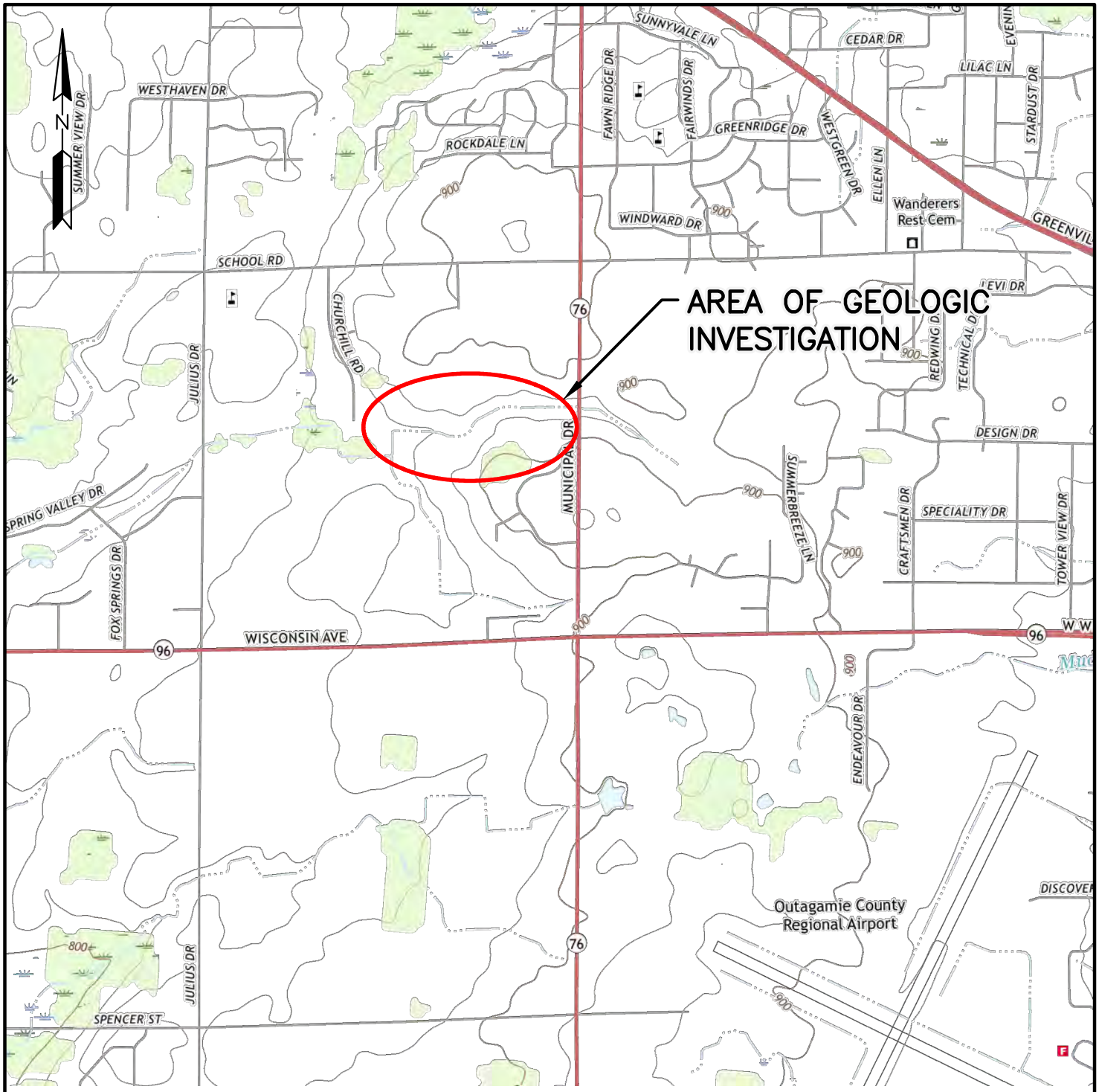
BIOGRAPHY

Dr. David Ozsvath is a Professor of Geology in the Department of Geography/Geology at the University of Wisconsin-Stevens Point and a technical expert for Sand Creek Consultants, Inc. In addition to his 30 years teaching courses in hydrogeology, geochemistry, geomorphology; environmental geology; and glacial geology, Dr. Ozsvath has concurrently been a consulting hydrogeologist on projects including soil and groundwater contamination and remediation, well site investigation, wellhead protection, landfill feasibility studies, and landfill performance studies. In addition to his numerous academic publications

and presentations, Dr. Ozsvath has authored or co-authorized more than 100 technical reports and memos addressed to regulators, municipalities, and private sector regarding environmental concerns.

Peter Arntsen has a Master's Degree in Water Resources, is a licensed professional hydrologist and a licensed professional geologist, and has 27 years of experience as a private-sector environmental scientist. Mr. Arntsen's fields of emphasis include soil and groundwater contamination investigation and remediation, geologic and hydrogeologic evaluation, environmental fate and transport, wetland delineation and permitting, and project management. He has authored or co-authored reports addressed to regulators, municipalities, and private industry throughout the Midwest on a wide spectrum of technical environmental subjects that include petroleum, solvent, fertilizer, and pesticide releases; solid waste facility development, operation, and monitoring; sensitive receptor evaluations; and environmental condition documentation.

Figures



WISCONSIN
OUTAGAMIE COUNTY

0 100 200
SCALE IN FEET

REFERENCE:
USGS 7.5 MIN. GREENVILLE WISCONSIN TOPOGRAPHIC QUADRANGLE DATED 2016.

SAND CREEK CONSULTANTS, Inc. SM Environmental and Geological Scientists and Engineers	SITE LOCATION MAP	DATE: AUGUST 2017	DRAWN BY: KAP
	KARST INVESTIGATION TOWN OF GREENVILLE WISCONSIN	SCALE: 1"=200'	APPROVED : PDA
		FIGURE 1	

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8/15/2017

SAND CREEK CONSULTANTS, Inc.
Environmental and Geological Scientists and Engineers

N

AIRPHOTO OF GEOLOGIC INVESTIGATION AREA

0 100 200
SCALE IN FEET

KARST INVESTIGATION
TOWN OF GREENVILLE
WISCONSIN

DATE:	AUGUST 2017
SCALE:	1"=200'
DRAWN BY:	KAP
APPROVED :	PDA

FIGURE 2

PHOTOSOURCE: GOOGLE EARTH PRO IMAGE APRIL 2017.
DATE ACCESSED AUGUST 2017.

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6/12/2017

SAND CREEK CONSULTANTS, Inc.
Environmental and Geological Scientists and Engineers

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0 50 100
SCALE IN FEET

GEOLOGIC TEST PIT LOCATIONS

KARST INVESTIGATION TOWN OF GREENVILLE WISCONSIN

DATE:	AUGUST 2017
SCALE:	1"=100'
DRAWN BY:	KAP
APPROVED :	PDA

FIGURE 3

LEGEND

TP–02 ◑ TEST PIT LOCATION AUGUST 8, 2017

PHOTOSOURCE: GOOGLE EARTH PRO IMAGE APRIL 2017.
DATE ACCESSED AUGUST 2017.

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8/18/2017

Geologic Logs of the Test Pits

TEST PIT LOG INFORMATION

Facility/Project Name: Greenville Karst Geologic Investigation			Test Pit Number: TP- 01
Excavating Contractor and Operator: Town of Greenville	Date Drilling Started: 08/08/2017 (M M D D Y Y)	Date Drilling Completed: 08/08/2017 (M M D D Y Y)	Digging Method: Excavator 135D
	Final Static Water Level: None Feet MSL	Surface Elevation: ____ Feet MSL	Borehole Diameter: ____ inches
Boring Location: S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.808 / Long -88 32.803	Local Grid Location (if applicable): ☐ N ____ Feet ☐ S ☐ E ____ Feet ☐ W	
County: Outagamie	Civil Town/City/or Village: Town of Greenville		

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
TP01-10"	0	**Topsoil** Dark grey silt loam	ML	10YR3/2		D
TP01-18"		Grey silt loam (more silt)	ML	10YR3/3		D
	2	**Subsoil**				
TP01-35"		Grey-brown silt loam Brown clay coatings	ML	7.5YR4/3	7.5YR3/4	D
	4	**Weathered Dolostone** @ 3.5 ft highly fractured				
		Competent Dolostone @ 5 ft				
	6					
	8					
	10					

Signature	Firm
Pete Arntsen	Sand Creek Consultants, Inc.

TEST PIT LOG INFORMATION

Facility/Project Name: Greenville Karst Geologic Investigation			Test Pit Number: TP- 02
Excavating Contractor and Operator: Town of Greenville	Date Drilling Started: 08/08/2017 (M M D D Y Y)	Date Drilling Completed: 08/08/2017 (M M D D Y Y)	Digging Method: Excavator 135D
	Final Static Water Level: None Feet MSL	Surface Elevation: ____ Feet MSL	Borehole Diameter: ____ inches
Boring Location: S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.829 / Long -88 32.763	Local Grid Location (if applicable): ____ Feet ☐ N ☐ S ____ Feet ☐ E ☐ W	
County: Outagamie	Civil Town/City/or Village: Town of Greenville		

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
TP02-12"	0	**Topsoil** Dark grey silt loam	ML	10YR3/2		D
TP02-20"	2	Grey silt loam w/coarse gravel and small cobble **Subsoil**	ML	10YR3/4		D
TP02-42"		Yellow-brown clean silty very fine sand	SM	10YR5/4		D
	4	**Weathered Dolostone** @ ~4 ft highly fractured				
	6	**Competent Dolostone** @ ~6 ft				
	8					
	10					

Signature	Firm
Pete Arntsen	Sand Creek Consultants, Inc.

TEST PIT LOG INFORMATION

Facility/Project Name		Test Pit Number
Greenville Karst Geologic Investigation		TP- 03

Excavating Contractor and Operator	Date Drilling Started	Date Drilling Completed	Digging Method
Town of Greenville	08/08/2017 (M M D D Y Y)	08/08/2017 (M M D D Y Y)	Excavator 135D

Final Static Water Level	Surface Elevation	Borehole Diameter
None Feet MSL	_____ Feet MSL	_____ inches

Boring Location	Lat / Long	Local Grid Location (if applicable)
S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.842 / Long -88 32.694	☐ N _____ Feet ☐ S ☐ E _____ Feet ☐ W

County	Civil Town/City/or Village
Outagamie	Town of Greenville

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
TP03-10"		**Topsoil** Dark grey silt loam	ML	7.5YR3/1		D
TP03-24"	2	Brown loam **Subsoil**	ML	7.5YR4/3		D
TP03-36"		Brown loam w/ gravel and cobble	ML	7.5YR4/3		
TP03-48"	4	Brown loamy sand	SM	7.5YR4/4		D
	6	Unconsolidated material removed with rock is yellow-brown silty very fine sand w/ gravel and cobbles	SM	10YR5/6		D
	8	**Weathered Dolostone** @ ~6.5 ft highly fractured (Rock fragments include one with highly polished surface, another with a drusey vug (calcite?), and a third with a chalk filled vug)				
	10	**Competent Dolostone** @ ~8.5 ft				

Signature	Firm
Pete Arntsen	Sand Creek Consultants, Inc.

TEST PIT LOG INFORMATION

Facility/Project Name		Test Pit Number
Greenville Karst Geologic Investigation		TP- 04

Excavating Contractor and Operator	Date Drilling Started	Date Drilling Completed	Digging Method
Town of Greenville	08/08/2017 (M M D D Y Y)	08/08/2017 (M M D D Y Y)	Excavator 135D

	Final Static Water Level	Surface Elevation	Borehole Diameter
	None Feet MSL	____ Feet MSL	____ inches

Boring Location		Local Grid Location (if applicable)
S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.845 Long -88 32.669	☐ N ☐ E ____ Feet ☐ S ____ Feet ☐ W

County	Civil Town/City/or Village
Outagamie	Town of Greenville

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
TP04-10"		**Topsoil** Dark grey silt loam	ML	10YR3/2		D
TP04-19"		Dark brown sandy loam w/ gravel and small cobbles	SM	10YR4/3		D
TP04-26"	2	Dark brown loam; little coarse fraction **Subsoil**	ML	7.5YR4/3		D
TP04-40"		Reddish-brown clay loam w/ pale brown and yellow-brown redox concentrations	CL	5YR4/4	10YR6/3 5YR4/6	M
TP04-48"	4	Weathered Boulder? Cemented sands ranging in color from black to gray to brown to white	SP			D
TP04-58"		Brown sandy loam	SM	10YR4/4		
	6					
		Unconsolidated material removed with rock is yellow-brown silty very fine sand w/ gravel and cobbles	SM	10YR5/6		D
	8	**Weathered Dolostone** @ ~8 ft highly fractured				
	10	**Competent Dolostone** @ ~10 ft				

Signature	Firm
Pete Arntsen	Sand Creek Consultants, Inc.

TEST PIT LOG INFORMATION

Facility/Project Name: Greenville Karst Geologic Investigation			Test Pit Number: TP- 05
Excavating Contractor and Operator: Town of Greenville	Date Drilling Started: 08/08/2017 (M M D D Y Y)	Date Drilling Completed: 08/08/2017 (M M D D Y Y)	Digging Method: Excavator 135D
	Final Static Water Level: None Feet MSL	Surface Elevation: ____ Feet MSL	Borehole Diameter: ____ inches
Boring Location: S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.849 / Long -88 32.575	Local Grid Location (if applicable): ☐ N ____ Feet ☐ S ☐ E ____ Feet ☐ W	
County: Outagamie	Civil Town/City/or Village: Town of Greenville		

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
		Topsoil Dark grey silt loam	ML	10YR3/2		D
TP05-10"						
TP05-16"		Dark brown sandy loam, blocky structure	ML	10YR4/3		D
	2					
TP05-28"		Dark brown loam; little coarse fraction	ML	7.5YR4/3		D
		Dark brown silt loam w/ gravel & cobbles	ML	7.5YR4/3		
TP05-44"						
	4					D
		Subsoil				
	6					
TP05-6.5'		Yellowish brown silty very fine sand, w/ dark brown clay coatings and brown mottles	SM	10YR5/4	10YR3/2 7.5YR4/6	D
	8					
TP05-~9'		Reddish-brown clay loam, some sand coatings	CL	5YR4/4	7.5YR4/6	M
	10					
		Weathered Dolostone @ ~10.5 ft highly fractured EOB @ ~11 ft				

Signature: Pete Arntsen	Firm: Sand Creek Consultants, Inc.

TEST PIT LOG INFORMATION

Facility/Project Name		Test Pit Number
Greenville Karst Geologic Investigation		TP- 06

Excavating Contractor and Operator	Date Drilling Started	Date Drilling Completed	Digging Method
Town of Greenville	08/08/2017 (M M D D Y Y)	08/08/2017 (M M D D Y Y)	Excavator 135D

	Final Static Water Level	Surface Elevation	Borehole Diameter
	None Feet MSL	Feet MSL	inches

Boring Location		Local Grid Location (if applicable)
S 1/2, NE 1/4, Sec. 22, T 21N, R 16E	Lat 44 16.868 Long -88 32.550	☐ N ☐ E Feet ☐ S Feet ☐ W

County	Civil Town/City/or Village
Outagamie	Town of Greenville

Sample Number and Type	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	Soil Properties: USCS	Matrix Color	Secondary Color	Moisture Content
TP06-22"	2	**Topsoil** Dark grey silt loam Friable fine sub-angular blocky structure	ML	10YR4/2		D
TP06-34"		Same, slightly more clay, stronger structure	ML	10YR4/2		D
TP06-40"		Light/dark "varves" Brown loam	ML	7.5YR4/4		D
	4					D
TP06-55"		Brown loam; dark brown clay coatings, yellow-brown sandy coatings		7.5YR4/4	7.5YR3/3 7.5YR4/6	D
		Subsoil Layer of cobble @ ~ 6 ft				
	6					
TP06-~8'	8	Yellowish brown sandy loam, gravelly and cobbly	SM	10YR5/4		D
	10					
TP05-~11'		Yellowish brown silty sand, gravelly and cobbly	SM	10YR5/6		D
		Weathered Dolostone @ ~11 ft EOB @~12 ft				

Signature	Firm
Pete Arntsen	Sand Creek Consultants, Inc.

Photolog of the Investigation

Photo No. 1 Excavator used for test pits

Photo No. 2 Location of TP-01; the westernmost test pit

Photo No. 3 TP-01

Photo No. 4 TP-01 bottom

Photo No. 5 TP-01; excavated materials

Photo No. 6 TP-01; “flagstone”

Photo No. 7 TP-01 final depth approximately 5 feet

Photo No. 8 TP-01; backfilled and restored

Photo No. 9 TP-02 location

Photo No. 10 TP-02; shallow sediment evaluation

Photo No. 11 TP-02; shallow sediments

Photo No. 12 TP-02; shallow sediments

Photo No. 13 TP-02; layer of very fine sand

Photo No. 14 TP-02; “flagstone”

Photo No. 15 TP-02 excavated material

Photo No. 16 TP-02; maximum depth

Photo No. 17 TP-02; base of excavation approximately 6 feet

Photo No. 18 TP-02; backfilled and restored

Photo No. 19 TP-03 location

Photo No. 20 TP-03; shallow sediments.

Photo No. 21 TP-03; excavated materials

Photo No. 22 TP-03; rock samples

Photo No. 23 TP-03; maximum depth approximately 8.5 feet

Photo No. 24 TP-03; backfilled and restored

Photo No. 25 TP-04 location

Photo No. 26 TP-04; shallow pit

Photo No. 27 TP-04; shallow sediments

Photo No. 28 TP-04; maximum depth approximately 10 feet

Photo No. 29 TP-04; excavated materials

Photo No. 30 TP-04; sample of sediments on “flagstone”

Photo No. 31 TP-04; backfilled and restored

Photo No. 32 TP-05 location

Photo No. 33 TP-05; shallow pit

Photo No. 34 TP-05; shallow sediments

Photo No. 35 TP-05; profile beneath rock pile

Photo No. 36 TP-05; profile beneath rock pile

Photo No. 37 TP-05; excavated materials: sediments

Photo No. 38 TP-05; excavated materials: fractured rock “blocks”

Photo No. 39 TP-05; backfilled and restored

Photo No. 40 TP-06 location

Photo No. 41 TP-06; shallow pit

Photo No. 42 TP-06; shallow sediments

Photo No. 43 TP-06; shallow sediments close-up

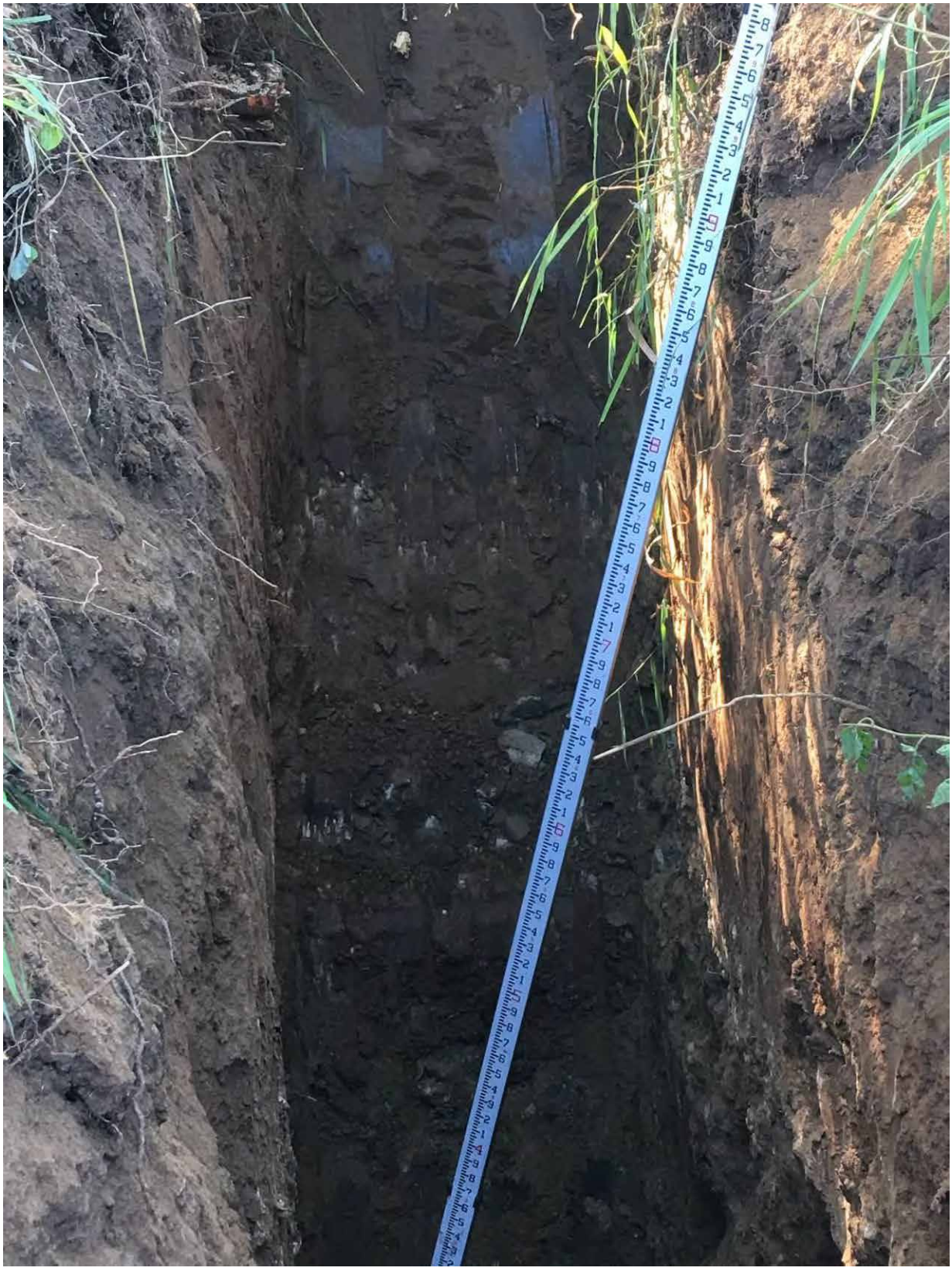

Photo No. 44 TP-06; maximum depth

Photo No. 45 TP-06; excavated materials: sediments

Photo No. 46 TP-06; backfilled and restored