

# GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND  
ENVIRONMENTAL CONSULTANTS

*A Practicing ASFE Member Firm*

April 29, 2009



Gredell & Associates  
725 Art Lane  
Newark, Delaware 19713

Attn: Mr. Gary W. Gredell, P.E.

Re: Subsurface Exploration  
***Granary at Turner's Creek Landing***  
Kent County, Maryland

Gentlemen:

In accordance with our agreement dated April 1, 2009, Geo-Technology Associates, Inc. (GTA) has reviewed published geological information, observed the existing site conditions, and performed a subsurface exploration at the referenced property. Our subsurface exploration consisted of drilling Standard Penetration Test (SPT) borings at three building corners and observing test pits excavated adjacent to the existing building. A summary of our observations and recommendations regarding temporary and permanent support of the existing structure for the restoration project are provided below.

## Site Description

The existing granary is located at the end of Turner's Creek Road in the Sassafras River Natural Resource Management Area, located in Kent County, Maryland as shown on the *Site Location Map, Figure 1*. Turner's Creek Landing consists of a wharf along Turner Creek, a tributary of the Sassafras River that is located north of the referenced site. The granary is situated on the southern end of the wharf. The wharf is surrounded by timber bulkheads along the perimeter. Access to the wharf is from the south, off of Turner's Creek Road. Access to Turner Creek is provided via a boat ramp along the western edge of the bulkhead or a small beach along the eastern side of the bulkhead. Pictures of the site, *Figures 2A and 2B*, are attached.

According to the USGS Topographic Quad for Galena (Maryland), the surface topography for the site vicinity is gently to steeply sloping toward the north into Turner Creek. Surface grades along the natural shoreline transition from about elevation (EL) 40 to approximately EL 5 in the vicinity of the existing granary. The water depth was up to 16 feet deep around the bulkhead; however, this will vary based on tidal fluctuations.

At the time our exploration was performed, the existing granary was vacant. GTA understands that the granary dates back to the pre-Civil War era and is considered a historic

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landmark. The granary was observed to be a two-story, timber-framed structure with a crawl space. A dry stacked rock foundation was observed along the interior of the southern wall and along a bisecting interior wall, extending east to west. A concrete foundation was observed from the interior of the crawl space under the north wall. It also appears that the sills had been replaced, and the walls had been shimmed in the past. The majority of the wood near the ground surface was observed to be damaged or decayed.

A sketch from Gredell & Associates, dated March 13, 2009, indicates that the existing granary is likely supported by timber beams that extend in the east to west direction. The timber beams appear to be supported by rubble masonry walls and rubble masonry piers spaced approximately 12 feet on-center.

### **Geologic Information**

According to the *Geological Map of Maryland, Kent County* (1968), prepared by the Maryland Geological Survey (MGS), the area is situated in the Coastal Plain Physiographic Province. The Coastal Plain is characterized by undifferentiated and inter layered sedimentary deposits derived from eroded and transported rock formations to the north and west. Specifically, the site is underlain by the Pleistocene Age Lowland Deposits Formation consisting of gravel, sand, silt and clay commonly containing glauconite, and varicolored silts and clays, usually dark brown to gray lignitic, silt, and clay. According to the referenced geologic map, the Lowland Deposits Formation is found at the ground surface to 150 feet thick in the site area.

According to the U.S. Department of Agriculture (USDA), Soil Conservation Service (SCS) Soil Survey of Kent County, Maryland (1982), the soils underlying the site are generally mapped as the Sassafras Series. The Sassafras Series soil is described as strong sloping deep well drained soils. Refer to the publications for more detailed information.

### **Subsurface Exploration**

The field exploration consisted of drilling Standard Penetration Test (SPT) borings at 3 locations, designated as B-1 through B-3, in the vicinity of the existing granary. The test borings were drilled April 13, 2009, to depths ranging from 25 to 30 feet below the existing ground surface using an ATV-mounted CME 550X drill rig, equipped with hollow stem augers and an automatic hammer. On April 16, 2009, GTA returned to the site to observe the exploration of supplemental test pits. Three test pits, designated TP-1 through TP-3, were excavated using a JCB 3CX backhoe. The test pits were excavated adjacent to the existing structure and extended approximately 6 feet below the ground surface. The boring and test pit locations were field selected by GTA, with the approximate locations indicated on the *Exploration Location Plan, Figure 3*. Elevations provided on the boring and test pit logs were interpolated from contours shown on the referenced USGS Topographic Quad and should be considered approximate.

Standard Penetration Testing was performed in the boreholes, with soil samples obtained continuously in the upper 10 feet and then at 5-foot intervals thereafter. Standard Penetration Testing involves driving a 2-inch O.D., 1<sup>3</sup>/<sub>8</sub>-inch I.D. split-spoon sampler with a 140-pound hammer free-falling 30 inches. The SPT N-value, given as blows per foot (bpf), is defined as the total number of blows required to drive the sampler from 6 to 18 inches.

Detailed descriptions of the encountered subsurface conditions are indicated on the individual boring and test pit logs, which are attached. The soil samples retrieved from the borings and test pits were brought to GTA's laboratory for visual classification by laboratory personnel. The soil descriptions indicated on the logs are based on visual observations of the individual soil samples. The classification system and graphic symbol legend, which accompany the exploration summary logs, are attached to this letter.

### **Subsurface Conditions**

The borings typically encountered 2 inches of asphalt at the ground surface. Underlying the asphalt, fill materials visually classified as silty sand, sandy silt, sandy lean clay, and clayey sand with varying percentages of gravel, brick, shells, and wood, were encountered to depths of 7 to 18 feet below the existing grades. Underlying the fill materials, natural soils, visually classified as silty sand, lean clay, clayey sand, and poorly-graded sand with silt, were encountered. A layer of organic soil and possibly a timber mat or grillage was generally encountered at the fill/natural soil interface. Refer to the boring and test pit logs for detailed information.

Uncorrected SPT N-values for the fill materials ranged from weight of hammer (WOH) to 68 blows per foot (bpf), indicating that the fill materials were highly variable. The higher N-values are likely due to obstructions in the fill and are not believed to be indicative of the actual in-situ consistency. The SPT N-values for the natural materials ranged from WOH to 12 bpf, indicating these soils are generally loose.

Groundwater was encountered at depths of 2½ to 4 below the ground surface. The holes were backfilled at the end of the day for safety considerations. The water levels are likely commensurate with the adjacent creek and will fluctuate several feet with the tide.

The test pits were excavated adjacent to the existing structure to observe the subsurface conditions and evaluate the type and depth of the existing footings for the building. Test Pits TP-1 and TP-3 encountered what appeared to be concrete deadmen for the bulkheads at approximately 12 inches below the existing grades. The concrete was observed to be approximately 3 feet below the existing grades. It appears that the north wall and portions of the east wall were resting on the concrete deadmen. Test Pit TP-2 was extended 4 feet below the existing grades and encountered fill materials throughout the excavation. No foundation wall or footing were observed in this location. Test Pit TP-3 encountered a rubble stone masonry

foundation wall that extended approximately 2 feet below the existing grades. Fill materials visually classified as silty sand with wood, shells, brick and gravel, were encountered to the termination depth in each of the test pits. The test pits were terminated at relatively shallow depths and backfilled immediately due to the sidewalls collapsing.

### **Conclusions and Recommendations**

Based on the existing grades, it appears that Turner's Creek Road, where it approaches the granary and wharf, was excavated or dredged, and the spoils were used as fill materials behind the bulkhead. Based on our borings, up to 18 feet of fill were placed to achieve the present grades behind the bulkhead. During our exploration, wood and organic soils were observed at or near the fill/natural soil interface. Typical construction practices on or near water during this era were to place timber grillages for stabilization before placing fill. It appears that this construction method was used based on the amount of wood encountered.

Currently, it is assumed that the granary framing is supported along Wall Lines A, B, C, D, and E, as shown on the sketch provided by Gredell & Associates. The foundation appears to be rubble stone masonry walls and piers under most of the wall lines, with the exception of Wall Line A. The framing appears to rest on the concrete deadman in this area. Also, a concrete deadman appears to be adjacent or under Wall Line 4.

We understand that in order to restore the granary building, temporary shoring of the existing structure will be performed until funding is available for new permanent foundations. The temporary shoring can consist of cribbing or cast in place pier footings that will support needle beams along the primary columns lines. The temporary cribbing or pier foundations should be designed for a maximum net bearing pressure of 2,000 pounds per square foot (psf) and preferably less than 1,000 psf. Minimum equivalent loaded areas of the cribbing or footings should be at least 30 inches by 30 inches if the size based on a 2,000 psf bearing pressure is smaller. Relatively quick settlement of the cribbing/footings is anticipated given the subsurface conditions and relatively light loading; however, we recommend that an initial re-leveling of the structure be performed if necessary within the first few weeks. This can typically be done using jacks and/or shims at each pick point. Care should be given to not overload the bulkhead during the temporary shoring work. Therefore, GTA recommends that the temporary cribbing/footings not be placed within 4 feet of the bulkheads and heavy equipment should not operate directly adjacent to the bulkheads.

Permanent foundation support can be provided by deep foundations or new shallow foundations. Deep foundations consisting of helical piers or driven timber piles are generally considered feasible for support of the structure. Given the magnitude of the point loads at the end of each column line a single pile could carry the vertical load but additional piles could be necessary for lateral stability. The existing deadmen and any buried tie-rods could potentially impact the pile locations and we recommend that the top 3 to 4 feet be hand cleared prior to

installing piles to look for potential obstructions. Deep foundations are expected to be cost prohibitive and will not be discussed in further detail.

Since the new loads will be less than the past loads, constructing new footings along the existing footing alignments would be the best choice for controlling settlement. However, this may be difficult to construct. As an alternate that will potentially be subject to more total and differential settlement, new footings can be constructed around the perimeter. Due to the variability of the fill materials, GTA recommends that the footings be designed similar to grade beam construction (top and bottom reinforcing steel) to better distribute the loads and control differential settlement. The grade beams should be designed for a maximum net allowable bearing pressure of 1,000 psf. The bottom of the grade beams should be founded a minimum of 24 inches below the exterior finished grade for frost protection. It may be necessary to design portions of the foundations/framing to cantilever where the existing deadmen and proposed grade beams conflict. Depending on the design depth and tide level at the time the excavations are performed, water could be encountered. Temporary dewatering and placement of a crushed stone working mat may be required to control water during construction of the new foundations.

### **Limitations**

This report, including all supporting, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this Project have been prepared for the exclusive use of Gredell & Associates pursuant to the agreement between GTA and Gredell & Associates and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Gredell & Associates is unauthorized and such use is at the sole risk of the user.

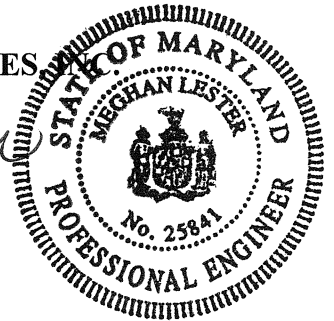
The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. The borings and test pits indicate soil conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between borings and test pit locations. If variations of subsurface conditions from those described in this report are noted, recommendations in this report may need to be re-evaluated. Geo-Technology Associates, Inc. is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

We appreciate the opportunity to be of assistance on this project. Please contact our office at (302) 326-2100 if you have any questions or require additional information.

Sincerely,  
**GEO-TECHNOLOGY ASSOCIATES**

*Meghan Lester*

Meghan Lester, P.E.  
Associate

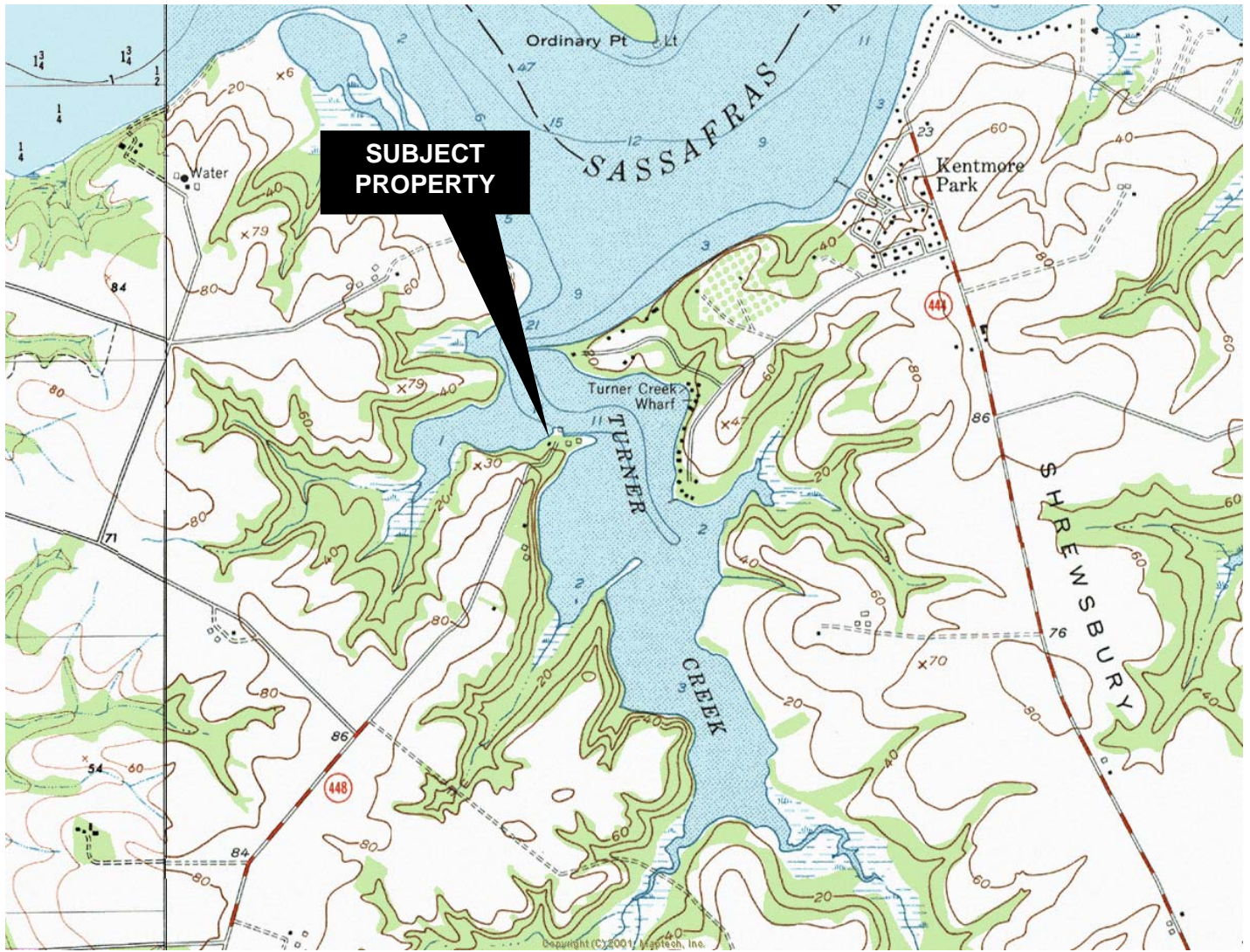


*Christopher M. Reith*  
Christopher M. Reith, P.E.  
Principal

EW/ML/CMR/mlm  
090207

Attachments:

- Site Location Map (Figure 1)
- Site Pictures (Figure 2A and 2B)
- Exploration Location Plan (Figure 3)
- Notes for Exploration Logs
- Boring Logs (B-1 through B-3)
- Test Pit Logs (TP-1 through TP-3)



**Notes:**

- 1) Base map obtained from MAPTECH Inc. Terrain Navigator 2001, from Galena (Maryland) Quadrangle, USGS 7.5-Minute Series (Topographic), created 1974.



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SITE LOCATION MAP

**GRANARY AT TURNER'S  
 CREEK LANDING**

KENT COUNTY, MARYLAND

SCALE  
 1 in. = 1,000 ft.

DATE  
 APRIL 2009

DRAWN BY  
 MAPTECH

REVIEW BY  
 CMR

JOB NO.  
 090207

FIGURE NO.  
 1



Above: Southwestern view of granary  
 Below: Southern view of granary



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SITE PHOTOGRAPHS

**GRANARY AT TURNER'S  
 CREEK LANDING**

KENT COUNTY, MARYLAND

SCALE

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DATE

APRIL 2009

DRAWN BY

---

REVIEW BY

CMR

JOB NO.

090207

FIGURE NO.

2A





Above: North wall of granary  
 Below: South wall of granary



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SITE PHOTOGRAPHS

**GRANARY AT TURNER'S  
 CREEK LANDING**

KENT COUNTY, MARYLAND

SCALE

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DATE

APRIL 2009

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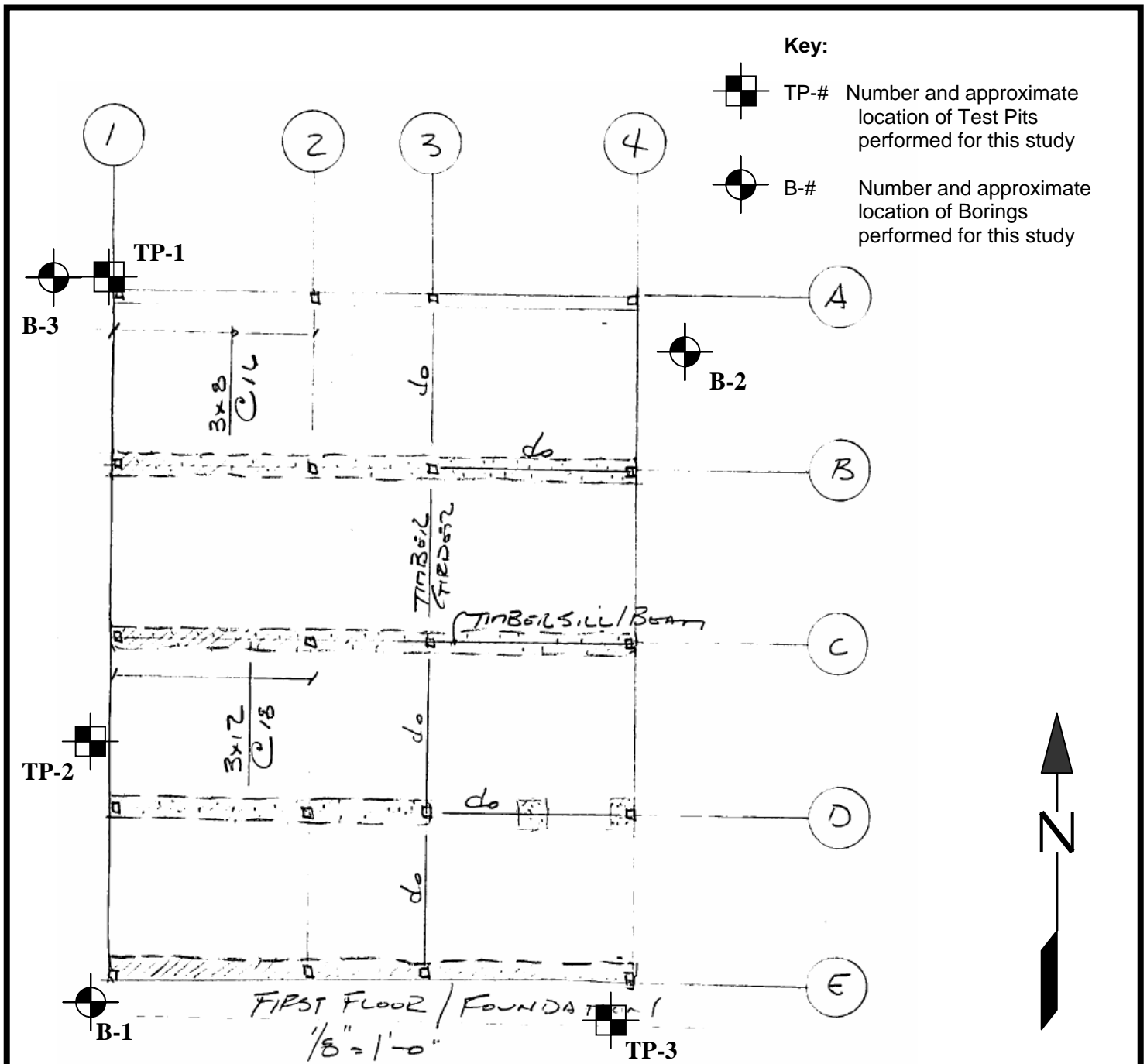
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FIGURE NO.














2B



	<p>GEO-TECHNOLOGY ASSOCIATES, INC.  <i>Geotechnical and Environmental Consultants</i>        18 Boulden Circle, Suite 36        New Castle, Delaware 19720        (302) 326-2100        Fax (302) 326-2399</p>	<p>EXPLORATION LOCATION PLAN</p>			
<p><b>GRANARY AT TURNER'S        CREEK LANDING</b></p>		<p>KENT COUNTY, MARYLAND</p>			
<p>SCALE        NTS</p>	<p>DATE        APRIL 2009</p>	<p>DRAWN BY        Gredell &amp; Associates</p>	<p>REVIEW BY        CMR</p>	<p>JOB NO.        090207</p>	<p>FIGURE:        3</p>

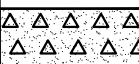

# NOTES FOR EXPLORATION LOGS

## KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS	
			GRAPHIC	LETTER
COARSE - GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		GW
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		GP
	SAND AND SANDY SOILS	CLEAN SANDS (LESS THAN 5% PASSING THE NO. 200 SIEVE)		SW
				SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		SM
				SC
FINE - GRAINED SOILS	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		ML
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CL
		SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OL
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50	SILT OR CLAY (<15% RETAINED THE NO. 200 SIEVE)		MH
		SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED THE NO. 200 SIEVE)		CH
		SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED THE NO. 200 SIEVE)		OH
HIGHLY ORGANIC SOILS				PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS CONTAINING AN ESTIMATED 10% FINES BY VISUAL CLASSIFICATION OR WHEN THE SOIL HAS BETWEEN 5 AND 12 PERCENT FINES FROM LABORATORY TESTS; AND FOR FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSSHATCHED AREA. RESULTS OF LABORATORY TESTING ARE USED TO SUPPLEMENT THE CLASSIFICATION OF THE SOILS BASED ON THE VISUAL-MANUAL PROCEDURES OF ASTM D2488.

## ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

ADDITIONAL DESIGNATION	DESCRIPTION		GRAPHIC SYMBOLS
	TOPSOIL		
	MAN-MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATION	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" PENETRATION, AUGER PENETRABLE	

### COARSE-GRAINED SOILS (GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D1586

### FINE-GRAINED SOILS (SILT AND CLAY)




CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:  
WOH = WEIGHT OF HAMMER  
WOR = WEIGHT OF ROD(S)

### SAMPLE TYPE

DESIGNATION	SYMBOL
SPLIT-SPOON	S-
SHELBY TUBE	U-
ROCK CORE	R-

### WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	
UPON COMPLETION OF DRILLING	
24 HOURS AFTER COMPLETION	

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

# LOG OF BORING NO. B-1

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT NO: **090207**  
 PROJECT LOCATION: **Kent County, Maryland**

WATER DEPTH (ft):  $\nabla$  **4.1**  $\nabla$  **4.0**  $\nabla$  \_\_\_\_\_  
 DATE: **4/13/09** **4/13/09** \_\_\_\_\_  
 CAVED (ft): **In Auger** **6.0** \_\_\_\_\_

DATE STARTED: **April 13, 2009**  
 DATE COMPLETED: **April 13, 2009**  
 DRILLING CONTRACTOR: **GTA**  
 DRILLER: **Doug Turner**  
 DRILLING METHOD: **Hollow Stem Auger/Mud Rotary**  
 SAMPLING METHOD: **Split Spoon**

GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 EQUIPMENT: **CME55 ATV**  
 LOGGED BY: **D. Zmijewski**  
 CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	SAMPLE BLOWS/6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
S-1	0.0	13	2-7-10-7	17	5.0 4.8	0			Asphalt: +/- 2 inches		
									Brown, moist, medium dense, silty sand FILL, trace gravel		
S-2	2.0	20	5-4-1-7	5	2.0				Same, moist to wet, loose		
S-3	4.0	0	1-1-1-1	2		5			Brown and black, wet, medium stiff, sandy lean clay FILL, trace organic matter		
									No recovery - gravel and wood in spoon		
S-4	6.0	16	5-16-14-7	30	-1.0 -2.0				Brown, wet, medium dense, clayey sand FILL with organic matter and wood		
							SM		Orange, wet, loose, Silty SAND with gravel		
S-5	8.0	10	2-2-5-4	7		10					
S-6	13.0	12	2-2-2-2	4		15			Orange, wet, very loose, Silty SAND		
S-7	18.0	5	1-2-1/12 in.	3		20			Same, tan and orange		
S-8	23.0	14	6-6-6-6	12		25			Same, orange and gray, mottled, medium dense, trace gravel		
S-9	28.0	18	3-3-4-4	7	-23.0 -25.0	30		SC	Orange, wet, loose, Clayey SAND		
									Boring terminated at 30.0 feet.		

NOTES:

LOBG\_090207.GPJ 4/29/09



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 New Castle, Delaware 19720

**LOG OF BORING NO. B-1**

# LOG OF BORING NO. B-2

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT NO: **090207**  
 PROJECT LOCATION: **Kent County, Maryland**

WATER DEPTH (ft):  $\nabla$  **3.0**  $\nabla$  **2.0**  $\nabla$  \_\_\_\_\_  
 DATE: **4/13/09** **4/13/09** \_\_\_\_\_  
 CAVED (ft): **In Auger** **4.0** \_\_\_\_\_

DATE STARTED: **April 13, 2009**  
 DATE COMPLETED: **April 13, 2009**  
 DRILLING CONTRACTOR: **GTA**  
 DRILLER: **Doug Turner**  
 DRILLING METHOD: **Hollow Stem Auger/Mud Rotary**  
 SAMPLING METHOD: **Split Spoon**

GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 EQUIPMENT: **CME55 ATV**  
 LOGGED BY: **D. Zmijewski**  
 CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	SAMPLE BLOWS/6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	8	5-2-1-1	3	5.0 4.8	0	[Cross-hatch symbol]	Asphalt: +/- 2 inches Orange-brown, wet, very loose, silty sand FILL with gravel	▼ ▼
S-2	2.0	10	1-1-3-9	4			[Cross-hatch symbol]	Same, contains shell fragments	
S-3	4.0	5	3-10-6-3	16	1.0	5	[Cross-hatch symbol]	Brown, wet, medium dense, gravel with sand FILL, contains shell fragments	
S-4	6.0	10	1-18-50-7	68	-1.0		[Cross-hatch symbol]	Dark gray, wet, very dense, clayey sand FILL, contains wood	
S-5	8.0	4	1-4-12-7	16	-3.0		[Cross-hatch symbol]	Dark gray, wet, medium dense, silty sand FILL, contains gravel	
					-8.0	10	[Cross-hatch symbol]		
S-6	13.0	15	WOH/24 in.			15	[Horizontal line symbol]	Black and dark gray, wet, very soft, sandy, organic SILT	
					-13.0		[Horizontal line symbol]		
S-7	18.0	5	4-1-6-13	7		20	[Dotted symbol]	Orange, wet, loose, Poorly-graded SAND with Silt and gravel	
					-18.0		[Dotted symbol]		
S-8	23.0	5	4-5-4-4	9	-19.0		[Diagonal line symbol]	Brown and gray, soft, Sandy Lean CLAY	
					-20.0	25	[Diagonal line symbol]	Brown, wet, loose, Clayey SAND	
								Boring terminated at 25.0 feet.	

NOTES:

LOBG\_090207.GPJ 4/29/09



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 New Castle, Delaware 19720

**LOG OF BORING NO. B-2**

# LOG OF BORING NO. B-3

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT NO: **090207**  
 PROJECT LOCATION: **Kent County, Maryland**

WATER DEPTH (ft):  $\nabla$  2.5  $\nabla$  2.5  $\nabla$  \_\_\_\_\_  
 DATE: 4/13/09 4/13/09 \_\_\_\_\_  
 CAVED (ft): In Auger 4.0 \_\_\_\_\_

DATE STARTED: **April 13, 2009**  
 DATE COMPLETED: **April 13, 2009**  
 DRILLING CONTRACTOR: **GTA**  
 DRILLER: **Doug Turner**  
 DRILLING METHOD: **Hollow Stem Auger/Mud Rotary**  
 SAMPLING METHOD: **Split Spoon**

GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 EQUIPMENT: **CME55 ATV**  
 LOGGED BY: **D. Zmijewski**  
 CHECKED BY: **C. Reith**

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	SAMPLE BLOWS/6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
S-1	0.0	17	6-5-10-6	15	5.0 4.8	0			Asphalt: +/- 2 inches	
S-2	2.0	6	4-4-3-2	7				Brown, wet, medium dense, silty sand FILL, contains shell fragments and wood	$\nabla$	
S-3	4.0	7	1-1-1-3	2		5		Same, loose		
S-4	6.0	14	WOH-1-2-2	3				Same, very loose		
S-5	8.0	7	50-50/1 in.					Same, dark gray, trace organic matter		
S-6	10.0	0	12-2-2-5	4		10		Same		
S-7	12.0	6	4-3-1-2	4	-7.0			No recovery		
S-8	14.0	0	5-2-2-2	4		15		Black, wet, soft, sandy silt FILL, contains wood and gravel		
S-9	16.0	14	2-1-1/12 in.	2	-11.0			No recovery		
S-10	18.0	8	1-1-1-1	2	-13.0		SM	Black and dark gray, wet, very loose, silty sand FILL, trace organic matter		
						20		Black, wet, very loose, Silty SAND, contains organic matter		
S-11	23.0	19	1-1-2-2	3	-18.0		SC	Orange, wet, loose, Clayey SAND		
					-20.0	25		Boring terminated at 25.0 feet.		

NOTES:

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 18 Boulden Circle, Suite 36  
 New Castle, Delaware 19720

**LOG OF BORING NO. B-3**



# LOG OF TEST PIT NO. TP-1

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT LOCATION: **Kent County, Maryland**  
 CLIENT: **Gredell & Associates**

PROJECT NO: **090207**

DATE STARTED: **April 16, 2009**  
 DATE COMPLETED: **April 16, 2009**  
 CONTRACTOR: **Kent County**  
 EQUIPMENT: **JCB 3CX**

GROUNDWATER UPON COMPLETION: **Dry**  
 GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 LOGGED BY: **E. Williams**  
 CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL		
				DESCRIPTION	REMARKS
5.0	0			Asphalt +/- 2 inches	
4.8				Tan, moist, silty sand FILL	
4.0				Test pit terminated at 12 inches.	Concrete deadman encountered

NOTES:

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**LOG OF TEST PIT NO. TP-1**


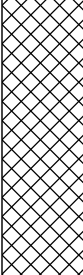
# LOG OF TEST PIT NO. TP-2

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT LOCATION: **Kent County, Maryland**  
 CLIENT: **Gredell & Associates**

PROJECT NO: **090207**

DATE STARTED: **April 16, 2009**  
 DATE COMPLETED: **April 16, 2009**  
 CONTRACTOR: **Kent County**  
 EQUIPMENT: **JCB 3CX**

GROUNDWATER UPON COMPLETION: **Dry**  
 GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 LOGGED BY: **E. Williams**  
 CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
5.0	0			Asphalt +/- 2 inches	
4.8				Tan, moist, silty sand FILL, contains brick, wood, and shells	
1.0				Test pit terminated at 4 feet.	

NOTES:

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**LOG OF TEST PIT NO. TP-2**




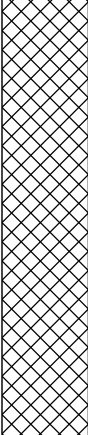
# LOG OF TEST PIT NO. TP-3

PROJECT: **Granary at Turner's Creek Landing**  
 PROJECT LOCATION: **Kent County, Maryland**  
 CLIENT: **Gredell & Associates**

PROJECT NO: **090207**

DATE STARTED: **April 16, 2009**  
 DATE COMPLETED: **April 16, 2009**  
 CONTRACTOR: **Kent County**  
 EQUIPMENT: **JCB 3CX**

GROUNDWATER UPON COMPLETION: **Dry**  
 GROUND SURFACE ELEVATION: **5.0**  
 DATUM: **USGS**  
 LOGGED BY: **E. Williams**  
 CHECKED BY: **C. Reith**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
-5.0	0			Asphalt +/- 2 inches	
-4.8				Tan, moist to wet, silty sand FILL, contains brick, concrete, wood, and shells	Top of concrete deadman encountered at 12 inches Bottom of stone foundation observed at 24 inches Bottom of concrete deadman at 48 inches
-1.0	5			Test pit terminated at 6 feet.	

NOTES:

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**LOG OF TEST PIT NO. TP-3**