H. C. NUTTING

A Terracon COMPANY

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March 16, 2009

Project: N1095043

Mr. John Dietz
Linden Grove Cemetery Board of Overseers
303 Court Street
Covington, Kentucky 41011

RE: Preliminary Test Pit Study
Linden Grove Cemetery Renovations
Covington, Kentucky

Dear Mr. Dietz:

We are pleased to present the results of our preliminary test pit study for the proposed improvements at the Linden Grove Cemetery in Covington, Kentucky. This study was conducted in general accordance with our proposal dated February 17, 2009. The following sections describe the test pit excavations, encountered subsurface materials, and geotechnical engineering recommendations. A Test Pit Location Plan (Figure 1) is attached.

PROJECT DESCRIPTION

The site is located immediately south of West 13th Street between Kavanaugh Street and Holman Street in Covington, Kentucky as shown on Figure 1. The subject area is the location of a former lake which was backfilled with uncontrolled materials several decades ago. This area is currently a low-lying grass covered field; however, the approximate outline of the former lake footprint is still visible. We understand that several improvements are planned in this area, including undercutting the fill on the west side of the former lake to re-establish that portion of the lake. The proposed improvements also include additional fill placement on the eastern side of the former lake. We understand that consideration is being given to utilizing this eastern area for additional grave sites, a picnic area, or a shelter building; however, a detailed grading plan and finalized plans have not been developed.

ENCOUNTERED SUBSURFACE CONDITIONS

Six test pits were excavated on February 25, 2009 at the approximate locations shown on Figure 1. These test pits were excavated using a backhoe provided by Kenton County. The test pit logs are attached in the appendix of this report. Select soil samples were returned to our Soil Mechanics Laboratory for natural moisture content determination.

The primary purpose of the test pits was to evaluate the thickness and consistency of the existing uncontrolled fill soil. At the test pit locations, the fill thickness ranged from 5.5 ft. to 11 ft. except at test pit TP-2 which was terminated at the maximum reach of the backhoe at 16 ft. below existing grade and did not penetrate the fill soil. The existing fill soils were primarily cohesive soil described as brown to gray lean to sandy clay with rock, brick, and concrete fragments, glass, wood, and various debris materials. The existing fill soil was typically soft and appeared to be poorly compacted. One sample of cohesive fill soil had a tested natural moisture content of 23%.

Underlying the existing fill soils, the test pits typically encountered a layer of alluvium underlain by lakebed clay. The alluvium was described as silty clay to clayey sand with organics. The cohesive alluvium was very soft to soft with pocket penetrometer readings ranging from less than 0.25 tsf to 0.5 tsf. One sample of the alluvium had a tested natural moisture content of 31%. The lakebed clay was described as brown to gray clay to fat clay. The lakebed clay consistency ranged from very soft to very stiff with pocket penetrometer readings less than 0.25 tsf to greater than 4.0 tsf. The lakebed clay had a tested natural moisture content of 21% to 28%.

Groundwater seepage was encountered in all of the test pits except for TP-2. Shallow groundwater (4 ft. to 4.5 ft. below grade) was encountered in TP-1 and TP-6 in areas which reportedly stay wet year-round. Test pits TP-3 to TP-5 encountered groundwater seepage at depths of 13 ft. to 15 ft. below grade.

CONCLUSIONS AND RECOMMENDATIONS

The site will be challenging to develop due to the presence of deep, compressible soils and localized high groundwater levels. Detailed grading plans and proposed structure locations

must be developed to provide specific geotechnical recommendations. Depending upon the depth of the proposed lake on the west side of the subject area, the excavation will encounter a variety of existing fill materials and wet conditions which will make excavation difficult. Much of the undercut material is expected to be suitable for re-use as structural fill; however, some sorting to remove deleterious materials and significant aeration and drying will be required prior to placement as structural fill.

For the proposed area of fill placement on the eastern side of the former lake, it will be difficult to establish a firm platform to begin earthwork and significant long-term settlement of the fill (and any structures placed on the fill) should be expected. Construction techniques such as pre-loading (surcharging) and partial undercut and replacement of existing soils should be considered to reduce the settlement and minimize its impact on the proposed structures. Chemical stabilization or the use of geosynthetics may be required to establish a stable platform prior to fill placement. Additional details on the proposed fill thicknesses and structure types, loads, and locations must be provided to develop more specific recommendations for this area. The following, preliminary recommendations are provided for planning purposes only and should be re-evaluated once the final plans are developed.

For preliminary planning purposes, we anticipate that less than 5 ft. of fill will be required to establish finished grades on the eastern side of the former lake and that proposed structures will include grave sites, a picnic area, and/or a lightly loaded wooden pavilion/shelter. Initial site preparation should include stripping the existing topsoil in areas of proposed fill placement. After the topsoil is stripped, structural fill can be placed to establish finished grades. The structural fill material should be free of organics, topsoil, debris, or other deleterious substances. We recommend that all structural fill be placed in maximum 8 inch thick loose lifts and be compacted to 98% of the maximum standard proctor density (ASTM D 698). It is recommended that the moisture content of cohesive fill soils be adjusted to within ±3% of the optimum moisture content.

The fill placement will induce settlement in the compressible existing fill, alluvium, and lakebed clay. The magnitude and duration of the fill induced settlement will depend on the thickness and footprint of the new fill. Additional settlement will also be induced if structures are placed on the new fill. To minimize the long-term settlement induced by the new fill and structures, consideration should be given to pre-loading (surcharging) the new fill. Temporarily stockpiling several feet of additional fill above the proposed grades can induce much of this settlement

prior to building the structures. The size of the temporary stockpile and duration of the surcharge period will depend on many variables including: thickness and footprint of the new fill, proposed structures and settlement tolerances, availability of surcharge materials, and construction schedule. For preliminary planning purposes, we anticipate a surcharge thickness on the order of 8 ft. high would be required for a minimum 4 month period. Again, these estimates must be re-evaluated once final details are available.

We appreciate this opportunity to provide our professional services. Please contact the writer if you have any questions about this preliminary report. We request the opportunity to review final grading plans and provide continued input as the project develops.

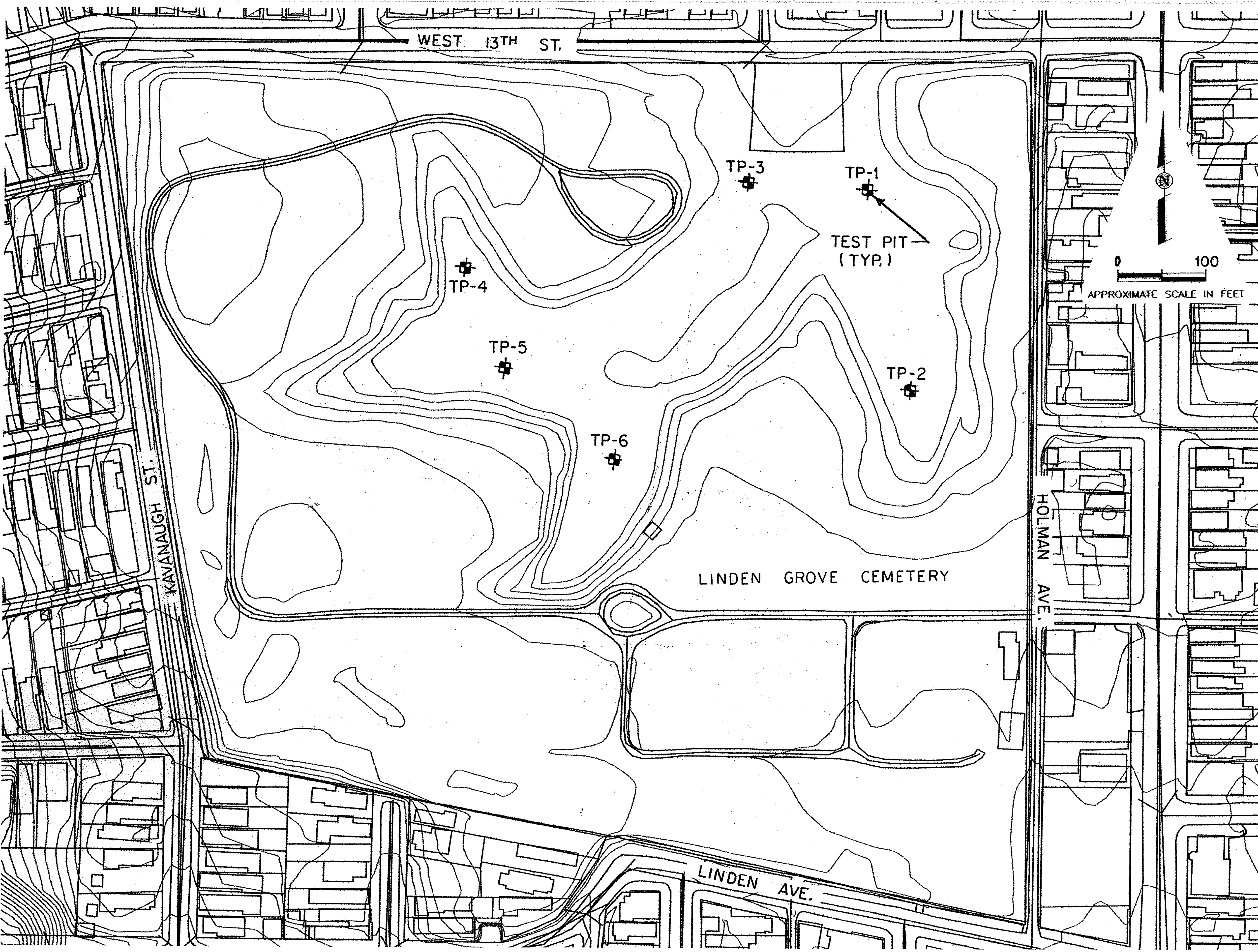
Respectfully submitted,
H. C. NUTTING COMPANY

Ron S. Lech, P.E.
Principal- Engineering

Swaminathan Srinivasan
NCD

Swaminathan Srinivasan, P.E.
Senior Principal- Chief Engineer

Attachments: Figure 1 – Test Pit Location Plan.
Test Pit Logs.



TEST PIT LOCATION PLAN

CLIENT: LINDEN GROVE CEMETERY
BOARD OF OVERSEERS

JOB: LINDEN GROVE CEMETERY
COVINGTON, KY.

H. C. NUTTING
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Consulting Engineers and Scientists
611 LUNKEN PARK DRIVE CINCINNATI, OHIO 45226
PH. (513) 321-5816 FAX (513) 321-4540

Project Mngr: RL	Project: NI095043
Drawn By:	Scale: 1" = 100'
Checked By:	File No.
Approved By: RL	Date: MARCH 2009

FIG. No. 1

LOG OF TEST PIT NO. TP-1

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL											
	Brown to brown and gray lean clay (FILL) with rock and brick fragments, moist-soft to stiff											
	4.5 ▼											
	Brown and gray sandy clay with rock, brick, cinders, wood, glass, metal, and concrete (FILL), wet-soft	5										
	7.5											
	Dark gray SILTY CLAY (ALLUVIUM), trace organics, very moist-very soft		1	Jar	7.5 - 8			31				<0.25
	11	10										
	Dark gray to bluish-gray CLAY (LAKEBED), very moist to wet-very soft		2	Jar	11 - 12							<0.25
	16	15										
	TEST PIT TERMINATED AT 16 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 4.5 Immed.	▼ 4.5	Comp.
WL	▼ BF at 0 hrs.	▼	
WL	No water used in drilling.		

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BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

BOREHOLE 99 TEST PIT LOGS.GPJ TERRACON 20080217.GDT 3/13/09

LOG OF TEST PIT NO. TP-2

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL Dark brown to brown sandy clay, with few to little concrete, brick, and block fragments, trace wood, metal, and plastic (FILL), moist-stiff to very stiff		1	Jar	2 - 2.5							1.5-2.25
	4 -concrete fragment measured is 5' x 2' x 10"											
	Dark brown to gray silty to sandy clay with brick and wood, trace metal (FILL), very moist-very soft to medium stiff	5	2	Jar	4.5 - 5							<0.25
		10	3	Jar	12 - 13			23				0.5
	16	15										
	TEST PIT TERMINATED AT 16 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ NW Immed.	▼ NW	Comp.
WL	▼ BF at 0 hrs.	▼	
WL	No water used in drilling.		

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BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

LOG OF TEST PIT NO. TP-3

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL											
	Brown lean clay with concrete and brick fragments (FILL), moist-stiff to very stiff		1	Jar	1.5 - 2.5							2.0
		5										
	7.5		2	Jar	7 - 7.5							2.5
	Brown and bluish-gray clay (FILL), moist-very stiff		3	Jar	8 - 9							
	11	10										
	Olive-gray SILTY CLAY, trace organics (ALLUVIUM), moist-soft		4	Jar	11 - 12							0.5
			5	Jar	13 - 14							0.25
	15 ▼	15										
	Brown to olive-brown LEAN CLAY, trace rock fragments (LAKEBED), moist-very stiff		6	Jar	15.5 - 16			21				4.0
	16.5 TEST PIT TERMINATED AT 16.5 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 15 Immed.	▼ 15	Comp.
WL	▼ BF at 0 hrs.	▼	
WL	No water used in drilling.		

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BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

LOG OF TEST PIT NO. TP-4

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL											
	Brown lean clay with black cinders, brick and rock fragments, trace clay tile (FILL), moist-stiff											
	6	5										
	Olive-brown SILTY CLAY (ALLUVIUM), moist-soft		1	Jar	6 - 6.5							0.25
	9											
	Brown to mottled brown and gray LEAN CLAY (LAKEBED), trace iron concretions, moist-medium stiff to stiff	10	2	Jar	9 - 9.5							0.5-1.25
	14											
	Brown and gray FAT CLAY (LAKEBED), moist-stiff to very stiff ▼	15	3	Jar	14.5 - 15			28				1.5-3.(
	16.5		4	Jar	16 - 16.5							3.0
	TEST PIT TERMINATED AT 16.5 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 15 Immed.	▼ 15	Comp.
WL	▼ BF at 0 hrs.	▼	
WL	No water used in drilling.		

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BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

LOG OF TEST PIT NO. TP-5

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL											
	Dark brown lean clay with sand, little brick and rock fragments (FILL), moist-soft											
	3.5											
	Brown and olive-gray lean clay, few brick fragments, trace wood (FILL), moist-medium stiff		1	Jar	4 - 4.5							0.5-0.75
	5.5	5										
	Olive-brown SILTY CLAY (ALLUVIUM), noted dark brown to black silt seam, moist-soft		2	Jar	6.5 - 7							0.25
	11	10										
	Brown CLAYEY SAND to brown fine SAND (ALLUVIUM), moist to wet-medium dense		3	Jar	11 - 11.5							1.0
	14 -wet seam at 13 ft.		4	Jar	13 - 13.5							
	15 Brown and gray CLAY (LAKEBED), moist-very stiff to hard	15	5	Jar	14 - 15							>4.0
	TEST PIT TERMINATED AT 15 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 13 Immed.	▼ 13	Comp.
WL	▼ BF at 0 hrs.	▼	
WL	No water used in drilling.		

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BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

LOG OF TEST PIT NO. TP-6

CLIENT
Linden Grove Cemetery Board of Overseers

ELEVATION REFERENCE

SITE
Covington, Kentucky

PROJECT
Linden Grove Cemetery

Boring Location: As Shown on Test Pit Location Plan

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES DEPTH, ft.	SAMPLES RECOV, in./(RQD %)	SAMPLES BLOWS / 6in. (SPT - N)	TESTS WATER CONTENT, %	TESTS LIQUID LIMIT, %	TESTS PLASTICITY INDEX, %	TESTS UNCONFINED STRENGTH, tsf	TESTS POCKET PEN, tsf
	Approx. Surface Elev.:											
	0.5 TOPSOIL											
	Brown sandy lean clay, trace brick, block, concrete, metal, plastic, and textiles (FILL), moist-soft to medium stiff											
	4 ▼											
	Gray clay, trace brick, rock fragments and cinders (FILL), wet-soft to very soft	5	1	Jar	6 - 6.5							<0.25-0.25
	10	10										
	Olive brown to gray SILTY CLAY (ALLUVIUM), noted dark brown to black silt seam, moist-soft to very soft		2	Jar	11 - 12							<0.25-0.25
	14											
	TEST PIT TERMINATED AT 14 ft											

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 4	Immed.	▼ 4	Comp.
WL	▽	BF at 0 hrs.	▼	
WL	No water used in drilling.			

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A Terracon COMPANY

BORING STARTED	2-25-09		
BORING COMPLETED	2-25-09		
RIG	Deere 310J	FOREMAN	RSL
LOGGED	JLW	JOB #	N1095043

BOREHOLE 99 TEST PIT LOGS.GPJ TERRACON 20080217.GDT 3/13/09