Permit No.	Date	Document ID No.
96-06	**May 03, 2013**	**18894**

Sent by an e-mail
Date: **May 3, 2013**
Solid Waste Section
Raleigh Central Office

From: Chao, Ming-tai
To: "Wayne Sullivan"
Cc: Mussler, Ed; "Tim.Rogers@waynegov.com" (Tim.Rogers@waynegov.com)
Subject: RE: Wayne Co. PTO
Date: Friday, May 03, 2013 11:46:00 AM
Attachments: Pages from 12564.pdf

Wayne:

After reviewing the response letter dated 05/02/2013 and prepared by ECS Carolina, LLP, I have to inform you that the response to the DWM Comment No. 19 (Doc ID 17328) is not acceptable. The 05/02/13 letter said that " It appears the 18.26 degrees referred in the email from Mr. Chao corresponds to a 3H:1V slope and that is what ECS **had used in our slope stability analyses presented in the Report No. 06:16642-A dated November 5, 2010 (the Report)**". I quickly reviewed the Report again and couldn't locate the 18.26 angle anywhere in the Report. On page 187 (Appendix B of the report) I found out the engineering parameters used in the slope stability analyses (I attach the report for your reference); the friction angle used in the analyses is 26 degree for HDPE Liner, LLDPE Liner & Drainage Net (Figure E12 of the approved permit application) which is consistent with the specified angle stated in Section 4.2 (on Page 237) of the approved CQA Plan & Technical Specifications (Doc ID 14016).

The Wayne County MSWLF – Phases 1 & 2 has the approved gross capacity of 1,785,711 cubic yards which stated in the current permit issued 06/13/2011 (Doc ID 13553). According to the 2012 annual report (as of June 2012) the landfill contained in-place wastes of 1,842,541 cubic yards, and the landfill is overfilled 568,300 cubic yards and increasing daily. The new Phase 3, although it has been completely constructed since September 2012, can't be used for waste disposal because the CQA Report can't be approved resulting from the DWM comments initially issued on 10/03/2012 can't be properly addressed & responded.

I don't have position to give you any business advice; but I would like to advise you to provide the Solid Waste Section a reasonable schedule of completing the CQA Report, which meets the NC Solid Waste Management Rule (Section 1600) and the approved CQA Plan and Technical Specifications (Doc ID 14016) within 10 business day (no later than 05/17/2013); Otherwise, the Permit Branch might consider to issue a deny letter for operating the Phase 3 of Wayne County MSW landfill.

If you like to discuss this matter in a meeting, I would like to suggest you invite all related parties and send me several potential meeting times/dates next week, so I can arrange/finalize meeting date and reserve meeting room in the Green Square Building.

Best regards,

Ming-Tai Chao, P.E.
Environmental Engineer
Permitting Branch, Solid Waste Section
Division of Waste Management

ECS CAROLINAS, LLP
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities NC Registered Engineering Firm F-1078

November 5, 2010

Mr. Wayne Sullivan
Municipal Engineering Services Co. PA
PO Box 97
Garner, NC 27529

RE: Report of Geotechnical Services
Wayne County Landfill, Phase 3
460 S. Landfill Road
Dudley, North Carolina
ECS Project No. 06:16642-A

Dear Mr. Sullivan:

ECS Carolinas, LLP (ECS) has completed the revised geotechnical analysis for the proposed Phase 3 of the Wayne County Landfill as requested by Municipal Engineering Services Company, PA (MESCO). ECS previously analyzed the proposed project and presented our findings in a report dated October 8, 2009 under ECS Project No. 16642. The revised analysis includes a change in the liner modeling in the slope stability analysis to better represent the planned system and an increase in the final slope to 3 horizontal to 1 vertical.

Project Information

The Wayne County Landfill is located at 460 South Landfill Road in Dudley, North Carolina. Based on information and the facility plan dated April 27, 2009 for the landfill prepared and provided by MESCO, the proposed approximately 20-acre Phase 3 of the landfill will be located north-northeast of and adjacent to the existing Phases 1 and 2. Based on the information provided to us, two possible liner systems are being considered. The first system is a standard systeme consisting of a 2 foot thick conventional clay liner overlain by a 60 mil thick HDPE flexible membrane liner (FML), a 250 mil thick drainage net, and a 3 foot thick layer of protective cover soil. The second system consists of an 1.5 foot thick alternate clay liner overlain by a 0.24 inch thick geosynthetic clay liner (GCL), a 60 mil thick HDPE flexible membrane liner (FML), a 250 mil thick drainage net, and a 3 foot thick layer of protective cover soil. In both cases the landfill will be capped with an 18 inch thick clay liner, a 40 mil thick LLDPE flexible membrane liner and a 2-foot thick cap of protective soil.

Based on the proposed finished cap grades for Phase 3 from the facility plan, we understand that the maximum waste height will be approximately 115 feet. The permanent side slopes for the cap will have an inclination of 4H:1V (horizontal to vertical).). For the purpose of this analysis, we have been asked to assume maximum slopes of 3H:1V in case additional storage capacity is desired. Based on available drawings, the subgrades for the Phase 3 have been previously prepared.

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Soil borings in the Phase 3 area were conducted by Derry's Well Drilling under subcontract to MESCO. ECS has been provided with the boring logs (the Boring Logs and the Exploration Location Diagram are presented in Appendix A). The Wayne County Landfill lies in the Coastal Plains Province, and consists of sands overlaying Black Creek Formations Clay. The soils encountered on the site generally consist of loose to medium dense Silty SANDS, with a layer of Sandy, Silty CLAY located near the ground surface in many borings near the perimeter of the proposed phase 3 landfill areas. Groundwater was encountered within most of the borings ranging from approximately 1 to 8 feet below the prevailing ground surface.

Engineering Analyses

Analyses were performed on Phase 3 to determine settlement of the subgrade soils and local slope stability of the proposed embankment and global slope stability of the landfill. These analyses were based on the design drawings provided by MESCO. Shear strength and compressibility of the soil were estimated based on the soil descriptions on the provided boring logs and our previous experience. The analyses were performed by engineers specializing in geotechnical engineering and copies of the slope stability analyses are attached in Appendix B.

The approximately 115-foot maximum height of proposed waste, the liner system and cap, will apply a foundation load of approximately 8,185 psf or 4.1 tsf. The maximum fill height was determined to be in the vicinity of boring P3-8 where the proposed final fill elevations are approximately 115 feet higher than proposed subgrade elevations. An average in-place moist density of the compacted waste and daily cover of 70 pounds per cubic foot was assumed based on the typical values published by National Solid Wasted Management Association and several studies consulted by this office. Based on our experience with similar soil conditions, the silty sands at the proposed subgrade elevations are suitable for support of the applied loads.

The total and differential settlement of the foundation soils from the applied solid waste loads were estimated using an elastic analysis and estimated compressibility based on the Standard Penetration Test N-values obtained form the Boring Logs provided to us. The borings performed within the proposed landfill area were advanced to depths ranging from approximately 15 to 54 feet below the prevailing ground surface.

Based on available boring information provided by MESCO, settlements were estimated for locations along section B-B' shown on Figure 1 included in the Appendix to this report. The maximum waste fill height occurred in the vicinity of boring P3-8 along section B-B'. The thickness of the soil profile underlying the waste and clay liner is approximately 18 feet of fill material, assumed to be onsite silty sand borrow material, and 36 feet of natural silty sands in the vicinity of P3-8. The applied load is approximately 8,185 psf, resulting in estimated settlements on the order of 18 inches.

Based on the provided boring results, the soil conditions across the site are reasonably uniform. Settlement will typically be proportional to the waste and embankment height, with little abrupt differential movements.

The waste fill and perimeter embankment were evaluated for slope stability analysis using circular potential failure mechanism. Three sections were selected for the stability analysis, which is considered representative of the most unfavorable conditions. The locations of the analyzed sections are shown on the Exploration Location Diagram in Appendix A. Each section was analyzed using the two liner options. The slope stability analysis was performed using the proprietary Slide 5.0 computer program. The modeled slope configuration was generally based on the topographic information and site grading plan provided to us by the client with the face slopes steepened to 3H:1V, while the soil strata information, index properties and engineering properties used in these analyses were estimated based on the soil descriptions on the provided boring logs and our previous experience.

The factors of safety were determined for both static and seismic loading, using the pseudo-static method. For the pseudostatic analysis of the slope, we used an earthquake ground motion having a 2-percent probability of exceedance within a 50-year period (2,475 year return period). According to the USGS Map, October 2002, the seismic acceleration at the bedrock level based on the probabilistic earthquake (2,475 year return period) for this site is 0.08g. The seismic coefficient, k_s, for the site is 0.04g.

The resulting minimum factors of safety were computed to be 1.5 for permanent slopes under static loading conditions and 1.3 for seismic conditions. The failure planes with the lowest factors of safety were through the waste material and the type of liner system did not affect the results of the analysis. Analyses that forced the failure plane through the liner system calculated higher factors of safety. The results of the slope stability analysis are presented in Appendix B.

In conclusion, the results of the geotechnical analysis indicate that permanent slope configurations of 3H:1V or flatter and the proposed configuration of perimeter embankment fill slopes will be stable and provide an appropriate factor of safety.

Construction Considerations

Based on the provided boring logs and the design drawings, we expect that dewatering will be necessary during any excavation into natural site soils. If groundwater is encountered during construction, it probably can be controlled through the use of ditches, sumps, and pumps. If water is encountered that cannot be controlled by such procedures, ECS should be further consulted. Earthwork and trench excavation in saturated materials may require sheeting and shoring, slope flattening, or benching to control sloughing of soils. Seasonal variations in groundwater levels should be anticipated due to precipitation changes, evaporation, surface water runoff, and other factors.

The soils encountered within the test borings should generally be able to be excavated with conventional earth moving equipment such as pans/scrapers, loaders, bulldozers, rubber tired backhoes, etc. On-site soils used as earth fill should have a well-graded grain size distribution with rock and soil particles ranging from clay or silt size particles to a maximum size of 6 inches in diameter. Particles larger than this should be broken by mechanical compaction equipment to achieve the desired grain size distribution, and the samples shall have a minimum of 20 percent passing the No. 200 sieve and 50 percent passing the No. 40 sieve. Variations from

these requirements shall be approved by the geotechnical engineer in the field at the time the samples are prepared.

This report has been prepared in order to aid in the evaluation of this property and to assist the architect and/or engineer in the design of this project. The scope is limited to the specific project and locations described herein and our description of the project represents our understanding of the significant aspects relative to soil and foundation characteristics. In the event that any changes in the nature or location of the proposed construction outlined in this report are planned, we should be informed so that the changes can be reviewed and the conclusions of this report modified or approved in writing by the geotechnical engineer. It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced geotechnical engineer to provide information as to whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The data submitted in this report are based upon the information obtained from the soil borings and tests performed by others at the locations as indicated on the information referenced in this report. This report does not reflect any variations which may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations at specific times. However, it is a well known fact that variations in soil conditions exist on most sites between boring locations and also such situations as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If site conditions vary from those identified during the explorations, the recommendations contained in this report may require revision.

Thank you for the opportunity to work with you on this project. Should you have any questions or if we could be of further assistance, please do not hesitate to contact us.

Respectfully,
ECS CAROLINAS, LLP represented by;
Firm License Number: F-1078

NORTH CAROLINA PROFESSIONAL SEAL 036537 11/5/10 ENGINEER MATTHEW B. OLSEN

Matthew B. Olsen, PE
Manager of Engineering Services
NC PE License No. 036537

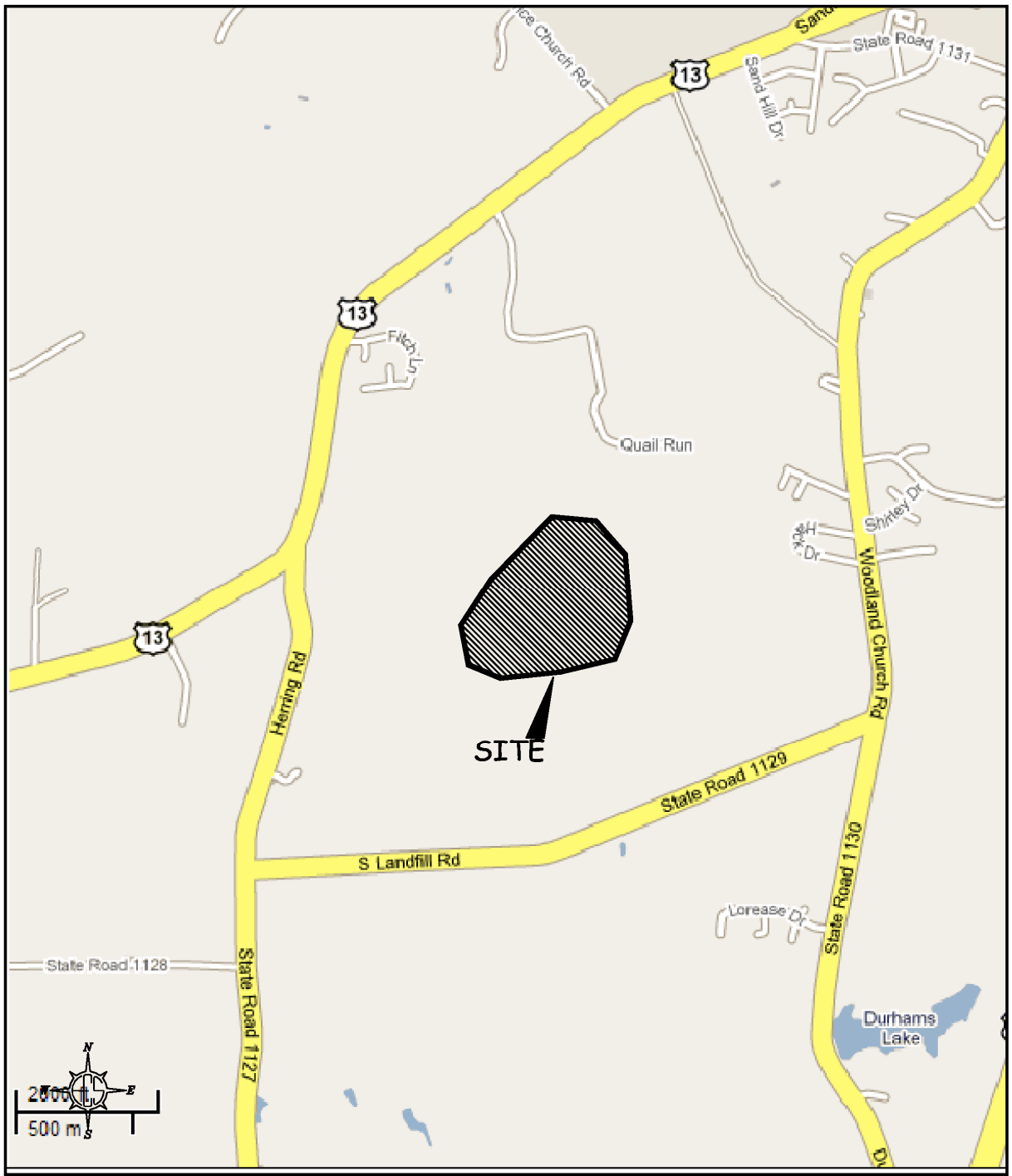
C. (Nathan) Nallainathan, PE
Principal Engineer
NC PE License No. 019937

APPENDICES

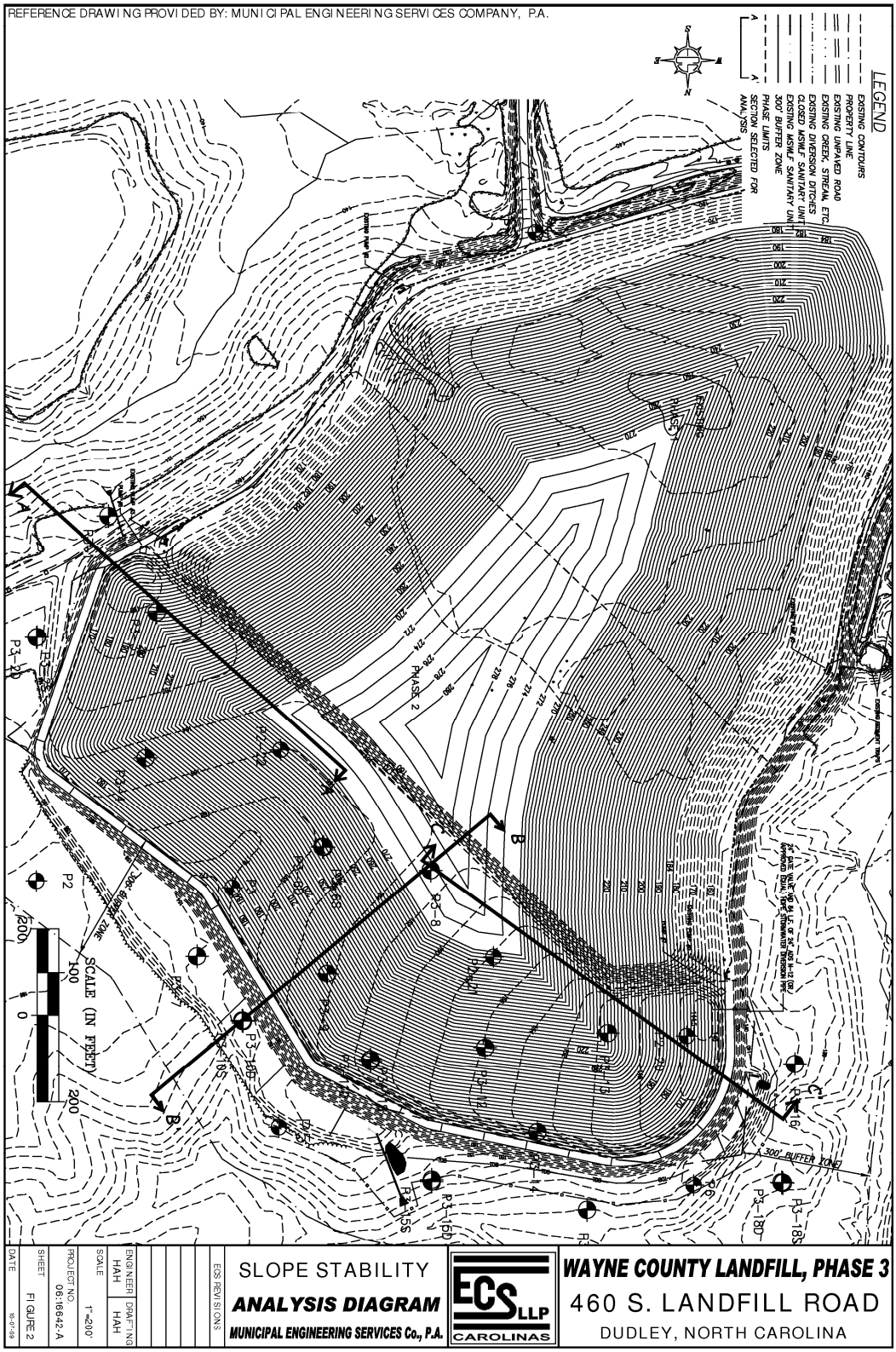
APPENDIX A

EXPLORATION LOCATION DIAGRAM

SELECTED BORING LOGS



VICINITY MAP DIAGRAM	ECS LLP CAROLINAS SETTING THE STANDARD FOR SERVICE	**WAYNE COUNTY LANDFILL, PHASE 3** 460 S. LANDFILL ROAD **DUDLEY, NORTH CAROLINA**	ENGINEER HAH	SCALE NTS
MUNICIPAL ENGINEERING SERVICES Co., P.A.			DRAFTSMAN HAH	PROJECT NO. 06:16642-A
			REVISIONS	SHEET FIGURE 1
				DATE 10-07-10


REFERENCE DRAWING PROVIDED BY: MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.
LEGEND
EXISTING CONTOURS
PROPERTY LINE
EXISTING UNPAVED ROAD
EXISTING CREEK, STREAM, ETC.
EXISTING DIVERSION DITCHES
CLOSED MSWLF SANITARY UNIT
EXISTING MSWLF SANITARY UNIT
300' BUFFER ZONE
PHASE LIMITS
SECTION SELECTED FOR ANALYSIS
PHASE 2
PHASE 3
300' BUFFER ZONE
SCALE (IN FEET)
0
100
200
SLOPE STABILITY
ANALYSIS DIAGRAM
MUNICIPAL ENGINEERING SERVICES Co., P.A.
ECS LLP
CAROLINAS
WAYNE COUNTY LANDFILL, PHASE 3
460 S. LANDFILL ROAD
DUDLEY, NORTH CAROLINA
ENGINEER HAH
DRAFTING HAH
SCALE 1"=200'
PROJECT NO. 06-16642-A
SHEET FIGURE 2
DATE 10-07-08

LOG OF BORING: P3-1

Wayne County Landfill, Phase 3 **Project No. G06096.6**

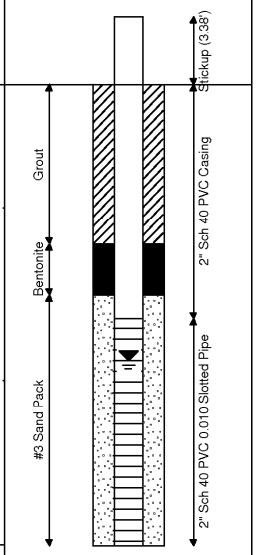
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" O.D. HSA w/ S.S
Logged by: J. Pfohl

Date started: 9/14/2006
Date ended: 9/14/2006
Completion depth: 20.28 ft
Stickup height: 3.38 ft

Surface elevation: 157.82 ft (MSL)
Top of pipe elevation: 161.20 ft (MSL)
Depth to water (TOB): 10.00 ft
Depth to water (24hrs): 12.13 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	8			Silty Clay with Sand; pale yellow brown, mottled with black top soil, fine root debris, moist
	25			Silty Clay with Sand; pale yellow brown, mottled, relict structure, root debris
5				Clay
	24			Clay; dark brown, light grey, mottled, cohesive, moist
10				
	6			Silty Sand; very light grey to white, fine grained, wet
15				
	7			Silty Sand; same as above, saturated
20				Boring terminated at 20.3 feet
25				
30				
35				
40				
45				

Well Diagram



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Page 1 of 1

LOG OF BORING: P3-2S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

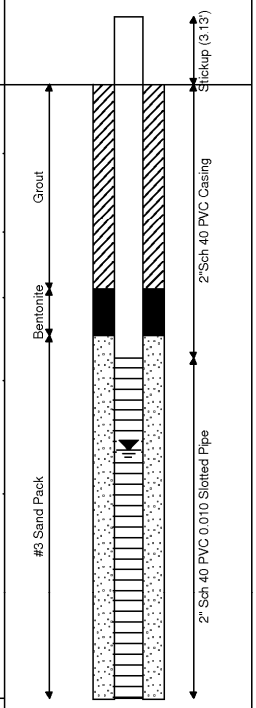
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

Date started: 9/14/2006
Date ended: 9/14/2006
Completion depth: 27.00 ft
Stickup height: 3.13 ft

Surface elevation: 165.45 ft (MSL)
Top of pipe elevation: 168.58 ft (MSL)
Depth to water (TOB): 17.00 ft
Depth to water (24hrs): 16.06 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	13			Sandy Clay; moderate yellow brown clay with medium grained pale brown and grey orange sand, mottled, damp
	6			Sand; grey orange, medium grained, damp
5	28			Silty Clay with Sand; light grey with yellow red mottles, very fine sand, cohesive, moist
10				Clay
	28			Silty Clay with Sand; light grey with yellow red mottles, very fine grained sand, cohesive, moist
15				
	5			Silty Sand; very light grey to white, fine grained, wet
20				
	6			Silty Sand; same as above
25				
				Boring terminated at 27.0 feet
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-2D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

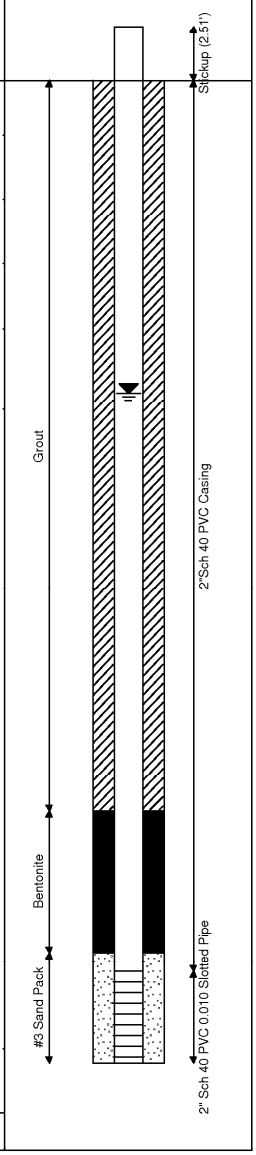
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/29/2006
Date ended: 9/29/2006
Completion depth: 53.80 ft
Stickup height: 2.51 ft

Surface elevation: 165.43 ft (MSL)
Top of pipe elevation: 167.94 ft (MSL)
Depth to water (TOB): 17.00 ft
Depth to water (24hrs): 17.07 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	13			Sandy Clay; moderate yellow brown clay with medium grained pale brown and grey orange sand, mottled, damp
	6			Sand; grey orange, medium grained, damp
5	28			Silty Clay with Sand; light grey with yellow red mottles, very fine sand, cohesive, moist
10				Fat Clay (CH) Gravel = 0.0%, Sand = 4.63%, Silt & Clay = 95.37%, LL=64, PL=23, PI=41
	28			Silty Clay with Sand; light grey with yellow red mottles, very fine grained sand, cohesive, moist
15	5			Silty Sand; very light grey to white, fine grained, wet
20	6			Silty Sand; same as above
25	6			Silty Sand; same as above
30	4			Silty Sand; very light grey to white, fine grained, trace clay nodules, wet
35	6			Silty Sand; very light grey to white, fine grained, saturated
40	8			Silty Sand; same as above
45	10			Silty Sand; same as above
50				Silty Sand; grey
55				Sandy Clay; dark grey, cohesive, fine to medium grained, bottom is black, confining layer, Black Creek Formation
				Boring terminated at 53.8 feet

Well Diagram



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Page 1 of 1

LOG OF BORING: P3-3

Wayne County Landfill, Phase 3 **Project No. G06096.6**

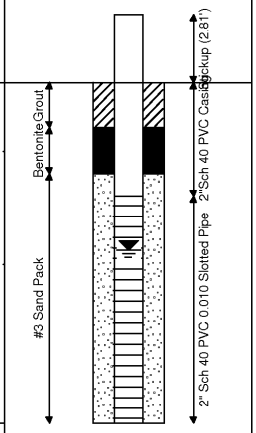
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/17/2006
Date ended: 9/17/2006
Completion depth: 14.99 ft
Stickup height: 2.81 ft

Surface elevation: 154.06 ft (MSL)
Top of pipe elevation: 156.87 ft (MSL)
Depth to water (TOB): 6.50 ft
Depth to water (24hrs): 7.37 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	3			Silty Sand; brown, medium grained sand with some clay, fine root debris, moist
5	11			Clayey Sand; dark yellow orange, poorly sorted, fine to medium grained, trace light grey nodules, slightly plastic, moist
10	13			Silty Sand; pale yellow orange, poorly graded fine to medium grained, wet
	4			Silty Sand; very pale orange, fine grained, saturated
15				Boring terminated at 15.0 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-4

Wayne County Landfill, Phase 3 **Project No. G06096.6**

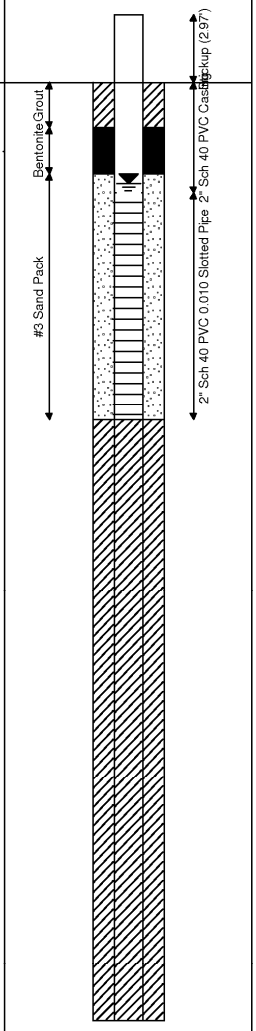
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" O.D. HSA w/ S.S
Logged by: J. Pfohl

Date started: 9/15/2006
Date ended: 9/15/2006
Completion depth: 41.30 ft
Stickup height: 2.97 ft

Surface elevation: 152.88 ft (MSL)
Top of pipe elevation: 155.85 ft (MSL)
Depth to water (TOB): 4.00 ft
Depth to water (24hrs): 4.41 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	3			Clayey Sand; grey orange with dark yellow orange and grey mottles, poorly sorted, fine to medium grained, cohesive, moist, root debris,
	12			Silty Sand; grey orange, with grey and dark yellow mottles, trace clay nodules, fine grained, moist
5	15			Silty Sand; light brown
				Silty Sand (SM) Gravel = 0.0%, Sand = 77.62%, Silt & Clay = 22.38%, Non-Plastic
10	4			Silty Sand; very pale orange, fine grained, poorly sorted, saturated
15	5			Silty Sand; same as above
20	6			Silty Sand; very pale orange to white, fine grained, poorly sorted, saturated
25	5			Silty Sand; same as above
30	4			Silty Sand; same as above
35	16			Silty Sand with Clay; medium to light grey, black clay nodules, moist
40				Black clay confining layer "black creek formation"
				Boring terminated at 41.3 feet
45				

Well Diagram



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LOG OF BORING: P3-5

Wayne County Landfill, Phase 3 **Project No. G06096.6**

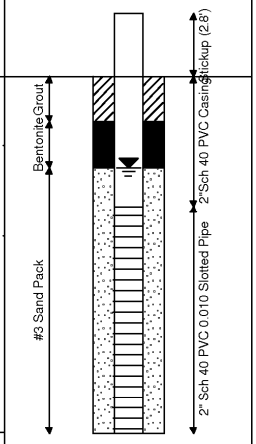
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

Date started: 10/1/2006
Date ended: 10/1/2006
Completion depth: 15.70 ft
Stickup height: 2.80 ft

Surface elevation: 151.51 ft (MSL)
Top of pipe elevation: 154.31 ft (MSL)
Depth to water (TOB): 4.00 ft
Depth to water (24hrs): 4.01 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	16			Sand; tan, moist, medium dense with silt, fine grained, trace coarse
5	28			Clayey Sand; tan, mottled orange, wet, medium dense, trace silt, fine grained
10	32			Sandy Clay; gray and red, moist, hard, fine grained, trace silt
15	34			Sandy Clay; same as above, wet
				Boring terminated at 15.7 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-6S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

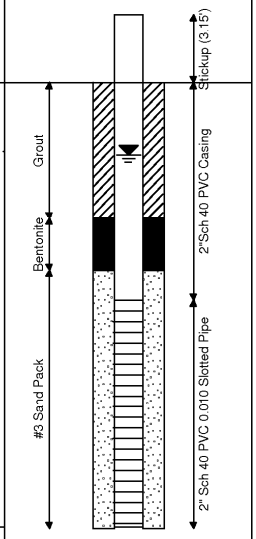
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

Date started: 9/18/2006
Date ended: 9/18/2006
Completion depth: 19.59 ft
Stickup height: 3.15 ft

Surface elevation: 149.16 ft (MSL)
Top of pipe elevation: 152.31 ft (MSL)
Depth to water (TOB): 3.50 ft
Depth to water (24hrs): 3.16 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	15			Clayey Sand; light brown, medium grained sand interlayerd with grey orange cohesive clay, root debris, slightly micaceous, moist
	9			Silty Sand with Clay; moderate orange pink, fine grained sand with grey orange mottled clay, moist
5				
	6			Silty Sand; very light grey to white, poorly sorted, few mottled clay nodules, wet
10				
	16			Silty Sand; grey orange, fine grained, relict structure, slightly micaceous, moist
15				
	5			Silty Sand; grey orange, fine grained, slightly micaceous, saturated
20				Boring terminated at 19.6 feet
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-6D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

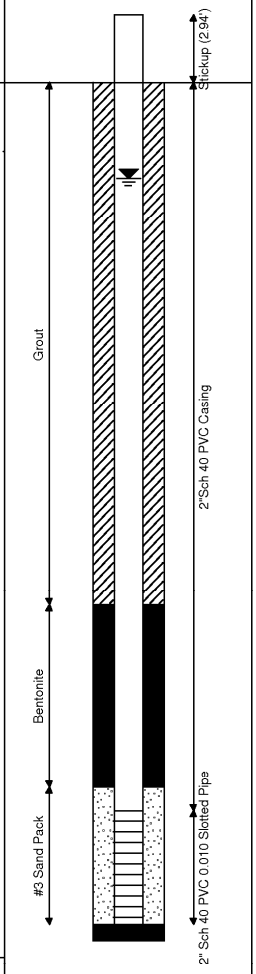
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/27/2006
Date ended: 9/27/2006
Completion depth: 37.75 ft
Stickup height: 2.94 ft

Surface elevation: 149.24 ft (MSL)
Top of pipe elevation: 152.18 ft (MSL)
Depth to water (TOB): 3.50 ft
Depth to water (24hrs): 4.19 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	15			Clayey Sand; light brown, medium grained sand interlayerd with grey orange cohesive clay, root debris, slightly micaceous, moist
	9			Silty Sand with Clay; moderate orange pink, fine grained sand with grey orange mottled clay, moist
5				
	6			Silty Sand; very light grey to white, poorly sorted, few mottled clay nodules, wet
10				
	16			Silty Sand; grey orange, fine grained, relict structure, slightly micaceous, moist
15				
	5			Silty Sand; grey orange, fine grained, slightly micaceous, saturated
20				
	8			Silty Sand; same as above
25				
	8			Silty Sand; grey orange, fine grained sand with very pale orange silt interlayered, slightly micaceous, saturated
30				
	6			Silty Sand; same as above
35				Silty Sand with Clay; medium to light grey, black clay nodules
				hard black clay confining layer "black creek formation"
				Boring terminated at 37.8 feet
40				
45				

Well Diagram



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LOG OF BORING: P3-7

Wayne County Landfill, Phase 3 **Project No. G06096.6**

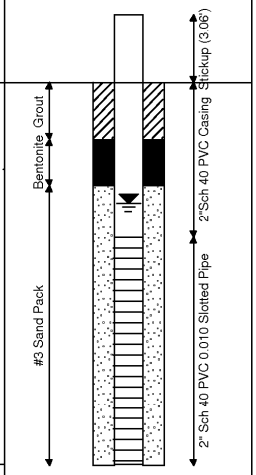
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/19/2006
Date ended: 9/19/2006
Completion depth: 16.83 ft
Stickup height: 3.06 ft

Surface elevation: 153.80 ft (MSL)
Top of pipe elevation: 156.86 ft (MSL)
Depth to water (TOB): 5.00 ft
Depth to water (24hrs): 5.30 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	10			Sandy Clay; moderate yellow brown and very pale orange mottled clay with fine to medium grained sand, few fine root fragments, cohesive, moist
	8			Sandy Silt; grey orange silt interlayered with fine grained very pale orange sand, few mottled clay nodules, moist
5				
	6			Silty Sand; very light grey to white, poorly graded, wet
10				
	6			Silty Sand; same as above, saturated
15				
				Boring terminated at 16.8 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-8

Wayne County Landfill, Phase 3 **Project No. G06096.6**

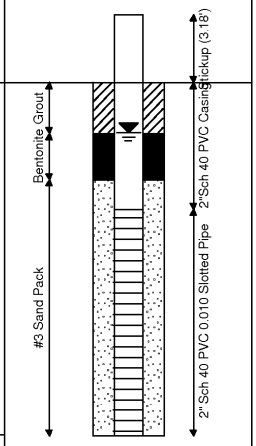
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/18/2006
Date ended: 9/18/2006
Completion depth: 15.54 ft
Stickup height: 3.18 ft

Surface elevation: 146.54 ft (MSL)
Top of pipe elevation: 149.72 ft (MSL)
Depth to water (TOB): 2.00 ft
Depth to water (24hrs): 2.21 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	2			Silty Sand; moderate yellow brown, medium grained, trace dark grey organic top soil with roots, few cohesive clay nodules, moist
	12			Silty Sand; moderate red orange, interlayered with fine grained yellow orange, trace mottled cohesive clay nodules, wet
5				
	3			Silty Sand; grey orange, fine to medium grained, saturated
10				
	3			Silty Sand; very pale orange, fine to medium grained, saturated
15				Boring terminated at 15.5 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-9

Wayne County Landfill, Phase 3 **Project No. G06096.6**

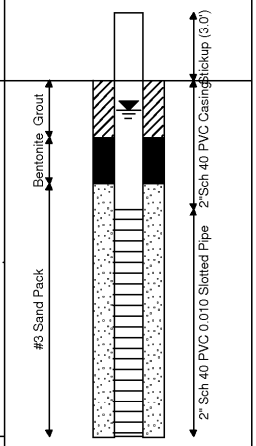
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/18/2006
Date ended: 9/18/2006
Completion depth: 15.67 ft
Stickup height: 3.08 ft

Surface elevation: 147.01 ft (MSL)
Top of pipe elevation: 150.09 ft (MSL)
Depth to water (TOB): 1.00 ft
Depth to water (24hrs): 1.30 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	4			Sandy Clay; dark yellow orange and very pale orange, mottled, cohesive, fine grained, moist
				Sandy Clay, dark yellow orange, cohesive, fine grained, moist
5				Fat Clay (CH) Gravel = 0.0%, Sand = 7.19%, Silt & Clay = 92.81%, LL=67, PL=22, PI=45
	4			Silty Sand; very pale orange, fine grained sand, saturated
10				Sandy Silt (ML) Gravel = 0.0%, Sand = 32.45%, Silt & Clay = 67.55%, LL=49, PL=28, PI=21
	5			Silty Sand; same as above
15				Boring terminated at 15.7 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-10S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

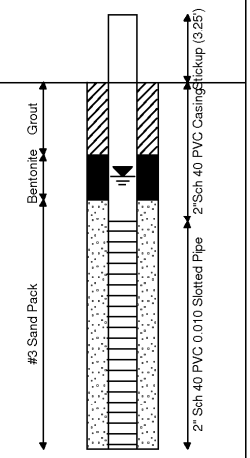
Date started: 9/11/2006
Date ended: 9/11/2006
Completion depth: 16.12 ft
Stickup height: 3.25 ft

Surface elevation: 151.23 ft (MSL)
Top of pipe elevation: 154.48 ft (MSL)
Depth to water (TOB): 4.00 ft
Depth to water (24hrs): 4.12 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	3			Clayey Sand; moderately yellow brown, medium grained sand with pale yellow brown and light brown mottled clay nodules, few fine roots, relict structure, moist
	4			Sandy Clay; moderately yellow brown and very pale orange, mottled, cohesive, fine grained, few root fragments, moist
	8			Sandy Clay; moderately yellow brown and very pale orange, mottled, very cohesive, sand fine grained, moist
	7			Silty Sand; very pale orange, fine grained, wet
				Boring terminated at 16.1 feet

Depth (ft): 5, 10, 15, 20, 25, 30, 35, 40, 45

Well Diagram



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LOG OF BORING: P3-10D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

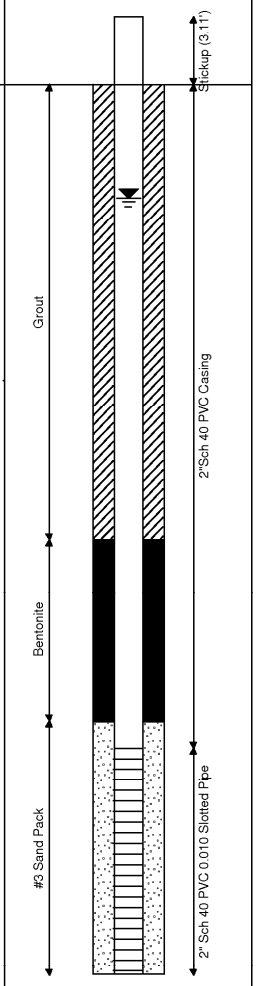
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/27/2006
Date ended: 9/27/2006
Completion depth: 39.19 ft
Stickup height: 3.11 ft

Surface elevation: 150.96 ft (MSL)
Top of pipe elevation: 154.07 ft (MSL)
Depth to water (TOB): 4.00 ft
Depth to water (24hrs): 5.00 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	3			Clayey Sand; moderately yellow brown, medium grained sand with pale yellow brown and light brown mottled clay nodules, few fine roots, relict structure, moist
5	4			Sandy Clay; moderately yellow brown and very pale orange, mottled, cohesive, fine grained, few root fragments, moist
10	8			Sandy Clay; moderately yellow brown and very pale orange, mottled, very cohesive, fine grained, moist
15	7			Silty Sand; very pale orange, fine grained, wet
20	5			Silty Sand with Clay; very pale orange, fine grained sand with moderate yellow brown and very pale orange morttled clay nodules, wet
25	12			Silty Sand; very pale orange, fine grained, saturaed
30	13			Silty Sand; same as above
35	11			Silty Sand; same as above
				Silty Sand with Clay; medium light grey, black clay nodules
40				hard black clay confining layer "black creek formation"
				Boring terminated at 39.2 feet
45				

Well Diagram



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LOG OF BORING: P3-11S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

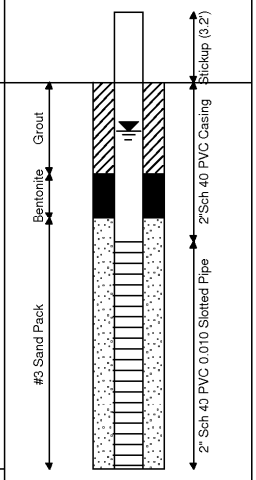
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

Date started: 9/25/2006
Date ended: 9/25/2006
Completion depth: 17.03 ft
Stickup height: 3.20 ft

Surface elevation: 146.53 ft (MSL)
Top of pipe elevation: 149.73 ft (MSL)
Depth to water (TOB): 2.00 ft
Depth to water (24hrs): 2.13 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	5			Silty Sand; dark yellow orange, trace clay, moist
	4			Silty Sand; same as above
5				
	12			Silty Sand; grey orange, fine to medium grained, moist
10				
	7			Silty Sand; same as above
15				
				Boring terminated at 17.0 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-11D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

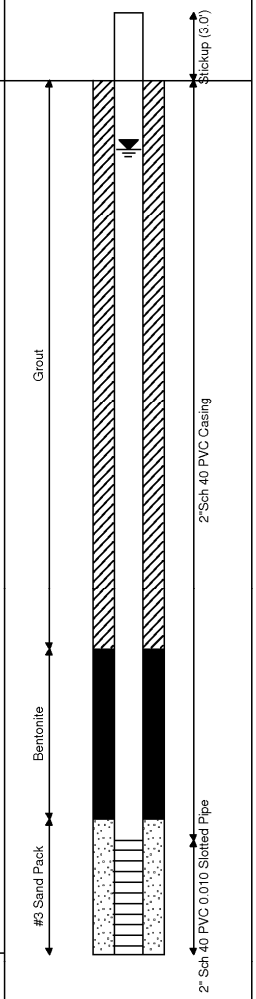
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/11/2006
Date ended: 9/11/2006
Completion depth: 38.42 ft
Stickup height: 3.01 ft

Surface elevation: 146.58 ft (MSL)
Top of pipe elevation: 149.59 ft (MSL)
Depth to water (TOB): 2.00 ft
Depth to water (24hrs): 3.00 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	5			Silty Sand; dark yellow orange, trace clay, moist
	4			Silty Sand; same as above
5				
	12			Silty Sand; grey orange, fine to medium grained,moist
10				
	7			Silty Sand; same as above
15				
	7			Silty Sand; same as above, saturated
20				
	3			Silty Sand; grey orange, fine to medium grained, saturated
25				
	11			Silty Sand; grey orange, fine to medium grained, saturated
30				Silty Sand with Clay; grey to white, hard
	26			Silty Sand with Clay; moderate light grey, black clay nodules, moist
35				hard black clay confining layer "black creek formation"
40				Boring terminated at 38.4 feet
45				

Well Diagram



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LOG OF BORING: P3-12

Wayne County Landfill, Phase 3 **Project No. G06096.6**

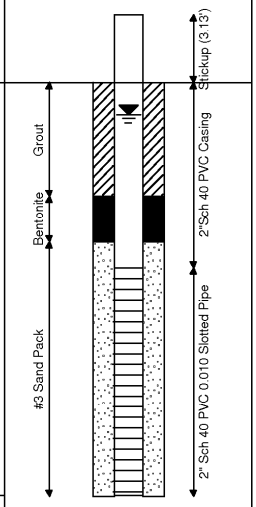
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/27/2006
Date ended: 9/27/2006
Completion depth: 18.18 ft
Stickup height: 3.13 ft

Surface elevation: 143.46 ft (MSL)
Top of pipe elevation: 146.59 ft (MSL)
Depth to water (TOB): 1.00 ft
Depth to water (24hrs): 1.40 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	6			Silty Sand; grey orange, poorly graded, fine to medium grained, trace root fragments, moist
	15			Silty Sand; moderate brown, medium grained, few round gravel size rock fragments, moist
5				
	7			Silty Sand; grey orange, fine grained sand with laminated very pale orange silt, wet
10				
	3			Silty Sand; very light grey to white, poorly graded, fine grained, saturated
15				
				Boring terminated at 18.2 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-13

Wayne County Landfill, Phase 3 **Project No. G06096.6**

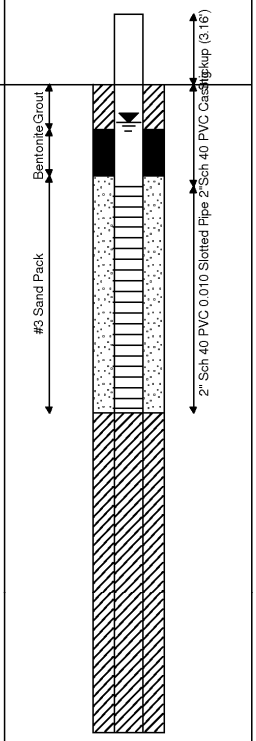
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/26/2006
Date ended: 9/26/2006
Completion depth: 28.50 ft
Stickup height: 3.16 ft

Surface elevation: 139.88 ft (MSL)
Top of pipe elevation: 143.04 ft (MSL)
Depth to water (TOB): 1.00 ft
Depth to water (24hrs): 1.67 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	8			Silty Sand; brown grey orange, fine to medium grained, trace root fragments, trace black organic silt partings, poorly graded, moist
	7			Silty Sand; same as above
5				
	3			Silty Sand; grey orange, fine grained, poorly graded, wet
10				
	3			Silty Sand; very light grey to white, fine grained, poorly sorted, saturated
15				
	2			Silty Sand; no recovery, samples too saturated
20				
	5			Silty Sand; grey blue green, poorly graded, fine to medium grained, saturated
25				Silty Sand with Clay
				Silty Sand; dark grey, confining layer Black Creek Formation
30				Silty Sand (SM) Gravel = 2.36%, Sand = 79.12%, Silty & Clay = 18.52%, LL=40, PL=27, PI=13
				Boring terminated at 28.5 feet
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-14

Wayne County Landfill, Phase 3 **Project No. G06096.6**

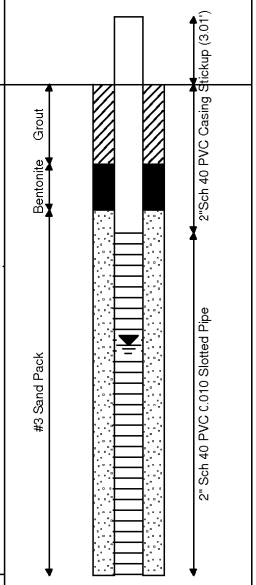
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/19/2006
Date ended: 9/19/2006
Completion depth: 21.56 ft
Stickup height: 3.01 ft

Surface elevation: 151.16 ft (MSL)
Top of pipe elevation: 154.17 ft (MSL)
Depth to water (TOB): 11.50 ft
Depth to water (24hrs): 11.44 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	7			Sandy Clay; light brown with dark yellow orange mottles, trace fine grained sand, very cohesive, root debris, moist
	29			Sandy Clay; light brown, trace fine grained sand, cohesive, moist
5				
	11			Silty Sand; grey orange, fine grained sand, laminated with very pale orange silt, trace clay, moist
10				
	10			Silty Sand; same as above without clay
15				
	6			Silty Sand; grey orange, fine grained sand laminated with very pale orange silt, saturated
20				
				Boring terminated at 21.6 feet
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-15S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

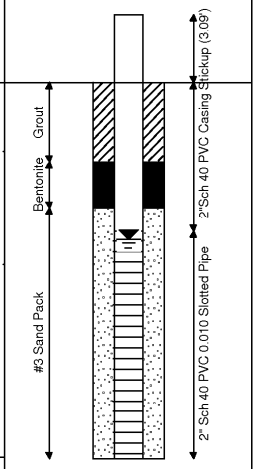
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/21/2006
Date ended: 9/21/2006
Completion depth: 16.53 ft
Stickup height: 3.09 ft

Surface elevation: 149.14 ft (MSL)
Top of pipe elevation: 152.23 ft (MSL)
Depth to water (TOB): 7.00 ft
Depth to water (24hrs): 6.92 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	6			Silty Sand with Clay; dusky yellow brown, medium grained sand with organic top soil, root debris, trace grey orange clay, moist
	24			Sandy Clay; moderate yellow brown, medium grained sand laminated with cohesive clay, moist
5				
	22			Silty Sand; grey orange, medium to coarse grained, micaceous, moist
10				
	6			Silty Sand; very light grey to white, fine to medium grained, moist
15				
				Boring terminated at 16.5 feet
20				
25				
30				
35				
40				
45				

Well Diagram



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LOG OF BORING: P3-15D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

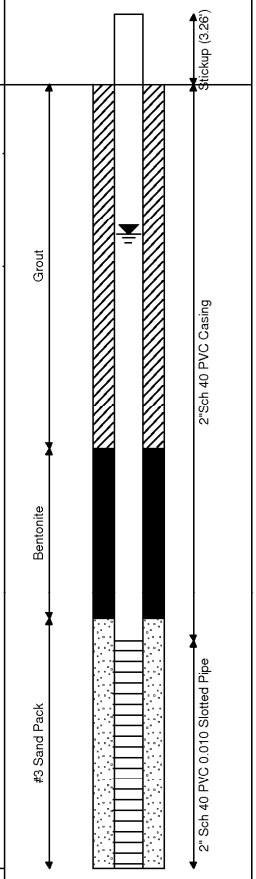
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/22/2006
Date ended: 9/22/2006
Completion depth: 34.49 ft
Stickup height: 3.26 ft

Surface elevation: 148.98 ft (MSL)
Top of pipe elevation: 152.24 ft (MSL)
Depth to water (TOB): 7.00 ft
Depth to water (24hrs): 6.60 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	6			Silty Sand with Clay; dusky yellow brown, medium grained sand with organic top soil, root debris, trace grey orange clay, moist
	24			Sandy Clay; moderate yellow brown, medium grained sand laminated with cohesive clay, moist
5				
	22			Silty Sand; grey orange, medium to coarse grained, micaceous, moist
10				
	6			Silty Sand; very light grey to white, fine to medium grained, moist
15				
	5			Silty Sand; same as above
20				
	3			Silty Sand; very light grey to white, fine grained, saturated
25				
	4			Silty Sand; same as above
30				
	25			Silty Sand with Clay; moderately light grey, black clay nodules, moist
35				Boring terminated at 34.5 feet
40				
45				

Well Diagram



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LOG OF BORING: P3-16

Wayne County Landfill, Phase 3 **Project No. G06096.6**

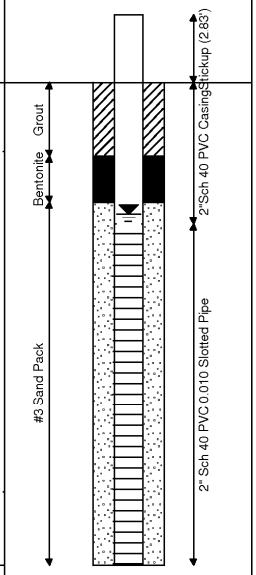
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/21/2006
Date ended: 9/21/2006
Completion depth: 21.24 ft
Stickup height: 2.83 ft

Surface elevation: 134.68 ft (MSL)
Top of pipe elevation: 137.51 ft (MSL)
Depth to water (TOB): 8.50 ft
Depth to water (24hrs): 5.78 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	4			Silty Sand; brown, medium grained, top soil 0.00-0.25', black with root debris
	11			Sandy Clay; moderate yellow brown, cohesive, moist
5				
	21			Sandy Clay; moderate yellow brown, medium grained, moist
10				
	4			Clayey Sand; grey blue green, poorly graded, fine to medium grained, moist
15				
	4			Silty Sand; grey blue green, poorly graded, fine to medium grained, wet
20				
				Boring terminated at 21.2 feet
25				
30				
35				
40				
45				

Well Diagram



Municipal Engineering Services Company, P.A.
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PO Box 97, Garner, North Carolina 27529 (919) 772-5393PO Box 349, Boone, North Carolina 28607 (828) 262-1767

LOG OF BORING: P3-17

Wayne County Landfill, Phase 3 **Project No. G06096.6**

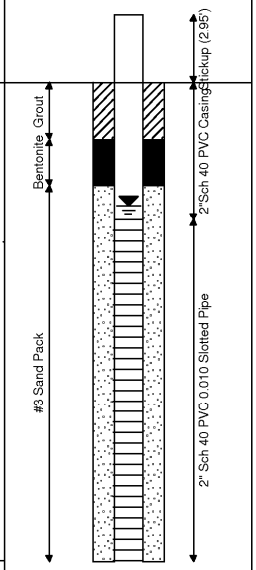
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/25/2006
Date ended: 9/25/2006
Completion depth: 21.05 ft
Stickup height: 2.95 ft

Surface elevation: 140.37 ft (MSL)
Top of pipe elevation: 143.32 ft (MSL)
Depth to water (TOB): 10.00 ft
Depth to water (24hrs): 5.43 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	7			Sandy Clay; light brown with dark yellow orange, mottles, fine grained, cohesive, root debris, moist
	8			Sandy Clay; same as above without roots
5				
	12			Silty Sand; grey orange, fine grained sand laminated with very pale orange silt, trace clay, moist
10				
	10			Silty Sand; same as above but lacks clay
15				
	3			Silty Sand; very light grey to white, fine to medium grained, saturated
20				
				Boring terminated at 21.1 feet
25				
30				
35				
40				
45				

Well Diagram



Municipal Engineering Services Company, P.A.
Operation/Construction Managers Civil/Sanitary EngineersEnvironmental Studies
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LOG OF BORING: P3-18S

Wayne County Landfill, Phase 3 **Project No. G06096.6**

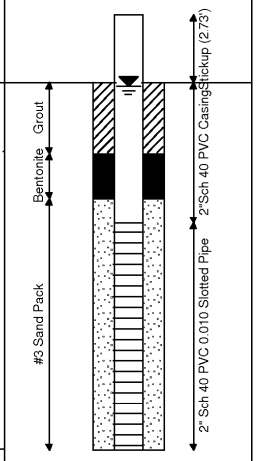
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA w/ S.S.
Logged by: J. Pfohl

Date started: 9/26/2006
Date ended: 9/26/2006
Completion depth: 16.17 ft
Stickup height: 2.73 ft

Surface elevation: 129.01 ft (MSL)
Top of pipe elevation: 131.74 ft (MSL)
Depth to water (TOB): 0.50 ft
Depth to water (24hrs): 0.17 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	6			Top Soil; black organic soil, root debris, "creek mud", wet
	27			Silty Sand; grey green, medium grained, wet
5				
	7			Silty Sand; very light grey to white, fine grained, saturated
10				
	3			Silty Sand; same as above, saturated
15				
				Boring terminated at 16.2 feet
20				
25				
30				
35				
40				
45				

Well Diagram



Municipal Engineering Services Company, P.A.
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LOG OF BORING: P3-18D

Wayne County Landfill, Phase 3 **Project No. G06096.6**

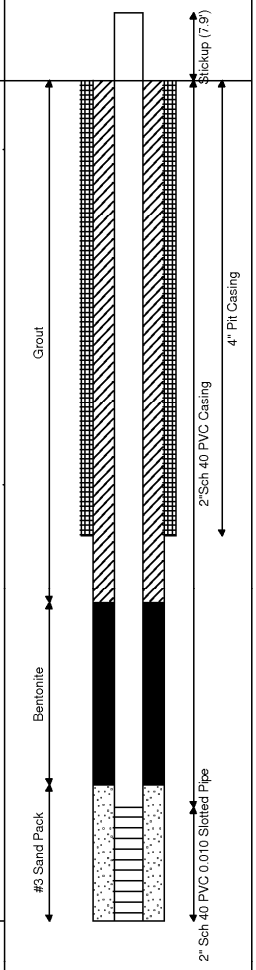
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5"OD HSA w/S.S.,3 7/8"mud tricone
Logged by: J. Pfohl

Date started: 9/28/2006
Date ended: 9/28/2006
Completion depth: 36.98 ft
Stickup height: 7.90 ft

Surface elevation: 128.89 ft (MSL)
Top of pipe elevation: 136.79 ft (MSL)
Depth to water (TOB): 0.50 ft
Depth to water (24hrs): -

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	6			Top Soil; black organic soil, root debris, "creek mud", wet
	27			Silty Sand; grey green, medium grained, wet
5				
	7			Silty Sand; very light grey to white, fine grained, saturated
10				
	3			Silty Sand; same as above, saturated
15				
	85			Clay with Sand; black, very cohesive, abundant lignitic wood, very stiff, "black creek formation"
20				
				extremely hard, black clay
25				
				softer drilling with depth, more grey sand and less clay
30				
35				
				Boring terminated at 37.0 feet
40				
45				

Well Diagram



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Page 1 of 1

LOG OF BORING: P3-19

Wayne County Landfill, Phase 3 **Project No. G06096.6**

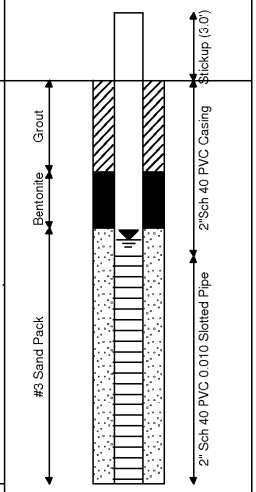
Drilling contractor: Derry's Well Drilling
Drill rig & method: 8.5" OD HSA
Logged by: J. Pfohl

Date started: 9/30/2006
Date ended: 9/30/2006
Completion depth: 17.74 ft
Stickup height: 3.00 ft

Surface elevation: 141.13 ft (MSL)
Top of pipe elevation: 144.13 ft (MSL)
Depth to water (TOB): 7.00 ft
Depth to water (24hrs): 7.01 ft

Depth (ft)	SPT (bpf)	Soil Type Symbol	Sample	Description of Material & Remarks
	13			Clayey Sand; orange, moist, medium dense with silt, fine grained
5	31			Clayey Sand; grades dense, increasing sand
10	10			Sand; tan and white, saturated, fine grained
15	28			Sand; grades orange, moderately dense, increasing silt
20				Boring terminated at 17.7 feet
25				
30				
35				
40				
45				

Well Diagram



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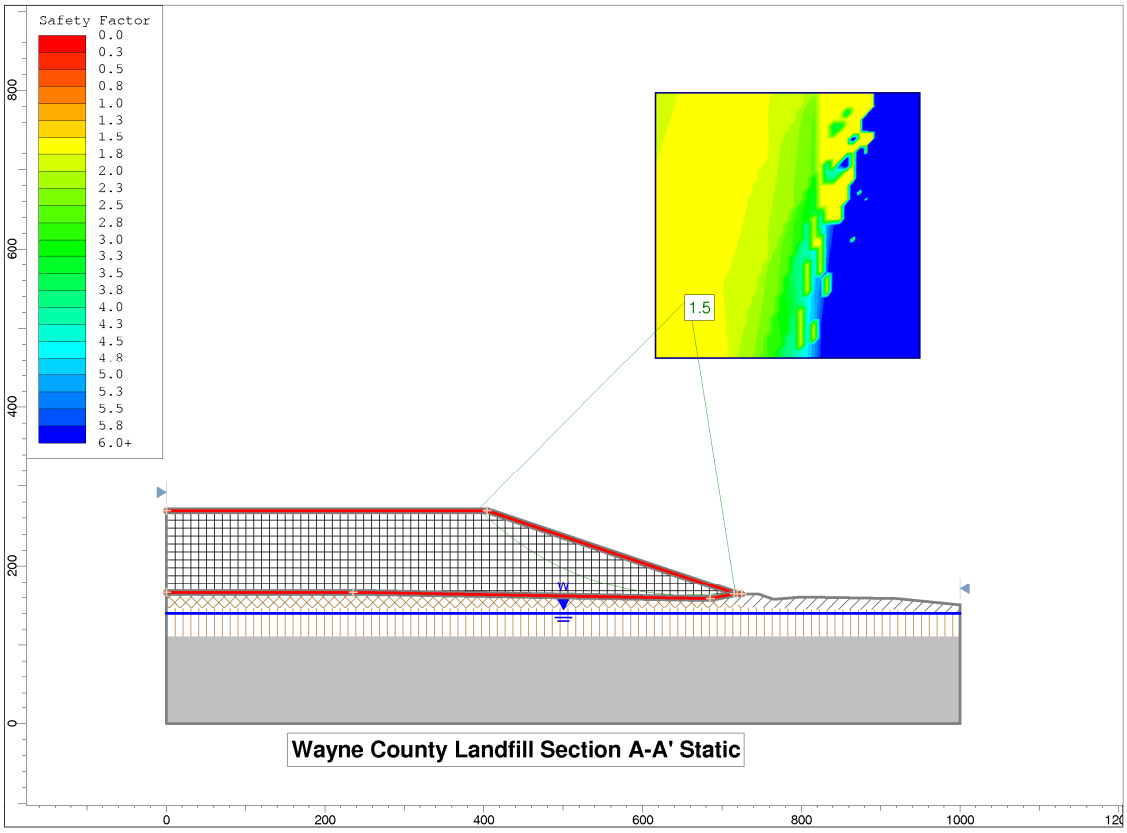
APPENDIX B

SLOPE STABILITY ANALYSES RESULTS

Material Property Legend

Soil Layer/Material	Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)
Waste	70	20	200
Protective Soil	125	30	0
Clay Liner	125	20	400
Fill: Silty Sand	130	34	150
Sandy to Silty CLAY	115	20	400
Silty SAND	125	32	150
Black Creek Clay	130	20	800
HDPE Liner, LLDPE Liner, & Drainage Net	-	26	0
Geosynthetic Clay Liner	-	21	0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W
Wayne County Landfill Section A-A' Static
0
200
400
600
800
1000

Slide Analysis Information

Document Name

File Name: Section A-A' Static.sli

Project Settings

Project Title: Wayne County Landfill Section A-A' Static
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 70 lb/ft3
Cohesion: 200 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay Liner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 400 psf

Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 0

Material: Fill: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 150 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 115 lb/ft3
Cohesion: 400 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 150 psf
Friction Angle: 32 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Black Creek Clay
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 800 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Protective
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

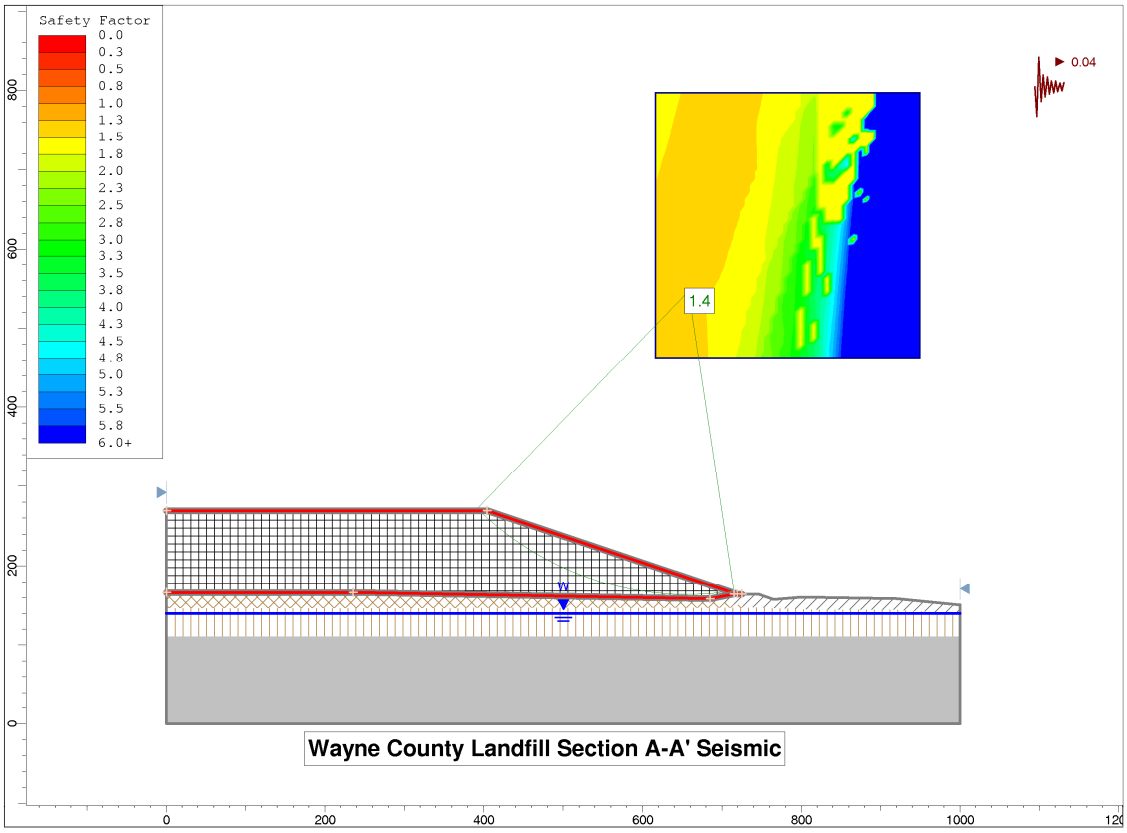
Support Properties

Support: Liner and Drainage Net (Frict Angle = 26)
Liner and Drainage Net (Frict Angle = 26)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Bisector of Parallel and Tangent
Anchorage: None
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0 lb/ft
Pullout Strength Adhesion: 0 lb/ft2

Pullout Strength Friction Angle: 26 degrees

Global Minimums

Method: bishop simplified
FS: 1.539300
Center: 657.682, 537.565
Radius: 375.425
Left Slip Surface Endpoint: 393.321, 271.000
Right Slip Surface Endpoint: 716.615, 166.795
Resisting Moment=1.26393e+008 lb-ft
Driving Moment=8.21108e+007 lb-ft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0.04
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Wayne County Landfill Section A-A' Seismic
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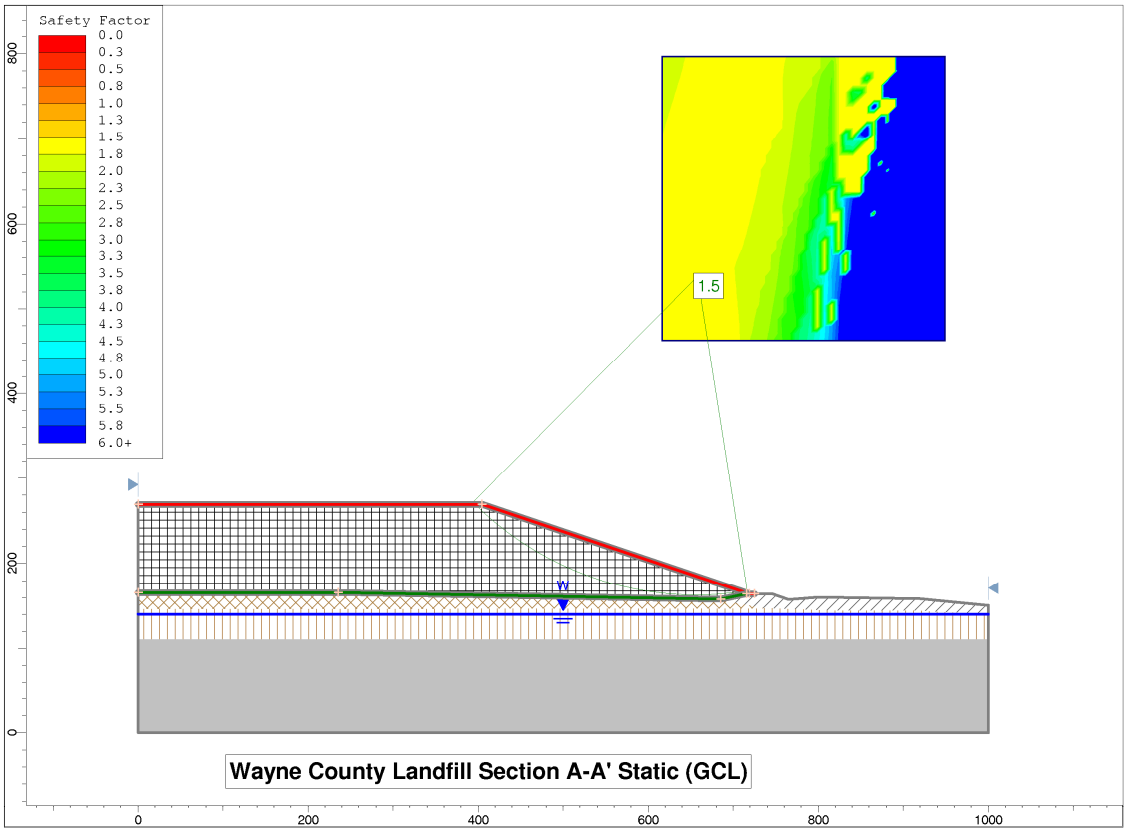
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W
Wayne County Landfill Section A-A' Static (GCL)
0
200
400
600
800
1000

Slide Analysis Information

Document Name

File Name: Section A-A' Static GCL.sli

Project Settings

Project Title: Wayne County Landfill Section A-A' Static (GCL)
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Bishop simplified

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Waste
Strength Type: Mohr-Coulomb
Unit Weight: 70 lb/ft3
Cohesion: 200 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay Liner
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3

Cohesion: 400 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 0

Material: Fill: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 150 psf
Friction Angle: 34 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Clay
Strength Type: Mohr-Coulomb
Unit Weight: 115 lb/ft3
Cohesion: 400 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Silty Sand
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 150 psf
Friction Angle: 32 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Black Creek Clay
Strength Type: Mohr-Coulomb
Unit Weight: 130 lb/ft3
Cohesion: 800 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Protective
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Support Properties

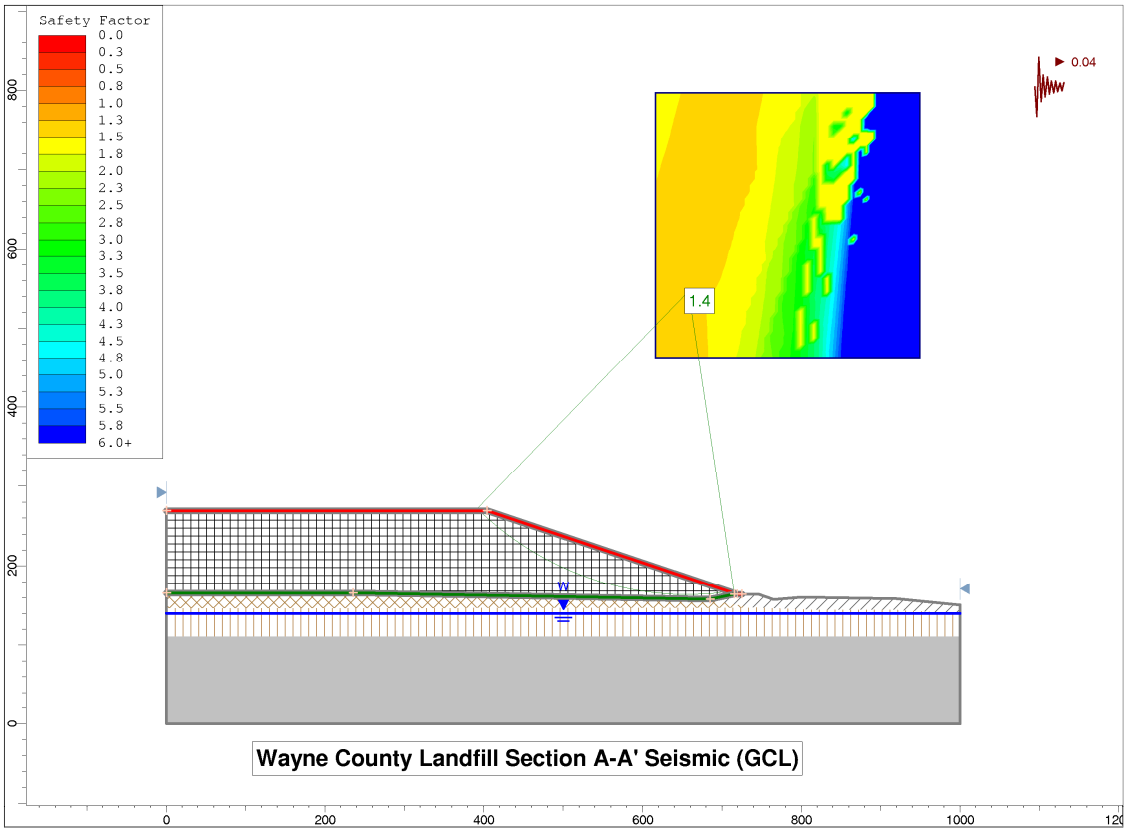
Support: Liner and Drainage Net (Frict Angle = 26)
Liner and Drainage Net (Frict Angle = 26)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Bisector of Parallel and Tangent
Anchorage: None
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0 lb/ft

Pullout Strength Adhesion: 0 lb/ft2
Pullout Strength Friction Angle: 26 degrees

Support: GCL (Frict Angle = 21)
GCL (Frict Angle = 21)
Support Type: GeoTextile
Force Application: Passive
Force Orientation: Bisector of Parallel and Tangent
Anchorage: None
Shear Strength Model: Linear
Strip Coverage: 100 percent
Tensile Strength: 0 lb/ft
Pullout Strength Adhesion: 0 lb/ft2
Pullout Strength Friction Angle: 21 degrees

Global Minimums

Method: bishop simplified
FS: 1.539300
Center: 657.682, 537.565
Radius: 375.425
Left Slip Surface Endpoint: 393.321, 271.000
Right Slip Surface Endpoint: 716.615, 166.795
Resisting Moment=1.26393e+008 lb-ft
Driving Moment=8.21108e+007 lb-ft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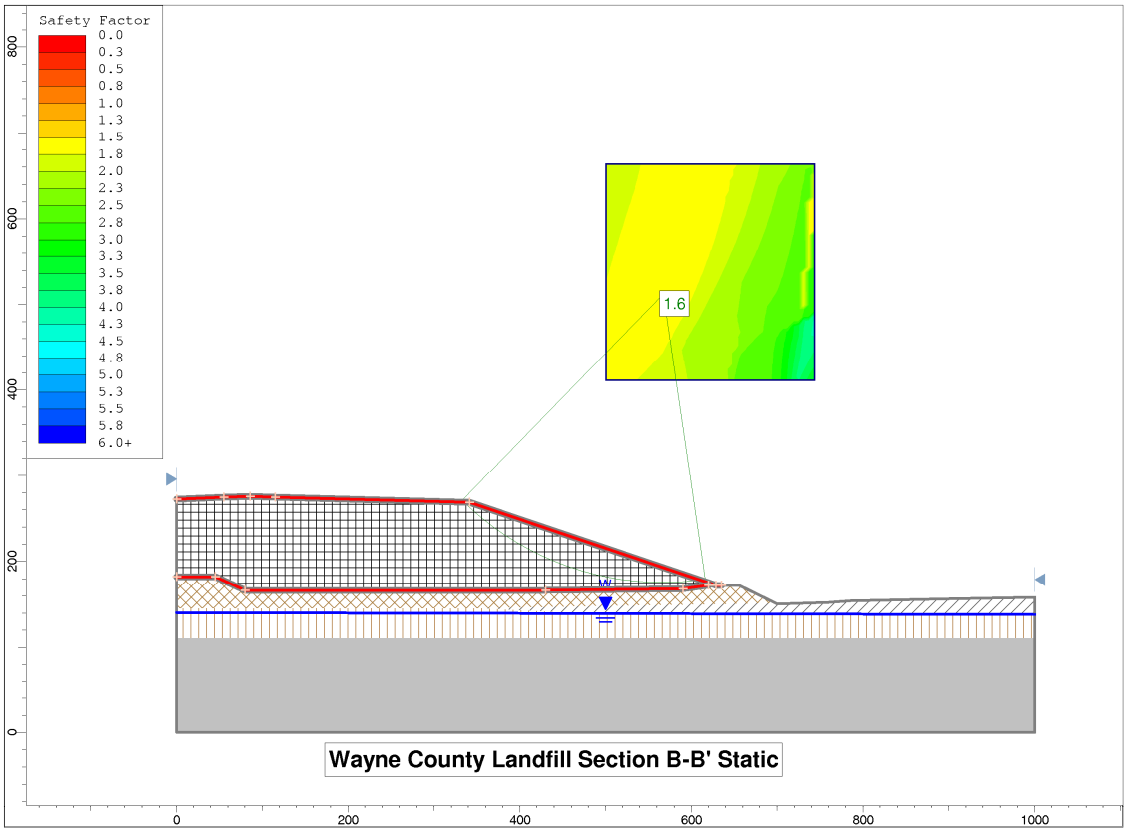
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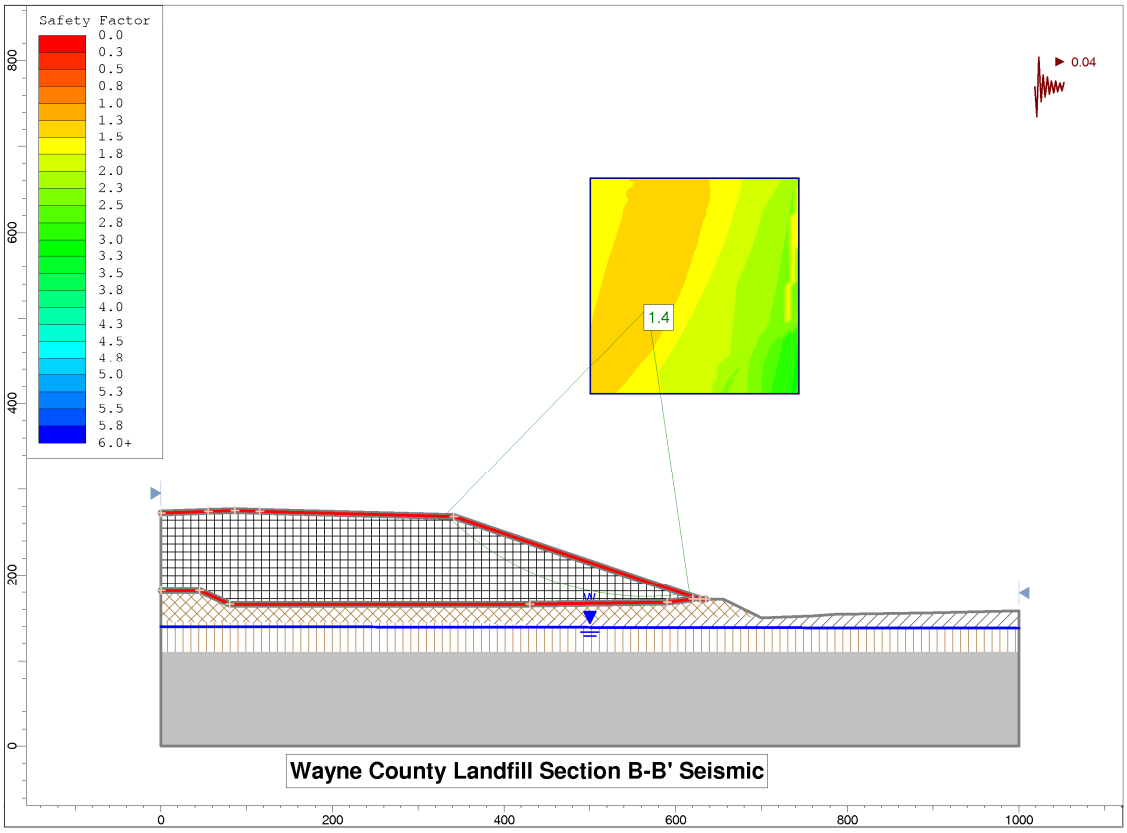
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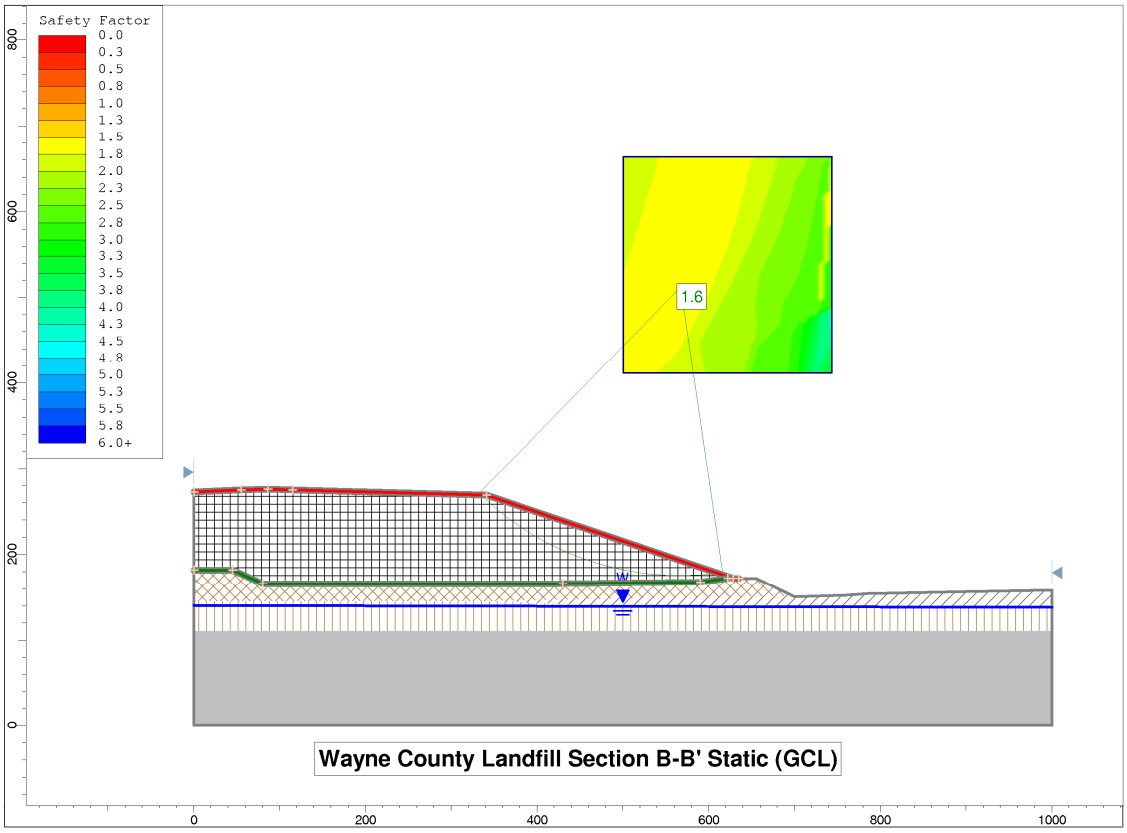
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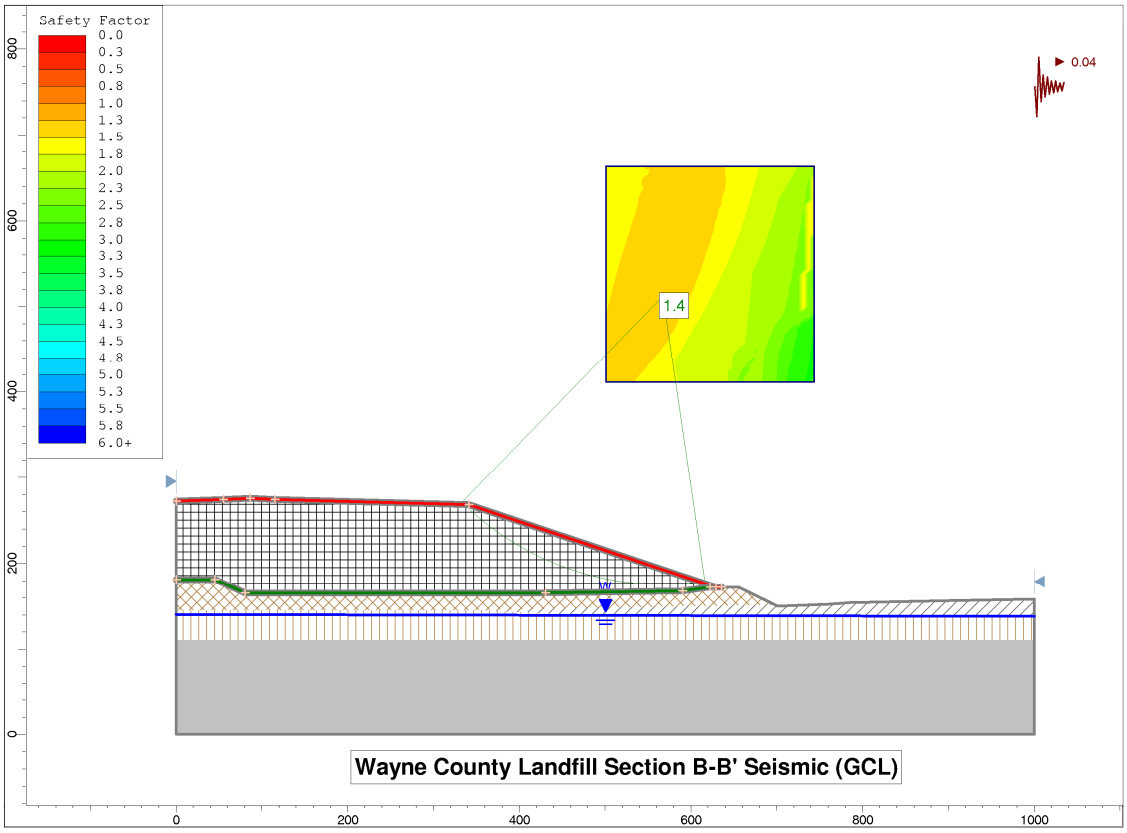
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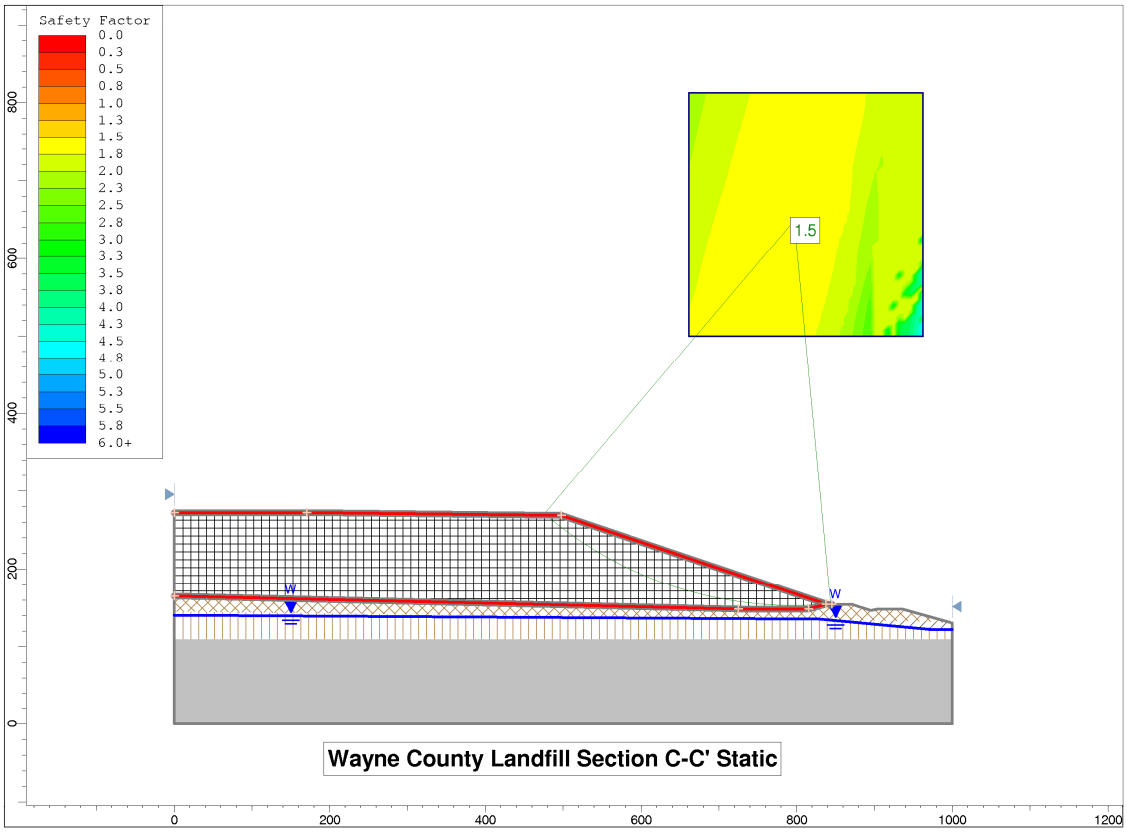
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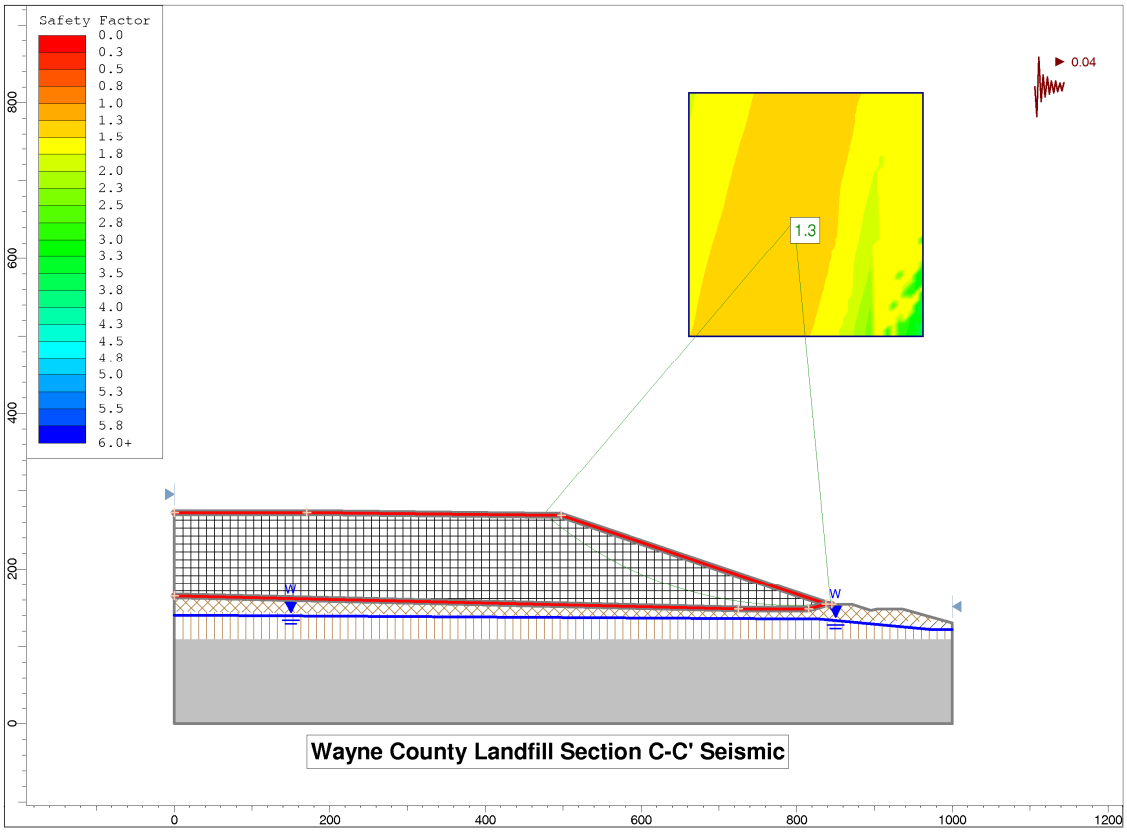
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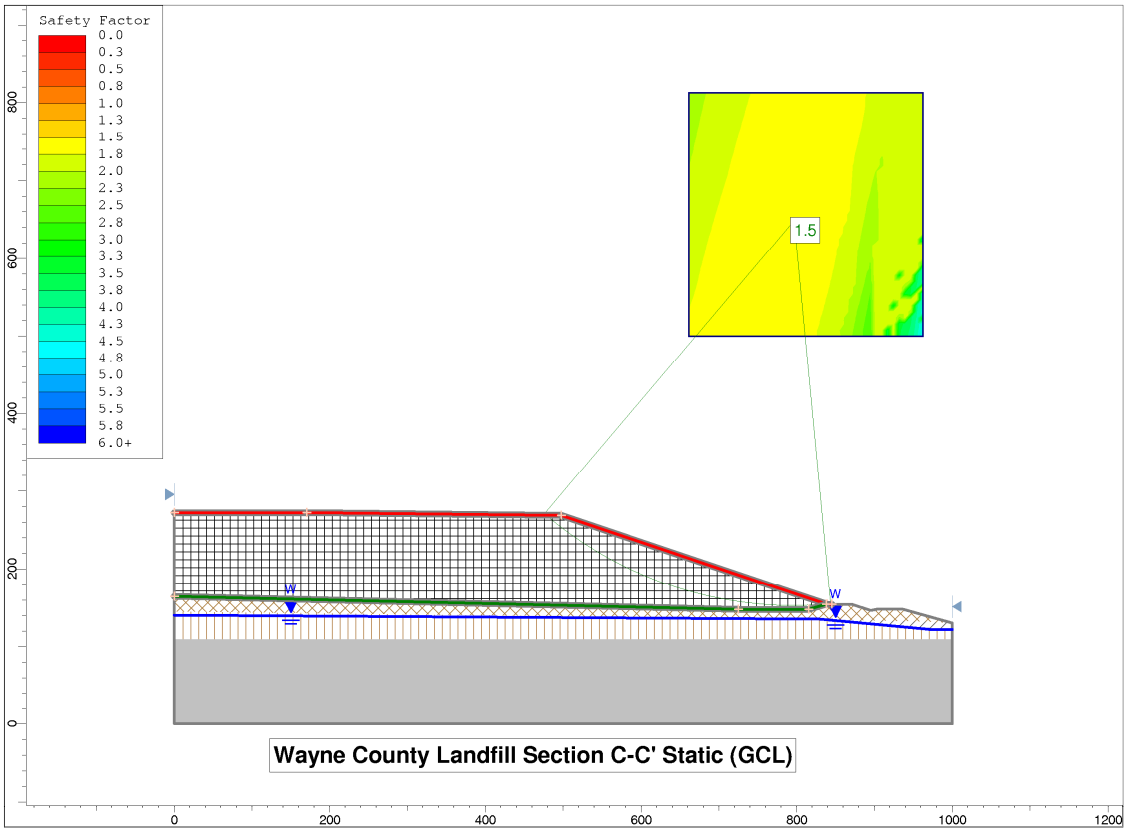
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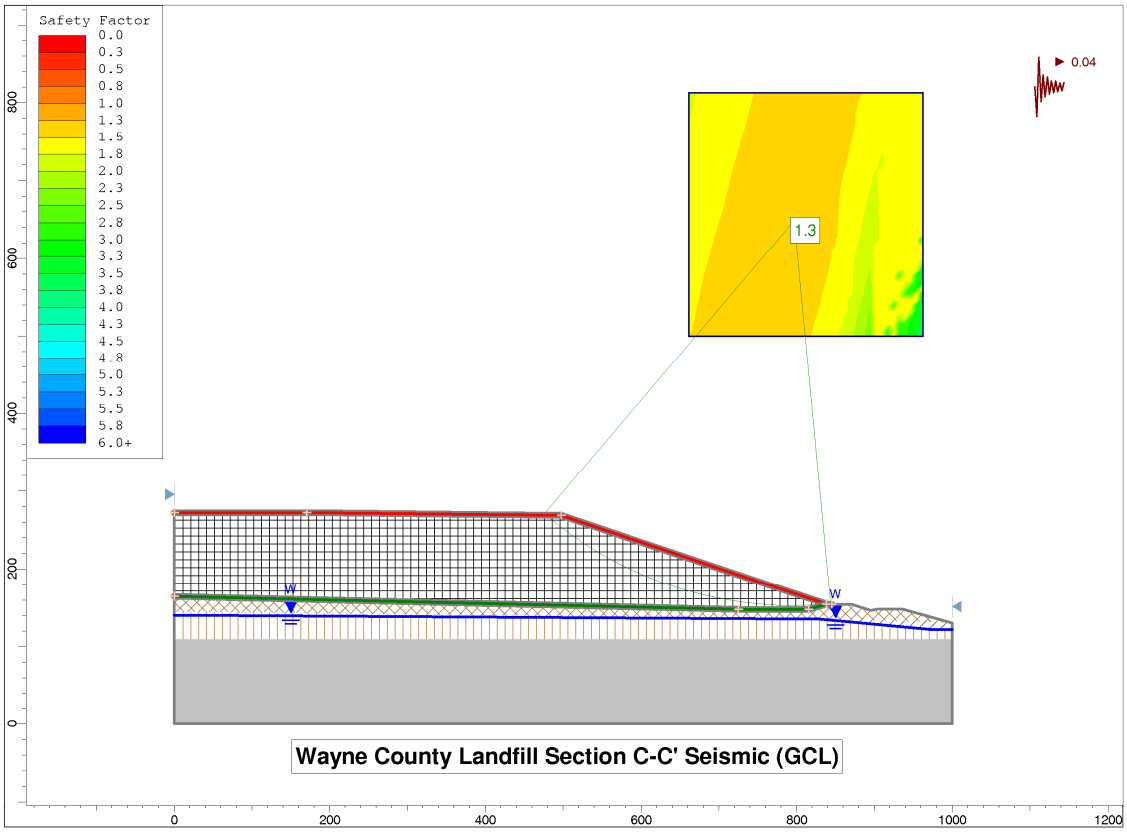
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W
Wayne County Landfill Section C-C' Seismic (GCL)
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(Mailing Address)
1646 Mail Service Center
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E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Wayne Sullivan [mailto:wsullivan@mesco.com]
Sent: Friday, May 03, 2013 10:57 AM
To: Chao, Ming-tai
Subject: Wayne Co. PTO

Ming,

Hope you are doing well. Attached is a letter from ECS concerning the slope stability (Item 19) from your)October 2, 2012 review letter. If you need anything else, just let me know.

Thanks and have a nice day and weekend.

D. Wayne Sullivan
Municipal Engineering Services Co., Inc.
Phone: (919) 772-5393
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ECS CAROLINAS, LLP
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May 2, 2013

Mr. Wayne Sullivan
Municipal Engineering Services Co. PA
PO Box 97
Garner, NC 27529

RE: Comment Letter – NCDENR Response Dated March 6, 2013
Wayne County Landfill, Phase 3
460 S. Landfill Road
Dudley, North Carolina
ECS Project No. 06:16642-A

Dear Wayne:

As requested by you, we have reviewed the email response dated March 6, 2013 from Mr. Ming-Tai Chao, PE with the NCDENR - Division of Waste Management, and offer the following comment. It appears the 18.26 degrees referred in the email from Mr. Chao corresponds to a 3H:1V slope and that is what ECS had used in our slope stability analyses presented in the Report No. 06:16642-A dated November 5, 2010. We also understand the as-built slopes are 3H:1V as well. Therefore, our calculations and recommendations presented in the above report are still valid.

Should you have any questions or if we could be of further assistance, please do not hesitate to contact us.

Respectfully,

ECS CAROLINAS, LLP represented by;
Firm License Number: F-1078

NORTH CAROLINA PROFESSIONAL SEAL 19937 ENGINEER C. NALLAINATHAN
05/02/13

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