



NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT



JAMES B. HUNT JR.
GOVERNOR

September 21, 1998

MEMORANDUM

WAYNE McDEVITT
SECRETARY

To: Bill Sessoms

From: Matt Gamble *MG*

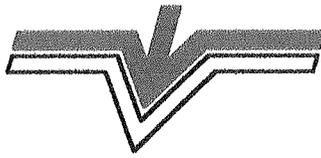
Re: Landfill Expansion
White Oaks Sanitary Landfill
Haywood County, NC

Fac/Perm/Co ID #	Date	Doc ID#
<i>44-07</i>	<i>08/10/1 2011</i>	<i>DIN 14672</i>

WILLIAM L. MEYER
DIRECTOR

Dear Bill:

The Hydrogeologic Unit of the Solid Waste Section has completed a review of the information submitted regarding the above referenced matter. The data submitted in July 1998 and revised in August 1998 by Steffen Robertson and Kirsten (NC), Inc. appears to meet the minimum requirements of 13B .1623 (b).



July 23, 1998

Mr. Bobby Lutfy, Hydrogeologist
Solid Waste Section, Division of Waste Management
North Carolina Department of Environment and Natural Resources
P.O. Box 29603
Raleigh, NC 2711-9603



RE: Design Hydrogeologic Report REV 1 Addendum 1 for the White Oak Landfill, Haywood County, NC

Dear Mr. Lutfy,

This Addendum to the White Oak Landfill Design Hydrogeologic Report REV 1 is in response to your comments during the July 19, 1998 meeting between NCDENR and Steffen, Robertson and Kirsten (N.C.), Inc. (SRK). Please note that this addendum includes an updated Page ii, a new Figure 3 - Single Event 7/7/98 Water Table, and additional boring logs for inclusion in Appendix IV - Cell Specific Investigations.

On Figure 3, you will see that the potentiometric surface mimics the ground surface when crossing the valley. This new figure includes information from borings that Municipal Engineering installed on the western side of the valley (P-4, P-10, and P-12). Although the potentiometric map for this single event does not show any spring relief in the valley, spring relief is probable in the valley from B-113 northwards.

Although the potentiometric surface indicates that any leachate that might escape the liner system will have a direct flow-path to one of the monitoring wells on site (MW-06, MW-05, MW-05D, MW-03, and MW-03D), fractures in the underlying bedrock may affect the flow of leachate prior to encountering the water table. From the rock corings at P2-1 and P2-2, fracturing was observed to occur at 30° from horizontal. Beneath the proposed expansion, the maximum probable distance between the start of bedrock and the potentiometric surface is no more than 15-feet. With fracturing at an angle of 30°, leachate would have a horizontal displacement of no more than 32-feet in any direction. From the figures, one can see the potentiometric surface within a 32-foot radius of the proposed expansion footprint would still direct all flow, and thus any contaminants, to the monitoring wells.

I hope that this resolves the issues that were brought up in the meeting. If not, please feel free to contact me at (803) 790-0602.

Regards,


James Hugh M. Barringer, E.I.T.
Associate Engineer

Attachments

Steffen Robertson and Kirsten (N.C.), Inc.
5641 Piper Drive
Fuquay, North Carolina 27526

WHITE OAK LANDFILL
WASTE CELL 4 DESIGN HYDROGEOLOGIC REPORT REV 1

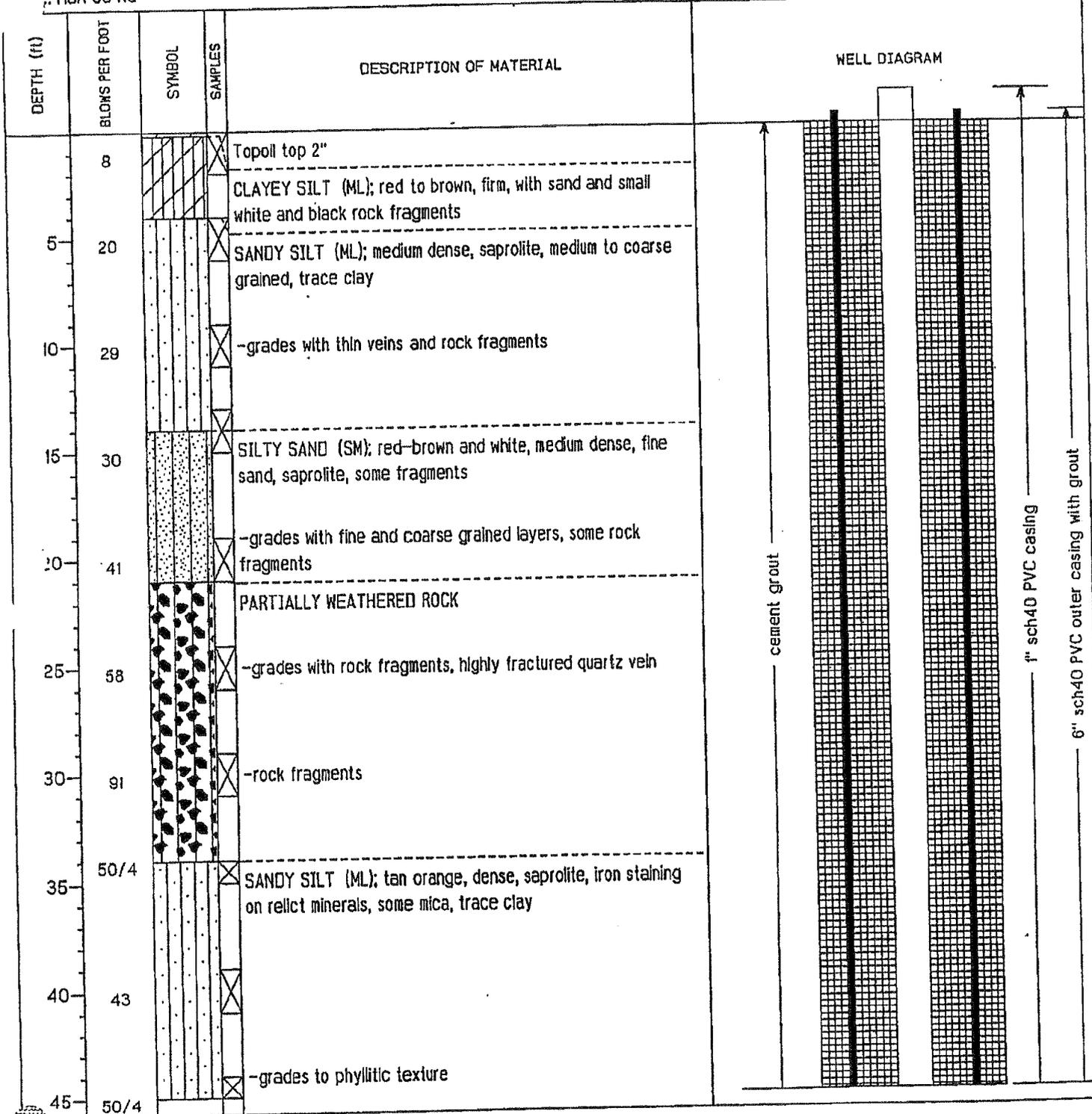
- Appendix I Report of Hydrogeological Study – Law Engineering, Inc.
Appendix II Historical Groundwater Measurements
Appendix III Climatological Information
Appendix IV Cell Specific Investigations
- Figure 1 Bedrock and Potentiometric Surface Map – “Seasonal High Water Table”
Figure 2 Waste Cell 4 Centerline Profile
Figure 3 Single Event 7/7/98 Water Table

LOG OF BORING: P-4

Project: Haywood County
Project No. G98C10.5
HSA SS NQ

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2571.90ft
Top of Casing: 2573.97ft



Depth to Water: 62 ft WD

Completion Depth: 81ft
DATE: 5/9/98

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-4

Project: Haywood County

Drilling Contractor: Graham & Currie

Surface Elevation: 2571.90ft

Project No. G98010.5

Registration Number: 537

Top of Casing: 2573.97ft

Notes: HSA SS NG

DEPTH (ft)	BLOMS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
50	30	[Symbol]	[Symbol]	-grades medium dense, some mica, trace quartz grains and clay	<p>The well diagram shows a cross-section of the well. From top to bottom, it includes: cement grout at the surface; bentonite seal; 6" sch40 PVC outer casing with grout; 1" sch40 PVC casing; gravel pack; 1" sch40 PVC .010 slotted screen; and 6" sch40 PVC outer casing with grout at the bottom.</p>
55	42	[Symbol]	[Symbol]	-grades with medium to coarse grains	
59				Auger Refusal at 59 feet	
60		[Symbol]		GNEISS; grey, moderately weathered, muscovite, biotite, quartz, feldspar, iron staining in fractures fractures parallel to banding at 45 to 60 degrees	
70				REC=77%, RQD=59%	
75				REC=100%, RQD=78%	
81				End of Boring at 81 feet	

Completion Depth: 81ft
DATE: 5/9/98

Depth to Water: 62 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-10

Project: Haywood County
Project No. G98010.5
HSA 55

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2579.73ft
Top of Casing: 2582.10ft

DEPTH (ft)	BLOWS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
5			X	SILT (ML); pink-brown, firm, with sand and clay, trace mica, relict structure	<p>The well diagram shows a 2" sch40 PVC casing extending from the surface down to a depth of 52 feet. The area between the casing and the borehole is filled with cement grout. The borehole itself is shown with a grid pattern representing the soil profile.</p>
7			X	-grades with weathered zones of biotite	
12			X	SANDY SILT (ML); olive green to brown, medium dense, fine to coarse sand, relict structure, weathered relict crystals, some mica	
17			X	SILT (ML); brown to white, very stiff, trace fine sand and rock fragments, layers of mica	
26			X	SANDY SILT (ML); red to brown, medium dense, sand medium grained, zones of muscovite	
32			X	-grades brown, dense, fine sand, rock fragments, iron stained, relict gneissic layering	
31			X	-grades brown to rust colored, poorly sorted sand, rock fragments relict structure	
34			X	-grades with rock fragments	
50/4			X	-grades very dense, relict gneissic structure, rust staining	

Completion Depth: 73.0ft
DATE: 3/19/98

Depth to Water: 52 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-10

Project: Haywood County
Project No. 698010.5
HSA SS

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2579.73ft
Top of Casing: 2582.10ft

DEPTH (ft)	BLOWS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
45	38		X	-grades moist, dense, gneissic structure, trace coarse sand, some mica	<p>The well diagram illustrates the vertical profile of the well. From top to bottom, it shows: a 2" sch40 PVC casing; a section of cement grout; a bentonite seal; a gravel pack; and a 2" sch40 PVC .010 slotted screen. The casing extends to a depth of approximately 65 feet, and the screen is located between 65 and 70 feet depth.</p>
50	18		X	-grades medium dense, with mica and trace clay, iron stained relict fracture	
55	27		X	-grades wet	
60	25		X	-grades with more clay	
65	50/4		X	-grades very dense, relict foliation near vertical	
70	50/5		X	-grades with black and white relict layering	
73.0				End of Boring at 73.0 feet	

Completion Depth: 73.0ft
DATE: 3/19/98

Depth to Water: 52 ft WD

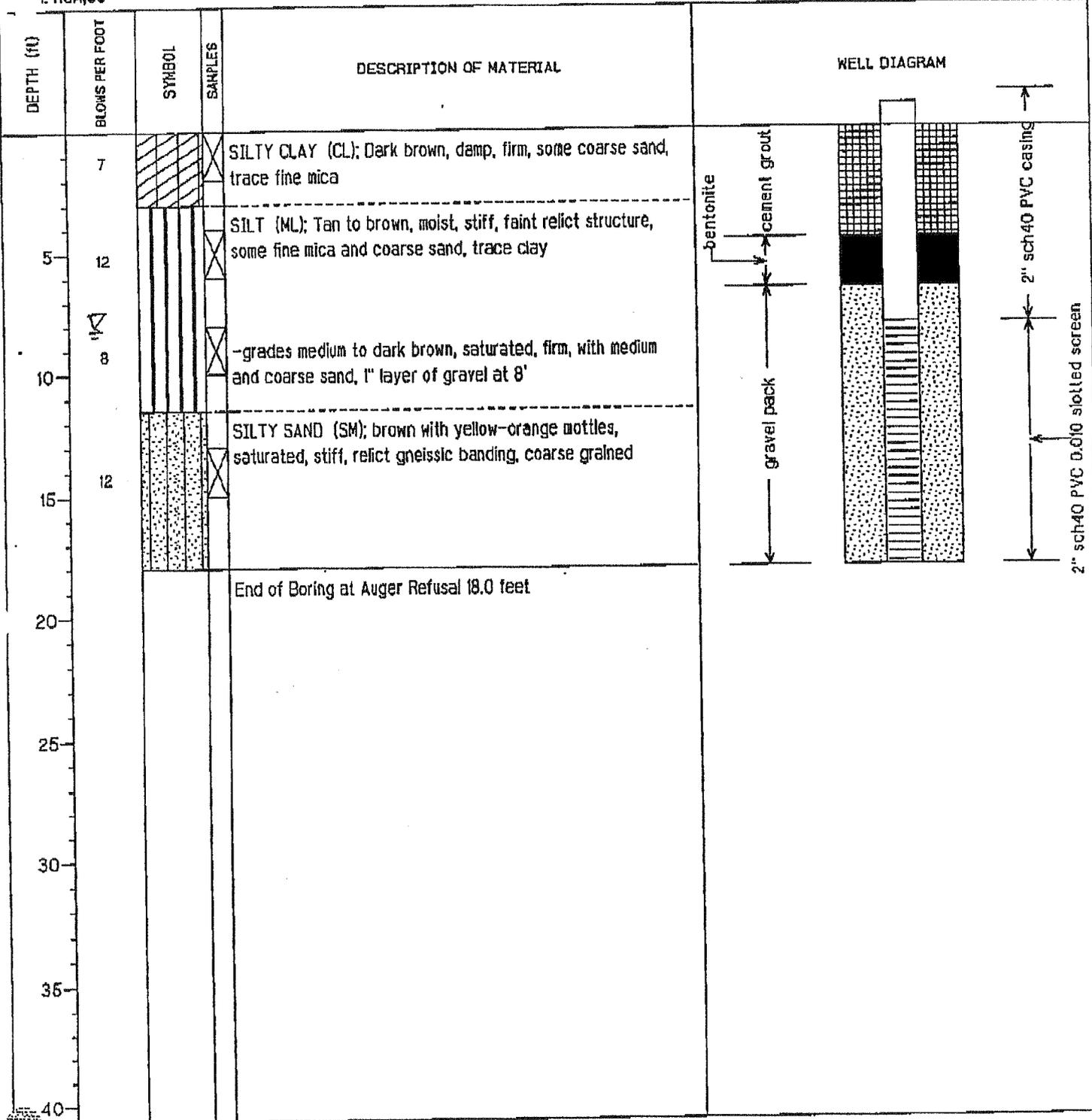
MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-12

Project: Haywood County
Project No. 698010.5
S: HSA,SS

Drilling Contractor: Graham & Currie
Registration Number: 537

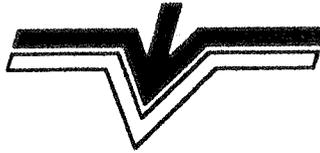
Surface Elevation: 2555.53ft
Top of Casing: 2557.80ft



Completion Depth: 18.0ft
DATE: 3/13/98

Depth to Water: 8.0 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.



July 23, 1998

Mr. Bobby Lutfy, Hydrogeologist
Solid Waste Section, Division of Waste Management
North Carolina Department of Environment and Natural Resources
P.O. Box 29603
Raleigh, NC 2711-9603



RE: Design Hydrogeologic Report REV 1 Addendum 1 for the White Oak Landfill, Haywood County, NC

Dear Mr. Lutfy,

This Addendum to the White Oak Landfill Design Hydrogeologic Report REV 1 is in response to your comments during the July 19, 1998 meeting between NCDENR and Steffen, Robertson and Kirsten (N.C.), Inc. (SRK). Please note that this addendum includes an updated Page ii, a new Figure 3 - Single Event 7/7/98 Water Table, and additional boring logs for inclusion in Appendix IV - Cell Specific Investigations.

On Figure 3, you will see that the potentiometric surface mimics the ground surface when crossing the valley. This new figure includes information from borings that Municipal Engineering installed on the western side of the valley (P-4, P-10, and P-12). Although the potentiometric map for this single event does not show any spring relief in the valley, spring relief is probable in the valley from B-113 northwards.

*why is
springs relief
not reflected
in map*

Although the potentiometric surface indicates that any leachate that might escape the liner system will have a direct flow-path to one of the monitoring wells on site (MW-06, MW-05, MW-05D, MW-03, and MW-03D), fractures in the underlying bedrock may affect the flow of leachate prior to encountering the water table. From the rock corings at P2-1 and P2-2, fracturing was observed to occur at 30° from horizontal. Beneath the proposed expansion, the maximum probable distance between the start of bedrock and the potentiometric surface is no more than 15-feet. With fracturing at an angle of 30°, leachate would have a horizontal displacement of no more than 32-feet in any direction. From the figures, one can see the potentiometric surface within a 32-foot radius of the proposed expansion footprint would still direct all flow, and thus any contaminants, to the monitoring wells.

I hope that this resolves the issues that were brought up in the meeting. If not, please feel free to contact me at (803) 790-0602.

Regards,

James Hugh M. Barringer

James Hugh M. Barringer, E.I.T.
Associate Engineer

Attachments

Steffen Robertson and Kirsten (N.C.), Inc.
5641 Piper Drive
Fuquay, North Carolina 27526

WHITE OAK LANDFILL
WASTE CELL 4 DESIGN HYDROGEOLOGIC REPORT REV 1

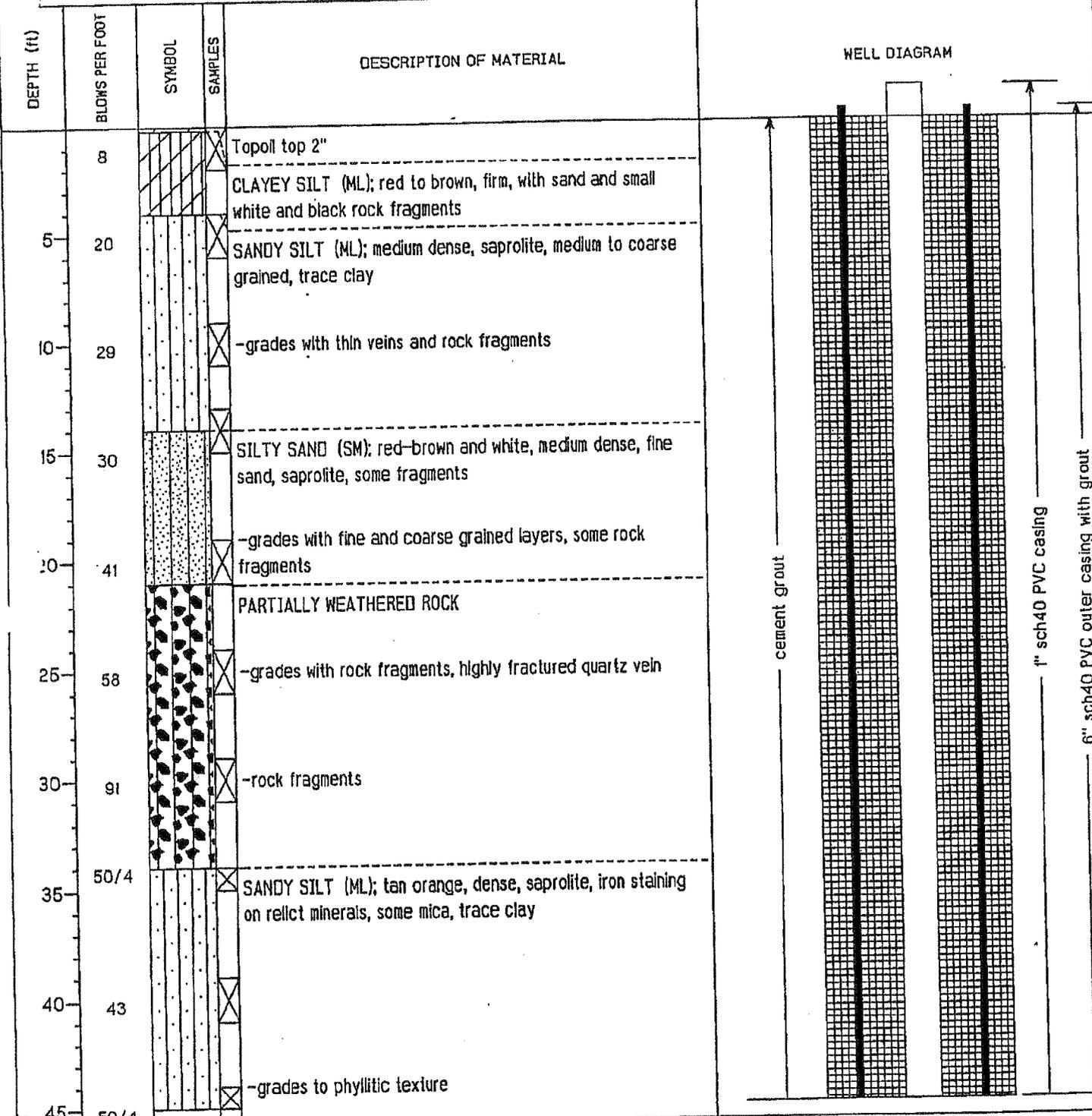
Appendix I	Report of Hydrogeological Study – Law Engineering, Inc.
Appendix II	Historical Groundwater Measurements
Appendix III	Climatological Information
Appendix IV	Cell Specific Investigations
Figure 1	Bedrock and Potentiometric Surface Map – “Seasonal High Water Table”
Figure 2	Waste Cell 4 Centerline Profile
Figure 3	Single Event 7/7/98 Water Table

LOG OF BORING: P-4

Project: Haywood County
Project No. G98010.5
HSA SS NG

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2571.90ft
Top of Casing: 2573.97ft



Depth to Water: 62 ft WD

Completion Depth: 81ft
DATE: 5/9/98

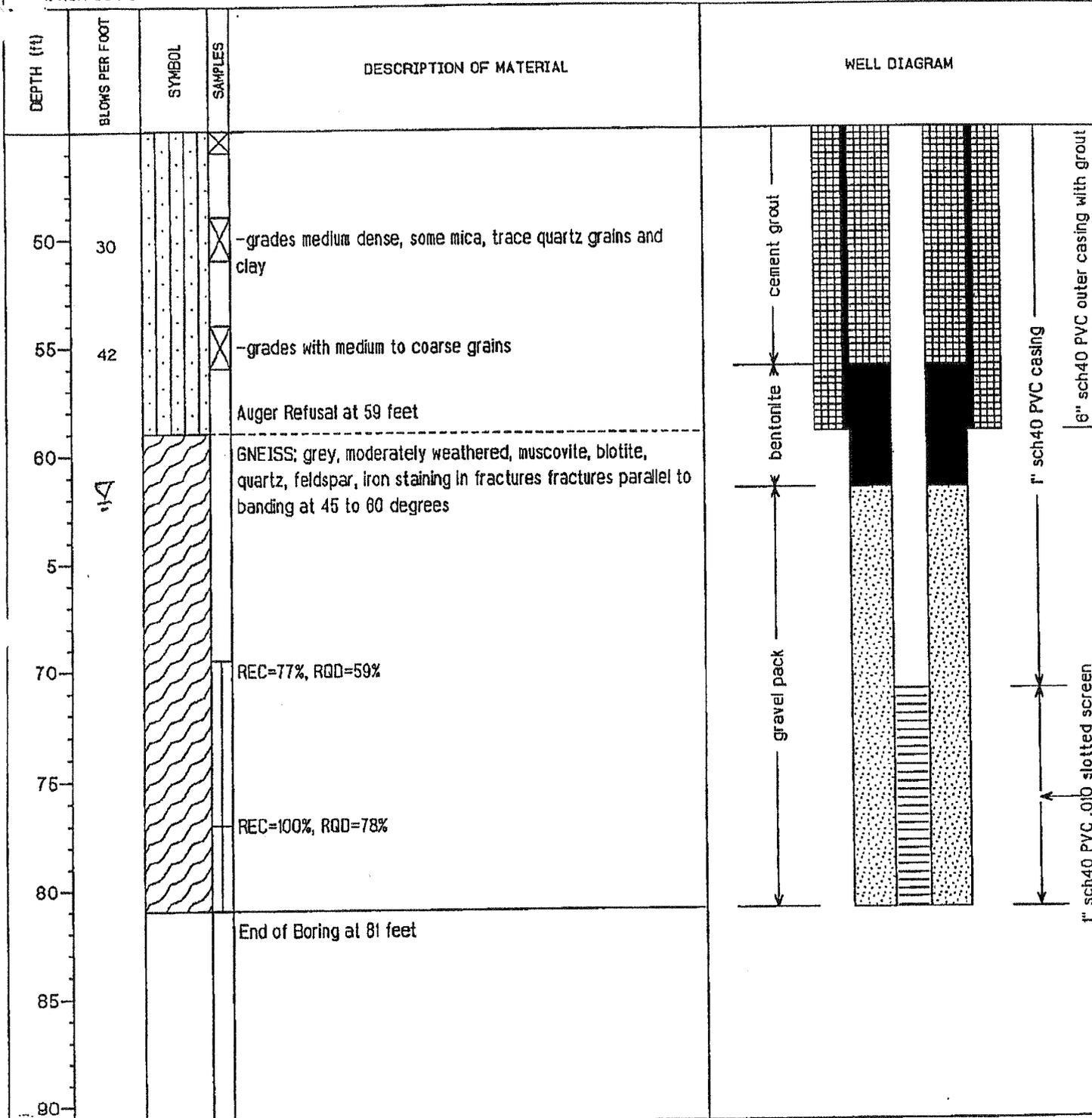
MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-4

Project: Haywood County
Project No. G98010.5
HSA SS NQ

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2571.90ft
Top of Casing: 2573.97ft



Completion Depth: 81ft
DATE: 5/9/98

Depth to Water: 62 ft WD

LOG OF BORING: P-10

Project: Haywood County
Project No. G08010.5
HSA SS

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2579.73ft
Top of Casing: 2582.10ft

DEPTH (ft)	BLOCKS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
5			X	SILT (ML); pink-brown, firm, with sand and clay, trace mica, relict structure	
7			X	-grades with weathered zones of biotite	
12			X	SANDY SILT (ML); olive green to brown, medium dense, fine to coarse sand, relict structure, weathered relict crystals, some mica	
17			X	SILT (ML); brown to white, very stiff, trace fine sand and rock fragments, layers of mica	
26			X	SANDY SILT (ML); red to brown, medium dense, sand medium grained, zones of muscovite	
32			X	-grades brown, dense, fine sand, rock fragments, iron stained, relict gneissic layering	
31			X	-grades brown to rust colored, poorly sorted sand, rock fragments relict structure	
34			X	-grades with rock fragments	
50/4			X	-grades very dense, relict gneissic structure, rust staining	

Completion Depth: 73.0ft
DATE: 3/19/08

Depth to Water: 52 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-10

Project: Haywood County

Drilling Contractor: Graham & Currie

Surface Elevation: 2579.73ft

Project No. 698010.5

Registration Number: 537

Top of Casing: 2582.10ft

HSA SS

DEPTH (ft)	BLOWS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
45	38		X	-grades moist, dense, gneissic structure, trace coarse sand, some mica	<p>The well diagram shows a 2" sch40 PVC casing extending from the surface down to a 2" sch40 PVC .010 slotted screen at 62 feet depth. Above the screen is a gravel pack. A bentonite seal is located between the casing and the gravel pack. Cement grout is shown above the bentonite seal.</p>
50	18		X	-grades medium dense, with mica and trace clay, iron stained relict fracture	
55	27		X	-grades wet	
60	25		X	-grades with more clay	
65	50/4		X	-grades very dense, relict foliation near vertical	
70	50/6		X	-grades with black and white relict layering	
73.0				End of Boring at 73.0 feet	

Completion Depth: 73.0ft
DATE: 3/19/98

Depth to Water: 62 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

LOG OF BORING: P-12

Project: Haywood County
Project No. G98010.5
: HSA,SS

Drilling Contractor: Graham & Currie
Registration Number: 537

Surface Elevation: 2555.53ft
Top of Casing: 2557.80ft

DEPTH (ft)	BLOWS PER FOOT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	WELL DIAGRAM
7		[Diagonal Hatching]	[X]	SILTY CLAY (CL); Dark brown, damp, firm, some coarse sand, trace fine mica	<p>The well diagram shows a 2" sch 40 PVC casing extending from the surface to 8.0 feet depth. Below the casing, there is a gravel pack. The soil layers are shown with their respective patterns: silty clay (diagonal hatching), silt (vertical lines), silty sand (stippled), and a 1" layer of gravel at 8 feet. Labels include 'bentonite' at the top, 'cement grout' between casing sections, and 'gravel pack' for the lower section. A 2" sch 40 PVC 0.010 slotted screen is located at the bottom of the casing at 8.0 feet.</p>
5	12	[Vertical Lines]	[X]	SILT (ML); Tan to brown, moist, stiff, faint relict structure, some fine mica and coarse sand, trace clay	
10	8	[Vertical Lines]	[X]	-grades medium to dark brown, saturated, firm, with medium and coarse sand, 1" layer of gravel at 8'	
15	12	[Stippled]	[X]	SILTY SAND (SM); brown with yellow-orange mottles, saturated, stiff, relict gneissic banding, coarse grained	
20				End of Boring at Auger Refusal 18.0 feet	
25					
30					
35					
40					

Completion Depth: 18.0ft
DATE: 3/13/98

Depth to Water: 8.0 ft WD

MUNICIPAL ENGINEERING SERVICES COMPANY, P.A.

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF WASTE MANAGEMENT



JAMES B. HUNT JR.
GOVERNOR

WAYNE MCDEVITT
SECRETARY

WILLIAM L. MEYER
DIRECTOR

April 29, 1998

C. Jack Horton
Haywood County Manager
420 North Main Street
Courthouse Annex
Waynesville, NC 28786

Ref: Haywood County Permit Renewal

~~Mr. Haywood:~~

The Division of Waste Management, Solid Waste Section (Section) has completed the initial review of the Permit Application for the above referenced project.

The following items must be provided or addressed in order to complete the review process.

Revisions must be made in accordance with North Carolina Solid Waste Management Rule 15A NCAC 13B .1603(b).

Section 1.0 Waste Cell 4 Permit Application Overview refers to seeking a permit modification to allow construction of the additional cell. The proposed revision seeks to expand the current landfill with additional lined cell area. This proposed area constitutes a lateral expansion of the footprint. Lateral expansions require a permit application and review under permit renewal. As such, the application should be revised to address the requirements of 15A NCAC 13B .1603(a)(5) and .1617(e).

Solid Waste Management Rule 15A NCAC 13B 1603(a)(5) references the following:

- .1622(1), (2), (3), (4), (5), and (6)
- .1624(b)(1)

and .1617(e) references the following:

- .1619
- .1620
- .1621
- .1625
- .1629
- .1623(b)

This review letter will attempt to correlate and address the applicable requirements as presented in the submitted modification application. However, it is the applicant's responsibility to ensure that all applicable rules requirements are submitted and addressed.

.1619 Facility Plan

The Section has no engineering comments or questions regarding the Facility Plan at this time.

.1620 Engineering Plan

The Section recommends that where perforated HDPE leachate collection pipe is located, extend the filter wrapped #57 stone through the protective sand layer such that the stone conveyance is in contact with initial waste layer.

.1621 Construction Quality Assurance Plan

Section 5.1.5.1.3 specifies that excavation lines may vary from those shown on the plans. Construction must be in accordance with the final Section approved plans, to include the grade lines shown. Adjustments in base grades must receive prior approval from the Section. Revise this section of the CQA plan accordingly.

The earthwork and clay liner section of the CQA portion of the application does not specify which party is responsible for CQA testing. Rules require that the CQA or Project Engineer is responsible for certifying that the project is constructed in accordance with the approved plans and rules, to include CQA testing. If the bulk of the Construction Quality Control testing is performed by the contractor and to be used as CQA testing, then independent CQA verification testing will be required by the Section. Revise the CQA section of the application accordingly to clarify responsible parties and testing frequencies where applicable.

Permeability testing frequency is not specified in Table 5-2. The Section recommends 1 undisturbed test per acre per lift.

Clay liner thickness is generally verified by as built survey based upon measurements from a grid layout (typically 50 foot grid), except on side slopes where probes are typically utilized. One hand auger probe per acre is not acceptable.

In addition, if auger holes are utilized, filling techniques were not provided (usually a tamped bentonite fill or bentonite blend fill).

Testing and frequency to insure properties of the leachate drainage layer is not provided.

CQA procedures for leachate pipe installation was not provided.

Installation of geonets and geogrids are shown in selected areas. CQA plan not provided.

Acceptable properties and CQA of the top 12 inches of 'native' soil protection, above the leachate collection layer, is not provided.

Overall, the CQA portion of the application appears to be in the form of contract specifications between the owner and contractor rather than a CQA plan. Please review and revise the CQA plan to clarify construction tests, frequency, verifications, and the parties which will be responsible for providing such tests and information which will be presented to the Section in the CQA documentation.

.1622 Location Restrictions for MSWLF Facility Siting

Compliance with .1622(1) Airport Safety not provided.

Compliance with .1622(2) Floodplains not specifically provided. However, location of proposed lateral expansion is obviously not located in a floodplain. General statement to that effect should be provided in the application or on the plans.

Compliance with .1622(3) Wetlands not specifically provided. Location of proposed lateral expansion should have not wetlands impact. However, this should be addressed in the permit renewal application.

Compliance with .1622(4) Fault areas not provided.

Compliance with .1622(5) Seismic Impact Zones not provided.

Compliance with .1622(6) Unstable Areas not provided. This is an evaluation of the overall site stability, not the calculations provided for side slope design.

.1623(b) Design Hydrogeologic Report

Please refer to correspondence from the Sections Hydrogeologists, Mr. Bobby Lutfy and Mr. Matt Gamble for comments and questions regarding .1623(b).

.1624 Construction Requirements for MSWLF Facilities

Indicate location of survey control monuments, tied to North Carolina State Plane coordinates.

Provide information, construction and CQA, specific to the test pad for the clay liner system. The test pad can be located within the proposed cell.

Acceptance and rejection criteria is not completely clear for .1624(b)(8)(B). While some components were found in the CQA plan, these overall parameters should be presented as part of the engineering design plan or supporting calculations appendix.

.1625 Operations Plans for MSWLF Facilities

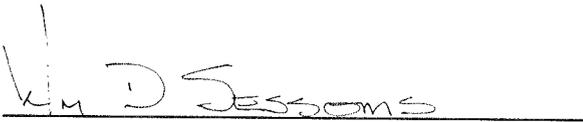
The Section has no comments under .1625 and .1626 at this time. A copy of the operations plan has been sent to the Waste Management Specialist for additional review. Any forthcoming comments will be forwarded to you.

The Section has no comments under .1629 at this time.

The Section reserves the right to request additional information during the continuing review. If additional information is required, you will be notified by the Section.

Should you have any questions concerning this review, please contact me at (919) 733-0692 extension 266 or Matt Gamble at extension 344.

Thank you,



William D. Sessoms, PE

copy: Jim Patterson - DWM
Matt Gamble, PG - DWM