RICHARDSON SMITH GARDNER & ASSOCIATES
ENGINEERING & GEOLOGICAL SERVICES

Permit No.	Date	Document ID No.
94-04	**April 11, 2012**	**16425**

April 11, 2012

Mr. Ming-Tai Chao, P.E.
Environmental Engineer II
NC DENR - Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, NC 27605

RECEIVED – via an e-mail
Date: **April 11, 2012**
Solid Waste Section
Raleigh Central Office

Re: Washington County C&D Landfill (Permit No. 94-04)
Permit Amendment Application - Phase 2
Response to Comments

Dear Mr. Chao:

On behalf of Washington County, Richardson Smith Gardner & Associates, Inc. (RSG) would like to the comments in your email dated January 20, 2012, as follows. The comments stated in your email are repeated below in *italics* and our response follows in **bold**.

Attachment A - Facility and Engineering Plan

1. *(Appendix A) In "1.0 - Capacity Evaluation, Sheet 8 of 9" the soil volume of periodic cover for Phase 6 is 1,674 cubic yards (CY). However, in "2.0 – Earthwork Quantities, Sheet 2 of 3" the amount of the soil volume of periodic cover for Phase 6 is 2,293 CY. Please clarify. Should the value of 1,674 CY is correct, please revise Table 2 of Attachment A accordingly.*

   The value of 1,674 CY is correct. The value shown in the Earthwork Quantity calculations has been revised and Table 2 of the Facility and Engineering Plan has been revised accordingly. Please see the attached revised Facility and Engineering Plan.

Attachment D – Operations Manual

2. *(Section 1.2.2) Please update the contact info of Raleigh Central Office:*
   Address: 217 West Jones Street, Raleigh, NC 27603
   Phone/Fax: 919-707-8200

   Section 1.2.2 has been revised accordingly. Please see the attached revised Operations Manual.

3. *(Section 2.10) Since the contact information of the contactors to haul and manage recyclable and the landfill(s) to receive the collected MSW is unknown at this time, please add the following requirement to the section (the sentence is an example, and you can tailor/polish it as appropriate):*
   "The contact information of the waste/recyclable haulers, firms, and disposal facilities including applicable solid waste permit number, contact person name, phone number, and company/facility addresses will be placed in the operating record."

   Section 2.10 has been revised accordingly. Please see the attached revised Operations Manual.

Also per your request, please find attached the following documents:

1. Revised Attachment I (Local Government Approval Documentation) of the permit application.
2. Erosion and Sedimentation Control Plan Letter of Approval (April 5, 2012).

Please contact me at your earliest convenience with any questions or comments which you may have on this submittal or any further questions or comments you may have on this application.

Sincerely,
Richardson Smith Gardner & Associates, Inc.

NORTH CAROLINA PROFESSIONAL SEAL 021666 ENGINEER PIETER K. SCHEER

4/11/12

Pieter K. Scheer, P.E.
Principal, Project Manager
pieter@rsgengineers.com

Attachments: Revised Facility & Engineering Plan
Revised Operations Manual
Revised Attachment I (Local Government Approval Documentation)
E&SC Plan - Letter of Approval

cc: Carl Critcher, Washington County (x2)
Joan A. Smyth, P.G., RSG

Chao, Ming-tai

From: Pieter Scheer [pieter@rsgengineers.com]
Sent: Wednesday, April 11, 2012 2:30 PM
To: Chao, Ming-tai
Cc: CCRITCHER@WASHCONC.ORG
Subject: RE: Washington County C&DLF, Permit # 94-04

Ming:

I've posted our response to your comments below plus the completed local government approval documentation and approval letter from the Division of Land Resources (just received) on our ftp server (access instruction are below). Please let me know if you have any difficulty in accessing and/or if you would like any hard copies. (Carl – I'll forward 2 hard copies for placement in the County's hard copies.)

https://rsgengineers.egnyte.com/

username: washington
password: wash2011

Thanks!

Pieter

Pieter K. Scheer, P.E.
Principal, Senior Engineer
Richardson Smith Gardner & Associates, Inc.
14 N. Boylan Ave.
Raleigh, NC 27603
Phone: (919) 828-0577
Fax: (919) 828-3899
www.rsgengineers.com

From: Chao, Ming-tai [mailto:ming.chao@ncdenr.gov]
Sent: Friday, January 20, 2012 3:06 PM
To: Pieter Scheer
Cc: CCRITCHER@WASHCONC.ORG; Ritter, Christine
Subject: Washington County C&DLF, Permit # 94-04

Hey Pieter:

I have completed a review of the engineering portions of the revised permit application (Doc ID 15769) dated 11/30/2011, and the comment stated below:

Attachment A - Facility and Engineering Plan

1. (Appendix A) In "1.0 - Capacity Evaluation, Sheet 8 of 9" the soil volume of periodic cover for Phase 6 is 1,674 cubic yards (CY). However, in "2.0 – Earthwork Quantities, Sheet 2 of 3" the amount of the soil volume of periodic cover for Phase 6 is 2,293 CY. Please clarify. Should the value of 1,674 CY is correct, please revise Table 2 of Attachment A accordingly.

Attachment D – Operations Manual

2. (Section 1.2.2) Please update the contact info of Raleigh Central Office:
   Address: 217 West Jones Street, Raleigh, NC 27603
   Phone/Fax: 919-707-8200

3. (Section 2.10) Since the contact information of the contactors to haul and manage recyclable and the landfill(s) to receive the collected MSW is unknown at this time, please add the following requirement to the section (the sentence is an example, and you can tailor/polish it as appropriate): *"The contact information of the waste/recyclable haulers, firms, and disposal facilities including applicable solid waste permit number, contact person name, phone number, and company/facility addresses will be placed in the operating record."*

You can respond the above-mentioned comments at the time when the completed permit application is ready to submit to this office including the documentations associated with local governmental approval processes and the Erosion and Sediment Control Plan approved by the NC Land Quality Section. By the way, I received the document (a letter) to demonstrate the lateral expansion of the C&DLF meets local zone ordinance (Doc ID 15941). Christine may or may not have any comments on design hydro, you can make an inquiry when the completed permit application is about to ready for a final review. Have a nice weekend.

Ming-Tai Chao, P.E.
Environmental Engineer II
Permitting Branch, Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646 (Mailing Address)

Green Square, 217 West Jones Street
Raleigh, NC 27603
Tel. 919-707-8251
ming.chao@ncdenr.gov
http://portal.ncdenr.org/web/wm/sw

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.

Facility and Engineering Plan

Washington County C&D Landfill
Roper, North Carolina

Prepared for:

Washington County Public Utilities
Roper, North Carolina

January 2010
Revised: April 2012

RICHARDSON SMITH GARDNER
& ASSOCIATES
ENGINEERING & GEOLOGICAL
SERVICES

14 N. BOYLAN AVENUE
RALEIGH, NORTH CAROLINA 27603
NC LIC. NO. C-0828 (ENGINEERING)

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WASHINGTON COUNTY C&D LANDFILL
PHASE 2

FACILITY AND ENGINEERING PLAN

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WASHINGTON COUNTY C&D LANDFILL
PHASE 2

FACILITY AND ENGINEERING PLAN

1.0 OVERVIEW

Washington County, North Carolina currently owns and operates a landfill facility off of NC Highway 308 (Mackeys Road) near Roper. Access for the facility is and will continue to be off of Landfill Road. The landfill is permitted under NC Permit 94-04 for the disposal of construction and demolition debris (C&D) waste. The County also conducts several other solid waste management activities at the facility. Refer to the attached **Drawing S1** (Existing Conditions) (**Attachment I**), which shows the existing conditions and **Section 2.1**, which describes facility services.

The County has operated the landfill facility under the current permit since 1996. From the 1980s through 1993 (ceased receipt of waste before Oct. 9, 1993), the facility was permitted to receive municipal solid waste (MSW) under NC Permit 94-02. The MSW was disposed of in an unlined disposal unit (see **Drawing S1**) located on County owned property to the west of the C&D site. The MSW landfill unit was closed in accordance with applicable State Solid Waste Management Rules.

This plan presents information describing the development of Phase 2 and future phases of the C&D landfill.

2.0 FACILITY SERVICES AND WASTE STREAM

2.1 <u>Facility Services</u>

Currently, the following activities or services are provided at the Washington County Landfill facility:

- Scales and office/scale house building
- Maintenance building
- C&D landfill
- Used tire storage area
- White goods and scrap metal handling area
- Yard waste processing area
- Mobile home deconstruction area.

The County may also add roll-off or other suitable containers for recyclables and/or municipal solid waste (MSW). Areas in the vicinity of the white goods/scrap metal handling area would be used for this purpose.

2.2 Types of Waste

C&D waste, used tires, white goods and scrap metal, and yard waste are accepted at the Washington County landfill facility. Wastes are routed to the landfill or other area as appropriate.

2.3 Disposal Rate and Anticipated Variances

An average of approximately 1,500 tons per year of C&D waste (average of approximately 5 tons per day based on 280 days of operation per year) is currently accepted for disposal at the Washington County facility. The County proposes to dispose of a maximum of 10,000 tons per year of C&D waste (average of approximately 36 tons per day based on 280 days of operation per year). Actual annual and daily amounts of C&D waste are expected to vary but will not exceed the proposed annual maximum.

2.4 Service Area

The landfill facility currently serves Washington County.

2.5 Procedures for Waste Segregation

A brief description of procedures for waste segregation is as follows.

Wastes are segregated at the scales. Operators at the scalehouse are trained to classify and segregate the waste stream. C&D wastes are directed to the landfill. Yard wastes are directed toward the yard waste storage and processing area.

Employees at the landfill are trained in the safety procedures for the handling and detection of illegal waste. The screening of unacceptable waste is done through the random checking of incoming loads by a County employee at the scale house and at the tipping area. When unacceptable waste is detected at the scale house, the load is rejected and not permitted into the facility. If hazardous waste is found at the tipping area, identification of the truck or persons is made (if possible) and documented, then the hazardous waste is identified and placed in a hazardous waste container and taken to a designated hazardous waste staging area for proper disposal. If this occurs, the event is reported to the appropriate authorities.

2.6 Equipment Requirements

The County will maintain on-site equipment required to perform the necessary landfill activities. The County currently uses a CAT 953 bulldozer in their day to day operation of the C&D landfill unit. Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed in the landfill's maintenance building.

3.0 LANDFILL CAPACITY

3.1 Total Operating Capacity and Life Expectancy

Drawing S3 (Site Development Plan - Final Cover Grading and Drainage), identifies the final configurations for the C&D landfill. The exterior side slopes will be at a 4H to 1V slope and the top elevation will be at approximately 46 feet.

The estimated total gross operating capacity, net capacity (accounts for periodic and final cover), disposal area, and life expectancy for the landfill are shown in **Table 1**.

3.2 In-Place Ratio of Waste to Soil and Compaction Factor

The capacities obtained above were based on a 10 percent periodic cover ratio and an assumed compaction factor of 900 pounds per cubic yard (0.45 tons/cy). The assumed periodic cover ratio is typical for C&D landfills.

4.0 AVAILABLE SOIL RESOURCES AND REQUIRED SOIL QUANTITIES

The soils required to construct the proposed landfill will be removed from on-site borrow sources.

4.1 Earthwork Quantities

The anticipated quantity of soil to be required as structural fill for foundation soils and berms is shown in **Table 2**.

4.2 Periodic Cover

Assuming the previously mentioned periodic cover ratio of 10 percent, the estimated quantity of soil that will be required for use as periodic cover during C&D landfill operations is shown in **Table 2**.

4.3 Vegetative Soil Layer

On the basis of an average 2 foot thickness, the estimated in-place volume of the vegetative soil layer component of the final cover system required is shown in **Table 2**.

4.4 Soil Summary

The above soil quantities are summarized in **Table 2**. Available on-site borrow sources are anticipated to have an adequate supply of soil to meet the expected needs.

5.0 FACILITY DESIGN CRITERIA

The Washington County C&D landfill is designed and operates in accordance with Section .0542 of the North Carolina Administrative Code, Title 15A, Chapter 13, Subchapter 13B including the following requirements.

5.1 Horizontal Separation Requirements

The horizontal separation requirement between the disposal boundary (edge of waste) and the property lines is a more than 50 feet (as required for existing facilities) (for all phases, the minimum buffer exceeds 200 feet), the minimum buffer between private residences and wells and the disposal boundary is 500 feet, and the minimum buffer between any surface water (stream, river, creek) and the disposal boundary is 50 feet.

5.2 Vertical Separation Requirements

The landfill subgrade elevations have been designed to meet the minimum requirement of four feet above the seasonal high groundwater table and bedrock. Additionally, the in-situ or modified soils making up the upper two feet of separation will consist of SC, SM, ML, CL, MH, or CH soils per the Unified Soil Classification System (USCS).

6.0 CONTAINMENT AND ENVIRONMENTAL CONTROL SYSTEMS

Technical specifications and a project construction quality assurance (CQA) manual for the following materials can be found in **Attachments B and C**, respectively.

6.1 Landfill Subgrade

The subgrade elevations will be achieved by excavation or placement of compacted structural fill (embankment). During excavation, a determination of unsuitable soils (i.e. soils which are too soft, wet, or organic) will be made. Where unsuitable soils are found, the soils will be undercut and backfilled with structural fill. Structural fill will consist of on-site soils, except that no CH, OL, or OH soils will be allowed.

6.2 Final Cover System

The components of the final cover system will consist of the following components (top-down):

Regulatory Final Cover System (.0543 (c) (1)):

- a 6-inch thick vegetative soil layer; and
- an 18-inch thick soil liner with a permeability of no more than 1×10^{-5} cm/sec ("compacted soil barrier").

OR

Alternative Final Cover System (.0543 (c) (3)):

Top Slopes (Typically 5 to 10%):

- an 18-inch thick vegetative soil layer;
- a drainage geocomposite;
- a 30-mil textured LLDPE geomembrane or geosynthetic clay liner (GCL); and
- a 12-inch thick intermediate cover layer.

Side Slopes (Typically 4H:1V):

- a 24-inch thick vegetative soil layer.

The final cover system will be placed on prepared intermediate cover at a maximum slope of 4H:1V. Top slopes will be approximately 8%. A landfill gas (LFG) control system and surface water control devices will also be incorporated into the final cover. The final cover surface will be vegetated upon completion of the final cover installation according to the project seeding specifications.

A final cover infiltration analysis was performed to demonstrate that the proposed final cover system allows less infiltration than the regulatory final cover system (see **Appendix A**). Note that this permit application assumes the installation of the proposed alternative final cover system.

An analysis of the final cover drainage layer (drainage geocomposite) is provided in **Appendix A**. This analysis focused on determining the required transmissivity to maintain the peak head within the drainage geocomposite. An analysis is also provided in **Appendix A** which shows that the upper geotextile of the drainage geocomposite will perform acceptably as a filter when covered with typical site soils.

6.3 Erosion and Sedimentation Control

The Erosion and Sedimentation Control structures provided will be designed and maintained to manage the run-off generated by the 24-hour, 25-year storm event, and conform to the requirements of the Sedimentation Pollution Control Law (15A, NCAC, 4).

A detailed discussion of site erosion and sedimentation control for the landfill can be found in the Project Erosion and Sedimentation Control Plan (**Attachment F**).

6.4 Landfill Gas Control

Landfill gas control will consist of 4 passive wells/vents as shown on **Drawing S3**. Due to a number of factors (the limited depth to groundwater, the sandy soils around the perimeter of the landfill, the distance to site structures, and the existence of wetlands around much of the property), no perimeter monitoring of gas from the C&D landfill is proposed.

6.5 Access and Roadways

Site operations will provide for all-weather access to active areas and site monitoring locations.

7.0 SLOPE STABILITY AND SETTLEMENT

The slope stability of the waste mass as well as an evaluation of foundation settlement are addressed in **Appendix A**. The results of the slope stability analysis indicates that the proposed C&D landfill configuration is stable. The results of the settlement evaluation indicates that there will be minimal settlement and that vertical separation criteria will be achieved.

TABLE 1
SUMMARY OF LANDFILL CAPACITY AND LIFE EXPECTANCY

Unit	Area (Ac.)	Capacity (See Note 1)		Life Expectancy (Years) (See Note 2)
		Gross (CY)	Net (CY/Tons)	
Phase 1 (Filled Through March 28, 2009)	2.34	45,000	40,500 CY 19,777 Tons	-----
Phase 2	0.93	18,430	15,135 CY 7,568 Tons	5.0
Phase 3	0.74	16,783	13,943 CY 6,972 Tons	4.6
Phase 4	----- (See Note 3)	21,571	17,672 CY 8,836 Tons	5.9
Phase 5	----- (See Note 3)	20,986	17,435 CY 8,718 Tons	5.8
Phase 6	----- (See Note 3)	23,195	15,068 CY 7,534 Tons	5.0
Totals:	4.01	145,965	119,753 CY 59,405 Tons	26.3

Notes:
1. The net capacity is based on an assumed 10% periodic cover soil ratio and waste density of 0.5 tons/CY.
2. Phase 2 life expectancy is based on an assumed average disposal rate of 1,500 tons/year and is projected from March 28, 2009 (date of most recent survey).
3. Phases 4-6 are a vertical expansion of Phases 1-3.

TABLE 2
SOIL SUMMARY

Material				
	Phase 2	**Phase 3**	**Phases 4-6 (Final)**	**Total**
Excavation	34	5	-----	39
Embankment	(3,253)	(3,174)	-----	(6,427)
Periodic Cover	(1,682)	(1,549)	(5,575)	(8,806)
Final Cover Soil	(1,613)	(1,291)	(10,002)	(12,906)
Total =	(6,514)	(6,009)	(15,577)	(28,100)

Notes:
1. Phase 2 volumes estimated from March 28, 2009.

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Appendix A

Landfill Design Calculations

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WASHINGTON COUNTY C&D LANDFILL
PHASE 2

FACILITY AND ENGINEERING PLAN
APPENDIX A: LANDFILL DESIGN CALCULATIONS

TABLE OF CONTENTS

1.0 Capacity Evaluation (Density & Life Calcs.) ***(Rev - 11/11)***
2.0 Earthwork Quantities ***(Rev - 4/12)***
3.0 Final Cover Infiltration Analysis
4.0 Final Cover Drainage Layer Analysis ***(New - 11/11)***
5.0 Filter Geotextile Analysis - Final Cover System ***(New - 11/11)***
6.0 Slope Stability Evaluation
7.0 Foundation Settlement Evaluation ***(New - 11/11)***

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PROJECT Washington County C&D Landfill - Phase 2

SUBJECT Capacity Evaluation (Density & Life Calcs.)

JOB NO. WASH-11-1
DATE 11/23/2011
COMPUTED BY PKS
CHECKED BY

Objective To determine the capacity of landfill units. Also, to estimate the expected life of the landfill unit(s) given the proposed contours and the anticipated waste loading rate(s). As part of the evaluation, an evaluation or estimate of waste density will be required based on the known or assumed percentage of periodic cover soil.

Analysis The volume(s) will be calculated by using AutoCAD. Alternatively, the volume(s) will be calculated by taking cross sections of the landfill, using a planimeter to measure the area of the cross sections, and using the average end area method.

CAPACITY LF DENSITY & LIFE.WPD

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET: 2/9
JOB #: WASH-11-1
DATE: 11/23/11
BY: PKS
CHKD BY:

Washington County C&D Landfill - Phase 1
Capacity Evaluation - Filling Rate & Density Calculations

Density and Filling Rate Calculations:

Start Date	Period of Interest End Date	Total Time (years)	Volume Filled (cy)	Quantity of Waste Disposed (tons)	Waste Filling Rate* (lbs/cy)	Periodic Cover Assumed %	Periodic Cover Volume (cy)	Waste Volume (cy)	Waste Density** (lbs/cy)
6/1/1996	3/28/2009	12.83	45,000 *	19,777	**879**	10	4,500	40,500	**977 ** **
		Total Volume =	45,000	19,777			4,500	40,500	

* 45,000 CY Estimated Based on Orig. Design of Soil Berm and Existing Topography.
** Density of Waste is Lower than Actual Based on Unknown Weight of Tires in Monofill. Assume 1,000 pcf is conservative figure.

Notes:
*Waste Filling Rate = (Tons of Waste Disposed)/(Volume Filled).
**Waste Density = (Tons of Waste Disposed)/(Volume Filled - Volume of Periodic Cover).

EXISTING VOLUME USED:

Through 3/28/09

Composite Volumes

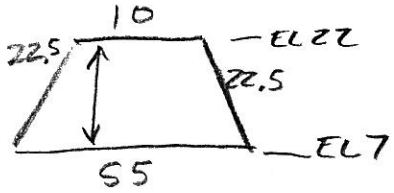
Index	Surface Pair Base Surface	Comparison Surface	Volume Cut	Fill	Net	Net Graph
1	TOPO 050709-ELEV_8	TOPO 050709	0.27 Cu. Yd.	50221.36 Cu. Yd.	50221.09 Cu. Yd....	

+ 1' to EL 7' ≈ 5100 CY

− Berm (660' x 18 CY/LF) ≈ 11,880 CY

Σ = 43,441 ⇒ SAY 45K CY

Panorama



RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	4/9
JOB #:	WASH-11-1
DATE:	11/23/11
BY:	PKS
CHKD BY:	

Washington County Landfill
Capacity Evaluation - C&D - Phase 2

Waste & Periodic Cover Parameters:

Waste Density (pcy) =	1,000	(From Filling Rate and Density Calcs.)
Waste Density (tcy) =	0.50	
Percentage of Periodic Cover =	10	

Volume Calculations:

Volume From AutoCAD (cy) =	18,430	(Compared to March 28, 2009 Topo.)
(= Gross Volume Remaining)		

Net (Waste) Capacity:

Adjustment For Other Layers:

	Area of Final Cover (Ac.) =	0.5
2 feet	Vegetative Soil Layer =	(1,613) cy
	Sum =	(1,613) cy
	Volume of Waste and Periodic Cover (cy) =	16,817
	Volume of Periodic Cover (cy) =	(1,682)
	Net (Waste) Capacity (cy) =	15,135
	Net (Waste) Capacity (tons) =	7,568

Life Expectancy Calculations:

Start Time	End Time	Tons Disposed	Total Tons	Remainder	
2009.24	2010	1,140	1,140	6,428	
2010	2014	6,000	7,140	428	Based on 1,500 Tons/Year
2014	2014.29	428	7,568	(0)	

Landfill Life Expectancy (years) = 5.0 April 2014

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
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Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	5/9
JOB #:	WASH-11-1
DATE:	11/23/11
BY:	PKS
CHKD BY:	

Washington County Landfill
Capacity Evaluation - C&D - Phase 3

Waste & Periodic Cover Parameters:

Waste Density (pcy) =	1,000	(From Filling Rate and Density Calcs.)
Waste Density (tcy) =	0.50	
Percentage of Periodic Cover =	10	

Volume Calculations:

Volume From AutoCAD (cy) =	16,783	(Compared to Phase 2 Fill Contours)
(= Gross Volume Remaining)		

Net (Waste) Capacity:

Adjustment For Other Layers:

	Area of Final Cover (Ac.) =	0.4	
2 feet	Vegetative Soil Layer =	(1,291)	cy
	Sum =	(1,291)	cy
	Volume of Waste and Periodic Cover (cy) =	15,492	
	Volume of Periodic Cover (cy) =	(1,549)	
	Net (Waste) Capacity (cy) =	13,943	
	Net (Waste) Capacity (tons) =	6,972	

Life Expectancy Calculations:

Start Time	End Time	Tons Disposed	Total Tons	Remainder	
2014.29	2015	1,072	1,072	5,900	
2015	2018.93	5,900	6,972	(0)	Based on 1,500 Tons/Year

Landfill Life Expectancy (years) = 4.6 December 2018

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	6/9
JOB #:	WASH-11-1
DATE:	11/23/11
BY:	PKS
CHKD BY:	

Washington County Landfill
Capacity Evaluation - C&D - Phase 4

Waste & Periodic Cover Parameters:

Waste Density (pcy) = 1,000 (From Filling Rate and Density Calcs.)
Waste Density (tcy) = 0.50
Percentage of Periodic Cover = 10

Volume Calculations:

Volume From AutoCAD (cy) = 21,571 (Compared to Phase 3 Fill Contours)
(= Gross Volume Remaining)

Net (Waste) Capacity:

Adjustment For Other Layers:

Area of Final Cover (Ac.) = 0.6

2 feet Vegetative Soil Layer = (1,936) cy

Sum = (1,936) cy

Volume of Waste and Periodic Cover (cy) = 19,635

Volume of Periodic Cover (cy) = (1,964)

Net (Waste) Capacity (cy) = 17,672

Net (Waste) Capacity (tons) = 8,836

Life Expectancy Calculations:

Start Time	End Time	Tons Disposed	Total Tons	Remainder	
2018.93	2019	100	100	8,736	
2019	2024	7,500	7,600	1,236	Based on 1,500 Tons/Year
2024	2024.82	1,236	8,836	(0)	

Landfill Life Expectancy (years) = 5.9 October 2024

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	7/9
JOB #:	WASH-11-1
DATE:	11/23/11
BY:	PKS
CHKD BY:	

Washington County Landfill
Capacity Evaluation - C&D - Phase 5

Waste & Periodic Cover Parameters:

Waste Density (pcy) = 1,000 (From Filling Rate and Density Calcs.)
Waste Density (tcy) = 0.50
Percentage of Periodic Cover = 10

Volume Calculations:

Volume From AutoCAD (cy) = 20,986 (Compared to Phase 4 Fill Contours)
(= Gross Volume Remaining)

Net (Waste) Capacity:

Adjustment For Other Layers:

Area of Final Cover (Ac.) = 0.5

2 feet Vegetative Soil Layer = (1,613) cy

Sum = (1,613) cy

Volume of Waste and Periodic Cover (cy) = 19,373

Volume of Periodic Cover (cy) = (1,937)

Net (Waste) Capacity (cy) = 17,435

Net (Waste) Capacity (tons) = 8,718

Life Expectancy Calculations:

Start Time	End Time	Tons Disposed	Total Tons	Remainder	
2024.82	2025	264	264	8,454	
2025	2030	7,500	7,764	954	Based on 1,500 Tons/Year
2030	2030.64	954	8,718	(0)	

Landfill Life Expectancy (years) = 5.8 August 2030

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	8/9
JOB #:	WASH-11-1
DATE:	11/23/11
BY:	PKS
CHKD BY:	

Washington County Landfill
Capacity Evaluation - C&D - Phase 6

Waste & Periodic Cover Parameters:

Waste Density (pcy) =	1,000	(From Filling Rate and Density Calcs.)
Waste Density (tcy) =	0.50	
Percentage of Periodic Cover =	10	

Volume Calculations:

Volume From AutoCAD (cy) =	23,195	(Compared to Phase 5 Fill Contours)
(= Gross Volume Remaining)		

Net (Waste) Capacity:

Adjustment For Other Layers:

	Area of Final Cover (Ac.) =	2.0
2 feet	Vegetative Soil Layer =	(6,453) cy
	Sum =	(6,453) cy
	Volume of Waste and Periodic Cover (cy) =	16,742
	Volume of Periodic Cover (cy) =	(1,674)
	Net (Waste) Capacity (cy) =	15,068
	Net (Waste) Capacity (tons) =	7,534

Life Expectancy Calculations:

Start Time	End Time	Tons Disposed	Total Tons	Remainder	
2030.64	2031	546	546	6,988	
2031	2035	6,000	6,546	988	Based on 1,500 Tons/Year
2035	2035.66	988	7,534	(0)	

Landfill Life Expectancy (years) = 5.0 August 2035

Richardson Smith Gardner & Associates 11/22/2011

9/9

Client - Washington County
Project - Wash 11-1
Volume Report - Running Volume 11/22/11

version	date	time	surfBase	surfCompare	volCut	volFill	volNet
1	11/22/2011	11-23-02	Topo 050709	PH2-SGRD	34.32	3,253.15	3,218.83
1	11/22/2011	11-23-02	Topo paste PH2-SGRD	PH3-SGRD	4.77	3,173.58	3,168.81
1	11/22/2011	11-23-02	Prior paste PH3-SGRD	PH2-FCVR	~~88.44~~	18,430.15	18,341.71
1	11/22/2011	11-23-02	Prior paste PH2-FCVR	PH3-FCVR	~~1,476.90~~	16,783.03	15,306.13
1	11/22/2011	11-23-02	Prior paste PH3-FCVR	PH4-FCVR	~~556.43~~	21,571.11	21,014.68
1	11/22/2011	16-22-59	Prior paste PH4-FCVR	PH5-FCVR	0.00	20,986.16	20,986.16
1	11/22/2011	16-22-59	Prior paste PH5-FCVR	PH6-FCVR	0.00	23,194.61	23,194.61

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PROJECT Washington County C&D Landfill - Phase 2

SUBJECT Earthwork Quantities

JOB NO. WASH-11-1
DATE 4/10/2012
COMPUTED BY PKS
CHECKED BY

Objective To determine the earthwork and related material quantities associated with the construction and operation of the landfill.

Analysis The volumes of each material will be calculated by taking design thicknesses and/or cross sections and multiplying by design areas and/or lengths. Areas and lengths are determined using AutoCAD, a planimeter, and/or direct measurement.

EARTHWORK.WPD

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

RICHARDSON SMITH GARDNER & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET:	2/3
JOB #:	WASH-11-1
DATE:	4/10/12
BY:	PKS
CHKD BY:	

Washington County C&D Landfill
Earthwork Quantities

Phase 2:

Subgrade Cut and Fill Volumes:

Volume of Cut (cy) = 34 **(From AutoCAD - See Attached)**
Volume of Fill (cy) = 3,253 **(From AutoCAD - See Attached)**

Periodic Cover Soil Volumes:

Volume of Periodic Cover (cy) = 1,682 **(User Input - From Capacity Evaluation)**

Vegetative Soil Layer (VSL) Volume:

Volume of VSL (cy) = 1,613 **(User Input - From Capacity Evaluation)**

Phase 3:

Subgrade Cut and Fill Volumes:

Volume of Cut (cy) = 5 **(From AutoCAD - See Attached)**
Volume of Fill (cy) = 3,174 **(From AutoCAD - See Attached)**

Periodic Cover Soil Volumes:

Volume of Periodic Cover (cy) = 1,549 **(User Input - From Capacity Evaluation)**

Vegetative Soil Layer (VSL) Volume:

Volume of VSL (cy) = 1,291 **(User Input - From Capacity Evaluation)**

Phase 4:

Periodic Cover Soil Volumes:

Volume of Periodic Cover (cy) = 1,964 **(User Input - From Capacity Evaluation)**

Vegetative Soil Layer (VSL) Volume:

Volume of VSL (cy) = 1,936 **(User Input - From Capacity Evaluation)**

Phases 5:

Periodic Cover Soil Volumes:

Volume of Periodic Cover (cy) = 1,937 **(User Input - From Capacity Evaluation)**

Vegetative Soil Layer (VSL) Volume:

Volume of VSL (cy) = 1,613 **(User Input - From Capacity Evaluation)**

Phase 6:

Periodic Cover Soil Volumes:

Volume of Periodic Cover (cy) = 1,674 **(User Input - From Capacity Evaluation)**

Vegetative Soil Layer (VSL) Volume:

Volume of VSL (cy) = 6,453 **(User Input - From Capacity Evaluation)**

Richardson Smith Gardner & Associates 11/22/2011

3/3

Client - Washington County
Project - Wash 11-1
Volume Report - Running Volume 11/22/11

version	date	time	surfBase	surfCompare	volCut	volFill	volNet
1	11/22/2011	11-23-02	Topo 050709	PH2-SGRD	34.32	3,253.15	3,218.83
1	11/22/2011	11-23-02	Topo paste PH2-SGRD	PH3-SGRD	4.77	3,173.58	3,168.81
1	11/22/2011	11-23-02	Prior paste PH3-SGRD	PH2-FCVR	~~88.44~~	18,430.15	18,341.71
1	11/22/2011	11-23-02	Prior paste PH2-FCVR	PH3-FCVR	~~1,476.90~~	16,783.03	15,306.13
1	11/22/2011	11-23-02	Prior paste PH3-FCVR	PH4-FCVR	~~556.43~~	21,571.11	21,014.68
1	11/22/2011	16-22-59	Prior paste PH4-FCVR	PH5-FCVR	0.00	20,986.16	20,986.16
1	11/22/2011	16-22-59	Prior paste PH5-FCVR	PH6-FCVR	0.00	23,194.61	23,194.61

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PROJECT Washington County C&D Landfill - Phase 2

SUBJECT Final Cover Infiltration Analysis

JOB NO. WASH-09-1
DATE 11/16/09
COMPUTED BY PKS
CHECKED BY

Objective

To determine the expected average annual infiltration into the landfill through the proposed final cover system. In that the proposed final cover system is an alternate system to the regulatory final cover, the infiltration through the proposed system is compared to the infiltration through the regulatory system. Use the EPA HELP Model (v. 3.07) in the analysis.

References

Schroeder, P.R., Lloyd, C.M., et. al, (1994), "The Hydrologic Evaluation of Landfill Performance (HELP) Model - User's Guide for Version 3," EPA/600/9-94/168a, USEPA Risk Reduction Laboratory, Cincinnati, Ohio.

Schroeder, P.R., Lloyd, C.M., et. al, (1994), "The Hydrologic Evaluation of Landfill Performance (HELP) Model - Engineering Documentation for Version 3," EPA/600/9-94/168b, USEPA Risk Reduction Laboratory, Cincinnati, Ohio.

Analysis

Final Cover Systems Analyzed:

1A. Proposed Final Cover System (Top Slopes - 5 to 8%): (Top Down)

A. 18 inches Vegetative Soil Layer
B. Drainage Geocomposite
C. 30 mil Textured LLDPE Geomembrane or Geosynthetic Clay Liner (GCL)
D. 12 inches Intermediate Cover

1B. Proposed Final Cover System (Side Slopes - 4H:1V):

A. 24 inches Vegetative Soil Layer

2. Regulatory Final Cover System: (Top Down)

A. 6 inches Vegetative Soil Layer
B. 18 inches Compacted Soil Barrier ($k = 1 \times 10^{-5}$ cm/sec)
C. 12 inches Intermediate Cover

Results

The results as summarized below show that the proposed final cover system allows less infiltration than the regulatory final cover system. HELP Model runs are attached.

Case	Avg. Annual Infiltration (in)
1A (GM)	0.03
1A (GCL)	0.03
1B (Soil)	12.2
2 (RMC)	17.9

FCS HELP.WPD

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Engineering and Geological Services
14 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\PROGRA~1\HELP3\RALNCP.D4
TEMPERATURE DATA FILE:       C:\PROGRA~1\HELP3\RALNCT.D7
SOLAR RADIATION DATA FILE:   C:\PROGRA~1\HELP3\RALNCS.D13
EVAPOTRANSPIRATION DATA:     C:\PROGRA~1\HELP3\RALNCE.D11
SOIL AND DESIGN DATA FILE:   C:\PROGRA~1\HELP3\WCGM08.D10
OUTPUT DATA FILE:            C:\PROGRA~1\HELP3\WCGM08.OUT


TIME:   9:15     DATE:  11/16/2009


******************************************************************************

     TITLE:  Washington County C&DLF - Case 1A (GM) (8% Slope)
******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     18.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0671 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

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                                  LAYER  2
                                  --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                         MATERIAL TEXTURE NUMBER  20
          THICKNESS                    =      0.25   INCHES
          POROSITY                     =      0.8500 VOL/VOL
          FIELD CAPACITY               =      0.0100 VOL/VOL
          WILTING POINT                =      0.0050 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0749 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =   10.0000000000     CM/SEC
          SLOPE                        =      8.00   PERCENT
          DRAINAGE LENGTH              =     70.0    FEET


                                  LAYER  3
                                  --------

                     TYPE 4 - FLEXIBLE MEMBRANE LINER
                         MATERIAL TEXTURE NUMBER  36
          THICKNESS                    =      0.03   INCHES
          POROSITY                     =      0.0000 VOL/VOL
          FIELD CAPACITY               =      0.0000 VOL/VOL
          WILTING POINT                =      0.0000 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
          FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
          FML INSTALLATION DEFECTS     =      8.00   HOLES/ACRE
          FML PLACEMENT QUALITY        =  3 - GOOD


                                  LAYER  4
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1060 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC


                  GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                  ----------------------------------------

     NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
              SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A
              FAIR STAND OF GRASS, A SURFACE SLOPE OF  8.%
              AND A SLOPE LENGTH OF   70. FEET.

     SCS RUNOFF CURVE NUMBER              =     64.60
     FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
     AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
     EVAPORATIVE ZONE DEPTH               =     18.2    INCHES
```

2/2

INITIAL WATER IN EVAPORATIVE ZONE	=	1.226	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.078	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.847	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	2.499	INCHES
TOTAL INITIAL WATER	=	2.499	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
RALEIGH NORTH CAROLINA

STATION LATITUDE	=	35.87	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	86	
END OF GROWING SEASON (JULIAN DATE)	=	310	
EVAPORATIVE ZONE DEPTH	=	18.2	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.60	41.60	49.30	59.50	67.20	73.90
77.70	77.00	71.00	59.70	50.00	42.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA
AND STATION LATITUDE = 35.87 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.44	2.92	3.81	2.20	4.34	3.74
	4.24	5.43	2.40	2.87	3.05	2.80
STD. DEVIATIONS	2.07	1.23	1.51	1.52	2.22	1.98
	1.91	3.72	1.67	2.00	1.79	1.04
RUNOFF						
TOTALS	0.000	0.000	0.005	0.000	0.000	0.000
	0.000	0.026	0.001	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.023	0.000	0.002	0.000
	0.000	0.101	0.006	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	1.422	1.621	2.390	1.916	2.776	2.760
	3.097	3.150	1.653	1.185	1.262	1.143
STD. DEVIATIONS	0.279	0.344	0.586	0.941	1.187	1.390
	1.146	1.259	0.904	0.478	0.432	0.210
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	1.8204	1.4153	1.5422	0.7660	1.6326	1.0592
	1.1420	2.1174	1.0483	1.2971	1.3930	1.5288
STD. DEVIATIONS	1.5094	0.8850	0.9858	0.6279	1.2008	0.7387
	0.9350	2.2062	1.0631	1.2040	1.0598	0.7784
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0035	0.0030	0.0031	0.0017	0.0029	0.0019
	0.0020	0.0034	0.0018	0.0022	0.0027	0.0030
STD. DEVIATIONS	0.0023	0.0016	0.0017	0.0011	0.0020	0.0013
	0.0015	0.0031	0.0016	0.0018	0.0018	0.0013
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0017	0.0015	0.0018	0.0024	0.0022	0.0025
	0.0027	0.0024	0.0027	0.0026	0.0020	0.0020
STD. DEVIATIONS	0.0007	0.0007	0.0007	0.0007	0.0009	0.0007
	0.0006	0.0008	0.0006	0.0009	0.0007	0.0006

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0111	0.0094	0.0094	0.0048	0.0099	0.0067
	0.0070	0.0129	0.0066	0.0079	0.0088	0.0093
STD. DEVIATIONS	0.0092	0.0059	0.0060	0.0039	0.0073	0.0046
	0.0057	0.0134	0.0067	0.0073	0.0067	0.0047

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	41.25	(8.104)	149735.7	100.00
RUNOFF	0.033	(0.1113)	120.23	0.080
EVAPOTRANSPIRATION	24.375	(3.7723)	88480.87	59.091
LATERAL DRAINAGE COLLECTED FROM LAYER 2	16.76228	(5.00257)	60847.090	40.63633
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.03109	(0.00813)	112.853	0.07537
AVERAGE HEAD ON TOP OF LAYER 3	0.009	(0.003)		
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02659	(0.00459)	96.514	0.06446
CHANGE IN WATER STORAGE	0.053	(0.8534)	190.98	0.128

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	0.450	1632.0024
DRAINAGE COLLECTED FROM LAYER 2	1.79238	6506.35205
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.001762	6.39447
AVERAGE HEAD ON TOP OF LAYER 3	0.338	
MAXIMUM HEAD ON TOP OF LAYER 3	0.651	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	2.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000159	0.57787
SNOW WATER	1.80	6547.7266

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.2873

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0464

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.1643	0.1202
2	0.0243	0.0974
3	0.0000	0.0000
4	1.3621	0.1135
SNOW WATER	0.000	

```
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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\PROGRA~1\HELP3\RALNCP.D4
TEMPERATURE DATA FILE:       C:\PROGRA~1\HELP3\RALNCT.D7
SOLAR RADIATION DATA FILE:   C:\PROGRA~1\HELP3\RALNCS.D13
EVAPOTRANSPIRATION DATA:     C:\PROGRA~1\HELP3\RALNCE.D11
SOIL AND DESIGN DATA FILE:   C:\PROGRA~1\HELP3\WCGCL08.D10
OUTPUT DATA FILE:            C:\PROGRA~1\HELP3\WCGCL08.OUT


TIME:   9:24     DATE:  11/16/2009


******************************************************************************

     TITLE:  Washington County C&DLF - Case 1A (GCL) (8% Slope)

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     18.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0563 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

```
                                  LAYER  2
                                  --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                         MATERIAL TEXTURE NUMBER  20
          THICKNESS                    =      0.25   INCHES
          POROSITY                     =      0.8500 VOL/VOL
          FIELD CAPACITY               =      0.0100 VOL/VOL
          WILTING POINT                =      0.0050 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0763 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =   10.0000000000     CM/SEC
          SLOPE                        =      8.00   PERCENT
          DRAINAGE LENGTH              =     70.0    FEET

                                  LAYER  3
                                  --------

                     TYPE 3 - BARRIER SOIL LINER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =      0.20   INCHES
          POROSITY                     =      0.7500 VOL/VOL
          FIELD CAPACITY               =      0.7470 VOL/VOL
          WILTING POINT                =      0.4000 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC

                                  LAYER  4
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1054 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC


                  GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                  ----------------------------------------

        NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                 SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A
                 FAIR STAND OF GRASS, A SURFACE SLOPE OF  8.%
                 AND A SLOPE LENGTH OF   70. FEET.

SCS RUNOFF CURVE NUMBER              =     64.60
FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
EVAPORATIVE ZONE DEPTH               =     18.2    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      1.033  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =      8.078  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      0.847  INCHES
INITIAL SNOW WATER                   =      0.000  INCHES
```

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INITIAL WATER IN LAYER MATERIALS	=	2.447	INCHES
TOTAL INITIAL WATER	=	2.447	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
RALEIGH NORTH CAROLINA

STATION LATITUDE	=	35.87	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	86	
END OF GROWING SEASON (JULIAN DATE)	=	310	
EVAPORATIVE ZONE DEPTH	=	18.2	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.60	41.60	49.30	59.50	67.20	73.90
77.70	77.00	71.00	59.70	50.00	42.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA
AND STATION LATITUDE = 35.87 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.44	2.92	3.81	2.20	4.34	3.74
	4.24	5.43	2.40	2.87	3.05	2.80
STD. DEVIATIONS	2.07	1.23	1.51	1.52	2.22	1.98
	1.91	3.72	1.67	2.00	1.79	1.04
RUNOFF						
TOTALS	0.000	0.000	0.005	0.000	0.001	0.000
	0.000	0.025	0.001	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.022	0.000	0.003	0.000
	0.000	0.106	0.006	0.000	0.001	0.000
EVAPOTRANSPIRATION						
TOTALS	1.467	1.654	2.345	1.909	2.807	2.734
	2.923	3.184	1.684	1.243	1.261	1.159
STD. DEVIATIONS	0.269	0.317	0.614	0.997	1.123	1.440
	1.321	1.131	0.889	0.502	0.465	0.198
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	1.8128	1.5632	1.6989	0.6449	1.5006	1.2998
	1.3085	1.9957	1.0964	1.0334	1.3887	1.4132
STD. DEVIATIONS	1.5435	0.9714	1.1582	0.5873	1.2192	0.9499
	0.9314	2.1968	1.1342	1.0592	1.0185	0.6486
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0043	0.0041	0.0037	0.0024	0.0023	0.0014
	0.0012	0.0018	0.0010	0.0016	0.0032	0.0042
STD. DEVIATIONS	0.0014	0.0011	0.0016	0.0019	0.0016	0.0010
	0.0009	0.0013	0.0009	0.0012	0.0019	0.0014
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0008	0.0006	0.0013	0.0022	0.0025	0.0030
	0.0032	0.0028	0.0032	0.0028	0.0015	0.0009
STD. DEVIATIONS	0.0008	0.0008	0.0012	0.0016	0.0012	0.0010
	0.0011	0.0010	0.0010	0.0012	0.0014	0.0010

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0110	0.0104	0.0103	0.0041	0.0091	0.0082
	0.0080	0.0121	0.0069	0.0063	0.0087	0.0086
STD. DEVIATIONS	0.0094	0.0065	0.0070	0.0037	0.0074	0.0060
	0.0057	0.0134	0.0071	0.0064	0.0064	0.0039

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	41.25	(8.104)	149735.7	100.00
RUNOFF	0.032	(0.1131)	116.34	0.078
EVAPOTRANSPIRATION	24.371	(3.6606)	88465.12	59.081
LATERAL DRAINAGE COLLECTED FROM LAYER 2	16.75596	(5.15566)	60824.145	40.62100
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.03101	(0.00742)	112.576	0.07518
AVERAGE HEAD ON TOP OF LAYER 3	0.009	(0.003)		
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.02494	(0.00693)	90.527	0.06046
CHANGE IN WATER STORAGE	0.066	(1.0441)	239.56	0.160

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	0.472	1715.1364
DRAINAGE COLLECTED FROM LAYER 2	1.78592	6482.88867
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000457	1.65831
AVERAGE HEAD ON TOP OF LAYER 3	0.337	
MAXIMUM HEAD ON TOP OF LAYER 3	0.649	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	2.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000198	0.71986
SNOW WATER	1.80	6547.7266

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.2871

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0464

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.2069	0.1226
2	0.0243	0.0973
3	0.1500	0.7500
4	1.3859	0.1155
SNOW WATER	0.000	

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\PROGRA~1\HELP3\RALNCP.D4
TEMPERATURE DATA FILE:       C:\PROGRA~1\HELP3\RALNCT.D7
SOLAR RADIATION DATA FILE:   C:\PROGRA~1\HELP3\RALNCS.D13
EVAPOTRANSPIRATION DATA:     C:\PROGRA~1\HELP3\RALNCE.D11
SOIL AND DESIGN DATA FILE:   C:\PROGRA~1\HELP3\WCSOIL25.D10
OUTPUT DATA FILE:            C:\PROGRA~1\HELP3\WCSOIL25.OUT


TIME:   9:25     DATE:  11/16/2009


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     TITLE:  Washington County C&DLF - Cases 1B (Soil) (25%)

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                  =     24.00   INCHES
          POROSITY                   =      0.4370 VOL/VOL
          FIELD CAPACITY             =      0.1050 VOL/VOL
          WILTING POINT              =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.1780 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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                    GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                    ----------------------------------------

     NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
              SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A
              FAIR STAND OF GRASS, A SURFACE SLOPE OF 25.%
              AND A SLOPE LENGTH OF  130. FEET.

     SCS RUNOFF CURVE NUMBER              =     64.40
     FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
     AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
     EVAPORATIVE ZONE DEPTH               =     22.0    INCHES
     INITIAL WATER IN EVAPORATIVE ZONE    =      3.852  INCHES
     UPPER LIMIT OF EVAPORATIVE STORAGE   =      9.614  INCHES
     LOWER LIMIT OF EVAPORATIVE STORAGE   =      1.034  INCHES
     INITIAL SNOW WATER                   =      0.000  INCHES
     INITIAL WATER IN LAYER MATERIALS     =      4.271  INCHES
     TOTAL INITIAL WATER                  =      4.271  INCHES
     TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR


                  EVAPOTRANSPIRATION AND WEATHER DATA
                  -----------------------------------

     NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
              RALEIGH                NORTH CAROLINA

         STATION LATITUDE                        =  35.87 DEGREES
         MAXIMUM LEAF AREA INDEX                 =   2.00
         START OF GROWING SEASON (JULIAN DATE)   =     86
         END OF GROWING SEASON (JULIAN DATE)     =    310
         EVAPORATIVE ZONE DEPTH                  =  22.0  INCHES
         AVERAGE ANNUAL WIND SPEED               =   7.70 MPH
         AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  66.00 %
         AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  70.00 %
         AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  78.00 %
         AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  72.00 %


     NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR    RALEIGH              NORTH CAROLINA

              NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
-------     -------     -------     -------     -------     -------
  3.55        3.43        3.69        2.91        3.67        3.66
  4.38        4.44        3.29        2.73        2.87        3.14


     NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
              COEFFICIENTS FOR    RALEIGH              NORTH CAROLINA
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NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.60	41.60	49.30	59.50	67.20	73.90
77.70	77.00	71.00	59.70	50.00	42.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR RALEIGH NORTH CAROLINA AND STATION LATITUDE = 35.87 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.44	2.92	3.81	2.20	4.34	3.74
	4.24	5.43	2.40	2.87	3.05	2.80
STD. DEVIATIONS	2.07	1.23	1.51	1.52	2.22	1.98
	1.91	3.72	1.67	2.00	1.79	1.04
RUNOFF						
TOTALS	0.000	0.000	0.006	0.000	0.003	0.000
	0.000	0.031	0.001	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.026	0.000	0.015	0.000
	0.000	0.130	0.004	0.000	0.001	0.000
EVAPOTRANSPIRATION						
TOTALS	1.418	1.672	2.522	2.100	3.766	3.850
	3.851	4.039	2.343	1.222	1.173	1.061
STD. DEVIATIONS	0.163	0.298	0.458	0.960	0.748	1.510
	1.465	1.230	1.061	0.415	0.192	0.144
PERCOLATION/LEAKAGE THROUGH LAYER 1						
TOTALS	2.1528	1.3866	1.4046	0.6721	1.0688	0.5441
	0.2472	1.0644	0.4552	0.5287	1.2643	1.4163
STD. DEVIATIONS	1.6844	1.0386	1.0830	0.6927	1.3560	0.5599
	0.3675	2.2762	0.9140	0.8363	1.1706	0.8777

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	41.25	(8.104)	149735.7	100.00
RUNOFF	0.042	(0.1365)	152.09	0.102
EVAPOTRANSPIRATION	29.015	(3.3638)	105324.96	70.341
PERCOLATION/LEAKAGE THROUGH LAYER 1	12.20509	(5.86268)	44304.473	29.58845
CHANGE IN WATER STORAGE	-0.013	(0.8544)	-45.85	-0.031

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	0.581	2108.7217
PERCOLATION/LEAKAGE THROUGH LAYER 1	2.838470	10303.64550
SNOW WATER	1.80	6547.7266

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3321

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0470

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	4.0187	0.1674
SNOW WATER	0.000	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\PROGRA~1\HELP3\RALNCP.D4
TEMPERATURE DATA FILE:       C:\PROGRA~1\HELP3\RALNCT.D7
SOLAR RADIATION DATA FILE:   C:\PROGRA~1\HELP3\RALNCS.D13
EVAPOTRANSPIRATION DATA:     C:\PROGRA~1\HELP3\RALNCE.D11
SOIL AND DESIGN DATA FILE:   C:\PROGRA~1\HELP3\WCRMC.D10
OUTPUT DATA FILE:            C:\PROGRA~1\HELP3\WCRMC.OUT


TIME:   9:26     DATE:  11/16/2009


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     TITLE:  Washington County C&DLF - Case 2 (RMC)

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =      6.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1246 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                   LAYER  2
                                   --------

                     TYPE 3 - BARRIER SOIL LINER
                         MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =     18.00   INCHES
          POROSITY                     =      0.4750 VOL/VOL
          FIELD CAPACITY               =      0.3780 VOL/VOL
          WILTING POINT                =      0.2650 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.4750 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC


                                   LAYER  3
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   4
          THICKNESS                    =     12.00   INCHES
          POROSITY                     =      0.4370 VOL/VOL
          FIELD CAPACITY               =      0.1050 VOL/VOL
          WILTING POINT                =      0.0470 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1964 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.170000002000E-02 CM/SEC


                 GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                 ----------------------------------------

     NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
              SOIL DATA BASE USING SOIL TEXTURE # 4 WITH A
              FAIR STAND OF GRASS, A SURFACE SLOPE OF 25.%
              AND A SLOPE LENGTH OF  130. FEET.

SCS RUNOFF CURVE NUMBER              =     64.40
FRACTION OF AREA ALLOWING RUNOFF     =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
EVAPORATIVE ZONE DEPTH               =      6.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      0.748  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =      2.622  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      0.282  INCHES
INITIAL SNOW WATER                   =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS     =     11.655  INCHES
TOTAL INITIAL WATER                  =     11.655  INCHES
TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR


                 EVAPOTRANSPIRATION AND WEATHER DATA
                 -----------------------------------

     NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
              RALEIGH                NORTH CAROLINA

        STATION LATITUDE                          =  35.87 DEGREES
        MAXIMUM LEAF AREA INDEX                   =   2.00
        START OF GROWING SEASON (JULIAN DATE)     =     86
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END OF GROWING SEASON (JULIAN DATE) = 310
EVAPORATIVE ZONE DEPTH = 6.0 INCHES
AVERAGE ANNUAL WIND SPEED = 7.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.55	3.43	3.69	2.91	3.67	3.66
4.38	4.44	3.29	2.73	2.87	3.14

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
39.60	41.60	49.30	59.50	67.20	73.90
77.70	77.00	71.00	59.70	50.00	42.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR RALEIGH NORTH CAROLINA
AND STATION LATITUDE = 35.87 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.44	2.92	3.81	2.20	4.34	3.74
	4.24	5.43	2.40	2.87	3.05	2.80
STD. DEVIATIONS	2.07	1.23	1.51	1.52	2.22	1.98
	1.91	3.72	1.67	2.00	1.79	1.04
RUNOFF						
TOTALS	0.087	0.000	0.037	0.000	0.129	0.012
	0.049	0.327	0.047	0.035	0.041	0.006
STD. DEVIATIONS	0.216	0.000	0.101	0.000	0.380	0.054
	0.218	0.945	0.212	0.109	0.170	0.029
EVAPOTRANSPIRATION						
TOTALS	1.355	1.559	2.188	1.610	2.461	2.576
	3.000	2.953	1.422	1.200	1.227	1.056
STD. DEVIATIONS	0.255	0.371	0.557	0.947	0.875	1.120
	1.029	1.041	0.759	0.496	0.437	0.223
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	2.0194	1.5858	1.5898	0.6479	1.6071	1.2121
	1.3054	2.0999	1.0229	1.3609	1.7422	1.6851
STD. DEVIATIONS	1.6795	1.1497	1.1360	0.8210	1.4135	1.1102
	1.0609	1.9061	0.9160	1.3940	1.4685	0.9376
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	2.0700	1.5523	1.6056	0.8595	1.4706	1.2703
	1.1967	2.0668	1.2331	1.1558	1.7196	1.6903
STD. DEVIATIONS	1.4970	1.0671	1.0509	0.7450	1.3320	1.0369
	1.0795	1.6660	0.8623	1.1723	1.3050	1.0604

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2						
AVERAGES	0.3346	0.1658	0.1823	0.0599	0.2408	0.1527
	0.1475	0.3243	0.1276	0.1651	0.2563	0.1693
STD. DEVIATIONS	0.4122	0.1799	0.2450	0.1313	0.3236	0.1722
	0.1699	0.4872	0.1679	0.2572	0.2941	0.1623

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	41.25	(8.104)	149735.7	100.00
RUNOFF	0.772	(1.2906)	2800.57	1.870
EVAPOTRANSPIRATION	22.607	(2.8828)	82061.99	54.805
PERCOLATION/LEAKAGE THROUGH LAYER 2	17.87865	(5.10849)	64899.500	43.34270
AVERAGE HEAD ON TOP OF LAYER 2	0.194	(0.101)		
PERCOLATION/LEAKAGE THROUGH LAYER 3	17.89057	(5.24721)	64942.762	43.37159
CHANGE IN WATER STORAGE	-0.019	(0.9040)	-69.62	-0.046

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	5.22	18948.600
RUNOFF	2.914	10578.0020
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.453537	1646.34021
AVERAGE HEAD ON TOP OF LAYER 2	6.000	
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.445178	1615.99609
SNOW WATER	1.80	6547.7266

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4370

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0470

FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	0.6025	0.1004
2	8.5500	0.4750
3	2.1190	0.1766
SNOW WATER	0.000	

Objective To evaluate the required transmissivity for the drainage geocomposite placed in the final cover system.

Reference Richardson, G.N., Giroud, J-P., and Zhao, A. (2000), Design of Lateral Drainage Systems for Landfills, Tenax Corp., Baltimore.

Analysis **Step 1:**

Determine the required transmissivity (θ_{reqd}) of the drainage geocomposite based on the following equation:

$$\theta_{reqd} = \frac{RF_{dc} q_n L i}{\sin\beta} = \frac{RF_{dc} q_n L \cos\beta}{\sin\beta} = \frac{RF_{dc} q_n L}{\tan\beta}$$ (Richardson et. al. Eq. 4-6 Mod.)

where:
θ_{reqd} = required transmissivity (m^3/m/sec)
RF_{dc} = drainage geocomposite reduction factor (See Note 1)
q_n = fluid input rate/impingement rate (m/s) (See Note 2)
L = flow length/drain spacing (horizontally projected) (m)
β = slope angle of final cover (degrees).

Notes:

1. Based on the recommendations of Richardson, Giroud, & Zhao, use RF_{dc} = 6 for steeper slopes where veneer stability is key (i.e. 5H:1V or steeper). Lesser reduction factors are appropriate where there are shallow slopes.

2. Typically the impingement into the drainage geocomposite is determined by the **lessor** of:

   a. Permeability of the overlying vegetative soil layer(k_{veg}) or
   b. Design rainfall.

   Per Richardson,Giroud, & Zhao, use $q_n = k_{veg}$ except in arid/semi-arid areas.

Step 2:

Determine the required transmissivity test parameters:

- Normal Stress (cover thickness x unit weight of cover soil) and
- Hydraulic Gradient (equals slope of cover system).

FCS DRAIN LAYER.WPD

Step 3:

Calculate the required total flow capacity (Q) of the drain based on the following equation:

$$Q = q_n A$$

where:

Q	=	flow capacity (cfs)
q_n	=	impingement (ft/s)
A	=	total area served by the drain (= L x DL) (ft^2)
DL	=	length of drain between outlet locations (ft).

Step 4:

After finding Q for each drain, the designer shall select the appropriate type and size of drain.

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SHEET:	3/3
JOB #:	WASH-11-1
DATE:	11/8/11
BY:	PKS
CHKD BY:	

Washington County C&D Landfill
Final Cover Drainage Layer Analysis

Input Parameters:

Side Slope Angle (β):	5.7	degrees	(10%)
Impingement (q_n):	0.0001	cm/sec	(= Permeability of Vegetative Soil Layer) (Conservative)
Drain Spacing (L):	75	ft	(= Horizontally Projected Distance Up & Down Slope)
Reduction Factors for Drainage Geocomposite:			(Per Richardson, Giroud, & Zhao Recommendations)
$RF_{intrusion}$:	1.1		
RF_{creep}:	1.2		
$RF_{chemical\ clogging}$:	1.1		
$RF_{biological\ clogging}$:	1.3		
Overall Factor of Safety:	2.0		
Reduction Factor for Drainage Geocomposite in Final Cover (RF_{dc}):	3.5		
Drain Length (DL):	200	ft	(= Distance Across Slope at Toe)
Final Cover: Thickness:	1.5	ft	
Unit Weight:	110	pcf	

Note: Spreadsheet Converts Units as Required.

Transmissivity Requirements:

Determine Minimum Transmissivity:

θ_{min} = 8.0E-04 m^3/m/sec = 3.9 gpm/ft

Determine Transmissivity Test Parameters:

Min. Normal Stress = 165.0 psf

Hydraulic Gradient = 0.10

Determine Required Drain Capacity:

Calculate Required Total Flow Capacity:

Q = 0.05 cfs *Based on 200 foot spacing between outlets.

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PROJECT Washington County C&D Landfill

SUBJECT Filter Geotextile Analysis - Final Cover System

JOB NO. WASH-11-1
DATE 11/8/11
COMPUTED BY PKS
CHECKED BY

Objective To determine the maximum geotextile apparent opening size (AOS) to provide proper retention to protect drainage media from piping and clogging from adjacent soil. Additionally, to determine the minimum required geotextile permittivity to provide proper drainage from the adjacent soil. Geotextile filtration properties must be selected based on the up-gradient soil gradation and plasticity and site specific hydraulic conditions.

References

Bhatia, S.K. and Huang, Q. (1995), "Geotextile Filters for Internally Stable/Unstable Soils", *Geosynthetics International*, Vol. 2, No. 3, pp. 537-565.

Koerner, Robert M. (1999), Designing with Geosynthetics, 4th Ed., Prentice-Hall Inc., Englewood Cliffs, NJ, pp. 84-91.

Mirafi - Geotextile Filter Design, Application, and Product Selection Guide, Ten Cate Nicolon Corp. (www.mirafi.com).

Richardson, G.N., Giroud, J-P., and Zhao, A. (2000), Design of Lateral Drainage Systems for Landfills, Tenax Corp., Baltimore.

Assumption The design criteria given assume that the soil is "set" in intimate contact with the geotextile.

Background From Richardson et. al.:

For the purposes of filtration design, soils can be characterized as stable or unstable. Stable soils perform an internal filtration process that limits migration of fines within the soil. Typically, these soil types include well-graded soils. Unstable soils are those which cannot perform self-filtration (i.e. they have the potential to pipe internally). They may include gap-graded, broad-graded, and other highly erodible soils. In gap-graded soils, there exists a coarse and fine fraction, but very little medium fraction. If there is an insufficient quantity of soil particles in the medium fraction, fine soil particles pipe through the coarse fraction. In broad-graded soils, the gradation is distributed over a very wide range of particle sizes such that fine soil tends to pipe through coarser particles.

Analysis

1. **Define Application and Function of Geotextile:**

Define the application and function of the geotextile (i.e. where the geotextile is to be used and whether retention or permeability is the key function of the material) and also the confining stress (i.e. high - leachate collection system; low - final cover system) and flow conditions (i.e. steady-state - landfill drains; dynamic - shoreline protection).

GT FILTER.WPD

2. Evaluate Soils Information:

For representative soils, evaluate grain size and plasticity information. From the grain size curves determine the coefficients of uniformity and curvature as follows:

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{d_{30}^{\ 2}}{\left(d_{10} \times d_{60}\right)}$$

where: C_u = coefficient of uniformity (quantifies the distribution of particle sizes)
C_c = coefficient of curvature (identifies internal soil stability)
d_x = the diameter at which x percent of the soil is finer

For $C_u \leq 4$, the soil is uniformly-graded; for $4 < C_u \leq 20$, the soil is well-graded; and for $C_u > 20$, the soil is broad-graded. Uniformly-graded and broad-graded soils require careful analysis. Gap-graded soils which have a coarse and fine fraction, but limited medium fraction are of particular concern and should be avoided. Gap-graded soils are readily identified by the appearance of the grain size curve. For $1 \leq C_c \leq 3$, the soil should be internally stable (Bhatia and Huang state that soils having $C_c \leq 7$ are internally stable.).

Additionally, in general, particles do not move within soils having a plasticity index (PI) greater than 15% so there is no clogging potential (Richardson et. al.).

3. Selection of Soil Retention Requirements (Maximum AOS):

To determine the maximum AOS, use the method given in Koerner/Mirafi (after Luettich) and the method given in Bhatia and Huang. For the AOS determined by either method, the following shows the relationship between opening size and the corresponding U.S. sieve number (with typical non-woven geotextile information as shown).

Opening Size (mm)	U.S. Sieve
0.150	100 (most 8 to 16 oz/sy non-wovens)
0.180	80
0.212	70 (most 4 to 6 oz/sy non-wovens)
0.250	60
0.300	50
0.425	40
0.600	30

- Luettich Method:

For steady-state conditions, use the chart below.

- Bhatia and Huang Method:

Bhatia and Huang developed the following retention criteria:

For $n \geq 60\%$: $O_{95} < d_{85}\left(2.71 - 0.36C_c\right)$ $C_c \leq 7$

$O_{95} < d_{85}\left(0.65 - 0.05C_c\right)$ $C_c > 7$

For $n < 60\%$: $O_{95} < d_{85}$

where: O_{95} = apparent opening size
n = geotextile porosity (%) (for non-woven geotextiles this value is typically 70 to 90%)

4. Determine Geotextile Permittivity Requirements:

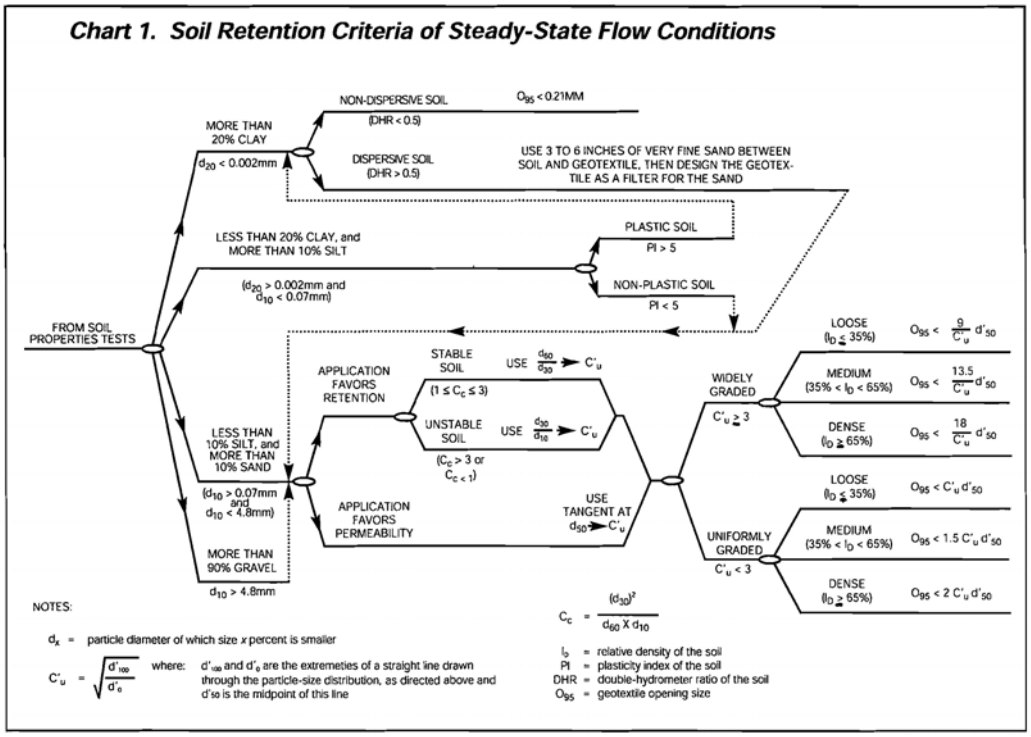
Determine the geotextile permittivity requirements:

$$\Psi = \frac{k_g}{t_g} \qquad (\text{sec}^{-1})$$

where: Ψ = minimum required geotextile permittivity (sec^{-1})
k_g = minimum allowable geotextile permeability (cm/sec)
$k_g \geq i_S k_S$
t_g = geotextile thickness under design load (cm)
i_S = hydraulic gradient (use 1.5 for landfills)
k_S = permeability of retained soil (cm/sec).

5. Other Considerations:

Other things to consider in the design of a filter geotextile include anti-clogging requirements and survivability/durability requirements. For anti-clogging, it is generally best to use the largest AOS that satisfies the retention criteria. For non-woven geotextiles used in landfill applications, an AOS of 0.21 mm (No. 70 sieve) is typically the largest AOS that is available. For survivability/durability concerns, generally an adequately UV stabilized geotextile made from polypropylene or polyester with an AASHTO M288 Strength Class of 2 is suitable for use in subsurface drainage applications.



Ref: Mirafi (After Luettich)

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SHEET: 5/7
JOB #: WASH-11-1
DATE: 11/8/11
BY: PKS
CHKD BY:

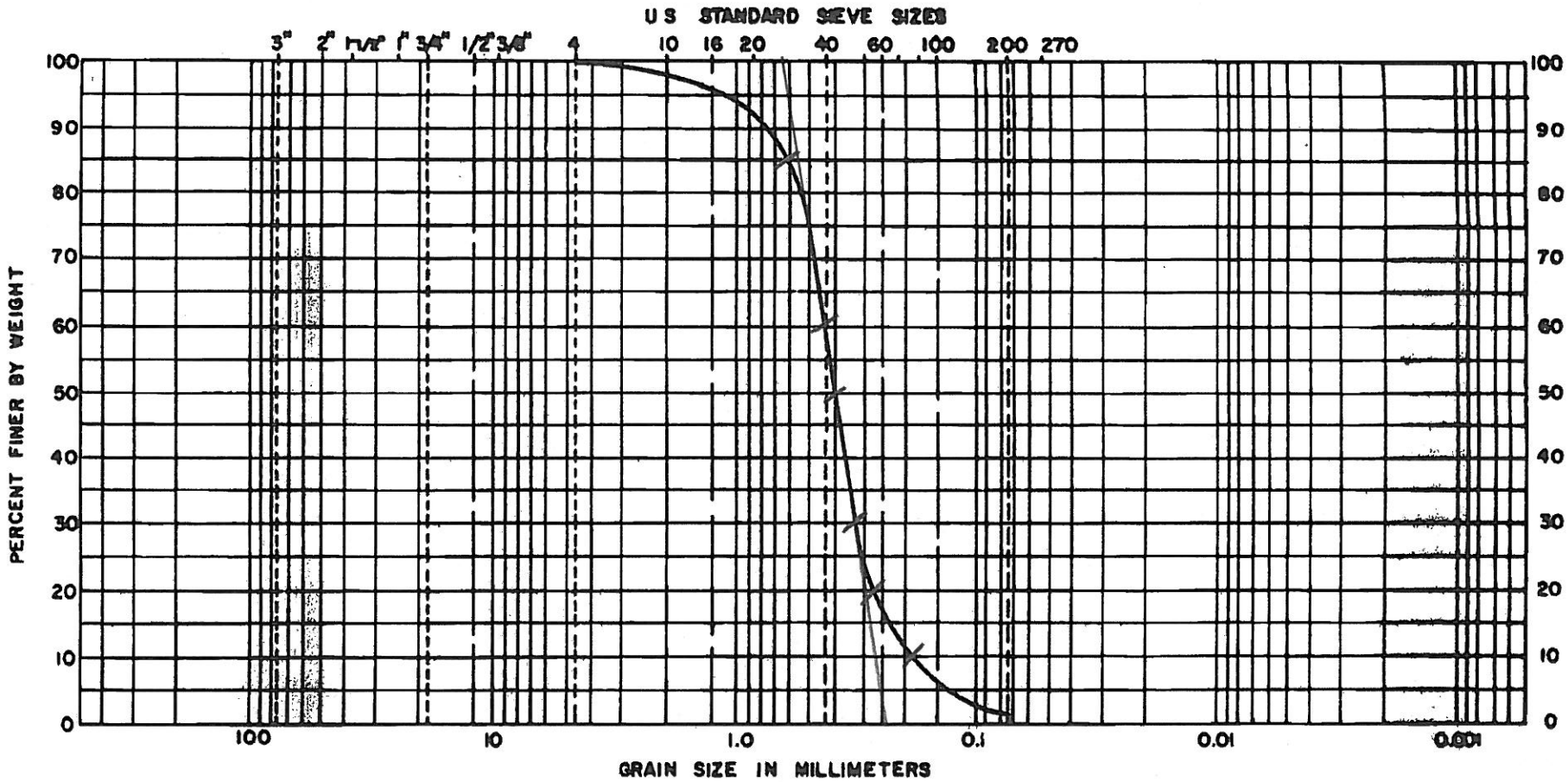
Washington County C&D Landfill - Final Cover
Filter Geotextile Analysis (Final Cover System)

Application: Final Cover Drainage Geocomposite
Primary Function: Retention
Relative Confining Stress: Low
Flow Conditions: Steady-State

Soil Evaluated

	B-1 (3.5 - 5')	B-4 (1 - 2.5')			
Soil Description:	Tan-Brown Fine Sand	Lt. Gray & Brown Fine Sand			
Soil Type:	SP	SP			
Particle Size (mm) d_{85}:	0.600	0.330			
d_{60}:	0.410	0.280			
d_{50}:	0.400	0.260			
d_{30}:	0.310	0.220			
d_{20}:	0.260	0.180			
d_{10}:	0.180	0.110			
PI:	0	0			
C_u:	2.28	2.55			
	Use Caution - Soil is Uniform Graded!	Use Caution - Soil is Uniform Graded!			
C_c	1.30	1.57			
Luettich Method:*	-----	-----			
Soil Dispersion (When Applicable):	NA	NA			
Recommended Maximum AOS (mm) (When Applicable):					
Internal Soil Stability (When Applicable):	Soil is Stable	Soil is Stable			
	Draw straight line through d60 and d30 to obtain C'u.	Draw straight line through d60 and d30 to obtain C'u.			
Particle Size (mm) for Determining C'_u: d'_{100}:	0.630	0.370			
d'_{50}:	0.400	0.260			
d'_0:	0.220	0.200			
C'_u (When Applicable):	1.69	1.36			
	Soil is Uniformly Graded.	Soil is Uniformly Graded.			
Soil Relative Density (I_D) (Loose (L), Medium (M), Dense (D) (When Applicable):	M	M			
Recommended Maximum AOS (mm) (When Applicable):	**1.015**	**0.530**			
	No. 30 Sieve	**No. 40 Sieve**			
Bhatia & Huang Method:	-----	-----			
Internal Soil Stability:	Soil is Stable.	Soil is Stable.			
Geotextile Porosity (%):	80	80			
Recommended Max. AOS (mm):	**1.345**	**0.708**			
	No. 30 Sieve	**No. 30 Sieve**			
Required Geotextile Properties:	-----	-----			
Hydraulic Gradient (i_s):	1.5	1.5			
Estimated Soil Permeability (k_s) (cm/sec):	1.0E-04	1.0E-04			
Min. Allowable Geotextile Permeability (k_g) (cm/sec):	1.5E-04	1.5E-04			
Geotextile Thickness (t_g) (cm):	0.25	0.25			
Min. Required Geotextile Permittivity (Ψ) (sec^{-1}):	**0.0006**	**0.0006**			

***Note: Spreadsheet assumes retention application in using the Luettich Method.**



BOUL DERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	ELEV./DEPTH	NAT. WC	L.L.	PL	PI	DESCRIPTION OR CLASSIFICATION
B-1 S 2	3.5' - 5'	--	--	--	--	TAN-BROWN FINE SAND

JOB NO. 1054-94-119

GRAIN SIZE DISTRIBUTION

S&ME

1724

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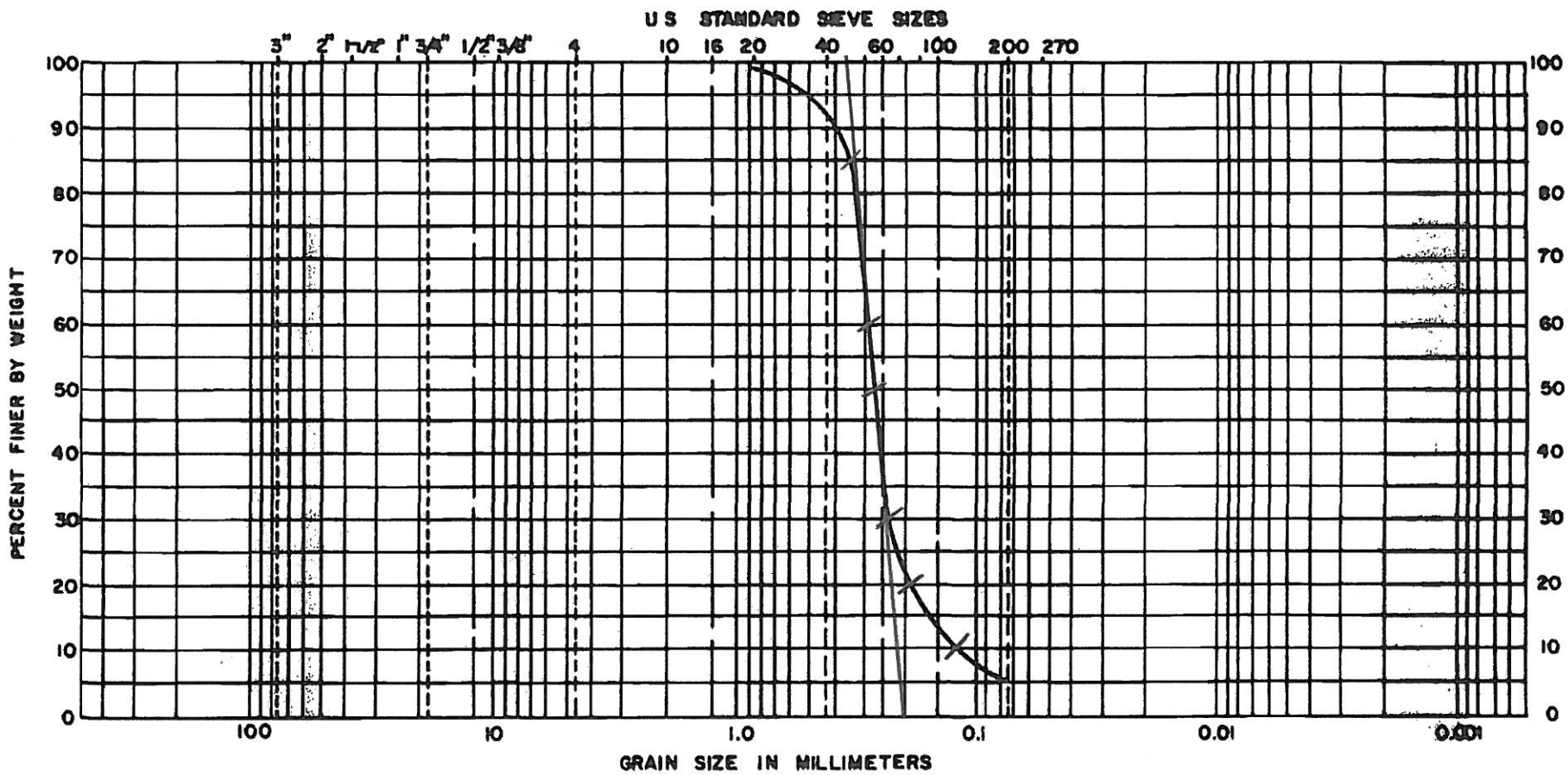
172A



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	ELEV./DEPTH	NAT. WC	L.L.	PL	PI	DESCRIPTION OR CLASSIFICATION
B-4 S 1	1' - 2.5'	--	--	--	--	LIGHT GRAY & BROWN FINE SAND

JOB NO. 1054-94-119

GRAIN SIZE DISTRIBUTION

S&ME

4/2

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PROJECT Washington County C&D Landfill - Phase 2

SUBJECT Slope Stability Evaluation

JOB NO. WASH-09-1
DATE 11/16/09
COMPUTED BY PKS
CHECKED BY

Objective

To perform a slope stability evaluation for the C&D landfill. Note that only static conditions were evaluated in that the landfill is not in a seismic impact zone ($a_{peak} = \pm 0.06$ according to 2008 USGS mapping). Based on EPA guidance for MSW landfills (EPA/600/R-95/051), landfills are required to have a minimum long-term static factor of safety of 1.5.

Analysis

The slope stability evaluations for the overall C&D landfill area were performed using the computer program STABL5M, a computer program developed by Purdue University.

The slope stability evaluation was performed on the worst case cross section shown on the attached figure (final grades shown). The shear strength envelope assumed for the waste in this evaluation was cohesion = 200 psf and phi = 25 degrees; which is believed to be conservative for C&D wastes. The shear strength envelope assumed for the Alum sludge, which comprises the existing Phase 1 berm, in this evaluation was cohesion = 100 psf and phi = 28.5 degrees; which is based on prior analysis by Law Engineering (1991). Also, the shear strength envelope assumed for the subgrade in this evaluation was cohesion = 0 psf and phi = 30 degrees; which is conservative for sands. The result is as follows:

Circular Failure (Static): FS = 2.23

Results

The minimum factor of safety satisfies EPA guidelines.

STABILITY.WPD

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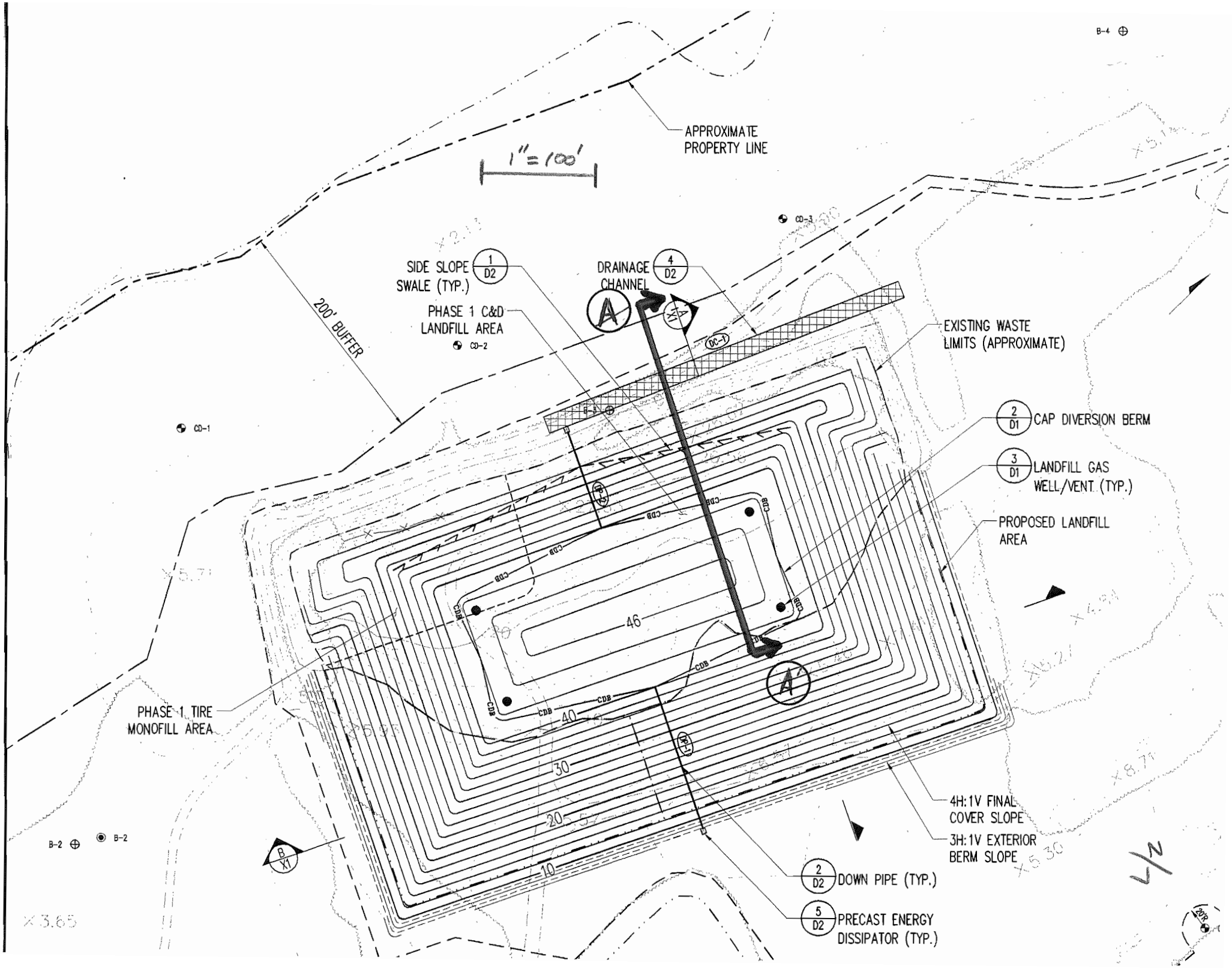
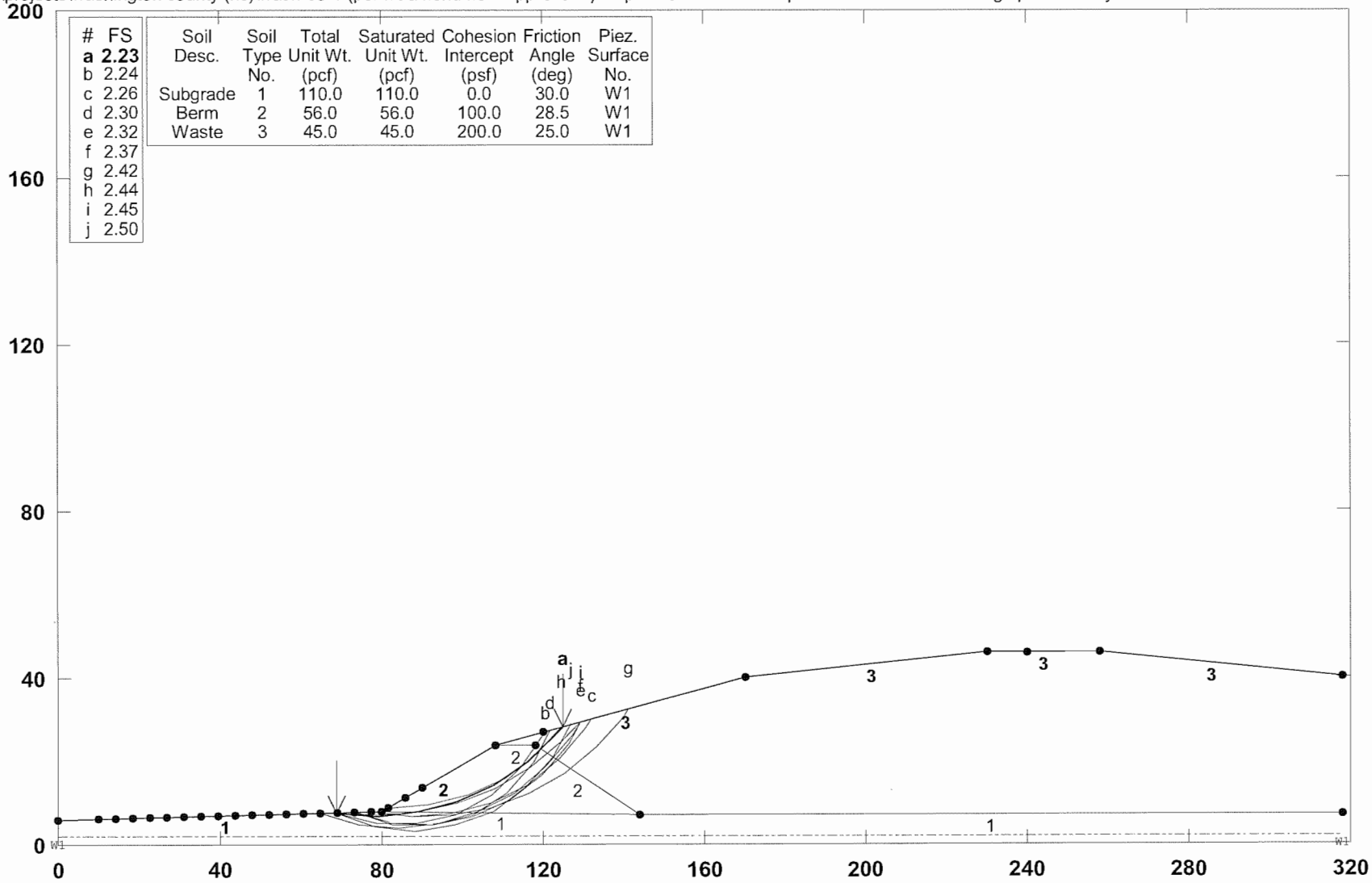

APPROXIMATE PROPERTY LINE
1" = 100'
200' BUFFER
SIDE SLOPE SWALE (TYP.) 1/D2
DRAINAGE CHANNEL 4/D2
PHASE 1 C&D LANDFILL AREA
CD-2
CD-1
CD-3
B-4
B-3
B-2
EXISTING WASTE LIMITS (APPROXIMATE)
2/D1 CAP DIVERSION BERM
3/D1 LANDFILL GAS WELL/VENT (TYP.)
PROPOSED LANDFILL AREA
PHASE 1 TIRE MONOFILL AREA
4H:1V FINAL COVER SLOPE
3H:1V EXTERIOR BERM SLOPE
2/D2 DOWN PIPE (TYP.)
5/D2 PRECAST ENERGY DISSIPATOR (TYP.)
DC-1
DP-1
CDB
46
40
30
20
10
A
A'
B
X1

Washington County C&DLF - Section A Circular - Global - Static

h:\projects\washington county (nc)\wash-09-1 (permit amendment application)\nc permit amendment - phase 2\calculations\wcacgs.pl2 Run By: Pieter Scheer 11/16/2009 10:56AM

#	FS
a	**2.23**
b	2.24
c	2.26
d	2.30
e	2.32
f	2.37
g	2.42
h	2.44
i	2.45
j	2.50

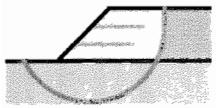
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	110.0	110.0	0.0	30.0	W1
Berm	2	56.0	56.0	100.0	28.5	W1
Waste	3	45.0	45.0	200.0	25.0	W1



PCSTABL5M/si FSmin=2.23

Safety Factors Are Calculated By The Modified Bishop Method

STED



3/7

```
                    ** PCSTABL5M **
                          by
                   Purdue University
             --Slope Stability Analysis--
          Simplified Janbu, Simplified Bishop
             or Spencer`s Method of Slices
Run Date:                  11/16/2009
Time of Run:               10:56AM
Run By:                    Pieter Scheer
Input Data Filename:       H:WCACGS.in
Output Filename:           H:WCACGS.OUT
Unit:                      ENGLISH
Plotted Output Filename:   H:WCACGS.PLT
PROBLEM DESCRIPTION   Washington County C&DLF - Section A
                      Circular - Global - Static
BOUNDARY COORDINATES
    6 Top   Boundaries
   10 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1          .00       6.00      80.00       8.00        1
    2        80.00       8.00     108.00      24.00        2
    3       108.00      24.00     170.00      40.00        3
    4       170.00      40.00     230.00      46.00        3
    5       230.00      46.00     258.00      46.00        3
    6       258.00      46.00     318.00      40.00        3
    7       108.00      24.00     118.00      24.00        2
    8       118.00      24.00     144.00       7.00        2
    9        80.00       8.00     144.00       7.00        1
   10       144.00       7.00     318.00       7.00        1
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)   Param.    (psf)    No.
  1   110.0    110.0       .0      30.0     .00        .0      1
  2    56.0     56.0     100.0     28.5     .00        .0      1
  3    45.0     45.0     200.0     25.0     .00        .0      1
1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water =  62.40
Piezometric Surface No.  1 Specified by  2 Coordinate Points
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          .00        2.00
    2       318.00        2.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
400 Trial Surfaces Have Been Generated.
 20 Surfaces Initiate From Each Of 20 Points Equally Spaced
Along The Ground Surface Between  X =  10.00 ft.
                                and  X =  90.00 ft.
Each Surface Terminates Between   X = 120.00 ft.
                                and  X = 240.00 ft.
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =   .00 ft.
10.00 ft. Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Examined.  They Are Ordered - Most Critical
      First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Failure Surface Specified By  8 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        68.95        7.72
          2        78.92        6.94
          3        88.88        7.81
          4        98.57       10.30
          5       107.71       14.34
```

6	116.07	19.83
7	123.41	26.62
8	124.73	28.32

Circle Center At X = 78.7 ; Y = 67.1 and Radius, 60.2
*** 2.225 ***

Individual data on the 12 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	564.8	.0	.0	.0	.0	.0	.0	.0
2	1.1	118.7	.0	.0	.0	.0	.0	.0	.0
3	8.9	1792.1	.0	.0	.0	.0	.0	.0	.0
4	.2	57.4	.0	.0	.0	.0	.0	.0	.0
5	9.5	3624.6	.0	.0	.0	.0	.0	.0	.0
6	9.1	4558.9	.0	.0	.0	.0	.0	.0	.0
7	.3	153.6	.0	.0	.0	.0	.0	.0	.0
8	8.1	3458.1	.0	.0	.0	.0	.0	.0	.0
9	1.9	556.8	.0	.0	.0	.0	.0	.0	.0
10	1.5	322.5	.0	.0	.0	.0	.0	.0	.0
11	3.9	466.5	.0	.0	.0	.0	.0	.0	.0
12	1.3	40.1	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.95	7.72
2	78.61	5.16
3	88.61	5.03
4	98.34	7.35
5	107.21	11.98
6	114.68	18.63
7	120.30	26.90
8	120.41	27.20

Circle Center At X = 84.1 ; Y = 45.4 and Radius, 40.6
*** 2.237 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.37	7.93
2	87.30	6.73
3	97.27	7.45
4	106.92	10.06
5	115.90	14.46
6	123.87	20.51
7	130.53	27.97
8	131.83	30.15

Circle Center At X = 88.6 ; Y = 58.2 and Radius, 51.5
*** 2.257 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.16	7.83
2	82.70	4.84
3	92.70	4.62
4	102.36	7.19
5	110.93	12.35
6	117.73	19.68
7	121.68	27.53

Circle Center At X = 88.5 ; Y = 40.0 and Radius, 35.6
*** 2.299 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.95	7.72
2	78.93	7.08
3	88.90	7.88
4	98.65	10.10

```
    5        107.98        13.70
    6        116.69        18.60
    7        124.61        24.71
    8        129.25        29.48
Circle Center At X =   78.4 ; Y =   75.9  and Radius,   68.8
      ***     2.315   ***
Failure Surface Specified By  8 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         73.16        7.83
    2         82.80        5.18
    3         92.79        4.76
    4        102.62        6.60
    5        111.79       10.59
    6        119.83       16.53
    7        126.34       24.13
    8        129.12       29.45
Circle Center At X =   89.6 ; Y =   48.5  and Radius,   43.8
      ***     2.365   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         77.37        7.93
    2         87.29        6.68
    3         97.28        7.01
    4        107.10        8.91
    5        116.50       12.34
    6        125.23       17.21
    7        133.08       23.40
    8        139.86       30.75
    9        141.04       32.53
Circle Center At X =   90.2 ; Y =   69.7  and Radius,   63.1
      ***     2.420   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         81.58        8.90
    2         91.57        9.36
    3        101.28       11.74
    4        110.34       15.96
    5        118.42       21.87
    6        124.24       28.19
Circle Center At X =   84.3 ; Y =   59.6  and Radius,   50.8
      ***     2.437   ***
Failure Surface Specified By  9 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         64.74        7.62
    2         74.36        4.89
    3         84.32        4.02
    4         94.27        5.02
    5        103.86        7.86
    6        112.74       12.45
    7        120.61       18.62
    8        127.19       26.15
    9        129.12       29.45
Circle Center At X =   84.0 ; Y =   57.2  and Radius,   53.2
      ***     2.447   ***
Failure Surface Specified By  8 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         68.95        7.72
    2         78.37        4.37
    3         88.31        3.30
    4         98.23        4.57
    5        107.58        8.12
    6        115.84       13.75
```

```
    7        122.57       21.15
    8        126.81       28.85
Circle Center At X =   87.8 ; Y =   45.8  and Radius,   42.5
      ***     2.500   ***
```

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Objective To estimate the total and differential foundation settlements due to the weight of the planned waste and embankment loads. The resulting post-settlement slopes are evaluated to ensure that 1) positive drainage is maintained toward collection piping and/or sumps and 2) the maximum tensile strains in the liner system do not exceed allowable values.

References

Holtz, R.D., & Kovacs, W.D. (1981), An Introduction To Geotechnical Engineering, Prentice-Hall, Englewood Cliffs, NJ, Chapters 8 and 9.

Ohio EPA - Geotechnical Resource Group (2004), "Geotechnical and Stability Analyses for Ohio Waste Containment Facilities", Ohio EPA, Columbus, Ohio, Chapter 6.

Quian, X., Koerner, R.M., & Gray, D.H. (2001), Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, Upper Saddle River, N.J., pp. 310, 469-473.

Assumptions

1. Vertical stresses acting on the liner are assumed to be one-dimensional (1-D).
2. Assumptions for soil properties are listed in the attached spreadsheet.

Analysis The following approach is used to perform the evaluation:

1. Identify the critical cross section(s) to be evaluated (maximum waste fill, minimum liner slopes, etc.).
2. Select points along each cross section to perform calculations (points of grade breaks in final cover and/or liner system).
3. For each calculation point, determine the subsurface profile beneath the liner system and separate into distinct layers (thickness and material properties) (Include structural fill where applicable).
4. For each calculation point, determine the stresses acting on the midpoint of each layer both before and after liner construction.
5. For each calculation point, determine the stress change at the liner. Take into account the stress decrease due to excavation (where applicable) and the stress increase due to waste loads.
6. Calculate elastic settlements for each granular soil layer using the equations below.
7. Calculate consolidation (primary and secondary) settlements for each clay/silt soil layer using the equations below.
8. Calculate total settlements at each calculation point and resulting post-settlement slopes and liner strain between each point. Verify that slopes meet or exceed the minimum allowable slope. Verify that tensile strains do not exceed allowable values.

SETTLEMENT 1D.WPD

Calculations

- Elastic Settlement Equation:

$$S_e = \frac{\Delta p}{M_S} H$$

where:
S_e = elastic settlement (ft)
Δp = net stress change acting on middle of soil layer (psf)
Ms = constrained modulus of soil (psf)

$$M_S = \frac{E_S(1-\upsilon_S)}{(1+\upsilon_S)(1-2\upsilon_S)}$$

Es = elastic modulus of soil (psf)
v_s = Poisson's ratio of soil
H = initial thickness of soil layer (ft).

- Primary Consolidation Settlement Equations:

$for\ p'_O + \Delta p \geq p'_{mp}$

$$S_C = H\left(C_{r\varepsilon} \log \frac{p'_{mp}}{p'_o} + C_{c\varepsilon} \log \frac{p'_o + \Delta p}{p'_{mp}} \right)$$

$for\ p'_O + \Delta p < p'_{mp}$

$$S_C = H\left(C_{r\varepsilon} \log \frac{p'_o + \Delta p}{p'_o} \right)$$

where:
S_C = primary consolidation settlement (ft)
H = initial thickness of soil layer (ft)
p'_{mp} = maximum past consolidation pressure (psf)
p'_o = effective vertical stress in middle of soil layer afer excavation, but before loading (psf)
Δp = net stress change acting on middle of soil layer (psf).
$C_{r\varepsilon}$ = modified recompression index

$$C_{r\varepsilon} = \frac{C_r}{1+e_o}$$

$C_{c\varepsilon}$ = modified primary compression index

$$C_{c\varepsilon} = \frac{C_c}{1 + e_o}$$

C_r = recompression index
C_c = primary compression index
e_O = initial void ratio

- Secondary Consolidation Settlement Equation:

$$S_s = C_{s\varepsilon} H \log \frac{t_s}{t_{pf}}$$

where:
S_s = secondary consolidation settlement (ft)
$C_{s\varepsilon}$ = modified secondary compression index
H = initial thickness of soil layer (ft)
t_s = time over which secondary settlement is to be calculated (typ. this is a max. of 100 years plus the max. time to complete primary consolidation)
t_{pf} = time to complete primary consolidation

$$t_{pf} = \frac{T_V * H_t^2}{C_V}$$

T_V = dimensionless time factor associated with the time it takes for primary consolidation settlement to be completed

$$For U < 60\%: \; T_V = \frac{\pi}{4}\left(\frac{U\%}{100}\right)^2$$

$$For U \geq 60\%: \; T_V = 1.781 - 0.933 \log(100 - U\%)$$

H_t = maximum length of drainage in the consolidating layer (= H for single-drained; = 0.5H for double-drained)
C_V = coefficient of consolidation (ft^2/year)
U = percent of primary consolidation (%) (typ. max. is 99.999; results in T_V = 4.58).

- Total Settlement Equation:

$$S_{Total} = S_e + S_c + S_s$$

where:
S_{Total} = total settlement (ft)
Se = elastic settlement (ft)
S_C = primary consolidation settlement (ft)
S_s = secondary consolidation settlement (ft).

- Liner Strain Equation:

$$E_T = \frac{L_f - L_o}{L_o} \text{x}100$$

where:

E_T = total strain (%) ("+" = tension; "-" = compression)

L_o = original distance separating two adjacent calculation points (ft)

L_f = final distance separating two adjacent calculation points after settlement is complete (ft).

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Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
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SHEET: 5/9
JOB #: WASH-11-1
DATE: 11/7/11
BY: PKS
CHKD BY:

Washington County C&D Landfill - Phases 1-6
Settlement Analysis **Cross Section No.: Worst Case Point**

Soils Information: (Note: When elastic or consolidation settlement is not applicable to a particular layer, enter "NA" for requested parameters.)

Soil Layer	Description	Dry Unit Wt. (pcf)	Natural Moisture Content (%)	Wet Unit Wt. (pcf)	Elastic Settlement Parameters E_s (psf)	ν_s	M_s (psf)	Consolidation Settlement Parameters OCR	$C_{c\varepsilon}$	$C_{r\varepsilon}$	$C_{s\varepsilon}$
1	Medium to Dense Sands (Ncor = 25)	110.0	15.0	126.5	360,000	0.30	484,615	NA	NA	NA	NA
2	Sandy & Clayey Silts (Ncor = 10)	110.0	15.0	126.5	200,000	0.30	269,231	NA	NA	NA	NA
3											
4											
5											
6											
7											
8											
9											
10											

Waste Information:

Average Unit Weight, γ_{Waste} (pcf) = 50 Conservative for Waste plus Periodic Cover

Assumptions:

Layer 1:

Dry Unit Weight (pcf): 100.0 (Assumed)
Natural moisture content (%), w_n: 15.0 (Assumed)
Young's Modulus, E_S (psf): 360,000 (Based on Das Table 3.6 for Medium Dense Sand - Low End Value)
Poisson's Ratio, ν_s: 0.3 (Based on Das Table 3.6)

Layer 2:

Dry Unit Weight (pcf): 100.0 (Assumed)
Natural moisture content (%), w_n: 15.0 (Assumed)
Young's Modulus, E_S (psf): 220,000 (Based on Bowles Table 2-7 for Silt - Avg Value)
Poisson's Ratio, ν_s: 0.3 (Assumed)

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Settlement Points - Location Information:

Parameter	Point 1	2	3	4	5	6	7	8	9	10	11	12
Position:	0											
Original Ground Surface Elevation (ft) =	10.0											
Avg. Unit Wt. of Soil Excavated (pcf) =	110.0											
Top of Landfill Elevation (ft) =	46.0											
Top of Liner Elevation (ft) =	8.5											
Top of Groundwater Elevation (ft) =	4.0											
Layer 1: Thickness (ft) =	30.0											
Elevation of Mid Point (ft) =	-6.5											
(Before Liner Construct.) p'_o at Mid Point (psf) =	1,407											
p'_{mp} at Mid Point (psf) =	NA											
(After Liner Construct.) p'_o at Mid Point (psf) =	1,242											
Layer 2: Thickness (ft) =	20.0											
Elevation of Mid Point (ft) =	-31.5											
(Before Liner Construct.) p'_o at Mid Point (psf) =	3,010											
p'_{mp} at Mid Point (psf) =	NA											
(After Liner Construct.) p'_o at Mid Point (psf) =	2,845											
Layer 3: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 4: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 5: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 6: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 7: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 8: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 9: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												
Layer 10: Thickness (ft) =												
Elevation of Mid Point (ft) =												
(Before Liner Construct.) p'_o at Mid Point (psf) =												
p'_{mp} at Mid Point (psf) =												
(After Liner Construct.) p'_o at Mid Point (psf) =												

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Stress Change, Δp, at Liner:

Parameter	Point 1	2	3	4	5	6	7	8	9	10	11	12
Stress Decrease From Excavation (psf) =	165											
Stress Increase From Waste Load (psf) =	1,875											
Net Stress Increase/Decrease, Δ_p (psf) =	1,710											

Elastic Settlement:

Parameter		Point 1	2	3	4	5	6	7	8	9	10	11	12
Elastic Settlement (ft):													
Layer 1:	**S_e =**	**0.11**											
Layer 2:	**S_e =**	**0.13**											
Layer 3:	**S_e =**												
Layer 4:	**S_e =**												
Layer 5:	**S_e =**												
Layer 6:	**S_e =**												
Layer 7:	**S_e =**												
Layer 8:	**S_e =**												
Layer 9:	**S_e =**												
Layer 10:	**S_e =**												
Total Elastic Settlement (ft) =		**0.23**											

Elastic Settlement Equation:

$$Se = \frac{\Delta p}{M_S} H$$

Primary Consolidation Settlement:

Parameter		Point 1	2	3	4	5	6	7	8	9	10	11	12
Primary Consolidation Settlement (ft):													
Layer 1:	**S_c =**	**NA**											

Layer 2:	**S_c =**	**NA**											

Layer 3:	**S_c =**												
Layer 4:	**S_c =**												
Layer 5:	**S_c =**												
Layer 6:	**S_c =**												
Layer 7:	**S_c =**												
Layer 8:	**S_c =**												
Layer 9:	**S_c =**												
Layer 10:	**S_c =**												
Total Primary Consol. Settlement (ft) =		**0.00**											

Primary Consolidation Settlement Equations:

For primary recompression and compression (designated C):

$$S_C = H\left(C_{r\varepsilon} \log \frac{p'_{mp}}{p'_o} + C_{c\varepsilon} \log \frac{p'_o + \Delta p}{p'_{mp}}\right)$$

For primary recompression only (designated R):

$$S_C = H\left(C_{r\varepsilon} \log \frac{p'_o + \Delta p}{p'_o}\right)$$

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Secondary Consolidation Settlement:

Assumed % Primary Consolidation (U) = 99.999 **(Max. = 99.999)**
T_v (dimensionless) = 4.58
$t_s = t_{pf}$ + "X" (years) = 100

Parameter		Point 1	2	3	4	5	6	7	8	9	10	11	12
Secondary Consolidation Settlement (ft):													
Layer 1:	Drainage* =	1											
	H_t (ft) =	30.0											
	C_v (in^2/min) =	0.000											
	t_{pf} (years) =	0.0											
	S_s =	**NA**											
Layer 2:	Drainage* =	1											
	H_t (ft) =	20.0											
	C_v (in^2/min) =	0.000											
	t_{pf} (years) =	0.0											
	S_s =	**NA**											
Layer 3:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 4:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 5:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 6:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 7:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 8:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 9:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Layer 10:	Drainage* =												
	H_t (ft) =												
	C_v (in^2/min) =												
	t_{pf} (years) =												
	S_s =												
Total Sec. Consol. Settlement (ft) =		**0.00**											

* Single-Drained = 1; Double-Drained = 2

Secondary Consolidation Settlement Equation:

$$S_s = C_{se} H \log \frac{t_s}{t_{pf}}$$

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Total Settlement:

Parameter		Point 1	2	3	4	5	6	7	8	9	10	11	12
Total Settlement (ft):													
Layer 1:	**S_{Total} =**	**0.11**											
Layer 2:	**S_{Total} =**	**0.13**											
Layer 3:	**S_{Total} =**												
Layer 4:	**S_{Total} =**												
Layer 5:	**S_{Total} =**												
Layer 6:	**S_{Total} =**												
Layer 7:	**S_{Total} =**												
Layer 8:	**S_{Total} =**												
Layer 9:	**S_{Total} =**												
Layer 10:	**S_{Total} =**												
	Total Settlement (ft) =	**0.23**											

Total Settlement Equation:

$$S_{Total} = S_e + S_c + S_s$$

Liner Slopes & Liner Strain:

Min. Post-Settlement Liner Slope (%) =	0.5	**N/A**
Max. Liner Strain (%) =	0.5	**N/A**

Parameter	Point 1	2	3	4	5	6	7	8	9	10	11	12
Position:	0											
Before Settlement:												
Top of Liner Elevation (ft) =	8.5											
Slope of Liner (%) (+ up;- down)=	-----											
Length Along Liner (L_o) Bet. Points (ft) =	-----											
After Settlement:												
Top of Liner Elevation (ft) =	8.3											
Slope of Liner (%) (+ up; - down)=	**-----**											
Slope Change (%) (+ steeper; - flatter)=	-----											
Length Along Liner (L_f) Bet. Points (ft) =	-----											
Liner Strain (E_T) (%) (+ tension; - comp.)=	**-----**											
Comments:												
Liner Slope:	**-----**											
Liner Strain:	**-----**											

Liner Strain Equation:

$$E_T = \frac{L_f - L_o}{L_o} \text{x} 100$$

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Operations Manual

Washington County C&D Landfill
Roper, North Carolina

Prepared for:

Washington County Public Utilities
Roper, North Carolina

January 2010
Revised: April 2012

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WASHINGTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL

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SECTION 1.0
GENERAL FACILITY OPERATIONS

1.1 OVERVIEW

This Operations Manual was prepared for operations of the Washington County Landfill facility (Permit No. 94-04) located near Roper. This document discusses the operation of the following landfill units and other solid waste management activities:

- C&D landfill;
- Used tire storage area;
- White goods and scrap metal handling area;
- Yard waste processing area; and
- Mobile home deconstruction area.

Refer to **Drawing S1** (Existing Site Conditions) for the location of existing and proposed landfill units and other solid waste management activities.

The County may also add roll-off or other suitable containers for recyclables and/or municipal solid waste (MSW). Areas in the vicinity of the white goods/scrap metal handling area would be used for this purpose.

1.2 CONTACT INFORMATION

All correspondence and questions concerning the operation of the Washington County Landfill should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

1.2.1 <u>Washington County</u>

Washington County Landfill
718 Landfill Road
Roper, NC 27970
P.O. Box 1007
Plymouth, NC 27962
Phone/Fax: (252) 793-5615

Landfill Operator:	Carl Critcher
Public Utilities Director:	Lou Manring ((252) 793-7545)

1.2.2 North Carolina Department of Environment and Natural Resources

North Carolina DENR - Fayetteville Regional Office (FRO)
225 Green Street, Suite 714
Fayetteville, NC 28301
Phone: (910) 486-1541
Fax: (910) 486-0707

North Carolina DENR - Raleigh Central Office (RCO)
217 West Jones Street
Raleigh, NC 27603
Phone/Fax: (919) 707-8200

North Carolina DENR - Washington Regional Office (W1RO)
943 Washington Square Mall
Washington, NC 27889
Phone: (252) 946-6481
Fax: (252) 975-3716

North Carolina DENR - Wilmington Regional Office (W2RO)
127 Cardinal Drive Extension
Wilmington, NC 28405
Phone: (910) 796-7215
Fax: (910) 350-2004

Division of Waste Management (DWM) - Solid Waste Section:

Field Operations Branch Head:	Mark Poindexter (RCO)
Eastern District Supervisor:	Dennis Shackelford (FRO)
Waste Management Specialist:	Ray Williams (W2RO)

Division of Land Resources - Land Quality Section:

Regional Engineer:	Pat McClain, P.E. (W1RO)

1.3 ACCESS CONTROL

Limiting access to the landfill facility is important for the following reasons:

- Unauthorized and illegal dumping of waste materials is prevented.
- Trespassing, and injury resulting therefrom, is discouraged.
- The risk of vandalism is greatly reduced.

Access to active areas of the landfill will be controlled by a combination of fences and natural barriers, and strictly enforced operating hours. A landfill attendant will be on duty at all times

when the facility is open for public use to enforce access restrictions (see also **Section 1.11**).

1.3.1 Physical Restraints

The site will be accessed by the existing entrance on Landfill Road. Scales and a scale house/office are provided at the entrance. All waste will have been weighed prior to being placed in the landfill. The entrance has a gate which will be securely locked during non-operating hours.

1.3.2 Security

Frequent inspections of gates and fences will be performed by landfill personnel. The County will arrange for a random security patrol of the main gate to further discourage trespassing. Evidence of trespassing, vandalism, or illegal operation will be reported to the Landfill Operator.

1.4 SIGNAGE

A prominent sign(s) containing the information required by the DWM will be placed at the landfill entrance. This sign(s) will provide information on operating hours, operating procedures, and acceptable wastes. Additional signage will be provided as necessary within the landfill complex to distinctly distinguish the roadway to the active landfill unit(s). Service and maintenance roads for use by operations personnel will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be provided as required.

1.5 COMMUNICATIONS

Two way radio communication will be maintained between the active landfill unit(s) and the landfill scale house/office. The scale house/office has a telephone in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house/office.

1.6 FACILITY OPERATING HOURS

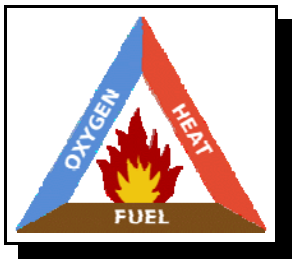
Normal hours of operation will be 8:30 A.M. to 4:30 P.M. Monday to Friday and 8:30 A.M. to 1:00 p.m. on Saturday. The facility will be closed on Sunday.

The County may elect to modify these hours from time to time.

1.7 FIRE CONTROL

Although no open burning of waste is allowed at the facility, the possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. Potential fire hazards include both surface conditions and subsurface conditions. Surface conditions include equipment operations and newly placed waste. Subsurface conditions include existing waste previously landfilled.

1.7.1 Fire Triangle



The "triangle" illustrates the rule that in order to ignite and burn, a fire requires three (3) elements: heat, fuel, and oxygen. A fire is prevented or extinguished by "removing" any one of them. A fire naturally occurs when the elements are combined in the right mixture (e.g., more heat needed for igniting some fuels, unless there is concentrated oxygen). These principles are integral in the prevention and management of potential fire situations.

1.7.2 Equipment

A combination of factory installed fire suppression systems and/or portable fire extinguishers will be operational on all pieces of heavy equipment at all times. Potential fire hazards are created from the build-up of fine, dry dust particles on and around operational motors and control panels. The presence of these build-ups can cause overheating and potential fire if periodic equipment cleaning and maintenance are not practiced. Portable fire extinguishers should be maintained in a state of readiness on each piece of moving equipment and equipment should be cleaned periodically.

1.7.3 General Fire Management Strategies

Each fire situation is site specific; however, general strategies for active fire management include the following (in no particular order):

- Accelerated high temperature combustion (displacing fuel);
- Covering of the landfill burn area with soil (reduce oxygen);
- Covering of the burn area with foams (reduce oxygen);
- Flooding the burn area with water (reduce heat);
- Injecting an inert gas such as CO_2 (reduce oxygen); and
- Excavating the burning material (displacing fuel) and then extinguishing it in small controlled areas.

1.7.4 Fires within Disposal Areas

Fires within the landfill disposal areas will be limited by the use of daily/periodic cover as a fire break and control of "hot" loads entering the landfill. Landfill personnel at the scale house will turn away all trucks containing waste that is suspected to be hot. If a hot load is placed on the working face, then the load will be spread as thin as possible and daily cover soil will be immediately placed on the waste to extinguish the fire.

In general, fires that break out close to the surface of the disposal area should be excavated and smothered with cover material. Deep fires should be smothered out by placing moist soil on the surface and by constructing soil barriers around the fire. Where the smothering technique fails, the burning material must be excavated and smothered or

quenched with water once the burning material is brought to the surface. Water is usually not effective unless it can be directly applied to the burning material.

1.7.5 Notification

The County will verbally notify the DWM (see **Section 1.2.2**) within 24 hours of discovery of a fire within any landfill disposal area. In addition, written documentation describing the fire, the actions carried out to extinguish the fire, and a strategy for preventing future occurrences will be provided to the DWM within 15 days following any such occurrence.

1.7.6 Coordination with Local Fire Department

A copy of this Operations Manual will be filed with the local fire department including all contact information for the facility.

1.8 LITTER CONTROL

The vegetative trees/bushes act as a barrier to keep litter contained within the site and a litter control crew will pick up litter around the site and on access roads routinely as required. Wind screens adjacent to active areas will be used as required to control windblown waste. Additionally, landfill staff will make operational changes as practical based on wind conditions that may spread litter.

1.9 SEVERE WEATHER CONDITIONS

Unusual weather conditions can directly affect the operation of the landfill facility. Some of these weather conditions and recommended operational responses are as follows.

1.9.1 Ice Storms

An ice storm can make access to the landfill dangerous, prevent movement or placement of daily cover, and, thus, may require closure of the landfill until the ice is removed or has melted.

1.9.2 Heavy Rains

Exposed soil surfaces can create a muddy situation in some portions of the landfill during rainy periods. The control of drainage and use of crushed stone on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. In areas where the aggregate surface is washed away or otherwise damaged, new aggregate should be used for repair.

Intense rains can affect newly constructed drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, inspection by landfill personnel will be initiated and corrective measures taken to repair any damage found before the next

rainfall.

1.9.3 Electrical Storms

The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfilling activities will be temporarily suspended during such an event. To guarantee the safety of all field personnel, refuge will be taken in the on-site buildings or in rubber-tired vehicles.

1.9.4 Windy Conditions

Landfill operations during a particularly windy period may require that the working face be temporarily shifted to a more sheltered area. When this is done, the previously exposed face will be immediately covered with daily cover.

1.9.5 Violent Storms

In the event of hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations may be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured.

1.10 EQUIPMENT REQUIREMENTS

The County will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

1.11 PERSONNEL REQUIREMENTS

At least one member of the landfill supervisory staff will be certified as a Manager of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA). Each landfill employee will go through an annual training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. As part of this training, personnel learn to recognize loads which may contain prohibited wastes.

1.12 HEALTH AND SAFETY

All aspects of the landfill facility operations were developed with the health and safety of the operating staff, customers, and neighbors in mind. Prior to commencement of operations of the facility, a member of the operating staff will be designated site safety officer. This individual, together with the facility's management will modify the site safety and emergency response program to remain consistent with SWANA and Occupational Safety and Health Administration (OSHA) guidance.

Safety equipment provided includes equipment rollover protective cabs, seat belts, audible

reverse warning devices, hard hats, safety shoes, and first aid kits. Facility personnel will be encouraged to complete the American Red Cross Basic First Aid Course. Other safety requirements as designated by the County will also be implemented.

Facility employees will be routinely trained in health and safety by supervisory staff. All training will be documented. The following are some general recommendations for the health and safety of workers:

1.12.1 Personal Hygiene

The following items are recommended as a minimum of practice:

- Wash hands before eating, drinking, or smoking.
- Wear personal protective equipment as described in **Section 1.12.2.**
- Wash, disinfect, and bandage ANY cut, no matter how small it is. Any break in the skin can become a source of infection.
- Keep fingernails closely trimmed and clean (dirty nails can harbor pathogens).

1.12.2 Personal Protective Equipment

Personal Protective Equipment (PPE) must be evaluated as to the level of protection necessary for particular operating conditions and then made available to facility employees. The list below includes the PPE typically used and/or required in a solid waste management facility workplace.

- Safety shoes with steel toes.
- Noise reduction protection should be used in areas where extended exposure to continuous high decibel levels are expected.
- Disposable rubber latex or chemical resistant gloves for handling and/or sampling of waste materials.
- Dust filter masks.

Following use, PPE's should be disposed of or adequately cleaned, dried, or readied for reuse.

1.12.3 Mechanical Equipment Hazard Prevention

All equipment should be operated with care and caution. All safety equipment such as horns, backup alarms, and lights should be functional. A Lockout-Tagout program will be used to identify equipment in need or under repair and insure that operation is "off-limits" prior to maintenance or repair. All operators will be trained in the proper operation of equipment.

1.12.4 Employee Health and Safety

Some general safety rules are:

- Consider safety first when planning and conducting activities.
- Review the equipment O&M manual(s) prior to attempting repairs/changes.
- Remember the buddy system for repair of mechanical equipment.
- Post emergency contact phone numbers.
- Provide easy and visible access to the Right to Know materials.
- Provide easy and visible access to the first aid kit and fire extinguishers.

1.12.5 Physical Exposure

Facility personnel may come in contact with the fluids, solids, and airborne constituents found at the facility. Routine training should be conducted regarding the individual and collective materials used at the facility and their associated hazards. Training concerning safe work practices around these potential exposures should cover the use of equipment and proper disposal procedures.

1.12.6 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) will be collected on every waste (if available) that enters the facility. Information will also be made available for all chemicals stored on site for use by the facility. MSDS sheets shall be stored in a location with all other Right to Know information for the site.

1.13 UTILITIES

Electrical power, water, telephone, and a restroom are provided at the landfill scale house/office.

1.14 RECORD KEEPING PROGRAM

The County will maintain the following records in an operating record at the landfill:

A. Current permit(s);
B. Inspection reports;
C. Audit and compliance records;
D. Annual landfill reports;
E. Waste inspection records (see **Section 2.4**);
F. Daily tonnage records - including source of generation;
G. Waste determination records;
H. Quantity, location of disposal, generator, and special handling procedures for all special wastes disposed of at the site;
I. List of generators and haulers that have attempted to dispose of restricted wastes;
J. Employee training procedures and records of training completed;
K. All ground water monitoring and surface water quality information (See the

current **Water Quality Monitoring Plan**) including:

1. Monitoring well construction records;
2. Sampling dates and results;
3. Statistical analyses; and
4. Results of inspections, repairs, etc.

L. All closure and post-closure information, where applicable, including:

1. Notification of intent to close;
2. Testing;
3. Certification; and
4. Recording.

M. Cost estimates or financial assurance documentation.

N. A notation of the date and time of cover placement.

O. Documentation of mobile home deconstruction (see **Appendix B**).

The operating record will be kept up to date by the Landfill Operator or his designee. It will be presented upon request to the DWM for inspection. A copy of this Operations Manual will be kept at the landfill and will be available for use at all times.

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SECTION 2.0
WASTE HANDLING OPERATIONS

2.1 OVERVIEW

This section describes the required waste handling operations for the Washington County Landfill facility. In addition to the C&D waste disposed of at this facility, the County also processes scrap tires, white goods/scrap metal, yard and wood wastes, and performs deconstruction of mobile homes. These materials are stored at the landfill facility until there are sufficient quantities for pick up by various recycling contractors.

2.2 ACCEPTABLE WASTES

2.2.1 C&D Landfill Unit

Only the following wastes generated within the approved service area may be disposed of in the C&D landfill unit:

- Construction and Demolition (C&D) Solid Waste: as defined in 15A NCAC 13B.0532(8) means solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement and buildings or structures. C&D waste does not include municipal and industrial wastes that may be generated by the on-going operations at buildings or structures.
- Land Clearing and Inert Debris Landfill: as defined in 15A NCAC 13B.0101(54) means a facility for the disposal of land-clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash.
- Land Clearing Waste: as defined in 15A NCAC 13B.0101(53) means solid waste which is generated solely from land-clearing activities, limited to stumps, trees, limbs, brush, grass, and other naturally occurring vegetative material.
- Asphalt: in accordance with NCGS 130A-294(m).
- Other Wastes as Approved by the Solid Waste Section of the Division of Waste Management.

In addition, the asbestos as described in **Section 2.5.3** and may also be disposed of in the C&D landfill unit.

2.3 PROHIBITED WASTES

2.3.1 C&D Landfill Unit

Only wastes as defined in **Section 2.2.1** above may be accepted for disposal in the C&D landfill unit. Prohibited wastes include waste exclusions listed in 15A NCAC 13B 0.0542 as follows:

- Wastewater treatment sludge. Wastewater treatment sludge may be accepted,

with the approval of the DWM, for utilization as a soil conditioner and incorporated into or applied onto the vegetative soil layer component of the final cover system. In this case, the sludge will be applied at no greater than agronomic rates and to a maximum depth of six inches.

- Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous, or municipal solid waste is contained therein;
- Garbage as defined in G.S. 130A-290(a)(7);
- Hazardous waste as defined in G.S. 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators;
- Industrial solid waste unless a demonstration has been made and approved by the DWM that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A);
- Liquid wastes;
- Medical waste as defined in G.S. 130A-290(a)(18);
- Municipal solid waste (MSW) as defined in G.S. 130A-290(a)(18a);
- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761;
- Radioactive waste as defined in G.S. 104E-5(14);
- Septage as defined in G.S. 130A-290(a)(32);
- Sludge as defined in G.S. 130A-290(a)(34);
- Special wastes as defined in G.S. 130A-290(a)(40);
- White goods as defined in G.S. 130A-290(a)(44); and
- Yard trash as defined in G.S. 130A-290(a)(45).

The following wastes cannot be received if separate from C&D waste:

- lamps or bulbs including but not limited to halogen, incandescent, neon or fluorescent;
- lighting ballast or fixtures;
- thermostats and light switches;
- batteries including but not limited to those from exit and emergency lights and smoke detectors;
- lead pipes;
- lead roof flashing;
- transformers;
- capacitors;
- copper chrome arsenate (CCA) and creosote treated woods; and
- pallets.

Waste accepted for disposal in the C&D landfill unit must be readily identifiable as C&D waste and must not have been shredded, pulverized, or processed to such an extent that the composition of the original waste cannot be readily ascertained except as specified as follows:

- C&D waste that has been shredded, pulverized, or otherwise processed may be accepted for disposal from a facility that has received a permit from an authorized regulatory authority which specifies such activities are inspected by the authority,

and whose primary purpose is recycling and reuse of the C&D material. For this case, a waste screening plan and waste acceptance plan will be prepared and made available to the DWM upon request.

The County will not dispose of C&D waste that is known to be generated within the boundaries of a unit of local government that by ordinance:

(A) Prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste.
(B) Requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

2.4 WASTE SCREENING PROGRAMS

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation.

2.4.1 Waste Receiving and Inspection

All vehicles must stop at the scale house located at the entrance of the facility and visitors are required to sign-in. All waste transportation vehicles are weighed and the content of the load assessed. The scale attendant(s) requests from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The attendant(s) then visually checks the vehicle as it crosses the scale. Signs informing users of the acceptable and unacceptable types of waste are posted at the scale house. Once passing the scales, the vehicles are routed to the appropriate landfill unit or other area (white goods/scrap metal handling area, etc.) as appropriate.

Vehicles are randomly selected for screening on a regular basis, depending on personnel available. At least one vehicle per week, but not less than 1% by weight of the waste stream entering the landfill (based on the previous week's total), will be randomly selected by inspection personnel. A random truck number and time will be selected (e.g., the third load after 10:00 a.m.) on the day of inspections. However, if something looks suspicious is spotted in any waste load, that load is inspected further.

Vehicles selected for inspection are directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site. If unacceptable waste is found, including wastes generated from outside of the service area, the load will be isolated and secured by berming off the area. For unacceptable wastes that are non-

hazardous, the Landfill Operator will then notify officials of the DWM (see **Section 1.2.2**) within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action. For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 2.4.2** will be followed. The hauler is responsible for removing unacceptable waste from the landfill property.

If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell. All random waste inspections will be documented by landfill staff using the waste screening form provided in **Appendix A**.

In addition to random waste screening described above, waste unloaded on the active face will be inspected by the equipment operators, trained to spot unacceptable wastes, before and during spreading and compaction. Any suspicious looking waste is reported immediately to the designated primary inspector for further evaluation.

2.4.2 Hazardous Waste Contingency Plan

In the event that identifiable hazardous waste or waste of questionable character is detected at the landfill, appropriate equipment, protective gear, personnel, and materials as necessary will be employed to isolate the wastes. The DWM will be notified immediately (see **Section 1.2.2**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, all attempts will be made to prevent that vehicle from leaving the site or, if the vehicle has left the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The County will assist the DWM as necessary and appropriate in the removal and disposition of the hazardous waste and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with either on-site soils or other tarping material until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill.

Should an incident where hazardous waste is found at the landfill occur, the event will be documented by landfill staff using the waste screening form provided in **Appendix A**.

Records of information gathered as part of the waste screening programs will be maintained at the landfill site during its active life and as long as required by the County and the DWM.

2.5 WASTE DISPOSAL

2.5.1 Access

Traffic will be clearly directed to the appropriate active access road. The location of access roads during waste placement will be determined by operations personnel in order to reflect waste placement strategy. Additionally, access will be maintained for site monitoring locations.

2.5.2 General Procedures

Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, a certain number of vehicles will be allowed on the working face at a time. The actual number will be determined by the truck spotter. This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity. Operations at the working face will be conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of waste.

The approach to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face area. Personnel will direct traffic necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover required each day. Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either periodic, intermediate, or final cover, as appropriate.

The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e. 5H:1V max.) using a landfill compactor and a minimum number of three full passes.

Wind screens adjacent to the working face may be used as required to control windblown waste.

The use of portable signs with directional arrows and portable traffic barricades will

facilitate the unloading of wastes to the designated disposal locations. These signs and barricades will be placed along the access route to the working face of the landfill or other designated areas which may be established.

The removal of solid waste from any landfill unit is prohibited unless an appropriate recycling plan has been approved by the DWM. Regardless, the general public is prohibited from any waste removal activities from any landfill unit.

2.5.3 Special Waste Management

2.5.3.1 Asbestos Management

The County may dispose of asbestos within the C&D landfill unit. Asbestos will only be accepted if it has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Asbestos will arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator.

Once the hauler brings the asbestos to the landfill, the hauler will be directed to the designated asbestos disposal area by operations personnel. The designated disposal area will be prepared by operations personnel by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal area. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill compactor will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place.

The landfill staff will record the approximate location and elevation of the asbestos waste once cover is in-place. The Landfill Operator will then review pertinent disposal and location information to assure compliance with regulatory requirements and enter the information into the Operating Record.

Once disposal and recording for asbestos waste is completed, the disposal area may be covered with waste. No excavation into designated asbestos disposal areas will be permitted.

2.5.4 Periodic Cover

At the completion of waste placement each week, or sooner if the area of exposed waste exceeds one-half acre in size, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste. This periodic cover is

intended to control vectors, fire, odors, and blowing debris.

2.5.5 Intermediate Cover

A 12 inch layer of soil cover should be placed on all waste surfaces that have not received waste in 30 days but are below final elevation. This intermediate cover should be seeded immediately and graded such that all precipitation run-off is channeled to the surface water systems.

2.5.6 Height Monitoring

Approximately every month, the landfill staff will monitor landfill top and side slope elevations with a level. When such elevations approach design grades, the final top-of-waste grades will be staked to limit over-placement of waste.

2.6 WHITE GOODS/SCRAP METAL HANDLING AREA

A white goods/scrap metal handling area is located to the north of the scale house. The operation of the white goods/scrap metal handling area is as follows:

Within the white goods/scrap metal handling area, white goods and scrap metal are stockpiled on a concrete pad up to about 10 feet high over an approximate 280 foot by 30 foot area. Once the stockpile reaches capacity, a recycler removes Freon and hauls the white goods and scrap metal off-site to be recycled.

2.7 USED TIRE STORAGE AREA

Used tires are collected at an area near the landfill scale house and placed in up to two tire trailers. Once one or more trailers are full, the trailer(s) are picked up by a recycling contractor.

2.8 YARD WASTE PROCESSING AREA

The operation of the yard waste processing area is as follows:

Acceptable wood and yard wastes (including wooden pallets) are stockpiled to an approximate height of 10 feet over an area of approximately 1 acre. At that time a contractor is brought in to grind the waste. The ground waste is typically delivered to the Domtar Paper Mill in Plymouth for use as boiler fuel. Alternatively, ground waste can be used around the site, primarily for surface stabilization, or placed in windrows to be given to the public or otherwise used in the future.

Unacceptable wastes found in this area, if not otherwise prohibited, will be routed to the C&D landfill.

2.9 DECONSTRUCTION OF MOBILE HOMES

The deconstruction of mobile homes is handled in an area adjacent to the C&D landfill. A description of the process is provided in **Appendix B**.

2.10 CONVENIENCE CENTER OPERATIONS

The County plans to place suitable containers for the collection of MSW (small loads) and/or recyclables in the vicinity of the white goods/scrap metal handling area. A maximum of eight 40-yard roll-off containers (or equivalent total volume) are anticipated. Visible signs and/or placards will be used to direct traffic and identify acceptable materials. Containers will be located such as to allow sufficient access for inspection and fire fighting.

Containers for collection of MSW will be covered, leakproof, durable, and of easily cleanable construction. These containers will be cleaned as often as necessary to prevent a nuisance or insect breeding and will be maintained in good repair. Containers will be covered at the end of each day or as necessary to keep the contents as dry as practical and to prevent blowing of material. Containers will be moved in such a manner as to prevent the spillage or leakage of the contents. Any spillage will be picked up immediately, returned to the collection vehicle or container, and the area cleaned.

Collected waste and recyclables will be removed from the site by the County, a qualified waste hauler, and/or a qualified recycling firm. These materials will be transported to a permitted disposal facility and/or appropriate recycling facility. The contact information (company and contact names, facility address, and phone number) for waste/recyclable haulers, firms, and/or disposal/recycling facilities, including applicable solid waste permit number, will be placed in the operating record.

SECTION 3.0
ENVIRONMENTAL MANAGEMENT

3.1 OVERVIEW

This section reviews the overall environmental management tasks required for the successful operation of the landfill facility.

3.2 SURFACE WATER CONTROL

As used herein, the definition of "surface water" is water which results from precipitation or site run-on that has not contacted the waste.

Proper control of surface water at the landfill will accomplish the following goals:

- Prevent the run-on of surface water into the landfill unit(s) or the active face(s);
- Limit the erosion caused by surface waters; and
- Limit sediments carried off-site by surface waters.

Separate erosion and sedimentation control plans have been provided for the various landfill units. These plans describe both short and long term engineered features and practices for preventing erosion and controlling sedimentation at this site. The following is a brief discussion of some of these features and practices, focusing more on the landfill units.

3.2.1 <u>Surface Water Run-On Control</u>

The perimeter berms and/or perimeter channels around the landfill unit(s) are designed to prevent the run-on of surface water from adjacent land into the landfill. Additional structures such as diversion berms, channels, down pipes, etc. carry surface water away from the landfill.

3.2.2 <u>Erosion Control</u>

The serviceability of the landfill relies heavily on soil berms, barrier layers, and agricultural layers that are readily eroded by flowing water. Erosion control provisions incorporated in the landfill include the following:

- The slope of the working face must be no steeper than 5H:1V where practical to limit erosion of the periodic cover.
- Intermediate cover that has been exposed for more than 30 days must be seeded immediately and repaired when erosion features are identified.
- Drainage breaks (diversion berms) are provided on the final cover to limit

the flow length of run-off.

- Water collected by each drainage break is routed to stormwater drainage channels or down pipes so that the run-off volume does not accumulate going down the slope.

- The vegetative soil layer placed over the final cover must be seeded immediately.

Additional erosion control measures have been taken within the drainage channels and at points of stormwater discharge. All final cover should be inspected regularly for erosion damage and promptly repaired.

3.2.3 Sedimentation Control

Stormwater run-off from the landfill unit(s) is conveyed to one of the on site basins and/or traps. These basins and/or traps should be inspected regularly for sediment build-up or erosion damage. The basins and/or traps should be cleaned out when sediment fills the lower half of the basin. Due to the sandy soils at the site, sedimentation is expected to be minimal.

3.3 WATER QUALITY MONITORING

The monitoring program and procedures outlined in the current Water Quality Monitoring Plan will be followed for the monitoring of site groundwater monitoring wells and surface water monitoring locations. The results of the water quality monitoring program will be placed in the facility operating record as described in **Section 1.14**.

3.4 LANDFILL GAS (LFG) MANAGEMENT

Due to a number of factors (the limited depth to groundwater, the sandy soils around the perimeter of the landfill, the distance to site structures, and the existence of wetlands around much of the property), no perimeter monitoring of gas from the C&D landfill is proposed.

Upon closure of the landfill, LFG control will consist of passive wells/vents installed in the final cover.

3.5 VECTOR CONTROL

Due to the nature of the waste disposed in this landfill unit, vector control is not anticipated to be of concern. Note that the use of periodic cover will discourage animals from nesting in the waste.

3.6 ODOR CONTROL

Due to the nature of the waste disposed in this landfill unit, odor control is not anticipated to be of concern. However, if odor control becomes a problem, additional measures (such as additional cover over wastes such as drywall) will be taken to ensure odor control.

3.7 DUST CONTROL

Dust has not historically been an issue at the landfill primarily due to the sandy soils at the site. If needed in the future, the County will take measures to control dust.

3.8 LEACHATE SEEPS

Leachate seeps can occur due to a variety of circumstances. The goal in dealing with leachate seeps is to prevent seepage from leaving the limits of waste disposal areas and to minimize the potential for reoccurrence. If evidence of leachate seeps is observed, the County will take the following actions. Depending on the circumstances, various combinations of actions may be appropriate.

1. If leachate is observed outside of the limits of waste disposal areas, notify the DWM (see **Section 1.2.2**).
2. Contain the flow of leachate using soil berms and/or excavation.
3. Excavate the area of seepage to attempt to allow flow into the underlying waste (i.e. break-up soil layers that may be causing the seep.).
4. For contained leachate that will not flow into underlying waste, a pump may be required to route the leachate to a tanker truck.
5. The use of soil (particularly clay) to plug the seepage may also be successful in the case where flows are minor.
6. Remove and dispose of impacted cover soils accordingly.
7. Repair landfill cover as necessary.

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Appendix A

Waste Screening Form

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Washington County Department of Public Utilities
Washington County C&D Landfill
Permit No. 94-04
(252) 793-5615

WASTE SCREENING FORM

Day / Date: _____ Time Weighed in: _____
Truck Owner: _____ Driver Name: _____
Truck Type: _____ Vehicle ID / Tag No: _____
Weight _____ Tare: _____
Waste Generator / Source: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
Detained at Scales _____ Staff Initials _____
Detained by Operating Staff _____ Staff Initials _____

Inspection Location: _____

Approved Waste Determination Form Present? Yes _____ No _____ N/A _____

Description of Load: _____
_____
_____

Load Accepted (signature) _____ Date _____
Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete only if load not accepted)

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
Texture _____ _____
Drums Present _____ Smell _____
Est. Cu. Yds. Present in Load _____
Est. Tons Present in Load _____

Washington County Emergency Management Contacted? Yes _____ No _____

Company or Authority Contacted? _____
Hazardous Materials Present: _____
_____

Hauler Notified (if waste not accepted) Phone: Time Contacted:
Other Observations: _____
_____

Final Disposition
Signed _____ Date _____
Waste Screening Inspector

Attach related correspondence to this form.
File completed form in Operating Record.

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Appendix B

Mobile Home Deconstruction

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Operations Manual
Appendix B: Mobile Home Deconstruction

Washington County Landfill Facility
Roper, North Carolina

Prepared for:

Washington County Public Utilities
Roper, North Carolina

January 2010

RICHARDSON SMITH GARDNER
& ASSOCIATES
ENGINEERING & GEOLOGICAL
SERVICES

14 N. BOYLAN AVENUE
RALEIGH, NORTH CAROLINA 27603
NC LIC. NO. C-0828 (ENGINEERING)

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WASHINGTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX B: MOBILE HOME DECONSTRUCTION

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2.0 MOBILE HOME DECONSTRUCTION PROCESS 1
- 2.1 Access 1
- 2.2 Waste Disposal 1
- 2.3 White Goods 1
- 2.4 Asbestos 2
- 2.5 Deconstruction of Mobile Homes 2
- 2.6 Holding Time for Mobile Homes 2
- 2.7 Holding Time for Recyclables 2

3.0 RECORD KEEPING PROGRAM 2

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WASHINGTON COUNTY LANDFILL FACILITY

OPERATIONS MANUAL
APPENDIX D: MOBILE HOME DECONSTRUCTION

1.0 OVERVIEW

This portion of the Operations Manual was prepared for the Mobile Home Deconstruction Area located adjacent to the Washington County Construction and Demolition Debris (C&D) Landfill unit. The Mobile Home Deconstruction Area is strictly for the deconstruction of mobile homes in order to recycle materials from the mobile homes. Washington County plans to recycle as many varieties of materials as possible as end users are available. Initially, scrap metal recycling will be conducted. Once an end-user of another material (i.e. glass) is located, these other materials may be recycled. Any non-recyclable material will be disposed of appropriately by the County upon completion of the deconstruction process.

2.0 MOBILE HOME DECONSTRUCTION PROCESS

Mobile homes will be deconstructed using the following processes.

2.1 Access

Mobile home owners seeking disposal will contact the landfill facility and be placed on a waiting list. No more than TWO (2) mobile homes will be allowed on-site for deconstruction at one time. Once space is available for a mobile home, landfill personnel will contact the next owner on the waiting list. The owner will have a 48 hour window in which to contact the landfill facility with information regarding the delivery date and hauler. If owner cannot arrange delivery within this initial 48 hour period, the owner may make alternate arrangements for delivery and must notify the landfill facility a minimum of 48 hours prior to planned delivery. The delivered mobile home will not be weighed on the scales at time of delivery, but the owner will be charged based upon the size and dimensions of the mobile home.

If delivery is not made within 48 hours of the scheduled delivery date, the owners name will be placed on the waiting list and the owner will be notified. If an owner has more than one mobile home, they will be rotated with others on the waiting list.

2.2 Waste Disposal

All mobile homes must be free of garbage, household hazardous waste, and all other non-construction and demolition waste prior to acceptance by the landfill.

2.3 White Goods

White goods will be accepted with the mobile home. White goods will be removed and handled in accordance with all State and Federal regulations. Any white goods containing CFC's will have them managed properly prior to removal of the white goods

and deconstruction of the mobile home.

2.4 Asbestos

Since asbestos may be located in the building materials of mobile homes constructed prior to 1983, all mobile homes built before 1/1/1983 will be thoroughly sprayed with water (both interior and exterior) to minimize dust. Upon demolition of a mobile home constructed prior to 1983, the waste generated will be placed in the C&D landfill and covered with six inches of soil or approved alternate cover.

2.5 Deconstruction of Mobile Homes

Once accepted, the mobile home will be placed in the mobile home deconstruction area. Mobile home deconstruction will be dependant upon weather conditions and manpower availability and will ONLY take place in the deconstruction area. Prior to deconstruction, mobile homes constructed before 1983 will be thoroughly sprayed with water to minimize dust (as noted above). The home will then be deconstructed using a track-hoe. The track-hoe will tear the trailer apart and lay the pieces on the ground to be separated by landfill personnel. The personnel will separate the non-recyclable materials from the recyclable materials. Initially, scrap metal is planned for recycling. As other end-users for other materials are available, other materials may be separated for recycling. All material not planned for recycling will be placed in the C&D landfill before the end of the day in which the deconstruction takes place. Material from mobile homes constructed prior to 1983 will be covered prior to the end of the day. All recyclable materials will be stockpiled in the deconstruction area for future recycling. **NO OPEN FLAMES OR CUTTING WITH TORCHES WILL BE ALLOWED WITHIN 100 FEET OF THE C&D LANDFILL**.

2.6 Holding Time for Mobile Homes

All mobile homes must be deconstructed within 45 days from acceptance into the deconstruction area. Upon receipt at the landfill, the date shall be painted on the side or end of the mobile home, or on the frame, for identification purposes for Solid Waste Section personnel.

2.7 Holding Time for Recyclables

Once a recyclable material is removed from a mobile home, it may be stockpiled in the mobile home deconstruction area for up to 45 days. No materials shall be kept in this area for more than 45 days, nor shall they be stockpiled in other areas awaiting recycling.

3.0 RECORD KEEPING PROGRAM

The County shall maintain the following records related to the Mobile Home Deconstruction in an operating record at the landfill (see also **Section 1.14** of the Operations Manual):

A. Mobile Home Acceptance records including dates and description;

B. Owner and hauler information for each mobile home;
C. Date of deconstruction for each mobile home and materials to be recycled;
D. Date and disposal information for all recycled materials ton include location and vendor of recipient of recycled materials.
E. Date and certification of CFC's removed.

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ATTACHMENT I

LOCAL GOVERNMENT APPROVAL DOCUMENTATION

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WASHINGTON COUNTY C&D LANDFILL
PHASE 2

LOCAL GOVERNMENT APPROVAL DOCUMENTATION

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1.0 Legal Notice of Public Meeting

2.0 Information for Adjacent Property Owners
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- Example Letter
- Certified Mail Receipts

3.0 Information from February 6, 2012 Commissioner's Meeting
- Agenda
- Copy of RSG PowerPoint Presentation
- Approved Resolution
- Meeting Minutes

4.0 Letter Demonstrating Consistency with Zoning Ordinances

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NORTH CAROLINA
WASHINGTON COUNTY.

AFFIDAVIT OF PUBLICATION

Before the undersigned, a Notary Public of said County and State, duly commissioned, qualified, and authorized by law to administer oaths, personally appeared

Mary R. Wayt,

who being first duly sworn, deposes and says: that she is publisher of The Roanoke Beacon engaged in the publication of a newspaper known as The Roanoke Beacon, published, issued, and entered as periodical mail in the Town of Plymouth, in said County and State; that he is authorized to make this affidavit and sworn statement; that the notice or other legal advertisement, a true copy of which is attached hereto, was published in The Roanoke Beacon on the following dates:

Jan 4, 2012

;

and that said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statutes of North Carolina.

This 7 day of February, 2012

Mary R. Wayt

Sworn to and subscribed before me, this 7

day of February, 2012

Mary Moscato
Notary Public

My Commission expires: 3-2-2013

MARY MOSCATO
NOTARY PUBLIC
WASHINGTON COUNTY, NC
My Commission Expires 3-2-2013

NOTICE OF PUBLIC MEETING

WASHINGTON COUNTY BOARD OF COMMISSIONERS
February 6, 2012 at 6:00 pm
116 Adams Street, Plymouth, NC 27962

WASHINGTON COUNTY LANDFILL FACILITY
LOCAL GOVERNMENT APPROVAL

NOTICE is hereby given that on February 6, 2012 at 6:00 pm, a public meeting will be held before the Washington County Board of Commissioners related to the local government approval of the continued operations and future expansion (Phase 1-6) of the existing construction and demolition debris (C&D) landfill at the County's landfill facility/ The Washington County Board of Commissioners will hear request to approve the issuance of a permit by the North Carolina Division of Waste Management for the continued operation of the C&D landfill.

Anyone interested in this matter is invited to attend the public meeting and present information to the Board of Commissioners.

Additional information related to the landfill is available for review at the Washington County Manager's Office, 120 Adams Street, Plymouth, NC. Contact Julie Bennett for an appointment at (252) 793-5823.

Lou Manning
Director
Washington Department of Public Utilities

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Washington County Geographic Information Systems

120 Adams Street, Plymouth, NC 27962
Phone: 252-793-2662
Email: tesolen@washconc.org

The following is the list of adjoining parcel owners surrounding the Washington County Landfill site located at 712 Landfill Road, Roper, NC 27970 as of Dec 20, 2011.

NORTH: Susan HARRISON, T/A VIRGINIA DARE FARMS
PO BOX 339
PLYMOUTH, NC 27962

EAST: MOORMAN FARMS LLC
Attn: Jill Moorman KELSO
501 BARCLAY AVE
ALTAMONTE SPRINGS, FL 32701

WEST: Susan HARRISON, T/A VIRGINIA DARE FARMS
PO BOX 339
PLYMOUTH, NC 27962

SW: ALBEMARLE BEACH FARMS INC
c/o Leonard C SMALL
PO BOX 148
EDENTON, NC 27932

SE: Jerry LUCAS HEIRS
c/o Jarette LUCAS
8142 CUMBERLAND GAP TRL N
JACKSONVILLE, FL 32244-6518

Timothy J. ESOLEN
Washington County GIS Director

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- EXAMPLE -

Washington County Public Utilities
396 West Millpond Road
Roper, NC 27970

252-793-7545
252-793-4546 fax

lmanring@washconc.org

Washington Public Utilities

December 28, 2011

Susan Harrison
T/A Virginia Dare Farms
Box 339
Plymouth, NC27962

RE: Washington County C&D Landfill - Permit No. 94-04
Local Government Approval
Notice of Public Meeting

Dear Property Owner:

This letter is to notify you that a public meeting will be held before the Washington County Board of Commissioners on February 6, 2012 at 6:00 p.m. at 116 Adams Street, Plymouth, NC, related to the local government approval of the continued operations and future expansion (Phases 1-6) of the existing construction and demolition debris (C&D) landfill at the County's landfill facility. The Washington County Board of Commissioners will hear a request to approve the issuance of a permit by the North Carolina Division of Waste Management for the continued operations and future expansion of the C&D landfill.

Information related to the landfill facility is attached for your review. Further information is also available for review at the Washington County Manager's Office, 120 Adams Street, Plymouth, NC. Contact Julie Bennett for an appointment at (252) 793-5823.

Anyone interested in this matter is invited to attend the public meeting and present information to the Board of Commissioners.

Sincerely,
Washington County Department of Public Utilities

Louis A. Manring
Public Utilities Director

Attachment

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WASHINGTON COUNTY LANDFILL FACILITY

FACILITY PLAN INFORMATION

1.0 OVERVIEW

Washington County, North Carolina currently owns and operates a landfill facility off of NC Highway 308 (Mackeys Road) near Roper. Access for the facility is and will continue to be off of Landfill Road. The landfill is permitted under NC Permit 94-04 for the disposal of construction and demolition debris (C&D) waste. The County also conducts several other solid waste management activities at the facility. Refer to the attached **Figure 1**, which shows the existing conditions and **Section 2.1**, which describes facility services.

The County has operated the landfill facility under the current permit since 1996. From the 1980s through 1993 (ceased receipt of waste before Oct. 9, 1993), the facility was permitted to receive municipal solid waste (MSW) under NC Permit 94-02. The MSW was disposed of in an unlined disposal unit (see **Figure 1**) located on County owned property to the west of the C&D site. The MSW landfill unit was closed in accordance with applicable State Solid Waste Management Rules.

The information contained herein is a brief description of the County's plans to continue to operate and expand the C&D landfill.

2.0 FACILITY SERVICES AND WASTE STREAM

2.1 Facility Services

Currently, the following activities or services are provided at the Washington County Landfill facility:

- Scales and office/scale house building
- Maintenance building
- C&D landfill
- Used tire storage area
- White goods and scrap metal handling area
- Yard waste processing area
- Mobile home deconstruction area.

The County may also add roll-off or other suitable containers for recyclables and/or municipal solid waste (MSW). Areas in the vicinity of the white goods/scrap metal handling area would be used for this purpose.

2.2 Types of Waste

C&D waste, used tires, white goods and scrap metal, and yard waste are accepted at the Washington County landfill facility. Wastes are routed to the landfill or other area as appropriate.

2.3 Disposal Rate and Anticipated Variances

An average of approximately 1,500 tons per year of C&D waste (average of approximately 5 tons per day based on 280 days of operation per year) is currently accepted for disposal at the

Washington County facility. The County proposes to dispose of a maximum of 10,000 tons per year of C&D waste (average of approximately 36 tons per day based on 280 days of operation per year). Actual annual and daily amounts of C&D waste are expected to vary but will not exceed the proposed annual maximum.

2.4 Service Area

The landfill facility serves Washington County.

3.0 LANDFILL CAPACITY

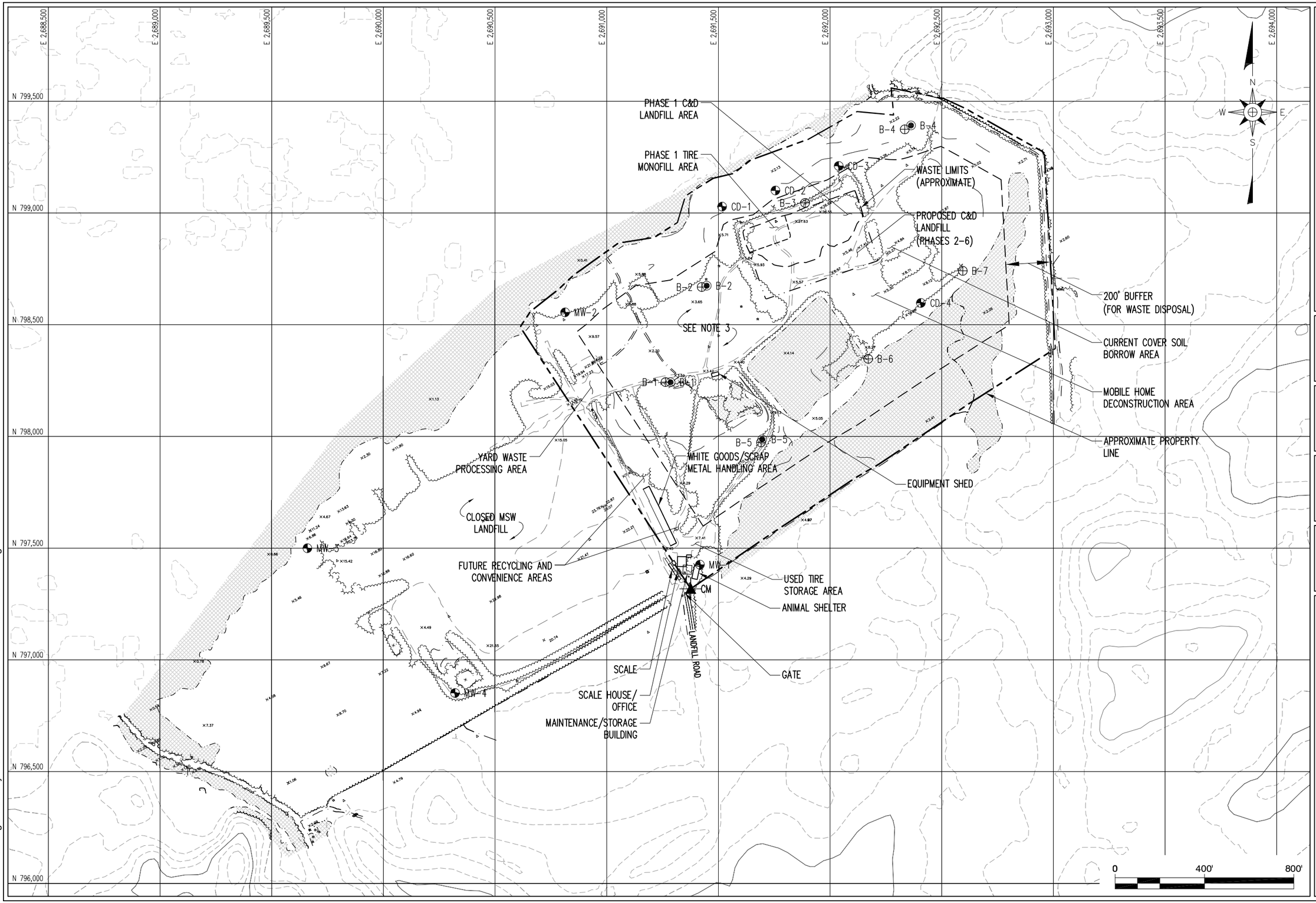
Figure 2 (C&D Landfill Development Plan), identifies the proposed final configuration for the C&D landfill. The exterior side slopes will be at a 4H to 1V slope and the top elevation will be at approximately 46 feet.

The estimated total gross operating capacity, net capacity (accounts for periodic and final cover), disposal area, and life expectancy for the landfill are shown in **Table 1**.

TABLE 1: SUMMARY OF LANDFILL CAPACITY AND LIFE EXPECTANCY

Unit	Area (Ac.)	Capacity (See Note 1)		Life Expectancy (Years) (See Note 2)
		Gross (CY)	Net (CY/Tons)	
Phase 1 (Filled Through March 28, 2009)	2.34	45,000	40,500 CY 19,777 Tons	-----
Phase 2	0.93	18,430	15,135 CY 7,568 Tons	5.0
Phase 3	0.74	16,783	13,943 CY 6,972 Tons	4.6
Phase 4	----- (See Note 3)	21,571	17,672 CY 8,836 Tons	5.9
Phase 5	----- (See Note 3)	20,986	17,435 CY 8,718 Tons	5.8
Phase 6	----- (See Note 3)	23,195	15,068 CY 7,534 Tons	5.0
Totals:	4.01	145,965	119,753 CY 59,405 Tons	26.3

Notes:
1. The net capacity is based on an assumed 10% periodic cover soil ratio and waste density of 0.5 tons/CY.
2. Life expectancy is based on an assumed average disposal rate of 1,500 tons/year and is projected from March 28, 2009 (date of most recent survey).
3. Phases 4-6 are a vertical expansion of Phases 1-3.



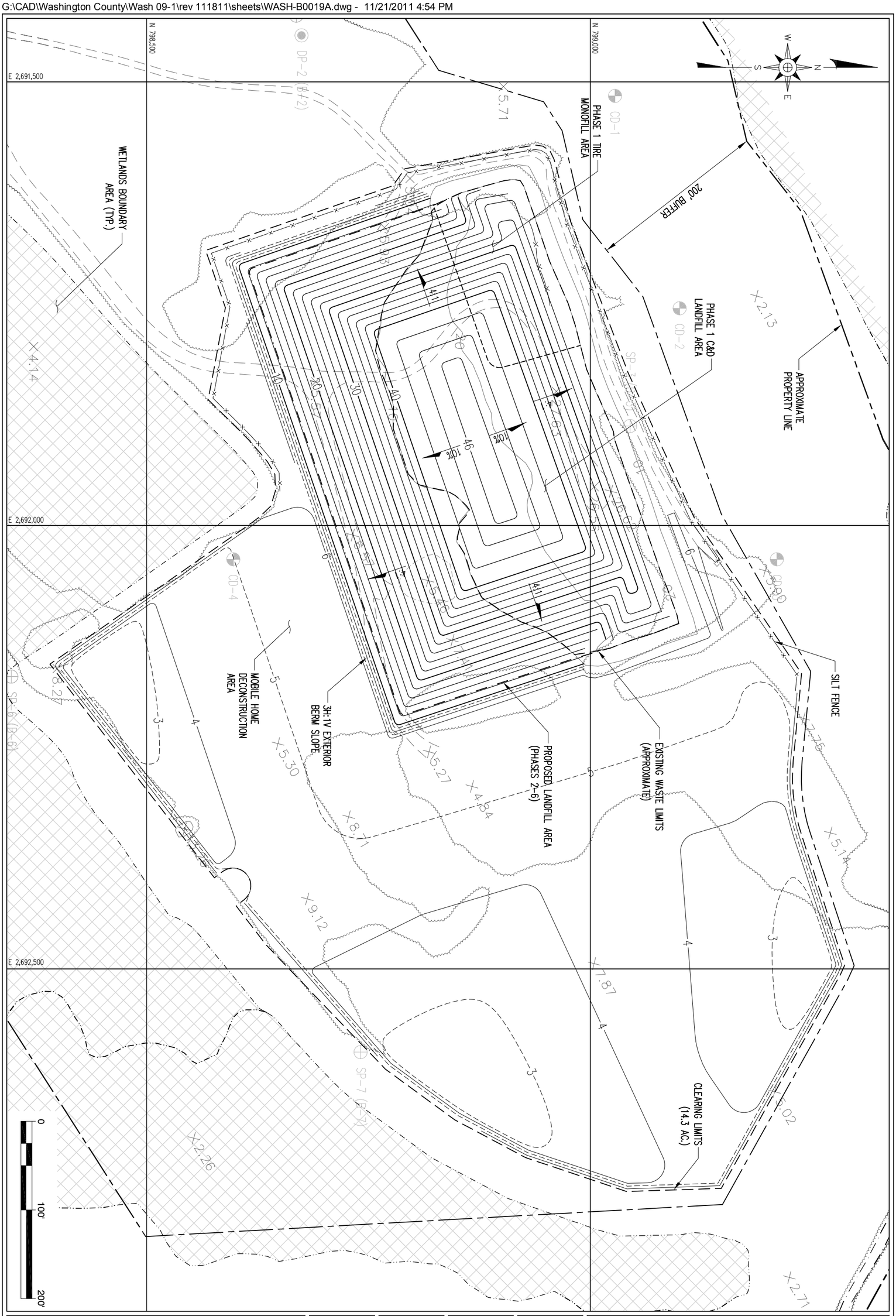
RICHARDSON SMITH GARDNER & ASSOCIATES
14 N. Boylan Ave.
Raleigh, N.C. 27603
ph: 919-828-0577
fax: 919-828-3899
NC LIC. NO. C-0205 (Engineering)
www.rsgengineers.com

FIGURE NO.	1
FILE NAME	WASH-B0018A
SCALE:	AS NOTED
PROJECT NO.	WASH 11-1
CHECKED BY:	P.K.S.
DRAWN BY:	W.R.B.
DATE:	Nov. 2011

TITLE:
WASHINGTON COUNTY C&D LANDFILL EXISTING SITE CONDITIONS

G:\CAD\Washington County\Wash 09-1\rev 111811\sheets\WASH-B0018A.dwg - 11/21/2011 4:51 PM

G:\CAD\Washington County\Wash 09-1\rev 111811\sheets\WASH-B0019A.dwg - 11/21/2011 4:54 PM



TITLE:	DRAWN BY:	CHECKED BY:	SCALE:	FIGURE NO.
WASHINGTON COUNTY C&D LANDFILL DEVELOPMENT PLAN	W.R.B.	P.K.S.	AS NOTED	2
	DATE: Nov. 2011	PROJECT NO. WASH 11-1	FILE NAME WASH-B0019A	

RICHARDSON SMITH GARDNER & ASSOCIATES
14 N. Boylan Ave.
Raleigh, N.C. 27603
NC LIC. NO. C-0526 (Engineering)
www.rsgengineers.com
ph: 919-828-0577
fax: 919-828-3899

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Moorman Farms LLC
Attn: Jill Moorman Kelso
501 Barclay Ave.
Altamonte Springs, FL
32701

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☒ Addressee

B. Received by (Printed Name) Jill Kelso
C. Date of Delivery 1/3/12

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☒ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0470 0002 7508 0837

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Susan Harrison
T/A Virginia Dare Farm
Box 339
Plymouth, NC 27962

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Clay Harper
C. Date of Delivery 12-24-11

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☒ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0470 0002 7508 0875

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Albemarle Bch. Farms
C/o Leonard C. Small
Box 148
Edenton, NC 27932

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name)
C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☒ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7011 0470 0002 7508 0851

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

WASHINGTON COUNTY
P.O. BOX 1007
PLYMOUTH, NORTH CAROLINA 2796

7011 0470 0002 7508 0844

Hasler
016H26505080
$05.79
12/28/2011
Mailed From 27962
US POSTAGE

12-30
L/N
R83

1st NOTICE 1-20
2nd NOTICE
RETURNED

Jerry Lucas heirs
c/o Ja
8142
Jacks

NIXIE 322 5E 1 00 01/18/12
RETURN TO SENDER
UNCLAIMED
UNABLE TO FORWARD
BC: 27962100707 *1380-02319-28-35

27962@1007

WASHINGTON COUNTY BOARD OF COMMISSIONERS
MONDAY, FEBRUARY 6, 2012
REGULAR BOARD MEETING

	6:00 PM	Call to Order
	6:01 PM	Invocation / Pledge Additions / Deletions
Item 1	6:05 PM	Consent Agenda a) Approval of Minutes b) Tax Refunds & Releases and Insolvent Accounts c) NC Education Lottery Public School Building Capital Fund—Stage Curtains—Creswell High School—$5,704.66 d) Resolution to Approve the Discarded Computer Equipment and Television Management Plan as an Amendment to the Washington County Solid Waste Management Plan
Item 2	6:10 PM	Public Forum
Item 3	6:20 PM	Public Hearing—Landfill Permits
Item 4	6:30 PM	Hazard Mitigation Plan
Item 5	6:40 PM	Board of Elections
Item 6	6:55 PM	Annual Tax Collection Report
Item 7	7:05 PM	Comprehensive Annual Financial Report (CAFR)
Item 8	7:25 PM	Airport Projects ➢ Taxiway Turnaround – Runway 21 ➢ Airport Terminal Renovation Project
Item 9	7:40 PM	Board & Committee Appointments
Item 10	7:45 PM	Finance Officer's Report
Item 11	7:50 PM	Other Items by Chair, Commissioners, County Manager, Clerk or County Attorney
Item 12	8:00 PM	Closed Session 143-318.11(a)(5) and 143-318.11(a)(6)

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Washington County Construction & Demolition Debris (C&D) Landfill

Local Government Approval for Continued Operations and Future Expansion

February 6, 2012

Presenter:

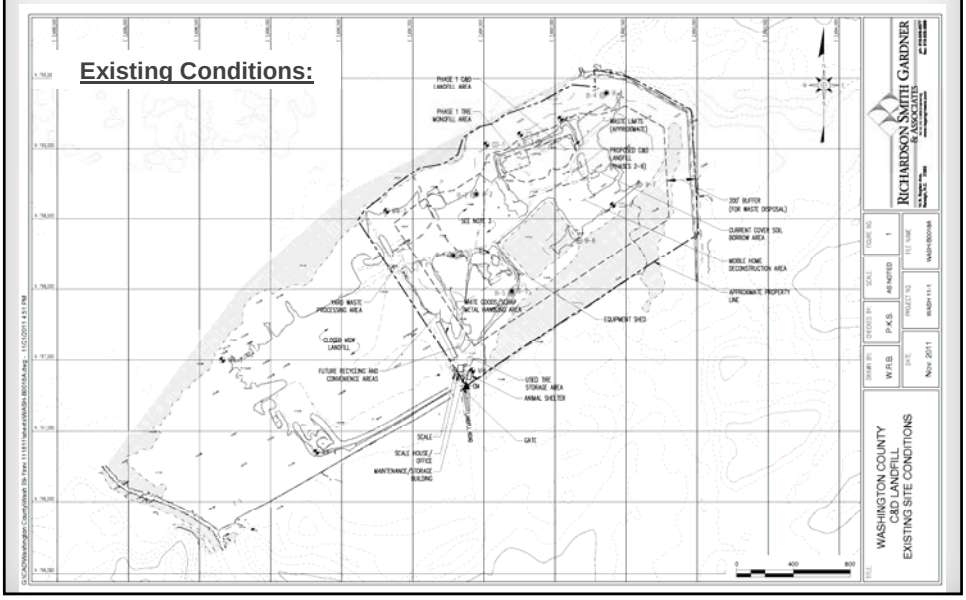
Pieter K. Scheer, P.E.

Washington County C&D Landfill - Overview

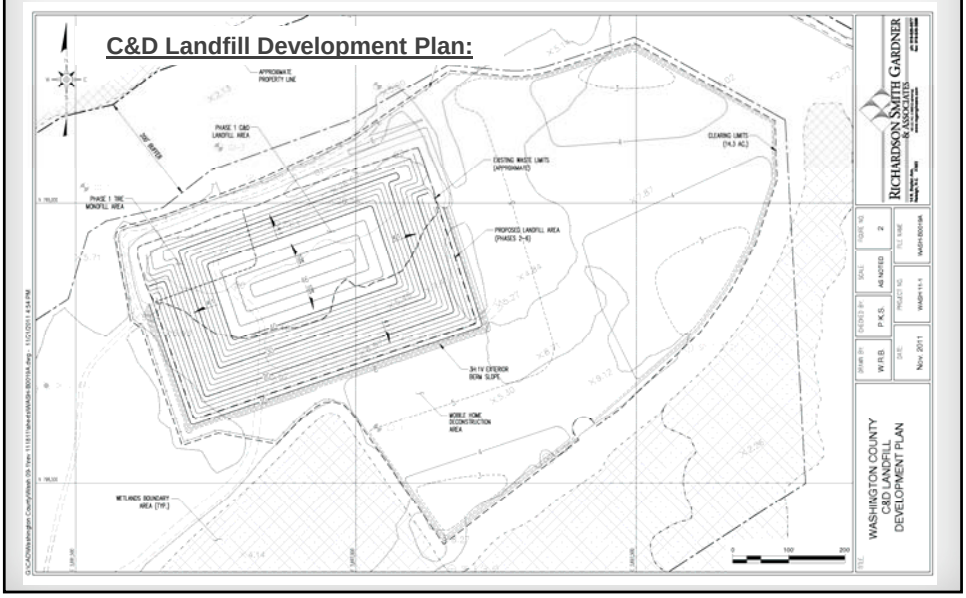
- **Items for Consideration:**
  - Continued Operations of C&D Landfill (Phase 1)
  - Future Expansion of C&D Landfill (Phases 2-6)
- **Regulatory Requirements:**
  - Local Government Approval process is required by the NC Solid Waste Management Rules (15A NCAC 13B.0536) for expansion of landfill beyond 110% of it's previously approved capacity.
- **Format:**
  - Short Presentation
  - Public Questions and Comments
  - Consideration of Resolution

RICHARDSON SMITH GARDNER & ASSOCIATES ENGINEERING & GEOLOGICAL SERVICES
www.rsgengineers.com
14 N. BOYLAN AVENUE | RALEIGH, NC 27603

Washington County C&D Landfill – Background



Washington County C&D Landfill – Development Plan



Washington County C&D Landfill – Capacity/Life

- **Capacity Summary:**

Landfill Unit	Total Waste Footprint	Gross Volume
Phase 1	2.34 Ac.	45,000 CY
Phases 2-6	1.67 Ac.	100,965 CY

- **Service Life:** Until 2035 based on 1,500 tons/year

Washington County C&D Landfill – Other Requirements

- **Other Requirements for Local Approval:**
  - **Service Area:** Washington County
  - **Waste Type:** Construction and Demolition Debris (C&D) Waste
  - **Disposal Rates:**
    - Average: 1,500 tons/year
    - Maximum: 10,000 tons/year

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Washington County C&D Landfill

- Questions/Comments?

Washington County C&D Landfill

- Consideration of Resolution to Approve Continued Operations and Future Expansion

COUNTY OF WASHINGTON

BOARD OF COMMISSIONERS

COMMISSIONERS:
BUSTER MANNING, CHAIR
RAYMOND R. MCCRAY, VICE-CHAIR
TRACEY A. JOHNSON
JEAN D. ALEXANDER
WOODY COLLINS

ADMINISTRATION STAFF:
DAVID L. PEOPLES
COUNTY MANAGER

JULIE J. BENNETT
CLERK TO THE BOARD
jbennett@washconc.org

CHERYL R. YOUNG
ASSISTANT COUNTY MANAGER
COUNTY ATTORNEY

POST OFFICE BOX 1007
PLYMOUTH, NORTH CAROLINA 27962
OFFICE (252) 793-5823 FAX (252) 793-1183

RECEIVED MAR 13 2012

WASHINGTON COUNTY LANDFILL
RESOLUTION TO APPROVE THE CONTINUED OPERATIONS AND FUTURE EXPANSION OF THE C&D LANDFILL UNIT

BE IT RESOLVED that the Washington County Board of Commissioners hereby grants approval for the issuance of a landfill permit by the NC Division of Waste Management (DWM) for the continued operations and future expansion of the construction and demolition debris (C&D) landfill unit at the County's landfill facility in compliance with North Carolina Solid Waste Management Rules T15A NCAC 13B.0536(c)(11)(A).

The C&D landfill unit is located within the previously approved landfill facility boundary (approximate 71 acre tract owned by the County) as shown the attached **Figure 1**. The Board of Commissioners hereby approves the following items related to the landfill facility:

1. Service Area:
   The landfill facility serves the County of Washington in the State of North Carolina (approximate population of 13,228 people based on Census 2010 data).

2. Waste Types and Disposal Rates:
   The landfill facility will accept construction and demolition debris (C&D) waste at a maximum rate of 10,000 tons/year (36 tons/day based on 280 operating days per year).

3. Landfill Volumes:
   The landfill facility will provide the following gross volumes (volume of waste plus periodic and final cover soil) consistent with the contours shown on the attached **Figure 2**:

Landfill Unit	Total Waste Footprint	Gross Volume
Phase 1	2.34 AC	45,000 CY
Phases 2-6	1.67 AC	100,965 CY

4. Landfill Service Life:
   Depending upon the actual disposal rates, the C&D landfill unit is projected to have an approximate remaining service life of 26.3 years (from March 28, 2009), respectively (based on an average disposal rate of 1,500 tons/year).

Adopted, this 6th day of February, 2012.

WASHINGTON COUNTY BOARD OF COMMISSIONERS

Buster Manning, Chair

Attest: Julie J. Bennett, Clerk to the Board

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WASHINGTON COUNTY

PLYMOUTH, NORTH CAROLINA

P.O. BOX 1007
27962

I, Julie J. Bennett, Clerk to the Board of Commissioners of Washington County, North Carolina do hereby certify that the foregoing is a true copy of the approved minutes of the Washington County Board of Commissioners held on February 6, 2012.

Witness my hand and the corporate seal of the said County, this the 7th day of March, 2011.

Julie J. Bennett
Clerk to the Washington County Board
of Commissioners

February 6, 2012

The Washington County Board of Commissioners met in a regular session on Monday, February 6, 2012 at 6:00 PM in the County Commissioners' Room, 116 Adams Street, Plymouth, NC. Commissioners Alexander, Johnson, McCray, and Manning were present. Also present were County Manager David L. Peoples, Clerk to the Board Julie J. Bennett, and Finance Officer Frank Milazi. Assistant County Manager/County Attorney Cheryl Young was absent.

Chair Manning called the meeting to order and asked that everyone stand for a moment of silence for Commissioner Collins who passed away on February 3, 2012. Chair Manning gave the invocation; Commissioner Alexander led the pledge of allegiance.

ADDITIONS/DELETIONS: Chair Manning moved item 5, Board of Elections up to Item 3 subsequently moving all of the others items down. Ms. Bennett added the following items to the Consent agenda:

1e) Education Lottery Public School Building Capital Fund—Replace Floor Tiles—Pines Elem. Cafe—$6,438.15
1f) Resolution—Opposition to Ferry Tolls
1g) Resolution—Children's Dental Health Month

CONSENT AGENDA: Commissioner Johnson made a motion to approve the Consent Agenda as presented along with the additions:

Consent Agenda
a) Approval of Minutes
b) Tax Refunds & Releases and Insolvent Accounts
c) NC Education Lottery Public School Building Capital Fund—Stage Curtains—Creswell High School—$5,704.66
d) Resolution to Approve the Discarded Computer Equipment and Television Management Plan as an Amendment to the Washington County Solid Waste Management Plan
e) Education Lottery Public School Building Capital Fund—Replace Floor Tiles—Pines Elem. Cafe—$6,438.15
f) Resolution—Opposition to Ferry Tolls
Resolution—Children's Dental Health Month

Commissioner McCray seconded, motion carried unanimously.

PUBLIC FORUM: None.

BOARD OF ELECTIONS: Mr. Bill Forbes, Chair of Washington County's Election Board, spoke to the Board regarding changing three polling places in the County for the upcoming May election to be in compliance with the Americas with Disabilities Act (ADA). Mr. Forbes also stated that the Elections Board recommended having laptop computers at each precinct to help Election Day run more smoothly and accurately. The three new polling sites would be at the Washington County Roper Annex Building (formerly Window on the World),

the Roper Fire Department and the Plymouth Municipal Airport. At the present time, the Scuppernong site is not ADA compliant, but the County is going to make it ADA compliant rather than moving to a new site. The cost for making the polling site changes and buying laptop computers is approximately $10,000.

Ms. Dora Bell, Elections Director, stated that making sites ADA compliant takes precedence over purchasing the laptop computers. The laptop computers could wait to be put in next year's budget.

Mr. Peoples stated that something that must also be considered is that Ms. Bell informed him that the state may not be paying for maintenance of her polling equipment next year which is about $11,000 and that the County may have to foot the bill for that next year. Money for the laptop computers this year would have to come out of the County's reserve fund. Two laptop computers would be needed at each polling site for a total of ten. The Board asked Ms. Bell to come back to the Board with more definitive numbers for what is actually needed.

PUBLIC HEARING ON LANDFILL PERMITS: Commissioner Johnson made a motion to open the public hearing on landfill permits. Commissioner Alexander seconded, motion passed unanimously.

Mr. Lou Manring introduced Mr. Pieter Scheer, Richardson Smith Gardner & Associates. Mr. Sheer showed a brief presentation.

Washington County
Construction & Demolition
Debris (C&D) Landfill

Local Government Approval for
Continued Operations and Future Expansion

Presenter:

Pieter K. Scheer, P.E.

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14 N. BOYLAN AVENUE | RALEIGH, NC 27603

Washington County C&D Landfill - Overview

Items for Consideration:

Continued Operations of C&D Landfill (Phase 1)

Future Expansion of C&D Landfill (Phases 2-6)

Regulatory Requirements:

Local Government Approval process is required by the NC Solid Waste Management Rules (15A NCAC 13B.0536) for expansion of landfill beyond 110% of it's previously approved capacity.

Format:

Short Presentation

Public Questions and Comments

Consideration of Resolution

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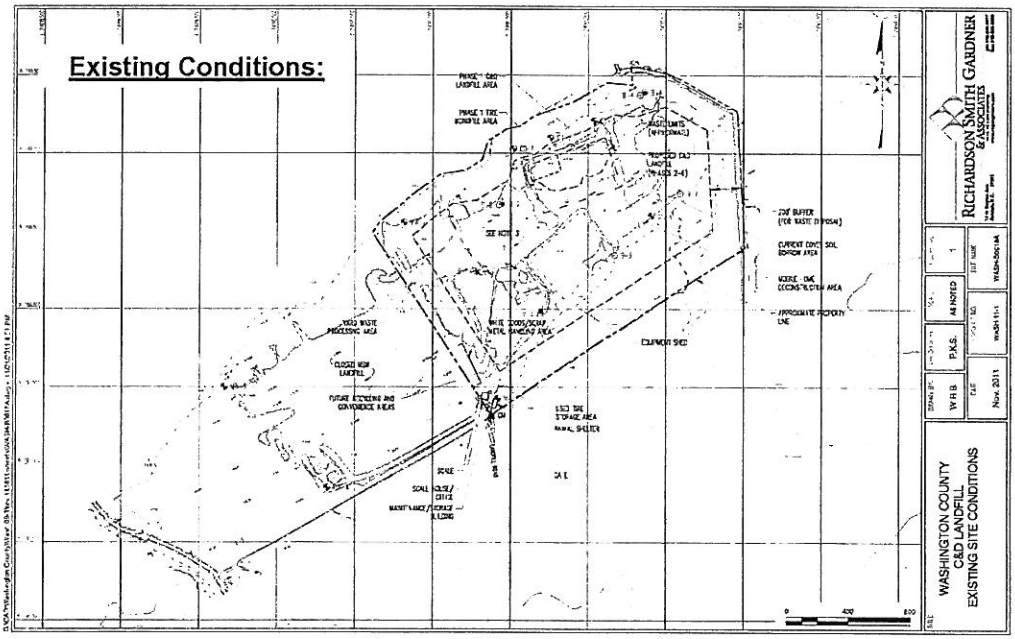
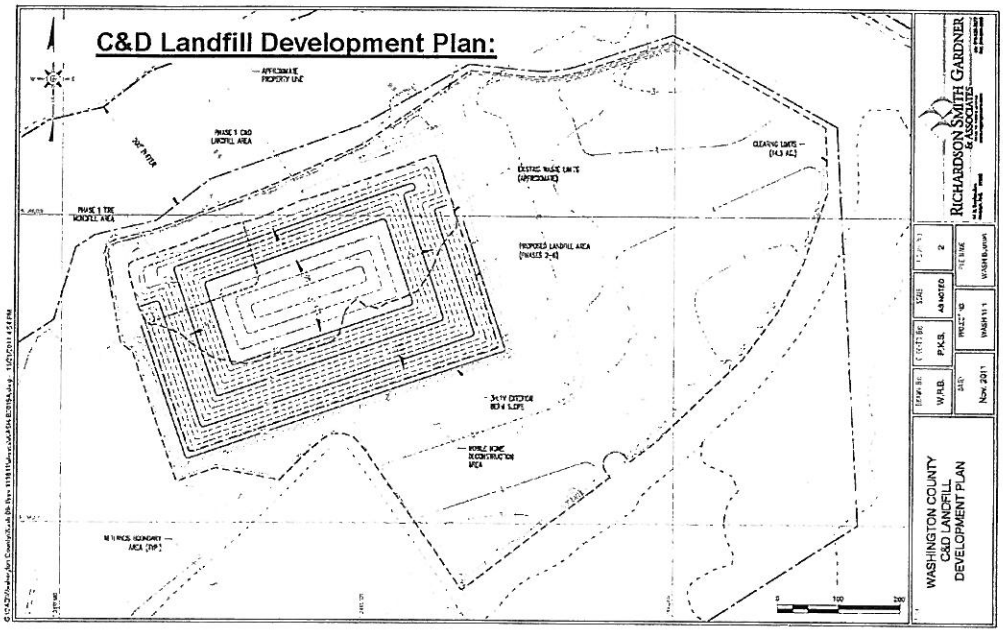
Washington County C&D Landfill – Background



Washington County C&D Landfill – Development Plan



Washington County C&D Landfill – Capacity/Life

Capacity Summary:

Landfill Unit	Total Waste Footprint	Gross Volume
Phase 1	2.34 Ac.	45,000 CY
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Other Requirements for Local Approval:

Service Area: Washington County

Waste Type: Construction and Demolition Debris (C&D) Waste

Disposal Rates:

- Average: 1,500 tons/year
- Maximum: 10,000 tons/year

Washington County C&D Landfill

Questions/Comments?

Washington County C&D Landfill

Consideration of Resolution to Approve Continued Operations and Future Expansion

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Mr. Jones asked Mr. Scheer if the percentage of growth had been figured in. Mr. Scheer replied yes, but it has been figured on the conservative side. Mr. Joyner asked if the landfill could be expanded. Mr. Scheer stated that expansion is very limited due to wetlands.

Commissioner Johnson made a motion to close the public hearing. Commissioner Alexander seconded, motion passed unanimously.

Commissioner McCray made a motion to approve the resolution to approve the continued operations and future expansion of the C&D landfill unit. Commissioner Alexander seconded, motion passed unanimously.

HAZARD MITIGATION PLAN: Ms. Ann Keyes spoke to the Board regarding the MTW Regional Hazard Mitigation Plan prepared by Holland Consulting Planners, Inc.

This plan was prepared for Washington, Martin and Tyrrell counties to promote the public health, safety, and general welfare of residents and minimize public and private losses due to natural hazards. Further, mitigation will reduce the risk and impact of future natural disasters by regulating development in known high hazard areas.

Commissioner Alexander made a motion to approve having a public hearing for the Hazard Mitigation Plan at the March 5, 2012 Board of Commissioners meeting. Commissioner McCray seconded, motion passed unanimously.

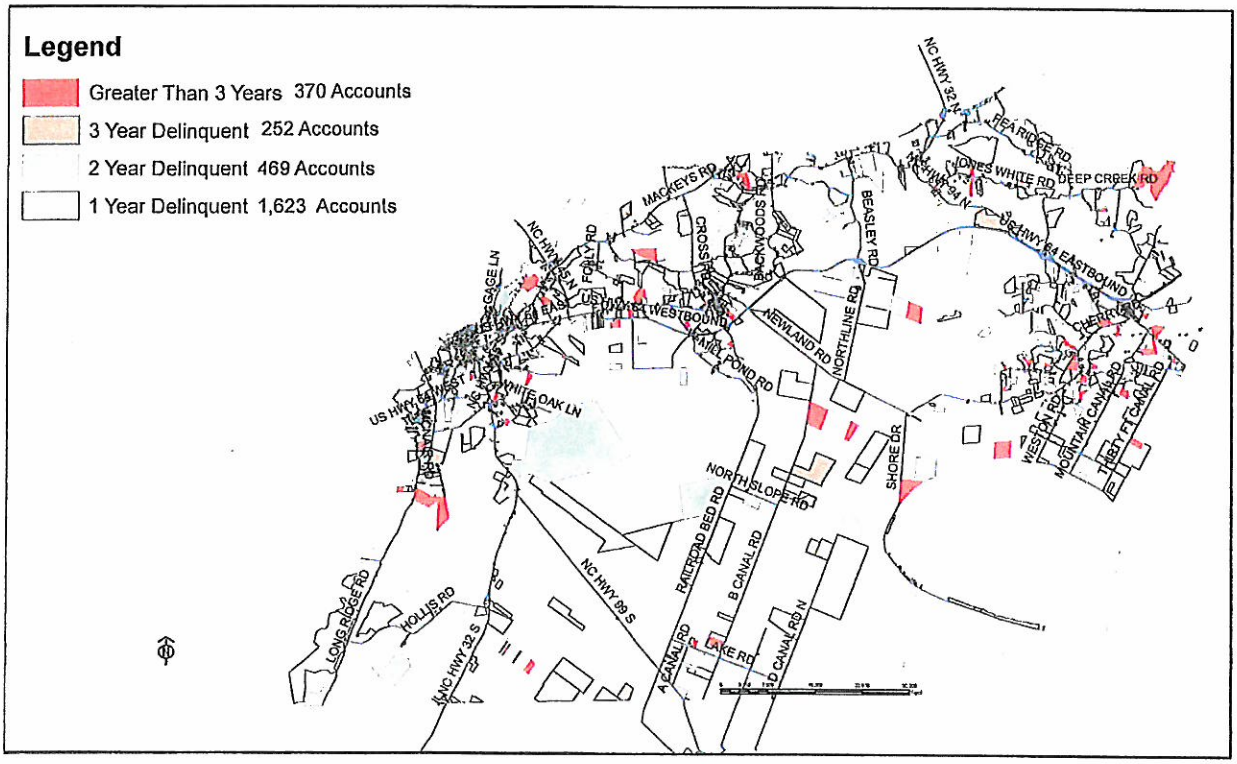
ANNUAL TAX COLLECTION REPORT: Mr. Chip Main, Tax Collector spoke to the Board regarding the annual tax collection report that he is required to do each February. Mr. Main is required by state statute to advertise unpaid 2011 taxes that are liens on real property.

Mr. Main distributed a handout on Washington County Tax Collections Update and Revaluation.

Washington County Tax Collections Update

February 6, 2012

Fiscal Year 2011-2012	
Total amount to collect by Tax Dept.	$7,240,957
Total amount of County Budget	$13,038,239
Percent of Total County Revenue Collected by Tax Dept.	56%
Percentage Collected to date	83.1%
Efforts to Enforce Collections	
Total number of 2011 Delinquent Real Property Accounts	1,623
Total number of prior year 2011 Delinquent Real Property Accounts	1,091
Amount of Delinquent Taxes Collected since 2010	$900,000
2 notices of impending In-rem Foreclosure These property had been unpaid for 10+ years	$13,000
35 notices of intent to Levy on Personal Property Had Washington County Sheriff Assist	$27,000
Discovered Personal Property $480,000 attached bank account	$4,300
Garnished / Attached 48 Payroll and/or Bank Accounts	$108,874
Debt Set-off (DSO) received	$96,856
Utilizing the NC DOR option to verify SSNs for DMV accounts for DSO and/or garnishments	
Utilizing Accurint to find people or their heirs for those accounts that seemed insolvent	
Sending a Delinquency Report to Mortgage Companies in an attempt to find and collect on delinquent accounts that are mortgaged	
Currently preparing 2nd Tax Notices to mail 2/10/12	2600
Delinquent Taxpayer's List will advertise in Newspaper	March 14, 2012
Third and final Tax notices will mail	May 7, 2012


Legend
Greater Than 3 Years 370 Accounts
3 Year Delinquent 252 Accounts
2 Year Delinquent 469 Accounts
1 Year Delinquent 1,623 Accounts
NC HWY 32 N
PEA RIDGE RD
JONES WHITE RD
DEEP CREEK RD
US HWY 64 EASTBOUND
CHERRY
MOUNTAIR CANAL RD
WESTON RD
THIRTY FT CANAL RD
MACKEYS RD
CROSS RD
BLACKWOODS RD
BEASLEY RD
NORTHLINE RD
NEWLAND RD
MILL POND RD
SHORE DR
NORTH SLOPE RD
RAILROAD BED RD
B CANAL RD
D CANAL RD N
A CANAL RD
LAKE RD
NC HWY 99 S
NC HWY 32 S
HOLLIS RD
LONG RIDGE RD
US HWY 64 WESTBOUND
US HWY 64 EAST
NC HWY 64 W
FOLLY RD
GAGE LN
WHITE OAK LN
WESTON

WASHINGTON COUNTY

P.O. BOX 1007
Plymouth, North Carolina 27962

(252) 793-1176 (PHONE)
(252) 793-2849 (FAX)

February 6, 2012

TO: Washington County Commissioners

FROM: Chip Main, Tax Administrator

Subject: Update on 2013 Revaluation

1. In July 2012 we mailed out 7,400 letters containing information on each of the 11,000 pieces of Real Property in Washington County.
   Received responses from more than 1,400 owners notifying us of some change to their property and in some situations requesting a visit to their property. I have reviewed approximately 400 of these properties and made the necessary changes. Will complete these reviews and make the necessary changes during the next 3 months.

2. Will have programmers make necessary changes and create the 2013 Computer Assisted Mass Appraisal System during March and April of 2012.

3. Changes to the property characteristics will be data entered by the existing Tax Office staff as the properties are reviewed by the Tax Administrator and his appraisal assistance.

4. The Schedule of Values, Standards and Rules will be developed by analyzing sales properties, building costs and other land and building information as needed. It will then be presented to the Washington Board of Commissioners in July-August of 2012.

5. After adoption of the Schedule of Values, the land and building rates will then be applied in the Computer Assisted Mass Appraisal System and a new preliminary value will be applied to each piece of Real Property in Washington County.

6. During the months of August thru December of 2012, all Property Record cards will be printed and the Appraisal staff will review each property to verify the value that will be placed on it.

7. 2013 Revaluation Notices will be mailed during the months of January and February 2013.

8. Appeals of Value will be held during the months of February and March 2013.

9. The Washington County Board of Equalization and Review will hold its Appeals during the months on April and May 2013.

10. Washington County Commissioners will set budget and Tax rate in June 2013.

Do our appraisers and cartographers have the authority to go on a property owner's land without their permission? If the purpose of the visit is to gather information necessary to list and appraise the property the answer is – yes.

G.S. 105-303(b) provides that the county assessor is responsible for listing all real property in the county. A part of the listing process is to accurately describe the land and any buildings located on the property (G.S. 105-309(c)). The statutes cited above implicitly give the assessor and his employees the right to enter on land in order to prepare a description of any buildings or other improvements thereon. Of course, if a property owner directed a county employee to leave the property, the employee would have to comply; but there is no trespass without such a direction from the property owner.

G.S. 105-294(a) makes the county assessor responsible for appraising all property at its true value in money pursuant to the values, standards, and rules adopted for appraisal of real property in the county's most recent revaluation year. G.S. 105-317(a)(2) requires the assessor, in appraising a building or other improvement, to consider a number of factors that influence value, including location, type of construction, age, and "any other factors that may affect its value." These statutes also give the assessor implicit authority to enter on real property for the purpose of gathering the information necessary to make an accurate appraisal of the property.

Digital imagery is used to assist the county in the quadrennial reappraisal of property. The county is under a statutory obligation to conduct the reappraisal, which gives the county a legitimate reason to enter upon the property, obtain accurate measurements and descriptions of improvements, and take other steps necessary to an adequate valuation of the property and improvements. The taking of a digital image of a building is equivalent to preparing a written description. Additionally, it is hard to imagine that someone has a right of privacy or exclusivity to the external facade of his or her home. The facade is usually visible from other properties, from the street or from aerial photography. Without such a right, the owner cannot complain of someone taking a photograph of the façade.

If the owner asks us to leave, we must do so; however, measurements estimated from the street are usually inaccurate and typically result in an over-assessment.

(This article is paraphrased from the written opinions of Joe Ferrell and David Lawrence of the Institute of Government)

Mr. Larry Jones asked what the time frame is for a resident to file an appeal. Mr. Main stated that he will ask for the Board of Equalization to open in April and close in May, and also any resident can contact tax office when they receive their evaluation notice if they would like to discuss it.

Commissioner McCray made a motion to approve advertising unpaid taxes that are liens on real property. Commissioner Alexander seconded, motion passed unanimously.

COMPREHENSIVE ANNUAL FINANCIAL REPORT (CAFR): Mr. Frank Milazi introduced Chris Burton from our auditor's office of Pittard Perry and Crone. Mr. Milazi and Mr. Burton gave the following presentation.

Comprehensive Annual Financial Statements For Fiscal Year ended June 30, 2011

Presented By:

Frank S. Milazi, Finance Officer
Chris Burton, Partner, Pittard Perry, Crone

2/27/2012 1

CAFR Format

- Introductory Section
  - Transmittal letter includes
    - formal transmittal of CAFR
    - profile of the government
    - information useful in assessing economic condition
    - awards and acknowledgements
    - expresses "more subjective information"
- Financial Section
  - Independent auditor's report
  - Management's Discussion & Analysis
    - Narrative introduction, overview, and analysis of the statements
  - Basic Financial Statements including Notes
  - Combining & individual fund statements, schedules, & supplementary information

2/27/2012 2

CAFR Format continued

- Statistical Section

  Chief source of information regarding economic condition

  20 Schedules which provide information on:
  Financial trends, Revenue Capacity,
  Debt Capacity, Operating Information
  Demographic & economic information

- Compliance Section

Transmittal Letter

Profile of the County
Economic Conditions and Outlook
Business/Industrial Development
Major Initiatives

*20 Yr Economic Development Enhancement Plan
*Completed several Airport enhancement projects
*Completion of the Bus/Industrial Commerce Center
*Proposed government services complex in the eastern part of the County composed of – clinic, library and EMS

Transmittal Letter

Economic Condition and outlook

*Sunenergy1-a major solar farm in the Co

*Travel & Tourism activities-150,000 visitors/year

*Success Dynamics–medical records tech

Awards & Acknowledgements

GFOA – Certificate of Achievement No. 16

Thanks to everyone for your contribution!

Financial Section

Independent Auditor Report

UNQUALIFED REPORT

CLEAN OPINION

To Be Reviewed in Full by Auditors

Management Discussion & Analysis (MD&A)

- Highlights

*Total assets increased by $631,497

*Combined ending fund balances of $4,102,282

*$1,397,230 is unassigned fund balance

*Unassigned fund balance has decreased due to change of fund balance allocation, state statutes as well as the 2013 tax revaluation

Management's Discussion & Analysis (MD&A)

*Narrative overview of the financial statements

*Intended to be objective straightforward, and understandable introduction

*Summary analysis of local government's financial health

*Highlights important financial issues

Statement of Net Assets

	Governmental Activities	Business Type Activities	Total Primary Government
Assets:			
Current and other assets	$ 5,420,936	$ 1,347,520	$ 6,768,456
Capital Assets	10,257,617	8,208,043	18,465,660
Total assets	15,678,553	9,555,563	25,234,116
Liabilities:			
Long-term liabilities	647,610	228,619	876,229
Other Liabilities	995,427	5,032,430	6,027,857
Total liabilities	1,643,037	5,261,049	6,904,086
Net assets:			
Invested in capital assets net of related debt	11,875,963	3,094,715	14,970,678
Unrestricted	2,159,553	1,199,799	3,359,352
Total net assets	$ 14,035,516	$ 4,294,514	$ 18,330,030

M D & A continued

Changes in Net Assets

*Fund Balance discussion–Reviewed later slide

*Budgetary Highlights include commitment of $52,598 for tax revaluation

*Capital Assets Purchased

Capital Assets
(net of depreciation)

	Governmental Activities 2011	Business-type Activities 2011	Total 2011
Land	$ 2,151,262	$ 330,158	$ 2,481,420
Buildings and improvements	3,088,911	10,510,703	13,599,614
Equipment, furniture and fixtures	897,045	229,351	1,126,396
Vehicles and motorized equipment	822,140	7,675	829,815
Construction in Progress	3,298,259	-	3,298,259
Total	$ 10,257,617	$ 11,077,887	$ 21,335,504

Outstanding Debt

	Governmental Activities 2010	Governmental Activities 2011	Business-type Activities 2010	Business-type Activities 2011
General obligation b	$ 145,000		$ -	$ -
Revenue bonds			5,204,450	5,113,328
Other debt	372,521	961,610		
Total debt	$ 517,521	$ 961,610	$ 5,204,450	$ 5,113,328

Statement of Activities

Function/Programs	Expenses	Program Revenues	Total Governmental	Total Business-Type	Total
Governmental activities:					
General government	$ 2,026,071	$ 147,564	$ (1,878,507)	$ -	$ (1,878,507)
Public safety	3,697,483	1,090,072	(2,607,411)	-	(2,607,411)
Economic and physical deve	506,253	861,398	355,145	-	355,145
Human services	6,221,993	4,737,978	(1,484,015)	-	(1,484,015)
Cultural and recreational	296,577	10,659	(285,918)	-	(285,918)
Education	1,927,016	230,968	(1,696,048)	-	(1,696,048)
Interest on long-term debt	28,383	-	(28,383)	-	(28,383)
Total governmental activi	14,703,776	7,078,639	(7,625,137)	-	(7,625,137)
Business-type activities	2,432,018	2,473,643	-	41,625	41,625
Total primary government	$ 17,135,794	$ 9,552,282	(7,625,137)	41,625	(7,583,512)
General revenues:					
Property taxes			6,324,595	-	6,324,595
Other taxes			1,677,773		1,677,773
Other revenue			147,279	964	148,243
Land/Bldg donation (airport)			64,398		
Transfers			203,412	(203,412)	-
Total revenues and transfer			8,417,457	(202,448)	8,215,009
Change in net assets			792,320	(160,823)	631,497
Net assets - beginning			13,243,196	4,455,337	17,698,533
Net assets - ending			$ 14,035,516	$ 4,294,514	$ 18,330,030

Budget & Actual-General Fund - Exhibit 5

	Final Budget	Actual	Variance
Revenues:	$13,918,508	12,794,874	$ 1,123,634
Expenditures:	14,914,689	14,631,317	283,372
Revenues under Expenditures	(996,181)	(11,836,443)	(840,262)
Total other Financing Sources	730,263	708,524	(21,739)
Revenues & other financing sources over expenditures and other financing uses	(265,918)	(1,127,919)	(862,001)
Appropriated fund Balance	$265,918	-	(265,918)
Deduction from fund balance			$(1,127,919)

CAFR Page 2-20

Fund Balance Uses

General Obligation Bonds retirement	$145,000
Tax revaluation (committed)	52,598
Balance original budget (assigned)	72,498
Revenue shortfall General Fund	597,580
Revenue shortfall – EMS	184,649
	$1,127,919

Fund Balance – General Fund

	June 30, 2010 General Fund	June 30, 2011 General Fund	Difference
Restricted for State Statute	1,539,427	1,869,229	
Committed/assigned		125,096	
Unassigned	**2,980,935**	1,450,659	**-1,530,276**
Total fund balance	$ 4,520,362	3,444,984	
Available fund balance as a % of budgeted expenditures	**19.22%**	**24.00%**	
	15,513,181	**14,654,512**	

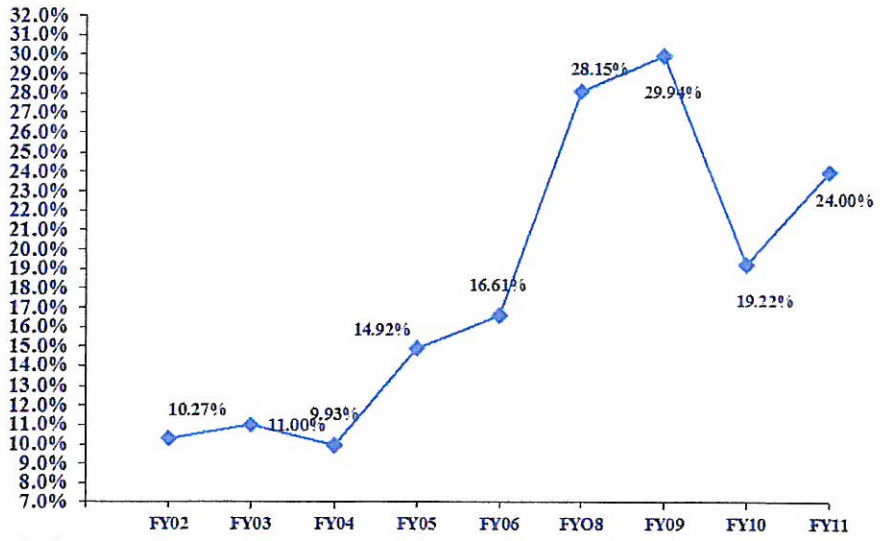
Fund Balance – General Fund

	June 30, 2011 General Fund	Hospital Reserve	Without Hospital Reserve
Restricted for State Statute	1,869,229		1,869,229
Committed/Assigr	125,096		125,096
Unassigned	1,450,659	*$1,450,659*	0
Total fund balanc	$ 3,444,984		1,994,325
Available fund balance as a % of adopted budget expenditures	24.00%		*5.50%*
	14,654,512		14,654,512

NC Average Fund Balance Available 20.76%

20 units with population less than 25,000 6/30/2011

General Fund Undesignated Fund Balance



Revenues, Expenses, and Changes in Net Assets

Exhibit 7

Proprietary Funds	Sanitation	Waterworks
Operating Revenues	$1,165,285	$1,308,358
Operating Expenditures	1,180,991	994,185
Operating Income	(15,706)	314,173
Non-operating Revenue/Expenses	286	(256,164)
Transfers/capital contributions	(50,469)	(152,943)
Changes in Net Assets	**(65,889)**	**(94,934)**

CAFR page 2-23

Other Schedules-Tax Collections

June 30, 2011	TOTAL	Excluding Vehicles (real estate)	Motor Vehicles
Current levy Collection %	91.84%	93.22%	79.61%
June 30, 2010	91.98%	93.45%	78.82%
Difference	-0.14%	-0.23%	0.79%
NC County Average	94.94%	95.85%	84.12%
Difference	(3. 10%)	(2.63%)	(4.51%)

CAFR: Page 2-82

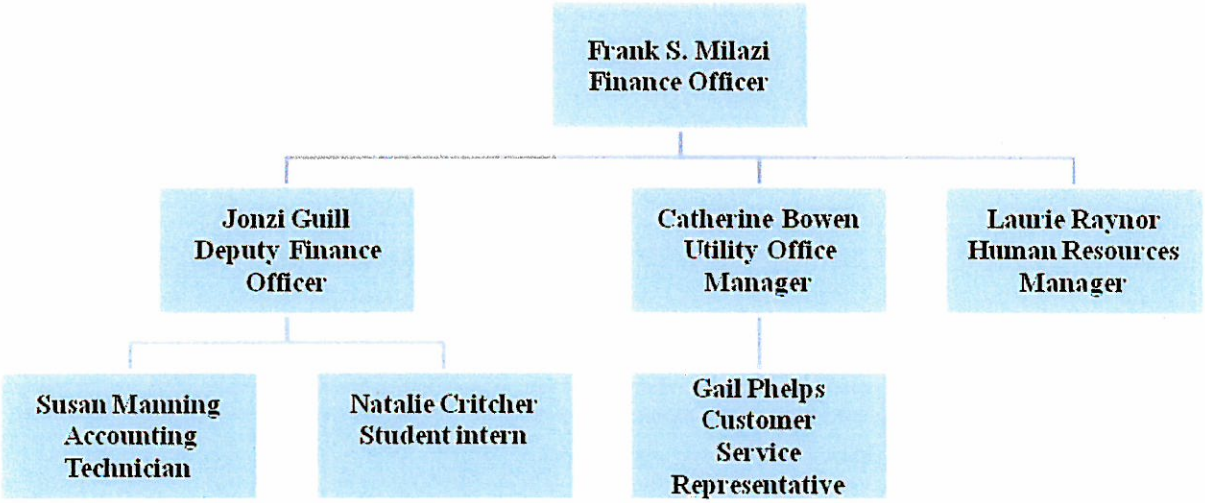
Statistical Section

Net Assets by Component
Changes in Net assets
Fund Balances of Government Funds
Changes in Fund Balance of Governmental funds
Governmental Activities Tax Revenues by Source
Assessed & Estimated Actual Value of Taxable Property
Principal Property Taxpayers
Property Tax Levies and Collections
Ratio of Debt to Assessed Value and per Capita
Other Debt Schedules

Statistical Section

Demographic and Economic Statistics
Principal Employers
County Government Employees
Water System Major Users
Water System Statistics
Capital Asset Statistics
Operating Indicators

Finance Office Staff



Audit Results

- Generally Accepted Auditing Standards
  Basic Financial Statements:
  - Unqualified – "clean opinion"
  - Represents *highest* level of assurance
- Governmental Auditing Standards
- OMB A-133 – State and Federal Financial Assistance:
  - Unqualified – "clean opinion"
  - Management Letter

Mr. Burton suggested that the County needs new accounting software since ours is getting archaic. The County currently has one programmer and if something happens to him the County would have no one to support our current system.

Mr. Jones asked how much funding was received from Golden Leaf. Mr. Burton stated that the County received $1,216,000 for the Commerce building and $480,000 for the Creswell Health Clinic from the Golden Leaf Foundation.

AIRPORT PROJECTS: Mr. David Peoples spoke to the Board regarding the taxiway turnaround on runway 21.

TAXIWAY TURNAROUND-RUNWAY 21

- Two turnarounds are needed to overcome aircraft safety concerns
- Aircraft should exit runways as soon as possible in case other aircraft need to land immediately
- A number of aircraft depending on their size and space requirements for landing are having to travel from one end of the runway to the other end and then turnaround to get back to the runway exit
- The aircraft are having to turnaround at the end of the runway with a number of them going off of the concrete surface to accomplish the turnaround
- This maneuver takes an inordinate amount of time and it can cause damage to the aircraft and ground depending on ground conditions
- The first turnaround is proposed to be constructed on the runway 21 end or north end of the runway
- The reason for selection of this project first is because this end of the runway is the farthest from the runway exit and tarmac
- There are 72 general aviation airports in our state and the NC Division of Aviation has identified this project as one of the highest priority projects of all the airport projects currently under review
- The NC Division of Aviation has announced a grant award out of their own discretionary funding of $400,000 for the engineering and construction of the turnaround
- Construction must be completed this year and our engineers have indicated that it will take approximately six months to complete this project
- Washington County will have to provide a 10 percent match or $40,000 to complete this project
- I will address a potential source of funding for the $40,000 match requirement after I conclude discussion of the next project

Mr. David Peoples spoke to the Board regarding the airport terminal building renovations. Mr. Peoples showed the Board some recent pictures of the airport terminal building where it clearly can be seen that it has been decades since any improvements have been done. There is water damage on some walls and ceiling tiles. The roof has been fixed and currently there are no leakage problems. The carpet/paneling is outdated in the conference room and there is also bad lighting and no windows in there. The chairs are also falling apart. Mr. Peoples would like to make the airport terminal more usable by expanding the conference room and making it a business area also with room for approximately 25+ people.

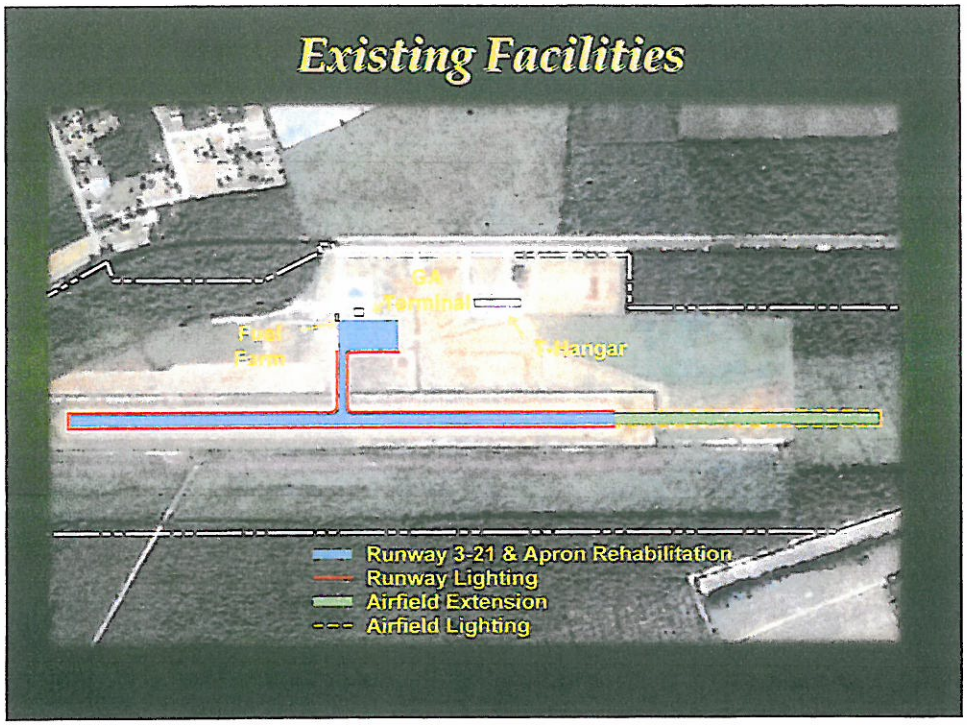
AIRPORT TERMINAL BUILDING RENOVATIONS

- Remove walls in current conference room, storage room and pilot lounge
- Remove display counter
- Construct new walls for expanded conference room and door
- Remove paneling and install sheetrock on all new conference room walls
- Install window in the conference room
- Install equipment for presentations, conference calls, internet and fax capability
- Install partition for new pilot area
- Replace ceiling tiles
- Replace flooring
- Repair walls and paint entire facility
- Purchase new furnishings
- Estimated costs $10,000 to $20,000

Mr. David Peoples spoke to the Board regarding the airport projects and their funding.

AIRPORT PROJECTS – FUNDING

- Total Airport acreage is approximately 373 acres
- Approximately 62 acres have timber that potentially could be harvested now
- Need to maintain tree buffer on Airport Road
- An acre of harvestable timber can potentially yield $2,000
- Timber prices are up considerably
- Recommend providing the $40,000 match for the turnaround project from the Airport operating budget
- Harvest approximately 20 acres of land and use the proceeds to reimburse the Airport operating budget for the $40,000 match
- Recommend providing up to "if needed" $20,000 from harvesting approximately 10 acres of timber to fund the terminal building renovations



Mr. Rick Barkas, Director of the Division of Aviation (DOA), Chastity Clark, Regional Airport Project Manager, DOA, Jason Elliott, Engineer, with Baker/LPA Group, and Jim Farthing, LPA Group were in attendance and Mr. Barkas stated that the DOA is behind the County in these projects for the airport.

Mr. Jones asked if any of the airport projects will create any jobs. Mr. Peoples stated that there could be some construction jobs if a local contractor performs the work, but no permanent jobs past the construction. Mr. Jones also asked if the facility will be able to be used by groups in Washington County. Mr. Peoples stated that might be possible, as long as the activity doesn't interfere with airport activities and that charges would be incurred if used after non-business hours because someone would have to be paid to oversee the activity.

Mr. Barkas spoke about an economic study done showing that aviation has stayed on the 'uptick' and the return to the county could be good.

Commissioner Johnson spoke to Mr. Jones saying our long range economic plan is to lure companies here and hopefully have jobs available to our local people.

Ms. Clark stated pilot's use their own discretion as to which airports they will fly into and they would more likely fly into a more updated airport.

Mr. Joyner wants the weather report to come from Plymouth Airport.

Mr. Aycock (Board of Elections member) stated he thought there was only one entrance to the airport terminal building which would be a problem as a polling place. Mr. Peoples stated that there are three entrances and the airport terminal building is ADA compliant.

Chair Manning asked for a more definitive cost for the airport terminal renovation. Chair Manning has 'cruised' timber before and the County needs to have someone do that to make sure the County knows the value per acre to get the most of our money. Chair Manning also stated that the County doesn't need to harvest the timber before it is ready. Chair Manning asked Mr. Peoples to have someone 'cruise' the timber before the Board makes a decision.

Mr. Peoples stated he will come back to the Board with more definitive numbers as to what the timber is worth. The Board will then decide whether or not to move forward with the projects and how to pay for them.

BOARD & COMMITTEE APPOINTMENTS:

a) Coastal Resources

Mr. David Peoples, County Manager recommended that the Board re-appoint Mr. Wayne Howell to the Coastal Resources Board. Mr. Howell's term expires February 1, 2012.

Mr. Howell has agreed to serve in this capacity if re-appointed.

Commissioner Johnson made a motion to approve Mr. Howell's appointment to the Coastal Resources Board. Commissioner Alexander seconded, motion carried unanimously.

FINANCE OFFICER'S REPORT: Mr. Milazi distributed his Finance Officer's Report. According to the report, EMS still looks to be a problem. Mr. Peoples explained that there is a systematic problem with the billing of EMS due to the Medicare/Medicaid reimbursement structure. Mr. Clary has done a good job of containing his cost this year and is on budget. If the County reduces its service from paramedic level to intermediate level, this would make a difference in what is reimbursed, but in the past the County has not wanted to reduce our level of service.

OTHER ITEMS BY CHAIRPERSON, COMMISSIONERS, COUNTY MANAGER, CLERK, OR ATTORNEY: Mr. Peoples reminded the Board of the Broadband meeting being held at the Martin Community College Auditorium at 7:00 pm on February 9, 2012.

Mr. Peoples also reminded the Board of Representative Butterfield's visit to the new Medical Clinic on February 22. Mr. Peoples will soon be sending out the agenda.

Commissioner Johnson made a motion to go into Closed Session pursuant to G.S. 143-381-11(1)(4) and 143-381.11(a)(5). Commissioner Alexander seconded, motion carried unanimously.

Commissioner Johnson made a motion to recess the meeting. Commissioner Alexander seconded, motion carried unanimously.

Buster Manning
Chair

Julie J. Bennett
Clerk to the Board

WASHINGTON COUNTY

PLYMOUTH, NORTH CAROLINA

P.O. BOX 1007
27962

December 28, 2011

RECEIVED JAN 12 2012

Mr. Edward F. Mussler, P.E.
NC DENR Division of Waste Management
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

RE: Washington County C&D Landfill - Permit No. 94-04
Demonstration of Consistency with Zoning Ordinances

Dear Mr. Mussler:

In compliance with 15A NCAC 13B.536(c)(11)(E), this letter is to notify you that the construction and demolition debris (C&D) landfill unit at the Washington County Landfill facility is part of the currently permitted landfill site and that this site was in existence prior to the adoption of the Washington County Zoning Ordinance. Therefore the (C & D) landfill unit at the Washington County Landfill would meet **Article 2: General Regulations: (B) Prior Approvals** of the Washington County Zoning Ordinance which states: "Nothing in this Ordinance shall be deemed to require any change to the plans, plats, lots or buildings previously approved prior to the effective date of this Ordinance."

Should you have any questions or require clarification, please contact me at your earliest convenience.

Sincerely,

Ann Keyes, CFM
Planning & Safety Director

cc: Pieter Scheer, P.E., Richardson Smith Gardner & Associates

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RECEIVED APR - 6 2012

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Land Resources
Land Quality Section

James D. Simons, PG, PE
Director and State Geologist

Beverly Eaves Perdue, Governor
Dee Freeman, Secretary

April 5, 2012

LETTER OF APPROVAL WITH MODIFICATIONS

County of Washington
ATTN: Mr. Frank S. Milazi, Finance Officer
116 Adams Street
Plymouth, North Carolina 27962

RE: Erosion and Sedimentation Control Plan No.: Washi-2012-001
Project Name: County C & D Landfill
Location: SR 1363 County: Washington
River Basin: Pasquotank
Date Received by LQS: March 27, 2012
Acres Approved: 14.3 Project Type: Revised
Project Description: This is a revision to the E & S plan approved on July 10, 1995. This plan is for expanding of the current landfill to ± 4.5 acres, increasing its height by ± 20 feet, plus the clearing, grubbing, and grading of the area around the present landfill.

Dear Sir:

This office has reviewed the subject erosion and sedimentation control plan. We find the plan to be acceptable and hereby issue this Letter of Approval with Modifications. The modifications required for approval are listed on the attached page. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as required by 15A NCAC 4B.0129, unless modified by other legislation.

Please be advised that 15A NCAC 4B.0118(a) requires that a copy of the approved erosion and sedimentation control plan be on file at the job site. Also, you should consider this letter as giving the Notice required by G.S. 113A-61.1(a) of our right of periodic inspection to ensure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Program is performance oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, it is determined that the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (G.S. 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations and rules. In addition, local city or county ordinances or rules may also apply to this land-disturbing activity. This approval does not supersede any other permit or approval

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility/Ownership Form, which you have submitted. You are required to file an amended form if there is any change in the information included on the form.

Due to the time that has passed since the original approval for this site and the many changes that have made to the pertinant environmental laws, your project will be covered by the enclosed NPDES General Stormwater Permit NCG010000 (Construction Activities). You should first become familiar with all of the requirements for compliance with the enclosed permit.

Sincerely,

Patrick H. McClain, PE
Regional Engineer

Enclosures

cc w/o enc: Pieter K. Scheer, PE, Richardson Smith Gardner & Associates
Alton Hodge, Division of Water Quality

Erosion and Sedimentation Control Plan No.: Washi-2012-001
Project Name: County C & D Landfill
April 5, 2012
MODIFICATIONS
Page A

1. **AS THE DECLARED RESPONSIBLE PARTY, YOUR LEGAL RESPONSIBILITY** is to understand the Act and comply with the following minimum requirements of the Act:

   A. In the event of a conflict between the requirements of the Sedimentation Pollution Control Act, the submitted plan and/or the contract specifications, the more restrictive requirement shall prevail;

   B. The land disturbing activity shall be conducted in accordance with the approved erosion and sedimentation control plan;

   C. The **LATEST APPROVED** erosion and sediment control plan will be used during periodic unannounced inspections to determine compliance and a copy of the plan must be on file at the job site. If it is determined that the implemented plan is inadequate, this office may require the installation of additional measures and/or that the plan be revised to comply with state law.

   D. All site revisions, including those required by other local, state or federal agencies, which affect site layout, drainage patterns, limits of disturbance and/or disturbed acreage must be submitted to this office for approval a minimum of 15 day prior implementing the revision;

   E. Revisions exceeding the approved scope of this project without this office's prior approval of the plan showing the changes can be considered a violation. Failure to comply with any part of the approved plan or with any requirements of this program could result in appropriate legal action (civil or criminal) against the financially responsible party. Legal actions could include Stop Work Orders, the assessing of a civil penalty of up to $5000 for the initial violation and/or a civil penalty of up to $5000 per day for each day the site is out of compliance.

   F. The **CERTIFICATE OF PLAN APPROVAL must be posted** at the primary entrance to the job site and remain until the site is permanently stabilized

   G. In cases of natural disaster related changes to the proposed land disturbing activity, all appropriate actions and adequate measure installations may be performed to prevent sediment damage, prior to submitting and receiving approval of the revised plan. A revised plan must be submitted for approval as soon as possible, but no later than 15 days after all emergency actions have been performed;

H. Erosion and sediment control measures or devices are to be constructed and/or installed to safely withstand the runoff resulting from a 10 year storm event (25 year storm event in High Quality Zones). The 10 year storm event is generally equivalent to a storm producing 6.5 - 7 inches in 24 hours or at the rate of 6.5 - 7 inches in 1 hour, depending on the location of the project within the region;

I. No earthen material is to be brought on or removed from the project site, until the off-site borrow and/or disposal sites are identified as part of the erosion control plan. If an off-site borrow and/or disposal site is to be utilized, submit the name and identification number (E&SCP# or Mine Permit #), prior to use.

J. A buffer zone, sufficient to restrain visible sedimentation within the 25% of the width closest to the land disturbance, must be provided and maintained between the land-disturbing activity and any adjacent property or watercourse.

K. In order to comply with the intent of the Act, the scheduling of the land-disturbing activities is to be such that both the area of exposure and the time between the land disturbance and the providing of a ground cover is minimized.

L. Unless a temporary, manufactured, lining material has been specified, a clean straw mulch must be applied, at the minimum rate of 2 tons/acre, to all seeded areas. The mulch must cover at least 75% of the seeded area after it is either tacked, with an acceptable tacking material, or crimped in place.

M. New or affected cut or filled slopes must be at an angle that can be retained by vegetative cover or other adequate erosion-control devices or structures appropriate, AND **must be provided with a ground cover** sufficient to restrain erosion **within 21 calendar days of completion of any phase (rough or final) of grading** (**ANNUAL RYE GRASS IS NOT** in the **APPROVED** seeding specifications **NOR** is it an **ACCEPTABLE** substitute for the providing of a temporary ground cover).

N. A **permanent ground cover**, sufficient restrain erosion, **must be provided** within the shorter of 15 working or 90 calendar days (if in a High Quality Zone, the shorter of 15 working or 60 calendar days) after completion of construction or development on any portion of the tract (**ANNUAL RYE GRASS IS NOT** in the **APPROVED** seeding specifications **NOR** is it an **ACCEPTABLE** substitute for the providing of a nurse cover for the permanent grass cover).

O. All sediment and erosion control details for this project must conform to the standards as shown in the current Erosion & Sediment Control Planning and Design Manual; These details must be utilized for construction and incorporated in the plan. The Design Manual may be found on-line at: http://portal.ncdenr.org/web/lr/publications

2. Adequate and appropriate measures must be properly installed downstream, within the limits of disturbance, of any land disturbing activity to prevent sediment from leaving the limits of disturbance, entering existing drainage systems, impacting an on-site natural watercourse or adjoining property