PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-07-242

Prepared For:

Edgecombe County
P. O. Box 10
Tarboro, North Carolina 27886

Prepared By:

S&ME

S&ME, Inc.
3201 Spring Forrest Road
Raleigh, North Carolina 27616

Submitted June 30, 2008
Amended November 10, 2008

S&ME

Celebrating 35 Years
1973 • 2008

November 10, 2008

Ms. Donna Wilson
Solid Waste Section
NCDENR-DWM
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

Reference: Amendment to Permit Appendices (Addendum 1)
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-242

Dear Ms. Wilson:

On behalf of Edgecombe County, S&ME, Inc. is pleased to submit two (2) copies of revisions made to the Appendices of the Permit Application for the Edgecombe County C&D Landfill (Permit # 33-01). These revisions have been made to document additional public notification made by Edgecombe County, and the approval of the Edgecombe County Board of Commissioners during a meeting held on August 4, 2008. Please replace the existing sections of the Permit Appendices with the following revised sections:

Section A - Local Government Approval
Section A-1: Edgecombe County Commissioners Approval,
Section A-2: Public Notice Documentation, including copies of published advertisements in local newspapers;
Section A-3: Adjacent Property Owner Notification Documentation;
Section A-4: Public Meeting Documentation, including an excerpt of the meeting minutes;

Section C - Corrective Action Permit Modification Application
Section C-1: North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application;
Section C-2: Public Meeting Minutes, including copies of published advertisements in local newspapers, an excerpt of the meeting minutes and copies of written material used at the meeting.
Section C-3: Resolution Adopting the Remedy

We have also included revised report cover pages, binder covers and table of contents pages to replace the originals.

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

John A. Moody, P.E.
Project Engineer

Samuel P. Watts, P.G.
Senior Project Manager

Enclosure: *Revised Permit Appendices,* dated November 10, 2008

cc: Mr. Danny Bagley - Edgecombe County Solid Waste Manager

S&ME

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June 30, 2008

Ms. Donna Wilson
Solid Waste Section
NCDENR-DWM
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

Received
JUL 2008
Waste Management

Reference: C&D Landfill Permit Application Renewal
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-242

Dear Ms. Wilson:

On behalf of Edgecombe County, S&ME, Inc. is pleased to submit two (2) copies of the application to renew the permit for the Edgecombe County C&D Landfill (Permit # 33-01). In accordance with North Carolina Solid Waste Rules defined under 15A NCAC 13B .0547(4), the permit is divided into the following sections:

- Section A Local Government Approval;
- Section B Operation and Waste Acceptance Plan;
- Section C Corrective Action Permit Modification Application;
- Section D Closure and Post-Closure Plan; and
- Section E Financial Assurance Documentation.

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

John A. Moody, P.E.
Project Manager

Samuel P. Watts, P.G.
Senior Project Manager

Enclosure: *Permit Application, Edgecombe County C&D Landfill,* dated June 2008

cc: Mr. Danny Bagley - Edgecombe County Solid Waste Manager

TABLE OF CONTENTS

SECTION A LOCAL GOVERNMENT APPROVAL [RULE .0536(c)(11)]

SECTION A-1	Edgecombe County Commissioners Approval
SECTION A-2	Public Notice Documentation
SECTION A-3	Adjacent Property Owner Notifications Documentation
SECTION A-4	Public Meeting Documentation
SECTION A-5	Edgecombe County Zoning Approval

SECTION B OPERATION AND WASTE ACCEPTANCE PLAN [RULE .0542]

APPENDIX I	Waste Screening and Acceptance Program Sample Forms
APPENDIX II	Water Quality Monitoring Plan
APPENDIX III	Gas Monitoring Plan

SECTION C CORRECTIVE ACTION PERMIT MODIFICATION APPLICATION [RULES .138, .1636 AND .1637]

SECTION C-1	North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application
SECTION C-2	Public Meeting Minutes
SECTION C-3	Resolution Document Adopting the Remedy
SECTION C-4	Site Map Illustrating Groundwater and Surface Water Monitoring Locations
SECTION C-5	Corrective Action Plan
SECTION C-6	Registrations, Permits, and Approvals
SECTION C-7	Edgecombe County Landfill Permit #33-01
SECTION C-8	Amendment to Financial Assurance Mechanism

TABLE OF CONTENTS (CONT.)

SECTION D **CLOSURE AND POST-CLOSURE PLAN [RULE .1627]**

APPENDIX I	**Borrow Area Wetland and Geotechnical Evaluation Report**
APPENDIX II	**Storm Water Calculations**
APPENDIX III	**Closure Cost Estimate**
APPENDIX IV	**Post-Closure Monitoring Form**
APPENDIX V	**Post-Closure Cost Estimate**

SECTION E **FINANCIAL ASSURANCE DOCUMENTATION [RULE .1628]**

SECTION A

LOCAL GOVERNMENT APPROVAL
[RULE .0536(c) (11)]

SECTION A-1

Edgecombe County Commissioners Approval

Approval of the C&D Landfill Permit Application

Section A-1: Edgecombe County Commissioners Approval

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed on the agenda for the following County Commissioners meeting held on August 4, 2008. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

At the August 4, 2008 meeting, the proposed C&D Landfill Permit Application was discussed, reviewed, and **approved** by the Edgecombe County Commissioners. **Approval** of the C&D Landfill Permit Application is in the form of a resolution. A copy of the resolution is included in accordance with Title 15A NCAC 13B.0536(c)(11)(A).

RESOLUTION OF THE EDGECOMBE COUNTY BOARD OF COMMISSIONERS TO APPROVE THE CONTINUED OPERATIONS OF THE C&D LANDFILL

WHEREAS, Edgecombe County, herein referred to as COUNTY, owns and operates an existing facility for disposal of construction & demolition (C&D) waste known as the Edgecombe County Landfill, herein referred to as LANDFILL; and

WHEREAS, the LANDFILL consist of an active construction & demolition (C&D) unit on top of the closed municipal solid waste (MSW) unit operated under Permit No. 33-01 issued by the North Carolina Division of Waste Management (DWM) for operation in compliance with North Carolina Solid Waste Management Rules 15A NCAC 13B .0547(4); and

WHEREAS, the permit to operate the LANDFILL is due to be renewed; and

WHEREAS, the COUNTY conducted a public information meeting on August 4, 2008, to inform the community of the proposed waste management activities; and

WHEREAS, the placement of construction and demolition (C&D) waste over top of the closed MSW unit has the benefit of reducing water infiltrating into the closed MSW landfill unit, and possibly minimizing future groundwater contamination at the LANDFILL.

NOW, THEREFORE, BE IT RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY approves the submittal of a landfill permit application for the issuance of a landfill permit by the North Carolina Division of Waste Management (DWM) for continued operations of the LANDFILL.

Motion was made by Commissioner Jonathan Felton *and duly seconded by Commissioner* E. Wayne Hines *to approve the resolution pending review by the County Attorney. Vote: Motion unanimously approved, this 4th day of August, 2008.*

Attest:

Carolyn S. Hedgepeth

Carolyn S. Hedgepeth, Clerk to the Board

SECTION A-2

Public Notice Documentation

Approval of the C&D Landfill Permit Application

Section A-2: Public Notice Documentation

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County Construction and Demolition (C&D) Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed on the agenda for the following County Commissioners meeting held on August 4, 2008. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Edgecombe County Landfill provided a public notice of the meeting at least 30 days prior to the meeting. Public notice included a legal advertisement placed in *The Daily Southerner* and the *Rocky Mount Telegram* newspapers which serve Edgecombe County. Public notice included time, place, and purpose of the meeting. The application and other documentation was placed at a location that is accessible by the public and this location was noted in the public notice. Notification of the public meeting was completed in accordance with Title 15A NCAC 13B.0536(c)(11)(C).

On June 25, 2008, S&ME, Inc. submitted to the NCDENR-DWM, Solid Waste Section a copy of the legal advertisement the County intends to post in their local newspaper on July 3, 2008. The intended advertisement and a copy of the transmittal of this advertisement to the section are enclosed. A copy of the published advertisement is also included.

Classifieds

Edg Co Public Meeting

The Daily Southerner
THURSDAY, JULY 3, 2008

Public Meeting
to Inform the Community
of the
Proposed Waste Management
Activities at the
Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County is holding a public meeting to inform the community of the proposed future operating plans for the Edgecombe Count Construction and Demolition (C&D) Landfill. Edgecombe County C&D Landfill is located at 287 Colonial Road in Tarboro, NC. The meeting will be held, Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m

Rocky Mount TELEGRAM

EDGE COUNTY MANAGER
P.O. BOX 10

TARBORO, NC 27886

CopyLine:	ngtoInformtheCommunityofthePr
Lines:	34
Total Price:	$51.00

PUBLISHER'S AFFIDAVIT

AD ID: 7002295

NORTH CAROLINA
NASH COUNTY:

JUANITA COOPER-FORD affirms that she is clerk of the Rocky Mount Telegram, a newspaper published daily at Rocky Mount, Nash County, North Carolina, and that the advertisement, a true copy of which is hereto attached, entitled PublicMeetingtoInformtheCommunityofthePr was published in said the Rocky Mount Telegram on the following dates:

Thursday, July 3, 2008 Page: D1

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

Juanita Cooper Ford

Affirmed and subscribed before me this 03 day of July 2008

Michelle W. Parker
(Notary Public Signature)

Michelle W. Parker
(Notary Public Printed Name)

MICHELLE W. PARKER
NOTARY PUBLIC
NASH COUNTY
NORTH CAROLINA

My commission expires 11-18-12

Public Meeting to Inform the Community of the Proposed Waste Management Activities at the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County is holding a public meeting to inform the community of the proposed future operating plans for the Edgecombe County Construction and Demolition (C&D) Landfill. Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. The meeting will be held, Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

SB/Carolyn S. Hedgepeth
Clerk to the Board
This the 25th day of June 2008

07/03/2008

S&ME

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June 25, 2008

Mr. Ervin Lane
Solid Waste Section
NCDENR-DWM
401 Oberlin Road, Suite 150
Raleigh, North Carolina 27605

Received
JUN 2008
Waste Management

Reference: **Public Notice Requirements**
Edgecombe County Landfill (Permit #33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-241

Dear Mr. Lane:

On behalf of Edgecombe County, S&ME, Inc. (S&ME) is pleased to provide copies of two legal advertisements the County will posting in their local newspaper on July 3, 2008. The first advertisement is to inform the local community of the proposed waste management activities (re-permitting) at the Edgecombe County Landfill in accordance with Title 15A NCAC 13B.0536(c)(11). The second advertisement is to inform the local community of a public meeting to review the groundwater findings and corrective measures for the Edgecombe County Landfill in accordance with Title 15A NCAC 13B.1635(d).

Edgecombe County intends to hold a public meeting on August 4, 2008, to receive community comments on the above referenced items.

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Michelle L. Logue
Environmental Scientist

Samuel P. Watts, P.G.
Senior Project Manager

cc: Mr. Danny Bagley - Edgecombe County Solid Waste Manager

TWO SEPARATE ADVERTISEMENTS:

Public Meeting to Inform the Community of the Proposed Waste Management Activities at the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County is holding a public meeting to inform the community of the proposed future operating plans for the Edgecombe County Construction and Demolition (C&D) Landfill. Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. The meeting will be held, Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Public Meeting to Review Groundwater Findings and Corrective Measures for the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County is holding a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. After the public meeting, Edgecombe County will select a remedy(ies) in accordance with the requirements of 15A NCAC 13B .1636 and submit the corrective measure(s) in a Corrective Action Plan for approval by the Solid Waste Section of the NC Department of Environment and Natural Resources.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

The Assessment of Corrective Measures, Nature and Extent Study, and Alternative Source Demonstration are available for public review at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Rd.
Tarboro, NC 27886

SECTION A-3

Adjacent Property Owner Notifications Documentation

Approval of the C&D Landfill Permit Application

Section A-3: Notification to Adjacent Property Owners

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed in the agenda. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Edgecombe County has notified the property owners of all properties that share a common border with the Edgecombe County Landfill by means of a U.S. Postal Service registered letter, return receipt requested. Letters were sent to the following individuals: Mr. F. Dun, Jr. at P. O. Box 306, Pinetops, North Carolina 27864, Ms. Janice Loftis at 6006 Wiss Drive, Laurel MD, 20707, Mr. Bill Eagles, Eagles Farms, LLC at P. O. Box 20570, Greensboro, North Carolina and Mr. Donald Stone (Trustee), John C. Barnes Irrevocable Trust at 5648 Stone Whitley Road, Middlesex, North Carolina 27577. The letters included a site map and listed the date, time and place of the public meeting, and described the facility plan for the landfill, including the area location and final elevation of all waste disposal units, the type and amount of waste to be disposed at the landfill, other waste management activities to be conducted at the facility, and the existing location of the entrance to the facility. Mailings were postmarked June 12, 2008, a minimum of 30 days prior to the public meeting which was being noticed. The documentation of the content and mailing of the notices are included in this permit application in accordance with Title 15A NCAC 13B.0536(c)(11)(C).

June 4, 2008

P.O. Box 306
Pinetops, NC 27864

Attention: Mr. F. Dunn Jr. et al

Reference: Edgecombe County Landfill Public Hearing

Dear Mr. Dunn:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) and municipal solid waste (MSW) transfer station. The Edgecombe County C&D Landfill and MSW transfer station are located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B §.0536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road, and consists of a C&D landfill operated on top of a closed MSW landfill regulated under Permit #32-01. The facility is bounded by woodlands to the east, west, and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973-1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the location of the active C&D landfill in relation to the other components of the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair, or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the on-going operations at buildings or structures. The C&D Landfill contains approximately 329,400 tons of C&D waste as of June 30, 2007.

A summary of the existing C&D landfill is as follows:

- Total acreage of property: 271 acres
- Total acreage of C&D landfill: 21.2 acres
- 5-year average annual tonnage rate (fiscal years 2002-2006): 13,500 tons/year
- In-place tonnage of C&D waste: 329,400 tons
- Total remaining volume of waste (as of June 30, 2007): 1,107,000cubic yards or 620,000 tons
- Remaining life expectancy (based on 5-year average annual tonnage rate as of June 30 2007): 45.9 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located east of Colonial Rd), which operates under Permit No. 33-02T;
- Yard waste compost area (located east of SR 1601);
- Tire collection area (located east of SR 1601) for shipment off-site; and
- White goods collection area (located east of SR 1601) for shipment off-site.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m. A "fact sheet" summarizing the C&D landfill permit application is available for public inspection at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Rd.
Tarboro, NC 27886

Please contact me at (252) 827-4253 if you have any questions or require additional information regarding this public hearing. Thank you very much.

Sincerely,

Danny Bagley

Mr. Danny Bagley
Solid Waste Director

Attachments: Figure 1

June 4, 2008

Eagles Farms LLC
P.O. Box 20570
Greensboro, NC 27420

Attention: Mr. Bill Eagles

Reference: Edgecombe County Landfill Public Hearing

Dear Mr. Eagles:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) and municipal solid waste (MSW) transfer station. The Edgecombe County C&D Landfill and MSW transfer station are located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B §.0536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road, and consists of a C&D landfill operated on top of a closed MSW landfill regulated under Permit #32-01. The facility is bounded by woodlands to the east, west, and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973-1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the location of the active C&D landfill in relation to the other components of the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair, or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the on-going operations at buildings or structures. The C&D Landfill contains approximately 329,400 tons of C&D waste as of June 30, 2007.

A summary of the existing C&D landfill is as follows:

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- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located east of Colonial Rd), which operates under Permit No. 33-02T;
- Yard waste compost area (located east of SR 1601);
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The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m. A "fact sheet" summarizing the C&D landfill permit application is available for public inspection at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Rd.
Tarboro, NC 27886

Please contact me at (252) 827-4253 if you have any questions or require additional information regarding this public hearing. Thank you very much.

Sincerely,

Danny Bagley

Mr. Danny Bagley
Solid Waste Director

Attachments: Figure 1

June 4, 2008

John C Barnes Irrevocable Trust
5648 Stone Whitley Rd
Middlesex, NC 27577

Attention: Mr. Donald Stone

Reference: Edgecombe County Landfill Public Hearing

Dear Mr. Stone:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) and municipal solid waste (MSW) transfer station. The Edgecombe County C&D Landfill and MSW transfer station are located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B §.0536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road, and consists of a C&D landfill operated on top of a closed MSW landfill regulated under Permit #32-01. The facility is bounded by woodlands to the east, west, and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973-1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the location of the active C&D landfill in relation to the other components of the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair, or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the on-going operations at buildings or structures. The C&D Landfill contains approximately 329,400 tons of C&D waste as of June 30, 2007.

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Sincerely,

Danny Bagley

Mr. Danny Bagley
Solid Waste Director

Attachments: Figure 1

June 4, 2008

6006 Wiss Dr.
Laurel, MD 20707

Attention: Ms. Janice Loftus

Reference: Edgecombe County Landfill Public Hearing

Dear Ms. Loftus:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) and municipal solid waste (MSW) transfer station. The Edgecombe County C&D Landfill and MSW transfer station are located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

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Other waste operations on the County facility include:

- MSW Transfer Facility (located east of Colonial Rd), which operates under Permit No. 33-02T;
- Yard waste compost area (located east of SR 1601);
- Tire collection area (located east of SR 1601) for shipment off-site; and
- White goods collection area (located east of SR 1601) for shipment off-site.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m. A "fact sheet" summarizing the C&D landfill permit application is available for public inspection at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Rd.
Tarboro, NC 27886

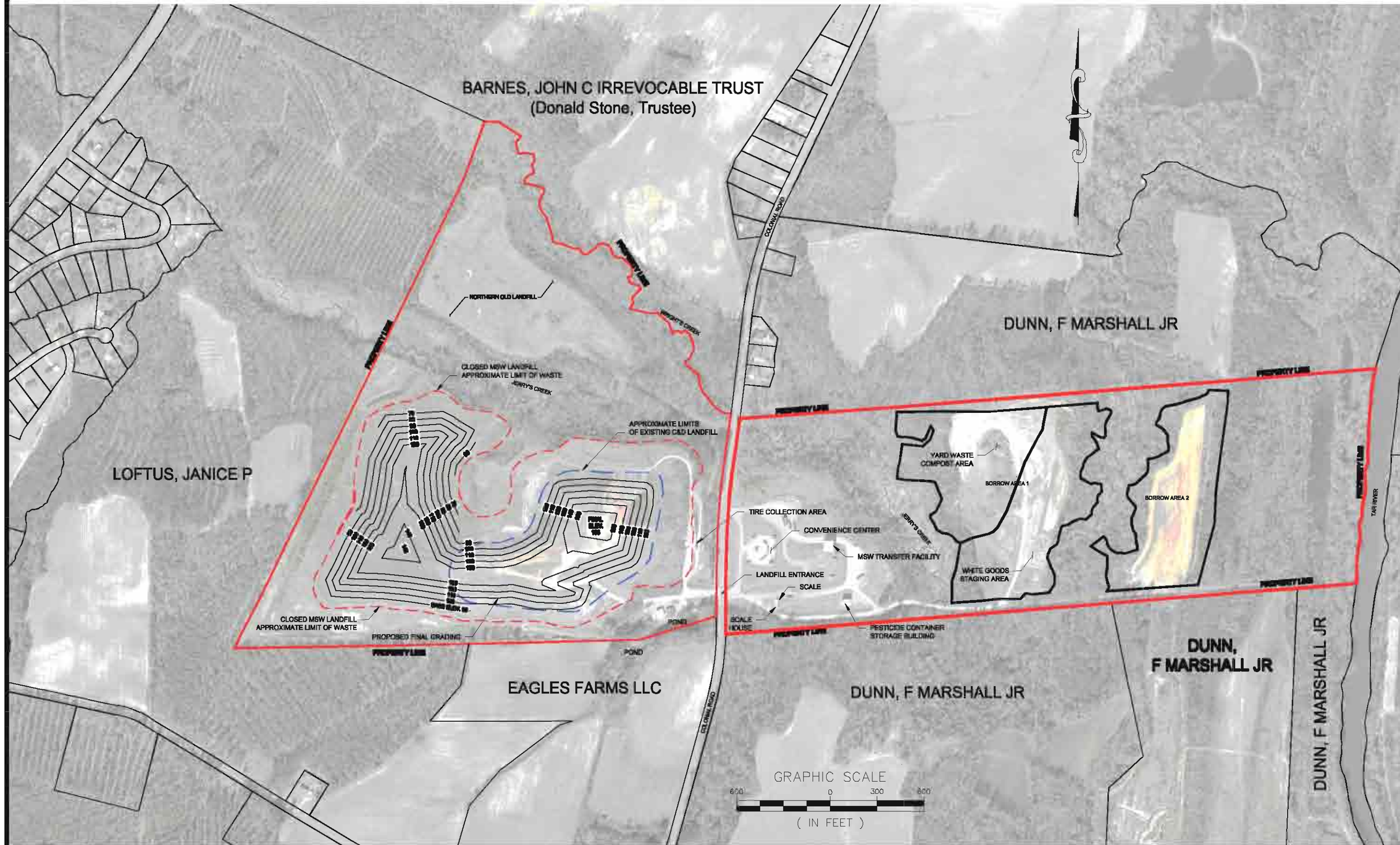
Please contact me at (252) 827-4253 if you have any questions or require additional information regarding this public hearing. Thank you very much.

Sincerely,

Danny Bagley

Mr. Danny Bagley
Solid Waste Director

Attachments: Figure 1



DATE: JUNE 2008

SCALE: 1" = 600'

DRAWN BY:

PROJECT NUMBER: 1054-07-242

CHECKED BY:

DRAWING NUMBER: B-1073

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FACILITY INFORMATION

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.

1

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Street, Apt. No.; or PO Box No.: 5648 Stone Whitley Rd

City, State, ZIP+4: Middlesex, NC 27577

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1. Article Addressed to:

John C. Barnes Irrevocable Trust
Attn: Donald Stone
5648 Stone Whitley Rd.
Middlesex, NC 27577

COMPLETE THIS SECTION ON DELIVERY

A. Signature: X Donald Stone ☐ Agent ☐ Addressee

B. Received by (Printed Name): C. Date of Delivery: 6-17-08

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7007 1490 0003 2424 5086

Sent To: Eagles Farms LLC - Bill Eagles

Street, Apt. No.; or PO Box No.: P.O. Box 20570

City, State, ZIP+4: Greensboro, NC 27420

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1. Article Addressed to:

Eagles Farms LLC
Bill Eagles
P.O. Box 20570
Greensboro, NC
27420

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A. Signature
X
☐ Agent
☐ Addressee

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$ 5.90

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TARBORO NC 27886 JUN 12 2008 USPS

Sent To: Janice Loftus
Street, Apt. No., or PO Box No.: 6006 Wiss Dr.
City, State, ZIP+4: Laurel, MD 20707

PS Form 3800, August 2006 See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

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- 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:

Janice Loftus
6006 Wiss Dr.
Laurel, MD
20707

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Janice B. Loftus ☐ Agent ☐ Addressee

B. Received by (Printed Name): Janice B. Loftus
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
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☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7007 1490 0003 2424 5093

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7007 1490 0003 2424 5079

Sent To: Frances Dunn Jr. et al
Street, Apt. No.; or PO Box No.: Po Box 306
City, State, ZIP+4: Pinetops, NC 27864

PS Form 3800, August 2006 — See Reverse for Instructions

SENDER: COMPLETE THIS SECTION

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- 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:

Frances Dunn Jr. et al
Po Box 306
Pinetops, NC 27864

COMPLETE THIS SECTION ON DELIVERY

A. Signature: X H. Whitfield ☐ Agent ☐ Addressee

B. Received by (Printed Name): H. Whitfield 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): 7007 1490 0003 2424 5079

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

SECTION A-4

Public Meeting Documentation

Approval of the C&D Landfill Permit Application

Section A-4: Public Meeting Documentation

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed on the agenda for the following County Commissioners meeting held on August 4, 2008. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Public notice of the meeting was documented and is being submitted to the Division in Section A-2. Enclosed is an excerpt of the meeting minutes regarding the C&D Landfill Permit, all written material submitted representing community concerns, and all other relevant written material distributed or used at the meeting in accordance with Title 15A NCAC 13B.0536(c)(11)(D).

A copy of the "fact sheet", which the County provided during the public meeting held August 4, 2008, is enclosed. The "fact sheet" summarizes the C&D landfill permit. Since June 12, 2008, the "fact sheet" has been available for public inspection at the Edgecombe County Landfill Office/Weigh Station located at 2872 Colonial Road, Tarboro, North Carolina, 27886.

EXCERPT FROM THE MINUTES OF THE REGULAR SCHEDULED MEETING OF THE BOARD OF COMMISSIONERS OF EDGECOMBE COUNTY HELD MONDAY, AUGUST 4, 2008 AT 2:00 P.M. IN THE COMMISSIONERS' ROOM, COUNTY ADMINISTRATIVE BUILDING TARBORO, NORTH CAROLINA

---

(3) **Mr. Harrell called a public hearing to order to inform the community of the planned re-permitting of the County's Construction and Demolition (C&D) landfill located on SR 1601, Colonial Road approximately 4.5 miles south of Tarboro.**

Mr. DeLoatch read the public notice as published.

Mr. Carmon said that a permit application fact sheet was presented as part of the agenda package relative to the continued operations of the Edgecombe County Construction and Demolition (C&D) landfill and Municipal Solid Waste (MSW) transfer station. He said that a public hearing was required prior to submitting the permit application to the State. He said that the expected life of the landfill under its current conditions is 45 years. He stated that Mr. Sam Watts, Engineer for SM&E and Mr. Danny Bagley, Solid Waste Director was present to address any questions from the Board.

Mr. Harrell called for public comments. There being none the public hearing was adjourned.

Mr. Felton moved to adopt the resolution to approve the submittal of a landfill permit application for the issuance of a landfill permit by the North Carolina Division of Waste Management for continued operations of the Edgecombe County C&D Landfill

Rev. Hines seconded the motion which carried by unanimous vote.

(4) **Mr. Harrell called a public hearing to order to review the findings and discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998.**

Mr. DeLoatch read the public notice as published.

Mr. Carmon presented a copy of information regarding the corrective action plan with the landfill to the Board of Commissioners. He said that groundwater testing is required as part of the monitoring program performed at the landfill and whenever a material is found that exceeds the State limits a corrective action plan must be implemented. He said

the County had received a positive test result for cobalt at the landfill. He said several corrective measures had been proposed for consideration and once those proposals have gone to the state he will bring back a final correction action plan. He recommended approval of a resolution to adopt a groundwater contamination corrective measure for the closed portion of the landfill.

Mr. Harrell called for public comments. There being none, the public hearing was adjourned.

Mr. Anderson moved to approve a resolution to adopt a groundwater contamination corrective measure for the closed portion of the Edgecombe County landfill as presented.

Ms. Harris seconded the motion which carried by unanimous vote.

CERTIFICATION STATEMENT

This is to certify that the above is a true and official copy of an excerpt of the minutes of the August 4, 2008 board meeting of the Edgecombe County Board of Commissioners as recorded in the official minute book of the Edgecombe County Board of Commissioners.

This 12th day of August, 2008.

Carolyn Hedgepeth

Clerk to the Board of Edgecombe County Commissioners

PERMIT APPLICATION FACT SHEET

Edgecombe County C&D Landfill
2872 Colonial Road
Tarboro, North Carolina
(Permit #33-01)

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) and municipal solid waste (MSW) transfer station. The Edgecombe County C&D Landfill and MSW transfer station are located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B §.0536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road, and consists of a C&D landfill operated on top of a closed MSW landfill regulated under Permit #33-01. The facility is bounded by woodlands to the east, west, and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973-1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the location of the active C&D landfill in relation to the other components of the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair, or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the on-going operations at buildings or structures. The C&D Landfill contains approximately 329,400 tons of C&D waste as of June 30, 2007.

A summary of the existing C&D landfill is as follows:

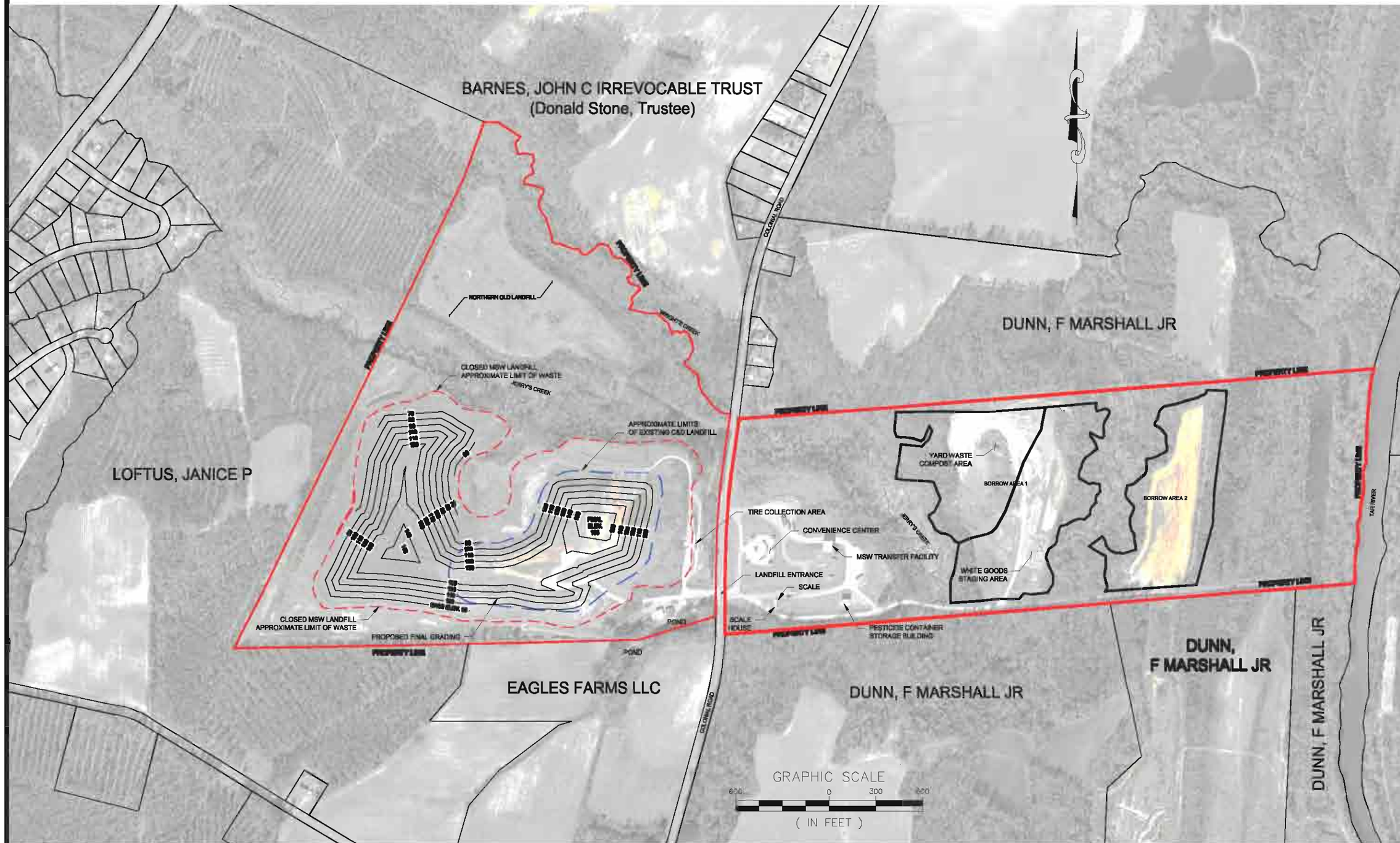
- Total acreage of property: 271 acres
- Total acreage of C&D landfill: 21.2 acres
- 5-year average annual tonnage rate (fiscal years 2002-2006): 13,500 tons/year
- In-place tonnage of C&D waste: 329,400 tons
- Total remaining volume of waste (as of June 30, 2007): 1,107,000 cubic yards or 620,000 tons
- Remaining life expectancy (based on 5-year average annual tonnage rate as of June 30 2007): 45.9 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located east of Colonial Rd), which operates under Permit No. 33-02T;
- Yard waste compost area (located east of SR 1601);
- Tire collection area (located east of SR 1601) for shipment off-site; and
- White goods collection area (located east of SR 1601) for shipment off-site.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Please contact Mr. Danny Bagley, Solid Waste Director, Edgecombe County Solid Waste Department at (252) 827-4253 if you have any questions or require additional information regarding this public hearing.



SCALE: 1" = 600'	DATE: JUNE 2008
PROJECT NUMBER: 1054-07-242	DRAWN BY:
DRAWING NUMBER: B-1073	CHECKED BY:

S&ME
WWW.SMEINC.COM

FACILITY INFORMATION

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.
1

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SECTION A-5

Edgecombe County Zoning Approval

Edgecombe County

Planning: (252) 641-7803
Inspections: (252) 641-7802
Fax: (252) 641-6913

PLANNING & INSPECTIONS

May 21, 2008

John Moody
3201 Spring Forest Rd.
Raleigh, NC 27616

The Edgecombe County Solid Waste Disposal/Landfill is located at 2759 Colonial Rd. Tarboro, NC 27886. The property is zoned AR-30, where lot sizes are to be a 30,000 sq. foot minimum. The AR-30 district allows solid waste disposal and landfill activities. The site is in compliance with all zoning regulations (9-1.2) and development standards (11-4.79).

It you have any questions or concerns feel free to give us a call.

Sincerely,

Josh Edmondson
Planner I
Edgecombe County
252-641-7804

SECTION B

OPERATION AND WASTE ACCEPTANCE PLAN
[RULE .0542]

OPERATION AND WASTE ACCEPTANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-07-242

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 2008

John A. Moody, P.E.
Project Manager
NC Licensed Engineer No. 024294

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

TABLE OF CONTENTS

1. BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Project Information 1
2. WASTE ACCEPTANCE AND DISPOSAL 2
2.1 General Requirements 2
2.1.1 Waste Acceptance 2
2.1.2 Asbestos Waste 3
2.2 Wastewater Treatment Sludge 3
2.3 Waste Exclusions 3
2.4 Waste Screening and Acceptance Program 5
3. COVER MATERIAL 6
3.1 General Requirements 6
3.2 Inactive Areas 6
3.3 Alternate Cover Material and Thickness 7
4. WASTE SPREADING AND COMPACTING 7
5. DISEASE VECTOR CONTROL 7
6. AIR CRITERIA AND FIRE CONTROL 7
6.1 Compliance 7
6.2 Open Burning 7
6.3 Equipment 8
6.4 Notification 8
7. ACCESS AND SAFETY 8
7.1 Site Access 8
7.2 Personnel 8
7.3 Access Roads 8
7.4 Dust Control 8
7.5 Facility Signs 8
7.6 Traffic Signs 9
7.7 Waste Removal 9
8. EROSION AND SEDIMENTATION CONTROL 9
8.1 Control Measures 9
8.2 Vegetative Cover 9
9. DRAINAGE CONTROL AND WATER PROTECTION 10
9.1 Surface Water Diversion 10
9.2 Surface Water Impoundment 10
9.3 Waste Disposal 10
9.4 Leachate Handling 10
9.5 Pollution Discharge 10
10. SURVEY FOR COMPLIANCE 10
11. OPERATING RECORD AND RECORDKEEPING 11
11.1 Recorded Information 11
11.2 Information Availability 11
11.3 Additional Items Included in Operating Record 11

FIGURES

Figure 1 Title Sheet
Figure 2 Existing Conditions
Figure 3 Proposed Final Grading
Figure 4 5-Year Filling Plan – Years 1 Through 4
Figure 5 5-Year Filling Plan – Year 5
Figure 6 Borrow Area Plan
Figure 7 Final Cover and Gas Vent Details
Figure 8 Stormwater Management/Erosion Controls Details I
Figure 9 Stormwater Management/Erosion Controls Details II
Figure 10 Stormwater Management/Erosion Controls Details III

APPENDICES

Appendix I Waste Screening and Acceptance Program Sample Forms
Appendix II Water Quality Monitoring Plan
Appendix III Gas Monitoring Plan

OPERATION AND WASTE ACCEPTANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT# 33-01)
EDGECOMBE COUNTY, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Operation Plan is presented to provide the necessary requirements as specified in the Solid Waste Management Rules, Section .0542. The purpose of the Operation Plan is to provide details of the facility procedures and policies of the Edgecombe County C&D Landfill in a single document for use at the facility. The information contained in this plan shall be used to assist Edgecombe County in the day-to-day operations and the periodic maintenance and monitoring requirements during the operation of the landfill. Included in this plan are sections concerning waste acceptance, landfill and site operations and maintenance, and recordkeeping.

1.2 Project Information

The Edgecombe County C&D Landfill is located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill site is bounded to the north by Jerry's Creek, to the east by State Route 1601 and to the west and south by undeveloped agricultural land. The landfill site is shown on the Site Vicinity Map (Title Sheet). Beyond Jerry's Creek to the north is the "old landfill," a pre-Subtitle D landfill which stopped receiving waste in 1979. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory. North of the northern old landfill is Wright's Creek, which merges with Jerry's Creek east (downstream) of the site.

The existing construction and demolition (C&D) landfill is operated on top of a closed municipal solid waste (MSW) unit. The MSW unit consists of two sections, an eastern section and a western section. The eastern section is approximately 33 acres, began receiving waste in 1979, and was closed in 1991. The cap in this area consists of 2 feet of soil. The western section is approximately 35 acres, began receiving waste in 1991 and was closed in 2000. The cap consists of 2.5 feet of soil.

The North Carolina Department of Environment and Natural Resources (NCDENR) issued Permit No. 33-01 to construct and operate a C&D landfill unit over the existing closed MSW unit on December 30, 1997. The County has continued to operate the C&D landfill in accordance with that permit since that time. The landfill currently receives an average of approximately 45 tons of C&D waste per day based on waste receipts over the past five (5) years, although it received as much as 600 tons per day of waste in 1999-2000 following Hurricane Floyd.

Waste operations on the facility properly, which are located west of State Route 1601 (Colonial Road) include:

- Tire collection area for shipment to an off-site vendor;
- Equipment Maintenance buildings, and
- Employee break trailer.

Other waste operations on the facility property, which are located east of State Route 1601 (Colonial Road) include:

- MSW Transfer Facility which operates under Permit No. 33-02T;
- Yard Waste Processing Area;
- Pesticide Container Recycling Building for shipment to an off-site vendor;
- White goods collection area for shipment to an off-site vendor;
- Borrow areas for landfill cover soils; and
- Several buildings used for office, equipment maintenance, and employee break trailer.

A water supply well is located on-site at the County-owned property on the east side of Colonial Road; however, this well has been removed from service. The water for the facility is supplied from the County-wide municipal water distribution system.

2. WASTE ACCEPTANCE AND DISPOSAL

2.1 General Requirements

2.1.1 Waste Acceptance

The Edgecombe County C&D Landfill shall only accept those wastes it is permitted to receive, which includes the following:

- Land-clearing debris as defined in North Carolina General Statutes (G.S), 130A-290, specifically, solid waste which is generated solely from land-clearing activities, such as stumps, trees, etc.;

- Inert debris defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil;

- Asphalt in accordance with G.S. 130A-294(m);

- Construction and demolition debris defined as solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings, or other structures;

- C&D like waste that are similar to wastes typically found in the land clearing-inert debris and C&D waste streams consisting of: roofing shingle waste from the manufacturer, waste building materials from mobile home/modular home manufacturer and wooden pallets; and

- Asbestos waste as described in Section 2.1.2 below.

Other wastes may be approved by the Division upon receipt of a written request with the specific waste type, how its generated, how much is generated; along with any additional information the Division may request to render a final decision on the disposal options for the waste.

Yard trash, as defined in G.S. 130A-290, shall not be disposed in the landfill area. However, yard trash, along with land-clearing debris, may be accepted for processing in the Yard Waste Processing Area.

The landfill operator shall notify the Division within 24 hours of any attempt to dispose of any waste products not approved by the Division for disposal at the facility.

2.1.2 Asbestos Waste

Regulated asbestos waste received at the landfill shall be managed in accordance with 40 CFR 61. Edgecombe County requires a 24 hour notice prior to receiving any shipment of asbestos. Each shipment will include the current North Carolina Asbestos Waste Shipment Record from North Carolina Department of Health and Human Services, Division of Public Health, Health Hazards Control Unit. The regulated asbestos waste will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause airborne conditions. Non-regulated asbestos waste may be comingled with other waste and disposed of in the landfill. If non-friable asbestos is identified by the County's waste screening and acceptance program and is separated from other wastes, it will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause airborne conditions.

2.2 Wastewater Treatment Sludge

The landfill shall not accept wastewater treatment sludge as waste for disposal in the landfill. However, the landfill may accept wastewater treatment sludge, with prior approval of the Division, for utilization as a soil conditioner and incorporated into or applied onto the vegetative growth layer. The wastewater treatment sludge shall neither be applied at greater than agronomic rates nor to a depth greater than six (6) inches.

2.3 Waste Exclusions

The following waste shall not be accepted by the facility for disposal:

- 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 Division 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 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 shall not be accepted if separate from C&D landfill 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; and
- Copper chrome arsenate (CCA) and creosote treated woods.

Waste accepted for disposal in a landfill unit shall be readily identifiable as C&D waste. C&D waste that has been shredded, pulverized or otherwise processed shall not be accepted for disposal from a facility unless that facility 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. A waste screening and acceptance program is provided below.

Edgecombe County shall not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste or requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

2.4 Waste Screening and Acceptance Program

The County conducts a waste screening and acceptance program at the facility for detecting and preventing disposal of hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as land clearing and inert debris (LCID) or C&D. The program consists of random inspections of incoming loads. One inspection is performed on a minimum weekly basis for commercial and industrial waste. The selection of the vehicle that will have its load inspected is the responsibility of the Operations Manager or a person he designates. The selection is made at the scales. The hauler is required to sign the Pre-Acceptance Agreement as shown in the Appendix I. The Scale Technician notifies the landfill facility's Screening Inspector (chosen by Operations Manager and adequately trained) to meet the designated hauler at an area specifically set aside for conducting screening inspections away from the working face and any on-going landfill operations. The hauler dumps the load of waste, and then the Screening Inspector sorts through the waste using a loader or other similar equipment for handling bulky materials and by hand with a rake or shovel. Once the waste is spread thin enough to observe the entire load, the inspector records the information required on the Detailed Screening Report form and Waste Screening Check List as shown in Appendix I. If hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as LCID or C&D are not found in the inspected load, then the waste is disposed of on the working face in the cell immediately after completion of the inspection.

If hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as LCID or C&D are identified in the load, the Screening Inspector shall immediately notify the Operations Manager. If hazardous waste is identified, the hazardous materials emergency response team for Edgecombe County shall also be notified. If liquid waste is discovered, it shall be contained temporarily until an absorbent can be placed or until proper containers are available for pumping. The saturated absorbent or containers will then be disposed of at an appropriate facility. The hazardous waste shall be contained in the same manner as the liquid waste and will be disposed of at a suitable facility for hazardous waste as determined by the emergency response team or a qualified environmental/hazardous waste consultant. If MSW, industrial waste or waste not characterized as LCID or C&D are identified in the load, the material will be removed by

the responsible party for disposal at an appropriate facility. The landfill staff will record the identity of the hauler and generator of the unauthorized waste.

In addition, the scale personnel and operators shall be educated to recognize probable violations to the acceptable waste guidelines. Personnel will attempt to halt the disposal of unauthorized waste and have the material removed by the responsible party if non-hazardous. If the waste is thought to be hazardous, the procedures described above will be implemented. If the presence of excluded waste is discovered only after spreading and compaction has commenced, the operator will contact the scale house to establish the hauler and generator responsible for the load so that they can be made aware of their mistake and their future loads inspected more carefully.

Records of the inspections shall be maintained in the Operating Record for the facility. Sample forms for the screening inspections are provided in Appendix I. Facility personnel involved with the screening inspections shall be trained for identification of hazardous and liquid wastes through programs offered by the State or by SWANA. Records of the training shall be maintained in the Operating Record for the facility and include the following:

1. Date of training.
2. A statement asserting that the training included:
   A. Recognition of regulated hazardous waste, liquid waste, PCBs and banned items.
   B. Hazardous waste safety precautions.
3. Written acknowledgement of training by facility personnel.

The landfill operator shall notify the Division within 24 hours of any attempt to dispose of any waste products not approved by the Division for disposal at the facility.

3. COVER MATERIAL

3.1 General Requirements

The solid waste disposed of in the landfill shall be covered with six (6) inches of earthen material, or approved alternate cover material and thickness, when the waste disposal area exceeds one-half acre and at least once weekly. Cover shall be placed at more frequent intervals if necessary to control disease vectors, fires, odors, blowing litter, and scavenging. A notation of the date and time of the cover placement shall be recorded in the Operating Record. Any asbestos waste received at the landfill shall be covered immediately with cover material in a manner that will not cause airborne conditions.

3.2 Inactive Areas

Areas which will not have additional wastes placed on them for three (3) months or more, but where final termination of disposal operations has not occurred, shall be covered and stabilized with vegetative ground cover or other stabilizing material.

3.3 Alternate Cover Material and Thickness

Currently, Edgecombe County does not utilize alternate cover materials or thicknesses. However, the landfill may utilize alternative materials or an alternative thickness of cover for the landfill units following approval by the Division. A demonstration shall be performed to show that the alternative material or thickness controls disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment. Once approval by the Division is given, this approval will extend to all units at the facility.

4. WASTE SPREADING AND COMPACTING

Edgecombe County shall restrict solid waste placement to the smallest area feasible for operations. The solid waste shall be compacted as densely as practical using landfill compactors and dozers. Fencing and/or diking shall be provided within the landfill area to confine solid waste which is subject to be blown by the wind. At the conclusion of each operating day, windblown material resulting from the operation shall be collected and disposed of.

5. DISEASE VECTOR CONTROL

Control of vectors, such as rodents, flies, mosquitoes, or other animals or insects, capable of transmitting disease to humans, is an important environmental control. Control is accomplished by denying them a source of food and water through the use of cover, proper grading, and only accepting waste the facility is permitted to receive.

6. AIR CRITERIA AND FIRE CONTROL

6.1 Compliance

The following State Implementation Plan (SIP) applies to Edgecombe County:

> Edgecombe County Redesignation Demonstration and Maintenance Plan for the Rocky Mount, North Carolina 8-hour Ozone Nonattainment Area

The SIP includes federal and state control measures. The measures which directly affect the Landfill include the on-board diagnostic vehicle inspection and maintenance program and an open burning ban during ozone action days. Currently, the Landfill is in general compliance with this SIP.

6.2 Open Burning

Open burning of solid waste, except for the approved burning of land clearing debris generated on-site or debris from emergency clean-up operations, shall be prohibited at the landfill. Prior to any burning which meets the above criteria, a request shall be sent to the Division for review and approval. A notation of the date of approval and the name of the Division personnel who approved the burning shall be included in the Operating Record.

6.3 Equipment

Equipment and stockpiled soil is available to control accidental fires. Edgecombe County has made arrangements with the Princeville Fire Department to immediately provide fire-fighting services as needed.

6.4 Notification

Any fires or explosions that occur at the facility shall be verbally reported to the Division within 24 hours and written notification provided within 15 days. Written notification shall include the suspected cause of fire or explosion, the response taken to manage the incident, and the action(s) to be taken to prevent the future occurrence of fire or explosion.

7. ACCESS AND SAFETY

7.1 Site Access

Edgecombe County's Solid Waste operations are located on both the east and west side of Colonial Road. Access to the entrances to the site is controlled by means of gates. During operation, vehicles entering the site are directed to the east side of the facility (east of Colonial Road) to pass through the security check station and weigh scales. After loads have been weighed and approved for disposal by the scale personal, vehicles disposing of C&D Waste are directed to the landfill located on the west side of Colonial Road. The eastern boundary of the landfill, along Colonial Road, and the southeast boundary of the landfill are fenced. Access to the unfenced portions of the southern and western landfill boundary is prevented by dense woods and a deep perimeter ditch. Access to the unfenced northern landfill boundary is prevented by dense woods and Jerry's Creek.

7.2 Personnel

An individual trained in landfill operations shall be on duty at the site while the facility is open for public use and at all times during active waste management operations to ensure compliance with operational requirements.

7.3 Access Roads

Access roads to the site are of all weather construction and shall be maintained in good condition.

7.4 Dust Control

Dust generated due to landfill activities will be controlled through the application of water by truck or other approved dust control procedures, if necessary. Removal of mud and dirt from the roads will also be a part of the dust control measures and be accomplished with a motor grader. Additionally, cover will be stabilized, as required, which will minimize the blowing of dust on-site.

7.5 Facility Signs

Signs providing information on disposal procedures, the hours that the site is open for public use, the permit number, and other pertinent information, such as scale location, are

posted at the site entrance. A sign is posted at the landfill entrance which states that liquid, hazardous, and municipal solid wastes are excluded from the C&D Landfill.

7.6 Traffic Signs

Traffic signs and markers are provided as necessary to promote an orderly traffic pattern to and from the disposal area and maintain efficient operating conditions

7.7 Waste Removal

The removal of solid waste from the C&D landfill is prohibited. The general public is prohibited from removal activities on the working face.

8. EROSION AND SEDIMENTATION CONTROL

8.1 Control Measures

Erosion/sedimentation control structures, which include sediment basins, check dams, and diversion ditches, are used to prevent excessive on-site erosion and prevent sediment from leaving the site. Vegetative cover is also used to reduce erosion and prevent off-site transportation of sediment. Maintenance of the control structures will be in accordance with the Erosion and Sedimentation Control Plan for the site.

Sedimentation basins shall be checked after periods of significant run-off. Sediment shall be removed from the basin to its original dimensions when sediment accumulates to one half of the design depth. The sedimentation basins, embankments, spillways and outlets shall also be inspected for erosion damage. Necessary repairs shall be made immediately. Any trash or debris within the sedimentation basin riser pipe shall be removed.

Existing check dams and diversion ditches shall be inspected for damage after each significant rainfall event. Any sediment accumulated behind check dams shall be removed. Check dams, riprap-lined channels and outlet protection used to prevent damage to channel vegetation shall be inspected for wash-outs. Riprap shall be added to these areas as needed to maintain integrity of the structure. Siltation that has accumulated in diversion ditches shall be removed periodically to maintain adequate flow capacity.

Borrow areas shall be graded to promote positive drainage of surface water out of the area.

8.2 Vegetative Cover

Embankment slopes shall be periodically monitored for erosion and shall be mowed at least once a year. The embankment slopes shall be refertilized in the second year unless vegetation growth is fully adequate. Any damaged areas shall be reseeded, fertilized and mulched immediately. Seeding, fertilizing and mulching shall be in accordance with the North Carolina Erosion and Sedimentation Control Guidelines.

9. DRAINAGE CONTROL AND WATER PROTECTION

9.1 Surface Water Diversion

Surface water will be diverted from the operational area. A drainage feature at the center of the active area collects the surface water run-off and directs the flow toward Jerry's Creek.

Other surface drainage features collect surface water run-off from an area of the eastern side of the landfill. Surface water from this portion of the site flows around the eastern end of the landfill through drainage ditches that flow into Jerry's Creek and eventually to the Tar River.

9.2 Surface Water Impoundment

Surface water shall not be impounded over or in the waste. The waste surface shall be graded and soil berms used as necessary to divert surface water away from the operational area and away from the waste.

9.3 Waste Disposal

Waste shall not be disposed of in water. The waste surface shall be graded and soil berms used as necessary to divert surface water away from the operational area and away from the waste.

9.4 Leachate Handling

Leachate at the facility is currently contained on-site. If it becomes necessary to collect leachate, methods for leachate handling will be evaluated at that time. Leachate handling methods will be submitted to NCDENR and other relevant and appropriate agencies for review and approval at that time.

9.5 Pollution Discharge

Edgecombe County shall operate the landfill in ways to prevent the discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including the National Pollutant Discharge Elimination System (NPDES) requirements, pursuant to Section 402.

Edgecombe County shall also operate the landfill in ways to prevent the discharge of a nonpoint source of pollution to waters of the United States, including wetlands, that violates any requirement of an area-wide or State-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

10. SURVEY FOR COMPLIANCE

In accordance with Solid Waste Management Rules, Section .0542(m), within 60 days of Edgecombe County's receipt of the Division's written request, Edgecombe County shall conduct a survey of active or closed portions of unit or units at the facility in order to determine whether operations are being conducted in accordance with the approved design and operational plans. The survey shall be performed by a registered land

surveyor (RLS) duly authorized under North Carolina law to conduct such activities. Edgecombe County shall then report the results of such survey, including a map produced by the survey, to the Division within 90 days of receipt of the Division's request.

Operations personnel will periodically monitor landfill top and side slope elevations with a level or through construction staking by a land surveyor. When top and side slope elevations approach design grades, the final waste grades will be staked to provide filling operations consistent with the approved Drawings.

11. OPERATING RECORD AND RECORDKEEPING

11.1 Recorded Information

Edgecombe County shall maintain on-site the following information:

- Records of random waste inspections, monitoring results, certifications of training, and training procedures required by the Solid Waste Management Rules, Section .0544;
- Amounts by weight of solid waste received at the facility to include, consistent with G.S. 130A-309.09D, county of generation;
- Any demonstration, certification, finding, monitoring, testing, or analytical data required by the Solid Waste Management Rules, Sections .0544 through .0545;
- Any closure or post-closure monitoring, testing, or analytical data as required by the Solid Waste Management Rules, Section .0543;
- Any cost estimates and financial assurance documentation required by the Solid Waste Management Rules, Section .0546;
- Notation of date and time of placement of cover material; and
- All audit records, compliance records and inspection reports.

11.2 Information Availability

Information contained in the Operating Record shall be furnished to the Division according to the permit or upon request, or be made available for inspection by the Division.

11.3 Additional Items Included in Operating Record

The Operating Record shall also include:

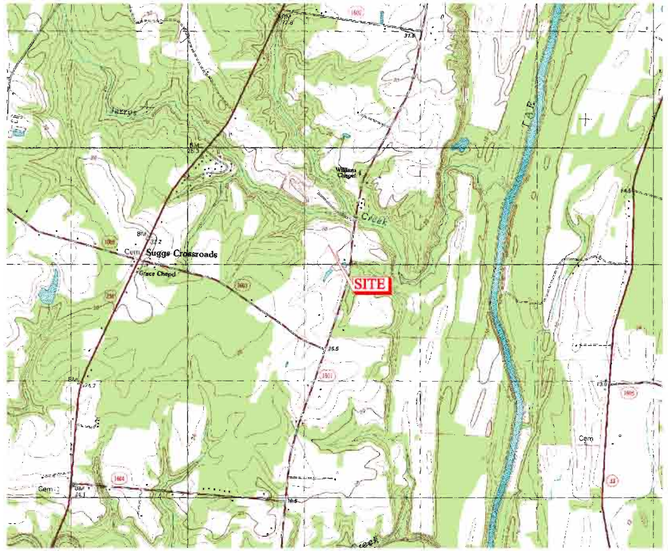
- A copy of the approved operation plan;
- A copy of the current Permit to Construct and Permit to Operate; and
- The Monitoring Plan included as appendices to the Operation Plan.

FIGURES

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
PERMIT # 33-01

EDGECOMBE COUNTY
TARBORO, NORTH CAROLINA

JUNE 2008



SITE VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

DRAWING	TITLE
1.	TITLE SHEET
2.	EXISTING CONDITIONS
3.	PROPOSED FINAL GRADING
4.	5-YEAR FILLING PLAN - YEARS 1 THROUGH 4
5.	5-YEAR FILLING PLAN - YEAR 5
6.	BORROW AREA PLAN
7.	FINAL COVER AND GAS VENT DETAILS
8.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS I
9.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS II
10.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS III

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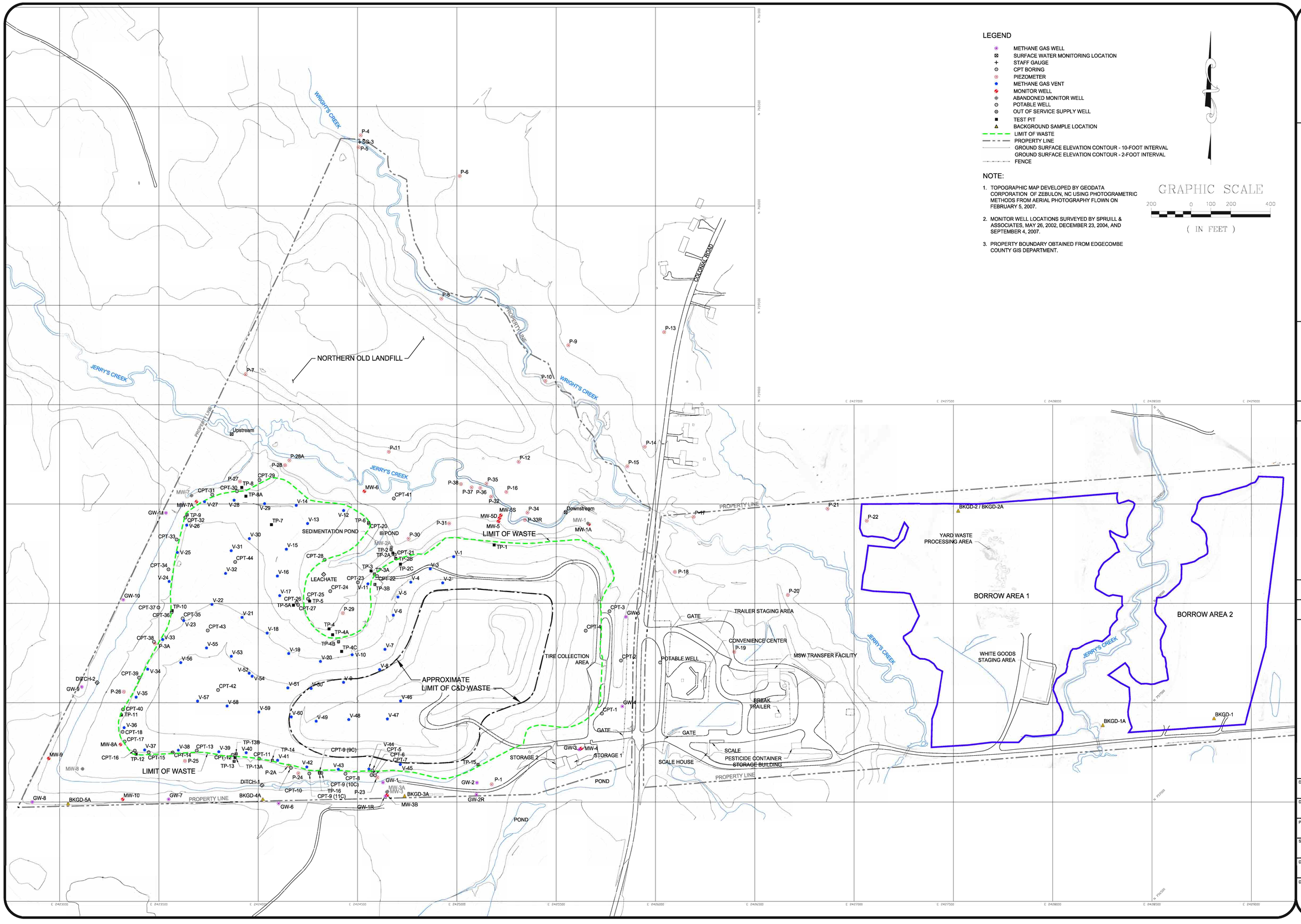
NO.	DATE	DESCRIPTION	BY

TITLE SHEET

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:
CHECKED BY:
DESIGNED BY:
APPROVED BY:
PROJECT NUMBER: 1054-07-242
SCALE: AS SHOWN
DATE: JUNE 2008
DRAWING NUMBER: D-1028-01
DRAWING: 1
OF: 10



LEGEND

- METHANE GAS WELL
- SURFACE WATER MONITORING LOCATION
- STAFF GAUGE
- CPT BORING
- PIEZOMETER
- METHANE GAS VENT
- MONITOR WELL
- ABANDONED MONITOR WELL
- POTABLE WELL
- OUT OF SERVICE SUPPLY WELL
- TEST PIT
- BACKGROUND SAMPLE LOCATION
- LIMIT OF WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

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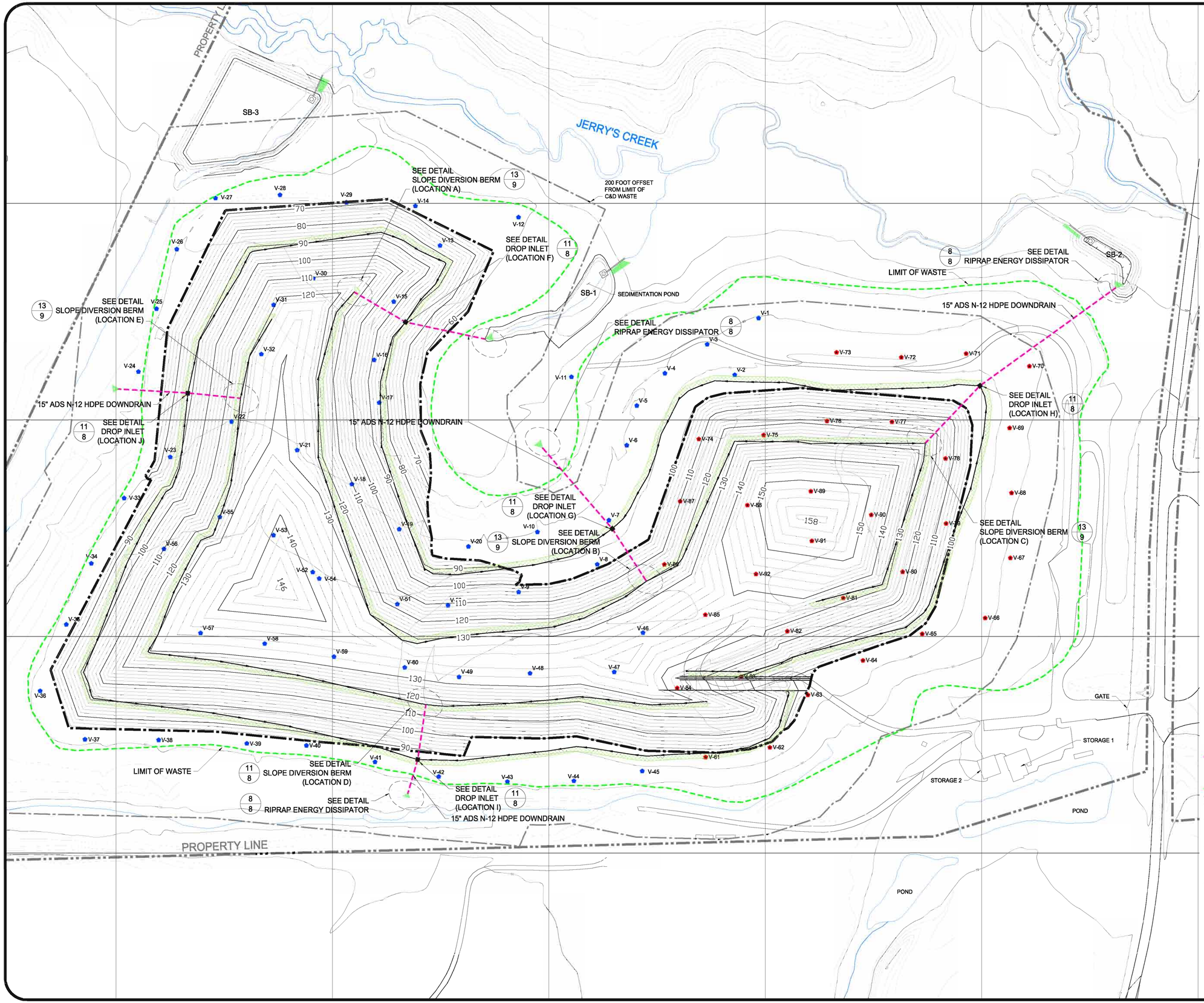
NO.	DATE	DESCRIPTION	BY

EXISTING CONDITIONS

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1023	
DRAWING: 2	OF: 10



NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

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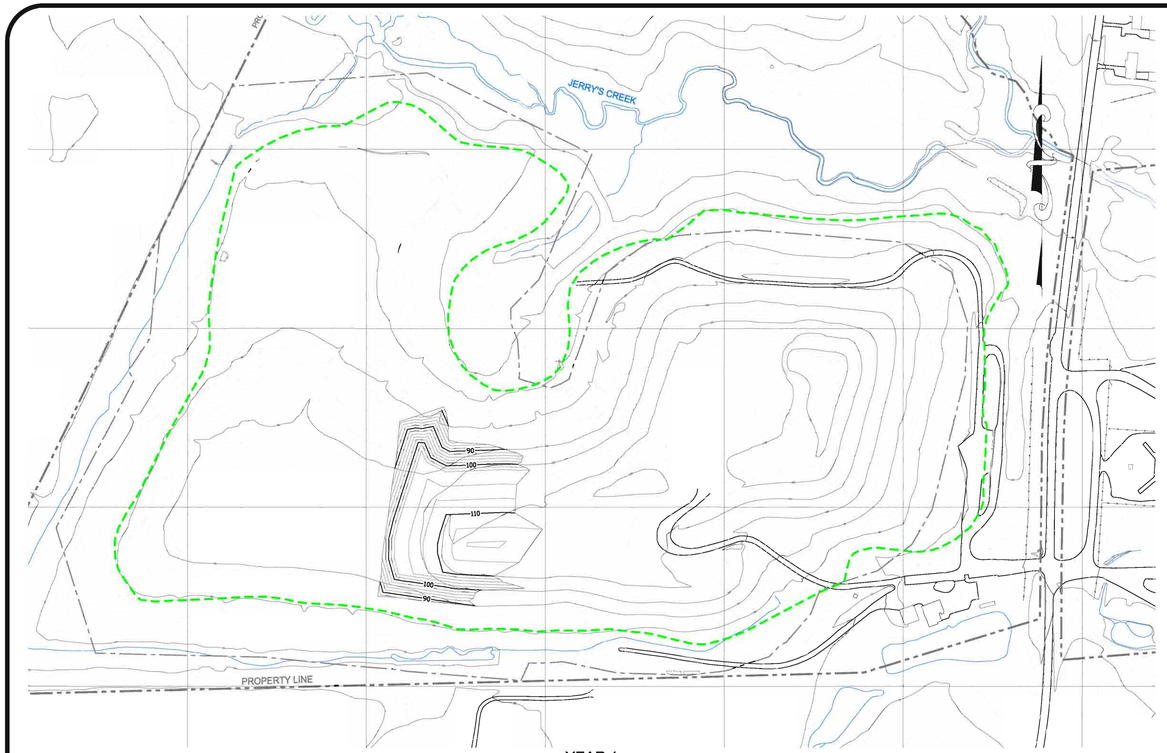
NO.	DATE	DESCRIPTION	BY

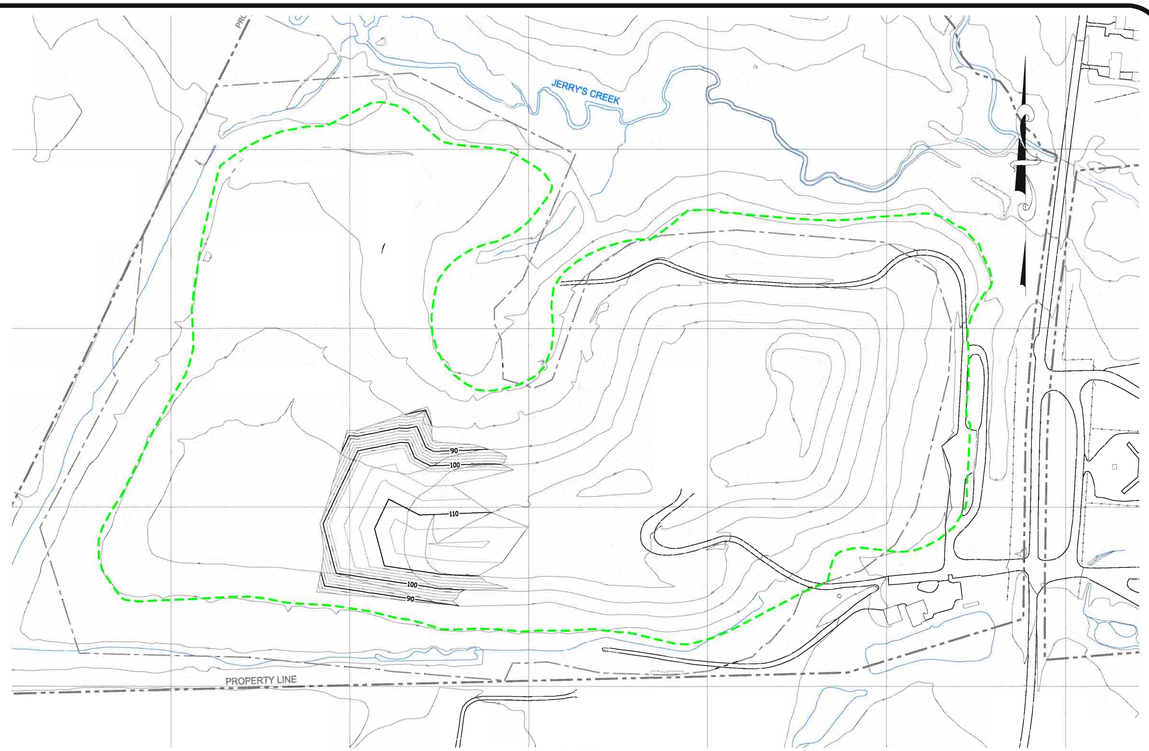
PROPOSED FINAL GRADING

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

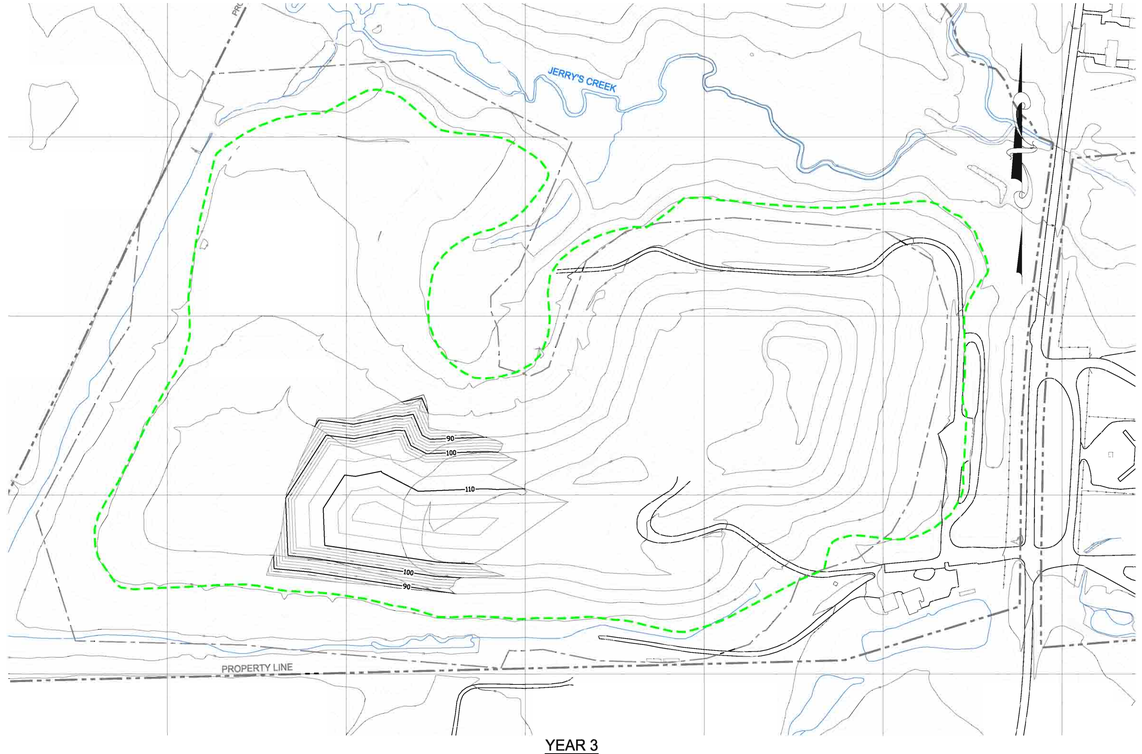
DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 100'	DATE: JUNE 2008
DRAWING NUMBER: D-1024	
DRAWING: 3	OF: 10



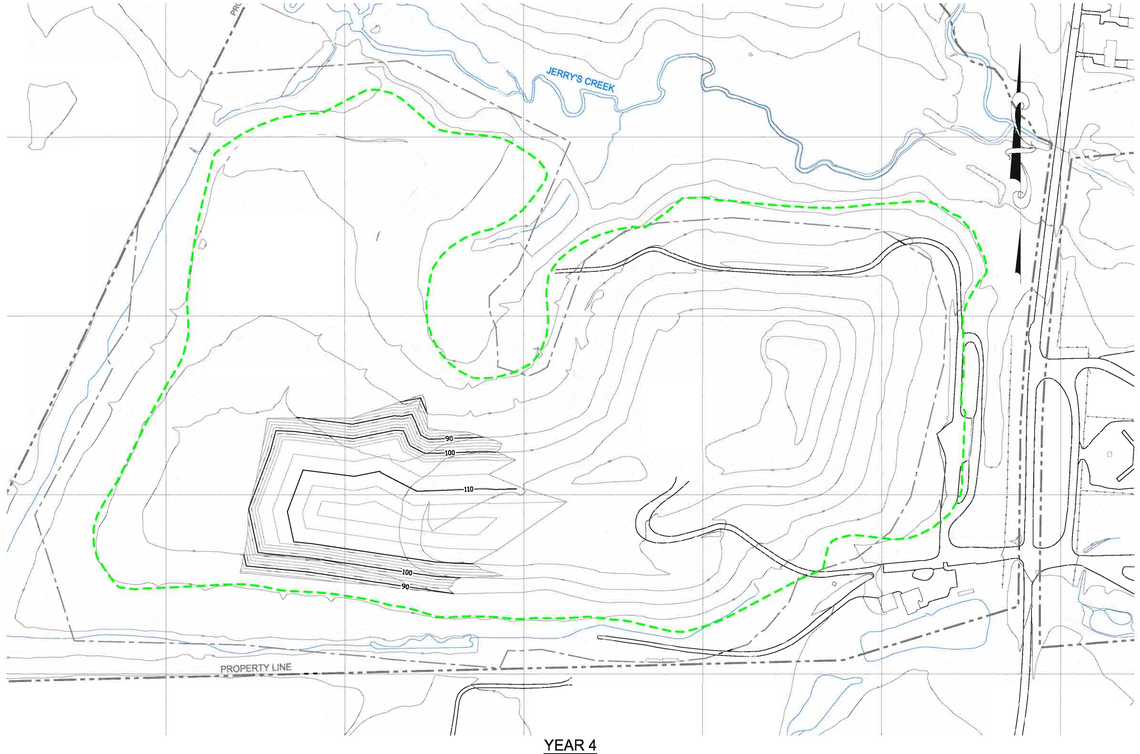
YEAR 1



YEAR 2



YEAR 3



YEAR 4

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- LIMIT OF WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D GRADE ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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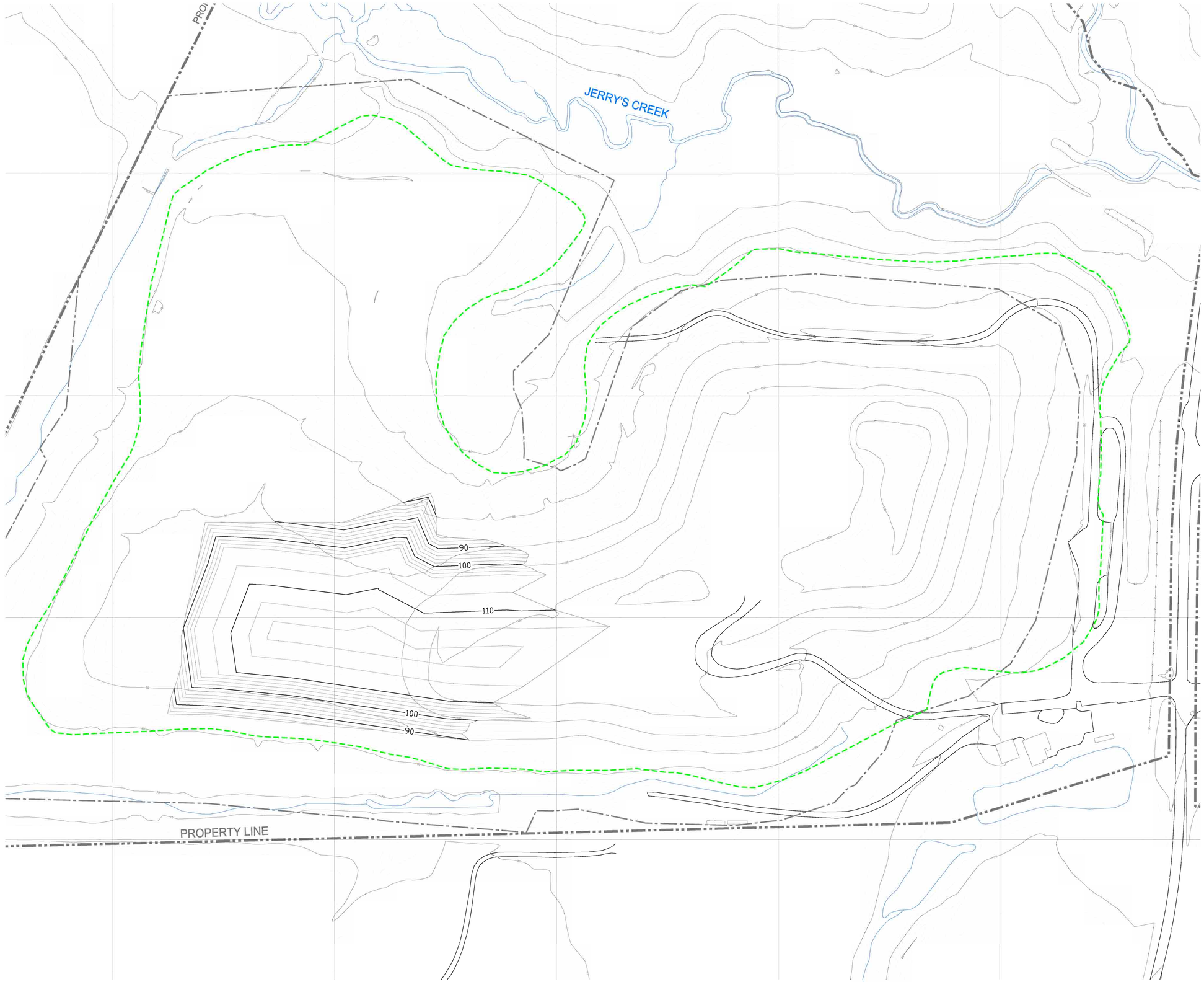
NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MODY

NO.	DATE	DESCRIPTION	BY

5 YEAR FILLING PLAN - YEARS 1 THROUGH 4

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1025-01	
DRAWING: 4	OF: 10



LEGEND

- LIMIT OF WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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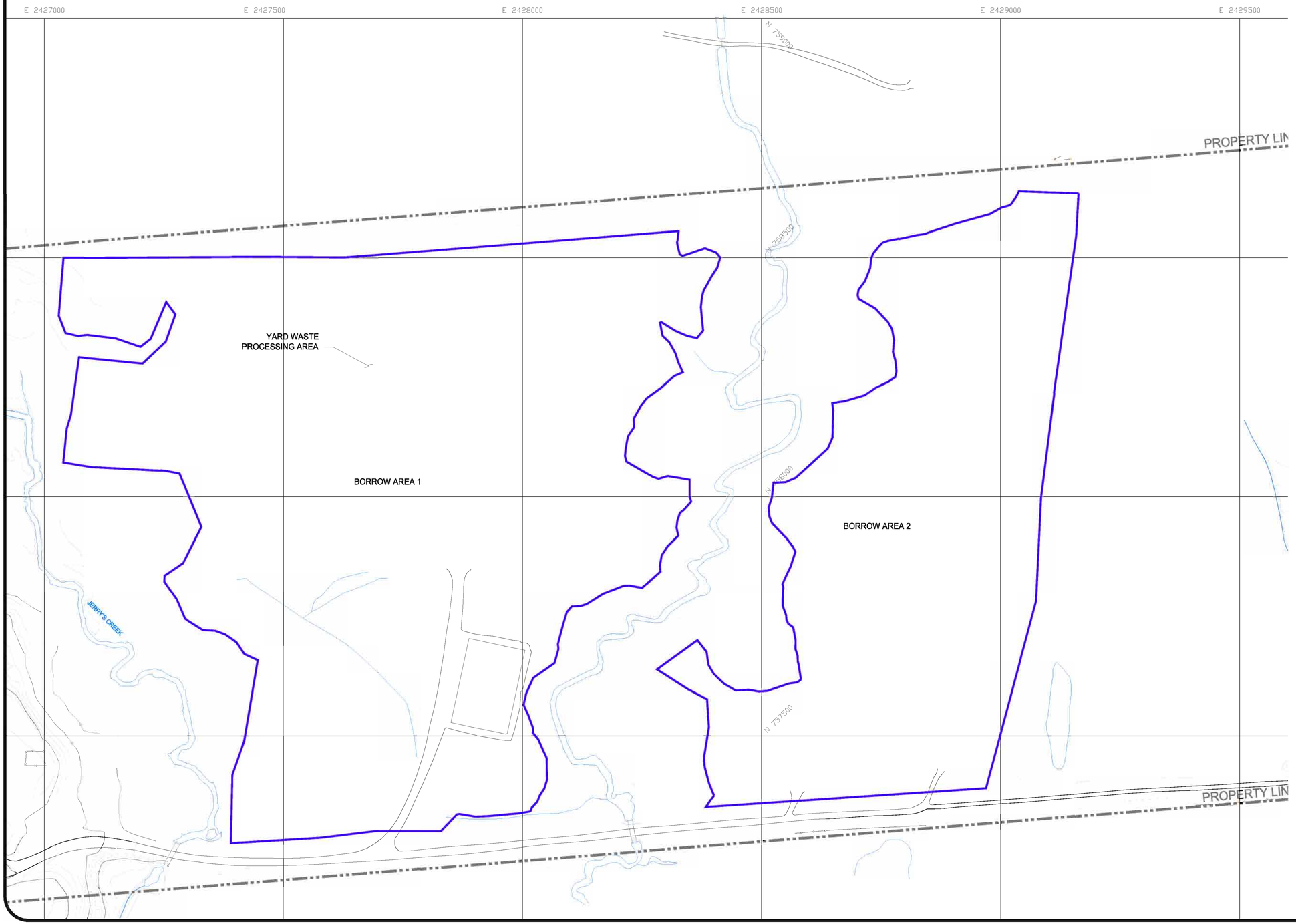
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024294 JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

5 YEAR FILLING PLAN - YEAR 5

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1025-02	
DRAWING: 5	OF: 10



LEGEND

- BORROW AREA
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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NO.	DATE	DESCRIPTION	BY

BORROW AREA PLAN

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 100'	DATE: JUNE 2008
DRAWING NUMBER: D-1026	
DRAWING: 6	OF: 10

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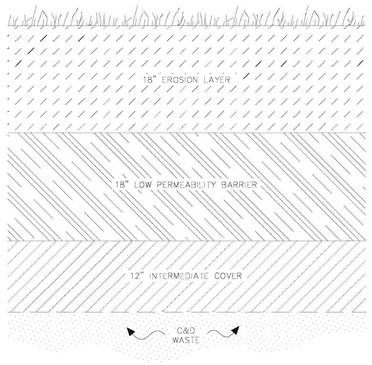
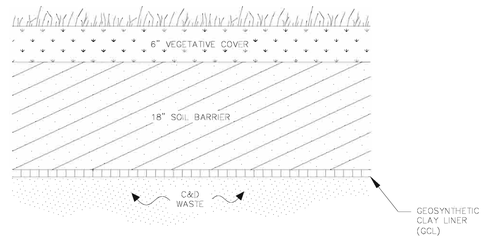


1/7 COVER SYSTEM
SCALE: 1"=1'



2/7 ALTERNATE COVER SYSTEM
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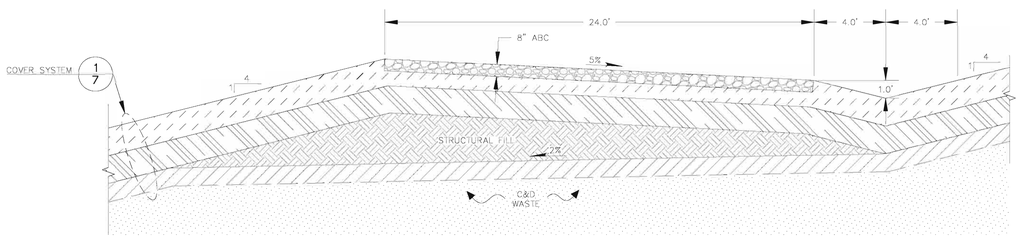

3/7 ACCESS ROAD DETAIL
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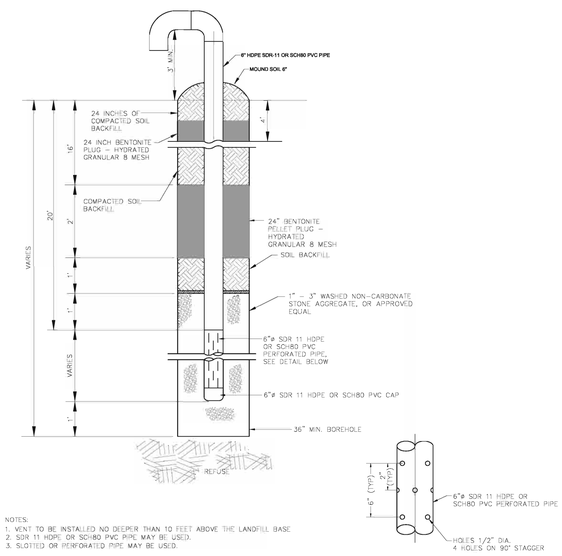

NOTES:
1. VENT TO BE INSTALLED NO DEEPER THAN 10 FEET ABOVE THE LANDFILL BASE
2. SDR 11 HDPE OR SCH80 PVC PIPE MAY BE USED.
3. SLOTTED OR PERFORATED PIPE MAY BE USED.

PERFORATED PIPE FOR VERTICAL WELLS DETAIL
NO SCALE

6/7 PASSIVE GAS VENT
SCALE: 1"=2'

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NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

FINAL COVER DETAILS

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1027	
DRAWING: 7	OF: 10

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CONSTRUCTION SPECIFICATIONS

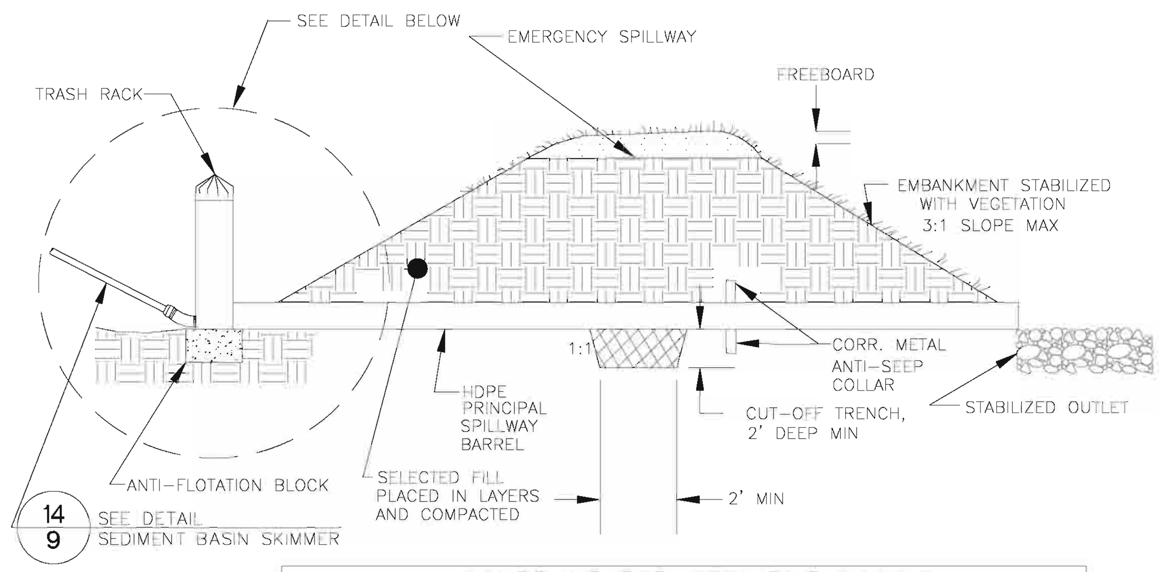
1. SITE PREPARATIONS: CLEAR, GRUB, AND STRIP TOPSOIL FROM AREAS UNDER THE EMBANKMENT TO REMOVE TREES, VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL. TO FACILITATE SEDIMENT CLEANOUT AND RESTORATION, CLEAR THE POOL AREA OF ALL BRUSH, TREES, AND OTHER OBJECTIONABLE MATERIALS. STOCKPILE ALL TOPSOIL OF SOIL CONTAINING ORGANIC MATTER FOR USE ON THE OUTER SHELL OF THE EMBANKMENT TO FACILITATE VEGETATIVE ESTABLISHMENT. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW THE BASIN AS NEEDED.
2. CUT-OFF TRENCH: EXCAVATE A CUT-OFF TRENCH ALONG THE CENTERLINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 2 FT. DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE RISER CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF EXCAVATION AND COMPACTION EQUIPMENT BUT IN NO CASE LESS THAN 2 FT. MAKE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS ARE THE SAME AS THOSE FOR THE EMBANKMENT. KEEP THE TRENCH DRY DURING BACKFILLING AND COMPACTION OPERATIONS.
3. EMBANKMENT: TAKE FILL MATERIAL FROM THE APPROVED AREAS SHOWN ON THE PLANS. IT SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY VEGETATION, ROCKS, AND OTHER OBJECTIONABLE MATERIAL. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING FILL. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT IT. COMPACTION MAY BE OBTAINED BY ROUTING THE CONSTRUCTION HAULING EQUIPMENT OVER THE FILL SO THAT THE ENTIRE SURFACE OF EACH LAYER IS TRAVERSED BY AT LEAST WHEEL OR TREAD TRACK OF THE HEAVY EQUIPMENT, OR A COMPACTOR MAY BE USED. CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING.
4. CONDUIT SPILLWAYS: SECURELY ATTACH THE RISER TO THE BARREL OR BARREL STUB TO MAKE A WATERTIGHT STRUCTURAL CONNECTION. SECURE ALL CONNECTIONS BETWEEN BARREL SECTIONS BY APPROVED WATERTIGHT ASSEMBLIES. PLACE THE BARREL AND RISER ON A FIRM, SMOOTH FOUNDATION OR IMPERVIOUS SOIL. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE OR ANTI-SEEP COLLARS. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FT. OF HAND-COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. ANCHOR THE RISER IN PLACE BY CONCRETE OR OTHER SATISFACTORY MEANS TO PREVENT FLOTATION. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.
5. EMERGENCY SPILLWAY: INSTALL THE EMERGENCY SPILLWAY IN UNDISTURBED SOIL. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE EMERGENCY SPILLWAY.
6. INLETS: DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY.
7. EROSION CONTROL: CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION.
8. SAFETY: SEDIMENT BASINS MAY ATTRACT CHILDREN AND CAN BE DANGEROUS. AVOID STEEP SIDE SLOPES, AND FENCE AND MARK BASINS WITH WARNING SIGNS IF TRESPASSING IS LIKELY. FOLLOW ALL STATE AND LOCAL REQUIREMENTS.

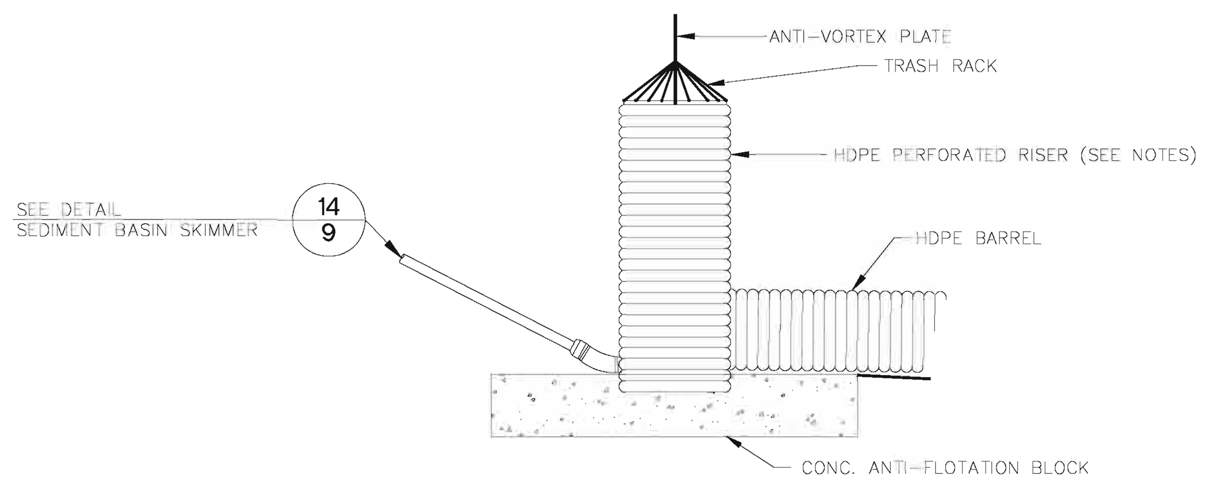
MAINTENANCE

CHECK SEDIMENT BASINS AFTER PERIODS OF SIGNIFICANT RUNOFF. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE DESIGN DEPTH.

CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE RISER AND POOL AREA.



SCHEDULE FOR SEDIMENT BASINS	SB-1	SB-2	SB-3
SKIMMER ORIFICE (in)	3	2	4
RISER DIAMETER (in)	36	24	54
BARREL DIAMETER (in)	24	18	42
BARREL INVERT @ RISER (ft.)	46	40	48
BARREL INVERT @ OUTLET (ft.)	45.5	39.5	47.5
RISER CREST ELEV. (ft.)	50	44	52
TOP OF DAM ELEV. (ft.)	53.5	47	53.5
EMERGENCY SPILLWAY ELEV. (ft.)	51.2	45	55.8
EMERGENCY SPILLWAY WIDTH (ft)	10	10	20
ANTI FLOTATION BLOCK (CONCRETE)	2'x5'x5'	2'x5'x5'	2'x6'x6'
ANTI SEEP COLLAR (CORR. METAL)	6'x6'	6'x6'	6'x6'



NOTES:

1. FOR SB-1, PLACE 18-1 INCH PERFORATIONS AT ELEV. 511.5 & 510.5 @ 6-INCH HORIZONTAL SPACING AND 6-1 INCH PERFORATIONS AT ELEV. 509.5 & 508.5 @ 6-INCH HORIZONTAL SPACING.
2. FOR SB-2, PLACE 9-1 INCH PERFORATIONS FROM ELEVATION 529.0 TO 527.5 @ 6-INCH HORIZONTAL SPACING AND 6-INCH VERTICAL SPACING.

7 / 8 EXISTING SEDIMENT BASIN DETAIL
SCALE: NTS

DEFINITION

A STRUCTURE DESIGNED TO CONTROL EROSION AT THE INLET OR OUTLET OF A CHANNEL OR CONDUIT.

PURPOSE

TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISSIPATING THE ENERGY.

CONSTRUCTION SPECIFICATIONS

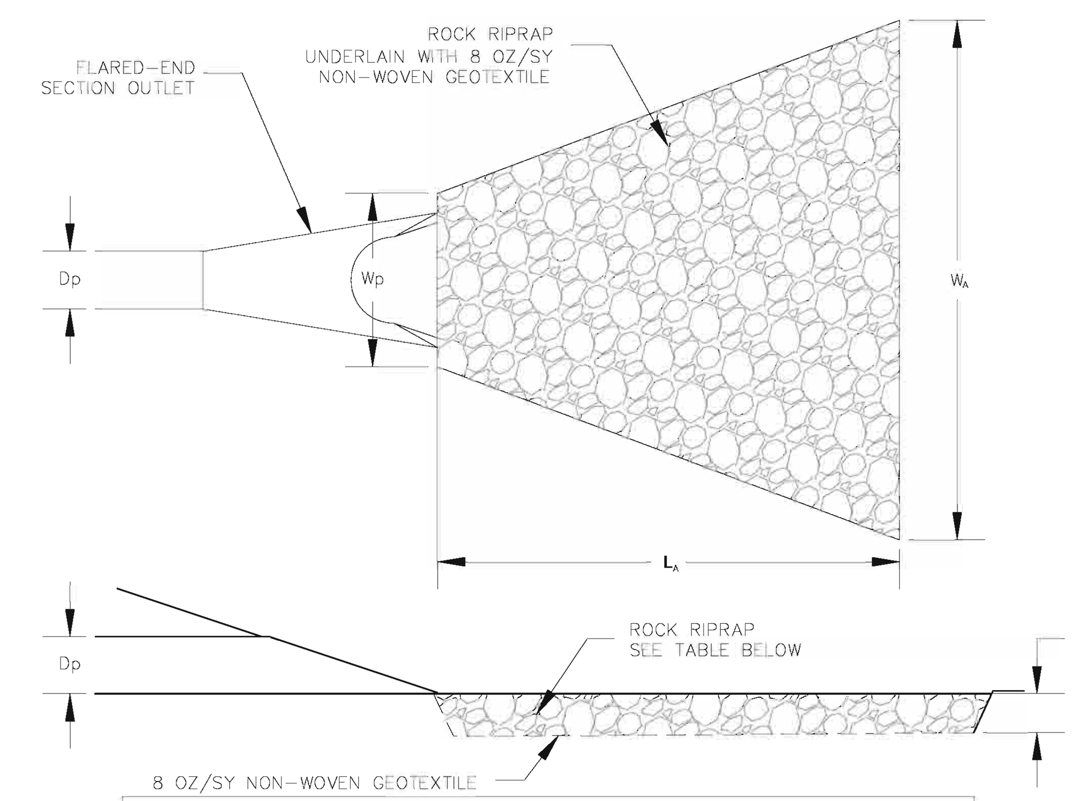
1. ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING DISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.
2. THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.
3. FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP A MINIMUM OF 1 FT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.
4. RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.
5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.
6. RIPRAP MAY BE FIELD STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.
7. CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFALL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.
8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE

INSPECT RIPRAP OUTLET STRUCTURES AFTER HEAVY RAINS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

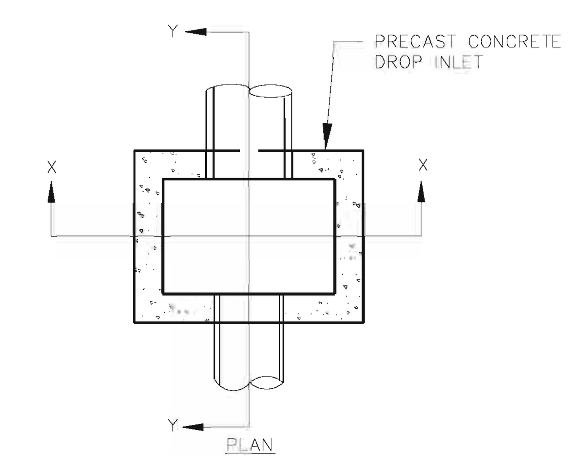
REFERENCE

N.C. EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL, 1988.



SUMMARY OF PROTECTION APRONS								
APRON LABEL	DISCHARGE PIPE LOCATION	Dp (FT)	LA (FT)	Wp (FT)	WA (FT)	T (IN)	D50 (IN)	DMAX. (IN)
F	DOWNDRAIN F	1.50	13	4.50	14.50	18.00	8.00	12.00
G	DOWNDRAIN G	1.25	16	3.75	17.25	18.00	8.00	12.00
H	DOWNDRAIN H	1.25	15	3.75	16.25	18.00	8.00	12.00
I	DOWNDRAIN I	1.25	17	3.75	18.25	18.00	8.00	12.00
J	DOWNDRAIN J	1.25	13	3.75	14.25	18.00	8.00	12.00
SB-1	OUTLET FROM SED BASIN	2.50	27	7.50	29.50	25.50	10.00	17.00
SB-2	OUTLET FROM SED BASIN	1.50	13	4.50	14.50	18.00	8.00	12.00
SB-3	OUTLET FROM SED BASIN	5.00	37	15.00	42.00	34.50	14.00	23.00

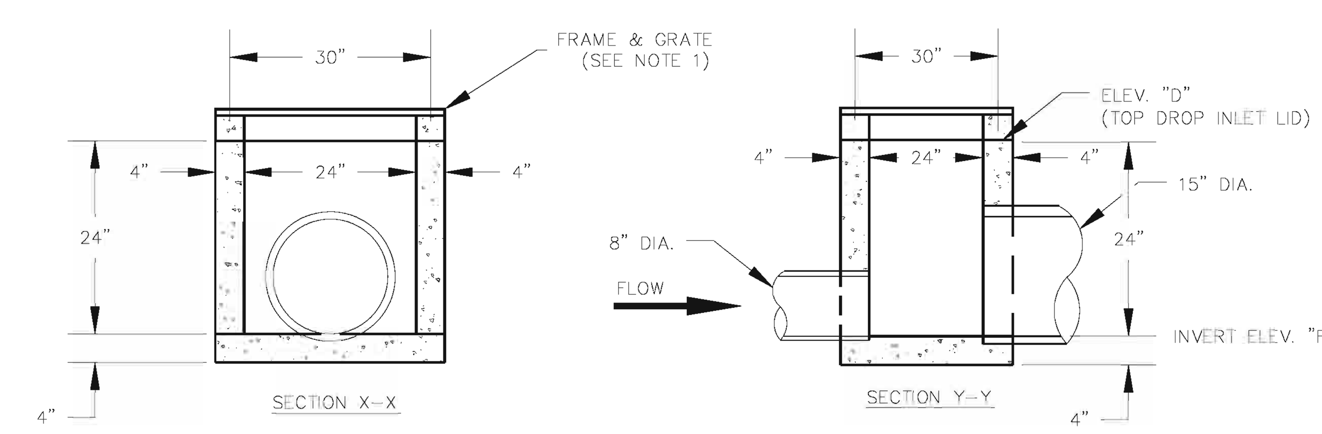
8 / 8 ENERGY DISSIPATOR DETAIL
SCALE: NTS



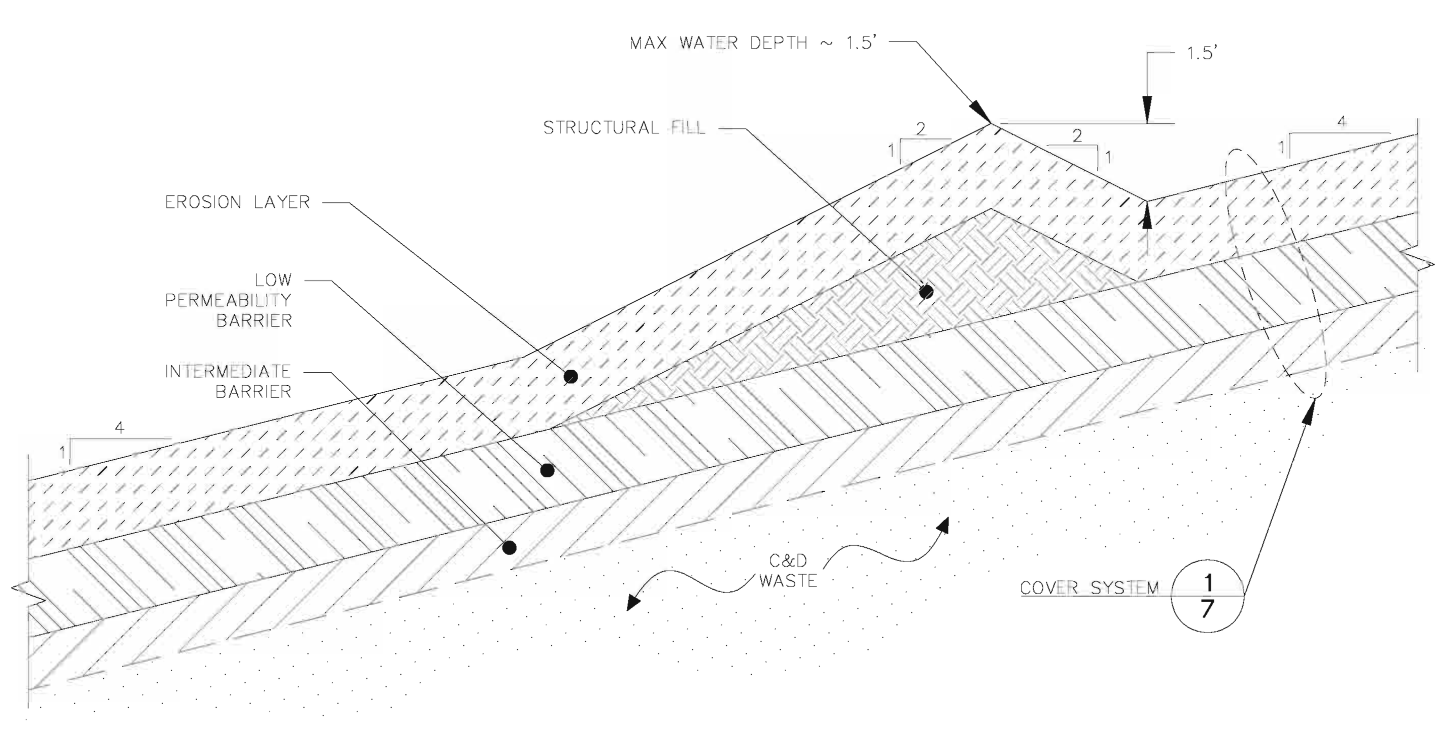
DROP INLET SCHEDULE		
DROP INLET NO.	ELEVATIONS	
	TOP	INVERT
	D	F
F	80.0	78.0
G	86.0	84.0
H	93.0	91.0
I	86.0	84.0
J	88.0	86.0

NOTES:

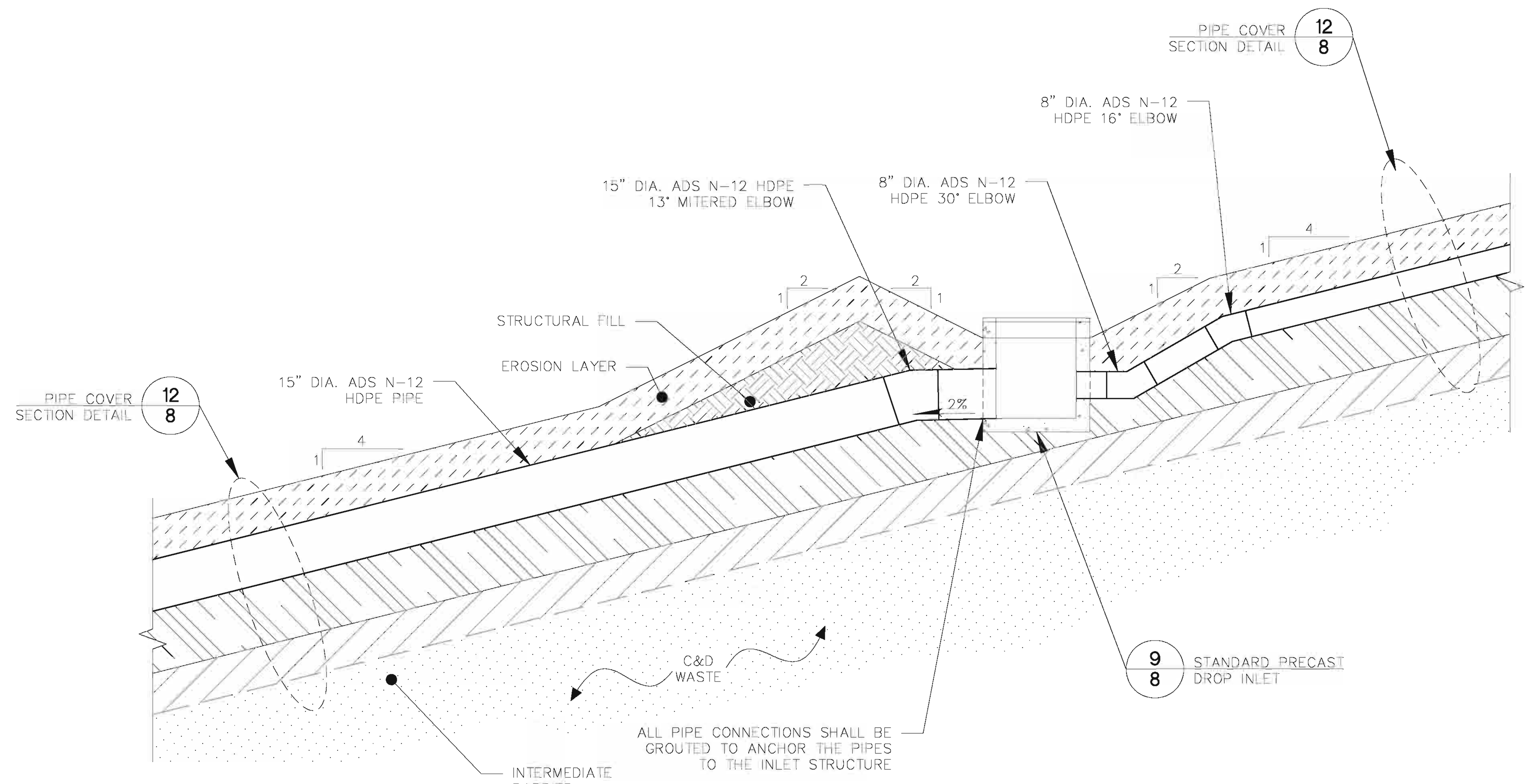
1. STORM GRATE SHALL CONSIST OF AN ELEVATED LID PROVIDING 6" (MIN.) CLEAR SPACE ABOVE DROP INLET.



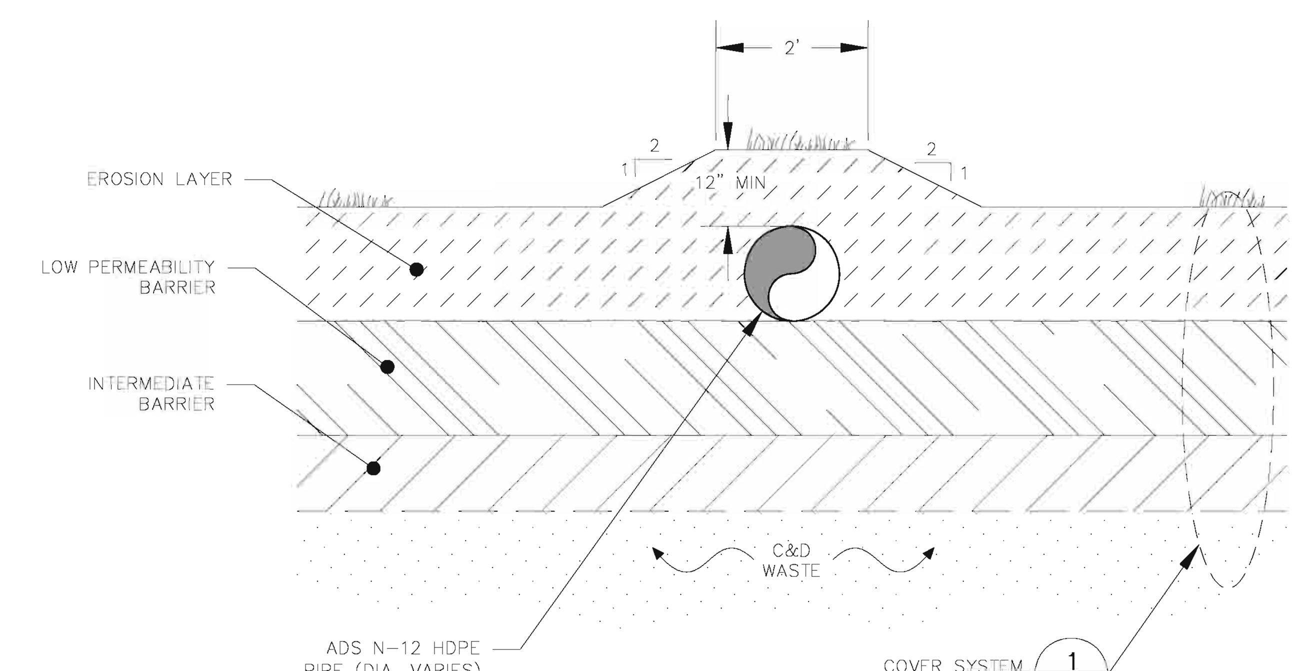
9 / 8 STANDARD PRECAST DROP INLET DETAIL
NTS



10 / 8 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



11 / 8 SLOPE DIVERSION BERM DROP INLET DETAIL
SCALE: 1"=3'



12 / 8 PIPE COVER SECTION DETAIL
SCALE: 1"=2'

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024294 JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS I

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-01	
DRAWING: 8	OF: 10

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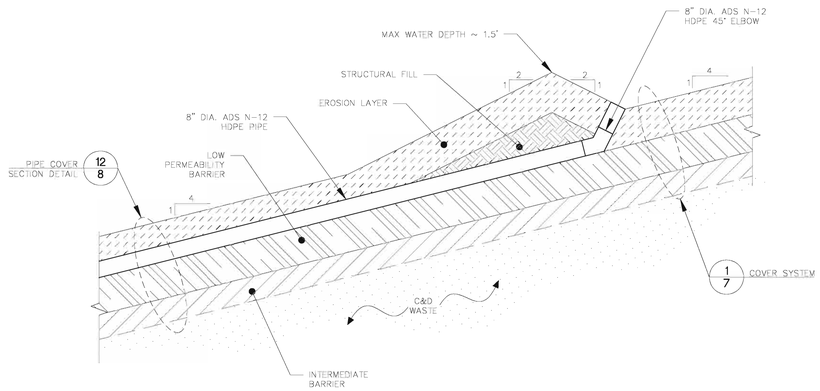
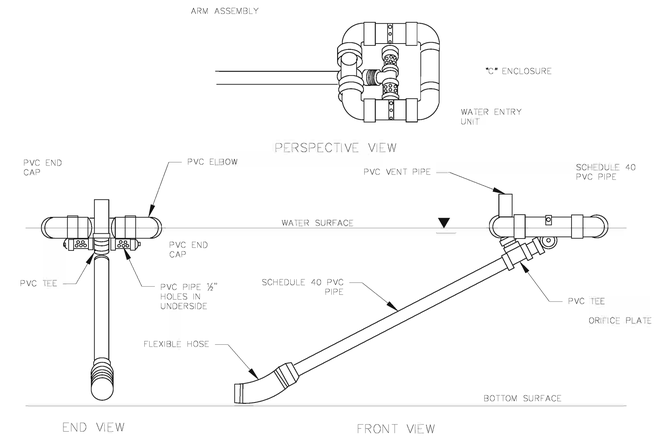
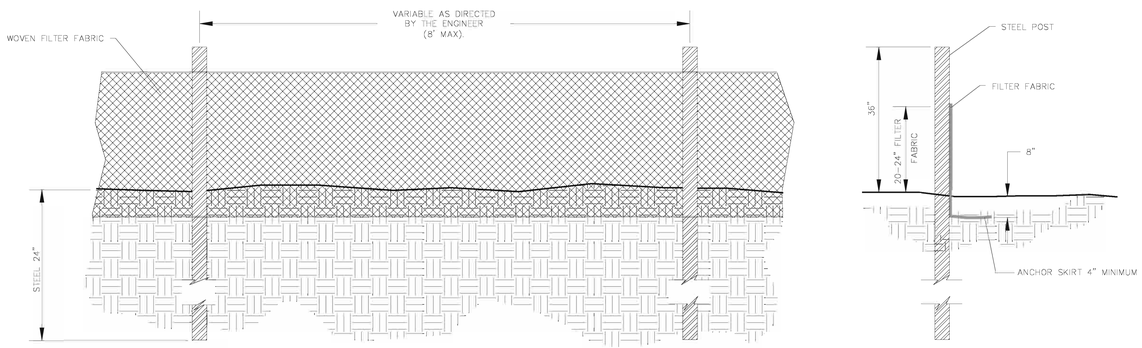


13/9 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



14/9 SEDIMENT BASIN SKIMMER DETAIL
N.T.S.



GENERAL NOTES:

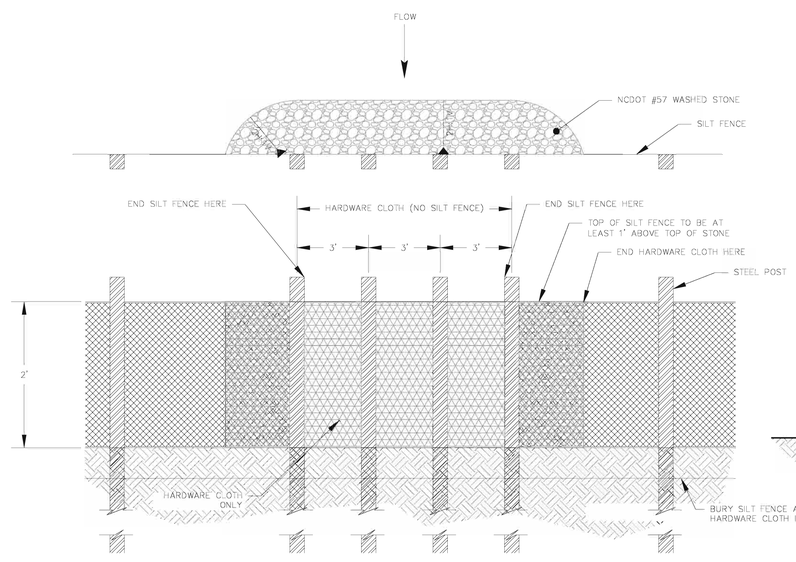
1. PREFABRICATED SILT FENCE IS NOT ACCEPTABLE ON THIS PROJECT.
2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS.
3. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
4. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS.
5. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
6. TURN SILT FENCE UP SLOPE AT ENDS.
7. SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC.
8. WHEN FABRIC IS USED WITH WIRE MESH, 8' CENTERED POSTS MAY BE USED.
9. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE

MAINTENANCE NOTES:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006

15/9 SILT FENCE DETAIL
NTS



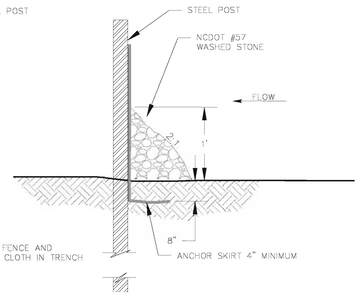
GENERAL NOTES:

1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL
2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼" MESH OPENINGS.
3. INSTALL 5' SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
4. SPACE POST A MAXIMUM OF 3'.

MAINTENANCE NOTES:

1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE OUTLET AS NEEDED TO PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: NC DOT Roadway Standard Detail 1606.01 – Special Sediment Control Fence, 2006



16/9 SILT FENCE OUTLET DETAIL
NTS

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024294 JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS II

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-02	
DRAWING: 9	OF: 10

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DEFINITION
Controlling runoff and erosion on disturbed areas by establishing perennial vegetative : cover with seed.

PURPOSE
To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

SPECIFICATIONS

SEEDBED REQUIREMENTS
Establishment of vegetation should not be attempted on sites that are unsuitable due to excessive soil compaction, inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine-grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0 – 6.5.
- Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met – i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation – special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoil may be applied.

SEEDBED PREPARATION
Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

- Ground agricultural limestone:
  Light-textured, sandy soils: 1 to 1-1/2 tons/acre
  Heavy-textured, clayey soils: 2-3 tons/acre
- Fertilizer:
  Grasses: 800-1200 lb/acre of 10-10-10 (or the equivalent)
  Grass-legume mixtures: 800-1200 lb/acre of 5-10-10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4-6 inches of soil by discing or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding.

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

SEEDING
Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30-50%. Always take this into account in scheduling land-disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non-certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious weed seed.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume.
Apply seed uniformly with a cyclone seeder, drop-type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern: then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

HYDRO SEEDING
Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

MAINTENANCE
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding--If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization--On the typical disturbed site, full establishment usually requires re-fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

TEMPORARY SEEDING SPECIFICATIONS

Seeding mixture (fall)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120

Seeding Mixture (late winter early spring)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120
Annual (Korean) Lespedeza (*Kummerowia stipulacea*)	50

Seeding mixture (summer)

Species*	Rate (lb/acre)
German Millet (*Setaria italica*)	40

Seeding dates (Piedmont)

Fall:	Aug. 15 – Dec. 30
Late winter (early spring):	Jan. 1 – May 1 Late
Summer:	May 1 – Aug. 15

Soil amendments
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch
Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring. tool.

Maintenance
Re-fertilize if growth is not fully adequate. Reseed, re-fertilize and mulch immediately following erosion or other damage.

Pursuant to G.S. 113A-57(2), the angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.
Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.
*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

PERMANENT SEEDING SPECIFICATIONS

Seeding mixture

Species*	Rate (lb/acre)
Tall fescue (*Festuca arundinacea*) (Grass lined Channels)	200
Tall fescue (*Festuca arundinacea*) (Other Areas)	100

Nurse plants
Between May 1 and Aug. 15, add 10 lb/acre German millet (*Setaria italica*) or 15 lb/acre Sudan grass. Prior to May 1 or after Aug. 15, add 40 lb/acre Rye Grain (*Festuca arundinacea*).

Seeding dates

	Best	Possible
Fall:	Aug. 25 – Sept. 15	Aug. 20 – Oct. 25
Late winter:	Feb. 15 – Mar. 21	Feb. 1 –Apr. 15

Fall is best for tall fescue (*Festuca arundinacea*) and late winter or summer for lespedeza. Over seeding of Kobe lespedeza (*Kummerowia striata*) over fall-seeded tall fescue is very effective.

Soil amendments
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

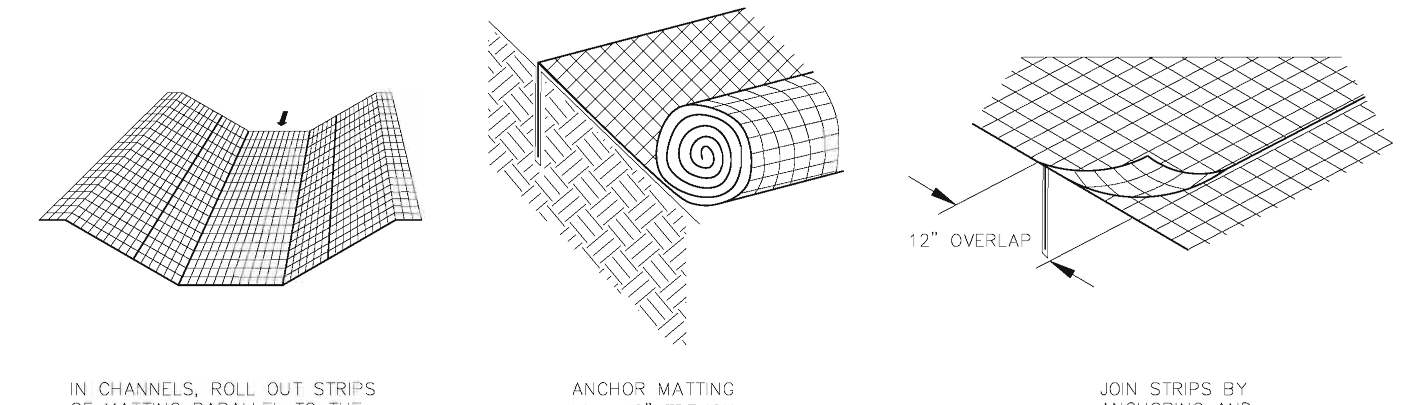
Mulch
Apply 4,000-5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

Maintenance
Re-fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.11L NC Erosion and Sediment Control Planning and Design Manual, 2006

GENERAL SEEDING SPECIFICATIONS



IN CHANNELS, ROLL OUT STRIPS OF MATTING PARALLEL TO THE DIRECTION OF FLOW.

ANCHOR MATTING IN A 12" TRENCH

JOIN STRIPS BY ANCHORING AND OVERLAPPING

GENERAL NOTES:

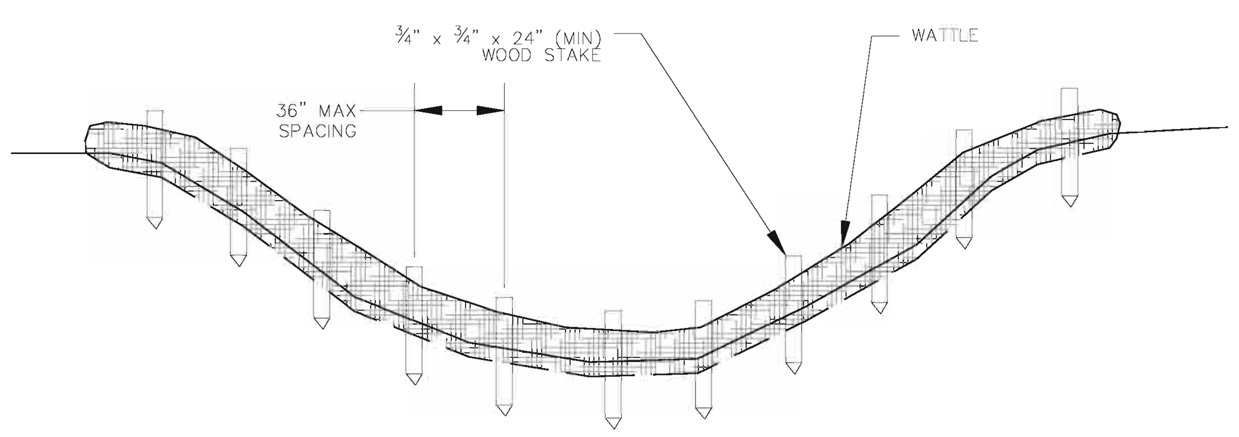
1. DITCH LINES OVER 3 PERCENT MUST BE MATTED WITH NORTH AMERICAN GREEN DS-75 MATTING OR EQUIVALENT.
2. APPLY SEED BEFORE LAYING THE NET OR MAT. IF OPEN-WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPRAYED ON AFTERWARD.
3. START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES-DO NOT STRETCH.
4. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET.

MAINTENANCE NOTES:

1. INSPECT ROLLED EROSION CONTROL PRODUCTS (RECP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAIN FALL EVENT.
2. GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE RECP.
3. ANY AREAS OF THE RECP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
4. IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.
5. MONITOR AND REPAIR THE RECP AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED,

*REF: 6.17.12 NC Erosion and Sediment Control Planning and Design Manual, 2006

17/10 TYPICAL TEMPORARY MATTING DETAIL
NTS



GENERAL NOTES:

1. SPACE WATTLES ACCORDING TO TABLE 1 ALONG ANY PORTION OF DITCHLINE WITH A SLOPE OF 5 PERCENT OR GREATER AND A SLOPE LENGTH OF 50 FEET OR GREATER.

TABLE 1: WATTLE SPACING

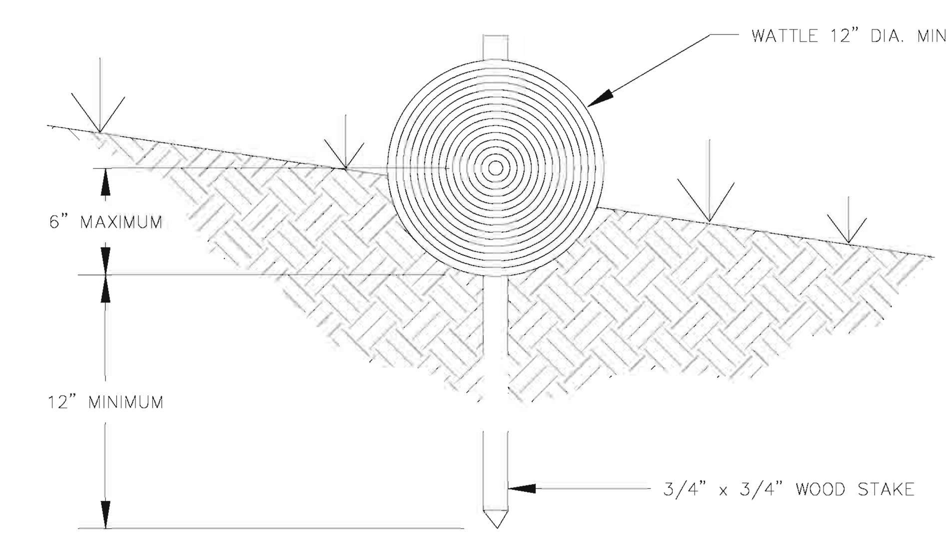
SLOPE (%)	SPACING DISTANCE (FT. O.C.) 12" DIA.	18" DIA.
5	20	30
6	17	25
7	14	21
8	13	19
9	11	17
10	10	15

2. PLACE FIRST WATTLE 1/2 SPACING DISTANCE FROM CREST OF QUALIFYING SLOPE.
3. SPACE WOODEN STAKES 3 FEET O.C.
4. PLACE CHECK DAMS OR WATTLES AT THE LOWER LIMITS OF EACH DAYS WORK.

MAINTENANCE NOTES:

1. IT IS IMPERATIVE THAT WATTLES BE INSPECTED AFTER INSTALLATION AND SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENTS.
2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE HEIGHT.
6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR REPLACEMENT.

*REF: EAST COAST EROSION BLANKETS INSPECTION AND MAINTENANCE WWW.EROSIONBLANKETS.COM



19/10 TYPICAL WATTLE DETAIL
NTS

DEFINITION

A CHANNEL WITH VEGETATIVE LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

PURPOSE

TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION, DEPOSITION, OR FLOODING.

CONSTRUCTION SPECIFICATIONS

1. REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.
2. PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE PLANS PLUS A 0.2-FT OVERCUT AROUND THE CHANNEL PERIMETER TO ALLOW FOR BULKING DURING SEEDBED PREPARATIONS AND SOD BUILDUP.
3. REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE CHANNEL FREELY.
4. THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF SPECIES. PROTECT THE CHANNEL WITH MULCH OR A TEMPORARY LINER SUFFICIENT TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE SEEDING SPECIFICATIONS).
5. APPLY LIME, FERTILIZER AND SEED BEFORE LAYING THE NET (WITHOUT MULCH) OR MAT (WITH MULCH OR SYNTHETIC). IF OPEN-WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND THE FERTILIZER AND SEED CAN BE SPRAYED ON AFTERWARD, OTHERWISE APPLY SEED AND FERTILIZER BEFORE INSTALLATION.
6. START LAYING THE NET OR MAT FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES – DO NOT STRETCH.
7. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 6 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END AND EVERY 3 FT AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF NETTING OR MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER OR EVERY 3 FT IF THE STRIP IS NOT WIDER THAN 8 FEET. DO NOT STRETCH THE NET/MAT WHEN APPLYING STAPLES.
8. STAPLES SHOULD BE THE "U"-SHAPED TYPE AND 4" TO 6" LONG (DEPENDING ON SOIL CONDITIONS).
9. TO JOIN ENDS OF TWO STRIPS OF NETTING, CUT A TRENCH TO ANCHOR THE END OF THE DOWN GRADIENT NET. OVERLAP THE END OF THE PREVIOUS ROLL 18 INCHES AND STAPLE EVERY 12 INCHES JUST BELOW THE ANCHOR SLOT.
10. TO JOIN ENDS OF TWO STRIPS OF MATTING, OVERLAP THE UPGRADIENT STRIP OVER THE DOWNGRADIENT ONE AT LEAST 4 INCHES. STAPLE THE OVERLAP AT THE ENDS AND EVERY 12 INCHES ALONG THE CENTER OF THE OVERLAP.

MAINTENANCE

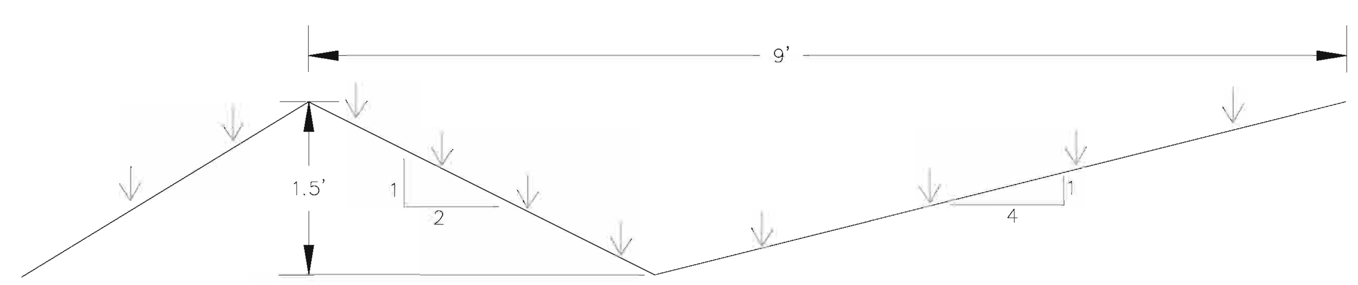
DURING THE ESTABLISHMENT PERIOD, CHECK GRASS-LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT. IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL (SEE SEEDING SPECIFICATIONS).

INSPECT ALL MULCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED, AND REINSTALL MULCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FIRMLY ESTABLISHED.

GENERAL NOTES

1. CHANNELS ARE TO BE LINED WITH NORTH AMERICAN GREEN MATTING OR APPROVED EQUIVALENT.
2. NETTING AND MATTING PRODUCTS SHOULD BE INSTALLED ACCORDING TO MANUFACTURER'S GUIDELINES. IF THE MANUFACTURER DOES NOT PROVIDE GUIDELINES, THE ABOVE GUIDELINES FOR NETTING AND MATTING MAY BE USED.



CHANNELS ARE TO BE LINED WITH DS75.
CHANNELS ARE TO BE CONSTRUCTED AT A 2% SLOPE.
THE LANDFILL SIDE SLOPE IS 4H:1V.
THE SLOPE DIVERSION BERM SIDE SLOPE IS 2H:1V.

18/10 GRASS LINED DITCH DETAIL
NTS

S&ME
WWW.SMEINC.COM

NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS III

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-03	
DRAWING: 10	OF: 10

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APPENDIX I

(WASTE SCREENING AND ACCEPTANCE PROGRAM SAMPLE FORMS)

EDGECOMBE COUNTY SOLID WASTE FACILITY
TARBORO, NORTH CAROLINA

PRE-ACCEPTANCE AGREEMENT

DATE _____ TIME _____ WEIGH BILL _____

CLERK OR RECEIVING AGENT _____

CUSTOMER NAME/NUMBER OR IDENTIFICATION _____

VEHICLE LICENSE _____ STATE _____

WASTE DESCRIPTION (check ALL that apply)

RESIDENTIAL _____ COMMERCIAL _____ INDUSTRIAL _____

INSTITUTIONAL _____ YARD TRIMMINGS _____ SPECIAL _____

SPECIAL DESCRIPTION _____

TOTAL WEIGHT _____

WEIGHT OF VEHICLE (TARE WEIGHT) _____

WEIGHT OF WASTE DELIVERED _____

HAULER AGREES AND WARRANTS THAT HE/SHE IS DELIVERING SOLID WASTE ONLY FOR THIS LOAD AND ANY SUBSEQUENT LOADS TO THIS FACILITY. HAULER DOES HEREBY INDEMNIFY THE FACILITY OPERATOR FOR DAMAGES CAUSED BY THE DELIVERY OF ANY HAZARDOUS/TOXIC OR OTHERWISE UNACCEPTABLE MATERIAL.

_____

DRIVERS SIGNATURE

(SOURCE: SWANA)

EDGECOMBE COUNTY SOLID WASTE FACILITY
TARBORO, NORTH CAROLINA

DETAILED SCREENING REPORT

WASTE SOURCE _____
ADDRESS _____
_____
_____
_____

PROBABLE [ ] SUSPECTED [ ] CONFIRMED [ ]

WASTE HAULER _____
ADDRESS _____
_____
_____
_____

DRIVER'S NAME _____
DETAIL _____
_____
_____

NOTIFIED:

WASTE SOURCE [ ] HAULING MANAGEMENT [ ] SITE MANAGEMENT [ ]

STATE [ ] FEDERAL [ ]

NAME _____

WITNESS (IF ANY) _____

DATE _____ TIME _____ AM PM

ACTION REQUIRED:

SOURCE: SWANA

EDGECOMBE COUNTY SOLID WASTE FACILITY TARBORO, NORTH CAROLINA WASTE SCREENING CHECK LIST	YES	NO
CONTAINERS		
FULL	____	____
PARTIALLY FULL	____	____
EMPTY	____	____
CRUSHED	____	____
PUNCTURED	____	____
POWDERS/DUSTS		
IDENTIFIED	____	____
UNKNOWN	____	____
MATERIAL SATURATED	____	____
LABEL FOR HAZARDOUS MATERIAL	____	____
ODOR/FUMES		
STRONG	____	____
FAINT	____	____
SUBSTANTIAL HEAT COMING FROM ANY MATERIAL	____	____
ITEMS FOUND		
BATTERIES	____	____
OIL	____	____
BIOMEDICAL	____	____
RADIOACTIVE	____	____
ASHES/RESIDUE	____	____
SOD/SOIL	____	____
OTHER	____	____
(CHECK ALL THAT APPLY)		

SOURCE: SWANA

NC DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
HEALTH HAZARDS CONTROL UNIT

TYPE OR USE BALLPOINT PEN
PRESS FIRMLY - ALL COPIES
MUST BE LEGIBLE

NORTH CAROLINA ASBESTOS WASTE SHIPMENT RECORD

1. Waste Generator/Owner Name and Address:	Work Site Name and Physical Address:	Waste Generator/Owner Phone Number: ( )
2. Contractor Name and Address:		Contractor Phone Number: ( )
3. Waste Disposal Site (WDS) Name, Mailing Address:	WDS Physical Site Location: NC Landfill Permit #:	WDS Phone Number: ( )

4. Name of Responsible Agency:

[ ] Forsyth Co. Environmental Affairs Dept.
[ ] Mecklenburg Co. Dept. of Environmental Protection
[ ] NC DHHS - Health Hazards Control Unit
[ ] WNC Regional Air Pollution Control Agency

Permit #:_____ NESHAP (ACTS) ID #:_____
Start Date:_____ Complete Date:_____

5. Description of materials:

6. Containers Number:_____ Type:_____ Vehicle: _____ _____	RQ, ASBESTOS, CLASS 9 NA 2212, III	7. Total Quantity (yd^3)m^3:

8. Special Handling Instructions and Additional Information:

EMERGENCY CONTACT: DIVISION OF EMERGENCY MANAGEMENT AT 1-800-858-0368

9. CONTRACTOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Printed/Typed Name & Title:_____

Signature:_____ Date (MM/DD/YY):_____

10. Transporter 1 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:_____

Address:_____ Phone Number:_____

Signature:_____ Date (MM/DD/YY):_____

11. Transporter 2 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:_____

Address:_____ Phone Number:_____

Signature:_____ Date (MM/DD/YY):_____

12. Discrepancy Indication Space:

13. Waste Disposal Site: Owner or Operator Certification of Receipt of Asbestos Materials Covered by this Manifest, Except as Noted in Item #12.

Printed/Typed Name & Title:_____ Total Weight (Tons):_____

Signature:_____ Date (MM/DD/YY):_____

DHHS 3787 (Revised8/99)
Health Hazards Control Unit

(1 copy- Waste Generator/Owner; 1 copy- Contractor; 1 copy - Transporter; 1 copy -Disposal Site; 1 copy - Health Hazards Control Unit)

APPENDIX II

(WATER QUALITY MONITORING PLAN)

WATER QUALITY MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA
S&ME Project No. 1054-07-242

Prepared For:

Edgecombe County
P.O. Box 10
Tarboro, NC 27886

Prepared By:

3201 Spring Forest Road
Raleigh, NC. 27616

June 30, 2008

WATER QUALITY MONITORING PLAN
Edgecombe County Landfill
(Permit #33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-242

I hereby certify this 30th of June, 2008, that this report was prepared by me or under my direct supervision.

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

Report preparation performed by:

David B. Wells, P.G.
Senior Geologist
NC Licensed Geologist No. 1607

SR: SPW

TABLE OF CONTENTS

1.0 BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Project Information 1

2.0 GEOLOGY AND HYDROGEOLOGY STUDY 3
2.1 Regional Physiography 3
2.2 Regional Geology 3
2.3 Site Topography 4
2.4 Site Soil Classification 4
2.5 Site Geology 5
2.6 Hydrogeologic Setting 5
2.6.1 Surface Water – Pre Landfill 5
2.6.2 Surface Water – Operating Landfill 5
2.6.3 Groundwater Hydrogeology 6
2.6.4 Site Hydrology 7
2.7 Hydraulic Conductivity 7
2.7.1 Darcy's Velocity 8
2.7.2 Seepage Velocity 8

3.0 EVALUATION OF EXISTING MONITORING SYSTEM 9
3.1 Existing Monitor Wells 9
3.2 Existing Monitor Well Construction 9
3.3 Existing Surface Water Sampling Locations 10

4.0 UPGRADED GROUNDWATER MONITORING NETWORK 11
4.1 Basis for Planned Monitor Wells 11
4.1.1 Detection, Assessment, Corrective Action Compliance Monitoring 11
4.1.2 Water Level Elevations 12
4.2 Typical Monitor Well Design Construction and Maintenance 13
4.3 Sampling and Analysis Plan 15
4.3.1 Well Development 15
4.3.2 Well Measurements and Aquifer Tests 15
4.3.3 Well Purging and Sampling 16
4.3.4 Sample Containers and Quality Control Procedures 18
4.3.5 Sampling Frequency 21

4.3.6 Field Reporting Requirements 22
4.3.7 Laboratory Analysis Parameters 22
4.3.8 Detection Monitoring Data Evaluation and Reporting 22
4.3.9 Monitored Corrective Measures 23

5.0 UPGRADED SURFACE WATER MONITORING PLAN 24
5.1 Monitor Station Locations 24
5.2 Surface Water Sampling Procedures 24
5.3 Stormwater Sampling (Permit Requirements) 25
5.4 Quality Control 25

6.0 REPORT SUBMITTAL 26

7.0 QUALIFICATIONS OF REPORT 27

8.0 REFERENCES 28

Tables

Table 1 – Existing Well/Piezometer Construction Details
Table 2 – Summary of Proposed Well Construction Details
Table 3 – Laboratory Parameters and Schedule
Table 4 – Parameters List to Evaluate Groundwater Quality

Figures

Figure 1 – Vicinity Map
Figure 2 – Water Quality Monitoring Site Plan
Figure 3 – Typical Upper Aquifer Groundwater Monitor Well Detail
Figure 4 – Typical Protection for Monitor Wells

1.0 BACKGROUND INFORMATION

1.1 Introduction

This Water Quality Monitoring Plan (WQMP) summarizes the activities and protocol recommended to perform monitoring at the subject site in general accordance with the requirements as specified in the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Management Rules, Sections .0600 and .1637(a)(1) of 15A NCAC 13B. The WQMP is designed to effectively monitor groundwater and surface water quality in order to detect a release from the landfill into the uppermost aquifer [.1623(b)(3)(C)] as well as to monitor the degradation of constituent concentrations released from the municipal solid waste (MSW) landfill that were detected downgradient from the MSW unit.

The purpose of the WQMP is to describe the methods to effectively monitor the quality of the groundwater in the uppermost aquifer underlying the Edgecombe County Landfill facility; to monitor groundwater and surface water diverted and discharged from the facility as part of the proposed corrective actions; and to monitor surface water downgradient of the facility during the implementation of corrective measures for the closed landfill.

The information generated from implementing this plan will be used to assist Edgecombe County and the NCDENR Division of Waste Management (DWM) in evaluating the effectiveness of corrective measures implemented at the closed landfill site. Included in this plan are sections concerning monitoring well locations, surface water sampling locations, monitoring well construction methods, sampling procedures, analytical procedures, data evaluation, and reporting procedures. Sampling and analytical procedures will be performed in general accordance with the NCDENR DWM policy.

Included in the WQMP is a hydrogeologic study of the landfill site and an evaluation of the existing water quality monitoring system that is based on the review of previous studies performed by others, available documents, and limited data collected by S&ME.

1.2 Project Information

The Edgecombe County Landfill is located along State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill site is bound to the north by Jerry's Creek, to the east by SR Route 1601 and to the west and south by undeveloped agricultural land. The landfill site is shown on the Site Location Map (**Figure 1**).

Results of the detection monitoring previously performed at the site indicated that a statistically significant increase over background constituent concentrations was detected for one or more constituents at the landfill in the semiannual sampling event performed in 1998. The constituent detections indicated that the groundwater water quality downgradient from

the MSW unit was adversely impacted. An assessment monitoring program was implemented by Edgecombe County in 1998.

Volatile organic compounds (VOCs) and inorganic constituents have been detected above North Carolina groundwater protection standards in groundwater samples collected from groundwater compliance monitoring points used to monitor the Edgecombe County Landfill. In addition, statistical evaluation of groundwater monitoring data indicates a release of VOCs and inorganic constituents from the landfill. The findings from the assessment monitoring program triggered the next regulatory directive to characterize the nature and extent of the release [.1634 (g) (1)].

In accordance with NCDENR Division of Waste Management (DWM), Solid Waste Section (SWS) Solid Waste Rules defined under 15A NCAC 13B, S&ME has completed the following activities on behalf of Edgecombe County in response to the detections of these constituents:

- Statistical analyses of semi-annual water quality results of compliance well monitoring system in accordance with the facility's *Water Quality Monitoring Plan* (WQMP);
- Alternate Source Demonstration (ASD) study in accordance with Solid Waste Rules defined under 15A NCAC 13B.1633(c)(3) and .1634(g)(2);
- Nature and Extent Study (NES) prepared in accordance with Solid Waste Rules defined under 15A NCAC 13B.1634(g)(1); and,
- Assessment of Corrective Measures (ACM) in accordance with Solid Waste Rules defined under 15A NCAC 13B.1635.

These previous assessments identified five organic compounds (vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene) and one inorganic analyte (cobalt) as constituents of concern (COCs) at the Edgecombe County Landfill.

Based on the findings of the previous assessments, and the selection of remedial action, a Corrective Action Plan (CAP) was prepared for the facility in accordance with 15A NCAC 13B.1636, for the selection of a remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards. Remedial alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for corrective action. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

2.0 GEOLOGY AND HYDROGEOLOGY STUDY

2.1 Regional Physiography

Edgecombe County lies within the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain was formed by the deposition of sediments during a series of sea level transgressions and regressions. The regional topography slopes generally to the east with major topographic features consisting of three terraces modified by surface water drainage. The terraces were formed at the margin of the sea when it stood at different levels during Pleistocene time. Each terrace is indicated by a more or less pronounced scarp that marks the location of a former shore line and is separated from the adjacent terrace by an area of gentle slopes. One terrace is indicated in **Figure 1 from the NES Report** east of Colonial Road. (*Nature and Extent Study*, dated June 25, 2008 by S&ME, Inc.)

Edgecombe County is drained by the Tar River and its tributaries. The river has cut 60 to 70 feet into the land surface. The highest topographic elevations are about 140 feet-NGVD along the western edge of the county. The lowest elevation is about 10 feet-NGVD along Tar River as it leaves the county.

2.2 Regional Geology

In general, geologic units in the Coastal Plain Region consist of deep, unconsolidated clastic sediments. The geology of Tarboro, North Carolina contains local remnants of Tertiary fossiliferous clay within the Yorktown Formation. The age of the basement units is described as pre-Cretaceous. Other formations in this region from youngest to oldest (top to bottom) include:

- The Surficial Deposits (Quaternary)
- The Yorktown Formation (Tertiary)
- The Upper Cape Fear Formation (Cretaceous)

In the site vicinity, the Quaternary surficial sediments are comprised of the Penholoway, Wicomico, and Sunderland Formations. These formations are generally less than 50 feet thick, with an average of 20 to 30 feet and consist of yellow silty sand and sandy clays. The sediments are cross bedded in areas. The Yorktown Formation lies beneath these surficial sediments. The Yorktown consists of 30 to 60 feet of blue gray silty clay with sandy clay, shell beds and fine sands. The Yorktown is extensive throughout the county forming an almost continuous layer. Beneath the Yorktown are Cretaceous-aged sediments of reddish brown to brown clay, sand and sandy clay with some gravel resting on the irregular bedrock surface. These sediments range in thickness from 30 in the west to 400 feet or more in thickness in the eastern area of the county. There are no known faults within 2,000 feet of the site. The closest expected fault cited in the literature is located outside Edgecombe County, 15 miles south of the site. This fault is the Roanoke Island-Goldsboro Fault.

The Cretaceous sediments are underlain by crystalline igneous and metamorphic rocks,

with an irregular surface that dips gently to the east. The depth to the bedrock is approximately 300 feet below National Geodetic Vertical Datum (NGVD) (approximately 240 to 400 feet below land surface). A geologic map with the site location is shown on **Figure 4 of the NES** (S&ME, 2008).

2.3 Site Topography

Topography at the site (outside of the landfill area) is generally level to gently rolling with a slope down to the east. Manmade topographic conditions at the site include the landfill structure, roadways, and surface drainage features located along the south, east and west boundaries of the landfill. The eastern portion of the landfill has side slopes that range from approximately 4 horizontal to 1 vertical (4H:1V) to 6H:1V and top slopes ranging from 2 to 6 percent. The western portion of the landfill has slopes that range from approximately 8H:1V on the side slopes to about 5 percent on top.

The existing ground surface elevations at the site range from approximately 136 feet-NGVD at the top of the C&D landfill, to about 107 feet-NGVD on the top of the MSW landfill. South of the landfill, elevations range from approximately 80 feet-NGVD near the southwest corner to approximately 70 feet-NGVD near the southeast corner. Along Jerry's Creek near the northwest corner of the site, the elevation is approximately 48 feet-NGVD and near the northeast corner the elevation is approximately 37 feet-NGVD.

2.4 Site Soil Classification

According to the Soil Survey of Edgecombe County, North Carolina, prepared by the United States Department of Agriculture and the Soil Conservation Service (1979), the soils in the vicinity of the site are classified as the Norfolk-Aycock-Wagram association. This association is comprised of nearly level to strongly sloping, well-drained soils. The surface layer is loamy sand to fine sandy loam with clay loam to sandy clay loam subsoil. The Norfolk-Aycock-Wagram association is usually found on uplands. The soils in this association are found in broad, slightly convex areas that are rounded along the drainage features. They are dissected by many drainageways that have short side slopes and narrow to wide flood plains.

Soils in the vicinity of Jerry’s Creek and Wright’s Creek streams are classified as the Bibb-Johnston association. These soils are usually found on flood plains in narrow to moderately broad areas along major streams. The Bibb-Johnston association is comprised of nearly level, poorly-drained and very poorly-drained soils that have loamy and sandy underlying material. The surface layer is mucky loam to fine sandy loam. The underlying material is loamy sand to sandy loam.

A previous subsurface exploration report by Patterson Exploration Services (PES) that was included in the Edgecombe County Landfill expansion submittal dated February 12, 1979 (Brown, Edwards, and Miller, Inc.) identified the soil conditions at the landfill site (west of SR 1601). Sandy topsoil and sand were encountered from ground surface to depths of 1.5 to 3.0 feet. The soil underlying the sandy topsoil and sand generally consisted of the following:

clay to silty clay at the east and southeast area of the site (Borings No. 5 and No. 11); clayey to sandy silts and silty to clayey sands at the south, center and west areas of the site (Borings No. 6, No. 7, No. 8, No.9, and No. 10); and coarse sand to silty sand at the northern area of the site along Jerry's Creek (Borings No. 12 and No. 13).

A marine clay (Yorktown Formation) underlying the near surface soil was encountered by the PES borings at the landfill site (described above). None of the borings appear to have penetrated the full thickness of the marine clay at depths ranging from 13 to 24 feet. In addition, about 2 feet of clayey sand was encountered in Borings 12 and 13 above the marine clay.

2.5 Site Geology

S&ME personnel performed several test pits, soil borings, and installed temporary piezometers at the site to identify the soil conditions at the landfill. The findings at the test pits, soil borings, and temporary piezometers are further discussed in Sections 4.1.1, 4.1.2, and 4.2.1 of the NES Report (S&ME, 2008). Sand and silty sand were identified from the ground surface to depths of 4 to 6 feet below ground surface (ft bgs). The soil underlying the sand and silty sand surface layer generally consisted of the following: sandy silty clay; sandy clayey silt; silty sandy gravel; and sandy clayey silt. The subsurface exploration identified a marine clay (Yorktown Formation), underlying the near surface soils at the landfill site at depths ranging from 3 to 20 ft bgs. The full thickness of the Yorktown clay does not appear to have been fully penetrated at any of the boring locations used to evaluate the subsurface conditions at the landfill site. Based on the borings drilled to assess the lithologic sequence, the Yorktown Formation appears to be greater than 25 feet thick. Contours illustrating the approximated top surface elevations of the Yorktown clay layer are shown on **Figure 5 of the NES**. A summary of soil property testing results is included in **Table 1 of the NES**. The logs for borings completed by S&ME or others, with lithologic descriptions are included in **Appendix II of the NES**.

2.6 Hydrogeologic Setting

2.6.1 Surface Water – Pre Landfill

Surface water from storm events at the landfill site either infiltrated into the surficial soils or flowed as sheet flow to the drainage features (paleo-channels) that originated near the southwest corner and south central area of the site. The drainage features flowed to the west and north and converged to form an intermittent tributary to Jerry's Creek. The remaining portions of the site drained directly into Jerry's Creek or to a drainage feature in the southeast area of the site that also converges with Jerry’s Creek.

2.6.2 Surface Water – Operating Landfill

The operating landfill was developed over paleo-channels that were present in the southwest and central portions of the site. Flow that entered the former drainage features was re-directed by a drainage ditch constructed at the south and west boundary of the facility. The

drainage ditch was designed to transport surface water and groundwater around the perimeter of the waste boundary.

Surface water from the active portion of the waste disposal unit now drains into a sediment basin located at the north central area of the landfill site. Water flows from the sediment basin through a discharge pipe into a drainage ditch that converges with Jerry's Creek. The sediment basin was constructed in the north portion of the drainage feature (paleo-channel) mentioned above. Jerry's Creek converges with the Tar River approximately 2,300 feet to the east of the site.

The surface water flow across the topography in the southeast area of the site passes through either of two control structures: a small detention basin located northwest of the landfill or a farm pond located southeast of the landfill. A portion of the farm pond is on the landfill facility property. The water from the farm pond passes through a culvert under SR1601 and converges with the drainage feature from the small detention basin that passes through a culvert under the landfill access road. This drainage feature converges with Jerry's Creek.

The local surface water features in the immediate vicinity of the landfill facility include: Jerry’s Creek; Wright’s Creek; the drainage features in the active landfill area; and the farm pond located in the southeast corner of the site. The undisturbed natural topography in the area surrounding the waste management unit has gradual to moderate slopes that grade downward toward these local surface water features. The surface of the landfill generally mimics the gradients of the natural slopes and also discharges to these surface water features. Jerry’s Creek is the primary receptor of surface water runoff from the landfill. Infiltration and percolation into the upper soil horizon is expected to be moderate due to the sandy loam content within this stratum. The uppermost aquifer underlying the landfill is expected to discharge to the local surface water features.

2.6.3 Groundwater Hydrogeology

The Coastal Plain Physiographic Region of North Carolina is located between the uplands of the Piedmont and the Atlantic Ocean. Investigations of the Coastal Plain Region have identified as many as 10 aquifers separated by 9 confining units. However, these aquifers can basically be divided into three major deep aquifer systems in North Carolina: the Quaternary Aquifer System, the Tertiary Aquifer System, and the Cretaceous Aquifer System. Each of these three major aquifer systems are separated from each other by units of lower permeability composed of clays and silts. The Quaternary Aquifer is composed of surficial deposits of sandy silt and clay. The Tertiary Aquifer is composed of glauconitic sands, clayey sands, and limestone. The Cretaceous Aquifer is composed of sand, silty and clayey sand, and clay separated by confining units of clay and silt.

The uppermost aquifer at the site is unconfined and is found in the silty sands of the Quaternary Sunderland formation. This aquifer is recharged by inflow from upgradient areas and by infiltration of precipitation. The Tertiary Yorktown clay layer, encountered at depths less than 10 feet bgs to 35 feet bgs, appears to act as a confining layer with an approximate thickness of over 20 feet below the landfill.

2.6.4 Site Hydrology

According to the facility's WQMP, dated September 1994, and the revision in November 1998, depths to static water levels have been historically measured on a semi-annual basis in several monitor wells and piezometers located at the landfill. Additionally, during performance of the NES, depths to static water levels have been measured in piezometers installed in the vicinity of the landfill. **Figure 2** shows the locations of monitoring wells and piezometers located at the Edgecombe County Landfill Facility. These wells and piezometers are screened in the surficial water bearing zone underlying the site. A summary of the construction details for the monitor wells and piezometers installed in the vicinity of the landfill is included in **Table 1**. Static water levels representative of the phreatic groundwater surface (water table) are measured from the top of the casing (TOC) of each monitoring well or piezometer with an electronic water level meter. These measurement data were recorded in a field logbook and used to calculate the corresponding groundwater elevation within each monitor well and piezometer based on surveyed elevations of TOCs. A summary of historical groundwater elevation data measured in the vicinity of the facility is included in **Table 3 of the NES**.

In addition to the groundwater potentiometric maps presented in the facility's semi-annual monitoring reports, a groundwater potentiometric map was prepared from groundwater elevation data from one event that illustrated relatively normal site groundwater conditions in January 2005 and for one event that illustrated drought conditions observed in August 2007 (**Figures 6 and 7, respectively, in the NES**). Based upon the water table elevations and the resulting potentiometric gradients, the groundwater flow direction within the surficial water bearing zone underlying the facility is projected generally to the north-northeast toward Jerry's Creek.

The well network used to prepare the potentiometric maps included compliance wells and piezometers installed to evaluate groundwater flow at the closed MSW landfill facility. Staff gauges in Jerry's Creek and Wright's Creek, piezometers installed along the southern boundary of the northern old landfill just north of Jerry's Creek, and piezometers along Wright's Creek along the northern boundary of the northern landfill were used to evaluate the interaction of groundwater with surface water. Water levels in these piezometers demonstrated that shallow groundwater has radial flow to the south toward Jerry's Creek, to the northeast toward Wright's Creek, and east toward the confluence of Wright's Creek and Jerry's Creek from below the old landfill. The potentiometric maps indicate that the creeks act as discharge features for the groundwater.

2.7 Hydraulic Conductivity

Rising and falling head slug tests were previously performed at the monitor wells installed at the site to estimate the hydraulic conductivity of the sediments in the surficial water bearing zone at those locations. The test data (provided in previous reports) from the monitoring wells were analyzed by the Bouwer and Rice Method. The estimated permeability or hydraulic conductivity values at the site range from 6.58×10^{-6} cm/sec (centimeters per second) at MW-9 to 9.81×10^{-4} cm/sec at P-32. Slug test hydraulic

conductivities are summarized in **Table 4 of the NES**.
Using the groundwater elevation information and historical information on hydraulic conductivity and effective porosity, S&ME calculated the horizontal groundwater flow gradient at each monitor well or piezometer and calculated the estimated groundwater flow velocity at each location for the January 2005 (normal conditions) and August 2007 (drought conditions) sampling events. These calculated groundwater flow velocities are presented on **Figure 6 and Figure 7 of the NES** and were portrayed by a vector arrow that showed the direction of groundwater flow and the estimated velocity in that vicinity on the potentiometric maps. The calculated groundwater flow velocity in the surficial aquifer at the site during the January 2005 sampling event ranged from 1.73 to 45.62 feet per year (ft/yr). The calculated groundwater flow velocity in the surficial aquifer at the site during the August 2007 sampling event ranged from 0.21 ft/yr to 69.14 ft/yr. These velocities were based on typical aquifer characteristics (porosity, hydraulic conductivity and hydraulic gradient) measured at each well. While the values measured at each well represented aquifer characteristics at that well location, the average groundwater flow velocity for the site was 24.12 ft/yr in January 2005 and 22.84 ft/yr in August 2007. Hydraulic conductivity and groundwater flow velocity calculations were included in **Appendix III of the NES**. The methods used for the calculations are described in the following sections.

2.7.1 Darcy's Velocity

Darcy's Law states that: $q = kiA$

where; q = Rate of flow, [cm3/sec]
k = Hydraulic Conductivity, [cm/sec]
i = Hydraulic gradient = dh/dl
A = Cross sectional area, perpendicular to direction of flow [cm2]

Therefore, flow is equal to the velocity of the fluid multiplied by the cross-sectional area where flow is occurring. This yields Darcy's velocity ($Vd = ki$).

2.7.2 Seepage Velocity

The seepage velocity (Vs) of a fluid flowing through a porous media is derived from Darcy's velocity. Darcy's Law describes the flow of a fluid on a macroscopic generalized basis, assuming that the flow occurs across the entire cross-sectional area. Flow through a soil actually occurs through the void spaces between soil grains, and occurs only through that portion of the cross-section not occupied by soil particles. To determine the actual speed a fluid flows through a porous media, such as soil, a more accurate representation of the area of flow must be realized. Porosity is defined as the volume of voids per volume of total space;

$$n = Vv / Vt$$

Therefore, the seepage velocity of a fluid moving through soil may be expressed as;

$$Vs = Vd / n = ki/n$$

3.0 EVALUATION OF EXISTING MONITORING SYSTEM

3.1 Existing Monitor Wells

Monitoring well and piezometer locations currently used for water level measurements and sample locations are shown on **Figure 2**. The monitor well network sampled semiannually for the detection and assessment monitoring programs include three upgradient (background) monitor wells: MW-3B, MW-4, and MW-9; and four downgradient (compliance) monitor wells: MW-1A, MW-5, MW-6, and MW-7A. These wells were installed by S&ME or others between 1994 and 2004.

Monitor well MW-3B appears to be located approximately 125 feet upgradient of the waste boundary. Monitor well MW-4, appears to be located within 125 feet upgradient of the waste boundary and monitor well MW-9 appears to be located approximately 375 feet upgradient of the waste boundary. Monitor well MW-9 was located west of a constructed drainage feature that influenced its position beyond 150 feet from the waste boundary. The relative point of compliance for the landfill is considered to be between 100 and 150 feet of the waste boundary. The downgradient wells, MW-1A, MW-5, and MW-6, appear to be within the relative point of compliance at approximately 100 feet from the waste boundary. Monitor well MW-7A appears to be located approximately 20 feet downgradient of the waste boundary. The downgradient monitoring wells appear to be located in areas to enable early detection of groundwater contamination that may originate from the landfill and travel in the uppermost aquifer.

3.2 Existing Monitor Well Construction

Monitoring well construction records for the well network are summarized below:

Well ID	Date Installed	Total Depth (ft-bgs)	Screen Interval (ft-bgs)	Installed By
MW-1A	9/15/1994	17.5	2.5-17.5	Law Engineering
MW-3B	2/5/2004	20.5	5.5-20.5	S&ME, Inc.
MW-4	9/9/1994	18	3-18	Law Engineering
MW-5	9/16/1994	22	7-22	Law Engineering
MW-6	9/16/1994	17.5	2.5-17.5	Law Engineering
MW-7A	11/13/1999	25	15-25	Geotek
MW-9	2/26/2002	15	5-15	S&ME, Inc.

Monitor wells were installed in general accordance with 15A NCAC 2C Well Construction Standards. A summary of the existing monitor well and piezometer construction details is presented in **Table 1.** Monitor wells were constructed with 2-inch diameter Schedule 40 PVC; sand pack was placed in the annular space around the screen sections of the PVC piping and the annular space around the PVC piping above the screen was sealed with bentonite and then grouted to the surface. The design of the well screen interval is targeted to intersect the water table during high or low water level conditions within the well screen

interval. Monitor wells MW-6 and MW-7A have been measured to occasionally have water levels that are above the well screen interval. Other monitor wells included in the water quality monitoring network occasionally have water levels that are above the well screen interval.

3.3 Existing Surface Water Sampling Locations

Existing surface water monitoring stations include one upgradient station, Upstream, and one downgradient station, Downstream, located on Jerry's Creek as shown on WQMP **Figure 2**. Both surface water sample locations are identified in the field by staff gauge locations set to monitor surface water elevation in Jerry's Creek. The upgradient station is located northwest of the landfill facility in Jerry's Creek, and the downgradient station northeast of the landfill is west and upstream to the convergence of Jerry's Creek and Wright's Creek.

4.0 UPGRADED GROUNDWATER MONITORING NETWORK

4.1 Basis for Planned Monitor Wells

4.1.1 Detection, Assessment, Corrective Action Compliance Monitoring

Existing monitor well and piezometer locations in the monitor well network were suitable for detection monitoring and assessment. However, based on the refined location of the waste boundary from the NES (S&ME, June 2008) relative to the wells used for the existing well network, the well locations MW-7A and MW-9 will require relocation to meet the NCDENR relative point of compliance requirement of not less than 100 feet and not more than 150 feet from the waste boundary.

Monitor well MW-7A is located within 20 feet of the waste boundary delineated by the activities discussed in the NES. The proposed replacement location for MW-7A will be positioned approximately 150 feet north and approximately 150 feet east of the existing location of MW-7A. This proposed well location is expected to monitor water quality for constituents previously detected in MW-7A. The proposed well designation will be MW-11 and will be approximately 125 feet from the waste boundary. The proposed new well location appears to be suitable but may be repositioned to monitor proposed corrective measures that will be implemented as part of the CAP. A trench drain that will induce hydraulic control on surface and groundwater migrating toward the landfill is one part of a proposed corrective measure. The well location will be designed to monitor the water level for drawdown near the proposed trench drain once it is installed.

Monitor well MW-9 is located approximately 375 feet west-southwest of the waste boundary delineated by the activities discussed in the NES. The replacement location for MW-9 will be positioned approximately 75 feet north and approximately 240 feet east of the existing location of MW-9. The proposed well designation will be MW-9A and will be approximately 130 feet from the waste boundary.

Additional points are necessary to monitor the progress of the proposed corrective measures that will be implemented to mitigate the release site. Based on the location of the constituent concentrations delineated in the NES, S&ME proposes to install new monitor wells or convert existing piezometer locations into six new permanent downgradient and one relocated background network monitor wells. The piezometers will be converted into monitoring wells by installing protective casings set in concrete pads in the same manner at the monitoring wells.

The proposed monitor well MW-12 is positioned near the northwest corner of the facility approximately 150 feet north and 375 feet west of MW-6. This proposed well will be constructed by converting piezometer P-28A into a permanent monitor well. The location is expected to monitor water quality for constituents previously detected in MW-7A, geochemical parameters to assess natural attenuation, and groundwater levels downgradient to a proposed trench drain that is expected to induce hydraulic control on surface and groundwater west of the landfill.

The proposed monitor well MW-13 is positioned centrally near the north boundary of the landfill approximately 350 feet west of MW-5 and approximately 175 feet south of Jerry's Creek. The proposed location for MW-13 will be approximately 120 feet from the waste boundary. This proposed well location is expected to monitor water quality for constituents previously detected in MW-2A, P-30 and P-31, geochemical parameters centrally located in the constituent plume to assess natural attenuation, and groundwater levels.

The proposed monitor well MW-14 will be constructed by converting piezometer P-36 into a permanent monitor well location. Piezometer P-36 is located centrally on the north boundary of the landfill site approximately 20 feet south of Jerry's Creek, approximately 170 feet north and 90 feet west of MW-5, and approximately 265 feet north of the waste boundary. The converted well location is expected to monitor water quality for constituents previously detected in MW-5, geochemical parameters to assess natural attenuation, and groundwater levels.

The proposed monitor well MW-15 will be constructed by converting piezometer P-33R into a permanent monitor well location. Piezometer P-33R is located centrally on the north boundary of the landfill site approximately 10 feet south of Jerry's Creek, approximately 10 feet north and 135 feet east of MW-5, and approximately 130 feet north of the waste boundary. The converted well location is expected to monitor water quality for constituents previously detected in MW-5 and groundwater levels.

The proposed monitor well MW-16 is positioned near the northeast corner of the landfill facility approximately 35 feet north and 250 feet east of MW-1A. The location will be used as a location to review the proposed implemented corrective measures. This proposed well location is approximately 250 feet northeast of the waste boundary and is expected to monitor water quality for constituents previously detected in MW-1A, geochemical parameters to assess natural attenuation, and groundwater levels south of Jerry's Creek.

The proposed groundwater monitoring well locations described above are shown on **Figure 2**. There are six new compliance (downgradient) detection monitoring wells (MW-11 through MW-16) and one new background (upgradient) monitoring well (MW-9A) proposed for the site. These wells are to be located within the relative point of compliance (100 to 150 feet of waste boundary).

4.1.2 Water Level Elevations

In addition, five piezometers P-12, P-17, P-18, P-34, and P-35 are proposed to be converted to permanent monitor wells along the southern and eastern boundaries of the landfill for additional groundwater surface information at the site. The piezometers will be converted into monitor wells by installing protective casings set in concrete pads in the same manner as the monitor wells. The five converted piezometers will not be sampled for laboratory analysis.

The proposed monitoring well locations were selected for the characterization of groundwater quality and flow in the uppermost aquifer, and to allow the detection of changes

in groundwater quality at the site. The spacing and locations of the wells were selected based on existing drainage features and estimated groundwater flow directions.

4.2 Typical Monitor Well Design Construction and Maintenance

The proposed seven monitor wells and five piezometers will be constructed or converted into Type II wells, in general accordance with the North Carolina Well Construction Standards (15A NCAC 2C .0108) and the requirements of the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities. A typical monitoring well construction detail is presented on **Figure 3**. The final screened intervals will be selected based on site conditions encountered during the drilling.

Boreholes will be drilled and the wells constructed by a NCDENR registered well driller. All equipment used for drilling and completion of the wells will be cleaned according to protocols before drilling and monitoring well installation. At a minimum, the cleaning will consist of high pressure hot-water cleaning of the downhole drilling equipment prior to performing each boring. Boreholes for the wells will be drilled using rotary drilling methods or other typical drilling methods as site conditions dictate.

In order to obtain additional subsurface information at strategic locations, soil test borings that include soil sampling using split-barrel sampling procedures (samples taken at 2.5-foot intervals first 10 feet and 5-foot intervals below 10 feet) are proposed at the planned locations for new monitor wells.

Monitor wells will be constructed with 2-inch diameter Schedule 40 PVC flush joint threaded casing and .01-inch slotted screen. Only casing with water-tight joints will be used. All well construction materials will be thoroughly cleaned prior to installation or will be installed directly from factory sealed packaging.

Following the completion of each borehole, the qualified geologist or engineer will select the screened interval for the monitoring well based on site-specific factors and the following general criteria:

1. Each slotted well screen interval is to be 10 or 15 feet and located so that the groundwater surface is within the screened interval. The proposed depths of the screen intervals are provided in **Table 2**. For areas with high groundwater levels (i.e., less than 3 feet below land surface), the top of screen will be placed at a depth of not less than 2 feet below land surface to allow adequate seal and to allow sufficient grout to secure the protective casing.
2. The base of the screen will not be placed more than 2 feet into the marine clay, as identified during the soil test borings.
3. The annular space between the borehole wall and the well casing will be backfilled with clean, washed sand properly sized to the formation material. The sand pack will be placed no more than one to two feet above or below the slotted screen.
   The hollow-stem augers or temporary casing will be incrementally withdrawn while the filter pack is placed. For depths greater than 30 feet (not anticipated), the filter

pack will be placed into the annular space using a tremie pipe. The filter pack level will be frequently sounded and kept at the base of the augers or temporary casing until the desired depth of filter pack is obtained.

4. A 1-foot to 2-foot thick bentonite seal will be placed above the filter pack and hydrated with clean water adequate for hydration before placement of the grout seal. Care will be taken so that the augers or temporary steel casing is withdrawn above the top of the pellets to prohibit the bentonite pellet seal from sticking to the auger or casing.
5. Adequate time will be provided for the hydration of the bentonite seal prior to grouting the annular space of the wells. The remainder of the annular space will be filled with a cement/bentonite grout from the top of the bentonite seal to the ground surface. In boreholes where the groundwater surface is above the bentonite seal, the grout will be slowly pumped into the tremie pipe at a constant rate to prevent dilution until it flows out at the surface. The augers or temporary casing should be removed immediately after the grout is placed in the borehole. Subsequent to set up, additional grout may be required for "topping off" the grout seal to the surface. After grouting, no work is permitted on the well for a minimum of 24 hours while the grout is setting.
6. A 4-inch square (or approved equivalent) steel protective casing with a lockable cover will be placed over the well's riser pipe. The protective casing will extend from about 1.5 to 2.0 feet below ground surface to slightly above the well casing top (approximately 30 inches above ground). The protective casing will be placed over the well casing following the initial grouting. The protective casing will be sealed and immobilized in concrete placed around the outside of the protective casing. The protective casing will be primed, painted, and provided with a permanently affixed name plate with the following information, as required in the well standards:
   - Well identification number
   - Drilling contractor name and registration number.
   - Total depth of well.
   - Depth of screen interval.
   - A warning that the well is for monitoring only and that the groundwater may contain hazardous materials.
7. A nominal 6-inch thick concrete slab or pad with dimensions of 2 feet by 2 feet sloping gently away from the well casing in all directions will be provided. The slab will serve as anchorage and is intended to prevent surface water from migrating into the well and along the wall of the casing. A typical detail for the monitoring well is shown on the attached **Figure 3**.
8. The location, installation methods and construction details of the wells may be modified depending on field conditions (i.e. shallow groundwater, confining clay layer, etc.). These modifications, if any, will be discussed with NCDENR DWM prior to the construction.

The wells and surrounding area will be maintained in such a way to ensure access to the wells for sampling and to maintain the integrity of the wells. The monitoring wells will be accessible by at least a four-wheel drive vehicle. Brush and weeds will be cleared from around the wells (minimum of 10-foot radius). For additional well protection, barricades

(protective bollards) are recommended to be constructed around the wells (see **Figure 4**, Typical Protection for Monitoring Wells, an alternative design may be used). The barricades and well protective casings will be painted with a high visibility color paint or an approved equivalent. Surface water run-on controls will be provided, where necessary, to minimize erosion near or below the concrete pads. The concrete pads will be monitored for integrity and repairs performed as needed.

4.3 Sampling and Analysis Plan

The following Sampling and Analysis Plan (SAP) is prepared based on the S&ME plan dated May 1994 and the plan revision by S&ME dated November 1998. The sampling techniques include low-flow purging and sampling as well as bailer or dedicated pump sampling, as necessary, to obtain groundwater samples from monitor wells currently installed at the Edgecombe County Landfill. This SAP outlines the procedures and protocols that will be used to collect groundwater samples.

4.3.1 Well Development

Following well installation, the wells will be developed in order to remove clay, silt, sand and other fines that may have been introduced into the formation or sand pack during drilling and well installation. Well development will also establish communication of the well with the aquifer. Well development will be performed as soon as possible after each well construction and will continue until the suspended solids are removed from the well and turbidity is minimized. Pumping/bailing and surging cycles will be used to develop the wells.

4.3.2 Well Measurements and Aquifer Tests

4.3.2.1 Survey Well Locations and Top of Casing Elevations

Prior to the initial well sampling, the highest point on the top of casing for each well will be surveyed by a state registered land surveyor. The casing elevation will be tied in to the site benchmark in order to calculate the elevation of the groundwater surface. The well locations will also be surveyed for horizontal control.

4.3.2.2 Water Level Measurements

Prior to the well evacuation for every sampling event, the depth to water and total well depth will be measured with the use of an electronic water level indicator. The water level will be measured by turning the instrument on and slowly lowering the instrument probe into the well until the water level indictor contacts the water activating an alarm. The depth to the water from the highest point on the well casing will be measured and recorded and the amount of water within the well casing will be calculated. All measurements will be recorded to the nearest .01 foot. After the measurement is made, the water level probe and lead will be cleaned with a detergent and potable water solution, and rinsed with clean deionized or HPLC water.

4.3.2.3 Aquifer Tests and Well Yield

The hydraulic conductivities measured in the uppermost aquifer are shown on the summary of monitoring well information provided in **Table 4 of the NES**. The hydraulic conductivity

test data are also provided in Appendix VII of the NES. Hydraulic conductivity tests will be performed on all new wells prior to the initial sampling event to allow the estimation of groundwater flow rate in the vicinity of each well using the updated estimated hydraulic gradients at the site.

The primary objectives during the collection of groundwater samples for analysis are to obtain a representative groundwater sample and to prevent the sample from being altered or contaminated during withdrawal from the well, shipping, or during sample preparation. Special procedures are often necessary for sampling monitoring wells based on their yield. For the purpose of this plan, a high-yield well will be defined as a well that cannot be drawn down more than 20 percent of the water column by bailing or pumping by hand. A moderate-yield well can be drawn down more than 20 percent; however, it cannot be evacuated to dryness. A low-yield well can be evacuated to dryness and requires a minimum of a few hours to a day to fully recover.

4.3.3 Well Purging and Sampling

4.3.3.1 Purging with a Bailer, or Dedicated Pump

For monitor wells that may be purged using either clean disposable Teflon® or PVC bailers, or dedicated bladder pumps, the following procedures will be applied. For moderate and high-yield wells, a minimum of 3 to 5 times the volume of water standing in the well will be removed prior to sampling. For low-yield wells, a minimum of 1.5 well volumes will be removed if evacuated to dryness. For example, a 2-inch diameter (I.D.) pipe (Schedule 40 PVC) has 0.1632 gallon per foot of pipe length. Therefore, five times the volume of a 2-inch diameter well having a seven-foot water column would be equal to 5.7 gallons (0.1632 gal/ft x 7 ft. x 5 volumes).

4.3.3.2 Field Parameter Measurements (Bailer or Dedicated Sample Pump)

During groundwater purging activities, the well effluent will be sampled and field parameters including but not limited to temperature, specific conductance, and pH of the groundwater will be measured and recorded after each a volume of groundwater approximately equal one water column volume is purged. Stabilization is defined as after three consecutive field parameter measurements agree with each other within 10 percent. The instruments will be calibrated at the beginning and end of each sampling day or in accordance with the manufacturer’s specifications.

4.3.3.3 Sampling with a Bailer or Dedicated Sample Pump

Low-yield wells may be sampled utilizing clean disposable Teflon® or PVC bailers. During sample collection the bailer will be slowly lowered into the water column until full, then slowly retrieved. The sample containers will be filled by slowly pouring the sample from the bailer directly into the sample container without the bailer contacting the well's outer casing, sample bottle, or the ground. The sample will be handled in a way to minimize aeration. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers. Following sampling, filled sample containers will be labeled and placed in an insulated cooler with wet ice. The bailers will be properly disposed of following sampling.

Field cleaning and re-use of bailers is not recommended. A new clean disposable bailer is required for each monitoring well.

For wells sampled using a dedicated bladder pump, the pump will be stainless steel construction. The pump bladder, airline, vent line and effluent sampling tube will be compatible to chemical constituents likely present at the site. During sample collection with the dedicated bladder pump, the sample containers will be filled directly from the discharge tubing into the sample container without the tubing contacting the well's outer casing, sample bottle or ground. The sample will be handled in a way to minimize aeration. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers. Following sampling, filled sample containers will be labeled and placed in an insulated cooler with wet ice.

4.3.3.4 Low Flow Well Purging with a Peristaltic Pump

A section of flexible tubing will be inserted into each well so that the end of the tubing is located approximately mid-point of the saturated section of the well screen. The tubing will be Teflon®-lined polyethylene or PVC material with an approximate outside diameter of 0.375 inches. The tubing will be dedicated to the well and remain in the well between sampling events. This tubing has been approved by the DWM for sites using dedicated sampling pumps.

At the time groundwater samples are collected, the Teflon® or PVC tubing will be attached to a short length of new flexible peristaltic pump tubing. Tubing used in the pump will consist of silicon, or other high quality tubing designed for use with peristaltic pumps and compatible with any of the constituents that may be present in groundwater. New pump tubing will be used at each well. Pump tubing will not be reused between wells or subsequent sample events. A variable-speed peristaltic pump will be used that is capable of generating flow rates less than 100 milliliters per minute.

The stagnant water in the tubing from the previous sampling event will be removed by operating the pump to remove a minimum of one discharge tubing volume. This is estimated to be approximately 200 ml. The pump will be operated at a low flow rate during purging. This rate will be less than the well recovery rate and in no case exceeding 500 ml/min. Also, the purge rate will be low enough that recharge water does not become excessively agitated or that colloids are drawn into the well bore. The recovery rate of the well will be evaluated during pumping with the use of a decontaminated water level probe.

4.3.3.5 Field Parameter Measurements with a Peristaltic Pump

During groundwater purging and sampling activities, field parameters including but not limited to temperature, specific conductance, pH and turbidity of the groundwater will be measured and recorded. The instruments will be calibrated at the beginning and end of each sampling day in accordance with the manufacturer's specifications. These measurements will be used to indicate when stabilization of each field parameter has occurred. Readings will be taken at approximately five-minute intervals until stabilization occurs. Stabilization is defined as after three consecutive measurements in a flowing sample (as described above) agree with each other within 10 percent.

4.3.3.6 Sample Collection with a Peristaltic Pump

For wells sampled using a peristaltic pump, the pump tubing and sample tubing will be compatible to chemical constituents likely present at the site. During sample collection with the peristaltic pump, the sample containers will be filled directly from the discharge tubing into the sample container without the tubing contacting the well's outer casing, sample bottle, or ground. The sample will be handled in a way to minimize aeration. The discharge will be regulated so that the sample will be delivered at a slow rate of approximately 100 to 300 ml/min. directly into the sampling container with minimal turbulence, aeration or volatilization. The pump will be operated at a low flow rate until each container has been filled. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers. Following sampling, filled sample containers will be labeled and placed in an insulated cooler with wet ice.

4.3.4 Sample Containers and Quality Control Procedures

4.3.4.1 Laboratory Sample Packs

The laboratory performing the groundwater analysis will be certified by NCDENR for the analytical test procedures required to monitor the site. The laboratory performing the analyses will supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, chain-of-custody and shipping forms. Adequate instructions to the laboratory shall be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures shall be given to the laboratory in writing prior to the field sampling personnel arriving on the site. A specific contact person shall be established at both the facility and contract laboratory for communication between the two (2) parties.

The selected analytical laboratory will prepare and supply the sample containers in a protective cooler or lab sample pack. Delivery of the empty containers by the laboratory to the sampler will be noted on the Chain-of-Custody form. A complete set of pre-cleaned and pre-labeled sample bottles will be supplied by the laboratory in an insulated cooler for each well/location to be sampled as approved by EPA procedures appropriate for the parameters of interest. The sample pack with bottles specific to each parameter to be analyzed will be removed from the cooler, and a groundwater sample from the bailer or pump (for each well) will be poured into each type of fresh container. Unpreserved sample bottles may be rinsed with sample liquid before filling. Preservatives will be added as necessary (in accordance with EPA Methods SW-846) to the sample bottles either by the laboratory or in the field immediately prior to sampling. Sample containers are kept closed until used.

4.3.4.2 Sample Container Types and Sample Collection Order

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. As noted above, the contract laboratory performing the analysis shall supply all the required containers. In special circumstances when the facility must obtain its own containers, these containers shall be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon^{TM})

lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

Water samples will be analyzed for various parameters and several types of containers are required. Routine sampling will fill the containers for the following analyses in the order that they are discussed below.

- Volatile organic Compounds (VOCs) and Total Organic Halogens (TOX). VOCs and TOX will be collected first in 40-ml glass vials with Teflon™-lined caps. The vials will be filled completely leaving no "headspace".

- Metals. Samples to be analyzed for inorganic constituents (i.e., metals) will be collected next. The containers are most often plastic bottles that have acid placed in them as a preservative. These containers will not be rinsed prior to filling.

- Semivolatile Organic Compounds (SVOCs). If organic contamination is suspected, additional samples may be analyzed for SVOCs. If required, SVOCs will be collected following collection of the inorganics. Generally the SVOCs are collected in 1-liter amber bottles.

- Radiological and Bacteriological Samples. If necessary, groundwater samples to be analyzed for radiological parameters will be collected next followed by bacteriological parameters. The radiological samples will be collected in 1-liter bottles and the bacteriological samples will be collected in 120-ml plastic bottles containing sodium thiosulfate as a preservative.

After transferring the groundwater sample to the appropriate container, each container will be placed in a chilled cooler or lab sample pack pending completion of the sampling event and delivery of all of the samples to the laboratory. After all samples from the well have been collected, the well will be capped and secured. Because many of the analyses have a short maximum holding time, particularly the bacteriological analyses, the samples will be shipped or delivered to the laboratory on the day of collection whenever possible.

4.3.4.3 Quality Control Procedures

A trip blank will be prepared for each sample event to evaluate possible sample contamination that may occur during transport to and from the site. Trip blanks will be prepared by the laboratory and will accompany the sample containers from the laboratory to the field. The trip blank will be labeled and remain unopened throughout the duration of the field activities and subsequent shipment of the filled containers back to the laboratory. Trip blanks will be analyzed for the Appendix I or the expanded Appendix II volatile compound list using EPA Method 8260, depending on the sample analysis requirements.

To evaluate the effectiveness of the decontamination process, an equipment rinse blank will be prepared during each sampling event by pumping laboratory-supplied deionized water through a new piece of silicone pump tubing into a second empty laboratory-supplied sample container. In the case where a bailer or dedicated pump is used to collect the samples, the

equipment rinse blank will be prepared by pouring laboratory-supplied deionized water directly into the sampling equipment and then transferring the water directly into the laboratory-supplied containers. One equipment blank will be collected for each sampling event. The equipment blank will be analyzed for the each parameter of the record samples.

One duplicate sample will be analyzed for each parameter of the record samples for each sampling event. At least one duplicate sample will be collected during each sampling event. The sampling personnel will select a sampling location at random in the field and the location will be identified in the logbook. When the selected location is sampled, an additional set of sample containers will be prepared and labeled with the sample location listed as "duplicate". The sampling date will be recorded on the container, but not the time of sample collection. The time of duplicate sample collection will be noted in the field book. Sample containers for the record and duplicate sample will be filled at the same time, alternately, to maximize the reproducibility of analyses between the record and duplicate sample containers.

The filled sample bottles will be labeled then be securely placed into a pre-cleaned cooler with wet ice and a chain-of-custody form completed and placed with the samples prior to shipping to a laboratory for analysis. Duplicate samples are only labeled as "Duplicate" with the date sampled. No sample time or location designation will be noted on the duplicate sample containers. Upon completion of sampling, the well will be capped and secured.

4.3.4.4 Chain-of-Custody and Sample Transportation Requirements

Chain-of-custody procedures will be used to establish documentation tracing sample possession from the time of sample collection until completion of analysis. The chain of custody will be used by the field personnel responsible for ensuring integrity of the samples from the time of collection to shipment to the laboratory. The laboratory will not proceed with sample analysis without a correctly prepared chain-of-custody form. The laboratory will be responsible for maintaining custody of the samples from the time of receipt to their disposal. The chain-of-custody form will include the following:

- Signature of sampling personnel
- Date and time of sample collection
- Sample type (e.g., groundwater, immiscible layer)
- Number of containers
- Preservative used
- Parameters requested for analysis
- Identification of Well
- Unique identification for each sample
- Signature of each person that has maintained possession of the samples
- Date and time of possession
- Airbill Number, if the samples are shipped by common carrier

For the purpose of these procedures, a sample is considered in custody if it is:

- In actual possession of the responsible person;
- In view, after being in physical possession;

- Locked so that no one can tamper with it, after having been in physical custody; or in a secured area, restricted to authorized personnel. All samples are maintained in the custody of the sampling crew during the sampling event. At the end of each sampling day and prior to the transfer of the samples off-site, chain-of-custody entries are completed on the COC for all samples. Upon transfer of custody, the chain-of-custody form is signed by a sampling crew member, including the date and time. If outside vendor laboratories are utilized, samples are delivered to these facilities by Duke Energy personnel or courier.

All chain-of-custody forms received by the laboratory(s) are signed and dated by the respective Supervising Scientist(s) or their designee, or the laboratory sample custodian (at vendor labs) immediately following receipt by the laboratory.

The analysts at the laboratory(s) maintain a sample-tracking record that will follow each sample through all stages of laboratory processing. The sample tracking records show the date of sample extraction or preparation, and analysis. These records are used to determine compliance with holding time limits during lab audits and data validation.

4.3.4.5 Validation of Field Data Package

The field data package includes all of the field records and measurements developed by the sampling team personnel. The field data package validation procedure consists of:

- A review of field data contained on the Groundwater Monitoring Data Sheets for completeness.
- Verification that equipment blanks, field blanks, and trip blanks were properly prepared, identified, and analyzed.
- A check of the Field Sampling Calibration Form for equipment calibration and instrument condition.
- A review of the Chain-Of-Custody Record for proper completion, signatures of field personnel and the laboratory sample custodian, and dates, and for verification that the correct analyses were specified.

4.3.5 Sampling Frequency

Two independent sampling events are required annually by the NCDENR DWM for each monitoring well. The independent sampling events will be performed semiannually with one event occurring between October and January and the other occurring between April and July.

Groundwater elevation data and methane gas levels will be measured on a quarterly basis at the landfill. Groundwater and surface water monitoring for Appendix I constituents will be collected on a semiannual basis. Geochemical parameters will be collected to review natural attenuation on an annual basis, which will coincide with a semiannual event. Statistical analysis of Appendix I detections will be run annually.

4.3.6 Field Reporting Requirements

The sample collector will record all pertinent information regarding the purging and sampling of monitoring wells in a field book or logbook. The field data will be recorded and retained in the operating record files. The data will also be submitted to the appropriate State agencies. The information will include at a minimum the following:

1. Sampling date and time;
2. Collector's name;
3. Site name and location;
4. Well identification number;
5. Well depth;
6. Water level measured from top of casing to the water surface;
7. Well casing inside diameter;
8. Well casing volume;
9. Time that purging was initiated and completed;
10. Sample pH, temperature, specific conductance (conductivity), and nephelometric turbidity;
11. Reason for Sampling;
12. Sample volume, container type, and preservatives added to the sample;
13. Sample observations, i.e., color;
14. Analytical methods for each sample;
15. Weather conditions at the time of sampling; and
16. Additional comments regarding the sampling event, sample, or well.

4.3.7 Laboratory Analysis Parameters

Laboratory analysis parameters listed in **Table 3** represent compound detections that will be monitored on a semiannual schedule. The parameters that will be tested at each location will include the Appendix I list of volatile constituents, and cobalt. This list will be verified and updated if new constituents are detected. The groundwater quality monitoring data will be compared to the North Carolina Groundwater Standards, 15A NCAC 2L. 0202, or NCDENR DWM Groundwater Protection Standards, where applicable. Sample analyses will be performed by a NCDENR "certified" laboratory. All data will be subjected to quality assurance and quality control protocols per NCDENR. Only analytical methods that are acceptable to NCDENR DWM will be used by the laboratory.

4.3.8 Detection Monitoring Data Evaluation and Reporting

Detection monitoring is performed to determine if contamination may be occurring. All analytical reports will be completed with referenced analytical methodologies, QA/QC documentation, field logs, analysis request forms, chain-of-custody forms, and parameter concentrations.

The groundwater analyses results will be evaluated to determine if statistically significant evidence of contamination exists between the "background" (upgradient) well samples and the "compliance" (downgradient) well samples. Statistics will be applied on well locations that have four or more data points to analyze. One or more of the following statistical tests will be used:

- Parametric analysis of variance using comparison of mean values.
- Parametric analysis of variance using comparison of median values.
- Tolerance interval procedure.
- Control chart approach.
- An alternative chosen by the operator and acceptable to the Division.

A determination will be made whether or not there is a statistically significant increase over background values for each parameter. Within 14 days of completing the statistical analysis for the analytical data, the operator will submit a report to the Division. The report will include field observations relating to condition of monitoring wells, field data, statistical analysis, sampling methodologies, chain-of-custody records, QC/QA data, information on groundwater flow direction, groundwater flow rate calculations, effective porosity of formation materials (at screened interval), constituents that exceed groundwater standards for each well and any other pertinent information related to the sampling event.

If it is determined that there is a statistically significant increase over the background levels or exceed state standards for any constituent listed in **Table 4**, the well(s) will be resampled within 30 days to verify the water quality data. If the data are verified, the following will be performed:

- Report to the Division and place a notice in the operating record, within 14 days of finding, indicating the constituents exceeding background levels; and either
- Demonstrate that either a source other than the landfill unit caused contamination or that an error in sampling, analysis or evaluation occurred; or
- Establish an assessment monitoring program meeting the requirements of Rule .1634 of 15A NCAC 13B within 90 days that includes sampling of all detection monitoring wells for Appendix II (EPA, Subtitle D Regulations) constituents.

4.3.9 Monitored Corrective Measures

This WQMP was prepared as a result of a chemical release that was delineated by activities completed for an NES. A corrective action plan was prepared based on the findings of an ACM. The monitoring program and network will be designed to monitor target constituents previously detected at the landfill as well as to monitor geochemical parameters to evaluate the natural attenuation process at the site.

5.0 UPGRADED SURFACE WATER MONITORING PLAN

Surface water flow at the landfill site is generally toward the northeast into Jerry's Creek with local flow towards adjacent drainage features. Jerry's Creek flows throughout the year and is therefore a discharge boundary for the site.

5.1 Monitor Station Locations

The current surface water monitoring station located northwest of the site is designated Upstream - SW-1. The downgradient surface water monitoring station (Downstream - SW-2) is located east of the northeast corner of the site. S&ME proposes additional surface water sampling locations:

- SW-3 (if the sediment basin drainage feature north of MW-6 is included in the CAP design) is proposed to be located in the sediment basin drainage feature north of MW-6, prior to its convergence with Jerry's Creek, which currently collects surface water from approximately 60 percent of the site;
- SW-4 is proposed to monitor effluent groundwater and surface water that will be discharged to Jerry’s Creek from a trench drain north and west of the landfill that is part of the proposed corrective measures; and
- SW-5 is proposed to monitor effluent groundwater and surface water that will be discharged from a trench drain that will discharge to a tributary to Jerry’s Creek north and east of the landfill that is also part of the proposed corrective measures.

5.2 Surface Water Sampling Procedures

The following sampling procedures are referenced from "EPA Standard Operating Procedures", Section 4.8 and "North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities", 1987.

The actual sampling point in the stream or creek will be in an area of minimal turbulence and aeration. The sampling point will not be located at a constriction (where creek narrows), immediately upstream or downstream of a confluence with a tributary, nor immediately upstream or downstream of any structure in the creek. To the extent possible, a single grab sample will be taken at mid-depth, at the center of the channel, in an area that exhibits the greatest degree of cross-sectional homogeneity.

Direct dipping of the sample container into the creek is the most desirable method of collection but a laboratory cleaned Teflon or PVC bailer, or dipper may be used. The sample container should be rinsed with the water to be sampled prior to filling the container unless preservatives have been added. The sample container, bailer, or dipper will be lowered to the desired depth in the creek and then removed. Care should be taken not to allow sediment or other debris to get in or on the sample container. If the stream flow is not deep enough to submerse the sample container in the water, a pool may be used to collect the sample.

After the sample has been collected, the sample container should be lifted from the water or sample poured directly into the sample container (if sample container not used to collect

sample). About one-half inch of air space should be left in the container and the uncontaminated cap placed on the container. The containers for volatile organic samples will be filled to the top without bubbles or headspace. The containers should be placed in protective cooler with ice for shipping.

5.3 Stormwater Sampling (Permit Requirements)

Surface water generated from precipitation falling on the active landfill area will be diverted to sediment basins. The locations for existing and proposed sediment basin structures and stormwater diversion ditches are shown on **Figure 2**. Surface water samples will be collected from the effluent from the trench drains or stormwater basins in general accordance with a Strom Water Pollution Prevention Plan (SWPP), a NPDES General Permit No. NCG120000, or Site Specific NPDES Permit, if applicable. The sediment basin surface water samples will be analyzed in accordance with the SWPP or the NPDES permit, as applicable.

5.4 Quality Control

A primary concern during collection of surface water samples is to insure that samples are not altered or contaminated by sediment or other debris that may affect the analytical results. A set of sample bottles that have been pre-cleaned in the laboratory and are pre-labeled will be removed from the cooler and the surface water sample poured into a fresh container. Preservatives will be added as necessary to the sample bottles at the laboratory or immediately prior to samples being placed in them. The sample bottles will then be securely placed into a pre-cleaned cooler and a chain-of-custody form completed and placed with the samples.

The surface water sampling frequency, field analysis procedures, laboratory analysis parameters, field reporting requirements, data assessment (excluding statistical analysis), evaluation and reporting of the data and results will be the same as that of the groundwater samples (Sections 4.3.3, 4.3.4, 4.3.5 and 4.3.6).

6.0 REPORT SUBMITTAL

A groundwater monitoring report will be prepared semiannually that summarizes the field activities performed, date of activities, personnel present, and site conditions encountered. The report will present the findings of the analytical testing, present maps with locations of constituent concentration detections as well as groundwater potentiometric maps that can be used to predict groundwater flow direction and hydraulic gradient. The report will describe data trends from statistical analysis annually. The report will include summary tables of the field and laboratory data and a cover letter that will be submitted to the NCDENR-DWM within 90 days of sampling. The DWM will be notified in the event that vendor lab analyses have not been completed within this time frame. All Groundwater Monitoring Data Sheets, Field Calibration Forms, Chain-of-Custody Record, Laboratory(s) QA data, and Data Validation Checklists will be kept on file and will be made available to NCDENR upon request.

7.0 QUALIFICATIONS OF REPORT

The contents of groundwater monitoring reports, including the summary, conclusions, and recommendations, will be based on the data available to S&ME at the time of the reports. Groundwater monitoring reports present an assessment of the existing conditions at the site at the time of our evaluation and available public information. The interpretations and conclusions provided in these reports will be based on widely spaced data within a complex hydrogeologic framework. Conditions may exist at the site which may not be recognized from the available data.

Groundwater monitoring reports will be prepared for the use of Edgecombe County for specific application to this project. The reports will be prepared in accordance with generally accepted engineering and hydrogeologic practices for projects of this type. The findings and recommendations contained in these reports will be based on applicable standards of our profession at the time these reports will be prepared.

The analysis and findings submitted in these reports will be based, in part, upon data obtained from subsurface exploration. The nature and extent of variations between boring and sampling locations may not be evident. Analysis and findings of these reports will be based on interpolation between data points and may not be representative of all subsurface conditions. Regardless of the thoroughness of an assessment, there is always the possibility that conditions between borings are different from those at specific boring locations due to the variability of subsurface conditions.

Groundwater monitoring reports will be prepared for the sole purpose of providing an engineering evaluation of the site that can be used by Edgecombe Country for detection monitoring, assessment monitoring, or corrective measures monitoring at the landfill facility. The party or parties involved in this specific evaluation, as authorized by the addressee, may rely upon the conclusions provided in these reports. By their use and reliance on these reports, all parties agree to be bound by the provisions of the contract between Edgecombe County and S&ME, Inc. The use of these reports by any third party or parties will be such party's sole risk, and S&ME disclaims liability for any such use or reliance by third parties. No other warranties are implied or expressed.

8.0 REFERENCES

Lawrence, D.P. and Hoffman, C.W., 1993, Geology of Basement Rocks Beneath the North Carolina Coastal Plan: North Carolina Geological Survey Bulletin 95, 60 pp, Plate 1.

Mundorf, M.J., 1946, Groundwater in the Halifax Area, North Carolina; North Carolina Department of Conservation and Development Bulletin No. 51, 76 pp.

North Carolina Administrative Code, Title 15, Subchapter 13B, North Carolina Environmental Management Commission, Raleigh, North Carolina, January 1997.

North Carolina Administrative Code, Title 15, Subchapter 2L, North Carolina Environmental Management Commission, Raleigh, North Carolina, April 1994.

North Carolina Water Quality Monitoring Guidance Document For Solid Waste Facilities, North Carolina Division of Solid Waste Management, 1987.

USEPA, May 1996, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual.

Bouwer and Rice, 1976; *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifer with Completely or Partially Penetrating Wells*.

Bouwer and Rice, 1989; *Bouwer and Rice Slug Test - An Update*.

Department of Natural Resources and Community Development, 1985, Geologic Map of North Carolina.

Fetter, C.W.; 1994; *Applied Hydrogeology*, 3rd Edition.

Fetter, C.W.; 1988; *Applied Hydrogeology*, 2nd Edition.

Freeze, R. Allan and Cherry, John A., 1979, *Groundwater*.

Heath, Ralph C., 1982, *Basic Ground-Water Hydrology, U.S. Geological Survey Water-Supply Paper 2220*.

Horton, J. Wright, Jr. and Zullo, Victor A, *The Geology of the Carolinas*; Carolina Geologic Society Fiftieth Anniversary Volume, The University of Tennessee Press, 1991.

North Carolina Division of Waste Management, Solid Waste Section, *New Guidelines for Electronic Submittal of Environmental Data*, memorandum dated October 27, 2006.

North Carolina Division of Waste Management, Solid Waste Section, *Addendum to October 27, 2006, North Carolina Solid Waste Section Guidelines for Electronic*

submittal of Environmental Data, memorandum dated February 23, 2007.

North Carolina Division of Waste Management, Solid Waste Section, *Environmental Monitoring Data for North Carolina Solid Waste Management Facilities*, memorandum dated October 16, 2007.

North Carolina Division of Waste Management, *North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities*, 1987.

Edgecombe County Landfill, Tarboro, North Carolina, *Geophysical Survey Services*, Geo Solutions Ltd., August 2007.

Edgecombe County Landfill, Tarboro, North Carolina, *Water Quality Monitoring Plan*, S&ME, Inc., May 1994.

Edgecombe County Landfill, Tarboro, North Carolina, *Subsurface Conditions Edgecombe County Landfill Site*, Patterson Exploration Services, 1979.

Edgecombe County Landfill, Tarboro, North Carolina, *January 2003 Semi-Annual Sampling Event and Baseline Statistical Analyses*, S&ME, Inc., January 2003.

Edgecombe County Landfill, Tarboro, North Carolina, *July 2006 Semi-Annual Sampling Event*, S&ME, Inc., December 2006.

Edgecombe County Landfill, Tarboro, North Carolina, *January 2007 Semi-Annual Sampling Event*, S&ME, Inc., May 2007.

Edgecombe County Landfill, Tarboro, North Carolina, *June 2007 Semi-Annual Sampling Event*, S&ME, Inc., December 2007.

Edgecombe County Landfill, Tarboro, North Carolina, *Work Plan for Groundwater Assessment*, S&ME, Inc., March 1999.

Edgecombe County Landfill, Tarboro, North Carolina, *Methane Monitoring and Corrective Action Report*, S&ME, Inc., March 2002.

Edgecombe County Landfill, Tarboro, North Carolina, *Response to Environmental Assessment Requirements*, S&ME, Inc., June 2001.

Environmental Protection Agency **http://www.epa.gov/**.

North Carolina Administrative Code, Title 15A. Department of Environment, Health, and Natural Resources (Chapters 13 to 26), June 1998.

RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD), United States Environmental Protection Agency, 1986.

Screening Information Data Set (SIDS) for High Production Volume Chemicals, **www.inchem.org**.

United State Department of Agriculture and Soil Conservation Service, *Soil Survey of Edgecombe County*, North Carolina, 1979.

U.S. Environmental Protection Agency, **www.epa.gov**.

Edgecombe County Landfill (Permit #33-01), Tarboro, North Carolina, *Water Quality Monitoring Plan* (WQMP), S&ME, Inc., September 1994.

Edgecombe County Landfill (Permit #33-01), Tarboro, North Carolina, *Nature and Extent Study* S&ME, Inc., June 2008.

Edgecombe County Landfill (Permit #33-01), Tarboro, North Carolina, *Alternate Source Demonstration*, S&ME, Inc., June 2008.

APPENDIX III

(GAS MONITORING PLAN)

GAS MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-07-242

Prepared for:

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TABLE OF CONTENTS

1. BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Project Information 1
2. METHANE MONITORING PROGRAM 1
2.1 General Requirements 1
2.2 Methane Monitoring Well Construction 2
2.3 Methane Monitoring Procedures and Frequency 2
2.4 Reporting Requirements 3

FIGURES

Figure 1 Vicinity Map
Figure 2 Site Map
Figure 3 Methane Monitoring Well Detail
Figure 4 Flowchart – Methane Monitoring Requirements

GAS MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT# 33-01)
TARBORO, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Gas Monitoring Plan is presented to provide the necessary requirements as specified in the Solid Waste Management Rules, Sections .0544(d) and .1626 (4). These rules present the criteria for explosive gas control as it relates to operational requirements for C&D and MSW landfill facilities. The purpose of the Gas Monitoring Plan is to provide details of the gas monitoring procedures and policies of the Edgecombe County Landfill in a single document for use at the facility. The methane gas monitoring program shall be implemented to detect possible migration of methane gas off-site from the existing landfill and future landfill development. Included in this program is the methane monitoring system, monitoring well location and construction, methane monitoring procedures, sampling frequency, and reporting requirements.

1.2 Project Information

Edgecombe County (County) currently operates a solid waste facility on a tract of land located off of State Road 1601 (Colonial Road), in Edgecombe County, south of Tarboro, North Carolina (Figure 1). At their solid waste facility, the County operates a municipal solid waste (MSW) transfer station and a construction & demolition (C&D) debris landfill unit over an existing closed MSW landfill unit, in accordance with North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM) Solid Waste Facility Permit No.33-01.

2. METHANE MONITORING PROGRAM

2.1 General Requirements

Owners and operators of all C&DLF units must ensure the following:

- The concentration of methane gas or other explosive gases generated by the facility does not exceed 25 percent of the lower explosive limit (LEL) in on-site facility structures (excluding gas control or recovery system components);
- The concentration of methane gas or other explosive gases does not exceed the LEL for methane or other explosive gases at the facility property boundary; and
- The facility does not release methane gas or other explosive gases in any concentration that can be detected in off-site structures.

The methane gas monitoring wells at the Edgecombe County Landfill are positioned to detect methane gas that may migrate into the structures located at the landfill or beyond the landfill property boundary. The wells are located between the waste boundary and the property boundary and between the waste boundary and facility structures that are

occupied or used regularly by County personnel. The landfill perimeter gas monitoring wells are spaced from 50 to 100 feet outside the waste boundary and at intervals of no more than 500 feet apart. The gas monitoring wells for the facility structures are placed adjacent to the structure between the structure and the waste.

Methane gas monitoring wells are not required north of the landfill between the waste disposal unit and Jerry's Creek. Any methane gas that flows toward Jerry's Creek is anticipated to dissipate to the atmosphere prior to reaching the property boundary. Methane monitoring gas wells are required along the eastern, western and southern property boundaries.

Eleven methane gas monitoring wells (GW-1R, GW-2R, GW-3, GW-4, GW-5, GW-6, GW-7, GW-8, GW-9, GW-10, and GW-11) and five building structures (Storage 1, Storage 2, Transfer Station, Scale House, Break Trailer 1 and Break Trailer 2) currently comprise the regular methane gas monitoring system for the landfill. Methane monitoring locations are illustrated on Figure 2.

2.2 Methane Gas Monitoring Well Construction

The methane gas monitoring wells were constructed by advancing an auger to a depth of the maximum refuse depth or to the depth of groundwater, which ever is less. A one-inch to two-inch diameter schedule 40 PVC perforated pipe was inserted into the boring hole and the annular space backfilled with pea gravel. The top of the borehole was sealed with a concrete bentonite mixture and the well protected with a steel lockable cover. The PVC pipe was installed with a non-venting PVC pipe cap. A typical detail of a methane gas monitoring well is presented on Figure 3.

2.3 Methane Monitoring Procedures and Frequency

Methane gas present in the gas monitoring wells shall be monitored by trained personnel using a LandTec portable gas analyzer equipped with an 18-inch insertion tube (or similar equivalent) using the following procedures:

1. Calibrate the explosimeter (if required) in accordance with the manufacturer's recommendations.

2. Unlock and remove the cap from the monitor well and allow pressure within the well to equilibrate. Measure the static groundwater level (when present) in the well.

3. Insert tube approximately 18 inches into the well casing, or to just above the static groundwater level if it is determined to be less than 18 inches from the top of the well casing.

4. Monitor percent methane (%CH_4) in each well until the reading on the meter stabilizes.

5. Recorded percent methane and the corresponding LEL. (LEL for methane is 5% CH_4).

Methane gas present in the facility structures will be measures by recording detected concentrations until readings stabilize, generally after approximately three to five minutes in each structure. As required by the Solid Waste Management Rules, the methane monitoring is to be conducted on a quarterly basis.

In addition, an annual visual inspection of the final cover will be conducted to detect gas break-outs (such as crack or hole in the cover soils) and areas where discolored ground or distressed vegetation indicate leakage of gas through the final cover. Any apparent gas outbreaks should be monitored with a combustible gas indicator to determine if gas is emanating from the crack or hole. The area around the gas outbreak should be "probed" by performing bar punches or hand auger boreholes at depths of 12 to 18 inches. Each borehole should be monitored with an explosimeter to record the concentration of methane gas. The data will help determine the extent of elevated landfill gas concentrations at or near the ground surface.

2.4 Reporting Requirements

The measurements collected from the methane gas monitoring wells shall be recorded for each monitoring well and within each facility structure for each sampling event and placed in the operating record. The state regulations require that explosive gases be controlled such that concentrations of gases will be less than 25 percent of the LEL in site structures and in the subgrade at the property boundary.

If methane gas levels exceeding the maximum LEL are detected, the County shall perform the following:

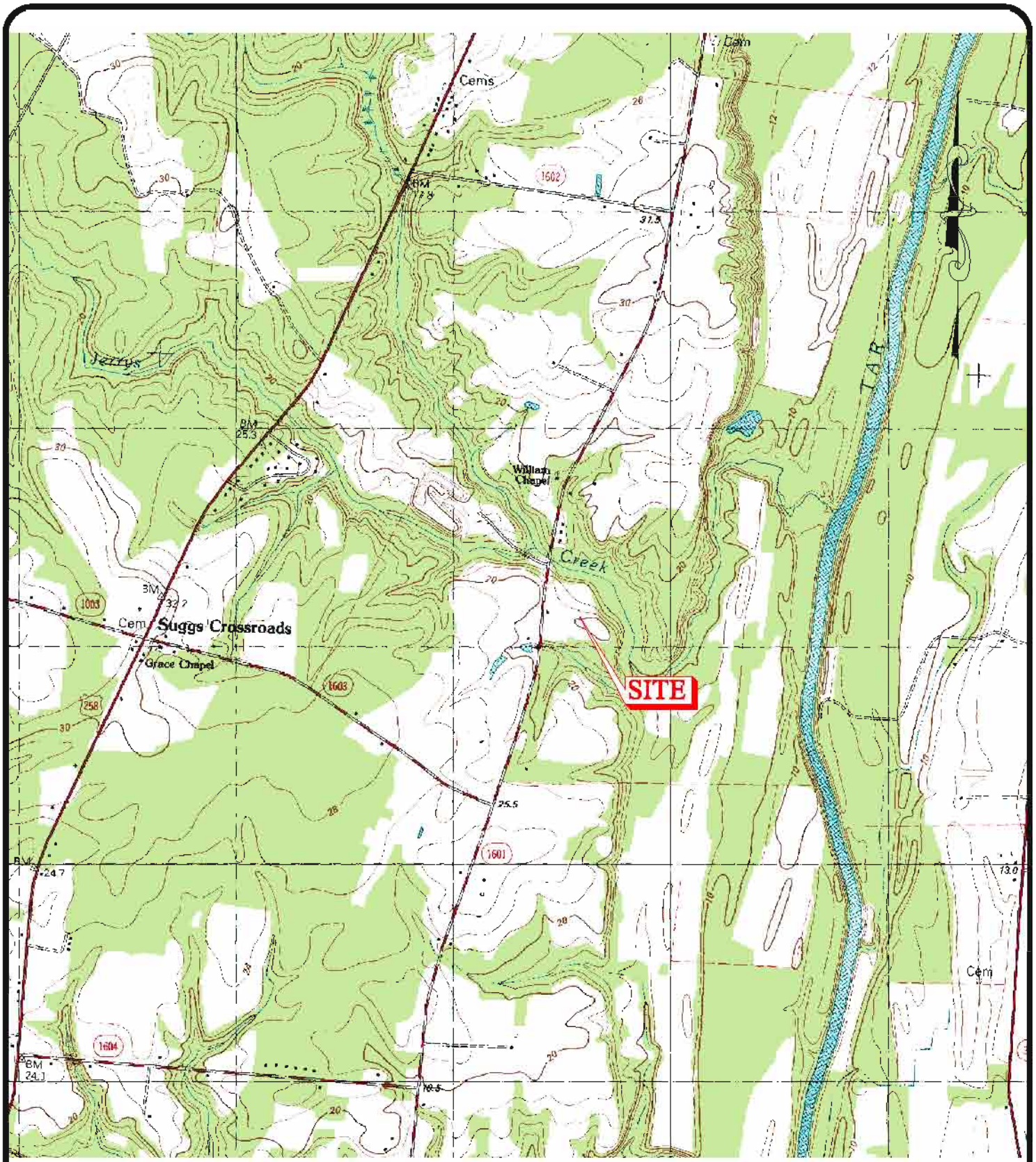
- Immediately take all steps necessary to ensure protection of human health and notify the Division;

- Within seven days of detection, place in the operating record the methane or explosive gas levels detected and a description of the steps taken to protect human health; and

- Within 60 days of detection, implement a remediation plan for the methane or explosive gas releases, place a copy of the plan in the operating record, and notify the Division that the plan has been implemented. The plan must describe the nature and extent of the problem and the proposed remedy.

Figure 4 presents a flow chart summarizing methane monitoring requirements, and the necessary steps the owner/operator must take if methane gas concentrations exceed the action levels in monitor wells or facility strutures. An extension to the schedules noted above may be granted by the Division if a need for an extension is demonstrated by the County.

FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

A-1112

SCALE: 1" = 2000'	S&ME WWW.SMEINC.COM	VICINITY MAP	FIGURE NO.
DATE: JUNE 2008		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	1
DRAWN BY:			
PROJECT NO: 1054-07-242			

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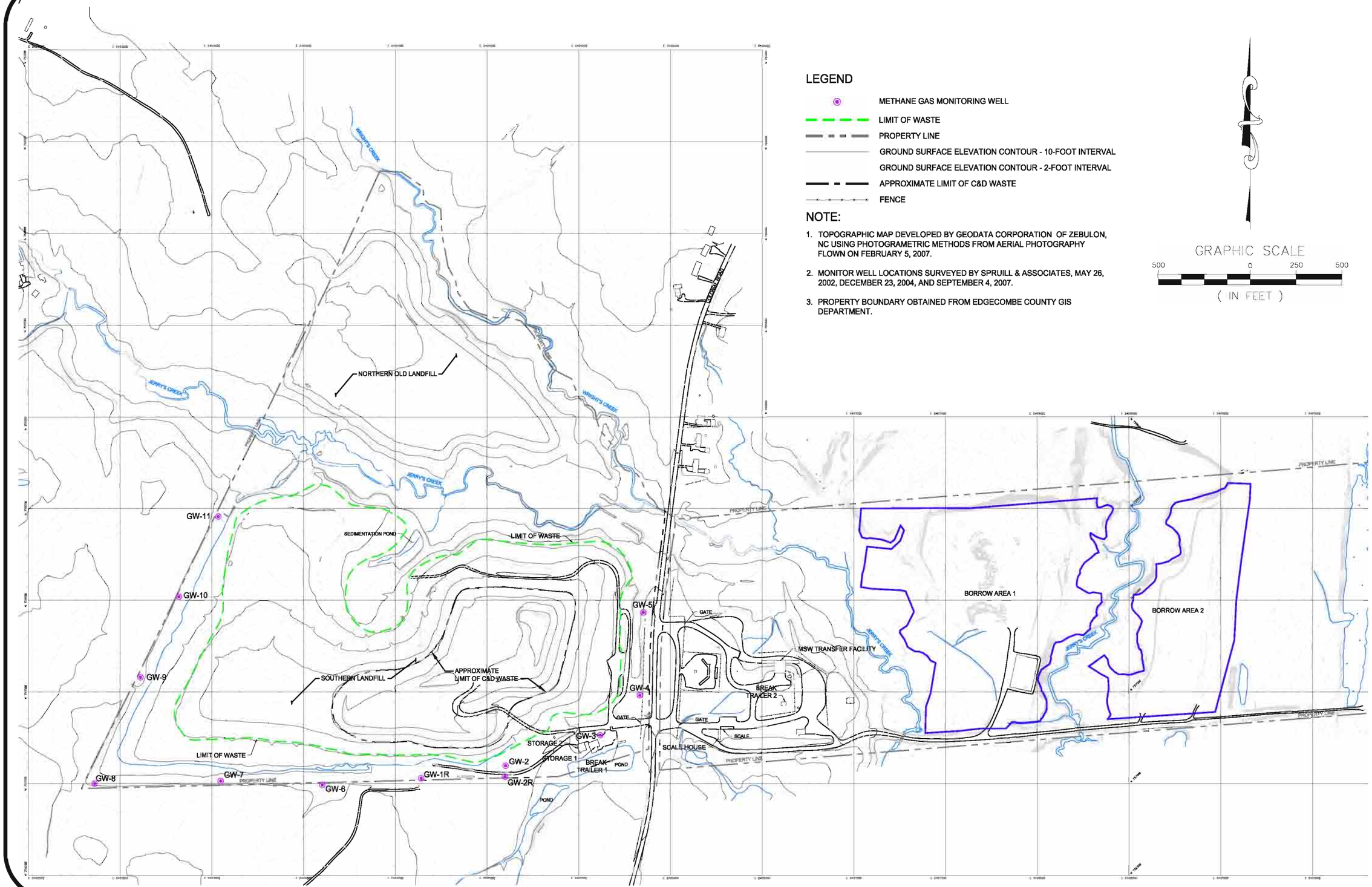


LEGEND

- METHANE GAS MONITORING WELL
- LIMIT OF WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- APPROXIMATE LIMIT OF C&D WASTE
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

500 0 250 500

(IN FEET)

SCALE: 1" = 500'	PROJECT NUMBER: 1054-07-242	DRAWING NUMBER: B-1089
DATE: JUNE 2008	DRAWN BY: BTR	CHECKED BY:

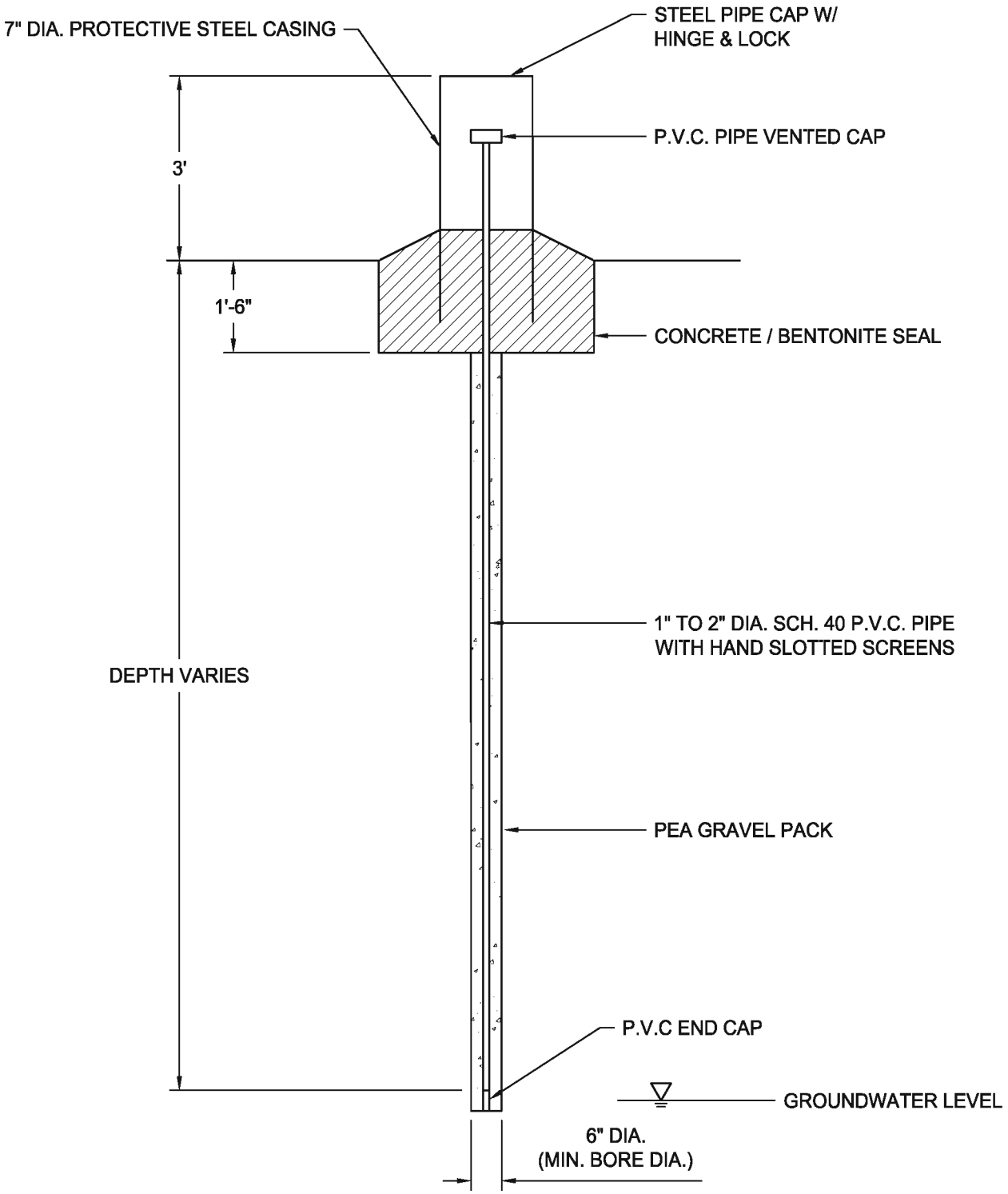
S&ME
WWW.SMEINC.COM

SITE MAP

GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.
2

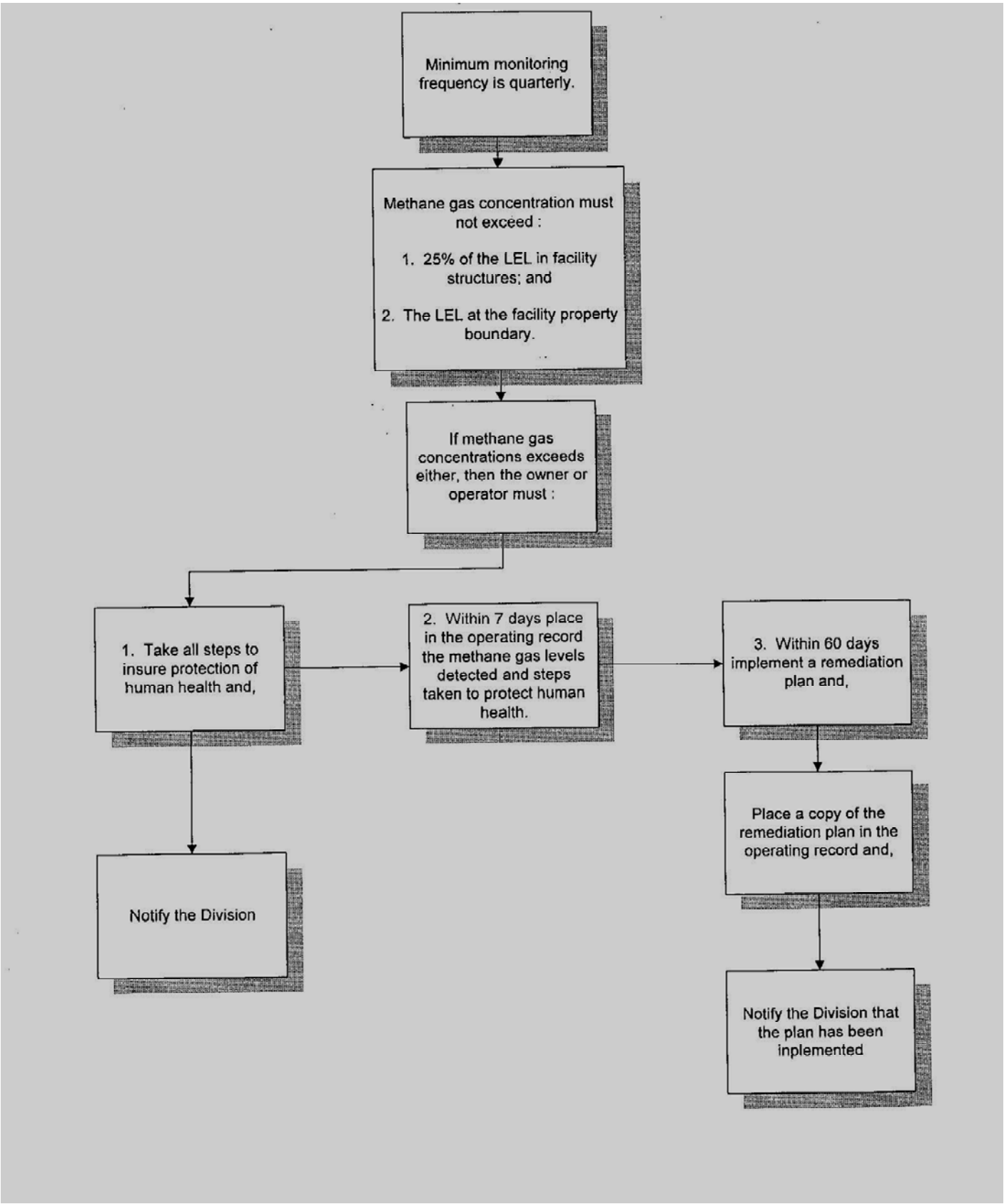
Q:\CadData\ACTIVE\2007\1054-07-242\Permit Drawings\B1089.dwg, B1089, 7/2/2008 10:51:34 AM, 1:1



A-1115

SCALE: N.T.S.	S&ME WWW.SMEINC.COM	METHANE MONITORING WELL DETAIL	FIGURE NO.
DATE: JULY 2008		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	3
DRAWN BY:			
PROJECT NO: 1054-07-242			

Q:\CadData\ACTIVE\2007\1054-07-242\Permit Drawings\A1115.dwg, A1115, 7/2/2008 10:35:38 AM, 1:1



SCALE: NTS	S&ME *Engineering/Testing* *Environmental Services*	**METHANE MONITORING REQUIREMENTS**
CHECKED BY: JAM		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TABRORO, NORTH CAROLINA S&ME PROJECT NO. 1054-07-242
DRAWN BY: SPW		Figure No. 4
DATE: 6/30/2008		

SECTION C

CORRECTIVE ACTION PERMIT MODIFICATION APPLICATION [RULES .1635, .1636, AND .1637]

SECTION C-1

North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application

Corrective Action Permit Modification Application

Section C-1: North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility near the north-northeastern property boundary Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for a selected remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

The enclosed Solid Waste Section Form (GWCA Permit Modification), Corrective Action Plan, amendment to financial assurance mechanism and other supporting documents constitute the Corrective Action Permit Modification Application.

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section

North CarolinaSolid Waste Groundwater Corrective Action Permit Modification Application

Pursuant to 15A NCAC 13B .1636, "Within 14 days of selecting a remedy, the permittee shall submit an application to modify the permit describing the selected remedy to the Division for evaluation and approval." The application shall include the demonstrations necessary to comply with the financial assurance requirements set forth in Paragraph (d) of Rule .1628.

Please attach the following: (1) a copy of the minutes from the public meeting discussing the Assessment of Corrective Measures, (2) a signed resolution/proclamation/document adopting the remedy, (3) a site map designating locations of groundwater monitoring wells and surface water monitoring locations that will be impacted by the remedy, (4) any draft conceptual schematics/figures/plans relating to the selected remedy, (5) a list of any required registrations, permits, and approvals, (6) a copy of most recent permit issued by the Solid Waste Section, and (7) an amendment to the Financial Assurance Mechanism, including a break-down of the cost estimates for closure, post-closure and corrective action.

Send the application and attachments to NCDENR-DWM, Solid Waste Section, Compliance Unit, 1646 Mail Service Center, Raleigh, NC 27699-1646. This application and any documents attached to this application are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Please type or print all information legibly.

I. Site Identification

Permit Number: 33-01

Solid Waste Rule Designation (.0500 or .1600): .1600

Facility Name: Edgecombe County Landfill

Facility Physical Address: SR 1601 (Colonial Road)

City: Tarboro

Zip: 27886

County: Edgecombe

Waste Type: Construction & Demolition Landfill

II. Owner and Operator Information

☒ Check box, if owner and operator are the same.

Owner

Name: County of Edgecombe

Address: P.O. Box 10, Tarboro, NC 27886

Phone Number: (252) 827-4253

Operator

Name: SAME

Address:

Phone Number:

III. Groundwater Corrective Action

Selected remedy (include addition lines if needed):

(1) In-Situ Isolation – Installation of a upgradient groundwater barrier wall

(2) In-Situ Isolation – Maintaining a consistent contour with pre-1998 waste area

(3) In-Situ Isolation – Increase slope of closed MSW area

(4) In-Situ Isolation – Stormwater improvements on the western half of the landfill

(5) Monitored Natural Attenuation (MNA)

Contingency Plan A: In-Situ Isolation - Stormwater improvements on the eastern half of the landfill

Contingency Plan B: Enhance landfill cap

Contingency Plan C: Landfill gas extraction

IV. Financial Assurance

Financial Assurance Mechanism: Local Government Financial Test

Total Cost Estimate for 30 Years (based upon ACM): $ 2,235,000.00

V. Project Schedule (upon Division approval)

Approximate Date of Remedy Construction Completion (if applicable): 06/30/2008

Approximate Date of Implementation of Remedy: 24-42 months from CAP Approval

Approximate Date of Baseline Sampling Completion (it applicable): 48-66 months from CAP Approval

Approximate Date of First Remedy Performance and Effectiveness Report Submittal: 48-66 months from CAP Approval

VI. Environmental Consultant

Consulting Company: S&ME, Inc.

Address: 3201 Spring Forest Road, Raleigh, NC 27616

Phone Number: (919) 872-2660

VII. Signatures

To the best of my knowledge, the information reported and statements made in this North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of fine and imprisonment.

If Owner and Operator are the same, please sign for Owner and type or write SAME for Operator.

Owner

Owner Name (Printed or Typed): Danny Bagley - Edgecombe County Solid Waste Director

Owner Signature: Danny Bagley Date: 6-30-08

Operator

Operator Name (Printed or Typed): SAME

Operator Signature: Date:

NC Professional Geologist or NC Professional Engineer

Name (Printed or Typed): Sam Watts - S&ME, Inc.

Signature: Samuel P Watts Date: 6/30/08

AffixNCProfessional Geologist/Engineer Seal:

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS

SECTION C-2

Public Meeting Minutes

Corrective Action Permit Modification Application

Section C-2: Public Meeting Minutes

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility near the north-northeastern property boundary, Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for a selected remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County is held a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. The schedule for this public meeting and review of corrective measures was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed in the agenda. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

On June 25, 2008, S&ME, Inc. submitted to the NCDENR-DWM Solid Waste Section (Section) a copy of the legal advertisement to County intended to post in their local newspaper on July 3, 2008. The intended advertisement and a copy of the transmittal of this advertisement to the Section are enclosed along with a copy of the published advertisement. The advertisement was published in *The Daily Southerner* and *The Rocky Mount Telegram* newspapers which serve Edgecombe County. An excerpt of the minutes from the public meeting held on August 4, 2008 to discuss the Assessment of Corrective

Measures is enclosed. Also enclosed is written material used at the meeting which includes a copy of Table 3, Detailed Evaluation of Retained Remedial Action Alternatives from the ACM, and Figure 1, Site Location Map which depicts the locations of the proposed corrective measures.

Classifieds

Edgecombe Public Meeting

The Daily Southerner
THURSDAY, JULY 3, 2008

Public Meeting
to Review Groundwater Findings and Corrective Measures for the Edgecombe County Landfill

In accordance with Title 15A NCAC 13 B.1635(d),the Solid Waste Department of Edgecombe County is holding a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County Landfill C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. After the public meeting, Edgecombe County will select a remedy(ies) in accordance with the requirements of 15A NCAC 13B. 1636 and submit the corrective measure(s) in a Corrective Action Plan for approval by the Solid Waste Section of the NC Department of Environment and Natural Resources.

The Public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

The Assessment of Corrective Measures, Nature and Extent Study and Alternative Source Demonstration are Available for public review at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2861 Colonial Rd.
Tarboro, NC 27886

Rocky Mount TELEGRAM

EDGE COUNTY MANAGER
P.O. BOX 10

TARBORO, NC 27886

CopyLine:	igtoReviewGroundwaterFindings
Lines:	64
Total Price:	$96.00

PUBLISHER'S AFFIDAVIT

AD ID: 7002307

NORTH CAROLINA
NASH COUNTY:

JUANITA COOPER-FORD affirms that she is clerk of the Rocky Mount Telegram, a newspaper published daily at Rocky Mount, Nash County, North Carolina, and tha : the advertisement, a true copy of which is hereto attached, entitled PublicMeetingtoReviewGroundwaterFinding: was published in said the Rocky Mount Telegram on the following dates:

Thursday, July 3, 2008 Page: D1

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

Juanita Cooper Ford

Affirmed and subscribed before me this 03 day of July 2008

Michelle W. Parker
(Notary Public Signature)

Michelle W. Parker
(Notary Public Printed Name)

My commission expires 11-15-12

MICHELLE W. PARKER
NOTARY PUBLIC
NASH COUNTY
NORTH CAROLINA

Public Meeting to Review Groundwater Findings and Corrective Measures for the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County is holding a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. After the public meeting, Edgecombe County will select a remedy(ies) in accordance with the requirements of 15A NCAC 13B. 1636 and submit the corrective measure(s) in a Corrective Action Plan for approval by the Solid Waste Section of the NC Department of Environment and Natural Resources.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

The Assessment of Corrective Measures, Nature and Extent Study, and Alternative Source Demonstration are available for public review at the following location during normal business hours:

Edgecombe County Landfill
Office/Weigh Station
2861 Colonial Rd.
Tarboro, NC 27886

EXCERPT FROM THE MINUTES OF THE REGULAR SCHEDULED MEETING OF THE BOARD OF COMMISSIONERS OF EDGECOMBE COUNTY HELD MONDAY, AUGUST 4, 2008 AT 2:00 P.M. IN THE COMMISSIONERS' ROOM, COUNTY ADMINISTRATIVE BUILDING TARBORO, NORTH CAROLINA

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(3) Mr. Harrell called a public hearing to order to inform the community of the planned re-permitting of the County's Construction and Demolition (C&D) landfill located on SR 1601, Colonial Road approximately 4.5 miles south of Tarboro.

Mr. DeLoatch read the public notice as published.

Mr. Carmon said that a permit application fact sheet was presented as part of the agenda package relative to the continued operations of the Edgecombe County Construction and Demolition (C&D) landfill and Municipal Solid Waste (MSW) transfer station. He said that a public hearing was required prior to submitting the permit application to the State. He said that the expected life of the landfill under its current conditions is 45 years. He stated that Mr. Sam Watts, Engineer for SM&E and Mr. Danny Bagley, Solid Waste Director was present to address any questions from the Board.

Mr. Harrell called for public comments. There being none the public hearing was adjourned.

Mr. Felton moved to adopt the resolution to approve the submittal of a landfill permit application for the issuance of a landfill permit by the North Carolina Division of Waste Management for continued operations of the Edgecombe County C&D Landfill

Rev. Hines seconded the motion which carried by unanimous vote.

(4) Mr. Harrell called a public hearing to order to review the findings and discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998.

Mr. DeLoatch read the public notice as published.

Mr. Carmon presented a copy of information regarding the corrective action plan with the landfill to the Board of Commissioners. He said that groundwater testing is required as part of the monitoring program performed at the landfill and whenever a material is found that exceeds the State limits a corrective action plan must be implemented. He said

the County had received a positive test result for cobalt at the landfill. He said several corrective measures had been proposed for consideration and once those proposals have gone to the state he will bring back a final correction action plan. He recommended approval of a resolution to adopt a groundwater contamination corrective measure for the closed portion of the landfill.

Mr. Harrell called for public comments. There being none, the public hearing was adjourned.

Mr. Anderson moved to approve a resolution to adopt a groundwater contamination corrective measure for the closed portion of the Edgecombe County landfill as presented.

Ms. Harris seconded the motion which carried by unanimous vote.

CERTIFICATION STATEMENT

This is to certify that the above is a true and official copy of an excerpt of the minutes of the August 4, 2008 board meeting of the Edgecombe County Board of Commissioners as recorded in the official minute book of the Edgecombe County Board of Commissioners.

This 12th day of August, 2008.

Carolyn Hedgepeth

Clerk to the Board of Edgecombe County Commissioners

Table 3
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
1 – Monitored Natural Attenuation (MNA) of GW	MNA provides a long term method of reducing impact to environment. MNA will not eliminate potential for human exposure, groundwater & surface water will be monitored.	MNA is allowable under current federal and state regulations.	**Short:** MNA will provide no short term reductions in GW impact. **Long:** MNA will provide method to monitor long term attenuation mechanisms, reduce impact to environment and reduce potential for future human exposure. Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. The GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering, permitting, groundwater flow modeling, and installing additional monitoring wells as required is approx. **$120,000** Annual Maintenance, GW sampling & reporting is approx. **$40,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$555,000** 30 yr total: Approx. **$1,355,000**	MNA is a common and often used remedial option. Must prove viability of MNA. Concurrence of MNA by downgradient property owners may be required.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2A – Groundwater Collection with Off-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures.	Groundwater recovery and disposal as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators.	**Short**: CoCs will be recovered from groundwater recovery system. There may be short term reductions in GW impact. **Long**: GW recovery reduces and possibly eliminates COCs, reduces impact to environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require hauling/discharge permit. System installation may take less than four (4) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, and recovery system is approx. $300,000 Annual Maintenance, GW sampling, 100gpm groundwater disposal & reporting is approx. **$1,500,000+/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$15,000,000** 30 yr total: Approx. **$45,000,000**	GW recovery and treatment and a permitted discharge at an off-site permitted facility are acceptable remedial options.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals
gpm – gallons per minute

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2B – Groundwater Collection with On-Site Water Treatment System and On-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures.	Groundwater recovery and treatment as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators.	**Short**: COCs will be recovered from groundwater recovery system. There may short term reductions in GW impact. **Long**: GW recovery reduces and possibly eliminates COCs, reduces impact to environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require a discharge permit and possible bench and/or pilot testing. System installation may take less than four (4) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery system, and treatment system is approx. **$750,000** Annual Maintenance, GW sampling & reporting is approx. **$200,000/yr** Site Closure is approx: **$77,000** 10 yr total: Approx. **$3,000,000** 30 yr total: Approx. **$7,000,000**	GW recovery and treatment and a permitted discharge into a water body are common and often used remedial options.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2C – Groundwater Collection with Constructed Wetland and On-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures. Will require limited access to constructed wetlands area.	Groundwater recovery and treatment as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators. Constructed wetlands is a newer technology, but is favorable as an improvement and wildlife habitat.	**Short:** COCs will be recovered from groundwater recovery system. There may short term reductions in GW impact. **Long:** GW recovery reduces and possibly eliminates COCs, reduces impact to . environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require discharge permit and possible bench and or pilot testing. System installation may take less than six (6) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery system, and constructed wetlands is approx. **$1,300,000** Annual Maintenance, GW sampling & reporting is approx. **$110,000/yr** Site Closure is approx: $85,000 10 yr total: Approx. **$2,500,000** 30 yr total: Approx. **$4,700,000**	GW recovery and treatment and a permitted discharge into a water body are common and often used remedial options. Constructed wetlands is a newer technology, but, is favorable as an improvement and wildlife habitat.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
3 – Gas Extraction: Convert existing vents to wells and install additional wells to extract landfill gas (LFG). **Option 1 – MNA will also have to be performed.**	The system will extract LFG from the landfill and reduce the pressure buildup of the LFG to prevent migration and potential groundwater contamination.	Extracting LFG to reduce LFG migration and contamination of GW is a demonstrated and often used technology, and is acceptable to regulators.	**Short:** There should be short term reductions in GW impact. **Long:** Extracting the LFG will reduce a source of GW contamination. Eventually the landfill will stop producing LFG at a rate where migration outside of the landfill will no longer be a concern.	Short term reductions of volume, toxicity & mobility is attainable with a gas extraction system Long term reductions in toxicity of GW impact are likely.	Will require air permit and possible bench and or pilot testing. System installation may take less than six (6) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery wells, and treatment system is approx. **$500,000** Annual Maintenance, GW sampling & reporting is approx. **$170,000/yr** Site Closure is approx: **$25,000** 10 yr total: Approx. **$2,225,000** 30 yr total: Approx. **$6,000,000**	A gas extraction systems is a common and often used remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4A – In-Situ Isolation: Install a 2,200' Long, 30' Deep Barrier Wall **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and barrier wall installation is approx. **$615,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$1,100,000** 30 yr total: Approx. **$2,000,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.
4B – In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Annual Contouring, Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$485,000** 30 yr total: Approx. **$1,385,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

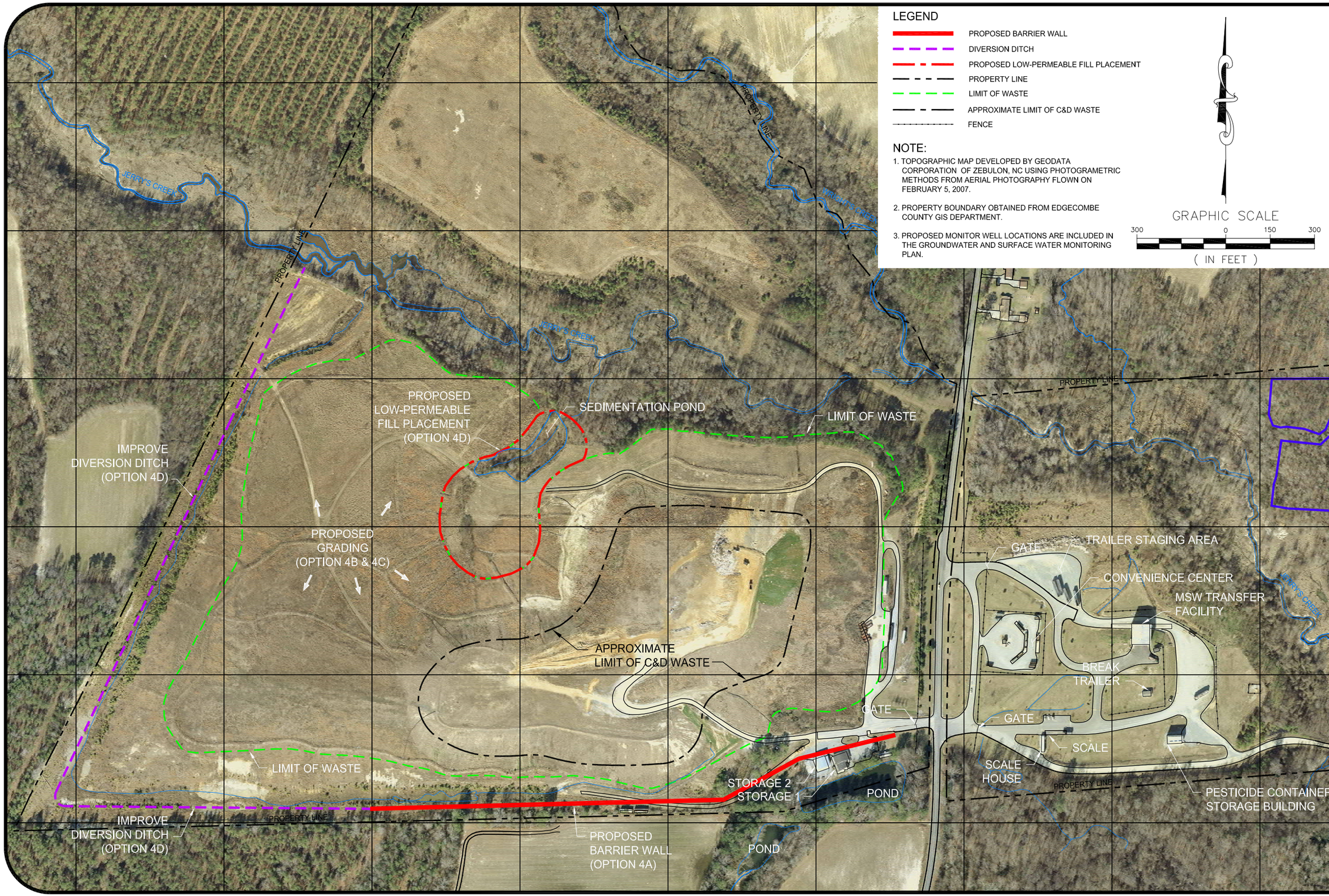
OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4C – In-Situ Isolation: Increase Slope of Closed MSW Area **Option 1 – MNA will also have to be performed**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$25,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$510,000** 30 yr total: Approx. **$1,410,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option.
4D – In-Situ Isolation: Stormwater Improvements on Western Half of Landfill. **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$30,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$515,000** 30 yr total: Approx. **$1,415,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4E – In-Situ Isolation: Stormwater Improvements on Eastern Half of Landfill. **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$30,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$515,000** 30 yr total: Approx. **$1,415,000**	GW redirection with stormwater improvements is common and an often used remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals



SCALE: 1" = 300'	PROJECT NUMBER: 1054-07-241	DRAWING NUMBER: B-1092
DATE: JULY 2008	DRAWN BY: BTR	CHECKED BY:

S&ME
WWW.SMEINC.COM

SITE LOCATION MAP

CORRECTIVE ACTION PLAN - EDGECOMBE CO. LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.
1

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SECTION C-3

Resolution Adopting the Remedy

Corrective Action Permit Modification Application

Section C-3: Resolution Adopting the Remedy

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

The Assessment of Corrective Measures (ACM) Report has been submitted to the Solid Waste Section for approval. The selection process of the ACM has been fully completed, following the meetings for public questions and input. There were no changes to the CAP required based on public comments.

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County held a public meeting to review the findings and to discuss potential corrective measures described in the ACM Report. The schedule for this public meeting and review of corrective measures was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed on the agenda for the following County Commissioners meeting held on August 4, 2008. The public meeting was held, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Following the public meeting to discuss the corrective measures remedy at the August 4, 2008 Edgecombe County Commissioners meeting, the commissioners **approved** the selected remedy in the form of a resolution. In accordance with 15A NCAC 13B .1636, within 14 days of selecting the remedy, Edgecombe County is submitting notification to the Division. Enclosed is a copy of the resolution adopting the remedy.

RESOLUTION OF THE EDGECOMBE COUNTY BOARD OF COMMISSIONERS TO ADOPT A GROUNDWATER CONTAMINATION CORRECTIVE MEASURE FOR THE CLOSED PORTION OF THE EDGECOMBE COUNTY LANDFILL

WHEREAS, Edgecombe County, herein referred to as COUNTY, owns and operates a facility for disposal of solid waste known as the Edgecombe County Landfill, herein referred to as LANDFILL; and

WHEREAS, a portion of the LANDFILL which received municipal solid waste (MSW) has been closed in accordance with North Carolina Solid Waste Section Rules in effect at the time of closure; and a portion of the landfill which receives construction & demolition (C&D) waste operates over top of the closed MSW unit under Permit No. 33-01 issued by the North Carolina Division of Waste Management (DWM) for operation in compliance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Solid Waste Management, Section .0547(4); and

WHEREAS, the COUNTY is required to monitor groundwater at the LANDFILL in accordance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Section .1633; and

WHEREAS, certain chemical constituents detected in groundwater at the LANDFILL exceeded the North Carolina groundwater protection standards, thereby triggering an Assessment of Corrective Measures in accordance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Section .1634; and

WHEREAS, the COUNTY, through its engineering consultant, S&ME, Inc., herein referred to as S&ME, has submitted a report to the Solid Waste Section to characterize the nature and extent groundwater impact from a release of chemical constituents from the LANDFILL in accordance with North Carolina Solid Waste Rule .1634 (*Nature and Extent Study*, dated June 25, 2008); and

WHEREAS, the COUNTY, through its engineering consultant, S&ME, has submitted a report to the North Carolina Solid Waste Section describing an analysis of the effectiveness of potential corrective measures for the LANDFILL in accordance with North Carolina Solid Waste Rule .1634 (*Assessment of Corrective Measures*, dated June 26, 2008); and

WHEREAS, the North Carolina Solid Waste Section has approved the referenced reports; and

WHEREAS, the COUNTY conducted a public information meeting on August 4, 2008, to review the results of the nature and extent study and the corrective measures assessment and receive public comment prior to the selection of a remedy; and

WHEREAS, COUNTY staff has recommended Monitored Natural Attenuation in conjunction with In-Situ Isolation as the preferred corrective measure alternative due to its effectiveness and relative low cost when compared with other alternatives; and

NOW, THEREFORE, BE IT RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY adopts Monitored Natural Attenuation and In-Situ Isolation as the preferred groundwater contamination corrective measure alternative. Because In-Situ Isolation consists of several different corrective measures, IT IS FURTHER RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY, in coordination with its engineering consultant, shall endeavor to implement only the In-Situ Isolation corrective measures necessary to provide remediation of groundwater in the most cost effective manner.

Motion was made by Commissioner CALVIN ANDERSON *and duly seconded by Commissioner* VIOLA HARRIS *to approve the resolution pending review by the County Attorney. Vote: Motion unanimously approved, this 4th day of August, 2008.*

Attest:

Carolyn S Hedgepeth

Carolyn S Hedgepeth, Clerk to the Board

SECTION C-4

Site Map Illustrating Groundwater and Surface Water Monitoring Locations

Corrective Action Permit Modification Application

Section C-4: Site Map Illustrating Groundwater and Surface Water Monitoring Locations

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

A site map designating locations of groundwater monitoring wells and surface water monitoring locations that will be impacted by the remedy, can be found in **Section B** Operation and Waste Acceptance Plan, **Appendix II** Water Quality Monitoring Plan.

SECTION C-5

Corrective Action Plan

EDGECOMBE COUNTY LANDFILL
CORRECTIVE ACTION PLAN
(PERMIT #33-01)
TARBORO, NORTH CAROLINA
S&ME Project No. 1054-07-241

Prepared For:

Edgecombe County
P. O. Box 10
Tarboro, North Carolina 27886

Prepared By:

S&ME, Inc.
3201 Spring Forrest Road
Raleigh, North Carolina 27616

June 30, 2008

CORRECTIVE ACTION PLAN
Edgecombe County Landfill
(Permit #33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-241

I hereby certify this 30th of June, 2008, that this report was prepared by me or under my direct supervision.

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

6/30/08

Thomas P. Raymond, P.E.
Environmental Department Manager
NC Licensed Engineer No. 18760

Michelle L. Logut
Environmental Scientist

SR: SPW

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY i
1. INTRODUCTION.....1
1.1 Site Background..... 1
1.2 Purpose..... 1
1.3 Previous Studies..... 2
1.3.1 Water Quality Monitoring Plans.....2
1.3.2 Semi-Annual Groundwater and Surface Water Sampling.....3
1.3.3 Alternate Source Demonstration.....4
1.3.4 Nature and Extent Study.....5
1.3.5 Assessment of Corrective Measures.....5
1.4 Regional Geology 7
1.5 Site Geology..... 7
1.6 Hydrologic Setting..... 8
1.6.1 Surface Water.....8
1.6.2 Groundwater Hydrogeology 8
1.7 Site Conceptual Model..... 9
2. CONTAMINANT CHARACTERIZATION 11
2.1 Constituents of Concern..... ..11
2.2 Background Concentrations..... ..11
2.3 Source Area Determination..... ..12
2.4 Exposure Pathways 12
2.5 Receptor Survey..... ..14
3. SELECTED REMEDY/TECHNICAL APPROACH 15
3.1 Introduction..... ..15
3.2 Technical Approach..... ..15
3.2.1 Upgradient Groundwater Barrier Wall 15
3.2.2 Maintaining a Consistent Contour with Pre-1998 Waste Area.....16
3.2.3 Increase Slope of the Closed MSW Area 17
3.2.4 Stormwater Improvements on the Western Half of the Landfill 17
3.2.5 Monitored Natural Attenuation for Groundwater.....19
4. WATER QUALITY MONITORING PLAN 21
5. EVALUATION OF CORRECTIVE ACTION EFFECTIVENESS.....22
5.1 Evaluation of Natural Attenuation..... ..22
5.2 Evaluation of In-Situ Isolation..... ..23
6. CONTINGENCY PLAN 24
6.1 Option 1 – Stormwater Improvements on the Eastern Half of the Landfill..... ..24
6.2 Option 2 – Enhance Landfill CAP 24
6.3 Option 3 – Landfill Gas Extraction..... ..25
7. SCHEDULE AND MAINTENANCE 26
8. FINANCIAL ASSURANCE 28
9. COMPLETION OF CORRECTIVE ACTIONS.....29
10. REFERENCES.....30

FIGURES

Figure 1 –Vicinity Map
Figure 2 – Site Map
Figure 3 – Proposed Corrective Measures

EXECUTIVE SUMMARY

Edgecombe County (County) currently operates a construction and demolition (C&D) debris landfill on top of a closed municipal solid waste (MSW) landfill in general accordance with North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Facility Permit No. 33-01. The landfill is located off of State Road 1601 (Colonial Road), south of Tarboro, North Carolina. The C&D landfill is used for the disposal of waste generated within Edgecombe County and from surrounding counties.

The NCAC 2L Groundwater Quality Standards (2L Standard) for several target constituents in groundwater have been exceeded at the facility near the north-northeastern property boundary. The nearest receptor north-northwest of the facility is Jerry's Creek.

S&ME previously performed a Nature and Extent Study (NES) and an Assessment of Corrective Measures (ACM) to characterize the nature and extent of the release and identify several potential solutions or corrective measures which could be implemented to address the migration of groundwater contaminants beyond the compliance boundary.

NCDENR, Division of Waste Management (DWM), Solid Waste Section (SWS) Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for the selection of a remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

The ACM Report has been submitted to the Solid Waste Section for approval, however, the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this CAP, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect any changes based on public comments.

In-situ isolation and monitored natural attenuation (MNA) have been selected as the remedies at the Edgecombe County Landfill, which will involve the following:

- Installation of an upgradient groundwater barrier wall;
- Maintaining a consistent contour with pre-1998 waste area;
- Increase slope of the closed MSW area;
- Stormwater improvements on the western half of the landfill; and,
- Implementation of a MNA program to address impacted groundwater.

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

1. INTRODUCTION

1.1 Site Background

The Edgecombe County Landfill is owned and operated by Edgecombe County (County). The landfill is located off of State Road 1601 (Colonial Road), south of Tarboro, North Carolina. The landfill location and site vicinity are shown on **Figure 1**. The active C&D landfill is accessed off of Colonial Road and is regulated under the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Facility Permit No. 33-01. The C&D landfill is used for the disposal of waste generated within Edgecombe County and from surrounding counties. The C&D landfill is located over a closed MSW landfill cell which is also regulated under Facility Permit 33-01.

The C&D landfill and closed MSW landfill are bounded by Jerry's Creek to the north and by woodlands to the west and south-southwest. The topography of the landfill facility generally slopes downward from south to north, toward Jerry's Creek. Agricultural fields are located immediately adjacent to the facility to the south and Colonial Road is immediately adjacent to the east. Across Colonial Road farther to the east is an Edgecombe County MSW convenience center, MSW transfer station, and borrow areas for landfill cover soils. Three residential single-family homes are located to the northeast.

A closed pre-Subtitle D Landfill (northern old landfill), which stopped receiving waste in 1979, is located just north of the active landfill, across Jerry's Creek. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory and is located between Jerry's Creek and Wright's Creek off of Colonial Road. Wright's Creek is present along the northern property boundary of the old landfill and converges with Jerry's Creek to the east of the old landfill.

Figure 2 is a site map illustrating site features. For the purposes of this report, the "landfill" or "waste disposal unit" refers to the Edgecombe County Landfill facility regulated under Facility Permit 33-01, located south of Jerry's Creek at 1601 Colonial Road, comprised of the active C&D landfill unit and the underlying closed MSW unit.

1.2 Purpose

The County performs landfill gas monitoring on a quarterly basis and performs semi-annual groundwater and surface water monitoring from a monitor well network consisting of seven monitor well locations surrounding the boundary of the waste disposal unit, two surface water sample locations, and eleven gas monitoring wells. The network of monitor wells was designed for compliance monitoring in the event that concentrations of contaminants originating from the landfilled waste materials were released to the environment. Groundwater and surface water compliance monitoring is performed to comply with the requirements of North Carolina Solid Waste Management Rules (Solid Waste Rules), 15A NCAC 13B § .600, §.1632 and §.1634 of the Solid Waste Rules.

Volatile organic compounds (VOCs) and inorganic constituents have been detected above North Carolina groundwater protection standards in groundwater samples collected from groundwater compliance monitoring points used to monitor the Edgecombe County Landfill. In addition, statistical evaluation of groundwater monitoring data indicates a release of VOCs and inorganic constituents from the landfill.

In accordance with NCDENR Division of Waste Management (DWM), Solid Waste Section (SWS) Solid Waste Rules defined under 15A NCAC 13B, S&ME has completed the following activities on behalf of Edgecombe County in response to the detections of these constituents:

- Statistical analyses of semi-annual water quality results of compliance well monitoring system in accordance with the facility's *Water Quality Monitoring Plan* (WQMP);
- Alternate Source Demonstration (ASD) study in accordance with Solid Waste Rules defined under 15A NCAC 13B.1633(c)(3) and .1634(g)(2);
- Nature and Extent Study (NES) prepared in accordance with Solid Waste Rules defined under 15A NCAC 13B.1634(g)(1); and,
- Assessment of Corrective Measures (ACM) in accordance with Solid Waste Rules defined under 15A NCAC 13B.1635.

These previous assessments identified five organic compounds (vinyl chloride, benzene, cis-1, 2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene) and one inorganic analyte (cobalt) as constituents of concern (COCs) at the Edgecombe County Landfill. This Corrective Action Plan (CAP) has been prepared in accordance with 15A NCAC 13B.1636, for the selection of a remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

1.3 Previous Studies

1.3.1 Water Quality Monitoring Plans

Groundwater has been monitored at the landfill facility since 1994 in accordance with the facility's *Water Quality Monitoring Plan* (WQMP), dated September 1994. Statistical analyses of the groundwater monitoring data indicated a statistical release from the waste disposal unit.

On March 31, 1999, on behalf of Edgecombe County, S&ME submitted a *Work Plan for Groundwater Assessment – Edgecombe County Landfill* (Work Plan) to the Solid Waste Section (Section). The Section approved the Work Plan, with comments, on May 10, 1999. The Section comments were addressed in a revision to the Work Plan. Using the revised Work Plan, the County began to assess potential impacts to groundwater quality from the waste disposal unit.

As the County began these activities to implement the groundwater assessment Work Plan, several significant events occurred affecting conditions at the facility. These events

included: closure of the MSW landfill (1997-1999); Hurricane Floyd (1999); a revision to the WQMP groundwater sampling and analysis plan (1998), and revisions to the surface water locations and monitor wells included in the water quality monitoring network (1998-2002). These events so altered the water quality observed at the facility that a re-evaluation of the site-wide water quality was performed.

The results of a baseline statistical re-evaluation were reported to the Section in S&ME's report titled *January 2003 Semi-Annual Sampling/Baseline Statistical Analysis*, dated August 19, 2003. These findings indicated a release of Appendix I constituents in the area of monitor well MW-5. However, no statistical evidence of a release of any Appendix II constituents was found.

1.3.2 Semi-Annual Groundwater and Surface Water Sampling

Eleven monitor wells (MW-1A, MW-3B, MW-4, MW-5, MW-5S, MW-5D, MW-6, MW-7A, MW-8A, MW-9, and MW-10) and three piezometers (P-1, P-2A, and P-3A) currently comprise the groundwater quality monitoring network for the facility. Of these eleven monitor wells and three piezometers, seven of the monitor wells are sampled on a semi-annual basis for water quality indicators and laboratory analyses. The remaining seven monitor wells/piezometers are only used to measure groundwater elevations to enhance the potentiometric mapping.

Water Quality Monitoring Network
Groundwater Sampling Locations

Background Monitor Wells	Compliance Monitor Wells
MW-3B	**MW-1A**
MW-4	**MW-5**
MW-9	**MW-6**
	MW-7A

Two surface water sampling locations (upstream and downstream) located on Jerry's Creek currently comprise the surface water monitoring system for the landfill facility.

The facility's water quality monitoring network has been sampled on a semi-annual basis since 1994. These wells and surface water locations were selected in order to monitor constituent concentrations migrating hydraulically downgradient towards Jerry's Creek. Groundwater and surface water samples collected from the water quality monitoring network have historically been analyzed for Appendix I constituents including VOCs and metals and Appendix II constituents including VOCs, semi-volatile organic compounds (SVOCs), metals, sulfide, and cyanide. In addition, groundwater and surface water samples have also been historically analyzed for several other constituents including polychlorinated biphenyls (PCBs), pesticides, and herbicides.

Several organic as well as inorganic constituents have been historically detected in some water samples above the 15A North Carolina Administrative Code (NCAC), Subchapter

2L Groundwater Standards (2L Standards), the NCDENR DWM Groundwater Protection Standard (GWPST), and NCAC, Subchapter 2B Surface Water Standards (2B Standards). The organic constituents detected above standards include the following VOCs: vinyl chloride, benzene, 1,1-dichloroethane, 1,2-dichloroethane, cis-1,2-dichloroethene, trichloroethene, 1,2-dichloropropane, tetrachloroethene, 1,4-dichlorobenzene, and methylene chloride. The SVOC 4-methylphenol has also historically detected above its respective 2L Standard/2B Standard in the samples collected from sampling locations at the waste disposal unit. The inorganic constituents detected above standards include the following metals: cadmium, beryllium, cobalt, chromium, lead, silver, nickel, vanadium, and thallium.

A statistical evaluation of the laboratory analytical data from the historical groundwater monitoring data set was last performed as part of the July 2006 Monitoring Report for the Edgecombe County Landfill prepared by S&ME. The historical data pool has been updated and included in the subsequent sampling events, however, no statistical analysis was performed due to the changes in sample analytical methods. According to the July 2006 Monitoring Report, four analytes (vinyl chloride, 1,1-dichloroethane, cis-1,2-dichlorethene, and trichloroethene) were shown to have statistical evidence of a release at the facility and were detected at both monitor wells MW-1A and MW-5. Two additional analytes (benzene and cobalt) were detected at monitor well MW-5 and were shown to have statistical evidence of a release at the facility at that location. Only one analyte (cis-1,2-dichloroethene) was detected at monitor well MW-7A and was shown to have a statistical evidence of a release at the facility. These statistically significant constituents along with additional historically detected constituents are further discussed in **Section 2.1**.

1.3.3 Alternate Source Demonstration

On behalf of Edgecombe County, S&ME previously performed an Alternate Source Demonstration (ASD) in response to the detection of inorganic constituents at concentrations exceeding their respective 2L Standards/GWPST in several monitoring wells. (*Alternate Source Demonstration*, dated June 10, 2008)

During the January 2008 groundwater monitoring event, lead was detected in the groundwater sample from monitor well MW-7A at a reported concentration exceeding its respective 2L Standard. Additionally, three metals for which there is no corresponding 2L Standard (cobalt, thallium, and, vanadium) were detected above their GWPST during the four most recent groundwater monitoring events (July 2006, January 2007, June 2007, and January 2008). In order to examine whether naturally occurring metals concentrations within the in-situ native soils on-site could be influencing groundwater quality, an ASD for metals was undertaken.

The concentrations of several naturally occurring metals within the in-situ soil at the facility were found to be sufficient to influence the concentrations of these metals in groundwater samples from the downgradient compliance monitoring wells. Other metals were found to not represent a statistically significant increase (SSI) above background

values. Therefore, the concentrations of some constituents could be attributed to naturally occurring background values of these metals within the hydrogeologic regime.

The results of the ASD analyses did not support influence to groundwater quality from the natural occurrence of the metal cobalt because, while cobalt was detected in the in-situ soils at the facility, the levels of cobalt detected in the groundwater samples from monitoring well MW-5 could not be attributed solely to its natural occurrence in the overlying soils. Therefore, cobalt remains an inorganic constituent of concern at the facility.

1.3.4 Nature and Extent Study

Due to the detection of VOCs and inorganic constituents in excess of the 2L Standards/GWPST in groundwater samples from the landfill facility compliance wells and the determination that those findings indicated significant increases of some of the constituents, S&ME has performed a Nature and Extent Study (NES) in compliance with the Solid Waste Rules. (*Nature and Extent Study*, dated June 25, 2008)

As a part of the NES, S&ME reviewed the recent and historical groundwater and surface water analytical data at the landfill facility to identify the constituents of concern (COCs) and trends in their concentration and distribution. The extent of the contaminant plume in the area of groundwater compliance monitor wells was characterized and delineated. In addition, S&ME evaluated the limits of waste placed at the former MSW landfill site. The contaminant distribution in the groundwater within the waste disposal unit was also evaluated for the potential of contaminant migration to and beyond the waste boundary. S&ME personnel also identified possible receptors within 1,500 feet of the landfill facility.

The NES identified five organic compounds and one inorganic analyte as the COCs at the Edgecombe County Landfill. These constituents include the VOCs: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene, as well as the metal cobalt.

The results of this NES indicated that the area impacted by these constituents of concern is limited to areas within the Edgecombe County Landfill facility boundary. The COC concentrations do not appear to have adversely impacted surface water quality. The concentrations of the organic and inorganic COCs detected within the plume are relatively low. In addition, there are no identified drinking water wells located downgradient of the landfill facility. Therefore, the NES determined that the level of risk to human health from the identified release is expected to be low.

1.3.5 Assessment of Corrective Measures

On behalf of Edgecombe County, S&ME previously prepared an Assessment of Corrective Measures (ACM) to identify the options for potential corrective measures, to consider the advantages and disadvantages, including costs, for these methods and to

recommend, with public input, measures that are appropriate to address the constituents and conditions at the Edgecombe County Landfill. (*Assessment of Corrective Measures*, dated June 26, 2008)

The ACM evaluated the performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination; the time required to begin and complete the remedy; the costs of remedy implementation; and the institutional requirements such as State and Local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s), in accordance with 15A NCAC 13.B1635.

The following techniques were considered as possible effective corrective measures:

- Institutional Controls – Monitored Natural Attenuation (MNA), Access Restrictions, and Deed Restrictions
- Groundwater Collection –Pumping Wells/Hydraulic Barrier and Interceptor Trenches
- Gas Extraction – Volatilization
- On-Site Treatment – Physical: Air Stripping, Carbon Adsorption, Filtration, Ion Exchange, Reverse Osmosis

  Chemical: Neutralization, Physical/Chemical Separation

  Biological: Constructed Wetlands
- In Situ Isolation – Surface Cap / Grade and Barrier / Containment Wall
- Off-Site Disposal – POTW Discharge
- On-Site Disposal – Discharge to Surface Water

Of these potential measures, the facility will choose the most feasible method which will achieve the combined goals of protection of human health and the environment with a reasonable allocation of County resources. The ACM report was submitted to the Solid Waste Section (SWS) of NCDENR, Division of Waste Management (DWM), however the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this Corrective Action Plan, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the waste disposal unit. MNA will be incorporated into the facility's water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to

this CAP will be submitted, if necessary, to reflect any changes based on public comments.

1.4 Regional Geology

Edgecombe County lies within the Coastal Plain Physiographic Province of North Carolina. In general, geologic units in the Coastal Plain Region consist of deep, unconsolidated clastic deposits overlying crystalline basement rocks. The Coastal Plain sedimentary formations in this region include, from youngest to oldest (top to bottom):

- The Surficial Deposits (Quaternary)
- The Yorktown Formation (Tertiary)
- The Upper Cape Fear Formation (Cretaceous)

In the site vicinity, the Quaternary surficial sediments are comprised of the Penholoway, Wicomico, and Sunderland Formations. These formations are generally less than 50 feet in total thickness, with an average of 20 to 30 feet and consist of yellow silty sand and sandy clays. The Yorktown Formation lies beneath these surficial sediments. The Yorktown consists of 30 to 60 feet of blue gray fossiliferous silty clay with sandy clay, shell beds and fine sands. The Yorktown is extensive throughout the county forming an almost continuous layer. Beneath the Yorktown are Cretaceous-aged Cape Fear Formation sediments of reddish brown to brown clay, sand and sandy clay with some gravel resting on the irregular bedrock surface. These sediments range in thickness from 30 in the west to 400 feet or more in thickness in the eastern area of the county.

The Cretaceous sediments are underlain by crystalline igneous and metamorphic rocks, with an irregular surface that dips gently to the east. The depth to the bedrock is approximately 300 feet below National Geodetic Vertical Datum (NGVD) (approximately 240 to 400 feet below land surface).

1.5 Site Geology

S&ME personnel have previously performed several test pits, soil borings, and the installation of temporary piezometers throughout the site to identify the soil conditions at the landfill facility. Sand and silty sand were identified from the ground surface to typical depths of 4 to 6 feet below ground surface (ft bgs). The soil underlying the sand and silty sand surface layer generally consisted of the following: sandy silty clay; sandy clayey silt; silty sandy gravel; and sandy clayey silt. The subsurface exploration identified a marine clay (Yorktown Formation) underlying the near surface soils at the landfill site at depths ranging from 3 to 20 ft bgs. The full thickness of the Yorktown clay has not been determined. However, two deep borings (MW-5D and CPT-1) have been performed at the site which indicate the Yorktown formation is at least 25 feet thick. On the north side of the landfill at MW-5D the clayey soils associated with the Yorktown formation were encountered from approximately 10 ft bgs to the termination of the boring at 40 ft bgs (40 ft AMSL to 10 ft AMSL). On the south southeast corner of the landfill at CPT-1, the clayey soils associated with the Yorktown formation were

encountered from approximately 10 ft bgs to the termination of the boring at approximately 35 ft bgs (55 ft AMSL to 30 ft AMSL).

The MSW landfill is constructed largely within and above the surficial Quaternary deposits, with embankment and cover soils derived largely from these sandy and silty sand soils. The Yorktown clays form a hydraulic base for the landfill.

1.6 Hydrologic Setting

1.6.1 Surface Water

The local surface water features in the immediate vicinity of the landfill include: Jerry's Creek; Wright's Creek; the drainage features in the waste disposal unit including a former sediment basin; and the farm pond located in the southeast corner of the site. The undisturbed natural topography in the areas surrounding the waste management units at the facility is characterized as gradual to moderate slopes toward these local surface water features. The surface of the landfill facility generally mimics these natural slope gradients and also discharges to these surface water features. Jerry's Creek is the primary receptor of surface water runoff from the landfill. Some areas of the landfill drain surface water directly to Jerry's Creek, while much of the central portion of the waste disposal unit drains to a topographic "horseshoe" feature in the northern boundary of the landfill. A sedimentation pond which is a remnant of former MSW operations collects the surface drainage in this area. Infiltration and percolation into the upper soil horizon is expected to be moderate due to the sandy loam content within this stratum. The uppermost aquifer underlying the landfill is expected to discharge to the local surface water features. During periods of rainfall with high surface water runoff, Jerry's Creek, Wright's Creek, the sediment pond, the southwest perimeter trench, and the farm pond may recharge the aquifer. Surface water features are shown on **Figure 2**.

1.6.2 Groundwater Hydrogeology

The Coastal Plain Physiographic Region of North Carolina is located between the uplands of the Piedmont and the Atlantic Ocean. Investigations of the Coastal Plain Region have identified as many as 10 aquifers separated by 9 confining units. However, these aquifers can basically be divided into three major deep aquifer systems in North Carolina: the Quaternary Aquifer System, the Tertiary Aquifer System, and the Cretaceous Aquifer System. Each of these three major aquifer systems are separated from each other by units of lower permeability composed of clays and silts. The Quaternary Aquifer is composed of surficial deposits of sandy silt and clay. The Tertiary Aquifer is composed of glauconitic sands, clayey sands, and limestone. The Cretaceous Aquifer is composed of sand, silty and clayey sand, and clay separated by confining units of clay and silt.

The uppermost aquifer at the site is unconfined and is found in the silty sands of the Quaternary-age Sunderland formation. This aquifer is recharged by inflow from upgradient areas and by infiltration of precipitation. The Tertiary-age Yorktown clay layer appears to act as a confining layer below the landfill. In some areas, this water may

be "perched" over the Yorktown clays beneath the Quaternary sands, rather than forming a true unconfined aquifer.

Groundwater within and below the landfill appears to result partially from lateral flow recharge through the sandy surficial soils from upland areas to the south flowing downgradient through the waste disposal unit toward Jerry's Creek. Surface water from the waste disposal unit surface also infiltrates through the sandy cap and cover soils and buried wastes to further recharge groundwater within and beneath the landfill. Just north of the waste disposal unit, groundwater levels are very near the ground surface and the water surface in the old sediment pond, which is likely further recharging groundwater in this area.

1.7 Site Conceptual Model

The Edgecombe County landfill is unlined and was constructed in the sandy soils of the geologically recent Quaternary deposits which overlie the Yorktown Formation in this area. The Quaternary deposits typically extend for a few feet below the base of the landfill, where they rest on a medium gray marine clay of the Yorktown. This Yorktown clay appears to form an aquitard beneath the sandy Quaternary deposits.

The topography of the area around the landfill slopes naturally from the south toward Jerry's Creek to the north. The unconfined aquifer is contained within the Quaternary sands and may be "perched" in some locations on the Yorktown clay. The groundwater in this unconfined aquifer generally follows the topography and flows from south to north over the basal Yorktown clay toward Jerry's Creek. In the area of Jerry's Creek, the groundwater is thought to converge with groundwater flowing south toward Jerry's Creek from the old landfill to the north. Thus, the Jerry's Creek topographic depression is thought to form a hydraulic barrier to groundwater flow from the active landfill. The mingled groundwaters from the active landfill and the northern old landfill apparently flow along the trace of the creek topographic depression, in a more easterly direction.

The detected groundwater contamination consists of mostly VOCs, one SVOC, and several metals, appearing at the compliance wells to the north, just downgradient of the limits of the landfill. The contaminants are limited to the shallow unconfined aquifer and no contaminants have been detected in the deeper aquifer beneath the Yorktown clay layer. The VOC concentrations at compliance wells MW-1A, MW-6, and MW-7 have a decreasing trend in recent years. The VOC levels at MW-5 have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring.

The mechanism for the release of contaminants from the MSW landfill appears to be largely due to surface water from precipitation infiltrating through the waste disposal unit cap, percolating through the buried MSW, and impinging as leachate on the groundwater flowing beneath the waste disposal unit. The geochemical indicator parameters support the interpretation that the generation of leachate in the MSW landfill is the primary contaminant mechanism. Analysis of collected landfill gas samples for non-methane

organic compounds indicate that some portion of the contamination reaching the underlying groundwater may also be attributed to landfill gas. Once the leachate reaches the groundwater, the contaminants are then carried by groundwater flow beyond the limits of the waste disposal unit toward Jerry's Creek.

Contributing factors to the release of contaminants from the waste disposal unit include:

- The western half of the MSW landfill cap is very flat with some soil berms that create ponding on the waste disposal unit surface.

- The closed MSW unit was capped with sandy soils because more clayey soils were not available. To achieve an effective permeability of approximately 1×10^{-5} cm/sec, an extra vegetative layer was added.

- On the eastern half of the landfill an active C&D unit overlies the closed MSW unit. Although the C&D materials may add additional components to the leachate percolating through the waste disposal unit, the combination of additional daily cover soils and the increased surface slope enhances the drainage of precipitation surface water from this portion of the waste disposal unit, reducing the total volume of water available for the generation of leachate.

- Until recently, the waste disposal unit cap supported very little vegetation. Vegetation protects the integrity of the cap and reduces the volume of surface water percolating through the cap by evapotranspiration.

- Due to the shallow water table aquifer and the elevation of the land surface to the south of the waste disposal unit, infiltrated surface water and/or shallow groundwater appears to enter the south side of the waste disposal unit into the wastes. This is providing another source of water for the generation of leachate.

- The waste disposal unit was constructed in what was previously a swampy area, indicating that the unconfined groundwater was at or very close to the ground surface. Ditches and drainage channels may have actually extended into the water table aquifer during wet seasons. A combination of possible filling of such ditches and channels and a rise in groundwater levels due to settlement of the waste disposal unit base from the weight of the waste may mean that some buried waste may be in direct contact with the groundwater.

- The old sedimentation pond located on the north side of the landfill in the "horseshoe" provides a collection point for shallow leachate seeps along the north face during wet seasons. The increased surface water directed to the center of the "horseshoe" from three sides also provides an infiltration source recharging and likely mounding the groundwater at the toe of the waste disposal unit.

2. CONTAMINANT CHARACTERIZATION

2.1 Constituents of Concern

Historical groundwater monitoring results have been compiled since the facility initiated groundwater monitoring in September of 1994. Several organic and inorganic constituents have been both historically detected exceeding 2L Standards/GWPST and *consistently* detected at compliance monitor well locations at the landfill facility. *Consistently* detected constituents are defined as those constituents that have been detected exceeding their respective groundwater quality standard during at least two separate semi-annual sampling events and also have been detected at least one time within the last three semi-annual sampling events at the landfill facility. S&ME reviewed historical monitoring results and previous statistical data for Edgecombe County Landfill to identify which organic and inorganic constituents are constituents of concern. Five organic compounds and one inorganic constituent have been identified as the COCs at the Edgecombe County Landfill. These organic compounds include the VOCs: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene. The inorganic constituent is the metal cobalt.

2.2 Background Concentrations

Three upgradient (background) monitor wells (MW-3B, MW-4, and MW-9) are currently sampled for water quality indicators and laboratory analyses as part of the semi-annual groundwater monitoring at the landfill facility. Review of historical groundwater monitoring data indicate that no VOCs or SVOCs have been detected exceeding 2L Standards/GWPST in the groundwater samples collected from upgradient monitor wells MW-3B, MW-4, and MW-9. Therefore, vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene remain organic COCs at the landfill facility.

Several inorganic constituents have been historically detected exceeding their respective groundwater quality standards in the groundwater samples collected from the upgradient wells. Four of these historically detected inorganics (cobalt, lead, thallium, and vanadium) have also been *consistently* detected at background and compliance monitor well locations. As discussed in **Section 1.3.3**, S&ME performed an ASD for metals in response to these inorganic constituent exceedances. The ASD found that concentrations of the naturally occurring lead and vanadium within the in-situ soil at the facility were sufficient to influence the concentrations of these metals in groundwater samples from the monitoring wells. Thallium was found to not represent a statistically significant increase above background values. Therefore, the concentrations of these constituents could be attributed to naturally occurring background values of these metals within the hydrogeologic regime. However, the results of the ASD analyses did not support influence to groundwater quality from the natural occurrence of the metal cobalt. Cobalt remains an inorganic COC at the facility.

2.3 Source Area Determination

The Nature and Extent Study indicates that the source area(s) for the contaminant plume are located within the landfilled MSW. The contaminant plume appears to be migrating outside of the waste boundary, north-northeast toward Jerry's Creek, but remaining on the landfill property. Historical surface water and temporary piezometer data indicate that the topographically low area located along Jerry's Creek is acting as a hydraulic barrier. The downgradient extent of the contaminant plume has been delineated along the northern property boundary and the contaminant plume is contained within the facility boundaries. In addition, the contaminant plume located within the waste disposal unit is confined to the surficial, uppermost aquifer.

Concentrations of the COCs at compliance monitor wells MW-1A, MW-6, and MW-7, located along the northern property boundary, have a decreasing trend or no trend, due to lack of detections, in recent years. The VOC levels at MW-5, located along the north-northeast property boundary, have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring. Elevated concentrations of the chlorinated compound tetrachloroethene and its daughter products have been historically detected at monitor well MW-5. Chlorinated COC trends in concentration over time are further discussed in **Section 5.1**. It appears that the source area(s) for the chlorinated COCs are located within the landfilled MSW hydraulically upgradient of monitor well MW-5.

The concentration of benzene in groundwater samples from monitor well MW-5 has strong evidence of a decreasing trend in recent years. Based on our interpretation of these conditions, benzene concentrations will likely not cause future compliance issues in the area of monitor well MW-5. Elevated concentrations of 1,4-dichlorobenzene have also been historically detected in the groundwater samples collected from compliance monitor well MW-5. However, no trend is evident for 1,4-dichlorobenzene concentrations in monitor well MW-5. It appears that the presence of benzene and 1,4-dichlorobenzene at the landfill is likely due to the direct transport from an upgradient source within the waste disposal unit.

In addition, the concentration of cobalt in groundwater samples from monitor well MW-5 has strong evidence of an increasing trend. The historical increasing trend of cobalt concentrations in groundwater suggests a potential source of cobalt hydraulically upgradient of this area.

2.4 Exposure Pathways

The landfilled waste disposed at the site is the most likely source of groundwater contamination observed in the area surrounding the waste disposal unit. Historical data indicate that geochemical leachate indicator parameters detected in groundwater samples collected from temporary piezometers and monitor wells were more elevated in the downgradient groundwater samples, along the northern property boundary, than in the upgradient groundwater samples. These data suggest that leachate from the MSW is contributing to the contamination observed in the downgradient piezometers and wells. It

appears that the infiltration of precipitation through the disposed waste mass is "leaching" contaminants from the waste, through the bottom of the unlined waste disposal unit, and to the groundwater below the waste management unit. Subsequent lateral migration of groundwater further transports and distributes the contamination to a surrounding larger area. In addition, shallow groundwater flowing into the waste disposal unit and through the landfilled waste is further aiding in the transport of contamination outside of the waste boundary. Therefore, soil leachate from landfilled MSW to groundwater is the most likely source of groundwater contamination at the landfill.

In general, potential exposure pathways from soil leachate to groundwater include the use of potable wells or surface water within the area of the facility. The NES has delineated the downgradient extent of the groundwater contaminant plume along the northern property boundary of the waste disposal unit and found that the contaminant plume is contained within the facility boundaries. In addition, historical surface water data indicate that no VOCs or SVOCs have been detected exceeding 2B Standards in the surface water samples collected at the landfill since semi-annual sampling was initiated in 1994. Several inorganic constituents have been historically detected exceeding 2B Standards in the surface water samples collected at the landfill including beryllium, cadmium, chromium, cobalt, lead, and zinc. However, no inorganic constituents have been detected exceeding 2B Standards in the surface water samples collected since January 2003. Therefore, it appears that the groundwater contaminant plume has not impacted surface water quality at the landfill.

The potential for direct exposure to MSW and the contaminants of concern by direct contact is low. The MSWs are covered by daily cover soils and the landfill cap. A large portion of the MSW landfill is further covered by the C&D landfill wastes. Therefore, exposure from contaminated soil at the landfill is limited.

Landfill gas is another potential exposure pathway for the VOCs at the facility. Eleven gas wells located along the perimeter of the waste disposal unit and five building structures currently comprise the regular methane gas monitoring system for the landfill. The locations of methane gas wells for the landfill facility are shown on **Figure 2**. The regular network methane gas monitor wells and building structures at the landfill are monitored on a quarterly basis. At various times (June 2001 - November 2002) the methane concentrations have exceeded the North Carolina Solid Waste Standards as promulgated in 15A North Carolina Administrative Code 13B (13B Standard). Edgecombe County has performed corrective measures to reduce the concentrations of methane at the facility's compliance points. These corrective actions were described in the following reports previously submitted to the Section: *Response to Environmental Assessment Requirements* dated June 2001 and *Methane Monitoring and Corrective Action Report* dated March 2002. Methane gas concentrations have not exceeded the 13B Standards in any of the monitored gas wells or building structures at the landfill since November 2002. Exposure from landfill gas at the facility is limited to methane vents located on the top of the waste disposal unit and the potential for significant direct exposure to these gases is considered low.

It appears that the potential for exposure to landfill contaminants, either through migrating leachate from the buried waste to the groundwater, contaminated soil, or landfill gas, is limited to the site.

2.5 Receptor Survey

As part of the Nature and Extent Study, S&ME completed visual observations for evidence of drinking water wells within a 1,500-foot radius of the waste disposal unit. The results of the survey show that there are nine (9) identified potable wells within a 1,500-foot radius of the waste disposal unit, including one potable well located on-site at the County-owned property comprising part of the facility. The potable well located on-site at the facility has been removed from service. The water for the facility is supplied from the County-wide municipal water distribution system. Eight properties were identified within 1,500 feet of the waste disposal unit where the potential presence of a potable well is unknown. Two (2) of the nine potable wells identified are known to be used for drinking water purposes. The use for two (2) of the nine potable wells identified is unknown. The majority of the properties containing potable wells are located at least 1,200 feet away from the waste disposal unit and at a topographically higher elevation than the landfill. However, three (3) potable wells, located at 2549, 2577, and 2595 Colonial Road, were identified approximately 600 to 900 feet northeast of the waste disposal unit and at a similar topographic elevation as the landfill facility. Property owners at all three addresses indicated that they are currently connected to the municipal water supply and use their potable wells for non-drinking water purposes, i.e. washing vehicles. Based on groundwater levels collected at the site vicinity, and the resulting potentiometric contours calculated, it appears that all of the potable wells identified within 1,500 feet of the landfill are hydraulically upgradient. Therefore, the level of risk to human health is expected to be low.

Jerry's Creek is the primary receptor of surface water runoff from the landfill. Wright's Creek is present along the northern property boundary of the northern old landfill. Wright's Creek converges with Jerry's Creek to the east of the old landfill and continues east to the Tar River.

3. SELECTED REMEDY/TECHNICAL APPROACH

3.1 Introduction

The selection process of the ACM has not yet been fully completed, pending meetings for public comment and input. Due to schedule requirements for submission of this Corrective Action Plan, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the COCs at the waste disposal unit. MNA will be incorporated into the facility's water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect possible changes based on public comments.

In-situ isolation and MNA as the selected remedies at the Edgecombe County Landfill will involve the following:

- Installation of an upgradient groundwater barrier wall (Option 4A from ACM);
- Maintaining a consistent contour with pre-1998 waste area (Option 4B from ACM)
- Increase slope of the closed MSW area (Option 4C from ACM);
- Stormwater improvements on the western half of the landfill (Option 4D from ACM); and,
- Implementation of a MNA program to address impacted groundwater (Option 1 from ACM).

See **Figure 3** for a plan view of the conceptual remedies.

3.2 Technical Approach

3.2.1 Upgradient Groundwater Barrier Wall

Because of the shallow depth to groundwater in the upgradient region of the waste disposal unit, as well as the available space between the waste boundary and the facility boundary, an upgradient physical barrier that diverts groundwater around the landfill will restore groundwater quality at the facility. Diverting the flow of groundwater around the waste disposal unit would minimize interaction of the groundwater with the waste mass, thereby reducing leachate production. Installation of a barrier wall consisting of interlocking sheet piles will be designed. See **Figure 3** for a plan view of the barrier wall location.

An approximately 1,900 feet long, barrier wall will be installed to approximately 15 – 30 feet below ground surface along the southern boundary of the landfill. The barrier wall

will be anchored into the low permeability confining unit of the Tertiary-age marine clay layer (Yorktown Formation).

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; underground utility location and management; clearing, grading and erosion control.
- Installation of Barrier Wall: submittal of sheet pile materials make-up formulation for pre-approval by the Engineer; methods to determine the varying depth of the barrier wall in the field during construction to ensure that the barrier wall extends into the confining layer; installation of sheet pile wall methods; handling and relocation of excavated soil; quality control methods and testing.
- Site Restoration Requirements.

3.2.2 Maintaining a Consistent Contour with Pre-1998 Waste Area

Maintaining consistent contour elevations across the waste disposal unit where C&D waste is not currently being placed (western portion of waste disposal unit) will reduce groundwater contamination by reducing vertical percolation of pounded rain water into the waste mass which can produce leaching. Maintaining a consistent contour entails some initial grading operations to remove or regrade existing stormwater slope diversion berms on the landfill cap and maintenance to those areas where ditches, slumps, and sinkholes have formed from waste decomposition. Maintenance would involve filling or grading over only those anomalous surface deficiencies that facilitate the influx of water into the waste mass.

Maintaining a consistent contour would involve a continuous process of inspection and backfilling on a quarterly basis for existing or potential surface water collection locations followed by timely addition of backfill soil and reseeding.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; clearing, grading and erosion control.
- Site Grading and Backfilling Operation: grading and soil application plans to maximize transfer of stormwater off the waste disposal unit; specifications for acceptable types of fill (backfill materials will likely be supplied from Edgecombe County's on-site borrow sources); reseeding and establishment of vegetation; quality control methods and testing.
- Site Restoration Requirements.

3.2.3 Increase Slope of the Closed MSW Area

Increasing the slope of the cap will decrease the infiltration of stormwater into the MSW waste and reduce the potential for groundwater contamination. The eastern portion of the waste disposal unit is where the current C&D waste disposal is being conducted. The C&D waste has been placed over the existing MSW landfill cap and has increased the slope in this area. The waste placement also provides an additional barrier to stormwater infiltrating into the MSW landfill.

The slopes in the western portion of the MSW landfill are relatively flat with a majority of the area at a slope of approximately 5 to 6 percent. Increasing the slope in this area would involve moving the current C&D waste placement operations from the eastern portion of the waste disposal unit to the western portion. The C&D waste placement would increase the slope in this area and also provides an additional barrier to stormwater infiltrating into the MSW landfill.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; clearing, grading and erosion control.
- Site Grading and Filling Operation: soil and C&D waste application plans to maximize transfer of stormwater off the waste disposal unit; specifications for acceptable types of fill (backfill materials will likely be supplied from Edgecombe County's on-site borrow sources); an approximation of the application schedule versus project backfill and C&D waste applications; establishment of target fill grades and methods to measure the grades; quality control methods and testing.
- Site Restoration Requirements.

3.2.4 Stormwater Improvements on the Western Half of the Landfill

There are currently stormwater diversion trenches which run parallel to the direction of groundwater flow on both sides (eastern and western) of the waste disposal unit. A stormwater diversion trench located along the southern boundary of the waste disposal unit runs perpendicular to the direction of groundwater flow.

The diversion trenches located along the western and southwestern boundaries of the waste disposal unit (totaling approximately 3,100 feet in length) will be expanded and improved to serve as groundwater diversion ditches to transport groundwater and surface water diverted from the top of the waste disposal unit and from around the sides of the upgradient physical barrier wall. Water diverted in the upgradient region of the waste disposal unit, before interaction with the landfilled wastes, would likely not require pre-treatment before discharging to the downgradient receiving creek. See **Figure 3** for a plan view of the ditch locations.

The old sedimentation pond just north of the landfill is to be lined with low permeability fill material and improved to capture stormwater run-off from the waste disposal unit before discharging off-site. Reference the Edgecombe County Landfill *Closure and Post-Closure Plan*, dated June 30, 2008, for details on the stormwater management system. The remainder of this "horseshoe-shaped" area will be backfilled with low permeability fill material. **See Figure 3** for the location of this area. The old sedimentation pond in the horseshoe provides a collection point for shallow leachate seeps along the north face during wet seasons. The surface water directed from the landfill cap and side slopes to the sedimentation pond also provides an infiltration source recharging and likely mounding the groundwater at the toe of the waste disposal unit. The sedimentation pond will be improved in order to isolate stormwater run-off collecting in the pond from shallow groundwater and leachate migrating from the waste disposal unit.

The old sedimentation pond is less than one acre in size and may have been up to eight feet deep in some locations before the pond filled with sediment and plant growth. The total volume of the old sedimentation pond before it filled may have been approximately 8,000 cubic yards or more.

The rest of the horseshoe area, minus the area of the old sedimentation pond, is approximately 2 ½ acres in size. This area will be capped with low permeable fill and graded to direct surface water flow over this area rather than percolating into the groundwater.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; underground utility location and management; clearing, grading and erosion control.
- Stormwater Diversion Ditches: specifications of dimensions (width and depth) along the center line of the ditches; surveying to confirm grade points; excavation and placement of engineered fill requirements; quality control methods and testing.
- Grade and Line Old Sedimentation Pond: submittal of design and low permeable fill materials for pre-approval by the Engineer; plant removal and disposal; mucking out of sediment; handling and relocation of excavated sediment; placement and grading of low permeable fill material (backfill materials may be supplied from Edgecombe County's on-site borrow sources); and quality control methods and testing.
- Cap and Grade Horseshoe Area: backfill and compaction requirements; surveying to confirm grade points; and quality control methods and testing.
- Site Restoration Requirements.

3.2.5 Monitored Natural Attenuation for Groundwater

The COCs in groundwater at the landfill include the organic parameters: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene, and the inorganic constituent: cobalt. Following construction of the corrective measures presented above, surface water and groundwater coming in contact with waste materials in the waste disposal unit will be minimized. Waste material leachate coming into contact with groundwater will then be minimized. The COCs in groundwater are then expected to naturally attenuate and trend toward cleanup goals. MNA will be implemented as the corrective measure for impacted groundwater.

Based on the years of groundwater monitoring, analytical data coupled with the various studies throughout the groundwater monitoring history of the facility, including the previously discussed NES, the primary substrate at the facility should contain a sufficient quantity of anthropogenic organic carbon to support biodegradation of the chlorinated solvent COCs. In addition, there is likely native organic carbon in trace amounts which will further enhance biodegradation rates of these constituents.

The contaminant of concern, cobalt, was detected in groundwater samples at levels of only up to 0.131 milligrams per liter (mg/L) within the last two years of groundwater monitoring (July 2006, January 2007, June 2007, and January 2008). The GWPST for cobalt is 0.07 mg/L. Cobalt in groundwater at the facility would be expected to attenuate by dispersion and absorption.

For the Edgecombe County Landfill, it has not yet been determined if the contaminant plume is still in a growth phase, stable phase, or if the plume has already reached its peak and is now a shrinking plume. At a time of one to three years following implementation of the isolation and water management correction measures presented above, the groundwater plume status at the facility would be determined during the MNA process.

This process would involve sampling the appropriate property boundary groundwater monitoring wells for the constituents found exceeding their respective 2L Standards/GWPST. After an appropriate amount of samples have been taken, assumptions may be drawn concerning the constituent magnitude concentration trend (increasing, decreasing, or static) in order to re-evaluate the dispersion and natural attenuation process effectiveness. The objectives for a MNA groundwater remediation program include the following:

- Demonstrate that natural attenuation is occurring;
- Be protective of human health and the environment;
- Monitor natural attenuation and environmental impact; and,
- Restore groundwater at the edges of the plume to below the 2L Standard and GWPST.

The existing monitoring network, plus additional monitor wells to be installed, will be used to monitor groundwater quality and trends. Monitoring wells MW-3B, MW-4, and MW-9, the upgradient wells, would allow determination of geochemical conditions in the

groundwater prior to entering the source area. Monitoring well MW-5 is located in the plume and will be utilized to collect data for bioremediation rate calculations. Additional wells will be installed along the downgradient facility boundary to define the edge of the plume and act as sentinel wells. These wells would be monitored and evaluated to determine if bioremediation is working as well as to determine if re-evaluation triggers have been exceeded. For additional information on the proposed evaluation of water quality at the landfill, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**.

4. WATER QUALITY MONITORING PLAN

An updated Water Quality Monitoring Plan (WQMP) is included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. The updated WQMP summarizes the activities and protocol recommended to perform monitoring at the subject site in general accordance with the requirements as specified in Sections .0600 and .1637(a)(1) of the North Carolina Solid Waste Management Rules (15A NCAC 13B). The WQMP is designed to effectively monitor groundwater and surface water quality in order to detect a release from the landfill into the uppermost aquifer underlying the landfill; monitor groundwater and surface water diverted and discharged from the facility as part of the proposed corrective actions; and monitor surface water downgradient of the facility during the implementation of corrective measures for the closed landfill.

5. EVALUATION OF CORRECTIVE ACTION EFFECTIVENESS

5.1 Evaluation of Natural Attenuation

Geochemical data and changes of site constituent concentrations with time are important in evaluating the effectiveness of natural attenuation. The NES Report previously prepared for the landfill discussed the changes of site constituent concentrations and plume characteristics with time.

The facility's water quality monitoring network has been sampled on a semi-annual basis since 1994. Groundwater and surface water samples collected from the water quality monitoring network have historically been analyzed for Appendix I constituents including VOCs and metals and Appendix II constituents including VOCs, SVOCs, metals, sulfide, and cyanide. In addition, groundwater and surface water samples have also been historically analyzed for several other constituents including PCBs, pesticides, and herbicides. However, the facility's water quality monitoring network has only been sampled for geochemical parameters on two occasions, in January 2003 and June 2007. Therefore, the current historical pool of geochemical data collected from the facility's water quality monitoring network is insufficient to evaluate geochemical parameter trends over time.

According to historical groundwater analytical data, concentrations of the COCs at compliance monitor wells MW-1A, MW-6, and MW-7, located along the northern property boundary, have a decreasing trend or no trend, due to lack of detections, in recent years. The evidence suggests that natural degradation is likely occurring in the area of monitor wells MW-1A, MW-6, and MW-7.

The VOC levels at MW-5, located along the north-northeast property boundary, have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring. Elevated concentrations of the chlorinated compound tetrachloroethene have been historically detected at monitor well MW-5, until 2004. Trichloroethene is a daughter product from the degradation of tetrachloroethene. Concentrations of trichloroethene detected at MW-5 show a significant downward trend in concentrations over time. Two of the daughter products from the degradation of trichloroethene are cis-1, 2-dichloroethene and 1,1-dichloroethane. The concentration of cis-1,2-dichloroethene in groundwater samples from monitor well MW-5 has strong evidence of an increasing trend. This increase is likely due to the degradation of trichloroethene through natural attenuation processes. The concentration of 1,1-dichloroethane in groundwater samples from monitor well MW-5 has strong evidence of a decreasing trend. Vinyl chloride is a degradation product of cis-1,2-dichloroethene and 1,1-dichloroethane, and further breaks down to water and carbon dioxide through natural processes. The analysis of vinyl chloride concentrations shows no significant upward or downward trend in concentration over time at monitor well MW-5. Due to the degradation characteristics of vinyl chloride, relatively steady concentrations are expected while the larger alkene compounds degrade (Montgomery, 1996). Therefore, it appears that the site conditions are condusive

to natural attenuation processes and that natural attenuation is occurring within and surrounding the waste disposal unit.

Semi-annual groundwater and surface water monitoring of the water quality monitoring network for Appendix I constituents, and possibly Appendix II constituents, will continue. Annual groundwater and surface water monitoring of select monitor wells and surface water locations for geochemical parameters and Appendix I constituents, and possibly Appendix II constituents, will begin with the approval of this CAP. For additional information on the semi-annual compliance monitoring and annual corrective measures monitoring, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. Changes of site constituent concentrations and plume characteristics with time will be included in the annual corrective measures monitoring reports.

5.2 Evaluation of In-Situ Isolation

Changes in groundwater elevation data within the waste disposal unit are important in evaluating the effectiveness of the in-situ isolation program. In-situ isolation is proposed as part of the corrective measures in this report. However, there are currently no in-situ isolation structures in-place at the landfill facility.

Groundwater elevation data will be collected from the facility's water quality monitoring network, as discussed in the updated WQMP, on a quarterly basis. A decrease in groundwater levels under the waste disposal unit is expected after the in-situ isolation program is implemented. For additional information on the proposed collection of groundwater elevation data, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. Operation and maintenance inspections of the in-situ isolation program will be conducted on a quarterly basis. Updated assessments of the effectiveness of the in-situ isolation program will be included in the annual reports.

6. CONTINGENCY PLAN

If it is determined that MNA in conjunction with in-situ isolation are not effectively reducing groundwater contamination at the landfill facility, then one or more of the following contingency plan options may be implemented.

6.1 Option 1 – Stormwater Improvements on the Eastern Half of the Landfill

If groundwater elevation data collected from monitor wells and piezometers at the landfill facility do not indicate a decrease in groundwater levels under the waste disposal unit, then improvement of stormwater structures on the eastern portion of the waste disposal unit will be implemented. Improving the stormwater structures on the eastern half of the landfill will decrease the infiltration of stormwater into the ground which could come in contact with the MSW waste and produce leaching. Structures that would be improved include the perimeter ditch which flows north along the eastern portion of the landfill, installing a new ditch between the southern access road and property line, and removing the pond located south of the maintenance building.

The eastern perimeter ditch would be re-graded to improve its slope and flow and be extended as necessary to convey stormwater away from the landfill. This would reduce the amount of stormwater infiltrating from the ditch and becoming groundwater which could come in contact with the waste and potentially produce leaching.

A new ditch will be installed between the southern access road and the property boundary. This ditch would intercept stormwater prior to reaching the landfill at a location farther away from the landfill than the existing perimeter ditch. During periods of high groundwater, the ditch would intercept a portion of the groundwater and divert it around the landfill.

The pond south of the maintenance building would be removed. This would reduce infiltration into groundwater and therefore reduce the groundwater level under the landfill.

6.2 Option 2 – Enhance Landfill CAP

If groundwater elevation data do not indicate a decrease in groundwater levels under the waste disposal unit after Option 1 of the contingency plan is implemented, then an alternate cover system will be placed on the eastern and western portions of the waste disposal unit to enhance the cap of the landfill. Enhancing the landfill cap will decrease the infiltration of stormwater into the ground which could come in contact with the MSW waste and produce leaching.

A proposed alternate cover system for the facility would be the following:

- erosion layer;
- low-permeability barrier; and
- geosynthetic clay liner (GCL).

The alternate cover system will be planted with grass to stabilize the cover soils, minimize erosion, and reduce maintenance. The soil will be prepared by fertilizing, amending the soil, and seeding in accordance with the North Carolina Erosion and Sediment Control Guidelines.

6.3 Option 3 – Landfill Gas Extraction

If statistically significant increasing trends are noted for the COCs trichloroethene, benzene, or 1,4-dichlorobenzene, then monitoring for that parameter(s) in the area of the increase may be expanded to quarterly for one year. During this time, a review of the contribution of landfill gas (LFG) to contaminant migration in that area will be completed to establish whether LFG extraction is needed if the trend continues. Groundwater contamination from LFG can occur through direct contact of groundwater with LFG; rising groundwater or infiltrating water washing contaminants from the vadose zone contaminated by LFG; LFG cooling in the soil outside the landfill causing condensate to form, which percolates to the groundwater; and acids in the LFG causing some naturally occurring metals in the soil to dissolve into the groundwater.

The waste disposal unit currently has a passive LFG system consisting of 60 vertical wells which vent the LFG to the atmosphere. The number of passive vents can be increased if a review of the spatial distribution and effective influence of the vents indicates a need for additional vents. Also, the passive system can be converted to an active system by installing new well heads which can be connected to a piping system which will connect to a blower. The blower will create a vacuum which will extract the LFG from the landfill. This reduces the pressure buildup of the LFG to prevent migration and potential groundwater contamination. Additional vertical wells can be installed to increase the effectiveness of the system.

Statistically significant increasing trends currently exist for the remaining COCs, vinyl chloride, cis-1,2-dichloroethene, and cobalt. If these increasing trends continue, the distribution of constituent concentrations will be evaluated to determine if quarterly monitoring and subsequent corrective actions are necessary.

7. SCHEDULE AND MAINTENANCE

Once the CAP is approved and a schedule has been finalized, implementation of the CAP will be initiated. An estimated schedule of tasks to be performed is provided below. The schedule assumes certain time frames for the regulator's review of submittals. Tasks and subtasks that are dependent on responses from the Section will be initiated after receipt of the Section's response. Per the North Carolina Solid Waste Management Rules, the Section has 90 days to complete their review of the submitted CAP and provide their comments.

The ACM Report has been submitted to the Section for approval, however, the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this CAP, alternatives for in-situ isolation combined with monitored natural attention (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated Water Quality Monitoring Plan to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect any changes based on public comments.

The first phase of the project involves the preparation, submittal, and review of this CAP. The second phase involves the ACM public meeting process and possible preparation, submittal, and review of an addendum to this CAP, if needed. The third phase of the project involves implementation of MNA in conjunction with in-situ isolation. The performance of the MNA and in-situ isolation program will be evaluated annually and will coincide with one of the groundwater and surface water compliance monitoring events conducted semi-annually at the landfill facility. In addition, the physical structures installed as part of the in-situ isolation program (i.e. barrier walls, monitor wells, trenches) will be evaluated quarterly and will coincide with the current quarterly methane and maintenance inspection monitoring. Groundwater elevation data will be collected from the facility's water quality monitoring network on a quarterly basis. This schedule will be revised periodically to reflect knowledge developed with the implementation of the monitoring program.

If the contingency plan is required, a schedule of response will be developed based on the appropriate activity needed. If a failure of the in-situ isolation program is observed, no immediate negative response would be anticipated and no emergency actions would be required. However, notification of the change in status will be provided immediately and a proposed plan of action will be developed within 30 days.

A proposed scheduled of activities from date of CAP approval (expected by the end of 2008) is as follows:

	Duration	**Time from CAP Approval**
• Design and Specifications	90 days	90 days
• Specifications Out to Bid/ Pre-Bid Meeting	60 days	150 days
• Selection of Contractor(s)	30 days	180 days
• Installation of In-Situ Isolation Program ➢ Improve Diversion Ditches ➢ Install Barrier Wall ➢ Install Type II Monitor Wells ➢ Grade Cap ➢ Place Fill in Sedimentation Pond	18 months – 36 months	24 months – 42 months
• In-Situ Isolation Operation and Maintenance	Quarterly	N/A
• Collection of Groundwater Elevation Data	Quarterly	N/A
• Monitored Natural Attenuation (MNA) and Hydrogeological Monitoring	Annually	N/A
• Estimated Time Frame to Achieve Goals and Project Completion	Natural Attenuation Program and Performance Monitoring will be implemented until cleanup goals are achieved.	N/A

8. FINANCIAL ASSURANCE

The County has prepared a written estimate, in current dollars, of the cost of hiring a third party to implement the Corrective Action Plan for the facility. The CAP cost estimate is based on the most expensive total costs of implementation of the proposed corrective measures and accounts for annual and periodic costs over the entire performance monitoring period.

The County shall annually adjust the CAP cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Section.

The County shall increase the CAP cost estimate and the amount of financial assurance provided if changes in the CAP or facility conditions increase the maximum costs of the implementation of corrective measures.

The County may reduce the CAP cost estimate and the amount of financial assurance provided if the cost estimate exceeds the maximum remaining costs of corrective action. Prior to any reduction of the CAP cost estimate by the County, a written justification for the reduction shall be submitted to the Section. No reduction of the CAP cost estimate shall be allowed without the Section’s approval.

The capital costs for the implementation of the CAP in-situ isolation program will be approximately $700,000. The CAP costs for maintenance and monitoring of the landfill facility will be approximately $50,000 annually. The CAP costs for closure of the corrective actions will be approximately $35,000. The total CAP costs will be approximately $2,235,000 over a 30-year period.

9. COMPLETION OF CORRECTIVE ACTIONS

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

10. REFERENCES

Department of Environment and Natural Resources, Division of Water Quality, *15A NC Administrative Code Subchapter 2B .0200 Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of NC,* August 2004.

Department of Environment and Natural Resources, Division of Water Quality, *15A NC Administrative Code Subchapter 2L .0200 Groundwater Quality Standards*, December 2005.

Department of Environment and Natural Resources, Division of Waste Management, *15A NC Administrative Code Subchapter 13B .1634(h) Solid Waste Groundwater Protection Standard, Solid Waste Management Rules*, November 2004.

Montgomery, John H., *Groundwater Chemicals, Second Edition Desk Reference*, CRC Press, Inc., 1996.

S&ME, Inc., *Alternate Source Demonstration Report, Edgecombe County Landfill*, June 10, 2008.

S&ME, Inc., *Assessment of Corrective Measures Report, Edgecombe County Landfill*, June 26, 2008.

S&ME, Inc., *Closure and Post-Closure Plan, Edgecombe County Landfill*, June 30, 2008.

S&ME, Inc., *Nature and Extent Study, Edgecombe County Landfill*, June 25, 2008.

S&ME, Inc., *Methane Monitoring and Corrective Action Report, Edgecombe County Landfill*, March 2002.

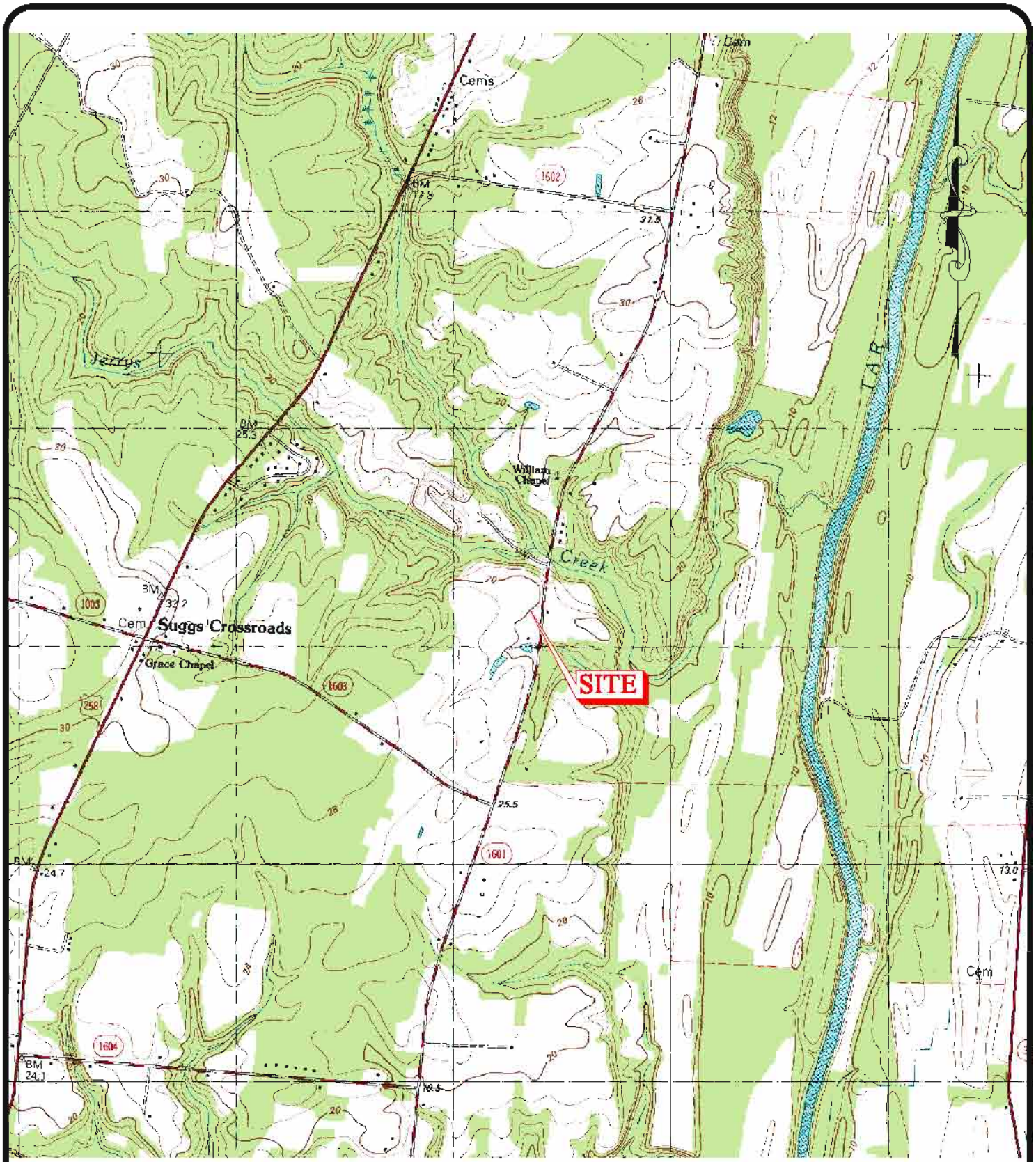
S&ME, Inc., *Response to Environmental Assessment Requirements, Edgecombe County Landfill*, June 2001.

S&ME, Inc, *Revision to the Sampling and Analysis Plan (SAP), Edgecombe County Landfill*, November 9, 1998.

S&ME, Inc., *Water Quality Monitoring Plan, Edgecombe County Landfill*, May 10, 1994.

US Department of Agriculture, Soil Conservation Service, *Soil Survey of Edgecombe County, NC*, November 1979.

FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

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SCALE: 1" = 2,000'	S&ME WWW.SMEINC.COM	VICINITY MAP CORRECTIVE ACTION PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	FIGURE NO.
DATE: JUNE 2008			1
DRAWN BY:			
PROJECT NO: 1054-07-241			

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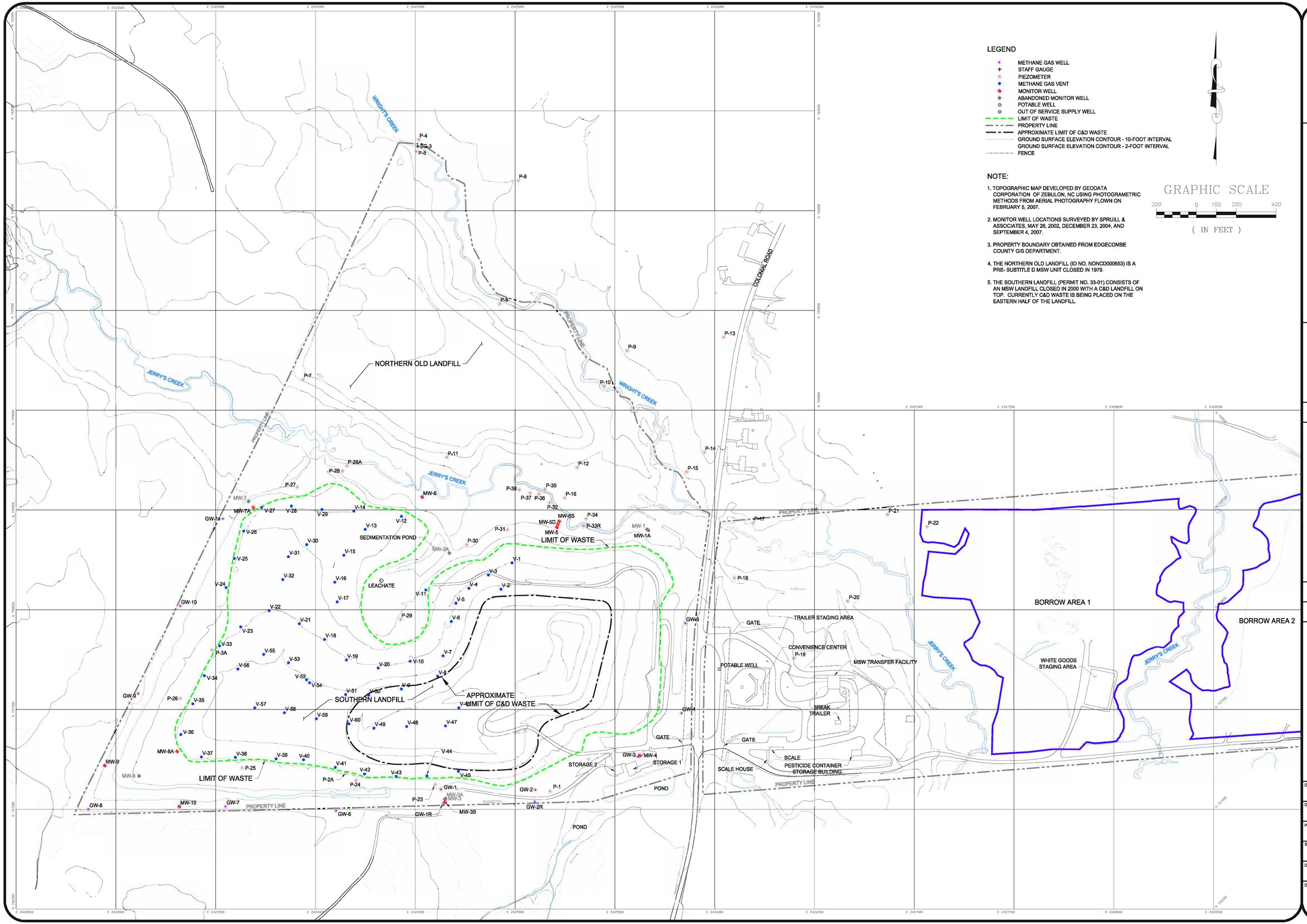

LEGEND

- METHANE GAS WELL
- STAFF GAUGE
- PIEZOMETER
- METHANE GAS VENT
- MONITOR WELL
- ABANDONED MONITOR WELL
- POTABLE WELL
- OUT OF SERVICE SUPPLY WELL
- LIMIT OF WASTE
- PROPERTY LINE
- APPROXIMATE LIMIT OF C&D WASTE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
4. THE NORTHERN OLD LANDFILL (ID NO. NONCD000653) IS A PRE- SUBTITLE D MSW UNIT CLOSED IN 1979.
5. THE SOUTHERN LANDFILL (PERMIT NO. 33-01) CONSISTS OF AN MSW LANDFILL CLOSED IN 2000 WITH A C&D LANDFILL ON TOP. CURRENTLY C&D WASTE IS BEING PLACED ON THE EASTERN HALF OF THE LANDFILL.

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

S&ME
WWW.SMEINC.COM

NO.	DATE	DESCRIPTION	BY

SITE MAP

CORRECTIVE ACTION PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1029	
DRAWING: 2	OF: 3

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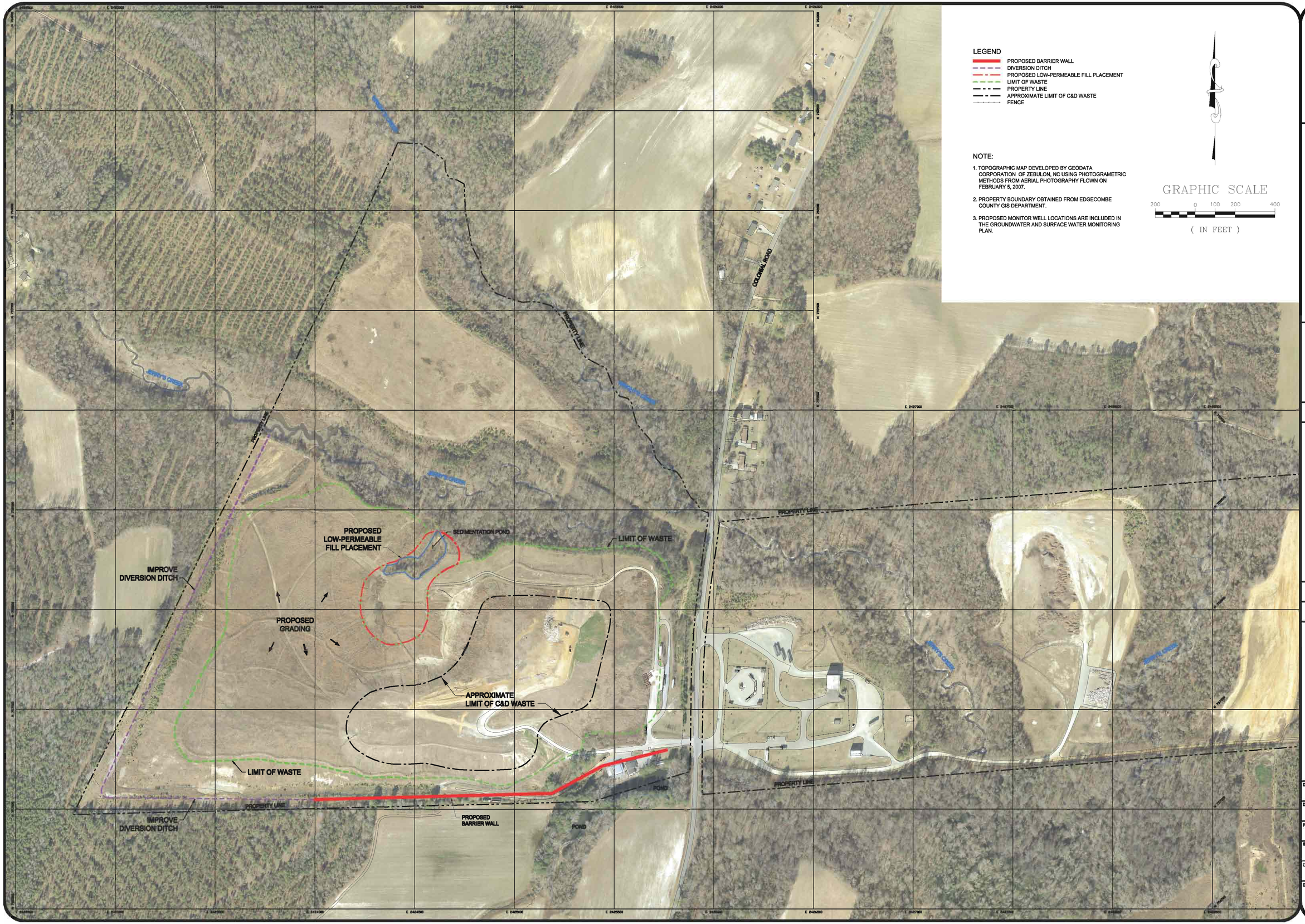

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
3. PROPOSED MONITOR WELL LOCATIONS ARE INCLUDED IN THE GROUNDWATER AND SURFACE WATER MONITORING PLAN.

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NO.	DATE	DESCRIPTION	BY

PROPOSED CORRECTIVE MEASURES

CORRECTIVE ACTION PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1030	
DRAWING: 3	OF: 3

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SECTION C-6

Registrations, Permits, and Approvals

Corrective Action Permit Modification Application

Section C-6: Registrations, Permits, and Approvals

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

Required registrations, permits, and approvals for the implementation of the CAP include the following:

- Land Disturbance Permit;
- Construction Permit;
- Erosion Control Permit; and,
- National Pollutant Discharge Elimination System (NPDES) Permit.

SECTION C-7

Edgecombe County Landfill Permit #33-01

S&ME

FILE

November 15, 2006

North Carolina Department of Environment and Natural Resources
Division of Waste Management - Solid Waste Section
1646 Mail Service Center
Raleigh; NC 27699-1946

Attention: Ms. Toni Jones
Environmental Engineer II

Reference: Edgecombe County C&D Landfill – Permit #33-01
Edgecombe County MSW Transfer Station – Permit #33-02T
Edgecombe County, North Carolina
S&ME Project No. 1040-01-545D

Dear Ms. Jones:

S&ME Inc. (S&ME) prepared this letter on behalf of the Edgecombe County Department of Solid Waste (the County) regarding the permit status of the County's construction and demolition (C&D) landfill and municipal solid waste (MSW) transfer station. Although S&ME has been providing the County environmental monitoring services for some time, we just recently began providing more comprehensive solid waste consulting services. Site records are unclear regarding the status of the C&D landfill and transfer station permits. We reviewed records on file in the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Section file room on October 11, 2006 seeking clarification. Based on review of the County and NCDENR files, we note the following regarding the C&D landfill:

- Permit #33-01, to construct and operate a C&D landfill unit over an existing MSW landfill was issued on December 30, 1997;
- facility compliance audit reports dating back to April 4, 2003 note the permit status as "due for review before December 29, 2002";
- facility compliance audit reports dating back to December 4, 2003 note that the permit is expired;
- the County requested Permit #33-01 renewal in the January 14, 2004 letter to NCDENR; and

- Solid Waste Section facility compliance audit reports dating back to May 19, 2004 note that re-permitting documentation has been submitted.

Based on review of the County and NCDENR files, we note the following regarding the MSW transfer station:

- Permit # 33-02T for a solid waste transfer station was issued on June 9, 1998;
- facility compliance audit report dated April 4, 2003 notes the permit status as due for review by June 9, 2003;
- facility compliance audit reports dating back October 30, 2003 note that the permit is expired;
- Edgecombe County requested renewal of Permit # 33-02T in the December 31, 2003 letter to NCDENR; and
- Solid Waste Section facility compliance audit report dated January 15, 2004 notes that the permit renewal was received.

S&ME did not find NCDENR response to the County's January 14, 2004 or December 31, 2003 request for permit renewals or renewed permits on record. Based on the absence of information on record and the statements made in audit reports, we believe the C&D landfill and MSW transfer station permits are expired. Edgecombe County has operated, and intends to continue operating their facilities, in good faith consistent with the permit conditions on record. However, we wish to resolve the permit status as soon as possible.

On behalf of the County, S&ME is requesting your recommendation on how to proceed with renewing these permits. Please contact us at (919) 872-2660 if you have any questions or comments.

Sincerely,

S&ME, Inc.

Ken Daly, P.E.
Project Engineer

Sam Watts, P.G.
Senior Project Manager

Ernest F. Parker, Jr., P.E., P.G.
Senior Reviewer

Cc: Danny Bagley, Edgecombe County
File

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

NCDENR

JAMES B. HUNT JR.
GOVERNOR

WAYNE MCDEVITT
SECRETARY

WILLIAM L. MEYER
DIRECTOR

April 28, 1998

Mr. Joseph K. Durham, County Manager
County of Edgecombe
201 St. Andrews Street
Tarboro, North Carolina 27886

Subject: Edgecombe County MSWLF Facility Transition Plan Modification for Permit #33-01

Dear Mr. Durham:

The Solid Waste Section hereby approves the modification of the referenced MSWLF Facility permit to allow the construction and operation of a CONSTRUCTION & DEMOLITION LANDFILL UNIT, Phase 1(in accordance with sheet 3 of 6 of the approved plans) at the Edgecombe County landfill. The operation of Phase 1 is effective 30 December 1997 and the operational permit for the facility will be reviewed every five years, on or before 29 December 2002 (see Condition Number 2, Page 1).

Please note operational conditions outlined on pages one thru five for the facility. The Waste Management Specialist for this facility is Mr. Ben Barnes and he can be reached in our Raleigh Regional Office at (919) 571-4700.

If you have any questions about this approval letter, please contact me at (910) 486-1191 or James C. Coffey at (919) 733-0692 Ext. 255.

Sincerely,

Jim Barber
Eastern Area Engineer
Solid Waste Section

cc: Jim Coffey
Terry Dover
Ben Barnes
Todd Tripp
Raleigh Central Office: Edgecombe County MSW Facility Transition Plan Permit # 33-01

FAYETTEVILLE REGIONAL OFFICE
225 GREEN STREET, SUITE 601, FAYETTEVILLE, NC 28301-5043
PHONE 910-486-1191 FAX 910-486-1791
AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER - 50% RECYCLED/10% POST-CONSUMER PAPER

PERMIT NO. 33-01
Modification dated: 04-28-98

STATE OF NORTH CAROLINA

DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

DIVISION OF SOLID WASTE MANAGEMENT

P.O. BOX 27687 RALEIGH, NC 27611

SOLID WASTE PERMIT

COUNTY OF EDGECOMBE

is hereby issued a permit to operate PHASE 1 of a

Construction and Demolition Landfill Unit

located on S.R. 1601 (Colonial Road), at the Edgecombe County Landfill, Tarboro, Edgecombe County in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

James C. Coffey

James C. Coffey, Supervisor
Permitting Branch
Solid Waste Section

certification and documentation of partial unit closure submitted for approval. Seeding and stabilization of cover soils shall be performed prior to receiving C&D waste.

5. Operation of the C&D landfill units shall conform to the operating procedures described in the approved plan, in accordance with Section .1626 of the Solid Waste Management Rules, and in accordance with the following requirements:

Waste Acceptance and Disposal

a. The facility shall accept only those solid wastes which it is permitted to receive.
b. No municipal solid waste, hazardous waste, industrial waste, liquid waste or waste not charaterized as LCID or C&D shall be accepted for disposal.
c. The permittee shall implement a program at the facility for detecting and preventing the disposal wastes listed in item "b" of this section. The program shall include, at a minimum:
   (i) Random inspections of incoming loads or other comparable procedures:
   (ii) Records of any inspections;
   (iii) Training of personnel to recognize hazardous and liquid wastes;
   (iv) Development of a contingency plan to properly manage any identified wastes listed in item "b" of this section; the plan must address identification, removal, storage, and final disposition of waste.

Cover Material Requirements

a. Operational soil cover of at least six inches shall be placed at least once per week or when the active area reaches 1/2 acre in size or more often as necessitated by the nature of the waste so as to prevent the site from becoming a visual nuisance and to prevent fire, windblown materials, vectors or water infiltration.
b. Areas which will not have additional waste placed on them for 12 months or more, but where final termination of operations has not occurred, shall be covered with a minimum of one foot of soil cover.
c. After final termination of disposal operations at the site or major part thereof, or upon revocation of a permit, the fill areas shall be covered with a cap in accordance with .1627(c) or in accordance with the rules at the time of closure.

Access and Safety

a. The facility shall be adequately secured by means of gates, chains, berms, fences, or other security measures approved by the DSWM to prevent unauthorized entry.

b. An attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.
c. The access road to the site shall be of all-weather construction and maintained in good condition.
d. Dust control measures shall be implemented when necessary.
e. Signs providing information on dumping procedures, the hours of operation, the permit number, and other pertinent information shall be posted at the site entrance.
f. Signs shall be posted stating that no MSW, hazardous waste or liquid waste can be received.
g. Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.
h. The removal of solid waste from the facility is prohibited unless the owner/operator approves and the removal is not performed on the working face.
i. Barrels and drums shall not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos.
j. Open burning of solid waste is prohibited.
k. The concentration of explosive gases generated at the facility shall not exceed:
    i. twenty-five percent of the limit for gases in site structures (excluding gas control or recovery system components; and
    ii. the lower explosive limit for gases at the facility boundary.

Erosion and Sedimentation Control
a. Adequate sedimentation and erosion control measures shall be practiced to prevent silt from leaving the site.
b. Adequate sedimentation and erosion control measures shall be practiced to prevent excessive on-site erosion.
c. Provisions for a vegetative ground cover sufficient to restrain erosion must be accomplished within 30 working days or 120 calendar days upon completion of any phase of C&D landfill development.

Drainage Control and Water Protection Requirements
a. Surface water shall be diverted from the operational area.
b. Surface water shall not be impounded over or in waste.
c. A separation distance of at least four feet shall be maintained between waste and the ground-water table.
d. Solid waste shall not be disposed of in water.

e. Leachate shall be contained on site or properly treated prior to discharge. An NPDES permit may be required prior to discharge of leachate to surface waters.

All pertinent landfill operating personnel will receive training and supervision necessary to properly operate this landfill.

6. Ground water quality at this facility is subject to the classification and remedial action provisions referenced in Rule .1634 thru .1637 of 15A NCAC 13B.

7. A closure and post-closure plan must be submitted for approval at least 90 days prior to closure or partial closure of any landfill unit. The plan must include all steps and measures necessary to close and maintain the facility in accordance with all rules in effect at that time. At a minimum, the plan shall address the following:

   a. Design of a final cover system; using the cap requirements outlined in Rule .1627
   b. Construction and maintenance/operation of the final cover system and erosion control structures;
   c. Surface water, ground water, and explosive gas monitoring.

MONITORING AND REPORTING REQUIREMENTS

1. Ground-water monitoring wells and monitoring requirements for the C&D landfill units shall be in accordance with the monitoring system approved in the TRANSITION PLAN for the facility and these additional conditions:

   a. Monitoring well design and construction shall conform to the specifications outlined in Attachment 2, "North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities".
   b. A geologist shall be in the field to supervise well installation, if necessary. The exact locations, screened intervals, and nesting of the wells shall be established after consultation with the SWS Hydrogeologist at the time of well installation for new monitoring wells.
   c. For each new monitoring well constructed, a well completion record shall be submitted to DSWM within 30 days upon completion.

   d. Sampling equipment, procedures, and parameters shall conform to specifications outlined in the above-referenced guidance document, (Attachment 2), or the current guidelines established by DSWM at the time of sampling and in accordance with the approved TRANSITION PLAN OR ASSESSMENT AND REMEDIATION PLAN.

e. In order to determine ground-water flow directions and rates, each monitoring well shall be surveyed, and hydraulic conductivity values and effective porosity values shall be established for the screened intervals for each new monitoring well.
f. The permittee shall sample the monitoring wells semi-annually or as directed by the SWS Hydrogeologist.
g. A readily accessible unobstructed path shall be initially cleared and maintained so that four-wheel drive vehicles may access the monitoring wells at all times.

2. The permittee shall maintain a record of all monitoring events and analytical data. Reports of the analytical data for each water quality monitoring sampling event shall be submitted to DSWM in a timely manner.

3. The permittee shall maintain a record of the amount of solid waste received at the facility, compiled on a monthly basis. Scales shall be used to weigh the amount of waste received.

4. On or before 01 August 98 (or an earlier date as requested by the Solid Waste Section), and each year thereafter, the permittee shall report the amount of waste received (in tons) at this facility and disposed of in the landfill to the Solid Waste Section and to all counties from which waste was accepted, on forms prescribed by the Section. This report shall include the following information:

   a. The reporting period shall be for the previous year, beginning 01 July and ending on 30 June;
   b. The amount of waste received and landfilled in tons, compiled on a monthly basis, according to Condition 6 described above; and
   c. Documentation that a copy of the report has been forwarded to all counties from which waste was accepted.

5. All records shall be maintained on-site and made available to the SWS upon request.

6. The Post-Closure plan approved in the TRANSITION PLAN shall be implimented and followed upon capping and closing the operating unit(s).

ATTACHMENT LIST

List of Additional Documents for the Approved Transition Plan

1. Site and Construction Transition Plan modification application for the Edgecombe County Landfill, Permit #33-01. Document titled Amendment No. 15 to the Transition Plan for Edgecombe County, North Carolina; dated 8 December 1997.

2. Site plans dated December 1997; Edgecombe County, North Carolina Construction and Demolition Landfill.

3. Modification dated 28 April 1998: Certification letter dated 6 February 1998 addressing the placing of additional cover soil in a one acre area at the Edgecombe County landfill.

The Wooten Company

Engineering
Planning
Architecture

RECEIVED
FEB 06 1998
DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

February 6, 1998

Mr. Jim Barber
Eastern Area Engineer
NCDEHNR - Solid Waste Section
225 Greene Street, Suite 601
Fayetteville, NC 28301

Re: Closure of the MSWLF
Amendment 15 of the MSWLF Transition Plan
Edgecombe County, NC

Dear Jim:

Attached as discussed, we are forwarding a follow-up certification for the area of the MSWLF which required additional soil to be properly closed. Please let us know if additional information would be helpful.

Sincerely,

THE WOOTEN COMPANY

By Todd Tripp
Todd A. Tripp, P.E.

TAT/hw

Attachment

c: Larry Hathaway w/attachment

The Wooten Company

Engineering
Planning
Architecture

Follow-Up Certification
of
Closed Units
Edgecombe County MSWLF
Permit #33-01

WHEREAS, Amendment 15 of the approved Transition Plan for the referenced MSWLF was granted on December 30, 1997, and the said Amendment included an Operational Plan for the CDLF to be situated on the closed-out MSWLF, and;

WHEREAS, documents describing the CDLF depicted a 100' x 400' of existing MSWLF cap which was believed to be deficient due to on-site test pit information, and;

WHEREAS, the Edgecombe County repaired the deficient area and requested re inspection by The Wooten Company, now therefore:

The Wooten Company did revisit the site on January 5, 1998 and re-inspect the site and based upon the following we believe the 100' x 400' area to now be properly closed in conformance with Solid Waste Management Rules:

1) The landfill manager informed us that the deficient area uniformly received 1' to 1.5' of additional soil cover giving a total thickness of 2' to 2.5'.
2) The edges of the area filled exhibited an edge 1' thick giving appearance of at least 1' thick fill being placed.
3) The filled area presented a continuous grade with no low or ponding areas with good drainage.

I hereby attest that to the best of my knowledge and abilities the foregoing is true and that the conditions of inadequate cover cited in the original "Certification of Closed Units" have been removed.

NORTH CAROLINA PROFESSIONAL SEAL 17480

Todd A. Tripp

Todd Alan Tripp, PE
NC License No. 17480
For The Wooten Company
Engineerin•Planning•Architecture

2/5/98

RECEIVED
FEB 09 1998
DIVISION OF WASTE MANAGEMENT
FAYETTEVILLE REGIONAL OFFICE

State of North Carolina
Department of Environment
and Natural Resources
Division of Waste Management

James B. Hunt, Jr., Governor
Wayne McDevitt, Secretary
William L. Meyer, Director

DENR

December 30, 1997

Mr. Joseph K. Durham, County Manager
County of Edgecombe
201 St. Andrews Street
Tarboro, North Carolina 27886

Subject: Edgecombe County MSWLF Facility Transition Plan Modification for Permit #33-01

Dear Mr. Durham:

The Solid Waste Section hereby approves the modification of the referenced MSWLF Facility permit to allow the construction and operation of a CONSTRUCTION & DEMOLITION LANDFILL UNIT, Phase 1(in accordance with sheet 3 of 6 of the approved plans) at the Edgecombe County landfill. The operation of Phase 1 is effective 30 December 1997 and the operational permit for the facility will be reviewed every five years, on or before 29 December 2002 (see Condition Number 2, Page 1).

Please note operational conditions outlined on pages one thru five for the facility. The Waste Management Specialist for this facility is Mr. Ben Barnes and he can be reached in our Raleigh Regional Office at (919) 571-4700.

If you have any questions about this approval letter, please contact me at (910) 486-1191 or James C. Coffey at (919) 733-0692 Ext. 255.

Sincerely,

Jim Barber
Eastern Area Engineer
Solid Waste Section

cc: Jim Coffey
Terry Dover
Ben Barnes
Raleigh Central Office: Edgecombe County MSW Facility Transition Plan
Permit # 33-01

PERMIT NO. 33-01
Modification dated: 12-30-97

STATE OF NORTH CAROLINA

DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES

DIVISION OF SOLID WASTE MANAGEMENT

P.O. BOX 27687 RALEIGH, NC 27611

SOLID WASTE PERMIT

COUNTY OF EDGECOMBE

is hereby issued a permit to operate PHASE 1 of a

Construction and Demolition Landfill Unit

located on S.R. 1601 (Colonial Road), at the Edgecombe County Landfill, Tarboro, Edgecombe County in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit.

James C. Coffey, Supervisor
Permitting Branch
Solid Waste Section

PERMIT NO. 33-01
MODIFICATION DATED: 12-30-97

SOLID WASTE PERMIT

Permit to Operate
Edgecombe County Landfill
Construction and Demolition Debris Landfill Unit

CONDITIONS OF PERMIT:

GENERAL

1. When this property is sold, leased, conveyed or transferred, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument, a statement that the property has been used as a sanitary landfill.

2. This permit will be subject to review every five years, on or before 30 December 2002, as per 15A NCAC 13B .0201(c) or sooner, according to the issuance date of this permit. Modifications to the facility may be required in accordance with rules in effect at the time of review.

3. The approved plan is described by Attachment 1, "List of Documents for Approved Plan". Where discrepancies may exist, the most recent submittal and the Conditions of Permit shall govern. Some components of the approved plan are reiterated in the Conditions of Permit.

4. This permit is not transferable.

5. The Financial Assurance Instrument(FAI) for this facility shall be amended when Closure Certification has been complete and the Closure/Post-Closure Care portion of the instrument is amended. The FAI shall be reviewed and updated annually for this facility once closure of the MSW unit is complete.

6. If during the operational life of the C&D unit it becomes apparent that the operations at the facility are impacting ground water adversely; the Solid Waste Section will require landfilling activities to cease and closure of the operating unit.

CONSTRUCTION AND OPERATION

1. This permit is for development of the Edgecombe County Landfill Construction and Demolition Unit, Phase 1 in accordance with the approved plan, sheet 3 of 6; with the exception of a one acre area in the southwest corner of the phase as shown on sheet 2 of 6. This one acre area requires additional soil cover and will be repaired in the future.

2. This solid waste management facility is permitted to receive the following waste types:

   a. Land-clearing debris as defined in G.S. 130A-290, specifically, solid waste which is generated solely from land-clearing activities, such as stumps, trees, etc.;
   b. Inert debris defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil; and
   c. Asphalt in accordance with G.S. 130-294(m).
   d. Construction and demolition debris defined as solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings, or other structures.
   e. C&D like waste that are similar to wastes typically found in the land clearing-inert debris and C&D waste streams consisting of wastes at this time: roofing shingle waste from the manufacturer, waste building materials from mobile home/modular home manufacturer and wooden pallets. Other wastes **MAY** be approved by the Division upon receipt of a written request with the specific waste type, how its generated, how much is generated; along with any additional information the Division may request to render a final decision on the disposal options for the waste.

   Yard trash as defined in G.S. 130A-290, shall not be disposed in the landfill area. However, yard trash, along with land-clearing debris, may be accepted for processing in the Yard Waste Composting Area.

3. All sedimentation/erosion control activities will be conducted in accordance with the Sedimentation Control Act codified at 15 NCAC 4. Native vegetation shall be established on the completed landfill.

4. The following requirements shall be met prior to operation of Phase 1 at this facility:

   a. Site preparation and or closure of that area of the MSW unit shall be in accordance with the construction plans(dated December 1997).
   b. Signs shall be posted at the facility in accordance with the Access and Safety Requirements under Operation Condition No. 5 listed below.
   c. The existing groundwater monitoring system will be utilized for ground water monitoring for the C&D unit(s) in accordance with .1630 thru .1633. Assessment monitoring shall continue in accordance with Solid Waste Management Rules and any additional requirements set forth by Solid Waste Section Hydrogeologist.

   d. Closure certification and documentation shall be submitted to the Solid Waste Section and a approved by the Section prior to receiving C&D waste in the proposed unit(s).Partial closure of units will be accepted with certification and documentation of partial unit closure submitted for approval. Seeding and stabilization of cover soils shall be performed prior to receiving C&D waste.

5. Operation of the C&D landfill units shall conform to the operating procedures described in the approved plan, in accordance with Section .1626 of the Solid Waste Management Rules, and in accordance with the following requirements:

   Waste Acceptance and Disposal
   a. The facility shall accept only those solid wastes which it is permitted to receive.
   b. No municipal solid waste, hazardous waste, industrial waste, liquid waste or waste not charaterized as LCID or C&D shall be accepted for disposal.
   c. The permittee shall implement a program at the facility for detecting and preventing the disposal wastes listed in item "b" of this section. The program shall include, at a minimum:
      (i) Random inspections of incoming loads or other comparable procedures:
      (ii) Records of any inspections;

(iii) Training of personnel to recognize hazardous and liquid wastes;

(iv) Development of a contingency plan to properly manage any identified wastes listed in item "b" of this section; the plan must address identification, removal, storage, and final disposition of waste.

Cover Material Requirements

a. Operational soil cover of at least six inches shall be placed at least once per week or when the active area reaches 1/2 acre in size or more often as necessitated by the nature of the waste so as to prevent the site from becoming a visual nuisance and to prevent fire, windblown materials, vectors or water infiltration.

b. Areas which will not have additional waste placed on them for 12 months or more, but where final termination of operations has not occurred, shall be covered with a minimum of one foot of soil cover.

c. After final termination of disposal operations at the site or major part thereof, or upon revocation of a permit, the fill areas shall be covered with a cap in accordance with .1627(c) or in accordance with the rules at the time of closure.

Access and Safety

a. The facility shall be adequately secured by means of gates, chains, berms, fences, or other security measures approved by the DSWM to prevent unauthorized entry.

b. An attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.

c. The access road to the site shall be of all-weather construction and maintained in good condition.

d. Dust control measures shall be implemented when necessary.

e. Signs providing information on dumping procedures, the hours of operation, the permit number, and other pertinent information shall be posted at the site entrance.

f. Signs shall be posted stating that no MSW, hazardous waste or liquid waste can be received.

g. Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.
h. The removal of solid waste from the facility is prohibited unless the owner/operator approves and the removal is not performed on the working face.
i. Barrels and drums shall not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos.
j. Open burning of solid waste is prohibited.
k. The concentration of explosive gases generated at the facility shall not exceed:
    i. twenty-five percent of the limit for gases in site structures (excluding gas control or recovery system components; and
    ii. the lower explosive limit for gases at the facility boundary.

Erosion and Sedimentation Control

a. Adequate sedimentation and erosion control measures shall be practiced to prevent silt from leaving the site.
b. Adequate sedimentation and erosion control measures shall be practiced to prevent excessive on-site erosion.
c. Provisions for a vegetative ground cover sufficient to restrain erosion must be accomplished within 30 working days or 120 calendar days upon completion of any phase of C&D landfill development.

Drainage Control and Water Protection Requirements

a. Surface water shall be diverted from the operational area.
b. Surface water shall not be impounded over or in waste.
c. A separation distance of at least four feet shall be maintained between waste and the ground-water table.
d. Solid waste shall not be disposed of in water.
e. Leachate shall be contained on site or properly treated prior to discharge. An NPDES permit may be required prior to discharge of leachate to surface waters.

All pertinent landfill operating personnel will receive training and supervision necessary to properly operate this landfill.

6. Ground water quality at this facility is subject to the classification and remedial action provisions referenced in Rule .1634 thru .1637 of 15A NCAC 13B.

7. A closure and post-closure plan must be submitted for approval at least 90 days prior to closure or partial closure of any landfill unit. The plan must include all steps and measures necessary to close and maintain the facility in accordance with all rules in effect at that time. At a minimum, the plan shall address the following:

   a. Design of a final cover system; using the cap requirements outlined in Rule .1627
   b. Construction and maintenance/operation of the final cover system and erosion control structures;
   c. Surface water, ground water, and explosive gas monitoring.

MONITORING AND REPORTING REQUIREMENTS

1. Ground-water monitoring wells and monitoring requirements for the C&D landfill units shall be in accordance with the monitoring system approved in the TRANSITION PLAN for the facility and these additional conditions:

   a. Monitoring well design and construction shall conform to the specifications outlined in Attachment 2, "North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities".
   b. A geologist shall be in the field to supervise well installation, if necessary. The exact locations, screened intervals, and nesting of the wells shall be established after consultation with the SWS Hydrogeologist at the time of well installation for new monitoring wells.
   c. For each new monitoring well constructed, a well completion record shall be submitted to DSWM within 30 days upon completion.

d. Sampling equipment, procedures, and parameters shall conform to specifications outlined in the above-referenced guidance document, (Attachment 2), or the current guidelines established by DSWM at the time of sampling and in accordance with the approved TRANSITION PLAN OR ASSESSMENT AND REMEDIATION PLAN.

e. In order to determine ground-water flow directions and rates, each monitoring well shall be surveyed, and hydraulic conductivity values and effective porosity values shall be established for the screened intervals for each new monitoring well.

f. The permittee shall sample the monitoring wells semi-annually or as directed by the SWS Hydrogeologist.

g. A readily accessible unobstructed path shall be initially cleared and maintained so that four-wheel drive vehicles may access the monitoring wells at all times.

2. The permittee shall maintain a record of all monitoring events and analytical data. Reports of the analytical data for each water quality monitoring sampling event shall be submitted to DSWM in a timely manner.

3. The permittee shall maintain a record of the amount of solid waste received at the facility, compiled on a monthly basis. Scales shall be used to weigh the amount of waste received.

4. On or before 01 August 98 (or an earlier date as requested by the Solid Waste Section), and each year thereafter, the permittee shall report the amount of waste received (in tons) at this facility and disposed of in the landfill to the Solid Waste Section and to all counties from which waste was accepted, on forms prescribed by the Section. This report shall include the following information:

a. The reporting period shall be for the previous year, beginning 01 July and ending on 30 June;

b. The amount of waste received and landfilled in tons, compiled on a monthly basis, according to Condition 6 described above; and

c. Documentation that a copy of the report has been forwarded to all counties from which waste was accepted.

5. All records shall be maintained on-site and made available to the SWS upon request.

6. The Post-Closure plan approved in the TRANSITION PLAN shall be implimented and followed upon capping and closing the operating unit(s).

ATTACHMENT LIST

List of Additional Documents for the Approved Transition Plan

1. Site and Construction Transition Plan modification application for the Edgecombe County Landfill, Permit #33-01. Document titled Amendment No. 15 to the Transition Plan for Edgecombe County, North Carolina; dated 8 December 1997.

2. Site plans dated December 1997; Edgecombe County, North Carolina Construction and Demolition Landfill.

SECTION C-8

Amendment to Financial Assurance Mechanism

Edgecombe County

Phone: (252) 641-7840
Fax: (252) 641-0456

Finance Department

June 25, 2008

Amy Kadrie-NCDENR
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Edgecombe County Financial Assurance

Dear Sir:

I am the chief financial officer of Edgecombe County, 201 St. Andrew Street, Tarboro, NC 27886. This letter is in support of this unit of local government's use of the financial test to demonstrate financial assurance, as specified in 15A NCAC 13 B.1628 (e) (1) (F). This letter is an update of the letter sent on November 30, 2007. The update is required per Rule 15A NCAC 13B Rule .0547(4)(e). The C&D costs for closure and post-closure have been revised and corrective action costs for the old (MSW) landfill have been added.

This unit of local government is the owner or operator of the following facility for which financial assurance for closure, post-closure, or corrective action is demonstrated through the financial test specified in 15A NCAC 13B.1628 (e) (1) (F). The current closure, post-closure, or corrective action cost estimates covered by the test are shown for the facility:

Permit Number - #33-01
Edgecombe County Sanitary Landfill
Address – Rt 3 State Road 1601

Closure cost estimates -	$2,044,626
Post-closure cost estimates	1,426,643
Corrective Action	2,235,000
Total -	$5,706,269

Edgecombe County

The fiscal year of this unit of local government ends on June 30, 2008. The figures for the following items marked with an asterisk are derived from this unit of local government's Annual Financial Information Report (AFIR) for the latest completed fiscal year, ended June 30, 2007.

I hereby certify that the wording of this letter is identical to the wording in 15A NCAC 13B .1628 (e) (2) (G) as such rules were constituted on the date shown immediately below. I further certify the following: (1) that the unit of local government has not operated at a total operating fund deficit equal to five percent or more total annual revenue in either of the past two fiscal years, (2) that the unit of local government is not in default on any outstanding general obligation bond or long-term obligations, and (3) does not have any outstanding general obligation bonds rated lower than Baa as issued by Moody's, BBB as issued by Standard & Poor's, BBB as issued by Fitch's, or 75 as issued by the Municipal Council.

JoAnne J. Harrell
FINANCE DIRECTOR

June 25, 2008

P.O. Box 10• 201 Saint Andrew Street •Tarboro, North Carolina 27886

Edgecombe County

APPENDIX

BOND RATING INDICATOR OF FINANCIAL STRENGTH

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shown in paragraphs above] $ 5,706,269

2. Current bond rating of most recent issuance and name of rating service Moodys-**A3** Standard & Poors-**A**

3. Date of Issuance bond Feb. 1, 2006

4. Date of maturity bond Feb. 1, 2026

5. Assured environmental cost to demonstrate financial responsibility in the following amounts under Division rules:

MSWLF under 15A NCAC 13B .1600	$5,706,269
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 .0010 And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$5,706,269

6. Total Annual Revenue (AFIR Part 2) $62,678,062

Circle either "yes" or "no" to the following question.

7. Is line 5 divided by line 6 less than or equal to 0.43? yes /no

Edgecombe County

APPENDIX

RATIOS INDICATORS OF FINANCIAL STRENGTH

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shoen in the paragraphs above]	$ 5,706,269
*2. Sum of cash and investments (AFIR Part 7)	$25,291,043
*3. Total expenditures (AFIR Part 4 Columns a & b Part 5 for municipalities or Part 5 excluding educational capital outlays for counties)	$71,093,818
*4. Annual debt service (AFIR Part 4 Section I)	$ 3,196,918
5. Assured environmental costs to demonstrate financial Responsibility in the following amount under Division rules:	
MSWLF under 15A NCAC 13B .1600	$ 5,706,269
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 . And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$ 5,706,269
*6. Total Annual Revenue (AFIR Part 2)	$62,678,062

Circle either "yes" or "no" to the following questions.

7. Is line 5 divided by line 6 less than or equal to 0.43?	yes /no
8. Is line 2 divided by line 3 greater than or equal to 0.05?	yes /no
9. Is line 4 divided by line 3 less than or equal to 0.20?	yes /no

Detailed Evaluation of Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
1 – Monitored Natural Attenuation (MNA) of GW	MNA provides a long term method of reducing impact to environment. MNA will not eliminate potential for human exposure, groundwater & surface water will be monitored.	MNA is allowable under current federal and state regulations.	**Short:** MNA will provide no short term reductions in GW impact. **Long:** MNA will provide method to monitor long term attenuation mechanisms, reduce impact to environment and reduce potential for future human exposure. Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. The GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering, permitting, groundwater flow modeling, and installing additional monitoring wells as required is approx. **$120,000** Annual Maintenance, GW sampling & reporting is approx. **$40,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$555,000** 30 yr total: Approx. **$1,355,000**	MNA is a common and often used remedial option. Must prove viability of MNA. Concurrence of MNA by downgradient property owners may be required.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Detailed Evaluation of Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4A – In-Situ Isolation: Install a 2,200' Long, 30' Deep Barrier Wall **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent**.**	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and barrier wall installation is approx. **$615,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$1,100,000** 30 yr total: Approx. **$2,000,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.
4B – In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Annual Contouring, Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$485,000** 30 yr total: Approx. **$1,385,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.

Notes:
GW – Groundwater COC – Contaminant of Concern RGs – Remedial Goals

Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4C – In-Situ Isolation: Increase Slope of Closed MSW Area **Option 1 – MNA will also have to be performed**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent**.**	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent**.**	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$25,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$510,000** 30 yr total: Approx. **$1,410,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option.
4D – In-Situ Isolation: Stormwater Improvements on Western Half of Landfill. **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent**.**	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent**.**	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$30,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$515,000** 30 yr total: Approx. **$1,415,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option

GW – Groundwater COC – Contaminant of Concern RGs – Remedial Goals

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

General Site Information

Cap System Construction		
Total area Requiring Closure	35.4	ac
Area of Landfill Requiring Regrading and Cover Material (10 Percent of the Closure Area)	3.5	ac
Volume of Soil required for 18-inch Low Permeability Layer	85,670	cy
Volume of Soil required for 18-inch Vegetation/Erosion Layer	85,670	cy
Stormwater Downchutes	1,500	lf
Perimeter Channels	1,250	lf
Stormwater Benches	5,000	lf
Gas Vent System Construction		
Number of Gas Vents	32	ea
Total Length of Gas Vent to be Installed (50' Avg Depth)	1,600	lf

Closure Cost Estimate

	Quantity	Unit	Unit Price	Total
Task 1- Engineering Services				
Prepare Construction Drawings and Specifications	1	lump sum	$10,000	$10,000
Bid Process (Including Announcements)	1	lump sum	$5,000	$5,000
			Subtotal Task 1 =	**$15,000**
Task 2 - Mobilization				
Mobilization/Demobilization (5% of Construction Cost)	1	lump sum	$50,036	$50,036
Construction and Record Surveying and Deed Notation	35.4	acre	$1,350	$47,790
			Subtotal Task 2 =	**$97,826**
Task 3 - Low Permeability Layer				
Regrade Existing C&D Waste and Complete Intermediate Cover	3.5	acre	$750	$2,625
Place 18-inch Low Permeability Layer	85,670	cy	$5.50	$471,185
			Subtotal Task 3 =	**$473,810**
Task 4 - Vegetation/Erosion Layer				
Place 18-inch Vegetation/Erosion Layer	85,670	cy	$4.75	$406,933
Seeding and Fertilizing the Topsoil Layer	35.4	acre	$1,200	$42,480
			Subtotal Task 4 =	**$449,413**
Task 5 - Surface Drainage Structures				
Downchute Channels	1,500	lf	$15.00	$22,500
Stormwater Benches	5,000	lf	$6.00	$30,000
Perimeter Channels	1,250	lf	$20.00	$25,000
			Subtotal Task 5 =	**$77,500**

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

Task 6 - Gas System Mobilization and Construction Survey				
Mobilization/Demobilization	1	lump sum	$13,500	$13,500
Construction Survey	1	lump sum	$7,500	$7,500
			Subtotal Task 6 =	**$21,000**
Task 7 - Gas System Installation				
Install Gas Vents	1,600	lf	$70.00	$112,000
Install Gas Vent Heads	32	ea	$350	$11,200
			Subtotal Task 7 =	**$123,200**
Task 8 - CQA and Certification				
Low Permeability Layer CQA	140	hrs	$45.00	$6,300
Low Permeability Layer Laboratory Testing	9	ea	$300.00	$2,700
Erosion Layer CQA	120	hrs	$45.00	$5,400
Erosion Layer Laboratory Testing	9	ea	$100.00	$900
Gas System CQA	120	hrs	$45.00	$5,400
CQA Project Management	100	hrs	$85.00	$8,500
CQA Report and Certification	1	lump sum	$10,000	$10,000
			Subtotal Task 8 =	**$39,200**
			Project Subtotal=	**$1,296,949**
Contingency Fee (10%)	1	10% total	$129,695	$129,695
			Project Total=	**$1,426,643**
			Cost Per Acre=	**$40,301**

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

General Site Information

Post-Closure Monitoring and Maintenance

Total Area Requiring Post-Closure (Permitted Area)	68.0	ac
Post-Closure Period	30	years
Number of Groundwater Monitoring Wells	7	ea
Number of Gas Monitoring Probes	11	ea
Number of Surface Water Sampling Points	2	ea

	Quantity	Unit	Unit Price	Total
Task 1 - Groundwater and Surface Water Sampling and Analysis				
Sampling Crew (2 man crew)	48	hours	$70	$3,360
Equipment	1	lump sum	$1,301	$1,301
Laboratory Analysis	1	lump sum	$4,592	$4,592
Report (Includes Surface Water Reporting)	1	lump sum	$5,750	$5,750
Project Coordination	1	lump sum	$1,000	$1,000
			Cost per Sampling Event =	$16,003
Cost for Groundwater Monitoring for Post-Closure Period	60	events	$16,003	$960,195
(Assuming Biannual Sampling Frequency or 60 Sampling Events)			**Subtotal Task 1 =**	**$960,195**
Task 2 - Gas Probe Monitoring				
Sampling Crew (2 man crew)	4	hours	$75	$300
Project Management and Report	1	lump sum	$175	$175
Equipment and Expenses	1	lump sum	$165	$165
			Cost per Sampling Event =	$640
Cost for Gas Probe Monitoring for Post-Closure Period	120	events	$640	$76,800
(Assuming Quarterly Sampling Frequency or 120 Sampling Events)			**Subtotal Task 2 =**	**$76,800**

Task 3 - Erosion and Settlement Repairs

Assume that 10% of the post-closure area will require repair in the first 5 years from erosion and settlement at an average depth of 1.0' (6.8 ac @ 1.0 ft deep = 10,971 cy). Assume that 5% of the post-closure area will require repair repair from settlement and erosion for the remaining post-closure period. (3.4 ac @ 1.0 ft deep = 5,485 cy)

Erosion and Settlement Repair	16,456	cy	$6.00	$98,736
Reseeding	10.2	ac	$1,200	$12,240
			Subtotal Task 3 =	**$110,976**

Task 4 - Reseeding and Fertilizing

Assume that the post-closure area will require reseeding and fertilizing of 30% of the post-closure area annually for the first 2 years of the post-closure period. For the remaining 28 years, it is assumed that 5% of the post-closure area will require reseeding and fertilizing annually (2 years * 0.30 * 57.9 ac/year = 57.9 ac) + (28 years * 0.05 * 57.9 ac = 81.1 ac).

Reseeding and Fertilizing	136.00	ac	$1,200	$163,200
			Subtotal Task 4 =	**$163,200**

Task 5 - Mowing

Assume the post-closure area will be mowed 2 times each year during the post-closure period.

Mowing	68.0	ac	$50	$3,400
			Cost per Event =	$3,400
Cost for Mowing for Post-Closure Period	60	events	$3,400	$204,000
(Assuming Biannual or 60 Events)			**Subtotal Task 5 =**	**$204,000**

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

Task 6 - Surface Water Control Structures Maintenance
Assume the surface water control structures will be maintained on an annual basis at an estimated cost of $100 per hour.

Surface Water Control Structure Maintenance	20	hr	$100	$2,000
			Cost per Event =	$2,000
Cost for Surface Water Control Structure Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 6 =	**$60,000**

Task 7 - Security and Maintenance
Assume that the annual cost for security, fencing repairs, gate repairs, road maintenance and signs is $2,000.

Cost for Security and Maintenance for Post-Closure Period	30	events	$2,000	$60,000
			Subtotal Task 7 =	**$60,000**

Task 8 - Groundwater Monitoring Well Repair
Assume the annual cost for groundwater well repair is $2,000.

Cost for Groundwater Well Repair for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 8 =	**$60,000**

Task 9 - Gas System Repair and Maintenance
Assume that 10 gas vents at an average depth of 50 feet will be replaced during the post-closure period. Assume that 10 gas monitoring probes will be replaced during the post-closure period. Assume the gas system will require 100 hours per year to complete.

Gas Vent Replacement	50	ft	$70.00	$3,500
Gas Monitoring Probe Replacement	1	ea	$750.00	$750
			Cost per Event =	$4,250
Cost for Gas Vent and Gas Probe Replacement for Post-Closure Period (Assuming 10 Events)	10	events	$4,250	$42,500
			Subtotal =	**$42,500**
Gas System Monitoring and Maintenance	100	hrs	$40.00	$4,000
			Cost per Event =	$4,000
Cost for Gas System Monitoring and Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$4,000	$120,000
			Subtotal =	**$120,000**
			Subtotal Task 9 =	**$162,500**
			Post-Closure Subtotal=	**$1,857,671**
Contingency Fee (10%)	1	10% total	$185,767	$185,767
			Post-Closure Total=	**$2,043,438**

SECTION D

CLOSURE AND POST-CLOSURE PLAN
[RULE .1627]

FILE COPY

CLOSURE AND POST-CLOSURE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-07-242

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 2008

NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

6-30-08

John A. Moody, P.E.
Project Manager
NC Licensed Engineer No. 024294

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS 6/30/08

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

TABLE OF CONTENTS

1. BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Project Information 1
2. CLOSURE PLAN 2
2.1 Cap System 2
2.1.1 Low-Permeability Barrier 2
2.1.2 Vegetation/Erosion Layer 3
2.1.3 Gas Venting System 3
2.1.4 Alternate Cover System 3
2.2 Storm Water Management Systems 4
2.3 Largest Area Requiring Capping 4
2.4 Estimated Maximum Inventory of Wastes 4
2.5 Closure Schedule 4
2.6 Financial Assurance 5
3. POST-CLOSURE PLAN 6
3.1 General 6
3.2 Maintenance Activities 6
3.3 Monitoring Activities 6
3.3.1 Groundwater Monitoring 7
3.3.2 Surface Water Monitoring 7
3.3.3 Gas Monitoring 7
3.4 Facility Contact 7
3.5 Post-Closure Planned Use 7
3.6 Financial Assurance 8
3.7 Certification 8

FIGURES

Figure 1 Title Sheet
Figure 2 Existing Conditions
Figure 3 Proposed Final Grading
Figure 4 5-Year Filling Plan – Years 1 Through 4
Figure 5 5-Year Filling Plan – Year 5
Figure 6 Borrow Area Plan
Figure 7 Final Cover and Gas Vent Details
Figure 8 Stormwater Management/Erosion Controls Details I
Figure 9 Stormwater Management/Erosion Controls Details II
Figure 10 Stormwater Management/Erosion Controls Details III

APPENDICES

Appendix I Borrow Area Wetland and Geotechnical Evaluation Report
Appendix II Storm Water Calculations
Appendix III Closure Cost Estimate
Appendix IV Post-Closure Monitoring Form
Appendix V Post-Closure Cost Estimate

CLOSURE AND POST-CLOSURE PLAN
EDEGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Closure and Post-Closure Plan was prepared to establish criteria for the closure of all waste units and subsequent requirements for post-closure compliance of the above-referenced construction and demolition (C&D) landfill in accordance with Solid Waste Management Rules, Section .1627. The information contained in this plan will be used to assist Edgecombe County in the closure of active waste units at any point during the active life of the C&D landfill, and the maintenance and monitoring of the facility required during the post-closure care period.

1.2 Project Information

The Edgecombe County C&D Landfill is located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill site is bounded to the north by Jerry's Creek, to the east by Sate Route 1601 and to the west and south by undeveloped agricultural land. The landfill site is shown on the Site Vicinity Map (Title Sheet). Beyond Jerry's Creek to the north is the "old landfill," a pre-Subtitle D landfill which stopped receiving waste in 1979. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory. North of the northern old landfill is Wright's Creek, which merges with Jerry's Creek east (downstream) of the site.

The existing C&D landfill is operated on top of a closed municipal solid waste (MSW) landfill. The MSW unit consists of two sections, an eastern section and a western section. The eastern section is approximately 33 acres, began receiving waste in 1979, and was closed prior to 1991. The cap in this area consists of 2 feet of soil. The western section is approximately 35 acres, began receiving waste in 1991 and was closed in 2000. The cap consists of 2.5 feet of soil.

The North Carolina Department of Environment and Natural Resources (NCDENR) issued Permit No. 33-01 to construct and operate a C&D landfill unit over the existing closed MSW unit on December 30, 1997. The County has continued to operate the C&D landfill in accordance with that permit since that time. The landfill currently receives an average of approximately 45 tons of C&D waste per day based on waste receipts over the past five (5) years, although it received as much as 600 tons per day of waste in 1999-2000 following Hurricane Floyd.

Waste operations on the facility properly, which are located west of State Route 1601 (Colonial Road) include:

- Tire collection area for shipment to an off-site vendor;
- Equipment Maintenance buildings, and
- Employee break trailer.

Other waste operations on the facility property, which are located east of State Route 1601 (Colonial Road) include:

- MSW Transfer Facility which operates under Permit No. 33-02T;
- Yard Waste Processing Area;
- Pesticide Container Recycling Building for shipment to an off-site vendor;
- White goods collection area for shipment to an off-site vendor;
- Borrow areas for landfill cover soils; and
- Several buildings used for office, equipment maintenance, and employee break trailer.

A water supply well is located on-site at the County-owned property on the east side of Colonial Road; however, this well has been removed from service. The water for the facility is supplied from the County-wide municipal water distribution system.

2. CLOSURE PLAN

2.1 Cap System

The cap system has been designed to minimize storm water infiltration into the landfill and to resist erosive forces. A construction plan including construction drawings and specifications shall be prepared for construction of the cap system. The construction plan shall incorporate the design provided in this section and the accompanying drawings. The drawings for the cap system are provided in the Figures section.

The proposed cap system will consist of the following:

- 18-inch thick Low-Permeability Barrier; and
- 18-inch thick Vegetation/Erosion Layer.

If the landfill must be closed prior to reaching the final contours, the surface of the landfill will be sloped to a minimum post-settlement grade of 5 percent and maximum grade of 25 percent.

2.1.1 Low-Permeability Barrier

The low-permeability barrier is designed to minimize infiltration into the landfill and to provide a sound working platform over the C&D waste prior to placement of the erosion layer. The low-permeability barrier will consist of at least 18 inches of compacted soil with a coefficient of permeability of approximately $1x10^{-5}$ cm/sec. The low-permeability barrier will extend over the entire C&D waste area and onto the existing perimeter embankment.

A borrow study was conducted to evaluate the presence and location of suitable soil in the borrow areas to meet the requirements for the cap system including the low permeability barrier. Two soil borrow areas located east of State Route 1601 were sampled using test pit excavations. Selected soil samples were returned to S&ME's soil laboratory for soil classification and testing. A copy of the report, including test pit locations, sample depths, and test results are provided in Appendix I.

The laboratory soil test results indicated that the samples obtained from Borrow Area 1 have material suitable for the cap system. The laboratory soil test results for Borrow Area 2 indicate material suitable for daily and intermediate cover but not for the low permeability cap system.

2.1.2 Vegetation/Erosion Layer

The vegetation/erosion layer consists of at least 18 inches of earthen material capable of supporting native plant growth, prohibiting vector intrusion, and protecting the underlying low-permeability barrier from damage due to desiccation (from drying) and from freeze-thaw.

The cover system will be planted with grass to stabilize the cover soils, minimize erosion, and reduce cover system maintenance. The soil will be prepared by fertilizing, amending the soil, and seeding in accordance with the North Carolina Erosion and Sediment Control Guidelines.

2.1.3 Gas Venting System

The existing gas venting system for the landfill consists of perforated 6-inch diameter high density polyethylene (HDPE) pipe surround by gravel. Four vents within the active C&D Landfill were recently extended using schedule 40 PVC pipe surrounded by gravel with solid 6-inch diameter HDPE stick-up pipe. The gas vents are extended prior to placing C&D waste in an area. Prior to placing the soil layers of the cap system, the gas vent shall be extended, as necessary, so that there is a minimum 3 feet of stick-up above the vegetation/erosion layer. A monitoring port shall be installed above the ground to allow sampling and flow measurements of the gas. The drawings for the gas vents are provided in the Figures section.

The proposed final cover system on the landfill top deck (slopes of 5 percent or less) will consist of the following from top to bottom:

2.1.4 Alternate Cover System

A proposed alternate cover system for the facility would be the following:

- 6-inch thick erosion layer;
- 18-inch thick low-permeability barrier; and
- geosynthetic clay liner (GCL).

2.2 Storm Water Management Systems

The proposed landfill is designed with a network of various storm water controls and conveyances to manage storm water during active operations, over interim cover soils, and upon final closure. Storm water will be conveyed to sediment basins and sediment traps located around the landfill perimeter. During active operations, storm water will be managed by interim cover soils, temporary drainage swales, down-drain pipes, and perimeter drainage channels. Upon landfill closure, storm water will be collected and conveyed through a network of drainage benches and down-drain pipes to the perimeter surface water management system. Plans and details illustrating the storm water management system are provided in the Figures section. Engineering analyses supporting the storm water management system design are provided in Appendix II.

2.3 Largest Area Requiring Capping

The maximum area of the landfill that would require closure operations at any one time is approximately 35.4 acres.

2.4 Estimated Maximum Inventory of Wastes

The maximum amount of C&D waste at the facility will be approximately 1,699,300 cubic yards (cy). The amount of MSW in the landfill beneath the C&D landfill is approximately 1,108,000 cy.

2.5 Closure Schedule

Prior to closure of any area, the County shall notify NCDENR, Division of Waste Management that a notice of intent to close the area has been placed in the Operating Record.

The County shall begin closure activities of each area no later than 30 days after the final known date on which the area receives wastes. If the area has remaining capacity and there is a reasonable likelihood that the area will receive additional wastes, the area will be closed no later than one year after the most recent receipt of wastes. If an extension beyond the one-year deadline for beginning closure is required, the County will demonstrate to NCDENR that the area has the capacity to receive additional wastes and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the unclosed area.

The County shall complete closure activities of each area in accordance with the closure plan within 180 days following the beginning of closure. If an extension of the closure period is required, the County will demonstrate to NCDENR that closure will, of necessity, take longer than 180 days and County has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed area.

Following closure of each area, the County shall notify the Division that a certification, signed by the project engineer verifying that closure has been completed in accordance with the Closure Plan, has been placed in the Operating Record.

Following closure of all units, the County shall record a notation on the deed to the landfill facility property, or some other instrument that is normally examined during title search, and notify the Division that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that:

- The land has been used as a landfill facility; and
- Its use is restricted under the closure plan approved by the Division.

The County may request permission from the Division to remove the notation from the deed if all wastes are removed from the facility.

2.6 Financial Assurance

The County has prepared a detailed written estimate, in current dollars, of the cost of hiring a third party to close the largest area of the C&D landfill at any time during the active life of the facility. A copy of the detailed closure cost estimate is included as Appendix III and shall be placed in the facility Operating Record.

The largest area to be closed at any one time is 35.4 acres. The cost estimate includes the following items:

- Final cap system (including soil, aggregate, testing, and documentation);
- Sedimentation and erosion control devices;
- Gas controls;
- Final landscaping (including seeding, fertilizing, and mulching);
- Mobilization/demobilization;
- Engineering construction management and construction quality assurance (CQA);
- Administration (including announcements, deeds, and fees); and
- Labor.

The cost estimate assumes that the soils required for the final closure are available on-site. Soil laboratory testing was performed on on-site soils that appear to be suitable for the low permeability soil layer (i.e., permeability approximately $1x10^{-5}$ cm/sec). Based on test results, the soil is suitable for construction of the low permeability soil layer. Other borrow areas and stockpiles are available on the site for the cover soil and vegetation/erosion layer. The laboratory analyses results are provided in Appendix I.

During the active life of the landfill, the County shall annually adjust the closure cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Division. The County shall increase the closure cost estimate and the amount of financial assurance provided if changes to the closure plan or facility conditions increase the maximum cost of closure at any time during the remaining active life.

The County may reduce the closure cost estimate and the amount of financial assurance if the cost estimate exceeds the maximum cost of closure at any time during the remaining

life of the landfill. Prior to any reduction of the closure cost estimate by the County, a written justification for the reduction shall be submitted to NCDENR, Division of Waste Management. No reduction of the closure cost estimate shall be allowed without Division approval. The reduction justification and the NCDENR approval shall be placed in the facility Operating Record.

The County shall establish financial assurance for closure of the C&D landfill in compliance with Rule .1628(e). The County shall provide continuous coverage for closure until released from financial assurance requirements by demonstrating compliance with Rule .1627(c) for final closure certification.

3. POST-CLOSURE PLAN

3.1 General

The Post-Closure Plan outlines the monitoring and maintenance activities intended to maintain cover system integrity during the post-closure period. The post-closure period is a minimum of 30 years. During the post-closure period the landfill cover system and related facilities must be monitored and maintained.

3.2 Maintenance Activities

Maintenance required for the final cover is anticipated to be minimal. The vegetative cover shall be mowed a minimum of once a year. The vegetative cover shall be amended and fertilized as needed to maintain healthy vegetation. Depressions in the cover that pond water or otherwise impair the function of the final cover will be filled and/or regraded. Areas subject to regrading will be revegetated. Animal burrows and eroded areas should be filled in with compacted soil and reseeded. If vegetative cover is not adequate in a particular area, fertilizer should be applied and the area re seeded in order to re establish vegetation. Insecticides may be used to eliminate insect populations that are detrimental to the vegetation. Any deep-rooted or woody vegetation that may have established itself on the cover soil will be removed.

3.3 Monitoring Activities

Post-closure monitoring will be conducted quarterly for the first two years and semi-annually thereafter for the remainder of the post-closure period. The following cover system and landfill components will be monitored:

- Security measures such as fences, gates, locks, and other measures that control site and facility access;
- Surface water management systems for signs of erosion, sedimentation, and condition;
- Cover system for signs of erosion;
- Cover system for evidence of settlement or subsidence;
- Condition and/or presence of vegetation (for distressed or dying vegetation, woody vegetation with potential to penetrate the low permeability barrier);
- Condition of the landfill gas system (passive vents and monitoring probes); and
- Condition of the groundwater monitoring system.

Post closure monitoring will be documented on post-closure monitoring forms. Post-Closure Monitoring Form sheets are provided in Appendix IV. Completed post-closure monitoring forms will be maintained in the facilities operating record.

3.3.1 Groundwater Monitoring

Groundwater monitoring will be conducted consistent with the Water Quality Monitoring Plan (Operation and Waste Acceptance Plan, Appendix II) during the post-closure period. Consistent with current landfill operations, it is anticipated that groundwater monitoring will be conducted semi-annually. Groundwater monitoring results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.3.2 Surface Water Monitoring

Surface water monitoring will be conducted consistent with the facility Water Quality Monitoring Plan (Operation and Waste Acceptance Plan, Appendix II) and NPDES permit during the post-closure period. Consistent with current landfill operations, it is anticipated that surface water monitoring will be conducted semi-annually. Surface water monitoring results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.3.3 Gas Monitoring

Landfill gas monitoring will be conducted during the post-closure period consistent with the Gas Monitoring Plan (Operation and Waste Acceptance Plan, Appendix III). Gas monitoring results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.4 Facility Contact

The post-closure maintenance of the landfill will be the responsibility of the Supervisor of Solid Waste for Edgecombe County and will be the contact for the facility during the post-closure period. The Supervisor's address and telephone number is as follows:

Supervisor of Solid Waste
Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886
(919) 827-4253

3.5 Post-Closure Planned Use

Following closure operations, the landfill will be developed as a grassed area or possibly a recreational/wildlife area. Any post-closure use of the property shall not disturb the integrity of the cap system, base liner system, or any other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in Rule .1629. If the post-closure planned use is changed and may disturb the facility, the County shall obtain prior approval from NCDENR by demonstrating that disturbance of the cap system, base liner system, or other component of the containment system, including any removal of waste, will not increase the potential threat to human health or the environment.

3.6 Financial Assurance

The County has prepared a detailed written estimate, in current dollars, of the cost of hiring a third party to conduct post-closure care for the facility. The post-closure cost estimate is based on the most expensive total costs of post-closure care and accounts for annual and periodic costs as described above over the entire post-closure care period. A copy of the detailed post-closure cost estimate is included as Appendix V and shall be placed in the facility Operating Record.

The County shall annually adjust the post-closure cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Division. The County shall increase the post-closure care cost estimate and the amount of financial assurance provided if changes in the post-closure plan or facility conditions increase the maximum costs of post-closure care.

The County may reduce the post-closure cost estimate and the amount of financial assurance provided if the cost estimate exceeds the maximum costs of post-closure care remaining over the post-closure care period. Prior to any reduction of the post-closure cost estimate by the County, a written justification for the reduction shall be submitted to NCDENR, Division of Waste Management. No reduction of the post-closure cost estimate shall be allowed without Division approval. The reduction justification and NCDENR approval shall be placed in the Operating Record.

3.7 Certification

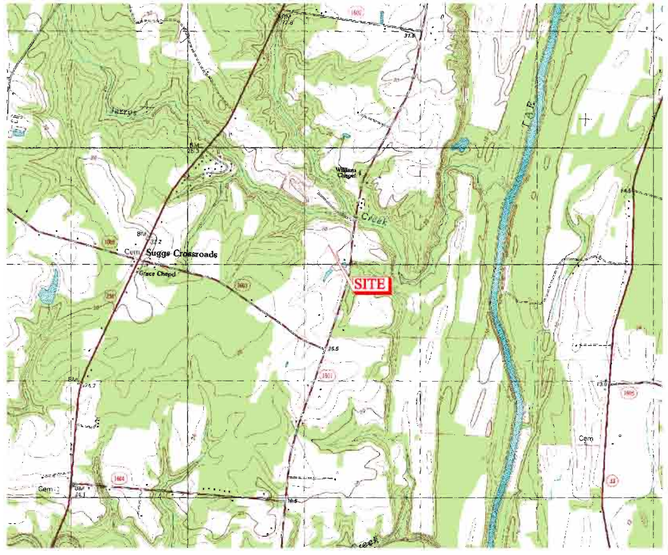
Consistent with regulations, the end of the closure-post closure period must be certified by a registered professional engineer. To accomplish certification over the required 30 year duration, a registered professional engineer will prepare annual certifications. The annual certifications will document that the cover system has been monitored and maintained in accordance with the Post-Closure Plan. The annual certifications shall be based on observations and results documented on regular post-closure monitoring reports, maintenance records, and compliance monitoring reports maintained in the operating record.

FIGURES

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
PERMIT # 33-01

EDGECOMBE COUNTY
TARBORO, NORTH CAROLINA

JUNE 2008



SITE VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

DRAWING	TITLE
1.	TITLE SHEET
2.	EXISTING CONDITIONS
3.	PROPOSED FINAL GRADING
4.	5-YEAR FILLING PLAN - YEARS 1 THROUGH 4
5.	5-YEAR FILLING PLAN - YEAR 5
6.	BORROW AREA PLAN
7.	FINAL COVER AND GAS VENT DETAILS
8.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS I
9.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS II
10.	STORMWATER MANAGEMENT/EROSION CONTROL DETAILS III

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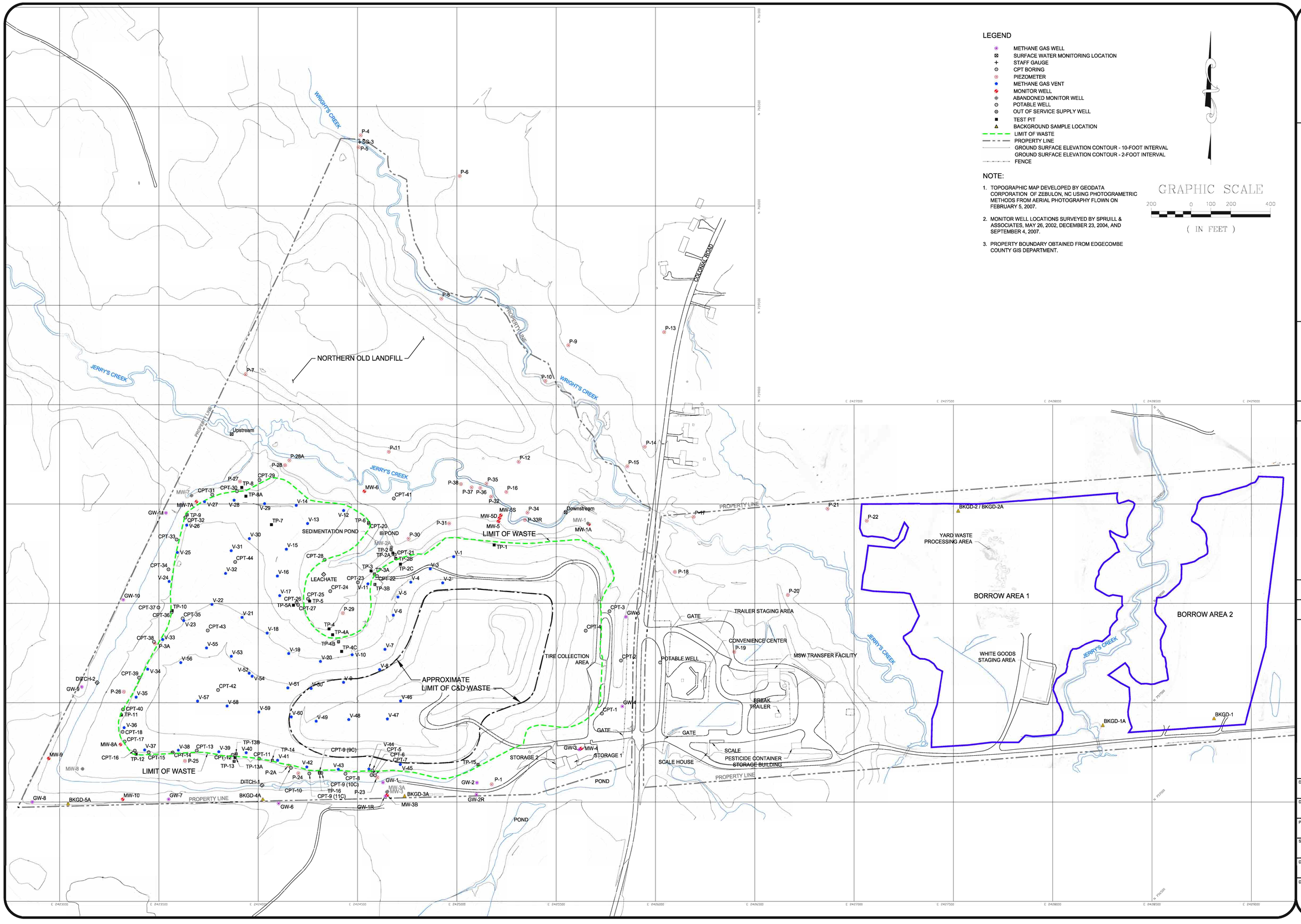
NO.	DATE	DESCRIPTION	BY

TITLE SHEET

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:
CHECKED BY:
DESIGNED BY:
APPROVED BY:
PROJECT NUMBER: 1054-07-242
SCALE: AS SHOWN
DATE: JUNE 2008
DRAWING NUMBER: D-1028-01
DRAWING: 1
OF: 10



LEGEND

- METHANE GAS WELL
- SURFACE WATER MONITORING LOCATION
- STAFF GAUGE
- CPT BORING
- PIEZOMETER
- METHANE GAS VENT
- MONITOR WELL
- ABANDONED MONITOR WELL
- POTABLE WELL
- OUT OF SERVICE SUPPLY WELL
- TEST PIT
- BACKGROUND SAMPLE LOCATION
- LIMIT OF WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

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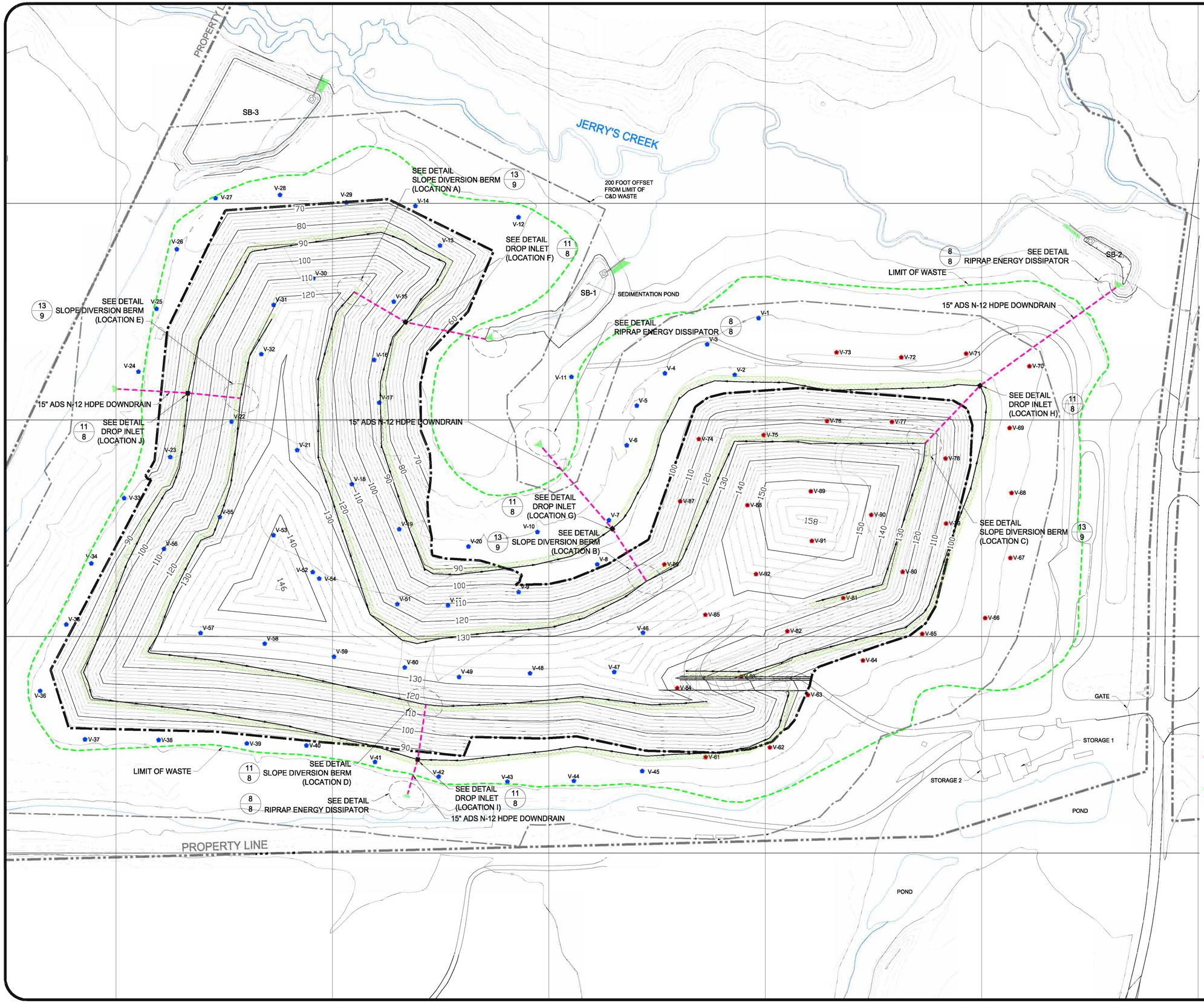
NO.	DATE	DESCRIPTION	BY

EXISTING CONDITIONS

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1023	
DRAWING: 2	OF: 10



NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

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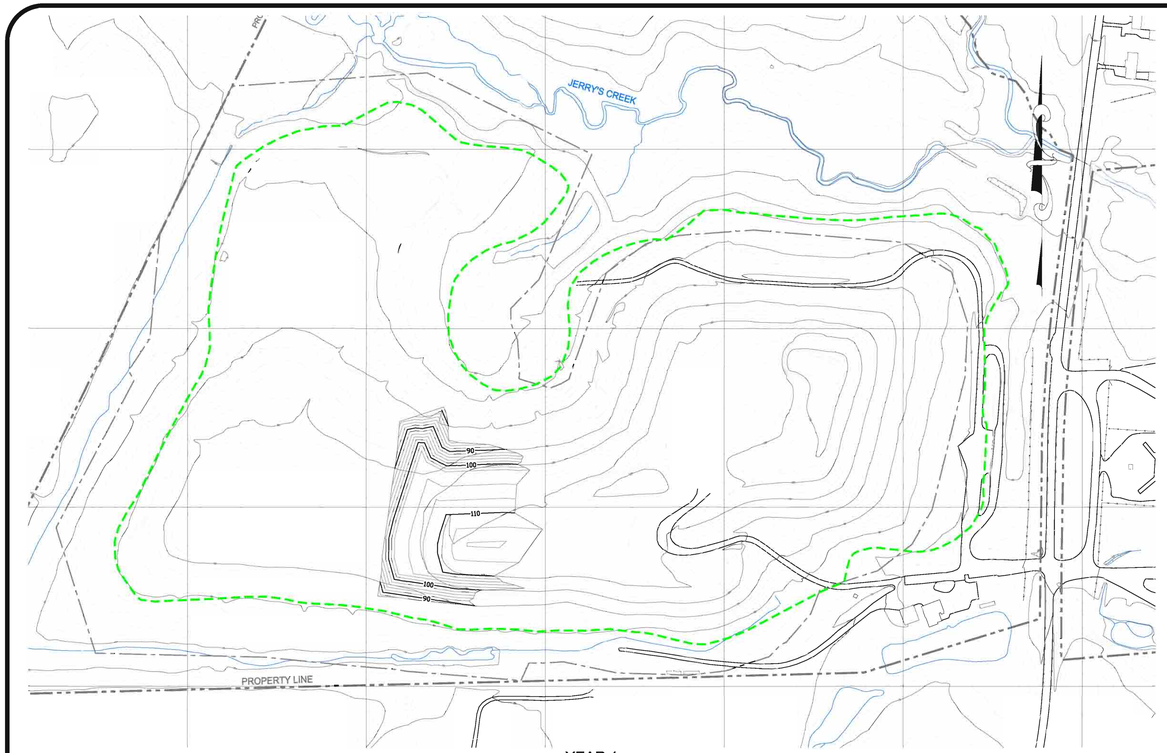
NO.	DATE	DESCRIPTION	BY

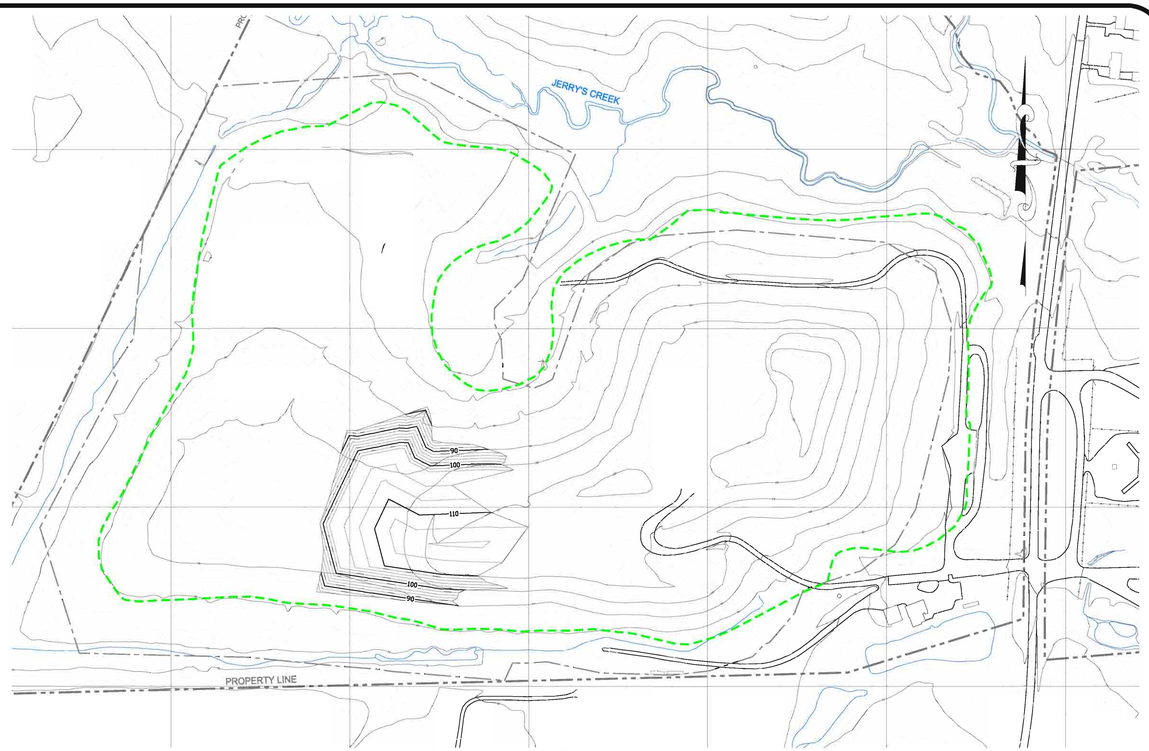
PROPOSED FINAL GRADING

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

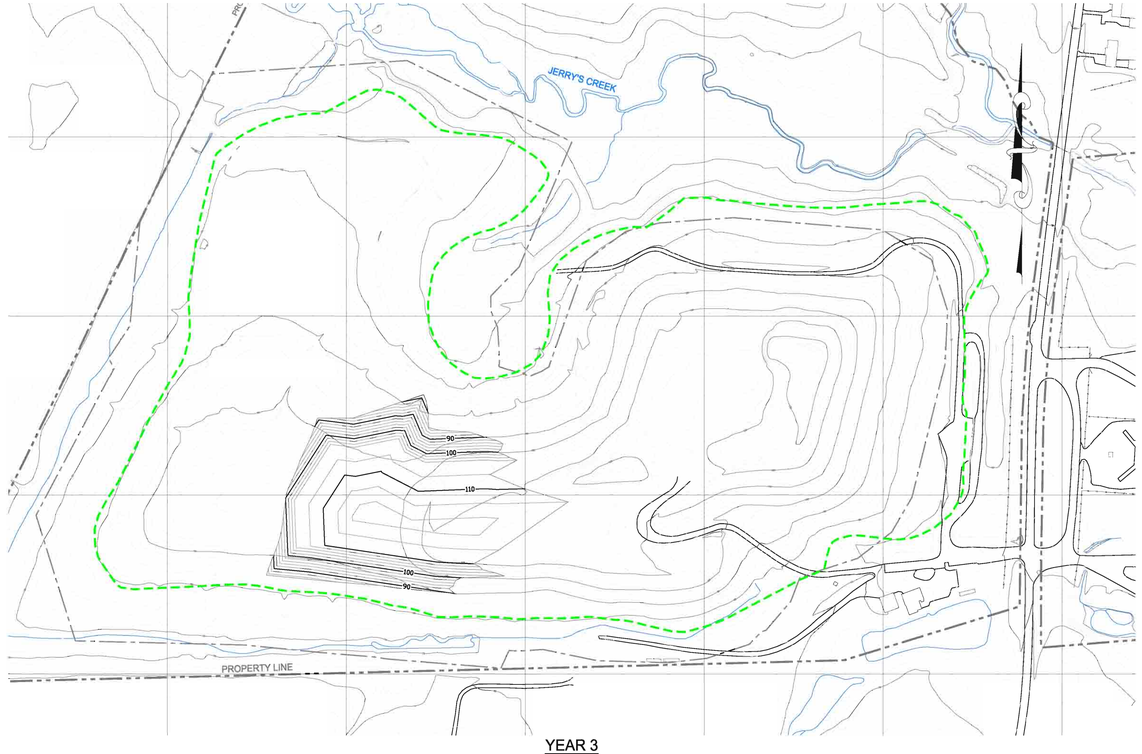
DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 100'	DATE: JUNE 2008
DRAWING NUMBER: D-1024	
DRAWING: 3	OF: 10



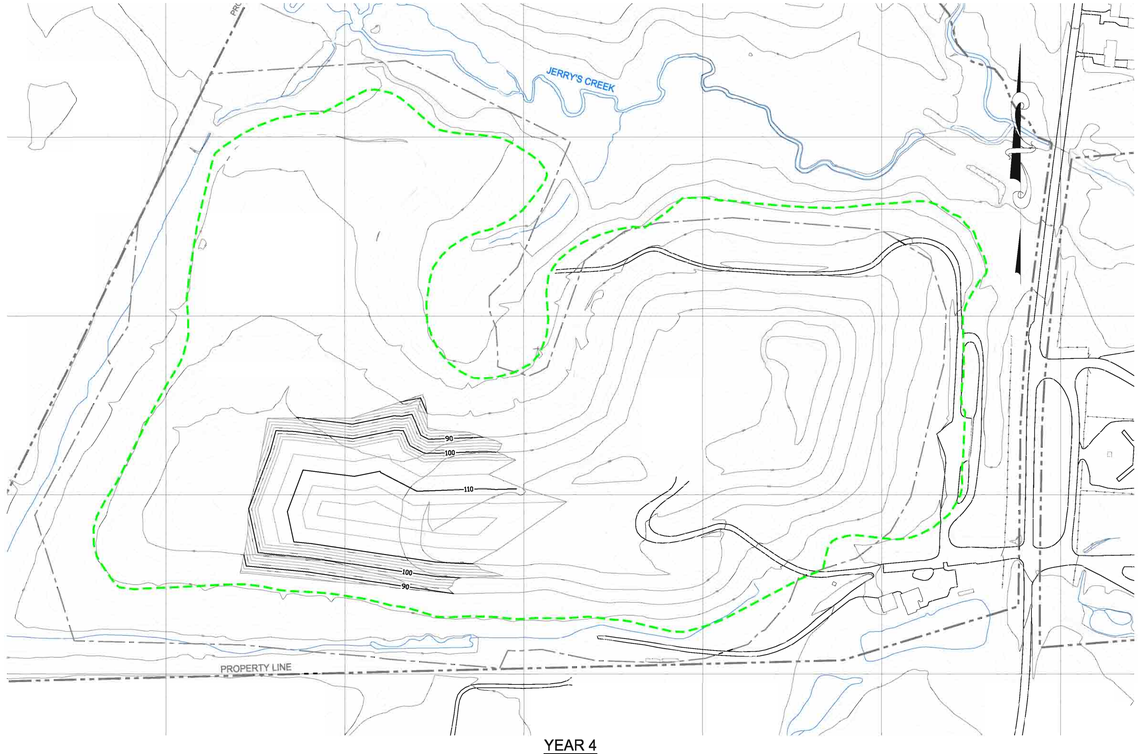
YEAR 1



YEAR 2



YEAR 3



YEAR 4

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- LIMIT OF WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D GRADE ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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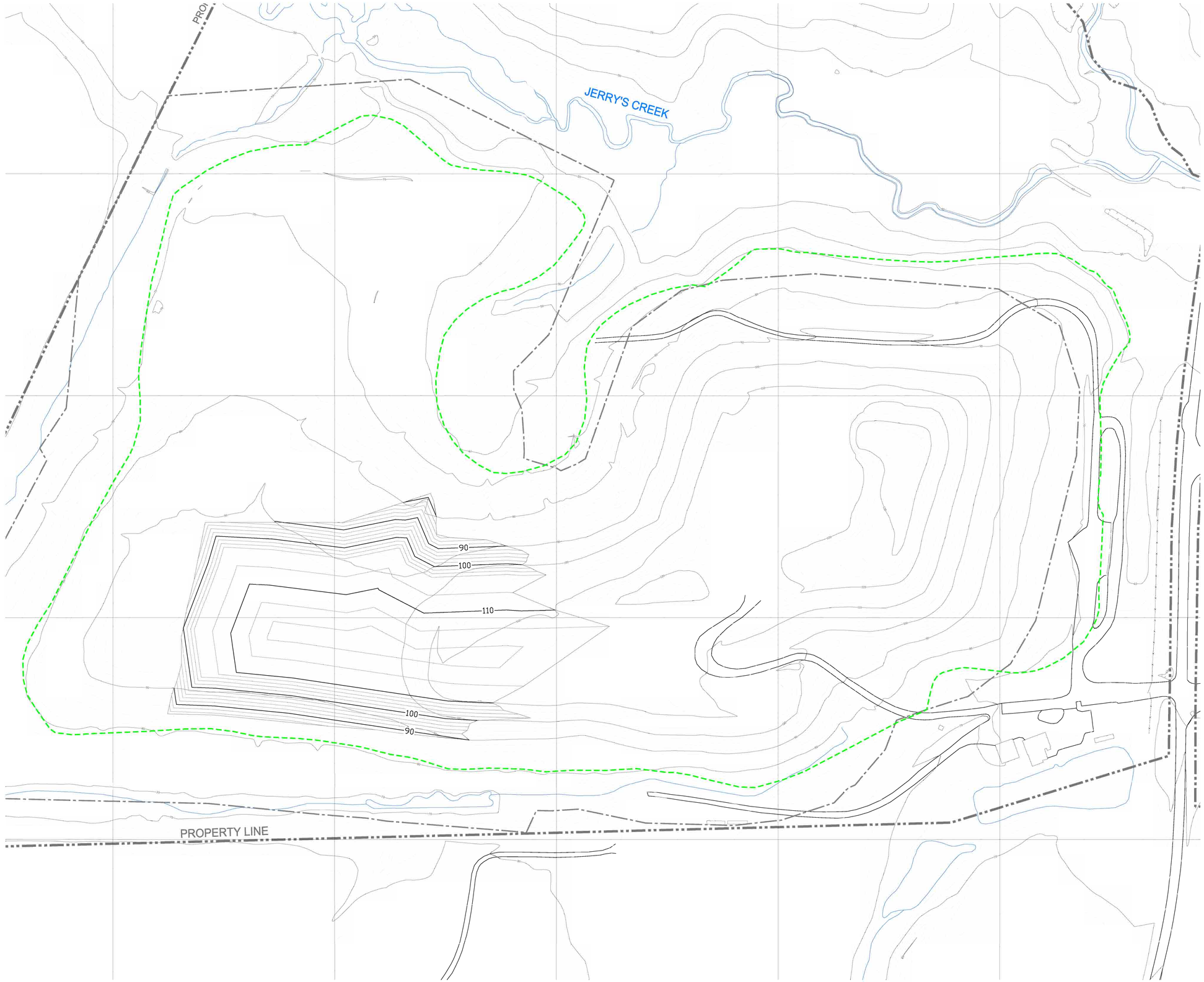
NO.	DATE	DESCRIPTION	BY

5 YEAR FILLING PLAN - YEARS 1 THROUGH 4

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1025-01	
DRAWING: 4	OF: 10



LEGEND

- LIMIT OF WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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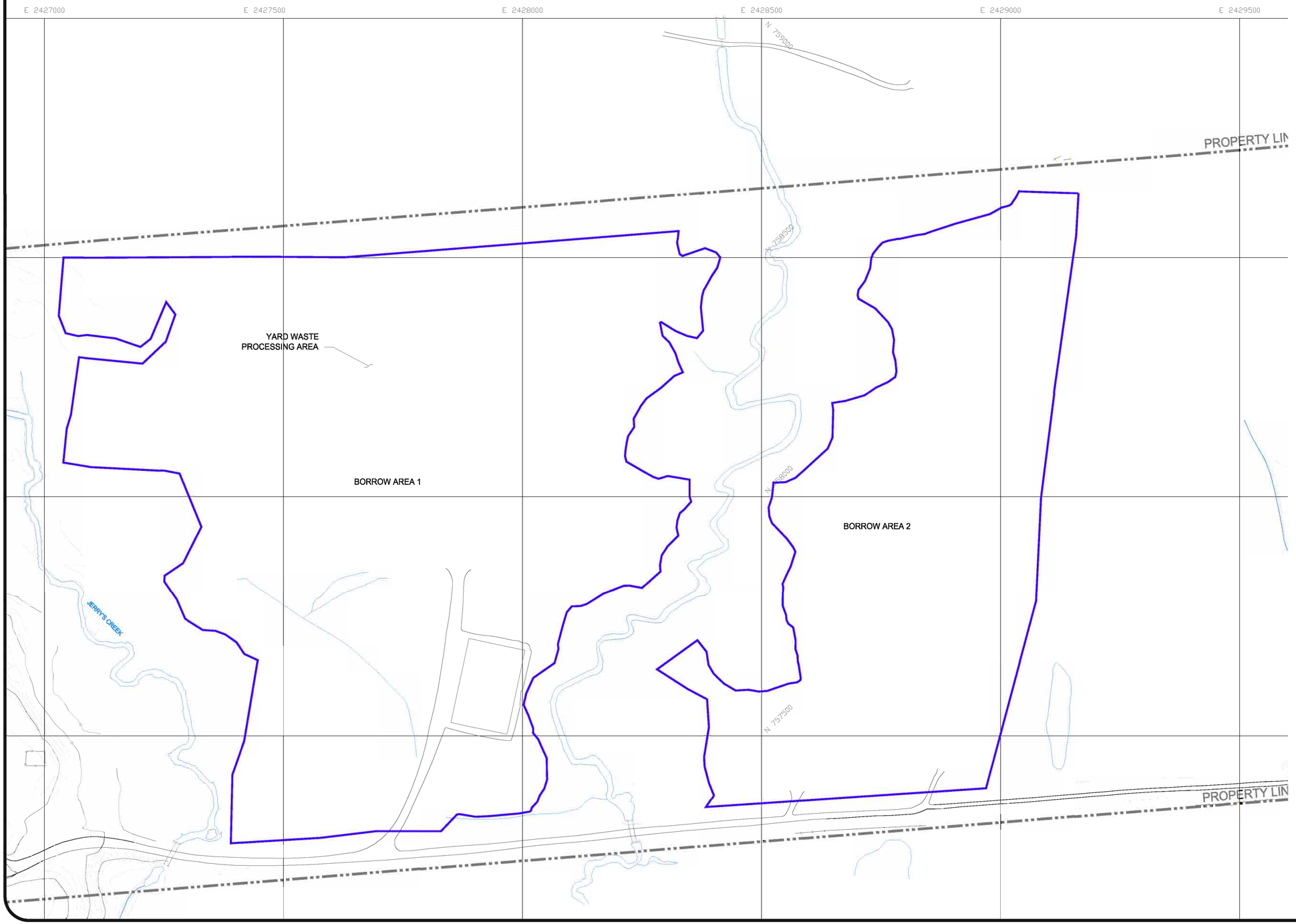
NO.	DATE	DESCRIPTION	BY

5 YEAR FILLING PLAN - YEAR 5

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1025-02	
DRAWING: 5	OF: 10



LEGEND

- BORROW AREA
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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NO.	DATE	DESCRIPTION	BY

BORROW AREA PLAN

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 100'	DATE: JUNE 2008
DRAWING NUMBER: D-1026	
DRAWING: 6	OF: 10

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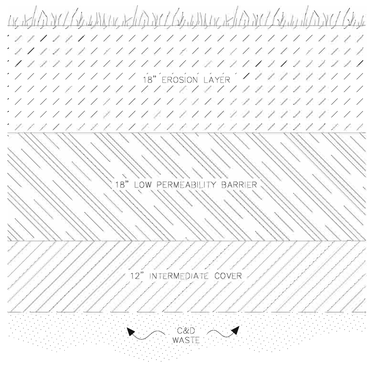
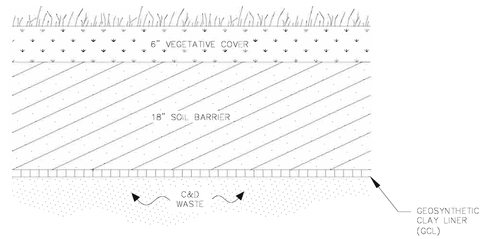
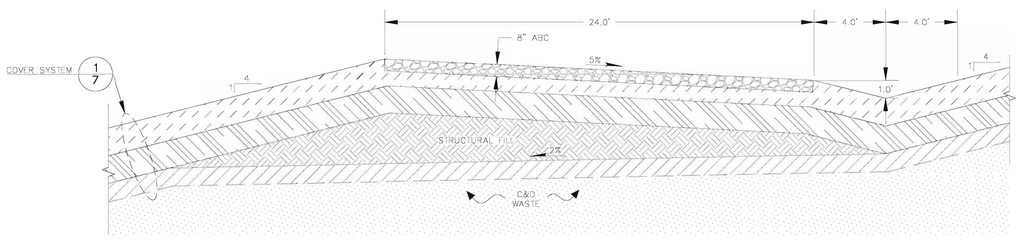


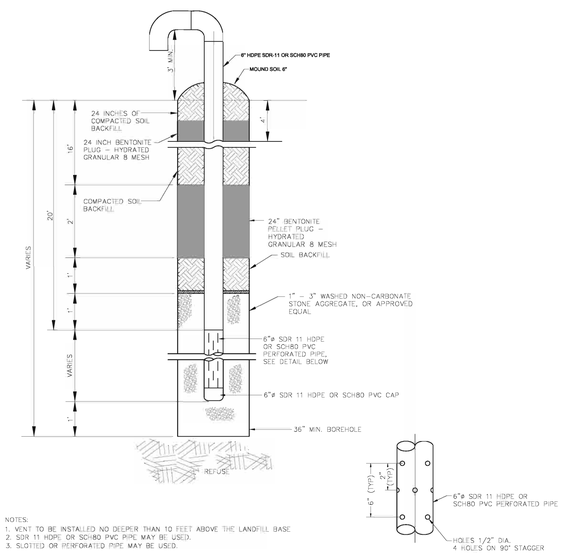
1/7 COVER SYSTEM
SCALE: 1"=1'



2/7 ALTERNATE COVER SYSTEM
SCALE: 1"=1'



3/7 ACCESS ROAD DETAIL
SCALE: 1"=4'



NOTES:
1. VENT TO BE INSTALLED NO DEEPER THAN 10 FEET ABOVE THE LANDFILL BASE
2. SDR 11 HDPE OR SCH80 PVC PIPE MAY BE USED.
3. SLOTTED OR PERFORATED PIPE MAY BE USED.

PERFORATED PIPE FOR VERTICAL WELLS DETAIL
NO SCALE

6/7 PASSIVE GAS VENT
SCALE: 1"=2'

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NO.	DATE	DESCRIPTION	BY

FINAL COVER DETAILS

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1027	
DRAWING: 7	OF: 10

Q:\CADDATA\ACTIVE\2007\1054-07-242\DWG\ DRAWINGS\D1027.DWG

7/8 EXISTING SEDIMENT BASIN DETAIL

CONSTRUCTION SPECIFICATIONS

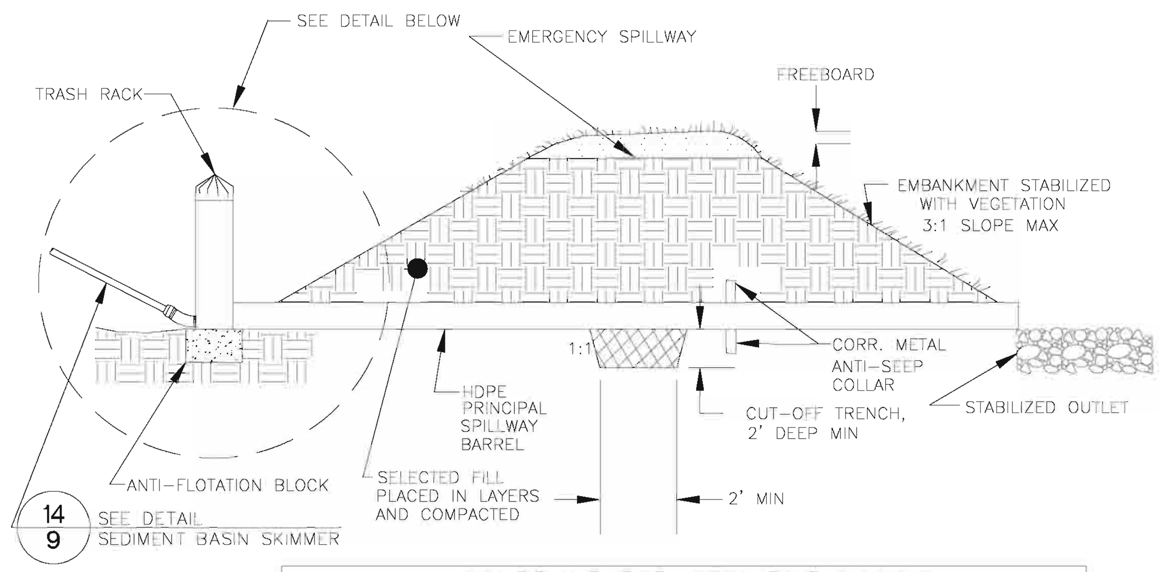
1. SITE PREPARATIONS: CLEAR, GRUB, AND STRIP TOPSOIL FROM AREAS UNDER THE EMBANKMENT TO REMOVE TREES, VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL. TO FACILITATE SEDIMENT CLEANOUT AND RESTORATION, CLEAR THE POOL AREA OF ALL BRUSH, TREES, AND OTHER OBJECTIONABLE MATERIALS. STOCKPILE ALL TOPSOIL OF SOIL CONTAINING ORGANIC MATTER FOR USE ON THE OUTER SHELL OF THE EMBANKMENT TO FACILITATE VEGETATIVE ESTABLISHMENT. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW THE BASIN AS NEEDED.
2. CUT-OFF TRENCH: EXCAVATE A CUT-OFF TRENCH ALONG THE CENTERLINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 2 FT. DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE RISER CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF EXCAVATION AND COMPACTION EQUIPMENT BUT IN NO CASE LESS THAN 2 FT. MAKE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS ARE THE SAME AS THOSE FOR THE EMBANKMENT. KEEP THE TRENCH DRY DURING BACKFILLING AND COMPACTION OPERATIONS.
3. EMBANKMENT: TAKE FILL MATERIAL FROM THE APPROVED AREAS SHOWN ON THE PLANS. IT SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY VEGETATION, ROCKS, AND OTHER OBJECTIONABLE MATERIAL. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING FILL. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT IT. COMPACTION MAY BE OBTAINED BY ROUTING THE CONSTRUCTION HAULING EQUIPMENT OVER THE FILL SO THAT THE ENTIRE SURFACE OF EACH LAYER IS TRAVERSED BY AT LEAST WHEEL OR TREAD TRACK OF THE HEAVY EQUIPMENT, OR A COMPACTOR MAY BE USED. CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING.
4. CONDUIT SPILLWAYS: SECURELY ATTACH THE RISER TO THE BARREL OR BARREL STUB TO MAKE A WATERTIGHT STRUCTURAL CONNECTION. SECURE ALL CONNECTIONS BETWEEN BARREL SECTIONS BY APPROVED WATERTIGHT ASSEMBLIES. PLACE THE BARREL AND RISER ON A FIRM, SMOOTH FOUNDATION OR IMPERVIOUS SOIL. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE OR ANTI-SEEP COLLARS. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FT. OF HAND-COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. ANCHOR THE RISER IN PLACE BY CONCRETE OR OTHER SATISFACTORY MEANS TO PREVENT FLOTATION. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.
5. EMERGENCY SPILLWAY: INSTALL THE EMERGENCY SPILLWAY IN UNDISTURBED SOIL. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE EMERGENCY SPILLWAY.
6. INLETS: DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY.
7. EROSION CONTROL: CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION.
8. SAFETY: SEDIMENT BASINS MAY ATTRACT CHILDREN AND CAN BE DANGEROUS. AVOID STEEP SIDE SLOPES, AND FENCE AND MARK BASINS WITH WARNING SIGNS IF TRESPASSING IS LIKELY. FOLLOW ALL STATE AND LOCAL REQUIREMENTS.

MAINTENANCE

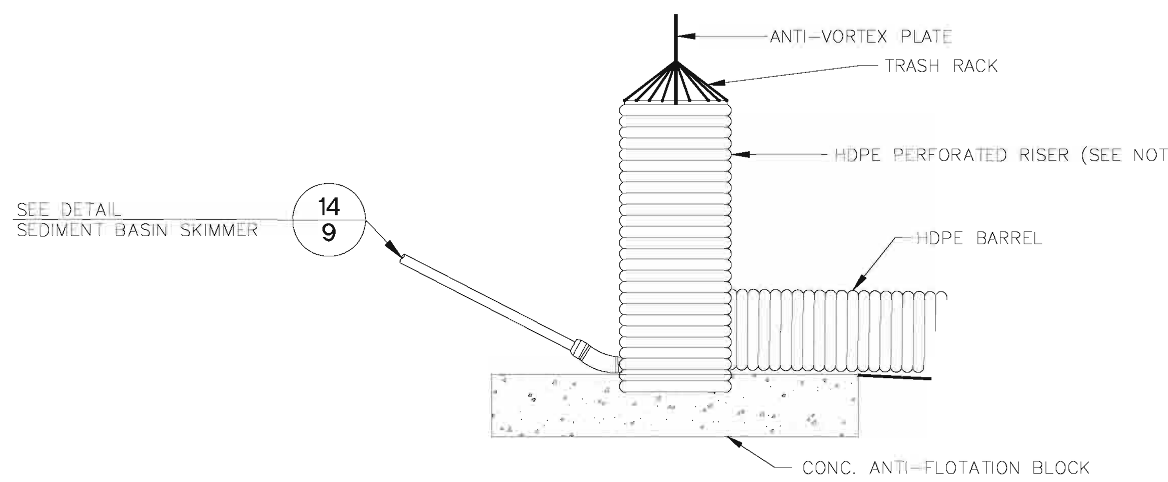
CHECK SEDIMENT BASINS AFTER PERIODS OF SIGNIFICANT RUNOFF. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE DESIGN DEPTH.

CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE RISER AND POOL AREA.



SCHEDULE FOR SEDIMENT BASINS

	SB-1	SB-2	SB-3
SKIMMER ORIFICE (in)	3	2	4
RISER DIAMETER (in)	36	24	54
BARREL DIAMETER (in)	24	18	42
BARREL INVERT @ RISER (ft.)	46	40	48
BARREL INVERT @ OUTLET (ft.)	45.5	39.5	47.5
RISER CREST ELEV. (ft.)	50	44	52
TOP OF DAM ELEV. (ft.)	53.5	47	53.5
EMERGENCY SPILLWAY ELEV. (ft.)	51.2	45	55.8
EMERGENCY SPILLWAY WIDTH (ft)	10	10	20
ANTI FLOTATION BLOCK (CONCRETE)	2'x5'x5'	2'x5'x5'	2'x6'x6'
ANTI SEEP COLLAR (CORR. METAL)	6'x6'	6'x6'	6'x6'



NOTES:

1. FOR SB-1, PLACE 18-1 INCH PERFORATIONS AT ELEV. 511.5 & 510.5 @ 6-INCH HORIZONTAL SPACING AND 6-1 INCH PERFORATIONS AT ELEV. 509.5 & 508.5 @ 6-INCH HORIZONTAL SPACING.
2. FOR SB-2, PLACE 9-1 INCH PERFORATIONS FROM ELEVATION 529.0 TO 527.5 @ 6-INCH HORIZONTAL SPACING AND 6-INCH VERTICAL SPACING.

7/8 EXISTING SEDIMENT BASIN DETAIL
SCALE: NTS

8/8 ENERGY DISSIPATOR DETAIL

DEFINITION

A STRUCTURE DESIGNED TO CONTROL EROSION AT THE INLET OR OUTLET OF A CHANNEL OR CONDUIT.

PURPOSE

TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISSIPATING THE ENERGY.

CONSTRUCTION SPECIFICATIONS

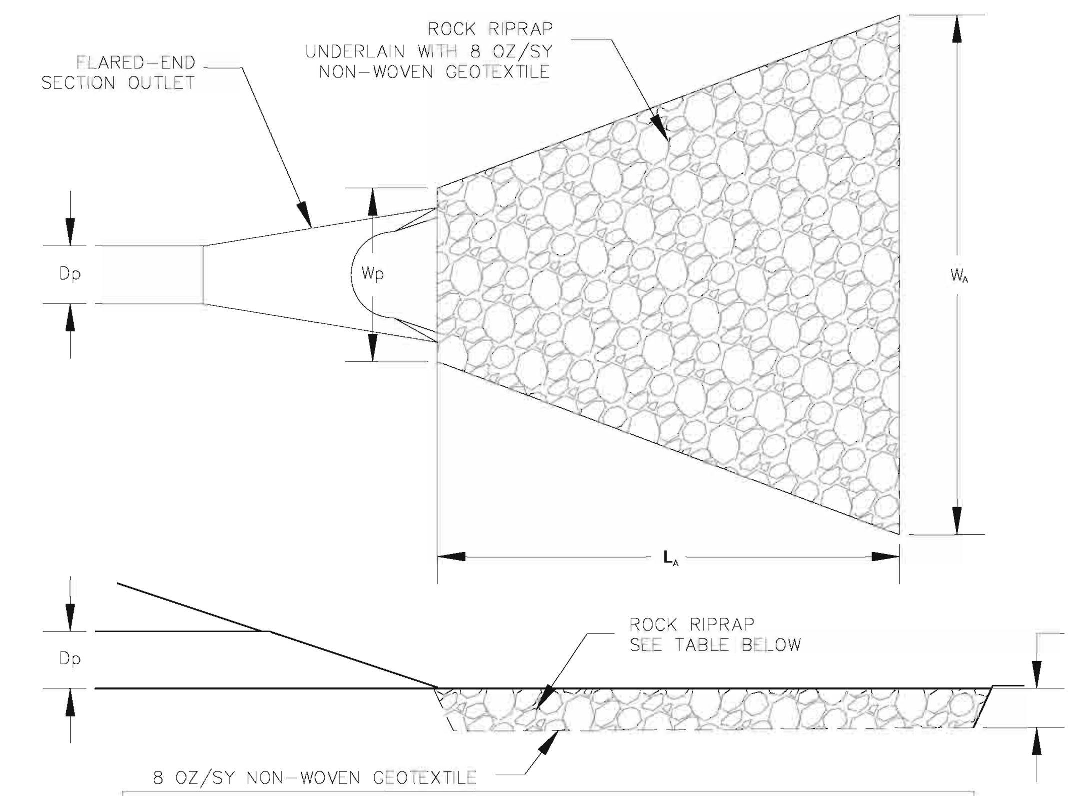
1. ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING DISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.
2. THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.
3. FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP A MINIMUM OF 1 FT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.
4. RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.
5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.
6. RIPRAP MAY BE FIELD STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.
7. CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFALL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.
8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE

INSPECT RIPRAP OUTLET STRUCTURES AFTER HEAVY RAINS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

REFERENCE

N.C. EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL, 1988.

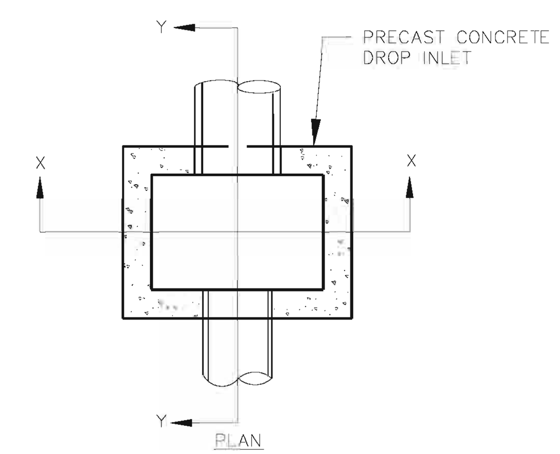


SUMMARY OF PROTECTION APRONS

APRON LABEL	DISCHARGE PIPE LOCATION	Dp (FT)	LA (FT)	Wp (FT)	WA (FT)	T (IN)	D50 (IN)	DMAX. (IN)
F	DOWNDRAIN F	1.50	13	4.50	14.50	18.00	8.00	12.00
G	DOWNDRAIN G	1.25	16	3.75	17.25	18.00	8.00	12.00
H	DOWNDRAIN H	1.25	15	3.75	16.25	18.00	8.00	12.00
I	DOWNDRAIN I	1.25	17	3.75	18.25	18.00	8.00	12.00
J	DOWNDRAIN J	1.25	13	3.75	14.25	18.00	8.00	12.00
SB-1	OUTLET FROM SED BASIN	2.50	27	7.50	29.50	25.50	10.00	17.00
SB-2	OUTLET FROM SED BASIN	1.50	13	4.50	14.50	18.00	8.00	12.00
SB-3	OUTLET FROM SED BASIN	5.00	37	15.00	42.00	34.50	14.00	23.00

8/8 ENERGY DISSIPATOR DETAIL
SCALE: NTS

9/8 STANDARD PRECAST DROP INLET DETAIL

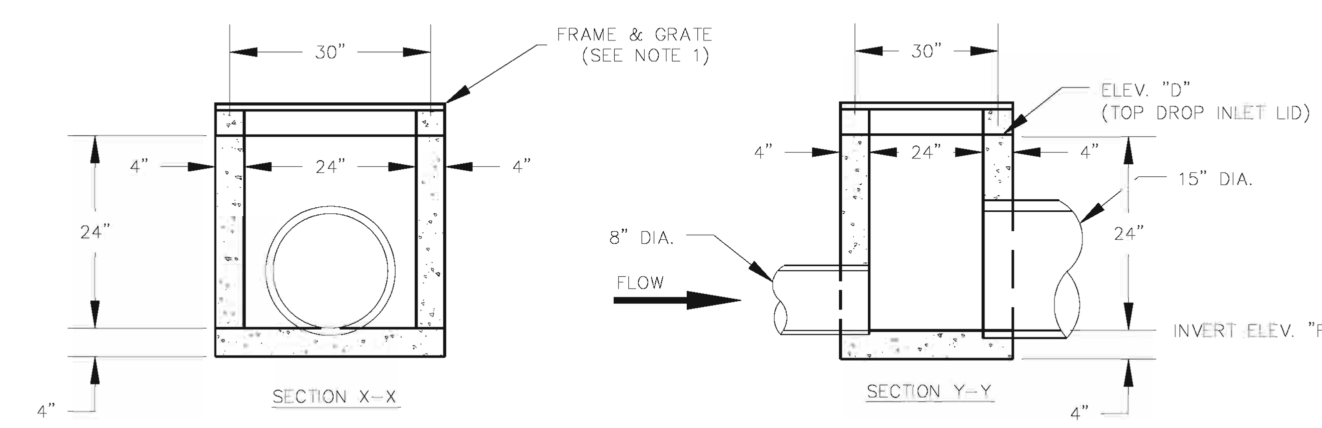


DROP INLET SCHEDULE

DROP INLET NO.	ELEVATIONS TOP D	ELEVATIONS INVERT F
F	80.0	78.0
G	86.0	84.0
H	93.0	91.0
I	86.0	84.0
J	88.0	86.0

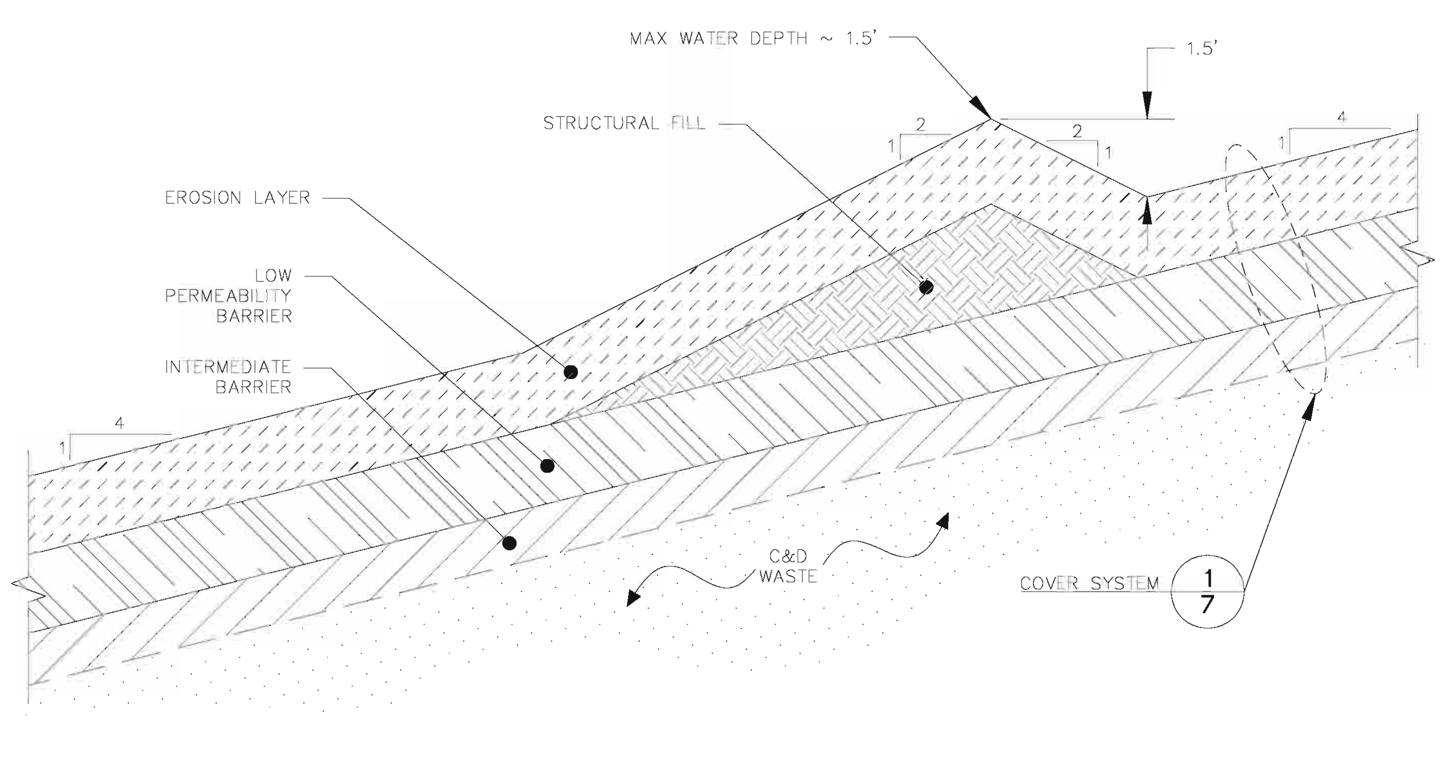
NOTES:

1. STORM GRATE SHALL CONSIST OF AN ELEVATED LID PROVIDING 6" (MIN.) CLEAR SPACE ABOVE DROP INLET.



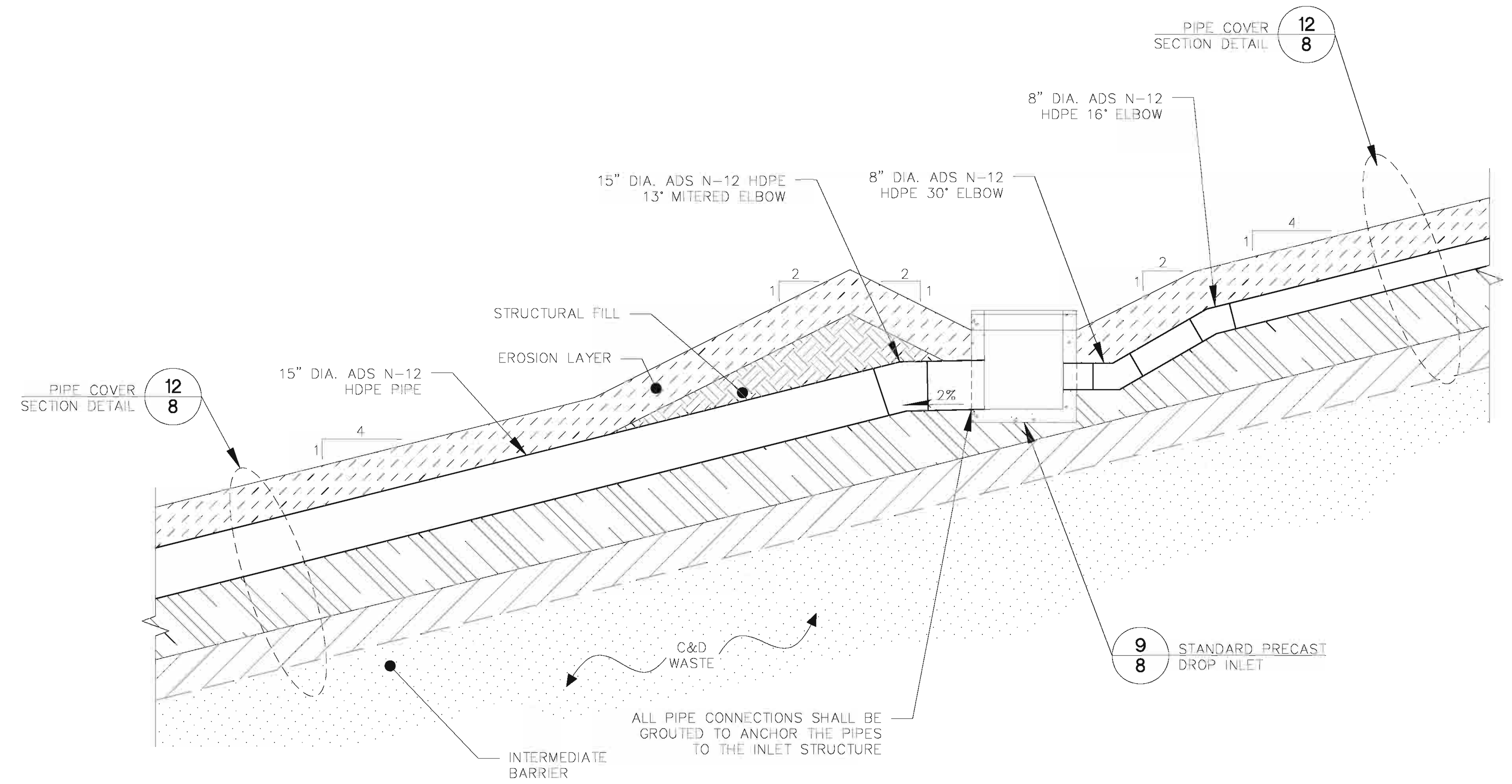
9/8 STANDARD PRECAST DROP INLET DETAIL
NTS

10/8 SLOPE DIVERSION BERM DETAIL



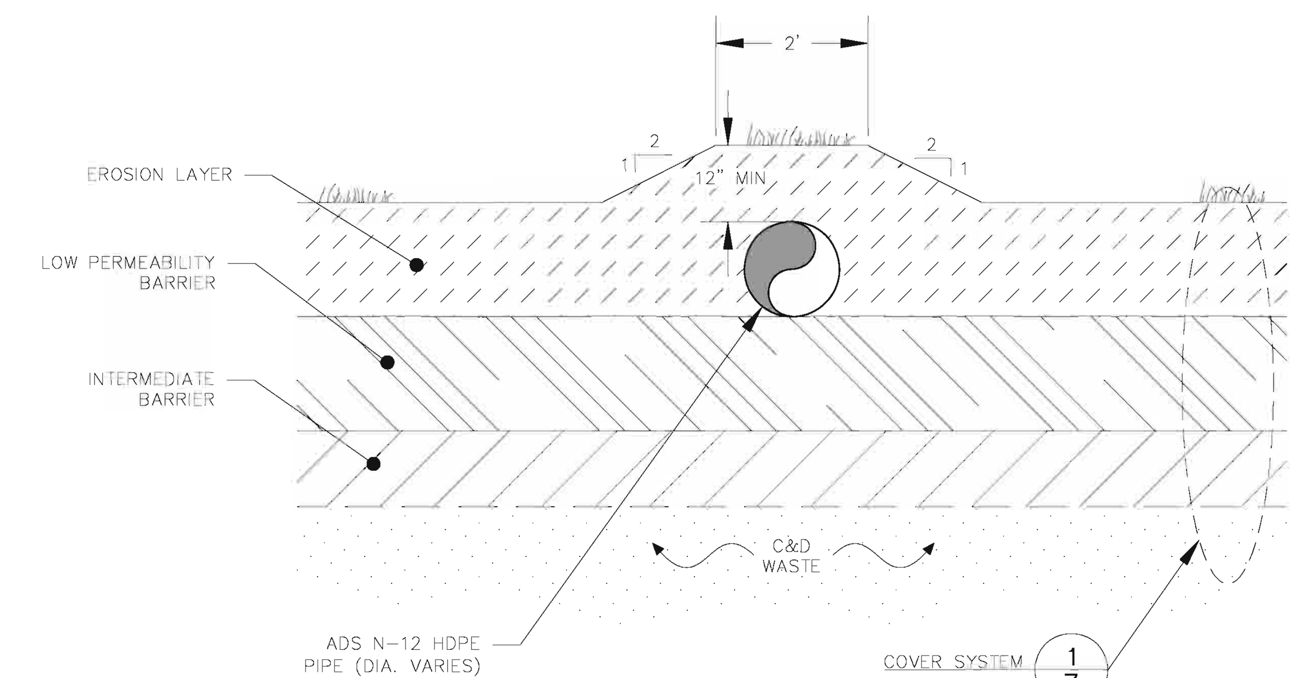
10/8 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'

11/8 SLOPE DIVERSION BERM DROP INLET DETAIL



11/8 SLOPE DIVERSION BERM DROP INLET DETAIL
SCALE: 1"=3'

12/8 PIPE COVER SECTION DETAIL



12/8 PIPE COVER SECTION DETAIL
SCALE: 1"=2'

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NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS I

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-01	
DRAWING: 8	OF: 10

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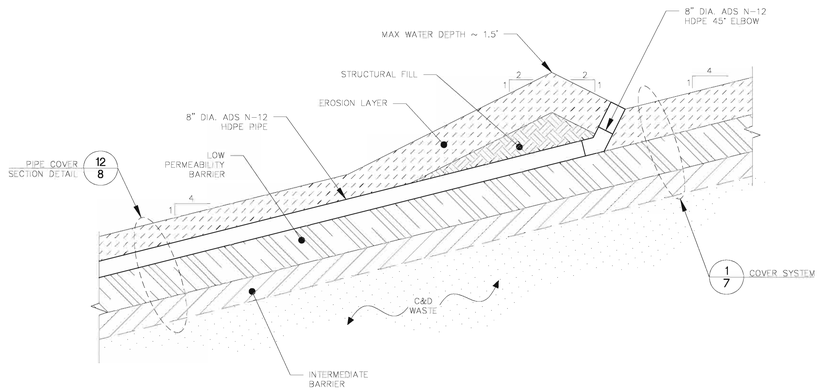
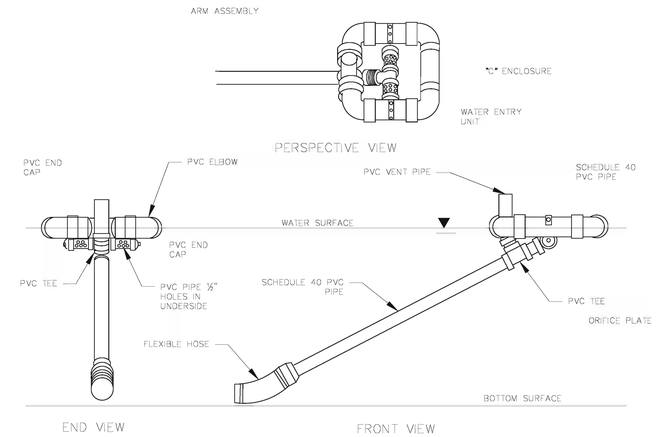
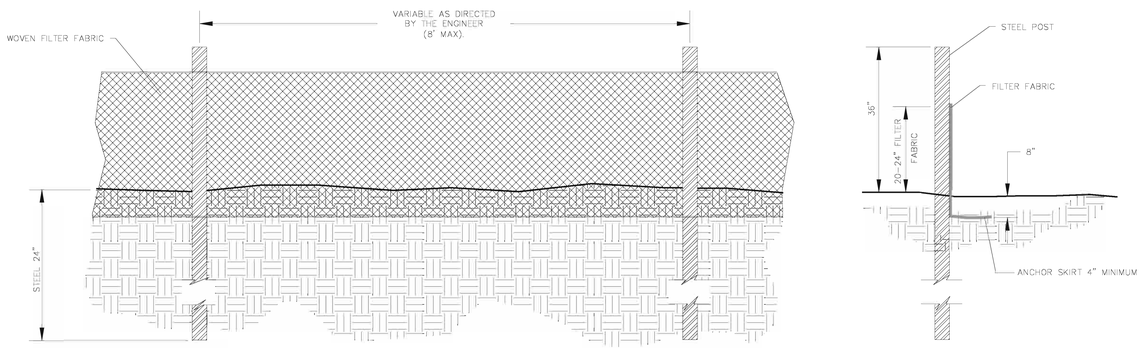


13/9 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



14/9 SEDIMENT BASIN SKIMMER DETAIL
N.T.S.



GENERAL NOTES:

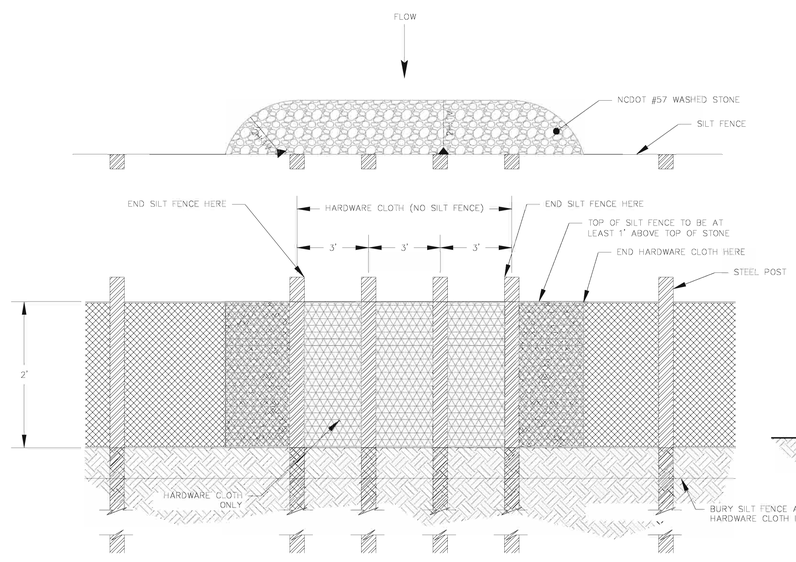
1. PREFABRICATED SILT FENCE IS NOT ACCEPTABLE ON THIS PROJECT.
2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS.
3. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
4. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS.
5. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
6. TURN SILT FENCE UP SLOPE AT ENDS.
7. SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC.
8. WHEN FABRIC IS USED WITH WIRE MESH, 8' CENTERED POSTS MAY BE USED.
9. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE

MAINTENANCE NOTES:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006

15/9 SILT FENCE DETAIL
NTS



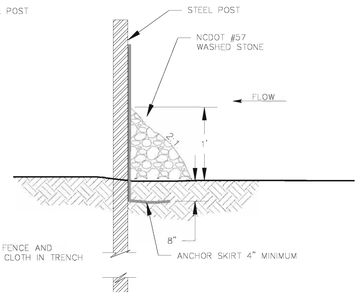
GENERAL NOTES:

1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL
2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼" MESH OPENINGS.
3. INSTALL 5' SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
4. SPACE POST A MAXIMUM OF 3'.

MAINTENANCE NOTES:

1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE OUTLET AS NEEDED TO PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: NC DOT Roadway Standard Detail 1606.01 – Special Sediment Control Fence, 2006



16/9 SILT FENCE OUTLET DETAIL
NTS

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 024294 JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS II

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-02	
DRAWING: 9	OF: 10

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GENERAL SEEDING SPECIFICATIONS

<u>DEFINITION</u>
Controlling runoff and erosion on disturbed areas by establishing perennial vegetative : cover with seed.

<u>PURPOSE</u>
To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

<u>SPECIFICATIONS</u>

<u>SEEDBED REQUIREMENTS</u>
Establishment of vegetation should not be attempted on sites that are unsuitable due to excessive soil compaction, inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine-grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0 – 6.5.
- Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met – i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation – special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoil may be applied.

<u>SEEDBED PREPARATION</u>
Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

- Ground agricultural limestone:
  Light-textured, sandy soils: 1 to 1-1/2 tons/acre
  Heavy-textured, clayey soils: 2-3 tons/acre
- Fertilizer:
  Grasses: 800-1200 lb/acre of 10-10-10 (or the equivalent)
  Grass-legume mixtures: 800-1200 lb/acre of 5-10-10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4-6 inches of soil by discing or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding.

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

<u>SEEDING</u>
Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30-50%. Always take this into account in scheduling land-disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non-certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious weed seed.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Apply seed uniformly with a cyclone seeder, drop-type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern: then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

<u>HYDRO SEEDING</u>
Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

<u>MAINTENANCE</u>
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding--If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization--On the typical disturbed site, full establishment usually requires re-fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

<u>TEMPORARY SEEDING SPECIFICATIONS</u>

<u>Seeding mixture (fall)</u>

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120

<u>Seeding Mixture (late winter early spring)</u>

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120
Annual (Korean) Lespedeza (*Kummerowia stipulacea*)	50

<u>Seeding mixture (summer)</u>

Species*	Rate (lb/acre)
German Millet (*Setaria italica*)	40

<u>Seeding dates (Piedmont)</u>

Fall:	Aug. 15 – Dec. 30
Late winter (early spring):	Jan. 1 – May 1 Late
Summer:	May 1 – Aug. 15

<u>Soil amendments</u>
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

<u>Mulch</u>
Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring. tool.

<u>Maintenance</u>
Re-fertilize if growth is not fully adequate. Reseed, re-fertilize and mulch immediately following erosion or other damage.

Pursuant to G.S. 113A-57(2), the angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.

Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

<u>PERMANENT SEEDING SPECIFICATIONS</u>

<u>Seeding mixture</u>

Species*	Rate (lb/acre)
Tall fescue (*Festuca arundinacea*) (Grass lined Channels)	200
Tall fescue (*Festuca arundinacea*) (Other Areas)	100

<u>Nurse plants</u>
Between May 1 and Aug. 15, add 10 lb/acre German millet (*Setaria italica*) or 15 lb/acre Sudan grass. Prior to May 1 or after Aug. 15, add 40 lb/acre Rye Grain (*Festuca arundinacea*).

<u>Seeding dates</u>

	Best	Possible
Fall:	Aug. 25 – Sept. 15	Aug. 20 – Oct. 25
Late winter:	Feb. 15 – Mar. 21	Feb. 1 –Apr. 15

Fall is best for tall fescue (*Festuca arundinacea*) and late winter or summer for lespedeza. Over seeding of Kobe lespedeza (*Kummerowia striata*) over fall-seeded tall fescue is very effective.

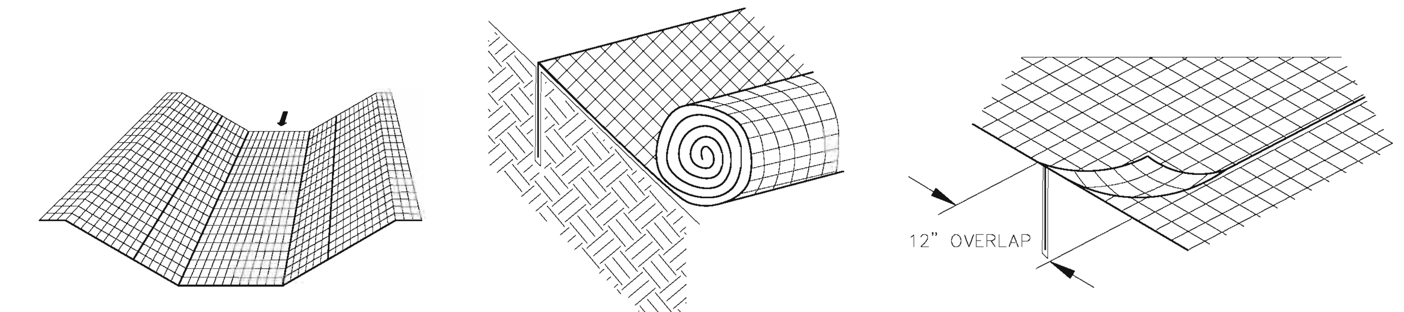
<u>Soil amendments</u>
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

<u>Mulch</u>
Apply 4,000-5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

<u>Maintenance</u>
Re-fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.11L NC Erosion and Sediment Control Planning and Design Manual, 2006



IN CHANNELS, ROLL OUT STRIPS OF MATTING PARALLEL TO THE DIRECTION OF FLOW.

ANCHOR MATTING IN A 12" TRENCH

JOIN STRIPS BY ANCHORING AND OVERLAPPING

<u>GENERAL NOTES:</u>

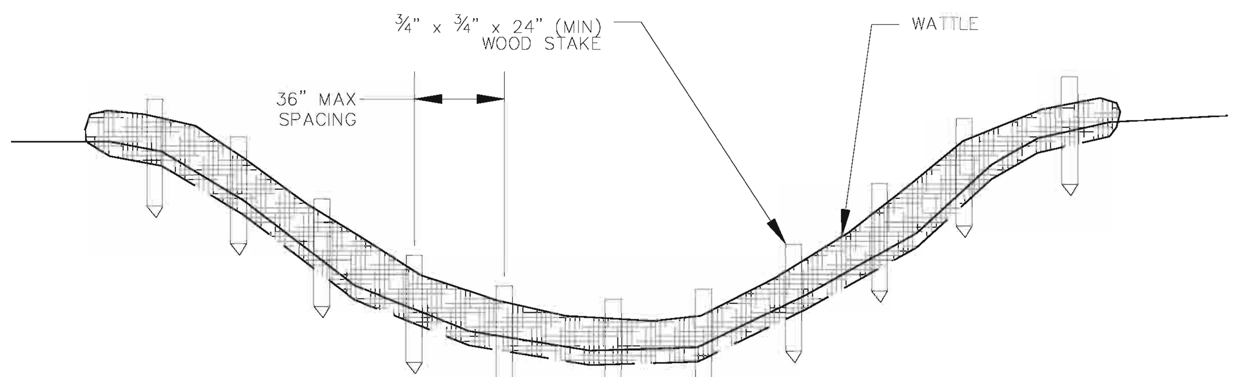
1. DITCH LINES OVER 3 PERCENT MUST BE MATTED WITH NORTH AMERICAN GREEN DS-75 MATTING OR EQUIVALENT.
2. APPLY SEED BEFORE LAYING THE NET OR MAT. IF OPEN-WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPRAYED ON AFTERWARD.
3. START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES-DO NOT STRETCH.
4. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET.

<u>MAINTENANCE NOTES:</u>

1. INSPECT ROLLED EROSION CONTROL PRODUCTS (RECP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAIN FALL EVENT.
2. GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE RECP.
3. ANY AREAS OF THE RECP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
4. IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.
5. MONITOR AND REPAIR THE RECP AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED,

*REF: 6.17.12 NC Erosion and Sediment Control Planning and Design Manual, 2006

17/10 TYPICAL TEMPORARY MATTING DETAIL
NTS



<u>GENERAL NOTES:</u>

1. SPACE WATTLES ACCORDING TO TABLE 1 ALONG ANY PORTION OF DITCHLINE WITH A SLOPE OF 5 PERCENT OR GREATER AND A SLOPE LENGTH OF 50 FEET OR GREATER.

<u>TABLE 1: WATTLE SPACING</u>

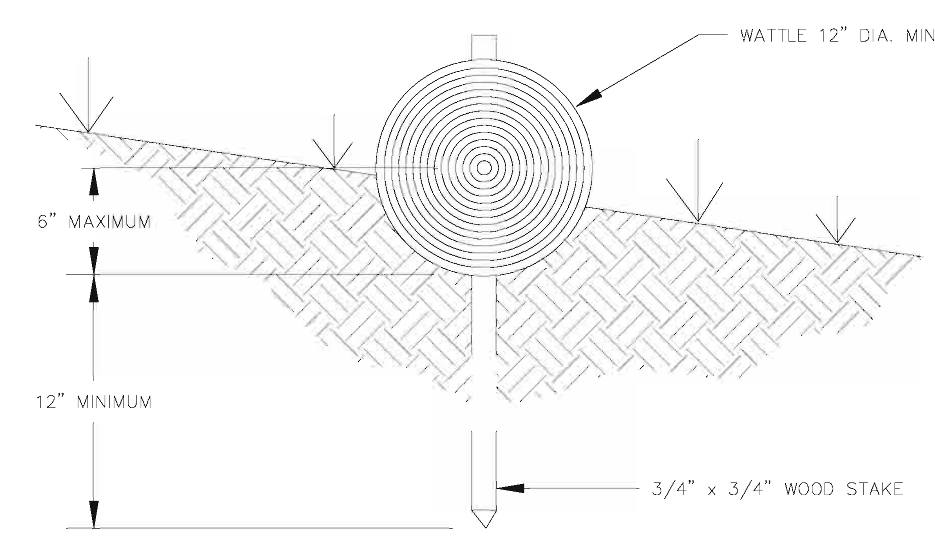
	SPACING DISTANCE (FT. O.C.)	
SLOPE (%)	12" DIA.	18" DIA.
5	20	30
6	17	25
7	14	21
8	13	19
9	11	17
10	10	15

2. PLACE FIRST WATTLE 1/2 SPACING DISTANCE FROM CREST OF QUALIFYING SLOPE.
3. SPACE WOODEN STAKES 3 FEET O.C.
4. PLACE CHECK DAMS OR WATTLES AT THE LOWER LIMITS OF EACH DAYS WORK.

<u>MAINTENANCE NOTES:</u>

1. IT IS IMPERATIVE THAT WATTLES BE INSPECTED AFTER INSTALLATION AND SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENTS.
2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE HEIGHT.
6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR REPLACEMENT.

*REF: EAST COAST EROSION BLANKETS INSPECTION AND MAINTENANCE WWW.EROSIONBLANKETS.COM



19/10 TYPICAL WATTLE DETAIL
NTS

<u>DEFINITION</u>

A CHANNEL WITH VEGETATIVE LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

<u>PURPOSE</u>

TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION, DEPOSITION, OR FLOODING.

<u>CONSTRUCTION SPECIFICATIONS</u>

1. REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.
2. PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE PLANS PLUS A 0.2-FT OVERCUT AROUND THE CHANNEL PERIMETER TO ALLOW FOR BULKING DURING SEEDBED PREPARATIONS AND SOD BUILDUP.
3. REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE CHANNEL FREELY.
4. THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF SPECIES. PROTECT THE CHANNEL WITH MULCH OR A TEMPORARY LINER SUFFICIENT TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE SEEDING SPECIFICATIONS).
5. APPLY LIME, FERTILIZER AND SEED BEFORE LAYING THE NET (WITHOUT MULCH) OR MAT (WITH MULCH OR SYNTHETIC). IF OPEN-WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND THE FERTILIZER AND SEED CAN BE SPRAYED ON AFTERWARD, OTHERWISE APPLY SEED AND FERTILIZER BEFORE INSTALLATION.
6. START LAYING THE NET OR MAT FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES – DO NOT STRETCH.
7. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 6 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END AND EVERY 3 FT AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF NETTING OR MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER OR EVERY 3 FT IF THE STRIP IS NOT WIDER THAN 8 FEET. DO NOT STRETCH THE NET/MAT WHEN APPLYING STAPLES.
8. STAPLES SHOULD BE THE "U"-SHAPED TYPE AND 4" TO 6" LONG (DEPENDING ON SOIL CONDITIONS).
9. TO JOIN ENDS OF TWO STRIPS OF NETTING, CUT A TRENCH TO ANCHOR THE END OF THE DOWN GRADIENT NET. OVERLAP THE END OF THE PREVIOUS ROLL 18 INCHES AND STAPLE EVERY 12 INCHES JUST BELOW THE ANCHOR SLOT.
10. TO JOIN ENDS OF TWO STRIPS OF MATTING, OVERLAP THE UPGRADIENT STRIP OVER THE DOWNGRADIENT ONE AT LEAST 4 INCHES. STAPLE THE OVERLAP AT THE ENDS AND EVERY 12 INCHES ALONG THE CENTER OF THE OVERLAP.

<u>MAINTENANCE</u>

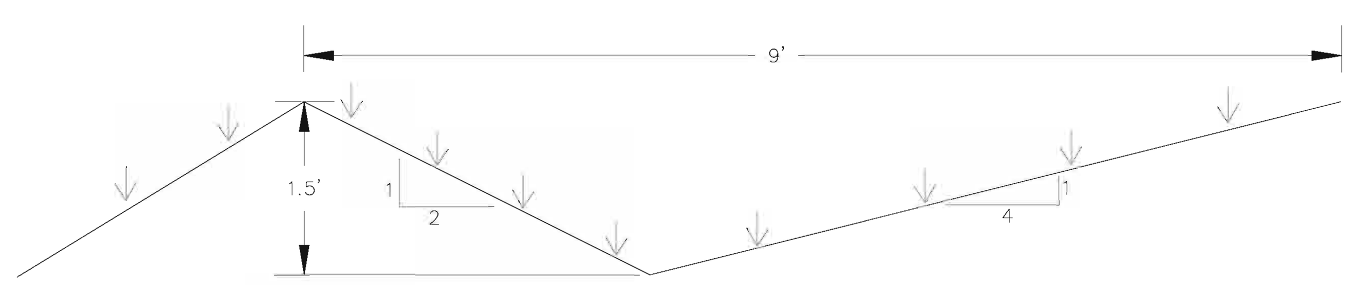
DURING THE ESTABLISHMENT PERIOD, CHECK GRASS-LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT. IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL (SEE SEEDING SPECIFICATIONS).

INSPECT ALL MULCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED, AND REINSTALL MULCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FIRMLY ESTABLISHED.

<u>GENERAL NOTES</u>

1. CHANNELS ARE TO BE LINED WITH NORTH AMERICAN GREEN MATTING OR APPROVED EQUIVALENT.
2. NETTING AND MATTING PRODUCTS SHOULD BE INSTALLED ACCORDING TO MANUFACTURER'S GUIDELINES. IF THE MANUFACTURER DOES NOT PROVIDE GUIDELINES, THE ABOVE GUIDELINES FOR NETTING AND MATTING MAY BE USED.



CHANNELS ARE TO BE LINED WITH DS75.
CHANNELS ARE TO BE CONSTRUCTED AT A 2% SLOPE.
THE LANDFILL SIDE SLOPE IS 4H:1V.
THE SLOPE DIVERSION BERM SIDE SLOPE IS 2H:1V.

18/10 GRASS LINED DITCH DETAIL
NTS

S&ME
WWW.SMEINC.COM

NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS III

PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-07-242	
SCALE: AS SHOWN	DATE: JUNE 2008
DRAWING NUMBER: D-1028-03	
DRAWING: 10	OF: 10

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APPENDIX I

(BORROW AREA WETLAND AND GEOTECHNICAL EVALUATION REPORT)

FILE COPY

BORROW AREA
WETLAND AND GEOTECHNICAL EVALUATION
EDGECOMBE COUNTY LANDFILL

S&ME Project No. 1040-01-545G

Prepared for:
Edgecombe County Solid Waste Department
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME, Inc.

S&ME

3201 Spring Forest Road
Raleigh, North Carolina, 27616

Kenneth Daly, PE
Project Engineer

Samuel P. Watts, PG
Senior Reviewer

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS

May 30, 2008

S&ME

Celebrating 35 Years
1973 • 2008

May 30, 2008

Mr. Danny Bagley
Edgecombe County Solid Waste Manager
P.O. Box 10
Tarboro, North Carolina 27886

Reference: Borrow Area – Wetland and Geotechnical Consulting Services
Edgecombe County Construction & Demolition Landfill
Tarboro, North Carolina
S&ME Project No. 1040-01-545G

Dear Mr. Carmon:

S&ME is pleased to submit this report of our engineering and consulting services to Edgecombe County for the evaluation of borrow soils and wetland areas at the Edgecombe County Construction & Demolition Landfill located near Tarboro, North Carolina. These services were provided in accordance with our proposal P3745-05V, dated September 2, 2005. The work was authorized under our existing contract with Edgecombe County as a Change to Agreement for Services, S&ME Form CA-041, incorporated into our proposal.

The opinions expressed in the attached report are based on the observations of S&ME personnel on the site, consultation with Edgecombe County Solid Waste Department personnel and maps and other documents from our files or provided by the County. S&ME appreciates the opportunity to continue our services to Edgecombe County and we hope that the information included in the report meets your needs. If you have any questions or if we can be of additional service to you, please contact us at 919-872-2660.

Sincerely,
S&ME, Inc.

Kenneth Daly/jah
Kenneth Daly, P. E.
Project Engineer

Samuel P. Watts, P.G.
Senior Project Manager

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Background 1
1.2 Objective 1
2. JURISDICTIONAL DELINEATION, VERIFICATION AND SURVEY COORDINATION 2
2.1 Background Research 2
2.2 Jurisdictional Stream/Wetland Delineation 2
2.3 Wetland/Stream Verification 3
2.4 Path Forward 3
3. LIMITED GEOTECHNICAL EVALUATION 3
3.1 Test Pits/Exploration Activities 3
3.2 Soil Conditions 4
3.3 Groundwater Conditions 5
3.4 Borrow Soil Quantity Estimate 6
4. LIMITATIONS 7

FIGURES

Figure 1 Vicinity Map
Figure 2 Existing Conditions
Figure 3 Jurisdictional Stream/Wetland Delineation
Figure 4 Borrow Area No. 1- Conceptual Grading Plan
Figure 5 Borrow Area No. 2- Conceptual Grading Plan

TABLES

Table 1 Summary of Laboratory Test Results

APPENDICES

Appendix I GPS Point Locations
Appendix II Supporting Wetland Documents
Appendix III Borrow Area Test Pit Summary
Appendix IV Laboratory Test Results

1. INTRODUCTION

1.1 Background

Edgecombe County currently operates a C&D landfill facility on a tract of land located off of State Road 1601 in Edgecombe County, south of Tarboro, North Carolina. S&ME is currently assisting the County with environmental engineering services to meet reporting requirements for groundwater, surface water, and methane at the facility as required by the North Carolina Solid Waste Management Rules.

Edgecombe County owns an approximate 45-acre tract to the east of the existing C&D Landfill. Figure 1 shows the vicinity of the Edgecombe County Landfill site and the location of the subject 45-acre tract. This tract is currently being used by Edgecombe County as a source of cover soils for the landfill. Edgecombe County requested that S&ME delineate the extent of wetlands on the property and evaluate the remaining soils on site for use as cover borrow and to estimate the approximate volume of such soils. S&ME developed a proposed Scope of Work to address Edgecombe County's request, which was submitted to Edgecombe County in our proposal P3745-05V, dated September 2, 2005.

Edgecombe County provided to S&ME an orthographic aerial photograph of the subject site and a site topographic map based on that photography. This photograph and map were produced by GeoData Corporation of Zebulon, North Carolina. The aerial photograph was flown on February 5, 2007. This mapping has been used as a basemap for our attached Figures 2 through 5. The site features and elevations shown on this mapping have been used as the basis of our wetlands delineations and borrow soil estimates.

In order to evaluate the usefulness of the site for use as a borrow soil source, it was necessary to perform many of the property tasks in sequence, rather than concurrently. The wetland areas and floodplains for Jerry's Creek and the Tar River were first evaluated and mapped to locate those protected areas where clearing and excavation activities could not encroach. After the protected areas were mapped and confirmed by the US Army Corps of Engineers (USACE), the approximate limits of the borrow areas were defined and the test pits were excavated. Samples were selected for laboratory testing for evaluation of the primary soil units. The site was then flown for aerial photography and the site map produced. The location and elevation of the test pits were surveyed. Once these work tasks were completed, the data were evaluated and this report produced.

1.2 Objective

The objective of the Scope of Services described in this report includes the delineation of jurisdictional wetlands on the 45-acre tract and a description and general inventory of borrow soils on the property available for use as cover soils for the C&D Landfill. The wetlands delineation portion of the project included review of available mapping of

jurisdictional wetlands for the property, walking the property to identify and flag the limits of these wetlands, co-ordination with Edgecombe County's surveyor to produce a site map showing these areas and an on-site meeting with representatives of the USAC to obtain their concurrence with these delineations. The objective of the borrow study was to identify the primary soil types available for borrow soils on the property by the use of test pits, an evaluation of the primary soil types identified through the use of physical laboratory testing, and an approximation of the available volume of such cover soils on the property based on topography and the findings at the test pits.

2. JURISDICTIONAL DELINEATION, VERIFICATION AND SURVEY COORDINATION

Waters of the U.S., which include wetlands, are regulated by the USACE through Section 404 of the Clean Water Act, and by the North Carolina Division of Water Quality (DWQ) through Section 401 of the Clean Water Act. The term *waters of the U.S.* refers to waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide as well as all other waters such as intrastate lakes, rivers, streams (including intermittent streams), or natural ponds that the use, degradation or destruction of which could affect interstate or foreign commerce. The term *wetlands* refers to those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

2.1 Background Research

S&ME reviewed selected maps of the subject site and documents that regulatory agencies use to indicate the presence or absence of jurisdictional features, which included a USGS Topographic Map, NRCS Soils Map, Aerial Imagery, and a National Wetland Inventory Map (NWI). These documents are included in Appendix II.

2.2 Jurisdictional Stream/Wetland Delineation

S&ME staff flagged wetland and stream boundaries in accordance with the protocols set forth in the 1987 USACE Wetlands Delineation Manual. Indicators (e.g., vegetation, hydrology, soils) were used to locate the boundaries of jurisdictional streams and wetland within the site boundary. The site boundary is identified on Figure 3.

The delineation identified areas that appeared to have jurisdictional wetland status or appeared to be Waters of the U.S. In general, these features included the eastern side of the floodplain of Jerry's Creek, the stream banks of Jerry's Creek located on the western portion of the site as it flows back across the central portion of the site in a northerly direction, a few wetland areas east of Jerry's Creek, and a man-made water impoundment and ditch connected to the large wetland adjacent to the Tar River. This large wetland on the east side of the site was also delineated.

2.3 Wetland/Stream Verification

S&ME coordinated a site visit with USACE in order to obtain concurrence with our classification of the identified streams and jurisdictional status of identified wetlands on the subject property. Mr. Jason Volker with S&ME met with Mr. Thomas Brown with the USACE at the above referenced site on November 21, 2006 to review our delineations.

Based on the guidance provided by Mr. Brown on November 21, 2006, a portion of our preliminary wetland delineation was modified. A revised map that indicated the approximate location and extent of the modification was emailed to Mr. Brown and Jamie Shern, also with USACE, on November 28, 2006. The final delineated wetland areas and surface waters reviewed by Mr. Brown during our meeting are presented in Figure 3. The GPS point locations (ID, northing, easting) are presented in Appendix I.

At the time of our site meeting, Mr. Brown informed us that his office was not issuing jurisdictional determinations due to a recent Supreme Court case. He did state that he could process wetland permit applications based on his assessment of our delineations.

2.4 Path Forward

Based on Mr. Brown's comments, it appears that it would be prudent to move forward with borrow area activities based on the USACE verbal approval of the delineation to date. S&ME recommends the following guidelines during clearing/grubbing and excavation activities:

- No disturbance of the 50-ft stream buffer as shown on the attached maps.
- No disturbance of the wetland; recommend maintaining an approximately 10-ft setback from the wetland boundary line with vegetation.
- Maintain an approximately 20-ft setback from the wetland boundary line with excavations of more than 3 feet deep to prevent drainage effects on the wetland.

The USACE is now issuing formal written documents related to jurisdictional determinations, but has a large backlog to process. It is now common practice that USACE will sign a surveyed site plat showing the wetland boundaries that will lock the delineation for a period of five years.

3. LIMITED GEOTECHNICAL EVALUATION

3.1 Test Pits/Exploration Activities

As shown on Figure 2, the subject site is approximately 45 acres in size and is rectangular in shape. The western end of the property borders Road 1601, across from the landfill site. This end of the property is used as a transfer and drop-off station. To the east of the drop-off station is Jerry's Creek. Borrow Area No. 1 is located across Jerry's Creek from the drop-off station. Jerry's Creek in this area flows to the southeast but once off-site; it turns to the northeast and once again crosses the subject site. Borrow Area No. 2 is located to the east of this second leg of Jerry's Creek. Farther to the east of Borrow Area No. 2 is a relative lowland area with wetlands and the Tar River forming the eastern boundary of the property.

On September 13, 2006, a representative of S&ME visited the site to explore the borrow areas by means of test pits. Edgecombe County Landfill provided a backhoe and operator for the test pit excavation. Test pits TP-1 through TP-5 were excavated in Borrow Area No. 2 and test pits TP-6 through TP-8 were excavated in Borrow Area No. 1 on that date. Our personnel returned to the site on October 12, 2006 to perform additional test pits in Borrow Area No. 1 (TP-9 through TP-11).

The method used for the test pit excavation was to remove the soil from the test pit by means of the backhoe and to examine the soils in the exposed side of the excavation. As the test pits became deeper, the soils in the backhoe bucket were examined. The thickness and depth of the soil units was logged from the ground surface. Moisture conditions such as wetness, seepage and water bearing zones were noted. The depth of excavation of the test pits in most cases was limited by caving due to water conditions in the test pit. The logs of the test pits are included in Appendix III.

Representative soil samples were collected for laboratory testing. The collected samples were returned to S&ME's physical properties soil testing laboratory in Raleigh, North Carolina. In the laboratory, the soil samples were classified according to the Unified Soil Classification System (USCS) and tested for grain size analysis (sieve), natural moisture content, and Atterberg Limits. The results of the laboratory testing are included in Appendix IV and are summarized on Table 1.

3.2 Soil Conditions

Based on the test pit logs, several primary soil types were described in the test pits. The upper few feet of soil at most of the test pits consisted of orange, tan and brown fine or medium to fine sand with minor amounts of silt and clay. At some locations in the Borrow Area No. 1 area, the upper soils appeared as an orange to gray sandy clay. With depth, a gray medium to fine sand with shells was observed. Where water conditions allowed excavation through this gray sandy layer, the underlying soils were described as dark gray medium sand with shells.

The results of the laboratory testing indicate that the soils in the borrow areas are more consistent than they appear on the test pit logs. These results indicate that there are two primary soil types encountered, with one being predominant with each of the two borrow areas. Within each borrow area, the variables in soil lithology appear to be color, the presence of shells and soil moisture.

Test pits TP-6 through TP-11 were excavated within Borrow Area No. 1. Soil samples were collected for testing from test pits TP-6, TP-8 and TP-10. The test results indicate a relatively uniform soil in this area consisting of tan, orange, brown and gray silty and/or clayey fine to medium sand. The percent of fines (silts and clays) varies in the samples from about 24% to 49%, with an average of 33 %. The plasticity index, a measure of the relative plasticity of the soils, varied from 14% to 27%, averaging 21%. Although the sieve analyses show that the soils are predominantly sand, the relatively high secondary percentages of fines give the soils some of the typical physical properties of silts and clays, such as increased plasticity and moisture content.

By comparison, the soils tested from Borrow Area No. 2 contain relatively few fines and have physical properties more typical of granular soils. The soils in the test pits were described as orange and brown grading to gray medium to fine sand. Below depths of 2.5 to 5 feet below the surface, the sand was observed to contain shells and grade to a darker gray color. These soil samples are classified as a medium to fine sand with a fines content ranging between 5% and 13%, averaging about 7%. The plasticity index ranges between non-plastic to 3%.

Based on the laboratory testing of the representative soil samples collected from the exploratory test pits, the soils in both Borrow Area No. 1 and Borrow Area No. 2 are generally suitable for use as cover soils for the C&D Landfill. The laboratory testing indicates that the soils within either borrow area are reasonably consistent within the borrow area but that there are some lithologic differences between the soils in the two areas. Since both borrow areas are currently in use, actual experience with the excavation and use of these soils is likely the best guide to the ongoing use of these materials. However, the results of the laboratory testing may be useful in maximizing the productive use of these soils, particularly in longer term planning for cover soil volumes and landfill closure.

The soils within Borrow Area No. 2 consist largely of medium to fine sand with relatively few fines (silts and clays). Because of the low fines content, these soils should drain effectively and are not expected to be very moisture sensitive. Therefore, these soils should be relatively more manageable to spread and compact over a wider range of soil moisture contents. However, also because of the low fines content, these soils will not be very effective in limiting water infiltration. Therefore, the soils from Borrow Area No. 2 will generally be more suitable for use as intermediate cover rather than final cover. These soils should also be more workable during wet weather conditions.

The soils in Borrow Area No. 1 contain relatively more fines than those from Borrow Area No. 2. Although still composed largely of sand, the fines content is high enough that these soils will exhibit many of the properties of finer grained soils. These soils may be more difficult to spread and compact during wet weather conditions. Although these soils are also suitable for use as intermediate cover, they should be less water transmissive than the soils from Borrow Area No. 2 and therefore more useful as final cover and cap construction. If borrow soil volumes allow, soils in the more clayey areas of Borrow Area No. 1 should be reserved for potential use as final cover soils. Additional laboratory testing should be performed on these soils for compactive and water transmissive properties to further evaluate their use for final cover and cap construction.

3.3 Groundwater Conditions

Groundwater was found at the test pit locations and varied within a few feet to several feet below existing ground surface throughout both borrow areas. This groundwater appears to be related to the infiltration of precipitation into the soils from the surface, making this a groundwater recharge area. The groundwater is somewhat mounded in the borrow areas, reflecting the balance between the rate of this infiltration and the rate at

which the water can drain away through the soils. Due to this mounding of groundwater at higher elevations than those wetland areas to the east and west of the borrow areas, the use of ditching should be effective in lowering groundwater levels in the borrow areas, increasing the volume of practically available borrow soils.

In Borrow Area No. 1, the groundwater was found in the test pits ranged from one foot to more than six feet below the ground surface. The elevation of the water varied substantially across this area, ranging between Elevation 35 feet to Elevation 46 feet. The elevation of the water appeared to vary with the topography and the distance from given locations to open drainage (groundwater discharge) areas. Water levels in Borrow Area No. 2 reflected the nature of the soils in that area. These soils appear to drain more effectively than the soils in Borrow Area No. 1, producing a more uniform groundwater level ranging between Elevation 33 feet and Elevation 35 feet. The groundwater levels can be expected to vary over time, depending on precipitation rates and patterns.

There are lower surrounding areas to the east and west of both borrow areas. Borrow Area No. 1 is located within a bend of Jerry's Creek and can drain to the floodplain to both the east and west. Borrow Area No. 2 is located between Jerry's Creek to the west and the Tar River to the east.

3.4 Borrow Soil Quantity Estimate

The projected volume of borrow soils available from each borrow area was estimated under two scenarios. The first scenario is "Limited Draining/Ditching", and was calculated based on recorded existing groundwater elevations and topography with little or no dewatering of the borrow areas. The second scenario is the "Extensive Drainage/Ditching" using the maximum effective use of dewatering efforts for the borrow areas. Surface elevations at the time of the GeoData survey (February 5, 2007) and water elevations in the test pits at the time of excavation were used for both scenarios. Under both scenarios, the maximum depth of excavation was projected as being one (1) foot over the projected groundwater elevations for the traffickability of earthmoving equipment. Depending on soil and groundwater conditions and the actual equipment used, the actual depth of excavation relative to the water levels may vary.

For the calculation of borrow soil volumes, Borrow Area No. 1 has been divided into two sub-areas (A & B) based on groundwater elevations, as illustrated on Figure 4. For the first scenario (excavation without dewatering), the projected available borrow soil volume has been calculated based on a limit of excavation to approximately Elevation 40 in Sub-Area A and Elevation 38 in Sub-Area B. The projected volume of available soils in Borrow Area No. 1 under this scenario is 200,000 cubic yards. Due to the fines content of soils in this area, some limited ditching and trenching for drainage may be necessary to achieve these volumes under Scenario 1. Under the second scenario with the maximum practical use of dewatering, we have estimated that the groundwater may be effectively lowered by more extensive ditching and trenching by an average of about two feet. Using a depth of excavation for Sub-Area A to Elevation 38 and to Elevation 36 for Sub-Area B and enlarging those areas as shown on Figure 4, we estimate that about 275,000 cubic yards of soil would be available for use.

As previously discussed, the observed water levels in the test pits in Borrow Area No. 2 ranged between Elevation 33 and Elevation 35 feet. Therefore, we used an average excavation depth to site Elevation 35 (average elevation 34 plus 1 foot buffer) to calculate the approximate volume of soils available under Scenario 1. Using this base elevation and the area shown on Figure 5, we estimate that approximately 40,000 cubic yards may be available for use from Borrow Area No. 2. Drainage and ditching can likely be used in this area also to lower groundwater levels by about two feet. By the use of effective site drainage, we estimate that the excavation of soils to about site Elevation 33 can be used. The calculated volume of borrow soils from Borrow Area No. 2 under Scenario 2 will be about 80,000 cubic yards.

Summary of Estimated Available Soil Volumes

	Scenario 1: Limited Drainage/Ditching	**Scenario 2: Extensive Drainage/Ditching**
Borrow Area No. 1	200,000	275,000
Borrow Area No. 2	40,000	80,000
Totals	240,000	355,000

Note: All Values in Cubic Yards of In-Place Volume

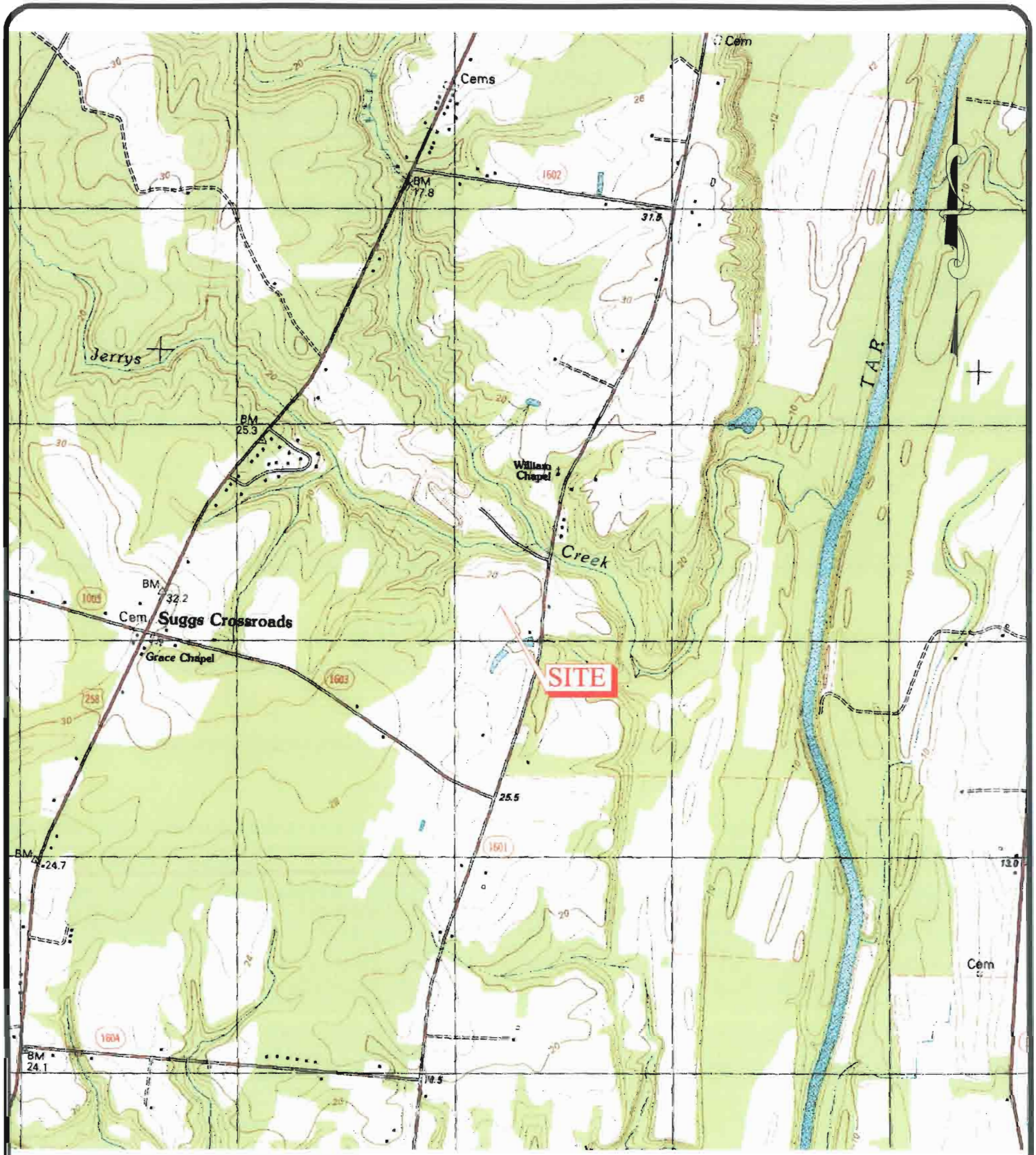
4. LIMITATIONS

The purpose of this study has been to evaluate the nature of available soils on the subject tract relative to their suitability for use as intermediate and final cover for the Edgecombe County C&D landfill and to develop an approximation of the volume of suitable soils available for those purposes. The methods used to address these issues have included a delineation of wetlands, riparian buffer and floodplain portions of the property that are not suitable as a borrow source and to evaluate two portions of the remaining property as a source of these borrow materials. The nature and extent of the soils in these two areas have been evaluated by the use of widely-spaced test pits and the collection of a limited number of soil samples for laboratory physical testing. The variations in soil and groundwater conditions within these borrow areas are assumed to be reasonably represented by the conditions observed at these test pits. The volume estimates are based on similar conditions as those observed and the effectiveness of measures to drain and lower groundwater levels. The volumes described represent the volumes of undisturbed soils in-place and some volume shrinkage of soil volumes due to spreading and compaction may be expected.

Portions of the two borrow areas on the subject property are currently being used for the staging and storage of white good and other wastes. Other portions of the property may be used by landfill personnel for other purposes. At least one large concrete storage pad exists in Borrow Area No. 1. No allowances for these current uses have been made in our borrow volume estimates and it is assumed that these current uses will ultimately be moved or ceased so that the soils in these areas are available for borrow soil.

This report is solely intended for the use of Edgecombe County for its C&D landfill. No other use is authorized by S&ME, Inc.

FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

SCALE: 1" = 2,000'	S&ME WWW.SMEINC.COM	VICINITY MAP	FIGURE NO.
DATE: APRIL 2008		EDGECOMBE COUNTY LANDFILL	1
DRAWN BY:		TARBORO, NORTH CAROLINA	
PROJECT NO: 1040-01-545G			

FLOODPLAIN BOUNDARY

LANDFILL

TRANSFER STATION

SCALES

BORROW AREA 1

BORROW AREA 2

50-FOOT STORM BOUNDARY

APPROXIMATE WETLANDS BOUNDARY

APPROXIMATE WETLAND BOUNDARY

TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11

E 2424500 E 2425000 E 2425500 E 2426000 E 2426500 E 2427000 E 2427500

N 757000 N 756500 N 756000 N 755500 N 755000

NOTES

1. TOPOGRAPHIC MAP DEVELOPED BY GeoData CORPORATION, OF ZEBULON , NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOW ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
3. FLOODPLAIN BOUNDARY AND WETLANDS DELINEATED IN THE FIELD BY S&ME IN 2006.

LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

200 0 100 200 400

(IN FEET)
1 inch = 200 ft.

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NO.	DATE	DESCRIPTION	BY

EXISTING CONDITIONS

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 2	OF:

DRAWING PATH: G:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G-TO 02.DWG

Q:\Cadbase\ACTIVE\2001\01-545G\1040-01-545G\Fig 02.dwg, FIGURE 2, 7/2/2008 1:25:22 PM, 1:1

FLOODPLAIN BOUNDARY

LANDFILL

TRANSFER STATION

SCALES

BORROW AREA 1

BORROW AREA 2

50-FOOT STORM BOUNDARY

APPROXIMATE WETLANDS BOUNDARY

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TP-1 TP-2 TP-3 TP-4 TP-5 TP-6 TP-7 TP-8 TP-9 TP-10 TP-11

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200 0 100 200 400

(IN FEET)
1 inch = 200 ft.

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NO.	DATE	DESCRIPTION	BY

EXISTING CONDITIONS

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
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PROJECT NUMBER 1040-01-545G	
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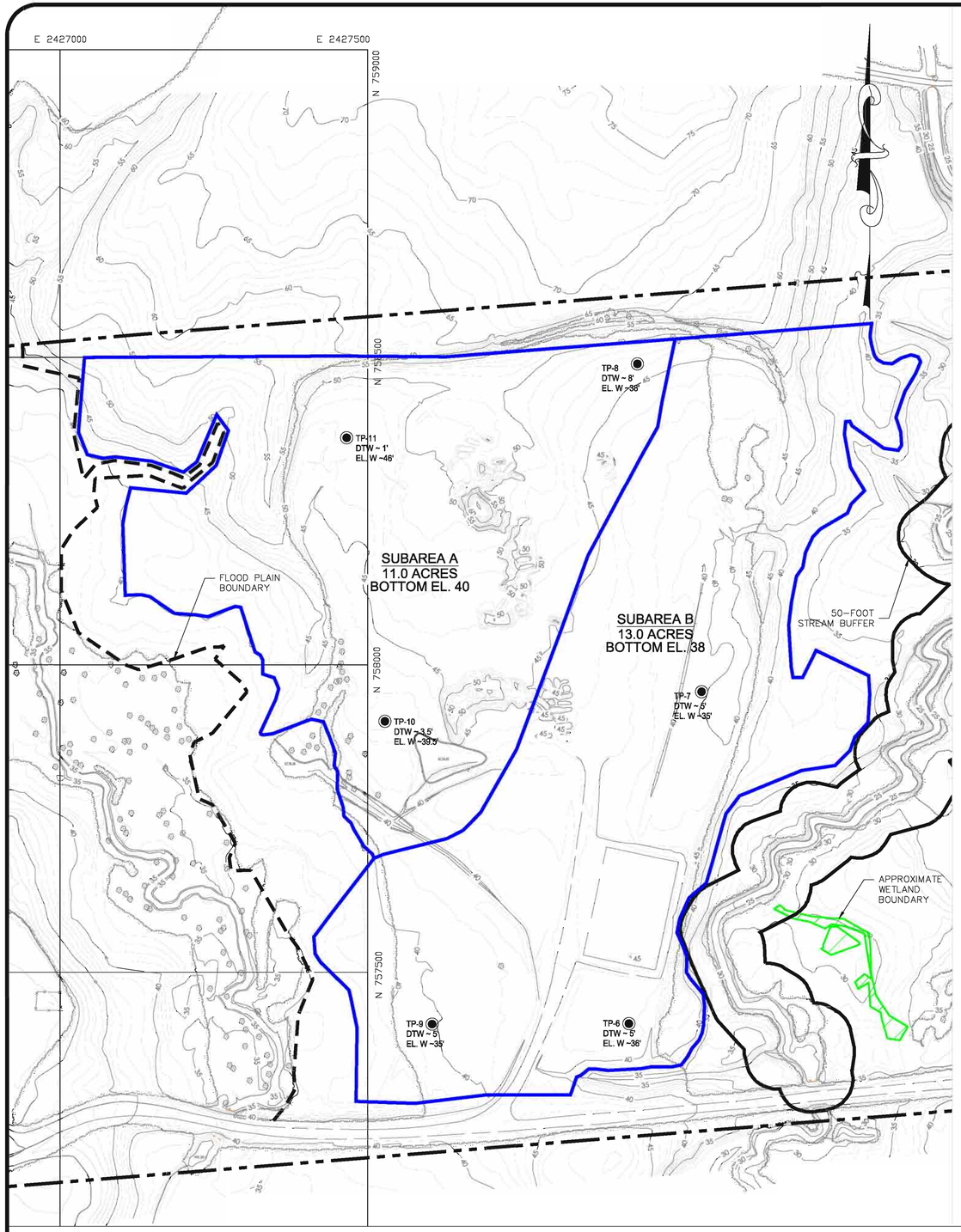
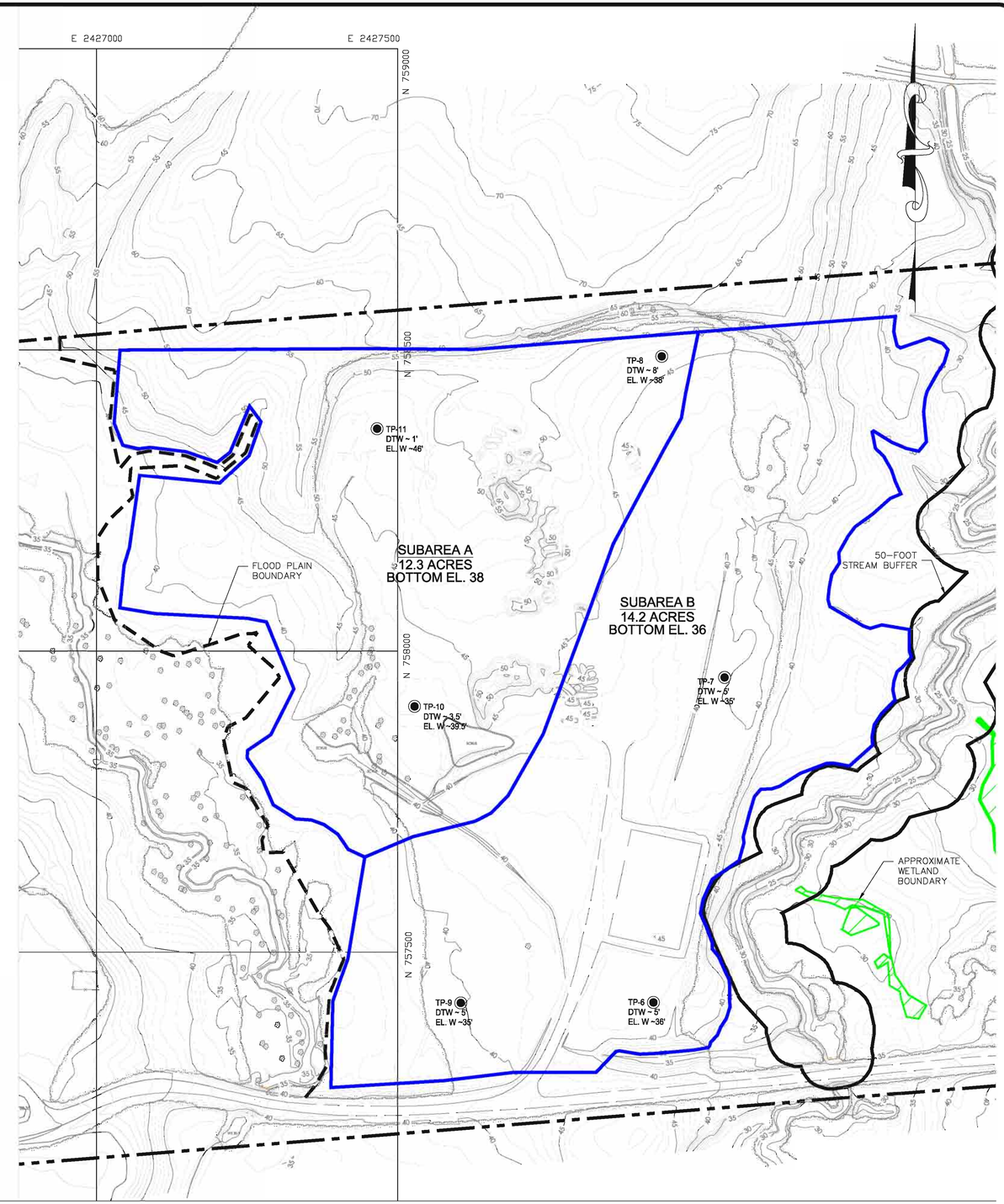
DRAWING PATH: G:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G-TO 02.DWG

Q:\Cadbase\ACTIVE\2001\01-545G\1040-01-545G\Fig 02.dwg, FIGURE 2, 7/2/2008 1:25:22 PM, 1:1



SCENARIO 1 - LIMITED DRAINAGE/DITCHING
~200,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~275,000 CY BORROW MATERIAL

NOTES

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LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

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NO.	DATE	DESCRIPTION	BY

BORROW AREA 1
CONCEPTUAL GRADING PLAN

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 4	OF:

DRAWING PATH: Q:\CADDATA\ACTIVE\2007\01-545G\1040-01-545G_FIG 04.DWG

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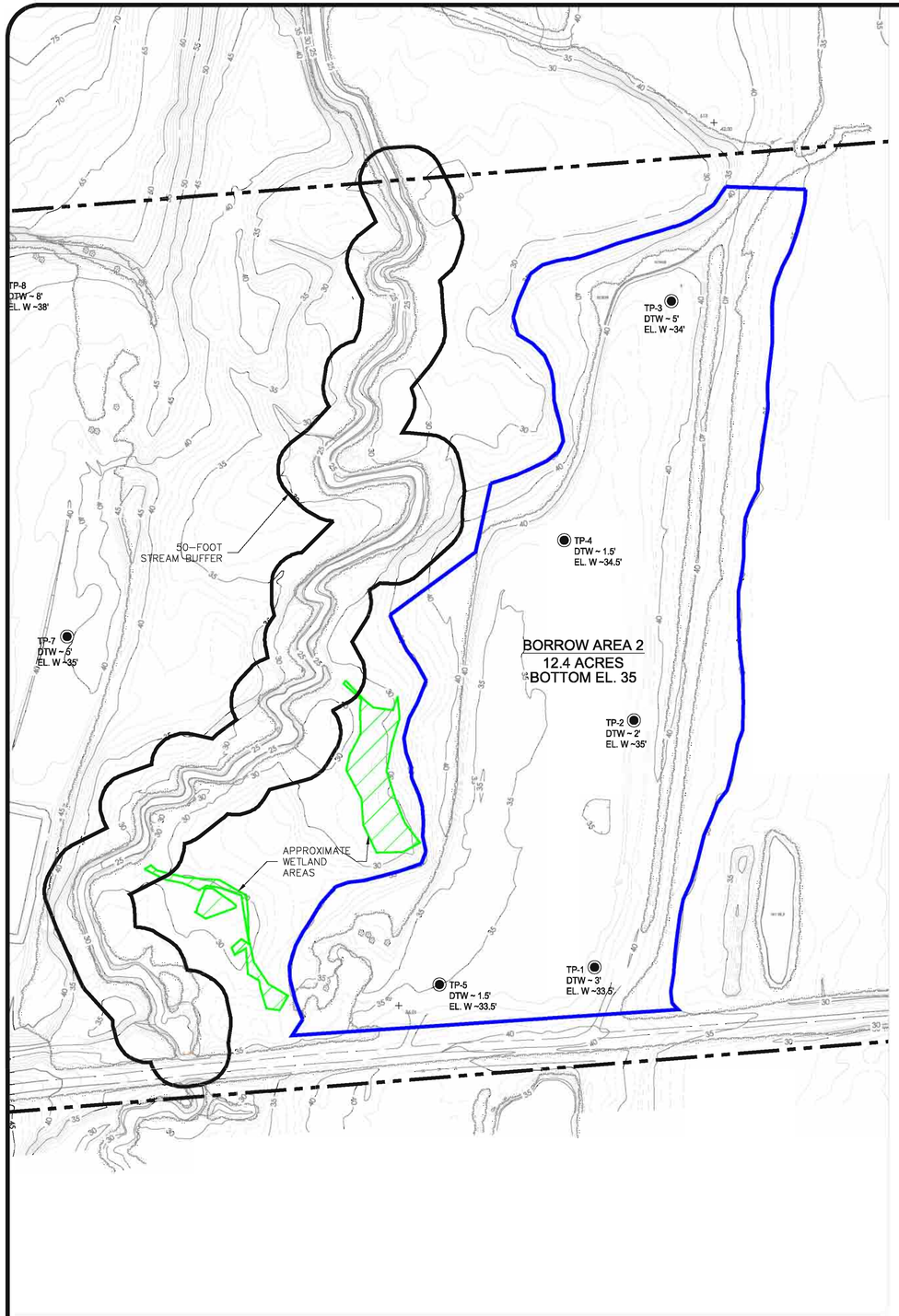
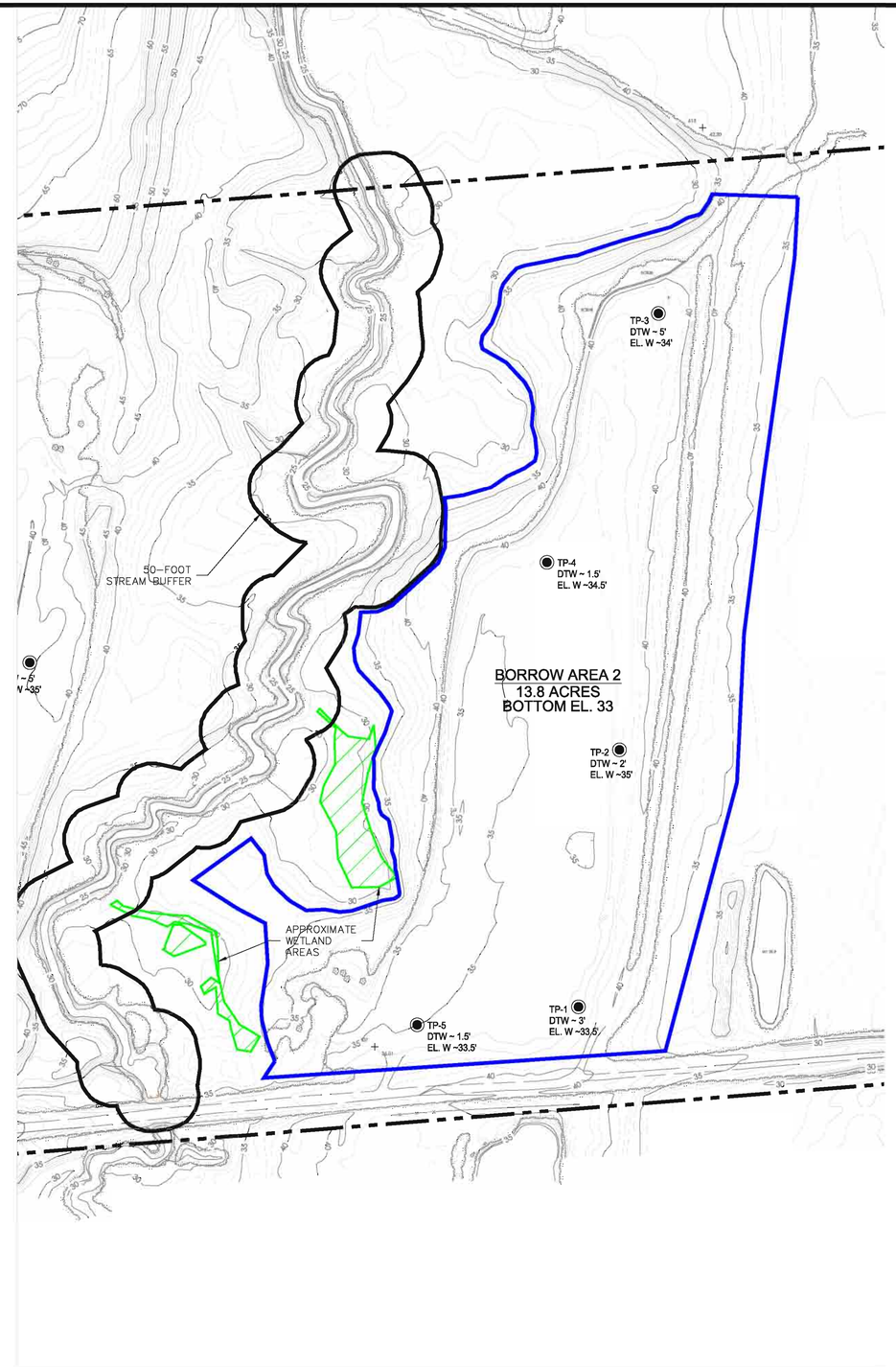


SCENARIO 1 - LIMITED DRAINAGE/DITCHING
~40,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~80,000 CY BORROW MATERIAL

NOTES

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LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

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NO.	DATE	DESCRIPTION	BY

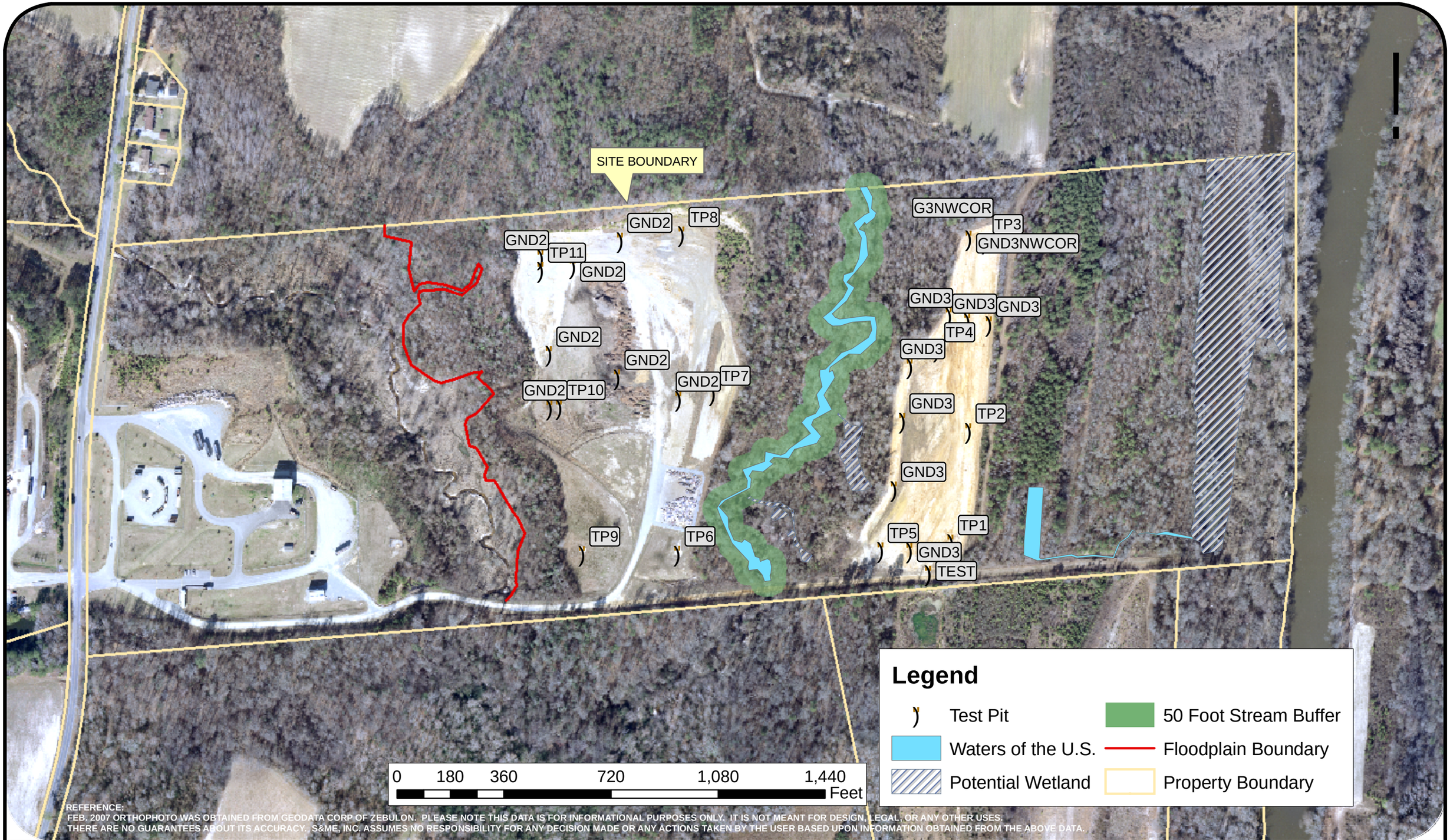
BORROW AREA 2
CONCEPTUAL GRADING PLAN

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 5	OF:

DRAWING PATH: Q:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G_TG 05.DWG

Q:\Cadata\ACTIVE\2001\01-545G\1040-01-545G Fig 05.dwg, Borrow Area 2, 7/22/2008 1:30:19 PM, 1:1



REFERENCE:
FEB. 2007 ORTHOPHOTO WAS OBTAINED FROM GEODATA CORP OF ZEBULON. PLEASE NOTE THIS DATA IS FOR INFORMATIONAL PURPOSES ONLY. IT IS NOT MEANT FOR DESIGN, LEGAL, OR ANY OTHER USES.
THERE ARE NO GUARANTEES ABOUT ITS ACCURACY. S&ME, INC. ASSUMES NO RESPONSIBILITY FOR ANY DECISION MADE OR ANY ACTIONS TAKEN BY THE USER BASED UPON INFORMATION OBTAINED FROM THE ABOVE DATA.

SCALE:	DATE:	
AS SHOWN	MAY 2008	
PROJECT NO:	DRAWN BY:	CHECKED BY:
1040-01-545G	JLV	JD

S&ME
3201 SPRING FOREST RD
RALEIGH, N.C. 27616
PH. 919-872-2660
FAX. 919-876-3958
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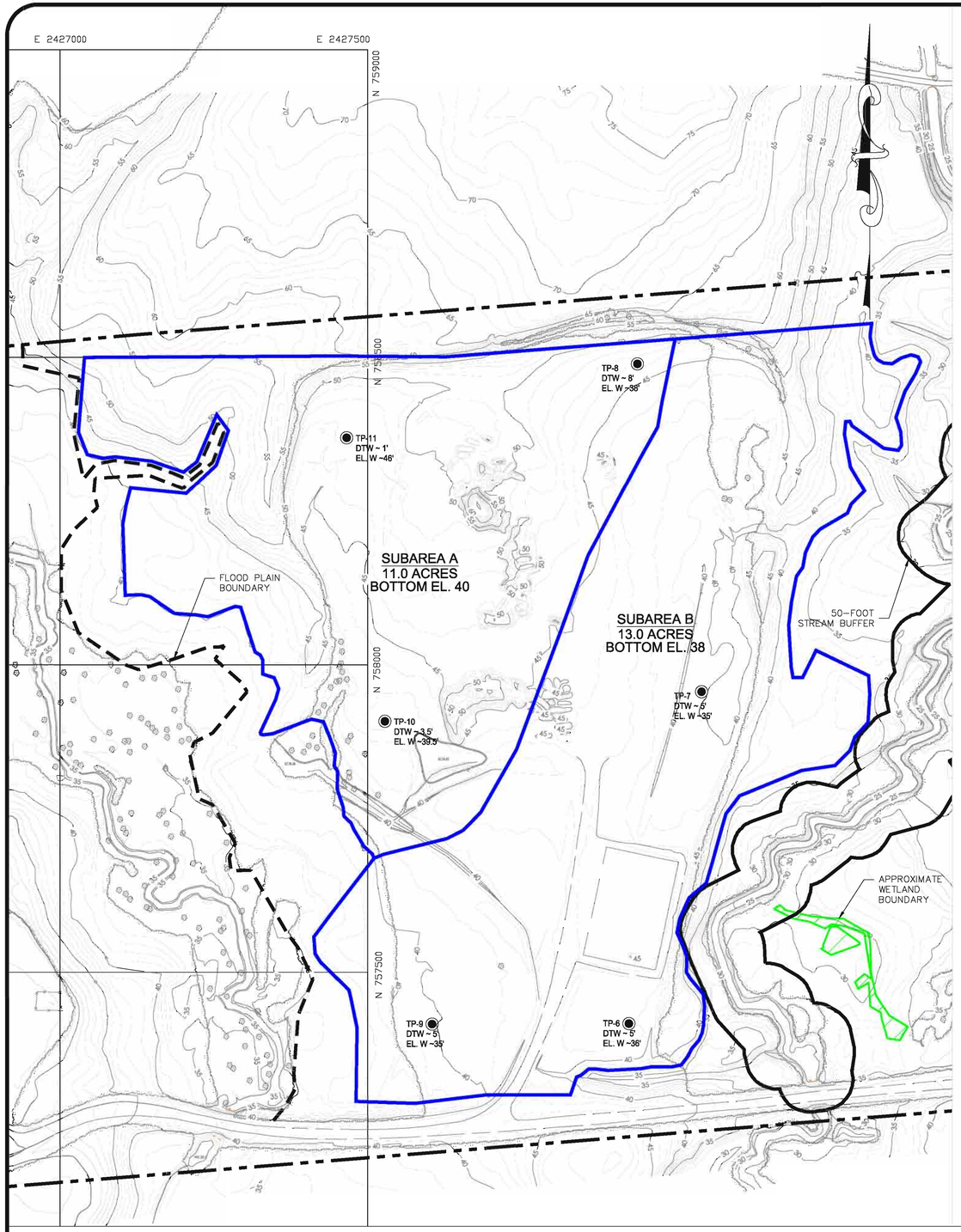
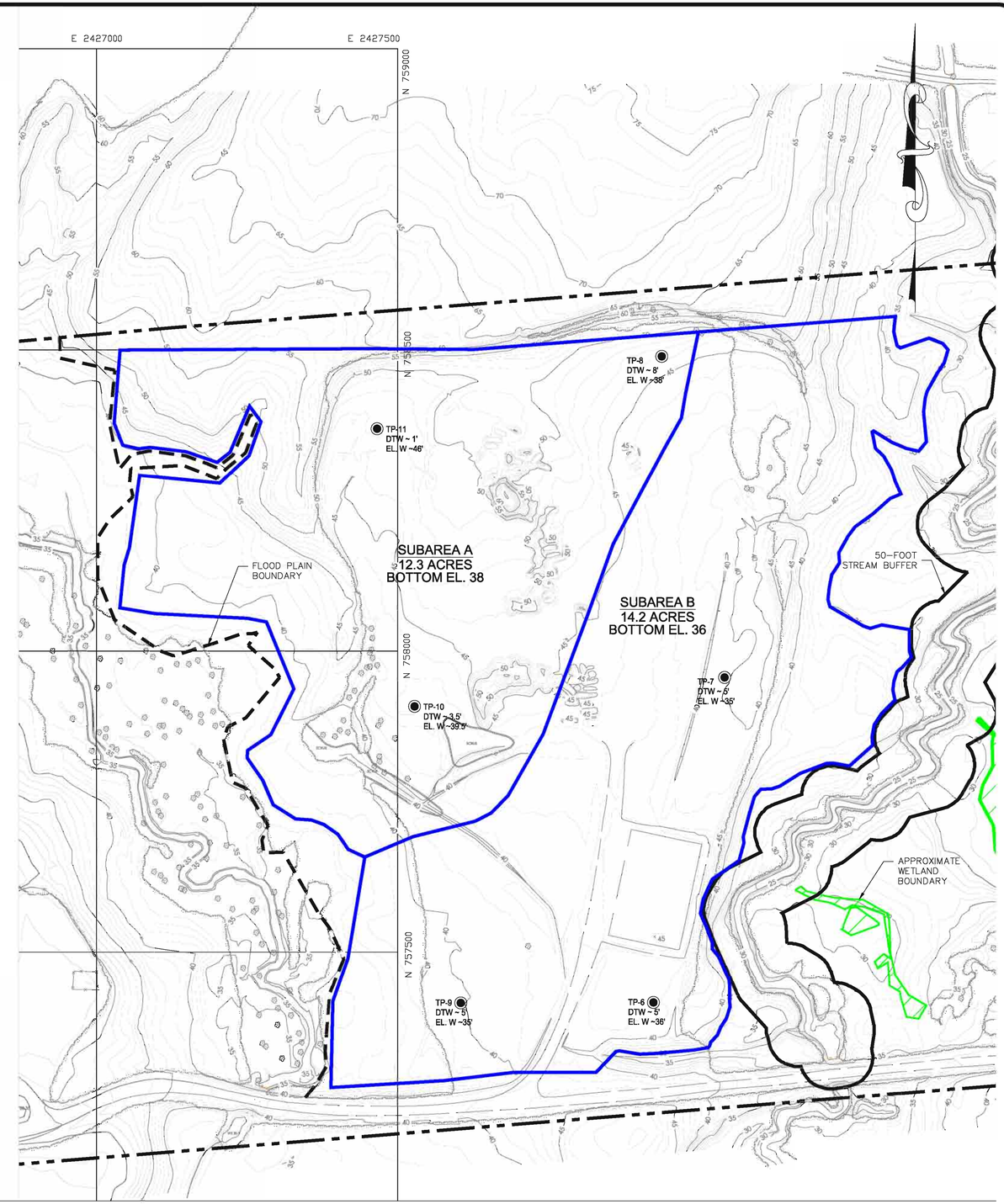
Preliminary Jurisdictional Stream/Wetland Delineation

Edgecombe County Landfill
Tarboro, North Carolina

FIGURE NO.
3



SCENARIO 1 - LIMITED DRAINAGE/DITCHING
~200,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~275,000 CY BORROW MATERIAL

NOTES

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LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

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NO.	DATE	DESCRIPTION	BY

BORROW AREA 1
CONCEPTUAL GRADING PLAN

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 4	OF:

DRAWING PATH: Q:\CADDATA\ACTIVE\2007\01-545G\1040-01-545G_FIG 04.DWG

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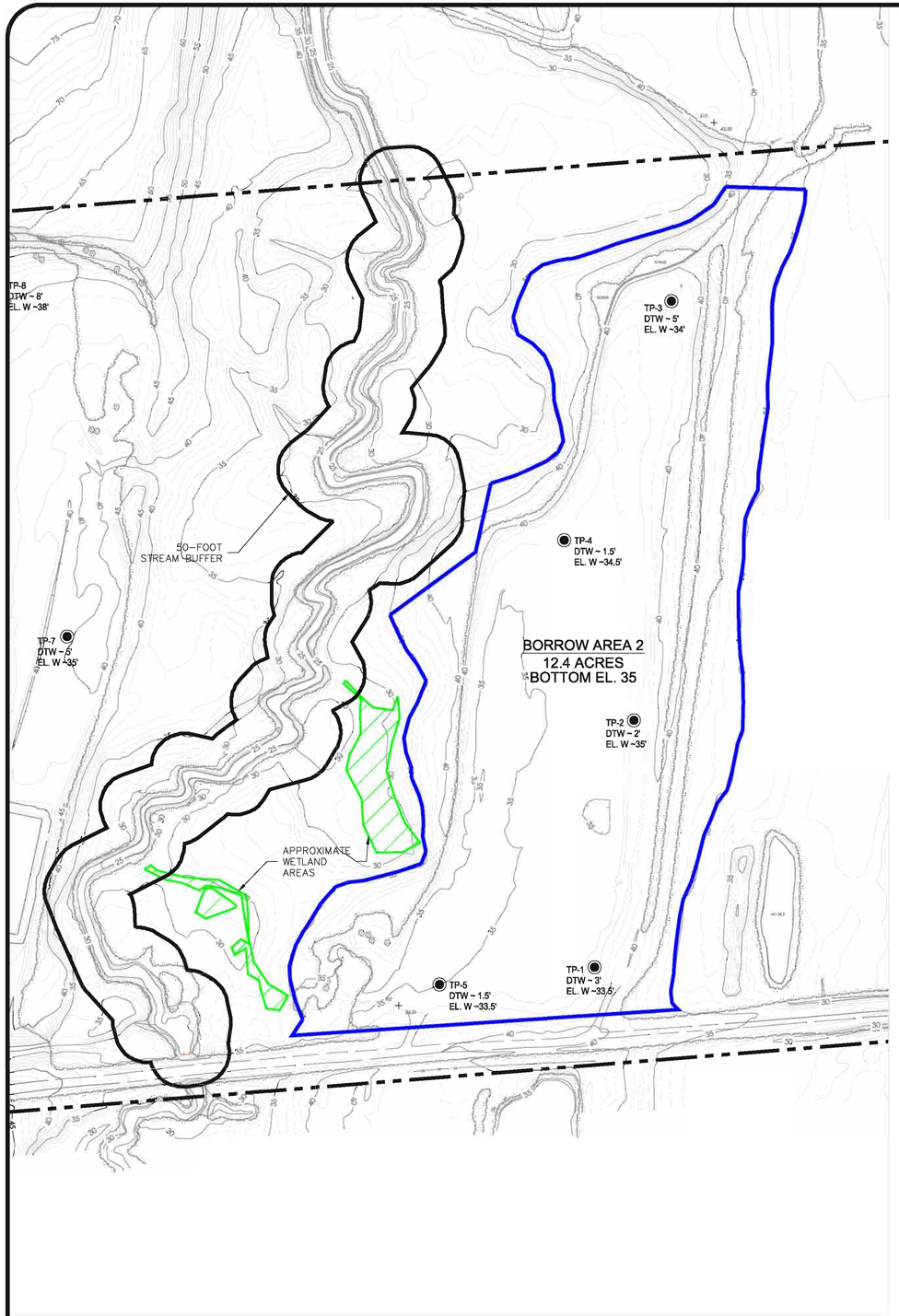

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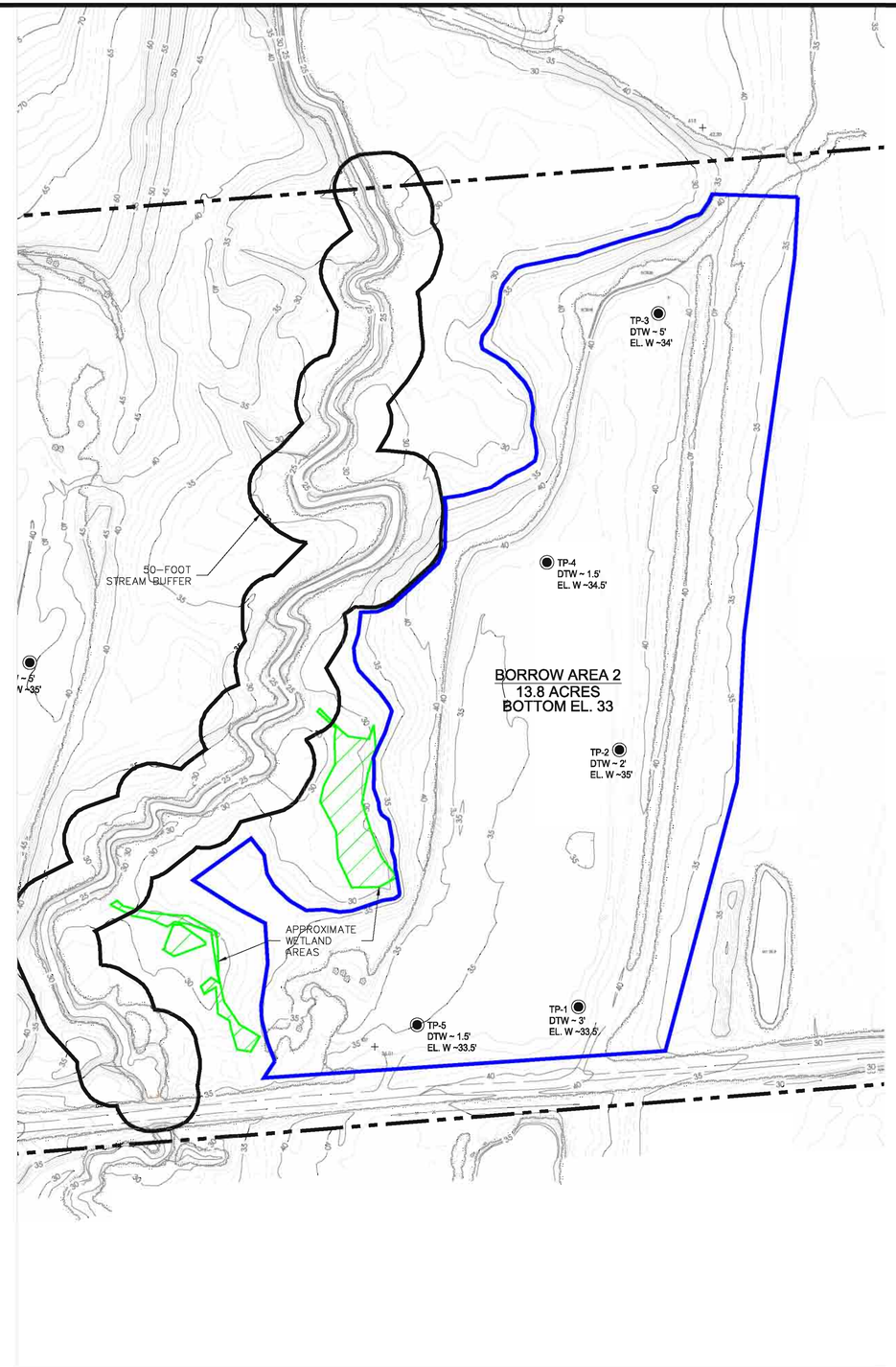
~40,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~80,000 CY BORROW MATERIAL

NOTES

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LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

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NO.	DATE	DESCRIPTION	BY

BORROW AREA 2
CONCEPTUAL GRADING PLAN

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 5	OF:

DRAWING PATH: Q:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G_TG 05.DWG

Q:\Cadata\ACTIVE\2001\01-545G\1040-01-545G Fig 05.dwg, Borrow Area 2, 7/22/2008 1:30:19 PM, 1:1

TABLES

Table 1

Summary of Laboratory Test Results
Edgecombe County Landfill - Soil Borrow Areas
Tarboro, North Carolina
S&ME Project No. 1040-01-545G

SAMPLE NUMBER	SAMPLE DEPTH (ft-bgs) (1)	VISUAL SOIL DESCRIPTION (2)	Lab USCS Symbol	Laboratory Grain Size Analysis (3)			Natural Moisture Content %	Atterberg Limits		
				Silt and Clay%	% Sand	% Gravel		Liquid Limit	Plastic Limit	Plasticity Index
TP-2	1.0	Brown SAND with Silt	SP	4.8	95.1	0.1	9.0	--	--	--
TP-2	4.0	Tan Silty SAND	SM	4.8	95.1	0.1	9.0	18	15	3
TP-3	5.0	Olive-Brown Silty SAND	SM	12.6	86.9	0.5	19.9	22	19	3
TP-4	7.5	Olive-Brown Silty SAND	SM	6.9	89.3	3.8	26.3	18	17	1
TP-6	6.0	Tan-Brown Clayey SAND	SC	23.5	76.5	0	16.3	30	16	14
TP-8	1.0	Olive-Gray Clayey SAND	SC	36.9	63.1	0	38.2	51	24	27
TP-10	2.0	Olive Silty SAND	SM	48.7	51.3	0	46.2	60	39	21
TP-10	4.0	Orange Red Silty SAND	SM	24.8	71.1	4.1	33.8	53	30	23

Notes:

1) ft. bgs.= Depth in feet below ground surface
2) Classification is based on visual analysis and/or Atterberg limits test results
3) Grain size analysis laboratory data are included in the report appendix.
4) -- = No data or parameter not collected

APPENDIX I

(GPS POINT LOCATIONS)

GPS Point Locations

LOCATION ID	NORTHING	EASTING	No.
w4-38	757428.051	2429750.335	1
w4-39	757458.914	2429758.518	2
w4-40	757569.226	2429781.004	3
w4-41	757867.201	2429812.958	4
w4-43	758143.115	2429870.962	6
w4-44	758136.845	2429928.343	7
w4-45	758084.531	2429955.373	8
w4-46	758101.971	2429972.438	9
w4-47	758152.372	2429972.760	10
w4-48	758233.020	2429945.156	13
w4-49	758332.274	2429947.966	14
w4-50	758460.973	2429946.862	15
w5-46	758466.296	2427031.377	16
w5-47	758486.498	2426940.567	17
w5-48	758559.392	2426939.405	18
w5-44	758376.777	2427022.582	19
43	758302.973	2427038.895	20
42	758326.261	2427058.566	21
41	758332.003	2427088.321	22
40	758324.011	2427148.038	23
40a1	758286.144	2427200.228	24
40xtie	758311.561	2427184.046	25
40a2	758301.988	2427214.168	26
40a3	758329.677	2427248.227	27
40a4	758393.843	2427256.540	28
40a5	758378.186	2427266.484	29
40a	758325.124	2427227.700	30
40a7	758304.548	2427200.729	31
36	758280.674	2427055.348	32
37	758303.102	2427057.150	33
38	758304.270	2427075.024	34
39	758308.761	2427144.901	35
35	758256.189	2427061.039	36
34	758219.166	2427022.384	37
33	758188.663	2427002.962	38
32	758121.715	2427002.512	39
31	758052.134	2427030.321	40
30	757992.962	2427128.913	42
21	757854.341	2427211.136	43
21b	757874.696	2427218.601	44
22	757889.392	2427248.626	45
24	757970.611	2427296.256	46
23	757956.157	2427304.920	47
25	758009.769	2427252.984	48
26	758031.829	2427267.197	49
27	758029.015	2427259.979	50
28	758028.953	2427239.695	51
29	758009.088	2427184.039	52
20	757782.003	2427226.328	53
19	757772.945	2427248.691	54
18	757710.504	2427285.513	55
17	757686.929	2427275.203	56

16	757665.346	2427278.921	57
15	757666.143	2427310.287	58
10	757564.796	2427369.564	64
9	757540.015	2427387.632	65
9-a	757489.302	2427411.337	66
2	757281.242	2427365.850	72
3	757310.125	2427382.940	73
3a	757336.878	2427380.800	74
w5-1	757259.189	2427347.468	75
w4-7	757415.877	2429249.471	77
w4-8	757408.540	2429247.577	78
w4-5	757406.886	2429190.887	80
w4-6	757401.103	2429192.392	81
w4-3	757399.318	2429148.168	82
w4-4	757395.018	2429146.790	83
w4-1	757402.414	2429141.240	84
w4-2	757393.944	2429134.920	85
a-1	757411.657	2429088.354	86
a-2	757458.354	2429089.177	88
a-3	757640.884	2429104.777	89
a-4	757640.017	2429154.108	90
w4-37	757417.751	2429690.091	1
w436	757431.965	2429684.051	2
w4-34	757456.151	2429683.192	3
w4-32	757465.953	2429657.676	4
w4-33	757472.665	2429653.081	5
w4-35	757495.498	2429649.670	6
w4-37	757527.948	2429660.559	7
x1	757604.932	2429666.968	8
x2	757645.781	2429654.392	9
x3	757742.066	2429667.585	10
x4	757812.201	2429668.819	11
x5	757879.211	2429673.924	12
x6	757899.669	2429662.356	13
x7	757934.156	2429658.125	14
13	757968.866	2429666.475	15
12	758021.861	2429665.024	16
11	758054.374	2429673.578	17
10	758091.118	2429654.616	18
10	758133.974	2429664.120	19
9	758192.673	2429667.142	20
8	758247.520	2429674.437	21
7	758313.827	2429678.747	22
6	758389.255	2429687.654	23
5	758442.842	2429687.816	24
4	758505.707	2429690.644	25
3	758540.058	2429684.612	26
1	758606.561	2429697.510	27
s2	757343.319	2428236.986	31
s1	757326.433	2428239.166	32
s3	757352.430	2428239.122	33
s4	757372.233	2428241.780	34
s5	757394.598	2428236.958	35
s6	757400.152	2428227.245	36
s7	757396.754	2428204.883	37
s8	757407.736	2428186.437	38
s7-a	757390.604	2428203.573	39

s8a	757402.384	2428201.241	40
s9	757451.793	2428172.659	41
s10	757465.323	2428151.056	42
s11	757454.803	2428141.436	43
s12	757462.984	2428115.940	44
s13	757505.178	2428097.580	45
s14	757540.987	2428095.424	46
s15	757575.110	2428065.587	47
s16	757594.966	2428085.835	48
s17	757638.102	2428170.521	49
s18	757668.389	2428173.806	50
s19	757677.966	2428166.385	51
s20	757695.941	2428177.488	52
s21	757691.918	2428212.801	53
s22	757718.638	2428247.258	54
93	757727.053	2428235.786	55
91	757740.680	2428249.849	56
89	757736.354	2428299.235	57
87	757767.893	2428319.091	58
85	757787.929	2428393.912	59
83	757811.312	2428408.274	60
83	757849.707	2428375.844	61
81	757866.364	2428382.467	62
79	757900.234	2428444.901	63
w3-1	757889.429	2428465.689	64
77	757949.885	2428417.239	66
75	758008.247	2428454.287	67
71	758032.586	2428447.086	68
69	758026.613	2428435.427	69
65	758042.640	2428438.485	70
61	758086.506	2428540.537	71
ukn	758087.898	2428501.778	72
59	758134.009	2428593.040	74
57	758146.841	2428592.290	75
55	758177.428	2428596.054	76
53	758212.924	2428589.458	77
49	758215.701	2428558.386	78
47	758205.032	2428470.379	79
45	758211.025	2428455.288	80
43	758222.624	2428446.094	81
41	758266.909	2428494.573	82
39	758310.705	2428520.515	83
35	758328.271	2428494.618	84
3	758363.278	2428515.091	85
ukn	758394.852	2428551.766	86
31	758418.877	2428566.690	87
29	758443.439	2428563.569	88
27	758478.706	2428561.662	89
25	758498.858	2428554.752	90
23	758506.964	2428535.489	91
21	758529.447	2428554.477	92
19	758522.522	2428560.895	93
17	758544.773	2428587.489	94
15	758562.085	2428593.412	95
13	758576.181	2428577.264	96
11	758615.763	2428580.348	97
10	758591.062	2428564.211	105

8	758640.782	2428541.100	106
14	758562.485	2428569.633	107
16	758554.554	2428553.209	108
18	758526.609	2428517.884	109
24	758478.171	2428543.501	112
26	758407.779	2428534.862	113
32	758354.121	2428484.631	115
32	758334.304	2428481.710	116
34	758307.342	2428498.036	117
34	758277.938	2428482.892	118
36	758233.298	2428442.987	120
36b	758210.453	2428413.154	121
38	758190.623	2428432.530	122
38b	758181.690	2428447.560	123
40	758182.629	2428473.827	124
42	758194.710	2428512.772	125
44	758198.780	2428573.480	126
46	758167.564	2428578.939	127
46b	758143.114	2428566.974	128
50	758104.980	2428510.693	130
52	758091.234	2428476.352	131
58	758037.176	2428422.248	132
64	758033.995	2428403.116	133
66	758012.373	2428403.154	134
70	757977.443	2428411.207	136
72	757951.954	2428392.928	137
74	757909.386	2428402.932	138
76	757888.113	2428389.687	139
78	757874.628	2428357.561	140
80	757857.323	2428342.288	141
80b	757820.509	2428372.286	142
82	757771.235	2428303.439	143
86	757754.270	2428288.125	144
88	757747.728	2428272.319	145
90	757759.618	2428221.084	146
92	757726.888	2428218.654	147
96	757699.552	2428143.433	148
98	757662.655	2428160.284	149
100	757639.076	2428158.961	150
104	757570.590	2428058.584	152
106	757531.554	2428074.052	153
118	757390.602	2428165.902	159
120	757372.639	2428162.471	160
122	757360.352	2428165.677	161
124	757364.340	2428193.398	162
126	757358.346	2428199.140	163
128	757345.296	2428210.625	164
129	757323.348	2428218.751	165
w12	757411.594	2428378.312	176
w13	757389.081	2428365.168	177
w14	757392.134	2428345.340	178
w15	757422.475	2428336.157	179
w16	757434.545	2428334.591	180
w11	757429.512	2428348.810	181
16	757444.021	2428317.929	182
9	757462.097	2428326.314	183
w18	757473.792	2428297.766	184

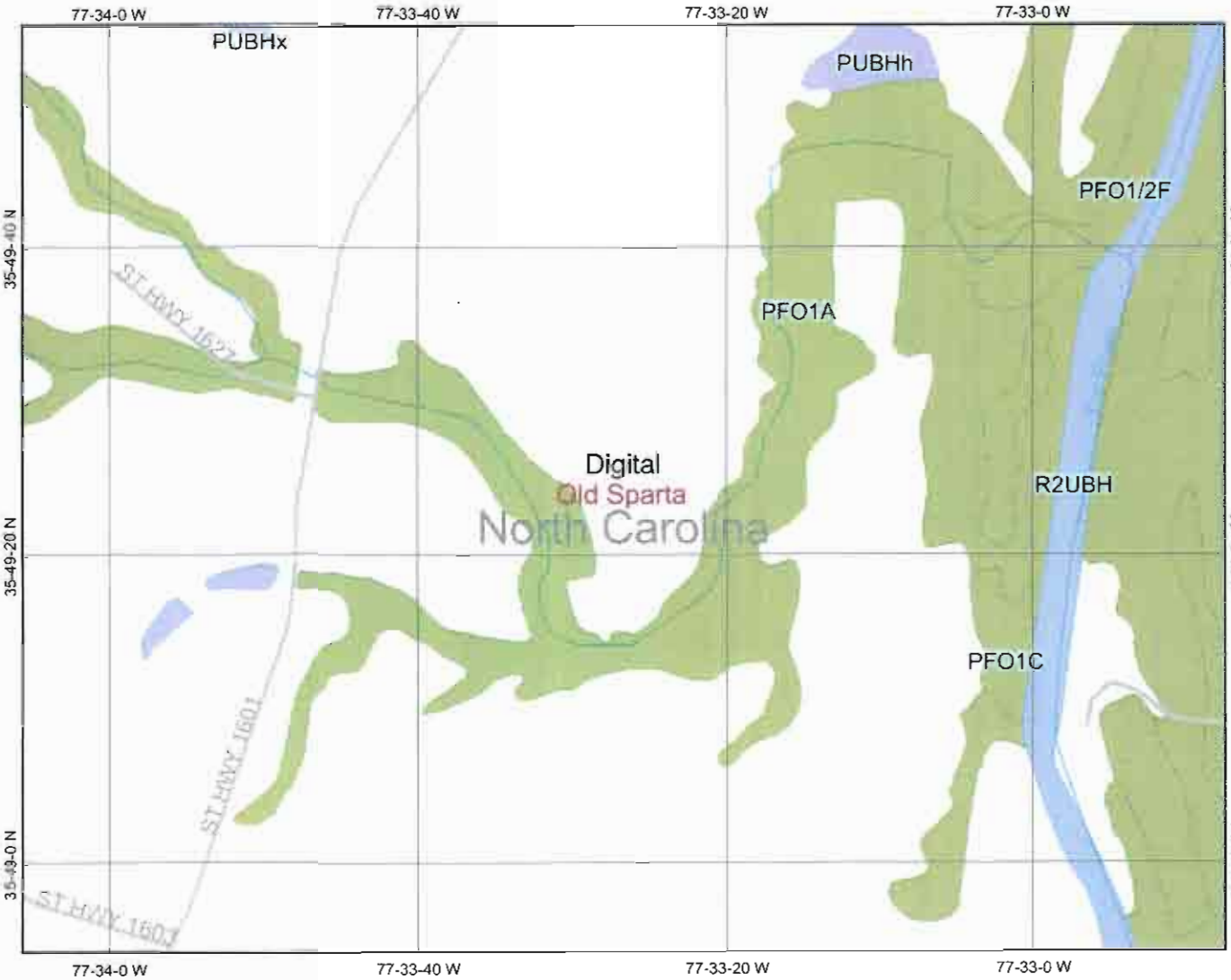
w19	757484.401	2428292.890	185
w20	757497.335	2428307.351	186
w17	757483.652	2428314.737	187
w21	757489.902	2428319.597	188
8	757499.458	2428318.345	189
w22	757511.143	2428315.938	190
w7	757537.308	2428317.667	191
w6	757563.885	2428315.540	192
w23	757563.736	2428307.290	193
w24	757575.873	2428274.706	194
ukn	757587.814	2428273.791	195
w4	757588.748	2428252.547	196
w25	757571.425	2428243.595	197
w26	757582.973	2428218.710	198
w3	757591.424	2428220.136	199
w27	757587.274	2428192.170	200
w2	757601.234	2428179.978	201
end	757603.626	2428160.577	202
w1	757609.714	2428170.175	203
w2-2	757574.016	2428263.266	204
w2-1	757574.640	2428252.167	205
w2-11	757544.528	2428240.454	206
w2-10	757540.178	2428240.418	207
w2-9	757538.300	2428237.646	208
w2-8	757528.462	2428253.263	209
w2-5	757545.734	2428299.798	212
w2-4	757548.425	2428299.817	213
w2-3	757553.991	2428293.819	214
w3-15	757670.521	2428492.139	215
w3-14	757628.296	2428512.345	216
w3-13	757629.007	2428552.576	217
w3-12	757643.716	2428578.162	218
w3-11	757673.938	2428555.833	219
w3-10	757708.571	2428541.687	220
w3-9	757752.964	2428527.888	221
w3-8	757796.020	2428536.357	222
w3-7	757832.820	2428547.502	223
w3-5	757865.960	2428544.455	224
w3-4	757844.375	2428537.815	225
w3-3	757848.930	2428507.691	226
w3-2	757859.458	2428494.564	227
w3-20	757848.469	2428487.046	229
w3-22 to 1	757884.460	2428462.271	231
w3-19	757808.642	2428488.511	232
w3-18	757776.218	2428471.926	233
w3-17	757753.711	2428466.517	234
w3-16	757710.898	2428489.419	235
27	757901.209	2429662.639	258
w4-33	757473.065	2429655.051	260
w4-29	757483.529	2429597.835	262
w4-30	757475.274	2429593.988	263
w4-27	757491.433	2429566.767	264
w4-28	757481.019	2429567.031	265
26	757479.930	2429541.518	266
w4-25	757484.798	2429535.160	267
w4-24	757485.507	2429498.237	268
w4-23	757488.487	2429500.616	269

w4-21	757484.029	2429472.241	270
w4-22	757480.747	2429474.497	271
w4-20	757484.383	2429449.790	272
w4-19	757498.604	2429453.214	273
w4-18	757481.128	2429443.029	274
w4-17	757474.998	2429436.694	275

APPENDIX II

(SUPPORTING WETLAND DOCUMENTS)

USFWS NWI Wetlands



Legend

CONUS_wet_scan
- 0
- 1
- Out of range

Interstate

Major Roads
- Other Road
- Interstate
- State highway
- US highway

Roads

Cities

USGS Quad Index 24K

Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan

NHD Streams

Counties 100K

Urban Areas 300K

States 100K

South America

Scale: 1:17,316

Map center: 35° 49' 24" N, 77° 33' 27" W

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

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EDGECOMBE COUNTY, NORTH CAROLINA — SHEET NUMBER 26

APPENDIX III

(BORROW AREA TEST PIT SUMMARY)

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-1	0.0 - 3.0	Orange brown medium SAND, with trace of silt. Seepage at 3 ft bgs and sloughing was observed
		3.0 - 5.0	Gray medium-fine SAND with shells, wet and saturated
		5.0	Test Pit Terminated
9/13/2006	TP-2	0.0 - 2.0	Orange brown medium SAND, water at 2 ft.
		2.0 - 4.0	Gray medium-fine SAND with shells
		4.0	Test Pit Terminated
9/13/2006	TP-3	0.0 - 1.5	Orange tan , fine SAND
		1.5 - 4.5	Orange tan , medium-fine SAND
		4.5 - 5.0	Brown-orange, medium-fine SAND with clay, wet (SC)
		5.0	Gray medium-fine SAND (SW-SP) with shells. Water at 5 ft.
		5.0	Test Pit Terminated

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-4	0.0 - 1.5	Orange/ orange brown medium-course SAND. Slow seepage observed at 1.5 ft-bgs
		1.5 - 5.0	Gray medium-fine SAND with shells
		5.0 - 7.5	Dark gray medium SAND with shells
		7.5 - 8.0	Dark gray, clayey SAND with shells
		8.0	Test Pit Terminated.
9/13/2006	TP-5	0.0 - 1.5	Tan / light gray sandy CLAY
		1.5 - 2.0	Tan, medium SAND. Water/ seepage observed at 1.5-2 ft.
		2.0 - 4.5	Tan medium-fine SAND
		4.5	Dark gray medium-fine SAND with shells. Sloughing observed
		4.5	Test Pit Terminated.
9/13/2006	TP-6	0.0 - 1.5	Orange-brown CLAY to tan sandy CLAY
		1.5 - 3.5	Tan clayey SAND
		3.5 - 6.0	Tan/orange fine SAND
		6.0 - 8.0	Tan/orange clayey SAND
		8.0 - 9.0	Gray clayey SAND, wet
		9.0	Gray clayey SAND, saturated
		9.0	Test Pit Terminated.

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-7	0.0 - 2.0	Rust-red SAND
		2.0 - 4.5	Brown-orange clayey SAND, wet 2.5' bgs (seepage observed)
		4.5 - 5.0	Tan and gray medium-fine SAND with shells.
		5.0	Test Pit Terminated.
9/13/2006	TP-8	0.0 - 0.5	Orange sandy CLAY
		0.5 - 5.0	Gray sandy CLAY
		5.0 - 6.0	Gray sandy CLAY with shells
		6.0 - 8.0	Gray clayey SAND
		8.0	Test Pit Terminated.

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
10/12/2006	TP-9	0.0 - 0.5	Silty LOAM with organics
		0.5 - 5.5	Tan, medium-fine SAND, moist
		5.5 - 6.5	Tan, medium-fine SAND, trace of coarse-medium sand. Seepage observed ~6.0 ft-bgs
		6.5	Tan, fine-medium SAND with shells, wet.
		6.5	Test Pit Terminated
10/12/2006	TP-10	0.0 - 3.5	Tan CLAY, mottling below 2.5 ft.
		3.5 - 7.0	Orange CLAY with trace of mdium sand. Water entered test pit at 4.0 ft-bgs.
		7.0 - 8.0	Orange-brown sandy CLAY
		8.0 - 8.5	Orange-brown sandy CLAY with shells
		8.5 - 9.0	Gray medium SAND with shells
		9.0	Test Pit Terminated
10/12/2006	TP-11	0.0 - 2.5	Light tan medium SAND, moist, wet below 1.0 ft.
		2.5	Test Pit Terminated due to collapsing side walls

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

APPENDIX IV

(LABORATORY TEST RESULTS)

S&ME

LAB ASSIGNMENT SHEET

Request Completion Date:
Date Assigned: 9-18-06
Sampling Date:
Date Completed:

Log Number

Project #: 1040-01-5456 Project Name: EDGECOMB Co. LANDFILL BORROW STUDY
Project Address: Engineer in Charge: KEN DALY
Client Name: ~~EDGECOMB COUNTY~~ Sampled By: KEN DALY
Client Address: Sample Location: BORROW AREAS

Alternate Test: AASHTO ☐ NCDOT ☐ Other ☐

	Boring #	Sample #	DEPTH	Moisture Content D2216	Plastic Index D4318	Grain Size (200 Wash) D422	Hydrometer D422	Standard Proctor D698	Modified Proctor D1557	Soil Specific Gravity D854	Aggregate Gradation C136	Fine Aggregate Specific Gravity C	Coarse Agg. Specific Gravity C12	Marshall Test D1559 o D5581 o	Extraction / Gradation D2172 / D	Maximum Theoretical D2041	Core Bulk Specific Gravity D2726	Compressive Str. Concrete Core	CMU Prism Compressive Stength	Flex. Strenght Concrete Beam	CBR D1883 Compaction	CBR D1883 Moisture	CBR D1883 Soak	One-Dimensional Consolidation Test D2435 Preload	Saturate	Loads	Permeability D5084	Triaxial Shear CU D4767 ☐ UU D2850 ☐ Confining Pressures				U
1	TP2	–	0-1'			X																										
2	TP2	–	4'		X	X																										
3	TP3	–	5'		X	X																										
4	TP4	–	7.5'		X	X																										
5	TP6	–	6'		X	X																										
6																																
7																																
8																																
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17																																
18																																
19																																
20																																

NOTE: Field Samples obtained from: Stockpiles ☐ Roadway ☐ Conveyor belt ☐ Aggregate Stream ☐ Borehole ☐
Material Suppliers, Sampling Parameters, and Project Specifications.

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 09/18 - 09/25/2006

Project Name: Edgecomb County Landfill Borrow Study Report Date: 09/25/2006

Client Name:

Client Address:

Boring #: TP-2 Sample #: N/A Sample Date: Unknown

Location: Borrow Areas Depth (ft): 0 - 1.0'

Sample Description: Brown SAND with Silt (SP)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	7
	Tare Number	7	A	Tare Weight	146.72
A	Tare Weight	146.72	B	Wet Weight + Tare Wt.	665.01
B	Total Sample Dry Wt. + Tare Wt.	622.24	C	Dry Weight + Tare Wt.	622.24
C	Total Sample Dry Weight (B-A)	475.52	D	Water Wt. (B-C)	42.77
D	Total Sample Wt. After #200 Wash	456.37	E	Dry Wt.(C-A)	475.52
E	Percent Passing #200 (1-D/C)x100	4.0%		Moisture Content (100 x D/E) (%)	9.0%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.71	0.1%	**99.9%**
2.00	#10	16.20	3.4%	**96.6%**
0.85	#20	132.63	27.9%	**72.1%**
0.43	#40	346.09	72.8%	**27.2%**
0.25	#60	437.99	92.1%	**7.9%**
0.15	#100	449.63	94.6%	**5.4%**
0.075	#200	452.56	95.2%	**4.8%**

Notes:						
	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.1%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**3.3%**
Liquid Limit	ND	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**69.4%**
Plastic Limit	ND	Cu = D60/D10: **2.5**	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**22.4%**
Plastic Index	ND	Cc =(D30)^2/ (D10xD60): **1.0**	% Silt and Clay	< 0.075 mm	**4.8%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
					Organic Content **ND**

D10 = **0.28** D30 = **0.45** D60 = **0.69** D50 = **0.6** D90 = **1.5**

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132 *Certification #*

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

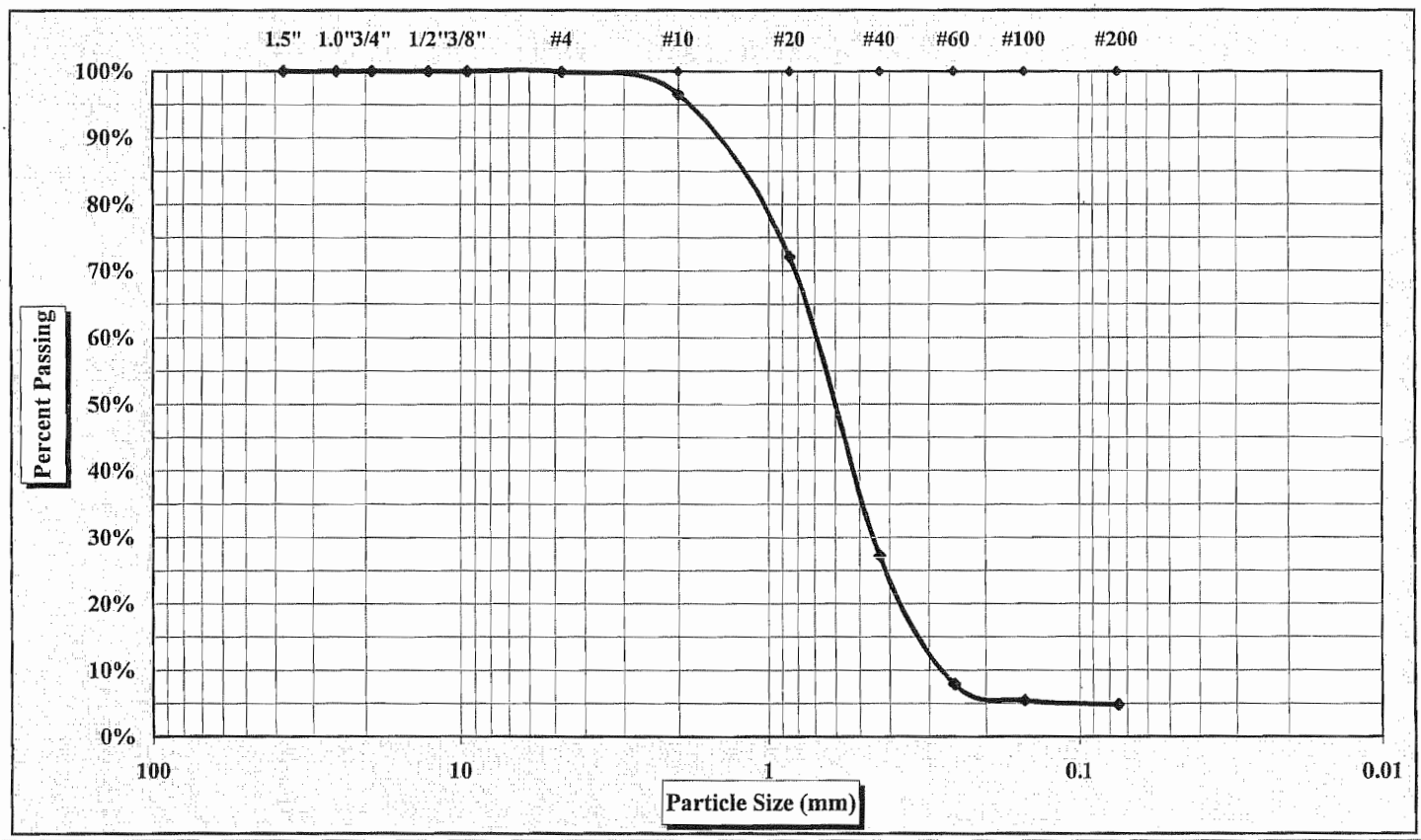
S&ME Project #: **1040-01-545G** Report Date: 09/25/2006

Project Name: **Edgecomb County Landfill Borrow Study** Test Date(s): 09/18 - 09/25/2006

Client Name:

Client Address:

Boring #:	TP-2	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	0 - 1.0'
Sample Description:	Brown SAND with Silt (SP)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	0%	Medium Sand	69%
Silt & Clay (% Passing #200)	4.8%	Coarse Sand	3%	Fine Sand	22%
Apparent Relative Density	ND	Moisture Content	9.0%	Organic Content	ND
Liquid Limit	ND	Plastic Limit	ND	Plastic Index	ND

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 09/18 - 09/25/2006

Project Name: Edgecomb County Landfill Borrow Study Report Date: 09/25/2006

Client Name:

Client Address:

Boring #: TP-2 Sample #: N/A wn

Location: Borrow Area

Sample Description: Tan Silty SAND (SM) w / Shells?

Particle Size Analysis / Without Hydrometer Analysis					Natural
					98
	Tare Number	98	A		161.21
A	Tare Weight	161.21	B	Wet Weight + Tare Wt.	570.12
B	Total Sample Dry Wt. + Tare Wt.	540.12	C	Dry Weight + Tare Wt.	540.12
C	Total Sample Dry Weight (B-A)	378.91	D	Water Wt. (B-C)	30.00
D	Total Sample Wt. After #200 Wash	347.77	E	Dry Wt.(C-A)	378.91
E	Percent Passing #200 (1-D/C)x100	8.2%		Moisture Content (100 x D/E) (%)	7.9%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.35	0.1%	**99.9%**
4.75	#4	10.76	2.8%	**97.2%**
2.00	#10	24.47	6.5%	**93.5%**
0.85	#20	46.41	12.2%	**87.8%**
0.43	#40	125.22	33.0%	**67.0%**
0.25	#60	264.22	69.7%	**30.3%**
0.15	#100	338.75	89.4%	**10.6%**
0.075	#200	346.40	91.4%	**8.6%**

Notes:						
	Maximum Particle Size	**1/2"**	Gravel	< 75 mm and > 4.75 mm (#4)	**2.8%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**3.7%**
Liquid Limit	18	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**26.5%**
Plastic Limit	15	Cu = D60/D10: **2.5**	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**58.4%**
Plastic Index	3	Cc =$(D30)^2$/ (D10xD60): **1.1**	% Silt and Clay	< 0.075 mm	**8.6%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = **0.15** D30 = **0.25** D60 = **0.38** D50 = **0.34** D90 = **1**

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

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Technician Name: Chana Savanapridi NICET 116132 *Certification #*

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

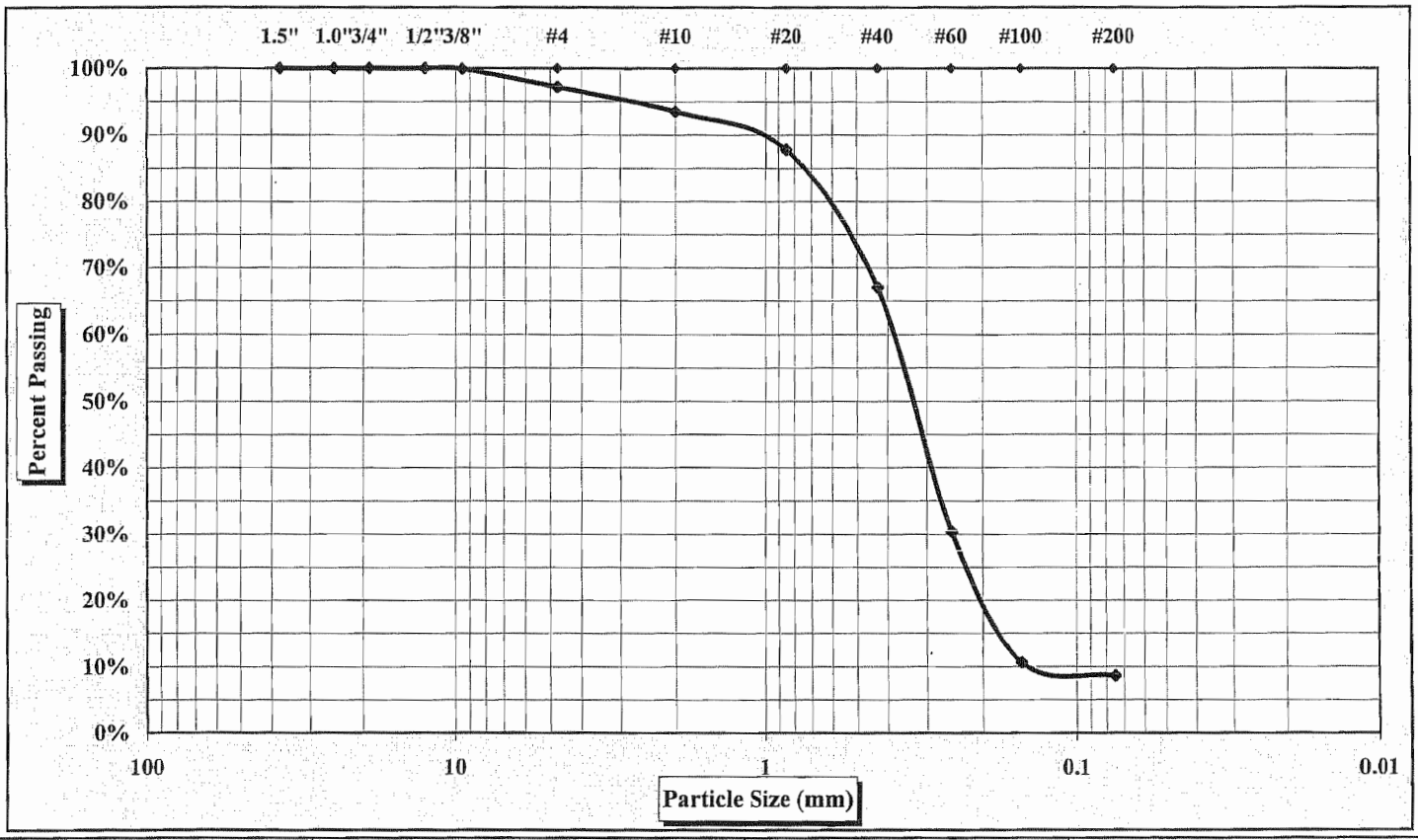
S&ME Project #: **1040-01-545G** Report Date: 09/25/2006

Project Name: **Edgecomb County Landfill Borrow Study** Test Date(s): 09/18 - 09/25/2006

Client Name:

Client Address:

Boring #:	TP-2	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Area			Depth (ft):	- 4.0'
Sample Description:	Tan Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Gravel	3%	Medium Sand	27%
Silt & Clay (% Passing #200)	8.6%	Coarse Sand	4%	Fine Sand	58%
Apparent Relative Density	ND	Moisture Content	7.9%	Organic Content	ND
Liquid Limit	18	Plastic Limit	15	Plastic Index	3

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan Laboratory Supervisor

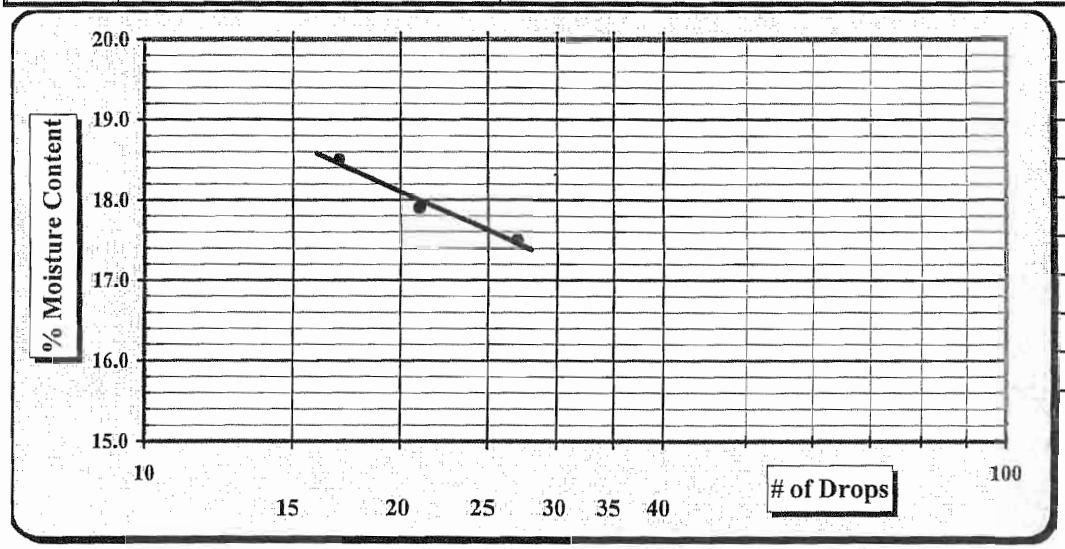
Signature *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 09/25/2006
Project Name: Edgecomb County Landfill Borrow Study Test Date(s): 09/18 - 09/25/2006
Client Name:
Client Address:
Boring #: TP-2 Sample #: N/A Sample Date: Unknown
Location: Borrow Area Offset: NA Depth (ft): - 4.0'
Sample Description: Tan Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	5	11	16				46	27	
A	Tare Weight	11.05	21.13	21.04				21.02	20.90	
B	Wet Soil Weight + A	30.93	35.04	36.16				31.65	30.48	
C	Dry Soil Weight + A	27.82	32.93	33.91				30.24	29.22	
D	Water Weight (B-C)	3.11	2.11	2.25				1.41	1.26	
E	Dry Soil Weight (C-A)	16.77	11.80	12.87				9.22	8.32	
F	% Moisture Content (D/E)*100	18.5%	17.9%	17.5%				15.3%	15.1%	
N	# OF DROPS	17	21	27				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							15.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	18
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	15
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	3
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 09/18 - 09/25/2006

Project Name: Edgecomb County Landfill Borrow Study Report Date: 09/25/2006

Client Name:

Client Address:

Boring #: TP-3 Sample #: N/A Sample Date: Unknown

Location: Borrow Areas Depth (ft): - 5.0'

Sample Description: Olive-Brown Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	9
	Tare Number	9	A	Tare Weight	138.77
A	Tare Weight	138.77	B	Wet Weight + Tare Wt.	515.76
B	Total Sample Dry Wt. + Tare Wt.	453.30	C	Dry Weight + Tare Wt.	453.30
C	Total Sample Dry Weight (B-A)	314.53	D	Water Wt. (B-C)	62.46
D	Total Sample Wt. After #200 Wash	276.06	E	Dry Wt.(C-A)	314.53
E	Percent Passing #200 (1-D/C)x100	12.2%		Moisture Content (100 x D/E) (%)	19.9%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	1.61	0.5%	**99.5%**
2.00	#10	4.17	1.3%	**98.7%**
0.85	#20	24.34	7.7%	**92.3%**
0.43	#40	108.63	34.5%	**65.5%**
0.25	#60	217.74	69.2%	**30.8%**
0.15	#100	269.14	85.6%	**14.4%**
0.075	#200	274.92	87.4%	**12.6%**

Notes:	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.5%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.8%**
Liquid Limit 22	Fineness Modulus		Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.2%**
Plastic Limit 19	Cu = D60/D10:		Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**52.9%**
Plastic Index 3	Cc =(D30)^2/ (D10xD60):		% Silt and Clay	< 0.075 mm	**12.6%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132 *Certification #*

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

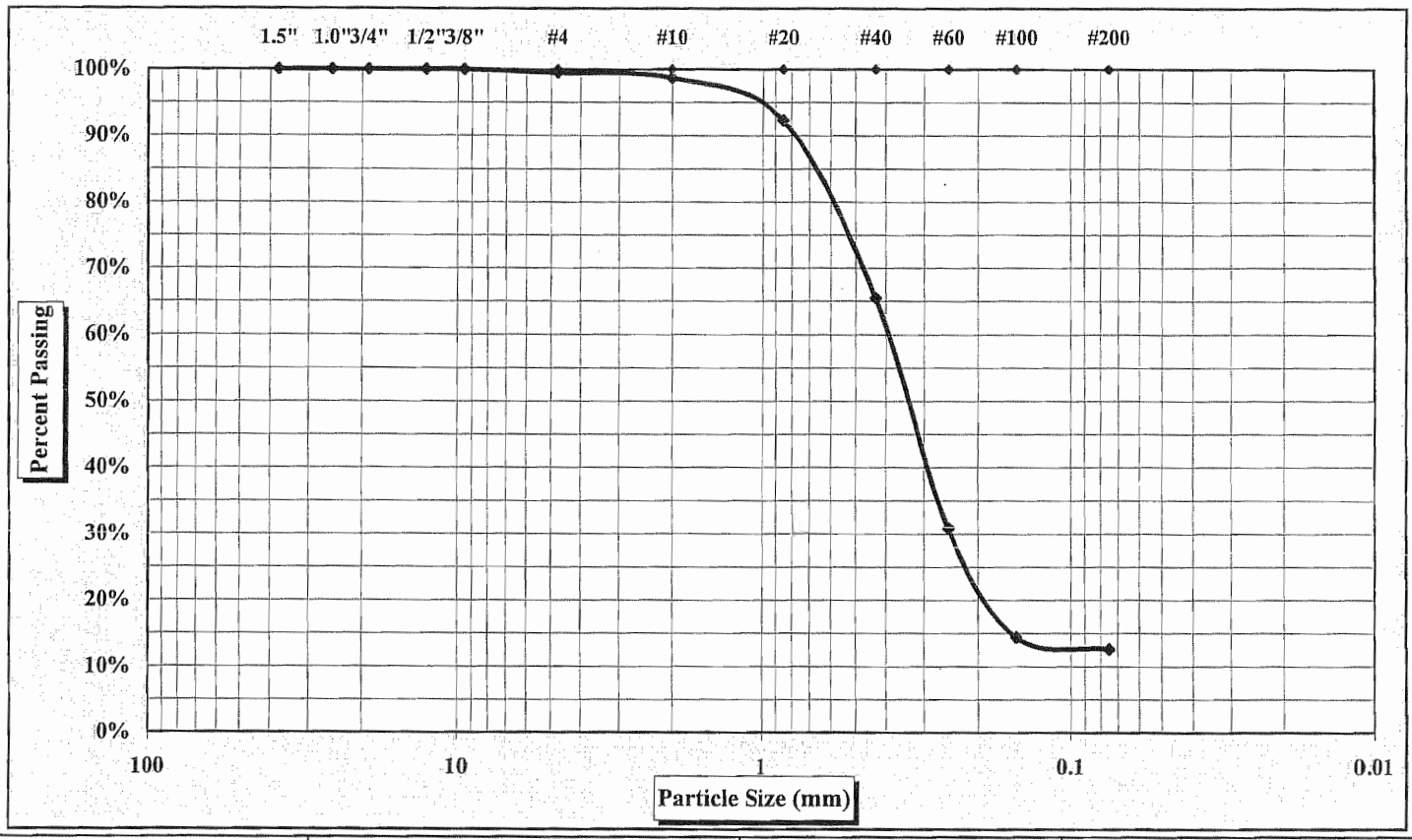
S&ME Project #: **1040-01-545G** Report Date: 09/25/2006

Project Name: **Edgecomb County Landfill Borrow Study** Test Date(s): 09/18 - 09/25/2006

Client Name:

Client Address:

Boring #:	TP-3	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 5.0'
Sample Description:	Olive-Brown Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	1%	Medium Sand	33%
Silt & Clay (% Passing #200)	12.6%	Coarse Sand	1%	Fine Sand	53%
Apparent Relative Density	ND	Moisture Content	19.9%	Organic Content	ND
Liquid Limit	22	Plastic Limit	19	Plastic Index	3

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

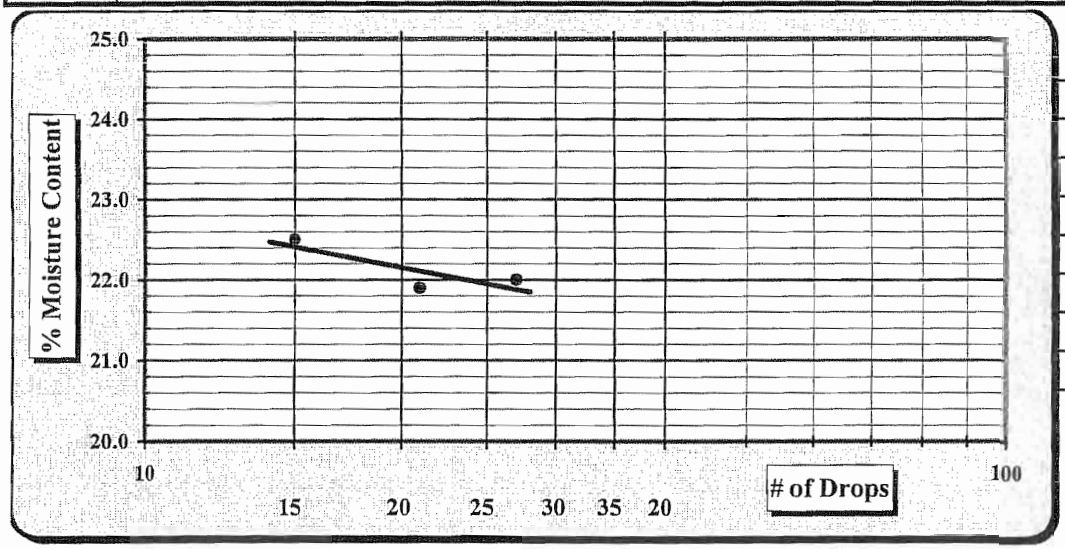
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 09/25/2006
Project Name: Edgecomb County Landfill Borrow Study Test Date(s): 09/18 - 09/25/2006
Client Name:
Client Address:
Boring #: TP-3 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Offset: NA Depth (ft): - 5.0'
Sample Description: Olive-Brown Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	2	54	57				5	22	
A	Tare Weight	15.31	18.60	18.55				17.79	21.11	
B	Wet Soil Weight + A	37.09	38.55	41.42				31.07	33.33	
C	Dry Soil Weight + A	33.09	34.97	37.30				29.01	31.38	
D	Water Weight (B-C)	4.00	3.58	4.12				2.06	1.95	
E	Dry Soil Weight (C-A)	17.78	16.37	18.75				11.22	10.27	
F	% Moisture Content (D/E)*100	22.5%	21.9%	22.0%				18.4%	19.0%	
N	# OF DROPS	15	21	27				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							18.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	22
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	19
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	3
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 09/18 - 09/25/2006

Project Name: Edgecomb County Landfill Borrow Study Report Date: 09/25/2006

Client Name:

Client Address:

Boring #: TP-4 Sample #: N/A Sample Date: Unknown

Location: Borrow Areas Depth (ft): - 7.5'

Sample Description: Olive-Gray Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**60M**
	Tare Number	60M	A	Tare Weight	221.85
A	Tare Weight	221.85	B	Wet Weight + Tare Wt.	681.47
B	Total Sample Dry Wt. + Tare Wt.	585.81	C	Dry Weight + Tare Wt.	585.81
C	Total Sample Dry Weight (B-A)	363.96	D	Water Wt. (B-C)	95.66
D	Total Sample Wt. After #200 Wash	341.56	E	Dry Wt.(C-A)	363.96
E	Percent Passing #200 (1-D/C)x100	6.2%		Moisture Content (100 x D/E) (%)	26.3%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	1.97	0.5%	**99.5%**
9.50	3/8"	6.34	1.7%	**98.3%**
4.75	#4	13.91	3.8%	**96.2%**
2.00	#10	31.85	8.8%	**91.2%**
0.85	#20	60.54	16.6%	**83.4%**
0.43	#40	155.16	42.6%	**57.4%**
0.25	#60	280.71	77.1%	**22.9%**
0.15	#100	327.05	89.9%	**10.1%**
0.075	#200	338.73	93.1%	**6.9%**

Notes:						
	Maximum Particle Size	**3/4"**	Gravel	< 75 mm and > 4.75 mm (#4)	**3.8%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**5.0%**
Liquid Limit	18	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.8%**
Plastic Limit	17	Cu = D60/D10: **3.0**	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**50.5%**
Plastic Index	1	Cc =$(D30)^2$/ (D10xD60): **1.2**	% Silt and Clay	< 0.075 mm	**6.9%**
ND=Not determined			Description of Sand & Gravel	Rounded ☒	Angular ☒
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☒
				Organic Content	**ND**

D10 = **0.15** D30 = **0.28** D60 = **0.45** D50 = **0.38** D90 = **1.8**

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132 *Certification #*

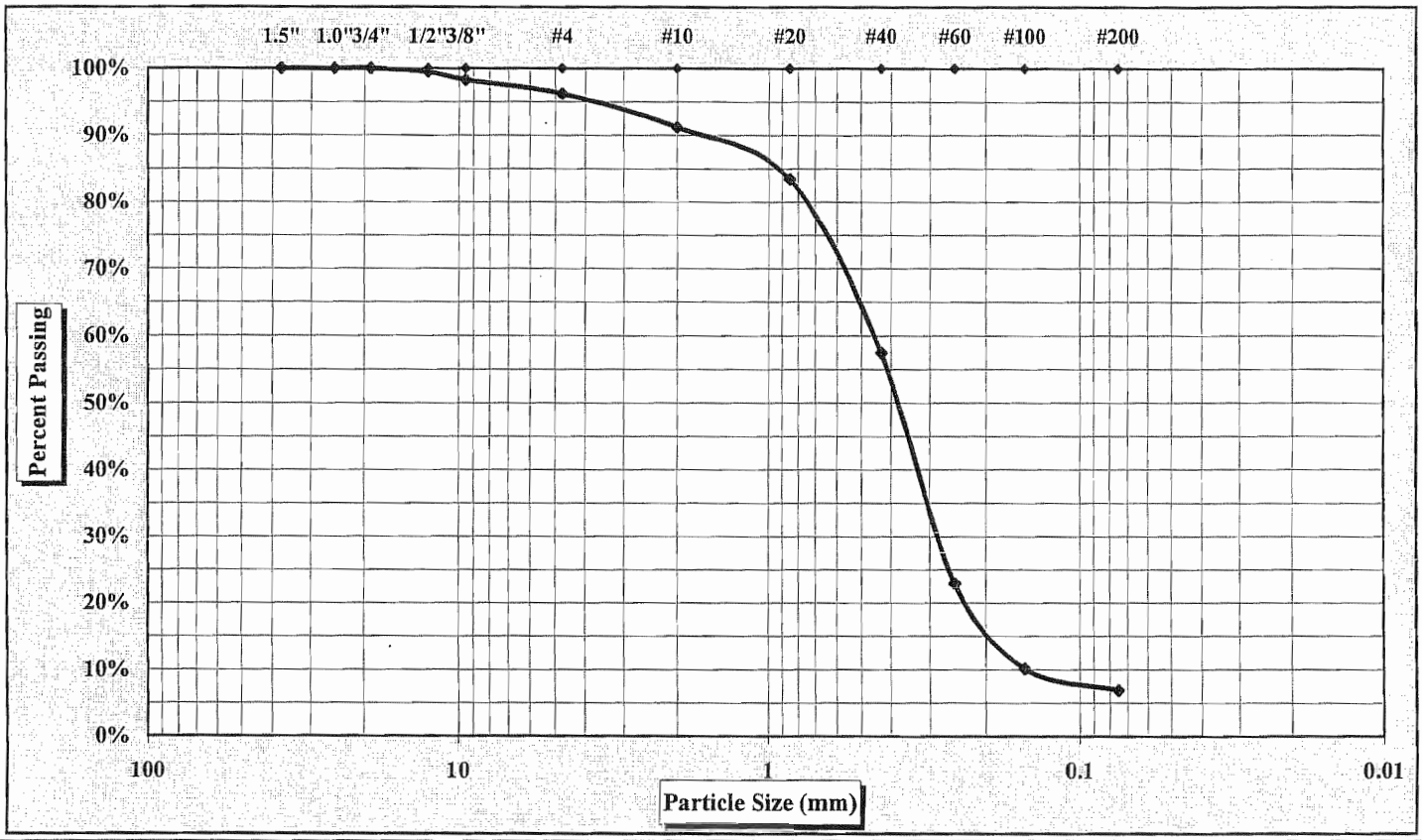
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G** Report Date: 09/25/2006
Project Name: **Edgecomb County Landfill Borrow Study** Test Date(s): 09/18 - 09/25/2006
Client Name:
Client Address:

Boring #:	TP-4	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 7.5'
Sample Description:	Olive-Gray Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/4"	Gravel	4%	Medium Sand	34%
Silt & Clay (% Passing #200)	6.9%	Coarse Sand	5%	Fine Sand	51%
Apparent Relative Density	ND	Moisture Content	26.3%	Organic Content	ND
Liquid Limit	18	Plastic Limit	17	Plastic Index	1

ND=Not determined

Description of Sand & Gravel

Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

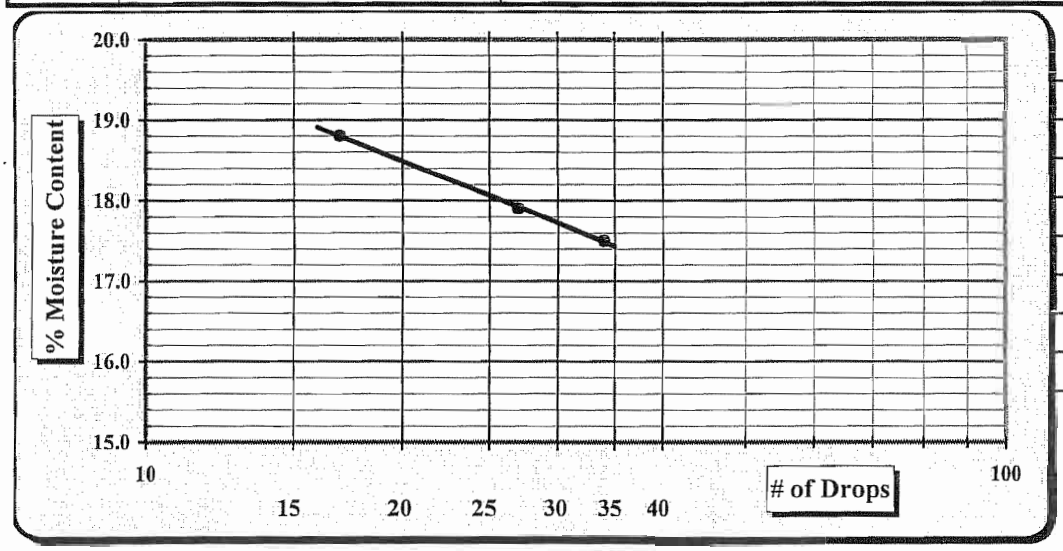
Technical Responsibility: Mal Krajan Laboratory Supervisor
Signature *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 09/25/2006
Project Name: Edgecomb County Landfill Borrow Study Test Date(s): 09/18 - 09/25/2006
Client Name:
Client Address:
Boring #: TP-4 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Offset: NA Depth (ft): - 7.5'
Sample Description: Olive-Gray Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	14	0	9				43	39	
A	Tare Weight	18.47	18.42	18.39				21.07	21.02	
B	Wet Soil Weight + A	37.55	40.98	38.64				34.48	30.65	
C	Dry Soil Weight + A	34.53	37.55	35.63				32.50	29.28	
D	Water Weight (B-C)	3.02	3.43	3.01				1.98	1.37	
E	Dry Soil Weight (C-A)	16.06	19.13	17.24				11.43	8.26	
F	% Moisture Content (D/E)*100	18.8%	17.9%	17.5%				17.3%	16.6%	
N	# OF DROPS	17	27	34				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	18
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	17
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	1
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan Laboratory Supervisor
Signature *Position*

Particle Size Analysis of Soils

ASTM D 422

Project #: 1040-01-545G Test Date(s): 09/18 - 09/25/2006
Project Name: Edgecomb County Landfill Borrow Study Report Date: 09/25/2006
Client Name:
Client Address:

Boring #: TP-6 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Depth (ft): - 6.0'
Sample Description: Tan-Brown Clayey SAND (SC)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**AA**
	Tare Number	AA	A	Tare Weight	217.31
A	Tare Weight	217.31	B	Wet Weight + Tare Wt.	593.08
B	Total Sample Dry Wt. + Tare Wt.	540.32	C	Dry Weight + Tare Wt.	540.32
C	Total Sample Dry Weight (B-A)	323.01	D	Water Wt. (B-C)	52.76
D	Total Sample Wt. After #200 Wash	247.60	E	Dry Wt.(C-A)	323.01
E	Percent Passing #200 (1-D/C)x100	23.3%		Moisture Content (100 x D/E) (%)	16.3%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.12	0.0%	**100.0%**
2.00	#10	1.78	0.6%	**99.4%**
0.85	#20	23.34	7.2%	**92.8%**
0.43	#40	107.90	33.4%	**66.6%**
0.25	#60	207.89	64.4%	**35.6%**
0.15	#100	238.37	73.8%	**26.2%**
0.075	#200	247.11	76.5%	**23.5%**

Notes:	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.6%**
Liquid Limit 30	Fineness Modulus		Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**32.8%**
Plastic Limit 16	Cu = D60/D10:		Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**43.1%**
Plastic Index 14	Cc =$(D30)^2$/ (D10xD60):		% Silt and Clay	< 0.075 mm	**23.5%**
ND=Not determined			Description of Sand & Gravel	Rounded ☒	Angular ☒
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☒
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

Particle Size Analysis of Soils

ASTM D 422

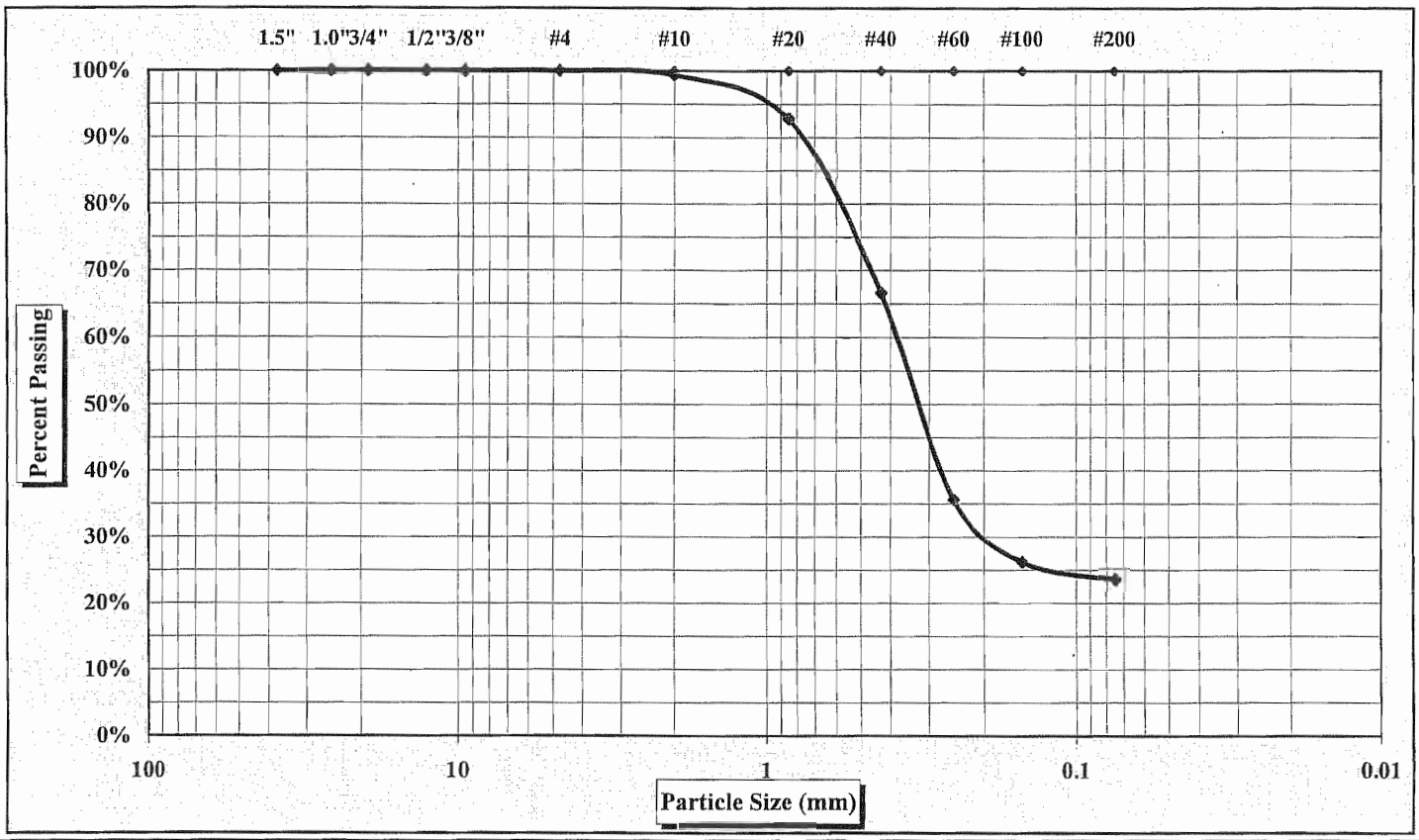
S&ME Project #: **1040-01-545G** Report Date: 09/25/2006

Project Name: **Edgecomb County Landfill Borrow Study** Test Date(s): 09/18 - 09/25/2006

Client Name:

Client Address:

Boring #:	TP-6	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 6.0'
Sample Description:	Tan-Brown Clayey SAND (SC)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	0%	Medium Sand	33%
Silt & Clay (% Passing #200)	23.5%	Coarse Sand	1%	Fine Sand	43%
Apparent Relative Density	ND	Moisture Content	16.3%	Organic Content	ND
Liquid Limit	30	Plastic Limit	16	Plastic Index	14

ND=Not determined

Description of Sand & Gravel

Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 09/25/2006

Project Name: Edgecomb County Landfill Borrow Study Test Date(s): 09/18 - 09/25/2006

Client Name:

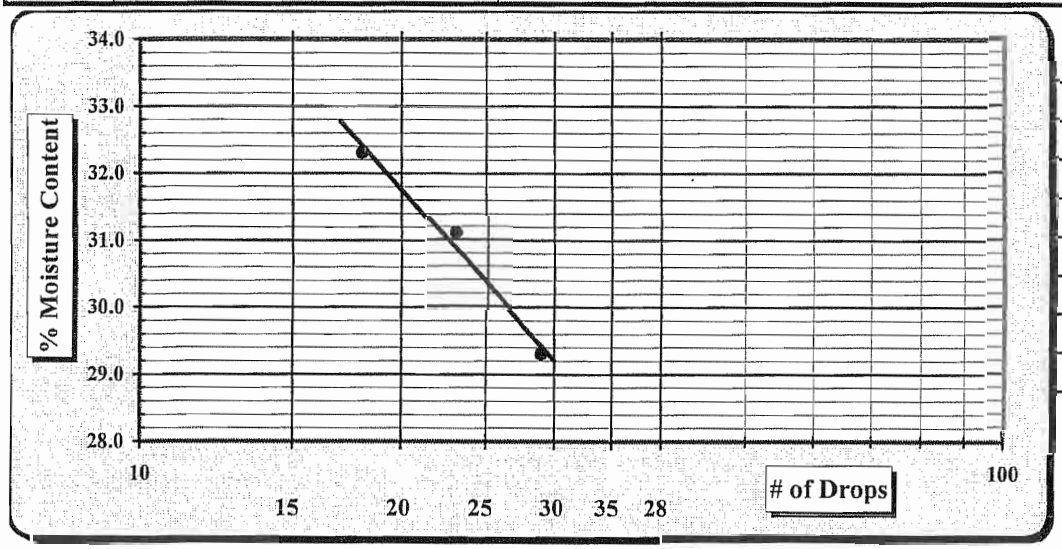
Client Address:

Boring #: TP-6 Sample #: N/A Sample Date: Unknown

Location: Borrow Areas Offset: NA Depth (ft): - 6.0'

Sample Description: Tan-Brown Clayey SAND (SC)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	7	52	32				23	30	
A	Tare Weight	15.39	18.58	18.38				21.04	21.07	
B	Wet Soil Weight + A	28.67	36.86	35.47				33.23	31.10	
C	Dry Soil Weight + A	25.66	32.52	31.30				31.53	29.70	
D	Water Weight (B-C)	3.01	4.34	4.17				1.70	1.40	
E	Dry Soil Weight (C-A)	10.27	13.94	12.92				10.49	8.63	
F	% Moisture Content (D/E)*100	29.3%	31.1%	32.3%				16.2%	16.2%	
N	# OF DROPS	29	23	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							16.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	30
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	16
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	14
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SC

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

S&ME

LAB ASSIGNMENT SHEET

Request Completion Date: 10/23/06
Date Assigned: ~~10-2~~
Sampling Date:
Date Completed:

Log Number

Project #: 1040-01-5456 Project Name: EDGECOMBE CO. LANDFILL - BURROW STUDY
Project Address: Engineer in Charge: KEN DALY
Client Name: Sampled By: KEN DALY
Client Address: Sample Location: BURROW AREA 3

Alternate Test
AASHTO ☐
NCDOT ☐
Other ☐

	Boring #	Sample #	DEPTH	Moisture Content D2216	Plastic Index D4318	Grain Size (200 Wash) D422	Hydrometer D422	Standard Proctor D698	Modified Proctor D1557	Soil Specific Gravity D854	Aggregate Gradation C136	Fine Aggregate Specific Gravity C	Coarse Agg. Specific Gravity C12	Marshall Test D1559 o D5581 o	Extraction / Gradation D2172 / D	Maximum Theoretical D2041	Core Bulk Specific Gravity D2726	Compressive Str. Concrete Core	CMU Prism Compressive Stength	Flex. Strenght Concrete Beam	CBR D1883 Compaction	CBR D1883 Moisture	CBR D1883 Soak	One-Dimensional Consolidation Test D2435 Preload	One-Dimensional Consolidation Test D2435 Saturate	One-Dimensional Consolidation Test D2435 Loads	Permeability D5084	Triaxial Shear CU D4767 ☐ UU D2850 ☐ Confining Pressures				UD Tube / Remold Samp U/R
1	TP8	—	1'		X	X																									
2	TP10	—	2'		X	X																									
3	TP10	—	4'		X	X																									
4																															
5																															
6																															
7																															
8																															
9																															
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17																															
18																															
19																															
20																															

NOTE: Field Samples obtained from: Stockpiles ☐ Roadway ☐ Conveyor belt ☐ Aggregate Stream ☐ Borehole ☐
Material Suppliers, Sampling Parameters, and Project Specifications.

Particle Size Analysis of Soils

ASTM D 422

Project #: 1040-01-545G | Test Date(s): 10/24 - 10/27/06

Project Name: Edgecomb County Landfill - Borrow Study | Report Date: 10/27/2006

Client Name:

Client Address:

Boring #: TP-8 | Sample #: Bulk Bag | Sample Date: Unknown

Location: Borrow Area 3 | Depth (ft): - 1.0'

Sample Description: Olive-Gray Clayey SAND (SC)

Particle Size Analysis / Without Hydrometer Analysis			Moisture Content		Natural
				Tare #	**16M**
	Tare Number	16M	A	Tare Weight	185.79
A	Tare Weight	185.79	B	Wet Weight + Tare Wt.	519.93
B	Total Sample Dry Wt. + Tare Wt.	427.53	C	Dry Weight + Tare Wt.	427.53
C	Total Sample Dry Weight (B-A)	241.74	D	Water Wt. (B-C)	92.40
D	Total Sample Wt. After #200 Wash	152.77	E	Dry Wt.(C-A)	241.74
E	Percent Passing #200 (1-D/C)x100	36.8%		Moisture Content (100 x D/E) (%)	38.2%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.00	0.0%	**100.0%**
2.00	#10	0.25	0.1%	**99.9%**
0.85	#20	8.31	3.4%	**96.6%**
0.43	#40	49.77	20.6%	**79.4%**
0.25	#60	116.99	48.4%	**51.6%**
0.15	#100	136.01	56.3%	**43.7%**
0.075	#200	152.54	63.1%	**36.9%**

Notes:	Maximum Particle Size	**#4**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.1%**
Liquid Limit	51	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**20.5%**
Plastic Limit	24	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**42.5%**
Plastic Index	27	Cc =(D30)^2/ (D10xD60):	% Silt and Clay	< 0.075 mm	**36.9%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils — *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples — ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi — NICET 116132 (Certification #)

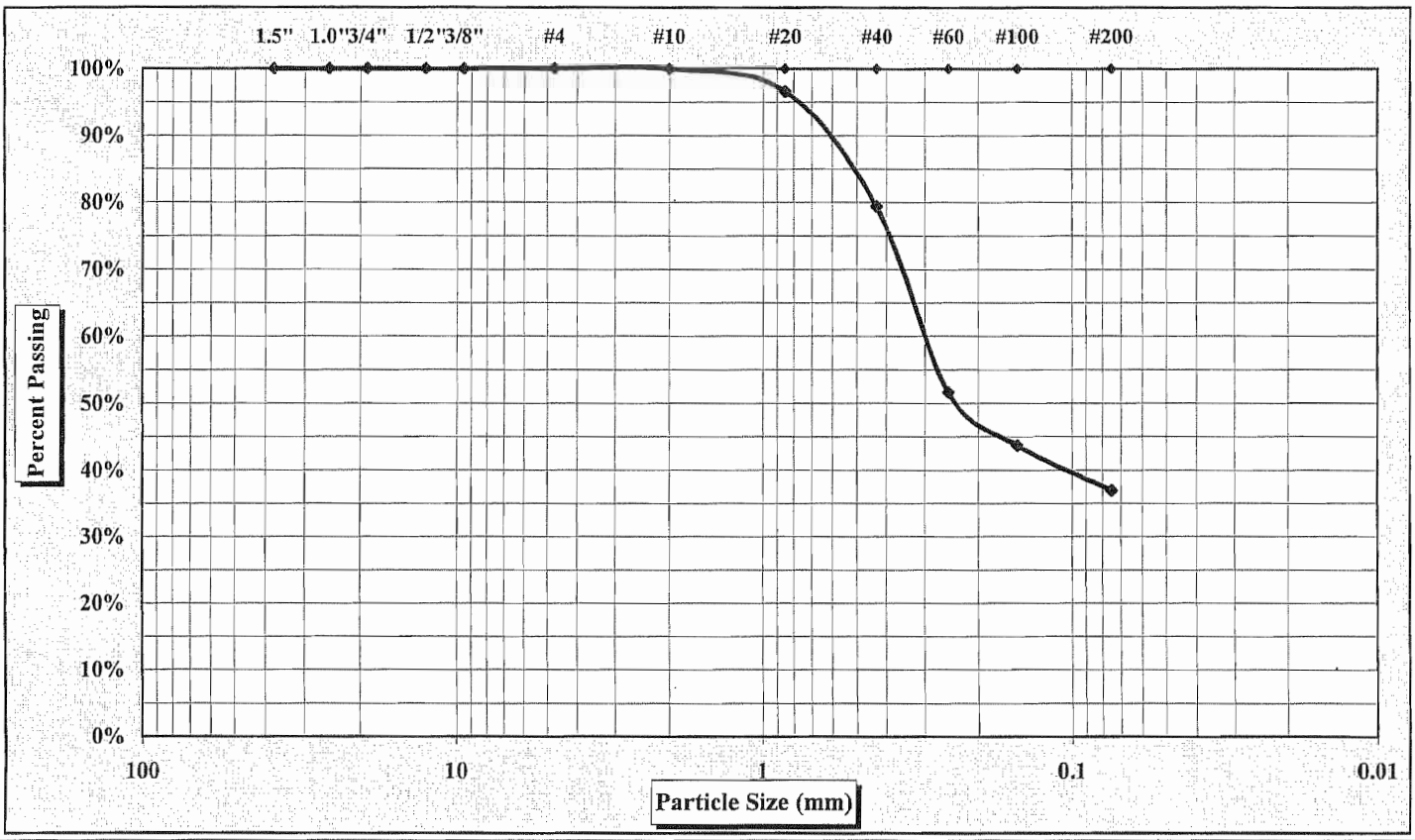
Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME Project #:	**1040-01-545G**	Report Date:	10/27/2006
Project Name:	**Edgecomb County Landfill - Borrow Study**	Test Date(s):	10/24 - 10/27/06
Client Name:			
Client Address:			

Boring #:	TP-8	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 1.0'
Sample Description:	Olive-Gray Clayey SAND (SC)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	#4	Gravel	0%	Medium Sand	21%
Silt & Clay (% Passing #200)	36.9%	Coarse Sand	0%	Fine Sand	43%
Apparent Relative Density	ND	Moisture Content	38.2%	Organic Content	ND
Liquid Limit	51	Plastic Limit	24	Plastic Index	27

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

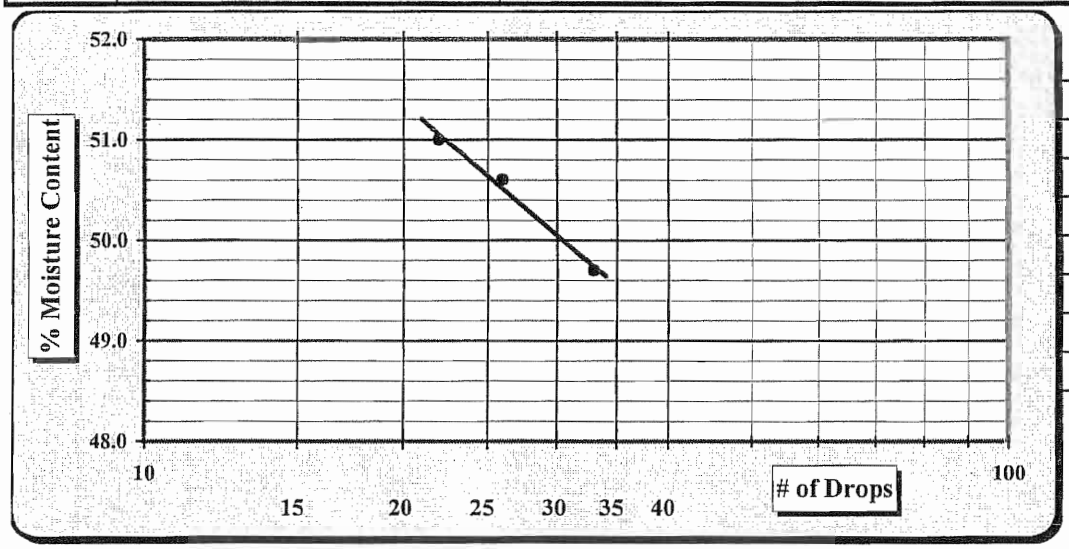
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 10/27/2006
Project Name: Edgecomb County Landfill - Borrow Study Test Date(s): 10/24 - 10/27/06
Client Name:
Client Address:
Boring #: TP-8 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 1.0'
Sample Description: Olive-Gray Clayey SAND (SC)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	52	2	54				15	13	
A	Tare Weight	18.58	15.32	18.60				20.93	20.97	
B	Wet Soil Weight + A	33.77	29.78	31.77				30.99	30.26	
C	Dry Soil Weight + A	28.64	24.92	27.40				29.07	28.43	
D	Water Weight (B-C)	5.13	4.86	4.37				1.92	1.83	
E	Dry Soil Weight (C-A)	10.06	9.60	8.80				8.14	7.46	
F	% Moisture Content (D/E)*100	51.0%	50.6%	49.7%				23.6%	24.5%	
N	# OF DROPS	22	26	33				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							24.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	51
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	24
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	27
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SC

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

Project #: 1040-01-545G | Test Date(s): 10/24 - 10/27/06

Project Name: Edgecomb County Landfill - Borrow Study | Report Date: 10/27/2006

Client Name:

Client Address:

Boring #: TP-10 | Sample #: Bulk Bag | Sample Date: Unknown

Location: Borrow Area 3 | Depth (ft): - 2.0'

Sample Description: Olive Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**2M**
	Tare Number	2M	A	Tare Weight	190.57
A	Tare Weight	190.57	B	Wet Weight + Tare Wt.	511.92
B	Total Sample Dry Wt. + Tare Wt.	410.35	C	Dry Weight + Tare Wt.	410.35
C	Total Sample Dry Weight (B-A)	219.78	D	Water Wt. (B-C)	101.57
D	Total Sample Wt. After #200 Wash	114.40	E	Dry Wt.(C-A)	219.78
E	Percent Passing #200 (1-D/C)x100	47.9%		Moisture Content (100 x D/E) (%)	46.2%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.00	0.0%	**100.0%**
2.00	#10	0.19	0.1%	**99.9%**
0.85	#20	6.66	3.0%	**97.0%**
0.43	#40	42.43	19.3%	**80.7%**
0.25	#60	88.84	40.4%	**59.6%**
0.15	#100	101.88	46.4%	**53.6%**
0.075	#200	112.83	51.3%	**48.7%**

Notes:	Maximum Particle Size	**#4**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.1%**
Liquid Limit 60	Fineness Modulus		Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**19.2%**
Plastic Limit 39	Cu = D60/D10:		Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**32.0%**
Plastic Index 21	Cc =(D30)^2/ (D10xD60):		% Silt and Clay	< 0.075 mm	**48.7%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils — *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples — ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi — NICET 116132 (Certification #)

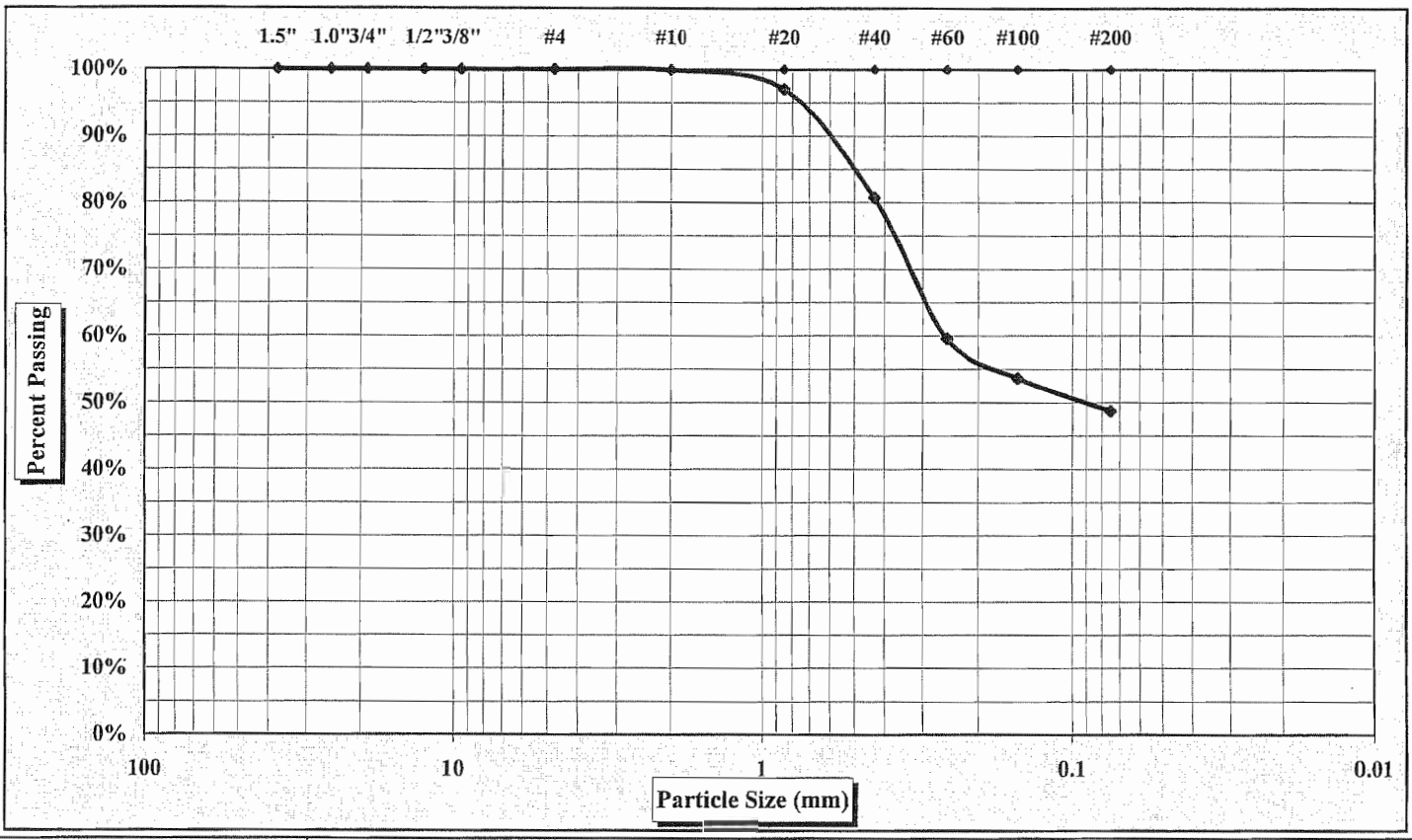
Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME Project #:	**1040-01-545G**	Report Date:	10/27/2006
Project Name:	**Edgecomb County Landfill - Borrow Study**	Test Date(s):	10/24 - 10/27/06
Client Name:			
Client Address:			

Boring #:	TP-10	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 2.0'
Sample Description:	Olive Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	#4	Gravel	0%	Medium Sand	19%
Silt & Clay (% Passing #200)	48.7%	Coarse Sand	0%	Fine Sand	32%
Apparent Relative Density	ND	Moisture Content	46.2%	Organic Content	ND
Liquid Limit	60	Plastic Limit	39	Plastic Index	21

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

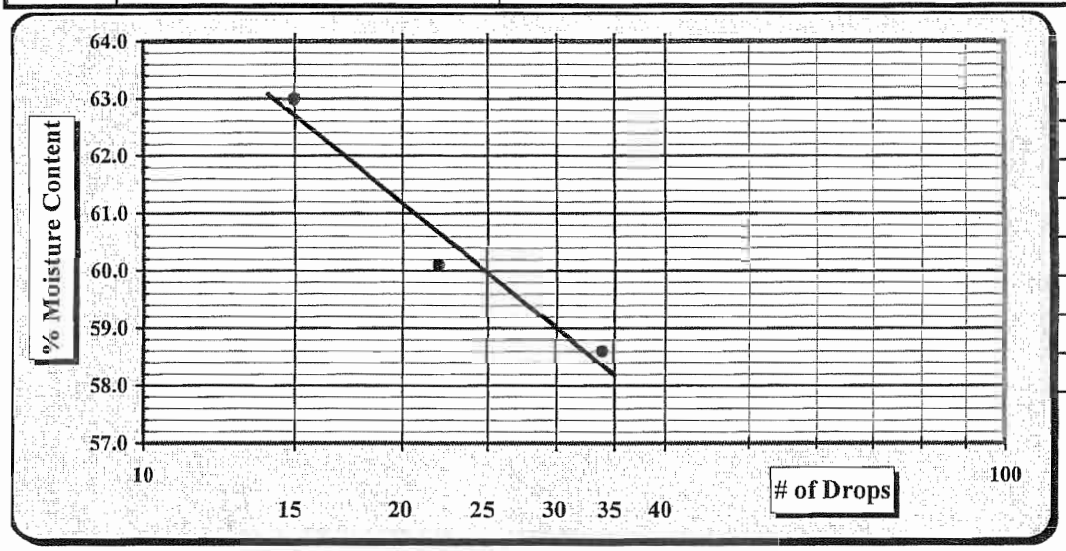
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 10/27/2006
Project Name: Edgecomb County Landfill - Borrow Study Test Date(s): 10/24 - 10/27/06
Client Name:
Client Address:
Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 2.0'
Sample Description: Olive Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	16	52	0				25	39	
A	Tare Weight	18.48	18.39	18.42				20.97	21.03	
B	Wet Soil Weight + A	30.69	32.93	27.84				29.82	30.61	
C	Dry Soil Weight + A	25.97	27.47	24.36				27.37	27.94	
D	Water Weight (B-C)	4.72	5.46	3.48				2.45	2.67	
E	Dry Soil Weight (C-A)	7.49	9.08	5.94				6.40	6.91	
F	% Moisture Content (D/E)*100	63.0%	60.1%	58.6%				38.3%	38.6%	
N	# OF DROPS	15	22	34				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							38.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	60
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	39
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	21
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 10/27/2006
Project Name: Edgecomb County Landfill - Borrow Study Report Date: 10/27/2006
Client Name:
Client Address:

Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Depth (ft): - 4.0'
Sample Description: Orange Red Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**4M**
	Tare Number	4M	A	Tare Weight	180.98
A	Tare Weight	180.98	B	Wet Weight + Tare Wt.	512.57
B	Total Sample Dry Wt. + Tare Wt.	428.88	C	Dry Weight + Tare Wt.	428.88
C	Total Sample Dry Weight (B-A)	247.90	D	Water Wt. (B-C)	83.69
D	Total Sample Wt. After #200 Wash	188.22	E	Dry Wt.(C-A)	247.90
E	Percent Passing #200 (1-D/C)x100	24.1%		Moisture Content (100 x D/E) (%)	33.8%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	1.31	0.5%	**99.5%**
4.75	#4	10.16	4.1%	**95.9%**
2.00	#10	20.46	8.3%	**91.7%**
0.85	#20	38.06	15.4%	**84.6%**
0.43	#40	103.99	41.9%	**58.1%**
0.25	#60	167.90	67.7%	**32.3%**
0.15	#100	180.13	72.7%	**27.3%**
0.075	#200	186.32	75.2%	**24.8%**

Notes:					
	Maximum Particle Size	**1/2"**	Gravel	< 75 mm and > 4.75 mm (#4)	**4.1%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**4.2%**
Liquid Limit	53	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.6%**
Plastic Limit	30	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**33.3%**
Plastic Index	23	Cc =$(D30)^2$/ (D10xD60):	% Silt and Clay	< 0.075 mm	**24.8%**
ND=Not determined			Description of Sand & Gravel	Rounded ☒	Angular ☒
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☒
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132 *Certification #*

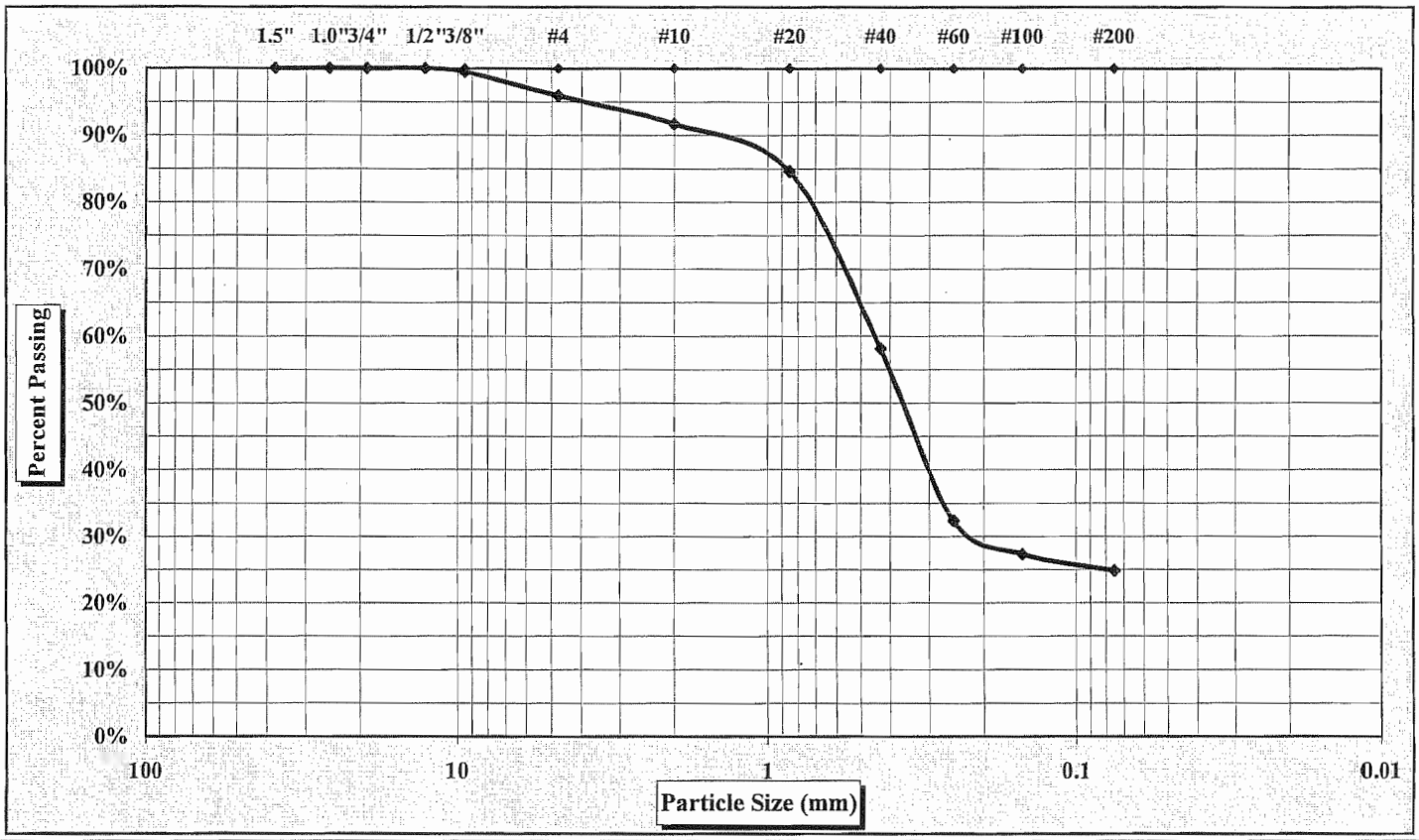
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

S&ME Project #:	**1040-01-545G**	Report Date:	10/27/2006
Project Name:	**Edgecomb County Landfill - Borrow Study**	Test Date(s):	10/27/2006
Client Name:			
Client Address:			

Boring #:	TP-10	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 4.0'
Sample Description:	Orange Red Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Gravel	4%	Medium Sand	34%
Silt & Clay (% Passing #200)	24.8%	Coarse Sand	4%	Fine Sand	33%
Apparent Relative Density	ND	Moisture Content	33.8%	Organic Content	ND
Liquid Limit	53	Plastic Limit	30	Plastic Index	23

ND=Not determined

Description of Sand & Gravel

Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan Laboratory Supervisor

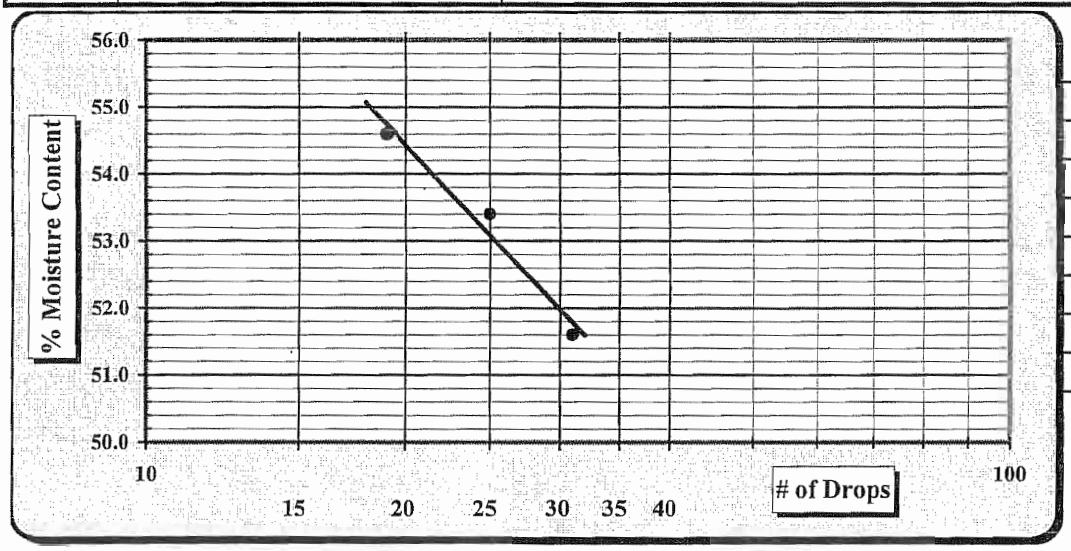
Signature *Position*

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Project #: **1040-01-545G** Report Date: 10/27/2006
Project Name: Edgecomb County Landfill - Borrow Study Test Date(s): 10/27/2006
Client Name:
Client Address:
Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 4.0'
Sample Description: Orange Red Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	57	7	14				31	51	
A	Tare Weight	18.56	15.39	18.45				21.07	20.89	
B	Wet Soil Weight + A	37.34	26.88	34.05				30.70	30.75	
C	Dry Soil Weight + A	30.95	22.88	28.54				28.52	28.47	
D	Water Weight (B-C)	6.39	4.00	5.51				2.18	2.28	
E	Dry Soil Weight (C-A)	12.39	7.49	10.09				7.45	7.58	
F	% Moisture Content (D/E)*100	51.6%	53.4%	54.6%				29.3%	30.1%	
N	# OF DROPS	31	25	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							29.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	53
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	30
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	23
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan Laboratory Supervisor
Signature *Position*

APPENDIX II

(STORM WATER CALCULATIONS)

OBJECTIVE: Based on a 25 yr design storm:

1. Design proposed grass-lined channels for the proposed C&D expansion's closure system.
2. Design the proposed drop-inlets, down-chute piping, outlet aprons, and sediment basins for the proposed C&D expansion's closure system.

REFERENCE:

1. Erosion and Sediment Control Planning and Design Manual, NCDENR, June 1, 2006.
2. Erosion Control Materials Design Software; V4.1, North American Green.
3. Edgecombe County C&D Landfill Closure Plan, S&ME, Inc., 2008.
4. CulvertMaster v. 3.1, Haestad Methods.
5. FlowMaster v. 8.01, Haestad Methods.
6. PondPack v. 10.01, Haestad Methods.
7. Advanced Drainage Systems, Inc. (ADS). http://www.ads-pipe.com

PARAMETERS:

Drainage Areas obtained from AutoCad drawings.

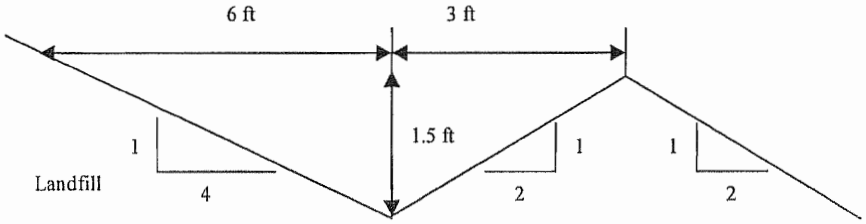
Use a 25-yr storm to obtain design flows.

Assume 100% disturbed area (bare earth)

Assume Class C Vegetation Retardance [Ref. 1, Table 8.05c]

Channels:

Bench Dimensions: 1.5 ft deep, 4:1 side slope (landfill side), 2:1 side slope (bench side), 9 ft wide total.



DESIGN:

Calculate Flows (Q):

Use Rational Formula to determine Q

Q = c x i x A c = Runoff Coefficient [Ref. 1]

i = Rainfall Intensity Factor (in/hr)

A = Drainage Area (acres)

c = 0.3 for drainage areas within C&D limits (A1-J2); (Agricultural Lands:Bare Packed Soil, Rough)

c = 0.2 for drainage areas around sedimentation basins (K1-K3); (Lawns: Sandy soil, steep, 7%)

c = 0.1 for drainage area to far west (K4); (Woodlands)

(Ref. 1, Table 8.03b)

Determine Tc (Time of Concentration)

Assume minimum Tc = 5 minute

Determine i

Let i = 7.78 in/hr (Ref. 1, Figure 8.03c, 25yr storm, use Tc = 5 min to be conservative) for all areas

Determine peak flow for each channel segment.

Channel Data				
Channel ID	Area Draining Directly to Channel (Acres)	Areas Draining to Channel	Total Q (cfs)	Channel Type
A1	2.13	A1	4.97	Tack-on Bench
B1	1.12	B1	2.61	Tack-on Bench
B2	1.81	B2	4.22	Tack-on Bench
C1	0.64	C1	1.49	Tack-on Bench
C2	0.90	C2	2.10	Tack-on Bench
D1	1.15	D1	2.68	Tack-on Bench
D2	1.76	D2	4.11	Tack-on Bench
E1	1.65	E1	3.85	Tack-on Bench
E2	0.34	E2	0.79	Tack-on Bench
F1	1.38	F1	3.22	Tack-on Bench
F2	2.86	F2	6.68	Tack-on Bench
G1	1.40	G1	3.27	Tack-on Bench
G2	2.20	G2	5.13	Tack-on Bench
H1	0.85	H1	1.98	Tack-on Bench
H2	3.93	H2	9.17	Tack-on Bench
I1	2.43	I1	5.67	Tack-on Bench
I2	2.02	I2	4.71	Tack-on Bench
J1	1.98	J1	4.62	Tack-on Bench
J2	0.82	J2	1.91	Tack-on Bench

S&ME

PROJECT NO. 1054-07-242

SHEET NO. 3 / 7

DATE June 23, 2008

JOB NAME Edgecombe County C&D Landfill

COMPUTED BY KB

SUBJECT Storm Water, Sedimentation, and Erosion Control Devices

CHECKED BY

Design of Channel Stabilization:

GRASS LINED CHANNEL	*DESIGN DISCHARGE* Q_{total} (cfs)	*SLOPE (%)*	*LEFT SIDE SLOPE (H:V)*	*RIGHT SIDE SLOPE (H:V)*	*BOTTOM WIDTH (ft)*	*CHANNEL DEPTH (ft)*	*DESIGN FLOW DEPTH (ft)**	*DESIGN VELOCITY* (ft/s)*	*E&S MATTING PROPOSED**
A1	*4.97*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.83*	*2.38*	*DS75*
B1	*2.61*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.67*	*1.91*	*DS75*
B2	*4.22*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.79*	*2.25*	*DS75*
C1	*1.49*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.56*	*1.61*	*DS75*
C2	*2.10*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.63*	*1.71*	*DS75*
D1	*2.68*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.68*	*1.94*	*DS75*
D2	*4.11*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.78*	*2.23*	*DS75*
E1	*3.85*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.77*	*2.19*	*DS75*
E2	*0.79*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.44*	*1.35*	*DS75*
F1	*3.22*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.72*	*2.05*	*DS75*
F2	*6.68*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.92*	*2.65*	*DS75*
G1	*3.27*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.73*	*2.07*	*DS75*
G2	*5.13*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.84*	*2.40*	*DS75*
H1	*1.98*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.62*	*1.76*	*DS75*
H2	*9.17*	*2*	*4:1*	*2:1*	*0*	*1.5*	*1.02*	*2.97*	*DS75*
I1	*5.67*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.87*	*2.50*	*DS75*
I2	*4.71*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.82*	*2.33*	*DS75*
J1	*4.62*	*2*	*2:1*	*4:1*	*0*	*1.5*	*0.81*	*2.32*	*DS75*
J2	*1.91*	*2*	*4:1*	*2:1*	*0*	*1.5*	*0.60*	*1.73*	*DS75*

*Refer to attached North American Green printouts for more details [Ref. 2].

Pipe Design

- See attached Flowmaster Output.

S&ME

PROJECT NO. 1054-07-242

SHEET NO. 4 / 7

DATE June 23, 2008

JOB NAME Edgecombe County C&D Landfill

COMPUTED BY KB

SUBJECT Storm Water, Sedimentation, and Erosion Control Devices

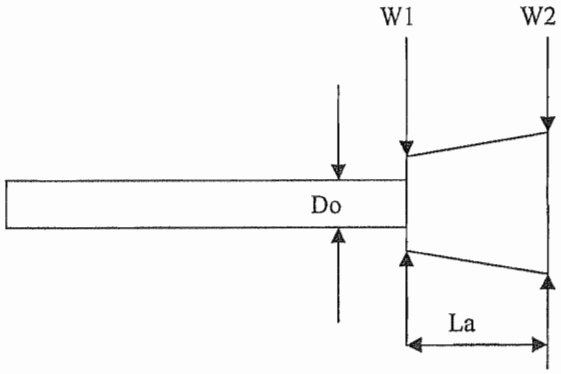
CHECKED BY

Outlet Apron Design:

Pipe	Diam, D_o (ft)	Q (cfs)	Flows Into/Onto	L_a (ft) [Ref. 1; Fig. 8.06a][1]	d_{50} Rip-Rap Size (ft) [Ref.1; Fig.8.06a][1]	d_{max} Rip-Rap Size = d_{50} x 1.5 (ft) [Ref. 1]	W_1=3xD_o (ft) [Ref. 1; Fig. 8.06a][1]	W_2=D_o+L_a (ft) [Ref. 1; Fig. 8.06a][1]	Apron Thickness = d_{max} x 1.5 ft [Ref. 1]
F	1.50	14.87	Apron	13	0.40	0.60	4.50	14.50	0.90
G	1.25	15.24	Apron	16	0.60	0.90	3.75	17.25	1.35
H	1.25	14.75	Apron	15	0.60	0.90	3.75	16.25	1.35
I	1.25	17.18	Apron	17	0.70	1.05	3.75	18.25	1.58
J	1.25	11.18	Apron	13	0.50	0.75	3.75	14.25	1.13
SB-1	2.50[2]	54.22	Apron	27	0.75	1.13	7.50	29.50	1.69
SB-2	1.50[2]	14.75	Apron	13	0.40	0.60	4.50	14.50	0.90
SB-3	5.00[2]	107.43	Apron	37	1.30	1.95	15.00	42	2.93

[1] Note: Minimum Tailwater assumed (free outfall).

Outlet Apron



Sediment Basin SB-1:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = A1 + B1 + B2 + F1 + F2 + G1 + G2 + K1

= 2.13 + 1.12 + 1.81 + 1.38 + 2.86 + 1.40 + 2.20 + 10.33 = 23.23 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 23.23 Ac = **41,814 ft^3**

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED1,\ 10yr}$ = (c x i x $A_{BENCHES}$) + (c x i x A_{SED1})

$Q_{SED1,\ 10yr}$ = (0.3 x 7.08 in/hr x 12.90 Acres) + (0.2 x 7.08 in/hr x 10.33 Acres)

$Q_{SED1,}$ 10yr = 42.03 cfs

Required Surface Area = 0.01 x 42.03 cfs = 0.4203 Acres = **18,307 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED1,\ 2yr}$ = (c x i x $A_{BENCHES}$) + (c x i x A_{SED1})

$Q_{SED1,\ 2yr}$ = (0.3 x 5.58 in/hr x 12.90 Acres) + (0.2 x 5.58 in/hr x 10.33 Acres)

$Q_{SED1,\ 2yr}$ = 33.12 cfs

Use 3' Riser pipe – Crest at EL. 50

Use 2' Culvert pipe – US invert at EL. 46

DS invert at EL. 45.5

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED1,\ 10yr}$ = 42.03 cfs

$Q_{SED1,\ 25yr}$ = (0.3 x 7.78 in/hr x 12.90 Acres) + (0.2 x 7.78 in/hr x 10.33 Acres)

$Q_{SED1,\ 25yr}$ = 46.18 cfs

Use 2.3' deep trapezoidal emergency spillway – Bottom width 10' at EL 51.2

Sediment Basin SB-2:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = C1 + C2 + H1 + H2

= 0.64 + 0.90 + 0.85 + 3.93 = 6.32 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 6.32 Ac = **11,376 ft^3**

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED2,\ 10yr} = c \times i \times A_{BENCHES}$

$Q_{SED2,\ 10yr}$ = 0.3 x 7.08 in/hr x 6.32 Acres

$Q_{SED2,}$ 10yr = 13.42 cfs

Required Surface Area = 0.01 x 13.42 cfs = 0.1342 Acres = **5,847 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED1,\ 2yr} = c \times i \times A_{BENCHES}$

$Q_{SED1,\ 2yr}$ = 0.3 x 5.58 in/hr x 6.32 Acres

$Q_{SED1,\ 2yr}$ = 10.58 cfs

Use 2' Riser pipe – Crest at EL. 44

Use 1.5' Culvert pipe – US invert at EL. 40

DS invert at EL. 39.5

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED1,\ 10yr}$ = 13.42 cfs

$Q_{SED1,\ 25yr}$ = 0.3 x 7.78 in/hr x 6.32

$Q_{SED1,\ 25yr}$ = 14.75 cfs

Use 2' deep trapezoidal emergency spillway – Bottom width 10' at EL 45

Sediment Basin SB-3:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = D1 + D2 + I1 + I2 + K2 + E1 + E2 + J1 + J2 + K3 + K4

= 1.15 + 1.76 + 2.43 + 2.02 + 6.76 +1.65 + 0.34 + 1.98 + 0.82 + 9.06 + 70.01 = 97.98 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 97.98 Ac = **176,364 ft^3**

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED3,\ 10yr}$ = [c x i x (D1+D2+I1+I2+E1+E2+J1+J2)] + [c x i x (K2+K3)] + [c x i x (K4)]

$Q_{SED3,\ 10yr}$ = (0.3 x 7.08 in/hr x 12.15 Acres) + (0.2 x 7.08 in/hr x 15.82 Acres) + (0.1 x 7.08 in/hr x 70.01 Acres)

$Q_{SED3,\ 10yr}$ = 97.77 cfs

Required Surface Area = 0.01 x 97.77 cfs = 0.9777 Acres = **42,591 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED1,\ 2yr}$ = [c x i x (D1+D2+I1+I2+E1+E2+J1+J2)] + [c x i x (K2+K3)] + [c x i x (K4)]

$Q_{SED1,\ 2yr}$ = (0.3 x 5.58 in/hr x 12.15 Acres) + (0.2 x 5.58 in/hr x 15.82 Acres) + (0.1 x 5.58 in/hr x 70.01 Acres)

$Q_{SED1,\ 2yr}$ = 77.06 cfs

Use 4.5' Riser pipe – Crest at EL. 52

Use 3.5' Culvert pipe – US invert at EL. 48

DS invert at EL. 47.5

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED1,\ 10yr}$ = 97.77 cfs

$Q_{SED1,\ 25yr}$ = (0.3 x 7.78 in/hr x 12.15 Acres) + (0.2 x 7.78 in/hr x 15.82 Acres) + (0.1 x 7.78 in/hr x 70.01 Acres)

$Q_{SED1,\ 25yr}$ = 107.44 cfs

Use 2.3' deep trapezoidal emergency spillway – Bottom width 20' at EL 53.5

[Ref 1]

Raleigh, North Carolina 35.8706N, 78.7864W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	5.58	4.46	3.74	2.58	1.62	0.94	0.66	0.40	0.24	0.14
10	7.08	5.66	4.78	3.46	2.25	1.33	0.95	0.58	0.34	0.021
25	7.78	6.19	5.24	3.88	2.58	1.54	1.11	0.68	0.41	0.24
100	8.64	6.86	5.78	4.43	3.05	1.85	1.36	0.84	0.51	0.30

Fayetteville, North Carolina 35.0583N, 78.8583W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.11	4.88	4.09	2.83	1.77	1.04	0.74	0.44	0.26	0.15
10	7.96	6.36	5.36	3.88	2.53	1.54	1.10	0.66	0.39	0.23
25	8.94	7.13	6.02	4.46	2.97	1.83	1.32	0.80	0.47	0.28
100	10.44	8.29	6.99	5.35	3.69	2.29	1.69	1.03	0.62	0.36

Wilmington, North Carolina 34.2683N, 77.9061W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.39	5.92	4.96	3.42	2.15	1.28	0.91	0.56	0.33	0.19
10	9.70	7.75	6.54	4.74	3.08	1.94	1.39	0.87	0.51	0.30
25	10.98	8.75	7.40	5.48	3.65	2.38	1.73	1.08	0.64	0.38
100	12.92	10.27	8.65	6.63	4.56	3.18	2.37	1.49	0.89	0.53

Washington, North Carolina 35.5333N, 77.0167W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.41	5.12	4.29	2.96	1.86	1.10	0.78	0.47	0.27	0.16
10	8.38	6.70	5.65	4.09	2.66	1.64	1.19	0.72	0.42	0.25
25	9.48	7.55	6.38	4.73	3.15	1.99	1.46	0.88	0.52	0.31
100	11.16	8.87	7.47	5.72	3.94	2.58	1.93	1.18	0.70	0.42

Manteo Airport, North Carolina 35.9167N, 75.7000W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.46	5.16	4.32	2.99	1.87	1.08	0.79	0.48	0.29	0.17
10	8.47	6.77	5.71	4.14	2.69	1.62	1.20	0.74	0.44	0.27
25	9.56	7.62	6.44	4.77	3.17	1.96	1.47	0.91	0.54	0.33
100	11.26	8.95	7.54	5.77	3.98	2.54	1.95	1.21	0.73	0.44

Cape Hatteras, North Carolina, 35.2322N, 75.6225W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.20	5.75	4.82	3.33	2.09	1.29	0.94	0.58	0.34	0.20
10	9.41	7.52	6.35	4.60	2.99	1.93	1.43	0.89	0.53	0.31
25	10.66	8.49	7.18	5.31	3.54	2.33	1.75	1.09	0.65	0.38
100	12.53	9.95	8.39	6.42	4.42	3.03	2.32	1.45	0.88	0.51

Table 8.03b
Value of Runoff Coefficient (C) for Rational Formula

Land Use	C
Business:	
Downtown areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential:	
Single-family areas	0.30-0.50
Multi units, detached	0.40-0.60
Multi units, Attached	0.60-0.75
Suburban	0.25-0.40
Industrial:	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad yard areas	0.20-0.40
Unimproved areas	0.10-0.30
Streets:	
Asphalt	0.70-0.95
Concrete	0.80-0.95
Brick	0.70-0.85
Drives and walks	0.75-0.85
Roofs	0.75-0.85

Land Use	C
Lawns:	
Sandy soil, flat, 2%	0.05-0.10
Sandy soil, ave., 2-7%	0.10-0.15
Sandy soil, steep, 7%	0.15-0.20
Heavy soil, flat, 2%	0.13-0.17
Heavy soil, ave., 2-7%	0.18-0.22
Heavy soil, steep, 7%	0.25-0.35
Agricultural land:	
Bare packed soil	0.30-0.60
Smooth	0.20-0.50
Rough	0.20-0.40
Cultivated rows	0.10-0.25
Heavy soil no crop	0.15-0.45
Heavy soil with crop	0.05-0.25
Sandy soil no crop	0.05-0.25
Sandy soil with crop	0.10-0.25
Pasture	
Heavy soil	0.15-0.45
Sandy soil	0.05-0.25
Woodlands	0.05-0.25

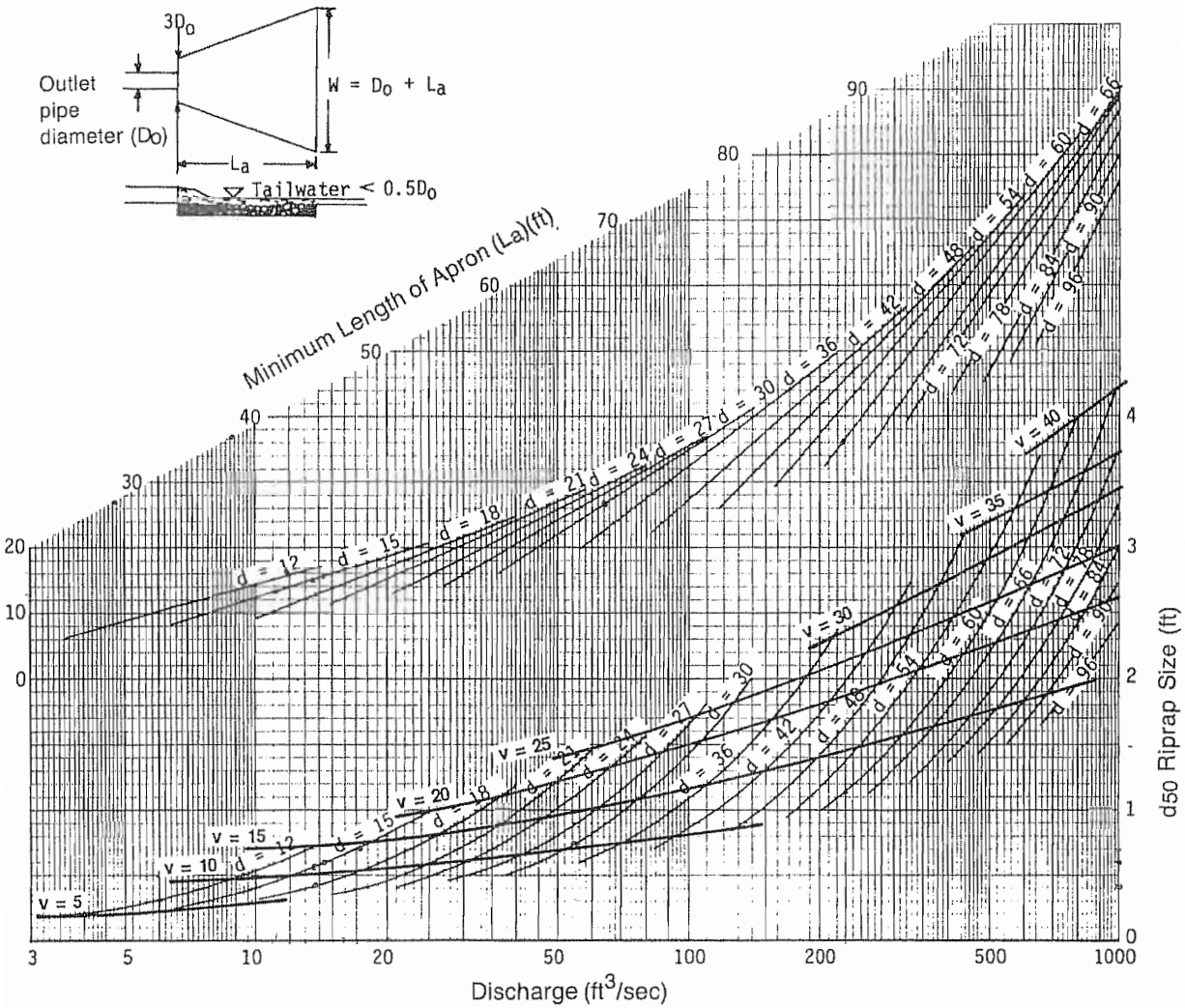
NOTE: The designer must use judgement to select the appropriate C value within the range for the appropriate land use. Generally, larger areas with permeable soils, flat slopes, and dense vegetation should have lowest C values. Smaller areas with slowly permeable soils, steep slopes, and sparse vegetation should be assigned highest C values.

Source: American Society of Civil Engineers

C = 0.30 → A1 - J2

C = 0.20 → K1, K2, K3

C = 0.10 → K4



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

[Ref. 2]

A1

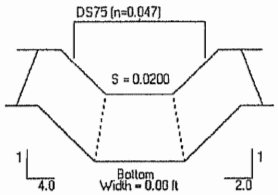
North American Green - ECMDS Version 4.3 | 6/18/2009 02:53 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of A1 | TO STATION/REACH: end of A1 | DRAINAGE AREA: 2.13 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.0	24.0	2.38	2.09	0.39	0.83



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	1.04	1.49	STABLE
	Staple D									

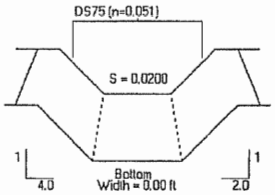
Back to Input Screen

B1

North American Green - ECMDS Version 4.3	6/18/2008	02:56 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of B1	TO STATION/REACH: end of B1	DRAINAGE AREA: 1.12 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
2.6	24.0	1.91	1.36	0.32	0.67



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.84	1.85	STABLE
	Staple D									

Back to Input Screen

B2

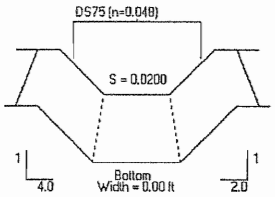
North American Green : ECMDS Version 4.3 | 6/18/2008 02:57 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of B2 | TO STATION/REACH: end of B2 | DRAINAGE AREA: 1.91 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
4.2	24.0	2.25	1.87	0.37	0.79



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.99	1.57	STABLE
	Staple D									

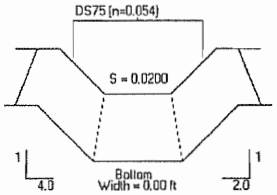
Back to Input Screen

C1

North American Green - ECMDS Version 4.3	6/18/2008 02:50 PM	COMPUTED BY: Kyle Baucom	
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of C1	TO STATION/REACH: end of C1	DRAINAGE AREA: 0.64 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
1.5	24.0	1.61	0.93	0.26	0.56



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.70	2.23	STABLE
	Staple D									

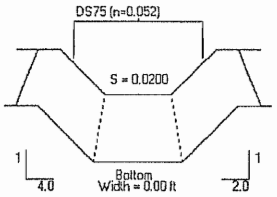
Back to Input Screen

C2

North American Green - ECMDS Version 4.3	6/18/2008	02:59 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of C2	TO STATION/REACH: end of C2	DRAINAGE AREA: 0.90 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
2.1	24.0	1.79	1.18	0.30	0.63



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.78	1.98	STABLE
	Staple D									

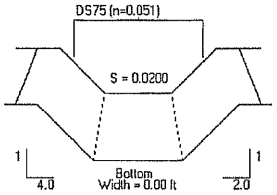
Back to Input Screen

D1

North American Green - ECMDS Version 4.3	6/19/2008	03:00 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of D1	TO STATION/REACH: end of D1	DRAINAGE AREA: 1.15 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
2.7	24.0	1.94	1.39	0.32	0.68



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.85	1.82	STABLE
	Staple D									

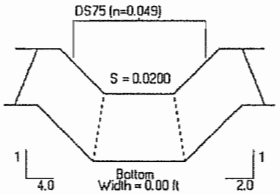
Back to Input Screen

D2

North American Green : ECMDS Version 4.3	6/18/2009 03:01 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242	
FROM STATION/REACH: start of D2 TO STATION/REACH: end of D2	DRAINAGE AREA: 1.76 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
4.1	24.0	2.23	1.84	0.37	0.78



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.98	1.59	STABLE
	Staple D									

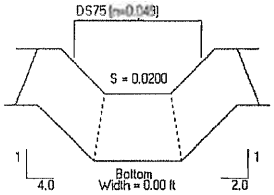
Back to Input Screen

E1

North American Green ECMDS Version 4.3		6/18/2008 03:02 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD		PROJECT NO.: 1054-07-242	
FROM STATION/REACH: start of E1	TO STATION/REACH: end of E1	DRAINAGE AREA: 1.65 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
3.9	24.0	2.19	1.78	0.36	0.77



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.96	1.61	STABLE
	Staple D									

Back to Input Screen

E2

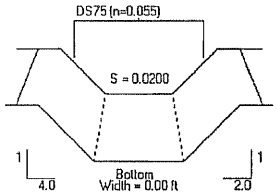
North American Green : ECMDS Version 4.3 | 6/18/2008 03:04 PM | COMPUTED BY: Kyle Beucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of E2 | TO STATION/REACH: end of E2 | DRAINAGE AREA: 0.34 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
0.8	24.0	1.35	0.59	0.21	0.44



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.55	2.79	STABLE
	Staple D									

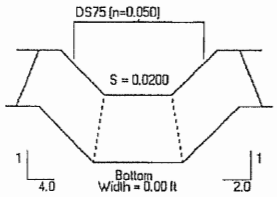
Back to Input Screen

F1

North American Green - ECMDS Version 4.3	6/18/2008 03:05 PM	COMPUTED BY: Kyle Baucom	
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of F1	TO STATION/REACH: end of F1	DRAINAGE AREA: 1.38 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
3.2	24.0	2.05	1.56	0.34	0.72



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	DS75	Unvegetated					1.55	0.90	1.72	STABLE
	Staple D									

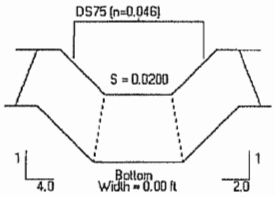
Back to Input Screen

F2

North American Green - ECMDS Version 4.3	6/10/2008	03:06 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Escambia County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of F2	TO STATION/REACH: end of F2	DRAINAGE AREA: 2.86 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
6.7	24.0	2.65	2.53	0.43	0.92



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	DS75	Unvegetated					1.55	1.15	1.35	STABLE
	Staple D									

Back to Input Screen

G1

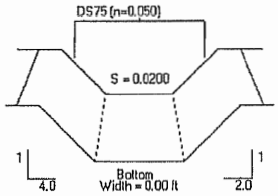
North American Green ECM DS Version 4.3 | 6/18/2008 | 03:07 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of G1 | TO STATION/REACH: end of G1 | DRAINAGE AREA: 1.40 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
3.3	24.0	2.07	1.59	0.34	0.73



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.91	1.70	STABLE
	Staple D									

Back to Input Screen

G2

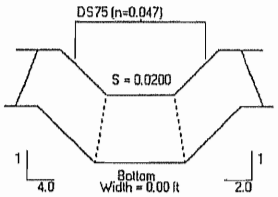
North American Green - ECMDS Version 4.3 | 6/18/2009 | 03:00 PM | COMPUTED BY: Kyle Beucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of G2 | TO STATION/REACH: end of G2 | DRAINAGE AREA: 2.20 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.1	24.0	2.40	2.12	0.40	0.84



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	DS75	Unvegetated					1.55	1.05	1.48	STABLE
	Staple D									

Back to Input Screen

H1

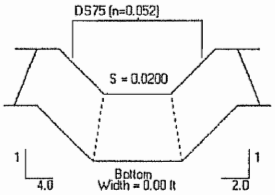
North American Green - ECMDS Version 4.3 | 6/18/2009 03:03 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CO | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of H1 | TO STATION/REACH: end of H1 | DRAINAGE AREA: 0.85 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
2.0	24.0	1.76	1.14	0.29	0.62



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.77	2.02	STABLE
	Staple D									

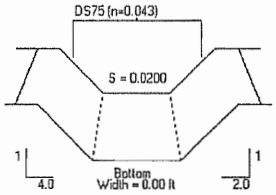
Back to Input Screen

H2

North American Green - ECMDS Version 4.3	6/19/2009 03:10 PM	COMPUTED BY: Kyle Baucom	
PROJECT NAME: Edgecombe County CD		PROJECT NO.: 1054-07-242	
FROM STATION/REACH: start of H2	TO STATION/REACH: end of H2	DRAINAGE AREA: 3.93 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
9.2	24.0	2.97	3.10	0.48	1.02



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	1.27	1.22	STABLE
	Staple D									

Back to Input Screen

I1

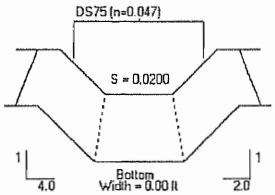
North American Green - ECM09 Version 4.3 | 6/19/2008 | 03:12 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of I1 | TO STATION/REACH: end of I1 | DRAINAGE AREA: 2.43 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.7	24.0	2.50	2.28	0.41	0.87



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	1.09	1.42	STABLE
	Staple D									

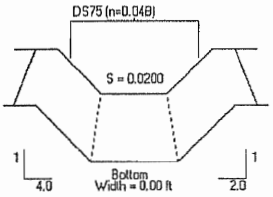
Back to Input Screen

I2

North American Green - ECMDS Version 4.3	6/19/2008	03:13 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of I2	TO STATION/REACH: end of I2	DRAINAGE AREA: 2.02 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
4.7	24.0	2.33	2.01	0.39	0.82



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
			Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	1.02	1.52	STABLE
	Staple D									

Back to Input Screen

J1

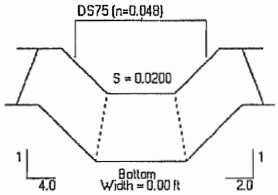
North American Green - ECMDS Version 4.3 | 6/18/2008 03:14 PM | COMPUTED BY: Kyle Baucom

PROJECT NAME: Edgecombe County CD | PROJECT NO.: 1054-07-242

FROM STATION/REACH: start of J1 | TO STATION/REACH: end of J1 | DRAINAGE AREA: 1.99 acres | DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
4.6	24.0	2.32	1.99	0.38	0.81



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	DS75	Unvegetated					1.55	1.02	1.53	STABLE
	Staple D									

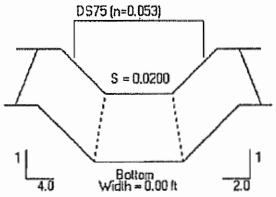
Back to Input Screen

J2

North American Green - ECMDS Version 4.3	6/18/2008	03:15 PM	COMPUTED BY: Kyle Baucom
PROJECT NAME: Edgecombe County CD	PROJECT NO.: 1054-07-242		
FROM STATION/REACH: start of J2	TO STATION/REACH: end of J2	DRAINAGE AREA: 0.82 acres	DESIGN FREQUENCY: 25 yr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
1.9	24.0	1.73	1.10	0.29	0.60



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	DS75	Unvegetated					1.55	0.75	2.05	STABLE
	Staple D									

Back to Input Screen

[Ref. 4]

Culvert Calculator Report
Drop Inlet F

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	83.50	ft	Headwater Depth/Height	1.90	
Computed Headwater Elev:	82.85	ft	Discharge	14.87	cfs
Inlet Control HW Elev.	82.85	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev.	82.80	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	80.00	ft	Downstream Invert	50.00	ft
Length	188.00	ft	Constructed Slope	0.159574	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.59	ft
Slope Type	Steep		Normal Depth	0.59	ft
Flow Regime	Supercritical		Critical Depth	1.40	ft
Velocity Downstream	23.02	ft/s	Critical Slope	0.014760	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	82.80	ft	Upstream Velocity Head	1.16	ft
Ke	0.20		Entrance Loss	0.23	ft

Inlet Control Properties					
Inlet Control HW Elev.	82.85	ft	Flow Control	Submerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	1.8	ft2
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

Culvert Calculator Report
Drop Inlet J

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	91.50	ft	Headwater Depth/Height	2.36	
Computed Headwater Elev:	90.95	ft	Discharge	11.18	cfs
Inlet Control HW Elev.	90.95	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev.	90.79	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	88.00	ft	Downstream Invert	69.00	ft
Length	112.00	ft	Constructed Slope	0.169643	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.54	ft
Slope Type	Steep		Normal Depth	0.54	ft
Flow Regime	Supercritical		Critical Depth	1.21	ft
Velocity Downstream	22.00	ft/s	Critical Slope	0.022337	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	1.25	ft
Section Size	15 inch		Rise	1.25	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	90.79	ft	Upstream Velocity Head	1.32	ft
Ke	0.20		Entrance Loss	0.26	ft

Inlet Control Properties					
Inlet Control HW Elev.	90.95	ft	Flow Control	Submerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	1.2	ft2
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

[Ref. 5]

Tack-On Bench

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.02000	ft/ft
Normal Depth	1.50	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)

Results

Discharge	28.16	ft³/s
Flow Area	6.75	ft²
Wetted Perimeter	9.54	ft
Top Width	9.00	ft
Critical Depth	1.41	ft
Critical Slope	0.02834	ft/ft
Velocity	4.17	ft/s
Velocity Head	0.27	ft
Specific Energy	1.77	ft
Froude Number	0.85	
Flow Type	Subcritical	

Q → 28.16 ft³/s

C = 0.3

i = 7.78

$A = \frac{Q}{C \times i} = \frac{28.16 \text{ cfs}}{0.3 \times 7.78} =$

A = 12.07 acres

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	1.41	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.02834	ft/ft

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
46.00	-----	.1430	.0000	.000	.000
48.00	-----	.3490	.7154	.477	.477
50.00	-----	.4891	1.2513	.834	1.311

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 1.311 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 57{,}107 \text{ ft}^3 > 41{,}814 \text{ ft}^3$$

$$A = 0.4891 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 21{,}305 \text{ ft}^2 > 18{,}307 \text{ ft}^2$$

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Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
40.00	-----	.0642	.0000	.000	.000
42.00	-----	.1130	.2623	.175	.175
44.00	-----	.1671	.4175	.278	.453

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 0.453 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 19{,}733 \text{ ft}^3 > 11{,}376 \text{ ft}^3$$

$$A = 0.1671 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 7{,}279 \text{ ft}^2 > 5{,}847 \text{ ft}^2$$

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Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
48.00	-----	.9113	.0000	.000	.000
50.00	-----	1.0275	2.9064	1.938	1.938
52.00	-----	1.1493	3.2635	2.176	4.113

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 4.113 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 179{,}162 \text{ ft}^3 > 176{,}364 \text{ ft}^3$$

$$A = 1.1493 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 50{,}064 \text{ ft}^2 > 42{,}591 \text{ ft}^2$$

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
50.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
50.10	.92	50.10	Free	46.47	.000	.000	Free Outfall	
		Weir: H =.10ft						
50.20	2.61	50.20	Free	46.80	.000	.000	Free Outfall	
		Weir: H =.20ft						
50.30	4.80	50.30	Free	47.12	.000	.000	Free Outfall	
		Weir: H =.30ft						
50.40	7.39	50.40	Free	47.42	.000	.000	Free Outfall	
		Weir: H =.40ft						
50.50	10.33	50.50	Free	47.72	.000	.000	Free Outfall	
		Weir: H =.50ft						
50.60	13.58	50.60	Free	48.03	.000	.000	Free Outfall	
		Weir: H =.60ft						
50.70	17.11	50.70	Free	48.36	.000	.000	Free Outfall	
		Weir: H =.70ft						
50.80	20.91	50.80	Free	48.76	.000	.000	Free Outfall	
		Weir: H =.80ft						
50.90	24.95	50.90	Free	49.31	.000	.000	Free Outfall	
		Weir: H =.90ft						
51.00	29.22	51.00	Free	50.00	.000	.000	Free Outfall	
		Weir: H =1.00ft						
51.10	33.71	51.10	50.83	50.83	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.10ft						
51.20	37.27	51.20	51.20	51.20	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.20						
51.30	38.79	51.30	51.30	51.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.30						
51.40	40.25	51.40	51.40	51.40	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.40						
51.50	41.67	51.50	51.50	51.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.50						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
51.60	43.03	51.60	51.60	51.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.60						
51.70	44.36	51.70	51.70	51.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.70						
51.80	45.64	51.80	51.80	51.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
51.90	46.90	51.90	51.90	51.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90						
52.00	48.11	52.00	52.00	52.00	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00						
52.10	49.30	52.10	52.10	52.10	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.10						
52.20	*	52.20	52.20	52.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.30	*	52.30	52.30	52.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.40	*	52.40	52.40	52.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.50	*	52.50	52.50	52.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.60	*	52.60	52.60	52.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.70	*	52.70	52.70	52.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.80	*	52.80	52.80	52.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.90	*	52.90	52.90	52.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.00	*	53.00	53.00	53.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.10	*	53.10	53.10	53.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.20	*	53.20	53.20	53.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.30	*	53.30	53.30	53.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.40	*	53.40	53.40	53.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.50	*	53.50	53.50	53.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
50.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
50.10	.92	46.47	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .115ft	Dcr= .331ft		CRIT.DEPTH Hev= .00ft	
50.20	2.61	46.80	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .202ft	Dcr= .563ft		CRIT.DEPTH Hev= .00ft	
50.30	4.81	47.12	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .287ft	Dcr= .772ft		CRIT.DEPTH Hev= .00ft	
50.40	7.40	47.42	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .376ft	Dcr= .967ft		CRIT.DEPTH Hev= .00ft	
50.50	10.33	47.72	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .473ft	Dcr= 1.151ft		CRIT.DEPTH Hev= .00ft	
50.60	13.59	48.03	Free	Free	.000	.009	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .586ft	Dcr= 1.327ft		CRIT.DEPTH Hev= .00ft	
50.70	17.11	48.36	Free	Free	.000	.004	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .721ft	Dcr= 1.491ft		CRIT.DEPTH Hev= .00ft	
50.80	20.91	48.76	Free	Free	.000	.003	Free Outfall	
		INLET CONTROL...	Submerged:	HW =2.76				
50.90	24.95	49.31	Free	Free	.000	.005	Free Outfall	
		INLET CONTROL...	Submerged:	HW =3.31				
51.00	29.22	50.00	Free	Free	.000	.001	Free Outfall	
		INLET CONTROL...	Submerged:	HW =4.00				
51.10	33.71	50.83	Free	Free	.000	.001	Free Outfall	
		INLET CONTROL...	Submerged:	HW =4.83				
51.20	35.50	51.20	Free	Free	.000	1.768	Free Outfall	
		INLET CONTROL...	Submerged:	HW =5.20				
51.30	35.98	51.30	Free	Free	.000	2.813	Free Outfall	
		INLET CONTROL...	Submerged:	HW =5.30				
51.40	36.44	51.40	Free	Free	.000	3.812	Free Outfall	
		INLET CONTROL...	Submerged:	HW =5.40				
51.50	36.91	51.50	Free	Free	.000	4.760	Free Outfall	
		INLET CONTROL...	Submerged:	HW =5.50				

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
51.60	37.36	51.60	Free	Free	.000	5.674	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.60			
51.70	37.81	51.70	Free	Free	.000	6.545	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.70			
51.80	38.25	51.80	Free	Free	.000	7.390	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.80			
51.90	38.70	51.90	Free	Free	.000	8.200	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.90			
52.00	39.12	52.00	Free	Free	.000	8.989	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.00			
52.10	39.55	52.10	Free	Free	.000	9.748	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.10			
52.20	39.98	52.20	Free	Free	.000	10.479	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.20			
52.30	40.41	52.30	Free	Free	.000	11.190	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.30			
52.40	40.82	52.40	Free	Free	.000	11.888	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.40			
52.50	41.23	52.50	Free	Free	.000	12.558	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.50			
52.60	41.64	52.60	Free	Free	.000	13.218	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.60			
52.70	42.05	52.70	Free	Free	.000	13.858	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.70			
52.80	42.44	52.80	Free	Free	.000	14.484	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.80			
52.90	42.84	52.90	Free	Free	.000	15.092	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.90			
53.00	43.24	53.00	Free	Free	.000	15.689	Free	Outfall
		INLET CONTROL...		Submerged:	HW =7.00			
53.10	43.62	53.10	Free	Free	.000	16.276	Free	Outfall
		INLET CONTROL...		Submerged:	HW =7.10			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.20	44.01	53.20	Free	Free	.000	16.847	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.20			
53.30	44.39	53.30	Free	Free	.000	17.409	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.30			
53.40	44.77	53.40	Free	Free	.000	17.963	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.40			
53.50	45.14	53.50	Free	Free	.000	18.504	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.50			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,	Device Q	Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
50.00	.00	Free Outfall		WS below an invert; no flow.
50.10	.00	Free Outfall		WS below an invert; no flow.
50.20	.00	Free Outfall		WS below an invert; no flow.
50.30	.00	Free Outfall		WS below an invert; no flow.
50.40	.00	Free Outfall		WS below an invert; no flow.
50.50	.00	Free Outfall		WS below an invert; no flow.
50.60	.00	Free Outfall		WS below an invert; no flow.
50.70	.00	Free Outfall		WS below an invert; no flow.
50.80	.00	Free Outfall		WS below an invert; no flow.
50.90	.00	Free Outfall		WS below an invert; no flow.
51.00	.00	Free Outfall		WS below an invert; no flow.
51.10	.00	Free Outfall		WS below an invert; no flow.
51.20	.00	Free Outfall		WS below an invert; no flow.
51.30	1.00	Free Outfall		Max.H=.10; Max.Htw=free out;; W(ft)=10.60
51.40	2.89	Free Outfall		Max.H=.20; Max.Htw=free out;; W(ft)=11.20

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
51.50	5.42	Free Outfall		Max.H=.30; Max.Htw=free out;; W(ft)=11.80
51.60	8.51	Free Outfall		Max.H=.40; Max.Htw=free out;; W(ft)=12.40
51.70	12.12	Free Outfall		Max.H=.50; Max.Htw=free out;; W(ft)=13.00
51.80	16.24	Free Outfall		Max.H=.60; Max.Htw=free out;; W(ft)=13.60
51.90	20.85	Free Outfall		Max.H=.70; Max.Htw=free out;; W(ft)=14.20
52.00	25.95	Free Outfall		Max.H=.80; Max.Htw=free out;; W(ft)=14.80
52.10	31.52	Free Outfall		Max.H=.90; Max.Htw=free out;; W(ft)=15.40
52.20	37.58	Free Outfall		Max.H=1.00; Max.Htw=free out;; W(ft)=16.00
52.30	44.11	Free Outfall		Max.H=1.10; Max.Htw=free out;; W(ft)=16.60
52.40	51.12	Free Outfall		Max.H=1.20; Max.Htw=free out;; W(ft)=17.20
52.50	58.62	Free Outfall		Max.H=1.30; Max.Htw=free out;; W(ft)=17.80
52.60	66.60	Free Outfall		Max.H=1.40; Max.Htw=free out;; W(ft)=18.40
52.70	75.07	Free Outfall		Max.H=1.50; Max.Htw=free out;; W(ft)=19.00
52.80	84.03	Free Outfall		Max.H=1.60; Max.Htw=free out;; W(ft)=19.60
52.90	93.49	Free Outfall		Max.H=1.70; Max.Htw=free out;; W(ft)=20.20

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
53.00	103.45	Free Outfall		Max.H=1.80; Max.Htw=free out;; W(ft)=20.80
53.10	113.91	Free Outfall		Max.H=1.90; Max.Htw=free out;; W(ft)=21.40
53.20	124.88	Free Outfall		Max.H=2.00; Max.Htw=free out;; W(ft)=22.00
53.30	136.36	Free Outfall		Max.H=2.10; Max.Htw=free out;; W(ft)=22.60
53.40	148.37	Free Outfall		Max.H=2.20; Max.Htw=free out;; W(ft)=23.20
53.50	160.89	Free Outfall		Max.H=2.30; Max.Htw=free out;; W(ft)=23.80

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
44.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
44.10	.62	44.10	Free	40.41	.000	.000	Free Outfall	
		Weir: H =.10ft						
44.20	1.74	44.20	Free	40.71	.000	.000	Free Outfall	
		Weir: H =.20ft						
44.30	3.20	44.30	Free	40.99	.000	.000	Free Outfall	
		Weir: H =.30ft						
44.40	4.93	44.40	Free	41.27	.000	.000	Free Outfall	
		Weir: H =.40ft						
44.50	6.89	44.50	Free	41.56	.000	.000	Free Outfall	
		Weir: H =.50ft						
44.60	9.05	44.60	Free	41.87	.000	.000	Free Outfall	
		Weir: H =.60ft						
44.70	11.41	44.70	Free	42.32	.000	.000	Free Outfall	
		Weir: H =.70ft						
44.80	13.52	44.80	Free	42.81	.000	.000	Free Outfall	
		Orifice: H =.80; Riser orifice equation controlling.						
44.90	14.34	44.90	Free	43.05	.000	.000	Free Outfall	
		Orifice: H =.90; Riser orifice equation controlling.						
45.00	15.12	45.00	Free	43.30	.000	.000	Free Outfall	
		Orifice: H =1.00; Riser orifice equation controlling.						
45.10	15.86	45.10	Free	43.54	.000	.000	Free Outfall	
		Orifice: H =1.10; Riser orifice equation controlling.						
45.20	16.56	45.20	Free	43.78	.000	.000	Free Outfall	
		Orifice: H =1.20; Riser orifice equation controlling.						
45.30	17.24	45.30	44.02	44.02	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.30						
45.40	17.89	45.40	44.25	44.25	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.40						
45.50	18.52	45.50	44.49	44.49	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.50						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
45.60	19.13	45.60	44.72	44.72	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.60						
45.70	19.71	45.70	44.96	44.96	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.70						
45.80	20.29	45.80	45.19	45.19	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
45.90	20.84	45.90	45.43	45.43	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90						
46.00	21.38	46.00	45.67	45.67	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00						
46.10	21.91	46.10	45.90	45.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.10						
46.20	22.43	46.20	46.13	46.13	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.20						
46.30	22.93	46.30	46.30	46.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.30						
46.40	23.42	46.40	46.40	46.40	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.40						
46.50	23.91	46.50	46.50	46.50	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.50						
46.60	24.38	46.60	46.60	46.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.60						
46.70	24.85	46.70	46.70	46.70	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.70						
46.80	25.30	46.80	46.80	46.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.80						
46.90	25.75	46.90	46.90	46.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.90						
47.00	26.19	47.00	47.00	47.00	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=3.00						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 11.67 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
44.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
44.10	.62	40.41	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .102ft	Dcr= .291ft		CRIT.DEPTH	Hev= .00ft
44.20	1.75	40.71	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .181ft	Dcr= .497ft		CRIT.DEPTH	Hev= .00ft
44.30	3.20	40.99	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .261ft	Dcr= .681ft		CRIT.DEPTH	Hev= .00ft
44.40	4.92	41.27	Free	Free	.000	.004	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .349ft	Dcr= .854ft		CRIT.DEPTH	Hev= .00ft
44.50	6.89	41.56	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .454ft	Dcr= 1.016ft		CRIT.DEPTH	Hev= .00ft
44.60	9.05	41.87	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .588ft	Dcr= 1.164ft		CRIT.DEPTH	Hev= .00ft
44.70	11.41	42.32	Free	Free	.000	.001	Free Outfall	
		INLET CONTROL...	Submerged:	HW =2.32				
44.80	13.52	42.81	Free	Free	.000	.000	Free Outfall	
		INLET CONTROL...	Submerged:	HW =2.81				
44.90	14.34	43.05	Free	Free	.000	.000	Free Outfall	
		FULL FLOW...	Lfull=47.57ft	Vh=1.024ft	HL=1.985ft		Hev= .00ft	
45.00	15.12	43.30	Free	Free	.000	.000	Free Outfall	
		FULL FLOW...	Lfull=50.37ft	Vh=1.138ft	HL=2.255ft		Hev= .00ft	
45.10	15.86	43.54	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...	Lfull=51.91ft	Vh=1.252ft	HL=2.510ft		Hev= .00ft	
45.20	16.56	43.78	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...	Lfull=52.84ft	Vh=1.365ft	HL=2.758ft		Hev= .00ft	
45.30	17.24	44.02	Free	Free	.000	.002	Free Outfall	
		FULL FLOW...	Lfull=53.78ft	Vh=1.479ft	HL=3.009ft		Hev= .00ft	
45.40	17.89	44.25	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...	Lfull=53.91ft	Vh=1.593ft	HL=3.244ft		Hev= .00ft	
45.50	18.52	44.49	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...	Lfull=54.09ft	Vh=1.707ft	HL=3.481ft		Hev= .00ft	

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 11.67 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
45.60	19.12	44.72	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.26ft		Vh=1.820ft	HL=3.717ft	Hev= .00ft	
45.70	19.72	44.96	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.39ft		Vh=1.935ft	HL=3.955ft	Hev= .00ft	
45.80	20.29	45.19	Free	Free	.000	.001	Free	Outfall
		FULL FLOW...	Lfull=54.53ft		Vh=2.048ft	HL=4.191ft	Hev= .00ft	
45.90	20.84	45.43	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.59ft		Vh=2.162ft	HL=4.427ft	Hev= .00ft	
46.00	21.38	45.67	Free	Free	.000	.001	Free	Outfall
		FULL FLOW...	Lfull=54.74ft		Vh=2.275ft	HL=4.664ft	Hev= .00ft	
46.10	21.91	45.90	Free	Free	.000	.000	Free	Outfall
		FULL FLOW...	Lfull=54.77ft		Vh=2.389ft	HL=4.898ft	Hev= .00ft	
46.20	22.41	46.13	Free	Free	.000	.017	Free	Outfall
		FULL FLOW...	Lfull=54.78ft		Vh=2.499ft	HL=5.124ft	Hev= .00ft	
46.30	22.79	46.30	Free	Free	.000	.146	Free	Outfall
		FULL FLOW...	Lfull=54.79ft		Vh=2.584ft	HL=5.297ft	Hev= .00ft	
46.40	23.00	46.40	Free	Free	.000	.426	Free	Outfall
		FULL FLOW...	Lfull=54.80ft		Vh=2.632ft	HL=5.397ft	Hev= .00ft	
46.50	23.21	46.50	Free	Free	.000	.696	Free	Outfall
		FULL FLOW...	Lfull=54.78ft		Vh=2.681ft	HL=5.497ft	Hev= .00ft	
46.60	23.42	46.60	Free	Free	.000	.960	Free	Outfall
		FULL FLOW...	Lfull=54.82ft		Vh=2.730ft	HL=5.598ft	Hev= .00ft	
46.70	23.63	46.70	Free	Free	.000	1.220	Free	Outfall
		FULL FLOW...	Lfull=54.83ft		Vh=2.778ft	HL=5.697ft	Hev= .00ft	
46.80	23.83	46.80	Free	Free	.000	1.469	Free	Outfall
		FULL FLOW...	Lfull=54.83ft		Vh=2.827ft	HL=5.797ft	Hev= .00ft	
46.90	24.04	46.90	Free	Free	.000	1.710	Free	Outfall
		FULL FLOW...	Lfull=54.84ft		Vh=2.876ft	HL=5.899ft	Hev= .00ft	
47.00	24.24	47.00	Free	Free	.000	1.949	Free	Outfall
		FULL FLOW...	Lfull=54.86ft		Vh=2.924ft	HL=5.999ft	Hev= .00ft	

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q cfs	Tail Water TW Elev ft	Converge +/-ft	Notes Computation Messages
44.00	.00	Free Outfall		WS below an invert; no flow.
44.10	.00	Free Outfall		WS below an invert; no flow.
44.20	.00	Free Outfall		WS below an invert; no flow.
44.30	.00	Free Outfall		WS below an invert; no flow.
44.40	.00	Free Outfall		WS below an invert; no flow.
44.50	.00	Free Outfall		WS below an invert; no flow.
44.60	.00	Free Outfall		WS below an invert; no flow.
44.70	.00	Free Outfall		WS below an invert; no flow.
44.80	.00	Free Outfall		WS below an invert; no flow.
44.90	.00	Free Outfall		WS below an invert; no flow.
45.00	.00	Free Outfall		WS below an invert; no flow.
45.10	1.00	Free Outfall		Max.H=.10; Max.Htw=free out;; W(ft)=10.60
45.20	2.89	Free Outfall		Max.H=.20; Max.Htw=free out;; W(ft)=11.20
45.30	5.42	Free Outfall		Max.H=.30; Max.Htw=free out;; W(ft)=11.80
45.40	8.51	Free Outfall		Max.H=.40; Max.Htw=free out;; W(ft)=12.40

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q Tail Water Notes

WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
45.50	12.12	Free Outfall		Max.H=.50; Max.Htw=free out;; W(ft)=13.00
45.60	16.24	Free Outfall		Max.H=.60; Max.Htw=free out;; W(ft)=13.60
45.70	20.85	Free Outfall		Max.H=.70; Max.Htw=free out;; W(ft)=14.20
45.80	25.95	Free Outfall		Max.H=.80; Max.Htw=free out;; W(ft)=14.80
45.90	31.52	Free Outfall		Max.H=.90; Max.Htw=free out;; W(ft)=15.40
46.00	37.58	Free Outfall		Max.H=1.00; Max.Htw=free out;; W(ft)=16.00
46.10	44.11	Free Outfall		Max.H=1.10; Max.Htw=free out;; W(ft)=16.60
46.20	51.12	Free Outfall		Max.H=1.20; Max.Htw=free out;; W(ft)=17.20
46.30	58.62	Free Outfall		Max.H=1.30; Max.Htw=free out;; W(ft)=17.80
46.40	66.60	Free Outfall		Max.H=1.40; Max.Htw=free out;; W(ft)=18.40
46.50	75.07	Free Outfall		Max.H=1.50; Max.Htw=free out;; W(ft)=19.00
46.60	84.03	Free Outfall		Max.H=1.60; Max.Htw=free out;; W(ft)=19.60
46.70	93.49	Free Outfall		Max.H=1.70; Max.Htw=free out;; W(ft)=20.20
46.80	103.45	Free Outfall		Max.H=1.80; Max.Htw=free out;; W(ft)=20.80
46.90	113.91	Free Outfall		Max.H=1.90; Max.Htw=free out;; W(ft)=21.40

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
47.00	124.88	Free Outfall		
		Max.H=2.00; Max.Htw=free out;; W(ft)=22.00		

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
52.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
52.10	1.39	52.10	Free	48.49	.000	.000	Free Outfall	
		Weir: H =.10ft						
52.20	3.92	52.20	Free	48.84	.000	.000	Free Outfall	
		Weir: H =.20ft						
52.30	7.20	52.30	Free	49.15	.000	.000	Free Outfall	
		Weir: H =.30ft						
52.40	11.09	52.40	Free	49.44	.000	.000	Free Outfall	
		Weir: H =.40ft						
52.50	15.49	52.50	Free	49.73	.000	.000	Free Outfall	
		Weir: H =.50ft						
52.60	20.37	52.60	Free	50.00	.000	.000	Free Outfall	
		Weir: H =.60ft						
52.70	25.67	52.70	Free	50.27	.000	.000	Free Outfall	
		Weir: H =.70ft						
52.80	31.36	52.80	Free	50.55	.000	.000	Free Outfall	
		Weir: H =.80ft						
52.90	37.42	52.90	Free	50.82	.000	.000	Free Outfall	
		Weir: H =.90ft						
53.00	43.83	53.00	Free	51.09	.000	.000	Free Outfall	
		Weir: H =1.00ft						
53.10	50.56	53.10	Free	51.37	.000	.000	Free Outfall	
		Weir: H =1.10ft						
53.20	57.61	53.20	Free	51.66	.000	.000	Free Outfall	
		Weir: H =1.20ft						
53.30	64.96	53.30	Free	51.95	.000	.000	Free Outfall	
		Weir: H =1.30ft						
53.40	72.60	53.40	52.25	52.25	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.40ft						
53.50	80.51	53.50	52.62	52.62	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.50ft						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.60	88.70	53.60	53.05	53.05	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.60ft						
53.70	97.14	53.70	53.55	53.55	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.70ft						
53.80	102.70	53.80	53.80	53.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
53.90	105.51	53.90	53.90	53.90	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90						
54.00	108.26	54.00	54.00	54.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00						
54.10	110.93	54.10	54.10	54.10	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.10						
54.20	113.54	54.20	54.20	54.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.20						
54.30	116.09	54.30	54.30	54.30	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.30						
54.40	118.59	54.40	54.40	54.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.40						
54.50	121.03	54.50	54.50	54.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.50						
54.60	*	54.60	54.60	54.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.70	*	54.70	54.70	54.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.80	*	54.80	54.80	54.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.90	*	54.90	54.90	54.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.00	*	55.00	55.00	55.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.10	*	55.10	55.10	55.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
55.20	*	55.20	55.20	55.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.30	*	55.30	55.30	55.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.40	*	55.40	55.40	55.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.50	*	55.50	55.50	55.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
52.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
52.10	1.39	48.49	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .119ft	Dcr= .351ft		CRIT.DEPTH	Hev= .00ft
52.20	3.93	48.84	Free	Free	.000	.005	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .206ft	Dcr= .593ft		CRIT.DEPTH	Hev= .00ft
52.30	7.20	49.15	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .285ft	Dcr= .808ft		CRIT.DEPTH	Hev= .00ft
52.40	11.08	49.44	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .362ft	Dcr= 1.009ft		CRIT.DEPTH	Hev= .00ft
52.50	15.48	49.73	Free	Free	.000	.011	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .439ft	Dcr= 1.199ft		CRIT.DEPTH	Hev= .00ft
52.60	20.35	50.00	Free	Free	.000	.017	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .516ft	Dcr= 1.382ft		CRIT.DEPTH	Hev= .00ft
52.70	25.67	50.27	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .596ft	Dcr= 1.560ft		CRIT.DEPTH	Hev= .00ft
52.80	31.37	50.55	Free	Free	.000	.009	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .678ft	Dcr= 1.732ft		CRIT.DEPTH	Hev= .00ft
52.90	37.43	50.82	Free	Free	.000	.010	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .765ft	Dcr= 1.900ft		CRIT.DEPTH	Hev= .00ft
53.00	43.82	51.09	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .857ft	Dcr= 2.063ft		CRIT.DEPTH	Hev= .00ft
53.10	50.55	51.37	Free	Free	.000	.015	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .956ft	Dcr= 2.223ft		CRIT.DEPTH	Hev= .00ft
53.20	57.62	51.66	Free	Free	.000	.008	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.065ft	Dcr= 2.378ft		CRIT.DEPTH	Hev= .00ft
53.30	64.98	51.95	Free	Free	.000	.023	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.186ft	Dcr= 2.527ft		CRIT.DEPTH	Hev= .00ft
53.40	72.60	52.25	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.322ft	Dcr= 2.669ft		CRIT.DEPTH	Hev= .00ft
53.50	80.51	52.62	Free	Free	.000	.002	Free Outfall	
		INLET CONTROL...	Submerged:	HW =4.62				

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = CO (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = RO (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.60	88.69	53.05	Free	Free	.000	.004	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.05			
53.70	97.13	53.55	Free	Free	.000	.008	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.55			
53.80	101.14	53.80	Free	Free	.000	1.563	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.80			
53.90	102.69	53.90	Free	Free	.000	2.827	Free	Outfall
		INLET CONTROL...		Submerged:	HW =5.90			
54.00	104.24	54.00	Free	Free	.000	4.019	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.00			
54.10	105.74	54.10	Free	Free	.000	5.190	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.10			
54.20	107.24	54.20	Free	Free	.000	6.298	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.20			
54.30	108.67	54.30	Free	Free	.000	7.420	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.30			
54.40	110.15	54.40	Free	Free	.000	8.438	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.40			
54.50	111.58	54.50	Free	Free	.000	9.453	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.50			
54.60	112.99	54.60	Free	Free	.000	10.443	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.60			
54.70	114.39	54.70	Free	Free	.000	11.388	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.70			
54.80	115.78	54.80	Free	Free	.000	12.313	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.80			
54.90	117.14	54.90	Free	Free	.000	13.221	Free	Outfall
		INLET CONTROL...		Submerged:	HW =6.90			
55.00	118.47	55.00	Free	Free	.000	14.115	Free	Outfall
		INLET CONTROL...		Submerged:	HW =7.00			
55.10	119.81	55.10	Free	Free	.000	14.971	Free	Outfall
		INLET CONTROL...		Submerged:	HW =7.10			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
55.20	121.12	55.20	Free	Free	.000	15.817	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.20			
55.30	122.43	55.30	Free	Free	.000	16.628	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.30			
55.40	123.72	55.40	Free	Free	.000	17.432	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.40			
55.50	124.98	55.50	Free	Free	.000	18.229	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.50			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
52.00	.00	Free Outfall		WS below an invert; no flow.
52.10	.00	Free Outfall		WS below an invert; no flow.
52.20	.00	Free Outfall		WS below an invert; no flow.
52.30	.00	Free Outfall		WS below an invert; no flow.
52.40	.00	Free Outfall		WS below an invert; no flow.
52.50	.00	Free Outfall		WS below an invert; no flow.
52.60	.00	Free Outfall		WS below an invert; no flow.
52.70	.00	Free Outfall		WS below an invert; no flow.
52.80	.00	Free Outfall		WS below an invert; no flow.
52.90	.00	Free Outfall		WS below an invert; no flow.
53.00	.00	Free Outfall		WS below an invert; no flow.
53.10	.00	Free Outfall		WS below an invert; no flow.
53.20	.00	Free Outfall		WS below an invert; no flow.
53.30	.00	Free Outfall		WS below an invert; no flow.
53.40	.00	Free Outfall		WS below an invert; no flow.

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,	Device Q	Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
55.00	132.02	Free Outfall		Max.H=1.50; Max.Htw=free out;; W(ft)=29.00
55.10	146.77	Free Outfall		Max.H=1.60; Max.Htw=free out;; W(ft)=29.60
55.20	162.20	Free Outfall		Max.H=1.70; Max.Htw=free out;; W(ft)=30.20
55.30	178.31	Free Outfall		Max.H=1.80; Max.Htw=free out;; W(ft)=30.80
55.40	195.10	Free Outfall		Max.H=1.90; Max.Htw=free out;; W(ft)=31.40
55.50	212.56	Free Outfall		Max.H=2.00; Max.Htw=free out;; W(ft)=32.00

APPENDIX III

(CLOSURE COST ESTIMATE)

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

General Site Information

Cap System Construction		
Total area Requiring Closure	35.4	ac
Area of Landfill Requiring Regrading and Cover Material (10 Percent of the Closure Area)	3.5	ac
Volume of Soil required for 18-inch Low Permeability Layer	85,670	cy
Volume of Soil required for 18-inch Vegetation/Erosion Layer	85,670	cy
Stormwater Downchutes	1,500	lf
Perimeter Channels	1,250	lf
Stormwater Benches	5,000	lf
Gas Vent System Construction		
Number of Gas Vents	32	ea
Total Length of Gas Vent to be Installed (50' Avg Depth)	1,600	lf

Closure Cost Estimate

	Quantity	Unit	Unit Price	Total
Task 1- Engineering Services				
Prepare Construction Drawings and Specifications	1	lump sum	$10,000	$10,000
Bid Process (Including Announcements)	1	lump sum	$5,000	$5,000
			Subtotal Task 1 =	**$15,000**
Task 2 - Mobilization				
Mobilization/Demobilization (5% of Construction Cost)	1	lump sum	$50,036	$50,036
Construction and Record Surveying and Deed Notation	35.4	acre	$1,350	$47,790
			Subtotal Task 2 =	**$97,826**
Task 3 - Low Permeability Layer				
Regrade Existing C&D Waste and Complete Intermediate Cover	3.5	acre	$750	$2,625
Place 18-inch Low Permeability Layer	85,670	cy	$5.50	$471,185
			Subtotal Task 3 =	**$473,810**
Task 4 - Vegetation/Erosion Layer				
Place 18-inch Vegetation/Erosion Layer	85,670	cy	$4.75	$406,933
Seeding and Fertilizing the Topsoil Layer	35.4	acre	$1,200	$42,480
			Subtotal Task 4 =	**$449,413**
Task 5 - Surface Drainage Structures				
Downchute Channels	1,500	lf	$15.00	$22,500
Stormwater Benches	5,000	lf	$6.00	$30,000
Perimeter Channels	1,250	lf	$20.00	$25,000
			Subtotal Task 5 =	**$77,500**

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

Task 6 - Gas System Mobilization and Construction Survey				
Mobilization/Demobilization	1	lump sum	$13,500	$13,500
Construction Survey	1	lump sum	$7,500	$7,500
			Subtotal Task 6 =	**$21,000**
Task 7 - Gas System Installation				
Install Gas Vents	1,600	lf	$70.00	$112,000
Install Gas Vent Heads	32	ea	$350	$11,200
			Subtotal Task 7 =	**$123,200**
Task 8 - CQA and Certification				
Low Permeability Layer CQA	140	hrs	$45.00	$6,300
Low Permeability Layer Laboratory Testing	9	ea	$300.00	$2,700
Erosion Layer CQA	120	hrs	$45.00	$5,400
Erosion Layer Laboratory Testing	9	ea	$100.00	$900
Gas System CQA	120	hrs	$45.00	$5,400
CQA Project Management	100	hrs	$85.00	$8,500
CQA Report and Certification	1	lump sum	$10,000	$10,000
			Subtotal Task 8 =	**$39,200**
			Project Subtotal=	**$1,296,949**
Contingency Fee (10%)	1	10% total	$129,695	$129,695
			Project Total=	**$1,426,643**
			Cost Per Acre=	**$40,301**

APPENDIX IV

(POST-CLOSURE MONITORING FORM)

S&ME

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date: _____ Observation Personnel: _____

Time: _____

Observed Weather Conditions: _____

SITE SECURITY
Condition of Fences, Gates, Locks:
Evidence of vandalism (wells, vents, protective cover damage):
Evidence of penetrations (poles, posts, stakes):
Evidence of human encroachment (trash, fire pits, tire/footprints):
General site condition:
Additional Comments:

S&ME

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

COVER SYSTEM
Evidence of erosion, settlement, rutting, potholes:
Evidence of cover system intrusion (ruts, burrows, excavation):
Evidence of stressed vegetation or bare spots. Evidence of woody vegetation (small trees and/or shrubs):
Condition of storm water channels, talk-on benches, drainage swales, down drain pipes – sings of erosion or sedimentation?:
Sediment basin, sediment traps – evidence of erosion, sedimentation, sediment accumulation:
Additional Comments:

S&ME

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

GAS PROBES & GAS VENTING SYSTEM
Evidence of damage to probes/vents or surrounding area (cracking, misalignment, missing pieces):
Evidence of cover system subsidence or upheaval near probes/vents:
Evidence of wildlife intrusion (nests, burrows, wasp nests):
Evidence of spilled liquids (probe tampering/vent blowout):
GAS PROBES: Probe covers in place & secure:
GAS VENTS: Unusual conditions – belching, whistling, excessive gas (odor) production:
Additional Comments:

S&ME

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

GROUNDWATER MONITORING WELLS
Evidence of damage to wells or surrounding area (cracking, misalignment, missing pieces):
Evidence of cover system subsidence or upheaval near wells:
Evidence of wildlife intrusion (nests, burrows, wasp nests):
Evidence of spilled liquids (well tampering):
Well covers in place & secure:
Additional Comments:

S&ME

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

OTHER

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM **Date** _____

PHOTOGRAPHIC LOG

Photograph No.	Description
1:	
2:	
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APPENDIX V

(POST-CLOSURE COST ESTIMATE)

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

General Site Information

Post-Closure Monitoring and Maintenance

Total Area Requiring Post-Closure (Permitted Area)	68.0	ac
Post-Closure Period	30	years
Number of Groundwater Monitoring Wells	7	ea
Number of Gas Monitoring Probes	11	ea
Number of Surface Water Sampling Points	2	ea

	Quantity	Unit	Unit Price	Total
Task 1 - Groundwater and Surface Water Sampling and Analysis				
Sampling Crew (2 man crew)	48	hours	$70	$3,360
Equipment	1	lump sum	$1,301	$1,301
Laboratory Analysis	1	lump sum	$4,592	$4,592
Report (Includes Surface Water Reporting)	1	lump sum	$5,750	$5,750
Project Coordination	1	lump sum	$1,000	$1,000
			Cost per Sampling Event =	$16,003
Cost for Groundwater Monitoring for Post-Closure Period	60	events	$16,003	$960,195
(Assuming Biannual Sampling Frequency or 60 Sampling Events)			**Subtotal Task 1 =**	**$960,195**
Task 2 - Gas Probe Monitoring				
Sampling Crew (2 man crew)	4	hours	$75	$300
Project Management and Report	1	lump sum	$175	$175
Equipment and Expenses	1	lump sum	$165	$165
			Cost per Sampling Event =	$640
Cost for Gas Probe Monitoring for Post-Closure Period	120	events	$640	$76,800
(Assuming Quarterly Sampling Frequency or 120 Sampling Events)			**Subtotal Task 2 =**	**$76,800**

Task 3 - Erosion and Settlement Repairs

Assume that 10% of the post-closure area will require repair in the first 5 years from erosion and settlement at an average depth of 1.0' (6.8 ac @ 1.0 ft deep = 10,971 cy). Assume that 5% of the post-closure area will require repair repair from settlement and erosion for the remaining post-closure period. (3.4 ac @ 1.0 ft deep = 5,485 cy)

Erosion and Settlement Repair	16,456	cy	$6.00	$98,736
Reseeding	10.2	ac	$1,200	$12,240
			Subtotal Task 3 =	**$110,976**

Task 4 - Reseeding and Fertilizing

Assume that the post-closure area will require reseeding and fertilizing of 30% of the post-closure area annually for the first 2 years of the post-closure period. For the remaining 28 years, it is assumed that 5% of the post-closure area will require reseeding and fertilizing annually (2 years * 0.30 * 57.9 ac/year = 57.9 ac) + (28 years * 0.05 * 57.9 ac = 81.1 ac).

Reseeding and Fertilizing	136.00	ac	$1,200	$163,200
			Subtotal Task 4 =	**$163,200**

Task 5 - Mowing

Assume the post-closure area will be mowed 2 times each year during the post-closure period.

Mowing	68.0	ac	$50	$3,400
			Cost per Event =	$3,400
Cost for Mowing for Post-Closure Period	60	events	$3,400	$204,000
(Assuming Biannual or 60 Events)			**Subtotal Task 5 =**	**$204,000**

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: June 2008

Task 6 - Surface Water Control Structures Maintenance
Assume the surface water control structures will be maintained on an annual basis at an estimated cost of $100 per hour.

Surface Water Control Structure Maintenance	20	hr	$100	$2,000
			Cost per Event =	$2,000
Cost for Surface Water Control Structure Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 6 =	**$60,000**

Task 7 - Security and Maintenance
Assume that the annual cost for security, fencing repairs, gate repairs, road maintenance and signs is $2,000.

Cost for Security and Maintenance for Post-Closure Period	30	events	$2,000	$60,000
			Subtotal Task 7 =	**$60,000**

Task 8 - Groundwater Monitoring Well Repair
Assume the annual cost for groundwater well repair is $2,000.

Cost for Groundwater Well Repair for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 8 =	**$60,000**

Task 9 - Gas System Repair and Maintenance
Assume that 10 gas vents at an average depth of 50 feet will be replaced during the post-closure period. Assume that 10 gas monitoring probes will be replaced during the post-closure period. Assume the gas system will require 100 hours per year to complete.

Gas Vent Replacement	50	ft	$70.00	$3,500
Gas Monitoring Probe Replacement	1	ea	$750.00	$750
			Cost per Event =	$4,250
Cost for Gas Vent and Gas Probe Replacement for Post-Closure Period (Assuming 10 Events)	10	events	$4,250	$42,500
			Subtotal =	**$42,500**
Gas System Monitoring and Maintenance	100	hrs	$40.00	$4,000
			Cost per Event =	$4,000
Cost for Gas System Monitoring and Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$4,000	$120,000
			Subtotal =	**$120,000**
			Subtotal Task 9 =	**$162,500**
			Post-Closure Subtotal=	**$1,857,671**
Contingency Fee (10%)	1	10% total	$185,767	$185,767
			Post-Closure Total=	**$2,043,438**

SECTION E

FINANCIAL ASSURANCE DOCUMENTATION
[RULE .1628]

Edgecombe County

Phone: (252) 641-7840
Fax: (252) 641-0456

Finance Department

June 25, 2008

Amy Kadrie-NCDENR
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Edgecombe County Financial Assurance

Dear Sir:

I am the chief financial officer of Edgecombe County, 201 St. Andrew Street, Tarboro, NC 27886. This letter is in support of this unit of local government's use of the financial test to demonstrate financial assurance, as specified in 15A NCAC 13 B.1628 (e) (1) (F). This letter is an update of the letter sent on November 30, 2007. The update is required per Rule 15A NCAC 13B Rule .0547(4)(e). The C&D costs for closure and post-closure have been revised and corrective action costs for the old (MSW) landfill have been added.

This unit of local government is the owner or operator of the following facility for which financial assurance for closure, post-closure, or corrective action is demonstrated through the financial test specified in 15A NCAC 13B.1628 (e) (1) (F). The current closure, post-closure, or corrective action cost estimates covered by the test are shown for the facility:

Permit Number - #33-01
Edgecombe County Sanitary Landfill
Address – Rt 3 State Road 1601

Closure cost estimates -	$2,044,626
Post-closure cost estimates	1,426,643
Corrective Action	2,235,000
Total -	$5,706,269

Edgecombe County

The fiscal year of this unit of local government ends on June 30, 2008. The figures for the following items marked with an asterisk are derived from this unit of local government's Annual Financial Information Report (AFIR) for the latest completed fiscal year, ended June 30, 2007.

I hereby certify that the wording of this letter is identical to the wording in 15A NCAC 13B .1628 (e) (2) (G) as such rules were constituted on the date shown immediately below. I further certify the following: (1) that the unit of local government has not operated at a total operating fund deficit equal to five percent or more total annual revenue in either of the past two fiscal years, (2) that the unit of local government is not in default on any outstanding general obligation bond or long-term obligations, and (3) does not have any outstanding general obligation bonds rated lower than Baa as issued by Moody's, BBB as issued by Standard & Poor's, BBB as issued by Fitch's, or 75 as issued by the Municipal Council.

JoAnne J. Harrell
FINANCE DIRECTOR

June 25, 2008

P.O. Box 10• 201 Saint Andrew Street •Tarboro, North Carolina 27886

Edgecombe County

APPENDIX

BOND RATING INDICATOR OF FINANCIAL STRENGTH

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shown in paragraphs above] $ 5,706,269

2. Current bond rating of most recent issuance and name of rating service Moodys-**A3** Standard & Poors-**A**

3. Date of Issuance bond Feb. 1, 2006

4. Date of maturity bond Feb. 1, 2026

5. Assured environmental cost to demonstrate financial responsibility in the following amounts under Division rules:

MSWLF under 15A NCAC 13B .1600	$5,706,269
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 .0010 And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$5,706,269

6. Total Annual Revenue (AFIR Part 2) $62,678,062

Circle either "yes" or "no" to the following question.

7. Is line 5 divided by line 6 less than or equal to 0.43? yes /no

Edgecombe County

APPENDIX

RATIOS INDICATORS OF FINANCIAL STRENGTH

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shoen in the paragraphs above]	$ 5,706,269
*2. Sum of cash and investments (AFIR Part 7)	$25,291,043
*3. Total expenditures (AFIR Part 4 Columns a & b Part 5 for municipalities or Part 5 excluding educational capital outlays for counties)	$71,093,818
*4. Annual debt service (AFIR Part 4 Section I)	$ 3,196,918
5. Assured environmental costs to demonstrate financial Responsibility in the following amount under Division rules:	
MSWLF under 15A NCAC 13B .1600	$ 5,706,269
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 . And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$ 5,706,269
*6. Total Annual Revenue (AFIR Part 2)	$62,678,062

Circle either "yes" or "no" to the following questions.

7. Is line 5 divided by line 6 less than or equal to 0.43?	yes /no
8. Is line 2 divided by line 3 greater than or equal to 0.05?	yes /no
9. Is line 4 divided by line 3 less than or equal to 0.20?	yes /no