

Carmen Johnson
Fac/Perm/Co ID # 92-30 Date 8/14/13 Doc ID#
DIN

APPROVED
DIVISION OF SOLID WASTE MANAGEMENT

DATE 8/12/02 BY JAB

PTC 92-30

PHASE 1 / RAL. REG. OFFICE
CONSTRUCTION PLAN
APPLICATION

HIGHWAY 55 C&D LANDFILL
& RECYCLING CENTER



Prepared For:

NCDENR
Solid Waste Section
Raleigh, North Carolina

Re-**SCANNED**
3/13/14

Prepared By:

PATTERSON

BREWER

& Associates

Engineering • Surveying • Planning

RECEIVED
AUG 15 2002
DEHNR RALEIGH REGIONAL OFFICE

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**SITING CRITERIA REPORT
HIGHWAY 55 C & D LANDFILL
& RECYLING CENTER
WAKE COUNTY, NORTH CAROLINA**

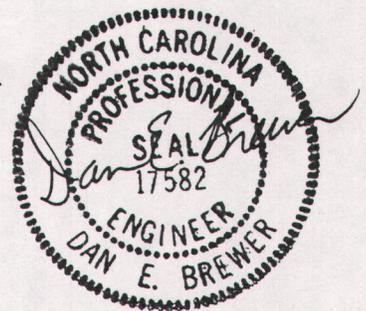
Prepared for:

NCDENR
Solid Waste Section
Raleigh, North Carolina

Prepared by:

Patterson, Brewer & Associates, P.A.
P.O. Box 1387
 Mooresville, NC 28115

May 6, 2002



SITING CRITERIA REPORT

The proposed C & D landfill meets the siting criteria requirements of Section .0503 of the Solid Waste Management Rules. The siting criteria requirements are outlined below in bold text. The text that follows each criterion describes where the information is presented.

Section .0503 (1) - Facilities or practices, shall not be located in the 100-year floodplain.

As shown on the Site Plan, the proposed site is not located within a 100-year floodplain.

Section .0503 (2) - Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.

A September 24, 2001 letter from the NCDENR Division of Parks and Recreation is presented in the appendix. Based on the letter, there is no record of rare species, significant natural communities, or priority natural areas at the site.

Section .0503 (3) - Facilities or practices shall not result in the destruction or adverse modification of the critical habitat of endangered or threatened species as identified in 50 CFR Part 17 which is hereby incorporated by reference including any subsequent amendments and editions...

Based upon the referenced September 24, 2001 letter from the NCDENR Division of Parks and Recreation, there is no record of rare species at the site.

Section .0503 (4) - Facilities or practices shall not damage or destroy an archaeological or historic site.

An October 11, 2001 letter from NCDENR Department of Cultural Resources presented in the appendix indicates that no archaeological or historic site is present at the site.

Section .0503 (5) - Facilities or practices shall not cause an adverse impact on a state park, recreation or scenic area, or any other lands included in the state nature and historic preserve.

The above referenced September 24, 2001 letter from the Division of Parks and Recreation indicates that there are no records of significant natural communities or priority natural areas at or within a one-mile radius of the site.

Section .0530 (6) - Facilities shall not be located in any wetland as defined in the Clean Water Act, Section 404(b).

A small wetland area is delineated along a drainage feature just north of Falls Branch in the Phase III portion of the site. Any landfill development that will impact wetlands are permitted through the appropriate State and Federal agencies. A copy of all wetland permit applications and approvals are included in the appendix. These permits describe all permitted wetland crossings allowing up to 149 linear feet of impact.

Section .0503 (7) - It must be shown that adequate suitable soils are available for cover, either from on or off site.

Borrow soil calculations are presented in the appendix of the Engineering Report. Based upon an excavation of 600,000 cubic yards of soil, there is adequate quantities of on-site borrow material to operate and close out the landfill.

Section .0503 (8) - Land clearing and Inert Debris landfills shall meet the following surface and ground water requirements:

- (a) Facilities or practices shall not cause a discharge of pollutants into waters of the state that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES), under Section 402 of the Clean Water Act, as amended.**

Based on the composition of the waste stream, runoff from the site will not cause a discharge of pollutants into surface waters. The proposed erosion and sediment control structures along the perimeter of the site will filter out sediments prior to discharge into existing off-site drainage features.

- (b) Facilities or practices shall not cause a discharge of dredged materials or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended.**

There are no dredged materials on this site. Fill material from excavations will be stockpiled upgradient of the erosion and sediment control structures. In accordance with the erosion and sediment control plan, the stockpile areas will be stabilized in accordance with the seeding specifications.

- (c) Facilities or practices shall not cause non-point source pollution of waters of the state that violates assigned water quality standards.**

Due to the composition of the waste stream, run-off or leachate from the facility is not anticipated to cause a non-point source pollution of waters of the state.

- (d) Waste in landfills with a disposal area greater than two acres shall be placed a minimum of four feet above the seasonal high water table...**

The proposed subgrade elevations of the facility have been design to provide a minimum separation of four feet above the seasonal high water table. The

proposed subgrade elevations are depicted on the Grading Plan and the Profiles in the appendix of the Engineering Report. Detailed information regarding the subsurface conditions is presented in the hydrogeological report. Based on the soil test borings and test pits performed on the site, auger refusal was generally encountered well above anticipated ground water depths.

(e) N/A

Section .0503 (9) - The facility shall meet the following minimum buffer requirements:

(a) 50 feet from the waste boundary to all surface waters of the state as defined in G.S. 143-212.

As indicated on the Grading Plan, a 50-foot buffer is provided from the waste boundary to adjacent streams.

(b) 100 feet from the disposal area to property lines, residential dwellings, commercial or public buildings, and wells.

The site has a 200-foot buffer along the property boundaries as indicated on the Site Plan.

Section 0503 (10) - The facility shall meet all requirements of any applicable zoning ordinance.

Wake County has approved the proposed site. Documentation of approval from the Wake County is presented in the Appendix of the Site Plan Application Report.

APPENDIX

LETTER FROM NCDENR DIVISION OF PARKS AND RECREATION

**LETTER FROM NC DEPARTMENT OF
CULTURE RESOURCES**

North Carolina
Department of Environment and Natural Resources
Division of Parks and Recreation

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Philip K. McKnelly, Director



September 24, 2001

Mr. Dan E. Brewer
Patterson, Brewer, & Associates
P.O. Box 1387
Mooresville, NC 28115

Subject: Proposed Highway 55 C&D Landfill Site near Holly Springs, Wake County

Dear Mr. Brewer:

The Natural Heritage Program has no record of rare species, significant natural communities, or priority natural areas at the site nor within a mile of the site.

You may wish to check the Natural Heritage Program database website at www.ncsparks.net/nhp/search.html for a listing of rare plants and animals and significant natural communities in the county and on the topographic quad map. Please do not hesitate to contact me at 919-715-8687 if you have questions or need further information.

Sincerely,

A handwritten signature in cursive script that reads "Harry E. LeGrand, Jr." is positioned above the typed name.

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program

HEL/hel



**North Carolina Department of Cultural Resources
State Historic Preservation Office**

David L. S. Brook, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary

Division of Archives and History
Jeffrey J. Crow, Director

October 11, 2001

Dan E. Brewer
Patterson & Brewer
PO Box 137
Mooresville, NC 28115

Re: Proposed Hwy 55 C&D Landfill & Recycling Center, Wake County, ER 02-7731

Dear Mr. Brewer:

Thank you for your letter of September 17, 2001, concerning the above project.

We have conducted a review of the project and are aware of no historic resources, which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919/733-4763. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

David Brook

DB:kgc

	Location	Mailing Address	Telephone/Fax
Administration	507 N. Blount St. Raleigh, NC	4617 Mail Service Center, Raleigh 27699-4617	(919) 733-4763 • 733-8653
Restoration	515 N. Blount St. Raleigh, NC	4613 Mail Service Center, Raleigh 27699-4613	(919) 733-6547 • 715-4801
Survey & Planning	515 N. Blount St. Raleigh, NC	4618 Mail Service Center, Raleigh 27699-4618	(919) 733-4763 • 715-4801

WETLAND PERMIT APPLICATION

NC DIVISION OF WATER QUALITY

&

**US ARMY CORPS OF ENGINEER
PERMIT APPROVALS**



Michael F. Easley
Governor
William G. Ross, Jr., Secretary
Department of Environment and Natural Resources
Gregory J. Thorpe, Ph.D., Acting Director
Division of Water Quality

January 2, 2002
DWQ# 01-1489
Wake County

Ron Gilkerson
Griffin Brothers Companies
19109 West Catawba Avenue
Cornelius, NC, 28031

APPROVAL of 401 Water Quality Certification

Dear Mr. Gilkerson:

You have our approval, in accordance with the attached conditions, to place fill in 149 linear feet of streams in order to construct the Highway 55 C&D Landfill and Recycling Center in Wake County, as described in your application received by the Division of Water Quality on October 12, 2001, and in additional correspondence received December 21, 2001. After reviewing your application, we have determined that this fill is covered by General Water Quality Certification Number 3287, which can be downloaded from our web site at <http://h2o.cnr.state.nc.us>. This Certification allows you to use Nationwide Permit Number 39 when it is issued by the U.S. Army Corps of Engineers. In addition, you should get any other federal, state or local permits before you go ahead with your project including (but not limited to) Sediment and Erosion Control, Non-Discharge and Water Supply Watershed regulations. You should send an application to the Division of Land Resources for their review of your project under dam safety rules as well as erosion and sediment control. Also this approval will expire when the accompanying 404 permit expires unless otherwise specified in the General Certification.

This approval is only valid for the purpose and design that you described in your application. If you change your project, you must notify us in writing and you may be required to send us a new application for a new certification. If the property is sold, the new owner must be given a copy of the Certification and approval letter and is thereby responsible for complying with all conditions. If total wetland fills for this project (now or in the future) exceed one acre, compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h). For this approval to be valid, you must follow the conditions listed in the attached certification.

If you do not accept any of the conditions of this certification, you may ask for an adjudicatory hearing. You must act within 60 days of the date that you receive this letter. To ask for a hearing, send a written petition which conforms to Chapter 150B of the North Carolina General Statutes to the Office of Administrative Hearings, P.O. Box 27447, Raleigh, N.C. 27611-7447. This certification and its conditions are final and binding unless you ask for a hearing.

This letter completes the review of the Division of Water Quality under Section 401 of the Clean Water Act. If you have any questions, please telephone Steve Mitchell in our Raleigh Regional Office at 919-571-4700 or Cyndi Karoly in Raleigh at 919-733-1786.

Sincerely,

Cyndi Karoly
for Gregory J. Thorpe, Ph.D.,

Attachment

cc: Corps of Engineers Raleigh Regulatory Field Office
Raleigh DWQ Regional Office
Central Files
File Copy
Britt Feldner, P.O. Box 1532, Conway, SC, 29528

011489

U.S. ARMY CORPS OF ENGINEERS
Wilmington District

Action ID: 200220297 County: Wake

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Property	Authorized
Owner <u>Highway 55 C&D Landfill, LLC</u>	Agent <u>The Brigman Company, Inc.</u>
	<u>Attn: Britt Feldner</u>
Address <u>19109 West Catawba Ave., Ste 118</u>	Address <u>P.O. Box 1532</u>
<u>Cornelius, NC 28031</u>	<u>Conway, SC 29528</u>
Telephone Number <u>843-248-9388</u>	Telephone Number <u>843-248-9388</u>

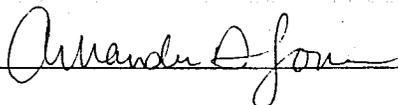
Size and Location of Property (waterbody, Highway name/number, town, etc.): The site is located on the north side of Sunset Lake Road (SR 1301), approximately 0.7 miles west of its intersection with N.C. Hwy 55, in Holly Springs, Wake County, North Carolina.

Description of Activity: This permit authorizes the installation of culverts and the placement of fill associated with the construction of a C&D (construction and debris) landfill and associated road crossings. Impacts to waters authorized by this permit include 85 linear feet of stream channel for four road crossings and 64 linear feet of stream channel for proposed fill. Total impacts to waters are 149 linear feet of stream channel to Little Branch and its unnamed tributaries in the Cape Fear River Basin.

Applicable Law: Section 404 (Clean Water Act, 33 USC 1344) only.
 Section 10 (River and Harbor Act of 1899) only.

Authorization: Regional General Permit Number
 39 Nationwide Permit Number

Any violation of the conditions of the Regional General or Nationwide Permit referenced above may subject the permittee to a stop work order, a restoration order, and/or appropriate legal action. This Department of the Army Regional General Permit or Nationwide Permit verification does not relieve the permittee of the responsibility to obtain any other required Federal, State, or local approvals/permits. The permittee may need to contact appropriate State and local agencies before beginning work. If you have any questions regarding the Corps of Engineers regulatory program, please contact Amanda D. Jones at telephone number (919) 876 - 8441 extension 30.

Regulatory Project Manager Signature 

Date December 14, 2001 Expiration Date December 14, 2003

SURVEY PLATS, FIELD SKETCH, WETLAND DELINEATION FORM, ETC., MUST BE ATTACHED TO THE YELLOW (FILE) COPY OF THIS FORM, IF REQUIRED OR AVAILABLE.

Permit Number: 200220297 – Nationwide Permit Number 39

Name of Permittee: Highway 55 C&D Landfill, LLC

Project Manager: Amanda D. Jones

Issuance: December 14, 2001

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

**US ARMY CORPS OF ENGINEERS
RALEIGH REGULATORY FIELD OFFICE
6508 FALLS OF NEUSE ROAD, SUITE 120
RALEIGH, NORTH CAROLINA 27615**

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and condition of the said permit, and required mitigation was completed in accordance with the permit conditions.

 12/18/01

Signature of Permittee

U.S. ARMY CORPS OF ENGINEERS
Wilmington District

COPY

Action ID: 200220297 County: Wake

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property	Authorized
Owner <u>Highway 55 C&D Landfill, LLC</u>	Agent <u>The Brigman Company, Inc.</u>
	<u>Attn: Jamie McLain</u>
Address <u>19109 West Catawba Ave., Ste. 118</u>	Address <u>P.O. Box 1532</u>
<u>Cornelius, NC 28031</u>	<u>Conway, SC 29528</u>
Telephone Number <u>843-248-9388</u>	Telephone Number <u>843-248-9388</u>

Size and Location of Property (waterbody, Highway name/number, town, etc.): The site is located on the north side of Sunset Lake Road (SR 1301), approximately 0.7 miles west of its intersection with N.C. Hwy 55, in Holly Springs, Wake County, North Carolina.

Basis for Determination: The site contains wetlands and stream channels with indicators of ordinary high water marks, located adjacent to and including Little Branch and its unnamed tributaries, above headwaters, in the Cape Fear River Basin.

Indicate Which of the Following Apply:

There are waters of the U.S., to include wetlands, on the above described property which we strongly suggest should be delineated and surveyed. The surveyed wetland lines must be verified by our staff before the Corps will make a final jurisdictional determination on your property.

Because of the size of your property and our present workload, our identification and delineation of your wetlands cannot be accomplished in a timely manner. You may wish to obtain a consultant to obtain a more timely delineation of the wetlands. Once the consultant has flagged a wetland line on the property, Corps staff will review it, and, if it is accurate, we strongly recommend that you have the line surveyed for final approval by the Corps. The Corps will not make a final jurisdictional determination on your property without an approved survey.

The waters of the U.S., to include wetlands, on your lot have been delineated, and the limits of the Corps jurisdiction have been explained to you. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

There are no waters of the U.S., to include wetlands, present on the above described property which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

Placement of dredged or fill material in wetlands on this property without a Department of the Army Permit is in most cases a violation of Section 301 of the Clean Water Act (33 USC 1311). A permit is not required for work on the property restricted entirely to existing high ground. If you have any questions regarding the Corps of Engineers regulatory program, please contact Amanda D. Jones at telephone number (919) 876 - 8441 extension 30.

Project Manager Signature *Amanda D. Jones*
Date December 14, 2001 Expiration Date December 14, 2006

SURVEY PLAT OR FIELD SKETCH OF THE DESCRIBED PROPERTY AND THE WETLAND DELINEATION FORM MUST BE ATTACHED TO THE YELLOW (FILE) COPY OF THIS FORM.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Highway 55 C&D Landfill, LLC	File Number: 200220297	Date: 12-14-01
Attached is:		See Section below

	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION II - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at <http://usace.army.mil/ncr/functions/cw/ceawo/rag> or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION

<p>If you have questions regarding this decision and/or the appeal process you may contact: Mr. Todd Tugwell, Regulatory Specialist Raleigh Regulatory Field Office 6508 Falls of the Neuse Road, Suite 120 Raleigh, North Carolina 27615</p>	<p>If you only have questions regarding the appeal process you may also contact: Mr. Arthur Middleton, Administrative Appeal Review Officer CESAD-ET-CO-R U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 9M15 Atlanta, Georgia 30303-8801</p>
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RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:
-------------------------------------------	-------	-------------------

DIVISION ENGINEER:
Commander
U.S. Army Engineer Division, South Atlantic
60 Forsyth Street, Room 9M15
Atlanta, Georgia 30303-3490

October 1, 2001

Mr. Todd Tugwell
U.S. Army Corps of Engineers
6508 Falls of the Neuse Road, Suite 120
Raleigh, NC 27615

RE: Highway 55 C&D Landfill
Wake County, North Carolina

Dear Mr. Tugwell:

The Brigman Company, Inc. has conducted a wetland determination of the referenced project. Based on our reconnaissance the study area was determined to contain areas subject to the jurisdiction of your office.

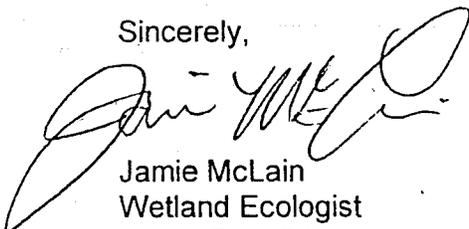
Acting as agent for Griffin Brothers Companies, on the highway 55 C&D Landfill Project, we are requesting an audit and that an wetland verification letter be received.

Enclosed please find a "Request for Concurrence" form along with the following:

- Project Location Map
- Soil Survey
- USGS 7.5 Min. Quadangle
- Upland/ Wetland Determination Sheets

Please notify us when you schedule your on-site inspection so we can be available to accompany you. Should you have any questions or require additional information to facilitate your review, please advise.

Sincerely,



Jamie McLain
Wetland Ecologist
cc: Ron Gilkerson

Request for Wetlands Concurrence

Date: 10/1/2001 County: Wake Latitude: _____
Wetland Acreage: 10 Upland Acreage: 82 Longitude: _____
Project Name: Hwy. 55 C&D Landfill Total Acreage of Tract: 92

Property Owner:
(name, address, phone):
Griffin Brothers Companies
19109 West Catawba Ave. Suite 118
Cornelius, NC 28031
Attn: Ron Gilkerson

Agent/Developer/Engineer
(name, address, phone):
The Brigman Company, Inc.
P.O. Box 1532
Conway, SC 29528
843-248-9388

Status of Project: *(Check One)*

- On-going site work for development purposes.
- Development in planning stages.
- No specific development planned at this time.

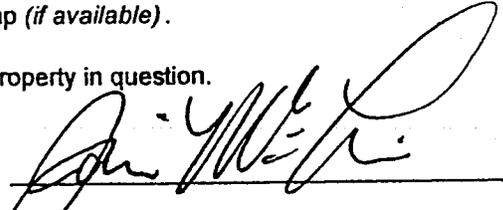
Project Type: *(Indicate the proposed use of the land in question or, if no specific work is planned at present, indicate the current zoning or land use at the site.)*

- Residential Commercial Mixed use (resid. & com.)
- Industrial Agriculture Public Works
- Silviculture Aquaculture Other: Landfill

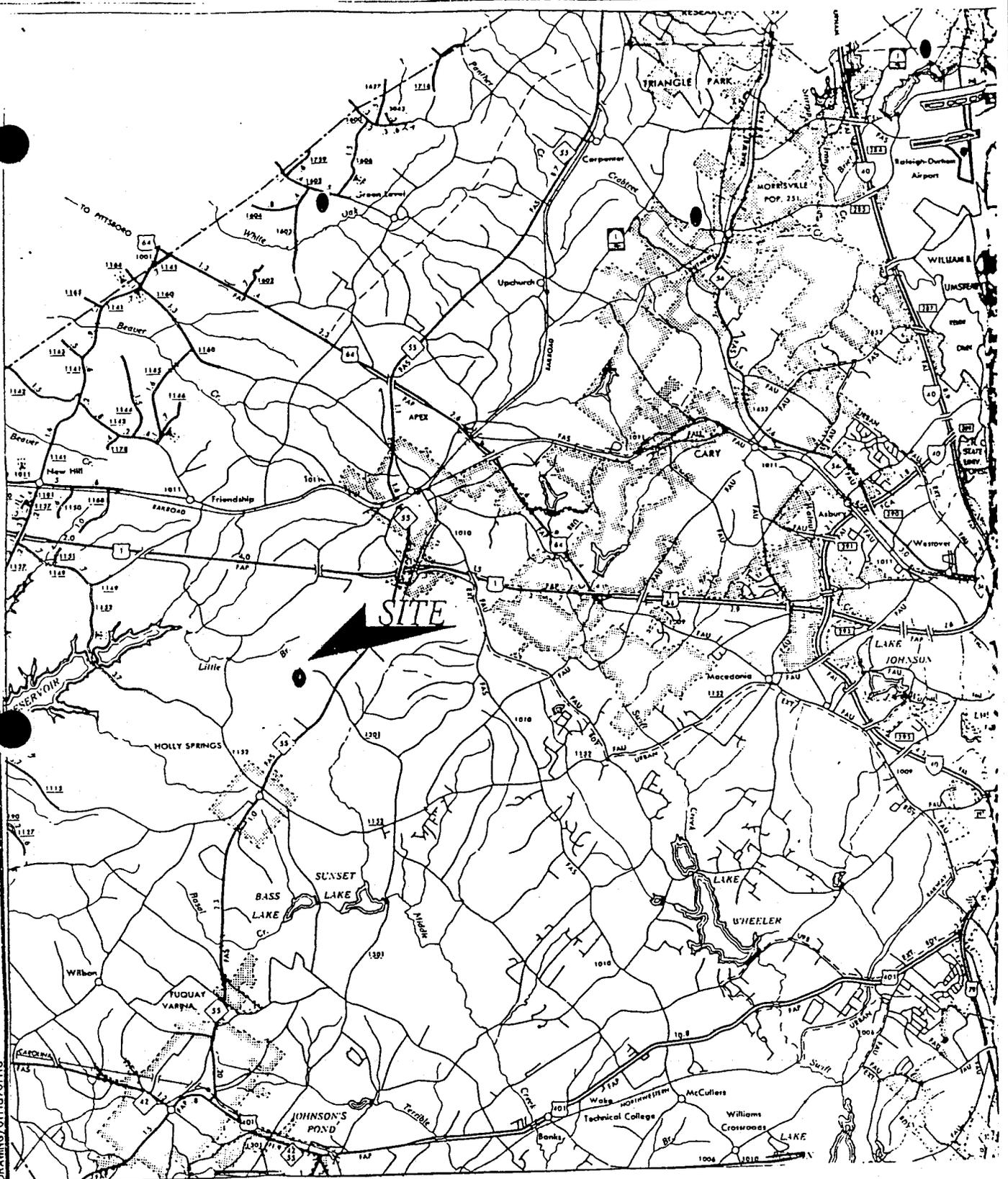
Information Required to Accompany Request: *(Check the items submitted. Forward as much information as is available. At a minimum, the first two items must be forwarded.)*

- Accurate Location Map *(from County Map, USGS Quad Sheet, etc.)*
- Soil Survey Sheet *(from SCS) or Aerial Photograph (from County Assessors Office or other source - property boundaries shown on soil survey photo would be very helpful.)*
- National Wetlands Inventory Map *(if available).*
- Wetland/Upland Data Sheets
- Survey Plat or Tax Map of the property in question.

Signature of Property Owner or Authorized Agent: _____



(The person signing this form must have the authority of the owner to authorize Corps of Engineers employees or their agents to enter onto the property for on-site investigations if such is deemed necessary. Do not sign unless you have the specific authority of the owner.)



C:\DRAWING\01118\01118

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

THE BRIGMAN COMPANY
INCORPORATED

LOCATION MAP

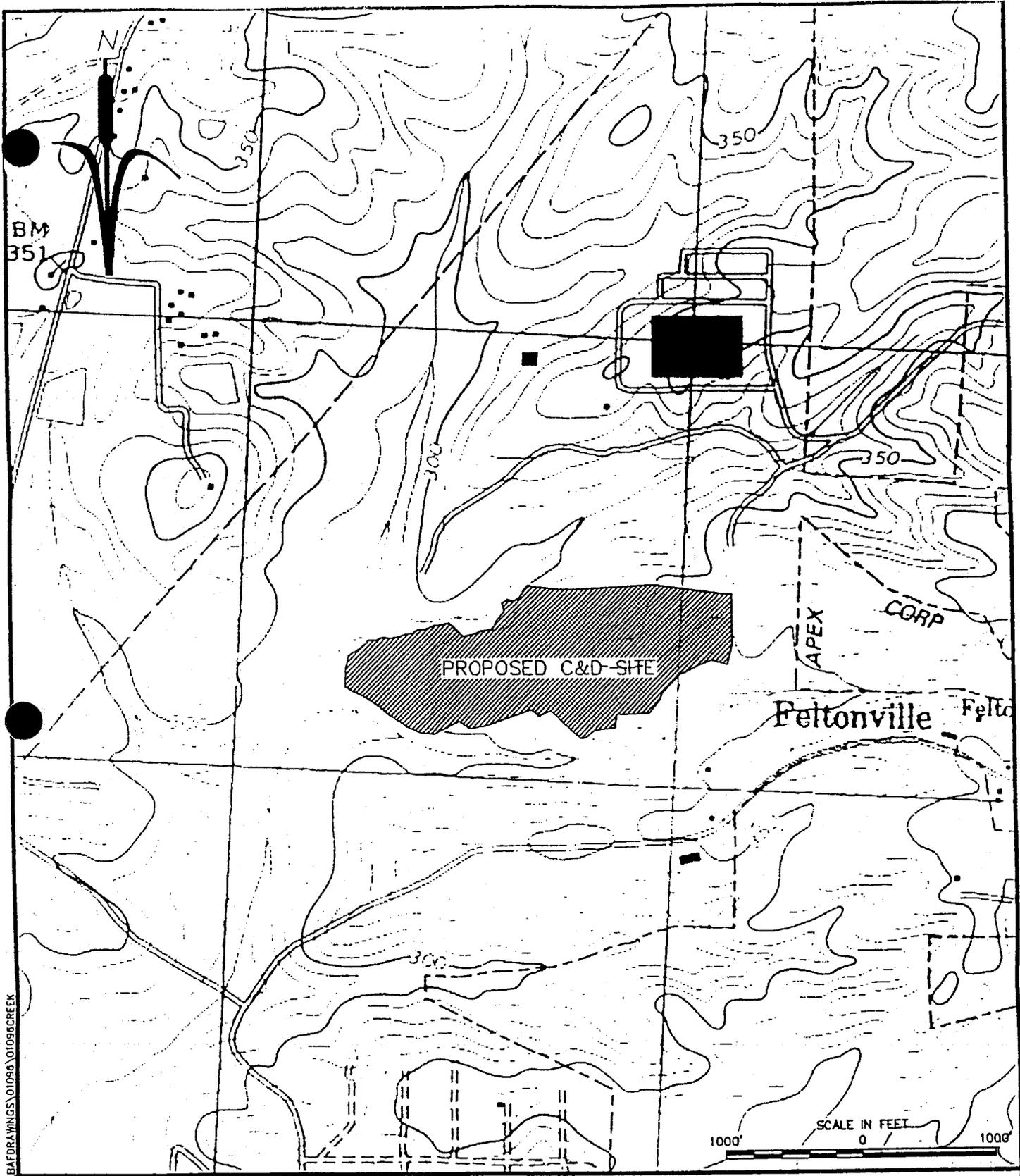
PROJECT/SITE
HIGHWAY 55 C&D LANDFILL

APPLICANT/OWNER
GRIFFIN BROTHERS

SCALE:	1" = 2 MILES
DATE:	9-28-01
JOB NO.:	01118
DWG. NO.:	01118

AGENT: THE BRIGMAN COMPANY, INC., P.O. BOX 1932, CONWAY SC 29526

(843) 248-9388 FAX: (843) 248-9596



G:\BAFDRAWINGS\01096\01096CREEK

USGS 7.5 MIN QUADRANGLE (APEX QUAD)

THE BRIGMAN COMPANY
INCORPORATED

AGENT: THE BRIGMAN COMPANY, INC., P.O. BOX 1932, CONWAY SC 29526

USGS QUADRANGLE

PROJECT/SITE
WAKE COUNTY C&D LANDFILL

APPLICANT/OWNER
GRIFFIN BROTHERS

SCALE:
1"=1000'

DATE:
8/10/01

JOB NO.:
01096

DWG. NO.:
01096CREEK

(843) 248-9388 FAX: (843) 248-9596

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Highway 55 C&D Landfill Applicant/Owner: Griffin Brothers Investigators: The Brigman Company, Inc.	Project No: 01-118	Date: 3-Oct-2001 County: Wake State: North Carolina Plot ID: 1
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Do Normal Circumstances exist on the site? Yes <input type="radio"/> No <input type="radio"/> Is the site significantly disturbed (Atypical Situation:)? Yes <input type="radio"/> No <input checked="" type="radio"/> Is the area a potential Problem Area? Yes <input type="radio"/> No <input checked="" type="radio"/> (If needed, explain on the reverse side)	Community ID: R2SB Transect ID: Field Location:
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VEGETATION (USFWS Region No. 2)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
<i>Acer rubrum</i>	Tree	FAC	<i>Pinus taeda</i>	Tree	FAC
Maple,Red			Pine,Loblolly		
<i>Viburnum dentatum</i>	Tree	FAC	<i>Onoclea sensibilis</i>	Herb	FACW
Arrow-Wood			Fern,Sensitive		
<i>Platanus occidentalis</i>	Tree	FACW-	<i>Polystichum acrostichoides</i>	Herb	FAC
Sycamore,American			Fern,Christmas		
<i>Betula nigra</i>	Tree	FACW	<i>Athyrium pycnocarpon</i>	Herb	FAC
Birch,River			Fern,Narrow-Leaf Lady		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 8/8 = 100.00%	FAC Neutral: 3/3 = 100.00% Numeric Index: 21/8 = 2.63
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Remarks:
 The hydrophytic vegetation criteria was meet.

HYDROLOGY

<u>NO</u> Recorded Data(Describe in Remarks): <u>N/A</u> Stream, Lake or Tide Gauge <u>N/A</u> Aerial Photographs <u>N/A</u> Other <u>YES</u> No Recorded Data Field Observations Depth of Surface Water: = 3-8" (in.) Depth to Free Water in Pit: N/A (in.) Depth to Saturated Soil: = 0 (in.)	Wetland Hydrology Indicators Primary Indicators <u>NO</u> Inundated <u>YES</u> Saturated in Upper 12 Inches <u>YES</u> Water Marks <u>YES</u> Drift Lines <u>YES</u> Sediment Deposits <u>YES</u> Drainage Patterns in Wetlands Secondary Indicators <u>NO</u> Oxidized Root Channels in Upper 12 Inches <u>YES</u> Water-Stained Leaves <u>YES</u> Local Soil Survey Data <u>YES</u> FAC-Neutral Test <u>NO</u> Other(Explain in Remarks)
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Remarks:
 The hydrology criteria was meet.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Highway 55 C&D Landfill Applicant/Owner: Griffin Brothers Investigators: The Brigman Company, Inc.	Project No: 01-118	Date: 3-Oct-2001 County: Wake State: North Carolina Plot ID: 1
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SOILS

Map Unit Name (Series and Phase): Augusta
Map Symbol: Au **Drainage Class:** Poorly drained
Taxonomy (Subgroup): _____
Profile Description: _____

Mapped Hydric Inclusion?
Field Observations Confirm Mapped Type? Yes No

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-8"	A	10YR2/2	N/A	N/A	N/A	Sandy loam, Subangular
8"-18"	E	10YR7/1	N/A	N/A	N/A	Sandy clay loam, Subangular blocky

Hydric Soil Indicators:

<u>NO</u> Histosol <u>NO</u> Histic Epipedon <u>NO</u> Sulfidic Odor <u>NO</u> Aquic Moisture Regime <u>NO</u> Reducing Conditions <u>NO</u> Gleyed or Low Chroma Colors	<u>NO</u> Concretions <u>NO</u> High Organic Content in Surface Layer in Sandy Soils <u>NO</u> Organic Streaking in Sandy Soils <u>YES</u> Listed on Local Hydric Soils List <u>YES</u> Listed on National Hydric Soils List <u>NO</u> Other (Explain in Remarks)
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Remarks:
 The hydric soils criteria was meet.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Wetland Hydrology Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Hydric Soils Present? <input checked="" type="radio"/> Yes <input type="radio"/> No	Is the Sampling Point within the Wetland? <input checked="" type="radio"/> Yes <input type="radio"/> No
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Remarks:
 This area meets all the criteria for jurisdictional wetlands.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Highway 55 C&D Landfill Applicant/Owner: Griffin Brothers Investigators: The Brigman Company, Inc.	Project No: 01-118	Date: 3-Oct-2001 County: Wake State: North Carolina Plot ID: 2
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Do Normal Circumstances exist on the site? Yes <input checked="" type="radio"/> No <input type="radio"/> Is the site significantly disturbed (Atypical Situation:)? Yes <input type="radio"/> No <input checked="" type="radio"/> Is the area a potential Problem Area? Yes <input type="radio"/> No <input checked="" type="radio"/> (If needed, explain on the reverse side)	Community ID: Upland Transect ID: Field Location:
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VEGETATION (USFWS Region No. 2)

Dominant Plant Species(Latin/Common)	Stratum	Indicator	Plant Species(Latin/Common)	Stratum	Indicator
<i>Cornus florida</i>	Tree	FACU	<i>Quercus nigra</i>	Tree	FAC
Dogwood, Flowering			Oak, Water		
<i>Pinus taeda</i>	Tree	FAC	<i>Pteridium aquilinum</i>	Herb	FACU
Pine, Loblolly			Fern, Bracken		
<i>Liquidambar styraciflua</i>	Tree	FAC+	<i>Vitis rotundifolia</i>	Vine	FAC
Gum, Sweet			Grape, Muscadine		
<i>Acer rubrum</i>	Tree	FAC	<i>Smilax rotundifolia</i>	Vine	FAC
Maple, Red			Greenbrier, Common		

Percent of Dominant Species that are OBL, FACW or FAC: (excluding FAC-) 6/8 = 75.00%	FAC Neutral: 0/2 = 0.00% Numeric Index: 26/8 = 3.25
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Remarks:
 The hydrophytic vegetation criteria was meet.

HYDROLOGY

<u>NO</u> Recorded Data(Describe in Remarks): <u>N/A</u> Stream, Lake or Tide Gauge <u>N/A</u> Aerial Photographs <u>N/A</u> Other <u>YES</u> No Recorded Data Field Observations Depth of Surface Water: N/A (in.) Depth to Free Water in Pit: N/A (in.) Depth to Saturated Soil: N/A (in.)	Wetland Hydrology Indicators Primary Indicators <u>NO</u> Inundated <u>NO</u> Saturated in Upper 12 Inches <u>NO</u> Water Marks <u>NO</u> Drift Lines <u>NO</u> Sediment Deposits <u>NO</u> Drainage Patterns in Wetlands Secondary Indicators <u>NO</u> Oxidized Root Channels in Upper 12 Inches <u>NO</u> Water-Stained Leaves <u>NO</u> Local Soil Survey Data <u>NO</u> FAC-Neutral Test <u>NO</u> Other(Explain in Remarks)
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Remarks:
 The hydrology criteria was not meet.

DATA FORM
ROUTINE WETLAND DETERMINATION
 (1987 COE Wetlands Delineation Manual)

Project/Site: Highway 55 C&D Landfill Applicant/Owner: Griffin Brothers Investigators: The Brigman Company, Inc.	Project No: 01-118	Date: 3-Oct-2001 County: Wake State: North Carolina Plot ID: 2
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SOILS

Map Unit Name (Series and Phase): Creedmore
 Map Symbol: CtB Drainage Class: Well drained
 Taxonomy (Subgroup):
 Profile Description:

Mapped Hydric Inclusion?
 Field Observations Confirm Mapped Type? Yes No

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast		Texture, Concretions, Structure, etc
0-6"	A	10YR4/3	N/A	N/A	N/A	Clay loam, Subangular blocky
6"-18"	E	10YR5/4	N/A	N/A	N/A	Clay loam, Subangular blocky

Hydric Soil Indicators:

<u>NO</u> Histosol <u>NO</u> Histic Epipedon <u>NO</u> Sulfidic Odor <u>NO</u> Aquic Moisture Regime <u>NO</u> Reducing Conditions <u>NO</u> Gleyed or Low Chroma Colors	<u>NO</u> Concretions <u>NO</u> High Organic Content in Surface Layer in Sandy Soils <u>NO</u> Organic Streaking in Sandy Soils <u>NO</u> Listed on Local Hydric Soils List <u>NO</u> Listed on National Hydric Soils List <u>NO</u> Other (Explain in Remarks)
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Remarks:
 The hydric soils criteria was not meet.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? <input checked="" type="radio"/> Yes <input type="radio"/> No Wetland Hydrology Present? Yes <input checked="" type="radio"/> No Hydric Soils Present? Yes <input checked="" type="radio"/> No	Is the Sampling Point within the Wetland? Yes <input type="radio"/> <input checked="" type="radio"/> No
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------

Remarks:
 This area does not meet all the criteria for jurisdictional wetlands.

THE
BRIGMAN
COMPANY
INCORPORATED

ENVIRONMENTAL SERVICES
P.O. BOX 1532
CONWAY, SC 29528
(843) 248-9388
FAX (843) 248-9596
wetlandman@aol.com

October 4, 2001

Todd Tugwell
US Army Corps Of Engineers
Raleigh Regulatory Field Office
6508 Falls of the Neuse Road
Suite 120
Raleigh, NC 27615

RE: Highway 55 C&D Landfill, LLC
Proposed Hwy 55 C&D Landfill & Recycling Center
Wake County, North Carolina

Dear Mr. Tugwell:

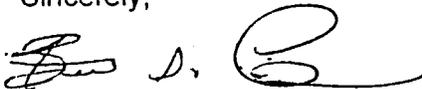
The Brigman Company, Inc., acting as agent for the applicant, seeks the issuance of a Nationwide Permit # 39 to accomplish the deposition of fill within Waters of the US required to construct the referenced project and fulfill NCDENR requirements.

Enclosed herewith the application, is the following supporting information:

- Project Location Map
- USGS Quadrangle
- Wetland Master Plan

If you have any questions concerning the application or require additional information to complete the approval process, please do not hesitate to call me.

Sincerely,



Britt A. Feldner
Project Manager

cc: Ron Gilkerson
John Dorney - NCDENR

Office Use Only:

Form Version April 2001

USACE Action ID No. _____

DWQ No. _____

If any particular item is not applicable to this project, please enter "Not Applicable" or "N/A" rather than leaving the space blank.

I. Processing

1. Check all of the approval(s) requested for this project:

- Section 404 Permit
 Section 10 Permit
 401 Water Quality Certification
 Riparian or Watershed Buffer Rules

2. Nationwide, Regional or General Permit Number(s) Requested: _____ 39 _____

3. If this notification is solely a courtesy copy because written approval for the 401 Certification is not required, check here:

4. If payment into the North Carolina Wetlands Restoration Program (NCWRP) is proposed for mitigation of impacts (see section VIII – Mitigation), check here:

II. Applicant Information

1. Owner/Applicant Information

Name: _____ Highway 55 C&D Landfill, LLC
Mailing Address: _____ 19109 West Catawba Ave.

Suite 118

Cornelius, NC 28031

Telephone Number: _____ (843) 248-9388 _____ Fax Number: _____ (843) 248-9596
E-mail Address: _____ wetlandman@aol.com _____

2. Agent Information (A signed and dated copy of the Agent Authorization letter must be attached if the Agent has signatory authority for the owner/applicant.)

Name: _____ Britt A. Feldner
Company Affiliation: _____ The Brigman Company, Inc.
Mailing Address: _____ 900B Main Street

Conway, SC 29526

Telephone Number: _____ (843) 248-9388 _____ Fax Number: _____ (843) 248-9596
E-mail Address: _____ wetlandman@aol.com _____

III. Project Information

Attach a **vicinity map** clearly showing the location of the property with respect to local landmarks such as towns, rivers, and roads. Also provide a detailed **site plan** showing property boundaries and development plans in relation to surrounding properties. Both the vicinity map and site plan must include a scale and north arrow. The specific footprints of all buildings, impervious surfaces, or other facilities must be included. If possible, the maps and plans should include the appropriate USGS Topographic Quad Map and NRCS Soil Survey with the property boundaries outlined. Plan drawings, or other maps may be included at the applicant's discretion, so long as the property is clearly defined. For administrative and distribution purposes, the USACE requires information to be submitted on sheets no larger than 11 by 17-inch format; however, DWQ may accept paperwork of any size. DWQ prefers full-size construction drawings rather than a sequential sheet version of the full-size plans. If full-size plans are reduced to a small scale such that the final version is illegible, the applicant will be informed that the project has been placed on hold until decipherable maps are provided.

1. Name of project: Highway 55 C&D Landfill & Recycling Center
2. T.I.P. Project Number (NCDOT Only): _____
3. Property Identification Number (Tax PIN): 0740.02-55-8687
4. Location
County: Wake Nearest Town: Apex
Subdivision name (include phase/lot number): _____
Directions to site (include road numbers, landmarks, etc.): Travel north on highway 55 from Holly Springs in Wake County approximately 2 miles and turn left on to Old Smithfield Road (Hwy 1172) traveling about 1/2 miles and the site is on the right.
5. Site coordinates, if available (UTM or Lat/Long): Lat:35°41'10" Long:78°50'40"
(Note – If project is linear, such as a road or utility line, attach a sheet that separately lists the coordinates for each crossing of a distinct waterbody.)
6. Describe the existing land use or condition of the site at the time of this application: The site consist of mostly 15 to 20 year old Loblolly pines with some shortleaf pine and mixed hardwoods.
7. Property size (acres): 89.1
8. Nearest body of water (stream/river/sound/ocean/lake): Little Branch
9. River Basin: Cape Fear River Basin
(Note – this must be one of North Carolina's seventeen designated major river basins. The River Basin map is available at <http://h2o.enr.state.nc.us/admin/maps/>.)

10. Describe the purpose of the proposed work: The purpose of the proposed work is to
Construct a C&D Landfill and Recycling Center.
11. List the type of equipment to be used to construct the project: Typical land grading
Equipment: back-hoe, trac-hoe and bulldozers etc.
12. Describe the land use in the vicinity of this project: Commercial

IV. Prior Project History

If jurisdictional determinations and/or permits have been requested and/or obtained for this project (including all prior phases of the same subdivision) in the past, please explain. Include the USACE Action ID Number, DWQ Project Number, application date, and date permits and certifications were issued or withdrawn. Provide photocopies of previously issued permits, certifications or other useful information. Describe previously approved wetland, stream and buffer impacts, along with associated mitigation (where applicable). If this is a NCDOT project, list and describe permits issued for prior segments of the same T.I.P. project, along with construction schedules.

V. Future Project Plans

Are any additional permit requests anticipated for this project in the future? If so, describe the anticipated work, and provide justification for the exclusion of this work from the current application: At this time we are unable to determine any definite future impacts to wetlands or Waters of the United States.

VI. Proposed Impacts to Waters of the United States/Waters of the State

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to wetlands, open water, and stream channels associated with the project. The applicant must also provide justification for these impacts in Section VII below. All proposed impacts, permanent and temporary, must be listed herein, and must be clearly identifiable on an accompanying site plan. All wetlands and waters, and all streams (intermittent and perennial) must be shown on a delineation map, whether or not impacts are proposed to these systems. Wetland and stream evaluation and delineation forms should be included as appropriate. Photographs may be included at the applicant's discretion. If this proposed impact is strictly for wetland or stream mitigation, list

and describe the impact in Section VIII below. If additional space is needed for listing or description, please attach a separate sheet.

1. Wetland Impacts

Wetland Impact Site Number (indicate on map)	Type of Impact*	Area of Impact (acres)	Located within 100-year Floodplain** (yes/no)	Distance to Nearest Stream (linear feet)	Type of Wetland***

- * List each impact separately and identify temporary impacts. Impacts include, but are not limited to: mechanized clearing, grading, fill, excavation, flooding, ditching/drainage, etc. For dams, separately list impacts due to both structure and flooding.
- ** 100-Year floodplains are identified through the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM), or FEMA-approved local floodplain maps. Maps are available through the FEMA Map Service Center at 1-800-358-9616, or online at <http://www.fema.gov>.
- *** List a wetland type that best describes wetland to be impacted (e.g., freshwater/saltwater marsh, forested wetland, beaver pond, Carolina Bay, bog, etc.)

List the total acreage (estimated) of existing wetlands on the property: +/- 4.3 acres
 Total area of wetland impact proposed: 0

2. Stream Impacts, including all intermittent and perennial streams

Stream Impact Site Number (indicate on map)	Type of Impact*	Length of Impact (linear feet)	Stream Name**	Average Width of Stream Before Impact	Perennial or Intermittent? (please specify)
1	Culv. Rd X-sing	30	N/A	15	Perennial
2	Culv. Rd X-sing	25	N/A	5	Intermittent
3	Fill	64	N/A	5	Intermittent
4	Culv. Rd X-sing	15	N/A	20	Perennial
5	Culv. Rd X-sing	15	Little Branch	25	Perennial

- * List each impact separately and identify temporary impacts. Impacts include, but are not limited to: culverts and associated rip-rap, dams (separately list impacts due to both structure and flooding), relocation (include linear feet before and after, and net loss/gain), stabilization activities (cement wall, rip-rap, crib wall, gabions, etc.), excavation, ditching/straightening, etc. If stream relocation is proposed, plans and profiles showing the linear footprint for both the original and relocated streams must be included.

Stream names can be found on USGS topographic maps. If a stream has no name, list as UT (unnamed tributary) to the nearest downstream named stream into which it flows. USGS maps are available through the USGS at 1-800-358-9616, or online at www.usgs.gov. Several internet sites also allow direct download and printing of USGS maps (e.g., www.topozone.com, www.mapquest.com, etc.).

Cumulative impacts (linear distance in feet) to all streams on site: 149

3. Open Water Impacts, including Lakes, Ponds, Estuaries, Sounds, Atlantic Ocean and any other Water of the U.S.

Open Water Impact Site Number (indicate on map)	Type of Impact*	Area of Impact (acres)	Name of Waterbody (if applicable)	Type of Waterbody (lake, pond, estuary, sound, bay, ocean, etc.)

* List each impact separately and identify temporary impacts. Impacts include, but are not limited to: fill, excavation, dredging, flooding, drainage, bulkheads, etc.

4. Pond Creation

If construction of a pond is proposed, associated wetland and stream impacts should be included above in the wetland and stream impact sections. Also, the proposed pond should be described here and illustrated on any maps included with this application.

Pond to be created in (check all that apply): uplands stream wetlands

Describe the method of construction (e.g., dam/embankment, excavation, installation of draw-down valve or spillway, etc.): N/A

Proposed use or purpose of pond (e.g., livestock watering, irrigation, aesthetic, trout pond, local stormwater requirement, etc.): N/A

Size of watershed draining to pond: _____ Expected pond surface area: _____

VII. Impact Justification (Avoidance and Minimization)

Specifically describe measures taken to avoid the proposed impacts. It may be useful to provide information related to site constraints such as topography, building ordinances, accessibility, and financial viability of the project. The applicant may attach drawings of alternative, lower-impact site layouts, and explain why these design options were not feasible. Also discuss how impacts were minimized once the desired site plan was developed. If applicable, discuss construction techniques to be followed during construction to reduce impacts.

VIII. Mitigation

DWQ - In accordance with 15A NCAC 2H .0500, mitigation may be required by the NC Division of Water Quality for projects involving greater than or equal to one acre of impacts to freshwater wetlands or greater than or equal to 150 linear feet of total impacts to perennial streams.

USACE – In accordance with the Final Notice of Issuance and Modification of Nationwide Permits, published in the Federal Register on March 9, 2000, mitigation will be required when necessary to ensure that adverse effects to the aquatic environment are minimal. Factors including size and type of proposed impact and function and relative value of the impacted aquatic resource will be considered in determining acceptability of appropriate and practicable mitigation as proposed. Examples of mitigation that may be appropriate and practicable include, but are not limited to: reducing the size of the project; establishing and maintaining wetland and/or upland vegetated buffers to protect open waters such as streams; and replacing losses of aquatic resource functions and values by creating, restoring, enhancing, or preserving similar functions and values, preferable in the same watershed.

If mitigation is required for this project, a copy of the mitigation plan must be attached in order for USACE or DWQ to consider the application complete for processing. Any application lacking a required mitigation plan or NCWRP concurrence shall be placed on hold as incomplete. An applicant may also choose to review the current guidelines for stream restoration in DWQ's Draft Technical Guide for Stream Work in North Carolina, available at <http://h2o.enr.state.nc.us/ncwetlands/strmgide.html>.

1. Provide a brief description of the proposed mitigation plan. The description should provide as much information as possible, including, but not limited to: site location (attach directions and/or map, if offsite), affected stream and river basin, type and amount (acreage/linear feet) of mitigation proposed (restoration, enhancement, creation, or preservation), a plan view, preservation mechanism (e.g., deed restrictions, conservation easement, etc.), and a description of the current site conditions and proposed method of construction. Please attach a separate sheet if more space is needed.

2. Mitigation may also be made by payment into the North Carolina Wetlands Restoration Program (NCWRP) with the NCWRP's written agreement. Check the box indicating that you would like to pay into the NCWRP. Please note that payment into the NCWRP must be reviewed and approved before it can be used to satisfy mitigation requirements. Applicants will be notified early in the review process by the 401/Wetlands Unit if payment into the NCWRP is available as an option. For additional information regarding the application process for the NCWRP, check the NCWRP website at <http://h2o.enr.state.nc.us/wrp/index.htm>. If use of the NCWRP is proposed, please check the appropriate box on page three and provide the following information:

Amount of stream mitigation requested (linear feet): _____
Amount of buffer mitigation requested (square feet): _____
Amount of Riparian wetland mitigation requested (acres): _____
Amount of Non-riparian wetland mitigation requested (acres): _____
Amount of Coastal wetland mitigation requested (acres): _____

X. Environmental Documentation (DWQ Only)

Does the project involve an expenditure of public funds or the use of public (federal/state/local) land?
Yes No

If yes, does the project require preparation of an environmental document pursuant to the requirements of the National or North Carolina Environmental Policy Act (NEPA/SEPA)? Note: If you are not sure whether a NEPA/SEPA document is required, call the SEPA coordinator at (919) 733-5083 to review current thresholds for environmental documentation.
Yes No

If yes, has the document review been finalized by the State Clearinghouse? If so, please attach a copy of the NEPA or SEPA final approval letter.
Yes No

X. Proposed Impacts on Riparian and Watershed Buffers (DWQ Only)

It is the applicant's (or agent's) responsibility to determine, delineate and map all impacts to required state and local buffers associated with the project. The applicant must also provide justification for these impacts in Section VII above. All proposed impacts must be listed herein, and must be clearly identifiable on the accompanying site plan. All buffers must be shown on a map, whether or not impacts are proposed to the buffers. Correspondence from the DWQ

Regional Office may be included as appropriate. Photographs may also be included at the applicant's discretion.

Will the project impact protected riparian buffers identified within 15A NCAC 2B .0233 (Neuse), 15A NCAC 2B .0259 (Tar-Pamlico), 15A NCAC 2B .0250 (Randleman Rules and Water Supply Buffer Requirements), or other (please identify _____)?

Yes No If you answered "yes", provide the following information:

Identify the square feet and acreage of impact to each zone of the riparian buffers. If buffer mitigation is required calculate the required amount of mitigation by applying the buffer multipliers.

Zone*	Impact (square feet)	Multiplier	Required Mitigation
1		3	
2		1.5	
Total			

* Zone 1 extends out 30 feet perpendicular from near bank of channel; Zone 2 extends an additional 20 feet from the edge of Zone 1.

If buffer mitigation is required, please discuss what type of mitigation is proposed (i.e., Donation of Property, Conservation Easement, Riparian Buffer Restoration / Enhancement, Preservation or Payment into the Riparian Buffer Restoration Fund). Please attach all appropriate information as identified within 15A NCAC 2B .0242 or .0260.

XI. Stormwater (DWQ Only)

Describe impervious acreage (both existing and proposed) versus total acreage on the site. Discuss stormwater controls proposed in order to protect surface waters and wetlands downstream from the property.

XII. Sewage Disposal (DWQ Only)

Clearly detail the ultimate treatment methods and disposition (non-discharge or discharge) of wastewater generated from the proposed project, or available capacity of the subject facility.

Water and Sewer for the facility will be met by the use of a port-a-john and bottled water
For construction. The town of Apex water and sewer will be utilized once the facility is opened.

XIII. Violations (DWQ Only)

Is this site in violation of DWQ Wetland Rules (15A NCAC 2H .0500) or any Buffer Rules?

Yes No

Is this an after-the-fact permit application?

Yes No

XIV. Other Circumstances (Optional):

It is the applicant's responsibility to submit the application sufficiently in advance of desired construction dates to allow processing time for these permits. However, an applicant may choose to list constraints associated with construction or sequencing that may impose limits on work schedules (e.g., draw-down schedules for lakes, dates associated with Endangered and Threatened Species, accessibility problems, or other issues outside of the applicant's control).

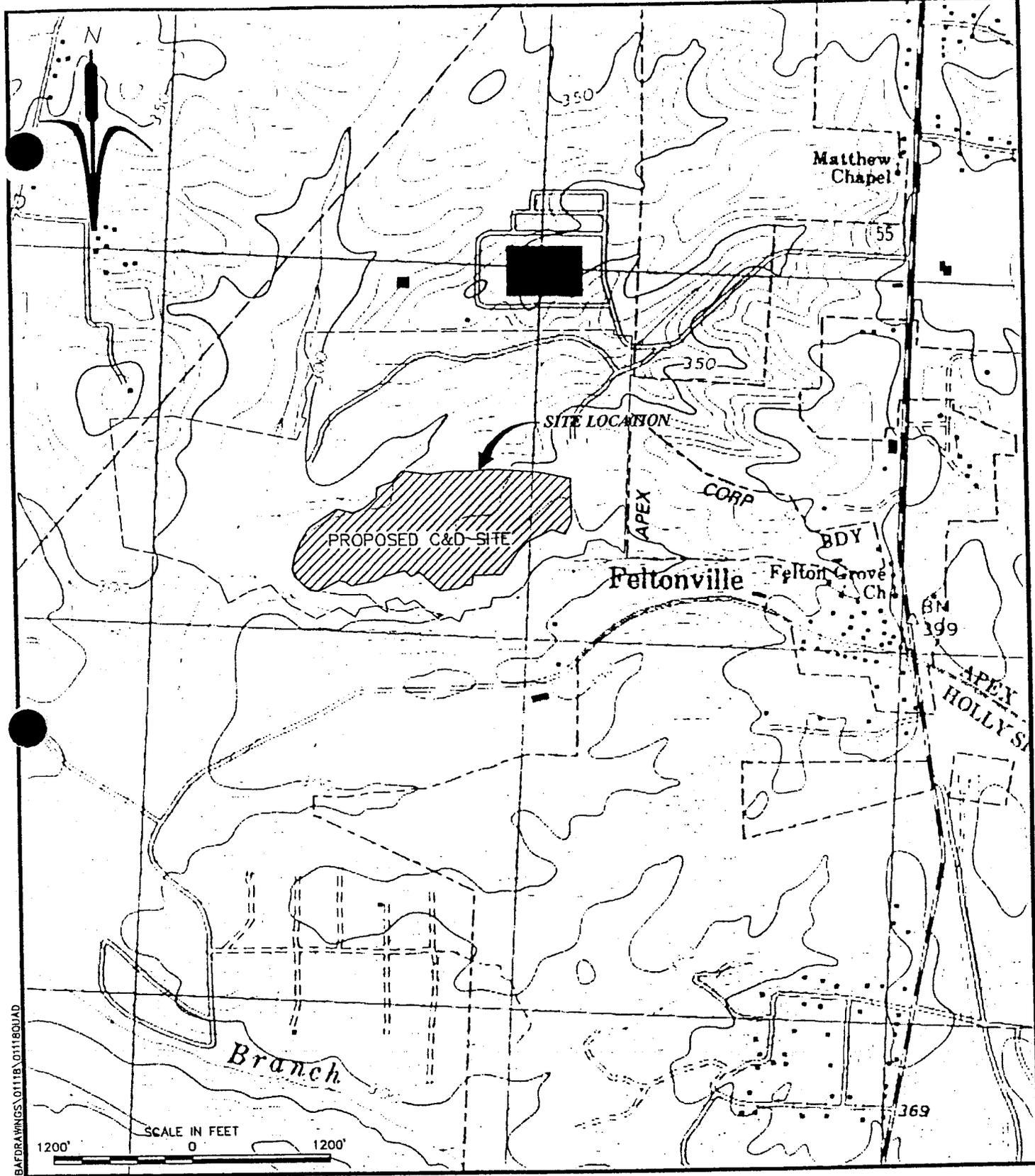


10/9/01

Applicant/Agent's Signature

Date

(Agent's signature is valid only if an authorization letter from the applicant is provided.)



C:\BAFDRAWINGS\01118\01118QUAD

SCALE IN FEET
1200' 0 1200'

USGS 7.5 MIN QUADRANGLE (APEX QUAD)

THE
BRIGMAN
COMPANY
INCORPORATED

AGENT: THE BRIGMAN COMPANY, INC., P.O. BOX 1932, CONWAY SC 29526

USGS QUADRANGLE

PROJECT/SITE
PROPOSED HIGHWAY 55 C&D LANDFILL
APPLICANT/OWNER
HWY 55 C&D LANDFILL, LLC

SCALE:

1" = 1200'

DATE:

8/10/01

JOB NO.:

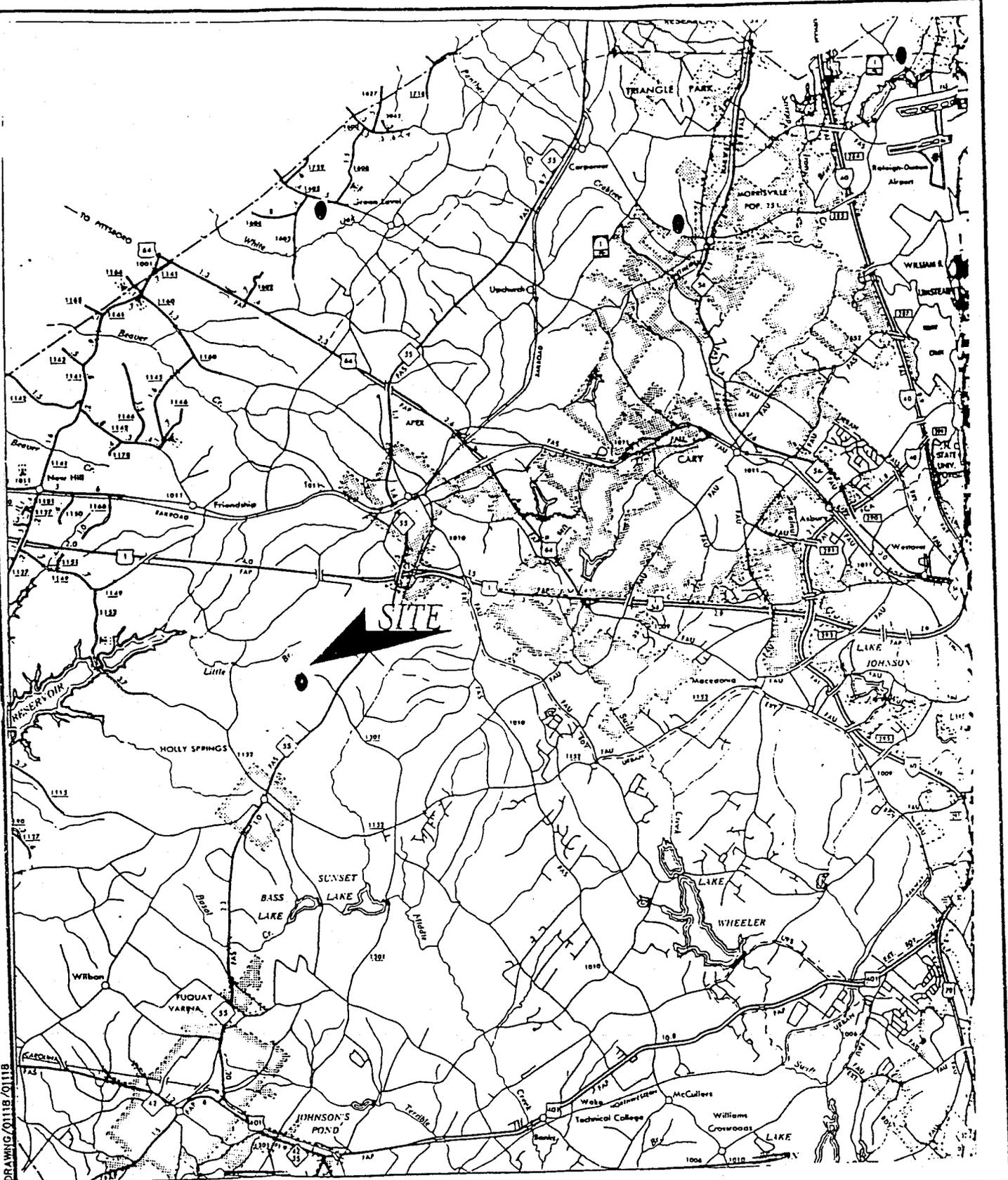
01118

DWG. NO.:

01118QUAD

(843) 248-9388

FAX: (843) 248-9596



C: DRAWING 201118 201118

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

THE BRIGMAN COMPANY
INCORPORATED

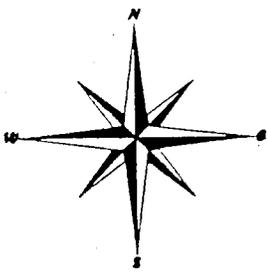
LOCATION MAP

PROJECT/SITE
HIGHWAY 55 C&D LANDFILL

APPLICANT/OWNER
GRIFFIN BROTHERS

SCALE:	1" = 2 MILES
DATE:	9-28-01
JOB NO.:	01118
DWG. NO.:	01118

AGENT: THE BRIGMAN COMPANY, INC., P.O. BOX 1932, CONWAY SC 29526 (843) 248-9388 FAX: (843) 248-9596



WESTERN WAKE EXPRESSWAY ROAD CORRIDOR
STATE PROJECT NO. 6.408006T

IMPACT 5
PROP. 15' CREEK
CROSSING

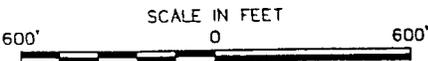
IMPACT 4
PROP. 15' CREEK
CROSSING

PROPOSED CONSTRUCTION AND
DEMOLITION LANDFILL SITE
46.35 ACRES

IMPACT 3
PROPOSED FILL
84 LINEAR FEET

IMPACT 2
PROP. 25' CREEK
CROSSING

IMPACT 1
PROP. 30' CREEK
CROSSING



TOTAL PROP. AREA	89.10 ACRES
WETLANDS/WATERS	8.11 ACRES
CREEK FILL (FEET)	149 FEET

LAT: 35D41'10" LONG: 78D50'40"

WETLAND MASTER PLAN
PROPOSED HIGHWAY 55 C&D LANDFILL
WAKE COUNTY, NORTH CAROLINA
NATIONWIDE PERMIT #14 APPLICATION

DATE: 10/2/01

PAGE 3/3

APPLICATION NO. _____

PROPOSED ACTIVITY:	WATERS/WETLAND FILL
PURPOSE:	C&D LANDFILL
LOCATION:	APEX COMMUNITY
APPLICANT:	GRIFFIN BROTHERS COMPANIES

C:\BAFDRAWINGS\01118\01118PERM

**CONSTRUCTION PLAN APPLICATION
HIGHWAY 55 C&D LANDFILL & RECYCLING CENTER
WAKE COUNTY, NORTH CAROLINA**

Prepared for:
NCDEHNR
Solid Waste Section
Raleigh, North Carolina

Prepared by:
Patterson, Brewer & Associates, P.A.
P.O. Box 1387
Mooresville, North Carolina 28115

May 6, 2002



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APPENDICES

1.0 INTRODUCTION

1.1 Project Description

On behalf of Highway 55 C&D Landfill, LLC, Patterson, Brewer & Associates, P.A. herewith submits this Application for a Permit to Construct the Highway 55 C&D Landfill & Recycling Center, Phase 1. This application meets the landfill design parameters, construction requirements and design drawings as required by Rule .0504(2) of 15A NCAC 13B of the North Carolina Solid Waste Management Rules. The design drawings are submitted under separate cover. Included in this report is information regarding the site design, construction, operation, and closure of the proposed facility. The Proposed Highway 55 C&D Landfill & Recycling Center is located off Old Smith Field Road and the new Highway 55 Bypass, in the southwest portion of Wake County, NC.

The landfill property encompasses 88.6 acres of which approximately 43 acres will be utilized for landfilling operations. The property is owned by Highway 55 C&D Landfill, LLC and will be operated by Griffin Brothers Landfill Division. The Regional Operations Manager responsible for the operations and maintenance of the site will be Mr. Roger Barnes and the assistant site manager will be Mr. Steve Blossom.

The C&D landfill will service Wake County. The waste stream will consist of waste resulting from the clearing, construction, remodeling, and repair or demolition operations on pavement, buildings or other structures.

The reprocessing/recycling center will be operated for the Town of Apex and Wake County residents. The reprocessing/recycling center will include a 1.0 acre paved drop-off area for separated materials such as inert debris (concrete, brick, block, rock and clean soil), land clearing debris, and yard waste materials collected by the Town of Apex. The reprocessing site includes 4.2 acres in the northeast section of the property

1.2 Site Conditions

The landfill property consists mainly of woodlands. Ground surface elevation range from approximately 358 feet (MSL) in the eastern portion of the site to approximately 274 feet (MSL) along Little Branch, which flows south along the western landfill property boundary. Falls Branch flows west along the southern landfill boundary. The Proposed Western Wake Expressway Road Corridor forms the northern landfill boundary. Based on the FEMA floodway maps, there is no 100-year flood plain located on the subject property. A 100-year floodplain is located along Little Branch just off-site to the south of the southwestern property corner. Floodplain areas can be reviewed from USACOE/FEMA Restudy Worksheet Nos. 296, 297, 317, and 318 and FEMA FIRM Panel Nos. 0490, 0495, 0675, and 0660 Branch Creek.

358
- 274

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2.0 LANDFILL DESIGN

2.1 Site Development

The C&D landfill consists of three phases. Phase 1 is designed with a capacity of approximately five years. Each phase will have an exterior perimeter berm varying in height from 2 to 10 feet in height. The exterior perimeter berms are located along the outside edge of each phase. The perimeter berms will prevent run-on from entering the landfill during development. All fill placement for the berms will be compacted to a minimum of 95 percent of the standard Proctor maximum dry density. The berms will be constructed with on-site borrow material.

A 200-foot buffer will be maintained around the entire perimeter. A 50-foot buffer will be maintained from Little Branch, which flows across the northern and western portion of the property. A 500-foot buffer will be maintained from existing residences and water supply wells. The majority of the areas within the buffer will remain wooded.

Area fill will be required only in a small area in the western section of Phase 1. Unsuitable soils encountered in these areas will be undercut prior to placing compacted earth fill. Replacement of suitable structural fill material within the undercut areas will reduce localized settlement within the filled areas.

Each phase will be constructed with a minimum one percent base grade. The subgrade, as shown on the Site Grading Plan, will be a minimum of four feet above the estimated seasonal high groundwater level and four feet above bedrock. Based on the Site Plan Application Report, excavation will be allowed within most of the landfill footprint. Sufficient quantities of borrow material for construction is available from excavation within the landfill. Excavated material will be stockpiled for future use as weekly, intermediate, and final cover.

Surface water control structures are to be sized in accordance with the North Carolina Erosion and Sedimentation Pollution Control Act. Surface water control structures located downgradient of the landfill are designed to handle a 25 year, 24-hour maximum storm event.

Access roads will be provided around the landfill perimeter for maintenance. Temporary access roads will be constructed throughout the operation of the landfill. The roads will be approximately 24 feet wide with side ditches to prevent erosion of the roadway surface. The main haul road that extends east to west will be surfaced with asphalt to provide all weather access and limit dust.

Auxiliary facilities to be constructed, as shown on the Entrance Area Grading Plan include the scale house, scales, maintenance and administrative building, access road and erosion and sediment control structures for operation of Phase 1.

Final cover elevations, as shown on the Final Closure Plan will be sloped no steeper than 3H:1V (horizontal to vertical) with erosion control benches. The final cover will include an 18-inch thick compacted soil layer with a 6-inch thick topsoil layer.

2.2 Landfill Operation

The landfill will be operated from the upgradient end to the downgradient end so that stormwater that falls into an active area will be routed to the erosion and sediment control structures.

Waste acceptance and operational procedures are presented in the C&D Landfill Operations and Maintenance Plan, Section 6.0.

Closure of phases will commence once final elevations are reached. Partial closure of phases may be implemented during landfill operations. Site phasing diagrams are presented in the C&D Landfill Operations and Maintenance Plan, Section 6.0.

2.3 Weekly/Intermediate Cover

The weekly cover will be a minimum 6-inch thick layer of soil placed over the active face of the landfill. The weekly cover promotes surface water runoff and reduces nuisances caused by odors, vectors, etc. Cover soils will be placed on landfilled areas to the proposed finished grades.

A 12-inch thick intermediate layer of soil will be placed on landfill areas that are exposed for more than 30 days and on areas where final waste placement areas have been achieved. Also, mulch product generated from our recycling area may be added to slopes for erosion control purposes.

2.4 Closure Design

The primary purpose of a landfill cap is to minimize infiltration of water into the waste. The infiltration of rainwater and surface water through the waste results in leachate generation. One of the primary goals of the landfill operator is to reduce the amount of leachate generation.

The typical cap cross section is presented on the Final Closure Plan. As depicted on the cross section, the final closure includes a 24-inch thick cover soil including a 6-inch thick topsoil layer. Specifics regarding the closure and post-closure activities are included in the Closure/Post-Closure Plan, Section 8.0.

3.0 WASTE STREAM

3.1 Types of Waste

The types of waste specified for disposal in the landfill area is anticipated to be consistent with those permitted for disposal in other local C&D landfills. These wastes include wastes resulting from the clearing, construction, remodeling, and repair or demolition operations on pavement, buildings, or

other structures.

3.2 Disposal Rates

The waste generation rate projected for this facility will be on the order of 300 tons/day (5.5 days/week) for a monthly total of 7,150 tons.

Future phases are assumed to have disposal rates similar to those of year 1. Future disposal rates may vary due to population, industrial and commercial growth within the region, recycling efforts, or availability of other landfills or alternative waste disposal methods.

3.3 Service Area

The C&D landfill will service Wake County. The waste stream will consist of waste resulting from the clearing, construction, remodeling, and repair or demolition operations on pavement, buildings or other structures.

3.4 Equipment Requirements

The proposed C&D landfill will be operated with equipment owned by the landfill owner. A dozer or track loader, two CAT 826 compactors, a track-hoe and motor grader will be used for operation of the C&D landfill. A scraper will also be on site for placement of cover soils.

4.0 LANDFILL CAPACITY AND BORROW SOIL

4.1 Design Parameters

Landfill capacity calculations were performed for Phases 1 through 3 from proposed grading and closure plans using anticipated monthly disposal rate data presented previously. The calculations assume a two-percent gross volume for weekly cover and account for a 2-foot thick final cover. The calculations presented in Appendix 1 assume the waste generation rate of 7,150 tons per month.

4.2 Operating Capacity

The gross capacity for the proposed landfill will be on the order approximately 3 million cubic yards. Based on the anticipated waste generation rates at a density of 1000 pounds per cubic yard, the operating capacity for Phases 1 through 3 will be on the order of 15.7 years. Total life span of each phase will be on the order of 5 years.

4.3 Borrow Soil Quantities

Based on the borrow soil quantity calculations presented in Appendix 1, about 270,000 cubic yards of soil will be required for construction, operation and closure of Phases 1 through 3. Borrow soil from excavation within the landfill footprint will provide approximately 600,000 cubic yards of borrow soil. Soil excavated from Phase 1 will be stockpiled on Phase 2. Excess stockpile soils for future phases will be sold to area contractors as fill material. Excess soil may also be utilized for closure operations for the adjacent municipal solid waste landfill.

5.0 CONTAINMENT AND ENVIRONMENTAL CONTROL SYSTEMS

5.1 Groundwater Considerations

The maximum seasonal high groundwater levels and top of bedrock at the project site were used to select the maximum depth/excavation of each phase. As indicated on the Profiles, a minimum four feet separation has been maintained from the landfill subgrade elevation to the estimated seasonal high groundwater level or top of bedrock (whichever is shallower).

5.2 Nuisance and Vectors

Potential nuisances to the areas surrounding the landfill include odor, dust, fires, sedimentation, blowing litter and scavenging. The potential for odors, fires, and blowing litter will be decreased with weekly cover. Small fires (if any) will be extinguished by smothering the fire with soil. Fire fighting equipment from local fire fighting units will be available to extinguish large fires (if any). Blowing litter will also be controlled as necessary with fences and frequent policing. Dust will be minimized by use of road surfaces with aggregate and regular spraying with water. Sedimentation will be controlled with

appropriate erosion and sedimentation control devices. Potential vectors that are not typically a problem with C&D materials include rodents, birds, and other scavengers will be controlled by providing cover material that will limit access of said vectors to waste.

5.3 Surface Water and Sedimentation Control

Surface water will be diverted from the refuse by weekly, intermediate and final cover. The perimeter berms and ditches will divert overland runoff from intercepting the proposed landfill. Weekly and intermediate cover will be used to shed precipitation during development of the landfill. Positive drainage will be maintained on the soil cover surfaces. The surface will be graded to drain toward ditches and berms and routed to the erosion and sediment control structures. Surface water flowing from disturbed areas will be routed into ditches that lead to the sediment basins. The sediment basins will be designed to remove the majority of the sediment from the surface water prior to discharge into Little Branch and Falls Branch.

5.4 Wetlands and Floodplain

A small wetland area is delineated along a drainage feature just north of Falls Branch in the phase III portion of the site. Any landfill development that will impact wetlands are permitted through the appropriate State and Federal agencies. A copy of all wetland permit applications and approvals are included in the Appendix of the Sitting Criteria Report. These permits describe all permitted wetland crossings allowing up to 149 linear feet of impacts.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map there is no 100-year floodplain on the landfill property.

6.0 C&D LANDFILL OPERATIONS AND MAINTENANCE PLAN

6.1 Hours of Operation

The C&D landfill and recycling center will be open Monday through Sunday from the hours of 7:00 am to 7:00 pm.

6.2 Landfill Development

The landfill will be developed within the areas shown on the Grading Plan. A 200-foot buffer will be maintained around the entire perimeter. A 500-foot buffer will be maintained from existing residences and water supply wells. A majority of the areas within the buffer will remain wooded with existing trees and vegetation.

The C&D landfill will be constructed so that excavated soil can be used for weekly and final cover. The landfill will be developed in three 5-year phases. The site will be graded in accordance with the Grading Plan which will provide a minimum of four foot separation from waste to the estimated seasonal high groundwater level or top of bedrock (whichever is shallower). Additional borrow soil for the C&D landfill will be available from adjacent phases as needed. The erosion control devices for each phase as shown on the Erosion and Sediment Control Plan will be constructed prior to excavation within each phase.

Waste will be placed initially from the upgradient to the downgradient end of each phase. An initial 10-foot lift of waste will be placed across the landfill phase floor working from upgradient to downgradient areas. After the initial lift has been placed, subsequent lifts will also proceed from the upgradient end toward the downgradient end. This procedure will continue within a permitted phase until proposed final contours are reached. The final cover will consist of a minimum of 2 feet of compacted soil. The final cover will be vegetated with native grasses within six months following closure. Operational phasing diagrams for each phase of development are presented at the end of this section.

6.3 Training of Facility Personnel

Due to the diversity of job tasks required at C&D landfills and the critical nature of the landfill components, personnel are properly trained to handle the operation and maintenance of the facility.

Some of the critical tasks include:

- Maintenance of storm water control devices;
- Accurate records of waste loading (quantitative and qualitative);
- Identification of hazardous and liquid wastes; and
- Control of accidental fires.

The proposed management staff for this facility is properly trained for operation and maintenance of a C&D landfill. The staff includes Mr. Larry Griffin, Sr., owner and operator of three existing C&D landfills located in Huntersville and Harrisburg, North Carolina and Lancaster, South Carolina. Mr. Ron Gilkerson will be Co-Owner and Senior Site Geologist, and Mr. Roger Barnes will be the Operations Manager. Roger Barnes is a SWANA certified landfill manager (certification # 34245). Also, Mr. Steve Blossom will be certified by SWANA in August of 2002. All landfill technicians will have a minimum two years of landfill experience.

6.4 Stormwater Collection and Removal

Stormwater runoff from the C&D landfill will be directed to the sediment basins. Perimeter ditches located at the boundaries of the C&D area will help divert run-on from entering the area. The ditches and sediment basins will be inspected on a regular basis, and any necessary repairs will be made immediately.

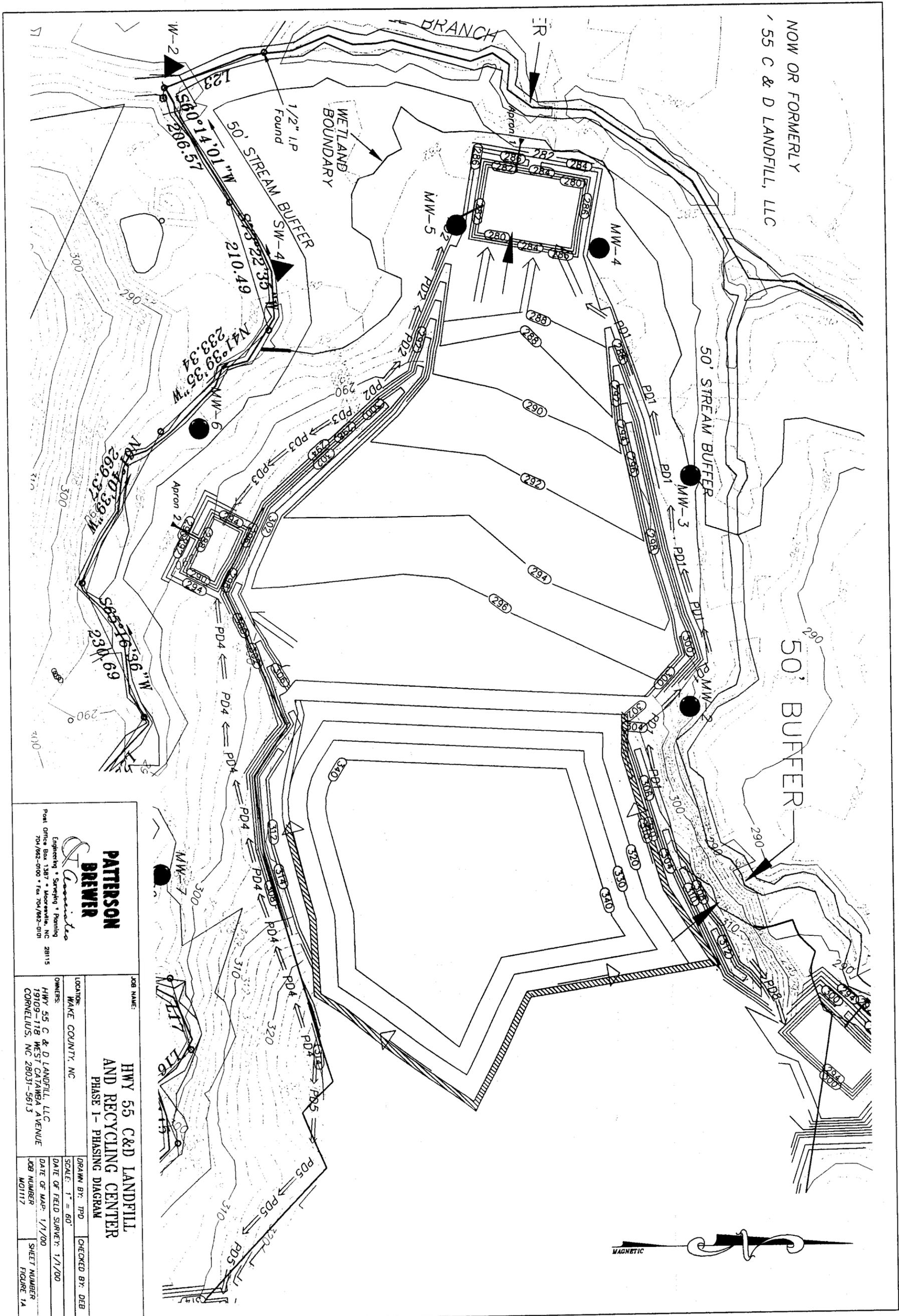
6.5 Waste Placement

Waste placement will be in lifts of approximately 10 feet in vertical thickness. As mentioned previously, each lift will begin at the upgradient end of each landfill phase and progress towards the downgradient end. As higher elevations are reached, the waste may be placed from downgradient to upgradient on the active face slope as long as landfill surfaces are graded to allow proper drainage. Soil berms will be constructed as necessary to divert run-on from entering the working face or allowing runoff to drain from active areas.

Waste shall be compacted as densely as practical and placed on the smallest active face as feasible. C&D waste shall be covered with a compacted layer of six inches of cover soil at least on a weekly basis or as specified by the Division of Waste Management.

Areas that will not have waste placed for 30 days or more shall be covered with a minimum of one foot of intermediate cover. Areas not filled for 12 months or more shall be seeded with temporary seeding

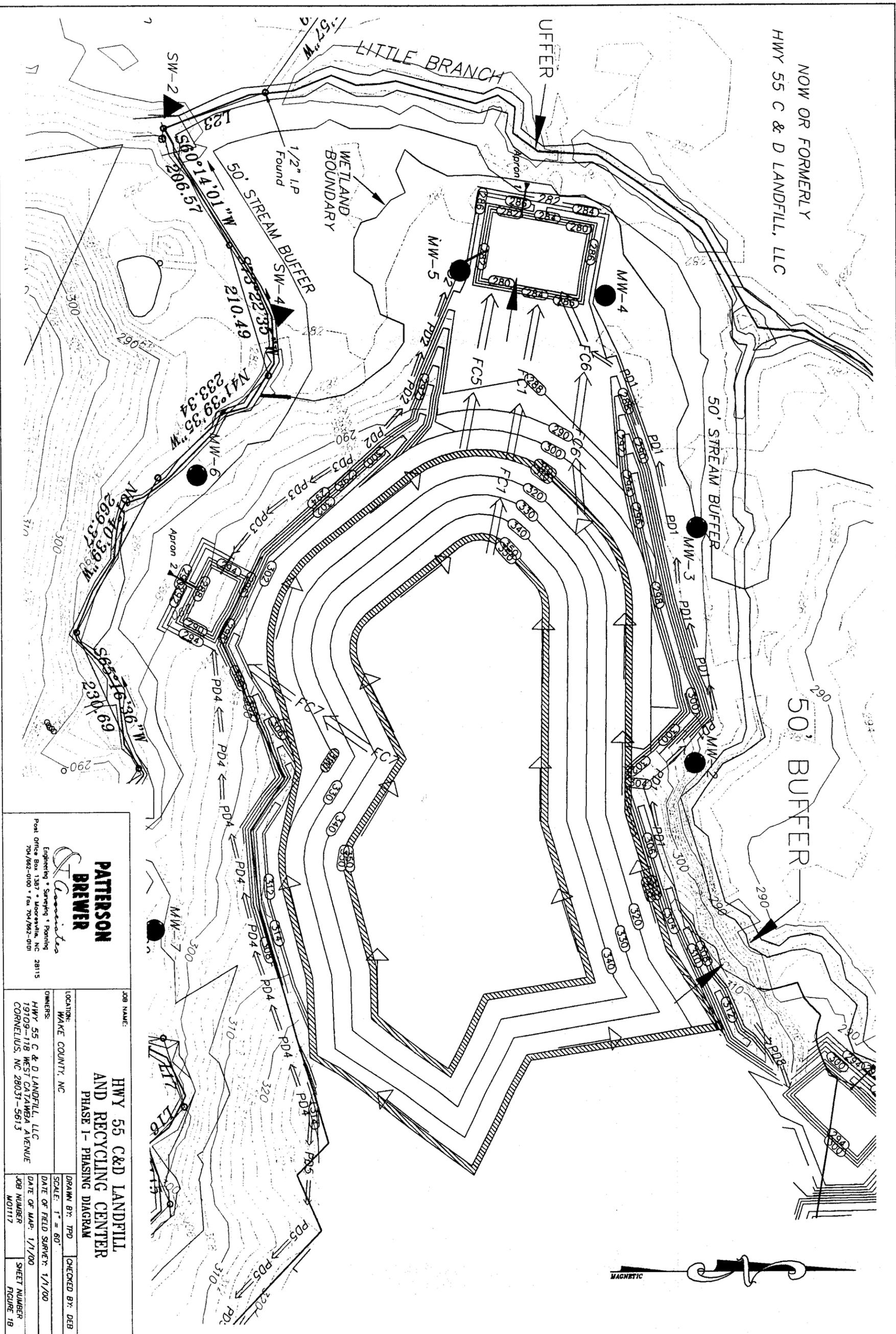
NOW OR FORMERLY
55 C & D LANDFILL, LLC



PATERSON BREWER
Associates
 Engineering • Surveying • Planning
 Post Office Box 1387 • Mooresville, NC 28115
 704/662-0100 • Fax 704/662-0101

JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER PHASE I - PHASING DIAGRAM	
LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD
OWNERS: HWY 55 C & D LANDFILL, LLC 19109-718 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	CHECKED BY: DEB
DATE OF FIELD SURVEY: 1/1/00	SCALE: 1" = 60'
DATE OF MAP: 1/1/00	
JOB NUMBER M01117	SHEET NUMBER FIGURE 1A

NOW OR FORMERLY
 HWY 55 C & D LANDFILL, LLC



**PATTERSON
 BREWER**

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 Post Office Box 1387 • Mooresville, NC
 704/662-0100 • Fax 704/662-0101

JOB NAME:
**HWY 55 C&D LANDFILL
 AND RECYCLING CENTER
 PHASE 1 - PHASING DIAGRAM**

LOCATION:
 WAKE COUNTY, NC

OWNERS:
 HWY 55 C & D LANDFILL, LLC
 19109-118 WEST CATAWBA AVENUE
 CORNELIUS, NC 28031-5613

DRAWN BY: TPD
 SCALE: 1" = 60'
 DATE OF FIELD SURVEY: 1/1/00
 DATE OF MAP: 1/1/00
 JOB NUMBER: M01117
 SHEET NUMBER: FIGURE 1B

CHECKED BY: DEB

in accordance with the seeding specifications presented in the Erosion and Sediment Control Plan. The seeding will be provided as necessary to stabilize the cover.

6.6 Waste Acceptance

The permit requirements for the C&D landfill will allow the facility to accept the following waste types:

- a. Land-clearing debris as defined in G.S. 130A-290, specifically, solid waste that is generated solely from land-clearing activities, such as stumps, trees, etc.;
- b. Inert Debris defined as solid waste that consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil;
- c. Asphalt in accordance with G.S. 130-294(m); and
- d. Construction and demolition debris defined as solid waste resulting solely from construction, remodeling, repair and demolition operations on pavement, buildings, or other structures.

The Operations Manager shall notify the Division within 24 hours of attempt to dispose of any other waste products. No hazardous, liquid, or infectious waste shall be accepted or disposed of in the C&D landfill.

7.0 SITE OPERATIONS AND MAINTENANCE

7.1 Entranceway

The entranceway as shown on the Entrance Area Grading Plan is located at the southeast corner of the property. The entrance is accessed by a paved access road that enters the subject property through a 60-foot access easement off Old Smith Field Road. The entrance will have one 15-foot wide entrance lane and one 15-foot wide exit lane.

An island will be placed between the entrance and exit lanes near the scale house to better facilitate landfill traffic. The access road will also provide access to the Recycling Area Convenience Center. The entrance area and island near the scale house will be vegetated with hardy evergreen bushes and seasonal blooming trees. An irrigation system will be installed along the entrance area to provide sufficient watering. The entire length of the access road will be seeded to provide a dense grass cover. This area will be maintained to provide the required Department of Transportation sight distances.

7.2 Recycling Center

A recycling center will be operated for the Town of Apex and Wake County residences. The initial plans are to propose a recycling convenience center drop off area for inert debris, land clearing debris and small amounts of yard waste materials from the Town of Apex. The mulch material will be provided to local residents free of charge. The 1-acre drop off area and 4.2 acre reprocessing area is shown on the Site Grading Plan. The incoming C&D waste volume will also be recycled as much as practicable. Initial estimates anticipate on the order of 20 percent of the incoming waste volume to be recycled. The percent of waste recycled is anticipated to increase each year of operation. The recycling/reprocessing facility will be permitted separately from the landfill. An operations and maintenance plan for the recycling/reprocessing facility will be prepared for the separate permit application.

7.3 Access and Security Requirements

The site will have controlled access with the use of entrance gates. The remainder of the site has wooded buffer zones along the northern property boundary and streams along the western and southern boundaries that prohibit vehicular traffic. A chain-link fence is also proposed along the eastern property boundary. Access roads into the site shall be of all weather construction and maintained in good condition.

A security check station and weigh scales are located at the landfill entrance to evaluate the incoming waste for proper disposal. An attendant will be on duty at the site at all times while the landfill is open for public use to assure compliance with operational requirements. The Operations Manager will be available after normal operating hours.

7.4 Erosion/Sedimentation Control Maintenance

The entire site is designed with erosion and sedimentation control in accordance with the requirements of the Sedimentation Pollution Control Law (15A NCAC 4). The surface water drainage design meets the requirements of the NPDES under Section 402 of the Clean Water Act so that pollutants are not discharged into waters of the State. Erosion/sedimentation control structures include sediment basins and diversion ditches. Sedimentation basins shall be checked after periods of significant runoff.

Sediment shall be removed from the basin to its original dimensions when sediment accumulates to one half of the design depth. The sedimentation basin embankments, spillways and outlets shall also be inspected for erosion damage. All necessary repairs shall be made immediately. Any trash or debris within the sedimentation basin riser shall be removed.

Diversion ditches shall be inspected for damage after each runoff event. 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.

Embankment and landfill cover slopes shall be periodically inspected for erosion. The slopes shall be mowed no more than twice a year. The embankment slopes shall be re-fertilized in the second year unless vegetation growth is fully adequate. The damaged areas shall be reseeded (permanent seeding for embankment slopes and temporary seeding for landfill cover slopes), fertilized and mulched immediately. Seeding, fertilizing and mulching shall be in accordance with the Erosion and Sediment Control Plan.

7.5 Landscaping Maintenance

Landscaping maintenance will generally include the entranceway closest to the scale house. An irrigation system will provide sufficient watering of the grassed and planted areas. The grass along the entrance will be mowed as needed. Any distressed areas will be reseeded and fertilized as needed to maintain a dense grass cover. Planted bushes and trees will be fertilized and mulched at least twice a year.

7.6 Dust, Litter, Odors and Vectors

Dust generated due to operations will be controlled by the application of water by irrigation or truck. The east access road will be paved from the scale house to Phase I. Removal of mud and dirt from the paved roads will also be a part of the dust control measures. Additionally, final cover and borrow areas will be vegetated as soon as practical in order to reduce the blowing of dust on-site.

The potential problem of blowing litter will be reduced by limiting the size of the active working face and using soil cover over the active fill area. Other methods, such as the utilization of pickers and portable fencing will be employed to contain loose or other wind blown refuse during the landfill operations. The landfill area will be policed as required to collect airborne materials.

Orders are not anticipated to be a problem at this site. However, if odor does occur at the C&D Landfill it will be controlled by the application of soil cover. Vectors are not a typical problem at C&D sites but will also be controlled by the application of soil cover.

7.7 Landfill Signs

Signs providing information on disposal procedures, the hours which the site is open for public use, the permit number, statement that no hazardous or non-permitted waste can be received, and other pertinent information will be posted at the site entrance. Traffic signs and markers will be provided as necessary to promote an orderly traffic pattern to and from the disposal area and maintain efficient operating conditions.

7.8 Fire Control

No open burning of waste will be permitted at the site. Equipment and stockpiled soil shall be provided to control accidental fires. Any fire that occurs at the landfill shall be reported to the Division of Waste Management within 24 hours, and the Operations Manager will submit a written notification within 15 days.

If a fire occurs at the landfill, the local fire department shall be notified. Hot loads that are brought in are to be immediately dumped away from the landfill, and the fire department is to be called. The hot load shall be sprayed down with water until the fire or combustion is extinguished. The load is then to be reloaded for disposal in the landfill.

The local fire department, Apex Fire Department, has been notified of the construction of the C&D Landfill. A letter from the fire department is included in Appendix 2.

7.9 Methane Monitoring

A methane gas-monitoring program will be implemented to detect possible migration of methane gas off-site from the existing landfill and future landfill development. The methane gas-monitoring program is in accordance to the requirements of the North Carolina Solid Waste Management Rules, Section .0503(2)(a). Included in this program is the methane monitoring system, temporary monitoring probe locations and construction, methane-monitoring procedures, sampling frequency and reporting requirements.

7.9.1 Temporary Methane Monitoring Probe Location

The proposed temporary methane gas monitoring probes will be installed to detect methane gas that may migrate into the structures located at the landfill (landfill office) or beyond the landfill property boundary. The temporary probes will be located between the waste boundary and the property boundary and between the waste boundary and facility structures that are occupied or used regularly by landfill personnel. The landfill perimeter gas monitoring probes will be spaced 50 feet outside the waste boundary and at intervals of about 500 feet apart.

7.9.2 Temporary Methane Monitoring Probe Construction

Temporary methane monitoring probes shall be constructed around the perimeter of the landfill by advancing a hand auger to the depth of six feet. A one-inch diameter schedule 40 PVC perforated pipe will be inserted into each boring hole and the annular space backfilled with soil cuttings. The PVC pipe will be installed with a nonventing PVC pipe cap at each location

7.9.3 Methane Monitoring Procedures and Frequency

The landfill personnel trained to use an explosimeter will perform the methane monitoring. Methane monitoring will be conducted in each temporary methane-monitoring probe and within the facility structures occupied by the landfill personnel. Monitoring shall be performed at least 24 hours following monitoring probe installation. Testing procedures for the monitoring probes are to be as follows:

1. Calibrate the explosimeter (if required) in accordance with the manufacturer's recommendations for methane calibration using 1.5% methane test gas in an area free

from potential methane contamination.

2. Aspirate to purge the explosimeter 4 to 5 times prior to each reading in an area free from potential methane contamination.
3. Open the cover of the methane monitoring probe.
4. Insert the explosimeter tube into the probe at a depth of 1-2 feet from the top of casing.
5. Aspirate 5 to 7 times immediately before gas is evacuated.
6. Read the percent methane and percent LEL (lower explosive limit).
7. Record reading.
8. Remove temporary probe and backfill boreholes (Testing procedures for the facility structures are as follows:)
 - a. Calibrate the explosimeter (if required) in accordance with the manufacturer's recommendations.
 - b. Aspirate to purge the explosimeter (4 to 5 times) prior to each reading in an area free from potential methane contamination.
 - c. For Structures with concrete slab-on-grade: Place explosimeter tube beside any penetrations through walls or floors (i.e., floor drains, electrical outlets and switches, wall mounted lights, cracks in slab, etc.) or around floor board if plumbing and electrical fixtures are not present. Aspirate 5 to 7 times at each location. Purge explosimeter (as above) prior to moving to the next location. For Structures with a crawl space: Conduct testing as described above. In addition, perform testing at the opening for the entrance to the crawl space and any vents or openings for the crawl space. Insert explosimeter 2 to 3 feet into the opening to the crawl space and aspirate 5 to 7 times. Purge explosimeter prior to moving to the next location.
 - d. Read and record percent methane and percent LEL.
The methane monitoring will be conducted on a minimum quarterly basis.

7.9.4 Reporting Requirements And Response Plan

The results of the measurements of the methane gas monitoring probes will be recorded for each temporary monitoring probe 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 (lower explosive limit) for methane in site structures and less than the LEL for methane in the subgrade at the facility property boundaries.

If methane gas levels exceeding the maximum LEL (25% LEL in site structures and LEL at facility property boundary) are detected, the landfill personnel shall immediately take all necessary steps to protect human health and notify the Division of Waste Management. The steps that should be taken include but are not limited to:

- Evacuate and restrict access to facility structures or exterior areas with high methane

levels;

- Prohibit use of equipment and materials that may cause sparks or an open flame;
- Report methane levels to the Operations Manager;
- Turn off electrical main switch outside of the structure where high methane levels are present; and/or
- Operations Manager should direct qualified and properly equipped response teams/contractors to locate the source of methane and cap or isolate it.

Within seven days of detecting levels exceeding the maximum LEL (25% LEL in site structures and LEL at facility property boundary), the methane gas levels shall be placed in the operating record with a description of the steps taken to protect human health. Within 60 days of detecting gas levels exceeding the maximum LEL, a permanent methane monitoring program and remediation plan for the methane gas releases shall be implemented. The plan shall be placed in the operating record, and the Division shall be notified that the plan has been implemented. The Division may grant an extension to the schedules noted above if the owner demonstrates a need for an extension.

8.0 CLOSURE/POST-CLOSURE PLAN

8.1 Closure Design

As required by the North Carolina Solid Waste Management Rules, the landfill will be closed out at the permitted final cover elevations with a minimum two foot-thick final soil cover. The final cover will be compacted as densely as practical to reduce surface water infiltration. The final cover slopes will be graded to 3 horizontal to 1 vertical (3H: 1V) so that a stable final cover can be maintained. Erosion control benches will be provided to break the velocity of the surface water runoff and route the runoff to the sediment basins. The proposed final cover elevations are shown on the Final Closure Plan.

8.2 Final Cover Vegetation and Maintenance

The final cover surface will be seeded, fertilized and mulched to provide a dense stand of grass. The proposed seeding specifications are presented in the Erosion and Sediment Control Plan. The grass cover will be reseeded and fertilized as needed in the second year. The grass cover should not be mowed more than twice a year until dense vegetation is established.

The final cover will be inspected quarterly for signs of settlement, erosion, vector damage, and bare spots. Additional inspections will be performed after large storm events. Depressions in the cover that pond water will be regraded as needed to provide positive drainage. Areas subject to regrading or any bare spots will be reseeded in accordance with the permanent seeding specifications. Any deep-rooted vegetation will be removed so that deep root growth will not compromise the integrity of the final cover.

8.3 Post-Closure Property Use

Once the C&D landfill has been closed-out in accordance with NCDENR guidelines, the entire site would be offered to Wake County for possible use as a park and recreational facility.

8.4 Post-Closure Water Quality Monitoring

Following closure of the landfill, the water quality monitoring will continue in accordance with the State approved water quality-monitoring plan. The Division of Waste Management will determine the monitoring period.

APPENDIX 1

**LANDFILL CAPACITY AND BORROW SOIL CALCULATIONS
EROSION & SEDIMENT CONTROL CALCULATIONS
LETTER FROM LOCAL FIRE DEPARTMENT**

CALCULATIONS

LANDFILL CAPACITY CALCULATIONS

OBJECTIVE: ESTIMATE CAPACITY OF HWY 55 C&D LANFILL

PARAMETERS:

WASTE GENERATION=	300 TONS/DAY
DAYS IN OPERATION PER WEEK=	5.5 DAYS
WASTE UNIT WEIGHT=	1000 LBS/CU. YARD
WEEKLY COVER=	2% OF GROSS VOLUME
FINAL COVER=	2 FT OVER 43 ACRES
GROSS VOLUME=	3,000,000 CU. YARDS (APPROX.) (REF: AUTOCAD 2000 LDD CUT/FILL CALCULATIONS)

CALCULATIONS:

WASTE/YEAR =	$(300 \text{ TONS/DAY}) \times (5.5 \text{ DAYS/WEEK})$ $\times (52 \text{ WEEKS/YEAR}) \times (1 \text{ CU. YARD}/0.5 \text{ TONS}) =$ 171,600 CU. YARDS/YEAR
NET VOLUME=	$(3,000,000 \text{ CU. YARDS}) (0.98) - 138746 =$ 2,828,400 CU. YARDS
LANDFILL LIFE=	$2,828,400 \text{ CU. YARDS}/171,600 \text{ CU. YARDS/YEAR} =$ 16.4 YEARS

3 - 5 YEAR PHASES

Borrow Calculations Based on Land Development Desktop Software / ACAD 2000

Site Volume Table: Unadjusted

Cut	Fill	Net	Method
cu.yds	cu.yds	cu.yds	

Stratum: 5-6-02 eg vs sub existing subsurface

688194

74914

613280 (C) Grid

↖ Fill for Berms and Bottom (CY)

↖ excess excavation (CY)

Stratum: 5-6-02 sub vs final subsurface fg

3617

2865632

2862014 (F) Grid

↖ Gross Volume (CY)

$$\begin{aligned} \text{Soil Cover} &= 2\% \approx 3,000,000 (0.02) \\ &= 60,000 \text{ CY} \end{aligned}$$

$$\begin{aligned} \text{Final Cover} &= 43 \text{ Acres} (43,560 \text{ ft}^2/\text{ac}) (2 \text{ ft}) (1/27) \\ &= 139,000 \text{ CY} \end{aligned}$$

$$\begin{aligned} \text{Excess Soil} &= 613,280 \text{ CY} \\ &- 60,000 \text{ CY Soil Cover} \\ &- 139,000 \text{ CY Final Cover} \\ \hline &414,280 \text{ CY Excess} \end{aligned}$$

Allow 15% Shrinkage

$$\text{Excess Soil} \approx \boxed{350,000 \text{ CY}}$$

**EROSION & SEDIMENT CONTROL
DESIGN CALCULATIONS**

FOR

**HWY 55 C&D LANDFILL
WAKE COUNTY, NORTH CAROLINA**

PREPARED FOR:

Hwy 55 C&D Landfill, LLC
Wake County, North Carolina

PREPARED BY:

PATTERSON, BREWER & ASSOCIATES, P.A.
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APRIL 2007



Job Name Hwy 55 LF Job No. M01117 Date _____ Sheet 1
 Subject Erosion & Sediment Control By TD Chk By DEB

Sediment Basin Design SB-1

Drainage Area = 11.4 Ac $C = 0.45$ $I = 8.19$ in/hr
 $T_L = 5$ min

$$Q_{25} = CIA$$

$$Q_{25} = (0.45 \times 8.19 \times 11.4)$$

$$Q_{25} = 42.0 \text{ cfs}$$

Basin Volume

$$1800 \text{ ft}^3/\text{Ac} (11.4 \text{ Ac}) = 20,520 \text{ ft}^3$$

Min Basin Area for 75% Efficiency
 $(0.01 \text{ Ac/cfs})(42.0 \text{ cfs}) = 18,295 \text{ ft}^2$

Principal Spillway Design

From table 8.07a where $H = 4$ ft

$$\phi \text{ CMP Barrel} = 30''$$

From chart 8.07b

$$\phi \text{ Riser} = 36''$$

$$\text{Height of Riser} = 3.5'$$

$$Q_p = 37.62 \text{ cfs} \quad Q_{25} = 42.0 \text{ cfs}$$

Anti-Flotation Device

$$3.5 \times \frac{\pi 3^2}{4} \times 62.4 \times 1.1 = 169816$$

$$169816 / 150 \text{ lb/ft}^3 = 11.3 \text{ ft}^3$$

Concrete anti-flotation device

$$4' \times 4' \times 0.75' = 12 \text{ ft}^3$$

Dewatering Holes

$$A_o = \frac{A_s \sqrt{2h}}{Tcd} = \frac{20,520}{3(0.6)(20,428)}$$

$$A_o = \frac{20,520 \sqrt{2(4)}}{3(0.6)(20,428)} = 0.59 \text{ ft}^2 = 85.2 \text{ in}^2$$

Job Name Hwy 55 Landfill Job No. M0117 Date _____ Sheet 2
 Subject Erosion + Sediment Control By TPD Chk By DEB

Sediment Basin Design SB-1 (continued)

$$3/4" \text{ hole} = \left(\frac{\pi (0.75^2)}{4} \right) = 0.44 \text{ in}^2$$

$$A_0 = 85.2 \text{ in}^2$$

$$85.2 / 0.44 = 193 \text{ holes}$$

$$\text{Riser circumference} = 113 \text{ in}$$

$$\text{Holes placed every 3 in on center} \\ = 37 \text{ holes/row}$$

$$193 / 37 = 6 \text{ Rows}$$

Outlet Design - Apron 1

Riprap size from figure 8.06a

$$d_{50} = 6"$$

$$d_{\text{max}} = 6" \times 1.5 = 9"$$

$$"t" \text{ (thickness)} = 9" \times 1.5 = 13.5"$$

$$\text{Apron length} = 16'$$

$$\text{Apron width} = D_0 + \text{length} = 2.5' + 16 = 18.5'$$

Emergency Spillway Design

$$Q_e = Q_{25} - Q_p$$

$$Q_e = 42 - 37.62 = 4.38 \text{ cfs}$$

From 8.07d: Bottom width = 16'
stage ft = 0.6'

Job Name Hwy 55 C+D Landfill Job No. M01117 Date 4/8/02 Sheet 3
 Subject Phase I Erosion - Sediment Control Plan By TPC Chk By _____

Sediment Trap ST1

Min. Volume of Sediment Trap

$$1800 \text{ ft}^3/\text{Acre} \times 2.9 \text{ Acre} = 5220 \text{ ft}^3$$

$$Q_{25} = C i a \quad C = 0.45 \quad I = 8.2 \text{ in/hr}$$

$$Q_{25} = (0.45 \times 8.2 \times 2.9) \quad T_c = 5 \text{ min}$$

$$Q_{25} = 10.7 \text{ cfs}$$

Surface Area for 75% Efficiency

$$10.7 \times 0.01 = 4661 \text{ ft}^2$$

See Table 6.60a For Spillway Design

$$DA \approx 3.0 \text{ Ac} \therefore \text{Weir Length} = 8.0 \text{ ft}$$

$$\text{Top} = 324 \quad \text{Weir elev} = 322.5 \quad \text{Bottom} = 320$$

$$SA @ 322.5 = 5768 \text{ ft}^2$$

Rock Dam RD1

Min Volume for Rock Dam

$$1800 \text{ ft}^3/\text{Acre} \times 5.5 \text{ Acre} = 9900 \text{ ft}^3$$

$$C = 0.45$$

$$I = 8.2 \text{ in/hr}$$

$$T_c = 5 \text{ min}$$

Surface Area Requirement

$$Q_{25} = C i a$$

$$Q_{25} = (0.45 \times 8.2 \times 5.5)$$

$$Q_{25} = 20.3 \text{ cfs}$$

$$0.01 \times 20.3 = 8840 \text{ ft}^2$$

Job Name Hwy 55 Landfill Job No. M0117 Date _____ Sheet 4
 Subject Erosion + Sediment Control By TPD Chk By DEB

Sediment Basin Design SB-2

$$\text{Drainage Area} = 6.2 \text{ AC} \quad C = 0.45 \quad I = 8.19 \text{ In/Hr}$$

$$T_c = 5 \text{ min}$$

$$Q_{25} = CIA$$

$$Q_{25} = (0.45 \times 8.19 \times 6.2)$$

$$Q_{25} = 22.9 \text{ cfs}$$

Basin Volume

$$(1800 \text{ ft}^3/\text{AC})(6.2 \text{ AC}) = 11,160 \text{ ft}^3$$

Min Basin Area for 75% Efficiency

$$(0.01 \text{ AC/cfs})(22.9 \text{ cfs}) = 9,975 \text{ ft}^2$$

Principal Spillway Design

From table 8.07a where $H = 4 \text{ ft}$

$$\phi \text{ CMP Barrel} = 21''$$

From figure 8.07b

$$\phi \text{ Riser} = 24''$$

$$\text{Height of Riser} = 3 \text{ ft}$$

$$Q_p = 15.98 \text{ cfs} \quad Q_{25} = 22.9 \text{ cfs}$$

Anti-Flotation Device

$$3' \times \frac{\pi 2^2}{4} \times 62.4 \times 1.1 = 647 \text{ lb}$$

$$647 \text{ lb} / 150 \text{ lb/ft}^3 \text{ (concrete)} = 4.3 \text{ ft}^3$$

Concrete anti-flotation device

$$3' \times 3' \times 0.5' = 4.5 \text{ ft}^3$$

Dewatering Holes

$$A_o = \frac{A_s \sqrt{2gh}}{T_c \times 20,428}$$

$$A_o = \frac{9975 \sqrt{8}}{(8 \times 0.6 \times 20,428)} = 0.28 \text{ ft}^2 = 41.4 \text{ in}^2$$

Job Name Hwy 5.5 Landfill Job No. M01117 Date _____ Sheet 5
 Subject Erosion & Sediment Control By TPD Chk By _____

Sediment Basin Design SB-2 (continued)

$$\frac{1}{2} \text{ " hole} = \frac{\pi(0.5)^2}{4} = 0.196 \text{ in}^2$$

$$A_0 = 41.4 \text{ in}^2$$

$$41.4 / 0.196 = 212 \text{ holes}$$

$$\text{Riser Circumference} = 75.4 \text{ in}$$

$$\text{holes placed every 3" on center} = 25 \text{ holes/row}$$

$$212 \text{ holes} / 25 \text{ holes/row} = 9 \text{ rows}$$

Outlet Design - Apron 2

Riprap size from figure 8.06a

$$d_{50} = 6 \text{ "}$$

$$d_{\text{max}} = 6 \text{ "} \times 1.5 = 9 \text{ "}$$

$$\text{"t" (thickness)} = 9 \text{ "} \times 1.5 = 13.5 \text{ "}$$

$$\text{Apron length} = 9 \text{ '}$$

$$\text{Apron width} = 9 \text{ '} + 1.5 \text{ '} = 10.5 \text{ '}$$

Emergency Spillway Design

$$Q_e = Q_{25} - Q_p$$

$$Q_e = 22.9 - 15.98 = 6.92$$

$$\text{From 8.07d: Bottom width} = 8.0 \text{ ft}$$

$$\text{stage feet} = 0.68 \text{ ft}$$

PATTERSON, BREWER & ASSOCIATES, P.A.

Job Name Hwy 55 LF Job No. M01117 Date 3/25/02 Sheet 6
Subject EROSION + Sediment Control Plan By TPD Chk By DEL

Drainage Ditch Design PDI

Length = 883 ft Slope = 2.2% C = 0.45
 $Q_{10} = (0.45 \times 7.2 \times 6.6)$ I = 7.2 in/hr
 $Q_{10} = 21.3$ cfs $T_c = 5$ min
DA = 6.6 Acres

Temp Liner Based on 2YR Storm Event

C = 0.45 I = 5.6 IN/HR $T_c = 5$ min DA = 6.6 Ac

$$Q_2 = CIA$$

$$Q_2 = (0.45 \times 5.6 \times 6.6)$$

$$Q_2 = 16.6 \text{ cfs}$$

PD1
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	Ditch Calculation
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

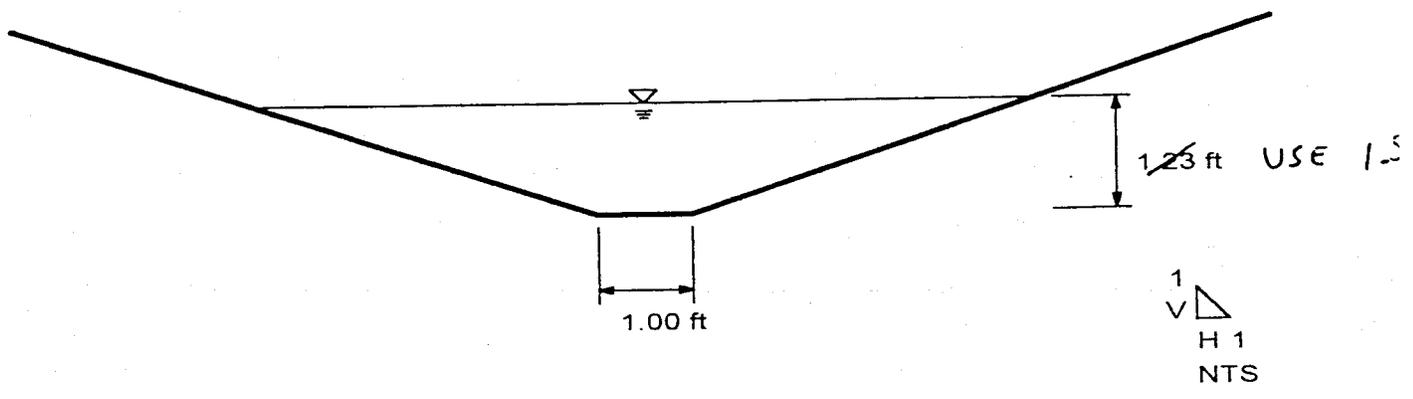
Input Data	
Mannings Coefficient	0.045
Channel Slope	0.022000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	21.30 cfs

Results	
Depth	1.23 ft
Flow Area	5.76 ft ²
Wetted Perimeter	8.77 ft
Top Width	8.37 ft
Critical Depth	1.10 ft
Critical Slope	0.036712 ft/ft
Velocity	3.70 ft/s
Velocity Head	0.21 ft
Specific Energy	1.44 ft
Froude Number	0.79
Flow is subcritical.	

Cross Section PD1
Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	Ditch Calculation
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.045
Channel Slope	0.022000 ft/ft
Depth	1.23 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	21.30 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.045$

Flow Area = 5.66 ft^2 , Wetted Perimeter = 8.69 ft , Velocity = 3.68 ft/s

$V_r = 5.76 / 8.77 \times 3.68$

$V_r = 2.43$ Refer to Figure 8.05c $n = 0.045$

Velocity $> 2.0 \text{ ft/s}$ \therefore Temp liner is required

Straw W/ Net Liner-PD1 Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	Temporary Liner- PD1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.033
Channel Slope	0.022000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	16.60 cfs

Results	
Depth	0.97 ft
Flow Area	3.79 ft ²
Wetted Perimeter	7.13 ft
Top Width	6.82 ft
Critical Depth	0.99 ft
Critical Slope	0.020401 ft/ft
Velocity	4.38 ft/s
Velocity Head	0.30 ft
Specific Energy	1.27 ft
Froude Number	1.04
Flow is supercritical.	

PERMISSIBLE SHEAR STRESS: 1.45 lbs/ft (table 8.05g)

Nvalue=0.033 (table 8.05e)

T=YDS

$$T = (62.4 \times 0.97)(0.22)$$

$$T = 1.33 \text{ lb/ft}^2$$

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Job Name Hwy 55 LF Job No. M01117 Date 3/04/02 Sheet 12
Subject Phase 1 Erosion + Sediment Control By TPC Chk By DEB

Permanent Ditch Design PD 2

Drainage Area = 0.5 Acres $C = 0.45$ $I = 7.2 \text{ in/h}$
Length = 340 ft Slope = $\frac{294 - 283.5}{340}$ $T_c = 5 \text{ min}$
= 3%

$$Q_{10} = C i a$$

$$Q_{10} = (0.45 \times 7.2 \times 0.5)$$

$$Q_{10} = 1.62 \text{ cfs}$$

PD2
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	Ditch Calculation-PD2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

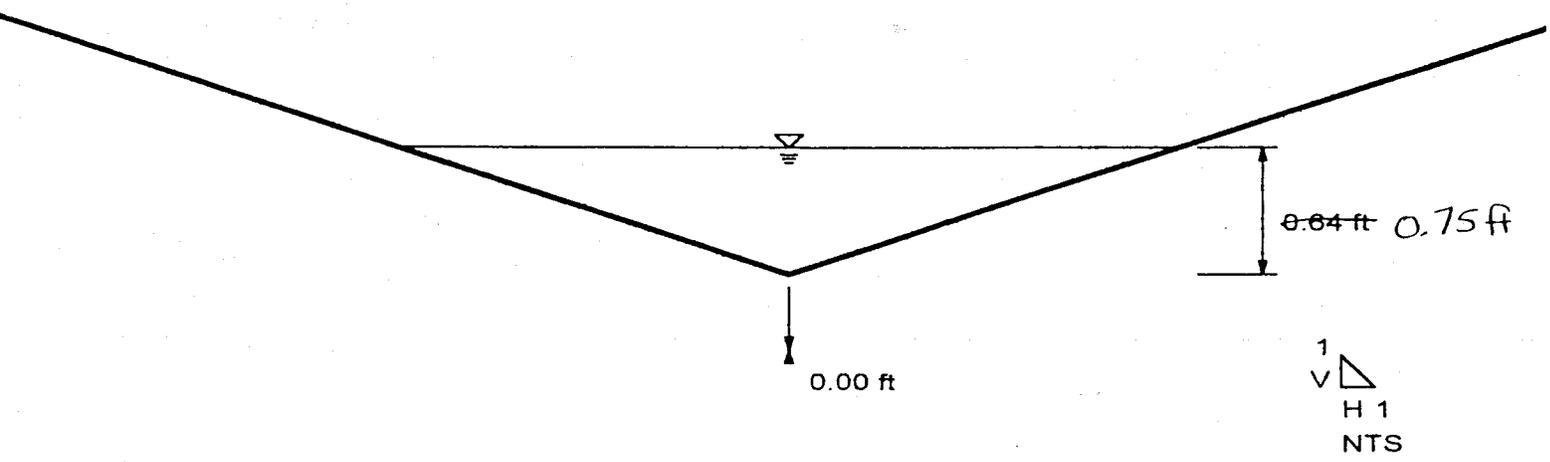
Input Data	
Mannings Coefficient	0.090
Channel Slope	0.030000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	1.62 cfs

Results	
Depth	0.64 ft
Flow Area	1.25 ft ²
Wetted Perimeter	4.08 ft
Top Width	3.87 ft
Critical Depth	0.45 ft
Critical Slope	0.208424 ft/ft
Velocity	1.30 ft/s
Velocity Head	0.03 ft
Specific Energy	0.67 ft
Froude Number	0.40
Flow is subcritical.	

Cross Section-PD2 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	Ditch Calculation-PD2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.090
Channel Slope	0.030000 ft/ft
Depth	0.64 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	1.62 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.09$

$$\frac{\text{Flow Area} = 1.25 \text{ ft}^2 \text{ Wetted Perimeter} = 4.08 \text{ ft} \text{ Velocity} = 1.3 \text{ ft/s}}{V_r = (1.25 / 4.08) \times 1.3}$$

$$V_r = 0.40$$

Refer to figure 8.05c, for $V_r = 0.4$; $n = 0.09$

Velocity $< 2.0 \text{ ft/s}$ \therefore Temporary liner not required

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Job Name Hwy 55 LF Job No. M0117 Date 3/4/02 Sheet 16
 Subject Phase 1 Erosion + Sediment Control By TPD Chk By DEB

Perminent Ditch Design PD3

Drainage Area = 1.06 acres $C = 0.45$ $I = 7.2 \text{ in/hr}$
 Length = 240 ft, Slope = $\frac{2}{240}$ $T_c = 5 \text{ min.}$
 0.8%

$$Q_{10} = CIA$$

$$Q_{10} = (0.45 \times 7.2 \times 1.06)$$

$$Q_{10} = 3.4 \text{ cfs}$$

Perminent Ditch Design PD4

Drainage Area = 4.2 acres $C = 0.45$ $I = 7.2 \text{ in/hr}$
 Length = 700 ft Slope = $\frac{329 - 294}{700} = 5\%$ $T_c = 5 \text{ min.}$

$$Q_{10} = CIA$$

$$Q_{10} = (0.45 \times 7.2 \times 4.2)$$

$$Q_{10} = 13.6 \text{ cfs}$$

Temp liner Design Based on 2 YR storm

Drainage Area = 4.2 acres $C = 0.45$ $I = 5.6$
 $T_c = 5 \text{ min.}$

$$Q_2 = CIA$$

$$Q_2 = (0.45 \times 5.6 \times 4.2)$$

$$Q_2 = 10.6 \text{ cfs}$$

PD3
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	PD3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

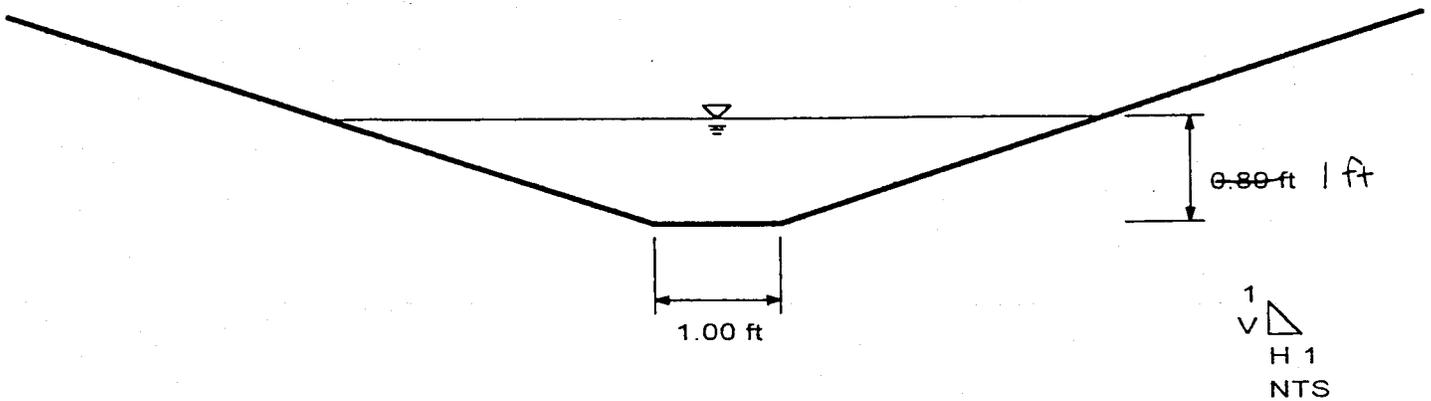
Input Data	
Mannings Coefficient	0.080
Channel Slope	0.008000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.40 cfs

Results	
Depth	0.89 ft
Flow Area	3.28 ft ²
Wetted Perimeter	6.64 ft
Top Width	6.35 ft
Critical Depth	0.46 ft
Critical Slope	0.147909 ft/ft
Velocity	1.04 ft/s
Velocity Head	0.02 ft
Specific Energy	0.91 ft
Froude Number	0.25
Flow is subcritical.	

Cross Section PD3
Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ addedprojects\m01117\dwg\ditches.fm2
Worksheet	PD3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.080
Channel Slope	0.008000 ft/ft
Depth	0.89 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.40 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.08$

$$\frac{\text{Flow Area} = 3.28 \text{ ft}^2 \quad \text{Wetted Perimeter} = 6.64 \text{ ft} \quad \text{Velocity} = 1.04 \text{ ft/s}}{V_r = (3.28 / 6.64) \times 1.04}$$

$$V_r = 0.51$$

Refer to Figure 8.05c $n = 0.08$

Velocity < 2.0 ft/s \therefore temp liner not required

PD4
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	PD4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

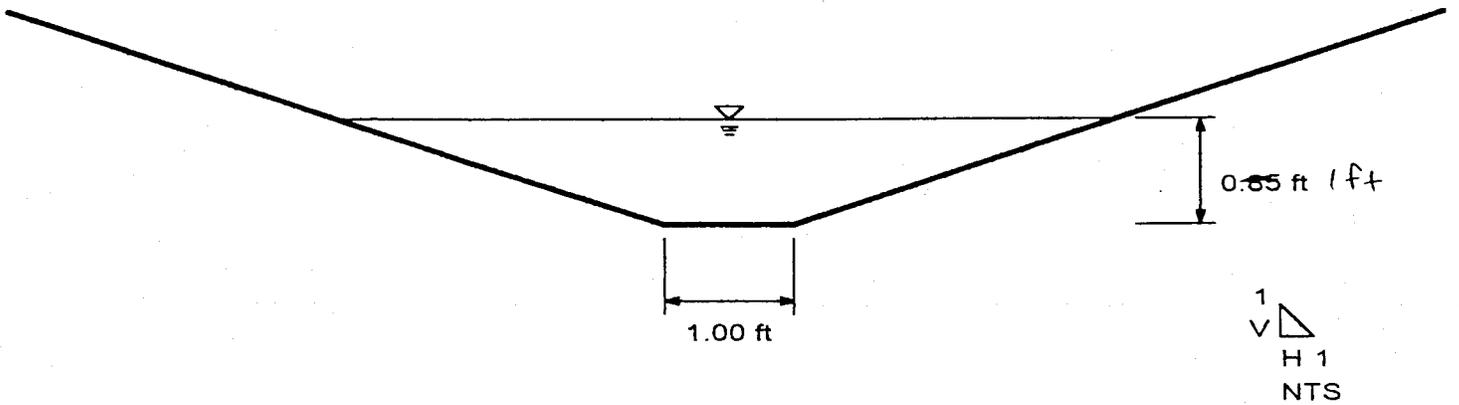
Input Data	
Mannings Coefficient	0.045
Channel Slope	0.050000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	13.60 cfs

Results	
Depth	0.85 ft
Flow Area	3.03 ft ²
Wetted Perimeter	6.39 ft
Top Width	6.11 ft
Critical Depth	0.90 ft
Critical Slope	0.038947 ft/ft
Velocity	4.49 ft/s
Velocity Head	0.31 ft
Specific Energy	1.17 ft
Froude Number	1.12
Flow is supercritical.	

Cross Section PD4 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	PD4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.045
Channel Slope	0.050000 ft/ft
Depth	0.85 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	13.60 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.045$

$$\text{Flow Area} = 3.03 \text{ ft}^2 \quad \text{Wetted Perimeter} = 6.39 \quad \text{Velocity} = 4.49 \text{ ft/s}$$

$$V_r = (3.03 / 6.39) \times 4.49$$

$$V_r = 2.12$$

Refer to figure 8.05c $n = 0.045$

Velocity $> 2.0 \text{ ft/s}$ \therefore Temp lines is required

SYNTHETIC MAT PD4
Worksheet for Trapezoidal Channel

Project Description

Project File	p:\laddprojects\m01117\dwg\ditches.fm2
Worksheet	PD4 TEMPORARY LINER
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.025
Channel Slope	0.050000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	10.60 cfs

Results

Depth	0.59	ft
Flow Area	1.62	ft ²
Wetted Perimeter	4.72	ft
Top Width	4.53	ft
Critical Depth	0.80	ft
Critical Slope	0.012422	ft/ft
Velocity	6.53	ft/s
Velocity Head	0.66	ft
Specific Energy	1.25	ft
Froude Number	1.92	

Flow is supercritical.

PERMISSIBLE SHEAR STRESS: 2.00 lbs/ft (table 8.05g)

Nvalue=0.025 (table 8.05e)

T=YDS

$T = (62.4)(0.59 \times 0.5)$

T= 1.84 use Synthetic Mat

TD1
Worksheet for Trapezoidal Channel

Project Description

Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.100
Channel Slope	0.030000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	1.17 cfs

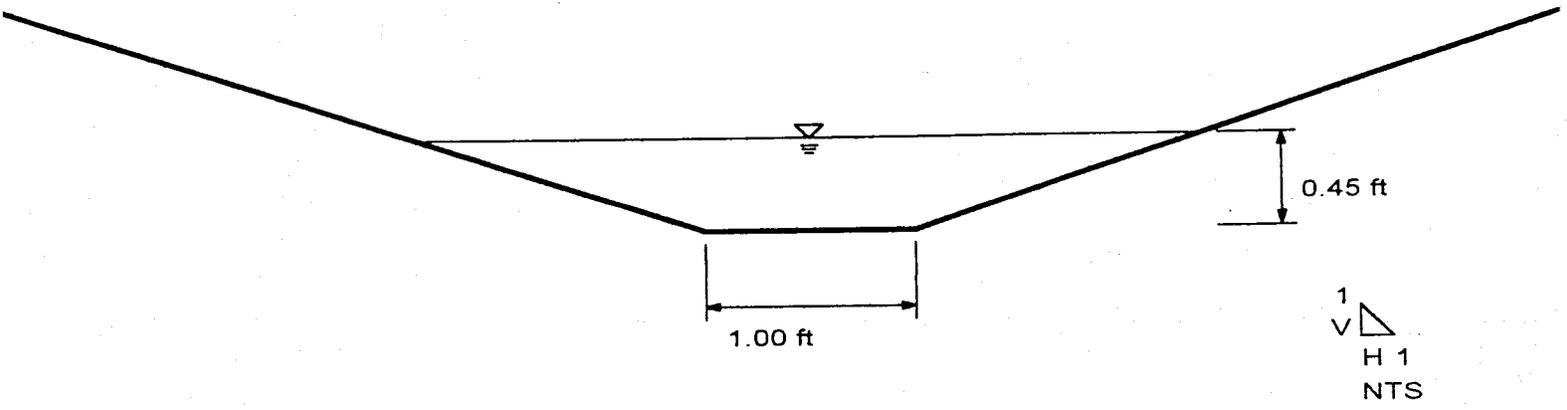
Results

Depth	0.45	ft
Flow Area	1.07	ft ²
Wetted Perimeter	3.87	ft
Top Width	3.72	ft
Critical Depth	0.27	ft
Critical Slope	0.267329	ft/ft
Velocity	1.09	ft/s
Velocity Head	0.02	ft
Specific Energy	0.47	ft
Froude Number	0.36	
Flow is subcritical.		

Cross Section TD1 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\laddprojects\m01117\dwg\ditches.fm2
Worksheet	TD1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.100
Channel Slope	0.030000 ft/ft
Depth	0.45 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	1.17 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: ft./sec. (table 8.05a)

Assume $n = 0.1$

$$\text{Flow Area} = 1.07 \quad \text{Wetted Perimeter} = 3.87 \quad \text{Velocity} = 1.09 \text{ ft/s}$$

$$V_r = (1.07/3.87) \times 1.09 = 0.3$$

$V_r = 0.3$ Refer to figure 8.05c $n \approx 0.1$

Velocity < 2.0 ft/s \therefore NO Temporary Lining Required

Drawings at
back of File

TD2
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

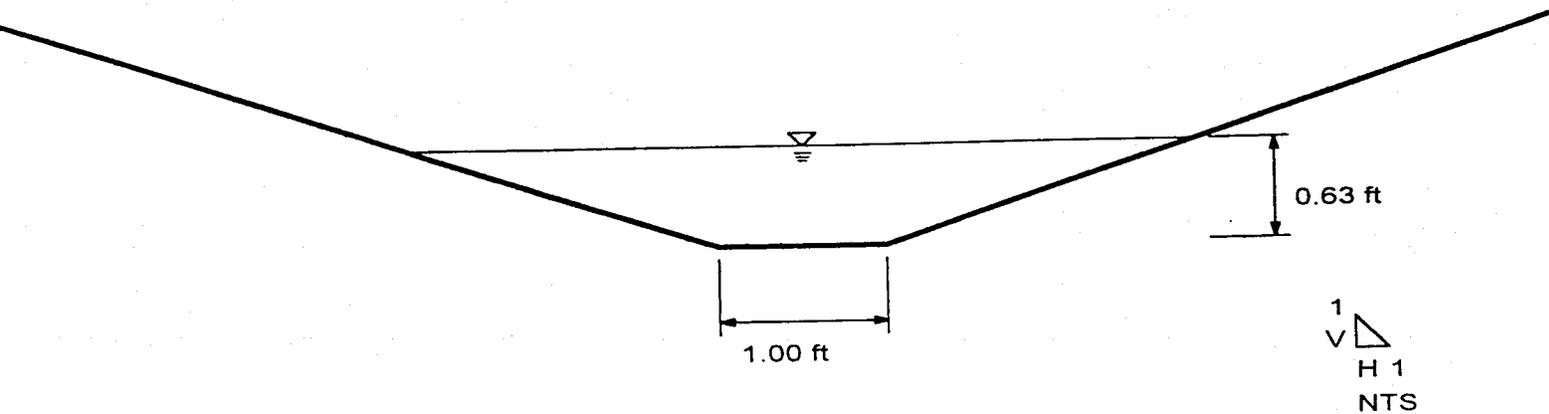
Input Data		
Mannings Coefficient	0.070	
Channel Slope	0.034000 ft/ft	
Left Side Slope	3.000000 H : V	
Right Side Slope	3.000000 H : V	
Bottom Width	1.00	ft
Discharge	3.60	cfs

Results		
Depth	0.63	ft
Flow Area	1.81	ft ²
Wetted Perimeter	4.96	ft
Top Width	4.76	ft
Critical Depth	0.48	ft
Critical Slope	0.112379	ft/ft
Velocity	1.99	ft/s
Velocity Head	0.06	ft
Specific Energy	0.69	ft
Froude Number	0.57	
Flow is subcritical.		

Cross Section TD2 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	TD2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.070
Channel Slope	0.034000 ft/ft
Depth	0.63 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.60 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: ft./sec. (table 8.05a)

Assume $n = 0.07$

Flow Area = 1.81 Wetted Perimeter = 4.96 Velocity = 1.99 ft/s

$$V_r = (1.81 / 4.96) \times 1.99 = 0.73$$

$V_r = 0.73$ Refer to figure 8.05c $n \approx 0.07$

Velocity < 2.0 ft/s \therefore Temporary Lining is not Required

TD3
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	TD3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

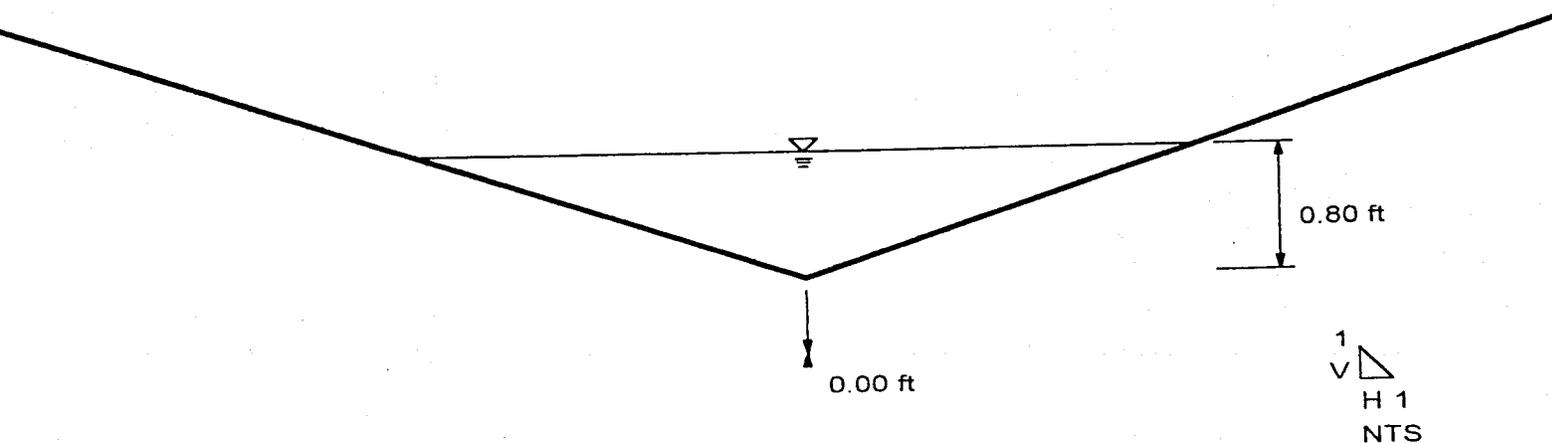
Input Data	
Mannings Coefficient	0.150
Channel Slope	0.008000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	0.90 cfs

Results	
Depth	0.80 ft
Flow Area	1.93 ft ²
Wetted Perimeter	5.08 ft
Top Width	4.82 ft
Critical Depth	0.35 ft
Critical Slope	0.626218 ft/ft
Velocity	0.47 ft/s
Velocity Head	0.34e-2 ft
Specific Energy	0.81 ft
Froude Number	0.13
Flow is subcritical.	

Cross Section TD3
Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.150
Channel Slope	0.008000 ft/ft
Depth	0.80 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	0.90 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.15$

$$\text{Flow Area} = 1.93 \text{ ft}^2 \quad \text{Wetted Perimeter} = 5.08 \text{ ft} \quad \text{Velocity} = 0.47 \text{ ft/s}$$

$$V_r = (1.93 / 5.08) \times 0.47$$

$$V_r = 0.17 \quad \text{Refer to figure 8.05c} \quad n \approx 0.15$$

Velocity $< 2.0 \text{ ft/s} \therefore$ Temporary Lining not Required

Job Name Highway 55 CTD Landfill Job No. MC1117 Date 4/4/02 Sheet 34
 Subject Phase I Erosion + Sed. Mgmt. Control By TPD Chk By _____

Temporary Drainage Ditch Design

TD1 Drainage Area = 0.18 Acres $C = 0.9$

$$Q_{10} = C I a \quad I = 7.2 \text{ in/hr}$$

$$Q_{10} = (0.9 \times 7.2 \times 0.18) \quad T_c = 5 \text{ min}$$

$$Q_{10} = 1.17 \text{ cfs}$$

Temporary Drainage Ditch Design

TD2 Drainage Area = 0.56 Acres $C = 0.9$

$$I = 7.2 \text{ in/hr} \quad T_c = 5 \text{ min}$$

$$Q_{10} = (0.9 \times 7.2 \times 0.56)$$

$$Q_{10} = 3.6 \text{ cfs}$$

Temporary Drainage Ditch Design

TD3 Drainage Area = 0.14 Acres $C = 0.9$

$$I = 7.2 \text{ in/hr} \quad T_c = 5 \text{ min}$$

$$Q_{10} = C I a$$

$$Q_{10} = (0.9 \times 7.2 \times 0.14)$$

$$Q_{10} = 0.9 \text{ cfs}$$

Temporary Drainage Ditch Design

TD4 Drainage Area = 0.12 Acres $C = 0.9$ $I = 7.2 \text{ in/hr}$
 $T_c = 5 \text{ min}$

$$Q_{10} = C I a$$

$$Q_{10} = (0.9 \times 7.2 \times 0.12)$$

$$Q_{10} = 0.78 \text{ cfs}$$

TD4
Worksheet for Triangular Channel

Project Description	
Project File	p:\iddprojects\m01117\dwg\ditches.fm2
Worksheet	TD4
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

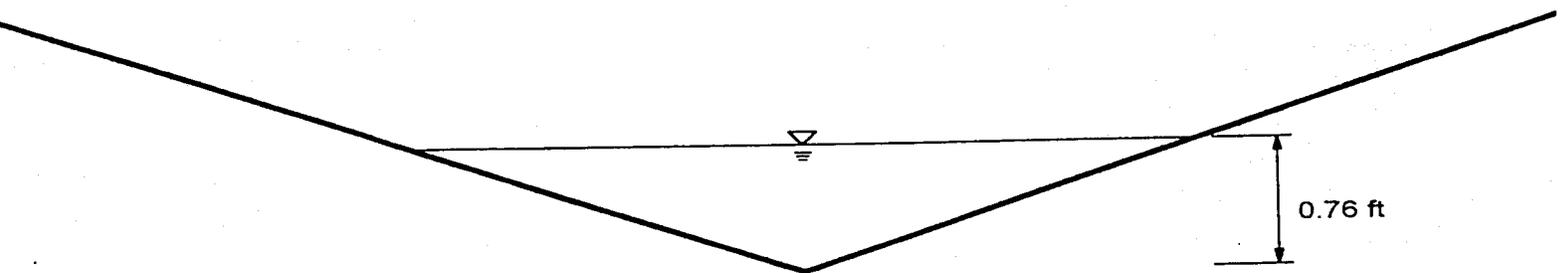
Input Data	
Mannings Coefficient	0.150
Channel Slope	0.008000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Discharge	0.78 cfs

Results		
Depth	0.76	ft
Flow Area	1.74	ft ²
Wetted Perimeter	4.81	ft
Top Width	4.57	ft
Critical Depth	0.33	ft
Critical Slope	0.638282	ft/ft
Velocity	0.45	ft/s
Velocity Head	0.31e-2	ft
Specific Energy	0.76	ft
Froude Number	0.13	
Flow is subcritical.		

Cross Section TD4
 Cross Section for Triangular Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	TD4
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.150
Channel Slope	0.008000 ft/ft
Depth	0.76 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Discharge	0.78 cfs



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Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.15$

Flow Area = 1.74 ft² Wetted Perimeter = 4.81 ft Velocity = 0.45 ft/s

$$V_r = (1.74 / 4.81) \times 0.45 = 0.16$$

$V_r = 0.16$ Refer to figure 8.05c $n \approx 0.15$

velocity < 2.0 ft/s \therefore Temporary Lining is not Required

Job Name Highway 55 C-D Landfill Job No. M01117 Date 4/13/02 Sheet 38
 Subject Phase I Erosion + Sediment Control By TPD Chk By _____

Temporary Drainage Ditch Design

TDS Drainage Area = 1.06 Acres $I = 7.2 \text{ in/hr}$
 $T_c = 5 \text{ min}$

$$C = \frac{(0.9 \times 0.18) + (0.45 \times 0.88)}{1.06} = 0.52$$

$$Q_{10} = C i a$$

$$Q_{10} = (0.52 \times 7.2 \times 1.06)$$

$$Q_{10} = 4.0 \text{ cfs}$$

Temporary Lining Design TDS

Drainage Area = 1.06 $I = 6.6 \text{ in/hr}$ $T_c = 5 \text{ min}$
 $C = 0.52$

$$Q_2 = C i a$$

$$Q_2 = (0.52 \times 6.6 \times 1.06)$$

$$Q_2 = 3.6 \text{ cfs}$$

$$n = 0.033$$

Shear Stress - Permissible = 1.45 lb/ft^2

$$T = 4 \text{ DS}$$

$$T = 62.4 \times 0.44 \times 0.036$$

$$T = 0.98 \text{ lb/ft}^2$$

TD5
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	TD5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

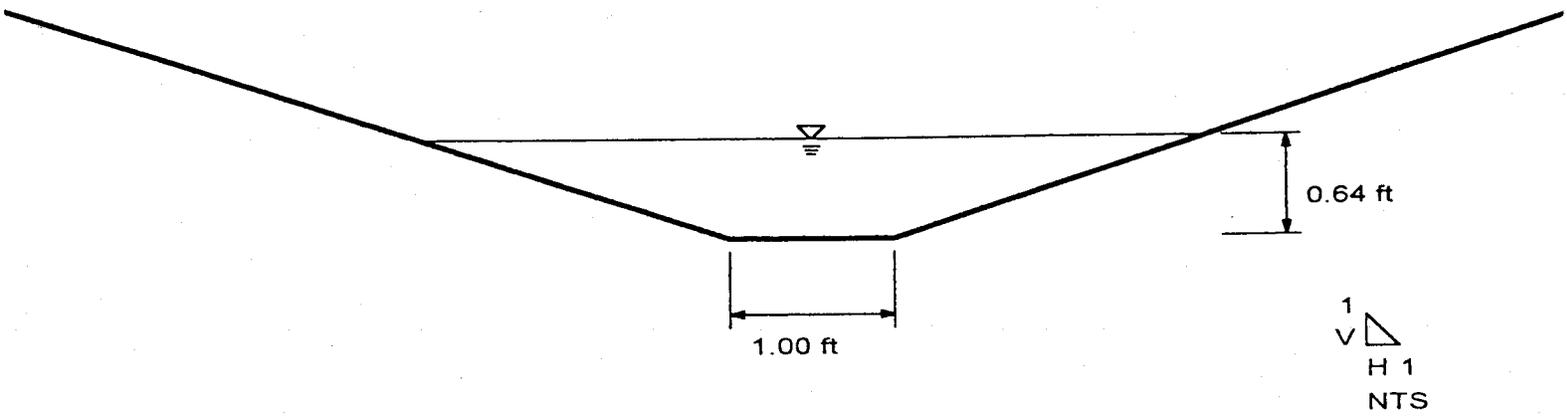
Input Data	
Mannings Coefficient	0.068
Channel Slope	0.036000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	4.00 cfs

Results	
Depth	0.64 ft
Flow Area	1.87 ft ²
Wetted Perimeter	5.05 ft
Top Width	4.84 ft
Critical Depth	0.50 ft
Critical Slope	0.104572 ft/ft
Velocity	2.14 ft/s
Velocity Head	0.07 ft
Specific Energy	0.71 ft
Froude Number	0.61
Flow is subcritical.	

Cross Section TD5 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.068
Channel Slope	0.036000 ft/ft
Depth	0.64 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	4.00 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.068$

Flow Area = 1.87 ft² Wetted Perimeter = 5.05 ft Velocity = 2.14 ft/s

$$V_r = (1.87 / 5.05) \times 2.14$$

$V_r = 0.79$ Refer to Figure 8.05c $n \approx 0.068$

Velocity > 2.14 ft/s \therefore Temporary Lining is Required

TD5-STRAW W/ NET LINING
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD5-TEMPORARY LINING
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.033
Channel Slope	0.036000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.60 cfs

Results	
Depth	0.44 ft
Flow Area	1.01 ft ²
Wetted Perimeter	3.77 ft
Top Width	3.63 ft
Critical Depth	0.48 ft
Critical Slope	0.024978 ft/ft
Velocity	3.56 ft/s
Velocity Head	0.20 ft
Specific Energy	0.63 ft
Froude Number	1.19
Flow is supercritical.	

TD6
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\dddprojects\m01117\dwg\ditches.fm2
Worksheet	TD6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

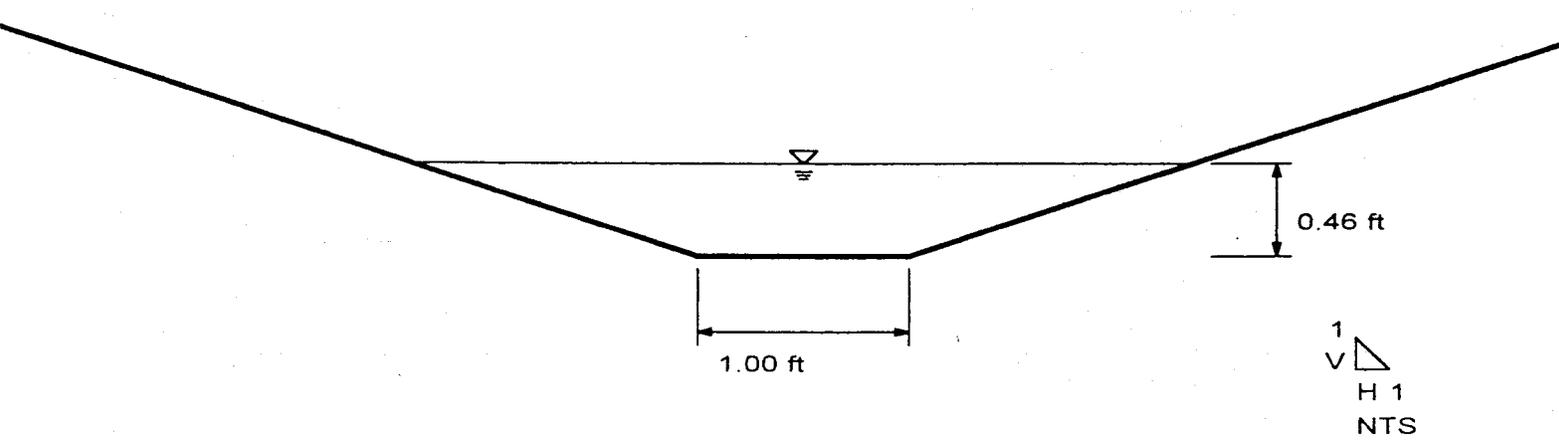
Input Data		
Mannings Coefficient	0.080	
Channel Slope	0.029000 ft/ft	
Left Side Slope	3.000000 H : V	
Right Side Slope	3.000000 H : V	
Bottom Width	1.00	ft
Discharge	1.46	cfs

Results		
Depth	0.46	ft
Flow Area	1.08	ft ²
Wetted Perimeter	3.89	ft
Top Width	3.74	ft
Critical Depth	0.30	ft
Critical Slope	0.165893 ft/ft	
Velocity	1.35	ft/s
Velocity Head	0.03	ft
Specific Energy	0.49	ft
Froude Number	0.44	
Flow is subcritical.		

Cross Section TD6 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	TD6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.080
Channel Slope	0.029000 ft/ft
Depth	0.46 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	1.46 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.08$

Flow Area = 1.08 ft² Wetted Perimeter = 3.89 ft Velocity = 1.35 ft/s

$$V_r = (1.08 / 3.89) \times 1.35$$

$V_r = 0.37$ Refer to Figure 8.05c $n \approx 0.08$

Velocity < 2.0 ft/s \therefore Temporary Lining is not Required.

TD7
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ ditches . fm2
Worksheet	TD7
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

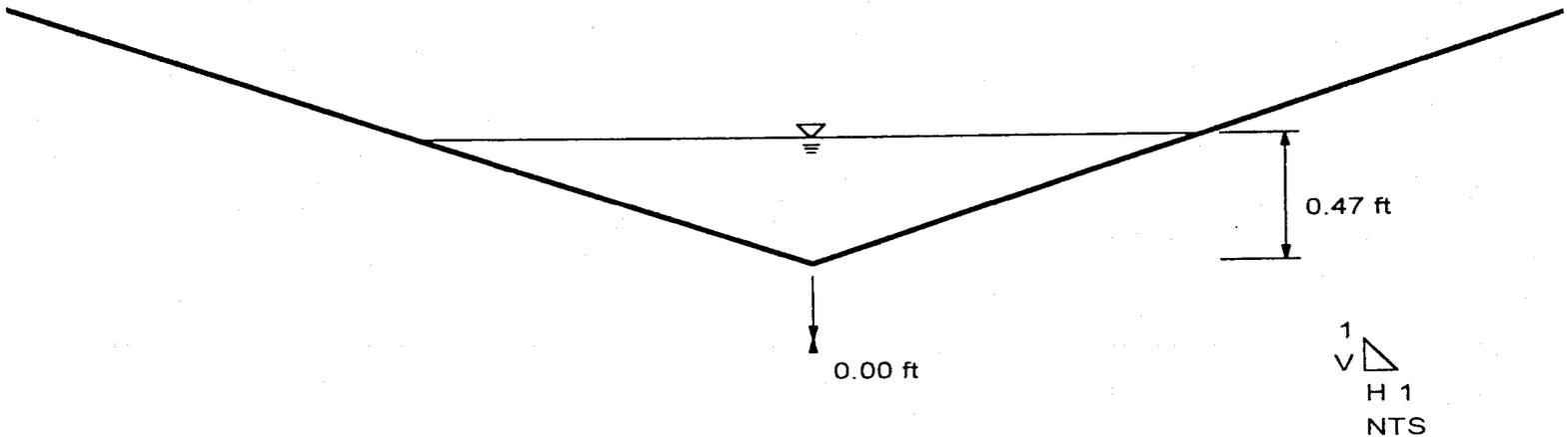
Input Data	
Mannings Coefficient	0.100
Channel Slope	0.036000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	0.70 cfs

Results	
Depth	0.47 ft
Flow Area	0.67 ft ²
Wetted Perimeter	2.99 ft
Top Width	2.84 ft
Critical Depth	0.32 ft
Critical Slope	0.287806 ft/ft
Velocity	1.04 ft/s
Velocity Head	0.02 ft
Specific Energy	0.49 ft
Froude Number	0.38
Flow is subcritical.	

Cross Section TD7
Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	TD7
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.100
Channel Slope	0.036000 ft/ft
Depth	0.47 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	0.00 ft
Discharge	0.70 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.1$

$$\text{Flow Area} = 0.67 \text{ ft}^2 \quad \text{Wetted Perimeter} = 2.99 \text{ ft} \quad \text{Velocity} = 1.04$$

$$V_r = (0.67 / 2.99) \times 1.04 = 0.23$$

$V_r = 0.23$ Refer to Figure 8.05c $n \approx 0.1$

Velocity < 2.0 ft/s \therefore Temporary Lining is not Required

Job Name Hwy 55 C+D LANDFILL Job No. MO1117 Date 4/8/02 Sheet 49
 Subject Phase 1 Erosion + Sediment Control By TPD Chk By _____

Temporary Drainage Ditch Design
 TD6 Drainage Area = 0.39 Acres $I = 7.2 \text{ in/hr}$

$$C = \frac{(0.06 \times 0.9) + (0.33 \times 0.45)}{0.39} = 0.52$$

$$Q_{10} = C i a$$

$$Q_{10} = (0.52 \times 7.2 \times 0.39)$$

$$Q_{10} = 1.46 \text{ cfs}$$

Temporary Drainage Ditch Design

TD7 Drainage Area = 0.16 Acres $I = 7.2 \text{ in/hr}$

$$C = \frac{(0.05 \times 0.9) + (0.11 \times 0.45)}{0.16}$$

$$T_c = 5 \text{ min.}$$

$$C = 0.59$$

$$Q_{10} = C i a$$

$$Q_{10} = (0.59 \times 7.2 \times 0.16)$$

$$Q_{10} = 0.7 \text{ cfs}$$

Temporary Drainage Ditch Design

TD8 Drainage Area = 0.22 Acres $I = 7.2 \text{ in/hr}$

$$C = 0.9$$

$$T_c = 5 \text{ min}$$

$$Q_{10} = C i a$$

$$Q_{10} = (0.9 \times 7.2 \times 0.22)$$

$$Q_{10} = 1.4 \text{ cfs}$$

TD8
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects\m01117\dwg\ditches.fm2
Worksheet	TD8
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

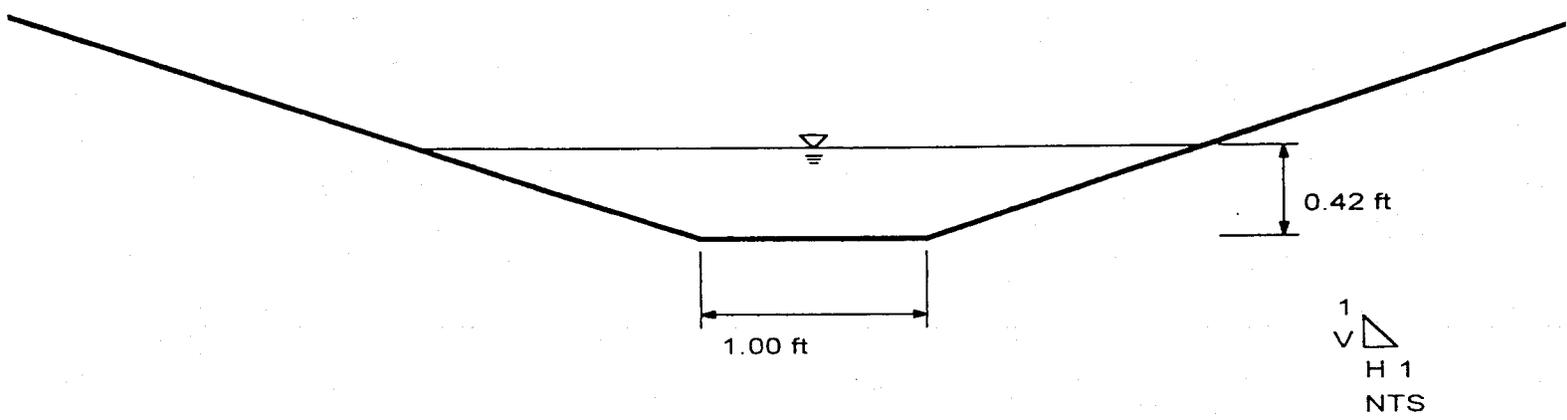
Input Data	
Mannings Coefficient	0.095
Channel Slope	0.056000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	1.40 cfs

Results	
Depth	0.42 ft
Flow Area	0.93 ft ²
Wetted Perimeter	3.63 ft
Top Width	3.49 ft
Critical Depth	0.29 ft
Critical Slope	0.235317 ft/ft
Velocity	1.50 ft/s
Velocity Head	0.03 ft
Specific Energy	0.45 ft
Froude Number	0.51
Flow is subcritical.	

Cross Section TD8
 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	TD8
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.095
Channel Slope	0.056000 ft/ft
Depth	0.42 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	1.40 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.095$

$$\text{Flow Area} = 0.93 \text{ ft}^2 \quad \text{Wetted Perimeter} = 3.63 \text{ ft} \quad \text{Velocity} = 1.5 \text{ ft/s}$$
$$v_r = (0.93 / 3.63) \times 1.5 =$$

$v_r = 0.38$ Refer to figure 8.05c $n \approx 0.095$

Velocity $< 2.0 \text{ ft/s} \therefore$ Temporary Lining is not Required

Job Name Hwy 55 C+D Landfill Job No. M01117 Date 4/10/02 Sheet 53Subject Phase 1 Sediment + Erosion Control Plan By TFL Chk By _____

Temporary Drainage Ditch Design TD9

Drainage Area = 1 acre $C = 0.45$ $I = 7.2 \text{ In/hr}$ $T_c = 5 \text{ min}$

$$Q_{10} = CIA$$

$$Q_{10} = (0.45 \times 7.2 \times 1)$$

$$Q_{10} = 3.24 \text{ cfs}$$

Temporary Drainage Ditch Design TD10

Flow for TD10 = (Flow For TD4) + (Flow For TD5)
+ (Flow For TD3) + (Flow For TD2)

$$Q_{10} \text{ for TD10} = 0.78 + 4.0 + 0.9 + 3.6 = 9.28 \text{ cfs}$$

$$Q_2 \text{ for TD10} = (0.9 \times 6.6 \times 0.56) + (0.9 \times 6.6 \times 0.14)$$

$$+ (0.9 \times 6.6 \times 0.12) + (0.52 \times 6.6 \times 1.06)$$

$$Q_2 - \text{TD10} = 8.5 \text{ cfs}$$

TD9
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\laddprojects\m01117\dwg\ditches.fm2
Worksheet	TD9
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

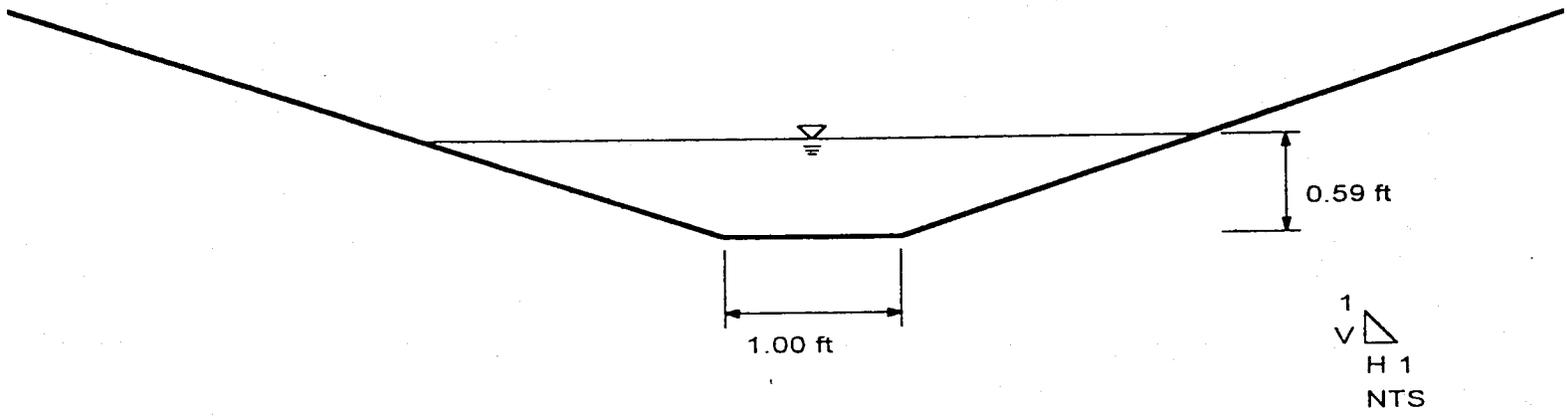
Input Data	
Mannings Coefficient	0.070
Channel Slope	0.036000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.24 cfs

Results	
Depth	0.59 ft
Flow Area	1.63 ft ²
Wetted Perimeter	4.73 ft
Top Width	4.54 ft
Critical Depth	0.45 ft
Critical Slope	0.113976 ft/ft
Velocity	1.98 ft/s
Velocity Head	0.06 ft
Specific Energy	0.65 ft
Froude Number	0.58
Flow is subcritical.	

Cross Section TD9
 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ddprojects\m01117\dwg\ditches.fm2
Worksheet	TD9
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.070
Channel Slope	0.036000 ft/ft
Depth	0.59 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.24 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: ft./sec. (table 8.05a)

Assume $n = 0.070$

$$\text{Flow Area} = 1.63 \text{ ft}^2 \quad \text{Wetted Perimeter} = 4.73 \text{ ft} \quad \text{Velocity} = 1.98 \text{ ft/s}$$

$$V_r = (1.63 / 4.73) \times 1.98 =$$

$$V_r = 0.68 \quad \text{Refer to figure 8.05c} \quad n \approx 0.07$$

Velocity $< 2.0 \text{ ft/s}$ \therefore Temporary Lining is not Required

TD10
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ addedprojects\m01117\dwg\ditches.fm2
Worksheet	TD10
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

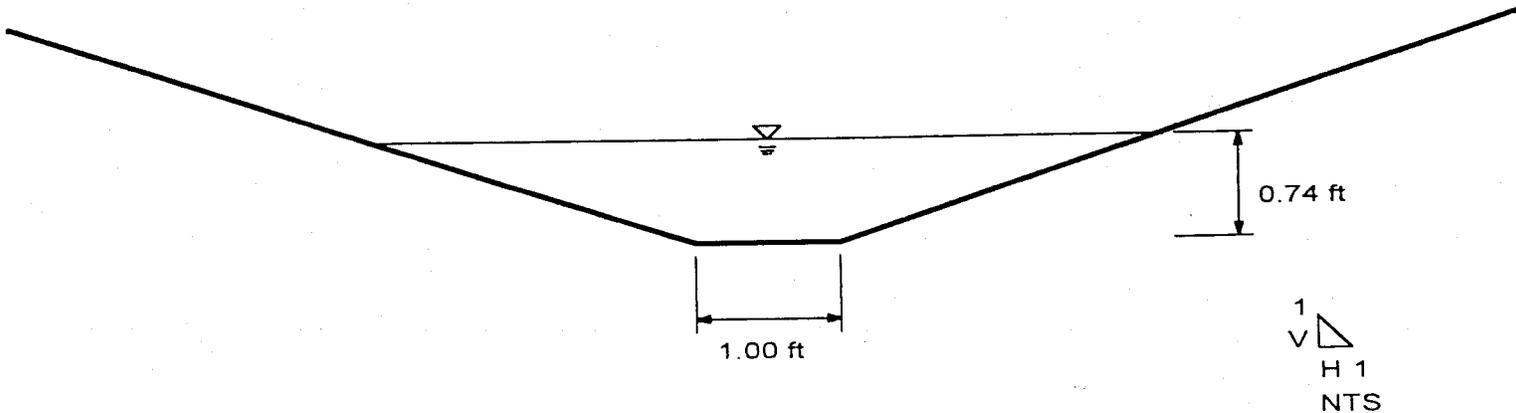
Input Data	
Mannings Coefficient	0.050
Channel Slope	0.054000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	9.28 cfs

Results	
Depth	0.74 ft
Flow Area	2.39 ft ²
Wetted Perimeter	5.69 ft
Top Width	5.45 ft
Critical Depth	0.75 ft
Critical Slope	0.050564 ft/ft
Velocity	3.88 ft/s
Velocity Head	0.23 ft
Specific Energy	0.98 ft
Froude Number	1.03
Flow is supercritical.	

Cross Section TD10
 Cross Section for Trapezoidal Channel

Project Description	
Project File	p:\ addedprojects\m01117\dwg\ditches.fm2
Worksheet	TD10
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.050
Channel Slope	0.054000 ft/ft
Depth	0.74 ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	9.28 cfs



Retardance class D (Tall Fescue - Table 8.05c)

Maximum Permissible Velocity: 4.5 ft./sec. (table 8.05a)

Assume $n = 0.05$

Flow Area = 2.39 ft² Wetted Perimeter = 5.69 ft Velocity = 3.88 ft/s

$$V_r = (2.39 / 5.69) \times 3.88$$

$V_r = 1.6$ Refer to figure 8.05c $n \approx 0.05$

Velocity > 2.0 ft/s \therefore Temporary Lining is Required

SYNTHETIC MAT TD10 Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ltdprojects\m01117\dwg\ditches.fm2
Worksheet	TD 10 TEMPORARY LINING
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.025
Channel Slope	0.054000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	8.50 cfs

Results	
Depth	0.52 ft
Flow Area	1.34 ft ²
Wetted Perimeter	4.30 ft
Top Width	4.13 ft
Critical Depth	0.72 ft
Critical Slope	0.012789 ft/ft
Velocity	6.35 ft/s
Velocity Head	0.63 ft
Specific Energy	1.15 ft
Froude Number	1.96
Flow is supercritical.	

PERMISSIBLE SHEAR STRESS: 2.00 lbs/ft (table 8.05g)

Nvalue=0.025 (table 8.05e)

T=YDS

$$T = (62.4) \times (0.52) \times (0.054)$$

$$T = 1.75 \text{ lb/ft}^2 \quad \text{OK}$$

PATTERSON, BREWER & ASSOCIATES, P.A.

Job Name Hwy 55 C+D LF Job No. M0117 Date 5/6/02 Sheet _____
 Subject Final Cover Stormwater Measures By TPD Chk By DEB

FC 6 Drainage Area = 2.8 Acres $Q_{10} = 7.2 \text{ In/hr}$
 $Q_{10} = (0.3 \times 7.2 \times 2.8)$ $T_c = 5 \text{ min}$
 $Q_{10} = 6.05 \text{ cfs}$ Slope = 33%
 $C = 0.3$

Armor Form[®] Uniform Section Mat (USM)

For 3" Thickness

Permissible Velocity = 13.5 ft/s

Velocity = 13.24 ft/s OK

Note: See Attached Flowmaster worksheet
 and Product Information sheets

FC 7 Drainage Area = 4.2 Acres $Q_{10} = 7.2 \text{ In/hr}$
 $Q_{10} = (0.3 \times 7.2 \times 4.2)$ $T_c = 5 \text{ min}$
 $Q_{10} = 9.07 \text{ cfs}$ Slope = 33%
 $C = 0.3$

Armor Form[®] Uniform Section Mat (USM)

For 3" Thickness

Permissible Velocity = 13.5 ft/s

Velocity = 13.11 ft/s OK

Note: See Attached Flowmaster worksheet
 and Product Information sheets

ARMORFORM (3" USM)
Worksheet for Trapezoidal Channel

Project Description

Project File	p:\ added projects \ m01117 \ dwg \ fcditch. fm2
Worksheet	FC 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.015
Channel Slope	0.330000 ft/ft
Left Side Slope	5.000000 H : V
Right Side Slope	5.000000 H : V
Bottom Width	3.00 ft
Discharge	6.48 cfs

Results

Depth	0.13	ft
Flow Area	0.49	ft ²
Wetted Perimeter	4.36	ft
Top Width	4.33	ft
Critical Depth	0.41	ft
Critical Slope	0.005004	ft/ft
Velocity	13.24	ft/s
Velocity Head	2.72	ft
Specific Energy	2.86	ft
Froude Number	6.95	

Flow is supercritical.

ARMOFORM (3" USM)
Worksheet for Trapezoidal Channel

Project Description

Project File	p:\ added projects \ m01117 \ dwg \ fcditch . fm2
Worksheet	FC 5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data

Mannings Coefficient	0.015
Channel Slope	0.330000 ft/ft
Left Side Slope	3.000000 H : V
Right Side Slope	3.000000 H : V
Bottom Width	1.00 ft
Discharge	3.02 cfs

Results

Depth	0.15	ft
Flow Area	0.23	ft ²
Wetted Perimeter	1.98	ft
Top Width	1.93	ft
Critical Depth	0.44	ft
Critical Slope	0.005283	ft/ft
Velocity	13.39	ft/s
Velocity Head	2.79	ft
Specific Energy	2.94	ft
Froude Number	6.90	

Flow is supercritical.

ARMORFORM (3" USM)
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\ added projects \ m01117 \ dwg \ fcditch . fm2
Worksheet	FC 6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.015
Channel Slope	0.330000 ft/ft
Left Side Slope	4.000000 H : V
Right Side Slope	4.000000 H : V
Bottom Width	3.00 ft
Discharge	6.05 cfs

Results	
Depth	0.13 ft
Flow Area	0.46 ft ²
Wetted Perimeter	4.07 ft
Top Width	4.04 ft
Critical Depth	0.41 ft
Critical Slope	0.004973 ft/ft
Velocity	13.24 ft/s
Velocity Head	2.72 ft
Specific Energy	2.85 ft
Froude Number	6.94
Flow is supercritical.	

UNIFORM SECTION MAT (USM)

TYPICAL DIMENSIONS, WEIGHTS AND VOLUMES

(Values shown are typical only, and will vary with field conditions.)



Uniform Section Size	Cord Spacing	Nominal Thickness	Weight/ Sq. Ft.	Coverage/ Cu. Yd. Concrete	Availability
3" USM	3" x 3"	3.0"	35 lbs.	97 ft. ³	Inventory
4" USM	3" x 3"	4.0"	47 lbs.	73 ft. ³	Inventory
6" USM	3" x 4"	6.0"	70 lbs.	49 ft. ³	Inventory
8" USM	3" x 5"	8.0"	93 lbs.	36 ft. ³	Special Order

PRODUCT DESCRIPTION

Uniform Section Mat (USM) is formed with a double-layer woven fabric, joined together by spacer cords and engineered exclusively to serve as a form for casting concrete erosion control linings. The fabric forms are positioned on the area to be protected, where they are filled with a pumpable fine aggregate concrete (structural grout).

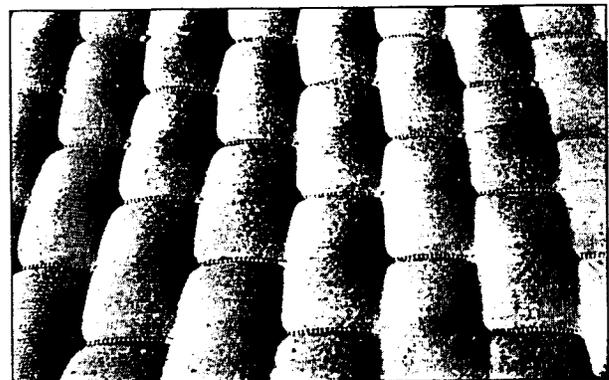
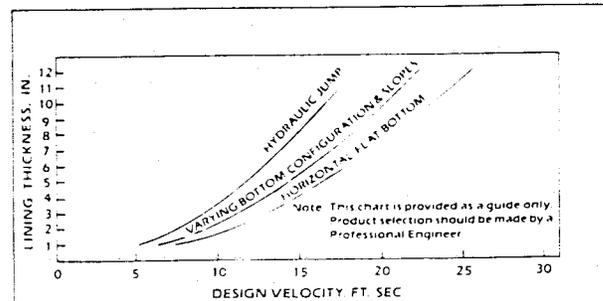
Uniform Section Mat fabric is woven from polypropylene slit film yarns, and designed with the required strength, stability, and filtration characteristics of a superior fabric form. The fabric forms are constructed with spacer cords on closely spaced centers to form a lining of required nominal thickness, bonded cobbled surface, and specified weight to provide strength and erosion protection. The design criterion for selection of lining thickness is the same as that used to determine the thickness of conventional concrete slope paving.

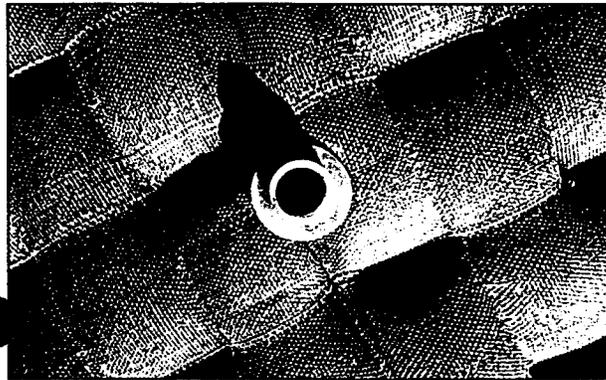
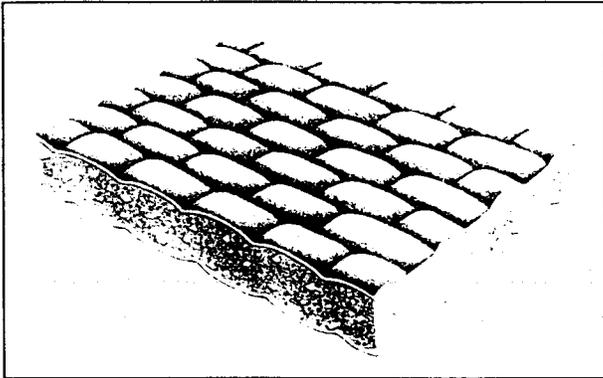
Relief of hydrostatic uplift pressure, caused by entrapped and ground water, may be provided by inserting plastic weep tubes through the mat at specified centers. When weep tubes are used, the lower end of the weep tube should be covered by filter fabric or the mat should be placed over filter fabric.

At Nicolon's fabrication facilities, Uniform Section Mat fabric in mill width rolls is factory fabricated into multiple mill width panels, designed to fit site dimensions and topography.

Panels are delivered to the job site where the installer assembles the panels into a continuous concrete forming system. Fabric forms contract as they are pumped with a structural grout. Allowance must be made for this contraction in estimating the quantity of fabric form required. Nicolon should be contacted to determine the appropriate contraction factors for your site conditions.

VELOCITY -VS- THICKNESS

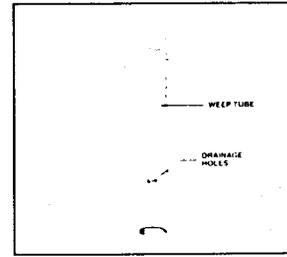
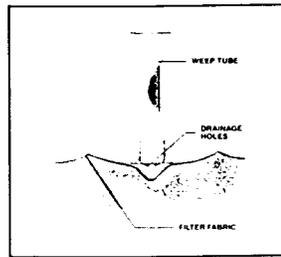




DESIGN CONSIDERATIONS

- Uniform Section Mat (USM) is used where velocities are low, bedload and ice formations are light, and roughness coefficient, $n = 0.015$, is required.
- Uniform Section Mat (USM) is used where wave action and ice formations are light.
- Uniform Section Mat (USM) reduces seepage losses in reservoirs, ponds, holding basins, and channels.
- Uniform Section Mat (USM) is ideal for underwater placement.
- Uniform Section Mat (USM) is recommended for well compacted soil conditions only.

The information presented herein will not apply to every installation. Dimensions and quantities shown are approximate only and will vary as a result of site conditions and installation procedures. No warranty or guarantee expressed or implied is made regarding the performance of any product, since the manner of use and handling are beyond our control.



To relieve hydrostatic uplift pressure, specially designed weep tubes may be installed in the fabric forms prior to filling. These are normally placed on 5 to 10 feet centers, either concentrated in groups or distributed.

FINE AGGREGATE CONCRETE MIX DESIGN

1. A pumpable fine aggregate concrete (structural grout) is used in the construction of all Uniform Section Mat (USM) linings. As an aid to pumpability, a pozzolan grade fly ash may be substituted for up to 35% of the cement. Mixes designed with 5% to 8% air content will have improved pumpability and resistance to freeze-thaw. A retarding admixture may be used in hot weather.
2. Excess mixing water expelled through the permeable ARMORFORM fabric will reduce the volume of fluid structural grout from 27 cu. ft. to approximately 25 cu. ft. of hardened grout.

Typical Range of Mix Proportions

Material	Mix Proportions lbs./cu. yd.	After Placement lbs./cu. yd.
Cement	750-850	815-920
Sand	2120-2030	2275-2195
Water	540-555	460-470
Air	As Required	

3. Fine aggregate concrete (structural grout) consistency should be in the 9-11 second range when passed through the $\frac{3}{4}$ " orifice of the standard flow cone described in ASTM C-939-80. Tests utilizing a concrete slump cone are not appropriate.

ARMORFORM® is a NICOLON® product.
 U.S. Patent No. 4,502,815 and 4,449,847
 Other U.S. and foreign patents issued and pending

NICOLON
 CORPORATION

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 Suite 300
 Norcross, GA 30071
 Telephone (404) 447-6272
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Europe
 Nicolon
 Almeto/Holland
 Telephone 30-44811
 Telex 44811

1.0 GENERAL

1.1 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, and incidentals required to perform all operations in connection with the installation of the proposed Uniform Section Mat (USM) lining in accordance with the lines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

1.2 DESCRIPTION

The work shall consist of installing an unreinforced concrete mat lining, by positioning a specially woven double-layer synthetic fabric form on the surface to be protected and filling it up with a pumpable fine aggregate concrete (structural grout) in such a way as to form a stable mat of required thickness, weight and configuration.

2.0 MATERIALS

2.1 FINE AGGREGATE CONCRETE

Fine aggregate concrete shall consist of a mixture of portland cement, fine aggregate (sand), and water so proportioned and mixed as to provide a pumpable grout. Pozzolan and grout fluidifier conforming to these Specifications may be used at the option of the Contractor. The mix shall exhibit a compressive strength of 2,000 psi at 28 days when made and tested in accordance with ASTM C-31 and C-39.

Note: The average compression strength of ARMORFORM cast fine aggregate concrete shall be at least 20% higher at 7 days than that of the companion test cylinders made in accordance with ASTM C-31, and not less than 2,500 psi at 28 days.

2.1.1 Portland cement shall conform to ASTM C-150, Type I or Type II.

2.1.2 Fine aggregate shall conform to ASTM C-33, except as to grading. Aggregate grading shall be reasonably consistent and shall be well graded from the maximum size which can be conveniently handled with available pumping equipment.

2.1.3 Water for mixing shall be clean and free from injurious amounts of oil, acid, salt, alkali, organic matter or other deleterious substances.

2.1.4 Pozzolan, if used, shall conform to ASTM C-350.

2.2 FABRIC FORM

The fabric forms shall be, as specified, ARMORFORM *note a* Uniform Section Mat as manufactured by Nicolon Corporation, or approved equal. Each layer of fabric shall meet the statistical mean (average) results as shown below.

Property	Test Method	Unit	Values USM
Physical:			
Composition			PP ¹
Weight (double-layer)	ASTM D-3776-79	oz/lyd	10
Thickness	ASTM D-1777-75	mils	20
Mill Width		in	84/172

Property	Test Method	Unit	Values USM
Mechanical:			
Grab Tensile Strength	ASTM D-1682-75	lbs	
Warp			200
Fill			200
Grab Tensile Elongation	ASTM D-1682-75	%	
Warp			20
Fill			20
Diaphragm Burst Strength	ASTM D-3786-80 a	psi	475
Trapezoid Tear Strength	ASTM D-1117-80	lbs	
Warp			65
Fill			75
Puncture Strength	ASTM D-3787-80	lbs	60
Hydraulic:			
Water Flow Rate	ASTM D-4491	gal/min/ft ²	80
Coefficient of Permeability (k)	ASTM D-4491	cm/sec	0.05
Permittivity (k ₁)	ASTM D-4491	1/sec	1.0
Porosity	ASTM D-737-75	cf/min/ft ²	125
Spacer Cord:			
Break Strength	ASTM D-2256	lbs/cord	135 (2)

¹ PP - Polypropylene

The Contractor shall furnish the Engineer, in duplicate, manufacturer's certified test results showing actual test values obtained when the above physical properties were tested for compliance with the Specifications.

Note a: The Engineer shall indicate the Uniform Section Mat size required. Example: 4" USM.

2.2.1 Fabric form material shall consist of double-layer woven fabric joined together by spacer cords, of uniform length, to produce a mat with a finished nominal thickness of *note b* inches, and a nominal weight of *note b* lbs./ft.². Spacer cords shall connect two layers of fabric on *note c* centers. Points of connection shall be staggered to provide a bonded cobbled surface appearance.

Note b: The Engineer shall indicate the nominal mat thickness and weight/sq. ft. for the Uniform Section Mat required.

Note c: The Engineer shall indicate the cord spacing for the Uniform Section Mat required.

2.2.2 Individual mill width rolls of fabric form shall be a minimum width of 84 inches. Mill width rolls shall be cut to the length required, and the two layers of fabric separately joined bottom edge to bottom edge, and top edge to top edge by means of sewing thread, to form multiple mill width panels. All factory sewn seams shall be downward facing as shown on the Contract Drawing. The grab tensile strength of all sewn seams shall be not less than 100 lbs./in. when tested in accordance with ASTM D-1692-75.

2.2.3 Grout stops shall be installed at predetermined, mill width, intervals to regulate the flow of fine aggregate concrete.

2.2.4 Plastic weep tubes, for relief of hydrostatic uplift pressure, shall be inserted through the mat, at *note d* foot centers, at locations shown on the Contract Drawings. Where weep tubes are required, the

lower end of the weep tube shall be covered by filter fabric held securely in place or the mat shall be placed over filter fabric as specified elsewhere in these Specifications.

Note d: Plastic weep tubes are normally inserted in Uniform Section Fabric on approximately 5' to 10' centers, or as specified by the Engineer.

2.2.5 Immediately following receipt of fabric forms to the job site, forms should be inspected and stored in a clean dry area where they will not be subject to mechanical damage, exposure to moisture or direct sunlight.

3.0 INSTALLATION

3.1 SITE PREPARATION

3.1.1 Areas on which fabric forms are to be placed shall be constructed to the lines and grades shown on the Contract Drawings. Where such areas are below the allowable grades they shall be brought to grade by placing compacted layers of selected material. The depth of layers and amount of compaction shall be as specified by the Engineer. All obstructions such as roots and projecting stones shall be removed.

3.1.2 Excavation and preparation of anchor trenches, terminal trenches, and toe trenches or aprons shall be done in accordance with the lines, grades and dimensions shown on the Contract Drawings.

3.1.3 Immediately prior to placing the fabric forms, the prepared area shall be inspected by the Engineer and no forms shall be placed thereon, until the area has been approved.

3.2 FABRIC FORM PLACEMENT

3.2.1 Fabric form panels, as specified in Section 2.2 of this Specification shall be placed within the limits shown on the Contract Drawings.

3.2.2 Adjacent fabric form panels shall be joined before fine aggregate concrete injection, by field sewing or zipping the two bottom layers of fabric together and the two top layers of fabric together. All sewn

seams shall be downward facing as shown on the Contract Drawings except with the approval of the Engineer.

3.2.3 When conventional joining of panels is impractical, or where called for on Contract Drawings, adjacent panels may be overlapped a minimum of two feet pending approval by the Engineer. In no case shall simple butt joints between panels be permitted.

3.2.4 Lap joints and expansion joints shall be provided as shown on the Contract Drawing, or as specified by the Engineer. Filter fabric with a minimum width of six feet shall be placed under all lap joints and expansion joints and shall extend continuously along the length of the joint.

3.2.5 Immediately prior to injection of fine aggregate concrete, the assembled fabric form panels shall be inspected by the Engineer and no fine aggregate concrete shall be pumped therein until the fabric seams and panel connections have been approved.

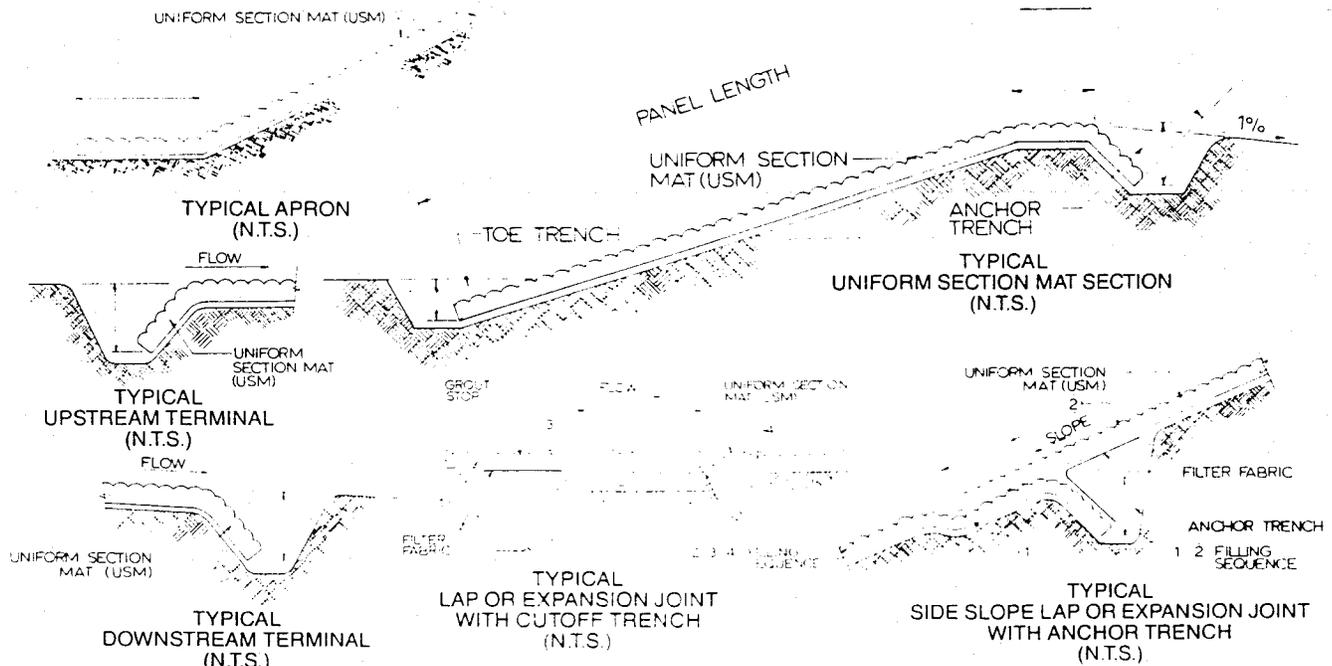
3.3 FINE AGGREGATE CONCRETE PLACEMENT

3.3.1 Following panel placement, small slits shall be cut in the top layer of the fabric form to allow for the insertion of the injection pipe. Fine aggregate concrete shall be injected between the top and bottom layers of fabric, filling the panel to the recommended thickness and configuration.

3.3.2 Fine aggregate concrete shall be injected in such a way that excessive pressure on the fabric form and cold joints are avoided.

3.3.3 Holes in the fabric left by the removal of the injection pipe shall be temporarily closed by inserting a piece of burlap or similar material. The burlap shall be removed when the concrete is no longer fluid and the concrete surface at the hole smoothed by hand. Foot traffic on the filled mat shall be restricted to an absolute minimum for one hour after pumping.

3.3.4 Upon completion of the fine aggregate concrete placement, all the anchor trenches, terminal trenches and toe trenches shall be backfilled and compacted, as specified by the Engineer.





Town of Apex

P. O. BOX 250
APEX, NORTH CAROLINA 27502

April 30, 2002

Ronald C. Gilkerson
Hwy 55 Landfill and Recycling Center
19109 West Catawba Ave.; Suite 118
Cornelius, NC 28031-5613

Dear Mr. Gilkerson:

I am writing this letter to confirm that the Apex Fire Department is aware of your project and will respond to any fire safety needs. The Fire Department has received a site plan and has knowledge of all products and their locations that will be on site. Based on the information provided, we understand the following about the project:

- The project is located on Old Smithfield Road off Highway 55 Bypass, Wake County, NC.
- The facility will be reprocessing land-clearing debris, grass clippings, loose leaves, soil components, aggregate material, and tree limbs.
- These materials will be reprocessed in windrows that will be 8-12 feet high. Windrows that are 12 feet high will require a width of 20 feet, and each windrow will be placed no closer than 25 feet apart which will provide adequate fire breaks.

If you required additional information from the Town of Apex, please contact me at 919-362-4001 or Dan LaMontagne at 919-362-8166.

Sincerely,

A handwritten signature in cursive script that reads "Alan Capps".

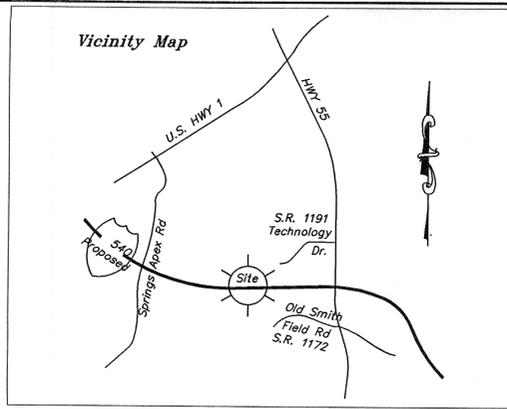
Alan Capps
Interim Chief

Cc: Dan LaMontagne, PE - Apex Public Works

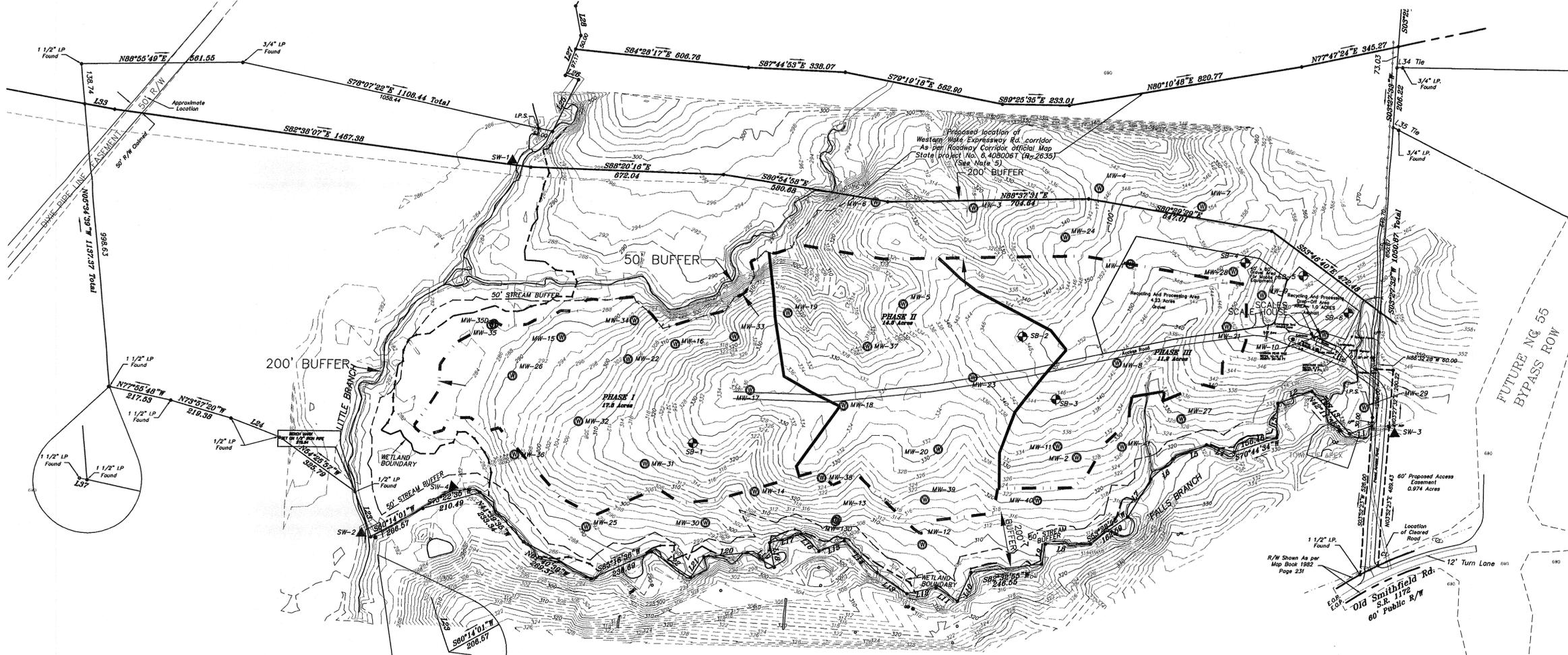


APPENDIX 2

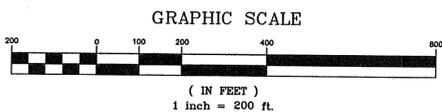
DRAWINGS



CONSTRUCTION PLAN APPLICATION HIGHWAY 55 C & D LANDFILL & RECYCLING CENTER WAKE COUNTY, NORTH CAROLINA MAY 6, 2002

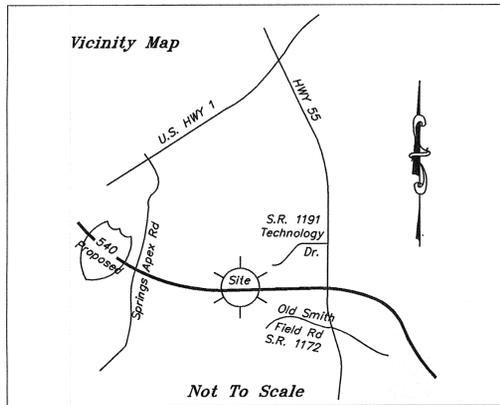


SHEET NO.	TITLE
C 1	SITE PLAN
C 2	MASTER GRADING PLAN
C 3	PHASE I GRADING PLAN
C 4	MASTER CLOSURE PLAN
C 5	PHASE I CLOSURE PLAN
C 6	PHASE I EROSION & SEDIMENT CONTROL PLAN
C 7	ENTRANCE AREA GRADING AND EROSION & SEDIMENT CONTROL PLAN
C 8	EROSION & SEDIMENT CONTROL DETAILS
C 9	PHASE I CROSS-SECTION PROFILE 1 - 1'
C 10	PHASE I CROSS-SECTION PROFILE 2 - 2'

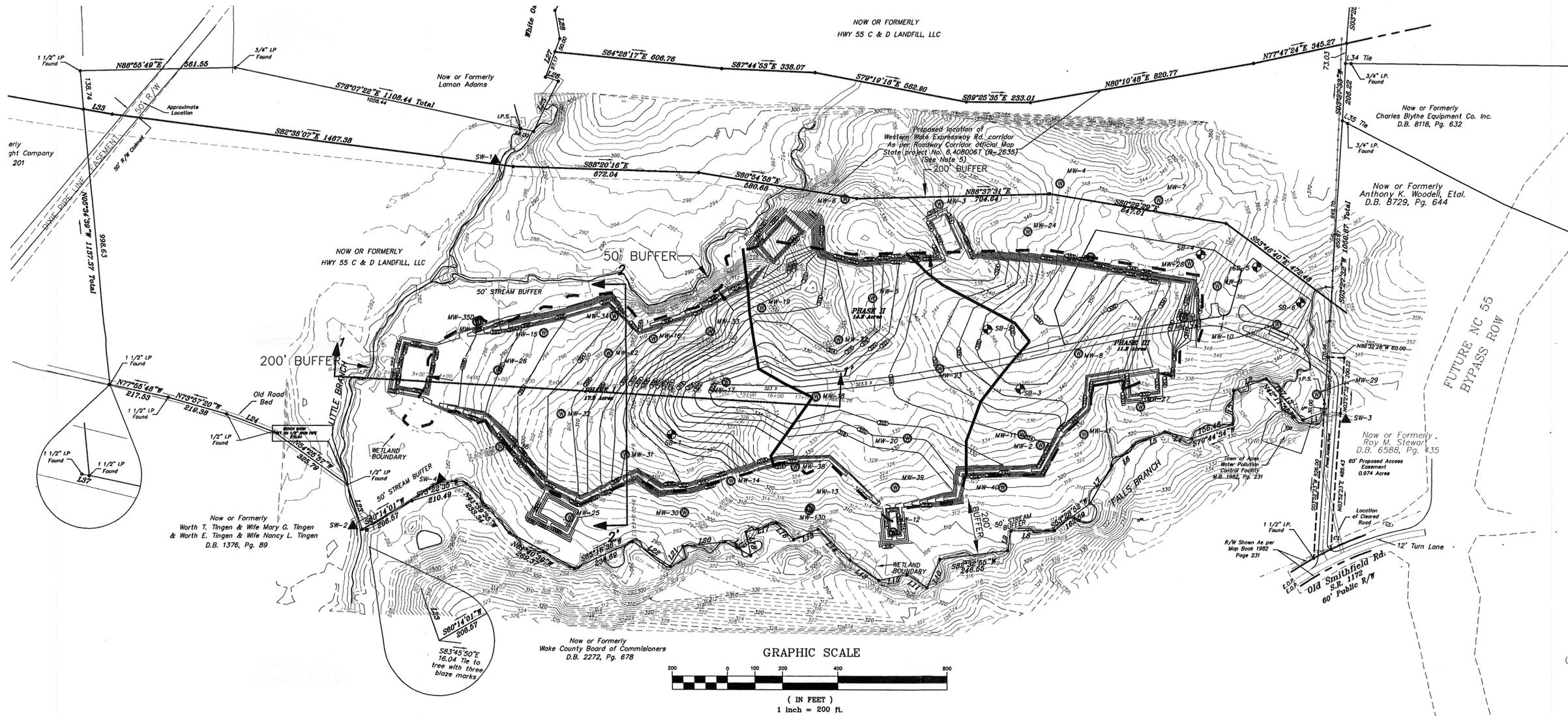


**PATTERSON
BREWER**
Associates

Engineering * Surveying * Planning
Post Office Box 1387 * Mooresville, NC 28115
704/662-0100 * Fax 704/662-0101



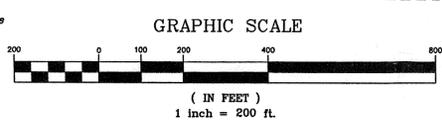
⊕ BENCHMARK	⊙ POWER POLE	○ WM WATER MAIN	RAILROAD SIGNAL	— TREE LINE	— PAINTED LINE	— DEPRESSION INT. CONTOUR
△ TRAVERSE POINT	⊙ POWER POLE W/ LIGHT	○ WV WATER VALVE	RETAINING WALL	⊙ SMALL TREE	— TRAILS (TO SCALE)	⊙ SIGN
X 2428.28 FIELD ELEVATION	○ LP LIGHT POLE	○ GM GAS METER	WATER LINE	⊙ LARGE TREE	— PAVED ROADS (TO SCALE)	○ UNIDENTIFIED OBJECT
X 2428.3 PHOTOGAMMETRIC ELEVATION	> GUIDE WIRE	○ FM PARKING METER	SEWER LINE	⊙ LARGE TREE W/ TRUNK	— INDEX CONTOURS	⊙ TRAFFIC SIGNAL
⊠ PROPERTY CORNER	○ MH MANHOLE	○ FP FLAG POLE	GAS LINE	⊙ BUSH	— DEPRESSION INDEX CONTOUR	⊙ TELEPHONE PEDESTAL
⊠ CATCH BASIN	○ FH FIRE HYDRANT	○ MB MALBOX	FENCE	⊙ PINE TREE	— INTERMEDIATE CONTOUR	⊙ ROTATING BEACON
					— MONITORING WELL	⊙ WIND SOCK



PROPOSED CONSTRUCTION AND DEMOLITION LANDFILL SITE
 USEABLE ACRES 42.9
 TOTAL ACRES 88.6

Legend

- ⊙ MW-18 = Monitoring Well Location
- ⊙ SB-3 = Soil Boring Location
- = Wetland Boundary
- = 50' Stream Buffer
- = Total Landfill Boundary
- = Usable Landfill Boundary
- = Drainage Area
- SW 3 ▲ = Surface Water Monitoring Location

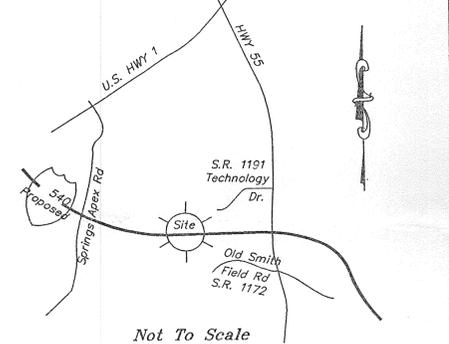


NOTES:
 FINAL GRADING PLAN & EROSION & SEDIMENT CONTROL MEASURES FOR PHASES II AND III ARE SUBJECT TO REVISIONS BASED UPON NCDENR GROUNDWATER MONITORING PLAN REVIEW AND NEW SEASONAL HIGH GROUNDWATER DATA FOR PHASES II AND III.
 THE PARCEL IS NOT LOCATED IN THE 100-YEAR FLOODWAY OR FLOODWAY FRINGE. (REFERENCE USACOE/FEMA RESTUDY WORKSHEETS (NUMBERS 296, 297, 317 & 318) AND FEMA FIRM PANELS (NUMBERS 0490, 0495, 0675 & 0660).)



PATTERSON BREWER & Associates Engineering * Surveying * Planning Post Office Box 1387 * Mooresville, NC 28115 704/662-0100 * Fax 704/662-0101	JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER MASTER SITE GRADING PLAN	
	LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD CHECKED BY: DEB
	OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	SCALE: 1" = 200' DATE OF FIELD SURVEY: 1/1/00 DATE OF MAP: 1/1/00
		JOB NUMBER: M01117 SHEET NUMBER: C 2

Vicinity Map



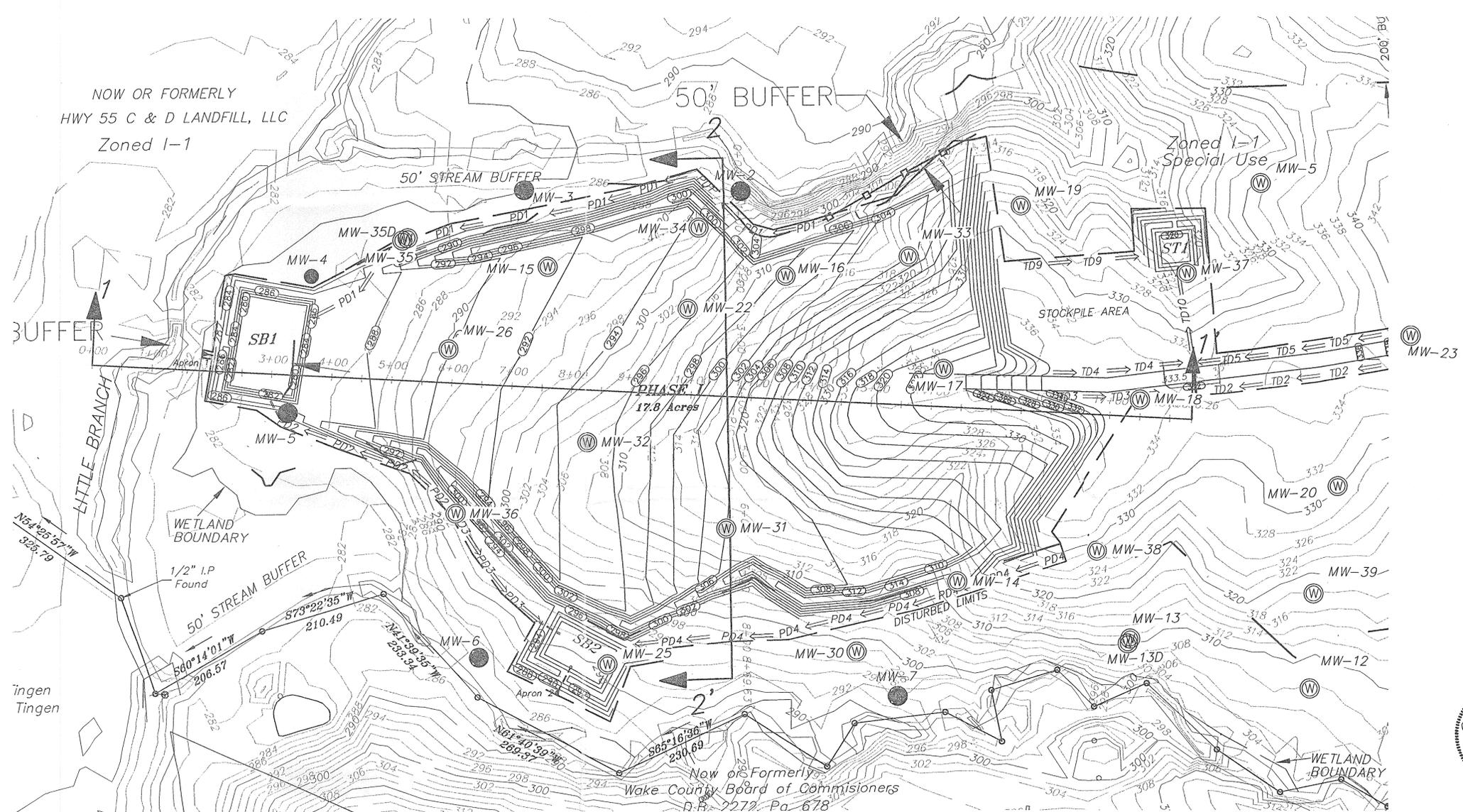
Not To Scale

GENERAL CONSTRUCTION NOTES:

1. ALL EARTH FILL TO BE COMPACTED TO MINIMUM 95% OF STANDARD PROCTOR MAXIMUM DRY DENSITY.
2. CONTRACTOR SHALL WORK WITH CAUTION DURING EARTHWORK ACTIVITIES NEAR EXISTING UTILITIES. CONTRACTOR IS RESPONSIBLE FOR CONTACTING APPROPRIATE AGENCY FOR FIELD LOCATIONS OF ALL UNDERGROUND UTILITIES BEFORE STARTING CONSTRUCTION.

NOTE:

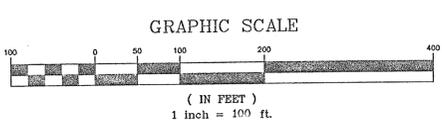
THE PARCEL IS NOT LOCATED IN THE 100-YEAR FLOODWAY OR FLOODWAY FRINGE. (REFERENCE USACOE/FEMA RESTUDY WORKSHEETS (NUMBERS 296, 297, 317 & 318) AND FEMA FIRM PANELS (NUMBERS 0490, 0495, 0675 & 0660).



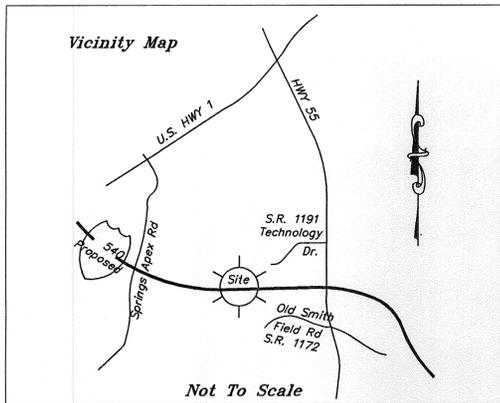
PROPOSED CONSTRUCTION AND DEMOLITION LANDFILL SITE
USEABLE ACRES 42.9
TOTAL ACRES 88.6

Legend

- = Wetland Boundary
- = 50' Stream Buffer
- = Total Landfill Boundary
- = Usable Landfill Boundary
- = Drainage Area
- 318 = Existing Grade Contour
- 320 = Proposed Subgrade Contour
- = Stream
- ST = Sediment Trap
- SB = Sediment Basin
- = Siltfence
- A1 = Apron
- PD → = Permanent Ditch
- TD → = Temporary Ditch

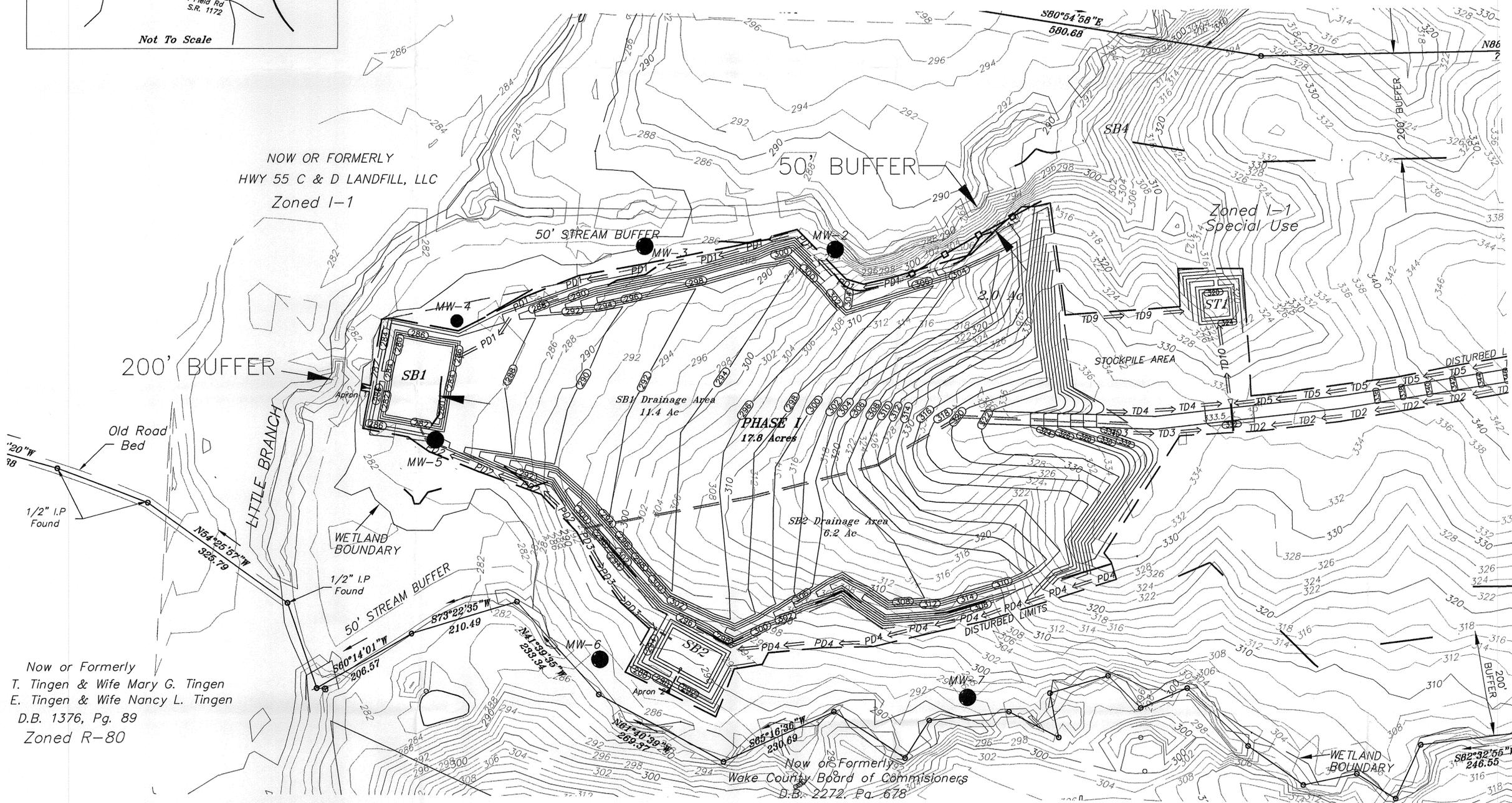
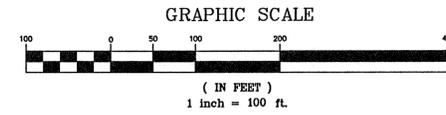


PATTERSON BREWER & Associates Engineering * Surveying * Planning Post Office Box 1387 * Mooresville, NC 28115 704/662-0100 * Fax 704/662-0101	JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER PHASE I GRADING PLAN	
	LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD CHECKED BY: DEB
	OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	SCALE: 1" = 100' DATE OF FIELD SURVEY: 1/1/00 DATE OF MAP: 1/1/00
	JOB NUMBER MO1117	SHEET NUMBER C 3



NARRATIVE:
 The proposed C&D landfill encompasses 88.6 acres. Total disturbed acreage for Phase I is 29.3 acres. Scope of work includes clearing and grubbing, stripping, grading, installation of sediment traps, sediment basins, temporary diversions, permanent diversions, siltfences access road and entrance area. The site will be used for the disposing of construction and demolition material. The C&D landfill will consist of three phases, each operating for approximately five years. Construction, operation, and closure of the C&D landfill will be permitted through NCDENR. The Highway 55 C&D landfill is located in the Cape Fear River Basin.

FLOODWAY NOTE:
 The Parcel is not located in the 100-year floodway or the flood fringe. (Reference USACOE/FEMA Restudy Worksheet #'s 296, 297, 317 & 318 and FEMA Firm Panels-0490,0495,0675 & 0660).



See Sheet 2 For Continuation

PROPOSED CONSTRUCTION AND DEMOLITION LANDFILL SITE
USEABLE ACRES 42.9
TOTAL ACRES 88.6

Legend

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- TD = Temporary Ditch



Now or Formerly
 T. Tingen & Wife Mary G. Tingen
 E. Tingen & Wife Nancy L. Tingen
 D.B. 1376, Pg. 89
 Zoned R-80

Now or Formerly
 Wake County Board of Commissioners
 D.B. 2272, Pa. 678

CONSTRUCTION SEQUENCE:

1. Obtain a land-disturbing permit. Schedule a preconstruction conference with the Environmental Engineer, Lee Squires (919-856-6199).
2. Install gravel construction pad, temporary diversions, silt fence, sediment basins or other measures as shown on the approved plan. Clear only as necessary to install these devices. Seed temporary diversions, berms and basins immediately after construction.
3. Call Lee Squires for an on site inspection by the Environmental Engineer to obtain a Certificate of Compliance.
4. Begin clearing and grubbing. Maintain devices as needed. Rough grade site.
5. Install storm sewer, if shown, and protect inlets with block and gravel inlet controls, sediment traps or other approved measures as shown on the plan. Begin construction building, etc.
6. Stabilize site as areas are brought up to finish grade with vegetation, paving, ditch linings etc. Seed and mulch denuded areas within fifteen (15) days of completion of any phase of construction.
7. When construction is complete and all areas are stabilized completely, call Lee Squires for an inspection by the Environmental Engineer.
8. If site is approved, remove temporary diversions, silt fence, sediment basins etc., and seed out or stabilize any resulting bare areas. All remaining permanent erosion control devices, such as velocity dissipators, should now be installed.
9. When vegetation has become established, call for final site inspection by the Environmental Engineer, Lee Squires. Obtain a certificate of completion.

MAINTENANCE PLAN:

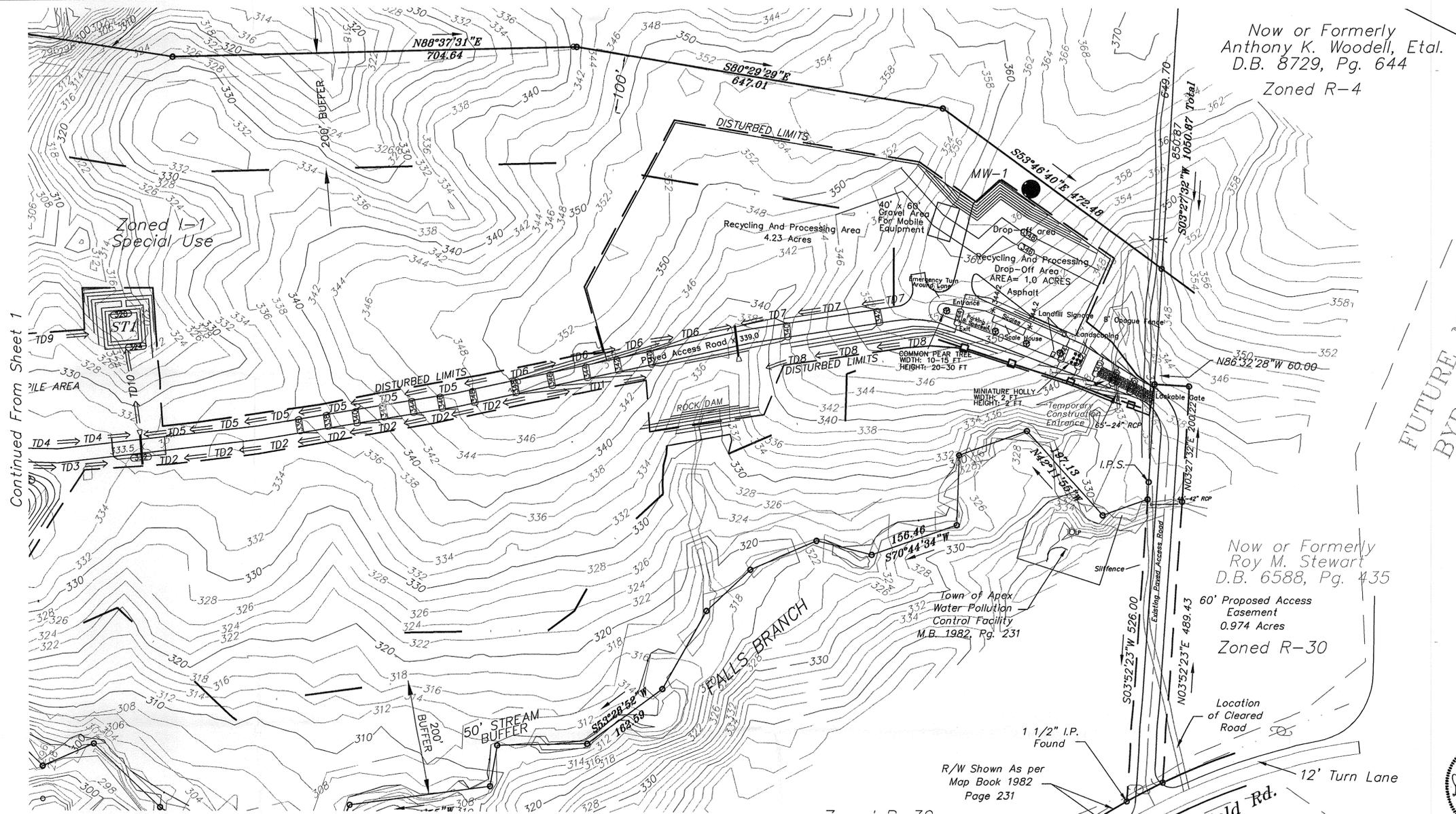
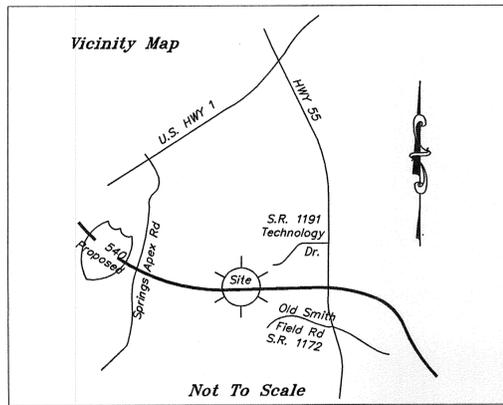
The following maintenance plan shall be followed until the site is completely stabilized after construction. During construction the Contractor shall be responsible for inspection and maintenance of all erosion and sediment control structures.

1. All erosion control measures shall be checked for stability and operation following any runoff producing rainfall and at least once every week. Any needed repairs shall be made immediately so that all erosion control measures are maintained as designed.
2. The sediment basins and traps shall be cleaned out when the level of sediment reaches the mid-depth point below the weir elevation. Washed stone shall be cleaned or replaced when the sediment pool no longer drains properly.
3. All seeded areas will be fertilized, reseeded as necessary, and mulched in accordance with the seeding specifications in order to maintain a dense vegetative cover.

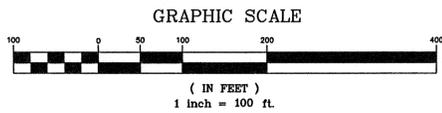
DRAINAGE AREA TABLE			
SB1	11.4	Q25 (CFS)=42	
SB2	6.2	Q25 (CFS)=23	
ST1	2.9	Q25 (CFS)=10.7	
ROCK DAM	5.5	Q25 (CFS)=20.3	

PATTERSON & BREWER Associates
 Engineering * Surveying * Planning
 Post Office Box 1387 * Mooresville, NC 28115
 704/662-0100 * Fax 704/662-0101

JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER PHASE I EROSION & SEDIMENT CONTROL PLAN	
LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD CHECKED BY: DEB
OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	SCALE: 1" = 100'
	DATE OF FIELD SURVEY: 1/1/00
	DATE OF MAP: 1/1/00
JOB NUMBER MO1117	SHEET NUMBER C 6



- Legend**
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PATTERSON BREWER & Associates Engineering * Surveying * Planning Post Office Box 1387 * Mooresville, NC 28115 704/662-0100 * Fax 704/662-0101	JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER		
	ENTRANCE AREA GRADING & EROSION & SEDIMENT CONTROL PLAN		
	LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD	CHECKED BY: DEB
	OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	SCALE: 1" = 100'	DATE OF FIELD SURVEY: 1/1/00
	DATE OF MAP: 1/1/00		
	JOB NUMBER MO1117	SHEET NUMBER C 7	

SEEDING MIXTURE	RATE (lb/acre)
Tall Fescue	100
Shawnee Lespedeza	50
Kobe Lespedeza	10

SEEDING NOTES
After Aug. 15 use unscarified seed. Where periodic mowing is planned or a neat appearance is desired, seed surface and increase Kobe lespedeza to 40 lb/acre to extend spring seeding dates into June, add 15 lb/acre hulled Bermudagrass. However, after mid-April it is preferable to seed temporary cover.

NURSE PLANTS
Between May 1 and Aug. 15, add 10 lb/acre German millet or 15 lb/acre Sudangrass. Prior to May 1 or after Aug. 15 add 40 lb/acre rye (grain).

SEEDING DATES
Fall: Aug. 25 - Sept. 15
Late Winter: Feb. 15 - Mar. 21
Best: Aug. 20 - Oct. 25
Possible: Feb. 1 - Apr. 15

Fall is best for tall fescue and late winter for lespedezas. Overseeding of Kobe lespedeza over fall-seeded tall fescue is very effective.

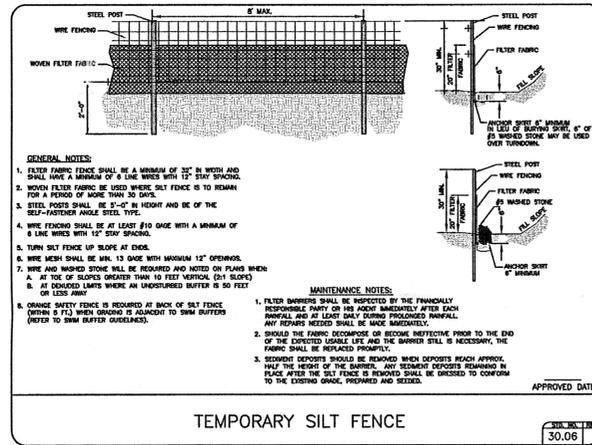
SOIL AMENDMENTS
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

MULCH
Apply Erosion Control Blanket per manufacturer's recommendations.

MAINTENANCE
Refer to 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.

Reference: Table 6.11.1 from NC Erosion and Sediment Control Planning and Design Manual, 1988.

SEEDING SPECIFICATIONS



TEMPORARY SILT FENCE

APPROVED DATE: 30.06

SEEDING MIXTURE	RATE (lb/acre)
Species: Tall Fescue	200 (4-5/1,000ft)

NURSE PLANTS
Between May 1 and Aug. 15, add 10 lb/acre Sudangrass or 10 lb/acre German millet. Prior to May 1 or after Aug. 15 add 40 lb/acre rye (grain).

SEEDING DATES
Best: August 25 - October
Possible: February - April 15

Avoid seeding from Nov. to Jan. If seeding must be done at this time, add 40 lb/acre rye grain and use a channel lining that offers maximum protection.

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. Operate tillage equipment across the waterway.

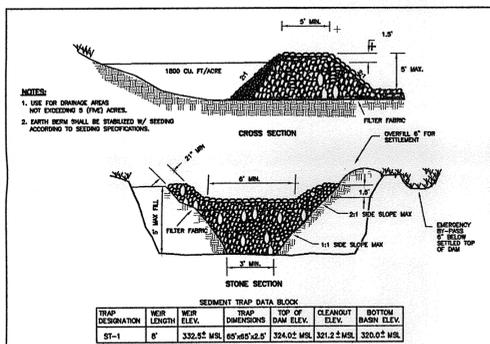
MULCH
Use jute, excelsior matting, or other effective channel lining material to cover the bottom of channels and ditches, and slope securely. The lining should extend above the highest calculated depth of flow. On channel side slopes above this height, and in drainages not requiring temporary linings, apply 4,000 lb/acre grain straw and anchor straw by stapling netting over the top.

Mulch and anchoring materials must not be allowed to wash down slopes where they can clog drainage devices.

MAINTENANCE
Inspect and repair mulch frequently. Refer to late winter of the following year: use soil tests; apply 150 lb/acre 10-10-10. Mow regularly to a height of 2-4 inches.

Refer to Appendix 8.02 for botanical names.

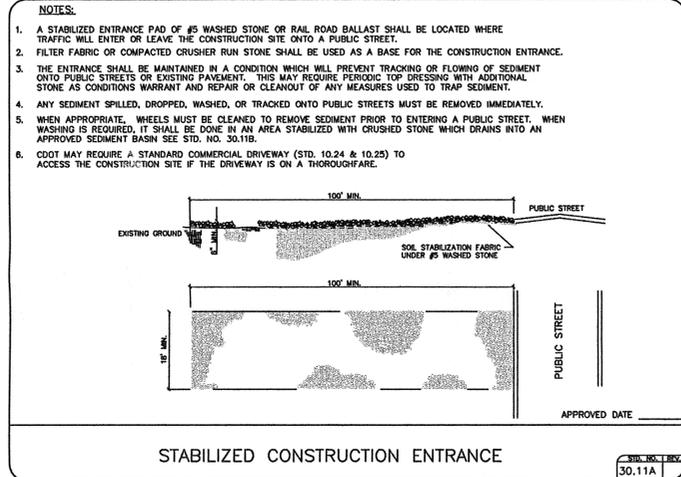
GRASS-LINED DITCH SEEDING SPECIFICATIONS



MAINTENANCE
Inspect temporary sediment traps after each period of significant rainfall. Remove sediment and restore trap to its original condition. If the trap is damaged, repair or replace the trap. Place the sediment that is removed in a designated disposal area and replace the contaminated part of the gravel facing.

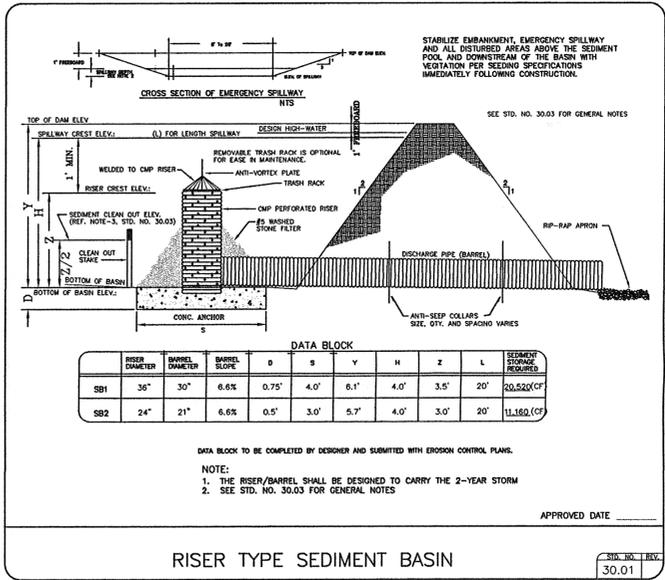
Check the structure for damage from erosion or ponding. If the structure is damaged, repair or replace the structure. If the structure is damaged, repair or replace the structure. If the structure is damaged, repair or replace the structure.

GRAVEL AND RIP RAP FILTER BASIN



STABILIZED CONSTRUCTION ENTRANCE

APPROVED DATE: 30.11A



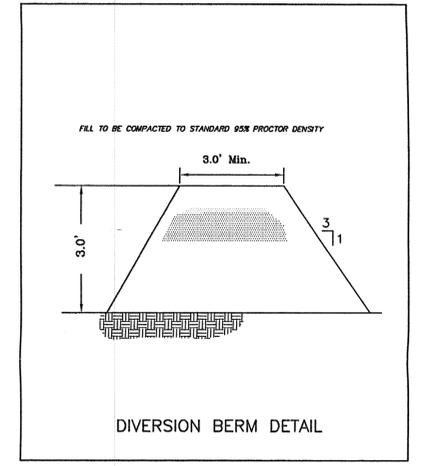
RISER TYPE SEDIMENT BASIN

APPROVED DATE: 30.01

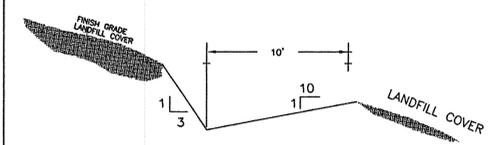
- GENERAL NOTES-SEDIMENT BASINS**
- AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
 - THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVERSIZED STONES, ROCKS, LIMING MATERIAL OR OTHER OBSTRUCTIVE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAMPING WITH EQUIPMENT WHILE BEING CONSTRUCTED. SPILLWAYS SHOULD NOT BE CONSTRUCTED THROUGH FILL SECTIONS. ALL SPILLWAYS SHOULD BE LINED AND/OR RIPRAPPED.
 - SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA IN SUCH A MANNER THAT IT WILL NOT ERODE.
 - THE TRAP SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NECESSARY.
 - CONSTRUCTION OPERATION SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION IS MINIMIZED.
 - ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER, UNLESS GOVERNED BY REGISTERED GEOTECHNICAL ENGINEER.
 - SEDIMENT BASINS SHOULD BE PROVIDED WITH EROSION CONTROL AND STABILIZATION.
 - STORAGE AREA IS SHOWN AS RECTANGULAR FOR ILLUSTRATIVE PURPOSES ONLY, AND MAY BE CONSTRUCTED IN ANY SHAPE PROVIDED THE MINIMUM STORAGE VOLUME REQUIREMENT IS MET. THE BASIN SHOULD ALSO BE ORIENTED SUCH THAT THE FILTER AND THE MAIN FLOW OF WATER AND SEDIMENT ARE ON OPPOSITE ENDS ON THE LONGER BASIN DIMENSIONS.
 - REQUIRED STORAGE IS 1000 CUBIC FEET OF STORAGE VOLUME PER ACRES OF DRAINAGE AREA, IF CLEAR WATER FROM UNDISTURBED AREAS IN DRAINAGE BASIN ARE TAKEN ACCOUNT OF THROUGH THE DENOTED AREA. BY NON ERODIBLE MEASURES THEN BASINS MAY BE SIZED BY DENOTED ACRES. RECOMMENDED STORAGE IS 1000 CUBIC FEET OF STORAGE PER ACRES OF DRAINAGE AREA. THE LENGTH OF THE STONE OUTLET (SPILLWAY) IS TO BE THE LENGTH OF THE STONE OUTLET (SPILLWAY) IS TO BE BASED ON A 10 YEAR STORM.
 - WHENEVER TOPOGRAPHY ALLOWS, THE BASIN LENGTH SHOULD BE TWICE (2X) THE BASIN WIDTH, TO ALLOW FOR SETTLING. Baffles SHOULD BE PROVIDED IN THE BASIN WHERE THE LENGTH IS LESS THAN TWICE THE WIDTH.
 - CLEANOUT STAKES SHALL BE PLACED IN ALL SEDIMENT BASINS AT THE LOW POINT IN THE BASIN. THE STAKES SHALL BE MARKED SHOWING THE HALF FULL CLEANOUT POINT OF THE BASIN.
 - SAFETY FENCING 3' HIGH SHOULD BE PLACED AROUND ALL SEDIMENT BASINS.
 - FOR DESIGN OF RISER TYPE SEDIMENT BASINS, REFER TO THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT, HEALTH, AND NATURAL RESOURCES, EROSION AND SEDIMENT CONTROL, PLANNING AND DESIGN MANUAL.
 - FOR SLOPES GREATER THAN 10:1 IN LENGTH AND PROTECTED BY SILT FENCE AT THE TOE OF THE SLOPE, SLOPE TERRACING WALLS REQUIRED.
 - THE BERM ON SEDIMENT BASINS SHALL BE SEEDED ONCE FINAL GRADE HAS BEEN REACHED. THE SILT FENCE MAY BE REMOVED IF PERMISSION HAS BEEN OBTAINED BY THE CITY/COUNTY LAND DEVELOPMENT INSPECTOR AFTER THE GRASS IS ESTABLISHED AND STABLE GROUND HAS BEEN ESTABLISHED.
 - WASHED STONE AND WIRE BASKETS SHALL BE USED WITH SILT FENCE WHENEVER SILT FENCE IS PLACED AT THE TOE OF A SLOPE >10:1 VERTICAL OR ALONG ANY CHANNEL OR WATER COURSE WHERE 50' OF BUFFER IS NOT PROVIDED.

GENERAL NOTES-SEDIMENT BASINS

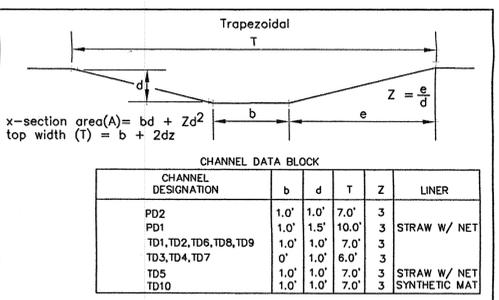
APPROVED DATE: 30.03



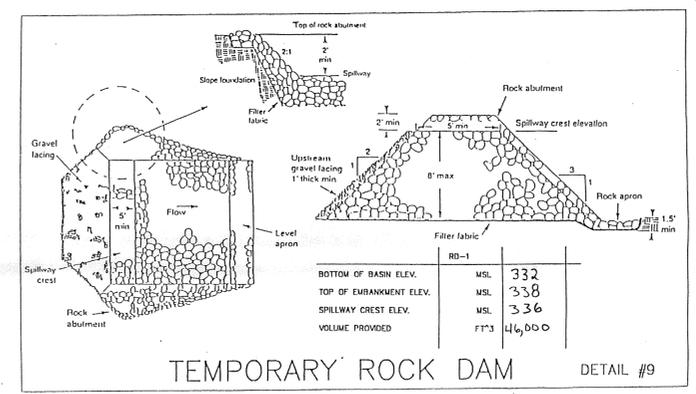
DIVERSION BERM DETAIL



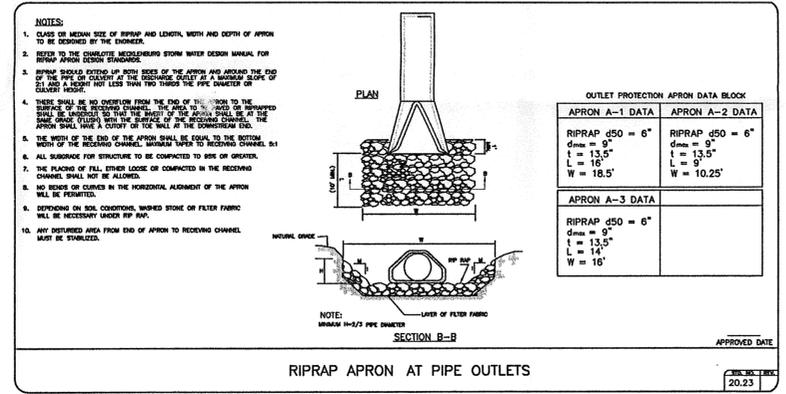
TYPICAL BENCH CROSS-SECTION



CROSS SECTION GEOMETRY OF GRASS-LINED DIVERSION CHANNELS



TEMPORARY ROCK DAM DETAIL #9



RIPRAP APRON AT PIPE OUTLETS

APPROVED DATE: 20.23

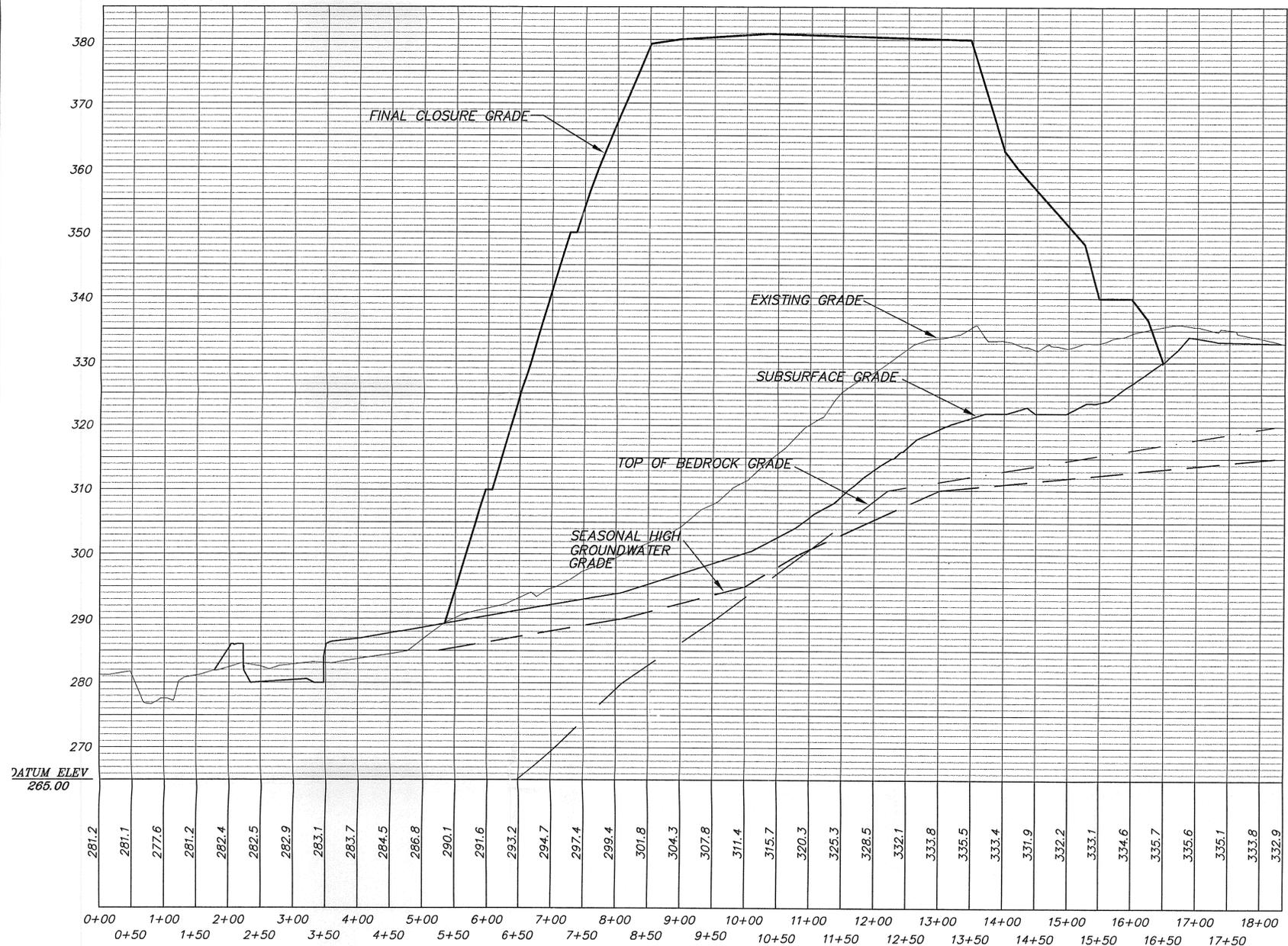
PATTERSON BREWER & Associates
Engineering * Surveying * Planning
Post Office Box 1387 * Mooresville, NC 28115
704/662-0100 * Fax 704/662-0101

HWY 55 C&D LANDFILL AND RECYCLING CENTER
EROSION & SEDIMENT CONTROL DETAILS

JOB NAME: HWY 55 C & D LANDFILL AND RECYCLING CENTER
LOCATION: WAKE COUNTY, NC
OWNERS: HWY 55 C & D LANDFILL, LLC
19109-118 WEST CATAWBA AVENUE
CORNELIUS, NC 28031-5613

DRAWN BY: TPD
SCALE: 1" = 200'
DATE OF FIELD SURVEY: 1/1/00
DATE OF MAP: 1/1/00
JOB NUMBER: M01117
SHEET NUMBER: C8

CHECKED BY: DEB
PROFESSIONAL SEAL 17582
ENGINEER DAN E. BREWER
4/10/02

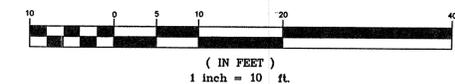


PHASE I CROSS-SECTION PROFILE 1-1'

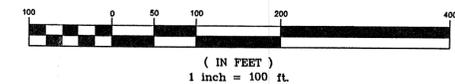
LEGEND

- = FINAL CLOSURE GRADE
- = SUBGRADE
- = EXISTING GRADE
- - - - - = SEASONAL HIGH GROUNDWATER
- = TOP OF BEDROCK

VERTICAL GRAPHIC SCALE GRAPHIC SCALE



HORIZONTAL GRAPHIC SCALE GRAPHIC SCALE



**PATTERSON
BREWER**

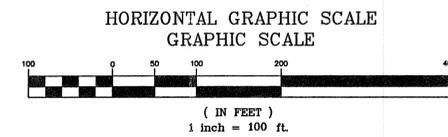
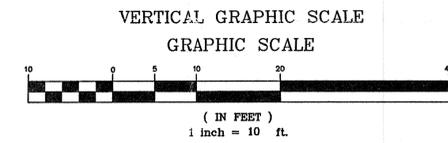
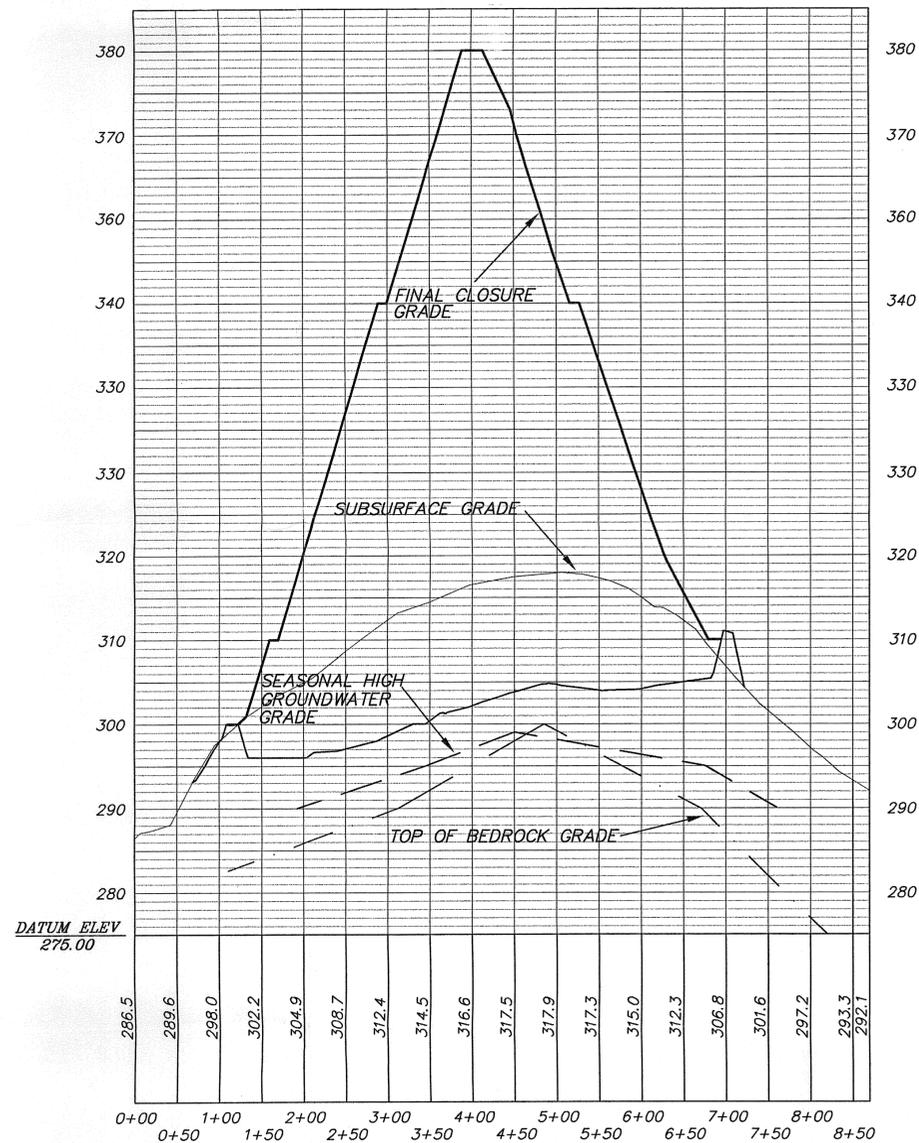
Patterson Brewer Associates
Engineering * Surveying * Planning
Post Office Box 1387 * Mooresville, NC 28115
704/662-0100 * Fax 704/662-0101

JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER PHASE I CROSS-SECTION PROFILE 1 - 1'	
LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD SCALE:
OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	CHECKED BY: DEB DATE OF FIELD SURVEY: 1/1/00 DATE OF MAP: 1/1/00
JOB NUMBER MO1117	SHEET NUMBER C 9

PHASE I CROSS-SECTION PROFILE 2-2'

LEGEND

-  = FINAL CLOSURE GRADE
-  = SUBGRADE
-  = EXISTING GRADE
-  = SEASONAL HIGH GROUNDWATER
-  = TOP OF BEDROCK



 PATTERSON BREWER <i>& Associates</i> Engineering * Surveying * Planning Post Office Box 1387 * Mooresville, NC 28115 704/662-0100 * Fax 704/662-0101	JOB NAME: HWY 55 C&D LANDFILL AND RECYCLING CENTER PHASE I CROSS-SECTION PROFILE 2-2'	
	LOCATION: WAKE COUNTY, NC	DRAWN BY: TPD CHECKED BY: DEB
	OWNERS: HWY 55 C & D LANDFILL, LLC 19109-118 WEST CATAWBA AVENUE CORNELIUS, NC 28031-5613	SCALE: DATE OF FIELD SURVEY: 1/1/00 DATE OF MAP: 1/1/00
		JOB NUMBER M01117 SHEET NUMBER C 10