Fac/Perm/Co ID #	Date	Doc ID#
44-06	4/27/11	13671

Blue Ridge Paper Products Inc. - Canton Mill / Waynesville Plant

April 20, 2011

Hand Delivered

RECEIVED

APR 20 2011

SOLID WASTE SECTION
ASHEVILLE REGIONAL OFFICE

Mr. Allen Gaither
North Carolina DENR
Division of Waste Management
2090 US Highway 70
Swannanoa, NC 28778

RE: Blue Ridge Paper Products Inc., Landfill Number 6, Permit Number 44-06, Area 6A-West Closure Design

Dear Mr. Gaither:

Blue Ridge Paper Products dba Evergreen Packaging is submitting the enclosed plan and specification packages for the closure of Landfill 6, Area 6A-West. Two options are included:

1. The design utilizing on-site soils within the closure cap system.
2. An amended design utilizing off-site as well as on-site soils within the closure cap system.

At present, negotiations continue with the EPA's on-site representative, Environmental Restoration LLC, to determine a soil delivery plan utilizing off-site soils (Option 2, above) that is acceptable to all parties. We hope to reach an agreement to take the off-site soils. If an agreement cannot be reached, then the design plan (Option 1, above) described by the approved Area 6A-West Operating Permit will be utilized.

With the submittal of these documents, Evergreen Packaging requests that the Division of Waste Management approve the closure plan and specification packages so we can proceed with closure of Area 6A-West during the 2011 summer and fall construction season.

Thank you for your time and consideration. Should you have questions or comments at this time please let us know.

Sincerely,

James A. Giauque
Waste Compliance & Landfill Supervisor
Evergreen Packaging - Canton Mill
Jim.giauque@everpack.com
828-646-2028 Fax 828-646-6892

Paul Dickens
Manager, Environmental, Health & Safety
Evergreen Packaging – Canton Mill
paul.dickens@everpack.com
828-646-6141 Fax 828-646-6892

Enclosures
File:gaither041911

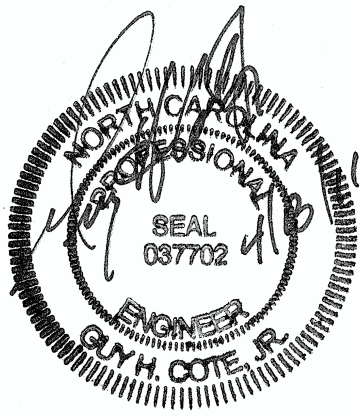
Copy: Guy Cote (SME)(letter only)
Andy Apostolopoulos
Bill vonVitzthume
Luke Williams
Bruce Wyer

DESIGN REPORT
FOR
LANDFILL NO. 6
AREA A WEST CLOSURE
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011



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LIST OF ATTACHMENTS

LIST OF FIGURES

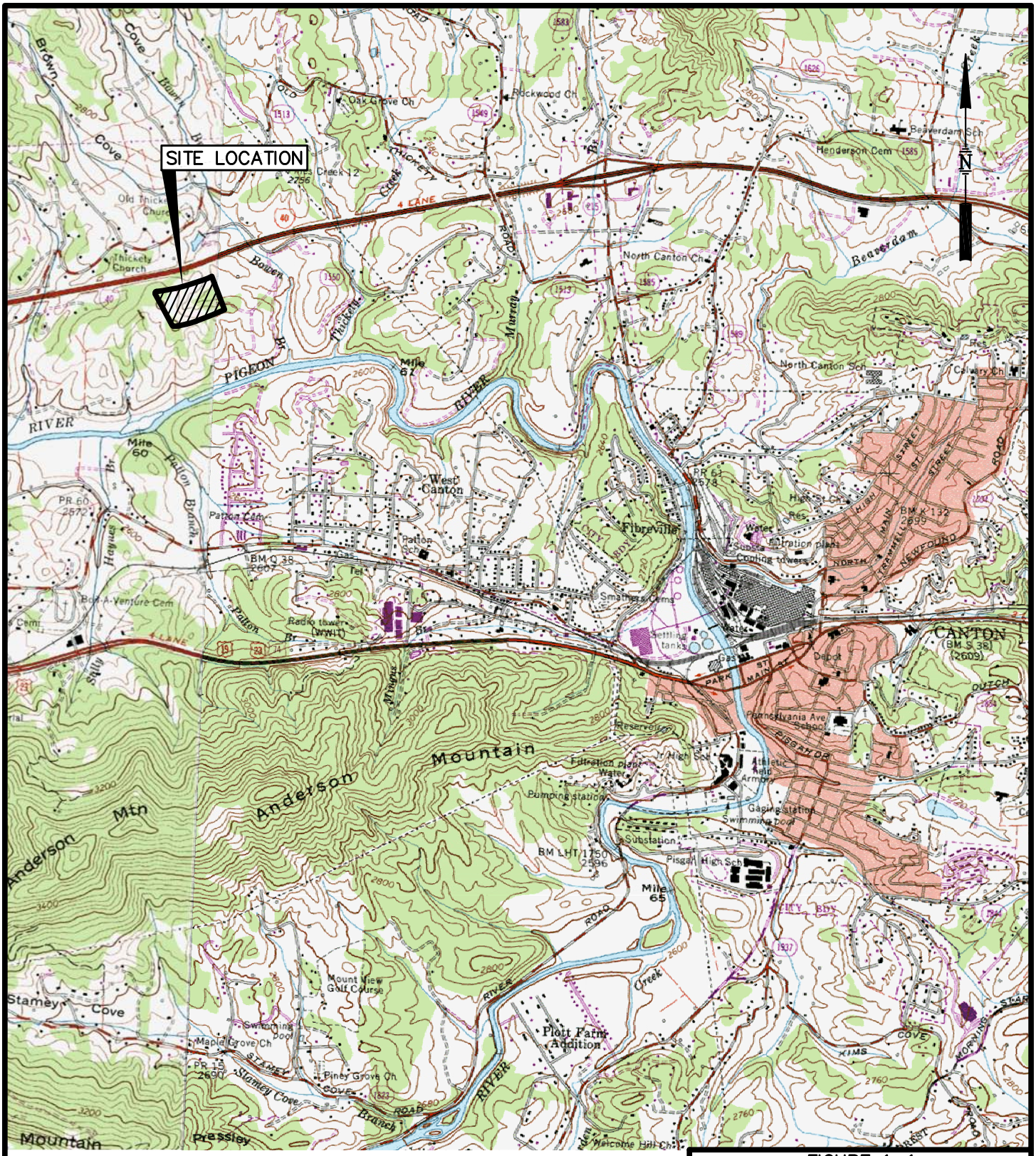
1.0 INTRODUCTION

This closure plan is being submitted by Evergreen Packaging (Evergreen) in accordance with the Operations Manual approved by the North Carolina Department of Environment and Natural Resources (NCDENR). In part, the Operations Manual requires Evergreen to close areas of Landfill No. 6 (Landfill) upon moving to newly developed areas. The Landfill is located on Evergreen property in Haywood County, North Carolina. The current operating area and soon-to-reach capacity is Area 6A West. This area is expected to reach capacity in the summer of 2011 and will then require closure. The closure of Area 6A West is planned similar to the previous closure of Area 6A East. This closure plan contains design-related information such as stormwater management, erosion control, construction specifications, construction quality control and quality assurance, and post-closure practices.

1.1 Background

Area 6A West is used primarily for the disposal of sludge, ash, lime mud, and wood waste disposal, which are all papermaking waste products. Figure 1-1 illustrates the location of the Landfill and other cells in the Landfill No. 6 area, shown on a portion of a USGS 7.5-minute topographic quadrangle map (USGS, 1978 and 1990).

Area 6A West encompasses an area of approximately 18 acres, and is located within a ravine-like setting west of Area 6A East. Area 6A West was constructed by Blue Ridge Paper in 2000. The site was permitted to receive waste in compliance with NCDENR Permit # 44-06.



BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLES
CANTON, NC (1990)
CLYDE, NC (1978)

1250 0 2500 FEET

FIGURE 1–1
SITE LOCATION MAP
LANDFILL NO. 6
WEST AREA CLOSURE
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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DWG: SITELOC LMN: NONE CTB: SME–STD REV: 2/3/2011

\\Nserver\cfs\Brpp\NC\6a-west\Closure\Acad\Figures\SITELOC.dwg, 4/15/2011 10:16:07 AM, sjm

1.2 Contact Information

The following person will be the Evergreen contact for the closure and post closure activities at the Landfill.

Jim Giauque
Waste Compliance and Landfill Supervisor

Evergreen Packaging
175 Main Street
P.O. Box 4000
Canton, NC 28716

Phone (828)646-2028
Fax (828)646-6892
E-mail jim.giauque@everpack.com

2.0 CLOSURE DESIGN

2.1 Development Concept

The closure plan for the Landfill was developed to minimize leachate generation through placement of a cover system engineered from locally available materials. The closure design was developed considering site-specific conditions, availability of materials in the Canton area, understanding of the past operating procedures of the site, and the type of waste in the landfill. Closure of the site will include the following activities.

- Regrading of the waste, where necessary, in accordance with Subsection 2.2 of this document to obtain closure design grades;
- Placement of a soil cap in accordance with Subsection 2.3 of this document and as shown on the attached Drawings; and
- The seeding and fertilizing of the site in accordance with the seeding specifications described in Subsection 2.5 of this document.

The principal goals for the closure plan are as follows:

- To minimize infiltration; and
- To provide a cover system suitable for development of a grass crop that will prevent erosion and minimize infiltration.

2.2 Site Preparation and Regrade

Grading of the landfill site will be performed prior to cap placement. Areas needing fill will use on site material. Prior to placement of the next layer, drainage stone, a surveyor will check the elevations to assure that the proper grade exists for closure. Following grading of the waste, a 12-inch layer of drainage stone will be spread over the entire landfill area.

2.3 Cap Placement

The final cover system from bottom to top will consist of at least 36 inches of compacted soil, overlain by 4 inches of topsoil. Capping material will be obtained from locally available soil. Grading of the material will be performed to maintain positive drainage to stormwater structures. Prior to seeding, a surveyor will check the elevations to assure that the proper grades exist, and that there are no low areas or depressions within the site.

Placement of cover soil will be in accordance with the Engineering Specifications provided in Attachment A. Cross-sections through the final cover system are provided with the Engineering Drawings located in Attachment B.

Soil cover material will be excavated from an on-site stockpile west of Area A. Transport of material to the landfill will occur over the sludge landfill property roads. Dust control measures including spraying with water mist will be instituted as necessary to minimize airborne dust emissions on the site.

2.4 Site Seeding

All areas disturbed during placement of the final cover system will be seeded. Seeding will normally occur between March 1 and October 15. All site grading and surface water runoff control structures such as diversion berms, drainage ditches, stone check dams and culverts will be constructed prior to seeding. Raking, discing, or other acceptable means will be used to loosen the top layer of soil before seeding. Lime and fertilizer will be applied to areas prior to seeding. Application rates for lime and fertilizer will follow the engineering specifications (Attachment A), or, as needed based on testing. If the site is hydroseeded, lime, fertilizer and seed can be applied simultaneously. The seed mixture to be used will follow the engineering specifications. The seed will be applied uniformly with a cyclone seeder, drilled, cultipack seeder, or hydroseeder. Seeds shall not be planted if there is a danger of frost shortly after seed germination. Maximum seeding depth is ¼ inch when using methods other than hydroseeding. Wood fiber, cellulose mulch, or hay mulch will be spread uniformly upon completion of the seedbed preparation, liming, fertilization, and seeding. The mulch may be anchored in-place by uniformly applying an acceptable mulch binder such as Curasol or Terr-

Tac. If germination is unsuccessful (less than 75 percent catch) within 30 days of seeding, or there is unsatisfactory catch in the next year, the appropriate areas site will be reseeded in accordance with the seeding specifications contained herein.

2.5 Quality Assurance/Quality Control Program

The closure plan will be instituted upon regulatory approval. Closure is estimated to take about three month, depending on weather conditions. The owner will utilize qualified personnel or retain the services of a Professional Engineer certified in the State of North Carolina and familiar with the various aspects of landfill design and closure, will be utilized as the on-site representative during closure of the site. The on-site representative will provide observation of the proposed closure activities and will be responsible for quality control enforcement and construction documentation at the site. Services of a contractor familiar and experienced with the various aspects of landfill construction will be procured for the installation of the final closure system.

To control the quality of the soil materials used in the landfill closures, a quality assurance/quality control (QA/QC) program will be implemented. The program will include source testing to demonstrate compliance with the materials specifications and construction testing to demonstrate that materials have been properly installed. Section 01400 of the Engineering specifications outline the QA/QC Program.

2.5.1 Soil QA/QC.

2.5.1.1 Source Testing

The soil materials used for the landfill closures will be tested at the source prior to being delivered on-site, to demonstrate compliance with the material specification. Samples will be collected by the owners representative at the borrow source in accordance with the methods specified by ASTM D 420 (investigation and sampling soil and rock), and tested by a qualified laboratory. The soil material specifications and frequency of testing are presented in the engineering specifications in Attachment A.

2.5.2 Weekly Inspection Reports. A weekly inspection report will be prepared by the owner's representative during the closure of the landfill. The reports will include material test results, summary of contractor submittals, summary of weekly progress and progress made to date, and anticipated work items for the following week. Copies of the reports will be provided in the construction certification report.

2.5.3 Photographic Documentation. To provide documentation of the landfill closure, photographs will be taken periodically of the closure construction. Copies of the photographs will be provided in the construction certification report.

2.5.4 Record Drawings. Upon completion of the landfill closure, a set of as built drawings will be prepared. The drawings will be sealed by a licensed State of North Carolina Professional Engineer and will be submitted to the NCDENR within 60 days of closure completion.

2.5.5 Final Construction Certification and Report. A final construction report will be submitted to the NCDENR within 60 days following the completion of closure construction at the landfill. The report will include written certification signed by the site representative, that the site has been closed in accordance with the requirements listed in 15A NCAC 13B Rule .0510.

2.6 Leachate and Gas Management

Leachate is primarily generated at each landfill site through precipitation falling onto and infiltrating into the landfill. Leachate will be managed through the placement of a cover system. Leachate generated at the Landfill is collected through a series of pipes and manholes at the base of the landfill. The leachate is then discharged to the mill for treatment. During the placement of final cover, all leachate generated will continue to be directed to the collection system.

The generation of gas and associated odors once the landfill cover is placed has not been a problem historically; therefore, no gas management/venting system will be incorporated into the final cover system.

2.7 Stormwater Management/Erosion Control

To design the necessary surface water control structures, stormwater runoff calculations for the site were performed utilizing the methodology outlined by the USDA Soil Conservation Service's (SCS) Technical Release No. 55 (TR-55, Urban Hydrology for Small Watersheds, June 1986 Revision) and a computer program named Hydrocad that uses TR-20. A 25-year/24-hour Type II storm with average Antecedent Runoff Conditions was used to calculate the runoff characteristics of the appropriate drainage areas. A Stormwater Management Plan including calculations used to determine design flow rates using TR-55 and TR-20 are included as Attachment C of this document.

Erosion control measures, including the use of erosion control matting, stone check dams, siltation fence, sediment traps, and riprap aprons will be implemented. In addition, the following erosion control procedures will be followed during closure construction operations and after site closure has been completed.

- All soil erosion and sediment control measures will be performed in strict accordance with the "North Carolina Erosion and Sediment Control Planning and Design Manual," including the latest data from the SCS.
- The disturbance of existing soil cover will be kept to a minimum during site closure.
- Acceptable existing topsoil will be stripped and stockpiled for reuse as final cover. Topsoil suitable for reuse will be stockpiled on-site in a manner that natural drainage is not obstructed and no off-site sediment damage will result.
- During grading operations, the site will be brought to approximate finish grades and stabilized without extended delays.
- Erosion and sediment control measures such as stone check dams, erosion control matting and siltation fencing will be installed as shown and/or adjusted to suit construction immediately after a cut or fill slope has been created.
- Silt fencing will be inspected after prolonged rainfall events and repairs made as necessary. Sediment deposits will be periodically removed from the upstream side of the silt areas. This sediment will be spread and stabilized in areas of the

site not subject to erosion. Silt fencing will be replaced as necessary to provide proper filtration action.

- Immediately following the final grading of the landfill cap all graded or disturbed areas will be seeded to provide a permanent vegetative cover.

2.8 Design Plans and Technical Specifications

Design plans showing the Landfill's existing site topography, proposed grading plans (elevations and sideslopes), design details, and cross-sections are contained in Attachment B. Technical specifications for the proposed closure activities are contained in Attachment A.

3.0 LONG-TERM (POST-CLOSURE) MAINTENANCE

The subsections that follow describe the various activities that must be done to insure the long-term integrity of the landfill subsequent to final closure.

3.1 Edge-of-Waste Marker

Following the installation of the cover system, edge-of-waste (EOW) markers will be installed delineating the waste boundary. The EOW markers will be permanent signs and inspected at the frequency indicated in the Landfill Operations Manual.

3.2 Mowing

To prevent deep-rooted tree growth, the closed portions of the landfill and drainage ditches will be mowed twice annually at a minimum. Mowing will not begin on 6A West until grass growth is established. Temporary stone check dams will be removed prior to mowing.

3.3 Site Inspections

Closed areas will be inspected twice per year for a period of at least three years to ensure the cover system integrity is maintained against erosion and other problems. The inspection will include an examination of the following items:

- surface drainageways
- surface grading
- grass growth

Each inspection will include notation of any problems and recommended remedial actions; please refer to the current landfill Operations Manual for maintenance inspection checklist. Following the three years, an inspection frequency of once per year will be instituted unless major problems develop, whereupon more frequent inspections will be made.

ATTACHMENT A

ENGINEERING SPECIFICATIONS

CONSTRUCTION DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE GENERAL CONTRACTOR

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

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INFORMATION FOR BIDDERS

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CANTON, NORTH CAROLINA

CONTRACT DOCUMENTS AND
CONSTRUCTION SPECIFICATIONS
FOR
LANDFILL NO. 6
AREA 6A-WEST CLOSURE

INFORMATION FOR BIDDERS

I. Receipt and Opening of Bids

Evergreen Packaging - Canton Mill (Evergreen) (herein called the "Owner"), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the office of Lynn Sellers until **4:00 P.M.** prevailing time, _____, 2011 and then at said office privately opened and read. The envelopes containing the bids must be sealed, addressed to:

Evergreen Packaging – Canton Mill
Attn: Ms. Lynn Sellers
Canton Mill
P.O. Box 4000
Canton NC 28716

Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 90 days after the actual date of the opening thereof.

II. Preparation of Bid

Each bid must be submitted on the prescribed form appended to these documents. All blank spaces for bid prices must be filled in, in ink or typewritten.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

III. Subcontractors

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner. A complete list of proposed subcontractors shall be included in the Contractor's proposal.

IV. Qualification of Bidder

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Contractor shall submit with the bid the name and resume of the Superintendent who shall be on site during the project. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

V. Time of Completion and Liquidated Damages

Bidder must agree to complete all work by _____, 2011. Bidder must submit a detailed schedule for all phases of the project showing starting and completion dates of key activities with their bid.

VI. Condition of Work

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligations to furnish all material and labor necessary to carry out the provisions of his Contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruptions of or interference with the work of any other contractor.

VII. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to Sevee & Maher Engineers, Inc., 4 Blanchard Rd., P.O. Box 85A, Cumberland Center, Maine 04021 and to be given consideration must be received at least five working days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued become part of the Contract documents.

VIII. Security for Faithful Performance

If requested by the Owner, simultaneously with his delivery of the executed Contract, the Contractor shall furnish a Surety Bond or Bonds for 100 percent of the Contract amount as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The surety on such bond or bonds shall be a duly authorized surety company satisfactorily to the Owner. The cost of these bonds, if required, will be reimbursed to the Contractor by the Owner.

IX. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

X. Notice of Special Conditions

Attention is particularly called to those parts of the Contract documents and specifications, especially Safety and Conduct Requirements.

XI. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

XII. Method of Award - Lowest Qualified Bidder

If at the time this Contract is to be awarded, the lowest base bid submitted by a reasonable bidder does not exceed the amount of funds then estimated by the Owner as available to finance the Contract, the Contract will be awarded on the base of bid only. If such bid exceeds said amount, the Owner may reject all bids or may award the Contract reducing the amount of unit price work to keep the overall Contract amount within the available funds.

XIII. Obligation of Bidder

At this time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and Contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

A pre-bid conference and/or inspection trip for prospective bidders is scheduled for _____, 2011 _____ **P.M.,** at the Purchasing Office.

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CANTON, NORTH CAROLINA

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

CONTRACT

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

GENERAL AND SPECIAL CONDITIONS

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

SAFETY AND CONDUCT REQUIREMENTS

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CONTRACT DOCUMENTS AND
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BID SCHEDULE

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE

GENERAL CONTRACTOR

BID SCHEDULE

Item No.	Item and Unit Price Bid	Unit	Engineer's Quantity Estimate	Contractor's Quantity Estimate	Lump Sum Bid	Add/Deduct Per Unit Bid
4.4.1	Mobilization / Demobilization	Lump Sum	1		$	$
4.4.2	Compacted Cover Soil, furnished by Owner, on-site	Cubic Yard	28,500		$	$
4.4.3	Topsoil (4-inch layer)	Cubic Yard	9,500		$	$
4.4.4	Manhole Connections	Each	6		$	$
4.4.5	24-Inch SD Pipe	Linear Foot	60		$	$
4.4.6	Seeding and Mulching	Acres	18		$	$
4.4.7	Erosion Control Mat	Square Yard	2,000		$	$
4.4.8	Optional Finish Waste Grading	Acres	18		$	$
4.4.9	Drainage Stone Placement, furnished by Owner and delivered to site	Cubic Yard	28,500		$	$
4.4.10	Stone Check Dams, furnished by Owner and delivered to site	Each	49		$	$
		LUMP SUM TOTAL:			$	$

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

DRAWING LIST

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CONTRACT DOCUMENTS AND
CONSTRUCTION SPECIFICATIONS
FOR
LANDFILL NO. 6
AREA 6A-WEST CLOSURE

DRAWING LIST

Drawing No.	Title
	Cover Sheet
C-100	Symbols and Abbreviations
C-101	Overall Site Location Plan
C-102	Existing Conditions Plan
C-103	Area 6A-West Final grading Plan
C-300	Sections and Details

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

TECHNICAL SPECIFICATIONS

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CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA 6A-WEST CLOSURE

TECHNICAL SPECIFICATIONS

DIVISION 1

DIVISION 2

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL INFORMATION

1.01 PROJECT DESCRIPTION

The intent of this project is to place final cover over Area 6A-West of Landfill No. 6. The project encompasses approximately 18 acres of final cover and will take place in the summer of 2011. Work shall include furnishing all materials, labor, and supervision and performing all operations required to complete the work shown on the contract drawings and as described in the Specifications contained herein, and as evidently necessary to complete the work. Work shall include, but not be limited to, the following items:

- Construction and maintenance of necessary erosion control items shown on the engineering drawings. Installation of erosion control shall be in accordance with State of North Carolina "Erosion and Sediment Control Planning and Design Manual". The erosion control measures will include, but not be limited to, siltation fencing, hay bales, temporary seeding, erosion control matting, riprap, and the use of hay mulch.

- Finish grading of waste, optional – Evergreen Packaging (Evergreen) will be responsible for grading the waste. However, Evergreen is requesting an alternative bid item for the Contractor to finish grade the crown portion of the landfill. The contractor shall be responsible for finish grading of the waste to ensure grade and alignment of the cover system are according to the project drawings. Evergreen shall be responsible for providing additional waste if it is required. If excess waste is encountered, the contractor shall move the waste to an active area of Area 6A-West.

- Installation of No. 67 stone on the crown and sideslopes of Area 6A-West. Evergreen will have the stone delivered to the site and dumped at locations selected by the contractor.

- Borrow pit development. The on-site borrow pit will be cleared and stumped by Evergreen. The area shall be grubbed to a depth of approximately one foot. The grubbing material shall be stockpiled and used for topsoil in the final cover system.

- Installation of 36 inches of compacted cover soil, including grading and compaction. Evergreen will be responsible for providing an on-site till borrow pit. The contractor shall be responsible for excavating, screening, and hauling of the cover soil. The cover soil will be excavated and hauled from an on-site source designated by Evergreen.

- Installation of 4 inches of topsoil over the compacted cover soil.

- Installation of a stormwater management system, as shown on the construction drawings, including a diversion berm, manholes, catch basins, and piping.

1.02 PROJECT/WORK IDENTIFICATION:

Project Title:	Landfill No. 6 Area 6A-West Closure
Owner:	Evergreen Packaging Canton, North Carolina
Design Engineer:	Sevee & Maher Engineers, Inc. Cumberland Center, Maine

1.03 DEFINITIONS:

A. Contract: The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract includes the proposal, contract form and contract bonds, Specifications, supplemental Specifications, special provisions, general and detailed plans and notice to proceed, also any change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

A contract may include any part of a project or one or more projects.

B. Contract Documents: The contract includes the technical Specification documents contained herein, the contract form, the Safety and Conduct Requirements, the General and Special Conditions, bid schedule, the drawings, and the addenda issued in the execution of the described work.

C. Information Precedence: In the event that any technical information presented herein conflicts with other such information, the information on the drawings will take precedence. Once such an item is found, it is the contractor's responsibility to report said conflict to the Owner's Representative.

D. Bidder: An individual, firm, or corporation submitting a bid for the advertised work.

E. Contractor: The individual, firm, or corporation contracting with the Owner for performance of prescribed work.

F. Indicated: The term "Indicated" is a cross-reference to graphic representation, notes, or schedules on drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for

purposes of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable to each instance.

H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

1.04 PROJECT CONDITIONS:

A. Permits: All the necessary permits for this project have been filed for from the appropriate agency. If the issuance of any permit affects the scope or Specification of work, all parties will be notified as soon as possible to determine the effect of cost, schedule, or previous contractual agreement.

B. Temporary Utilities: The Contractor shall be responsible for all utilities necessary to execute his contract. There may be some low voltage power and some telephone service available adjacent to the maintenance building. Any labor costs associated with the extension of these utilities will be borne by the Contractor. Any assumptions made by a bidder contrary to the intent of this paragraph must be explicitly detailed in his bid.

C. Temporary Facilities: Contractor shall provide all temporary facilities including, but not limited to, structures, secured areas for materials storage, potable water, sanitary and medical facilities, etc.

1.04 SUBMITTALS REQUIRED WITH PROPOSAL:

A. Construction Schedule: Contractor shall submit a preliminary bar-chart type schedule with the Bid Documents. On the schedule, indicate a time bar for each major category or unit of work to be performed at the site, properly sequenced, and coordinated with other elements of work. Include estimated man-hours for each activity.

B. Schedule of Rates: Contractor shall submit with the Bid Documents a Standard Schedule of Rates for Labor, Equipment, and Materials. Schedule of Rates will be used as a basis of time and materials payment for extra work.

C. Proposed Management Personnel: The diligent, proactive management of this project, and this construction contract in particular, is extremely important to the successful execution of the project's stated objectives. Towards this end, each bidder will submit with the proposal, the proposed supervisory structure. At a minimum, it will include one full time superintendent on site, the number, and type of foremen required to supervise the various activities and any anticipated clerical assistance. The proposed should be identified by name, with a resume of his associated experience as a superintendent.

This portion of the proposal will be reviewed very carefully and will be a major consideration in the contractor selection process.

PART 2 - PROJECT SCHEDULE:

2.01 GENERAL:

The Contractor in conjunction with the Owner/Owner's Representative is responsible for the coordination of all activities on site and will work with each contractor to ensure a timely project completion.

2.02 CONTRACTOR'S SUBMITTAL:

Each contractor shall submit to the Owner/Owner's Representative a time scaled, pert-type schedule for his/her procurement, construction, and quality assurance activities. Once accepted, these schedules become the baseline construction schedules.

2.03 WEEKLY REVIEW, UPDATING AND PROJECTIONS:

This schedule will be updated on a weekly basis to reflect the actual progress and the current completion projection. The updated schedule will be submitted one day prior to the weekly construction meeting. The Owner/Owner's Representative will review the schedules from both contractors for coordination and project compliance purposes.

PART 3 - CONSTRUCTION SITE MANAGEMENT:

3.01 SAFETY:

Completion of this construction project without incurring an OSHA recordable incident is the first priority of all involved.

3.02 WEEKLY MEETING:

The Owner/Owner's Representative will conduct a weekly meeting on the job site at a mutually agreed upon time. The meeting will take place at the prescribed time each week. The agenda for this meeting will consist of, at a minimum, progress to date, updated projections for each line item completion, safety performance. At this meeting the Owner's Representative will collect from each contractor their updated schedule, weekly safety talk minutes, and any accident investigation reports.

3.03 ACCIDENT REPORTS:

In the event of an accident, the Contractor will inform the Owner/Owner's Representative of said accident weekly for minor cut and bruises, that day for potential lost time accidents, and just as soon as practical on emergency care accidents.

3.04 JOB SITE COMMUNICATIONS:

Each Contractor on the job site will designate a project superintendent and one substitute. All discussions involving variances in schedule, cost, or quality will be directed to the designated representative.

3.05 NOTIFICATION OF POTENTIAL EXTRAS:

Just as soon as a potential contractual extra is revealed, the Contractor shall notify the Owner's Representative in writing (i.e. hand written speedy memo) of said potential which will be signed by the Owner's Representative and the appropriate superintendent(s).

3.06 RECORD DRAWINGS:

The Contractor shall submit as-built drawings to the Engineer for not more than 30 days following contract completion. The release of the final payment is contingent on the receipt of said drawings.

PART 4 - MEASUREMENT, EXECUTION, AND PAYMENT

4.01 DEFINITION OF PAYMENT ITEMS:

Unit price extras and deductions under this contract shall be paid as described herein under the appropriate items. Payment of work shall be full compensation for costs incurred by the Contractor in providing the work as described in the Contract Documents.

The Contractor shall provide a detailed breakdown of the lump sum costs, acceptable to the Owner/Owner's Representative, which will be used for estimating progress payment requests unless otherwise specified herein.

4.02 UNDEFINED AND CONTRACTUAL COSTS:

Costs for work not specifically mentioned, and which are incidental to the overall conduct of the work, shall be included in the Contractor's Bid, distributed into the actual Bid item as deemed appropriate. Examples of these types of costs are, but not necessarily limited to, the following:

Insurance's
Construction Permits and Licenses
Surveying
Temporary Erosion Control

4.03 MEASUREMENTS:

A. All work acceptably completed under the contract will be measured according to United States customary units. The Engineer shall approve all measurements taken for payment on unit price items. The Contractor shall assist the Engineer in conducting measurements for payment.

B. For all items, other than those to be paid for by lump sum, after the work is completed and before final payment is made, the Owner's Representative shall determine the quantities of various items of work accepted as the basis for final payment. In case of unit price items, the Contractor will be paid the amount for the quantity of work accepted and for the materials placed. The quantities of work performed shall be computed in accordance with the following methods of measurements.

1. Area measurement, such as square yard, square feet, units will be made along the ground surface. A unit is equal to one thousand (1,000) square feet.

2. Volume measurement, such as cubic yard or unit, will be an in-place measurement calculated by multiplying the area satisfactorily completed by the measured depth.

3. Linear measurement will be along the surface of the object being measured.

4. Actual count (per each) will be the number of individual units installed.

4.04 EXECUTION AND PAYMENT:

Quantities listed for each item are not guaranteed. The estimated quantities are provided as a Bidder's guide only; the Bidder should verify quantities.

A. Mobilization/Demobilization (4.4.1):

1. General: This item shall consist of preparatory work and operations including, but not limited to those necessary to the movement of personnel, equipment, supplies and incidentals to the project site; and for all other work and operations which must be performed or costs incurred prior to beginning work and upon completion of work on the various items on the project site.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope.

B. Compacted Cover Soil (4.4.2):

1. General: This item shall consist of all equipment, labor, and materials required, and the placement to grade of the compacted cover soil. There is 36 inches of compacted cover soil of 6-inch minus material placed over the prepared subgrade. The cover soil borrow source shall be provided by the Owner on-site. This work shall be installed in accordance with the Contract Drawings and Specification.

   The estimated quantity of soil on this project is 85,000 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

C. Topsoil (4.4.3):

1. General: This item consists of all labor, equipment, and material required, and the placement to grade of the topsoil in accordance with the Contract Drawings and Specifications.

   The estimated quantity of topsoil is 9,500 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

D. Storm Drain Manhole Connections (4.4.4):

1. General: This item shall consist of all equipment, labor, and materials required, and the excavation, coring, placement to grade, and backfill of the manhole pipe boot connection. The manhole connections shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantity of storm drain manhole connections is 6.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

E. Storm Drain Piping (4.4.5):

1. General: This item shall consist of all equipment, labor, and materials required, and the excavation, bedding, placement to grade, and backfill of the storm piping system. The pipe materials shall be furnished by the Owner and delivered to the project site. The piping shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantities are 18-inch diameter HDPE (solid) 60 lf.

F. Seeding and Mulching (4.4.6):

1. General: This item shall consist of all equipment, labor, and materials required for seeding and mulching of Area 6A-West and filled in accordance with the Contract Drawings and Specifications. Seeding includes soil preparation, seed, fertilizer, lime, and mulch.

   The estimated quantity of seed and mulch is 784 units.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

G. Erosion Control Mat (4.4.7):

1. General: This item shall consist of all equipment, labor, and materials required for the installation of erosion control mat on Area 6A-West. Erosion control mat in accordance with the Contract Drawings and Specifications.

   The estimated quantity of erosion control mat is 2,000 sy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

H. Finish Grading (Optional) (4.4.8):

1. General: This item consists of all labor, and equipment to grade the waste on the crown of the landfill to meet the elevations shown on the Contract Drawings.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

I. Drainage Stone (4.4.9):

1. General: This item shall consist of all equipment and labor required, and the placement to grade of the #67 stone. The #67 stone shall be provided by the Owner, delivered to the project site. This work shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantity of #67 stone on this project is 28,500 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

J. Stone Check Dams (4.4.10):

1. General: This item shall consist of all equipment and labor required to install stone check dams in accordance with the Contract Drawings and Specifications.

   The estimated quantity of stone check dams is 49 each.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

4.05 WORK BY OTHERS:

A. Liner Repairs:

1. General: This item includes repair to the existing 60-mil textured HDPE geomembrane, and geotextile.

2. Payment: Repairs will only be necessary due to contractor error. Therefore, Evergreen will not be responsible for the costs incurred for repairs to the geomembrane.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- Submittal procedures.
- Construction progress schedule.
- Proposed products list.
- Shop drawings.
- Product data.
- Samples.
- Manufacturer's instructions.
- Manufacturer's certificates.

1.02 RELATED SECTIONS AND DOCUMENTS

- Summary of Work: Section 01010

1.03 SUBMITTAL PROCEDURES:

A. Transmit each submittal with Engineer accepted form.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.

E. Schedule submittals to expedite the project, and deliver to the Engineer. Coordinate submission of related items. The Contractor may be obligated to provide submittals as dictated in the Contract between the Owner and the Contractor.

F. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.

G. Provide space for Contractor and Engineer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.04 PROPOSED PRODUCTS LIST:

A. Within 15 days after date of Owner-Contractor Agreement submit on forms provided complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer trade name, model or catalog designation, and reference standards.

1.05 SHOP DRAWINGS:

A. Submit in the form of one reproducible transparency.

B. After review, distribute in accordance with Article on Procedures above and for Record Documents.

1.06 PRODUCT DATA:

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents.

1.07 SAMPLES:

A. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturer's standard colors, textures, and patterns for Engineer's selection.

C. Include identification on each sample, will full project information.

D. Submit the number or samples specified in individual specification sections; one of which will be retained by Engineer.

E. Reviewed samples which may be used in the work are indicated in individual specification sections.

1.08 MANUFACTURER'S INSTRUCTIONS:

A. When specified in individual specification sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturer's instructions and Contract Documents.

1.09 MANUFACTURER'S CERTIFICATES:

A. When specified in individual specification sections, submit manufacturer's certificate to Engineer for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

END OF SECTION

SECTION 01561

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Related Requirements Specified Elsewhere:

- Summary of Work: Section 01010
- Cleaning for Specific Products or Work: Specification Section for that work

B. Maintain premises and public properties free from accumulations of waste, debris, sediment, and rubbish, caused by operations.

C. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project area clean.

Stumps and grubbings can be disposed of on-site within the limits of the landfill. The Contractor must make arrangements to properly dispose of other wastes not acceptable for disposal on-site.

1.02 SAFETY REQUIREMENTS:

A. Conduct cleaning and disposal operations to comply with local, state, and federal ordinances and laws, particularly anti-pollution laws.

- Do not burn rubbish and waste materials on project site.
- Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION:

A. At reasonable intervals during progress of work, clean site, and public properties, and dispose of waste materials, debris, and rubbish.

B. Provide on-site containers for collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from site and legally dispose of at approved public or private dumping areas off Owner's property.

3.02 FINAL CLEANING:

A. Perform cleaning operations described herein until project is completed.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, general provisions of contract, and Supplementary General Conditions apply to the work specified under this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- Summary of work: Section 01010
- Earthwork: Section 02200

1.03 DESCRIPTION: This work shall consist of furnishing all labor, materials, and equipment for applying water for dust control in conformity with the contract drawings and as specified herein, or as required by the Owner's Representative.

PART 2 - PRODUCTS

2.01 GENERAL: The water shall not be salt or brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01 SPRINKLING: Water shall be applied by approved methods as requested by the Owner or the Owner's Representative. Acceptable equipment may include a tank with gauge equipped pressure pump and a nozzle-equipped spray bar. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

3.02 CALCIUM CHLORIDE: DO NOT USE.

3.03 SWEEPING: Roads shall be kept free of soil and ash. Clay, ash and other materials tracked, spilled, and/or deposited on the roadways shall be scraped or swept clean on a daily basis.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of earthwork is indicated on drawings.

Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal or replacement (backfill) of materials removed.

1.03 QUALITY CONTROL:

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: The Owner shall employ a testing laboratory to perform soil testing of materials at point of source. The Owner shall perform the following analysis on borrow materials used at the site.

- #67 Stone/Stone bedding:

  - Grain Size (D422) - 1/5,000 cy

- Cover Soil:

  - Grain Size (D422) - 1/10,000 cy
  - Maximum Dry Density (D 698) – 1/10,000 cy

1.04 FIELD QUALITY ASSURANCE

A. Quality Assurance Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

Testing shall be as follows:

- #67 Stone/Stone bedding:
  - Grain Size (D422) - 1/5,000 cy
- Cover Soil:
  - Grain Size (D422) - 1/5,000 cy

- In-Place Moisture/Density (D 6938 or D 2937) - 5/acre/lift

If in opinion of Owner's Representative, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction, wetting, drying or removal of material as necessary, and testing at no additional expense.

1.05 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor.

Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Owner's Representative and then only after acceptable temporary utility services have been provided.

Provide minimum of 48-hour notice to Owner's Representative, and receive written notice to proceed before interrupting any utility.

Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: (None anticipated)

1. General: This work shall consist of furnishing, placing and detonating dynamite in places directed for the excavation of related work items in accordance with these specifications and in reasonably close conformity to the lines and grades shown on the plans or as established.

All blasting plans shall be approved prior to placing the explosive charges.

Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.

The Contractor is solely responsible for the handling, storage, and use of explosive materials.

The explosives shall be detonated by the propagation or electric method and shall be detonated the same day it is placed.

No explosives shall be stored on the site overnight.

D. Materials: Dynamite and caps shall be from fresh stock and shall have a maximum strength as specified in the approved blasting plan.

E. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

Operate warning lights as recommended by authorities having jurisdiction.

Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. General: Excavations made at the site for the construction of project facilities will generate unspecified quantities of soil materials. These soils will either be suitable or unsuitable for use as fill in the construction of earth-related portions of the project.

1. Suitable Materials: Those materials generated from outside excavations that satisfy the specifications for the material for which it is to be used (i.e., compacted silt/sand, common borrow, etc.). Specifications for suitable project materials follow.

2. Unsuitable Materials: Those materials generated from on-site excavations that do not satisfy the specifications for the project materials identified below. Generally these materials will consist of objectionable quantities of vegetation, organic matter, large stones, debris, and frozen material.

B. #67 Stone/Stone Bedding: Durable, clean angular rock fragments obtained by breaking and crushing rock material, furnished, and placed to the lines and grades as shown on the Drawings. Sieve analysis by weight:

Sieve Designation	% Passing by Weight
1"	100
3/4"	90-100
3/8"	25-55
#4	0- 0
#8	0- 5

C. Cover Soil: Screened cover soil material shall be placed to the lines and dimensions as shown on the Drawings. The soil shall not contain particles of rock which will not pass the 6-inch square mesh sieve. The soil shall have greater than 20 percent passing the U.S. Standard No. 200 Sieve.

D. Riprap: Stones used for riprap shall consist of sound durable rock which will not become disintegrated by exposure to the action of water or weather. Either field stone or rough unhewn quarry stone may be used. Stones shall weigh from 10 lbs to 200 lbs except that when available suitable stones weighing more than 200 lbs may be used. Approximately 50 percent of the stones by volume, shall exceed a unit weight of 90 lbs.

E. Common Borrow: Shall be earth suitable for embankment construction for use in any filling other than the soil cover. It shall be free of frozen material, perishable rubbish, peat, organic matter, large rock fragments over 12 inches, or other unsuitable material. AASHTO M145 Classifications A-1 through A-5 may be used. Use of other materials as common borrow is at the discretion of the Owner's Representative and only in approved areas.

F. Topsoil: Shall be the soil material stripped from the till borrow pit.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Unclassified Excavation includes excavation of materials and obstructions encountered to subgrade elevations indicated, regardless of character.

B. Excavation Classifications: The following classifications of excavation will be made when rock excavation is encountered in work:

C. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

D. Rock Excavation:

Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42" wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10'- 0" in width and pits in excess of 30'-0" in either length or width are classified as open excavation.

Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).

Typical of materials classified as rock are boulders 3 cu. yd. or more in volume, solid rock, rock in ledges, and rock hard cementitious aggregate deposits.

Intermittent drilling, blasting or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified and worksheets submitted to the Owner's Representative.

Rock payment lines are limited to the following:

In pipe trenches, 6 inches below invert elevation of pipe and
18 inches wider than inside diameter of pipe, but not less than 3 ft.

In open areas, 24 inches below base grade elevation.

E. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be at Contractor's expense.

Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Representative.

F. Additional Excavation: When excavation has reached required subgrade elevations, notify Owner's Representative who will make an inspection of conditions. Do not backfill excavations without notifying Owner's Representative.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Owner's Representative.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

G. Stability of Excavations: Slope sides of excavations to comply with federal and local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

Maintain sides and slopes of excavations in safe condition until completion of backfilling.

H. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.

Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.

I. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

Use appropriate erosion control in temporary ditches, as described in Section 02270, Erosion Control.

J. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Cover or seed stockpiles when long-term storage indicates the potential for wind or water erosion from the stockpile. Place silt fence around downstream edge of stockpile to prevent transportation of soil.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess soil material and waste materials as herein specified by Owner's Representative.

K. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

L. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide a minimum 6" to 9" clearance on both sides of pipe or conduit as indicated on Drawings.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

Where rock or unsuitable material is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel, as approved by Owner's Representative, prior to installation of pipe.

For pipes or conduit 6" or larger in nominal size, tanks and other work indicated to receive subbase, excavate to subbase depth or, if not otherwise indicated, to 6" below bottom of work to be supported.

Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.

Do not backfill trenches until tests and inspections have been made and backfilling authorized by Owner's Representative. Use care in backfilling to avoid damage or displacement of pipe systems. Owner's Representative must be notified of any intention to backfill trench or otherwise permanently cover pipe.

M. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35° F. (1°C).

N. Final Grading: The Owner will perform grading in accordance with Contract Drawings, in order to obtain subgrade elevations prior to the placement of the drainage stone and cover soil. During the regrading, the Owner shall fill voids encountered below the subgrade elevations with on-site materials or waste materials.

3.02 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698.

Pipeline: Compact top 6" of subgrade and each 12" layer of backfill or fill material at 90% maximum density.

Dikes: Compact each 12-inch layer of fill material at 90% maximum density.

Cover Soil: Compact each 12" lift of cover soil at 90 percent maximum density. Maintain these conditions until topsoil is placed.

C. Moisture Control: Moisture content of the cover soil and/or embankments shall be at, but not greater than 4 percent higher than optimum as determined by ASTM D 698 (standard proctor). Where subgrade or layer of soil material must be moisture conditioned to meet the allowable range of water content to achieve compaction, uniformly apply water to surface of subgrade, or layer of soil material. Apply water in manner to prevent free water appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

3.03 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

In excavations, use satisfactory excavated or borrow material free of frozen material, large stones, brush, roots, sod, or other unsuitable material.

Under grassed areas, use satisfactory excavated or borrow material.

Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90° of cylinder.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

Inspection by Owner's Representative, testing, approval, and recording locations of underground utilities.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

Removal of trash and debris.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 15" in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content within the optimum range as determined by the soil testing at point of source. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

To provide for clod break-up of the cover material, a minimum number of 2 passes will be made with deep-footed pad roller. To eliminate desiccation cracks the surface will be moistened (as necessary) and reworked with 2 passes of a smooth drum roller. Desiccation is defined as moisture content below optimum, or cracks deeper than 1 inch.

The cover soil shall be compacted and smooth drum rolled at the end of each work day to provide for moisture/density testing and prevent ponding of surface water overnight.

The following equipment will be used for compaction of the cover material:

Caterpillar 815F Pad Foot Roller or equivalent equipment approved by the Engineer. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	45,900 lbs
Maximum Pad Tip Area	18 square inches
Minimum Pad Height	7.5 inches
Minimum Wheel Diameter	40.5 inches

The passage of compaction equipment in either direction (forward or backward) is considered a "pass".

The following equipment will be used to obtain a smooth roll surface:

Caterpillar CS563 Vibratory Drum Roller or equivalent equipment approved by the Engineer. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	24,500 lbs
Vibration Frequency	1,400 to 1,800 vpm
Centrifugal Force	
High Amplitude	50,000 lbs
Low Amplitude	35,000 lbs
Maximum Drum Width	7.0 feet

Sealing the lifts will encourage runoff from storms, thus limiting development of excessively moist or wet lenses of soil within the barrier layer. The lift surface shall be scarified or otherwise roughened by tracking with a bulldozer prior to placing the next lift of cover soil to promote good bonding between lifts.

3.04 MAINTENANCE:

A. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

B. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, gravel road, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.05 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil and seed or spread and seed as directed by Owner's Representative.

Transport waste material, including unacceptable excavated material, trash, and debris to designated spoil areas on Owner's property and dispose of as directed.

END OF SECTION

SECTION 02270

EROSION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

Work covered by this Section includes the control of erosion, siltation, and sedimentation.

1.2 PROJECT REQUIREMENTS

A. Prevention: Take every reasonable precaution and do whatever is necessary to avoid any erosion and to prevent silting of rivers, streams, lakes, reservoirs, impoundment's, and drainage ditches and swales.

B. Exposure: The exposure of uncompleted cut slopes, embankments, trench excavations, and site graded areas shall be kept as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible.

C. Temporary Protection: Should it become necessary to suspend construction for any length of time, shape all excavated and graded areas in such a manner that runoff will be intercepted and diverted to points where minimal erosion will occur. Provide and maintain temporary erosion and sediment control measures, such as berms, dikes, slope drains, silt stops, and sedimentation basins, until permanent drainage facilities or erosion control features have been completed and are operative.

D. Handling of Fine Material: Fine material placed or exposed during the work shall be so handled and treated as to minimize the possibility of its reaching any surface waters. Use diversion channels, dikes, sediment traps, or any other effective control measures.

E. Silt Stops: Provide silt stops wherever erosion control measures may not be totally capable of controlling erosion, such as in drainage channels and where steep slopes may exist.

F. Special Precautions: Take special precautions in the use of construction equipment to minimize erosion. Do not leave wheel tracks where erosion might begin.

G. Off-Site Erosion Control: The requirements of this Section also apply to Project-related construction activities away from the Project site, such as at borrow pits, off-site storage areas, and haul and work roads.

H. Mulching: Mulching shall follow the seeding operation by not more than 24 hours.

I. Remedial Action: Should any protective measures employed indicate any deficiencies or erosion taking place, immediately provide additional materials, or employ different techniques to correct the situation and to prevent subsequent erosion.

J. Discontinuation: Continue erosion control measures until the permanent measures have been sufficiently established and are capable of controlling erosion on their own.

K. Permits: Comply with all Federal, state and local laws, ordinances, rules, and regulations.

1.03 QUALITY CONTROL:

Provide at least one person who shall be present at all times during erosion control operations and who shall be thoroughly familiar with the types of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

Material manufacturers and vendors shall be reputable, qualified firms regularly engaged in producing the required types of materials.

Protect and maintain all areas disturbed by the Work, such that erosion is adequately controlled and silt and sediments are not allowed to flow into any watercourse, onto adjacent properties, or into storm drains.

PART 2 - PRODUCTS

2.01 STRAW MULCH:

A. General: Straw mulches shall be reasonably free from swamp grass, weeds, twigs, debris and other deleterious material, and free from rot, mold, primary noxious weed seeds, and rough or woody materials. Mulches containing mature seed of species which would volunteer and be detrimental to the permanent seeding, or would result in overseeding, or would produce growth which is aesthetically unpleasing, is not permitted.

B. Straw Mulch: Properly aired native straw, Sudan grass straw, broomsedge straw, legume straw, or similar straw or grass mowings. When air-dried in the loose state, the contents of the representative bale shall lose not more than fifteen (15) percent of the resulting air-dry weight of the bale. Apply at the rate of 2 tons/ac.

C. Mulch Stabilizers: "Curasol" applied at the rate of 40 gal/ac. or Dow "Mulch Binder" applied at the rate of 45 gal/ac.

D. Permanent Type Mulch Nets: "Curlex" blanket as manufactured by American Excelsior, or equal.

2.02 SEED AND SOD FOR EROSION CONTROL:

A. For Temporary Control Use annual or perennial ryegrass.

B. For Permanent Control See Section "Seeding".

2.03 HAY BALES FOR EROSION CONTROL:

Rectangular shaped bales of straw or straw, weighing at least 40 lbs per bale, free from primary noxious weed seeds and rough or woody materials.

2.04 SILT FENCES:

"Envirofence" by Mirafi, Inc. or an approved equal.

2.05 EROSION CONTROL MATTING:

A. Shall be placed on newly loamed and seeded areas susceptible to erosion or in areas with surface water velocities above 4 feet per second (i.e., drainage swales or channels), as necessary or as indicated on the Contract Drawings, or as directed by the engineer. The matting shall be North American Green S150, P550, or an approved equivalent.

B. A mulch netting shall be placed over areas that cannot be seeded within the normal growing season, that are not susceptible to severe erosion or high surface water velocities (i.e., sideslopes of dikes). The mulch netting shall be installed over the hay mulch and anchored per the manufacturer's recommendations. The mulch netting shall be Radix manufactured by Tenax or an approved equal.

2.06 STONE CHECK DAMS:

A. Stone check dams shall be constructed of a core of two- to three-inch crushed stone.

B. The stone check dams shall be constructed and placed in ditches as indicated on the Contact Drawings.

PART 3 - EXECUTION

3.01 STRAW MULCHING:

A. Install straw mulch immediately after each area has been properly prepared. When permanent seed or seed for temporary erosion control is shown prior to placing the mulch, place mulch on seeded areas within 24 hours after seeding. Engineer may authorize the blowing of chopped mulch provided that 95% of the mulch fibers will be 6" or more in length and that it can be applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants. Straw mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see the ground through the mulch. Remove matted mulch or branches.

B. Apply a system of pegs and strings, a chemical stabilizer, or temporary type netting to the mulch, where mild winds may blow the mulch, or when ground slopes exceed 15%, or when otherwise required to maintain the mulch firmly in place. Unless otherwise directed, remove the strings and netting prior to the acceptance of the Work.

C. Apply temporary type netting over the mulch and take whatever measures are necessary to maintain the mulch firmly in place, where high winds exist, or heavy rainstorms are likely, or where ground surfaces are steep, or where other conditions require.

D. The use of permanent type netting is not permitted without the prior approval of Engineer, unless otherwise specified.

3.02 HAY BALES AND SILT FENCES:

A. Provide straw bales or silt fences, as required, for the temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, or entering catch basins, or damaging the Work.

B. Stake the straw bales as shown in the details to hold them firmly in place. Use a sufficient number of bales to accommodate runoff without causing any flooding and to adequately store any silt, sediment, and debris reaching them (minimum of 1 every 50 feet).

C. Erect silt fences and bury bottom edge in accordance with the manufacturer's recommended installation instructions. Provide a sufficient length of fence to accommodate runoff without causing any flooding and to adequately store any silt, sediment, and debris reaching it.

D. Leave straw bales and silt fences in place until permanent erosion control measures have stopped all erosion and siltation, then remove and dispose of properly.

3.03 MAINTENANCE

If any temporary erosion and sediment control measures are disturbed, repair them immediately. Check erosion control devices weekly and after any heavy rain storms.

If seed is washed out before germination, repair any damage, refertilize, and reseed.

Maintain mulched and matted areas, silt stops, and other temporary control measures until the permanent control measures are established and no further erosion is likely.

END OF SECTION

SECTION 02451

CORRUGATED HDPE PIPE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 02200

B. Erosion Control: Section 02270

1.03 DESCRIPTION OF WORK:

A. Work Included: Provide and install corrugated HDPE pipe of the type(s), size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Work Not Included: Temporary drainage devices used by the Contractor for construction purposes.

1.04 SUBMITTALS:

A. The Contractor shall furnish the name of the manufacturer to the Owner's Representative prior to commencing work. Pipe of the same manufacturer shall be used throughout the project.

B. The Owner's Representative may request the Contractor to submit manufacturer's certification that the product meets the requirements of this Specification.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Exercise care when handling corrugated pipe to prevent damage to pipe and finish.

B. Immediately remove damaged materials and replace at no additional cost to the Owner.

C. Store materials above ground on platforms, skids, or other adequate supports.

PART 2 - PRODUCTS

2.01 MATERIALS:

1. Stormwater transport pipe shall be annular smooth interior, high density polyethylene pipe.

a) AASHTO M 294 - Standard specifications for corrugated polyethylene pipe (18" diameter).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pipe:

1. Accurately lay to the line and grades to the satisfaction of the Owner's Representative.

2. The line and grade may be adjusted by the Owner's Representative from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore.

3. Stone Bedding: As specified in Section 02200.

4. Provide proper facilities for lowering the sections of pipe where pipe is to be placed.

5. Securely attach each section to the adjoining section by the approved method for the type of joint used.

6. Sections of Corrugated Pipe: Join by enclosing joints with coupling bands of the same material as the pipe.

7. Pipe Grade Defined: The pipe grade shown on the Drawings, and referred to in the Specifications is as follows: When a gravel or concrete foundation is used, it is the underside of the gravel or concrete indicated on the plans.

3.02 INSPECTION:

A. Pipe installation shall be subject to inspection by the Owner's Representative for quality, adherence to line grade, jointing, and proper backfill.

B. Any joint not satisfactory to the Owner's Representative shall be removed and remade to his satisfaction at the Contractor's expense.

C. No pipe shall be backfilled until it has been approved by the Owner's Representative.

END OF SECTION

SECTION 02480

SEEDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Erosion Control: Section 02270

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to perform seeding work in conformity with the contract drawings and as specified herein. Excavation, filling, and grading required to establish elevations shown on the Drawings are not specified in this Section. Refer to Section 02200, Earthwork.

1.04 QUALITY ASSURANCE: Subcontract the seeding work to a single firm specializing in landscape work.

A. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.

2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable or as further specified.

3. Grass Seed: All seed shall be certified as to mixture, germination, and purity, as being in conformity with the following requirements:

a. Each variety of seed shall have a percentage of germination of not less than 80, a percentage of purity of not less than 85, and shall have not more than one percent of weed content.

b. All seed shall be from the same or previous year's crop unless recent tests by an approved testing agency demonstrates that older seed meets the above requirements.

4. Inspection: The Owner's Representative reserves the right to inspect any plant materials either at the place of growth or at the site before planting, for compliance with requirements for name, variety, size, and quality.

1.05 SUBMITTALS

A. Certification: For information only, submit 2 copies of certificates of inspection as required by governmental authorities, and manufacturer's or vendors analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at the site.

1.07 JOB CONDITIONS: Contractor must examine the subgrade, verify the elevations, observe the conditions under which work is to be performed and notify the Owner's Representative of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

It shall be the Contractor's responsibility to restore to the line, grade, and surface of all eroded areas with approved material and to keep topsoiled areas in acceptable condition until turf is established and accepted by the Owner's Representative.

Proceed with and complete the seeding work as rapidly as portions of the site become available, working within the required seasonal limitations.

A. Seeding Seasons: Unless variance is requested in writing and approved by the Owner's Representative, seeding shall be done within the following dates:

Permanent Seeding:	March 1 – October 15
Temporary Seeding:	October 16 – February 28

PART 2 - PRODUCTS

A. Vegetative Soil (Topsoil): Vegetative soil shall be loam, sandy loam, silt loam, sandy clay loam, silty clay loam, clay loam, or loamy sand. Vegetative layer shall be fertile, friable soil free of roots stumps, stones larger than 3 inches in diameter, live plants, noxious weeds, and foreign matter. It shall contain more than of 1.5% organic matter by weight and should have a pH of above 3.6 before liming, and should have less than 500 parts per million of soluble salts.

An agronomic study should be performed on all vegetative soil sources planned use on the site. Agronomic testing should be performed by the North Carolina Department of Agriculture soil testing laboratory or by commercial laboratories qualified to perform agronomic testing.

B. Soil Amendments:

1. Lime: Natural limestone containing not less than 90% of total carbonates, ground so that not less than 100% passes a 10-mesh sieve, not less than 90% passes a 20 mesh sieve, and not less than 50% passes a 100 mesh sieve.

2. Fertilizer: Fertilizer shall be a commercial type with 50 percent of the elements derived from organic sources and shall conform to the recommendations of the agronomic testing.

2.02 GRASS MATERIAL:

A. Grass Seed: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

The seed mixtures shall consist of seeds proportioned by weight as follows:

Permanent Seeding		Temporary Seeding	
Kentucky 31	105 lbs/acre	Annual Rye	40 lbs/acre
Creeping Red Fescue	24 lbs/acre		
Kentucky Blue Grass	24 lbs/acre		
Sericea Lespadeza	24 lbs/acre		
Korean Lespadeza	21 lbs/acre		
Annual Rye	21 lbs/acre		
White Dutch Clover	6 lbs/acre		

2.03 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Mulch for Seeded Areas:

1. Hay or straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds and other undesirable material. No material shall be used which is too wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings, or other short fibered material shall be used unless directed.

2. Cellulose fiber mulch shall consist of natural wood, recycled paper, or humus cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Cellulose fiber mulch shall be supplied in moisture resistant, sealed bags marked with the manufacturer's name, the air dry weight, and composition of the contents.

B. Mulch Binder: Material for mulch tackifier shall be a non-asphaltic base product, such as Hydro Glass Corporation Hydrotack or an Owner's Representative approved equivalent.

PART 3 - EXECUTION

3.01 SEEDING:

A. Locations: All areas disturbed as a result of construction shall require seeding and mulching.

B. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

C. Rates of Application: Rates of application for limestone, fertilizer, and grass seed shall be in accordance with the Construction Drawings.

D. The hydraulic spray method shall be used for seeding all areas unless alternative methods are approved by the Owner's Representative.

E. Application Procedure:

1. Hydraulic Spray Method: The hydraulic spray method of sowing seed shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Owner's Representative finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to be abandoned and the balance of the work done as specified under another method.

F. Mulching:

1. Cellulose fiber mulch shall be applied as a waterborne slurry. The cellulose fiber and water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at a rate that completely covers the ground.

   Cellulose fiber mulch may be mixed with the proper quantities of seed, fertilizer, and agricultural limestone as required, or may be applied separately the next day after seeding.

2. Areas which cannot be seeded within the growing season shall be temporary seeded and mulched to provide protection to the soil surface. An organic mulch other than wood fiber alone shall be used along with a mulch netting. The areas will be reseeded with permanent seed as soon as seeding dates and weather conditions permit.

G. Erosion Control Blanket:

1. Erosion Control Blanket shall be placed at locations indicated on Contract Drawings. The anchoring of the blanket shall be as indicated on the Contract Drawings and as recommended by the manufacturer. All blankets shall be placed after seeding.

3.02 MAINTENANCE AND ACCEPTANCE:

A. Seeded Areas:

1. Maintain seeded areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, acceptable grass growth, free of eroded or bare areas.

2. Seeding, March 1 to October 15, Inclusive: The Contractor shall maintain each seeded area until acceptance of the individual area. Maintenance shall consist of providing protection by erecting necessary signs and barriers and by repairing damaged areas as directed. Damaged areas and areas which do not produce a satisfactory stand of grass shall be repaired to re-establish the condition and grade of the area prior to the original seeding and then refertilized, reseeded and remulched as specified to produce satisfactory results.

   Areas fertilized and seeded by the hydraulic method will be accepted only upon attainment of a reasonable thick uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots, i.e., 5-foot-diameter or more.

3. Seeding, October 16 to February 28, Inclusive: The Contractor shall maintain each seeded area until acceptance of the individual area. Maintenance shall consist of providing protection by erecting necessary signs or barriers and by repairing damaged areas as directed. Damaged areas shall be repaired by re-establishing the grade of the area prior to damage and by reapplying mulch. Refertilizing and reseeding will not be required during this period. Necessary maintenance or repairs will not be paid for but shall be considered incidental to the Contract. Areas fertilized, seeded, and mulched between October 16 and February 28 will be accepted only upon attainment of a reasonably thick uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots.

4. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorously growing condition for two cuttings.

5. Immediately reseed areas which show bare spots.

3.03 RESTORATION

A. Restore improvements damaged by or removed by this work to original condition, as acceptable to Owners or other parties or authorities having jurisdiction including but not limited to fences, curbs, signs, trees, shrubs, vegetation, poles, and posts.

END OF SECTION

SECTION 02570

MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, general provisions of contract, and supplementary general conditions apply to the work specified under this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to construct manholes or catch basins, and alter manholes or catch basins, in conformity with the contract drawings and as specified herein.

1.04 SUBMITTALS: The Contractor shall submit to the Owner's Representative shop drawings of all precast units. Manufacturer's information shall be submitted for precast structures, joint sealants and waterproofing.

PART 2 - MATERIALS

2.01 MORTAR: Cement mortar shall be prepared in the following manner:

A. The cement shall be Type II. The mix shall be one (1) part cement to three (3) parts clean, well graded, hard, durable sand. Hydrated lime may be added to the mixture in an amount not to exceed 15% by weight of the cement. The amount of water shall be only the amount necessary to make a workable mix.

2.02 BRICK: Brick for manholes shall meet the latest AASHTO Specification Designation M-91.

2.03 PRECAST MANHOLES AND CATCH BASINS: Precast sections shall be manufactured in accordance with the latest ASTM Specification Designation C-478. Fabrication of the precast structures shall be as follows:

A. The tongue and groove of manhole and catch basin sections shall be formed of concrete so as to receive "O"-Ring rubber gaskets or a premolded bituminous seal. Sections shall be set so as to be vertical and in true alignment. Approved lubricant shall be applied over the inside tongue and over the rubber gasket immediately prior to setting one section on top of another if "O"-Ring joints are used.

B. Each section of the precast manhole and catch basin shall have two (2) holes for the purpose of handling and installing. These holes shall be tapered and shall be plugged with mortar after installation.

C. Holes for pipes shall be cast in the base section so that there is a clear distance of 4-1/2" minimum between the inside bottom of the base section and the pipe invert.

D. The joint for the pipe at the base section shall consist of (a) a cast iron compression flange, together with cast iron inserts (embedded in the wall of the base section) and an "O"-Ring gasket to provide a watertight seal and to allow a flexible joint capable of deflecting a maximum 9" from centerline of pipe; (b) rubber gasket anchoring rings cast into the concrete base and hard rubber wedge driven in to compress the gasket around the pipe: or (c) flexible rubber sleeve cast into the base section; or other joint as approved by the Owner's Representative.

2.04 WATERPROOFING: Waterproofing for manholes shall be:

A. Asphalt conforming to ASTM Designation D-41, or

B. Cement base coating suitable for brush coat application.

2.05 FRAMES AND COVERS:

A. All castings shall be made of clean, even grain, grey cast iron. The castings shall be smooth, true to pattern and free from projections, sand holes, warp, and other defects which would interfere with the use of, or impair the serviceability of the castings.

B. The horizontal surface of the cover seat and under surface of the cover which rests upon the cover seat shall be machined on all frames and cover intended for vehicular traffic. After machining it shall be impossible to rock any cover after it has been seated on its associated frame.

C. The iron used for castings shall conform to ASTM Designation A-48 for Class 30 grey iron.

D. Unless otherwise shown on the Drawings, all castings shall be coated with coal tar pitch varnish, to which sufficient oil has been added to make a smooth coating, tough and tenacious when cold, not tacky and not brittle.

E. Manufacturer's name and catalog figure number must be cast on each frame and cover. The work SEWER or STORM must be stamped on the manhole covers as appropriate.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General:

1. The excavation shall be properly dewatered while placing bedding material and setting the base or placing concrete. Waterstops shall be used at the horizontal joint of cast-in-place manholes. Bases shall be placed on a 6" layer of compacted stone bedding.

2. Inlet and outlet stubs shall be connected and sealed as shown on the Drawings.

3. Barrel sections and cones of the appropriate combination of heights shall then be placed, using manufacturer's recommended procedure for sealing the horizontal joints, and as shown on the Drawings or the remaining barrel of the manhole shall be cast above the base.

4. If required, a leakage test shall then be made as described in "Leakage Tests."

5. Following satisfactory completion of the leakage test, the frame, and cover shall be placed on the top or some other means of preventing accidental entry by unauthorized persons, children, animals, etc., until the Contractor is ready to make final adjustment to grade.

B. Waterproofing: The waterproofing of the exterior surfaces of manholes shall be one of the following methods:

1. Bituminous Coating: After the concrete or cement plaster has set, two coats of an approved bituminous waterproofing material shall be applied to all outside surfaces of manholes. Waterproofing material shall be applied by brush or spray at approximate rate of 70 sq. ft./gal., in accordance with the manufacturer's instructions. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first.

2. Cement Base Coating: Cement base coatings delivered in sealed containers shall be mixed in accordance with the manufacturer's recommendations and applied with a stiff brush in 2 coats. Each coat shall be applied at the rate of 2 lb. per sq. yd.

D. Frames and Covers: Frames shall be set on mortared brick courses true to grade and concentric with the opening. All voids beneath the bottom flange and in the brick courses shall be completely filled to make a watertight fit. A ring of mortar at least 1 inch thick shall be placed around the outside of the bottom flange, extending to the edge of the manhole all around its circumference. The bricks and mortar shall not extend beyond the top of precast concrete cone section.

E. Pipe Connections: Pipes entering or leaving manholes shall not exceed two (2) feet in length measured from the inside face of the manhole wall. Pipe connection into precast bases shall be made by manufactured flexible rubber sleeves. Manhole bases using manufactured manhole connections shall be installed in accordance with the manufacturer's requirements.

3.02 ALTER EXISTING MANHOLES OR CATCH BASINS: When altering existing catch basins or manholes, the structure shall be dismantled sufficiently to allow reconstruction in accordance with the applicable requirements as shown on the Drawings for complete catch basins and manholes. Each altered manhole or catch basin shall be cleaned of all accumulated silt, debris, or foreign matter prior to final acceptance of work.

3.03 VACUUM LEAKAGE TESTS (as required):

A. General:

1. To be observed by the Engineer on each sewer manhole except for the air release valve manhole.

2. A vacuum test made as described below. Manhole to pipe connection must be a flexible connector to perform this testing.

B. Preparation for Test:

1. After the manhole has been assembled in place, fill lifting holes and point with an approved non-shrinking mortar.

2. Perform test prior to placing the shelf and invert and before filling and pointing the horizontal joints, and before backfilling.

3. If the groundwater table has been allowed to rise above the bottom of the manhole, lower for the duration of the test.

4. Plug pipes and other openings into the manhole and the plugs braced to prevent blow out.

C. Test Procedure:

1. Test immediately after manhole assembly.

2. Use manhole vacuum test equipment equal to NPC Systems, Inc., Milford, New Hampshire.

3. Set tester in place.

4. Inflate compression band to seal base to structure.

5. Draw a vacuum of 10-in. Hg.

6. Close the valve.

7. Acceptable test:

   a. Less than 1 in. Hg drop in one minute for a manhole less than 10 ft. in depth.

   b. Less than 1 in. Hg drop in two minutes for a manhole 10 ft. to 20 ft. in depth.

8. If leakage occurs fill those points with non-shrink grout, allow to set and retest.

9. Rejected Manholes: Disassemble, reconstruct, or replace as directed by the Engineer.

D. Backfilling: The test may be conducted either before or after backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

3.04 EXFILTRATION/INFILTRATION TESTS (AS REQUIRED):

A. General: Upon approval of the Owner's Representative, exfiltration/infiltration leakage tests, observed by the Owner's Representative, can be substituted for a vacuum leakage test on a case-by-case basis. The test shall be an exfiltration or infiltration test made as described below, and as selected by the Owner's Representative.

B. Exfiltration Test: After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. The test shall be made before backfilling and pointing the horizontal joints. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

Test Procedure: The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily watertight. If the test as described above is unsatisfactory as determined by the Owner's Representative or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Owner's Representative to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Owner's Representative. The manhole shall then be retested and, if satisfactory, all interior joints and those exterior joints within 6 feet of the surface shall be filled and pointed.

Backfilling: The test shall be conducted before backfilling around the manhole. However, if the Contractor requests to backfill prior to testing, and is granted permission by the Owner's Representative for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e. it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

C. Infiltration Test: If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Owner's Representative, such a test can be used to evaluate the watertightness of the manhole. However, if the Owner's Representative is not satisfied, the Contractor shall lower the water table and carry out the exfiltration test as described herein.

END OF SECTION

QUALITY ASSURANCE/ QUALITY CONTROL PLAN FOR LANDFILL NO. 6 AREA A WEST CLOSURE GENERAL CONTRACTOR

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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1.0 SCOPE

This Quality Assurance/Quality Control Plan (Plan) addresses construction quality assurance and quality control for earthwork at Area 6A-West at Evergreen Packaging Canton Mill (Evergreen) No. 6 Landfill. Area 6A-West encompasses approximately 18 acres, and will be closed with a soil cover over the entire cell. The development will consist of 12 inches of drainage stone over waste, covered by 12 inches of compacted soil cover, overlain by a 4-inch vegetative soil layer.

This plan outlines the characterization of the borrow source soil's physical properties to determine its ability to achieve the project's performance criteria; defines procedures for soil placement; defines tests and frequency of testing to assure the construction meets or exceeds design criteria; and provides a method for documenting the soil placement.

1.1 Parties

The parties discussed in this section are associated with the ownership, design, installation, and quality assurance of the cover system. The definitions, qualifications, and responsibilities of these parties are outlined in the following subsections.

Project Manager. The project manager is the official representative of Evergreen. In this manual the term Project Manager shall apply equally to Construction Coordinator. The Project Manager is responsible for coordinating construction and quality assurance activities for the project. The Project Manager shall serve as communications coordinator for the project, and is responsible for initiating the pre-bid, pre-construction, and construction meetings. As construction coordinator, the Project Manager shall serve as a liaison between all parties involved in the project to assure that communications are maintained. The Project Manager shall also be responsible for proper resolution of all quality assurance issues that arise during construction. For the construction of Area 6A-West, the Project Manager is Bill von Vitzhume (828-646-2635).

Qualifications. The selection of the Project Manager is the direct responsibility of Evergreen. Qualifications for this position include familiarity with the following:

1. Applicable QAMs.
2. All applicable regulatory requirements.
3. Policies and procedures for project management.
4. Placement techniques of low hydraulic conductivity material.

Designer (Engineer). The designer (Engineer) is the individual and/or firm responsible for the preparation of the development design including, project specific engineering drawings, technical specifications and the Quality Assurance Manual. The Engineer is responsible for approving all design and specification changes, manufacturer's material certifications and contractor submittals, and for making any design clarifications during the contract bidding process and construction of the cover system. The Engineer may attend the pre-bid, pre-construction, and construction meetings upon the request of the Project Manager. The Engineer may also act as the Owner's Representative and Construction Quality Assurance Agent (CQA Agent) during construction of the project. The Design Firm for the development of the Landfill is Sevee & Maher Engineers, Inc. (SME) of Cumberland, Maine. The Project Engineer is Guy Cote, P.E. of SME.

Construction Quality Assurance Agent. The CQA Agent is responsible for review of the borrow source and in-place material testing results and for the observation of the Contractor's work to assure that the liner system meets the design specifications. Qualifications for this position include familiarity with the following:

1. Applicable QAMs.
2. All applicable regulatory requirements.
3. Placement techniques of low hydraulic conductivity material.
4. Experience with soil inspection of landfill projects.

The CQA Agent is also responsible for the following:

- Approval/disapproval of borrow source material test results for the cover soil;
- The in-place testing and approval of the materials placed by the Contractor; and

- Ensure that the placement techniques utilized conform to industry standard and this QAM, and as described in Technical Specification Section 02200 Part 3.2, including the following:

  - measuring cover soil lift thickness;

  - monitoring and measuring as necessary the maximum clod size of the soil;

  - assuring the proper lift benching techniques are followed; and

  - assuring that proper lift bonding of the soil is achieved.

The CQA Agent will provide continuous monitoring during placement of the soil. It is anticipated that only one CQA Agent will be necessary during construction of the soil cover. However, should the Contractor begin placing the soil cover over separate areas of the landfill simultaneously, additional CQA Agents will be added for oversight. The CQA Agent will be under the direction of a State of North Carolina registered Professional Engineer.

General Contractor. The general contractor (Contractor) is responsible for construction of the soil cover system including supplying labor, material, equipment, and supervision for placement of the soil cover system. The primary responsibility of the general contractor is to ensure the soil cover system is constructed in accordance with the design and specifications developed by the Engineer and approved by the permitting agency. The Superintendent is the Contractor's designee who is responsible for the Contractor's field crew. The Superintendent shall represent the Contractor at all site meetings and shall be responsible for acting as the Contractor's spokesman for the project. The Contractor shall be responsible for all aspects of liner placement, including but not limited to, placement of all erosion control measures, subgrade preparation, placement of granular drainage material, placement of low hydraulic conductivity soil, topsoil, seeding, fertilizing, and mulching. The Contractor is also responsible for informing the Owner, the Engineer, and the CQA Agent of the scheduling and occurrence of all construction activities and of any discrepancies, errors, or omissions in the Contract Documents.

The Contractor shall be pre-qualified and approved by Evergreen. The Superintendent must be qualified based on previously demonstrated construction experience and management ability. Services of the Contractor will be procured through a competitive bid process. Bid packages for the solicitation of construction services will require the Contractor to identify and demonstrate familiarity and experience with the various aspects of landfill construction.

Subcontractors. Subcontractors are responsible for that portion of the work that they are designated to perform by the General Contractor. Subcontractors' work as agents of the General Contractor and as such the General Contractor is responsible for the work and actions of the Subcontractor.

1.2 Communication

To guarantee a high degree of quality during installation and assure a final product that meets all project specifications, clear, open channels of communication are essential. This section discusses appropriate lines of communication and describes all necessary meetings.

Pre-Construction Meeting. A pre-construction meeting shall be held at the site prior to beginning of the project. Typically, the meeting shall be attended by the Project Manager, Designer, CQA Agent, Contractor, Supervisor, and an Evergreen representative.

Specific topics considered for this meeting include review of the project QAP for any problems or additions. In addition, the responsibilities of each party should be reviewed and understood clearly. The meeting shall be documented by a person designated at the beginning of the meeting, and minutes shall be transmitted to all parties.

Progress Meetings. A weekly progress meeting shall be held between the Evergreen representative, Superintendent, CQA Agent, and any other concerned parties. This meeting shall discuss current progress, planned activities for the next week, issues requiring resolution, and any new business or revisions to the work. The CQA Agent shall log any problems, decisions, or questions arising at this meeting in his weekly report. If any matter remains unresolved at the end of this meeting, the Project Manager shall be responsible for the resolution of the matter and the communication of the decision to the appropriate parties.

2.0 SOIL QUALITY CONTROL

Approximately 85,000 cubic yards of cover soil borrow will be required to cover Area 6A-West. The following quality control procedures will be incorporated into the project specifications to assure that the cover soil borrow source delivered to the site meets the project specifications, and provides the data to define quality control acceptance criteria. Individual moisture density curves from the borrow source testing program will be used to guide soil placement.

Evergreen will retain the services of a technician familiar with various aspects of landfill construction, to serve as the on-site representative during construction. Services of a general contractor will be procured through a competitive bid process. Bid packages for the solicitation of construction services will require the contractor to identify and demonstrate familiarity and experience with the various aspects of landfill construction. To control the quality of the soil materials used in the landfill development, this Quality Assurance/Quality Control (QA/QC) program will be implemented. The program will include borrow source testing to demonstrate compliance with material specifications, and construction testing to demonstrate that materials have been properly installed.

2.1 Borrow Source Testing

The Owner will be required to perform an initial borrow source testing program to determine the variability of the source properties, and its compliance with the project specifications. The Owner shall employ a testing laboratory and contractor to perform the soil testing of the borrow source. Evergreen's representative will accompany the contractor during the collection of the soil samples to develop an understanding of the variability of the cover soil borrow source. The contractor will also be required to prepare soil logs and a plan of the borrow source showing the locations where the samples were collected.

The laboratory shall perform the analysis as shown on Table 2-1 and Table 2-2.

TABLE 2-1

AREA 6A WEST
BORROW SOURCE TESTING PROGRAM
COVER SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422-63	1/10,000 yd^3	Minimum 20% soil particles passing #200 sieve; maximum particle size 6 inch
Moisture/Density	ASTM D 698	1/10,000 yd^3	(2)

Notes:

1. Test frequency per source.
2. Moisture density tests used to define maximum dry density and associated optional moisture content.

TABLE 2-2

AREA 6A WEST
BORROW SOURCE TESTING PROGRAM
NO. 67 DRAINAGE STONE

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 yd^3	(2)

Notes:

1. Test frequency per source.
2. Grain size distribution listed in specifications packet.

3.0 SOIL QUALITY ASSURANCE

The following quality assurance procedures and testing will be utilized by Evergreen to guide and document construction of the soil cover.

3.1 Subgrade Preparation

3.1.1 Crown and Sideslopes. The areas of the crown and sideslopes receiving cover will be prepared by Evergreen prior to placing the stone. Preparation of the subgrade will include grading of waste. The Contractor shall be responsible for placement of a 12-inch layer of drainage stone on the crown and sideslopes of Area 6A-West.

3.2 Cover Soil Placement

The following QA/QC procedures will be used during placement of the soil cover material.

3.2.1 Moisture Control. Moisture content of the cover shall range from 0 to 4 percent higher than optimum, as determined by ASTM D 698 (standard proctor) or as determined necessary to meet the project specifications. Where subgrade or a layer of soil material must be moisture conditioned before compaction, water will be uniformly applied to surface of subgrade, or layer of soil material, in proper quantities to prevent free water appearing on surface during or subsequent to compaction operations.

Soil material that is too wet to permit compaction to the specified density will be removed and replaced, or scarified and air dried.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. The soils may be disced, harrowed, or pulverized until moisture content is reduced to a satisfactory level.

3.2.2 Placement and Compaction. Placement of cover soil will be in layers not more than 15" in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers. Lift thickness will be measured

by the Contractor and the CQA Agent during placement at the frequency of 5 tests per acre per lift. The Contractor may use driven wooden grade stakes to aid in the placement of each lift provided that all the grade stakes are collected and accounted for at the completion of the work and that all holes left behind by the grade stakes are filled with granular bentonite. Other methods of determining lift thickness such as laser survey or free-standing flexible grade stakes can also be used. The CQA Agent may also determine lift thickness by digging small test pits through the loose soil lift into the underlying layer.

Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and cover soil evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift. To connect soil lifts to a completed layer section (as a result of repairs or sequential liner section at construction), offset the lifts by one-half the compaction equipment width to create a horizontal bench without continuous vertical joints through all lifts of the barrier layer.

To provide for clod break-up of the cover soil material, a minimum number of 2 passes will be made with deep footed pad roller. The CQA Agent will perform visual inspections and measurements as necessary to assure the maximum clod size of the cover soil does not exceed 2 to 3 inches. The Contractor shall make the necessary adjustments including increasing the number of passes with the sheepsfoot roller, decreasing the lift thickness or adjusting the moisture content of the clay to control the clod size of the cover soil.

To eliminate desiccation cracks the surface will be moistened (as necessary) and reworked with 2 passes of a smooth drum roller. Desiccation is defined as moisture content below optimum, or cracks deeper than 1 inch.

Sealing the lifts will encourage runoff from storms, thus limiting development of excessively moist or wet lenses of soil within the barrier layer.

To promote good bonding between lifts, the lift surface shall be scarified or otherwise roughened by tracking with a bulldozer prior to placing the next lift of cover soil. The Contractor shall scarify the in-place lift surface to an approximate depth of 1 inch. The CQA Agent shall visually assure that the soil has been properly scarified prior to placement of subsequent lifts. The scarified zone will be considered part of the loose lift thickness of the subsequent lift.

The following types of equipment will be specified for compaction:

Caterpillar 815 Pad Foot Roller or equivalent equipment approved by the CQA Agent. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	45,900 lbs
Maximum Drum Width	38 inches
Maximum Pad Tip Area	18 square inches
Minimum Pad Height	7.5 inches
Minimum Wheel Diameter	40.5 inches

The passage of compaction equipment in either direction (forward or backward) is considered a "pass".

The following equipment will be used to obtain a smooth roll surface.

Caterpillar CS563 Vibratory Drum Roller or equivalent equipment approved by the CQA Agent. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	24,500 lbs
Vibration Frequency	1400 to 1800 vpm
Centrifugal Force	
High amplitude	50,000 lbs
Low amplitude	35,000 lbs
Maximum Drum Width	7.0 feet

3.3 In-Place Testing

As the soil material is used in the landfill cover, in-place testing will be performed by the owner's representative to monitor material placement and conformance with the criteria specified in the construction specifications. In-place material testing will be performed by a qualified materials testing laboratory and will be observed by the CQA Agent. Testing will be performed on each lift prior to placement of the subsequent lift. The contractor will be required to remove or rework material not conforming with material properties specified.

The owner's testing service shall perform the tests specified in Table 3-1 and Table 3-2 to document the liner soil in-place properties.

TABLE 3-1

AREA 6A WEST
IN-PLACE TESTING PROGRAM COVER SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 cy	Minimum 20% soil particles passing #200 sieve; maximum soil particle size 6 inch
Field Moisture Content	ASTM D 6938 or ASTM D 2937	5/acre/lift	0 to 4% above optimum
Field Density	ASTM D 6938 or ASTM D 2937	5/acre/lift	90% of maximum
Cover Thickness	Hand Auger	5/acre/lift	12 inch per lift

Note
1. Backfill all in-place test holes with bentonite.

TABLE 3-2

AREA 6A WEST
IN-PLACE TESTING PROGRAM
NO. 67 DRAINAGE STONE

Test	Method	Test Frequency	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 cy	(1)

Note
1. Grain size distribution listed in specifications packet.

4.0 CONSTRUCTION DOCUMENTATION

During construction, Evergreen's representative will document that the compaction procedures are being followed, the soil materials are as specified, and the required compaction of the cover soil is achieved. A full-time project representative will be assigned to the construction of the cover system, including the stormwater drainage system.

4.1 Inspection Reports

Inspection reports will be prepared daily and summarized weekly by Evergreen's representative during the development of the Landfill. The reports will include, but is not limited to:

- Contractor submittals and actions taken,
- Soil material test results,
- A summary of work progress,
- Summary of significant problems encountered and their resolutions,
- Change order status,
- Photographs,
- Record drawings,
- Upcoming work items for the next two weeks, and
- Punchlist items as applicable.

The weekly summaries will be forwarded to the Evergreen Project Manager within one week of the completion of each construction week.

4.2 Final Construction Certification and Report

A final construction report will be submitted to Evergreen within 45 days following the completion of Area 6A-West construction at the Landfill. The report will include, but is not limited to:

- Written certification signed and stamped by Engineer supervising project inspection (Statement of Compliance),
- Submittals,
- Field changes and construction modifications,
- QA/QC testing reports,
- Daily reports, and
- Photographs.

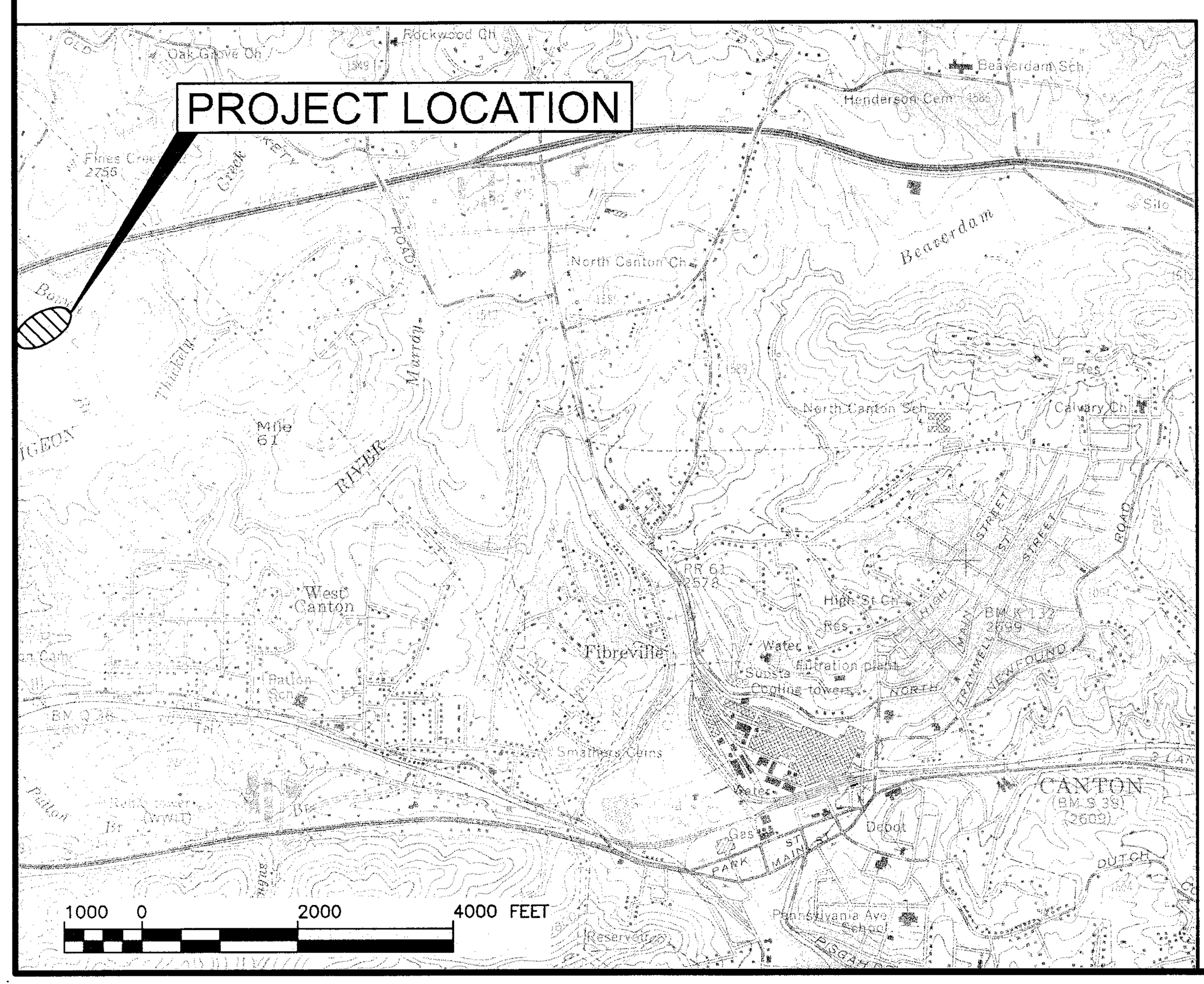
ATTACHMENT B

ENGINEERING DRAWINGS

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

TITLE	DRAWING NUMBER
COVER SHEET	
SYMBOLS, ABBREVIATIONS AND SPECIFICATIONS	C-100
SITE LOCATION PLAN	C-101
EXISTING CONDITIONS PLAN	C-102
AREA A WEST FINAL WASTE GRADING PLAN	C-103
AREA A WEST FINAL GRADING PLAN	C-104
SECTIONS & DETAILS	C-300

LOCATION MAP



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APRIL 2011
JOB NO. 10164.00

SYMBOLS

EXISTING	PROPOSED		EXISTING	PROPOSED		EXISTING	PROPOSED	
		NORTH ARROW (MAGNETIC)			STONE WALL			MANHOLE
N		NORTH ARROW (PLAN NORTH)			DRAINAGE COURSE (WITH DIRECTION)			CATCH BASIN
25	25	CONTOUR LINES	SHORE SIDE		EDGE OF WATER			WATER VALVE
25 x 63	25.56	SPOT ELEVATION (GRADE)			WATER ELEVATION (GROUND OR SURFACE)			HYDRANT
		EXISTING GROUND			FENCE LINE (WOOD)			UTILITY POLE
S B		SURVEY BASELINE WITH TRIANGULATION OR INTERSECTION PT.			FENCE LINE (WIRE)			CLEAN OUT STRUCTURE
		PROPERTY LINE OR R.O.W.			RETAINING WALL	G	G	UNDERGROUND GAS MAIN
N35°-10'-10"W 251.17'	N35°-10'-10"W 251.17'	PROPERTY LINE W/ BEARING AND DISTANCE			GUARD RAIL	T	T	UNDERGROUND TELEPHONE LINE
	0+00 1+00	CONSTRUCTION BASELINE			BUILDING AND STRUCTURES	E	E	UNDERGROUND ELECTRICAL LINE
		BOUNDARY LINE (State, County, Municipality)		1 2 OR 2:1	SLOPE RATIO (HORIZONTAL TO VERTICAL)	OE	OE	OVERHEAD ELECTRICAL LINE
		SURVEY MONUMENT		TOP OF SLOPE	SLOPES (WITH SLOPE RATIO)		12" ACP	SANITARY SEWER, SIZE & TYPE
IF	IF	SURVEY IRON			EDGE OF TRAVELED WAY	FM	8" PVC	FORCE MAIN, SIZE & TYPE
		DRILL HOLE, PK, OR STAKE		F	CUT OR FILL LINE	W	8" D.I.	WATER MAIN, SIZE & TYPE
		WOODS OR BRUSH LINE		CLL	CLEARING LIMIT LINE		12" RCP	STORM DRAIN, SIZE & TYPE
		INDIVIDUAL TREE (Deciduous)			BITUMINOUS PAVEMENT	UD	8" UD	UNDERDRAIN, SIZE & TYPE
		INDIVIDUAL TREE (Coniferous)			CONCRETE			CULVERT
		TREE, TO BE REMOVED	B-12 MW-12 P-12	B-12 MW-12 P-12	TEST BORING, MONITORING WELL, OR PIEZOMETER AND NUMBER			RAILROAD
		MARSH AREA	TP-12	TP-12	TEST PIT AND NUMBER		S	SILTATION FENCE
							D	DIVERSION BERM
								STONE CHECK DAM

GENERAL NOTES:

THE CONTRACTOR MUST COMPLY WITH ALL APPLICABLE SAFETY PROCEDURES WITH RESPECT TO THE EMPLOYEES OF THE CONTRACTOR AND HIS SUBCONTRACTOR UNDER THE OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) AND REGULATIONS ISSUED THEREUNDER AND STATE LABOR (SAFETY) DEPARTMENT AND MILL RULES, PROCEDURES, AND REGULATIONS REGARDING SAFETY.

CONTOURS SHOWN ON PLANS MAY NOT REPRESENT EXISTING CONDITIONS OF THE SITE.

MATERIAL SPECIFICATIONS:

OFF-SITE BORROW – SECTION 02200 SPECIFICATION
COVER SOIL – SECTION 02200 SPECIFICATION
VEGETATIVE SOIL – SECTION 02200 SPECIFICATION
#67 STONE – NCDOT #67 AGGREGATE

COMPACTION – ALL FILL SOIL SHALL BE COMPACTED TO A DENSITY OF 90 PERCENT OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 (STANDARD PROCTOR)

24" HDPE PIPE – SOLID, CORRUGATED, ANNULAR SMOOTH INTERIOR POLYETHYLENE PIPE

SEED AND FERTILIZER:

AREAS DISTURBED BY CONSTRUCTION SHALL BE FERTILIZED AND SEEDED.

MATERIAL:

AGRICULTURAL GROUND LIMESTONE: 100 LBS PER 1,000 SF OR AS NEEDED BASED ON TESTING

FERTILIZER: GRANULAR FERTILIZER 10,10,10 (N.P,K) 25 LB/1000 SF OR AS NEEDED BASED ON TESTING

SEED:

KENTUCKY 31	105 lbs/acre
CREEPING RED FESCUE	24 lbs/acre
KENTUCKY BLUE GRASS	24 lbs/acre
SERICEA LESPEDEZA	24 lbs/acre
KOREAN LESPEDEZA	21 lbs/acre
ANNUAL RYE	21 lbs/acre
WHITE DUTCH CLOVER	6 lbs/acre
	225 lbs/acre

SEEDING WILL BE OCCUR BETWEEN MARCH 1 AND OCT 15; IF NOT, ADD 40 LB/ACRE RYE GRAIN

MULCH – THE MULCH APPLICATION RATE SHALL BE 2 TONS PER ACRE

EROSION AND SEDIMENTATION CONTROL

PROJECT DESCRIPTION

THIS PROJECT CONSIST OF PLACEMENT OF COVER SOIL MATERIAL FOR THE PURPOSE OF CLOSING EXISTING LANDFILL CELLS. THIS PLAN REVISES PREVIOUSLY FILED EROSION CONTROL PLANS. THE PLAN INVOLVES THE CONSTRUCTION OF 6A WEST COVER SYSTEM.

THE PRIMARY MEANS OF EROSION AND SEDIMENT CONTROL WILL BE:

- STONE CHECK DAMS.
- TEMPORARY AND PERMANENT SEEDING OF SLOPES.
- INSTALLING EROSION CONTROL MATTING FOR CHANNEL LINING.
- TEMPORARY MULCHING OF DISTURBED AREAS.

SITE DESCRIPTION

AREA A WEST – THIS SITE IS APPROXIMATELY 18 ACRES IN SIZE AND MODERATELY SLOPING.

ADJACENT PROPERTY

AREAS ARE LOCATED ENTIRELY WITHIN PROPERTY OWNED BY EVERGREEN PACKAGING.

RESPONSIBLE PARTIES

THE CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES UNTIL THE SITE IS STABILIZED (90% GRASS COVER). EVERGREEN PACKAGING WILL BE RESPONSIBLE FOR MAINTENANCE OF THESE MEASURES AFTER GRASS IS ESTABLISHED.

MAINTENANCE PLAN

1. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY RUNOFF-PRODUCING RAINFALL; IN NO CASE LESS THAN ONCE EVERY WEEK. ANY NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED.
2. ALL SEDIMENT AND EROSION CONTROL FACILITIES SHALL BE INSPECTED AND RECORDS OF INSPECTIONS KEPT AS REQUIRED BY THE NCDENR GENERAL PERMIT TO DISCHARGE STORMWATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
3. ALL SEEDED AREAS WILL BE FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED ACCORDING TO THE SPECIFICATIONS TO REPAIR AND MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER.

SPECIFICATIONS

EROSION AND SEDIMENTATION CONTROL
EVERGREEN PACKAGING
LANDFILL 6 AREA A WEST CLOSURE AMENDMENT
HAYWOOD COUNTY, N. C.

THE CONTRACTOR IS ADVISED THAT PARTICULAR ATTENTION TO EROSION AND SEDIMENTATION CONTROL, ACCORDING TO GS 113A-54, IS AN INTEGRAL PART OF THIS WORK.

THE BASIC OBJECTIVE IN EROSION AND SEDIMENTATION CONTROL SHALL BE TO:

- IDENTIFY CRITICAL AREAS;
- LIMIT THE SIZE OF DISTURBED OR EXPOSED AREAS;
- LIMIT THE TIME OF EXPOSURE OR DURATION OF DISTURBANCE TO AN AREA;
- CONTROL SURFACE WATER RUNOFF OVER EXPOSED AREAS SO AS TO REDUCE EROSION AND SEDIMENT LOSS; AND
- TO PLAN AND CONDUCT THE WORK SO AS TO MINIMIZE EXPOSURE TO POSSIBLE EROSION AND OFF-SITE SEDIMENTATION DAMAGE.

THE CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION SHALL BE FAMILIAR WITH THE NORTH CAROLINA REGULATIONS FOR EROSION AND SEDIMENTATION CONTROL. THE MINIMUM STANDARDS SHALL BE THE GUIDE FOR SEDIMENT CONTROL ON CONSTRUCTION SITES IN NORTH CAROLINA. THESE DOCUMENTS MAY BE OBTAINED FROM THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES.

THE FINISHED GRADE IN ALL AREAS SHALL BE SEEDED AS SOON AS POSSIBLE AND IN NO CASE SHALL ANY DISTURBED AREAS REMAIN UNPROTECTED FOR MORE THAN 30 DAYS. PROTECTION SHALL BE MULCH, SEED AND MULCH.

CONSTRUCTION SEQUENCE

1. DITCHES, BERMS AND SWALES SHALL BE PROTECTED IMMEDIATELY USING EROSION CONTROL MATTING OR HAY BALES WHERE REQUIRED OR SEEDED WITH A QUICK COVER CROP SUCH AS RYE.
2. PROCEED WITH EARTHMOVING OPERATIONS, SLOPING THE AREAS TO MEET THE PROPOSED FINAL GRADES.
3. ALL GRADED OR DISTURBED AREAS SHALL BE SEEDED AND MULCHED AS SOON AS IS PRACTICAL. ALL EXPOSED AREAS MUST BE STABILIZED WITHIN 30 DAYS OF FIRST BEING DISTURBED. TEMPORARY MEASURES SHALL REMAIN AND BE MAINTAINED UNTIL FINISH GRADING, SEEDING AND MULCHING REQUIRES THEIR REMOVAL. THEY SHALL BE INSPECTED, REPAIRED OR OTHERWISE REINSTALLED AS NECESSARY AFTER EACH SIGNIFICANT RAIN.

A.C.C.M.P	ASPHALT COATED C.M.P.
A.C.P.	ASBESTOS CEMENT PIPE
AC	ACRE
AGG	AGGREGATE
ALUM	ALUMINUM
APPD	APPROVED
APPROX	APPROXIMATE
ASB	ASBESTOS
ASPH	ASPHALT
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AZ	AZIMUTH
B.C.C.M.P.	BITUMINOUS COATED C.M.P.
B.M.	BENCH MARK
BIT	BITUMINOUS
BLDG	BUILDING
BOT	BOTTOM
BRG	BEARING
C.B.	CATCH BASIN
CEN	CENTER
CEM. LIN.	CEMENT LINED
C.M.P.	CORRUGATED METAL PIPE
C.O.	CLEAN OUT
CF	CUBIC FEET
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CL	CLASS
CONC	CONCRETE
CONST	CONSTRUCTION
CONTR	CONTRACTOR
CTR	CENTER
CY	CUBIC YARD
D	DEGREE OF CURVE (ARC DEF.)
DBL	DOUBLE
DEG OR °	DEGREE
DEPT	DEPARTMENT
DI	DUCTILE IRON
DIA OR ø	DIAMETER
DIM	DIMENSION
DIST	DISTANCE
DN	DOWN
DR	DRAIN
DWG	DRAWING
EA	EACH
EG	EXISTING GROUND OR GRADE
ELEC	ELECTRIC
EL	ELEVATION
ELB	ELBOW
EQUIP	EQUIPMENT
EST	ESTIMATED
EXC	EXCAVATE
EXIST	EXISTING
F.G.	FINISH GRADE
FBRGL	FIBERGLASS
FDN	FOUNDATION
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FPS	FEET PER SECOND
FT OR '	FEET
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
HDPE	HIGH DENSITY POLYETHYLENE
HP	HORSEPOWER
HYD	HYDRANT
I.D.	INSIDE DIAMETER
IN OR "	INCHES
INV	INVERT
INV. EL	INVERT ELEVATION
LB	POUND
LC	LEACHATE COLLECTION
LD	LEAK DETECTION
LIN FT.	LINEAR FEET
LOC	LOCATION
LT	LEFT
M.H.	MANHOLE
M.J.	MECHANICAL JOINT
MATL	MATERIAL
MAX	MAXIMUM
MFR	MANUFACTURE
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
N.I.T.C.	NOT IN THIS CONTRACT
N.T.S.	NOT TO SCALE
N/F	NOW OR FORMERLY
NO. OR #	NUMBER
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
P.C.	POINT ON CURVE
P.I.	POINT OF INTERSECTION
P.T.	POINT OF TANGENT
PERF	PERFORATED
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
QTY	QUANTITY
R.O.W.	RIGHT OF WAY
RAD	RADIUS
REQD	REQUIRED
RT	RIGHT
RTE	ROUTE
S	SLOPE
SCH	SCHEDULE
SF	SQUARE FEET
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SHT	SHEET
STA	STATION
SY	SQUARE YARD
TAN	TANGENT
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPORARY
TYP	TYPICAL
V	VOLTS
W/	WITH
W/O	WITHOUT
YD	YARD

VIEW MARKERS & IDENTIFICATION

DETAIL TITLE
MANHOLE

SECTION TITLE & NO.
ACCESS ROAD 3
C-100
DRAWING WHERE SECTION APPEARS

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE
SYMBOLS, ABBREVIATIONS AND SPECIFICATIONS

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Sevee & Maher Engineers, Inc.
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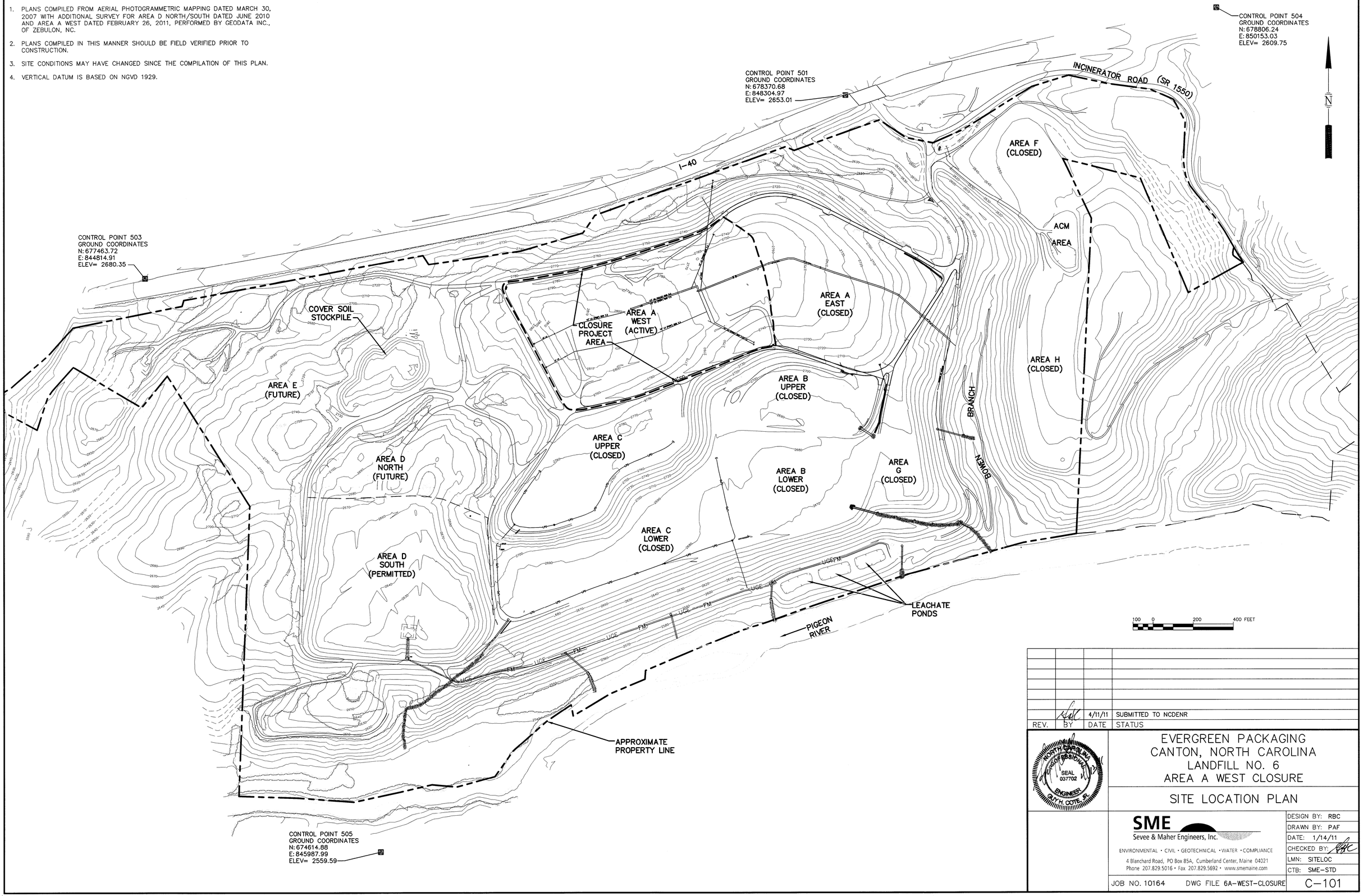
DESIGN BY: RBC
DRAWN BY: SJM
DATE: 1/25/2011
CHECKED BY:
LMN:
CTB: SME-STD

JOB NO. 10164.00 DWG FILE 6A-WEST-CLOSURE-SYMSHT

C-100

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.



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NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER RUTH C. COTE, JR.

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

SITE LOCATION PLAN

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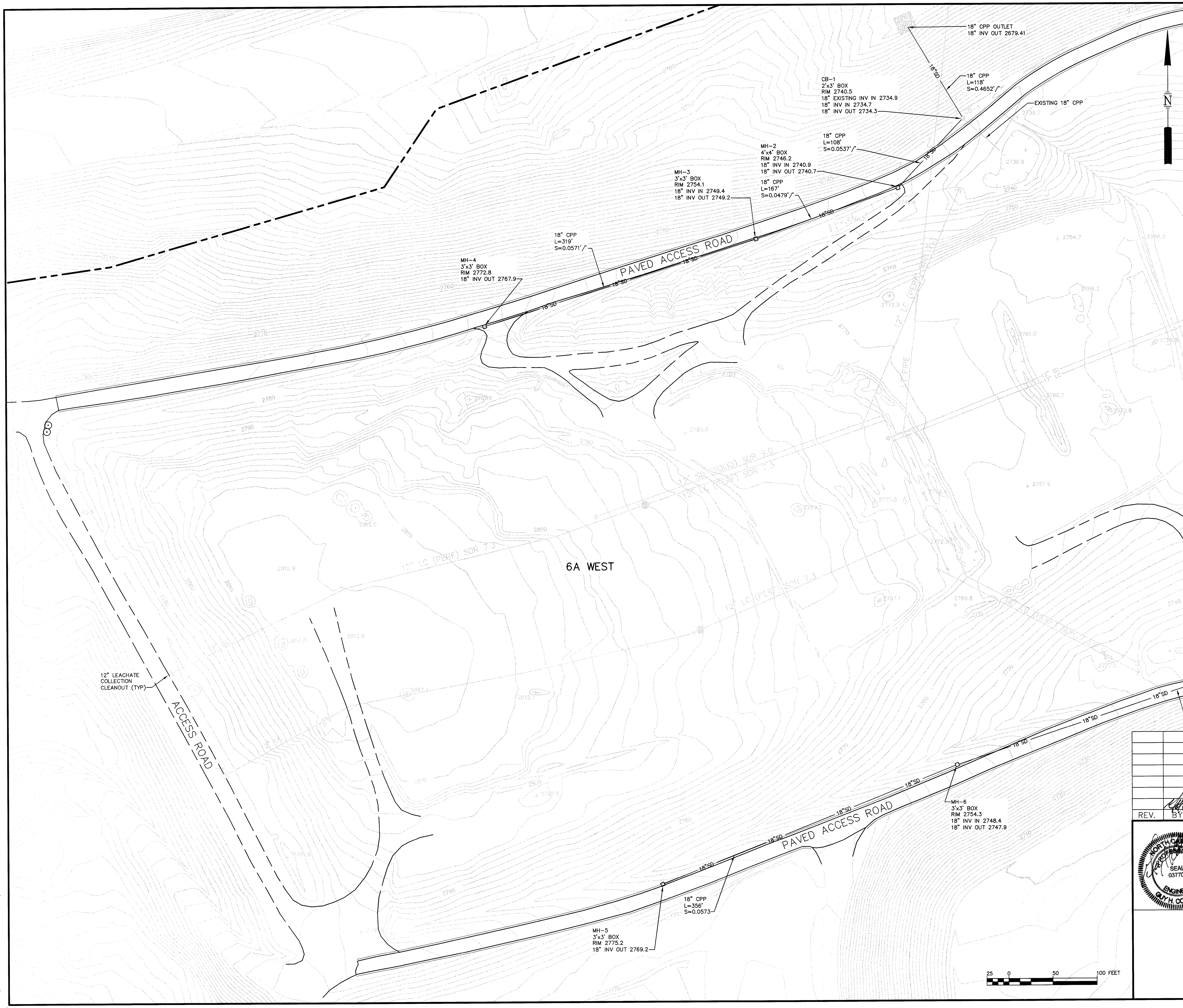
DRAWN BY:	PAF
DATE:	1/14/11
CHECKED BY:	
LMN:	SITELOC
CTB:	SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-CLOSURE C-101



NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.
5. BASE GRADE CONTOUR INTERVAL IS 2 FEET.

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 037702 GUY H. COTE, JR.

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

EXISTING CONDITIONS PLAN

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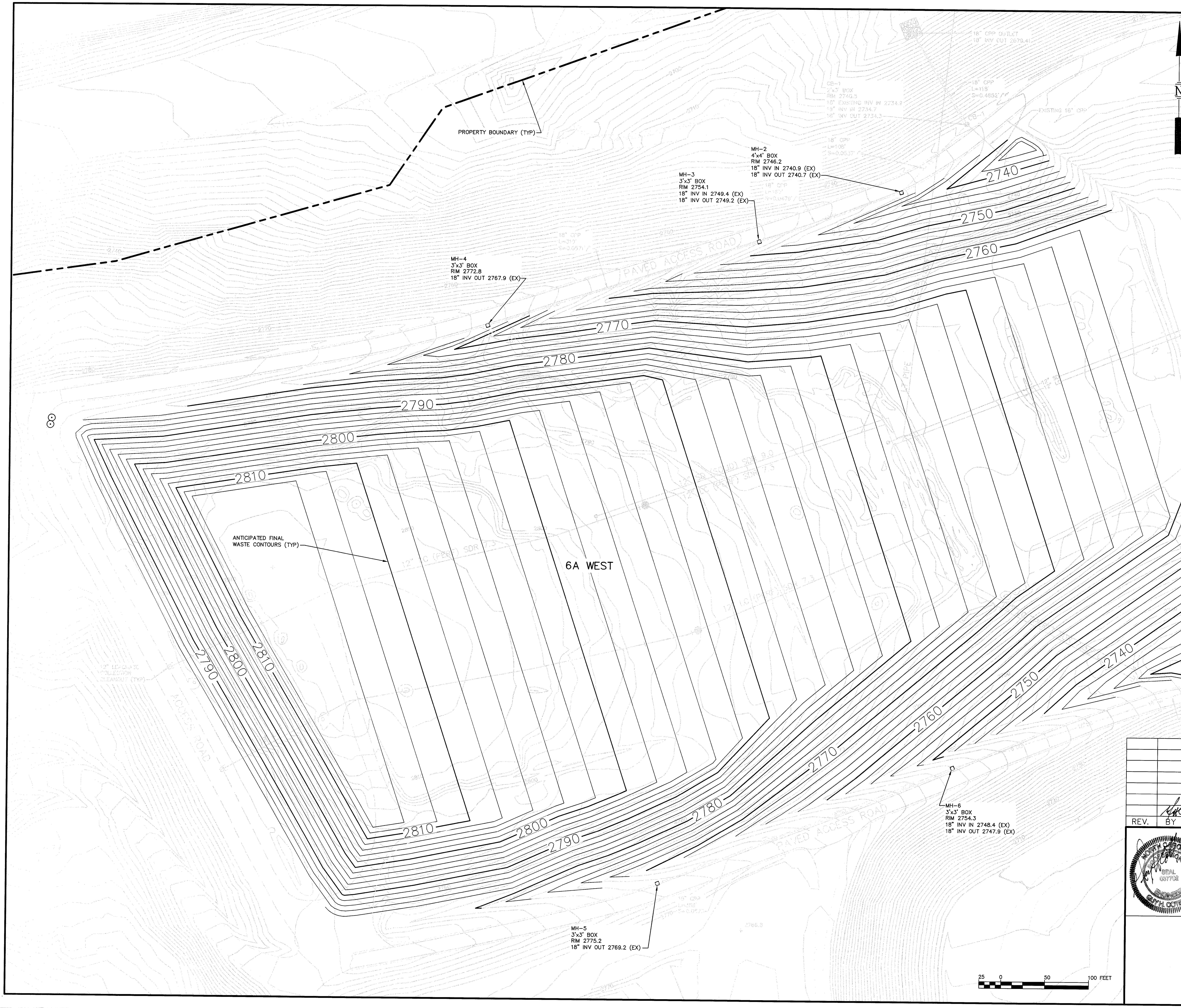
LMN: EXCON
CTB: SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-CLOSURE C-102



NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.
5. BASE GRADE CONTOUR INTERVAL IS 2 FEET.
6. PROPOSED CONTOURS REPRESENT PROPOSED TOP OF WASTE ELEVATIONS.

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE, JR.

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

AREA A WEST
FINAL WASTE GRADING PLAN

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DATE: 4/11/11
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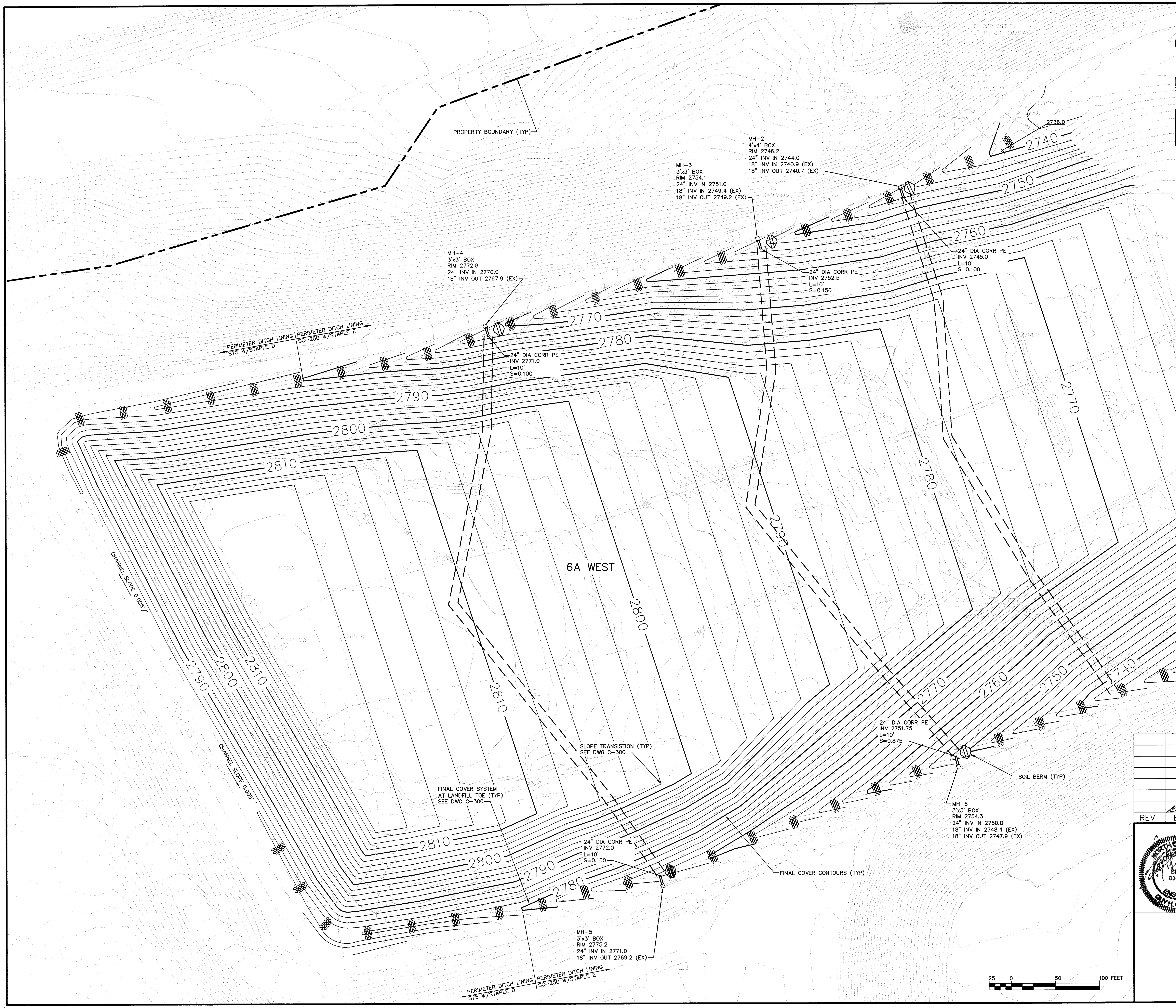
LMN: FINAL WASTE
CTB: SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-AMENDMENT C-103



NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.
5. BASE GRADE CONTOUR INTERVAL IS 2 FEET.
6. PROPOSED CONTOURS REPRESENT PROPOSED TOP OF FINAL COVER.

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

AREA A WEST FINAL GRADING PLAN

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE, JR.

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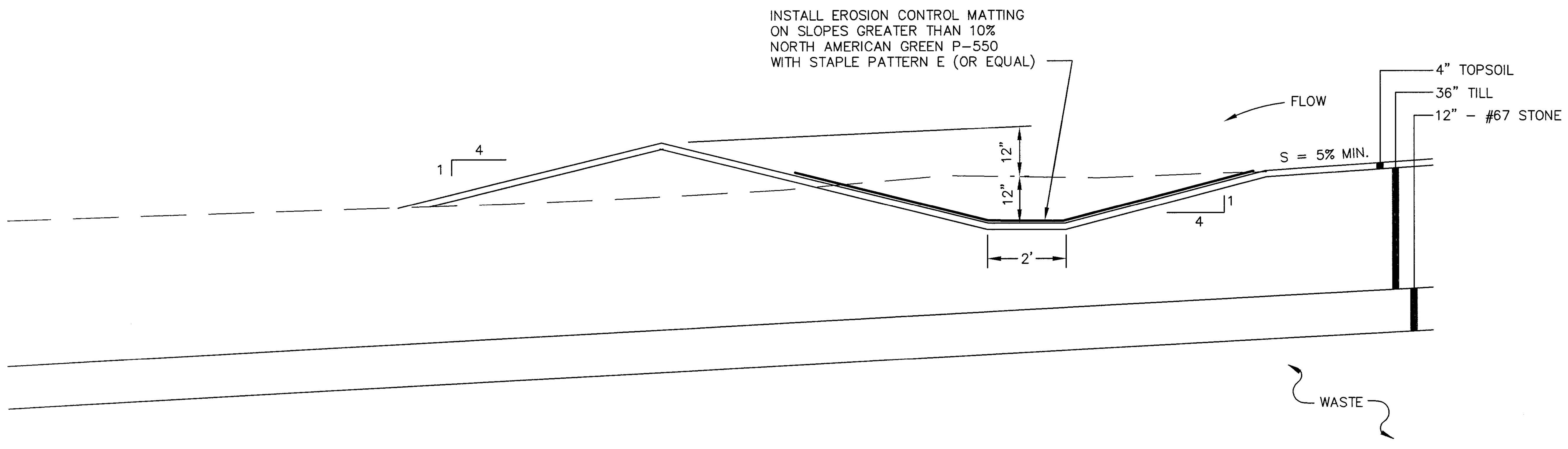
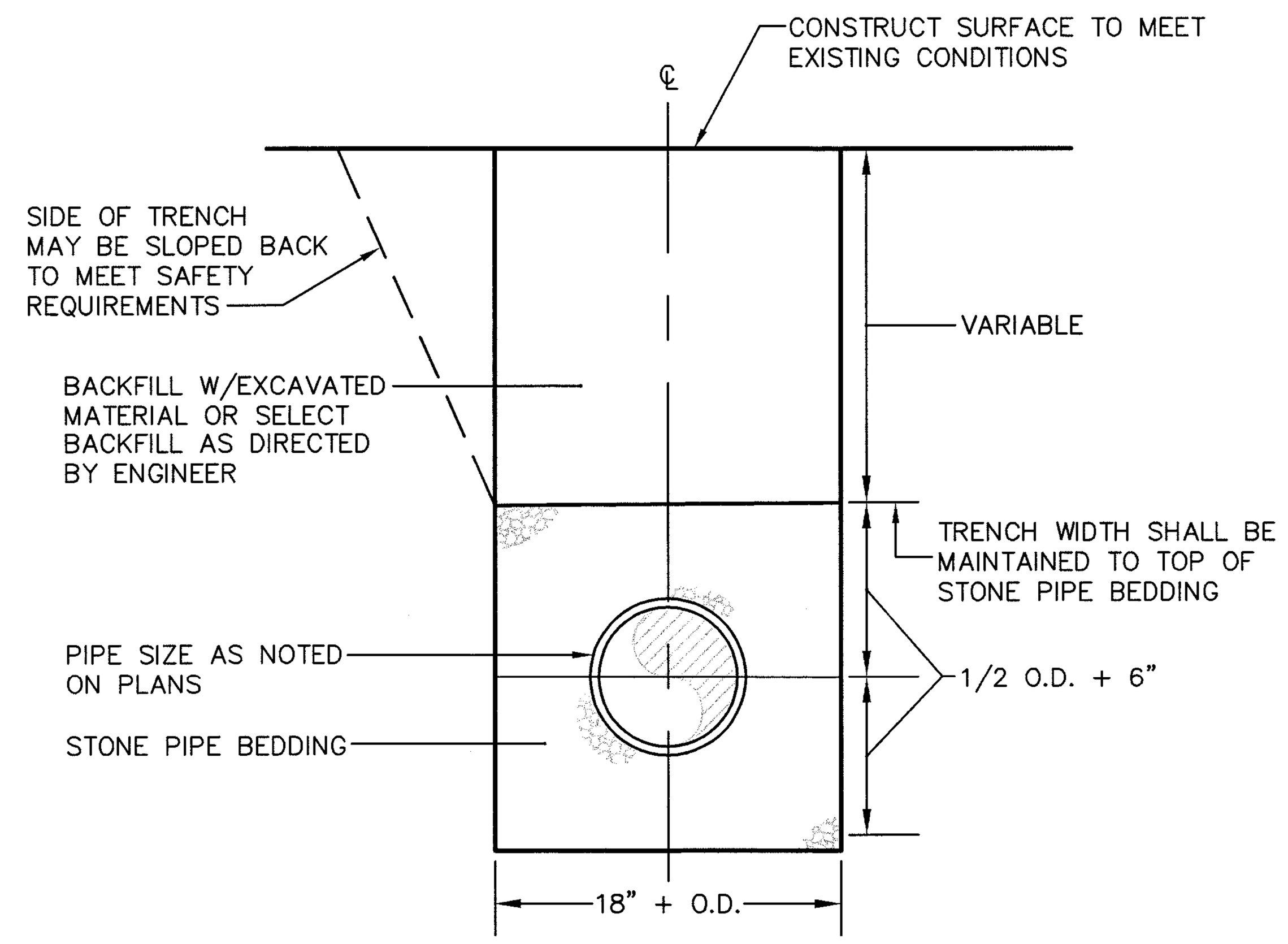
LMN:	FINGRADE
CTB:	SME-STD

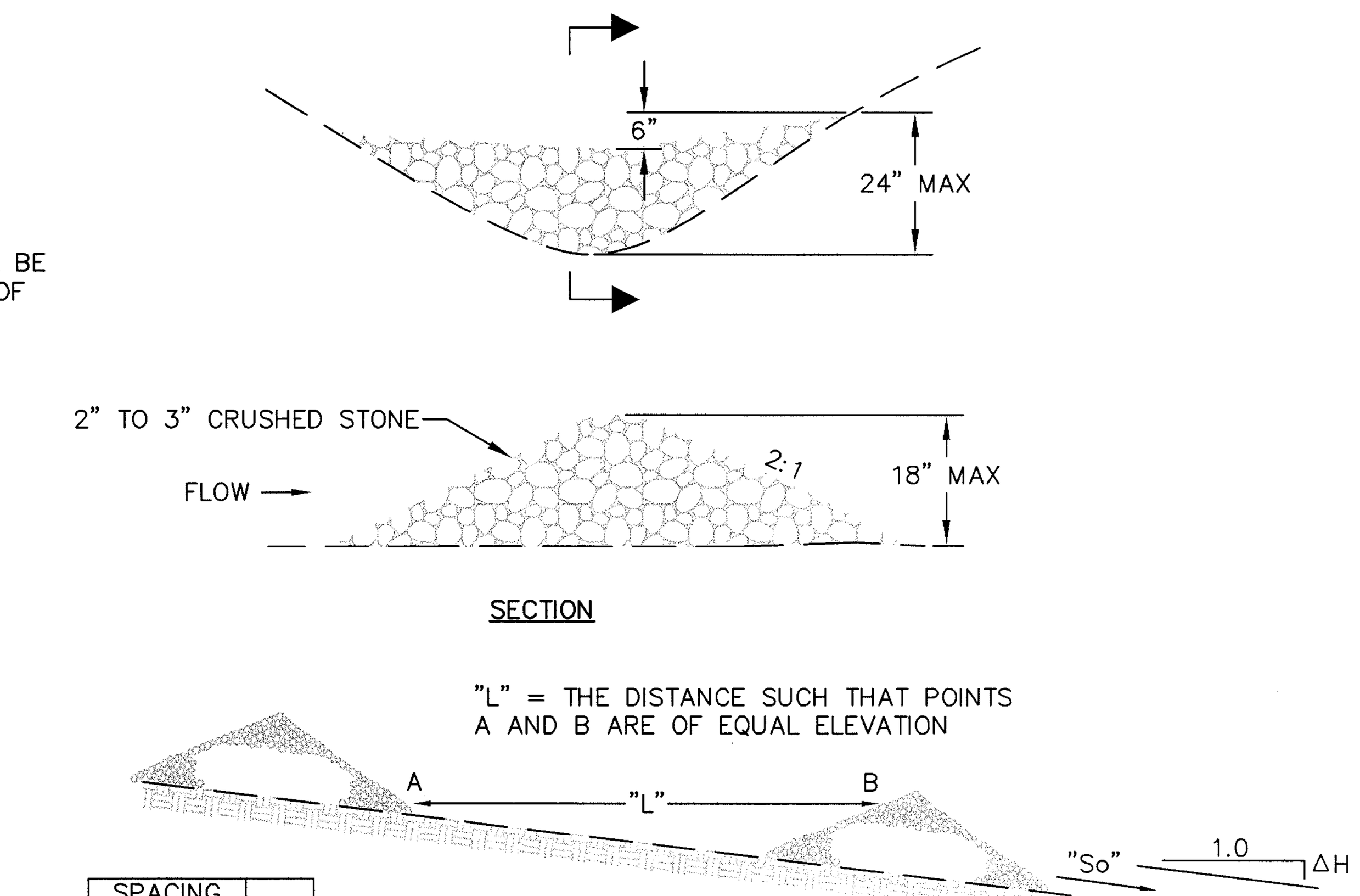
JOB NO. 10164 DWG FILE 6A-WEST-CLOSURE C-104



DIVERSION BERM
NTS

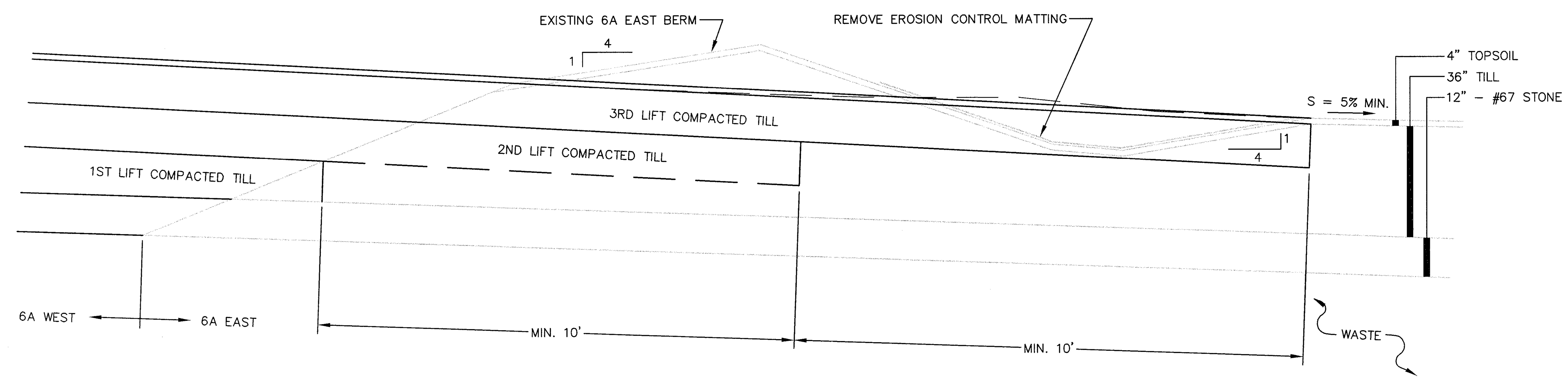


STORM DRAIN
NTS

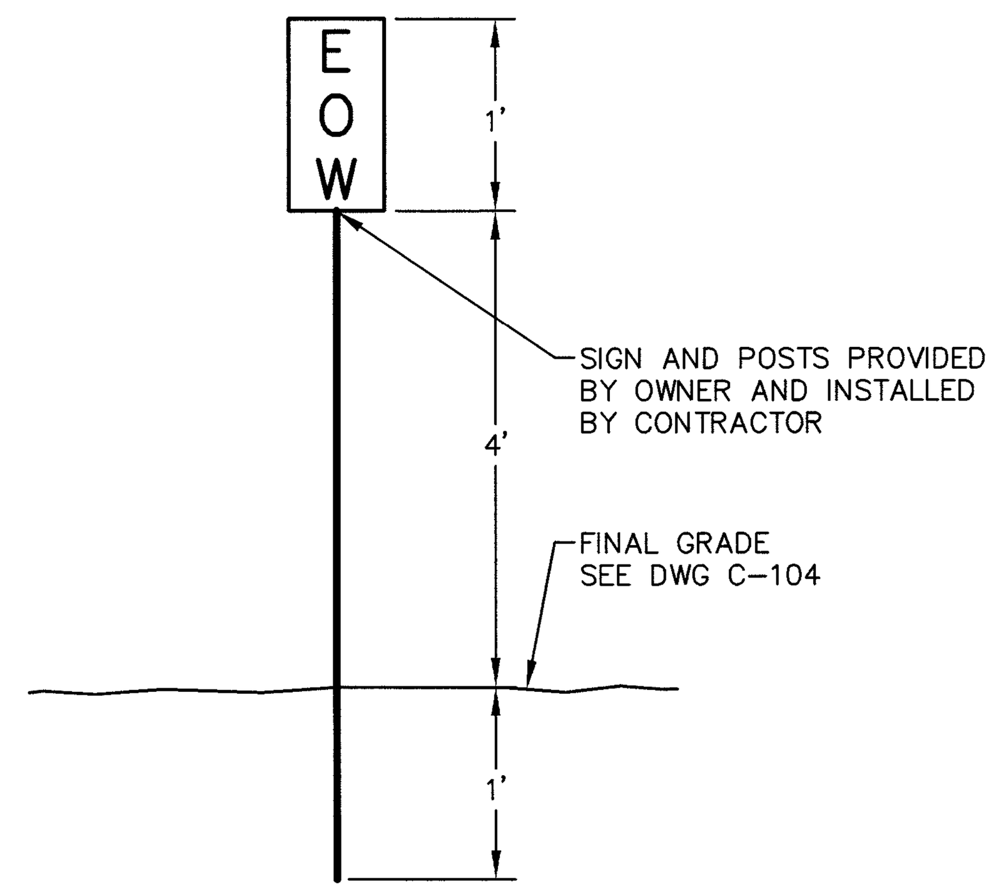


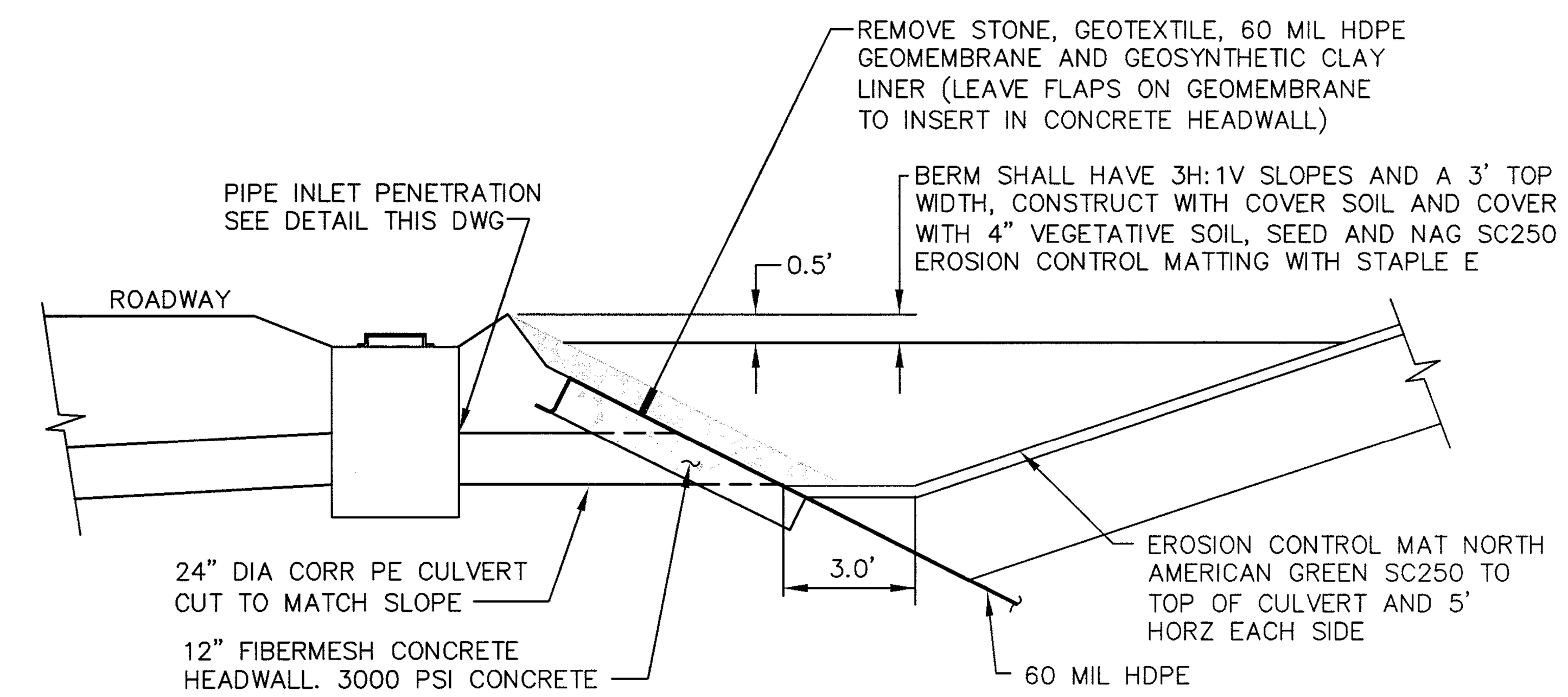
SPACING BETWEEN CHECK DAMS "So" FT/FT	"L" FT
0.020	75
0.030	50
0.040	40
0.050	30
0.080	20
0.100	10

STONE CHECK DAM
NTS

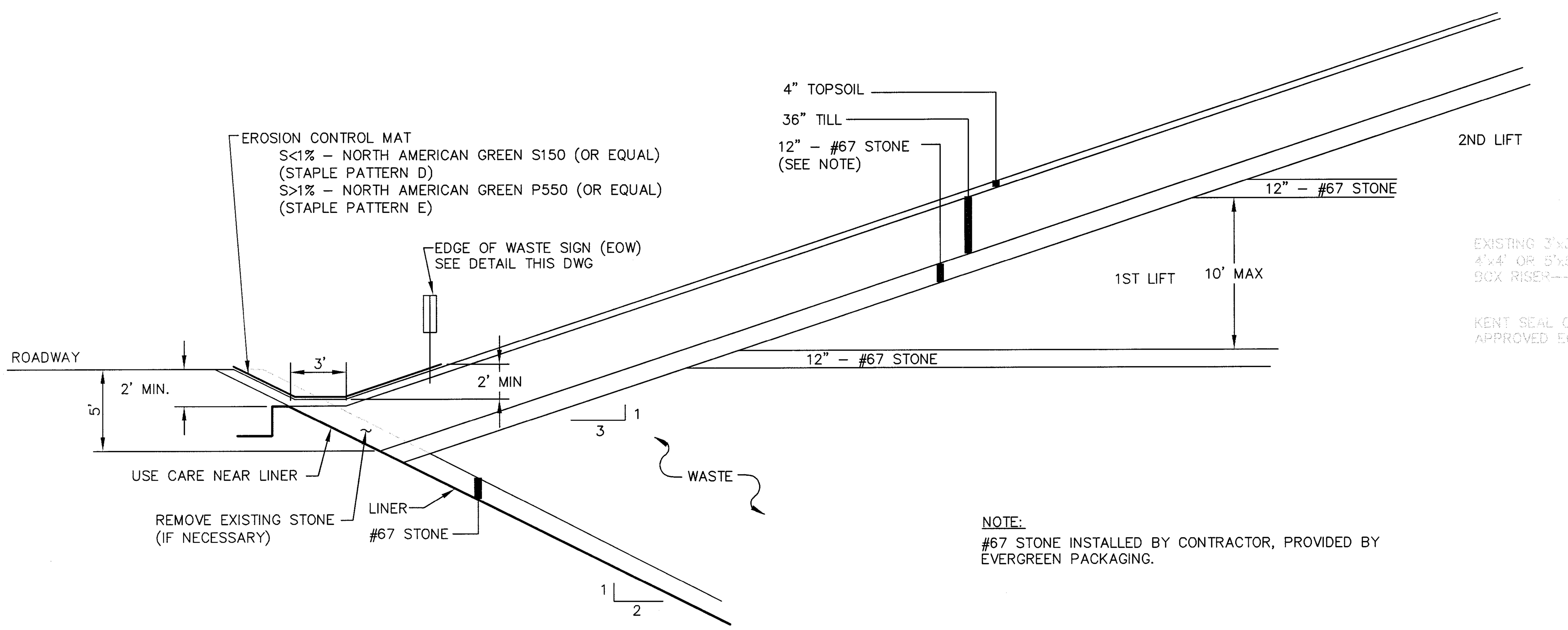


6A EAST TIE-IN
NTS



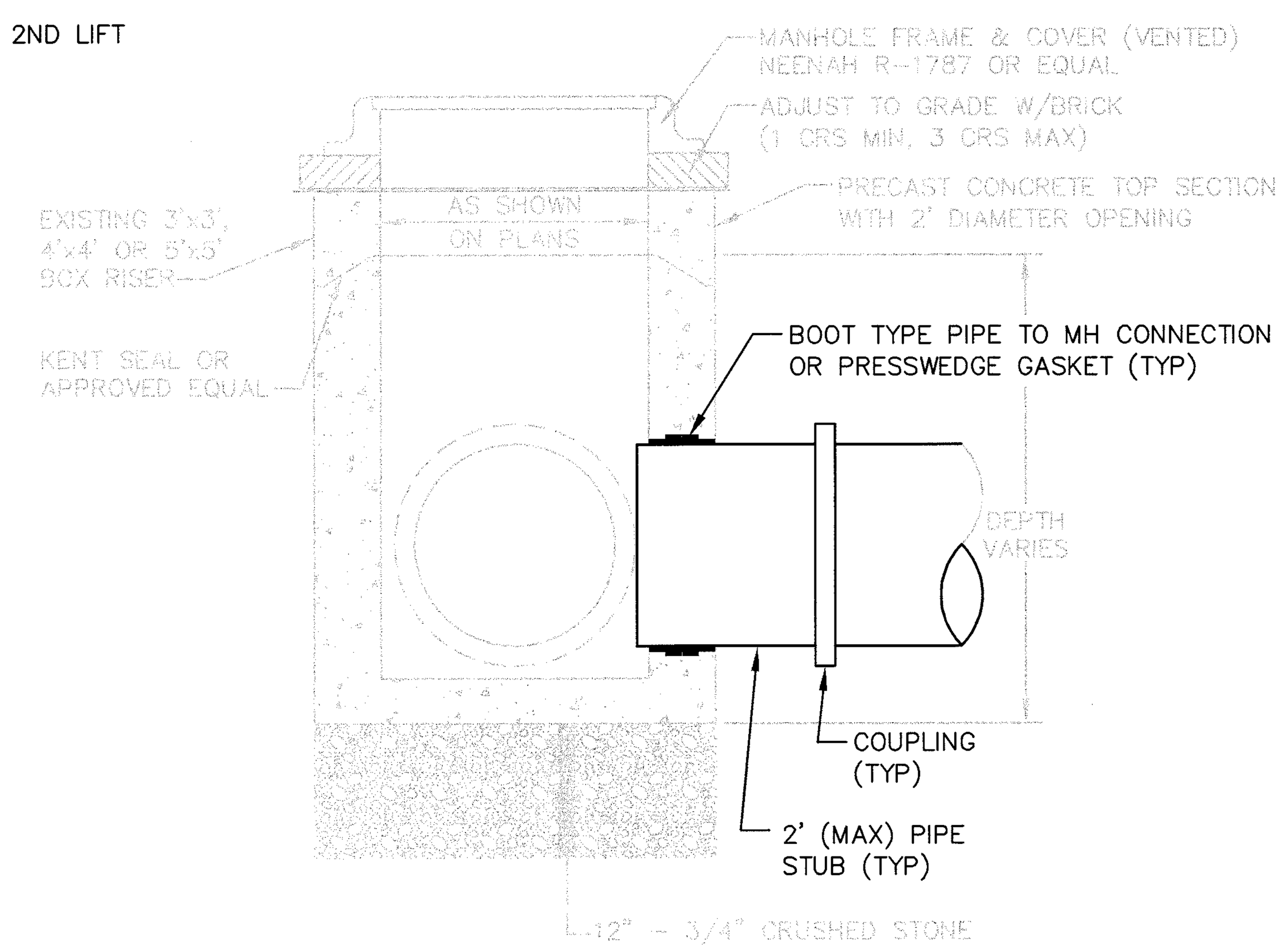


PIPE INLET/PENETRATION
NTS



NOTE:
#67 STONE INSTALLED BY CONTRACTOR, PROVIDED BY EVERGREEN PACKAGING.

FINAL COVER SYSTEM
NTS



PIPE INLET PENETRATION
NTS

REV.	BY	DATE	STATUS
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EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

SECTIONS AND DETAILS

SEAL 037732

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CTB: SME-STD

JOB NO. 10164 DWG FILE 6A-WEST CLOSURE-DETAILS C-300

ATTACHMENT C

STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN
FOR
LANDFILL NO. 6
AREA A WEST FINAL COVER

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

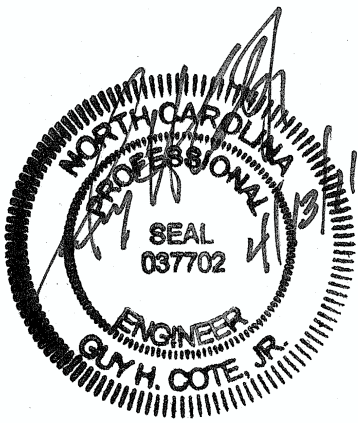

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TABLE OF CONTENTS

LIST OF ATTACHMENTS

STORMWATER MANAGEMENT PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
AREA 6A WEST FINAL COVER

1.0 INTRODUCTION

Evergreen Packaging (Evergreen) proposes to place final cover over Area 6A West at their Canton Landfill. Approximately 18 acres will be covered during the summer of 2011. The cover system will consist of 12 inches of drainage stone over waste, covered by 36 inches of compacted till, overlain by a 4-inch vegetative soil layer. The following is an overview of stormwater management and erosion control design considerations and calculations.

2.0 STORMWATER RUNOFF

Surface water runoff from the active portions of Area 6A West are currently collected and treated as leachate. Stormwater runoff calculations have been performed with Area 6A West, the valley fill and a portion of previously closed Area 6A East. Stormwater runoff calculations for the site were performed utilizing the methodology outlined by the USDA Soil Conservation Service's Technical Release Number 55 (TR55), "Urban Hydrology for Small Watersheds", June 1986 Revision, and a computer stormwater modeling system entitled "Hydrocad" by Applied Microcomputer Systems of Chocorua, New Hampshire. A 24-hour Type III storm with antecedent moisture condition II was used to model the runoff characteristics of the site. Models were created using a 25-year frequency storm event.

2.1 Final Cover

Upon completion of Area 6A West, final cover will be installed similar to cover placed over 6A East. A soil cover will be placed over Cell 6A West and the valley fill between Area 6A West and Area 6A East. Surface water runoff will be directed away from 6A-West to the east and southeast by perimeter ditches. The perimeter ditches will direct clean water runoff to a system of existing manholes, catch basins and culverts installed during the closure of Area 6A East and the 2010 Roadway Improvement Construction. Closure of Area 6A West will also include diversion berms (Appendix C-2) along the crown of the cover area to direct surface water to the existing manholes.

Surface water runoff from Area 6A West closure will be discharged to the southeast through a series of manholes, to a reinforced ditch and eventually to Pidgeon Stream. Surface water runoff from Area 6A West closure will be discharged to the northeast through a series of manholes, to an overflow structure north of Area 6A East.

When the landfill (6A West and 6A East) is closed, runoff from 12 acres will flow to the southeast side, and runoff from 13 acres will flow to the northeast side see figure in Attachment C-1. The calculated peak flow generated during a 25-year/24-hour rain event is 85 cfs, see calculations in Attachment C-1.

3.0 DESIGN CALCULATIONS

3.1 Turf Reinforcement Matting

Design of the erosion control matting was analyzed using North American Green's Erosion Control Material Software Version 4.1. Flow from a 2-year, 24-hour storm event was used to design areas where temporary turf reinforcement matting is adequate. Flow from a 25-year, 24-hour storm event was used to design areas where permanent turf reinforcement matting is required. Ditches and berms along areas with a slope less than ten percent will require temporary matting S-150, manufactured by North American Green or equal. Areas with slopes greater than ten percent will require permanent matting P-550, manufactured by North American Green or equal. See Attachment C-2 for erosion control calculations.

3.2 Stone Check Dams

Stone check dams will be installed on the perimeter ditches as a temporary (construction) erosion control measure. The locations and stone size are shown on the engineering drawings included in Attachment B of the Design Report.

OVERFLOW STRUCTURE WITH RIPRAP APRON OUTLET PROTECTION

18" CULVERT INV OUT 2879.4

5R 18" CPP L=118' S=0.465

4R 18" CPP L=108' S=0.054

MH-2 4'x4' BOX RIM 2746.2 18" INV IN 2743.0 18" INV IN 2740.9(ex) 18" INV OUT 2740.7(ex)

MH-3 3'x3' BOX RIM 2754.1 18" INV IN 2751.0 18" INV IN 2749.4(ex) 18" INV OUT 2749.2(ex)

C-2B 18" CPP L=7' S=0.15

3R 18" CPP L=319' S=0.057

MH-4 3'x3' BOX RIM 2772.8 18" INV IN 2770.0 18" INV OUT 2767.9(ex)

C-2A 18" CPP L=7' S=0.150

18R DITCH L=485' S=0.024

CB-1 2'x3' BOX RIM 2740.5 18" INV IN 2734.9 18" INV IN 2734.7 18" INV OUT 2734.3

C-2D 18" CULVERT INV IN 2736.0

C-2C 18" CPP L=10' S=0.100

3R 18" CPP L=167' S=0.048

11R EXISTING CB-2 AND 12" CPP L=105' S=0.052

12R 18" CPP L=150' S=0.103

10R 18" CPP L=20' S=0.05

1AR DITCH L=370' S=0.030

C-3A 18" CPP L=13' S=0.08

MH-5 3'x3' BOX RIM 2775.2 18" INV IN 2771.0 18" INV OUT 2769.2 (ex)

8R 18" CPP L=356' S=0.057

C-3B 18" CPP L=12' S=0.08

MH-6 3'x3' BOX RIM 2754.3 18" INV IN 2750.0 18" INV IN 2748.4 (ex) 18" INV OUT 2747.9 (ex)

7R 18" CPP L=318' S=0.074

C-3C 18" CPP L=21' S=0.100

MH-7 5'x5' BOX RIM 2730.4 18" INV IN 2728.0 18" INV IN 2724.2 (ex) 24" INV OUT 2724.1(ex)

8R 24" CPP L=347' S=0.071

MH-8 3'x3' BOX RIM 2704.8 18" INV IN 2700.1(ex) 24" INV IN 2699.9 (ex) 24" INV OUT 2699.4(ex)

C-4 18" CPP L=13' S=0.125

C-4B 18" CPP L=69' S=0.10

MH-9 5'x5' BOX RIM 2692.9 18" INV IN 2684.2(ex) 24" INV IN 2684.3 (ex) 24" INV OUT 2683.9(ex)

INV 2682.4

9R 24" CPP L=221' S=0.068

13R 24" CPP L=30' S=0.050

RIPRAP APRON

14R VEG DITCH W/ PERMANENT EROSION CONTROL L=230' S=.065

1A 1B 2A 2B 2C 2D 3A 3B 3C 4 4a 4b 4c 5 6

N

75 0 150 FEET

FIGURE C-1
POST-DEVELOPMENT
STORMWATER MANAGEMENT PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE

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DWG: 6A-WEST-CLOSURE LMN: SMP CTB: SME-STD REV: 2/2/2011

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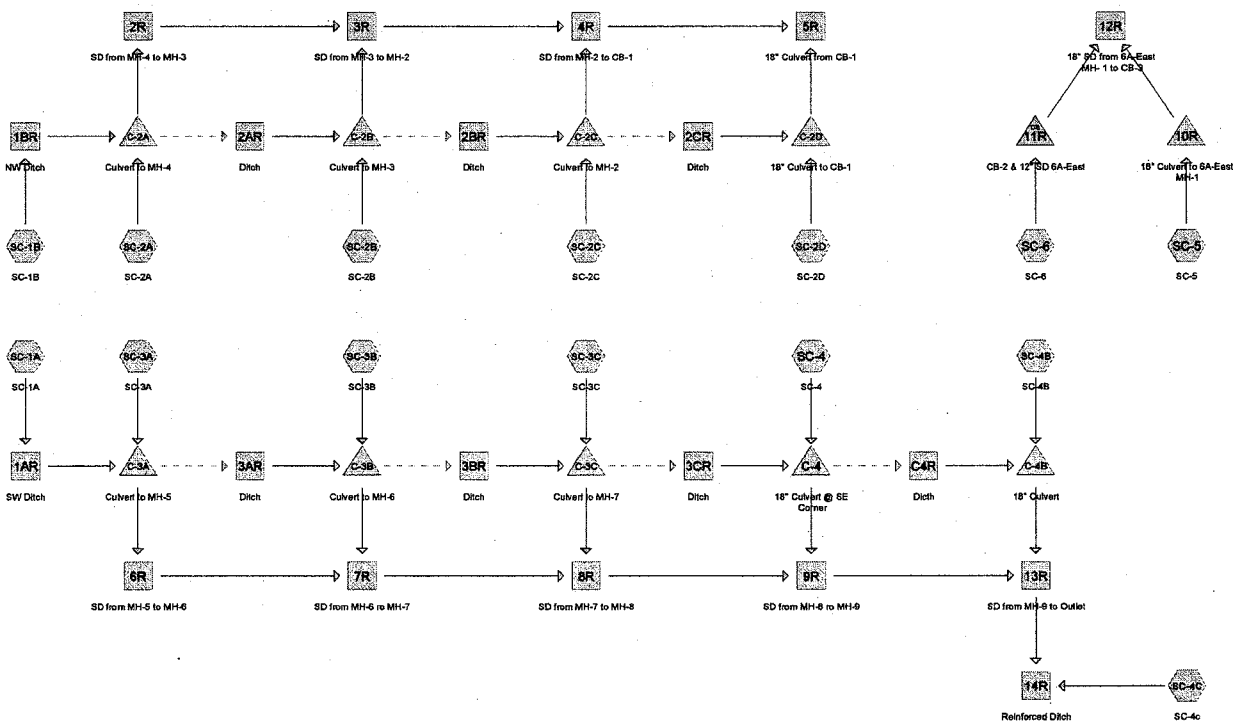
ATTACHMENT C-1

STORMWATER FLOW CLACULATIONS

2-YEAR/24-HOUR STORM

2-Year / 24-Hour Storm



Subcat Reach Pond Link

Drainage Diagram for 6A WEST FINAL CLOSURE
Prepared by Sevee & Maher Engineers, Inc., Printed 2/7/2011
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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment SC-1A: SC-1A Runoff Area=45,700 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=1,175' Tc=8.9 min CN=71 Runoff=1.72 cfs 0.093 af

Subcatchment SC-1B: SC-1B Runoff Area=31,000 sf 6.45% Impervious Runoff Depth>1.18"
Flow Length=425' Tc=5.7 min CN=73 Runoff=1.48 cfs 0.070 af

Subcatchment SC-2A: SC-2A Runoff Area=100,000 sf 5.00% Impervious Runoff Depth>1.12"
Flow Length=475' Tc=10.3 min CN=72 Runoff=3.78 cfs 0.214 af

Subcatchment SC-2B: SC-2B Runoff Area=98,000 sf 5.10% Impervious Runoff Depth>1.12"
Flow Length=620' Tc=11.9 min CN=72 Runoff=3.47 cfs 0.210 af

Subcatchment SC-2C: SC-2C Runoff Area=57,700 sf 5.20% Impervious Runoff Depth>1.12"
Flow Length=495' Tc=10.7 min CN=72 Runoff=2.15 cfs 0.123 af

Subcatchment SC-2D: SC-2D Runoff Area=16,900 sf 10.65% Impervious Runoff Depth>1.24"
Flow Length=220' Tc=0.7 min CN=74 Runoff=0.98 cfs 0.040 af

Subcatchment SC-3A: SC-3A Runoff Area=94,400 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=540' Tc=10.4 min CN=71 Runoff=3.35 cfs 0.192 af

Subcatchment SC-3B: SC-3B Runoff Area=129,800 sf 3.85% Impervious Runoff Depth>1.12"
Flow Length=695' Tc=12.0 min CN=72 Runoff=4.58 cfs 0.277 af

5.cfs

Subcatchment SC-3C: SC-3C Runoff Area=100,900 sf 2.97% Impervious Runoff Depth>1.12"
Flow Length=685' Tc=11.0 min CN=72 Runoff=3.71 cfs 0.216 af

Subcatchment SC-4: SC-4 Runoff Area=82,300 sf 8.02% Impervious Runoff Depth>1.18"
Flow Length=748' Tc=12.1 min CN=73 Runoff=3.06 cfs 0.185 af

Subcatchment SC-4B: SC-4B Runoff Area=28,725 sf 14.24% Impervious Runoff Depth>1.30"
Flow Length=320' Tc=6.3 min CN=75 Runoff=1.49 cfs 0.071 af

Subcatchment SC-4C: SC-4c Runoff Area=33,140 sf 25.14% Impervious Runoff Depth>1.49"
Flow Length=350' Tc=8.6 min CN=78 Runoff=1.81 cfs 0.095 af

Subcatchment SC-5: SC-5 Runoff Area=116,600 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=720' Tc=13.9 min CN=71 Runoff=3.62 cfs 0.236 af

Subcatchment SC-6: SC-6 Runoff Area=99,100 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=630' Tc=13.8 min CN=71 Runoff=3.09 cfs 0.201 af

Reach 1AR: SW Ditch Avg. Flow Depth=0.19' Max Vel=2.52 fps Inflow=1.72 cfs 0.093 af
n=0.030 L=370.0' S=0.0297 '/' Capacity=150.84 cfs Outflow=1.60 cfs 0.092 af

Reach 1BR: NW Ditch Avg. Flow Depth=0.17' Max Vel=2.18 fps Inflow=1.48 cfs 0.070 af
n=0.030 L=495.0' S=0.0242 '/' Capacity=136.21 cfs Outflow=1.27 cfs 0.069 af

Reach 2AR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=319.0' S=0.0580 '/' Capacity=210.67 cfs Outflow=0.00 cfs 0.000 af

Reach 2BR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=167.0' S=0.0509 '/' Capacity=489.75 cfs Outflow=0.00 cfs 0.000 af

Reach 2CR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=108.0' S=0.0741 '/' Capacity=238.09 cfs Outflow=0.00 cfs 0.000 af

Reach 2R: SD from MH-4 to MH-3 Avg. Flow Depth=0.44' Max Vel=10.91 fps Inflow=4.65 cfs 0.283 af
18.0" Round Pipe n=0.013 L=319.0' S=0.0580 '/' Capacity=25.30 cfs Outflow=4.58 cfs 0.283 af

Reach 3AR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=356.0' S=0.0590 '/' Capacity=212.47 cfs Outflow=0.00 cfs 0.000 af

Reach 3BR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=316.0' S=0.0728 '/' Capacity=236.01 cfs Outflow=0.00 cfs 0.000 af

Reach 3CR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=347.0' S=0.0749 '/' Capacity=239.46 cfs Outflow=0.00 cfs 0.000 af

Reach 3R: SD from MH-3 to MH-2 Avg. Flow Depth=0.60' Max Vel=11.98 fps Inflow=7.96 cfs 0.490 af
18.0" Round Pipe n=0.013 L=167.0' S=0.0497 '/' Capacity=23.42 cfs Outflow=7.89 cfs 0.490 af

Reach 4R: SD from MH-2 to CB-1 Avg. Flow Depth=0.65' Max Vel=13.54 fps Inflow=9.89 cfs 0.614 af
18.0" Round Pipe n=0.013 L=108.0' S=0.0593 '/' Capacity=25.57 cfs Outflow=9.84 cfs 0.613 af

Reach 5R: 18" Culvert from CB-1 Avg. Flow Depth=0.38' Max Vel=28.37 fps Inflow=9.97 cfs 0.654 af
18.0" Round Pipe n=0.013 L=120.0' S=0.4575 '/' Capacity=71.05 cfs Outflow=9.95 cfs 0.653 af

Reach 6R: SD from MH-5 to MH-6 Avg. Flow Depth=0.44' Max Vel=10.97 fps Inflow=4.70 cfs 0.282 af
18.0" Round Pipe n=0.013 L=356.0' S=0.0584 '/' Capacity=25.39 cfs Outflow=4.61 cfs 0.282 af

Reach 7R: SD from MH-6 ro MH-7 Avg. Flow Depth=0.58' Max Vel=14.55 fps Inflow=9.12 cfs 0.559 af
18.0" Round Pipe n=0.013 L=316.0' S=0.0766 '/' Capacity=29.07 cfs Outflow=9.00 cfs 0.559 af

Reach 8R: SD from MH-7 to MH-8 Avg. Flow Depth=0.62' Max Vel=15.05 fps Inflow=12.55 cfs 0.775 af
24.0" Round Pipe n=0.013 L=347.0' S=0.0697 '/' Capacity=59.74 cfs Outflow=12.38 cfs 0.774 af

Reach 9R: SD from MH-8 ro MH-9 Avg. Flow Depth=0.70' Max Vel=15.79 fps Inflow=15.35 cfs 0.956 af
24.0" Round Pipe n=0.013 L=221.0' S=0.0683 '/' Capacity=59.13 cfs Outflow=15.22 cfs 0.956 af

Reach 12R: 18" SD from 6A-East MH- 1 Avg. Flow Depth=0.41' Max Vel=16.75 fps Inflow=6.67 cfs 0.437 af
18.0" Round Pipe n=0.011 L=150.0' S=0.1033 '/' Capacity=39.91 cfs Outflow=6.64 cfs 0.437 af

Reach 13R: SD from MH-9 to Outlet Avg. Flow Depth=0.75' Max Vel=14.06 fps Inflow=15.22 cfs 0.978 af
24.0" Round Pipe n=0.013 L=30.0' S=0.0500 '/' Capacity=50.59 cfs Outflow=15.20 cfs 0.978 af

Reach 14R: Reinforced Ditch Avg. Flow Depth=0.68' Max Vel=7.58 fps Inflow=16.41 cfs 1.073 af
n=0.030 L=230.0' S=0.0670 '/' Capacity=149.47 cfs Outflow=16.14 cfs 1.072 af

Reach C4R: Dicth Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=221.0' S=0.0498 '/' Capacity=195.17 cfs Outflow=0.00 cfs 0.000 af

Pond 10R: 18" Culvert to 6A-East MH-1 Peak Elev=2,726.90' Storage=157 cf Inflow=3.62 cfs 0.236 af
18.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=3.59 cfs 0.236 af

Pond 11R: CB-2 & 12" SD 6A-East Peak Elev=2,722.17' Inflow=3.09 cfs 0.201 af
12.0" Round Culvert n=0.011 L=105.0' S=0.0524 '/' Outflow=3.09 cfs 0.201 af

Pond C-2A: Culvert to MH-4 Peak Elev=2,772.15' Storage=418 cf Inflow=4.92 cfs 0.283 af
Primary=4.65 cfs 0.283 af Secondary=0.00 cfs 0.000 af Outflow=4.65 cfs 0.283 af

Pond C-2B: Culvert to MH-3 Peak Elev=2,753.50' Storage=386 cf Inflow=3.47 cfs 0.210 af
Primary=3.38 cfs 0.208 af Secondary=0.00 cfs 0.000 af Outflow=3.38 cfs 0.208 af

Pond C-2C: Culvert to MH-2 Peak Elev=2,743.52' Storage=64 cf Inflow=2.15 cfs 0.123 af
Primary=2.13 cfs 0.123 af Secondary=0.00 cfs 0.000 af Outflow=2.13 cfs 0.123 af

Pond C-2D: 18" Culvert to CB-1 Peak Elev=2,736.49' Storage=57 cf Inflow=0.98 cfs 0.040 af
18.0" Round Culvert n=0.011 L=30.0' S=0.0567 '/' Outflow=0.94 cfs 0.040 af

Pond C-3A: Culvert to MH-5 Peak Elev=2,773.06' Storage=347 cf Inflow=4.76 cfs 0.284 af
Primary=4.70 cfs 0.282 af Secondary=0.00 cfs 0.000 af Outflow=4.70 cfs 0.282 af

Pond C-3B: Culvert to MH-6 Peak Elev=2,752.12' Storage=230 cf Inflow=4.58 cfs 0.277 af
Primary=4.52 cfs 0.277 af Secondary=0.00 cfs 0.000 af Outflow=4.52 cfs 0.277 af

Pond C-3C: Culvert to MH-7 Peak Elev=2,728.81' Storage=220 cf Inflow=3.71 cfs 0.216 af
Primary=3.63 cfs 0.216 af Secondary=0.00 cfs 0.000 af Outflow=3.63 cfs 0.216 af

Pond C-4: 18" Culvert @ SE Corner Peak Elev=2,702.63' Storage=446 cf Inflow=3.06 cfs 0.185 af
Primary=2.98 cfs 0.182 af Secondary=0.00 cfs 0.000 af Outflow=2.98 cfs 0.182 af

Pond C-4B: 18" Culvert Peak Elev=2,691.20' Storage=2,189 cf Inflow=1.49 cfs 0.071 af
18.0" Round Culvert n=0.011 L=69.0' S=0.1000 '/' Outflow=0.04 cfs 0.022 af

Total Runoff Area = 23.743 ac Runoff Volume = 2.223 af Average Runoff Depth = 1.12"
95.76% Pervious = 22.737 ac 4.24% Impervious = 1.006 ac

Summary for Subcatchment SC-1A: SC-1A

Runoff = 1.72 cfs @ 11.99 hrs, Volume= 0.093 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	45,700	71	Landfill Cover Soil
	45,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.1000	0.20		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
4.4	1,025	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.9	1,175	Total			

Summary for Subcatchment SC-1B: SC-1B

Runoff = 1.48 cfs @ 11.95 hrs, Volume= 0.070 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	29,000	71	Landfill Cover Soil
*	2,000	98	
	31,000	73	Weighted Average
	29,000		93.55% Pervious Area
	2,000		6.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.1000	0.20		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	275	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=13.00' n= 0.030
5.7	425	Total			

Summary for Subcatchment SC-2A: SC-2A

Runoff = 3.78 cfs @ 12.00 hrs, Volume= 0.214 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	95,000	71	Landfill Cover Soil
*	5,000	98	Paved. Gravel
	100,000	72	Weighted Average
	95,000		95.00% Pervious Area
	5,000		5.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.7	65	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	200	0.0250	8.25	165.04	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	110	0.2500	13.09	209.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=14.00' n= 0.060
10.3	475	Total			

Summary for Subcatchment SC-2B: SC-2B

Runoff = 3.47 cfs @ 12.02 hrs, Volume= 0.210 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	93,000	71	Cover Soil
	5,000	98	Paved parking, HSG C
	98,000	72	Weighted Average
	93,000		94.90% Pervious Area
	5,000		5.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
2.4	235	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	145	0.0200	7.41	118.50	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=14.00' n= 0.030
0.1	140	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
11.9	620	Total			

Summary for Subcatchment SC-2C: SC-2C

Runoff = 2.15 cfs @ 12.01 hrs, Volume= 0.123 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	54,700	71	Cover Soil
	3,000	98	Paved parking, HSG C
	57,700	72	Weighted Average
	54,700		94.80% Pervious Area
	3,000		5.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.2	120	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	150	0.0200	7.38	147.62	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	125	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
10.7	495	Total			

Summary for Subcatchment SC-2D: SC-2D

Runoff = 0.98 cfs @ 11.89 hrs, Volume= 0.040 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	15,100	71	Cover Soil
	1,800	98	Paved parking, HSG C
	16,900	74	Weighted Average
	15,100		89.35% Pervious Area
	1,800		10.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	125	0.2500	3.50		**Shallow Concentrated Flow, A-B** Short Grass Pasture Kv= 7.0 fps
0.1	95	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=3.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=15.00' n= 0.030
0.7	220	Total			

Summary for Subcatchment SC-3A: SC-3A

Runoff = 3.35 cfs @ 12.01 hrs, Volume= 0.192 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	94,400	71	Cover Soil
	94,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.7	70	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	265	0.0250	8.08	258.46	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.1	105	0.3300	29.98	599.62	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
10.4	540	Total			

Summary for Subcatchment SC-3B: SC-3B

Runoff = 4.58 cfs @ 12.02 hrs, Volume= 0.277 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	124,800	71	Cover Soil
	5,000	98	Paved parking, HSG C
	129,800	72	Weighted Average
	124,800		96.15% Pervious Area
	5,000		3.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
2.4	240	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	215	0.0250	8.08	258.46	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
0.1	140	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
12.0	695	Total			

Summary for Subcatchment SC-3C: SC-3C

Runoff = 3.71 cfs @ 12.01 hrs, Volume= 0.216 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	97,900	71	Cover Soil
	3,000	98	Paved parking, HSG C
	100,900	72	Weighted Average
	97,900		97.03% Pervious Area
	3,000		2.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.2	120	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	175	0.0200	7.22	231.17	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.1	160	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.2	130	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=3.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=15.00' n= 0.030
11.0	685	Total			

Summary for Subcatchment SC-4: SC-4

Runoff = 3.06 cfs @ 12.02 hrs, Volume= 0.185 af, Depth> 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	75,700	71	Cover Soil
	6,600	98	Paved parking, HSG C
	82,300	73	Weighted Average
	75,700		91.98% Pervious Area
	6,600		8.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	95	0.0550	1.64		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.7	263	0.1400	2.62		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	290	0.0740	14.87	237.97	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
12.1	748	Total			

Summary for Subcatchment SC-4B: SC-4B

Runoff = 1.49 cfs @ 11.95 hrs, Volume= 0.071 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	24,635	71	Cover Soil
	4,090	98	Paved parking, HSG C
	28,725	75	Weighted Average
	24,635		85.76% Pervious Area
	4,090		14.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.2	40	0.2000	3.13		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	180	0.0600	13.32	239.75	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
6.3	320	Total			

Summary for Subcatchment SC-4C: SC-4c

Runoff = 1.81 cfs @ 11.98 hrs, Volume= 0.095 af, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	24,810	71	Cover Soil
	8,330	98	Paved parking, HSG C
	33,140	78	Weighted Average
	24,810		74.86% Pervious Area
	8,330		25.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0700	0.20		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.3	250	0.0900	13.14	26.29	**Trap/Vee/Rect Channel Flow, Segment ID: B-C** Bot.W=1.00' D=1.00' Z= 1.0 '/' Top.W=3.00' n= 0.022 Earth, clean & straight
8.6	350	Total			

Summary for Subcatchment SC-5: SC-5

Runoff = 3.62 cfs @ 12.05 hrs, Volume= 0.236 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	116,600	71	Cover Soil
	116,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.57		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.1	90	0.0670	14.08	253.35	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
13.9	720	Total			

Summary for Subcatchment SC-6: SC-6

Runoff = 3.09 cfs @ 12.05 hrs, Volume= 0.201 af, Depth> 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (sf)	CN	Description
*	99,100	71	Cover Soil
	99,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.57		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
13.8	630	Total			

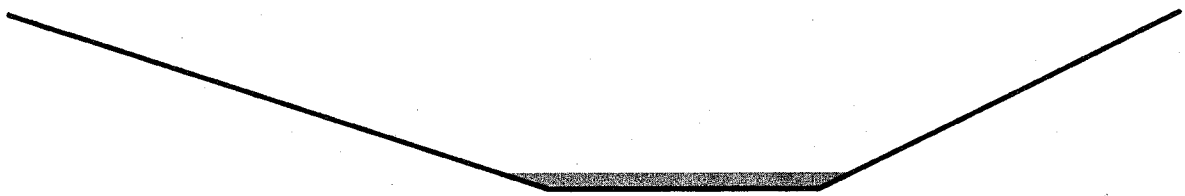
Summary for Reach 1AR: SW Ditch

Inflow Area = 1.049 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 1.72 cfs @ 11.99 hrs, Volume= 0.093 af
Outflow = 1.60 cfs @ 12.06 hrs, Volume= 0.092 af, Atten= 7%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 8.0 min

Peak Storage= 238 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.84 cfs

3.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 370.0' Slope= 0.0297 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,772.00'



Summary for Reach 1BR: NW Ditch

Inflow Area = 0.712 ac, 6.45% Impervious, Inflow Depth > 1.18" for 2-Yr Storm event
Inflow = 1.48 cfs @ 11.95 hrs, Volume= 0.070 af
Outflow = 1.27 cfs @ 12.05 hrs, Volume= 0.069 af, Atten= 15%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.18 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 12.5 min

Peak Storage= 295 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 136.21 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 495.0' Slope= 0.0242 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,771.00'

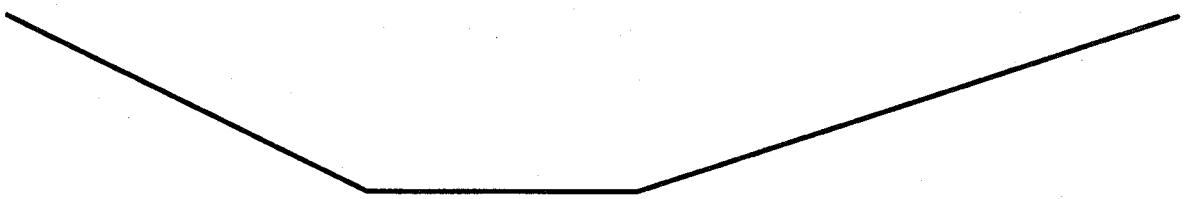
Summary for Reach 2AR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 210.67 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,770.00', Outlet Invert= 2,751.50'



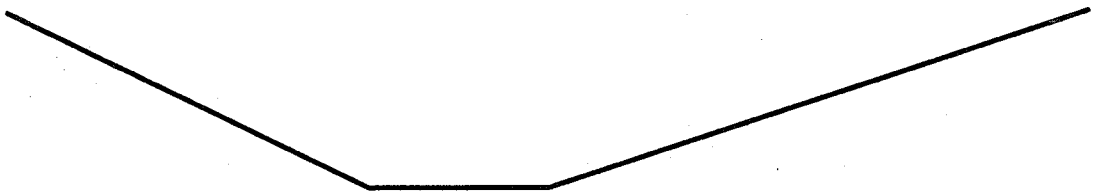
Summary for Reach 2BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 489.75 cfs

3.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 18.00'
Length= 167.0' Slope= 0.0509 '/'
Inlet Invert= 2,751.50', Outlet Invert= 2,743.00'



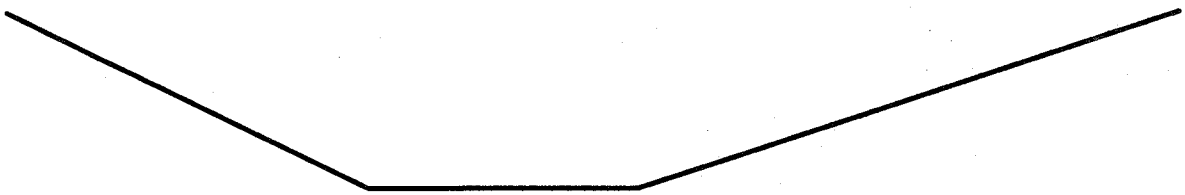
Summary for Reach 2CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 238.09 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 108.0' Slope= 0.0741 '/'
Inlet Invert= 2,743.00', Outlet Invert= 2,735.00'



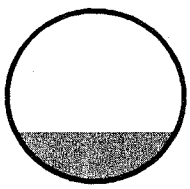
Summary for Reach 2R: SD from MH-4 to MH-3

Inflow Area = 3.007 ac, 5.34% Impervious, Inflow Depth > 1.13" for 2-Yr Storm event
Inflow = 4.65 cfs @ 12.04 hrs, Volume= 0.283 af
Outflow = 4.58 cfs @ 12.05 hrs, Volume= 0.283 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.91 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.02 fps, Avg. Travel Time= 1.3 min

Peak Storage= 136 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.30 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,767.90', Outlet Invert= 2,749.40'



Summary for Reach 3AR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 212.47 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 356.0' Slope= 0.0590 '/'
Inlet Invert= 2,772.00', Outlet Invert= 2,751.00'

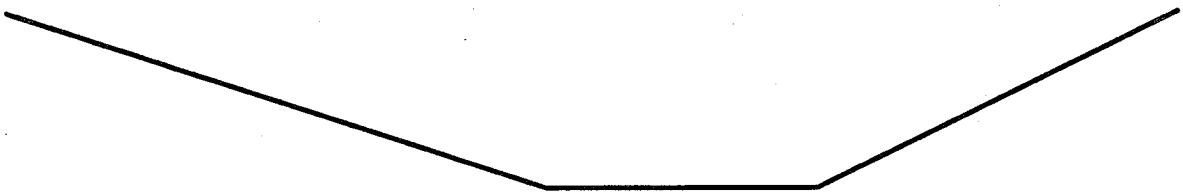
Summary for Reach 3BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 236.01 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 316.0' Slope= 0.0728 '/'
Inlet Invert= 2,751.00', Outlet Invert= 2,728.00'



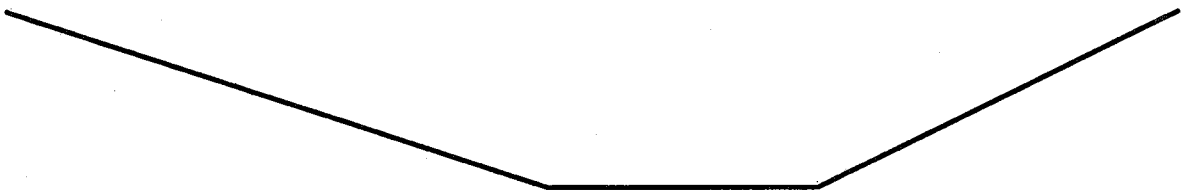
Summary for Reach 3CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs,	Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 239.46 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 347.0' Slope= 0.0749 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,702.00'



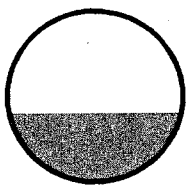
Summary for Reach 3R: SD from MH-3 to MH-2

Inflow Area = 5.257 ac, 5.24% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 7.96 cfs @ 12.05 hrs, Volume= 0.490 af
Outflow = 7.89 cfs @ 12.06 hrs, Volume= 0.490 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.98 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.48 fps, Avg. Travel Time= 0.6 min

Peak Storage= 111 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 23.42 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 167.0' Slope= 0.0497 '/'
Inlet Invert= 2,749.20', Outlet Invert= 2,740.90'



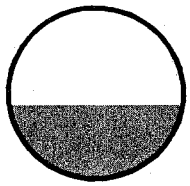
Summary for Reach 4R: SD from MH-2 to CB-1

Inflow Area = 6.582 ac, 5.23% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 9.89 cfs @ 12.05 hrs, Volume= 0.614 af
Outflow = 9.84 cfs @ 12.05 hrs, Volume= 0.613 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.10 fps, Avg. Travel Time= 0.4 min

Peak Storage= 79 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.57 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 108.0' Slope= 0.0593 '/'
Inlet Invert= 2,740.70', Outlet Invert= 2,734.30'



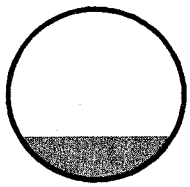
Summary for Reach 5R: 18" Culvert from CB-1

Inflow Area = 6.970 ac, 5.53% Impervious, Inflow Depth > 1.13" for 2-Yr Storm event
Inflow = 9.97 cfs @ 12.05 hrs, Volume= 0.654 af
Outflow = 9.95 cfs @ 12.05 hrs, Volume= 0.653 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 28.37 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 10.48 fps, Avg. Travel Time= 0.2 min

Peak Storage= 42 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 71.05 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 120.0' Slope= 0.4575 '/'
Inlet Invert= 2,734.30', Outlet Invert= 2,679.40'



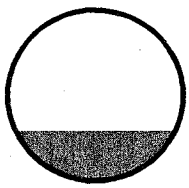
Summary for Reach 6R: SD from MH-5 to MH-6

Inflow Area = 3.216 ac, 0.00% Impervious, Inflow Depth > 1.05" for 2-Yr Storm event
Inflow = 4.70 cfs @ 12.04 hrs, Volume= 0.282 af
Outflow = 4.61 cfs @ 12.05 hrs, Volume= 0.282 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.97 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.14 fps, Avg. Travel Time= 1.4 min

Peak Storage= 152 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.39 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 356.0' Slope= 0.0584 '/'
Inlet Invert= 2,769.20', Outlet Invert= 2,748.40'



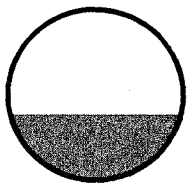
Summary for Reach 7R: SD from MH-6 ro MH-7

Inflow Area = 6.196 ac, 1.85% Impervious, Inflow Depth > 1.08" for 2-Yr Storm event
Inflow = 9.12 cfs @ 12.05 hrs, Volume= 0.559 af
Outflow = 9.00 cfs @ 12.06 hrs, Volume= 0.559 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.55 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.43 fps, Avg. Travel Time= 1.0 min

Peak Storage= 198 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 29.07 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 316.0' Slope= 0.0766 '/'
Inlet Invert= 2,748.40', Outlet Invert= 2,724.20'



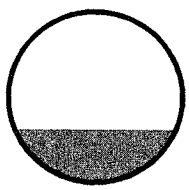
Summary for Reach 8R: SD from MH-7 to MH-8

Inflow Area = 8.512 ac, 2.16% Impervious, Inflow Depth > 1.09" for 2-Yr Storm event
Inflow = 12.55 cfs @ 12.05 hrs, Volume= 0.775 af
Outflow = 12.38 cfs @ 12.06 hrs, Volume= 0.774 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.05 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.59 fps, Avg. Travel Time= 1.0 min

Peak Storage= 289 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.74 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 347.0' Slope= 0.0697 '/'
Inlet Invert= 2,724.10', Outlet Invert= 2,699.90'



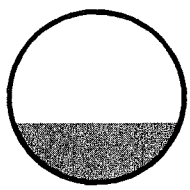
Summary for Reach 9R: SD from MH-8 ro MH-9

Inflow Area = 10.402 ac, 3.22% Impervious, Inflow Depth > 1.10" for 2-Yr Storm event
Inflow = 15.35 cfs @ 12.06 hrs, Volume= 0.956 af
Outflow = 15.22 cfs @ 12.06 hrs, Volume= 0.956 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.79 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.91 fps, Avg. Travel Time= 0.6 min

Peak Storage= 214 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.13 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 221.0' Slope= 0.0683 '/'
Inlet Invert= 2,699.40', Outlet Invert= 2,684.30'



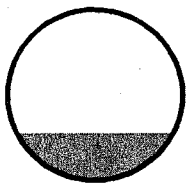
Summary for Reach 12R: 18" SD from 6A-East MH- 1 to CB-3

Inflow Area = 4.952 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 6.67 cfs @ 12.05 hrs, Volume= 0.437 af
Outflow = 6.64 cfs @ 12.06 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.75 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.37 fps, Avg. Travel Time= 0.4 min

Peak Storage= 60 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 39.91 cfs

18.0" Round Pipe
n= 0.011
Length= 150.0' Slope= 0.1033 '/'
Inlet Invert= 2,715.50', Outlet Invert= 2,700.00'



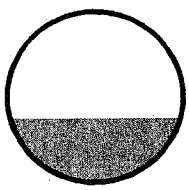
Summary for Reach 13R: SD from MH-9 to Outlet

Inflow Area = 11.061 ac, 3.88% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 15.22 cfs @ 12.06 hrs, Volume= 0.978 af
Outflow = 15.20 cfs @ 12.06 hrs, Volume= 0.978 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.06 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.37 fps, Avg. Travel Time= 0.1 min

Peak Storage= 32 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 50.59 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 30.0' Slope= 0.0500 '/'
Inlet Invert= 2,683.90', Outlet Invert= 2,682.40'



Summary for Reach 14R: Reinforced Ditch

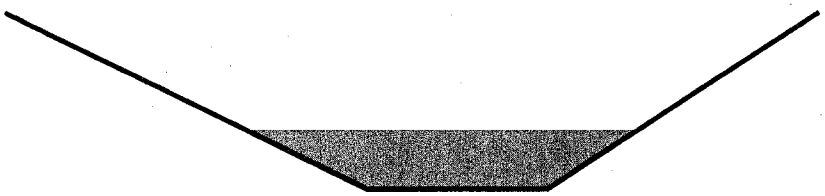
Stone lined ditch

Inflow Area = 11.822 ac, 5.25% Impervious, Inflow Depth > 1.09" for 2-Yr Storm event
Inflow = 16.41 cfs @ 12.06 hrs, Volume= 1.073 af
Outflow = 16.14 cfs @ 12.07 hrs, Volume= 1.072 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.58 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 1.5 min

Peak Storage= 497 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 149.47 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 1.5 '/' Top Width= 9.00'
Length= 230.0' Slope= 0.0670 '/'
Inlet Invert= 2,682.40', Outlet Invert= 2,667.00'



Summary for Reach C4R: Dicth

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 195.17 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 221.0' Slope= 0.0498 '/'
Inlet Invert= 2,702.00', Outlet Invert= 2,691.00'

Summary for Pond 10R: 18" Culvert to 6A-East MH-1

Inflow Area = 2.677 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 3.62 cfs @ 12.05 hrs, Volume= 0.236 af
Outflow = 3.59 cfs @ 12.06 hrs, Volume= 0.236 af, Atten= 1%, Lag= 0.7 min
Primary = 3.59 cfs @ 12.06 hrs, Volume= 0.236 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,726.90' @ 12.06 hrs Surf.Area= 298 sf Storage= 157 cf

Plug-Flow detention time= 1.1 min calculated for 0.236 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (867.0 - 866.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,726.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,726.00	50	0	0
2,728.00	600	650	650
2,729.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,726.00'	**18.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 2,726.00' / 2,725.00' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.54 cfs @ 12.06 hrs HW=2,726.89' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.54 cfs @ 3.22 fps)

Summary for Pond 11R: CB-2 & 12" SD 6A-East

Inflow Area = 2.275 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 3.09 cfs @ 12.05 hrs, Volume= 0.201 af
Outflow = 3.09 cfs @ 12.05 hrs, Volume= 0.201 af, Atten= 0%, Lag= 0.0 min
Primary = 3.09 cfs @ 12.05 hrs, Volume= 0.201 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,722.17' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2,721.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.500 Inlet / Outlet Invert= 2,721.00' / 2,715.50' S= 0.0524 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.07 cfs @ 12.05 hrs HW=2,722.16' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.07 cfs @ 3.90 fps)

Summary for Pond C-2A: Culvert to MH-4

Inflow Area = 3.007 ac, 5.34% Impervious, Inflow Depth > 1.13" for 2-Yr Storm event
Inflow = 4.92 cfs @ 12.01 hrs, Volume= 0.283 af
Outflow = 4.65 cfs @ 12.04 hrs, Volume= 0.283 af, Atten= 5%, Lag= 1.7 min
Primary = 4.65 cfs @ 12.04 hrs, Volume= 0.283 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,772.15' @ 12.04 hrs Surf.Area= 680 sf Storage= 418 cf
Flood Elev= 2,773.50' Surf.Area= 1,150 sf Storage= 1,200 cf

Plug-Flow detention time= 1.7 min calculated for 0.283 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (862.3 - 861.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.00'	1,200 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,771.00	50	0	0
2,772.00	600	325	325
2,773.00	1,150	875	1,200

Device	Routing	Invert	Outlet Devices
#1	Primary	2,771.00'	**18.0" Round Culvert** L= 10.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,771.00' / 2,770.00' S= 0.1000 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,773.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.59 cfs @ 12.04 hrs HW=2,772.13' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.59 cfs @ 3.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,771.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2B: Culvert to MH-3

Inflow Area = 2.250 ac, 5.10% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 3.47 cfs @ 12.02 hrs, Volume= 0.210 af
Outflow = 3.38 cfs @ 12.05 hrs, Volume= 0.208 af, Atten= 2%, Lag= 1.5 min
Primary = 3.38 cfs @ 12.05 hrs, Volume= 0.208 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,753.50' @ 12.05 hrs Surf.Area= 464 sf Storage= 386 cf
Flood Elev= 2,755.00' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 8.3 min calculated for 0.208 af (99% of inflow)
Center-of-Mass det. time= 3.1 min (864.8 - 861.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,752.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,752.00	50	0	0
2,754.00	600	650	650
2,755.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,752.50'	**18.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,752.50' / 2,751.50' S= 0.1429 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,755.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.36 cfs @ 12.05 hrs HW=2,753.50' (Free Discharge)
1=Culvert (Inlet Controls 3.36 cfs @ 2.69 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,752.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond C-2C: Culvert to MH-2

Inflow Area = 1.325 ac, 5.20% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 2.15 cfs @ 12.01 hrs, Volume= 0.123 af
Outflow = 2.13 cfs @ 12.02 hrs, Volume= 0.123 af, Atten= 1%, Lag= 0.5 min
Primary = 2.13 cfs @ 12.02 hrs, Volume= 0.123 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,743.52' @ 12.02 hrs Surf.Area= 194 sf Storage= 64 cf
Flood Elev= 2,745.00' Surf.Area= 600 sf Storage= 650 cf

Plug-Flow detention time= 1.0 min calculated for 0.123 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (861.4 - 860.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,743.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,743.00	50	0	0
2,745.00	600	650	650
2,746.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,743.00'	**18.0" Round Culvert X 2.00** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,743.00' / 2,742.00' S= 0.1000 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,744.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.07 cfs @ 12.02 hrs HW=2,743.52' (Free Discharge)
↑**1=Culvert** (Inlet Controls 2.07 cfs @ 1.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,743.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2D: 18" Culvert to CB-1

Inflow Area = 0.388 ac, 10.65% Impervious, Inflow Depth > 1.24" for 2-Yr Storm event
Inflow = 0.98 cfs @ 11.89 hrs, Volume= 0.040 af
Outflow = 0.94 cfs @ 11.90 hrs, Volume= 0.040 af, Atten= 4%, Lag= 0.6 min
Primary = 0.94 cfs @ 11.90 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,736.49' @ 11.90 hrs Surf.Area= 184 sf Storage= 57 cf

Plug-Flow detention time= 2.3 min calculated for 0.040 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (848.5 - 846.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,736.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,736.00	50	0	0
2,738.00	600	650	650
2,739.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,736.00'	**18.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,736.00' / 2,734.30' S= 0.0567 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=0.92 cfs @ 11.90 hrs HW=2,736.48' (Free Discharge)
1=Culvert (Inlet Controls 0.92 cfs @ 1.87 fps)

Summary for Pond C-3A: Culvert to MH-5

Inflow Area = 3.216 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 4.76 cfs @ 12.02 hrs, Volume= 0.284 af
Outflow = 4.70 cfs @ 12.04 hrs, Volume= 0.282 af, Atten= 1%, Lag= 1.1 min
Primary = 4.70 cfs @ 12.04 hrs, Volume= 0.282 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,773.06' @ 12.04 hrs Surf.Area= 394 sf Storage= 347 cf
Flood Elev= 2,775.75' Surf.Area= 1,150 sf Storage= 1,688 cf

Plug-Flow detention time= 5.4 min calculated for 0.282 af (99% of inflow)
Center-of-Mass det. time= 2.0 min (867.3 - 865.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.50'	1,688 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,771.50	50	0	0
2,774.00	600	813	813
2,775.00	1,150	875	1,688

Device	Routing	Invert	Outlet Devices
#1	Primary	2,772.00'	**18.0" Round Culvert** L= 13.0' Ke= 0.500 Inlet / Outlet Invert= 2,772.00' / 2,771.00' S= 0.0769 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,775.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.61 cfs @ 12.04 hrs HW=2,773.05' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.61 cfs @ 3.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,771.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3B: Culvert to MH-6

Inflow Area = 2.980 ac, 3.85% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 4.58 cfs @ 12.02 hrs, Volume= 0.277 af
Outflow = 4.52 cfs @ 12.04 hrs, Volume= 0.277 af, Atten= 1%, Lag= 1.1 min
Primary = 4.52 cfs @ 12.04 hrs, Volume= 0.277 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,752.12' @ 12.04 hrs Surf.Area= 359 sf Storage= 230 cf
Flood Elev= 2,754.50' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 1.2 min calculated for 0.277 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (862.5 - 861.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,751.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,751.00	50	0	0
2,753.00	600	650	650
2,754.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,751.00'	**18.0" Round Culvert** L= 12.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,751.00' / 2,750.00' S= 0.0833 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,754.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.45 cfs @ 12.04 hrs HW=2,752.11' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.45 cfs @ 3.17 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,751.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3C: Culvert to MH-7

Inflow Area = 2.316 ac, 2.97% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 3.71 cfs @ 12.01 hrs, Volume= 0.216 af
Outflow = 3.63 cfs @ 12.03 hrs, Volume= 0.216 af, Atten= 2%, Lag= 1.1 min
Primary = 3.63 cfs @ 12.03 hrs, Volume= 0.216 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,728.81' @ 12.03 hrs Surf.Area= 494 sf Storage= 220 cf
Flood Elev= 2,731.00' Surf.Area= 1,150 sf Storage= 2,075 cf

Plug-Flow detention time= 1.4 min calculated for 0.216 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (862.0 - 861.0)

Volume	Invert	Avail.Storage	Storage Description
#1	2,728.00'	2,075 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,728.00	50	0	0
2,729.00	600	325	325
2,731.00	1,150	1,750	2,075

Device	Routing	Invert	Outlet Devices
#1	Primary	2,728.00'	**24.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 2,728.00' / 2,726.00' S= 0.0952 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,730.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.53 cfs @ 12.03 hrs HW=2,728.80' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.53 cfs @ 3.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,728.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4: 18" Culvert @ SE Corner

Inflow Area = 1.889 ac, 8.02% Impervious, Inflow Depth > 1.18" for 2-Yr Storm event
Inflow = 3.06 cfs @ 12.02 hrs, Volume= 0.185 af
Outflow = 2.98 cfs @ 12.05 hrs, Volume= 0.182 af, Atten= 3%, Lag= 1.6 min
Primary = 2.98 cfs @ 12.05 hrs, Volume= 0.182 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,702.63' @ 12.05 hrs Surf.Area= 498 sf Storage= 446 cf
Flood Elev= 2,705.00' Surf.Area= 1,150 sf Storage= 2,400 cf

Plug-Flow detention time= 13.8 min calculated for 0.182 af (98% of inflow)
Center-of-Mass det. time= 4.8 min (863.5 - 858.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,701.00'	2,400 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,701.00	50	0	0
2,703.00	600	650	650
2,705.00	1,150	1,750	2,400

Device	Routing	Invert	Outlet Devices
#1	Primary	2,701.70'	**18.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,701.70' / 2,700.10' S= 0.1231 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,704.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.98 cfs @ 12.05 hrs HW=2,702.63' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.98 cfs @ 2.59 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,701.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4B: 18" Culvert

Inflow Area = 0.659 ac, 14.24% Impervious, Inflow Depth > 1.30" for 2-Yr Storm event
Inflow = 1.49 cfs @ 11.95 hrs, Volume= 0.071 af
Outflow = 0.04 cfs @ 15.57 hrs, Volume= 0.022 af, Atten= 97%, Lag= 217.0 min
Primary = 0.04 cfs @ 15.57 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,691.20' @ 15.57 hrs Surf.Area= 1,612 sf Storage= 2,189 cf
Flood Elev= 2,693.00' Surf.Area= 2,000 sf Storage= 3,641 cf

Plug-Flow detention time= 397.4 min calculated for 0.022 af (31% of inflow)
Center-of-Mass det. time= 258.8 min (1,107.2 - 848.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,688.50'	3,641 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

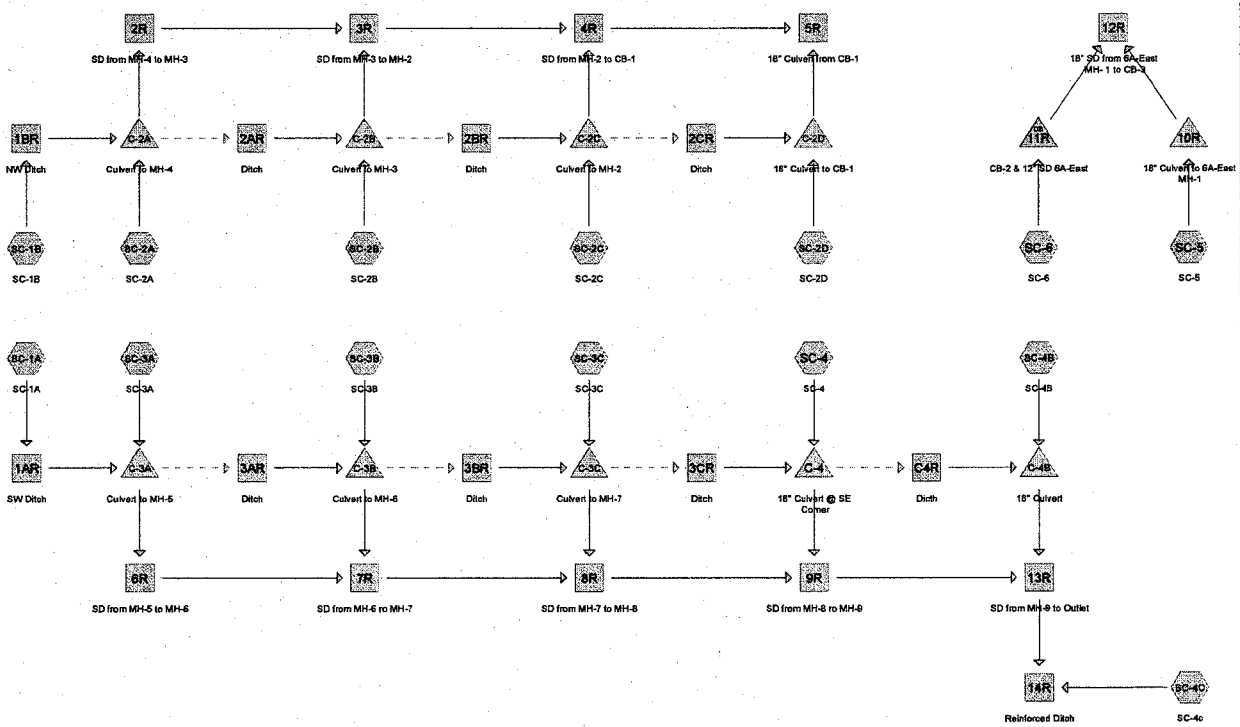
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,688.50	20	0	0
2,689.00	111	33	33
2,690.00	1,035	573	606
2,692.00	2,000	3,035	3,641

Device	Routing	Invert	Outlet Devices
#1	Primary	2,691.10'	**18.0" Round Culvert** L= 69.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,691.10' / 2,684.20' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=0.04 cfs @ 15.57 hrs HW=2,691.20' (Free Discharge)
↑**1=Culvert** (Inlet Controls 0.04 cfs @ 0.83 fps)

25-YEAR/24-HOUR STORM

25-YEAR / 24-HOUR STORM



Subcat Reach Pond Link

Drainage Diagram for 6A WEST FINAL CLOSURE
Prepared by Sevee & Maher Engineers, Inc., Printed 2/7/2011
HydroCAD® 9.10 s/n 01260 © 2009 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment SC-1A: SC-1A Runoff Area=45,700 sf 0.00% Impervious Runoff Depth>2.89"
Flow Length=1,175' Tc=8.9 min CN=71 Runoff=4.80 cfs 0.253 af

Subcatchment SC-1B: SC-1B Runoff Area=31,000 sf 6.45% Impervious Runoff Depth>3.09"
Flow Length=425' Tc=5.7 min CN=73 Runoff=3.89 cfs 0.183 af

Subcatchment SC-2A: SC-2A Runoff Area=100,000 sf 5.00% Impervious Runoff Depth>2.99"
Flow Length=475' Tc=10.3 min CN=72 Runoff=10.36 cfs 0.571 af

Subcatchment SC-2B: SC-2B Runoff Area=98,000 sf 5.10% Impervious Runoff Depth>2.99"
Flow Length=620' Tc=11.9 min CN=72 Runoff=9.58 cfs 0.560 af

Subcatchment SC-2C: SC-2C Runoff Area=57,700 sf 5.20% Impervious Runoff Depth>2.99"
Flow Length=495' Tc=10.7 min CN=72 Runoff=5.90 cfs 0.330 af

Subcatchment SC-2D: SC-2D Runoff Area=16,900 sf 10.65% Impervious Runoff Depth>3.18"
Flow Length=220' Tc=0.7 min CN=74 Runoff=2.46 cfs 0.103 af

Subcatchment SC-3A: SC-3A Runoff Area=94,400 sf 0.00% Impervious Runoff Depth>2.89"
Flow Length=540' Tc=10.4 min CN=71 Runoff=9.44 cfs 0.522 af

Subcatchment SC-3B: SC-3B 13.CFS Runoff Area=129,800 sf 3.85% Impervious Runoff Depth>2.99"
Flow Length=695' Tc=12.0 min CN=72 Runoff=12.65 cfs 0.741 af

Subcatchment SC-3C: SC-3C Runoff Area=100,900 sf 2.97% Impervious Runoff Depth>2.99"
Flow Length=685' Tc=11.0 min CN=72 Runoff=10.20 cfs 0.577 af

Subcatchment SC-4: SC-4 Runoff Area=82,300 sf 8.02% Impervious Runoff Depth>3.08"
Flow Length=748' Tc=12.1 min CN=73 Runoff=8.25 cfs 0.485 af

Subcatchment SC-4B: SC-4B Runoff Area=28,725 sf 14.24% Impervious Runoff Depth>3.28"
Flow Length=320' Tc=6.3 min CN=75 Runoff=3.74 cfs 0.180 af

Subcatchment SC-4C: SC-4c Runoff Area=33,140 sf 25.14% Impervious Runoff Depth>3.57"
Flow Length=350' Tc=8.6 min CN=78 Runoff=4.29 cfs 0.227 af

Subcatchment SC-5: SC-5 Runoff Area=116,600 sf 0.00% Impervious Runoff Depth>2.89"
Flow Length=720' Tc=13.9 min CN=71 Runoff=10.32 cfs 0.645 af

Subcatchment SC-6: SC-6 Runoff Area=99,100 sf 0.00% Impervious Runoff Depth>2.89"
Flow Length=630' Tc=13.8 min CN=71 Runoff=8.80 cfs 0.548 af

Reach 1AR: SW Ditch Avg. Flow Depth=0.34' Max Vel=3.58 fps Inflow=4.80 cfs 0.253 af
n=0.030 L=370.0' S=0.0297 '/' Capacity=150.84 cfs Outflow=4.51 cfs 0.252 af

Reach 1BR: NW Ditch Avg. Flow Depth=0.31' Max Vel=3.04 fps Inflow=3.89 cfs 0.183 af
n=0.030 L=495.0' S=0.0242 '/' Capacity=136.21 cfs Outflow=3.54 cfs 0.182 af

Reach 2AR: Ditch Avg. Flow Depth=0.10' Max Vel=2.45 fps Inflow=1.33 cfs 0.007 af
n=0.030 L=319.0' S=0.0580 '/' Capacity=210.67 cfs Outflow=0.72 cfs 0.007 af

Reach 2BR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=167.0' S=0.0509 '/' Capacity=489.75 cfs Outflow=0.00 cfs 0.000 af

Reach 2CR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=108.0' S=0.0741 '/' Capacity=238.09 cfs Outflow=0.00 cfs 0.000 af

Reach 2R: SD from MH-4 to MH-3 Avg. Flow Depth=0.63' Max Vel=13.27 fps Inflow=9.39 cfs 0.711 af
18.0" Round Pipe n=0.013 L=319.0' S=0.0580 '/' Capacity=25.30 cfs Outflow=9.34 cfs 0.710 af

Reach 3AR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=356.0' S=0.0590 '/' Capacity=212.47 cfs Outflow=0.00 cfs 0.000 af

Reach 3BR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=316.0' S=0.0728 '/' Capacity=236.01 cfs Outflow=0.00 cfs 0.000 af

Reach 3CR: Ditch Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=347.0' S=0.0749 '/' Capacity=239.46 cfs Outflow=0.00 cfs 0.000 af

Reach 3R: SD from MH-3 to MH-2 Avg. Flow Depth=0.96' Max Vel=14.52 fps Inflow=17.44 cfs 1.275 af
18.0" Round Pipe n=0.013 L=167.0' S=0.0497 '/' Capacity=23.42 cfs Outflow=17.42 cfs 1.275 af

Reach 4R: SD from MH-2 to CB-1 Avg. Flow Depth=1.11' Max Vel=16.36 fps Inflow=22.99 cfs 1.605 af
18.0" Round Pipe n=0.013 L=108.0' S=0.0593 '/' Capacity=25.57 cfs Outflow=22.95 cfs 1.604 af

Reach 5R: 18" Culvert from CB-1 Avg. Flow Depth=0.59' Max Vel=35.94 fps Inflow=23.31 cfs 1.707 af
18.0" Round Pipe n=0.013 L=120.0' S=0.4575 '/' Capacity=71.05 cfs Outflow=23.29 cfs 1.707 af

Reach 6R: SD from MH-5 to MH-6 Avg. Flow Depth=0.73' Max Vel=14.21 fps Inflow=12.19 cfs 0.773 af
18.0" Round Pipe n=0.013 L=356.0' S=0.0584 '/' Capacity=25.39 cfs Outflow=12.10 cfs 0.772 af

Reach 7R: SD from MH-6 ro MH-7 Avg. Flow Depth=1.01' Max Vel=18.22 fps Inflow=23.10 cfs 1.513 af
18.0" Round Pipe n=0.013 L=316.0' S=0.0766 '/' Capacity=29.07 cfs Outflow=23.04 cfs 1.513 af

Reach 8R: SD from MH-7 to MH-8 Avg. Flow Depth=1.05' Max Vel=19.39 fps Inflow=32.34 cfs 2.089 af
24.0" Round Pipe n=0.013 L=347.0' S=0.0697 '/' Capacity=59.74 cfs Outflow=32.14 cfs 2.088 af

Reach 9R: SD from MH-8 ro MH-9 Avg. Flow Depth=1.20' Max Vel=20.16 fps Inflow=39.62 cfs 2.570 af
24.0" Round Pipe n=0.013 L=221.0' S=0.0683 '/' Capacity=59.13 cfs Outflow=39.45 cfs 2.569 af

Reach 12R: 18" SD from 6A-East MH- Avg. Flow Depth=0.72' Max Vel=22.13 fps Inflow=18.44 cfs 1.192 af
18.0" Round Pipe n=0.011 L=150.0' S=0.1033 '/' Capacity=39.91 cfs Outflow=18.38 cfs 1.192 af

Reach 13R: SD from MH-9 to Outlet Avg. Flow Depth=1.37' Max Vel=17.93 fps Inflow=41.19 cfs 2.699 af
24.0" Round Pipe n=0.013 L=30.0' S=0.0500 '/' Capacity=50.59 cfs Outflow=41.16 cfs 2.699 af

Reach 14R: Reinforced Ditch Avg. Flow Depth=1.12' Max Vel=9.91 fps Inflow=43.96 cfs 2.926 af
n=0.030 L=230.0' S=0.0670 '/' Capacity=149.47 cfs Outflow=43.64 cfs 2.924 af

Reach C4R: Dicth Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=221.0' S=0.0498 '/' Capacity=195.17 cfs Outflow=0.00 cfs 0.000 af

Pond 10R: 18" Culvert to 6A-East MH-1 Peak Elev=2,728.07' Storage=696 cf Inflow=10.32 cfs 0.645 af
18.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=9.80 cfs 0.644 af

Pond 11R: CB-2 & 12" SD 6A-East Peak Elev=2,726.91' Inflow=8.80 cfs 0.548 af
12.0" Round Culvert n=0.011 L=105.0' S=0.0524 '/' Outflow=8.80 cfs 0.548 af

Pond C-2A: Culvert to MH-4 Peak Elev=2,773.31' Storage=1,200 cf Inflow=13.85 cfs 0.754 af
Primary=9.39 cfs 0.711 af Secondary=1.33 cfs 0.007 af Outflow=10.72 cfs 0.718 af

Pond C-2B: Culvert to MH-3 Peak Elev=2,754.91' Storage=1,420 cf Inflow=9.93 cfs 0.567 af
Primary=8.65 cfs 0.565 af Secondary=0.00 cfs 0.000 af Outflow=8.65 cfs 0.565 af

Pond C-2C: Culvert to MH-2 Peak Elev=2,743.92' Storage=162 cf Inflow=5.90 cfs 0.330 af
Primary=5.86 cfs 0.330 af Secondary=0.00 cfs 0.000 af Outflow=5.86 cfs 0.330 af

Pond C-2D: 18" Culvert to CB-1 Peak Elev=2,736.81' Storage=132 cf Inflow=2.46 cfs 0.103 af
18.0" Round Culvert n=0.011 L=30.0' S=0.0567 '/' Outflow=2.37 cfs 0.103 af

Pond C-3A: Culvert to MH-5 Peak Elev=2,774.80' Storage=1,472 cf Inflow=13.78 cfs 0.775 af
Primary=12.19 cfs 0.773 af Secondary=0.00 cfs 0.000 af Outflow=12.19 cfs 0.773 af

Pond C-3B: Culvert to MH-6 Peak Elev=2,753.89' Storage=1,406 cf Inflow=12.65 cfs 0.741 af
Primary=11.00 cfs 0.741 af Secondary=0.00 cfs 0.000 af Outflow=11.00 cfs 0.741 af

Pond C-3C: Culvert to MH-7 Peak Elev=2,729.45' Storage=619 cf Inflow=10.20 cfs 0.577 af
Primary=9.95 cfs 0.576 af Secondary=0.00 cfs 0.000 af Outflow=9.95 cfs 0.576 af

Pond C-4: 18" Culvert @ SE Corner Peak Elev=2,703.69' Storage=1,128 cf Inflow=8.25 cfs 0.485 af
Primary=7.48 cfs 0.482 af Secondary=0.00 cfs 0.000 af Outflow=7.48 cfs 0.482 af

Pond C-4B: 18" Culvert Peak Elev=2,691.78' Storage=3,218 cf Inflow=3.74 cfs 0.180 af
18.0" Round Culvert n=0.011 L=69.0' S=0.1000 '/' Outflow=1.74 cfs 0.130 af

Total Runoff Area = 23.743 ac Runoff Volume = 5.925 af Average Runoff Depth = 2.99"
95.76% Pervious = 22.737 ac 4.24% Impervious = 1.006 ac

Summary for Subcatchment SC-1A: SC-1A

Runoff = 4.80 cfs @ 11.98 hrs, Volume= 0.253 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	45,700	71	Landfill Cover Soil
	45,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.1000	0.20		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
4.4	1,025	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.9	1,175	Total			

Summary for Subcatchment SC-1B: SC-1B

Runoff = 3.89 cfs @ 11.94 hrs, Volume= 0.183 af, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	29,000	71	Landfill Cover Soil
*	2,000	98	
	31,000	73	Weighted Average
	29,000		93.55% Pervious Area
	2,000		6.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.1000	0.20		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	275	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=13.00' n= 0.030
5.7	425	Total			

Summary for Subcatchment SC-2A: SC-2A

Runoff = 10.36 cfs @ 12.00 hrs, Volume= 0.571 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	95,000	71	Landfill Cover Soil
*	5,000	98	Paved. Gravel
	100,000	72	Weighted Average
	95,000		95.00% Pervious Area
	5,000		5.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.7	65	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	200	0.0250	8.25	165.04	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	110	0.2500	13.09	209.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=14.00' n= 0.060
10.3	475	Total			

Summary for Subcatchment SC-2B: SC-2B

Runoff = 9.58 cfs @ 12.01 hrs, Volume= 0.560 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	93,000	71	Cover Soil
	5,000	98	Paved parking, HSG C
	98,000	72	Weighted Average
	93,000		94.90% Pervious Area
	5,000		5.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
2.4	235	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	145	0.0200	7.41	118.50	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=14.00' n= 0.030
0.1	140	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
11.9	620	Total			

Summary for Subcatchment SC-2C: SC-2C

Runoff = 5.90 cfs @ 12.00 hrs, Volume= 0.330 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	54,700	71	Cover Soil
	3,000	98	Paved parking, HSG C
	57,700	72	Weighted Average
	54,700		94.80% Pervious Area
	3,000		5.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.2	120	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.3	150	0.0200	7.38	147.62	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	125	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
10.7	495	Total			

Summary for Subcatchment SC-2D: SC-2D

Runoff = 2.46 cfs @ 11.88 hrs, Volume= 0.103 af, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	15,100	71	Cover Soil
	1,800	98	Paved parking, HSG C
	16,900	74	Weighted Average
	15,100		89.35% Pervious Area
	1,800		10.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	125	0.2500	3.50		**Shallow Concentrated Flow, A-B** Short Grass Pasture Kv= 7.0 fps
0.1	95	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=3.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=15.00' n= 0.030
0.7	220	Total			

Summary for Subcatchment SC-3A: SC-3A

Runoff = 9.44 cfs @ 12.00 hrs, Volume= 0.522 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	94,400	71	Cover Soil
	94,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.7	70	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	265	0.0250	8.08	258.46	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.1	105	0.3300	29.98	599.62	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
10.4	540	Total			

Summary for Subcatchment SC-3B: SC-3B

Runoff = 12.65 cfs @ 12.01 hrs, Volume= 0.741 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	124,800	71	Cover Soil
	5,000	98	Paved parking, HSG C
	129,800	72	Weighted Average
	124,800		96.15% Pervious Area
	5,000		3.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
2.4	240	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	215	0.0250	8.08	258.46	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
0.1	140	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
12.0	695	Total			

Summary for Subcatchment SC-3C: SC-3C

Runoff = 10.20 cfs @ 12.00 hrs, Volume= 0.577 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	97,900	71	Cover Soil
	3,000	98	Paved parking, HSG C
	100,900	72	Weighted Average
	97,900		97.03% Pervious Area
	3,000		2.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.2	120	0.0550	1.64		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	175	0.0200	7.22	231.17	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.1	160	0.2500	25.54	817.32	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 2.0 & 12.0 '/' Top.W=30.00' n= 0.030
0.2	130	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=3.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=15.00' n= 0.030
11.0	685	Total			

Summary for Subcatchment SC-4: SC-4

Runoff = 8.25 cfs @ 12.01 hrs, Volume= 0.485 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	75,700	71	Cover Soil
	6,600	98	Paved parking, HSG C
	82,300	73	Weighted Average
	75,700		91.98% Pervious Area
	6,600		8.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	95	0.0550	1.64		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.7	263	0.1400	2.62		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	290	0.0740	14.87	237.97	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
12.1	748	Total			

Summary for Subcatchment SC-4B: SC-4B

Runoff = 3.74 cfs @ 11.95 hrs, Volume= 0.180 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	24,635	71	Cover Soil
	4,090	98	Paved parking, HSG C
	28,725	75	Weighted Average
	24,635		85.76% Pervious Area
	4,090		14.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.2	40	0.2000	3.13		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	180	0.0600	13.32	239.75	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
6.3	320	Total			

Summary for Subcatchment SC-4C: SC-4c

Runoff = 4.29 cfs @ 11.98 hrs, Volume= 0.227 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	24,810	71	Cover Soil
	8,330	98	Paved parking, HSG C
	33,140	78	Weighted Average
	24,810		74.86% Pervious Area
	8,330		25.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	100	0.0700	0.20		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.3	250	0.0900	13.14	26.29	**Trap/Vee/Rect Channel Flow, Segment ID: B-C** Bot.W=1.00' D=1.00' Z= 1.0 '/' Top.W=3.00' n= 0.022 Earth, clean & straight
8.6	350	Total			

Summary for Subcatchment SC-5: SC-5

Runoff = 10.32 cfs @ 12.04 hrs, Volume= 0.645 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	116,600	71	Cover Soil
	116,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.57		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.1	90	0.0670	14.08	253.35	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
13.9	720	Total			

Summary for Subcatchment SC-6: SC-6

Runoff = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (sf)	CN	Description
*	99,100	71	Cover Soil
	99,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.18		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.57		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
13.8	630	Total			

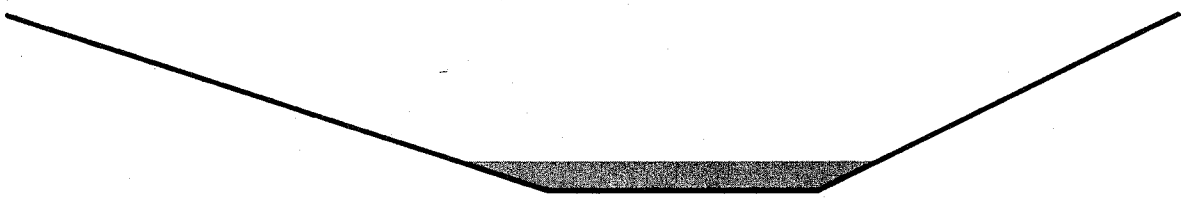
Summary for Reach 1AR: SW Ditch

Inflow Area = 1.049 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 4.80 cfs @ 11.98 hrs, Volume= 0.253 af
Outflow = 4.51 cfs @ 12.03 hrs, Volume= 0.252 af, Atten= 6%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.58 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 6.2 min

Peak Storage= 485 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.84 cfs

3.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 370.0' Slope= 0.0297 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,772.00'



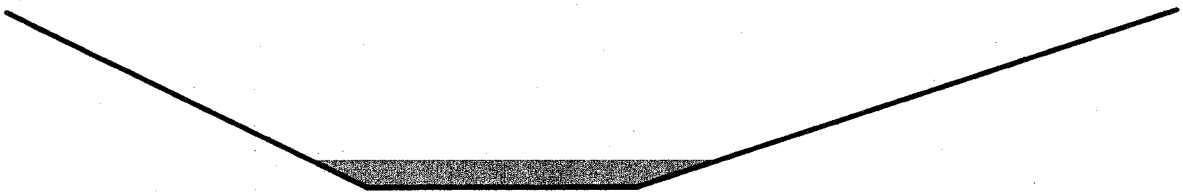
Summary for Reach 1BR: NW Ditch

Inflow Area = 0.712 ac, 6.45% Impervious, Inflow Depth > 3.09" for 25-Yr Storm event
Inflow = 3.89 cfs @ 11.94 hrs, Volume= 0.183 af
Outflow = 3.54 cfs @ 12.02 hrs, Volume= 0.182 af, Atten= 9%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 10.1 min

Peak Storage= 579 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 136.21 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 495.0' Slope= 0.0242 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,771.00'



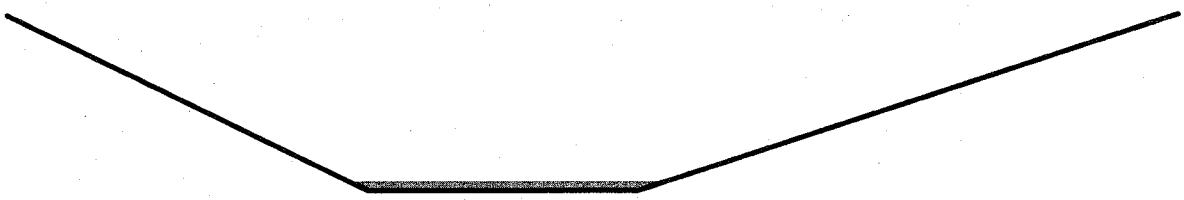
Summary for Reach 2AR: Ditch

Inflow	=	1.33 cfs @	12.00 hrs, Volume=	0.007 af
Outflow	=	0.72 cfs @	12.07 hrs, Volume=	0.007 af, Atten= 46%, Lag= 4.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.45 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 4.9 min

Peak Storage= 109 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 210.67 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,770.00', Outlet Invert= 2,751.50'



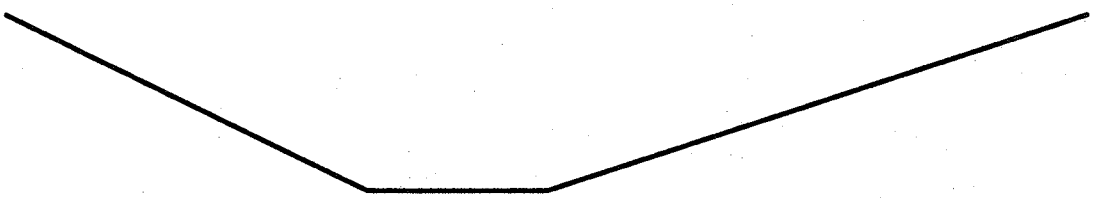
Summary for Reach 2BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 489.75 cfs

3.00' x 3.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 18.00'
Length= 167.0' Slope= 0.0509 '/'
Inlet Invert= 2,751.50', Outlet Invert= 2,743.00'



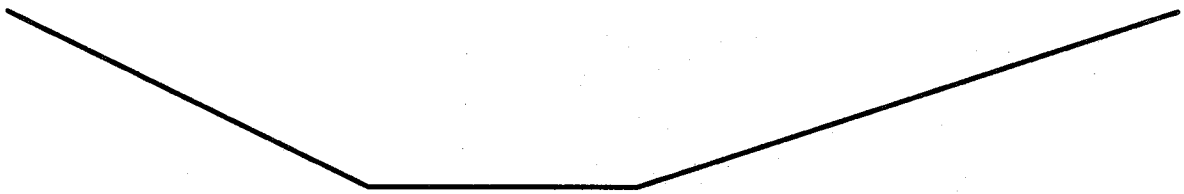
Summary for Reach 2CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 238.09 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 108.0' Slope= 0.0741 '/'
Inlet Invert= 2,743.00', Outlet Invert= 2,735.00'



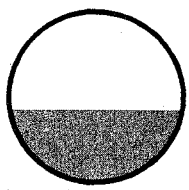
Summary for Reach 2R: SD from MH-4 to MH-3

Inflow Area = 3.007 ac, 5.34% Impervious, Inflow Depth > 2.84" for 25-Yr Storm event
Inflow = 9.39 cfs @ 12.00 hrs, Volume= 0.711 af
Outflow = 9.34 cfs @ 12.01 hrs, Volume= 0.710 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.27 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.91 fps, Avg. Travel Time= 1.1 min

Peak Storage= 227 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.30 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,767.90', Outlet Invert= 2,749.40'



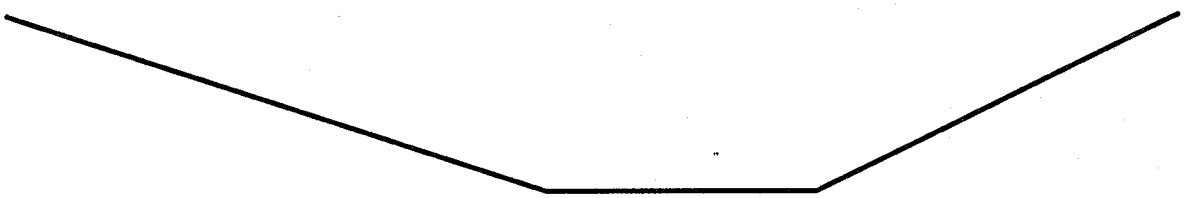
Summary for Reach 3AR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 212.47 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 356.0' Slope= 0.0590 '/'
Inlet Invert= 2,772.00', Outlet Invert= 2,751.00'



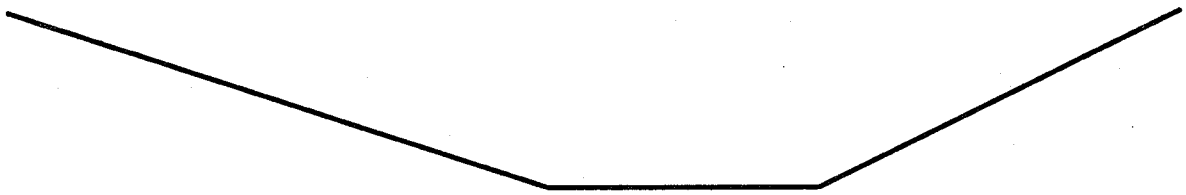
Summary for Reach 3BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 236.01 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 316.0' Slope= 0.0728 '/'
Inlet Invert= 2,751.00', Outlet Invert= 2,728.00'



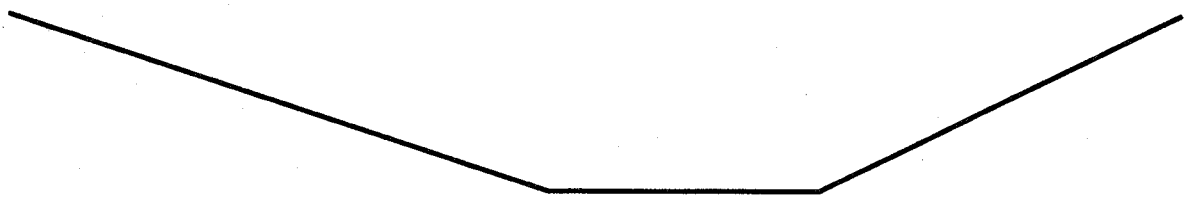
Summary for Reach 3CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 239.46 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 347.0' Slope= 0.0749 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,702.00'



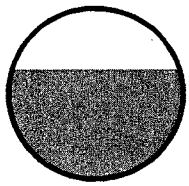
Summary for Reach 3R: SD from MH-3 to MH-2

Inflow Area = 5.257 ac, 5.24% Impervious, Inflow Depth > 2.91" for 25-Yr Storm event
Inflow = 17.44 cfs @ 12.04 hrs, Volume= 1.275 af
Outflow = 17.42 cfs @ 12.05 hrs, Volume= 1.275 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.52 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.46 fps, Avg. Travel Time= 0.5 min

Peak Storage= 201 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.96'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 23.42 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 167.0' Slope= 0.0497 '/'
Inlet Invert= 2,749.20', Outlet Invert= 2,740.90'



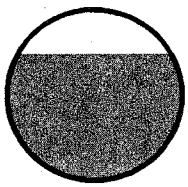
Summary for Reach 4R: SD from MH-2 to CB-1

Inflow Area = 6.582 ac, 5.23% Impervious, Inflow Depth > 2.93" for 25-Yr Storm event
Inflow = 22.99 cfs @ 12.03 hrs, Volume= 1.605 af
Outflow = 22.95 cfs @ 12.03 hrs, Volume= 1.604 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.36 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.22 fps, Avg. Travel Time= 0.3 min

Peak Storage= 152 cf @ 12.03 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.57 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 108.0' Slope= 0.0593 '/'
Inlet Invert= 2,740.70', Outlet Invert= 2,734.30'



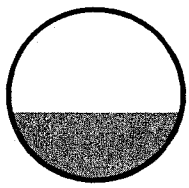
Summary for Reach 5R: 18" Culvert from CB-1

Inflow Area = 6.970 ac, 5.53% Impervious, Inflow Depth > 2.94" for 25-Yr Storm event
Inflow = 23.31 cfs @ 12.03 hrs, Volume= 1.707 af
Outflow = 23.29 cfs @ 12.03 hrs, Volume= 1.707 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 35.94 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 12.76 fps, Avg. Travel Time= 0.2 min

Peak Storage= 78 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 71.05 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 120.0' Slope= 0.4575 '/'
Inlet Invert= 2,734.30', Outlet Invert= 2,679.40'



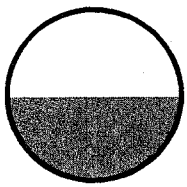
Summary for Reach 6R: SD from MH-5 to MH-6

Inflow Area = 3.216 ac, 0.00% Impervious, Inflow Depth > 2.88" for 25-Yr Storm event
Inflow = 12.19 cfs @ 12.05 hrs, Volume= 0.773 af
Outflow = 12.10 cfs @ 12.07 hrs, Volume= 0.772 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.21 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.18 fps, Avg. Travel Time= 1.1 min

Peak Storage= 305 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.39 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 356.0' Slope= 0.0584 '/'
Inlet Invert= 2,769.20', Outlet Invert= 2,748.40'



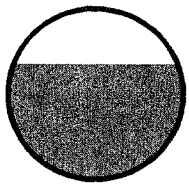
Summary for Reach 7R: SD from MH-6 ro MH-7

Inflow Area = 6.196 ac, 1.85% Impervious, Inflow Depth > 2.93" for 25-Yr Storm event
Inflow = 23.10 cfs @ 12.07 hrs, Volume= 1.513 af
Outflow = 23.04 cfs @ 12.08 hrs, Volume= 1.513 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 18.22 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 6.67 fps, Avg. Travel Time= 0.8 min

Peak Storage= 400 cf @ 12.07 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 29.07 cfs

18.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 316.0' Slope= 0.0766 '/'
Inlet Invert= 2,748.40', Outlet Invert= 2,724.20'



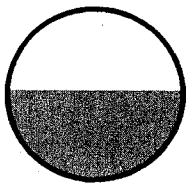
Summary for Reach 8R: SD from MH-7 to MH-8

Inflow Area = 8.512 ac, 2.16% Impervious, Inflow Depth > 2.94" for 25-Yr Storm event
Inflow = 32.34 cfs @ 12.05 hrs, Volume= 2.089 af
Outflow = 32.14 cfs @ 12.06 hrs, Volume= 2.088 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 19.39 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 6.85 fps, Avg. Travel Time= 0.8 min

Peak Storage= 579 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.05'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.74 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 347.0' Slope= 0.0697 '/'
Inlet Invert= 2,724.10', Outlet Invert= 2,699.90'



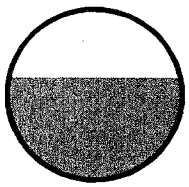
Summary for Reach 9R: SD from MH-8 ro MH-9

Inflow Area = 10.402 ac, 3.22% Impervious, Inflow Depth > 2.96" for 25-Yr Storm event
Inflow = 39.62 cfs @ 12.06 hrs, Volume= 2.570 af
Outflow = 39.45 cfs @ 12.06 hrs, Volume= 2.569 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 20.16 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 7.23 fps, Avg. Travel Time= 0.5 min

Peak Storage= 434 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.20'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.13 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 221.0' Slope= 0.0683 '/'
Inlet Invert= 2,699.40', Outlet Invert= 2,684.30'



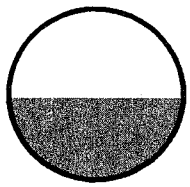
Summary for Reach 12R: 18" SD from 6A-East MH- 1 to CB-3

Inflow Area = 4.952 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 18.44 cfs @ 12.05 hrs, Volume= 1.192 af
Outflow = 18.38 cfs @ 12.05 hrs, Volume= 1.192 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 22.13 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 7.84 fps, Avg. Travel Time= 0.3 min

Peak Storage= 125 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 39.91 cfs

18.0" Round Pipe
n= 0.011
Length= 150.0' Slope= 0.1033 '/'
Inlet Invert= 2,715.50', Outlet Invert= 2,700.00'



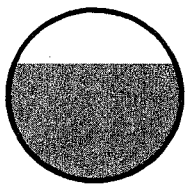
Summary for Reach 13R: SD from MH-9 to Outlet

Inflow Area = 11.061 ac, 3.88% Impervious, Inflow Depth > 2.93" for 25-Yr Storm event
Inflow = 41.19 cfs @ 12.06 hrs, Volume= 2.699 af
Outflow = 41.16 cfs @ 12.07 hrs, Volume= 2.699 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 17.93 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 6.58 fps, Avg. Travel Time= 0.1 min

Peak Storage= 69 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.37'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 50.59 cfs

24.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 30.0' Slope= 0.0500 '/'
Inlet Invert= 2,683.90', Outlet Invert= 2,682.40'



Summary for Reach 14R: Reinforced Ditch

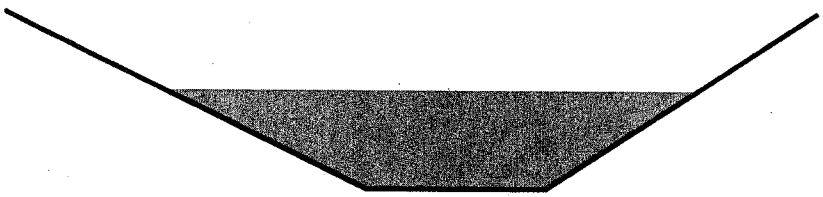
Stone lined ditch

Inflow Area =	11.822 ac,	5.25% Impervious,	Inflow Depth >	2.97" for 25-Yr Storm event
Inflow =	43.96 cfs @	12.05 hrs, Volume=	2.926 af	
Outflow =	43.64 cfs @	12.07 hrs, Volume=	2.924 af,	Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.91 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.16 fps, Avg. Travel Time= 1.2 min

Peak Storage= 1,020 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 149.47 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 1.5 '/' Top Width= 9.00'
Length= 230.0' Slope= 0.0670 '/'
Inlet Invert= 2,682.40', Outlet Invert= 2,667.00'



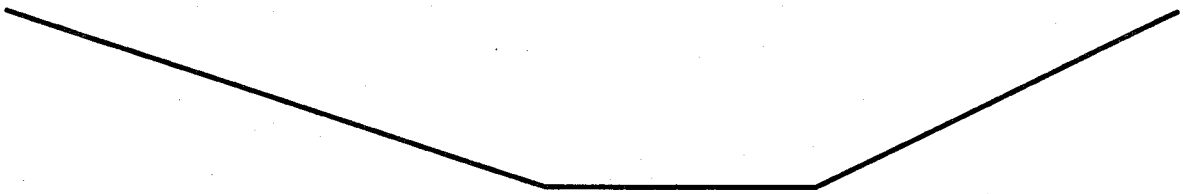
Summary for Reach C4R: Dicth

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 195.17 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 221.0' Slope= 0.0498 '/'
Inlet Invert= 2,702.00', Outlet Invert= 2,691.00'



Summary for Pond 10R: 18" Culvert to 6A-East MH-1

Inflow Area = 2.677 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 10.32 cfs @ 12.04 hrs, Volume= 0.645 af
Outflow = 9.80 cfs @ 12.07 hrs, Volume= 0.644 af, Atten= 5%, Lag= 2.0 min
Primary = 9.80 cfs @ 12.07 hrs, Volume= 0.644 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,728.07' @ 12.07 hrs Surf.Area= 641 sf Storage= 696 cf

Plug-Flow detention time= 1.0 min calculated for 0.643 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (837.4 - 836.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,726.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,726.00	50	0	0
2,728.00	600	650	650
2,729.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,726.00'	**18.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 2,726.00' / 2,725.00' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=9.66 cfs @ 12.07 hrs HW=2,728.04' (Free Discharge)
↑**1=Culvert** (Inlet Controls 9.66 cfs @ 5.46 fps)

Summary for Pond 11R: CB-2 & 12" SD 6A-East

Inflow Area = 2.275 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af
Outflow = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af, Atten= 0%, Lag= 0.0 min
Primary = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,726.91' @ 12.04 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2,721.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.500 Inlet / Outlet Invert= 2,721.00' / 2,715.50' S= 0.0524 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=8.65 cfs @ 12.04 hrs HW=2,726.73' (Free Discharge)
1=Culvert (Inlet Controls 8.65 cfs @ 11.01 fps)

Summary for Pond C-2A: Culvert to MH-4

Inflow Area = 3.007 ac, 5.34% Impervious, Inflow Depth > 3.01" for 25-Yr Storm event
Inflow = 13.85 cfs @ 12.00 hrs, Volume= 0.754 af
Outflow = 10.72 cfs @ 12.00 hrs, Volume= 0.718 af, Atten= 23%, Lag= 0.0 min
Primary = 9.39 cfs @ 12.00 hrs, Volume= 0.711 af
Secondary = 1.33 cfs @ 12.00 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,773.31' @ 12.00 hrs Surf.Area= 1,150 sf Storage= 1,200 cf
Flood Elev= 2,773.50' Surf.Area= 1,150 sf Storage= 1,200 cf

Plug-Flow detention time= 33.1 min calculated for 0.718 af (95% of inflow)
Center-of-Mass det. time= 6.7 min (838.5 - 831.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.00'	1,200 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,771.00	50	0	0
2,772.00	600	325	325
2,773.00	1,150	875	1,200

Device	Routing	Invert	Outlet Devices
#1	Primary	2,771.00'	**18.0" Round Culvert** L= 10.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,771.00' / 2,770.00' S= 0.1000 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,773.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=9.37 cfs @ 12.00 hrs HW=2,773.31' (Free Discharge)
└**1=Culvert** (Inlet Controls 9.37 cfs @ 5.30 fps)

Secondary OutFlow Max=1.30 cfs @ 12.00 hrs HW=2,773.31' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.30 cfs @ 1.40 fps)

Summary for Pond C-2B: Culvert to MH-3

Inflow Area = 2.250 ac, 5.10% Impervious, Inflow Depth > 3.03" for 25-Yr Storm event
Inflow = 9.93 cfs @ 12.02 hrs, Volume= 0.567 af
Outflow = 8.65 cfs @ 12.08 hrs, Volume= 0.565 af, Atten= 13%, Lag= 3.2 min
Primary = 8.65 cfs @ 12.08 hrs, Volume= 0.565 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,754.91' @ 12.08 hrs Surf.Area= 1,099 sf Storage= 1,420 cf
Flood Elev= 2,755.00' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 4.8 min calculated for 0.564 af (99% of inflow)
Center-of-Mass det. time= 2.5 min (833.9 - 831.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,752.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,752.00	50	0	0
2,754.00	600	650	650
2,755.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,752.50'	**18.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,752.50' / 2,751.50' S= 0.1429 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,755.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=8.53 cfs @ 12.08 hrs HW=2,754.86' (Free Discharge)
└**1=Culvert** (Inlet Controls 8.53 cfs @ 4.83 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,752.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2C: Culvert to MH-2

Inflow Area = 1.325 ac, 5.20% Impervious, Inflow Depth > 2.99" for 25-Yr Storm event
Inflow = 5.90 cfs @ 12.00 hrs, Volume= 0.330 af
Outflow = 5.86 cfs @ 12.01 hrs, Volume= 0.330 af, Atten= 1%, Lag= 0.5 min
Primary = 5.86 cfs @ 12.01 hrs, Volume= 0.330 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,743.92' @ 12.01 hrs Surf.Area= 303 sf Storage= 162 cf
Flood Elev= 2,745.00' Surf.Area= 600 sf Storage= 650 cf

Plug-Flow detention time= 0.7 min calculated for 0.329 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (832.4 - 831.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,743.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,743.00	50	0	0
2,745.00	600	650	650
2,746.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,743.00'	**18.0" Round Culvert X 2.00** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,743.00' / 2,742.00' S= 0.1000 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,744.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=5.76 cfs @ 12.01 hrs HW=2,743.91' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.76 cfs @ 2.57 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,743.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2D: 18" Culvert to CB-1

Inflow Area = 0.388 ac, 10.65% Impervious, Inflow Depth > 3.18" for 25-Yr Storm event
Inflow = 2.46 cfs @ 11.88 hrs, Volume= 0.103 af
Outflow = 2.37 cfs @ 11.89 hrs, Volume= 0.103 af, Atten= 3%, Lag= 0.6 min
Primary = 2.37 cfs @ 11.89 hrs, Volume= 0.103 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,736.81' @ 11.89 hrs Surf.Area= 274 sf Storage= 132 cf

Plug-Flow detention time= 1.7 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (820.6 - 819.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,736.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,736.00	50	0	0
2,738.00	600	650	650
2,739.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,736.00'	**18.0" Round Culvert** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,736.00' / 2,734.30' S= 0.0567 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=2.30 cfs @ 11.89 hrs HW=2,736.80' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 2.30 cfs @ 2.40 fps)

Summary for Pond C-3A: Culvert to MH-5

Inflow Area = 3.216 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 13.78 cfs @ 12.01 hrs, Volume= 0.775 af
Outflow = 12.19 cfs @ 12.05 hrs, Volume= 0.773 af, Atten= 12%, Lag= 2.8 min
Primary = 12.19 cfs @ 12.05 hrs, Volume= 0.773 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,774.80' @ 12.05 hrs Surf.Area= 1,042 sf Storage= 1,472 cf
Flood Elev= 2,775.75' Surf.Area= 1,150 sf Storage= 1,688 cf

Plug-Flow detention time= 3.2 min calculated for 0.773 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (836.6 - 834.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.50'	1,688 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,771.50	50	0	0
2,774.00	600	813	813
2,775.00	1,150	875	1,688

Device	Routing	Invert	Outlet Devices
#1	Primary	2,772.00'	**18.0" Round Culvert** L= 13.0' Ke= 0.500 Inlet / Outlet Invert= 2,772.00' / 2,771.00' S= 0.0769 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,775.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=12.15 cfs @ 12.05 hrs HW=2,774.79' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 12.15 cfs @ 6.87 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,771.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3B: Culvert to MH-6

Inflow Area = 2.980 ac, 3.85% Impervious, Inflow Depth > 2.99" for 25-Yr Storm event
Inflow = 12.65 cfs @ 12.01 hrs, Volume= 0.741 af
Outflow = 11.00 cfs @ 12.07 hrs, Volume= 0.741 af, Atten= 13%, Lag= 3.3 min
Primary = 11.00 cfs @ 12.07 hrs, Volume= 0.741 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,753.89' @ 12.07 hrs Surf.Area= 1,092 sf Storage= 1,406 cf
Flood Elev= 2,754.50' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 1.3 min calculated for 0.740 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (833.9 - 832.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,751.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,751.00	50	0	0
2,753.00	600	650	650
2,754.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,751.00'	**18.0" Round Culvert** L= 12.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 2,751.00' / 2,750.00' S= 0.0833 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,754.00'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=10.88 cfs @ 12.07 hrs HW=2,753.85' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 10.88 cfs @ 6.16 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,751.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3C: Culvert to MH-7

Inflow Area = 2.316 ac, 2.97% Impervious, Inflow Depth > 2.99" for 25-Yr Storm event
Inflow = 10.20 cfs @ 12.00 hrs, Volume= 0.577 af
Outflow = 9.95 cfs @ 12.02 hrs, Volume= 0.576 af, Atten= 2%, Lag= 1.1 min
Primary = 9.95 cfs @ 12.02 hrs, Volume= 0.576 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,729.45' @ 12.02 hrs Surf.Area= 722 sf Storage= 619 cf
Flood Elev= 2,731.00' Surf.Area= 1,150 sf Storage= 2,075 cf

Plug-Flow detention time= 1.2 min calculated for 0.576 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (833.0 - 832.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2,728.00'	2,075 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,728.00	50	0	0
2,729.00	600	325	325
2,731.00	1,150	1,750	2,075

Device	Routing	Invert	Outlet Devices
#1	Primary	2,728.00'	**24.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 2,728.00' / 2,726.00' S= 0.0952 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,730.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=9.71 cfs @ 12.02 hrs HW=2,729.42' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 9.71 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,728.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4: 18" Culvert @ SE Corner

Inflow Area = 1.889 ac, 8.02% Impervious, Inflow Depth > 3.08" for 25-Yr Storm event
Inflow = 8.25 cfs @ 12.01 hrs, Volume= 0.485 af
Outflow = 7.48 cfs @ 12.06 hrs, Volume= 0.482 af, Atten= 9%, Lag= 2.7 min
Primary = 7.48 cfs @ 12.06 hrs, Volume= 0.482 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,703.69' @ 12.06 hrs Surf.Area= 789 sf Storage= 1,128 cf
Flood Elev= 2,705.00' Surf.Area= 1,150 sf Storage= 2,400 cf

Plug-Flow detention time= 7.5 min calculated for 0.482 af (99% of inflow)
Center-of-Mass det. time= 3.5 min (834.1 - 830.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,701.00'	2,400 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,701.00	50	0	0
2,703.00	600	650	650
2,705.00	1,150	1,750	2,400

Device	Routing	Invert	Outlet Devices
#1	Primary	2,701.70'	**18.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,701.70' / 2,700.10' S= 0.1231 '/' Cc= 0.900 n= 0.011
#2	Secondary	2,704.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=7.40 cfs @ 12.06 hrs HW=2,703.66' (Free Discharge)
↑**1=Culvert** (Inlet Controls 7.40 cfs @ 4.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,701.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4B: 18" Culvert

Inflow Area = 0.659 ac, 14.24% Impervious, Inflow Depth > 3.28" for 25-Yr Storm event
Inflow = 3.74 cfs @ 11.95 hrs, Volume= 0.180 af
Outflow = 1.74 cfs @ 12.06 hrs, Volume= 0.130 af, Atten= 53%, Lag= 6.7 min
Primary = 1.74 cfs @ 12.06 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,691.78' @ 12.06 hrs Surf.Area= 1,895 sf Storage= 3,218 cf
Flood Elev= 2,693.00' Surf.Area= 2,000 sf Storage= 3,641 cf

Plug-Flow detention time= 161.6 min calculated for 0.130 af (72% of inflow)
Center-of-Mass det. time= 62.8 min (884.4 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,688.50'	3,641 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,688.50	20	0	0
2,689.00	111	33	33
2,690.00	1,035	573	606
2,692.00	2,000	3,035	3,641

Device	Routing	Invert	Outlet Devices
#1	Primary	2,691.10'	**18.0" Round Culvert** L= 69.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,691.10' / 2,684.20' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=1.70 cfs @ 12.06 hrs HW=2,691.77' (Free Discharge)
↑**1=Culvert** (Inlet Controls 1.70 cfs @ 2.21 fps)

ATTACHMENT C-2

EROSION CONTROL CALCULATIONS

PROJECT	COMP. BY	JOB NO.
EVERGREEN CELL 6A WEST CLOSURE TRM	RBC	10269
	CHK. BY	DATE
	ASB	1/30/11

TURF REINFORCEMENT MAT:

LONG TERM VEGETATED w/ 25 YR/24 HR STORM

SHORT TERM UNVEGETATED w/ 2 YR / 24 HR STORM

LONG TERM:

Q = 13 CFS

SLOPE 0.1 - 0.33

TRM - P-550

SHORT TERM:

Q = 5 CFS

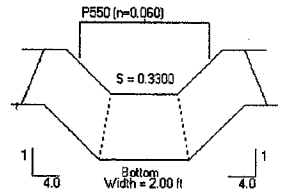
SLOPE = 0.1

TRM - S 150

North American Green - ECMDS Version 4.3				1/31/2011	09:23 AM	COMPUTED BY: rbc
PROJECT NAME: Evergreen - 6A West Closure				PROJECT NO.: 10164		
FROM STATION/REACH: Channel	TO STATION/REACH:			DRAINAGE AREA: SC-3B		DESIGN FREQUENCY: 25-yr/24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
13.0	2.0	6.71	1.94	0.32	0.49



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Straight	P550	Vegetation	3	C	Mix	75-95%	14.00	10.08	1.39	STABLE
	Staple E	Soil	Silt Loam				3.250	1.192	2.73	STABLE

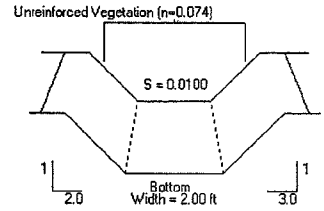
25 YEAR STORM w/ CHANNEL @ 3:1

INSTALL P-550

North American Green - ECMDS Version 4.3				1/31/2011	09:27 AM	COMPUTED BY: rbc
PROJECT NAME: Evergreen - 6A West Closure				PROJECT NO.: 10164		
FROM STATION/REACH: Ditch <1%	TO STATION/REACH:			DRAINAGE AREA: SC-3B		DESIGN FREQUENCY: 25-yr/24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
13.0	2.0	1.72	7.56	0.80	1.38



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
			Phase	Class	Type	Density				
Straight	Unreinforced	Vegetation		C	Mix	75-95%	4.20	0.86	4.86	STABLE
		Soil	Silt Loam				0.035	0.010	3.68	STABLE

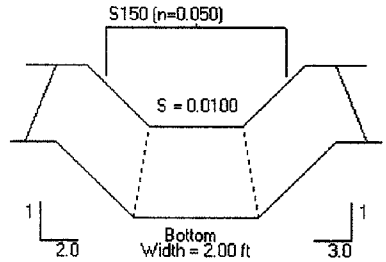
25 year storm Ditch <1%

No TRM

North American Green - ECMDS Version 4.3			1/31/2011	09:29 AM	COMPUTED BY: rbc
PROJECT NAME: Evergreen - 6A West Closure			PROJECT NO.: 10164		
FROM STATION/REACH: Ditch <1%	TO STATION/REACH:		DRAINAGE AREA: SC-3B		DESIGN FREQUENCY: 2-yr/24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.0	2.0	1.80	2.78	0.47	0.73



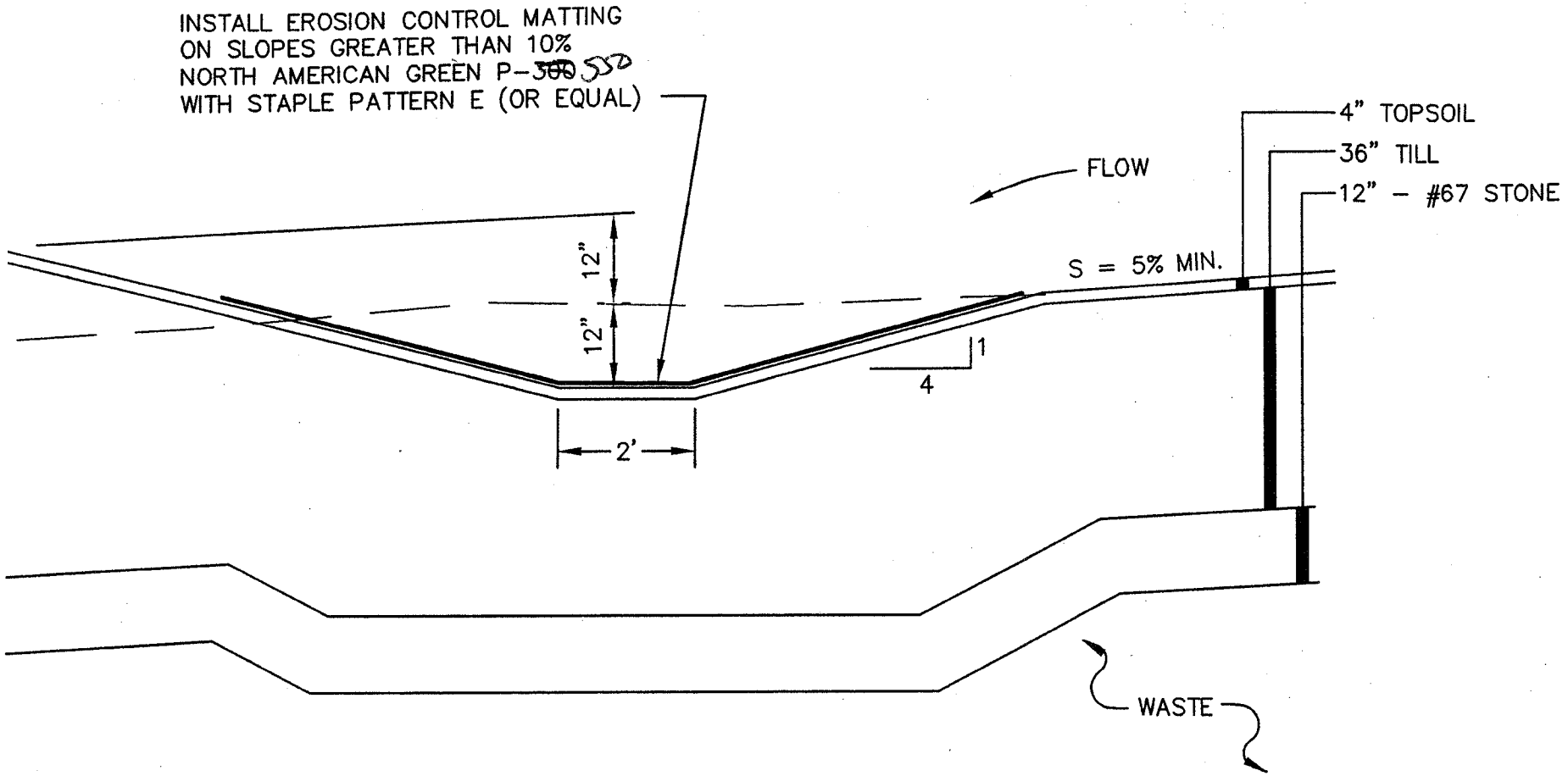
Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
			Phase	Class	Type	Density				
Straight	S150	Unvegetated					1.75	0.45	3.85	STABLE
	Staple D									

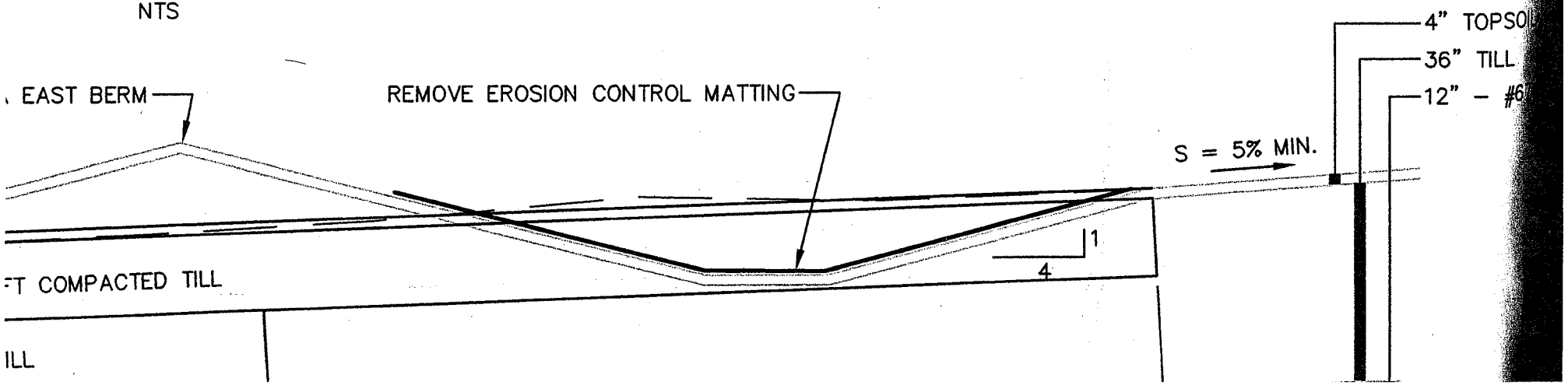
2-YEAR STORM UNVEGETATED DITCH <1%

INSTALL S-150



DIVERSION BERM

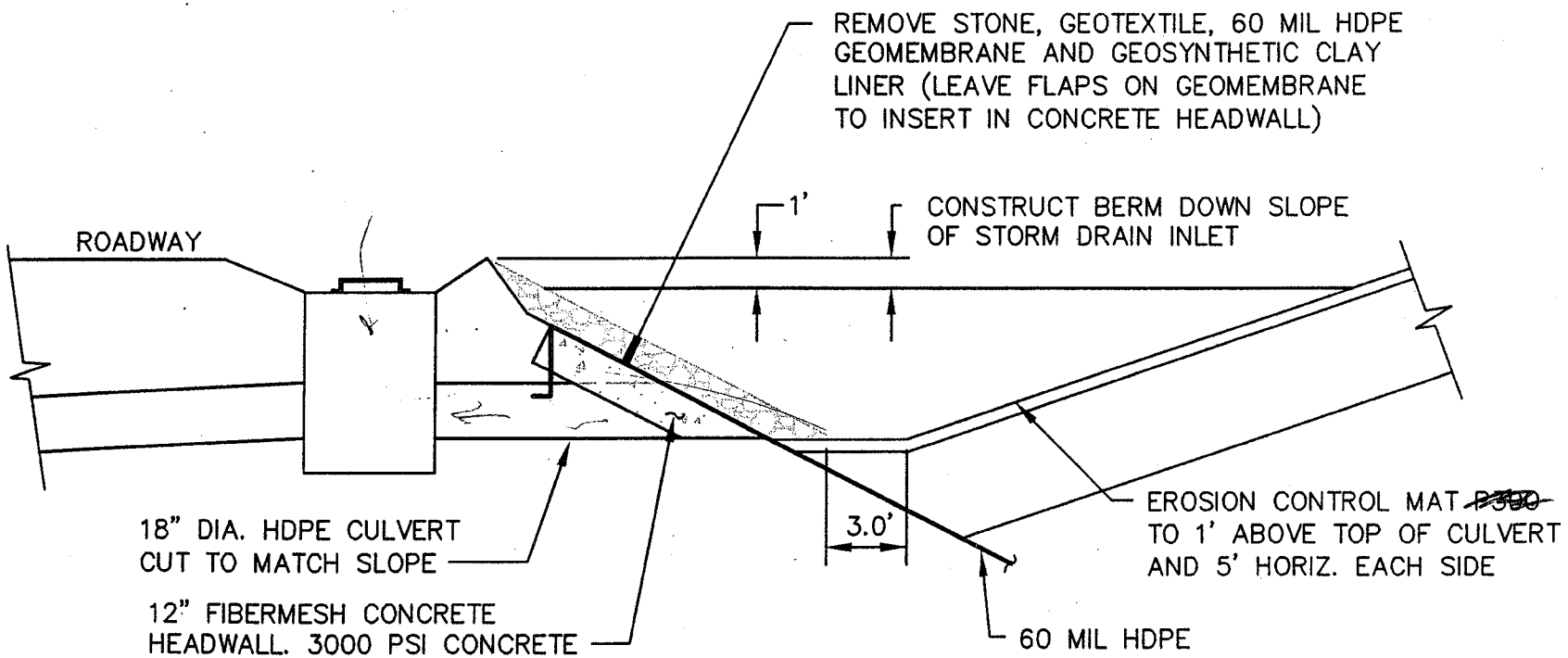
NTS



THAN 9".

RIPRAP INLET/OUTLET PROTECTION

NTS



JG.

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PIPE INLET/PENETRATION

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