CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **CC011**

DATE VERIFIED: **May 4, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 10, 2010

TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: CC011

PIN: 4820100003

Subdivision, Tract, Business or Owner Name (if known): Williamsburg Landing

Property Description: Senior Care/Retirment Facility

Site Address: 5560 Williamsburg Landing Drive

(For internal use only) **Box** 10 **Drawer:** 6

Agreements: (in file as of scan date) **N** **Book or Doc#:** **Page:**

Comments
This is a combined file with CC011 and CC012

CC-011-CC-012

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

1. As-built plan
2. Completed construction certification
3. Construction Plan
4. Design Calculations
5. Watershed Map
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions

IMPORTANT MESSAGE

FOR JOAN

DATE 10-1 TIME 11:35 A.M. P.M.

WHILE YOU WERE OUT

M CHUCK PINNELL

OF WMSBRG LANDING

PHONE NO. 898-3738

TELEPHONED		PLEASE CALL	✓
CALLED TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	
RETURNED YOUR CALL			

MESSAGE page 499-4371

NANCY HARRISON WILLIAMSBURG LANDING

565-6504

SIGNED DD

CASCADE P3-A2334 PRINTED IN U.S.A.

CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMW ATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **CC028**

DATE VERIFIED: **February 20, 2019**

QUALITY ASSURANCE TECHNICIAN: **Charles E. Lovett II**

Charles E. Lovett II

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: October 3, 2016
TO: Virginia Correctional Enterprises Document Management Services
FROM: Charles Lovett II, Stormwater Administrative Assistant
PO: CC028
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	Williamsburg Landing Maintenance Building		
BMP ID OR GEN FILE NUMBER:	CC028	**OWNER NAME :**	Williamsburg Landing Inc.
PIN:	4820100002	**SITE ADDRESS:**	5700 Williamsburg Landing Dr.
		LEGAL DESCRIPTION:	PT RICH NECK

MAINTENANCE AGREEMENT IN FILE:	YES	**BOOK/PAGE OR DOCUMENT NO:**	110018149	**OTHER DESCRIPTION:**	N/A

BOX NO:	D002	**COMMENTS:**	N/A

1. Maintenance Agreement

W [illegible] Expansion

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS
INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

Please type or print legibly in black ink. Covenantor(s) should submit this form to the JCC Engineering and Resource Protection Division, 101-E Mounts Bay Road, Williamsburg, VA 23185.

THIS DECLARATION OF COVENANTS, made this 29th day of July, 2011, between Williamsburg Landing, Inc., and all successors in interest, ("COVENANTOR(S)"), owner(s) of the following property:

Parcel Identification Number(s): 4820100002
Legal Description(s): PT Rich Neck 71.634 acres at 5700 Williamsburg Landing Dr.

Project or Subdivision Name: Williamsburg Landing
Document/Instrument No(s):
or Deed Book 246, Page No. 116,
and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

I (We), the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, monitoring, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

Prepared by (Name, Address & Phone):
Stephen H. Montgomery
President & CEO
Williamsburg Landing
5700 Williamsburg Landing Dr
Williamsburg VA 23185
757-565-6507

Return to:
JCC Attorney's Office
101-C Mount's Bay Road
Williamsburg, VA 23185
(757) 253-6612

Instrument # 110018149
Recorded on Aug. 22, 2011

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S) responsibilities for the SYSTEM. The COVENANTOR(S) shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

IN WITNESS WHEREOF, the COVENANTOR(S) has executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR(S)

S H Montgomery
Signature

Stephen H Montgomery President/CEO
Print Name and Title

ACKNOWLEDGMENT

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City, to wit:

I hereby certify that on this 29th day of July, 2011, before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared Stephen H. Montgomery and did acknowledge the foregoing instrument to be his/her Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 29th day of July, 2011.

[SEAL]

Mary L Grogan
Notary Public

Notary Registration Number: 183219

My Commission expires: 8-31-2011

Approved as to form:

Adam Kinsman
County Attorney

Drainage1_pre_doc
(Revised 5-11)

2.

Deeds/Easements/Agreements/Property Records

3. Construction Certificate

CONSULTING ENGINEERS

5248 Olde Towne Road • Suite 1 • Williamsburg, Virginia 23188
(757) 253-0040 • Fax (757) 220-8994 • E-mail aes@aesva.com

April 29, 2002

APR 2002
RECEIVED
ENVIRONMENTAL DIVISION

Mr. Scott Thomas, P.E.
Environmental Division
James City County
P.O. Box 8784
Williamsburg, VA 23187

RE: Williamsburg Landing Nursing and Living Facility
(Now Woodhaven at Williamsburg)
Plan No. SP-50-96
BMP ID Codes: CC 011 (BMP 1 Dry Pond)
AES Project No. 8162

Dear Scott:

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as noted herein.

As Engineering Consulting Services LTD provided daily on-site inspection and monitoring services for the construction of the BMP facilities, and as those records are lost and no longer available, AES Consulting Engineers can only offer our opinion based upon our weekly site visits and our recollection that the work was properly performed and approved at the time.

If you have any further questions or concerns, please do not hesitate to contact Howard W. Price or me at (757) 253-0040.

Sincerely,

AES Consulting Engineers

Richard A. Costello, P.E.
President

COMMONWEALTH OF VIRGINIA
RICHARD A. COSTELLO
CERTIFICATE NO.
013250
4/29/02
CERTIFIED PROFESSIONAL ENGINEER

S:\jobs\8162\00\WORDPROC\Document\81620L47.rac.doc

CERTIFICATION DOCUMENTS

Scott Thomas

From: Richard Costello [rcostello@aesva.com]
Sent: Thursday, April 25, 2002 9:09 AM
To: Scott Thomas
Cc: Howard Price; Alvin Anderson; Nancy Harrison
Subject: Williamsburg Landing BMP Certifications

Scott

I will be sending out an abbreviated certification letter shortly, that unfortunately meets only a portion of your usual requirements but will have to do.

This situation was indirectly caused by the Architect for the expansion, who required all of professionals to subcontract with him. ECS did all the geotechnical work and normally would have sent reports to the Architect (in Penna.), the Owner (in Nashville Tenn..) and the on-site Owner/Architects field trailer. Whatever the case AES received none of those reports and ECS says they cannot find them in their records. Neither the Architect nor ECS will provide the County with a Certification on Construction, therefore AES Consulting Engineers as the Designer will. However, I do not have the benefit of the reports to guide AES in the Certification letter.

While I know ECS did a proper job of inspection and testing on the project, I cannot certify it in accordance with your usual language, so a modified Certification as discussed in your email of January 31st will need to suffice.

I suggest that Williamsburg Landing withhold any geotechnical contracts from ECS in conjunction with their latest project in parallel effort to get this information recovered.

If any of the respondents have question on this email, please respond directly.

Thanks

Richard Costello, P.E.
President
AES Consulting Engineers
ph 757.253.0040 fax 757.220.8994

AES Consulting Engineers a Professional Corporation Confidentiality Note: This e-mail and any attachments are confidential and may be protected by legal privilege. If you are not the intended recipient, be aware that any disclosure, copying, distribution or use of this e-mail or any attachment is prohibited. If you have received this e-mail in error, please notify us immediately by returning it to the sender and delete this copy from your system. Thank you for your cooperation.

Stormwater Management/BMP Record Drawing and Construction Certification Review Tracking Form

Project Name: Williamsburg Landing Maintenance Building
County Plan No. (List any amendments): SP-0037-2010
Stormwater Management Facility Type: Storm Pipe Only

BMP Phase #: ☐ I ☐ II ☐ III

- ☒ Information Package Submittal Date: 3/16/2015 – 10/5/2015
- ☒ Completeness Check:
  - ☒ Record Drawing — Date/By: 10/1/2015 T. Ryan Stephenson
  - ☒ Construction Certification — Date/By: 10/1/2015 W. Lloyd Ward
  - ☒ RD/CC Standard Forms — (Ensure that all forms for the BMP type are included)
  - ☒ Insp/Maint Agreement — # / Date: 110018149 8/22/2011
  - ☒ BMP Maintenance Plan — Location: NA
  - ☒ Special Considerations: NONE
  - ☐
- ☒ Standard E&SC Notes on Approved Plan Requiring RD/CC or County comment in plan review
  Location (sheet #): Sheet 15

- ☒ **County BMP ID Code #:** NA
- ☒ Log into Division's "As-Built Tracking Log"
- ☒ Obtain basic site information (GPIN, Owner, Address, etc.)
- ☒ Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☐ Copy from Active Project File (correspondence, H&H, design computations, etc.).
- ☒ Create As-Built File using Project File information (File label, folder, copy plan/details/design information, etc.).
- ☒ Inspector Review of RD/CC (consult with Chief Engineer prior to completion of comments).
- ☒ Record Drawing Review against Approved Plan prior to Field Inspection.

- ☒ Final Site Inspection (FI) Performed — Date: 3/8/16
- ☒ Record Drawing (RD) Review — Date: 3/8/16
- ☒ Construction Certification (CC) Review — Date: 3/8/16

- ☒ Actions:
  - ☒ No comments.
  - ☐ Comments Letter Forwarded. — Date: _____
  - ☐ Record Drawing (RD)
  - ☐ Construction Certification (CC)
  - ☐ Construction-Related (CR)
  - ☐ Site Issues (SI)
  - ☐ Other : _____

- ☐ Resubmittal (# and date): _____
- ☐ Re-inspection (if necessary): _____
- ☐ Drainage System Information Acceptable (RD/CC/System Info).
  - ☐ Ok for bond release.
- ☐ Complete "Surety Request Form".
- ☐ Final Inspection of active file copying any relevant information to "As-Built" file.
- ☐ On County BMP Inventory (Phase I, II or III).
- ☐ Copy Final Inspection Report into County BMP Inspection Program file.
- ☐ Provide Digital Photographs of BMP and save into County BMP Inventory.
- ☐ Request mylar/reproducible from As-Built plan preparer.
- ☐ Complete "As-built Tracking Log".
- ☐ Last check of BMP Access Database (County BMP Inventory).
- ☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
- ☐ Add BMP to Municipal BMP list (if a County-owned facility)
- ☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Inspector: _____ Date: _____

Chief Engineer: _____ Date: _____

*** See separate checklist, if needed.

Stormwater Conveyance and Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

Standard Forms and Instructions

Contents | Page

Record Drawing and Construction Certification Forms

Section 1 - Site Information	1
Section 2 - Construction Information	2
Section 3 - Owner/Designer/Contractor Information	2
Section 4 - Professional Certifications	3
Section 4 - Standard Certification Form	4
Section 5 - Certification Requirements and Instructions	4

Engineering & Resource Protection
OCT 5 2015
RECEIVED

Issue Date: February 1, 2001
Revised: July 1, 2014

Stormwater Conveyance and Stormwater Management / BMP Facilities Record Drawing and Construction Certification Forms

Note: In accordance with the Subdivision and Zoning ordinances of the County Code, plans of development have requirements to ensure that at the completion of the project and prior to release of surety, certified record drawings (as-builts) and construction certifications by a registered Professional Engineer, must be provided for constructed stormwater conveyance/drainage system and stormwater management/Best Management Practice (BMP) facilities. In addition, Sections 8-25 and 8-26 of Article II of Chapter 8 of the County Code, require the submission of construction record drawings and construction certifications for permanent stormwater management/BMP facilities and permanent stormwater conveyance systems such as inlets, pipes and channels. In addition, for stormwater management/BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a professional engineer who performed inspections during construction of the facility.

Section 1 - Site Information:

Project Name: Williamsburg Landing Maintenance Building
Structure/BMP Name: Storm Pipe
Project Location: Adjacent to Woodhaven Building
BMP Location: N/A
County Plan No.: SP-0037-2010 VAHU6 HUC Code: N/A

Project Type:
- ☐ Residential ☐ Business
- ☐ Commercial ☐ Office
- ☐ Institutional ☐ Industrial
- ☐ Public ☐ Roadway
- ☑ Other Maint Bldg

Tax Map/Parcel No.: 4820100003
County BMP ID Code (if known): N/A
Zoning District: R5
Land Use:
Site Area (sf or acres): 50.01 Acres

Brief Description of Stormwater Conveyance and/or Stormwater Management/BMP Facility:
Storm pipe associated with maintenance building.

Nearest Visible Landmark to SWM/BMP Facility: Woodhaven Building

Nearest Vertical Ground Control (if known):

☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other

Station Number or Name:
Datum or Reference Elevation:
Control Description:
Control Location from Subject Facility:

Engineering & Resource Protection
OCT - 5 2015
RECEIVED

Section 2 – Construction Information

Section 2A - Stormwater Conveyance System Construction Information (Pipes, Channels, etc.):

Pre-Construction Meeting Held: ☑ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for System: Early 2014
System Milestone Inspection(s) by County Representative during Construction: ☑ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed System: Henderson, Inc.
Name of Professional Firm Who Monitored Construction: ECS
Date of Completion of System: Early 2014
Date of Record Drawing/Construction Certification Submittal: May 2014

Section 2B - Stormwater Management / BMP Facility Construction Information:

Pre-Construction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: _____
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: _____
Name of Professional Firm Who Monitored Construction: _____
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

(Note: Record drawings and construction certifications are required within thirty (30) days of the completion of the stormwater conveyance system and/or stormwater management/ BMP facility construction. Record drawings and construction certifications must be reviewed and approved by the VESCP/VSMP authority prior to final inspection, acceptance, and surety release or reduction.)

Section 3 - Owner/Designer/Contractor Information:

Owner/Developer: *(Note: Site owner, operator, applicant or permittee responsible for development of the project.)*

Name: Williamsburg Landing Inc.
Mailing Address: 5700 Williamsburg Landing Drive
Williamsburg, VA 23185
Business Phone: (757) 656-6503 Fax: (757) 565-6517
Email: rretan@williamsburglanding.com
Contact Person: Randy Retan Title: Assistant Director of Facilities

Design Professional: *(Note: Professional Engineer, Certified Land Surveyor or other qualified professional responsible for the design and preparation of plans and specifications for the stormwater conveyance system and/or stormwatermanagement/BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Business Phone/Fax: (757) 253-0040
Email: ryan.stephenson@aesva.com
Name of Responsible Plan Preparer: T. Ryan Stephenson, P.E.
Title: Project Manager
Plan Name: Williamsburg Landing Maintenance Building
Firm's Project No. 8162-06
Plan/Revision Date: April 21, 2010
Plan Sheet No.'s Applicable: 13 / ____ / ____ / ____ / ____ / ____ /

Site/Utility Contractor: *(Note: Contractor directly responsible for construction of the stormwater conveyance system and/or stormwater management/BMP facility.)*

Firm Name: Henderson, Inc.
Mailing Address: 5806 Mooretown Road
Williamsburg, VA 23188
Business Phone/Fax: (757) 645-2690
Email: matt@hendersoninc.com
Contact Person: Matt Hipple
Site Foreman/Supervisor:
Specialty Subcontractors and Purpose: ECS (Geotechnical)

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a record drawing, sometimes referred to as an as-built drawing, for the stormwater conveyance system for the project including any stormwater management/BMP facilities. A Registered Professional Engineer is responsible for the inspection, monitoring, and certification of stormwater conveyance systems and/or stormwater management / BMP facilities during its construction. See next page for the "simple" County provided certification form that can be used by qualified professionals to provide this information.)*

James City County
VIRGINIA
Jamestown 1607

STANDARD CERTIFICATION FORM

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188
Business Phone: (757) 253-0040
Fax:
Name: T. Ryan Stephenson, P.E.
Title: Project Manager
Signature:
Date: 10/1/15

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the,

- ☒ Stormwater conveyance system
- ☐ Stormwater management / BMP facility

and the facility appears to conform to the provisions of the approved design plan, specifications, and stormwater management plan, except as specifically noted here.

COMMONWEALTH OF VIRGINIA
T. RYAN STEPHENSON
Lic. No. 044405
10/1/15
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS MID-ATLANTIC, LLC
Mailing Address: 108 INGRAM ROAD
WILLIAMSBURG, VA 23188
Business Phone: 757-229-6677
Fax: 757-229-9978
Name: W. LLOYD WARD, P.E.
Title: VP / BRANCH MANAGER
Signature:
Date: 10/1/15

I hereby certify to the best of my knowledge and belief that this,

- ☒ Stormwater conveyance system
- ☐ Stormwater management / BMP facility

was monitored and constructed in accordance with the provisions of the approved plan, specifications, and stormwater management plan, except as specifically noted here.

COMMONWEALTH OF VIRGINIA
W. LLOYD WARD
Lic. No. 034612
10/1/15
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

- ☑ Pre-Construction Meeting - Provides an opportunity to review SWM/BMP facility construction, maintenance and operation plans and addresses any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Engineering and Resource Protection Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

- ☑ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

- ☑ ***Construction Certification*** - Construction of stormwater management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geotextiles, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the VESCP/VSMP authority as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the VESCP/VSMP authority to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the VESCP/VSMP authority.

- ☑ Record Drawing and Construction Certifications are required within **thirty (30) days** of the completion of Stormwater Management / BMP facility construction. Submittals must be reviewed and accepted by James City County Engineering and Resource Protection Division prior to final inspection, acceptance and bond/surety release.

  Dual Purpose Facilities (Temporary Sediment Basin & BMP) - Completion of construction also includes an interim stage for stormwater management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Engineering and Resource Protection Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

☐ In accordance with Sections 8-25 and 8-27 of the Chapter 8 of the County Code, an ***internal closed-circuit television (CCTV)*** post installation inspection, performed by the operator, is required as part of the asbuilt and construction certification process. CCTV inspections shall follow standards and specifications developed by the VSMP authority administrator.

☑ Record Drawings shall provide, at a minimum, all information as shown within these requirements, in accordance with standard industry practice, and in accordance with applicable **RECORD DRAWING CHECKLISTS** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the VESCP/VSMP authority. *(Note: Refer to the Virginia BMP Clearinghouse website and the current edition of the Virginia Stormwater Management Handbook for representative record drawing and construction certification checklists for the specific type of stormwater management/BMP facility being used. If none are available, the VSMP authority can provide this information if specifically requested.)*

☑ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

- ☑ Submission Requirements - Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa.
  Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County's BMP database and GIS system, it is requested that the record drawings also be submitted to the VESCP/VSMP authority on a CD-ROM in an acceptable electronic file format such as *.pdf, *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Engineering and Resource Protection Division staff at the time of final submission.

4. Record Drawing (as-built plan)

GENERAL NOTES:

1. FUTURE EXPANSION IS SHOWN FOR INFORMATION PURPOSES ONLY. ANY FUTURE CONSTRUCTION WILL REQUIRE AN ADDITIONAL SITE PLAN.
2. THE CONTOUR INTERVAL IS 1 FOOT.
3. THE PROJECT AREA IS ZONED R-5.
4. THIS PARCEL IS DESIGNATED AS PART OF TAX PARCEL (48-2)(1-3).
5. ADDRESS OF THIS SITE IS _____ WILLIAMSBURG LANDING DRIVE.
6. THE CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES AND MISS UTILITY (1-800-552-7001) FOR THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO STARTING ANY CONSTRUCTION.
7. A 20' UTILITY EASEMENT ALONG ALL WATER AND SEWER LINES SHALL BE PROVIDED TO JCSA AND SHOWN ON EASEMENT PLATS AT A LATER DATE.
8. PARKING TABULATIONS:

PHASE 1 (NURSING & ASSISTED LIVING FACILITY)

PARKING SPACES PROVIDED:
103 SPACES (EXCLUDES POOL PARKING)
5 VAN HANDICAP SPACES
TOTAL PARKING SPACES PROVIDED = 108

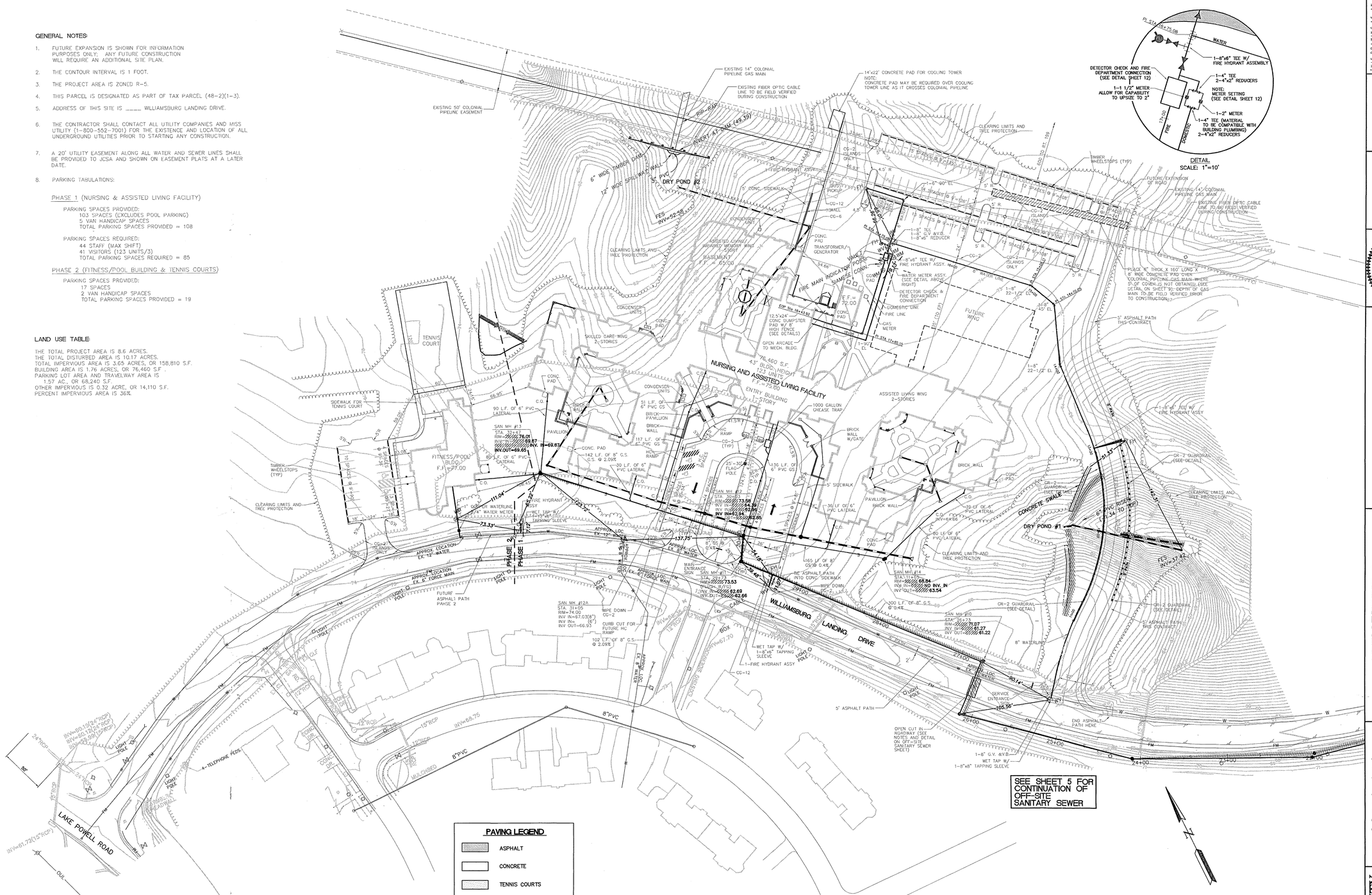
PARKING SPACES REQUIRED:
44 STAFF (MAX SHIFT)
41 VISITORS (123 UNITS/3)
TOTAL PARKING SPACES REQUIRED = 85

PHASE 2 (FITNESS/POOL BUILDING & TENNIS COURTS)

PARKING SPACES PROVIDED:
17 SPACES
2 VAN HANDICAP SPACES
TOTAL PARKING SPACES PROVIDED = 19

LAND USE TABLE:

THE TOTAL PROJECT AREA IS 8.6 ACRES.
THE TOTAL DISTURBED AREA IS 10.17 ACRES.
TOTAL IMPERVIOUS AREA IS 3.65 ACRES, OR 158,810 S.F.
BUILDING AREA IS 1.76 ACRES, OR 76,460 S.F .
PARKING LOT AREA AND TRAVELWAY AREA IS 1.57 AC., OR 68,240 S.F.
OTHER IMPERVIOUS IS 0.32 ACRE, OR 14,110 S.F.
PERCENT IMPERVIOUS AREA IS 36%.



COUNTY PLAN NO. SP-50-96

RECORD DRAWING INFORMATION AS SURVEYED BY AES CONSULTING ENGINEERS ON 5/15/2000

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

THIS DRAWING AS AN INSTRUMENT OF SERVICE, IS THE PROPERTY OF AES CONSULTING ENGINEERS. REPRODUCED WITHOUT THIS PERMISSION AND UNLESS THE REPRO-DUCER CITES THIS NAME AS ARCHITECT, IS PROHIBITED.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE BEFORE PROCEEDING

COMMONWEALTH OF VIRGINIA
10020
PROFESSIONAL ENGINEER
CERTIFIED

REVISIONS		
NO.	DATE	DESCRIPTION
1	6/26/96	REV. PER JCC COMMENTS - HWP

NEW NURSING & ASSISTED LIVING FACILITY

FOR

WILLIAMSBURG LANDING, INC. JAMES CITY COUNTY, VA.

DRAWN BY: EAW | CHECKED BY: EMG | APPROVED BY: RAC

SITE AND UTILITY PLAN

DRAWING NO. C001 | SCALE: 1" = 40' | DATE: 6/26/96

COMMISSION NO.

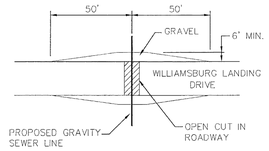
06.06.00-15,6620R00.dwg

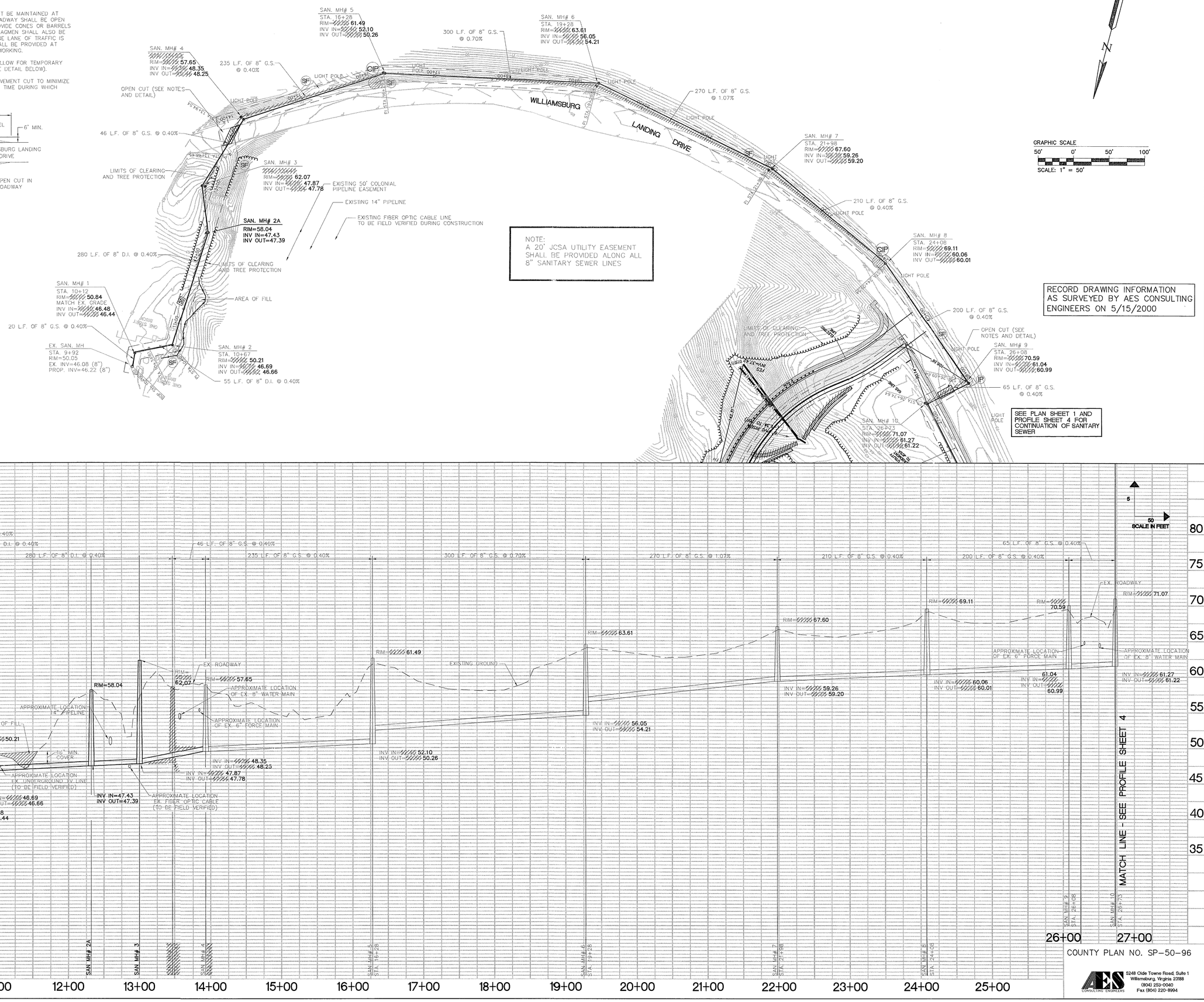
HEX

CC011_WILLIAMSBURG_LANDING_NURSERY_&_ASSISTED_LIVING - 006

ROAD OPEN CUT REQUIREMENTS:

1. ACCESS FOR EMERGENCY VEHICLES MUST BE MAINTAINED AT ALL TIMES. AT LEAST ONE LANE OF ROADWAY SHALL BE OPEN AT ALL TIMES. CONTRACTOR SHALL PROVIDE CONES OR BARRELS TO DELINEATE THE TRAVELLED LANE. FLAGMEN SHALL ALSO BE PROVIDED DURING TIMES WHEN ONLY ONE LANE OF TRAFFIC IS PERMITTED. TWO LANES OF TRAFFIC SHALL BE PROVIDED AT ALL TIMES WHEN CONTRACTOR IS NOT WORKING.
2. SHOULDERS SHALL BE GRAVELLED TO ALLOW FOR TEMPORARY TRAVELWAY DURING CONSTRUCTION (SEE DETAIL BELOW).
3. USE SELECT SAND FOR BACKFILL IN PAVEMENT CUT TO MINIMIZE FUTURE SETTLEMENT AND TO DECREASE TIME DURING WHICH ROAD IS BLOCKED.





AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

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CONTRACTORS SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ON THE SITE BEFORE PROCEEDING

COMMONWEALTH OF VIRGINIA REGISTERED PROFESSIONAL ENGINEER 013250 6/28/01

REESE LOWER PATRICK & SCOTT ARCHITECTS
1910 HARRISTON DRIVE - LANCASTER, PA. 17601 - 717 569-9581

NEW NURSING & ASSISTED LIVING FACILITY
FOR
WILLIAMSBURG LANDING, INC. JAMES CITY COUNTY, VA.

DRAWN BY: EAW | CHECKED BY: EMG/EWP | APPROVED BY: RAC

REVISIONS

NO.	DATE	DESCRIPTION
1	11/25/98	REV. PER JCC COMMENTS - HWP
2	7/19/99	COORDINATION/ADDENDUM NO. 4
3	7/29/99	COORDINATION/ADDENDUM NO. 5
4	11/21/99	REVISED BID DOCUMENTS

OFF-SITE SANITARY SEWER PLAN & PROFILE

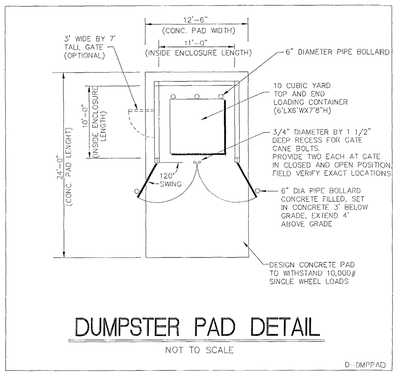
SCALE: AS SHOWN | DATE: 4/26/96

DRAWING NO. C005

COMMISSION NO.

HBK 06.06.00-15:23 620C05.dwg

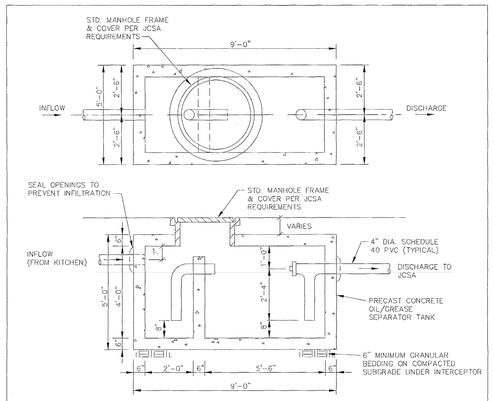
CC011_WILLIAMSBURG_LANDING_NURSERY_&_ASSISTED_LIVING - 007



DUMPSTER PAD DETAIL

NOT TO SCALE

D-DMPPAD



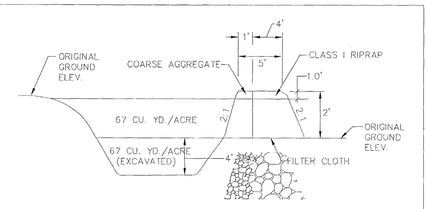
NOTES:

1. THE DIMENSIONS GIVEN ARE FOR A TYPICAL PRECAST 1,000 GALLON INTERCEPTOR. SIZE WILL VARY DEPENDING ON THE KITCHEN/RESTAURANT REQUIREMENTS.
2. ALL KITCHEN WASTES SHALL BE DISCARDED INTO THE INTERCEPTOR.
3. STEEL REINFORCEMENT IS REQUIRED WHEN INTERCEPTOR IS LOCATED IN TRAFFIC AREAS.
4. OWNER/DEVELOPER IS RESPONSIBLE FOR INSURING THAT INTERCEPTOR OPERATES PROPERLY AND RECEIVES REQUIRED MAINTAINANCE.

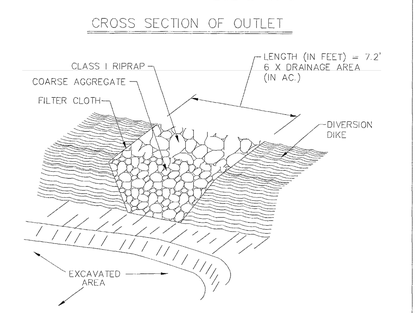
TYPICAL OIL/GREASE INTERCEPTOR (TRAP)

NOT TO SCALE

D-7-2



CROSS SECTION OF OUTLET



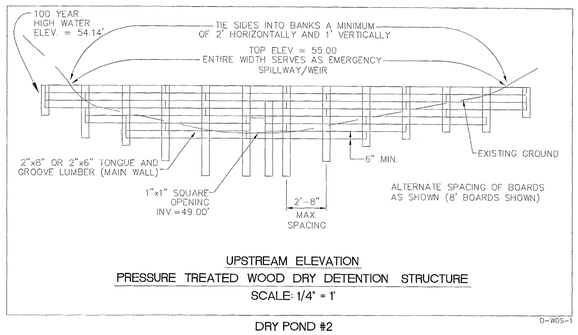
** COARSE AGGREGATE SHALL BE VDOT #3, #357 OR #5

OUTLET (PERSPECTIVE VIEW)

TEMPORARY SEDIMENT TRAP

N.T.S

D-STRAP



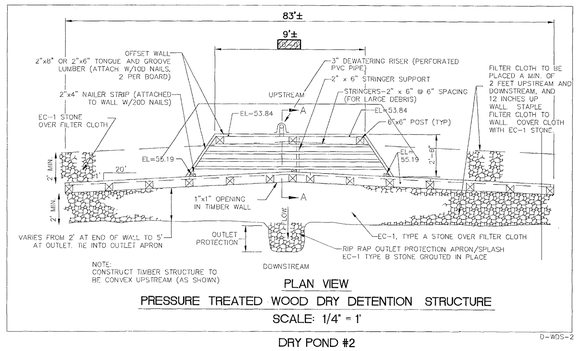
UPSTREAM ELEVATION

PRESSURE TREATED WOOD DRY DETENTION STRUCTURE

SCALE: 1/4" = 1'

DRY POND #2

D-WDS-1



NOTE:
CONSTRUCT TIMBER STRUCTURE TO BE CONVEX UPSTREAM (AS SHOWN)

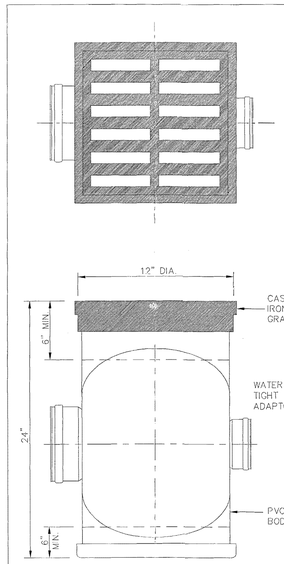
PLAN VIEW

PRESSURE TREATED WOOD DRY DETENTION STRUCTURE

SCALE: 1/4" = 1'

DRY POND #2

D-WDS-2



- MULTI NUMBER OF INLETS/OUTLETS
- OUTLET DIAMETERS AVAILABLE 4" THRU 10"
- VARIBLE ELEVATION OF OUTLETS
- VARIOUS TYPES OF OUTLETS WITH WATERTIGHT ADAPTERS SDR-35 SEWER/A-2000 CORRUGATED PVC/ ULTRA-RIB PVC/CORRUGATED POLY
- CUSTOM MADE TO SPECIFICATIONS
- HEAVY DUTY CAST IRON GRATE-PVC BODY

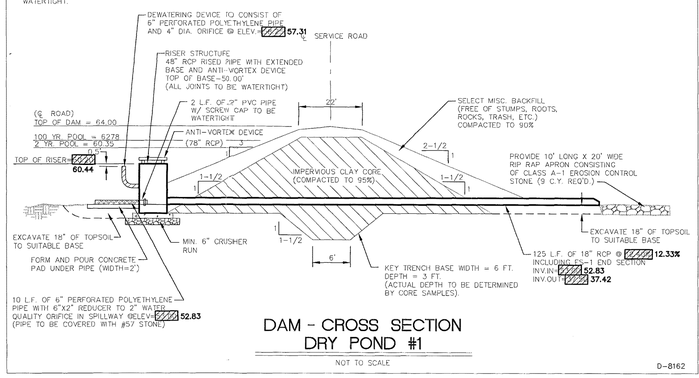
ADS 12" DRAIN BASIN

N.T.S.

D-ADS12B

NOTE:
AFTER ALL DISTURBED AREAS WITHIN THE BASIN'S DRAINAGE AREA ARE STABILIZED AND OPERATION AS TEMPORARY SEDIMENT BASIN CEASES, THE SCREW CAP ON THE 2" PVC PIPE ATTACHED TO THE WATER QUALITY ORIFICE IS TO BE OPENED, THE DEWATERING DEVICE REMOVED, AND THE DEWATERING ORIFICE SEALED TO BE WATERTIGHT.

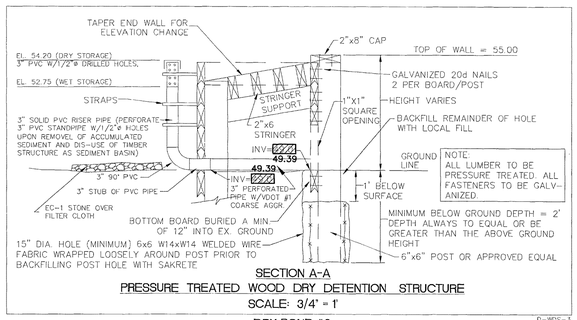
NOTE:
SEDIMENT CLEANOUT POINT DURING OPERATION AS TEMPORARY SEDIMENT BASIN AS AT 5,070 C.F. OF STORAGE OR ELEV.=57.00



DAM - CROSS SECTION DRY POND #1

NOT TO SCALE

D-8162



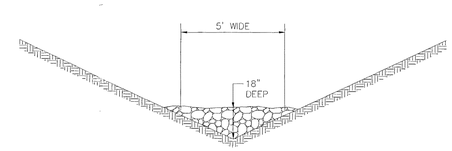
SECTION A-A

PRESSURE TREATED WOOD DRY DETENTION STRUCTURE

SCALE: 3/4" = 1'

DRY POND #2

D-WDS-3



OUTFALL CROSS SECTION

NOT TO SCALE

COUNTY PLAN NO. SP-50-96

RECORD DRAWING INFORMATION AS SURVEYED BY AES CONSULTING ENGINEERS ON 5/15/2000

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
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CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AT THE SITE BEFORE PROCEEDING

COMMONWEALTH OF VIRGINIA

RL REESE LOWER PS PATRICK & SCOTT ARCHITECTS
7500 MAIDSTONE DRIVE - LANCASTER, PA. 17601 - 717-581-9931

NEW NURSING & ASSISTED LIVING FACILITY
FOR
WILLIAMSBURG LANDING, INC. JAMES CITY COUNTY, VA.

DRAWN BY	CHECKED BY	APPROVED BY
MWC	EMG/RWP	RAC

REVISIONS

NO	DATE	DESCRIPTION
1	6/25/96	REV. PRE. JCC COMMENTS - HWP
2	7/19/96	COORDINATION/ADDENDUM NO. 4 (NONE THIS SHEET)
3	7/29/96	COORDINATION/ADDENDUM NO. 5
4	11/21/96	REVISED BID DOCUMENTS

NOTES AND DETAILS

DRAWING NO. C010

SCALE: AS NOTED

DATE: 6/25/96

COMMISSION NO.

HBK 06.06.00-15:33:20 P:\10.dwg

CC011_WILLIAMSBURG_LANDING_NURSERY_&_ASSISTED_LIVING - 008

DRAINAGE RECORD DRAWING

For

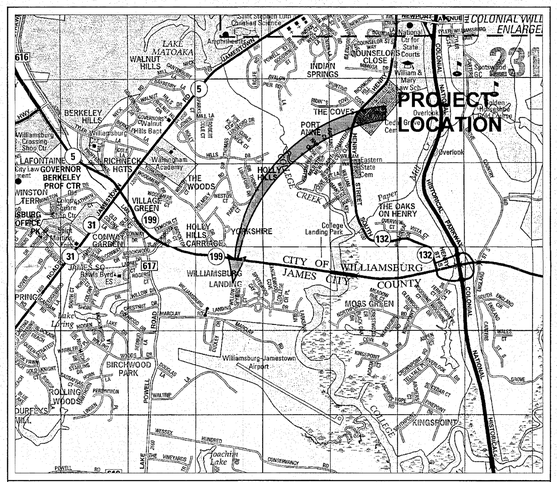
WILLIAMSBURG LANDING

WOODHAVEN EXPANSION, PHASE II

Jamestown District James City County Virginia

GENERAL NOTES

1. ALL ERRORS OR DISCREPANCIES WITH THE PLANS OR EXISTING SITE CONDITIONS SHALL BE REPORTED TO THE ENGINEER OR SURVEYOR OF RECORD BEFORE PROCEEDING WITH THE WORK.
2. CONTOUR INTERVAL IS 1 FOOT.
3. SOLID WASTE DISPOSAL SHALL BE PROVIDED BY A PRIVATE HAULER.
4. THE CONTRACTOR SHALL MAINTAIN A COMPLETE SET OF THE APPROVED PLANS AT THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
5. THE CONTRACTOR SHALL REFER TO SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS BY ECS MID-ATLANTIC, LLC, DATED SEPTEMBER 29, 2010 FOR CONSTRUCTION SPECIFICATIONS.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY (1-800-552-7001) FOR EXISTING UTILITY LOCATIONS AT LEAST 3 WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION, AND A PRIVATE UTILITY LOCATOR FOR THE LOCATING OF PRIVATE UTILITIES.
7. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF ANYBODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION.
8. ALL CONSTRUCTION METHODS AND MATERIALS SHALL CONFORM WITH THE CURRENT JAMES CITY COUNTY STANDARDS AND SPECIFICATIONS, VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS, VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS, AND ANY OTHER APPLICABLE CITY OR STATE ORDINANCES, CODES, AND LAWS.
9. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR THE WORK INDICATED.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF CONSTRUCTION EFFORTS WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT), LOCAL EMERGENCY SERVICES, AND ALL NECESSARY UTILITY COMPANIES INCLUDING, BUT NOT LIMITED TO, ELECTRICTY, NATURAL GAS, TELECOMMUNICATIONS, CABLE TELEVISION, WATER, SEWER, PETROLEUM TRANSMISSION, AND OTHERS THAT MAY BE REQUIRED.
12. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO ALL SITE CONDITIONS PRIOR TO CONSTRUCTION.
13. THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF ALL EXISTING SITE IMPROVEMENTS, INCLUDING LANDSCAPING, AS SHOWN ON THE APPROVED PLAN.
14. THE CONTRACTOR SHALL REMOVE ALL EXCESS MATERIAL, INCLUDING SOIL AND DEBRIS, FROM THE SITE.
15. BENCHMARK: STATION NO. 332, EASTING(X) 12000709.219, NORTHING(Y) 3617282.579, ELEVATION=71.71
    HORIZONTAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK
    VIRGINIA STATE PLANE COORDINATE SYSTEM – SOUTH ZONE NAD 83 (1994 VA HARN)
    VERTICAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK NGVD 29
16. THE STORMWATER MANAGEMENT/BMP #6 FACILITY REQUIRES THE SUBMISSION, REVIEW AND APPROVAL OF A RECORD DRAWING (AS-BUILT) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND/SURETY.
17. A LAND DISTURBING PERMIT AND SILTATION AGREEMENT, WITH SURETY, ARE REQUIRED FOR THIS PROJECT.
18. PRIOR TO OBTAINING A LAND DISTURBING PERMIT, THE OWNER OR CONTRACTOR SHALL OBTAIN A VSMP PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION FOR THE DISCHARGE OF STORMWATER FROM CONSTRUCTION ACTIVITIES. THIS PERMIT WILL REQUIRE DAILY LOGS OF EARTHWORK, RECORDATION OF STORM EVENTS, LOGS OF MAINTENANCE OF EROSION AND SEDIMENT CONTROL MEASURES, AND OTHER ACTIONS DURING CONSTRUCTION.
19. THE PROFESSIONAL WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR PURPOSES OF PLAN APPROVAL ONLY. PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT, THE OWNER OR DEVELOPER SHALL PROVIDE THE NAME OF A "RESPONSIBLE LAND DISTURBER" WHO SHALL ASSUME RESPONSIBILITY AS THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT. THE OWNER OR DEVELOPER SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.
20. NO OFFSITE LAND DISTURBANCE IS ANTICIPATED FOR THIS PROJECT.
21. ALL OBJECTIONABLE AND DELETERIOUS MATERIAL IS TO BE REMOVED FROM THE SITE AND DISPOSED OF IN A STATE APPROVED FACILITY MEETING THE REQUIREMENTS OF ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
22. ALL PROPOSED UTILITIES SHALL BE PLACED UNDERGROUND.
23. SITE IS SERVED BY PUBLIC WATER AND SEWER.
24. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES. IF EXISTING UTILITIES ARE FOUND TO BE IN CONFLICT WITH PROPOSED SITE IMPROVEMENTS, THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER, OWNER, AND THE UTILITY COMPANY TO EITHER REDESIGN THE PROPOSED IMPROVEMENTS OR RELOCATE THE EXISTING UTILITIES AT THE OWNER'S/DEVELOPER'S EXPENSE.
25. ALL UTILITY AND SURVEY DATA SHOWN ON THE DRAWINGS HAVE BEEN PROVIDED BY AES CONSULTING ENGINEERS. INFORMATION HAS BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES AT THE TIME OF THE SURVEY BUT IS NOT REPRESENTED AS BEING COMPLETE AND ACCURATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT EXISTING UTILITIES AND UNDERGROUND STRUCTURES. DAMAGE TO EXISTING UTILITIES AND UNDERGROUND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE DEVELOPER.
26. WATER AND SEWER SYSTEMS SHALL MEET THE REQUIREMENTS OF THE LATEST EDITIONS OF THE JAMES CITY SERVICE AUTHORITY (JCSA) DESIGN AND ACCEPTANCE CRITERIA, THE HAMPTON ROADS PLANNING DISTRICT COMMISSION (HRPDC) REGIONAL CONSTRUCTION STANDARDS, AND THE COMMONWEALTH OF VIRGINIA WATERWORKS AND SEWERAGE REGULATIONS. CURRENT COPIES SHALL BE MAINTAINED AT THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
27. PRIVATELY OWNED UTILITIES (I.E. WATER & SEWER LINES) SHOWN ON THIS SITE PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE AND ENFORCED BY THE CODE COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PREVENTION ASSOCIATION STANDARD 24, AND THE INTERNATIONAL FIRE CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT OBTAINING REQUIRED PERMITS AND INSPECTIONS.
28. JCSA WILL NOT PERFORM ANY TESTING ON THE PROPOSED WATER OR SEWER MAINS UNTIL ALL UTILITIES HAVE BEEN INSTALLED.
29. NOTIFY JAMES CITY SERVICE AUTHORITY PRIOR TO ANY EXCAVATION OR DEMOLITION WITHIN UTILITY CORRIDORS.
30. FORCE MAIN CONNECTIONS ARE TO BE COORDINATED WITH THE JCSA INSPECTOR. A MINIMUM OF 72 HOURS NOTICE IS REQUIRED. THE CONNECTIONS SHALL NOT BE SCHEDULED FOR A FRIDAY.
31. EASEMENTS DENOTED AS "JCSA UTILITY EASEMENTS" ARE FOR THE EXCLUSIVE USE OF THE JAMES CITY SERVICE AUTHORITY AND THE PROPERTY OWNER. OTHER UTILITY SERVICE PROVIDERS DESIRING TO USE THESE EASEMENTS WITH THE EXCEPTION OF PERPENDICULAR UTILITY CROSSINGS MUST OBTAIN AUTHORIZATION FOR ACCESS AND USE FROM JCSA AND THE PROPERTY OWNER. ADDITIONALLY, JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO IMPROVEMENTS WITHIN THIS EASEMENT, FROM ANY CAUSE."
32. ALL STORM SEWER SHALL BE INSTALLED IN ACCORDANCE WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) STANDARDS AND SPECIFICATIONS, AND THE JAMES CITY COUNTY STANDARDS AND SPECIFICATIONS.
33. THE STORM WATER MANAGEMENT/BMP FACILITY(S) WILL REQUIRE SUBMISSION, REVIEW AND APPROVAL OF RECORD DRAWINGS (AS-BUILTS) AND CONSTRUCTION CERTIFICATIONS PRIOR TO RELEASE OF POSTED BONDS/SURETIES. THE CONTRACTOR SHALL COORDINATE THE NECESSARY INSPECTIONS WITH THE PROFESSIONAL CERTIFYING THE CONSTRUCTION. THE OWNER IS REQUIRED TO ENSURE THESE ACTIVITIES ARE ADEQUATELY COORDINATED AND PERFORMED BEFORE, DURING AND FOLLOWING CONSTRUCTION IN ACCORDANCE WITH THE CURRENT JAMES CITY COUNTY ENVIRONMENTAL DIVISION REQUIREMENTS.
34. INSTALL RPA SIGNS ALONG RPA BUFFER PER SECTION 23-7(c) OF THE CHAPTER 23 CHESAPEAKE BAY PRESERVATION ORDINANCE.
35. ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3 OF THE ORDINANCE.



VICINITY MAP
(Approximate Scale: 1"=2000')
Copyright ADC The Map People permitted use number 20905145

County Project No.: SP-0037-2010
Original Submittal Date: 04/21/10

"THE STORM DRAINAGE AS-BUILT LOCATIONS AND GRADES SHOWN ON THESE DRAWINGS, ARE ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF AND I CERTIFY THAT I, OR MY AGENT, HAVE MADE SUFFICIENT INSPECTION TO ENSURE THE ACCURACY OF THIS STATEMENT."

Thomas C. Sublett 5/21/14
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
5/21/2014
LAND SURVEYOR

OWNER / DEVELOPER INFORMATION:

OWNER/DEVELOPER: WILLIAMSBURG LANDING, INC.
5700 WILLIAMSBURG LANDING DRIVE
WILLIAMSBURG, VIRGINIA 23185
TELEPHONE: (757) 258-2163
FAX: (757) 258-2167
CONTACT: STEVE MONTGOMERY

INDEX OF SHEETS

SHEET NO.	SHEET DESCRIPTION	SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET	17	STORMWATER MANAGEMENT PLAN
2	OVERALL DEVELOPMENT PLAN	18	STORMWATER MANAGEMENT NOTES AND DETAILS
3	ENVIRONMENTAL INVENTORY	19	LANDSCAPING PLAN
4	DEMOLITION PLAN	20	LANDSCAPING PLAN
5	SITE PLAN	21	LIGHTING PLAN
6	SITE PLAN	22	LIGHTING PLAN
7	SIDEWALK DEMOLITION PLAN	23	LANDSCAPE NOTES & DETAILS
8	SIDEWALK PLAN	24	LIGHTING NOTES & DETAILS
9	UTILITY PLAN	25	PUMP STATION NOTES AND DETAILS
10	UTILITY PLAN	26	PUMP STATION NOTES AND DETAILS
11	PROFILES	27	PUMP STATION NOTES AND DETAILS
12	DRAINAGE PLAN	28	PUMP STATION NOTES AND DETAILS
13	DRAINAGE PLAN	29	NOTES AND DETAILS
14	PHASE I EROSION AND SEDIMENT CONTROL PLAN	30	NOTES AND DETAILS
15	GRADING AND PHASE II EROSION & SEDIMENT CONTROL PLAN	31	NOTES AND DETAILS
16	GRADING AND PHASE II EROSION & SEDIMENT CONTROL PLAN	32	NOTES AND DETAILS

SITE DATA:

SITE ADDRESS #1: 5560 WILLIAMSBURG LANDING DRIVE
TAX MAP PARCEL ID.: 4820100003
ZONING: MULTIFAMILY RESIDENTIAL, R5 (WITH PROFFERS) (Z-0002-2008)(SUP-0018-2008)
HEIGHT LIMIT: 50' MAXIMUM PER HEIGHT WAIVER HW-0004-2008 APPROVED BY THE BOARD OF SUPERVISORS ON JANUARY 13, 2009.
WATERSHED: THIS PROJECT IS SITUATED IN THE COLLEGE CREEK WATERSHED.
FLOOD HAZARD MAP: THIS PROPERTY LIES IN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. MAP NUMBER 51095 0205C, DATED 9/28/07.

PROJECT AREA: 5.96 AC.±
DISTURBED AREA: 5.98 AC.±

	TOTAL EXISTING	TOTAL PROPOSED	
PARCEL AREA:	50.01 AC.±	50.01 AC.±	
IMPERVIOUS AREA:	12.57 AC.±	17.07 AC.±	30%±
OPEN AREA:	37.44 AC.±	33.94 AC.±	70%±

	EXISTING	PROPOSED	TOTAL	MAX PER SUP
NURSING BEDS	58	40 (NET)	98	100
ASSISTED LIVING UNITS	92	7 (NET)	99	100
INDEPENDENT LIVING UNITS	63	24	87	87

	BUILDING FOOTPRINT	2ND FLOOR	BASEMENT OR GROUND FLOOR	BUILDING HEIGHT	CONSTRUCTION TYPE	USE GROUP
GROUNDS MAINTENANCE BUILDING	2,150 SF			16'-0"	VB	S-1
SKILLED CARE (NURSING BEDS) ADDITION #1	5,090 SF	5,090 SF		31'-6"	III-B	I-1
SKILLED CARE (NURSING BEDS) ADDITION #2	565 SF	565 SF		31'-6"	III-B	I-1
MAIN STREET ADDITION	1,694 SF	1,694 SF		31'-6"	III-B	I-1
SPECIAL CARE (ASSISTED LIVING) ADDITION	5,516 SF		5,184 SF	28'-0"	III-B	I-1
SKILLED CARE (NURSING BEDS) BUILDING	20,225 SF		20,225 SF	22'-0"	II-A	I-2
INDEPENDENT LIVING BLDG. #1 (12 UNITS)	11,360 SF	11,360 SF	3,287 SF	41'-6"	VB	R-2, S-2, A-3
INDEPENDENT LIVING BLDG. #2 (12 UNITS)	11,360 SF	11,360 SF	3,287 SF	41'-6"	VB	R-2, S-2, A-3

PARKING REQUIRED
1 SPACE/4 RESIDENTS (220) = 55 SPACES
1 SPACE/NO. OF EMPLOYEES ON LARGEST SHIFT (102) = 102 SPACES
2.2 SPACES/2-BEDROOM INDEPENDENT LIVING UNIT (24) = 53
1 SPACE/250 SF (GROUNDS MAINTENANCE BLDG.) (2150) = 9
TOTAL SPACES REQUIRED = 219 SPACES

PARKING PROVIDED	TOTAL EXISTING	TO BE DEMOLISHED	TOTAL PROPOSED	TOTAL
REGULAR SPACES	158	-6	66	218
HANDICAP SPACES	6	0	4	10
TOTAL SPACES PROVIDED	164	-6	70	228

SITE ADDRESS #2: 5700 WILLIAMSBURG LANDING DRIVE
TAX MAP PARCEL ID.: 4820100002
ZONING: MULTIFAMILY RESIDENTIAL, R5 (WITH PROFFERS) (Z-0002-2008)(SUP-0018-2008)
WATERSHED: THIS PROJECT IS SITUATED IN THE COLLEGE CREEK WATERSHED.
FLOOD HAZARD MAP: THIS PROPERTY LIES IN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. MAP NUMBER 51095C0205C, DATED 9/28/07.

PROJECT AREA: 0.55 AC.±
DISTURBED AREA: 0.55 AC.±

PARCEL AREA: 71.63 AC.±
IMPERVIOUS AREA: 0.08 AC.± NET INCREASE PROPOSED

Environmental & Resource Protection
MAR 16 2015
RECEIVED

Rev.	Date	Description	Revised By
3	2/9/15	ADDED DRY POND, SSA#1, 5-2, 5-16	TCS
2	12/20/10	Revised Per JCC Comments, Dated 11/10/10	TCS
1	10/14/10	Revised Per JCC Comments Dated 10/22/10	TRS

AES CONSULTING ENGINEERS
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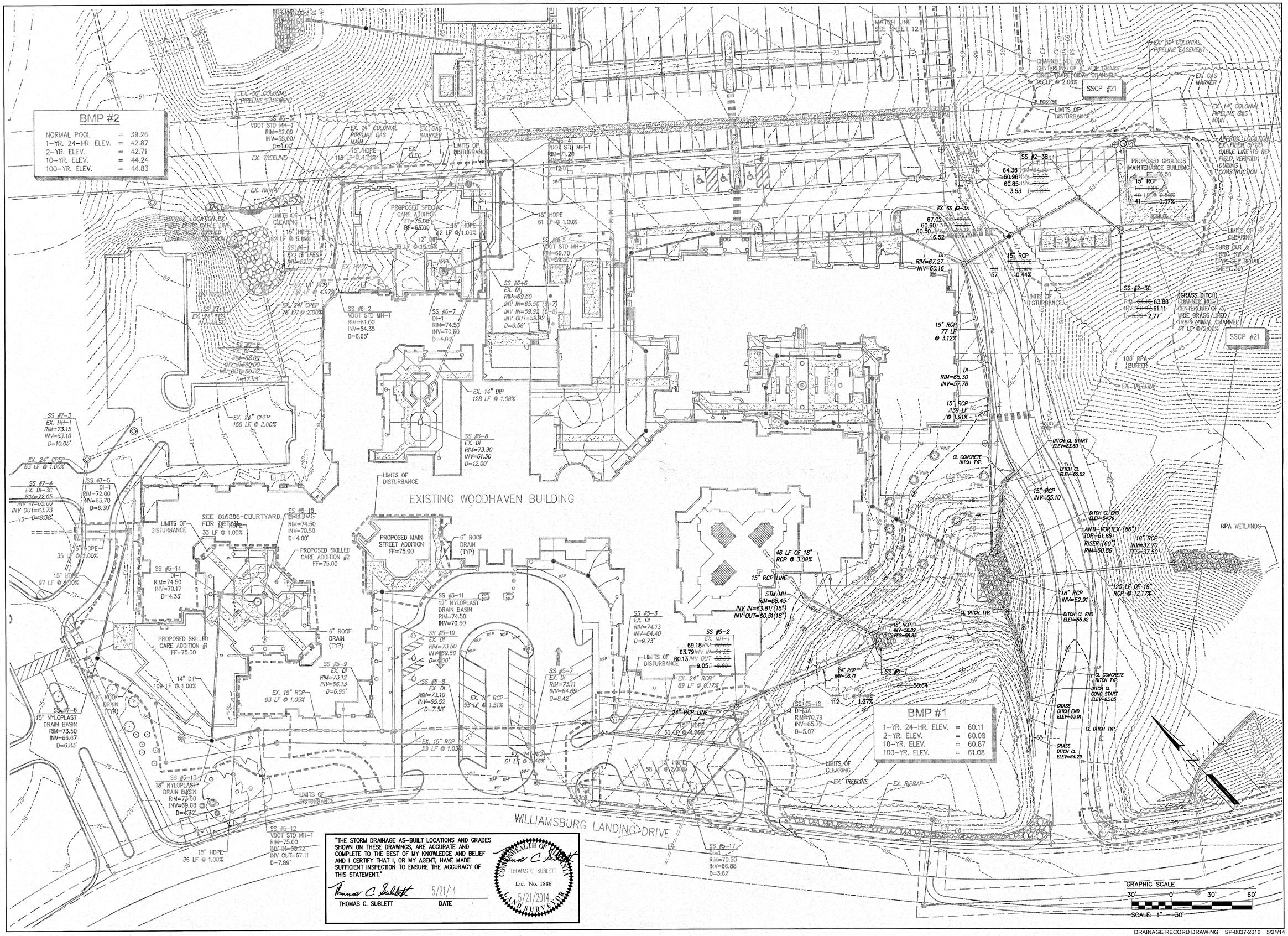
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-8994
www.aesva.com

DRAINAGE RECORD DRAWING
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: N/A	Date: 04/21/10
Sheet Title:	Cover Sheet
Sheet Number	1

S:\JOBS\8162\06-RPA Study\Survey\Record Dwgs\DRAINAGE RECORD DRAWINGS\W816206 DRAINAGE COVER.dwg, 2/6/2015 3:44:11 PM, bob.hegeman



"THE STORM DRAINAGE AS-BUILT LOCATIONS AND GRADES SHOWN ON THESE DRAWINGS, ARE ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF AND I CERTIFY THAT I, OR MY AGENT, HAVE MADE SUFFICIENT INSPECTION TO ENSURE THE ACCURACY OF THIS STATEMENT."

Thomas C. Sublett 5/21/14
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
5/21/2014
LAND SURVEYOR

Rev.	Date	Description	Revised By
3	2/6/15	ADDED DRY POND, SSR6-1, S-2, S-16	TCS
2	12/29/10	Revised Per JCC Comments Dated 11/19/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 10/28/10	TRS

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DRAINAGE RECORD DRAWING
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II

Jamestown District — James City County — Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10
Sheet Title:	Drainage Plan
Sheet Number	13

DRAINAGE RECORD DRAWING SP-0037-2010 5/21/14

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5. Construction Drawings

PHASE PLAN
for
GROUNDS MAINTENANCE BUILDING
WILLIAMSBURG LANDING

Jamestown District James City County Virginia

This Plan Set is intended to delineate a single phase of construction that is part of two previously approved Site Plans; SP-0062-2009 & SP-0037-2010.

INDEX OF SHEETS:

SHEET NO.	SHEET DESCRIPTION
1	Phase Plan Cover Sheet
2	Phase Plan
	PLAN SHEETS FROM APPROVED SITE PLAN SP-0062-2009
5	Utility Plan
6	Grading Plan
7	E&S Plan
9	Profile
12	Lighting Plan and Details
14	Detail
15	Detail
16	Detail
	PLAN SHEETS FROM APPROVED SITE PLAN SP-0037-2010
3	Environmental Inventory
6	Site Plan
10	Utility Plan
13	Drainage Plan
16	Grading and E&SC Plan
20	Landscaping Plan
22	Lighting Plan
23	Planting Notes and Detials
24	Lighting Notes and Details
26	Pump Station #3 Notes and Details
29	Notes and Details
30	Notes and Details
31	Notes and Details
32	Notes and Details

GENERAL NOTES

THE SITE EROSION AND SEDIMENT CONTROL PLAN INCLUDES MONITORING OF THE EXISTING DOWNSTREAM BMP'S FOR SIGNS OF SEDIMENTATION, SPECIFICALLY DURING, OR AS A RESULT OF, CONSTRUCTION ON THIS SITE. AS THIS FACILITY IS NOT TO BE USED FOR SEDIMENT CONTROL, THE CONTRACTOR SHOULD BE AWARE THAT ADDITIONAL ONSITE OR OFFSITE CONTROLS MAY BE NECESSARY TO PROTECT ALL DOWNSTREAM AREAS FROM DEGRADATION. THIS MAY INCLUDE ADDITIONAL E&SC MEASURES, CLEANING AND SEDIMENT REMOVAL WITHIN THE BASIN OR CONNECTING PIPE SYSTEMS, AND COORDINATION WITH THE OWNER, ENGINEER, OR THE COUNTY.

DEVELOPER INFORMATION

DEVELOPER: WILLIAMSBURG LANDING, INC.
5700 WILLIAMSBURG LANDING DRIVE
WILLIAMSBURG, VIRGINIA 23185
CONTACT: PHIL NAWROCKI
TELEPHONE: (757) 565-6515
FAX: (757) 565-6517

SITE DATA

SITE ADDRESS:	5560 WILLIAMSBURG LANDING DRIVE, WILLIAMSBURG, VIRGINIA 23185
TAX MAP PARCEL N0.:	4820100003
PARCEL AREA:	50.01± AC
ZONING:	MULTIFAMILY RESIDENTIAL, R5
FLOOD HAZARD MAP:	THE PROJECT AREA LIES IN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) PER F.I.R.M. MAP NUMBER 51095C0205C, DATED 9/28/07.
WATERSHED:	THE PROJECT AREA LIES IN THE COLLEGE CREEK WATERSHED.
NWBD HUC CODE:	JL33
LATITUDE / LONGITUDE:	37.2467 / -76.7272

GROUNDS MAINTENANCE BLDG. PHASE PLAN DISTURBED AREA: 1.55 AC.±

PHASE PLANS SPECIAL NOTES

1. THE PROPOSED ELEVATION OF THE RIM OF STORM MANHOLE SS #2-3A SHALL BE LOWERED FROM 68.00 TO 67.00. (SEE SHEET 6 - WOODHAVEN EXPANSION PLANS)
2. THE PROPOSED STORM PIPE BETWEEN SS #2-2 AND SS #2-1 SHALL BE CLASS III RCP. ALL OTHER PROPOSED STORM PIPES CAN BE EITHER HDPE AS SPECIFIED ON THE PLANS, OR CLASS III RCP. (SEE SHEET 6 - WOODHAVEN EXPANSION PLANS)
3. THE PROPOSED 5' WIDE ASPHALT PATH ALONG THE EAST SIDE OF THE SERVICE ROAD WILL NOT BE INCLUDED IN THIS PHASE OF WORK. THE EXISTING ASPHALT PATH IS TO BE REMOVED IN ITS ENTIRETY FOR THE INSTALLATION OF THE WATER LINE AND OTHER UTILITIES. (SEE SHEET 5 - WOODHAVEN EXPANSION PLANS)
4. THE 6" PVC FOUNDATION DRAIN FOR THE FUTURE BUILDING ADDITION SHALL BE INSTALLED UNDER THE NEW ROAD. THE DOWNSTREAM INVERT ELEVATION SHALL BE 59.00 AND THE 85 FEET OF PIPE SHALL BE INSTALLED WITH A 1.0% SLOPE WITH AN END CAP FOR FUTURE EXTENSION TO THE BUILDING AND A CLEANOUT RISER TO THE SURFACE. (SEE SHEET 6 - WOODHAVEN EXPANSION PLANS)
5. THE 2" FORCE MAIN SHALL END AT STATION 15+50 WITH AN END CAP AND FRAME AND COVER.
6. THE 12" WATER MAIN SHALL END AT STATION 15+40 WITH A BLOW OFF ASSEMBLY
7. THE 8" WATER MAIN SHALL END AT STATION 10+80 BEFORE TURNING SOUTHWARD WITH TWO (2) 45 DEGREE BENDS AND CONNECTING TO THE EXISTING 8" WATER MAIN WITH A CUT IN 8"x8" TEE.

APPROVED
James City County
Env & Resource Protection Div
By [illegible] Date: 11-18-13
E+S-019-13

E+S-019-13
(SP-37-10; SP-77-06)

Rev.	Date	Description	Revised By
1	11/8/2013	REVISED PER COUNTY COMMENTS	SDC

COMMONWEALTH OF VIRGINIA
NICHOLAS BO'TTA
Lic. No. 24730
11/8/13
PROFESSIONAL ENGINEER

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PHASE PLAN FOR THE
GROUNDS MAINTENANCE BUILDING
WILLIAMSBURG LANDING
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	NB
Project Number:	8162-05/06
Scale: N/A	Date: 9/25/2013
Sheet Title: Cover Sheet	
Sheet Number	1

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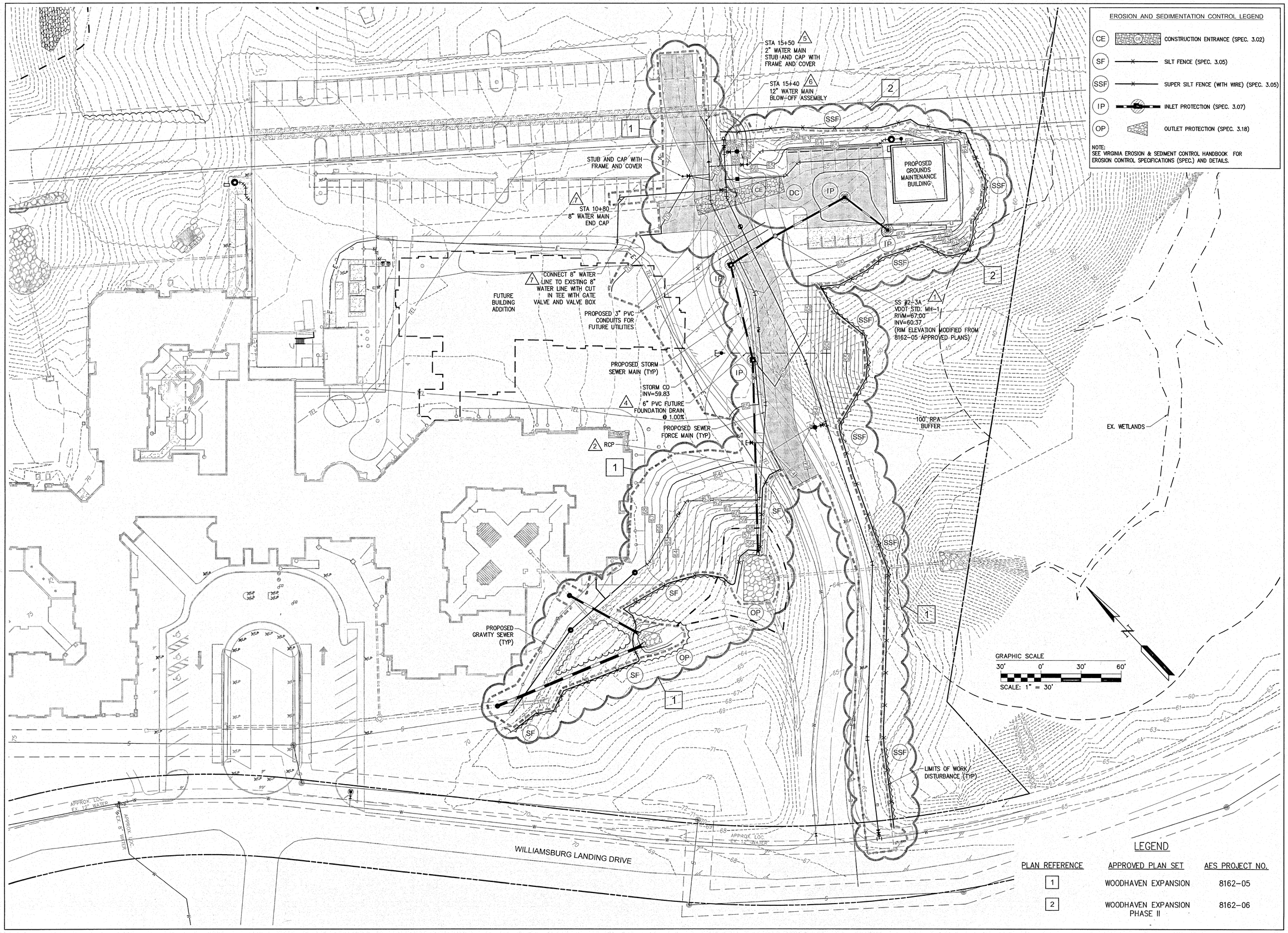

LEGEND

PLAN REFERENCE	APPROVED PLAN SET	AES PROJECT NO.
1	WOODHAVEN EXPANSION	8162-05
2	WOODHAVEN EXPANSION PHASE II	8162-06

Rev.	Date	Description	Revised By
1	11/8/2013	REVISED PER COUNTY COMMENTS	SDC

COMMONWEALTH OF VIRGINIA
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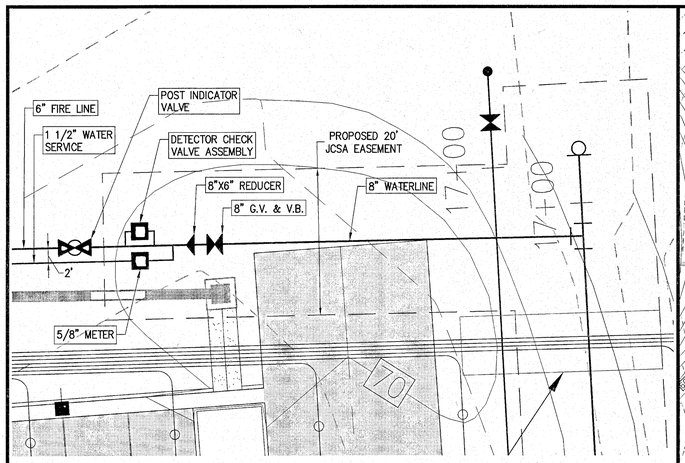
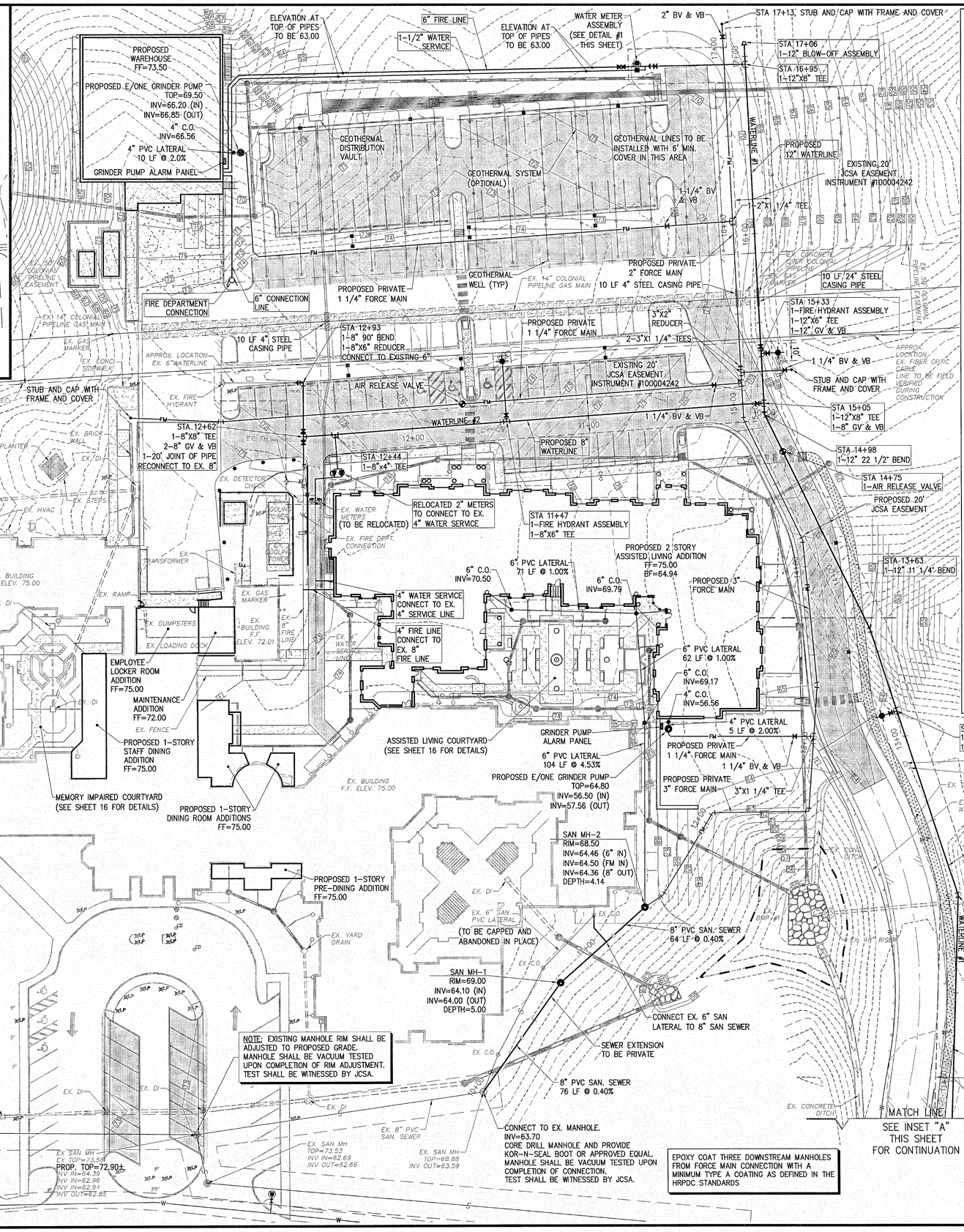
PHASE PLAN FOR THE
GROUNDS MAINTENANCE BUILDING
WILLIAMSBURG LANDING
JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	NB
Project Number:	8162-05/06
Scale: 1"=30'	Date: 9/25/2013
Sheet Title:	Grounds Maintenance Building Phase Plan
Sheet Number	2

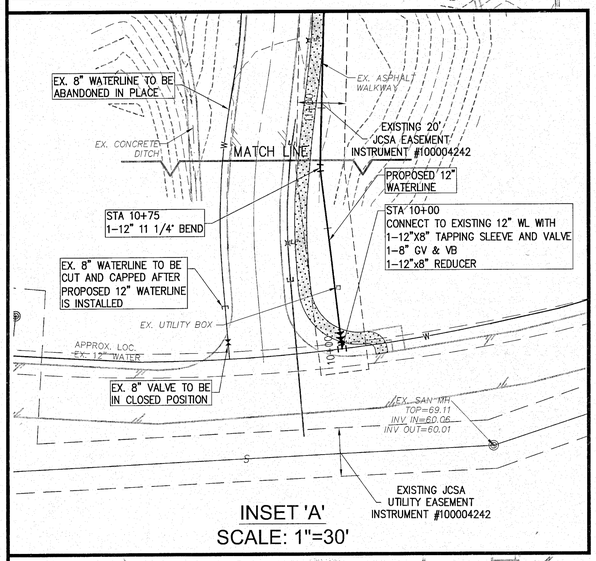


DETAIL #1
SCALE: 1"=10'



GEOTHERMAL WELL NOTES

1. THE APPLICANT SHALL SECURE APPROPRIATE STATE HEALTH DEPARTMENT PERMITS FOR THE PROPOSED WELLS.
2. NO WELLS SHALL BE PERMITTED WITHIN THE LIMITS OF A STORM WATER MANAGEMENT FACILITY OR OTHER AREAS SUBJECT TO FREQUENT SURFACE WATER INTRUSION.
3. THE APPLICANT MUST CONFIRM THAT THE CHICKAHOMINY-PINEY POINT AQUIFER IS EITHER BELOW THE BOTTOM OF THE PROPOSED DEPTH OF THE GEOTHERMAL WELL, OR IS NON-EXISTENT IN THE VICINITY OF THE PROPOSED GEOTHERMAL WELL FIELD.
4. A JAMES CITY COUNTY CERTIFIED WELL DRILLER SHALL BE EMPLOYED TO DRILL ALL WELLS.
5. A JCSA INSPECTOR SHALL WITNESS AND APPROVE ALL WELL GROUTING.
6. THE ONLY FLUIDS ALLOWED IN THE PIPING/WELL SYSTEM SHALL BE POTABLE WATER AND FOOD GRADE ANTIFREEZE ADDITIVES.
7. THE CONTRACTOR SHALL ENSURE FLUIDS FROM THE WELL DRILLING PROCESS ARE DIRECTED THROUGH APPROPRIATE EROSION CONTROL MEASURES TO ADEQUATELY CONTAIN SEDIMENT FROM ANY RUNOFF.



INSET 'A'
SCALE: 1"=30'

NOTE: EXISTING MANHOLE RIM SHALL BE ADJUSTED TO PROPOSED GRADE. MANHOLE SHALL BE VACUUM TESTED UPON COMPLETION OF RIM ADJUSTMENT. TEST SHALL BE WITNESSED BY JCSA.

UTILITY NOTES

1. BACKFLOW PREVENTION DEVICE FOR THE PROPOSED WAREHOUSE SHALL BE PLACED INSIDE THE BUILDING.
2. ALL PROPOSED SANITARY SEWER LINES SHALL BE PRIVATE.
3. COORDINATION OF WATER SERVICE TRANSFER IS REQUIRED BETWEEN THE OWNER, JCSA, JCC CODES COMPLIANCE AND JCC FIRE DEPT. ONLY JCSA PERSONNEL MAY REMOVE AND RESET THE WATER METERS AND SCHEDULING IS REQUIRED AT LEAST 72 HOURS IN ADVANCE.
4. PRIVATELY OWNED UTILITIES (I.E. WATER & SEWER LINES, FIRE SUPPRESSION MAINS) SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE AND ENFORCED BY THE CODE COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PREVENTION ASSOCIATION STANDARD 24, AND THE INTERNATIONAL FIRE CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT OBTAINING REQUIRED PERMITS AND INSPECTIONS.
5. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES. IF EXISTING UTILITIES ARE FOUND TO BE IN CONFLICT WITH PROPOSED SITE IMPROVEMENTS, THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER, OWNER, AND THE UTILITY COMPANY TO EITHER REDESIGN THE PROPOSED IMPROVEMENTS OR RELOCATE THE EXISTING UTILITIES AT THE OWNER'S EXPENSE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT EXISTING UTILITIES AND UNDERGROUND STRUCTURES. DAMAGE TO EXISTING UTILITIES AND UNDERGROUND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE DEVELOPER.
6. THE PLUMBING INSIDE THE BUILDINGS MUST BE INSPECTED BY JAMES CITY COUNTY FOR POTENTIAL CROSS CONNECTIONS. ANY CROSS CONNECTIONS MUST BE PROTECTED BY THE APPROPRIATE BACKFLOW PREVENTION DEVICE(S).
7. A MINIMUM HORIZONTAL SEPARATION BETWEEN THE SANITARY SEWER AND WATER MAINS SHALL BE 10 FEET UNLESS OTHERWISE SPECIFIED.
8. THE CONTRACTOR SHALL ENSURE THE MINIMUM VERTICAL SEPARATION IS PROVIDED BETWEEN THE PROPOSED PIPE AND OTHER PIPES AND STRUCTURES AS SHOWN ON THE PLANS, OR AS REQUIRED BY APPLICABLE STANDARDS AND REGULATIONS.
9. THE CONTRACTOR SHALL PROVIDE SUFFICIENT COVER OVER ALL UTILITY LINES DURING CONSTRUCTION.
10. PROPOSED WATER LINES AND FITTINGS SHALL BE AWWA C900.
11. ALL SANITARY SEWER FORCE MAIN STUBS BROUGHT TO WITHIN ONE FOOT OF FINAL GRADE, CAPPED, AND EQUIPPED WITH CAST IRON COVERS.
12. ALL PROPOSED SANITARY CLEANOUT TOPS SHALL BE FLUSH WITH FINISH GRADE IN WALKWAYS OR HAVE CAST IRON COVERS.
13. SANITARY SEWER LATERALS AND FITTINGS SHALL BE SCHEDULE 40 PVC. SANITARY SEWER FORCE MAINS AND FITTINGS SHALL BE SCHEDULE 80 PVC WITH MECHANICAL JOINTS. FORCE MAIN SHALL HAVE PVC BALL VALVES.
14. THE CONTRACTOR SHALL USE PIPE AND/OR JOINT DEFLECTION AS SPECIFIED BY THE PIPE MANUFACTURER OR FITTINGS AS NECESSARY TO OBTAIN THE REQUIRED HORIZONTAL AND VERTICAL ALIGNMENT OF THE PROPOSED WATER AND SEWER LINES.
15. THE PLAN AND PROFILE SHEETS ARE BASED UPON ALLOWABLE DEFLECTIONS OF JOINTS, BENDS, AND FITTINGS FOR PVC AND DUCTILE IRON PIPE. PROJECT STATIONING IS ALONG THE CENTERLINE OF THE PIPE PROJECTED ONTO THE HORIZONTAL PLANE. A DETAILED LAY SCHEDULE FOR THE PIPE MATERIALS USED MUST BE SUBMITTED TO THE ENGINEER DEPICTING A CHANGE IN ALIGNMENT AS COMPARED TO THE DRAWINGS.
16. THE PUMP STATION AND FORCE MAIN DESIGNS MEET ALL VIRGINIA DEPARTMENT OF HEALTH SEWAGE COLLECTION AND TREATMENT (S.C.A.T.) REGULATIONS.

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
4	06/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB

COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
08/23/10
REGISTERED PROFESSIONAL ENGINEER

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Fax (757) 220-8994

CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

UTILITY PLAN
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
JAMES CITY COUNTY • JAMESTOWN DISTRICT • VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
1"=30'	6/28/06
Project No.	
8162-05	
Drawing No.	
5	

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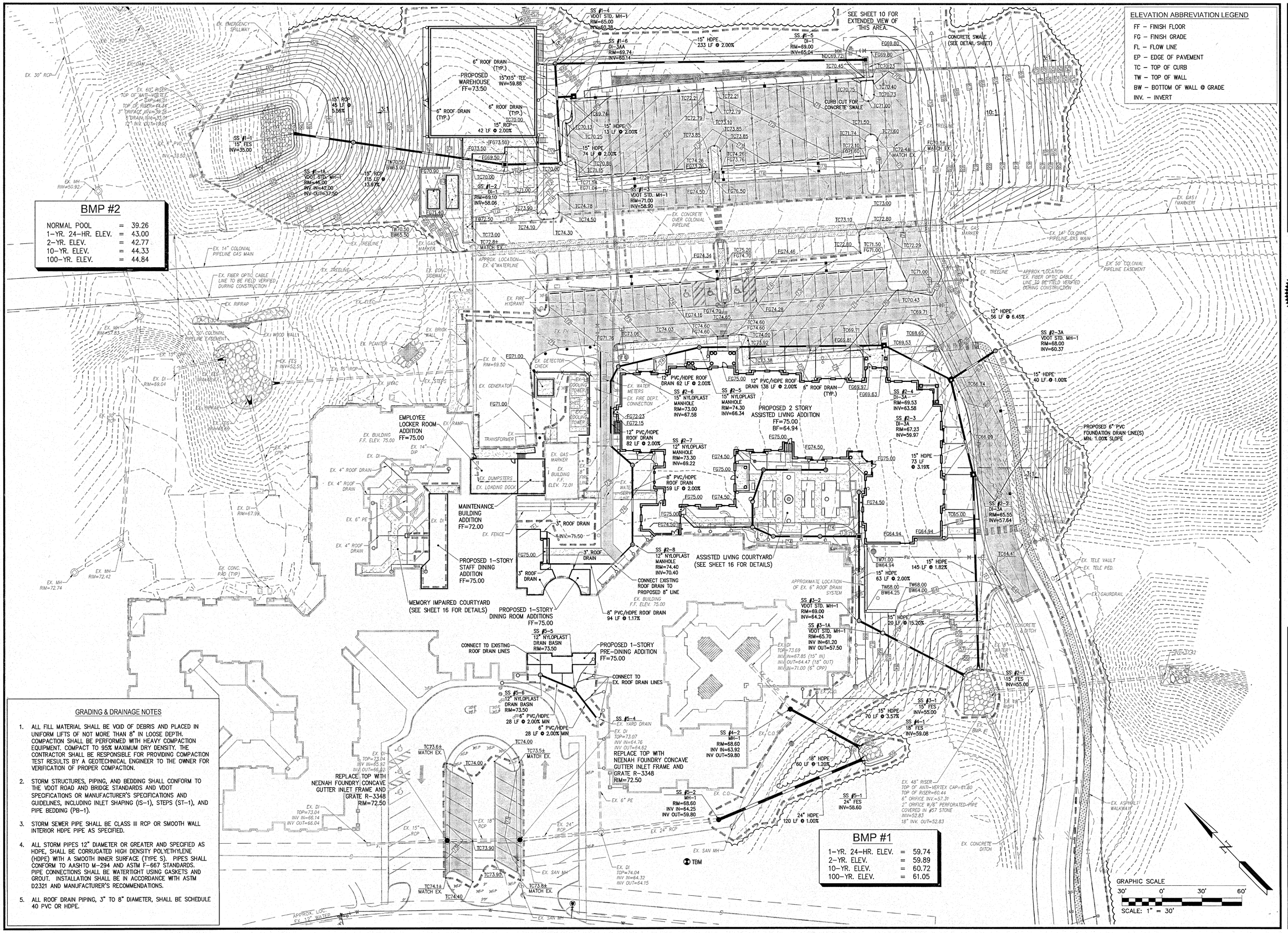

GRADING & DRAINAGE NOTES

1. ALL FILL MATERIAL SHALL BE VOID OF DEBRIS AND PLACED IN UNIFORM LIFTS OF NOT MORE THAN 8" IN LOOSE DEPTH. COMPACTION SHALL BE PERFORMED WITH HEAVY COMPACTION EQUIPMENT. COMPACT TO 95% MAXIMUM DRY DENSITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING COMPACTION TEST RESULTS BY A GEOTECHNICAL ENGINEER TO THE OWNER FOR VERIFICATION OF PROPER COMPACTION.
2. STORM STRUCTURES, PIPING, AND BEDDING SHALL CONFORM TO THE VDOT ROAD AND BRIDGE STANDARDS AND VDOT SPECIFICATIONS OR MANUFACTURER'S SPECIFICATIONS AND GUIDELINES, INCLUDING INLET SHAPING (IS-1), STEPS (ST-1), AND PIPE BEDDING (PB-1).
3. STORM SEWER PIPE SHALL BE CLASS III RCP OR SMOOTH WALL INTERIOR HDPE PIPE AS SPECIFIED.
4. ALL STORM PIPES 12" DIAMETER OR GREATER AND SPECIFIED AS HDPE, SHALL BE CORRUGATED HIGH DENSITY POLYETHYLENE (HDPE) WITH A SMOOTH INNER SURFACE (TYPE S). PIPES SHALL CONFORM TO AASHTO M-294 AND ASTM F-667 STANDARDS. PIPE CONNECTIONS SHALL BE WATERTIGHT USING GASKETS AND GROUT. INSTALLATION SHALL BE IN ACCORDANCE WITH ASTM D2321 AND MANUFACTURER'S RECOMMENDATIONS.
5. ALL ROOF DRAIN PIPING, 3" TO 8" DIAMETER, SHALL BE SCHEDULE 40 PVC OR HDPE.

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
4	08/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB

STATE OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
08/23/10
PROFESSIONAL ENGINEER

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Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

GRADING/DRAINAGE PLAN
WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION

JAMES CITY COUNTY — JAMESTOWN DISTRICT — VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
1"=30'	6/28/06

Project No. 8162-05

Drawing No. 6

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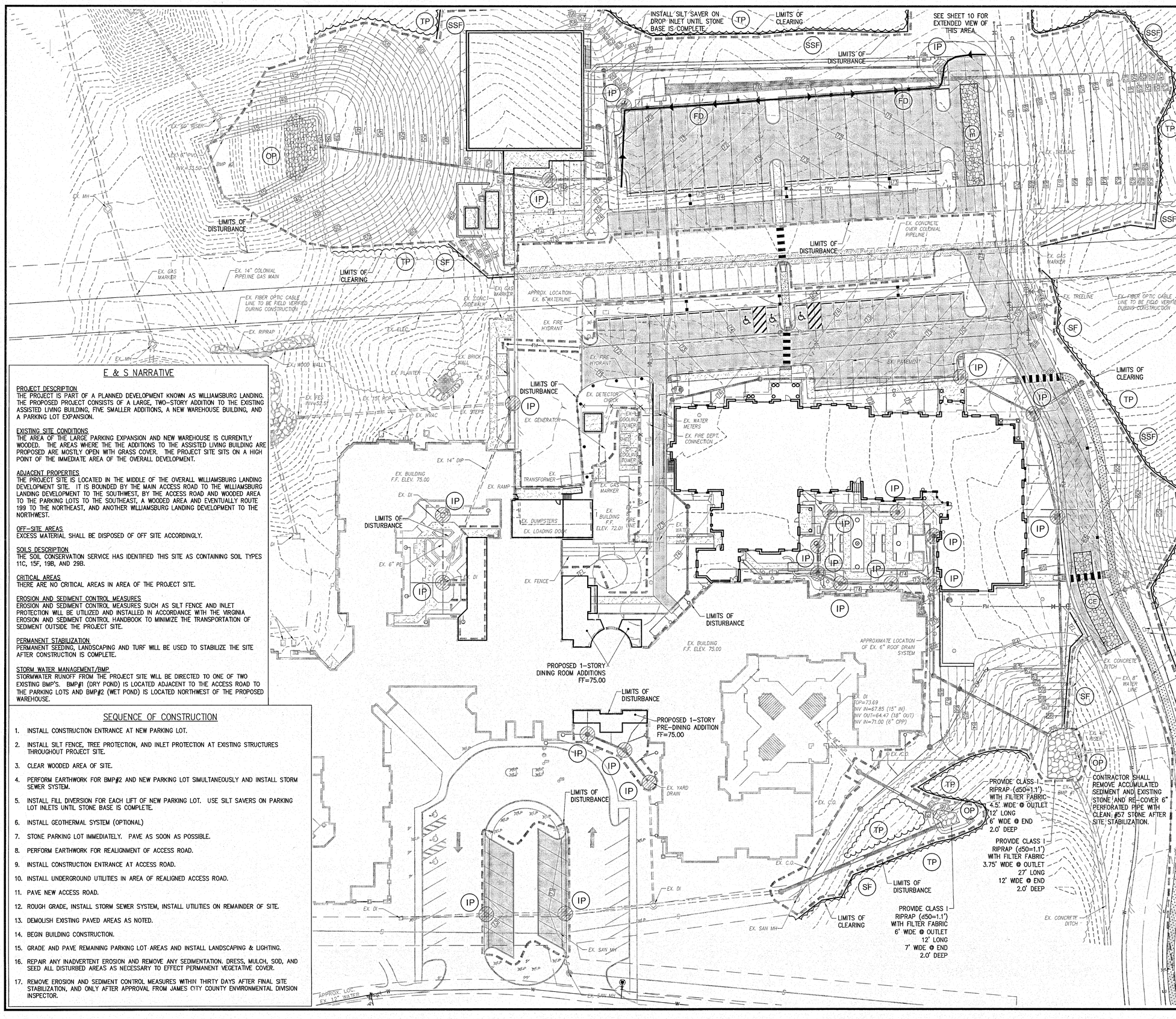


EROSION AND SEDIMENTATION CONTROL LEGEND

CE	CONSTRUCTION ENTRANCE (SPEC. 3.02)
SF	SILT FENCE (SPEC. 3.05)
SSF	SUPER SILT FENCE (WITH WIRE) (SPEC. 3.05)
IP	INLET PROTECTION (SPEC. 3.07)
OP	OUTLET PROTECTION (SPEC. 3.18)
TP	TREE PROTECTION (SPEC. 3.38)
FD	TEMPORARY FILL DIVERSION (SPEC. 3.10)

NOTE:
SEE VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK FOR EROSION CONTROL SPECIFICATIONS (SPEC.) AND DETAILS.

E & S NOTES

1. THE CONTRACTOR SHALL COMPLY WITH THE CURRENT LAWS AND REGULATIONS OF JAMES CITY COUNTY AND THE COMMONWEALTH OF VIRGINIA BEFORE, DURING, AND AFTER CONSTRUCTION ON THE SITE. ALL MINIMUM STANDARDS AND SPECIFICATIONS REGARDING THE INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE FOLLOWED BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL MONITOR ALL DOWNSTREAM AREAS FOR SIGNS OF EROSION AND SEDIMENTATION. REPAIR, SEDIMENT REMOVAL, AND INSTALLATION OF ADDITIONAL MEASURES IN AFFECTED AREAS SHALL BE PERFORMED AS NECESSARY.
3. WORK ON STORMWATER CONVEYANCE SYSTEM OUTFALLS SHALL BE COORDINATED WITH WEATHER PREDICTIONS TO PREVENT STORMWATER FROM FLOWING THROUGH OPEN TRENCHES LEADING INTO STORMWATER BASINS OR ENVIRONMENTALLY SENSITIVE AREAS.
4. AFTER FINAL STABILIZATION OF THE SITE, THE CONTRACTOR SHALL INSPECT THE BMP'S AND REMOVE ANY SEDIMENT AND DEBRIS.
5. EC-2 MATTING SHALL BE PLACED ON ALL PROPOSED SLOPES 4:1 OR STEEPER.
6. EC-3 MATTING SHALL BE PLACED ON ALL SLOPES 2:1 OR STEEPER.
7. AT THE END OF EACH WORKING DAY, ANY SEDIMENT TRACKED OR CONVEYED OFFSITE SHALL BE REMOVED AND REDEPOSITED ONTO THE CONSTRUCTION SITE. REMOVAL CAN BE COMPLETED THROUGH THE USE OF MECHANICAL OR HAND TOOLS, BUT MUST NEVER BE REMOVED WITH THE USE OF WATER.
8. ALL PUMPING OF SEDIMENT LADEN WATER SHALL BE THROUGH A DIRT BAG FILTRATION DEVICE, OR EQUIVALENT SEDIMENT REMOVAL FACILITY, OVER NON-DISTURBED VEGETATED AREAS. DISCHARGE POINTS SHOULD BE ESTABLISHED TO PROVIDE FOR MAXIMUM DISTANCE TO ACTIVE WATERWAYS.
9. EXISTING VEGETATION WHICH IS TO REMAIN IN PLACE SHALL BE PROTECTED WITHIN THE DRIP LINES. VEGETATION DAMAGED BY CONSTRUCTION OPERATIONS SHALL BE REPAIRED OR REPLACED IN A MANNER ACCEPTABLE TO THE OWNER/DEVELOPER.

E & S NARRATIVE

PROJECT DESCRIPTION
THE PROJECT IS PART OF A PLANNED DEVELOPMENT KNOWN AS WILLIAMSBURG LANDING. THE PROPOSED PROJECT CONSISTS OF A LARGE, TWO-STORY ADDITION TO THE EXISTING ASSISTED LIVING BUILDING, FIVE SMALLER ADDITIONS, A NEW WAREHOUSE BUILDING, AND A PARKING LOT EXPANSION.

EXISTING SITE CONDITIONS
THE AREA OF THE LARGE PARKING EXPANSION AND NEW WAREHOUSE IS CURRENTLY WOODED. THE AREAS WHERE THE THE ADDITIONS TO THE ASSISTED LIVING BUILDING ARE PROPOSED ARE MOSTLY OPEN WITH GRASS COVER. THE PROJECT SITE SITS ON A HIGH POINT OF THE IMMEDIATE AREA OF THE OVERALL DEVELOPMENT.

ADJACENT PROPERTIES
THE PROJECT SITE IS LOCATED IN THE MIDDLE OF THE OVERALL WILLIAMSBURG LANDING DEVELOPMENT SITE. IT IS BOUNDED BY THE MAIN ACCESS ROAD TO THE WILLIAMSBURG LANDING DEVELOPMENT TO THE SOUTHWEST, BY THE ACCESS ROAD AND WOODED AREA TO THE PARKING LOTS TO THE SOUTHEAST, A WOODED AREA AND EVENTUALLY ROUTE 199 TO THE NORTHEAST, AND ANOTHER WILLIAMSBURG LANDING DEVELOPMENT TO THE NORTHWEST.

OFF-SITE AREAS
EXCESS MATERIAL SHALL BE DISPOSED OF OFF SITE ACCORDINGLY.

SOILS DESCRIPTION
THE SOIL CONSERVATION SERVICE HAS IDENTIFIED THIS SITE AS CONTAINING SOIL TYPES 11C, 15F, 19B, AND 29B.

CRITICAL AREAS
THERE ARE NO CRITICAL AREAS IN AREA OF THE PROJECT SITE.

EROSION AND SEDIMENT CONTROL MEASURES
EROSION AND SEDIMENT CONTROL MEASURES SUCH AS SILT FENCE AND INLET PROTECTION WILL BE UTILIZED AND INSTALLED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK TO MINIMIZE THE TRANSPORTATION OF SEDIMENT OUTSIDE THE PROJECT SITE.

PERMANENT STABILIZATION
PERMANENT SEEDING, LANDSCAPING AND TURF WILL BE USED TO STABILIZE THE SITE AFTER CONSTRUCTION IS COMPLETE.

STORM WATER MANAGEMENT/BMP
STORMWATER RUNOFF FROM THE PROJECT SITE WILL BE DIRECTED TO ONE OF TWO EXISTING BMP'S. BMP#1 (DRY POND) IS LOCATED ADJACENT TO THE ACCESS ROAD TO THE PARKING LOTS AND BMP#2 (WET POND) IS LOCATED NORTHWEST OF THE PROPOSED WAREHOUSE.

SEQUENCE OF CONSTRUCTION

1. INSTALL CONSTRUCTION ENTRANCE AT NEW PARKING LOT.
2. INSTALL SILT FENCE, TREE PROTECTION, AND INLET PROTECTION AT EXISTING STRUCTURES THROUGHOUT PROJECT SITE.
3. CLEAR WOODED AREA OF SITE.
4. PERFORM EARTHWORK FOR BMP#2 AND NEW PARKING LOT SIMULTANEOUSLY AND INSTALL STORM SEWER SYSTEM.
5. INSTALL FILL DIVERSION FOR EACH LIFT OF NEW PARKING LOT. USE SILT SAVERS ON PARKING LOT INLETS UNTIL STONE BASE IS COMPLETE.
6. INSTALL GEOTHERMAL SYSTEM (OPTIONAL)
7. STONE PARKING LOT IMMEDIATELY. PAVE AS SOON AS POSSIBLE.
8. PERFORM EARTHWORK FOR REALIGNMENT OF ACCESS ROAD.
9. INSTALL CONSTRUCTION ENTRANCE AT ACCESS ROAD.
10. INSTALL UNDERGROUND UTILITIES IN AREA OF REALIGNED ACCESS ROAD.
11. PAVE NEW ACCESS ROAD.
12. ROUGH GRADE, INSTALL STORM SEWER SYSTEM, INSTALL UTILITIES ON REMAINDER OF SITE.
13. DEMOLISH EXISTING PAVED AREAS AS NOTED.
14. BEGIN BUILDING CONSTRUCTION.
15. GRADE AND PAVE REMAINING PARKING LOT AREAS AND INSTALL LANDSCAPING & LIGHTING.
16. REPAIR ANY INADVERTENT EROSION AND REMOVE ANY SEDIMENTATION. DRESS, MULCH, SOD, AND SEED ALL DISTURBED AREAS AS NECESSARY TO EFFECT PERMANENT VEGETATIVE COVER.
17. REMOVE EROSION AND SEDIMENT CONTROL MEASURES WITHIN THIRTY DAYS AFTER FINAL SITE STABILIZATION, AND ONLY AFTER APPROVAL FROM JAMES CITY COUNTY ENVIRONMENTAL DIVISION INSPECTOR.

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
6	09/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
4	08/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB

COMMONWEALTH OF VIRGINIA
NICHOLAS ROTTA
Lic. No. 24730
08/23/10
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

EROSION AND SEDIMENT CONTROL PLAN
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION

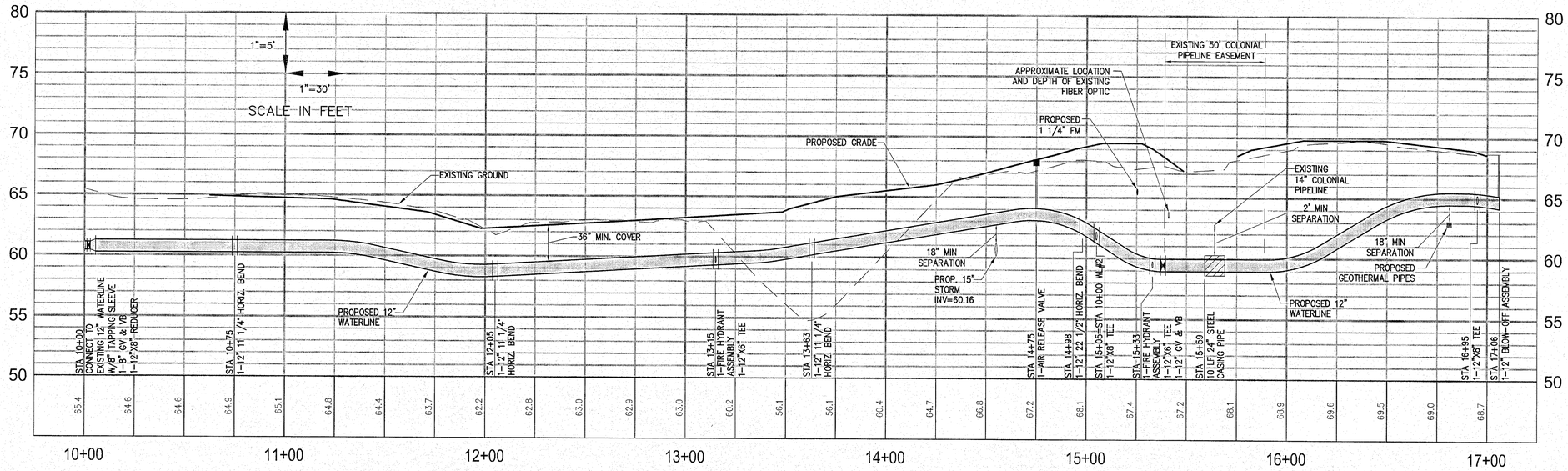
JAMES CITY COUNTY • JAMESTOWN DISTRICT • VIRGINIA

Designed NB	Drawn BBS
Scale 1"=30'	Date 6/28/06
Project No. 8162-05	
Drawing No. 7	

S:\Jobs\8162\05-WmbgLndgExp\dwg\Eng\Plans\8162\05c07-e&s.dwg, 8/20/2010 1:32:22 PM, ryan.stephenson

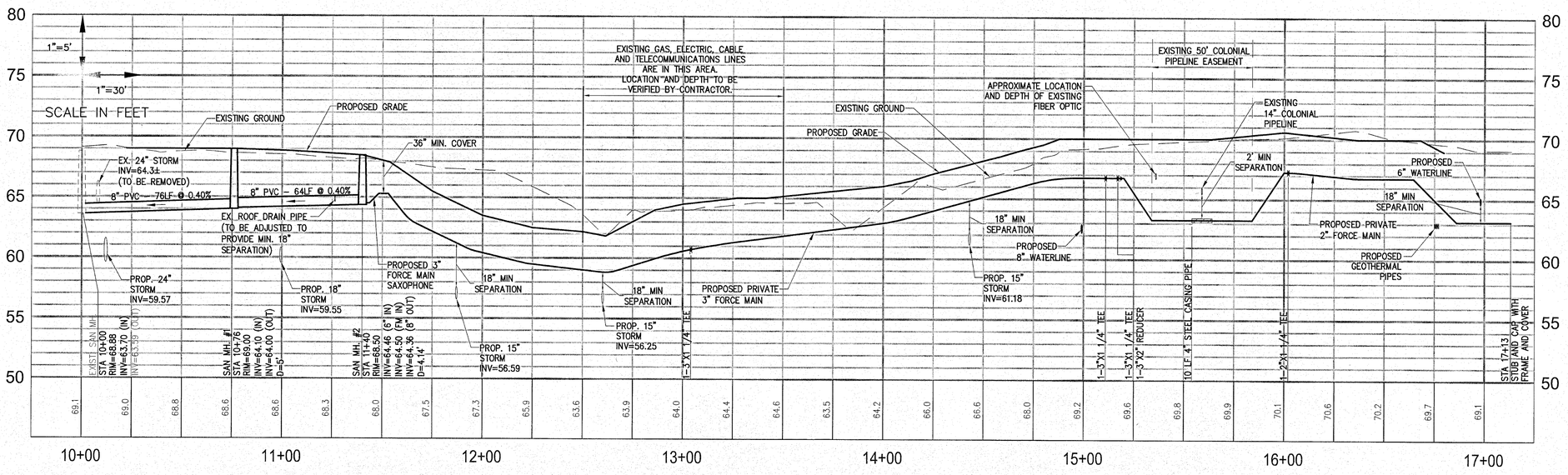
REFER TO JCSA JOINT RESTRAINT TABLE (DWG. NO. JR.1)

LOCATION AND DEPTH OF COLONIAL PIPELINE SHALL BE VERIFIED BY CONTRACTOR AT PROPOSED WATERLINE CROSSING.



PROPOSED WATERLINE #1 - STA 10+00 TO 17+09

LOCATION AND DEPTH OF COLONIAL PIPELINE SHALL BE VERIFIED BY CONTRACTOR AT PROPOSED FORCE MAIN CROSSING.



PROPOSED GRAVITY SANITARY SEWER AND FORCE MAIN
STA 10+00 TO 16+95±

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
7	11/08/13	ADJUSTED ELEV OF WL & FM THROUGH CP EASEMENT	SDC	NB
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
4	08/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB

COMMONWEALTH OF VIRGINIA
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CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

PROFILE SHEET
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
JAMES CITY COUNTY JAMESTOWN DISTRICT VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
AS NOTED	6/28/06
Project No.	
8162-05	
Drawing No.	
9	

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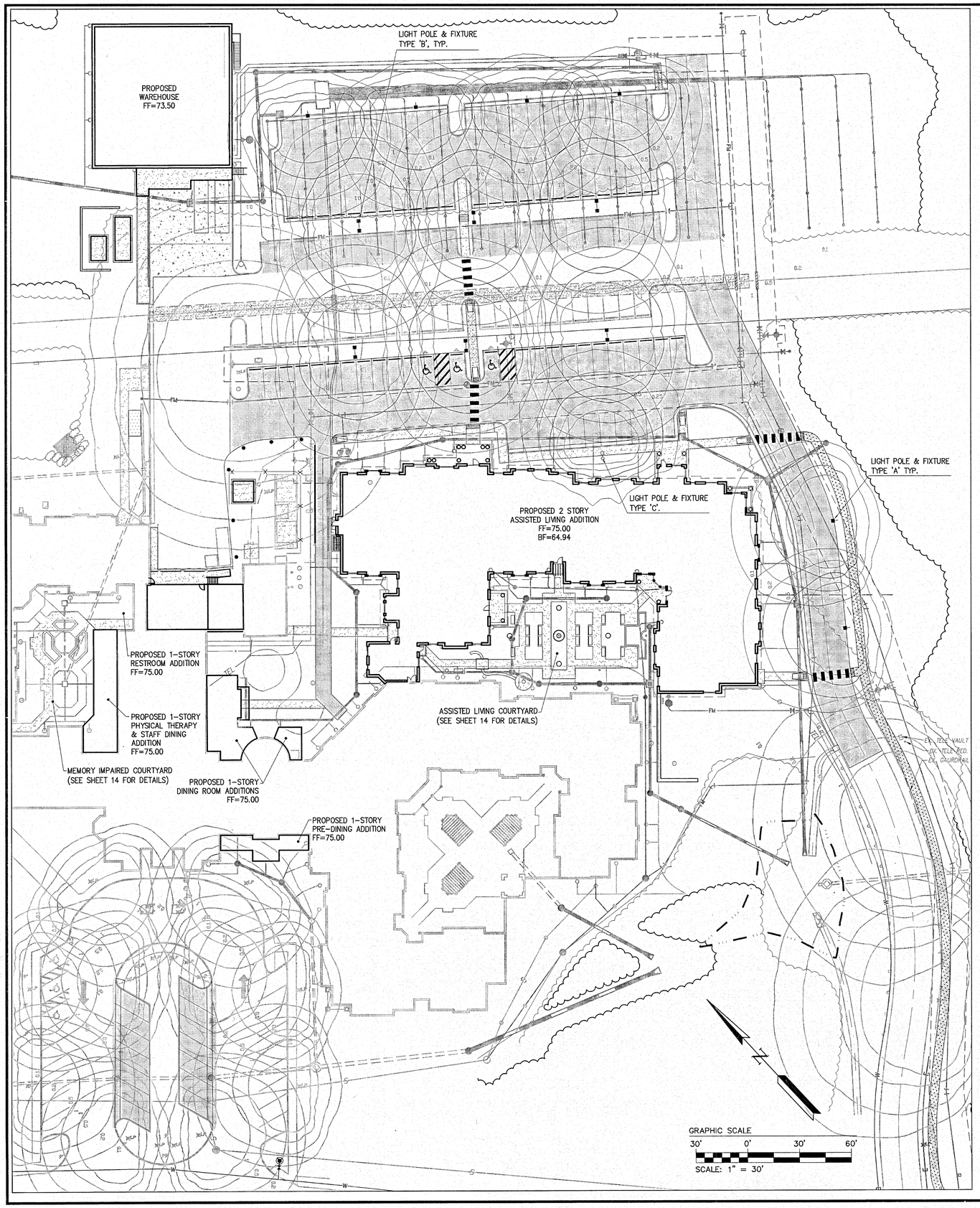

LIGHTING SCHEDULE

KEY	FIXTURE TYPE	MOUNTING HEIGHT	POLE TYPE/ MOUNTING INSTRUCTIONS	FIXTURES PER POLE	TOTAL FIXTURES
A	GARDCO MA17-1-FM-175MH-BRA: SEMI-SPHERICAL SHARP CUTOFF 17" DIA. LUMINAIRE, TYPE IV HORIZANTAL LAMP, 175 WATT METAL HALIDE, CLEAR FLAT LENSE, BRONZE TO MATCH EXISTING FIXTURES.	15'	GARDCO POLE TO MATCH EXISTING LIGHT POLES ON SITE, AND CONTRACTOR TO SPECIFY POLE SIZE.	1	6
B	GARDCO MA17-1-FM-175MH-BRA: SEMI-SPHERICAL SHARP CUTOFF 17" DIA. LUMINAIRE, TYPE IV HORIZANTAL LAMP, 175 WATT METAL HALIDE, CLEAR FLAT LENSE, BRONZE TO MATCH EXISTING FIXTURES.	15'	GARDCO POLE TO MATCH EXISTING LIGHT POLES ON SITE, AND CONTRACTOR TO SPECIFY POLE SIZE.	2	12
C	GARDCO MA17-1-FM-175MH-BRA-HSS: SEMI-SPHERICAL SHARP CUTOFF 17" DIA. LUMINAIRE, TYPE IV HORIZANTAL LAMP, 175 WATT METAL HALIDE, CLEAR FLAT LENSE W/ HOUSE-SIDE SHIELD, BRONZE TO MATCH EXISTING FIXTURES.	15'	GARDCO POLE TO MATCH EXISTING LIGHT POLES ON SITE, AND CONTRACTOR TO SPECIFY POLE SIZE.	1	1

Notes: Job: Type:

FORM 10 ROUND

CA/MA ARM MOUNT

GENERAL DESCRIPTION: The Gardco Round arm mounted Form 10 products are cylindrical (CA) or semi-spherical (MA) sharp cutoff luminaires using high intensity discharge lamps up to 1000 watts (400w in the MA). Housings are one-piece seamless spun aluminum and finished with either Architectural Class 1 anodizing or electrostatically applied polyurethane. Luminaires can accept one of eight (8) interchangeable and rotatable precision segmented optical systems.

ORDERING — *Flat glass lens luminaires meet IESNA Full Cutoff criteria. Sag Lens luminaires meet IESNA Cutoff criteria.*

PREFIX	CONFIGURATION	DISTRIBUTION	WATTAGE	VOLTAGE	FINISH	OPTIONS

Enter the order code into the appropriate box shown. Note: Gardco reserves the right to refuse a configuration. Not all combinations and configurations are valid. Refer to notes below for exclusions and restrictions. For questions or concerns, please consult the factory.

PREFIX

CA17	17" Diameter Cylindrical Luminaire	
MA17	17" Diameter Semi-Spherical Luminaire	
CA22	22" Diameter Cylindrical Luminaire	
MA22	22" Diameter Semi-Spherical Luminaire	

DISTRIBUTION

Horizontal Lamp

1	Type I
3	Type III
4X	Type IV (22" luminaire only)
FM	Type IV
Q	Type V

Vertical Lamp

VS	Type V
	(Supplied with acrylic sag lens. Medium base only on 17" luminaires only)
FCSV	Type III, Full cutoff
FCVS[5]	Type V, Full cutoff

[5] 70HPS/39W only. Supplied with MT30/BRZ/120/LC/CFS lamp

VOLTAGE

120	240	347	QUAD
208	277	480	MA8000/A277. Factory lead is 277V

FINISH

BRP	Bronze Paint	BLA	Black Anodized
BLP	Black Paint	BRA	Bronze Anodized
WP	White Paint	NA	Natural Anodized
NP	Natural Aluminum Paint		
OC	Optional Color Paint (Specify RAL equivalent. ex: OC-RAL7021)		
SC	Special Color Paint (Specify Vitrin supply color chip)		

CONFIGURATION

1	Single Assembly	3	Triple at 90°
2	Twin Assembly	3@120	Triple at 120°
2@90	Twin Assembly at 90°	4	Quad Assembly

WATTAGE

CA17	MA17	CA22	MA22
50MH[1]	50MH[1]	250MH	250MH
70MH	70MH[1]	400MH	400MH
100MH[1]	100MH[1]	1000MH[1,2,4]	260PSMH[1]
150MH[1]	150MH[1]	250PSMH[1]	320PSMH[1]
175MH	175MH	320PSMH[1]	350PSMH
200MH	175PSMH[1,4]	350PSMH	400PSMH
250MH[1,2]	70HPS	400PSMH[1]	450PSMH[1,2]
175PSMH[1,4]	100HPS	450PSMH	250HPS
250PSMH[1]	150HPS[1]	750PSMH[2]	400HPS
70HPS		875PSMH	
100HPS		1000PSMH[1,2,4]	
150HPS[3]		250HPS	MH: Metal Halide
		400HPS	PSMH: Pulse Start Metal Halide
		750HPS[3]	HPS: High Pressure Sodium

1 Medium base lamp
2 Available with vertical lamp option only
3 Available with horizontal lamps only
4 Pulse Start Metal Halide
5 Quad 277 Factory only
6 Pulsed and standard with Sag Glass Lens.
7 Available with 40' and 50' poles only
8 50' or 60' long mastarms option require 2 Sag Glass Lens and 2 FCSV Lens
9 MT25 or MT30
10 MT25 or MT30
11 MT30 or MT32
12 MT32 or MT40
13 Pulse Start Metal Halide only
14 For 400W/PSMH with HF ballast

For 1000 Watt Metallic vapor

Brand	Product Code	Catalog Number
Westinghouse	33750	M3 1000/PS/CH/U/BT37/DOH
G.E.	18856	M1PS1000/U/BT37
Mallory	15052	M1000/PS/U/BT37

For 1000 Pulse Start, use

Brand	Product Code	Catalog Number
G.E.	41911	M1PS1000/U/BT37/PS
Westinghouse	49111	M1 1000/PS/U/BT37/DOH/U

WARNING: Use of other lamps voids warranty

OPTIONS

HS	Internal House Side Shield (Supplied standard w/FM optics)	PCR	Photocontrol Receptacle only (N/A with MA units)	PTF2	Pole Top Fitter - 2 5/8" Dia. Tenon
F	Fusing in-Mast (N/A above 400w)	POLY	Polycarbonate Sag Lens (In lieu of flat glass. N/A MHP lamps, 750 - 1000w)	PTF3	Pole Top Fitter - 3-3.5" Dia. Tenon
LF	In-Line/In-Pole Fusing	QS	Quartz Standby (N/A above 400w)	PTF4	Pole Top Fitter - 3.5-4" Dia. Tenon
MF	Mast Arm Filter	SG	Sag Glass Lens (In lieu of flat glass. Supplied standard w/ AK optics and 750-1000w)		
PC	Photocontrol and Receptacle (N/A with MA units or 480V)				

Gardco Lighting reserves the right to change materials or modify the design of its product without notification as part of the company's continuing product improvement program.

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Cooper Group

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GARDCO LIGHTING 7915-400506

FORM 10 ROUND

CA/MA ARM MOUNT

SPECIFICATIONS

GENERAL: Each Gardco Form 10 arm mounted Hardtop is a cylindrical (CA) or semi-spherical (MA) sharp cutoff luminaire for high intensity discharge lamps. Internal components are totally enclosed, rain-tight, dust-tight and corrosion resistant. No venting of optical system or electrical components is required or permitted. Luminaires are completely assembled with no disassembly required for installation. Lamping requires no lifting or hinging the luminaire housing, disturbing wiring or exposing uninsulated live parts.

HOUSING: Housing is one piece, 1000/25cm seamless aluminum with integral rolled circumferential reveal and lower section aperture incorporating a returned flange stiffener to protect against housing edge deformation. Units are offered in profiles of 17"/43.18cm or 22" (55.88cm) diameter.

ARM: Extruded aluminum arm is secured to prewired fixture by contractor. Assembly is suitable for mounting to pole without requiring access to luminaire. Internal extruded channels capture tie rods for proper luminaire to pole alignment.

LENS: One piece, diecast aluminum door frame retains the optically clear, heat and impact resistant tempered flat glass or sag polycarbonate in a sealed maintenance free gasket. Hollow section, high compliance, memory retentive extruded silicone rubber. Type 4X luminaire features sag glass lens and VS unit employs sag acrylic lens. Concealed stainless steel hinge and two (2) flush quarter-turn fasteners secure lens assembly to luminaire.

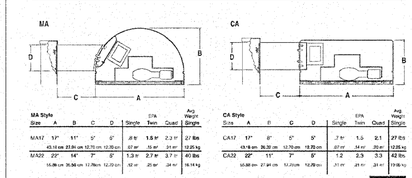
OPTICAL SYSTEMS: The segmented Form Ten optical system is homogeneous sheet aluminum, electrochemically brightened, anodized and sealed. The segmented reflectors are set in faceted arc tube image duplicator patterns to achieve IES Types I, III, IV and V distributions. The metal base lampholder is glazed porcelain with a nickel plated screw shell and is securely attached to the reflector assembly. 50MH, 70MH and 100MH units have medium base lampholders. All horizontal Metal Halide units in the 22" housings have lamp stabilizers ensuring precise arc tube positioning.

ELECTRICAL: Each high power factor ballast is the separate component type, capable of providing reliable lamp starting down to -20°F/-29°C. The ballast is mounted on a unitized tray and secured within the luminaire, above the reflector system. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600VAC at 150°C or higher. Plug disconnects are listed by UL for use at 600VAC, 15A or higher.

FINISH: Anodized housings are created with an Aluminum Association Architectural Class I anodizing process to achieve a bronze, black or natural aluminum finish. Painted units are finished with hardcoat, fade resistant, electrostatically applied polyurethane.

LABELS: All fixtures bear UL or CUL (where applicable) Wet Location labels.

DIMENSIONS



MA Style

Size	A	B	C	D	EPA Single	EPA Twin	EPA Quad	Avg Weight Single
MA17	17"	11"	5"	6"	.8 ft²	1.6 ft²	2.2 ft²	21 lbs
	43.18 cm	27.94 cm	12.70 cm	15.24 cm	.07 m²	.14 m²	.20 m²	10.05 kg
MA22	22"	14"	7"	5"	1.3 ft²	2.7 ft²	3.7 ft²	40 lbs
	55.88 cm	35.56 cm	17.78 cm	12.70 cm	.12 m²	.25 m²	.34 m²	18.14 kg

CA Style

Size	A	B	C	D	EPA Single	EPA Twin	EPA Quad	Avg Weight Single
CA17	17"	8"	5"	9"	.7 ft²	1.3 ft²	2.1 ft²	27 lbs
	43.18 cm	20.32 cm	12.70 cm	22.86 cm	.07 m²	.14 m²	.20 m²	12.25 kg
CA22	22"	11"	7"	9"	1.2	2.3	3.3	42 lbs
	55.88 cm	27.94 cm	17.78 cm	22.86 cm	.11 m²	.21 m²	.31 m²	19.05 kg

Gardco Lighting reserves the right to change materials or modify the design of its product without notification as part of the company's continuing product improvement program.

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Cooper Group

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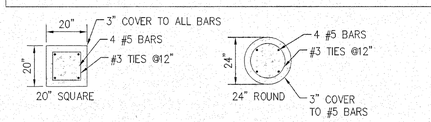
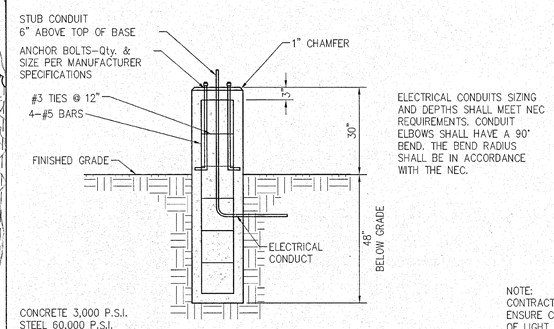
GARDCO LIGHTING 7915-400506

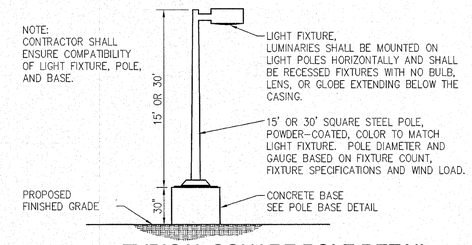




ELECTRICAL CONDUITS SIZING AND DEPTHS SHALL MEET NEC REQUIREMENTS. CONDUIT ELBOWS SHALL HAVE A 90° BEND. THE BEND RADIUS SHALL BE IN ACCORDANCE WITH THE NEC.

16-25' POLE BASE DETAIL

N.T.S



TYPICAL SQUARE POLE DETAIL

N.T.S.

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH
4	08/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH
3	06/28/09	SITE PLAN AMENDMENT #1	ARH
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS

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CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

LIGHTING PLAN AND DETAILS
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION

JAMES CITY COUNTY — JAMESTOWN DISTRICT — VIRGINIA

Designed	Drawn
KSU	KSU
Scale	Date
1"=30'	6/28/06

Project No. 8162-05

Drawing No. 12

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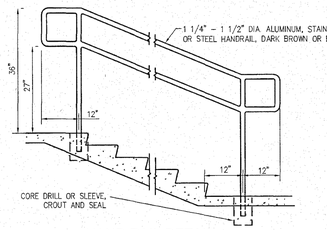
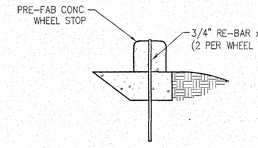
VDOT REFERENCE TABLE

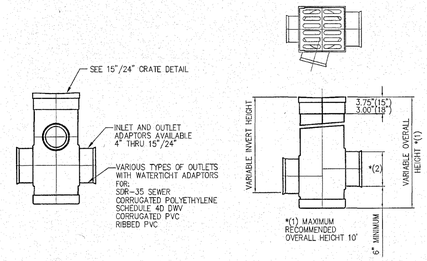
DI-1	104.01
DI-3	104.09 – 104.10
MH-1	106.01
IS-1	106.08
ST-1	106.09
PB-1	107.01 – 107.04
CG-2	201.01
CG-6	201.03
CG-12	203.09



HAND RAIL DETAIL
N.T.S.

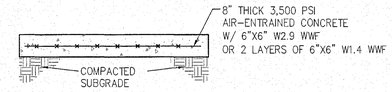


CONC. WHEEL STOP DETAIL
N.T.S.



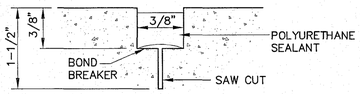
MANUFACTURED BY NYLOPLAST OR APPROVED EQUAL. *(2) 15" DRAIN BASIN – 4'–15" 18" DRAIN BASIN – 4'–18"

15"/18" DRAIN BASIN
N.T.S.



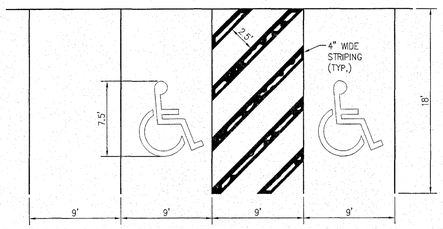
LOADING DOCK SECTION
N.T.S.

NOTE:
POLYURETHANE SEALANT TO BE SIKAFLEX-2C NS/SL POLYURETHANE ELASTOMERIC SEALANT OR EQUIVALENT INSTALLED PER MANUFACTURER'S SPECIFICATIONS IN TEMPERATURES BETWEEN 50°F AND 70°F. SEALANT COLORS AS SPECIFIED ON TNE CONTRACT.

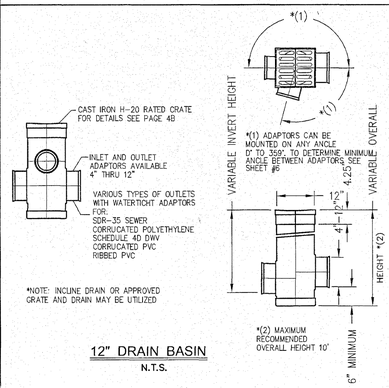


TRUCK LOADING AREA EXPANSION JOINT
N.T.S.

D-EXPJT



PARKING SPACE DETAIL
N.T.S.

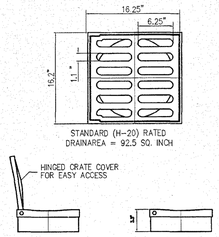


12" DRAIN BASIN
N.T.S.

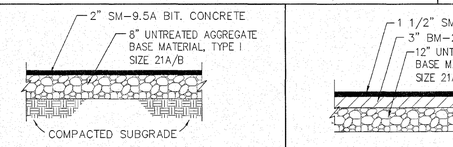
MATERIAL: CAST IRON

QUALITY: MATERIAL SHALL CONFORM TO ASTM A48 – CLASS 30B

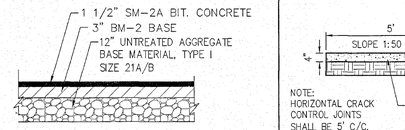
PAINT: CASTINGS ARE FURNISHED WITH A BLACK PAINT



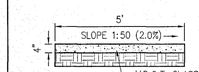
15" CAST IRON GRATE
N.T.S.



TYPICAL PAVEMENT SECTION
N.T.S.



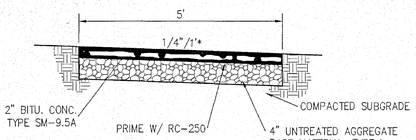
NEW PARKING LOT SECTION
N.T.S.



NOTE:
HORIZONTAL CRACK CONTROL JOINTS SHALL BE 5' C/C.

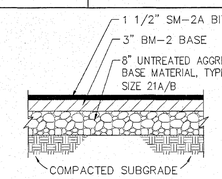
V.D.O.T. CLASS A3 GENERAL PURPOSE CONCRETE, 3000 PSI AT 28 DAY COMPRESSIVE STRENGTH

SIDEWALK DETAIL
N.T.S.

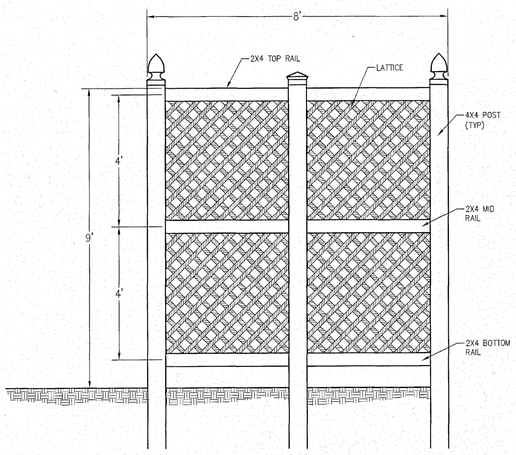


* SLOPES AWAY FROM ROAD

TYPICAL PATH SECTION
N.T.S.

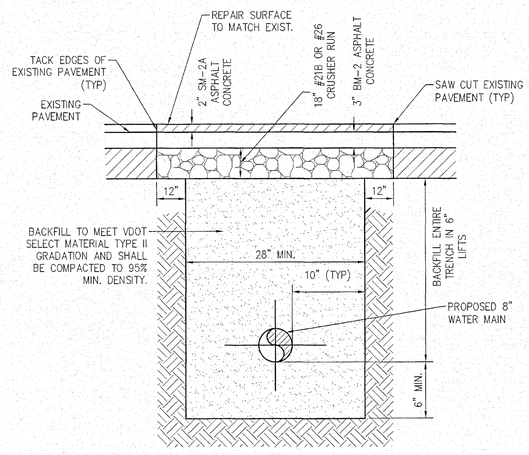


TYPICAL HEAVY PAVEMENT SECTION
N.T.S.

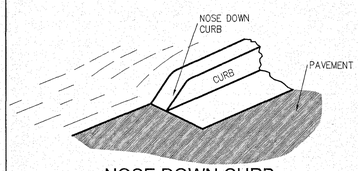


NOTES:
1. POSTS, RAILS AND LATTICE SHALL BE WHITE VINYL/PVC.

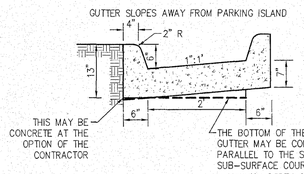
FENCE DETAIL
N.T.S.



PAVEMENT PATCH DETAIL
N.T.S.



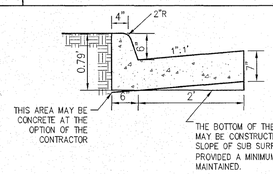
NOSE DOWN CURB
N.T.S.



THIS ITEM MAY BE PRECAST OR CAST IN PLACE

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST

ISLAND CUT THROUGH
N.T.S.

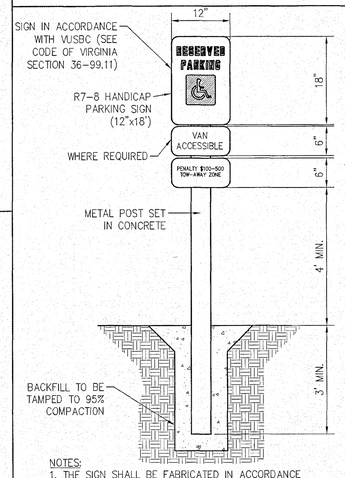


COMBINATION CURB AND GUTTER HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS A RADIAL COMBINATION CURB AND GUTTER.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

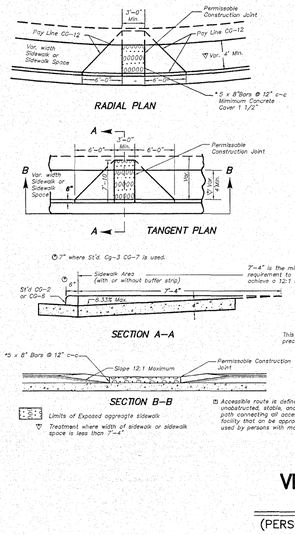
CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

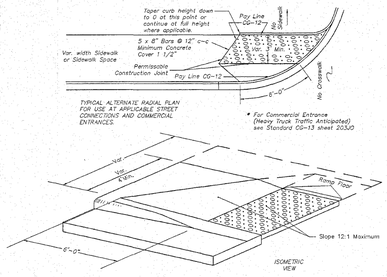
COMBINATION CURB AND GUTTER
N.T.S.



NOTES:
1. THE SIGN SHALL BE FABRICATED IN ACCORDANCE WITH SECTION 701 AND INSTALLED PER INSTALLATION DETAIL WSP-1 TYPE C OF THE VDOT ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS.
2. VAN ACCESSIBLE SPACES SHALL HAVE ADDITIONAL SIGNAGE READING "VAN ACCESSIBLE".

HANDICAP SIGN DETAIL
N.T.S.





NOTES:

Curb ramp to be class A-3 Concrete (class A-4 if precast) with slip resistant integral detectable warning surface covering the entire width of the ramp floor (ramp floor may be precast or cast in place). The detectable warning shall be provided by an exposed aggregate finish. Ramp shall not exceed a maximum slope of 12:1.

Flared sides of curb ramp to be poured monolithically with ramp floor or by using permissible construction joint with required bars.

If ramp floor is precast, holes must be provided for dowel bars so that adjoining flared sides can be cast in place after placement of precast ramp floor. Precast concrete shall be class A-4.

Required bars are to be No. 5 X 8" placed 1" center to center along both sides of the ramp floor, mid-depth of ramp floor. Minimum concrete cover 1 1/2".

Curb ramps will be measured and paid for at the contract unit prices for Hydraulic Cement Concrete Sidewalk and Exposed aggregate sidewalk, complete-in-place.

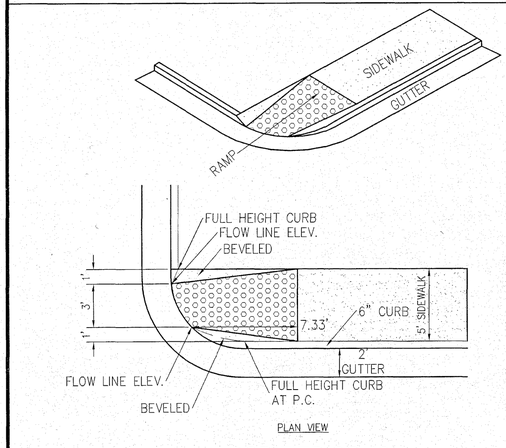
Curb/curb and gutter slope transitions adjacent to curb ramps are included in payment for curb/curb and gutter.

When used in conjunction with Standard CG-3 or CG-7, the curb face on this Standard is to be adjusted to match the mountable curb configuration.

Curb ramps are to be located as shown on the plans or as directed by the Engineer. They are to be provided at intersections wherever an accessible route * within the right-of-way of a highway facility crosses a curb regardless of whether sidewalk is existing, proposed or nonexistent. They may be offset from pedestrian crosswalks as shown on plans or as directed by the Engineer, but should not be located behind vehicle stop lines. Existing light poles, fire hydrants, drop inlets, etc. will also affect placement.

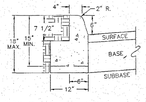
VDOT STD. CG-12 CURB RAMP
(PERSONS WITH MOBILITY IMPAIRMENTS)
N.T.S.

C&G\D-CG12



PLAN VIEW

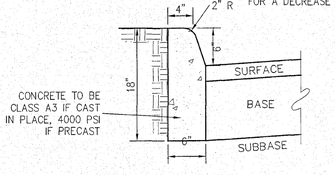
MODIFIED CG-12
N.T.S.



ACCEPTABLE ALTERNATE IF CURB IS EXTRUDED

NOTE:
CURB HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.

THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 3" (15" DEPTH) OR INCREASED AS MUCH AS 3" (21" DEPTH) IN ORDER THAT THE BOTTOM OF THE CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE, THE DEPTH IS TO BE 18" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.



CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST

THIS ITEM MAY BE PRECAST OR CAST IN PLACE

STANDARD 6" CURB
N.T.S.

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
4	09/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB

COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
08/23/10
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

NOTES AND DETAILS
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION

JAMES CITY COUNTY — JAMESTOWN DISTRICT — VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
1"=30'	6/28/06

Project No. 8162-05

Drawing No. 14

S:\Jobs\8162\05-Wmbg_Ldg\Exp\dwg\Eng\Plans\8162\05c14-detail.dwg, 8/20/2010 1:36:24 PM, ryan.stephenson

JAMES CITY COUNTY ENVIRONMENTAL DIVISION EROSION AND SEDIMENT CONTROL NOTES
REVISED 7/6/01

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OR STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, ALL APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. IN ADDITION TO THESE NOTES, ALL PROVISIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS SHALL APPLY TO THIS PROJECT.

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, 3RD EDITION, 1992. THE CONTRACTOR SHALL BE THOROUGHLY FAMILIAR WITH ALL APPLICABLE MEASURES CONTAINED THEREIN THAT MAY BE PERTINENT TO THIS PROJECT, INCLUDING MINIMUM STANDARDS 1 THROUGH 19. IF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN IS FOUND TO BE INADEQUATE IN THE FIELD, THE MINIMUM STANDARDS WILL APPLY IN ADDITION TO THE PROVISIONS OF THE APPROVED PLAN.

2. AS A PREREQUISITE TO APPROVAL OF AN EROSION AND SEDIMENT CONTROL PLAN FOR LAND-DISTURBING ACTIVITIES, THE NAME OF A RESPONSIBLE LAND-DISTURBER SHALL BE PROVIDED. THE RESPONSIBLE LAND-DISTURBER SHALL BE AN INDIVIDUAL WHO HOLDS A VALID CERTIFICATE OF COMPETENCE ISSUED BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND IS DEFINED AS THE PERSON IN CHARGE OF AND RESPONSIBLE FOR CARRYING OUT THE LAND-DISTURBING ACTIVITY. PERMITS OR PLANS WITHOUT THIS INFORMATION ARE DEEMED INCOMPLETE AND WILL NOT BE APPROVED UNTIL PROPER NOTIFICATION IS RECEIVED. ALSO, IF THE PERSON DESIGNATED AS RESPONSIBLE LAND-DISTURBER CHANGES BETWEEN THE TIME OF PLAN APPROVAL AND THE SCHEDULED PRECONSTRUCTION MEETING, THE ENVIRONMENTAL DIVISION SHALL BE INFORMED OF THE CHANGE, IN WRITING, 24-HOURS IN ADVANCE OF THE PRECONSTRUCTION MEETING.

3. A PRECONSTRUCTION MEETING SHALL BE HELD ON SITE BETWEEN THE COUNTY, THE DEVELOPER, THE PROJECT ENGINEER, THE RESPONSIBLE LAND-DISTURBER AND THE CONTRACTOR PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY FOR APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING. THE DESIGNATED RESPONSIBLE LAND-DISTURBER IS REQUIRED TO ATTEND THE PRECONSTRUCTION MEETING FOR THE PROJECT.

4. ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS SHALL BE PROTECTED BY A TEMPORARY CONSTRUCTION ENTRANCE TO PREVENT TRACKING OF MUD ONTO PUBLIC RIGHT-OF-WAYS. AN ENTRANCE PERMIT FROM VDOT IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES WITHIN STATE RIGHT-OF-WAYS. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, THE ROAD SHALL BE THOROUGHLY CLEANED AT THE END OF EACH DAY (STD & SPEC 3.02)

5. SEDIMENT BASINS AND TRAPS (STD & SPEC 3.13 AND 3.14), PERIMETER DIKES (STD & SPEC 3.09 AND 3.12), SEDIMENT FILTER BARRIERS (STD. & AND SPEC 3.05) AND OTHER MEASURES INTENDED TO TRAP SEDIMENT ON-SITE MUST BE CONSTRUCTED AS A FIRST STEP IN GRADING AND MUST BE MADE FUNCTIONAL PRIOR TO ANY UPSLOPE LAND DISTURBANCE TAKING PLACE. EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS MUST BE SEEDED AND MULCHED IMMEDIATELY AFTER INSTALLATION. PERIODIC INSPECTIONS OF THE EROSION CONTROL MEASURES BY THE OWNER OR OWNER'S REPRESENTATIVE SHALL BE MADE TO ASSESS THEIR CONDITION. ANY NECESSARY MAINTENANCE OF THE MEASURES SHALL BE ACCOMPLISHED IMMEDIATELY AND SHALL INCLUDE THE REPAIR OF MEASURES DAMAGED BY ANY SUBCONTRACTOR INCLUDING THOSE OF THE PUBLIC UTILITY COMPANIES.

6. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING THE SLOPES OR BY INSTALLING MECHANICAL DEVICES TO SAFELY LOWER WATER DOWNSLOPE WITHOUT CAUSING EROSION. A TEMPORARY FILL DIVERSION (STD & SPEC. 3.10) AND SLOPE DRAIN (STD. & SPEC 3.15) SHALL BE INSTALLED PRIOR TO THE END OF EACH WORKING DAY.

7. SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. ENVIRONMENTAL DIVISION APPROVAL WILL BE REQUIRED FOR OTHER DEVIATIONS FROM THE APPROVED PLAN.

8. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THE PLAN. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE ENVIRONMENTAL DIVISION PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

9. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF THE SAME (STD & SPEC 3.18). THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

10. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN SEVEN DAYS TO DENUDED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 30 DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.

11. NO MORE THAN 300 FEET OF SANITARY SEWER, STORM DRAIN, WATER OR UNDERGROUND UTILITY LINES ARE TO BE OPEN AT ONE TIME. FOLLOWING INSTALLATION OF ANY PORTION OF THESE ITEMS, ALL DISTURBED AREAS ARE TO BE IMMEDIATELY STABILIZED (I.E., THE SAME DAY).

12. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING (STD & SPEC 3.35). SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

13. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME AND FERTILIZER (STD & SPEC 3.32). IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

14. ALL SLOPES STEEPER THAN 3H:1V SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS AND MATTINGS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH STD. & SPEC. 3.35, MULCHING, STD. & SPEC. 3.36, SOIL STABILIZATION BLANKETS AND MATTING AND MANUFACTURER=S INSTRUCTIONS. NO SLOPES SHALL BE CREATED STEEPER THAN 2H:1V.

15. INLET PROTECTION (STD & SPEC 3.07 AND 3.08) SHALL BE PROVIDED FOR ALL STORM DRAIN AND CULVERT INLETS FOLLOWING CONSTRUCTION OF THE SAME.

16. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

17. PAVED DITCHES SHALL BE REQUIRED WHEREVER ACCELERATED EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

18. TEMPORARY EROSION CONTROL MEASURES SUCH AS SILT FENCE ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. TRAPPED SEDIMENT SHALL BE SPREAD, SEEDED AND MULCHED. AFTER THE PROJECT AND STABILIZATION IS COMPLETE, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS.

19. NO SEDIMENT TRAP OR SEDIMENT BASIN SHALL BE REMOVED UNTIL A) AT LEAST 75 PERCENT OF THE LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN HAVE BEEN SOLD TO A THIRD PARTY (UNRELATED TO THE DEVELOPER) FOR THE CONSTRUCTION OF HOMES AND/OR B) 60 PERCENT OF THE SINGLE FAMILY LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN HAVE BEEN COMPLETED AND THE SOIL STABILIZED. A BULK SALE OF THE LOTS TO ANOTHER BUILDER DOES NOT SATISFY THIS PROVISION. SEDIMENT TRAPS AND SEDIMENT BASINS SHALL NOT BE REMOVED WITHOUT THE EXPRESS AUTHORIZATION OF THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION.

20. RECORD DRAWINGS (AS-BUILTS) AND CONSTRUCTION CERTIFICATIONS ARE BOTH REQUIRED FOR NEWLY CONSTRUCTED OR MODIFIED STORMWATER MANAGEMENT/BMP FACILITIES. CERTIFICATION ACTIVITIES SHALL BE ADEQUATELY COORDINATED AND PERFORMED BEFORE, DURING AND FOLLOWING CONSTRUCTION IN ACCORDANCE WITH THE CURRENT VERSION OF THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION, STORMWATER MANAGEMENT/BMP FACILITIES, RECORD DRAWING AND CONSTRUCTION CERTIFICATION, STANDARD FORMS & INSTRUCTIONS.

21. DESIGN AND CONSTRUCTION OF PRIVATE-TYPE SITE DRAINAGE SYSTEMS OUTSIDE VDOT RIGHTS-OF-WAY SHALL BE PERFORMED IN ACCORDANCE WITH THE CURRENT VERSION OF THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION, STORMWATER DRAINAGE CONVEYANCE SYSTEMS (NON-BMP RELATED), GENERAL DESIGN AND CONSTRUCTION GUIDELINES.

JCSA GENERAL NOTES FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS
(Revised March 2008)

A. ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL CONSTRUCTION STANDARDS (FOURTH EDITION WITH AMENDMENTS DATED OCTOBER 2006), AND THE COMMONWEALTH OF VIRGINIA DEPARTMENT OF HEALTH *WATERWORKS AND SANITARY SEWERAGE REGULATIONS*. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA AND HRPDC REGIONAL CONSTRUCTION STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO JCSA.

B. THE CONTRACTOR/DEVELOPER SHALL ACQUIRE A CERTIFICATE TO CONSTRUCT WATER AND SANITARY SEWER FACILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION OF ANY WATER OR SANITARY SEWER FACILITIES.

C. A PRECONSTRUCTION MEETING SHALL BE HELD BETWEEN JCSA, THE DEVELOPER, THE CONTRACTOR INCLUDING RELEVANT SUBCONTRACTOR(S), AND THE PROJECT ENGINEER PRIOR TO ISSUANCE OF A JCSA CERTIFICATE TO CONSTRUCT. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SCHEDULE THIS MEETING WITH JCSA AND COORDINATE WITH THE OTHER ATTENDEES.

D. THE DEVELOPER'S REPRESENTATIVE SHALL SUBMIT SHOP DRAWINGS FOR ALL MATERIALS AND RECEIVE JCSA APPROVAL PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL MATERIALS ORDERED AND INSTALLED PRIOR TO JCSA'S REVIEW AND ACCEPTANCE WILL BE AT THE CONTRACTOR'S/DEVELOPER'S RISK.

E. PIPE LINES AND SERVICES SHALL BE INSTALLED AFTER GRADING TO WITHIN 6-INCHES OF FINAL GRADE AND PRIOR TO PLACEMENT OF BASE MATERIAL.

F. ALL WATER MAINS SHALL BE FULLY FLUSHED, PRESSURE TESTED, AND DISINFECTED AND SATISFACTORY BACTERIOLOGICAL SAMPLES OBTAINED, IN ACCORDANCE WITH JCSA DESIGN AND ACCEPTANCE CRITERIA. FLUSHING OF WATER MAINS SHALL BE SCHEDULED WITH THE JCSA INSPECTOR MINIMUM 3 BUSINESS DAYS PRIOR TO THE FLUSHING. CONTRACTOR SHALL PROVIDE THE REQUIRED DURATION AND VOLUME TO THE INSPECTOR. FLUSHING WILL BE SCHEDULED ONLY ON MONDAYS, UNLESS AUTHORIZED OTHERWISE BY JCSA, AND WILL BE ON A FIRST COME-FIRST SERVE BASIS.

G. ROUTINE PERIODIC INSPECTIONS DURING CONSTRUCTION WILL BE PROVIDED BY JCSA. THESE INSPECTIONS DO NOT RELIEVE THE DEVELOPER/CONTRACTOR/OWNER FROM HIS OBLIGATION AND RESPONSIBILITY FOR CONSTRUCTING A WATER DISTRIBUTION AND SANITARY SEWER SYSTEM IN STRICT ACCORDANCE WITH THE JCSA DESIGN AND ACCEPTANCE CRITERIA.

H. ANY FIELD MODIFICATIONS OR CHANGES TO THE APPROVED PLANS SHALL BE VERIFIED AND CHECKED BY THE ENGINEER OF RECORD AND APPROVED BY JCSA PRIOR TO ANY FIELD MODIFICATIONS OR CHANGES. ALL APPROVED CHANGES AND FIELD MODIFICATIONS SHALL BE ACCURATELY INDICATED ON THE RECORD DRAWINGS.

I. ALL LOTS SHALL BE PROVIDED WITH WATER SERVICE AND SANITARY SEWER CONNECTIONS. THE CONNECTIONS SHALL BE EXTENDED FROM THE MAIN TO THE PROPERTY LINE OR EASEMENT LINE, AND SHALL TERMINATE WITH A YOKE IN A METER BOX, OR AT THE CLEAN OUT, SET AT FINAL FINISHED GRADE. METERS FOR ALL LOTS (UNITS) SHALL BE PAID FOR BY THE DEVELOPER OR BUILDER AND INSTALLED BY JCSA.

J. ANY REQUIRED EASEMENTS, PERMITS AND APPROVALS SHALL BE ACQUIRED BY THE DEVELOPER PRIOR TO COMMENCEMENT OF WATER MAIN AND/OR SANITARY SEWER CONSTRUCTION.

K. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS AND ORDERS OF ANY PUBLIC BODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION. THE CONTRACTOR SHALL ALSO NOTIFY "MISS UTILITY" AT 1-800-552-7001 OR 811 PRIOR TO PERFORMING ANY UNDERGROUND EXCAVATION.

L. WATER METER BOX INSTALLATION SHALL MAINTAIN A MINIMUM 18-INCH HORIZONTAL EDGE-TO-EDGE CLEARANCE FROM DRIVEWAYS AND/OR DRIVE PATHS, SIDEWALKS, BIKE PATHS, CURBING AND ADJACENT WATER METER BOXES.

M. ONLY JCSA PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ON EXISTING JCSA WATER MAINS AND SANITARY FORCE MAINS. ONCE A SYSTEM HAS BEEN HYDRAULICALLY ENERGIZED, JCSA WILL BE RESPONSIBLE FOR OPERATING THE VALVES. THE CONTRACTOR SHALL CONTACT JCSA OPERATIONS AT 757-229-7421 IF THERE IS AN EMERGENCY OR NEED TO OPEN/CLOSE A VALVE.

N. ANY EXISTING UNUSED WELL(S) SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.

O. BEDDING OF JCSA UTILITIES SHALL BE IN ACCORDANCE WITH HRPDC DETAIL EW_01.

P. NO TREES, SHRUBS, STRUCTURES, FENCES, IRRIGATION MAINS, INVISIBLE PET FENCES OR OTHER OBSTACLES SHALL BE PLACED WITHIN AN EASEMENT WHICH WOULD RENDER THE EASEMENT INACCESSIBLE BY EQUIPMENT. SHRUBS SHALL BE A MINIMUM OF 5 FEET, AND TREES A MINIMUM OF 10 FEET, FROM THE CENTER OF WATER AND SANITARY SEWER PIPELINES.

Q. JOINT RESTRAINT SHALL BE PROVIDED IN ACCORDANCE WITH MINIMUM REQUIREMENTS OF JCSA DETAIL JR.1, UNLESS SHOWN OTHERWISE ON THE PLANS. ALL PRESSURE PIPELINES SHALL HAVE JOINT RESTRAINT. FIRE HYDRANTS SHALL BE RESTRAINED AT LEAST ONE FULL JOINT OF PIPE IN EACH DIRECTION ON THE MAINLINE.

R. PROPOSED WATER AND SANITARY SEWER SYSTEMS SHALL MAINTAIN A MINIMUM HORIZONTAL SEPARATION OF 5-FEET FROM OTHER UTILITIES AND STRUCTURES, INCLUDING BUT NOT LIMITED TO STORM SEWERS, STREET LIGHTS, ETC. WATER AND SANITARY SEWER FACILITIES SHALL HAVE A MINIMUM 10-FOOT HORIZONTAL EDGE-TO-EDGE SEPARATION.

S. ANY PROPOSED BACKFLOW PREVENTION DEVICE AND/OR GREASE TRAP MUST BE INSPECTED BY THE JCSA UTILITY SPECIAL PROJECTS COORDINATOR AT (757) 259-4138.

T. THE CONTRACTOR/DEVELOPER SHALL ACQUIRE A CERTIFICATE TO CONSTRUCT WATER AND SANITARY SEWER FACILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION OF ANY WATER OR SANITARY SEWER FACILITIES. PLUMBING INSIDE OF PROPOSED BUILDINGS MUST BE INSPECTED BY JCSA'S UTILITY SPECIAL PROJECTS COORDINATOR AT (757) 259-4138, FOR POTENTIAL CROSS CONNECTIONS. ANY CROSS CONNECTIONS MUST BE PROTECTED BY THE APPROPRIATE BACKFLOW PREVENTION DEVICE(S)".

U. EASEMENTS DENOTED AS "JCSA UTILITY EASEMENTS" ARE FOR THE EXCLUSIVE USE OF THE JAMES CITY SERVICE AUTHORITY AND THE PROPERTY OWNER. OTHER UTILITY SERVICE PROVIDERS DESIRING TO USE THESE EASEMENTS WITH THE EXCEPTION OF PERPENDICULAR UTILITY CROSSINGS MUST OBTAIN AUTHORIZATION FOR ACCESS AND USE FROM JCSA AND THE PROPERTY OWNER. ADDITIONALLY, JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO IMPROVEMENTS WITHIN THIS EASEMENT, FROM ANY CAUSE.

V. JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY PAVEMENT SETTLEMENT DUE TO PIPE BEDDING, BACKFILLING, BACKFILL MATERIALS OR COMPACTION FOR WATER OR SANITARY SEWER FACILITIES ON THIS PROJECT.

W. FIRE HYDRANTS TO BE INSTALLED WITHIN EXISTING OR PROPOSED VDOT RIGHT-OF-WAYS SHALL BE LOCATED IN ACCORDANCE WITH VDOT REQUIREMENTS.

X. PRIVATELY OWNED UTILITIES, (E.G., WATER AND SEWER LINES AND PRIVATE FIRE SERVICE MAINS), SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE, AND ENFORCED BY THE JAMES CITY COUNTY CODES COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 24, AND THE VIRGINIA STATEWIDE FIRE PREVENTION CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT FIRST OBTAINING THE REQUIRED PERMITS AND INSPECTIONS.

Y. SANITARY SEWER LATERALS SHALL NOT CONNECT TO THE MAINLINE WITHIN 5-FEET OF A MANHOLE. LATERALS UPSTREAM AND WITHIN 5-FEET OF THE MANHOLE SHALL CONNECT DIRECTLY INTO THE MANHOLE WHERE NECESSARY.

JCSA/HRPDC DETAIL REFERENCES

JCSA

W13.0 WATER METER INSTALLATION
W14.0 METER SETTING
JR.1 JOINT RESTRAINT TABLE

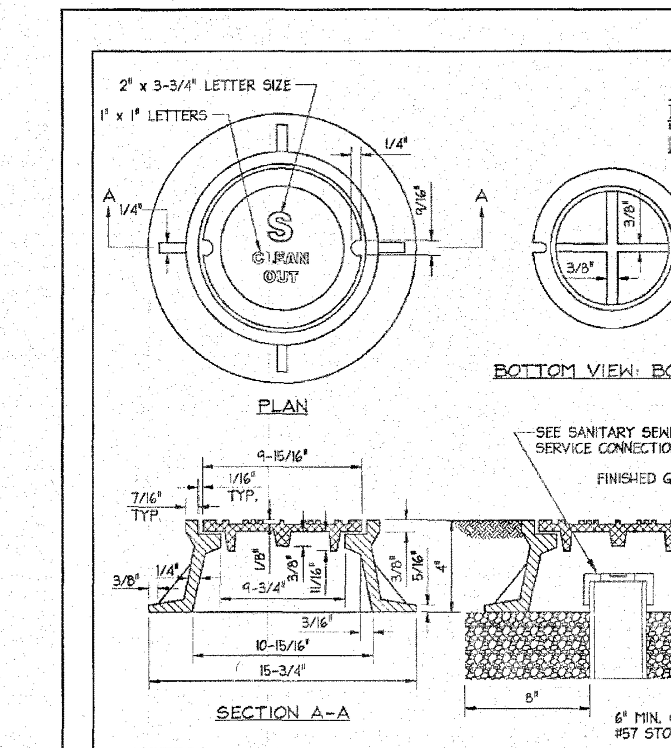
HRPDC

WATER DISTRIBUTION SYSTEMS (WD)
WD_05 BLOW-OFF ASSEMBLY
WD_09 TEMPORARY MANIFOLD FOR TEST & CHLORINATION

SANITARY SYSTEMS (SS)
SS_07 SANITARY SEWER MANHOLE INVERT SHAPING
SS_08 CONNECTION INTO EXISTING MANHOLES
SS_09 SANITARY SEWER MANHOLE CASTING (24")
SS_10 SANITARY SEWER MANHOLE COVER (24")
SS_11 SANITARY SEWER LATERAL CLEAN OUT FRAME AND COVER
SS_17 FORCE MAIN SAXOPHONE

WATER & SANITARY SYSTEMS (WS)
WS_01 STANDARD VALVE BOX FRAME AND COVER
WS_02 VALVE SETTING DETAIL
WS_03 MANUAL AIR VENT ASSEMBLY
WS_04 STEEL CASING DETAIL

REFER TO LATEST EDITIONS OF THE HAMPTON ROADS PLANNING DISTRICT COMMISSION REGIONAL (HRPDC) CONSTRUCTION STANDARDS AND JAMES CITY SERVICE AUTHORITY (JCSA) DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS.



NOTES:
1. CLEAN OUT FRAME & COVER TO BE SUPPLIED BY CAPITAL FOUNDRY OF VIRGINIA, INC. OR APPROVED EQUAL.
2. ALL GRAY IRON CASTINGS SHALL CONFORM TO LATEST EDITION OF ASTM A-48, CLASS 30 AND SHALL BE OF UNIFORM QUALITY.
3. ALL CASTING DIMENSIONS SHALL HAVE A TOLERANCE OF 1/8".
4. ALL CASTINGS SHALL BE CLEANED BY SHOT BLASTING AND HAND CHIPPING UTILIZING STANDARD INDUSTRY PRACTICES PRIOR TO SHOP APPLICATION OF ASPHALTIC COATING, BY DIPPING.

SANITARY SERVICE LATERAL CLEAN OUT FRAME AND COVER
NOT TO SCALE

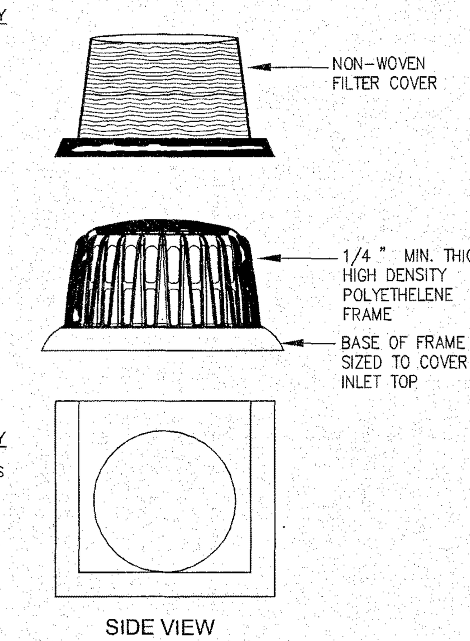
REFERENCE	CATEGORY	DATE	SHEET No.	DETAIL No.
200,802	SANITARY SYSTEMS	12/99	1 OF 1	SS_11

TYPICAL CONSTRUCTION SEQUENCE FOR SILT-SAVER FRAME & FILTER ASSEMBLY

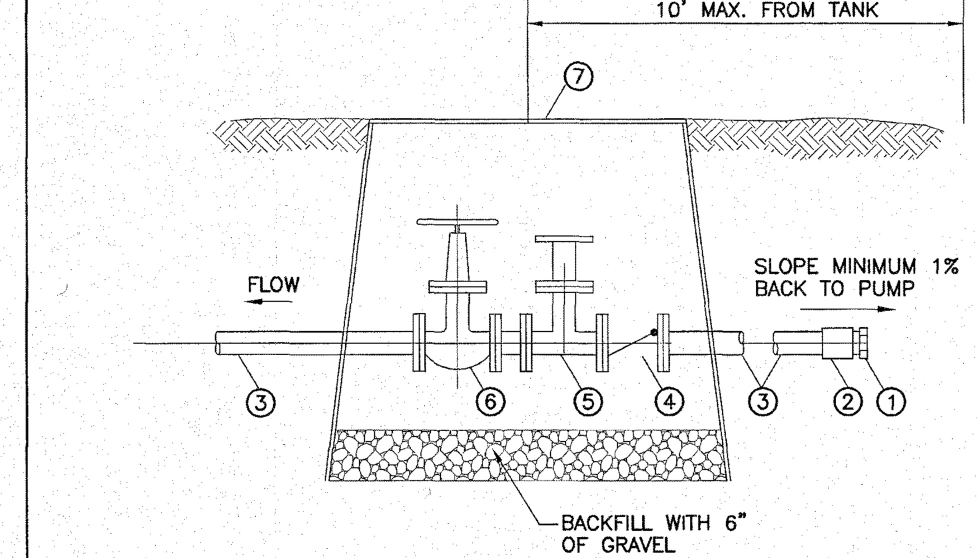
1. EXCAVATE APPROXIMATELY 4" TO 6" BELOW THE TOP OF THE INLET STRUCTURE.
2. PLACE THE FRAME ONTO THE INLET STRUCTURE, ENSURE THE FRAME COVERS STRUCTURE COMPLETELY.
3. PLACE THE FILTER OVER THE FRAME.
4. FILL THE FILTER POCKETS WITH SOIL, #57 GRAVEL OR EQUIVALENT. THE FILTER POCKETS SHOULD BE COMPLETELY FILLED TO ENSURE A GOOD SEAL BETWEEN THE GROUND AND THE INLET STRUCTURE.
5. BACKFILL AROUND THE FRAME AND FILTER ASSEMBLY IS NOT REQUIRED TO COMPLETE INSTALLATION; HOWEVER BACKFILLING MAY BE NECESSARY TO COMPLETE EXCAVATION REQUIREMENTS FOR THE SITE.

MAINTENANCE REQUIREMENTS FOR SILT-SAVER FRAME AND FILTER ASSEMBLY

1. MAINTENANCE IS REQUIRED WHEN ERODED SOILS REACH A POINT OF 65% OF THE TOTAL HEIGHT OF THE FRAME OR APPROXIMATELY 7 TO 9 INCHES OF THE GREY FILTER MATERIAL IS SHOWING.
2. REMOVE THE IMPACTED MATERIAL BY HAND OR MACHINE METHOD, PAYING CLOSE ATTENTION NOT TO DAMAGE THE FRAME OR FILTER.
3. BRUSH, SWEEP OR WASH FILTER AND INSPECT FOR ANY CUTS AND/OR ABRASIONS. REPLACE FILTER AS NECESSARY. INSPECT FRAME FOR ANY STRESS OR DAMAGE, REPLACE AS NECESSARY.
4. REFILL FILTER POCKETS, BACKFILL AS REQUIRED BY JOBSITE CONDITIONS.

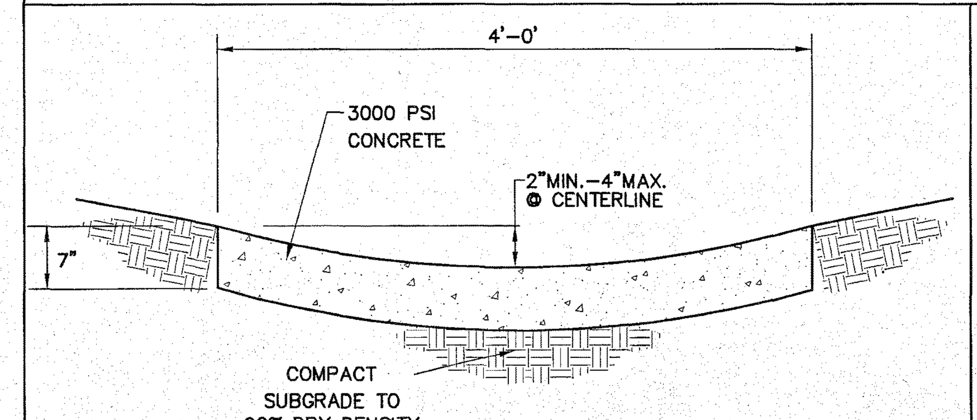


SILT-SAVER
N.T.S.



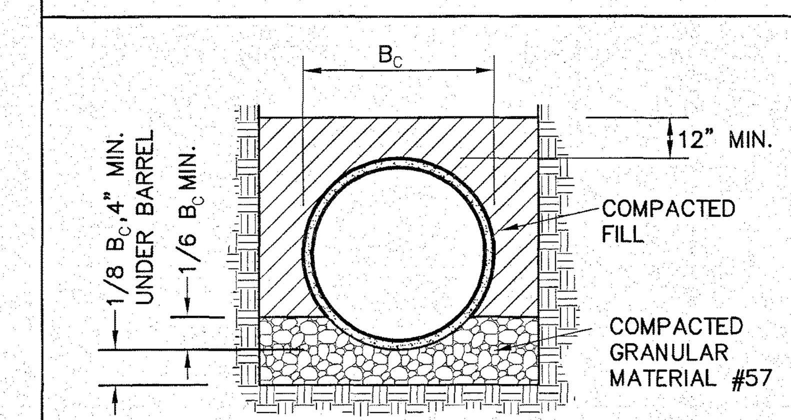
1. GRINDER PUMP DISCHARGE – 1-1/4" MIP BRASS
2. ADAPTER – 1-1/4" FIP x 1-1/2" SOCKET PVC
3. PIPE – 1-1/2" PVC (160 PSI MINIMUM)
4. 1-1/2" REDUNDANT CHECK VALVE
5. 1-1/2" TEE WITH THREADED PLUG, AND 6" SECTION OF PIPE WITH CAP
6. 1-1/2" GATE VALVE
7. STANDARD METER BOX

GATE VALVE, CHECK VALVE AND VALVE BOX DETAIL
NTS

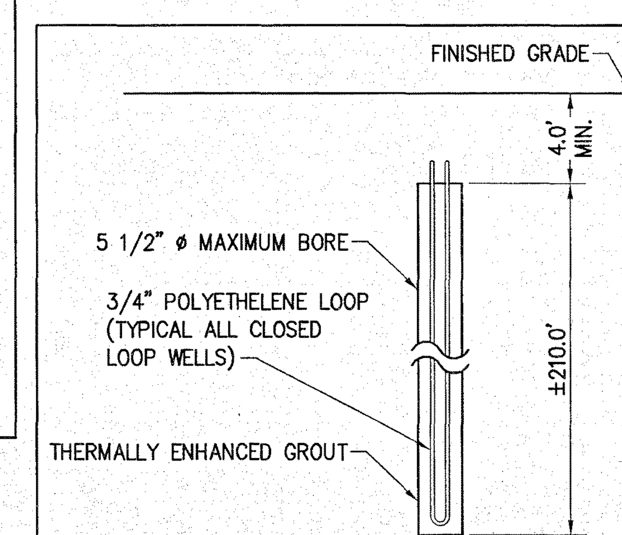


CONCRETE SWALE DETAIL
N.T.S.

D-P-SWALE.dwg

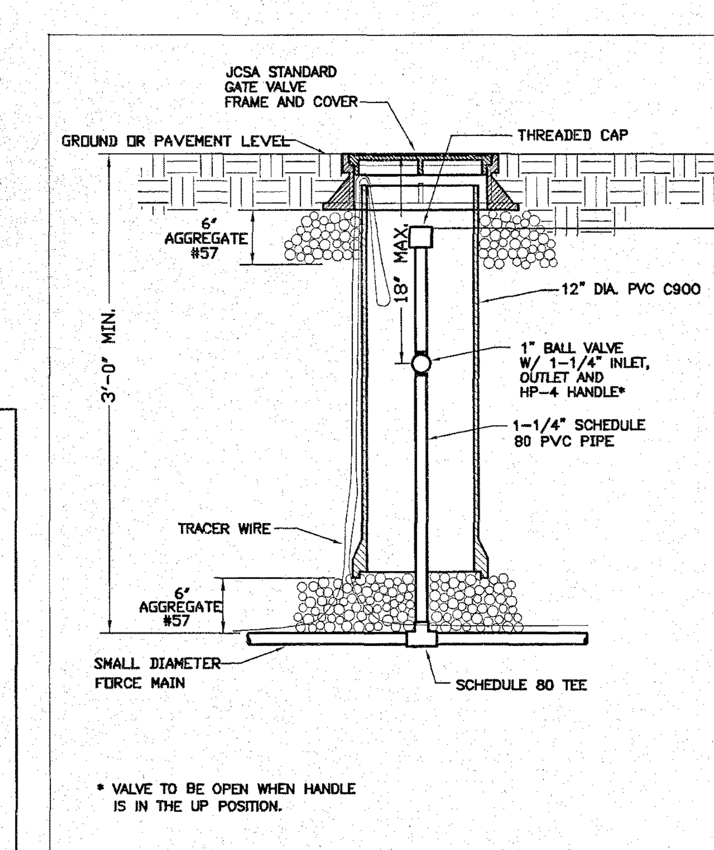


SANITARY SEWER BEDDING
N.T.S.



CLOSED LOOP WELL DETAIL
N.T.S.

NOTE: BOTTOM OF WELL MUST BE LOCATED AT LEAST 20 FEET ABOVE THE CHICKAHOMINY-PINEY POINT AQUIFER.



* VALVE TO BE OPEN WHEN HANDLE IS IN THE UP POSITION.

NOTE:
10 GAUGE SOLID COPPER CLAD TRACER WIRE TO BE ATTACHED WITH PLASTIC STRAPPING EVERY 100 FEET OF LENGTH. WIRE TO BE LOOPED THROUGH ALL VALVE BOXES AND EXTEND 12 INCHES ABOVE FINISHED GRADE AND BE COILED BACK INTO VALVE BOX.

JCSA
MANUAL AIR RELEASE VALVE FOR SMALL DIA. FORCE MAIN
PLATE: S12-1 SCALE: NONE
DWN BY: DAW DATE: 4-9-99

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
1	09/28/06	REVISED PER COUNTY COMMENTS 07/20/06	BBS	NB
2	04/09/07	REVISED PER COUNTY COMMENTS 10/18/06	BBS	NB
3	06/26/09	SITE PLAN AMENDMENT #1	ARH	NB
4	08/24/09	REVISED PER COUNTY COMMENTS 07/24/09	ARH	NB
5	10/28/09	REVISED PER COUNTY COMMENTS 09/15/09	ARH	NB
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB

NICHOLAS BOTTA Lic. No. 24730 08/23/10 PROFESSIONAL ENGINEER

AES CONSULTING ENGINEERS
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Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

NOTES AND DETAILS
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
JAMES CITY COUNTY JAMESTOWN DISTRICT VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
1"=20'	6/28/06

Project No. 8162-05
Drawing No. 15

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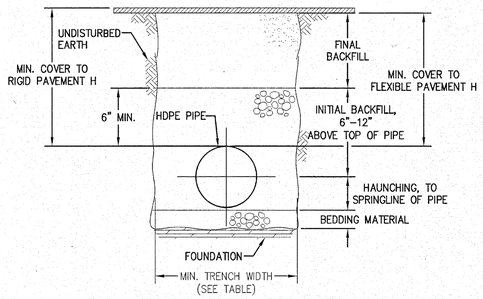


NOTES:

1. MATERIALS: UNLESS OTHERWISE SPECIFIED ON THE PLANS OR HEREIN, CORRUGATED POLYETHYLENE PIPE SHALL CONFORM TO AASHTO M-294, LATEST EDITION, STANDARD SPECIFICATION FOR CORRUGATED POLYETHYLENE PIPE.

   RESINS: CORRUGATED POLYETHYLENE PIPE SHALL BE MANUFACTURED FROM HIGH DENSITY POLYETHYLENE VIRGIN COMPOUNDS, AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM D-3350 FOR THE CELL CLASSIFICATION 335400C.

   COUPLING BANDS: EXCEPT AS OTHERWISE REQUIRED HEREIN, COUPLING BANDS AND OTHER HARDWARE FOR CORRUGATED POLYETHYLENE PIPE SHALL DEMONSTRATE THAT THEY MEET THE SOIL TIGHTNESS REQUIREMENTS OF AASHTO SECTION 26 "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES."

   COUPLING BANDS SHALL LAP EQUALLY ON EACH OF THE PIPES BEING CONNECTED TO FORM A TIGHTLY CLOSED JOINT AFTER INSTALLATION.
   THE CORRUGATIONS IN THE BAND SHALL INDEX THE CORRUGATIONS IN THE PIPE ENDS TO ENGAGE AT LEAST TWO FULL CORRUGATIONS FROM THE END OF EACH PIPE.
   WHEN INFILTRATION OR EXFILTRATION IS A CONCERN, THE COUPLING BANDS MAY BE REQUIRED TO HAVE GASKETS. THE GASKET MATERIAL SHALL BE CLOSED-CELL EXPANDED RUBBER OR NEOPRENE.
   OTHER COUPLINGS MAY BE BELL & SPIGOT AND CONFORM TO THE REQUIREMENTS OF AASHTO M294.

   DESIGNATION OF TYPE: THE PIPE SHALL BE THE FOLLOWING TYPE:
   TYPE S: THIS PIPE WILL HAVE A FULL CIRCULAR CROSS-SECTION, WITH AN OUTER CORRUGATED PIPE WALL AND A SMOOTH INNER LINER.

2. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL IN ACCORDANCE WITH ASTM D2321, LATEST EDITION. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING GEOTEXTILE MATERIAL.

3. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN ACCORDANCE WITH ASTM D2321, LATEST EDITION. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" FOR 4"-24"; 6" FOR 30"-60".

4. HAUNCHING AND INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

5. MINIMUM TRENCH WIDTHS SHALL BE AS FOLLOWS:

DIAMETER	MIN. TRENCH WIDTH
4"	21"
6"	23"
8"	26"
10"	28"
12"	30"

DIAMETER	MIN. TRENCH WIDTH
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"

DIAMETER	MIN. TRENCH WIDTH
42"	72"
48"	80"
54"	88"
60"	96"

THE TRENCH WIDTH MUST BE WIDE ENOUGH TO ACCOMMODATE COMPACTION EQUIPMENT.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS MEASURED FROM THE TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

	MINIMUM RECOMMENDED COVER	
	SURFACE LIVE LOADING CONDITION	
PIPE DIAM.	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD)*
12"-48"	12"	48"
54"-60"	24"	60"

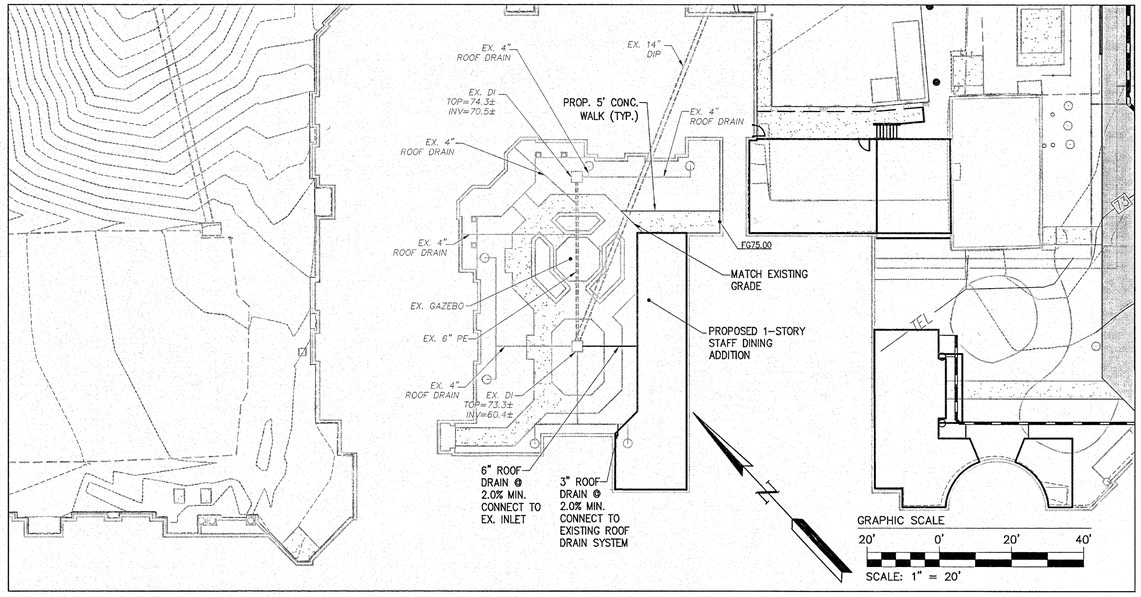
* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

7. CONNECTION TO CONCRETE STRUCTURES: CONNECTIONS SHALL MEET SPECIFICATIONS ASTM C923.

8. PERFORATED HDPE PIPE SHALL HAVE FIVE HOLES, ONE INCH IN DIAMETER EVENLY SPACED AND PLACED WITHIN AN ARC OF 130 DEGREES, THE CENTER HOLE BEING DIRECTLY OPPOSITE THE TOP MARKING. SPACING OF EACH SET OF FIVE HOLES SHALL BE AT 6 INCH INTERVALS ALONG THE TUBE. THE HOLES WILL BE DRILLED AND BE FREE OF ANY DEFECTS. THE PERFORATED PIPE SHALL BE INSTALLED SO THAT THE CENTER HOLE IS IN THE HORIZONTAL PLANE AND INTERFACES WITH THE GRADED GRAVEL.

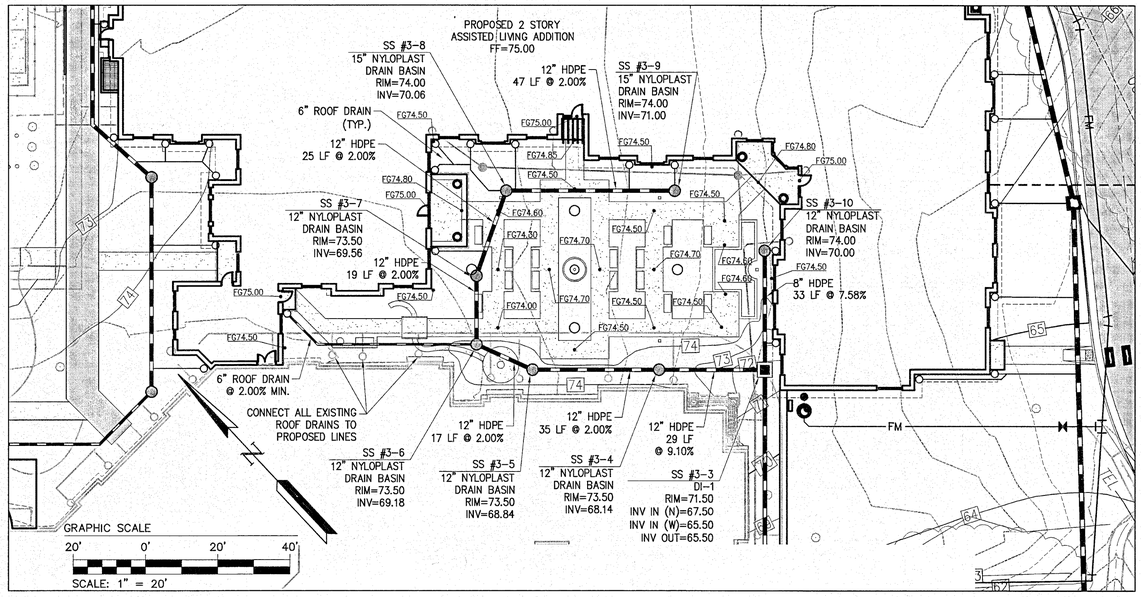
HDPE PIPE INSTALLATION DETAIL

N.T.S.



MEMORY IMPAIRED COURTYARD

(SEE ARCHITECTURAL PLANS FOR COURTYARD FEATURES AND DIMENSIONS)



ASSISTED LIVING COURTYARD

(SEE ARCHITECTURAL PLANS FOR COURTYARD FEATURES AND DIMENSIONS)

No.	DATE	REVISION / COMMENT / NOTE	REVISED BY	REVIEWED BY
6	08/23/10	REVISED PER COUNTY COMMENTS 11/12/09	TRS	NB
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COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
08/23/10
PROFESSIONAL ENGINEER

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CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND • GLOUCESTER

NOTES AND DETAILS
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION

JAMES CITY COUNTY — JAMESTOWN DISTRICT — VIRGINIA

Designed	Drawn
NB	BBS
Scale	Date
1"=20'	6/28/06

Project No. 8162-05

Drawing No. 16

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SOIL CHARACTERISTICS

SOIL NO.	SOIL NAME	HYDROLOGIC SOIL GROUP	TYPICAL SLOPES	EROSION FACTOR (K)	EROSION FACTOR (T)
11C	CRAVEN–UCHEE COMPLEX	A,C	6–10%	0.32–0.37	3
14B	EMPORIA FINE SANDY LOAM	C	2–6%	0.20–0.28	4
15F	EMPORIA COMPLEX	C	25–50%	0.20–0.28	4
17	JOHNSTON COMPLEX	D	–	0.17–0.20	5
19B	KEMPSVILLE–EMPORIA FINE SANDY LOAM	B,C	2–6%	0.24–0.32	3
29B	SLAGLE FINE SANDY LOAM	C	2–6%	0.24	3

INFORMATION TAKEN FROM "SOIL SURVEY OF JAMES CITY AND YORK COUNTIES AND THE CITY OF WILLIAMSBURG, VIRGINIA" ISSUED IN APRIL, 1985 BY THE UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE IN COOPERATION WITH VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY.

THE MAP SHOWN IS A "BEST FIT MODEL" OF THE SCS MAPS WITH EXISTING BASE INFORMATION.

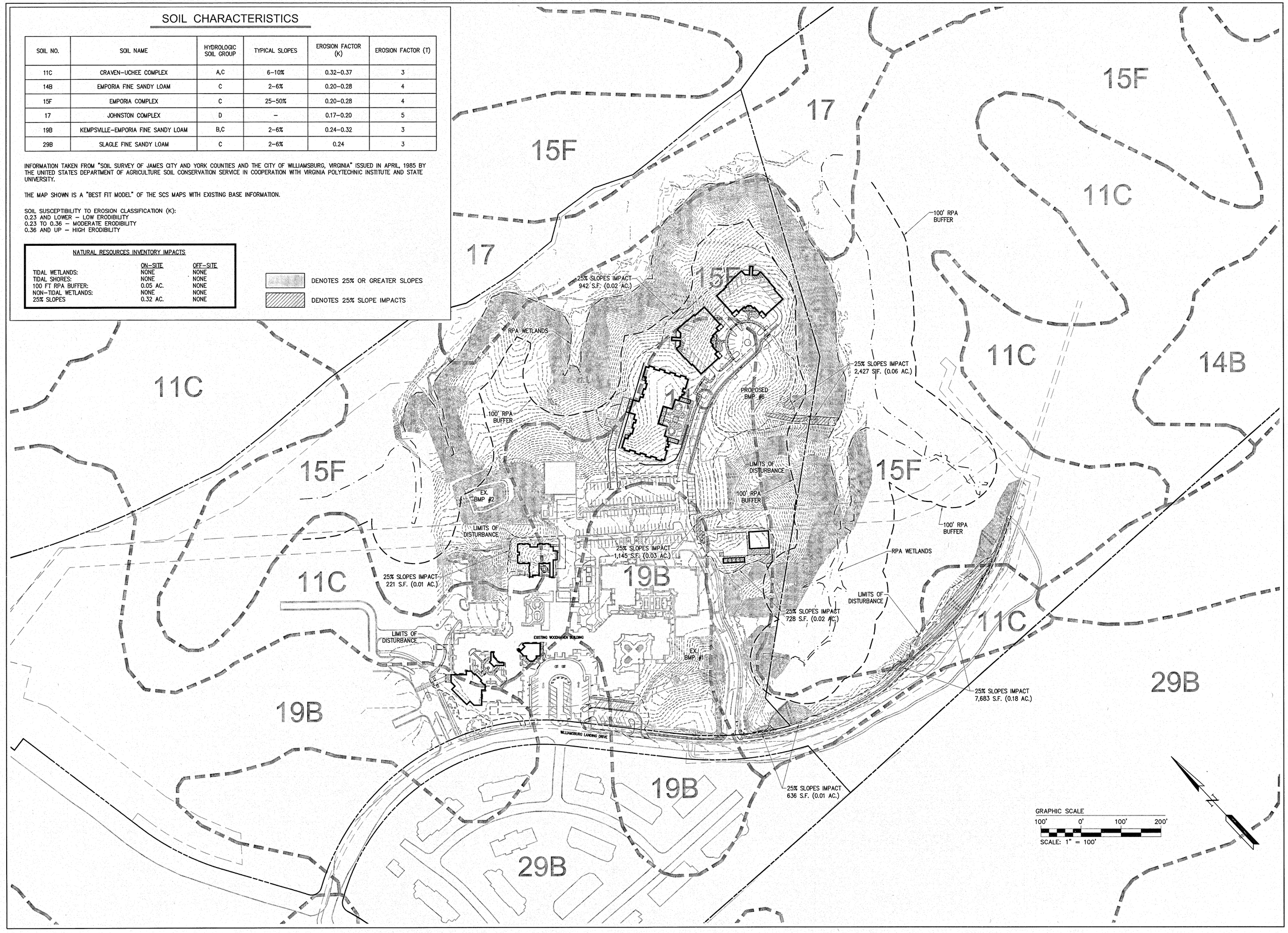
SOIL SUSCEPTIBILITY TO EROSION CLASSIFICATION (K):
0.23 AND LOWER – LOW ERODIBILITY
0.23 TO 0.36 – MODERATE ERODIBILITY
0.36 AND UP – HIGH ERODIBILITY

NATURAL RESOURCES INVENTORY IMPACTS

	ON-SITE	OFF-SITE
TIDAL WETLANDS:	NONE	NONE
TIDAL SHORES:	NONE	NONE
100 FT RPA BUFFER:	0.05 AC.	NONE
NON-TIDAL WETLANDS:	NONE	NONE
25% SLOPES	0.32 AC.	NONE

DENOTES 25% OR GREATER SLOPES

DENOTES 25% SLOPE IMPACTS



Rev.	Date	Description	Revised By
2	12/20/10	Revised Per JCC Comments Dated 11/30/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 09/20/10	TRS

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WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10

Sheet Title:
Environmental Inventory

Sheet Number
3

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EX. BMP #2

MATCH LINE SEE SHEET 5

SAWCUT EX. ASPHALT ROADWAY

24'

6 SPACES

5'R

2' CURB CUT (SPACED 17.5' APART)

EX. 50' COLONIAL PIPELINE EASEMENT

EX. 14" COLONIAL PIPELINE GAS MAIN

EX. GAS MARKER

EX. LOADING SPACES (2)

CONCRETE WHEEL STOP (TYP)

72'

8 SPACES

10'

50'

PROPOSED GROUNDS MAINTENANCE BUILDING BLDG HT 16'-0" 2,150 S.F.

43'

APPROX. LOCATION EX. FIBER OPTIC CABLE LINE TO BE FIELD VERIFIED DURING CONSTRUCTION

5' CONCRETE SIDEWALK

18.57'

PROPOSED CG-6

4' CONCRETE SIDEWALK

SAWCUT EX. PAVEMENT

81.77'

EX. ELEC

EX. RIPRAP

APPROX. LOCATION EX. FIBER OPTIC CABLE LINE TO BE FIELD VERIFIED DURING CONSTRUCTION

PROPOSED SPECIAL CARE ADDITION BLDG HT 28'-0" 10,700 G.S.F.

20'R

5'R

14.56'

9' (TYP)

10'R

10'R

24'

40'

5'R

5'

25.78'

SAWCUT EX. PAVEMENT

CG-2 (TYP)

15'

54.5'

15'

8.24'

54'

2' CURB CUT AND CONCRETE SWALE (TYP)

10'x10' CONCRETE DUMPSTER PAD

10'x8' STORAGE AREAS (5 TOTAL)

EX. HVAC

EX. FES

EX. RIPRAP

18.18'

EX. CONC. PAD

SPECIAL CARE COURTYARD

100' RPA BUFFER

EX. DI

EX. LOADING SPACES (2)

EXISTING WOODHAVEN BUILDING

SAWCUT EX. PAVEMENT

10'

SAWCUT EX. PAVEMENT

PROPOSED SKILLED CARE ADDITION #2 BLDG HT 31'-6" 1,130 G.S.F.

PROPOSED MAIN STREET ADDITION BLDG HT 31'-6" 3,388 G.S.F.

4' CONCRETE SIDEWALK

RPA WETLANDS

EX. BMP #1

DETECTABLE WARNING SURFACE (TYP)

14' WIDE CONC. PAD FOR EMERGENCY ACCESS (BROOM FINISH)

PROPOSED CONC. PATIO

SAWCUT EX. PAVEMENT

NOSE DOWN CURB

10'

14'

PROPOSED SKILLED CARE ADDITION #1 BLDG HT 31'-6" 10,180 G.S.F.

SKILLED CARE COURTYARD

MODIFIED CG-12

EX. LIGHT POLE

NOSE DOWN CURB

CG-3 (EXPOSED AGGREGATE)

4' WIDE CONCRETE VALLEY GUTTER (SEE DETAIL SHEET 30)

5' CONCRETE SIDEWALK

109.40'

DETECTABLE WARNING SURFACE (TYP)

R33'

8 SPACES @ 60'

20.09'

18'

3' WIDE CONCRETE VALLEY GUTTER

5'R

R10'

MUTCD R6-2 "ONE WAY" SIGN

9' (TYP)

5'R

5'R

R26'

MODIFIED CG-12

18'

R10'

8 SPACES @ 60'

20.09'

R10'

CG-6 (TYP)

15'R

CG-2 (TYP)

18'

16.7'

ERADICATE 3 EX. PARKING SPACES FOR DRIVE AISLE AND MEDIAN

83.02'

NOSE DOWN CURB

EX. RIPRAP

R15'

NOSE DOWN CURB

WILLIAMSBURG LANDING DRIVE

MUTCD R1-1 "STOP" SIGN AND MUTCD R5-1 "DO NOT ENTER" SIGN (BACK TO BACK)

NOTE: SEE ARCHITECTURAL DRAWINGS FOR BUILDING INFORMATION

NOTE: SEE SHEET 31 FOR CONCRETE AND PAVEMENT SECTION PLAN.

GRAPHIC SCALE

30' 0' 30' 60'

SCALE: 1" = 30'

Rev.	Date	Description	Revised By
2	12/20/10	Revised Per JCC Comments Dated 11/16/10	TRS
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WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10
Sheet Title: Site Plan	
Sheet Number 6	

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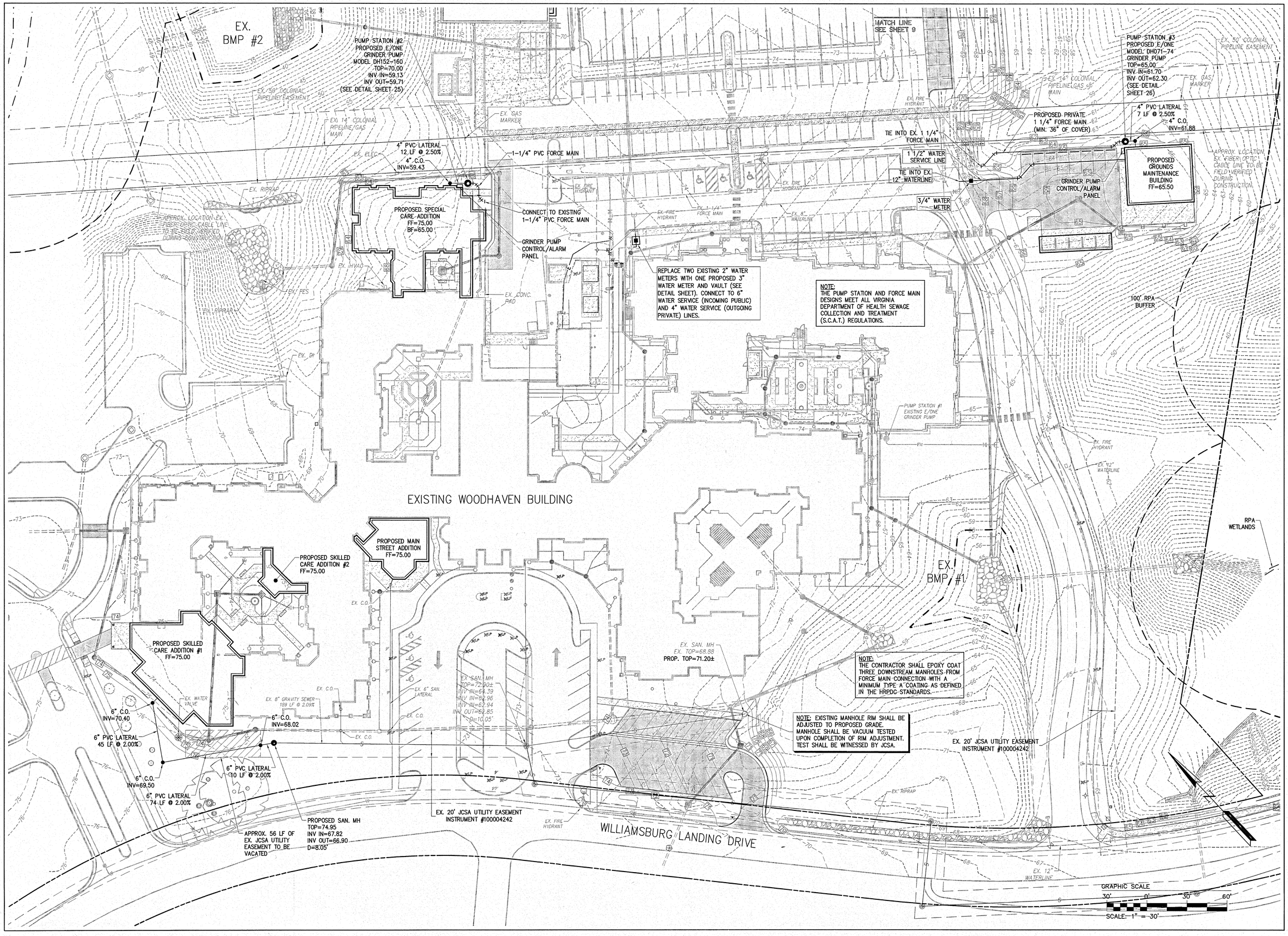

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WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II

Jamestown District — James City County — Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10

Sheet Title:
Utility Plan

Sheet Number
10

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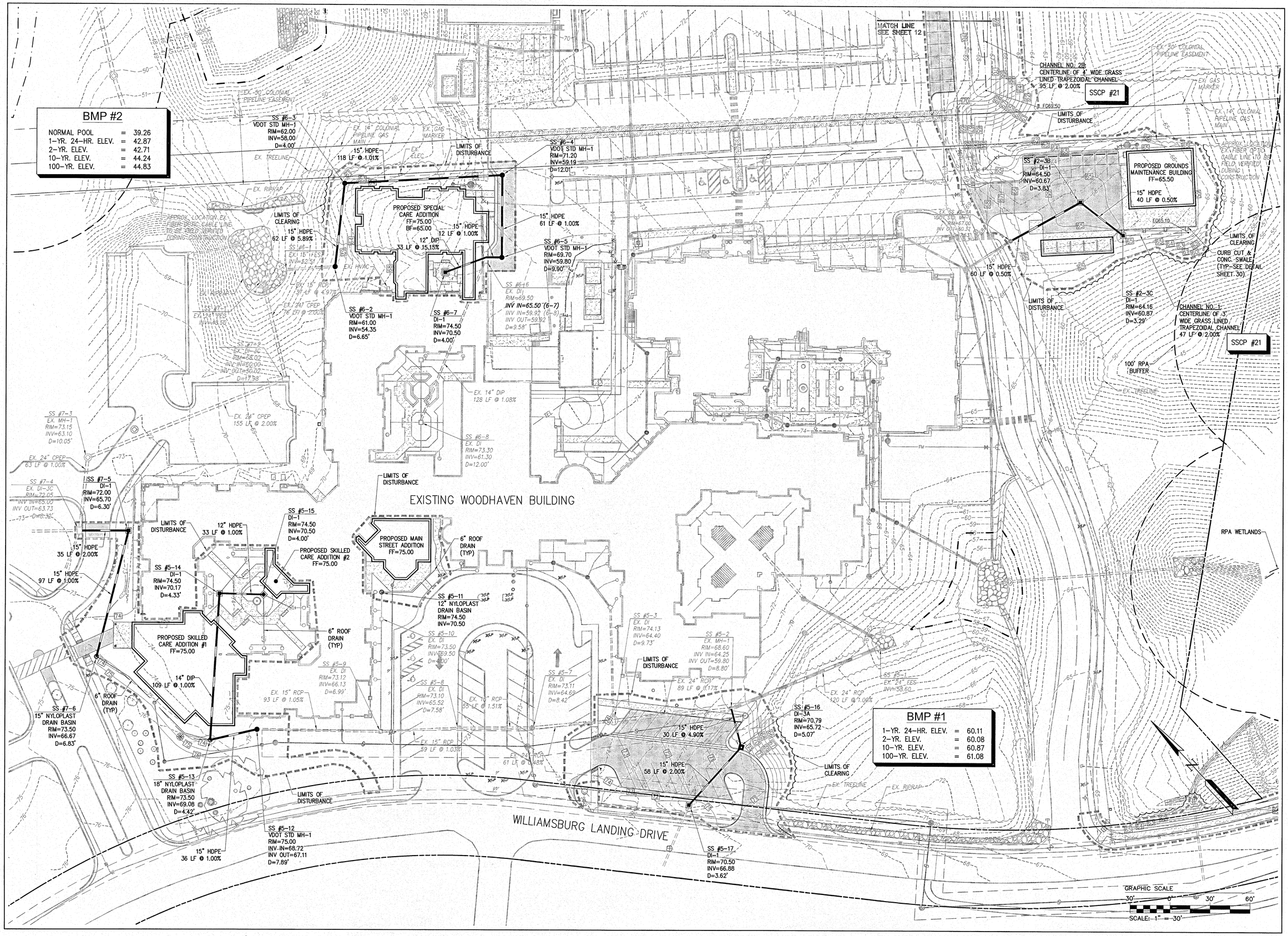

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WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION PHASE II

Jamestown District — James City County — Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10
Sheet Title:	Drainage Plan
Sheet Number	13

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ELEVATION ABBREVIATION LEGEND

FF – FINISH FLOOR
FG – FINISH GRADE
FL – FLOW LINE
EP – EDGE OF PAVEMENT
TC – TOP OF CURB
TW – TOP OF WALL
BW – BOTTOM OF WALL @ GRADE
INV. – INVERT
CONC. – CONCRETE

EX. BMP #2

MATCH LINE SEE SHEET 15

CHANNEL NO. 2B: CENTERLINE OF 4' WIDE GRASS LINED TRAPEZOIDAL CHANNEL 95 LF @ 2.00%

EX. 14" COLONIAL PIPELINE GAS MAIN

EX. 60' COLONIAL PIPELINE EASEMENT

EX. 50' COLONIAL PIPELINE EASEMENT

EX. GAS MARKER

LIMITS OF DISTURBANCE

LIMITS OF CLEARING

PROPOSED SPECIAL CARE ADDITION FF=75.00 BF=65.00

PROPOSED GROUNDS MAINTENANCE BUILDING FF=65.50

APPROX. LOCATION EX. FIBER OPTIC CABLE LINE TO BE FIELD VERIFIED DURING CONSTRUCTION

CHANNEL NO. 1: CENTERLINE OF 3' WIDE GRASS LINED TRAPEZOIDAL CHANNEL 47 LF @ 2.00%

100' RPA BUFFER

EX. TREELINE

EX. RIPRAP

EX. HVAC

EX. FES

EX. CONC. PAD

EXISTING WOODHAVEN BUILDING

PROPOSED SKILLED CARE ADDITION #2 FF=75.00

PROPOSED MAIN STREET ADDITION FF=75.00

PROPOSED SKILLED CARE ADDITION #1 FF=75.00

TIE INTO EX. SWALE

EX. BMP #1

RPA WETLANDS

GRAPHIC SCALE

30' 0' 30' 60'

SCALE: 1" = 30'

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WOODHAVEN EXPANSION
PHASE II

Jamestown District | James City County | Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10

Sheet Title:
Grading and Phase II Erosion & Sediment Control Plan

Sheet Number
16

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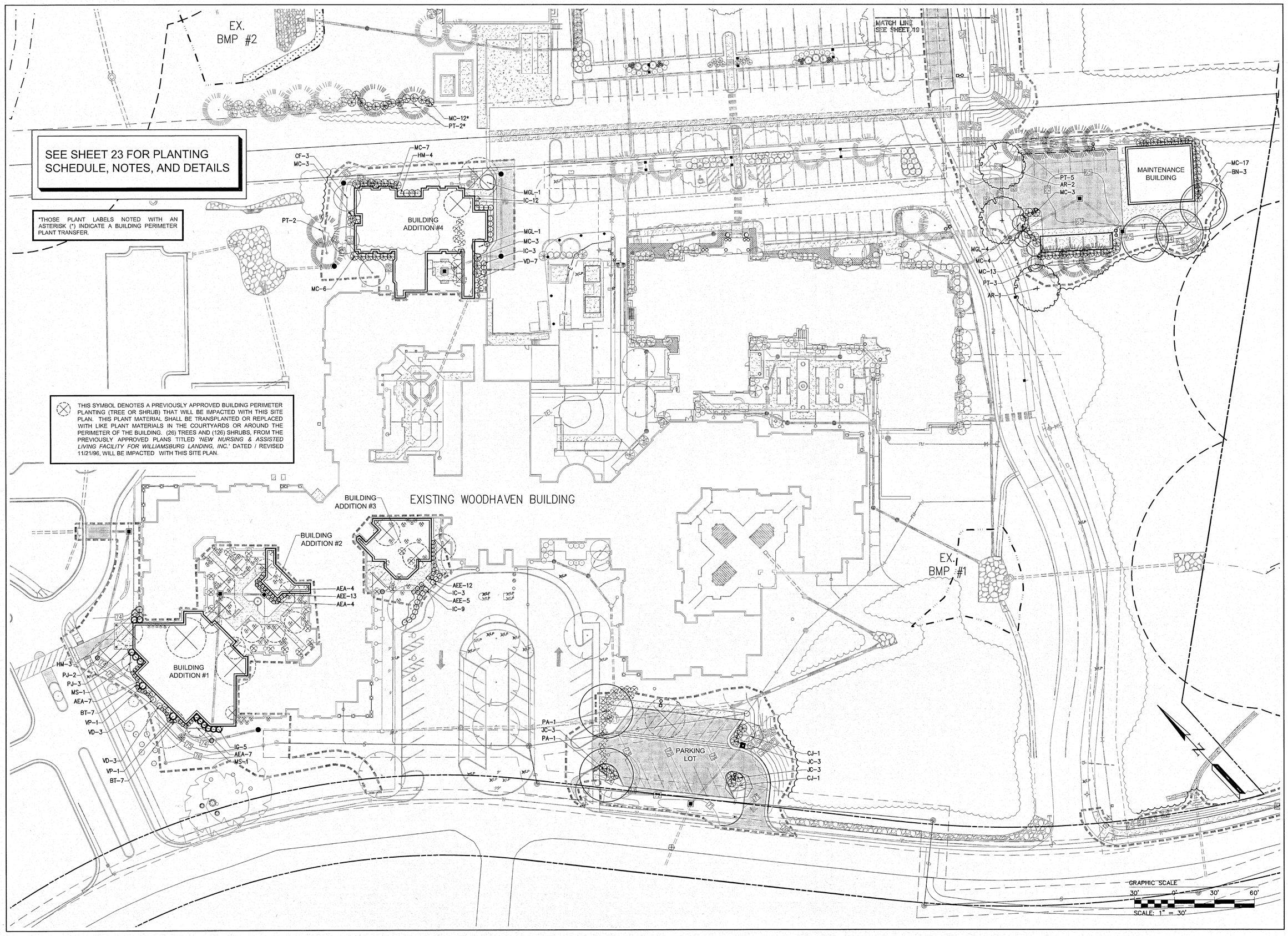

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1	10/14/10	Revised Per JCC Comments Dated 05/20/10	TRS

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WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION PHASE II

Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10
Sheet Title:	Landscaping Plan
Sheet Number	20

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Rev.	Date	Description	Revised By
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WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION PHASE II

Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=30'	Date: 04/21/10

Sheet Title:
Lighting Plan

Sheet Number
22

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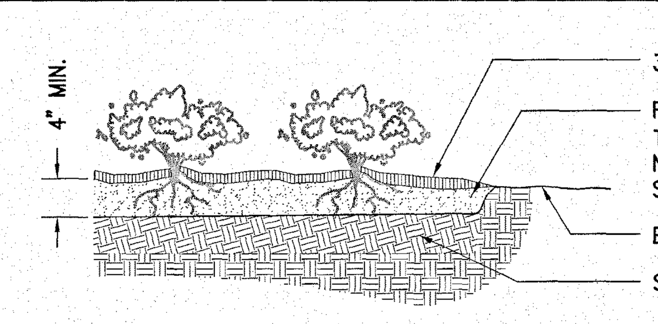
PLANT SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	COMMENT
LARGE DECIDUOUS TREES:						
AR	6	ACER RUBRUM 'RED SUNSET'	'RED SUNSET' RED MAPLE	2-1/2" CAL.	B & B	SINGLE STEM
BN	13	BETULA NIGRA 'DURA HEAT'	'DURA HEAT' RIVER BIRCH	8' HT.	B & B	3-5 STEMS
LT	3	LIRIODENDRON TULIPIFERA	TULIP POPLAR	2-1/2" CAL.	B & B	SINGLE STEM
PA	9	PLANTUNUS ACERFOLIA 'BLOODGOOD'	'BLOODGOOD' LONDON PLANETREE	2-1/2" CAL.	B & B	SINGLE STEM
ZS	8	ZELKOVA SERRATA 'GREEN VASE'	'GREEN VASE' JAPANESE ZELKOVA	2-1/2" CAL.	B & B	SINGLE STEM
EVERGREEN TREES:						
CJ	2	CRYPTOMERIA JAPONICA 'YOSHINO'	'YOSHINO' JAPANESE CRYPTOMERIA	8' HT.	B & B	SINGLE STEM
MGL	13	MAGNOLIA GRANDIFLORA 'LITTLE GEM'	'LITTLE GEM' SOUTHERN MAGNOLIA	8' HT.	B & B	SINGLE STEM
PT	32	PINUS THUNBERGIANA	JAPANESE BLACK PINE	8' HT.	B & B	SINGLE STEM
SMALL DECIDUOUS TREES:						
CF	9	CORNUS FLORIDA 'CHEROKEE BRAVE'	'CHEROKEE BRAVE' FLOWERING DOGWOOD	1-1/2" CAL.	B & B	SINGLE STEM
MS	5	MAGNOLIA x 'SHIRAZZ'	'SHIRAZZ' MAGNOLIA	1-1/2" CAL.	B & B	SINGLE STEM
PY	2	PRUNUS x YEDOENSIS	YOSHINO CHERRY	1-1/2" CAL.	B & B	SINGLE STEM
SHRUBS:						
AEA	54	AZALEA x ENCORE 'AUTUMN ANGEL'	'AUTUMN ANGEL' ENCORE AZALEA	18"-24" HT./W.	CONT.	DENSE, FULL
AEE	48	AZALEA x ENCORE 'AUTUMN EMBERS'	'AUTUMN EMBERS' ENCORE AZALEA	18"-24" HT./W.	CONT.	DENSE, FULL
AG	75	ABELIA x GRANDIFLORA 'EDWARD GOUCHER'	'EDWARD GOUCHER' GLOSSY ABELIA	18"-24" HT./W.	CONT.	DENSE, FULL
BT	59	BERBERIS THUNBURGII 'CRIMSON PYGMY'	'CRIMSON PYGMY' BARBERRY	22"-30" HT./W.	CONT.	DENSE, FULL
FL	3	FORSYTHIA x 'LYNWOOD GOLD'	'LYNWOOD GOLD' FORSYTHIA	22"-30" HT./W.	CONT.	DENSE, FULL
HM	11	HYDRANGEA MACROPHYLLA 'MARIESII VARIEGATA'	'MARIESII VARIEGATA' BIGLEAF HYDRANGEA	22"-30" HT./W.	CONT.	DENSE, FULL
IC	53	ILEX CRENATA 'GREEN LUSTER'	'GREEN LUSTER' JAPANESE HOLLY	18"-24" HT./W.	CONT.	DENSE, FULL
IG	57	ILEX GLABRA 'SHAMROCK'	'SHAMROCK' INKBERRY HOLLY	18"-24" HT./W.	CONT.	DENSE, FULL
JC	9	JUNIPERUS CHINENSIS 'SARGENTII'	SARGENT'S JUNIPER	18"-24" HT./W.	CONT.	DENSE, FULL
MC	179	MERICA CERIFERA	SOUTHERN WAXMYRTLE	18"-24" HT./W.	CONT.	DENSE, FULL
PJ	23	PIERIS JAPONICA 'MOUNTAIN FIRE'	'MOUNTAIN FIRE' PIERIS	18"-24" HT./W.	CONT.	DENSE, FULL
VD	43	VIBURNUM DAVIDII	DAVIDII VIBURNUM	18"-24" HT./W.	CONT.	DENSE, FULL
VP	5	VIBURNUM PRAGENSE	PRAGUE VIBURNUM	18"-24" HT./W.	CONT.	DENSE, FULL
VA	1	VITEX AGNUS-CASTUS 'SHOAL'S CREEK'	'SHOAL'S CREEK' CHASTE TREE	5-6' HT.	CONT.	TREE FORM
OTHER:						
CS	12	CORTADERIA SELLOANA 'PLUMILA'	'PLUMILA' DWARF PAMPAS GRASS	1 GAL.	CONT.	DENSE, FULL
CV	320	COREOPSIS VERTICILLATA 'ZAGREB'	'ZAGREB' THREADLEAF COREOPSIS	1 GAL.	CONT.	DENSE, FULL
HS	295	HEMEROCALLIS 'STELLA D'ORA'	'STELLA D'ORA' DAY LILLY	1 GAL.	CONT.	DENSE, FULL
HO	90	HEUCHERA 'OBSIDIAN'	'OBSIDIAN' HEUCHERA	1 GAL.	CONT.	DENSE, FULL
HF	21	HOSTA 'FRANCEE'	'FRANCEE' HOSTA	1 GAL.	CONT.	DENSE, FULL
LM	145	LIRIOPE MUSCARI 'BIG BLUE'	'BIG BLUE' LIRIOPE	1 GAL.	CONT.	DENSE, FULL
PO	26	PENNISETUM ORIENTALE 'KARLEY ROSE'	'KARLEY ROSE' ORIENTAL FOUNTAIN GRASS	1 GAL.	CONT.	DENSE, FULL
PS	120	PHLOX SUBULATA 'BLUE EMERALD'	'BLUE EMERALD' CREEPING PHLOX	1 GAL.	CONT.	DENSE, FULL
SG	110	SALVIA GREGGII 'FURMAN'S RED'	'FURMAN'S RED' SALVIA	1 GAL.	CONT.	DENSE, FULL
VC	80	VERBENA X CANADENSIS 'HOMESTEAD PURPLE'	'HOMESTEAD PURPLE' VERBENA	1 GAL.	CONT.	DENSE, FULL

JAMES CITY COUNTY LANDSCAPE REQUIREMENTS

AREAS		TREES AND SHRUBS		
LANDSCAPE YARD	COUNTY REQ	RATIO	MIN. NUMBER REQUIRED	NEW PLANTINGS PROVIDED
10' BLDG PERIMETER (SKILLED CARE)	9,153 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	46 TREES OR 229 SHRUBS	22 TREES AND 123 SHRUBS
10' BLDG PERIMETER (INDEPENDENT LIVING #1)	5,771 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	29 TREES OR 145 SHRUBS	15 TREES AND 70 SHRUBS
10' BLDG PERIMETER (INDEPENDENT LIVING #2)	5,771 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	29 TREES OR 145 SHRUBS	16 TREES AND 81 SHRUBS
10' BLDG PERIMETER (MAINTENANCE)	2,260 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	12 TREES OR 57 SHRUBS	7 TREES AND 22 SHRUBS
10' BLDG PERIMETER (ADDITION #1)	2,374 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	12 TREES OR 60 SHRUBS	2 TREES AND 50 SHRUBS
10' BLDG PERIMETER (ADDITION #2)	820 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	5 TREES OR 21 SHRUBS	0 TREES AND 21 SHRUBS
10' BLDG PERIMETER (ADDITION #3)	1,146 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	6 TREES OR 29 SHRUBS	0 TREES AND 29 SHRUBS
10' BLDG PERIMETER (ADDITION #4)	4,051 SQ.FT.	1 TREE OR 5 SHRUBS: 200 SQ.FT	21 TREES OR 102 SHRUBS	9 TREES AND 57 SHRUBS
PARKING LOT (LANDSCAPE AREA IS 23.5% OF PARKING)	16 SPACES	1 TREE: 5 SPACES AND 2 SHRUBS: 5 SPACES	4 TREES 35% 2 LG EVERGREEN 50% 2 DECID SHADE 7 SHRUBS 50% 4 EVERGREEN	4 TREES 2 LG EVERGREEN 2 DECID SHADE 9 SHRUBS 9 EVERGREEN



3" HT. SHREDDED HARDWOOD MULCH

REMOVE TOP 4" OF SOIL FROM FINISH GRADE W/IN THE GROUND COVER PLANTING BED. BACKFILL W/ NATIVE TOP SOIL; PARTIALLY BACKFILL, WATER TO SETTLE SOIL. FINISH BACKFILLING; TAMP LIGHTLY

EXISTING/FINISH GRADE

SCARIFY SUBGRADE TO 4" MIN. DEPTH

SECTION VIEW

NOTES:
1. SPACE AS SHOWN ON PLAN OR AS INDICATED ON PLANT CHART.
2. WATER IMMEDIATELY AFTER PLANTING.

GROUND COVER PLANTING BED

NOT TO SCALE

GENERAL NOTES

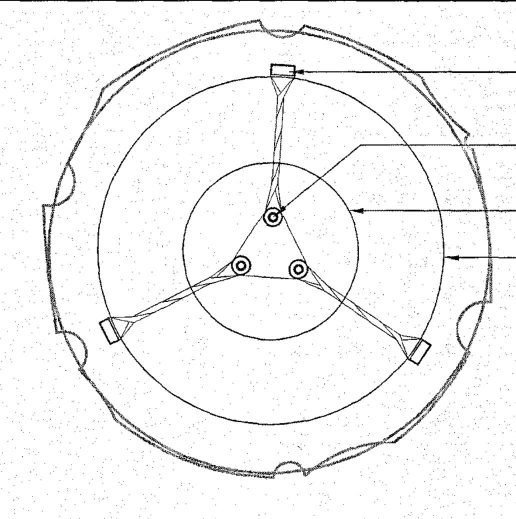
1. ALL PLANT STOCK SHALL MEET THE MINIMUM STANDARDS & SPECIFICATIONS DESCRIBED IN THE "AMERICAN STANDARD FOR NURSERY STOCK," LATEST EDITION, PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN.
2. ALL PLANT MATERIAL SHALL BE INSTALLED AS SPECIFIED IN THE VNLA STANDARDIZED LANDSCAPE SPECIFICATIONS, LATEST EDITION.
3. THE CONTRACTOR SHALL SUPPLY ALL NEW PLANT MATERIAL IN QUANTITIES SUFFICIENT TO COMPLETE ALL PLANTING SHOWN ON THE DRAWINGS. WHERE DISCREPANCIES EXIST BETWEEN THE PLANS & THE PLANT LIST, THE PLANS SHALL TAKE PRECEDENCE.
3. GROUPINGS OF PLANTS SHALL BE MULCHED IN CONTINUOUS PLANT BEDS.
4. AREAS DISTURBED BY CONSTRUCTION, NOT OTHERWISE WITHIN PLANT BEDS OR COVERED IN SITE CONTRACT, ARE TO BE SODDED OR SEEDED WITH A STATE CERTIFIED TURF-TYPE TALL FESCUE VARIETY SELECTED FROM THE FOLLOWING LIST:

   Biltmore, Bingo, Cochise III, Constitution, Coyote II, Crossfire II, Endeavor, Fidelity, Good-en, Grande, Greenkeeper WAF, Inferno, Kalahari, Magellan, Masterpiece, Onyx, Padre, Picasso, Penn 1901, Quest, Raptor, Rebel Exeda, Rembrandt, Rendition, SR 8250, SR 8300, Tarheel, Titanium, Watchdog, Wolfpack, WPEZE.

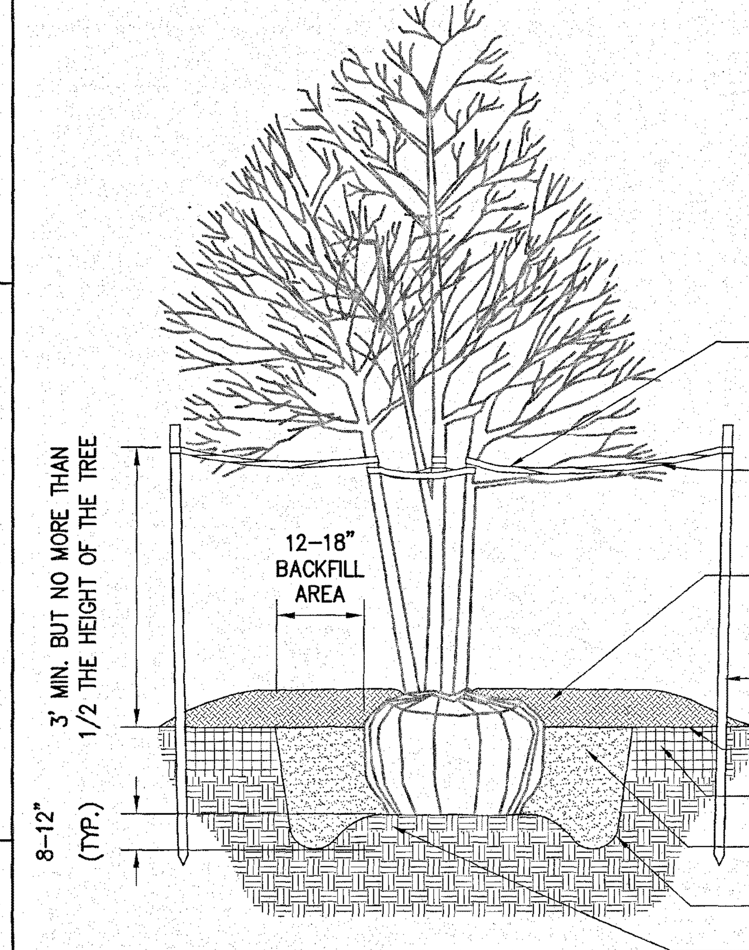
5. TREES SUPPORT STAKING IS OPTIONAL FOR TREES THAT ARE 1" CAL. OR 6' HT. OR LESS. ALL TREE STAKING SHALL BE REMOVED AFTER 1-2 GROWING SEASONS.
9. ALL TREES ARE TO BE PLANTED SO TOP OF ROOT BALL IS 3" ABOVE FINISH GRADE.
10. TREE SHALL BE INSTALLED PLUMB & STRAIGHT.
11. PRUNE ALL SUCKERS, RUBBING OR CROSSED BRANCHES, CODOMINANT LEADERS, NARROW CROTCH ANGLES, WATER SPROUTS, BROKEN BRANCHES.
12. DO NOT PRUNE CENTRAL LEADER OR BRANCH TIPS.
13. REMOVE TAGS, LABELS & PLASTIC SLEEVING.
14. DO NOT WRAP TRUNK.
15. IF PLANT MATERIAL IS CONTAINER-GROWN, REMOVE TOP OF WIRE BASKET, OR REMOVE CONTAINER & CUT CIRCLING ROOT; IF FIELD-GROWN, CUT ROPE SURROUNDING BOTTOM OF TREE TRUNK AFTER BACKFILLING BUT BEFORE MULCHING & REMOVE BURLAP FROM TOP 1/3 OF BALL ROOT.
16. REMOVE ALL STAKES, STRAPS, WIRES, RUBBER HOSES, ETC. AFTER 1-2 GROWING SEASONS.
17. PLANT SUBSTITUTIONS WILL NOT BE MADE WITHOUT THE WRITTEN CONSENT OF THE OWNER OR THE OWNER'S DESIGNATED REPRESENTATIVE PRIOR TO INSTALLATION.
18. ALL INSTALLED PLANT MATERIAL SHALL BE SUBJECT TO REGULAR MAINTENANCE, INCLUDING FERTILIZATION, PRUNING, REPLACEMENT, INSECT AND DISEASE CONTROL, WATERING, MULCHING, AND WEED CONTROL.
19. CONTRACTORS ARE RESPONSIBLE FOR LOCATING ALL UTILITIES PRIOR TO THE BEGINNING OF WORK AND AVOIDING THEM DURING LANDSCAPING OPERATIONS.
20. PLANT LOCATIONS AROUND PROPOSED BUILDINGS ARE SCHEMATIC DUE TO THE PRELIMINARY STATUS OF ARCHITECTURAL DRAWINGS. THE LANDSCAPE ARCHITECT SHALL BE NOTIFIED OF ANY CONFLICTS BETWEEN THE SCHEMATIC DESIGN AND FINAL BUILDING PLANS (i.e. WINDOW LOCATIONS, A/C UNIT LOCATIONS, PEDESTRIAN CONNECTION POINTS, ETC.). MINOR ADJUSTMENTS TO THE PLANTING PLAN MAY NEED TO BE MADE IN THE FIELD.

GENERAL NOTES FOR WETLANDS & AQUATIC BENCH PLANTING:

1. ALL WOODY PLANT MATERIAL SHALL BE INSTALLED A SPECIFIED IN THE VNLA STANDARDIZED LANDSCAPE SPECIFICATIONS, LATEST EDITION. ALL WETLAND & SPECIFICATIONS AQUATIC BENCH PLANTING SHALL BE INSTALLED AS SPECIFIED IN MINIMUM STANDARD 3.05 OF THE VIRGININA STORMWATER MANAGEMENT HANDBOOK.
2. ALL PLANT MATERIAL SHALL BE OBTAINED AQUATIC PLANT NURSERIES AND LOCAL FROM TRANSPLANTED/ INSTALLED BETWEEN APRIL & JUNE.
3. ONE PLANT SPECIES SHOULD BE PLANTED WITHIN A PLANTING ZONE, BASED ON THEIR APPROX. DEPTH REQUIREMENTS.
4. PLANT SUBSTITUTIONS MUST BE APPROVED BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.



PLAN VIEW FOR STAKING



2-3" WIDE WEBBING OR POLYETHYLENE STRAPS TWISTED LOOSELY AT THEIR MIDPOINT AND WRAPPED ONCE AROUND THE TREE TRUNK FLAT. ATTACHED TO THE STAKE WITH STAPLES.

LOOSELY TWIST EACH STRAP TO ALLOW FOR 4-6" OF TRUNK FLEXING (REMOVE ALL STRAPS AND STAKING AFTER 1-2 FULL GROWING SEASONS)

3" HT. SHREDDED HARDWOOD MULCH; KEPT AWAY FROM TRUNK. DO NOT COVER THE ROOT COLLAR WITH TOP SOIL OR MULCH.

6-8' WOOD STAKES, 3 PER TREE. STAKES TO BE SAME HEIGHT, DRIVEN IN ON A SLIGHT ANGLE.

EXISTING/FINISH GRADE

TILL 18" WIDTH AT TOP EDGE OF HOLE TO A 8-12" DEPTH

BACKFILL W/ NATIVE TOP SOIL; PARTIALLY BACKFILL, WATER TO SETTLE SOIL; FINISH BACKFILLING; TAMP LIGHTLY

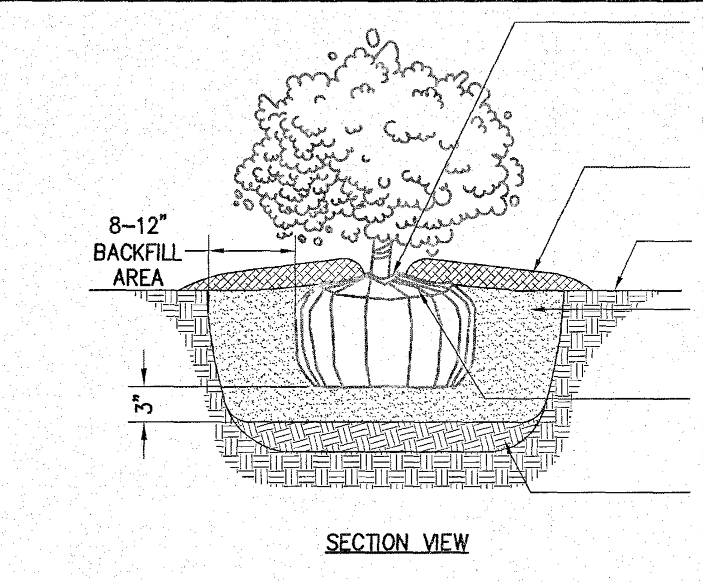
ROUGHEN HOLE WALLS AND BOTTOM

TRENCH AROUND PERIMETER OF MOUND TO DEPTH SHOWN.

SECTION VIEW

MULTI-STEM TREE PLANTING

NOT TO SCALE



SET TOP OF ROOTBALL 3" ABOVE FINISH GRADE; COVER EDGES OF ROOTBALL W/ SOIL, TAPERING DOWN TO SURROUNDING SOIL LINE; CUT ROPE SURROUNDING CROWN OF ROOTBALL AFTER BACKFILLING BUT BEFORE MULCHING.

4" HT. SAUCER, FILL WITH SHREDDED HARDWOOD MULCH

EXISTING/FINISH GRADE

BACKFILL W/ NATIVE TOP SOIL; PARTIALLY BACKFILL, WATER TO SETTLE SOIL; FINISH BACKFILLING; TAMP LIGHTLY

CUT CIRCLING ROOTS; SCARIFY SIDES BEFORE PLANTING; REMOVE BURLAP FROM TOP 1/3 OF BALL ROOT.

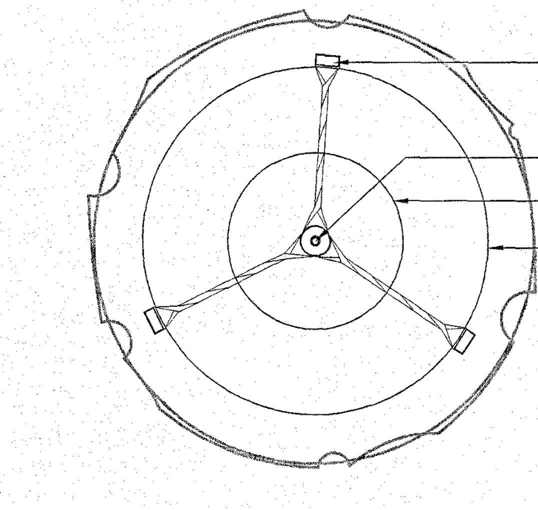
SCARIFY SUBSOIL TO 4" MIN. DEPTH

SECTION VIEW

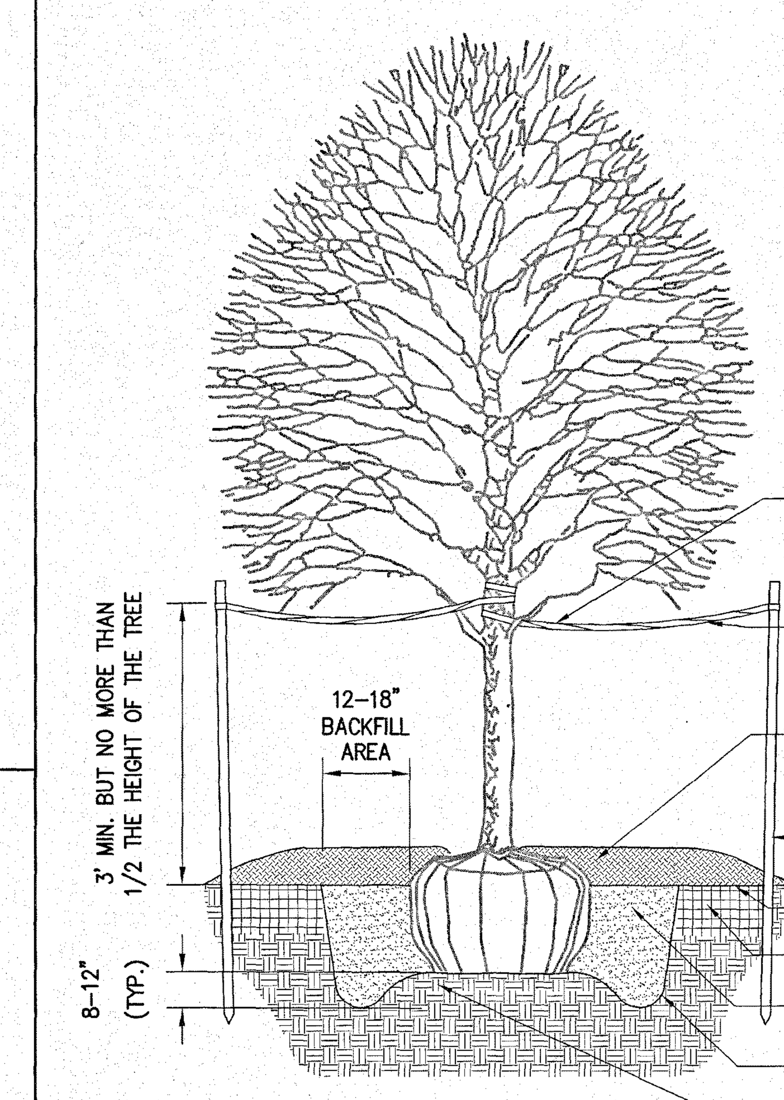
NOTES:
1. SPACE AS SHOWN ON PLAN OR AS INDICATED ON PLANT CHART.
2. WATER IMMEDIATELY AFTER PLANTING.

SHRUB PLANTING

NOT TO SCALE



PLAN VIEW FOR STAKING



2-3" WIDE WEBBING OR POLYETHYLENE STRAPS TWISTED LOOSELY AT THEIR MIDPOINT AND WRAPPED ONCE AROUND THE TREE TRUNK FLAT. ATTACHED TO THE STAKE WITH STAPLES.

LOOSELY TWIST EACH STRAP TO ALLOW FOR 4-6" OF TRUNK FLEXING (REMOVE ALL STRAPS AND STAKING AFTER 1-2 FULL GROWING SEASONS)

3" HT. SHREDDED HARDWOOD MULCH; KEPT AWAY FROM TRUNK. DO NOT COVER THE ROOT COLLAR WITH TOP SOIL OR MULCH.

6-8' WOOD STAKES, 3 PER TREE. STAKES TO BE SAME HEIGHT, DRIVEN IN ON A SLIGHT ANGLE.

EXISTING/FINISH GRADE

TILL 18" WIDTH AT TOP EDGE OF HOLE TO A 8-12" DEPTH

BACKFILL W/ NATIVE TOP SOIL; PARTIALLY BACKFILL, WATER TO SETTLE SOIL; FINISH BACKFILLING; TAMP LIGHTLY

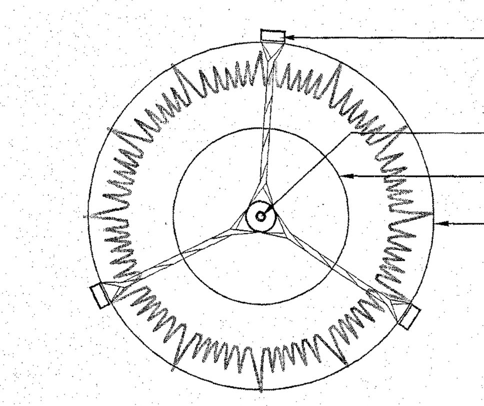
ROUGHEN HOLE WALLS AND BOTTOM

TRENCH AROUND PERIMETER OF MOUND TO DEPTH SHOWN.

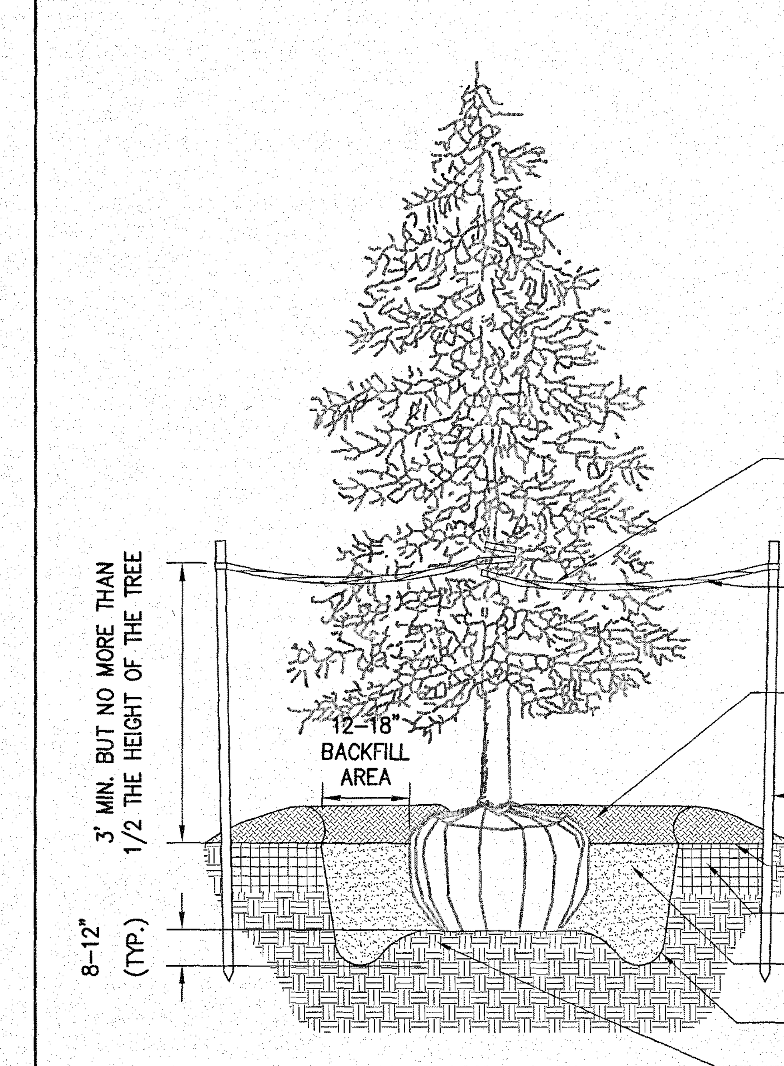
SECTION VIEW

DECIDUOUS TREE PLANTING

NOT TO SCALE



PLAN VIEW FOR STAKING



2-3" WIDE WEBBING OR POLYETHYLENE STRAPS TWISTED LOOSELY AT THEIR MIDPOINT AND WRAPPED ONCE AROUND THE TREE TRUNK FLAT. ATTACHED TO THE STAKE WITH STAPLES.

LOOSELY TWIST EACH STRAP TO ALLOW FOR 4-6" OF TRUNK FLEXING (REMOVE ALL STRAPS AND STAKING AFTER 1-2 FULL GROWING SEASONS)

3" HT. SHREDDED HARDWOOD MULCH; KEPT AWAY FROM TRUNK. DO NOT COVER THE ROOT COLLAR WITH TOP SOIL OR MULCH.

6-8' WOOD STAKES, 3 PER TREE. STAKES TO BE SAME HEIGHT, DRIVEN IN ON A SLIGHT ANGLE.

EXISTING/FINISH GRADE

TILL 18" WIDTH AT TOP EDGE OF HOLE TO A 8-12" DEPTH

BACKFILL W/ NATIVE TOP SOIL; PARTIALLY BACKFILL, WATER TO SETTLE SOIL; FINISH BACKFILLING; TAMP LIGHTLY

ROUGHEN HOLE WALLS AND BOTTOM

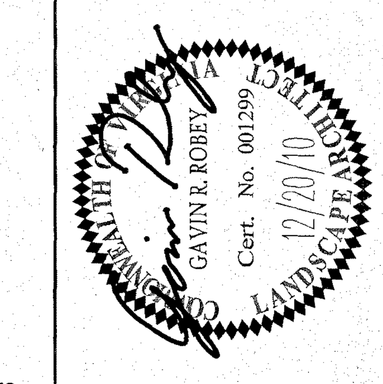
TRENCH AROUND PERIMETER OF MOUND TO DEPTH SHOWN.

SECTION VIEW

EVERGREEN TREE PLANTING

NOT TO SCALE

Rev.	Date	Description	Revised By
2	12/20/10	Revised Per JCC Comments Dated 11/10/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 05/20/10	TRS



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WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II

Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: NTS	Date: 04/21/10
Sheet Title: Planting Notes & Details	
Sheet Number	23

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2	12/20/10	Revised Per JCC Comments Dated 11/10/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 05/20/10	TRS
Rev.	Date	Description	Revised By

Notes: Job: Type:

FORM 10 ROUND
CA/MA ARM MOUNT

GENERAL DESCRIPTION: The Gardco Round arm mounted Form 10 products are cylindrical (CA) or semi-spherical (MA) sharp cutoff luminaires using high intensity discharge lamps up to 1000 watts (400w in the MA). Housings are one-piece seamless spun aluminum and finished with either Architectural Class 1 anodizing or electrostatically applied polyurethane. Luminaires can accept one of eight (8) interchangeable and rotatable precision segmented optical systems.

ORDERING *Flat glass lens luminaires meet IESNA Full Cutoff criteria. Sag Lens luminaires meet IESNA Cutoff criteria.*

PREFIX	CONFIGURATION	DISTRIBUTION	WATTAGE	VOLTAGE	FINISH	OPTIONS

Enter the order code into the appropriate box above. Note: Gardco reserves the right to refuse a configuration. Not all combinations and configurations are valid. Refer to notes below for exclusions and limitations. For questions or concerns, please consult the factory.

PREFIX

- CA17 17" Diameter Cylindrical Luminaire
- MA17 17" Diameter Semi-Spherical Luminaire
- CA22 22" Diameter Cylindrical Luminaire
- MA22 22" Diameter Semi-Spherical Luminaire

CONFIGURATION

- 1 Single Assembly
- 2 Twin Assembly
- 2@90 Twin Assembly at 90°
- 3 Triple at 90°
- 3@120 Triple at 120°
- 4 Quad Assembly

DISTRIBUTION

Horizontal Lamp
- 1 Type I
- 3 Type III
- 4X Type IV *(22" luminaires only)*
- FM Type IV
- Q Type V

Vertical Lamp
- VS Type V *(Supplied with acrylic sag lens. Medium base only on 17" luminaires only)*
- FC3V* Type III, Full cutoff
- FCVS* Type V, Full cutoff

*22" 320PSMH only. Supplied with MS32/BU/ED28/LLC/PS lamp

WATTAGE

CA17	MA17	CA22	MA22
50MH[1]	50MH[1]	250MH	250MH
70MH[1]	70MH[1]	400MH	400MH
100MH[1]	100MH[1]	1000MH[5,7,14]	250PSMH[9]
150MH[1]	150MH[1]	250PSMH[9]	320PSMH[10]
175MH	175MH	320PSMH[10]	350PSMH
200MH	175PSMH[2,12]	350PSMH	400PSMH
250MH[13]	70HPS	400PSMH[11]	450PSMH[2,11]
175PSMH[2,12]	100HPS	450PSMH[2]	250HPS
250PSMH[9]	150HPS[4]	750PSMH[8]	400HPS
70HPS		875PSMH	
100HPS		1000PSMH[7,14]	
150HPS[4]		250HPS	
		400HPS	
		750HPS[6]	

MH Metal Halide; PSMH Pulse Start Metal Halide; HPS High Pressure Sodium

1. Medium base lamp
2. Available with vertical lamp optics only.
3. Available with horizontal lamps only.
4. Operates 55V lamp.
5. Uses BT37 lamps only
6. Furnished standard with Sag Glass Lens.
7. Available with 4X and VS optics only.
8. M149 only. Horizontal optics require MS750/PS/BU-HOR/BT37 Lamp
9. M138 or M153
10. M132 or M154
11. M135 or M155
12. M137 or M152
13. Horizontal optics only.
14. For 1000w CA22 with 4X optics

For 1000 Metal Halide, use:

Brand	Product Code	Catalog Number
Venture	53702	MS1000W/HOR/BT37/3K
G.E.	18205	MVR1000/U/BT37
Venture	15332	MH1000W/U/BT37

For 1000 Pulse Start, use:

Brand	Product Code	Catalog Number
G.E.	10389	MVR1000/U/BT37/PA
Venture	49111	MS1000W/HOR/T25/PS

WARNING: Use of other lamps voids warranty

VOLTAGE

120 240 347 QUAD *120/208/240/277, Factory tied to 277V.*
208 277 480

FINISH

- BRP Bronze Paint
- BLP Black Paint
- WP White Paint
- NP Natural Aluminum Paint
- OC Optional Color Paint *Specify RAL designation ex: OC-RAL7024*
- SC Special Color Paint *Specify. Must supply color chip*
- BLA Black Anodized
- BRA Bronze Anodized
- NA Natural Anodized

OPTIONS

- HS Internal House Side Shield *Supplied standard w/FM optics*
- F Fusing *In Head. N/A above 400w*
- LF In-Line/In-Pole Fusing
- MF Mast Arm Fitter
- PC Photocontrol and Receptacle *N/A with MA units or 480V.*
- PCR Photocontrol Receptacle only *N/A with MA units*
- POLY Polycarbonate Sag Lens *In lieu of flat glass. N/A w/4X optics, 750 - 1000w*
- QS Quartz Standby *N/A above 400w*
- SG Sag Glass Lens *In lieu of flat glass. Supplied standard w/4X optics and 750-1000w*
- PTF2 Pole Top Fitter - 2 3/8" Dia. Tenon
- PTF3 Pole Top Fitter - 3-3.5" Dia. Tenon
- PTF4 Pole Top Fitter - 3.5-4" Dia. Tenon

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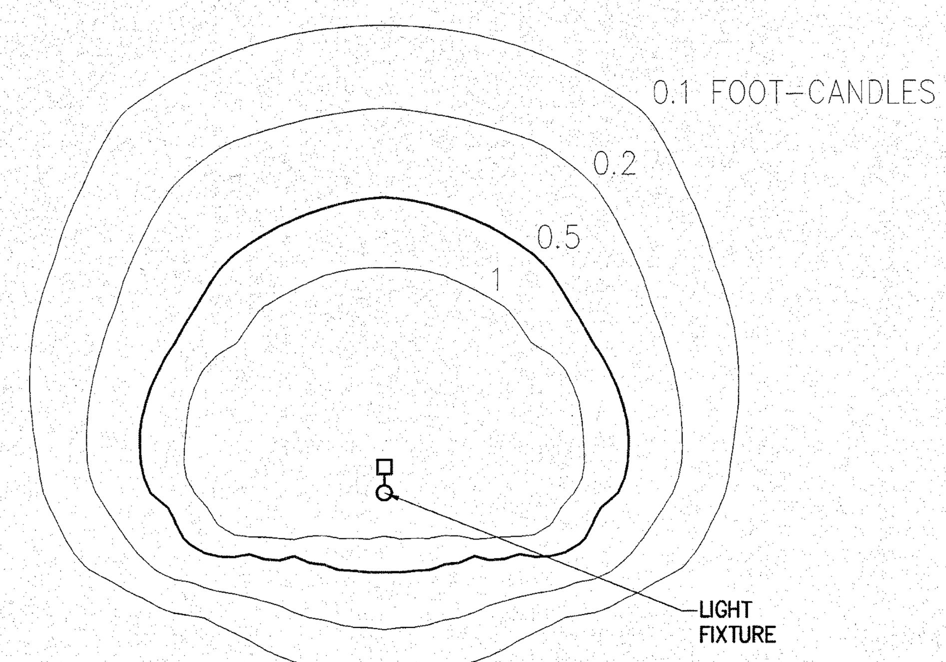
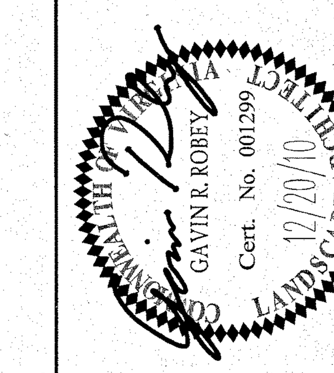
GARDCO LIGHTING
79115-40/0306

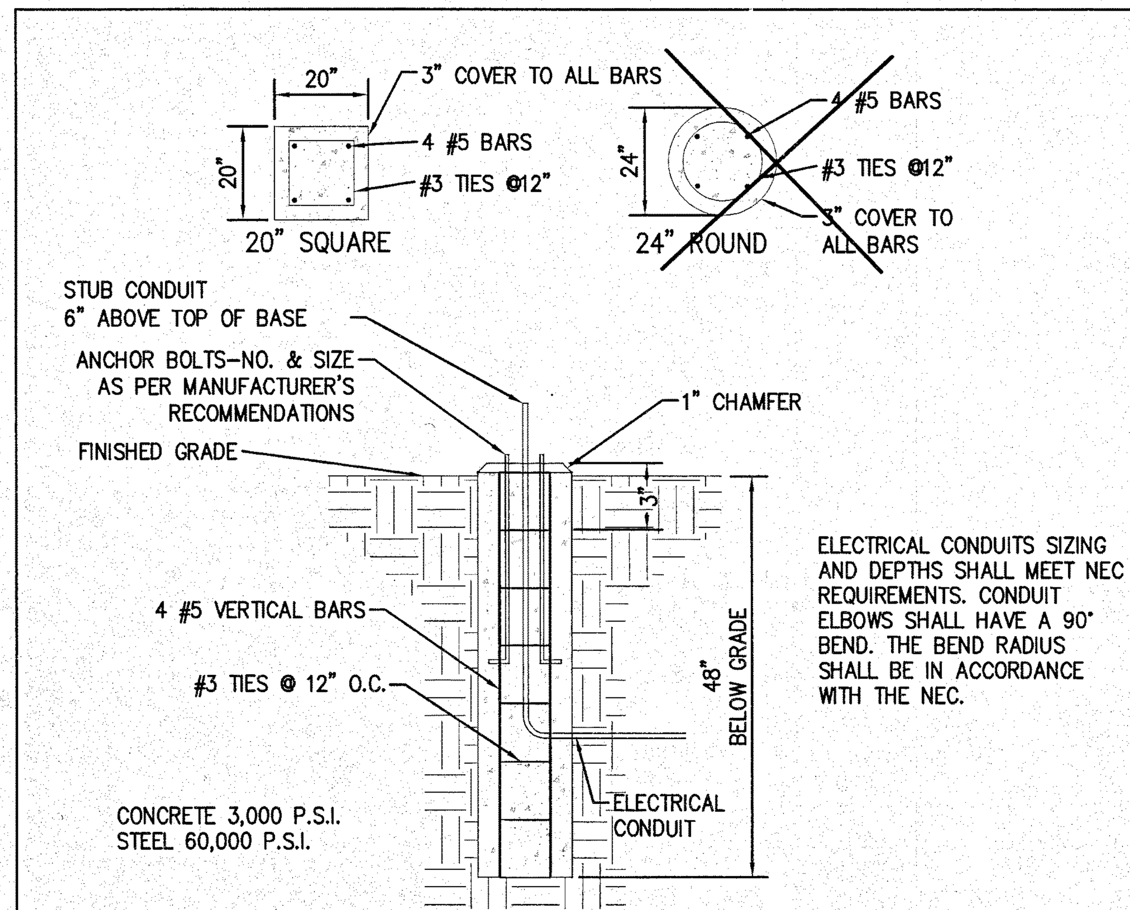


ISO FOOTCANDLE DIAGRAM

LIGHTING SCHEDULE

FIXTURE TYPE	MOUNTING HEIGHT	POLE TYPE/ MOUNTING INSTRUCTIONS	FIXTURES PER POLE	TOTAL FIXTURES
GARDCO MA17-1-FM-175MH-BRA: SEMI-SPHERICAL SHARP CUTOFF 17" DIA. LUMINAIRE, TYPE IV HORIZANTAL LAMP, 175 WATT METAL HALIDE, CLEAR FLAT LENSE, BRONZE TO MATCH EXISTING FIXTURES.	15'	GARDCO POLE TO MATCH EXISTING LIGHT POLES ON SITE, AND CONTRACTOR TO SPECIFY POLE SIZE.	1	21





FLUSH 16-25' POLE BASE DETAIL
N.T.S.

FORM 10 ROUND
CA/MA ARM MOUNT

SPECIFICATIONS

GENERAL: Each Gardco Form 10 arm mounted Hardtop is a cylindrical (CA) or semi-spherical (MA) sharp cutoff luminaire for high intensity discharge lamps. Internal components are totally enclosed, rain-tight, dust-tight and corrosion resistant. No venting of optical system or electrical components is required or permitted. Luminaires are completely assembled with no disassembly required for installation. Lamping requires no lifting or hinging the luminaire housing, disturbing wiring or exposing uninsulated live parts.

HOUSING: Housing is one piece, .100"/.25cm seamless aluminum with integral rolled circumferential reveal and lower section aperture incorporating a returned flange stiffener to protect against housing edge deformation. Units are offered in profiles of 17"(43.18cm) or 22" (55.88cm) diameter.

ARM: Extruded aluminum arm is secured to prewired fixture by contractor. Assembly is suitable for mounting to pole without requiring access to luminaire. Internal extruded channels capture tie rods for proper luminaire to pole alignment.

LENS: One piece, diecast aluminum door frame retains the optically clear, heat and impact resistant tempered flat glass or sag polycarbonate in a sealed manner using hollow section, high compliance, memory retentive extruded silicone rubber. Type 4X luminaire features sag glass lens and VS unit employs sag acrylic lens. Concealed stainless steel hinge and two (2) flush quarter-turn fasteners secure lens assembly to luminaire.

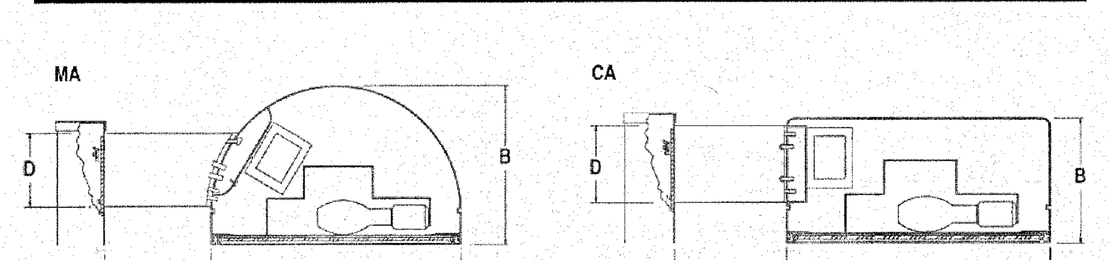
OPTICAL SYSTEMS: The segmented Form Ten optical system is homogeneous sheet aluminum, electrochemically brightened, anodized and sealed. The segmented reflectors are set in faceted arc tube image duplicator patterns to achieve IES Types I, III, IV and V distributions. The mogul base lampholder is glazed porcelain with a nickel plated screw shell and is securely attached to the reflector assembly. 50MH, 70MH and 100MH units have medium base lampholders. All horizontal Metal Halide units in the 22" housings have lamp stabilizers ensuring precise arc tube positioning.

ELECTRICAL: Each high power factor ballast is the separate component type, capable of providing reliable lamp starting down to -20°F/-29°C. The ballast is mounted on a unitized tray and secured within the luminaire, above the reflector system. Component-to-component wiring within the luminaire will carry no more than 80% of rated current and is listed by UL for use at 600 VAC at 150°C or higher. Plug disconnects are listed by UL for use at 600 VAC, 15A or higher.

FINISH: Anodized housings are created with an Aluminum Association Architectural Class I anodizing process to achieve a bronze, black or natural aluminum finish. Painted units are finished with hardcoat, fade resistant, electrostatically applied polyurethane.

LABELS: All fixtures bear UL or CUL (where applicable) Wet Location labels.

DIMENSIONS



MA Style Size	A	B	C	D	EPA Single	EPA Twin	EPA Quad	Avg. Weight Single
MA17	17"	11"	5"	5"	.8 ft²	1.6 ft²	2.3 ft²	27 lbs
	43.18 cm	27.94 cm	12.70 cm	12.70 cm	.07 m²	.15 m²	.21 m²	12.25 kg
MA22	22"	14"	7"	5"	1.3 ft²	2.7 ft²	3.7 ft²	40 lbs
	55.88 cm	35.56 cm	17.78cm	12.70 cm	.12 m²	.25 m²	.34 m²	18.14 kg

CA Style Size	A	B	C	D	EPA Single	EPA Twin	EPA Quad	Avg. Weight Single
CA17	17"	8"	5"	5"	.7 ft²	1.5	2.1	27 lbs
	43.18 cm	20.32 cm	12.70 cm	12.70 cm	.07 m²	.14 m²	.20 m²	12.25 kg
CA22	22"	11"	7"	5"	1.2	2.3	3.3	42 lbs
	55.88 cm	27.94 cm	17.78cm	12.70 cm	.11 m²	.21 m²	.31 m²	19.05 kg

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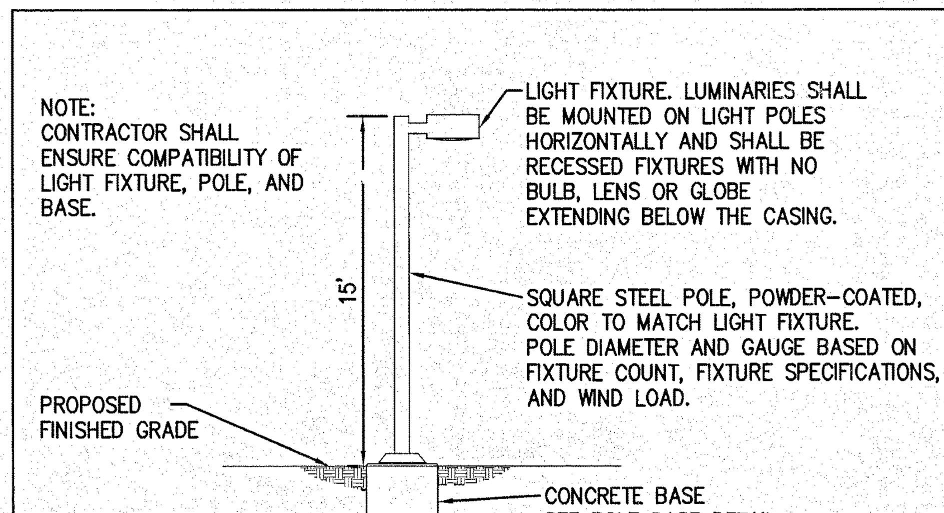

TYPICAL FLUSH SQUARE POLE DETAIL
N.T.S.

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WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: NTS	Date: 04/21/10
Sheet Title: Lighting Notes & Details	
Sheet Number	24

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GRINDER PUMP NOTES

1. GRINDER PUMPS SHALL BE ENVIRONMENT/ONE, MODEL: DH071-74, OR APPROVED EQUAL
2. THE PUMPS ARE TO BE SEMI-POSITIVE DISPLACEMENT TYPE; 15 GPM AT 0 PSIG; 11 GPM AT 40 PSIG AND 7.8 GPM @ 80 PSIG.
3. THE TANK SHALL BE 70 GALLON; NON-CORROSIVE, HEAVY DUTY, DUAL WALL, CORRUGATED HDPE SUITABLE FOR OUTDOOR USE; INTEGRAL FIBERGLASS ACCESS INCLUDED.
4. THE GRINDERS SHALL CONSIST OF TWO HARDENED STAINLESS STEEL CUTTERS ROTATING AT MOTOR SPEED IN PRECISION RELATIONSHIP TO HARDENED ALLOY SHEDDING RING TO PRODUCE A FINELY DIVIDED SLURRY.
5. PIPING CONNECTIONS: INLETS FOR 4-INCH LATERAL; DISCHARGE IS 1-1/4-INCH MALE NPT.
6. THE MOTOR SHALL BE 1 HP, 1725 RPM, HIGH-TORQUE, CAPACITOR START, 120 VOLT, 60 HERTZ, 8 AMP, 1 PHASE; WITH INTEGRAL, AUTOMATIC RESET, THERMAL PROTECTOR.
7. THE CONTROLS SHALL BE NON-FOULING STATIC SENSOR AND PRESSURE SWITCH SYSTEMS NO MOVING PARTS IN CONTACT WITH SEWAGE; SELF-CONTAINED UNIT.
8. ANTI-SIPHON VALVES SHALL BE INCLUDED ON THE DISCHARGE PIPES INSIDE THE TANK.
9. HIGH WATER LEVEL, POWER FAILURE AND PUMP ALARMS SHALL BE PROVIDED. A REMOTE PANEL WITH AN ALARM TEST FUNCTION SHALL ALSO BE PROVIDED; AS SHALL A REMOTE DISPLAY WITH AUDIBLE ALARM. AN ALARM SYSTEM SHALL BE PROVIDED AT THE BUILDING AND SHALL HAVE A BACK-UP POWER SUPPLY.
10. ELECTRIC TESTING SHALL BE PERFORMED BY THE ELECTRICAL SUBCONTRACTOR (A MASTER ELECTRICIAN) IN THE PRESENCE OF THE JAMES CITY COUNTY ELECTRICAL INSPECTOR. TESTING WILL BE TO ASSURE THAT THE STATION OPERATES AS INTENDED AND TO COMPLY WITH ALL OTHER POSSIBLE REQUIREMENTS RELATING TO SUCCESSFUL OPERATION AS OUTLINED IN THE VIRGINIA SEWAGE COLLECTION & TREATMENT REGULATIONS.
11. THE CONTROL CONSOLE AND ALARM SYSTEM SHALL BE LOCATED AS SHOWN ON THE DETAIL IN AN ACCESSIBLE AND VISIBLE LOCATION AS CLOSE TO THE GRINDER PUMP AS POSSIBLE. SEE GENERAL NOTE 9.
12. AN ELECTRICAL DISCONNECT SHALL BE PROVIDED ADJACENT TO THE PUMP PER NEC CODE. THE PUMP CONTROLS ARE LOCATED IN THE TOP HOUSING OF THE CORE UNIT INSIDE A WATERPROOF ACCESS COVER. THEY MAY ALSO BE LOCATED ADJACENT TO THE DISCONNECT, IN A NEMA 4X BOX.
13. ALL ELECTRICAL EQUIPMENT MUST BE UL LISTED.
14. ALL EQUIPMENT SHALL BE TESTED IN ACCORDANCE WITH THE NEC.
15. FORCE MAIN PIPING SHALL BE TESTED AT 150 PSI FOR 60 MINUTES OR 50% ABOVE THE DESIGN OPERATING PRESSURE, WHICHEVER IS GREATER. LEAKAGE SHALL NOT EXCEED LIMITS ESTABLISHED BY AWWA C600.
16. ALL COMPONENTS OF THE GRINDER PUMP SYSTEM SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE JAMES CITY COUNTY STANDARDS FOR SANITARY SEWER SYSTEMS, AND THE VIRGINIA SEWAGE COLLECTION & TREATMENT REGULATIONS.
17. THE GRINDER PUMP ASSEMBLY SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
18. CONTROL PANEL SHALL BE MODEL LM000333 WITH THE FOLLOWING FEATURES:

    120 VAC OPERATING VOLTAGE
    NEMA 4X FIBERGLASS ENCLOSURE
    VISUAL ALARM
    AUDIBLE ALARM
    MANUAL SILENCE
    REDUNDANT RUN ON ALARM
    POWER LOSS HIGH LEVEL ALARM CONTACTS
    PREDICTIVE STATUS DISPLAY
    GENERATOR RECEPTACLE (30 AMP, 250 VAC)
    MANUAL TRANSFER SWITCH

19. A CONCRETE ANCHOR OF 2,600 LBS. IS REQUIRED TO PREVENT THE TANK FROM FLOATING. A 6" DEPTH OF GRANULAR BEDDING MATERIAL SHALL BE PROVIDED UNDER THE CONCRETE ANCHOR.

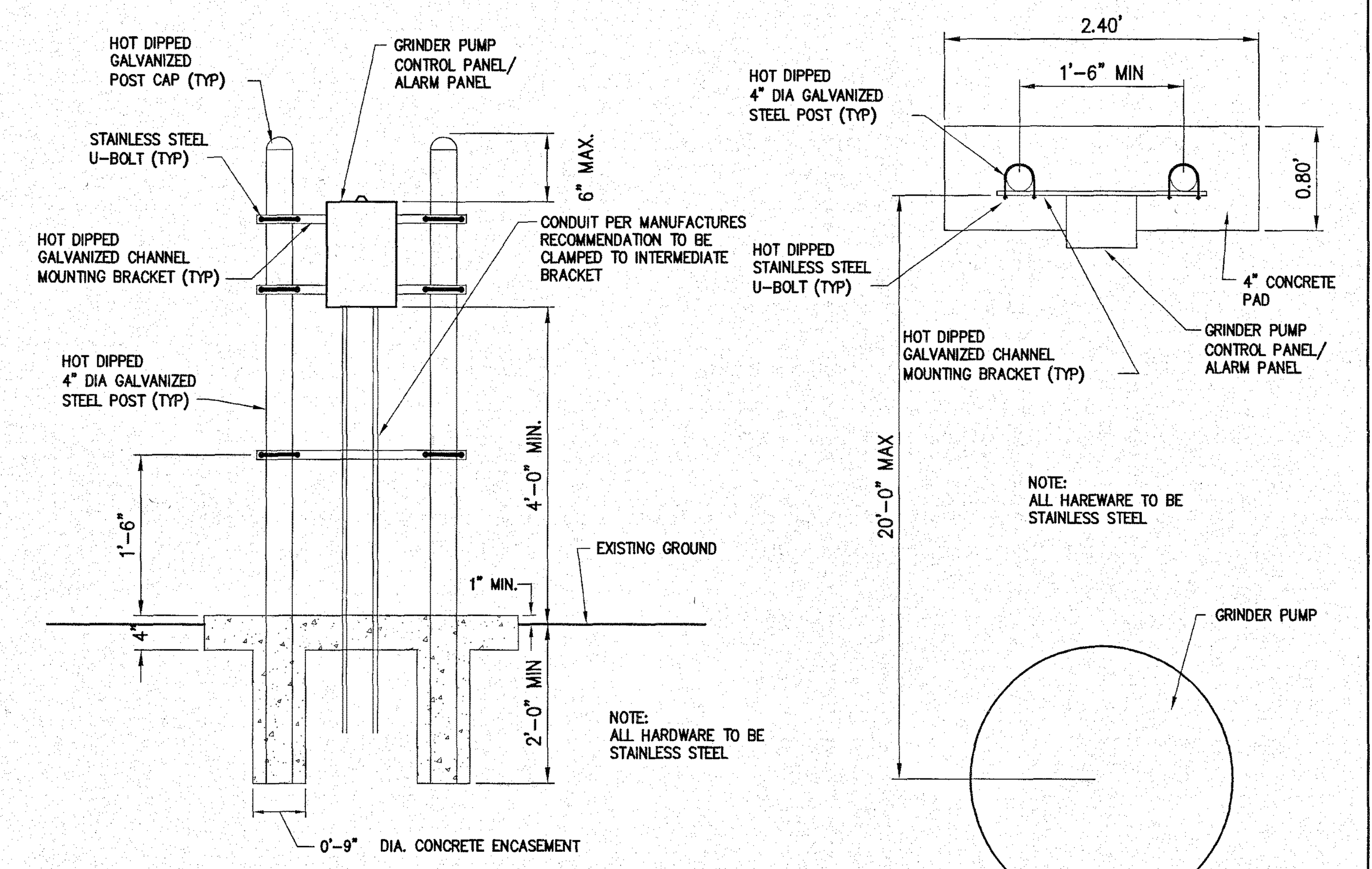
GRINDER PUMP FORCE MAIN PIPING

1. MATERIALS – SCHEDULE 80 PVC PIPE (ASTM D-1785 OR ASTM D-2241) OR SDR 21 (ASTM D2241).
2. JOINTS –
   A. SCHEDULE 80 SOLVENT WELDED JOINTS SHALL BE MADE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS OR IN ACCORDANCE WITH ASTM D-2564.
   B. SDR 21 PIPE SHALL HAVE GASKETED JOINTS. GASKETS SHALL BE IN ACCORDANCE WITH ASTM D3139-89.
3. THRUST RESTRAINT SHALL BE PROVIDED FOR GASKETED TYPE PIPING AT ALL BENDS, TEES AND CHANGES OF DIRECTION. ONE CUBIC FOOT THRUST BLOCKS SHALL BE PROVIDED FOR LINES THREE INCHES AND SMALLER.
4. FORCE MAIN PIPING SHALL BE TESTED AT 150 PSI FOR 60 MINUTES, OR 50% ABOVE THE DESIGN OPERATING PRESSURE, WHICHEVER IS GREATER.

   LEAKAGE SHALL NOT EXCEED:

   L = [SD(P^(1/2))]/133,200

   WHERE L = ALLOWABLE LEAKAGE IN GPH
   S = LENGTH OF PIPE TESTED IN FEET
   D = NOMINAL PIPE DIAMETER IN INCHES
   P = AVERAGE TEST PRESSURE IN PSI DURING THE LEAK TEST
5. PROVIDE BEDDING CLASS B AS SHOWN IN DETAIL.

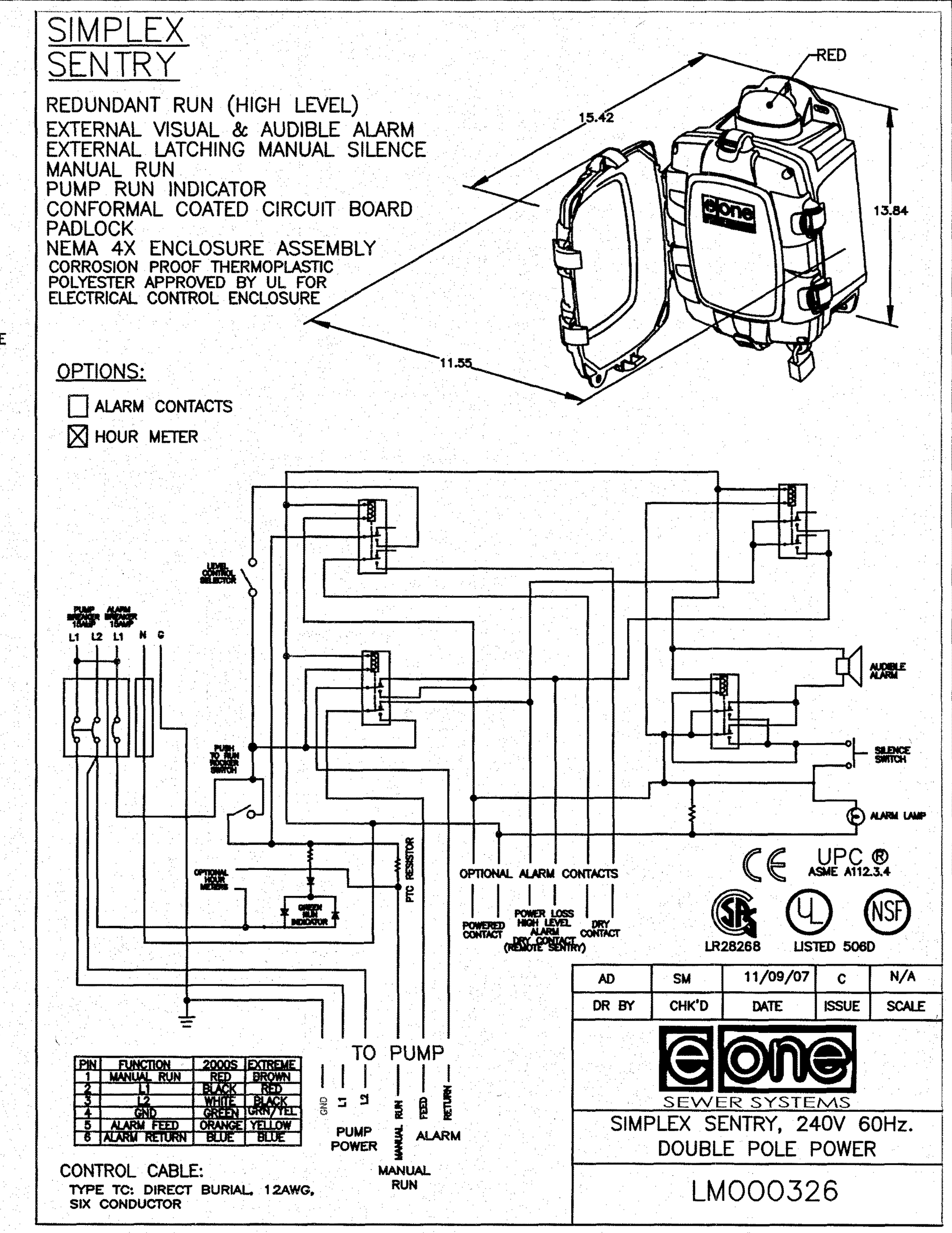


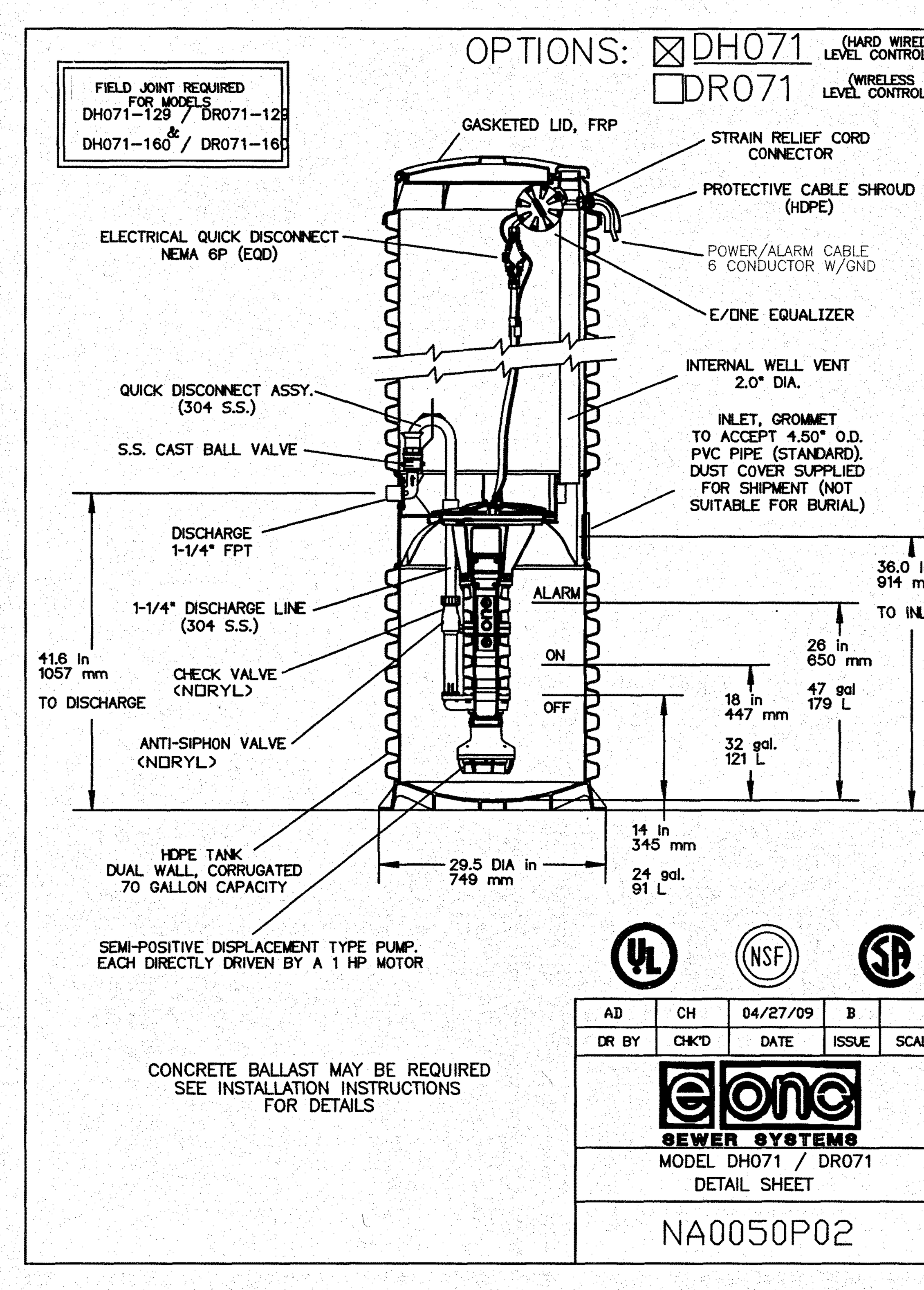
ELEVATION

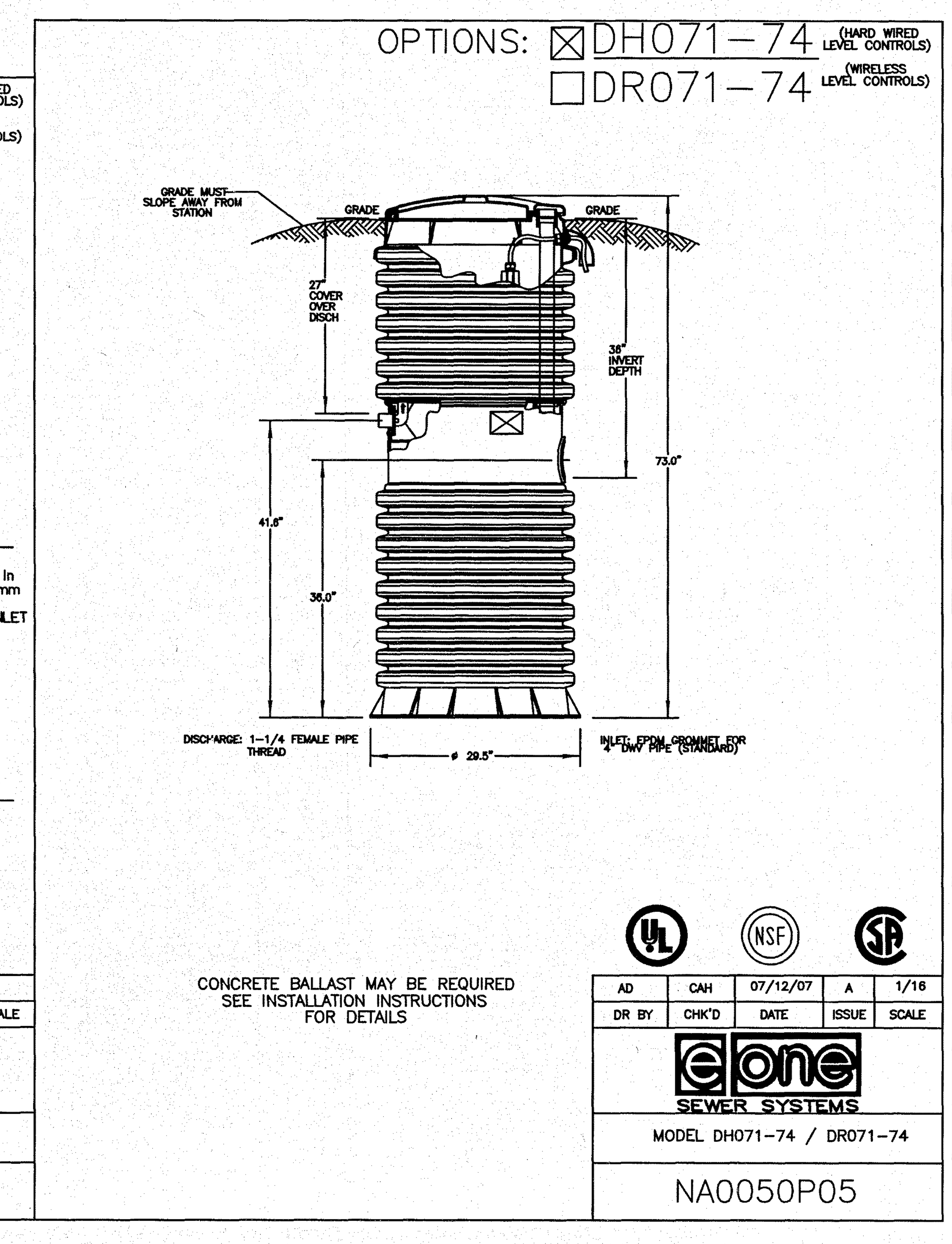
PLAN

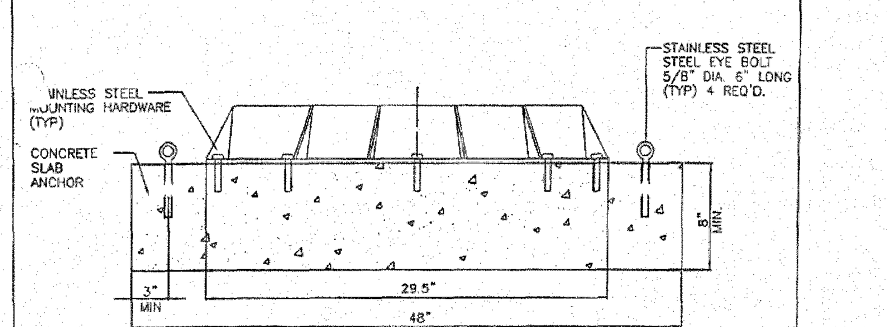
CONTROL PANEL/ALARM PANEL MOUNTING DETAIL

NTS









NOTES:

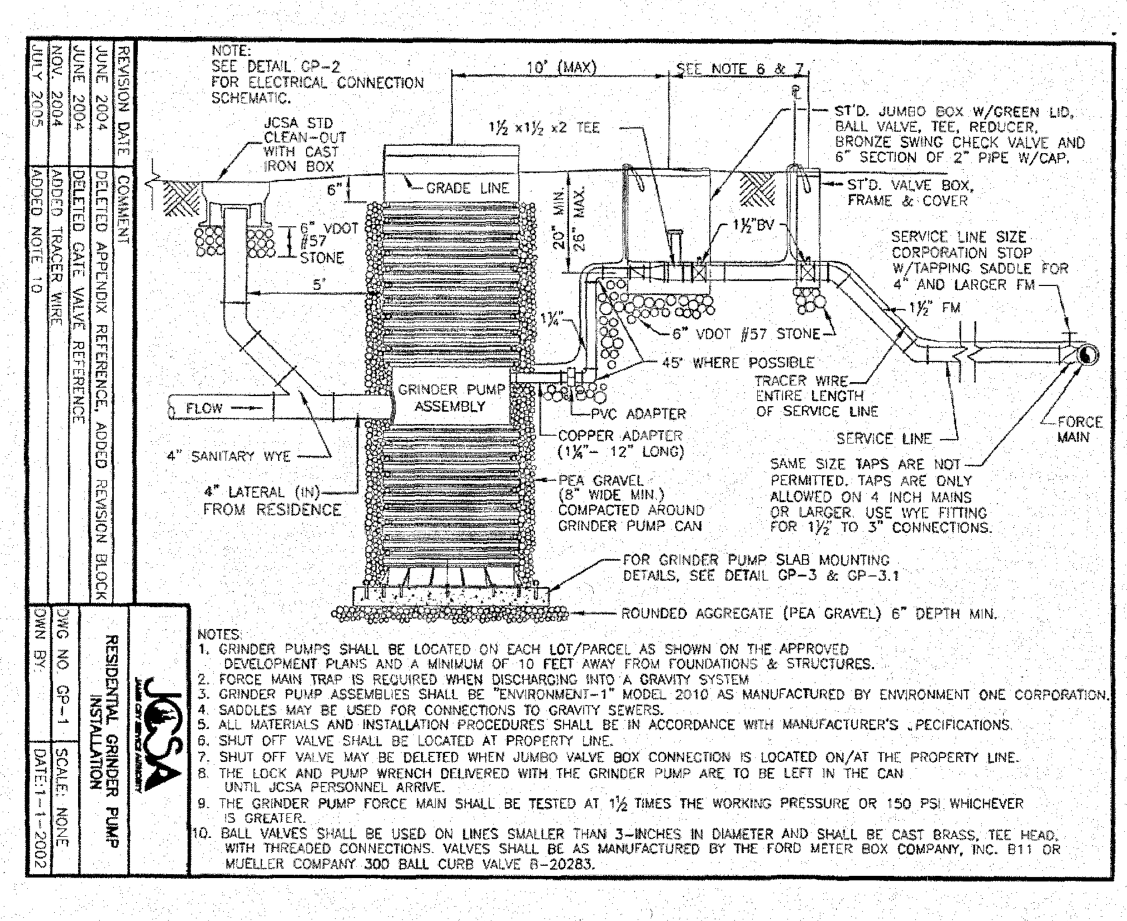
CONCRETE SLAB ANCHOR OF 370 LBS. (2.5 CU. FT.) PER FOOT OF TOTAL STATION HEIGHT, BASED ON STATION HEIGHT IN 6 INCH INCREMENTS, IS REQUIRED TO PREVENT TANK FROM FLOATING. MINIMUM DIMENSIONS SHOWN ABOVE ARE BASED ON STATION HEIGHT OF 4'-0". ONE INCH OF ADDITIONAL THICKNESS SHALL BE REQUIRED FOR EACH ADDITIONAL 6 INCHES OF TOTAL STATION HEIGHT. SEE EXAMPLES BELOW.

STATION HEIGHT	SLAB LENGTH	SLAB WIDTH	SLAB THICKNESS
4'-0" THRU 4'-6"	4 FT	4 FT	8 INCHES
4'-6" THRU 5'-0"	4 FT	4 FT	9 INCHES
5'-0" THRU 5'-6"	4 FT	4 FT	10 INCHES
5'-6" THRU 6'-0"	4 FT	4 FT	11 INCHES
6'-0" THRU 6'-6"	4 FT	4 FT	12 INCHES
6'-6" THRU 7'-0"	4 FT	4 FT	13 INCHES
7'-0" THRU 7'-6"	4 FT	4 FT	14 INCHES
7'-6" THRU 8'-0"	4 FT	4 FT	15 INCHES
8'-0" THRU 8'-6"	4 FT	4 FT	16 INCHES
8'-6" THRU 9'-0"	4 FT	4 FT	17 INCHES
9'-0" THRU 9'-6"	4 FT	4 FT	18 INCHES
9'-6" THRU 10'-0"	4 FT	4 FT	19 INCHES

FOR STATIONS EXCEEDING 10 FEET IN TOTAL HEIGHT, SLAB THICKNESS SHALL BE INCREASED BY ONE INCH FOR EACH ADDITIONAL 6 INCHES OF STATION HEIGHT, OR FRACTION THEREOF.

JCSA
JAMES CITY SERVICE AUTHORITY
GRINDER PUMP SLAB DETAIL
DWG NO GP-3.1 | SCALE: NONE
DWN BY: | DATE: 1-1-2002

APPENDIX



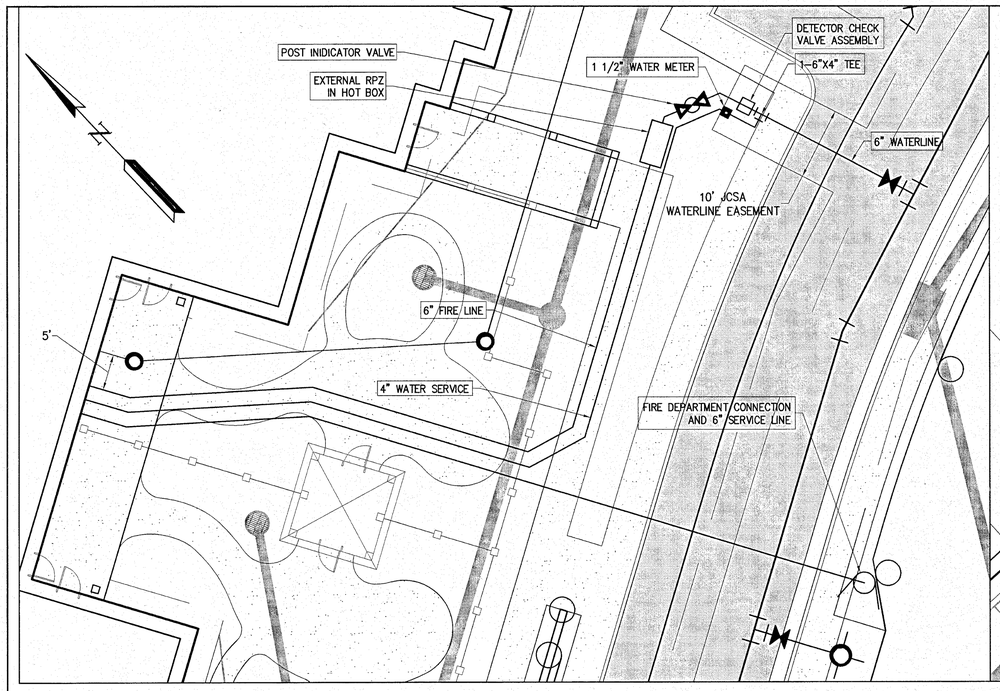
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II

Jamestown District | James City County | Virginia

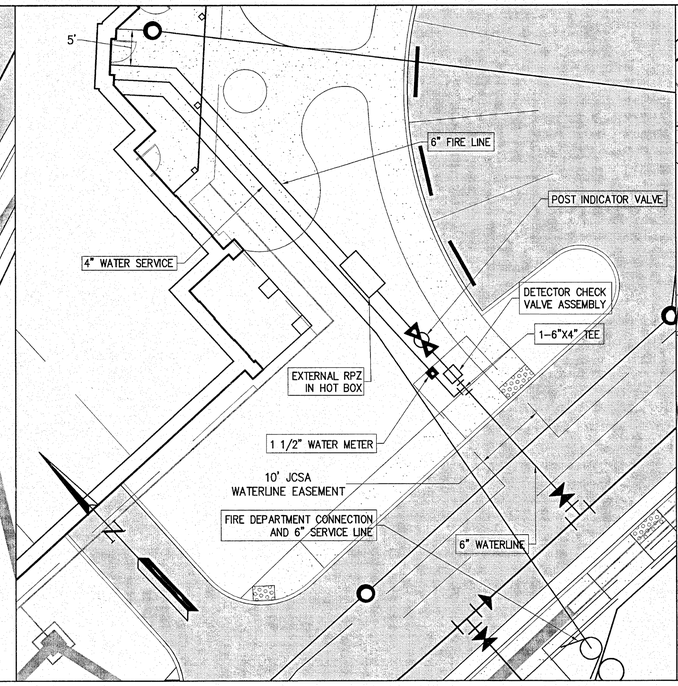
AES CONSULTING ENGINEERS

Project Contacts: NB / TRS
Project Number: 8162-06
Scale: N/A
Date: 04/21/10
Sheet Title: Pump Station #3 Notes and Details

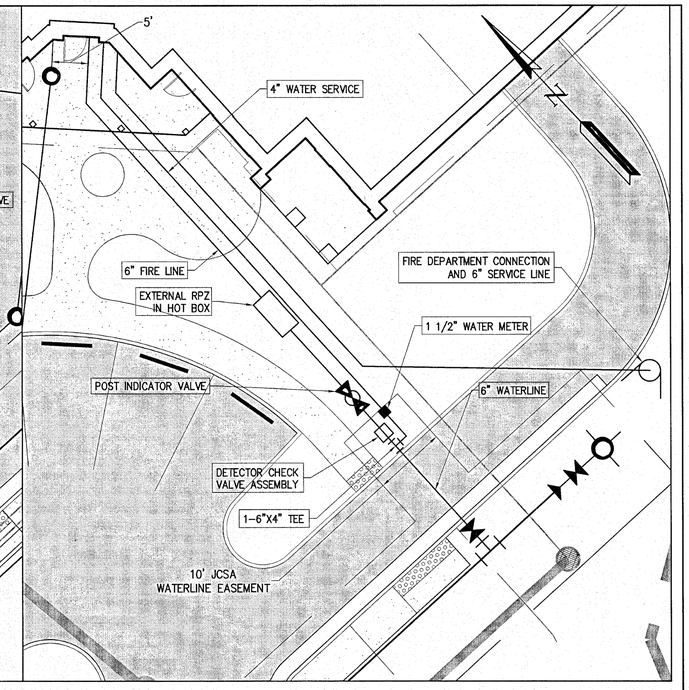
Sheet Number
26



SKILLED CARE BUILDING
WATER SERVICE CONFIGURATION (1"=10')



INDEPENDENT LIVING BUILDING #1
WATER SERVICE CONFIGURATION (1"=10')



INDEPENDENT LIVING BUILDING #2
WATER SERVICE CONFIGURATION (1"=10')

Rev.	Date	Description	Revised By
2	12/20/10	Revised Per JCC Comments Dated 11/10/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 05/20/10	TRS

STATE OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
12/20/10
PROFESSIONAL ENGINEER

JCSA GENERAL NOTES FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS

(Revised March 2008)

A. ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL CONSTRUCTION STANDARDS (FOURTH EDITION WITH AMENDMENTS DATED OCTOBER 2006), AND THE COMMONWEALTH OF VIRGINIA DEPARTMENT OF HEALTH *WATERWORKS AND SANITARY SEWERAGE REGULATIONS*. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA AND HRPDC REGIONAL CONSTRUCTION STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO JCSA.

B. THE CONTRACTOR/DEVELOPER SHALL ACQUIRE A CERTIFICATE TO CONSTRUCT WATER AND SANITARY SEWER FACILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION OF ANY WATER OR SANITARY SEWER FACILITIES.

C. A PRECONSTRUCTION MEETING SHALL BE HELD BETWEEN JCSA, THE DEVELOPER, THE CONTRACTOR INCLUDING RELEVANT SUBCONTRACTOR(S), AND THE PROJECT ENGINEER PRIOR TO ISSUANCE OF A JCSA CERTIFICATE TO CONSTRUCT. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SCHEDULE THIS MEETING WITH JCSA AND COORDINATE WITH THE OTHER ATTENDEES.

D. THE DEVELOPER'S REPRESENTATIVE SHALL SUBMIT SHOP DRAWINGS FOR ALL MATERIALS AND RECEIVE JCSA APPROVAL PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL MATERIALS ORDERED AND INSTALLED PRIOR TO JCSA'S REVIEW AND ACCEPTANCE WILL BE AT THE CONTRACTOR'S/DEVELOPER'S RISK.

E. PIPE LINES AND SERVICES SHALL BE INSTALLED AFTER GRADING TO WITHIN 6-INCHES OF FINAL GRADE AND PRIOR TO PLACEMENT OF BASE MATERIAL.

F. ALL WATER MAINS SHALL BE FULLY FLUSHED, PRESSURE TESTED, AND DISINFECTED AND SATISFACTORY BACTERIOLOGICAL SAMPLES OBTAINED, IN ACCORDANCE WITH JCSA DESIGN AND ACCEPTANCE CRITERIA. FLUSHING OF WATER MAINS SHALL BE SCHEDULED WITH THE JCSA INSPECTOR MINIMUM 3 BUSINESS DAYS PRIOR TO THE FLUSHING. CONTRACTOR SHALL PROVIDE THE REQUIRED DURATION AND VOLUME TO THE INSPECTOR. FLUSHING WILL BE SCHEDULED ONLY ON MONDAYS, UNLESS AUTHORIZED OTHERWISE BY JCSA, AND WILL BE ON A FIRST COME-FIRST SERVE BASIS.

G. ROUTINE PERIODIC INSPECTIONS DURING CONSTRUCTION WILL BE PROVIDED BY JCSA. THESE INSPECTIONS DO NOT RELIEVE THE DEVELOPER/CONTRACTOR/OWNER FROM HIS OBLIGATION AND RESPONSIBILITY FOR CONSTRUCTING A WATER DISTRIBUTION AND SANITARY SEWER SYSTEM IN STRICT ACCORDANCE WITH THE JCSA DESIGN AND ACCEPTANCE CRITERIA.

H. ANY FIELD MODIFICATIONS OR CHANGES TO THE APPROVED PLANS SHALL BE VERIFIED AND CHECKED BY THE ENGINEER OF RECORD AND APPROVED BY JCSA PRIOR TO ANY FIELD MODIFICATIONS OR CHANGES. ALL APPROVED CHANGES AND FIELD MODIFICATIONS SHALL BE ACCURATELY INDICATED ON THE RECORD DRAWINGS.

I. ALL LOTS SHALL BE PROVIDED WITH WATER SERVICE AND SANITARY SEWER CONNECTIONS. THE CONNECTIONS SHALL BE EXTENDED FROM THE MAIN TO THE PROPERTY LINE OR EASEMENT LINE, AND SHALL TERMINATE WITH A YOKE IN A METER BOX, OR AT THE CLEAN OUT, SET AT FINAL FINISHED GRADE. METERS FOR ALL LOTS (UNITS) SHALL BE PAID FOR BY THE DEVELOPER OR BUILDER AND INSTALLED BY JCSA.

J. ANY REQUIRED EASEMENTS, PERMITS AND APPROVALS SHALL BE ACQUIRED BY THE DEVELOPER PRIOR TO COMMENCEMENT OF WATER MAIN AND/OR SANITARY SEWER CONSTRUCTION.

K. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS AND ORDERS OF ANY PUBLIC BODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION. THE CONTRACTOR SHALL ALSO NOTIFY "MISS UTILITY" AT 1-800-552-7001 OR 811 PRIOR TO PERFORMING ANY UNDERGROUND EXCAVATION.

L. WATER METER BOX INSTALLATION SHALL MAINTAIN A MINIMUM 18-INCH HORIZONTAL EDGE-TO-EDGE CLEARANCE FROM DRIVEWAYS AND/OR DRIVE PATHS, SIDEWALKS, BIKE PATHS, CURBING AND ADJACENT WATER METER BOXES.

M. ONLY JCSA PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ON EXISTING JCSA WATER MAINS AND SANITARY FORCE MAINS. ONCE A SYSTEM HAS BEEN HYDRAULICALLY ENERGIZED, JCSA WILL BE RESPONSIBLE FOR OPERATING THE VALVES. THE CONTRACTOR SHALL CONTACT JCSA OPERATIONS AT 757-229-7421 IF THERE IS AN EMERGENCY OR NEED TO OPEN/CLOSE A VALVE.

N. ANY EXISTING UNUSED WELL(S) SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.

O. BEDDING OF JCSA UTILITIES SHALL BE IN ACCORDANCE WITH HRPDC DETAIL EW_01.

P. NO TREES, SHRUBS, STRUCTURES, FENCES, IRRIGATION MAINS, INVISIBLE PET FENCES OR OTHER OBSTACLES SHALL BE PLACED WITHIN AN EASEMENT WHICH WOULD RENDER THE EASEMENT INACCESSIBLE BY EQUIPMENT. SHRUBS SHALL BE A MINIMUM OF 5 FEET, AND TREES A MINIMUM OF 10 FEET, FROM THE CENTER OF WATER AND SANITARY SEWER PIPELINES.

Q. JOINT RESTRAINT SHALL BE PROVIDED IN ACCORDANCE WITH MINIMUM REQUIREMENTS OF JCSA DETAIL JR.1, UNLESS SHOWN OTHERWISE ON THE PLANS. ALL PRESSURE PIPELINES SHALL HAVE JOINT RESTRAINT. FIRE HYDRANTS SHALL BE RESTRAINED AT LEAST ONE FULL JOINT OF PIPE IN EACH DIRECTION ON THE MAINLINE.

R. PROPOSED WATER AND SANITARY SEWER SYSTEMS SHALL MAINTAIN A MINIMUM HORIZONTAL SEPARATION OF 5-FEET FROM OTHER UTILITIES AND STRUCTURES, INCLUDING BUT NOT LIMITED TO STORM SEWERS, STREET LIGHTS, ETC. WATER AND SANITARY SEWER FACILITIES SHALL HAVE A MINIMUM 10-FOOT HORIZONTAL EDGE-TO-EDGE SEPARATION.

S. ANY PROPOSED BACKFLOW PREVENTION DEVICE AND/OR GREASE TRAP MUST BE INSPECTED BY THE JCSA UTILITY SPECIAL PROJECTS COORDINATOR AT (757) 259-4138.

T. THE CONTRACTOR/DEVELOPER SHALL ACQUIRE A CERTIFICATE TO CONSTRUCT WATER AND SANITARY SEWER FACILITIES PRIOR TO COMMENCEMENT OF CONSTRUCTION OF ANY WATER OR SANITARY SEWER FACILITIES. PLUMBING INSIDE OF PROPOSED BUILDINGS MUST BE INSPECTED BY JCSA'S UTILITY SPECIAL PROJECTS COORDINATOR AT (757) 259-4138, FOR POTENTIAL CROSS CONNECTIONS. ANY CROSS CONNECTIONS MUST BE PROTECTED BY THE APPROPRIATE BACKFLOW PREVENTION DEVICE(S)".

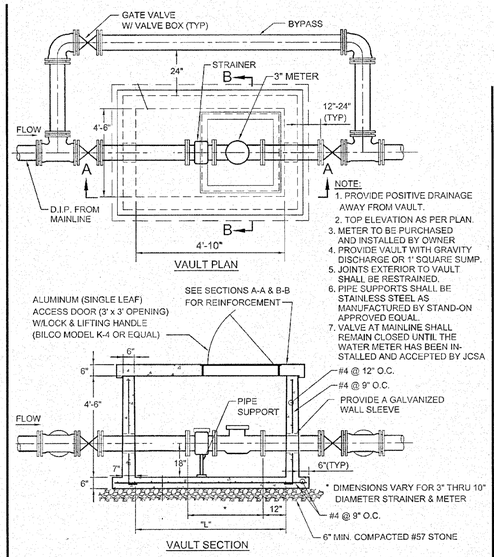
U. EASEMENTS DENOTED AS "JCSA UTILITY EASEMENTS" ARE FOR THE EXCLUSIVE USE OF THE JAMES CITY SERVICE AUTHORITY AND THE PROPERTY OWNER. OTHER UTILITY SERVICE PROVIDERS DESIRING TO USE THESE EASEMENTS WITH THE EXCEPTION OF PERPENDICULAR UTILITY CROSSINGS MUST OBTAIN AUTHORIZATION FOR ACCESS AND USE FROM JCSA AND THE PROPERTY OWNER. ADDITIONALLY, JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY DAMAGE TO IMPROVEMENTS WITHIN THIS EASEMENT, FROM ANY CAUSE.

V. JCSA SHALL NOT BE HELD RESPONSIBLE FOR ANY PAVEMENT SETTLEMENT DUE TO PIPE BEDDING, BACKFILLING, BACKFILL MATERIALS OR COMPACTION FOR WATER OR SANITARY SEWER FACILITIES FOR THIS PROJECT.

W. FIRE HYDRANTS TO BE INSTALLED WITHIN EXISTING OR PROPOSED VDOT RIGHT-OF-WAYS SHALL BE LOCATED IN ACCORDANCE WITH VDOT REQUIREMENTS.

X. PRIVATELY OWNED UTILITIES, (E.G., WATER AND SEWER LINES AND PRIVATE FIRE SERVICE MAINS), SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE, AND ENFORCED BY THE JAMES CITY COUNTY CODES COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 24, AND THE VIRGINIA STATEWIDE FIRE PREVENTION CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT FIRST OBTAINING THE REQUIRED PERMITS AND INSPECTIONS.

Y. SANITARY SEWER LATERALS SHALL NOT CONNECT TO THE MAINLINE WITHIN 5-FEET OF A MANHOLE. LATERALS UPSTREAM AND WITHIN 5-FEET OF THE MANHOLE SHALL CONNECT DIRECTLY INTO THE MANHOLE WHERE NECESSARY.



NOTE:
1. PROVIDE POSITIVE DRAINAGE AWAY FROM VAULT.
2. TOP ELEVATION AS PER PLAN.
3. METER TO BE PURCHASED AND INSTALLED BY OWNER
4. PROVIDE VAULT WITH GRAVITY DISCHARGE OR 1" SQUARE SUMP.
5. JOINTS EXTERIOR TO VAULT SHALL BE RESTRAINED.
6. PIPE SUPPORTS SHALL BE STAINLESS STEEL AS MANUFACTURED BY STAND-ON APPROVED EQUAL.
7. VALVE AT MAINLINE SHALL REMAIN CLOSED UNTIL THE WATER METER HAS BEEN INSTALLED AND ACCEPTED BY JCSA

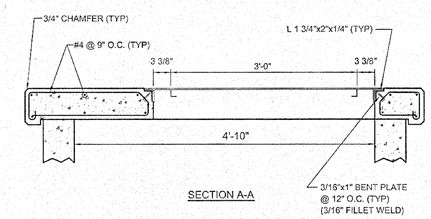
VAULT PLAN

VAULT SECTION

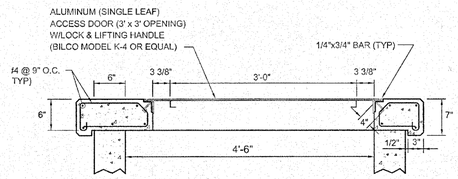
PRECAST CONCRETE VAULT- NON-LOAD BEARING
(3" THRU 10" WATER METER ASSEMBLIES)

NOT TO SCALE

NOTE: VAULT SHALL BE PAINTED IN ACCORDANCE WITH JCSA DETAIL VPT.1.



SECTION A-A



SECTION B-B

PRECAST CONCRETE VAULT- NON-LOAD BEARING
(3" THRU 10" WATER METER ASSEMBLIES)

NOT TO SCALE

JCSA/HRPDC DETAIL REFERENCES

JCSA

W13.0 WATER METER INSTALLATION
W14.0 METER SETTING
JR.1 JOINT RESTRAINT TABLE

HRPDC

WATER DISTRIBUTION SYSTEMS (WD)
WD_09 TEMPORARY MANIFOLD FOR TEST & CHLORINATION
WD_10 PRECAST CONCRETE VAULT-NON LOAD BEARING

SANITARY SYSTEMS (SS)
SS_07 SANITARY SEWER MANHOLE INVERT SHAPING
SS_09 SANITARY SEWER MANHOLE CASTING (24")
SS_10 SANITARY SEWER MANHOLE COVER (24")
SS_11 SANITARY SEWER LATERAL CLEAN OUT FRAME AND COVER

WATER & SANITARY SYSTEMS (WS)
WS_01 STANDARD VALVE BOX FRAME AND COVER
WS_02 VALVE SETTING DETAIL

REFER TO THE LATEST EDITIONS OF THE HAMPTON ROADS PLANNING DISTRICT COMMISSION REGIONAL (HRPDC) CONSTRUCTION STANDARDS AND JAMES CITY SERVICE AUTHORITY (JCSA) DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS.

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WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: N/A	Date: 04/21/10

Sheet Title:
Notes and Details

Sheet Number
29

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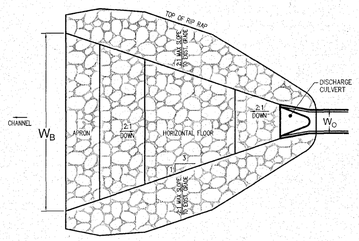
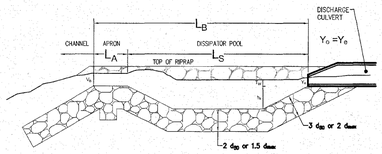


PLAN

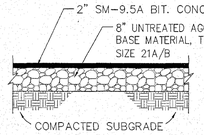


PROFILE

RIPRAP BASIN DETAIL (BMP #6)

N.T.S

L_B=10.2'	d_{50}=1.1'
L_S=6.8'	W_B=8.1'
L_A=3.4'	



TYPICAL PAVEMENT SECTION

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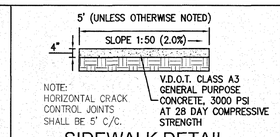

SIDEWALK DETAIL

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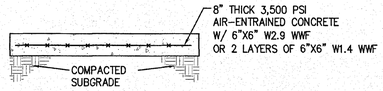

8" CONCRETE PAD SECTION

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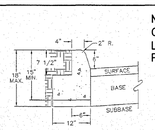
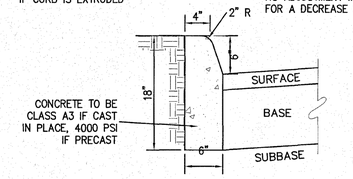


ACCEPTABLE ALTERNATE IF CURB IS EXTRUDED

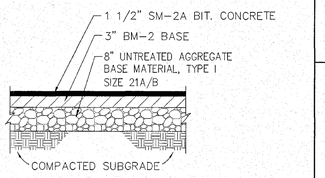
NOTE:
CURB HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.

THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 3" (15" DEPTH) OR INCREASED AS MUCH AS 3" (21" DEPTH) IN ORDER THAT THE BOTTOM OF THE CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE, THE DEPTH IS TO BE 18" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.



STANDARD 6" CURB (CG-2)

N.T.S.



TYPICAL HEAVY DUTY PAVEMENT SECTION

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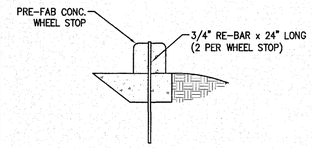
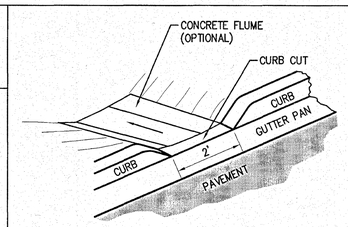


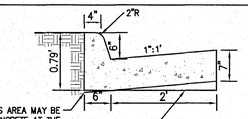
CONC. WHEEL STOP DETAIL

N.T.S.



CURB CUT

N.T.S.



THE BOTTOM OF THE CURB AND GUTTER MAY BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUB SURFACE COURSES PROVIDED A MINIMUM DEPTH OF 7" IS MAINTAINED.

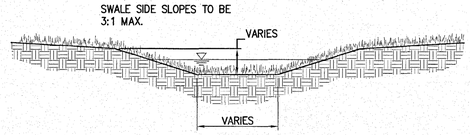
COMBINATION CURB AND GUTTER HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS A RADIAL COMBINATION CURB AND GUTTER.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

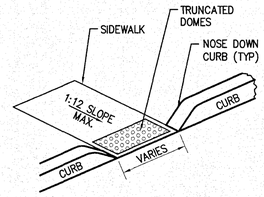
COMBINATION CURB AND GUTTER (CG-6)

N.T.S.



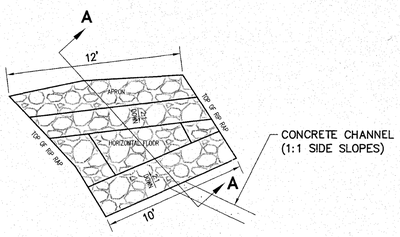
TYP. CHANNEL DETAIL

N.T.S.

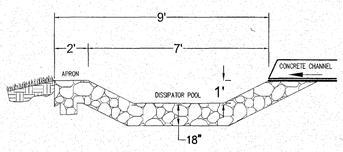


TYPICAL SIDEWALK RAMP

N.T.S.



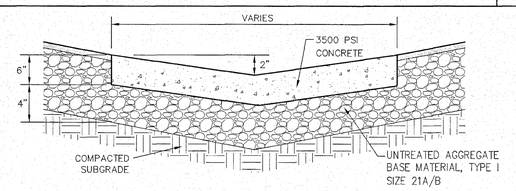
PLAN



PROFILE

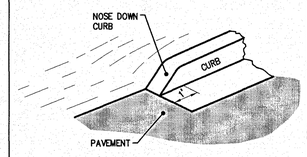
MODIFIED RIPRAP BASIN DETAIL

N.T.S



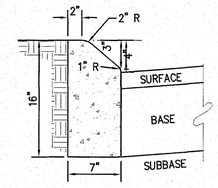
CONCRETE VALLEY GUTTER DETAIL

N.T.S.



NOSE DOWN CURB

N.T.S.



NOTES
THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

CURB HAVING A RADIUS OF 300'. OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.

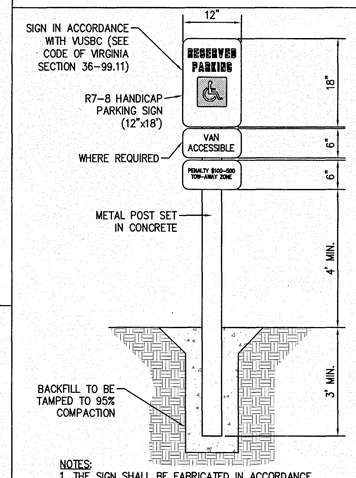
WHEN THIS STANDARD IS TO BE TIED INTO EXISTING BARRIER CURB, THE TRANSITION IS TO BE MADE WITHIN 10' OR THE CHANGE IN STANDARDS MADE AT REGULAR OPENINGS.

THIS CURB TO BE USED WHEN DESIGN SPEED IS 40 MPH OR LESS ON RURAL HIGHWAYS AND 45 MPH OR LESS IN URBAN AND SUBURBAN AREAS.

THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 3" (13" DEPTH) OR INCREASED AS MUCH AS 3" (19" DEPTH) IN ORDER THAT THE BOTTOM OF THE CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE THE DEPTH IS TO BE 16" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.

STANDARD 4" CURB (CG-3)

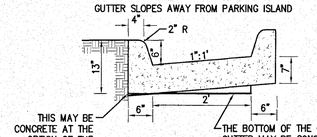
N.T.S.



NOTES:
1. THE SIGN SHALL BE FABRICATED IN ACCORDANCE WITH SECTION 701 AND INSTALLED PER INSTALLATION DETAIL WSP-1 TYPE C OF THE VDOT ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS.
2. VAN ACCESSIBLE SPACES SHALL HAVE ADDITIONAL SIGNAGE READING "VAN ACCESSIBLE".

HANDICAP SIGN DETAIL

N.T.S.



THE BOTTOM OF THE CURB AND GUTTER MAY BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUB-SURFACE COURSES PROVIDED A MINIMUM DEPTH OF 7" IS MAINTAINED

THIS ITEM MAY BE PRECAST OR CAST IN PLACE

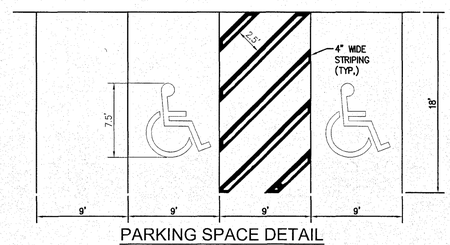
CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST

ISLAND CUT THROUGH

N.T.S.

VDOT REFERENCE TABLE

ES-1	102.01
DI-1	104.01
DI-3	104.09-104.11
DI-7	104.22-104.24
MH-1	106.01-106.05
IS-1	106.08
ST-1	106.09
PB-1	107.00-107.04
CG-2	201.01
CG-3	201.02
CG-6	201.03



PARKING SPACE DETAIL

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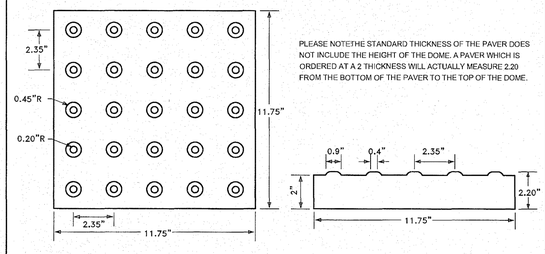

PLEASE NOTE:THE STANDARD THICKNESS OF THE PAVER DOES NOT INCLUDE THE HEIGHT OF THE DOME. A PAVER WHICH IS ORDERED AT A 2 THICKNESS WILL ACTUALLY MEASURE 2.20 FROM THE BOTTOM OF THE PAVER TO THE TOP OF THE DOME.

DETECTABLE WARNING SURFACE

N.T.S.

Rev.	Date	Description	Revised By
1	10/14/10	Revised Per JCC Comments Dated 09/20/10	TRS
2	12/20/10	Revised Per JCC Comments Dated 11/16/10	TRS

COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
12/20/10
PROFESSIONAL ENGINEER

AES CONSULTING ENGINEERS
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Williamsburg, Virginia 23188
Phone: (757) 220-8454
Fax: (757) 220-8994
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II

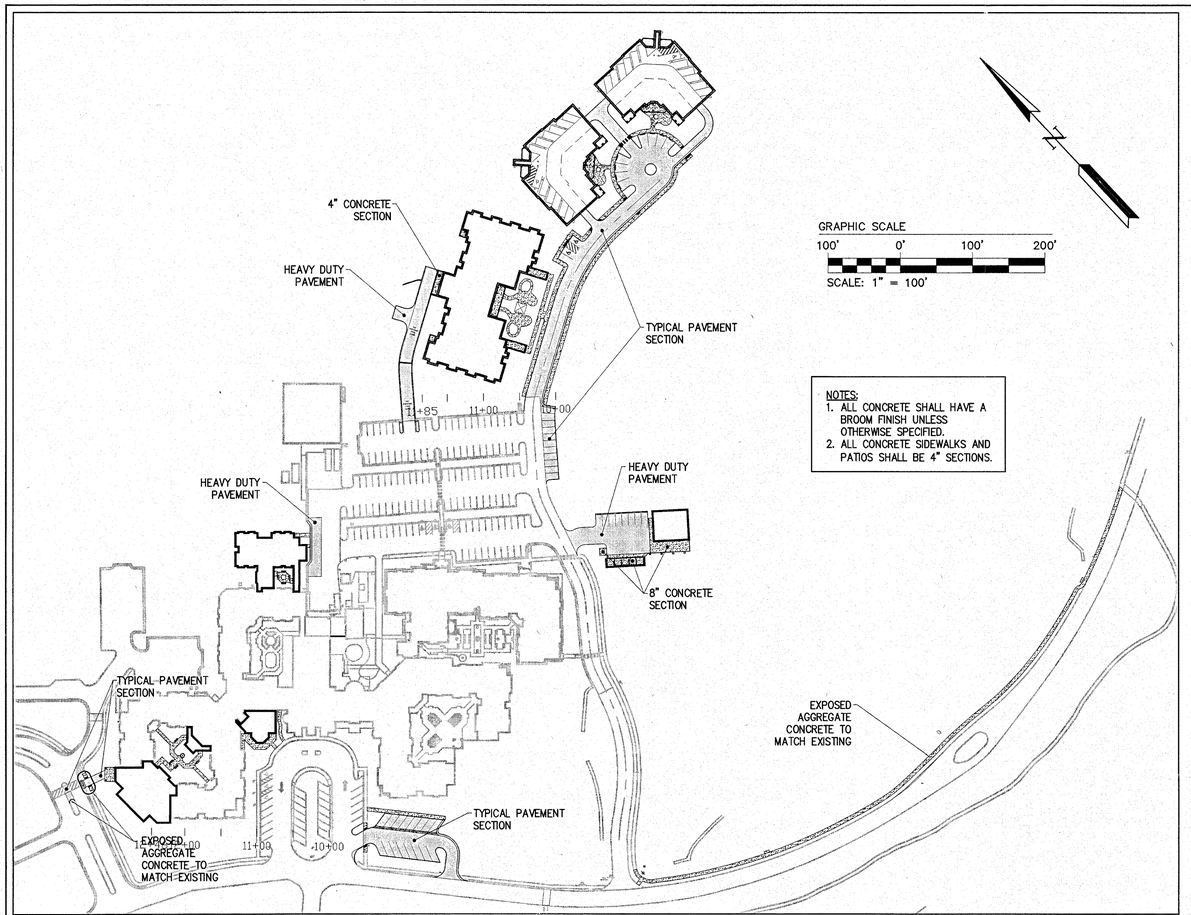
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: N/A	Date: 04/21/10

Sheet Title:
Notes and Details

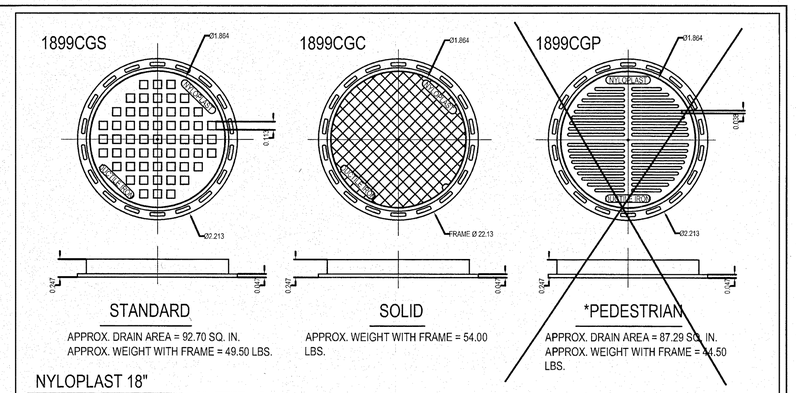
Sheet Number
30

S:\Jobs\8162\06-RPA Study\Engineering\Plans\W8162\06c30-details.dwg,12/20/2010 11:50:02 AM,ryan.stephenson



NOTES:
1. ALL CONCRETE SHALL HAVE A BROOM FINISH UNLESS OTHERWISE SPECIFIED.
2. ALL CONCRETE SIDEWALKS AND PATIOS SHALL BE 4" SECTIONS.

CONCRETE AND PAVEMENT SECTION PLAN
(1"=100')



STANDARD
APPROX. DRAIN AREA = 92.70 SQ. IN.
APPROX. WEIGHT WITH FRAME = 49.50 LBS.

SOLID
APPROX. WEIGHT WITH FRAME = 54.00 LBS.

*PEDESTRIAN
APPROX. DRAIN AREA = 87.29 SQ. IN.
APPROX. WEIGHT WITH FRAME = 44.50 LBS.

NYLOPLAST 18" GRATES/COVERS

STANDARD GRATE HAS H-25 HEAVY DUTY RATING
SOLID COVER HAS H-25 HEAVY DUTY RATING
PEDESTRIAN GRATE HAS H-10 MEDIUM DUTY RATING
QUALITY: MATERIALS SHALL CONFORM TO ASTM A536 GRADE 70-50-05
MATERIAL: DUCTILE IRON
PAINT: CASTINGS ARE FURNISHED WITH A BLACK PAINT LOCKING DEVICE AVAILABLE UPON REQUEST PRICE INCLUDES FRAME & GRATE/COVER

* SIZE OF OPENING MEETS REQUIREMENTS OF AMERICAN DISABILITY ACT AS STATED IN FEDERAL REGISTER PART III, DEPARTMENT OF JUSTICE, 28 CFR PART 36. NONDISCRIMINATION ON THE BASIS OF DISABILITY BY PUBLIC ACCOMMODATIONS AND IN COMMERCIAL FACILITIES; FINAL RULE.

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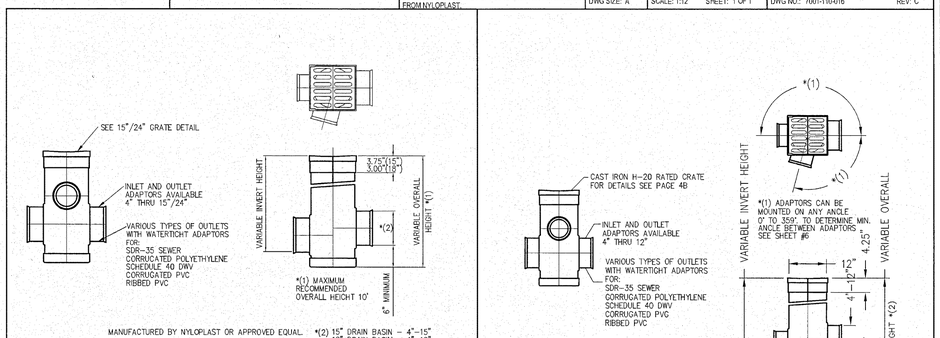
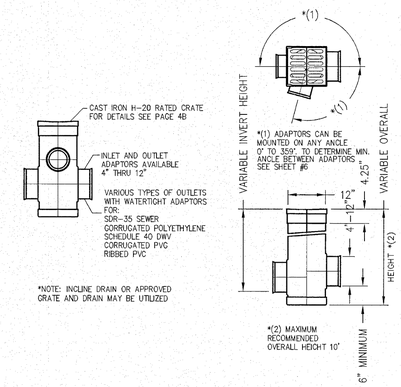
DRAWN BY: AWA	MATERIAL: DUCTILE IRON	Nyloplast	3130 VERONA AVE BUFORD, GA 30518 PHN (770) 932-2443 FAX (770) 932-2490 www.nyloplast-us.com
DATE: 15AUG00			
APPD BY: CJA	PROJECT NO./NAME: GRATE / COVER	TITLE: NEW STYLE 18" STANDARD, SOLID & PEDESTRIAN	
DATE: 15AUG00			
DWG SIZE: A	SCALE: 1:12 SHEET: 1 OF 1	DWG NO.: 7001-110-016	REV: C



15"/18" DRAIN BASIN
N.T.S.



12" DRAIN BASIN
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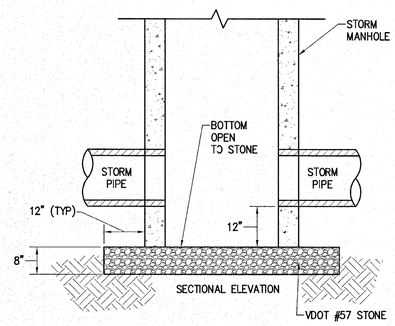

SUMP MANHOLE DETAIL
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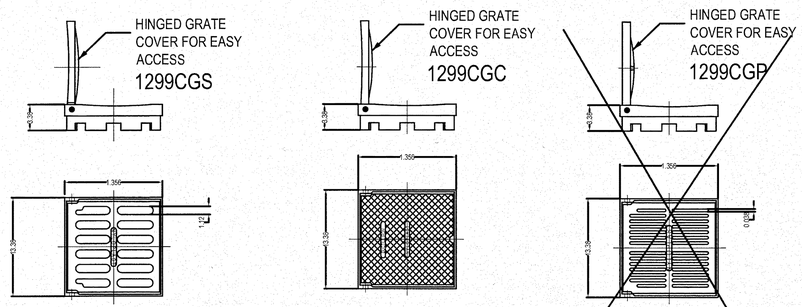


STANDARD
APPROX. DRAIN AREA = 60.62 SQ. IN.
APPROX. WEIGHT WITH FRAME = 40.68 LBS.

SOLID
APPROX. WEIGHT WITH FRAME = 39.90 LBS.

*PEDESTRIAN
APPROX. DRAIN AREA = 50.60 SQ. IN.
APPROX. WEIGHT WITH FRAME = 35.04 LBS.

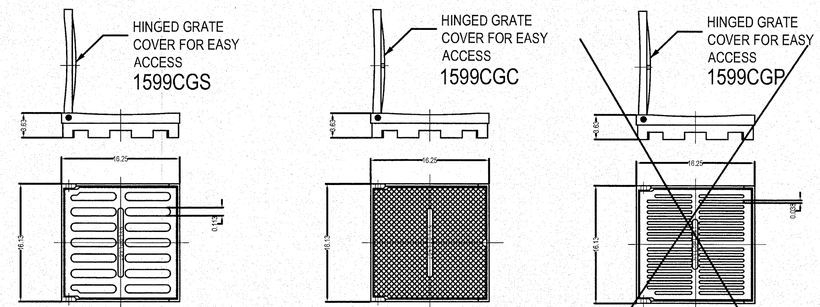
NYLOPLAST 12" GRATES/COVERS

STANDARD GRATE HAS H-25 HEAVY DUTY RATING
SOLID COVER HAS H-25 HEAVY DUTY RATING
PEDESTRIAN GRATE HAS H-10 MEDIUM DUTY RATING
QUALITY: MATERIALS SHALL CONFORM TO ASTM A536 GRADE 70-50-05 & A48-CLASS 30B
MATERIAL: DUCTILE IRON GRATE W/CAST IRON FRAME
PAINT: CASTINGS ARE FURNISHED WITH A BLACK PAINT LOCKING DEVICE AVAILABLE UPON REQUEST PRICE INCLUDES FRAME & GRATE/COVER

* SIZE OF OPENING MEETS REQUIREMENTS OF AMERICAN DISABILITY ACT AS STATED IN FEDERAL REGISTER PART III, DEPARTMENT OF JUSTICE, 28 CFR PART 36. NONDISCRIMINATION ON THE BASIS OF DISABILITY BY PUBLIC ACCOMMODATIONS AND IN COMMERCIAL FACILITIES; FINAL RULE.

THIS PRINT DISCLOSES SUBJECT MATTER IN WHICH NYLOPLAST HAS PROPRIETARY RIGHTS. THE RECEIPT OR POSSESSION OF THIS PRINT DOES NOT CONFER, TRANSFER, OR LICENSE THE USE OF THE DESIGN OR TECHNICAL INFORMATION SHOWN HEREIN REPRODUCTION OF THIS PRINT OR ANY INFORMATION CONTAINED HEREIN, OR MANUFACTURE OF ANY ARTICLE HEREFROM, FOR THE DISCLOSURE TO OTHERS IS FORBIDDEN, EXCEPT BY SPECIFIC WRITTEN PERMISSION FROM NYLOPLAST.

DRAWN BY: AWA	MATERIAL: DUCTILE IRON	Nyloplast	3130 VERONA AVE BUFORD, GA 30518 PHN (770) 932-2443 FAX (770) 932-2490 www.nyloplast-us.com
DATE: 15AUG00			
APPD BY: CJA	PROJECT NO./NAME: GRATE / COVER	TITLE: 12" STANDARD, SOLID & PEDESTRIAN	
DATE: 15AUG00			
DWG SIZE: A	SCALE: 1:12 SHEET: 1 OF 1	DWG NO.: 7001-110-049	REV: C



STANDARD
APPROX. DRAIN AREA = 92.70 SQ. IN.
APPROX. WEIGHT WITH FRAME = 59.62 LBS.

SOLID
APPROX. WEIGHT WITH FRAME = 59.00 LBS.

*PEDESTRIAN
APPROX. DRAIN AREA = 81.25 SQ. IN.
APPROX. WEIGHT WITH FRAME = 53.70 LBS.

NYLOPLAST 15" GRATES/COVERS

STANDARD GRATE HAS H-25 HEAVY DUTY RATING
SOLID COVER HAS H-25 HEAVY DUTY RATING
PEDESTRIAN GRATE HAS H-10 MEDIUM DUTY RATING
QUALITY: MATERIALS SHALL CONFORM TO ASTM A536 GRADE 70-50-05 & A48-CLASS 30B
MATERIAL: DUCTILE IRON GRATE W/CAST IRON FRAME
PAINT: CASTINGS ARE FURNISHED WITH A BLACK PAINT LOCKING DEVICE AVAILABLE UPON REQUEST PRICE INCLUDES FRAME & GRATE/COVER

* SIZE OF OPENING MEETS REQUIREMENTS OF AMERICAN DISABILITY ACT AS STATED IN FEDERAL REGISTER PART III, DEPARTMENT OF JUSTICE, 28 CFR PART 36. NONDISCRIMINATION ON THE BASIS OF DISABILITY BY PUBLIC ACCOMMODATIONS AND IN COMMERCIAL FACILITIES; FINAL RULE.

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DRAWN BY: AWA	MATERIAL: DUCTILE IRON	Nyloplast	3130 VERONA AVE BUFORD, GA 30518 PHN (770) 932-2443 FAX (770) 932-2490 www.nyloplast-us.com
DATE: 15AUG00			
APPD BY: CJA	PROJECT NO./NAME: GRATE / COVER	TITLE: 15" STANDARD, SOLID & PEDESTRIAN	
DATE: 15AUG00			
DWG SIZE: A	SCALE: 1:12 SHEET: 1 OF 1	DWG NO.: 7001-110-050	REV: C

Rev.	Date	Description	Revised By
2	12/28/10	Revised Per JCC Comments Dated 11/10/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 06/30/10	TRS

COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
12/30/10
PROFESSIONAL ENGINEER

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WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District | James City County | Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: N/A	Date: 04/21/10
Sheet Title: Notes and Details	
Sheet Number	31

S:\Jobs\8162\06-RPA Study\Engineering\Plans\W8162\06c3_details.dwg, 12/20/2010 11:50:22 AM, ryan.stephenson

JAMES CITY COUNTY ENVIRONMENTAL DIVISION
STANDARD EROSION AND SEDIMENT CONTROL NOTES
REVISED OCTOBER 1, 2009

THE FOLLOWING STANDARD EROSION AND SEDIMENT CONTROL (E&SC) NOTES SHALL BECOME PART OF APPROVED EROSION AND SEDIMENT CONTROL PLANS FOR ALL PLAN OF DEVELOPMENT PROJECTS IN JAMES CITY COUNTY, VIRGINIA.

1. ALL THE PROVISIONS OF VIRGINIA EROSION AND SEDIMENT CONTROL LAW AND REGULATIONS, MINIMUM STANDARDS, HANDBOOKS, AND TECHNICAL BULLETINS AS PUBLISHED BY THE VIRGINIA SOIL & WATER CONSERVATION BOARD AND/OR THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION, DIVISION OF SOIL & WATER CONSERVATION SHALL APPLY TO THE PROJECT.

2. MINIMUM STANDARDS # 1 THROUGH # 19 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS (4VAC50-30-40) SHALL APPLY TO THE PROJECT.

3. THE OWNER OR APPLICANT SHALL BE RESPONSIBLE TO REGISTER FOR COVERAGE UNDER THE GENERAL PERMIT FOR DISCHARGE OF STORMWATER FROM CONSTRUCTION ACTIVITIES, IN ACCORDANCE WITH CURRENT REQUIREMENTS OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) AND THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION.

4. THE OWNER OR APPLICANT SHALL PROVIDE THE NAME OF AN INDIVIDUAL HOLDING A VALID RESPONSIBLE LAND DISTURBER (RLD) CERTIFICATE OF COMPETENCE WHO WILL BE RESPONSIBLE FOR THE LAND-DISTURBING ACTIVITY PRIOR TO ENGAGING IN THE LAND-DISTURBING ACTIVITY. THIS WILL BE NECESSARY PRIOR TO ISSUANCE OF A LAND-DISTURBING PERMIT FOR THE PROJECT. THE RLD IS REQUIRED TO ATTEND THE PRECONSTRUCTION CONFERENCE FOR THE PROJECT.

5. THE CONTRACTOR IS RESPONSIBLE TO CONTACT MISS UTILITY (DIAL 811 IN VA OR 1-800-552-7001) PRIOR TO ANY UTILITY OR SITE WORK EXCAVATIONS.

6. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE PLANNED, DESIGNED, IMPLEMENTED, INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROVISIONS OF THE LATEST EDITION OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). THE CONTRACTOR SHALL MAINTAIN, INSPECT AND REPAIR ALL EROSION AND SEDIMENT CONTROL MEASURES AS NEEDED THROUGHOUT THE LIFE OF THE PROJECT TO ENSURE CONTINUED ACCEPTABLE PERFORMANCE.

7. A PRECONSTRUCTION CONFERENCE (MEETING) SHALL BE HELD ON SITE BETWEEN THE COUNTY ENVIRONMENTAL DIVISION, THE OWNER-APPLICANT, THE RESPONSIBLE LAND-DISTURBER (RLD), THE CONTRACTOR AND OTHER RESPONSIBLE AGENCIES, AS APPLICABLE, PRIOR TO ISSUANCE OF A LAND-DISTURBING PERMIT. THE OWNER OR APPLICANT IS REQUIRED TO COORDINATE SCHEDULING OF THE PRECONSTRUCTION CONFERENCE BETWEEN ALL APPLICABLE PARTIES. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY ENVIRONMENTAL DIVISION FOR REVIEW AND APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING.

8. ALL PERIMETER EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.

9. ADDITIONAL SAFETY FENCE OR DUST CONTROL MEASURES, IN ACCORDANCE WITH THE PROVISIONS OF MINIMUM STANDARDS & SPECS. 3.01 AND 3.39 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), MAY BE REQUIRED TO BE IMPLEMENTED IN ADDITION TO THAT SHOWN ON THE APPROVED PLAN IN ORDER TO ENSURE ADEQUATE PROTECTION OF THE HEALTH, SAFETY AND WELFARE OF THE PUBLIC OR IF SITE CONDITIONS CHANGE, BECOME APPARENT OR ALTER SIGNIFICANTLY FOLLOWING THE DATE OF PLAN APPROVAL.

10. EROSION AND SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT OR FOLLOWING TIME OF CONSTRUCTION TO ENSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED, TO ENSURE ADEQUATE PROTECTION OF THE HEALTH, SAFETY AND WELFARE OF THE PUBLIC, OR IF SITE CONDITIONS CHANGE, BECOME APPARENT OR ALTER SIGNIFICANTLY FOLLOWING THE DATE OF PLAN APPROVAL. COUNTY ENVIRONMENTAL DIVISION APPROVAL SHALL BE REQUIRED FOR ANY DEVIATION OF EROSION AND SEDIMENT CONTROL MEASURES FROM THE APPROVED PLAN.

11. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE COUNTY ENVIRONMENTAL DIVISION PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

12. CULVERT AND STORM DRAIN INLET PROTECTIONS, IN ACCORDANCE WITH THE PROVISIONS OF MINIMUM STANDARDS & SPECS. 3.07 & 3.08 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), MAY BE REMOVED AT THE DISCRETION OF THE ASSIGNED COUNTY ENVIRONMENTAL DIVISION INSPECTOR SHOULD PLACEMENT OF THE MEASURE RESULT IN EXCESSIVE ROAD FLOODING OR TRAFFIC HAZARD OR RESULT IN THE REDIRECTION OF DRAINAGE ONTO OR TOWARD EXISTING LOTS, DRIVEWAYS OR STRUCTURES. DECISIONS SHALL BE MADE ON A CASE-BY-CASE BASIS BASED ON FIELD SITUATIONS ENCOUNTERED.

13. DRAINAGE FACILITIES SHALL BE INSTALLED AND FUNCTIONAL WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT.

14. NO MORE THAN 300 FEET OF TRENCH MAY BE OPEN AT ONE TIME FOR UNDERGROUND UTILITY LINES, INCLUDING STORM WATER CONVEYANCES. ALL OTHER PROVISIONS OF MINIMUM STANDARD # 16 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS APPLY.

15. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH MINIMUM STANDARD & SPEC. 3.35 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

16. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION ON THE APPROVED PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED, IN ACCORDANCE WITH MINIMUM STANDARDS & SPECS. 3.29 THROUGH 3.37 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), AS APPLICABLE. IRRIGATION, IF NECESSARY, SHALL COMPLY WITH ALL APPLICABLE OUTDOOR WATER USE RESTRICTIONS OF THE JAMES CITY SERVICE AUTHORITY.

17. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL NOT BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. REMOVAL SHALL NOT OCCUR WITHOUT AUTHORIZATION BY THE COUNTY ENVIRONMENTAL DIVISION. DISTURBANCES ASSOCIATED WITH THE REMOVAL OF TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE PROPERLY STABILIZED.

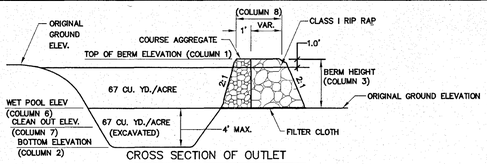
18. NO SEDIMENT TRAP OR SEDIMENT BASIN SHALL BE REMOVED UNTIL A) AT LEAST 75 PERCENT OF THE SINGLE-FAMILY LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN HAVE BEEN SOLD TO A THIRD PARTY FOR THE CONSTRUCTION OF HOMES (UNRELATED TO THE DEVELOPER); AND/OR, B) 60 PERCENT OF THE SINGLE-FAMILY LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN ARE COMPLETED AND STABILIZED. A BULK SALE OF THE LOTS TO ANOTHER BUILDER DOES NOT SATISFY THIS PROVISION. SEDIMENT TRAPS AND SEDIMENT BASINS SHALL NOT BE REMOVED WITHOUT AUTHORIZATION OF THE COUNTY ENVIRONMENTAL DIVISION.

19. APPLICABLE PROVISIONS OF THE COUNTY BMP MANUAL (JAMES CITY COUNTY GUIDELINES FOR DESIGN AND CONSTRUCTION OF STORMWATER MANAGEMENT BMPS) AND THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK (VSMH) APPLY TO THE PROJECT.

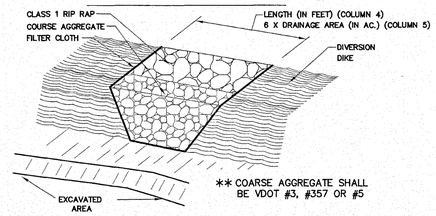
20. DESIGN AND CONSTRUCTION OF PRIVATE-TYPE STORM DRAINAGE SYSTEMS, OUTSIDE VDOT RIGHT-OF-WAY, SHALL BE PERFORMED IN ACCORDANCE WITH THE CURRENT VERSION OF THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION, STORMWATER DRAINAGE CONVEYANCE SYSTEMS (NON-BMP RELATED), GENERAL DESIGN AND CONSTRUCTION GUIDELINES.

21. RECORD DRAWINGS (ASBUILTS) AND CONSTRUCTION CERTIFICATIONS ARE REQUIRED FOR ALL STORMWATER FACILITIES INCLUDING STORMWATER MANAGEMENT/BMP FACILITIES AND STORM DRAINAGE CONVEYANCE SYSTEMS. RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS MUST MEET ESTABLISHED PROGRAM REQUIREMENTS OF BOTH THE COUNTY ENVIRONMENTAL AND STORMWATER DIVISIONS.

22. ALL STORMWATER FACILITIES INCLUDING BMPS, STORM DRAINAGE PIPES, STORMWATER CONVEYANCES, INLETS, MANHOLES, OUTFALLS AND ROADSIDE AND OTHER OPEN CHANNELS SHALL BE INSPECTED BY THE COUNTY STORMWATER DIVISION AND GEOTECHNICAL ENGINEER IN ACCORDANCE WITH ESTABLISHED COUNTY STORMWATER DIVISION PROGRAM REQUIREMENTS.



CROSS SECTION OF OUTLET

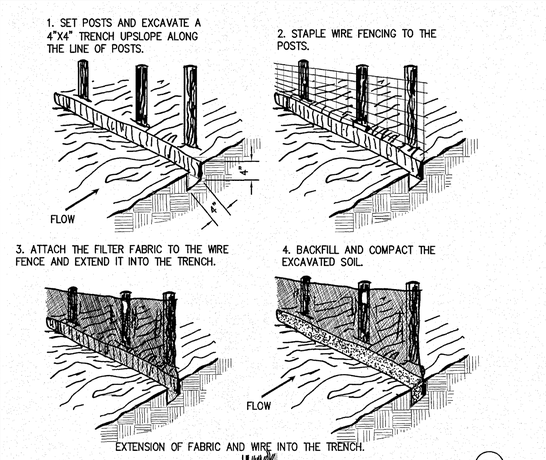


OUTLET (PERSPECTIVE VIEW)

	TOP OF BERM	BOTTOM ELEV.	BERM HEIGHT	SPILLWAY LENGTH	DRAIN AREA(Ac)	WET POOL ELEV.	CLEAN OUT ELEV.	TOP OF DAM WIDTH
SEDIMENT TRAP #		(2)	(3)	(4)	(5)	(6)	(7)	(8)
1		46.00	4.0'	6.2'	1.04	48.21	47.25	2.5'
2	43.00	39.00	4.0'	7.80'	1.30	41.04	40.12	2.5'

SOURCE: VA. DSWC PLATE. 3.13-2

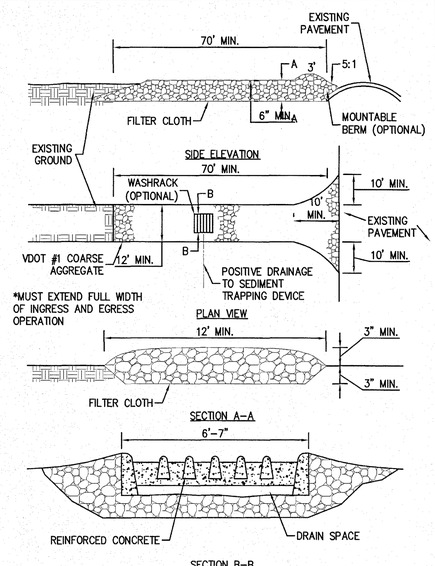
(ST) TEMPORARY SEDIMENT TRAP
N.T.S.



(SF)

SOURCE: INSTALLATION OF STRAW AND FABRIC FILTER BARRIERS FOR SEDIMENT CONTROL, SHERWOOD AND WYANT PLATE. 3.05-1

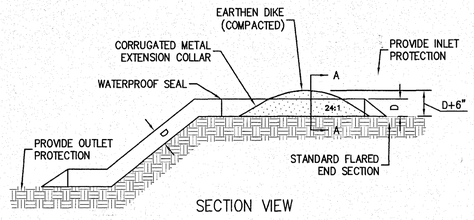
CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)
N.T.S.



(CE)

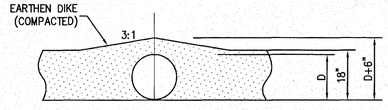
SOURCE: VA PLATE. 3.0

STONE CONSTRUCTION ENTRANCE
N.T.S.



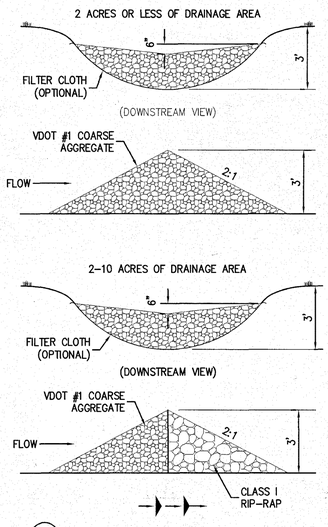
SECTION VIEW

NOTE: SEDIMENT MAY BE CONTROLLED AT OUTLET IF UPLAND PONDING WILL CREATE PROBLEMS



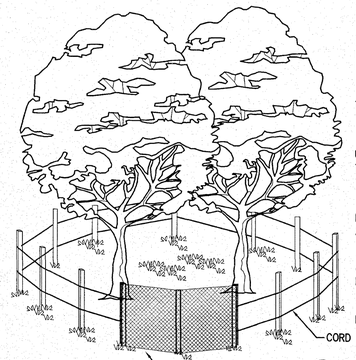
SECTION A – A

(TSD) TEMPORARY SLOPE DRAIN
N.T.S.



(CD) ROCK CHECK DAM

SOURCE: VA. DSWC PLATE. 3.20-1 N.T.S.



PLASTIC FENCING-40" HIGH "INTERNATIONAL ORANGE" PLASTIC (POLYETHYLENE) WEB FENCING SECURED TO CONVENTIONAL METAL "T" OR "U" POSTS DRIVEN TO A MINIMUM DEPTH OF 18" ON 6' MINIMUM CENTERS SHALL BE INSTALLED AT THE LIMITS OF CLEARING. THE FENCE SHALL HAVE THE FOLLOWING MINIMUM PHYSICAL QUALITIES:

TENSILE YIELD: AVERAGE 2,000 LBS. PER 4' WIDTH (ASTM D638)

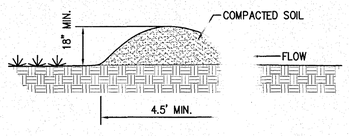
ULTIMATE TENSILE YIELD: AVERAGE 2,900 LBS. PER 4' WIDTH (ASTM D638)

ELONGATION AT BREAK (%): GREATER THAN 1000% (ASTM D638)

CHEMICAL RESISTANCE: INERT TO MOST CHEMICALS AND ACIDS

PLACE FENCE 5' OUTSIDE DRIPLINE

(TP) TREE PROTECTION
N.T.S.



(DD) TEMPORARY DIVERSION DIKE
N.T.S.

SOURCE: VA. DSWC PLATE. 3.09-1

	TOTAL LBS. PER ACRE
MINIMUM CARE LAWN	
COMMERCIAL OR RESIDENTIAL	
-KENTUCKY 31 OR TURF-TYPE TALL FESCUE	175-200 LBS.
OR	
-COMMON BERMUDA GRASS **	75 LBS.
HIGH-MAINTENANCE LAWN	
-KENTUCKY 31 OR TURF-TYPE TALL FESCUE	200-250 LBS.
OR	
-HYBRID BERMUDAGRASS (SEED)**	40 LBS. (UNHALLED)
OR	
-HYBRID BERMUDAGRASS (BY OTHER VEGETATIVE ESTABLISHMENT METHOD, SEE STD. & SPEC. 3.34)	30 LBS. (HULLED)
GENERAL SLOPE (3:1 OR LESS)	
-KENTUCKY 31 FESCUE	128 LBS.
-RED TOP GRASS	2 LBS.
-SEASONAL NURSE CROP *	20 LBS.
	150 LBS.
LOW MAINTENANCE SLOPE (STEEPER THAN 3:1)	
-KENTUCKY 31 TALL FESCUE	93-108 LBS.
-COMMON BERMUDAGRASS **	0-15 LBS.
-RED TOP GRASS	2 LBS.
-SEASONAL NURSE CROP *	20 LBS.
-SERICEA LESPEDEZA **	20 LBS.
	150 LBS.

* USE SEASONAL CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:
FEBRUARY, MARCH THROUGH APRIL.....ANNUAL RYE
MAY 1ST THROUGH AUGUST.....FOXTAIL MILLET
SEPTEMBER, OCTOBER THROUGH NOVEMBER 15TH.....ANNUAL RYE
NOVEMBER 16TH THROUGH JANUARY.....WINTER RYE

(PS) VA DSWC PG. III - 304

** MAY THROUGH OCTOBER, USE HULLED SEED. ALL OTHER SEEDING PERIODS, USE UNHULLED SEED. WEEPING LOVEGRASS MAY BE ADDED TO ANY SLOPE OR LOW-MAINTENANCE MIX DURING WARMER SEEDING PERIODS; ADD 10-20 LBS./ACRE IN MIXES.

SITE SPECIFIC SEEDING MIXTURES FOR COASTAL PLAIN AREA

Rev.	Date	Description	
2	12/20/10	Revised Per JCC Comments Dated 11/10/10	TRS
1	10/14/10	Revised Per JCC Comments Dated 05/20/10	TRS

Revised by

STATE OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
12/20/10
PROFESSIONAL ENGINEER

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone (757) 565-1677
Fax: (757) 220-8994
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
James City County Virginia
Jamestown District

Project Contacts: NB / TRS
Project Number: 8162-06
Scale: N/A
Date: 04/21/10
Sheet Title: Notes and Details

Sheet Number
32

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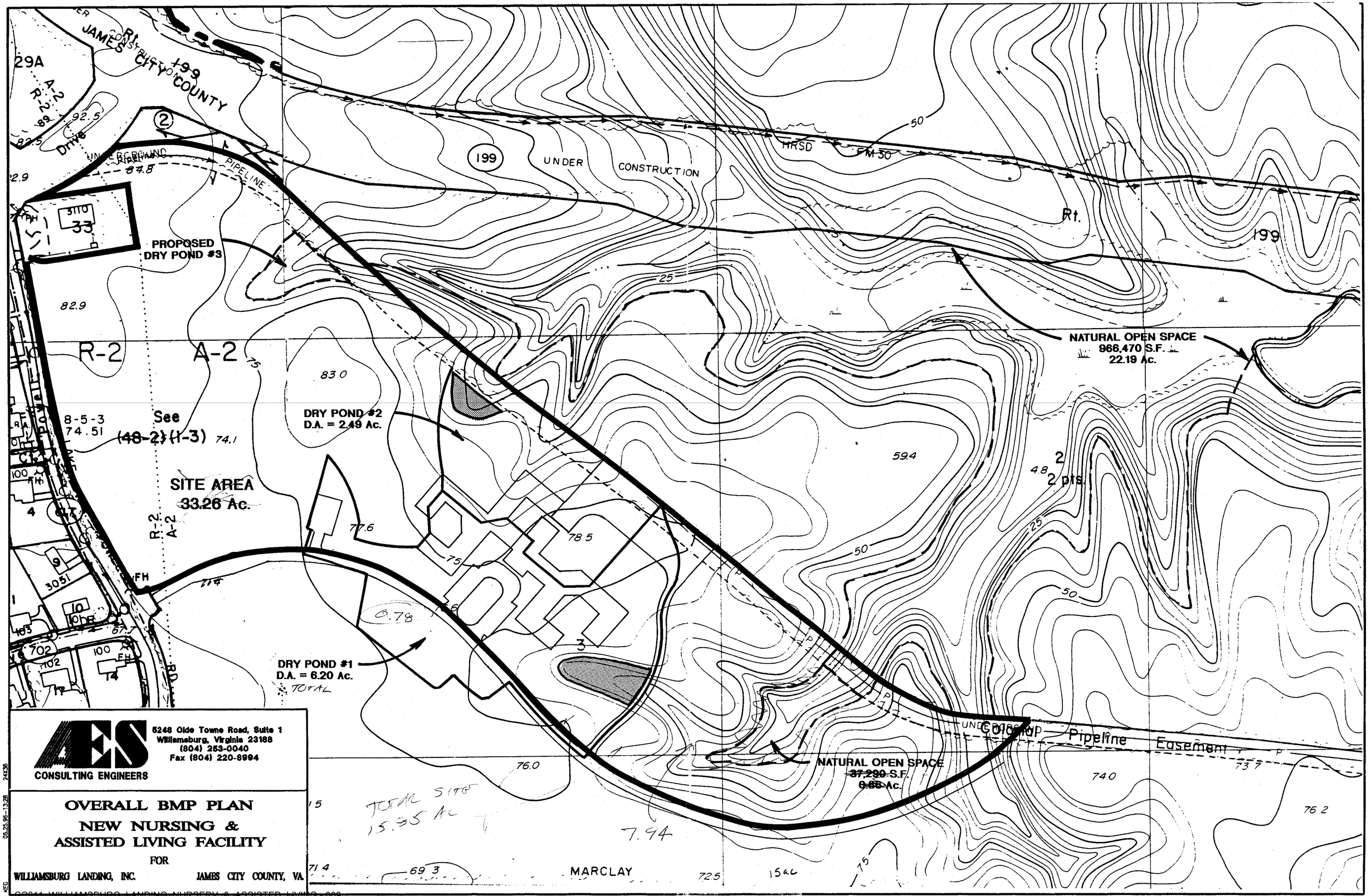

AES CONSULTING ENGINEERS

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

OVERALL BMP PLAN
NEW NURSING & ASSISTED LIVING FACILITY

FOR

WILLIAMSBURG LANDING, INC. JAMES CITY COUNTY, VA.

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05.25.95-13:28
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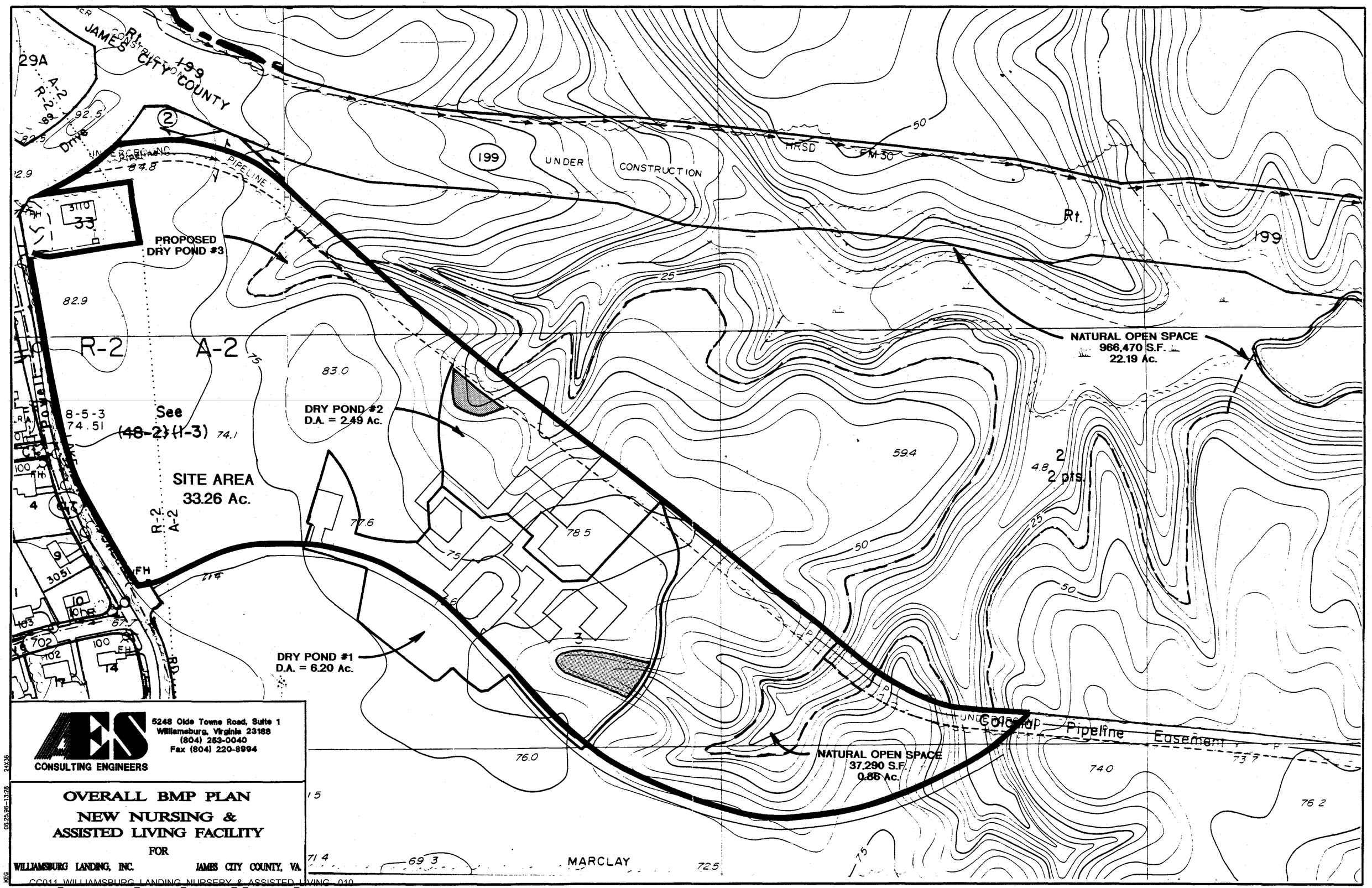

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24X36
06.25.98-13:28
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6. Design Calculations

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project WILLIAMSBURG LANDING #8162

Basin # 1 Location EAST OF BUILDING ADJACENT TO SERVICE ROAD.

Total area draining to basin: 5.69 acres.

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 6.20 acres = 415 cu. yds. = 11,216 cu. FT. @ 58.50 FT

2. Available basin volume = 2008 cu. yds. at elevation 63.00. (From storage - elevation curve)

3. Excavate 0 cu. yds. to obtain required volume*.

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x 6.20 acres = 205 cu. yds. = 5524 cu. FT.

5. Elevation corresponding to cleanout level = 57.10.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.45 ft. (Min. = 1.0 ft.)

Dry Storage:

7. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 6.20 acres = 415 cu. yds. = 11,216 cu. FT

8. Total available basin volume at crest of riser* = 840 cu. yds. at elevation 60.20. (From Storage - Elevation Curve)

* Minimum = 134 cu. yds./acre of total drainage area.

$Q = 0.6 A_o \sqrt{2gh}$
$h = 1.78$ FT
$Q = 11,276 / 21,600$ sec
$= 0.52$ CFS
$0.52 = 6.28 A_o$
$A_o = 0.0828$ FT^2 3.75"

DRAIN IN 6 HR

9. Diameter of dewatering orifice = use 4.0 in.

10. Diameter of flexible tubing = 6.0 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 60.20

Top of Dam = 64.00

Design High Water = 63.00

Upstream Toe of Dam = 53.00

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We} = \frac{170 \text{ FT}}{30} = 5.67$

If > 2, baffles are not required ✓

If < 2, baffles are required _____

Runoff

13. Q_2 = 20.67 cfs (From Chapter 5)

14. Q_{25} = 45.01 cfs (From Chapter 5)

Principal Spillway Design (SEE ATTACHED CALCULATIONS)

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = _____ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = _____ cfs. (riser and barrel)

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = ____ ft.

Slope of upstream face of embankment (Z) = _____:1.

Slope of principal spillway barrel (S_b) = _____%

Length of barrel in saturated zone (L_s) = _____ ft.

24. Number of collars required = _____ dimensions = _____

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 64.00

Design High Water = 62.78

Emergency Spillway Crest = —

Principal Spillway Crest = 60.20

Dewatering Orifice Invert = 53.00

Cleanout Elevation = 57.10

Elevation of Upstream Toe of Dam
or Excavated Bottom of "Wet Storage
Area" (if excavation was performed) = 53.00

WILLIAMSBURG LANDING

DRY POND #1

8162
6/21/96
HWA

SIZE WATER QUALITY ORIFICE TO RETAIN WATER FOR 24 HOURS

VOLUME = 22,432 CF TIME = 24 HOURS = 86,400 SEC

$Q_{RELEASE} = \frac{22,432 CF}{86,400 SEC} = 0.26 CFS$

ORIFICE IS @ ELEV. = 53.00'

$Q = kA_0 \sqrt{2g\Delta h}$ Δh = 60.2 − 53 = 7.20
Q = 0.26 CFS
k = 0.73

$0.26 CFS = 0.73 A_0 \sqrt{2(32.2)(7.2)}$ $0.26 = 15.72 A_0$

$A_0 = 0.0165 FT^2 = \frac{\pi D^2}{4}$ D = 0.1451 FT = 1.74 IN.

USE 2 IN ORIFICE → RETAINS 18 HRS

SMALLER ORIFICE WILL CLOG TO EASY.

SCS METHOD

PRE-DEVELOPMENT

D.A. = 5.19 AC SOIL GROUP C CN = 73

POST-DEVELOPMENT

D.A. = 6.20 AC SOIL GROUP C CN = 85

HYDROLOGIC REPORT FOR

WILLIAMSBURG LANDING

DRY POND #1

JOB NO. 8162

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD,SUITE 1

WILLIAMSBURG, VA. 23188

DATE: 06/21/96

```
 Option 1                          STAGE / STORAGE TABLE                          R to res
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: 1. RESERVOIR No = 1.     2. RESERVOIR NAME = DRY POND #1.
: 3. Q = Ks * Z^b
:      Ks = 0.............     b = 0..........
:      START ELEV = 0.....    INCREMENT = 0...
:
:      STAGE       ELEVATION      CO AREA       INC STORAGE      TOT STORAGE
:      ft          ft             sq ft         cu ft            cu ft
:
:  4     0.00        53.00.       70......          0                0
:  5     1.00        54.00.       356.....        213              213
:  6     2.00        55.00.       1076....        716              929
:  7     3.00        56.00.       2025....       1550             2479
:  8     4.00        57.00.       3245....       2635             5114
:  9     5.00        58.00.       4488....       3866             8980
: 10     6.00        59.00.       5884....       5186            14166
: 11     7.00        60.00.       7665....       6774            20940
: 12     8.00        61.00.       9838....       8751            29691
: 13     9.00        62.00.       12181...      11009            40700
: 14    10.00        63.00.       14868...      13524            54224
:
:
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
Change item number: 0                                                          DY to co

 Reservoir No. 1                        OUTLET STRUCTURES
IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
: CULVERT STRUC  A. Q=CoA[2gh/k]^.5     CULVERT STRUC  B. Q=CoA[2gh/k]^.5
:
: 1. WIDTH  (in)      = 18.              9. WIDTH  (in)      = 2..
: 2. HEIGHT (in)      = 18.             10. HEIGHT (in)      = 2..
: 3. No. BARRELS      = 1..             11. No. BARRELS      = 1..
: 4. INVERT ELEV.     = 53.......       12. INVERT ELEV.     = 53.......
: 5. Co = 0.60                          13. Co = 0.60
: 6. CULVERT LENGTH (ft) = 125.         14. CULVERT LENGTH (ft) = 10..
: 7. CULVERT SLOPE (%)   = 12.4         15. CULVERT SLOPE (%)   = 1...
: 8. MANNING'S N-VALUE   = .013         16. MANNING'S N-VALUE   = .013
:                                       17. MULTI-STAGE OPTION ? (Y/N) Y
:
: WEIR STRUCTURE A.       Q=CwLH^EXP    WEIR STRUCTURE B.       Q=CwLH^EXP
:
: 18. CREST LENGTH (ft)  = 12.57..      23. CREST LENGTH (ft)  = 0......
: 19. CREST ELEVATION    = 60.29..      24. CREST ELEVATION    = 0......
: 20. Cw = 3.00                         25. Cw = 3.00
: 21. EXP = 1.50                        26. EXP = 1.50
: 22. MULTI-STAGE OPTION ? (Y/N) Y      27. MULTI-STAGE OPTION ? (Y/N) N
:
:
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
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HYDROLOGIC REPORT

2 year pre dev.....
.....
.....

Hyd. No. 1

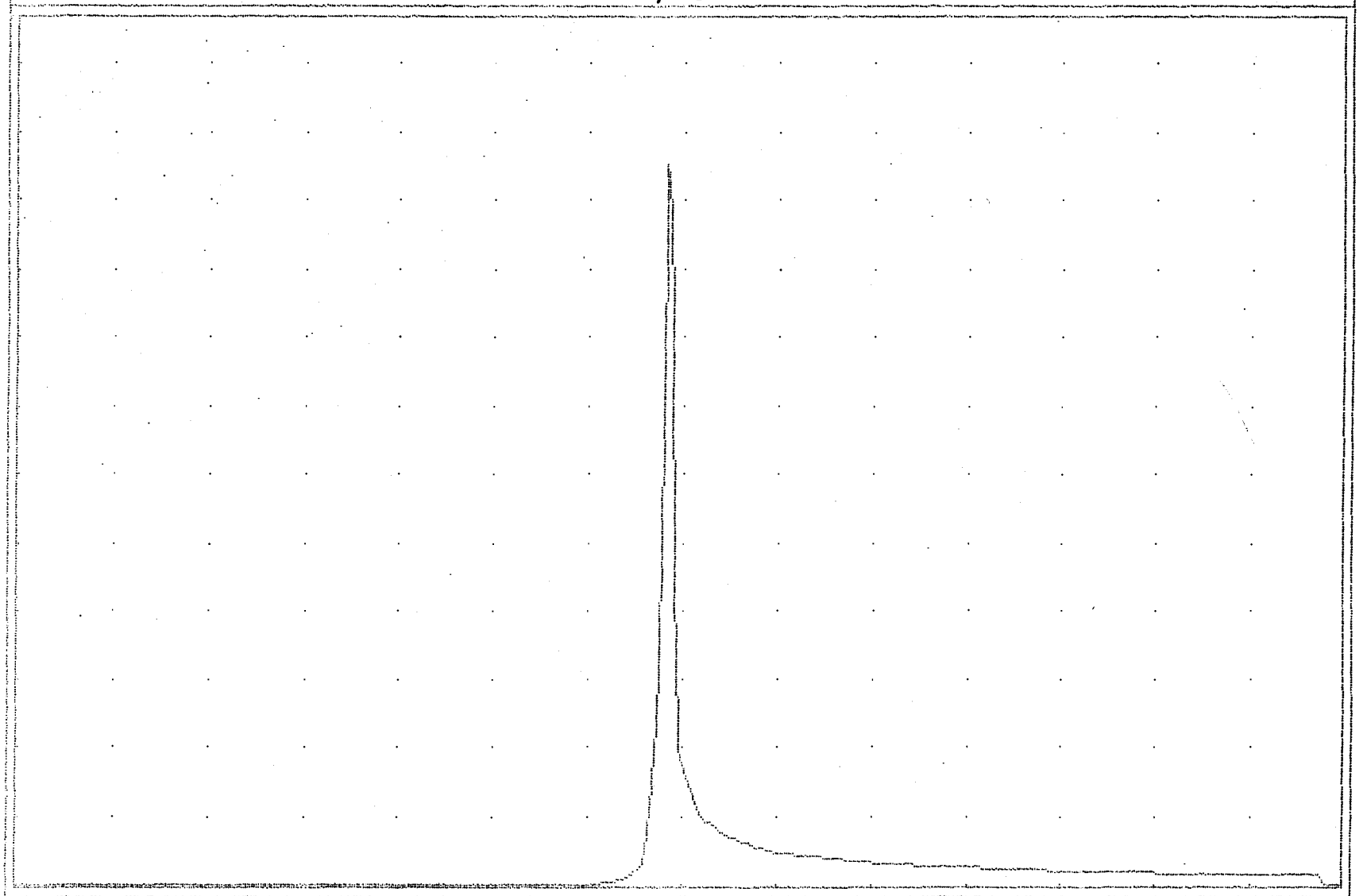
Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 10.55 cfs
Storm frequency	= 2 yr	Time interval	= 5 min
Basin area	= 5.19 ac	Basin curve No.	= 73
Ave basin slope	= 12 %	Hydraulic len	= 500 ft
Basin lag	= 3.9 min	Time of concen	= 6.49 min
Total precip.	= 3.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
11.42	0.20	11.50	0.25	11.58	0.52	11.67	1.22
11.75	2.46	11.83	5.19	11.92	10.55	12.00	9.73
12.08	4.12	12.17	1.92	12.25	1.74	12.33	1.56
12.42	1.36	12.50	1.16	12.58	1.01	12.67	0.94

Qp = 10.5 S.C.S. RUNOFF 2 Yr

PLG



HGU = 105 min 1 VGU = 1.0 cfs

VOL = (cuft/acft) = 25002 / 0.574

HYDROLOGIC REPORT

2 year post dev.....
.....
.....

Hyd. No. 2

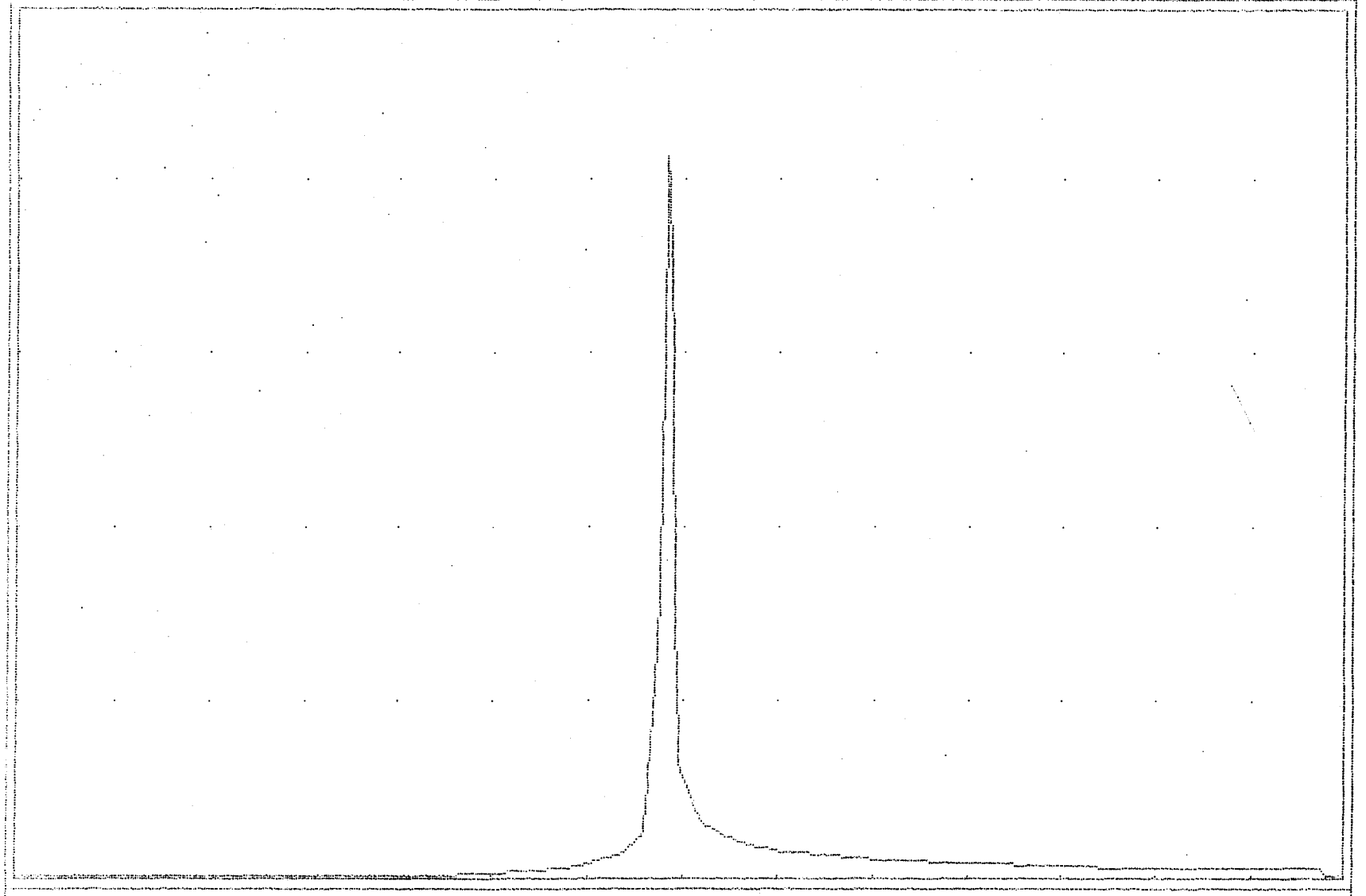
Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 20.67 cfs
Storm frequency	= 2 yr	Time interval	= 5 min
Basin area	= 5.69 ac	Basin curve No.	= 85
Ave basin slope	= 12 %	Hydraulic len	= 300 ft
Basin lag	= 1.8 min	Time of concen	= 2.97 min
Total precip.	= 3.50 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
11.42	1.03	11.50	1.14	11.58	2.04	11.67	4.03
11.75	6.82	11.83	11.98	11.92	20.67	12.00	17.46
12.08	7.00	12.17	3.17	12.25	2.85	12.33	2.53
12.42	2.20	12.50	1.86	12.58	1.61	12.67	1.49
12.75	1.42	12.83	1.34	12.92	1.27	13.00	1.19
13.08	1.12	13.17	1.08	13.25	1.04	13.33	0.99

Qp = 20.7 S.C.S. RUNOFF 2 Yr

POST

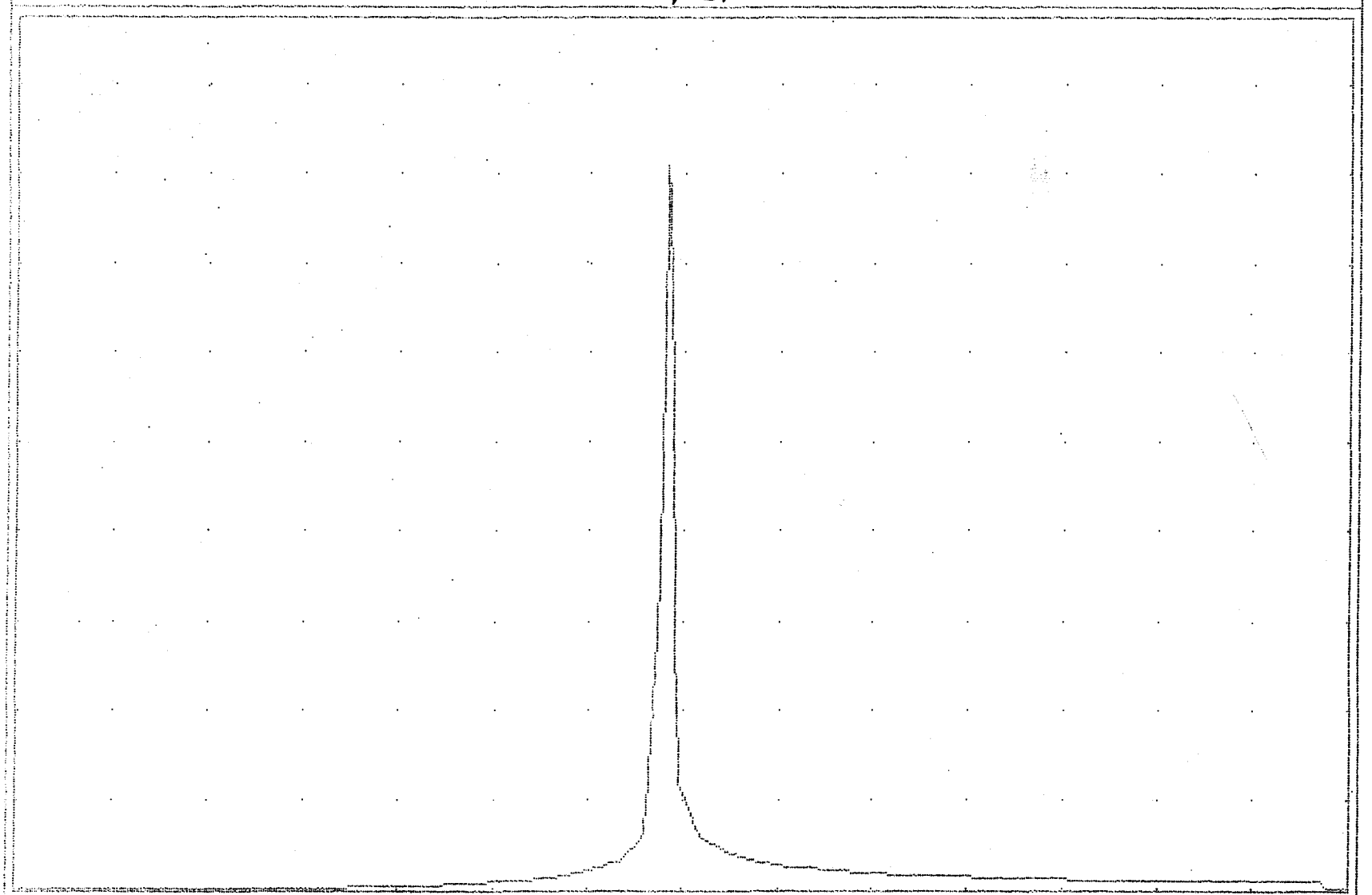


NGU = 105 min 2 VGU = 5.0 cfs

VOL = (cuft/acft) = 46854 / 1.076

Qp = 40.5 S.C.S. RUNOFF 10 Yr

POST

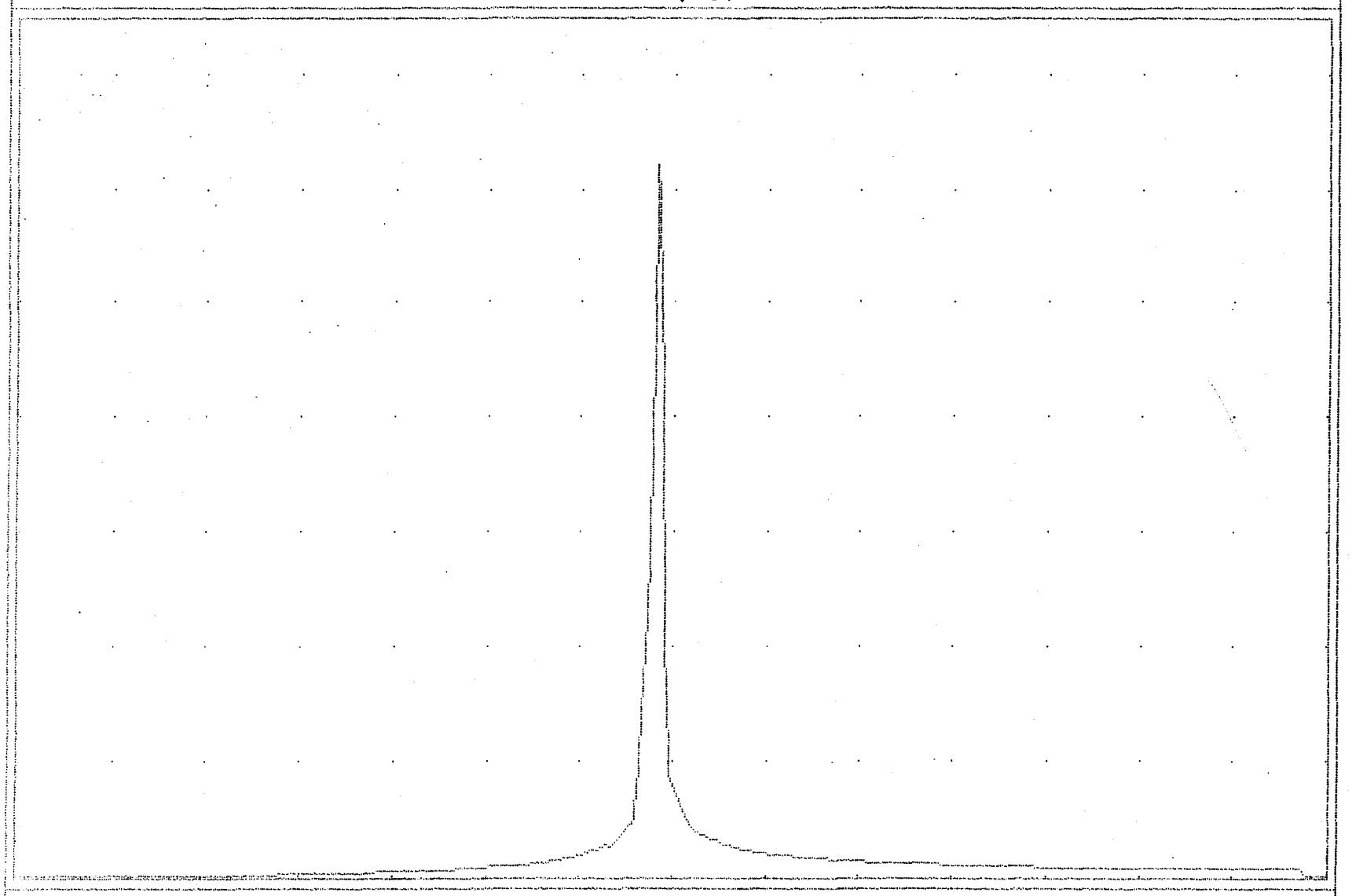


HGU = 105 min 3 VGU = 5.0 cfs

VOL = (cuft/acft) = 93417 / 2.145

Qp = 62.2 S.C.S. RUNOFF 100 Yr

POST

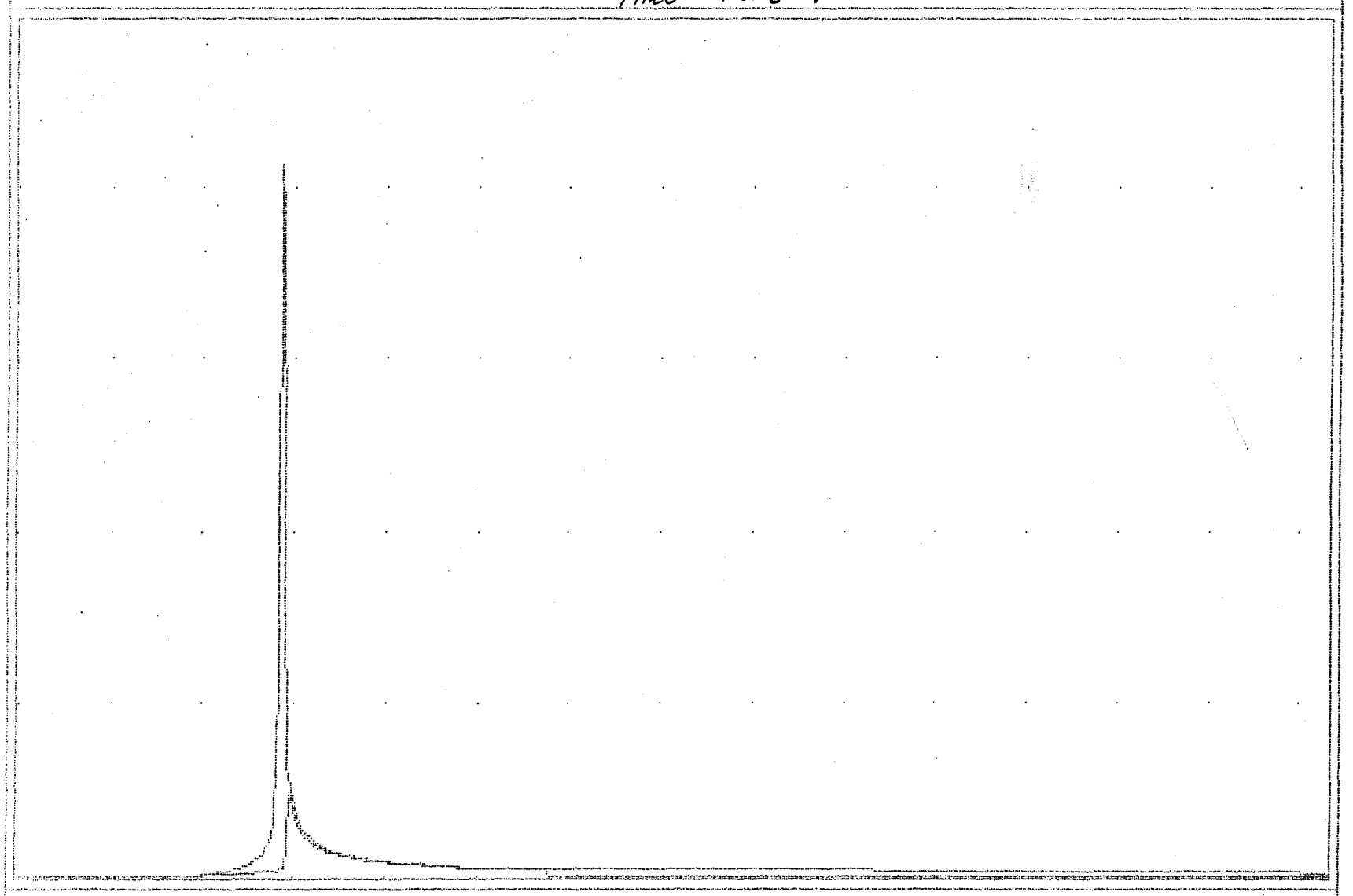


HGU = 105 min 5 VGU = 10.0 cfs

VOL = (cuft/acft) = 146617 / 3.366

Up = 2.5 RESERVOIR ROUTE 2 Yr

THRU POND #1



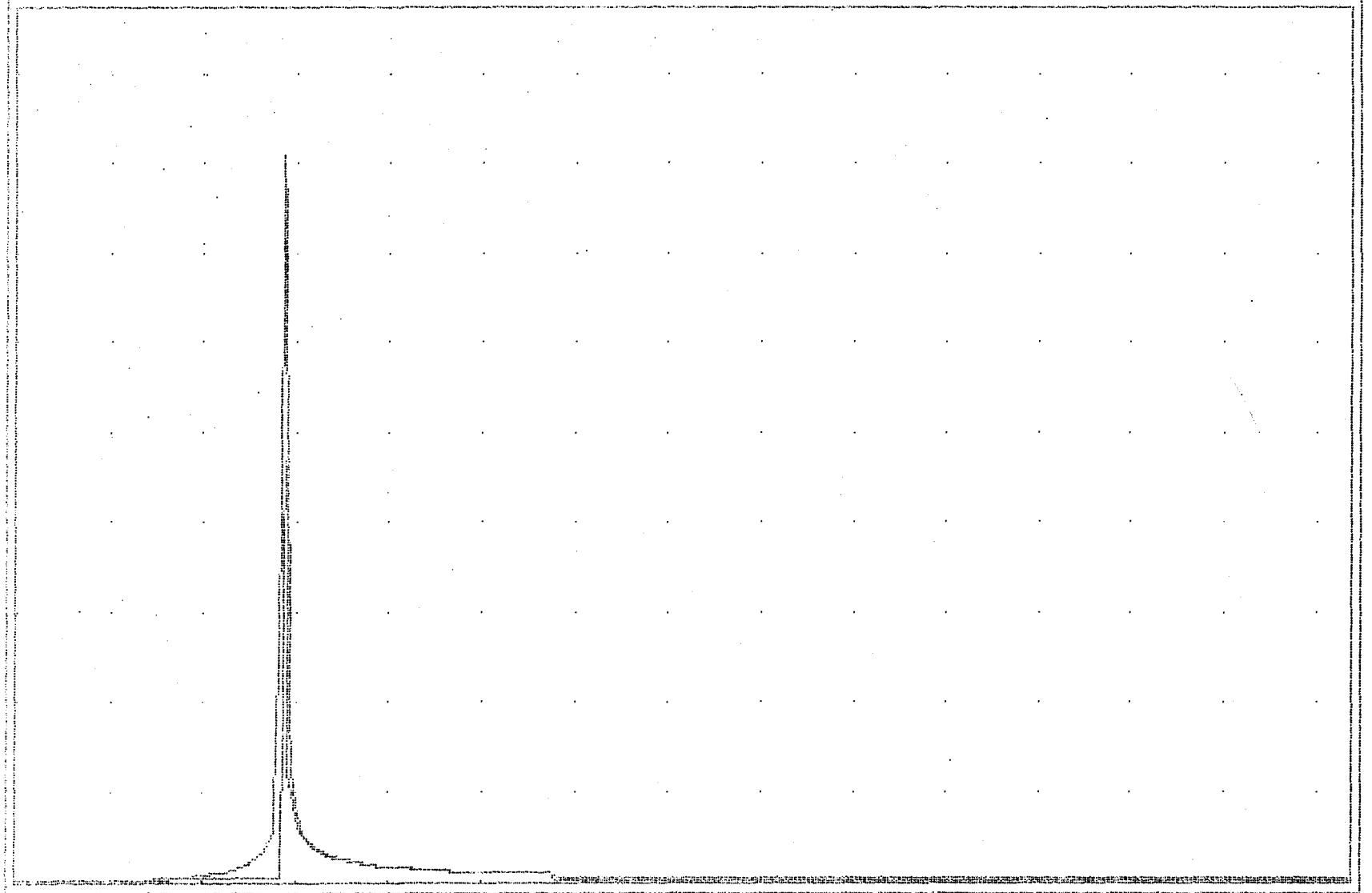
HGU = 250 min 12 VGU = 5.0 cfs

MAX STORAGE = 24008

MAX ELEVATION = 68.35

Qp = 23.4 RESERVOIR ROUTE 10 Yr

THRU POND #1



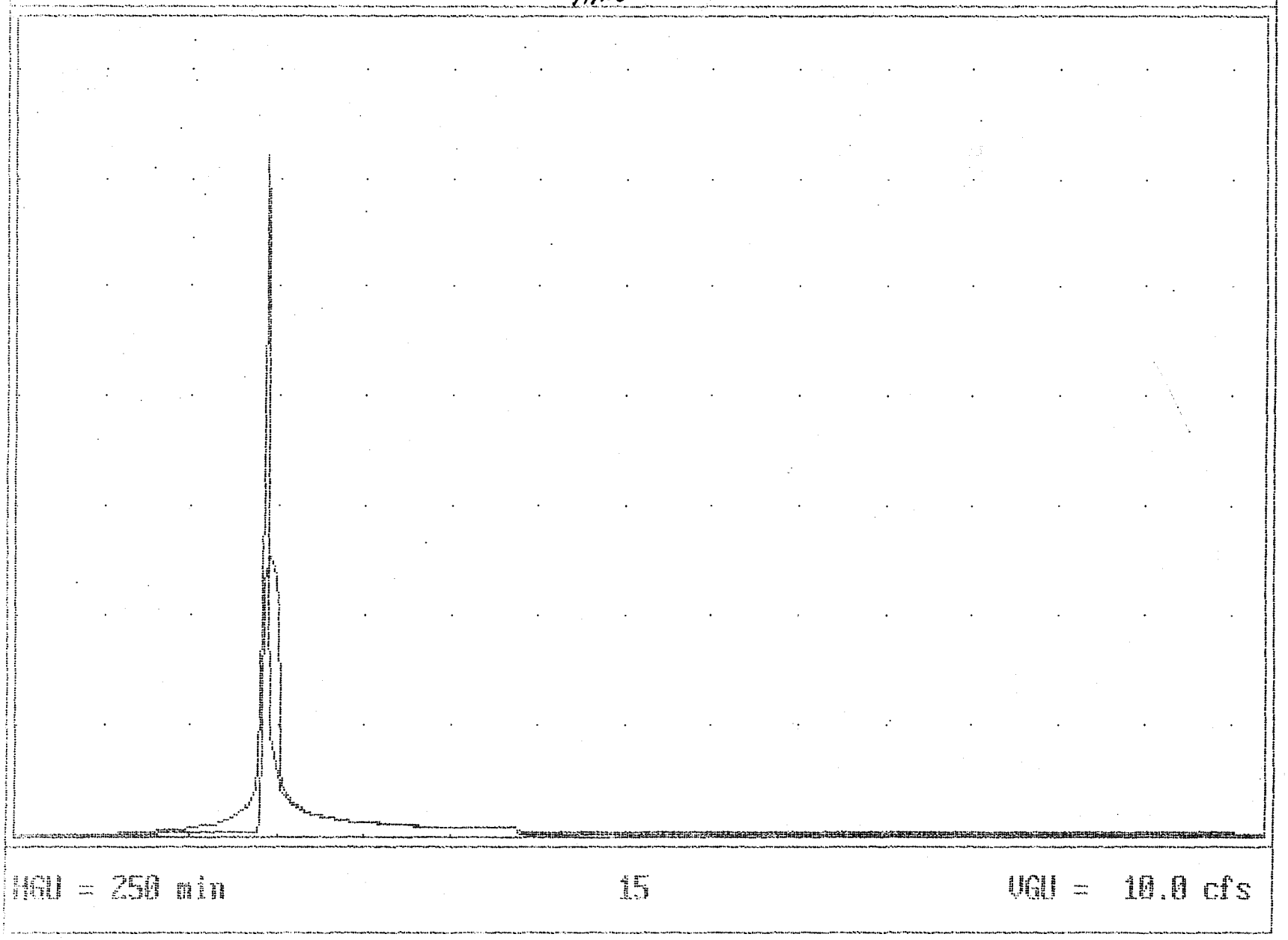
HGU = 250 min 13 VGU = 5.0 cfs

MAX STORAGE = 32918

MAX ELEVATION = 61.29

Qp = 25.6 RESERVOIR ROUTE 100 Yr

THRU POND #1



MAX STORAGE = 51303

MAX ELEVATION = 62.78

(S-50-96)

HYDRAULIC REPORT FOR

WILLIAMSBURG LANDING

JOB NO. 8162

STORM SEWER

SD-1 TO SD-6

prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD.,SUITE 1

WILLIAMSBURG, VA. 23188

REVISED DATE: 06/21/96

STORM SEWER DESIGN / ANALYSIS

Return Period = 10 Yrs
Rainfall file: JCCN

Run Date: 06-22-1996
File: F:8162.ST3

LINE 1 / Q = 10.11 / HT = 24 / WID = 24 / N = .013 / L = 190 / JLC = 0

OUTFALL TO SD-1 / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	65.39	13.71	64.25	5.45	65.85	18.14	-2.25	1.85
UPSTRM	66.32	17.07	64.90	4.23	66.60	21.76	6.09	2.39

Drainage area (ac)	=	0.52	Slope of invert (%)	=	0.3421
Runoff coefficient	=	0.80	Slope energy grade line (%)	=	0.3929
Time of conc (min)	=	5.45	Critical depth (in)	=	13.51
Inlet time (min)	=	5.00	Natural ground elev. (ft)	=	73.00
Intensity (in/hr)	=	6.83	Upstream surcharge (ft)	=	0.00
Cumulative C*A	=	1.48	Additional Q (cfs)	=	0.00
Q = CA * I (cfs)	=	10.11	Line capacity (cfs)	=	13.23
Q catchment (cfs)	=	2.90	Inlet length (ft)	=	0.00
Q carryover (cfs)	=	5.53	Gutter slope (ft/ft)	=	0.0000
Q captured (cfs)	=	0.00	Cross slope (ft/ft)	=	0.0000
Q bypassed (cfs)	=	8.43	Ponding width (ft)	=	N/A

LINE 2 / Q = 7.33 / HT = 18 / WID = 18 / N = .013 / L = 55 / JLC = 1

SD-1 TO SD-2 / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	66.32	17.07	64.90	4.23	66.60	17.53	6.59	1.73
UPSTRM	66.48	12.39	65.45	5.65	66.98	16.67	6.25	1.30

Drainage area (ac)	=	0.60	Slope of invert (%)	=	1.0000
Runoff coefficient	=	0.70	Slope energy grade line (%)	=	0.6869
Time of conc (min)	=	5.27	Critical depth (in)	=	12.39
Inlet time (min)	=	5.00	Natural ground elev. (ft)	=	73.20
Intensity (in/hr)	=	6.89	Upstream surcharge (ft)	=	0.00
Cumulative C*A	=	1.06	Additional Q (cfs)	=	0.00
Q = CA * I (cfs)	=	7.33	Line capacity (cfs)	=	10.50
Q catchment (cfs)	=	2.93	Inlet length (ft)	=	0.00
Q carryover (cfs)	=	2.60	Gutter slope (ft/ft)	=	0.0000
Q captured (cfs)	=	0.00	Cross slope (ft/ft)	=	0.0000
Q bypassed (cfs)	=	5.53	Ponding width (ft)	=	N/A

LINE 3 / Q = 4.49 / HT = 15 / WID = 15 / N = .013 / L = 60 / JLC = 1

SD-2 TO SD-3 / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	66.98	15.00	65.45	3.66	67.19	0.00	6.5	1.23
UPSTRM	67.23	13.53	66.10	3.85	67.46	8.92	5.65	1.17

Drainage area (ac)	= 0.83	Slope of invert (%)	= 1.0833
Runoff coefficient	= 0.45	Slope energy grade line (%)	= 0.4538
Time of conc (min)	= 5.00	Critical depth (in)	= 10.17
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 73.00
Intensity (in/hr)	= 6.97	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.64	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 4.49	Line capacity (cfs)	= 6.72
Q catchment (cfs)	= 2.60	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 2.60	Ponding width (ft)	= N/A

LINE 4 / Q = 2.41 / HT = 15 / WID = 15 / N = .013 / L = 130 / JLC = 0

SD-3 TO SD-4 / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	67.46	15.00	66.10	1.97	67.52	0.00	5.65	1.23
UPSTRM	68.02	7.46	67.40	3.96	68.27	15.00	5.34	0.61

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.0000
Runoff coefficient	= 0.00	Slope energy grade line (%)	= 0.5749
Time of conc (min)	= 0.42	Critical depth (in)	= 7.46
Inlet time (min)	= 0.00	Natural ground elev. (ft)	= 74.00
Intensity (in/hr)	= 8.94	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.27	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 2.41	Line capacity (cfs)	= 6.46
Q catchment (cfs)	= 0.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.00	Ponding width (ft)	= N/A

LINE 5 / Q = 2.47 / HT = 15 / WID = 15 / N = .013 / L = 95 / JLC = 0

SD-4 TO SD-5 / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	67.95	6.60	67.40	4.75	68.30	14.89	5.34	0.52
UPSTRM	68.90	6.60	68.35	4.75	69.25	14.89	3.7	0.52

Drainage area (ac)	= 0.15	Slope of invert (%)	= 1.0000
Runoff coefficient	= 0.90	Slope energy grade line (%)	= 1.0000
Time of conc (min)	= 0.09	Critical depth (in)	= 7.54
Inlet time (min)	= 0.00	Natural ground elev. (ft)	= 73.30
Intensity (in/hr)	= 9.14	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.27	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 2.47	Line capacity (cfs)	= 6.46
Q catchment (cfs)	= 0.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.00	Ponding width (ft)	= N/A

Note: Normal depth assumed

LINE 6 / Q = 1.24 / HT = 15 / WID = 15 / N = .013 / L = 15 / JLC = 0

SD-5 TO SD-6 / DNLN = 5

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	68.90	6.60	68.35	2.39	68.99	9.95	3.7	0.52
UPSTRM	68.95	5.35	68.50	3.16	69.10	14.37	3.55	0.39

Drainage area (ac)	= 0.15	Slope of invert (%)	= 1.0000
Runoff coefficient	= 0.90	Slope energy grade line (%)	= 0.7508
Time of conc (min)	= 0.00	Critical depth (in)	= 5.35
Inlet time (min)	= 0.00	Natural ground elev. (ft)	= 73.30
Intensity (in/hr)	= 9.19	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.14	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 1.24	Line capacity (cfs)	= 6.46
Q catchment (cfs)	= 0.00	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.00	Ponding width (ft)	= N/A

HYDRAULIC REPORT FOR

WILLIAMSBURG LANDING

JOB NO. 8162

STORM SYSTEM

SD-7 TO SD-8

Prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD,SUITE 1

WILLIAMSBURG, VA 23188

REVISED DATE: 6/21/96

Return Period = 100 Yrs
Rainfall file: JCCN

Run Date: 06-22-1996
File: F:8162-1.ST3

LINE 1 / Q = 2.82 / HT = 15 / WID = 15 / N = .013 / L = 48 / JLC = 1

SD-8 TO OUTFALL / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	67.47	5.67	67.00	6.63	68.16	14.55	-1.25	0.43
UPSTRM	68.47	5.67	68.00	6.63	69.16	14.55	4.05	0.43

Drainage area (ac)	= 0.16	Slope of invert (%)	= 2.0833
Runoff coefficient	= 0.75	Slope energy grade line (%)	= 2.0833
Time of conc (min)	= 5.19	Critical depth (in)	= 8.07
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 73.30
Intensity (in/hr)	= 9.18	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.31	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 2.82	Line capacity (cfs)	= 9.32
Q catchment (cfs)	= 1.11	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 1.73	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 2.84	Ponding width (ft)	= N/A

Note: Normal depth assumed

LINE 2 / Q = 1.73 / HT = 15 / WID = 15 / N = .013 / L = 28 / JLC = .9

SD-7 SD-8 / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	69.16	13.88	68.00	1.46	69.19	14.43	4.05	1.19
UPSTRM	70.10	6.32	69.40	3.53	70.29	14.81	2.65	0.49

Drainage area (ac)	= 0.25	Slope of invert (%)	= 5.0000
Runoff coefficient	= 0.75	Slope energy grade line (%)	= 3.3230
Time of conc (min)	= 5.00	Critical depth (in)	= 6.32
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 73.30
Intensity (in/hr)	= 9.24	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.19	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 1.73	Line capacity (cfs)	= 14.44
Q catchment (cfs)	= 1.73	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 1.73	Ponding width (ft)	= N/A

HYDRAULIC REPORT FOR

WILLIAMSBURG LANDING

JOB NO. 8162

STORM SYSTEM

SD-9 TO SD-11

Prepared by:

AES CONSULTING ENGINEERS

5248 OLDE TOWNE RD,SUITE 1

WILLIAMSBURG, VA 23188

DATE: 4/24/96

Return Period = 10 Yrs
Rainfall file: JCCN

Run Date: 04-24-1996
File: F:8162-2.ST3

LINE 1 / Q = 7.59 / HT = 15 / WID = 15 / N = .013 / L = 155 / JLC = 1.2

SD-11 OUTFALL / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	52.63	7.53	52.00	12.30	54.98	15.00	-1.25	0.62
UPSTRM	61.63	7.53	61.00	12.30	63.98	15.00	7.25	0.62

Drainage area (ac)	= 1.26	Slope of invert (%)	= 5.8065
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 5.8065
Time of conc (min)	= 6.96	Critical depth (in)	= 13.28
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 69.50
Intensity (in/hr)	= 6.41	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 1.18	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 7.59	Line capacity (cfs)	= 15.56
Q catchment (cfs)	= 7.03	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 1.23	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 8.25	Ponding width (ft)	= N/A

Note: Normal depth assumed

LINE 2 / Q = 1.21 / HT = 15 / WID = 15 / N = .013 / L = 100 / JLC = 1.1

SD-11 SD-10 / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	64.45	15.00	61.00	0.99	64.46	0.00	7.25	1.23
UPSTRM	64.48	15.00	63.00	0.99	64.50	0.00	9.05	1.23

Drainage area (ac)	= 0.11	Slope of invert (%)	= 2.0000
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 0.0352
Time of conc (min)	= 5.27	Critical depth (in)	= 5.29
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 73.30
Intensity (in/hr)	= 6.89	Upstream surcharge (ft)	= 0.23
Cumulative C*A	= 0.18	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 1.21	Line capacity (cfs)	= 9.13
Q catchment (cfs)	= 0.61	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.61	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 1.23	Ponding width (ft)	= N/A

LINE 3 / Q = 0.61 / HT = 15 / WID = 15 / N = .013 / L = 25 / JLC = .9

SD-10 SD-9 / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	64.50	15.00	63.00	0.50	64.50	0.00	9.05	1.23
UPSTRM	64.65	3.76	64.25	2.55	64.75	13.00	9	0.24

Drainage area (ac)	= 0.11	Slope of invert (%)	= 5.0000
Runoff coefficient	= 0.80	Slope energy grade line (%)	= 0.6474
Time of conc (min)	= 5.00	Critical depth (in)	= 3.76
Inlet time (min)	= 5.00	Natural ground elev. (ft)	= 74.50
Intensity (in/hr)	= 6.97	Upstream surcharge (ft)	= 0.00
Cumulative C*A	= 0.09	Additional Q (cfs)	= 0.00
Q = CA * I (cfs)	= 0.61	Line capacity (cfs)	= 14.44
Q catchment (cfs)	= 0.61	Inlet length (ft)	= 0.00
Q carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.0000
Q captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.0000
Q bypassed (cfs)	= 0.61	Ponding width (ft)	= N/A

Option 1 #1 STAGE / STORAGE TABLE R to re

1. RESERVOIR No = 1. 2. RESERVOIR NAME = FRONT POND..
3. S = Ks * Z^b
Ks = 0..... b = 0.....
START ELEV = 0..... INCREMENT = 0...

	STAGE ft.	ELEVATION ft	CO AREA sq ft	INC STORAGE cu ft	TOT STORAGE cu ft
4	0.00	53.00.	70.....	0	0
5	1.00	54.00.	356.....	213	213
6	2.00	55.00.	1076....	716	929
7	3.00	56.00.	2025....	1550	2479
8	4.00	57.00.	3245....	2635	5114
9	5.00	58.00.	4488....	3866	8980 wet 58.1
10	6.00	59.00.	5884....	5186	14166
11	7.00	60.00.	7665....	6774	20940
12	8.00	61.00.	9838....	8751	29691
13	9.00	62.00.	12181...	11009	40700
14	10.00	63.00.	14868...	13524	54224

64 - Top of Dam

Change item number: 0 DY to c

•Reservoir No. 1 OUTLET STRUCTURES

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

```
: CULVERT STRUC  A. Q=CoA[2gh/k]^.5     CULVERT STRUC  B. Q=CoA[2gh/k]^.5
:
: 1. WIDTH  (in)      = 15.              9. WIDTH  (in)      = 10.
: 2. HEIGHT (in)      = 15.             10. HEIGHT (in)      = 10.
: 3. No. BARRELS      = 1..   - 50      11. No. BARRELS      = 1..
: 4. INVERT ELEV.     = 53.......       12. INVERT ELEV.     = 53.......
: 5. Co = 0.60                          13. Co = 0.60
: 6. CULVERT LENGTH (ft) = 180.         14. CULVERT LENGTH (ft) = 1...
: 7. CULVERT SLOPE (%)   = 8.89         15. CULVERT SLOPE (%)   = 1...
: 8. MANNING'S N-VALUE   = .013         16. MANNING'S N-VALUE   = .013
:                                       17. MULTI-STAGE OPTION ? (Y/N) Y
:
: WEIR STRUCTURE A.       Q=CwLH^EXP    WEIR STRUCTURE B.       Q=CwLH^EXP
:
: 18. CREST LENGTH (ft)  = 12.57..      23. CREST LENGTH (ft)  = 0......
: 19. CREST ELEVATION    = 57.4...      24. CREST ELEVATION    = 0......
: 20. Cw = 3.00                         25. Cw = 3.00
: 21. EXP = 1.50                        26. EXP = 1.50
: 22. MULTI-STAGE OPTION ? (Y/N) Y      27. MULTI-STAGE OPTION ? (Y/N) N
:
:
HMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
Change item number: 0                                              DY to c
```

Rainfall file: jcc RATIONAL HYDROGRAPH C:8162

IMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

1. HYDROGRAPH No. = 1.............

2. HYDROGRAPH DESCRIPTION

   A. 2 year pre dev.........

   B. ....

   C. ....

3. AREA (ac) = 5.19..............

4. RUNOFF COEFFICIENT = .35......

5. TIME OF CONCEN. (min) = 24....

6. RETURN PERIOD = 2.............

7. RECEDING LIMB FACTOR = 1.49..

   (0 for Dekalb Rational)

Hyd.	Qpeak	Hyd.	Qpeak
1	5.11	2	15.24
3	18.00	4	21.18
5	24.87	6	2.78
7	11.61	8	13.65
9	16.47	10	19.69
11	0.00	12	4.31
13	4.52	14	4.75
15	4.97	16	0.00
17	2.74	18	3.63
19	4.38	20	7.37

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

Change item number: 0

Rainfall file: jcc RATIONAL HYDROGRAPH C:8162.

1. HYDROGRAPH No. = 2............

2. HYDROGRAPH DESCRIPTION

A. 2 year post dev........

B. ....

C. ....

3. AREA (ac) = 5.69..............

4. RUNOFF COEFFICIENT = .47......

5. TIME OF CONCEN. (min) = 5.....

6. RETURN PERIOD = 2.............

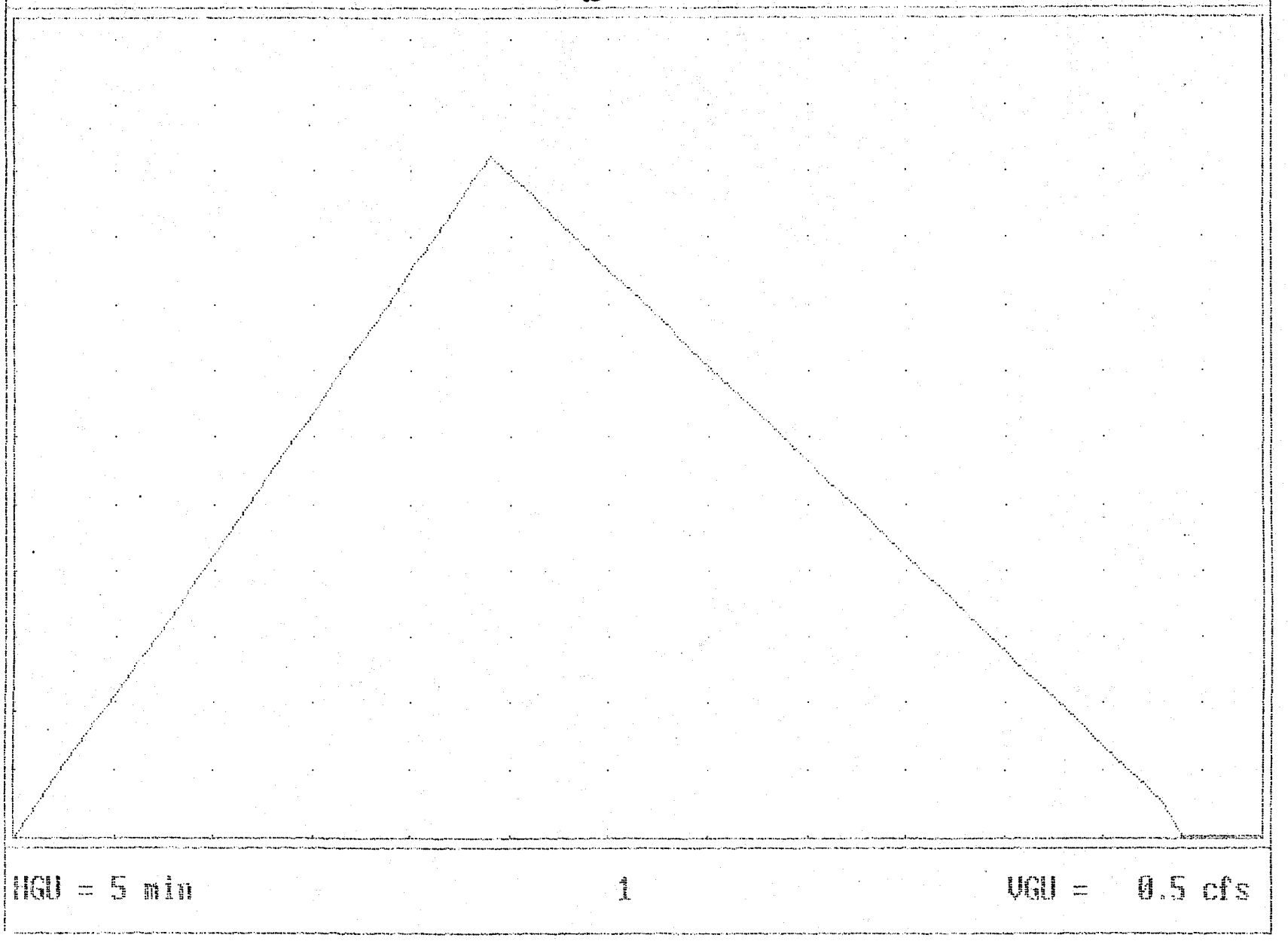
7. RECEDING LIMB FACTOR = 1.49..

(0 for Dekalb Rational)

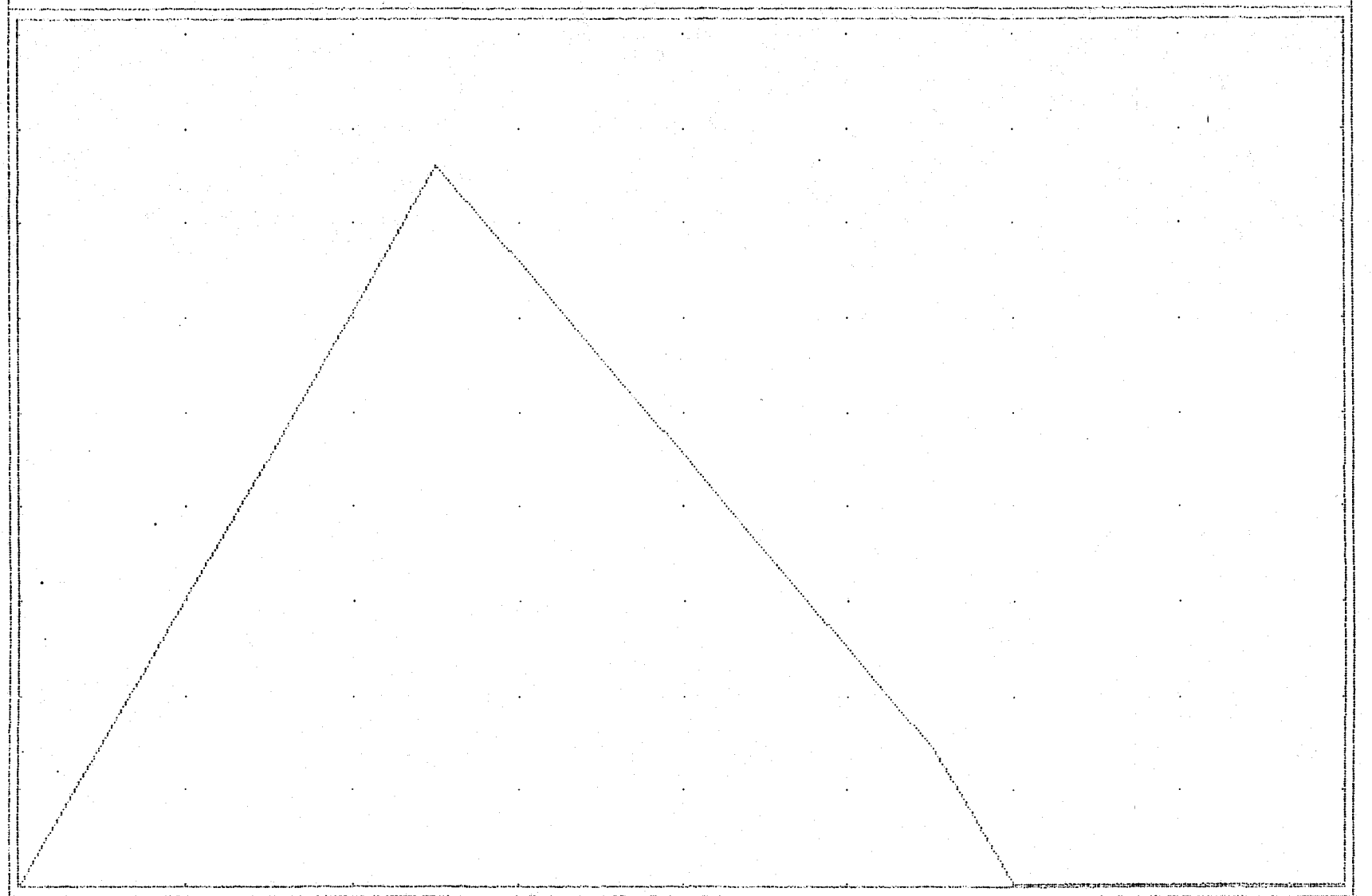
Hyd.	Qpeak	Hyd.	Qpeak
1	5.11	2	15.24
3	18.00	4	21.18
5	24.87	6	2.78
7	11.61	8	13.65
9	16.47	10	19.69
11	0.00	12	4.31
13	4.52	14	4.75
15	4.97	16	0.00
17	2.74	18	3.63
19	4.38	20	7.37

Change item number: 0

PRE

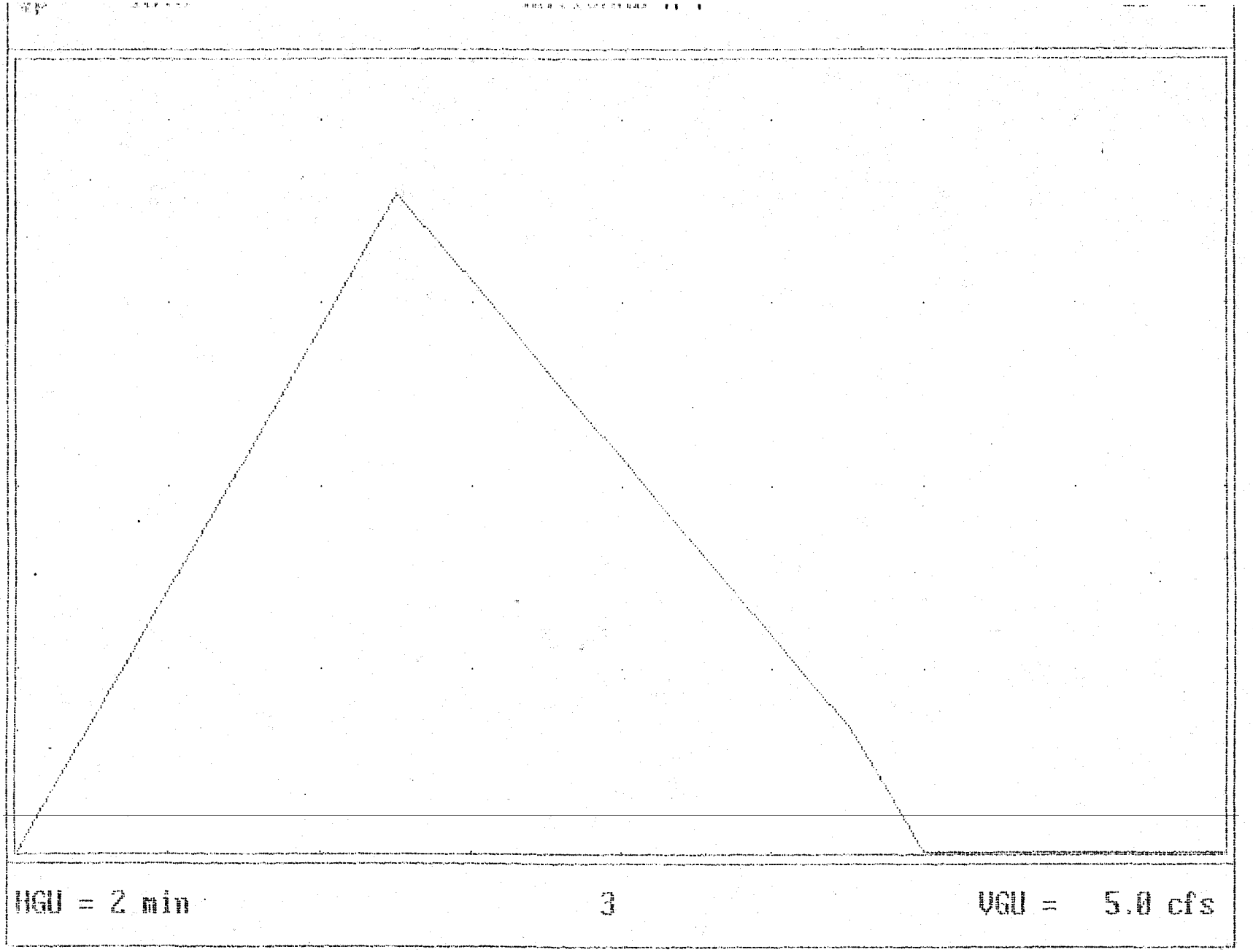


VOL = (cuft/acft) = 9164 / 0.210

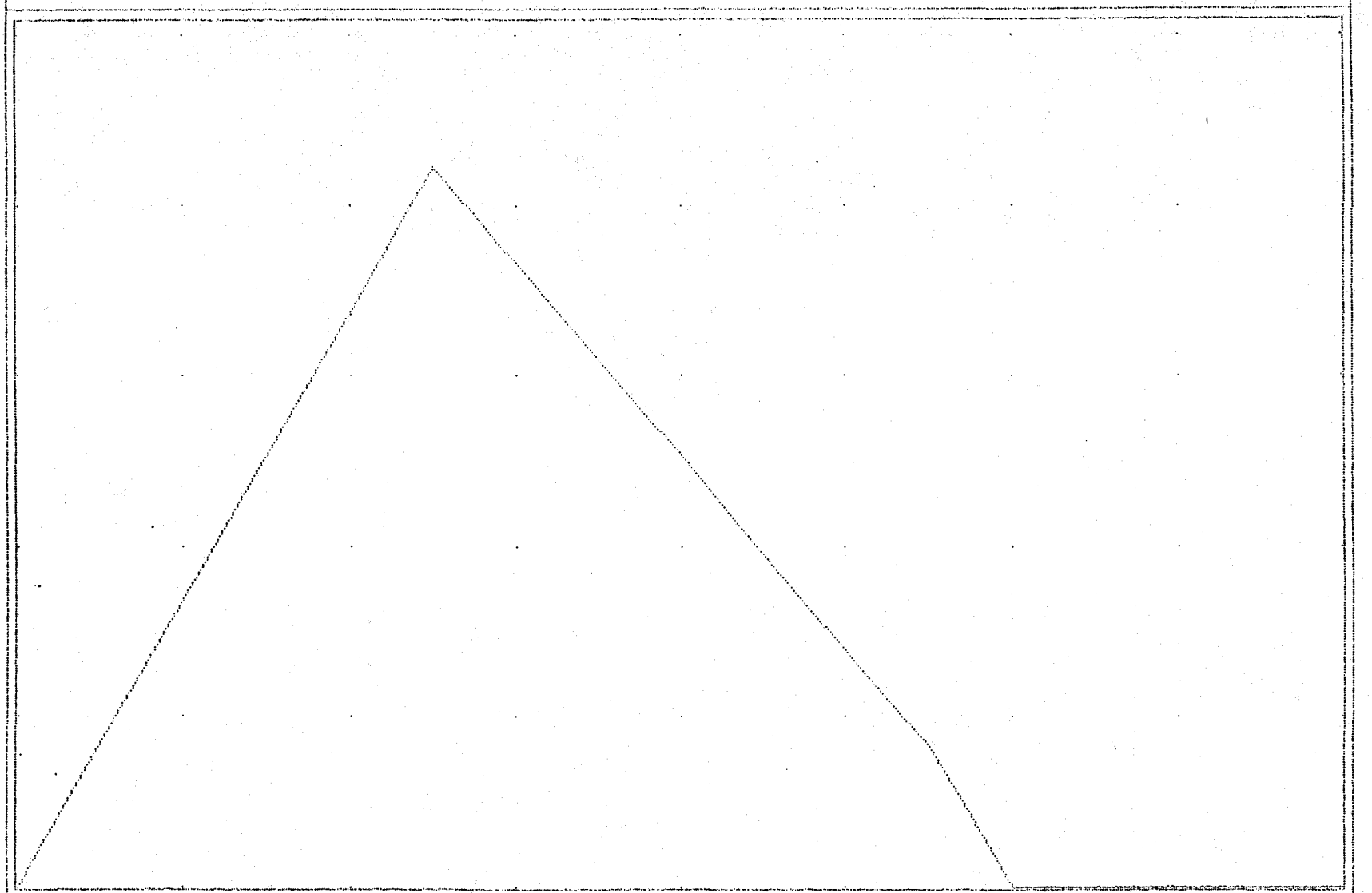


HGU = 2 min 2 VGU = 2.0 cfs

VOL = (cuft/acft) = 5651 / 0.130

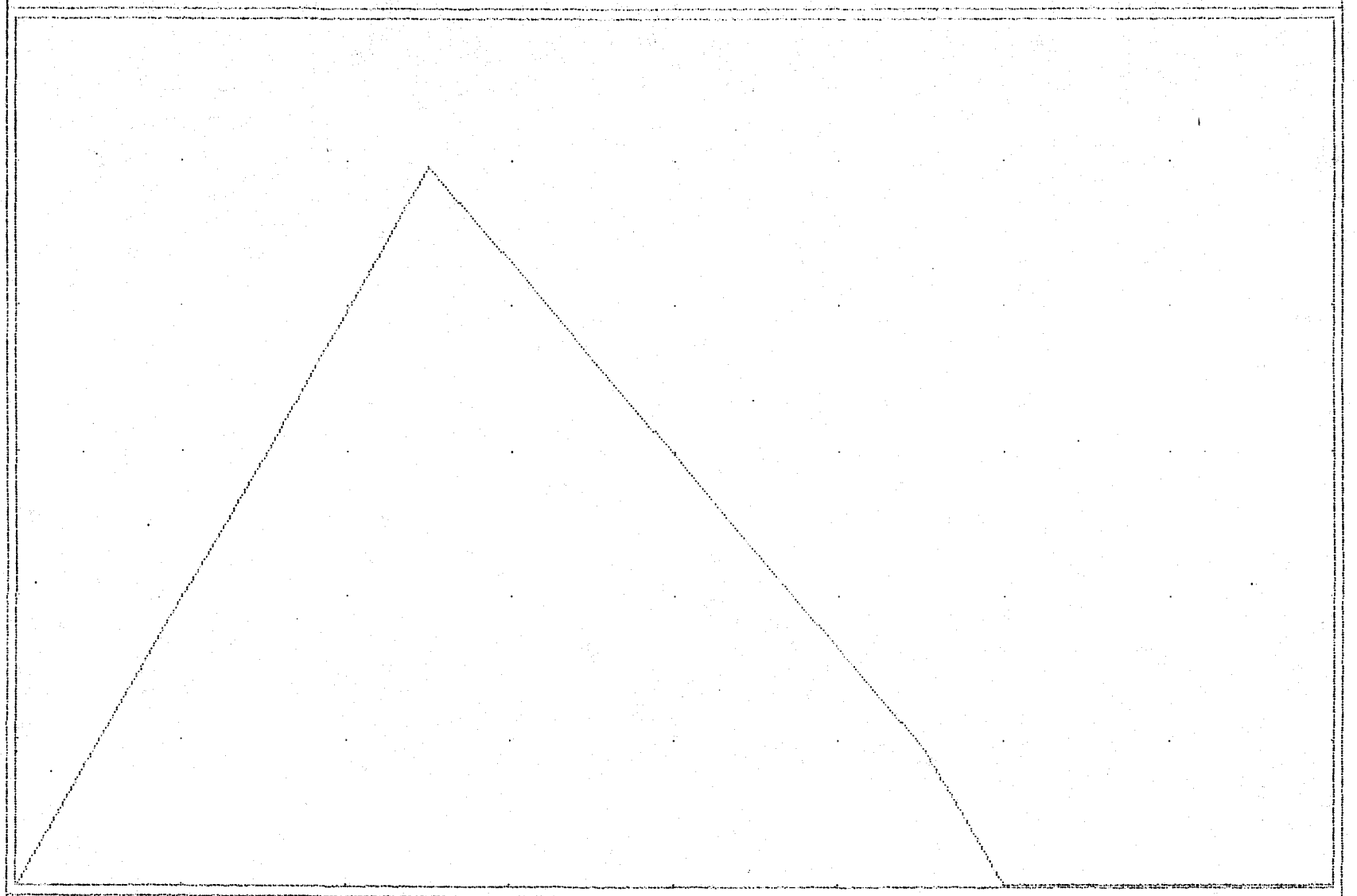


VOL = (cuft/acft) = 6676 / 0.153



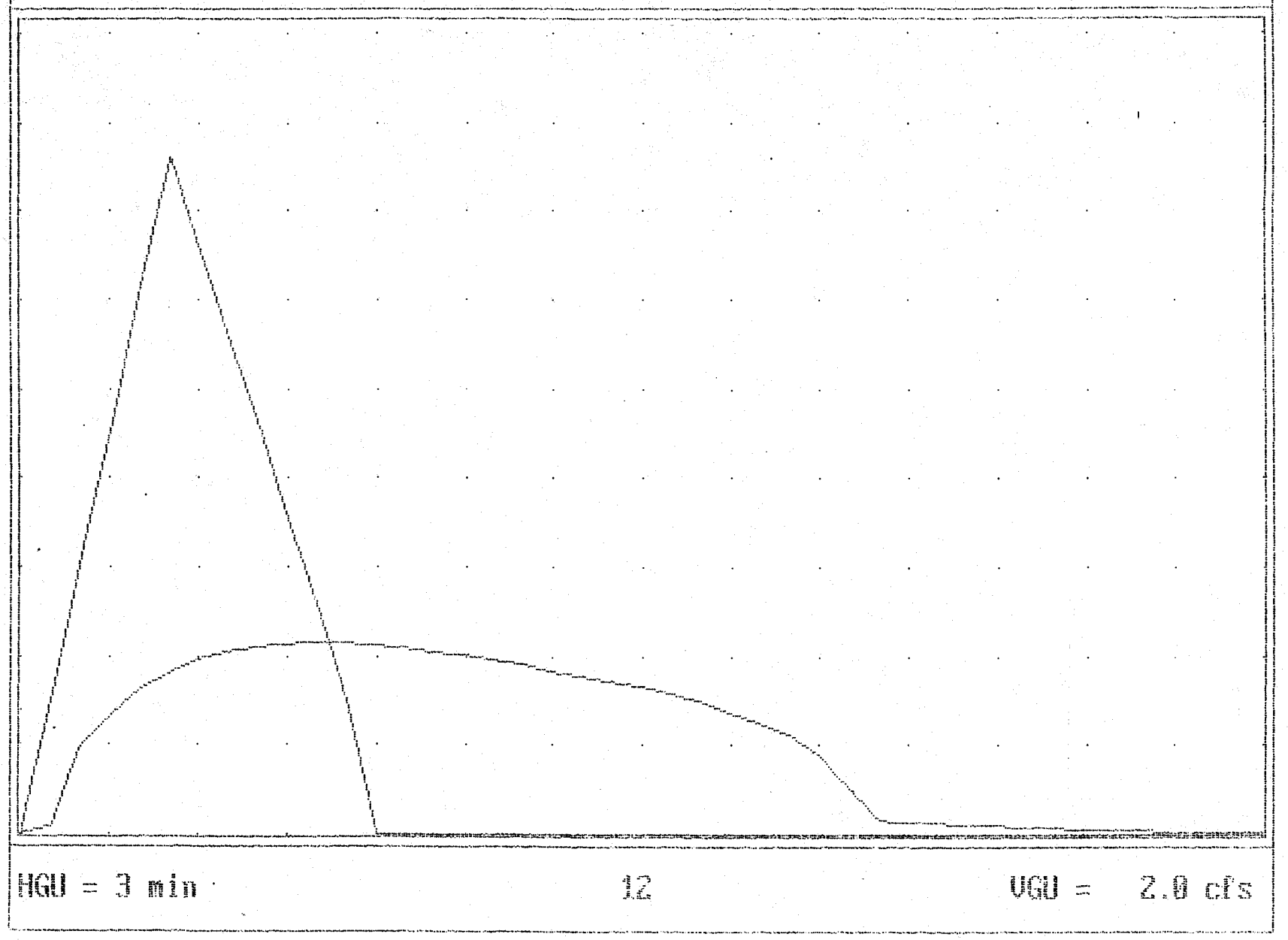
HGU = 2 min 4 UGU = 5.0 cfs

VOL = (cuft/acft) = 7853 / 0.180



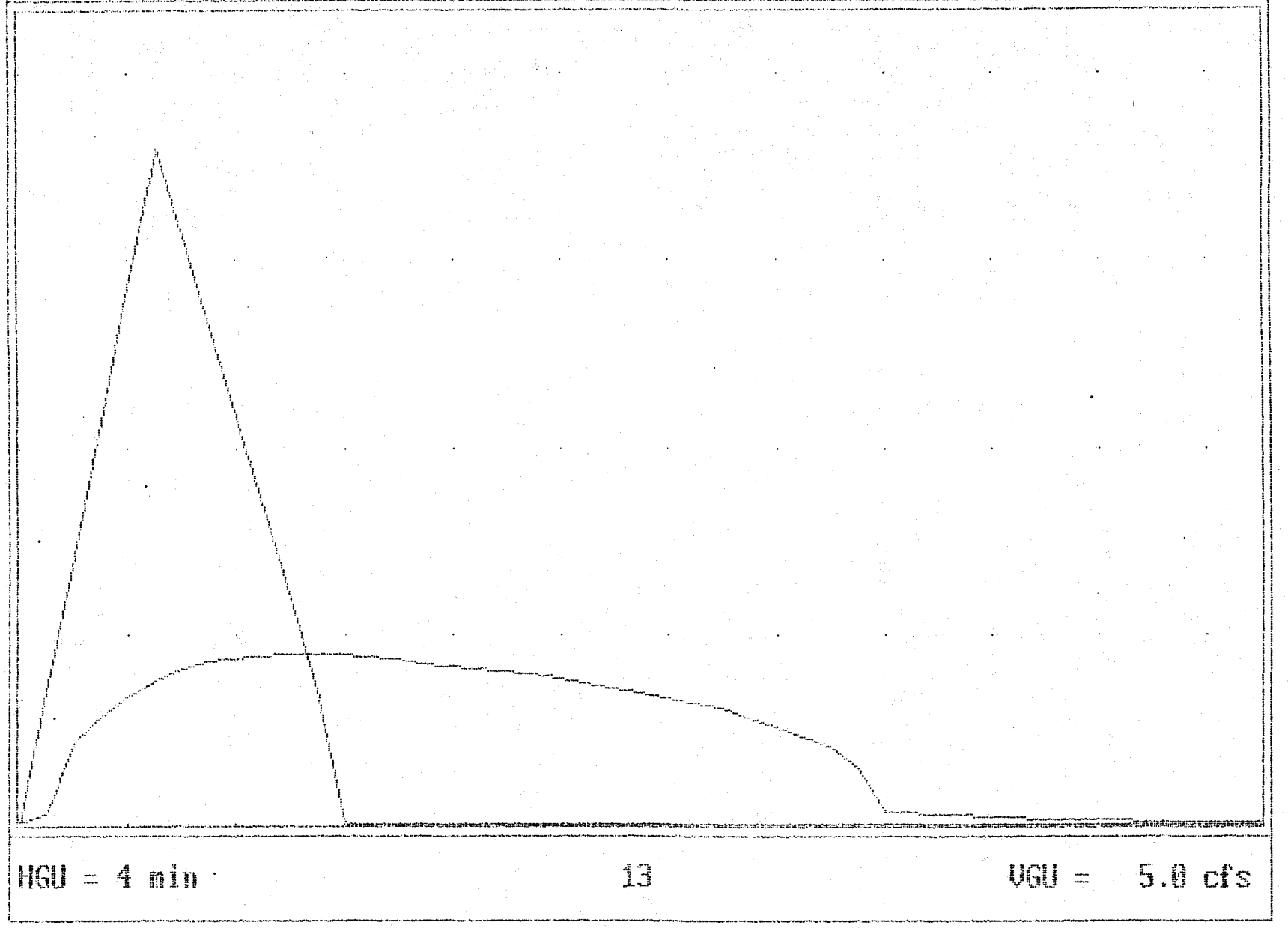
UGU = 2 min 5 UGU = 5.0 cfs

UOL = (cuft/acft) = 9222 / 0.212



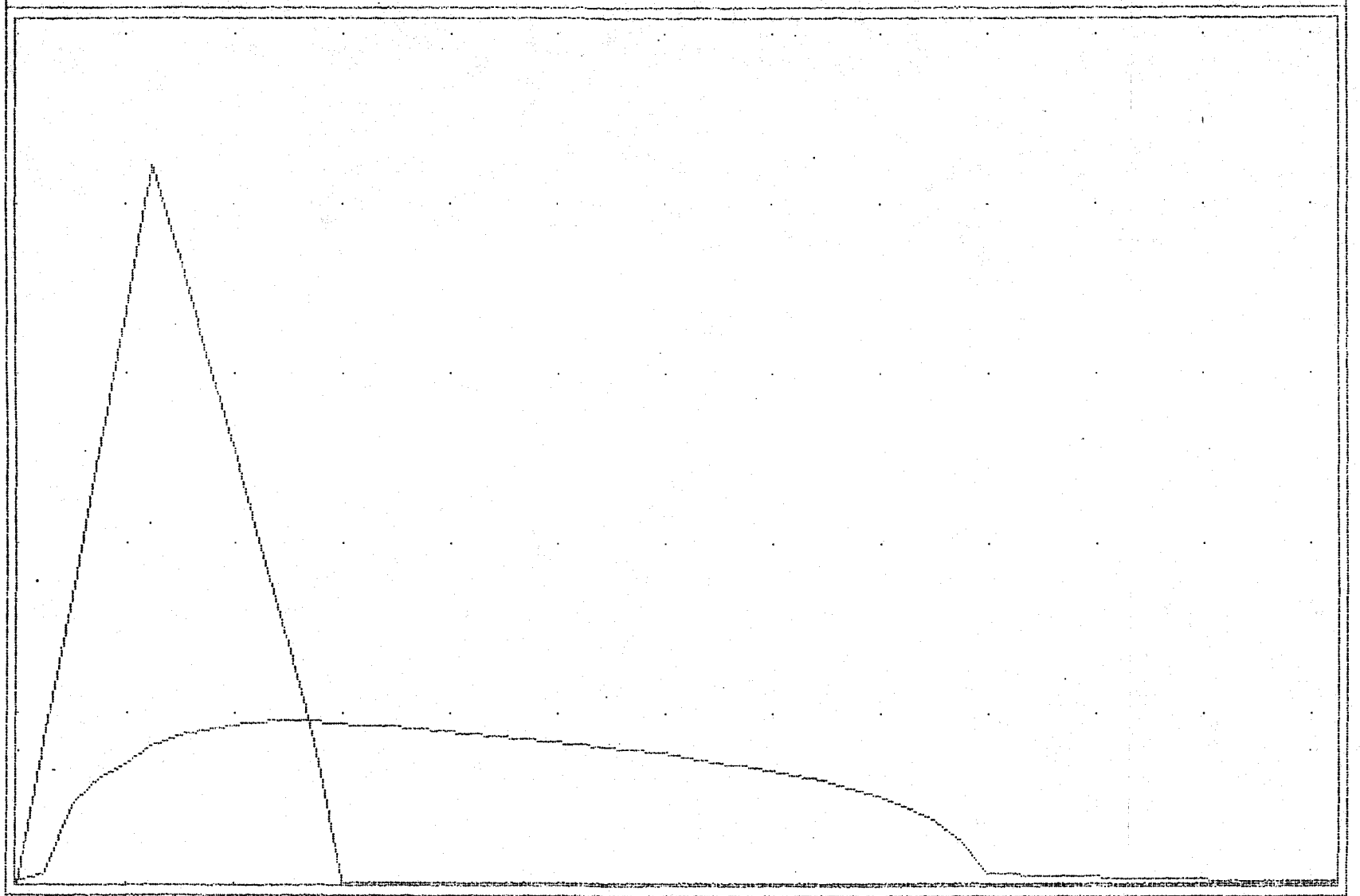
MAX STORAGE = 3512

MAX ELEVATION = 56.39



MAX STORAGE = 4386

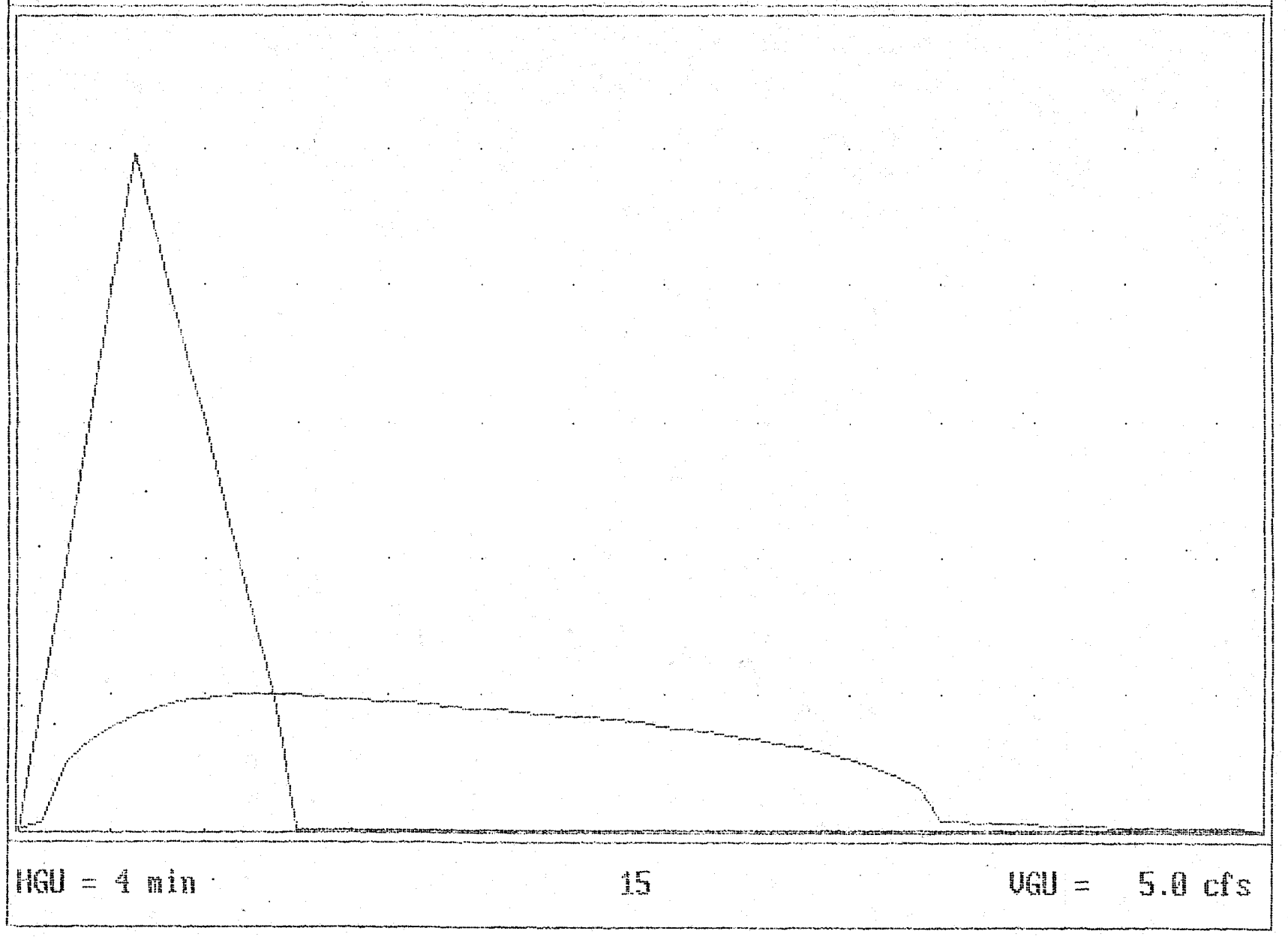
MAX ELEVATION = 56.72



HGU = 4 min 14 VGU = 5.0 cfs

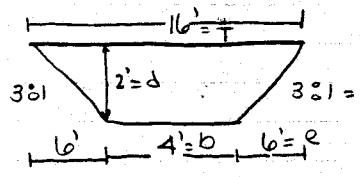
MAX STORAGE = 5430

MAX ELEVATION = 57.08



MAX STORAGE = 6670

MAX ELEVATION = 57.40



$Z = \frac{e}{d}$

TRAPEZOIDAL CHANNEL

X-SECTIONAL AREA (A) = $bd + Zd^2 = 4(2) + 3(2^2) = 20\ ft^2$

HYDRAULIC RADIUS = $\frac{bd + Zd^2}{b + 2d\sqrt{Z^2+1}} = \frac{4(2) + 3(2^2)}{4 + 2(2)\sqrt{3^2+1}} = 1.20$

FOR GRASS LINED CHANNELS:

CHANNEL S ≈ 10% ∴ V_{max} permissible = 4 ft/sec

CORRECTION FACTOR:
$R/T = 1.25 \Rightarrow .84$

∴ $V_{max} = 4(.84) = 3.36$ ft/sec

KNOWN $Q_{peak} = 9\ ft^3/sec$

$Q = VA$
$9\ ft^3/sec = V(20\ ft^2)$
∴ $V = 0.45$ ft/sec < $V_{max} = 3.36$ ft/sec

∴ THESE CALCULATIONS SHOW THE CHANNEL TO BE MORE THAN ADEQUATE FOR THE PEAK FLOW.

Job# 8162
WILLIAMSBURG LANDING
8/28/96

48 ϕ Concrete pipe - ID = 58" - OD

72" area = ~~4072~~ in^2

58" area = ~~2642~~

~~1430~~

48" area = 12.57 ft^2

58" " ~ 18.35

72" " = 28.27

72 28.27

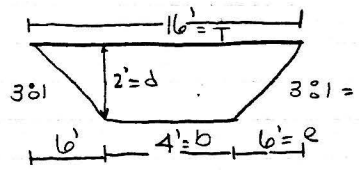
58 - 18.35

9.9 < 12.57 ft^2 - N.G.

78" = 33.18

- 18.35

14.83 > 12.57 - ok.



$Z = \frac{e}{d}$

TRAPEZOIDAL CHANNEL

X-SECTIONAL AREA (A) = $bd + Zd^2 = 4(2) + 3(2^2) = 20\ ft^2$

HYDRAULIC RADIUS = $\frac{bd + Zd^2}{b + 2d\sqrt{Z^2+1}} = \frac{4(2) + 3(2^2)}{4 + 2(2)\sqrt{3^2+1}} = 1.20$

FOR GRASS LINED CHANNELS:

CHANNEL S ≈ 10% ∴ V_{max} permissible = ~~4~~ ft/sec 2.5'/sec

CORRECTION FACTOR:
$A/T = 1.25 \Rightarrow .84$

∴ $V_{max} = 4(.84) = 3.36$ ft/sec

KNOWN Q_{peak} 9 ft^3/sec

→ $Q = VA$
$9\ ft^3/sec = V(20\ ft^2)$
∴ $V = 0.45$ ft/sec < $V_{max} = 3.36$ ft/sec

∴ THESE CALCULATIONS SHOW THE CHANNEL TO BE MORE THAN ADEQUATE FOR THE PEAK FLOW.

↳ depth will not be 2.0'

Need to use Manning eqn.

Job# 8162
WILLIAMSBURG LANDING
8/28/96

$\frac{25}{33}$ = 7.5 pts

Try 23.26

0.64 = $\frac{2.49 \text{ ac}}{23.26} \times 6$

2.4 = $\frac{6.2}{23.26} \times 9$ 6 ⇒ 1.6

3.0 or 2.2

1.68
.45
2.00

NOS - 6.26 ⇒ 9.26

.75 - need 1.63ac.

33.
-10
23
9 - site dev.
14
22
36 - NOS

8.7

$\frac{36}{45}$ = 8 PTS
3 PTS
11.0

8
2.2
10.2

1. Run calcs by WNB
2. Check on procedure w/ Gary - can we give final approval before everyone has a complete set.

- Wmbg Lndg -

2' deep

Filter Fabric

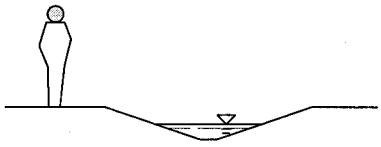
Class I RR

approx 2:1 SS w/ 1' bottom

approx 150' feet long w/ 3' high CD @ 20' below bottom

Computer-Aided Hydrology & Hydraulics
CHANNEL Program
Version 1.06

Project: The Landing - Timber Structure Outfall
User: Darryl Cook, P.E.
Date: 5 September 1996, Thursday
Time: 11:58 am
Output: C:\CAHH\REVIEW.OUT



Vegetation, Retardance Class B

FLEXIBLE (HEC-15) ANALYSIS

INPUTS:

DISCHARGE	7 cfs
Bottom Slope (ft/ft)	.1
Left Side Slope (hor/vert)	3
Right Side Slope (hor/vert)	3
Bottom Width (ft)	1
Freeboard (ft)	1

LINING MATERIAL:

Vegetation, Retardance Class B

OUTPUTS:

	MILD CHANNEL	
	NORMAL	CRITICAL
FLOW DEPTH	.893 ft	.659 ft
Velocity (fps)	2.13	3.568
Flow Area (sf)	3.286	1.962
Hydraulic Radius (ft)	.494	.38
Froude Number	0.5222	1.0000
Width at Depth (ft)	6.359	4.954
Width at Freeboard (ft)	12.359	
Computed Manning n	0.1378	

	COMPUTED	PERMISSIBLE
Velocity (fps)	2.13 Stable?	1.767
Shear Stress (psf)	5.573 Stable?	2.1

BMP CALCULATIONS

WMBG LANDING #8162

1) STRUCTURAL BMP POINTS

DRY POND #1	6 PTS	$\frac{6.20}{15.85}$	=	2.35
DRY POND #2	6 PTS	$\frac{2.49}{15.85}$	=	0.94
TOTAL STRUCTURAL POINTS				**3.29**

15.85 IS – 7.94 Ac BETWEEN COL PIPELINE STREET AND WMSB LAND SA
7.91 Ac OF BLDG SITE LOCATION DRAINING TO POND #2

2) OPEN SPACE

$\frac{30.13}{38.04}$ (100) × .1 = 7.92

30.13 IS 7.94Ac + 22.19 Ac OF OPEN SPACE

38.04 Ac IS BLDG SITE (~~7.94~~ 22.19 + 15.85)

TOTAL POINTS

3.29 + 7.92 = 11.21

THEREFORE, OPEN SPACE CAN BE CUT DOWN TO 25.52 Ac
WHICH IS 3.33Ac. OF THE 7.94 Ac

$\frac{25.52}{38.04}$ ×10 = 6.7 NOS

3.3

10.0 PTS -

Need Cons. Easement for the 3.33 ac of 22.19 ac.

~~9-6-96~~

BMP CALCULATIONS

WMBG LANDING

#8162 DARRYL

1) STRUCTURAL BMP POINTS

DRY POND #1	6 PTS	$\frac{6.20}{15.85}$	=	2.35
DRY POND #2	6 PTS	$\frac{2.49}{15.85}$	=	0.94
TOTAL STRUCTURAL POINTS				3.29

15.85 IS 7.94 Ac BETWEEN COL PIPELINE EASMNT AND WMBG LANDING
7.91 Ac OF BLDG SITE LOCATION DRAINING TO PONDS 1 & 2

2) OPEN SPACE

$\frac{30.13}{38.04}$ (100) × .1 = 7.92

30.13 IS 7.94Ac + 22.19 Ac OF OPEN SPACE

38.04 Ac IS BLDG SITE (~~7.94~~ 22.19 + 15.85)

TOTAL POINTS

3.29 + 7.92 = 11.21

THEREFORE, OPEN SPACE CAN BE CUT DOWN TO 25.52 Ac
WHICH IS 3.33Ac. OF THE 7.94 Ac

DRAINAGE CALCULATIONS

FOR

WILLIAMSBURG LANDING

WOODHAVEN - PHASE II EXPANSION

Engineering & Resource Protection
NOV 3 2015
RECEIVED

April 21, 2010
Revised: October 14, 2010
Revised: December 20, 2010

Prepared by:

AES Consulting Engineers
5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188
(757) 253-0040 Fax: (757) 220-8994
http://www.aesva.com

COMMONWEALTH OF VIRGINIA
NICHOLAS BOTTA
Lic. No. 24730
12/20/10
PROFESSIONAL ENGINEER

AES Project No. 8162-06

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NATURAL CHANNEL ADJACENT TO WILLIAMSBURG LANDING DRIVE

DRAINAGE AREA MAPS

I INTRODUCTION

The proposed project represents the Phase II expansion of the Woodhaven assisted living building and other site improvements at Williamsburg Landing including the following:

- 4 new additions to the existing assisted living building
- A Grounds Maintenance area including a 2,150 SF building
- A new Skilled Care Building (20,225 SF footprint)
- 2 Independent Living Buildings with 12 units in each (11,390 SF footprint each)
- Parking lot expansion in front of the existing assisted living building for net gain of 14 parking spaces
- Installation of approximately 900 LF of sidewalk along Williamsburg Landing Drive.

The elements of this Phase II project assumes that all Phase I improvements are existing (JCC SP-062-2009). The stormwater calculations follow the methods used for the Phase I plan.

II EXISTING SITE CONDITIONS

The areas of the proposed building additions were cleared during the construction of the original building, and currently has a cover of grass, landscaping, and sidewalks. These additions will drain to one of two existing BMPs - a dry detention stormwater management facility, known as BMP #1, located in the southeast corner of the site adjacent to the service road, or a wet–extended detention stormwater management facility, known as BMP #2, located northwest of the existing building.

The area of the proposed Grounds Maintenance building is currently partially wooded. Slopes on this area of the site range from 5-20%. This area primarily drains southward to a ravine, and eventually eastward to College Creek.

The area where the new Skilled Care Building and the 2 Independent Living Buildings are proposed is situated northeast of the existing Woodhaven Assisted Living Building. The site is currently wooded and drains in three directions to ravines that eventually convey the stormwater runoff to College Creek. Slopes on the area of the site range from 5-30%.

III PROPOSED SITE CONDITIONS

The impervious coverage associated with the new building additions will drain to either BMP#1 or BMP#2. The new parking area in the front of the Woodhaven Building and the Grounds Maintenance area will drain to BMP#1. A new stormwater management facility, BMP#6, will control the runoff from the 3 new buildings proposed at the rear of the site.

BMP #1

The drainage area to BMP #1 was calculated for pre- and post-development conditions. The runoff cooefficients were calculated by determining the pre- and post-development impervious coverage of the

drainage area. However, the pre-development drainage area of 5.19 acres and time of concentration of 6.49 minutes from the original design of the BMP ("Hydrologic Report for Williamsburg Landing Dry Pond #1" prepared by AES Consulting Engineers dated 6/21/96) are used in the calculations for comparison with the post-development routing results. The 2, 10, and 100 year, post-development storms were routed through the existing stormwater management facility.

The 2, 10, and 100-year, post-development storms were routed through the existing stormwater management facility using a calculated Critical Storm in the Modified Rational Method. The Critical Storms were determined using the conditions of the site before the BMP was first constructed and the post-development conditions., and adjusting the inflow hydrographs. In addition, the 1-year – 24-hour storm was routed through BMP to ensure that the entire volume flows through the low flow orifices.

BMP #1			
	Original Calculations[1]	**Updated Calculations[2]**	
	Pre-Dev Runoff to Design Point 5.19 ac – C=0.3	**Post-Dev Runoff to BMP #1** 6.61 ac – C=0.64	**Pond Discharge**
1-Year		18.91 CFS	1.78 CFS
2-Year	8.59 CFS	11.82 CFS	1.77 CFS
10-Year	11.13 CFS	12.43 CFS	10.22 CFS
100-Year	14.76 CFS	15.39 CFS	15.28 CFS

[1] – Based on calculations from original design of BMP "Hydrologic Report for Williamsburg Landing Dry Pond #1" prepared by AES Consulting Engineers dated 6/21/96 using the SCS Method and converting to the Modified Rational Method.

[2] – Calculations of Post-Development conditions for this project using SCS Method for the 1-Year Storm and the Modified Rational Method for the 2, 10, and 100-Year Storms.

BMP #2

The original calculations by Landmark Design Group (Williamsburg Landing – Phase 2 last revised 8/16/02) were referenced for the purposes of providing these updated calculations. The following information from that report was used in these updated calculations:

- Pre-Development Drainage Area: 4.84 Acres / C=0.46 / Tc=36 min.
- Post-Development Drainage Area: 7.90 Acres / C=0.61 / Tc=11 min.
- Impervious Area of Post Development Area: 2.9242 ac. (Phase 2 site) + 1.186 ac. (Woodhaven site) = 4.1103 ac.

The post-development drainage area and impervious area above were closely analyzed in developing the calculations in this report. The 7.90 acre area was divided into two sub-areas to focus on the Woodhaven portion of the drainage area. Area 2B includes all of the impervious areas associated with

the Woodhaven site. Area 2A was determined to be 4.79 acres after subtracting Area 2B from the 7.90 acres. The runoff coefficient of Area 2A was calculated using the impervious area of the Phase 2 site shown above.

The 2, 10, and 100-year, post-development storms were routed through the stormwater management facility using a calculated Critical Storm in the Modified Rational Method. The Critical Storms were determined using the conditions of the site, before the BMP was first constructed, and the post-development conditions including the time of concentration (11 min.), and adjusting the inflow hydrographs. In addition, the 1-year – 24-hour storm was routed through BMP to ensure that the entire volume flows through the 3" orifice.

BMP #2						
	Original Calculations[1]			Updated Calculations[2]		
	Pre-Dev Runoff to Design Point 4.84 ac – C=.46	Post-Dev Runoff to BMP #2 7.90 ac – C=.62	Pond Discharge		Post-Dev Runoff to BMP #2[3] 8.23 ac – C=.65	Pond Discharge[3]
1-Year	4.20 CFS	17.85 CFS	0.57 CFS		17.78 CFS	0.44 CFS
2-Year	5.10 CFS	21.01 CFS	2.73 CFS		9.51 CFS	0.43 CFS
10-Year	7.27 CFS	28.20 CFS	9.36 CFS		10.82 CFS	0.52 CFS
100-Year	10.35 CFS	37.72 CFS	16.33 CFS		13.86 CFS	13.81 CFS

[1] – Calculations from original design of BMP "Williamsburg Landing - Phase 2" prepared by Landmark Design Group last revised 8/16/02.
[2] – Calculations for future conditions of this project (Post-Development).
[3] – Using the SCS Method for the 1-Year storm and Modified Rational for the 2, 10, & 100-Year storms.

BMP #6

A new stormwater management facility will be constructed to serve the rear portion of the site where the 3 new buildings are proposed. This BMP will be a wet–extended detention stormwater management facility and it will be known as BMP#6. Since this development area does not have defined channels that carry a majority of the pre-development flow, and since most of the post-development discharge will be carried by a single pipe to the edge of the wetlands at the bottom of the ravine, the pre-development drainage area is identical to the post-development drainage area in order to compare the runoff rates from the development area.

The 2, 10, and 100-year, post-development storms were routed through the proposed stormwater management facility using a calculated Critical Storm in the Modified Rational Method. The Critical Storms were determined using the pre-development conditions of the site and the post-development

conditions., and adjusting the inflow hydrographs. In addition, the 1-year – 24-hour storm was routed through BMP to ensure that the entire volume flows through the low flow orifices.

BMP #6			
	Pre-Dev Runoff from the development area 3.18 ac – C=0.3	**Post-Dev Runoff to BMP #6** 3.18 ac – C=0.66	**Pond Discharge**
1-Year		8..97 CFS	0.25 CFS
2-Year	3.74 CFS	5.52 CFS	0.22 CFS
10-Year	4.90 CFS	6.17 CFS	0.27 CFS
100-Year	6.51 CFS	7.01 CFS	4.88 CFS

Special Stormwater Criteria (SSC)

In accordance with the Condition #10 of the Amended and Restated Proffer Agreement, dated November 20, 2008, the following Special Stormwater Criteria (SSC) measures have been included in the design of this project:

1. SSCP #14 – Sumped Inlet (1/2 Credit)
2. SSCP #20 – Enhanced Outlet Protection (1 Credit)
3. SSCP #21 – Flat, Large Bottom Width Swales (1 Credit)
4. SSCP #28 – Enhanced Channel Stabilization (1 Credit)

STORM SEWER

Calculations

AES
CONSULTING ENGINEERS

Project: Wmbg. Landing - Woodhaven Phase II
Project No.: 8162-06
Subject: Runoff Coefficients

Date: April 21, 2010
Calculated By: NB

Runoff Coefficients used in the following calculations were taken from Table 4-3 of the Virginia Stormwater Management Handbook.

Subject Area: Storm Drainage Systems

Area Description	Impervious	Open			Total Area	C x A	Weighted C
	0.90	0.20					
SS#1-2 (RD)	0.08				0.08	0.07	0.90
SS#1-2	0.07	0.01			0.08	0.07	0.81
SS#1-5	0.15	0.04			0.19	0.14	0.75
SS#1-6 (RD)	0.08				0.08	0.07	0.90
SS#1-6	0.12	0.02			0.14	0.11	0.80
					0.00		
SS#2-2	0.03	0.04			0.07	0.04	0.50
SS#2-3	0.10	0.06			0.16	0.10	0.64
SS#2-3 (RD)	0.10				0.10	0.09	0.90
2-3B	0.15	0.03			0.18	0.14	0.78
2-3C	0.08	0.02			0.10	0.08	0.76
SS#2-4	0.21	0.05			0.26	0.20	0.77
SS#2-5 (RD)	0.11				0.11	0.10	0.90
SS#2-6 (RD)	0.07				0.07	0.06	0.90
SS#2-7 (RD)	0.03				0.03	0.03	0.90
SS#2-8 (RD)	0.14				0.14	0.13	0.90
					0.00		
SS#3-9 thru #3-3	0.31	0.07			0.38	0.29	0.77
SS#3-10 thru #3-3	0.04	0.01			0.05	0.04	0.76
					0.00		
					0.00		
					0.00		
SS# 5-3	0.14	0.04			0.18	0.13	0.74
SS# 5-7	0.22	0.04			0.26	0.21	0.79
SS# 5-8	0.23	0.04			0.27	0.22	0.80
SS# 5-9	0.25	0.14			0.39	0.25	0.65
SS# 5-12	0.06				0.06	0.05	0.90
SS# 5-13	0.02	0.07			0.09	0.03	0.36
SS# 5-15	0.28	0.08			0.36	0.27	0.74
SS# 5-16	0.15	0.02			0.17	0.14	0.82
SS# 5-17	0.41	0.76			1.17	0.52	0.45

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CONSULTING ENGINEERS

Project: Wmbg. Landing - Woodhaven Phase II
Project No.: 8162-06
Subject: Runoff Coefficients

Date: December 20, 2010
Calculated By: NB

Runoff Coefficients used in the following calculations were taken from Table 4-3 of the Virginia Stormwater Management Handbook.

Subject Area: Storm Drainage Systems

Area Description	Impervious	Open			Total Area	C x A	Weighted C
	0.90	0.20					
SS# 6-2	0.13				0.13	0.12	0.90
SS# 6-3	0.01				0.01	0.01	0.90
SS# 6-4	0.04				0.04	0.04	0.90
SS# 6-6	0.76	0.24			1.00	0.73	0.73
SS# 6-7	0.06	0.01			0.07	0.06	0.80
SS# 6-8	0.20	0.03			0.23	0.19	0.81
					0.00		
SS# 7-5	0.05	0.06			0.11	0.06	0.52
SS# 7-6	0.03	0.03			0.06	0.03	0.55
					0.00		
SS# 10-2	0.28	0.18			0.46	0.29	0.63
SS# 10-3	0.09	0.04			0.13	0.09	0.68
SS# 10-4	0.14	0.02			0.16	0.13	0.81
SS# 10-5	0.27	0.02			0.29	0.25	0.85
SS# 10-7	0.02	0.01			0.03	0.02	0.67
SS# 10-9	0.02	0.01			0.03	0.02	0.67
SS# 10-10	0.02	0.01			0.03	0.02	0.67
SS# 10-11	0.10	0.07			0.17	0.10	0.61
SS# 10-13		0.08			0.08	0.02	0.20
SS# 10-14	0.19	0.08			0.27	0.19	0.69
SS# 10-15	0.06	0.01			0.07	0.06	0.80
SS# 10-16	0.12	0.02			0.14	0.11	0.80
SS# 10-17	0.11	0.19			0.30	0.14	0.46
SS# 10-19	0.17				0.17	0.15	0.90
SS# 10-20	0.14				0.14	0.13	0.90
SS# 10-21	0.15				0.15	0.14	0.90
					0.00		
					0.00		
					0.00		
					0.00		
					0.00		
					0.00		

AES
CONSULTING ENGINEERS

Project:	Williamsburg Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Existing Channel No. 1 (Section 1A)
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Existing Channel No. 1 (Section 1A)**

2 Year Storm - Velocity Check

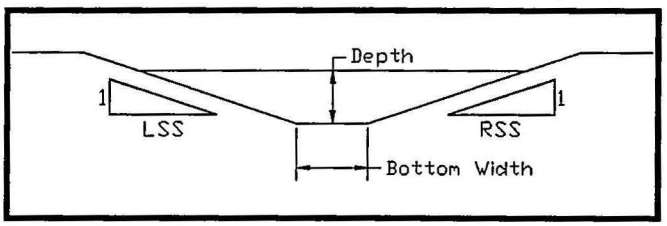
Drainage Area	=	0.49	Acres	(Area draining to Design Point)
C	=	0.58		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.58 x 5.78 x 0.49

= 1.64 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.10	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.49	Ft.	
Area	=	0.71	SF	Wetted Perimeter = 3.07 Ft.
Hydraulic Radius	=	0.23	Ft.	
Velocity (V)	=	2.31	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.64	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

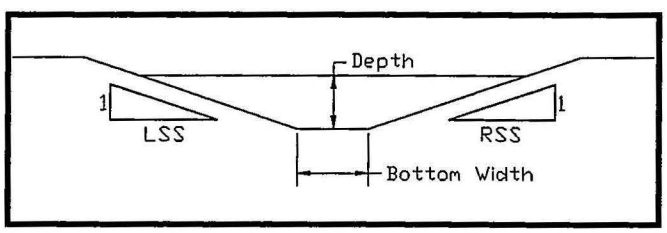
Drainage Area	=	0.49	Acres	(Area draining to Design Point)
C	=	0.58		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.58 x 7.50 x 0.49

= 2.13 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.10	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.54	Ft.	
Area	=	0.86	SF	Wetted Perimeter = 3.39 Ft.
Hydraulic Radius	=	0.25	Ft.	
Velocity (V)	=	2.47	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	2.13	CFS	(From Continuity Equation Q=AV)

AES
CONSULTING ENGINEERS

Project:	Williamsburg Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Existing Channel No. 1 (Section 1B)
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Existing Channel No. 1 (Section 1B)**

2 Year Storm - Velocity Check

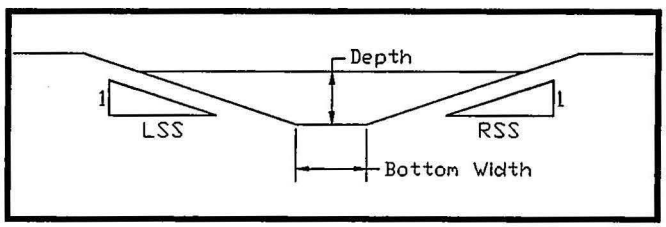
Drainage Area	=	0.89	Acres	(Area draining to Design Point)
C	=	0.69		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.69 x 5.78 x 0.89

= 3.55 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	4.50	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.56	Ft.	
Area	=	0.95	SF	Wetted Perimeter = 3.55 Ft.
Hydraulic Radius	=	0.27	Ft.	
Velocity (V)	=	3.73	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	3.53	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

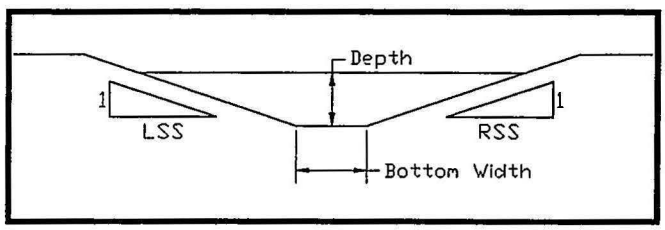
Drainage Area	=	0.89	Acres	(Area draining to Design Point)
C	=	0.69		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.69 x 7.50 x 0.89

= 4.61 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	4.50	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.62	Ft.	
Area	=	1.15	SF	Wetted Perimeter = 3.92 Ft.
Hydraulic Radius	=	0.29	Ft.	
Velocity (V)	=	3.98	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	4.59	CFS	(From Continuity Equation Q=AV)

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CONSULTING ENGINEERS

Project:	Williamsburg Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Existing Channel No. 1 (Section 1C)
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Existing Channel No. 1 (Section 1C)**

2 Year Storm - Velocity Check

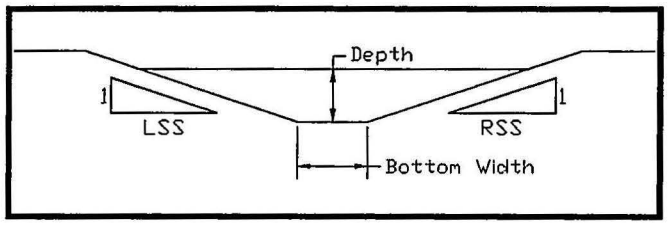
Drainage Area	=	1.01	Acres	(Area draining to Design Point)
C	=	0.64		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.64 x 5.78 x 1.01

= 3.74 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	14.30	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.52	Ft.	
Area	=	0.27	SF	Wetted Perimeter = 1.46 Ft.
Hydraulic Radius	=	0.18	Ft.	
Velocity (V)	=	13.92	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	3.72	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

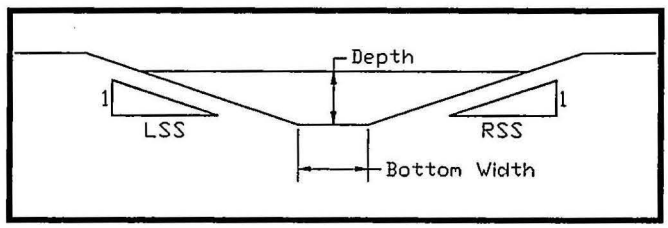
Drainage Area	=	1.01	Acres	(Area draining to Design Point)
C	=	0.64		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.64 x 7.50 x 1.01

= 4.85 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	14.30	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.57	Ft.	
Area	=	0.32	SF	Wetted Perimeter = 1.61 Ft.
Hydraulic Radius	=	0.20	Ft.	
Velocity (V)	=	14.86	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	4.83	CFS	(From Continuity Equation Q=AV)

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CONSULTING ENGINEERS

Project:	Williamsburg Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Existing Channel No. 1 (Section 1D)
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Existing Channel No. 1 (Section 1D)**

2 Year Storm - Velocity Check

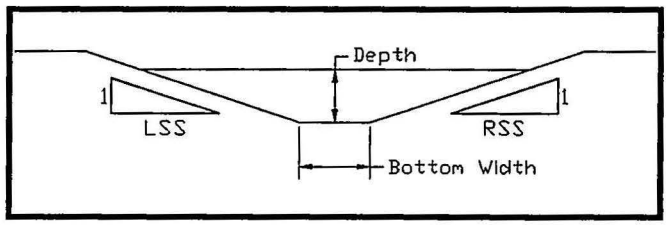
Drainage Area	=	1.95	Acres	(Area draining to Design Point)
C	=	0.48		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.48 x 5.78 x 1.95

= 5.41 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	1.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	37.00	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.22	Ft.	
Area	=	0.26	SF	Wetted Perimeter = 1.61 Ft.
Hydraulic Radius	=	0.16	Ft.	
Velocity (V)	=	20.70	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	5.41	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

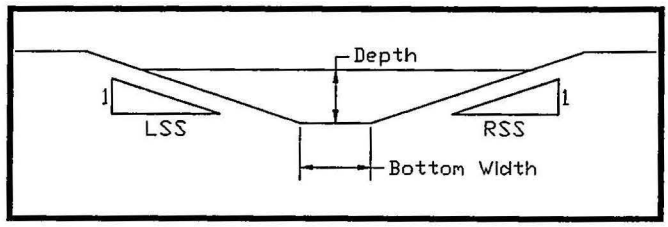
Drainage Area	=	1.95	Acres	(Area draining to Design Point)
C	=	0.48		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.48 x 7.50 x 1.95

= 7.02 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	1.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	37.00	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.25	Ft.	
Area	=	0.31	SF	Wetted Perimeter = 1.71 Ft.
Hydraulic Radius	=	0.18	Ft.	
Velocity (V)	=	22.42	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	7.01	CFS	(From Continuity Equation Q=AV)

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CONSULTING ENGINEERS

Project:	Williamsburg Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Existing Channel No. 1 (Section 1E)
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Existing Channel No. 1 (Section 1E)**

2 Year Storm - Velocity Check

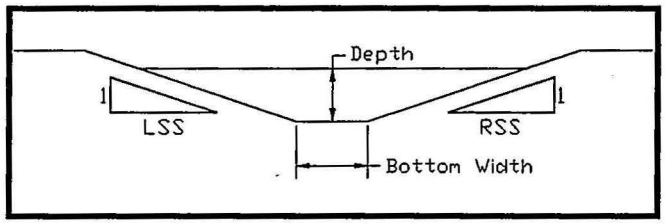
Drainage Area	=	2.06	Acres	(Area draining to Design Point)
C	=	0.47		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.47 x 5.78 x 2.06

= 5.60 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	1.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	15.40	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.28	Ft.	
Area	=	0.36	SF	Wetted Perimeter = 1.80 Ft.
Hydraulic Radius	=	0.20	Ft.	
Velocity (V)	=	15.40	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	5.57	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

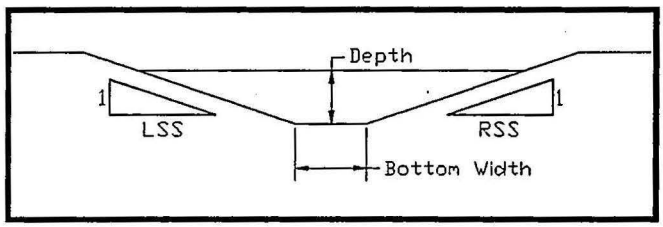
Drainage Area	=	2.06	Acres	(Area draining to Design Point)
C	=	0.47		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.47 x 7.50 x 2.06

= 7.26 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	1.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	15.40	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.33	Ft.	
Area	=	0.44	SF	Wetted Perimeter = 1.93 Ft.
Hydraulic Radius	=	0.23	Ft.	
Velocity (V)	=	16.64	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	7.25	CFS	(From Continuity Equation Q=AV)

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CONSULTING ENGINEERS

Project:	WL - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Channel No. 1
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Channel No. 1 (Outfall into SS #2-3C)**

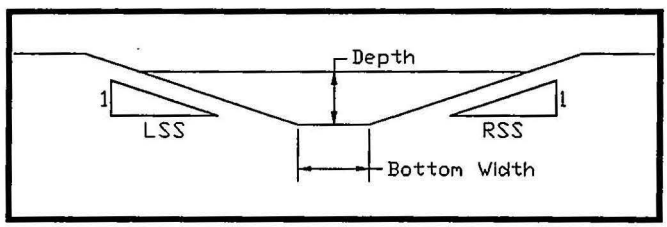
2 Year Storm - Velocity Check

Drainage Area	=	0.08	Acres	(Area draining to Design Point)
C	=	0.81		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.81 x 5.78 x 0.08

= 0.37 CFS



Channel Characteristics

Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	3.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.00	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.10	Ft.	
Area	=	0.32	SF	Wetted Perimeter = 3.61 Ft.
Hydraulic Radius	=	0.09	Ft.	
Velocity (V)	=	1.18	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.37	CFS	(From Continuity Equation Q=AV)

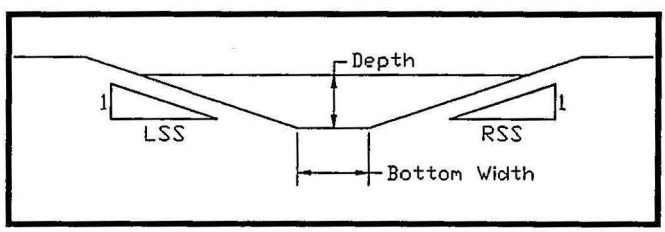
10 Year Storm - Capacity Check

Drainage Area	=	0.08	Acres	(Area draining to Design Point)
C	=	0.81		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.81 x 7.50 x 0.08

= 0.49 CFS



Channel Characteristics

Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	3.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.00	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.11	Ft.	
Area	=	0.37	SF	Wetted Perimeter = 3.71 Ft.
Hydraulic Radius	=	0.10	Ft.	
Velocity (V)	=	1.30	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.49	CFS	(From Continuity Equation Q=AV)

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CONSULTING ENGINEERS

Project:	WL - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Channel No. 2A
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Channel No. 2A (Outfall into SS #10-17)**

2 Year Storm - Velocity Check

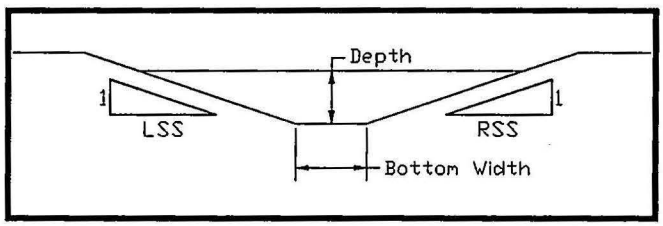
Drainage Area	=	0.30	Acres	(Area draining to Design Point)
C	=	0.46		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.46 x 5.78 x 0.30

= 0.80 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	6.10	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.09	Ft.	
Area	=	0.39	SF	Wetted Perimeter = 4.58 Ft.
Hydraulic Radius	=	0.08	Ft.	
Velocity (V)	=	2.03	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.79	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

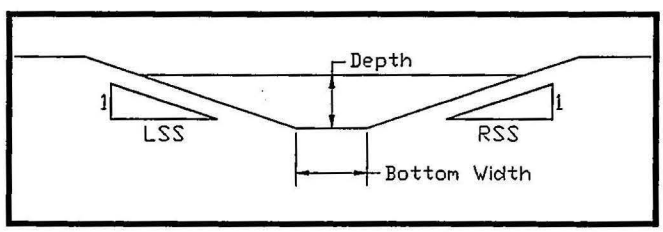
Drainage Area	=	0.30	Acres	(Area draining to Design Point)
C	=	0.46		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.46 x 7.50 x 0.30

= 1.04 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	6.10	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.11	Ft.	
Area	=	0.46	SF	Wetted Perimeter = 4.67 Ft.
Hydraulic Radius	=	0.10	Ft.	
Velocity (V)	=	2.23	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.02	CFS	(From Continuity Equation Q=AV)

AES
CONSULTING ENGINEERS

Project:	WL - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Channel No. 2B
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Channel No. 2B (Outfall into SS #10-17)**

2 Year Storm - Velocity Check

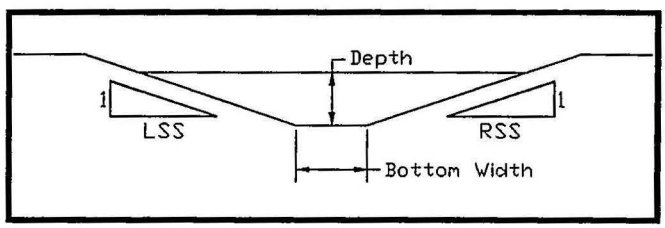
Drainage Area	=	0.19	Acres	(Area draining to Design Point)
C	=	0.61		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.61 x 5.78 x 0.19

= 0.67 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.00	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.11	Ft.	
Area	=	0.49	SF	Wetted Perimeter = 4.72 Ft.
Hydraulic Radius	=	0.10	Ft.	
Velocity (V)	=	1.34	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.66	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

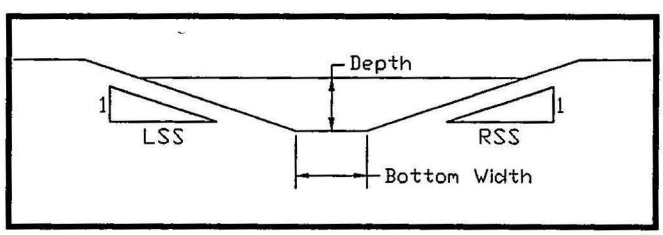
Drainage Area	=	0.19	Acres	(Area draining to Design Point)
C	=	0.61		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.61 x 7.50 x 0.19

= 0.87 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	2.00	%
Mannings (n)	=	0.035	**Short Grass**

Depth of Flow	=	0.13	Ft.	
Area	=	0.59	SF	Wetted Perimeter = 4.84 Ft.
Hydraulic Radius	=	0.12	Ft.	
Velocity (V)	=	1.47	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.86	CFS	(From Continuity Equation Q=AV)

AES
CONSULTING ENGINEERS

Project:	WL - Woodhaven Phase II
Project No.:	8162-06
Subject:	Channel Design
	Channel No. 3
Date:	October 14, 2010
Calculated By:	TRS

Design Point: **Channel No. 3 (Behind Skilled Care Building)**

2 Year Storm - Velocity Check

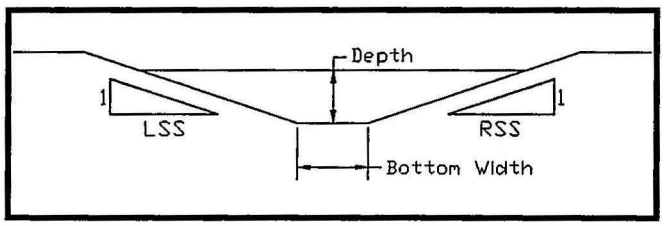
Drainage Area	=	0.15	Acres	(Area draining to Design Point)
C	=	0.61		(Runoff Coefficient)
I	=	5.78	in/hr	(Design Rainfall Intensity) **2-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.61 x 5.78 x 0.15

= 0.53 CFS

Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	0.50	Ft.
Channel Slope	=	23.33	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.23	Ft.	
Area	=	0.05	SF	Wetted Perimeter = 0.64 Ft.
Hydraulic Radius	=	0.08	Ft.	
Velocity (V)	=	10.26	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.53	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

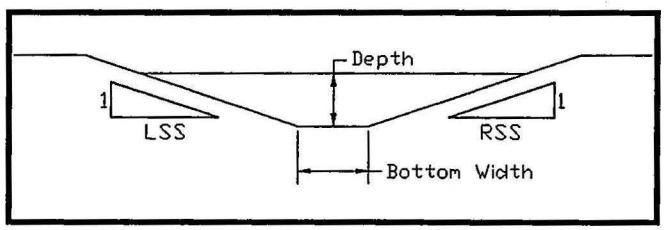
Drainage Area	=	0.15	Acres	(Area draining to Design Point)
C	=	0.61		(Runoff Coefficient)
I	=	7.50	in/hr	(Design Rainfall Intensity) **10-year storm, 5 min. TC**

Q = C I A (Peak Flow)

= 0.61 x 7.50 x 0.15

= 0.69 CFS

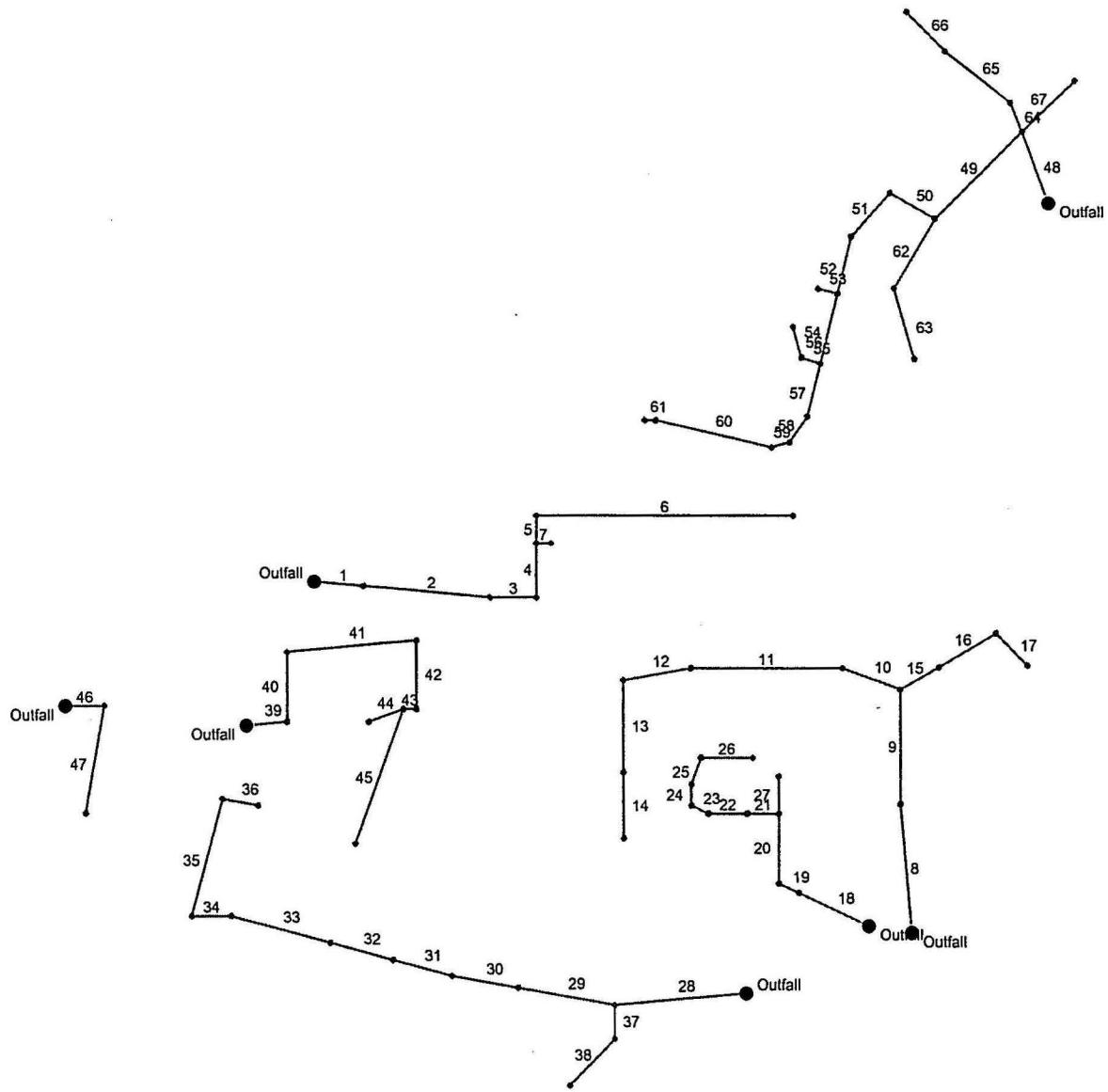
Channel Characteristics



Rt. Sideslope	=	1.00	:1
Lt. Sideslope	=	1.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	0.50	Ft.
Channel Slope	=	23.33	%
Mannings (n)	=	0.013	**Concrete Lined**

Depth of Flow	=	0.25	Ft.	
Area	=	0.06	SF	Wetted Perimeter = 0.71 Ft.
Hydraulic Radius	=	0.09	Ft.	
Velocity (V)	=	10.96	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.68	CFS	(From Continuity Equation Q=AV)

8162-06 Storm Systems



Project File: 816206 Storm Systems.stm	Number of lines: 67	Date: 12-15-2010

Hydraflow Storm Sewers Extension v6.066

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	45.000	5.000	MH	0.00	0.00	0.00	0.0	35.00	5.56	37.50	15	Cir	0.013	0.15	46.00	1-1A --> 1-1
2	1	115.000	0.000	MH	0.00	0.16	0.86	5.0	42.00	13.97	58.06	15	Cir	0.013	0.15	69.10	1-2 --> 1-1A
3	2	42.000	-5.000	MH	0.00	0.00	0.00	0.0	58.06	2.00	58.90	15	Cir	0.013	1.00	71.00	1-3 --> 1-2
4	3	49.000	-90.000	MH	0.00	0.00	0.00	0.0	58.90	2.00	59.88	15	Cir	0.013	1.00	68.00	1-3A --> 1-3
5	4	25.000	0.000	MH	0.00	0.00	0.00	0.0	59.88	2.00	60.38	15	Cir	0.013	1.00	65.00	1-4 --> 1-3A
6	5	233.000	90.000	MH	0.00	0.19	0.75	5.0	60.38	2.00	65.04	15	Cir	0.013	1.00	69.00	1-5 --> 1-4
7	4	13.000	90.000	MH	0.00	0.22	0.84	5.0	59.88	2.00	60.14	15	Cir	0.013	1.00	69.74	1-6 --> 1-3A
8	End	116.000	-95.000	MH	0.00	0.07	0.50	5.0	55.00	2.28	57.64	15	Cir	0.013	0.15	65.06	2-2 --> 2-1
9	8	102.000	5.000	MH	0.00	0.26	0.74	5.0	57.64	2.28	59.97	15	Cir	0.013	0.95	67.23	2-3 --> 2-2
10	9	56.000	-70.000	MH	0.00	0.26	0.77	5.0	59.97	6.45	63.58	12	Cir	0.013	0.40	69.53	2-4 --> 2-3
11	10	138.000	-20.000	MH	0.00	0.11	0.90	5.0	63.58	2.00	66.34	12	Cir	0.013	0.21	74.30	2-5 --> 2-4
12	11	62.000	-10.000	MH	0.00	0.07	0.90	5.0	66.34	2.00	67.58	12	Cir	0.013	0.99	73.00	2-6 --> 2-5
13	12	82.000	-80.000	MH	0.00	0.03	0.90	5.0	67.58	2.00	69.22	12	Cir	0.013	0.15	73.30	2-7 --> 2-6
14	13	59.000	0.000	MH	0.00	0.14	0.90	5.0	69.22	2.00	70.40	8	Cir	0.013	1.00	74.40	2-8 --> 2-7
15	9	40.000	60.000	MH	0.00	0.00	0.00	0.0	59.97	1.00	60.37	15	Cir	0.013	0.15	67.00	2-3A --> 2-3
16	15	60.000	0.000	MH	0.00	0.18	0.78	5.0	60.37	0.50	60.67	15	Cir	0.013	0.97	64.50	2-3B --> 2-3A
17	16	40.000	75.000	MH	0.00	0.10	0.76	5.0	60.67	0.50	60.87	15	Cir	0.013	1.00	64.16	2-3C --> 2-3B
18	End	70.000	-155.000	MH	0.00	0.00	0.00	0.0	55.00	3.57	57.50	15	Cir	0.013	0.15	65.70	3-1A --> 3-1
19	18	20.000	0.000	MH	0.00	0.00	0.00	0.0	61.20	15.20	64.24	15	Cir	0.013	0.92	69.00	3-2 --> 3-1A
20	19	63.000	65.000	MH	0.00	0.00	0.00	0.0	64.24	2.00	65.50	15	Cir	0.013	1.00	71.50	3-3 --> 3-2
21	20	29.000	-90.000	MH	0.00	0.00	0.00	0.0	65.50	9.10	68.14	12	Cir	0.013	0.15	73.50	3-4 --> 3-3
22	21	35.000	0.000	MH	0.00	0.00	0.00	0.0	68.14	2.00	68.84	12	Cir	0.013	0.48	73.50	3-5 --> 3-4

8162-06 Storm Systems | Number of lines: 67 | Date: 12-15-2010

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
23	22	17.000	25.000	MH	0.00	0.00	0.00	0.0	68.84	2.00	69.18	12	Cir	0.013	0.92	73.50	3-6 --> 3-5
24	23	19.000	65.000	MH	0.00	0.00	0.00	0.0	69.18	2.00	69.56	12	Cir	0.013	0.40	73.50	3-7 --> 3-6
25	24	25.000	20.000	MH	0.00	0.00	0.00	0.0	69.56	2.00	70.06	12	Cir	0.013	0.95	74.00	3-8 --> 3-7
26	25	47.000	70.000	MH	0.00	0.38	0.77	5.0	70.06	2.00	71.00	12	Cir	0.013	1.00	74.00	3-9 --> 3-8
27	20	33.000	0.000	MH	0.00	0.05	0.76	5.0	67.50	7.58	70.00	8	Cir	0.013	1.00	74.00	3-10 --> 3-3
28	End	120.000	175.000	MH	0.00	0.00	0.00	5.0	58.60	1.00	59.80	24	Cir	0.013	1.00	68.60	5-2 --> 5-1
29	28	89.000	15.000	MH	0.00	0.18	0.74	0.0	64.25	0.17	64.40	24	Cir	0.013	0.15	74.13	5-3 --> 5-2
30	29	61.000	0.000	MH	0.00	0.26	0.79	5.0	64.40	0.48	64.69	24	Cir	0.013	0.15	73.11	5-7 --> 5-3
31	30	55.000	5.000	MH	0.00	0.27	0.80	5.0	64.69	1.51	65.52	18	Cir	0.013	0.15	73.10	5-8 --> 5-7
32	31	59.000	0.000	MH	0.00	0.39	0.65	5.0	65.52	1.03	66.13	15	Cir	0.013	0.15	73.12	5-9 --> 5-8
33	32	93.000	0.000	MH	0.00	0.06	0.90	5.0	66.13	1.05	67.11	15	Cir	0.013	0.31	75.00	5-12 --> 5-9
34	33	36.000	-15.000	MH	0.00	0.09	0.36	5.0	68.72	1.00	69.08	15	Cir	0.013	1.00	73.50	5-13 --> 5-12
35	34	109.000	105.000	MH	0.00	0.00	0.00	5.0	69.08	1.00	70.17	14	Cir	0.013	1.00	74.50	5-14 --> 5-13
36	35	33.000	85.000	MH	0.00	0.36	0.74	5.0	70.17	1.00	70.50	12	Cir	0.013	1.00	74.50	5-15 --> 5-14
37	28	30.000	-85.000	MH	0.00	0.17	0.82	5.0	64.25	4.90	65.72	15	Cir	0.013	0.75	70.79	5-16 --> 5-2
38	37	58.000	45.000	MH	0.00	1.17	0.45	15.0	65.72	2.00	66.88	15	Cir	0.013	1.00	70.50	5-17 --> 5-16
39	End	37.000	-5.000	MH	0.00	0.13	0.90	5.0	52.51	4.97	54.35	15	Cir	0.013	1.00	61.00	6-2 --> 6-1
40	39	62.000	-85.000	MH	0.00	0.01	0.90	5.0	54.35	5.89	58.00	15	Cir	0.013	1.00	62.00	6-3 --> 6-2
41	40	118.000	85.000	MH	0.00	0.04	0.90	5.0	58.00	1.01	59.19	15	Cir	0.013	1.00	71.20	6-4 --> 6-3
42	41	61.000	95.000	MH	0.00	0.00	0.00	0.0	59.19	1.00	59.80	15	Cir	0.013	1.00	69.70	6-5 --> 6-4
43	42	12.000	90.000	MH	0.00	1.00	0.73	10.0	59.80	1.00	59.92	15	Cir	0.013	0.95	69.50	6-6 --> 6-5
44	43	33.000	-20.000	MH	0.00	0.07	0.80	5.0	65.50	15.15	70.50	12	Cir	0.013	1.00	74.50	6-7 --> 6-6

8162-06 Storm Systems | Number of lines: 67 | Date: 12-15-2010

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
45	43	128.000	-70.000	MH	0.00	0.23	0.81	5.0	59.92	1.08	61.30	14	Cir	0.013	1.00	73.30	6-8 --> 6-6
46	End	35.000	0.000	MH	0.00	0.11	0.52	5.0	65.00	2.00	65.70	15	Cir	0.013	1.00	72.00	7-5 --> 7-4
47	46	97.000	100.000	MH	0.00	0.06	0.55	5.0	65.70	1.00	66.67	15	Cir	0.013	1.00	73.50	7-6 --> 7-5
48	End	69.000	-110.000	MH	0.00	0.46	0.63	5.0	47.00	2.64	48.82	18	Cir	0.013	1.00	56.50	10-2 --> 10-1
49	48	112.000	-115.000	MH	0.00	0.13	0.68	5.0	48.82	2.00	51.06	18	Cir	0.013	0.97	58.80	10-3 --> 10-2
50	49	47.000	75.000	MH	0.00	0.16	0.81	5.0	51.06	2.00	52.00	15	Cir	0.013	0.98	57.50	10-4 --> 10-3
51	50	53.000	-78.000	MH	0.00	0.29	0.85	5.0	52.00	2.00	53.06	15	Cir	0.013	0.53	59.60	10-5 --> 10-4
52	51	53.000	-28.000	MH	0.00	0.00	0.00	0.0	53.06	2.00	54.12	15	Cir	0.013	1.00	63.20	10-6 --> 10-5
53	52	18.000	90.000	MH	0.00	0.03	0.67	5.0	58.14	2.00	58.50	12	Cir	0.013	1.00	62.50	10-7 --> 10-6
54	52	65.000	0.000	MH	0.00	0.00	0.00	0.0	54.12	2.00	55.42	15	Cir	0.013	1.00	63.20	10-8 --> 10-6
55	54	18.000	93.000	MH	0.00	0.03	0.67	5.0	57.56	2.00	57.92	12	Cir	0.013	0.87	62.50	10-9 --> 10-8
56	55	29.000	58.000	MH	0.00	0.03	0.67	5.0	57.92	2.00	58.50	12	Cir	0.013	1.00	62.50	10-10 --> 10-9
57	54	49.000	0.000	MH	0.00	0.17	0.61	5.0	55.42	3.22	57.00	15	Cir	0.013	0.41	60.50	10-11 --> 10-8
58	57	28.000	21.000	MH	0.00	0.00	0.00	0.0	57.00	6.39	58.79	15	Cir	0.013	0.68	61.50	10-12 --> 10-11
59	58	17.000	39.000	MH	0.00	0.08	0.20	5.0	58.79	1.00	58.96	15	Cir	0.013	0.54	61.50	10-13 --> 10-12
60	59	108.000	29.000	MH	0.00	0.27	0.69	5.0	58.96	0.50	59.50	15	Cir	0.013	0.25	61.50	10-14 --> 10-13
61	60	10.000	-12.000	MH	0.00	0.07	0.80	5.0	59.50	5.00	60.00	6	Cir	0.013	1.00	61.50	10-15 --> 10-14
62	49	73.000	-14.000	MH	0.00	0.14	0.80	5.0	54.42	2.00	55.88	15	Cir	0.013	0.77	60.50	10-16 --> 10-3
63	62	66.000	-47.000	MH	0.00	0.30	0.46	5.0	55.88	2.00	57.20	15	Cir	0.013	1.00	61.20	10-17 --> 10-16
64	48	28.000	-2.000	MH	0.00	0.00	0.00	0.0	50.00	5.36	51.50	15	Cir	0.013	0.56	56.50	10-18 --> 10-2
65	64	75.000	-30.000	MH	0.00	0.17	0.90	5.0	51.50	2.00	53.00	15	Cir	0.013	0.17	57.40	10-19 --> 10-18
66	65	50.000	8.000	MH	0.00	0.14	0.90	5.0	53.00	2.00	54.00	12	Cir	0.013	1.00	58.00	10-20 --> 10-19

8162-06 Storm Systems | Number of lines: 67 | Date: 12-15-2010

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
67	48	66.000	66.000	MH	0.00	0.15	0.90	5.0	48.82	2.00	50.14	12	Cir	0.013	1.00	56.00	10-21 --> 10-2

8162-06 Storm Systems | Number of lines: 67 | Date: 12-15-2010

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	45.000	0.00	0.57	0.00	0.00	0.46	0.0	7.8	6.6	3.07	15.22	2.50	15	5.56	35.00	37.50	44.24	44.34	34.00	46.00	1-1A --> 1-1
2	1	115.000	0.16	0.57	0.86	0.14	0.46	5.0	7.2	6.8	3.14	24.13	3.47	15	13.97	42.00	58.06	44.36	58.77	46.00	69.10	1-2 --> 1-1A
3	2	42.000	0.00	0.41	0.00	0.00	0.33	0.0	7.0	6.8	2.24	9.13	2.89	15	2.00	58.06	58.90	59.19	59.50	69.10	71.00	1-3 --> 1-2
4	3	49.000	0.00	0.41	0.00	0.00	0.33	0.0	6.7	6.9	2.26	9.13	3.13	15	2.00	58.90	59.88	59.80	60.48	71.00	68.00	1-3A --> 1-3
5	4	25.000	0.00	0.19	0.00	0.00	0.14	0.0	6.5	7.0	0.99	9.13	1.98	15	2.00	59.88	60.38	60.79	60.78	68.00	65.00	1-4 --> 1-3A
6	5	233.000	0.19	0.19	0.75	0.14	0.14	5.0	5.0	7.5	1.07	9.13	2.55	15	2.00	60.38	65.04	60.93	65.45	65.00	69.00	1-5 --> 1-4
7	4	13.000	0.22	0.22	0.84	0.18	0.18	5.0	5.0	7.5	1.39	9.13	1.88	15	2.00	59.88	60.14	60.79	60.75	68.00	69.74	1-6 --> 1-3A
8	End	116.000	0.07	1.22	0.50	0.04	0.96	5.0	8.1	6.5	6.24	9.74	5.09	15	2.28	55.00	57.64	60.87	61.96	55.00	65.06	2-2 --> 2-1
9	8	102.000	0.26	1.15	0.74	0.19	0.92	5.0	7.8	6.6	6.10	9.76	4.97	15	2.28	57.64	59.97	62.02	62.93	65.06	67.23	2-3 --> 2-2
10	9	56.000	0.26	0.61	0.77	0.20	0.52	5.0	6.9	6.9	3.54	9.04	4.89	12	6.45	59.97	63.58	63.29	64.38	67.23	69.53	2-4 --> 2-3
11	10	138.000	0.11	0.35	0.90	0.10	0.32	5.0	6.2	7.1	2.23	5.04	3.54	12	2.00	63.58	66.34	65.10	66.97	69.53	74.30	2-5 --> 2-4
12	11	62.000	0.07	0.24	0.90	0.06	0.22	5.0	5.9	7.2	1.55	5.04	2.83	12	2.00	66.34	67.58	67.39	68.11	74.30	73.00	2-6 --> 2-5
13	12	82.000	0.03	0.17	0.90	0.03	0.15	5.0	5.3	7.4	1.13	5.04	2.47	12	2.00	67.58	69.22	68.39	69.67	73.00	73.30	2-7 --> 2-6
14	13	59.000	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.5	0.94	1.71	3.20	8	2.00	69.22	70.40	69.88	70.86	73.30	74.40	2-8 --> 2-7
15	9	40.000	0.00	0.28	0.00	0.00	0.22	0.0	7.2	6.8	1.46	6.46	1.19	15	1.00	59.97	60.37	63.29	63.31	67.23	67.00	2-3A --> 2-3
16	15	60.000	0.18	0.28	0.78	0.14	0.22	5.0	6.4	7.0	1.52	4.57	1.24	15	0.50	60.37	60.67	63.32	63.35	67.00	64.50	2-3B --> 2-3A
17	16	40.000	0.10	0.10	0.76	0.08	0.08	5.0	5.0	7.5	0.57	4.57	0.46	15	0.50	60.67	60.87	63.37	63.37	64.50	64.16	2-3C --> 2-3B
18	End	70.000	0.00	0.43	0.00	0.00	0.33	0.0	6.2	7.1	2.34	12.20	1.90	15	3.57	55.00	57.50	60.87	60.96	63.50	65.70	3-1A --> 3-1
19	18	20.000	0.00	0.43	0.00	0.00	0.33	0.0	6.2	7.1	2.35	25.18	3.92	15	15.20	61.20	64.24	61.81	64.85	65.70	69.00	3-2 --> 3-1A
20	19	63.000	0.00	0.43	0.00	0.00	0.33	0.0	5.8	7.2	2.38	9.13	3.19	15	2.00	64.24	65.50	65.17	66.12	69.00	71.50	3-3 --> 3-2
21	20	29.000	0.00	0.38	0.00	0.00	0.29	0.0	5.7	7.3	2.12	10.74	3.47	12	9.10	65.50	68.14	66.44	68.76	71.50	73.50	3-4 --> 3-3
22	21	35.000	0.00	0.38	0.00	0.00	0.29	0.0	5.5	7.3	2.14	5.04	3.45	12	2.00	68.14	68.84	69.15	69.46	73.50	73.50	3-5 --> 3-4

8162-06 Storm Systems | Number of lines: 67 | Run Date: 12-15-2010

NOTES: Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period = 10 Yrs. ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	17.000	0.00	0.38	0.00	0.00	0.29	0.0	5.4	7.3	2.15	5.04	3.45	12	2.00	68.84	69.18	69.86	69.80	73.50	73.50	3-6 --> 3-5
24	23	19.000	0.00	0.38	0.00	0.00	0.29	0.0	5.3	7.4	2.16	5.04	3.46	12	2.00	69.18	69.56	70.19	70.19	73.50	73.50	3-7 --> 3-6
25	24	25.000	0.00	0.38	0.00	0.00	0.29	0.0	5.2	7.4	2.17	5.04	3.48	12	2.00	69.56	70.06	70.58	70.68	73.50	74.00	3-8 --> 3-7
26	25	47.000	0.38	0.38	0.77	0.29	0.29	5.0	5.0	7.5	2.19	5.04	3.51	12	2.00	70.06	71.00	71.09	71.63	74.00	74.00	3-9 --> 3-8
27	20	33.000	0.05	0.05	0.76	0.04	0.04	5.0	5.0	7.5	0.28	3.32	2.36	8	7.58	67.50	70.00	67.75	70.25	71.50	74.00	3-10 --> 3-3
28	End	120.000	0.00	2.95	0.00	0.00	1.83	5.0	15.4	5.1	9.27	22.62	3.87	24	1.00	58.60	59.80	60.87	60.98	58.60	68.60	5-2 --> 5-1
29	28	89.000	0.18	1.61	0.74	0.13	1.16	0.0	7.2	6.8	7.87	9.29	4.26	24	0.17	64.25	64.40	65.24	65.76	68.60	74.13	5-3 --> 5-2
30	29	61.000	0.26	1.43	0.79	0.21	1.03	5.0	6.9	6.9	7.06	15.59	3.45	24	0.48	64.40	64.69	65.78	65.82	74.13	73.11	5-7 --> 5-3
31	30	55.000	0.27	1.17	0.80	0.22	0.82	5.0	6.7	6.9	5.70	12.90	4.47	18	1.51	64.69	65.52	65.86	66.43	73.11	73.10	5-8 --> 5-7
32	31	59.000	0.39	0.90	0.65	0.25	0.61	5.0	6.4	7.0	4.25	6.57	3.59	15	1.03	65.52	66.13	67.02	67.23	73.10	73.12	5-9 --> 5-8
33	32	93.000	0.06	0.51	0.90	0.05	0.35	5.0	5.9	7.2	2.53	6.63	3.11	15	1.05	66.13	67.11	67.24	67.75	73.12	75.00	5-12 --> 5-9
34	33	36.000	0.09	0.45	0.36	0.03	0.30	5.0	5.8	7.2	2.16	6.46	3.81	15	1.00	68.72	69.08	69.31	69.67	75.00	73.50	5-13 --> 5-12
35	34	109.000	0.00	0.36	0.00	0.00	0.27	5.0	5.2	7.4	1.98	5.37	3.04	14	1.00	69.08	70.17	69.96	70.74	73.50	74.50	5-14 --> 5-13
36	35	33.000	0.36	0.36	0.74	0.27	0.27	5.0	5.0	7.5	2.00	3.56	3.40	12	1.00	70.17	70.50	71.04	71.10	74.50	74.50	5-15 --> 5-14
37	28	30.000	0.17	1.34	0.82	0.14	0.67	5.0	15.3	5.1	3.39	14.29	4.50	15	4.90	64.25	65.72	64.99	66.46	68.60	70.79	5-16 --> 5-2
38	37	58.000	1.17	1.17	0.45	0.53	0.53	15.0	15.0	5.1	2.70	9.13	3.19	15	2.00	65.72	66.88	66.91	67.54	70.79	70.50	5-17 --> 5-16
39	End	37.000	0.13	1.48	0.90	0.12	1.13	5.0	10.8	5.9	6.67	14.40	6.14	15	4.97	52.51	54.35	53.54	55.38	68.60	61.00	6-2 --> 6-1
40	39	62.000	0.01	1.35	0.90	0.01	1.02	5.0	10.7	5.9	6.02	15.67	5.36	15	5.89	54.35	58.00	56.39	58.98	61.00	62.00	6-3 --> 6-2
41	40	118.000	0.04	1.34	0.90	0.04	1.01	5.0	10.3	6.0	6.05	6.48	4.93	15	1.01	58.00	59.19	59.86	60.90	62.00	71.20	6-4 --> 6-3
42	41	61.000	0.00	1.30	0.00	0.00	0.97	0.0	10.0	6.0	5.88	6.46	4.79	15	1.00	59.19	59.80	61.28	61.78	71.20	69.70	6-5 --> 6-4
43	42	12.000	1.00	1.30	0.73	0.73	0.97	10.0	10.0	6.1	5.89	6.46	4.80	15	1.00	59.80	59.92	62.14	62.24	69.70	69.50	6-6 --> 6-5
44	43	33.000	0.07	0.07	0.80	0.06	0.06	5.0	5.0	7.5	0.42	13.86	2.39	12	15.15	65.50	70.50	65.77	70.77	69.50	74.50	6-7 --> 6-6

8162-06 Storm Systems | Number of lines: 67 | Run Date: 12-15-2010

NOTES: Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period = 10 Yrs. ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	43	128.000	0.23	0.23	0.81	0.19	0.19	5.0	5.0	7.5	1.40	5.58	1.31	14	1.08	59.92	61.30	62.58	62.67	69.50	73.30	6-8 --> 6-6
46	End	35.000	0.11	0.17	0.52	0.06	0.09	5.0	6.2	7.1	0.64	9.13	1.84	15	2.00	65.00	65.70	65.60	66.02	72.05	72.00	7-5 --> 7-4
47	46	97.000	0.06	0.06	0.55	0.03	0.03	5.0	5.0	7.5	0.25	6.46	1.32	15	1.00	65.70	66.67	66.13	66.87	72.00	73.50	7-6 --> 7-5
48	End	69.000	0.46	2.62	0.63	0.29	1.84	5.0	10.2	6.0	11.06	17.05	6.26	18	2.64	47.00	48.82	69.32	70.09	0.00	56.50	10-2 --> 10-1
49	48	112.000	0.13	1.70	0.68	0.09	1.14	5.0	9.8	6.1	6.95	14.85	3.93	18	2.00	48.82	51.06	70.69	71.18	56.50	58.80	10-3 --> 10-2
50	49	47.000	0.16	1.13	0.81	0.13	0.80	5.0	9.6	6.2	4.92	9.13	4.01	15	2.00	51.06	52.00	71.42	71.69	58.80	57.50	10-4 --> 10-3
51	50	53.000	0.29	0.97	0.85	0.25	0.67	5.0	9.3	6.2	4.16	9.13	3.39	15	2.00	52.00	53.06	71.93	72.15	57.50	59.60	10-5 --> 10-4
52	51	53.000	0.00	0.68	0.00	0.00	0.42	0.0	8.9	6.3	2.67	9.13	2.17	15	2.00	53.06	54.12	72.25	72.34	59.60	63.20	10-6 --> 10-5
53	52	18.000	0.03	0.03	0.67	0.02	0.02	5.0	5.0	7.5	0.15	5.04	0.19	12	2.00	58.14	58.50	72.41	72.41	63.20	62.50	10-7 --> 10-6
54	52	65.000	0.00	0.65	0.00	0.00	0.40	0.0	8.4	6.4	2.59	9.13	2.11	15	2.00	54.12	55.42	72.41	72.52	63.20	63.20	10-8 --> 10-6
55	54	18.000	0.03	0.06	0.67	0.02	0.04	5.0	7.5	6.7	0.27	5.04	0.34	12	2.00	57.56	57.92	72.59	72.59	63.20	62.50	10-9 --> 10-8
56	55	29.000	0.03	0.03	0.67	0.02	0.02	5.0	5.0	7.5	0.15	5.04	0.19	12	2.00	57.92	58.50	72.59	72.59	62.50	62.50	10-10 --> 10-9
57	54	49.000	0.17	0.59	0.61	0.10	0.36	5.0	6.8	6.9	2.49	11.60	2.03	15	3.22	55.42	57.00	72.59	72.66	63.20	60.50	10-11 --> 10-8
58	57	28.000	0.00	0.42	0.00	0.00	0.26	0.0	6.5	7.0	1.81	16.33	1.47	15	6.39	57.00	58.79	72.69	72.71	60.50	61.50	10-12 --> 10-11
59	58	17.000	0.08	0.42	0.20	0.02	0.26	5.0	6.3	7.0	1.82	6.46	1.48	15	1.00	58.79	58.96	72.73	72.74	61.50	61.50	10-13 --> 10-12
60	59	108.000	0.27	0.34	0.69	0.19	0.24	5.0	5.1	7.5	1.81	4.57	1.47	15	0.50	58.96	59.50	72.76	72.85	61.50	61.50	10-14 --> 10-13
61	60	10.000	0.07	0.07	0.80	0.06	0.06	5.0	5.0	7.5	0.42	1.25	2.14	6	5.00	59.50	60.00	72.86	72.91	61.50	61.50	10-15 --> 10-14
62	49	73.000	0.14	0.44	0.80	0.11	0.25	5.0	6.3	7.0	1.76	9.13	1.44	15	2.00	54.42	55.88	71.42	71.47	58.80	60.50	10-16 --> 10-3
63	62	66.000	0.30	0.30	0.46	0.14	0.14	5.0	5.0	7.5	1.03	9.13	0.84	15	2.00	55.88	57.20	71.50	71.51	60.50	61.20	10-17 --> 10-16
64	48	28.000	0.00	0.31	0.00	0.00	0.28	0.0	6.5	7.0	1.95	14.95	1.59	15	5.36	50.00	51.50	70.69	70.72	56.50	56.50	10-18 --> 10-2
65	64	75.000	0.17	0.31	0.90	0.15	0.28	5.0	5.7	7.2	2.02	9.13	1.65	15	2.00	51.50	53.00	70.74	70.82	56.50	57.40	10-19 --> 10-18
66	65	50.000	0.14	0.14	0.90	0.13	0.13	5.0	5.0	7.5	0.94	5.04	1.20	12	2.00	53.00	54.00	70.82	70.86	57.40	58.00	10-20 --> 10-19

8162-06 Storm Systems | Number of lines: 67 | Run Date: 12-15-2010

NOTES: Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period = 10 Yrs. ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
67	48	66.000	0.15	0.15	0.90	0.14	0.14	5.0	5.0	7.5	1.01	5.04	1.29	12	2.00	48.82	50.14	70.69	70.75	56.50	56.00	10-21 --> 10-2

8162-06 Storm Systems

Number of lines: 67

Run Date: 12-15-2010

NOTES: Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period = 10 Yrs. ; c = cir e = ellip b = box

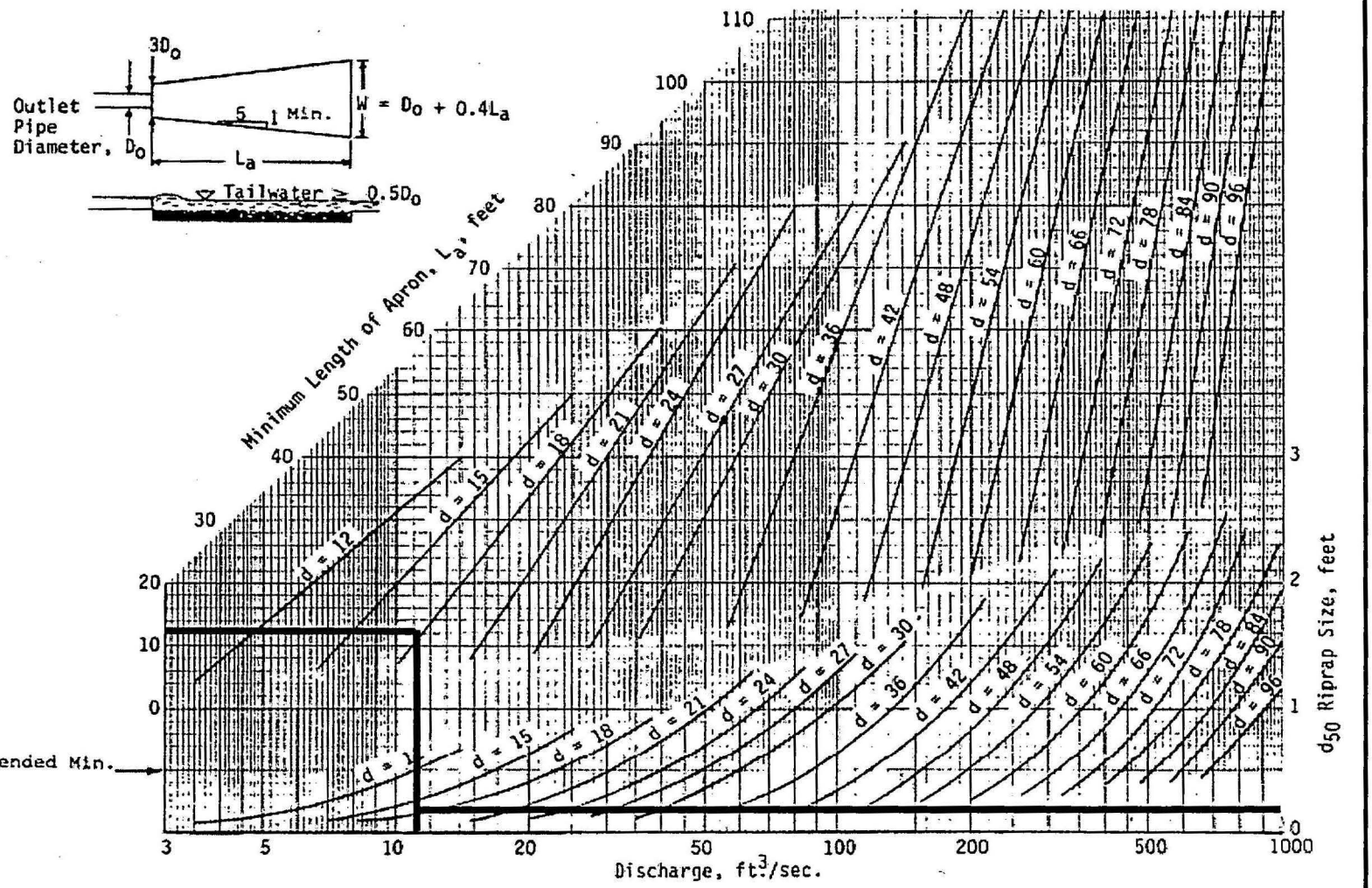
AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	December 20, 2010
Calculated By:	TRS

Outlet Location: Storm Structure 10-1

Source: USDA-SCS

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MAXIMUM TAILWATER CONDITION ($T_W \geq 0.5$ DIAMETER)



Q =	11.06	cfs	$3D_0$ =	4.5	ft	W =	6	ft	Depth = 2 ft
D_0 =	18	in	L_a =	12	ft	d_{50} =	1.1	ft	

SEDIMENT TRAPS / BASIN

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Sediment Trap Design
	ST #1
Date:	October 14, 2010
Calculated By:	TRS

Drainage Area to Sediment Trap = 1.04 Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = 70 cubic yards, or
1,881 cubic feet

Required Dry Storage = 67 cy/acre * (Drainage Area) = 70 cubic yards, or
1,881 cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
46	0	607	0	0	0	0
47	1	811	709	26	709	26
48	1	1040	925.5	34	1635	61
49	1	1295	1167.5	43	2802	104
50	1	1574	1434.5	53	4237	157
50	0		0	0	4237	157
50	0		0	0	4237	157

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = 6.24 feet

Elevation of Wet Storage Volume = 48.21

Elevation of Dry Storage Volume = 49.67

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = 47.25

Top Width of Embankment (H_O = 1.5 ft.) = 2.5 feet

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Sediment Trap Design
	ST #2
Date:	October 14, 2010
Calculated By:	TRS

Drainage Area to Sediment Trap = 1.30 Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = 87 cubic yards, or
2,352 cubic feet

Required Dry Storage = 67 cy/acre * (Drainage Area) = 87 cubic yards, or
2,352 cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
39	0	901	0	0	0	0
40	1	1136	1018.5	38	1019	38
41	1	1395	1265.5	47	2284	85
42	1	1680	1537.5	57	3822	142
43	1	1989	1834.5	68	5656	209
43	0		0	0	5656	209
43	0		0	0	5656	209

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = 7.8 feet

Elevation of Wet Storage Volume = 41.04

Elevation of Dry Storage Volume = 42.48

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = 40.12

Top Width of Embankment (H_O = 1.4 ft.) = 2.5 feet

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Sediment Basin Design
Date:	October 14, 2010
Calculated By:	TRS

1992 3.14

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emergency spillway)

Total area draining to basin: **3.18** acres.

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x **3.18** acres = **213.06** cu. yds.

2. Available basin volume = **470** cu. yds. at elevation **51**. (From storage - elevation curve)

3. Excavate **470** cu. yds. to obtain required volume*.

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x **3.18** acres = **104.94** cu. yds.

5. Elevation corresponding to cleanout level = **48.3**.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = **2.7** ft. (Min. = 1.0 ft.)

Dry Storage:

7. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x **3.18** acres = **213.06** cu. yds.

8. Total available basin volume at crest of riser* = **1049** cu. yds. at elevation **52.4** . (From Storage - Elevation Curve)

*Minimum = 134 cu. yds./acre of total drainage area.

9. Diameter of dewatering orifice = **3** in.

10. Diameter of flexible tubing = **5** in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = **52.4**

Top of Dam = **55**

Design High Water = **52.62**

Upstream Toe of Dam = **46**

Basin Shape

12. $\frac{\text{Length of Flow}}{\text{Effective Width}}$ $\frac{L}{We}$ = **3.0**

If > 2, baffles are not required ✓

If < 2, baffles are required _____

Runoff

13. Q_2 = **0.24** cfs (From Chapter 5)

14. Q_{25} = **1.66** cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = **0.24** cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = **1.66** cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = **N/A** ft. (Using Q_2)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway:

Assumed available head (h) = **0.22** ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = **60** in. Actual head (h) = **0.1** ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = **176** ft.

Head (H) on barrel through embankment = **39.4** ft.

(From Plate 3.14-7).

19. Barrel diameter = **15** in.

(From Table 3.14-B [concrete pipe] or Table 3.14-A [corrugated pipe]).

20. Trash rack and anti-vortex device **N/A**

Diameter = _____ inches.

Height = _____ inches.

(From Table 3.14-D).

Emergency Spillway Design **N/A**

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = _____ cfs.

22. Bottom width (b) = _____ ft.; the slope of the exit channel (s) = _____ ft./foot; and the minimum length of the exit channel (x) = _____ ft.
(From Table 3.14-C)

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = **6.4** ft.

Slope of upstream face of embankment (Z) = **3** :1.

Slope of principal spillway barrel (S_b) = **1** %

Length of barrel in saturated zone (L_s) = **47** ft.

24. Number of collars required = **2** dimensions = **4' x 4'**

(From Plate 3.14-12).

Final Design Elevations

25. Top of Dam = **55**

Design High Water = **52.62**

Emergency Spillway Crest = **N/A**

Principal Spillway Crest = **52.4**

Dewatering Orifice Invert = **51**

Cleanout Elevation = **48.3**

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = **46**

AES
CONSULTING ENGINEERS

Project:	**Wmbg. Landing - Woodhaven Phase II**
Project No.:	**8162-06**
Subject:	**Dewatering Orifice Design**
Date:	**October 14, 2010**
Calculated By:	**TRS**

Reference: Standard and Spec 3.14 of the Virginia Erosion and Sediment Control Handbook

h = **0.70** FT Average driving head (maximum possible head measured from radius of orifice to crest of principal spillway divided by 2)

S = **15649** CF Total storage available in dry storage area

Q = Volumetric flowrate through orifice needed to achieve approximate 6-hour drawdown

$$Q = \frac{S}{21600 \text{ sec.}} = \frac{15649}{21600} = 0.72 \text{ CFS}$$

A = Flow area of orifice

$$A = \frac{Q}{(64.32 \times h)^{0.5} (0.6)}$$

$$A = \frac{0.72}{(64.32 \times 0.70)^{0.5} (0.6)}$$

A = **0.180** SF

d = Diameter of circular orifice

$$d = 2 \times \left(\frac{A}{3.14}\right)^{0.5}$$

$$d = 2 \times \left(\frac{0.180}{3.14}\right)^{0.5}$$

d = **0.479** FT = **5.7** IN

Use **3** Inch Orifice

Note: Diameter of dewatering orifice should never be less than 3 inches in order to help prevent clogging by soil or debris.

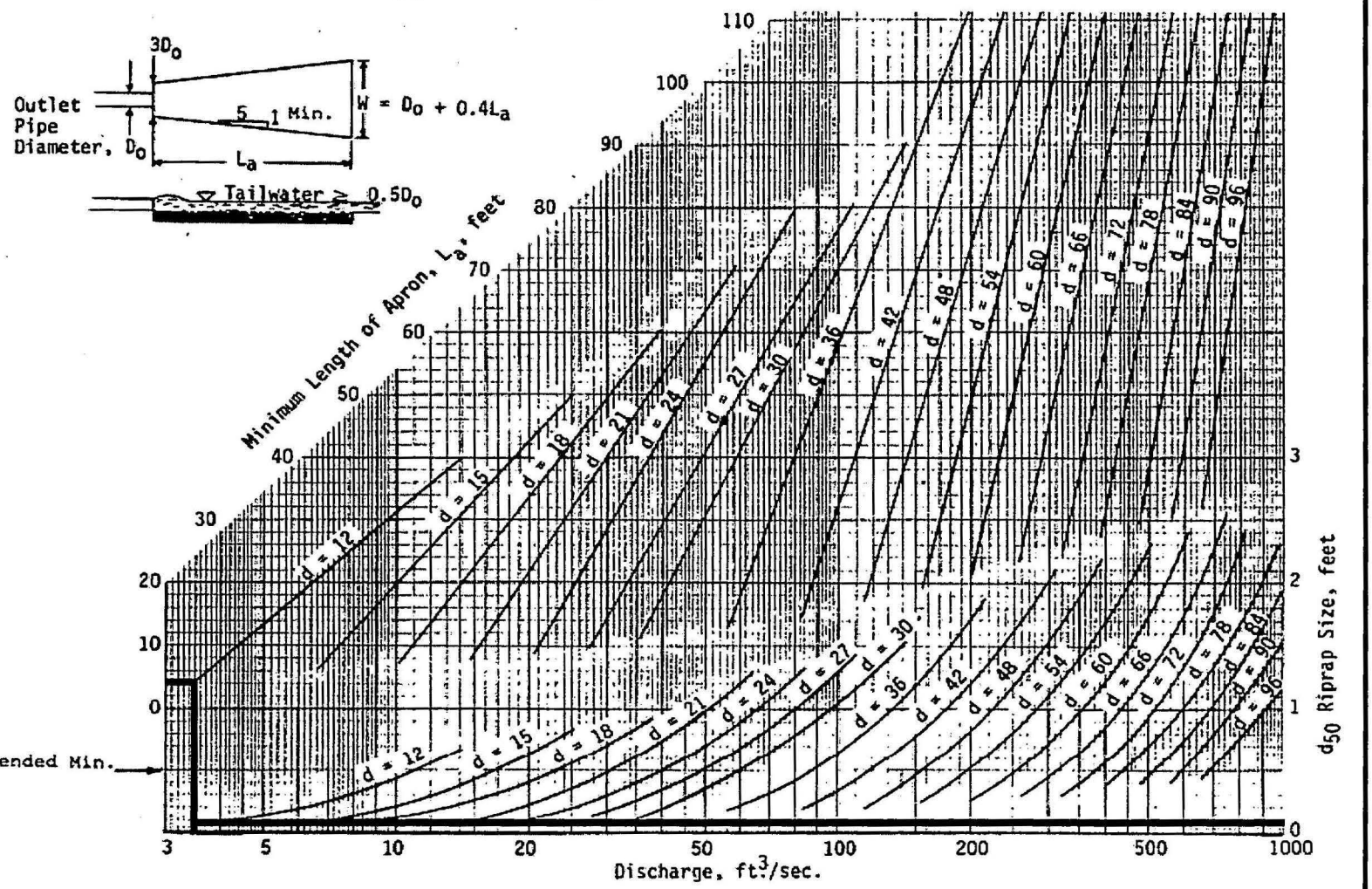
AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	October 14, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #1

Source: USDA-SCS

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MAXIMUM TAILWATER CONDITION ($T_W \geq 0.5$ DIAMETER)

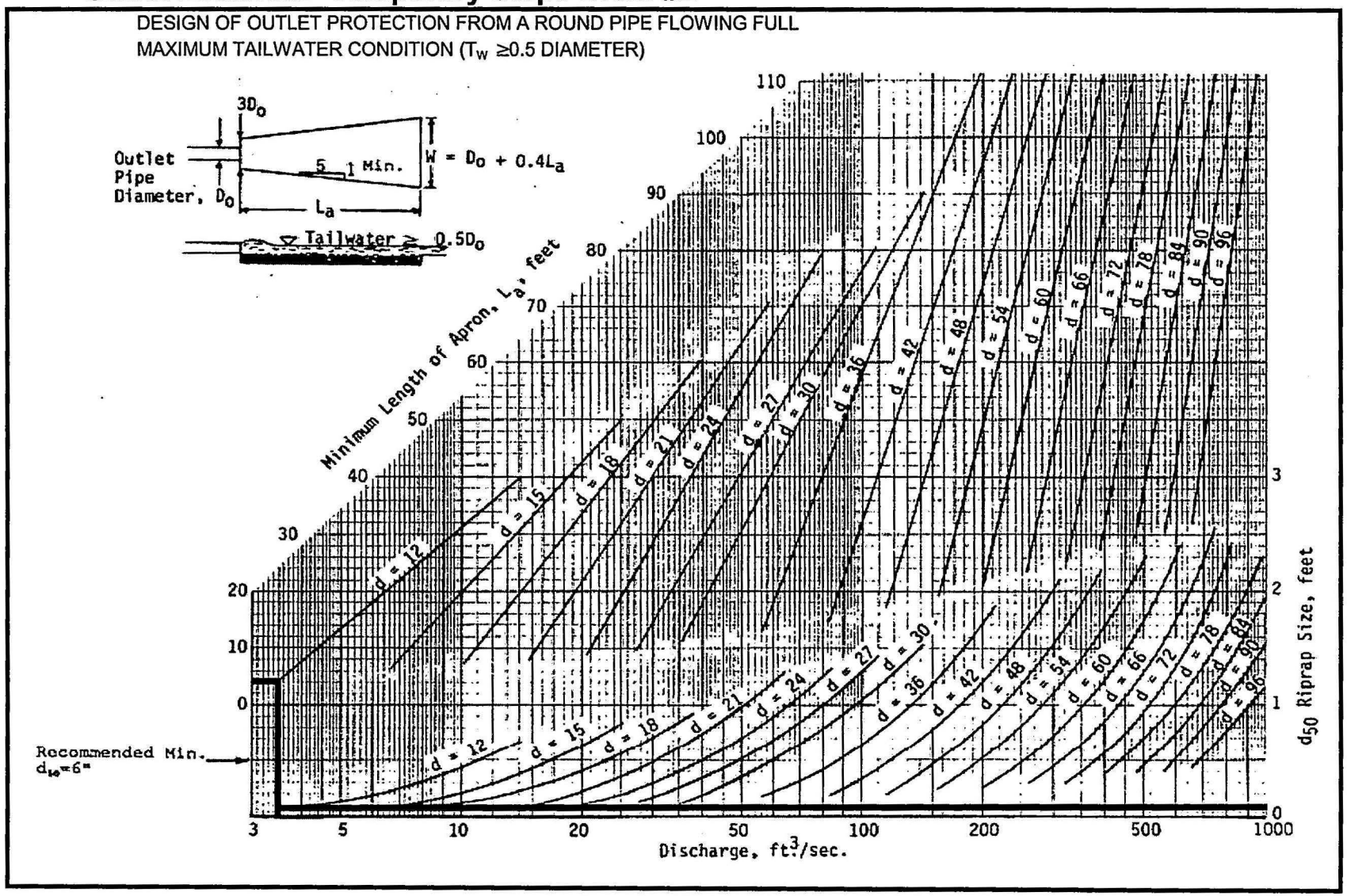


Q =	0.45	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	October 14, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #2



Source: USDA-SCS

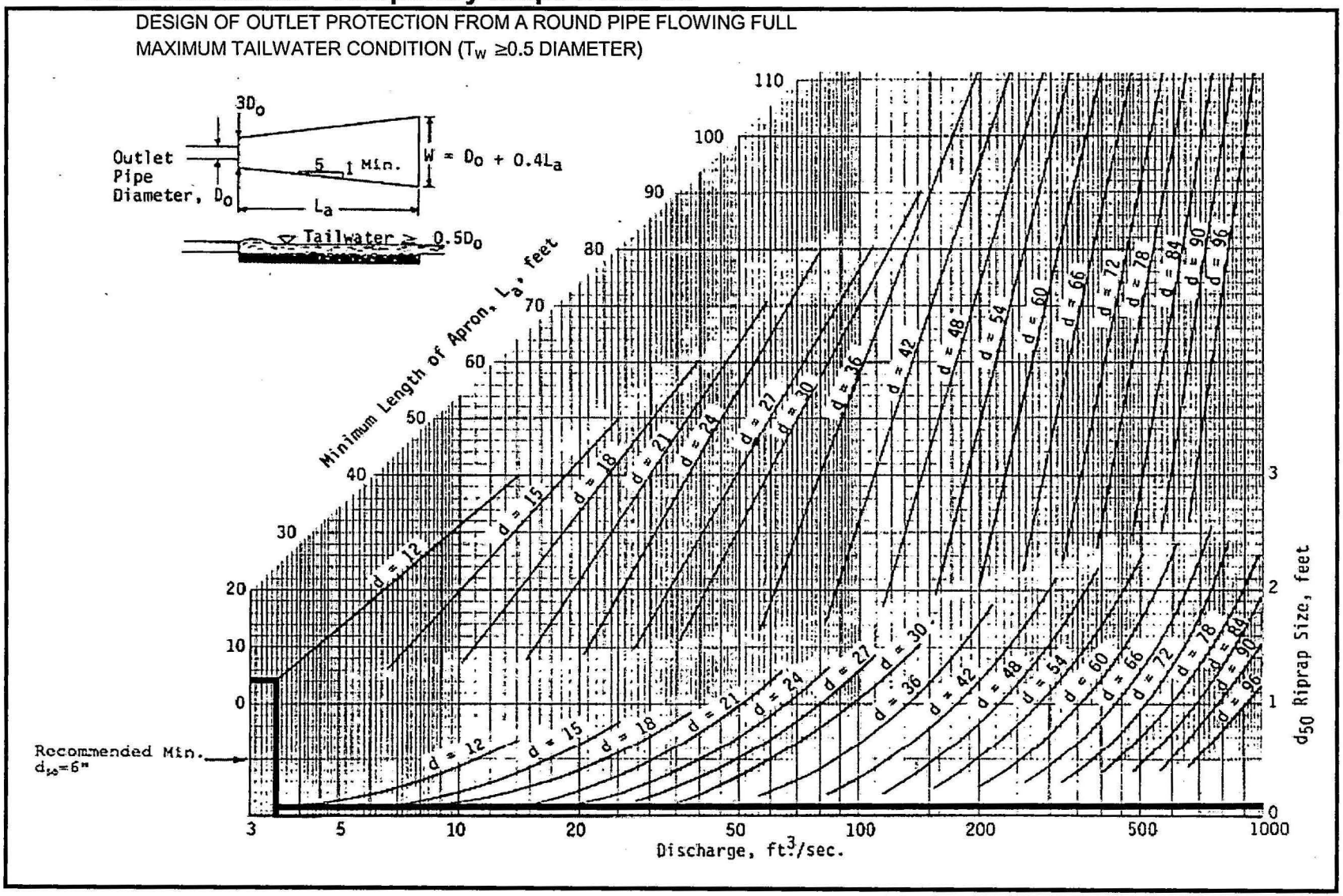
1992

Q =	0.3	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	December 20, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #3



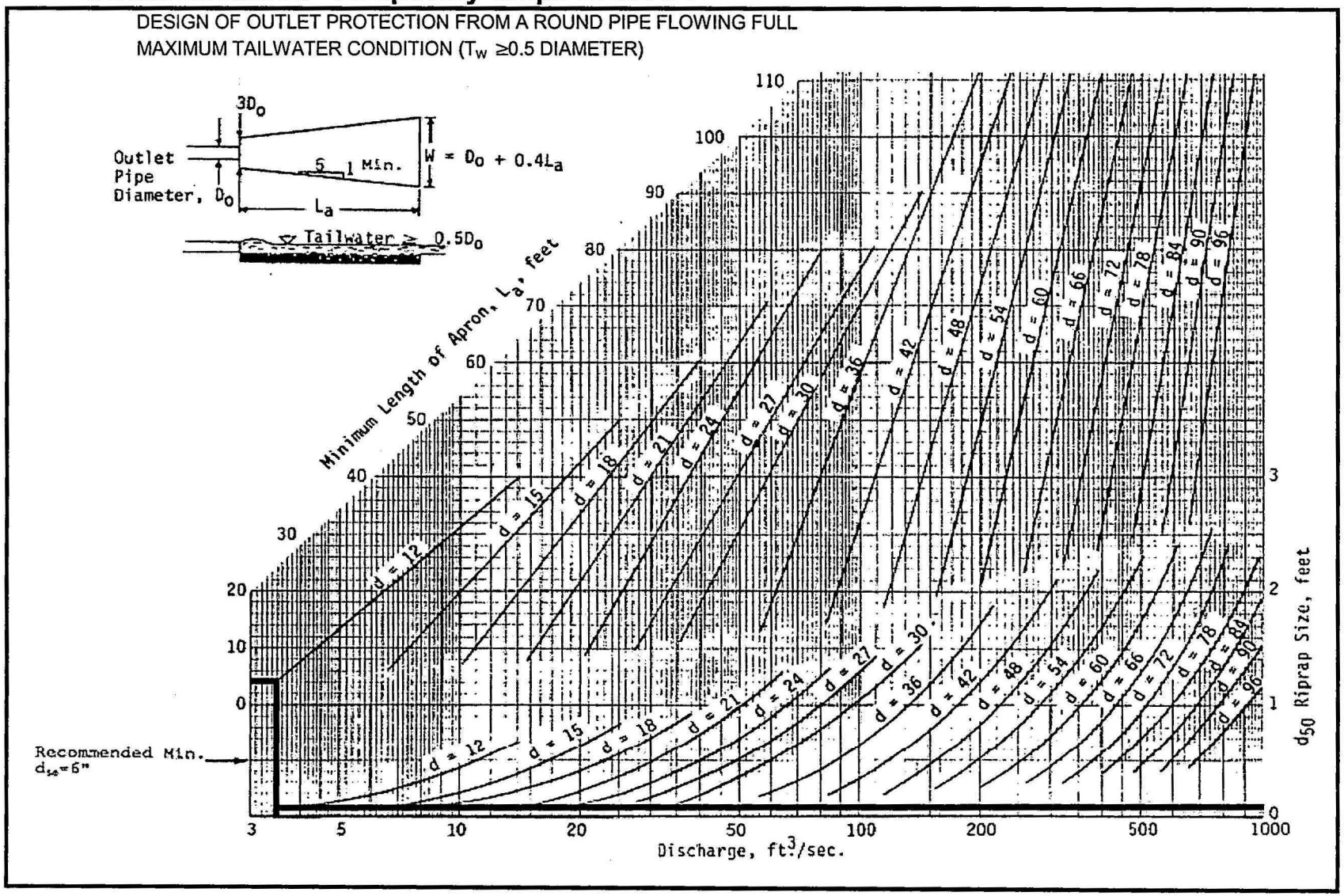
Source: USDA-SCS

Q =	0.1	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	December 20, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #4



Q =	0.55	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

Source: USDA-SCS

Plate 3.18-4

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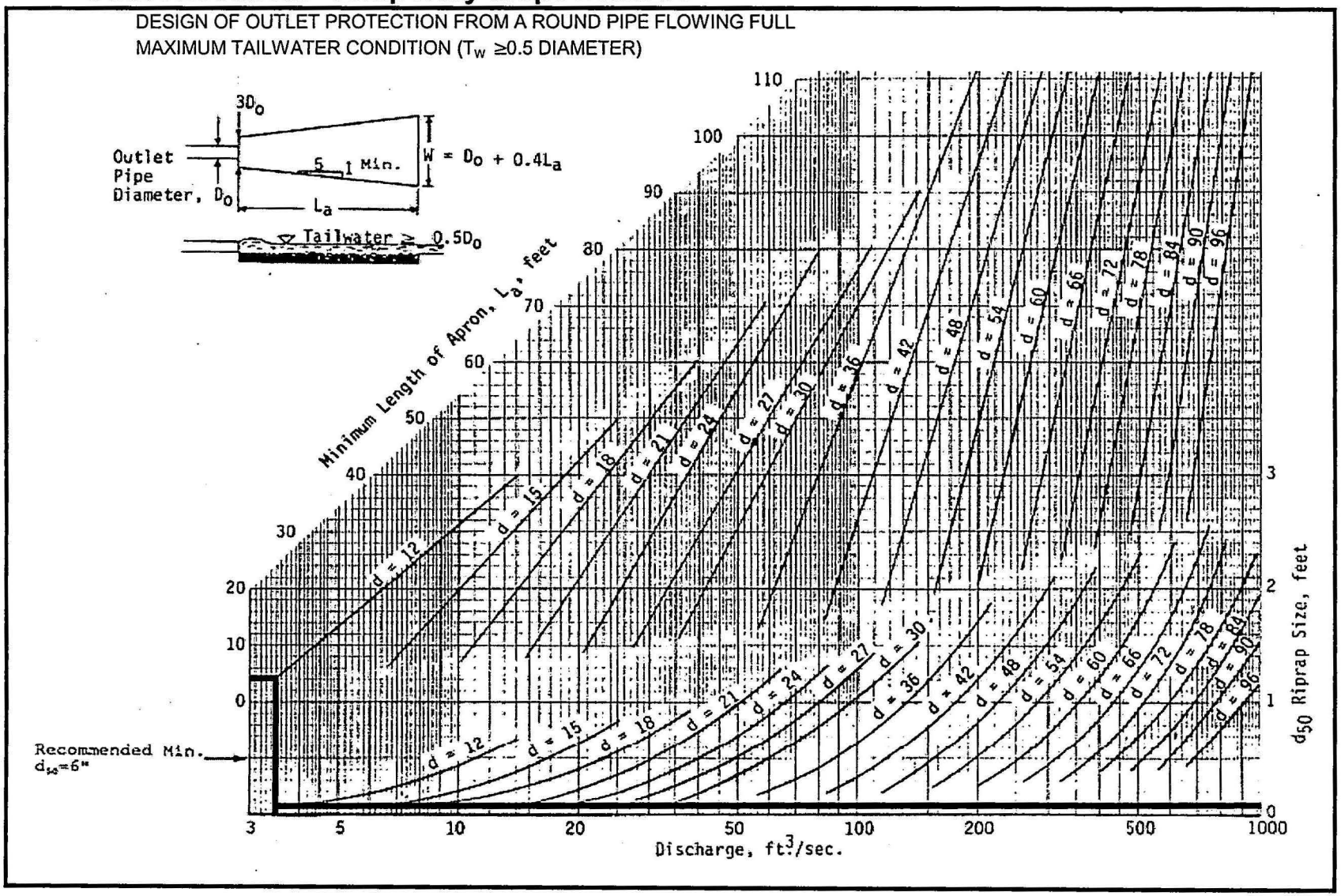
1992

3.18

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	December 20, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #5



Q =	0.2	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

Source: USDA-SCS 1992

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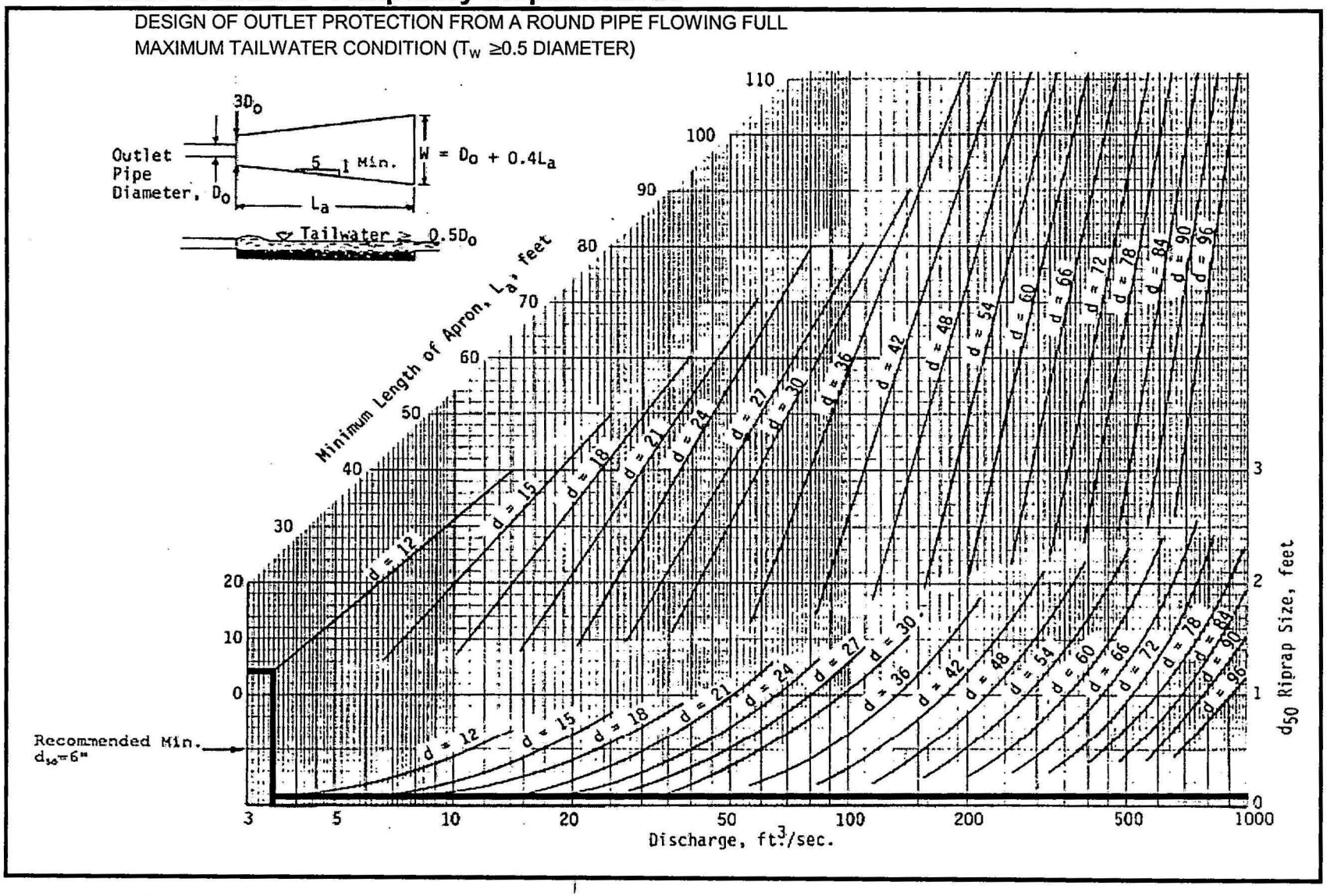
Plate 3.18-4 3.18

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Outlet Protection
Date:	December 20, 2010
Calculated By:	TRS

Outlet Location: Temporary Slope Drain #6



Q =	1	cfs	$3D_0$ =	3	ft	W =	3	ft	Depth = 2 ft
D_0 =	12	in	L_a =	4	ft	d_{50} =	1.1	ft	

Source: USDA-SCS

1992

III - 165

Plate 3.18-4

3.18

Hydraflow Table of Contents

816206 BMP#6 Sediment Basin (2010-10-14).gpw

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Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	------	------	1.440	------	------	------	2.124	------	------	Pre-Development
2	Mod. Rational	------	------	4.103	------	------	------	6.747	------	------	Post-Development
3	Reservoir	2	------	0.235	------	------	------	1.660	------	------	Routed

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	1.440	1	10	864	-----	-----	-----	Pre-Development
2	Mod. Rational	4.103	1	5	12,063	-----	-----	-----	Post-Development
3	Reservoir	0.235	1	54	11,863	2	52.11	24,283	Routed

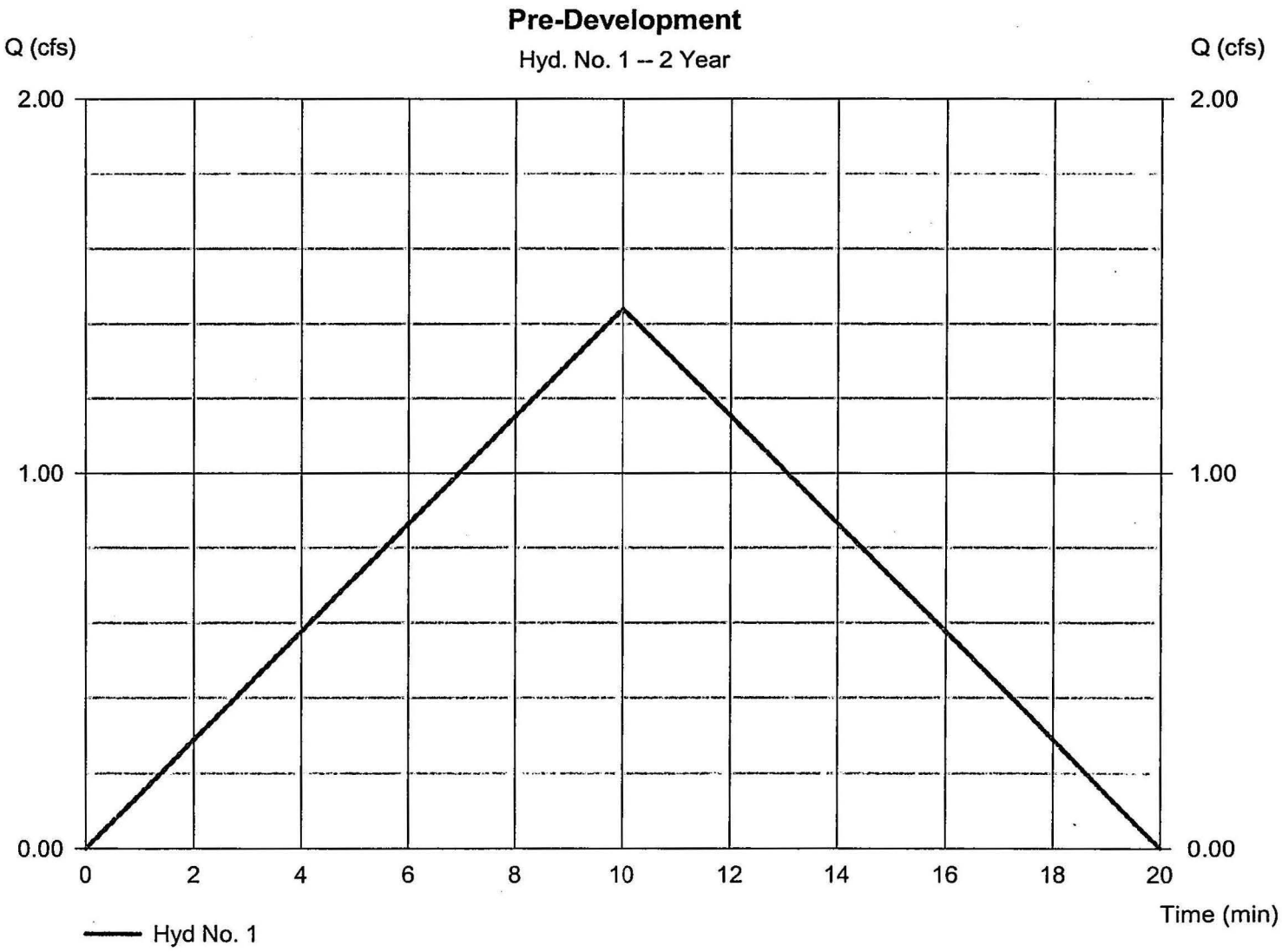
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 1.440 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 864 cuft
Drainage area	= 1.030 ac	Runoff coeff.	= 0.3
Intensity	= 4.660 in/hr	Tc by User	= 10.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



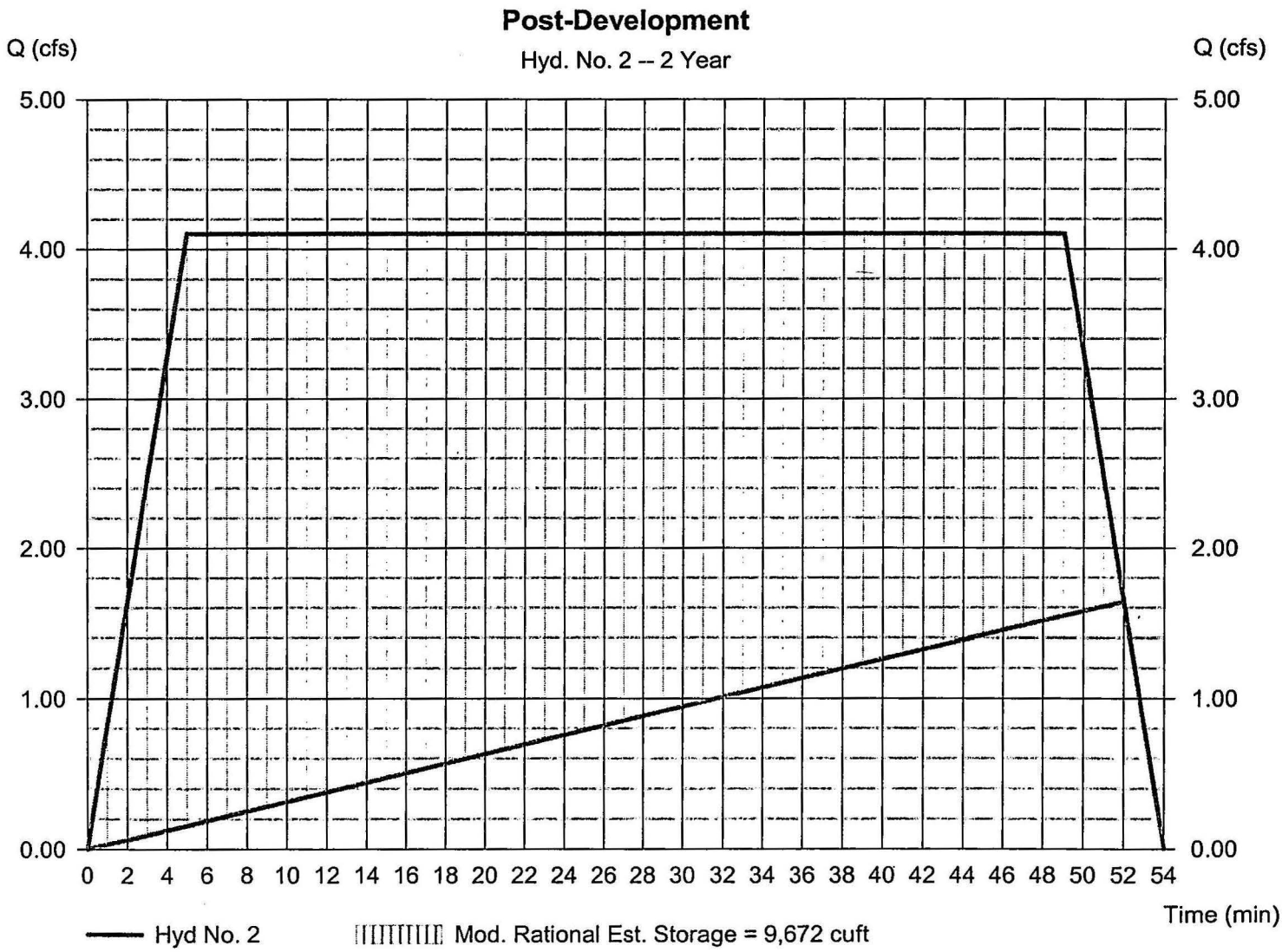
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 4.103 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 12,063 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 1.955 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 9.8 x Tc
Target Q	= 1.440 cfs	Est. Req'd Storage	= 9,672 cuft



Hydrograph Report

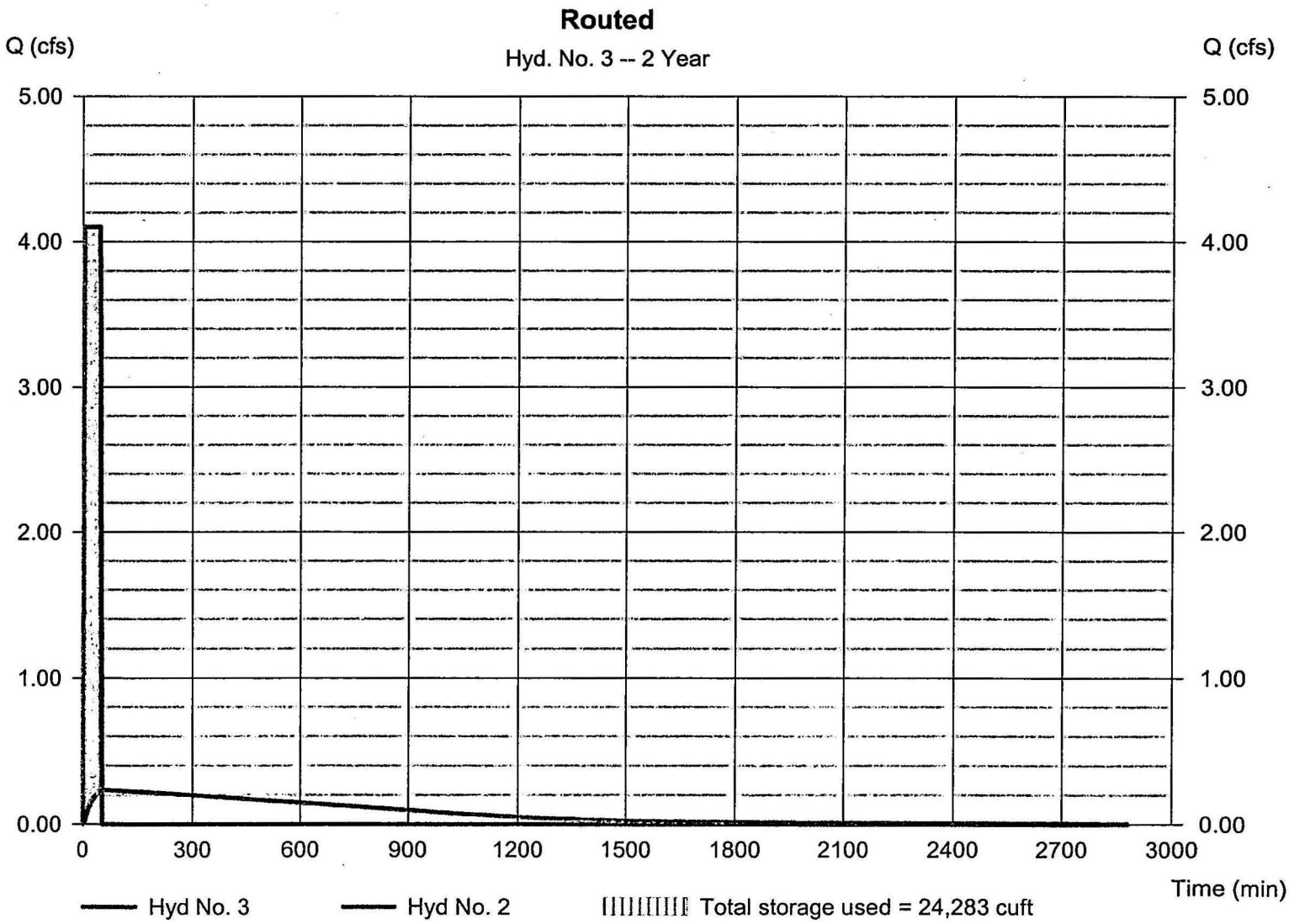
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.235 cfs
Storm frequency	= 2 yrs	Time to peak	= 54 min
Time interval	= 1 min	Hyd. volume	= 11,863 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 52.11 ft
Reservoir name	= BMP #6	Max. Storage	= 24,283 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Pond No. 2 - BMP #6

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 46.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	46.00	564	0	0
1.00	47.00	1,107	820	820
2.00	48.00	1,815	1,446	2,267
3.00	49.00	2,625	2,207	4,474
4.00	50.00	3,515	3,059	7,533
5.00	51.00	6,983	5,150	12,683
6.00	52.00	13,381	10,009	22,692
7.00	53.00	14,831	14,098	36,791
8.00	54.00	16,336	15,576	52,367
9.00	55.00	17,899	17,110	69,476

Culvert / Orifice Structures

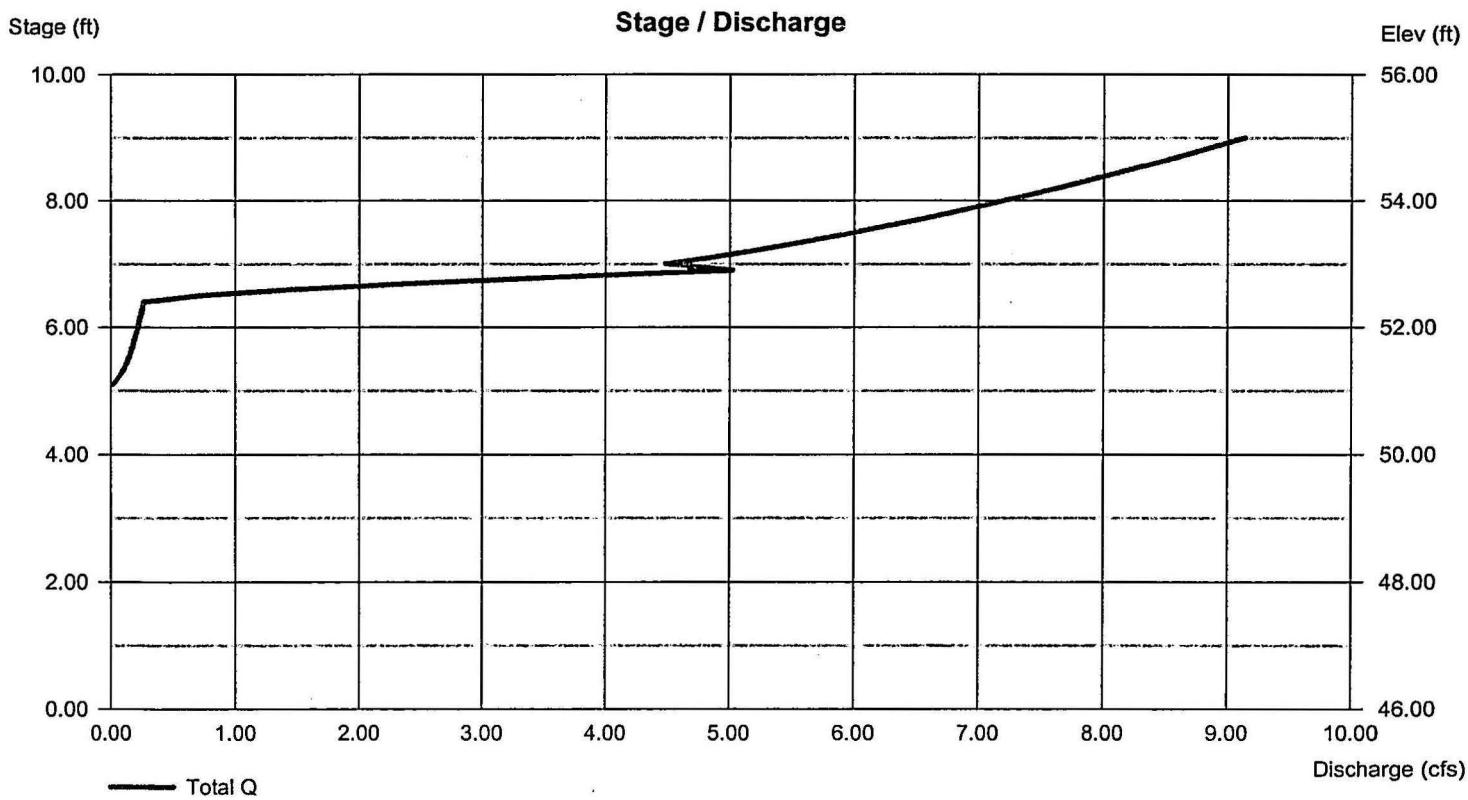
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	3.00	0.00	0.00
Span (in)	= 15.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 46.00	51.00	0.00	0.00
Length (ft)	= 176.00	27.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	Inactive	0.00	0.00
Crest El. (ft)	= 52.40	53.40	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	2.124	1	10	1,274	------	------	------	Pre-Development
2	Mod. Rational	6.747	1	5	19,835	------	------	------	Post-Development
3	Reservoir	1.660	1	53	19,531	2	52.62	31,406	Routed

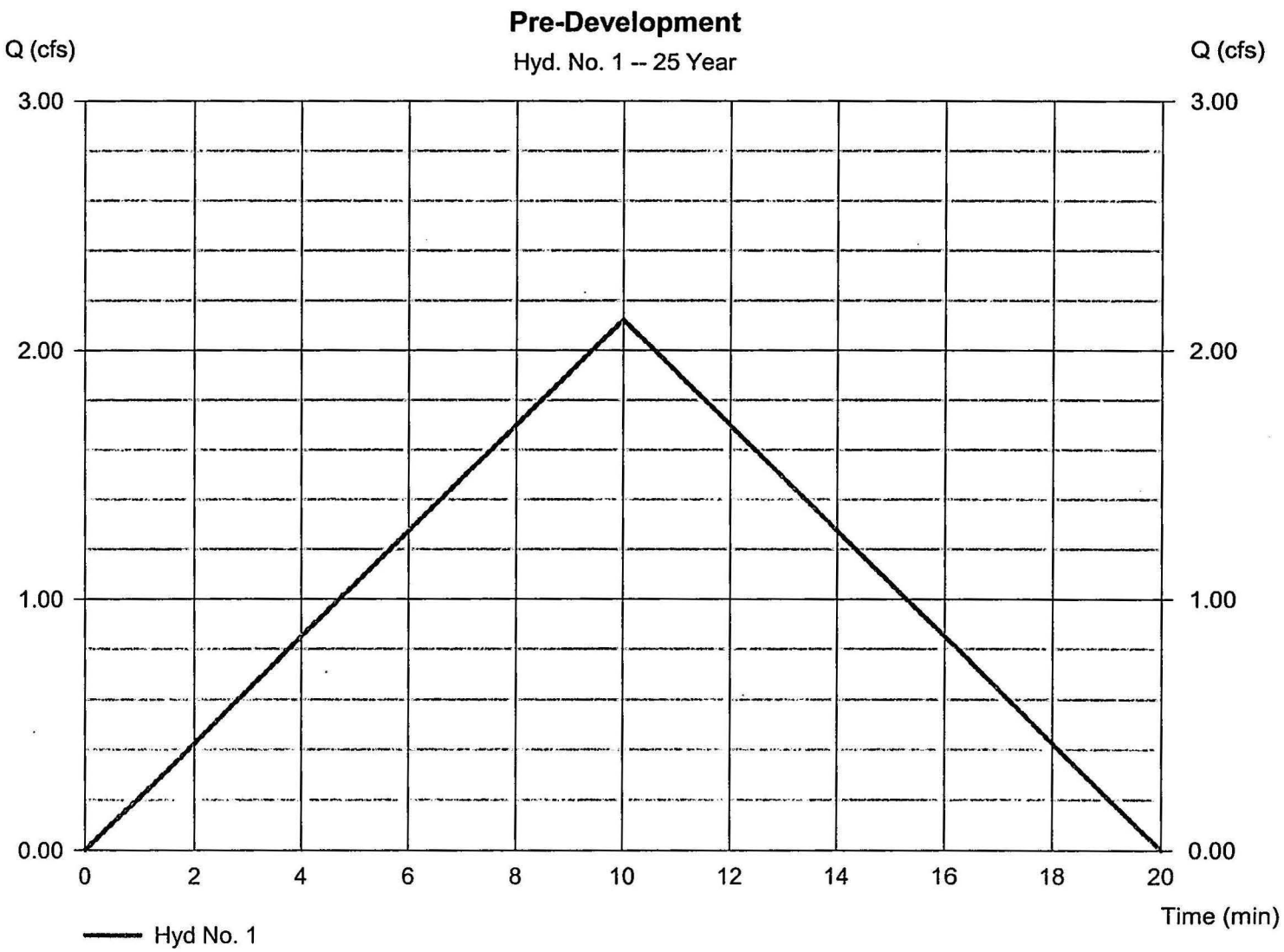
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 2.124 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,274 cuft
Drainage area	= 1.030 ac	Runoff coeff.	= 0.3
Intensity	= 6.872 in/hr	Tc by User	= 10.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



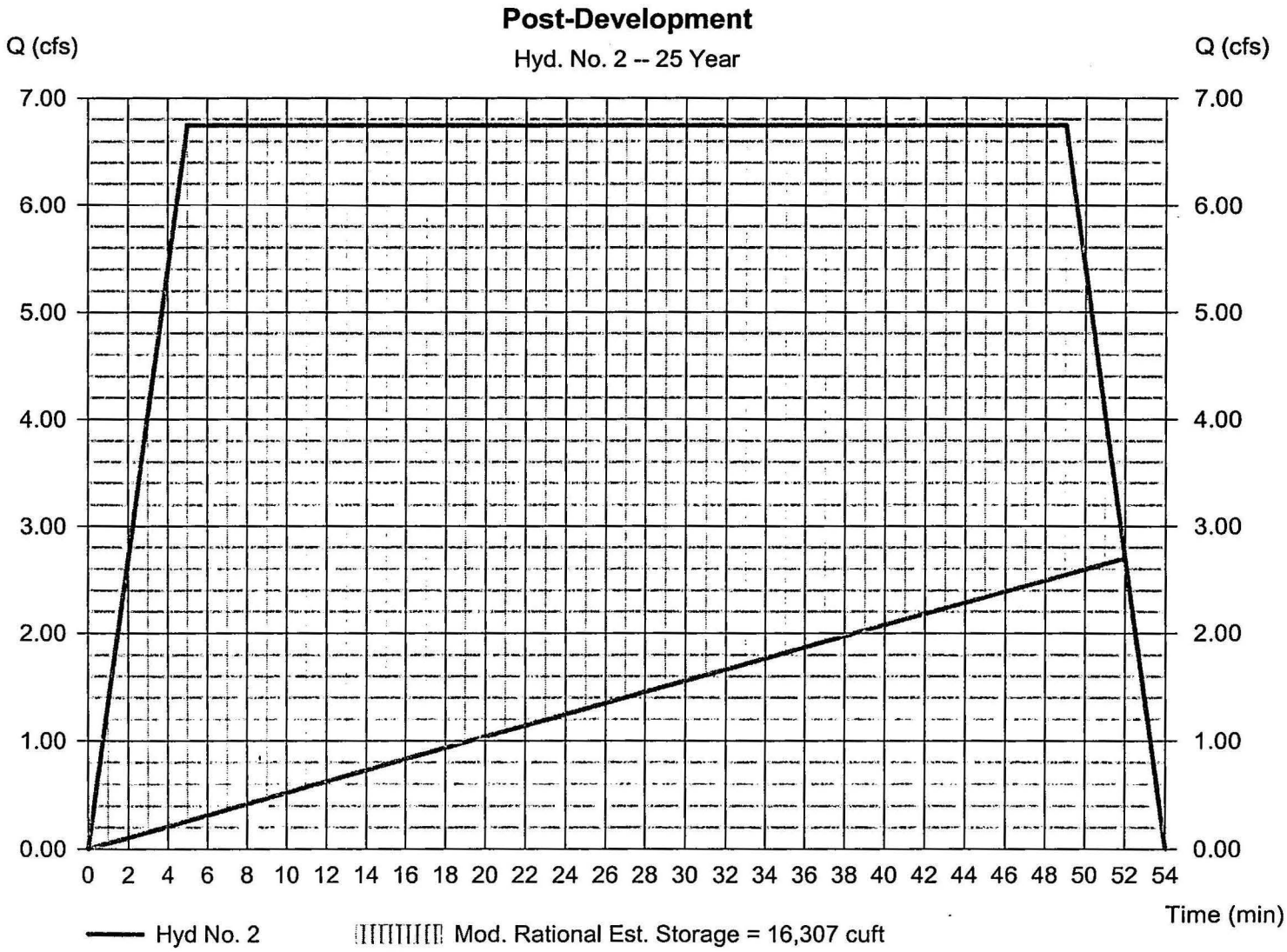
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 6.747 cfs
Storm frequency	= 25 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 19,835 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 3.215 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 9.8 x Tc
Target Q	= 2.120 cfs	Est. Req'd Storage	= 16,307 cuft



Hydrograph Report

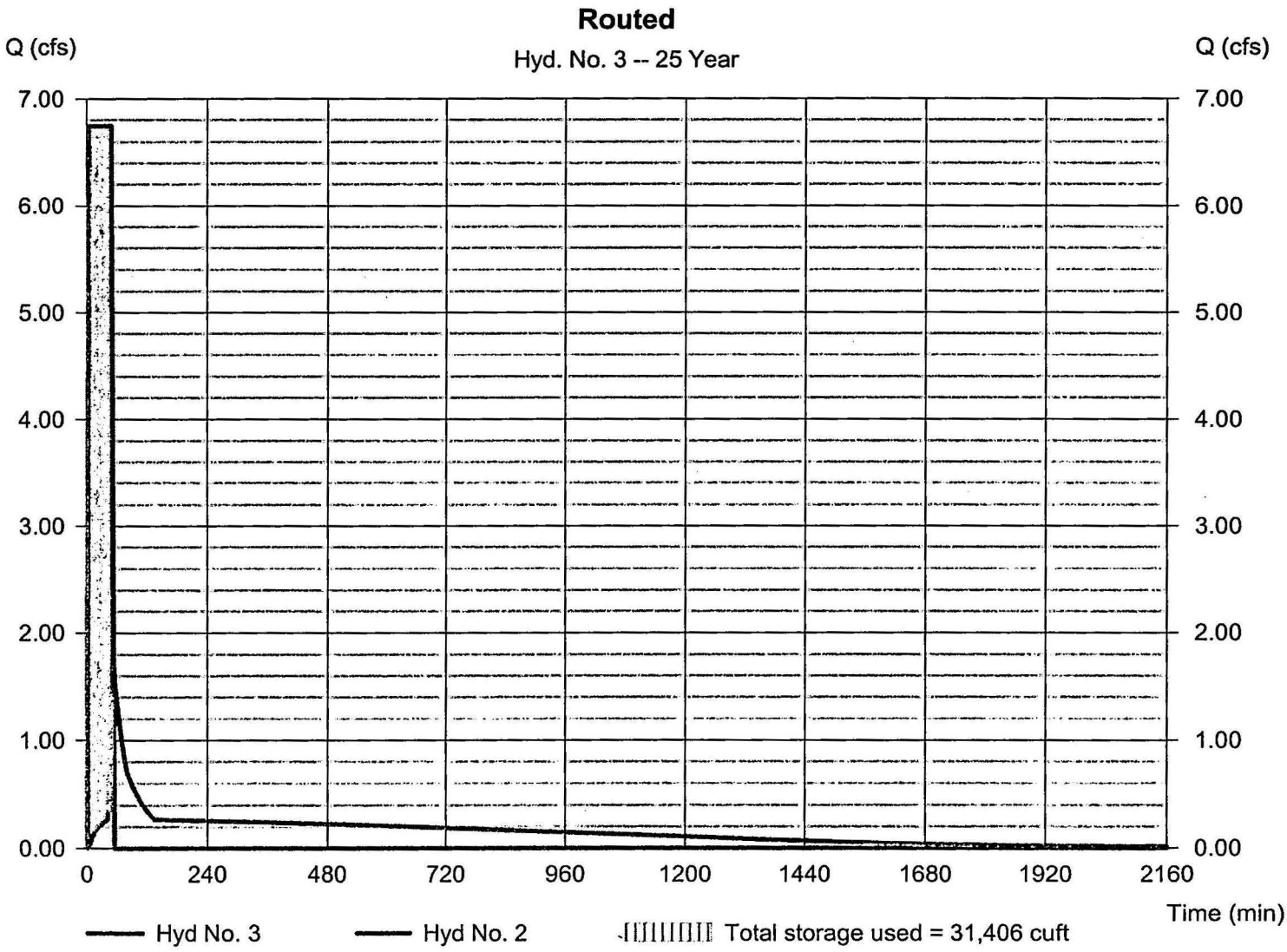
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.660 cfs
Storm frequency	= 25 yrs	Time to peak	= 53 min
Time interval	= 1 min	Hyd. volume	= 19,531 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 52.62 ft
Reservoir name	= BMP #6	Max. Storage	= 31,406 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



STORMWATER MANAGEMENT

Williamsburg Lainding
TOTAL AREA = 72.45 ACRES

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Drainage Area	BMP Points		Fraction of Site Served by BMP (BMP Drainage Area/Total Area)		Weighted BMP Points
1	6.61	4	X	0.091	=	0.36
2	8.22	10	X	0.113	=	1.13
3	12.14	10	X	0.168	=	1.68
4	13.34	4	X	0.184	=	0.74
5	6.65	4	X	0.092	=	0.37
6	3.18	10	X	0.044	=	0.44
		TOTAL WEIGHTED STRUCTURAL BMP POINTS:				**4.72**

B. NATURAL OPEN SPACE CREDIT

Open Space Area		Fraction of Site (Open Space Area/Total Area)	Natural Open Space Credit		Points for Natural Open Space (Fraction of Site * Natural Open Space Credit %)
37.18	(existing)	0.513	(0.1 per 1%)	=	5.13
0.60	(future)	0.008	(0.1 per 1%)	=	0.08
0.53	(future)	0.007	(0.15 per 1%)	=	0.11
			TOTAL OPEN SPACE POINTS:		**5.32**

C. TOTAL WEIGHTED POINTS

4.72	+	5.32	=	10.04
Structural BMP Points		Natural Open Space Points		TOTAL

BMP #1

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Runoff Coefficients
Date:	April 21, 2010
Calculated By:	NB

Runoff Coefficients used in the following calculations were taken from Table 4-3 of the Virginia Stormwater Management Handbook.

Subject Area: Pre-Development - BMP #1 (Before BMP was built)

Area Description	Impervious	Open		
	0.90	0.30		
BMP#1 Design Point		5.19		

Total Area	C x A	Weighted C
5.19	1.56	0.30
0.00	0.00	
0.00	0.00	

Subject Area: Pre-Development - BMP #1 (Incl. previously approved plans)

Area Description	Impervious	Open		
	0.90	0.30		
BMP#1 Drainage Point	3.14	3.33		

Total Area	C x A	Weighted C
6.47	3.83	0.59
0.00	0.00	
0.00	0.00	

Subject Area: Post-Development - BMP #1 Drainage Area

Area Description	Impervious	Open		
	0.90	0.30		
BMP#1 Drainage Point	3.72	2.89		

Total Area	C x A	Weighted C
6.61	4.22	0.64
0.00	0.00	
0.00	0.00	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Runoff Curve Number
	BMP #1
Date:	April 21, 2010
Calculated By:	TRS

Runoff Curve Numbers used in the following calculations were taken from Table 5-5 of the Virginia Erosion and Sediment Control Handbook

Subject Area: Post Development BMP #1

Soil Name and Hydrologic Group	Cover Description	CN	Area	CN x Area
C	Brush, weed, grass mix - Poor	77	2.89	222.53
C	Impervious Areas	98	3.72	364.56
		Totals =	6.61	587.09

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{587.09}{6.61} = 88.8$$

Use CN = 89

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Pond No. 1 - Pond #1

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 52.83 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	52.83	00	0	0
0.17	53.00	01	0	0
1.17	54.00	04	3	3
2.17	55.00	807	406	408
3.17	56.00	1,580	1,194	1,602
4.17	57.00	2,464	2,022	3,624
5.17	58.00	3,656	3,060	6,684
6.17	59.00	5,257	4,456	11,140
7.17	60.00	6,870	6,064	17,204
8.17	61.00	8,889	7,880	25,083
9.17	62.00	11,181	10,035	35,118
10.17	63.00	13,814	12,498	47,616
10.67	63.50	15,000	7,204	54,819

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	2.00	6.00	0.00
Span (in)	= 18.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 52.83	52.83	57.31	0.00
Length (ft)	= 125.00	0.00	0.00	0.00
Slope (%)	= 12.33	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

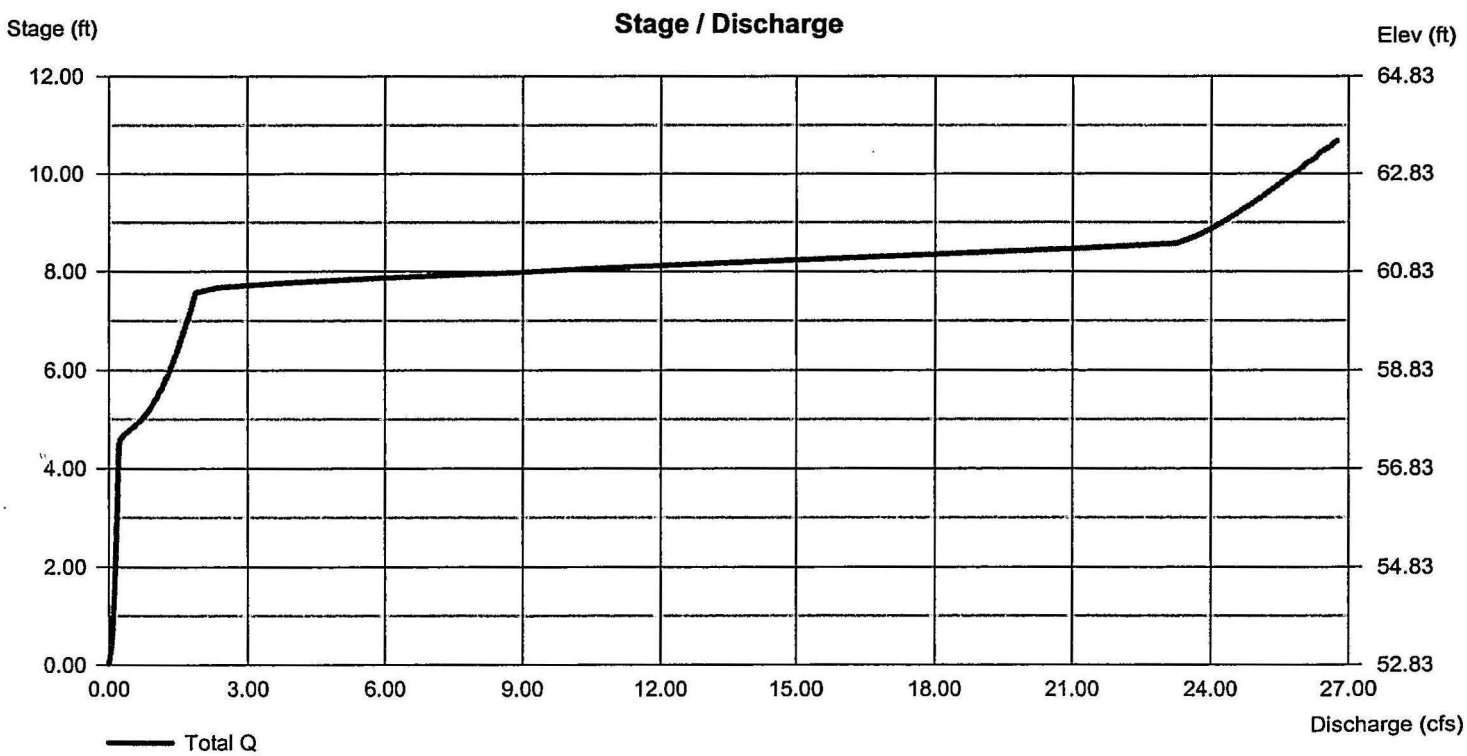
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.14	3.14	3.14	0.00
Crest El. (ft)	= 60.44	60.44	60.44	0.00
Weir Coeff.	= 3.33	3.33	3.33	0.00
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	Yes	Yes	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	18.91	25.57	------	------	49.35	------	------	68.14	1-Year SCS
2	Reservoir	1	1.780	8.159	------	------	24.74	------	------	26.32	Routed 1-yr SCS Storm
4	Rational	------	7.278	8.586	------	------	11.13	------	------	14.76	Pre-Dev (Original BMP Design)
5	Mod. Rational	------	9.825	11.82	------	------	12.43	------	------	15.39	Post-Dev
6	Reservoir	5	1.610	1.771	------	------	10.22	------	------	15.28	Routed Mod Rational

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	18.91	2	716	38,692	-----	-----	-----	1-Year SCS
2	Reservoir	1.780	2	744	38,695	1	60.11	18,057	Routed 1-yr SCS Storm
4	Rational	7.278	1	6	2,620	-----	-----	-----	Pre-Dev (Original BMP Design)
5	Mod. Rational	9.825	1	6	16,625	-----	-----	-----	Post-Dev
6	Reservoir	1.610	1	33	16,508	5	59.60	14,752	Routed Mod Rational

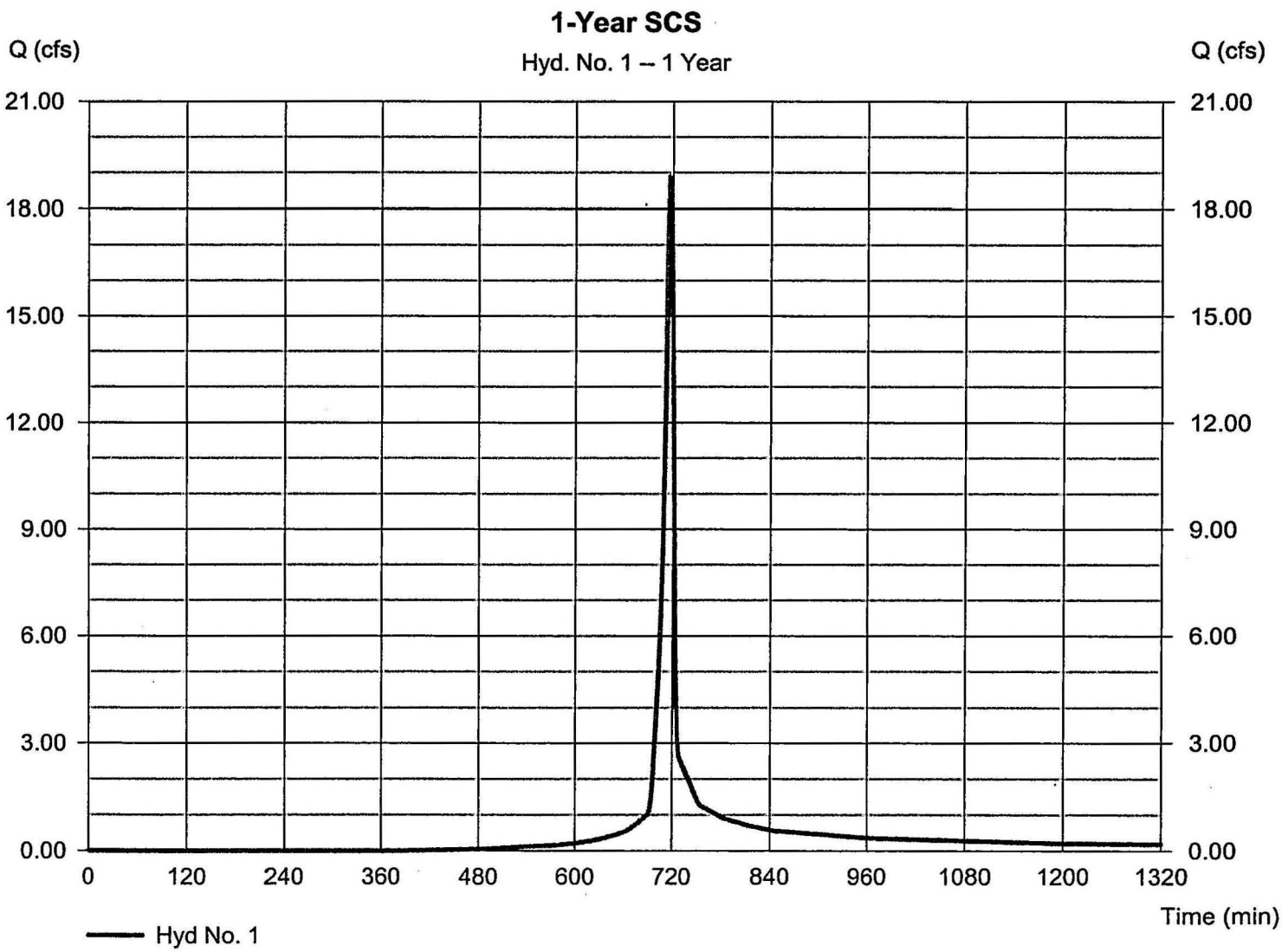
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 1

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 18.91 cfs
Storm frequency	= 1 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 38,692 cuft
Drainage area	= 6.610 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

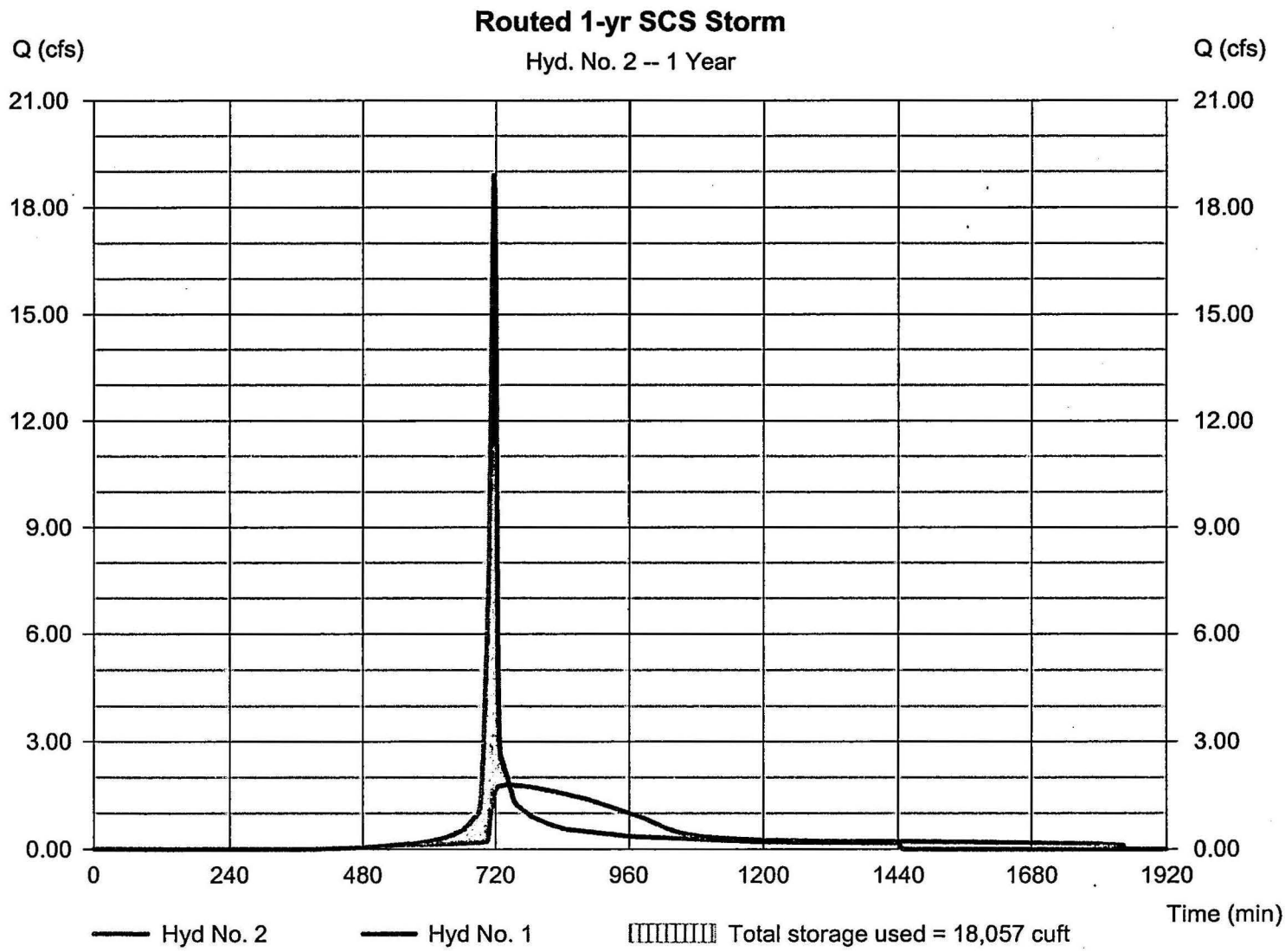
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 2

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 1.780 cfs
Storm frequency	= 1 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 38,695 cuft
Inflow hyd. No.	= 1 - 1-Year SCS	Max. Elevation	= 60.11 ft
Reservoir name	= Pond #1	Max. Storage	= 18,057 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	25.57	2	716	53,024	-----	-----	-----	1-Year SCS
2	Reservoir	8.159	2	724	53,027	1	60.79	23,334	Routed 1-yr SCS Storm
4	Rational	8.586	1	6	3,091	-----	-----	-----	Pre-Dev (Original BMP Design)
5	Mod. Rational	11.82	1	6	20,004	-----	-----	-----	Post-Dev
6	Reservoir	1.771	1	33	19,863	5	60.08	17,834	Routed Mod Rational

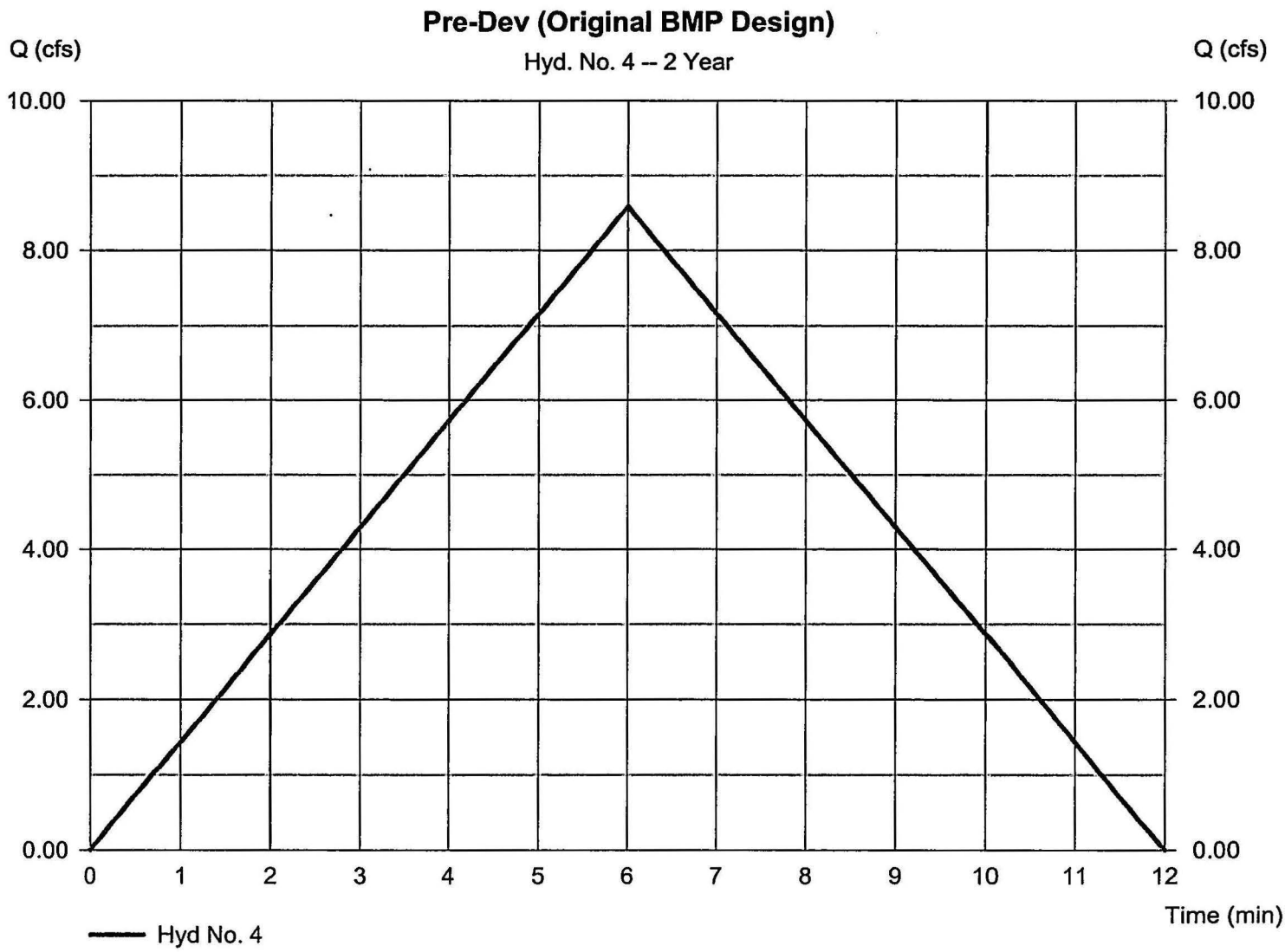
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 4

Pre-Dev (Original BMP Design)

Hydrograph type	= Rational	Peak discharge	= 8.586 cfs
Storm frequency	= 2 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 3,091 cuft
Drainage area	= 5.190 ac	Runoff coeff.	= 0.3
Intensity	= 5.514 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



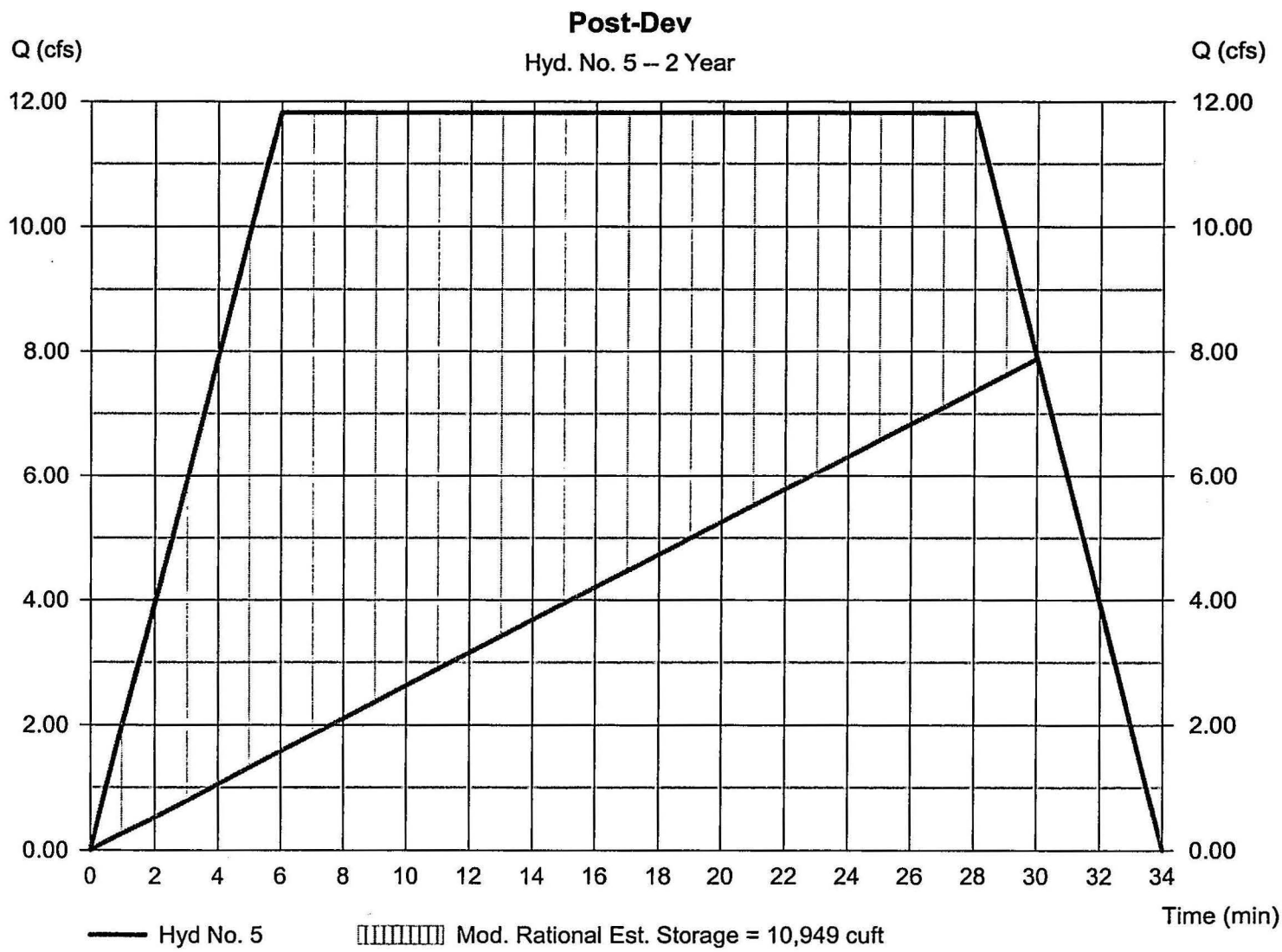
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 5

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 11.82 cfs
Storm frequency	= 2 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 20,004 cuft
Drainage area	= 6.610 ac	Runoff coeff.	= 0.64
Intensity	= 2.795 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 4.7 x Tc
Target Q	= 8.590 cfs	Est. Req'd Storage	= 10,949 cuft



Hydrograph Report

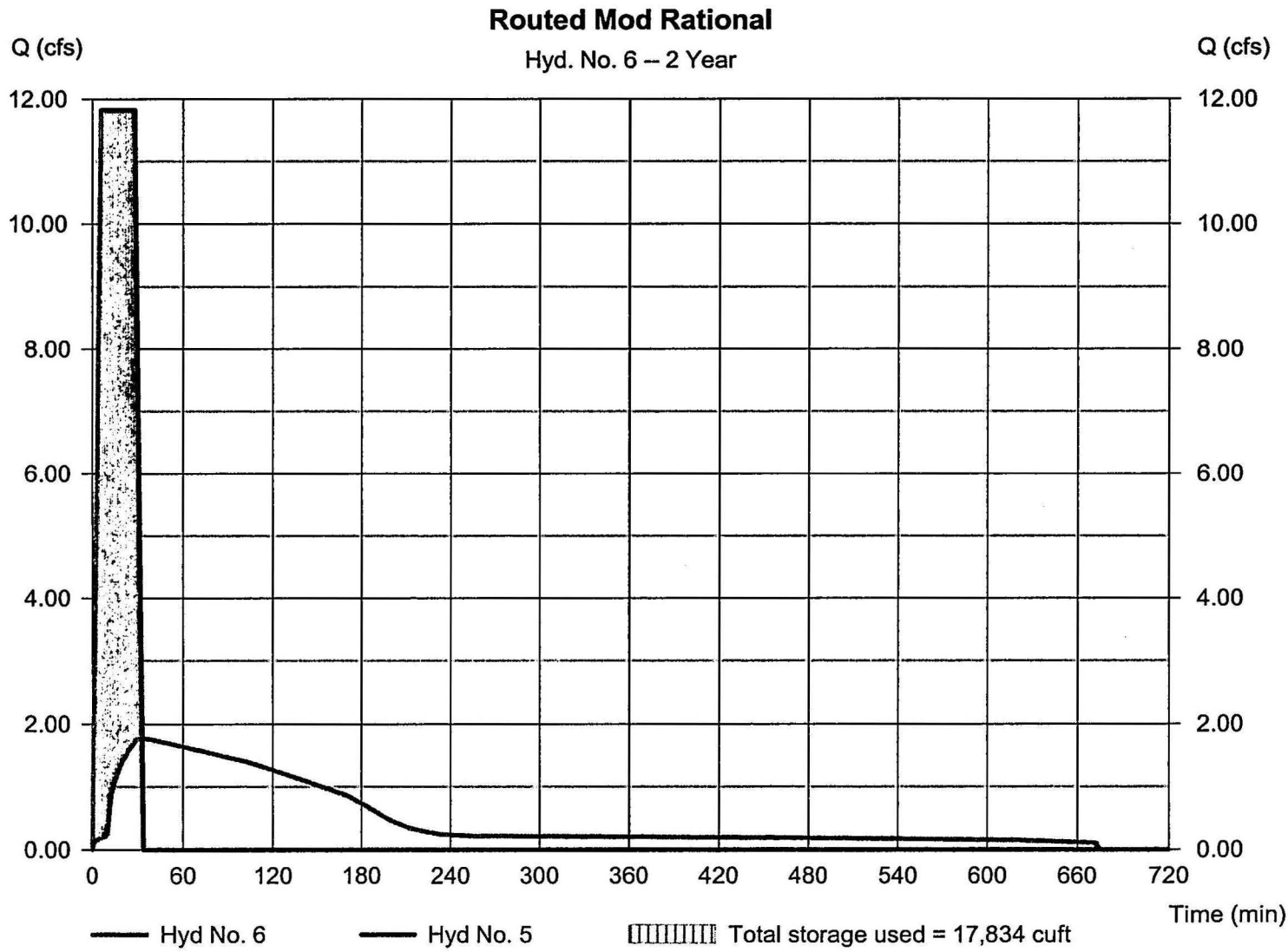
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 6

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 1.771 cfs
Storm frequency	= 2 yrs	Time to peak	= 33 min
Time interval	= 1 min	Hyd. volume	= 19,863 cuft
Inflow hyd. No.	= 5 - Post-Dev	Max. Elevation	= 60.08 ft
Reservoir name	= Pond #1	Max. Storage	= 17,834 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	49.35	2	716	106,522	----	----	----	1-Year SCS
2	Reservoir	24.74	2	722	106,526	1	62.13	36,664	Routed 1-yr SCS Storm
4	Rational	11.13	1	6	4,006	----	----	----	Pre-Dev (Original BMP Design)
5	Mod. Rational	12.43	1	6	32,210	----	----	----	Post-Dev
6	Reservoir	10.22	1	44	32,062	5	60.87	24,086	Routed Mod Rational

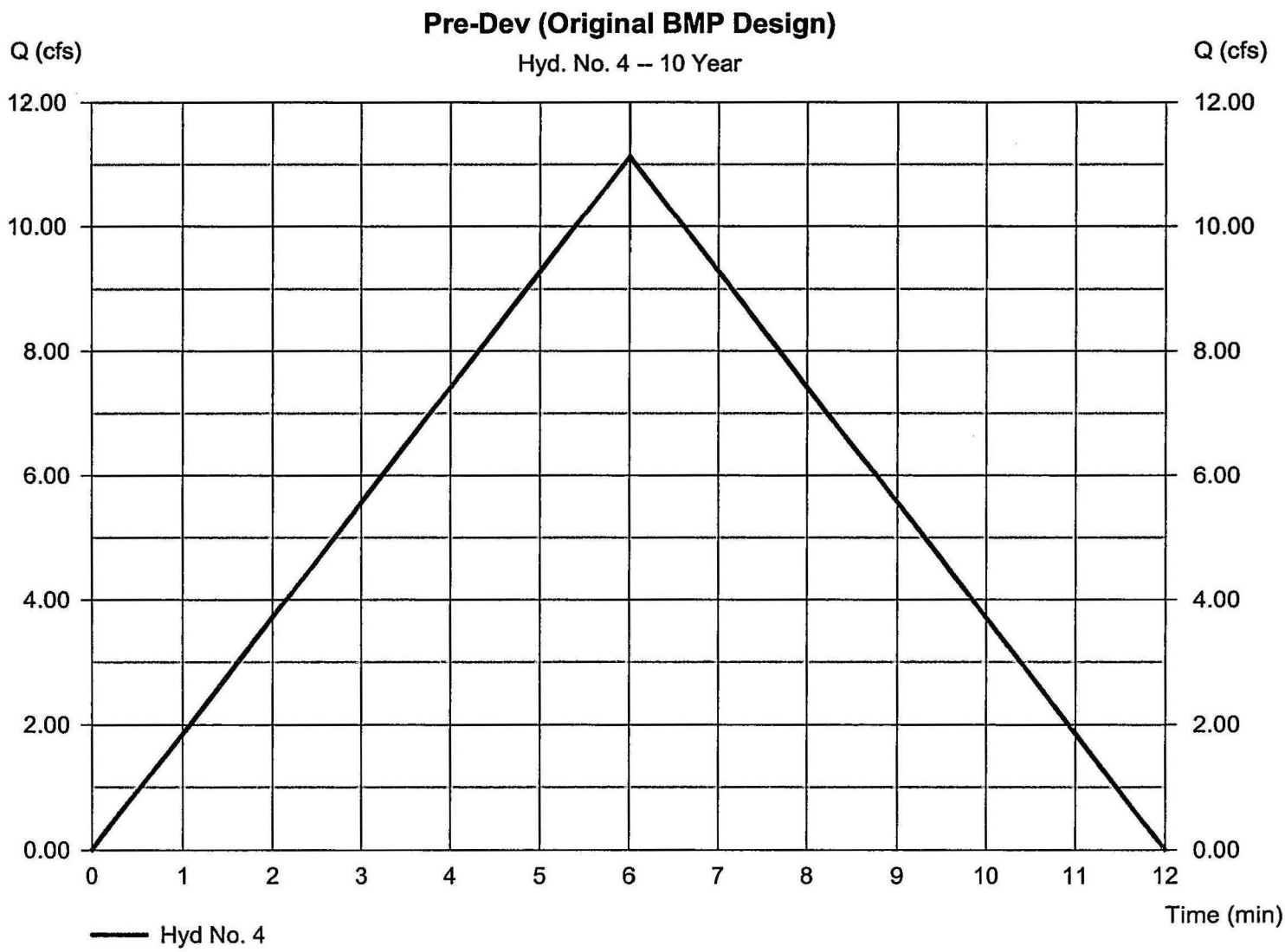
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 4

Pre-Dev (Original BMP Design)

Hydrograph type	= Rational	Peak discharge	= 11.13 cfs
Storm frequency	= 10 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 4,006 cuft
Drainage area	= 5.190 ac	Runoff coeff.	= 0.3
Intensity	= 7.147 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



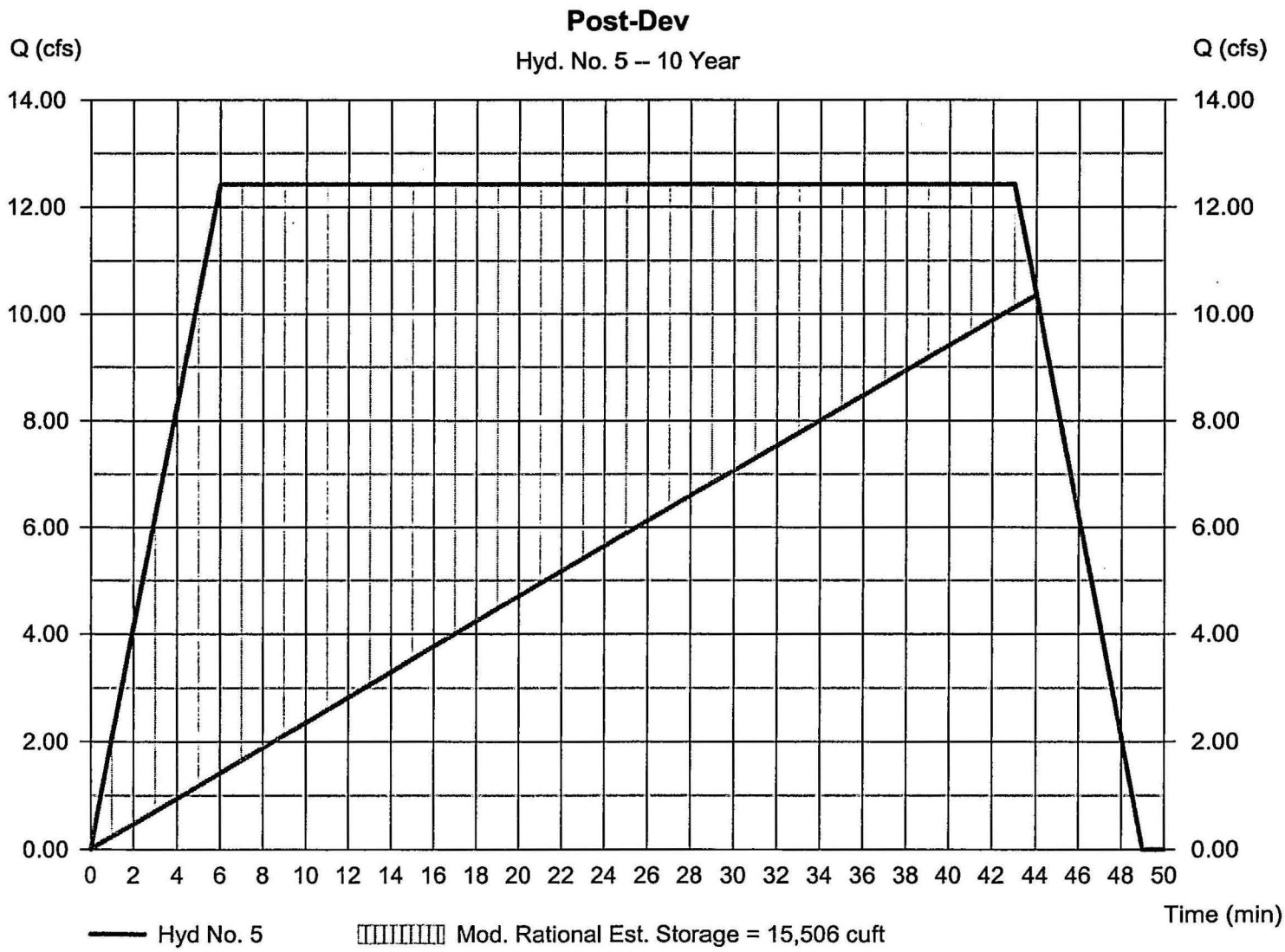
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 5

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 12.43 cfs
Storm frequency	= 10 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 32,210 cuft
Drainage area	= 6.610 ac	Runoff coeff.	= 0.64
Intensity	= 2.938 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 7.2 x Tc
Target Q	= 11.13 cfs	Est. Req'd Storage	= 15,506 cuft



Hydrograph Report

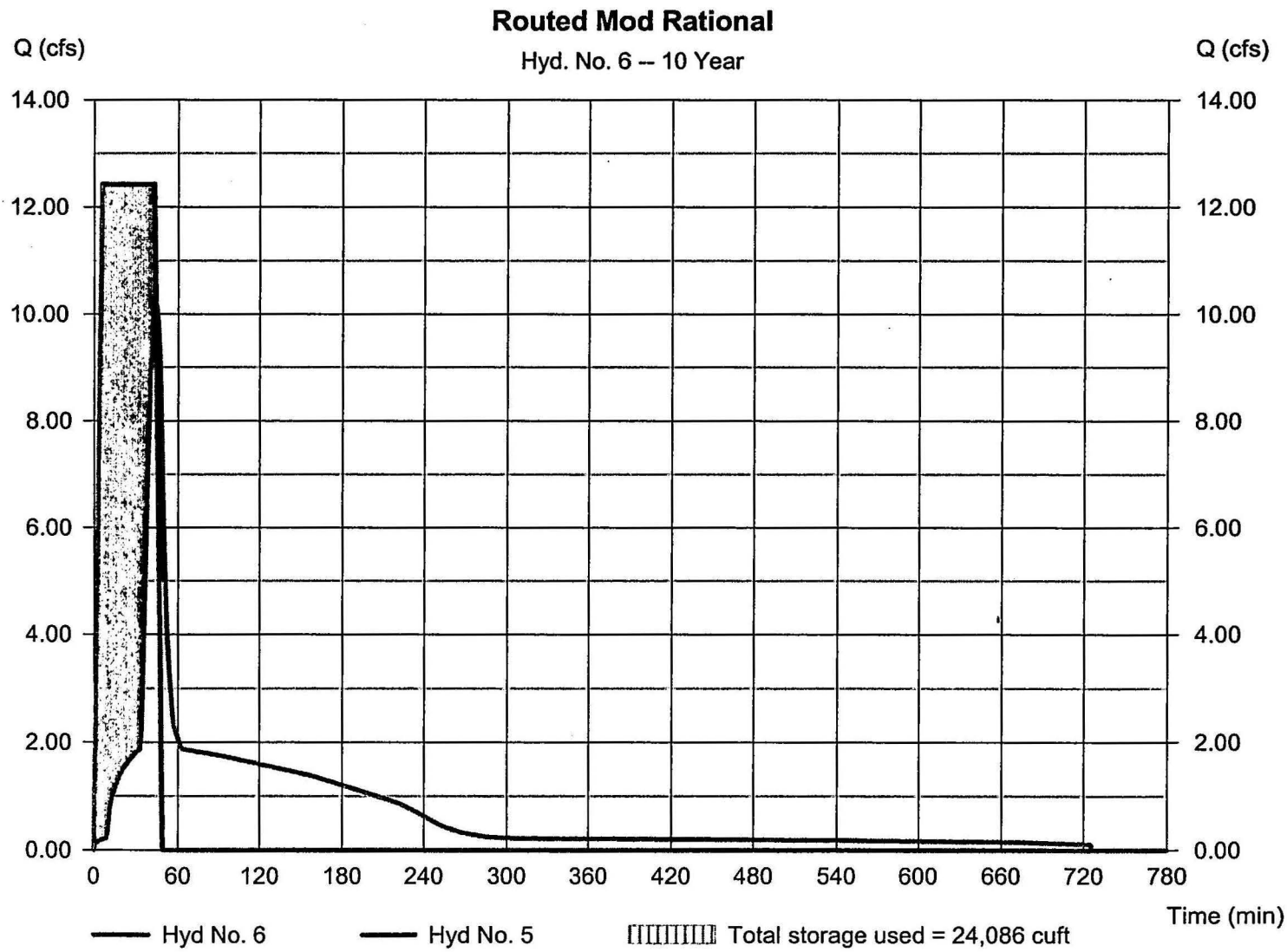
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 6

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 10.22 cfs
Storm frequency	= 10 yrs	Time to peak	= 44 min
Time interval	= 1 min	Hyd. volume	= 32,062 cuft
Inflow hyd. No.	= 5 - Post-Dev	Max. Elevation	= 60.87 ft
Reservoir name	= Pond #1	Max. Storage	= 24,086 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	68.14	2	716	150,417	-----	-----	-----	1-Year SCS
2	Reservoir	26.32	2	722	150,418	1	63.22	50,429	Routed 1-yr SCS Storm
4	Rational	14.76	1	6	5,314	-----	-----	-----	Pre-Dev (Original BMP Design)
5	Mod. Rational	15.39	1	6	52,624	-----	-----	-----	Post-Dev
6	Reservoir	15.28	1	57	52,625	5	61.08	25,855	Routed Mod Rational

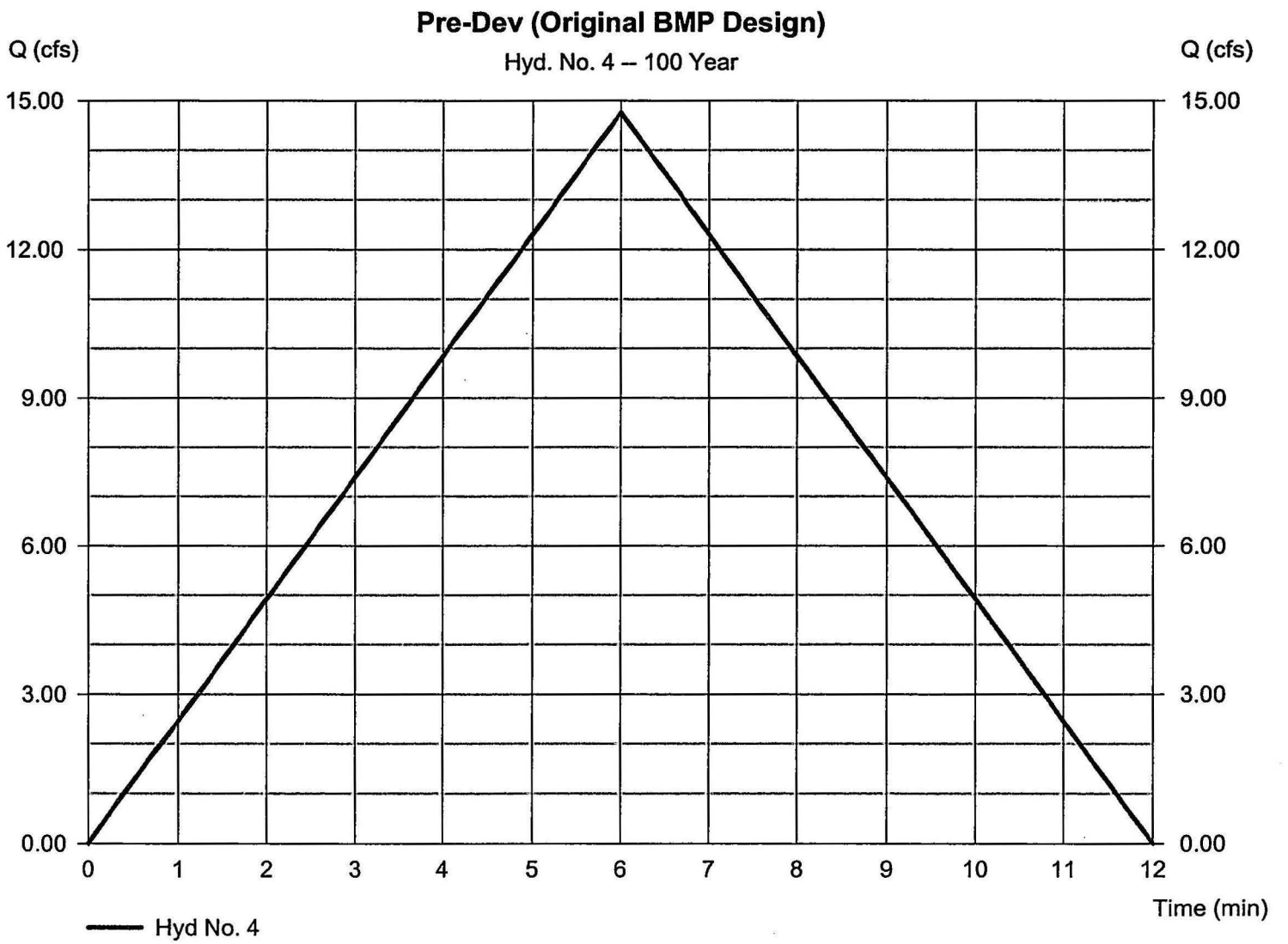
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 4

Pre-Dev (Original BMP Design)

Hydrograph type	= Rational	Peak discharge	= 14.76 cfs
Storm frequency	= 100 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 5,314 cuft
Drainage area	= 5.190 ac	Runoff coeff.	= 0.3
Intensity	= 9.481 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



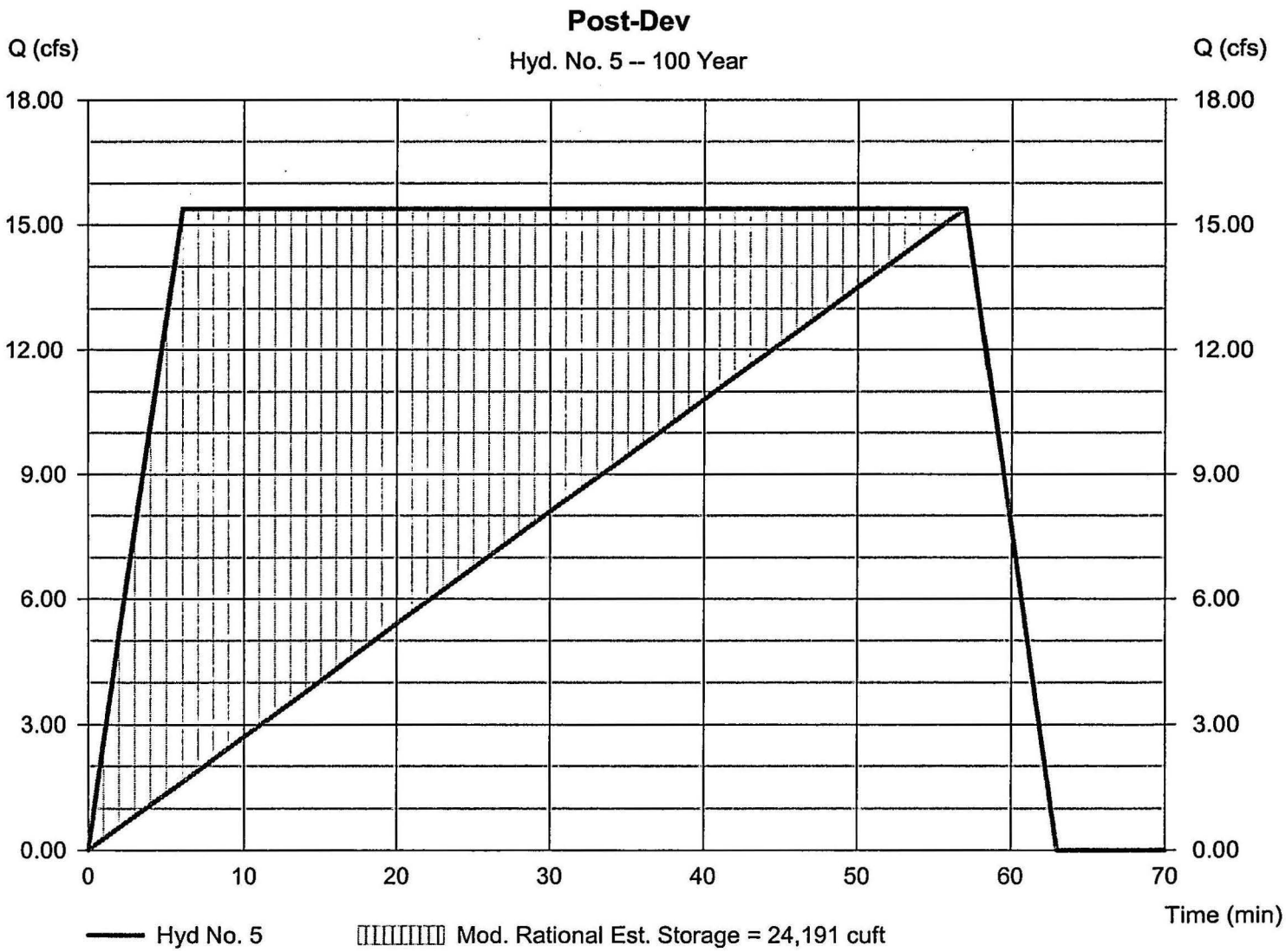
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Tuesday, Apr 20, 2010

Hyd. No. 5

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 15.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 6 min
Time interval	= 1 min	Hyd. volume	= 52,624 cuft
Drainage area	= 6.610 ac	Runoff coeff.	= 0.64
Intensity	= 3.637 in/hr	Tc by User	= 6.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 9.5 x Tc
Target Q	= 14.76 cfs	Est. Req'd Storage	= 24,191 cuft



Hydrograph Report

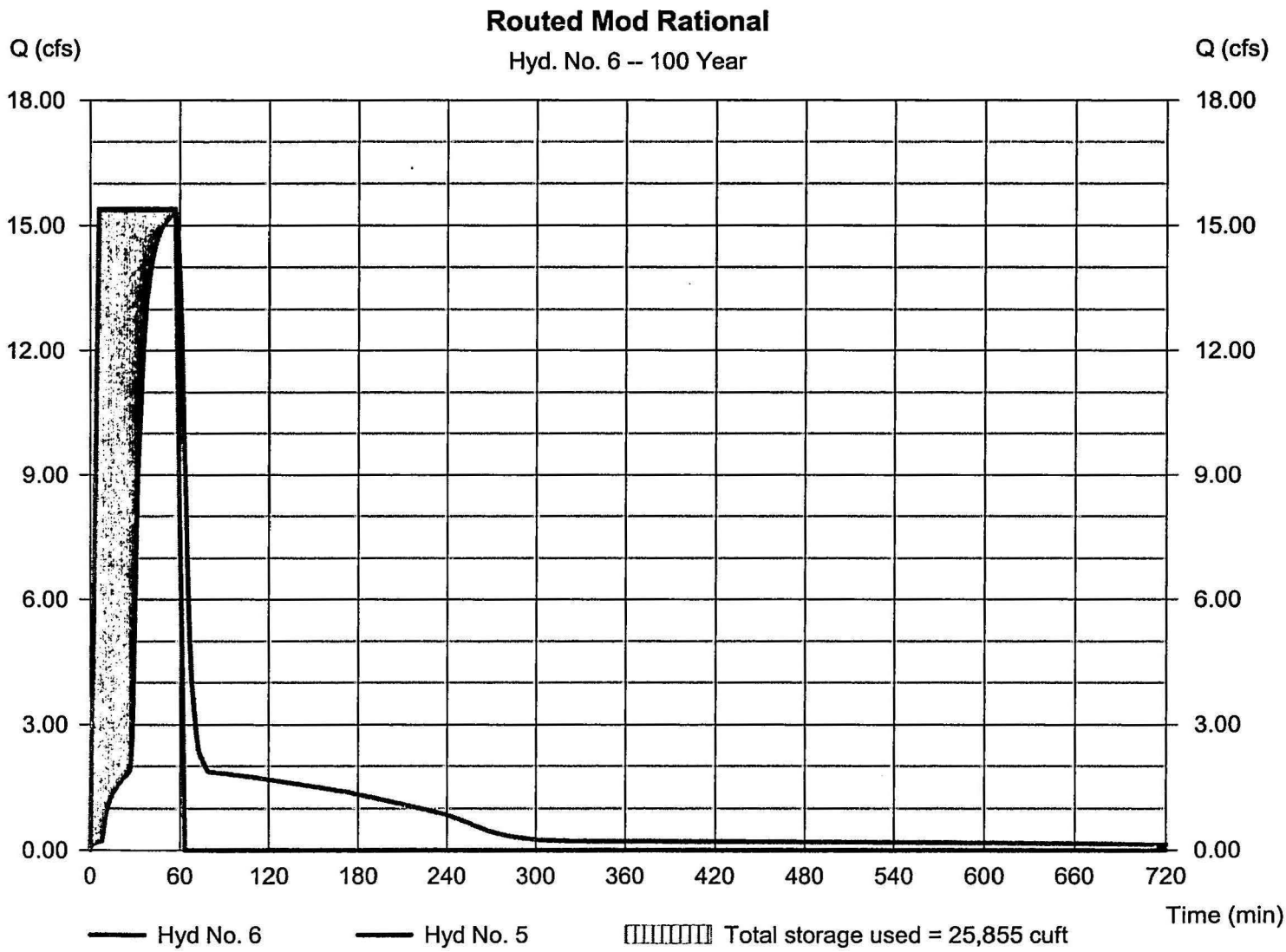
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 6

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 15.28 cfs
Storm frequency	= 100 yrs	Time to peak	= 57 min
Time interval	= 1 min	Hyd. volume	= 52,625 cuft
Inflow hyd. No.	= 5 - Post-Dev	Max. Elevation	= 61.08 ft
Reservoir name	= Pond #1	Max. Storage	= 25,855 cuft

Storage Indication method used.



BMP #2

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phas II
Project No.:	8162-06
Subject:	Runoff Coefficients
Date:	April 21, 2010
Calculated By:	NB

Runoff Coefficients used in the following calculations were taken from Table 4-3 of the Virginia Stormwater Management Handbook.

Subject Area: Pre-Development - BMP #2 (Before BMP was built)

Area Description	Impervious	Open			Total Area	C x A	Weighted C
	0.90	0.30					
BMP#2 Design Point	1.26	3.58			4.84	2.21	0.46
					0.00	0.00	
					0.00	0.00	

Subject Area: Pre-Development - BMP #2 (Incl. previously approved plans)

Area Description	Impervious	Open			Total Area	C x A	Weighted C
	0.90	0.30					
Phase 2 Area (2-A)	2.92	1.93			4.85	3.21	0.66
Woodhaven Area (2-B)	1.92	1.76			3.68	2.26	0.61
TOTAL	4.84	3.69			8.53	5.46	0.64
					0.00	0.00	

Subject Area: Post-Development - BMP #2 Drainage Area

Area Description	Impervious	Open			Total Area	C x A	Weighted C
	0.90	0.30					
Phase 2 Area (2-A)	2.92	1.87			4.79	3.19	0.67
Woodhaven Area (2-B)	1.83	1.61			3.44	2.13	0.62
TOTAL	4.75	3.48			8.23	5.32	0.65
					0.00	0.00	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Runoff Curve Number
	BMP #2
Date:	April 21, 2010
Calculated By:	TRS

Runoff Curve Numbers used in the following calculations were taken from Table 5-5 of the Virginia Erosion and Sediment Control Handbook

Subject Area: Post Development BMP #2

Soil Name and Hydrologic Group	Cover Description	CN	Area	CN x Area
C	Brush, weed, grass mix - Poor	77	3.48	267.96
C	Impervious Areas	98	4.75	465.5
		Totals =	8.23	733.46

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{733.46}{8.23} = 89.1$$

Use CN = **89**

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Pond No. 1 - BMP #2

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 33.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	33.00	00	0	0
1.00	34.00	2,652	1,326	1,326
2.00	35.00	3,091	2,872	4,198
3.00	36.00	3,555	3,323	7,521
4.00	37.00	4,044	3,800	11,320
5.00	38.00	4,559	4,302	15,622
6.00	39.00	6,253	5,406	21,028
6.26	39.26	6,663	1,679	22,707
7.00	40.00	7,886	5,383	28,090
8.00	41.00	8,940	8,413	36,503
9.00	42.00	10,050	9,495	45,998
10.00	43.00	11,217	10,634	56,631
11.00	44.00	12,440	11,829	68,460
11.34	44.34	12,869	4,303	72,762
12.00	45.00	13,721	8,775	81,537
13.00	46.00	15,057	14,389	95,926
14.00	47.00	16,450	15,753	111,679
15.00	48.00	17,900	17,175	128,854

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	0.00	0.00
Span (in)	= 12.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 19.95	39.26	0.00	0.00
Length (ft)	= 95.00	0.00	0.00	0.00
Slope (%)	= 1.50	0.00	0.00	n/a
N-Value	= .013	.013	.000	n/a
Orifice Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

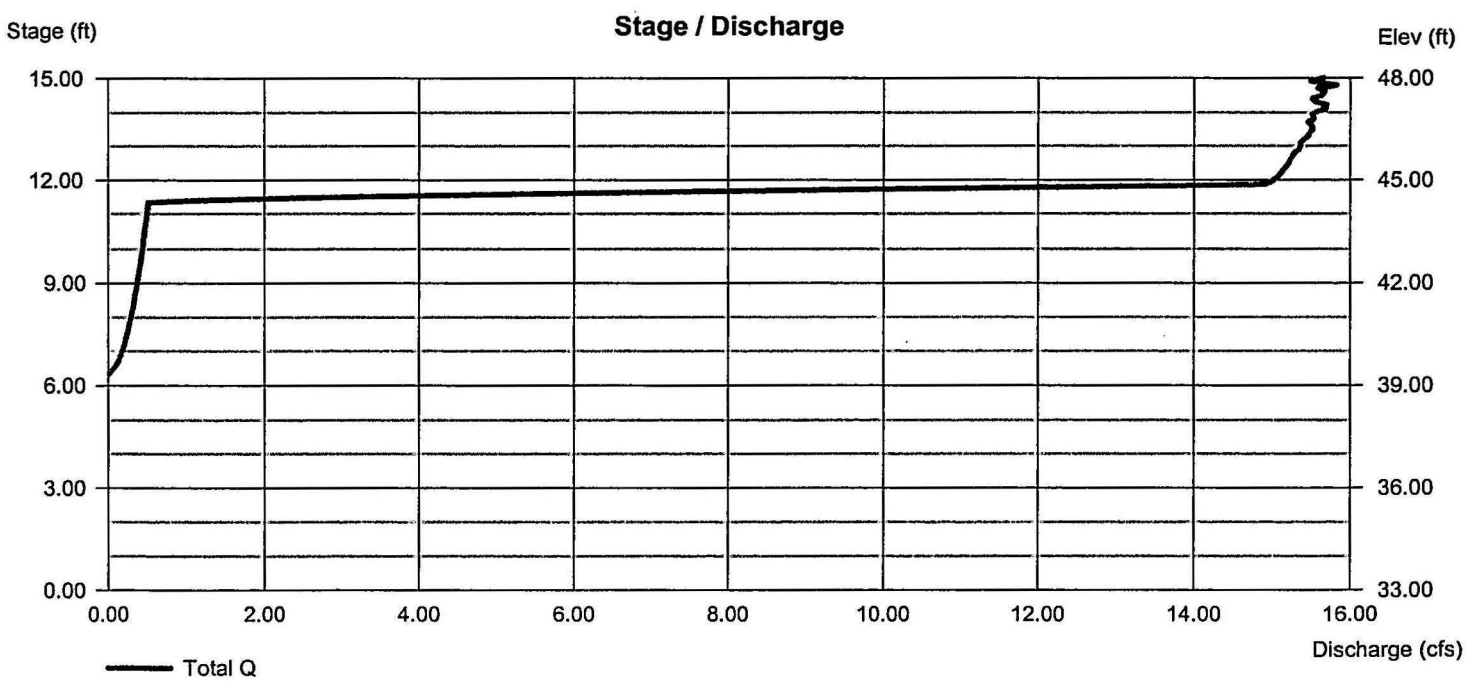
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.93	3.93	3.93	8.00
Crest El. (ft)	= 44.34	44.34	44.34	47.00
Weir Coeff.	= 3.33	3.33	3.33	2.60
Weir Type	= Rect	Rect	Rect	Broad
Multi-Stage	= Yes	Yes	Yes	Yes

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	----	4.395	5.346	----	----	7.283	----	----	10.20	Pre-Dev (Pre-BMP)
2	Mod. Rational	----	8.988	9.513	----	----	10.82	----	----	13.86	Post-Dev
3	Reservoir	2	0.383	0.431	----	----	0.521	----	----	13.81	Routed Mod Rational
5	SCS Runoff	----	17.78	24.16	----	----	47.03	----	----	65.14	1-Year SCS
6	Reservoir	5	0.441	0.511	----	----	15.20	----	----	15.70	Routed 1-yr SCS Storm

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	4.395	1	36	9,494	----	----	----	Pre-Dev (Pre-BMP)
2	Mod. Rational	8.988	1	11	24,323	----	----	----	Post-Dev
3	Reservoir	0.383	1	56	24,060	2	42.02	46,153	Routed Mod Rational
5	SCS Runoff	17.78	5	720	48,174	----	----	----	1-Year SCS
6	Reservoir	0.441	5	970	48,128	5	42.87	55,267	Routed 1-yr SCS Storm

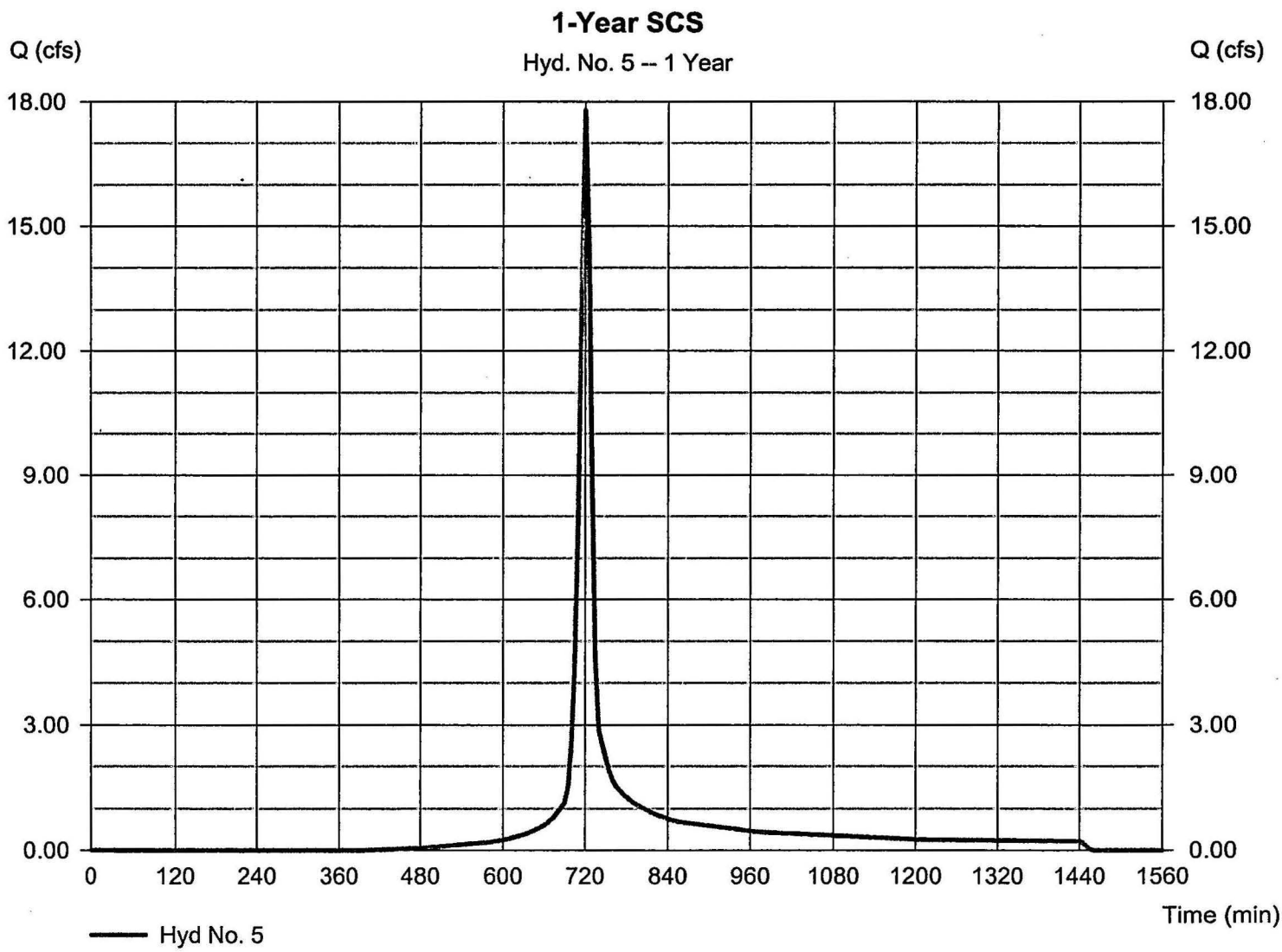
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 5

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 17.78 cfs
Storm frequency	= 1 yrs	Time to peak	= 720 min
Time interval	= 5 min	Hyd. volume	= 48,174 cuft
Drainage area	= 8.230 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

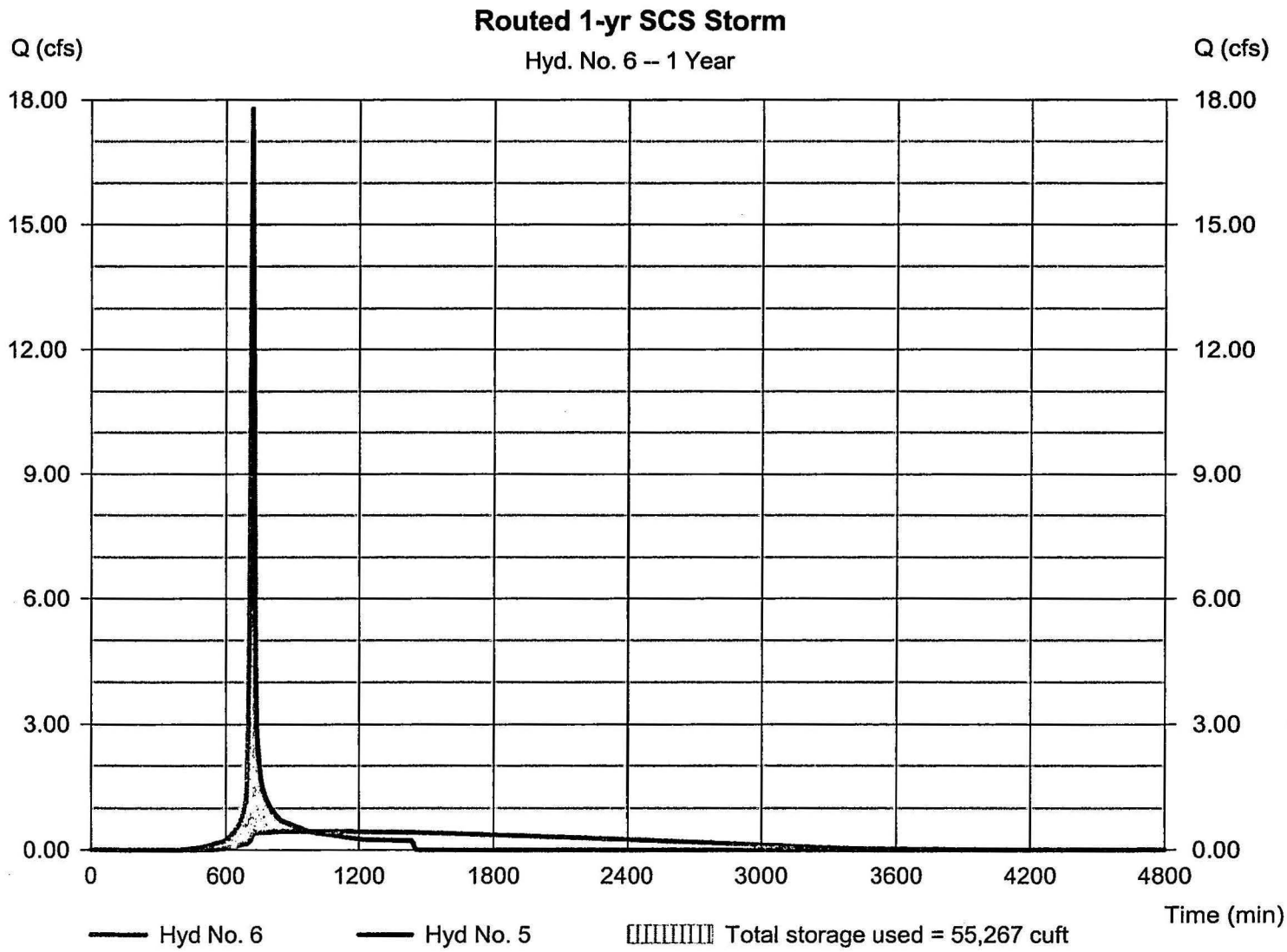
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 6

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 0.441 cfs
Storm frequency	= 1 yrs	Time to peak	= 970 min
Time interval	= 5 min	Hyd. volume	= 48,128 cuft
Inflow hyd. No.	= 5 - 1-Year SCS	Max. Elevation	= 42.87 ft
Reservoir name	= BMP #2	Max. Storage	= 55,267 cuft

Storage Indication method used. Wet pond routing start elevation = 39.26 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	5.346	1	36	11,548	-----	-----	-----	Pre-Dev (Pre-BMP)
2	Mod. Rational	9.513	1	11	32,021	-----	-----	-----	Post-Dev
3	Reservoir	0.431	1	67	31,651	2	42.71	53,540	Routed Mod Rational
5	SCS Runoff	24.16	5	720	66,019	-----	-----	-----	1-Year SCS
6	Reservoir	0.511	5	1025	65,972	5	44.05	69,128	Routed 1-yr SCS Storm

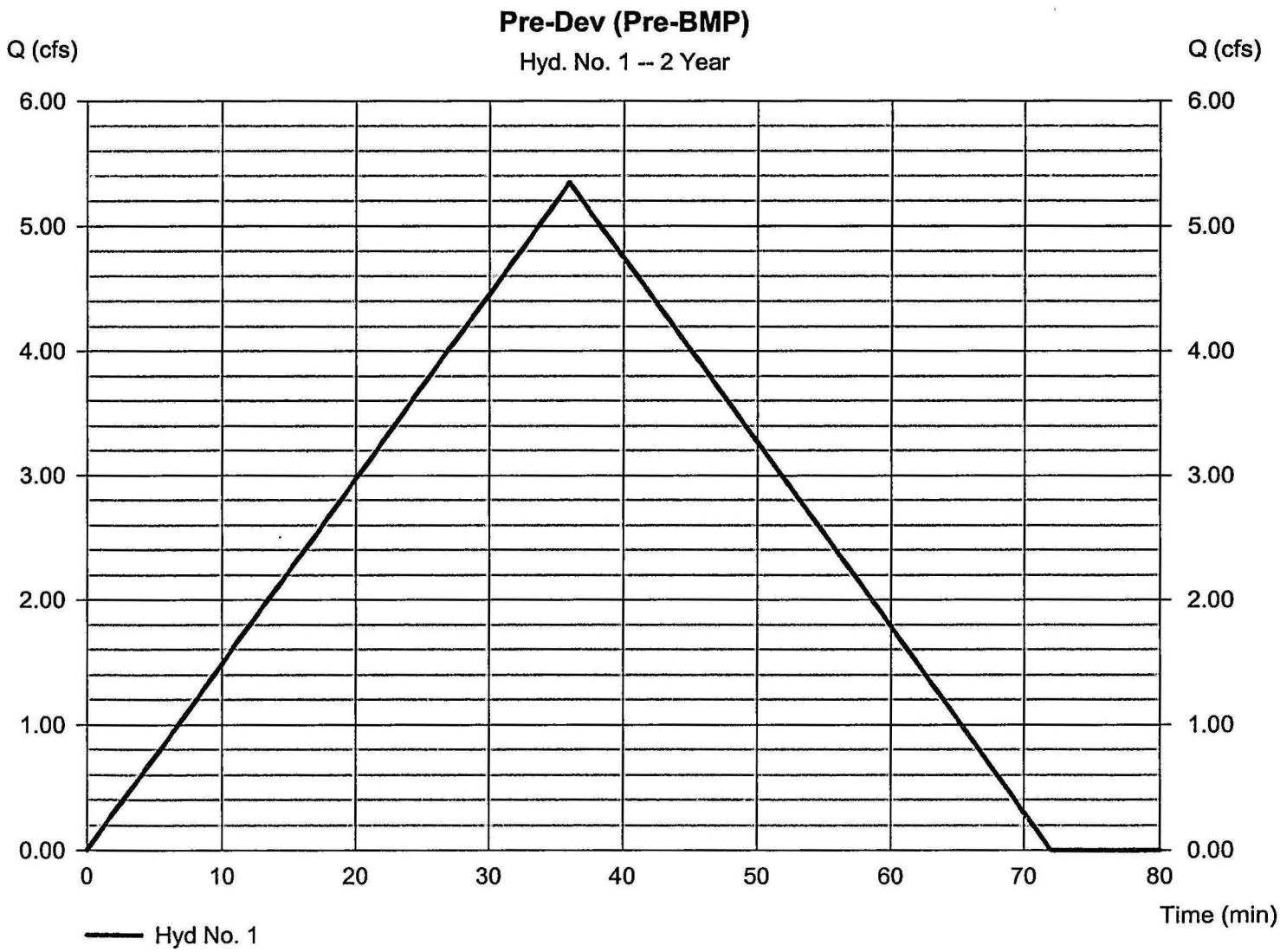
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 1

Pre-Dev (Pre-BMP)

Hydrograph type	= Rational	Peak discharge	= 5.346 cfs
Storm frequency	= 2 yrs	Time to peak	= 36 min
Time interval	= 1 min	Hyd. volume	= 11,548 cuft
Drainage area	= 4.840 ac	Runoff coeff.	= 0.46
Intensity	= 2.401 in/hr	Tc by User	= 36.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



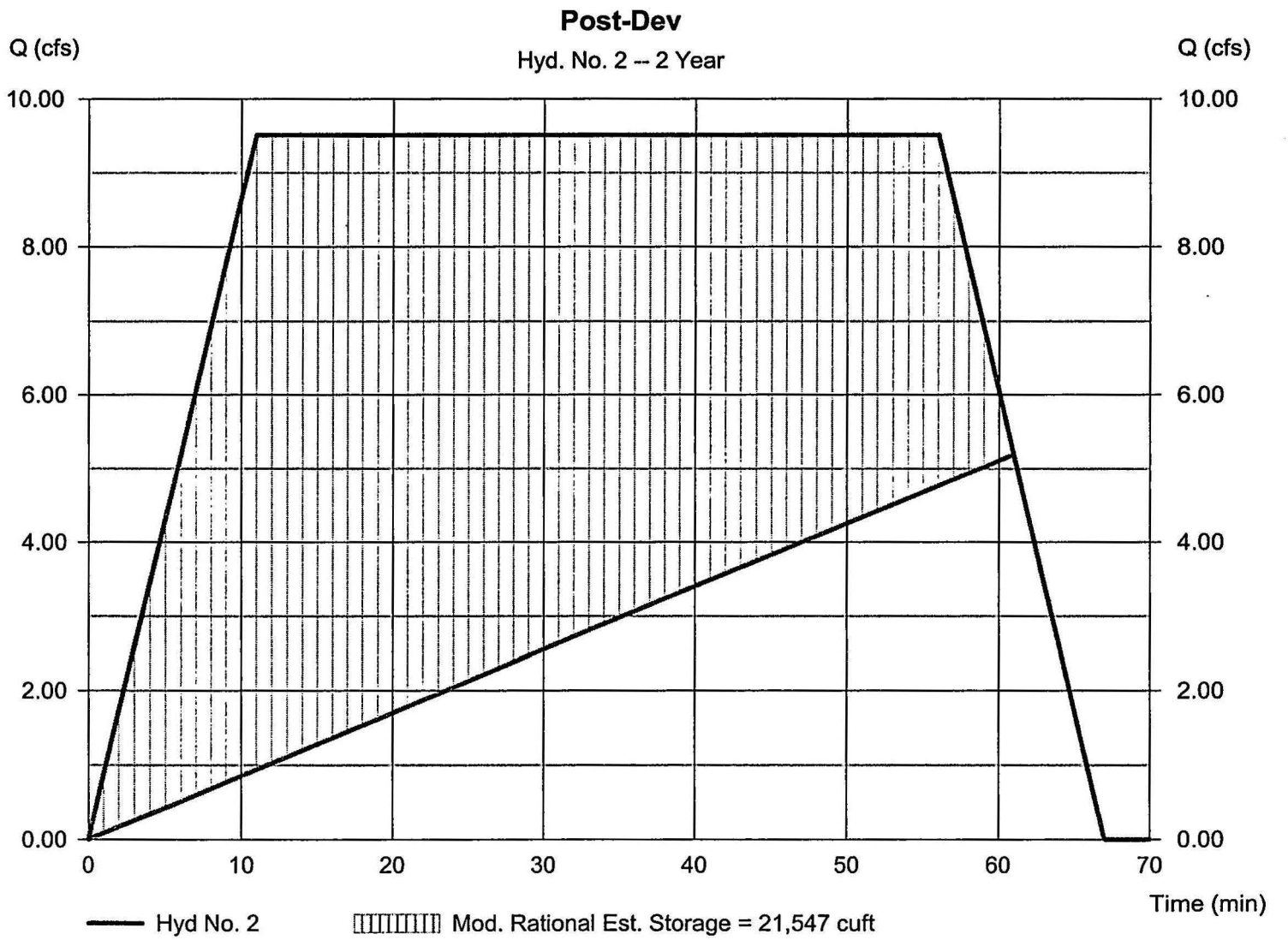
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Tuesday, Apr 20, 2010

Hyd. No. 2

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 9.513 cfs
Storm frequency	= 2 yrs	Time to peak	= 11 min
Time interval	= 1 min	Hyd. volume	= 32,021 cuft
Drainage area	= 8.230 ac	Runoff coeff.	= 0.65
Intensity	= 1.778 in/hr	Tc by User	= 11.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 5.1 x Tc
Target Q	= 5.100 cfs	Est. Req'd Storage	= 21,547 cuft



Hydrograph Report

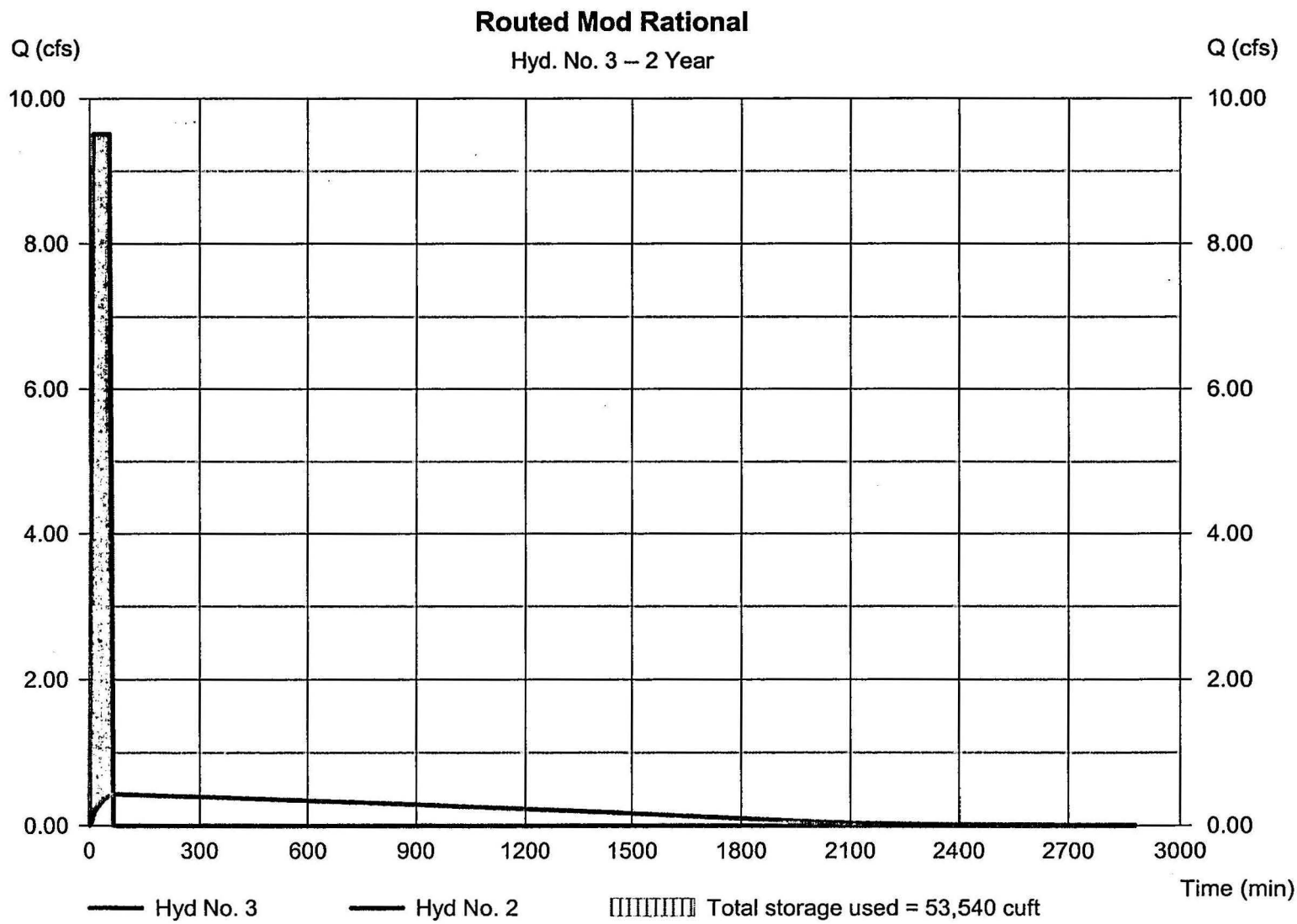
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 3

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 0.431 cfs
Storm frequency	= 2 yrs	Time to peak	= 67 min
Time interval	= 1 min	Hyd. volume	= 31,651 cuft
Inflow hyd. No.	= 2 - Post-Dev	Max. Elevation	= 42.71 ft
Reservoir name	= BMP #2	Max. Storage	= 53,540 cuft

Storage Indication method used. Wet pond routing start elevation = 39.26 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	7.283	1	36	15,731	-----	-----	-----	Pre-Dev (Pre-BMP)
2	Mod. Rational	10.82	1	11	50,697	-----	-----	-----	Post-Dev
3	Reservoir	0.521	1	88	49,864	2	44.24	71,469	Routed Mod Rational
5	SCS Runoff	47.03	5	720	132,629	-----	-----	-----	1-Year SCS
6	Reservoir	15.20	5	735	132,582	5	45.50	88,099	Routed 1-yr SCS Storm

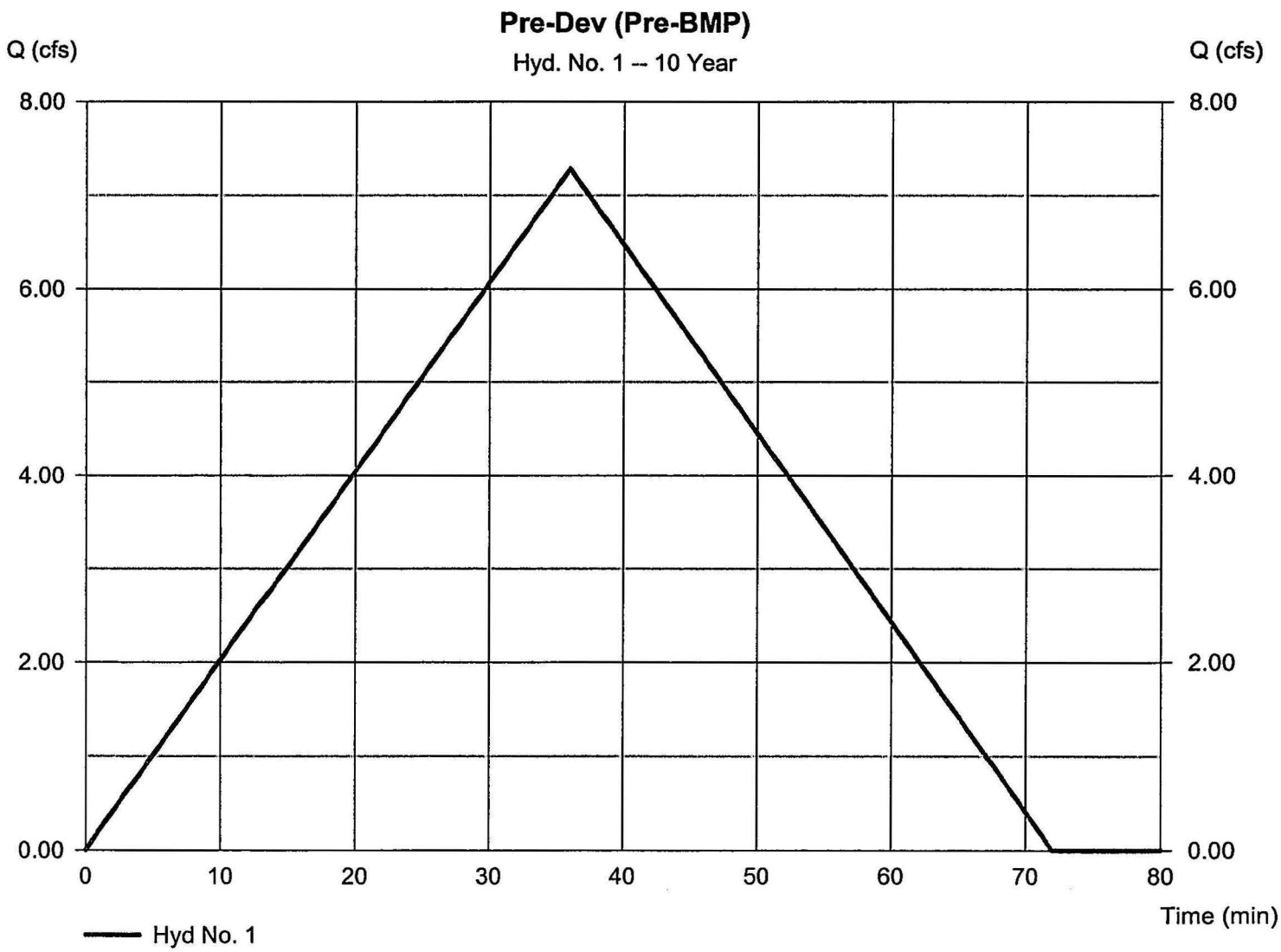
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 1

Pre-Dev (Pre-BMP)

Hydrograph type	= Rational	Peak discharge	= 7.283 cfs
Storm frequency	= 10 yrs	Time to peak	= 36 min
Time interval	= 1 min	Hyd. volume	= 15,731 cuft
Drainage area	= 4.840 ac	Runoff coeff.	= 0.46
Intensity	= 3.271 in/hr	Tc by User	= 36.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



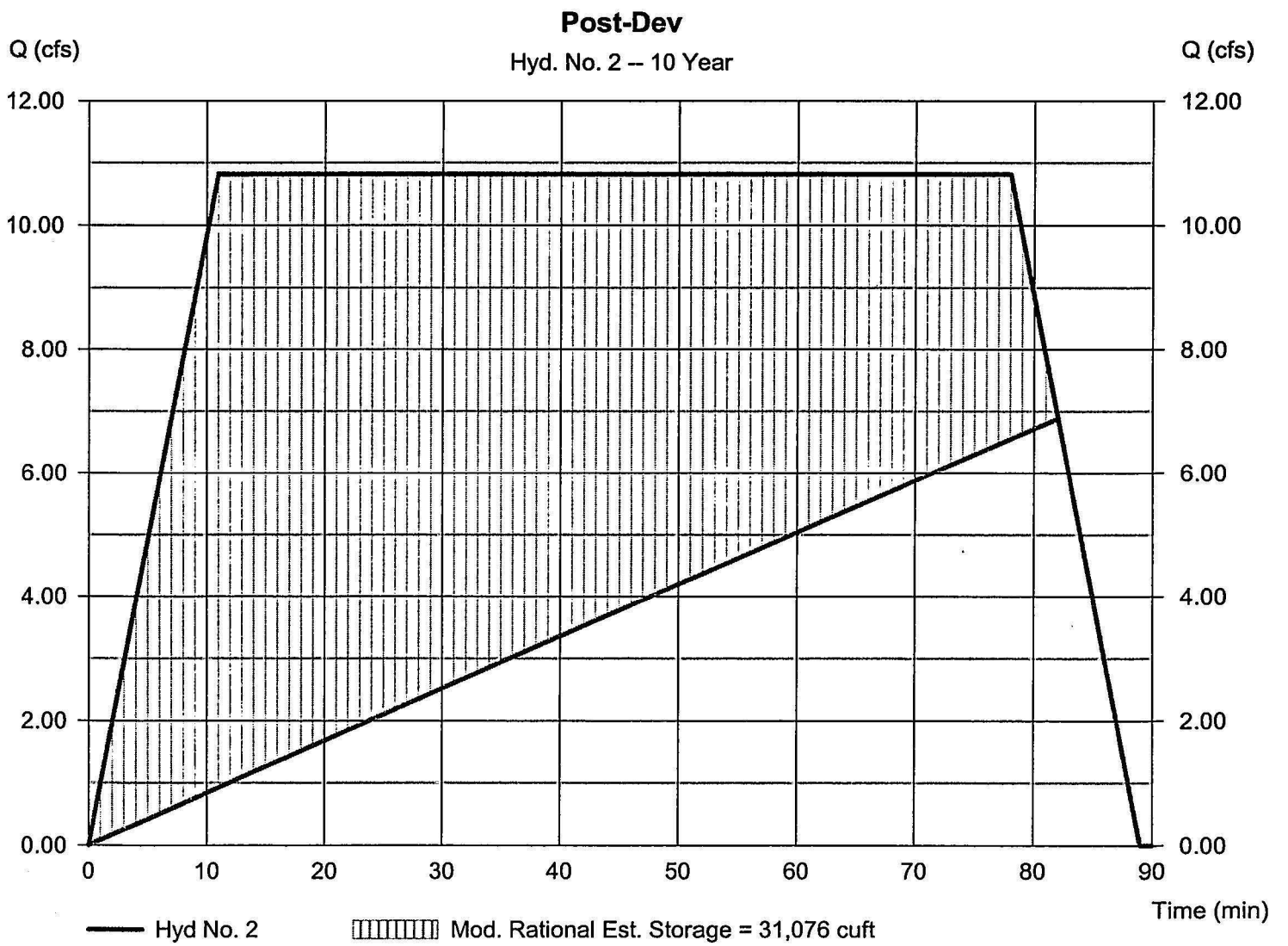
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Tuesday, Apr 20, 2010

Hyd. No. 2

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 10.82 cfs
Storm frequency	= 10 yrs	Time to peak	= 11 min
Time interval	= 1 min	Hyd. volume	= 50,697 cuft
Drainage area	= 8.230 ac	Runoff coeff.	= 0.65
Intensity	= 2.022 in/hr	Tc by User	= 11.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 7.1 x Tc
Target Q	= 7.270 cfs	Est. Req'd Storage	= 31,076 cuft



Hydrograph Report

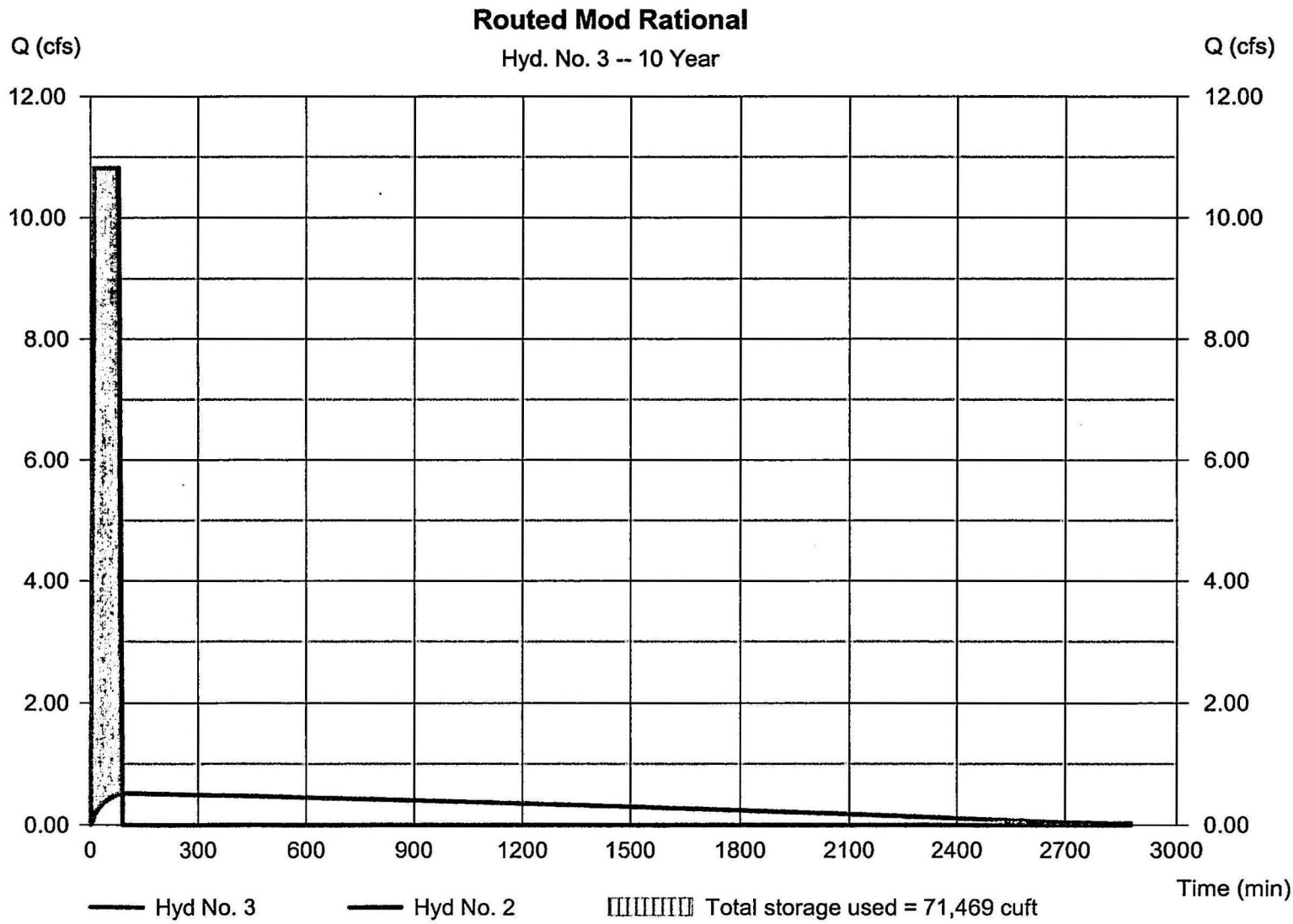
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 3

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 0.521 cfs
Storm frequency	= 10 yrs	Time to peak	= 88 min
Time interval	= 1 min	Hyd. volume	= 49,864 cuft
Inflow hyd. No.	= 2 - Post-Dev	Max. Elevation	= 44.24 ft
Reservoir name	= BMP #2	Max. Storage	= 71,469 cuft

Storage Indication method used. Wet pond routing start elevation = 39.26 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	10.20	1	36	22,025	-----	-----	-----	Pre-Dev (Pre-BMP)
2	Mod. Rational	13.86	1	11	90,531	-----	-----	-----	Post-Dev
3	Reservoir	13.81	1	108	88,836	2	44.83	79,307	Routed Mod Rational
5	SCS Runoff	65.14	5	720	187,282	-----	-----	-----	1-Year SCS
6	Reservoir	15.70	5	735	187,235	5	47.20	114,999	Routed 1-yr SCS Storm

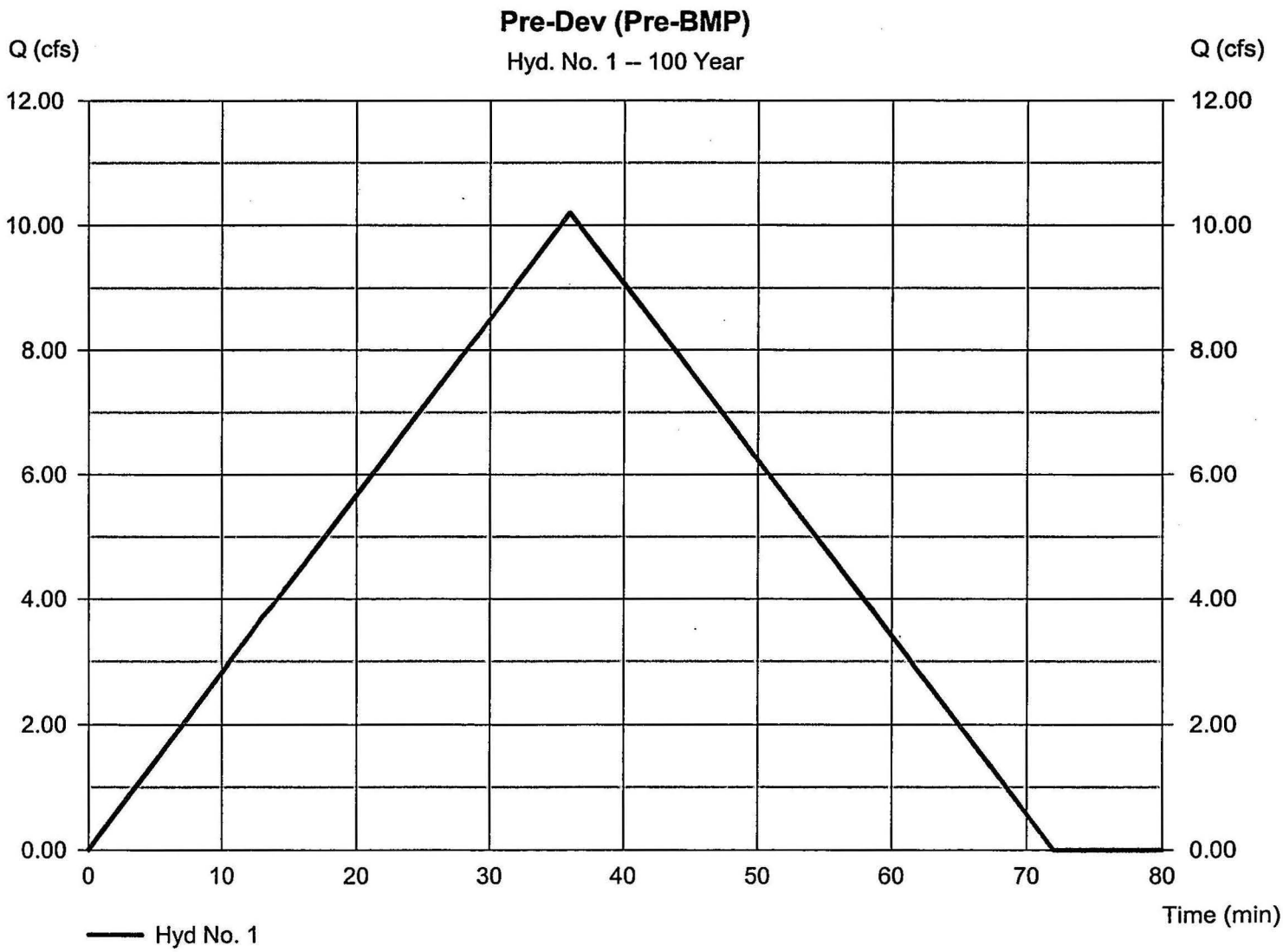
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 1

Pre-Dev (Pre-BMP)

Hydrograph type	= Rational	Peak discharge	= 10.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 36 min
Time interval	= 1 min	Hyd. volume	= 22,025 cuft
Drainage area	= 4.840 ac	Runoff coeff.	= 0.46
Intensity	= 4.580 in/hr	Tc by User	= 36.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



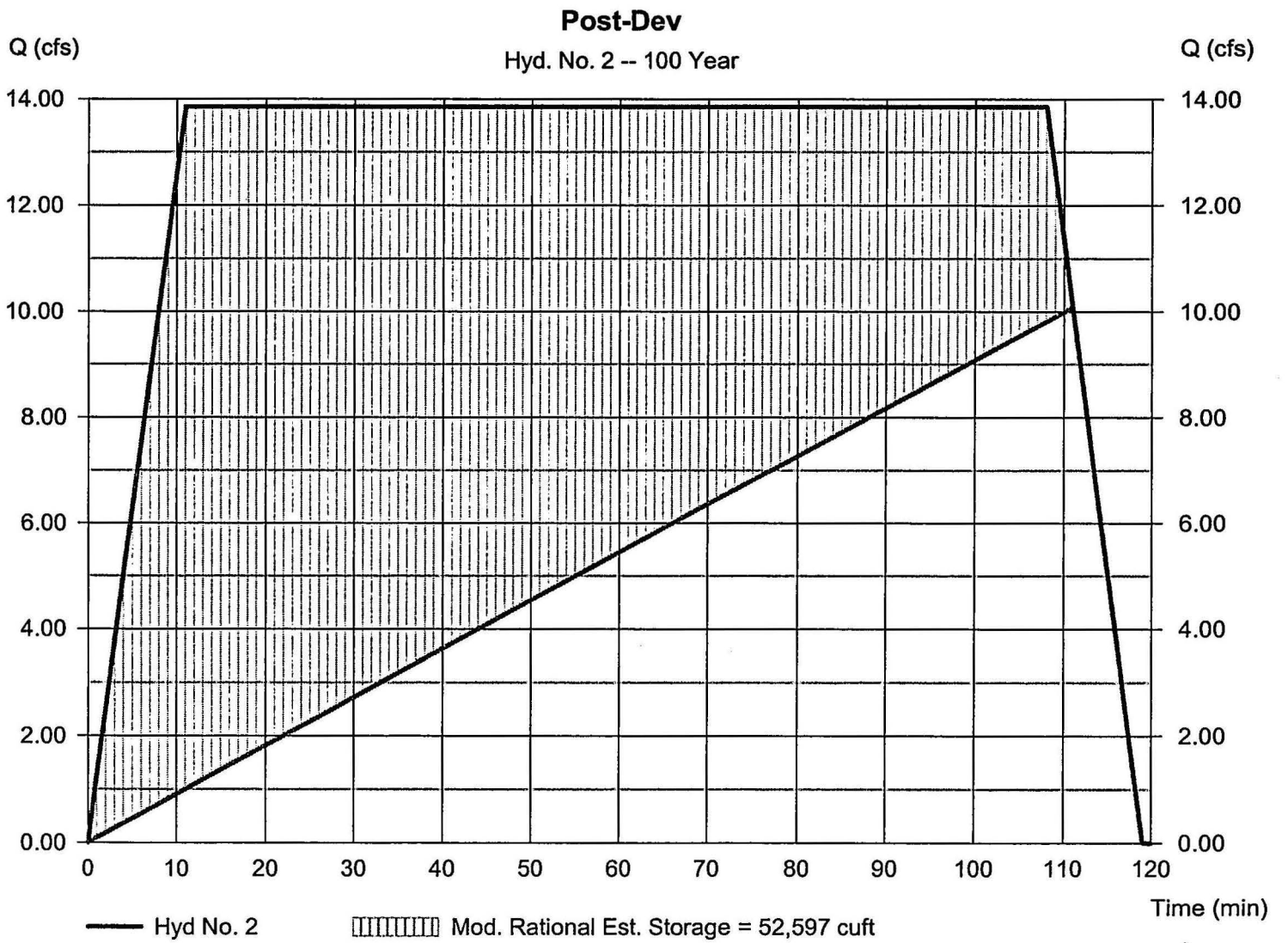
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Tuesday, Apr 20, 2010

Hyd. No. 2

Post-Dev

Hydrograph type	= Mod. Rational	Peak discharge	= 13.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 11 min
Time interval	= 1 min	Hyd. volume	= 90,531 cuft
Drainage area	= 8.230 ac	Runoff coeff.	= 0.65
Intensity	= 2.590 in/hr	Tc by User	= 11.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 9.9 x Tc
Target Q	= 10.35 cfs	Est. Req'd Storage	= 52,597 cuft



Hydrograph Report

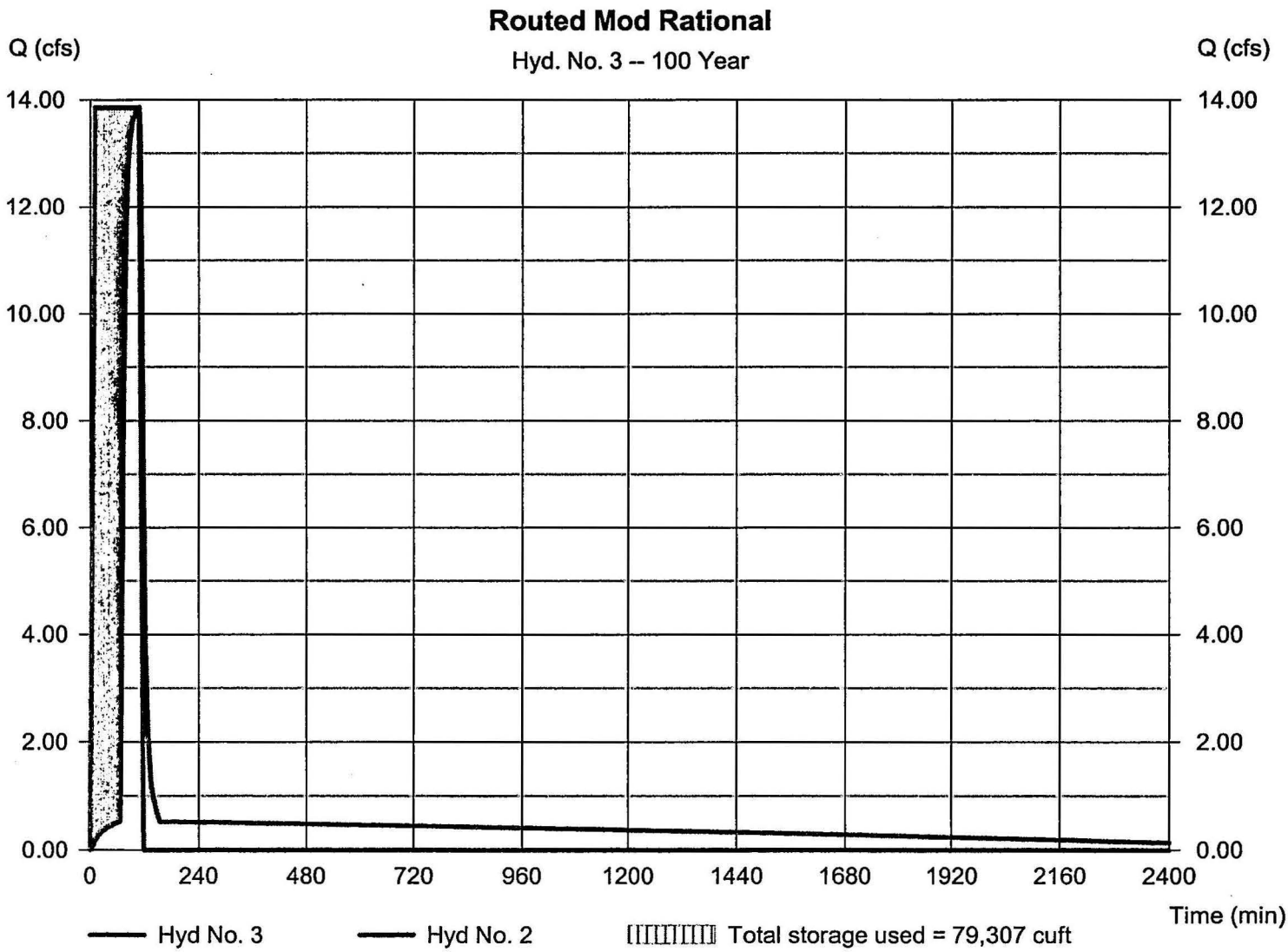
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Tuesday, Apr 20, 2010

Hyd. No. 3

Routed Mod Rational

Hydrograph type	= Reservoir	Peak discharge	= 13.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 108 min
Time interval	= 1 min	Hyd. volume	= 88,836 cuft
Inflow hyd. No.	= 2 - Post-Dev	Max. Elevation	= 44.83 ft
Reservoir name	= BMP #2	Max. Storage	= 79,307 cuft

Storage Indication method used. Wet pond routing start elevation = 39.26 ft.



BMP #6

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Runoff Coefficients
Date:	April 21, 2010
Calculated By:	NB

Runoff Coefficients used in the following calculations were taken from Table 4-3 of the Virginia Stormwater Management Handbook.

Subject Area: Pre-Development - BMP #6 Drainage Area

Area Description	Impervious	Open		
	0.90	0.30		
BMP #6 Drainage Area		3.18		

Total Area	C x A	Weighted C
3.18	0.95	0.30
0.00	0.00	
0.00	0.00	
0.00	0.00	

Subject Area: Post-Development - BMP #6 Drainage Area

Area Description	Impervious	Open		
	0.90	0.30		
BMP #6 Drainage Area	1.93	1.25		

Total Area	C x A	Weighted C
3.18	2.11	0.66
0.00	0.00	
0.00	0.00	
0.00	0.00	

AES
CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Runoff Curve Number
	BMP #6
Date:	April 21, 2010
Calculated By:	TRS

Runoff Curve Numbers used in the following calculations were taken from Table 5-5 of the Virginia Erosion and Sediment Control Handbook

Subject Area: Post Development BMP #6

Soil Name and Hydrologic Group	Cover Description	CN	Area	CN x Area
C	Brush, weed, grass mix - Poor	77	1.25	96.25
C	Impervious Areas, C	98	1.93	189.14
		Totals =	3.18	285.39

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{285.39}{3.18} = 89.7$$

Use CN = 90

AES CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	1 yr-24 hr Drawdown Calc. (Kerplunk Method)
	BMP #6
Date:	April 21, 2010
Calculated By:	TRS

Channel Protection Volume:

Drainage Area	=	3.18	Acres
Runoff Curve No.	=	90	
1-Yr, 24-Hr Storm Volume	=	2.8	Inches

Direct Runoff (From TR55 Equations 2-3 & 2-4)

Q = 1.80 inches

Channel Protection Volume = DA x Q x 60% (Virginia Stormwater Managment Handbook section 5-6.2 - Method 2)

Vcp = 3.44 Ac-in = 12,476 cubic feet

Determine Volume of Pond by Contour (starting at invert of low flow orifice):

Elevation	Incremental Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)	Incremental Avg Head[1] (feet)	Incremental Avg Flow[1] (feet)	Incremental Drawdown Time[1] (hrs)
51.0	0.0	6,983	-	-	-	-			
52.0	1.0	13,381	10,182	377	10,182	377	0.50	0.14	19.54
53.0	1.0	14,831	14,106	522	24,288	900	1.08	0.23	2.76
54.0	1.0	16,336	15,584	577	39,872	1,477	0.00	0.00	0.00
55.0	1.0	17,889	17,113	634	56,984	2,111	0.00	0.00	0.00
	0.0		-	-	56,984	2,111	0.00	0.00	0.00
	0.0		-	-	56,984	2,111	0.00	0.00	0.00
	0.0		-	-	56,984	2,111	0.00	0.00	0.00
	0.0		-	-	56,984	2,111	0.00	0.00	0.00
	0.0		-	-	56,984	2,111	0.00	0.00	0.00
		Total	56,984	2,111					22.30

[1] Incremental values computed from Channel Protection Volume Elevation

Elevation of Low Flow Orifice Invert	=	51.00	feet
Elevation of 1-yr, 24-hr Storage Volume	=	52.16	feet
Size of Orifice	=	3.00	inches
Total Average Drawdown Time	=	22.30	hrs

AES CONSULTING ENGINEERS

Project: Wmbg. Landing - Woodhaven Phase II
Project No.: 8162-06
Subject: Sediment Forebay Design
BMP #6
Date: April 21, 2010
Calculated By: TRS

Required Forebay Volume = 0.1 in. x 1.93 acres of impervious coverage

= (0.1 / 12) x (43,560 x 1.93) = 701 CF

Forebay Volume Provided = 1001 CF Elevation = 49.00

Stage (FT)	Elevation (FT)	Area (SF)	Incremental Volume (CF)	Total Volume (CF)
0	46	12		0
			81	
1	47	150		81
			294	
2	48	438		375
			626	
3	49	814		1001
			0	
				1001
			0	
				1001

AES CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Water Quality Volume
	BMP #6
Date:	April 21, 2010
Calculated By:	TRS

BMP Type = **Retention Basin III**

Water Quality Volume = 0.5 in. x **1.93** acres of impervious coverage

= (0.5 / 12) x (43,560 x **1.93**)

= **3503** CF

Total Storage Volume Required = **4** x Water Quality Volume

= **4** x **3503**

= **14012** CF

Min. Wet Storage Volume Required = **2** x Water Quality Volume

= **2** x **3503**

= **7006** CF

Wet Storage Volume Provided = **12683** CF Elevation = **51.00 (Normal Pool)**

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **3503**

= **7006** CF

Dry Storage Volume Provided = **15649** CF Elevation = **52.40 (Top of Riser)**

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816206 BMP#6.gpw

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Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	Rational	------	3.161	3.740	------	------	4.900	------	------	6.508	Pre-Development
2	Mod. Rational	------	4.988	5.516	------	------	6.165	------	------	7.012	Post-Development
3	Reservoir	2	0.192	0.220	------	------	0.265	------	------	4.877	Routed
5	SCS Runoff	------	8.969	12.04	------	------	22.94	------	------	31.56	1-Year SCS
6	Reservoir	5	0.250	0.682	------	------	5.337	------	------	7.105	Routed 1-yr SCS Storm

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	3.161	1	15	2,845	-----	-----	-----	Pre-Development
2	Mod. Rational	4.988	1	8	8,140	-----	-----	-----	Post-Development
3	Reservoir	0.192	1	35	7,942	2	51.79	20,537	Routed
5	SCS Runoff	8.969	2	718	20,794	-----	-----	-----	1-Year SCS
6	Reservoir	0.250	2	894	20,744	5	52.24	26,122	Routed 1-yr SCS Storm

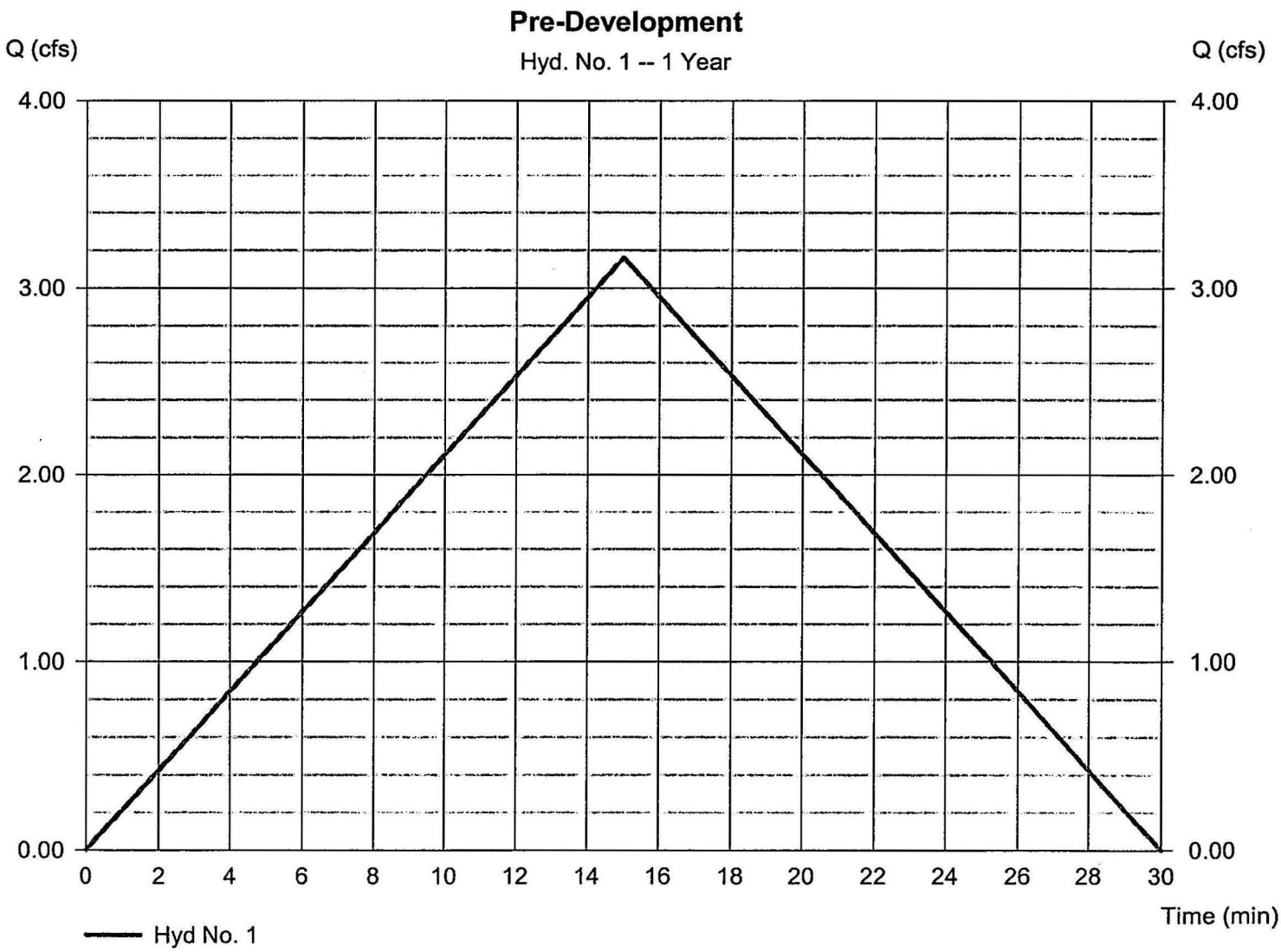
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 3.161 cfs
Storm frequency	= 1 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 2,845 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.3
Intensity	= 3.313 in/hr	Tc by User	= 15.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



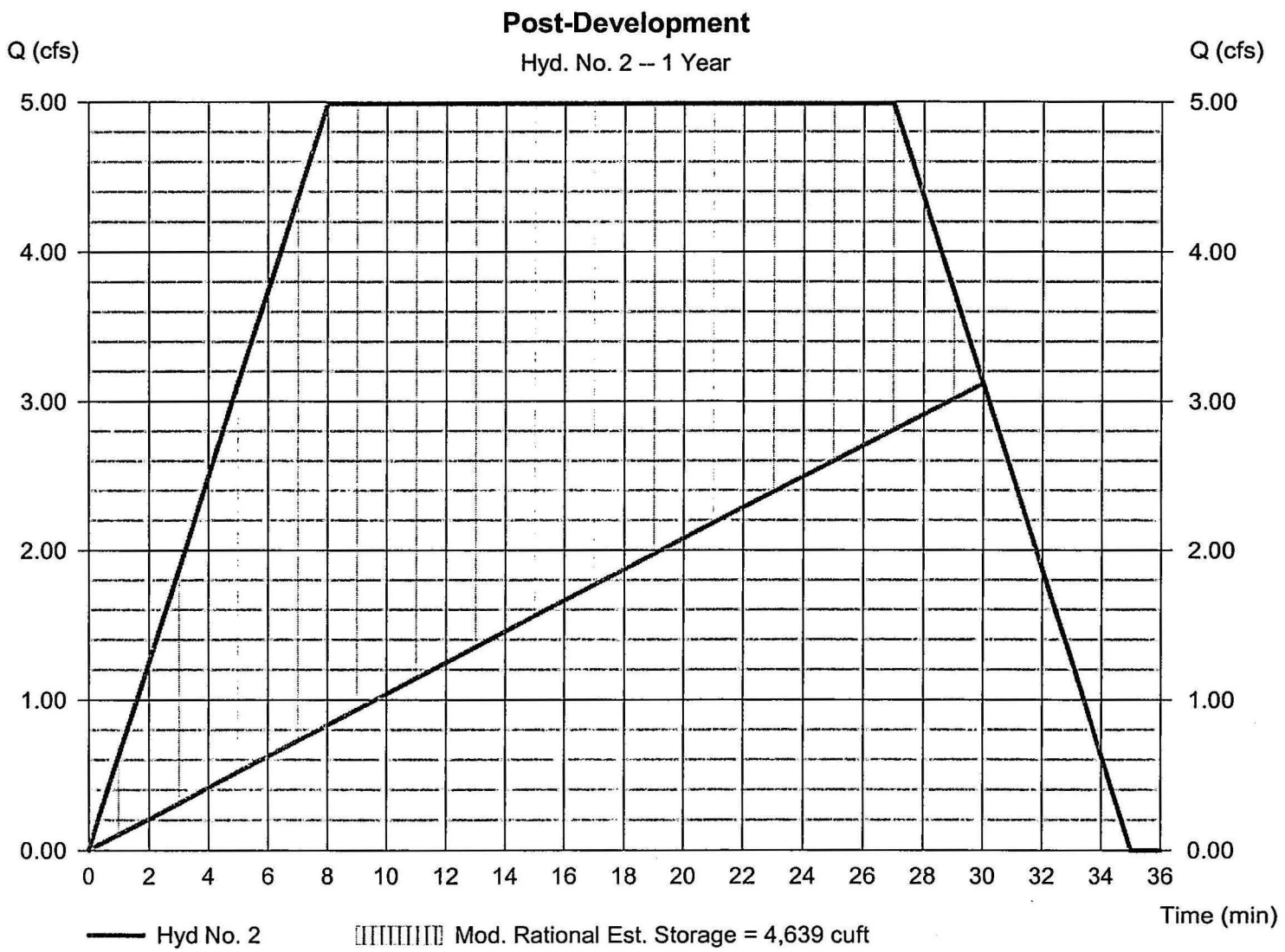
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 4.988 cfs
Storm frequency	= 1 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 8,140 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 2.376 in/hr	Tc by User	= 8.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 3.4 x Tc
Target Q	= 3.200 cfs	Est. Req'd Storage	= 4,639 cuft



Hydrograph Report

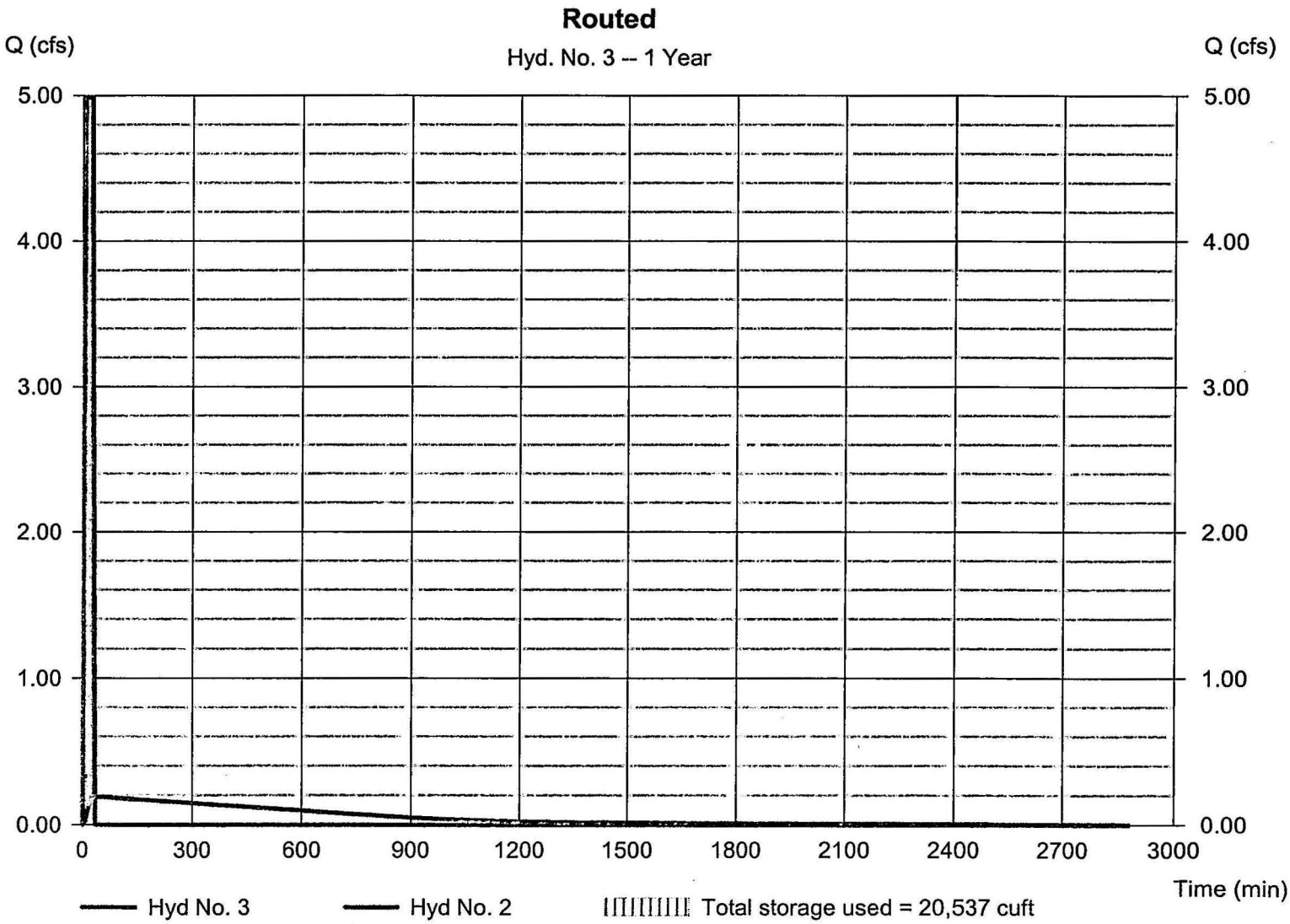
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.192 cfs
Storm frequency	= 1 yrs	Time to peak	= 35 min
Time interval	= 1 min	Hyd. volume	= 7,942 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 51.79 ft
Reservoir name	= BMP #6	Max. Storage	= 20,537 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Pond No. 2 - BMP #6

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 46.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	46.00	564	0	0
1.00	47.00	1,107	820	820
2.00	48.00	1,815	1,446	2,267
3.00	49.00	2,625	2,207	4,474
4.00	50.00	3,515	3,059	7,533
5.00	51.00	6,983	5,150	12,683
6.00	52.00	13,381	10,009	22,692
7.00	53.00	14,831	14,098	36,791
8.00	54.00	16,336	15,576	52,367
9.00	55.00	17,899	17,110	69,476

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	3.00	0.00	0.00
Span (in)	= 15.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 46.00	51.00	0.00	0.00
Length (ft)	= 176.00	27.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

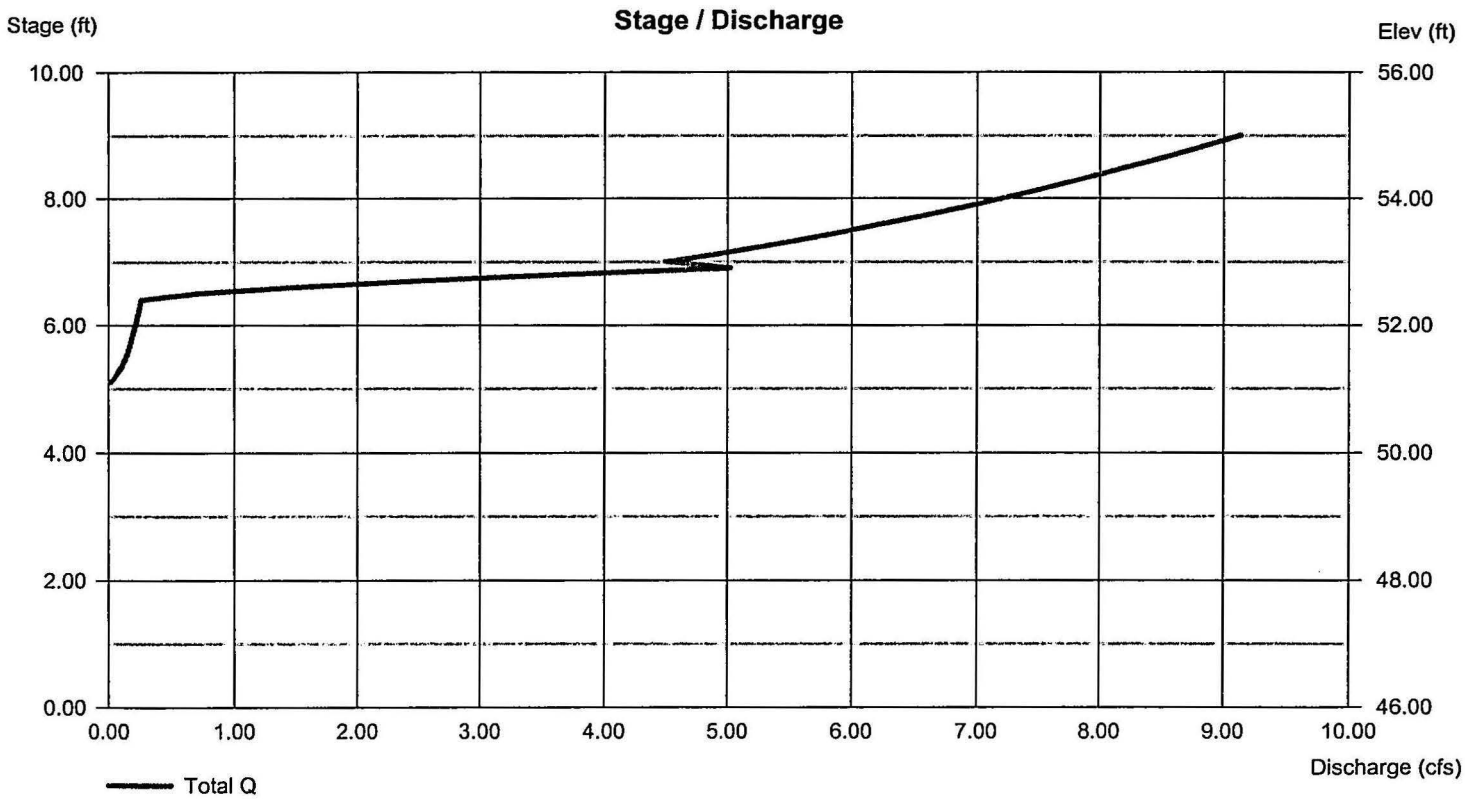
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	Inactive	0.00	0.00
Crest El. (ft)	= 52.40	53.40	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



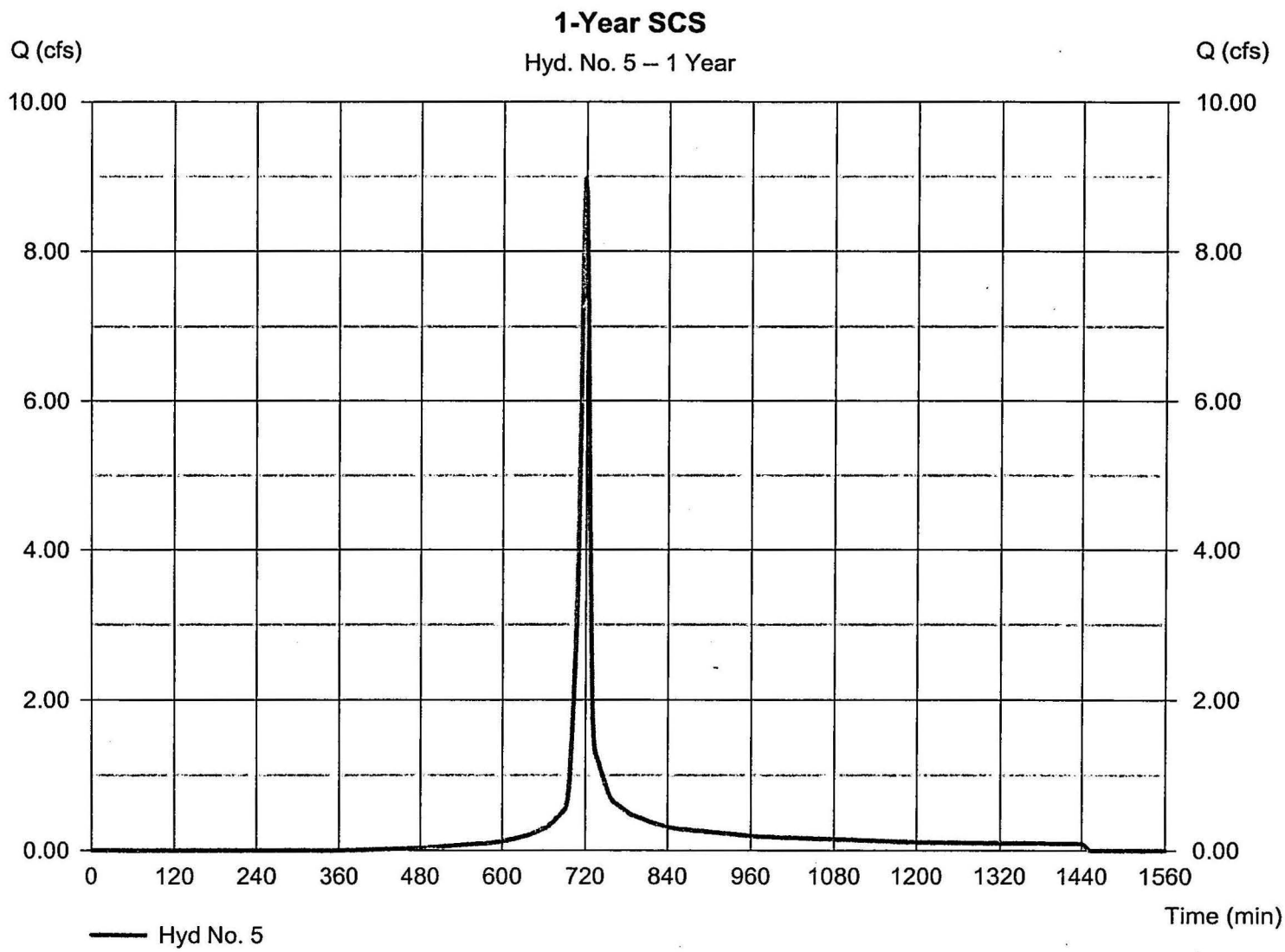
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 5

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 8.969 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 20,794 cuft
Drainage area	= 3.180 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

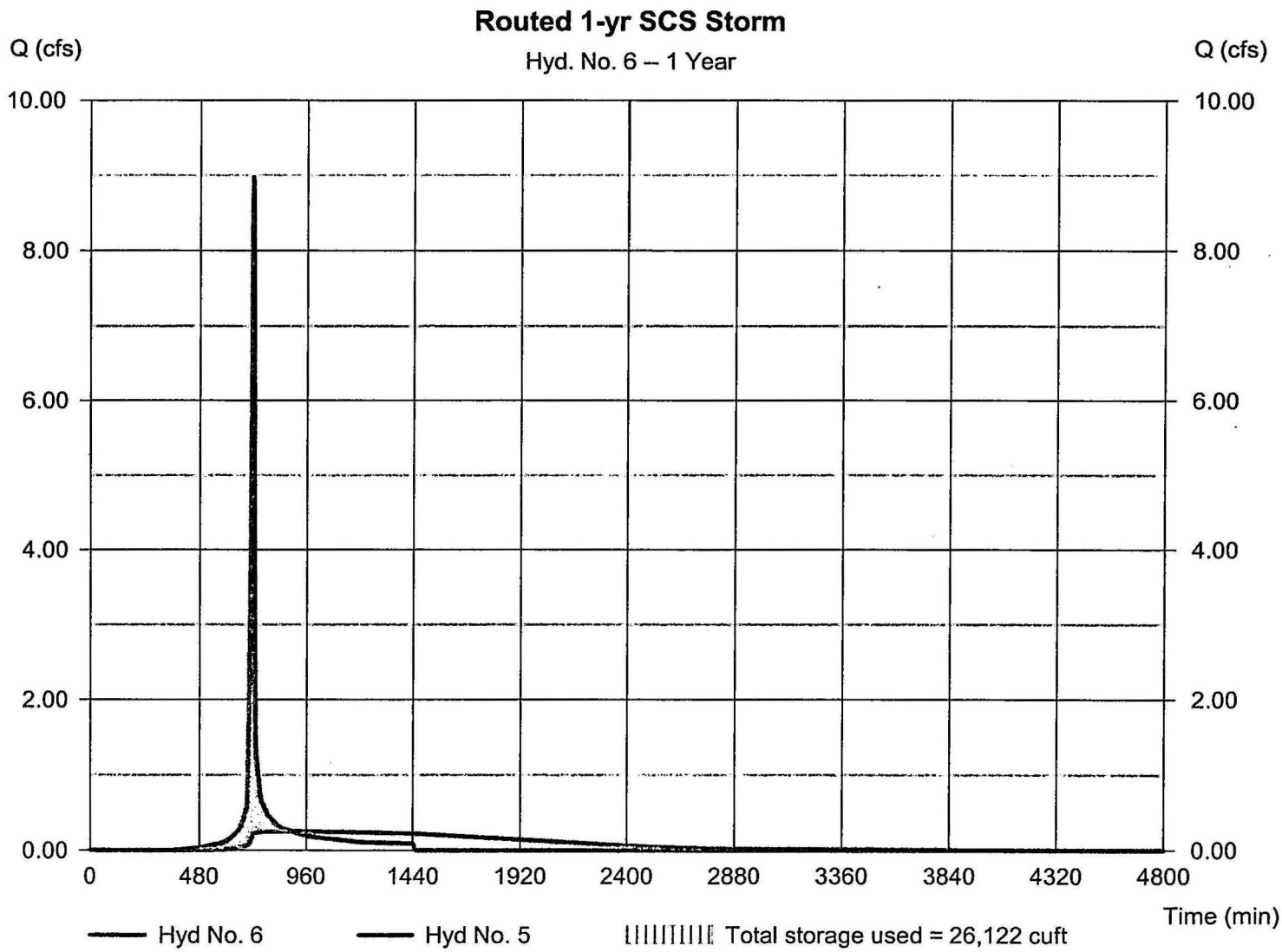
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 6

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 0.250 cfs
Storm frequency	= 1 yrs	Time to peak	= 894 min
Time interval	= 2 min	Hyd. volume	= 20,744 cuft
Inflow hyd. No.	= 5 - 1-Year SCS	Max. Elevation	= 52.24 ft
Reservoir name	= BMP #6	Max. Storage	= 26,122 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Pond No. 2 - BMP #6

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 46.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	46.00	564	0	0
1.00	47.00	1,107	820	820
2.00	48.00	1,815	1,446	2,267
3.00	49.00	2,625	2,207	4,474
4.00	50.00	3,515	3,059	7,533
5.00	51.00	6,983	5,150	12,683
6.00	52.00	13,381	10,009	22,692
7.00	53.00	14,831	14,098	36,791
8.00	54.00	16,336	15,576	52,367
9.00	55.00	17,899	17,110	69,476

Culvert / Orifice Structures

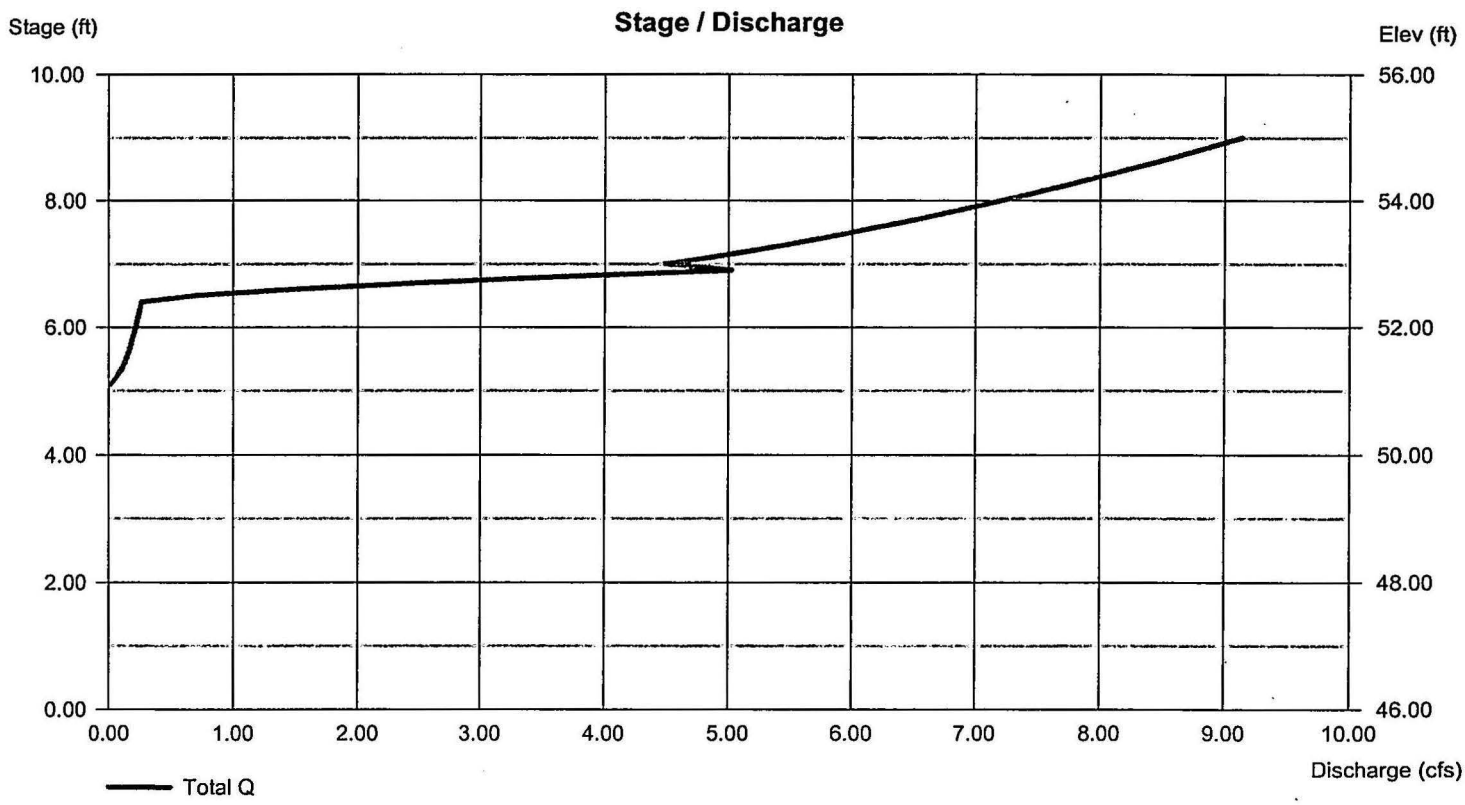
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	3.00	0.00	0.00
Span (in)	= 15.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 46.00	51.00	0.00	0.00
Length (ft)	= 176.00	27.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	Inactive	0.00	0.00
Crest El. (ft)	= 52.40	53.40	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	3.740	1	15	3,366	-----	-----	-----	Pre-Development
2	Mod. Rational	5.516	1	8	10,325	-----	-----	-----	Post-Development
3	Reservoir	0.220	1	39	10,089	2	52.00	22,644	Routed
5	SCS Runoff	12.04	2	718	28,258	-----	-----	-----	1-Year SCS
6	Reservoir	0.682	2	780	28,208	5	52.50	29,689	Routed 1-yr SCS Storm

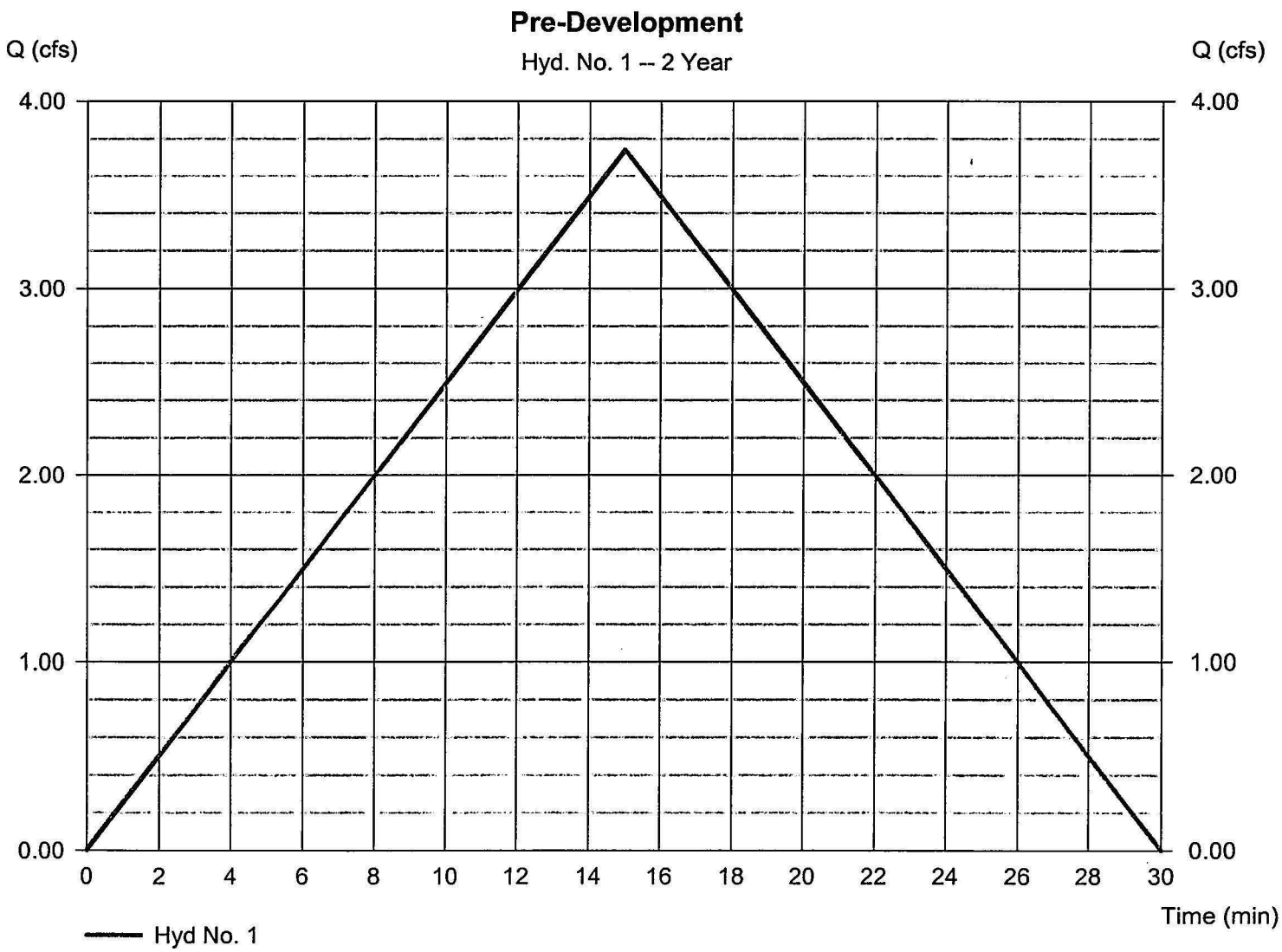
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 3.740 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 3,366 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.3
Intensity	= 3.921 in/hr	Tc by User	= 15.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



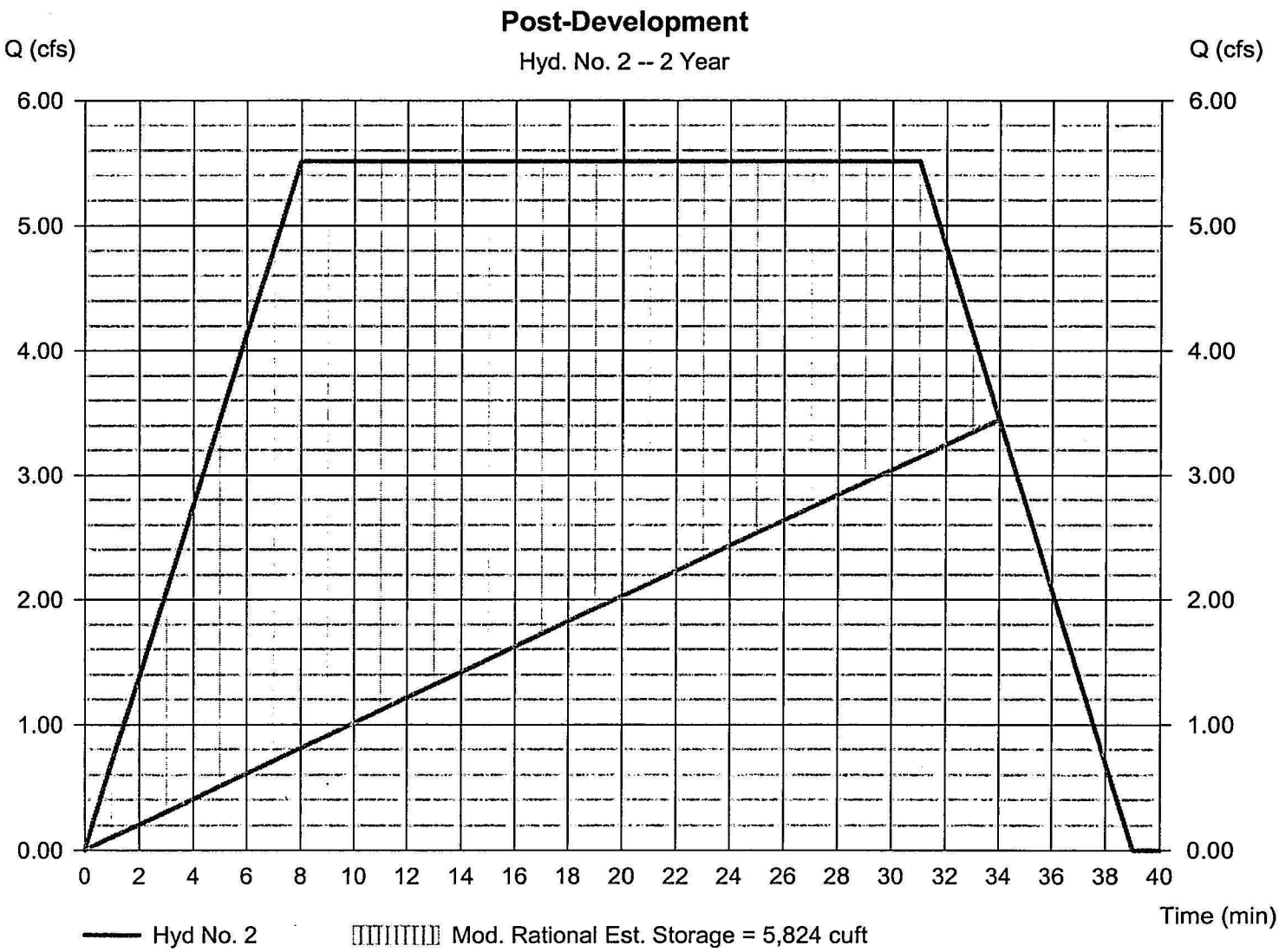
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 5.516 cfs
Storm frequency	= 2 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 10,325 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 2.628 in/hr	Tc by User	= 8.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 3.9 x Tc
Target Q	= 3.740 cfs	Est. Req'd Storage	= 5,824 cuft



Hydrograph Report

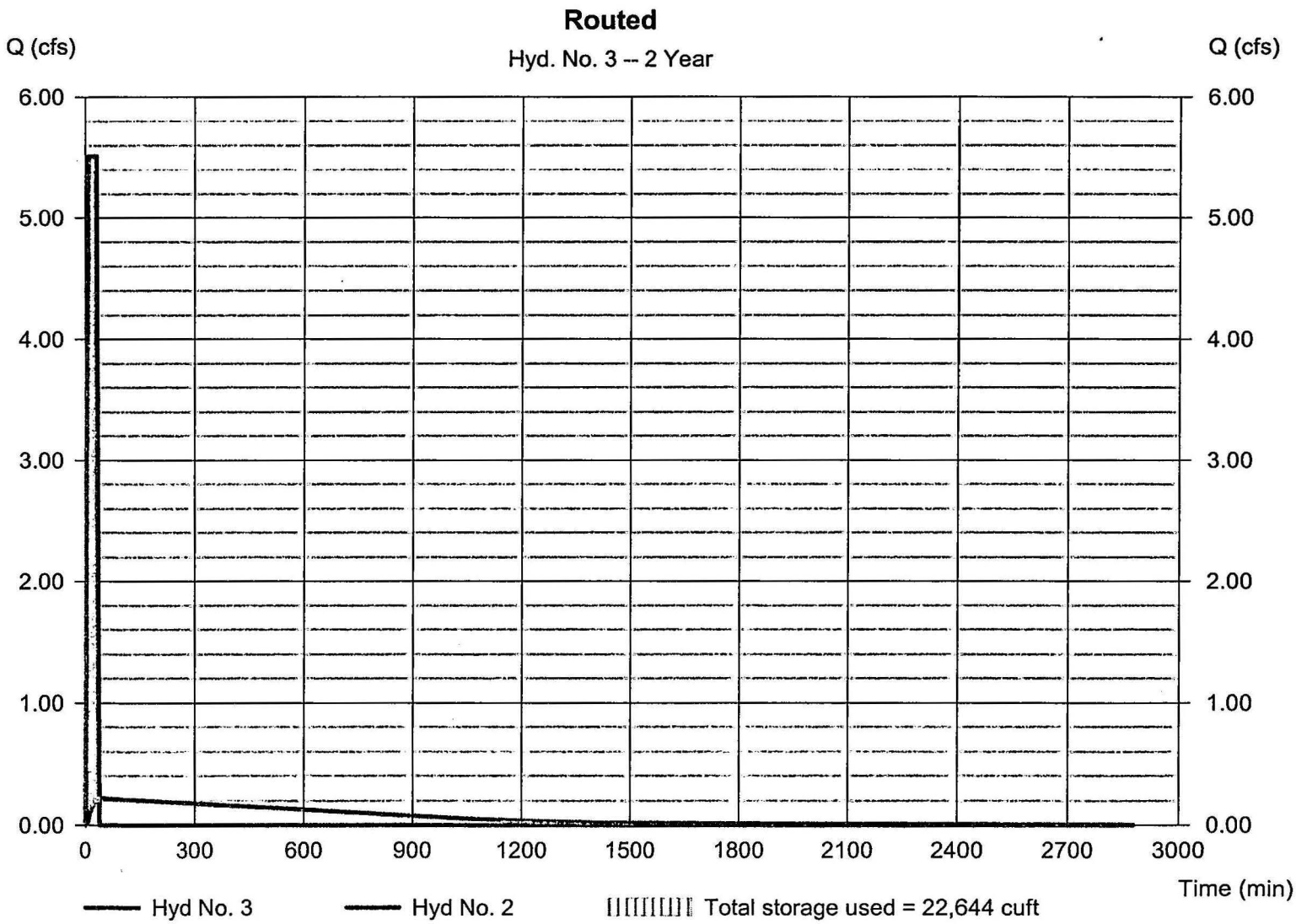
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.220 cfs
Storm frequency	= 2 yrs	Time to peak	= 39 min
Time interval	= 1 min	Hyd. volume	= 10,089 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 52.00 ft
Reservoir name	= BMP #6	Max. Storage	= 22,644 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



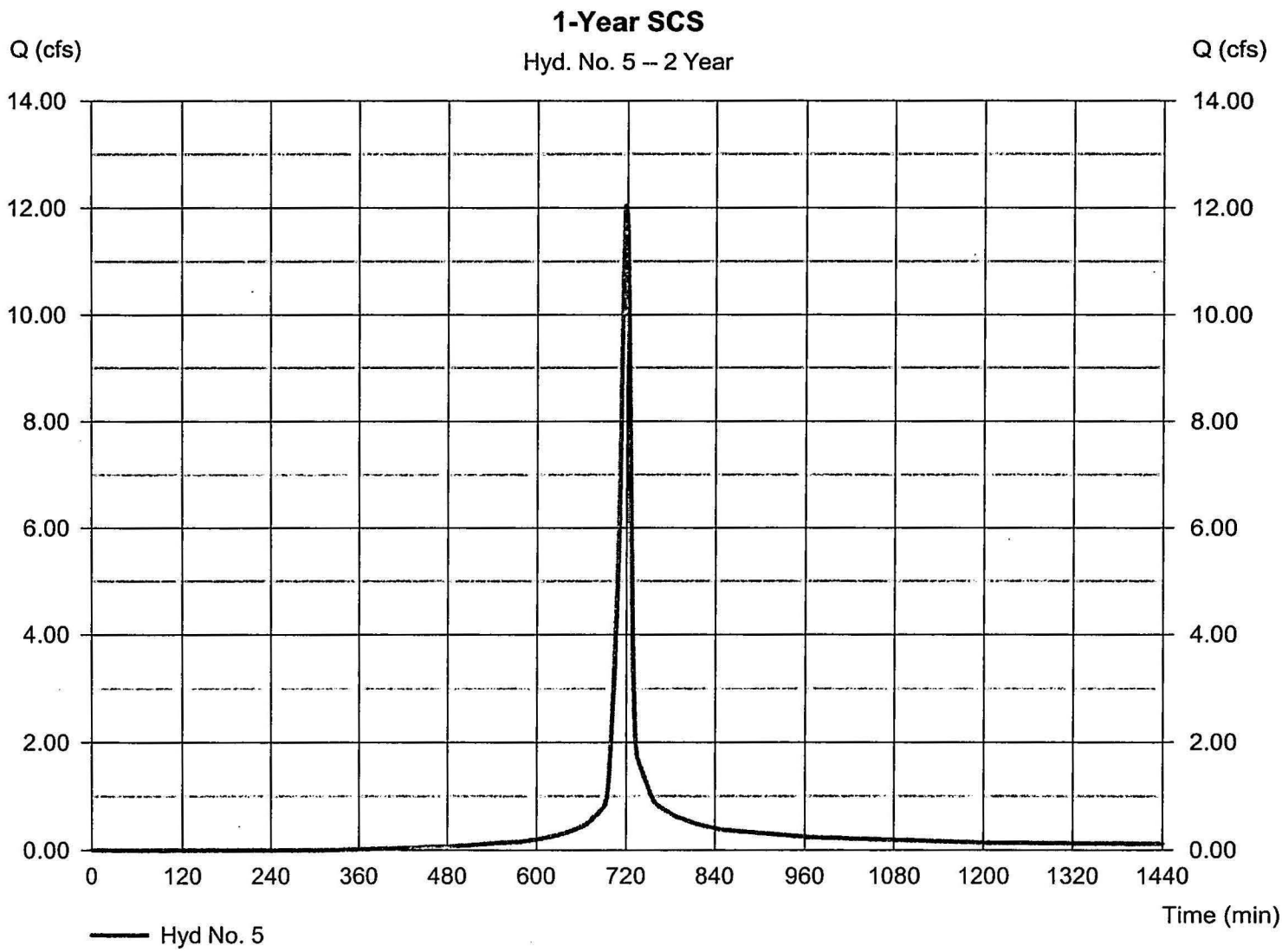
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 5

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 12.04 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 28,258 cuft
Drainage area	= 3.180 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

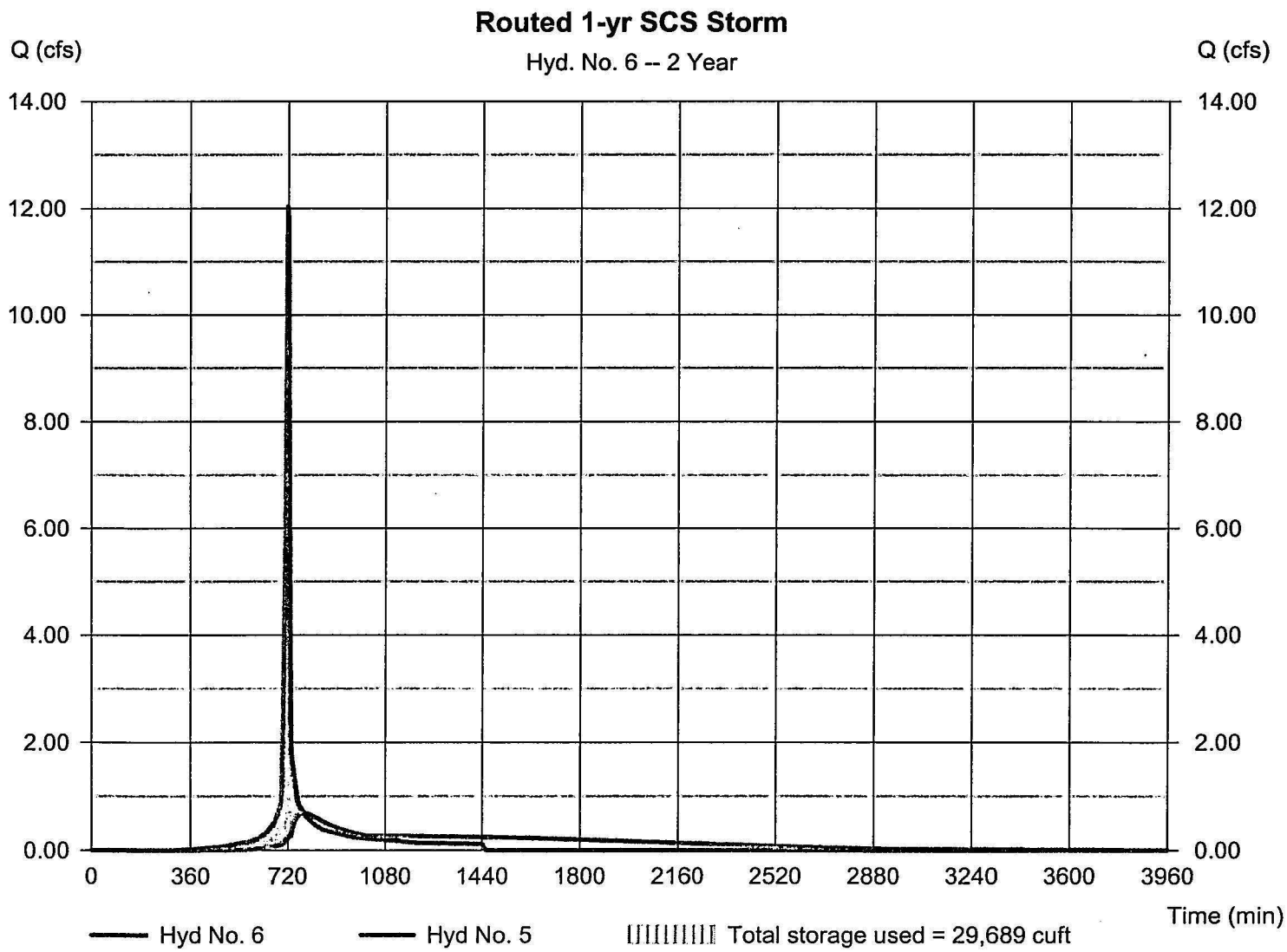
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 6

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 0.682 cfs
Storm frequency	= 2 yrs	Time to peak	= 780 min
Time interval	= 2 min	Hyd. volume	= 28,208 cuft
Inflow hyd. No.	= 5 - 1-Year SCS	Max. Elevation	= 52.50 ft
Reservoir name	= BMP #6	Max. Storage	= 29,689 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	4.900	1	15	4,410	-----	-----	-----	Pre-Development
2	Mod. Rational	6.165	1	8	15,980	-----	-----	-----	Post-Development
3	Reservoir	0.265	1	51	15,635	2	52.38	28,083	Routed
5	SCS Runoff	22.94	2	718	55,938	-----	-----	-----	1-Year SCS
6	Reservoir	5.337	2	730	55,888	5	53.27	40,881	Routed 1-yr SCS Storm

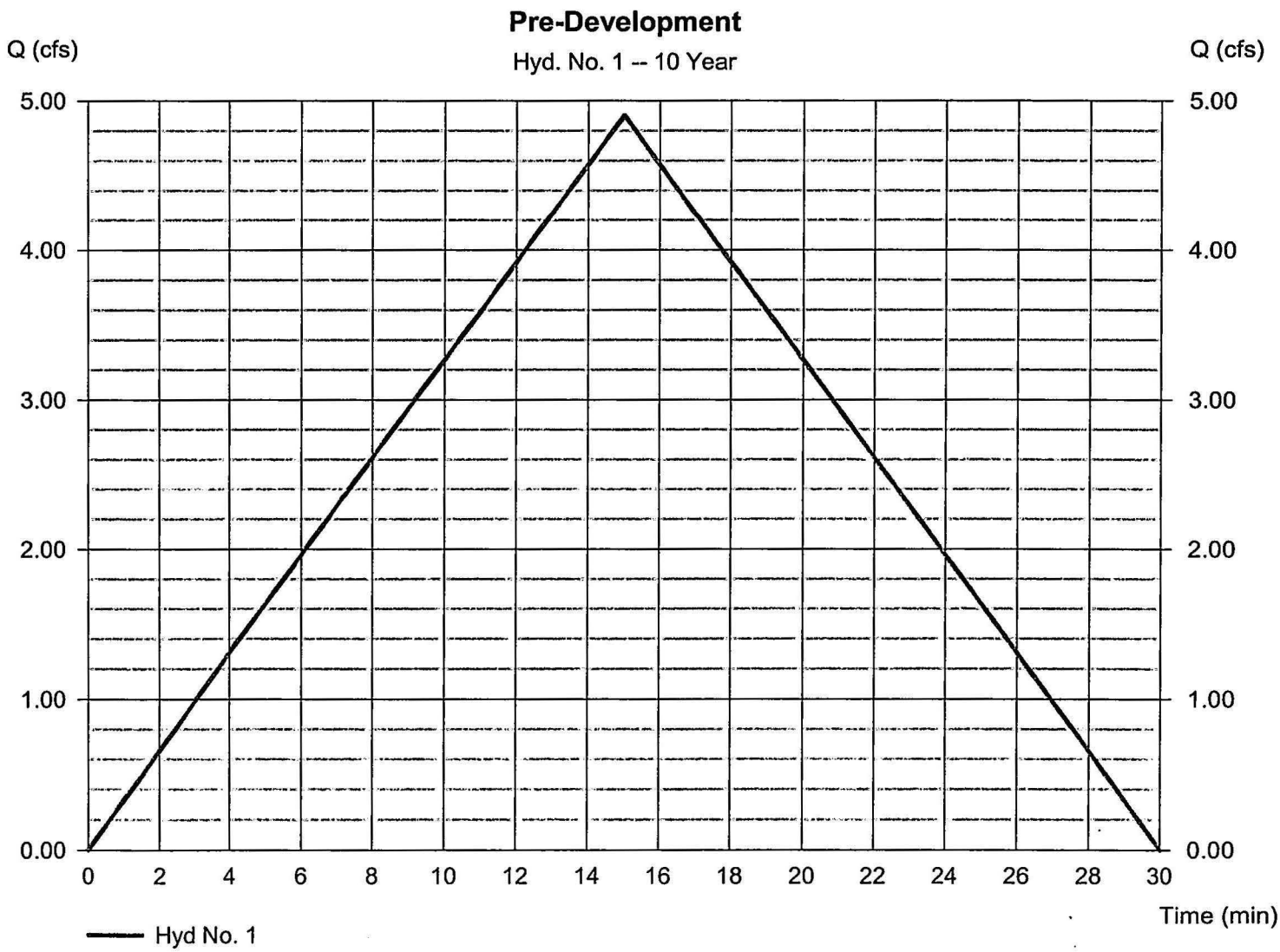
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 4.900 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 4,410 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.3
Intensity	= 5.137 in/hr	Tc by User	= 15.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



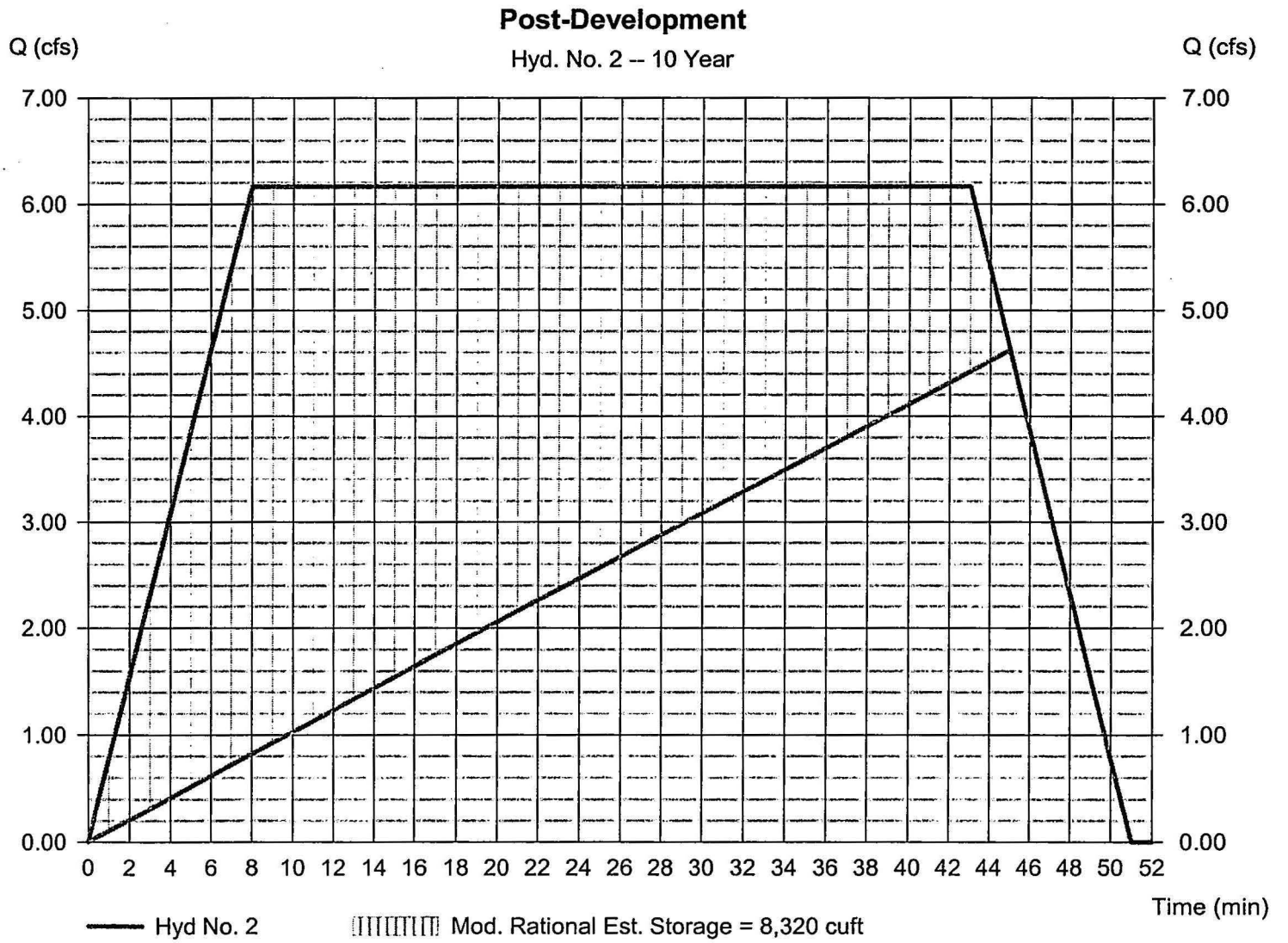
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 6.165 cfs
Storm frequency	= 10 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 15,980 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 2.938 in/hr	Tc by User	= 8.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 5.4 x Tc
Target Q	= 4.900 cfs	Est. Req'd Storage	= 8,320 cuft



Hydrograph Report

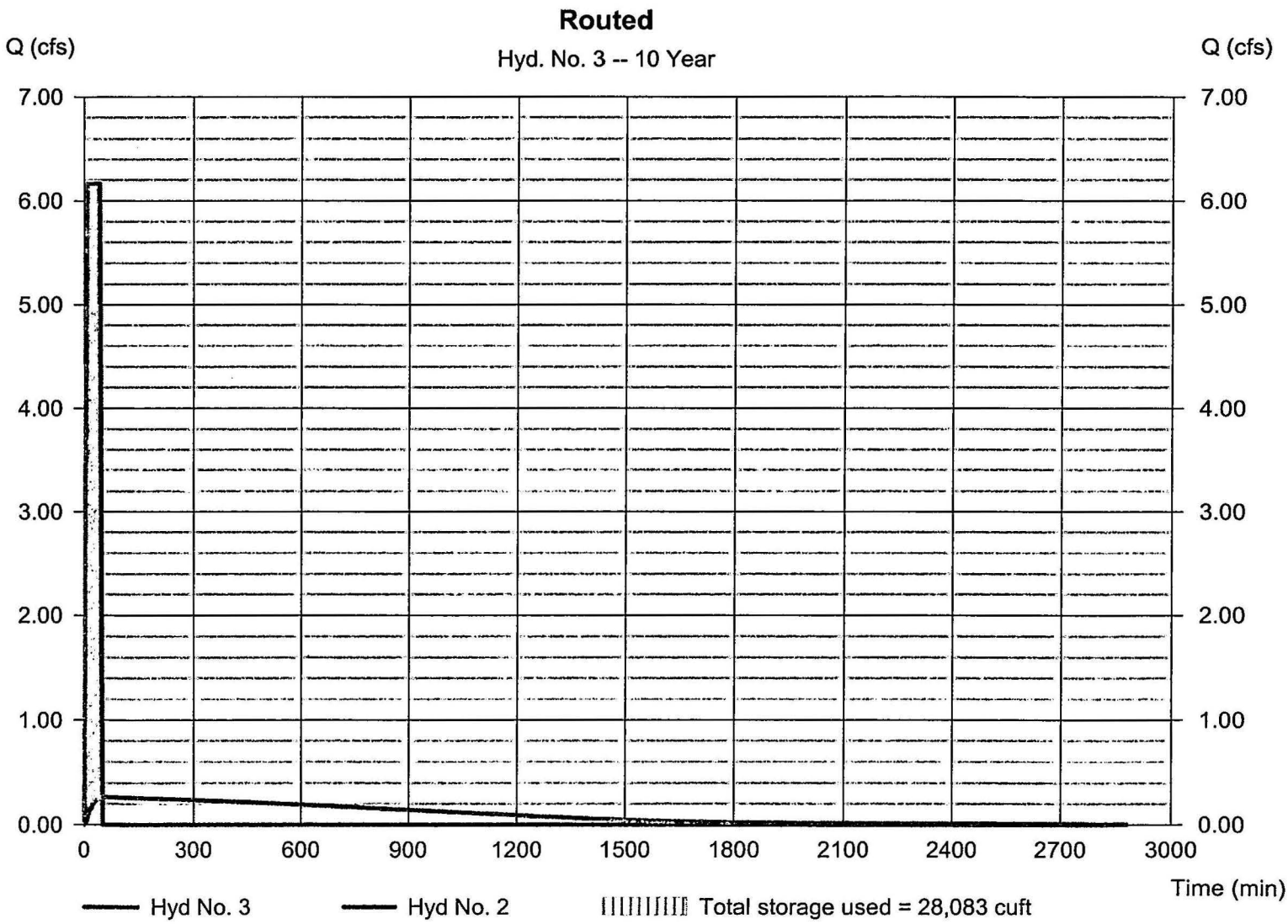
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.265 cfs
Storm frequency	= 10 yrs	Time to peak	= 51 min
Time interval	= 1 min	Hyd. volume	= 15,635 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 52.38 ft
Reservoir name	= BMP #6	Max. Storage	= 28,083 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



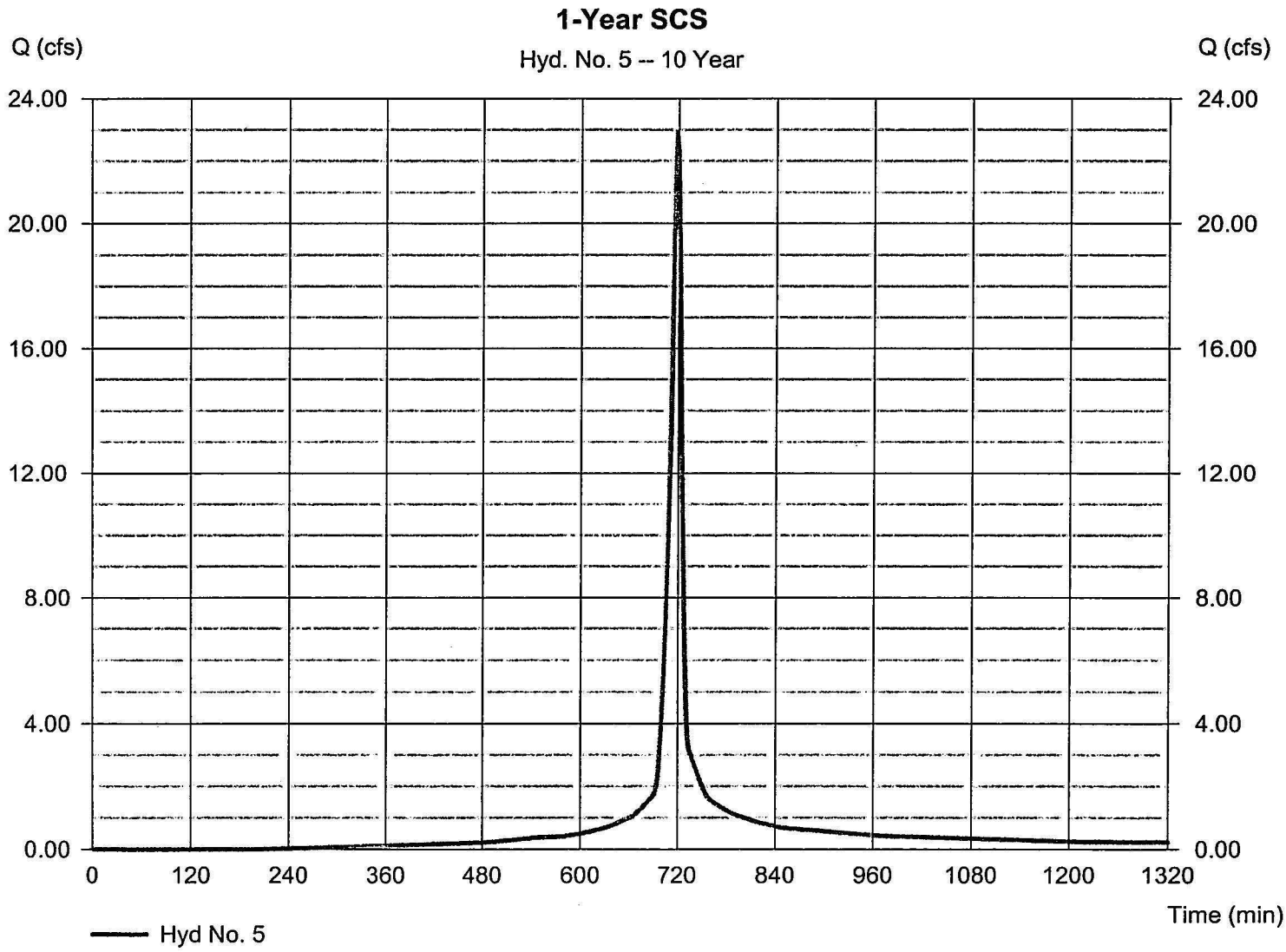
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 5

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 22.94 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 55,938 cuft
Drainage area	= 3.180 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 6.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

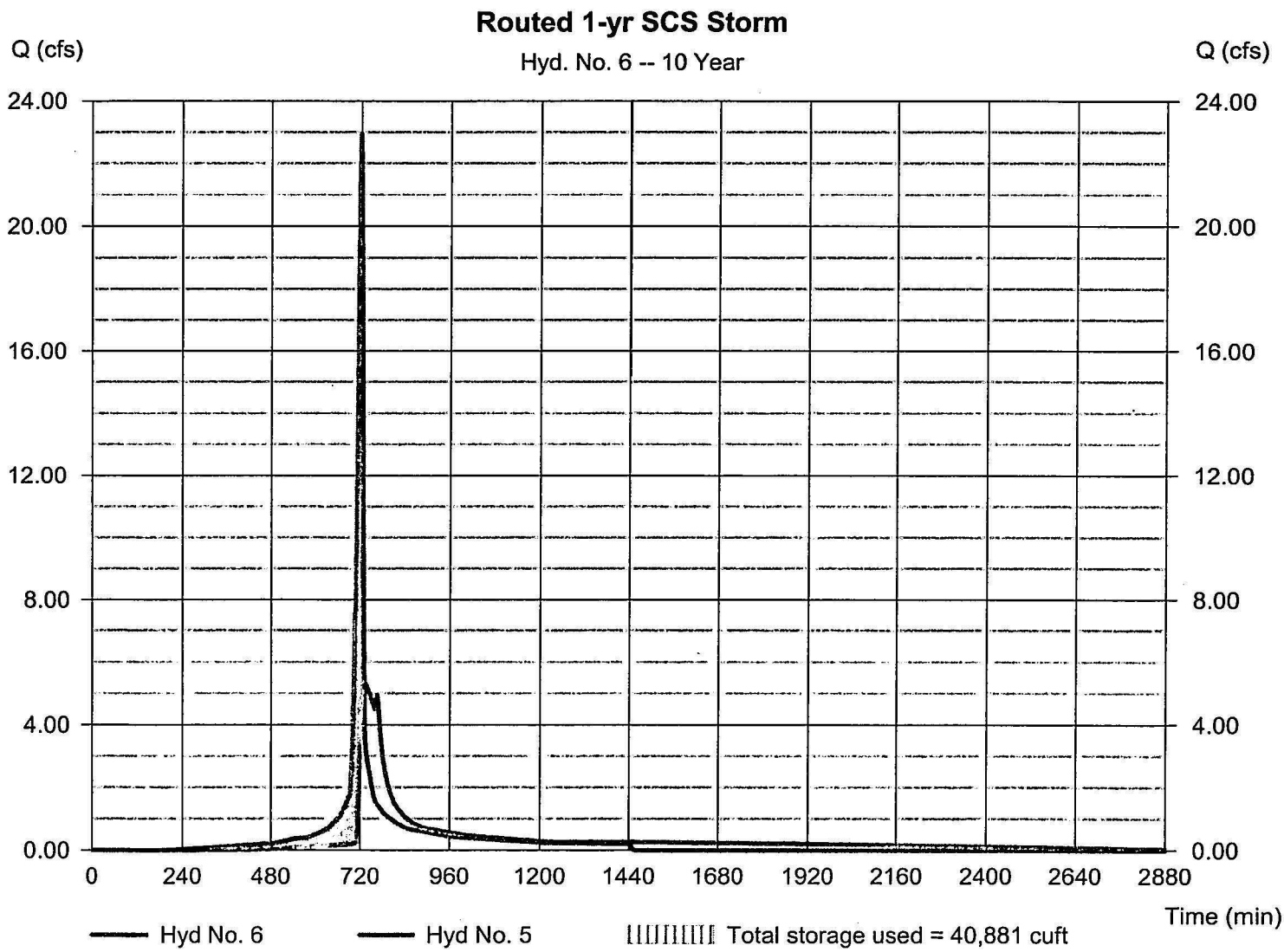
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 6

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 5.337 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 55,888 cuft
Inflow hyd. No.	= 5 - 1-Year SCS	Max. Elevation	= 53.27 ft
Reservoir name	= BMP #6	Max. Storage	= 40,881 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	6.508	1	15	5,857	-----	-----	-----	Pre-Development
2	Mod. Rational	7.012	1	8	28,272	-----	-----	-----	Post-Development
3	Reservoir	4.877	1	69	27,869	2	52.89	35,227	Routed
5	SCS Runoff	31.56	2	718	78,559	-----	-----	-----	1-Year SCS
6	Reservoir	7.105	2	730	78,510	5	53.96	51,689	Routed 1-yr SCS Storm

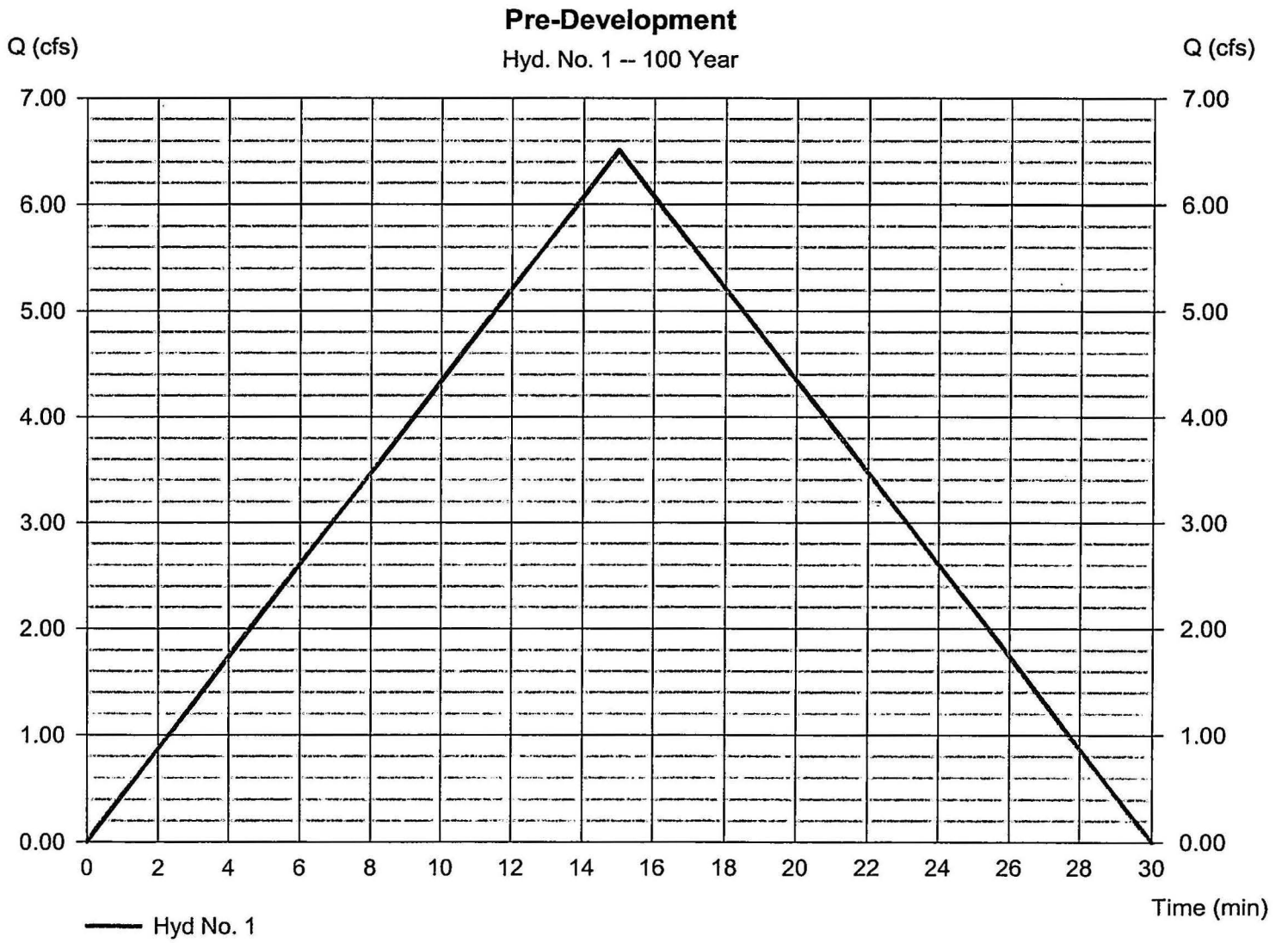
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 6.508 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 5,857 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.3
Intensity	= 6.822 in/hr	Tc by User	= 15.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/1



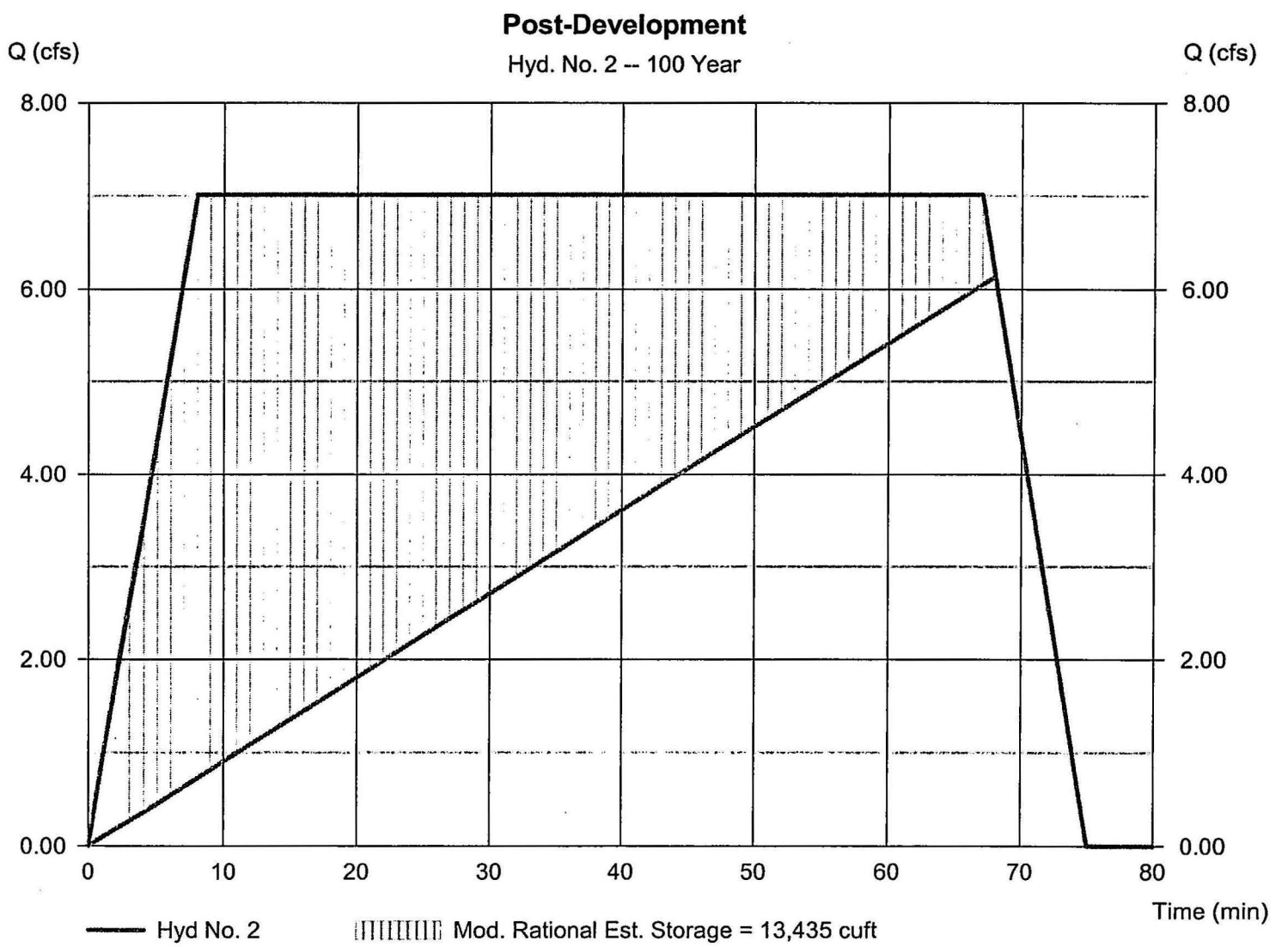
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 2

Post-Development

Hydrograph type	= Mod. Rational	Peak discharge	= 7.012 cfs
Storm frequency	= 100 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 28,272 cuft
Drainage area	= 3.180 ac	Runoff coeff.	= 0.66
Intensity	= 3.341 in/hr	Tc by User	= 8.00 min
IDF Curve	= JamesCity-NW-14.IDF	Storm duration	= 8.4 x Tc
Target Q	= 6.510 cfs	Est. Req'd Storage	= 13,435 cuft



Hydrograph Report

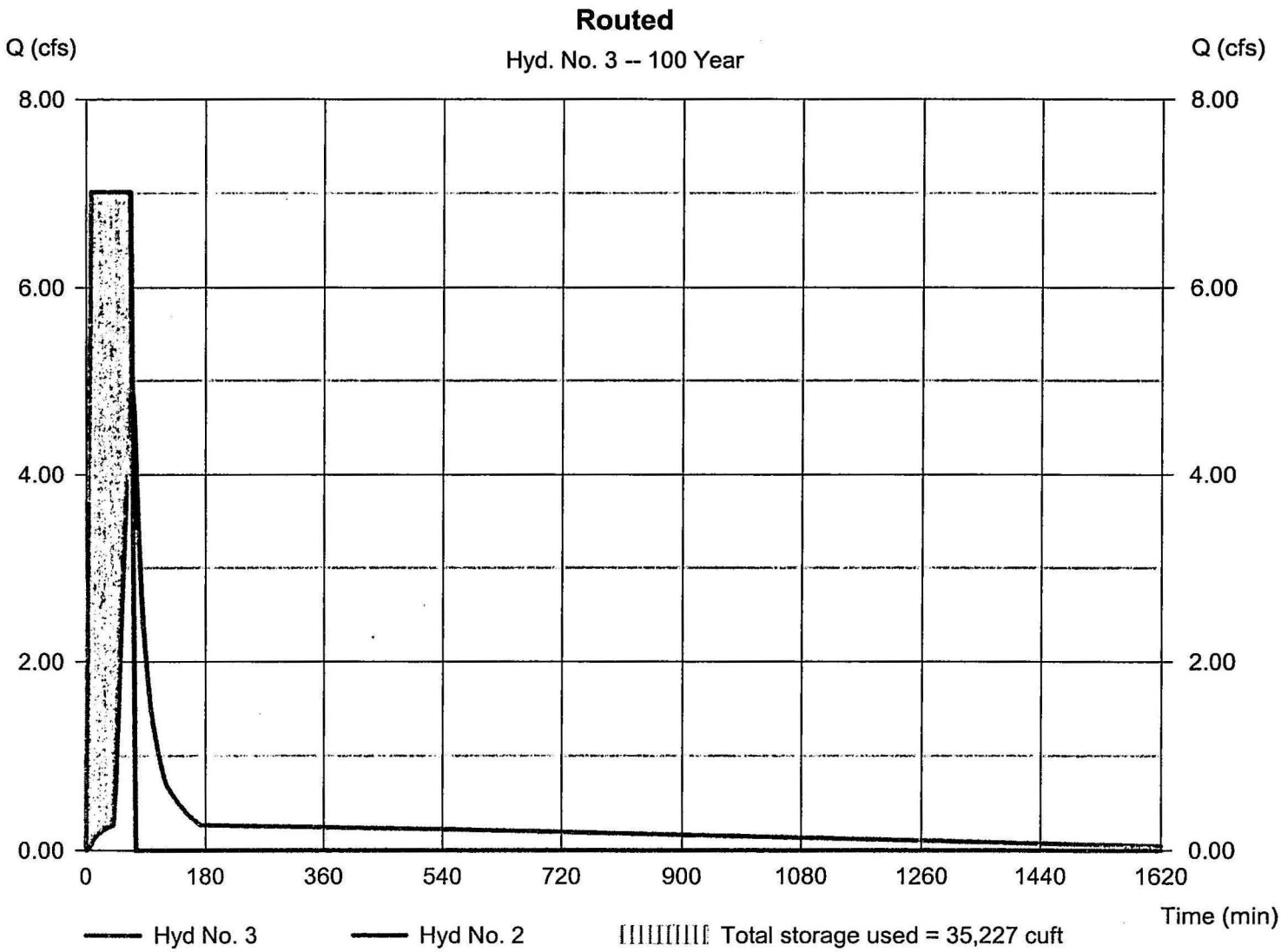
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 3

Routed

Hydrograph type	= Reservoir	Peak discharge	= 4.877 cfs
Storm frequency	= 100 yrs	Time to peak	= 69 min
Time interval	= 1 min	Hyd. volume	= 27,869 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 52.89 ft
Reservoir name	= BMP #6	Max. Storage	= 35,227 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



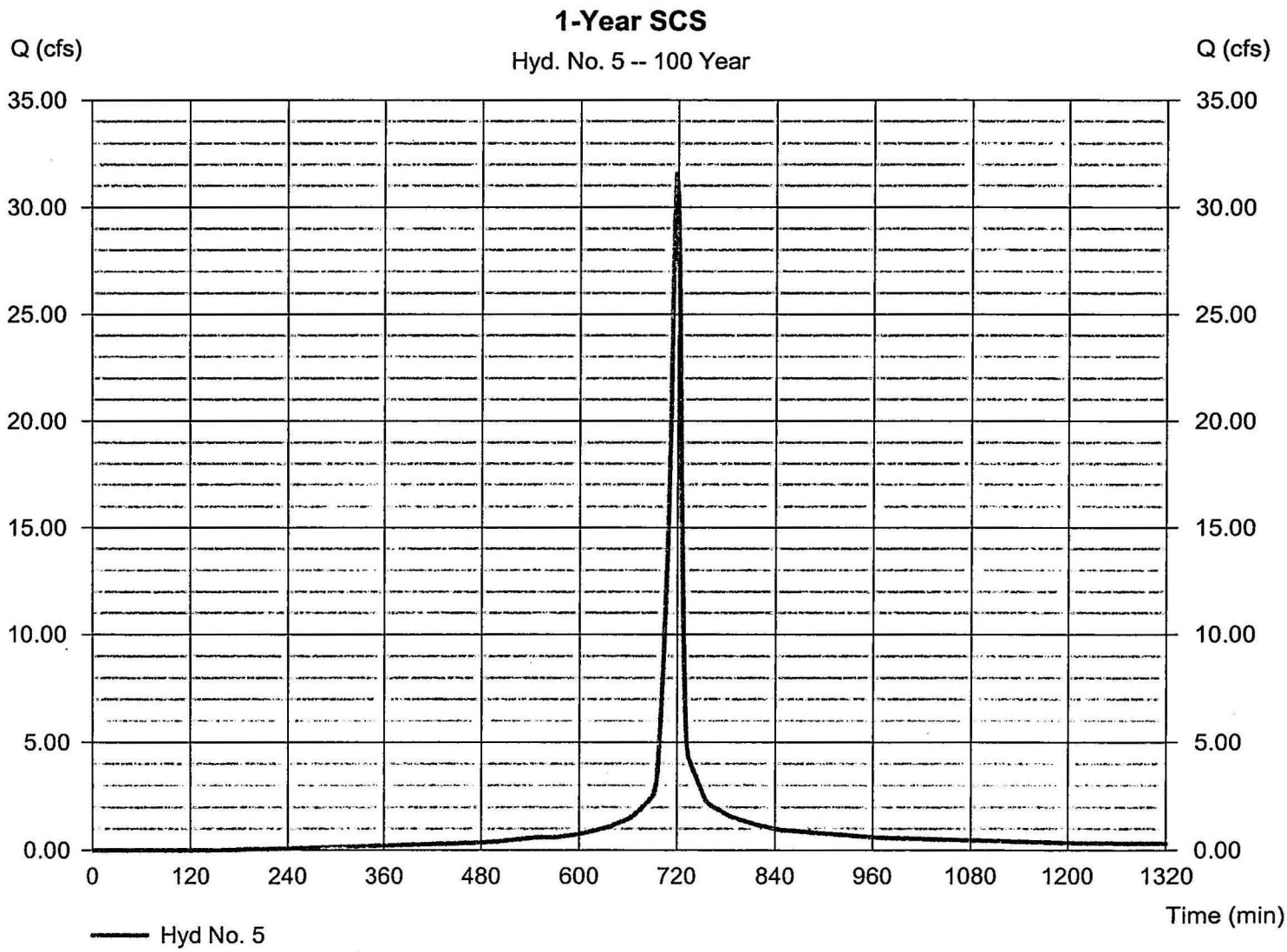
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 5

1-Year SCS

Hydrograph type	= SCS Runoff	Peak discharge	= 31.56 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 78,559 cuft
Drainage area	= 3.180 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

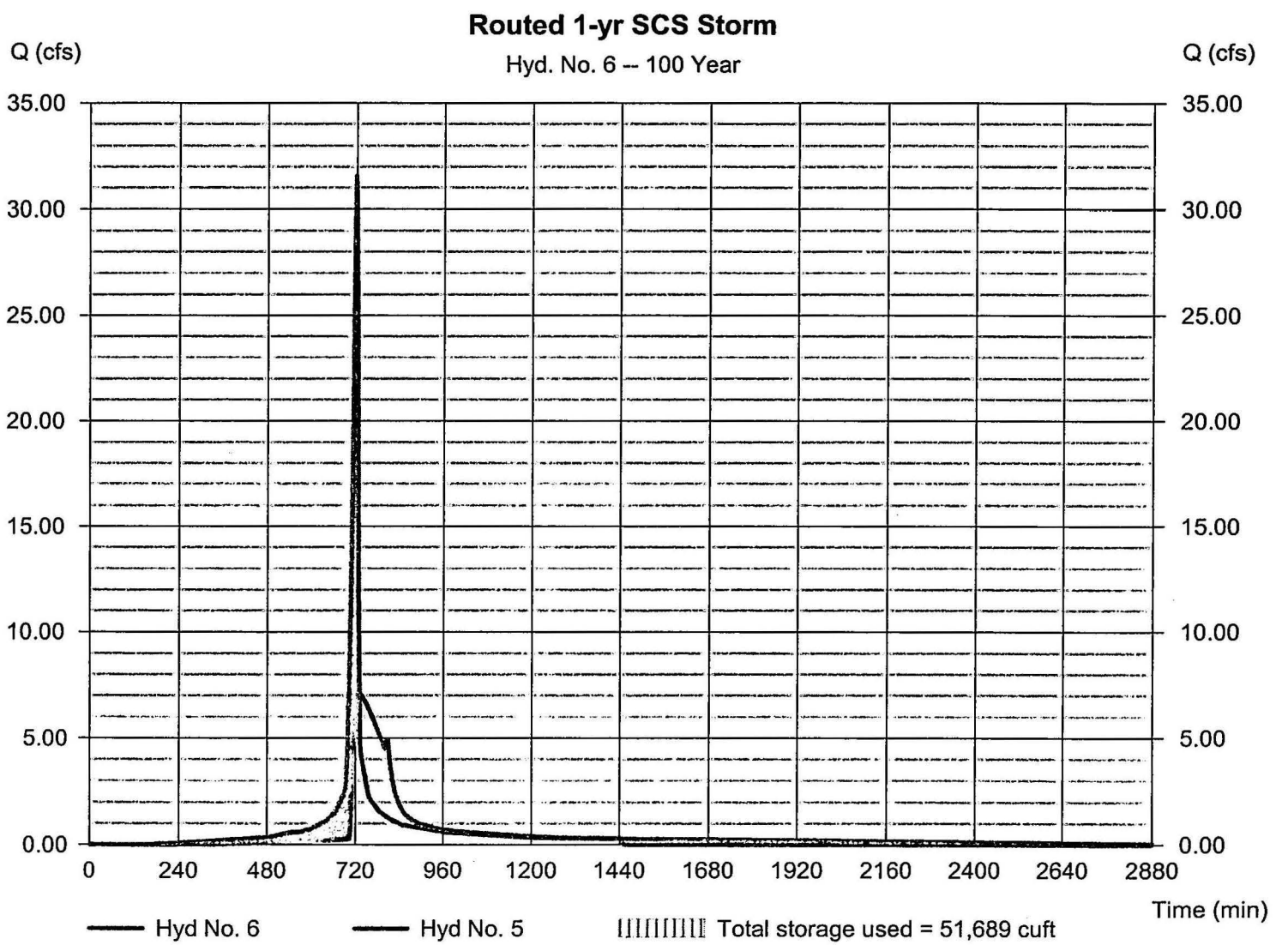
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, Oct 14, 2010

Hyd. No. 6

Routed 1-yr SCS Storm

Hydrograph type	= Reservoir	Peak discharge	= 7.105 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 78,510 cuft
Inflow hyd. No.	= 5 - 1-Year SCS	Max. Elevation	= 53.96 ft
Reservoir name	= BMP #6	Max. Storage	= 51,689 cuft

Storage Indication method used. Wet pond routing start elevation = 51.00 ft.



AES CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Buoyancy Calculation
	BMP #6 Riser Structure
Date:	April 21, 2010
Calculated By:	TRS

Structure: **BMP #6 Riser Structure**

WEIGHT OF STRUCTURE

		Section #1 (Top Section)		Section #2		Section #3	
Elevation at Top of Section	=	52.40	FT	46.00	FT	N/A	FT
Elevation at Bottom of Section	=	46.00	FT	45.00	FT		FT
Section Depth	=	6.4	FT	1.0	FT	0.0	FT
Inside Width	=	4.00	FT	0.00	FT		FT
Outside Width	=	5.33	FT	5.33	FT		FT
Wall Thickness (Width)	=	8.0	IN	32.0	IN	0.0	IN
Inside Length	=	5.00	FT	0.00	FT		FT
Outside Length	=	6.33	FT	6.33	FT		FT
Wall Thickness (Length)	=	8.0	IN	38.0	IN	0.0	IN
Volume of Sections	=	87.9	CF	33.7	CF	0.0	CF

Base

Elevation at Top of Base	=	45.00	FT
Elevation at Bottom of Base	=	44.33	FT
Base Thickness	=	8.0	IN
Width	=	6.00	FT
Length	=	7.00	FT
Volume of Base	=	28.1	CF

Top

Weight of Top	=	1000	LBS

Total Volume of Structure	=	149.8	CF
Weight of Concrete	=	150	LBS/CF
Total Weight of Structure	=	23,471	LBS

WEIGHT OF SOIL

Surface Elevation of Soil	=	52.4	FT
Elevation of Water Level	=	52.40	FT
Angle of Repose	=	10	DEGREES
Base Width	=	6.00	FT
Base Length	=	7.00	FT
Base Area	=	42.00	SF
Depth of Dry Soil	=	0.00	FT
Volume of Structure in Dry Soil between Surface and Water Level	=	N/A	CF
Surface Area	=	N/A	SF
Average Dry Soil Area	=	N/A	SF
Volume of Dry Soil	=	N/A	CF
Depth of Wet Soil	=	7.40	FT
Volume of Structure in Wet Soil between Water Level and Base	=	249.7	CF
Wet Soil Surface Area	=	82.74	SF
Average Wet Soil Area	=	62.37	SF
Volume of Wet Soil	=	211.85	CF

Weight of Dry Soil	110	LBS/CF		=	N/A	LBS
Weight of Wet Soil	47.6	LBS/CF	(120 - 62.4)	=	10,084	LBS
Total Weight of Soil				=	10,084	LBS

WEIGHT OF WATER DISPLACED BY STRUCTURE

		Section #1 (Top Section)		Section #2		Section #3	
Elevation at Top of Section	=	52.40	FT	46.00	FT	N/A	FT
Elevation at Bottom of Section	=	46.00	FT	45.00	FT	0.00	FT
Outside Width	=	5.33	FT	5.33	FT	0.00	FT
Outside Length	=	6.33	FT	6.33	FT	0.00	FT
Volume of Water Displaced by Section	=	215.9	CF	33.7	CF	0.0	CF

Base

Volume of Water Displaced by Base	=	28.1	CF
Total Volume of Water Displaced by Structure	=	277.8	CF
Weight of Water	=	62.4	LBS/CF
Total Weight of Water Displaced by Structure	=	17,335	LBS

SUMMARY

Total Weight of Structure	=	23,471	LBS
Total Weight of Soil	=	10,084	LBS
Total Down Force	=	33,555	LBS ↓
Total Weight of Water Displaced by Structure	=	17,335	LBS ↑
Factor of Safety	=	1.9 > 1.5	OK

AES CONSULTING ENGINEERS

Project:	Wmbg. Landing - Woodhaven Phase II
Project No.:	8162-06
Subject:	Riprap Basin
	For Circular Culvert (BMP #6)
Date:	April 21, 2010
Calculated By:	TRS

Hydraulic Design of Energy Dissipators for Culverts and Channels
Hydraulic Engineering Circular No. 14, Third Edition
U.S. Department of Transportation Federal Highway Administration - July 2006

Outfall Description: **Williamsburg Landing - BMP #6 Outfall**

Pipe Diameter (D) or (W_o) = **1.25** FT.

Flow (Q) = **10.00** CFS

Tailwater Depth (TW) = **0.50** FT.

Determine brink depth (y_o):

$$(K_u)\frac{Q}{D^{2.5}} = (1)\frac{10}{1.75} = 5.72$$

$$\frac{TW}{D} = \frac{0.50}{1.25} = 0.40$$

y_o / D = **0.97** From Figure 3.4

$$y_o = \underset{y_o/D}{0.97} \times \underset{D}{1.25} = 1.21 \text{ FT.}$$

Determine culvert outlet velocity (V_o):

$$\frac{TW}{y_o} = \frac{0.50}{1.21} = 0.412$$

A / D^2 = **0.7785** From Table B.2 where y_o / D = d / D

$$A = A/D^2 \times D^2 = 0.7785 \times 1.56 = 1.22 \text{ SF}$$

$$V_o = Q \div A = 10.0 \div 1.22 = 8.2 \text{ FT/S}$$

Determine Froude number (Fr):

$$y_e = (A/2)^{1/2} = 0.78 \text{ FT.}$$

$$Fr = V_o / [(32.2)(y_e)]^{1/2} = 1.64$$

Try d_{50} / y_e = **0.42** d_{50} = **0.42** x **0.78** = **0.33** FT. or **3.9** IN.

Tailwater Parameter, C_o	Equation 10.2
TW / y_e = **0.50** ÷ **0.78** = **0.64**	
$TW / y_e < 0.75$	C_o = 1.4
$0.75 < TW / y_e < 1.0$	C_o = 4.0 (TW/y_e) - 1.6
	= 4.0 (**0.64**) - 1.6 = **0.96**
$1.0 < TW / y_e$	C_o = 2.4

h_s / y_e = 0.86 $(d_{50} / y_e)^{-0.55}$ (Fr) - C_o Equation 10.1

h_s / y_e = 0.86 (**0.42** $)^{-0.55}$ (**1.64**) - **1.40**

h_s / y_e = **0.8735**

h_s = **0.8735** x **0.78** = **0.68** FT.

Check

hs / d_{50} = **2.08** ≥ 2 OK

d_{50} / y_e = **0.42** ≥ 0.1 OK

Riprap Basin Size

Length of Dissipator Pool

L_s = 10 x h_s = **6.8** FT.

or L_s = 3 x W_o = **3.8** FT. Use Larger Value L_s = **6.8** FT.

Total Length

L_B = 15 x h_s = **10.2** FT.

or L_B = 4 x W_o = **5.0** FT. Use Larger Value L_B = **10.2** FT.

Width of Apron

W_B = W_o + 2 $(L_B/3)$ = **8.1** FT.

Length of Apron

L_A = L_B - L_S

= **10.2** - **6.8** = **3.4** FT.

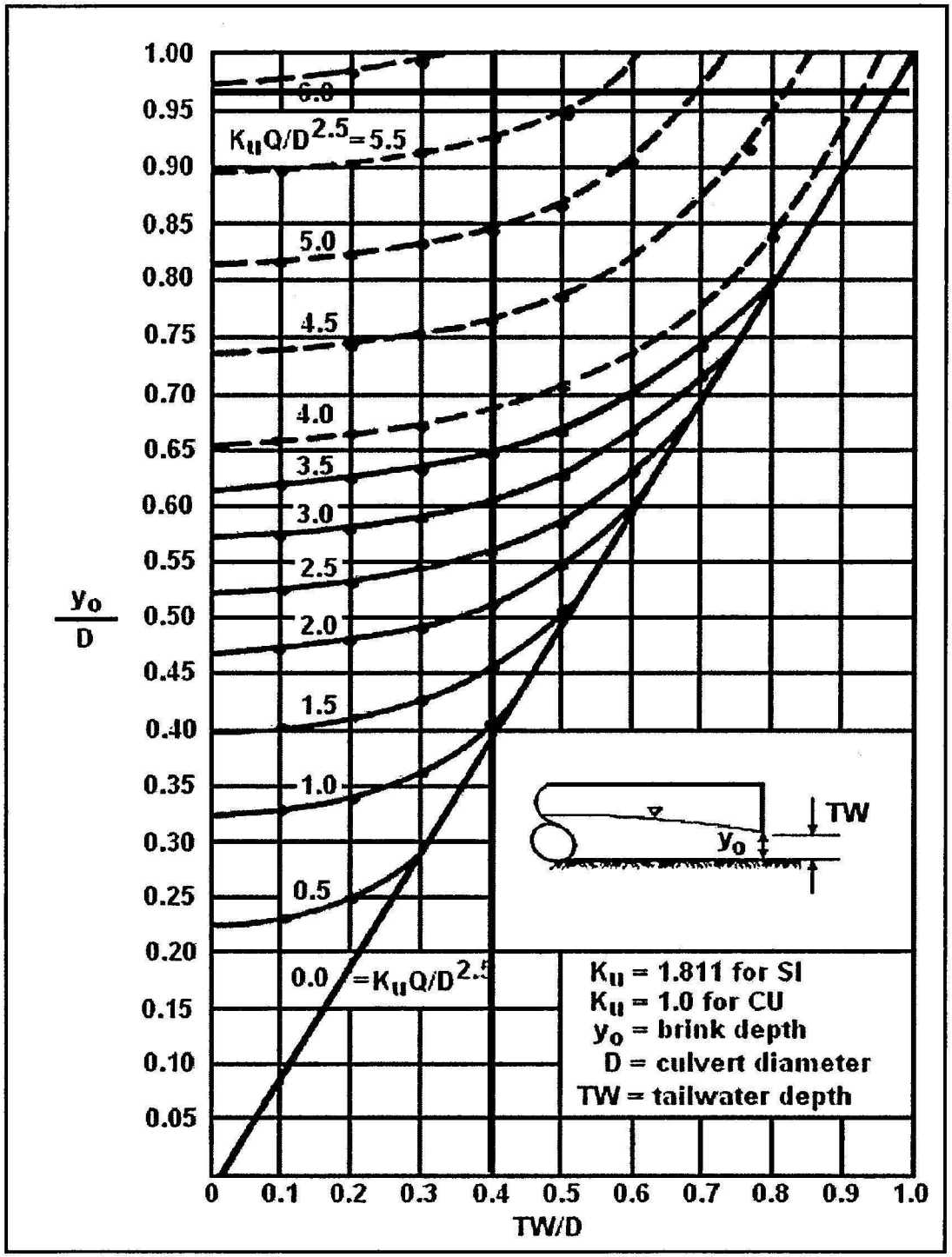


Figure 3.4. Dimensionless Rating Curves for the Outlets of Circular Culverts on Horizontal and Mild Slopes (Simons, 1970)

Table B.2. Uniform Flow in Circular Sections Flowing Partly Full

y/D	A/D^2	R/D	$\frac{(\alpha Qn)}{(D^{8/3} S^{1/2})}$	$\frac{(\alpha Qn)}{(y^{8/3} S^{1/2})}$	y/D	A/D^2	R/D	$\frac{(\alpha Qn)}{(D^{8/3} S^{1/2})}$	$\frac{(\alpha Qn)}{(y^{8/3} S^{1/2})}$
0.01	0.0013	0.0066	0.00007	15.04	0.51	0.4027	0.2531	0.239	1.442
0.02	0.0037	0.0132	0.00031	10.57	0.52	0.4127	0.2562	0.247	0.415
0.03	0.0069	0.0197	0.00074	8.56	0.53	0.4227	0.2592	0.255	1.388
0.04	0.0105	0.0262	0.00138	7.38	0.54	0.4327	0.2621	0.263	1.362
0.05	0.0147	0.0325	0.00222	6.55	0.55	0.4426	0.2649	0.271	1.336
0.06	0.0192	0.0389	0.00328	5.95	0.56	0.4526	0.2676	0.279	1.311
0.07	0.0294	0.0451	0.00455	5.47	0.57	0.1626	0.2703	0.287	1.286
0.08	0.0350	0.0513	0.00604	5.09	0.58	0.4724	0.2728	0.295	1.262
0.09	0.0378	0.0575	0.00775	4.76	0.59	0.4822	0.2753	0.303	1.238
0.10	0.0409	0.0635	0.0097	4.49	0.60	0.4920	0.2776	0.311	1.215
0.11	0.0470	0.0695	0.0118	4.25	0.61	0.5018	0.2799	0.319	1.192
0.12	0.0534	0.0755	0.0142	4.04	0.62	0.5115	0.2821	0.327	1.170
0.13	0.0600	0.0813	0.0167	3.86	0.63	0.5212	0.2842	0.335	1.148
0.14	0.0668	0.0871	0.0195	3.69	0.64	0.5308	0.2862	0.343	1.126
0.15	0.0739	0.0929	0.0225	3.54	0.65	0.5405	0.2988	0.350	1.105
0.16	0.0811	0.0985	0.0257	3.41	0.66	0.5499	0.2900	0.358	1.084
0.17	0.0885	0.1042	0.0291	3.28	0.67	0.5594	0.2917	0.366	1.064
0.18	0.0961	0.1097	0.0327	3.17	0.68	0.5687	0.2933	0.373	1.044
0.19	0.0139	0.1152	0.0365	3.06	0.69	0.5780	0.2948	0.380	1.024
0.20	0.1118	0.1206	0.0406	2.96	0.70	0.5872	0.2962	0.388	1.004
0.21	0.1199	0.1259	0.0448	2.87	0.71	0.5964	0.2975	0.395	0.985
0.22	0.1281	0.1312	0.0492	2.79	0.72	0.6054	0.2987	0.402	0.965
0.23	0.1365	0.1364	0.0537	2.71	0.73	0.6143	0.2998	0.409	0.947
0.24	0.1449	0.1416	0.0585	2.63	0.74	0.6231	0.3008	0.416	0.928
0.25	0.1535	0.1466	0.0634	2.56	0.75	0.6319	0.3042	0.422	0.910
0.26	0.1623	0.1516	0.0686	2.49	0.76	0.6405	0.3043	0.429	0.891
0.27	0.1711	0.1566	0.0739	2.42	0.77	0.6489	0.3043	0.435	0.873
0.28	0.1800	0.1614	0.0793	2.36	0.78	0.6573	0.3041	0.441	0.856
0.29	0.1890	0.1662	0.0849	2.30	0.79	0.6655	0.3039	0.447	0.838
0.30	0.1982	0.1709	0.0907	2.25	0.80	0.6736	0.3042	0.453	0.821
0.31	0.2074	0.1756	0.0966	2.20	0.81	0.6815	0.3043	0.458	0.804
0.32	0.2167	0.1802	0.1027	2.14	0.82	0.6893	0.3043	0.463	0.787
0.33	0.2260	0.1847	0.1089	2.09	0.83	0.6969	0.3041	0.468	0.770
0.34	0.2355	0.1891	0.1153	2.05	0.84	0.7043	0.3038	0.473	0.753
0.35	0.2450	0.1935	0.1218	2.00	0.85	0.7115	0.3033	0.453	0.736
0.36	0.2546	0.1978	0.1284	1.958	0.86	0.7186	0.3026	0.458	0.720
0.37	0.2642	0.2020	0.1351	1.915	0.87	0.7254	0.3018	0.485	0.703
0.38	0.2739	0.2062	0.1420	1.875	0.88	0.7320	0.3007	0.488	0.687
0.39	0.2836	0.2102	0.1490	1.835	0.89	0.7384	0.2995	0.491	0.670
0.40	0.2934	0.2142	0.1561	1.797	0.90	0.7445	0.2980	0.494	0.654
0.41	0.3032	0.2182	0.1633	1.760	0.91	0.7504	0.2963	0.496	0.637
0.42	0.3130	0.2220	0.1705	1.724	0.92	0.7560	0.2944	0.497	0.621
0.43	0.3229	0.2258	0.1779	1.689	0.93	0.7612	0.2921	0.498	0.604
0.44	0.3328	0.2295	0.1854	1.655	0.94	0.7662	0.2895	0.498	0.588
0.45	0.3428	0.2331	0.1929	1.622	0.95	0.7707	0.2865	0.498	0.571
0.46	0.3527	0.2366	0.201	1.590	0.96	0.7749	0.2829	0.496	0.553
0.47	0.3627	0.2401	0.208	1.559	0.97	0.7785	0.2787	0.494	0.535
0.48	0.3727	0.2435	0.216	1.530	0.98	0.7817	0.2735	0.489	0.517
0.49	0.3827	0.2468	0.224	1.500	0.99	0.7841	0.2666	0.483	0.496
0.50	0.3927	0.2500	0.232	1.471	1.00	0.7854	0.2500	0.463	0.463

y = depth of flow, m (ft)
D = diameter of pipe, m (ft)
A = area of flow, m^2 (ft^2)
R= hydraulic radius, m (ft)
Source: USBR (1974)

Q = discharge by Manning's Equation, m^3/s (ft^3/s)
n = Manning's coefficient
S = channel bottom and water surface slope
α = units conversion = 1.49 for SI, 1 for CU

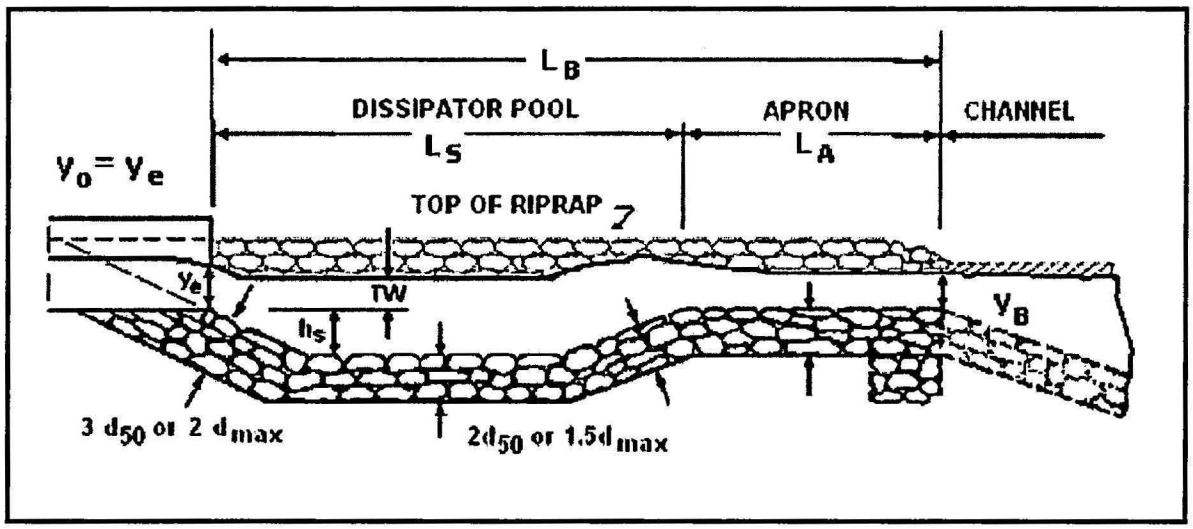


Figure 10.1. Profile of Riprap Basin

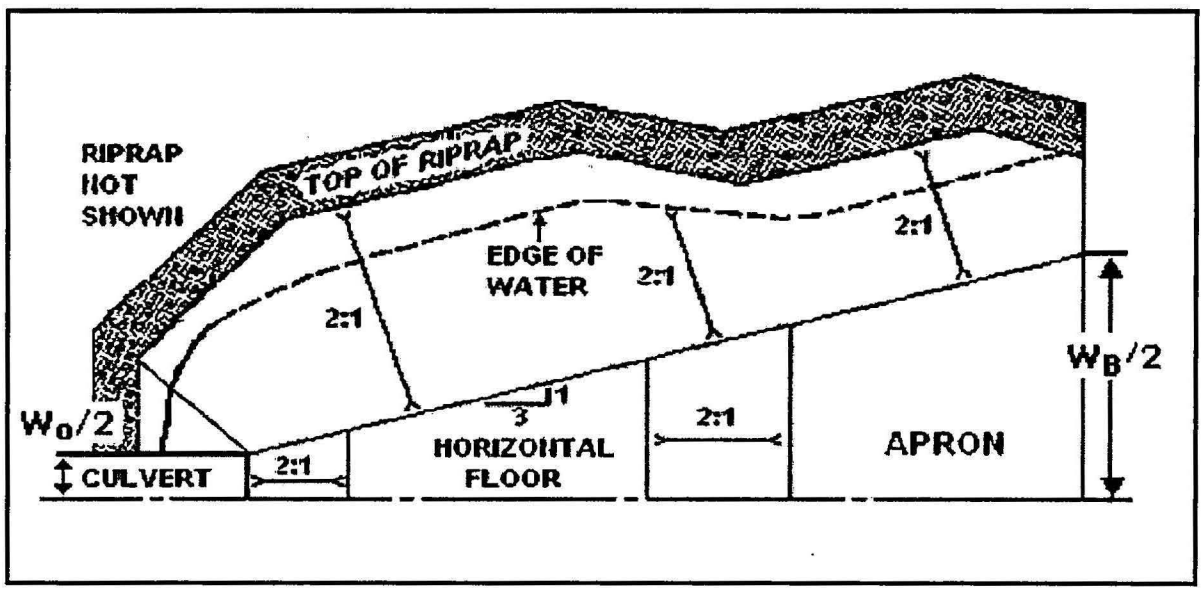
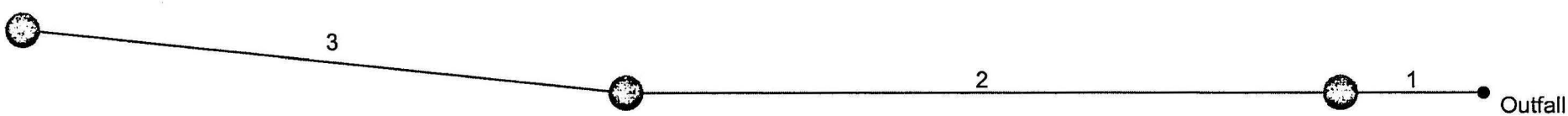


Figure 10.2. Half Plan of Riprap Basin

8162-06 BMP Outfall System



Project File: 816206 BMP Outfall System.stm	Number of lines: 3	Date: 10-14-2010

Hydraflow Storm Sewers Extension v6.066

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line shape	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	17.000	-180.000	MH	0.00	0.00	0.00	0.0	13.00	3.00	13.51	15	Cir	0.013	0.15	20.67	
2	1	86.000	0.000	MH	0.00	0.00	0.00	0.0	15.76	20.07	33.02	15	Cir	0.013	0.15	38.67	
3	2	73.000	6.000	MH	9.14	0.00	0.00	0.0	33.02	17.78	46.00	15	Cir	0.013	1.00	53.50	

8162-06 BMP Outfall System | Number of lines: 3 | Date: 10-14-2010

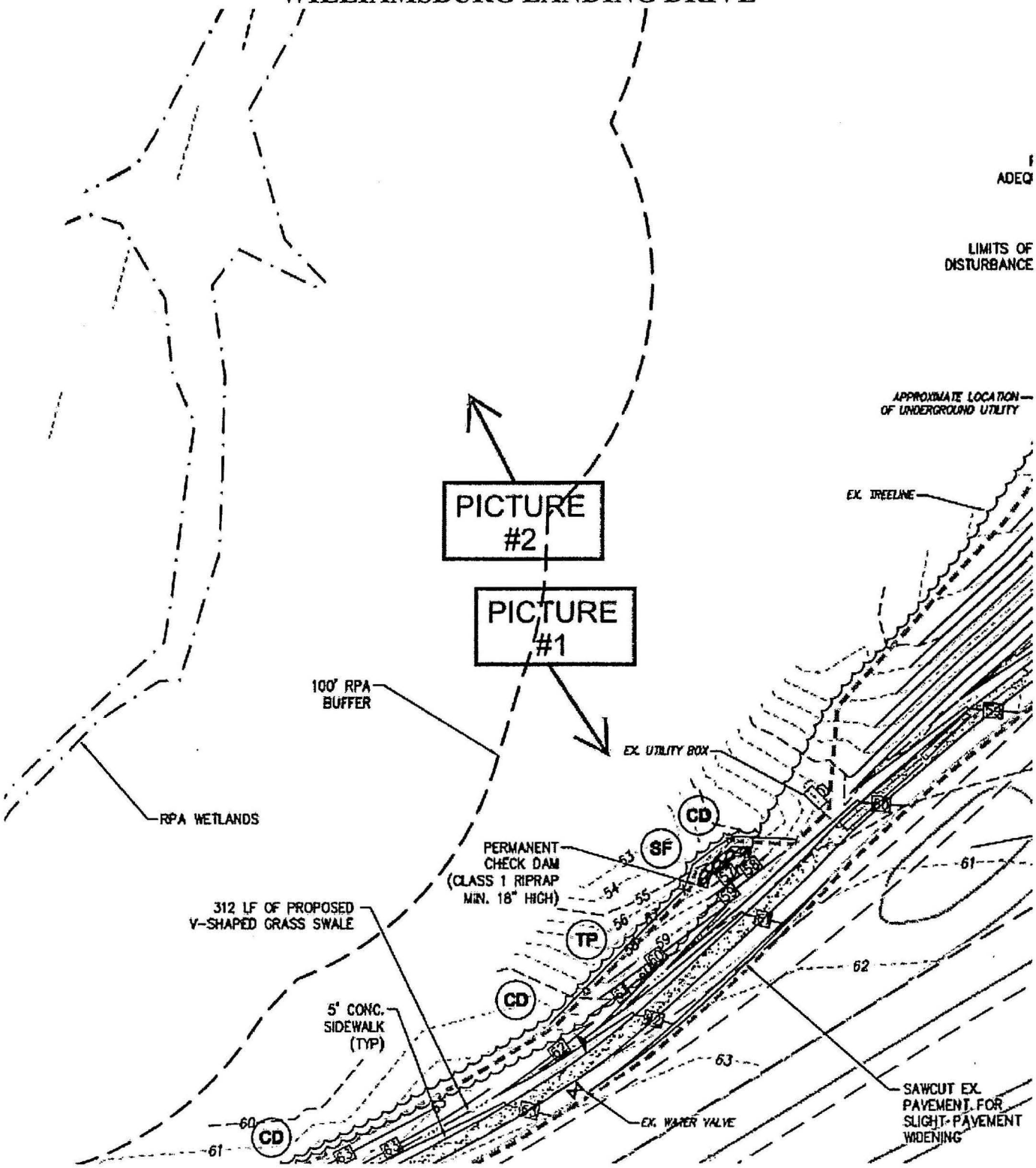
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	17.000	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	9.14	11.18	7.68	15	3.00	13.00	13.51	14.16	14.67	0.00	20.67	
2	1	86.000	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	9.14	28.93	10.11	15	20.07	15.76	33.02	16.48	34.18	20.67	38.67	
3	2	73.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	9.14	27.23	7.56	15	17.78	33.02	46.00	35.99	47.16	38.67	53.50	

8162-06 BMP Outfall System | Number of lines: 3 | Run Date: 10-14-2010

NOTES: Intensity = 36.77 / (Inlet time + 5.25) ^ 0.56; Return period = 100 Yrs. ; c = cir e = ellip b = box

NATURAL CHANNEL ADJACENT TO WILLIAMSBURG LANDING DRIVE



#1

#2

DRAINAGE AREA MAPS

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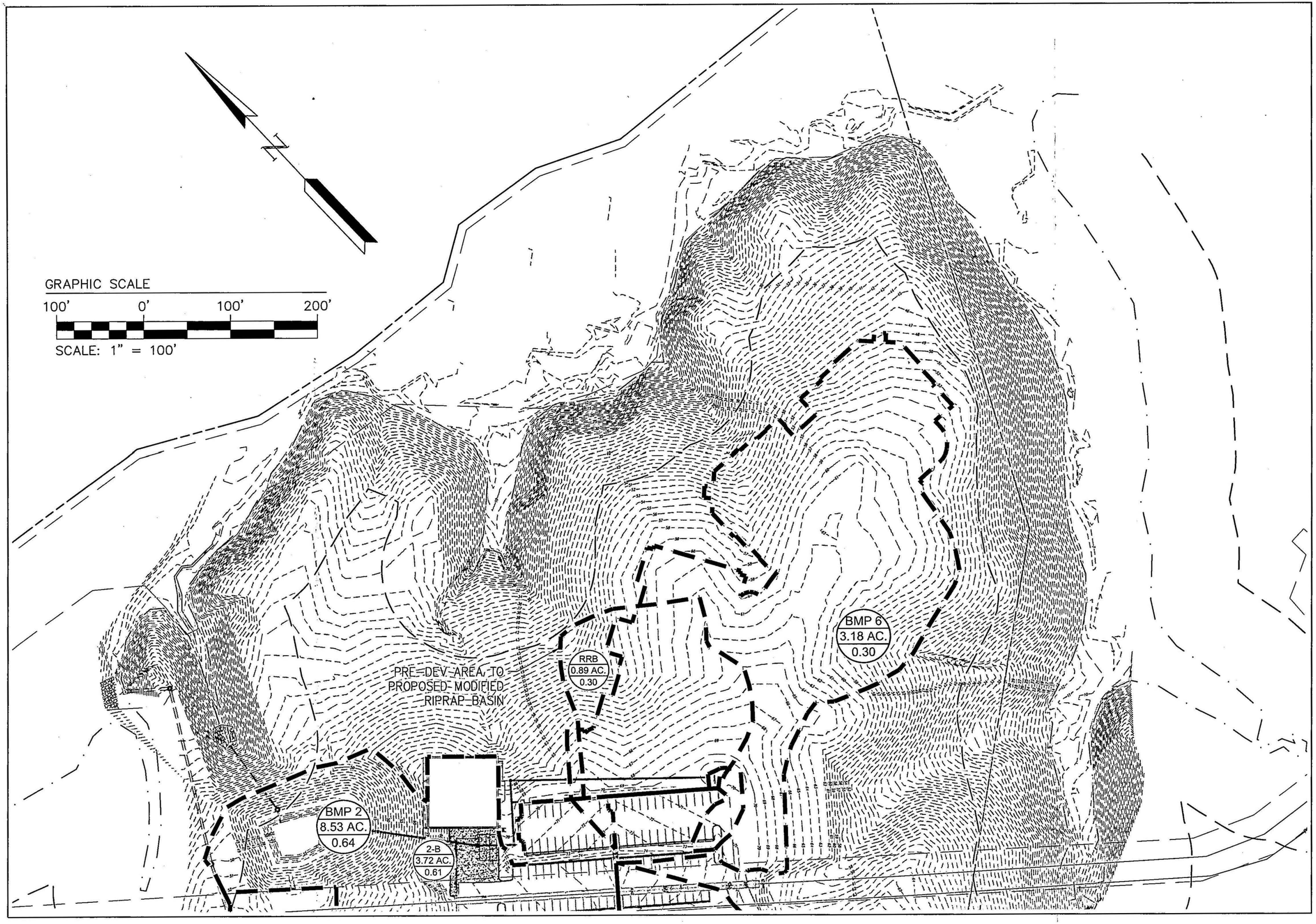

Rev.	Date	Description	Revised By

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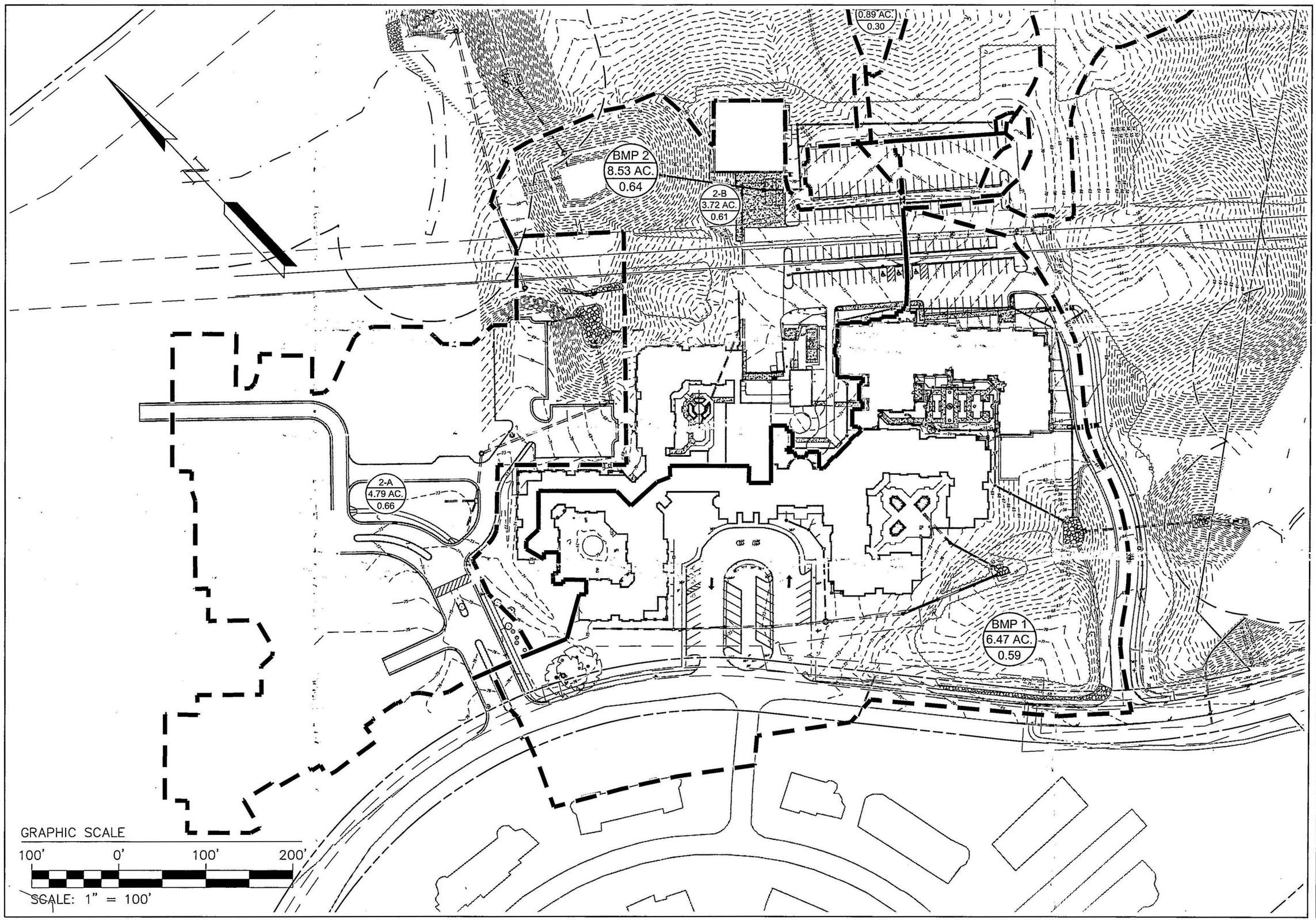
CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 220-0040
Fax: (757) 220-5954
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Drainage Area Map
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10
Sheet Title: Pre-Development (Based on Previously Approved Plans)	
Sheet Number 1	



Rev.	Date	Description	Revised By

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5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-6994
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Site Plan
WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION PHASE II
Jamestown District | James City County | Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10

Sheet Title:
Pre-Development (Based on Previously Approved Plans)

Sheet Number
2

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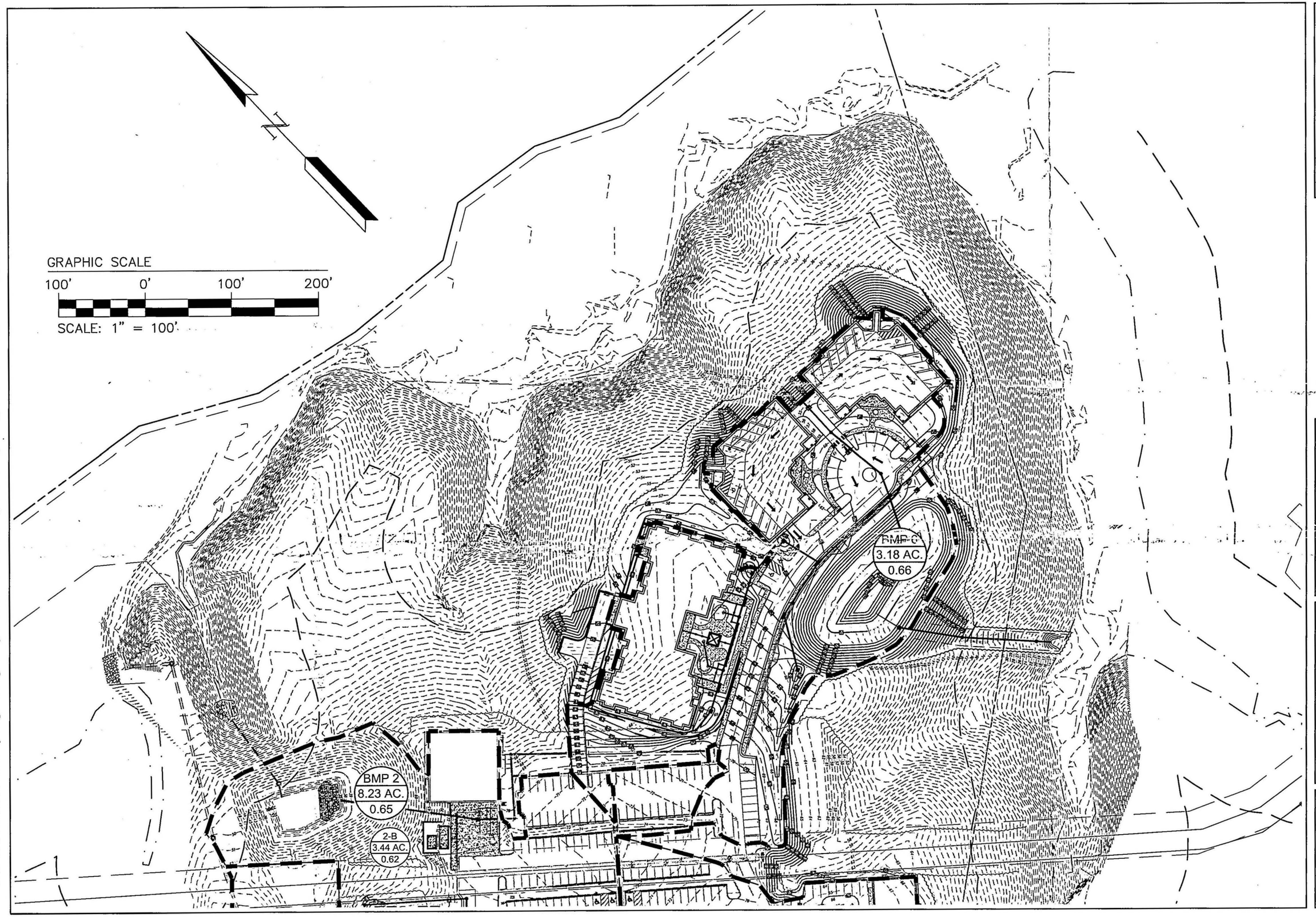

Rev.	Date	Description	Revised By

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-9594
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Site Plan
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10
Sheet Title: Post-Development	
Sheet Number	3

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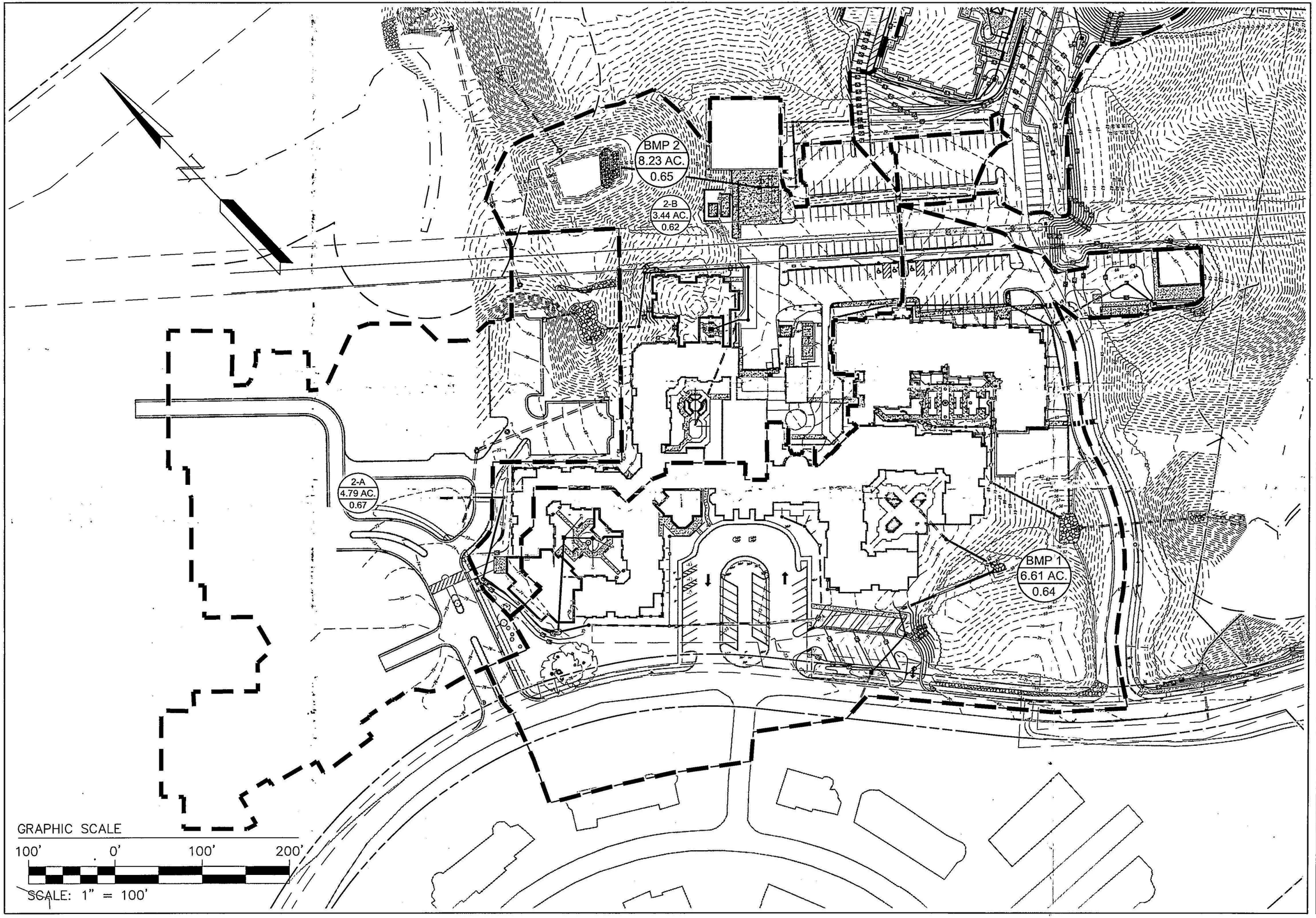

Rev	Date	Description	Revised By

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 253-9994
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Site Plan
WILLIAMSBURG LANDING, INC. WOODHAVEN EXPANSION PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10
Sheet Title: Post-Development	
Sheet Number	4

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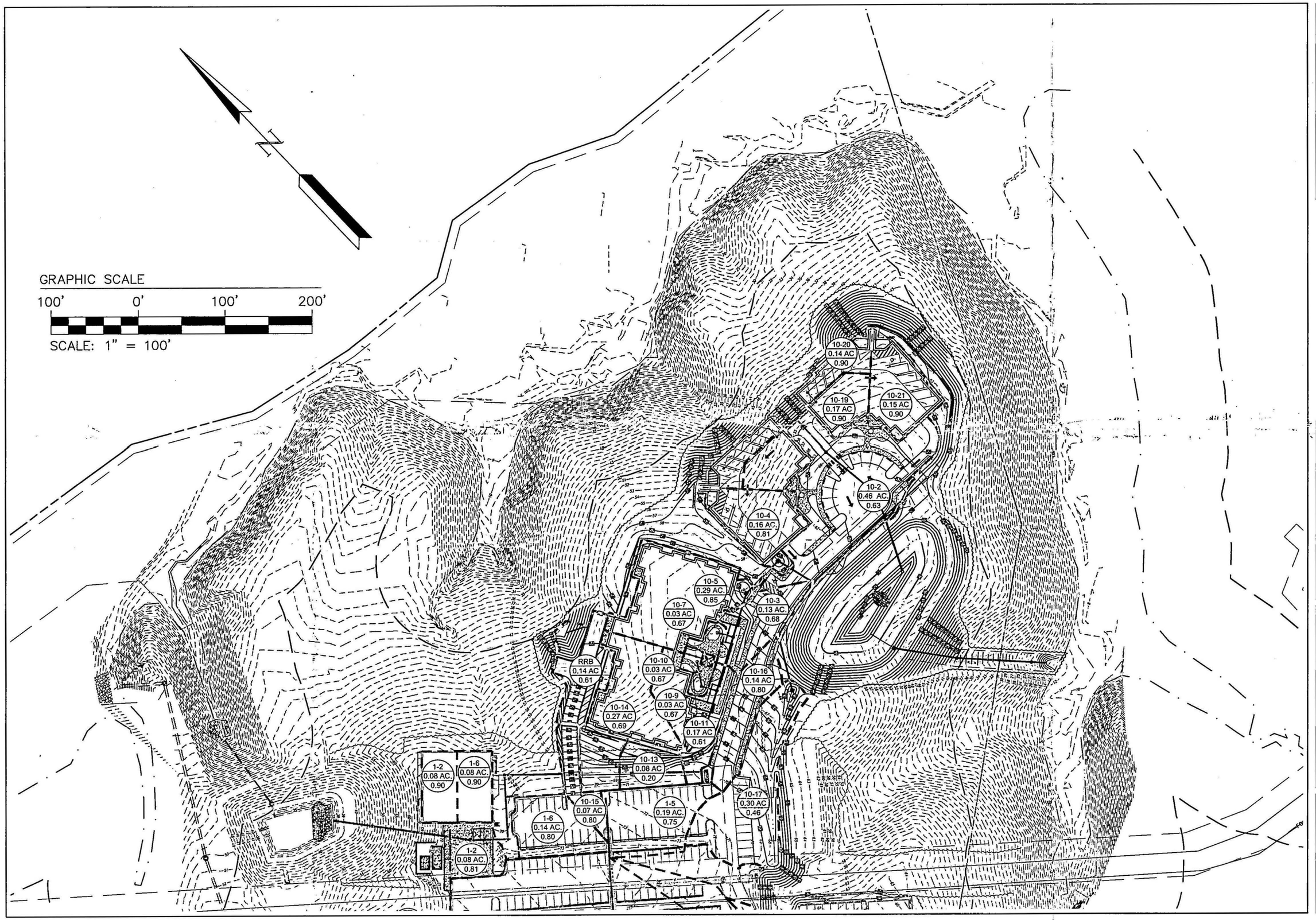

Rev.	Date	Description	Revised By

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
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www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Site Plan
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10
Sheet Title: Inlet Drainage Areas	
Sheet Number 5	

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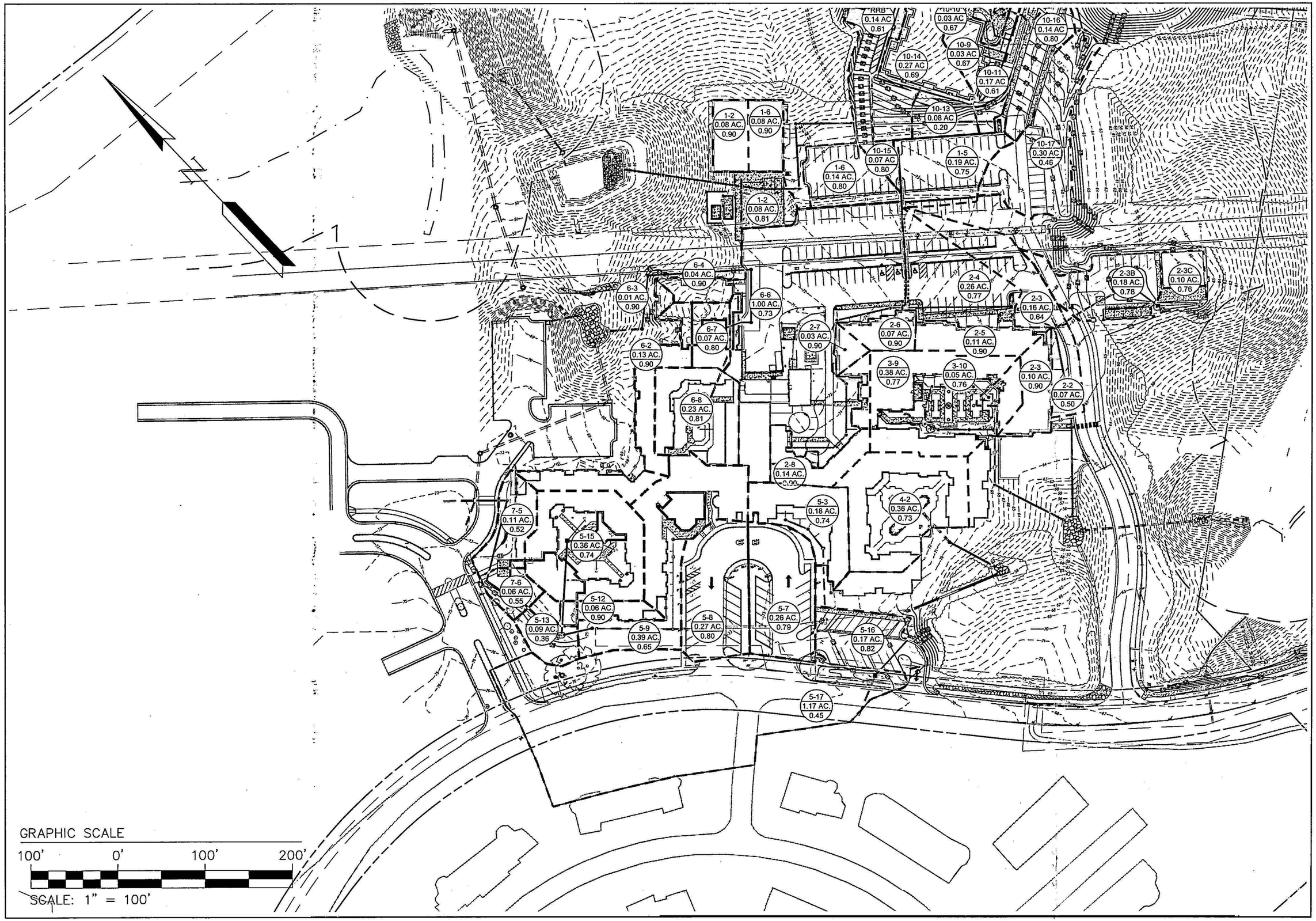

Rev	Date	Description	Revised By

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 565-1060
Fax: (757) 220-8934
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Site Plan
WILLIAMSBURG LANDING, INC.
WOODHAVEN EXPANSION
PHASE II
Jamestown District James City County Virginia

Project Contacts:	NB / TRS
Project Number:	8162-06
Scale: 1"=100'	Date: 04/21/10
Sheet Title: Inlet Drainage Areas	
Sheet Number 6	

7. Reports

8. Correspondence

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE
(757) 253-6626
codecomp@james-city.va.us

ENVIRONMENTAL DIVISION
(757) 253-6670
environ@james-city.va.us

PLANNING
(757) 253-6685
planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 253-2620

August 3, 2000

AES Consulting Engineers
5248 Olde Towne Road
Williamsburg, Va. 23188
Attn: Mr. Richard A. Costello, P.E.

Re: Williamsburg Landing (County Plan SP-50-96)
Nursing & Assisted Living Facility
Record Drawings and Construction Certification

Dear Mr. Costello:

The Environmental Division has reviewed a record drawing set, consisting of Sheets C001, C005 and C010, as submitted to our office on June 7th for the above referenced project.

The record drawings dated May 15th 2000 provide as-built information for two stormwater management/BMP facilities on this site. Dry Pond # 1 is an embankment-type detention facility located approximately 100 feet east of the main building and just west of the service road. Dry Pond # 2 is a timber crib wall- type dry detention facility located along the north (back) side of the main building.

Based on our review of the record drawings and concurrent field observations, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facilities:

1. In accordance with Erosion and Sediment Control Note # 18 on Sheet 009 of the approved plan, construction certifications for the BMP's are required. None were provided.

2. Add approved County plan number (SP-50-96) at the bottom right hand corner of each sheet.

3. Consistently add labels Dry Pond # 1 and Dry Pond # 2, as appropriate, on record drawing plan views and details.

4. Dry Pond # 1. The as-built invert-in and invert-out elevation for the pond outlet barrel would result in an as-built pond barrel slope different from that of the approved design plan. Make this correction on the detail on record drawing Sheet C010 as necessary.

5. Date and sign the professional seal as provided on each of the record drawing sheets.

Construction Related Items

6. Dry Pond # 1. Sediment, vegetation and tree growth at the pond's primary storm drain inflow (flared end section) needs cleaned and removed. This inflow is located approximately 170 feet upstream (west) of the riser near the building. Cleaning and removal only pertains to the actual flared end section and its associated outlet protection structure only, not established downstream vegetation areas.

7. Dry Pond # 1. Wood debris and trash within and in immediate overbank areas associated with the paved channels west (upstream side) of the pond embankment needs cleaned and removed. Erosion and scour holes formed at the end of the paved channels, especially the paved channel on the right side of the embankment, needs filled and stabilized.

8. Dry Pond # 1. Tree saplings and heavier vegetation within 15 feet of the riser needs removed. Also, floating wood debris and trash located on the pond embankment just east of the riser needs cleaned and removed.

9. Dry Pond # 1. An erosion/scour hole about 10' L x 8' W x 2' deep is present at the outfall end of the 18 inch pond outlet barrel. This area is located on the east side of the service road. The scour hole was temporarily filled with scrap 12 inch diameter cut wood logs. The wood logs need removed and the rock outlet protection pad needs re-established in accordance with the approved plan or with heavier or larger sized riprap.

10. Dry Pond # 2 (Timber Crib Wall). Thick vegetation and tree saplings, some higher than the height of the wall, are present along both sides of the timber crib wall. This vegetation needs cleaned and removed from both sides of the wall (Note: a 10 ft. clear zone is recommended).

11. Dry Pond # 2. The 3 inch diameter PVC riser needs perforated in accordance with the approved plan. Perforations were only visible on the bottom portion of the riser. Also, perforations that are present in the bottom half of the riser were clogged with organic material and need cleaned.

12. Dry Pond # 2. Sediment and organic material needs cleaned and removed from the immediate vicinity at the base of the perforated riser pipe. Sediment measured approximately 8 inches in depth at this location.

13. Dry Pond # 2. The proposed 2 x 6 longitudinal stringers at 6 inch spacing (provided for capture of large debris) were not observed atop the offset wall portion of the structure.

One reproducible and one blue/black set of the record drawings are requested once the items above are adequately addressed. Resubmission of corrected record drawings can be in advance of the construction certification or construction related items.

Please contact me at 757-253-6639 if you have any further comments or questions relative to record drawing or construction certification requirements for these facilities.

Sincerely,

Scott J. Thomas, P.E.
Civil Engineer
Environmental Division

G:\SWMProg\AsBuilts\SP-50-96.cert

Scott Thomas

From: Scott Thomas
Sent: Friday, February 22, 2002 11:42 AM
To: 'Richard Costello'
Subject: RE: Williamsburg Landing BMP Cert

I trust you will do whatever is prudent to get us a construction certification that is satisfactory for the two onsite BMP facilities. Thanks for the update.

-----Original Message-----
From: Richard Costello [mailto:rcostello@aesva.com]
Sent: Friday, February 22, 2002 10:21 AM
To: scottt@james-city.va.us
Cc: Nancy Harrison
Subject: RE: Williamsburg Landing BMP Cert

ECS did all the Geotechnical inspections. They have not found any records of reports on their first look. We are making them look again since we specifically remember them doing and Bob Moss also remembers. I hope they find something since I could certify something if I had their reports. The architect hired them on our recommendation and reports went to the Owner, arch, and contractor.

Maybe Nancy Harrison can find the Owner's copies. I know the arch & contractor settled on money issues on the project and will not help us.

Richard Costello, P.E.
President
AES Consulting Engineers
ph 757.253.0040 fax 757.220.8994

AES Consulting Engineers a Professional Corporation Confidentiality Note:
This e-mail and any attachments are confidential and may be protected by legal privilege. If you are not the intended recipient, be aware that any disclosure, copying, distribution or use of this e-mail or any attachment is prohibited. If you have received this e-mail in error, please notify us immediately by returning it to the sender and delete this copy from your system. Thank you for your cooperation.

-----Original Message-----
From: scottt@james-city.va.us [mailto:scottt@james-city.va.us]
Sent: Thursday, January 31, 2002 5:21 PM
To: rcostello@aesva.com
Subject: Williamsburg Landing BMP Cert

Project: Williamsburg Landing Nursing & Living Facility (now Woodhaven at Williamsburg)
Plan No.: SP-50-96
BMP ID Codes: CC 011 (BMP 1 Dry Pond) & CC 012 (BMP 2 Timber Crib)

RE: BMP Certification Issues

As discussed with you today, in an effort to close out this project and in full consideration of all related circumstances pertaining to certification of BMPs for the project, we have decided to proceed with release of the erosion and sediment control bond being held for this project, under the condition that you proceed with trying to resolve the construction certification issue that is still outstanding.

As of this date, all record drawing and construction related issues as outlined in the Environmental Division letter dated August 3rd 2000 have been fully addressed to our satisfaction. However, the letter as previously forwarded to our office to serve as construction certification (June 28th 2001) was considered inappropriate. Language in that letter did not meet the intent of Erosion and Sediment Control Note # 18 as provided on Sheet 009 of the approved plans. Therefore, submission of a construction certification in proper format is still outstanding.

Based on my review of the project and discussions with you and Environmental Division staff, I am aware of the history related to who actually performed onsite construction inspection and monitoring and how personnel changes in that organization may result in difficulty in obtaining certification from that firm. In addition, as current engineer of record, I am also aware that you are unable to certify certain portions of BMP construction as you (or your delegated person) were not onsite to monitor critical construction milestones. However, these circumstances do not release the owner/contractor from their responsibility to retain the services of a professional engineer while construction is being performed and to provide subsequent construction certification in accordance with the standard note that was present on the plans when it was approved.

As such, in order to resolve this issue, I request that you perform due dilegence to research available information on the construction of the BMP (as performed by others) and based on that information, provide us with a certification that is satisfactory to meet the intent of our program requirements. It is suggested you utilize Page 3 of the JCC Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions, if desired, with proper exceptions/exclusions as necessary based upon your knowledge, judgement and belief about construction of the BMPs.

If you have any questions, please call me at 757-253-6639.

Scott J. Thomas, P.E.
James City County
Environmental Division

Scott Thomas

From: Scott Thomas
Sent: Thursday, January 31, 2002 5:21 PM
To: 'rcostello@aesva.com'
Subject: Williamsburg Landing BMP Cert

Project: Williamsburg Landing Nursing & Living Facility (now Woodhaven at Williamsburg)
Plan No.: SP-50-96
BMP ID Codes: CC 011 (BMP 1 Dry Pond) & CC 012 (BMP 2 Timber Crib)
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If you have any questions, please call me at 757-253-6639.

Scott J. Thomas, P.E.
James City County
Environmental Division

Woodhaven @ WMBG.

CONSULTING ENGINEERS

5248 Olde Towne Road • Suite 1 • Williamsburg, Virginia 23188
(757) 253-0040 • Fax (757) 220-8994 • E-mail aes@aesva.com

June 28, 2001

NOT SUFFICIENT FOR CONST. CERT.

Mr. Scott Thomas
Environmental Division
James City County
P.O. Box 8784
Williamsburg, VA 23187

RE: Williamsburg Landing
Record Drawings – Dry Ponds #1 and #2
AES Project No. 8162

Dear Scott:

This letter is to certify that as of the date of this letter, having conducted a final inspection of the above referenced project, the dry ponds have been substantially complete in accordance with the plans and specifications for the project dated June 26, 1996.

If you have any further questions or concerns, please do not hesitate to contact Howard W. Price or me at (757) 253-0040.

Sincerely,

AES Consulting Engineers

Richard A. Costello, P.E.
President

S:\Jobs\8162\00\WORDPROC\Document\81620L44.HWP.doc

JAMES CITY COUNTY - ENVIRONMENTAL DIVISION

Office Phone: 757-253-6670 Fax Number: 757-259-4032

DATE SENT: 1/14/02

Name: Frank Huckaby

Firm or Company:

Facsimile Number: 258-3795

Number of pages including this transmittal: 3

From: Scott J. Thomas

James City County
P O Box 8784
Williamsburg VA 23187-8784

Comments: BMP Letter issued 8/03/00 for Williamsburg Landing Nursing & Assisted Living Facility (SP-50-96) BMP's CC011 AND CC012

If you do not receive all pages, call 757-253-6670 as soon as possible

CALLED 1/14/02 TO TELL ME THEY WILL BE STARTING BMP CR WORK. PER OUR LETTER AUG 3 2000

SCOTT J. THOMAS. P.E.
CIVIL ENGINEER

ENVIRONMENTAL DIVISION

101 MOUNTS BAY ROAD, P.O. BOX 8784 (757) 253-6639
WILLIAMSBURG, VIRGINIA 23187-8784 FAX: (757) 259-4032
E-MAIL: scottt@james-city.va.us

AES CONSULTING ENGINEERS
Engineering, Surveying and Planning
5248 Olde Towne Road, Suite 1
WILLIAMSBURG, VIRGINIA 23188

(757) 253-0040
FAX (757) 220-8994

LETTER OF TRANSMITTAL

DATE	JOB NO.
6/29/01	8162

ATTENTION: SCOTT THOMAS

RE: WMBG LANDING POND AS-BUILTS

TO: JCC ENVIRONMENTAL DIV.

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☒ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
2		35H.	AS-BUILTS/RECORD DRAWINGS
1		1SH.	CERTIFICATION LETTER

JUN 2001 RECEIVED ENVIRONMENTAL DIVISION

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

COPY TO _____ SIGNED: [signature]

If enclosures are not as noted, kindly notify us at once.

AES CONSULTING ENGINEERS
Engineering, Surveying and Planning
5248 Olde Towne Road, Suite 1
WILLIAMSBURG, VIRGINIA 23188

(757) 253-0040
FAX (757) 220-8994

LETTER OF TRANSMITTAL

DATE	JOB NO.
6/7/00	8162

ATTENTION: DARRYL COX

RE: WMBG LANDING AS-BUILTS

TO JAMES CITY COUNTY
ENVIRONMENTAL DIV.

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☒ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
2		3 SH.	RECORD DRAWINGS – ENV. DIV.
2		3 SH.	" " – JCSA

JUN 2000 RECEIVED ENVIRONMENTAL DIVISION

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

COPY TO JCSA - KEITH LOTCHWORTH SIGNED: [signature]

If enclosures are not as noted, kindly notify us at once.

CONSULTING ENGINEERS

5248 Olde Towne Road, Suite 1, Williamsburg, Virginia 23188

June 25, 1996

Mr. Michael A. Freda
James City County Planning
P. O. Box 8794
Williamsburg, Virginia 23187

RE: Williamsburg Landing
AES Project No. 8162

Dear Mr. Freda:

To facilitate your review of the subject project, we are providing the following list of revisions which correspond to your review comments dated May 29, 1996.

PLANNING

1. CG-2 has already been provided at the end of parking bays.

2. The correct zoning, R-5 is now indicated on the site plan.

3. The distance from Route 199 to the parking lot is shown on the site plan.

4. Reese Engineering is submitting electrical plans which include lighting details.

5. The sanitary sewer line has been relocated along Williamsburg Landing Drive.

6. The height, square footage, and number of floors are indicated on the site plan. Please note that the application for a height limitation waiver has already been submitted.

7. The number of units is also indicated on the site plan.

CODE COMPLIANCE

1-3. The owner/developer will be responsible for obtaining all permits and agreements.

4. **Noted - as-built drawings for the detention basins will be provided upon completion.**

5. Limits of clearing have been shown on the entire site.

Richard A. Costello, P.E. • Andrew M. Snyder, P.E. • G. Archer Marston, III, P.E.
G.T. Wilson, Jr., C.L.S. • Steven O. Wigley, P.E. • G. Donald Gartrell, III, P.E.

(804) 253-0040 FAX (804) 220-8994

4. Hydrant calls have also been revised.

5. The Detector Check and Fire Department Connection detail is on sheet 12. The meter bypasses the detector check to separate the domestic flow from the fire flow.

6. The Capacity of the water system will also be provided by ABS Consultants.

7. We will be happy to confer with staff concerning the sewage design flow.

V.D.O.T.

1-3. The traffic engineer will provide calculations as needed.

If you have any further questions or comments, please feel free to contact us at your convenience.

Sincerely,

AES Consulting Engineers

Howard W. Price

cc: Eric S. McRoberts - Reese, Lower, Patrick & Scott, Ltd.

File –
Wmbg Landing

DEPARTMENT OF DEVELOPMENT MANAGEMENT
P. O. Box 8784
Williamsburg, Virginia 23187-8784

County Government Center, 101-E Mounts Bay Road

Development Manager
(804) 253-6671

Code Compliance
253-6626

County Engineer
253-6678

Planning
253-6685

Integrated Pest Management
253-2620

July 3, 1996

Mr. Howard Price
AES, Consulting Engineers
5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188

Dear Mr. Price,

Pursuant to your letter request of May 14, 1996 an exception to the Chesapeake Bay Preservation Regulations is granted for disturbance of slopes exceeding 25% for development of a service road accessing the rear of the Assisted Living Facility at Williamsburg Landing. It is our understanding that you agreed to increase the slope of downstream face of the road crossing to 2:1 in order to decrease the steep area disturbed. Please contact me if you have any further questions.

Sincerely,

Bernard M. Farmer, Jr., P. E.
Director of Code Compliance

cc: Darryl Cook

Fax: (804) 253-6663

CONSULTING ENGINEERS

5248 Olde Towne Road, Suite 1, Williamsburg, Virginia 23188

May 14, 1996

Mr. Bernard M. Farmer Jr.
Director of Code Compliance
James City County
101-E Mounts Bay Road
Williamsburg, Virginia 23187

RE: Williamsburg Landing
AES Project No. 8162

Dear Mr. Farmer:

AES Consulting Engineers on behalf of Williamsburg Landing Inc. respectfully request an exception to allow land disturbance on 25% slopes per Section 19B-9 of the County's Chesapeake Bay Preservation Ordinance.

The proposed service road accessing the rear parking lot of the Nursing and Assisted Living Facility has some minor areas of disturbance with 25% slopes. This service road also acts as a dam for the proposed Dry Pond BMP facility on the site which enables us to remove all the necessary pollutants to achieve appropriate water quality. Consequently, this location of the service road is the most functional because it not only allows us to limit the amount of disturbance, but achieve water quality for the subject project.

After the construction of the road and dam have been completed, all disturbed areas shall be stabilized in accordance with all applicable VESCH standards and specifications.

Please review this request and advise me of your decision concerning this exception at your earliest convenience.

Best regards,

AES Consulting Engineers

Howard W. Price

cc: Eric S. McRoberts - Reese, Lower, Patrick & Scott, Ltd.

Richard A. Costello, P.E. • Andrew M. Snyder, P.E. • G. Archer Marston, III, P.E.
G.T. Wilson, Jr., C.L.S. • Steven O. Wigley, P.E. • G. Donald Gartrell, III, P.E.
(804) 253-0040 FAX (804) 220-8994

9. Inspection Records

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

Database Inventory No. (if known): CC-00-002

Name of Facility: Williamsburg Landing BMP No.: #1 Date: 08/02/00

Location: 100' EAST OF MAIN NURSING & ASSISTED LIVING FACILITY

Name of Owner: Williamsburg Landing, Inc.

Inspector: S.J. Thomas

Type of Facility: DRY DETENTION POND (EMBANKMENT TYPE) County F-2

Weather Conditions: PARTY Sunny, MID 80's

If an inspection item is not applicable, mark NA, otherwise mark the appropriate column.

O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory.
Routine - The item checked requires attention, but does not present an immediate threat to the function of the BMP.
Urgent - The item checked requires immediate attention to keep the BMP operational and prevent damage to the facility.

Provide an explanation and details in the comment column, if routine or urgent are marked.

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height	X			D/S GROWTH HIGHER & NOT MAINTAINED.
Vegetated Condition	X			U/S OK. D/S FERNS NO TREES YET.
Weed Growth	X			
Erosion	X			
Trash & Debris		X		LITTER & WOOD DEBRIS U/S EMB. NEAR RISER. CUT LOGS D/S RIGHT.
Seepage	X			
Fencing or Benches	X			
Constructed Wetlands (Interior Landscaped & Planted) Areas: N/A				
Vegetated Conditions				
Trash & Debris				
Floatables				
Erosion				
Sediment				
Dead Plant				
Aesthetics				
Other				

CC011_WILLIAMSBURG_LANDING_NURSERY_&_ASSISTED_LIVING - 069

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools ☐ Permanent Pool (Retention Basin) ☒ Shallow Marsh (Detention Basin)				
Shoreline Erosion	X			
Algae	X			NO WATER POOL OBSERVED.
Trash & Debris	X	X		TRASH & WOOD DEBRIS PAVED DITCH INFLOWS + EMBANKMENT @ RISER.
Sediment	X			
Aesthetics	X			GOOD LOW COVER.
Other	X			
Inflow Stuctures (Describe Locations): INFLOW PIPE 170' WEST OF RISER. 2 PAVED CHANNELS INFLOW AT U/S EMBANK. LEFT & RIGHT.				
Condition of Structure		X		REMOVE VEG. AT INFLOW POINTS.
Erosion		X		SCOUR HOLES @ END PAVED CHANNELS.
Trash and Debris		X		TRASH/DEBRIS @ END & OVERBANK CHAN.
Sediment	X			
Aesthetics	X	X		TRASH + DEBRIS NEEDS REMOVED.
Other	X			
Principal Flow Control Structure - Intake, Riser, etc. (Describe Location): 48" VERT. RCP W/ CAP @ EMB. MID POINT				
Condition of Structure	X			
Corrosion	X			
Trash and Debris		X		REMOVE TREES 15' OF RISER.
Sediment	X			
Aesthetics	X			
Other				GOOD CONDITION STRUCTURALLY.
Principal Outlet Structure - Barrel, Conduit, etc. : 18" OUTLET BARREL UNDER SERVICE ROAD.				
Condition of Structure	X			
Settlement	X			
Trash & Debris			X	OUT. PROT. RIPRAP WASHED D/S. 12" DIA CUT LOGS PUT IN SCOUR HOLE.
Sediment	X			
Erosion			X	10'W x 8'W x 2' DEEP SCOUR HOLE AT END. RIPRAP MISSING
Other				
Emergency Spillway (Overflow): NO PRIMARY STRUCT; ROAD LOW SPOT E/S.				
Vegetation	X			ROAD + ADJ. VEG GOOD, GROOMED.
Lining	X			
Erosion	X			
Trash & Debris	X			
Other				
NOTE: Dumped logs, bark + wood chips on D/S RT. EMBANKMENT APPROX. 50' from ℄ ROAD.				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	X			
Animal Burrows	X			
Graffiti	X			
Other				TRASH, WOOD DEBRIS FLOATABLES EVIDENT.
Surrounding Perimeter Conditions:				
Land Uses	X			
Vegetation	X			
Trash & Debris	X			
Aesthetics	X			GOOD, WELL GROOMED PERIMETER.
Access /Maintenance Roads or Paths	X			
Other	X			

Remarks: THIS INSPECTION WAS PERFORMED FOLLOWING CONSTRUCTION & PRIOR TO BOND RELEASE. LETTER DATED AUGUST 3RD 2000 FORWARD TO ENGINEER. 13 ITEMS TO BE ADDRESSED FOR BMP #1 & #2. Refer to Letter for BMP #1 RECORD DRAWING, CONSTRUCTION CERTIFICATION & "HIT-LIST" ITEMS.

Overall Environmental Division Internal Rating: 5

Signature: Arthur J. Thomas, P.E. **Date:** 08/14/00

Title: ENVIRONMENTAL DIVISION, CIVIL ENGINEER

SWMProg\BMP\CoInspProg\DetRet.wpd

S-50-96

DARCYL

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

WILLIAMSBURG LANDING #8162

NURSING & ASSISTED LIVING FACILITY

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
DRY POND #1	6	x	6.20 / 33.26	=	1.12
DRY POND #2	6	x	2.49 / 33.26	=	0.45
		x		=	
FUTURE DRY POND #3	6	x	10.0 / 33.26	=	(1.80)

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 1.57 (3.37)

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
23.05 / 33.26 (100)	x	23.05 + 2.19 / 33.26 = .416 / (0.1 per 1%)	=	6.93

C. TOTAL WEIGHTED POINTS

1.57 (3.37)	+	6.93	=	8.50 (10.30)
Structural BMP Points		Natural Open Space Points		TOTAL

NOTE: THE APPROXIMATE 11.5 AC ± TO THE WEST OF THE NURSING FACILITY SHALL BE RESPONSIBLE FOR OBTAINING A MINIMUM OF 1.50 POINTS PER JAMES CITY COUNTY.

(+) INDICATES FUTURE ADDITIONS.

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

WILLIAMSBURG LANDING #3162
NURSING & ASSISTED LIVING FACILITY

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
DRY POND #1	6	x	6.20 / 33.26	=	1.12
DRY POND #2	6	x	2.49 / 33.26	=	0.45
		x		=	
FUTURE DRY POND #3	6	x	10.0 / 33.26	=	(1.80)

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 1.57 (3.37) ←

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
23.05 / 33.26 (100) (22.19)	x	.1 (0.1 per 1%)	=	4.16 / 6.93

23.05 / 55.45

C. TOTAL WEIGHTED POINTS

(3.37) 1.57	+	6.93	=	(10.30) 8.50
Structural BMP Points		Natural Open Space Points		TOTAL

NOTE: 1) THE APPROXIMATE 11.5 AC ± TO THE WEST OF THE NURSING FACILITY SHALL BE RESPONSIBLE FOR OBTAINING A MINIMUM OF 1.50 POINTS PER JAMES CITY COUNTY.

(+) INDICATES FUTURE ADDITIONS.

2) ADDING THE 22.19 AC TO THE TOTAL SITE AREA AS OPEN SPACE HAS NO NET EFFECT ON THE TOTAL POINTS. (i.e., 100 x .1 = 10)

3) THE EXISTING ASSISTED LIVING REPORTS THE INTENT. PLEASE CALL.

10. Misc. (ex. photos)

Date Record Created:

Created By:

WS_BMPNO: CC011

Print Record

PRINTED ON
Wednesday, March 10, 201
3:05:28 PM

WATERSHED	CC
BMP ID NO	011
PLAN NO	SP-50-96
TAX PARCEL	(48-2)(1-3)
PIN NO	48201000030
CONSTRUCTION DATE	10/1/1999
PROJECT NAME	Williamsburg Landing
FACILITY LOCATION	100' East Main Building
CITY-STATE	Williamsburg, Va.
CURRENT OWNER	Williamsburg Landing
OWNER ADDRESS	5700 Wmbg Landing Drive
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, Va. 23185
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

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MAINTENANCE PLAN	No	CTRL STRUC DESC	RCP Riser
SITE AREA acre	33.26	CTRL STRUC SIZE inches	48
LAND USE	Nurs/Asst Liv	OTLT BARRL DESC	RCP
old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	18
JCC BMP CODE	F2 Dry ED with forebay		
POINT VALUE	6	EMERG SPILLWAY	No
		DESIGN HW ELEV	62.78
		PERM POOL ELEV	No
SVC DRAIN AREA acres	5.19	2-YR OUTFLOW cfs	0.00
		10-YR OUTFLOW cfs	0.00
		REC DRAWING	Yes
SERVICE AREA DESCRI	Building & Parking Area		
IMPERV AREA acres	0.00	CONSTR CERTIF	No
RECV STREAM	College Creek		
EXT DET-WQ-CTRL	Yes	LAST INSP DATE 8/2/2000	Inspected by:
WTR QUAL VOL acre-ft		INTERNAL RATING	4
CHAN PROT CTRL	No	MISC/COMMENTS	
CHAN PROT VOL acre-ft		Nurs & Liv Facility (Woodhaven). Also See CC 012. BMP#1 Dry Pond	
SW/FLOOD CONTROL	Yes		
GEOTECH REPORT	No		

Additional Comments:

CC012
Timber Crib Wall
North of Main Building
Williamsburg Landing
Nursing & Assisted
Living Facility
CC011
Embankment Facility
along Service Road