



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 HA VE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMPNUMBER: MC013

DATE VERIFIED: June 27, 2016

QUALITY ASSURANCE TECHNICIAN: Charles E. Lovett II

A handwritten signature in cursive script that reads "Charles E. Lovett II".

LOCATION: WILLIAMSBURG, VIRGINIA



Stormwater Division

MEMORANDUM

Date: March 28, 2012
To: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
From: Leah Hardenbergh
PO: 110426
Re: Files Approved for Scanning

General File ID or BMP ID: MC013
PIN: 3842500001A
Owner Name (if known): STRAWBERRY PLAINS CENTER
CONDOMINIUM
Legal Property Description: COMMON AREA STRAWBERRY PLAINS
CENTER
Site Address: STRAWBERRY PLAINS RD

(For internal use only):

Box # 3

Agreements (in file as of scan date): Book or Doc #: 990001221/000011207

MC-013

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

DECLARATION OF COVENANTS

COPY ✓

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 2 day of June, 19²⁰⁰⁰,
between STRAWBERRY Development LLC,
and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the
following property: 3701 STRAWBERRY PLAINS RD,
Deed Book _____, Page No. _____ or Instrument No. 990001221,
and James City County, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

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, 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.
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.

instrument # 000011207
recorded 6/12/00 @ 12:57

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 2nd day of June, 19 2000

COVENANTOR(S)

Bonnie J. Vautrot

Print Name/Title

Bonnie J. Vautrot, Managing Partner

ATTEST:

COVENANTOR(S)

Print Name/Title

ATTEST:

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF James City

I hereby certify that on this 2nd day of June, 2000, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City County, aforesaid personally appeared Bonnie J. Vautrot and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 2nd day of June, 2000.

Kimberly P. Hettler
Notary Public

My Commission expires: June 30, 2003

Approved as to form:

L. P. Rogers
Deputy County Attorney

This Declaration of Covenants prepared by:

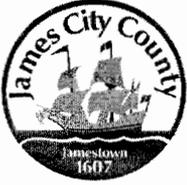
STEVE GUNDERSON
(Print Name)

VICE PRESIDENT
(Title)

800 FAIRFIELD BLVD
(Address)

Hampton VA 23669
(City) (State) (Zip)

drainage.pre
Revised 2/97



**James City County Environmental Division
Stormwater Management/BMP Record Drawing and
Construction Certification Review Tracking Form**

Project Name: Strawberry Plains Center
 County Plan No.: SP-001-04
 Stormwater Management Facility: Wet Pond
 BMP Phase #: I II III
 Information Package Received. Date/By: 8/6/09 Rick Smith
 Completeness Check:
 Record Drawing Date/By: 1/21/09 G. Mearlon
 Construction Certification Date/By: 5/26/09 M. Galli
 RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only)
 Insp/Maint Agreement # / Date: # 00001/207 4/12/2000
 BMP Maintenance Plan Location: Sheet 6 of site plan
 Other: _____
 Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
 Yes No Location: Sheet 13 Item # 20
 Assign County BMP ID Code #: Code: M6013
 Preliminary Input/Log into Division's "As-Built Tracking Log"
 Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
 Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
 Active Project File Review (correspondence, H&H, design computations, etc.)
 Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.)
 Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
 Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
 Final Inspection (FI) Performed Date: 7/14/2009
 Record Drawing (RD) Review Date: 7/14/2009
 Construction Certification (CC) Review Date: 7/14/2009
 Actions:
 No comments.
 Comments. Letter Forwarded. Date: 7/14/2009
 Record Drawing (RD)
 Construction Certification (CC)
 Construction-Related (CR)
 Site Issues (SI)
 Other: _____
 Second Submission: NA
 Reinspection (if necessary): NA
 Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
 Complete "Surety Request Form".
 Check/Clean active file of any remaining material and finish "As-Built" file.
 Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
 Copy Final Inspection Report into County BMP Inspection Program file.
 Obtain 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.



**James City County, Virginia
Environmental Division**

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

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 – Site Information:

Project Name: Strawberry Plains Center
 Structure/BMP Name: BMP
 Project Location: 3701 Strawberry Plains Road Williamsburg Va. 23188
 BMP Location: 3701 Strawberry Plains Road Williamsburg Va. 23188
 County Plan No.: SP-001-04

Project Type:	<input type="checkbox"/> Residential	<input checked="" type="checkbox"/> Business	Tax Map/Parcel No.:	<u>(38-4)(1-38A)</u>
	<input checked="" type="checkbox"/> Commercial	<input checked="" type="checkbox"/> Office	BMP ID Code (if known):	<u>Unknown MC 013</u>
	<input type="checkbox"/> Institutional	<input type="checkbox"/> Industrial	Zoning District:	<u>Berkeley District</u>
	<input type="checkbox"/> Public	<input type="checkbox"/> Roadway	Land Use:	<u>B-1 General Business</u>
	<input type="checkbox"/> Other _____		Site Area (sf or acres):	<u>5.63 Acres</u>

Brief Description of Stormwater Management/BMP Facility: Pond is in final BMP mode for this certification and is located on site. Currently the BMP is operating as a wet type facility.

Nearest Visible Landmark to SWM/BMP Facility: BackFin Restuarant

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: _____

Section 2 – Stormwater Management / BMP Facility Construction Information:

PreConstruction 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: C. Lewis Waltrip, II, Inc.
Name of Professional Firm Who Routinely Monitored Construction: ECS, Ltd.
Date of Completion for SWM/BMP Facility: December 2008
Date of Record Drawing/Construction Certification Submittal: 1/7/04 Revised 1/13/09

(Note: Record Drawing and Construction Certifications are required within thirty (30) days of the completion of Stormwater Management and/or BMP facility construction. Record Drawings and Construction Certifications must be reviewed and approved by the James City County Environmental Division prior to final inspection, acceptance and bond or surety release.)

Section 3 – Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*

Name: W& L Land, L.L.C.
Mailing Address: 3701 Strawberry Plains Road
Williamsburg, Virginia 23188
Business Phone: 757-258-2705 Fax: 757-258-0516
Contact Person: Mr. Waverly Brooks Title: _____

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Suite 1
Business Phone: (757)-253-0040
Fax: (757)-253-8994
Responsible Plan Preparer: George Archer Marston, III, P.E.
Title: Vice President
Plan Name: Strawberry Plains Center
Firm's Project No. 8720-00
Plan Date: January 7, 2004 / Revised 1/13/09
Sheet No.'s Applicable to SWM/BMP Facility: 6 / 15 / _____ / _____ / _____

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*

Name: C. Lewis Waltrip, II, Inc.
Mailing Address: 213 Ingram Road
Williamsburg, VA 23188
Business Phone: (757) 220-0856
Fax: (757) 220-0916
Contact Person: Mr. Bob Oliver, P.E.
Site Foreman/Supervisor: Mr. Bob Oliver, P.E.
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 – Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer of Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

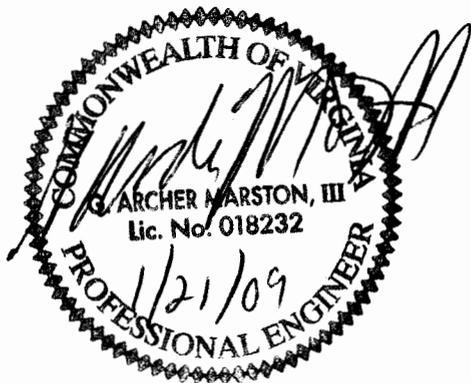
Record Drawing Certification

Firm Name: AES Consulting Engineers
 Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188
 Business Phone: 757-253-0040
 Fax: 757-220-8994

Name: ^{G.}George Archer Marston, III, P.E.
 Title: Vice President

Signature: [Handwritten Signature]
 Date: 1/21/09

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.



(Seal)

Virginia Registered Professional Engineer
 Or Certified Land Surveyor

Construction Certification

Firm Name: ECS M.D. Atlanta, LLC
 Mailing Address: 108 Ingram Rd., Suite 1
Williamsburg, VA 23188
 Business Phone: 229-6677
 Fax: 229-9978

Name: Michael Galli
 Title: Vice President

Signature: [Handwritten Signature]
 Date: 1/26/09

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 specifically noted.



(Seal)

Virginia Registered
 Professional Engineer

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

- ❑ PreConstruction Meeting – Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address 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 Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.
- ❑ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM and RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.
- ❑ 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, geosynthetics, 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 Environmental Division 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 Environmental Division 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 James City County Environmental Division.
- ❑ 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 Environmental Division prior to final inspection, acceptance and bond/surety release.

Dual Purpose Facilities – 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 Environmental 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.)

- ❑ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*
- ❑ 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 reproducible.
- ❑ 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 BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: **XX** Acceptable **N/A** Not Applicable **Inc** Incomplete)

I. Methods and Presentation: (Required for all Stormwater Management / BMP facilities.)

- XX 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.
- XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.
- XX 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).
- XX 4. All plans sheet revision blocks modified to indicate date and record drawing status.
- XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: (Required for all Stormwater Management / BMP facilities, as applicable.)

- XX 1. All requirements of Section I (Methods and Presentation) apply to this section.
- XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.
- XX 4. Top widths, berm widths and embankment side slopes.
- XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.
- XX 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.
- XX 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.
- XX 8. Elevation of the principal spillway crest or outlet crest of the structure.

- XX 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.
- XX 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.
- XX 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.
- XX 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**
- XX 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**
- XX 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.
- XX 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.
- XX 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.
- 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.
- XX 18. Maintenance plan taken from approved design plan transposed onto record drawing set.
- N/A 19. Fencing location and type, if applicable to facility.
- XX 20. BMP vicinity properly cleaned of stockpiles and construction debris.
- XX 21. No visual signs of erosion or channel degradation immediately downstream of facility.
- XX 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A – Wet Ponds (Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)

- XX A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.
- XX A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.
- N/A A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.
- XX A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.
- XX A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.
- N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.
- N/A A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).
- XX A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.
- XX A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.
- XX A10. Low flow orifice has a non-clogging mechanism.
- XX A11. A pond drain pipe with valve was provided.
- XX A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.
- N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

**STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST**

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IV. Group B – Wetlands: (Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland).

- N/A B1. Same requirements as Group A Wet Ponds.
- N/A B2. Minimum 2:1 length to width flow path provided across the facility.
- N/A B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).
- N/A B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.
- N/A B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).
- N/A B6. No more than one-half (½) of the wetland surface area is planted.
- N/A B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.
- N/A B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

- V. Group C – Infiltration Practices** *(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)*
- N/A C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.
- N/A C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.
- N/A C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.
- N/A C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.
- N/A C5. Sides of infiltration practice lined with filter fabric.
- N/A C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.
- N/A C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.
- N/A C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.
- N/A C9. Minimum twenty-five (25) foot separation down gradient from any structure.
- N/A C10. Stormwater outfalls provided for overflow associated with larger design storms.
- N/A C11. No visual signs of erosion or channel degradation immediately downstream of facility.
- N/A C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.
- N/A C13. Observation well provided.
- N/A C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VI. Group D – Filtering Systems *Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)*

- N/A D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.
- N/A D2. Sediment pretreatment devices provided.
- N/A D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.
- N/A D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.
- N/A D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.
- N/A D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed.
- N/A D7. Filtering system is off-line from storm drainage conveyance system.
- N/A D8. Overflow outlet has adequate erosion protection.
- N/A D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.
- N/A D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.
- N/A D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.
- N/A D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.
- N/A D13. No visual signs of erosion or channel degradation immediately downstream of facility.
- N/A D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VII. Group E – Open Channel Systems *(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales; and E-3 Biofilters)*

- N/A E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.
- N/A E2. Open channel system has constructed longitudinal slope of less than four (4) percent.
- N/A E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.
- N/A E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.
- N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).
- N/A E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.
- N/A E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.
- N/A E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.
- N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.
- N/A E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.
- N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.
- N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.
- N/A E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.
- N/A E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.
- N/A E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.
- N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

- VIII. Group F – Extended Dry Detention** *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*
- N/A F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.
 - N/A F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
 - N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)
 - N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.
 - N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging
 - N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.
 - N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.
 - N/A F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.
 - N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
 - N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
 - N/A F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
 - N/A F12. Stilling basin or standard outlet protection provided at principal spillway outlet.
 - N/A F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.
 - N/A F14. No visual signs of undercutting of timber walls or clogging of the low orifice were present.
 - N/A F15. No visual signs of erosion or channel degradation immediately downstream of facility.
 - N/A F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

**STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST**

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IX. Group G – Open Spaces (Includes All Open Space Types G-1; G-2; and G-3)

- N/A G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.
- N/A G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.
- N/A G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.
- N/A G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).
- N/A G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.
- N/A G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

X. Storm Drainage Systems (Associated with BMP's Only)

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

- N/A SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.
- N/A SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.
- N/A SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).
- N/A SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.
- N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

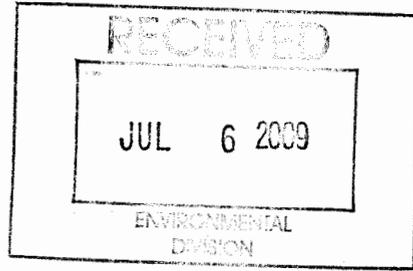
(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception.)

- N/A O1. All requirements of Section II, Minimum Standards, apply to this section.
- N/A O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

XIII. References *(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)*

- Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999.)
- James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- Prince William County, Virginia, Stormwater Management Fact Sheet.
- Stafford County, Virginia As-Built Plan Checklist.
- Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

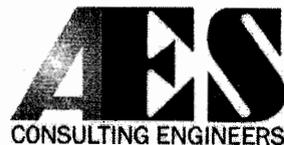


Strawberry Plains Center

Final Certification of BMP January 21, 2009

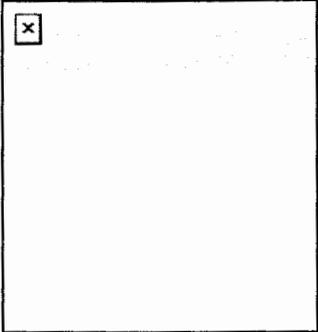
SP-139-99
MC 013

Prepared by:



AES Consulting Engineers

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Williamsburg, VA 23188
(757) 253-0040 Fax: (757) 220-8994
<http://www.aesva.com>



**James City County, Virginia
Environmental Division**

**Stormwater Management / BMP Facilities
Record Drawing and Construction Certification**

Standard Forms & Instructions

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*Issue Date
February 1, 2001*

January 21, 2009

Mr. Michael Majdeski
James City County Environmental Division
101-E Mounts Bay Road
P.O. Box 8784
Williamsburg, Virginia 23187-8784

**RE: Strawberry Plains Center BMP As-Built
AES Project No. 8784-00**

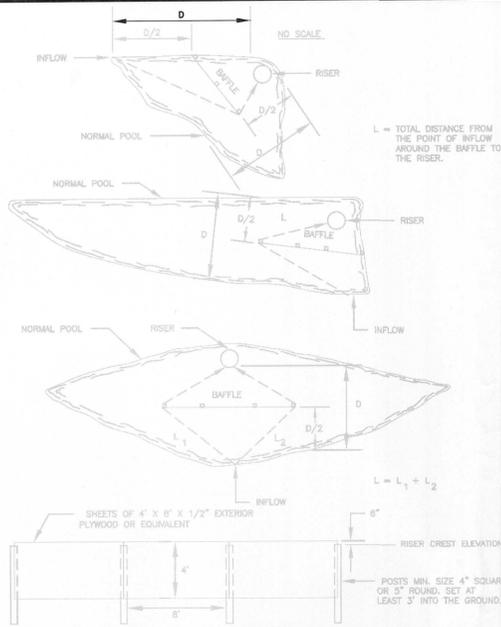
Dear Mr. Majdeski:

The attached file represents the field verified information for the as-built conditions of the BMP located at Strawberry Plains Center. The information provided here for the final certification of construction of the BMP is in accordance with the plans and James City County guidelines.

If you should have any questions or concerns as a result of this submittal, please do not hesitate to contact me.

Sincerely,
AES Consulting Engineers

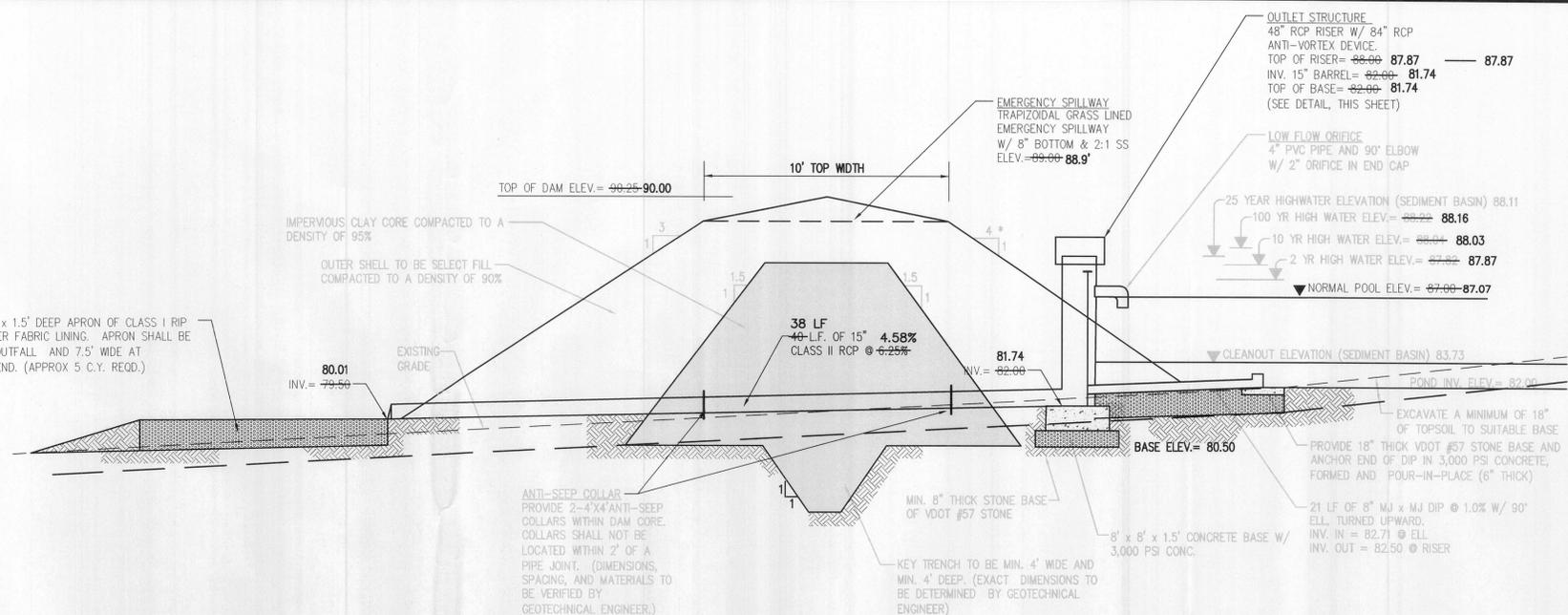
Richard Smith
Project Engineer



EXAMPLE PLAN VIEWS OF BAFFLE LOCATIONS IN SEDIMENT BASINS

SOURCE: USDA SCS PLATE 3-14-6 N.T.S. D-BAFFLE

EXISTING 22' PROVIDE 15' L x 1.5' DEEP APRON OF CLASS I RIP RAP WITH FILTER FABRIC LINING. APRON SHALL BE 4.5' WIDE AT OUTFALL AND 7.5' WIDE AT DOWNSTREAM END. (APPROX 5 C.Y. REQ.)



WET POND N.T.S.

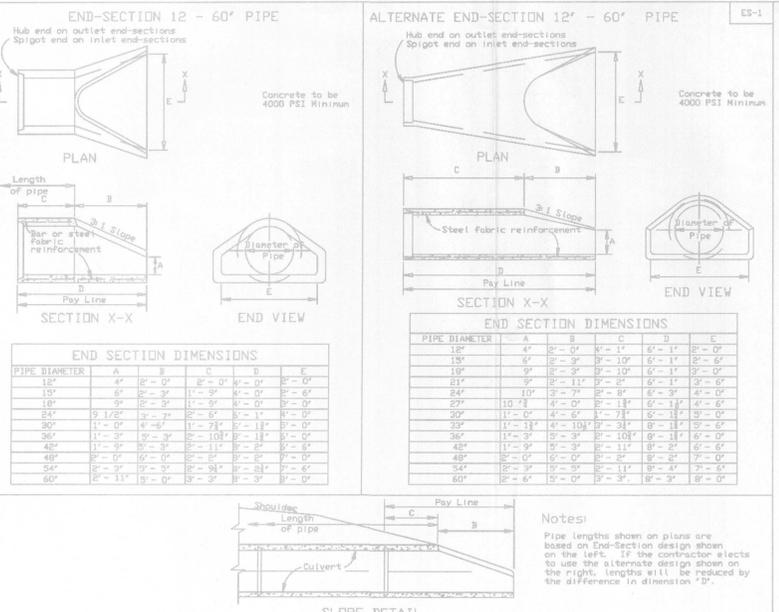
*NOTE: POND DAM IS AT A 4:1 SLOPE FROM ELEVATION 90 TO 86. POND IS AT A 3:1 SLOPE INSIDE OF DAM.

DAM CONSTRUCTION NOTES

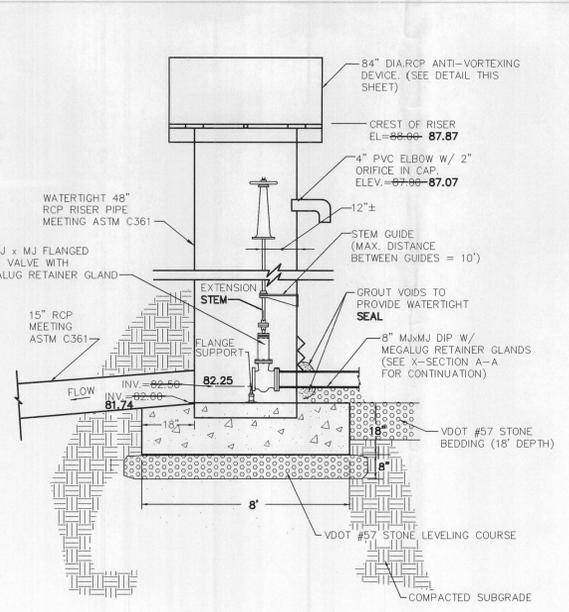
- A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED TO ENSURE SUITABILITY OF THE SUBGRADE. THE GEOTECHNICAL INVESTIGATION WILL DETERMINE SUITABILITY OF THE FILL MATERIAL, RECOMMENDED ANTI-SEEP MEASURES, KEY TRENCH DEPTH AND WIDTH, AND THE ANTICIPATED LOCATION OF THE PHREATIC LINE. THESE RECOMMENDATIONS ARE HEREBY MADE A PART OF THE DAM'S CONSTRUCTION SPECIFICATIONS. A REPRESENTATIVE OF THE GEOTECHNICAL CONSULTANT SHALL BE ON SITE DURING CONSTRUCTION TO ENSURE PROPER MATERIALS AND DAM CONSTRUCTION METHODS ARE UTILIZED. FOLLOWING DAM CONSTRUCTION, THE GEOTECHNICAL CONSULTANT SHALL PROVIDE WRITTEN DOCUMENTATION, SIGNED BY A PROFESSIONAL ENGINEER, THAT THE DAM WAS BUILT IN ACCORDANCE WITH THEIR RECOMMENDATIONS, PLANS, AND SPECIFICATIONS. THE GEOTECHNICAL CONSULTANT SHALL COORDINATE WITH THE DESIGN ENGINEER IN ORDER TO COMPLETE THE JCC ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT/EMP FACILITIES CONSTRUCTION AND AS-BUILT CERTIFICATION FORM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE DAM CONSTRUCTION SCHEDULE WITH THE GEOTECHNICAL CONSULTANT IN ORDER TO ENSURE ON-SITE MONITORING.
- SITE PREPARATION: THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT CONSTRUCTION TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS, AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.
- EMBANKMENT: THE EXPOSED SUB GRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER. ANY UNSUITABLE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING, AT THE DISCRETION OF THE OWNER / GEOTECHNICAL ENGINEER, SHALL BE PERFORMED AT THIS TIME. THE EMBANKMENT SHALL BE KEPT INTO THE UNDISTURBED (EXISTING) SOIL STRATUM. EMBANKMENT SHOULD BE KEPT AT LEAST 3 FEET INTO THE STRATUM OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER. (WIDTH = 6 FT. MINIMUM). THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUB GRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE, AND GENERALLY UNSUITABLE MATERIAL. ALL MATERIALS TO BE USED FOR BACKFILLING/COMPACTED FILL SHALL BE INSPECTED AND, IF NECESSARY, TESTED BY THE GEOTECHNICAL ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE. THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS - IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIAL. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACKFILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. AREAS ON WHICH FILL IS TO BE PLACED SHALL BE SCARIFIED A MINIMUM DEPTH OF 4 INCHES PRIOR TO PLACEMENT OF FILL. THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE +3 TO -2 PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL WILL BE PLACED IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUBGRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.
- CUTOFF TRENCH/KEY TRENCH: THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH SHALL BE AS SHOWN ON THE PLANS AND SHALL EXTEND UP BOTH ABUTMENTS. THE BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTING EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTING REQUIREMENTS SHALL BE THE SAME AS THOSE FOR THE EMBANKMENT. THE TRENCH SHALL BE KEPT DRAINED DURING THE BACKFILLING/COMPACTING OPERATIONS.
- PRINCIPAL SPILLWAY: THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE FOUNDATION'S BASE. ALL JOINTS IN THE PRINCIPAL SPILLWAY STRUCTURE SHALL BE OF WATERTIGHT CONSTRUCTION. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACKFILL AROUND THE BARREL OR ANTI-SEEP COLLAR. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4-INCH LAYERS AND COMPACTED BY HAND TO THE SAME DENSITY AS THE EMBANKMENT. A MINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
- VEGETATIVE STABILIZATION: FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHICH STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:
TOPSOIL: AT LEAST 4" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS, 4,000#/ACRE (90#/1,000 S.F.)
LIME: KENTUCKY 31 TALL FESQUE 250#/ACRE (6#/1,000 S.F.)
SEED: 10/20/10 MIX, 1,000#/ACRE (25#/1,000 S.F.)
FERTILIZER: STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)
MULCH:

"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."

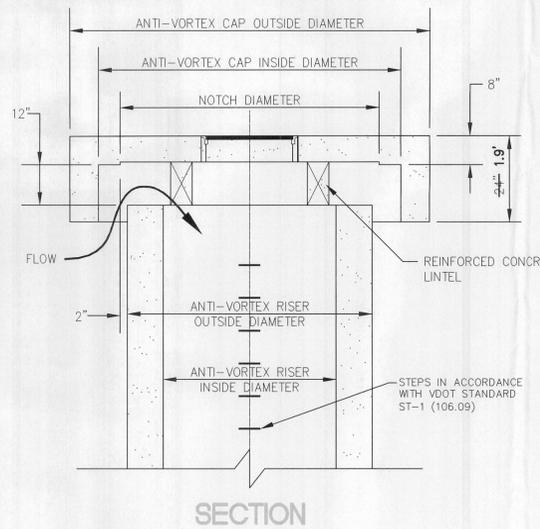
THOMAS C. SUBLETT DATE



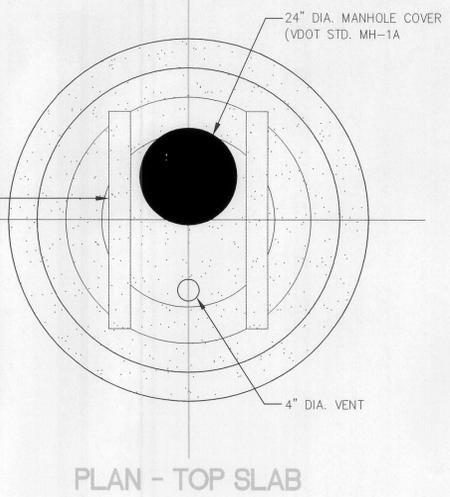
FLARED END-SECTION FOR CONCRETE PIPE CULVERTS



CROSS SECTION PROP. 48" RISER STRUCTURE WITH ANTI-VORTEXING TOP NOT TO SCALE



RISER I.D.	RISER O.D.	ANTI-VORTEX CAP I.D.	ANTI-VORTEX CAP O.D.	NOTCH DIAMETER	APPROXIMATE CAP WEIGHT
24"	30"	48"	58"	34"	1.49 T
27"	33-1/2"	60"	70" OR 72"	37-1/2"	2.28 T
30"	37"	60"	70" OR 72"	41"	2.26 T
36"	44"	60"	70" OR 72"	48"	2.22 T
42"	51"	72"	86"	55"	3.16 T
48"	58"	84"	100"	62"	4.27 T
54"	66-1/2"	84"	100"	70-1/2"	4.20 T
60"	72"	96"	114"	76"	5.48 T
66"	80-1/2"	96"	114"	84-1/2"	5.39 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126"	147"	98-1/2"	8.97 T
84"	100"	126"	147"	104"	8.90 T



- ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
- DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478.
- INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER I.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.).
- SLAB REINFORCEMENT TO BE ASTM A615 #4 BARS @ 8" E.W. CIRCUMFERENTIAL.

ANTI-VORTEX DETAIL NOT TO SCALE

RECORD DRAWING REVISED 1/13/09

NO.	DATE	REVISION / COMMENT	BY
1	2/14/08	REVISED PER COUNTY COMMENTS	HWP
2	2/20/08	AMENDED SITE PLAN	HWP



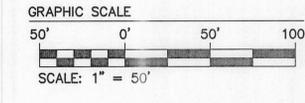
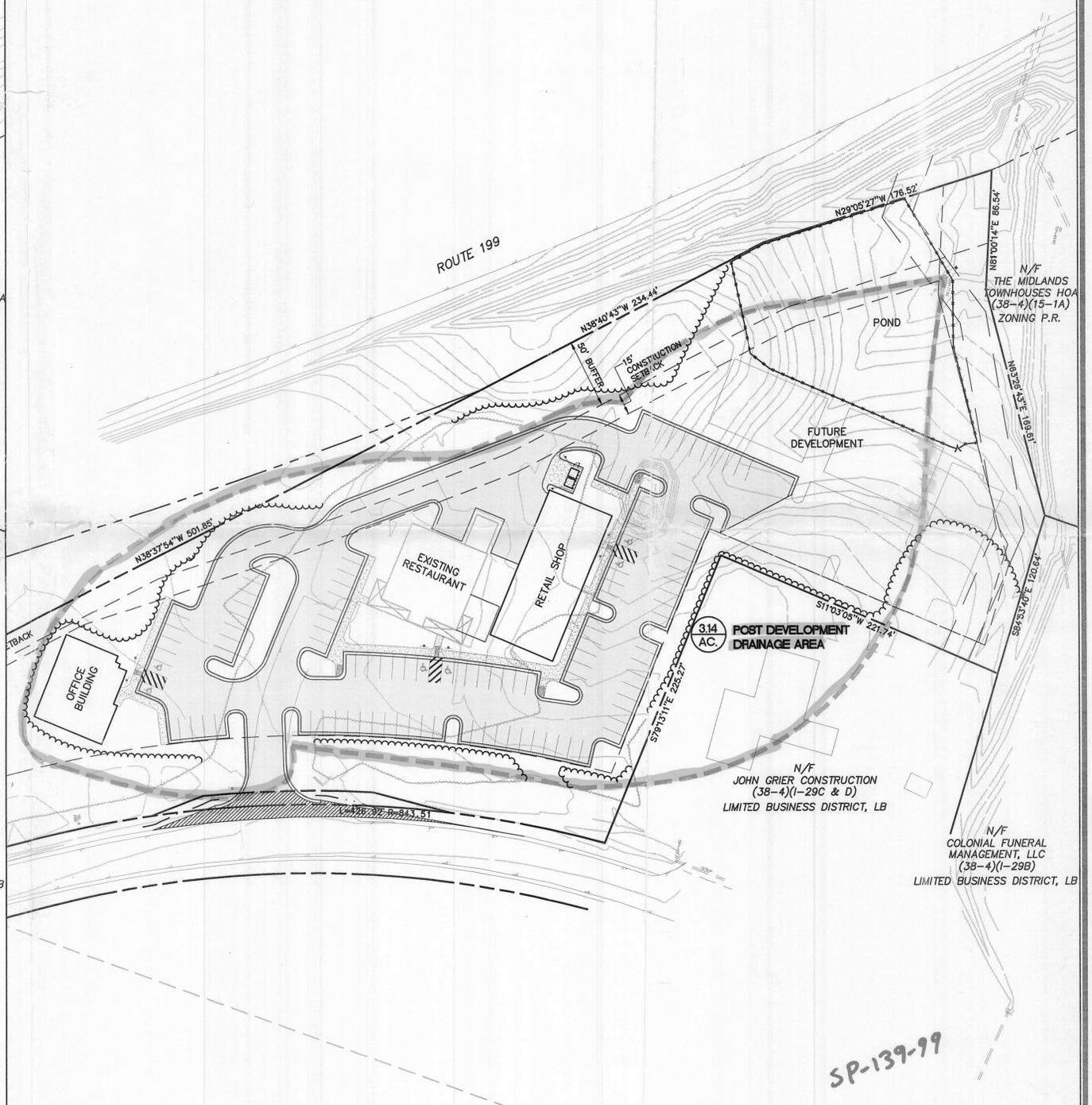
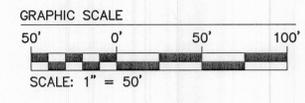
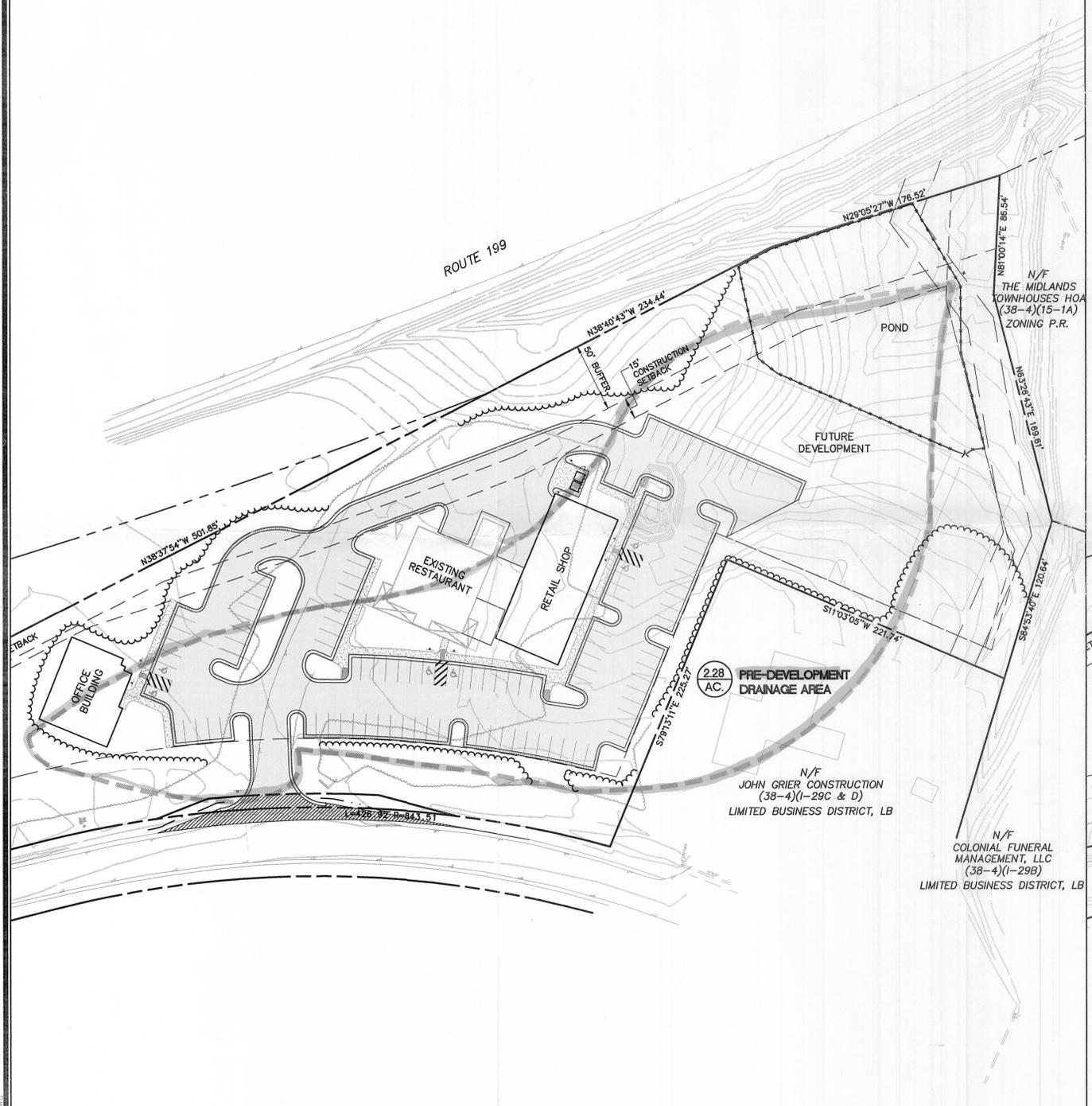
5248 Old Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 263-0040
Fax (757) 220-8994



OWNER/DEVELOPER: W & L LAND, LLC
BERKELEY DISTRICT

DESIGNED: CWG/HWP
SCALE: NONE
DRAWN: CWG
DATE: 1/7/04
PROJECT NO.: 8720-1
DRAWING NO.: 15

02.11.05-17.27.87200c15.dwg



SP-139-99

No.	DATE	REVISION / COMMENT / NOTE	BY

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



DRAINAGE AREA MAP
STRAWBERRY PLAINS CENTER

OWNER/DEVELOPER: STRAWBERRY DEVELOPMENT, L.L.C. VIRGINIA
BERKELEY DISTRICT JAMES CITY COUNTY

Designed HWP/CWG	Drawn CWG
Scale 1"=50'	Date 3/22/00
Project No. 8720	
Drawing No. D1	

03.22.00-08.17 87200001.dwg

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

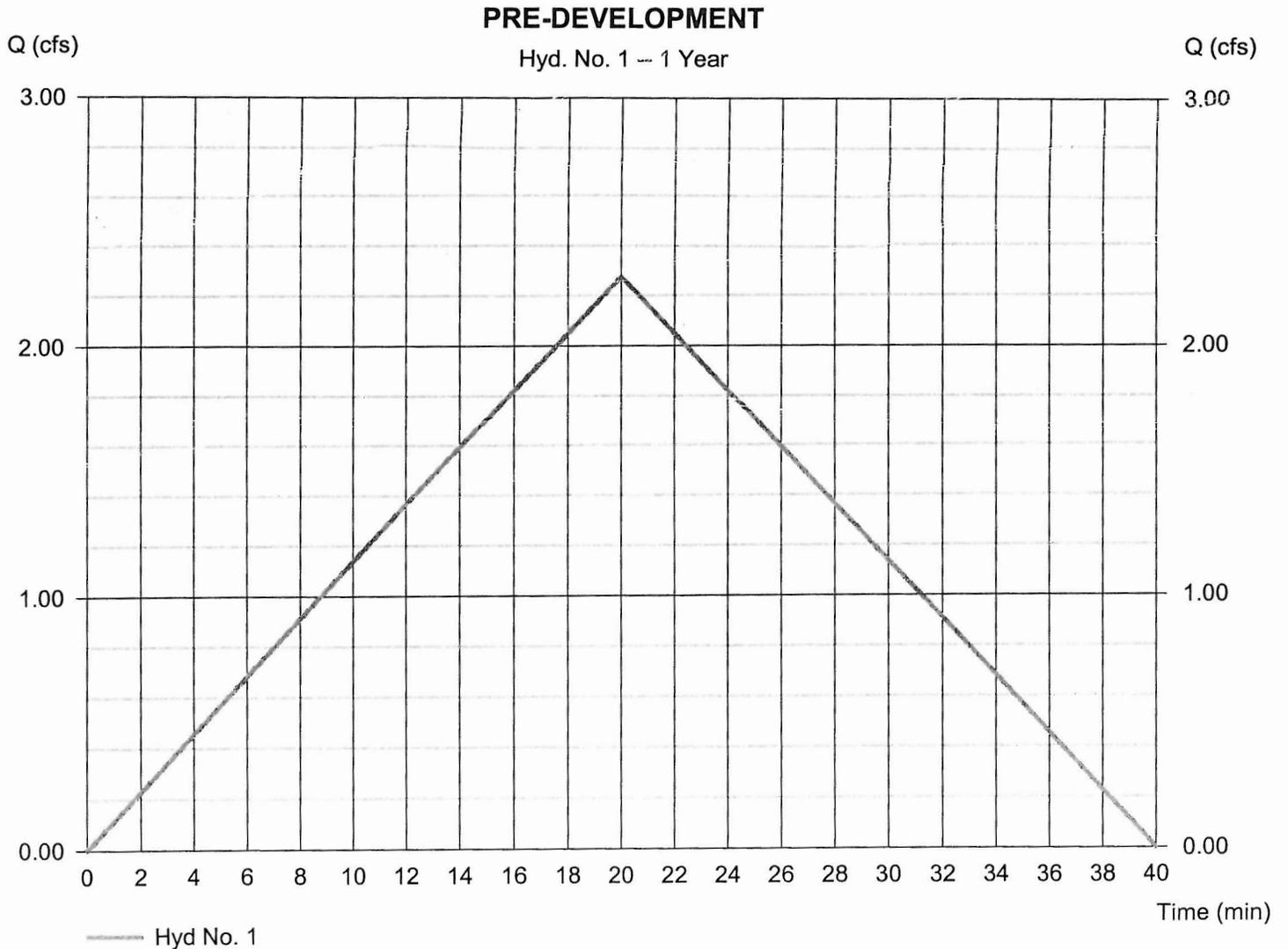
Wednesday, Jan 21, 2009

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 1 yrs
Time interval = 1 min
Drainage area = 2.280 ac
Intensity = 2.852 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 2.276 cfs
Time to peak = 20 min
Hyd. volume = 2,731 cuft
Runoff coeff. = 0.35
Tc by User = 20.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

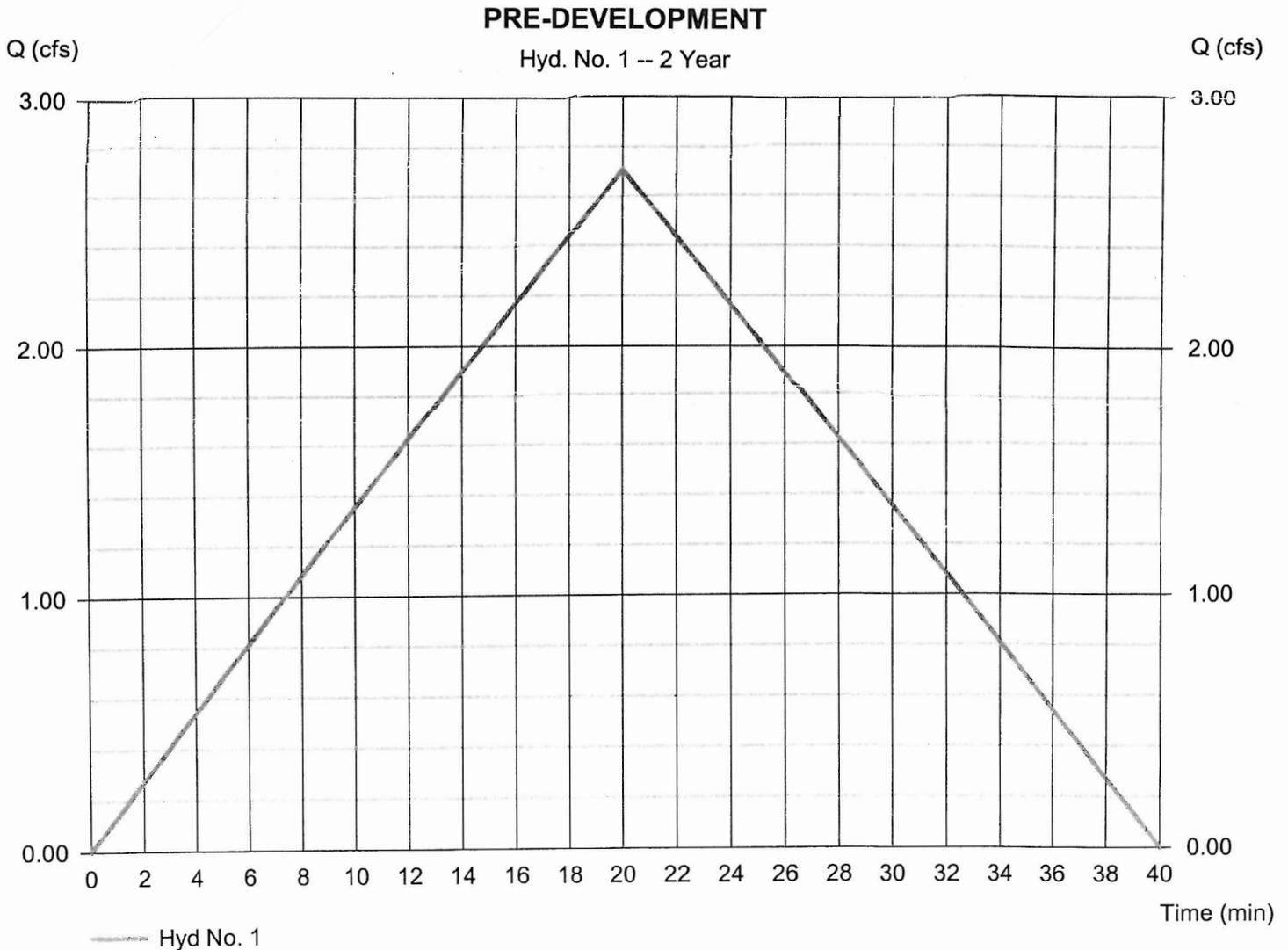
Wednesday, Jan 21, 2009

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 2.280 ac
Intensity = 3.394 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 2.709 cfs
Time to peak = 20 min
Hyd. volume = 270.9 cuft
Runoff coeff. = 0.35
Tc by User = 20.00 min
Asc/Rec limit fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

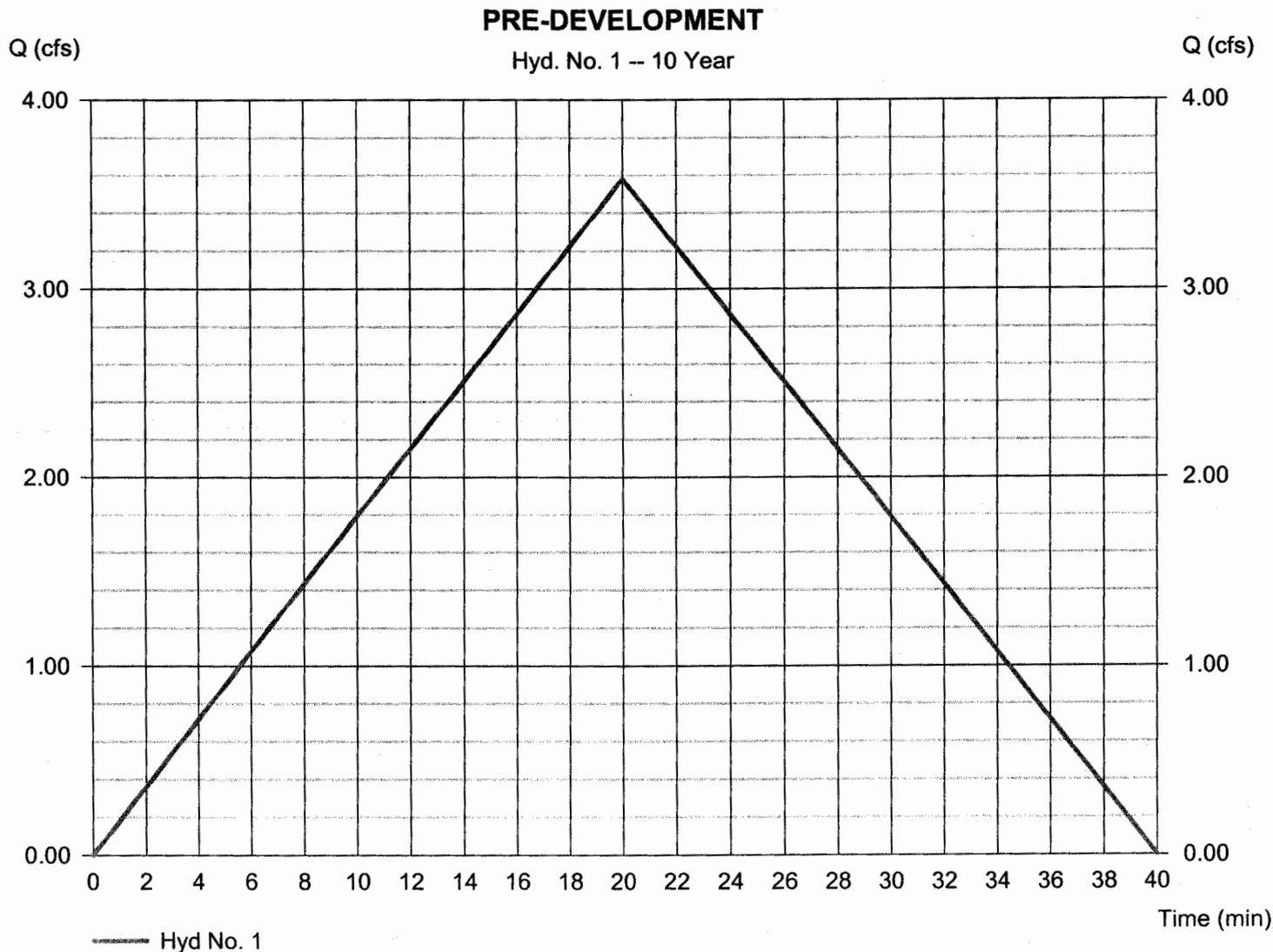
Wednesday, Jan 21, 2009

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 2.280 ac
Intensity = 4.488 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 3.582 cfs
Time to peak = 20 min
Hyd. volume = 4,298 cuft
Runoff coeff. = 0.35
Tc by User = 20.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

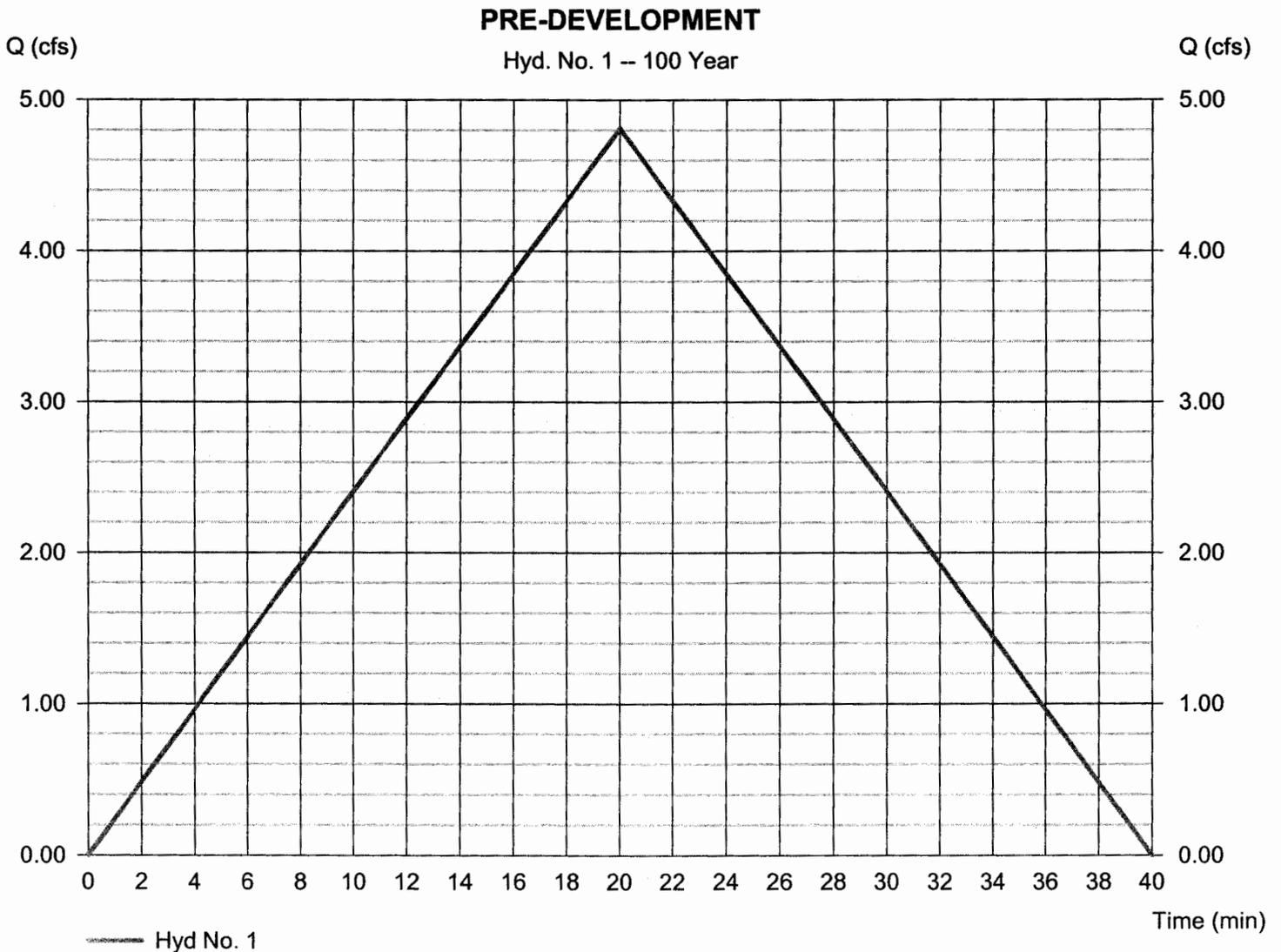
Wednesday, Jan 21, 2009

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 2.280 ac
Intensity = 6.029 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 4.811 cfs
Time to peak = 20 min
Hyd. volume = 5,773 cuft
Runoff coeff. = 0.35
Tc by User = 20.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

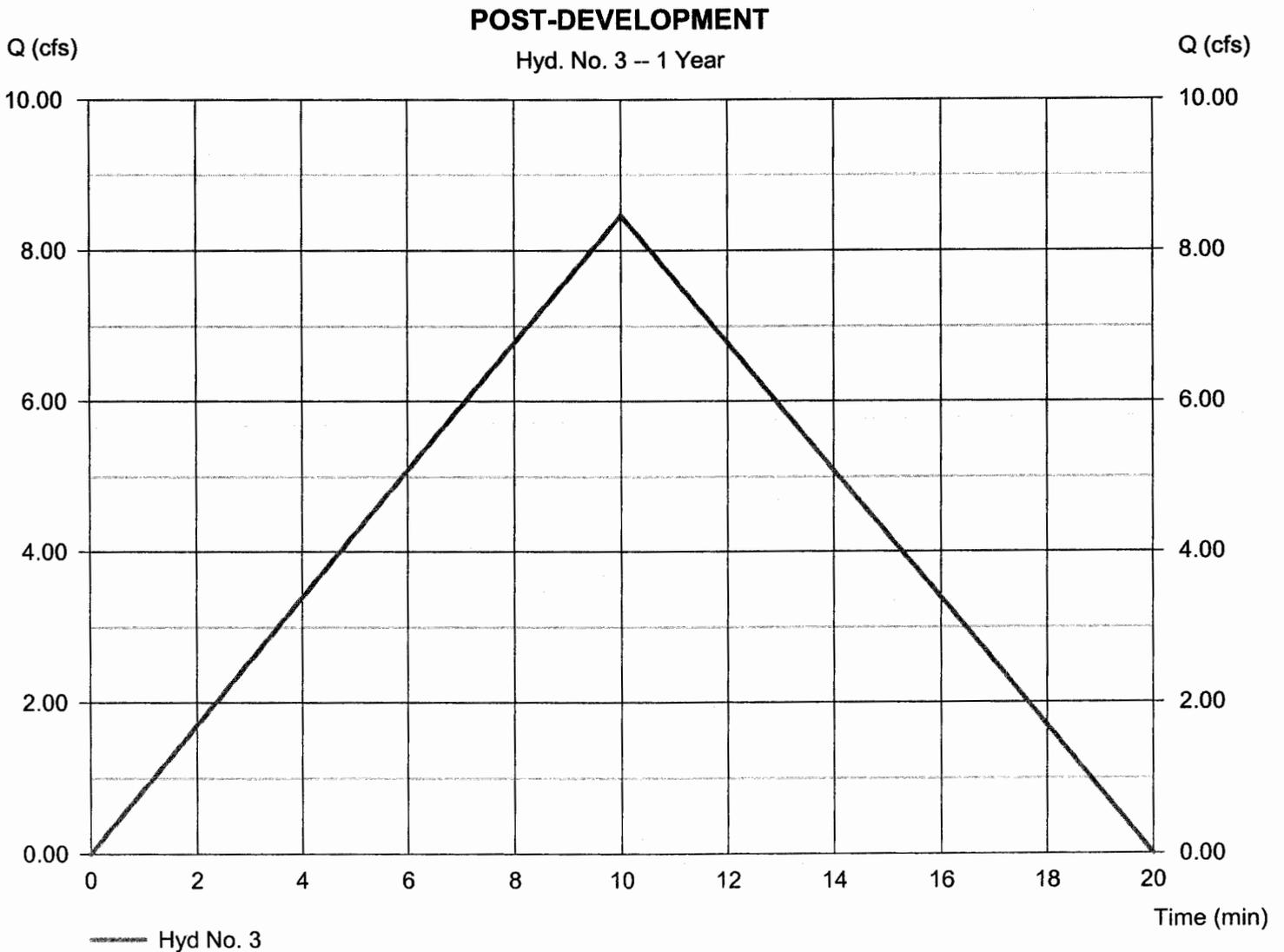
Wednesday, Jan 21, 2009

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 1 yrs
Time interval = 1 min
Drainage area = 3.570 ac
Intensity = 3.953 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 8.466 cfs
Time to peak = 10 min
Hyd. volume = 5,080 cuft
Runoff coeff. = 0.6
Tc by User = 10.00 min
Asc/Rec limb fact = 1/1



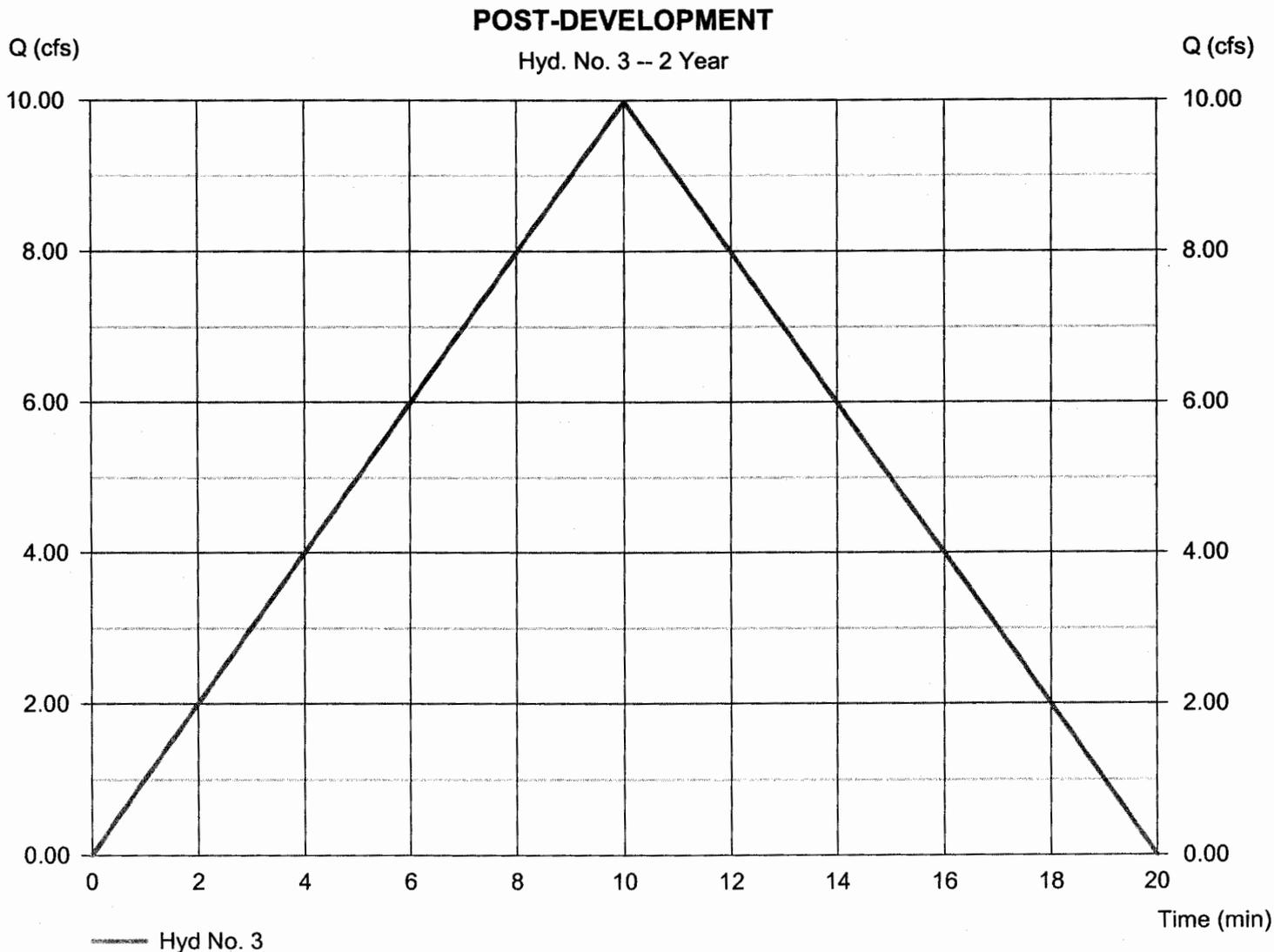
Hydrograph Report

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 3.570 ac
Intensity = 4.660 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 9.982 cfs
Time to peak = 10 min
Hyd. volume = 5,989 cuft
Runoff coeff. = 0.6
Tc by User = 10.00 min
Asc/Rec limb fact = 1/1



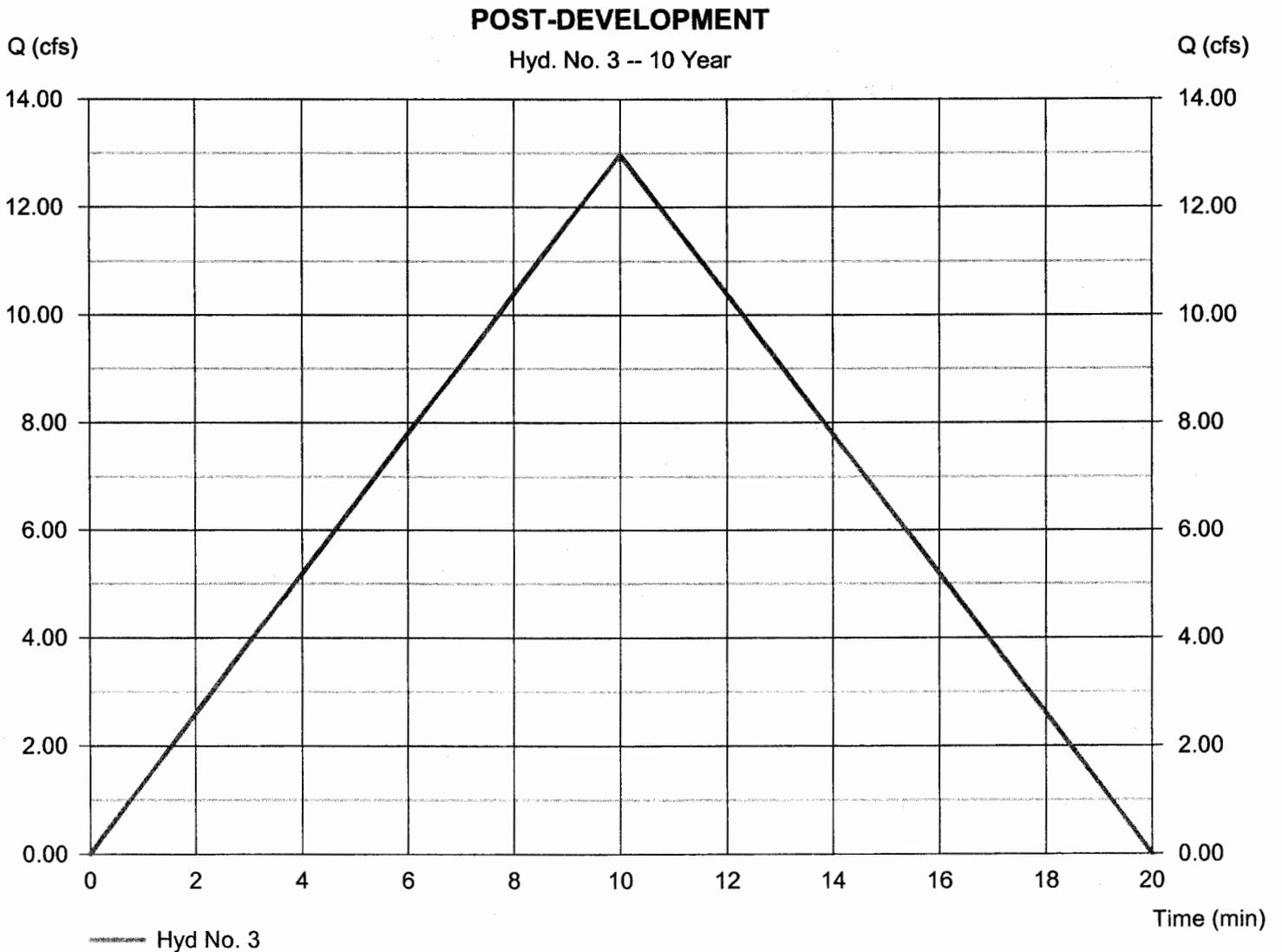
Hydrograph Report

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 3.570 ac
Intensity = 6.059 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 12.98 cfs
Time to peak = 10 min
Hyd. volume = 7,787 cuft
Runoff coeff. = 0.6
Tc by User = 10.00 min
Asc/Rec limb fact = 1/1



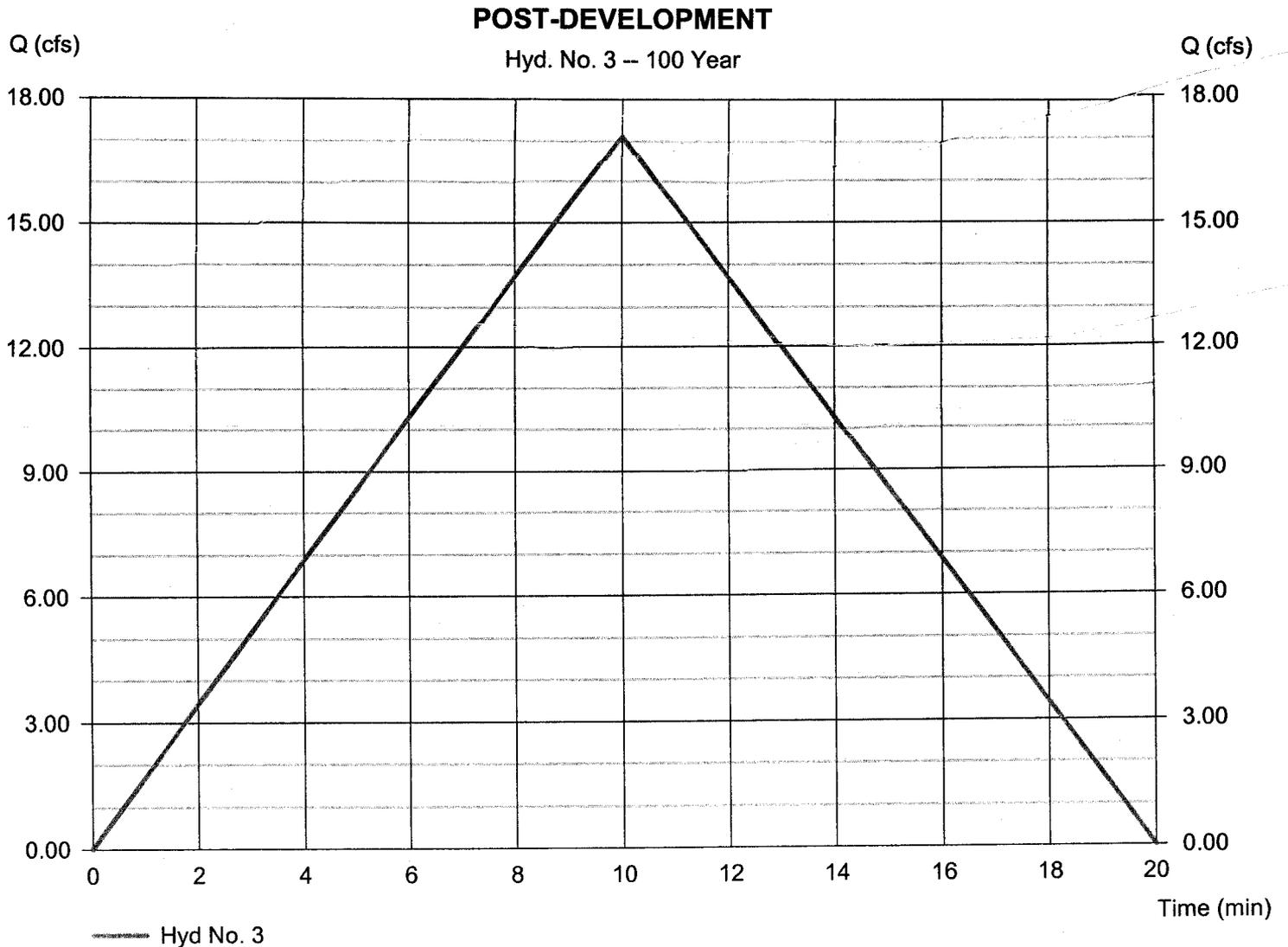
Hydrograph Report

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 3.570 ac
Intensity = 7.996 in/hr
IDF Curve = JamesCity-NW-14.IDF

Peak discharge = 17.13 cfs
Time to peak = 10 min
Hyd. volume = 10,276 cuft
Runoff coeff. = 0.6
Tc by User = 10.00 min
Asc/Rec limb fact = 1/1



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Pond No. 1 - WET POND 1 - Design

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 82.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	82.00	1,114	0	0
2.00	84.00	2,569	3,683	3,683
4.00	86.00	5,439	8,008	11,691
5.00	87.00	6,472	5,956	17,647
6.00	88.00	7,616	7,044	24,691
8.00	90.00	9,970	17,586	42,277

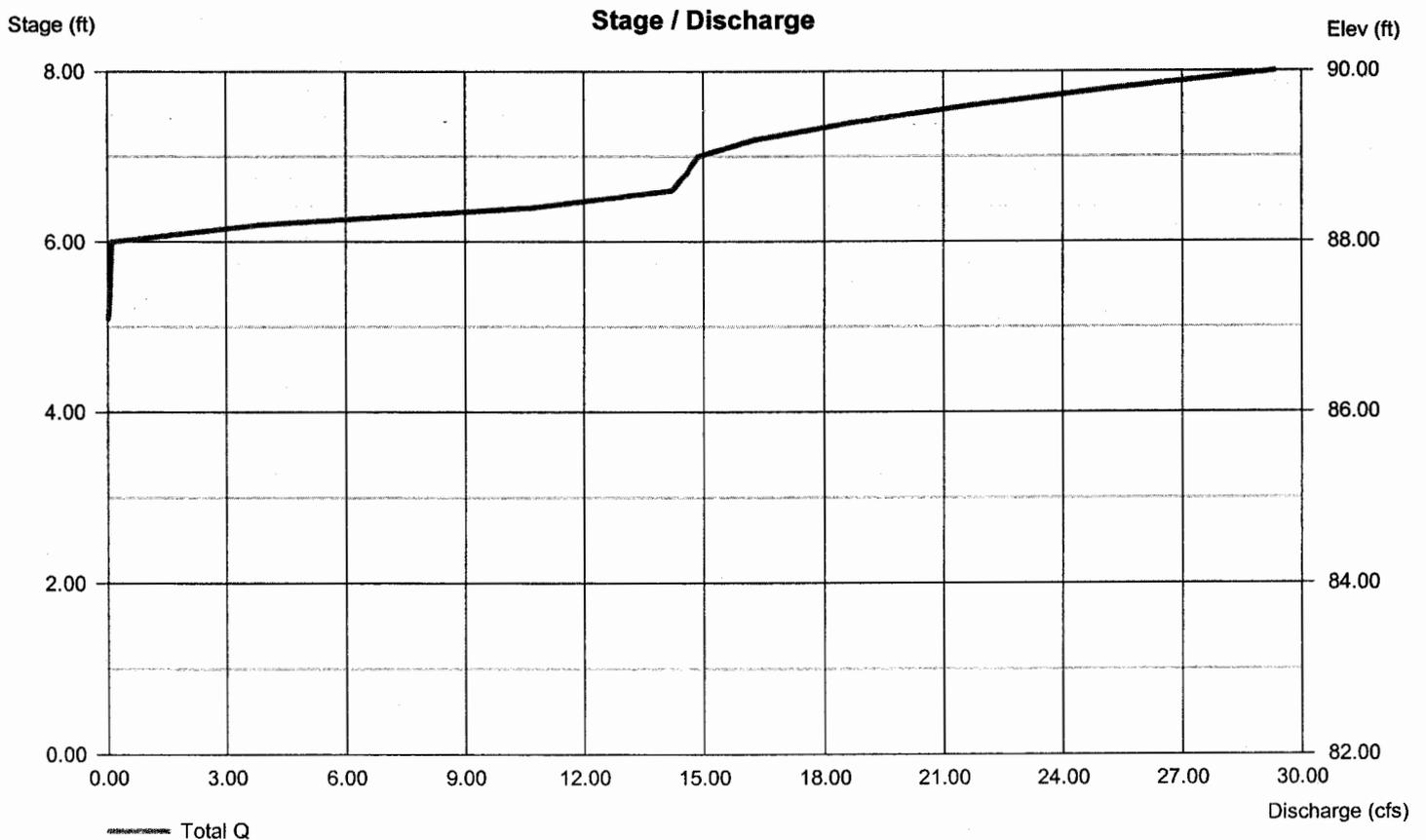
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 82.00	87.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 6.25	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)	= 12.57	4.00	0.00	0.00
Crest El. (ft)	= 88.00	89.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	No	No	No
Exfil. (in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Pond No. 1 - WET POND 1 - Design

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 82.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	82.00	1,114	0	0
2.00	84.00	2,569	3,683	3,683
4.00	86.00	5,439	8,008	11,691
5.00	87.00	6,472	5,956	17,647
6.00	88.00	7,616	7,044	24,691
8.00	90.00	9,970	17,586	42,277

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 82.00	87.00	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 6.25	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)	= 12.57	4.00	0.00	0.00
Crest El. (ft)	= 88.00	89.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.00
2.00	3,683	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.00
4.00	11,691	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.00
5.00	17,647	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.00
6.00	24,691	88.00	0.10	0.10	---	---	0.00	0.00	---	---	---	---	0.10
8.00	42,277	90.00	16.03	0.01	---	---	15.98	13.32	---	---	---	---	29.31

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

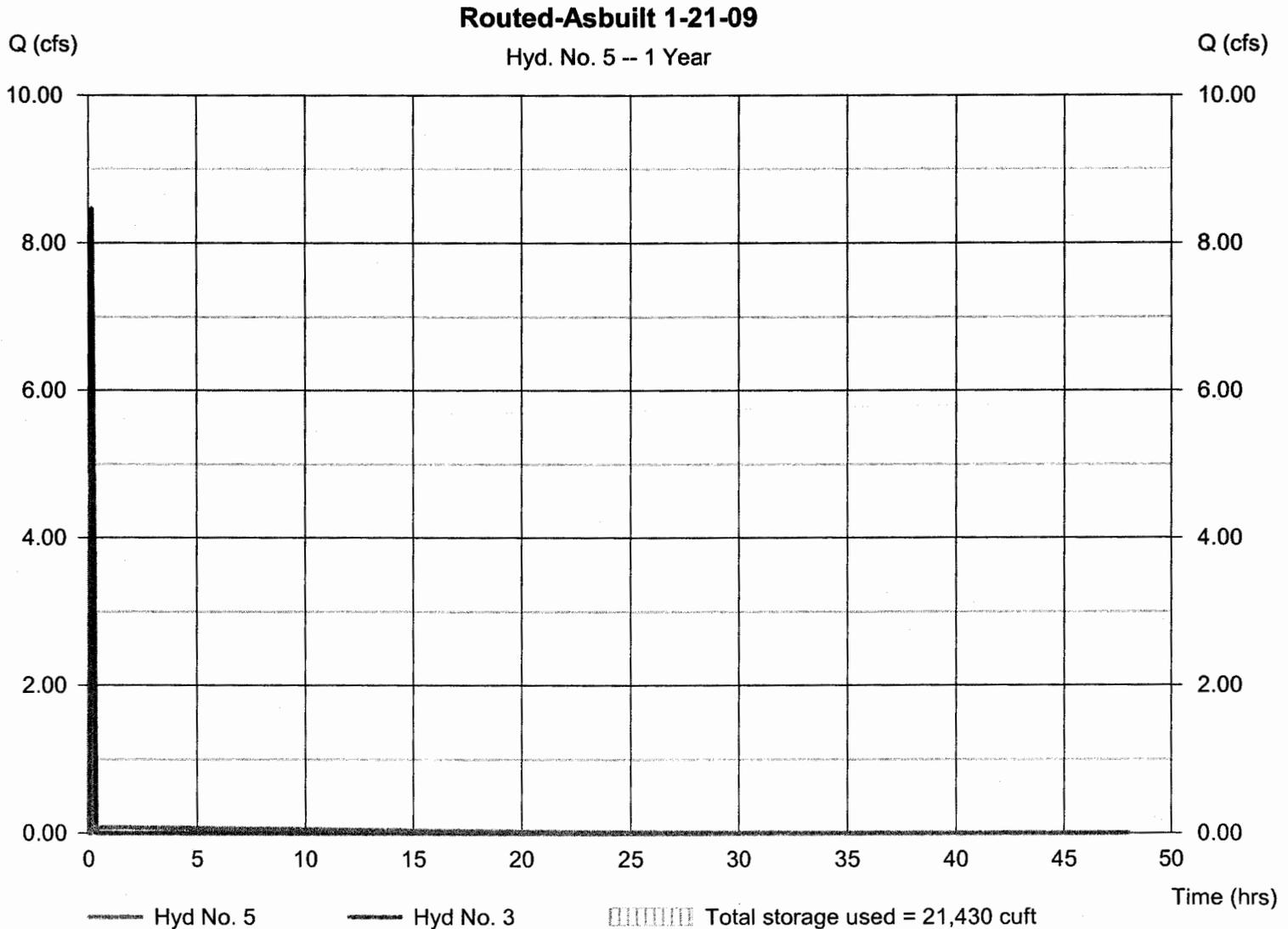
Hyd. No. 5

Routed-Asbuilt 1-21-09

Hydrograph type = Reservoir
Storm frequency = 1 yrs
Time interval = 1 min
Inflow hyd. No. = 3 - POST-DEVELOPMENT
Reservoir name = WET POND 1 - Jan 21 2009

Peak discharge = 0.080 cfs
Time to peak = 20 min
Hyd. volume = 4,417 cuft
Max. Elevation = 87.74 ft
Max. Storage = 21,430 cuft

Storage Indication method used. Wet pond routing start elevation = 87.00 ft.



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

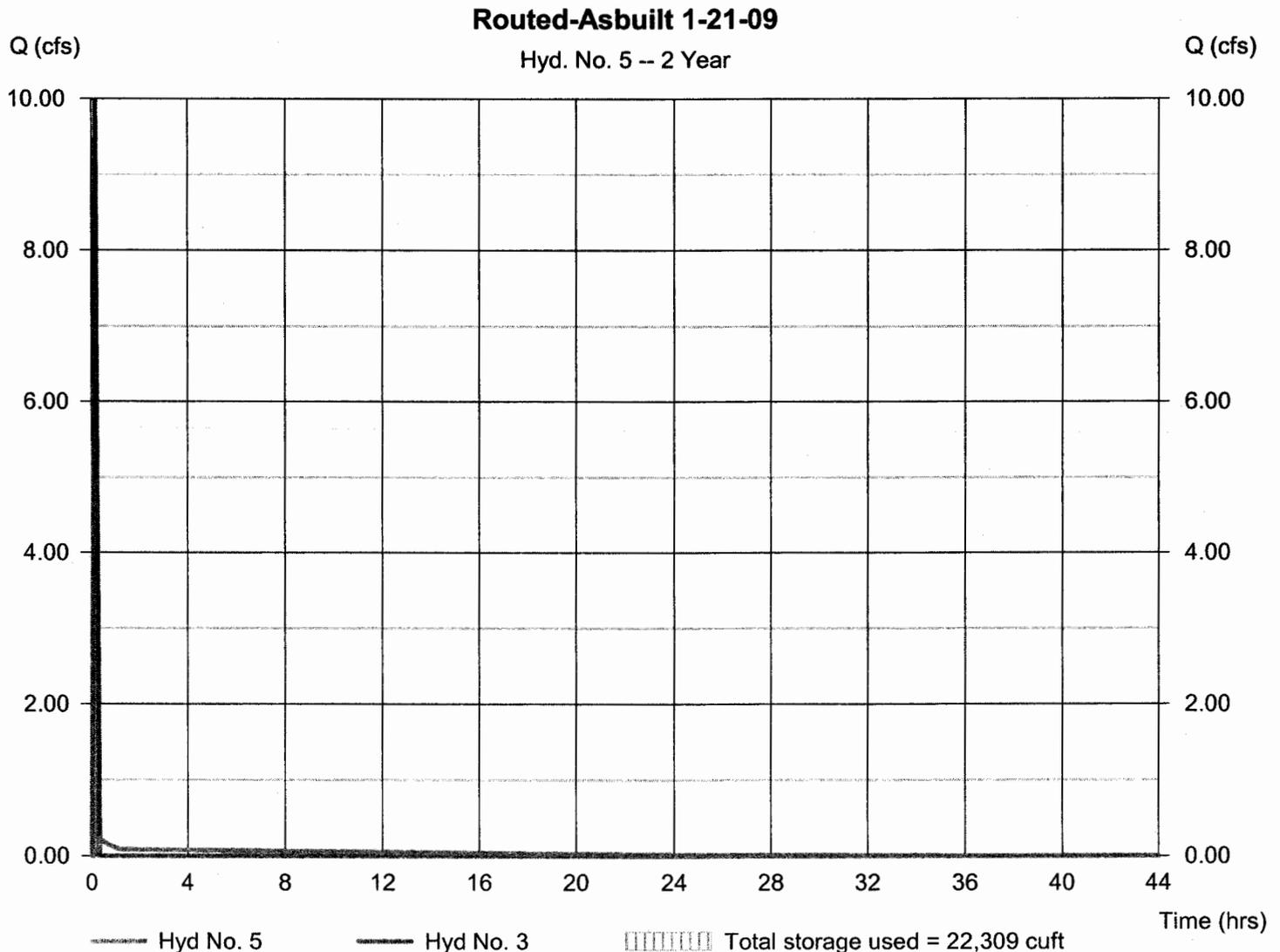
Hyd. No. 5

Routed-Asbuilt 1-21-09

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyd. No. = 3 - POST-DEVELOPMENT
Reservoir name = WET POND 1 - Jan 21 2009

Peak discharge = 0.230 cfs
Time to peak = 20 min
Hyd. volume = 5,313 cuft
Max. Elevation = 87.87 ft
Max. Storage = 22,309 cuft

Storage Indication method used. Wet pond routing start elevation = 87.00 ft.



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Hyd. No. 5

Routed-Asbuilt 1-21-09

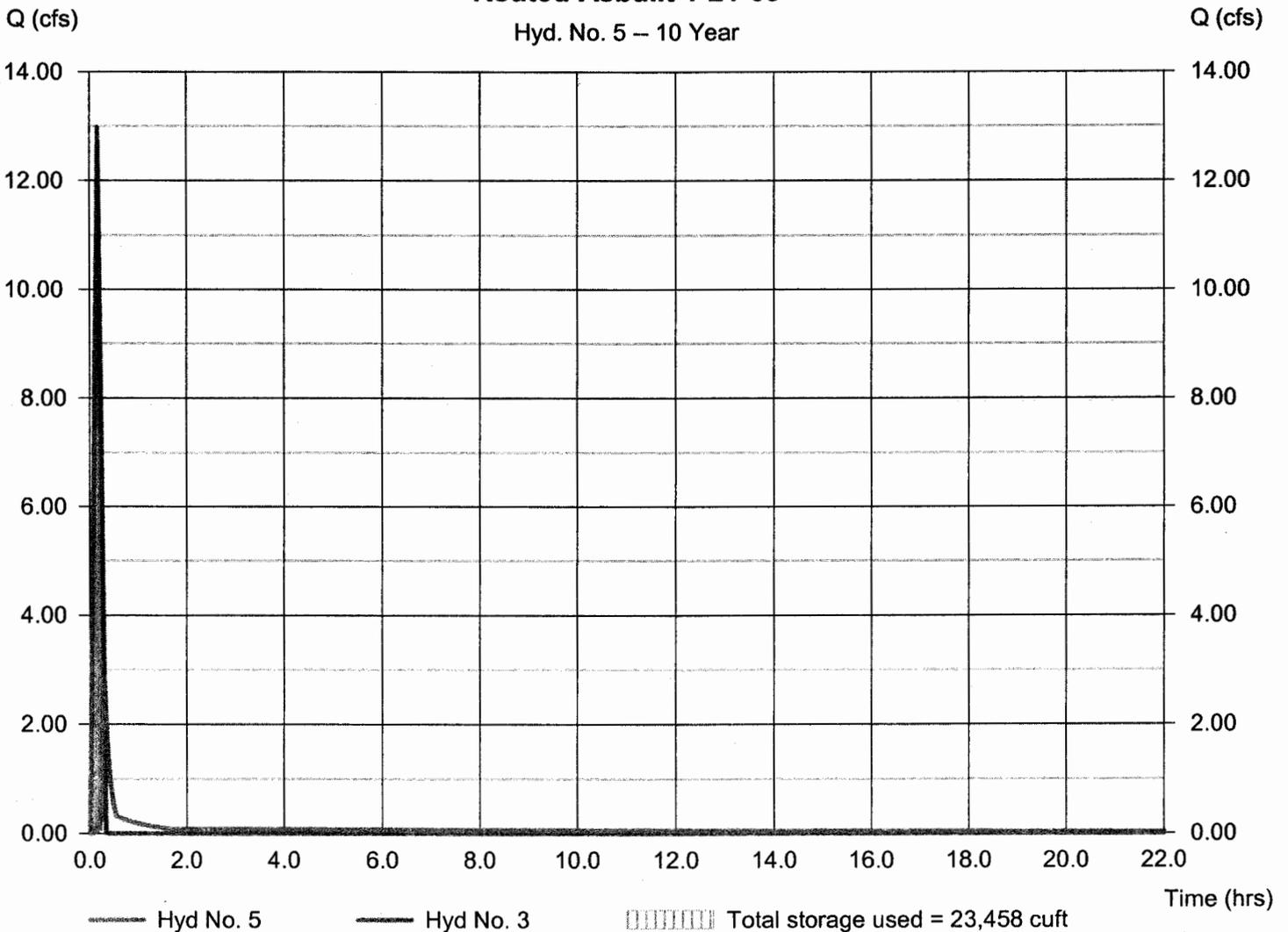
Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 3 - POST-DEVELOPMENT
Reservoir name = WET POND 1 - Jan 21 2009

Peak discharge = 2.834 cfs
Time to peak = 18 min
Hyd. volume = 7,108 cuft
Max. Elevation = 88.03 ft
Max. Storage = 23,458 cuft

Storage Indication method used. Wet pond routing start elevation = 87.00 ft.

Routed-Asbuilt 1-21-09

Hyd. No. 5 – 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Hyd. No. 5

Routed-Asbuilt 1-21-09

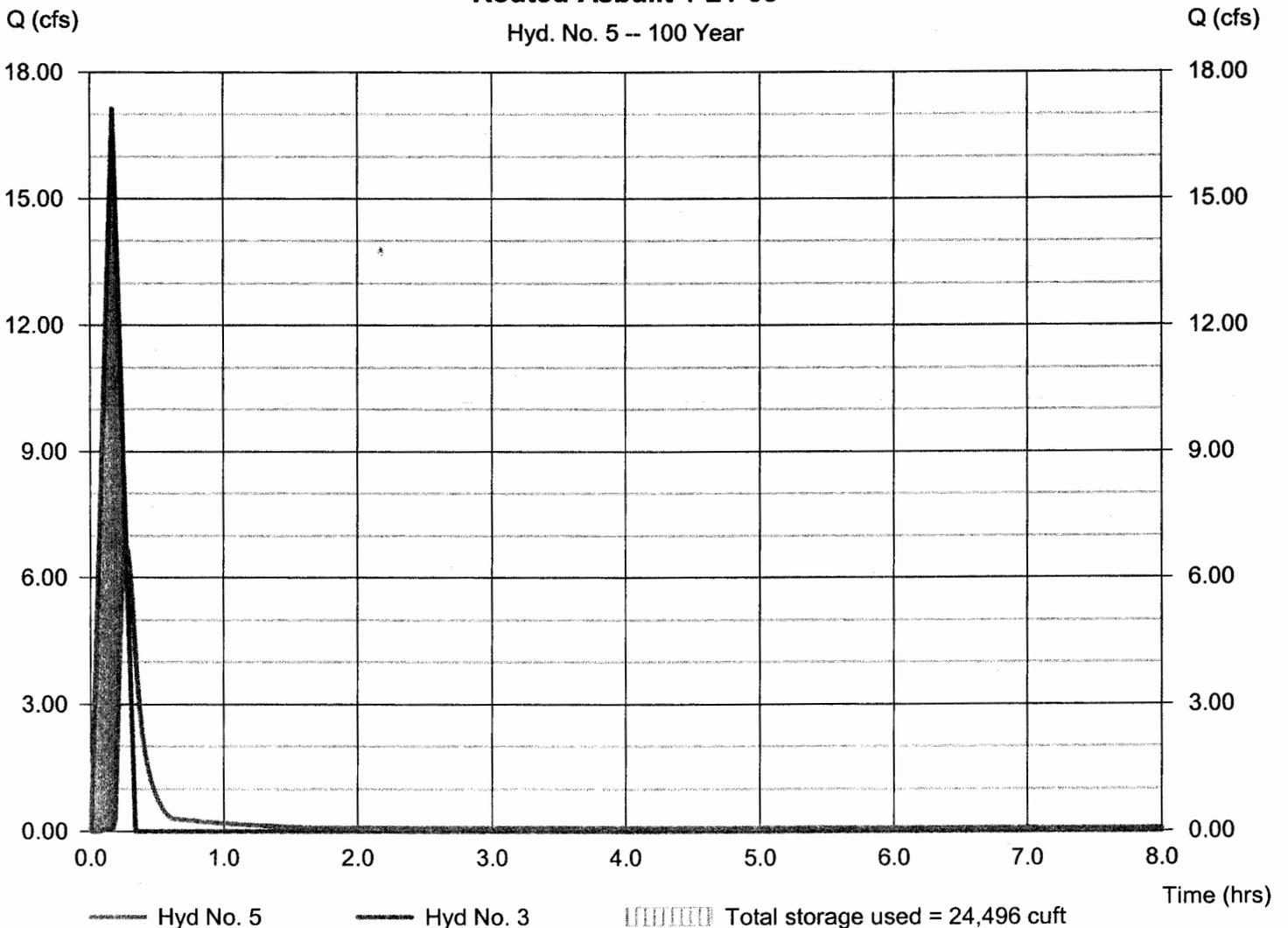
Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyd. No. = 3 - POST-DEVELOPMENT
Reservoir name = WET POND 1 - Jan 21 2009

Peak discharge = 6.785 cfs
Time to peak = 16 min
Hyd. volume = 9,597 cuft
Max. Elevation = 88.16 ft
Max. Storage = 24,496 cuft

Storage Indication method used. Wet pond routing start elevation = 87.00 ft.

Routed-Asbuilt 1-21-09

Hyd. No. 5 -- 100 Year



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Pond No. 3 - WET POND 1 - Jan 21 2009

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 83.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	83.00	2,078	0	0
1.00	84.00	3,561	2,820	2,820
2.00	85.00	4,064	3,813	6,632
3.00	86.00	4,560	4,312	10,944
4.00	87.00	6,351	5,456	16,400
5.00	88.00	7,312	6,832	23,231
6.00	89.00	8,289	7,801	31,032
7.00	90.00	9,352	8,821	39,852

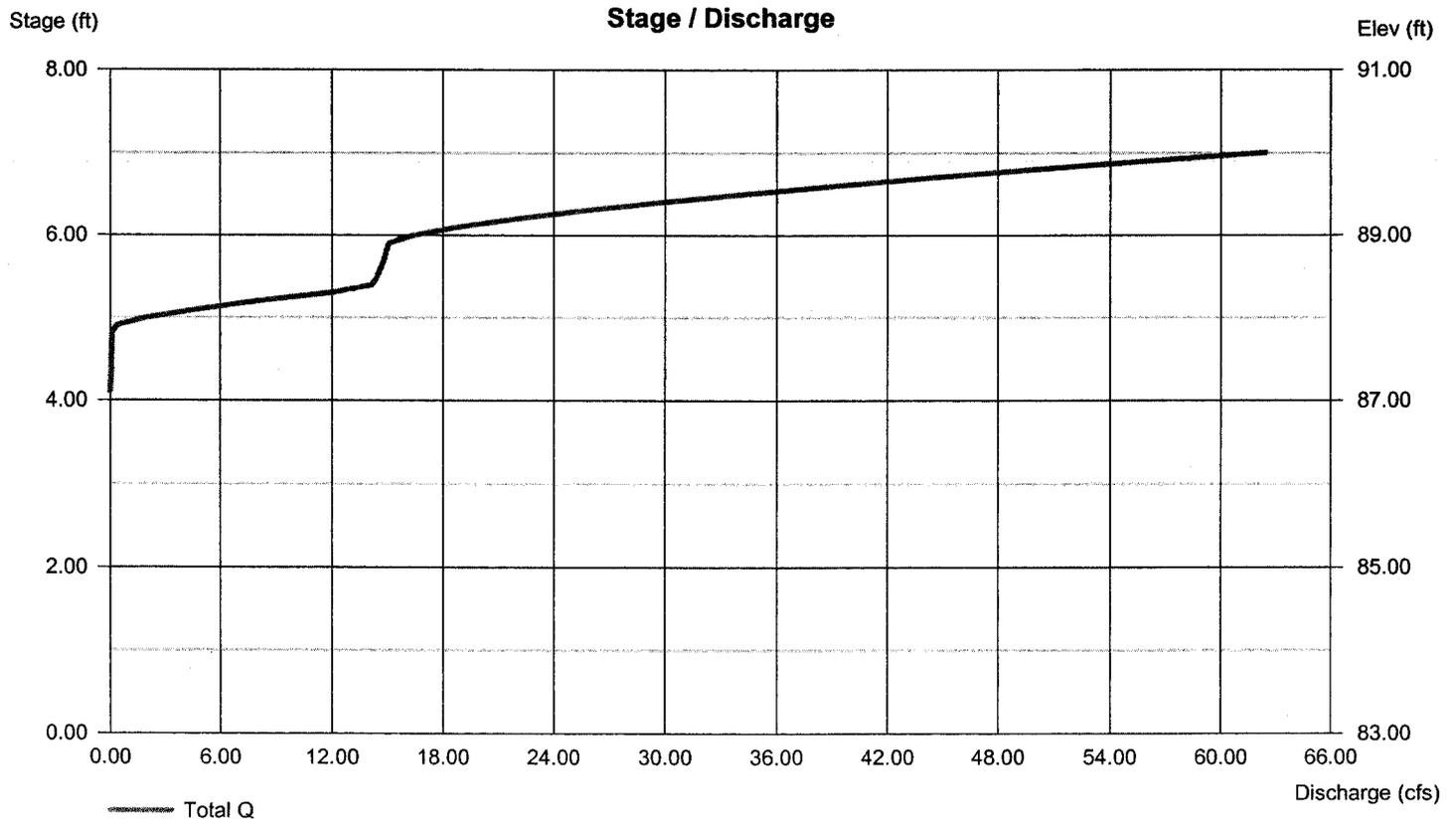
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 81.74	87.07	0.00	0.00
Length (ft)	= 38.00	0.00	0.00	0.00
Slope (%)	= 4.58	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)	= 12.57	12.00	0.00	0.00
Crest El. (ft)	= 87.87	88.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	No	No	No
Exfil. (in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.02

Wednesday, Jan 21, 2009

Pond No. 3 - WET POND 1 - Jan 21 2009

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 83.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	83.00	2,078	0	0
1.00	84.00	3,561	2,820	2,820
2.00	85.00	4,064	3,813	6,632
3.00	86.00	4,560	4,312	10,944
4.00	87.00	6,351	5,456	16,400
5.00	88.00	7,312	6,832	23,231
6.00	89.00	8,289	7,801	31,032
7.00	90.00	9,352	8,821	39,852

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 81.74	87.07	0.00	0.00
Length (ft)	= 38.00	0.00	0.00	0.00
Slope (%)	= 4.58	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)	= 12.57	12.00	0.00	0.00
Crest El. (ft)	= 87.87	88.90	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

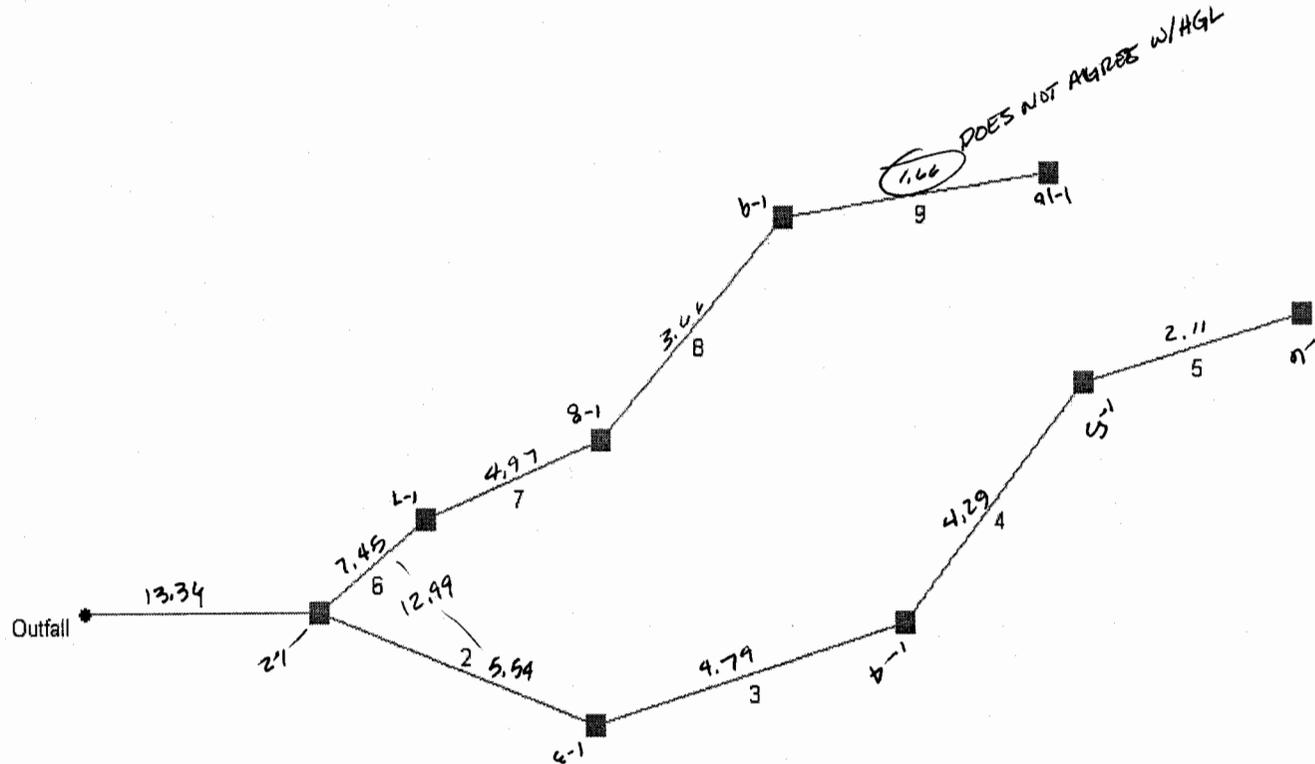
Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	83.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.00
1.00	2,820	84.00	4.71	0.00	---	---	0.00	0.00	---	---	---	---	0.00
2.00	6,632	85.00	4.71	0.00	---	---	0.00	0.00	---	---	---	---	0.00
3.00	10,944	86.00	4.71	0.00	---	---	0.00	0.00	---	---	---	---	0.00
4.00	16,400	87.00	4.71	0.00	---	---	0.00	0.00	---	---	---	---	0.00
5.00	23,231	88.00	4.71	0.10	---	---	1.96	0.00	---	---	---	---	2.06
6.00	31,032	89.00	15.18	0.02	---	---	15.16	1.26	---	---	---	---	16.44
7.00	39,852	90.00	16.31	0.01	---	---	16.30	46.10	---	---	---	---	62.41

Hydraflow Plan View

SYSTEM # 1



Project file: siteammend87200-1.stm

No. Lines: 9

12-01-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	76.0	0.08	2.73	0.90	0.07	2.05	5.0	6.9	6.5	13.36	20.13	7.56	18	2.63	87.00	85.00	88.97	88.09	93.00	87.00	1-1 to 1-2
2	1	96.0	0.14	1.16	0.90	0.13	0.84	5.0	6.6	6.6	5.54	19.08	5.05	15	6.25	93.00	87.00	93.94	89.95	97.50	93.00	1-2 to 1-3
3	2	106.0	0.12	1.02	0.70	0.08	0.71	5.0	6.1	6.7	4.79	15.72	4.56	15	4.25	97.50	93.00	98.38	94.48	101.50	97.50	1-3 to 1-4
4	3	91.0	0.47	0.90	0.70	0.33	0.63	5.0	5.7	6.8	4.29	5.66	4.18	15	0.55	98.00	97.50	98.86	98.67	102.00	101.50	1-4 to 1-5
5	4	74.0	0.43	0.43	0.70	0.30	0.30	5.0	5.0	7.0	2.11	8.87	2.80	15	1.35	99.00	98.00	99.58	99.11	104.00	102.00	1-5 to 1-6
6	1	44.0	0.55	1.49	0.70	0.39	1.14	5.0	6.8	6.6	7.45	11.50	6.07	15	2.27	88.00	87.00	90.37	89.95	93.00	93.00	1-2 to 1-7
7	6	62.0	0.26	0.94	0.80	0.21	0.75	5.0	6.5	6.6	4.97	19.38	4.68	15	6.45	92.00	88.00	92.89	90.77	97.30	93.00	1-7 to 1-8
8	7	91.0	0.34	0.68	0.90	0.31	0.54	5.0	6.0	6.7	3.66	11.31	3.84	15	2.20	94.00	92.00	94.77	93.20	98.00	97.30	1-8 to 1-9
9	8	85.0	0.34	0.34	0.70	0.24	0.24	5.0	5.0	7.0	1.66	15.49	2.45	15	4.12	97.50	94.00	98.02	95.13	101.50	98.00	1-9 to 1-10

TRY 12.18 FT/SEC
SEE ATTACHED SPREADSHEET

Project File: siteamend87200-1.stm

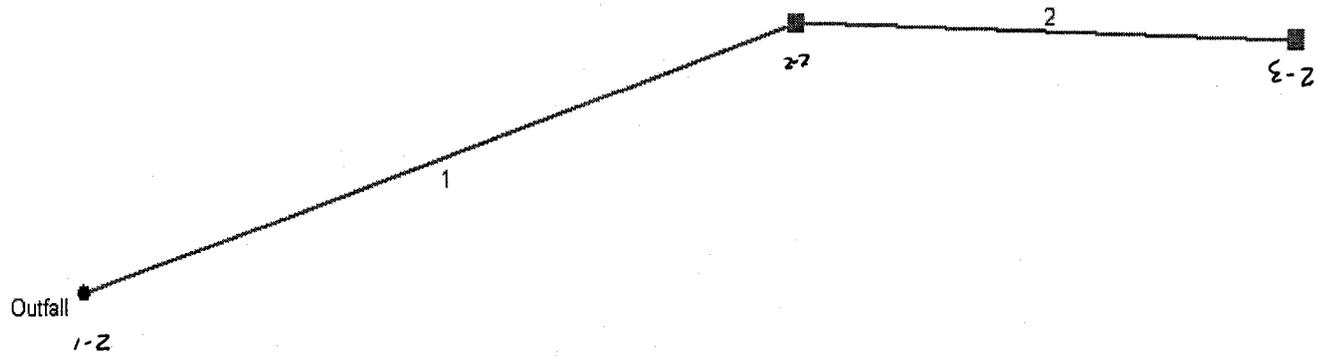
Number of lines: 9

Run Date: 12-01-2003

NOTES: Intensity = 140.36 / (Inlet time + 19.80) ^ 0.93; Return period = 10 Yrs.

Hydraflow Plan View

SYSTEM # 2



Project file: siteammend87200-2.stm

No. Lines: 2

12-01-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	105.0	0.09	0.39	0.90	0.08	0.32	5.0	5.9	6.8	2.18	7.45	1.77	15	0.95	86.00	85.00	88.18	88.09	93.00	86.00	2-1 to 2-2
2	1	70.0	0.30	0.30	0.80	0.24	0.24	5.0	5.0	7.0	1.68	12.90	2.43	15	2.86	88.00	86.00	88.52	88.21	93.00	93.00	2-2 to 2-3

*n=0.011 ✓
HDPE*

*NEED
RIP-APP
SEE
SPREADSHEET
ATTACHED*

S.27

Project File: siteamend87200-2.stm Number of lines: 2 Run Date: 12-01-2003

NOTES: Intensity = 140.36 / (Inlet time + 19.80) ^ 0.93; Return period = 10 Yrs.

SYSTEM #1 SPREAD CALC'S



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

PROJECT Strawberry Plains
 PROJECT NO. 8720
 SUBJECT Spread Calc's
 SHEET NO. 1
 DATE #####
 BY BWS

STORM WATER INLET COMPUTATIONS

INLET			Station	Drainage Area (Ac)	C _u	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	SW (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	SW = a/(12W)	Se (ft/ft) = Sx+SwEo	Lt (ft) 15 P Effic L	L/Lt d (ft)	E(#16) h (ft)	Q Int CFS d/h	Q Carryover Spread	Remark				
Number	Type	Length																																
SS1-10	DI-3A	2.5	0.34	0.11 0.23	0.7 0.7	0.077 0.161	0.077 0.161	4	0.308 0.644		0.308 0.952 0.644	0.001 0.001 0.001	0.02 0.02 0.02	5.6 7.9	Flow Approaching From 2																			
SS1-9	DI-3A	2.5		0.08 0.26	0.9 0.9	0.072 0.234	0.072 0.234	4	0.288 0.936		0.288 1.224 0.936	0.001 0.001 0.001	0.02 0.02 0.02	5.3 9.2	Flow Approaching From 2																			
SS1-8	DI-3A	2.5		0.06 0.2	0.8 0.8	0.048 0.16	0.048 0.16	4	0.192 0.64	0	0.192 0.832 0.64	0.001 0.001 0.001	0.02 0.02 0.02	4.1 7.9	Flow Approaching From 2																			

NEED SYSTEM #2
 SPREAD CALC'S



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

PROJECT
 PROJECT NO.
 SUBJECT
 SHEET NO. 1
 DATE
 BY
 Spread Calc's
 BWS

STORM WATER INLET COMPUTATIONS

INLET			Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eq(#10)	n	Local Dep.	a	Sw =aj/(12W)	Se (ft/ft) =Sx+SwEq	L1 (ft) 15 P Effec L	L/L1 (ft) d	E(#16) h (ft)	Q Int CFS d/h	Q Carryover Spread	Remark		
Number	Type	Length																														
SS1-7	DI-3A	2.5		0.08	0.7	0.056	0.056	4	0.224	0	0.224	0.001	0.02	4.5	Flow Approaching From																	
				0.47	0.7	0.329	0.329	4	1.316		1.316	0.001	0.02	10.4	Flow Approaching From											6.1	0.229	0.46	0.498	11.46		
SS1-4	DI-3B	4		0.12	0.7	0.084	0.084	4	0.336	0	0.336	0.04	0.02	1.4	2	1.429	0.08	4	1	0.015	2	3.44	0.143	0.163	5.325	0.751	0.918	0.309	0.027			
SS1-3	DI-3B	4		0.14	0.9	0.126	0.126	4	0.504	0	0.504	0.04	0.02	1.8	2	1.111	0.08	4	1	0.015	2	3.44	0.143	0.163	6.314	0.634	0.836	0.421	0.083			
SS1-2	DI-3A	2.5		0.06	0.9	0.054	0.054	4	0.216	0.11	0.326	0.001	0.02	5.7	Flow Approaching From																	
				0.02	0.9	0.018	0.018	4	0.072		0.072	0.001	0.02	#N/A	Flow Approaching From											6.1	0.093	0.46	0.202	4.652		

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points	Fraction of Site Served by BMP	Weighted BMP Points
WET POND	10	$\frac{3.14}{5.67}$	5.54
		x	
		x	
		x	
		x	
TOTAL WEIGHTED STRUCTURAL BMP POINTS:			5.54

B. NATURAL OPEN SPACE CREDIT

Fraction of Site	Natural Open Space Credit	Points for Natural Open Space
$\frac{1.35}{5.67}$	(0.1 per 1%)	2.38

C. TOTAL WEIGHTED POINTS

5.54	+	2.38	=	7.92
Structural BMP Points		Natural Open Space Points		TOTAL

* NOTE: EVEN THOUGH 10 AFS ARE NOT ACHIEVED, 100% OF OUR DISTURBED SITE DRAINS INTO A 10 A POND. THEREFORE, THE IMPACT OF THE CHANGES BY ORDINANCES IS NOT.

CONSERVATION ELEMENT WAS NEVER RECORDED BUT REMAINS REQUIRED FOR POINTS

SP-139-09 Strawberry Plains Center and WQ COMPLIANCE.

SP-1-04 Amend
SP-149-04 Amend

MC013 A2 Wet Pond, serves 3.57 AC; IMPERV. 2.41 AC.
WQ = 0.405 AC FT.



Site Plan Amendment
Strawberry Plains Center



Colonial Heritage

WILLIAMSBURG, VIRGINIA

James City County Environmental

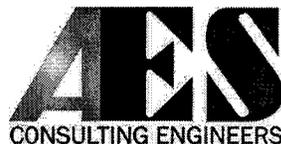
March 3, 2004

*REVISIONS
UNDER SP-1-04*

*SP-001-04
AMENDS
SP-139-99*

2ND SUB

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>

Reservoir Report

Reservoir No. 1 - WET POND 1

Hydraflow Hydrographs by Intelisolve

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	82.00 ✓	1,114	0	0
2.00	84.00	2,569	3,683	3,683
4.00	86.00	5,439	8,008	11,691
5.00	87.00	6,472	5,956	17,647
6.00	88.00	7,616	7,044	24,691
8.00	90.00 ✓	9,970	17,586	42,277

65 89.0 790.00 > NO STORAGE

8' PER PLAN

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 15.0 ✓	2.0 ✓	0.0	0.0
Span in	= 15.0	2.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 82.00 ✓	87.00 ✓	0.00	0.00
Length ft	= 40.0 ✓	0.0	0.0	0.0
Slope %	= 6.25	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. 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	= 12.57 ✓	4.00	0.00	0.00
Crest El. ft	= 88.00	89.00 ✓	0.00	0.00
Weir Coeff.	= 3.33 ✓	3.33 ✓	0.00	0.00
Weir Type	= Riser	Rect	—	—
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	82.00	0.00	0.00	—	—	0.00	0.00	—	—	—	0.00
2.00	3,683	84.00	0.00	0.00	—	—	0.00	0.00	—	—	—	0.00
4.00	11,691	86.00	0.00	0.00	—	—	0.00	0.00	—	—	—	0.00
5.00	17,647	87.00	0.00	0.00	—	—	0.00	0.00	—	—	—	0.00
6.00	24,691	88.00	0.10	0.10	—	—	0.00	0.00	—	—	—	0.10
8.00	42,277	90.00	16.04	0.01	—	—	16.00	13.32	—	—	—	29.33

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	2.64	1	20	3,164	---	---	---	2 YR PRE
2	Rational	2.64	1	20	3,164	---	---	---	10 YR PRE
3	Rational	2.64	1	20	3,164	---	---	---	100 YR PRE
5	Rational	9.77	1	10	5,859	---	---	---	2 YR POST
6	Rational	9.77	1	10	5,859	---	---	---	10 YR POST
7	Rational	9.77	1	10	5,859	---	---	---	100 YR POST
9	Reservoir	0.09	1	20	4,897	5	87.82	23,443	2 YR ROUTED
10	Reservoir	0.09	1	20	4,897	6	87.82	23,443	10 YR ROUTED
11	Reservoir	0.09	1	20	4,897	7	87.82	23,443	100 YR ROUTED
13	Rational	9.77	1	10	5,859	---	---	---	25 YR

2-YR PRE 2.64 CFS
 2-YR ROUTED 0.09 CFS

1997 ALLOWABLES
 2-YR 2.6 CFS
 10-YR 3.0 CFS

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	3.59	1	20	4,309	—	—	—	2 YR PRE
2	Rational	3.59	1	20	4,309	—	—	—	10 YR PRE
3	Rational	3.59	1	20	4,309	—	—	—	100 YR PRE
5	Rational	12.63	1	10	7,577	—	—	—	2 YR POST
6	Rational	12.63	1	10	7,577	—	—	—	10 YR POST
7	Rational	12.63	1	10	7,577	—	—	—	100 YR POST
9	Reservoir	0.85	1	19	6,219	5	88.04	25,044	2 YR ROUTED
10	Reservoir	0.85	1	19	6,219	6	88.04	25,044	10 YR ROUTED
11	Reservoir	0.85	1	19	6,219	7	88.04	25,044	100 YR ROUTED
13	Rational	12.63	1	10	7,577	—	—	—	25 YR

Proj. file: 8720-1siterev.gpw

Return Period: 10 yr

Run date: 03-04-2004

Hydrograph Summary Report

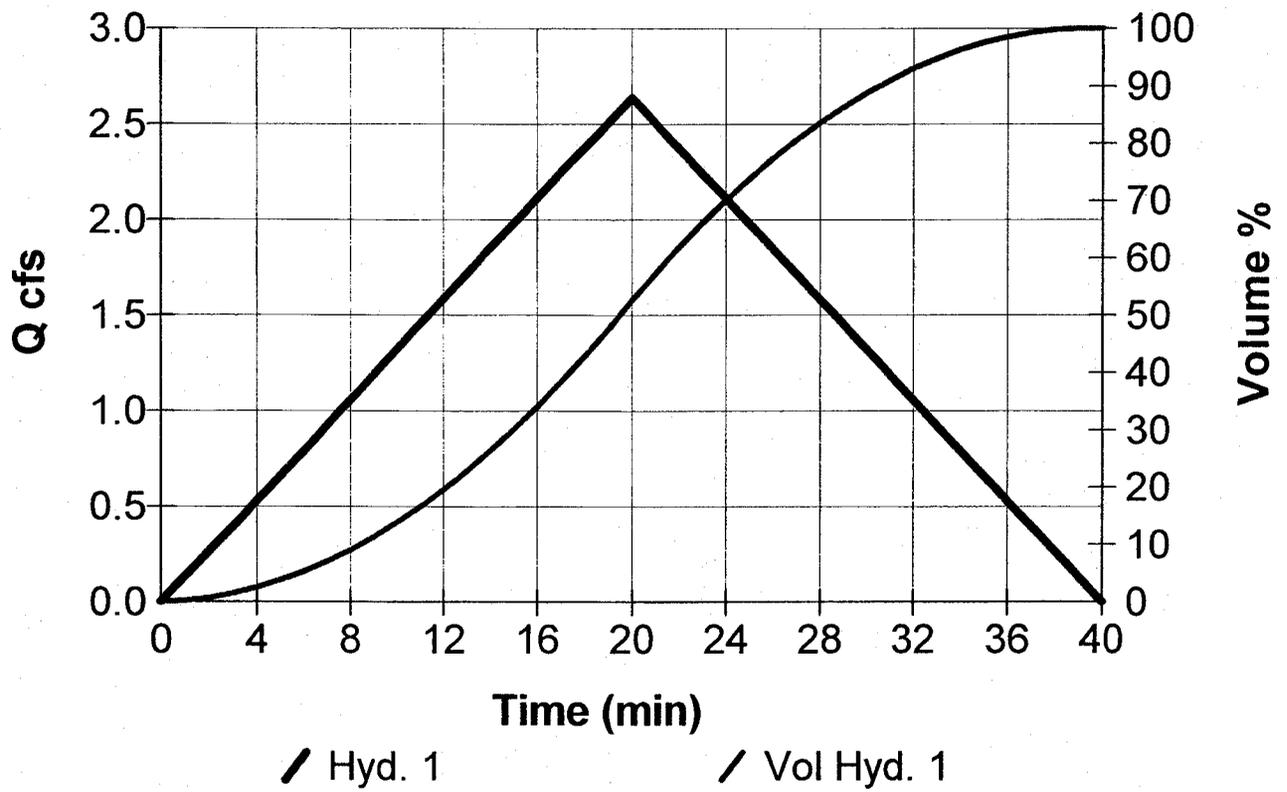
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	5.05	1	20	6,064	---	----	---	2 YR PRE
2	Rational	5.05	1	20	6,064	---	----	---	10 YR PRE
3	Rational	5.05	1	20	6,064	---	----	---	100 YR PRE
5	Rational	17.25	1	10	10,352	---	----	---	2 YR POST
6	Rational	17.25	1	10	10,352	---	----	---	10 YR POST
7	Rational	17.25	1	10	10,352	---	----	---	100 YR POST
9	Reservoir	4.59	1	17	8,969	5	88.22	26,637	2 YR ROUTED
10	Reservoir	4.59	1	17	8,969	6	88.22	26,637	10 YR ROUTED
11	Reservoir	4.59	1	17	8,969	7	88.22	26,637	100 YR ROUTED
13	Rational	17.25	1	10	10,352	---	----	---	25 YR

Proj. file: 8720-1siterev.gpw

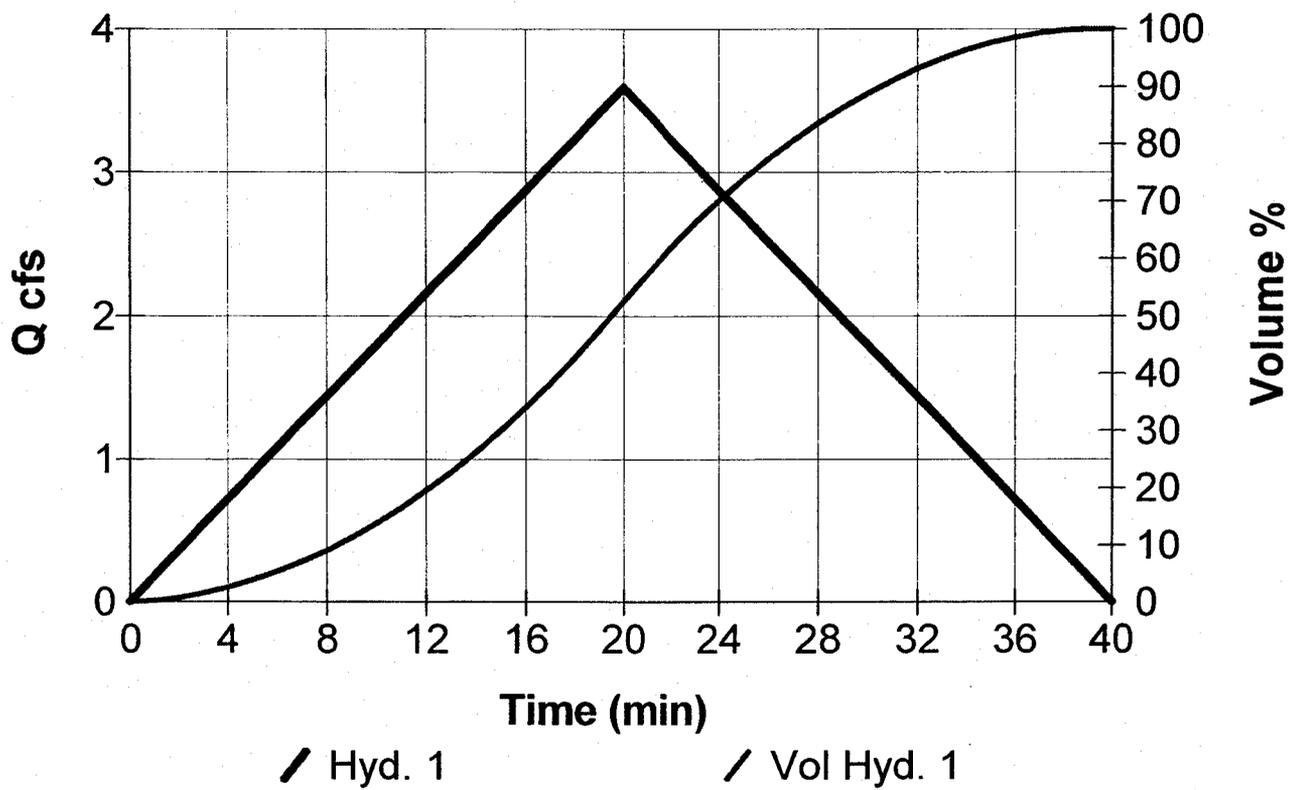
Return Period: 100 yr

Run date: 03-04-2004

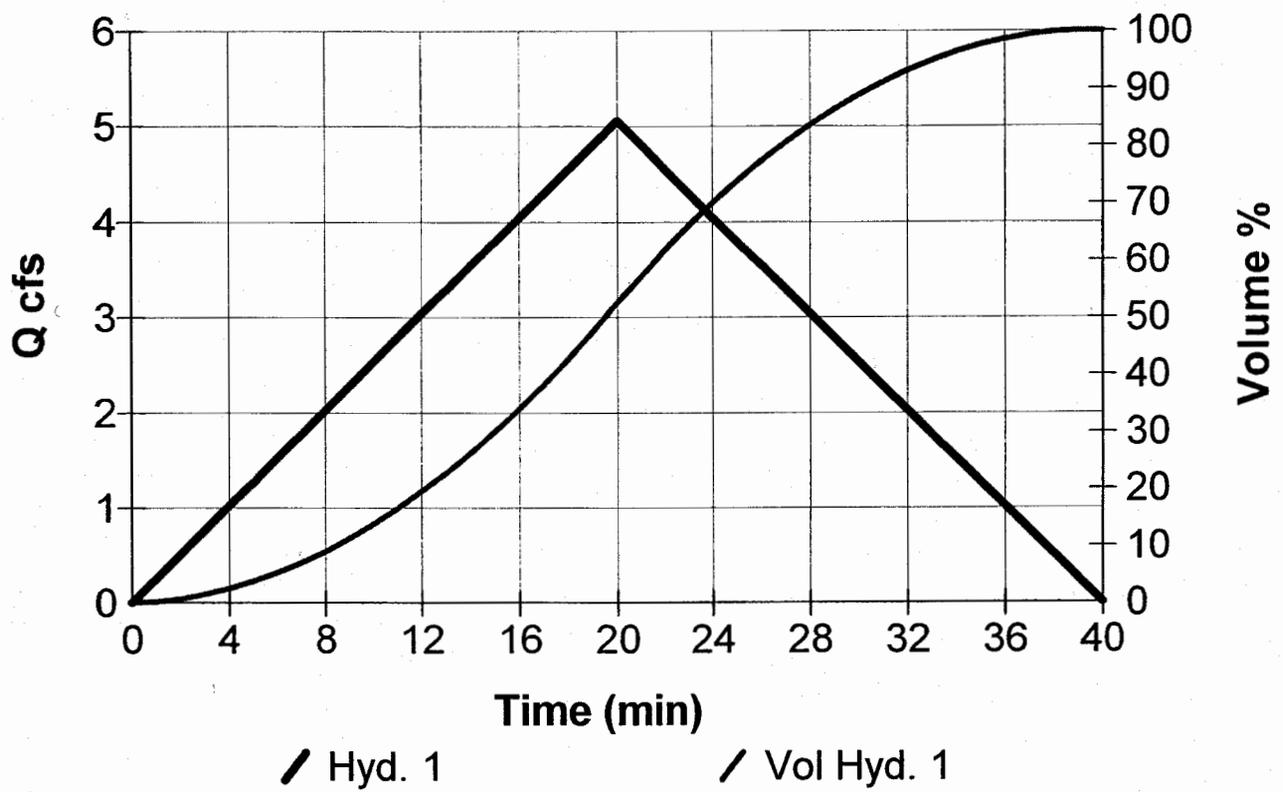
1 - Rational - 2 Yr - Qp = 2.64 cfs



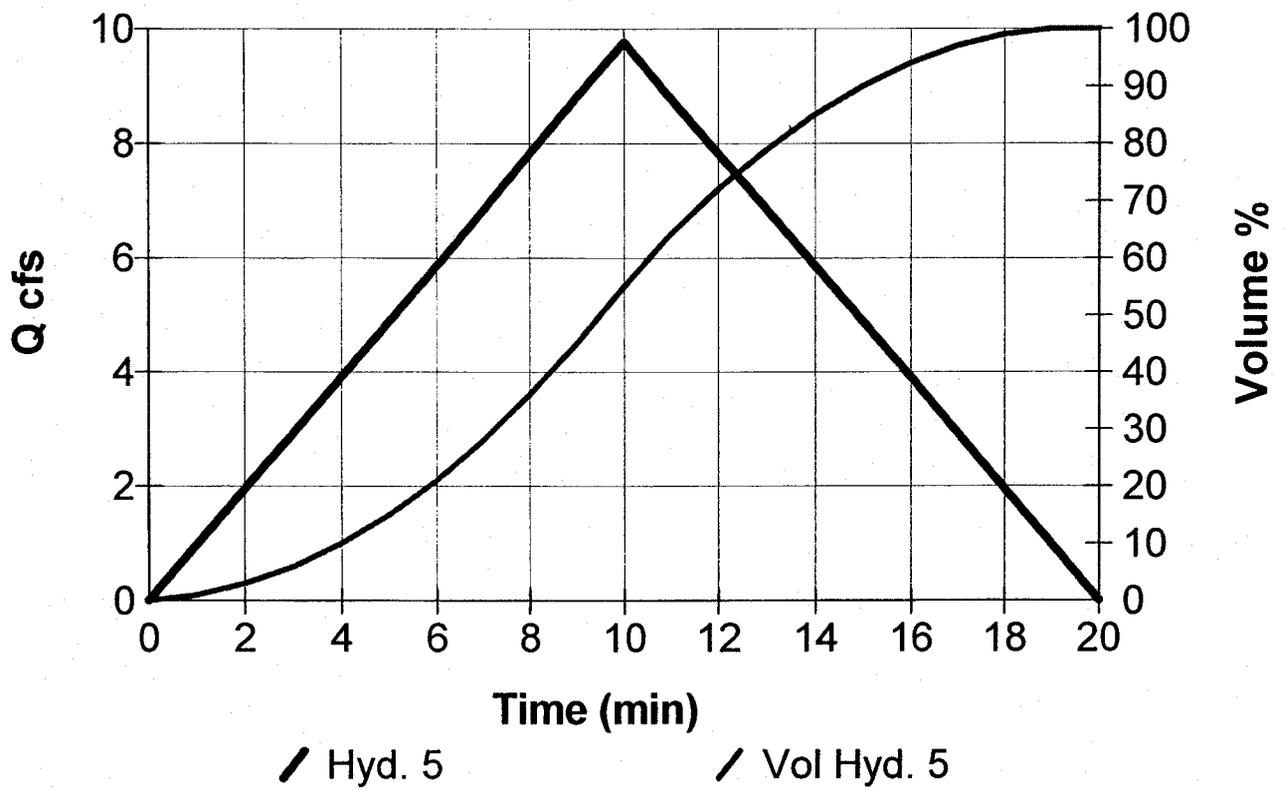
1 - Rational - 10 Yr - $Q_p = 3.59$ cfs



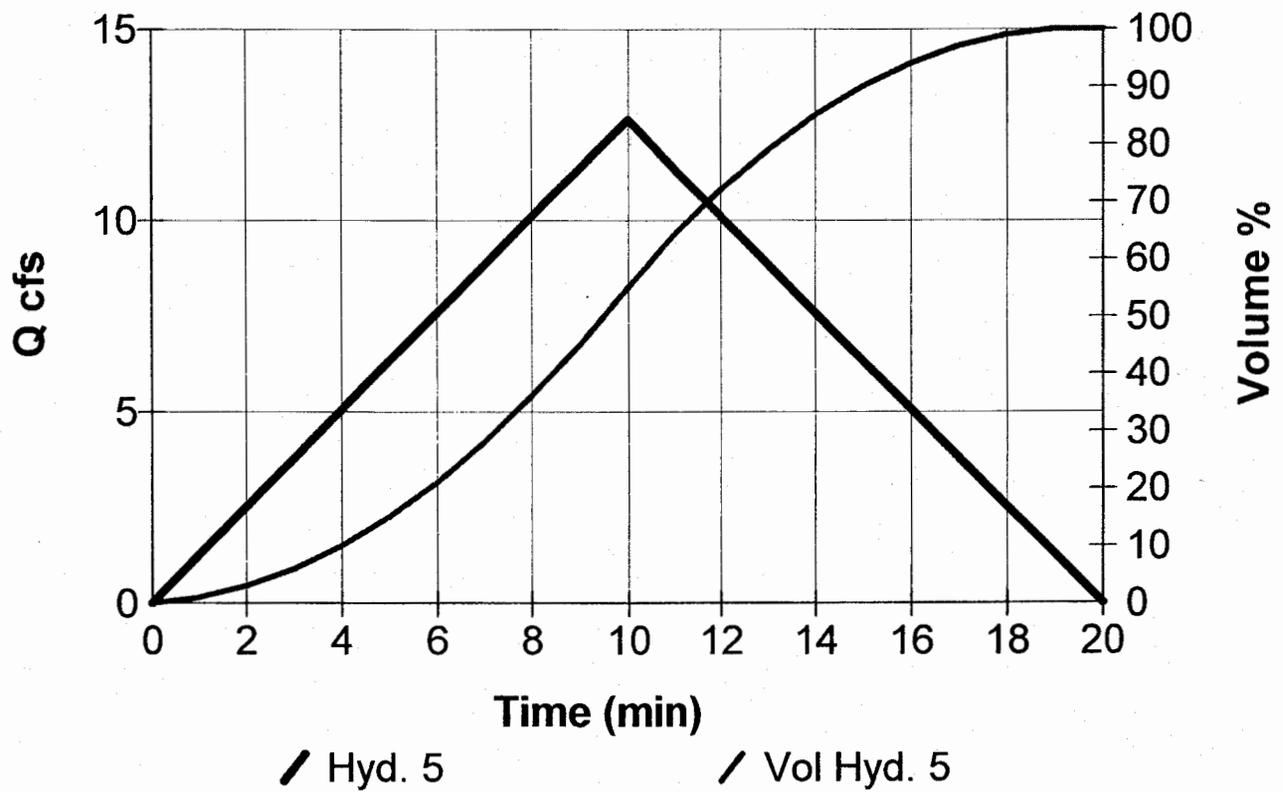
1 - Rational - 100 Yr - Qp = 5.05 cfs



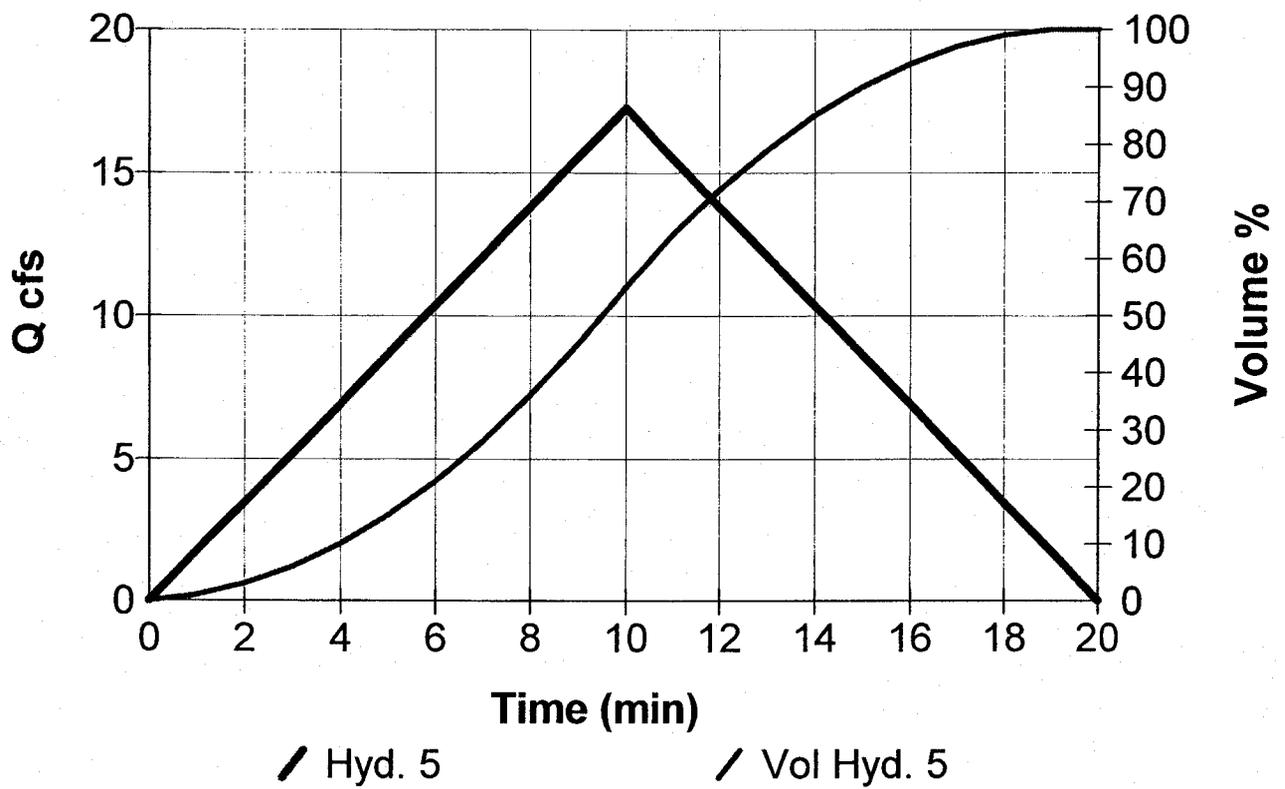
5 - Rational - 2 Yr - $Q_p = 9.77$ cfs



5 - Rational - 10 Yr - Qp = 12.63 cfs



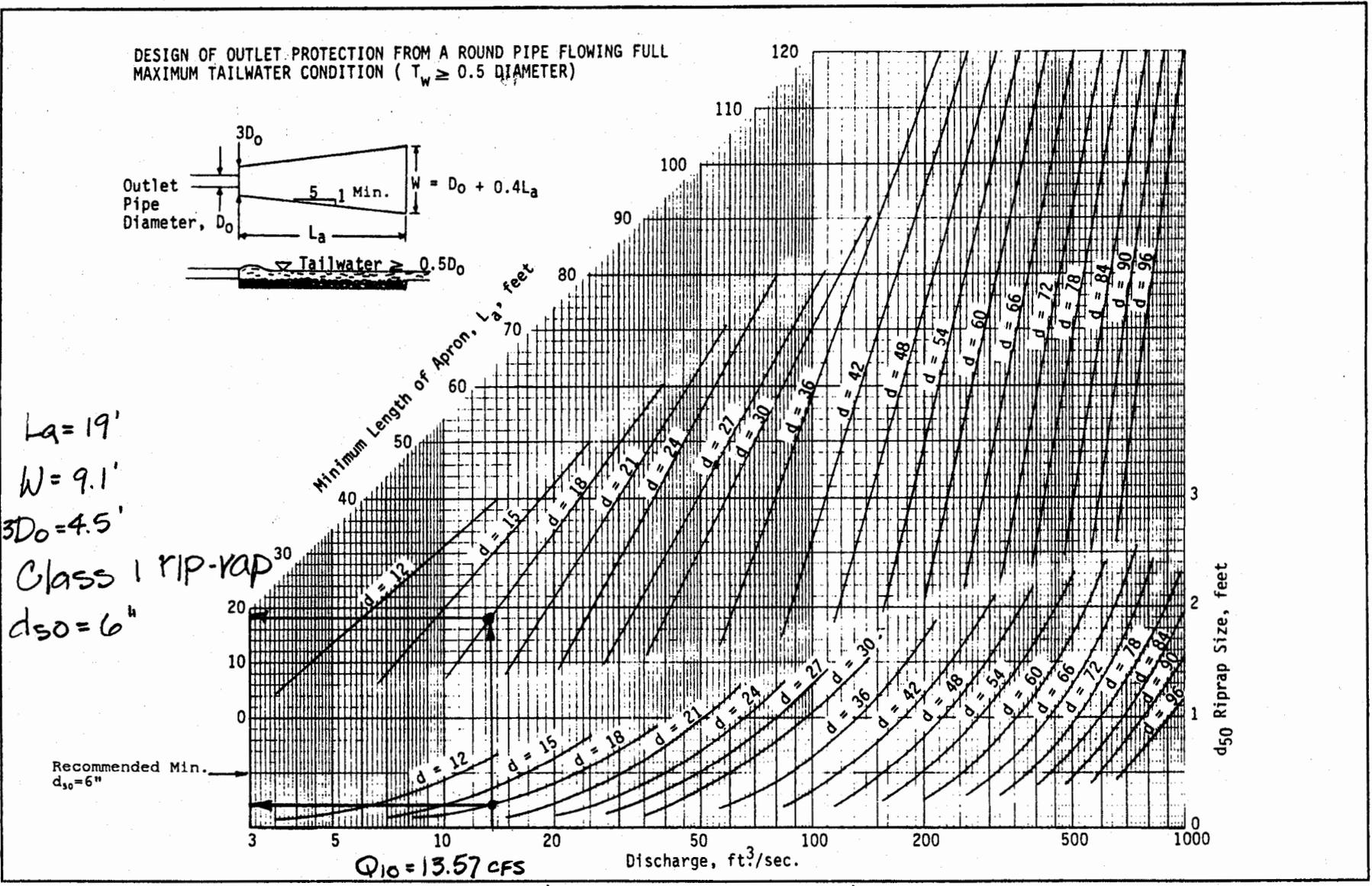
5 - Rational - 100 Yr - $Q_p = 17.25$ cfs



Source: USDA-SCS

III - 165

Plate 3.18-4



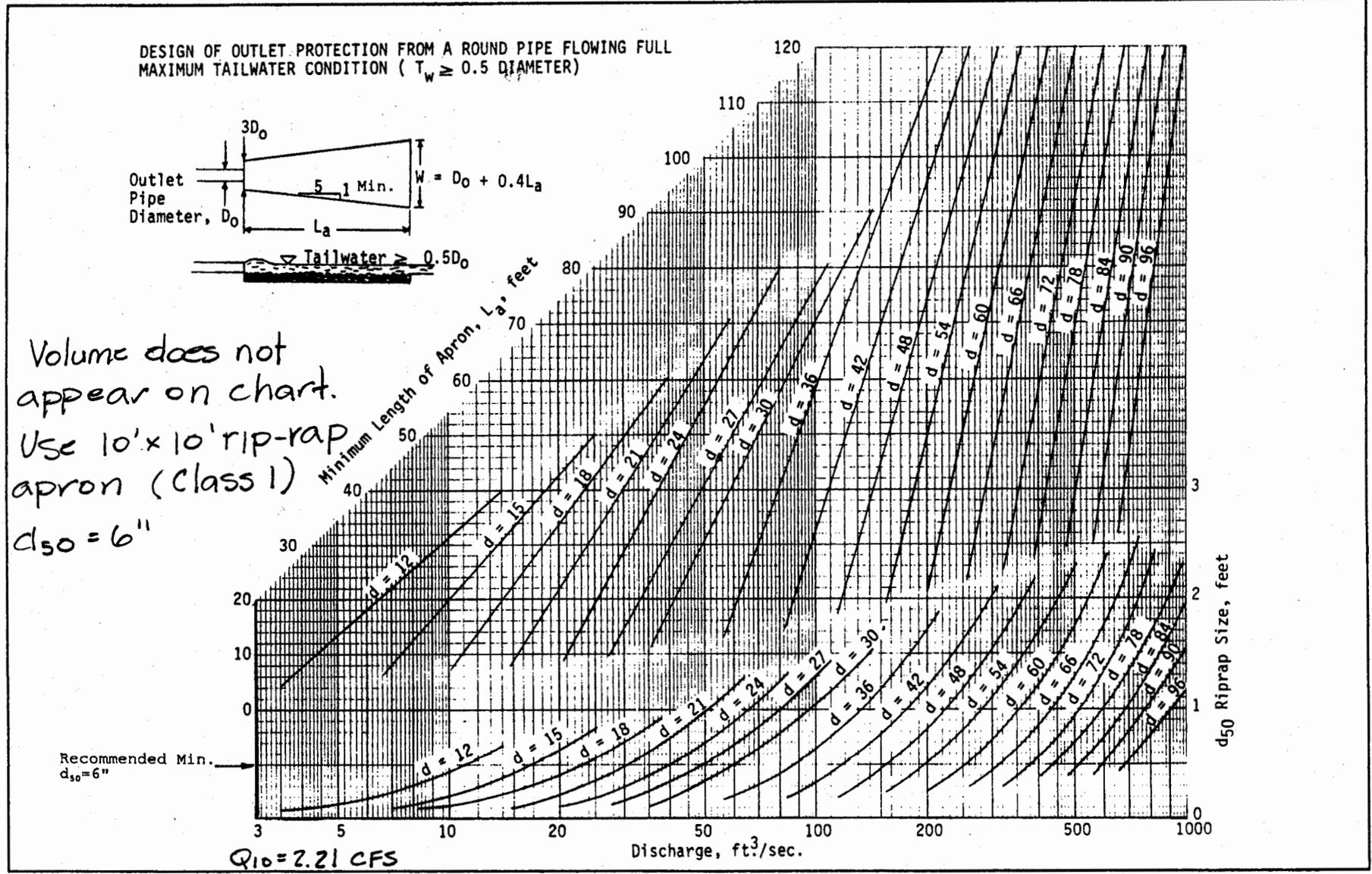
1992

3.18

Source: USDA-SCS

III - 165

Plate 3.18-4



Strawberry Plains System 2

Scott Thomas

From: Price, Howard W. [hprice@aesva.com]
Sent: Wednesday, April 07, 2004 8:27 AM
To: Scott Thomas
Subject: RE: Strawberry Plains Center SPA (SP-1-04)

Scott:

Attached is the calculations for the water quality volume you requested. As you can see, they were down before, but I forgot to include them with the submittal, SORRY! Call or email if you need any further information.

Thanks,

Howard

-----Original Message-----

From: Scott Thomas [mailto:SCOTTT@james-city.va.us]
Sent: Tuesday, April 06, 2004 9:45 AM
To: Price, Howard W.
Cc: Karen Drake
Subject: Strawberry Plains Center SPA (SP-1-04)

Environmental Division comment # 7 dated February 12th asked for revised water quality computations for BMP design. The response was that calculations were provided. No revised water quality computations were found in the amended design report. I need to know, due to pond regrading and an increase in the design drainage area from 3.14 acres to 3.57 acres, that there is adequate WQv present in the permanent and extended detention pools to meet minimum requirements.

(Previous approved design was based on a 1" per impervious acre treatment volume; impervious area was 1.41 acres; available volume 16,392 cubic feet was well in excess of 5,243 cubic feet required for water quality. Refer to Wet Pond # 1 calculation Sheet 1 of 2 revised 5/1/00.)

Although future building impervious area was anticipated in the original design, it is unclear if additional parking area as shown on the amended plan was. The plan amendment increases the design drainage area beyond original postdevelopment divides. Theoretically, this could trigger the need to conform with our stream channel protection volume requirements (24-hour detention of the 1-year, 24-hour storm). I will not require this; however, I need to ensure there is adequate water quality volume provided for building and parking lot expansion in the expanded drainage area.

Also, the wooden decorative fence around the basin as shown on Sheets 6 and 9 should not obstruct outflow from the pond barrel/outlet protection and emergency spillway. Please provide me an explanation how this will be resolved.

Please fax this over to me ASAP as I am currently reviewing this project and really prefer not to issue a repetitive comment.

Scott J. Thomas, P.E.
James City County
Environmental Division

4/7/2004

MC013_COMMON_AREA_STRAWBERRY_PLAINS_CTR - 065

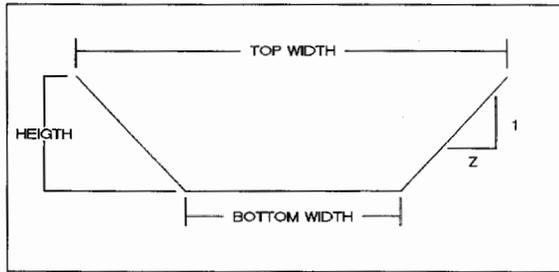
CALCULATION FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION
FOR SWMP POND
STRAWBERRY PLAINS
 AES Project No.: 8720-1
 September 15, 2003

I. DETERMINING REQUIRED WATER QUALITY VOLUME

Due to preliminary considerations, it is desired to provide this site extended detention wet pond to achieve a 10 point BMP rating for the facility. Under the James City County guide lines for storm water management BMPs, the extended detention wet pond may have one half of the water quality volume stored in the permanent pool and one half of the water quality volume released in a 24-hour period.

Percent Impervious of the BMP Watershed, Post-Development	67.6%		
Drainage Area of the BMP Watershed	3.57	acres	
Impervious Acres of BMP Watershed	2.41	acres	
Calculation for Water Quality Volume, WQ _v			
$WQ_v = (2.0 \text{ inches per impervious acre}) * (\text{impervious acres of BMP watershed})$			
$WQ_v = (2.0 \text{ inches}) * (1 \text{ ft} / 12 \text{ inches}) * (43560 \text{ sq. Ft per acre}) * (\text{impervious acres of BMP watershed})$			
$WQ_v = (2.0 \text{ inches}) * (1 \text{ ft} / 12 \text{ inches}) * (43560 \text{ sq. Ft per acre}) *$	2.41	=	17518 cu. Ft
WQ _v =	17518 cu. Ft		Required Volume for Permanent Pool (2" per Impervious Acre)
WQ _v (provided)=	17647 cu. Ft		Water Quality Volume Provided for Wet pool

V. DETERMINING CHANNEL ADEQUACY



TOP WIDTH =	196 FT
BOTTOM WIDTH =	46 FT
HEIGHT =	30 FT
Z =	2.5 FT/FT
SLOPE (S)	0.01
MANNING'S N	0.11

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

- V = AVERAGE VELOCITY
- N = MANNING'S ROUGHNESS COEF.
- R = HYDRAULIC RADIUS = A / WP
- S = SLOPE OF CHANNEL
- A = AREA OF CROSS SECTION
- WP = WETTED PERIMETER

MANNING'S ROUGHNESS COEF.

N1 = CHANNEL IN EARTH	0.020 (Earthen Channel)
N2 = EROSION	0.010 (Moderate channel)
N3 = SIZE/SHAPE OF CHANNEL	0.010 (Channel shape changes shape, shifting flow side to side)
N4 = OBSTRUCTIONS	0.020 (Appreciable)
N5 = VEGETATION	0.040 (trees and underbrush)
N6 = MEANDER	0.100 (Appreciable meander)

$$N = (N1 + N2 + N3 + N4 + N5) * N6 + (N1 + N2 + N3 + N4 + N5)$$

$$N = 0.11$$

SOIL TYPE

SANDY LOAM

MAX. PERMISSIBLE VELOCITY =

2.5 FT / SEC

2-YEAR STORM EVENT

PEAK FLOW RATE =	3.98 CFS	(FROM HYDROGRAPH)
PEAK VELOCITY =	0.45 FT/SEC	
DEPTH =	0.19 FT	

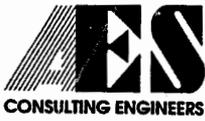
* VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS 0.45 F.P.S. - LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 FPS. THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 1 FOOT CHANNEL DEPTH IS ADEQUATE.

10-YEAR STORM EVENT

PEAK FLOW RATE =	26.69 CFS	(FROM HYDROGRAPH)
PEAK VELOCITY =	0.94 FT/SEC	
DEPTH =	0.60 FT	

* 10 YEAR STORM EVENT RESULTS IN A DEPTH WITHIN THE CONFINES OF THE EXISTING CHANNEL

<u>Incremental</u> <u>Depth</u> (FT)	<u>Area</u> (SQ FT)	<u>WP</u> (FT)	<u>Hydraulic</u> <u>Radius</u> (FT)	<u>Velocity</u> (FT/SEC)	<u>Flow</u> (CFS)
0.00	0.00	46.00	0.00	0.00	0.00
0.10	4.63	46.54	0.10	0.29	1.34
0.19	8.91	47.03	0.19	0.45	3.98
0.20	9.30	47.08	0.20	0.46	4.27
0.30	14.03	47.62	0.29	0.60	8.41
0.40	18.80	48.15	0.39	0.72	13.60
0.50	23.63	48.69	0.49	0.84	19.76
0.60	28.42	49.22	0.58	0.94	26.69
0.70	33.43	49.77	0.67	1.04	34.72
0.80	38.40	50.31	0.76	1.13	43.44
0.90	43.43	50.85	0.85	1.22	52.95
1.00	48.50	51.39	0.94	1.30	63.21
1.10	53.63	51.92	1.03	1.38	74.22
1.20	58.80	52.46	1.12	1.46	85.94
1.30	64.03	53.00	1.21	1.54	98.37
1.40	69.30	53.54	1.29	1.61	111.49
1.50	74.63	54.08	1.38	1.68	125.29
1.60	80.00	54.62	1.46	1.75	139.76
1.70	85.43	55.15	1.55	1.81	154.90
1.80	90.90	55.69	1.63	1.88	170.69
1.90	96.43	56.23	1.71	1.94	187.12
2.00	102.00	56.77	1.80	2.00	204.20
2.10	107.63	57.31	1.88	2.06	221.91
2.20	113.30	57.85	1.96	2.12	240.25
2.30	119.03	58.39	2.04	2.18	259.21
2.40	124.80	58.92	2.12	2.23	278.80
2.50	130.63	59.46	2.20	2.29	299.00
			#DIV/0!		



5248 Olde Towne Road, Suite 1
 Williamsburg, Virginia 23188
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PROJECT STRAWBERRY PLAINS CENTER
 PROJECT NO. 8720
 SUBJECT WBT POND #1
 SHEET NO. 1 OF 2
 CALCULATED BY HWA DATE 3/15/00

WBT POND #1

VOLUME REQUIRED (10 yr pond)

1" / 1MP AC (WBT) 1" / 1MP AC (DRY)

D. A. = 3.14 AC 75% imp ⇒ 1.41 AC

NP Vol: $(3.14 AC) (43,500 SF/AC) 1" / 1MP AC (\frac{1}{12}')$ K_v

$K_v: 0.05 + 0.009(15) = 0.96$

MIN. VOL. = 5,243 CU. FT (Perm. Pond)

NP ELEVATION = 85.00' ⇒ 8,561 CU. FT > 5,243 CU. FT ✓

DRAIN DRY VOLUME FOR 24 HRS

$Q = \frac{5243 \text{ CU. FT}}{86,400 \text{ SEC}} = 0.06 \text{ CFS}$

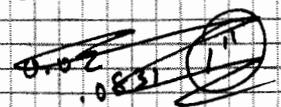
~~THIS WOULD MEAN A 2" ORIFICE AT BASE OF BERM POOL~~

$Q = KA_0 \sqrt{2gh}$ $gh = 1.0$

~~EL. 87.0 141000
 EL. 85.0 85000
 VOLUME DIFF. 56000
 AT POND~~

$0.06 = 0.73 A_0 \sqrt{64.4(h)}$

$0.06 = 5.86 A_0$ $A_0 = 0.01 = \pi r^2$ $r = 0.06 = 0.70 \text{ IN}$



USE 2 IN ORIFICE

* SINCE ORIFICE IS SMALLER THAN 3 INCHES

THE 10 YEAR, 24-HOUR STORM WENT IS NOT APPLICABLE



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PROJECT STRAWBERRY PLAINS CENTER
 PROJECT NO. 8720
 SUBJECT WWT POND #1
 SHEET NO. 2 OF 2
 CALCULATED BY HNP DATE 3/15/00

DRAIN DOWN TIMES

8" PIPE $r = r_{in} = 0.33'$ $A_0 = 0.3421$

$Q = 0.73 A_0 \sqrt{2gh}$ $A = 2.5'$ $g = 32.2$

$Q = (0.73)(0.3421) \sqrt{2(32.2)(2.5)} = 3.1688$ or 3.17 CFS ✓

$3.17 \text{ CFS} = \frac{8561 \text{ CU. FT}}{X \text{ SEC}}$ $X = 2700 \text{ SEC} = \underline{0.75 \text{ HRS}}$

BUOYANCY CALCULATIONS

$V_{\text{RISER INSIDE}} = \pi (r_{in})^2 h = \pi \left(\frac{2.00}{2}\right)^2 7.0$ ✓
 $= \underline{21.99 \text{ FT}^3}$

$V_{\text{RISER WALLS}} = \pi (r_{out})^2 h - \pi (r_{in})^2 h$
 $= \pi \left[\left(\frac{2.42}{2}\right)^2 7 - \left(\frac{2.00}{2}\right)^2 7 \right] = \underline{10.21 \text{ FT}^3}$

$V_{\text{BASE}} = \pi (r_{in})^2 h = \pi \left(\frac{3.06}{2}\right)^2 0.67 = \underline{4.93 \text{ FT}^3}$

$V_{\text{CONC}} = 150 \text{ FT}^3$

$W_{\text{CONC}} = (10.21 + 4.93)(150) = \underline{2271 \text{ \#}}$

$W_{\text{H2O}} = 62.4 \text{ \# / FT}^3$

$= (21.99)(62.4) = \underline{1372 \text{ \#}}$ USE 1.25 SAFETY FACTOR
 $(1372)(1.25) = \underline{1715 \text{ \#}}$

2271 \# > 1715 \# → STRUCTURE WILL NOT FLOAT

[Handwritten signature]

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

HWP
3/17/00

(with or without an emergency spillway)

Project STRAWBERRY PLAINS CENTER #8720

Basin # 1 Location _____

Total area draining to basin: 3.14 acres.

Basin Volume Design

Wet Storage:

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

67 cu. yds. x 3.14 acres = 210 cu. yds.

- 2. Available basin volume = 317 cu. yds. at elevation 85.00. (From storage - elevation curve)

- 3. Excavate 190 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 3.14 acres = 104 cu. yds.

- 5. Elevation corresponding to cleanout level = 82.80.

(From Storage - Elevation Curve)

- 6. Distance from invert of the dewatering orifice to cleanout level = 2.80 ft. (Min. = 1.0 ft.)

Dry Storage:

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

67 cu. yds. x 3.14 acres = 210 cu. yds.

5670 CF.

8. Total available basin volume at crest of riser* = 657 cu. yds. at elevation 87.00. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 2 in.

MIN SIZE IS 3 INCH PER VESCH.

10. Diameter of flexible tubing = 4 in. (diameter of dewatering orifice plus 2 inches).

$5670 \text{ CF} / (21,600 \text{ S}) = 0.2625 \text{ CFS}$

$h = \frac{87.05}{2} = 1 \text{ FT.}$

$A = \frac{0.2625}{(64.32 \times 1)^{0.5} (0.6)} = 0.0546 \text{ SF}$

$d = 2 \times \left(\frac{0.0546}{3.14} \right)^{1/2} = 0.2636'$

2" \angle 3.16" MIN ϕ FOR 6 HR DRAWDOWN.

Preliminary Design Elevations

11. Crest of Riser = 87.00

Top of Dam = 90.25

Design High Water = 86.70

Upstream Toe of Dam = 80.00

Basin Shape

12. $\frac{\text{Length of Flow}}{\text{Effective Width}} = \frac{L}{We} = \frac{40}{88} = 0.45$

If > 2 , baffles are not required _____

If < 2 , baffles are required ✓ $\frac{84}{41.4} = 2.03$ ok ✓

Runoff

13. $Q_2 = 7.2$ cfs (From Chapter 5) 2 2.6 2 7.2

14. $Q_{25} = 10.5$ cfs (From Chapter 5) 10 3.6 10 9.3

AT CLEARING $T_c = 20 \text{ C} = 0.6$ AT FINAL $T_c = 10 \text{ MIN C} = 0.6$

Principal Spillway Design

$Q_2 = 0.6(3.4)(3.14) = 6.4 \text{ CFS}$ $Q_2 = 0.6(4.62)(3.14) = 8.7 \text{ CFS}$

$Q_{25} = 0.6(5.3)(3.14) = 9.98 \text{ CFS}$ $Q_{25} = 0.6(6.00)(3.14) = 11.38 \text{ CFS}$

15. With emergency spillway, required spillway capacity $Q_p = Q_2 = 7.2$ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25} =$ _____ cfs.

$T_c =$

16. With emergency spillway:

Assumed available head (h) = / ft. (Using Q₂)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway:

Assumed available head (h) = ft. (Using Q₂₅)

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 48 ✓ in. Actual head (h) = 0.33 [±] ✓ ft.
 (From Plate 3.14-8.)

WEIR FLOW
 0.33' HEAD
 EL. 87.33'

Note: Avoid orifice flow conditions.

Riser = 3.27 x 1.50
 BAR

18. Barrel length (l) = 48 ft.

Head (H) on barrel through embankment = 9.5 ft.

H = 7.87'

(From Plate 3.14-7).

19. Barrel diameter = 15 ✓ in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

20. Trash rack and anti-vortex device

16.2 cfs CAP > 7.2 OK.

Diameter = 72 inches.

Height = 21 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity Q_e = Q₂₅ - Q_p = 3.3 ✓ cfs.

10.5 - 7.2 = 3.3 cfs

22. Bottom width (b) = 8 ft.; the slope of the exit channel (s) = / ft./foot; and the minimum length of the exit channel (x) = 32 ft.

(From Table 3.14-C).

H_p = 0.5
 + 88
88.5

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 5 ft.
 Slope of upstream face of embankment (Z) = 4 :1.
 Slope of principal spillway barrel (S_b) = 3 %
 Length of barrel in saturated zone (L_s) = 45.5 ft.
24. Number of collars required = 2 dimensions = 3.5' x 3.5'
 (from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 90.25 ✓
 Design High Water = 86.70
 Emergency Spillway Crest = 88.00
 Principal Spillway Crest = 87.00
 Dewatering Orifice Invert = 80.00
 Cleanout Elevation = 82.80
 Elevation of Upstream Toe of Dam
 or Excavated Bottom of "Wet Storage
 Area" (if excavation was performed) = 80.00

25-YEAR
 BELOW RISER CREST
 87.00 ?

RISER WOULD
 HAVE 0.33' HEAD
 FOR Q₂ = 7.2 CFS.
 YET DESIGN 25-YR
 HW EL. IS
 @ 86.7 < RISER
 CREST 87.0

Reservoir Report

Reservoir No. 1 - WET POND 1

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	80.00	235	0	0
2.00	82.00	1,114	1,349	1,349
4.00	84.00	2,569	3,683	5,032
6.00	86.00	4,489	7,058	12,090
8.00	88.00	6,812	11,301	23,391
10.00	90.00	9,537	16,349	39,740

Handwritten notes: 0.0054, 0.0256, 0.0590, 0.103, 0.1564, 0.2189, 0.029, 0.111, 0.271, 0.528, 0.902, 39,291

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 15.0	2.0	0.0	0.0
Span in	= 15.0	2.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 80.00	85.00	0.00	0.00
Length ft	= 48.0	0.0	0.0	0.0
Slope %	= 3.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	=	Yes	No	No

Handwritten notes: PLAN SHOW 1.04%

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 12.6	8.0	0.0	0.0
Crest El. ft	= 86.75	88.00	0.00	0.00
Weir Coeff.	= 3.00	3.00	0.00	0.00
Eqn. Exp.	= 1.50	1.50	0.00	0.00
Multi-Stage	= Yes	No	No	No

Handwritten notes: PLAN SHOWS 87.0, DS, ES

Tailwater Elevation = 0.00 ft

NO TW ASSUMED.

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	80.00	0.00	0.00	—	—	0.00	0.00	—	—	0.00
2.00	1,349	82.00	6.93	0.00	—	—	0.00	0.00	—	—	0.00
4.00	5,032	84.00	10.85	0.00	—	—	0.00	0.00	—	—	0.00
6.00	12,090	86.00	13.70	0.10	—	—	0.00	0.00	—	—	0.10
8.00	23,391	88.00	16.04	0.00	—	—	52.70	0.00	—	—	16.04
10.00	39,740	90.00	18.09	0.00	—	—	220.94	67.88	—	—	85.97

CULV. IS NOT A ORIFILE THIS WOULD MEAN ORIFILE FROM POND. RISPR -> BARREL. OK

DISCH FROM E.S. YET PLANS SHOW 100-YR BELOW AS.

2" ORIFILE HANDLES 100-YEAR?

WSEL NEVER GET TO RISER CRAPT?

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	2.6	1	20	3,164	2	—	—	—	2 YR PRE
2	Rational	3.6	1	20	4,309	10	—	—	—	10 YR PRE
3	Rational	5.1	1	20	6,064	100	—	—	—	100 YR PRE
5	Rational	7.2	1	10	4,294	2	—	—	—	2 YR POST
6	Rational	9.3	1	10	5,554	10	—	—	—	10 YR POST
7	Rational	12.6	1	10	7,588	100	—	—	—	100 YR POST
9	Reservoir	0.1	1	20	4,097	2	5	86.12	12,780	2 YR ROUTED
10	Reservoir	0.1	1	20	5,257	10	6	86.34	14,029	10 YR ROUTED
11	Reservoir	0.1	1	20	7,049	100	7	86.70	16,049	100 YR ROUTED
13	Rational	10.5	1	10	6,293	25	—	—	—	25 YR

ROUTED

2
10
100

0.1 CFS @ EL. 86.12
0.1 CFS @ EL. 86.34
0.1 CFS @ EL. 86.70

→ ROUTING IS CONSIDERING VOLUME IN PARM POOL IN 2, 10 & 100 YR PAR ROUTING. (IE POND EMPTY.) IS CURVE SHOULD BEGIN @ EL. 85.0

Proj. file: 8720-1.gpw	IDF file: New JCC.IDF	Run date: 03-22-2000
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**James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities**

County BMP ID Code (if known): MC013

Name of Facility: Strawberry Plains Center BMP No.: 1 of 1 Date: 7/14/2009

Location: _____

Name of Owner: Jamestown LLC

Name of Inspector: Gregory B. Johnson

Type of Facility: Wet Pond

Weather Conditions: Hot/Humid Type: Final Inspection County BMP Inspection Program Owner Inspection

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. No action required.
- Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
- Urgent - The item checked requires immediate attention to keep the BMP operational and to 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	✓			
Vegetation Condition		✓		
Tree Growth			✓	Dead trees, trees on dam
Erosion			✓	Several Area need stabilized
Trash & Debris		✓		Trash inside facility
Seepage	✓			
Fencing or Benches	✓			
Interior Landscaping/Planted Areas: <input checked="" type="checkbox"/> None <input type="checkbox"/> Constructed Wetland/Shallow Marsh <input type="checkbox"/> Naturally Established Vegetation				
Vegetated Conditions				
Trash & Debris		✓		Trash Inside BMP
Floating Material				
Erosion				
Sediment	✓			
Dead Plant			✓	Trees top of Dam
Aesthetics	✓			
Other				
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: <input checked="" type="checkbox"/> Permanent Pool (Retention Basin) <input type="checkbox"/> Shallow Marsh (Detention Basin) <input type="checkbox"/> None, Dry (Detention Basin)				
Shoreline Erosion				
Algae				
Trash & Debris				
Sediment				
Aesthetics				
Other				
Inflows (Describe Types/Locations):				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure				
Corrosion				
Trash and Debris				
Sediment				
Vegetation				
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure				
Settlement				
Trash & Debris				
Erosion/Sediment				
Outlet Protection				
Other				
Emergency Spillway (Overflow):				
Vegetation				
Lining				
Erosion				
Trash & Debris				
Other				
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding				
Animal Burrows				
Graffiti				
Other				
Surrounding Perimeter Conditions:				
Land Uses				
Vegetation				
Trash & Debris				
Aesthetics				
Access /Maintenance Roads or Paths				
Other				
Remarks:				
Overall Environmental Division Internal Rating: _____				
Signature: _____ Date: _____				
Title: _____				

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

Date Record Created: 7/20/2009

WS_BMPNO:

Created By: Greg Johnson

MC013

WATERSHED MC
 BMP ID NO 013
 PLAN NO SP-061-04
 TAX PARCEL
 PIN NO 3842500001A
 CONSTRUCTION DATE 12/1/2008
 PROJECT NAME Strawberry Plains Center
 FACILITY LOCATION 3701 Strawberry Plains Road
 CITY-STATE Williamsburg, VA
 CURRENT OWNER W & L Land, LLC (Waverly Brooks)
 OWNER ADDRESS 3701 Strawberry Plains Rd
 OWNER ADDRESS 2
 CITY-STATE-ZIP CODE Williamsburg, Va 23188
 OWNER PHONE 757-258-2705
 MAINT AGREEMENT Yes
 EMERG ACTION PLAN No

MAINTENANCE PLAN Yes
 SITE AREA acre 5.668
 LAND USE General Retail
 old BMP TYP Wet Pond
 JCC BMP CODE A2 Wet Pond

POINT VALUE

SVC DRAIN AREA acres 3.57

SERVICE AREA DESCR Parking lot and roofs

IMPERV AREA acres 2.41

RECV STREAM Mill Creek

EXT DET-WQ-CTRL Yes

WTR QUAL VOL acre-ft 0.405

CHAN PROT CTRL Yes

CHAN PROT VOL acre-ft

SW/FLOOD CONTROL No

GEOTECH REPORT No

CTRL STRUC DESC RISER

CTRL STRUC SIZE inches 48

OTLT BARRL DESC RCP

OTLT BARRL SIZE inch 15

EMERG SPILLWAY Yes

DESIGN HW ELEV 88.16

PERM POOL ELEV 87.00

2-YR OUTFLOW cfs 0.23

10-YR OUTFLOW cfs 2.83

REC DRAWING Yes

CONSTR CERTIF Yes

LAST INSP DATE 7/14/2009 Inspected by:

INTERNAL RATING

MISC/COMMENTS

SP-01-04; SP-139-99

Get Last BMP No

Return to Menu

Additional Comments:

