James City County VIRGINIA Jamestown 1607

Stormwater Division

MEMORANDUM

DATE: July 28, 2014
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jacob Smith, Stormwater Intern
PO: 110426
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	MID COUNTY PARK		
BMP ID OR GEN FILE NUMBER:	PC273	**OWNER NAME:**	JCC
PIN:	3830100010	**SITE ADDRESS:**	N/A
		LEGAL DESCRIPTION:	N/A

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

BOX NO.:	2	**COMMENTS:**	TRANSMITTAL

TRANSMITTAL SHEET

ENGINEERING & RESOURCE PROTECTION → STORMWATER

Project: Mid County Park

County Plan No.: **SP-057-12**

Assigned BMP No.: PC 273

BMP Type: **Dry Pond**

Information Enclosed:

X Computations

X Other: Project file information. Required final documents never provided. No remaining bond.

Appoved Plan AT ERP. This is PART OF THE MASTER PLAN.

Name: **Greg Johnson**

Date: **02/03/2014**

Signature: Greg Johnson

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

Project Name: Mid County Park Site Upgrade
County Plan No.: SP-057-12
Stormwater Management Facility: Dry Pond
BMP Phase #: ☐ I ☐ II ☐ III

- ☒ Information Package Received. Date/By: 7/9/2013 – 12/18/2013
- ☒ Completeness Check:
  - ☒ Record Drawing Date/By: 5/28/13 William S. Fields
  - ☒ Construction Certification Date/By: 11/15/13 B. Scott Gresham
  - ☒ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - ☐ Insp/Maint Agreement # / Date:
  - ☒ BMP Maintenance Plan Location: C-12
  - ☐ Other:
- ☒ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
  - ☒ Yes ☐ No Location: C-11 #21
- ☒ Assign **County BMP ID Code #**: Code: PC-273
- ☒ 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: 7/24/2013
- ☒ Record Drawing (RD) Review Date: 1/14/2014
- ☐ Construction Certification (CC) Review Date: 1/14/2014
- ☒ Actions:
  - ☐ No comments.
  - ☒ Comments. Letter Forwarded. Date: 8/8/2013
  - ☐ Record Drawing (RD)
  - ☒ Construction Certification (CC)
  - ☒ Construction-Related (CR)
  - ☐ Site Issues (SI)
  - ☐ Other :
- ☒ Second Submission: NOT REQUIRED
- ☒ Reinspection (if necessary):
- ☒ 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.

Environmental Division

DEC 18 2013

Stormwater Management/BMP Facilities
Record Drawing and Construction Certification Forms

RECEIVED

(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: MID COUNTY PARK SITE UPGRADES
Structure/BMP Name: SITE DRY POND
Project Location: MID COUNTY PARK (INTERSECTION OF IRONBOUND ROAD AND NEWS ROAD)
BMP Location: LOCATED ALONG SOUTHERN PROPERTY LINE OF PARCEL
County Plan No.: _____

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

Tax Map/Parcel No.: 3830100010
BMP ID Code (if known): NOT KNOWN
Zoning District: PL
Land Use: COUNTY PARK
Site Area (sf or acres): 18.03 ACRES (PER SITE PLAN)

Brief Description of Stormwater Management/BMP Facility:
BMP FACILITY IS DRY POND LOCATED ABOUT MID WAY BETWEEN MONTICELLO AVE AND IRONBOUND ROAD ALONG SOUTHERN PROERTY LINE OF MID COUNTY PARK PARCEL.

Nearest Visible Landmark to SWM/BMP Facility: MID COUNTY PARK PARKING LOT AND OFFICE

Nearest Vertical Ground Control (if known): NOT 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:

Pre-Construction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☑ Unknown
Approx. Construction Start Date for SWM/BMP Facility: JANUARY 2013
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☑ Unknown
Name of Site Work Contractor Who Constructed Facility: DAVID A. NICE BUILDERS, INC.
Name of Professional Firm Who Routinely Monitored Construction: NOT KNOWN
Date of Completion for SWM/BMP Facility: MAY 2013
Date of Record Drawing/Construction Certification Submittal: MAY 28, 2013

(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 Engineering and Resource Protection 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: JAMES CITY COUNTY PARKS AND RECREATION DEPARTMENT
Mailing Address: 5300 PALMER LANE, SUITE 1A
WILLIAMSBURG, VA. 23188
Business Phone: 757-259-3200 Fax: N/A
Contact Person: NANCY ELLIS Title: N/A

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
WILLIAMSBURG, VA. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Responsible Plan Preparer: GRAHAM V. CORSON
Title: PROFESSIONAL ENGINEER
Plan Name: MID COUNTY PARK SITE UPGRADES
Firm's Project No. W10119-E-19
Plan Date: 06-29-2012
Sheet No.'s Applicable to SWM/BMP Facility: C-09 / C-12 / ____ / ____ / ____

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

Firm Name: DAVID A. NICE BUIDERS, INC.
Mailing Address: 4571 WARE CREEK ROAD
WILLIAMSBURG, VA. 23188
Business Phone: 757-566-3032

Fax: 757-566-4686
Contact Person: NATHAN A. SKALAK
Site Foreman/Supervisor: SAME
Specialty Subcontractors and Purpose (for BMP Construction Only): _____

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built 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: LANDTECH RESOURCES, INC.
Mailing Address: 205-E BULIFANTS BLVD
WILLIAMSBURG, VA. 23188
Business Phone: 757-565-1677
Fax: 757-565-0782
Name: WILLIAM S. FELTS
Title: LAND SURVEYOR
Signature: Will Felts
Date: 05-28-2013

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 to the provisions of the approved design plan, specifications design, and stormwater management plan, ~~except as~~ specifically noted.

COMMONWEALTH OF VIRGINIA
WILLIAM S. FELTS
Lic. No. 3149
5-28-15
LAND SURVEYOR

_____ (Seal)
Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS Mid-Atlantic
Mailing Address: 108 Ingram Road Suite 1
Williamsburg Virginia 23188
Business Phone: 757-229-6677
Fax: 757-229-9978
Name: B. Scott Gresham, P.E.
Title: Construction Services Manager
Signature: B. Scott Gresham
Date: 11/15/13

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 plan, specifications, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
11/15/13
B. SCOTT GRESHAM
Lic. No. 037785
PROFESSIONAL ENGINEER

_____ (Seal)
Virginia Registered Professional Engineer

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

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

☑ 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 Engineering and Resource Protection 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 Engineering and Resource Protection 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 Engineering and Resource Protection 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 Engineering and Resource Protection Division due to the size or presence of the structure or due to evidence of improper construction.

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

☑ 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 Engineering and Resource Protection 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 reproducibles.

☑ Submission Requirements - Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system,

it is requested that the record drawings also be submitted to the Engineering and Resource Protection 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 Engineering and Resource Protection 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 plan 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 Engineering and Resource Protection 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.

N/A 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.**

N/A 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.

N/A 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

N/A 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 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.)*

_____ A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

_____ A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

_____ 3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

_____ 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.

_____ A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

_____ 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.

_____ 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).

_____ A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

_____ A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

_____ A10. Low flow orifice has a non-clogging mechanism.

_____ A11. A pond drain pipe with valve was provided.

_____ A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

_____ 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)*

_____ B1. Same requirements as Group A Wet Ponds.

_____ B2. Minimum 2:1 length to width flow path provided across the facility.

_____ B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

_____ 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.

_____ B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

_____ B6. No more than one-half (½) of the wetland surface area is planted.

_____ B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

_____ 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)*

_____ C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

_____ C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

_____ 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.

_____ 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.

_____ C5. Sides of infiltration practice lined with filter fabric.

_____ 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.

_____ C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

_____ 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.

_____ C9. Minimum twenty-five (25) foot separation down gradient from any structure.

_____ C10. Stormwater outfalls provided for overflow associated with larger design storms.

_____ C11. No visual signs of erosion or channel degradation immediately downstream of facility.

_____ C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

_____ C13. Observation well provided.

_____ 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)*

_____ D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

_____ D2. Sediment pretreatment devices provided.

_____ 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.

_____ 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.

_____ 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.

_____ D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed.

_____ D7. Filtering system is off-line from storm drainage conveyance system.

_____ D8. Overflow outlet has adequate erosion protection.

_____ D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

_____ D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

_____ 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.

_____ D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

_____ D13. No visual signs of erosion or channel degradation immediately downstream of facility.

_____ D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT/BMP FACILITIES
AS-BUILT PLAN 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)*

XX E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

XX E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

XX E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

XX E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

XX 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.

XX 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.

XX 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.

XX E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

XX 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.

XX 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)*

XX F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

XX 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.

XX 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.

XX F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

XX 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.

XX F15. No visual signs of erosion or channel degradation immediately downstream of facility.

XX 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)*

XX G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

XX 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.

XX G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensure 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).

XX G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

XX 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.)

XX SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

XX SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

XX SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

XX 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.

XI. 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.)*

XX O1. All requirements of Section II, Minimum Standards, apply to this section.

XX O2. Certification criteria to be determined on a case-by-case basis by the Engineering and Resource Protection Division specific to the proposed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

XII. <u>References</u> *(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.

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Infiltration Basin and Trench Facilities

County BMP ID Code (if known): PC-273

Name of Facility: Mid County Park Site Upgrade BMP No.: 1 Date: 7/24/2013

Location: Along southern Property line of parcel.

Name of Owner: James City County

Name of Inspector: Gregory B. Johnson

Type of Facility: Dry Pond

Weather Conditions: Warm/Sunny Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owners 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 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
Accessibility:				
Roads	✓			
Parking Areas	✓			
Gates	NA			
Locks	NA			
Safety Fencing	NA			
Observation Wells/Areas:				
Trap Doors	NA			
Manhole Covers	NA			
Grates	NA			
Steps	NA			
Pretreatment Devices: ☐ Inlet ☐ Sump ☐ Forebay ☒ Other				
Sediment		✓		Lower end of basin needs some sediment removed
Trash & Debris		✓		Lower part of pond has Algae
Structure	✓			
Other				

Facility Item	O.K.	Routine	Urgent	Comments
Primary Storage/ Infiltration Area:				
Trash & Debris	✓			
Sediment	✓	✓		
Ponding / Drawdown		✓		Slow draw down
Surface Aggregates		✓		Algae
Aesthetics	✓			
Other	✓			
Inlet Structure # 1 (Describe Location): South East Corner				
Condition of Structure	✓			
Erosion		✓		Around structure
Trash and Debris	✓			
Sediment		✓		Minor sediment
Aesthetics	✓			
Other	✓			
Inlet Structure # 2 (Describe Location):				
Condition of Structure				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Inlet Structure # 3 (Describe Location):				
Condition of Structure				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Outlets - Overflow or Bypass Control Structures (Describe Location):				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Other	✓			
Nuisance Type Conditions:				

Facility Item	O.K.	Routine	Urgent	Comments
Mosquito Breeding		✓		
Animals, Rodents	✓			
Graffiti	✓			
Other	✓			
Perimeter (Contributing Drainage Area) Conditions:				
Stabilization		✓		
Vegetation Condition		✓		
Trash and Debris	✓			
Aesthetics	✓			
Other	✓			

Remarks:

Overall Environmental Division Internal Rating: _____

Signature: Gregory B. Johnson **Date:** 7/23/2013

Title: Inspector

SWMProg\BMP\CoInspProg\SubDetInfil.wpd

ECS LLC
MID-ATLANTIC

Environmental Division
JUL - 5 2012
RECEIVED

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING REPORT

JAMES CITY COUNTY MID-COUNTY PARK REHABILITATION
3793 IRONBOUND ROAD
JAMES CITY COUNTY, VIRGINIA

FOR

Shawn Gordon, Capital Projects Coordinator
James City County General Services
113 Tewning Road
Williamsburg, Virginia 23188

July 3, 2012

ECS Project No. 07:11461

ECS MID-ATLANTIC, LLC *"Setting the Standard for Service"*
Geotechnical • Construction Materials • Environmental • Facilities

July 3, 2012

Shawn Gordon, Capital Projects Coordinator
James City County General Services
113 Tewning Road
Williamsburg, Virginia 23188

ECS Project No. 07:11566

Reference: Subsurface Exploration and Geotechnical Engineering Report
James City County Mid-County Park Rehabilitation
3793 Ironbound Road
James City County, Virginia

Dear Mr. Gordon:

ECS Mid-Atlantic, LLC (ECS) has completed a subsurface exploration and geotechnical engineering analysis for the referenced project. This study has been completed in general accordance with your authorization of our proposal No. 07:16056R3 dated June 12, 2012.

We have enjoyed being of service to you during the design and planning phase of this project. If you should have any questions regarding the information and recommendations contained in the accompanying report, or if we can be of further assistance, please do not hesitate to contact us.

Respectfully,

ECS Mid-Atlantic, LLC

Sara B. Phillips
Project Geologist

COMMONWEALTH OF VIRGINIA
W. LLOYD WARD
Lic. No. 034612
PROFESSIONAL ENGINEER

W. Lloyd Ward, P.E.
VP/Williamsburg Branch Manager

cc: - client via mail; Mr. Bruce Abbott with AES via e-mail (bruce.abbott@aesva.com)

SUBSURFACE EXPLORATION
AND GEOTECHNICAL ENGINEERING REPORT
JAMES CITY COUNTY MID-COUNTY PARK REHABILITATION
3793 IRONBOUND ROAD
JAMES CITY COUNTY, VIRGINIA

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REPORT

Subsurface Exploration and
Geotechnical Engineering Report

PROJECT

James City County Mid-County Park Rehabilitation
3793 Ironbound Road
James City County, Virginia

PREPARED FOR

Shawn Gordon, Capital Projects Coordinator
James City County General Services
113 Tewning Road
Williamsburg, Virginia 23188

PREPARED BY

ECS Mid-Atlantic, LLC
108 Ingram Road, Unit 1
Williamsburg, Virginia 23188

ECS PROJECT NO.

07:11566

DATE

July 3, 2012

EXECUTIVE SUMMARY

This report contains the results of our subsurface exploration and geotechnical engineering analysis for the proposed James City County Mid-County Park Rehabilitation project, located at 3793 Ironbound Road in James City County, Virginia.

The proposed development for the first phase of this project will include the relocation and redesign of the Kidsburg playground area, replacement of the main park building, infiltration areas, and parking lot upgrades.

At the time of this proposal, structural loading conditions were not available. Therefore, the estimated maximum column and wall loads for the new buildings are not expected to exceed 40 kips and 2 kips/linear foot. Furthermore, it was assumed that final grade will be at or near existing elevations.

At the time of our field investigation the majority of the site was open containing low lying vegetation, some trees, three one-story buildings and/or shelters, a playground, paved parking, a tennis and basketball court, ditch lines, and overhead and underground utilities. Therefore, uncontrolled FILL materials are expected to be present on this site. The site is relatively level with elevation changes of less than 2 feet for every 50 feet, with the exception of the ditch lines. The ditch lines were observed to range in depth from 2 to 4 feet.

Surface cover encountered at the boring locations included approximately up to 8-inches of topsoil materials, with an average of about 3-inches. Uncontrolled FILL materials of up to approximately 2 ft in depth were encountered at boring locations B-7, B-10, B-11, and B-12 only. The FILL materials were granular in nature and consisted of Silty SAND (SM) and Clayey SAND (SC) with trace Gravel, Clay, or Organics. Underlying the near surface topsoil or FILL, the natural subsurface soils were arranged in a 2-layer configuration.

The initial soil layer was granular in nature and consisted of Silty and Clayey SAND (SM and SC) with varying amounts of Clay to depths ranging from 2 to 20 feet below the existing site elevations. This layer was not encountered at borings B-1 and B-2. An isolated layer of Sandy CLAY (CL) was encountered at boring B-11 from a depth of 2 to 4 feet below the existing site elevations. The SPT, N-Values, ranged from 5 to 33 blows-per-foot (BPF), indicating a loose to dense relative density. Borings B-1, B-2, B-3, B-4, B-5, B-6, B-8, B-10, and B13 were terminated within this layer. The second and final soil layer was cohesive in nature and consisted of CLAY (CL) with varying amounts of Sand to the boring termination depths ranging from 6 to 20 feet below the existing site elevations. The SPT, N-Values, ranged from 12 to 29 BPF, indicating a stiff to very stiff consistency. Boring logs describing soil conditions encountered are included in Appendix II of this report.

The proposed building can be supported on shallow spread footing foundation systems, bearing on suitable undisturbed natural soils or on properly placed and compacted Engineered Fill. For planning purposes, a net allowable soil bearing pressure of 2,000 pounds per square foot (psf) can be used, assuming the minimum widths and embedment depth recommended herein are employed. In order to achieve this soil bearing pressure and limit foundation settlements to one inch or less, all existing FILL should be undercut from below footings such that they bear directly in approved natural subgrades or compacted and documented Engineered Fill. Based on the FILL depths encountered, and depending on final grading, up to 2-feet of existing FILL will need to be removed beneath new foundations. Detailed foundation design recommendations are provided in this report.

The first floor can be supported as a slab-on-grade bearing on approved natural soils or compacted and documented Engineered Fill. Test pits or hand augers should be performed at the time of construction to determine the content and extent of the FILL present on site. All existing FILL should be removed from the foundation excavations and replaced with Engineered Fill, VDOT gradation No 57 Stone, or Flowable Fill. However, pending the observed test pits and a proofroll, the existing FILL soils may be found suitable for floor slab or parking lot support. Detailed floor slab-on-grade design recommendations are provided in this report.

Based on the results of our soil test borings, it appears that the soils that will be exposed as pavement subgrades will consist mainly of Clayey SAND (SC) and Sandy CLAY (CL). Pavement design recommendations for the parking lot spaces and drive isles are included in this report.

Further information regarding the subsurface exploration procedures used; soil and groundwater conditions observed; recommended earthwork specifications; and design and construction recommendations for foundations, slabs-on-grade, and pavements is included in the text of this report.

This summary briefly discusses some of the major topics mentioned in the attached report. Accordingly, this report should be read in its entirety to thoroughly evaluate the contents.

1.0 PROJECT OVERVIEW

The professional consulting services for this project were performed in accordance with your authorization of our proposal No. 07:16056R3 dated June 12, 2012. Mr. Mark Bennett with AES provided ECS with a grading plan indicating the locations of the proposed boring locations with respect to existing site features. Our understanding of the project site and the proposed construction are outlined in the following sections.

1.1 Scope of Work

This subsurface exploration was completed by advancing a total of fourteen (14) soil test borings to depths ranging from 6 to 20 feet below the existing site elevations within the lateral limits of the proposed building, pavement, and infiltration areas. In addition, six (6) infiltration tests were completed in the areas of proposed infiltration. Appendix I presents the approximate location of the soil borings and infiltration tests relative to the site layout. The horizontal locations of the soil test borings were marked in the field by ECS personnel by measuring from existing field reference points. The boring locations were determined in the field as to avoid buried and overhead utilities, or other obstructions that prevented drill rig access to the boring location.

Our services included a site reconnaissance, a subsurface exploration with soil sampling and groundwater observations, laboratory testing of selected soil samples, and analyzing of the field and laboratory data to develop geotechnical engineering recommendations related to the design and construction of the project.

The engineering recommendations contained herein were developed from the data obtained from the soil test borings, which indicate subsurface conditions at these specific locations at the time of the exploration.

It is anticipated that the building will be of wood frame construction with masonry bearing walls. Maximum column and wall loads are not expected to exceed approximately 40 kips and 2 kips/foot, respectively. In our professional opinion, the number and location of the soil test borings are sufficient to provide a reasonable evaluation of the subsurface soil and groundwater conditions of the site.

1.2 Purposes of Exploration

The purpose of this work was to explore the soil and groundwater conditions by completing soil test borings at discrete locations at the project site. The gathered data from this exploration was used to develop our engineering recommendations. This purpose was accomplished by:

- Advancing soil borings to investigate the subsurface soil conditions and identify the depth of groundwater.
- Completing laboratory tests on representative soil samples obtained from the borings to evaluate pertinent engineering properties.
- Analyzing the field and laboratory data to develop appropriate engineering recommendations to aid in the planning of earthwork requirements and the design of foundations, floor slabs, and pavements.

1.3 Proposed Construction

The proposed development for the first phase of this project will include the relocation and redesign of the Kidsburg playground area, replacement of the main park building, infiltration areas, and parking lot upgrades.

At the time of this proposal, structural loading conditions were not available. Therefore, the estimated maximum column and wall loads for the new buildings are not expected to exceed 40 kips and 2 kips/linear foot. Furthermore, it was assumed that final grade will be at or near existing elevations.

2.0 EXPLORATION PROCEDURES

2.1 Subsurface Exploration Procedures

The soil borings were advanced with an ATV-mounted auger drill rig which utilized split spoon and mud rotary drilling techniques to advance the boreholes. Drilling services were provided by EarthCon Services, Inc. of Marietta, Georgia.

Representative samples were obtained from the soil borings by means of the split-barrel sampling procedure in accordance with ASTM Specification D 1586-99, (Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils). Soil samples were collected at 2 foot intervals to a depth of 10 feet bsg and at 5 foot intervals thereafter. In this procedure, a 2 inch O.D., split barrel sampler is driven into a soil a distance of 24 inches by a 140-pound hammer falling 30 inches, using a manual hammer. The first 6-inch depth increment is considered the seating interval. The number of blows required to drive the sampler through the next two 6-inch intervals is designated the Standard Penetration Test (SPT) N-value and is indicated for each sample on the boring logs. Individual Soil Boring Logs can be found in Appendix II, of this report. A copy of the Unified Soil Classification System (USCS) and Reference Notes for Boring Logs are included in Appendix III of this report.

After recovery, representative portions of each sample were removed from the sampler, visually classified and placed in sealed glass jars. A field log of the soils encountered in the soil test borings was maintained by ECS personnel and the drill crew. The samples were taken to our laboratory for classification in accordance with ASTM D 2488-00 (Standard Practice for Description and Identification of Soil (Visual-Manual Procedure)) and laboratory testing.

The soil samples will be retained in our laboratory for a period of 60 days after the date of this report, after which, they will be discarded unless other written instructions are received as to their disposition.

2.2 Laboratory Analysis Program

A geologist from our office visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS) and ASTM D 2488-00 (Description and Identification of Soils-Visual/Manual Procedures). The engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs.

Representative jar samples were selected and subjected to classification testing consisting of natural moisture content, gradation (including #200 wash), and Atterberg Limits testing and analysis. Four

(4) bulk soil samples were collected and returned to our laboratory for Moisture Density Relationship (Standard Proctor), and California Bearing Ratio (CBR) testing and analysis. A laboratory testing summary is included in Appendix IV.

3.0 EXPLORATION RESULTS

3.1 Site Characteristics

The project site is located at 3793 Ironbound Road in James City County, Virginia. A site plan was provided to ECS by the client, dated February 28, 2012.

At the time of our field investigation the majority of the site was open containing low lying vegetation, some trees, three one-story buildings and/or shelters, a playground, paved parking, a tennis and basketball court, ditch lines, and overhead and underground utilities. Therefore, uncontrolled FILL materials are expected to be present on this site. The site is relatively level with elevation changes of less than 2 feet for every 50 feet, with the exception of the ditch lines. The ditch lines were observed to range in depth from 2 to 4 feet.

3.2 Subsurface Conditions

Each soil sample obtained from the soil test borings was classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between subsurface materials on the boring logs are approximate; in-situ; the transitions may be gradual. The soil test boring logs are included in Appendix II of this report while a brief explanation of the USCS and Reference Notes for the Boring Logs is contained in Appendix III.

Surface cover encountered at the boring locations included approximately up to 8-inches of topsoil materials, with an average of about 3-inches. Uncontrolled FILL materials of up to approximately 2 ft in depth were encountered at boring locations B-7, B-10, B-11, and B-12 only. The FILL materials were granular in nature and consisted of Silty SAND (SM) and Clayey SAND (SC) with trace Gravel,

Clay, or Organics. Underlying the near surface topsoil or FILL, the natural subsurface soils were arranged in a 2-layer configuration.

The initial soil layer was granular in nature and consisted of Silty and Clayey SAND (SM and SC) with varying amounts of Clay to depths ranging from 2 to 20 feet below the existing site elevations. This layer was not encountered at borings B-1 and B-2. An isolated layer of Sandy CLAY (CL) was encountered at boring B-11 from a depth of 2 to 4 feet below the existing site elevations. The SPT, N-Values, ranged from 5 to 33 blows-per-foot (BPF), indicating a loose to dense relative density. Borings B-1, B-2, B-3, B-4, B-5, B-6, B-8, B-10, and B13 were terminated within this layer.

The second and final soil layer was cohesive in nature and consisted of CLAY (CL) with varying amounts of Sand to the boring termination depths ranging from 6 to 20 feet below the existing site elevations. The SPT, N-Values, ranged from 12 to 29 BPF, indicating a stiff to very stiff consistency. Boring logs describing soil conditions encountered are included in Appendix II of this report.

3.3 Groundwater Observations

Observations for groundwater were made during sampling and upon completion of the drilling operations at each boring location. A perched groundwater table was encountered at boring location B-4 at a depth of 14.5 feet below the existing site elevations. The groundwater table was not encountered in the remaining borings to the maximum depth explored (20-feet below the existing site elevations).

It is noted that groundwater levels are influenced by seasonal conditions and periods of significant precipitation or prolonged drought. Based on the soil boring data and our experience with the geology of the project area, a perched groundwater is possible and noted on this site.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 Subgrade Preparation and Earthwork Operations

The site should be cleared by means of removing all topsoil or organic material, unsuitable FILL (as recommended by the geotechnical engineer), or any other unsuitable materials. The soil test borings encountered up to 8 inches of topsoil materials and up to about 2 feet of uncontrolled FILL materials.

It is recommended that the clearing operations extend laterally at least five feet beyond the proposed building limits. Allowing stockpiled topsoil and other unsuitable materials to be stored on building or pavement subgrades for extended periods of time may result in the deterioration of suitable subgrade materials. Stockpiled topsoil and excavated materials, planned for later use, should be placed in a proposed landscaped area, until they can be used as appropriate.

Due to the complex nature of the site, the stripping depth should be evaluated at the time of construction by representatives of the Geotechnical Engineer. If additional stripping becomes necessary, suitable methods should be employed to determine additional stripping depths beyond the contract depth (such as elevations determined before and after stripping, etc.). If undercuts are recommended and extended into large areas, the undercut volume could be reduced by the use of geotextiles or geogrids. The use of geosynthetic reinforcement should be evaluated by the geotechnical engineer. Cut and fill operations should extend a minimum of 10-feet beyond the project limits.

Any voids caused by the removal of Fill material should be backfilled, per the recommendations of the Geotechnical Engineer, which may include compacted Engineered Fill, No. 57 Stone, Flowable Fill, or lean mixed concrete. Existing abandoned underground utility pipe systems (if any) may become conduits for soil migration, and the backfill above them may be inadequately compacted. They should therefore be removed and the resulting excavations backfilled with compacted Engineered Fill.

Existing FILL soils should be evaluated through test pits or hand augers prior to construction to determine the suitability of the FILL for ground slab or pavement support. Existing FILL soils are considered unsuitable for new foundation support and should be removed from below all foundations.

After removing all unsuitable materials, cutting to the desired grade, and prior to Engineered Fill placement, subgrades should be observed by the Geotechnical Engineer or their qualified representative. Proofrolling of the subgrade should be accomplished using a loaded tandem axle dump truck having a weight of at least 20 tons to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during proofrolling should be removed and replaced with Engineered Fill or scarified, moisture conditioned, and recompacted to the minimum specifications given in this report.

Existing subgrades within the expanded building and pavement limits to a depth of at least 12 inches and subsequent lifts of Engineered Fill should be compacted to at least 95 percent of maximum dry density as determined per ASTM D698-07 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)). Loose lifts should not exceed 8 inches. Compaction should be accomplished with a large sheepsfoot roller for predominately clayey soil materials and/or a heavy vibratory drum roller for granular soil materials (or equivalent compacting equipment). The Fill should extend at least 10 feet beyond the building limits and 2 feet beyond the edges of the pavements before being sloped to match existing grades. Fill and cut slopes should not be constructed steeper than 3H:1V.

Any soft or unsuitable materials encountered, which cannot be stabilized by reworking the soil, should be removed and replaced with an approved structural fill. Undercut volumes should be determined by cross-sectioning the area before and after undercut. We have found that calculating undercut volumes by truck counts is less accurate and generally results in additional expense to the owner. In order to minimize undercutting and issues during earthwork activities, we recommend earthwork operations be performed during the drier times of the year.

We recommend the contract documents include an allowance for undercutting and/or reworking soft near surface soils (if encountered) and replacement with engineered fill. Add/deduct unit prices should also be established so adjustment for the actual volume of undercut can be made.

The majority of the near surface soils are Sand. The sandy soils can be reused as fill or backfill. However, the near surface clayey soils should be evaluated to determine suitability for reuse as structural fill. Clayey material classified as CH should not be reused as structural fill. On site soils to be re-used as structural fill and all proposed select fill soils should be submitted to the geotechnical engineer for approval prior to their use on the project. In the event import fill material is needed, we recommend import engineered fill (select) material consist of approved inorganic material classified as SM, SM-SP, SP, SW, SC or better containing less than about 40% by weight Silt or Clay and free of debris. This material should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture conditioned to within +/- 3% of the optimum moisture content, and compacted to a minimum of 95% of the maximum dry density obtained in accordance with ASTM D-698, Standard Proctor method. Select fill slopes should be no greater than 3 horizontal to 1 vertical.

The following is an assessment of the fill materials considered suitable for use on this project:

On-Site Borrow Engineered Fill: Soil material classified as Sand (SM, SC, SP, SW or better) and free of organics, and other unsuitable material. Soils obtained on-site classified as Clay (CL) having a maximum Liquid limit of 40 and maximum Plasticity Index of 20 may also be used as Engineered Fill, if permitted in the final design documents.

Imported Engineered Fill: Granular soil material classified as Sand (SM, SM-SP, SC, SP, SW or better) containing a maximum 40% by weight passing the No. 200 Sieve (Silt or Clay). Imported Engineered Fill should be free of organics, debris, rubble, and other unsuitable material.

Porous Fill: Clean, crushed Gravel (such as No. 57 stone) with a maximum aggregate size of 1.5 inches. VDOT Size No. 57 Stone or ASTM C-33 washed concrete Sand are considered acceptable Porous Fill.

Foundation Undercut Backfill: VDOT gradation No.57 crushed stone or Flowable Fill with a minimum compressive strength of 200 psi at 28 days may be utilized for backfill beneath foundations. Footing undercut backfill should be placed under the observation of the Geotechnical Engineer.

Soils intended to be used as Engineered Fill should be thoroughly evaluated by the Geotechnical Engineer prior to placement. The evaluation should be performed per ASTM D2487-06 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

The ease with which suitable on-site soils can be used as Engineered Fill will depend upon their natural moisture contents at the time of construction. Scarifying and drying of the on-site soils may be required before recommended compaction can be achieved.

Drying and compaction of wet soils is typically difficult during the cold, winter months. Accordingly, earthwork should be performed during the warmer, drier times of the year, if practicable. Proper drainage should be maintained during the earthwork phases of construction to prevent ponding of water which has a tendency to degrade soil subgrades.

4.2 Foundation Recommendations

The proposed building can be supported on a shallow spread footing foundation system. Footings should be founded on suitable undisturbed natural soils or on newly compacted Engineered Fill. Footings can be designed for a net allowable bearing pressure of 2,000 psf. This bearing pressure provides a factor of safety of at least 3.0 against general shear failure. Minimum footing widths of 24 and 36 inches should be maintained for wall and column footings, respectively, for general shear considerations. The bottom of all footings should be embedded at least 24 inches below final surrounding grade due to moderate shrink-swell soil conditions, frost protection, and bearing capacity considerations.

FILL was observed in isolated areas across the project site to a depth of 2 ft below the existing site elevations. It is recommended that all existing FILL be removed from the foundation excavations. If existing FILL is determined at the time of proofrolling inspection to be suitable for slab support and is therefore left in place, all foundation excavations should penetrate the FILL to expose stable natural soils. Isolated areas of soft, unsuitable, or otherwise deleterious material exposed in the footing excavations should be undercut and removed from below the footings. The footing can be lowered or footing grades can be restored by backfilling with VDOT Size No. 57 Stone or Flowable Fill having a minimum 28-day compressive strength of 200 psi. The bearing capacity at the final footing elevation should be verified in the field by the Geotechnical Engineer or their qualified representative to assure that the in-situ bearing capacity at the bottom of each footing excavation is adequate for the design loads recommended in this study.

Provided our recommendations outlined herein are followed, total foundation settlement is expected to be less than 1 inch. Differential settlement between similarly loaded footings is not expected to exceed ½ inch. This evaluation is based on our engineering experience of the soil conditions and the anticipated structural loading and is to guide the structural engineer with their design.

The footings should be constructed as structurally independent of floor slabs-on-grade as differential settlement between the slabs and foundations could occur. Where this is not possible, the footings should be thickened and reinforced as necessary. New footings should be positioned so as to avoid bearing above or in close proximity to any deep utilities or storm drains.

4.3 Floor Slab Design

The floor slab may be supported on suitable natural soils and/or new Engineered Fill. Slab subgrades should be re-worked to a depth of 8 inches and be re-compacted to 95% of the Standard Proctor maximum dry density (ASTM D 698). Slab subgrades should be proofrolled by the Geotechnical Engineer or their qualified representative, remediated as required, and approved prior to Engineered Fill placement. If high plasticity soils are encountered at slab subgrade elevations, they should be removed so as to provide at least 12 inches of granular, non-cohesive material below the slab. Existing FILL should be evaluated to determine its suitability to remain in place below the floor slab and pavements. Approved existing FILL material should be re-worked and re-compacted to achieve stability, as required. In the event that large areas of unstable and unsuitable subgrade are encountered, stabilization utilizing geotextile, geogrid, moderate undercutting or a combination of these remedial type measures could be considered under the advisement of the Geotechnical Engineer.

The building slab-on-grade should be directly supported by a minimum of 6 inches of Porous Fill. Porous Fill should consist of a well graded, clean granular material having a maximum aggregate size of 1.5 inches and no more than 5% passing the #200 Sieve (GW, GP, SW, SP). VDOT Size No. 57 Stone or ASTM C-33 washed concrete Sand are considered acceptable Porous Fill. As an alternate, a 6-inch layer of Aggregate Base Material, VDOT Type I, Size 21A can be employed beneath the slabs. This densely graded aggregate will help shed water and protect sensitive, underlying soils during wetter, winter weather. The Porous Fill layer will facilitate the fine grading of the subgrade, provide more uniform bearing conditions, and help minimize the rise of water to the bottom of the slab (capillary action). A vapor barrier consisting of at least a 6 mil polyethylene sheet should be placed on top of the Porous Fill in heated areas prior to the placement of concrete and lapped at least 6 inches. Floor slab subgrades should be recompacted immediately before placing the porous fill to repair any disturbance that may have occurred due to construction operations.

Provided the placement of Engineered Fill and Porous Fill is per the recommendations discussed herein, the slabs may be designed assuming a Modulus of Subgrade Reaction, K_S, of 150 psi per inch.

Thickened slab sections which support relatively lightly loaded walls need not contain the underslab Porous Fill layer provided soils exposed in the excavation bottoms are suitable and stable.

However, their excavations should be prepared and, if necessary, undercut in the same manner as the footings.

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses in the floor slab. Where this is not possible, the footings should be thickened and reinforced as necessary. Also, in order to minimize the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement be included in the design of the floor slab. The mesh should be within the top half of the slab to be effective.

4.4 Seismic Design Recommendations

In accordance with Section 1613.5.2 of the 2009 International Building Code and based on the information collected during the implementation of our subsurface exploration, the site is assigned an initial Site Class of D. This Site Class was determined using the N-Value method (which tends to be a more conservative method) from shallow borings and our experience in the area.

4.5 Pavement Recommendations

Private Parking Lots and Access: For the construction of new pavements, we recommend that any soft, unstable and/or unsuitable materials be removed from within the 2-foot expanded pavement limits. The exposed surface should be proofrolled and carefully observed at the time of construction in order to aid in identifying any localized soft or unsuitable materials. This material where encountered, should be closely evaluated during construction and should be removed from below the pavement as required and/or considered necessary by the Geotechnical Engineer. In the event that large areas of unstable and unsuitable subgrade are encountered, stabilization utilizing geotextile, geogrid, moderate undercutting or a combination of these remedial type measures could be considered under the advisement of the Geotechnical Engineer.

Based on the results of our soil test borings and CBR test results, it appears that the soils that will be exposed as pavement subgrades will consist mainly of Silty SAND (SM) and Clayey SAND (SC). The average soaked CBR value was determined to be 9.3. The average soaked CBR value was multiplied by a value of 2/3, resulting a design CBR value of approximately 6.2. Therefore, a design CBR value of 6.2 should be utilized for the proposed pavement areas.

For the parking lot and access road, the following minimum pavement sections can be used. These sections assume a maximum ADT of 500 Vehicles Per Day (VPD) for the parking areas and main entrances. The Heavy Duty Pavement contains an allowance for up to 25 trucks per day (5%).

STANDARD DUTY PAVEMENT
(Automobile Parking)

Asphalt Surface:	2.0 inches Asphalt Surface Material Type SM-12.5A
Aggregate Base:	8.0 inches Aggregate Base Material Type I, Size 21B
Subgrade:	Stable and compacted to a dry density of at least 95% of the soil's Standard Proctor maximum dry density (ASTM D698) to a depth of 8.0 inches below subgrade elevation.

HEAVY DUTY PAVEMENT
(Drive Lanes/Entrances)

Asphalt Surface:	1.5 inches Asphalt Surface Material Type SM-12.5A
Asphalt Base:	2.5 inches Asphalt Base Material Type BM-25.0
Aggregate Base:	8.0 inches Aggregate Base Material Type I Size 21B
Subgrade:	Stable and compacted to a dry density of at least 95% of the soil's Standard Proctor maximum dry density (ASTM D698) to a depth of 8.0 inches below subgrade elevation.

The pavement sections provided above should be considered the minimum recommended section for the anticipated traffic classification. Revised and/or modified pavement sections may be required in areas of concentrated and heavy traffic. The Civil Engineer should review actual traffic patterns to assure they are compatible with the minimum recommended sections.

We recommend that any dumpster pads (including the area the collection truck will be on while emptying the dumpster) and loading dock pavements be rigid (concrete) pavement sections. We recommend that concrete pavements be comprised of a minimum of 6 inches of Portland cement concrete having a minimum 28-day compressive strength of 4,000 psi. The concrete should be air entrained and should be reinforced with welded wire mesh-type reinforcement. Construction joints or sawcut joints should be provided at a maximum spacing of 12 feet. Four inches of untreated aggregate base material, Type I - Size 21A, is recommended beneath exterior concrete pavements.
An important consideration with regard to the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the

subgrade materials becoming saturated over a long period of time. Based upon the results of the soil test borings, the groundwater table should not significantly affect the performance of pavements; however, surface runoff water that is trapped during construction on the exposed subgrade soils could create localized deterioration of the soil's bearing capacity. Standing water that may develop on the surface of the pavement may be controlled by adequate design (surface graded to control runoff to desired locations - catch basins, drain inlets, gutters, etc.), adequate compaction of each lift of pavement section component material (to reduce localized settlements that result in ponding) and accurate grading of each lift of pavement section component material (to achieve the desired design grades). Standing water that may develop within the base course layer may be removed by installing temporary weep holes in drainage structures, construction of drainage swales and diversion ditches, and proper backfill and grading behind curbs to minimize water intrusion from behind the curbs.

Pavement subdrains or drainage ditches should be provided behind curbs in cut areas where the grades slope toward the pavements. The invert elevation of swales should be at least 1 foot below the pavement subgrade level. Pavement subdrains should be extended to an appropriate discharge point.

4.6 Infiltration Testing

Six (6) field infiltration tests were completed utilizing the Johnson Meter at depths ranging from 6 to 10 feet below the existing surface elevations. The infiltration test results are provided in Appendix V.

Utilizing the Johnson Meter, we recorded the following in-situ infiltration values illustrated below:

Table 1: Measured Infiltration Rates

Test Location	Infiltration Test No.	Ksat Test Depth (Feet)	Ksat Rate (in/hour)	USDA Soil Classification
B-6	INF-1	10.0	0.01	SC
B-5	INF-2	10.0	0.01	SM
B-4	INF-3	6.0	0.01	SC
B-3	INF-4	6.0	0.01	SC
B-7	INF-5	10.0	0.01	SC
B-8	INF-6	10.0	0.01	SC

The measured rates fall into Hydrologic Soil Grouping D. Typically, soils with the Hydrologic Soil Group designations of A and B are considered suitable for infiltration purposes. Some soils designated as C type soils are considered suitable for infiltration practices, but these soils would need to be evaluated on a case specific basis. Soils with group designations of D are not considered suitable.

A perched groundwater table was encountered at boring location B-4 at a depth of 14.5 feet below the existing site elevations. The groundwater table was not encountered in the remaining borings to the maximum depth explored (20-feet below the existing site elevations). The soils encountered were generally granular in nature and consisted of Silty or Clayey SAND (SM or SC) in a medium dense to dense condition, rendering low infiltration results.

4.7 Construction Considerations

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are made. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete.

All Engineered Fill materials should be placed, compacted, and tested in accordance with the recommendations contained in this report. We recommend that all cut and fill operations be observed on a full-time basis by the Geotechnical Engineer or their qualified representative to determine if minimum earthwork and compaction requirements are being met.
In a dry and undisturbed state, the subgrade soils at the site will provide moderate subgrade support for Engineered Fill placement and construction operations. However, when wet, these soils will degrade quickly either with or without disturbance from contractor operations. Therefore, positive site drainage should be maintained during earthwork operations so as to help maintain the stability of the soil. We recommend that the design depths of stone be placed in the pavement areas early in the construction so as to help protect these subgrades. Any subgrades left exposed to precipitation will quickly degrade, regardless of the construction traffic exposure. Attempting site work during adverse seasonal conditions will have significant effect on the sitework budget as substantially more undercutting may be required. Ideally, earthwork should be performed during the summer or early fall (typically drier and warmer months).

5.0 CLOSING

If changes are made in the overall design or location of the building and other structures or if our assumptions differ significantly from the actual design, the recommendations presented in this report must not be considered valid unless the changes are reviewed by ECS and our recommendations are modified or verified in writing. We request the opportunity to review the foundation plan, grading plan, and applicable portions of the project specifications when the design is finalized. This review will allow us to ascertain whether these documents are consistent with the intent of our recommendations.

This report has been prepared for the exclusive use of James City County, its affiliates and subsidiaries and their successors, assigns, and grantees and their designers for specific application to the project described herein. Our conclusions and recommendations have been rendered in a manner consistent with the level and skill ordinarily exercised by members of the geotechnical engineering profession in the Commonwealth of Virginia. No other warranty is expressed or implied.

Our conclusions and recommendations are based on design information furnished to us and our experience with similar projects. They do not necessarily reflect variations in the subsurface conditions, which can occur between borings or in unexplored areas of the site, due to geologic characteristics of the region or past land use. Should such variations become apparent during construction, it will be necessary to reevaluate our conclusions and recommendations based upon site observations of the conditions.

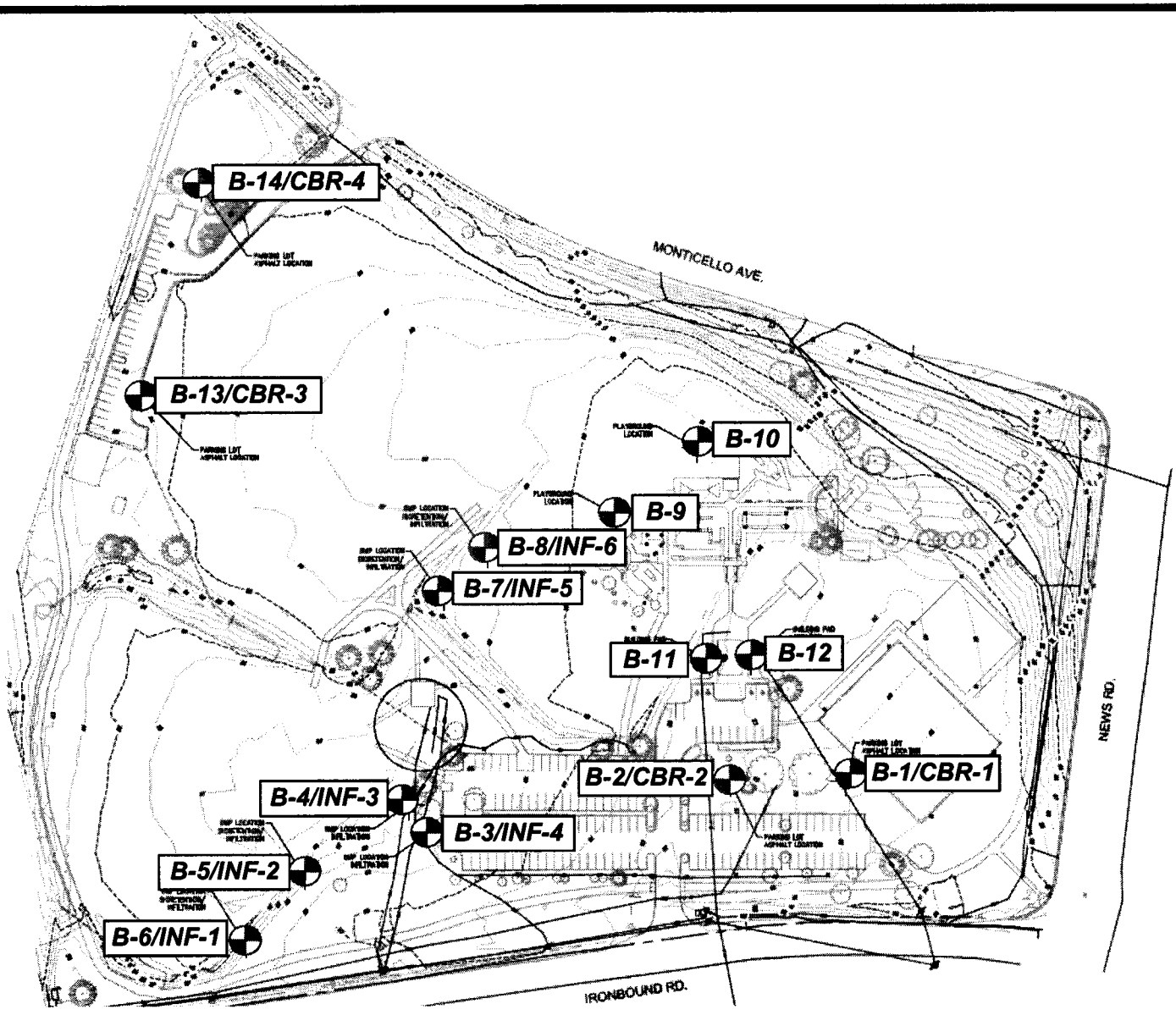
Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these services and we be allowed to continue our involvement throughout these phases of construction. ECS is not responsible for the conclusions, opinions or recommendations of others based on the data in this report.

APPENDICES

APPENDIX I	**Boring Location Plan**
APPENDIX II	**Soil Test Boring Logs**
APPENDIX III	**Unified Soil Classification System and Reference Notes for Boring Logs**
APPENDIX IV	**Summary of Laboratory Test Results**
APPENDIX V	**Field InfiltrationTest Results**

Appendix I

Boring Location Plan



LEGEND

- Approximate Boring Location

SCALE

NTS

SOURCE

AES Consulting Engineers

Dated: May 3, 2012

ECS LLC MID-ATLANTIC

FIGURE 1
BORING LOCATION PLAN
James City County
Mid-County Park Rehabilitation
3793 Ironbound Road
James City County, Virginia

ECS PROJECT NO.: 07:11566

Appendix II

Soil Test Boring Logs

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-1	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT^2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

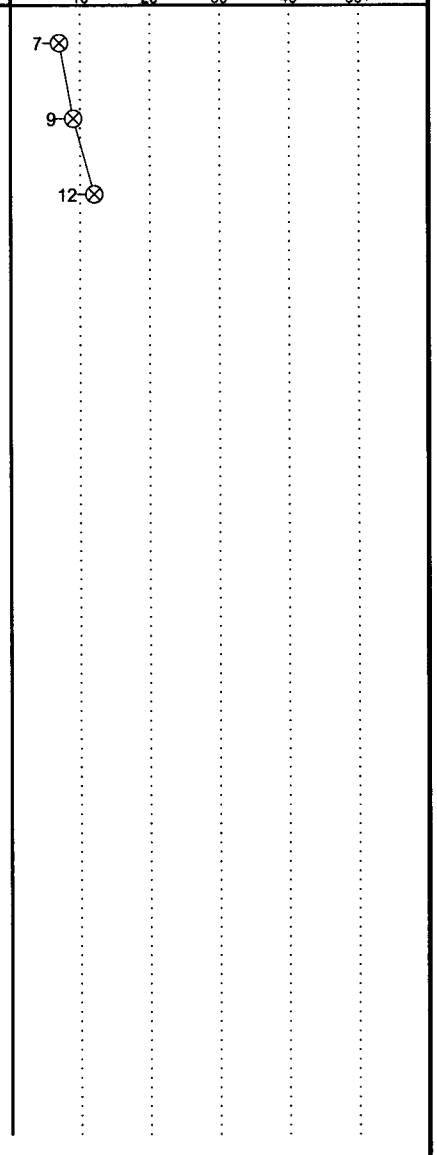
BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [2"]			
	S-1	SS	24	21	Sandy CLAY, Trace Organics, Tan to Tan and Orangish Brown, Moist, Medium Stiff to Stiff, (CL)			3 3 4 5 4 4 5 5 4 5 7 9
	S-2	SS	24	23				
5	S-3	SS	24	24				
					END OF BORING @ 6.00'			
10								
15								
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-2	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

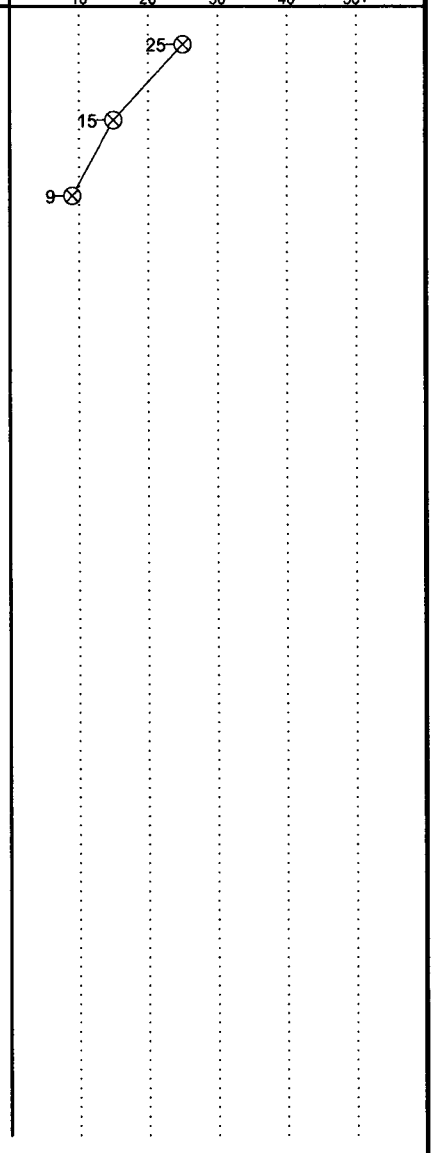
STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [2"]			
	S-1	SS	24	18	Sandy CLAY, Trace Organics, Tan to Tan and Orangish Brown, Moist, Very Stiff to Stiff, (CL)			10 12 13
	S-2	SS	24	24				16 7 9
5	S-3	SS	24	24				6 7 4 4 5 6
					END OF BORING @ 6.00'			
10								
15								
20								
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-3	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]		
	S-1	SS	24	21	Clayey Fine to Medium SAND, Tan to Light Gray and Reddish Brown, Moist, Medium Dense, (SC)	9 11 13 17	24
	S-2	SS	24	21		8 12 14 17	26
5	S-3	SS	24	23		7 8 11 13	19
							17.5
	S-4	SS	24	21		6 7 9 11	16
	S-5	SS	24	24		4 7 10 15	17
10							
	S-6	SS	24	23	Silty Fine to Medium SAND, Trace Clay, Orangish Brown, Moist, Medium Dense, (SM)	4 6 9 12	15
15							
	S-7	SS	24	24		5 7 8 12	15
20					END OF BORING @ 20.00'		
25							
30							

WATER LEVELS / ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-4	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]		
	S-1	SS	24	23	Clayey Fine to Medium SAND, Tan and Light Gray and Reddish Brown, Moist, Medium Dense, (SC)	5 7 8 12	15
	S-2	SS	24	24		4 7 11 13	18
5	S-3	SS	24	23		5 9 10 14	19
							17.2
	S-4	SS	24	22		6 8 11 14	19
	S-5	SS	24	24		5 8 11 16	19
10							
	S-6	SS	24	24	Silty Fine to Medium SAND, Trace Clay, Tan to Orangish Brown, Moist to Wet, Medium Dense, (SM)	4 8 10 14	18
15							
	S-7	SS	24	23		5 8 10 13	18
20					END OF BORING @ 20.00'		
25							
30							

WATER LEVELS — ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 14.50 WS ☐ WD ☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-5	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [4"]		
	S-1	SS	24	22	Clayey Fine to Medium SAND, Tan to Light Gray and Reddish Brown, Moist, Medium Dense, (SC)	3 4 8 18	12
	S-2	SS	24	23		4 7 9 13	16
5	S-3	SS	24	24		4 7 9 12	16
	S-4	SS	24	22		5 8 10 14	18
	S-5	SS	24	24	Silty Fine to Medium SAND, With Clay, Light Gray and Reddish Brown, Moist, Medium Dense, (SM)	5 7 11 19	18
10							21.7
	S-6	SS	24	19		4 7 9 12	16
15							
	S-7	SS	24	24		4 6 8 11	14
20					END OF BORING @ 20.00'		
25							
30							

WATER LEVELS — ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS ☐ WD ☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-6	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]				
	S-1	SS	24	22	Clayey Fine to Medium SAND, Tannish Brown, Moist, Medium Dense, (SC)			4 7 11 15	18
	S-2	SS	24	24	Clayey Fine to Medium SAND, Tan and Reddish Brown, Moist, Medium Dense, (SC)			5 9 12 15	21
5	S-3	SS	24	24				6 9 11 15	20
	S-4	SS	24	24				6 10 13 19	23
	S-5	SS	24	24				6 9 12 17	21
10									19.6
	S-6	SS	24	23				4 10 12 15	22
15									
	S-7	SS	24	24	Silty to Medium SAND, Trace Clay, Orangish Brown, Moist, Medium Dense, (SM)			5 9 11 14	20
20					END OF BORING @ 20.00'				
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-7	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

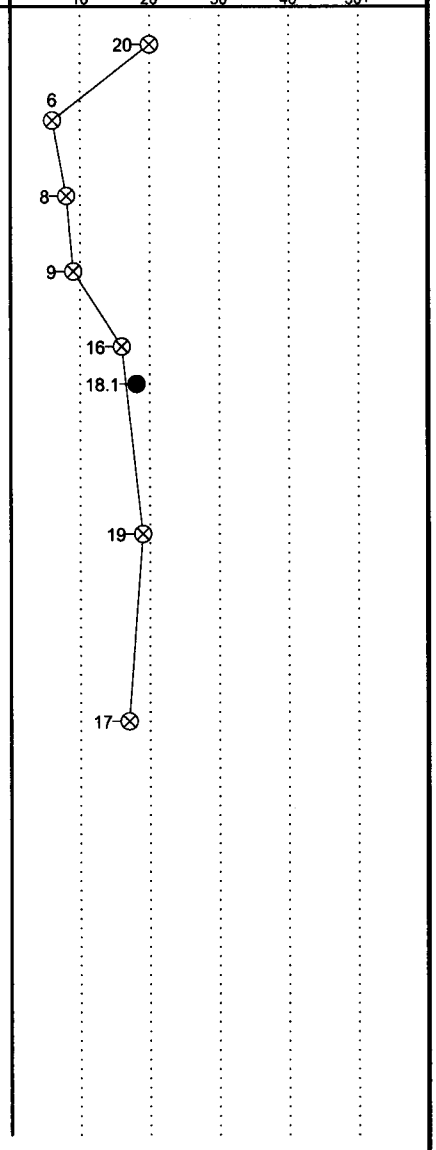
BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [3"]			
	S-1	SS	24	20	FILL - Clayey Fine to Medium SAND, Trace Gravel, Tannish Brown, Moist, Medium Dense, (FILL)			5 9 11 14
	S-2	SS	24	16	Clayey Fine to Medium SAND, Tannish Brown, Moist, Loose, (SC)			2 3 3 4
5	S-3	SS	24	23				3 3 5 6
	S-4	SS	24	24				4 4 5 6
	S-5	SS	24	24				5 7 9 13
10								
	S-6	SS	24	24	CLAY, With Sand, Tan and Reddish Brown, Moist, Very Stiff to Stiff, (CL)			6 8 11 14
15								
	S-7	SS	24	24				6 7 10 14
20					END OF BORING @ 20.00'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-8	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0	S-1	SS	24	22	Topsoil Depth [2"] Clayey Fine to Medium SAND, Tannish Brown Moist, Loose to Medium Dense, (SC)	3 3 4 4	7
	S-2	SS	24	23	FILL - Clayey Fine to Medium SAND, Trace Gravel and Organics, Tannish Brown, Moist, Medium Dense, (FILL)	4 4 7 9	11
5	S-3	SS	24	24	Clayey Fine to Medium SAND, Tan and Reddish Brown, Moist, Medium Dense, (SC)	4 7 9 13	16
	S-4	SS	24	22		5 6 9 12	15
	S-5	SS	24	23		4 7 10 13	17
10							19.9
	S-6	SS	24	22		5 9 11 14	20
15							
	S-7	SS	24	21		4 8 10 13	18
20					END OF BORING @ 20.00'		
25							
30							

WATER LEVELS — ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-9	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [8"]		
	S-1	SS	24	23	Clayey Fine to Medium SAND, Tannish Brown, Moist, Loose to Medium Dense, (SC)	3 4 4	8
	S-2	SS	24	24		5 3 5	12
5	S-3	SS	24	24		7 9 6	17 17.8
	S-4	SS	24	24	CLAY, With Sand, Tan and Reddish Brown, Moist, Stiff to Very Stiff, (CL)	7 10 12	19
	S-5	SS	24	24		5 8 11	16
10						13 5 6	
	S-6	SS	24	23		10 13 5	20
15					END OF BORING @ 15.00'	9 11 13	
20							
25							
30							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-10	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT^2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [4"]		
	S-1	SS	24	24	FILL - Clayey Fine to Medium SAND, Trace Gravel and Organics, Orangish Brown and Reddish Brown, Moist, Medium Dense, (FILL)	5 7 8 11	15
	S-2	SS	24	24	Clayey Fine to Medium SAND, Orangish Brown and Reddish Brown, Moist, Dense to Medium Dense, (SC)	4 7 10 14	17
5	S-3	SS	24	21		7 14 19 23	33 (23.7)
	S-4	SS	24	20		8 11 16 22	27
	S-5	SS	24	24		4 7 12 15	19
10							
	S-6	SS	24	24		5 8 11 14	19
15					END OF BORING @ 15.00'		
20							
25							
30							

WATER LEVELS / ELEVATION (FT)

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-11	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]				
	S-1	SS	24	18	FILL - Silty Fine to Medium SAND, With Clay and Trace Gravel, Tannish Brown, Moist, Medium Dense, (FILL)			4 7 9 11	16
	S-2	SS	24	20	Sandy CLAY, Tannish Brown, Moist, Stiff, (CL)			4 5 7 8	12
5	S-3	SS	24	22	Clayey Fine to Medium SAND, Tannish Brown, Moist, Medium Dense, (SC)			4 7 10 12	15.9; 17; 20.3
	S-4	SS	24	23	CLAY, With Sand, Orangish Brown and Reddish Brown, Moist, Stiff to Very Stiff, (CL)			5 8 11 13	19
	S-5	SS	24	23				5 12 17 20	29
10									
	S-6	SS	24	22				6 12 14 21	26
15					END OF BORING @ 15.00'				
20									
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-12	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100%; REC.%

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]				
	S-1	SS	24	18	FILL - Silty Fine to Medium SAND, Trace Clay and Gravel, Tannish Brown, Moist, Medium Dense, (FILL)			7 12 15 17	27
	S-2	SS	24	21	Clayey Fine to Medium SAND, Tannish Brown, Moist, Medium Dense, (SC)			8 11 13 16	24; 15.2
5	S-3	SS	24	24				6 8 12 17	20
	S-4	SS	24	24	CLAY, With Sand, Orangish Brown and Reddish Brown, Moist, Stiff to Very Stiff, (CL)			7 9 11 15	20
	S-5	SS	24	24				4 8 10 13	18
10									
	S-6	SS	24	24				5 8 9 11	17
15					END OF BORING @ 15.00'				
20									
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS ☐ WD ☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-13	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [3"]				
	S-1	SS	24	23	Clayey Fine to Medium SAND, Orangish Brown and Red, Moist, Medium Dense, (SC)			11 9 10 13	19
	S-2	SS	24	24				8 9 11 14	20
5	S-3	SS	24	23				7 10 12 17	22
					END OF BORING @ 6.00'				
10									
15									
20									
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

CLIENT	JOB #	BORING #	SHEET
James City County	11566	B-14	1 OF 1

PROJECT NAME: James City County Mid-County Park Rehabilitation

ARCHITECT-ENGINEER:

SITE LOCATION: Ironbound Road, Williamsburg, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [2"]				
	S-1	SS	24	21	Clayey Fine to Medium SAND, Tannish Brown, Moist, Loose, (SC)			2 2 3	5
	S-2	SS	24	24	Sandy CLAY, Tan and Reddish Brown, Moist, Medium Stiff to Stiff, (CL)			4 3 4	8
5	S-3	SS	24	21				4 7 4 5 7 9	12
					END OF BORING @ 6.00'				
10									
15									
20									
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

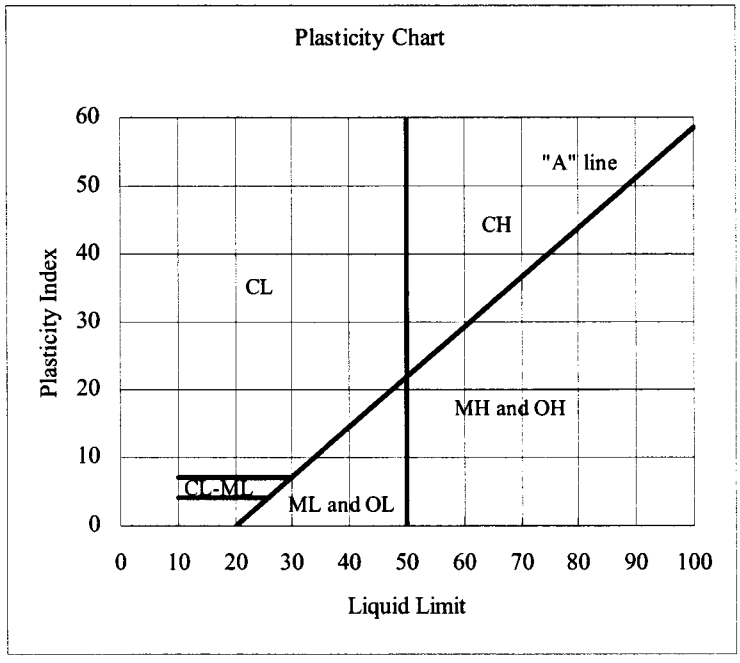
WL DRY WS☐ WD☐	BORING STARTED 06/25/12	
WL(BCR) WL(ACR)	BORING COMPLETED 06/25/12	CAVE IN DEPTH
WL	RIG Badger-1 FOREMAN M. Scott	DRILLING METHOD Split Spoon

Appendix III

Unified Soil Classification System
Reference Notes for Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 Sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols [b]	$C_u = D_{60}/D_{10}$ greater than 4; $C_c = (D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d	Silty gravels, gravel-sand mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			GM[a] u				
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or P.I. less than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ greater than 6; $C_c = (D_{30})^2/(D_{10} x D_{60})$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in CL-ML zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SM[a] u				
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 Sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly Organic soils		Pt	Peat and other highly organic soils			



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC,well-graded gravel-sand mixture with clay binder. (From Table 2.16 - Winterkorn and Fang, 1975)

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▼	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

Appendix IV

Summary of Laboratory Test Results

Engineering Consulting Services Mid Atlantic LLC

Williamsburg, VA

Laboratory Testing Summary

Date: 7/3/2012

Project Number: 11566 **Project Name:** James City County Mid-County Park Rehabilitation

Project Engineer: SBP **Principal Engineer:** WLW **Summary By:** JMC

Boring Number	Sample Number	Depth (Feet)	Moisture Content (%)	USC	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
CBR-1	1	1-3	16.3	CL	42	20	22	59.0	115.7	13.9	7.6	
CBR-2	1	1-3	13.9	CL	38	19	19	64.1	116	12.7	9.7	
CBR-3	1	1-3	8.1	SC	33	17	16	44.4	111.1	16.1	11.0	
CBR-4	1	1-3	20.6	SC	37	17	20	49.5	113.6	14.9	9.1	
B-3	3	4-6	17.5	SC	*	*	*	33.0	*	*	*	
B-4	5	8-10	17.2	SC	*	*	*	33.7	*	*	*	
B-5	5	8-10	21.7	SM	*	*	*	18.9	*	*	*	
B-6	5	8-10	19.6	SC	*	*	*	39.4	*	*	*	
B-7	5	8-10	18.1	SC	*	*	*	32.1	*	*	*	
B-8	2	2-4	19.9	SC	*	*	*	36.7	*	*	*	
B-9	3	4-6	17.8	SC	*	*	*	43.4	*	*	*	
B-10	3	4-6	23.7	SC	*	*	*	36.6	*	*	*	
B-11	2	2-4	15.9	CL	*	*	*	51.8	*	*	*	
B-11	3	4-6	20.3	SC	33	19	14	40.0	*	*	*	
B-12	2	2-4	15.2	SC	31	19	12	45.9	*	*	*	

Summary Key:

V = Virginia Test Method
S = Standard Proctor
M= Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Stabilization

OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted

Appendix V

Field Infiltration Test Results

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench	**Terminology and Solution**	
Boring No.....:	B-6/INF-1	**Date.....:**	6/21/2012	Ksat :	Saturated hydraulic conductivity
Investigators.:	SBP	**File Name.....:**	11566	Q:	Steady-state rate of water flow into the soil
Boring Depth.:	10.0'	**WCU Base. Ht. h:**	14.9 **cm**	H:	Constant height of water in borehole
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**	r:	Radius of cylindrical borehole
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**	Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.	

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		10:00:00 AM								
199	1	10:01:38 AM	0:01:38	1.63	0.61	0.000	8.25E-06	0.7	0.012	0.02
198	1	10:03:22 AM	0:01:44	1.73	0.58	0.000	7.78E-06	0.7	0.011	0.02
197	1	10:05:07 AM	0:01:45	1.75	0.57	0.000	7.70E-06	0.7	0.011	0.02
196	1	10:07:00 AM	0:01:53	1.88	0.53	0.000	7.16E-06	0.6	0.010	0.02
195	1	10:08:53 AM	0:01:53	1.88	0.53	0.000	7.16E-06	0.6	0.010	0.02
194	1	10:10:47 AM	0:01:54	1.90	0.53	0.000	7.09E-06	0.6	0.010	0.02
193	1	10:12:41 AM	0:01:54	1.90	0.53	0.000	7.09E-06	0.6	0.010	0.02
192	1	10:14:36 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
191	1	10:16:30 AM	0:01:54	1.90	0.53	0.000	7.09E-06	0.6	0.010	0.02
190	1	10:18:25 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
189	1	10:20:22 AM	0:01:57	1.95	0.51	0.000	6.91E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	9:35:00 AM	**ESTIMATED FIELD Ksat.....:**				0.010	
Texture/Classif:	SC	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A	**Notes:**	Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.		
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A				

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench
Boring No.....:	B-5/INF-2	**Date.....:**	6/21/2012
Investigators.:	SBP	**File Name.....:**	11566
Boring Depth.:	10.0'	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		9:30:00 AM								
199	1	9:31:38 AM	0:01:38	1.63	0.61	0.000	8.25E-06	0.7	0.012	0.02
198	1	9:33:20 AM	0:01:42	1.70	0.59	0.000	7.93E-06	0.7	0.011	0.02
197	1	9:35:03 AM	0:01:43	1.72	0.58	0.000	7.85E-06	0.7	0.011	0.02
196	1	9:37:00 AM	0:01:57	1.95	0.51	0.000	6.91E-06	0.6	0.010	0.02
195	1	9:38:52 AM	0:01:52	1.87	0.54	0.000	7.22E-06	0.6	0.010	0.02
194	1	9:40:47 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
193	1	9:42:43 AM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02
192	1	9:44:35 AM	0:01:52	1.87	0.54	0.000	7.22E-06	0.6	0.010	0.02
191	1	9:46:29 AM	0:01:54	1.90	0.53	0.000	7.09E-06	0.6	0.010	0.02
190	1	9:48:25 AM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02
189	1	9:50:19 AM	0:01:54	1.90	0.53	0.000	7.09E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	9:05:00 AM	**ESTIMATED FIELD Ksat.....:**	0.010
Texture/Classif:	SM	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench
Boring No.....:	B-4/INF-3	**Date.....:**	6/21/2012
Investigators.:	SBP	**File Name.....:**	11566
Boring Depth.:	6.0'	**WCU Base. Ht. h:**	14.9 cm
Boring Dia.....:	9.5 cm	**WCU Susp. Ht. S:**	0.0 cm
Boring Rad. (r):	4.76 cm	**Const. Wtr. Ht. H:**	14.9 cm

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		11:00:00 AM								
199	1	11:01:33 AM	0:01:33	1.55	0.65	0.001	8.70E-06	0.8	0.012	0.02
198	1	11:03:05 AM	0:01:32	1.53	0.65	0.001	8.79E-06	0.8	0.012	0.02
197	1	11:05:00 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
196	1	11:06:51 AM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
195	1	11:08:43 AM	0:01:52	1.87	0.54	0.000	7.22E-06	0.6	0.010	0.02
194	1	11:10:45 AM	0:02:02	2.03	0.49	0.000	6.63E-06	0.6	0.009	0.02
193	1	11:12:41 AM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02
192	1	11:14:30 AM	0:01:49	1.82	0.55	0.000	7.42E-06	0.6	0.011	0.02
191	1	11:16:35 AM	0:02:05	2.08	0.48	0.000	6.47E-06	0.6	0.009	0.02
190	1	11:18:28 AM	0:01:53	1.88	0.53	0.000	7.16E-06	0.6	0.010	0.02
189	1	11:20:25 AM	0:01:57	1.95	0.51	0.000	6.91E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	10:15:00 AM	**ESTIMATED FIELD Ksat.....:**	0.010
Texture/Classif:	SC	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench
Boring No.....:	B-3/INF-4	**Date.....:**	6/21/2012
Investigators.:	SBP	**File Name.....:**	11566
Boring Depth.:	6.0'	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		11:30:00 AM								
199	1	11:31:30 AM	0:01:30	1.50	0.67	0.001	8.99E-06	0.8	0.013	0.03
198	1	11:33:07 AM	0:01:37	1.62	0.62	0.001	8.34E-06	0.7	0.012	0.02
197	1	11:35:02 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
196	1	11:36:51 AM	0:01:49	1.82	0.55	0.000	7.42E-06	0.6	0.011	0.02
195	1	11:38:44 AM	0:01:53	1.88	0.53	0.000	7.16E-06	0.6	0.010	0.02
194	1	11:40:44 AM	0:02:00	2.00	0.50	0.000	6.74E-06	0.6	0.010	0.02
193	1	11:42:41 AM	0:01:57	1.95	0.51	0.000	6.91E-06	0.6	0.010	0.02
192	1	11:44:32 AM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
191	1	11:46:45 AM	0:02:13	2.22	0.45	0.000	6.08E-06	0.5	0.009	0.02
190	1	11:48:36 AM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
189	1	11:50:31 AM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	10:45:00 AM	**ESTIMATED FIELD Ksat.....:**	0.010
Texture/Classif:	SC	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench	**Terminology and Solution**	
Boring No.....:	B-7/INF-5	**Date.....:**	6/21/2012	Ksat :	Saturated hydraulic conductivity
Investigators.:	SBP	**File Name.....:**	11566	Q:	Steady-state rate of water flow into the soil
Boring Depth.:	10.0'	**WCU Base. Ht. h:**	14.9 **cm**	H:	Constant height of water in borehole
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**	r:	Radius of cylindrical borehole
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**	Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.	

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		12:30:00 PM								
199	1	12:31:01 PM	0:01:01	1.02	0.98	0.001	1.33E-05	1.1	0.019	0.04
198	1	12:33:07 PM	0:02:06	2.10	0.48	0.000	6.42E-06	0.6	0.009	0.02
197	1	12:35:05 PM	0:01:58	1.97	0.51	0.000	6.85E-06	0.6	0.010	0.02
196	1	12:36:54 PM	0:01:49	1.82	0.55	0.000	7.42E-06	0.6	0.011	0.02
195	1	12:38:50 PM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02
194	1	12:40:45 PM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
193	1	12:42:46 PM	0:02:01	2.02	0.50	0.000	6.68E-06	0.6	0.009	0.02
192	1	12:44:38 PM	0:01:52	1.87	0.54	0.000	7.22E-06	0.6	0.010	0.02
191	1	12:46:40 PM	0:02:02	2.03	0.49	0.000	6.63E-06	0.6	0.009	0.02
190	1	12:48:31 PM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
189	1	12:50:28 PM	0:01:57	1.95	0.51	0.000	6.91E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	12:00:00 PM	**ESTIMATED FIELD Ksat.....:**	0.010
Texture/Classif:	SC	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Rehabilitation	**Parcel.....:**	Infiltration Trench
Boring No.....:	B-8/INF-6	**Date.....:**	6/21/2012
Investigators.:	SBP	**File Name.....:**	11566
Boring Depth.:	10.0'	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
200		1:30:00 PM								
199	1	1:31:51 PM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
198	1	1:33:37 PM	0:01:46	1.77	0.57	0.000	7.63E-06	0.7	0.011	0.02
197	1	1:35:25 PM	0:01:48	1.80	0.56	0.000	7.49E-06	0.6	0.011	0.02
196	1	1:37:15 PM	0:01:50	1.83	0.55	0.000	7.35E-06	0.6	0.010	0.02
195	1	1:38:59 PM	0:01:44	1.73	0.58	0.000	7.78E-06	0.7	0.011	0.02
194	1	1:40:55 PM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02
193	1	1:42:56 PM	0:02:01	2.02	0.50	0.000	6.68E-06	0.6	0.009	0.02
192	1	1:44:47 PM	0:01:51	1.85	0.54	0.000	7.29E-06	0.6	0.010	0.02
191	1	1:46:48 PM	0:02:01	2.02	0.50	0.000	6.68E-06	0.6	0.009	0.02
190	1	1:48:43 PM	0:01:55	1.92	0.52	0.000	7.03E-06	0.6	0.010	0.02
189	1	1:50:39 PM	0:01:56	1.93	0.52	0.000	6.97E-06	0.6	0.010	0.02

Natural Moisture:	Moist	**Init. Satur.Time:**	1:00:00 PM	**ESTIMATED FIELD Ksat.....:**	0.010
Texture/Classif:	SC	**Consistency:**	Medium Dense	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	NA	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

DRAINAGE CALCULATIONS

FOR

MID COUNTY PARK

Environmental Division

AUG 14 2012

RECEIVED

SITE:

James City County

SUBMITTED TO:

Environmental Division
James City County

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
8/10/12
PROFESSIONAL ENGINEER

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June 29, 2012
Revised: August 10, 2012

AES Project No. W10119-E-19

W10119-E-19_Stormwater Management Report.doc

AES
CONSULTING ENGINEERS

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STORM WATER NARRATIVE

I PROJECT DESCRIPTION

This plan contains a multi-phase project for improvements in Mid County Park. The first phase (Phase 1) of this project consists of the replacement of the office building, relocation and remodel of the Kidsburg playground area, the addition of a Splash Park, parking lot upgrades, and stormwater management facilities. The stormwater facilities consist of an expanded existing on-site dry pond and two grass channels with timber check dams.

The next phases of this project (Phases 2 through 4) will include the addition of a 150 seat shelter and more improvements to existing parking lots. Stormwater management is provided for these next phases through the use of a bioretention facility.

II EXISTING SITE CONDITIONS

This site is currently developed as a park. The majority of the stormwater runoff is currently conveyed overland to existing onsite stormwater management facilities. These consist of grass channels with check dams on the southern and western sides of the properties.

III ADJACENT PROPERTIES

The proposed site is bordered on the south by Ironbound Road (State Route 615), on the east by News Road (Route 613), and on the north by Monticello Avenue (State Route 1471). West of the project is Steeplechase Apartments and Greensprings Chapel.

IV OFFSITE AREAS

There is one area of offsite disturbance associated with the waterline connection located in the Monticello Ave. right-of-way.

V SOILS

The project area consists of 11C-Craven-Uchee complex, 19B Kempsville-Emporia Fine Sandy Loam, and 29B-Slagle Complex with slopes ranging from 2 to 10 percent.

VI CRITICAL EROSION AREAS

There are no critical erosion areas or areas of 25% slope impact associated with this project.

VII EROSION & SEDIMENT CONTROL MEASURES

Erosion & Sediment Control is provided for this project through the use of sediment traps and other erosion and sediment control measures. Sediment traps are provided in the location of the proposed grass channels allowing for their conversion at the completion of construction. Silt fence, tree protection, inlet protection, etc., is provided where appropriate on the site. See plan sheet C-05 for the Phase 1 erosion and sediment control plan and sheet C-08 for Phase 2.

VIII STORMWATER MANAGEMENT & WATER QUALITY

This project is a being treated as a redevelopment project; therefore the required pollutant discharge for the site is based on the existing conditions less 10%. Stormwater Management and water quality will be attained for this project through the use of four stormwater management facilities. In Phase 1 construction, the existing dry pond will be expanded and there will be two grass channels with timber check dams that will provide water quality treatment. One bioretention facility will be constructed as part of Phase 2 Construction.

As shown in the Appendix C, water quality calculations have been provided for project at full build-out (Phase 1 through 4). The water quality treatment is provided by the expanded existing dry pond and the grass channels. Water quality volume for the site is provided by Grass Channel #2 and the expanded Dry Pond. Calculations are provided showing that these two facilities will treat the first flush of runoff (1" per impervious acre).

Runoff from the proposed building area, the northern end of the main parking lot, and the renovated playground will be treated by Grass Channel #1 before entering the expanded Dry Pond. Runoff will be conveyed via sheet flow to a system of storm systems, grass swales, and culverts and eventually into the grass channel. Eventually the runoff will reach the Dry Pond, which has been expanded to provide water quality volume as well as channel protection volume for its drainage area. A total of 2.45 acres of impervious cover are treated by Dry Pond, which requires a water quality treatment volume of 4,356 cf and a channel protecton volume of 15, 459 cf. 15,540 cf of storage is provided from the bottom of the facility (elev=79.0) to the outfall elevation of 81.85. The facility will utilize an existing Drop Inlet as its outlet structure. The outlet structure will have its low-flow orifice modified from 8" diameter to 2.5" diameter. This will provided the minimum required 24-hour drawdown time required. Information about pre-development and post-development flows for the Dry Pond Facility is shown below:

Dry Pond Facility

	Pre-Dev. Flow (cfs)	Post- Dev. Flow (cfs)	Post- Dev.Flow Routed through Facility (cfs)	Water Surface Elevation (ft)
1-Year	5.51	6.48	0.37	81.64
2-Year	9.18	10.39	3.47	82.03
10-Year	23.29	25.17	22.05	82.56
100-Year	38.11	40.39	35.57	83.16

As shown in the chart above, the dry pond will attenuate the flow to below pre-development conditions for all storm events. The pre-development curve number (CN=74) and time of concentration (25 min.) is based on numbers from the downstream restoration project performed by Williamsburg Environmental Group. The post-

development conditions have a higher curve number (CN=76) and a slightly larger drainage area, but a similar time of concentration.

Runoff from the southern side of the existing parking lot and the bus parking area will be treated by Grass Channel #2. Runoff will be conveyed via sheet flow across the parking lot, then into grass swales before discharging into the facility. The facility has been sized based on containing the first flush runoff volume of one inch per impervious acre. A total of 0.25 acres of impervious cover are treated by Grass Channel #2, which requires a treatment volume of 908 cf. 1,050 cf of storage is provided behind the proposed timber check dams.

Due to poor soils on the site, there may be some concern that runoff being treated by the timber check dams may pond for too long and become stagnant. This is remedied by having weep-holes with gravel filters at the subgrade level as shown in the plans. This will allow any runoff that has ponded behind the dams to slowly pass the check dams as intended. The gravel will be surrounded by mesh wire so that children will not be able remove any stones and it won't become a hazard.

In addition to the expanded dry pond and the two grass channels, a bioretention facility will be provided in Phase 2 of the project. It will be located within the traffic circle and will treat runoff from the proposed shelter and associated parking lot. Once treated by the bioretention facility, the runoff will outfall into the expanded dry pond. Due to topographic constraints of the site, the bioretention facility will only be able to provide a 16" section of bioretention soil. The bioretention facility is not needed to provide the necessary water quality treatment for the site. It will act as pretreatment for runoff coming from the shelter and associated parking lot before entering the dry pond facility. A Hydraflow analysis is provided in Appendix C to show that the bioretention facility will not be overwhelmed.

IX STORM SYSTEM, SWALE, AND CULVERT ANALYSIS

The runoff from the main parking lot will be collected into storm drainage systems installed as part of this project. These consist of several pipes and inlets located through the parking lot. The storm drainage system is analyzed using Rational Method with a minimal time of concentration and therefore maximum intensity. All pipes are oversized to minimize losses within the system and maintain the lowest possible HGL based on the computations. It should be further noted that the Hydraflow Software utilized for the design does not account for inlet shaping within the inlets, which reduces the junction losses at each inlet and therefore lowers the actual HGL within the system when compared to design.

Each swale on site was analyzed to determine velocity and capacity during 2-year and 10-year events. These computations can be found in the attached information for each swale.

Each culvert was checked to confirm adequacy and calculations are provided in the attached information.

X RESULTS & CONCLUSIONS

Through the use of the expanded dry pond and the proposed grass channels, water quality is provided to the entire redeveloped site. In addition, in accordance with MS-19 the 2 and 10 year storm peak flow are detained to a rate lower than the predeveloped condition. Through the use of grass channels, storm systems, and multiple stage stormwater management facilities, much of the storm runoff will be slowed down and attenuated. In addition to the required water quality treatment provided by the expanded dry pond and Grass Channel #2, the bioretention facility and Grass Channel #1 will provide additional water quality treatment for the site.

APPENDIX A

EROSION & SEDIMENT CONTROL CALCULATIONS

Sediment Trap Calculations
Temporary Slope Drain Calculations
TSD Outfall Protection Calculations

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Sediment Trap Design
	Sediment Trap #1
Date:	6/5/2012
Calculated By:	GVC

Drainage Area to Sediment Trap = **2.86** Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = **192** cubic yards, or **5,174** cubic feet

Required Dry Storage = 67 cy/acre * (Drainage Area) = **192** cubic yards, or **5,174** cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
83	0	3074	0	0	0	0
84	1	3832	3453	128	3453	128
85	1	4662	4247	157	7700	285
86	1	5566	5114	189	12814	475
86	0		0	0	12814	475
86	0		0	0	12814	475
86	0		0	0	12814	475

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = **17.16** feet

Elevation of Wet Storage Volume = **84.41** (Use 84.50)

Elevation of Dry Storage Volume = **85.52** (Use 86.00)

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = **83.75**

Top Width of Embankment **(H_O = 1.1 ft.)** = **3** feet

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Sediment Trap Design
	Sediment Trap #2
Date:	6/5/2012
Calculated By:	GVC

Drainage Area to Sediment Trap = 1.43 Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = 96 cubic yards, or 2,587 cubic feet

Required Dry Storage = 67 cy/acre * (Drainage Area) = 96 cubic yards, or 2,587 cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
82.5	0	1317	0	0	0	0
83	0.5	1634	737.75	27	738	27
84	1	2319	1976.5	73	2714	101
85	1	3074	2696.5	100	5411	200
85	0		0	0	5411	200
85	0		0	0	5411	200
85	0		0	0	5411	200

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = 8.58 feet (Use 9')

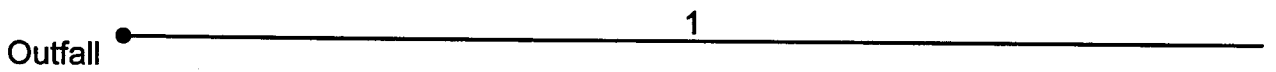
Elevation of Wet Storage Volume = 83.94 (Use 84.00)

Elevation of Dry Storage Volume = 84.91 (Use 85.00)

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = 83.28

Top Width of Embankment (H_O = 1.0 ft.) = 3 feet

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #1.stm	Number of lines: 1	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.000	1.07	1.07	0.60	0.64	0.64	5.0	5.0	7.9	5.06	32.29	5.05	15	25.00	83.00	86.50	84.01	87.40	0.00	86.50	TSD #1

Project File: W10119-E-19_Temporary Slope Drain #1.stm

Number of lines: 1

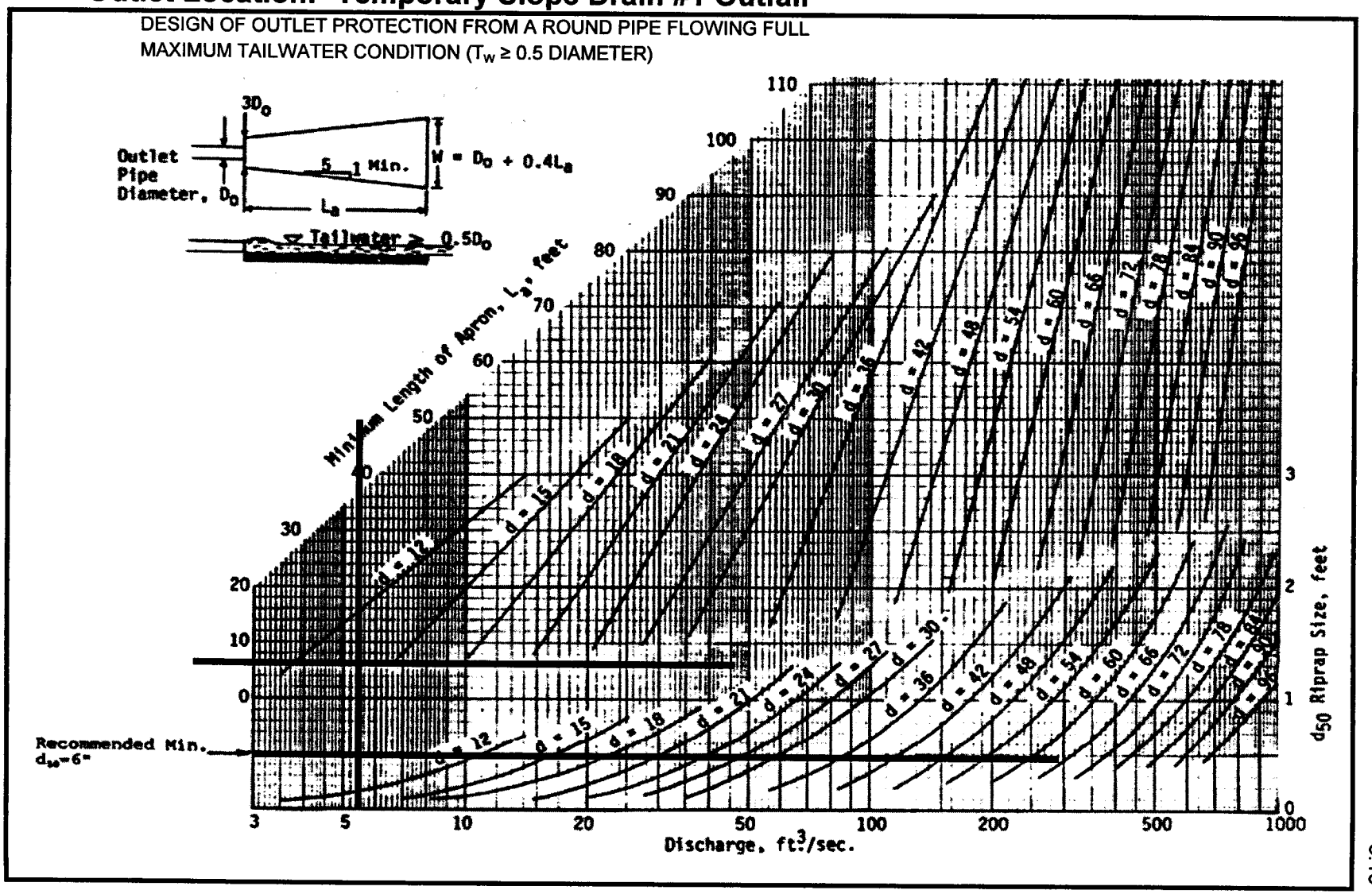
Run Date: 8/8/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

Outlet Location: Temporary Slope Drain #1 Outfall

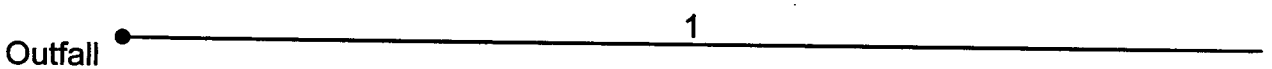


Q =	5.06	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	6	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-4

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #2.stm	Number of lines: 1	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.000	1.07	1.07	0.70	0.75	0.75	5.0	5.0	7.9	5.90	30.63	5.66	15	22.50	83.00	85.25	84.01	86.22	0.00	85.25	TSD #2

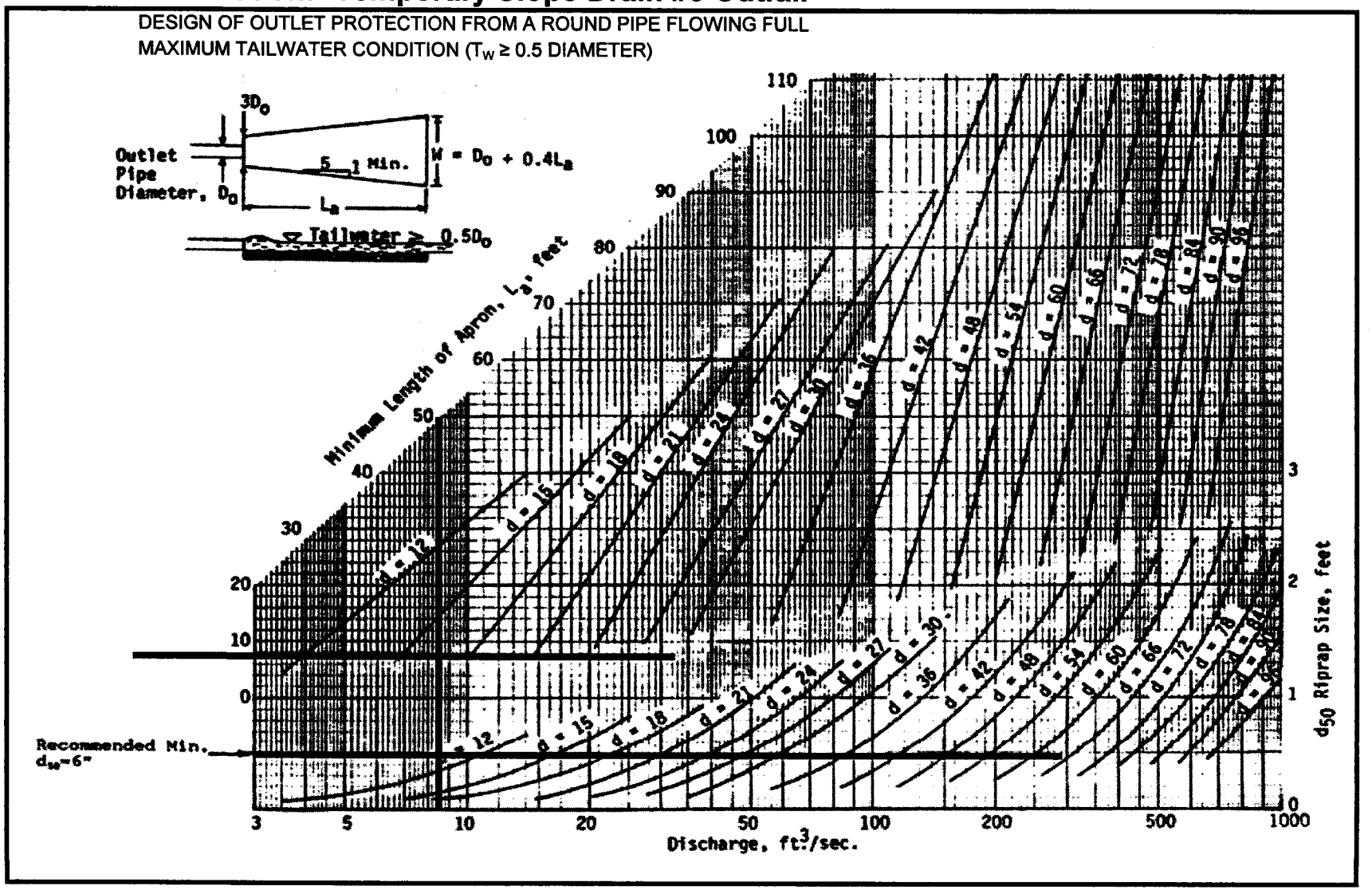
Project File: W10119-E-19_Temporary Slope Drain #2.stm | Number of lines: 1 | Run Date: 8/8/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

Outlet Location: Temporary Slope Drain #3 Outfall

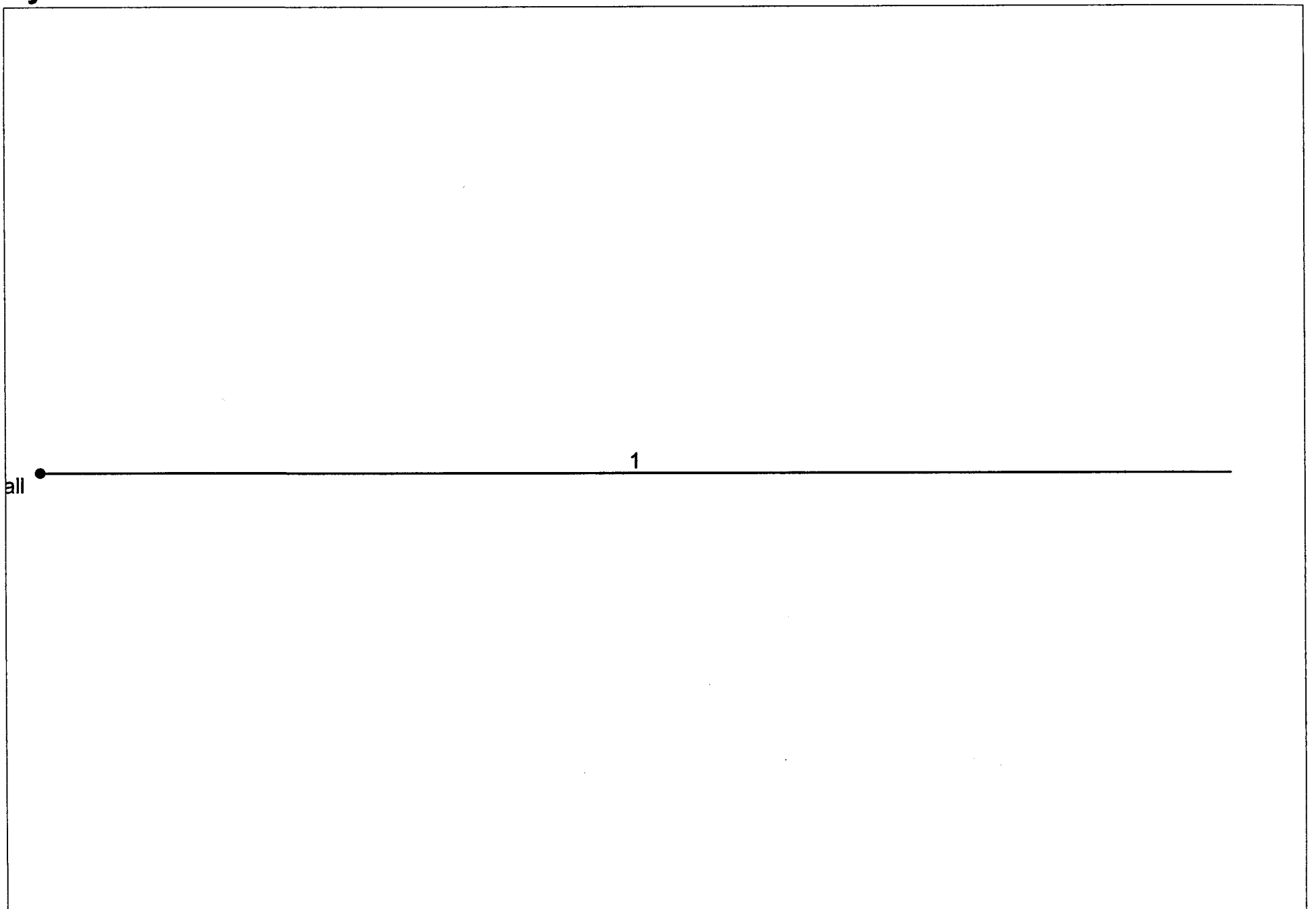


Q =	8.43	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	7	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-4

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #3.stm	Number of lines: 1	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.000	1.26	1.26	0.85	1.07	1.07	5.0	5.0	7.9	8.43	32.29	7.04	15	25.00	82.50	85.00	84.01	86.14	0.00	86.00	TSD #3

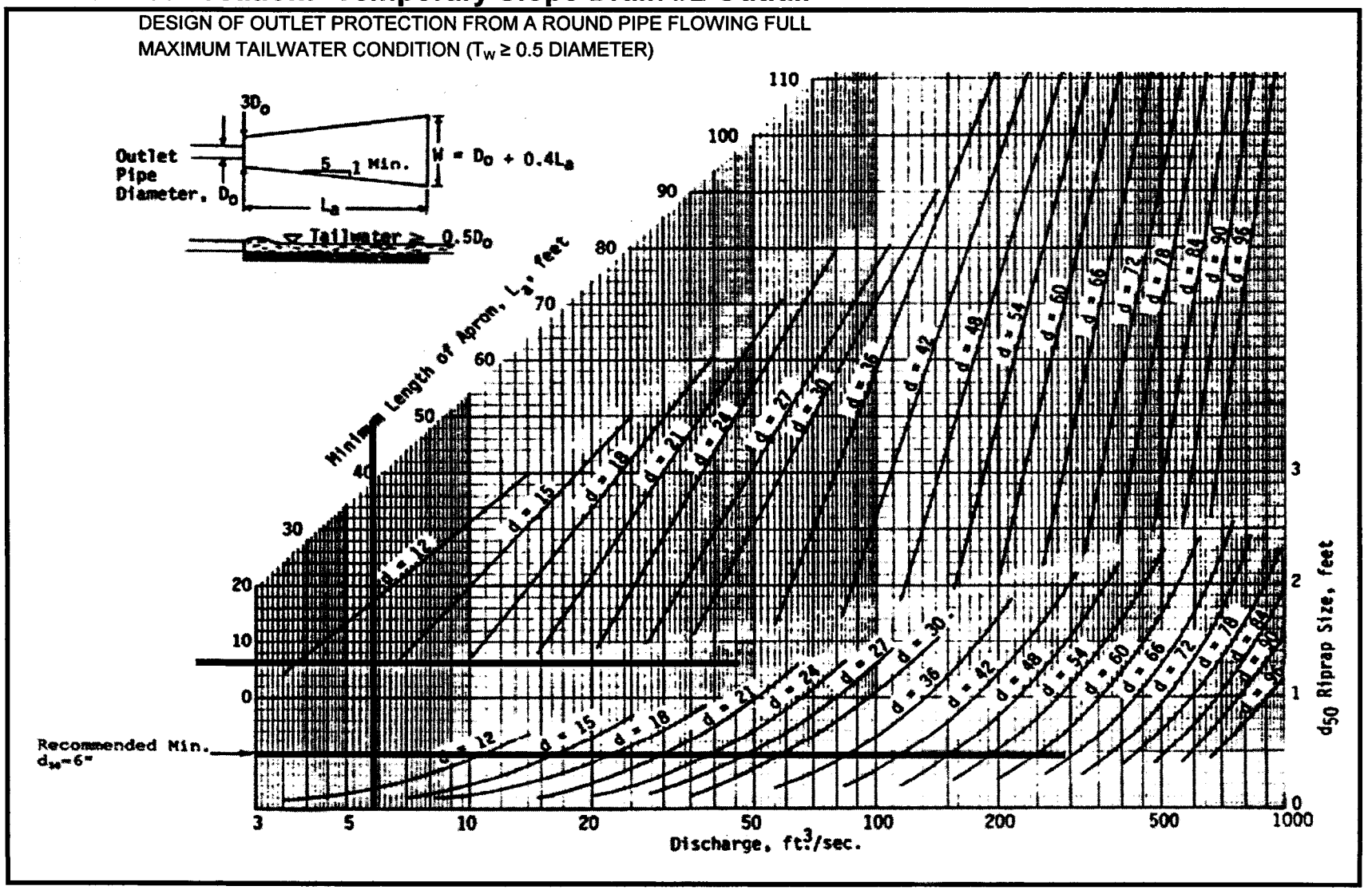
Project File: W10119-E-19_Temporary Slope Drain #3.stm | Number of lines: 1 | Run Date: 8/8/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

Outlet Location: Temporary Slope Drain #2 Outfall



Q =	5.9	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	6	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

1992

III - 165

Plate 3.18-4

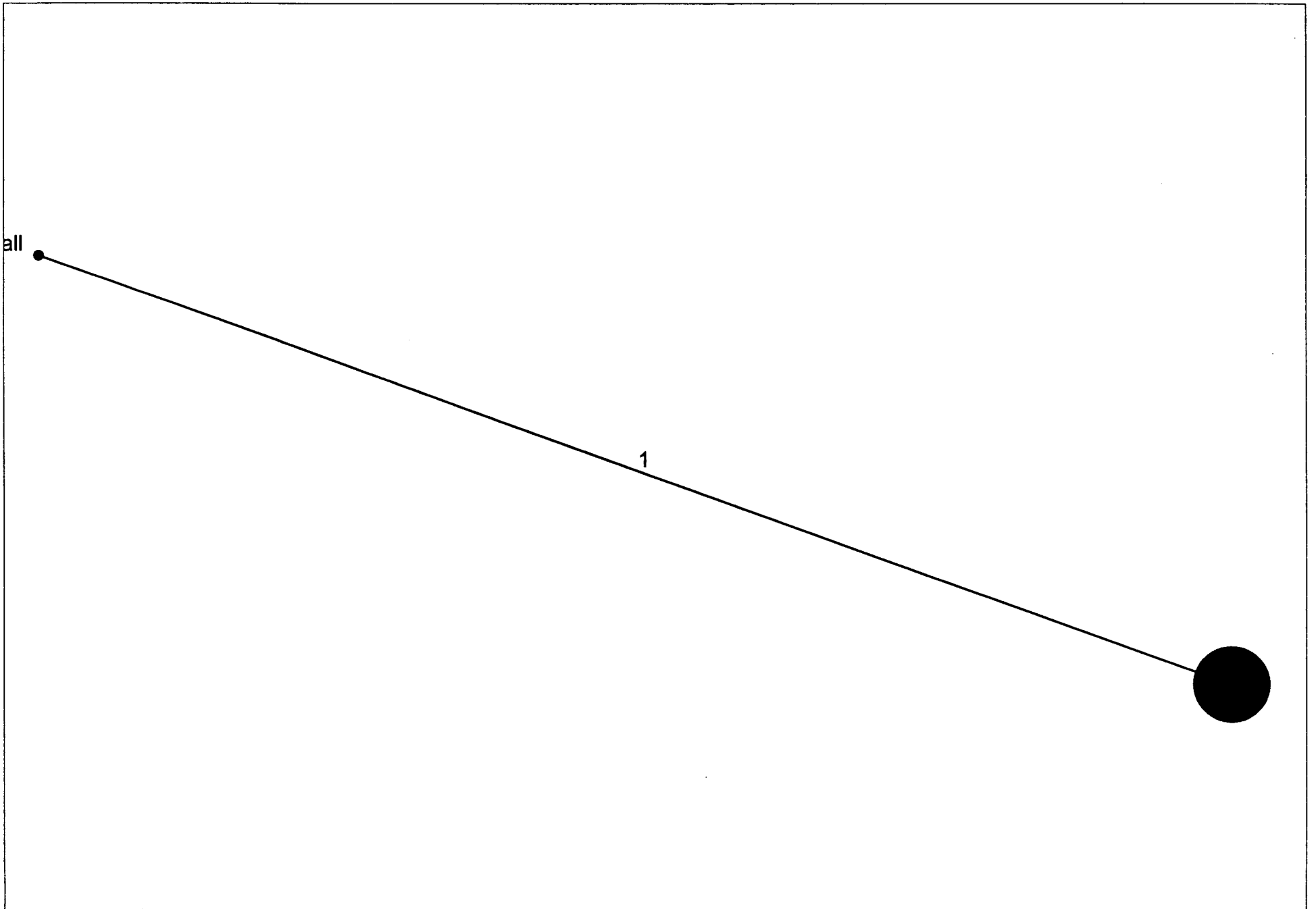
3.18

APPENDIX B

STORM SYSTEM, SWALE, AND CULVERT CALCULATIONS

Storm System Hydraflow Reports
Storm System Outfall Protection Calculations
Swale Adequacy Calculations
Culvert Calculations
Culvert Outfall Protection Calculations

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Storm System #1.stm	Number of lines: 1	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	68.000	0.23	0.23	0.85	0.20	0.20	5.0	5.0	7.0	1.37	3.56	3.50	12	1.00	88.85	89.53	89.35	90.03	88.83	92.50	SS#1-1 to SS#1-

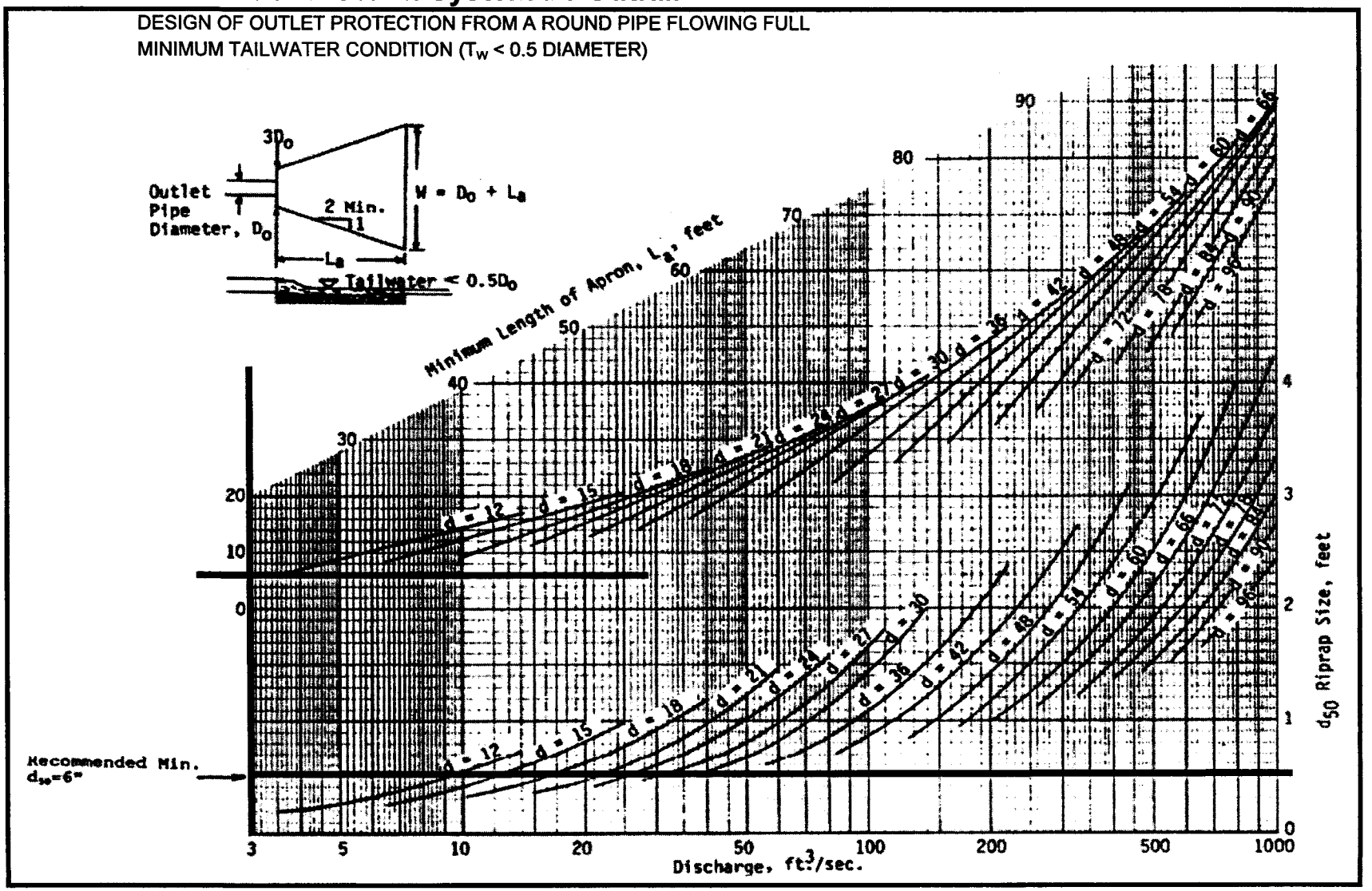
Project File: W10119-E-19_Storm System #1.stm | Number of lines: 1 | Run Date: 8/8/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Storm System #1 Outfall



Q =	1.37	cfs	$3D_0$ =	3	ft	W =	7	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	6	ft	d_{50} =	0.5	ft	

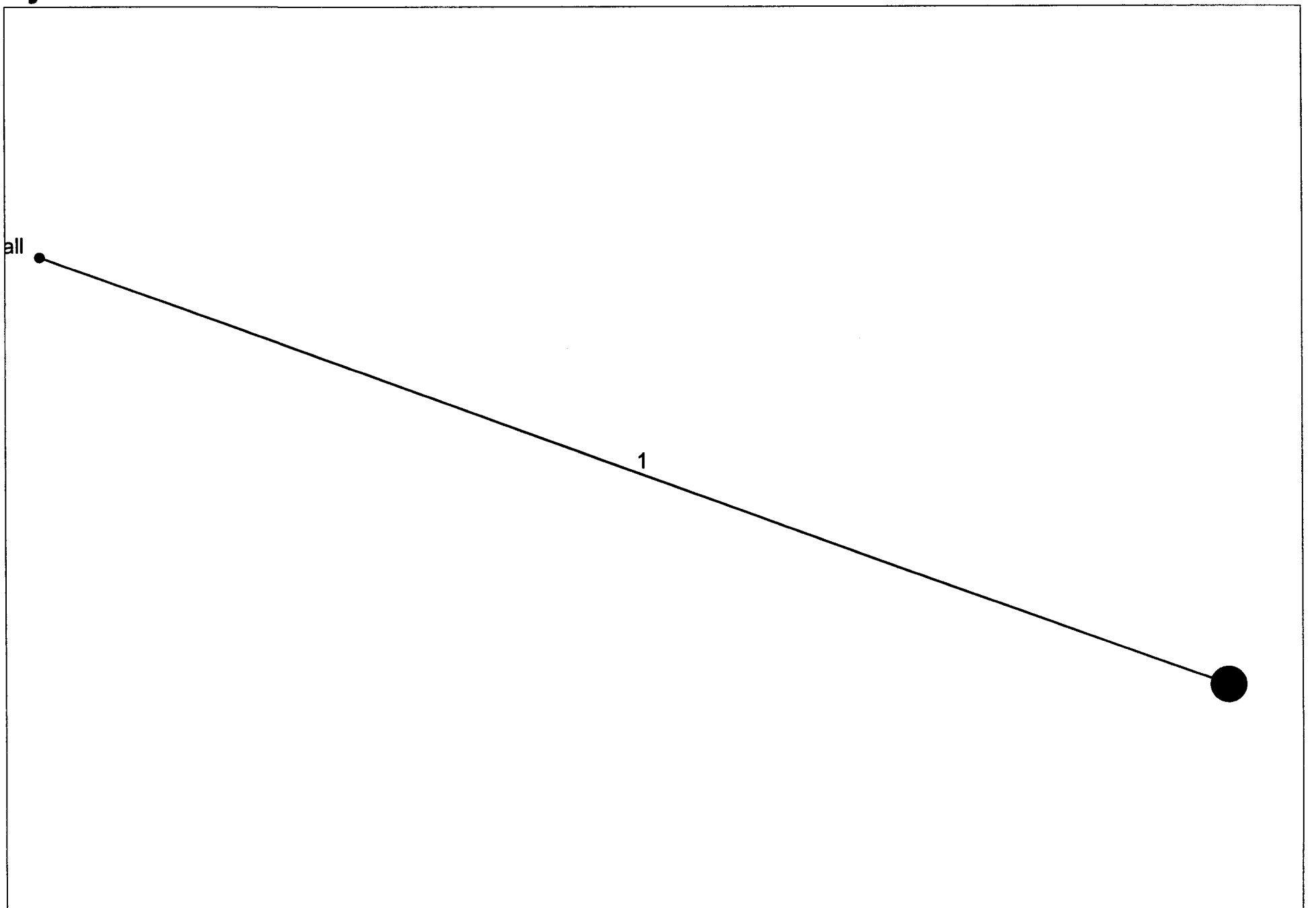
Source: USDA-SCS

1992

Plate 3.18-3

3.18

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Existing Parking Lot Storm System.stm	Number of lines: 1	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	147.000	0.80	0.80	0.85	0.68	0.68	5.0	5.0	7.0	4.76	6.84	4.01	15	1.12	82.86	84.51	84.89	85.61	87.50	87.72	Ex. Storm Pipe

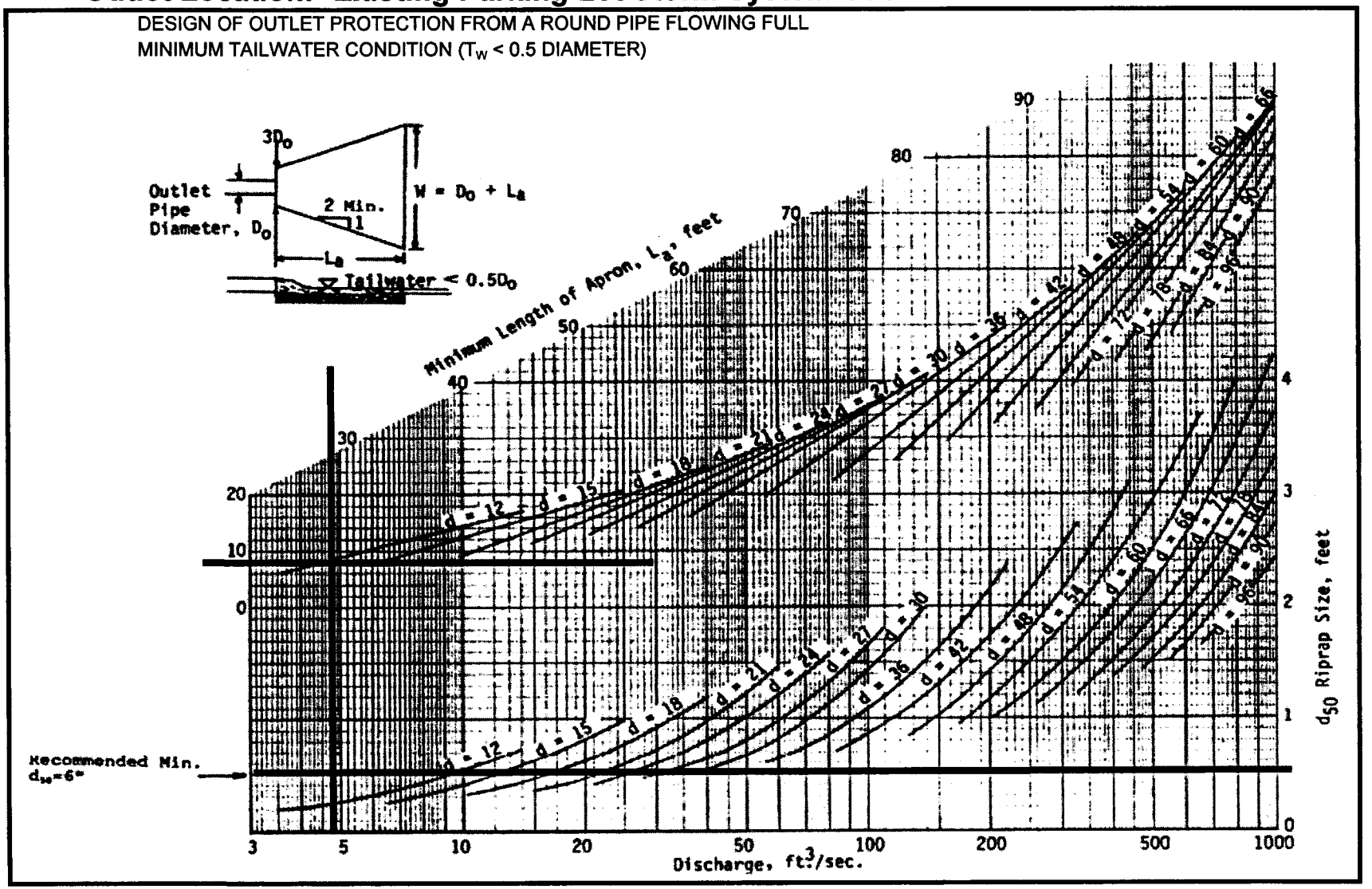
Project File: W10119-E-19_Existing Parking Lot Storm System.stm | Number of lines: 1 | Run Date: 8/8/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Existing Parking Lot Storm System Outfall



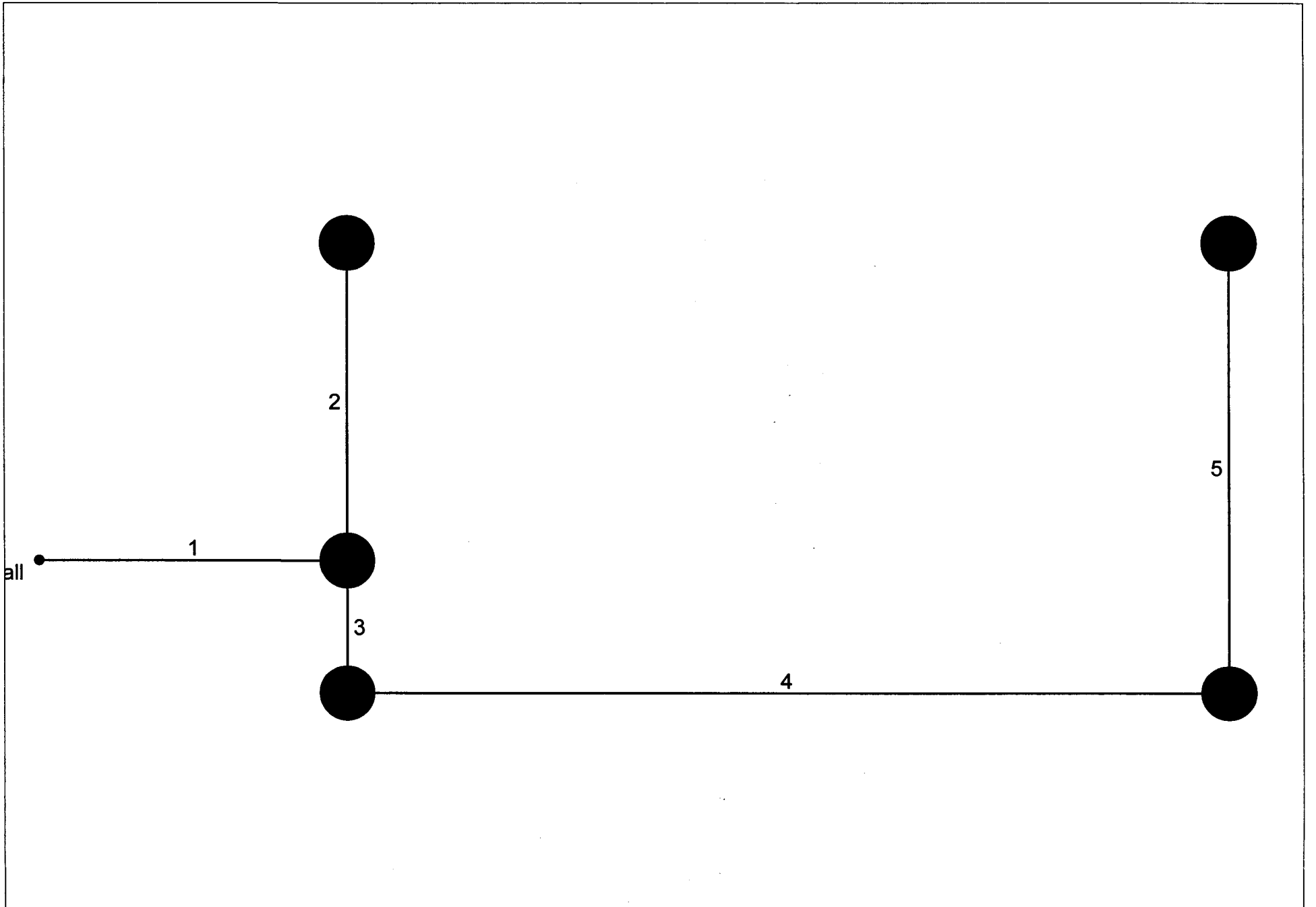
Q =	4.76	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3

3.18

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Roof Drain System.stm	Number of lines: 5	Date: 8/8/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	23.000	0.00	0.06	0.00	0.00	0.05	0.0	6.9	6.5	0.35	0.52	2.61	6	0.87	90.30	90.50	90.65	90.80	0.00	92.75	
2	1	24.000	0.01	0.01	0.90	0.01	0.01	5.0	5.0	7.0	0.06	0.44	0.46	6	0.63	90.50	90.65	90.93	90.93	92.75	92.50	
3	1	10.000	0.01	0.05	0.90	0.01	0.05	5.0	6.7	6.5	0.29	0.56	1.87	6	1.00	90.50	90.60	90.93	90.93	92.75	92.75	
4	3	66.000	0.02	0.04	0.90	0.02	0.04	5.0	5.9	6.8	0.24	0.44	1.94	6	0.61	90.60	91.00	91.00	91.25	92.75	93.00	
5	4	34.000	0.02	0.02	0.90	0.02	0.02	5.0	5.0	7.0	0.13	0.48	1.41	6	0.74	91.00	91.25	91.35	91.43	93.00	92.75	

Project File: W10119-E-19_Roof Drain System.stm | Number of lines: 5 | Run Date: 8/8/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

CONSULTING ENGINEERS
Williamsburg (757) 253-0040
Gloucester (804) 693-4450
Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 18, 2012
Calculated By:	GVC

Design Point: **Swale #1**

2 Year Storm - Velocity Check

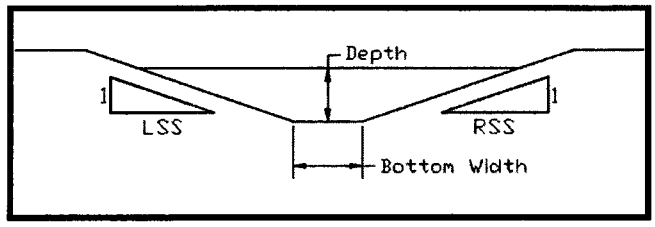
Drainage Area	=	0.38	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.60 x 5.70 x 0.38

= 1.30 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.58	Ft.	
Area	=	1.03	SF	Wetted Perimeter = 3.70 Ft.
Hydraulic Radius	=	0.28	Ft.	
Velocity (V)	=	1.26	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.30	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

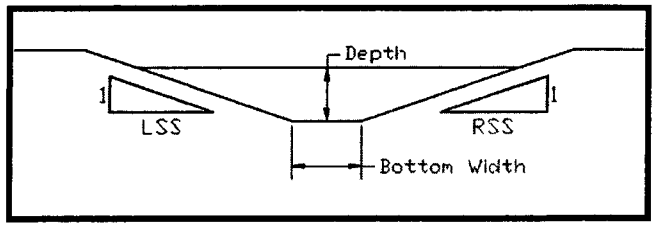
Drainage Area	=	0.38	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.60 x 7.20 x 0.38

= 1.64 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.64	Ft.	
Area	=	1.22	SF	Wetted Perimeter = 4.03 Ft.
Hydraulic Radius	=	0.30	Ft.	
Velocity (V)	=	1.34	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.63	CFS	(From Continuity Equation Q=AV)

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Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 29, 2012
Calculated By:	GVC

Design Point: **Swale #2**

2 Year Storm - Velocity Check

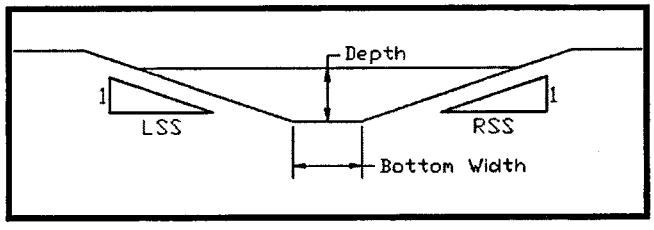
Drainage Area	=	0.71	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.70 x 5.70 x 0.71

= 2.83 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	0.50	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.89	Ft.				
Area	=	2.39	SF	Wetted Perimeter	=	5.64	Ft.
Hydraulic Radius	=	0.42	Ft.				
Velocity (V)	=	1.18	Ft./sec.	(From Manning's Equation)			
Flow (Q)	=	2.83	CFS	(From Continuity Equation Q=AV)			***Use EC-2 Matting**

10 Year Storm - Capacity Check

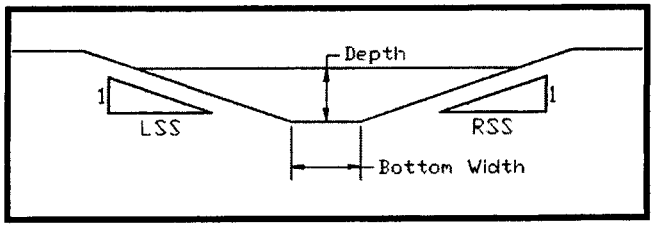
Drainage Area	=	0.71	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.70 x 7.20 x 0.71

= 3.58 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	0.50	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.97	Ft.				
Area	=	2.84	SF	Wetted Perimeter	=	6.16	Ft.
Hydraulic Radius	=	0.46	Ft.				
Velocity (V)	=	1.26	Ft./sec.	(From Manning's Equation)			
Flow (Q)	=	3.57	CFS	(From Continuity Equation Q=AV)			***Use EC-2 Matting**

CONSULTING ENGINEERS
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Fredericksburg (540) 710-6606

Project:	**Mid County Park**
Project No.:	**W10119-E-19**
Subject:	**Channel Design**
Date:	**June 29, 2012**
Calculated By:	**GVC**

Design Point: **Swale #3**

2 Year Storm - Velocity Check

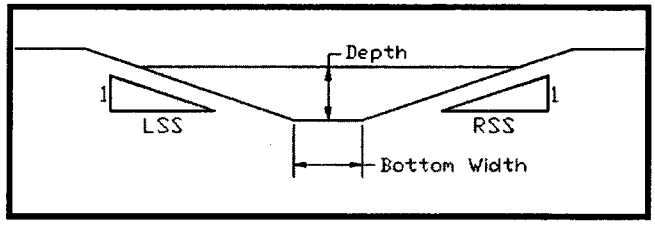
Drainage Area	=	**1.16**	Acres	(Area draining to Design Point)
C	=	**0.60**		(Runoff Coefficient)
I	=	**5.70**	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= **0.60** x **5.70** x **1.16**

= **3.97** CFS

Channel Characteristics



Rt. Sideslope	=	**3.00**	:1
Lt. Sideslope	=	**3.00**	:1
Base Width	=	**0.00**	Ft.
Max. Depth	=	**1.50**	Ft.
Channel Slope	=	**1.50**	%
Mannings (n)	=	**0.050**	**Fallow**

Depth of Flow	=	**0.82**	Ft.	
Area	=	**2.03**	SF	Wetted Perimeter = **5.21** Ft.
Hydraulic Radius	=	**0.39**	Ft.	
Velocity (V)	=	**1.95**	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	**3.96**	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

10 Year Storm - Capacity Check

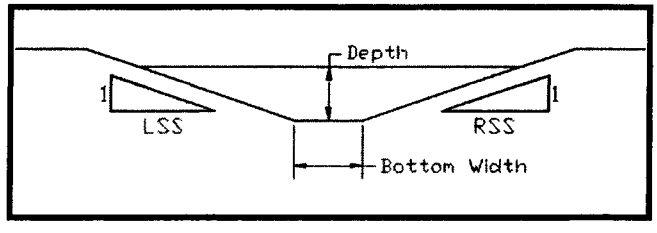
Drainage Area	=	**1.16**	Acres	(Area draining to Design Point)
C	=	**0.60**		(Runoff Coefficient)
I	=	**7.20**	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= **0.60** x **7.20** x **1.16**

= **5.01** CFS

Channel Characteristics



Rt. Sideslope	=	**3.00**	:1
Lt. Sideslope	=	**3.00**	:1
Base Width	=	**0.00**	Ft.
Max. Depth	=	**1.50**	Ft.
Channel Slope	=	**1.50**	%
Mannings (n)	=	**0.050**	**Fallow**

Depth of Flow	=	**0.90**	Ft.	
Area	=	**2.42**	SF	Wetted Perimeter = **5.68** Ft.
Hydraulic Radius	=	**0.43**	Ft.	
Velocity (V)	=	**2.06**	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	**4.99**	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

CONSULTING ENGINEERS
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Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	August 8, 2012
Calculated By:	GVC

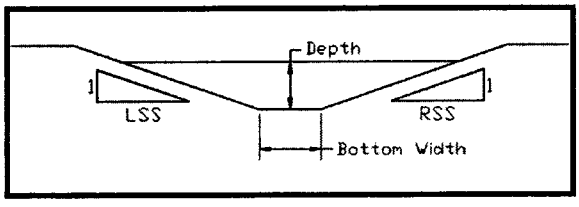
Design Point: **Grass Channel #1**

2 Year Storm - Velocity Check

Drainage Area	=	1.64	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.60 x 5.70 x 1.64
= 5.61 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	2.00	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

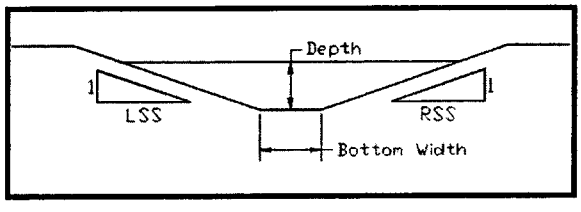
Depth of Flow	=	0.58	Ft.	
Area	=	3.30	SF	Wetted Perimeter = 7.64 Ft.
Hydraulic Radius	=	0.43	Ft.	
Velocity (V)	=	1.70	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	5.60	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

10 Year Storm - Capacity Check

Drainage Area	=	1.64	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.60 x 7.20 x 1.64
= 7.08 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	4.00	Ft.
Max. Depth	=	2.00	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.65	Ft.	
Area	=	3.88	SF	Wetted Perimeter = 8.12 Ft.
Hydraulic Radius	=	0.48	Ft.	
Velocity (V)	=	1.82	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	7.06	CFS	(From Continuity Equation Q=AV)

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Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 18, 2012
Calculated By:	GVC

Design Point: **Grass Channel #2**

2 Year Storm - Velocity Check

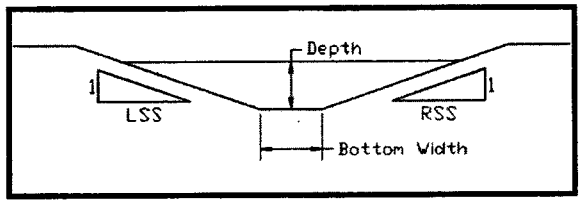
Drainage Area	=	3.37	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	5.50	in/hr	(Design Rainfall Intensity) **TC = 7 minutes**

Q = C I A (Peak Flow)

= 0.50 x 5.50 x 3.37

= 9.27 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	2.00	Ft.
Channel Slope	=	1.33	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	1.16	Ft.	
Area	=	4.02	SF	Wetted Perimeter = 7.32 Ft.
Hydraulic Radius	=	0.55	Ft.	
Velocity (V)	=	2.30	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	9.25	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

10 Year Storm - Capacity Check

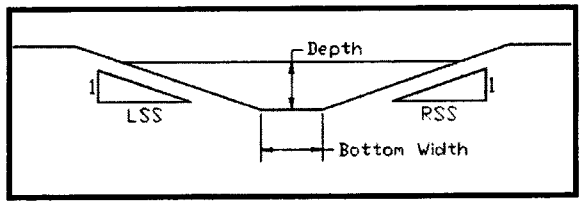
Drainage Area	=	3.37	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	7.00	in/hr	(Design Rainfall Intensity) **TC = 7 minutes**

Q = C I A (Peak Flow)

= 0.50 x 7.00 x 3.37

= 11.80 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	2.00	Ft.
Channel Slope	=	1.33	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	1.27	Ft.	
Area	=	4.82	SF	Wetted Perimeter = 8.02 Ft.
Hydraulic Radius	=	0.60	Ft.	
Velocity (V)	=	2.44	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	11.78	CFS	(From Continuity Equation Q=AV)

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Aug 8 2012

Culvert #1

C = 0.60
i_{10} = 7.0 in/hr
A = 0.38 AC

Invert Elev Dn (ft)	= 90.00
Pipe Length (ft)	= 25.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 90.25
Rise (in)	= 12.0
Shape	= Cir
Span (in)	= 12.0
No. Barrels	= 1
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

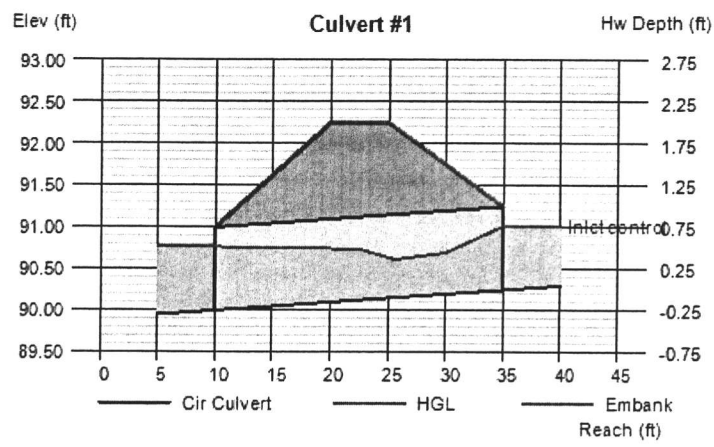
Top Elevation (ft)	= 92.25
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 1.60
Qmax (cfs)	= 1.60
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

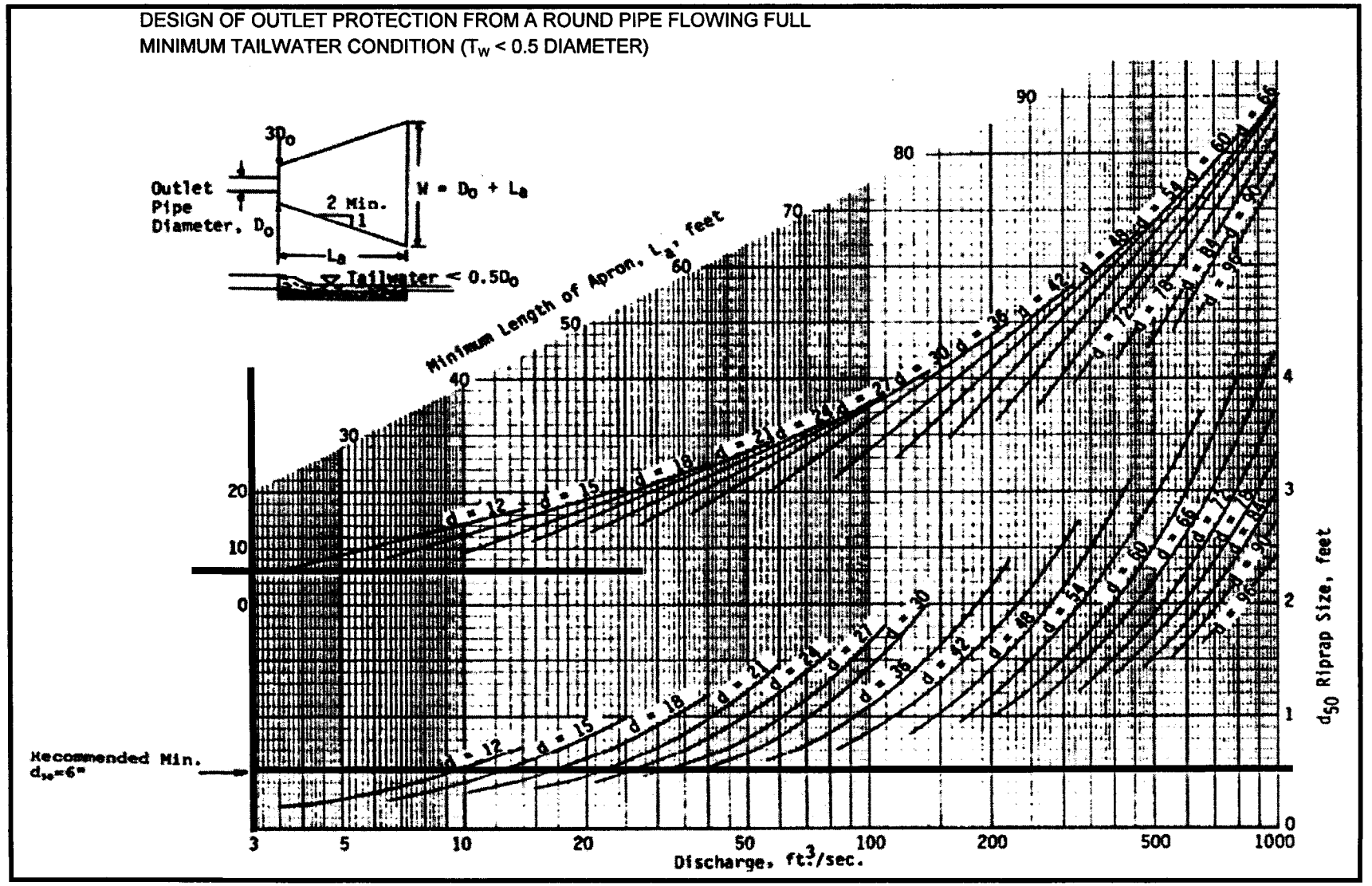
Qtotal (cfs)	= 1.60
Qpipe (cfs)	= 1.60
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 2.47
Veloc Up (ft/s)	= 3.68
HGL Dn (ft)	= 90.77
HGL Up (ft)	= 90.79
Hw Elev (ft)	= 91.02
Hw/D (ft)	= 0.77
Flow Regime	= Inlet Control



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Culvert #1



Q =	1.6	cfs	$3D_0$ =	3	ft	W =	7	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	6	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3 3.18

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Wednesday, Aug 8 2012

C = 0.75
i_{10} = 7.0
A = 0.97 AC

Culvert #2

Invert Elev Dn (ft)	= 88.78
Pipe Length (ft)	= 20.00
Slope (%)	= 4.60
Invert Elev Up (ft)	= 89.70
Rise (in)	= 12.0
Shape	= Cir
Span (in)	= 12.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

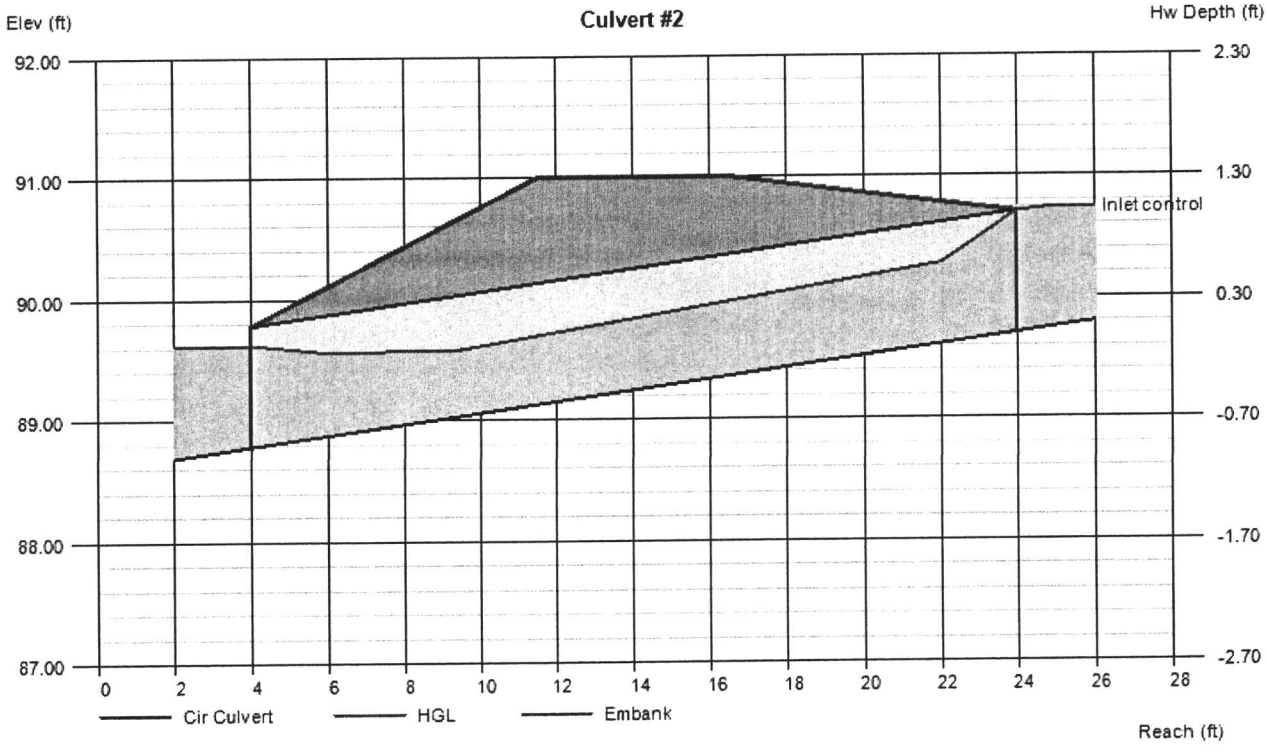
Top Elevation (ft)	= 91.00
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 5.09
Qmax (cfs)	= 5.09
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 5.09
Qpipe (cfs)	= 5.09
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.60
Veloc Up (ft/s)	= 4.44
HGL Dn (ft)	= 89.62
HGL Up (ft)	= 90.39
Hw Elev (ft)	= 90.74
Hw/D (ft)	= 1.04
Flow Regime	= Inlet Control



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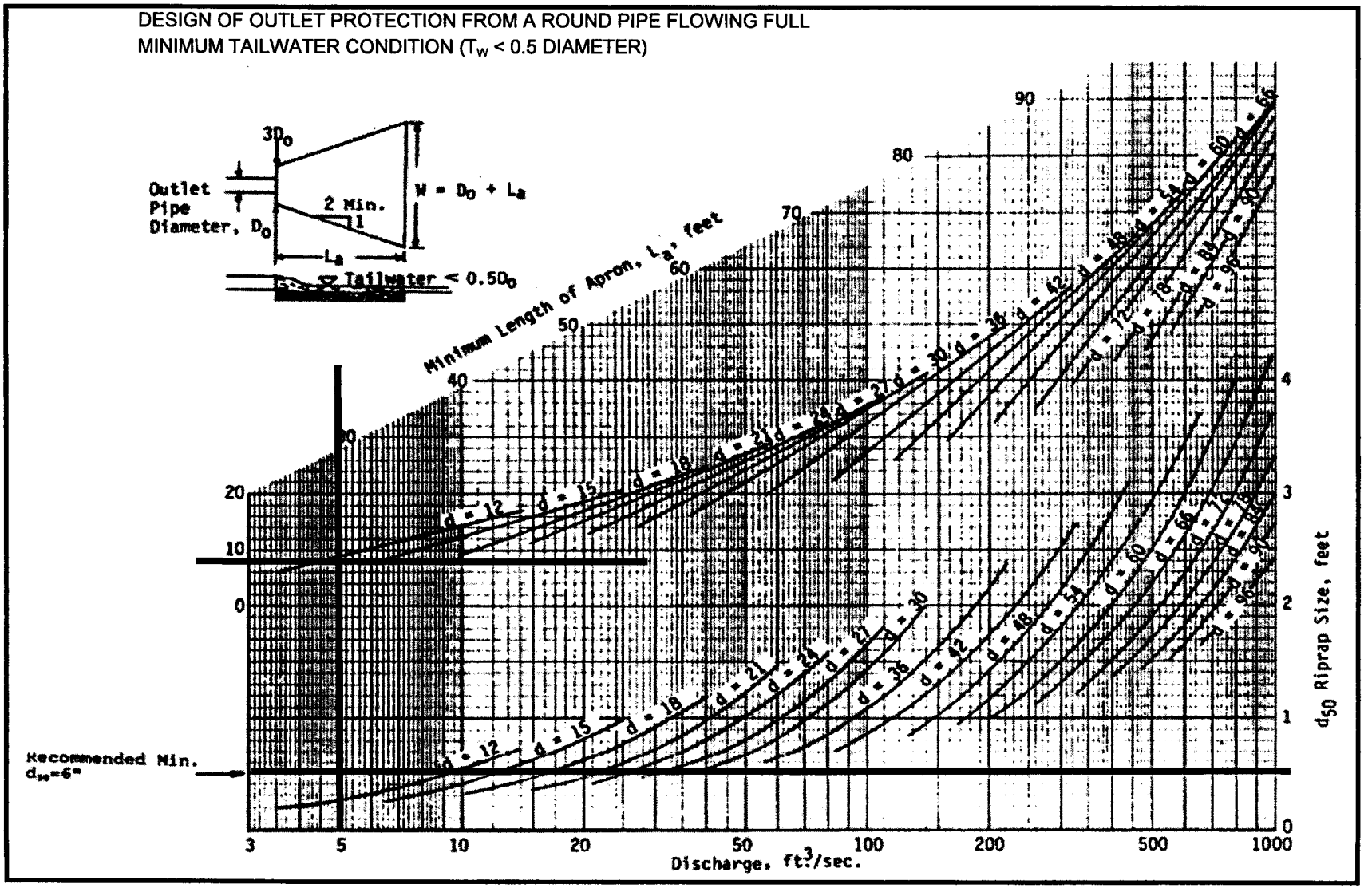
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Culvert #2



Q =	5.09	cfs	$3D_0$ =	3	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

1992

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Plate 3.18-3

3.18

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Aug 8 2012

C = 0.65
i_{10} = 7.0
A = 1.42 AC

Culvert #3

Invert Elev Dn (ft)	= 86.00
Pipe Length (ft)	= 28.00
Slope (%)	= 1.79
Invert Elev Up (ft)	= 86.50
Rise (in)	= 18.0
Shape	= Cir
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

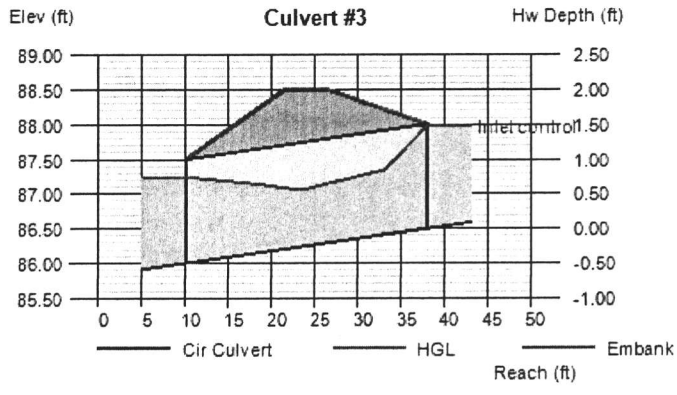
Top Elevation (ft)	= 88.50
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 6.51
Qmax (cfs)	= 6.51
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

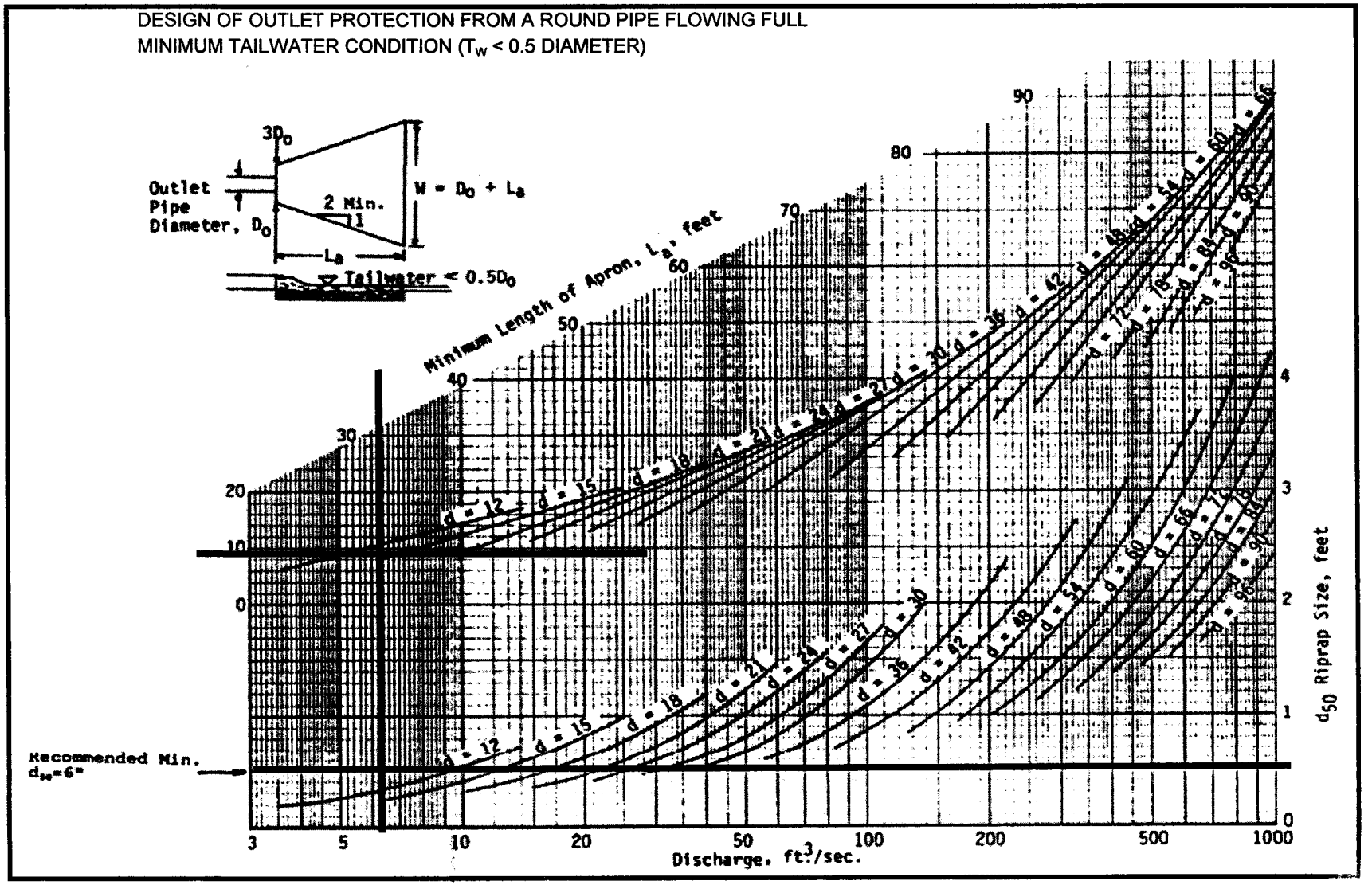
Qtotal (cfs)	= 6.51
Qpipe (cfs)	= 6.51
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.15
Veloc Up (ft/s)	= 5.27
HGL Dn (ft)	= 87.24
HGL Up (ft)	= 87.49
Hw Elev (ft)	= 87.98
Hw/D (ft)	= 0.99
Flow Regime	= Inlet Control



AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Culvert #3



Q =	6.51	cfs	$3D_0$ =	4.5	ft	W =	11	ft	Depth = 1.5 ft
D_0 =	18	in	L_a =	9	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-3

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Wednesday, Aug 8 2012

C = 0.40
i_{10} = 7.0 in/hr
A = 1.27 AC

Culvert #4

Invert Elev Dn (ft)	= 86.00
Pipe Length (ft)	= 36.00
Slope (%)	= 2.08
Invert Elev Up (ft)	= 86.75
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

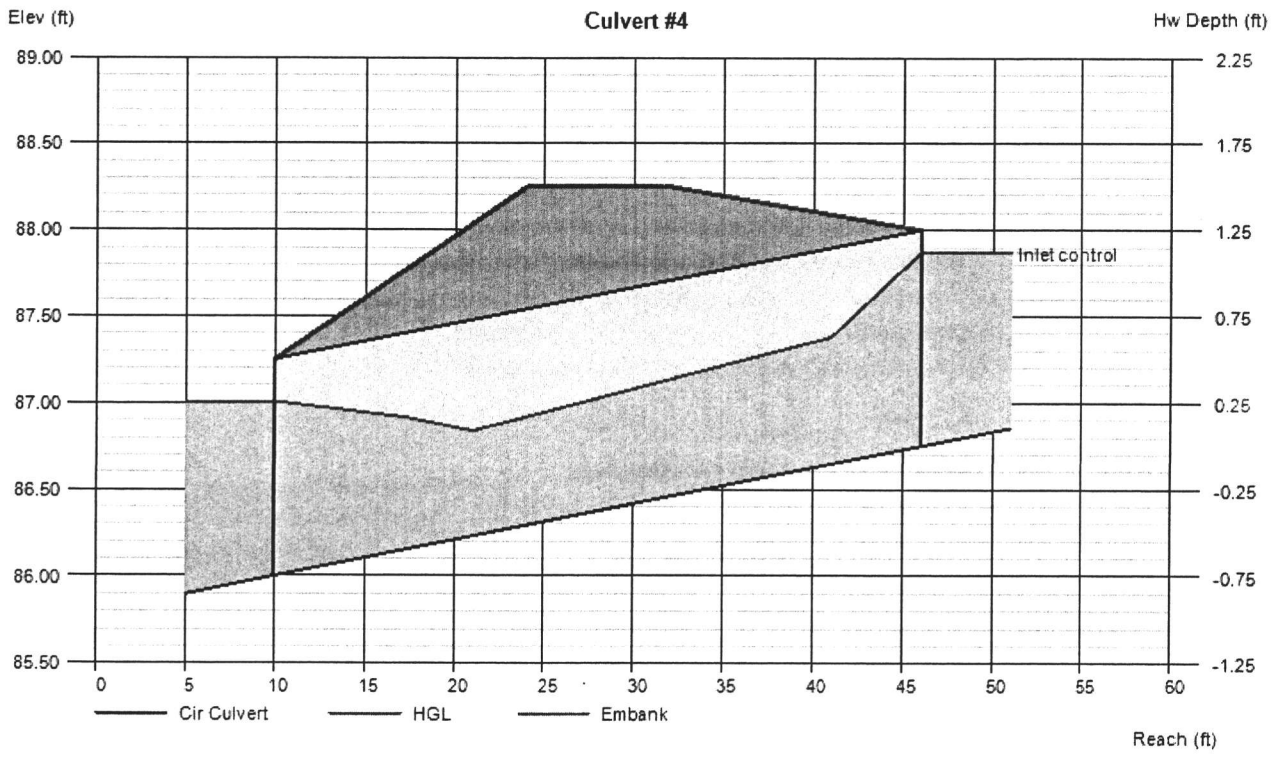
Top Elevation (ft)	= 88.25
Top Width (ft)	= 8.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 3.56
Qmax (cfs)	= 3.56
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

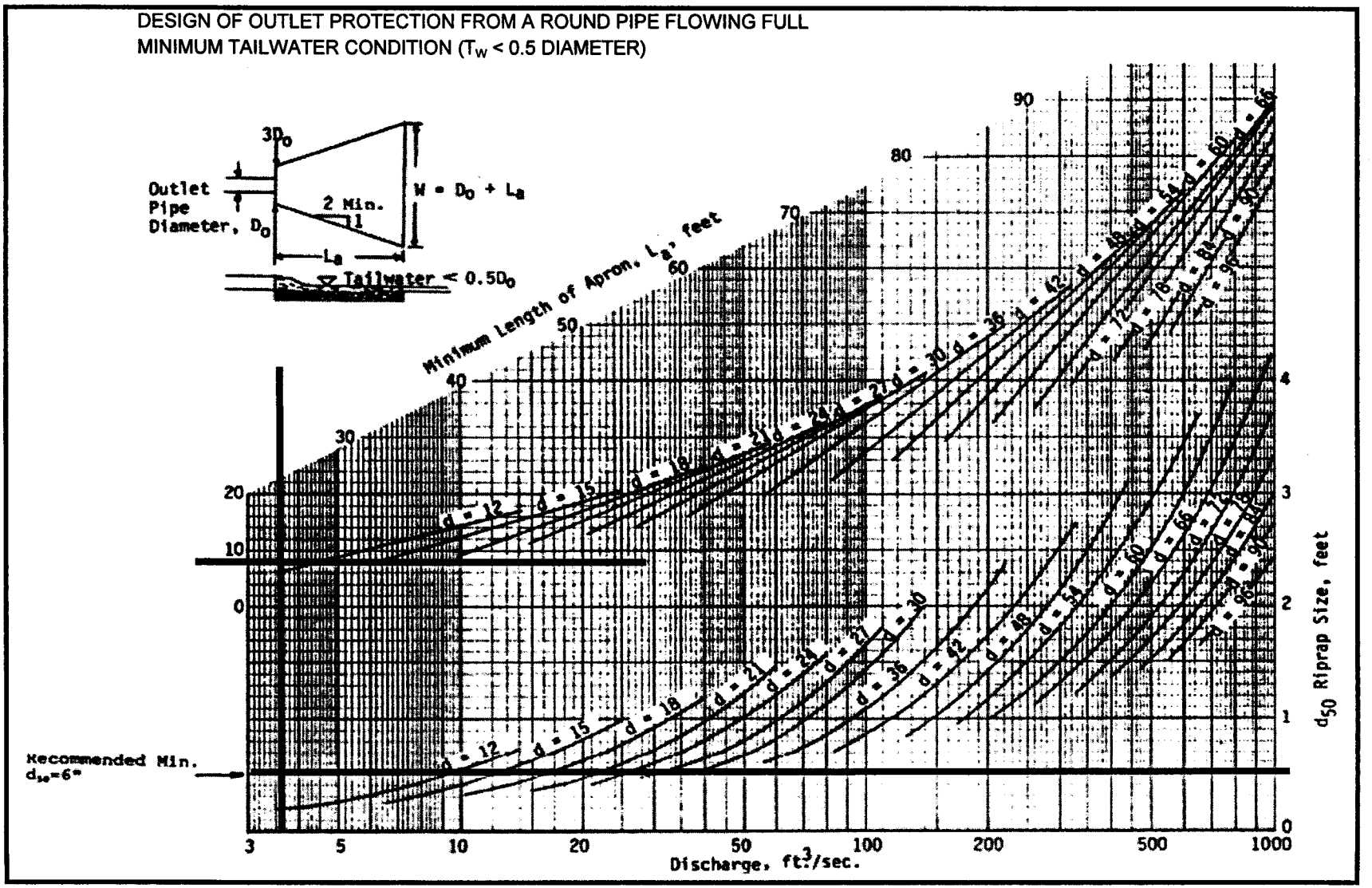
Qtotal (cfs)	= 3.56
Qpipe (cfs)	= 3.56
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.36
Veloc Up (ft/s)	= 4.53
HGL Dn (ft)	= 87.01
HGL Up (ft)	= 87.51
Hw Elev (ft)	= 87.87
Hw/D (ft)	= 0.90
Flow Regime	= Inlet Control



AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Culvert #4



Q =	3.56	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-3

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Wednesday, Aug 8 2012

C = 0.50
i = 7.0 in/hr
A = 3.37 Ac

Culvert #5 (Grass Channel #2)

Invert Elev Dn (ft)	= 83.73
Pipe Length (ft)	= 21.00
Slope (%)	= 2.19
Invert Elev Up (ft)	= 84.19
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

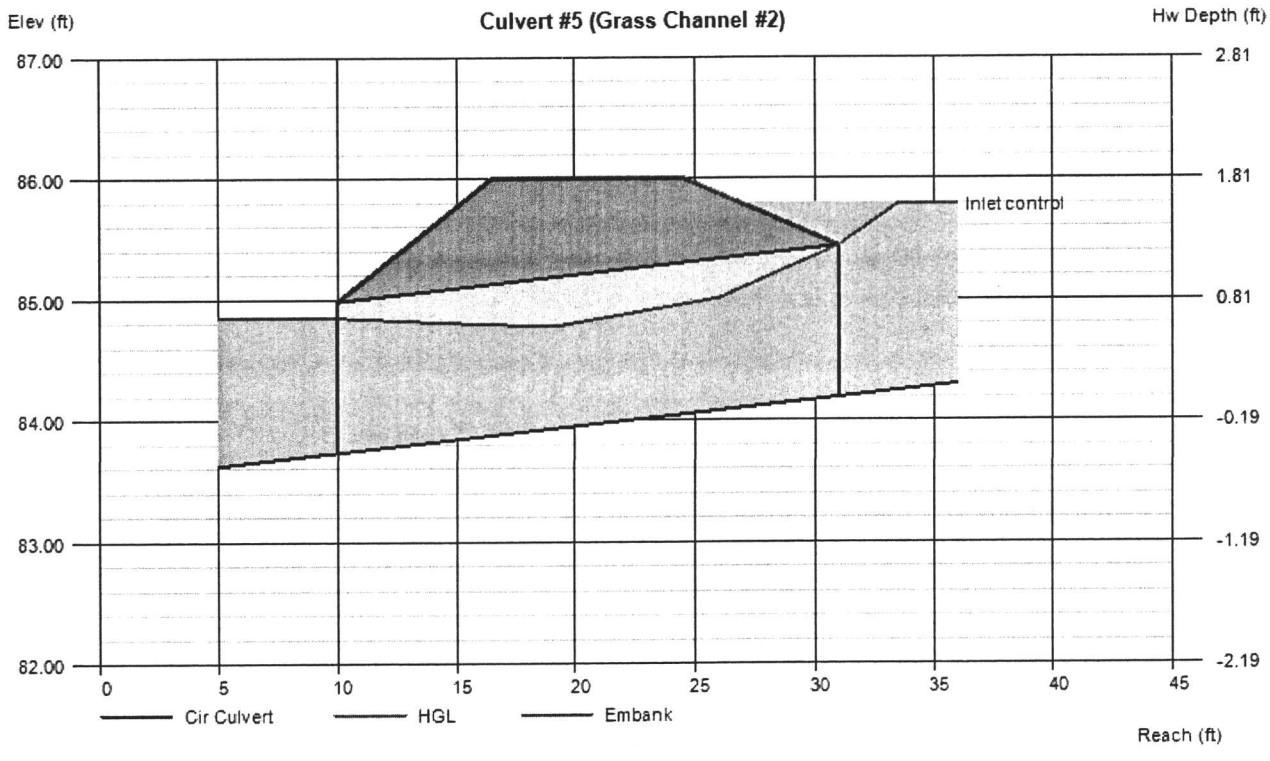
Top Elevation (ft)	= 86.00
Top Width (ft)	= 8.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 11.80
Qmax (cfs)	= 11.80
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

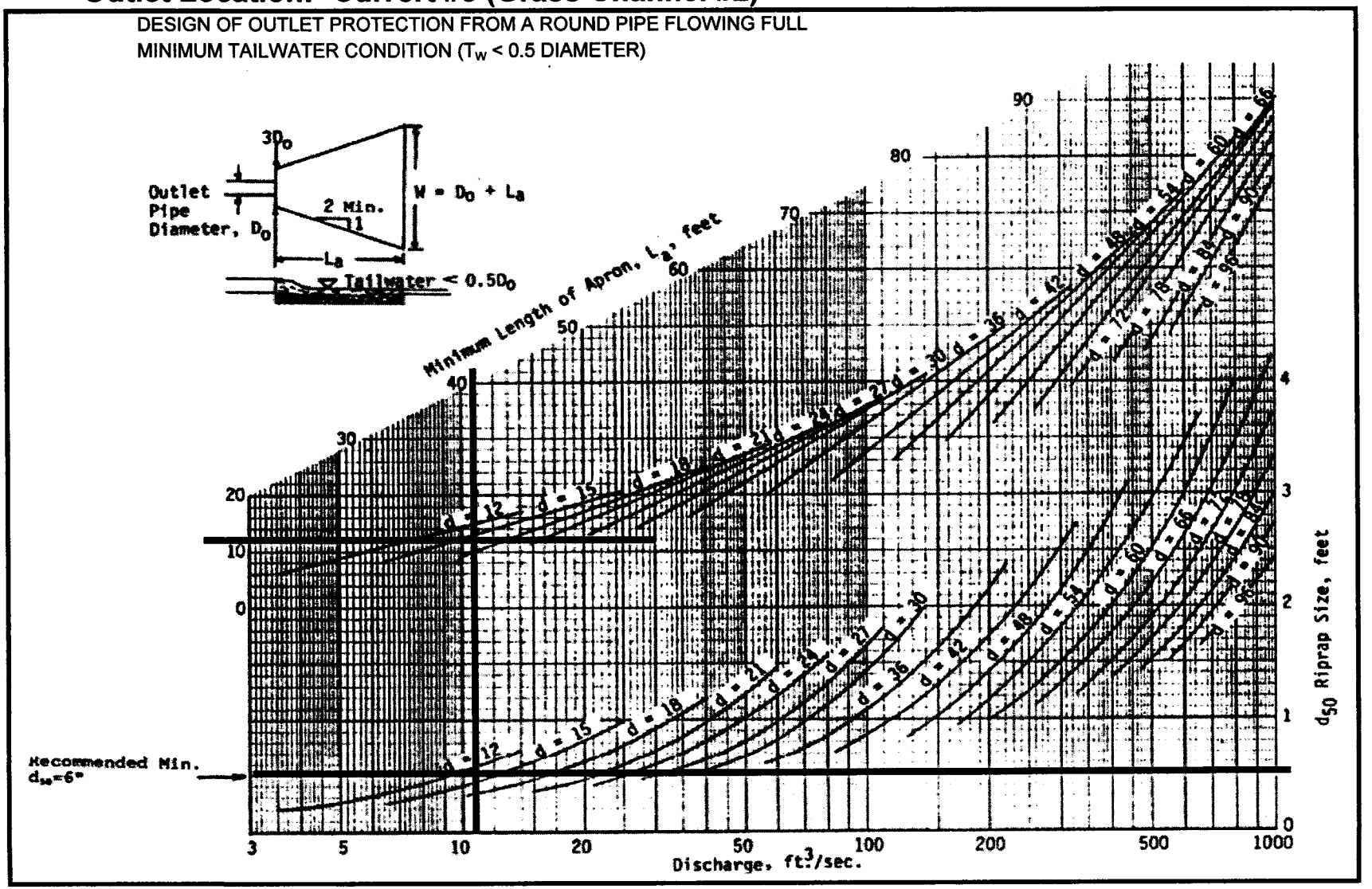
Qtotal (cfs)	= 11.80
Qpipe (cfs)	= 11.80
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.10
Veloc Up (ft/s)	= 5.69
HGL Dn (ft)	= 84.85
HGL Up (ft)	= 85.18
Hw Elev (ft)	= 85.78
Hw/D (ft)	= 1.27
Flow Regime	= Inlet Control



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	August 8, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Culvert #5 (Grass Channel #2)



Source: USDA-SCS

Q =	11.8	cfs	$3D_0$ =	3.75	ft	W =	13	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	12	ft	d_{50} =	0.5	ft	

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

Wednesday, Aug 8 2012

C = 0.55
i_{10} = 7.0 in/hr
A = 1.64 AC

Existing Culvert (Grass Channel #1)

Invert Elev Dn (ft)	= 83.09
Pipe Length (ft)	= 43.00
Slope (%)	= 1.02
Invert Elev Up (ft)	= 83.53
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

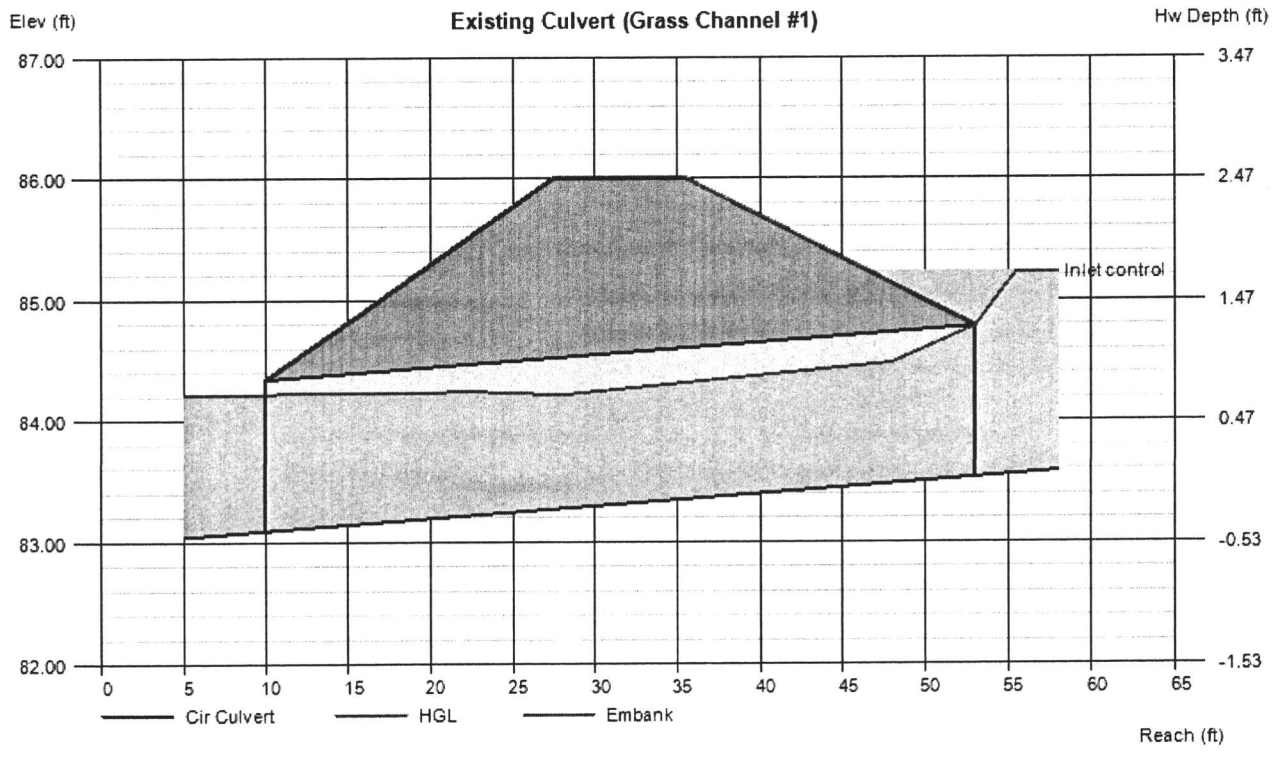
Top Elevation (ft)	= 86.00
Top Width (ft)	= 8.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 6.31
Qmax (cfs)	= 6.31
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

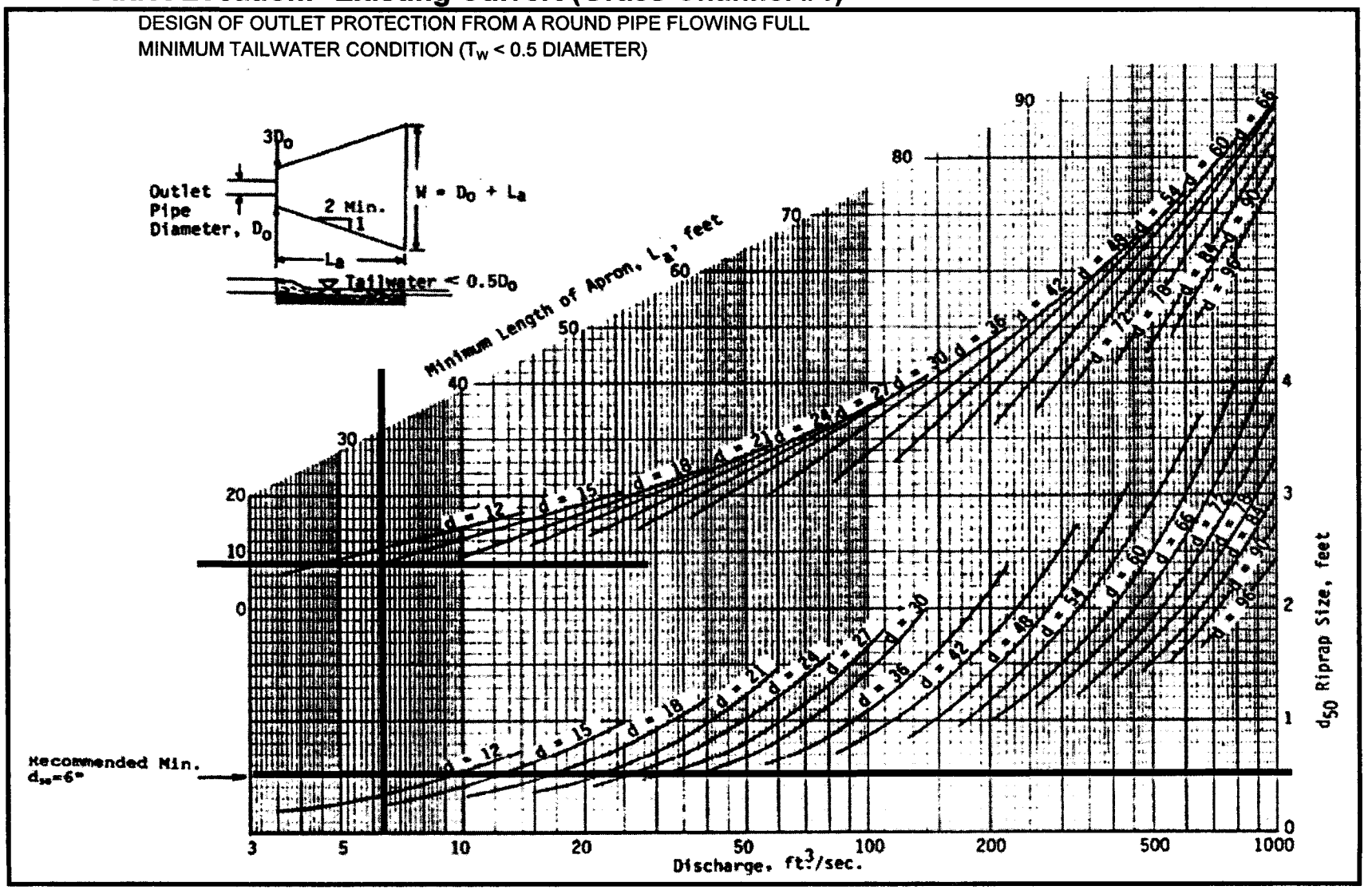
Qtotal (cfs)	= 6.31
Qpipe (cfs)	= 6.31
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.40
Veloc Up (ft/s)	= 5.91
HGL Dn (ft)	= 84.22
HGL Up (ft)	= 84.55
Hw Elev (ft)	= 85.22
Hw/D (ft)	= 1.36
Flow Regime	= Inlet Control



AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	August 8, 2012
Calculated By:	GVC

Outlet Location: Existing Culvert (Grass Channel #1)



Q =	6.31	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

1992

III - 164

Plate 3.18-3

3.18

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc.

C = 0.50
i = 5.5 in/hr
A = 4.63 AC

Wednesday, Aug 8 2012

Existing Culvert (Memorial)

Invert Elev Dn (ft)	= 81.97
Pipe Length (ft)	= 20.00
Slope (%)	= 2.30
Invert Elev Up (ft)	= 82.43
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

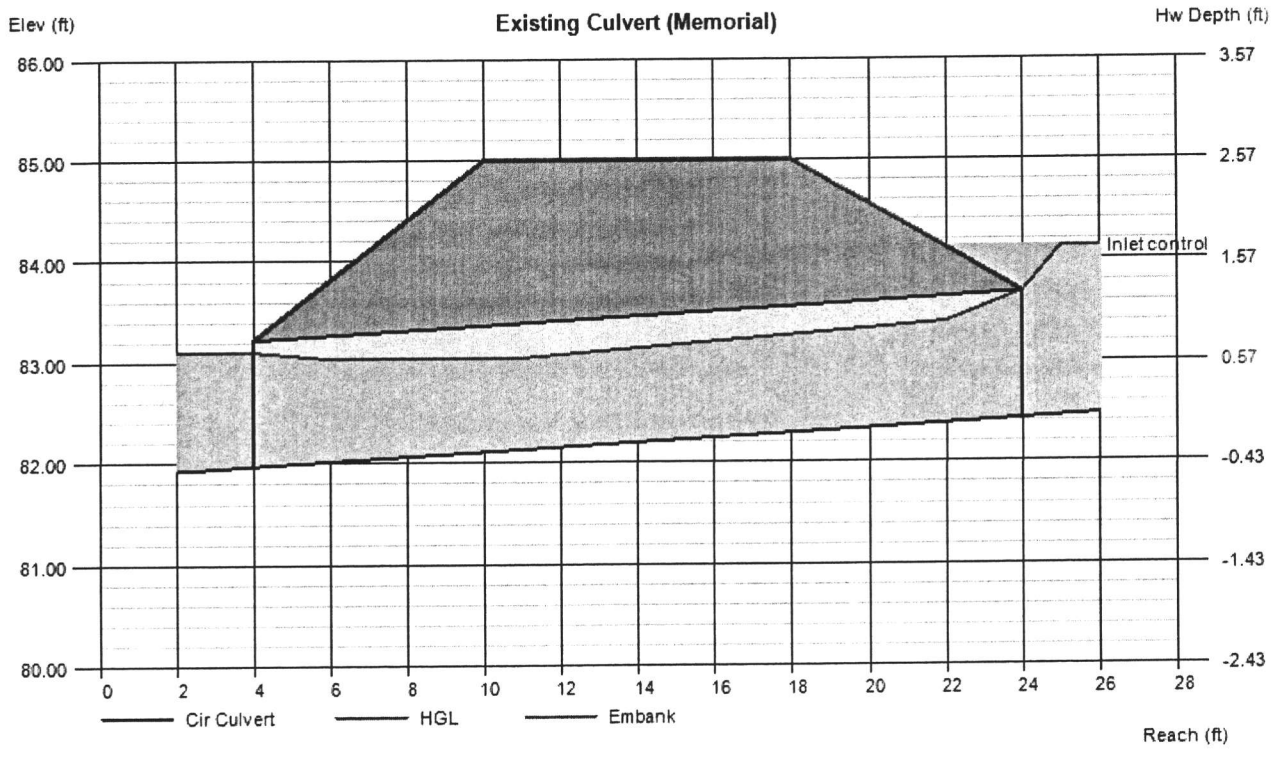
Top Elevation (ft)	= 85.00
Top Width (ft)	= 8.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 12.73
Qmax (cfs)	= 12.73
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 12.73
Qpipe (cfs)	= 12.73
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 5.44
Veloc Up (ft/s)	= 5.94
HGL Dn (ft)	= 83.11
HGL Up (ft)	= 83.45
Hw Elev (ft)	= 84.13
Hw/D (ft)	= 1.36
Flow Regime	= Inlet Control



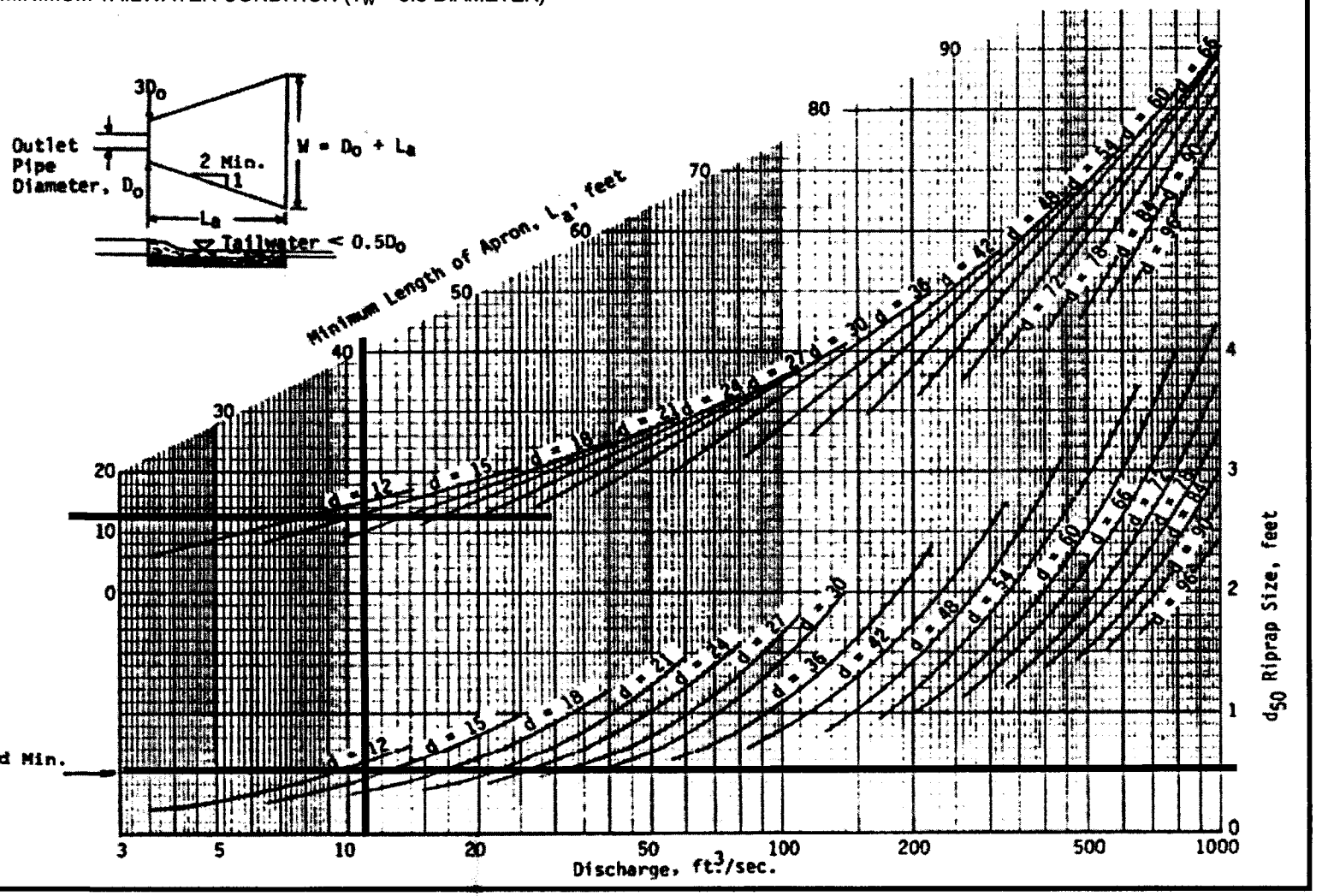
AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	August 8, 2012
Calculated By:	GVC

Outlet Location: Existing Culvert (Memorial)

Source: USDA-SCS 1992

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_W < 0.5 DIAMETER)



Q =	12.73	cfs	$3D_0$ =	3.75	ft	W =	13	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	12	ft	d_{50} =	0.5	ft	

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

Water Quality Calculations
Water Quality Volume Calculations
Bioretention Facility Hydraflow Report
Bioretention Facility Outfall Protections Calculations
24-hour drawdown Calculations – Dry Pond
Dry Pond Hydraflow Report

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-19**
Subject:	**Water Quality Calculations**
	Situation 3
Date:	**8/10/2012**
Calculated By:	**GVC**

Performance-Based Water Quality Calculations - Situation 3
(Appendix 5D - Virginia Stormwater Management Handbook Volume II)

STEP 1

18.03 Acres — Applicable Area
4.52 Acres — Post-development Impervious Cover

25.1 % — I_{post} (Total Post-development Impervious Cover / A x 100)

STEP 2

18 % — $I_{watershed}$
3.47 Acres — Existing Impervious Cover

19.2 % — $I_{existing}$ (Total Existing Impervious Cover / A x 100)

STEP 4

$L_{pre(existing)}$ = relative pre-development total pollutant load

$$L_{pre(existing)} = [\ 0.05 + (\ 0.009 \times \underbrace{19.2}_{I_{existing}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(existing)}$ = **9.2** pounds per year

$L_{pre(watershed)}$ = relative pre-development total pollutant load

$$L_{pre(watershed)} = [\ 0.05 + (\ 0.009 \times \underbrace{18}_{I_{watershed}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(watershed)}$ = **8.7** pounds per year

STEP 5

L_{post} = relative post-development total pollutant load

$$L_{post} = [\ 0.05 + (\ 0.009 \times \underbrace{25.1}_{I_{post}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

L_{post} = **11.3** pounds per year

STEP 6

RR = relative pollutant removal requirement

L_{post} $(0.9 \times L_{pre(existing)})$

RR = **11.3** - **8.3**

RR = **3.1** pounds per year

or

L_{post} $L_{pre(watershed)}$

RR = **11.3** - **8.7**

RR = **2.6** pounds per year

Use lesser of two values - RR = 2.6 pounds per year

STEP 7

EFF = required pollutant removal efficiency

RR L_{post}

EFF = **2.6** / **11.3** x 100

EFF = **23.1** %

BMP #1 **Expanded Existing Dry Pond**

8.04 Acres Drainage Area of proposed BMP

2.45 Acres Post-development Impervious Cover for BMP Drainage Area

30.5 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP1} = pollutant load entering BMP

I_{BMP} A_{BMP}

L_{BMP1} = [0.05 + (0.009 x **30.5**)] x **8.04** x 2.28

L_{BMP1} = **5.9** pounds per year

$L_{removed/BMP1}$ = pollutant load removed by proposed BMP

EFF L_{BMP}

$L_{removed/BMP1}$ = **35.0** x **5.9**

$L_{removed/BMP1}$ = **2.1** pounds per year

BMP #2 **Grass Channel #1**

1.99 Acres Drainage Area of proposed BMP
1.20 Acres Post-development Impervious Cover for BMP Drainage Area

60.3 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP2} = pollutant load entering BMP

$$L_{BMP2} = [\ 0.05 + (\ 0.009 \times \underbrace{60.3}_{I_{BMP}}\ )\ ] \times \underbrace{1.99}_{A_{BMP}} \times 2.28$$

L_{BMP2} = **2.7** pounds per year

$L_{removed/BMP2}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP2} = \underbrace{30.0}_{EFF} \times \underbrace{2.7}_{L_{BMP}}$$

$L_{removed/BMP2}$ = **0.8** pounds per year

BMP #3 **Grass Channel #2**

1.36 Acres Drainage Area of proposed BMP
0.25 Acres Post-development Impervious Cover for BMP Drainage Area

18.4 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP3} = pollutant load entering BMP

$$L_{BMP3} = [\ 0.05 + (\ 0.009 \times \underbrace{18.4}_{I_{BMP}}\ )\ ] \times \underbrace{1.36}_{A_{BMP}} \times 2.28$$

L_{BMP3} = **0.7** pounds per year

$L_{removed/BMP3}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP3} = \underbrace{30.0}_{EFF} \times \underbrace{0.7}_{L_{BMP}}$$

$L_{removed/BMP3}$ = **0.2** pounds per year

BMP #4 _____

BMP #5 _____

BMP #6 _____

$$L_{removed/total} = L_{removed/BMP1} + L_{removed/BMP2} + L_{removed/BMP3} + L_{removed/BMP4} + L_{removed/BMP5} + L_{removed/BMP6}$$

$$= \underline{2.1} + \underline{0.8} + \underline{0.2} + \underline{0.0} + \underline{0.0} + \underline{0.0}$$

$$= 3.1 \text{ pounds per year}$$

Compliance Check

$$L_{removed/total} \geq RR$$

$$\underline{3.1} \geq \underline{2.6}$$

Water Quality

AES CONSULTING ENGINEERS

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-E-19**
Subject:	**Water Quality Volume**
Date:	**8/10/2012**
Calculated By:	**GVC**

BMP Type = **Dry Pond**

Water Quality Volume = 0.5 in. x **2.45** acres of impervious coverage

= (0.5 / 12) x (43,560 x **2.45**)

= **4447** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **4447**

= **8893.5** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **4447**

= **8894** CF

Dry Storage Volume Provided = **15540** CF Elevation = **81.85 - Riser Elevation**

AES
CONSULTING ENGINEERS

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-E-19**
Subject:	**Water Quality Volume**
Date:	**8/10/2012**
Calculated By:	**GVC**

BMP Type = **Grass Channel with Timber Check Dams #2**

Water Quality Volume = 0.5 in. x **0.25** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.25**)

= **454** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **454**

= **907.5** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **454**

= **908** CF

Dry Storage Volume Provided = **1050** CF Elevation = **300 LF of Dry Swale**

Hydraflow Table of Contents

W10119-E-19_Bioretention #1.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.000	1	n/a	0	------	------	------	Pre-Development
2	Rational	0.000	1	n/a	0	------	------	------	Post-Development
4	Reservoir	0.000	1	n/a	0	2	81.50	0.000	Post Routed

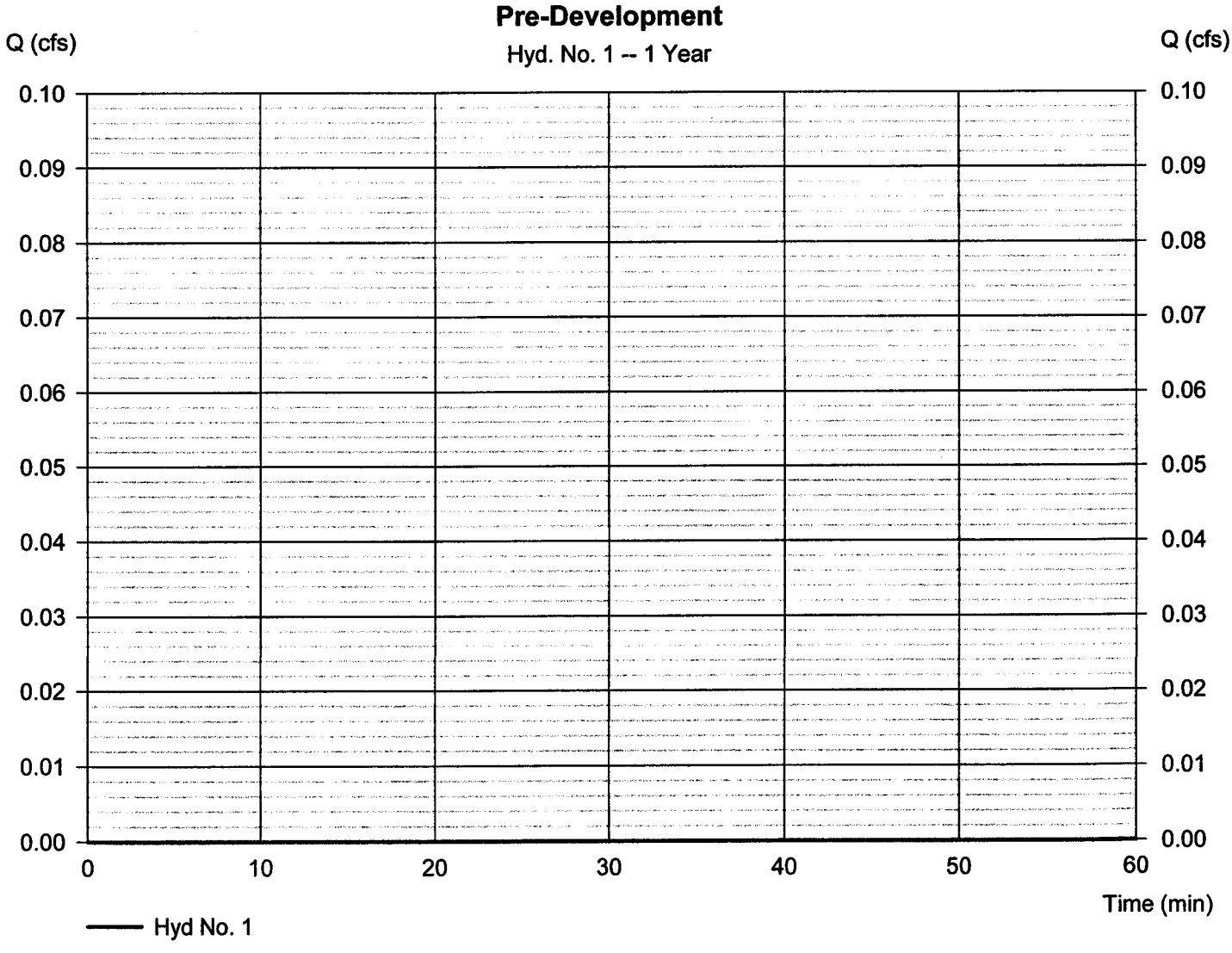
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Friday, 00 10, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Drainage area	= 1.810 ac	Runoff coeff.	= 0.5
Intensity	= 0.000 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



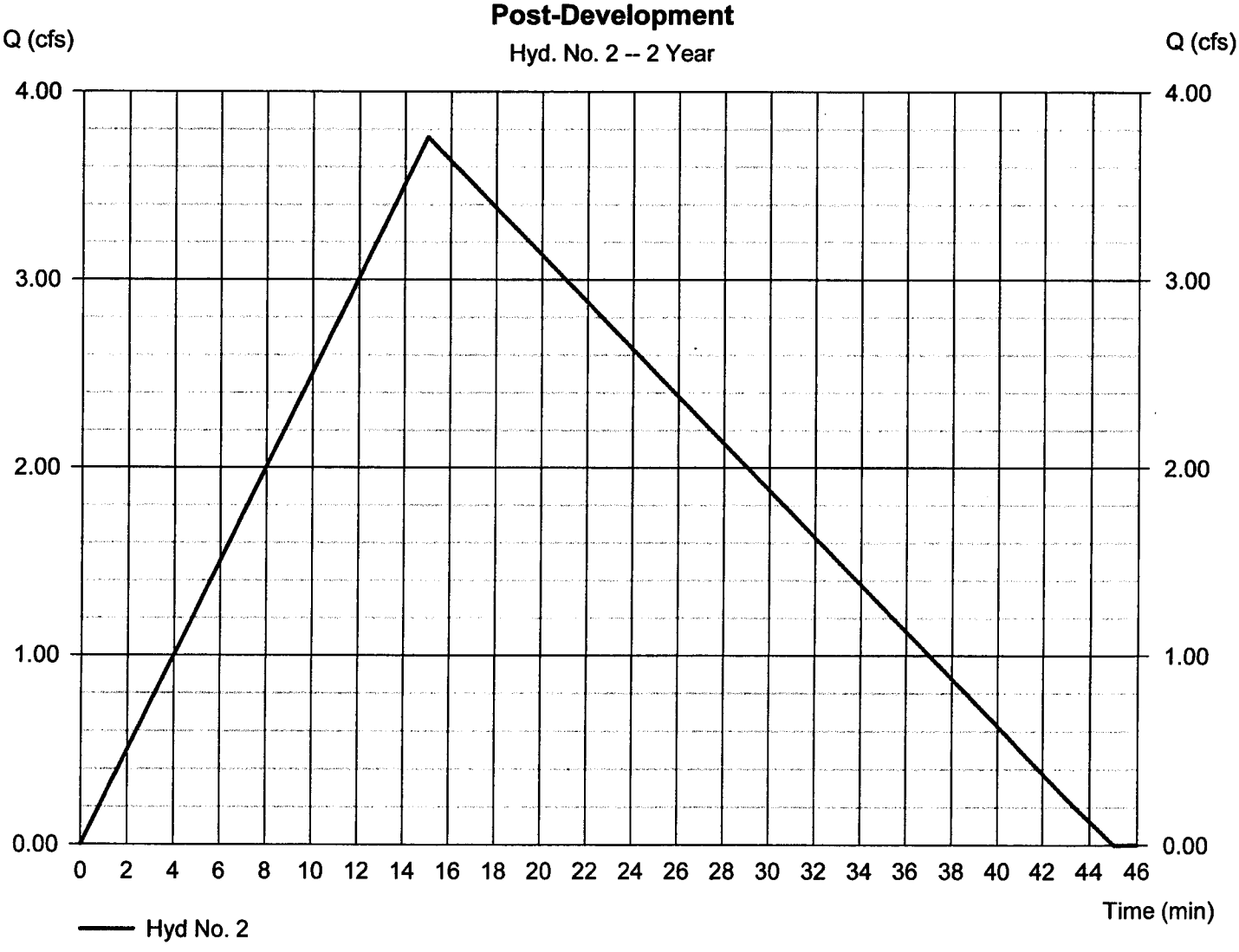
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 3.758 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 5,073 cuft
Drainage area	= 1.610 ac	Runoff coeff.	= 0.6
Intensity	= 3.890 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



Hydrograph Report

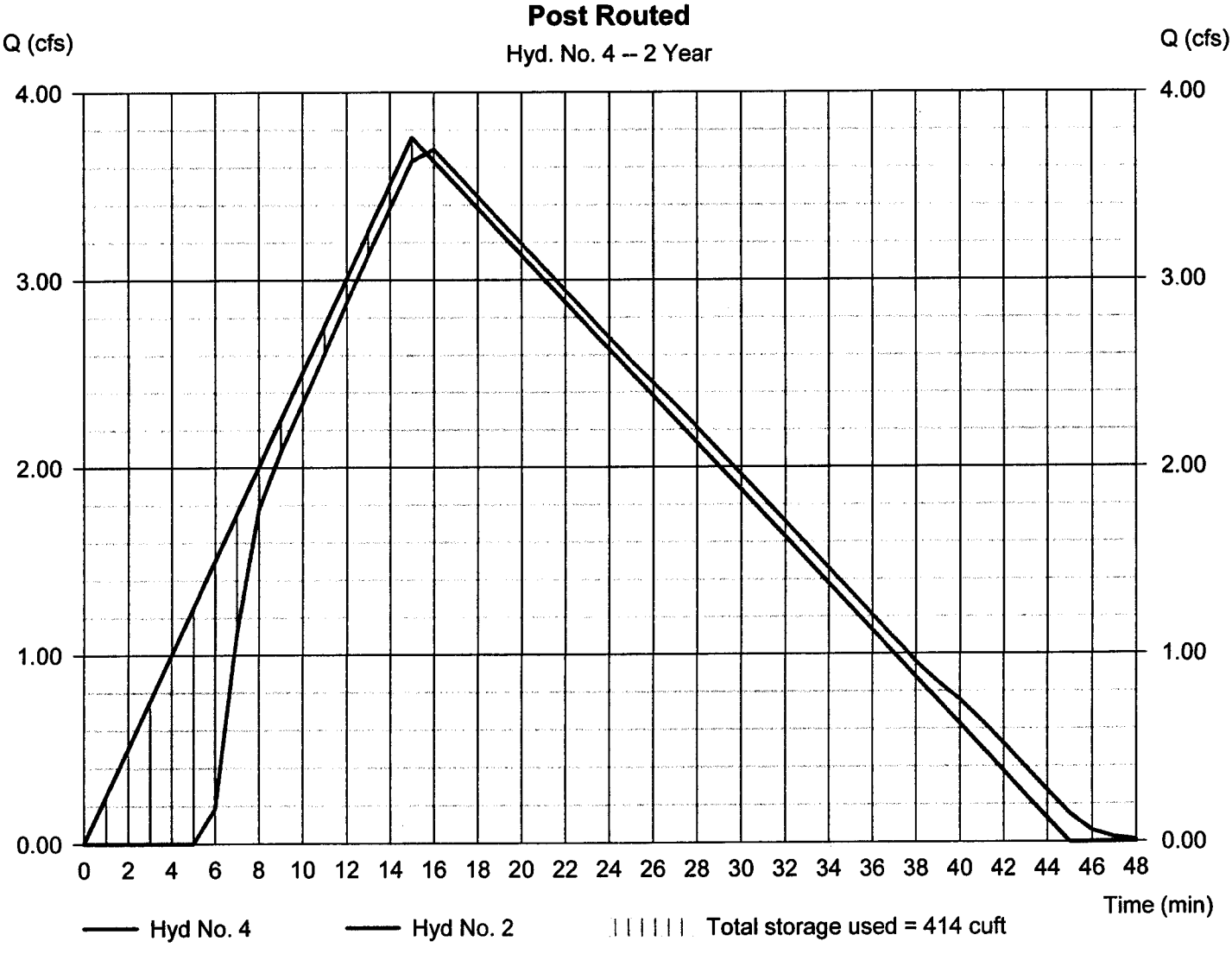
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 3.695 cfs
Storm frequency	= 2 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 4,821 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.33 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 414 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Pond No. 1 - Bioretention Facility #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 81.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	81.50	363	0	0
1.25	82.75	660	630	630
1.30	82.80	1,195	46	676
1.46	82.96	3,984	393	1,068
1.50	83.00	4,563	171	1,239

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 79.55	0.00	0.00	0.00
Length (ft)	= 140.00	0.00	0.00	0.00
Slope (%)	= 0.35	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	No	No	No

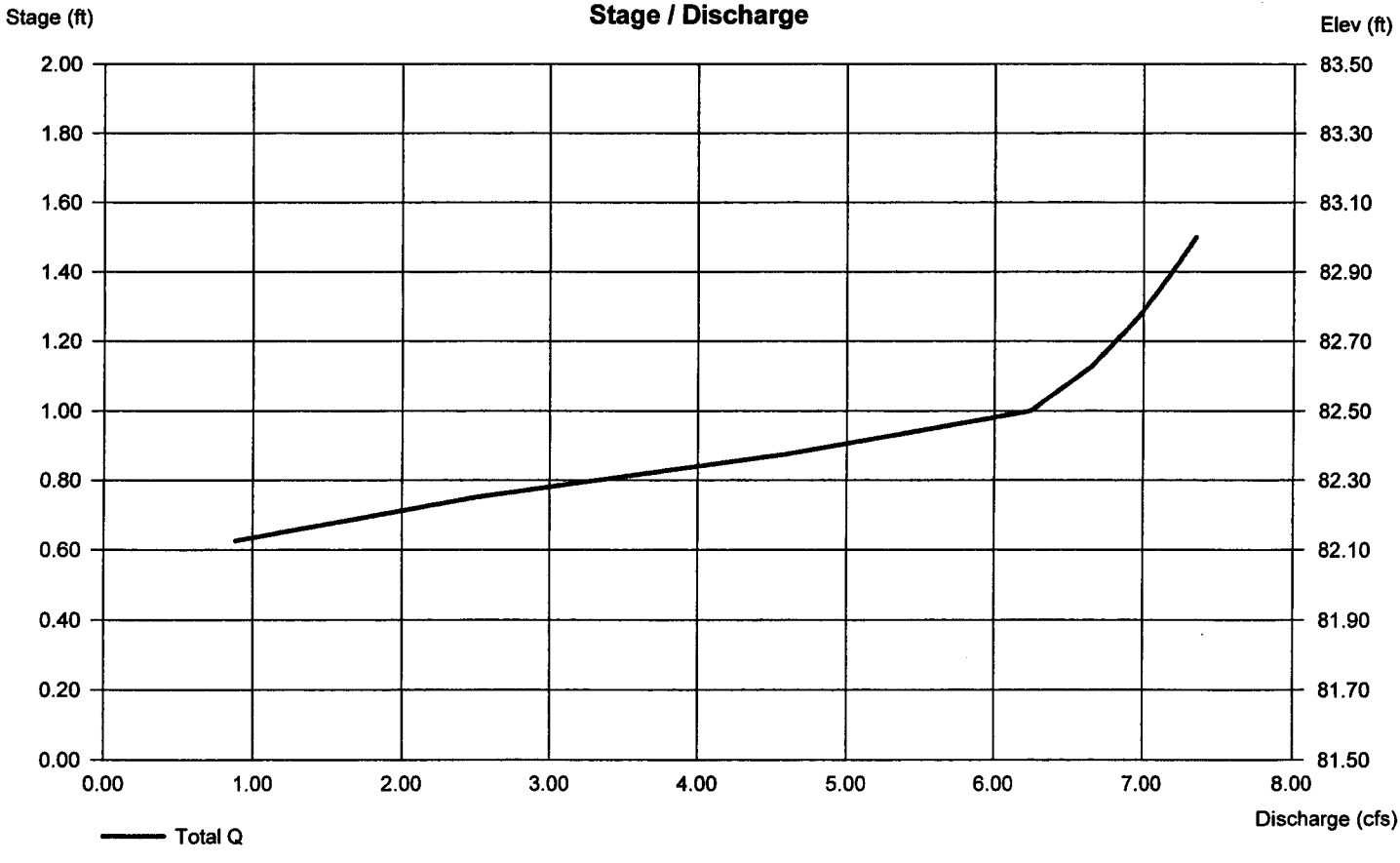
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 82.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	4.714	1	15	6,364	------	------	------	Pre-Development
2	Rational	5.032	1	15	6,793	------	------	------	Post-Development
4	Reservoir	4.934	1	16	6,541	2	82.41	454	Post Routed

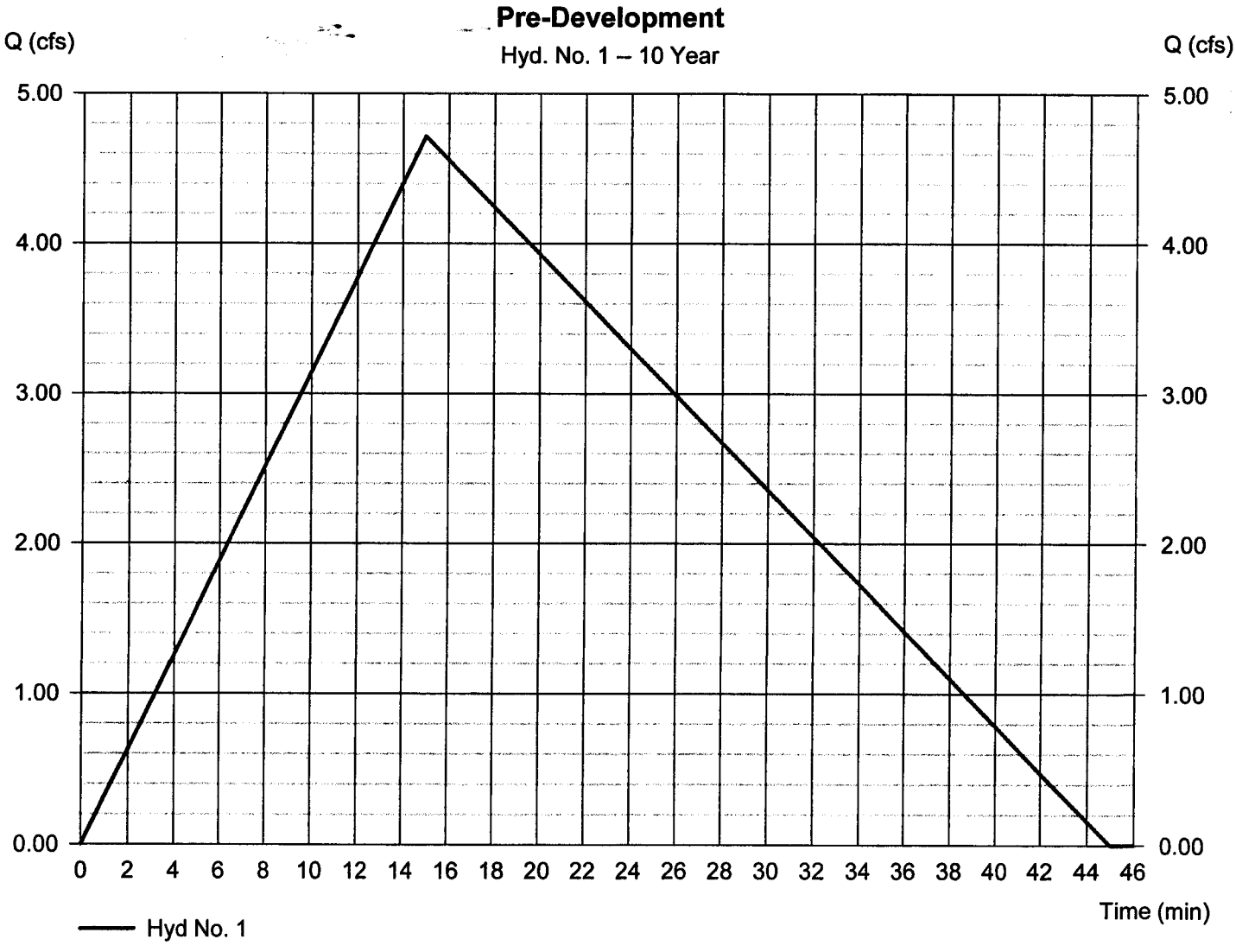
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 4.714 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,364 cuft
Drainage area	= 1.810 ac	Runoff coeff.	= 0.5
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



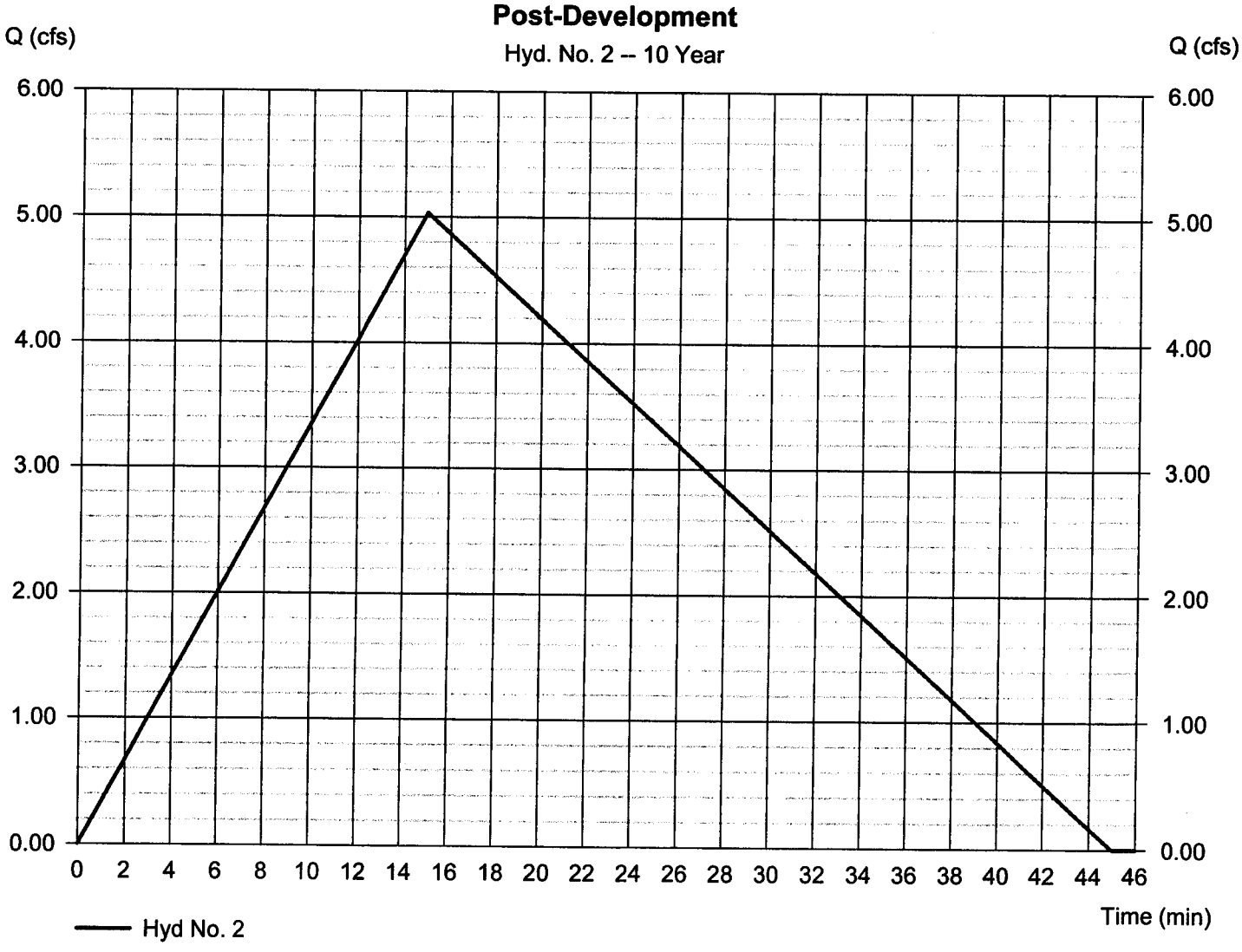
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 5.032 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,793 cuft
Drainage area	= 1.610 ac	Runoff coeff.	= 0.6
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



Hydrograph Report

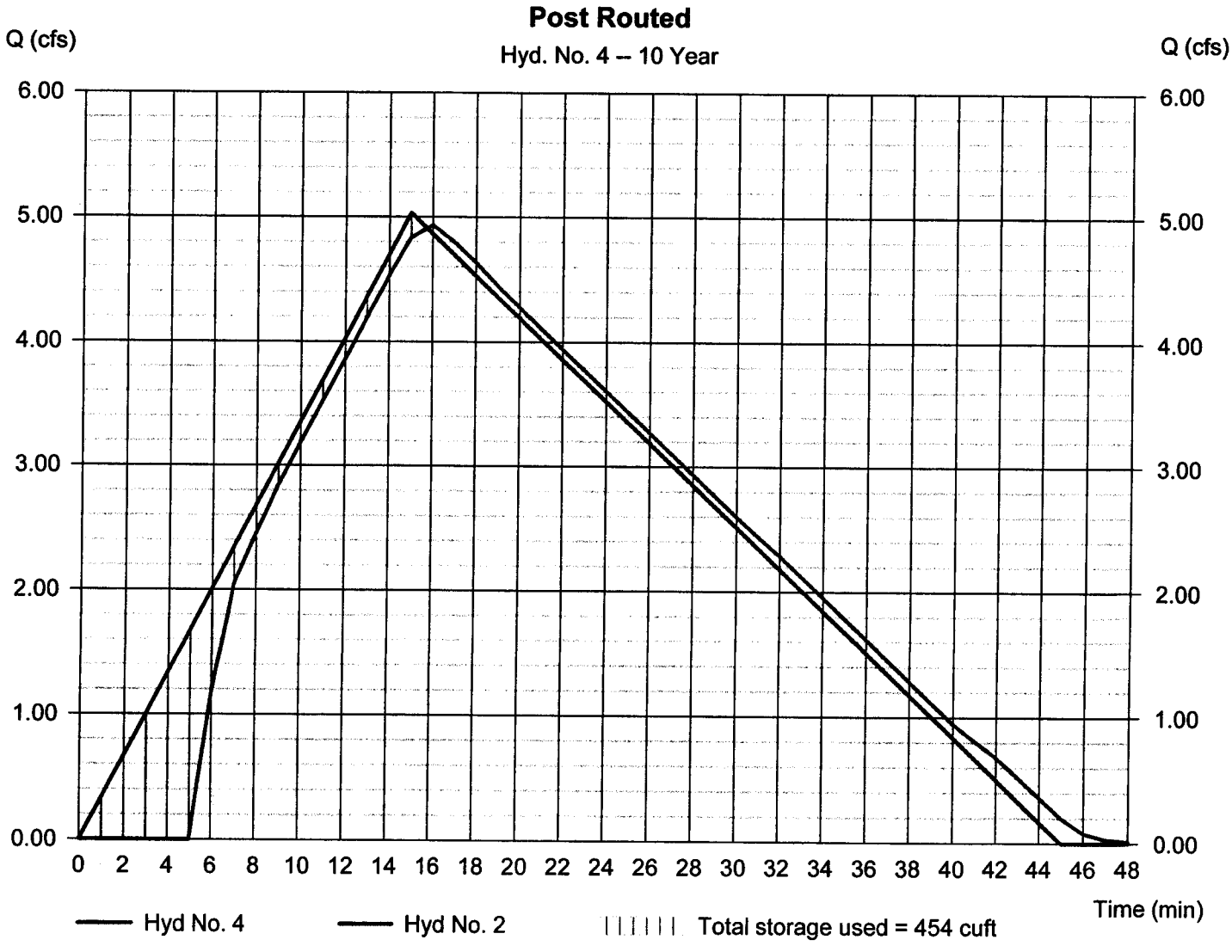
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 4.934 cfs
Storm frequency	= 10 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 6,541 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.41 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 454 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.607	1	15	8,920	------	------	------	Pre-Development
2	Rational	7.053	1	15	9,521	------	------	------	Post-Development
4	Reservoir	6.632	1	17	9,269	2	82.62	564	Post Routed

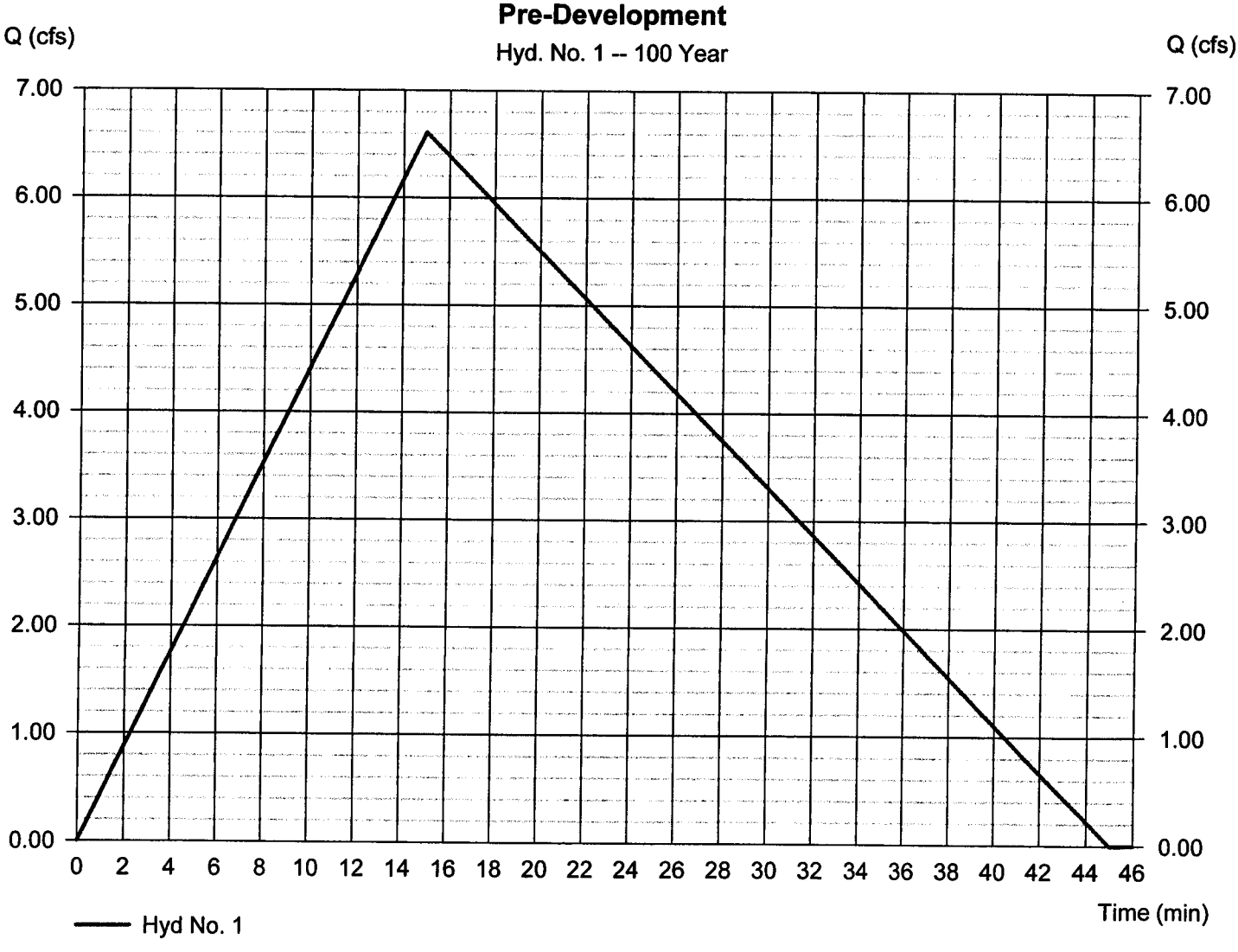
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 6.607 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,920 cuft
Drainage area	= 1.810 ac	Runoff coeff.	= 0.5
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



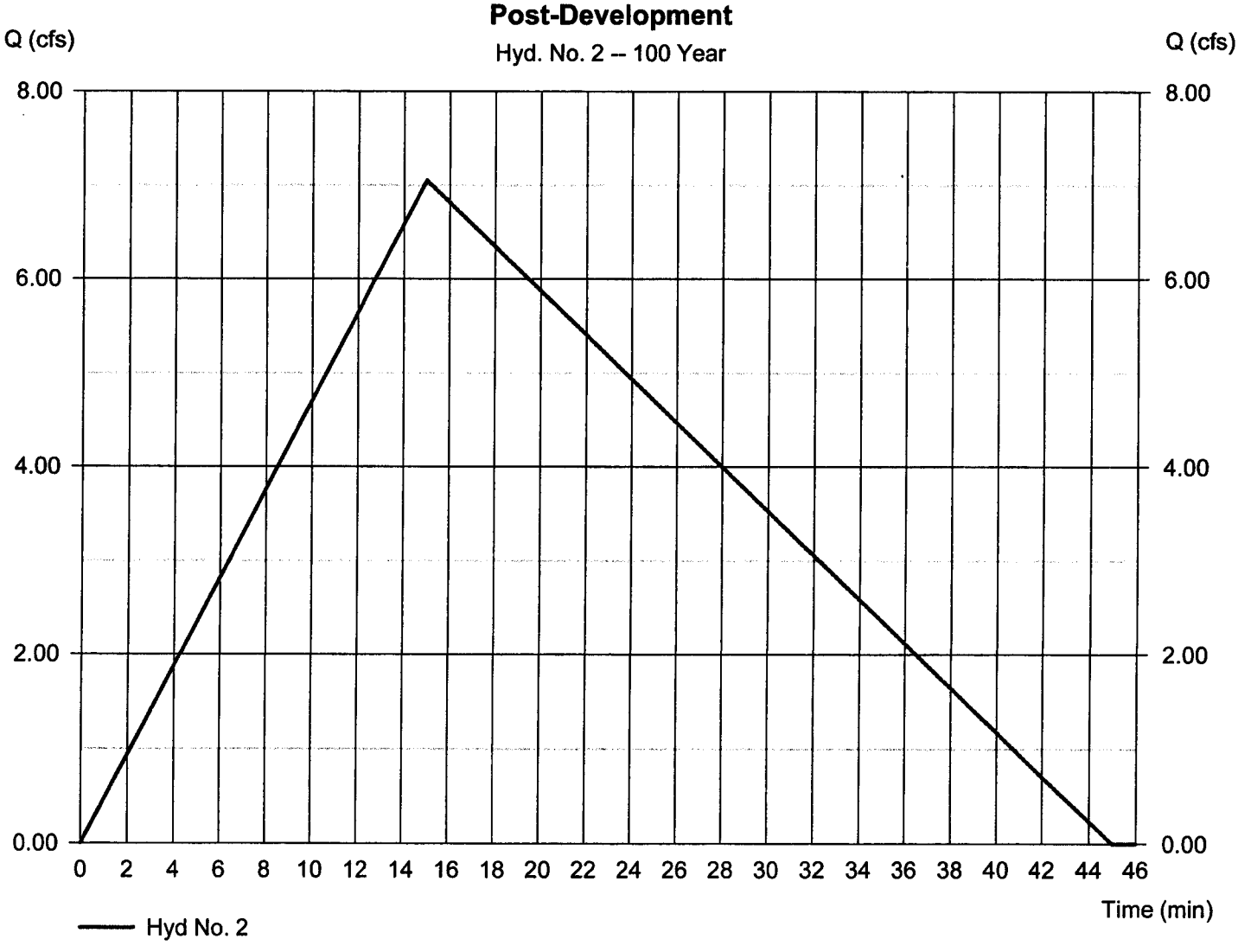
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 7.053 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 9,521 cuft
Drainage area	= 1.610 ac	Runoff coeff.	= 0.6
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



Hydrograph Report

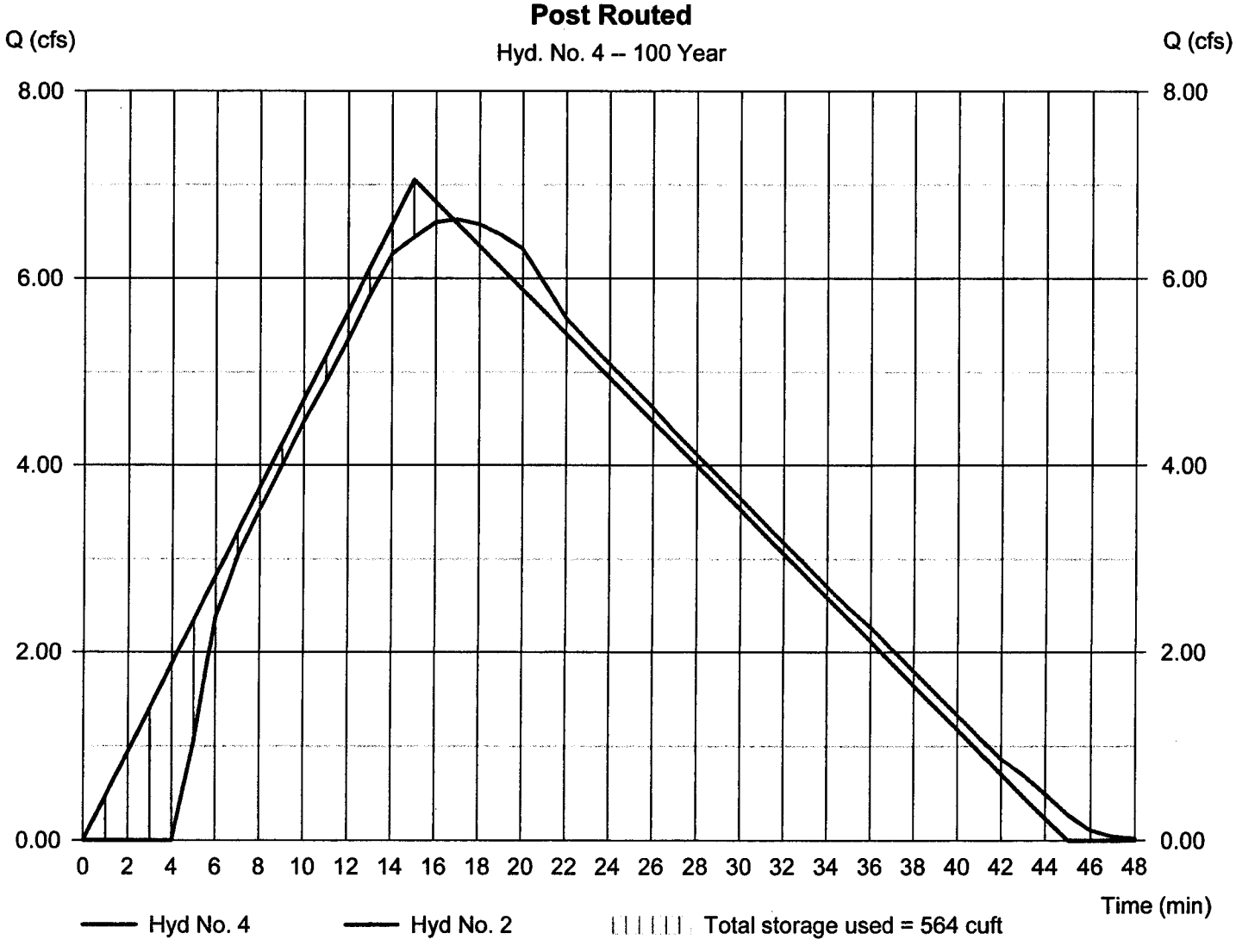
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 8, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 6.632 cfs
Storm frequency	= 100 yrs	Time to peak	= 17 min
Time interval	= 1 min	Hyd. volume	= 9,269 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.62 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 564 cuft

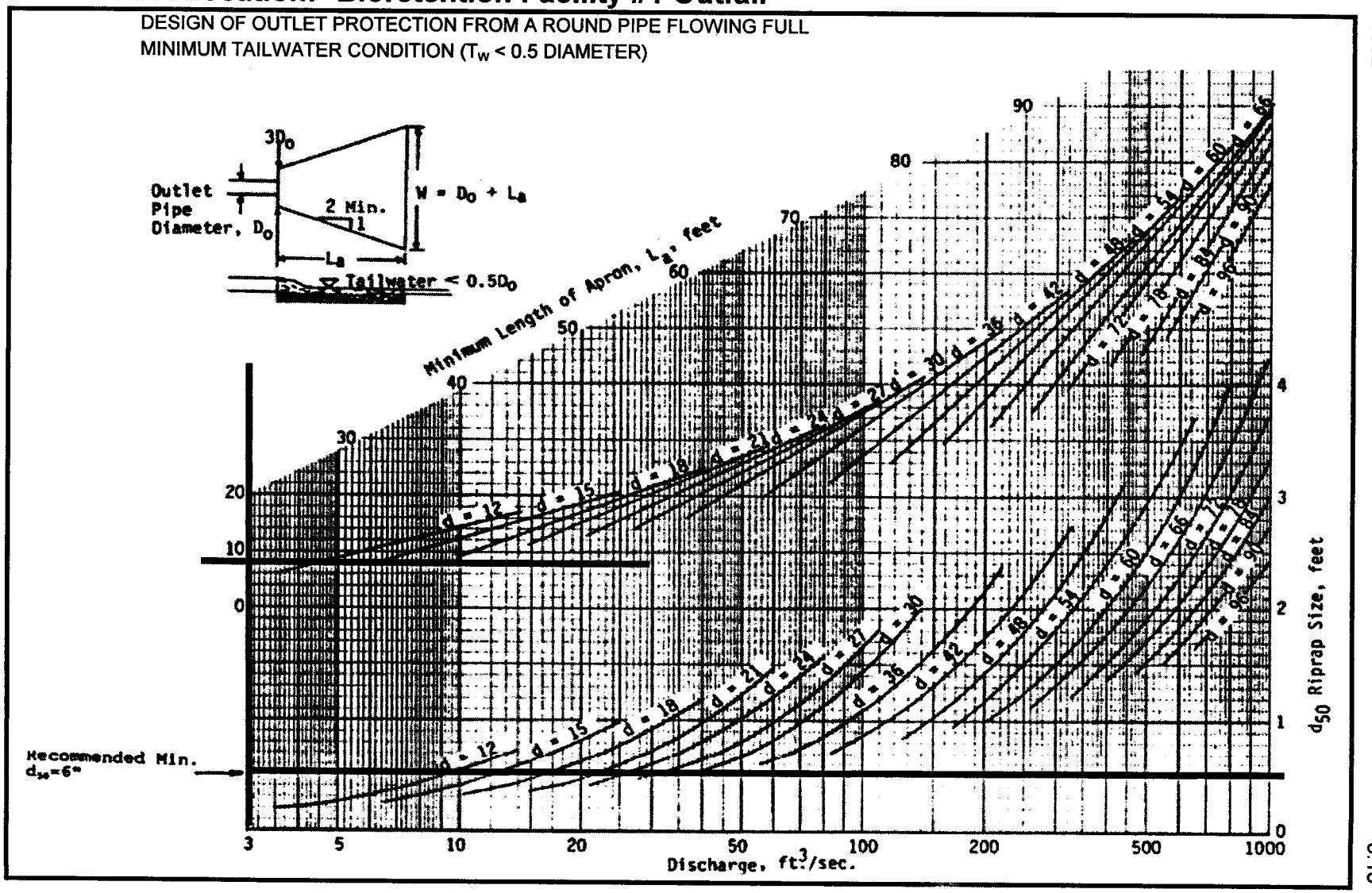
Storage Indication method used.



AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	August 8, 2012
Calculated By:	GVC

Outlet Location: Bioretention Facility #1 Outfall



Q =	6.63	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-3

1992

3.18

Channel Protection

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	1 yr-24 hr Drawdown Calculation
	Kerplunk Method
Date:	August 1, 2012
Calculated By:	GVC

Channel Protection Volume:

Drainage Area	=	8.04	Acres
Runoff Curve No.	=	76	
1-Yr, 24-Hr Storm Volume	=	2.8	Inches

Direct Runoff (From TR55 Equations 2-3 & 2-4)

Q = 0.88 inches

Channel Protection Volume = DA x Q x 60% (Virginia Stormwater Managment Handbook section 5-6.2 - Method 2)

Vcp = 4.26 Ac-in = 15,459 cubic feet

Determine Volume of Pond by Contour (starting at invert of low flow orifice):

Elevation	Incremental Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)	Incremental Avg Head[1] (feet)	Incremental Avg Flow[1] (feet)	Incremental Drawdown Time[1] (hrs)
79.0	0.0	3,237	-	-	-	-			
80.0	1.0	4,538	3,888	144	3,888	144	0.50	0.10	10.46
81.0	1.0	6,100	5,319	197	9,207	341	1.50	0.19	7.62
82.0	1.0	8,800	7,450	276	16,657	617	2.42	0.25	6.95
83.0	1.0	12,000	10,400	385	27,057	1,002	0.00	0.00	0.00
83.0	0.0		-	-	27,057	1,002	0.00	0.00	0.00
83.0	0.0		-	-	27,057	1,002	0.00	0.00	0.00
83.0	0.0		-	-	27,057	1,002	0.00	0.00	0.00
83.0	0.0		-	-	27,057	1,002	0.00	0.00	0.00
83.0	0.0		-	-	27,057	1,002	0.00	0.00	0.00
		Total	27,057	1,002					25.03

[1] Incremental values computed from Channel Protection Volume Elevation

Elevation of Low Flow Orifice Invert	=	79.00	feet	
Elevation of 1-yr, 24-hr Storage Volume	=	81.84	feet	(81.85 - Existing Riser Elev)
Size of Orifice	=	2.50	inches	
Total Average Drawdown Time	=	25.03	hrs	>24 HRS, OK

Hydraflow Table of Contents

W10119-E-19_Expanded Dry Pond.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Thursday, 00 9, 2012

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.509	2	730	22,270	------	------	------	Pre-Development
2	SCS Runoff	6.478	2	730	25,425	------	------	------	Post-Development
4	Reservoir	0.373	2	934	25,406	2	81.64	13,878	Post Routed

Hydrograph Report

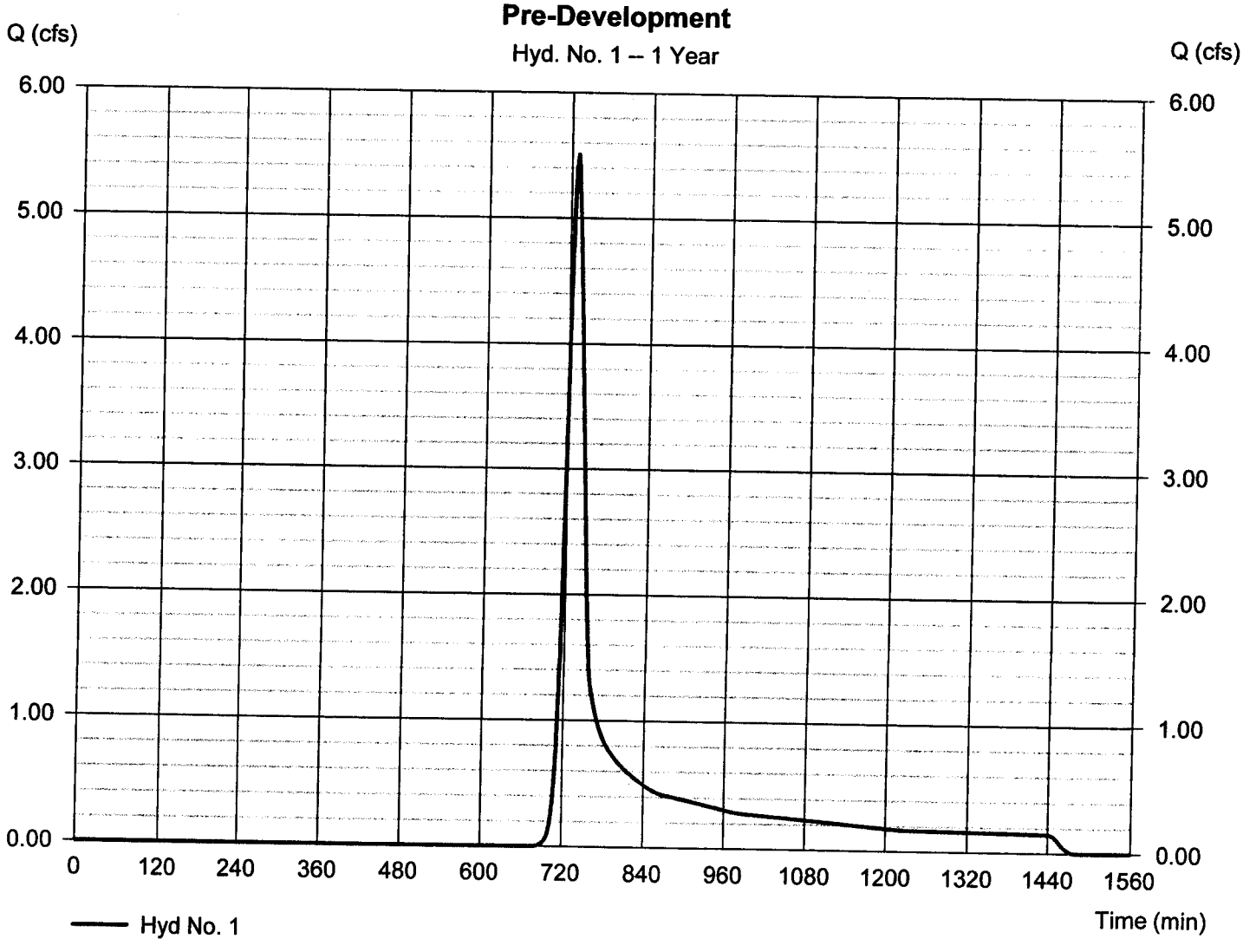
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Thursday, 00 9, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 5.509 cfs
Storm frequency	= 1 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 22,270 cuft
Drainage area	= 7.950 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

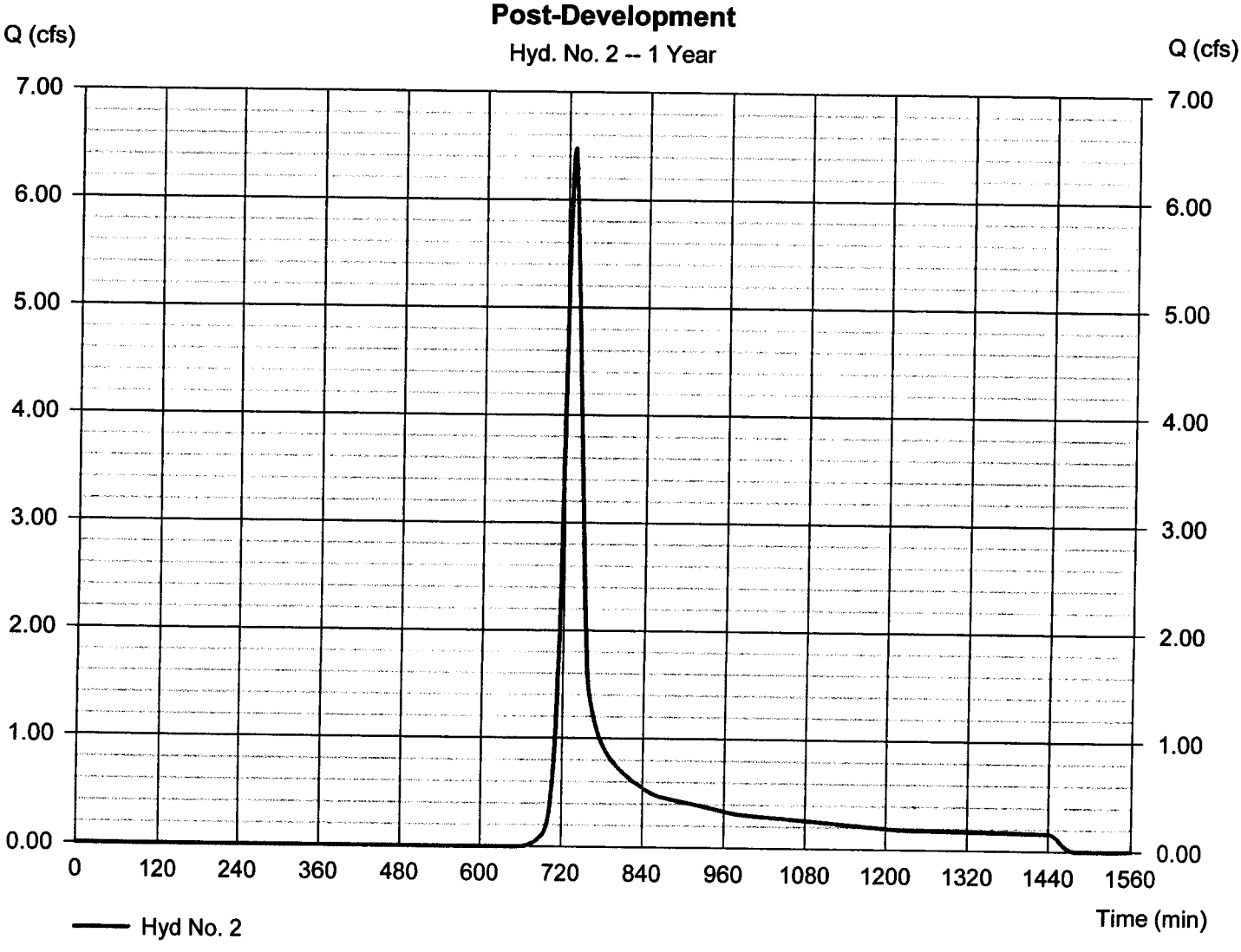
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Thursday, 00 9, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 6.478 cfs
Storm frequency	= 1 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 25,425 cuft
Drainage area	= 8.060 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

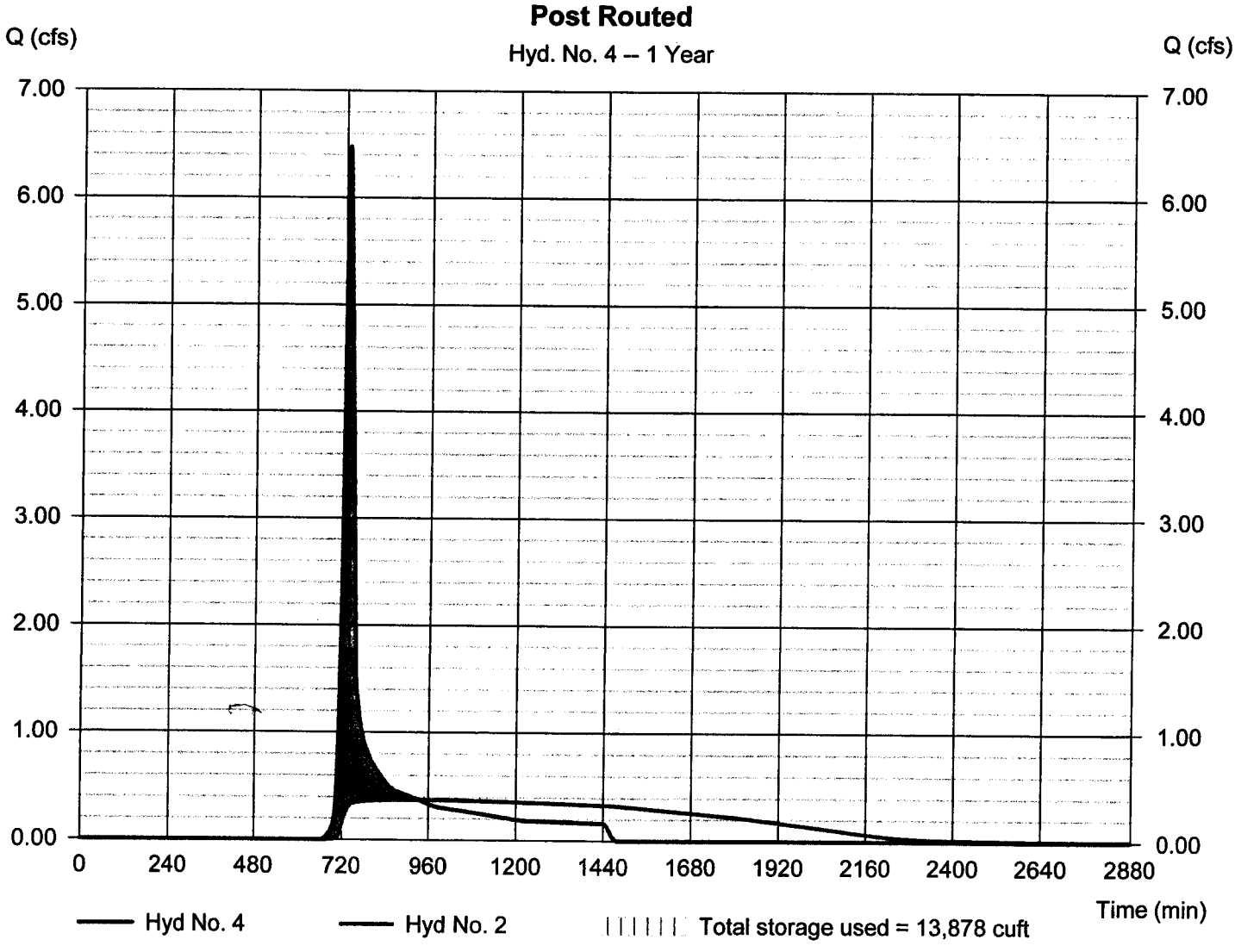
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.373 cfs
Storm frequency	= 1 yrs	Time to peak	= 934 min
Time interval	= 2 min	Hyd. volume	= 25,406 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 81.64 ft
Reservoir name	= Expanded Existing Dry Pond	Max. Storage	= 13,878 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Pond No. 1 - Expanded Existing Dry Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 79.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	79.00	3,237	0	0
1.00	80.00	4,538	3,869	3,869
2.00	81.00	6,100	5,299	9,168
3.00	82.00	8,800	7,408	16,576
4.00	83.00	12,000	10,358	26,934
5.00	84.00	14,500	13,229	40,163

Culvert / Orifice Structures

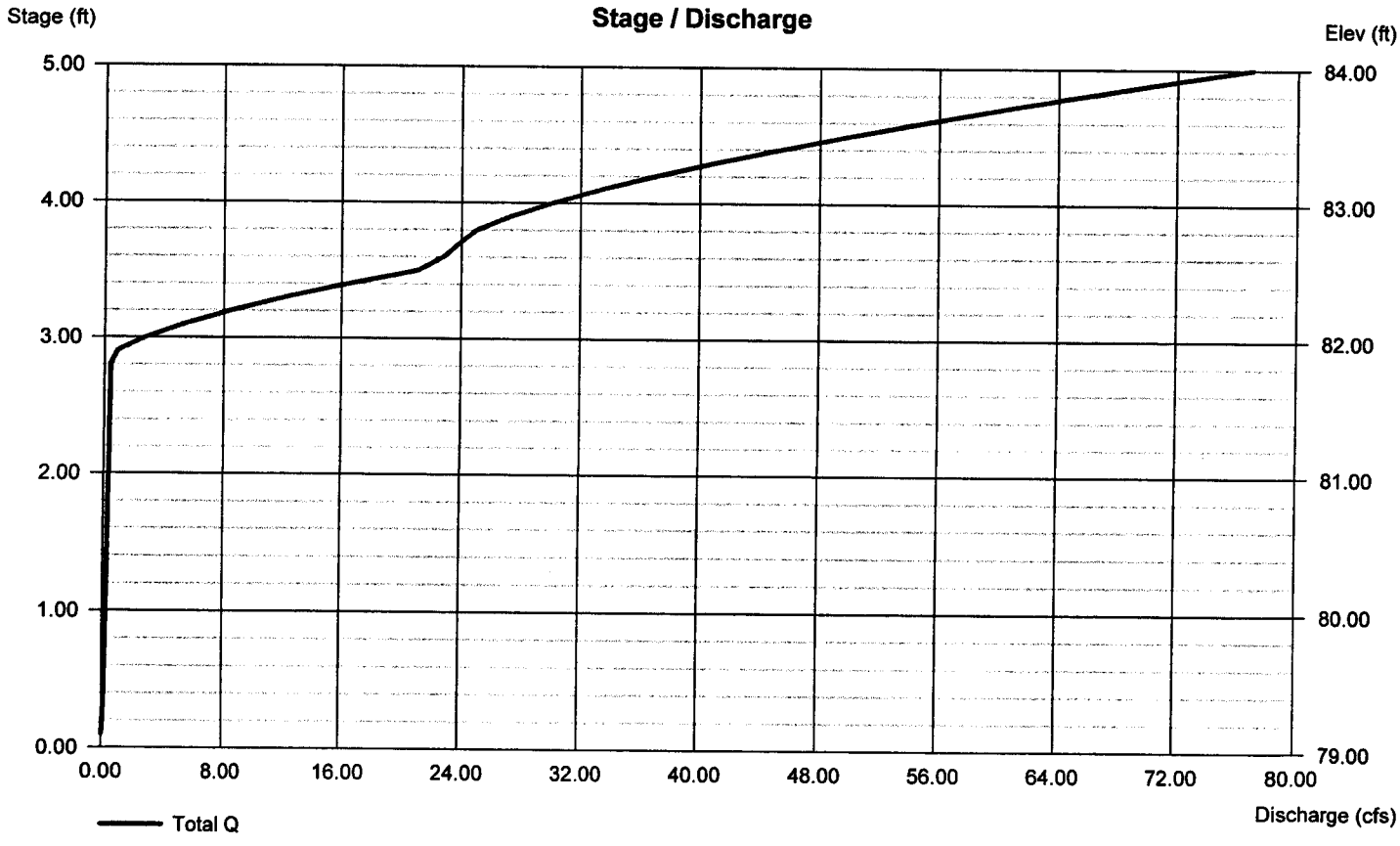
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	3.00	0.00	0.00
Span (in)	= 24.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 78.90	79.00	0.00	0.00
Length (ft)	= 42.00	0.00	0.00	0.00
Slope (%)	= 1.71	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	10.00	0.00	0.00
Crest El. (ft)	= 81.85	82.75	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.178	2	730	35,223	-----	-----	-----	Pre-Development
2	SCS Runoff	10.39	2	730	39,322	-----	-----	-----	Post-Development
4	Reservoir	3.468	2	752	39,303	2	82.03	16,880	Post Routed

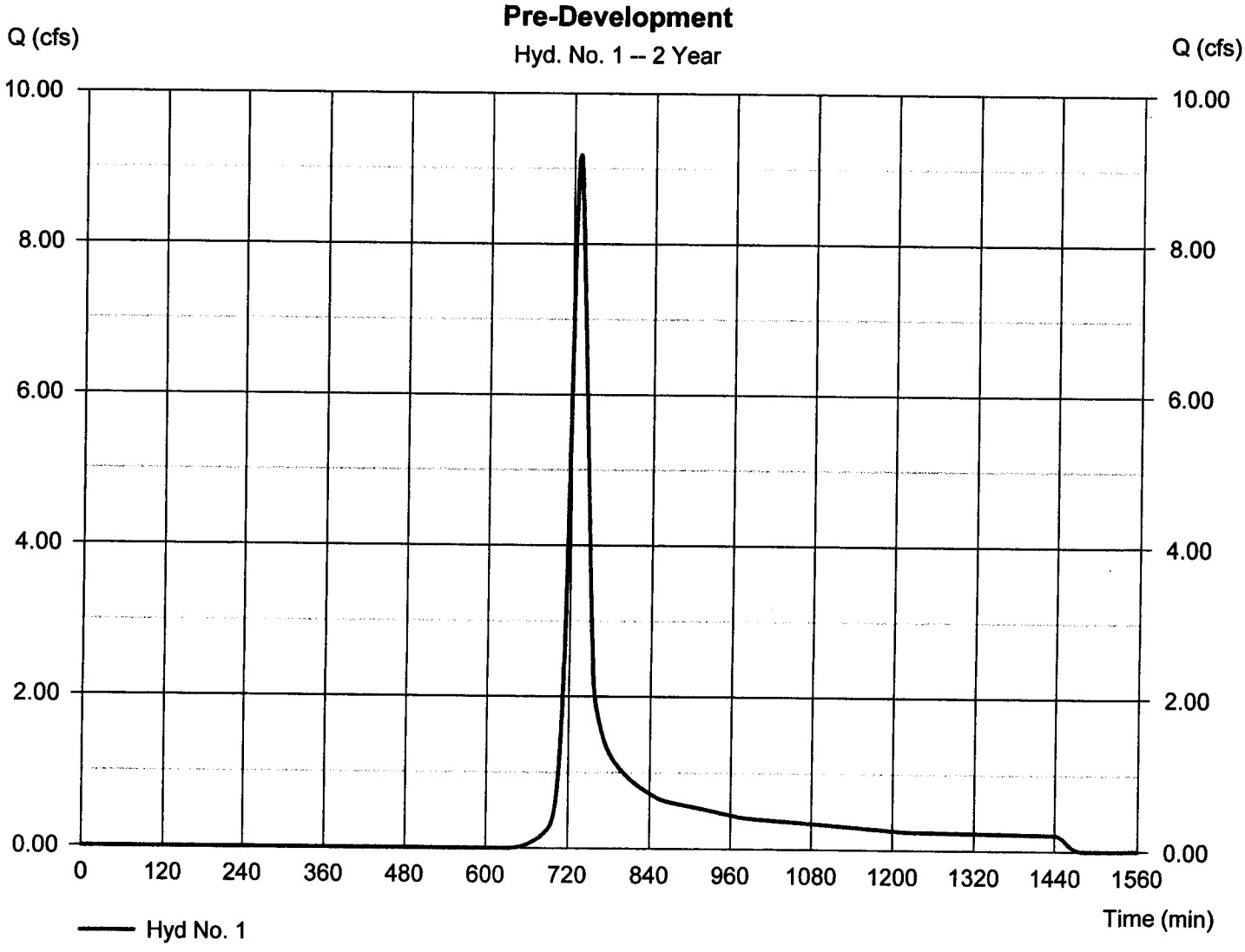
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 9.178 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 35,223 cuft
Drainage area	= 7.950 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



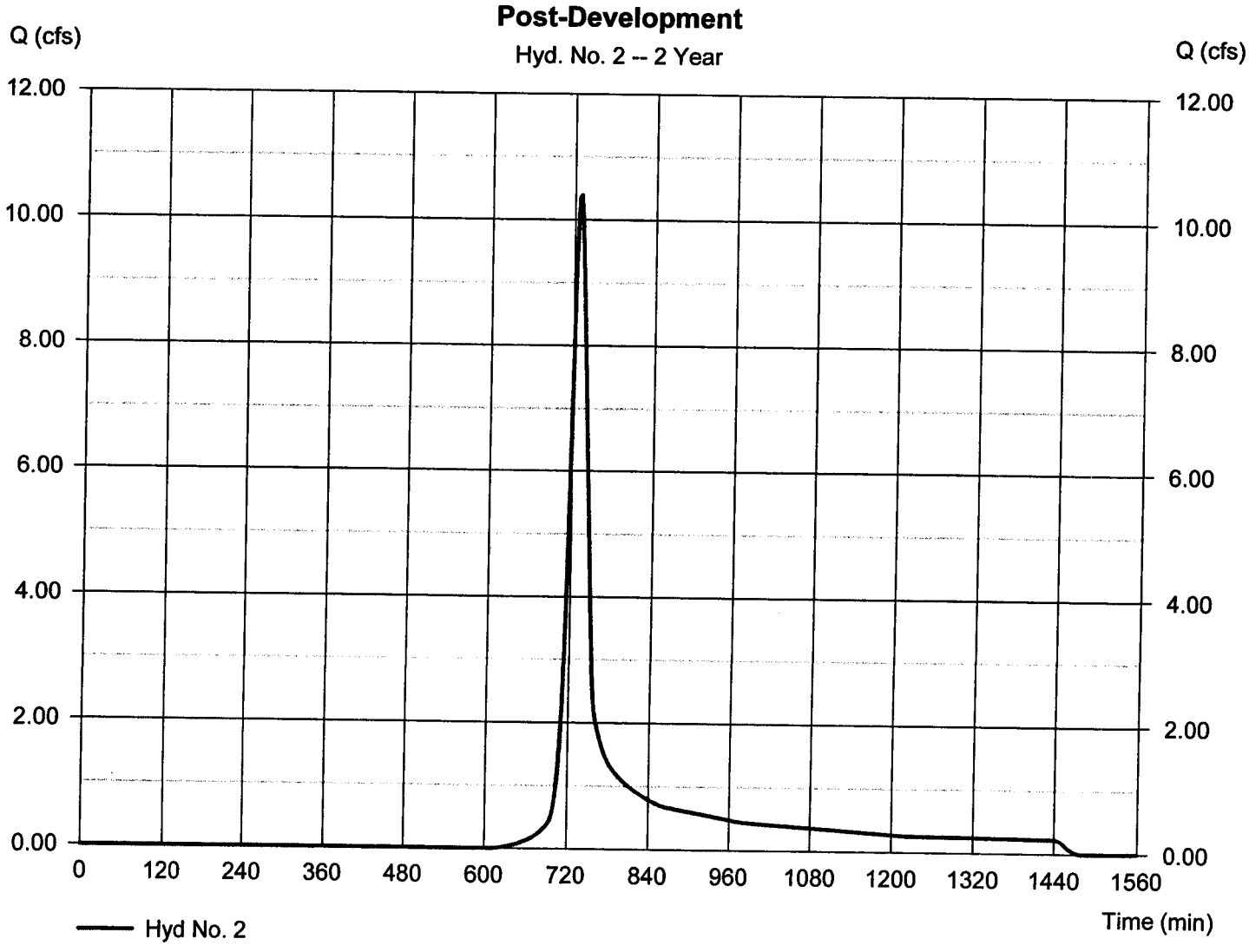
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 10.39 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 39,322 cuft
Drainage area	= 8.060 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

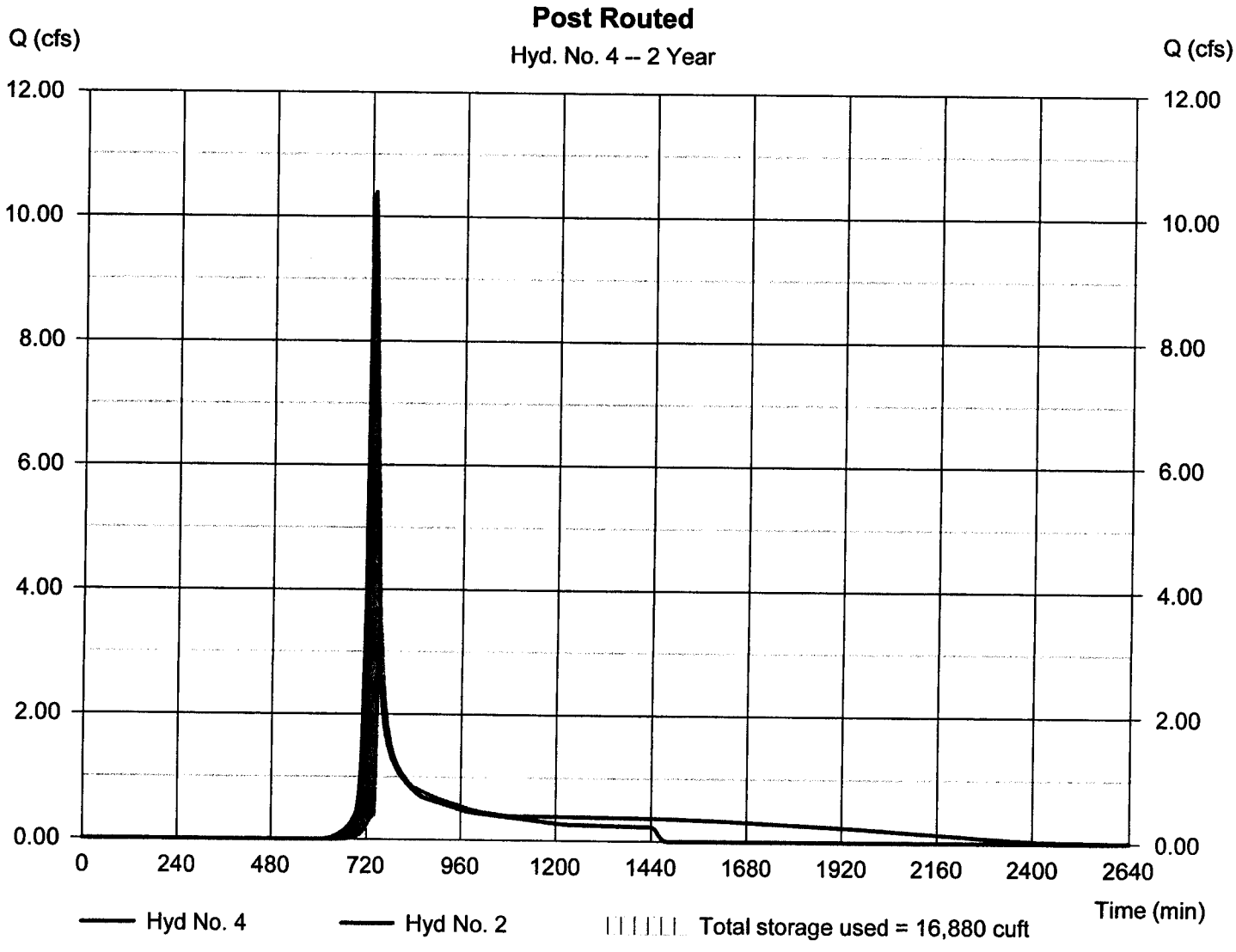
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 3.468 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 39,303 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.03 ft
Reservoir name	= Expanded Existing Dry Pond	Max. Storage	= 16,880 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	23.29	2	728	85,718	------	------	------	Pre-Development
2	SCS Runoff	25.17	2	728	92,398	------	------	------	Post-Development
4	Reservoir	22.05	2	734	92,379	2	82.56	22,308	Post Routed

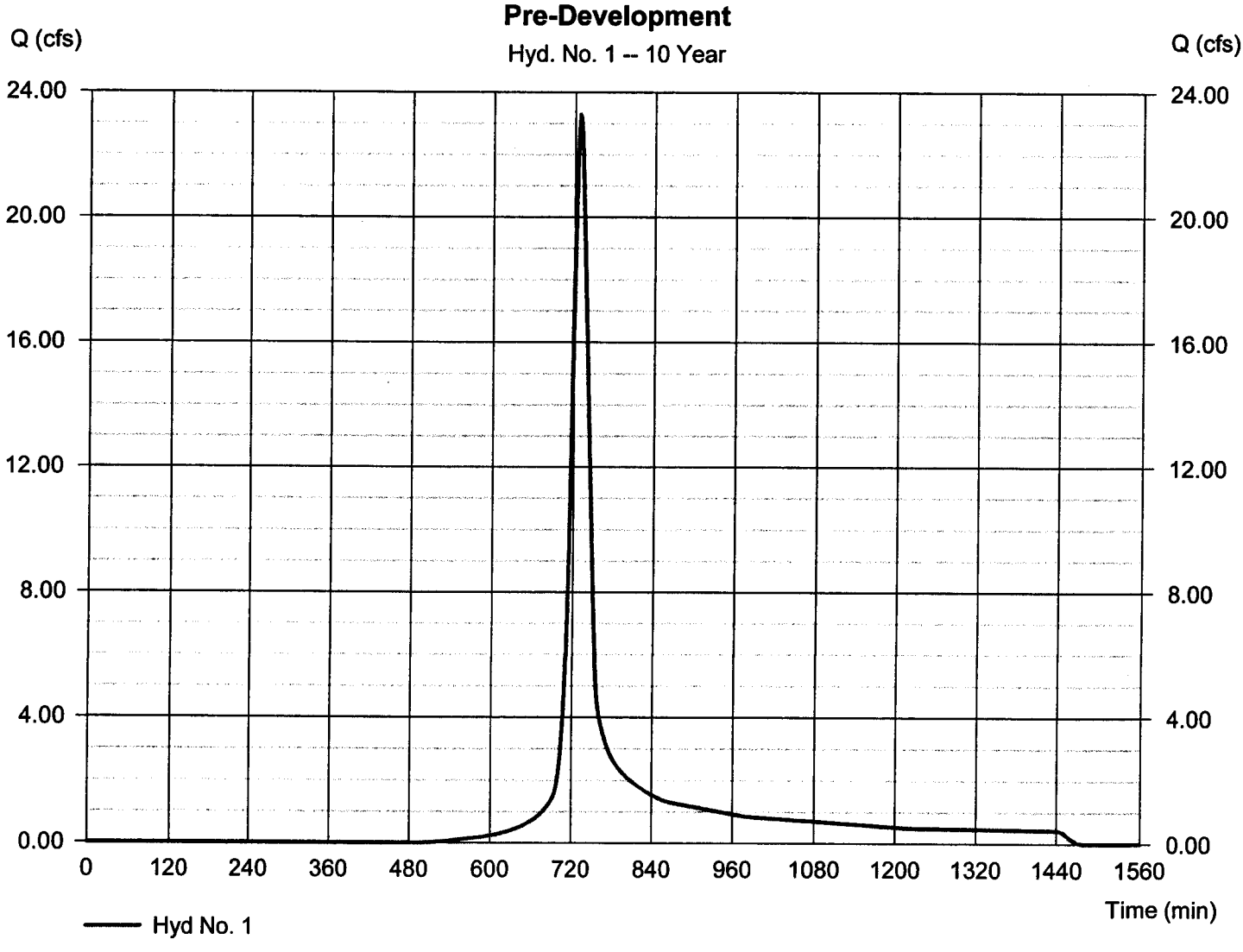
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 23.29 cfs
Storm frequency	= 10 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 85,718 cuft
Drainage area	= 7.950 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



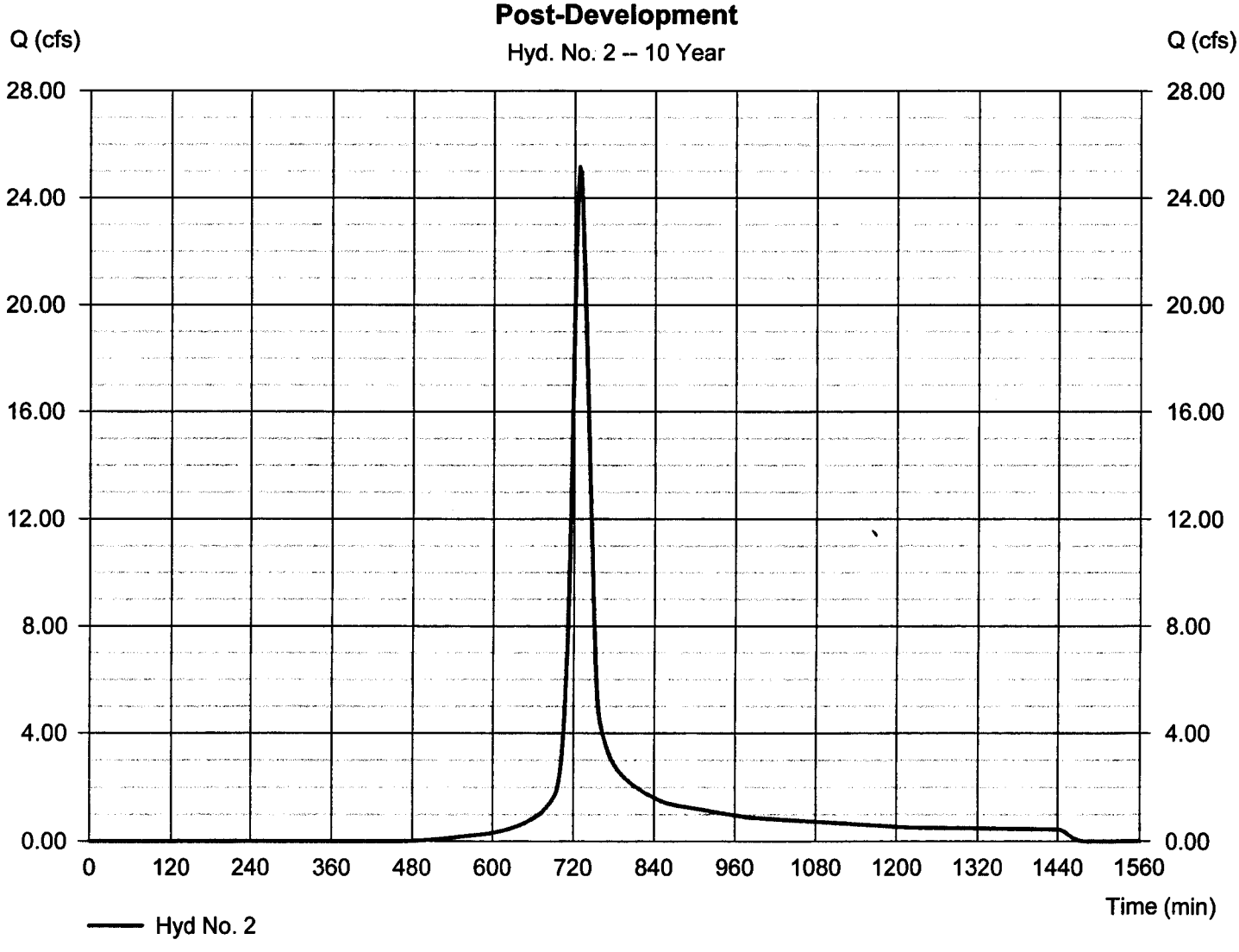
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 25.17 cfs
Storm frequency	= 10 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 92,398 cuft
Drainage area	= 8.060 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

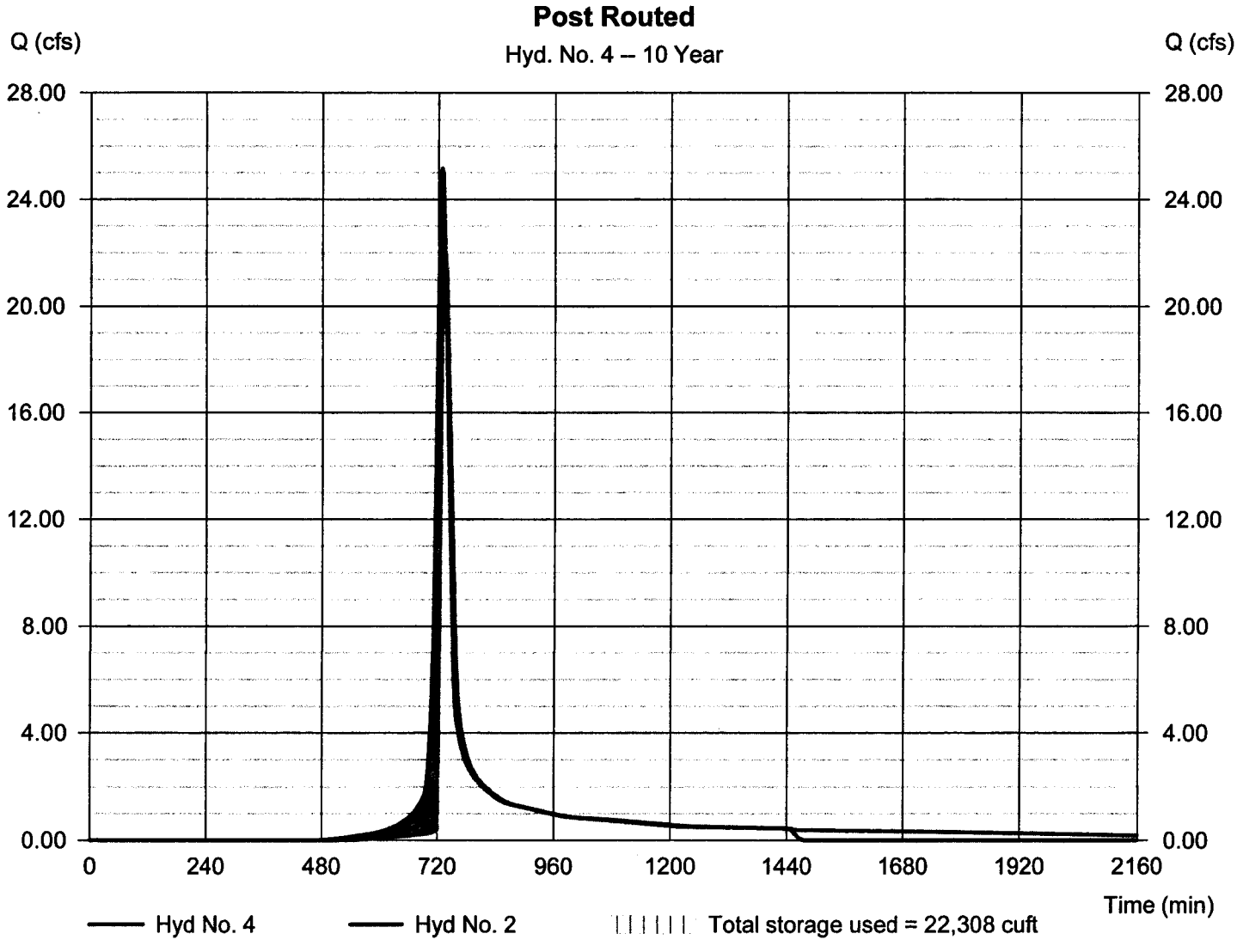
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 22.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 92,379 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.56 ft
Reservoir name	= Expanded Existing Dry Pond	Max. Storage	= 22,308 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	38.11	2	728	139,926	------	------	------	Pre-Development
2	SCS Runoff	40.39	2	728	148,551	------	------	------	Post-Development
4	Reservoir	35.57	2	734	148,531	2	83.16	29,032	Post Routed

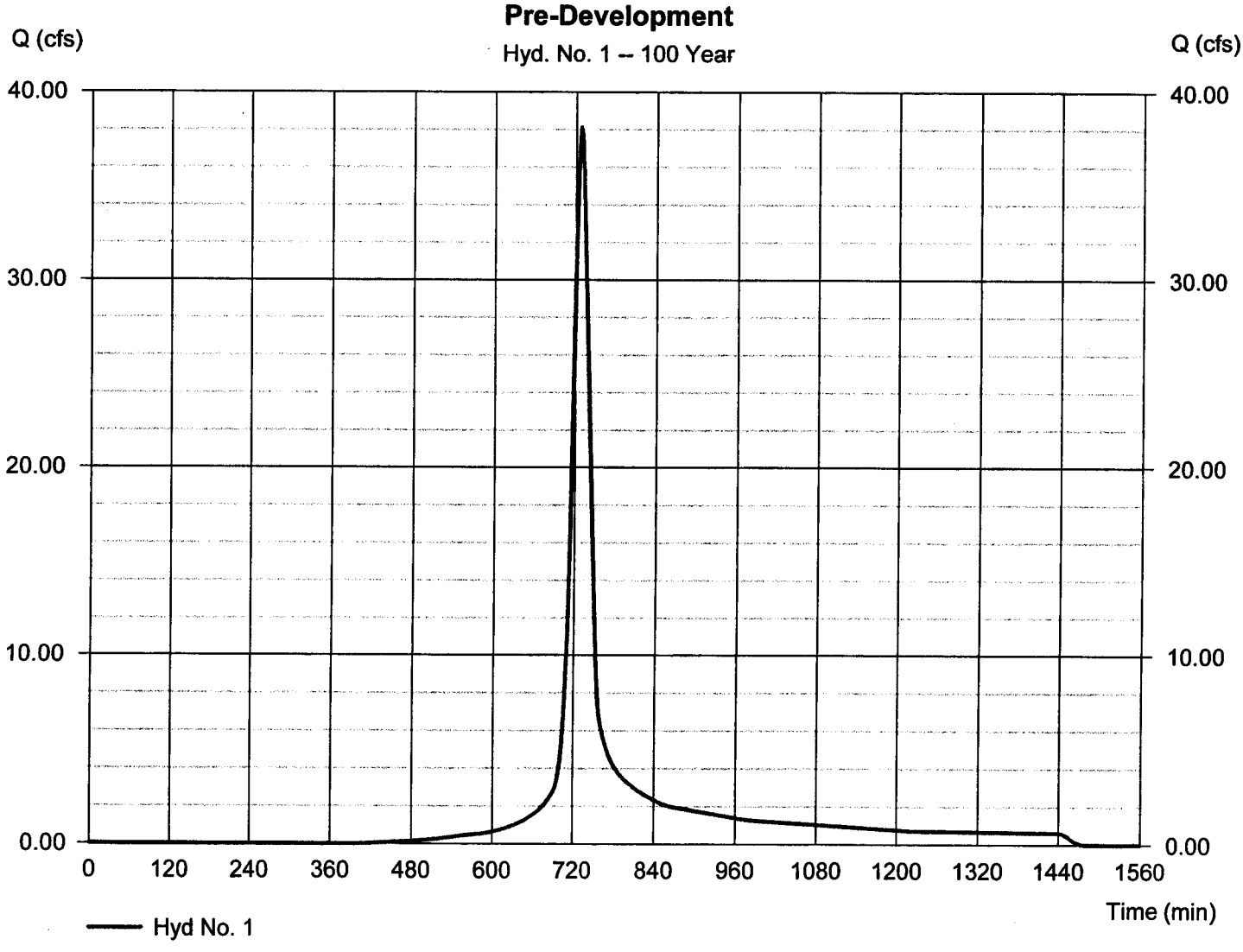
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 38.11 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 139,926 cuft
Drainage area	= 7.950 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



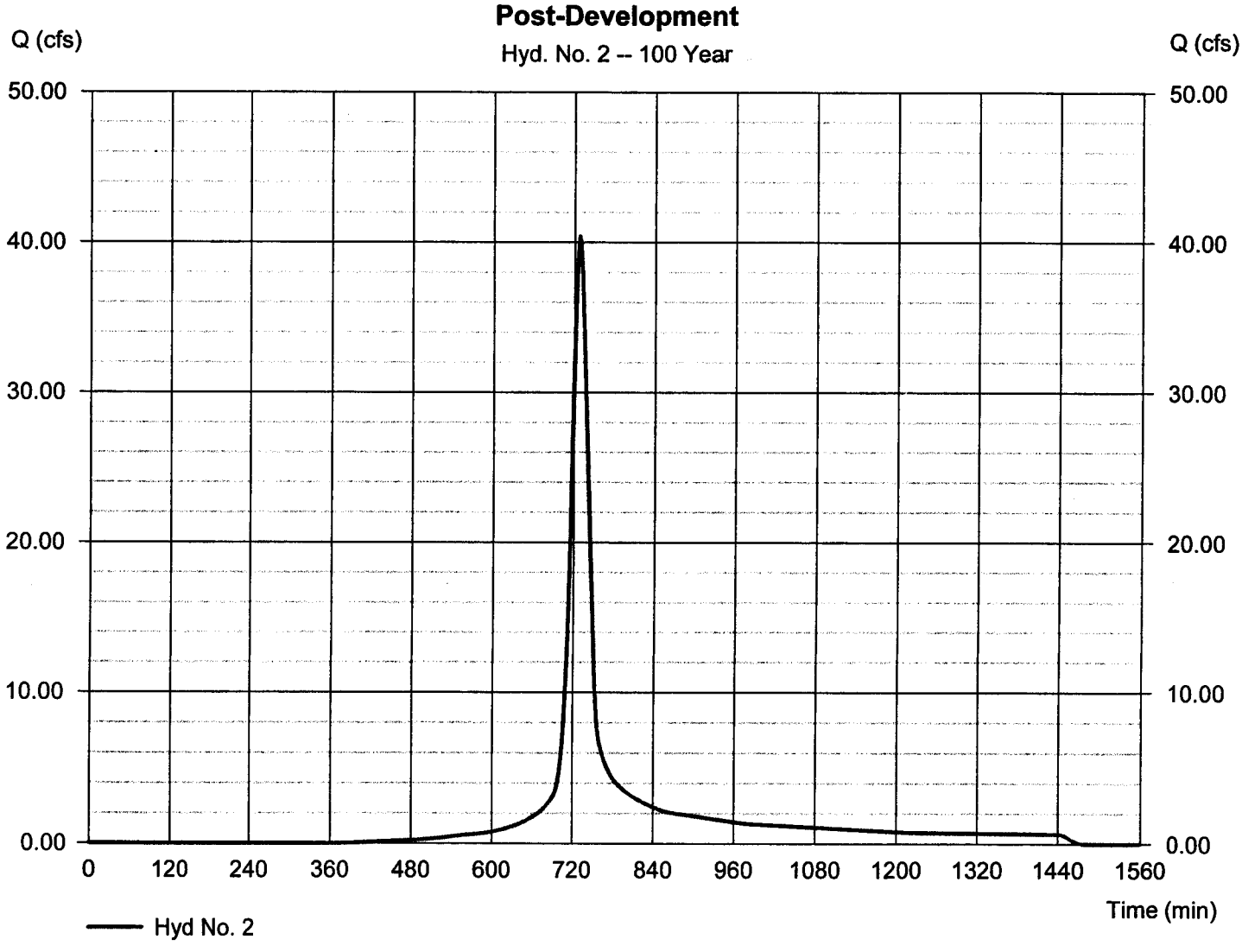
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 40.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 148,551 cuft
Drainage area	= 8.060 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.00 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

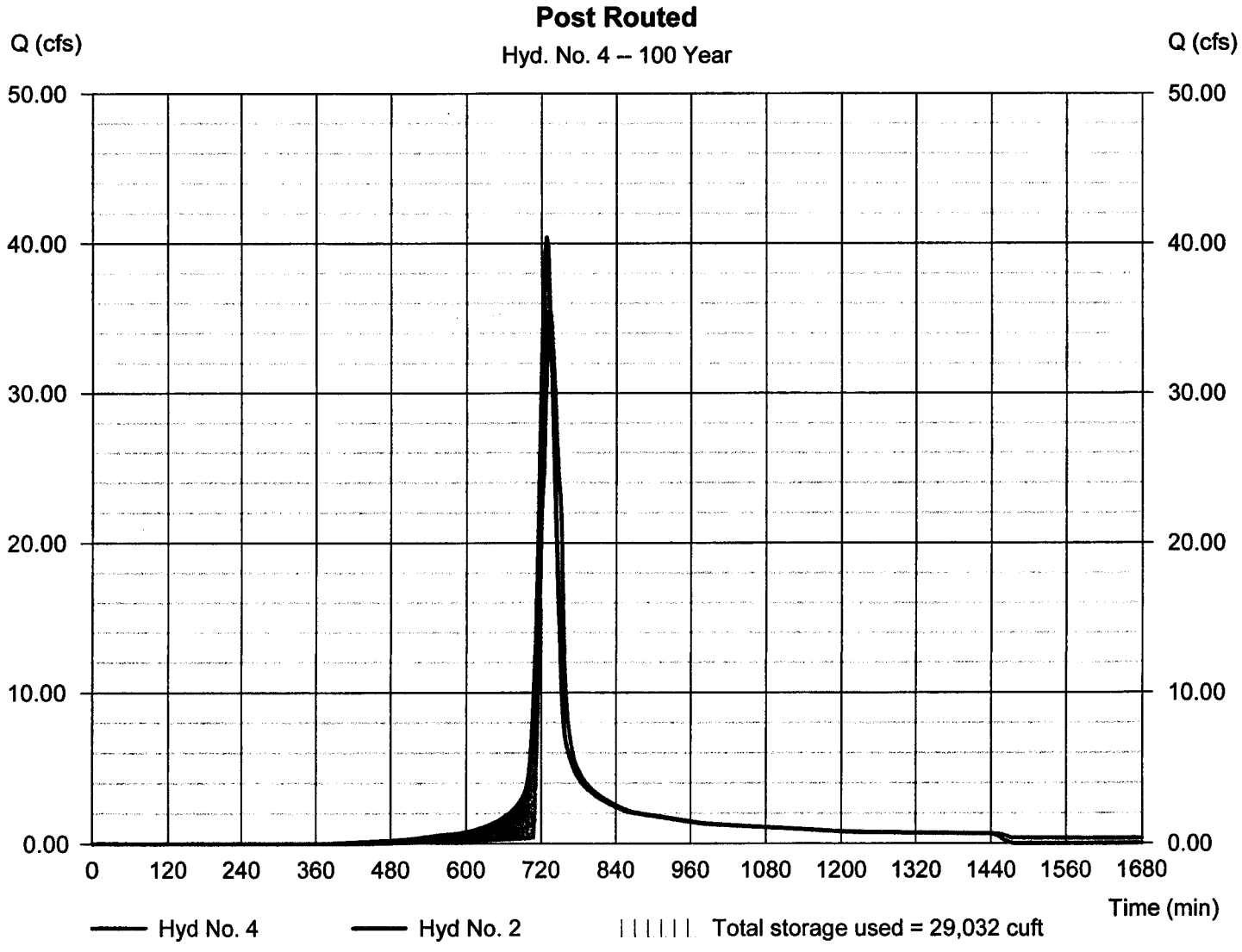
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 9, 2012

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 35.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 148,531 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 83.16 ft
Reservoir name	= Expanded Existing Dry Pond	Max. Storage	= 29,032 cuft

Storage Indication method used.



APPENDIX D

DRAINAGE AREA MAPS

(Submitted with this report)

NOT APPROVED PLAN

DRAINAGE CALCULATIONS

FOR

MID COUNTY PARK

PLANNING DIVISION
JUL 02 2012
RECEIVED

SITE:

James City County

SUBMITTED TO:

Environmental Division
James City County

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
PROFESSIONAL ENGINEER

Prepared By:

AES Consulting Engineers
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188

Environmental Division
JUL - 5 2012
RECEIVED

June 29, 2012

AES Project No. W10119-E-19

W10119-E-19_Stormwater Management Report.doc

AES
CONSULTING ENGINEERS

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IV OFFSITE AREAS
V SOILS
VI CRITICAL EROSION AREAS
VII EROSION & SEDIMENT CONTROL MEASURES
VIII STORMWATER MANAGEMENT & WATER QUALITY
IX STORM SYSTEM, SWALE AND CULVERT ANALYSIS
X RESULTS AND CONCLUSIONS

APPENDIX A Erosion & Sediment Control Calculations

APPENDIX B Storm System, Swale, and Culvert Calculations

APPENDIX C Stormwater Management Calculations

APPENDIX D Drainage Map

STORM WATER NARRATIVE

I PROJECT DESCRIPTION

This plan contains a multi-phase project for improvements in Mid County Park. The first phase (Phase 1) of this project consists of the replacement of the office building, relocation and remodel of the Kidsburg playground area, the addition of a Splash Park, parking lot upgrades, and stormwater management facilities. The stormwater facilities consist of two bioretention facilities.

The next phases of this project (Phases 2 through 4) will include the addition of a 150 seat shelter and more improvements to existing parking lots. Stormwater management is provided for these next phases through the use of an additional bioretention facility.

II EXISTING SITE CONDITIONS

This site is currently developed as a park. The majority of the stormwater runoff is currently conveyed overland to existing onsite stormwater management facilities. These consist of dry swales with check dams on the southern and western sides of the properties.

III ADJACENT PROPERTIES

The proposed site is bordered on the south by Ironbound Road (State Route 615), on the east by News Road (Route 613), and on the north by Monticello Avenue (State Route 1471). West of the project is Steeplechase Apartments and Greensprings Chapel.

IV OFFSITE AREAS

There is one area of offsite disturbance associated with the waterline connection located in the Monticello Ave. right-of-way.

V SOILS

The project area consists of 11C-Craven-Uchee complex, 19B Kempsville-Emporia Fine Sandy Loam, and 29B-Slagle Complex with slopes ranging from 2 to 10 percent.

VI CRITICAL EROSION AREAS

There are no critical erosion areas or areas of 25% slope impact associated with this project.

VII EROSION & SEDIMENT CONTROL MEASURES

Erosion & Sediment Control is provided for this project through the use of sediment traps and other erosion and sediment control measures. Sediment traps are provided in the location of the propose BMPs allowing for their conversion at the completion of construction. Silt fence, tree protection, inlet protection, etc., is provided where appropriate on the site. See plan sheet C-05 for the Phase 1 erosion and sediment control plan and sheet C-08 for Phase 2.

VIII STORMWATER MANAGEMENT & WATER QUALITY

Because this project is a redevelopment project, the required pollutant discharge for the site is based on the existing conditions less 10%. Stormwater Management and water quality will be attained for this project through the use of three stormwater management facilities. These include two bioretention facilities that are part of Phase 1 construction, and one bioretention facility that is part of Phase 2 Construction.

As shown in the Appendix C, water quality calculations have been provided for the first two phases of construction. The water quality provided by Bioretention Facilities #1 and #2 are shown to be sufficient in treating the runoff from the increase in impervious cover associated with Phase 1 construction. This means that the construction of Bioretention Facility #3 can be delayed until Phase 2 Construction begins. Including the additional impervious cover associated with Phases 2 & 4, Bioretention Facility #3 becomes necessary to provide the required water quality for the fully developed site.

Runoff from the proposed building area, the northern end of the main parking lot, and the renovated playground will be treated by Bioretention Facility #1. Runoff will be conveyed via sheet flow to a system of storm systems, grass swales, and culverts and eventually into the facility. The facility has been sized based on containing the first flush runoff volume of one inch per impervious acre. A total of 1.2 acres of impervious cover are treated by Bioretention Facility #1, which requires a treatment volume of 4,356 cf. 5,224 cf of storage is provided from the bottom of the facility (elev=83.0) to the outfall elevation of 84.19. The facility will utilize an existing culvert as its outfall pipe. Information about pre-development and post-development flows for Bioretention Facility #1 is shown below:

Bioretention Facility #1

	Pre-Dev. Flow (cfs)	Pre- Dev. Flow Routed through Existing Culvert (cfs)	Post- Dev. Flow (cfs)	Post- Dev.Flow Routed through Facility (cfs)	Water Surface Elevation (ft)
2-Year	6.12	5.37	7.6	0.33	84.45
10-Year	8.19	7.37	10.19	1.45	84.77
100-Year	11.48	10.96	14.28	3.44	85.16

Flow routed through Bioretention Facility #1 outfalls into a swale that conveys it to an existing BMP. This BMP consists of a dry swale system with check dams and a small bioretention/pond area. As shown in the table, proposed runoff from the area treated by the facility has been attenuated to well below pre-development conditions, and therefore will not overwhelm the existing BMP.

Runoff from the southern side of the existing parking lot and the bus parking area will be treated by Bioretention Facility #2. Runoff will be conveyed via sheet flow to a system of storm systems, then into grass swales before discharging into the facility. The facility has been sized based on containing the first flush runoff volume of one inch per impervious acre. A total of 0.85 acres of impervious cover are treated by Bioretention

Facility #2, which requires a treatment volume of 3,086 cf. 3,678 cf of storage is provided from the bottom of the facility (elev=83.0) to the outfall elevation of 83.53. The facility will utilize an existing culvert as its outfall pipe. Information about pre-development and post-development flows for Bioretention Facility #2 is shown below:

Bioretention Facility #2

	Pre-Dev. Flow (cfs)	Pre- Dev. Flow Routed through Existing Culvert (cfs)	Post- Dev. Flow (cfs)	Post- Dev.Flow Routed through Facility (cfs)	Water Surface Elevation (ft)
2-Year	6.47	5.64	6.97	0.024	83.60
10-Year	8.48	7.34	9.14	0.29	83.77
100-Year	11.74	10.45	12.64	1.09	84.02

Flow routed through Bioretention Facility #2 outfalls directly into an existing BMP. This BMP consists of a dry swale system with check dams. As shown in the table, proposed runoff from the area treated by the facility has been attenuated to well below pre-development conditions, and therefore will not overwhelm the existing BMP.

Runoff from the back parking lot associated with Phase 2 and Phase 4 of construction will be treated by Bioretention Facility #3. Runoff will be conveyed via sheet flow and curb and gutter into the facility. The facility has been sized based on containing the first flush runoff volume of one inch per impervious acre. A total of 0.60 acres of impervious cover are treated by Bioretention Facility #3, which requires a treatment volume of 2,178 cf. 2,212 cf of storage is provided from the bottom of the facility (elev=80.33) to the outfall elevation of 81.33. The facility will utilize a VDOT DI-7 outlet structure with a 3" orifice drilled at the outfall elevation that helps attenuate the flow. A trash/debris guard is provided at the orifice to prevent clogging. Information about pre-development and post-development flows for Bioretention Facility #3 is shown below:

Bioretention Facility #3

	Pre-Dev. Flow (cfs)	Pre- Dev. Flow Routed through Existing Culvert (cfs)	Post- Dev. Flow (cfs)	Post- Dev.Flow Routed through Facility (cfs)	Water Surface Elevation (ft)
2-Year	3.70	2.08	4.97	0.19	82.10
10-Year	4.96	2.58	6.66	0.25	82.55
100-Year	6.95	4.61	9.33	0.31	83.20

Flow routed through Bioretention Facility #3 outfalls directly into the same existing BMP as Bioretention Facility #1. As shown in the table, proposed runoff from the area treated by the facility has been attenuated to well below pre-development conditions, and therefore will not overwhelm the existing BMP.

In the example bioretention facility shown in the James City County BMP Manual, four feet of bioretention is provided. Due to topographic restrictions and the necessity of

having the underdrain outfall on the park's property, 30" of bioretention is provided in each of the facilities associated with this project. Each bioretention facility will have a cross section consisting of two inches of mulch, thirty inches of bioretention soil material, and eight inches of stone with a 6" perforated underdrain. The underdrain pipe will lay flat and help drain the facility once the water has fully permeated through the bioretention material. As shown in the plans, 6" HDPE pipe will convey any underdrain flow from Bioretention Facilities #1 and #2 to the existing BMP on site consisting of dry swale with check dams and small bioretention/pond area. Underdrain flow from Bioretention Facility #3 will be conveyed to an existing swale on the West side of the property.

IX STORM SYSTEM, SWALE, AND CULVERT ANALYSIS

The runoff from the main parking lot will be collected into storm drainage systems installed as part of this project. These consist of several pipes and inlets located through the parking lot. The storm drainage system is analyzed using Rational Method with a minimal time of concentration and therefore maximum intensity. All pipes are oversized to minimize losses within the system and maintain the lowest possible HGL based on the computations. It should be further noted that the Hydraflow Software utilized for the design does not account for inlet shaping within the inlets, which reduces the junction losses at each inlet and therefore lowers the actual HGL within the system when compared to design.

Each swale on site was analyzed to determine velocity and capacity during 2-year and 10-year events. These computations can be found in the attached information for each swale.

Each culvert was checked to confirm adequacy and calculations are provided in the attached information.

X RESULTS & CONCLUSIONS

Through the use of the bioretention facilities, water quality is provided to the entire redeveloped site. In addition, in accordance with MS-19 the 2 and 10 year storm peak flow are detained to a rate lower than the predeveloped condition. All three of the bioretention facilities convey flow into existing BMPs at levels less than predeveloped conditions. Through the use of grass swales, storm systems, and multiple stage stormwater management facilities, much of the storm runoff will be utilized by the plantings in the facilities and any runoff leaving the site is drastically slowed down and attenuated.

APPENDIX A

EROSION & SEDIMENT CONTROL CALCULATIONS

Sediment Trap Caculations
Temporary Slope Drain Calculations
TSD Outfall Protection Calculations

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Sediment Trap Design
	Sediment Trap #1
Date:	6/5/2012
Calculated By:	GVC

Drainage Area to Sediment Trap = **2.86** Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = **192** cubic yards, or **5,174** cubic feet

Required Dry Storage = 67 cy/acre * (Drainage Area) = **192** cubic yards, or **5,174** cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
83	0	3074	0	0	0	0
84	1	3832	3453	128	3453	128
85	1	4662	4247	157	7700	285
86	1	5566	5114	189	12814	475
86	0		0	0	12814	475
86	0		0	0	12814	475
86	0		0	0	12814	475

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = **17.16** feet

Elevation of Wet Storage Volume = **84.41** (Use 84.50)

Elevation of Dry Storage Volume = **85.52** (Use 86.00)

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = **83.75**

Top Width of Embankment (H_O = 1.1 ft.) = **3** feet

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Sediment Trap Design
	Sediment Trap #2
Date:	6/5/2012
Calculated By:	GVC

Drainage Area to Sediment Trap = 2.06 Acres

Required Wet Storage = 67 cy/acre * (Drainage Area) = 138 cubic yards, or
3,727 cubic feet 6

Required Dry Storage = 67 cy/acre * (Drainage Area) = 138 cubic yards, or
3,727 cubic feet

Determine Volume of Sediment Trap by Contour:

Elevation	Depth	Area (sq. ft.)	Volume (cu. ft.)	Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
82.5	0	2838	0	0	0	0
83	0.5	3456	1573.5	58	1574	58
84	1	4746	4101	152	5675	210
85	1	6105	5425.5	201	11100	411
85	0		0	0	11100	411
85	0		0	0	11100	411
85	0		0	0	11100	411

Length of Aggregate Outlet Weir = 6 ft./acre & (Drainage Area) = 12.36 feet
(Use 12')

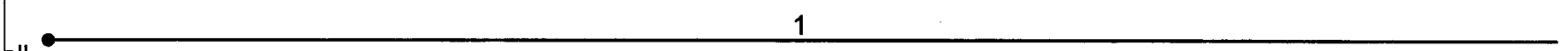
Elevation of Wet Storage Volume = 83.53
(Use 83.50)

Elevation of Dry Storage Volume = 84.33
(Use 85.00)

Elevation of accumulated sediment when sediment removed is required (1/2 wet storage volume) = 83.07

Top Width of Embankment (H_O = 0.8 ft.) = 3 feet

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #1.stm	Number of lines: 1	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	14.000	1.07	1.07	0.60	0.64	0.64	5.0	5.0	7.9	5.06	32.29	5.05	15	25.00	83.00	86.50	84.01	87.40	0.00	86.50	TSD #1

Project File: W10119-E-19_Temporary Slope Drain #1.stm

Number of lines: 1

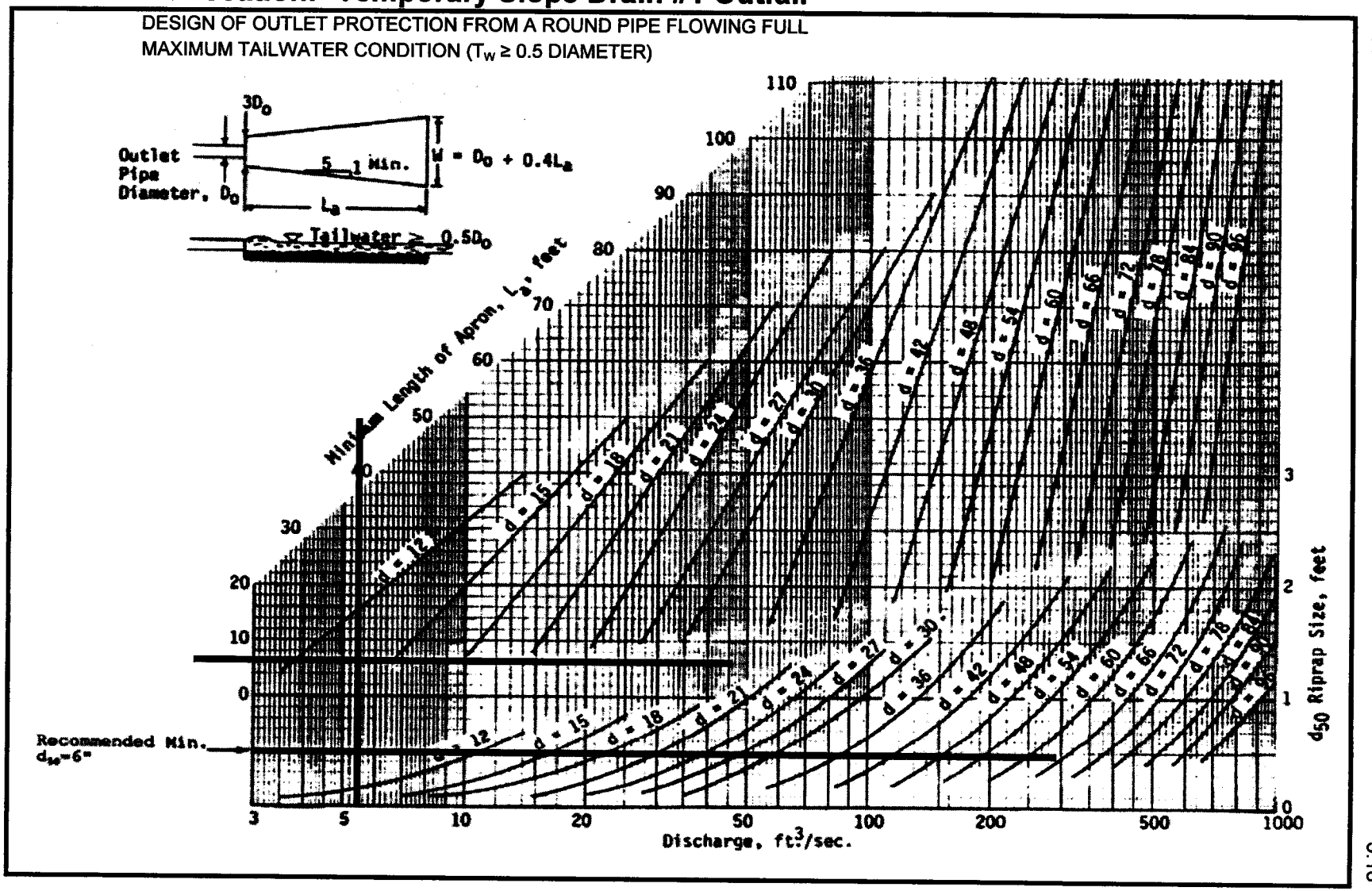
Run Date: 6/27/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

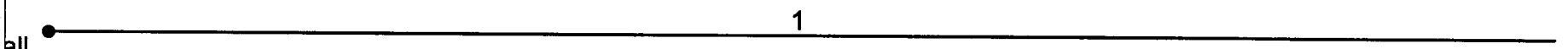
Outlet Location: Temporary Slope Drain #1 Outfall



Source: USDA-SCS

Q =	5.06	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	6	ft	d_{50} =	0.5	ft	

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #2.stm	Number of lines: 1	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.000	1.07	1.07	0.70	0.75	0.75	5.0	5.0	7.9	5.90	30.63	5.66	15	22.50	83.00	85.25	84.01	86.22	0.00	85.25	TSD #2

Project File: W10119-E-19_Temporary Slope Drain #2.stm

Number of lines: 1

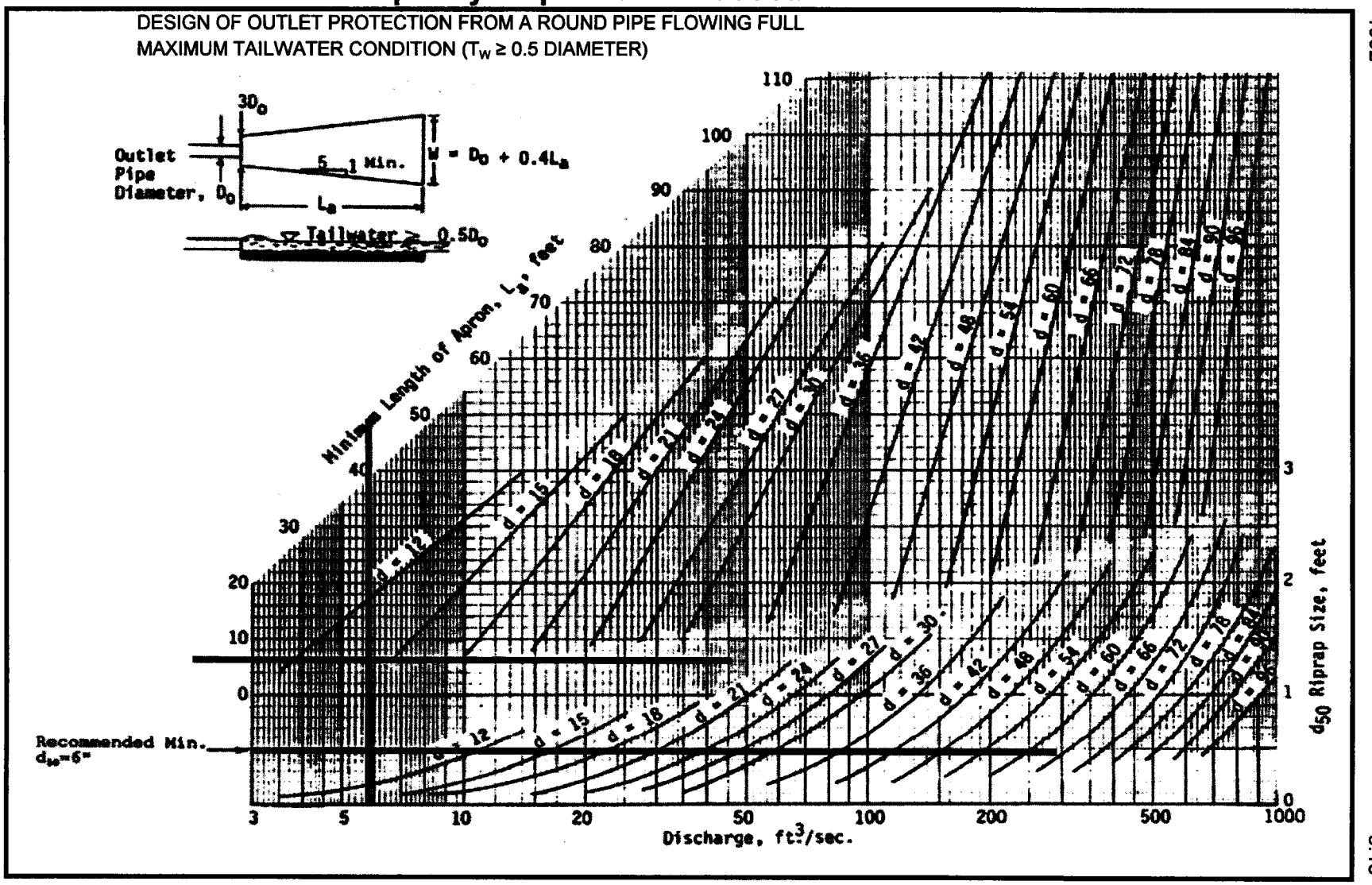
Run Date: 6/27/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

Outlet Location: Temporary Slope Drain #2 Outfall

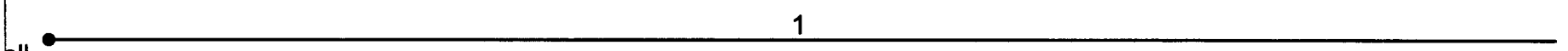


Q =	5.9	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	6	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-4

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Temporary Slope Drain #3.stm	Number of lines: 1	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	10.000	1.26	1.26	0.85	1.07	1.07	5.0	5.0	7.9	8.43	38.20	7.04	15	35.00	82.50	86.00	84.01	87.14	0.00	86.00	TSD #2

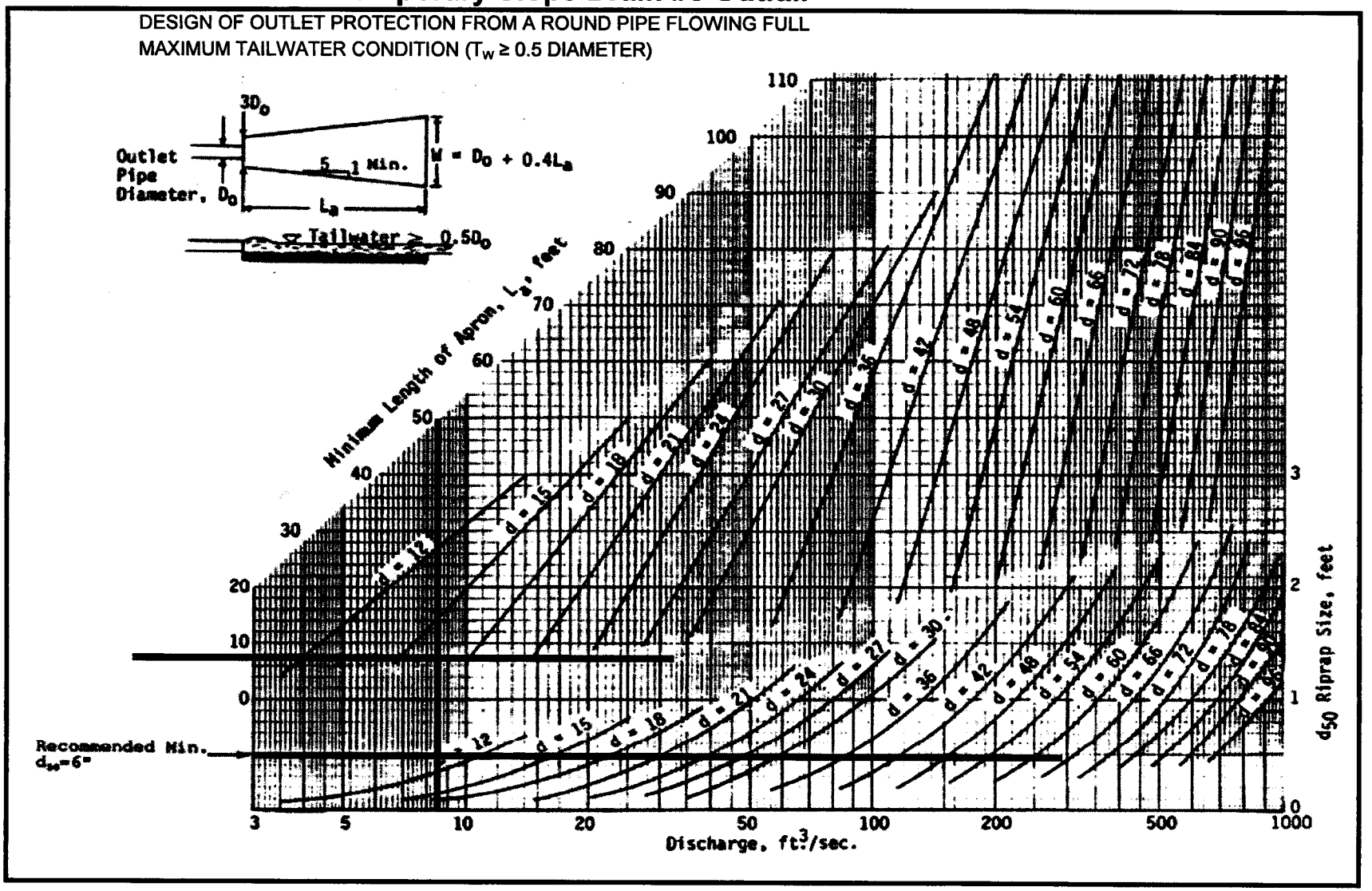
Project File: W10119-E-19_Temporary Slope Drain #3.stm | Number of lines: 1 | Run Date: 6/27/2012

NOTES:Intensity = 137.39 / (Inlet time + 19.50) ^ 0.89; Return period =Yrs. 25 ; c = cir e = ellip b = box

AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	6/5/2012
Calculated By:	GVC

Outlet Location: Temporary Slope Drain #3 Outfall



Q =	8.43	cfs	$3D_0$ =	3.75	ft	W =	4	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	7	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

1992

III - 165

Plate 3.18-4

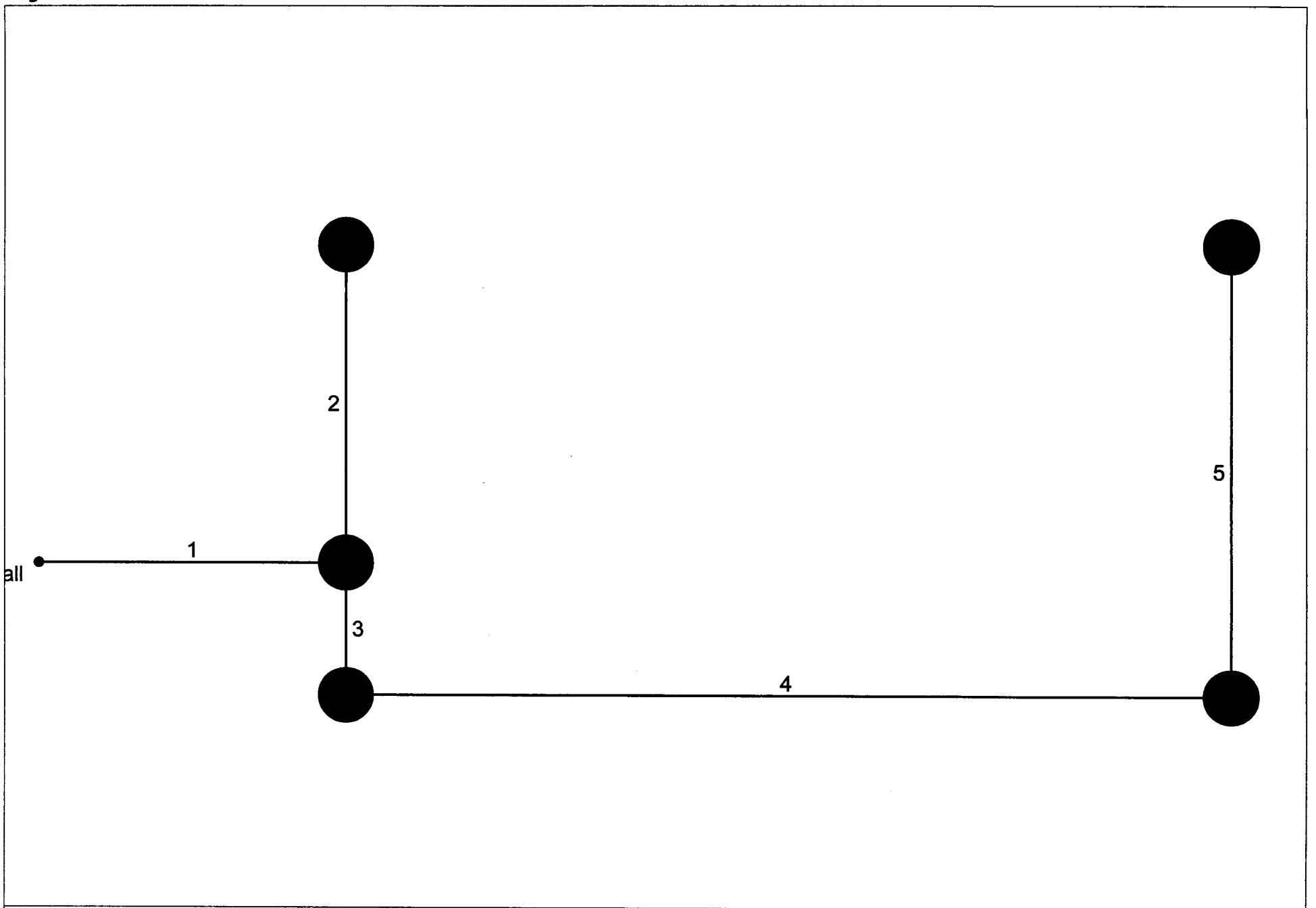
3.18

APPENDIX B

STORM SYSTEM, SWALE, AND CULVERT CALCULATIONS

Storm System Hydraflow Reports
Storm System Outfall Protection Calculations
Swale Adequacy Calculations
Culvert Calculations
Culvert Outfall Protection Calculations

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Roof Drain System.stm	Number of lines: 5	Date: 6/28/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	23.000	0.00	0.06	0.00	0.00	0.05	0.0	6.4	8.9	0.48	0.52	3.07	6	0.87	90.30	90.50	90.65	90.90	0.00	92.75	
2	1	24.000	0.01	0.01	0.90	0.01	0.01	5.0	5.0	9.3	0.08	0.44	0.47	6	0.63	90.50	90.65	91.03	91.03	92.75	92.50	
3	1	10.000	0.01	0.05	0.90	0.01	0.05	5.0	6.3	8.9	0.40	0.56	2.07	6	1.00	90.50	90.60	91.03	91.07	92.75	92.75	
4	3	66.000	0.02	0.04	0.90	0.02	0.04	5.0	5.7	9.1	0.33	0.44	1.89	6	0.61	90.60	91.00	91.14	91.37	92.75	93.00	
5	4	34.000	0.02	0.02	0.90	0.02	0.02	5.0	5.0	9.3	0.17	0.48	1.37	6	0.74	91.00	91.25	91.44	91.49	93.00	92.75	

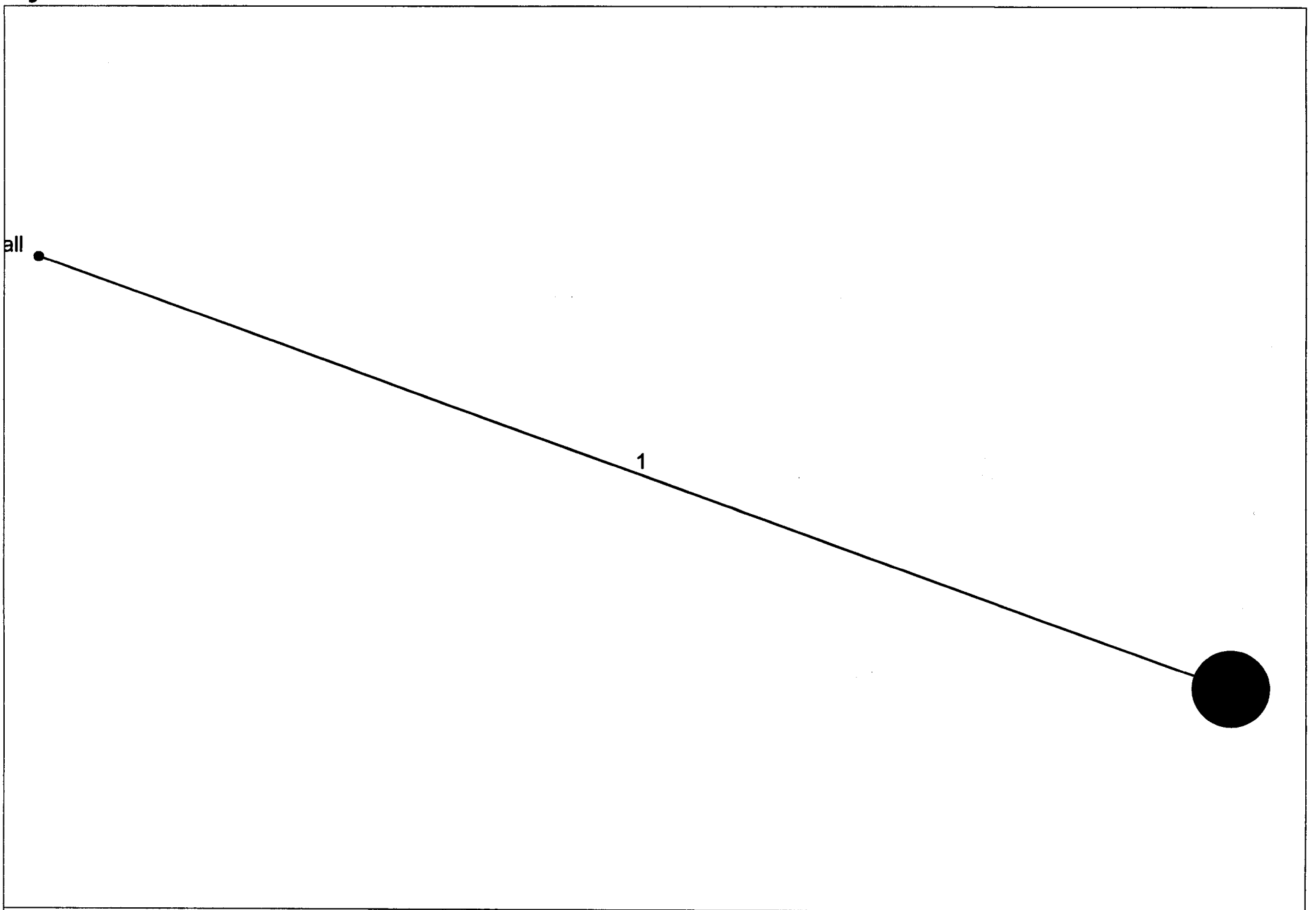
Project File: W10119-E-19_Roof Drain System.stm

Number of lines: 5

Run Date: 6/28/2012

NOTES:Intensity = 473.32 / (Inlet time + 30.90) ^ 1.10; Return period =Yrs. 100 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Storm System #1.stm	Number of lines: 1	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	68.000	0.23	0.23	0.85	0.20	0.20	5.0	5.0	7.0	1.37*	3.56	3.50	12	1.00	88.85	89.53	89.35	90.03	88.83	92.50	SS#1-1 to SS#1-

Project File: W10119-E-19_Storm System #1.stm

Number of lines: 1

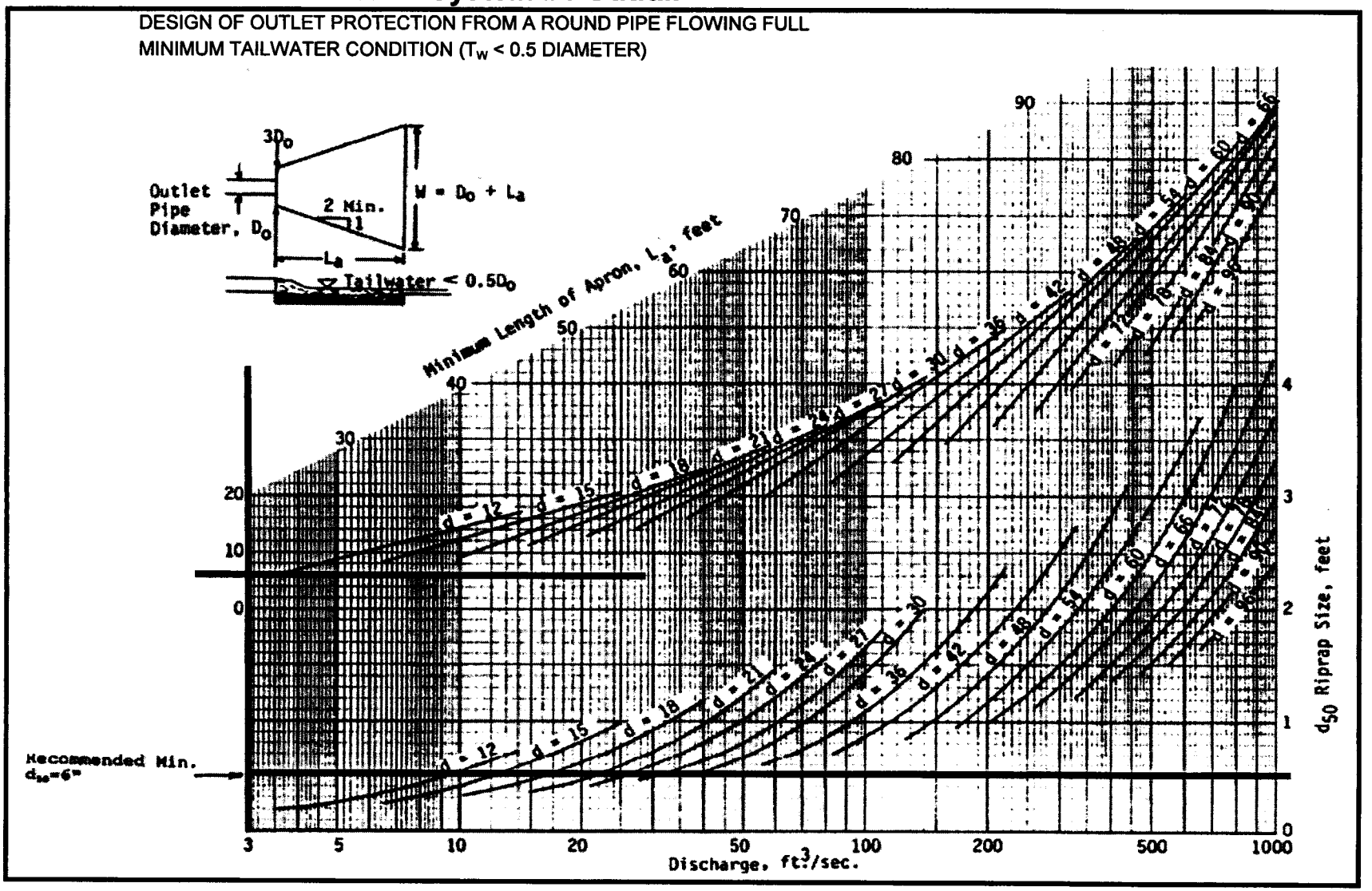
Run Date: 6/27/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

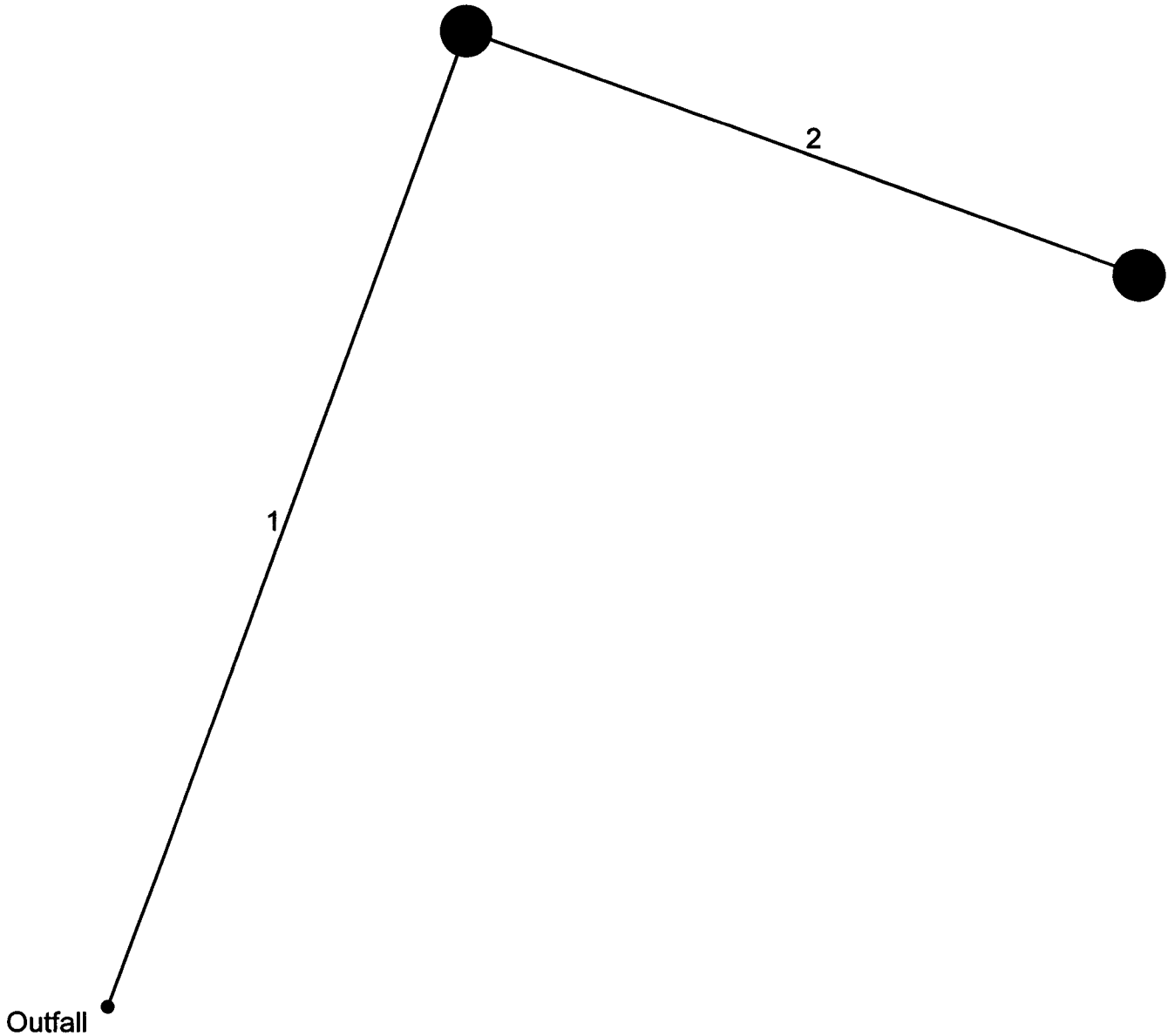
Outlet Location: Storm System #1 Outfall



Source: USDA-SCS

Q =	1.37	cfs	$3D_0$ =	3	ft	W =	7	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	6	ft	d_{50} =	0.5	ft	

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Storm System #2.stm	Number of lines: 2	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	85.000	0.00	0.83	0.00	0.00	0.71	0.0	5.2	6.9	4.89	5.05	3.98	15	0.61	83.00	83.52	84.89	85.38	0.00	87.50	SS#2-1 to SS#2-
2	1	58.000	0.83	0.83	0.85	0.71	0.71	5.0	5.0	7.0	4.94	8.44	4.02	15	1.71	83.52	84.51	85.62	85.96	87.50	87.72	Ex. DI to SS#2-1

14#7

Project File: W10119-E-19_Storm System #2.stm

Number of lines: 2

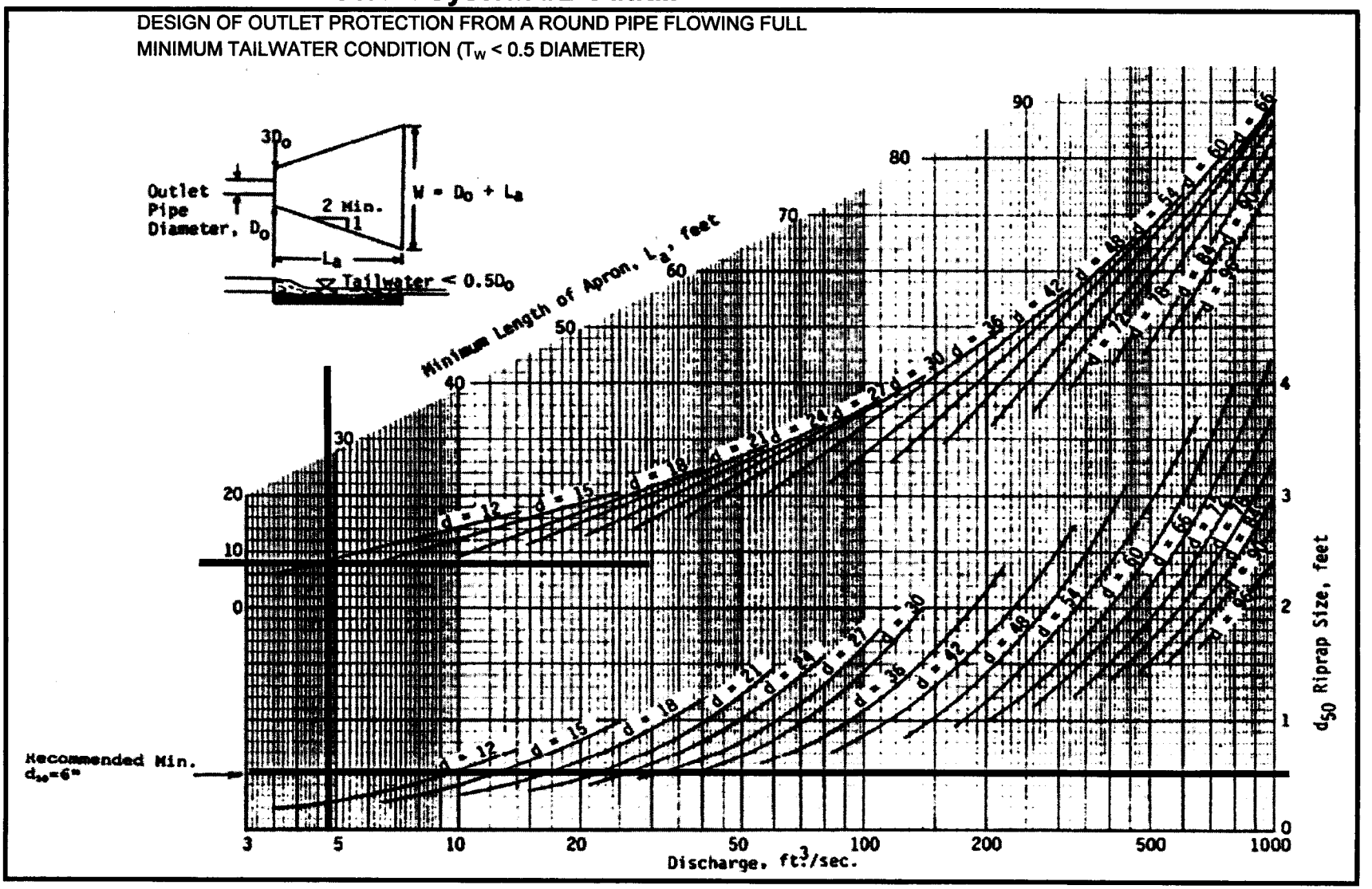
Run Date: 6/27/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Storm System #2 Outfall



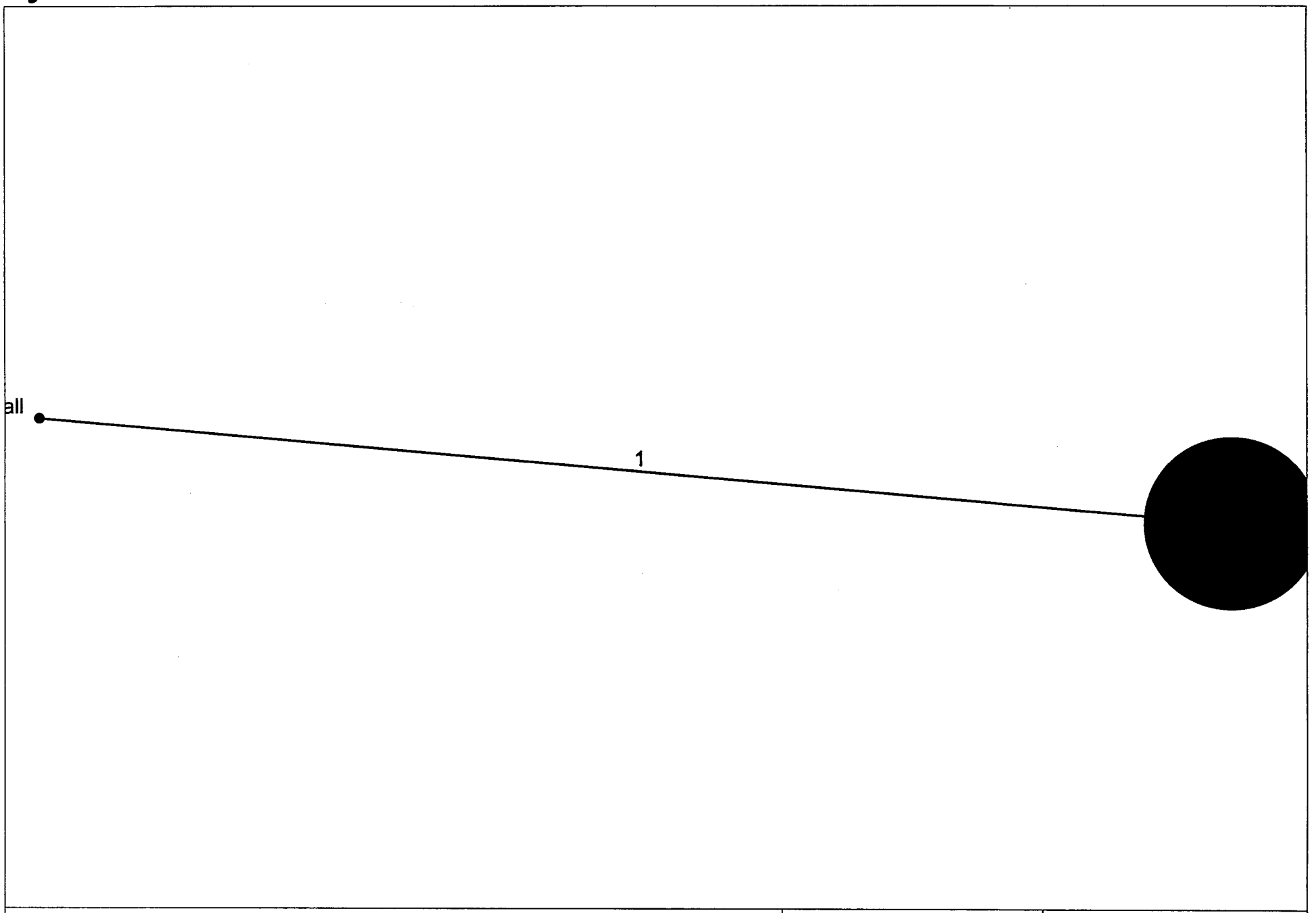
Q =	4.89	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3

3.18

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2012 Plan



Project File: W10119-E-19_Storm System #3.stm	Number of lines: 1	Date: 6/27/2012

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	28.000	0.37	0.37	0.75	0.28	0.28	5.0	5.0	7.0	1.94	13.37	3.66	15	4.29	83.00	84.20	83.56	84.76	88.83	92.50	SS#1-1 to SS#1-

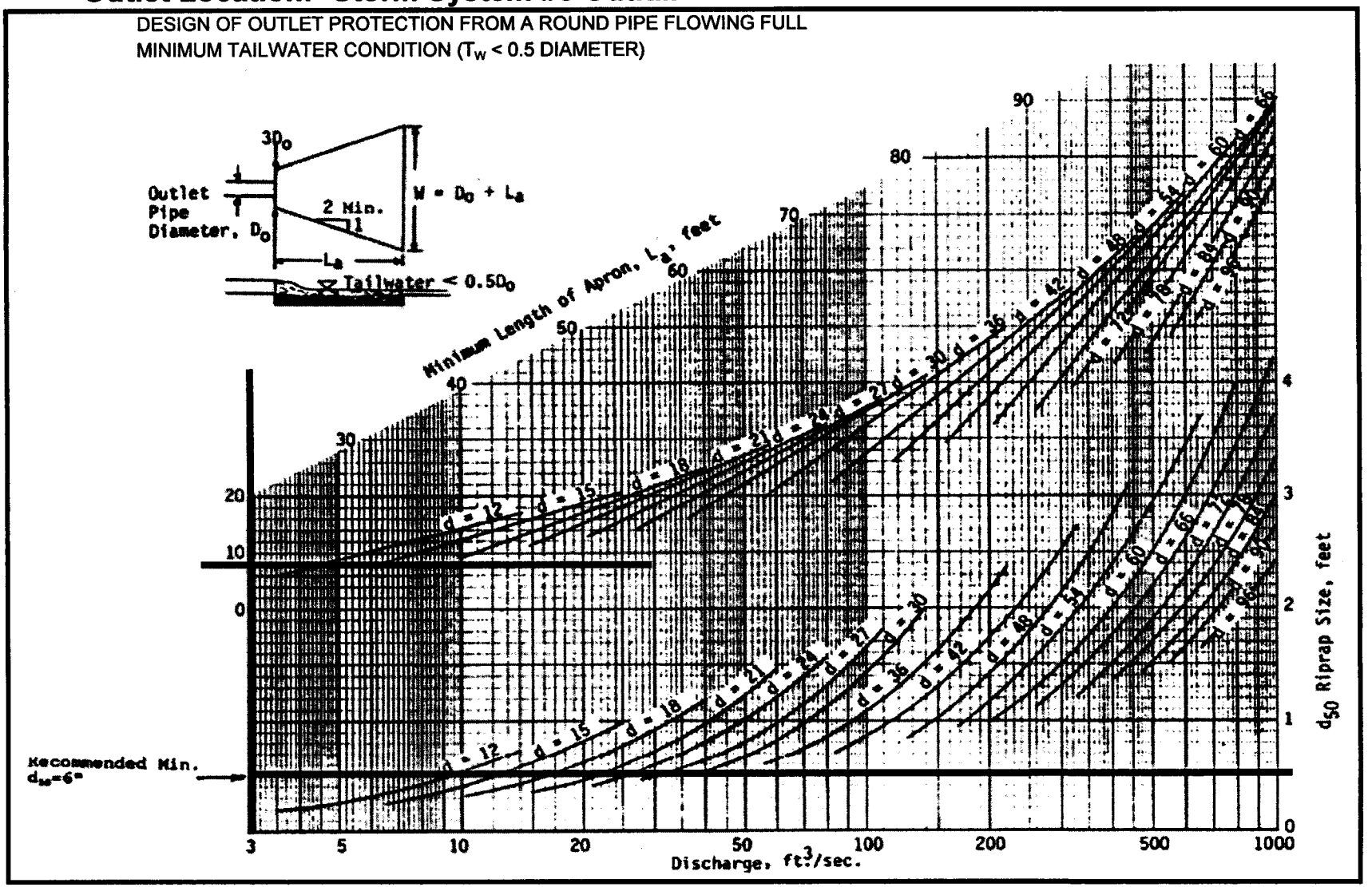
Project File: W10119-E-19_Storm System #3.stm | Number of lines: 1 | Run Date: 6/27/2012

NOTES:Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Storm System #3 Outfall



Source: USDA-SCS

1992

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Plate 3.18-3

3.18

Q =	1.94	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

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Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 18, 2012
Calculated By:	GVC

Design Point: **Swale #1**

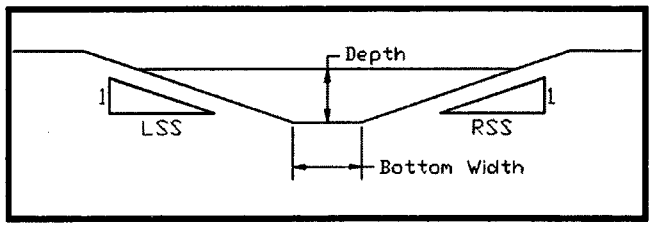
2 Year Storm - Velocity Check

Drainage Area	=	0.38	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.60 x 5.70 x 0.38

= 1.30 CFS



Channel Characteristics

Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.58	Ft.	
Area	=	1.03	SF	Wetted Perimeter = 3.70 Ft.
Hydraulic Radius	=	0.28	Ft.	
Velocity (V)	=	1.26	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.30	CFS	(From Continuity Equation Q=AV)

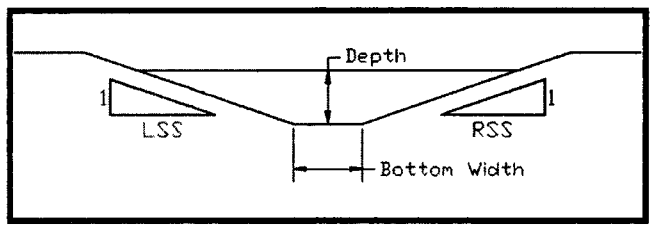
10 Year Storm - Capacity Check

Drainage Area	=	0.38	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.60 x 7.20 x 0.38

= 1.64 CFS



Channel Characteristics

Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.64	Ft.	
Area	=	1.22	SF	Wetted Perimeter = 4.03 Ft.
Hydraulic Radius	=	0.30	Ft.	
Velocity (V)	=	1.34	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	1.63	CFS	(From Continuity Equation Q=AV)

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Fredericksburg (540) 710-6606

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 29, 2012
Calculated By:	GVC

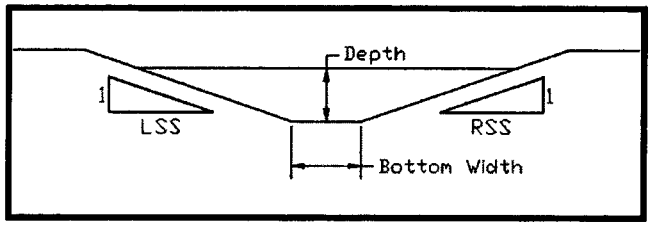
Design Point: **Swale #2**

2 Year Storm - Velocity Check

Drainage Area	=	0.71	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.70 x 5.70 x 0.71
= 2.83 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	0.50	%
Mannings (n)	=	0.050	**Fallow**

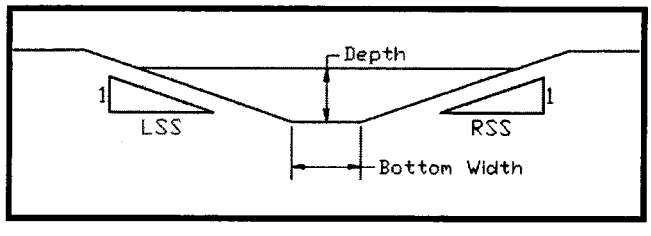
Depth of Flow	=	0.89	Ft.	
Area	=	2.39	SF	Wetted Perimeter = 5.64 Ft.
Hydraulic Radius	=	0.42	Ft.	
Velocity (V)	=	1.18	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	2.83	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

10 Year Storm - Capacity Check

Drainage Area	=	0.71	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.70 x 7.20 x 0.71
= 3.58 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	0.50	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.97	Ft.	
Area	=	2.84	SF	Wetted Perimeter = 6.16 Ft.
Hydraulic Radius	=	0.46	Ft.	
Velocity (V)	=	1.26	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	3.57	CFS	(From Continuity Equation Q=AV) ***Use EC-2 Matting**

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Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 29, 2012
Calculated By:	GVC

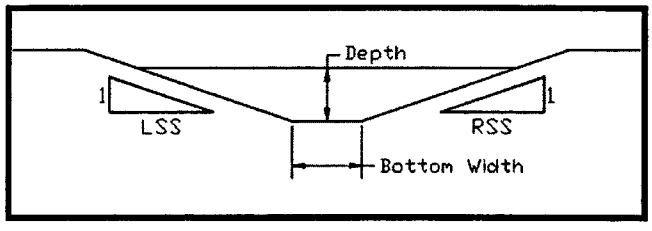
Design Point: **Swale #3**

2 Year Storm - Velocity Check

Drainage Area	=	1.16	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.60 x 5.70 x 1.16
= 3.97 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	2.50	%
Mannings (n)	=	0.050	**Fallow**

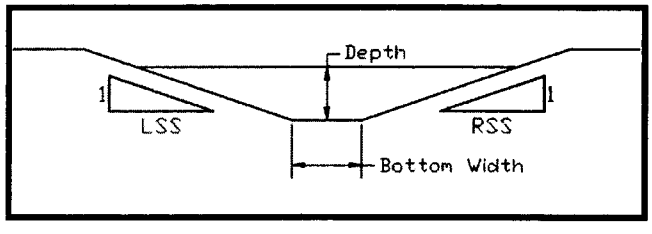
Depth of Flow	=	0.75	Ft.				
Area	=	1.68	SF	Wetted Perimeter	=	4.73	Ft.
Hydraulic Radius	=	0.36	Ft.				
Velocity (V)	=	2.36	Ft./sec.	(From Manning's Equation)			
Flow (Q)	=	3.96	CFS	(From Continuity Equation Q=AV)			***Use EC-2 Matting**

10 Year Storm - Capacity Check

Drainage Area	=	1.16	Acres	(Area draining to Design Point)
C	=	0.60		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.60 x 7.20 x 1.16
= 5.01 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	2.50	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.82	Ft.				
Area	=	2.00	SF	Wetted Perimeter	=	5.17	Ft.
Hydraulic Radius	=	0.39	Ft.				
Velocity (V)	=	2.50	Ft./sec.	(From Manning's Equation)			
Flow (Q)	=	5.01	CFS	(From Continuity Equation Q=AV)			***Use EC-2 Matting**

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Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Channel Design
Date:	June 18, 2012
Calculated By:	GVC

Design Point: **Swale #4**

2 Year Storm - Velocity Check

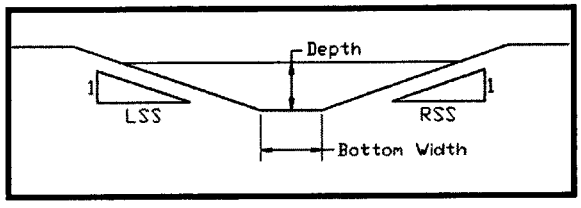
Drainage Area	=	1.55	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.70 x 5.70 x 1.55

= 6.18 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	1.05	Ft.			
Area	=	3.31	SF	Wetted Perimeter	=	6.64 Ft.
Hydraulic Radius	=	0.50	Ft.			
Velocity (V)	=	1.87	Ft./sec.	(From Manning's Equation)		
Flow (Q)	=	6.18	CFS	(From Continuity Equation Q=AV)		***Use EC-2 Matting**

10 Year Storm - Capacity Check

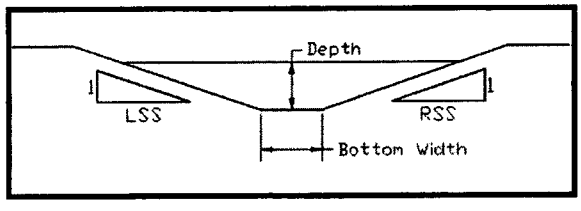
Drainage Area	=	1.55	Acres	(Area draining to Design Point)
C	=	0.70		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.70 x 7.20 x 1.55

= 7.81 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.50	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	1.15	Ft.			
Area	=	3.94	SF	Wetted Perimeter	=	7.25 Ft.
Hydraulic Radius	=	0.54	Ft.			
Velocity (V)	=	1.98	Ft./sec.	(From Manning's Equation)		
Flow (Q)	=	7.80	CFS	(From Continuity Equation Q=AV)		***Use EC-2 Matting**

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Jun 27 2012

Culvert #1

Invert Elev Dn (ft)	= 90.00
Pipe Length (ft)	= 25.00
Slope (%)	= 1.00
Invert Elev Up (ft)	= 90.25
Rise (in)	= 12.0
Shape	= Cir
Span (in)	= 12.0
No. Barrels	= 1
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

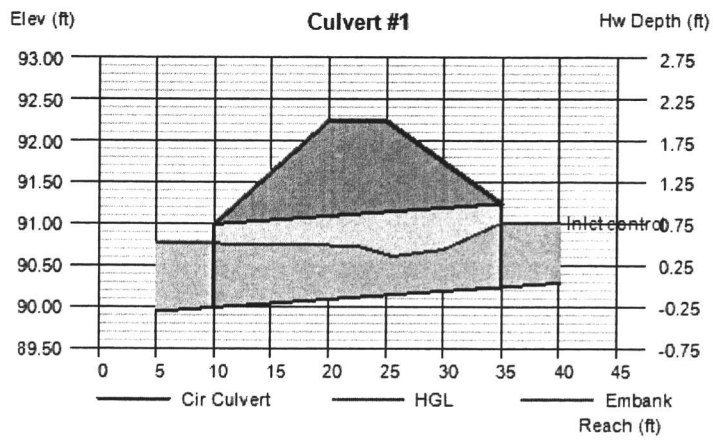
Top Elevation (ft)	= 92.25
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 1.60
Qmax (cfs)	= 1.60
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

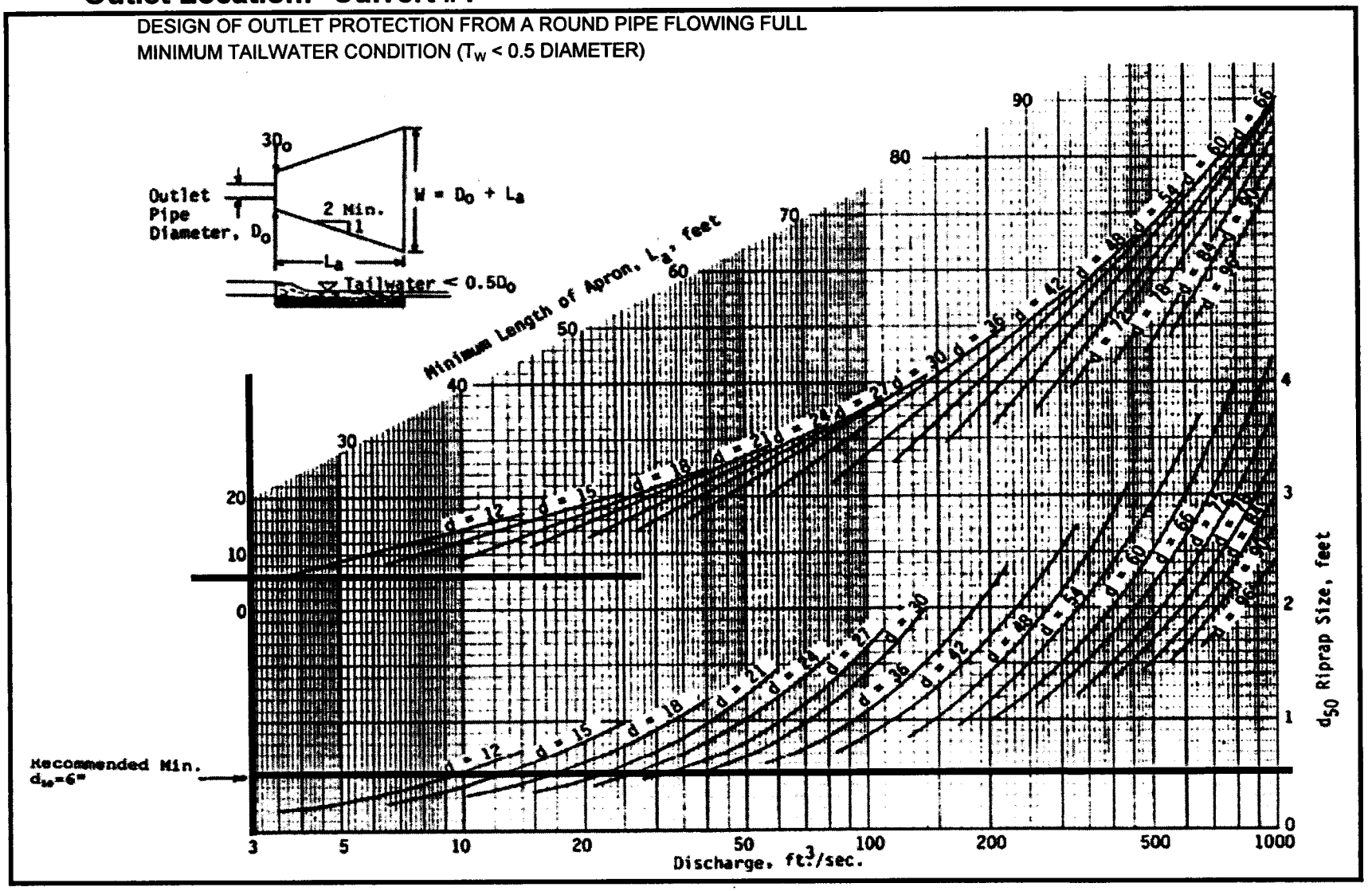
Qtotal (cfs)	= 1.60
Qpipe (cfs)	= 1.60
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 2.47
Veloc Up (ft/s)	= 3.68
HGL Dn (ft)	= 90.77
HGL Up (ft)	= 90.79
Hw Elev (ft)	= 91.02
Hw/D (ft)	= 0.77
Flow Regime	= Inlet Control



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Culvert #1



Q =	1.6	cfs	$3D_0$ =	3	ft	W =	7	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	6	ft	d_{50} =	0.5	ft	

Source: USDA-SCS

Plate 3.18-3

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Jun 27 2012

Culvert #2

Invert Elev Dn (ft)	= 88.78
Pipe Length (ft)	= 20.00
Slope (%)	= 4.60
Invert Elev Up (ft)	= 89.70
Rise (in)	= 12.0
Shape	= Cir
Span (in)	= 12.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

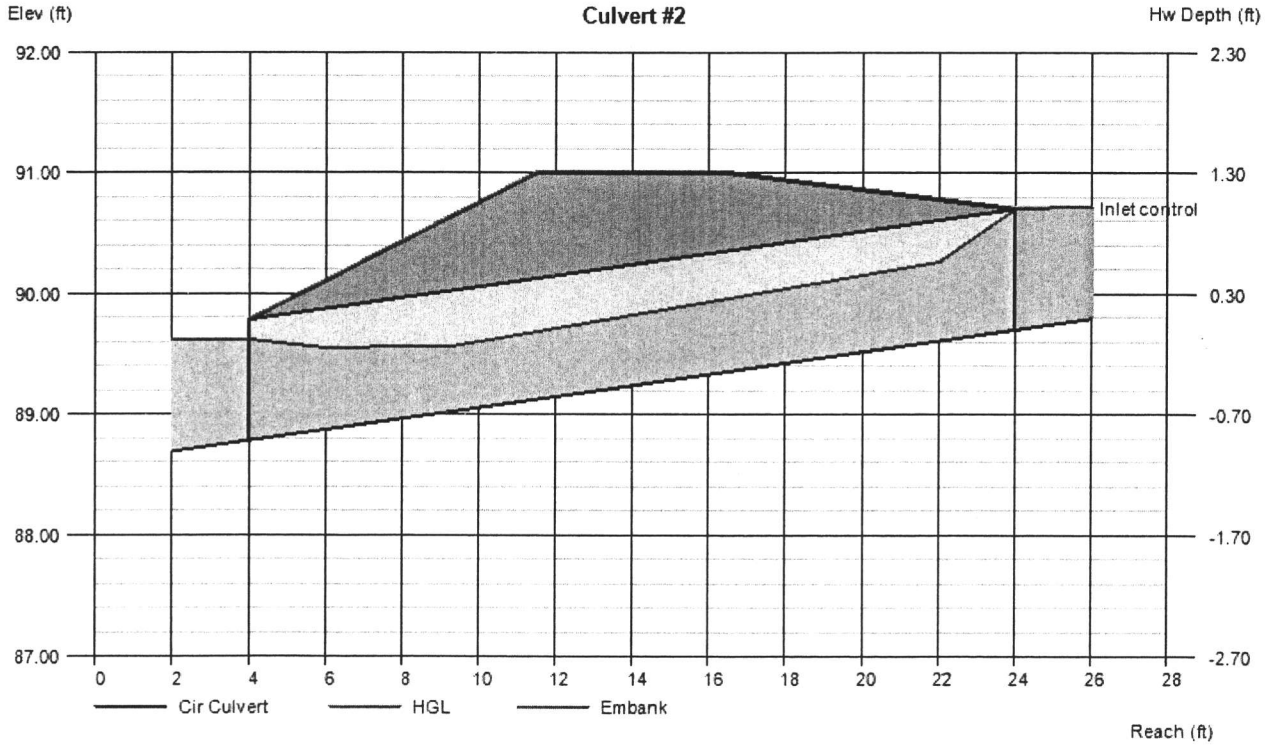
Top Elevation (ft)	= 91.00
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 4.92
Qmax (cfs)	= 4.92
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

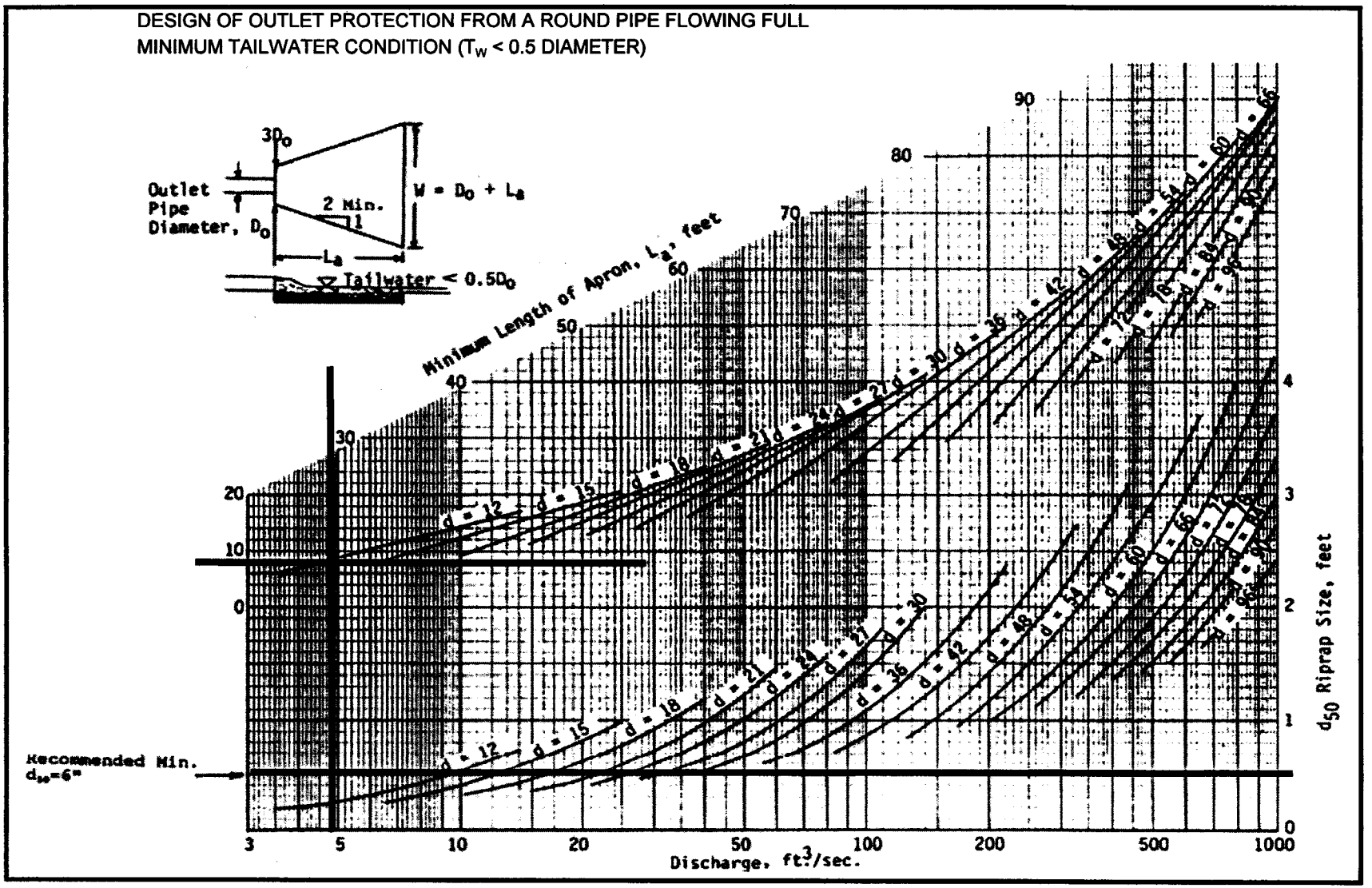
Qtotal (cfs)	= 4.92
Qpipe (cfs)	= 4.92
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.50
Veloc Up (ft/s)	= 4.37
HGL Dn (ft)	= 89.62
HGL Up (ft)	= 90.37
Hw Elev (ft)	= 90.71
Hw/D (ft)	= 1.01
Flow Regime	= Inlet Control



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Culvert #2



Source: USDA-SCS 1992

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Plate 3.18-3

3.18

Q =	4.92	cfs	$3D_0$ =	3	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	12	in	L_a =	8	ft	d_{50} =	0.5	ft	

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Jun 27 2012

Culvert #3

Invert Elev Dn (ft)	= 84.00
Pipe Length (ft)	= 36.00
Slope (%)	= 2.78
Invert Elev Up (ft)	= 85.00
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

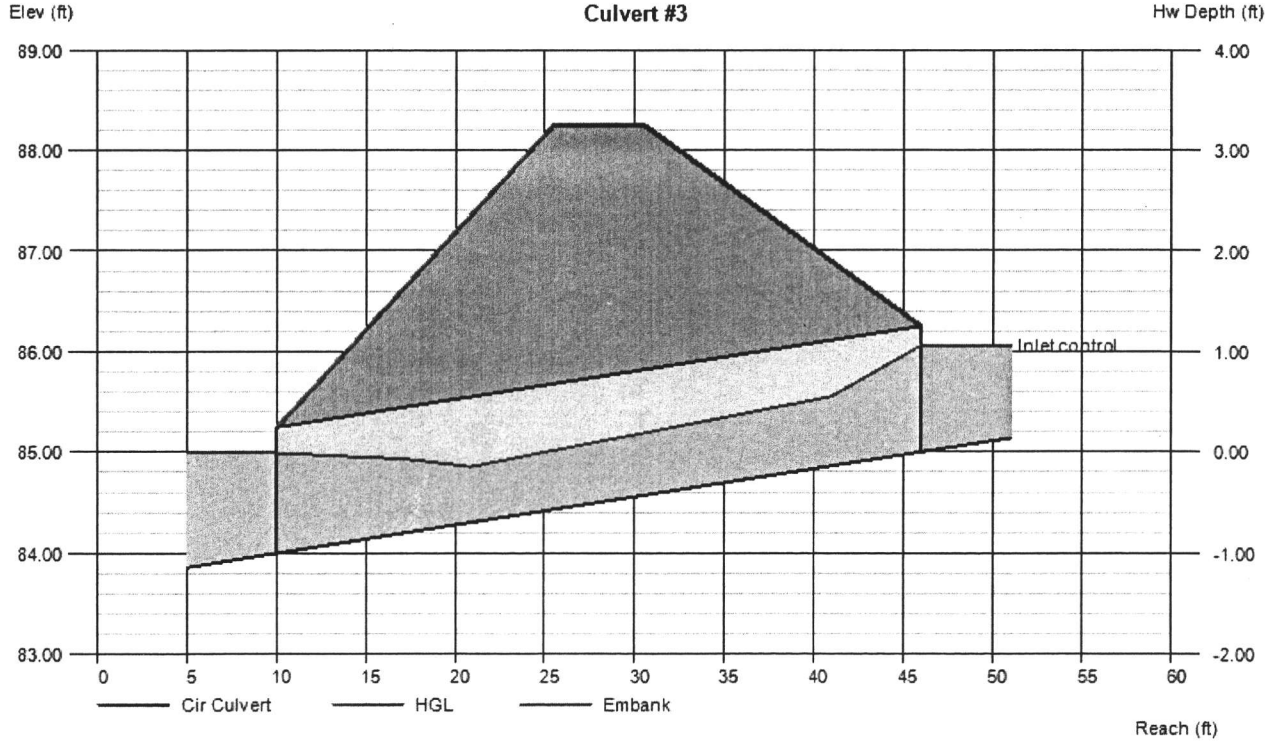
Top Elevation (ft)	= 88.25
Top Width (ft)	= 5.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 6.51
Qmax (cfs)	= 6.51
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

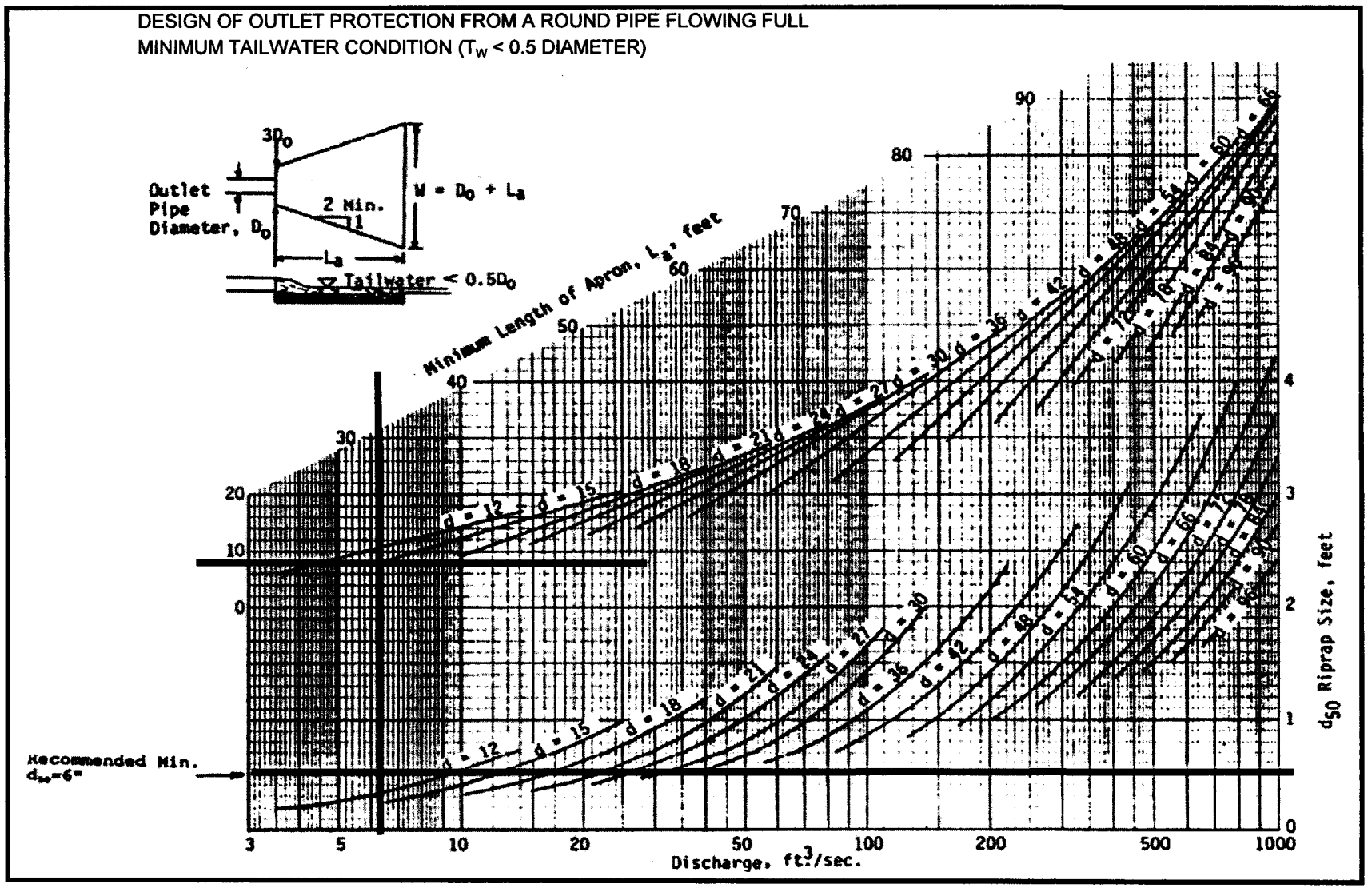
Qtotal (cfs)	= 6.51
Qpipe (cfs)	= 6.51
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.12
Veloc Up (ft/s)	= 4.37
HGL Dn (ft)	= 84.99
HGL Up (ft)	= 85.73
Hw Elev (ft)	= 86.06
Hw/D (ft)	= 0.85
Flow Regime	= Inlet Control



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Culvert #3



Q =	6.51	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3

3.18

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. Wednesday, Jun 27 2012

Culvert #4

Invert Elev Dn (ft)	= 83.00
Pipe Length (ft)	= 36.00
Slope (%)	= 7.64
Invert Elev Up (ft)	= 85.75
Rise (in)	= 15.0
Shape	= Cir
Span (in)	= 15.0
No. Barrels	= 2
n-Value	= 0.012
Inlet Edge	= Projecting
Coeff. K,M,c,Y,k	= 0.0045, 2, 0.0317, 0.69, 0.5

Embankment

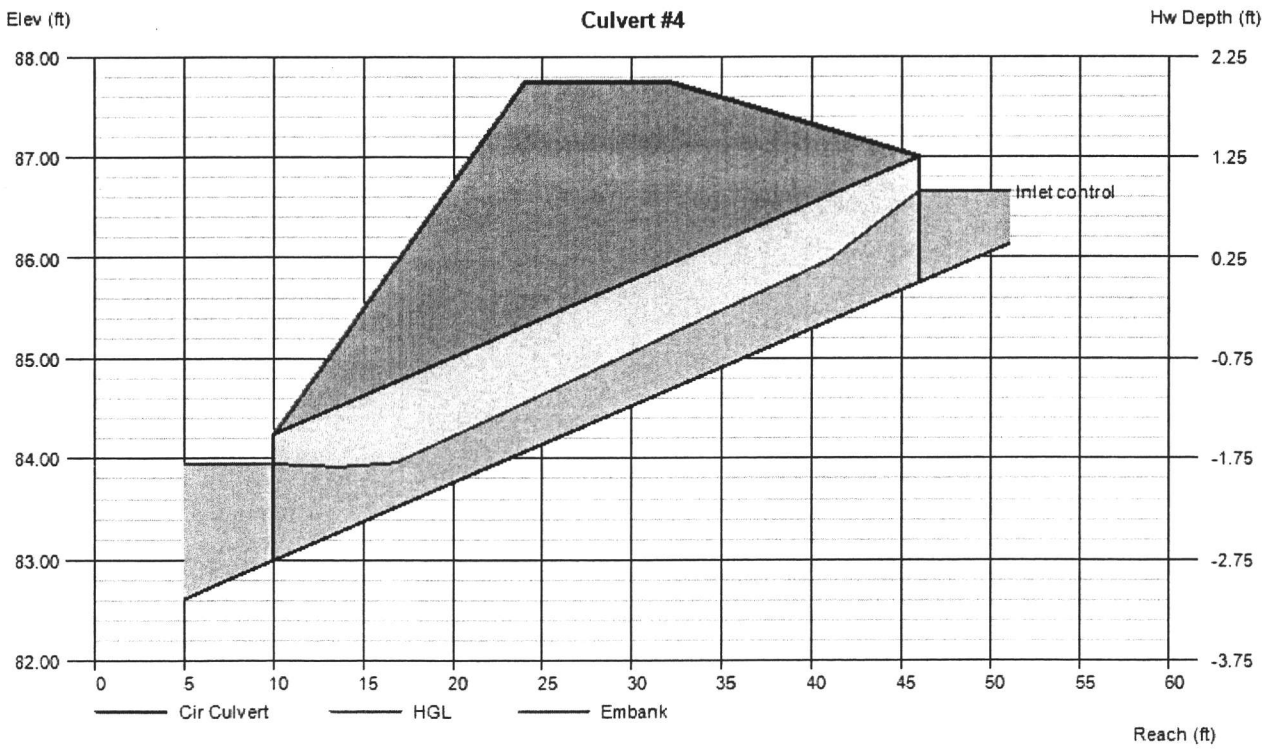
Top Elevation (ft)	= 87.75
Top Width (ft)	= 8.00
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 5.11
Qmax (cfs)	= 5.11
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

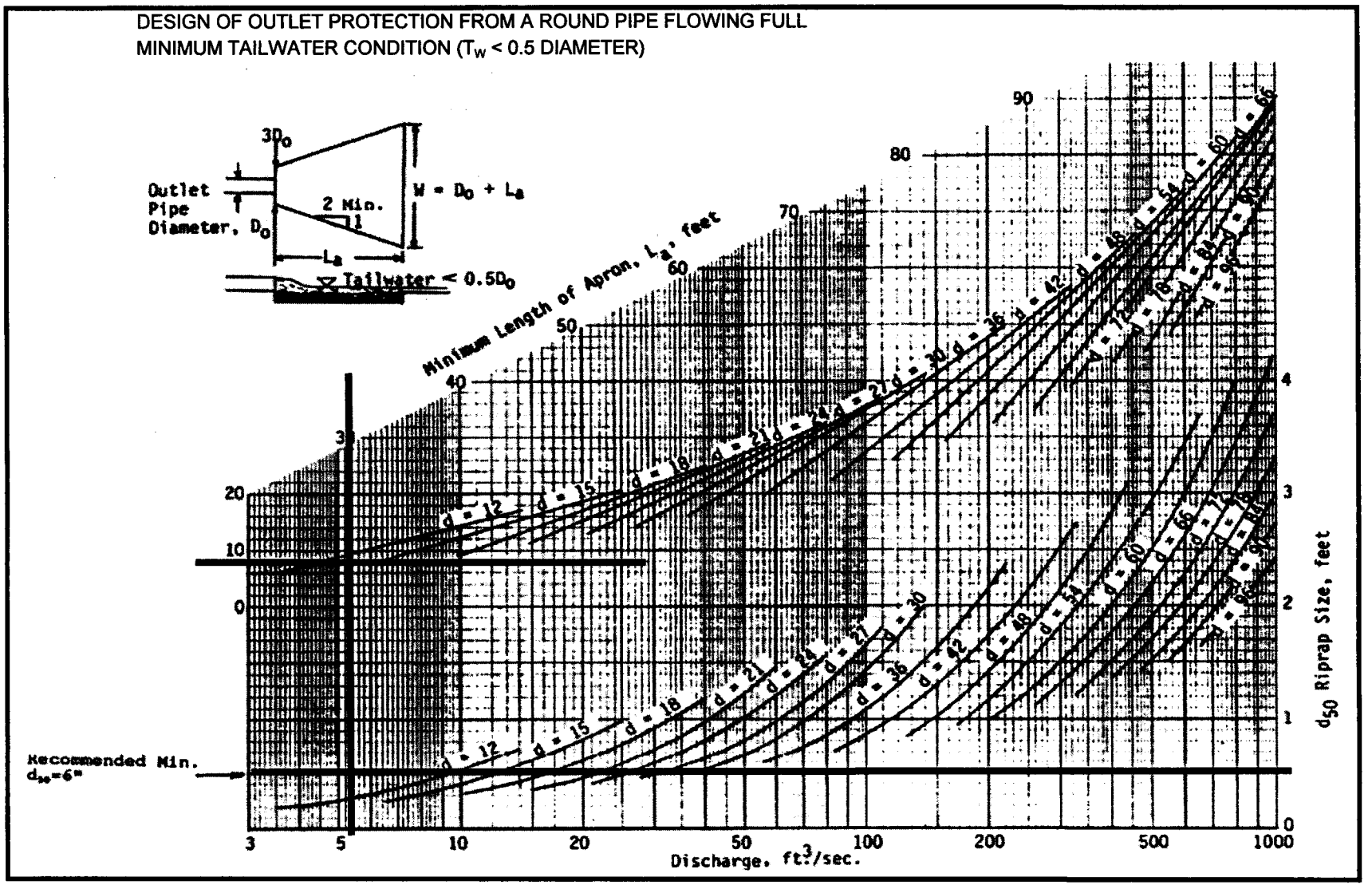
Qtotal (cfs)	= 5.11
Qpipe (cfs)	= 5.11
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 2.56
Veloc Up (ft/s)	= 4.01
HGL Dn (ft)	= 83.95
HGL Up (ft)	= 86.39
Hw Elev (ft)	= 86.66
Hw/D (ft)	= 0.73
Flow Regime	= Inlet Control



AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Culvert #4



Source: USDA-SCS

1992

III - 164

Plate 3.18-3

3.18

Q =	5.11	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS

Water Quality Calculations (Phase 1)
Water Quality Calculations (Phases 2,3,4)
Water Quality Volume Calculations
Bioretention Facility Hydraflow Reports
Bioretention Facility Outfall Protections Calculations

AES CONSULTING ENGINEERS

Project:	Mid County Park Upgrades
Project No.:	W10119-19
Subject:	Water Quality Calculations - Phase 1
	Situation 3
Date:	6/29/2012
Calculated By:	GVC

Performance-Based Water Quality Calculations - Situation 3
(Appendix 5D - Virginia Stormwater Management Handbook Volume II)

STEP 1

18.03	Acres	Applicable Area
4.05	Acres	Post-development Impervious Cover
22.5	%	I_{post} (Total Post-development Impervious Cover / A x 100)

STEP 2

18	%	$I_{watershed}$
3.47	Acres	Existing Impervious Cover
19.2	%	$I_{existing}$ (Total Existing Impervious Cover / A x 100)

STEP 4

$L_{pre(existing)}$ = relative pre-development total pollutant load

$$L_{pre(existing)} = [\ 0.05 + (\ 0.009 \times \underbrace{19.2}_{I_{existing}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(existing)}$ = **9.2** pounds per year

$L_{pre(watershed)}$ = relative pre-development total pollutant load

$$L_{pre(watershed)} = [\ 0.05 + (\ 0.009 \times \underbrace{18}_{I_{watershed}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(watershed)}$ = **8.7** pounds per year

STEP 5

L_{post} = relative post-development total pollutant load

$$L_{post} = [\ 0.05 + (\ 0.009 \times \underbrace{22.5}_{I_{post}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

L_{post} = **10.4** pounds per year

THUR. ~~WED.~~ 9:00 AM

STEP 6

RR = relative pollutant removal requirement

L_{post} $(0.9 \times L_{pre(existing)})$

RR = **10.4** - **8.3**

RR = **2.1** pounds per year

or

L_{post} $L_{pre(watershed)}$

RR = **10.4** - **8.7**

RR = **1.7** pounds per year

Use lesser of two values - RR = 1.7 pounds per year

STEP 7

EFF = required pollutant removal efficiency

RR L_{post}

EFF = **1.7** / **10.4** x 100

EFF = **15.9** %

BMP #1 **Bioretention Facility #1 - Kidsburg Area**

2.72 Acres Drainage Area of proposed BMP

1.20 Acres Post-development Impervious Cover for BMP Drainage Area

44.1 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP1} = pollutant load entering BMP

I_{BMP} A_{BMP}

L_{BMP1} = [0.05 + (0.009 x **44.1**)] x **2.72** x 2.28

L_{BMP1} = **2.8** pounds per year

$L_{removed/BMP1}$ = pollutant load removed by proposed BMP

EFF L_{BMP}

$L_{removed/BMP1}$ = **50.0** x **2.8**

$L_{removed/BMP1}$ = **1.4** pounds per year

BMP #2 **Bioretention Facility #2- Main Parking Lot**

1.75 Acres Drainage Area of proposed BMP
0.85 Acres Post-development Impervious Cover for BMP Drainage Area

48.6 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP2} = pollutant load entering BMP

$$L_{BMP2} = [\ 0.05 + (\ 0.009 \times \underbrace{48.6}_{I_{BMP}}\ )\ ] \times \underbrace{1.75}_{A_{BMP}} \times 2.28$$

L_{BMP2} = **1.9** pounds per year

$L_{removed/BMP2}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP2} = \underbrace{50.0}_{EFF} \times \underbrace{1.9}_{L_{BMP}}$$

$L_{removed/BMP2}$ = **1.0** pounds per year

BMP #3 _____

BMP #4 _____

BMP #5 _____

BMP #6 _____

$$L_{removed/total} = L_{removed/BMP1} + L_{removed/BMP2} + L_{removed/BMP3} + L_{removed/BMP4} + L_{removed/BMP5} + L_{removed/BMP6}$$

$$= 1.4 + 1.0 + 0.0 + 0.0 + 0.0 + 0.0$$

= **2.4** pounds per year

Compliance Check

$L_{removed/total} \geq RR$

2.4 ≥ **1.7**

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-19**
Subject:	**Water Quality Calculations - Phase 2, 3, 4**
	Situation 3
Date:	**6/29/2012**
Calculated By:	**GVC**

Performance-Based Water Quality Calculations - Situation 3
(Appendix 5D - Virginia Stormwater Management Handbook Volume II)

STEP 1

18.03 Acres — Applicable Area
4.52 Acres — Post-development Impervious Cover

25.1 % — I_{post} (Total Post-development Impervious Cover / A x 100)

STEP 2

18 % — $I_{watershed}$
3.47 Acres — Existing Impervious Cover

19.2 % — $I_{existing}$ (Total Existing Impervious Cover / A x 100)

STEP 4

$L_{pre(existing)}$ = relative pre-development total pollutant load

$$L_{pre(existing)} = [\ 0.05 + (\ 0.009 \times \underbrace{19.2}_{I_{existing}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(existing)}$ = **9.2** pounds per year

$L_{pre(watershed)}$ = relative pre-development total pollutant load

$$L_{pre(watershed)} = [\ 0.05 + (\ 0.009 \times \underbrace{18}_{I_{watershed}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

$L_{pre(watershed)}$ = **8.7** pounds per year

STEP 5

L_{post} = relative post-development total pollutant load

$$L_{post} = [\ 0.05 + (\ 0.009 \times \underbrace{25.1}_{I_{post}}\ )\ ] \times \underbrace{18.03}_{A} \times 2.28$$

L_{post} = **11.3** pounds per year

STEP 6

RR = relative pollutant removal requirement

L_{post} $(0.9 \times L_{pre(existing)})$

RR = **11.3** - **8.3**

RR = **3.1** pounds per year

or

L_{post} $L_{pre(watershed)}$

RR = **11.3** - **8.7**

RR = **2.6** pounds per year

Use lesser of two values - RR = 2.6 pounds per year

STEP 7

EFF = required pollutant removal efficiency

RR L_{post}

EFF = **2.6** / **11.3** x 100

EFF = **23.1** %

BMP #1 **Bioretention Facility #1 - Kidsburg Area**

2.72 Acres Drainage Area of proposed BMP

1.20 Acres Post-development Impervious Cover for BMP Drainage Area

44.1 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP1} = pollutant load entering BMP

I_{BMP} A_{BMP}

L_{BMP1} = [0.05 + (0.009 x **44.1**)] x **2.72** x 2.28

L_{BMP1} = **2.8** pounds per year

$L_{removed/BMP1}$ = pollutant load removed by proposed BMP

EFF L_{BMP}

$L_{removed/BMP1}$ = **50.0** x **2.8**

$L_{removed/BMP1}$ = **1.4** pounds per year

BMP #2 **Bioretention Facility #2- Main Parking Lot**

1.75 Acres Drainage Area of proposed BMP
0.85 Acres Post-development Impervious Cover for BMP Drainage Area

48.6 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP2} = pollutant load entering BMP

$$L_{BMP2} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\mathbf{48.6}}\ )\ ] \times \underset{A_{BMP}}{\mathbf{1.75}} \times 2.28$$

L_{BMP2} = **1.9** pounds per year

$L_{removed/BMP2}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP2} = \underset{EFF}{\mathbf{50.0}} \times \underset{L_{BMP}}{\mathbf{1.9}}$$

$L_{removed/BMP2}$ = **1.0** pounds per year

BMP #3 **Bioretention Facility #3 - Back Parking Lot**

1.84 Acres Drainage Area of proposed BMP
0.60 Acres Post-development Impervious Cover for BMP Drainage Area

32.6 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP3} = pollutant load entering BMP

$$L_{BMP3} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\mathbf{32.6}}\ )\ ] \times \underset{A_{BMP}}{\mathbf{1.84}} \times 2.28$$

L_{BMP3} = **1.4** pounds per year

$L_{removed/BMP3}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP3} = \underset{EFF}{\mathbf{50.0}} \times \underset{L_{BMP}}{\mathbf{1.4}}$$

$L_{removed/BMP3}$ = **0.7** pounds per year

BMP #4 _____

BMP #5 _____

BMP #6 _____

$$L_{removed/total} = L_{removed/BMP1} + L_{removed/BMP2} + L_{removed/BMP3} + L_{removed/BMP4} + L_{removed/BMP5} + L_{removed/BMP6}$$

$$= \underline{1.4} + \underline{1.0} + \underline{0.7} + \underline{0.0} + \underline{0.0} + \underline{0.0}$$

$$= 3.1 \text{ pounds per year}$$

Compliance Check

$$L_{removed/total} \geq RR$$

$$\underline{3.1} \geq \underline{2.6}$$

AES
CONSULTING ENGINEERS

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-E-19**
Subject:	**Water Quality Volume**
	Bioretention Facility #1
Date:	**4/2/2012**
Calculated By:	**GVC**

BMP Type = **Bioretention Facility #1 - Kidsburg**

Water Quality Volume = 0.5 in. x **1.2** acres of impervious coverage

= (0.5 / 12) x (43,560 x **1.2**)

= **2178** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **2178**

= **4356** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **2178**

= **4356** CF

Dry Storage Volume Provided = **5224** CF Elevation = **84.19 - Outlet Elevation**

Hydraflow Table of Contents

W10119-E-19_Bioretention #1.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Wednesday, 00 27, 2012

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.119	1	15	8,261	------	------	------	Pre-Development
2	Rational	7.609	1	15	6,848	------	------	------	Post-Development
4	Reservoir	5.374	1	19	8,246	1	85.65	544	Pre Through Culvert
5	Reservoir	0.333	1	29	884	2	84.45	6,670	Post Routed

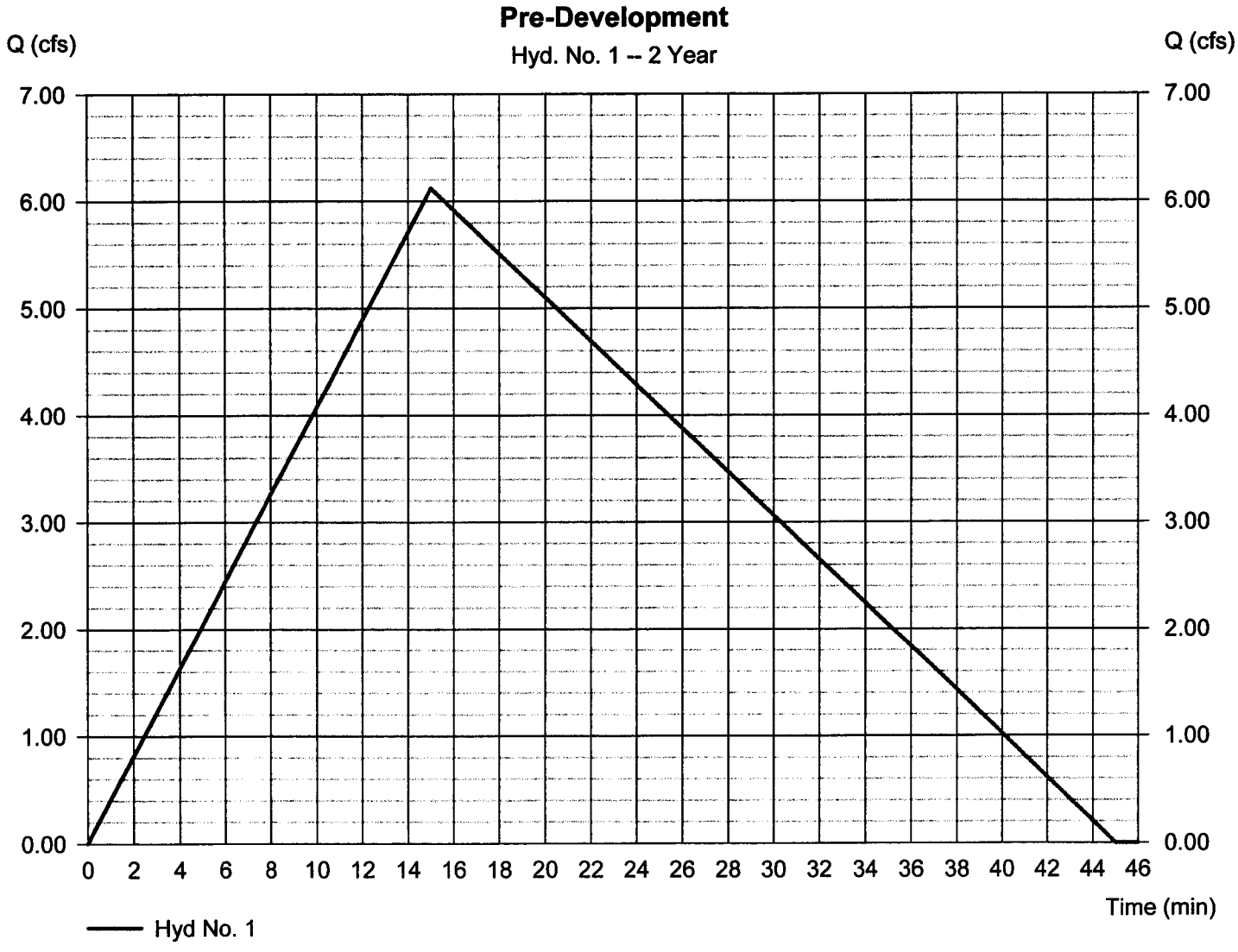
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 6.119 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,261 cuft
Drainage area	= 2.860 ac	Runoff coeff.	= 0.55
Intensity	= 3.890 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



Stormwater Division

MEMORANDUM

DATE: July 28, 2014
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jacob Smith, Stormwater Intern
PO: 110426
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	MID COUNTY PARK		
BMP ID OR GEN FILE NUMBER:	PC273	**OWNER NAME:**	JCC
PIN:	N/A	**SITE ADDRESS:**	N/A
		LEGAL DESCRIPTION:	N/A

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

BOX NO.:	2	**COMMENTS:**	TRANSMITTAL

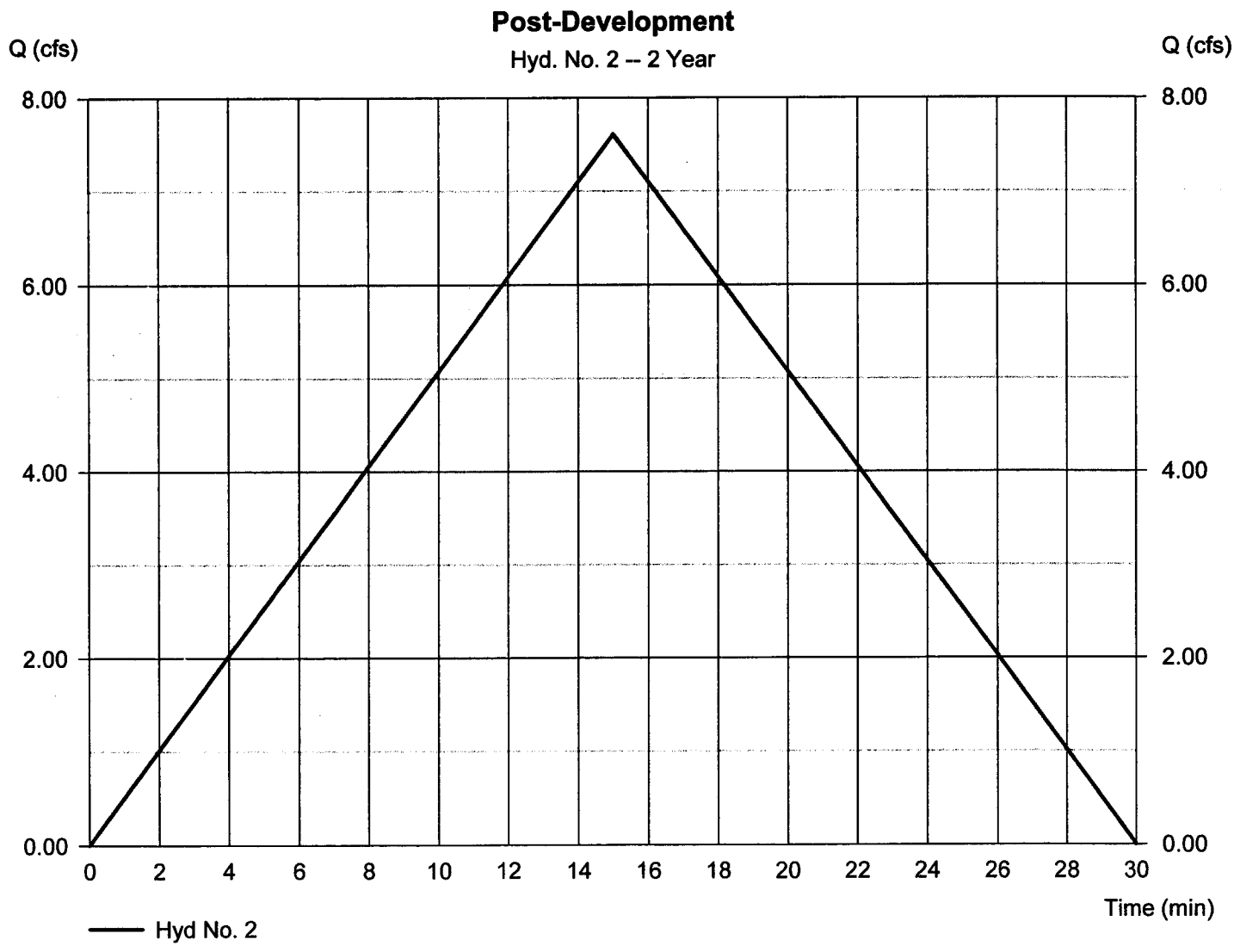
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 7.609 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,848 cuft
Drainage area	= 3.260 ac	Runoff coeff.	= 0.6
Intensity	= 3.890 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

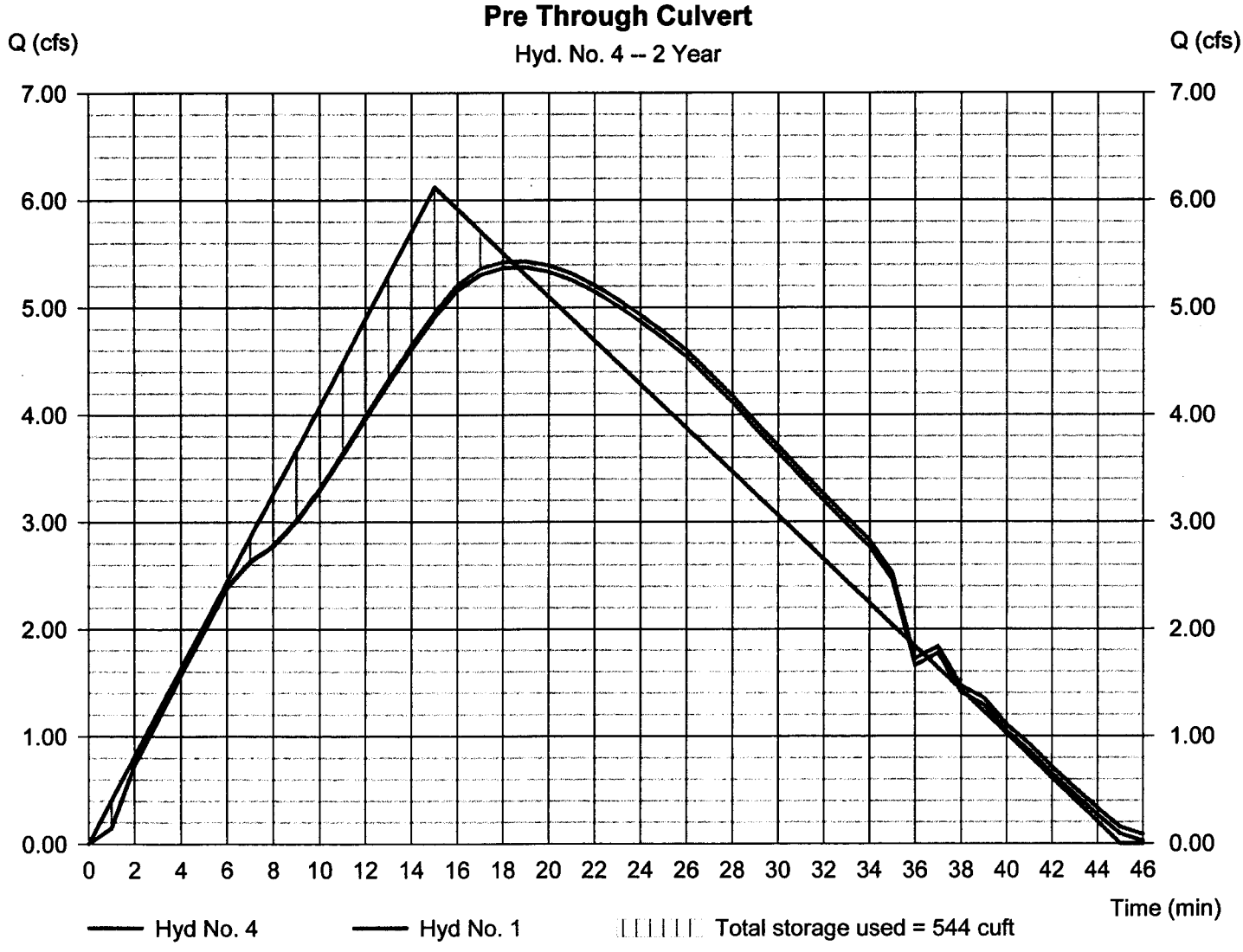
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 5.374 cfs
Storm frequency	= 2 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 8,246 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 85.65 ft
Reservoir name	= Existing Culvert	Max. Storage	= 544 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 1 - Existing Culvert

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 84.19 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	84.19	00	0	0
0.81	85.00	135	36	36
1.81	86.00	1,747	789	826
2.81	87.00	5,000	3,234	4,059

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 84.19	0.00	0.00	0.00
Length (ft)	= 21.00	0.00	0.00	0.00
Slope (%)	= 2.19	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	No	No	No

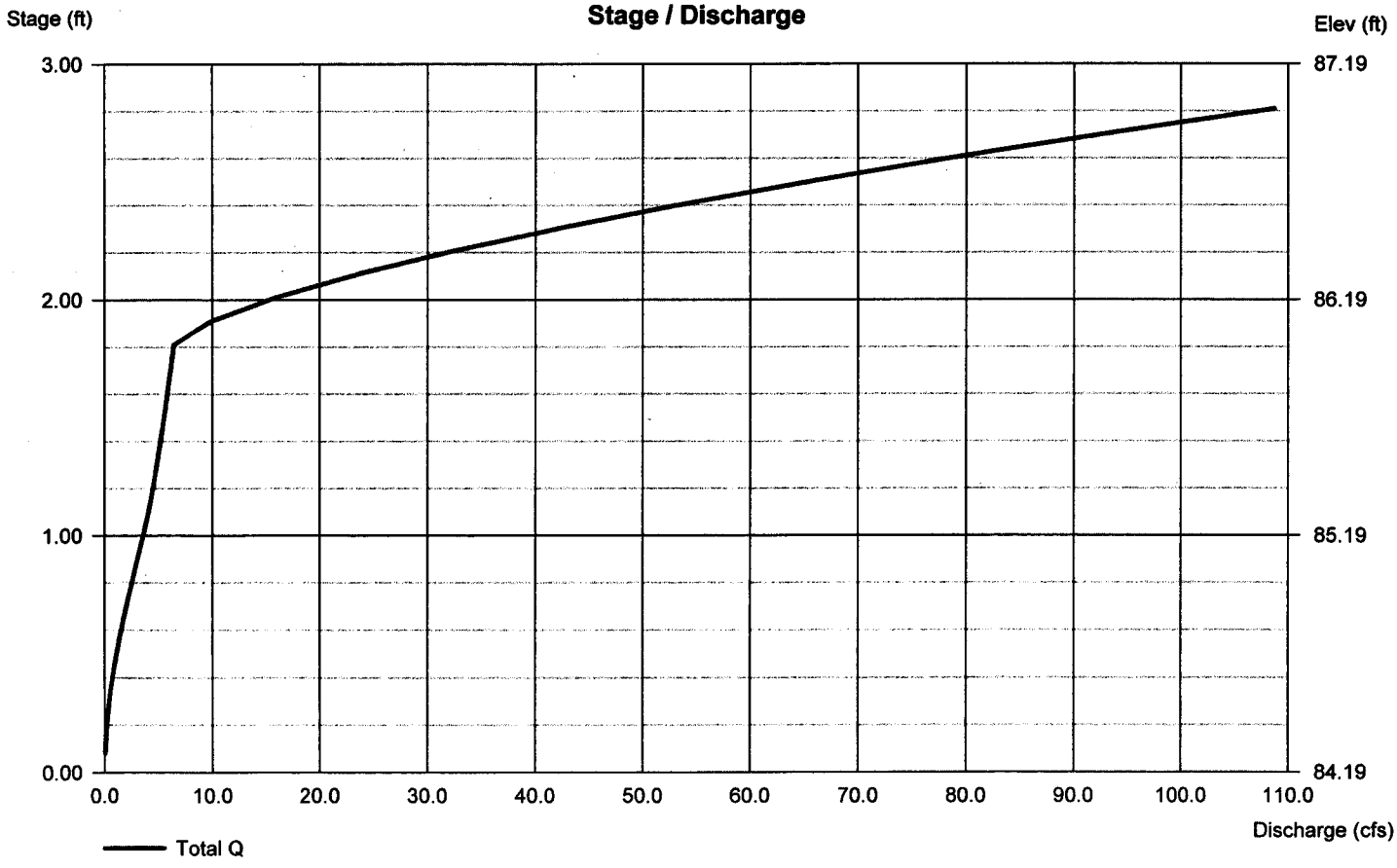
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 86.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

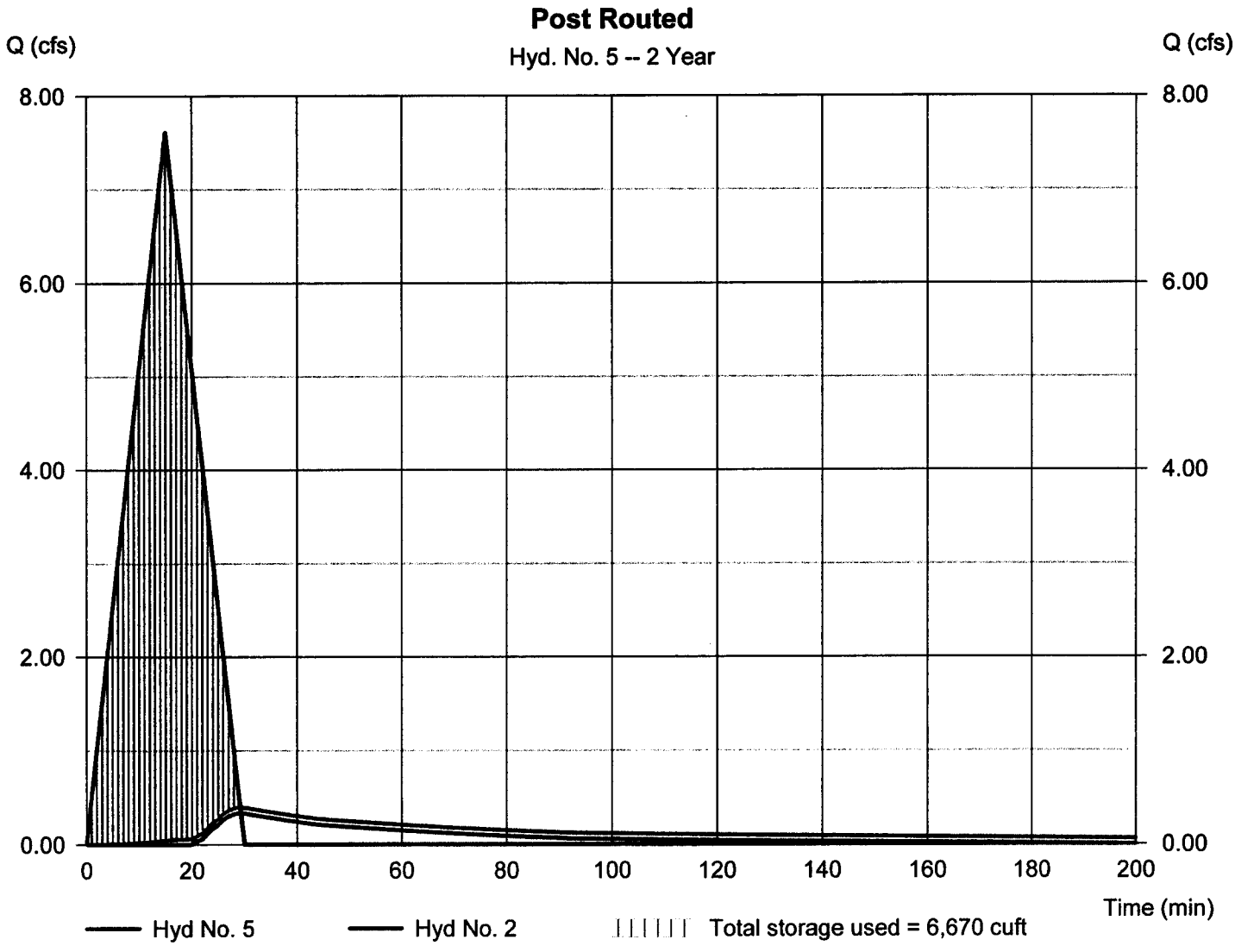
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.333 cfs
Storm frequency	= 2 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 884 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 84.45 ft
Reservoir name	= Bioretention #1	Max. Storage	= 6,670 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 2 - Bioretention #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 83.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	83.00	3,525	0	0
1.00	84.00	4,854	4,171	4,171
2.00	85.00	6,267	5,545	9,716
2.50	85.50	7,300	3,388	13,104

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 84.19	0.00	0.00	0.00
Length (ft)	= 21.00	0.00	0.00	0.00
Slope (%)	= 2.19	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	No	No	No

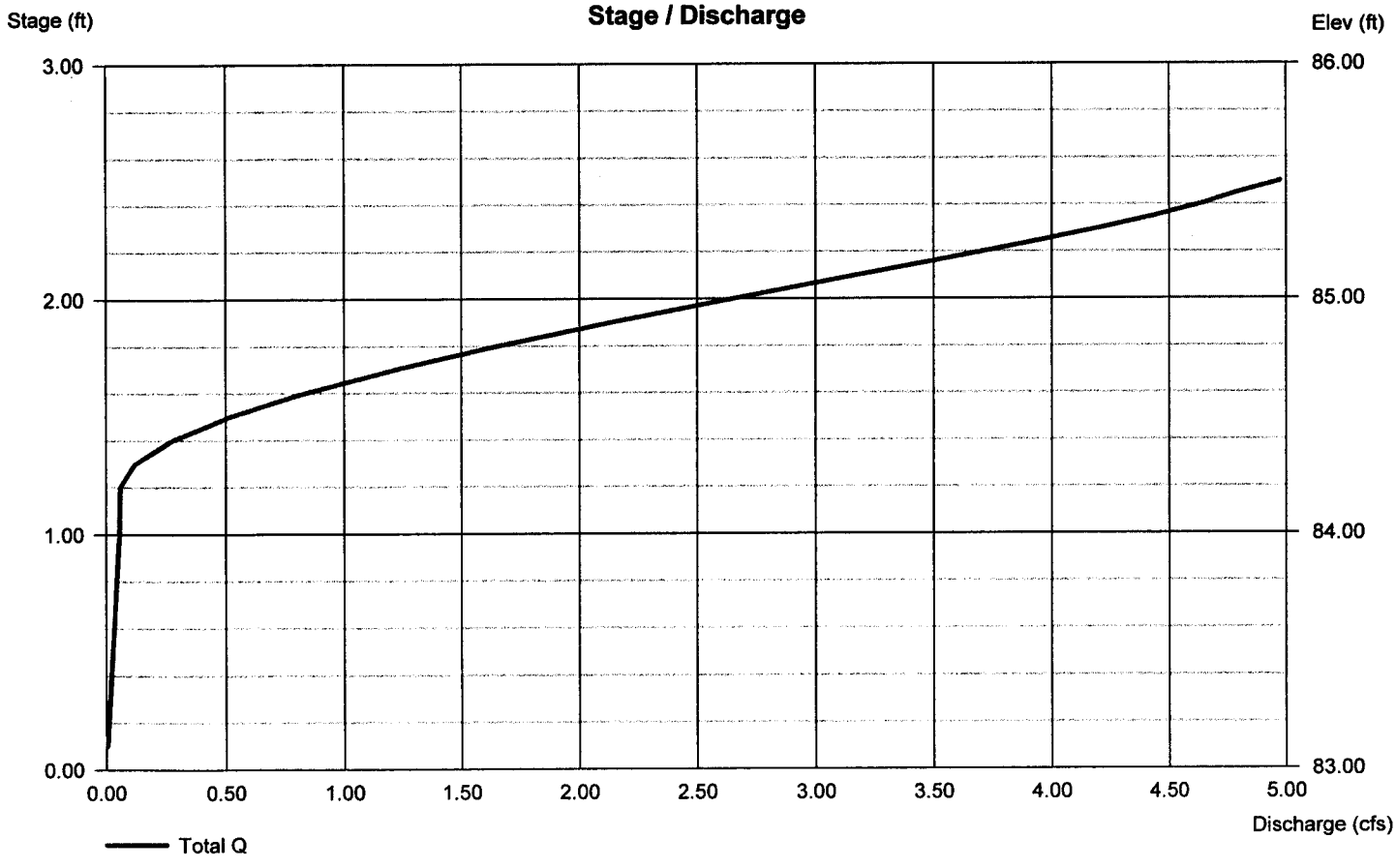
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	8.194	1	15	11,062	-----	-----	-----	Pre-Development
2	Rational	10.19	1	15	9,170	-----	-----	-----	Post-Development
4	Reservoir	7.374	1	18	11,036	1	86.03	915	Pre Through Culvert
5	Reservoir	1.445	1	28	3,051	2	84.77	8,433	Post Routed

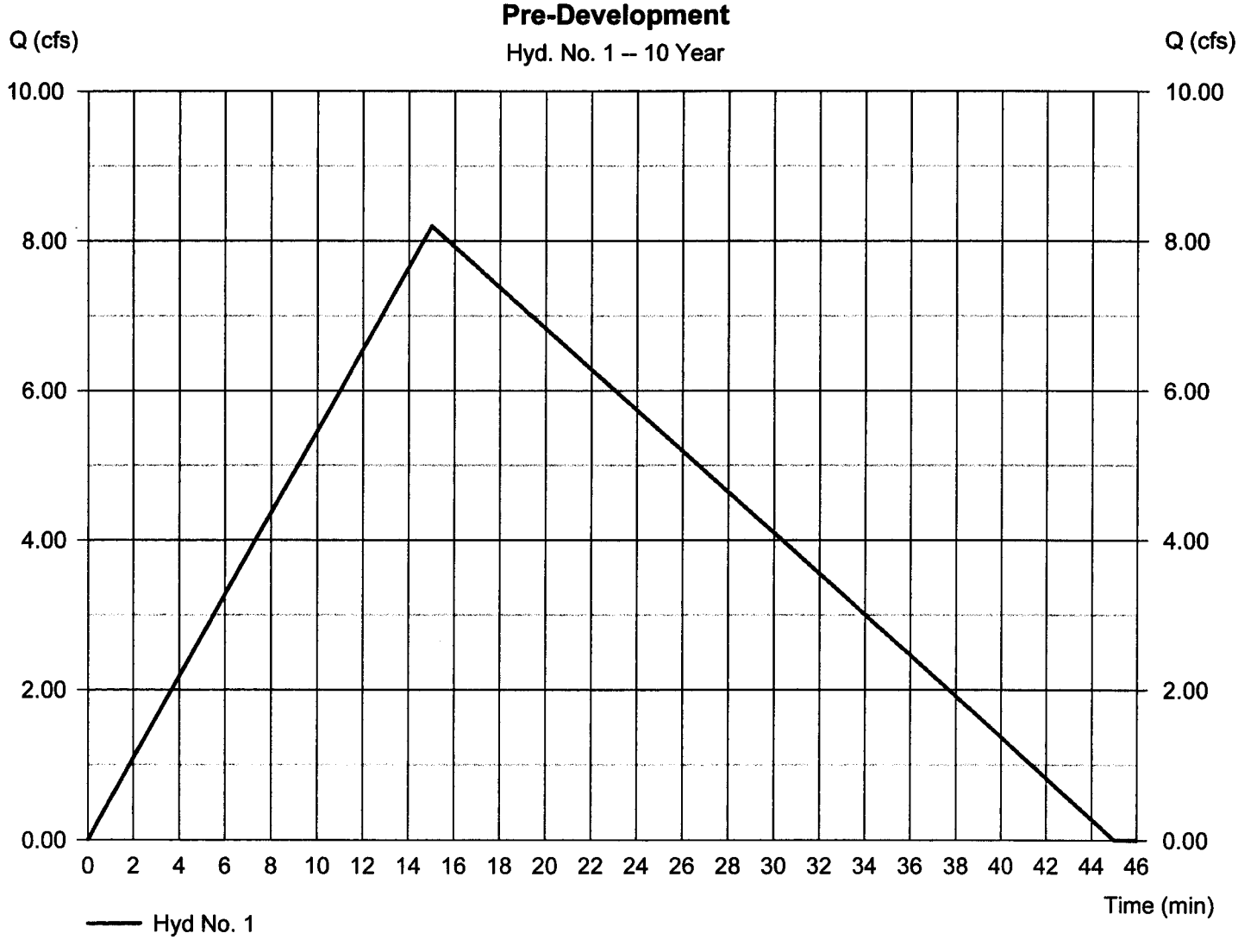
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 8.194 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 11,062 cuft
Drainage area	= 2.860 ac	Runoff coeff.	= 0.55
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



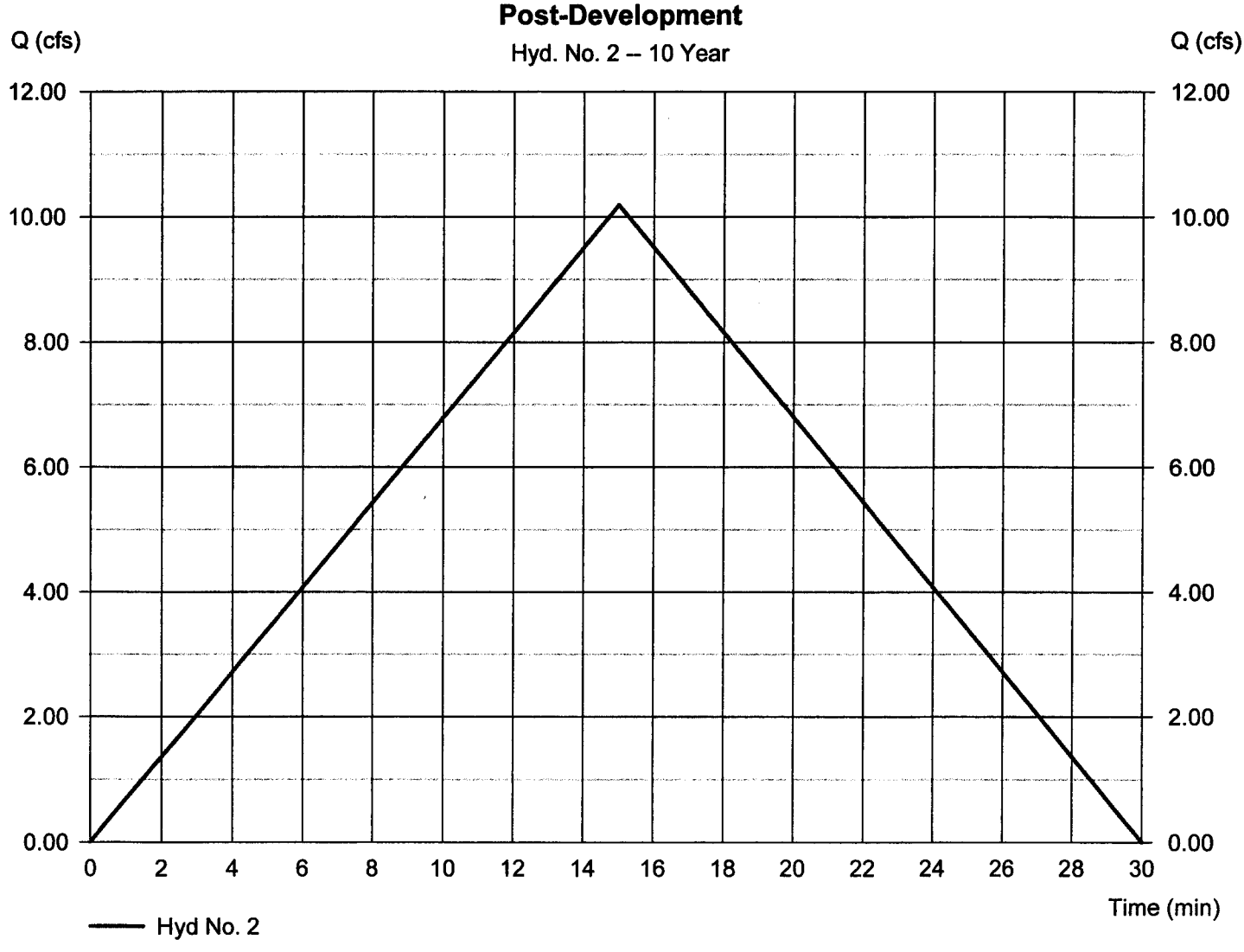
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 10.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 9,170 cuft
Drainage area	= 3.260 ac	Runoff coeff.	= 0.6
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

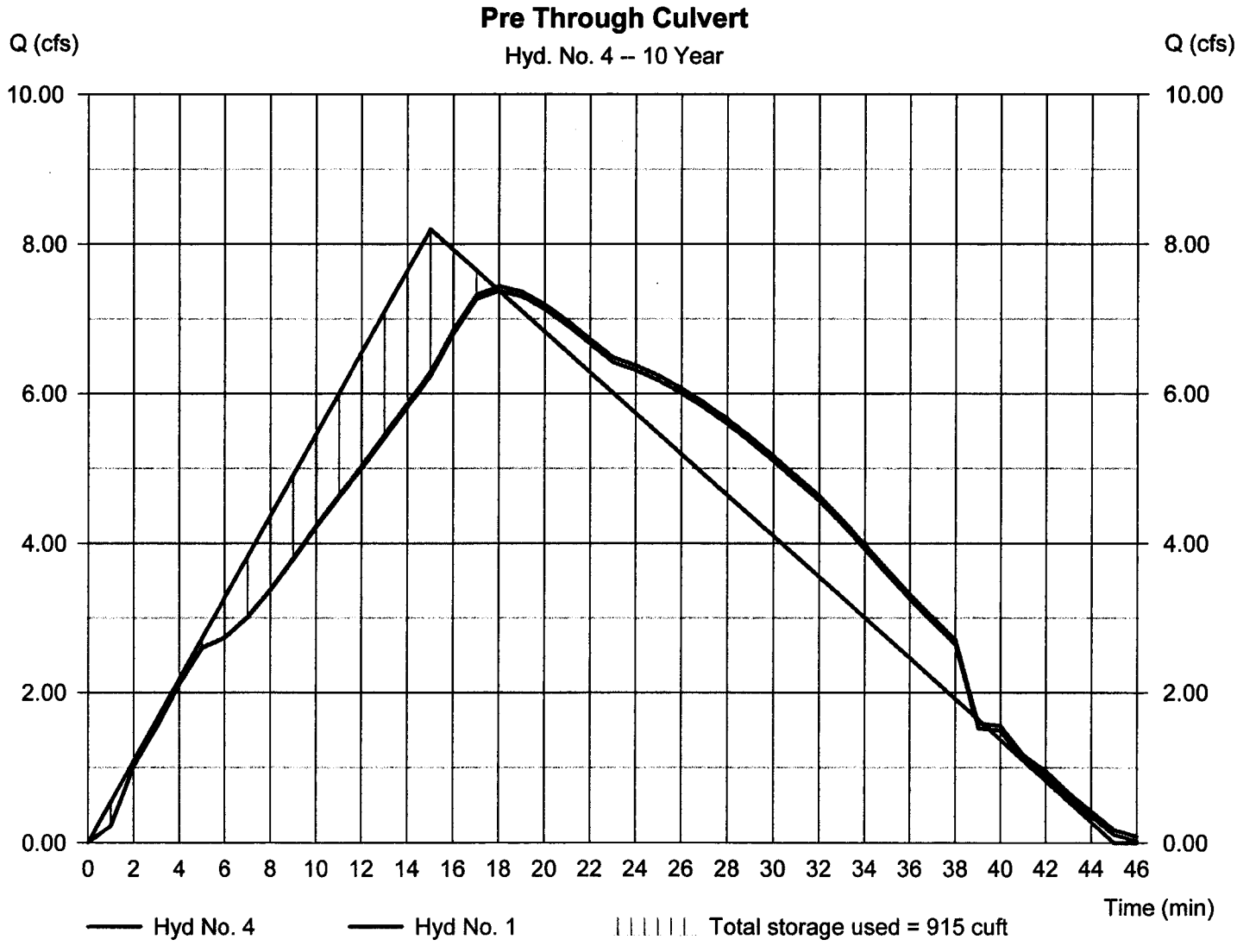
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 7.374 cfs
Storm frequency	= 10 yrs	Time to peak	= 18 min
Time interval	= 1 min	Hyd. volume	= 11,036 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 86.03 ft
Reservoir name	= Existing Culvert	Max. Storage	= 915 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

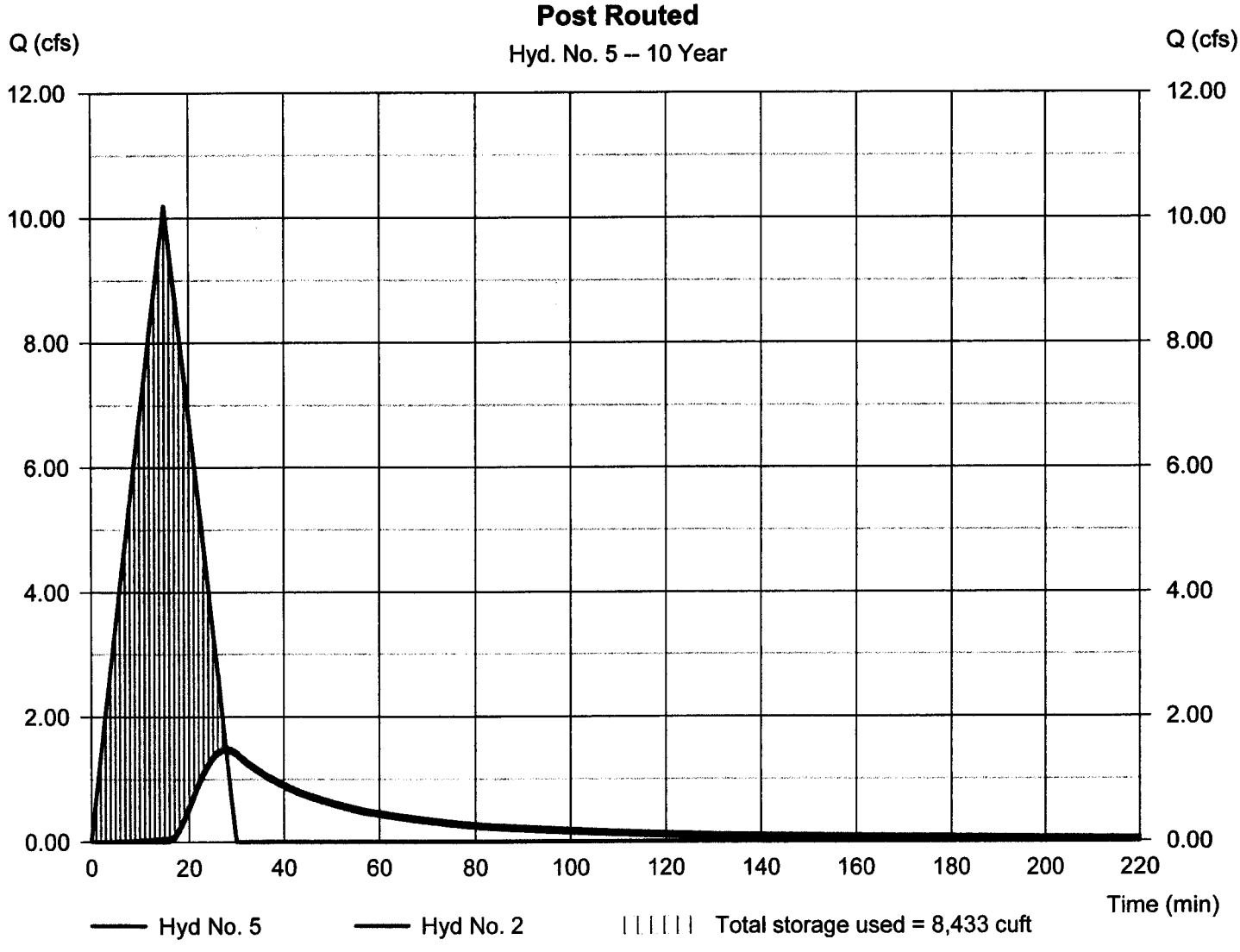
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.445 cfs
Storm frequency	= 10 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 3,051 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 84.77 ft
Reservoir name	= Bioretention #1	Max. Storage	= 8,433 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	11.48	1	15	15,504	-----	-----	-----	Pre-Development
2	Rational	14.28	1	15	12,853	-----	-----	-----	Post-Development
4	Reservoir	10.96	1	16	15,467	1	86.12	1,208	Pre Through Culvert
5	Reservoir	3.437	1	26	6,653	2	85.16	10,811	Post Routed

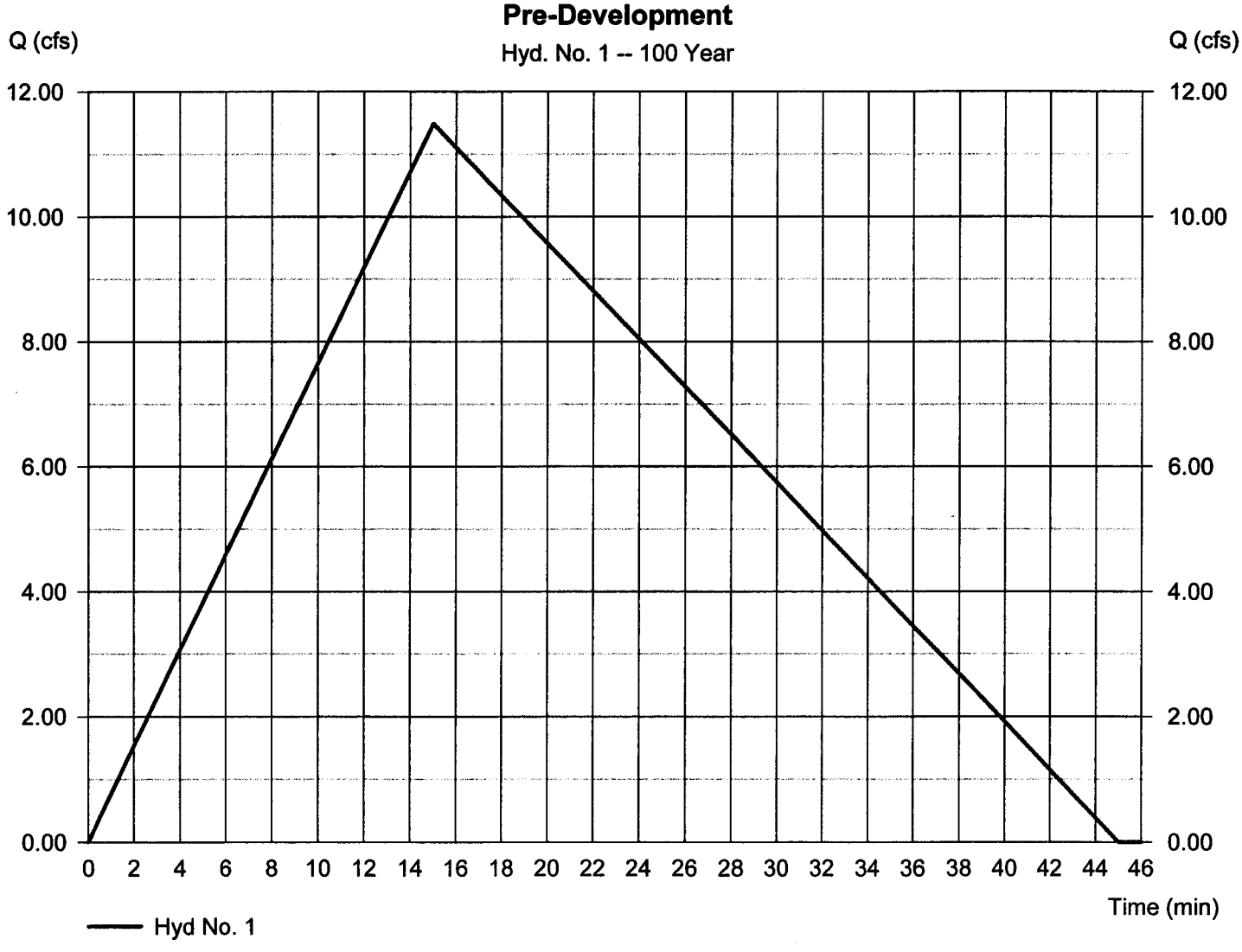
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 11.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 15,504 cuft
Drainage area	= 2.860 ac	Runoff coeff.	= 0.55
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



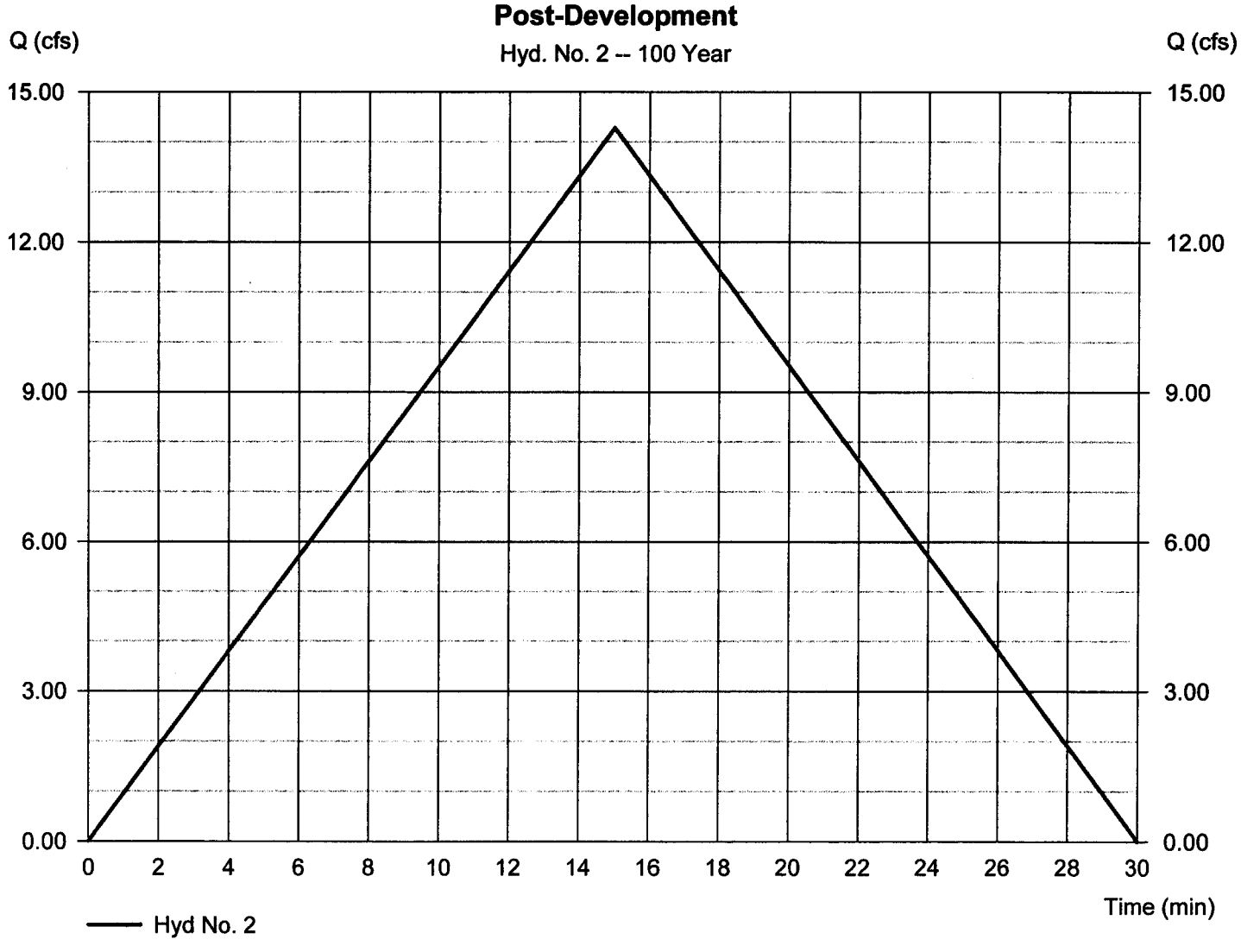
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 14.28 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 12,853 cuft
Drainage area	= 3.260 ac	Runoff coeff.	= 0.6
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

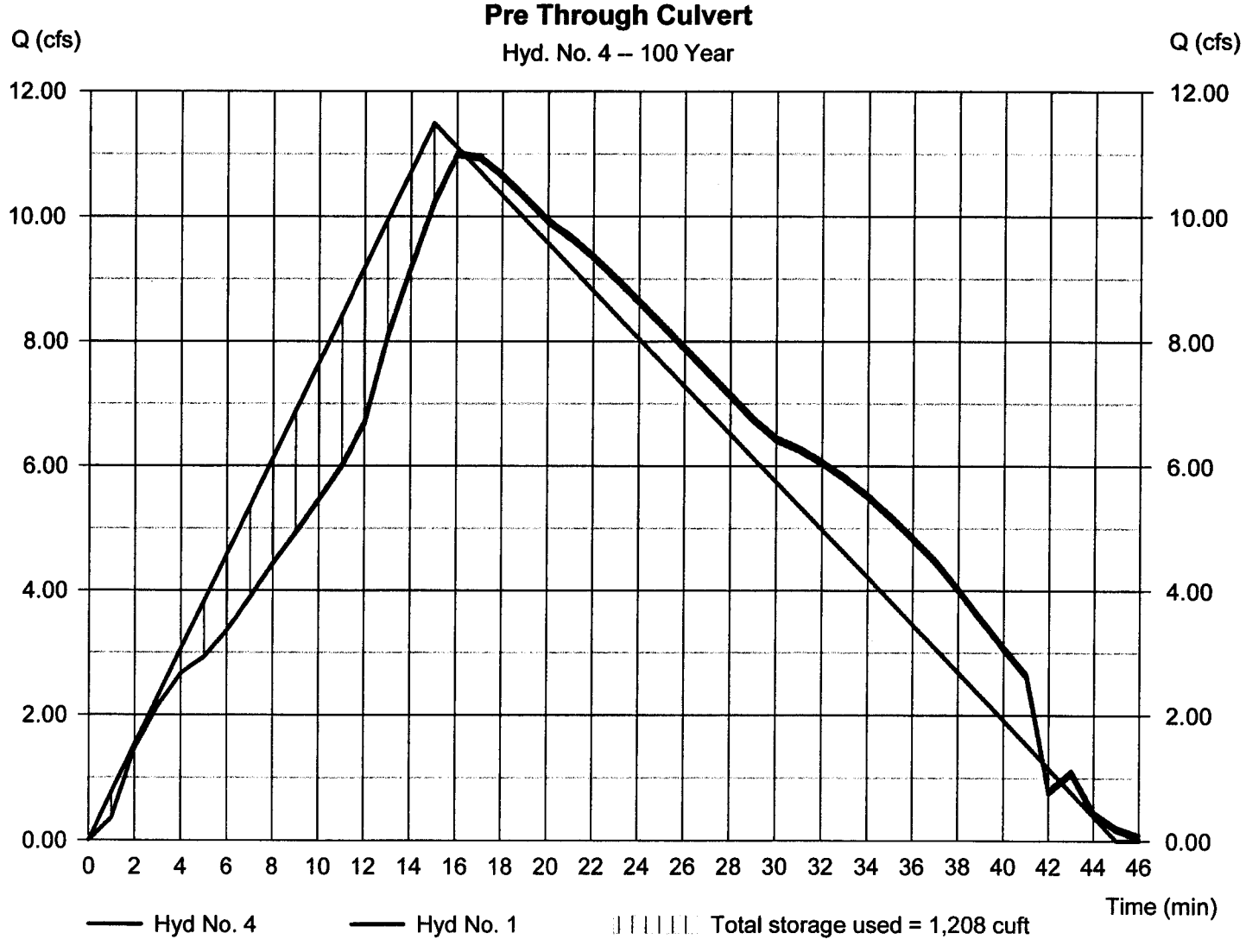
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 10.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 15,467 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 86.12 ft
Reservoir name	= Existing Culvert	Max. Storage	= 1,208 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

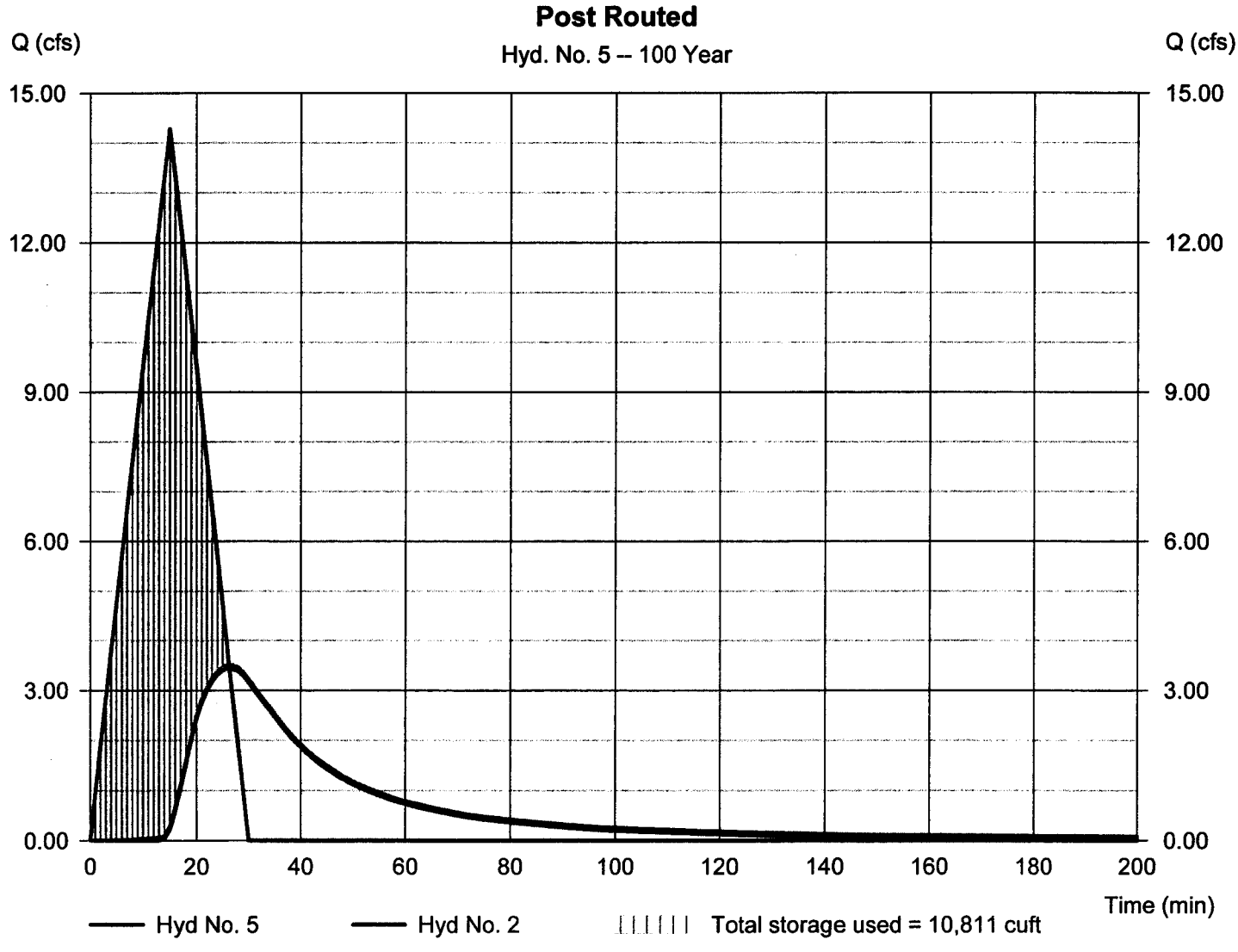
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 3.437 cfs
Storm frequency	= 100 yrs	Time to peak	= 26 min
Time interval	= 1 min	Hyd. volume	= 6,653 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 85.16 ft
Reservoir name	= Bioretention #1	Max. Storage	= 10,811 cuft

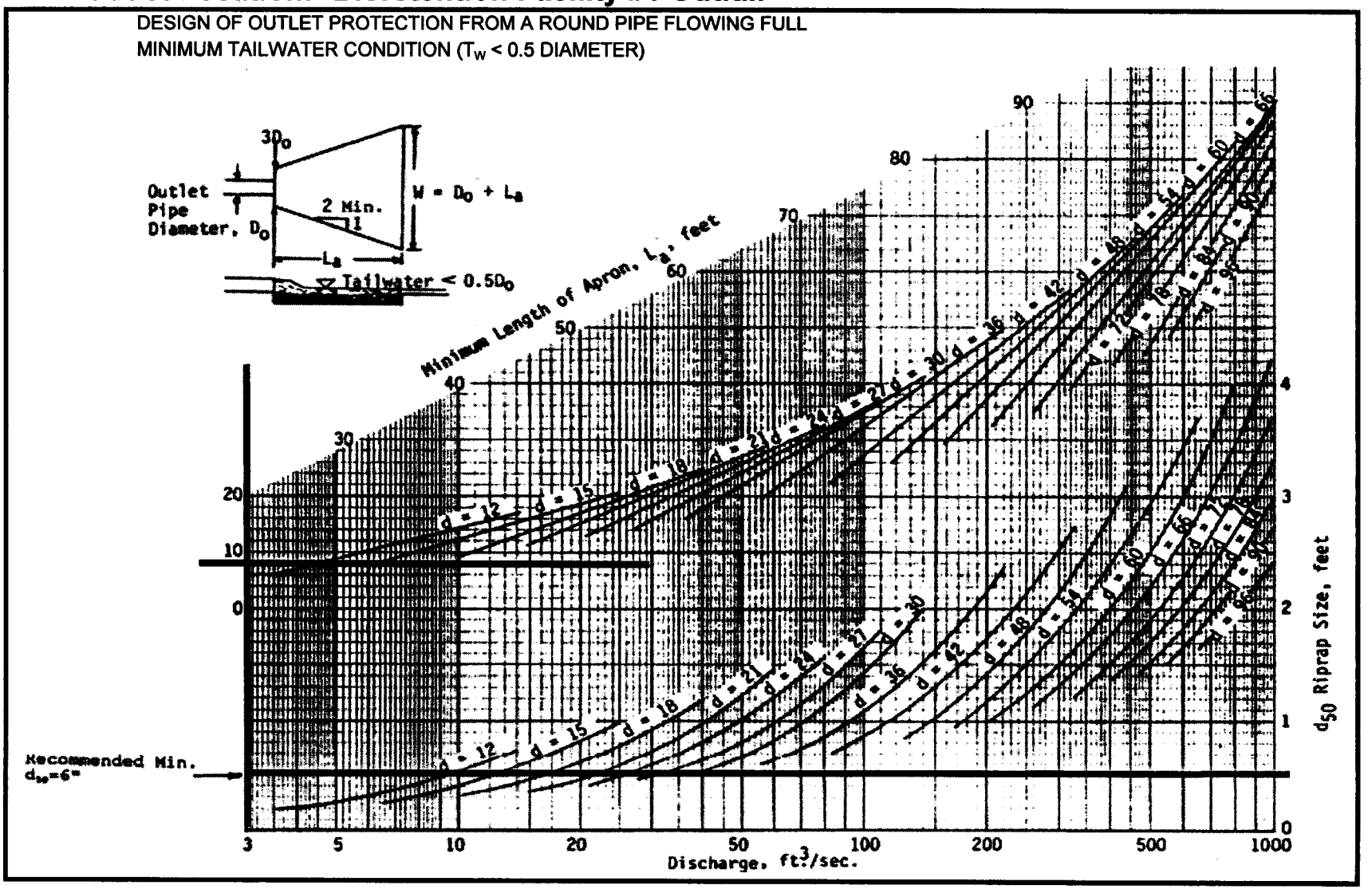
Storage Indication method used. Exfiltration extracted from Outflow.



AES
CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Bioretention Facility #1 Outfall



Q =	1.45	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3

3.18

AES
CONSULTING ENGINEERS

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-E-19**
Subject:	**Water Quality Volume**
	Bioretention Facility #2
Date:	**4/2/2012**
Calculated By:	**GVC**

BMP Type = **Bioretention Facility #2 - Main Parking Lot**

Water Quality Volume = 0.5 in. x **0.85** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.85**)

= **1543** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **1543**

= **3085.5** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **1543**

= **3086** CF

Dry Storage Volume Provided = **3678** CF Elevation = **#57 Stone - 2' Depth**

Hydraflow Table of Contents

W10119-E-19_Bioretention #2.gpw

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.471	1	10	5,824	-----	-----	-----	Pre-Development
2	Rational	6.969	1	10	4,182	-----	-----	-----	Post-Development
4	Reservoir	5.643	1	13	5,818	1	85.04	449	Pre Through Culvert
5	Reservoir	0.024	1	20	125	2	83.60	4,143	Post Through Bio #2

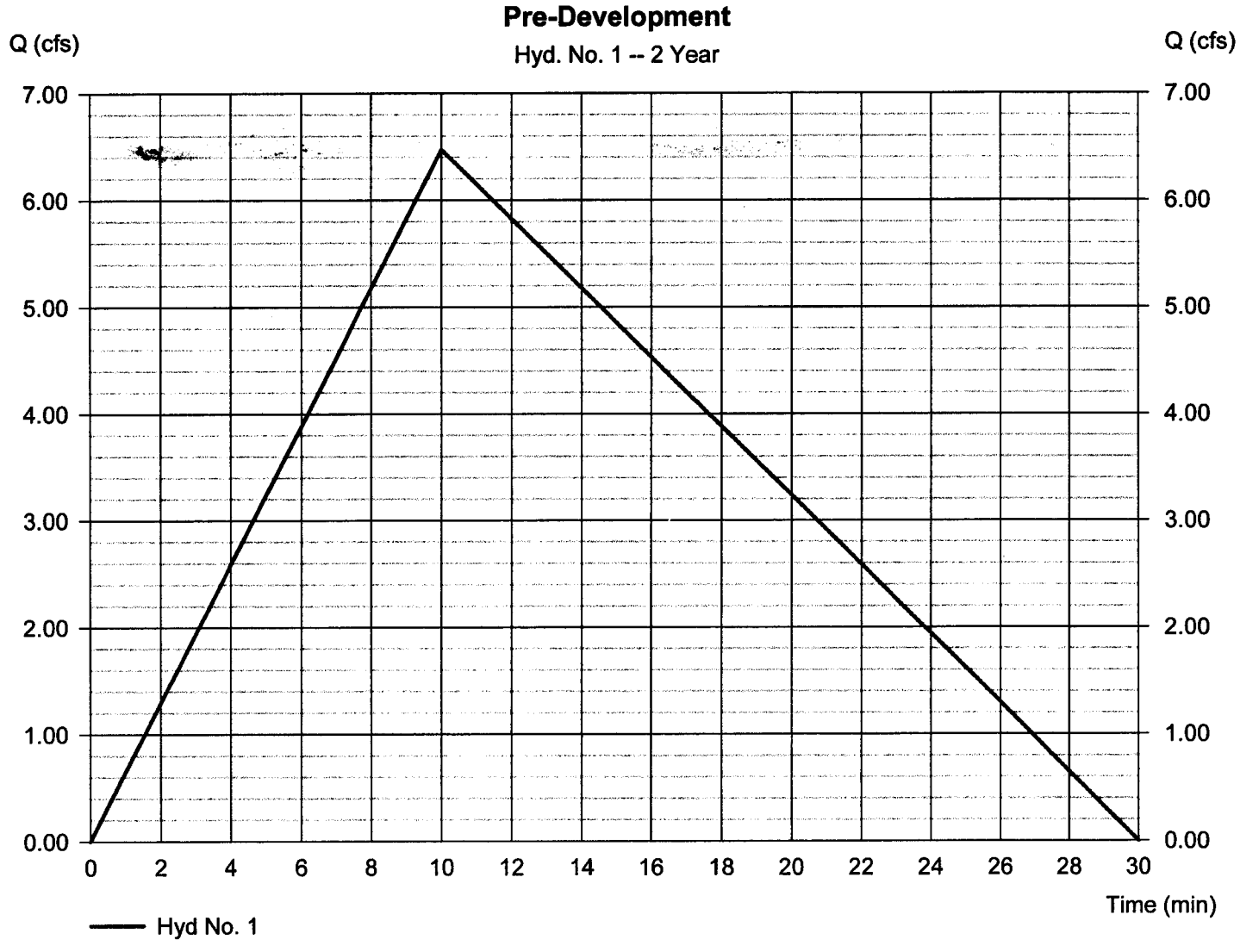
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 6.471 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 5,824 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.65
Intensity	= 4.609 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



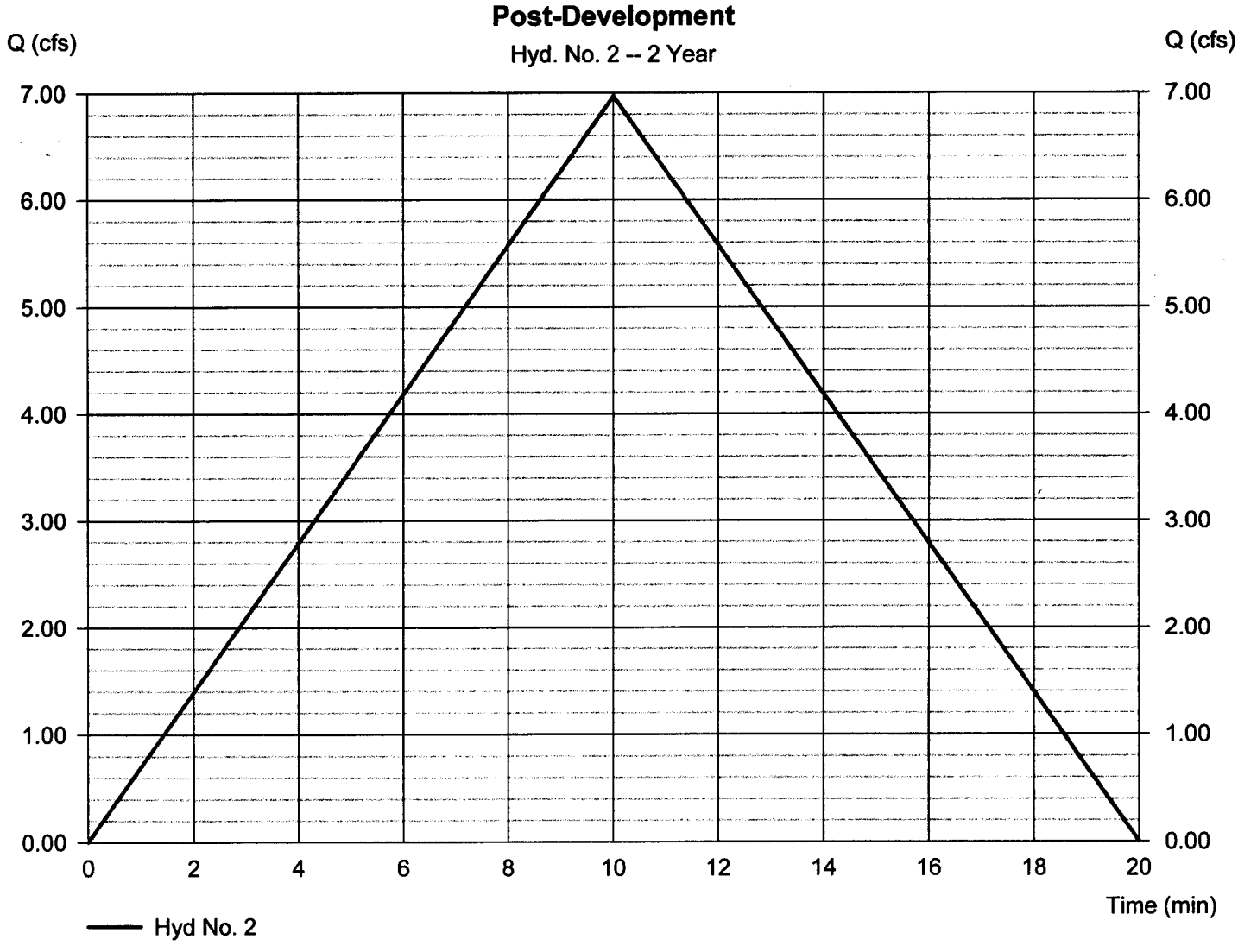
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 6.969 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 4,182 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.7
Intensity	= 4.609 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

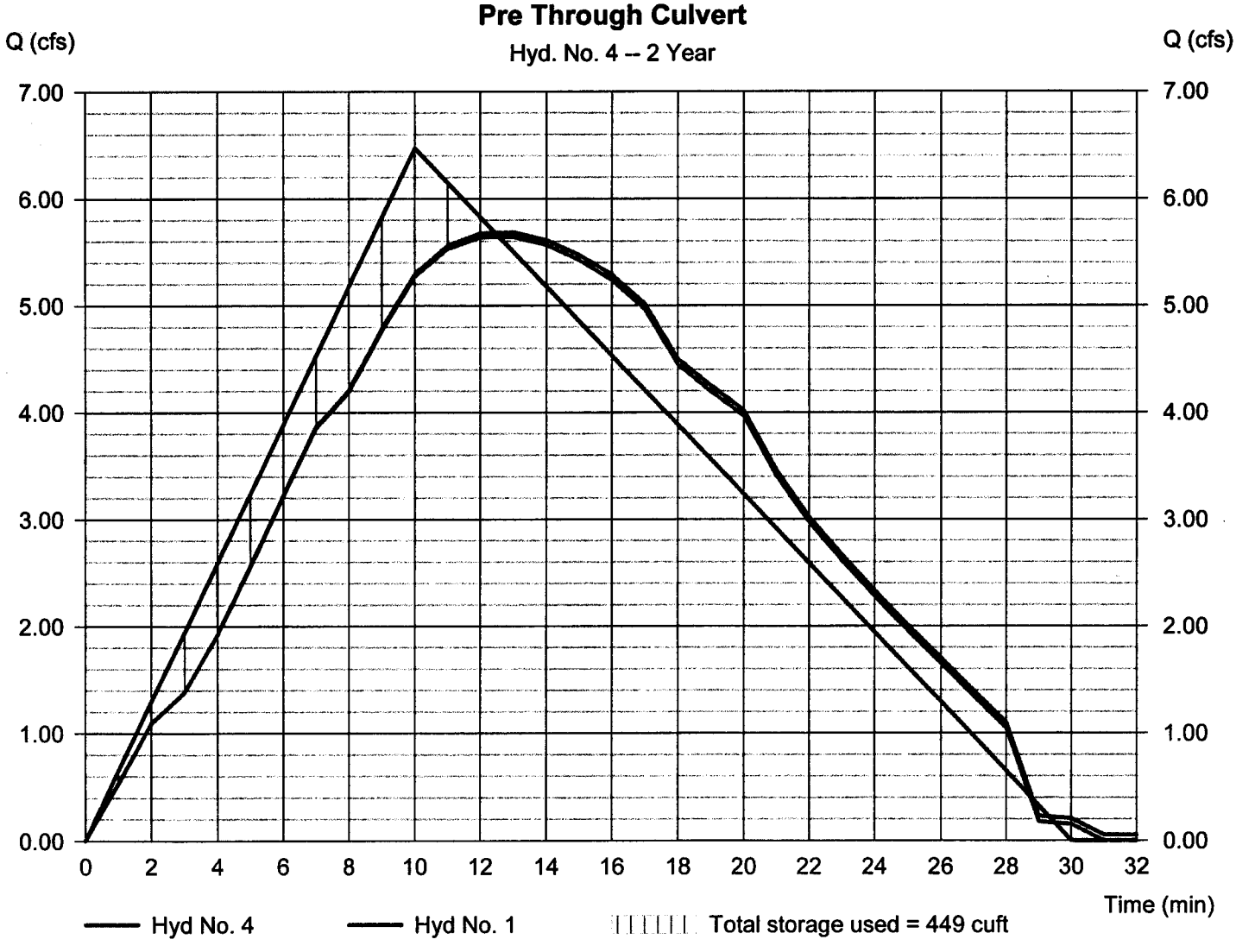
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 5.643 cfs
Storm frequency	= 2 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 5,818 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 85.04 ft
Reservoir name	= Existing Culvert	Max. Storage	= 449 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 1 - Existing Culvert

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 83.53 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	83.53	00	0	0
0.47	84.00	32	5	5
1.47	85.00	778	323	328
2.47	86.00	6,000	2,979	3,307

Culvert / Orifice Structures

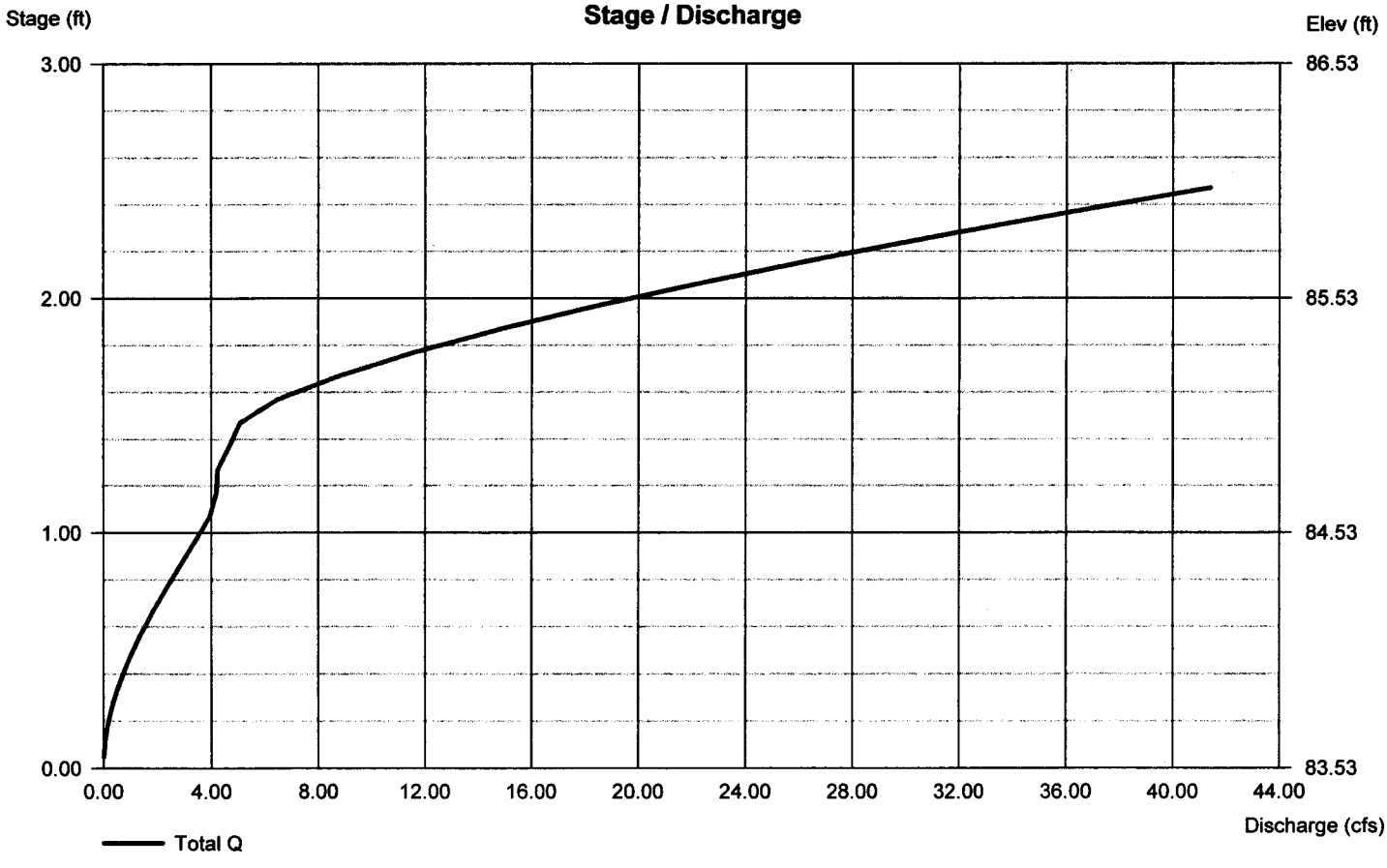
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 83.53	0.00	0.00	0.00
Length (ft)	= 43.00	0.00	0.00	0.00
Slope (%)	= 1.02	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 85.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

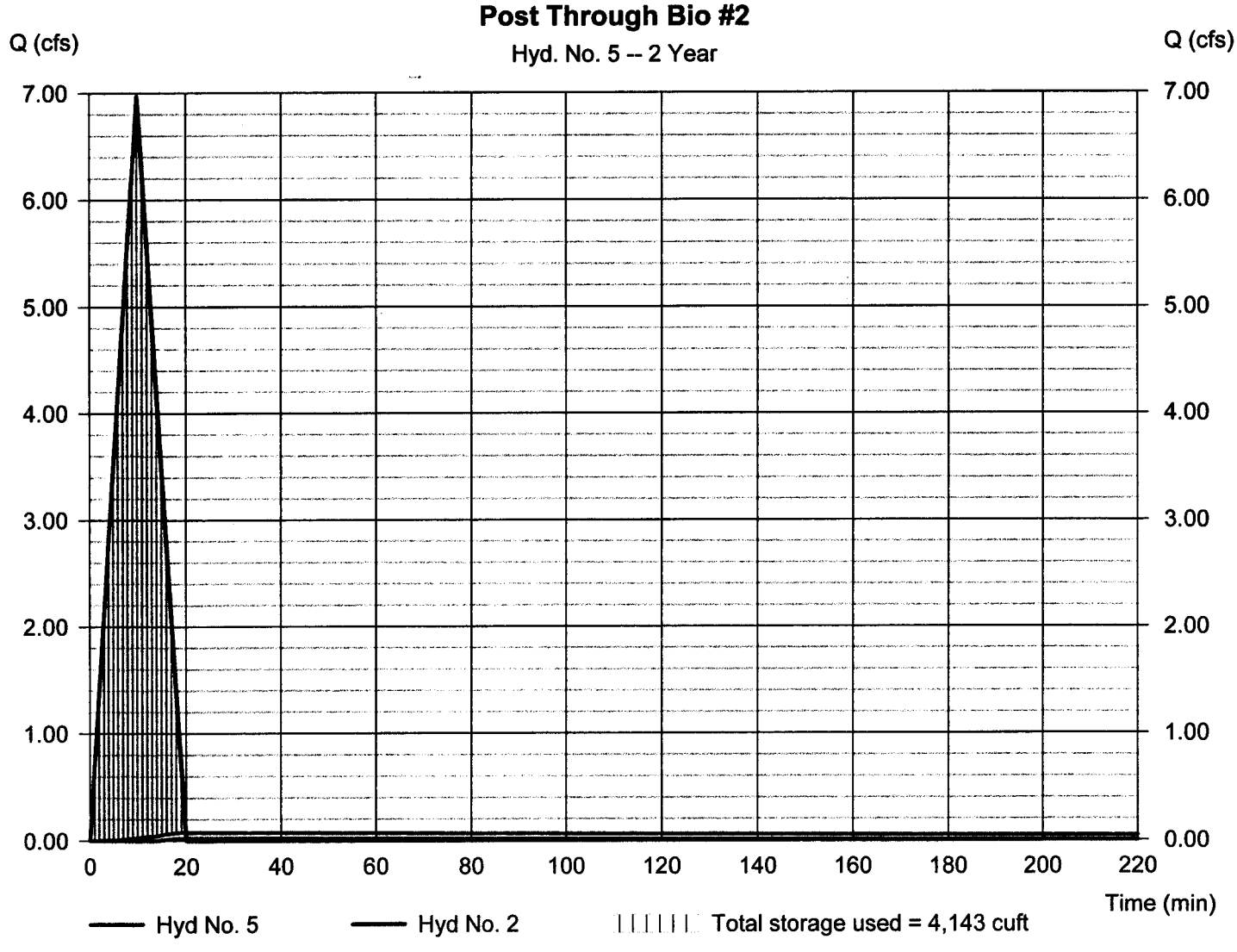
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Through Bio #2

Hydrograph type	= Reservoir	Peak discharge	= 0.024 cfs
Storm frequency	= 2 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 125 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 83.60 ft
Reservoir name	= Bioretention #2	Max. Storage	= 4,143 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 2 - Bioretention #2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 83.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	83.00	5,957	0	0
1.00	84.00	7,974	6,940	6,940
2.00	85.00	9,993	8,964	15,904

Culvert / Orifice Structures

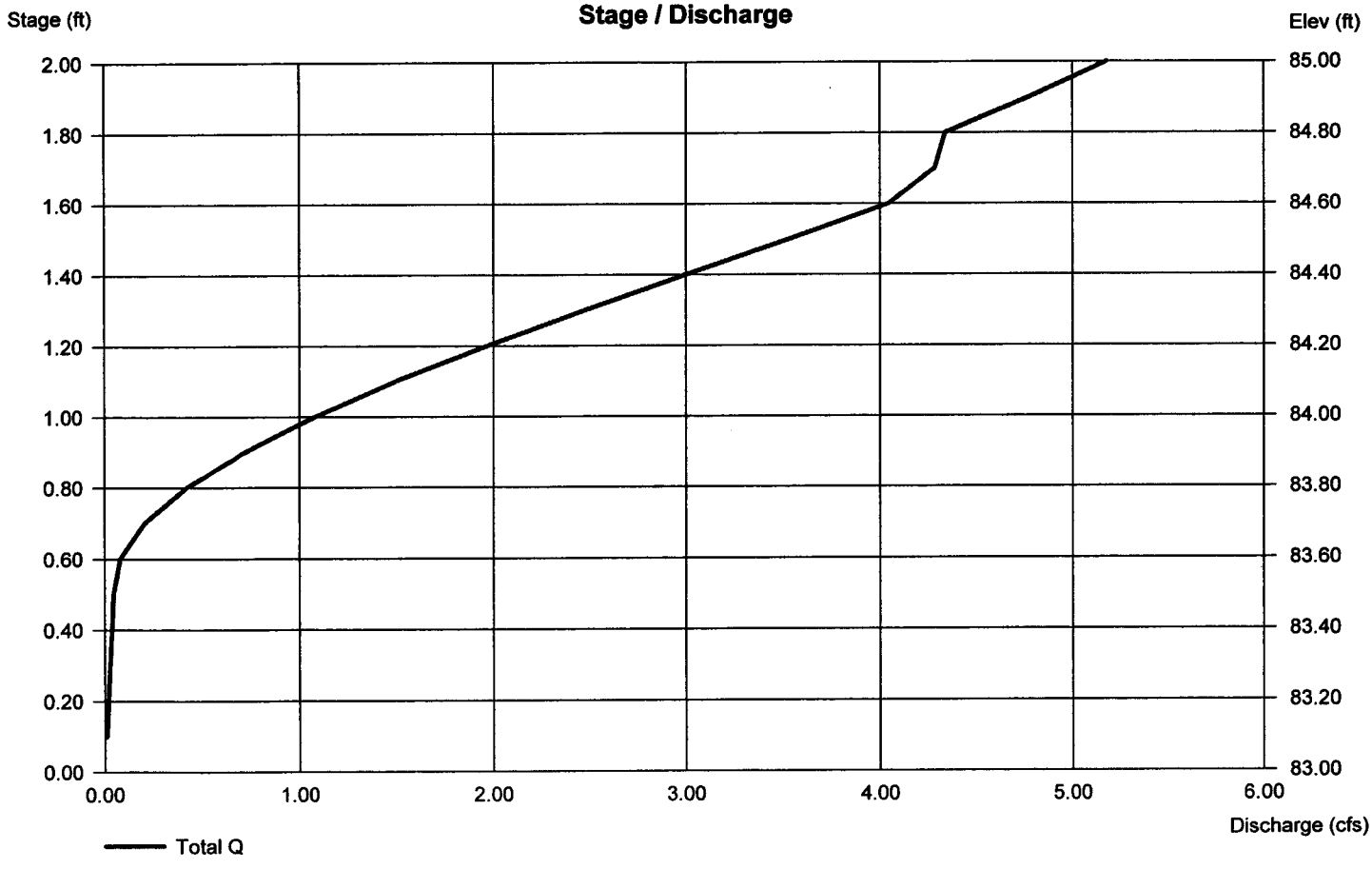
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	0.00	0.00	0.00
Span (in)	= 15.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 83.53	0.00	0.00	0.00
Length (ft)	= 43.00	0.00	0.00	0.00
Slope (%)	= 1.02	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	8.482	1	10	7,634	------	------	------	Pre-Development
2	Rational	9.135	1	10	5,481	------	------	------	Post-Development
4	Reservoir	7.336	1	13	7,627	1	85.14	737	Pre Through Culvert
5	Reservoir	0.288	1	20	968	2	83.77	5,357	Post Through Bio #2

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 8.482 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 7,634 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.65
Intensity	= 6.042 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2

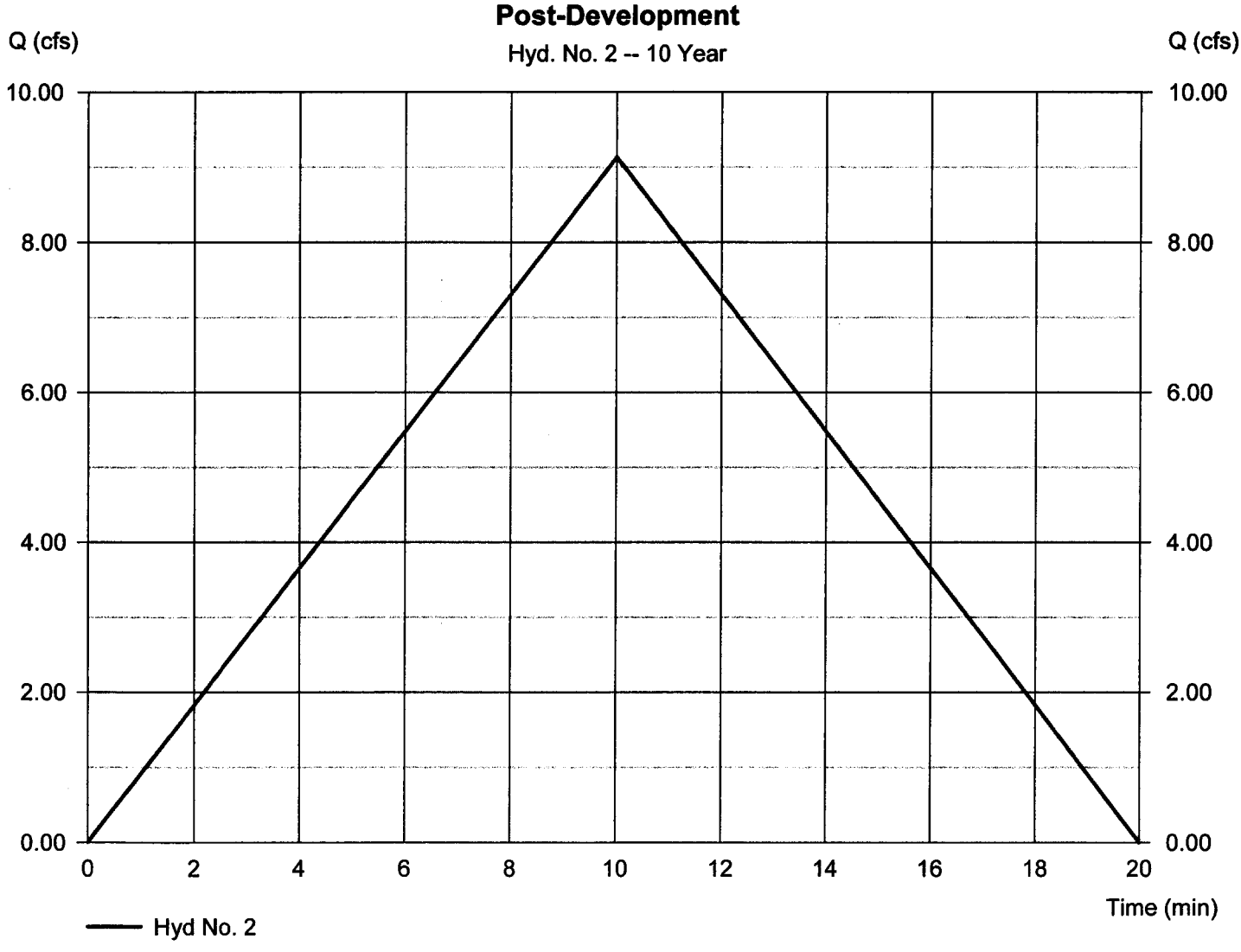
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 9.135 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 5,481 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.7
Intensity	= 6.042 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

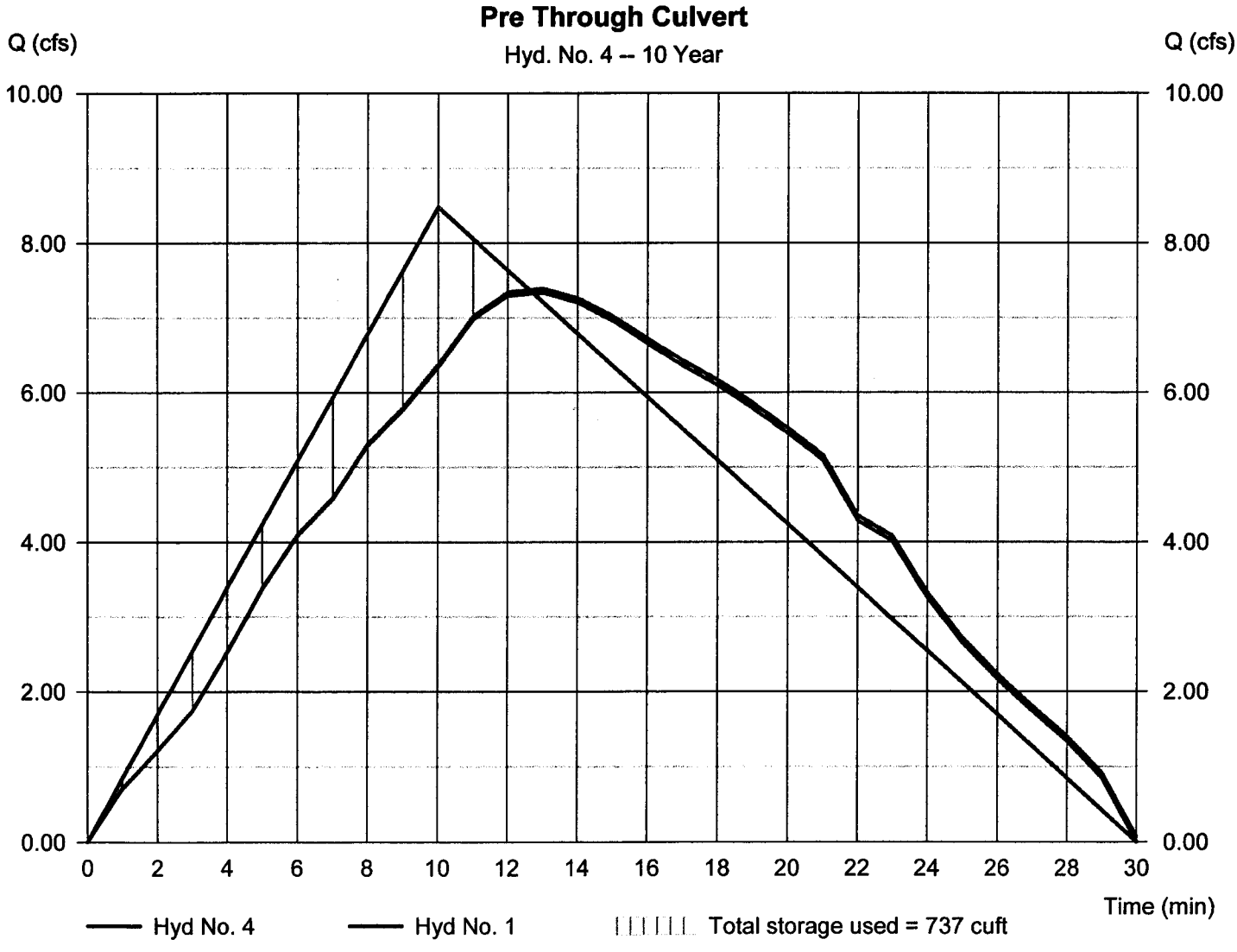
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 7.336 cfs
Storm frequency	= 10 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 7,627 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 85.14 ft
Reservoir name	= Existing Culvert	Max. Storage	= 737 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

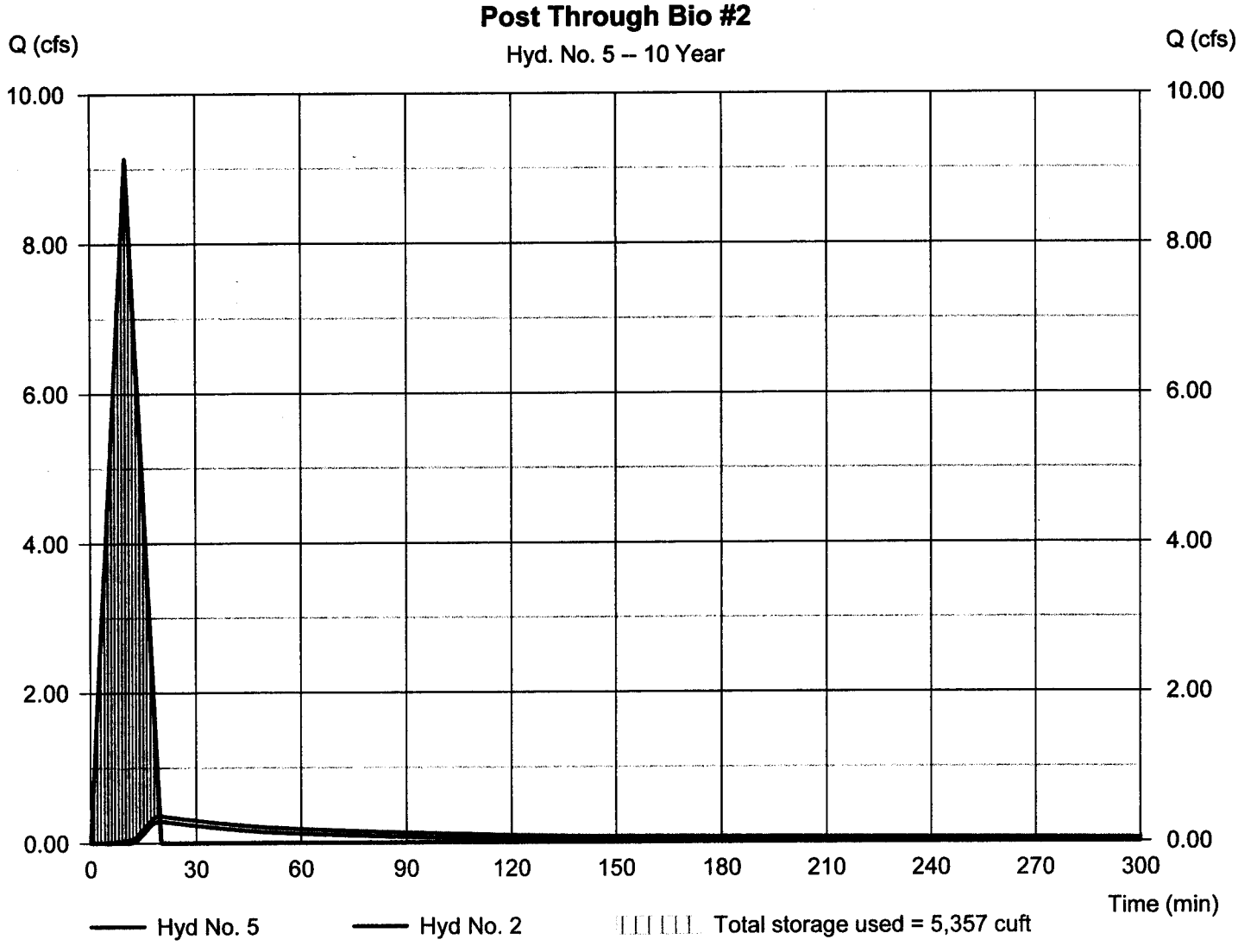
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Through Bio #2

Hydrograph type	= Reservoir	Peak discharge	= 0.288 cfs
Storm frequency	= 10 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 968 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 83.77 ft
Reservoir name	= Bioretention #2	Max. Storage	= 5,357 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	11.74	1	10	10,563	-----	-----	-----	Pre-Development
2	Rational	12.64	1	10	7,584	-----	-----	-----	Post-Development
4	Reservoir	10.45	1	12	10,544	1	85.26	1,102	Pre Through Culvert
5	Reservoir	1.087	1	19	2,837	2	84.02	7,158	Post Through Bio #2

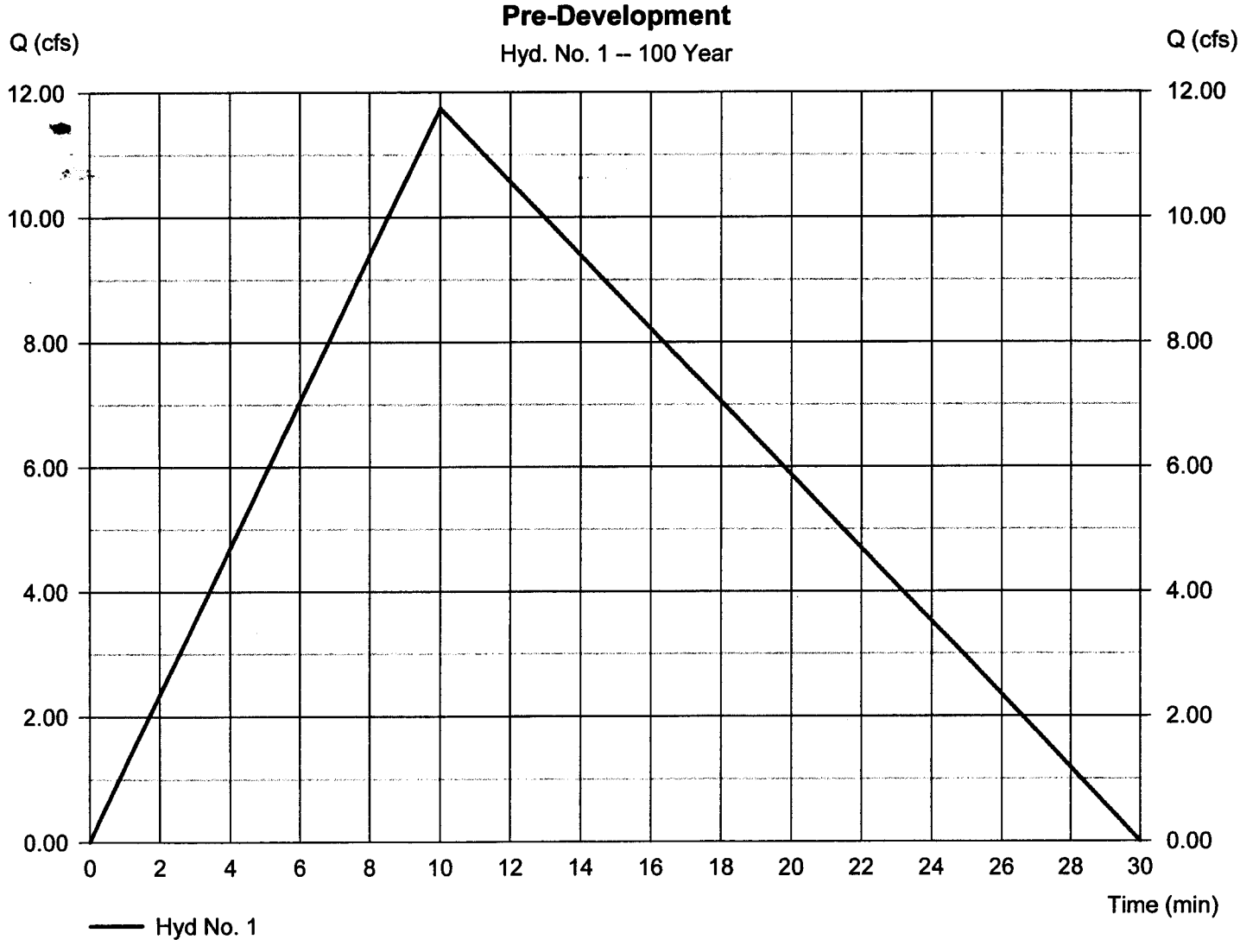
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 11.74 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 10,563 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.65
Intensity	= 8.360 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



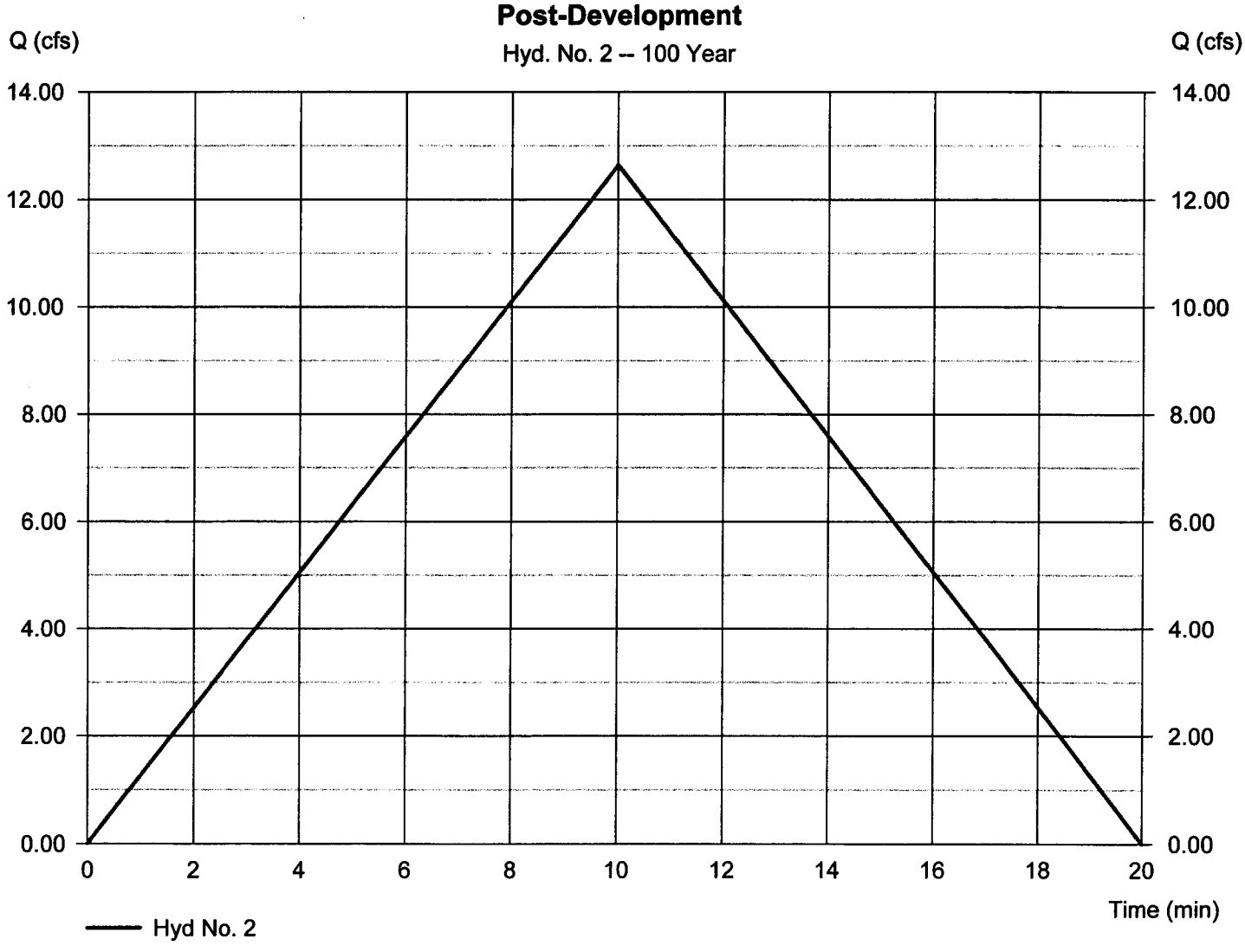
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 12.64 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 7,584 cuft
Drainage area	= 2.160 ac	Runoff coeff.	= 0.7
Intensity	= 8.360 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

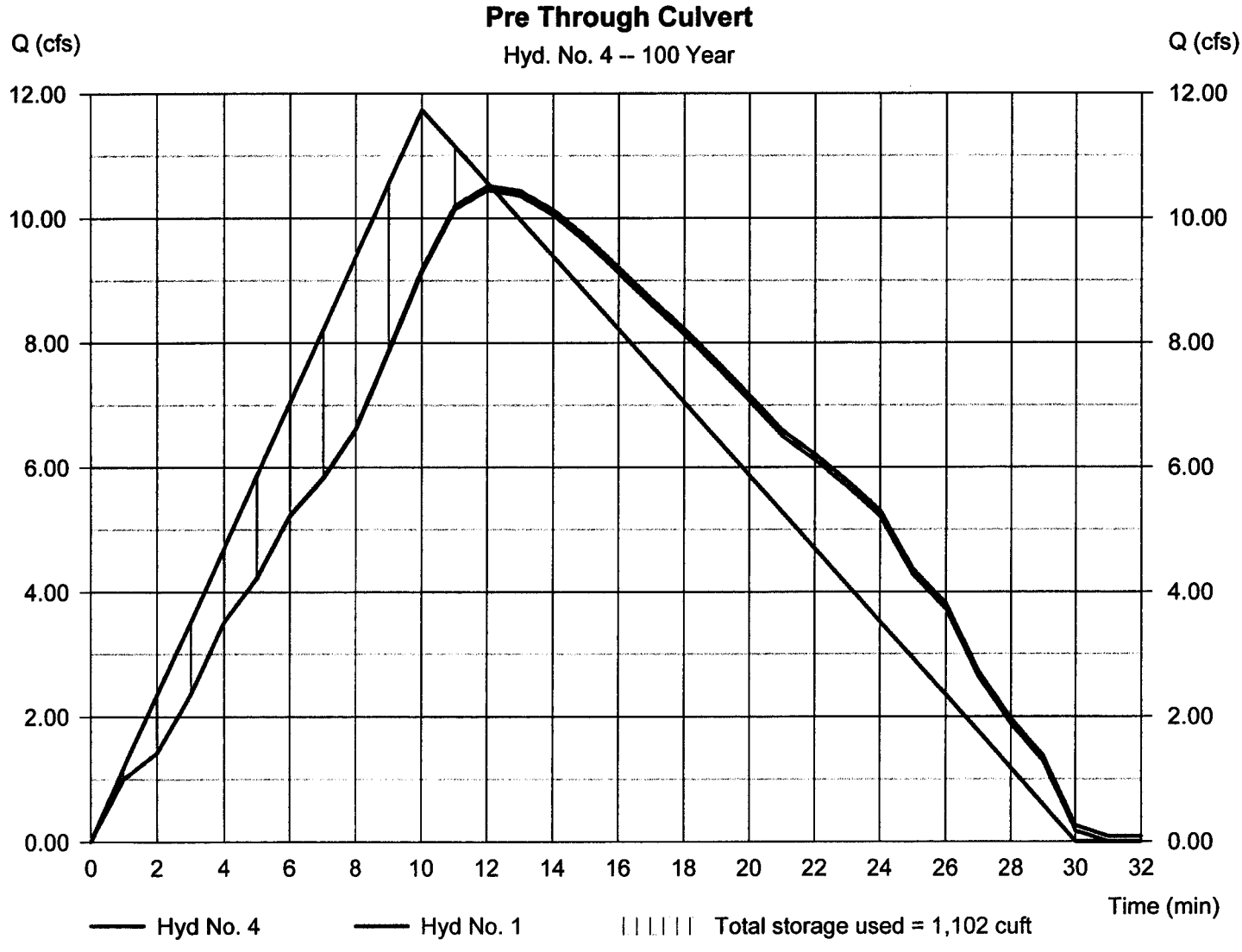
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 10.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 12 min
Time interval	= 1 min	Hyd. volume	= 10,544 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 85.26 ft
Reservoir name	= Existing Culvert	Max. Storage	= 1,102 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

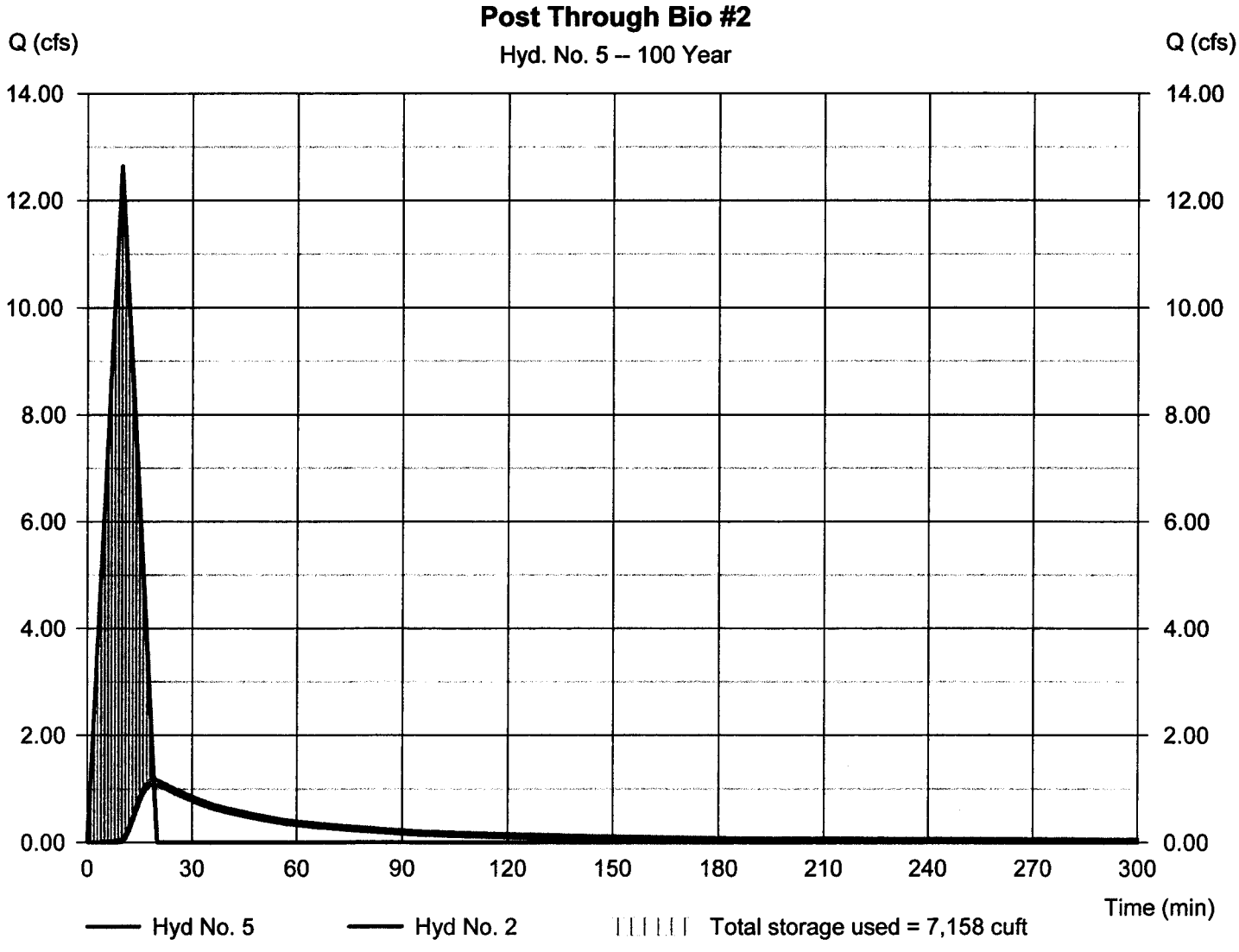
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post Through Bio #2

Hydrograph type	= Reservoir	Peak discharge	= 1.087 cfs
Storm frequency	= 100 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 2,837 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 84.02 ft
Reservoir name	= Bioretention #2	Max. Storage	= 7,158 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

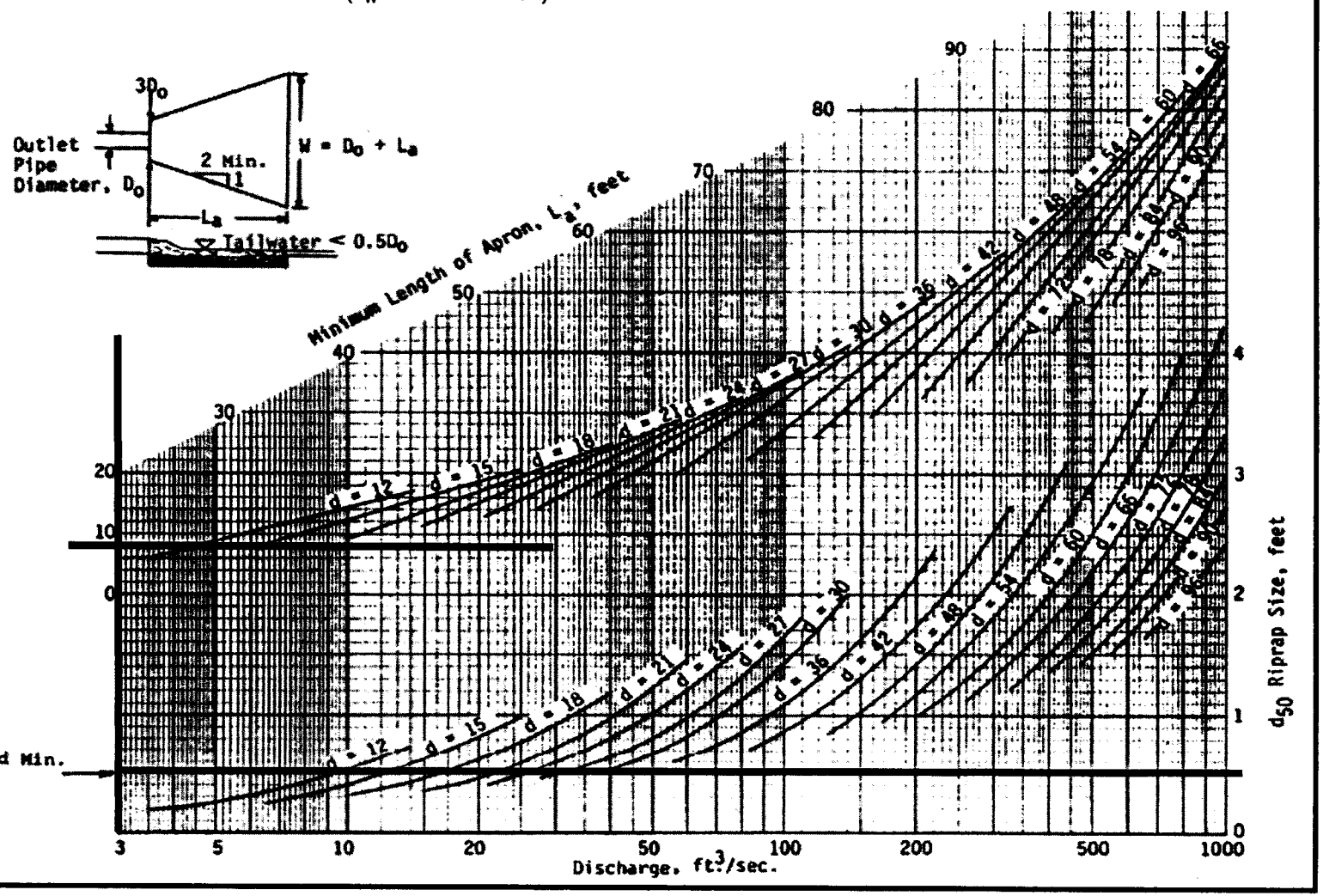


AES CONSULTING ENGINEERS

Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

Outlet Location: Bioretention Facility #2 Outfall

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_W < 0.5 DIAMETER)



Q =	0.29	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth = 1.5 ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft	

Source: USDA-SCS 1992

Plate 3.18-3

AES
CONSULTING ENGINEERS

Project:	**Mid County Park Upgrades**
Project No.:	**W10119-E-19**
Subject:	**Water Quality Volume**
Date:	**4/2/2012**
Calculated By:	**GVC**

BMP Type = **Bioretention Facility #3**

Water Quality Volume = 0.5 in. x **0.6** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.6**)

= **1089** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **1089**

= **2178** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **1089**

= **2178** CF

Dry Storage Volume Provided = **2212** CF Elevation = **81.33 - Outlet Elevation**

Hydraflow Table of Contents

W10119-E-19_Bioretention #3.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Wednesday, 00 27, 2012

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	3.701	1	15	4,997	------	------	------	Pre-Development
2	Rational	4.971	1	15	4,474	------	------	------	Post-Development
4	Reservoir	2.079	1	28	4,995	1	83.24	1,677	Pre Through Culvert
5	Reservoir	0.190	1	29	2,254	2	82.10	4,349	Post through Bio #3

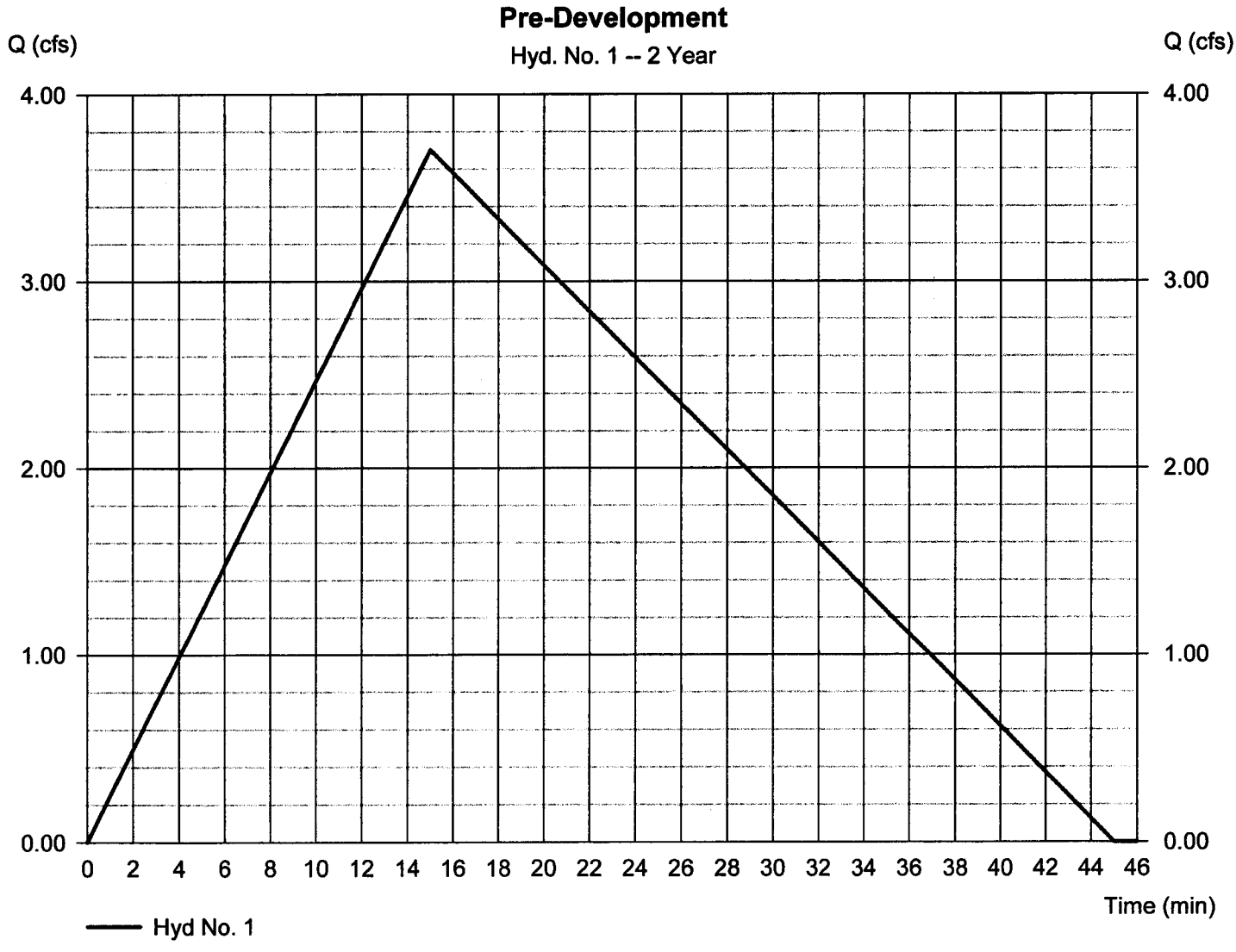
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 3.701 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 4,997 cuft
Drainage area	= 1.730 ac	Runoff coeff.	= 0.55
Intensity	= 3.890 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



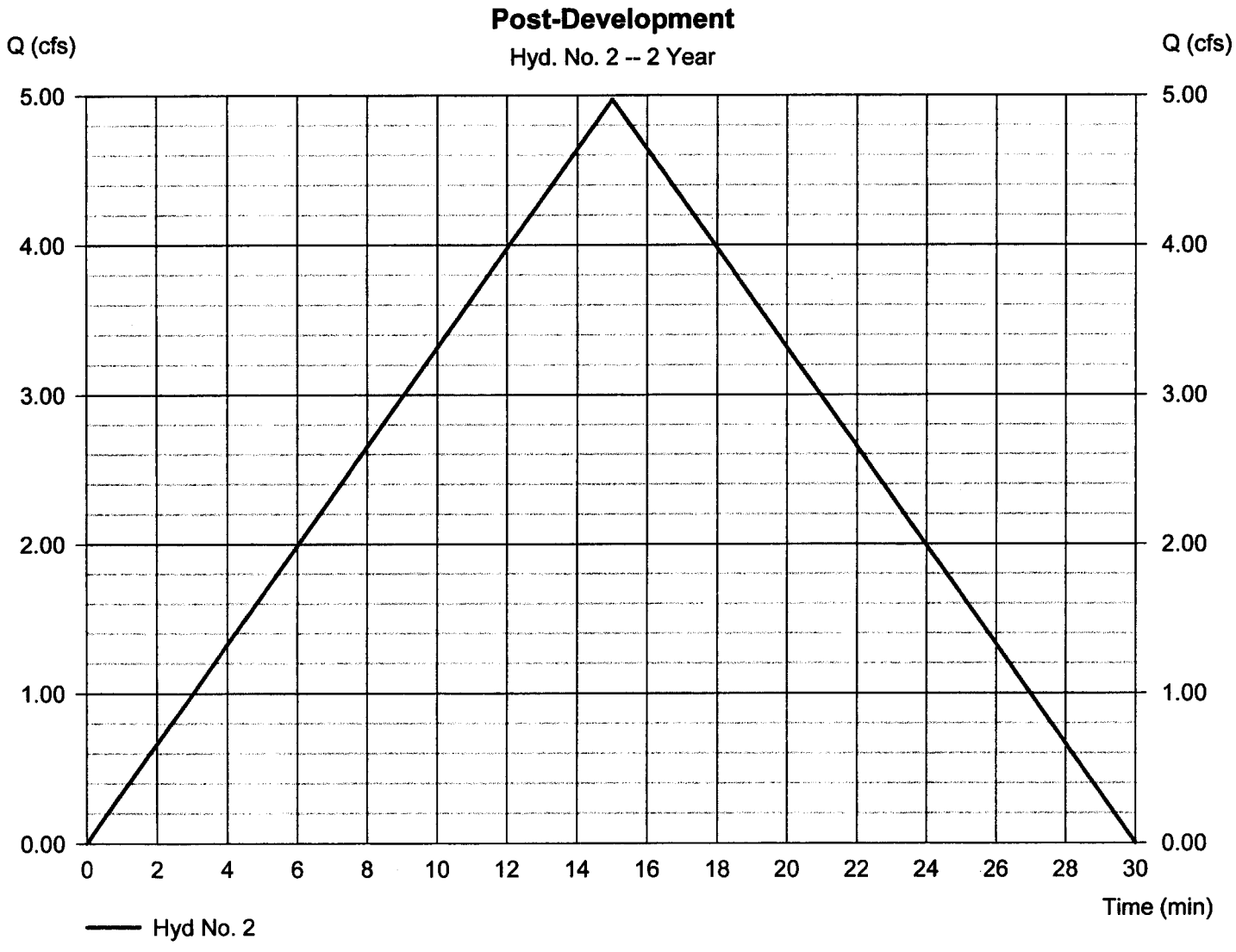
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 4.971 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 4,474 cuft
Drainage area	= 2.130 ac	Runoff coeff.	= 0.6
Intensity	= 3.890 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

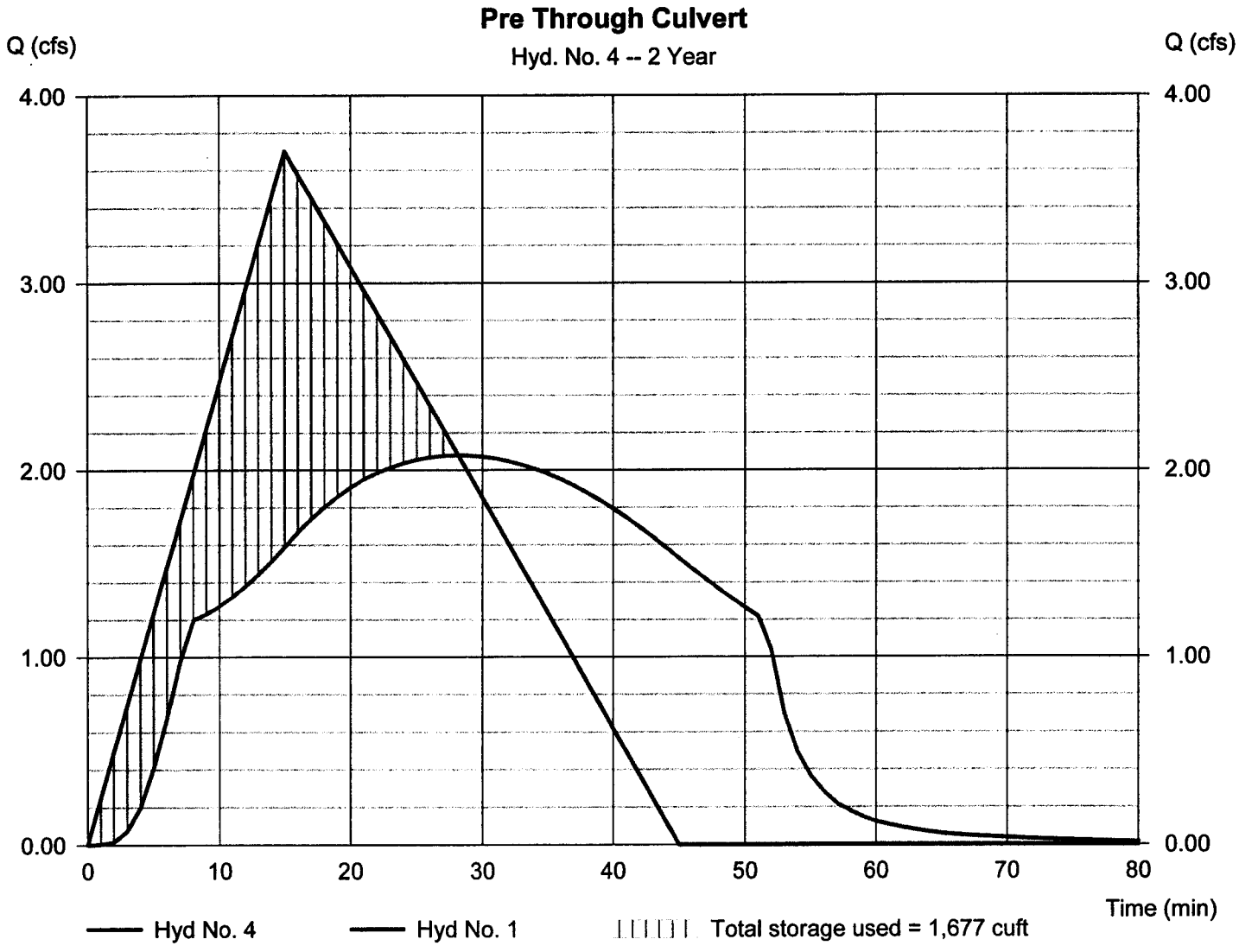
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 2.079 cfs
Storm frequency	= 2 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 4,995 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 83.24 ft
Reservoir name	= Existing Culvert	Max. Storage	= 1,677 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 1 - Existing Culvert

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 82.43 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	82.43	00	0	0
0.57	83.00	1,480	281	281
1.57	84.00	11,906	5,861	6,142

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 82.43	0.00	0.00	0.00
Length (ft)	= 182.00	0.00	0.00	0.00
Slope (%)	= 0.71	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	No	No	No

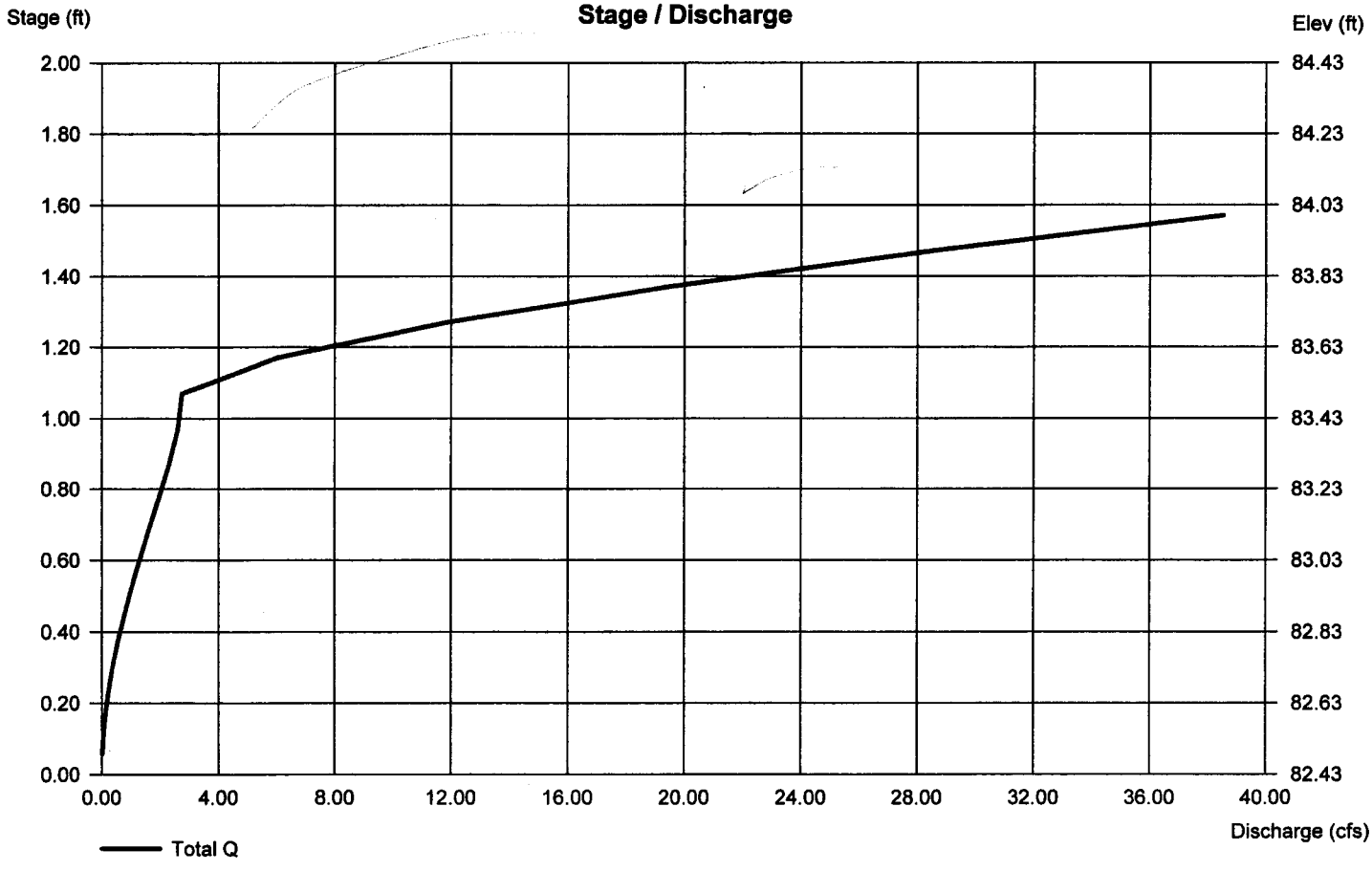
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 83.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

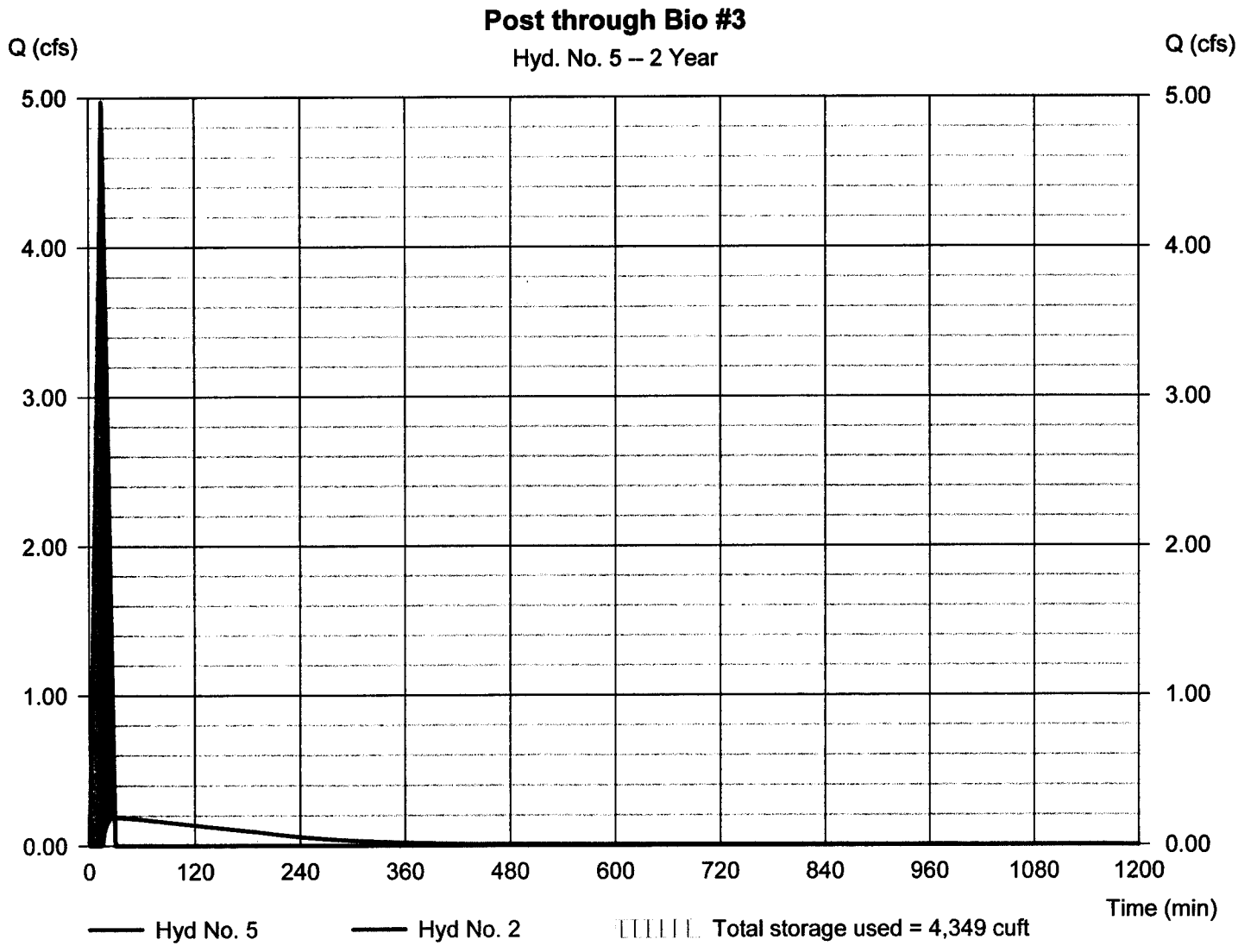
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post through Bio #3

Hydrograph type	= Reservoir	Peak discharge	= 0.190 cfs
Storm frequency	= 2 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 2,254 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.10 ft
Reservoir name	= Bioretention #3	Max. Storage	= 4,349 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Pond No. 2 - Bioretention #3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 80.33 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.33	1,918	0	0
0.67	81.00	2,303	1,412	1,412
1.67	82.00	2,929	2,609	4,021
2.67	83.00	3,611	3,264	7,285
3.17	83.50	5,000	2,143	9,428
3.67	84.00	6,000	2,746	12,174

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	0.00	0.00
Span (in)	= 12.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.33	81.33	0.00	0.00
Length (ft)	= 44.00	0.00	0.00	0.00
Slope (%)	= 3.02	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

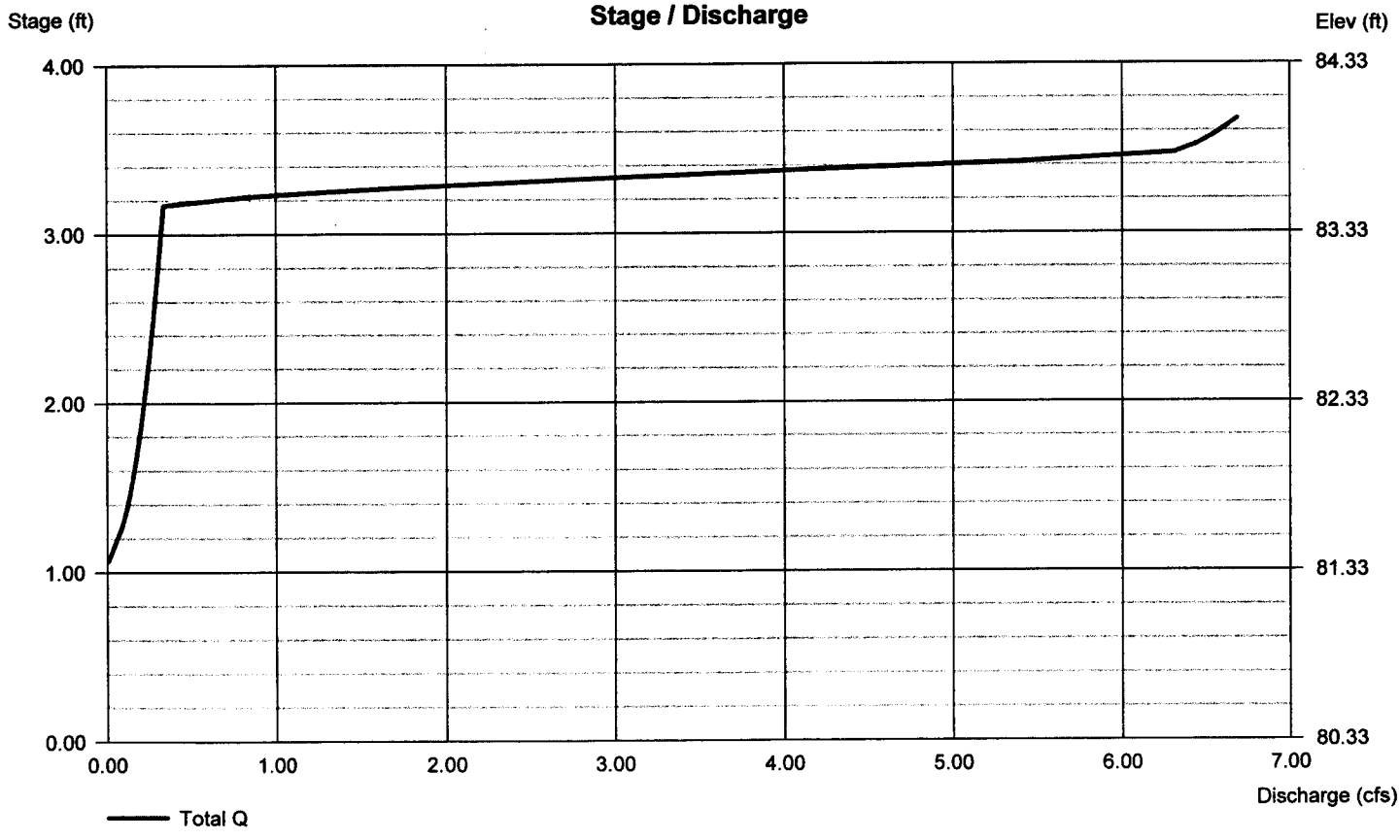
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.56	0.00	0.00	0.00
Crest El. (ft)	= 83.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	4.957	1	15	6,691	-----	-----	-----	Pre-Development
2	Rational	6.657	1	15	5,992	-----	-----	-----	Post-Development
4	Reservoir	2.577	1	29	6,689	1	83.39	2,560	Pre Through Culvert
5	Reservoir	0.247	1	29	3,771	2	82.55	5,801	Post through Bio #3

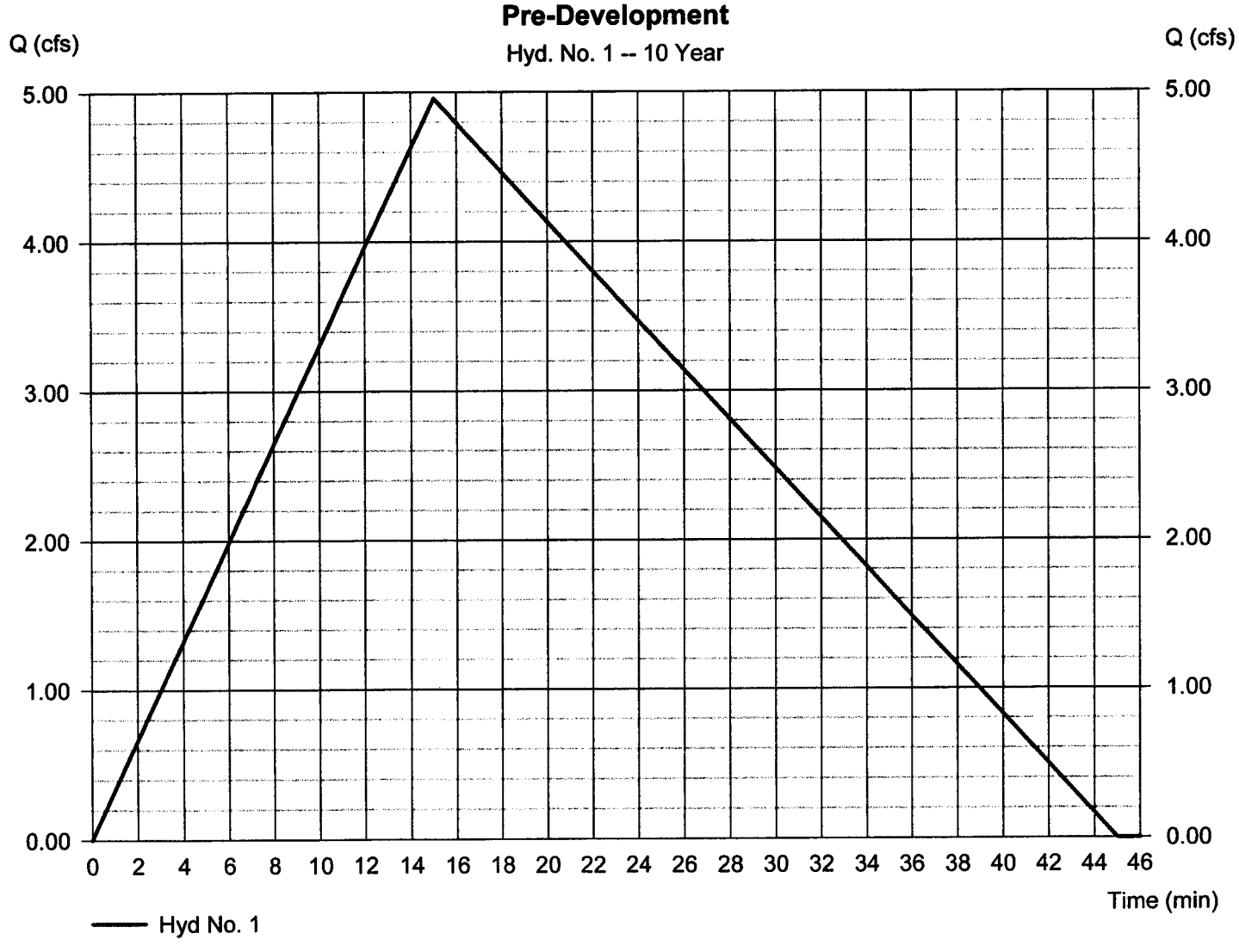
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 4.957 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,691 cuft
Drainage area	= 1.730 ac	Runoff coeff.	= 0.55
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



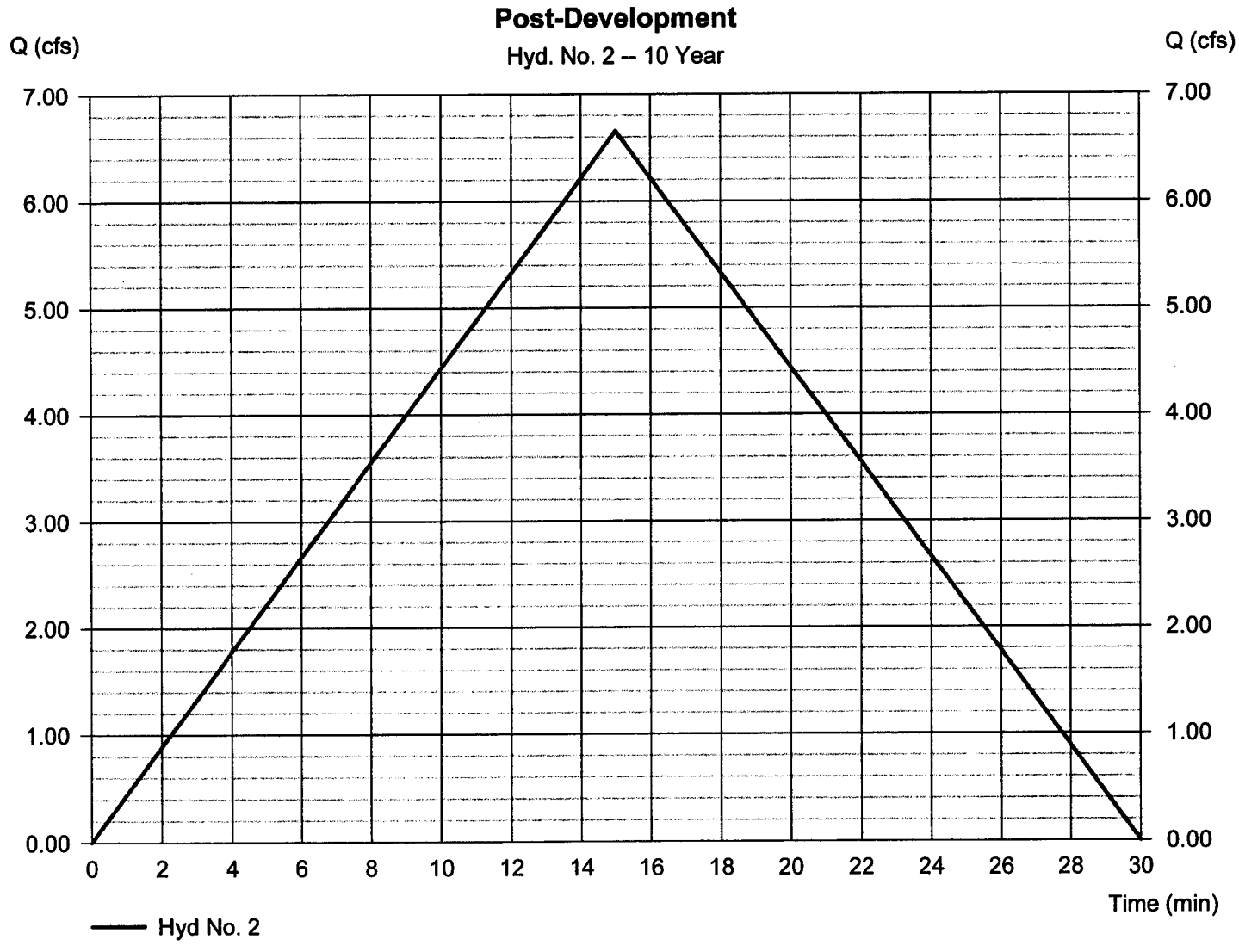
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 6.657 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 5,992 cuft
Drainage area	= 2.130 ac	Runoff coeff.	= 0.6
Intensity	= 5.209 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

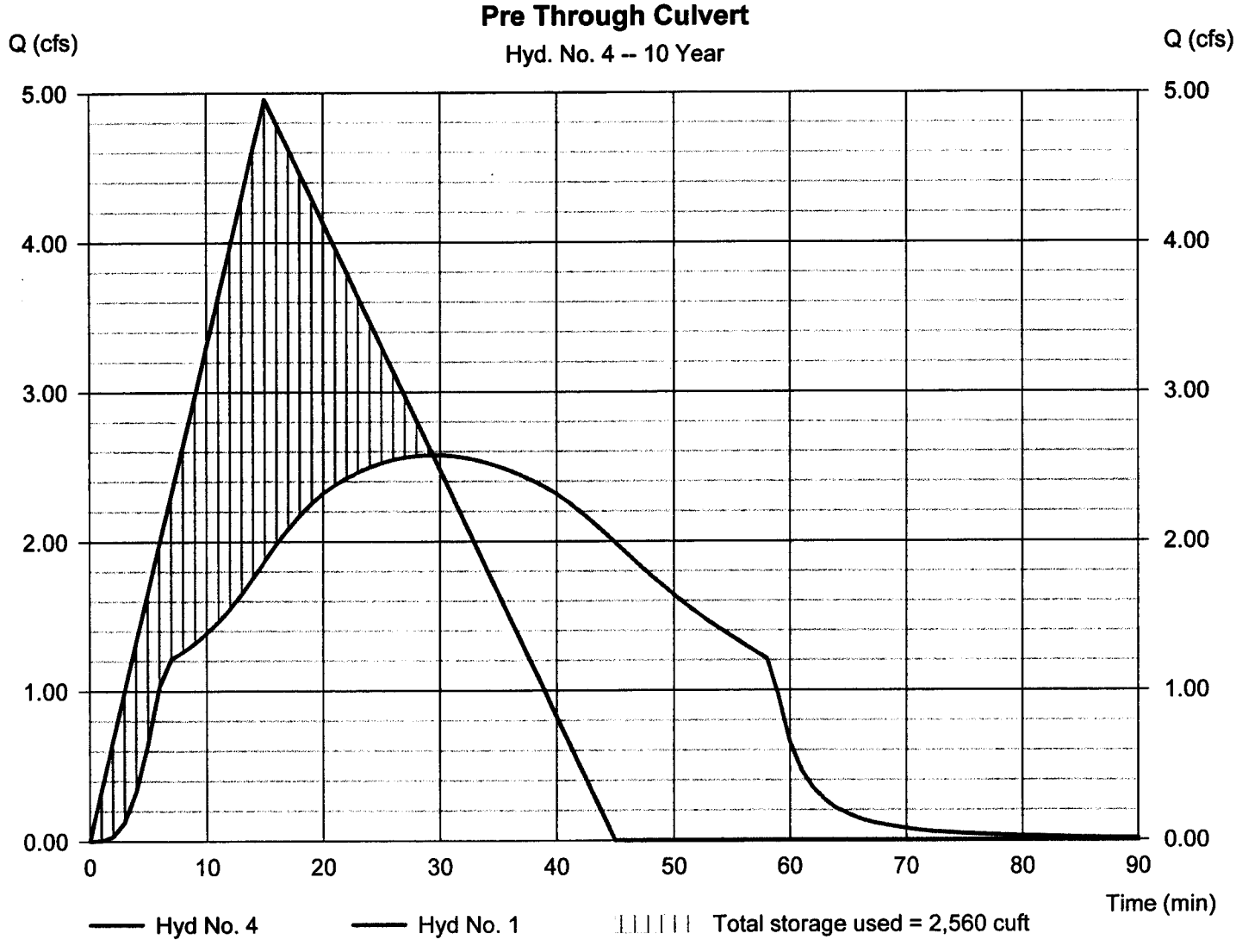
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 2.577 cfs
Storm frequency	= 10 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 6,689 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 83.39 ft
Reservoir name	= Existing Culvert	Max. Storage	= 2,560 cuft

Storage Indication method used.



Hydrograph Report

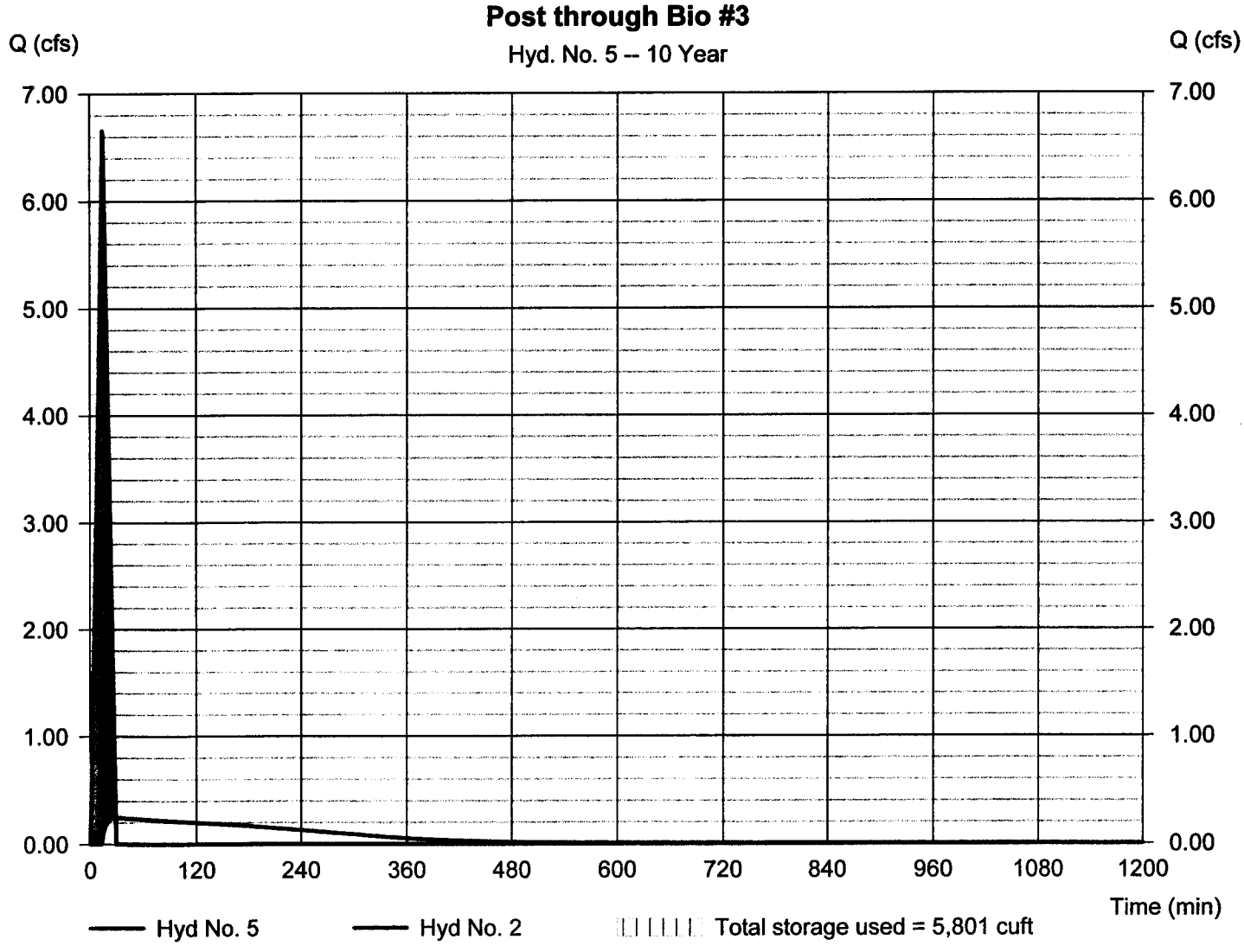
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post through Bio #3

Hydrograph type	= Reservoir	Peak discharge	= 0.247 cfs
Storm frequency	= 10 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 3,771 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 82.55 ft
Reservoir name	= Bioretention #3	Max. Storage	= 5,801 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	6.947	1	15	9,378	-----	-----	-----	Pre-Development
2	Rational	9.331	1	15	8,398	-----	-----	-----	Post-Development
4	Reservoir	4.613	1	25	9,376	1	83.56	3,546	Pre Through Culvert
5	Reservoir	0.312	1	29	6,177	2	83.20	8,125	Post through Bio #3

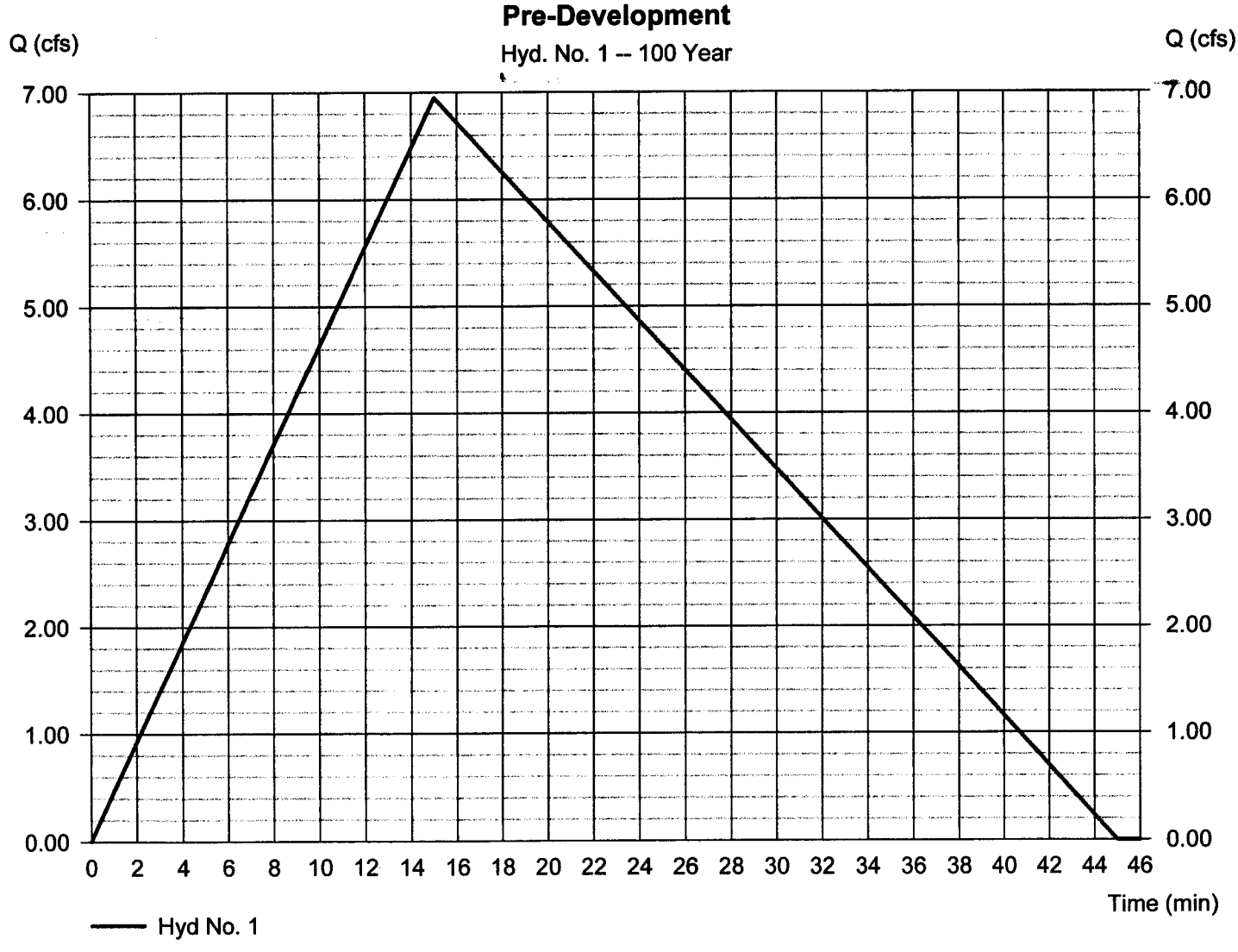
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 1

Pre-Development

Hydrograph type	= Rational	Peak discharge	= 6.947 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 9,378 cuft
Drainage area	= 1.730 ac	Runoff coeff.	= 0.55
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/2



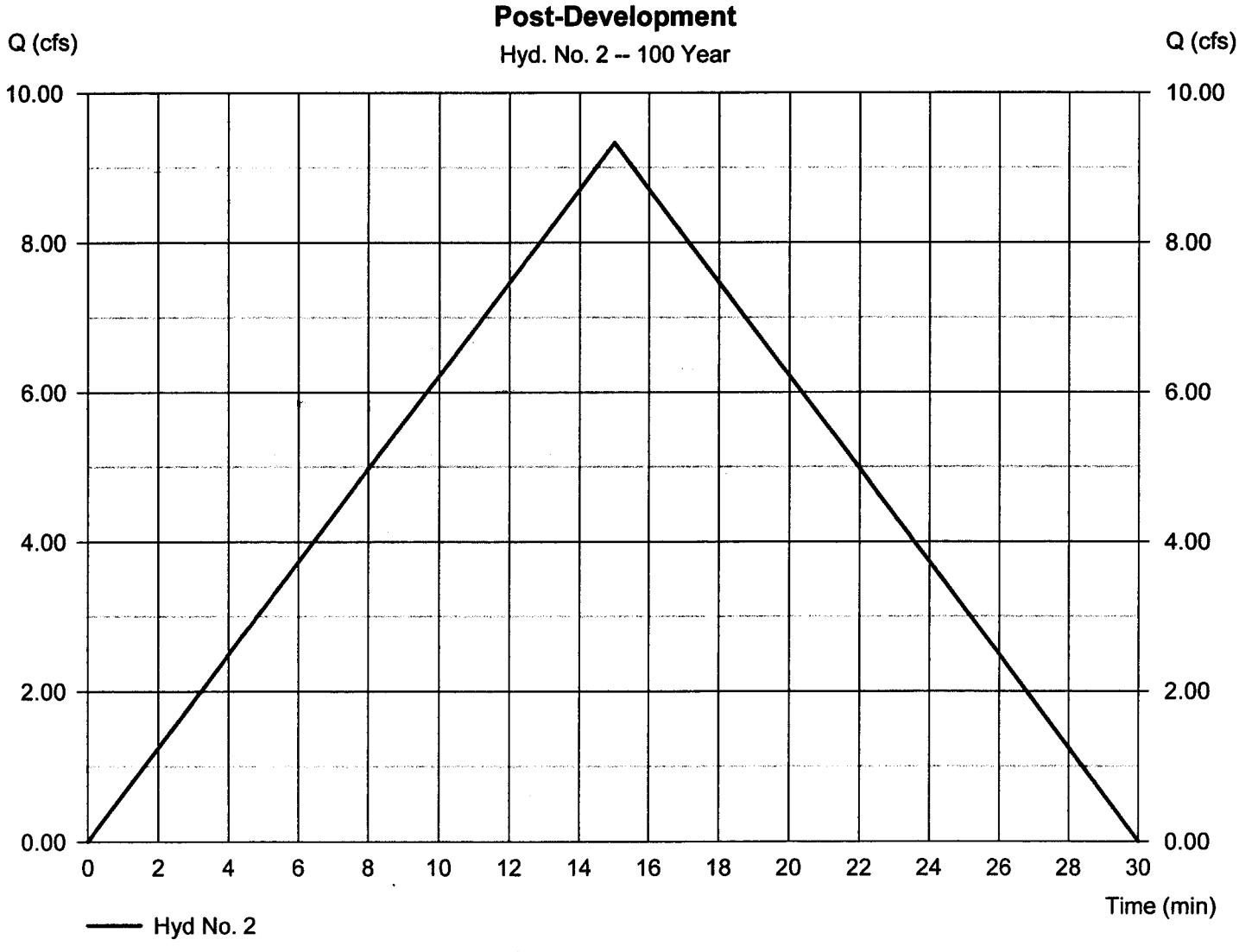
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 2

Post-Development

Hydrograph type	= Rational	Peak discharge	= 9.331 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,398 cuft
Drainage area	= 2.130 ac	Runoff coeff.	= 0.6
Intensity	= 7.301 in/hr	Tc by User	= 15.00 min
IDF Curve	= Jcc.idf	Asc/Rec limb fact	= 1/1



Hydrograph Report

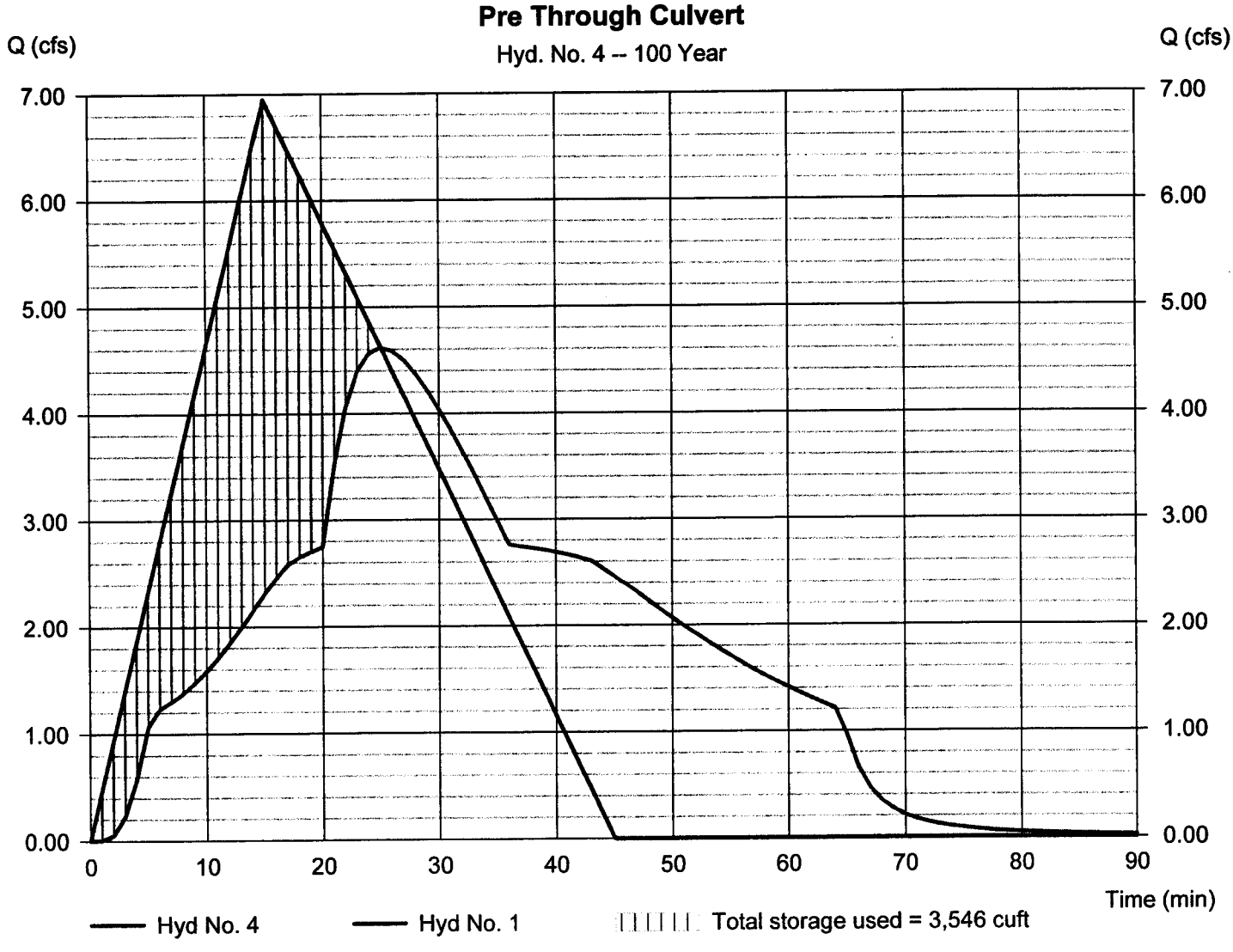
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 4

Pre Through Culvert

Hydrograph type	= Reservoir	Peak discharge	= 4.613 cfs
Storm frequency	= 100 yrs	Time to peak	= 25 min
Time interval	= 1 min	Hyd. volume	= 9,376 cuft
Inflow hyd. No.	= 1 - Pre-Development	Max. Elevation	= 83.56 ft
Reservoir name	= Existing Culvert	Max. Storage	= 3,546 cuft

Storage Indication method used.



Hydrograph Report

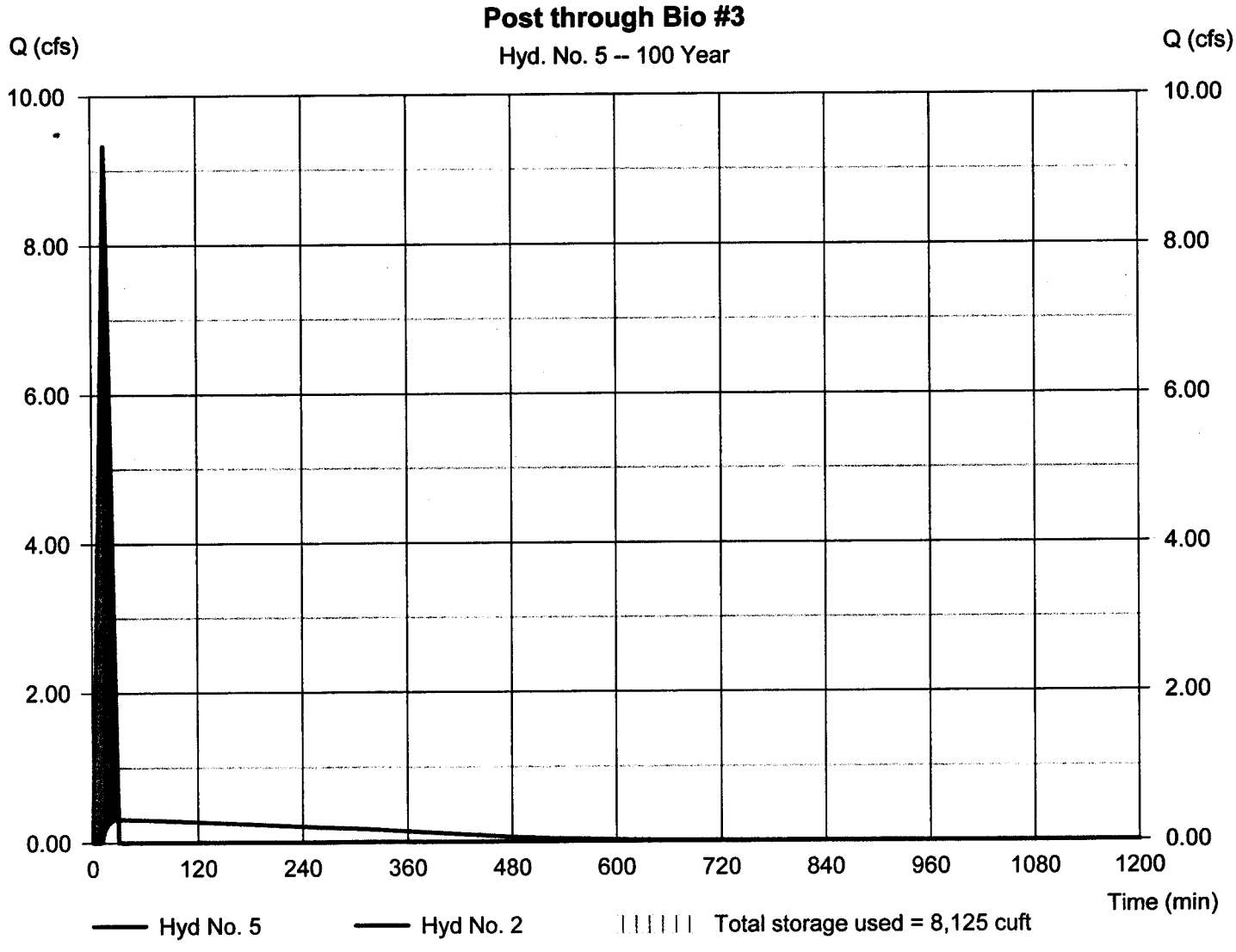
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Wednesday, 00 27, 2012

Hyd. No. 5

Post through Bio #3

Hydrograph type	= Reservoir	Peak discharge	= 0.312 cfs
Storm frequency	= 100 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 6,177 cuft
Inflow hyd. No.	= 2 - Post-Development	Max. Elevation	= 83.20 ft
Reservoir name	= Bioretention #3	Max. Storage	= 8,125 cuft

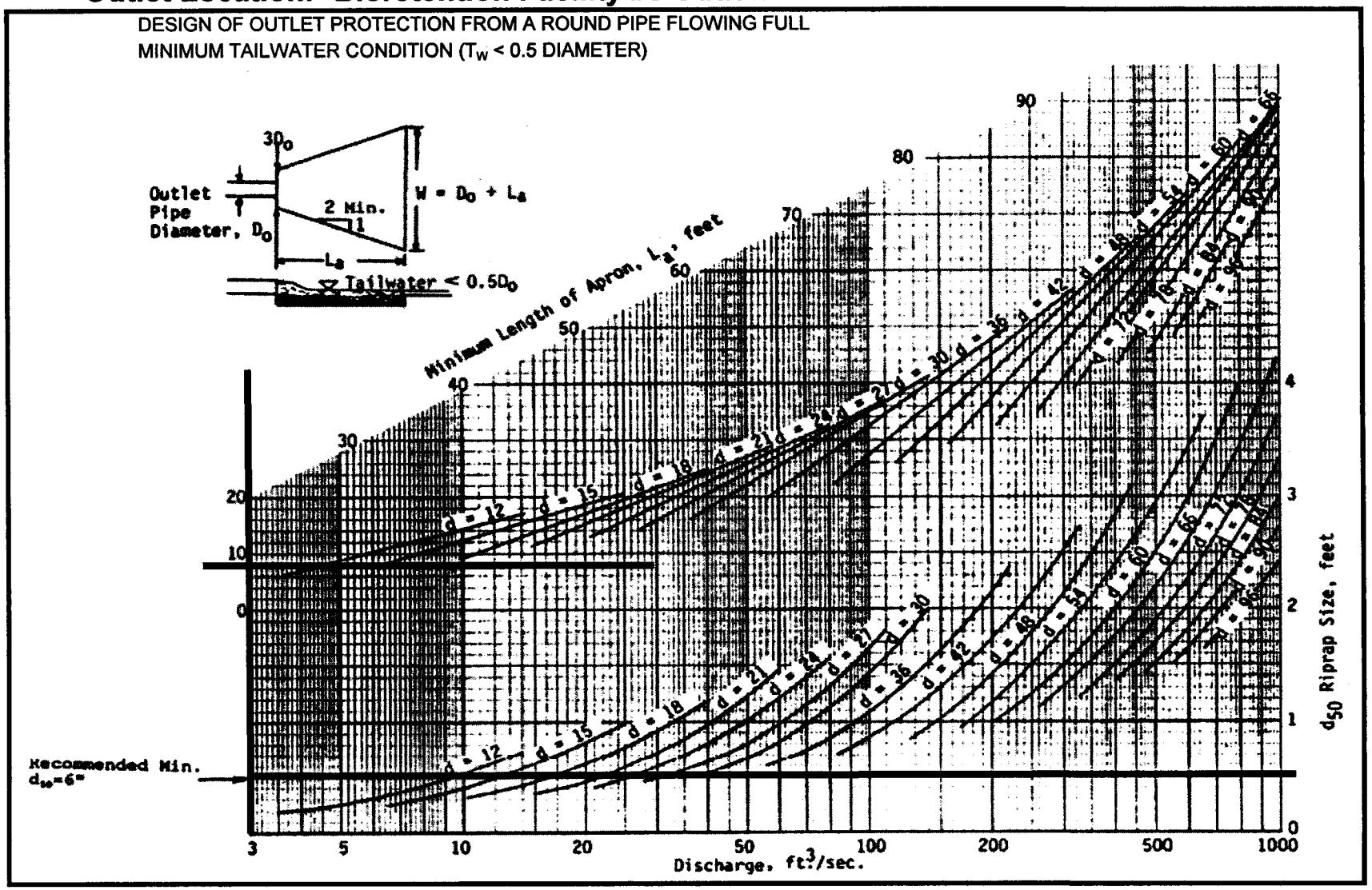
Storage Indication method used.



Project:	Mid County Park
Project No.:	W10119-E-19
Subject:	Outlet Protection
Date:	May 25, 2012
Calculated By:	GVC

AES CONSULTING ENGINEERS

Outlet Location: Bioretention Facility #3 Outfall



Source: USDA-SCS

Q =	0.25	cfs	$3D_0$ =	3.75	ft	W =	9	ft	Depth =	1.5	ft
D_0 =	15	in	L_a =	8	ft	d_{50} =	0.5	ft			

APPENDIX D

DRAINAGE AREA MAP

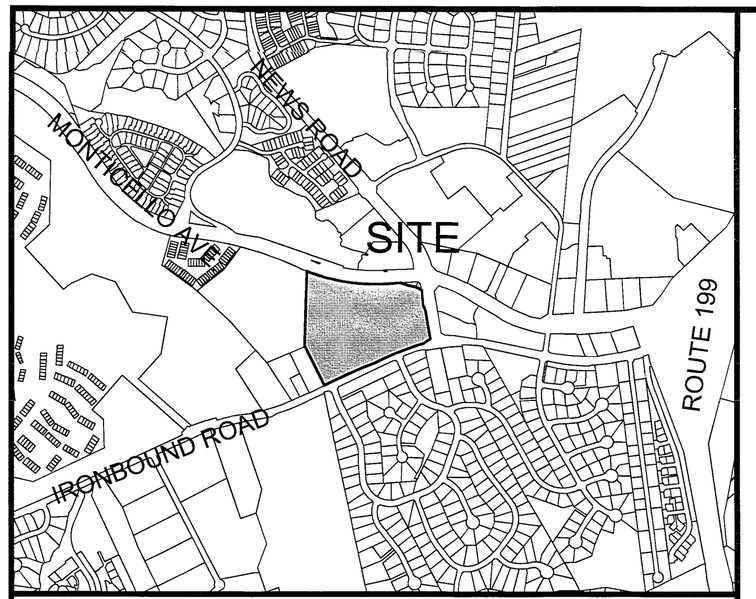
(Submitted with this report)

Environmental Division

MAR 5 2014

RECEIVED

SP-85-12



VICINITY MAP SCALE: N.T.S.

SITE INFORMATION:

PARCEL I.D. #3830100010
ZONING DISTRICT: PL

EXISTING ADDRESS:

#3793 IRONBOUND ROAD
WILLIAMSBURG, VIRGINIA

GENERAL NOTES:

1) A TITLE REPORT HAS NOT BEEN FURNISHED TO THIS FIRM.
2) THIS FIRM MADE NO ATTEMPT TO VERIFY UNDERGROUND UTILITIES EXCEPT THOSE SHOWN.
3) TOPOGRAPHIC DATA AS SHOWN IS BASED ON A CURRENT FIELD SURVEY.
4) ELEVATIONS SHOWN ARE RELATIVE TO THE APPROVED SITE PLAN.

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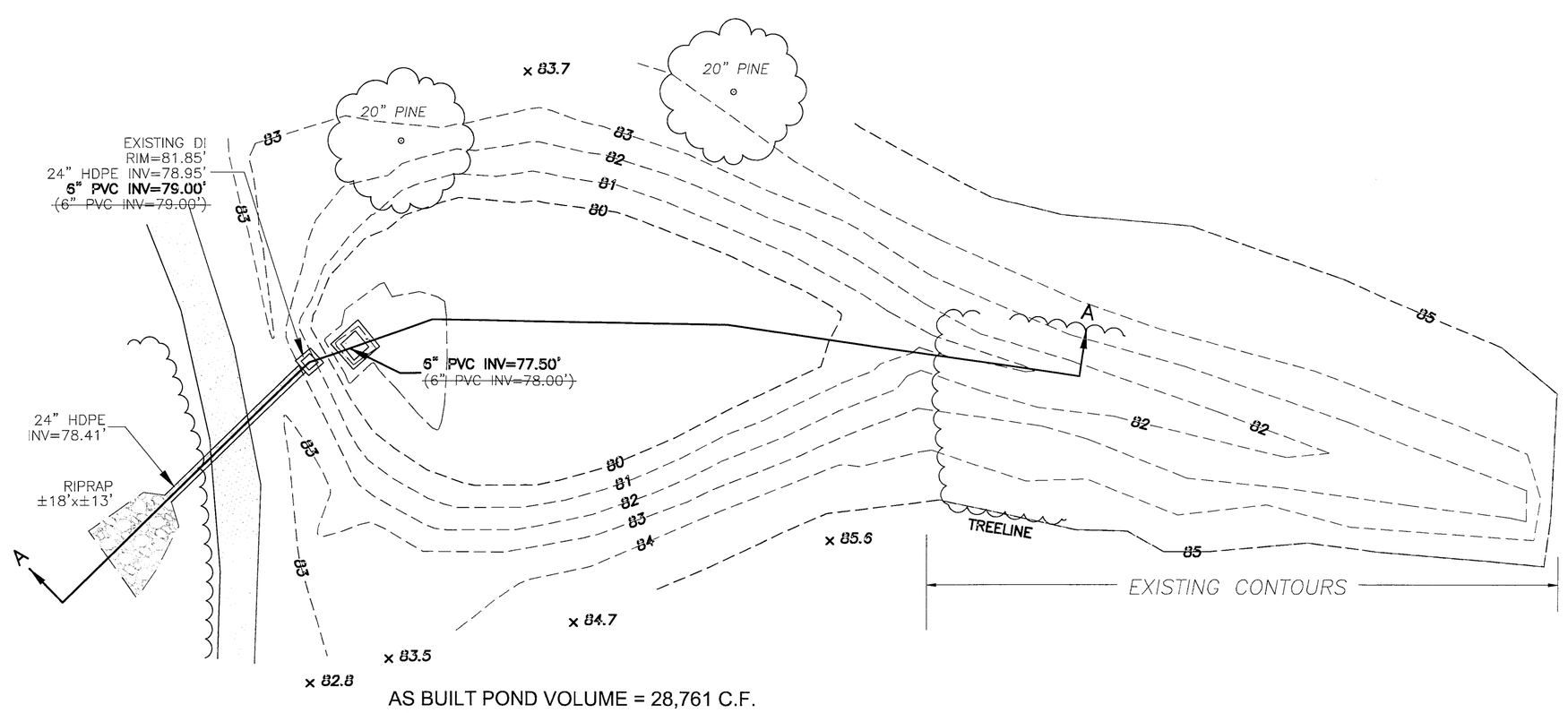
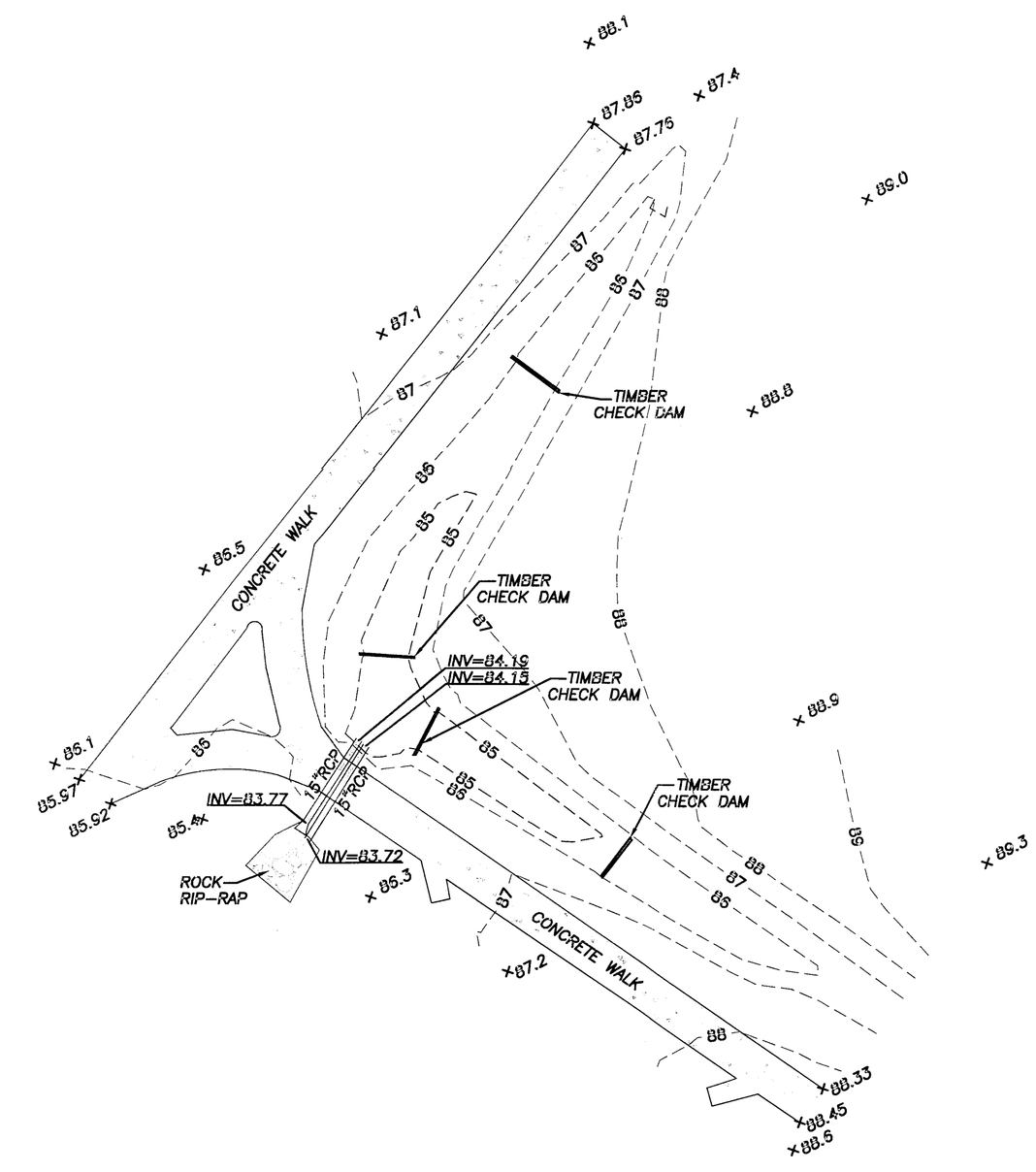
Will S Felts 02-27-2014
WILLIAM S. FELTS, LIC NO. 3149 DATE

DRAINAGE AS-BUILT
FOR
MID COUNTY PARK DRY POND



AS BUILT POND VOLUME = 28,761 C.F.
TO 100 YEAR FLOOD ELEVATION (83.16)

DRY POND PLAN VIEW
HORIZONTAL SCALE: 1"=20'



20 0 20 40 60
Scale: 1" = 20'

RECORD DRAWING

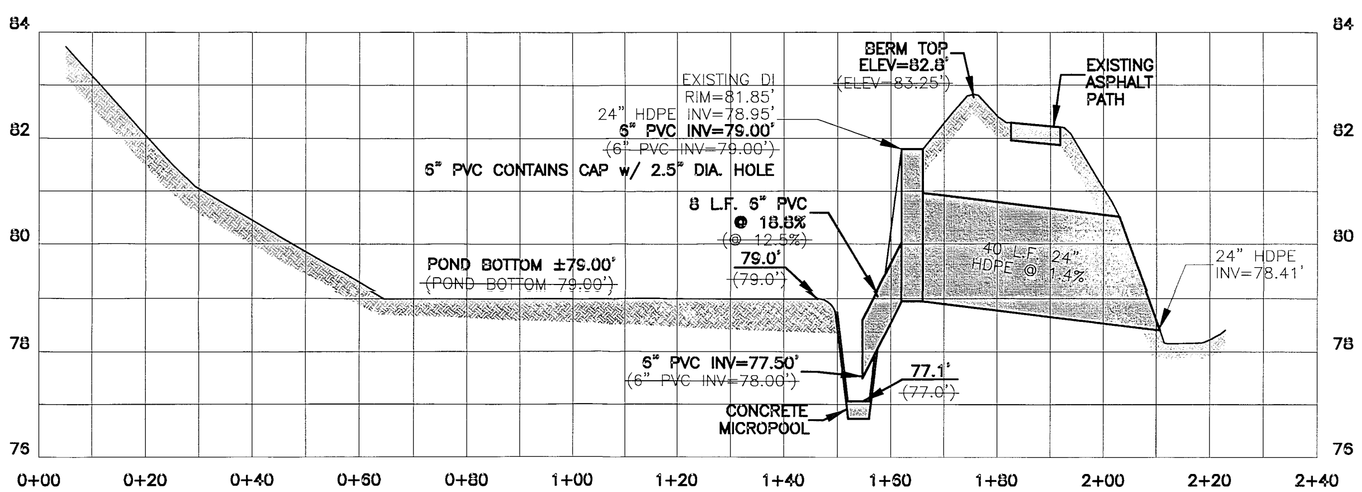
DRAINAGE AS-BUILT FOR MID COUNTY PARK DRY POND
JAMES CITY COUNTY VIRGINIA

NO.	DATE	REVISION / COMMENT / NOTE
2	02/27/14	REVISED PER POND RECONSTRUCTION
1	08/23/13	REVISED PER COUNTY COMMENTS

COMMONWEALTH OF VIRGINIA
WILLIAM S. FELTS
Lic. No. 3149
02-27-2014
LAND SURVEYOR

LandTech Resources, Inc.
Surveying • GPS • Engineering
205 Bulifants Blvd., Ste. F, Williamsburg, VA 23188
Phone: (757) 565-1877 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 20'
DATE: 05-28-2013
JOB: 13-062
DRAWN BY: WSF
SHEET: 1 OF 2



DRY POND SECTION A'-A'

HORIZONTAL SCALE: 1"=20'
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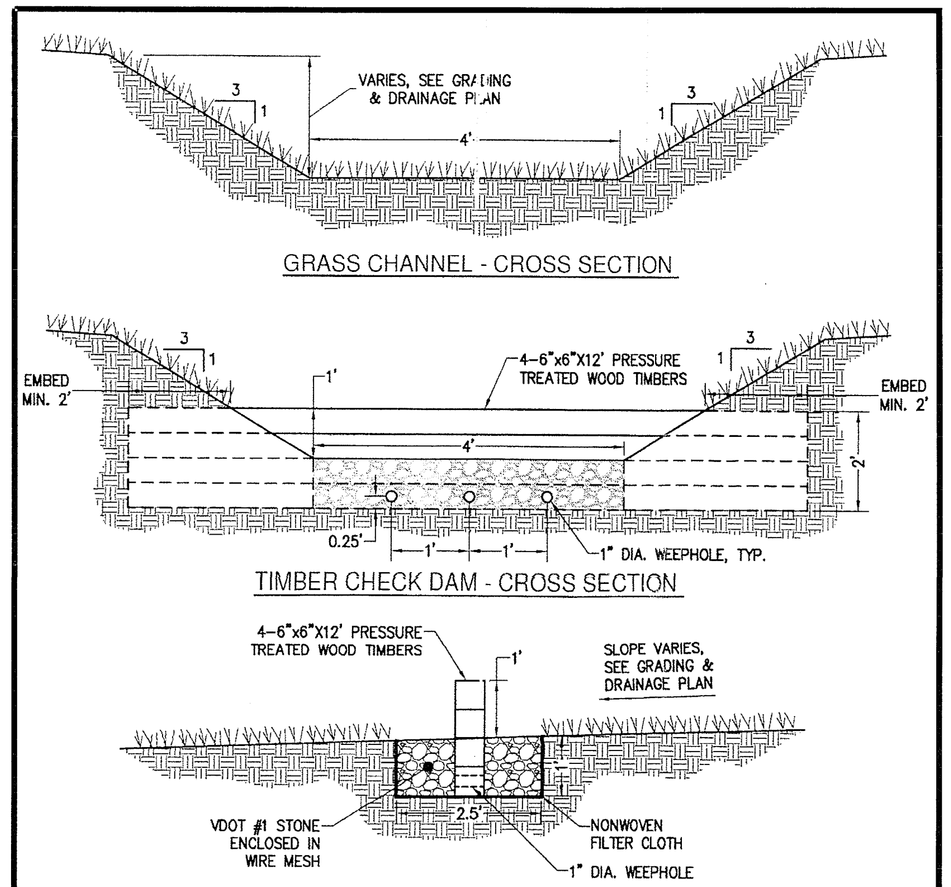

GRASS CHANNEL WITH TIMBER CHECK DAMS - DETAIL

N.T.S.

DETAIL SHOWN FROM DESIGN DRAWINGS

20 0 20 40 60

Scale: 1" = 20'

RECORD DRAWING

DRAINAGE AS-BUILT
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MID COUNTY PARK DRY POND

JAMES CITY COUNTY VIRGINIA

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Environmental Division

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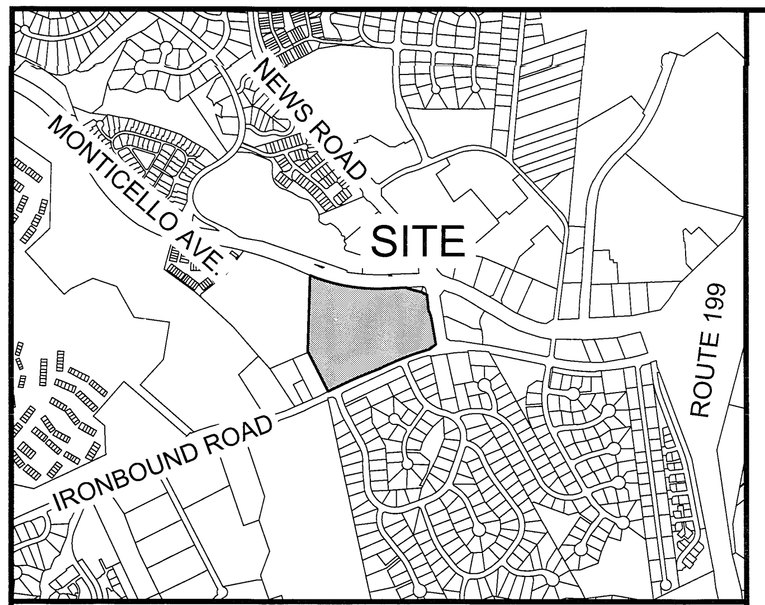

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WILLIAM S. FELTS, LIC NO. 3149 — 02-27-2014 DATE

DRAINAGE AS-BUILT
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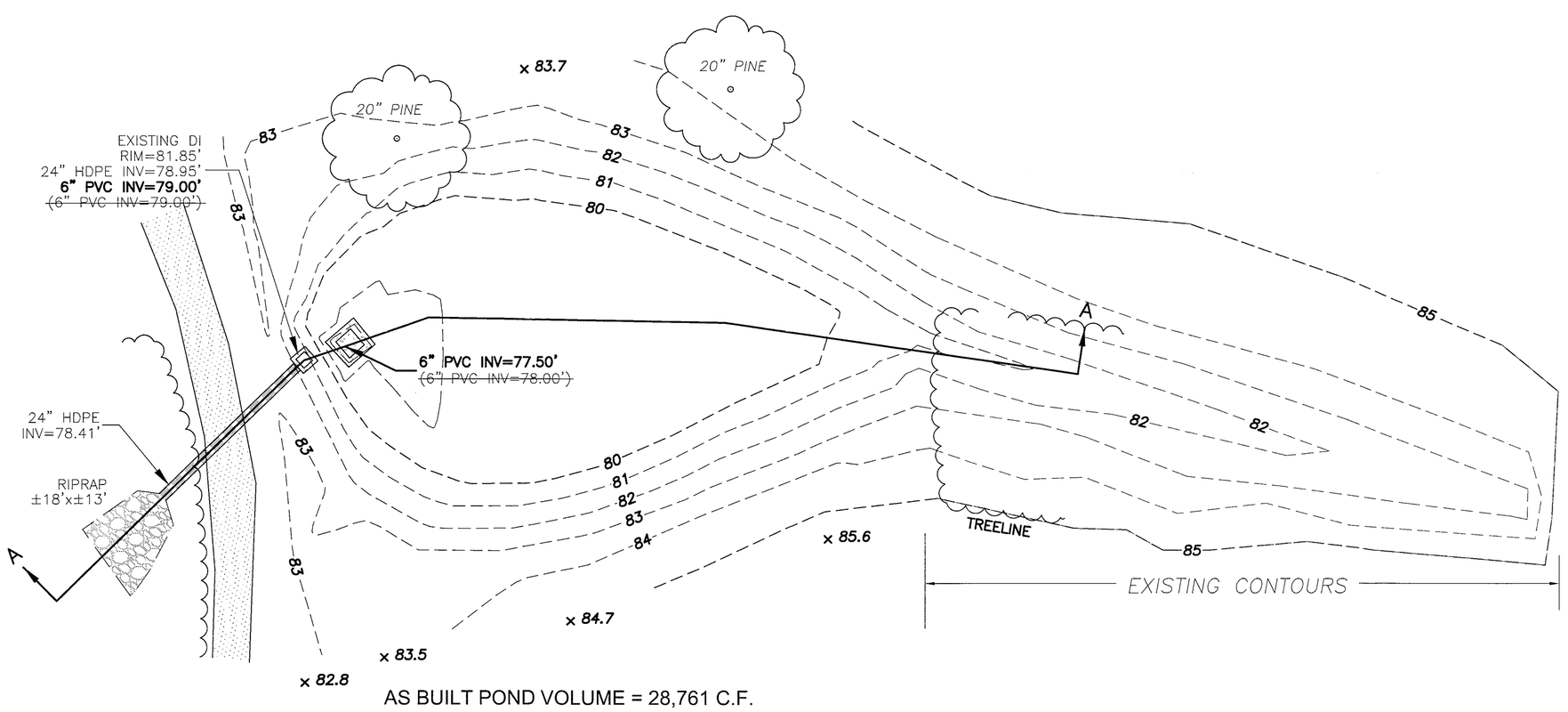
MID COUNTY PARK DRY POND



AS BUILT POND VOLUME = 28,761 C.F.
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DRY POND PLAN VIEW
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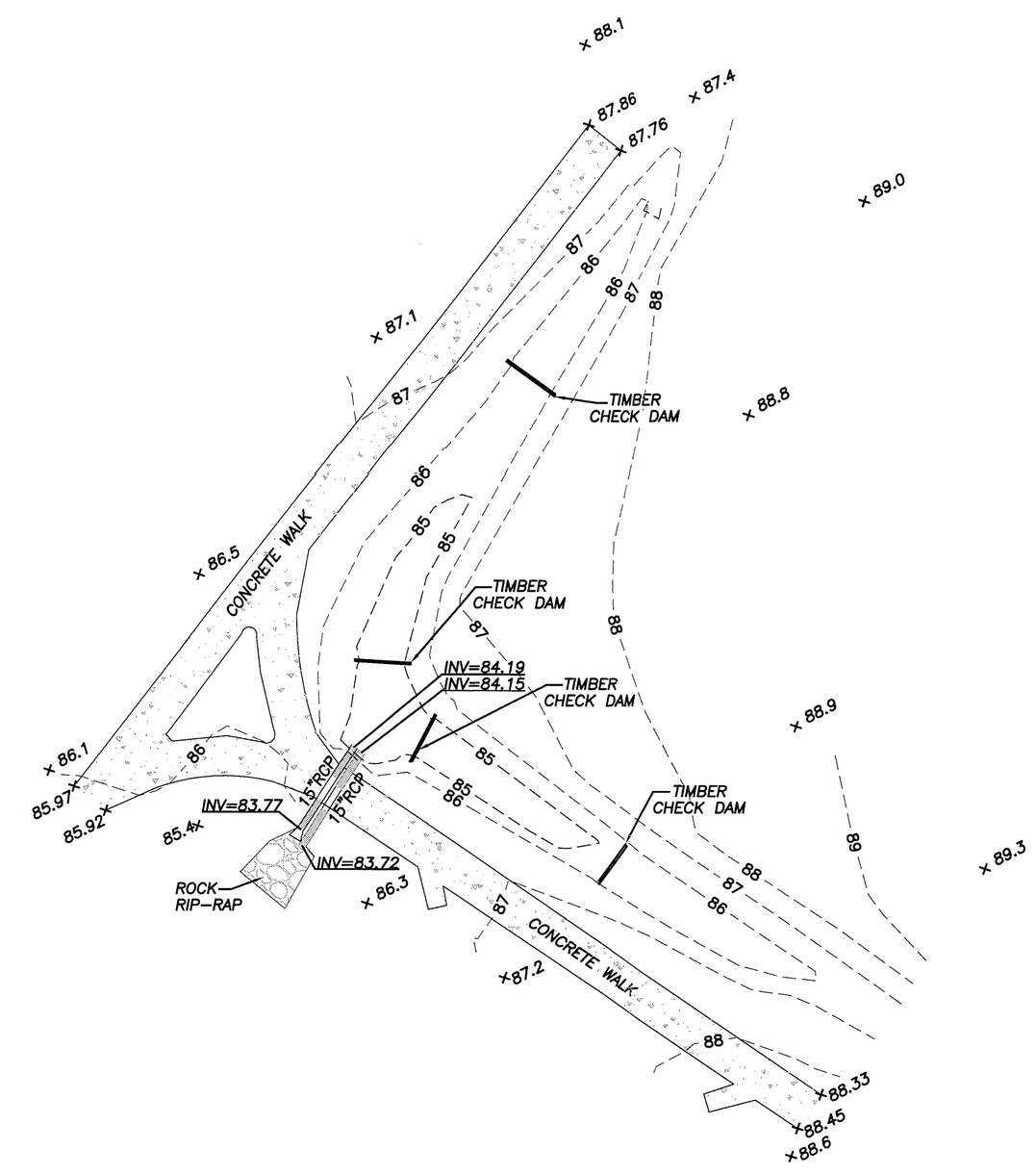

20 0 20 40 60
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DRY POND
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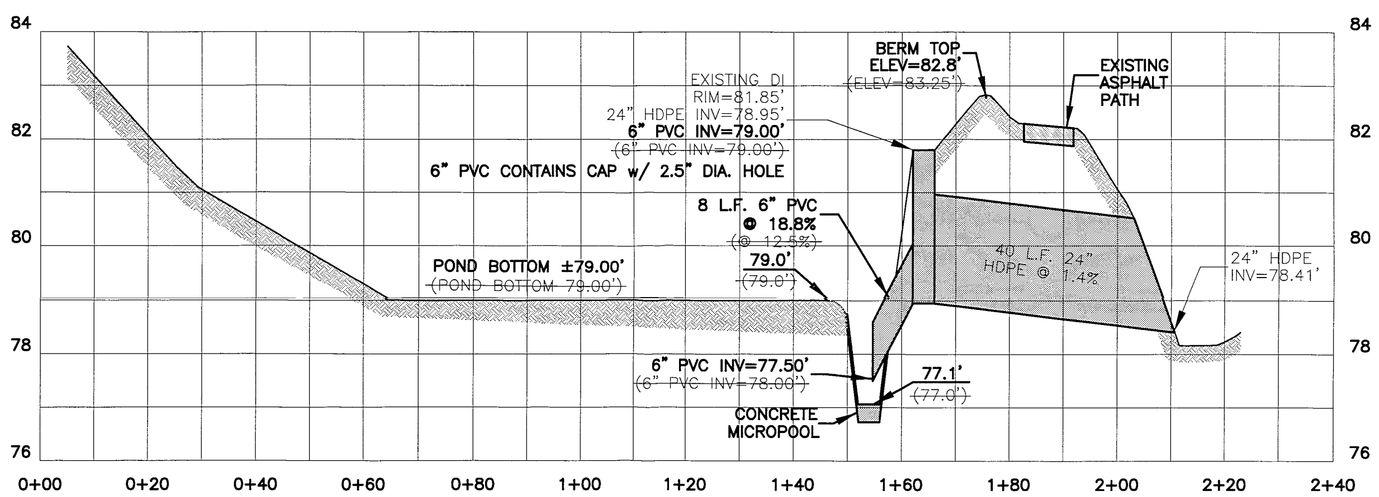

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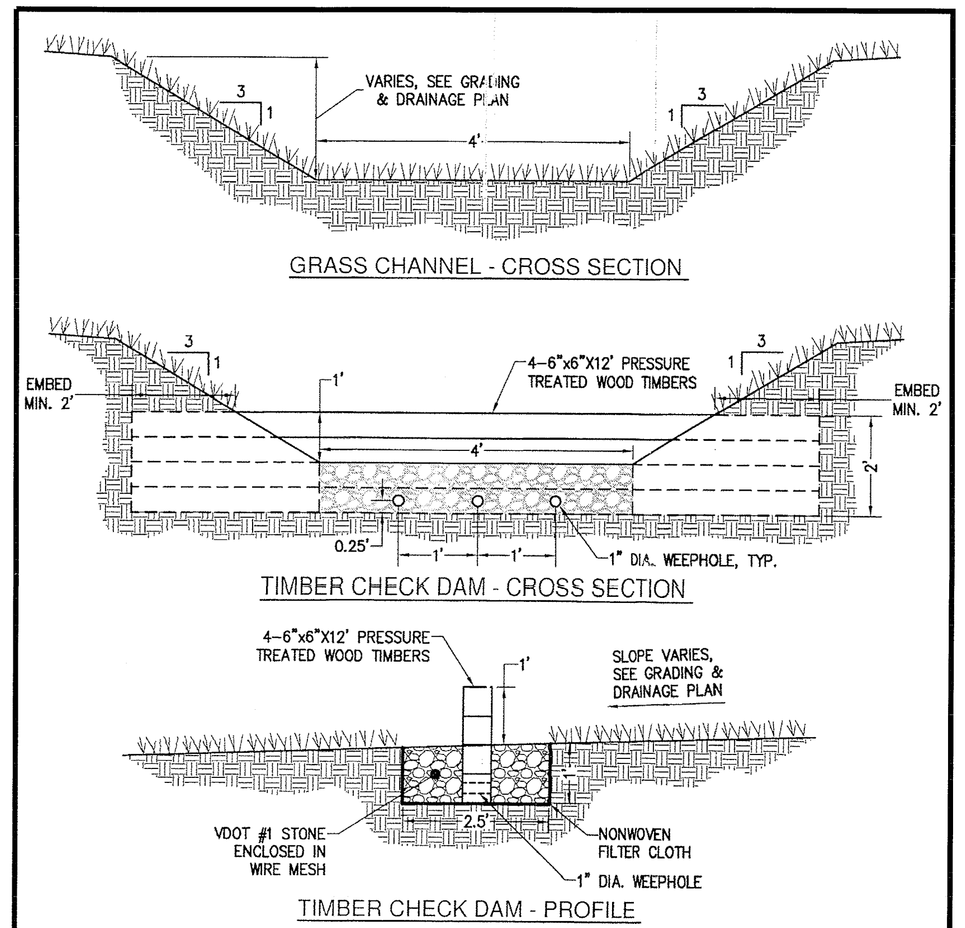

GRASS CHANNEL WITH TIMBER CHECK DAMS - DETAIL

N.T.S.

DETAIL SHOWN FROM DESIGN DRAWINGS

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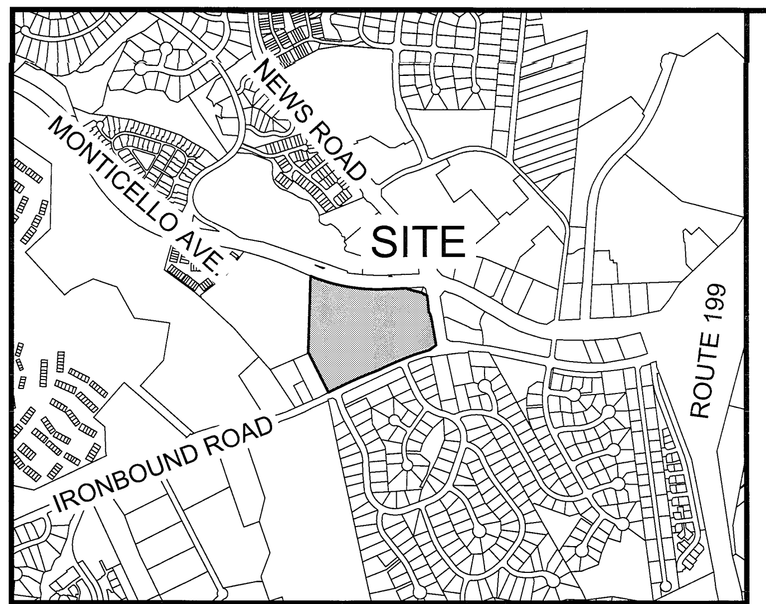

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WILLIAM S. FELTS, LIC NO. 3149 DATE

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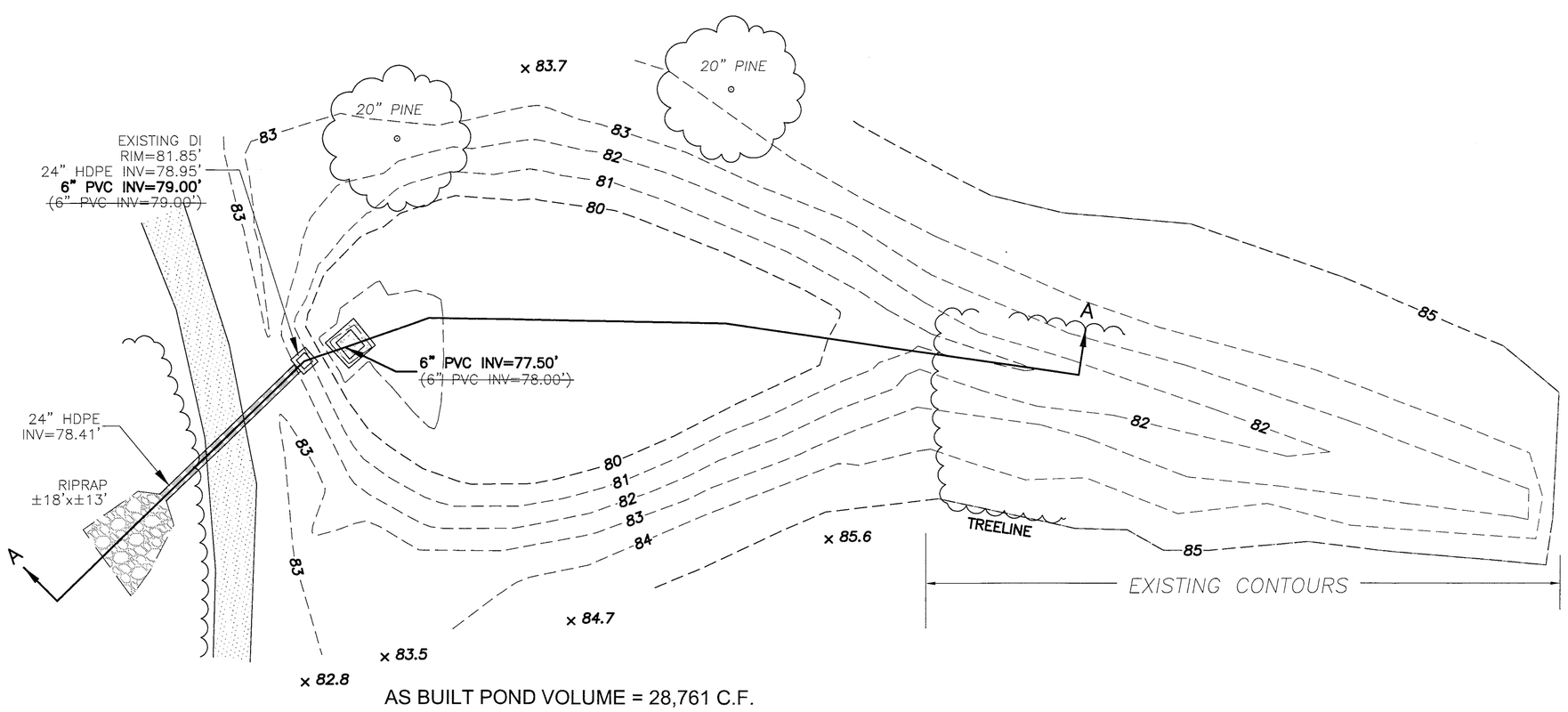
MID COUNTY PARK DRY POND



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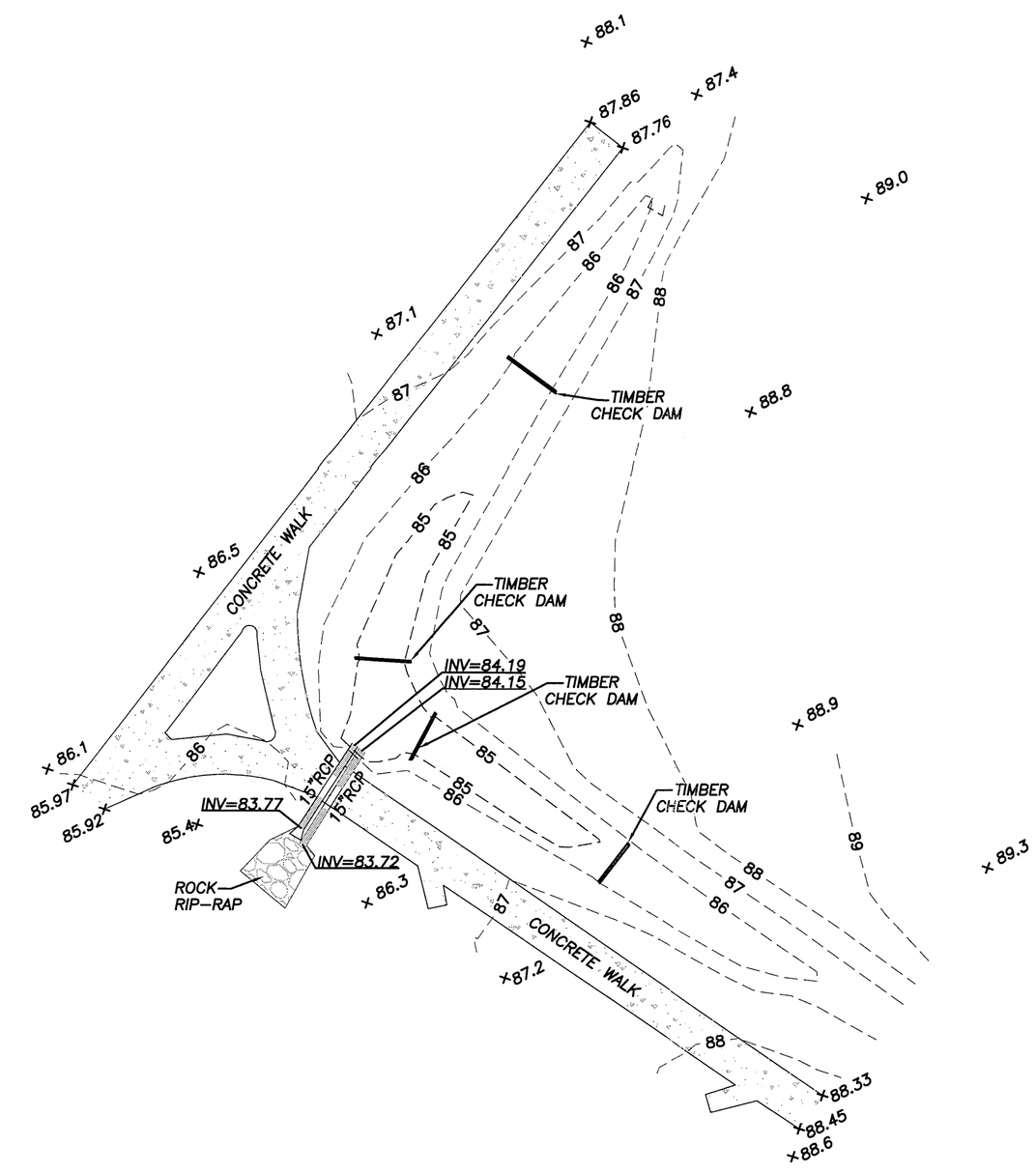

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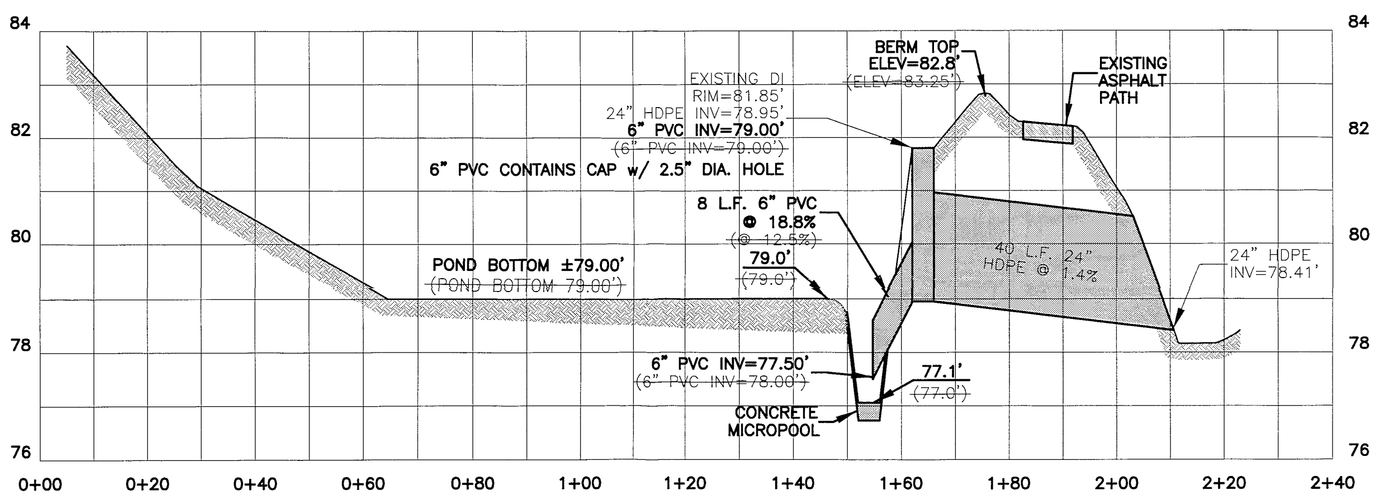

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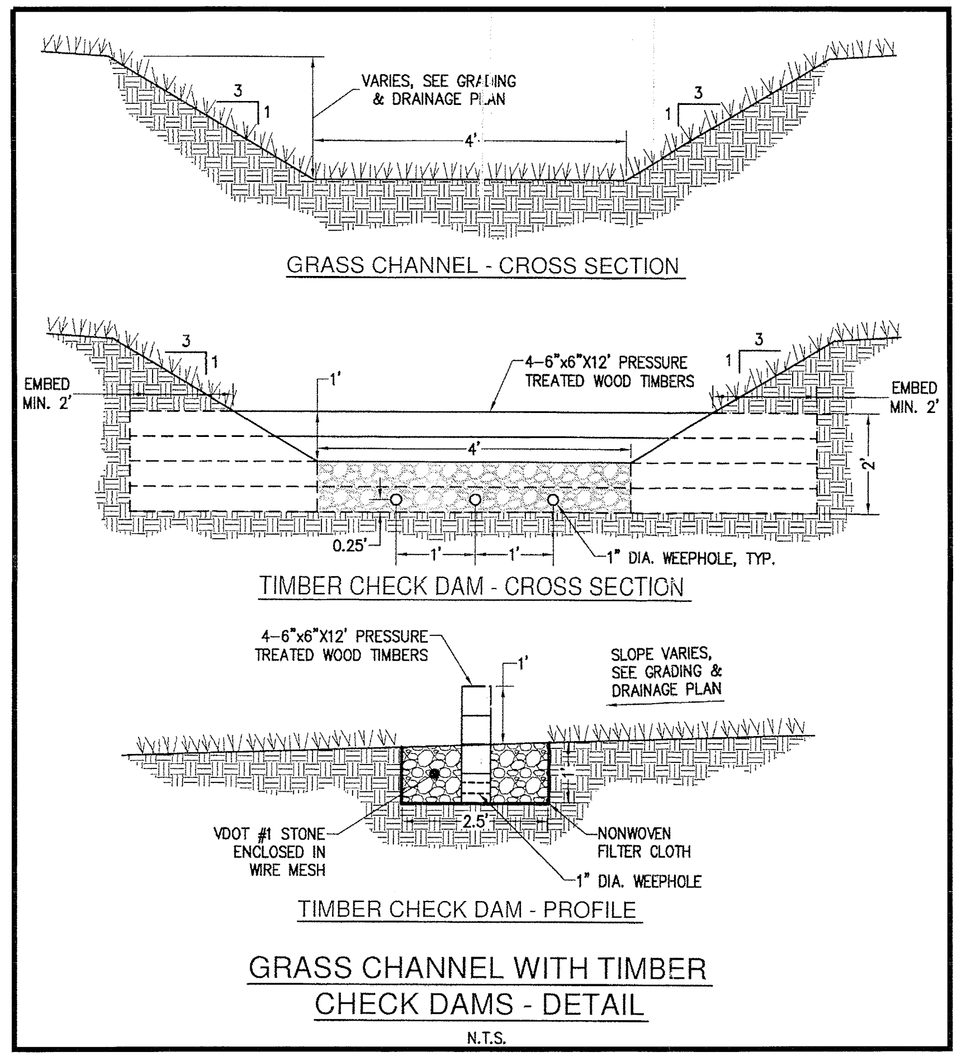

GRASS CHANNEL WITH TIMBER CHECK DAMS - DETAIL

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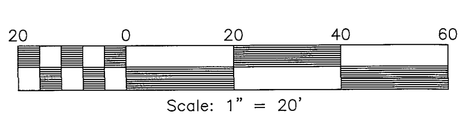
DETAIL SHOWN FROM DESIGN DRAWINGS



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MID COUNTY PARK DRY POND

JAMES CITY COUNTY VIRGINIA

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SHEET: 2 OF 2

TRANSMITTAL SHEET

ENGINEERING & RESOURCE PROTECTION → STORMWATER

Project: Mid County Park

County Plan No.: SP-85-12

Assigned BMP No.: PC-273

BMP Type: Dry Ponds

RECEIVED
APR 0 4 2014
JAMES CITY COUNTY
STORMWATER DIVISION

Information Enclosed:

X Record Drawings (Asbuilts) REVISED

Name: **Greg Johnson**

Date: 3/28/14

Signature: _____

Transmittal

LandTech Resources, Inc.
Surveying - Engineering - GPS
3925 Midlands Road, Williamsburg, VA 23188
Tel: 757-565-1677 Fax: 757-565-0782

Environmental Division
Environmental Division
MAR 5 2014
RECEIVED
RECEIVED

To: Scott Thomas, JCC Engineering & Resource Protection
From: Matt Connolly, LandTech Resources, Inc.
Date: 03/04/2014
Job Name/Number: Mid County Park 13-062

The following have been sent:

- ☐ as requested
- ☒ for review
- ☐ please sign and return
- ☐ for temporary use, please return by

Quantity	Drawing Date	Description
3	02/27/2014	Drainage As-builts for Mid County Park Dry Pond

Remarks:

Dry Pond as-built to reflect pond reconstruction

SP-85-12

SP-0085-2012

SITE PLAN AMENDMENT #1

FOR

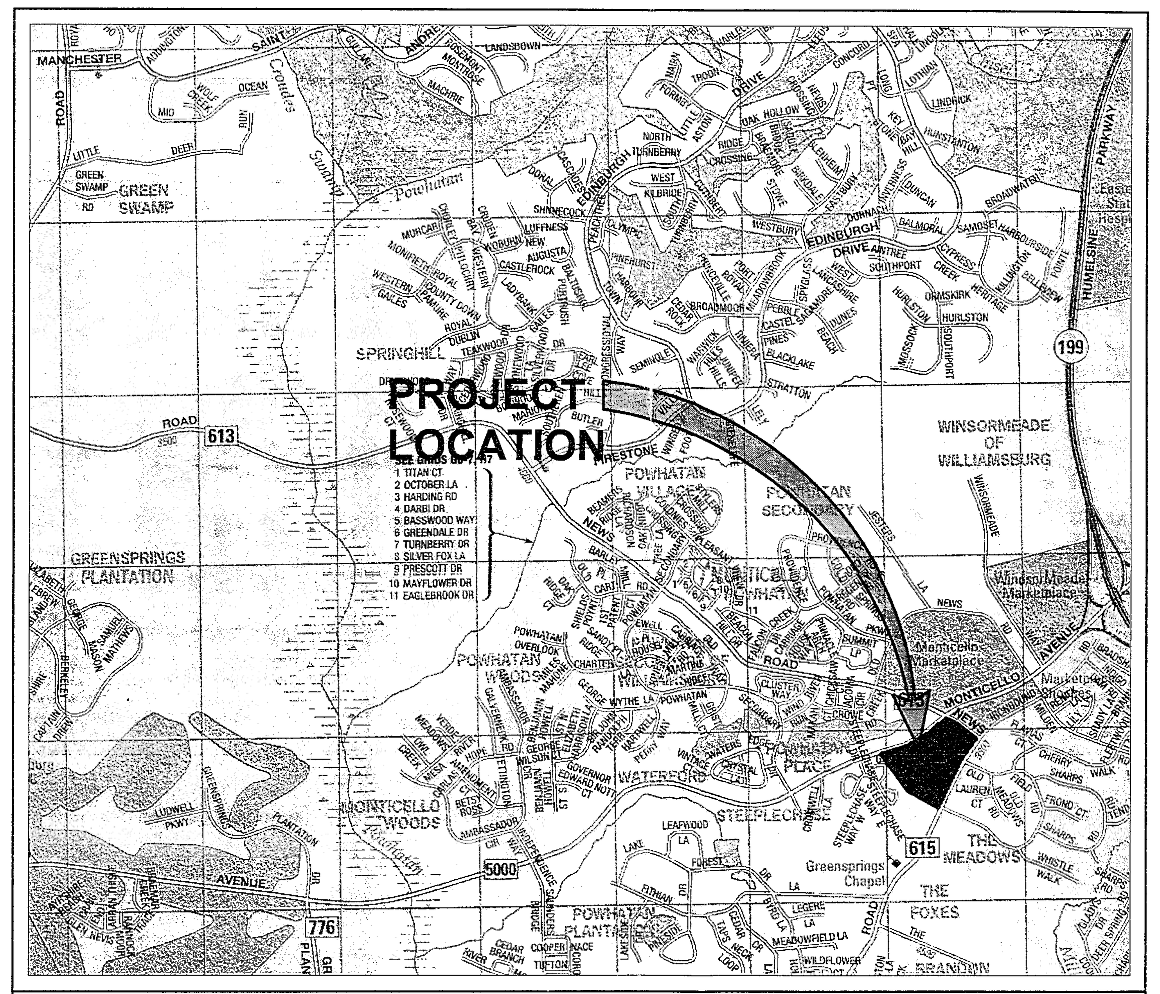
MID COUNTY PARK

IFB #12-XXXX

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

GENERAL NOTES:

1. DEVELOPER/OWNER: JAMES CITY COUNTY PARKS AND RECREATION DEPARTMENT
   5300 PALMER LANE, SUITE 1A
   WILLIAMSBURG, VA 23188
   CONTACT: NANCY ELLIS
   PHONE NO.: (757) 259-3200
2. THIS PROJECT IS LOCATED WITHIN SUB-WATERSHED 210, CATCHMENT 210-202-1 AND 210-203-1 OF THE POWHATAN CREEK WATERSHED.
3. THIS PROPERTY LIES IN ZONE X (AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. # 51095C0120C, DATED 09/28/07.
4. HORIZONTAL DATUM - NAD83 (1986) VIRGINIA STATE PLAIN COORDINATE SYSTEM SOUTH ZONE
   VERTICAL DATUM - NGVD29 VIRGINIA STATE PLAIN COORDINATE SYSTEM SOUTH ZONE.
   JAMES CITY COUNTY MONUMENTS USED - 322
5. GEOTECHNICAL INVESTIGATIONS AND SOIL BORINGS WERE PERFORMED FOR THIS PROJECT.
6. CONTOUR INTERVAL IS 1 FOOT.
7. SITE BOUNDARY IS BASED ON RECORD INFORMATION AND DOES NOT REPRESENT A CURRENT BOUNDARY BY AES CONSULTING ENGINEERS.
8. ALL UTILITY AND SURVEY DATA SHOWN ON THE DRAWINGS HAVE BEEN PROVIDED BY AES CONSULTING ENGINEERS. INFORMATION HAS BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES AT THE TIME OF THE SURVEY BUT IS NOT REPRESENTED AS BEING COMPLETE AND ACCURATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT EXISTING UTILITIES AND UNDERGROUND STRUCTURES. DAMAGE TO EXISTING UTILITIES AND UNDERGROUND STRUCTURES SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE DEVELOPER.
9. EXISTING UTILITY LOCATIONS INDICATED ARE APPROXIMATE. FIELD VERIFY PRIOR TO COMMENCING THE WORK.
10. OWNER HAS ALREADY OBTAINED A VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) PERMIT. AT TIME OF CONTRACTOR SELECTION THE PERMIT WILL BE TRANSFERRED TO THE CONTRACTOR. CONTRACTOR SHALL PROVIDE OWNER WITH ALL REQUIRE INFORMATION AND SITE CONTACT PERSON FOR TRANSFER.
11. A LAND DISTURBING PERMIT AND SILTATION AGREEMENT, WITH SURETY ARE REQUIRED FOR THIS PROJECT.
12. CONTACT MISS UTILITY (1-800-552-7001) FOR EXISTING UTILITY LOCATIONS 48 HOURS PRIOR TO COMMENCING THE WORK.
13. ALL PROPOSED UTILITIES SHALL BE PLACED UNDERGROUND AS PER JAMES CITY COUNTY SUBDIVISION ORDINANCE SECTION 24-200.
14. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO ALL SITE CONDITIONS PRIOR TO CONSTRUCTION.
15. CONTRACTOR SHALL BE RESPONSIBLE FOR ESTABLISHING AND MAINTAINING ALL LINES AND GRADES REQUIRED.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF CONSTRUCTION EFFORTS WITH VIRGINIA NATURAL GAS, DOMINION VIRGINIA POWER, VERIZON TELEPHONE, HAMPTON ROADS SANITATION DISTRICT, APPROPRIATE TELEVISION CABLE COMPANY, AND OTHERS THAT MAY BE REQUIRED.
17. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR THE WORK INDICATED.
18. THE CONTRACTOR SHALL REESTABLISH ALL PROPERTY PINS, MONUMENTS, WATER METERS, DRAINAGE CULVERTS, FENCES, UTILITY POLES, DRIVEWAYS, CURBS, GUTTERS, ETC. DISTURBED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE DEVELOPER/OWNER.
19. THE CONTRACTOR SHALL COMPLY WITH ALL PROVISIONS OF THE VIRGINIA UNDERGROUND UTILITY DAMAGE PREVENTION ACT (SECTION 56-265.14 ET. SEQ. CODE OF VIRGINIA, 1950, AS AMENDED) AND HEREBY AGREES TO HOLD THE DEVELOPER AND THE ENGINEER HARMLESS AGAINST ANY LOSS, DAMAGE, OR CLAIMS OF ANY NATURE WHATSOEVER ARISING OUT OF THE CONTRACTOR'S FAILURE TO COMPLY WITH THE REQUIREMENTS OF SAID ACT.
20. THE CONTRACTOR IS REQUIRED TO COMPLY WITH THE VIRGINIA OVERHEAD HIGH VOLTAGE LINE SAFETY ACT (SECTIONS 59.1-406 THROUGH 59.1-414, CODE OF VIRGINIA, 1950, AS AMENDED). THE CONTRACTOR IS REQUIRED TO VISIT THE SITE AND NOTE THE POSITION OF OVERHEAD CABLES PRIOR TO CONSTRUCTION.
21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING AND MAINTAINING EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE DRAWINGS AND FOR EXCAVATION STOCKPILES, STAGING AREAS, MOBILIZATION SITES, BEDDING/BACKFILL STOCKPILES AND OTHER LAND DISTURBANCES NOT SPECIFICALLY ADDRESSED IN THE DRAWINGS OR CONTRACT DOCUMENTS. EROSION AND SEDIMENT CONTROL MEASURES SHALL MEET OR EXCEED THE MINIMUM STANDARDS OF THE "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK" (LATEST PUBLICATION) AND THE REQUIREMENTS OF THE LOCAL GOVERNING AUTHORITY.
22. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF ANY BODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION.
23. THE CONTRACTOR SHALL INSTALL PIPE, FITTINGS, AND VALVES IN DRY TRENCH CONDITIONS AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION. THE CONTRACTOR SHALL PROVIDE ALL DEWATERING, WELL POINTING, SHEETING, TRENCH BOXES, AND TRENCH STABILIZATION AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
24. ALL DISTURBED AREAS, INCLUDING BUT NOT LIMITED TO PAVEMENT, SHOULDERS, DITCHES, HEADWALLS, ENDWALLS, CULVERT PIPES, CURB AND GUTTER, UTILITIES, DRIVEWAYS, SIGNS, MAILBOXES, ETC., SHALL BE REPAIRED TO A CONDITION EQUAL TO OR BETTER THAN THOSE EXISTING PRIOR TO CONSTRUCTION, OR AS SHOWN ON THE DRAWINGS. SIGNS, MAILBOXES, AND GUARDRAIL THAT ARE DISTURBED SHALL BE RETURNED TO THEIR ORIGINAL LOCATIONS DAILY, AND MAINTAINED THROUGHOUT THE PROJECT.
25. PRIVATELY OWNED UTILITIES SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE AND ENFORCED BY THE CODE COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PREVENTION ASSOCIATION STANDARD 24, AND THE INTERNATIONAL FIRE CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED SITE UTILITIES WITHOUT OBTAINING REQUIRED PERMITS AND INSPECTIONS.
26. ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE JAMES CITY SERVICE AUTHORITY DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL STANDARDS, AND THE COMMONWEALTH OF VIRGINIA WATERWORKS AND SEWAGE COLLECTION AND TREATMENT REGULATIONS.
27. ALL WATER MAIN PIPE SHALL BE BEDDED IN ACCORDANCE WITH THE FIFTH EDITION OF THE HRPDC REGIONAL CONSTRUCTION STANDARDS DETAIL EW_01 WITH TYPE III BEDDING OR TYPE IV BEDDING.
28. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND NOTIFY THE OWNER OF ANY DISCREPANCIES PRIOR TO AND DURING CONSTRUCTION .
29. ALL SANITARY SEWER FACILITIES MUST HAVE A 5 FOOT MINIMUM HORIZONTAL SEPARATION DISTANCE BETWEEN IT AND ALL OTHER FIXED STRUCTURES, SUCH AS: DROP INLETS, FIRE HYDRANTS, LIGHT POLES, WATERLINE FACILITIES (SHALL BE A MINIMUM OF 10 FEET PER STATE HEALTH DEPARTMENT REGULATIONS. AN ADDITIONAL 5 FEET HORIZONTAL SEPARATION FOR WATER FACILITIES SHALL ALSO BE MAINTAINED FOR CONSISTENCY AMONG THE UTILITIES EXCEPT FOR THE REQUIRED STANDARD HORIZONTAL SEPARATION FROM THE SANITARY SEWER.) AND STORM SEWER PIPES, ETC.
30. ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE.
31. ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.
32. THE ABSENCE OF THE DEVELOPER OR THE ENGINEER AT THE JOB SITE DOES NOT, IN ANY WAY, RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO PERFORM THE WORK IN ACCORDANCE WITH THE DRAWINGS, CONTRACT DOCUMENTS, ADDENDA, AND WRITTEN AUTHORIZED PLAN REVISIONS.
33. THE PROFESSIONAL WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR PURPOSES OF PLAN APPROVAL ONLY. PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT, THE CONTRACTOR OR DEVELOPER SHALL PROVIDE THE NAME OF A "RESPONSIBLE LAND DISTURBER" WHO SHALL ASSUME RESPONSIBILITY AS THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT. THE CONTRACTOR OR DEVELOPER SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.
34. THE STORMWATER MANAGEMENT/BMP FACILITY AND ASSOCIATED STORMWATER CONVEYANCE SYSTEMS AS PROPOSED FOR THIS PROJECT(EXPANDED DRY POND, GRASS CHANNELS WITH TIMBER CHECK DAMS, AND BIORETENTION FACILITY) WILL REQUIRE SUBMISSION, REVIEW, AND APPROVAL OF A RECORD DRAWING (AS-BUILT) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND/SURETY. THIS ACTIVITY IS ADEQUATELY COORDINATED AND PERFORMED BEFORE, DURING AND FOLLOWING CONSTRUCTION IN ACCORDANCE WITH CURRENT COUNTY GUIDELINES



VICINITY MAP
(APPROXIMATE SCALE: 1"=2000')
MAP COPYRIGHT KAPPA MAP GROUP, LLC (800)829-6277
PERMITTED USE #21004223

COUNTY PROJECT NO.: SP-0059-2012
ORIGINAL SUBMITTAL DATE: 6/29/12
ORIGINAL APPROVAL DATE: 8/29/12
AMENDMENT SUBMITTAL DATE: 11/29/12
AMENDMENT APPROVAL DATE: ?

SITE PLAN AMENDMENT #1:
THE PURPOSE OF THIS SITE PLAN AMENDMENT IS TO CHANGE THE PHASING OF THE PROPOSED PROJECT. PHASE 1 NOW CONSISTS OF THE PROPOSED OFFICE BUILDING AND PLAYGROUND. PHASE 2 NOW CONSISTS OF MAIN PARKING LOT UPGRADES AND A PROPOSED BUS PARKING AREA. PHASE 3 NOW CONSISTS OF A PROPOSED SHELTER AND BACK PARKING LOT UPGRADES. THE SHEETS HAVE BEEN REVISED TO REFLECT THESE PHASE CHANGES.

INDEX OF SHEETS:

SHEET NO.	SHEET DESCRIPTION
C-01	COVER SHEET
C-02	OVERALL ENVIRONMENTAL INVENTORY PLAN
C-03	OVERALL PHASING PLAN
C-O4A	PHASE 1 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN
C-04B	PHASE 2 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN
C-05	PHASES 1 & 2 SITE & UTILITY PLAN
C-06	PHASES 1 & 2 GRADING & DRAINAGE PLAN
C-07	PHASE 3 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN
C-08	PHASE 3 SITE & UTILITY PLAN
C-09	PHASE 3 GRADING & DRAINAGE PLAN
C-10	UTILITY PROFILES
C-11	EROSION & SEDIMENT CONTROL NOTES & DETAILS
C-12	SWM NOTES & DETAILS
C-13	UTILITY NOTES & DETAILS
C-14	NOTES & DETAILS
L-01	LANDSCAPE PLAN
L-02	LANDSCAPE PLAN

COUNTY OF JAMES CITY
FINAL SITE PLAN

APPROVALS		DATE
Fire Dept.		
Health Dept.		
VDOT		
Planning	CHJ	12/6/12
	ST/LAV	12/6/12
	CD	12/10/12
JA		
County Eng.		
REA		
Other		

PLANNING DIVISION
DEC 03 2012
RECEIVED

Environmental Division
JAN 8 2013
RECEIVED

OWNER/DEVELOPER INFORMATION:

JAMES CITY COUNTY PARKS AND RECREATION DEPARTMENT

CONTACT: NANCY ELLIS
5300 PALMER LANE, SUITE 1A
WILLIAMSBURG, VA 23188
PHONE NO.: (757) 259-3200

CERTIFIED RESPONSIBLE LAND DISTURBER:

GRAHAM V. CORSON, P.E.
AES CONSULTING ENGINEERS
5248 OLDE TOWNE ROAD, SUITE 1
WILLIAMSBURG, VIRGINIA 23188
TELEPHONE: 757-253-0040

* FOR SITE PLAN REVIEW PROCESS ONLY. OWNER OR CONTRACTOR SHALL NAME RESPONSIBLE LAND DISTURBER FOR CONSTRUCTION PROCESS.

SITE DATA:

SITE ADDRESS: 3793 IRONBOUND RD.
WILLIAMSBURG, VA 23188

ZONING: PL, PUBLIC LANDS

HYDROLOGIC UNIT CODE: JL31

TOTAL SITE AREA: 785,581 S.F.±, 18.03 AC.±

TOTAL IMPERVIOUS AREA (BY PHASE):

EXISTING	151,150 S.F.±, 3.47 AC.±
PHASE 1	174,464 S.F.±, 4.01 AC.±
PHASE 2	189,915 S.F.±, 4.36 AC.±
PHASE 3	196,920 S.F.±, 4.52 AC.±

TOTAL DISTURBED AREA: 279,035 S.F.±, 6.41 AC.± (SEE SHEET C-03 FOR DISTURBED AREA BY PHASE)

OFFSITE DISTURBED AREA: 1,830 S.F.±, 0.042 AC.± (WATERLINE CONNECTION, PHASE 1)

FLOOD HAZARD MAP: THIS PROPERTY IS IN ZONE "X" AS SHOWN ON MAP NUMBER 51095C0120C, PANEL 120 OF 240, FOR COMMUNITY NUMBER 510201, DATED 9/28/2007 OF THE FLOOD INSURANCE RATE MAPS FOR JAMES CITY COUNTY, VA. ZONE X IS DEFINED AS AREAS DETERMINED TO BE OUTSIDE THE 500-YEAR FLOODPLAIN.

EXISTING PARKING PROVIDED: 127 SPACES, 5 HANDICAP SPACES

PROPOSED PARKING PROVIDED:
PHASE 1: 124 SPACES, 5 HANDICAP SPACES
PHASE 2: 144 SPACES, 7 HANDICAP SPACES, 4 BUS PARKING SPACES
PHASE 3: 171 SPACES, 7 HANDICAP SPACES, 4 BUS PARKING SPACES

ENTRANCE INFORMATION:
EXISTING LAND USE: RECREATIONAL WITHOUT WATERCRAFT ACCESS OR CAMPING
PROPOSED LAND USE: RECREATIONAL WITHOUT WATERCRAFT ACCESS OR CAMPING
REQUIRED ENTRANCE RADII: 24' (FROM VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) ROAD DESIGN MANUAL, 2005)
EXISTING ENTRANCE RADII: SEE PLAN SHEETS C-05 & C-08 (MINIMUM 25')

ENTRANCE NOTE:
NO TRAFFIC COUNTS HAVE BEEN PERFORMED FOR THE PROPERTY, SO ACTUAL NUMBERS AREN'T PROVIDED. THE EXISTING ENTRANCE RADII MEET THE REQUIRED STANDARD AS SET IN THE VDOT ROAD DESIGN MANUAL. IN ADDITION, EXISTING TURN LANES ARE PROVIDED ON NEWS ROAD AND IRONBOUND ROAD TO ENTER THE PROPERTY.

NOTE:
PRIOR TO THE RELEASE OF THE POSTED BONDS AND SURETY FOR THIS PROJECT, ALL INFORMATION RELATED TO RECORD DRAWINGS AND CONSTRUCTION MUST BE PROVIDED TO AND APPROVED BY THE JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION AND CONSISTENT WITH THE STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING AND CONSTRUCTION CERTIFICATION FORMS.

NOTE:
THIS PROJECT HAS AN APPROVED SPECIAL USE PERMIT (SUP-0003-2011).

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
11/29/12
PROFESSIONAL ENGINEER

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www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: AS NOTED	Date: 6/29/12
Sheet Title:	COVER SHEET
Sheet Number	C-01

SOIL No.	SOIL NAME	TYPICAL SLOPES	EROSION FACTOR (K)	EROSION FACTOR (T)
11C	CRAVEN YELLOW FINE SANDY LOAM	2–10%	0.32–0.37	3
19B	KEMPSVILLE–EMPORIA	2–6%	0.20–0.32	3–4
29B	SLAGLE	2–6%	0.24	3

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

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

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

DENOTES 25% OR GREATER SLOPES

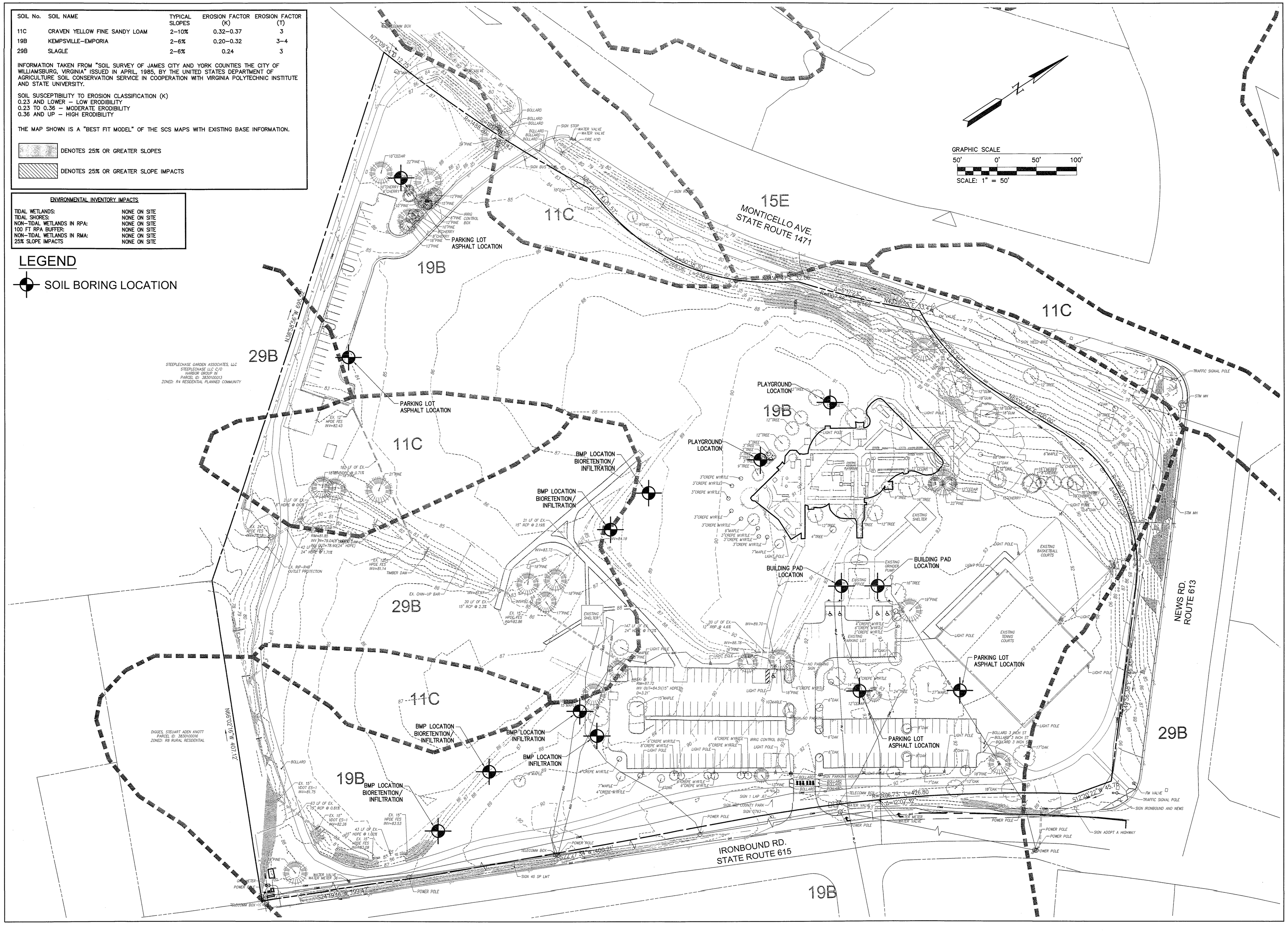
DENOTES 25% OR GREATER SLOPE IMPACTS

ENVIRONMENTAL INVENTORY IMPACTS

TIDAL WETLANDS:	NONE ON SITE
TIDAL SHORES:	NONE ON SITE
NON–TIDAL WETLANDS IN RPA:	NONE ON SITE
100 FT RPA BUFFER:	NONE ON SITE
NON–TIDAL WETLANDS IN RMA:	NONE ON SITE
25% SLOPE IMPACTS	NONE ON SITE

LEGEND

SOIL BORING LOCATION



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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=50'	Date: 6/29/12

Sheet Title:
OVERALL ENVIRONMENTAL INVENTORY

Sheet Number
C-02

PHASING PLAN

PHASE 1:

- DEMOLITION OF EXISTING KIDSBURG PLAYGROUND AREA
- CONSTRUCTION OF NEW PLAYGROUND AREA. (BY SEPARATE CONTRACTOR)
- PROPOSED OFFICE BUILDING
- NEW 8' PVC WATER MAIN ADDITION WITH FIRE HYDRANT ASSEMBLY
- PROPOSED STORMWATER MANAGEMENT FACILITY (GRASS CHANNEL #1)
- EXISTING SHELTER MODIFICATIONS (NOT SHOWN IN THIS PLAN, SEE ARCHITECTURAL PLANS)
- PROPOSED DRY POND EXPANSION

PHASE 2:

- EASTERN PARKING LOT ADDITION
- SLASH PARK AREA
- BUS PARKING ADDITION
- PROPOSED STORMWATER MANAGEMENT FACILITY (GRASS CHANNEL #2)
- PARK SIDEWALK CONNECTIONS

PHASE 3:

- PROPOSED SHELTER
- WESTERN PARKING ADDITION
- PROPOSED GATOR SHED AND DUMPSTER PAD
- PROPOSED BIORETENTION FACILITY #1
- PARK SIDEWALK CONNECTIONS
- VOLLEYBALL COURTS

PHASE 4:

- PERIMETER SIGHT LIGHTING

STEEPLECHASE GARDEN ASSOCIATES, LLC
STEEPLECHASE LLC C/O
HARBOR GROUP IN
PARCEL ID: 3830100013
ZONED: R4 RESIDENTIAL PLANNED COMMUNITY

DISTURBED AREAS BY PHASE

PHASE 1:

- 116,506 SF, 2.67 AC.

PHASE 2:

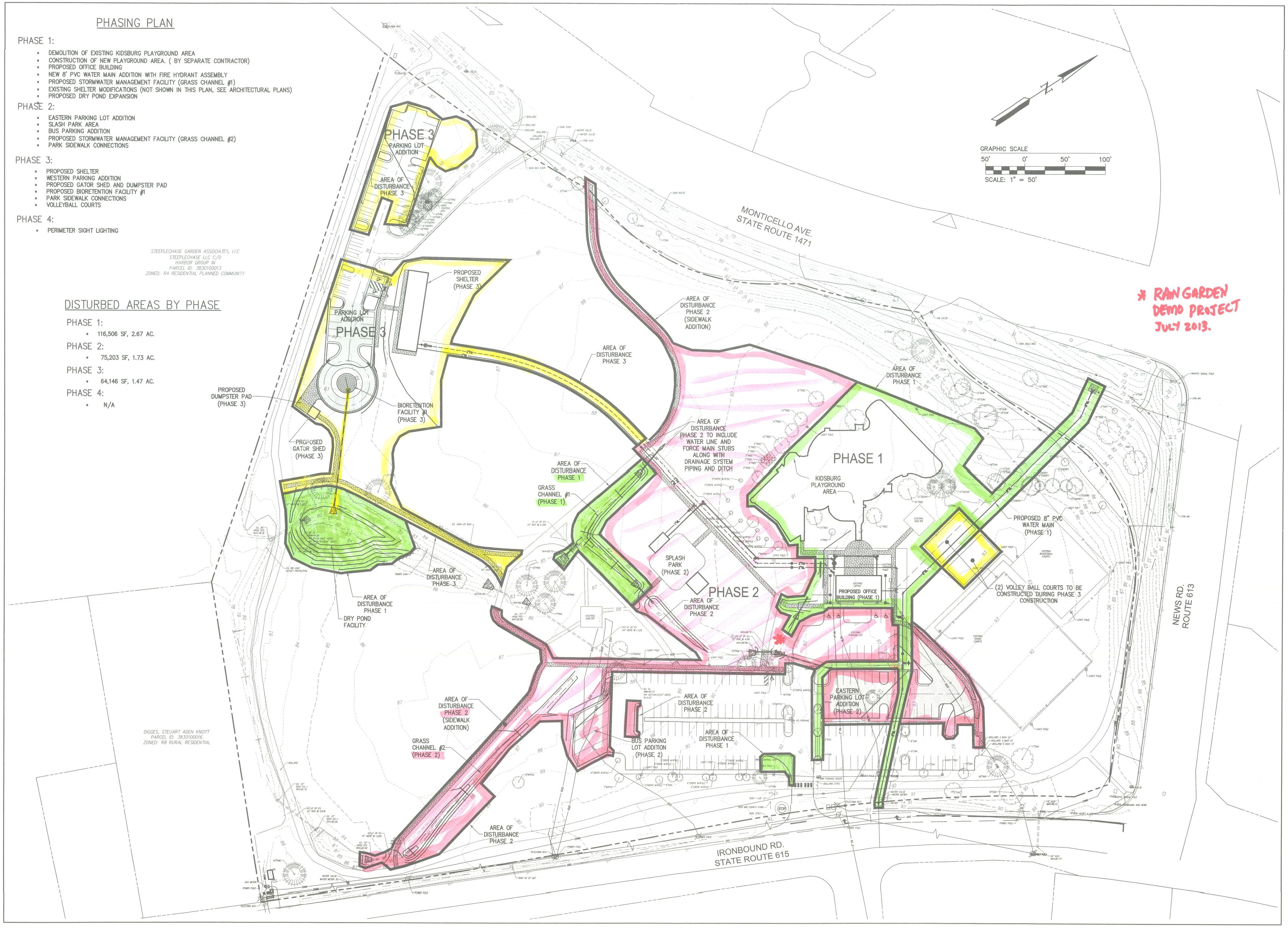
- 75,203 SF, 1.73 AC.

PHASE 3:

- 64,146 SF, 1.47 AC.

PHASE 4:

- N/A



* RAIN GARDEN DEMO PROJECT JULY 2013.

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

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BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=50'	Date: 6/29/12

Sheet Title:
OVERALL PHASING PLAN

Sheet Number
C-03

SEQUENCE OF CONSTRUCTION

PHASE 1:

1. CONTRACTOR SHALL FLAG LIMITS OF CONSTRUCTION.
2. *PRIOR TO OBTAINING LAND DISTURBING PERMIT, THE CONTRACTOR SHALL OBTAIN A VSMP* PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM DCR (VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION) AND A DEMOLITION PERMIT FROM CODE COMPLIANCE.
3. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE JAMES CITY COUNTY ENGINEERING & RESOURCE PROTECTION DIVISION PRIOR TO BEGINNING ANY WORK AT THE SITE.
4. CONTRACTOR SHALL CONTACT "MISS UTILITY" FOR PUBLIC SERVICES AND CONTACT A PRIVATE UTILITY LOCATOR FOR PRIVATE SERVICES.
5. TEMPORARY CONSTRUCTION ENTRANCE. DUE TO THE FACT THAT TRUCKS WILL BE LOADED AND UNLOADED ON PAVED SURFACES A CONSTRUCTION ENTRANCE MAY NOT BE NECESSARY. HARD SURFACE ROADWAYS WILL BE CLEANED DAILY OF ANY SEDIMENT CONTAMINATION FROM THE MOVEMENT OF SOIL OFF-SITE. THIS DOES NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO INSTALL A CONSTRUCTION ENTRANCE IF NEEDED AS DETERMINED BY THE ON-SITE ENGINEERING & RESOURCE PROTECTION DIVISION INSPECTOR.
6. THE CONTRACTOR SHALL INSTALL THE INLET PROTECTION, CULVERT INLET PROTECTION, TREE PROTECTION, CHECK DAMS AND SILT FENCE AS SHOWN.
7. ONCE TEMPORARY SEDIMENT CONTROL MEASURES ARE IN PLACE AND OPERATIONAL, CONTRACTOR SHALL PERFORM SELECTIVE CLEARING OF TREES AS SHOWN IN PLAN.
8. TEMPORARY SEEDING SHALL BE APPLIED IN ALL DENUDED AREAS.
9. ONCE THE EROSION & SEDIMENT CONTROL MEASURES ARE COMPLETE, FUNCTIONING, AND APPROVED BY COUNTY'S ENVIRONMENTAL INSPECTOR, THE CONTRACTOR SHALL PERFORM DEMOLITION OF EXISTING PLAYGROUND AREA, EXISTING BUILDING.
10. CONTRACTOR SHALL PERFORM ROUGH GRADING OPERATIONS IN AREAS OF BUILDING AND PROPOSED PLAYGROUND.
11. CONTRACTOR SHALL INSTALL STORMWATER MANAGEMENT PRACTICES SUCH AS CULVERTS WITH OUTLET PROTECTION AND PARKING LOT STORM SEWER SYSTEMS AS SHOWN ON SHEET C-06.
12. CONTRACTOR SHALL EXPAND DRY POND AS SHOWN ON SHEET C-09
13. THE CONTRACTOR SHALL BEGIN CONSTRUCTION ON THE PROPOSED WATERLINE, THE PROPOSED OFFICE BUILDING AND ASSOCIATED SERVICE UTILITIES, PLAYGROUND AREA, AND SIDEWALK CONNECTIONS.
14. FINE GRADE, TOPSOIL, AND PLANT PERMANENT SEEDING ON ALL DENUDED AREAS.
15. UPON COMPLETION OF CONSTRUCTION OF THE OFFICE BUILDING AND PLAYGROUND AREA, CONSTRUCT STORMWATER MANAGEMENT FACILITIES:
    - GRADE FACILITIES TO FINAL GRADING.
    - INSTALL GRASS CHANNEL #1.
16. REMOVE ALL EROSION AND SEDIMENT CONTROL MEASURES WITHIN THIRTY DAYS OF FINAL SITE STABILIZATION, BUT ONLY AFTER APPROVAL IS OBTAINED FROM THE ASSIGNED JAMES CITY COUNTY ENGINEERING & RESOURCE PROTECTION INSPECTOR.

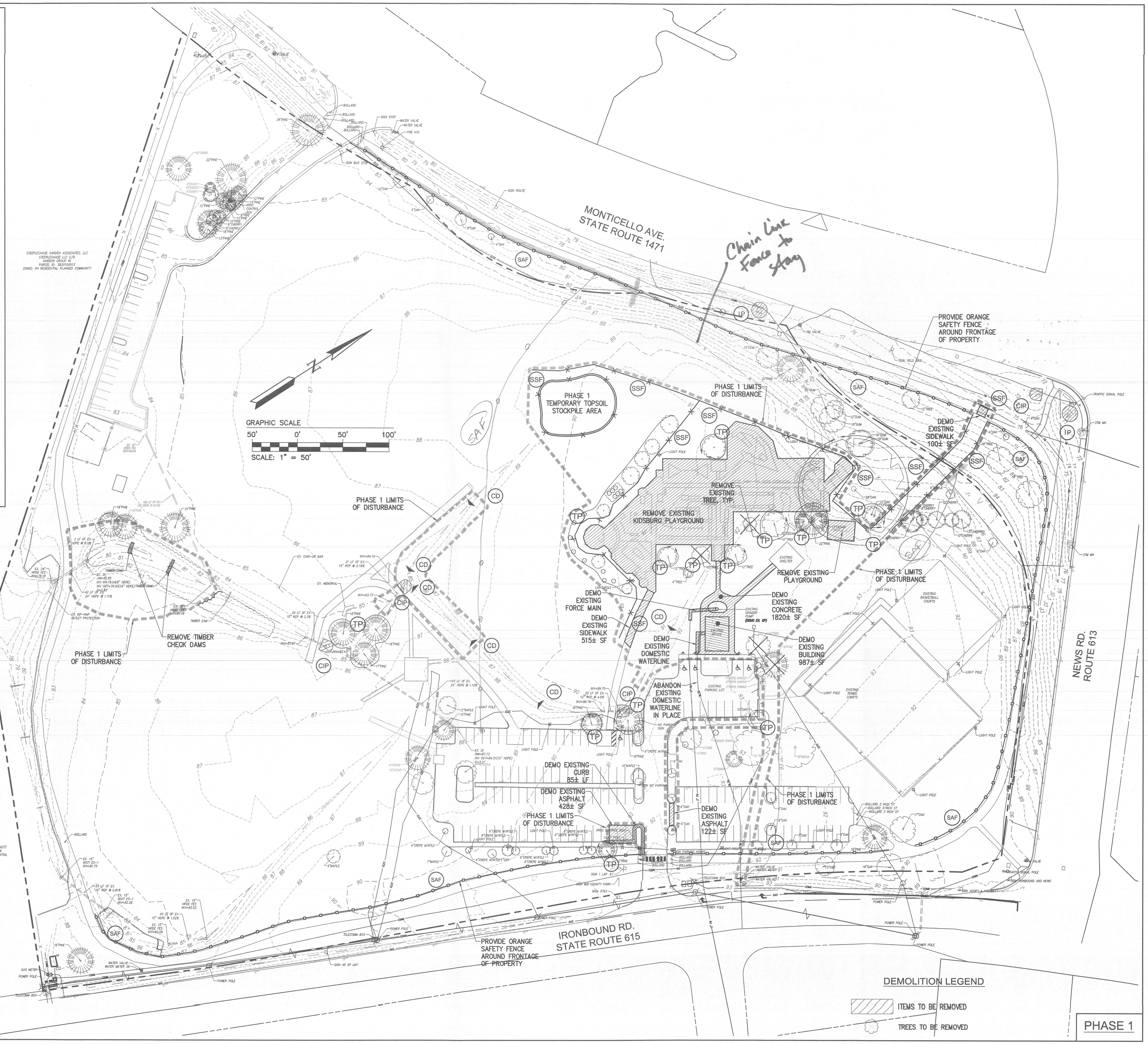
GENERAL NOTES:

- DUST CONTROL MEASURES IN ACCORDANCE WITH THE VESCH SHALL BE IMPLEMENTED AS NECESSARY.
- THERE ARE NO OFF-SITE LAND DISTURBING AREAS PROPOSED WITH THIS PROJECT.
- ALL EXCESS UNSUITABLE MATERIAL AND TOPSOIL SHALL BE REMOVED FROM PROJECT AREA AND DISPOSED OF OFF SITE.
- ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED DURING CONSTRUCTION PROGRESS AS DIRECTED BY THE ENGINEER OWNER, OR ENVIRONMENTAL DIVISION INSPECTOR TO MINIMIZE POTENTIAL FOR SEDIMENT TO LEAVE
- CONTRACTOR SHALL MONITOR THE EXISTING COUNTY OFFSITE STREAM RESTORATION PROJECT (LOCATED AT POWHATAN PLANTATION) FOR SIGNS OF SEDIMENTATION, SPECIFICALLY DURING OR AS A RESULT OF CONSTRUCTION ON THIS SITE. AS THIS FACILITY IS NOT TO BE USED FOR SEDIMENT CONTROL, THE CONTRACTOR SHOULD BE AWARE THAT ADDITIONAL ONSITE OR OFFSITE CONTROLS MAY BE NECESSARY TO PROTECT THE STREAM RESTORATION SITE FROM DEGRADATION. THIS MAY INCLUDE ADDITIONAL E&SC MEASURES, CLEANING AND SEDIMENT REMOVAL WITHIN THE BASIN OR CONNECTING PIPE SYSTEMS AND COORDINATION WITH THE OWNER, ENGINEER, OR THE COUNTY.

EROSION AND SEDIMENTATION CONTROL LEGEND

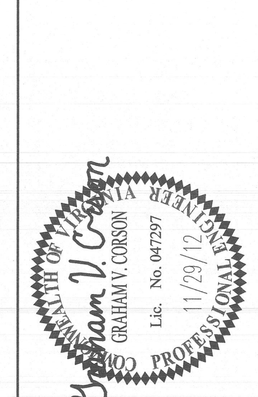
SAF		SAFETY FENCE (SPEC. 3.01)
SF		SILT FENCE (SPEC. 3.05)
SSF		SUPER SILT FENCE W/ WIRE SUPPORT (SPEC. 3.05)
IP		STORM DRAIN INLET PROTECTION (SPEC. 3.07)
CIP		CULVERT INLET PROTECTION (SPEC. 3.08-1 WITH STONE COMBINATION INSTEAD OF SILT FENCE)
OP		OUTLET PROTECTION (SPEC. 3.18)
CD		ROCK CHECK DAM (SPEC. 3.20)
TO	TO	TOPSOILING (SPEC. 3.30) (APPLY TOPSOIL IN ALL DENUDED AREAS)
TS	TS	TEMPORARY SEEDING (SPEC. 3.31) (TEMPORARY SEED DURING CONSTRUCTION)
PS	PS	PERMANENT SEEDING (SPEC. 3.32) (PERMANENT SEED IN ALL DISTURBED AREAS)
EC-2		TREATMENT 1 SOIL STABILIZATION MATTING (SPEC. 3.36)
TP	TP	TREE PROTECTION (SPEC. 3.38)
DC	DC	DUST CONTROL (SPEC. 3.39) (APPLY SITE-WIDE)

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



PHASE 1

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC



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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT | JAMES CITY COUNTY | VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=50'	Date: 6/29/12

Sheet Title:
PHASE 1 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN

Sheet Number
C-04A

SEQUENCE OF CONSTRUCTION

PHASE 2:

1. CONTRACTOR SHALL FLAG LIMITS OF CONSTRUCTION.
2. *PRIOR TO OBTAINING LAND DISTURBING PERMIT, THE CONTRACTOR SHALL OBTAIN A VSMP* PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM DCR (VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION) AND A DEMOLITION PERMIT FROM CODE COMPLIANCE.
3. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE JAMES CITY COUNTY ENGINEERING & RESOURCE PROTECTION DIVISION PRIOR TO BEGINNING ANY WORK AT THE SITE.
4. CONTRACTOR SHALL CONTACT "MISS UTILITY" FOR PUBLIC SERVICES AND CONTACT A PRIVATE UTILITY LOCATOR FOR PRIVATE SERVICES.
5. TEMPORARY CONSTRUCTION ENTRANCE. DUE TO THE FACT THAT TRUCKS WILL BE LOADED AND UNLOADED ON PAVED SURFACES A CONSTRUCTION ENTRANCE MAY NOT BE NECESSARY. HARD SURFACE ROADWAYS WILL BE CLEANED DAILY OF ANY SEDIMENT CONTAMINATION FROM THE MOVEMENT OF SOIL OFF-SITE. THIS DOES NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO INSTALL A CONSTRUCTION ENTRANCE IF NEEDED AS DETERMINED BY THE ON-SITE ENGINEERING & RESOURCE PROTECTION DIVISION INSPECTOR.
6. THE CONTRACTOR SHALL INSTALL THE INLET PROTECTION, CULVERT INLET PROTECTION, TREE PROTECTION, CHECK DAMS AND SILT FENCE AS SHOWN.
7. ONCE TEMPORARY SEDIMENT CONTROL MEASURES ARE IN PLACE AND OPERATIONAL, CONTRACTOR SHALL PERFORM SELECTIVE CLEARING OF TREES AS SHOWN IN PLAN.
8. TEMPORARY SEEDING SHALL BE APPLIED IN ALL DENUDED AREAS.
9. ONCE THE EROSION & SEDIMENT CONTROL MEASURES ARE COMPLETE, FUNCTIONING, AND APPROVED BY COUNTY'S ENVIRONMENTAL INSPECTOR, THE CONTRACTOR SHALL PERFORM DEMOLITION OF EXISTING PARKING LOT CURBING AS SHOWN IN PLAN.
10. CONTRACTOR SHALL PERFORM ROUGH GRADING OPERATIONS IN AREAS OF PARKING LOT ADDITION AND BUS PARKING AREA.
11. CONTRACTOR SHALL INSTALL STORMWATER MANAGEMENT PRACTICES SUCH AS CULVERTS WITH OUTLET PROTECTION AND PARKING LOT STORM SEWER SYSTEMS AS SHOWN ON SHEET C-06.
12. THE CONTRACTOR SHALL BEGIN CONSTRUCTION ON THE PROPOSED SERVICE UTILITIES, PARKING LOT ADDITIONS, AND SIDEWALK CONNECTIONS.
13. FINE GRADE, TOPSOIL, AND PLANT PERMANENT SEEDING ON ALL DENUDED AREAS.
14. UPON COMPLETION OF CONSTRUCTION OF THE PARKING LOT ADDITIONS AND BUS PARKING AREA, CONSTRUCT STORMWATER MANAGEMENT FACILITIES:
    - -INSTALL GRASS CHANNEL #2 AS SHOWN ON SHEET C-06.
15. REMOVE ALL EROSION AND SEDIMENT CONTROL MEASURES WITHIN THIRTY DAYS OF FINAL SITE STABILIZATION, BUT ONLY AFTER APPROVAL IS OBTAINED FROM THE ASSIGNED JAMES CITY COUNTY ENGINEERING & RESOURCE PROTECTION INSPECTOR.

GENERAL NOTES:

-DUST CONTROL MEASURES IN ACCORDANCE WITH THE VESCH SHALL BE IMPLEMENTED AS NECESSARY.
-THERE ARE NO OFF-SITE LAND DISTURBING AREAS PROPOSED WITH THIS PROJECT.
-ALL EXCESS UNSUITABLE MATERIAL AND TOPSOIL SHALL BE REMOVED FROM PROJECT AREA AND DISPOSED OF OFF SITE.
-ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED DURING CONSTRUCTION PROGRESS AS DIRECTED BY THE ENGINEER OWNER, OR ENVIRONMENTAL DIVISION INSPECTOR TO MINIMIZE POTENTIAL FOR SEDIMENT TO LEAVE
-CONTRACTOR SHALL MONITOR THE EXISTING COUNTY OFFSITE STREAM RESTORATION PROJECT (LOCATED AT POWHATAN PLANTATION) FOR SIGNS OF SEDIMENTATION, SPECIFICALLY DURING OR AS A RESULT OF CONSTRUCTION ON THIS SITE. AS THIS FACILITY IS NOT TO BE USED FOR SEDIMENT CONTROL, THE CONTRACTOR SHOULD BE AWARE THAT ADDITIONAL ONSITE OR OFFSITE CONTROLS MAY BE NECESSARY TO PROTECT THE STREAM RESTORATION SITE FROM DEGRADATION. THIS MAY INCLUDE ADDITIONAL E&SC MEASURES, CLEANING AND SEDIMENT REMOVAL WITHIN THE BASIN OR CONNECTING PIPE SYSTEMS AND COORDINATION WITH THE OWNER, ENGINEER, OR THE COUNTY.

EROSION AND SEDIMENTATION CONTROL LEGEND

SAF	SAFETY FENCE (SPEC. 3.01)	
SF	SILT FENCE (SPEC. 3.05)	
SSF	SUPER SILT FENCE W/ WIRE SUPPORT (SPEC. 3.05)	
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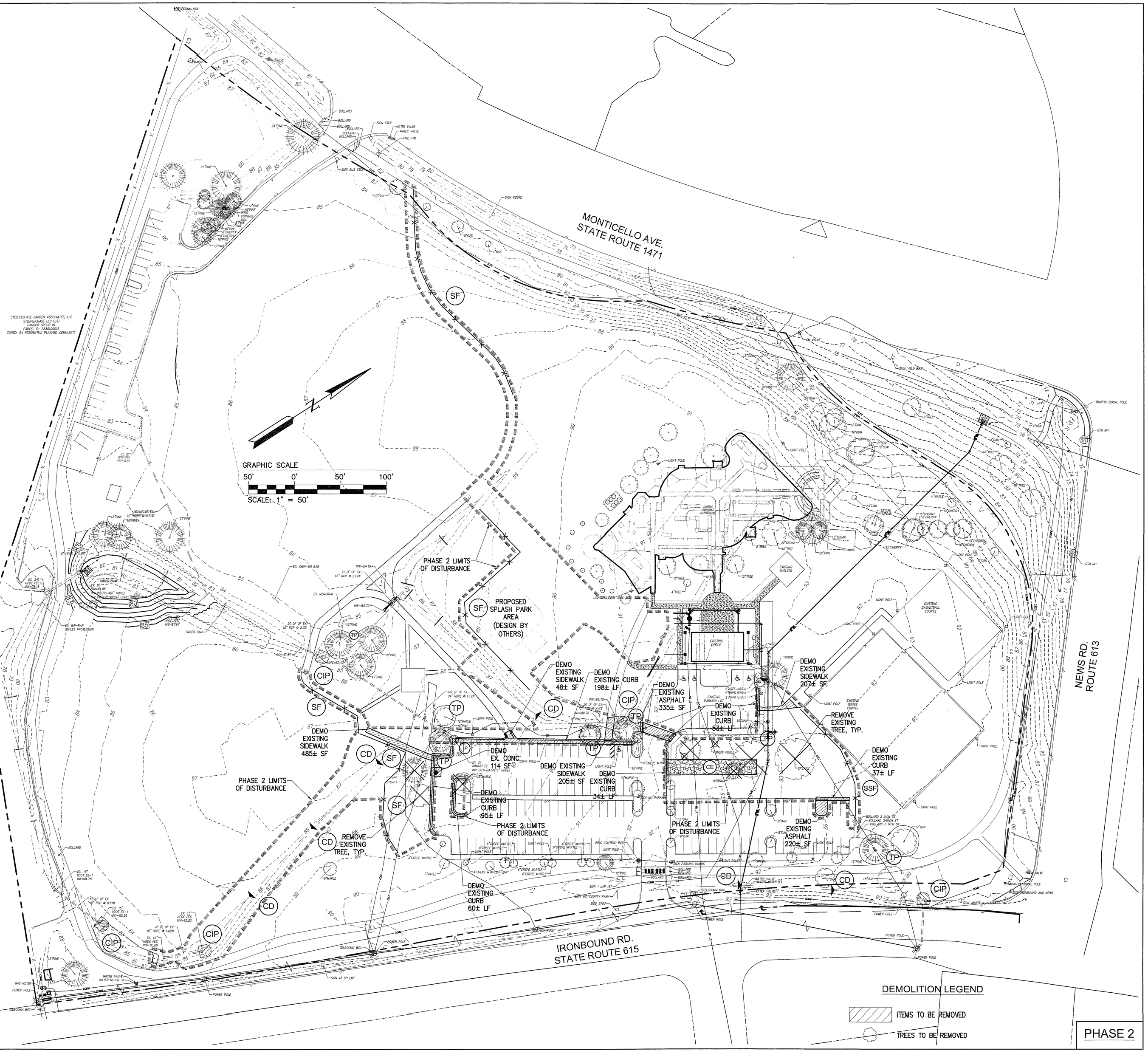
OP	OUTLET PROTECTION (SPEC. 3.18)	
CD	ROCK CHECK DAM (SPEC. 3.20)	
TO	TOPSOILING (SPEC. 3.30) (APPLY TOPSOIL IN ALL DENUDED AREAS)	
TS	TEMPORARY SEEDING (SPEC. 3.31) (TEMPORARY SEED DURING CONSTRUCTION)	
PS	PERMANENT SEEDING (SPEC. 3.32) (PERMANENT SEED IN ALL DISTURBED AREAS)	
EC-2	TREATMENT 1 SOIL STABILIZATION MATTING (SPEC. 3.36)	
TP	TREE PROTECTION (SPEC. 3.38)	
DC	DUST CONTROL (SPEC. 3.39) (APPLY SITE-WIDE)	

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



Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=50'	Date: 6/29/12

Sheet Title:
PHASE 2 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN

Sheet Number
C-04B

MATCHLINE - SEE SHEET C-04

SEE SHEET C-08 FOR CONTINUATION

MATCHLINE - SEE INSET

UTILITIES NOTES:
1. RPZ BACKFLOW PREVENTERS SHALL BE INSTALLED INSIDE EACH BUILDING BEING SERVED BY WATER SERVICE LINES. SEE ARCHITECTURAL PLANS.
2. TRACER WIRE SHALL BE INSTALLED WITH ALL SEWER AND WATER LINES, INCLUDING SERVICE LINES.

PHASE 3 LIMITS OF DISTURBANCE
FORCE MAIN 1-PLUG
WATERLINE 1-4"-PLUG 1-4" VALVE & BOX
5' WIDE SIDEWALK
WATERLINE 1-4"-TEE 1-4" VALVE & BOX 1-4"x1" REDUCER
4" SAN. SEWER 1-WYE 1-CLEANOUT(INV=88.7)
PHASE 1 LIMITS OF DISTURBANCE
PROPOSED PLAYGROUND AREA (DESIGN BY OTHERS)
8" PVC WATERLINE (SEE PROFILE, SHEET C-10)
20' JCSA UTILITY EASEMENT
PRIVATE 2" PVC FORCE MAIN
PRIVATE 4" PVC LATERAL
2" PVC CONDUIT
4" SAN. SEWER 1-WYE, 1-CLEANOUT (INV=87.7)
4" SAN. SEWER 2- WYE'S 2-45° BENDS 1-CLEANOUT
4" SAN. SEWER 1-WYE 1-45° BENDS 1-CLEANOUT (INV=89.0)
5' WIDE SIDEWALK
EXISTING SHELTER
WATER LINE 1-90° BEND
PROPOSED VOLLEYBALL COURTS, PHASE 3 (SEE DETAIL, SHEET C-14)
5' WIDE SIDEWALK
EX. CHIN-UP BAR (RELOCATE AS NECESSARY)
TIE IN TO EXISTING SIDEWALK
EX. MEMORIAL
21 LF OF EX. 15" RCP @ 2.19%
PRIVATE 1" PVC WATER SERVICE LINE
SUPPORT BUILDING
SPLASH PARK AREA 3,000 S.F.± (DESIGN SUPPLIED BY OTHERS)
GRINDER PUMP (SEE DETAIL, SHEET C-13)
PATIO AREA
PRIVATE 4" PVC WATER SERVICE LINE
PHASE 3 LIMITS OF DISTURBANCE
TIMBER DAM
FORCE MAIN 1-45° BEND
WATERLINE 1-45° BEND
FORCE MAIN 1-JUMBO BOX
FORCE MAIN 1-WYE 1- CHECK VALVE 1-45° BEND
PROPOSED BUILDING 1,735 S.F
WATER LINE 1-4"x2" TEE
PROVIDE AIR RELEASE VALVE AT WATERLINE AND FORCE MAIN HIGH POINTS
8" WATER MAIN STA 13+49 1-8" 45° BEND
PHASE 1 LIMITS OF DISTURBANCE
2" COMBINATION WATER METER W/ REDUCER ON BOTH ENDS
8" WATER MAIN STA 13+79 1-8"x4" TEE 1-8"x6" REDUCER
TIE IN TO EXISTING SIDEWALK
5' WIDE SIDEWALK
SUPPORT BUILDING
EXISTING SHELTER
TIE IN TO EXISTING SIDEWALK
RELOCATE EXISTING LIGHT POLE BEHIND SIDEWALK
5'-WIDE SIDEWALK
EXISTING HC SIGNS
WATER LINE 1-90° BEND
6" WATERLINE STA 14+37 1-6"x6" TEE 1-6" G.V. & V.B. 1-FIRE HYDRANT ASS'Y 1-6"x2" REDUCER 1- 2" G.V. & V.B.
EXISTING TENNIS COURTS
58 LF OF EX. 15" HDPE @ 1.12%
PHASE 2 LIMITS OF DISTURBANCE
RELOCATE EXISTING LIGHT POLE BEHIND SIDEWALK
5' WIDE SIDEWALK
8' WIDE SIDEWALK
ABANDON 1-1/2" WATER SERVICE LINE IN PLACE
10' WIDE PAVEMENT PATCH
6" WATERLINE STA 14+25 1-AIR RELEASE VALVE
ISLAND CUT-THROUGH
EXISTING WELL HOUSE
TIE IN EXISTING SIDEWALK
CG-6 CURB & GUTTER
CG-12 HANDICAP RAMP
RELOCATE EXISTING LIGHT POLE BEHIND SIDEWALK
CG-2 CURB
2" WATERLINE STA 14+69 1-2" 11.25° BEND
7 SPACES @ 9' EACH = 63.00'
4 SPACES @ 9' EACH = 36.00'
8 SPACE @ 9' EACH = 72.00'
7 SPACE @ 9' EACH = 63.00'
5' WIDE PAVEMENT PATCH
CG-6' CURB & GUTTER
4.5'x15' ANGLED BUS PARKING SPACES @ 15' WIDE = 85.18'
PHASE 2 LIMITS OF DISTURBANCE
2" PVC CONDUIT
20' JCSA UTILITY EASEMENT
PHASE 1 LIMITS OF DISTURBANCE
EXISTING PARKING LOT
CONTRACTOR TO POT HOLE AND UNCOVER EX. ELECTRICAL LINES AND REBURY DEEPER TO AVOID ASPHALT SECTION FOR BUS PARKING
PRIVATE 2" PVC FORCE MAIN 1-VALVE & BOX
WATER VALVE (TO BE REMOVED)
METER (TO BE REMOVED)
WATER VALVE (TO REMAIN)
TELECOMM BOX
POWER POLE
IRONBOUND RD. STATE ROUTE 615
GRAPHIC SCALE
25' 0' 25' 50'
SCALE: 1" = 25'

8" WATER MAIN STA 10+00 1-12"x8" TAPPING SLEEVE AND VALVE
8" WATER MAIN STA 10+37 1-8" 22.5° BEND
8" PVC WATER MAIN
PHASE 1 LIMITS OF DISTURBANCE
MATCHLINE

PHASES 1 & 2

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

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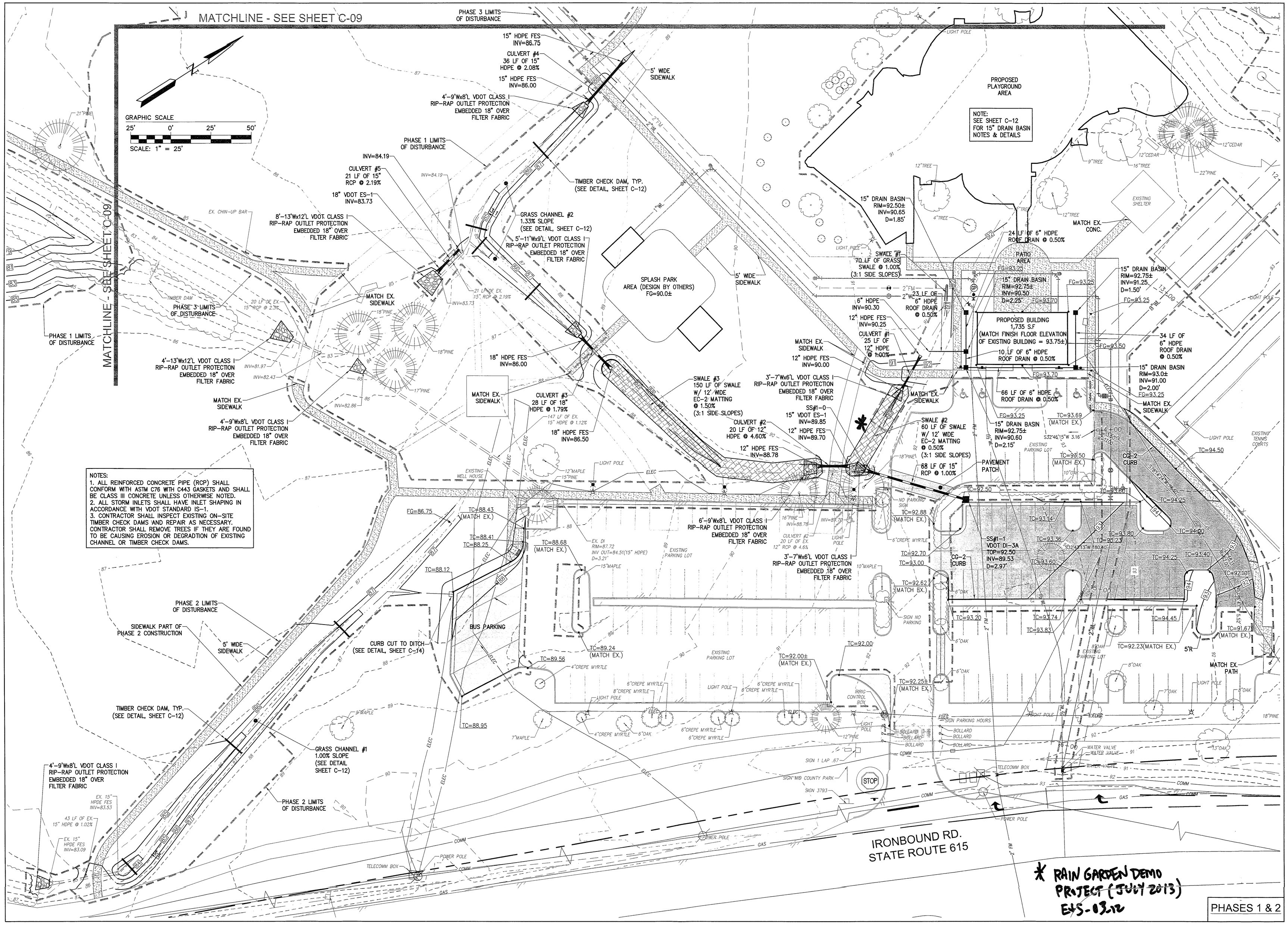
COMMONWEALTH OF VIRGINIA GRAHAM V. CORSON LICENSED PROFESSIONAL ENGINEER Lic. No. 047297 11/29/12

MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12
Sheet Title:	PHASES 1 & 2 SITE & UTILITY PLAN
Sheet Number	C-05



PHASES 1 & 2

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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT | JAMES CITY COUNTY | VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12

Sheet Title:
PHASES 1 & 2 GRADING & DRAINAGE PLAN

Sheet Number
C-06

SEQUENCE OF CONSTRUCTION

PHASE 3:

1. CONTRACTOR SHALL FLAG LIMITS OF CONSTRUCTION.
2. CONTRACTOR SHALL SETUP AND ATTEND A PRECONSTRUCTION MEETING WITH JAMES *CITY COUNTY ENVIRONMENTAL INSPECTOR AT LEAST 48 HOURS PRIOR TO THE* COMMENCEMENT OF ANY LAND–DISTURBING ACTIVITIES.
3. CONTRACTOR SHALL CONTACT "MISS UTILITY" FOR PUBLIC SERVICES AND CONTACT A PRIVATE UTILITY LOCATOR FOR PRIVATE SERVICES.
4. TEMPORARY CONSTRUCTION ENTRANCE. DUE TO THE FACT THAT TRUCKS WILL BE LOADED AND UNLOADED ON PAVED SURFACES A CONSTRUCTION ENTRANCE MAY NOT BE NECESSARY. HARD SURFACE ROADWAYS WILL BE CLEANED DAILY OF ANY SEDIMENT CONTAMINATION FROM THE MOVEMENT OF SOIL OFF–SITE. THIS DOES NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY TO INSTALL A CONSTRUCTION ENTRANCE IF NEEDED AS DETERMINED BY THE ON–SITE ENGINEERING & RESOURCE PROTECTION DIVISION INSPECTOR.
5. THE CONTRACTOR SHALL INSTALL THE CULVERT INLET PROTECTION, TREE PROTECTION AND SILT FENCE AS SHOWN.
6. CLEAR TREES AS SHOWN IN PLAN.
7. ESTABLISH TEMPORARY SEEDING IN ALL DENUDED AREAS.
8. ONCE THE EROSION & SEDIMENT CONTROL MEASURES ARE COMPLETE, FUNCTIONING, AND APPROVED BY COUNTY'S ENVIRONMENTAL INSPECTOR, PERFORM DEMOLITION OF EXISTING PARKING LOT.
9. PERFORM ROUGH GRADING OPERATIONS IN AREAS OF PARKING LOT ADDITION AND PROPOSED PICNIC SHELTER.
10. BEGIN CONSTRUCTION ON PROPOSED PICNIC SHELTER, PARKING LOT ADDITION, GATOR SHED AND DUMPSTER PAD, STORM PIPE ADDITION, AND SIDEWALK CONNECTIONS.
11. BEGIN CONSTRUCTION OF VOLLEYBALL COURT AREA.
12. FINE GRADE, TOPSOIL, AND PLANT PERMANENT SEEDING ON ALL DENUDED AREAS.
13. CONSTRUCT BIORETENTION FACILITY.
14. REMOVE ALL EROSION AND SEDIMENT CONTROL MEASURES WITHIN THIRTY DAYS OF FINAL SITE STABILIZATIONN, BUT ONLY AFTER APPROVAL IS OBTAINED FROM THE ASSIGNED JAMES CITY COUNTY INSPECTOR.

GENERAL NOTES:

–DUST CONTROL MEASURES IN ACCORDANCE WITH THE VESCH SHALL BE IMPLEMENTED AS NECESSARY.
–THERE ARE NO OFF–SITE LAND DISTURBING AREAS PROPOSED WITH THIS PROJECT.
–ALL EXCESS UNSUITABLE MATERIAL AND TOPSOIL SHALL BE REMOVED FROM PROJECT AREA AND DISPOSED OF OFF SITE.
–ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED DURING CONSTRUCTION PROGRESS AS DIRECTED BY THE ENGINEER OWNER, OR ENVIRONMENTAL DIVISION INSPECTOR TO MINIMIZE POTENTIAL FOR SEDIMENT TO LEAVE THE SITE.

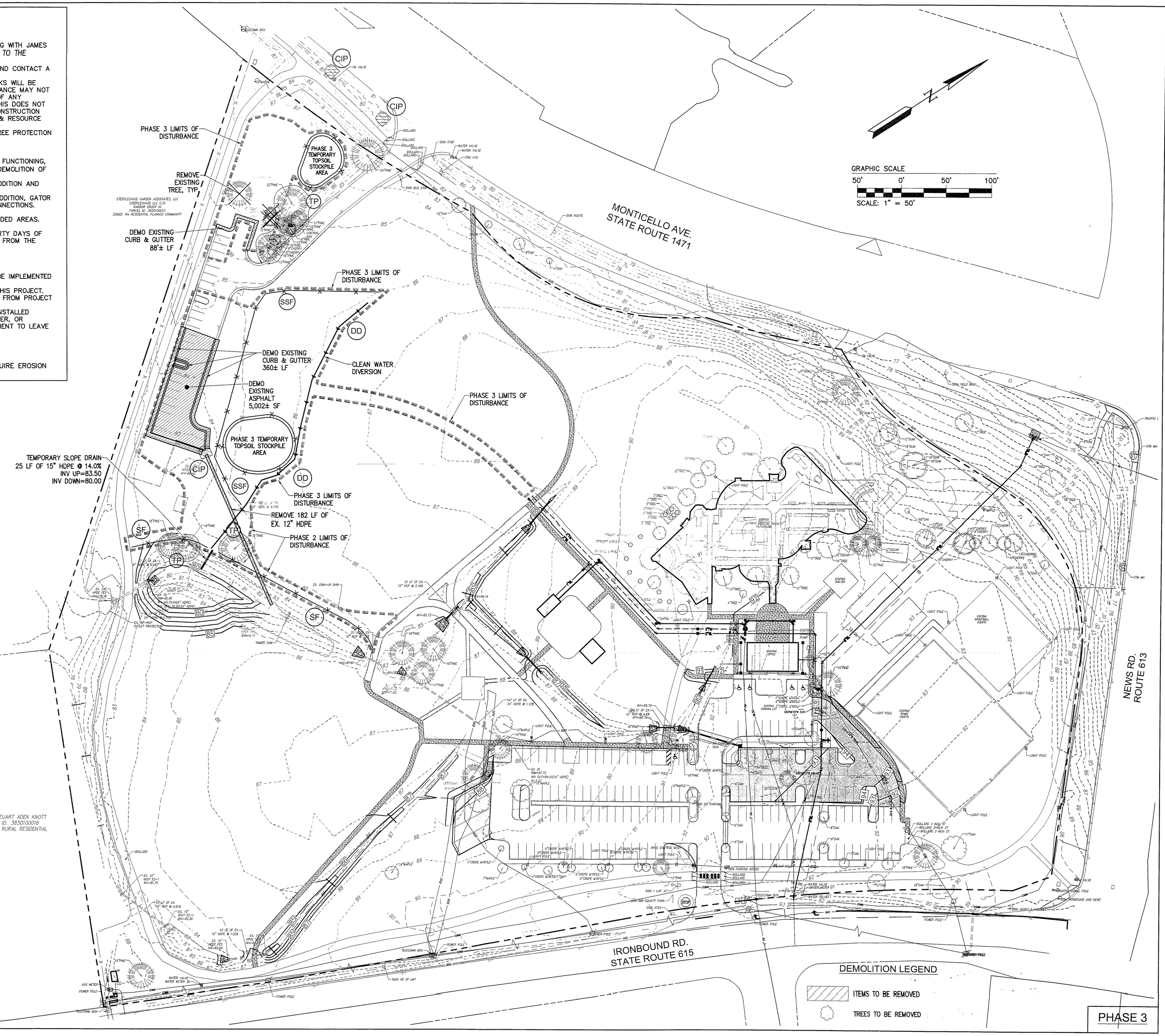
PHASE 4:

1. PHASE 4 CONSISTS OF SITE PERIMETER LIGHTING AND WILL NOT REQUIRE EROSION & SEDIMENT CONTROL MEASURES.

EROSION AND SEDIMENTATION CONTROL LEGEND

CE	CE	CONSTRUCTION ENTRANCE (SPEC. 3.02)
SF	SF	SILT FENCE (SPEC. 3.05)
SSF	SSF	SUPER SILT FENCE WITH WIRE SUPPORT (SPEC. 3.05)
CIP	CIP	CULVERT INLET PROTECTION (SPEC. 3.08–1 WITH STONE COMBINATION INSTEAD OF SILT FENCE)
DD	DD	TEMPORARY DIVERSION DIKE (SPEC. 3.09)
TO	TO	TOPSOILING (SPEC. 3.30) (APPLY TOPSOIL IN ALL DENUDED AREAS)
TS	TS	TEMPORARY SEEDING (SPEC. 3.31) (TEMPORARY SEED DURING CONSTRUCTION)
PS	PS	PERMANENT SEEDING (SPEC. 3.32) (PERMANENT SEED IN ALL DISTURBED AREAS)
TP	TP	TREE PROTECTION (SPEC. 3.38)
DC	DC	DUST CONTROL (SPEC. 3.39) (APPLY SITE–WIDE)

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



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1	11/29/12	CHANGES PER OWNER - PHASING	GVC

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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=50'	Date: 6/29/12

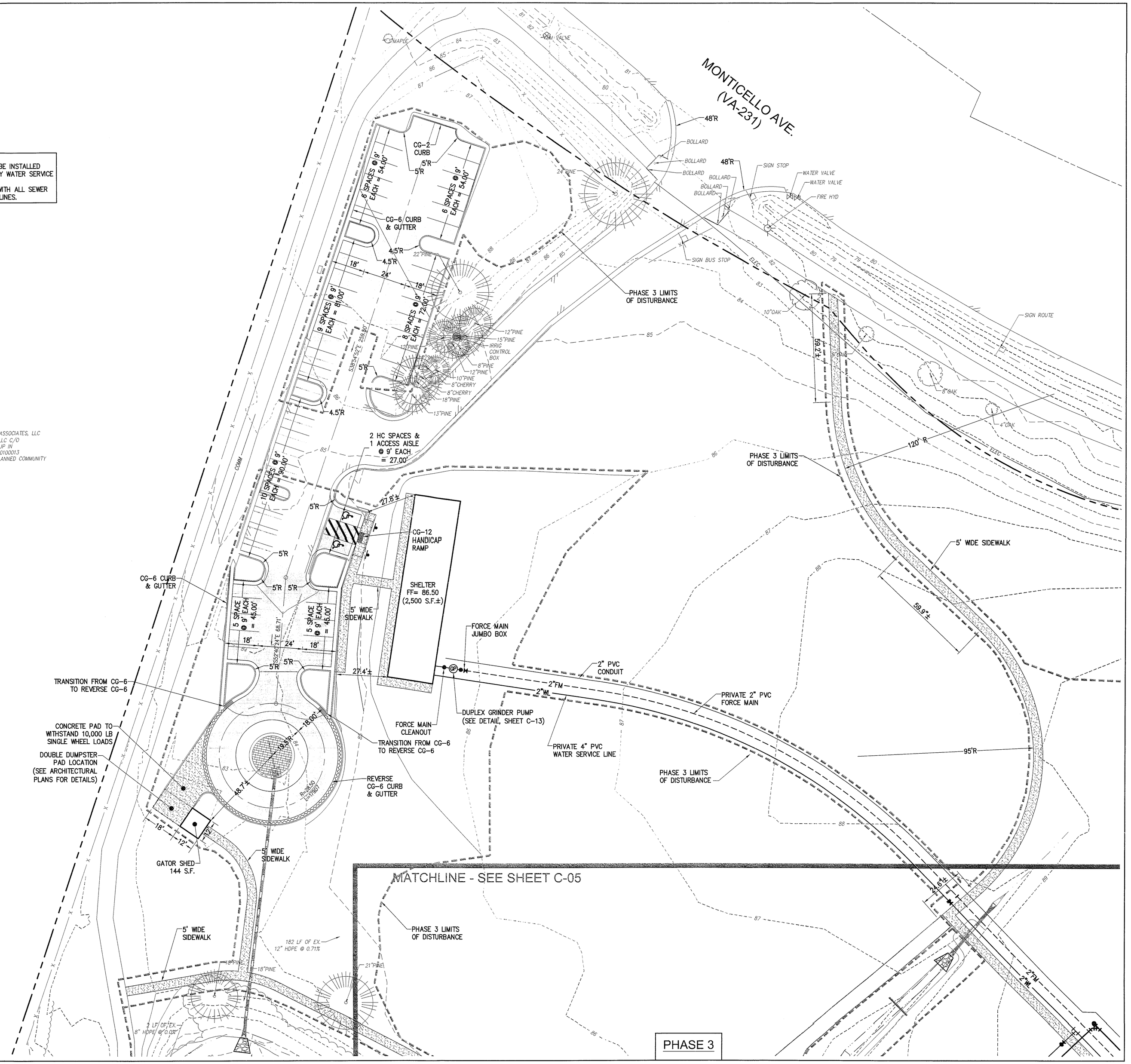
Sheet Title:
PHASE 3 DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN

Sheet Number
C-03

UTILITIES NOTES:
1. RPZ BACKFLOW PREVENTERS SHALL BE INSTALLED INSIDE EACH BUILDING BEING SERVED BY WATER SERVICE LINES. SEE ARCHITECTURAL PLANS.
2. TRACER WIRE SHALL BE INSTALLED WITH ALL SEWER AND WATER LINES, INCLUDING SERVICE LINES.

STEEPLECHASE GARDEN ASSOCIATES, LLC
STEEPLECHASE LLC C/O
HARBOR GROUP IN
PARCEL ID: 3830100013
ZONED: R4 RESIDENTIAL PLANNED COMMUNITY

GRAPHIC SCALE
25' 0' 25' 50'
SCALE: 1" = 25'



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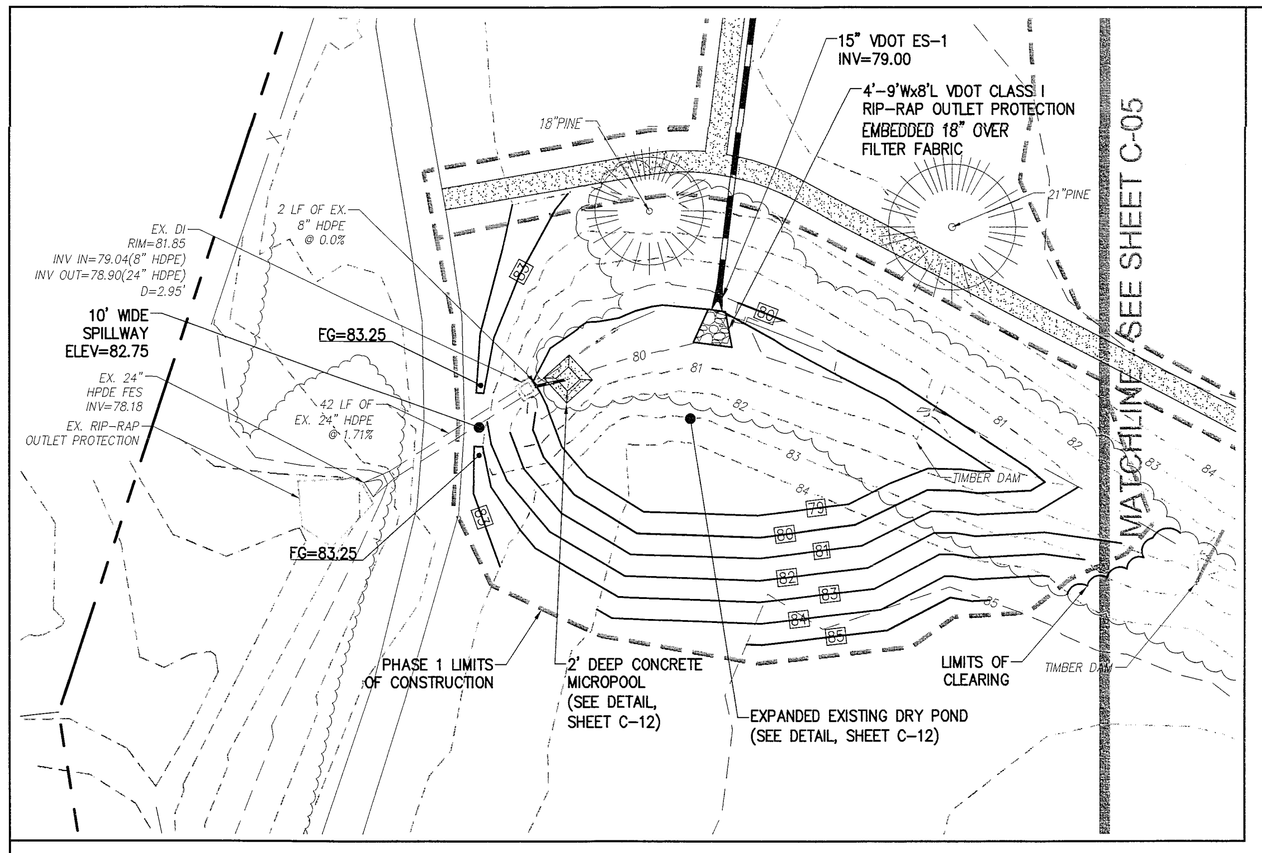
MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

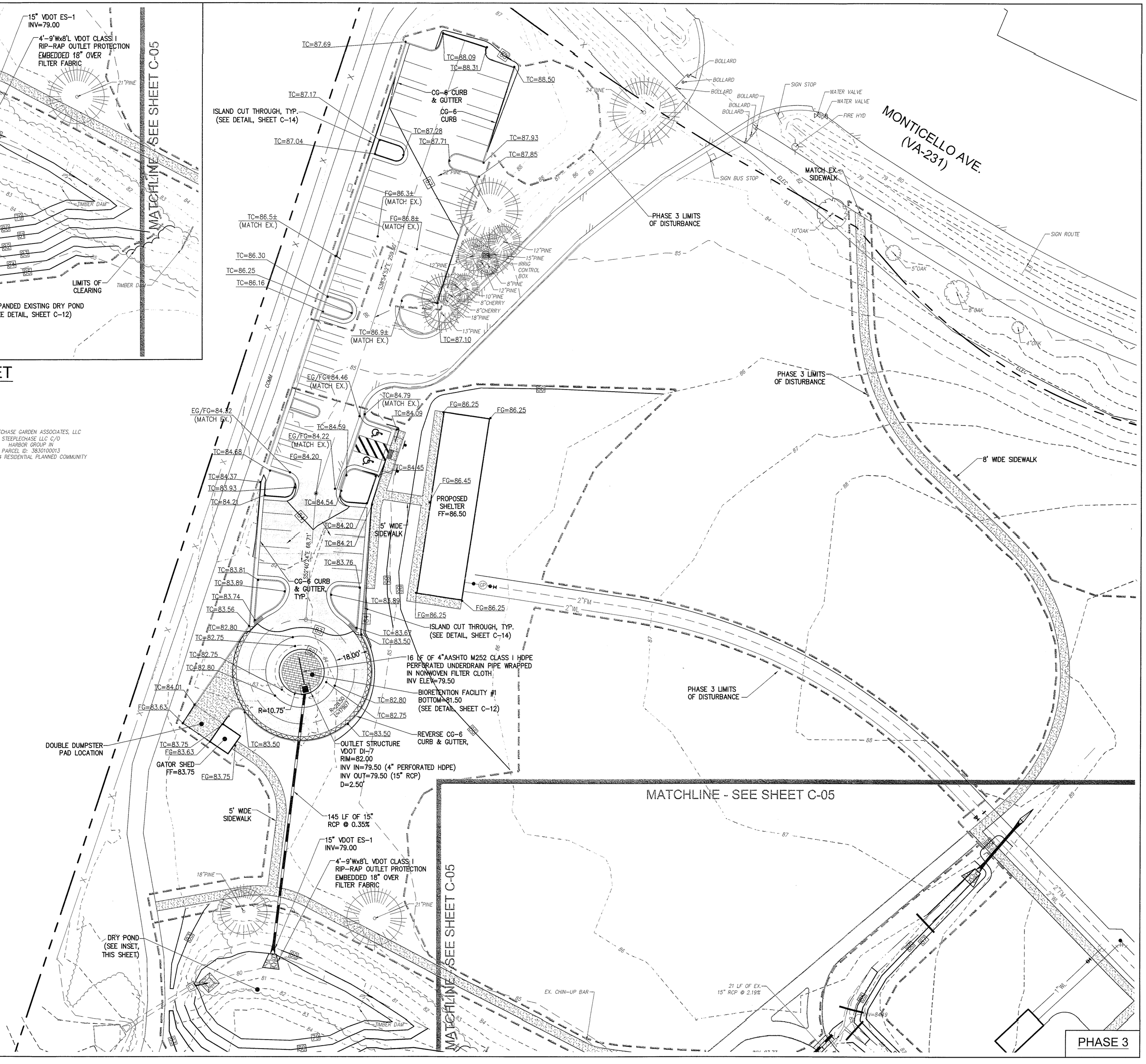
Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12

Sheet Title:
PHASE 3 SITE & UTILITY PLAN

Sheet Number
C-08



DRY POND INSET



STEEPLECHASE GARDEN ASSOCIATES, LLC
STEEPLECHASE LLC C/O
HARBOR GROUP IN
PARCEL ID: 3830100013
ZONED: R4 RESIDENTIAL PLANNED COMMUNITY

GRAPHIC SCALE
25' 0' 25' 50'
SCALE: 1" = 25'

NOTES:
1. ALL REINFORCED CONCRETE PIPE (RCP) SHALL CONFORM WITH ASTM C76 WITH C443 GASKETS AND SHALL BE CLASS III CONCRETE UNLESS OTHERWISE NOTED.
2. ALL STORM INLETS SHALL HAVE INLET SHAPING IN ACCORDANCE WITH VDOT STANDARD IS-1.
3. CONTRACTOR SHALL INSPECT EXISTING ON-SITE TIMBER CHECK DAMS AND REPAIR AS NECESSARY. CONTRACTOR SHALL REMOVE TREES IF THEY ARE FOUND TO BE CAUSING EROSION OR DEGRADTION OF EXISTING CHANNEL OR TIMBER CHECK DAMS.

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1	11/29/12	CHANGES PER OWNER - PHASING	GVC

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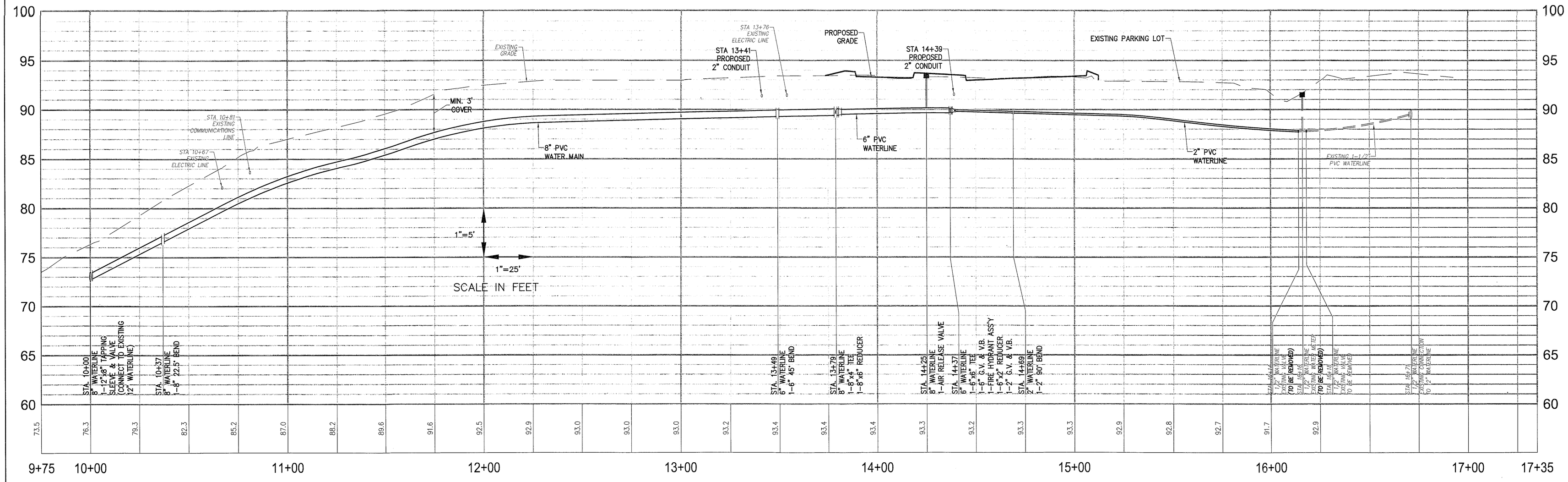
MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12

Sheet Title:
PHASE 3
GRADING &
DRAINAGE PLAN

Sheet Number
C-09



WATER MAIN LOOP ALIGNMENT

PHASE 1

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MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: AS SHOWN	Date: 6/29/12
Sheet Title: UTILITY PROFILES	
Sheet Number	C-10

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION

THIS PLAN CONTAINS A MULTI PHASE PROJECT FOR IMPROVEMENTS IN MID COUNTY PARK. THE FIRST PHASE OF THIS PROJECT CONSISTS OF THE REPLACEMENT OF THE OFFICE BUILDING AND RELOCATION, REMODEL OF THE KIDSBURG PLAYGROUND AREA, AND ASSOCIATED STORMWATER MANAGEMENT FACILITY. THE NEXT PHASE CONSISTS OF A SPLASH PARK, PARKING LOT UPGRADES, A BUS PARKING AREA, AND ASSOCIATED STORMWATER MANAGEMENT FACILITY. THE FINAL PHASE CONSISTS OF A PROPOSED SHELTER, REAR PARKING LOT UPGRADES, AND ASSOCIATED STORMWATER MANAGEMENT FACILITY. THE STORMWATER MANAGEMENT FACILITIES CONSIST OF THE EXPANDED DRY POND, TWO GRASS CHANNELS WITH TIMBER CHECK DAMS, AND A BIORETENTION FACILITY.

EXISTING SITE CONDITIONS

THIS SITE IS CURRENTLY DEVELOPED AS A PARK. THE MAJORITY OF THE STORMWATER RUNOFF IS CURRENTLY CONVEYED OVERLAND TO EXISTING ONSITE STORMWATER MANAGEMENT FACILITIES. THESE CONSIST OF DRY SWALES ON THE SOUTHERN AND WESTERN SIDES OF THE PROPERTIES.

ADJACENT PROPERTY

THE PROPOSED SITE IS BORDERED ON THE SOUTH BY IRONBOUND ROAD (STATE ROUTE 615), ON THE EAST BY NEWS ROAD (ROUTE 613), AND ON THE NORTH BY MONTICELLO AVENUE (STATE ROUTE 1471). WEST OF THE PROJECT IS STEEPLECHASE APARTMENTS AND GREENSPRINGS CHAPEL.

OFFSITE AREAS

THERE ARE AREAS OF OFFSITE DISTURBANCE ASSOCIATED WITH THE WATER SERVICE LINE AND METER UPGRADES. THESE AREAS ARE SHOWN ON THE SITE & UTILITY PLAN (SHEET C-05). ALL TEMPORARY SOILS STOCKPILES WILL RESIDE WITHIN THE PROJECT LIMITS.

SOILS

THE SOIL CONSERVATION SERVICE HAS IDENTIFIED THE PRESENCE OF THE SOILS TYPES AS INDICATED ON MAP NUMBER 22 OF THE SOIL SURVEY OF JAMES CITY AND YORK COUNTIES AND THE CITY OF WILLIAMSBURG, VIRGINIA. SEE THE ENVIRONMENTAL INVENTORY SHEET (SHEET C-02) FOR SOIL TYPES AND LOCATIONS.

CRITICAL AREAS

SEE THE ENVIRONMENTAL INVENTORY (SHEET C-02) FOR THE LOCATION OF 25% SLOPES. THERE AREA NO WETLANDS IN THE PROJECT AREA.

EROSION AND SEDIMENT CONTROL MEASURES

UNLESS OTHERWISE INDICATED, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). THE MINIMUM STANDARDS OF THE VESCH SHALL BE ADHERED TO UNLESS OTHERWISE WAIVED AND APPROVED BY THE ON-SITE E&S CONTROL INSPECTOR. THESE MEASURES SHALL INCLUDE BUT NOT BE LIMITED TO: CONSTRUCTION ENTRANCE, SAFETY FENCE, SILT FENCE, INLET PROTECTION, CULVERT INLET PROTECTION, CHECK DAMS, DUST CONTROL, TEMPORARY SEEDING, AND PERMANENT SEEDING.

MANAGEMENT STRATEGIES

1. CONSTRUCTION WILL BE SEQUENCED SO THAT GRADING OPERATIONS CAN BEGIN AND END AS QUICKLY AS POSSIBLE.
2. TEMPORARY SEEDING OR OTHER STABILIZATION WILL FOLLOW IMMEDIATELY AFTER GRADING.
3. AREAS, WHICH ARE NOT TO BE DISTURBED, WILL BE CLEARLY MARKED BY FLAGS, SIGNS, ETC.
4. THE CONTRACTOR SHALL HAVE A CERTIFIED RESPONSIBLE LAND DISTURBER AND SHALL BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL PRACTICES.
5. AFTER ACHIEVING ADEQUATE STABILIZATION, THE TEMPORARY E&S CONTROLS WILL BE CLEARED UP AND REMOVED.

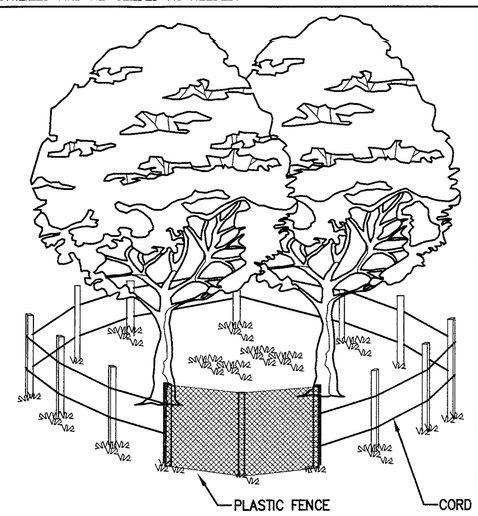
PERMANENT STABILIZATION

ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT OR TEMPORARY SEEDING IMMEDIATELY FOLLOWING FINISH GRADING.

MAINTENANCE

IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED DAILY AND AFTER EACH SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. THE INLET PROTECTION WILL BE CHECKED REGULARLY FOR SEDIMENT BUILDUP, WHICH COULD PREVENT POSITIVE DRAINAGE. IF THE INLET PROTECTION IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.
2. THE SILT FENCE BARRIER WILL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES HALF WAY TO THE TOP OF THE BARRIER.
3. THE SEEDED AREAS WILL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RE-SEEDED AS NEEDED.



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

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

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

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

CHEMICAL RESISTANCE: INERT TO MOST CHEMICALS AND ACIDS

PLACE FENCE 5' OUTSIDE DRIPLINE

(TP) TREE PROTECTION
N.T.S.

MINIMUM CARE LAWN	TOTAL LBS. PER ACRE
COMMERCIAL OR RESIDENTIAL	
-KENTUCKY 31 OR TURF-TYPE TALL FESCUE	175-200 LBS.
OR	
-COMMON BERMUDA GRASS **	75 LBS.
HIGH-MAINTENANCE LAWN	
-KENTUCKY 31 OR TURF-TYPE TALL FESCUE	200-250 LBS.
OR	
-HYBRID BERMUDAGRASS (SEED)**	40 LBS. (UNHALLED)
OR	
-HYBRID BERMUDAGRASS (BY OTHER VEGETATIVE ESTABLISHMENT METHOD, SEE STD. & SPEC. 3.34)	30 LBS. (HULLED)

GENERAL SLOPE (3:1 OR LESS)	TOTAL LBS. PER ACRE
-KENTUCKY 31 FESCUE	128 LBS.
-RED TOP GRASS	2 LBS.
-SEASONAL NURSE CROP *	20 LBS.
	150 LBS.
LOW MAINTENANCE SLOPE (STEEPER THAN 3:1)	
-KENTUCKY 31 TALL FESCUE	93-108 LBS.
-COMMON BERMUDAGRASS **	0-15 LBS.
-RED TOP GRASS	2 LBS.
-SEASONAL NURSE CROP *	20 LBS.
-SERICEA LESPEDEZA **	20 LBS.
	150 LBS.

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

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

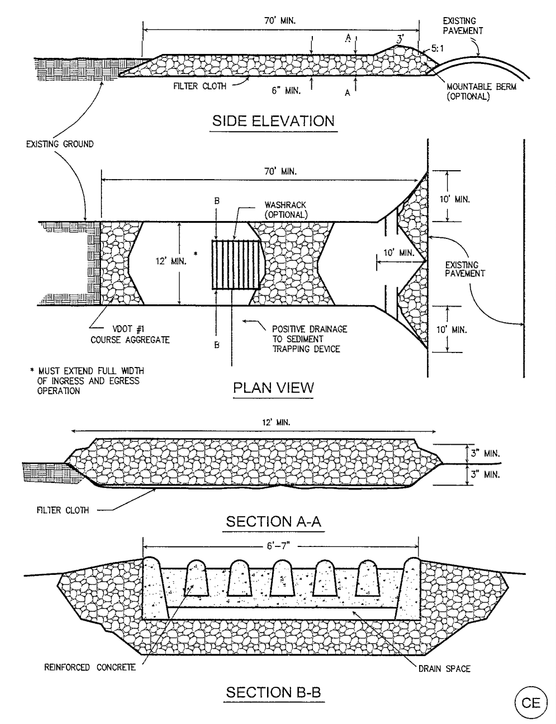
(PS) VA DSWC PG. III - 304 SITE SPECIFIC SEEDING MIXTURES FOR COASTAL PLAIN AREA

MINIMUM CARE LAWN	TOTAL LBS. PER ACRE
COMMERCIAL OR RESIDENTIAL	
-COMMON BERMUDA GRASS**	75 LBS.
OR	
-ZOYSIA GRASS	60 LBS.

** MAY THROUGH OCTOBER, USE HULLED SEED. ALL OTHER SEEDING PERIODS, USE UNHULLED SEED.

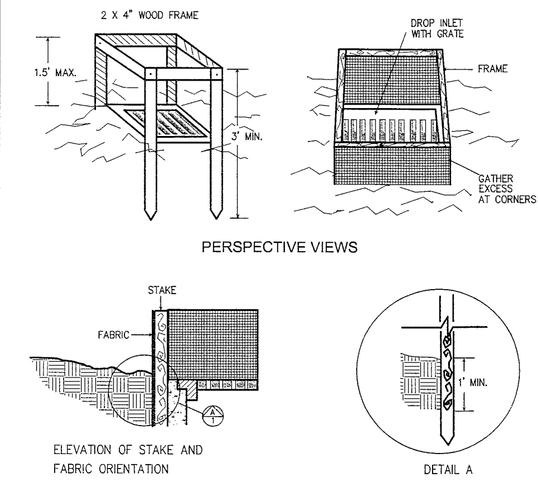
(PS) VA DSWC PG. III - 304 SITE SPECIFIC SEEDING MIXTURES FOR COASTAL PLAIN AREA

STONE CONSTRUCTION ENTRANCE



(CE) Plate 3.02-1

SILT FENCE DROP INLET PROTECTION

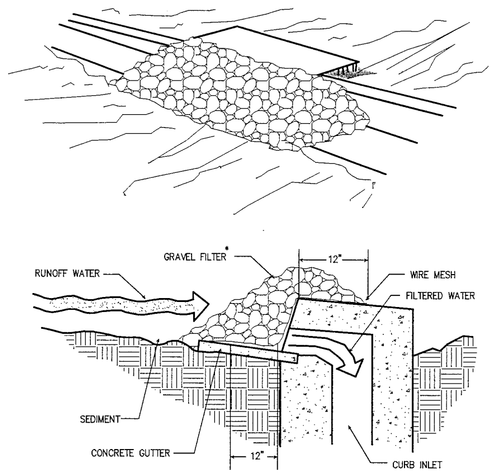


SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVERLAND FLOWS (NOT EXCEEDING 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS, SUCH AS IN STREET OR HIGHWAY MEDIANS.

(IP) Plate 3.07-1

GRAVEL CURB INLET SEDIMENT FILTER



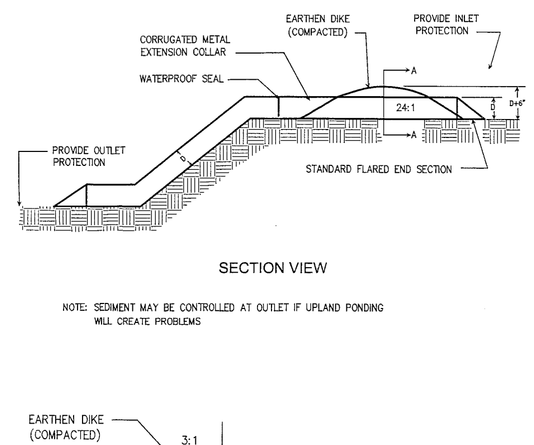
SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.

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

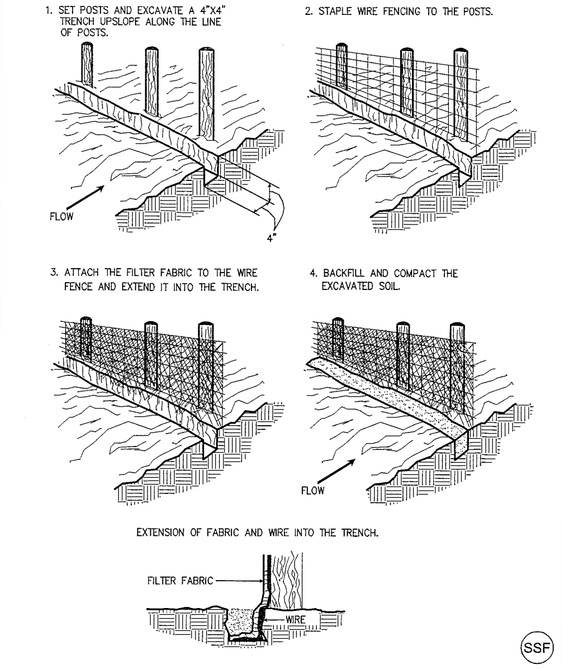
(IP) Plate 3.07-6

TEMPORARY SLOPE DRAIN



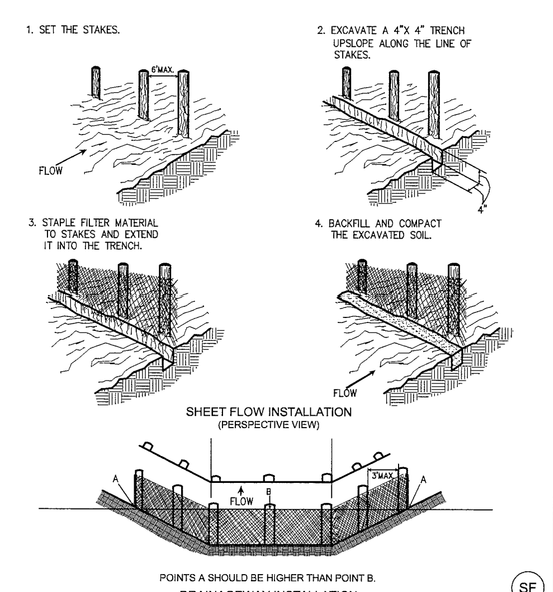
(TSD) Plate 3.15-1

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



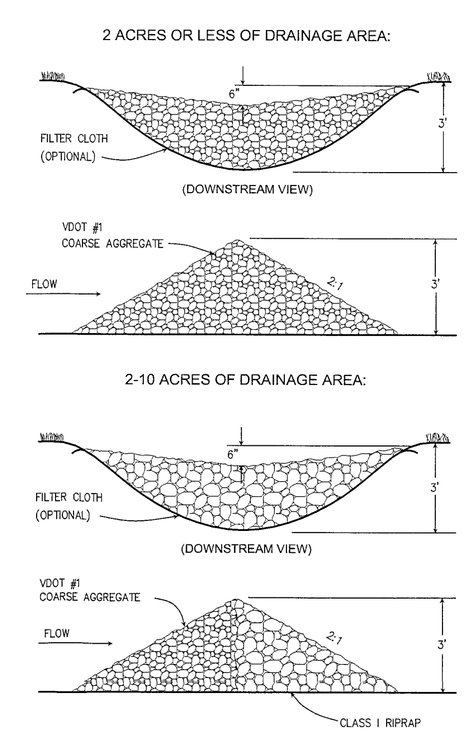
(SSF) Plate 3.05-1

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



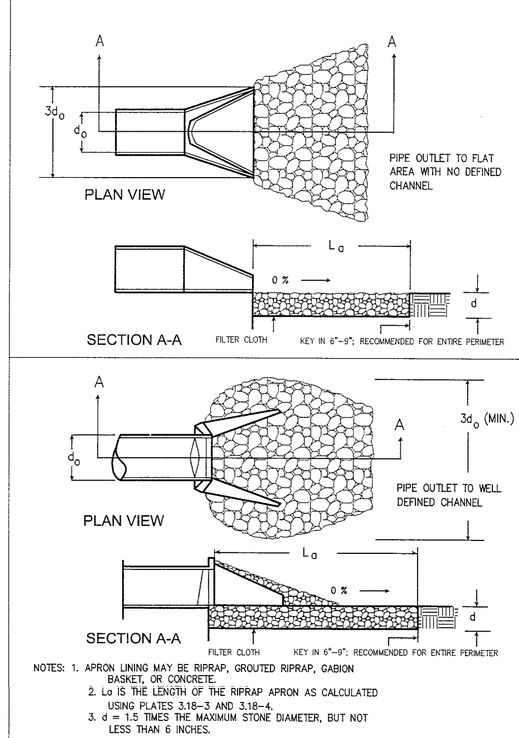
(SF) Plate 3.05-2

ROCK CHECK DAM



(CD) Plate 3.20-1

PIPE OUTLET CONDITIONS



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. Lo IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

(OP) Plate 3.18-1

ALL PHASES

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
11/29/12
PROFESSIONAL ENGINEER

AES CONSULTING ENGINEERS
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Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-8854
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Hampton Roads | Central Virginia | Middle Peninsula

MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: AS SHOWN	Date: 6/29/12

Sheet Title:
EROSION & SEDIMENT CONTROL NOTES & DETAILS

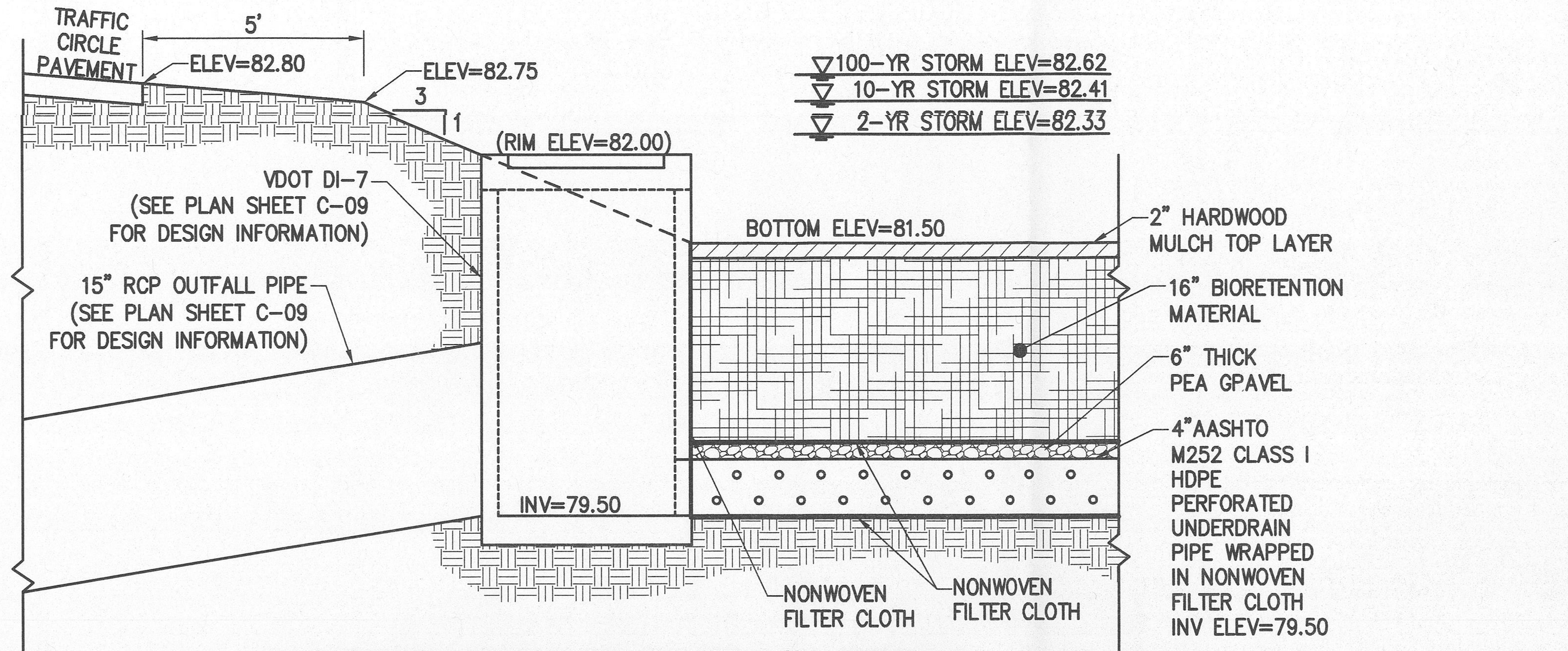
Sheet Number
C-11

POOR QUALITY

ORIGINAL(S) FOLLOW

THIS IS THE BEST COPY AVAILABLE

VCE DOCUMENT CONVERSION CENTER



BIORETENTION FACILITY #1 DETAIL

N.T.S.

NOTES

1. WATER PLANT MATERIAL EACH DAY FOR FOURTEEN CONSECUTIVE DAYS AFTER CONSTRUCTION.
2. CONTRACTOR SHALL REFER TO COUNTY BMP MANUAL (GROUP D, PGS. 48-50) AND MINIMUM STANDARD 3.11 AND 3.13 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK FOR METHODS/MATERIAL ASSOCIATED WITH CONSTRUCTION OF THE BIORETENTION CELLS.
3. VDOT SHALL BE SAVED HARMLESS FROM THE MAINTENANCE RESPONSIBILITY OR LIABILITY ASSOCIATED WITH ANY FAILURE OF THE STORM WATER MANAGEMENT FACILITY AND ITS STRUCTURES.
4. A PROFESSIONAL ENGINEER WHO HAS INSPECTED THE BASIN DURING CONSTRUCTION SHALL CERTIFY THE CONSTRUCTION OF THE BIORETENTION BASIN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE BIORETENTION BASIN CONSTRUCTION SCHEDULE WITH THE ENGINEER TO ENSURE ON SITE MONITORING.
5. 6" PERFORATED PIPE SHALL BE RIGID SMOOTH WALL PE IN ACCORDANCE WITH ASTMF810 OR 6" SCH40 PVC OR EQUIVALENT APPROVED BY JAMES CITY COUNTY ENVIRONMENTAL DIVISION.
6. CORE DRILL AND PROVIDE NEOPRENE SEAL (KOR-N-SEAL) OR EQUAL WHERE PLASTIC PIPE CONNECTS TO STORM STRUCTURE.

SOIL SPECIFICATIONS

THE BIORETENTION AREAS SHALL CONTAIN A PLANTING SOIL MIXTURE OF 50% SAND, 30% LEAF COMPOST (FULLY COMPOSTED, NOT PARTIALLY ROTTED LEAVES), AND 20% TOPSOIL. TOPSOIL SHALL BE SANDY LOAM OR LOAMY SAND OF UNIFORM COMPOSITION, CONTAINING NO MORE THAN 5% CLAY, FREE OF STONES, STUMPS, ROOTS, OR SIMILAR OBJECTS GREATER THAN ONE INCH, BRUSH, OR ANY OTHER MATERIAL OR SUBSTANCE WHICH MAY BE HARMFUL TO PLANT GROWTH, OR A HINDRANCE TO PLANT GROWTH OR MAINTENANCE. THE TOPSOIL SHALL BE FREE OF PLANTS OR PLANT PARTS OF BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, MUGWORT, NUTSEDGE, POISON IVY, CANADIAN THISTLE, CATTAIL, OR OTHERS AS SPECIFIED. IT SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH.

THE TOP SOIL SHALL BE TESTED AND MEET THE MINIMUM CRITERIA SET FORTH IN SECTION 3.11-28 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK (LATEST EDITION).

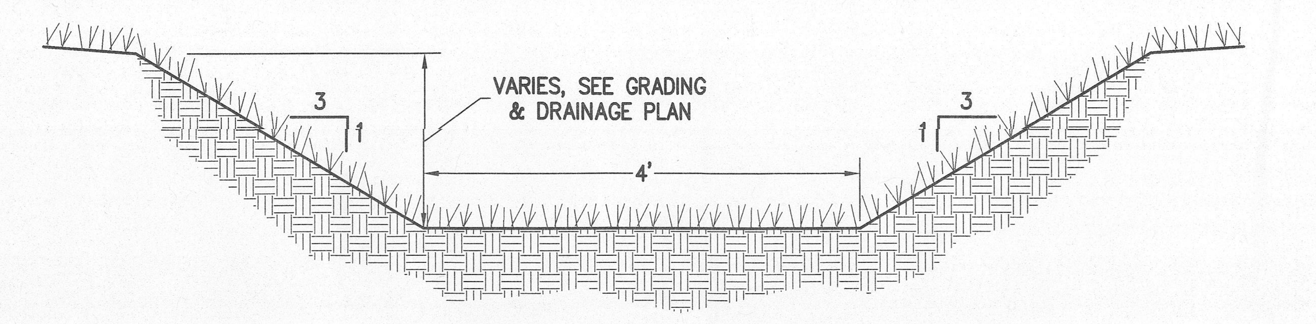
MULCH

A SURFACE LAYER OF SHREDDED HARDWOOD BARK SHALL BE PROVIDED ON TOP OF THE PLANTING SOIL. MULCH SHALL BE FREE OF WEED SEEDS, SOIL, ROOTS, OR ANY OTHER SUBSTANCE NOT CONSISTING OF EITHER BOLE OR BRANCH WOOD AND BARK. THE SHREDDED HARDWOOD BARK MULCH SHALL BE UNIFORMLY APPLIED.

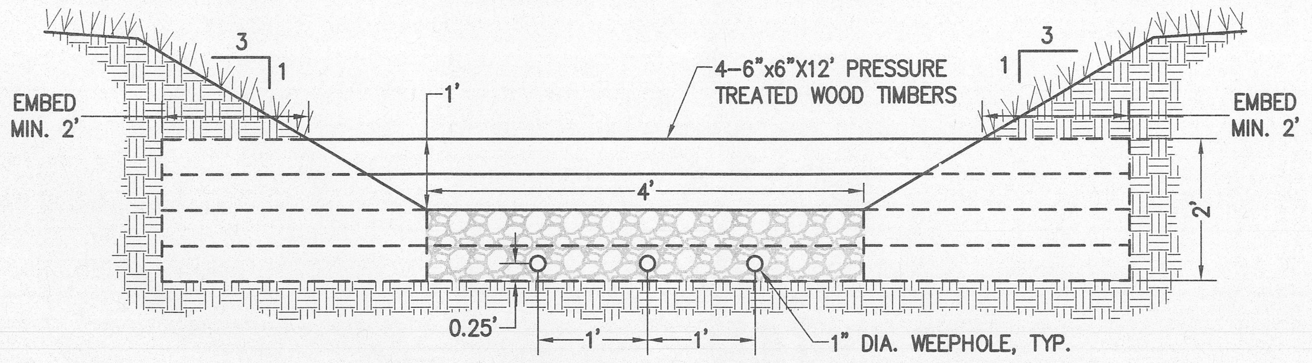
STRAW MULCH SHALL NOT BE UTILIZED IN STABILIZATION OF BIORETENTION OR DRY SWALE AREA.

BIORETENTION FACILITY MAINTENANCE PROGRAM & SCHEDULE

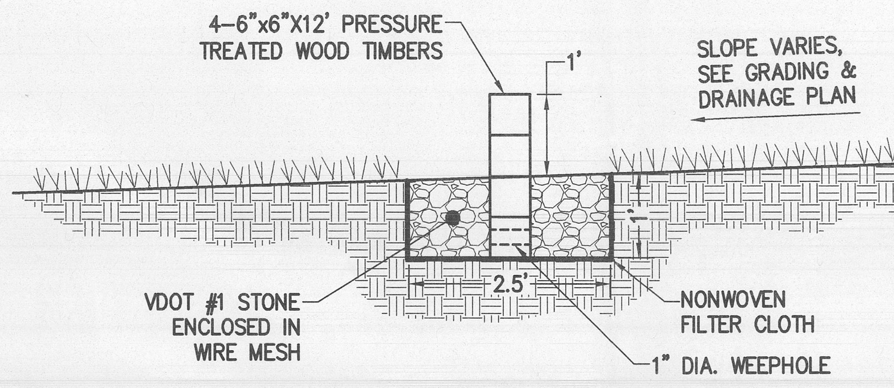
INSPECT AND REPAIR EROSION	MONTHLY
REMULCH ANY VOID AREAS	WHENEVER NEEDED
REMOVE PREVIOUS MULCH AND REAPPLY	EVERY 3 YEARS
REMOVAL AND REPLACEMENT OF ALL DISEASED VEGETATION CONSIDERED BEYOND TREATMENT	WHENEVER NEEDED
CHECK FOR ACCUMULATED SEDIMENTS	MONTHLY
INSPECT AND REMOVE ANY DEBRIS THAT MAY COLLECT AT THE DROP INLET AND WITHIN FACILITY	AFTER MAJOR STORM EVENTS/OR SEMI ANNUALLY
ADD FRESH LAYER OF MULCH	EVERY 6 MONTHS (SPRING & FALL)



GRASS CHANNEL - CROSS SECTION



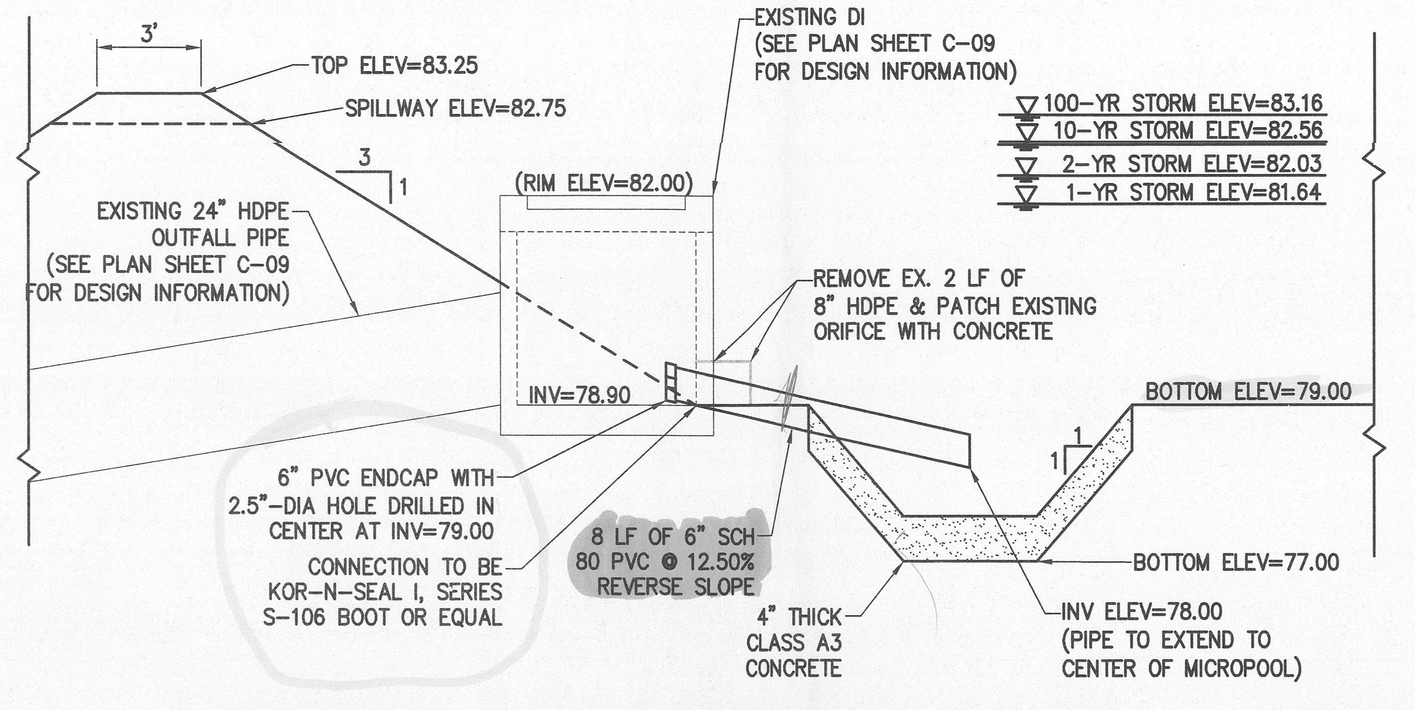
TIMBER CHECK DAM - CROSS SECTION



TIMBER CHECK DAM - PROFILE

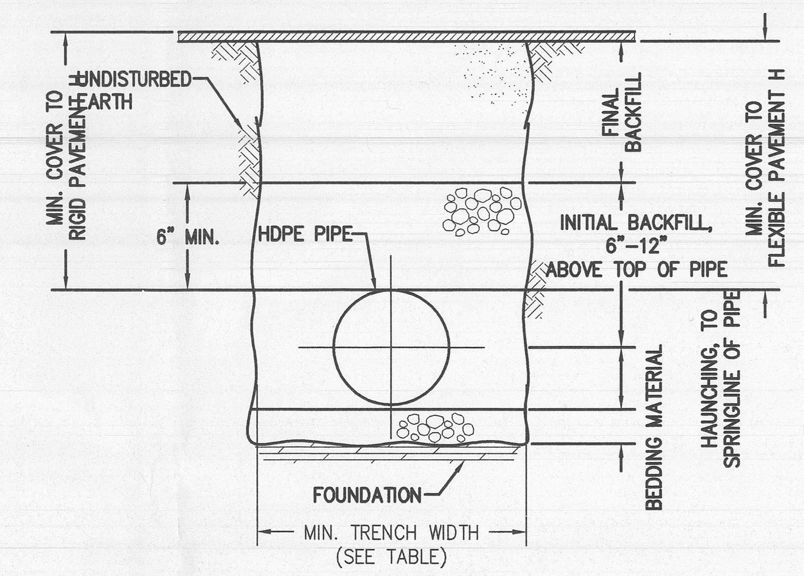
GRASS CHANNEL WITH TIMBER CHECK DAMS - DETAIL

N.T.S.



DRY POND DETAIL

N.T.S.



NOTES:

1. MATERIALS: UNLESS OTHERWISE SPECIFIED ON THE PLANS OR HEREIN, CORRUGATED POLYETHYLENE PIPE SHALL CONFORM TO AASHTO M-294, M-252, AND F-667, LATEST EDITION, STANDARD SPECIFICATION FOR CORRUGATED POLYETHYLENE PIPE.

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

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

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

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

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

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

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

5. MINIMUM TRENCH WIDTHS SHALL BE AS FOLLOWS:

DIAMETER	MIN. TRENCH WIDTH	DIAMETER	MIN. TRENCH WIDTH	DIAMETER	MIN. TRENCH WIDTH
4"	21"	15"	34"	42"	72"
6"	23"	18"	39"	48"	80"
8"	26"	24"	48"	54"	88"
10"	28"	30"	56"	60"	96"
12"	30"	36"	64"		

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

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

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

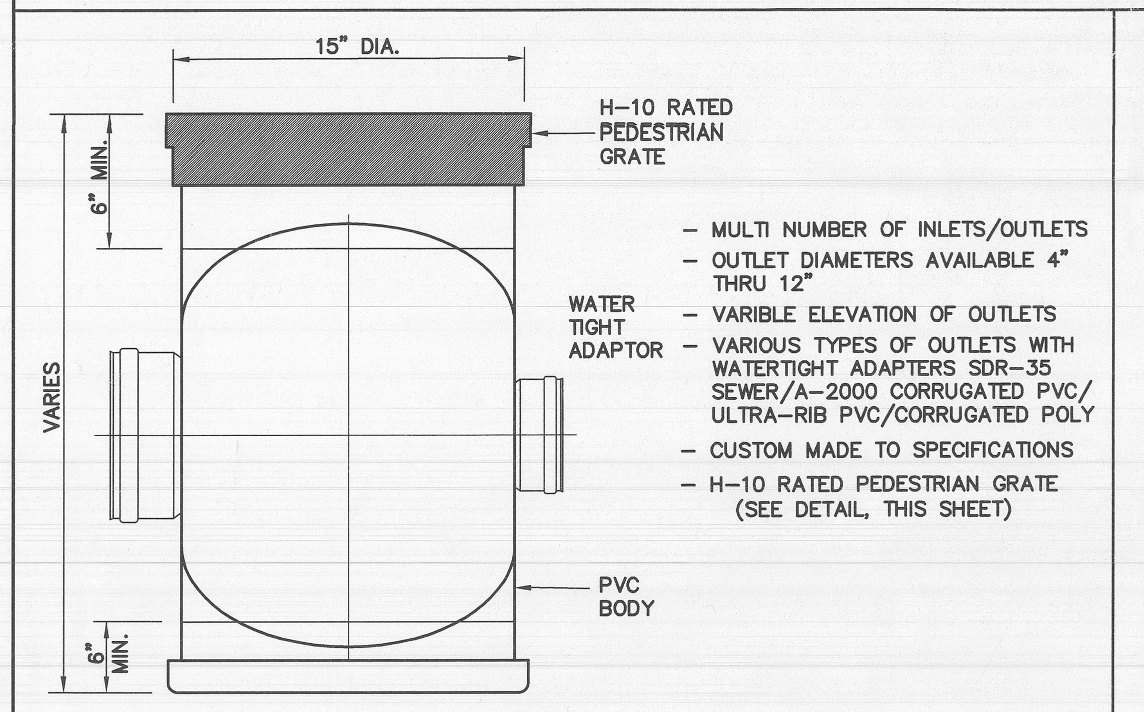
* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

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

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

HDPE PIPE INSTALLATION DETAIL

N.T.S.



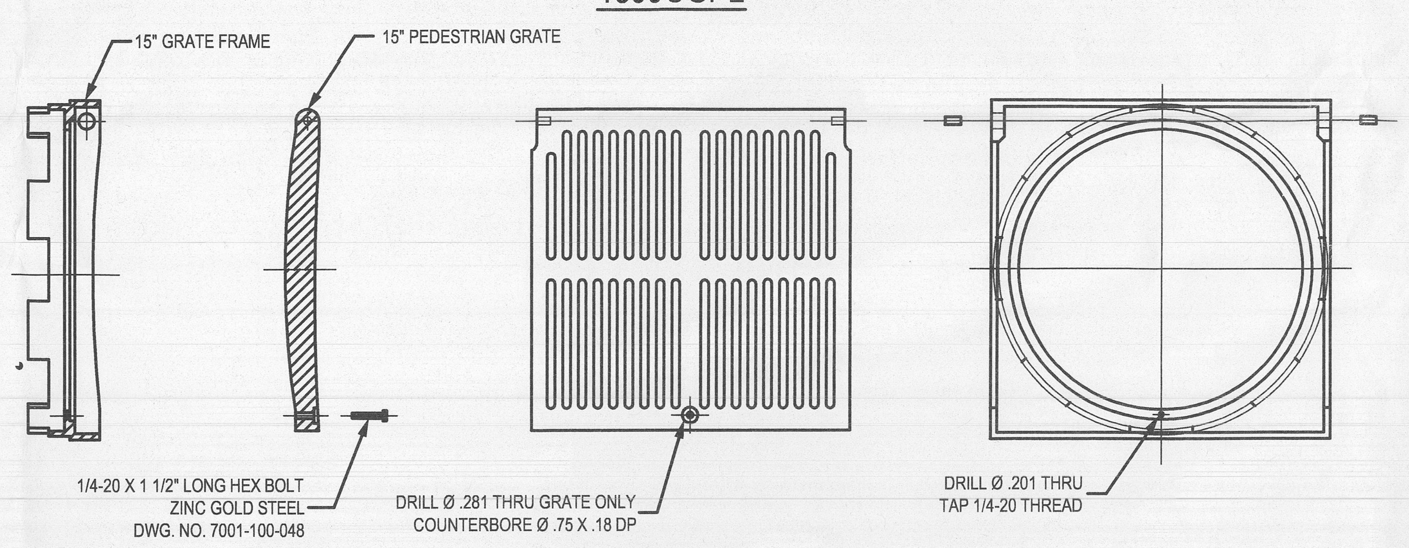
- MULTI NUMBER OF INLETS/OUTLETS
- OUTLET DIAMETERS AVAILABLE 4" THRU 12"
- VARIBLE ELEVATION OF OUTLETS
- VARIOUS TYPES OF OUTLETS WITH WATERTIGHT ADAPTERS SDR-35 SEWER/A-2000 CORRUGATED PVC/ ULTRA-RIB PVC/CORRUGATED POLY
- CUSTOM MADE TO SPECIFICATIONS
- H-10 RATED PEDESTRIAN GRATE (SEE DETAIL, THIS SHEET)

ADS NYLOPLAST 15" DRAIN BASIN

N.T.S.

D-ADS12B

1599CGPL



NOTE: LOCATION OF LOCKING DEVICE MAY VARY

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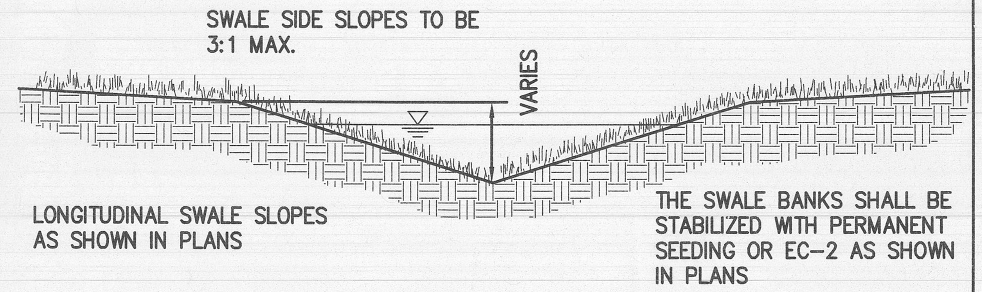
DRAWN BY	AWA	MATERIAL				
DATE	7-5-00					
APPD BY	CJA	PROJECT NO./NAME				
DATE	7-5-00					
DWG SIZE	A	SCALE	1:8	SHEET	1 OF 1	

Nyloplast — 3130 VERONA AVE, BUFORD, GA 30518, PHN (770) 932-2443, FAX (770) 932-2490, www.nyloplast-us.com

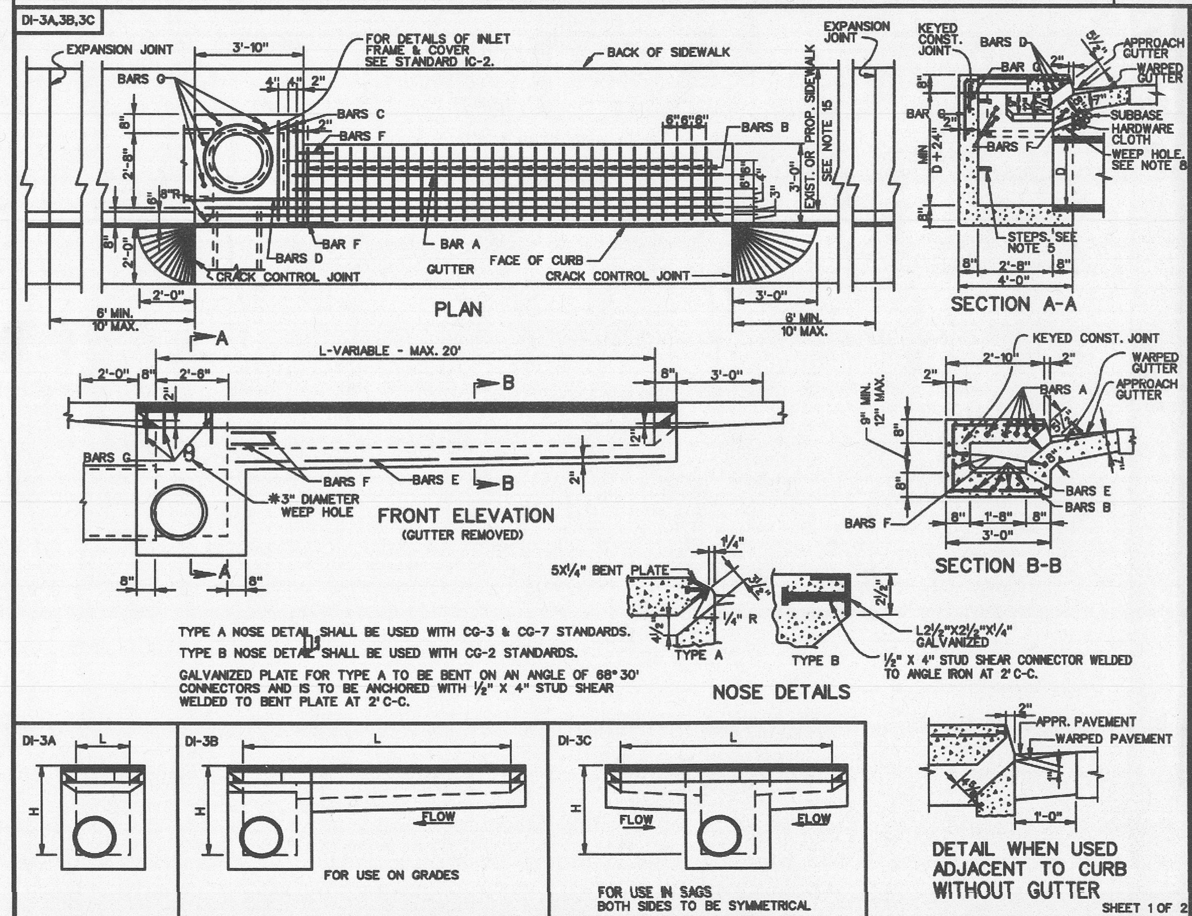
TITLE: 15 IN PEDESTRIAN LOCKING GRATE ASSEMBLY

DWG NO. 7001-110-031 REV B



TYP. SWALE DETAIL

N.T.S.



STANDARD CURB DROP INLET
12" - 30" PIPE: MAXIMUM DEPTH (H) - 8'
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 233 302 — 104.09

TABLE OF QUANTITIES

DI-3A,3B,3C

TYPE	L Ft.	AREA OF SLOT Sq. Ft.	Concrete Cu. Yds.	BARS A No.	BARS A Lin. Ft. *	BARS B No.	BARS B Lin. Ft. *	BARS C No.	BARS C Lin. Ft. *	BARS D No.	BARS D Lin. Ft. *	BARS E No.	BARS E Lin. Ft. *	BARS F No.	BARS F Lin. Ft. *	BARS G No.	BARS G Lin. Ft. *	WEIGHT Lbs.
DI-3A	2'-6"	1.15	2.28	-	-	-	-	1	5'-7"	3	3'-2"	-	-	-	-	6	1'-0"	22
DI-3B	4'	1.83	2.59	5	1'-6"	2	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	1'-6"	3	1'-6"	4	1'-0"	64
	6'	2.75	3.02	5	3'-6"	6	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	3'-6"	3	1'-6"	4	1'-0"	111
	8'	3.67	3.46	5	5'-6"	10	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	5'-6"	3	1'-6"	4	1'-0"	158
	10'	4.58	3.90	5	7'-6"	14	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	7'-6"	3	1'-6"	4	1'-0"	204
	12'	5.50	4.34	5	9'-6"	18	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	9'-6"	3	1'-6"	4	1'-0"	251
	14'	6.42	4.78	5	11'-6"	22	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	11'-6"	3	1'-6"	4	1'-0"	298
	16'	7.33	5.22	5	13'-6"	26	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	13'-6"	3	1'-6"	4	1'-0"	345
	18'	8.25	5.86	5	15'-6"	30	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	15'-6"	3	1'-6"	4	1'-0"	391
	20'	9.17	6.09	5	17'-9"	34	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	17'-9"	3	1'-6"	4	1'-0"	438
DI-3C	6'	2.75	3.01	10	1'-9"	4	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	1'-9"	6	1'-6"	2	1'-0"	111
	8'	3.67	3.45	10	2'-9"	8	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	2'-9"	6	1'-6"	2	1'-0"	158
	10'	4.58	3.89	10	3'-9"	12	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	3'-9"	6	1'-6"	2	1'-0"	205
	12'	5.50	4.33	10	4'-9"	16	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	4'-9"	6	1'-6"	2	1'-0"	252
	14'	6.42	4.77	10	5'-9"	20	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	5'-9"	6	1'-6"	2	1'-0"	298
	16'	7.33	5.21	10	6'-9"	24	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	6'-9"	6	1'-6"	2	1'-0"	345
	18'	8.25	5.65	10	7'-9"	28	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	7'-9"	6	1'-6"	2	1'-0"	392
	20'	9.17	6.09	10	8'-9"	32	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	8'-9"	6	1'-6"	2	1'-0"	439

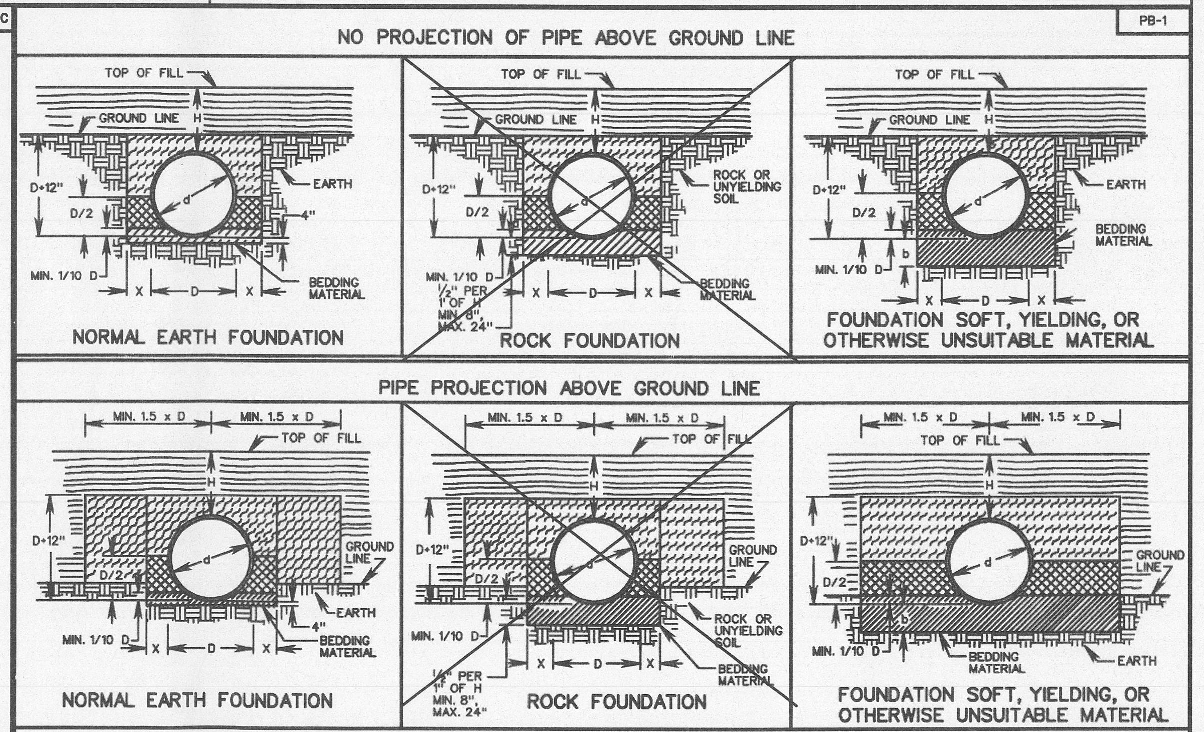
NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS.
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.
8. 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
13. IF INLET IS CONSTRUCTED IN MEDIAN CURB OR WITH INTEGRAL CURB, GUTTER IS TO BE OMITTED (SEE DETAIL).
14. STANDARD INLETS MAY BE CONSTRUCTED WITH CONCRETE BLOCKS IN ACCORDANCE WITH THE DETAILS SHOWN ON STANDARD DRAWING DI-MB.
15. THIS AREA MAY BE EARTHEN, IN WHICH CASE THE EXPANSION JOINTS WILL APPLY ONLY TO CURB AND GUTTER.
16. CONCRETE QUANTITIES SHOWN ARE FOR DEPTH (H) OF 5'-2" WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES. FOR INLETS OF DIFFERENT DEPTHS ADD OR SUBTRACT 0.32 CUBIC YARDS OF CONCRETE FOR EACH FOOT OF DEPTH.
17. LENGTH OF ANGLE IRON AS SHOWN ON SHEET 1 OF 2 IS TO BE L +16" AT 4.10 LBS./FT..
18. * DENOTES LENGTH OF ONE (1) BAR.
19. ALL REINFORCING BARS TO BE #5.
20. WHEN INLET IS USED IN 4'-0" MEDIAN, BACK OF INLET IS TO BE SHAPED TO CONFORM TO PROPOSED CURB.

Sheet 2 of 2

STANDARD CURB DROP INLET
12" - 30" PIPE: MAXIMUM DEPTH (H) - 8'
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 233 302 — 104.10



BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
EMBANKMENT

NOTES:

FOR PLASTIC PIPE, THE LIMITS OF THE CLASS I BACKFILL MATERIAL SHALL BE EXTENDED TO 12" ABOVE THE TOP OF THE PIPE.

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

SHEET 1 OF 4

INSTALLATION OF PIPE CULVERTS AND STORM SEWERS
CIRCULAR PIPE BEDDING AND BACKFILL - METHOD "A"
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE 302 303 — REV. 8/07 107.01

ALL PHASES

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

COMMONWEALTH OF VIRGINIA — GRAHAM V. CORSON — Lic. No. 047297 — 11/29/12 — PROFESSIONAL ENGINEER

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MID COUNTY PARK

SITE UPGRADES

BERKELEY DISTRICT — JAMES CITY COUNTY — VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12
Sheet Title:	SWM NOTES & DETAILS
Sheet Number	C-12

JCSA GENERAL NOTES FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS:
(revised May 2011)

A. ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL CONSTRUCTION STANDARDS (FIFTH EDITION WITH AMENDMENTS DATED *DECEMBER 2010), AND THE COMMONWEALTH OF VIRGINIA DEPARTMENT OF HEALTH WATERWORKS AND SANITARY SEWERAGE* REGULATIONS. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA DESIGN AND ACCEPTANCE CRITERIA AND HRPDC REGIONAL CONSTRUCTION STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO JCSA.

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

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

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

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

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

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

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

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

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

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

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

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

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

O. BEDDING OF JCSA UTILITIES SHALL BE IN ACCORDANCE WITH HRPDC DETAIL EW_01, TYPE III FOR RIGID PIPE AND TYPE IV FOR PVC PIPE.

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

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

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

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

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

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

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

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

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

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

Z. ALL PRIVATE UNDERGROUND FUEL STORAGE TANKS SHALL HAVE LEAK MONITORS AND SECONDARY CONTAINMENT IN ACCORDANCE WITH VIRGINIA STATE DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS.

JCSA DETAIL REFERENCES

W13.0 TYPICAL WATER METER INSTALLATION
W14.0 5/8"x3/4" THRU 1" RESIDENTIAL METER SETTING
W15.0 1 1/2" & 2" WATER METER SETTING
W17.0 DOUBLE GATE, DOUBLE CHECK DETECTOR CHECK ASSEMBLY

S16.0 TYPICAL ANCHOR DETAIL FOR GRADES OVER 20%
PC.1 PIPE CROSSING DETAIL

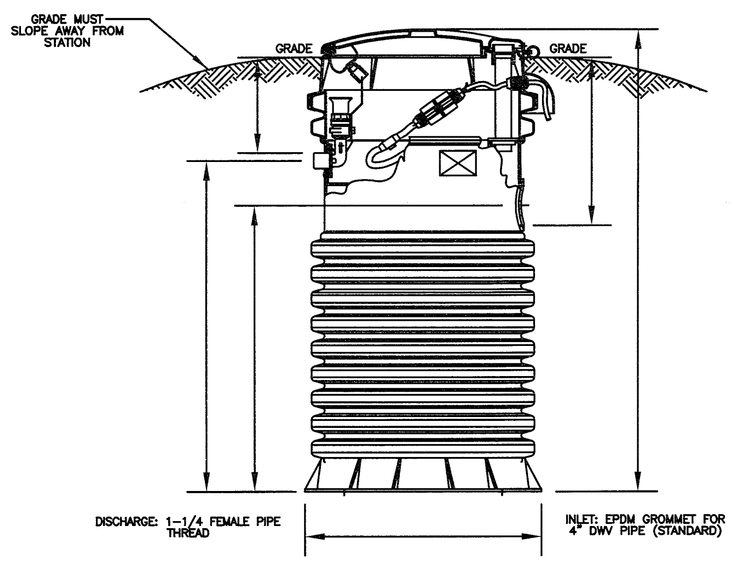
GP-1 RESIDENTIAL GRINDER PUMP INSTALLATION
GP-2 GRINDER PUMP ELECTRICAL SCHEMATIC
GP-3 GRINDER PUMP SLAB MOUNTING DETAIL
GP-3.1 GRINDER PUMP SLAB DETAIL

HRPDC DETAIL REFERENCES

EARTHWORK (EW)
EW_01 PIPE BEDDING, TYPE IV (CONTRACTOR SHALL ADD ADDITIONAL 1' OF STONE ABOVE PIPE)

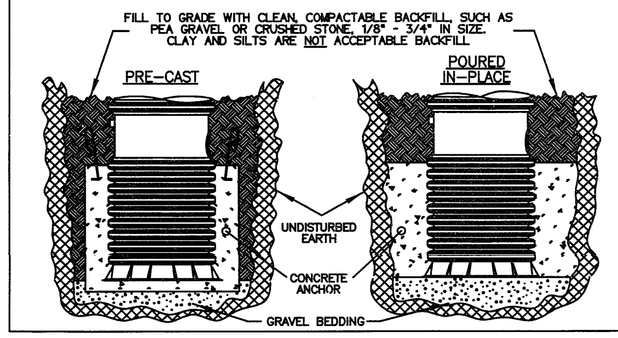
* REFER TO SPECIAL PROVISIONS TO REGIONAL STANDARDS (4TH EDITION, OCTOBER 2006) (APPENDIX A TO JCSA STANDARDS AND SPECIFICATIONS)

2010-58



**SEE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS

NOTE: A CONCRETE ANCHOR OF 1500 lbs (9.8 cu ft) IS REQUIRED ON ALL MODEL 2010 58" STATIONS.



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DR BY	CHK'D	DATE	ISSUE	SCALE

environment | one CORPORATION

MODEL 2010-58

PA 0856 P02

GENERAL NOTES - GRINDER PUMP SYSTEMS

GRINDER PUMPS ACCEPTED: ENVIRONMENT/ONE, MODEL: DH-152

THE PUMP IS TO BE A SEMI-POSITIVE DISPLACEMENT TYPE; 15 GPM AT 0 FT.TDH; 11 GPM AT 92 FT.TDH; 9 GPM AT 138 FT.TDH.

THE TANK SHALL BE 150 GALLON; NON-CORROSIVE, HEAVY-DUTY, HIGH DENSITY POLYETHYLENE WITH INTEGRAL FRP LID.

THE GRINDER SHALL CONSIST OF TWO HARDENED STAINLESS STEEL CUTTERS ROTATING AT MOTOR SPEED IN PRECISION RELATIONSHIP TO HARDENED ALLOY SHEDDING RING TO PRODUCE A FINELY DIVIDED SLURRY.

PIPING CONNECTIONS: INLET FOR 6-INCH LATERAL; DISCHARGE IS 1-1/4-INCH NPT.

THE MOTOR SHALL BE 1 HP, 1725 RPM, HIGH-TORQUE, CAPACITOR-START, 240 VOLT, 60 HERTZ, 8 AMP, 1 PHASE; WITH INTEGRAL, AUTOMATIC RESET, THERMAL PROTECTOR.

THE CONTROLS SHALL BE NON-FOULING STATIC SENSOR AND PRESSURE SWITCH SYSTEM WITH NO MOVING PARTS IN CONTACT WITH SEWAGE; SELF-CONTAINED UNIT.

TWO CHECK VALVES SHALL BE PROVIDED: ONE INTEGRAL ON DISCHARGE PIPE INSIDE TANK; ONE FOR SEWER SYSTEM USE BETWEEN PRESSURE MAIN AND GRINDER PUMP. CHECK VALVES SHALL BE FULL-PORTED, NONCLOGGING, CLAPPER TYPE.

AN ANTI-SIPHON VALVE SHALL BE INCLUDED ON THE DISCHARGE PIPE INSIDE THE TANK.

HIGH WATER LEVEL, POWER FAILURE AND PUMP ALARMS SHALL BE PROVIDED. A REMOTE PANEL WITH AN ALARM TEST FUNCTION SHALL ALSO BE PROVIDED; AS SHALL A REMOTE DISPLAY WITH AUDIBLE ALARM. THE ALARM SYSTEM SHALL BE PROVIDED WITH A BACK-UP POWER SUPPLY. THE INDIVIDUAL ALARM SYSTEMS FOR THE GRINDER PUMPS WILL NOT BE CONNECTED TO THE JAMES CITY SERVICE AUTHORITY CENTRAL ALARM SYSTEM.

ELECTRIC TESTING SHALL BE PERFORMED BY THE ELECTRICAL SUBCONTRACTOR (A MASTER ELECTRICIAN) IN THE PRESENCE OF THE JAMES CITY COUNTY ELECTRICAL INSPECTOR. TESTING WILL BE TO ASSURE THAT THE STATION OPERATIONS AS INTENDED AND TO COMPLY WITH ALL POSSIBLE OTHER REQUIREMENTS RELATING TO SUCCESSFUL OPERATION AS OUTLINED IN THE VIRGINIA SEWERAGE REGULATIONS.

THE CONTROL CONSOLE AND ALARM SYSTEM SHALL BE LOCATED ON AN INSIDE WALL OF THE BUILDING IN AN ACCESSIBLE AND VISIBLE LOCATION WITHIN 100 FEET OF GRINDER PUMP. IF THIS IS NOT POSSIBLE, PLEASE LOCATE THE PANEL NEXT TO THE PUMP STATION.

THE WET WELL OF THE GRINDER PUMP SHALL BE VENTED THROUGH THE BUILDING PLUMBING SYSTEM AS REQUIRED BY THE BOCA PLUMBING CODE.

A DISCONNECT SHALL BE PROVIDED ADJACENT TO THE PUMP PER NEC CODE. THE PUMP CONTROLS ARE LOCATED IN THE TOP HOUSING OF THE CORE UNIT INSIDE A WATERPROOF ACCESS COVER. THEY MAY ALSO BE LOCATED ADJACENT TO THE DISCONNECT, IN A NEMA 4 BOX.

ALL ELECTRICAL EQUIPMENT MUST BE UL LISTED.

ALL EQUIPMENT SHALL BE TESTED IN ACCORDANCE WITH THE NEC.

ALL FORCE MAIN PIPING SHALL CONFORM TO THE HRPDC REGIONAL STANDARDS (SECTION 200-5.10).

ALL PIPING SHALL BE TESTED IN ACCORDANCE WITH THE HDRPC REGIONAL STANDARDS (SECTION 803-2.7).

THRUST RESTRAINT SHALL BE PROVIDED FOR GASKETED TYPE PIPING AT ALL BENDS, TEES AND CHANGES OF DIRECTION.

GRINDER PUMP SYSTEM

MANUFACTURER/MODEL - ENVIRONMENT / ONE, MODEL DH-152

SEMI-POSITIVE DISPLACEMENT TYPE; 15 GPM @ 0 FT.TDH.; 11 GPM @ 92 FT.TDH. 9 *GPM @ 138 FT.TDH.*

150 GAL; NON-CORROSIVE, HEAVY-DUTY, HIGH DENSITY POLYETHYLENE; INTEGRAL FRP LID. AVAILABLE IN DEPTHS FROM 59" TO 159".

TWO HARDENED STAINLESS STEEL CUTTERS ROTATING AT MOTOR SPEED IN PRECISION RELATIONSHIP TO HARDENED AND GROUND CHROME SHEDDING RING PRODUCE A FINELY DIVIDED SLURRY.

CONNECTIONS INLET FOR 6 INCH DWV PIPE; DISCHARGE IS 1-1/4 INCH NPT.

1 HP, 1725 RPM, HIGH-TORQUE, CAPACITOR-START, 240 VOLT, 60 HERTZ, 8 AMP, 1 PHASE; WITH INTEGRAL, AUTOMATIC RESET, THERMAL PROTECTOR.

NON-FOULING STATIC SENSOR AND PRESSURE SWITCH SYSTEM HAS NO MOVING PARTS IN CONTACT WITH SEWAGE; COMPLETELY SELF-CONTAINED -- NO EXTERNAL PANELS NEEDED.

CHECK VALVES TWO PROVIDED: ONE INTEGRAL ON DISCHARGE PIPE INSIDE TANK, ONE IN "JUMBO BOX" BETWEEN FORCE MAIN AND GRINDER PUMP; FULL-PORTED, NON-CLOGGING, CLOPPER TYPE.

INTEGRAL ON DISCHARGE PIPE INSIDE TANK.

HIGH LEVEL INDICATOR LIGHT FURNISHED FOR REMOTE DISPLAY. REMOTE DISPLAY WITH AUDIBLE ALARM TO BE PROVIDED. ALARM SYSTEM TO BE PROVIDED WITH BACK-UP POWER SUPPLY.

ALL COMPONENTS OF THE GRINDER PUMP SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE HRPDC, JCSA STANDARDS AND SPECIFICATIONS FOR SANITARY SEWER SYSTEMS AND THE VIRGINIA SEWAGE HANDLING & DISPOSAL REGULATIONS DATED 7/1/00.

ALL JOINTS IN TANK AND ACCESSWAY ARE MANUFACTURED AND FACTORY TESTED FOR WATERTIGHT INTEGRITY. NO FIELD PENETRATIONS SHALL BE ACCEPTABLE.

TWO LIFTING HOOKS WITH NYLON LIFT-OUT HARNESS TO BE PROVIDED BY SUPPLIER.

CONCRETE ANCHOR SHALL BE INSTALLED ON STATION.

ONCE STATION IS FASTENED TO SLAB, UNIT SHALL BE LIFTED INTO PLACE USING THE EYE BOLTS, NOT THE TANK.

ALL FRP PARTS TO BE AVOCADO GREEN.

DISCHARGE LINE TO BE BELOW FROST LINE.

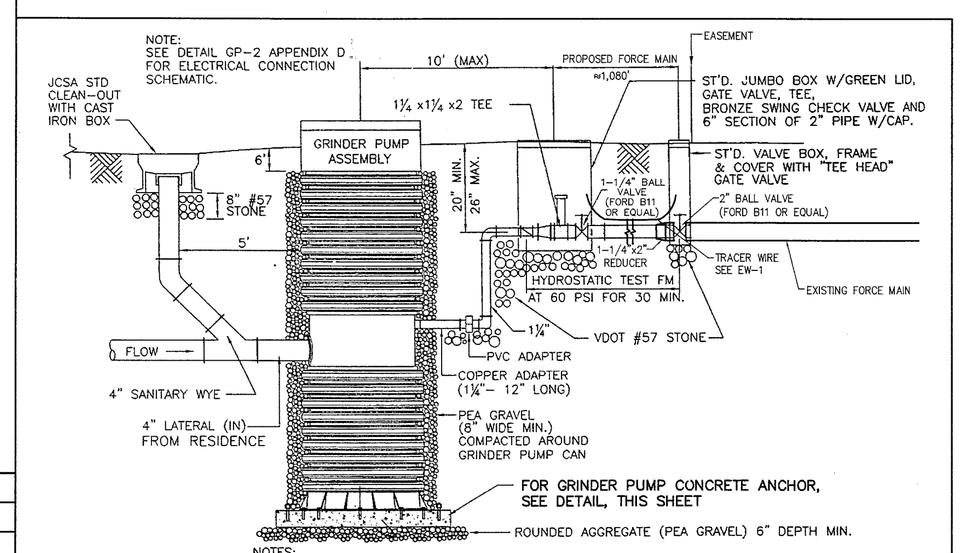
GRINDER PUMP ASSEMBLIES SHALL BE "ENVIRONMENT-1" MODEL DH-152-93 AS MANUFACTURED BY ENVIRONMENT ONE CORPORATION.

ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH MANUFACTURES SPECIFICATIONS.

SHUT OFF VALVE SHALL BE LOCATED AS SHOWN ON PLAN.

THE LOCK AND PUMP WRENCH DELIVERED WITH THE GRINDER PUMP ARE TO BE LEFT IN THE CAN UNTIL JCSA PERSONNEL ARRIVE.

NOTE:
SEWAGE PUMPING STATION TREATING SITE IS PART OF THE JAMES CITY COUNTY SEWER NETWORK AND MEETS ALL VIRGINIA DEPARTMENT OF HEALTH SEWAGE COLLECTION AND TREATMENT REGULATIONS.



NOTES:
1. GRINDER PUMP ASSEMBLIES SHALL BE "ENVIRONMENT-1" MODEL DH-152
2. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN ACCORDANCE WITH MANUFACTURES SPECIFICATIONS.
3. SHUT OFF VALVE SHALL BE LOCATED AS SHOWN IN PLANS
4. THE LOCK AND PUMP WRENCH DELIVERED WITH THE GRINDER PUMP ARE TO BE LEFT IN THE CAN UNTIL JCSA PERSONNEL ARRIVE.

GRINDER PUMP AND VALVE BOX DETAIL

NOT TO SCALE

PHASES 1& 3

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
11/29/12
PROFESSIONAL ENGINEER

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MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: AS SHOWN	Date: 6/29/12

Sheet Title:
UTILITY NOTES & DETAILS

Sheet Number
C-13

VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARD NOTES
HAMPTON ROADS DISTRICT
OCTOBER 2011

1.0 GENERAL INFORMATION

1.1 THESE PLANS WERE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF (SELECT ONE):
VDOT SUBDIVISION STREET REQUIREMENTS (SSR)
VDOT SUBDIVISION STREET ACCEPTANCE REQUIREMENTS (SSAR)
N/A

1.2 VDOT APPROVED EXCEPTIONS (SELECT ONE):
ACCESS MANAGEMENT DATE OF APPROVAL ______
SSAR DATE OF APPROVAL ______
OTHER: ______ DATE OF APPROVAL ______
N/A

1.3 TRIP GENERATION DATA:
USE: COUNTY PARK
ITE CODE: 412
TOTAL DAILY TRIPS: 650 VPD
AM PEAK HOUR TRIPS: – VPH
PM PEAK HOUR TRIPS: – VPH

1.4 A LAND USE PERMIT MUST BE OBTAINED FROM VDOT BEFORE ANY CONSTRUCTION IS STARTED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS. CONTACT THE VDOT DISTRICT OFFICE AT (757) 925-2500 FOR THE PERMIT FEE AND BOND AMOUNT. ALL LAND USE PERMIT APPLICATIONS MUST HAVE ONE (1) SET OF APPROVED PLANS, A COPY OF THE PLAN APPROVAL LETTER, A CHECK FOR THE PROCESSING FEE MADE PAYABLE TO TREASURER OF VIRGINIA, AND SURETY OR BOND IN THE REQUIRED AMOUNT.

1.5 THE VDOT DISTRICT OFFICE IS TO RECEIVE WRITTEN NOTIFICATION 48 HOURS PRIOR TO THE START OF ANY WORK WITHIN STATE MAINTAINED RIGHT OF WAY. A PRE-CONSTRUCTION MEETING SHOULD BE HELD AT LEAST ONE WEEK PRIOR TO ANY LAND DISTURBANCE OR WHEN CONSTRUCTION ACTIVITIES WILL AFFECT TRAFFIC OPERATIONS OF ANY ARTERIAL CORRIDOR.

1.6 ALL CONSTRUCTION METHODS AND MATERIALS WITHIN STATE MAINTAINED RIGHT OF WAY SHALL COMPLY WITH THE CURRENT STANDARDS AND SPECIFICATIONS OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION.

1.7 THE CONTRACTOR SHALL HAVE AVAILABLE A COPY OF THE LAND USE PERMIT(S), FINAL APPROVED PLANS, ANY APPROVED REVISIONS, AND A COPY OF THE APPROVAL LETTER ON SITE.

1.8 ANY ERRORS, CONFLICTS, OR DISCREPANCIES FOUND ON THE APPROVED PLANS SHALL BE REPORTED TO THE DEVELOPER'S ENGINEER. THE VDOT DISTRICT OFFICE SHOULD BE NOTIFIED FOR RESOLUTION BEFORE PROCEEDING FURTHER WITH THE WORK IF THE STATE MAINTAINED RIGHT OF WAY IS AFFECTED.

1.9 THE DEVELOPER IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING ROADS, UTILITIES, AND ANY OTHER INSTALLATIONS ALREADY IN PLACE WHICH OCCUR AS A RESULT OF PROJECT CONSTRUCTION WITHIN OR CONTIGUOUS TO STATE RIGHT OF WAY LIMITS.

1.10 THE COMMONWEALTH TRANSPORTATION BOARD MEMBERS OF THE BOARD, THE COMMONWEALTH AND ALL COMMONWEALTH EMPLOYEES, AGENTS, AND OFFICES, SHALL BE ABSOLVED FROM ALL RESPONSIBILITIES, DAMAGES AND LIABILITIES AS A RESULT OF WORK ARISING FROM THE EXERCISE OF THE PRIVILEGES GRANTED BY PLAN AND/OR PERMIT APPROVAL.

2.0 DRAINAGE & EROSION CONTROL

2.1 VDOT SHALL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY STORMWATER MANAGEMENT FACILITY OR OUTFALL STRUCTURE LOCATED OUTSIDE OF STATE MAINTAINED RIGHT OF WAY LIMITS AND SHALL BE ABSOLVED FROM ALL RESPONSIBILITIES, DAMAGES AND LIABILITIES AS A RESULT OF SUCH.

2.2 ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR IN ACCORDANCE WITH THE VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK AND VIRGINIA STORMWATER MANAGEMENT PROGRAM. AN INDIVIDUAL CERTIFIED BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION, HOLDING A RESPONSIBLE LAND DISTURBER CERTIFICATION, IS TO BE IN CHARGE OF THE LAND DISTURBING ACTIVITY AND ON THE WORK SITE AT ALL TIMES.

2.3 TEMPORARY DRAINAGE MEASURES SHALL BE INSTALLED DURING CONSTRUCTION TO PREVENT PONDING AND DIVERT SEDIMENT LADEN WATER.

2.4 ALL NECESSARY PRECAUTIONS SHALL BE TAKEN TO ENSURE AGAINST SILTATION OF ADJACENT PROPERTIES, DITCHES, STREAMS, ETC. ADDITIONAL DITCH LININGS OR SILTATION AND EROSION CONTROL MEASURES SHALL BE PROVIDED AS DETERMINED NECESSARY BY VDOT AND/OR THE COUNTY/TOWN DURING FIELD REVIEW. ALL COSTS SHALL BE ASSUMED BY THE DEVELOPER.

2.5 ALL DISTURBED AREAS SHALL BE STABILIZED IMMEDIATELY UPON THE END OF EACH DAY'S WORK AND RESEEDED IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS.

3.0 MATERIALS

3.1 WHEN UNSUITABLE MATERIALS ARE ENCOUNTERED DURING CONSTRUCTION SUCH MATERIALS SHALL BE UNDERCUT AND BACKFILLED WITH VDOT TYPE II SELECT MATERIAL MINIMUM CBR 20 ACCORDING TO VDOT SPECIFICATIONS.

3.2 PAVEMENT DESIGN SHALL BE PROVIDED IN ACCORDANCE WITH THE PAVEMENT DESIGN GUIDE FOR SUBDIVISION AND SECONDARY ROADS IN VIRGINIA. FOR PRIMARY ROADS AND INTERSTATE HIGHWAYS WHERE TRUCK TRAFFIC EXCEEDS 5%, PAVEMENT DESIGN SHALL BE PROVIDED IN ACCORDANCE WITH AASHTO GUIDELINES. TYPICAL PAVEMENT SECTIONS SHALL DEPICT THE TOP 6" OF THE SUBGRADE IMMEDIATELY UNDER THE PAVEMENT STRUCTURE COMPACTED TO 100% OF THE THEORETICAL MAXIMUM DRY DENSITY.

3.3 ASPHALT PAVEMENT WIDENING SHALL CONFORM TO VDOT STANDARD WP-2.

3.4 INSTALLATION OF PIPE CULVERTS AND STORM SEWERS SHALL CONFORM TO VDOT STANDARD PB-1.

3.5 THE DEPARTMENT USUALLY PROHIBITS THE OPEN-CUTTING OF HARD-SURFACED ROADS EXCEPT IN EXTENUATING CIRCUMSTANCES. THEREFORE, ALL UNDERGROUND UTILITIES WITHIN STATE MAINTAINED RIGHT OF WAY, AS DETERMINED NECESSARY BY GOOD ENGINEERING PRACTICE TO SERVE THE COMPLETE DEVELOPMENT OF ADJACENT PROPERTIES, SHALL BE INSTALLED DURING THE STREETS INITIAL CONSTRUCTION AND PRIOR TO THE APPLICATION OF ITS FINAL PAVEMENT SURFACE COURSE. THIS SHALL INCLUDE EXTENSIONS OF ALL NECESSARY CROSS-STREET CONNECTIONS OR SERVICE LINES TO AN APPROPRIATE LOCATION BEYOND THE PAVEMENT AND PREFERABLY THE RIGHT OF WAY LINE. IN THE EVENT IT IS NECESSARY TO OPEN THE STREET PAVEMENT TO WORK ON UTILITIES AFTER THE SURFACE HAS BEEN PLACED, ADDITIONAL COMPACTION TESTS AND PAVING AS NECESSARY TO RESTORE THE INTEGRITY AND APPEARANCE OF THE ROADWAY MAY BE REQUIRED.

4.0 RIGHT OF WAY & UTILITIES

4.1 ALL FIXED OBJECTS SUCH AS UTILITY CABINETS, PEDESTALS, AND STREETLIGHTS SHALL BE LOCATED IN ACCORDANCE WITH CLEAR ZONE REQUIREMENTS, AS NOTED IN THE ROAD DESIGN MANUAL OR AASHTO ROADSIDE DESIGN GUIDE. THERE SHALL NOT BE ANY CABINETS, PEDESTALS, OR FIRE HYDRANTS LOCATED ON THE SHOULDER.

4.2 FLOWERS, SHRUBS, AND TREES SHALL NOT BE PLACED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS WITHOUT AN APPROVED SET OF PLANS AND AN APPROVED PLANTING AGREEMENT. NO IRRIGATION (SPRINKLER) SYSTEMS, BRICK COLUMNS, ENDWALLS, AND/OR BRICK MAILBOXES WILL BE CONSTRUCTED OR INSTALLED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS WITHOUT A PERMIT. ANY OF THE ABOVE ITEMS FOUND IN THE RIGHT OF WAY WITHOUT A PERMIT WILL BE REMOVED, AND ALL COSTS OF THE REMOVAL WILL BE BORNE BY THE OWNER AND/OR DEVELOPER.

4.3 THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND AND OVERHEAD UTILITIES, WHETHER OR NOT THEY ARE SHOWN ON THE PLANS, PRIOR TO CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR REPAIRS AT HIS OWN EXPENSE OF ANY UTILITIES DAMAGED BY HIS CONSTRUCTION METHODS. MISS UTILITY MUST BE CONTACTED AT 811 AT LEAST 72 HOURS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

4.4 AUTHORIZED UNDERGROUND UTILITY INSTALLATIONS SHALL MAINTAIN A MINIMUM OF 36 INCHES OF COVER.

4.5 OVERHEAD UTILITY INSTALLATIONS WITHIN LIMITED ACCESS AND NON LIMITED ACCESS RIGHT OF WAY SHALL BE INSTALLED IN ACCORDANCE WITH VDOT LAND USE PERMIT REGULATIONS.

4.6 ALL ROADWAY LIGHTING SHALL BE DESIGNED IN ACCORDANCE WITH IESNA LIGHTING CRITERIA AND INSTALLED IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS. ALL ROADWAY LIGHTING SHALL ADHERE TO THE VIRGINIA LIGHTING LAW.

5.0 TRAFFIC

5.1 CONTACT TRAFFIC ENGINEERING OPERATIONS AT (757) 925-1659 OR (757) 925-1653 A MINIMUM OF 48 HOURS IN ADVANCE WHENEVER EXCAVATION IS WITHIN 500 FEET OF A TRAFFIC SIGNAL, SO THE LINES CAN BE MARKED. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

5.2 CONTACT ROADWAY LIGHTING OPERATIONS AT (757) 484-9015 OR (757) 484-8940 A MINIMUM OF 48 HOURS IN ADVANCE WHENEVER PLANNED CONSTRUCTION ACTIVITIES ARE LOCATED WITHIN LIMITED ACCESS HIGHWAYS. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

5.3 CONTACT TRAFFIC OPERATIONS CENTER MAINTENANCE MANAGER AT (757) 424-9903 A MINIMUM OF 48 HOURS IN ADVANCE OF ALL CONSTRUCTION ACTIVITIES LOCATED WITHIN LIMITED ACCESS HIGHWAYS. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

5.4 SIGHT DISTANCES AT ENTRANCES AND INTERSECTIONS SHALL BE MAINTAINED AT ALL TIMES DURING AND AFTER CONSTRUCTION. ANY OBJECT OR LANDSCAPING THAT OBSTRUCTS DRIVER VIEW SHALL BE RELOCATED AT THE DEVELOPER'S EXPENSE OR THE ENTRANCE MAY BE CLOSED AT VDOT'S DISCRETION.

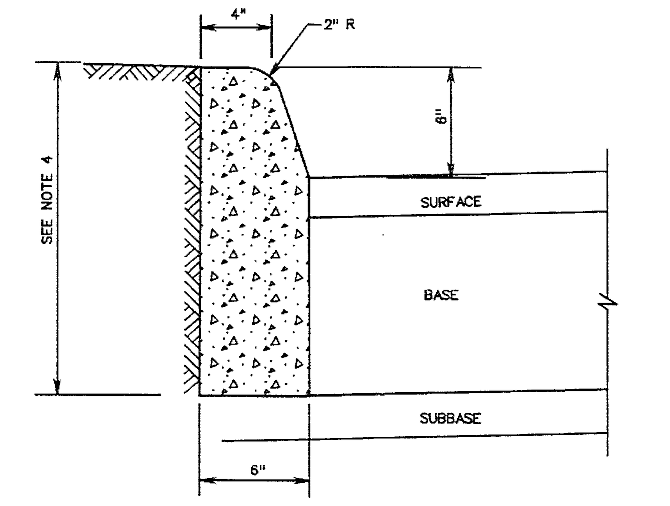
5.5 DURING CONSTRUCTION, THE MAINTENANCE OF TRAFFIC SHALL CONFORM TO THE REQUIREMENTS IN THE MOST RECENT VERSION OF THE VIRGINIA WORK AREA PROTECTION MANUAL AND THE MUTCD.

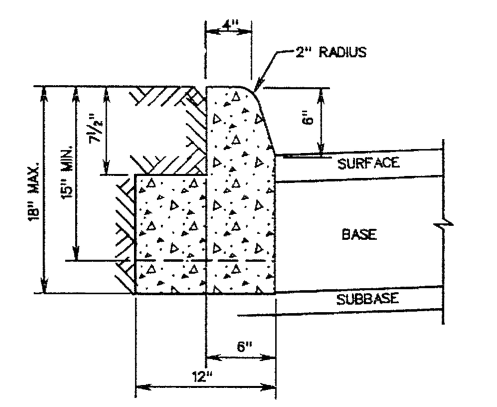
6.0 ENVIRONMENTAL

6.1 THE PERMITTEE IS RESPONSIBLE FOR PURSUING AND OBTAINING ANY AND ALL ENVIRONMENTAL CLEARANCES AND/OR PERMITS, INCLUDING, BUT NOT LIMITED TO, WATER QUALITY, THREATENED AND ENDANGERED SPECIES, HAZARDOUS MATERIALS, AND CULTURAL RESOURCES, REQUIRED TO PURSUE THE PROPOSED ACTIVITY BEFORE ANY CONSTRUCTION IS STARTED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS. DOCUMENTS RELATED TO THESE ACTIVITIES SHALL BE SUBMITTED WITH THE LAND USE PERMIT APPLICATION.

CG-2

NOTES:
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.
3. CURB HAVING A RADIUS OF 300 FEET OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.
4. THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 3" (15" DEPTH) OR INCREASED AS MUCH AS 3" (21" DEPTH) IN ORDER THAT THE BOTTOM OF CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE, THE DEPTH IS TO BE 18" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.
5. CG-2 IS TO BE USED ON ROADWAYS MEETING THE REQUIREMENTS FOR CG-6 AS SHOWN IN APPENDIX A OF THE VDOT ROAD DESIGN MANUAL, IN THE SECTION ON GS URBAN STANDARDS.



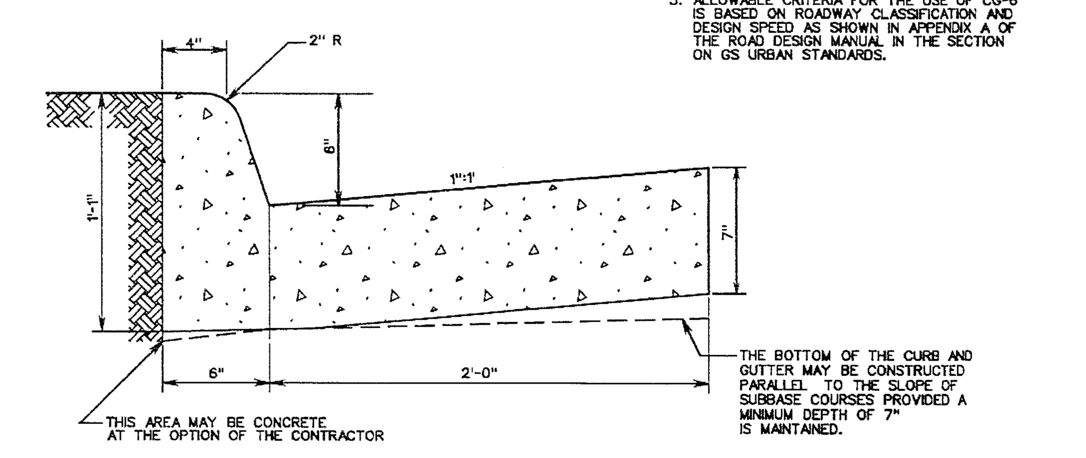


ACCEPTABLE ALTERNATIVE IF CURB IS EXTRUDED

SPECIFICATION REFERENCE	STANDARD 6" CURB	VDOT ROAD AND BRIDGE STANDARDS	
105 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 1
			201.01

CG-6

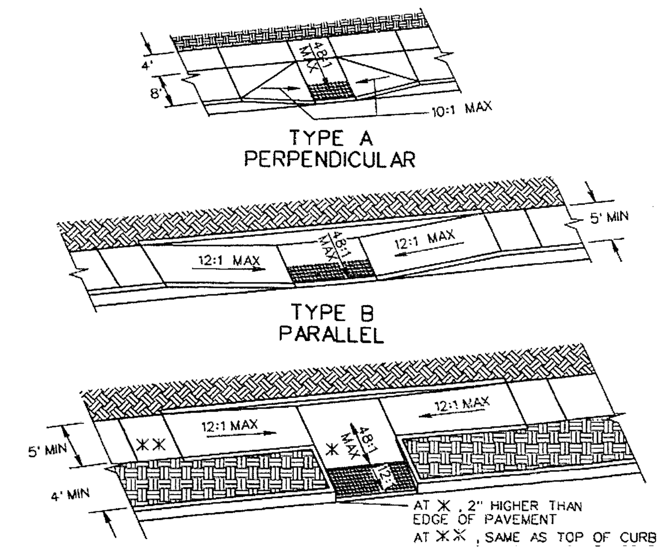
NOTES:
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.
3. COMBINATION CURB & GUTTER HAVING A RADIUS OF 300 FEET OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS RADIAL COMBINATION CURB & GUTTER.
4. FOR USE WITH STABILIZED OPEN-GRADED DRAINAGE LAYER, THE BOTTOM OF THE CURB & GUTTER SHALL BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUBBASE COURSES AND TO THE DEPTH OF THE PAVEMENT.
5. ALLOWABLE CRITERIA FOR THE USE OF CG-6 IS BASED ON ROADWAY CLASSIFICATION AND DESIGN SPEED AS SHOWN IN APPENDIX A OF THE ROAD DESIGN MANUAL IN THE SECTION ON GS URBAN STANDARDS.

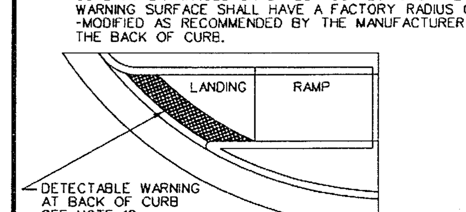


SPECIFICATION REFERENCE	COMBINATION 6" CURB AND GUTTER	VDOT ROAD AND BRIDGE STANDARDS	
105 502	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE	SHEET 1 OF 1
			201.03

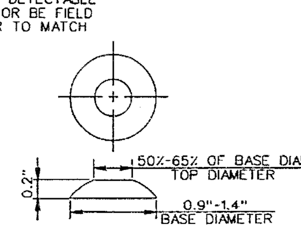
CG-12

GENERAL NOTES:
1. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES.
2. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2 FOOT IN LENGTH IN THE DIRECTION OF PEDESTRIAN TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOMES DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
5. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1½".
6. CURB / CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB / CURB AND GUTTER.
7. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES, EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. ACCESSIBLE ROUTES PROVIDE A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PEDESTRIANS.
8. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK AND THAT THE SLOPE AT THE CONNECTION OF THE CURB OPENING IS PERPENDICULAR TO THE CURB.
9. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC, REFER TO STANDARD CG-13, COMMERCIAL ENTRANCE (HEAVY TRUCK TRAFFIC) FOR CONCRETE DEPTH.
10. WHEN CURB RAMPS ARE USED IN CONJUNCTION WITH A SHARED USE PATH, THE MINIMUM WIDTH SHALL BE THE WIDTH OF THE SHARED USE PATH
11. WHEN ONLY ONE CURB RAMP IS PROVIDED FOR TWO CROSSINGS (DIAGONAL), A 4' x 4' LANDING AREA SHALL BE PROVIDED TO MANEUVER A WHEELCHAIR INTO THE CROSSWALK WITHOUT GOING INTO THE TRAVELWAY. THIS 4' x 4' LANDING AREA MAY INCLUDE THE GUTTER PAN.
12. ALL CASES WHERE CURB RAMPS INTERSECT A RADIAL SECTION OF CURB AT ENTRANCES OR STREET CONNECTIONS THE DETECTABLE WARNING SURFACE SHALL HAVE A FACTORY RADIUS OR BE FIELD -MODIFIED AS RECOMMENDED BY THE MANUFACTURER TO MATCH THE BACK OF CURB.

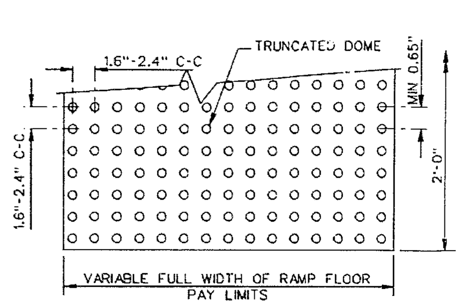




DETECTABLE WARNING INSTALLED ON A RADIUS

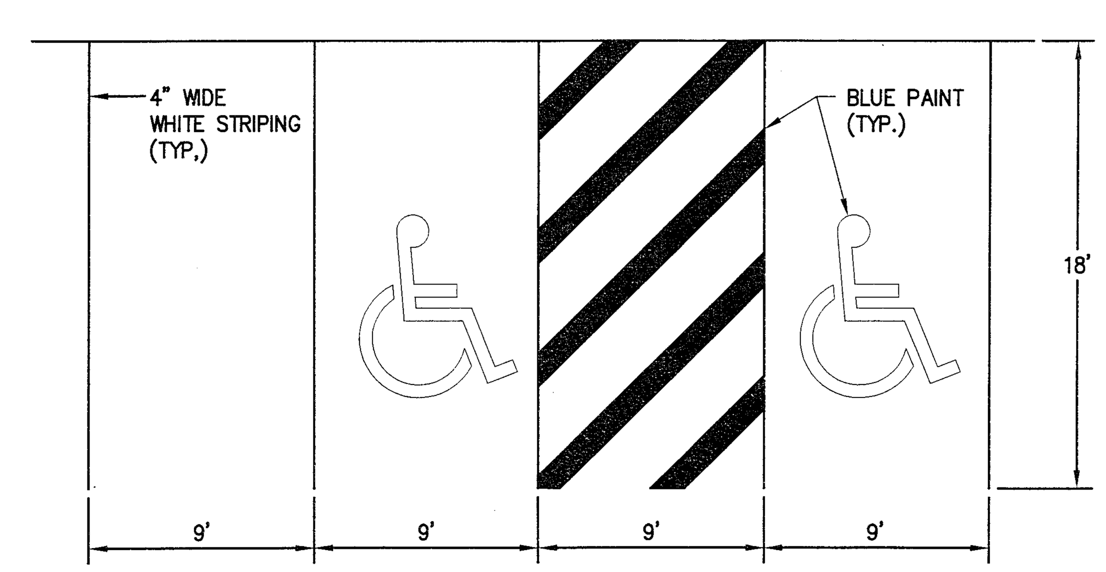


TRUNCATED DOME DETAIL



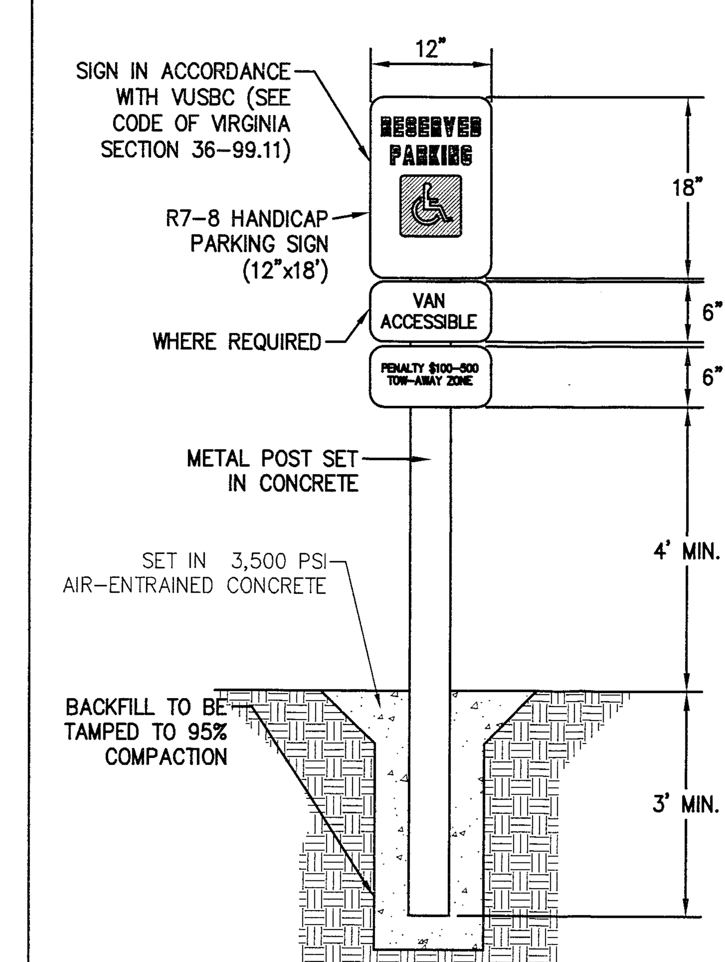
DETECTABLE WARNING DETAIL

VDOT ROAD AND BRIDGE STANDARDS		CG-12 DETECTABLE WARNING SURFACE (GENERAL NOTES)	SPECIFICATION REFERENCE
SHEET 1 OF 5	REVISION DATE 7/11	VIRGINIA DEPARTMENT OF TRANSPORTATION	105 502
203.05			



PARKING SPACE DETAIL
N.T.S.

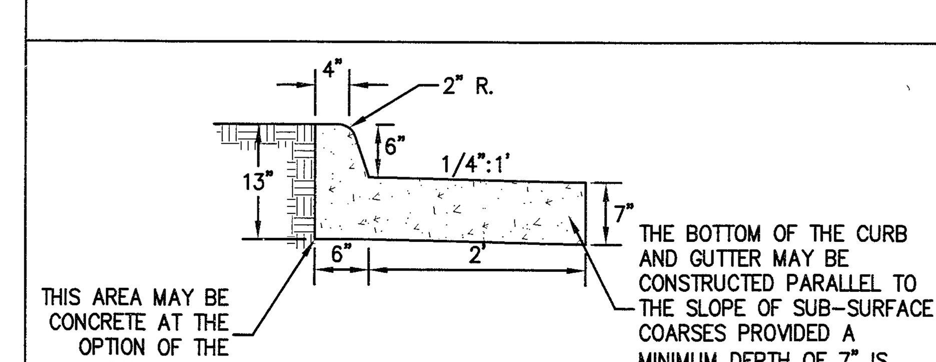
1. PARKING SPACES SHALL BE DELINEATED BY 4" PAVEMENT STRIPING.
2. ALL PARKING SPACES ARE TO BE PROVIDED WITH 4-INCH WHITE PAINTED STRIPING AND HANDICAP ACCESS AISLES WITH 1 FT. WIDE BLUE PAINTED HATCHING. HANDICAP PARKING SPACES SHALL BE DESIGNATED BY ABOVE GROUND SIGNS PER UNIFORM STATEWIDE BUILDING CODE (USBC) REQUIREMENTS.
3. ALL PROPOSED ON-SITE PAVEMENT MARKINGS SHALL BE REFLECTORIZED TYPE A (PAINT) OR TYPE B (PREFORMED OR THERMOPLASTIC MATERIAL) IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS. PARKING SPACES SHALL BE DELINEATED BY 4" WHITE LINES, (FEDERAL STANDARD COLOR # 595-17886 OR EQUIVALENT),HANDICAPPED PARKING SPACES SHALL BE DELINEATED BY 4" BLUE LINES (BENNETE'S PAINT BLUE WAVE Q13-28T OR EQUIVALENT) FOR SPACES AND SYMBOLS, FIRE LANES AND PARCEL PICK-UP MARKINGS SHALL BE 4" YELLOW (FEDERAL STANDARD COLOR #595-13538 OR EQUIVALENT).



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

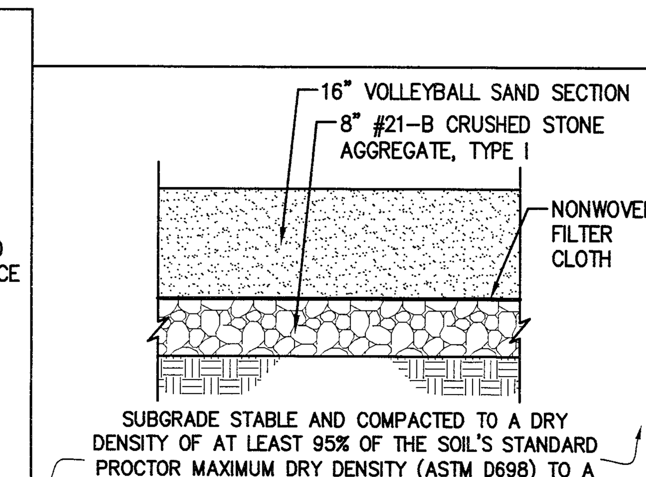
HANDICAP SIGN
N.T.S.

ALL PHASES



NOTE: COMBINATION CURB AND GUTTER HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS A RADIAL COMBINATION CURB AND GUTTER. THIS ITEM MAY BE PRECAST OR CAST IN PLACE. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

REVERSE COMBINATION CURB & GUTTER
N.T.S.



VOLLEYBALL COURT SECTION
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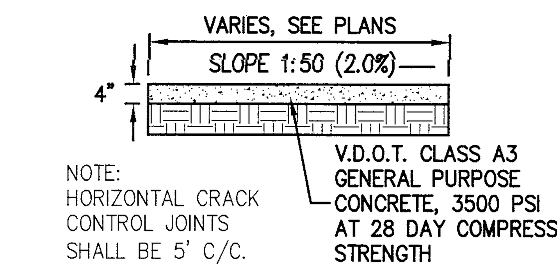
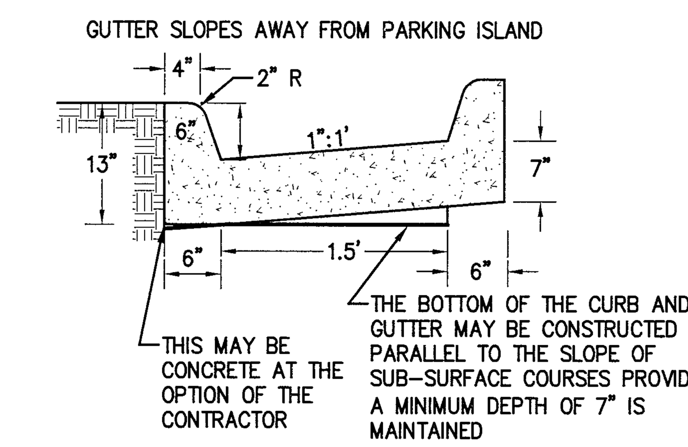


NOTE:
HORIZONTAL CRACK CONTROL JOINTS SHALL BE 5' C/C.

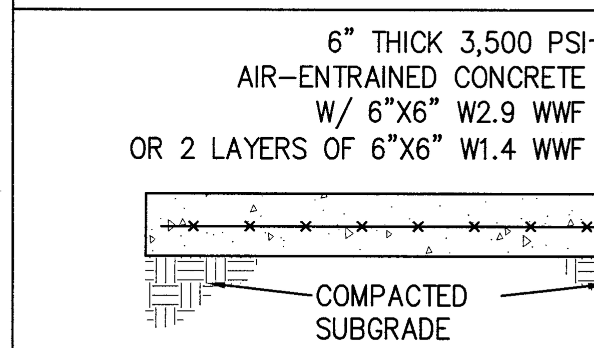
SIDEWALK DETAIL
N.T.S.



THIS ITEM MAY BE PRECAST OR CAST IN PLACE

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 3500 PSI IF PRECAST

ISLAND CUT THROUGH
N.T.S.



DUMPSTER PAD SECTION
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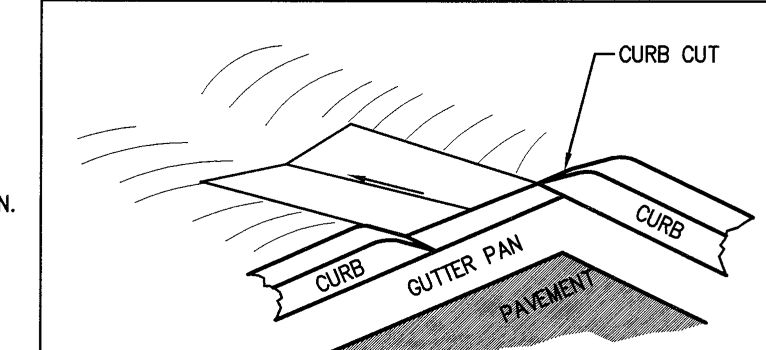
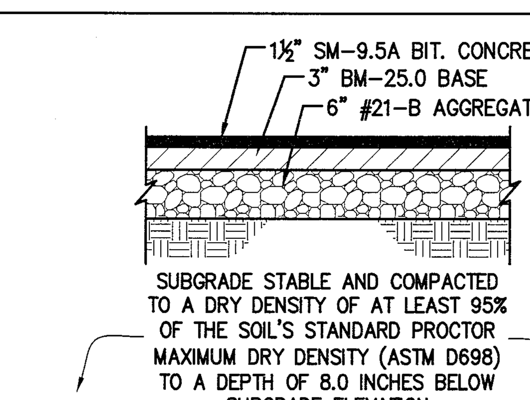
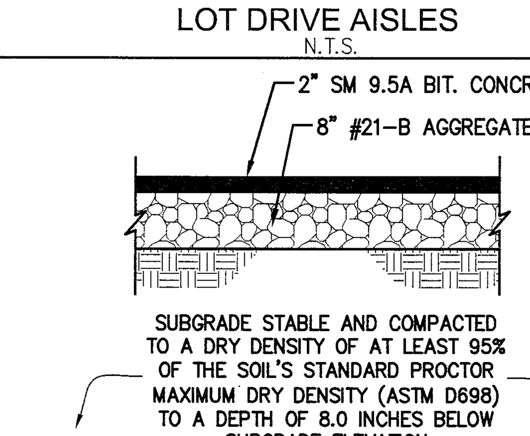


CURB CUT TO DITCH
N.T.S.

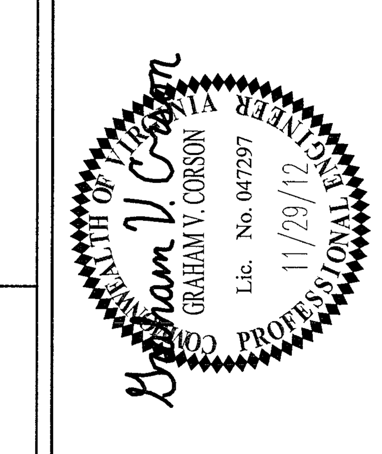


HEAVY DUTY PAVEMENT SECTION
BUS PARKING AND PARKING LOT DRIVE AISLES
N.T.S.



TYPICAL PAVEMENT SECTION
PARKING LOT STALLS
N.T.S.

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC



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MID COUNTY PARK
SITE UPGRADES
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: AS SHOWN	Date: 6/29/12
Sheet Title: NOTES & DETAILS	
Sheet Number	C-14

MATCHLINE - SEE SHEET L02

GRAPHIC SCALE
25' 0' 25' 50'
SCALE: 1" = 25'

PROPOSED PLAYGROUND AREA
SPLASH PARK AREA (DESIGN BY OTHERS)
PATIO AREA
PROPOSED BUILDING 1,735 S.F
EXISTING SHELTER
EXISTING PARKING LOT
EXISTING TENNIS COURTS
BUS PARKING
IRONBOUND RD. STATE ROUTE 615

SEE SHEET L02 FOR THE PLANT SCHEDULE, NOTES, AND DETAILS.

Rev.	Date	Description	Revised By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

COMMONWEALTH OF VIRGINIA
GAVIN E. ROBERTS
Lic. No. 001299
11/29/12
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MID COUNTY PARK
SITE UPGRADES

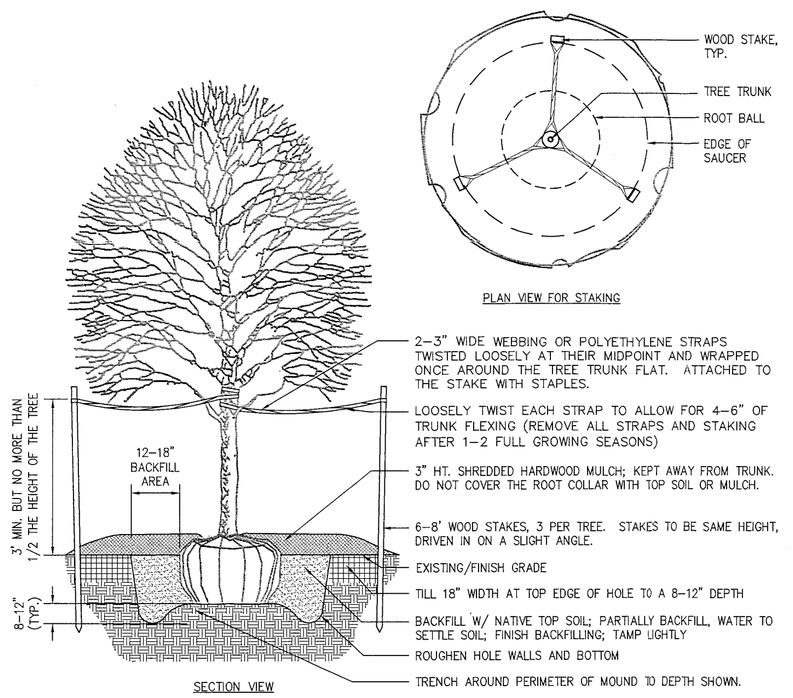
BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	GVC
Project Number:	W10119-E-19
Scale: 1"=25'	Date: 6/29/12
Sheet Title: LANDSCAPE PLAN	

Sheet Number
L01

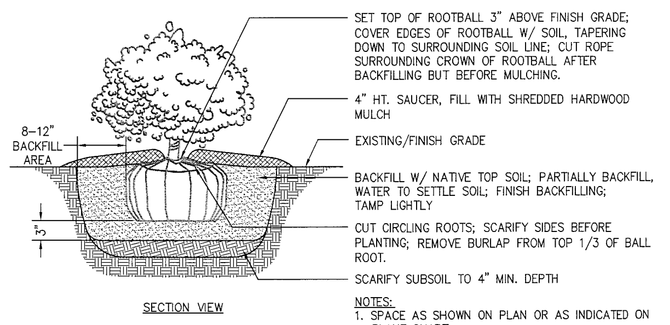
PLANT SCHEDULE

DECIDUOUS TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	REMARKS
AR	15	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	2-1/2" CAL.	B & B	SINGLE STEM
ASC	12	ACER SACCHARUM 'COMMEMORATION'	COMMEMORATION SUGAR MAPLE	2-1/2" CAL.	CONT	SINGLE STEM
BN	13	BETULA NIGRA 'DURAHEAT'	DURAHEAT RIVER BIRCH	8'-10' HT.	B & B	3-5 CANES
PA	16	PLATANUS X ACERIFOLIA 'BLOODGOOD'	LONDON PLANE TREE	2-1/2" CAL.	B & B	SINGLE STEM
QP	10	QUERCUS PHELLOS	WILLOW OAK	2-1/2" CAL.	B & B	SINGLE STEM
SB	11	SALIX BABYLONICA	WEEPING WILLOW	2-1/2" CAL.	B & B	SINGLE STEM
UP	14	ULMUS PARVIFOLIA	CHINESE ELM	2-1/2" CAL.	B & B	SINGLE STEM
EVERGREEN TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
INS	2	ILEX X 'NELLIE R STEVENS'	NELLIE STEVENS HOLLY	8'-10' HT.	B & B	DENSE, FULL
MG	7	MAGNOLIA GRANDIFLORA	SOUTHERN MAGNOLIA	8'-10' HT.	B & B	DENSE, FULL
PT	22	PINUS TAEDA	LOBLOLLY PINE	8'-10' HT.	B & B	DENSE, FULL
SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**ROOT**	**REMARKS**
BB	6	BUDDLEJA DAVIDII 'BLACK KNIGHT'	BLACK KNIGHT BUTTERFLY BUSH	22"-30" HT./W.	CONT.	DENSE, FULL
BD	36	BUDDLEJA DAVIDII 'NANHO BLUE'	NANHO BLUE BUTTERFLY BUSH	18"-24" HT./W.	CONT.	DENSE, FULL
CB	18	CORNUS BAILEYI	BAILEY'S RED-TWIG DOGWOOD	22"-30" HT./W.	CONT.	DENSE, FULL
CCS	6	COTINUS COGGYGRIA	SMOKE TREE	4-5' HT.	CONT.	TREE FORM
HQ	6	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	22"-30" HT./W.	CONT.	DENSE, FULL
ICB	57	ILEX CORNUTA 'BURFORDII'	BURFORD CHINESE HOLLY	18"-24" HT./W.	CONT.	DENSE, FULL
IW	11	ILEX VERTICILLATA	WINTERBERRY	18"-24" HT./W.	CONT.	DENSE, FULL
IB2	12	ILEX VOMITORIA 'BORDEAUX'	BORDEAUX HOLLY	18"-24" HT./W.	CONT.	DENSE, FULL
IV	3	ITEA VIRGINICA 'HENRY'S GARNET'	HENRY'S GARNET SWEETSPIRE	22"-30" HT./W.	CONT.	DENSE, FULL
LB	24	LOROPETALUM CHINENSE RUBRUM 'BURGUNDY'	BURGUNDY LOROPETALUM	18"-24" HT./W.	CONT.	DENSE, FULL
MC2	12	MUHLENBERGIA CAPILLARIS	PINK MUHLY	15"-18" HT./W.	CONT.	DENSE, FULL
MC	44	MYRICA CERIFERA	WAX MYRTLE	18"-24" HT./W.	CONT.	DENSE, FULL
OG	6	OSMANTHUS HETEROPHYLLUS 'GULFTIDE'	GULFTIDE OSMANTHUS	22"-30" HT./W.	CONT.	DENSE, FULL
VM2	12	VIBURNUM DENTATUM 'BLUE MUFFIN'	SOUTHERN ARROWWOOD	22"-30" HT./W.	CONT.	DENSE, FULL
VAC	27	VITEX AGNUS-CASTUS	CHASTE TREE	4-5' HT.	CONT.	TREE FORM



DECIDUOUS TREE PLANTING

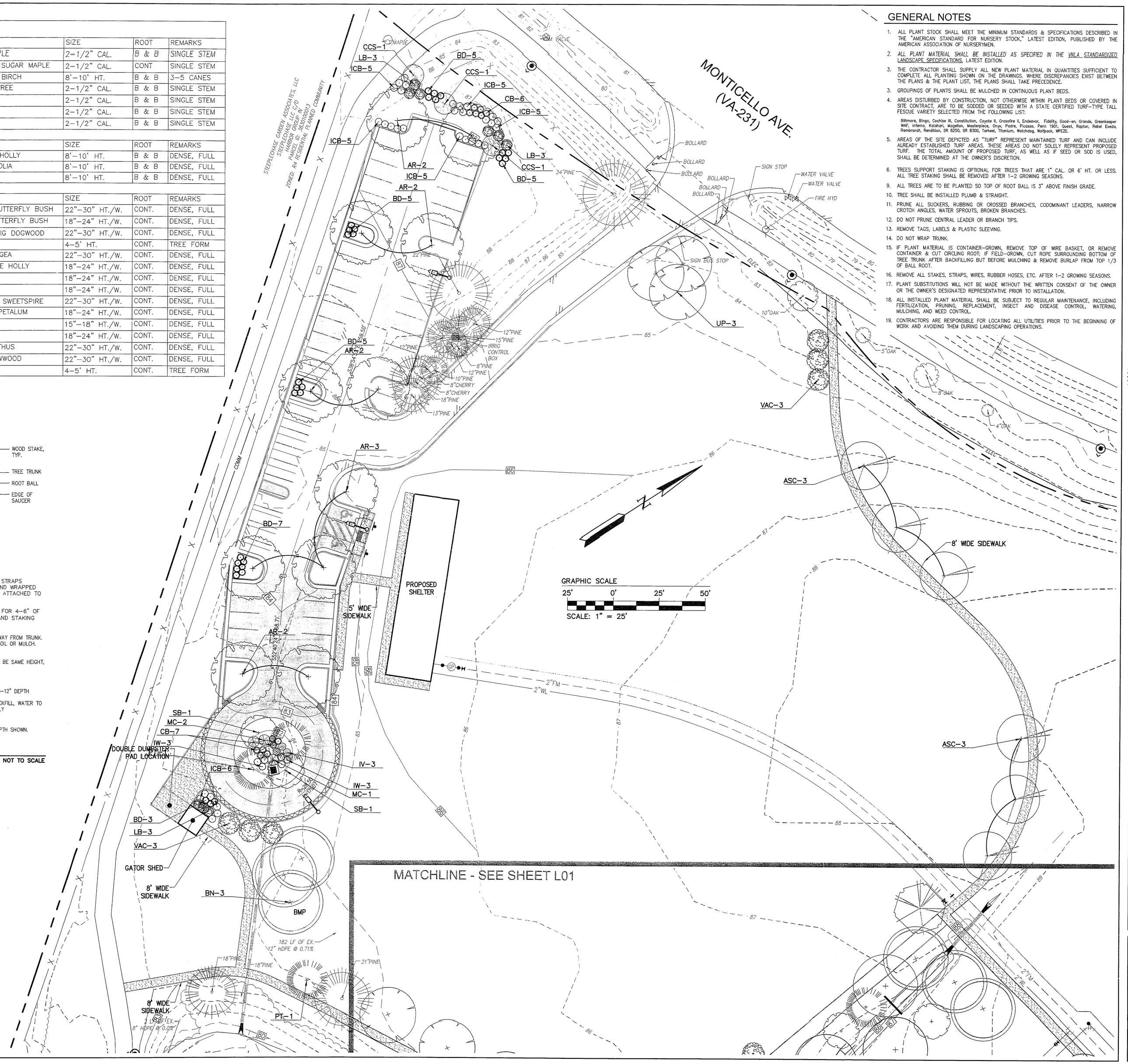
NOT TO SCALE



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

SHRUB PLANTING

NOT TO SCALE



GENERAL NOTES

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

   Biltmore, Bingo, Cochise III, Constitution, Coyote II, Crossfire II, Endeavor, Fidelity, Good-en, Grande, Greenkeeper WAF, Inferno, Kalahari, Magellan, Masterpiece, Onyx, Padre, Picasso, Penn 1901, Quest, Raptor, Rebel Exeda, Rembrandt, Rendition, SR 8250, SR 8300, Tarheel, Titanium, Watchdog, Wolfpack, WPE2E.
5. AREAS OF THE SITE DEPICTED AS "TURF" REPRESENT MAINTAINED TURF AND CAN INCLUDE ALREADY ESTABLISHED TURF AREAS. THESE AREAS DO NOT SOLELY REPRESENT PROPOSED TURF. THE TOTAL AMOUNT OF PROPOSED TURF, AS WELL AS IF SEED OR SOD IS USED, SHALL BE DETERMINED AT THE OWNER'S DISCRETION.
6. TREES SUPPORT STAKING IS OPTIONAL FOR TREES THAT ARE 1" CAL. OR 6' HT. OR LESS. ALL TREE STAKING SHALL BE REMOVED AFTER 1-2 GROWING SEASONS.
9. ALL TREES ARE TO BE PLANTED SO TOP OF ROOT BALL IS 3" ABOVE FINISH GRADE.
10. TREE SHALL BE INSTALLED PLUMB & STRAIGHT.
11. PRUNE ALL SUCKERS, RUBBING OR CROSSED BRANCHES, CODOMINANT LEADERS, NARROW CROTCH ANGLES, WATER SPROUTS, BROKEN BRANCHES.
12. DO NOT PRUNE CENTRAL LEADER OR BRANCH TIPS.
13. REMOVE TAGS, LABELS & PLASTIC SLEEVING.
14. DO NOT WRAP TRUNK.
15. IF PLANT MATERIAL IS CONTAINER-GROWN, REMOVE TOP OF WIRE BASKET, OR REMOVE CONTAINER & CUT CIRCLING ROOT; IF FIELD-GROWN, CUT ROPE SURROUNDING BOTTOM OF TREE TRUNK AFTER BACKFILLING BUT BEFORE MULCHING & REMOVE BURLAP FROM TOP 1/3 OF BALL ROOT.
16. REMOVE ALL STAKES, STRAPS, WIRES, RUBBER HOSES, ETC. AFTER 1-2 GROWING SEASONS.
17. PLANT SUBSTITUTIONS WILL NOT BE MADE WITHOUT THE WRITTEN CONSENT OF THE OWNER OR THE OWNER'S DESIGNATED REPRESENTATIVE PRIOR TO INSTALLATION.
18. ALL INSTALLED PLANT MATERIAL SHALL BE SUBJECT TO REGULAR MAINTENANCE, INCLUDING FERTILIZATION, PRUNING, REPLACEMENT, INSECT AND DISEASE CONTROL, WATERING, MULCHING, AND WEED CONTROL.
19. CONTRACTORS ARE RESPONSIBLE FOR LOCATING ALL UTILITIES PRIOR TO THE BEGINNING OF WORK AND AVOIDING THEM DURING LANDSCAPING OPERATIONS.

Rev.	Date	Description	Reviewed By
1	11/29/12	CHANGES PER OWNER - PHASING	GVC

VIRGINIA LICENSED LANDSCAPE ARCHITECT
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11/29/12

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MID COUNTY PARK
SITE UPGRADES

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts: GVC
Project Number: W10119-E-19
Scale: 1" = 25'
Date:
Sheet Title: LANDSCAPE
Sheet Number: L02