



## CERTIFICATE OF AUTHENTICITY

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

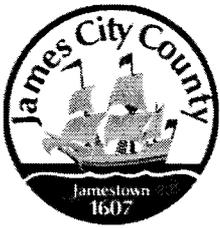
**BMP NUMBER:** PC143

**DATE VERIFIED:** October 3, 2012

**QUALITY ASSURANCE TECHNICIAN:** Leah Hardenbergh

*Leah Hardenbergh*

**LOCATION:** WILLIAMSBURG, VIRGINIA



# Stormwater Division

## MEMORANDUM

**DATE:** March 13, 2010  
**TO:** Michael J. Gillis, Virginia Correctional Enterprises Document Management Services  
**FROM:** Jo Anna Ripley, Stormwater  
**PO:** 270712  
**RE:** Files Approved for Scanning

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**General File ID or BMP ID:** PC143

**PIN:** 3740100002

**Subdivision, Tract, Business or Owner**

**Name (if known):**

Powhatan Secondary

**Property Description:**

Conservation Easement

**Site Address:**

*(For internal use only)*

**Box** 4

**Drawer:** 3

**Agreements: (in file as of scan date)**

N

**Book or Doc#:**

**Page:**

Comments

**James City County, Virginia  
Environmental Division**

**Stormwater Management/BMP Facilities  
Record Drawing/Construction Certification  
Review Tracking Form**

County Plan No.: S-50-98  
 Project Name: POWHATAN Woods Phase I  
 Stormwater Management Facility: Large Timber Crib Wall  
 Phase:  I  II  III

Information Received. Date: MAY 21 '02 LANOMARK  
 Administrative Check.  
 Record Drawing. Date: date 5/29/02 LANOMARK; Cert (RD, R-2  
 Construction Certification. Date: yes sheet R-1 unsigned  
 RD/CC Standard Forms (Required after Feb 1<sup>st</sup> 2001 Only)  
 Insp/Maint Agreement. Info: Centex / m # 980019413 OCT 8 1998  
 BMP Maintenance Plan. Location: NO  
 Other: \_\_\_\_\_

Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.  
 Yes  No. Location: Note #18 Sheet C-17; ENV Comm #5 7/7/98  
 Assign County BMP ID Code. Code: PC 143

Log into Division's "As-Built" Tracking Log  
 Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)  
 Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)  
 Active Project File Review (correspondence, H&H, etc.)  
 Initial As-Built File setup (label, copy hydraulics, BMP information, etc.)  
 Inspector Check of RD/CC.  
 Pre-Inspection Drawing Review - Approved Plan (Quick look prior to field inspection).  
 Final Inspection (FI) Performed. Date: 7/31/02  
 Record Drawing (RD) Review. Date: 7/31/02  
 Construction Certification (CC) Review. Date: 7/31/02

Actions:  
 No comments.  
 Comments. Letter Forwarded. Date: 8/01/02  
 Record Drawing (RD)  
 Construction Certification (CC)  
 Construction-Related (CR)  
 Site Issues (SI)  
 Other: \_\_\_\_\_

*Note: Specific CASC Approval of Architect certified Allowed.*

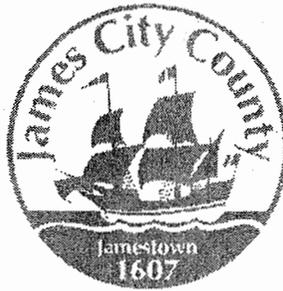
Second Submission: RD Sept 18 2002 Approved; cc OK  
 Third Submission: Resubmit 9-27-05 ok!  
 Acceptable for stormwater management facility purposes (RD/CC/CR/Other). Proceed with bond release.  
 Notify Darryl/Joan/Pat of acceptability using email (preferred), form or verbal.  
 Check/Clean active 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.  
 Digital Photographs obtained.  
 Add to JCC Hydrology & Hydraulic database (optional).

*CODE ZONING / SSVB  
AT END.  
RAILING / SSVB.*

BMP Certification Information Acceptable

Plan Reviewer: [Signature]

Date: 9-28-05



James City County, Virginia  
Environmental Division

Stormwater Management / BMP Facilities  
Record Drawing and Construction Certification Forms

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

Section 1 - Site Information:

Project Name: Powhatan Woods BMP  
Structure/BMP Name: Timber Dam  
Project Location: Powhatan Woods Subdivision  
BMP Location: Along Project perimeter adjacent to SR 5000 and upstream of culvert at tributary to Powhatan Cree  
County Plan No.: S - 50 - 98

Project Type:  Residential  Business Tax Map/Parcel No.: 3830100009  
 Commercial  Office BMP ID Code (if known): PC-143  
 Institutional  Industrial Zoning District: R-4  
 Public  Roadway Land Use: Planned Community  
 Other Site Area (sf or acres): 52.2635 ac.

Brief Description of Stormwater Management/BMP Facility: Timber sheet pile dam with integral pedestrian deck. Principal spillway is CMP riser & barrel.

Nearest Visible Landmark to SWM/BMP Facility: SR 5000

Nearest Vertical Ground Control ( if known ):  JCC Geodetic Ground Control  USGS  Temporary  Arbitrary  Other  
Station Number or Name: 322  
Datum or Reference Elevation: NGV (1929) EL=65.61'  
Control Description: JCC Geodetic Control Monument  
Control Location from Subject Facility: Approximately 2500' easterly along Monticello Avenue (SR5000) and 600' northerly along Powhatan Secondary.

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

PreConstruction Meeting Held for Construction of SWM/BMP Facility:  Yes  No  Unknown  
Approx. Construction Start Date for SWM/BMP Facility: November 2001  
Facility Monitored by County Representative during Construction:  Yes  No  Unknown  
Name of Site Work Contractor Who Constructed Facility: Virginia Marine Structures  
Name of Professional Firm Who Routinely Monitored Construction: LandMark Design Group  
Date of Completion for SWM/BMP Facility: May 2002  
Date of Record Drawing/Construction Certification Submittal: May 2002

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

**Section 3 - Owner / Designer / Contractor Information:**

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

Name: Centex Homes  
Mailing Address: 213 Riverwalk Parkway Suite 101  
Chesapeake, VA 23320  
Business Phone: 757-312-9660 Fax: 757-312-0861  
Contact Person: Eric Markowski Title: Project Manager

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: Langley and McDonald, P.C.  
Mailing Address: 4029 Ironbound Road, Suite 100  
Williamsburg, VA 23188  
Business Phone: 757-253-2975  
Fax: 757-229-0049  
Responsible Plan Preparer: Stephen A. Romeo / Willard E. Gwilliam  
Title: Surveyor / Architect  
Plan Name: Timber Dam Control Structure  
Firm's Project No. 1980019-000.99  
Plan Date: July 14, 1998  
Sheet No.'s Applicable to SWM/BMP Facility: C18 / C19 / C20 / \_\_\_ / \_\_\_

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

Name: Virginia Marine Structures, Inc.  
Mailing Address: 5021 Broad Street  
Virginia Beach, VA 23462  
Business Phone: 757-497-7880  
Fax: 757-497-7764  
Contact Person: Ben Deloiser  
Site Foreman/Supervisor: Ben Deloiser  
Specialty Subcontractors & 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: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
\_\_\_\_\_  
Business Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_  
  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
  
Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

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

*See Drawings  
R-1, R-2 & R-3*

\_\_\_\_\_ ( Seal )  
Virginia Registered Professional Engineer  
or Certified Land Surveyor

**Construction Certification**

Firm Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
\_\_\_\_\_  
Business Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_  
  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
  
Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

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

*See Drawings  
R-1, R-2 & R-3*

\_\_\_\_\_ ( Seal )  
Virginia Registered  
Professional Engineer

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

- PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.
- A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.
- The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.
- Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.
- Record Drawing and Construction Certifications are required within **thirty (30) days** of the completion of Stormwater Management / BMP facility construction. Submittals must be reviewed and accepted by James City County Environmental Division prior to final inspection, acceptance and bond/surety release.

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

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

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

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

- Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*
- Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate "**RECORD DRAWING**" in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, *or similar forms thereof*, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducible.
- Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as \*.dxf, \*.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

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

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

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

- XX 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.
- XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.
- XX 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).
- XX 4. All 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.
- N/A 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.
- N/A 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.
- N/A 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.
- N/A 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.
- INC 20. BMP vicinity properly cleaned of stockpiles and construction debris.
- XX 21. No visual signs of erosion or channel degradation immediately downstream of facility.
- N/A 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. )

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

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

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

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

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

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

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

**V.    Group C - Infiltration Practices**    ( Includes C-1 Infiltration Trench; C-2 Infiltration Trench;  
C-3 Infiltration Basin; and C-4 Infiltration Basin )

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

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

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

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

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

**STORMWATER MANAGEMENT / BMP FACILITIES  
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 )**

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

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

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

**VIII. Group F - Extended Dry Detention**    ( Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay )

- 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.
- XX F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)
- N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.
- N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.
- N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.
- N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.
- XX 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.
- XX F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
- XX F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
- XX 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.
- XX 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 )**

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

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

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

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

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

- 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.

**XII.    Other Systems**

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

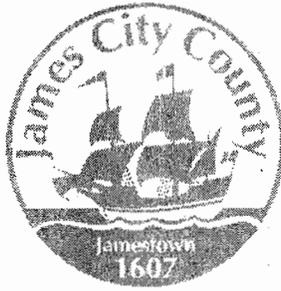
- N/A O1. All requirements of Section II, Minimum Standards, apply to this section.
- N/A O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

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

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

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

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James City County, Virginia  
Environmental Division

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

*Standard Forms & Instructions*

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<u>Contents</u>	<u>Page</u>
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*Issue Date  
February 1, 2001*

**Record Drawing/Construction Certification Submittal for a BMP Facility**

Date:

6/25/02

Inspector:



Pat Menichino



Gerry Lewis



Beth Davis



Mike Woolson



Joe Buchite



Other: \_\_\_\_\_

Project:

POWHATAN WOODS PHASE I

BMP Facility:

TIMBER CRIB WALL (LARGE)

Plan No.

S-50-98

BMP ID Code:

PC 143

I have received a transmittal for a  Record Drawing and  Construction Certification for the above referenced facility on MAY 24 '02. Prior to full engineering review of these items and a field inspection, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw in the field. Please review the drawing and return to me promptly so I can proceed with the review for certification purposes.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and will make comment in the following areas: Record Drawing (RD), Construction Certification (CC) and Construction-Related (CR) punch list items. If you have any other related non-BMP site issues such as erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, I can easily add these items to any comment letter that I may forward to the Owner/Engineer. Let me know if any outstanding site issues remain.

If I don't hear from you I will ask you if any other outstanding issues remain before I forward any letters to the Owner/Engineer.

Scott

**THIS IS ONLY COPY OF  
AS BUILT. RETURN TO ME**

SWMPProg\BMP\ConInsp\Insp.trans

# LANDMARK DESIGN GROUP TRANSMITTAL

To: Scott J. Thomas, P.E.  
 Company: James City County - Environmental Division  
 From: Stephen A. Romeo, L.S.  
 Date: May 23, 2002  
 Subject: Powhatan Woods Timber Structure BMP



LMDG Job No.: 1980019-000.23

*PC 143; S-50-98*

Attached please find:

- Prints
- Plans
- Specifications
- Drawings
- Report
- Letter
- 

Transmitted as checked below:

- For your use
- As requested
- For review and comment
- For approval
- Approved
- 

Copies	Date	Drawing No.	Description
1	05/23/02	N/A	Record Drawing and Construction Certification

Notes:

Copies

1. File: 1980019-000.23
2. Eric Markowski, Centex Homes
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

Enclosures

- 
- 
- 
- 
- 

LandMark Design Group, Inc.

By: T. Penci

Engineers ♦ Planners ♦ Surveyors ♦ Landscape Architects ♦ Environmental Consultants  
 4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgwb.com

# Powhatan Woods Timber Structure BMP

## Record Drawing and Construction Certification

May 23, 2002

S-50-98  
PC143



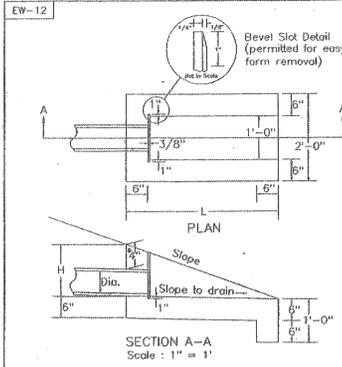
Project #1980019-000.23

**LANDMARK**  
**DESIGN GROUP**  
Engineers • Planners • Surveyors  
Landscape Architects • Environmental Consultants

**OWNER:**  
Centex Homes  
213 Riverwalk Parkway  
Suite 101  
Chesapeake, Virginia 23320

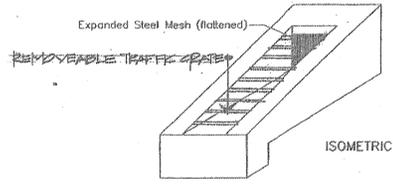






NOTES:  
 Typical endwall to be placed at the ends of all underdrain outlets. Endwall to be installed perpendicular to roadway and flush with the slope.  
 Concrete quantities shown are based on 6" Class III concrete pipe. The 4" dimension and concrete quantities will vary if 4" pipe, 8" pipe or other types of pipe are used.  
 Outlet pipes shall be rigid nonperforated, smooth-bore pipe, meeting the requirements of AASHTO M-252. If vitrified clay pipe is used, all joints shall be in accordance with ASTM C-443.  
 Expanded steel mesh (flattened) shall have openings of approx. 1/2"x1" and weigh approx. 0.82 per sq. ft. Mesh shall be galvanized in accordance with ASTM A-123. The mesh shall extend a minimum of 1" above the O.D. of the pipe, and is a barrier for rodents, etc. The slot for the steel mesh is to be constructed so that the mesh can be removed for cleanout purposes.  
 This item may be precast or cast in place.

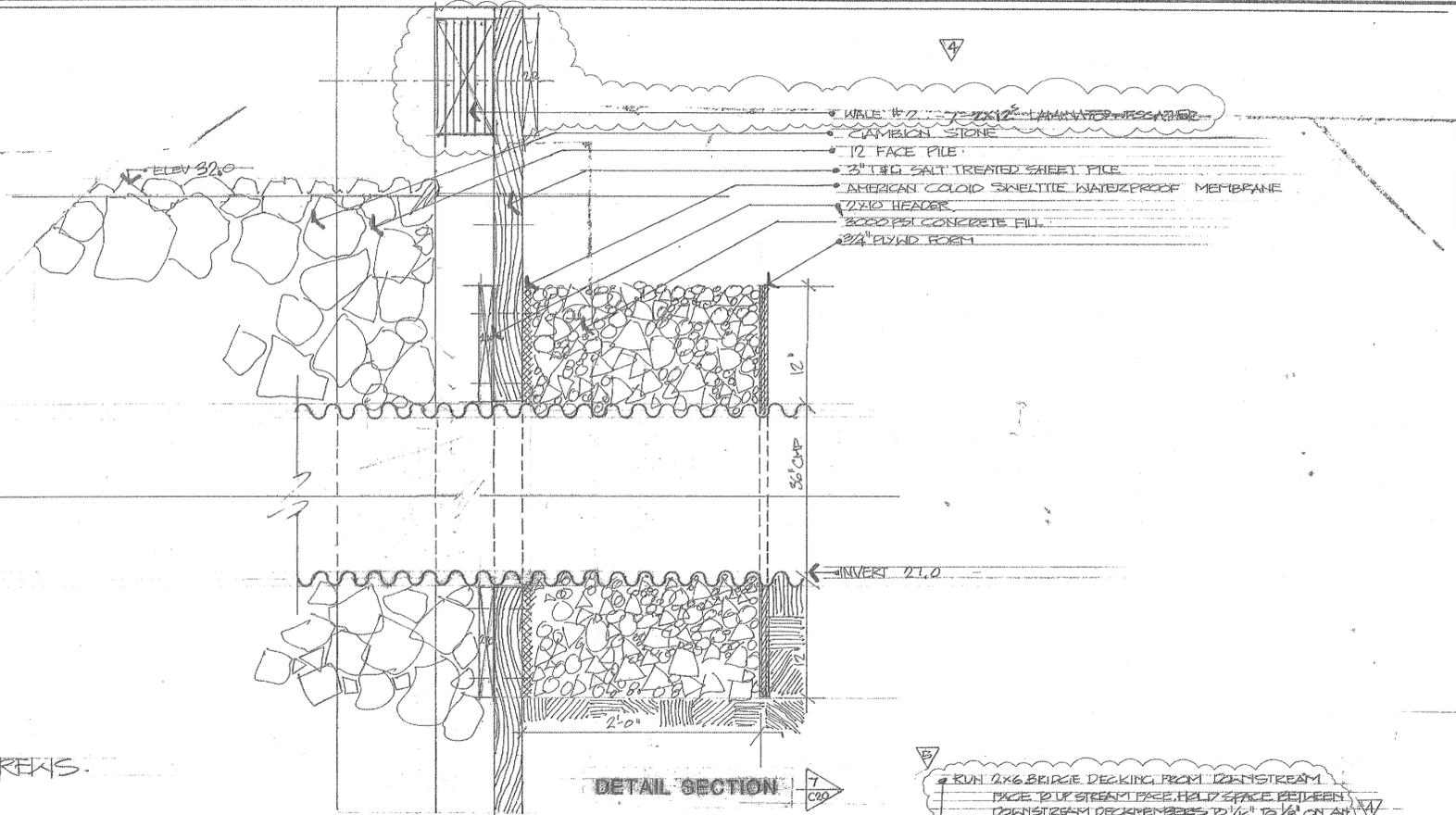
PIPE DIA.	SLOPE	DIMENSIONS		CLASS A3 CONCRETE CU. YD.
		L	H	
4"	0.5%	2'-5 1/2"	1'-2 3/4"	0.17
6"	0.5%	2'-5 1/2"	1'-2 3/4"	0.20
8"	0.5%	2'-10 1/2"	1'-5 1/4"	0.21
10"	0.5%	3'-3 3/4"	1'-3 3/4"	0.35



STANDARD ENDWALL FOR PIPE UNDERDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

Rev. 2-92  
 SPECIFICATION REFERENCE:  
 103  
 233  
 292



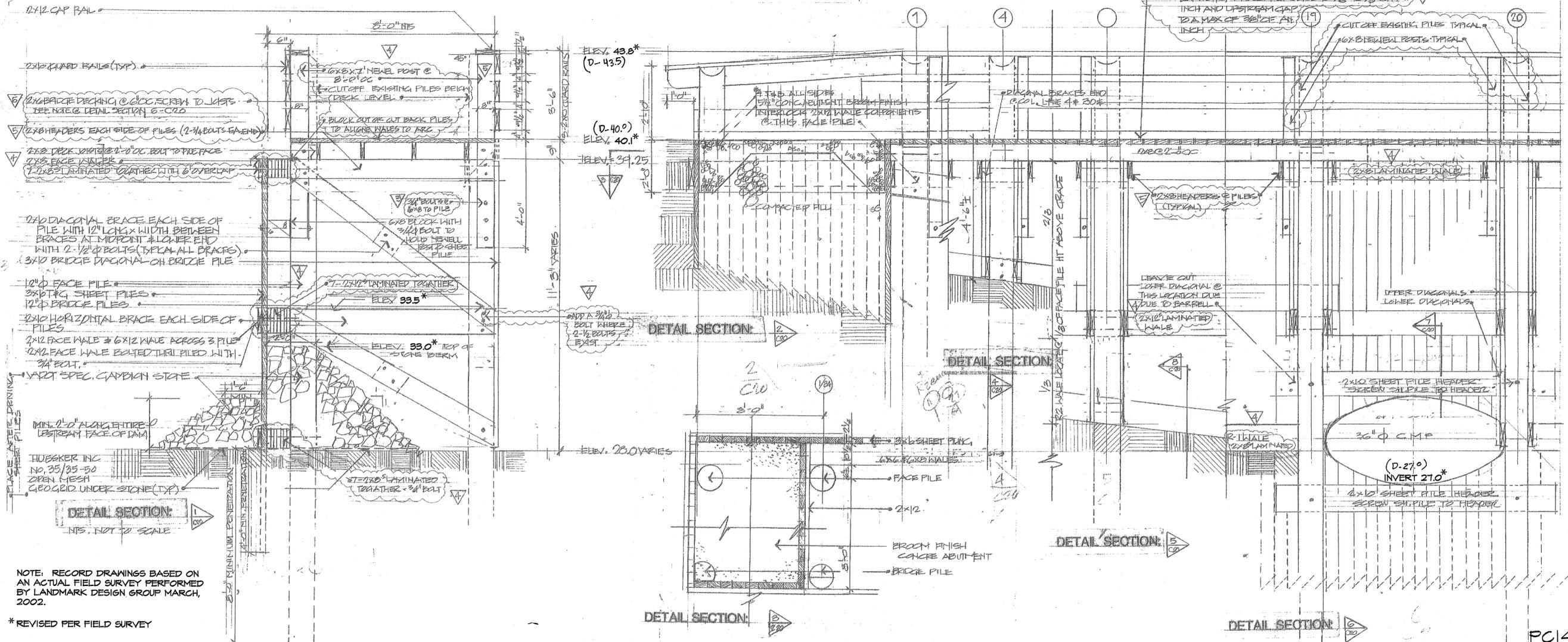
REVISED 1-08-02  
 REVISED 12-07-01  
 REVISED 4-27-99  
 REVISED 4-30-98  
 REVISED 8-25-98



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 Norfolk, VA 23462  
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 Fax: (757) 497-7833  
 Email: info@landmarkdg.com

**LANDMARK DESIGN GROUP**  
 Engineers • Planners • Surveyors  
 Landscape Architects • Environmental Scientists

ALL WOOD SALT TREATED GROUND CONTACT GALVANIZED BOLTS & SCREWS.



No.	Date	REVISIONS:	By

RECORD DRAWING  
 TIMBER DAM CONTROL STRUCTURE  
 POWHATAN WOODS  
 JAMES CITY COUNTY  
 VIRGINIA

Designed: WEG Date: 4/22/02  
 Checked: SAR Scale: 1"=10'  
 File Mgr./Drawn: LFV CADD File name: REC3-TIMBER  
 Project Number: 198019-000.23 Dwg. File No.: 13215W  
 Drawing Number: R-3  
 3 OF 3

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



Channel Design	Slope Design	Outfall
Channel Design From Rule (R)   Velocity (V)   Gravity Channel Slope (S)   Channel Length (L)   Channel Depth (D)	Slope Design From Rule (R)   Velocity (V)   Gravity Channel Slope (S)   Channel Length (L)   Channel Depth (D)	Outfall From Rule (R)   Velocity (V)   Gravity Channel Slope (S)   Channel Length (L)   Channel Depth (D)
Manning's Coefficient: 0.030 Channel Slope: 0.019100 Depth: 2.00 Left Side Slope: 1.000000 Right Side Slope: 1.000000 Bottom Width: 2.50 Discharge: 65.85 cfs	Manning's Coefficient: 0.030 Channel Slope: 0.019100 Depth: 2.00 Left Side Slope: 1.000000 Right Side Slope: 1.000000 Bottom Width: 2.50 Discharge: 65.85 cfs	Manning's Coefficient: 0.030 Channel Slope: 0.019100 Depth: 2.00 Left Side Slope: 1.000000 Right Side Slope: 1.000000 Bottom Width: 2.50 Discharge: 65.85 cfs

**DRY DETENTION BASIN:**

**PARTIAL DETAIL ELEVATION A-A**

CUTOUT EVERY 3RD SHEET PILE AROUND OBSERVATION PLATFORM BETWEEN WALES 162 AND 163 AS SHOWN TO CAUSE SHEET PILES TO ACT AS A TRASH RACK.  
 DOUBLE 2x10 DIAGONALS ON INSIDE FACE OF FACE PILES - BOTTOM 2 - 3/4 BOLTS (TOP & BOTTOM)  
 OBSERVATION DECK OVER 10'x10' BMP BASE WITH (NOT INSTALLED) \* TRASH RACK BACK AND FRONT DECKS WITH 1/2" WIDE COVER.  
 12x21 LOCKABLE HINGED ACCESS HATCH IN DECK ABOVE RISER.  
 1/2" x 1/2" x 1/2" WITH GRATE FOR 2" CMP PIPE SEE DETAIL SH. C-19 INVERT ELEV. 27.38\*

**STILLING BASIN**

STD. ES-1  
INV. = 28.65\*

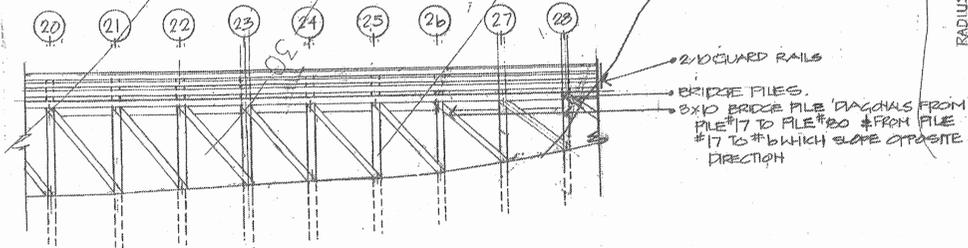
STORM MH (84" DIA.)  
RIM = 41.76\*  
INV. IN = 28.34\*  
INV. OUT = 28.20\*

STORM MH (60" DIA.)  
RIM = 41.08\*  
INV. IN = 28.92\*  
INV. OUT = 28.72\*

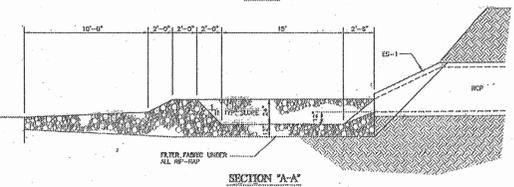
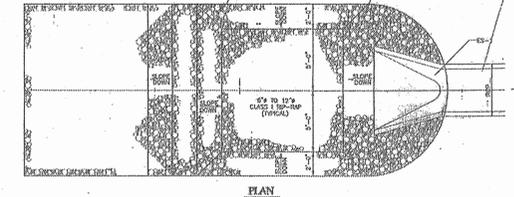
SINGLE DIAGONAL BRACE OF 2-2x10-1EA SIDE OF PILE 17X BRIDGE PILES 3x6 TAG SHEET PILES  
 WALES 162 TO 163 - 1EA SIDE OF PILE 17X BRIDGE PILES 12x16 FACE PILES 12x16 BRIDGE PILES  
 CON. ABUTMENT SEE DETAIL

**PLAN OF BRIDGE DAM**

80'-TRM LINED CHANNEL @ 0.191% LINE CHANNEL WITH "SYNTHETIC INDUSTRIES PYRAMAT" (OR EQUAL) TURF REINFORCED MAT.  
**2H:1V SIDE SLOPES**

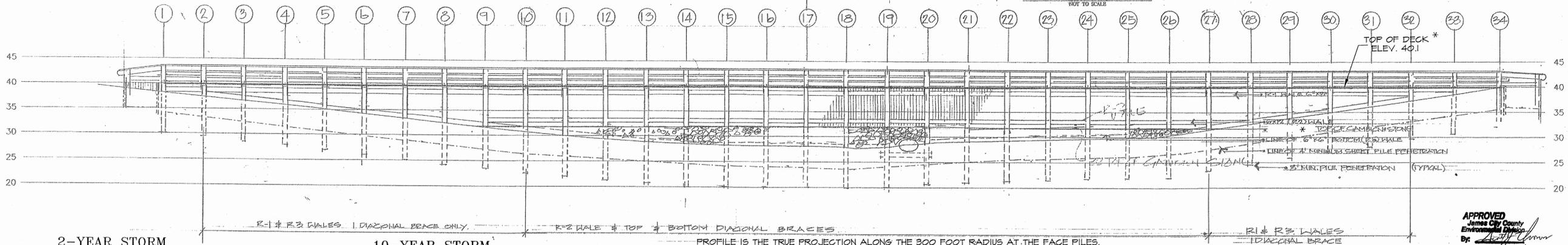


**PARTIAL DIRECT PROJECTION ALONG THE CORD BETWEEN ABUTMENTS**



**STILLING BASIN DETAIL**

THIS STORM DRAINAGE SYSTEM TO BE CONSTRUCTED BY THE TRANSPORTATION IMPROVEMENT DISTRICT AS PART OF MONTICELLO AVENUE EXTENDED CONSTRUCTION PROJECT.

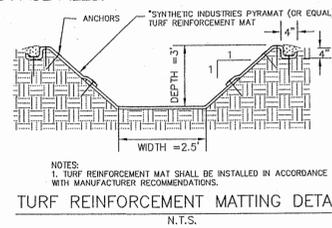
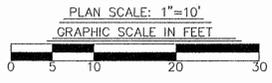


**2-YEAR STORM**

**10-YEAR STORM**

Worksheet: Timber Dam Outfall		Manning's Formula	
Solve for: Channel Depth		Flow Area: 1.53 ft <sup>2</sup>	
Manning's Coefficient: 0.030		Wetted Perimeter: 3.94 ft	
Channel Slope: 0.019100	R/H	Top Width: 3.52 ft	
Depth: 0.51	H/V	Critical Depth: 0.90 ft	
Left Side Slope: 1.000000	H/V	Critical Slope: 0.020183	R/H
Right Side Slope: 1.000000	H/V	Velocity: 3.65 ft/s	
Bottom Width: 2.50	ft	Velocity Head: 0.21 ft	
Discharge: 65.85	cfs	Specific Energy: 0.72 ft	
		Froude Number: 0.97	
		Flow is subcritical	

Worksheet: Timber Dam Outfall		Manning's Formula	
Solve for: Channel Depth		Flow Area: 9.01 ft <sup>2</sup>	
Manning's Coefficient: 0.030		Wetted Perimeter: 8.16 ft	
Channel Slope: 0.019100	R/H	Top Width: 6.50 ft	
Depth: 2.00	H/V	Critical Depth: 2.10 ft	
Left Side Slope: 1.000000	H/V	Critical Slope: 0.015792	R/H
Right Side Slope: 1.000000	H/V	Velocity: 7.31 ft/s	
Bottom Width: 2.50	ft	Velocity Head: 0.83 ft	
Discharge: 65.85	cfs	Specific Energy: 2.83 ft	
		Froude Number: 1.10	
		Flow is supercritical	



NOTE: RECORD DRAWINGS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP MARCH, 2002.  
 \* REVISED PER FIELD SURVEY

APPROVED  
 James City County  
 Environmental Division  
 By: [Signature]  
 Date: 1/10/02



544 Creech on Road  
 Virginia Beach, VA 23462  
 Tel: 757-435-2000  
 Fax: 757-435-2000  
 Email: info@landmarkdesign.com

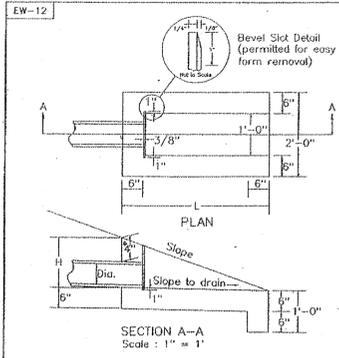
**LANDMARK DESIGN GROUP**  
 Engineers, Planners, Surveyors  
 Landscape Architects, Environmental Scientists

REV. NO.	DATE	BY	REVISIONS
1	08/17/02	WEG	REVISED OUTFALL CHANNEL

RECORD DRAWING  
 TIMBER DAM CONTROL STRUCTURE  
 POWHATAN WOODS  
 JAMES CITY COUNTY  
 VIRGINIA

Designed: WEG Date: 4/22/02  
 Checked: SAR Scale: 1"=10'  
 File Mgr./Drawn: CADD File name: REC1-TIMBER  
 LFV  
 Project Number: 190019-000-23 13217W  
 Drawing Number





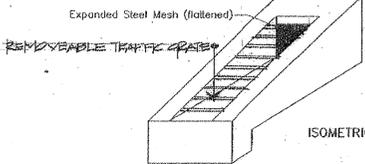
NOTES:

Typical endwall to be placed at the ends of all underdrain outlets. Endwall to be installed perpendicular to roadway and flush with the slope.

Concrete quantities shown are based on 6" Class III concrete pipe. The 4" dimension and concrete quantities will vary if 4" pipe, 8" pipe or other types of pipe are used.

Outlet pipes shall be rigid nonperforated, smooth-bore pipe, meeting the requirements of AASHTO M-252. If vitrified clay pipe is used, all joints shall be in accordance with ASTM C-443.

This item may be precast or cast in place.

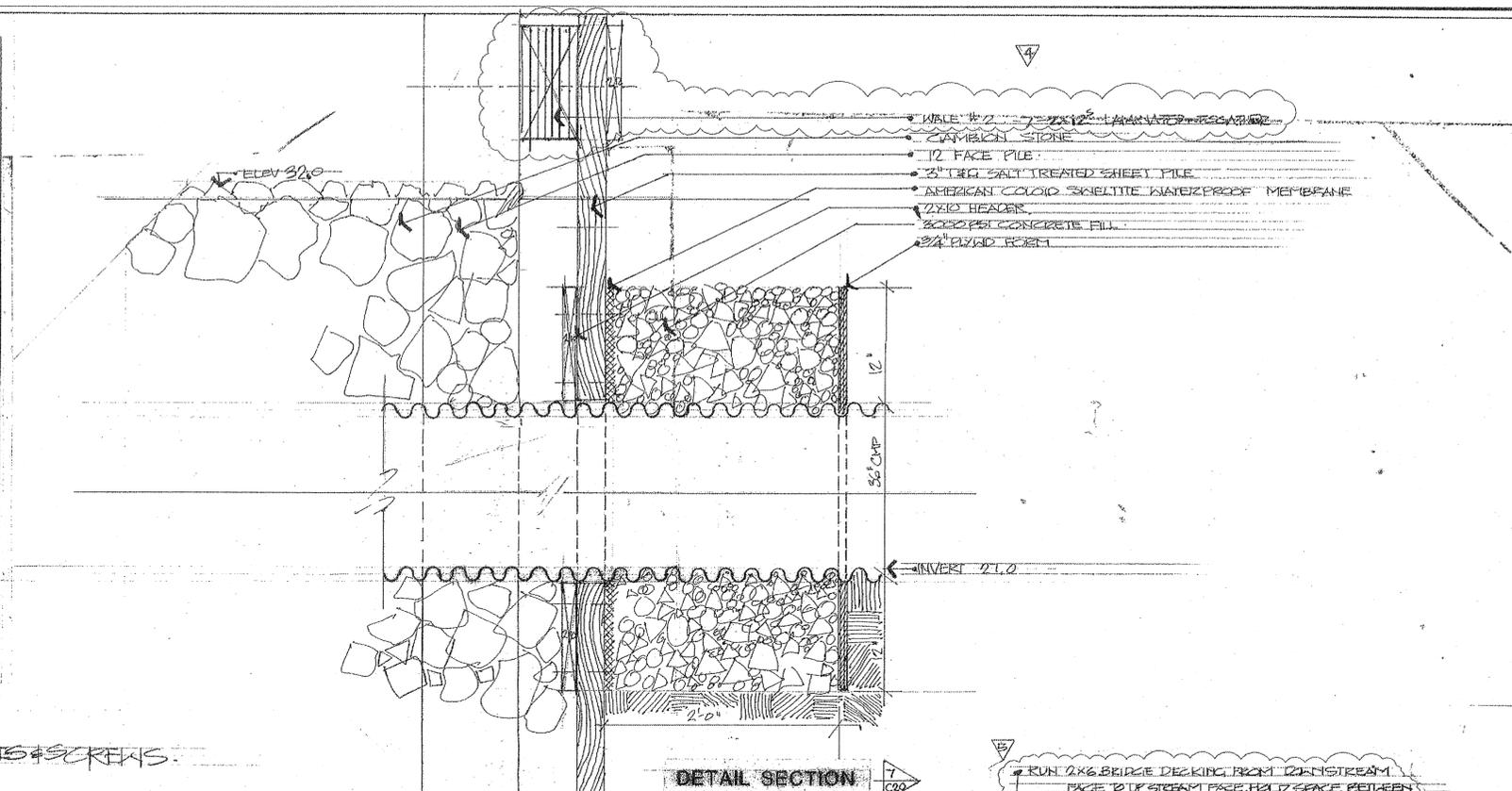


PIPE DIA.	SLOPE	DIMENSIONS		CLASS A3 CONCRETE CU. YD.
		L	H	
4"	2:1	2'-6 1/2"	1'-2 3/4"	0.17
6"	4:1	4'-5"	1'-3 1/4"	0.28
8"	2:1	2'-10 1/2"	1'-5 1/4"	0.21
8"	4:1	3'-3"	1'-3 3/4"	0.35

STANDARD ENDWALL FOR PIPE UNDERDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

Rev. 2-92  
SPECIFICATION REFERENCE  
103  
323  
302



COMMONWEALTH OF VIRGINIA  
W.E. C. [Signature]  
CERTIFICATE NO. 06688  
REVISED 1-08-02  
REVISED 12-07-01  
REVISED 4-27-09  
REVISED 4-30-06  
REVISED 8-25-05

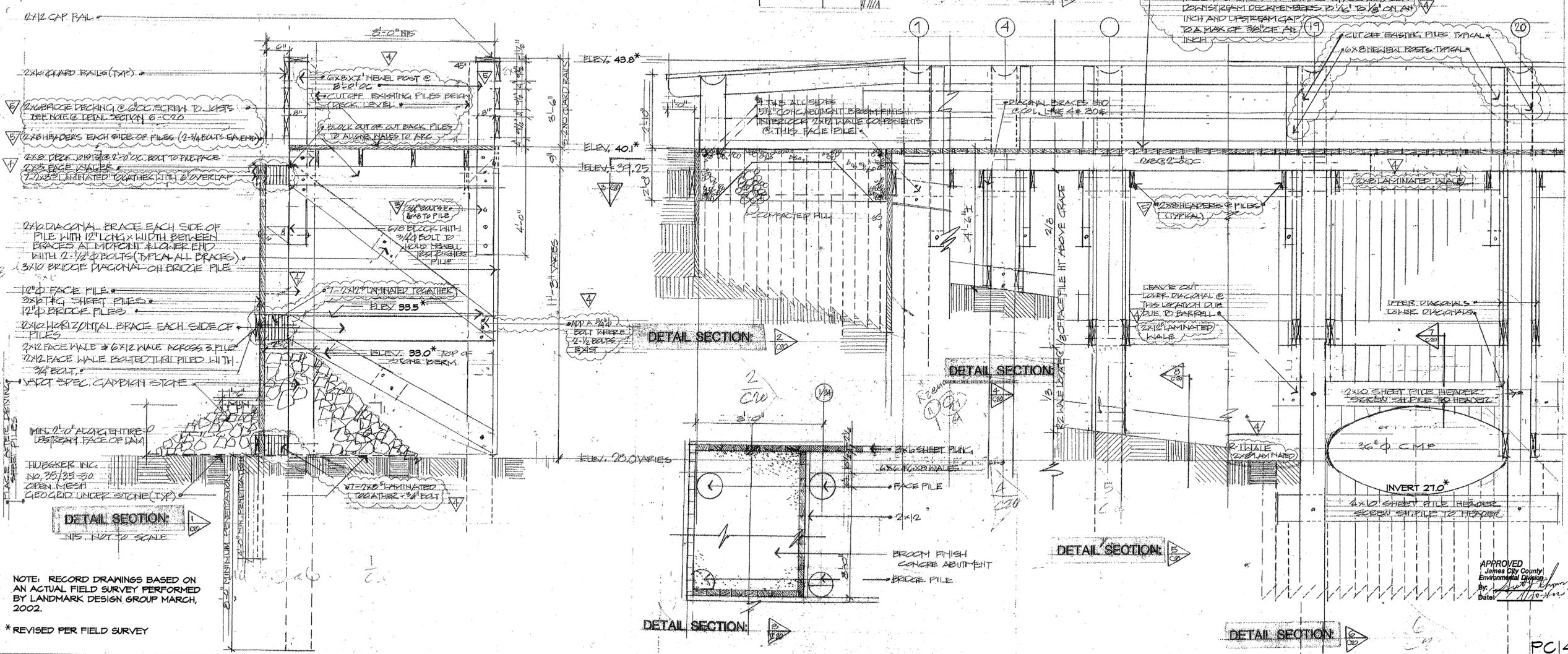
COMMONWEALTH OF VIRGINIA  
5-22-01  
STEPHEN A. ROMEO  
NO. 1448-B  
[Signature]  
AND SURVEYOR

5544 Greenleaf Road  
Suite 200  
Farmingdale, VA 23462  
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Fax: (757) 487-7833  
Email: info@landmarkdesign.com

4028 Ingham Road  
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Farmingdale, VA 23462  
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Email: info@landmarkdesign.com

**LANDMARK DESIGN GROUP**  
Engineers - Planners - Surveyors  
Landscape Architects - Environmental Scientists

ALL WOOD SALT TREATED GROUND CONTACT GALVANIZED BOLTS & SCREWS.



NOTE: RECORD DRAWINGS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP MARCH, 2002.

\* REVISED PER FIELD SURVEY

APPROVED  
James City County  
Environmental Division  
By: [Signature]  
Date: 7/17/09

DRAWING STATUS	No.	Date	REVISIONS:	
			By	Comment
Interface Review				
Client for Review				
Pre Approval Bidding				
COUNTY APPROVAL				
1st Submitted				
2nd Submitted				
3rd Submitted				
Approved				

RECORD DRAWING  
TIMBER DAM CONTROL STRUCTURE  
POWHTAN WOODS  
JAMES CITY COUNTY  
VIRGINIA

Designed: WEG Date: 4/22/02  
Checked: SAR Scale: 1"=10'  
File Mgr./Drawn: LFV CADD File name: REC3-TIMBER  
Project Number: 198019-000.23 Dwg. File No.: 13215W  
Drawing Number

PC143

R-3  
3 of 3

DRAINAGE AREA RIDGE LINE (TYP)

POWHATAN RECREATION SITE

POWHATAN SECONDARY

POWHATAN OF WILLIAMSBURG SECONDARY - PHASE III

FUTURE DEVELOPMENT

CONSERVATION EASEMENT

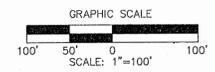
CONSERVATION EASEMENT

140' R/W

MONTICELLO AVE. EXTENDED

LEGEND

-  DRAINAGE STRUCTURE NUMBER
-  DRAINAGE AREA
-  RUNOFF COEFFICIENT



Langley and McDonald, P.C.

Engineers • Surveyors • Planners  
Landscape Architects • Environmental Consultants

VIRGINIA BEACH WILLIAMSBURG

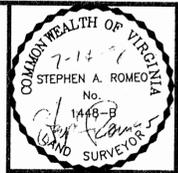


DES.	LMP
DWN.	LMP
CHK.	
DATE	JUNE 5, 1998

DRAINAGE AREA MAP  
POWHATAN WOODS

PHASE I  
JAMES CITY COUNTY VIRGINIA

SHEET	1	OF	1
DISK	DA-MAP.DWG		
PROJ. NO.	98019		
DWG.			



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 Landscape Architects • Environmental Consultants  
 WILLIAMSBURG  
 VIRGINIA BEACH

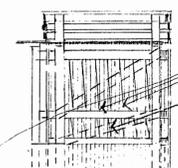


DES.	MEG
DWN.	WES
CHK.	CAR
DATE	12/11/99

TIMBER DAM CONTROL STRUCTURE  
**POWHATAN WOODS**  
 JAMES CITY COUNTY  
 VIRGINIA

SHEET C18 OF  
 DISK  
 PROJ. NO. POC-CC-99  
 DWG. 7204W

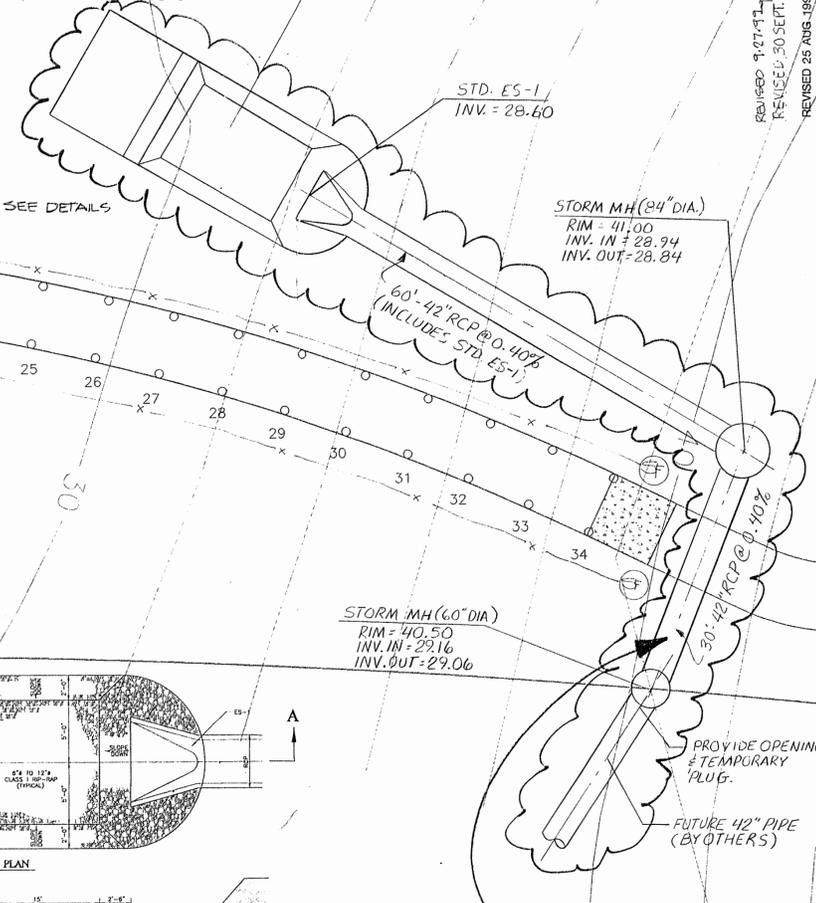
**DRY DETENTION BASIN:**



**PARTIAL DETAIL ELEVATION A-A:**

OUTLET EVERY 3RD SHEET PILE AND OBSERVATION PLATFORM BETWEEN WALES 1#2 AND 2#3 AS SHOWN TO CARE SHEET PILES TO ACT AS A TRASH RACK DOUBLE 2x10 DIAGONALS ON INSIDE FACE OF FACE PILES - BOLT WITH 2-3/4 BOLTS (TOP & BOTTOM)  
 OBSERVATION DECK OVER 2# CMP RISER WITH TRASH RACK AND ANTI-VERTEX DEVICE WITH MANHOLE COVER.  
 2x2' LOCKABLE HINGED ACCESS HATCH IN DECK ABOVE RISER.  
 VDOT - EL. 12 WITH GRATE FOR 2' CMP PIPE SEE DETAILS. C 20 INVERT/ELEV. 27.0

**STILLING BASIN**



STD. ES-1  
 INV. = 28.60

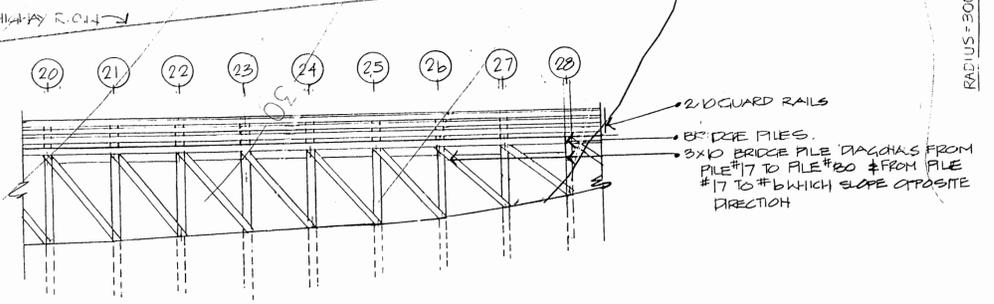
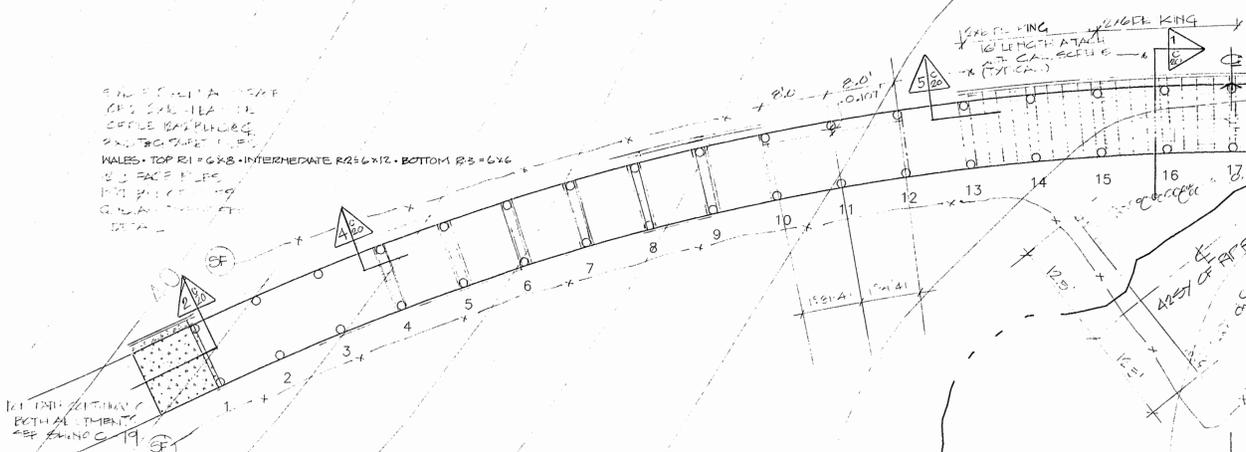
STORM MH (84" DIA.)  
 RIM = 41.00  
 INV. IN = 28.94  
 INV. OUT = 28.84

STORM MH (60" DIA.)  
 RIM = 40.50  
 INV. IN = 29.16  
 INV. OUT = 29.06

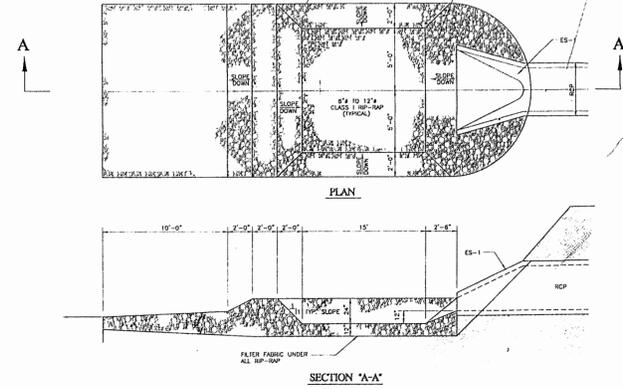
PROVIDE OPENING & TEMPORARY PLUG.  
 FUTURE 42" PIPE (BY OTHERS)

THIS STORM DRAINAGE SYSTEM TO BE CONSTRUCTED BY THE TRANSPORTATION IMPROVEMENT DISTRICT AS PART OF MONTICELLO AVENUE EXTENDED CONSTRUCTION PROJECT.

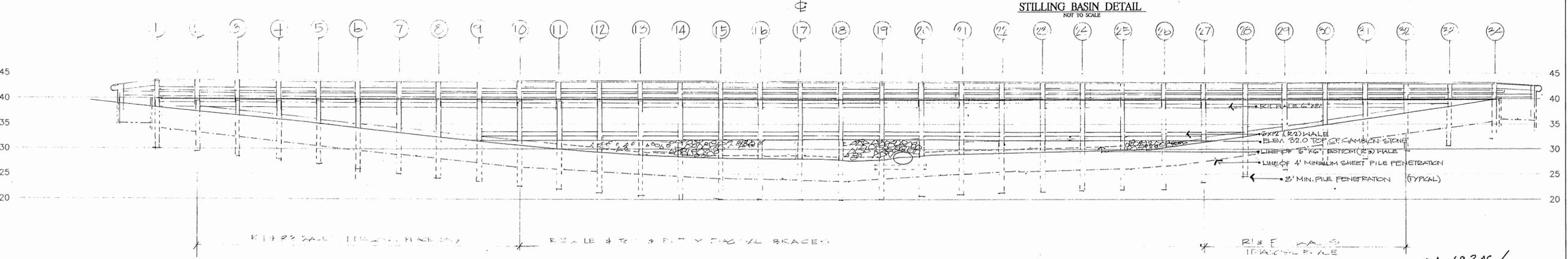
**PLAN OF BRIDGE DAM:**



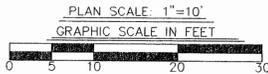
**PARTIAL DIRECT PROJECTION ALONG THE CORD BETWEEN ABUTMENTS:**



**STILLING BASIN DETAIL**  
 NOT TO SCALE

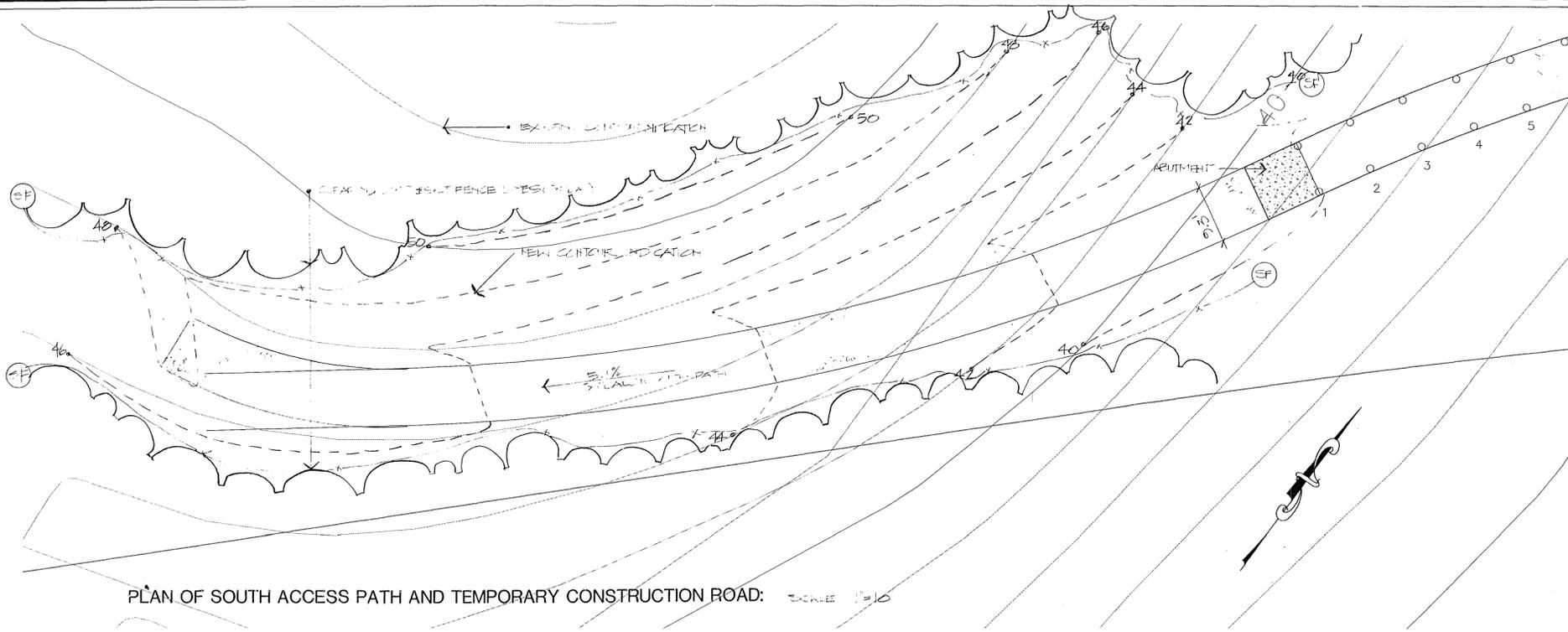


PROFILE IS THE TRUE PROJECTION ALONG THE 300 FOOT RADIUS AT THE FACE PILES:

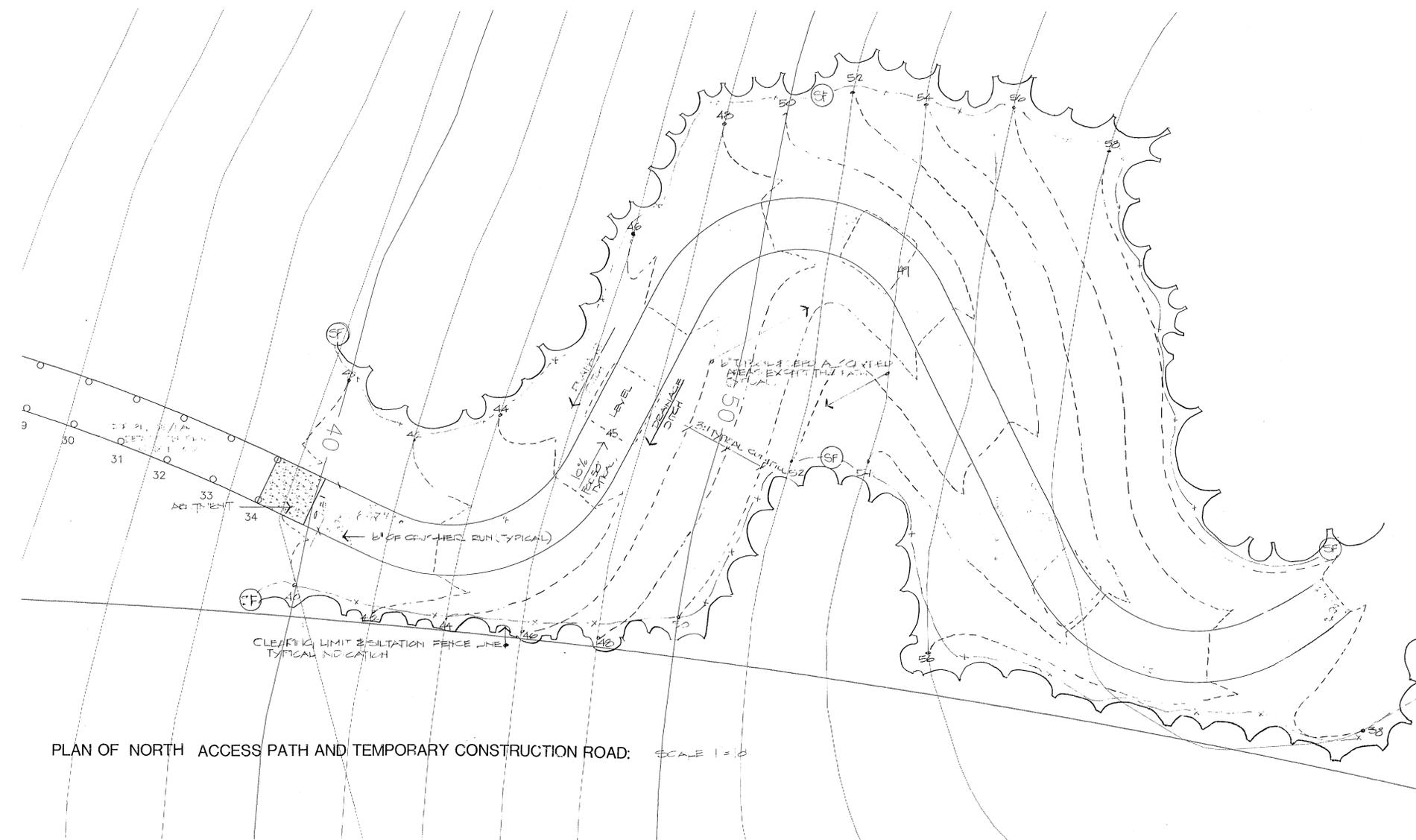


DA = 69.3 AC.  
 CN = 71  
 Tc = 38 MIN.  
 PREDEV  
 2- 49.27cfs  
 10- 134.37cfs  
 100- 229.96cfs  
 BMP ROUTED  
 2- 5.57cfs @ EL. 36.01  
 10- 65.85cfs @ EL. 37.81  
 100- 110.96cfs @ EL. 39.38  
 POST INFLOW  
 2- 91.68cfs  
 10- 206.29cfs  
 100- 326.72cfs  
 1-YR VOL 265,646

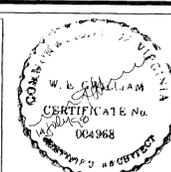
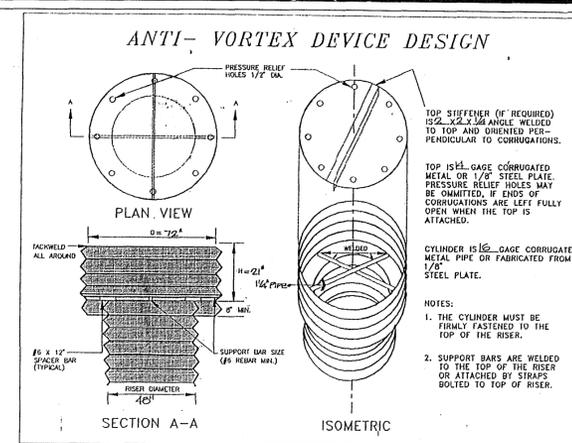
**DESIGN PLAN**



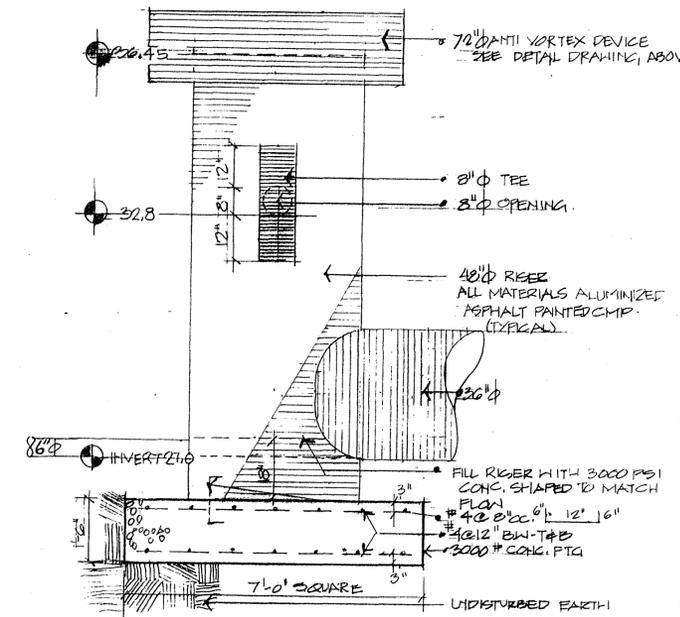
PLAN OF SOUTH ACCESS PATH AND TEMPORARY CONSTRUCTION ROAD: SCALE 1"=10'



PLAN OF NORTH ACCESS PATH AND TEMPORARY CONSTRUCTION ROAD: SCALE 1"=10'

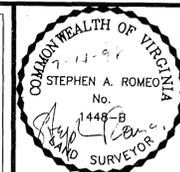
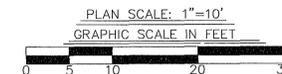


REVISED 7-27-99  
REVISED 30 SEPT 98  
REVISED 25 AUG 1998



DETAIL SECTION

SCALE 1/2"=10'



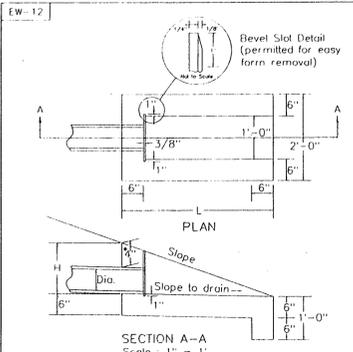
**Langley and McDonald, P.C.**  
Engineers • Surveyors • Planners  
Landscape Architects • Environmental Consultants  
WILLIAMSBURG  
VIRGINIA BEACH



DES.	WEG
DWN.	WEG
CHK.	SAK
DATE	1AUL98

TIMBER DAM CONTROL STRUCTURE  
**POWATAN WOODS**  
JAMES CITY COUNTY  
VIRGINIA

SHEET	C19
DISK	
PROJ. NO.	1203W-000.99
DWG.	1203W



**NOTES**

Typical endwall to be placed at the ends of all underdrain outlets. Endwall to be installed perpendicular to roadway and flush with the slope.

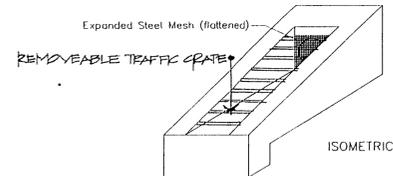
Concrete quantities shown are based on 6" Class III concrete pipe. The 4" dimension and concrete quantities will vary if 4" pipe, 8" pipe or other types of pipe are used.

Outlet pipes shall be rigid nonperforated, smooth-bore pipe, meeting the requirements of AASHTO M-252. If vitrified clay pipe is used, all joints shall be in accordance with ASTM C-443.

Expanded steel mesh (flattened) shall have openings of approx. 1/2"x1" and weigh approx. 0.82 per sq. ft. Mesh shall be galvanized in accordance with ASTM A-123. The mesh shall extend a minimum of 1" above the O.D. of the pipe, and is a barrier for rodents, etc. The slot for the steel mesh is to be constructed so that the mesh can be removed for cleanout purposes.

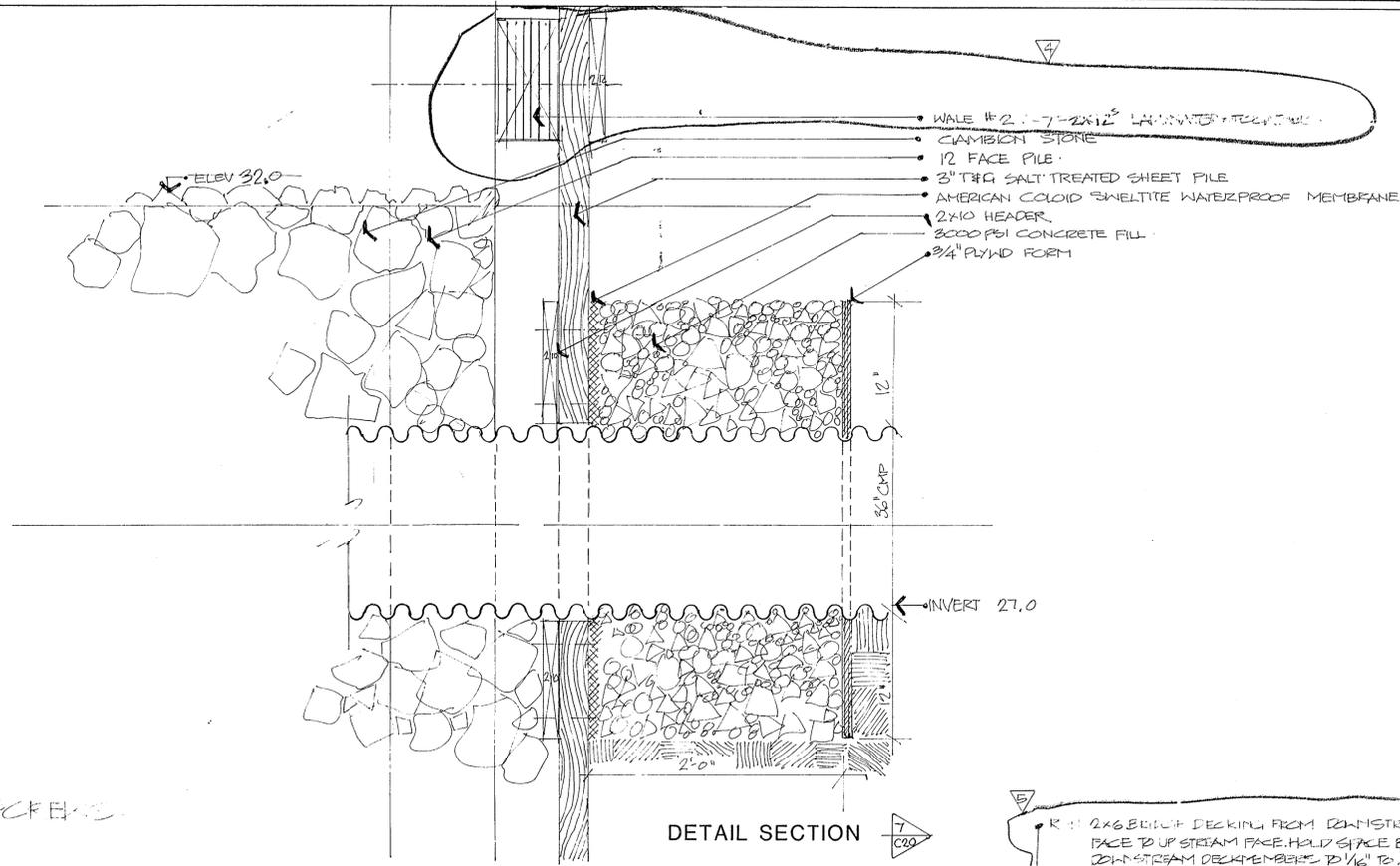
This item may be precast or cast in place.

PIPE DIA.	SLOPE	DIMENSIONS		CLASS A3 CONCRETE CU. YD.
		L	H	
4"	2:1	2'-5 1/2"	1'-2 3/4"	0.17
4"	4:1	4'-5"	1'-1 1/4"	0.28
6"	2:1	2'-10 1/2"	1'-5 1/4"	0.21
6"	4:1	5'-3"	1'-3 3/4"	0.35



STANDARD ENDWALL FOR PIPE UNDERDRAIN

Rev. 2-92  
SPECIFICATION REFERENCE  
105  
133  
202



DETAIL SECTION

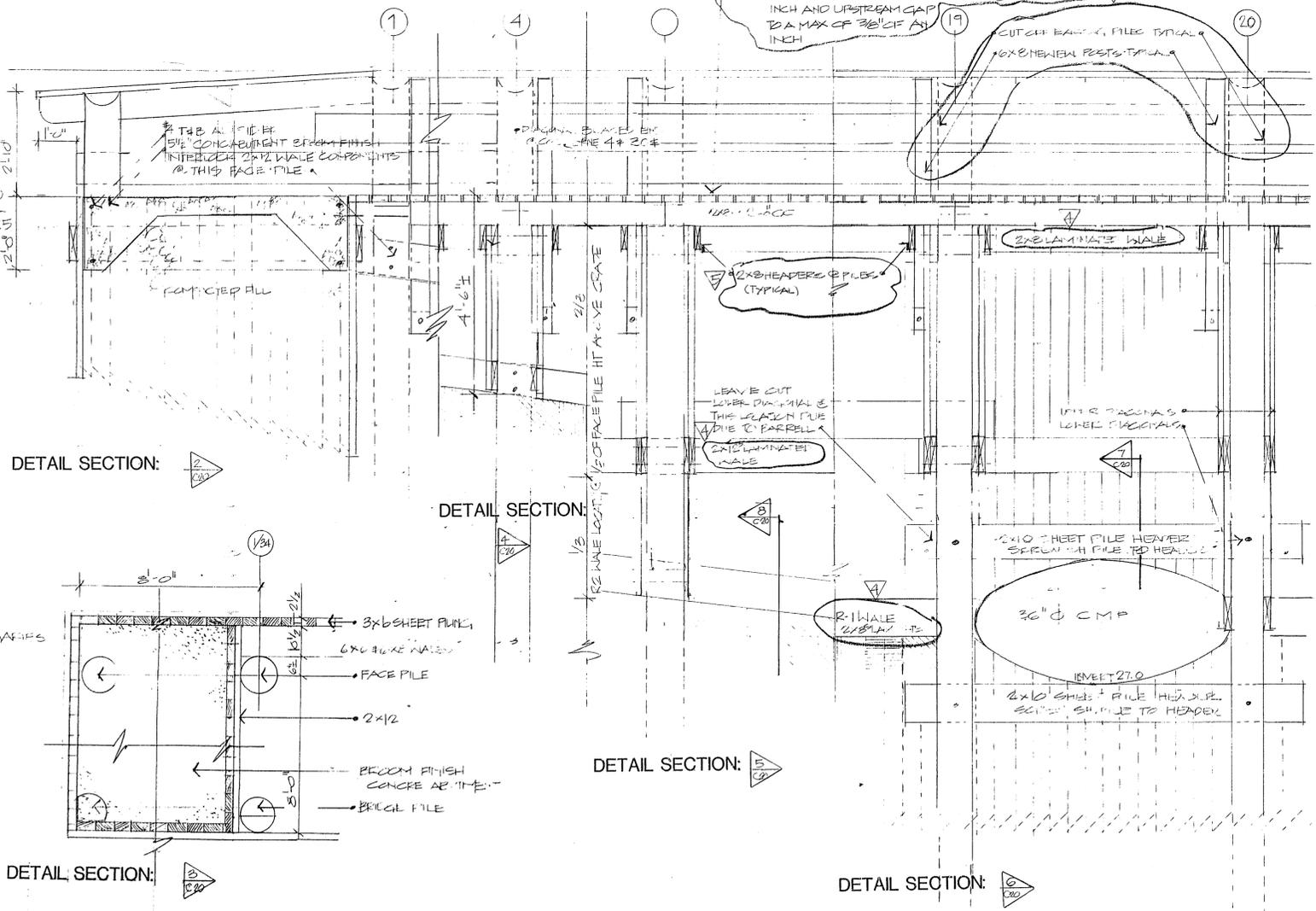
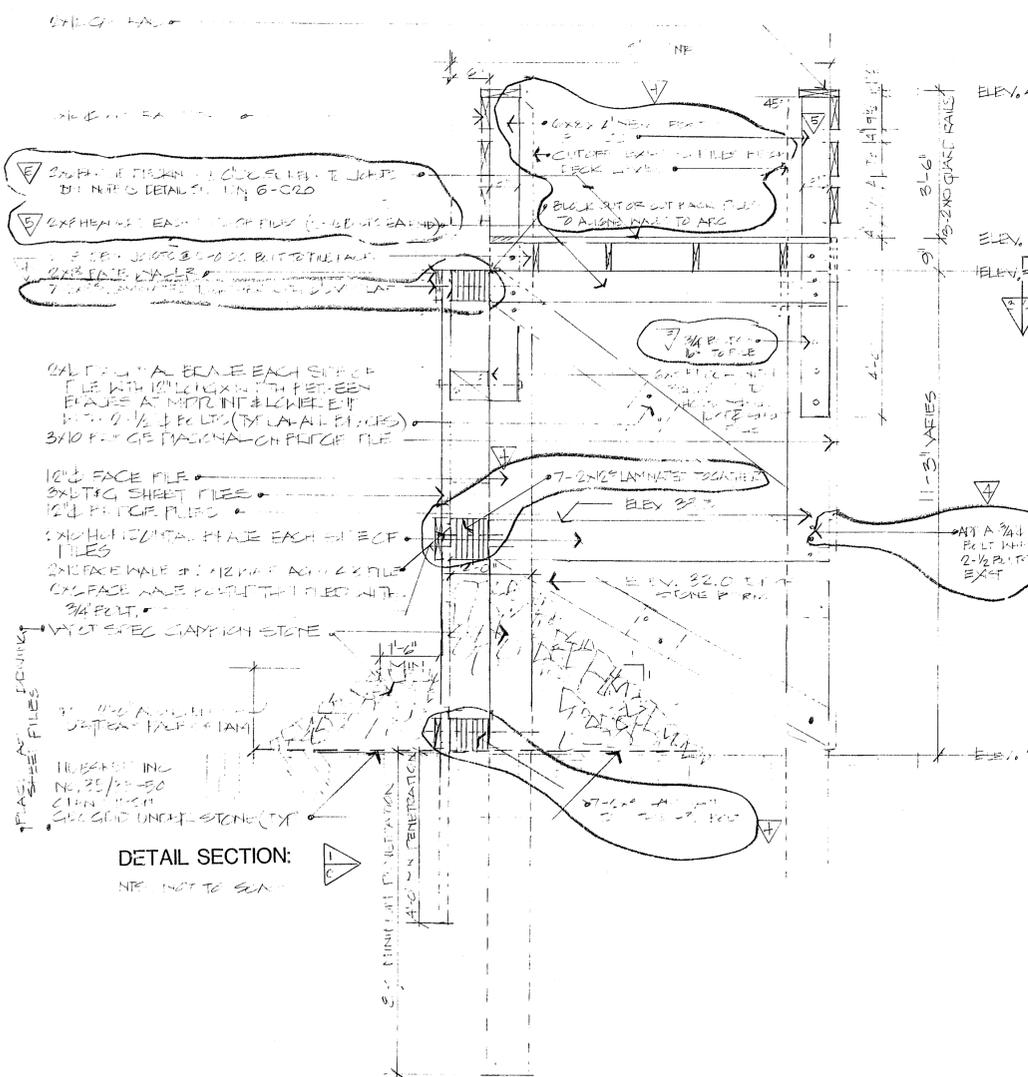
WALE #2 - 7-2X12 LAMINATED TOUGH PLY  
CLAMBION STONE  
12" FACE PILE  
3" TRIA SALT TREATED SHEET PILE  
AMERICAN COLLOID SWELTIME WATERPROOF MEMBRANE  
2X10 HEADER  
3600 PSI CONCRETE FILL  
3/4" PLYND FORM



**Langley and McDonald, P.C.**  
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Landscape Architects • Environmental Consultants  
VIRGINIA BEACH WILLIAMSBURG



ALL WALE TREATED WITH COPPER NAIL ANTIMONY PENTACHLOROPHENOL



DETAIL SECTION:

DETAIL SECTION:

DETAIL SECTION:

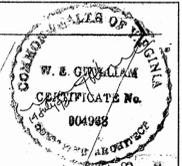
DETAIL SECTION:

DES. LECT	DWN. LECT	CHK. JAK	DATE 11/1/88
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TIMBER DAM CONTROL STRUCTURE:  
**POWHATAN WOODS**  
JAMES CITY COUNTY VIRGINIA

PROJ. NO. 1980017-000.99
SCALE: 1/2" = 1'-0"
SHEET C20 OF
DWG. NO. T202W





**Langley and McDonald, P.C.**  
 Engineers • Surveyors • Planners  
 Landscape Architects • Environmental Consultants  
 VIRGINIA BEACH  
 WILLIAMSBURG



DES.	MEG
DWN.	MEG
CHK.	SAR
DATE	1A/UL/99

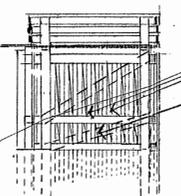
TIMBER DAM CONTROL STRUCTURE  
**POWHATAN WOODS**  
 JAMES CITY COUNTY  
 VIRGINIA

SHEET	C18 OF
DISK	
PROJ. NO.	190019-000.99
DWG.	7204W

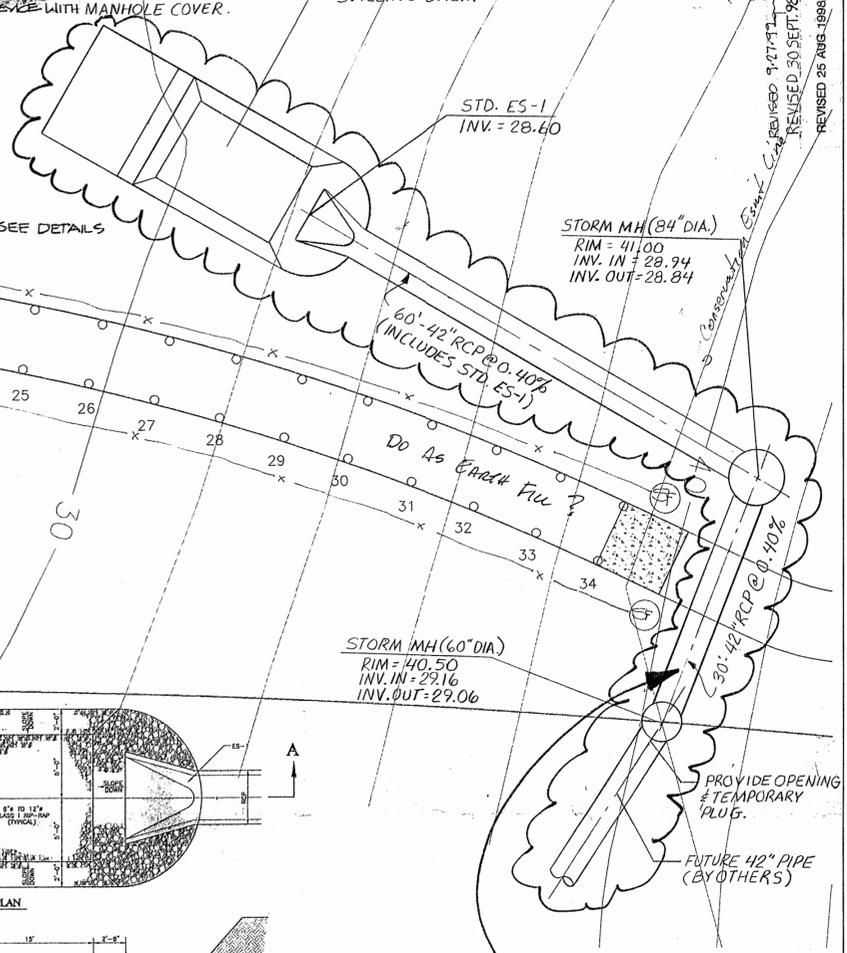
**DRY DETENTION BASIN:**

- CUTOUT EVERY 3RD SHEET PILE AROUND OBSERVATION PLATFORM BETWEEN PILES 14 & 22 AS SHOWN TO CAUSE SHEET PILES TO ACT AS A TRASH RACK.
- DOUBLE 2X10 DIAGONALS ON INSIDE FACE OF FACE PILES. BOLT WITH 2-3/4 BELTS (TOP & BOTTOM).
- OBSERVATION DECK OVER 48" CMP RISER WITH TRAP TRASH RACK AND ANTI-VORTEX DEVICE WITH MANHOLE COVER.
- 2X2 LOCKABLE HINGED ACCESS HATCH IN DECK ABOVE RISER.
- YDOT-E1412 WITH GRATE FOR 2" CMP PIPE SEE DETAIL SH. C-20. INVERT ELEV. 27.00.

**PARTIAL DETAIL ELEVATION A-A:**



**STILLING BASIN**



STD. ES-1  
INV. = 28.40

STORM MH (84" DIA.)  
RIM = 41.00  
INV. IN = 28.94  
INV. OUT = 28.84

STORM MH (60" DIA.)  
RIM = 40.50  
INV. IN = 29.16  
INV. OUT = 29.06

PROVIDE OPENING & TEMPORARY PLUG.  
FUTURE 42" PIPE (BY OTHERS)

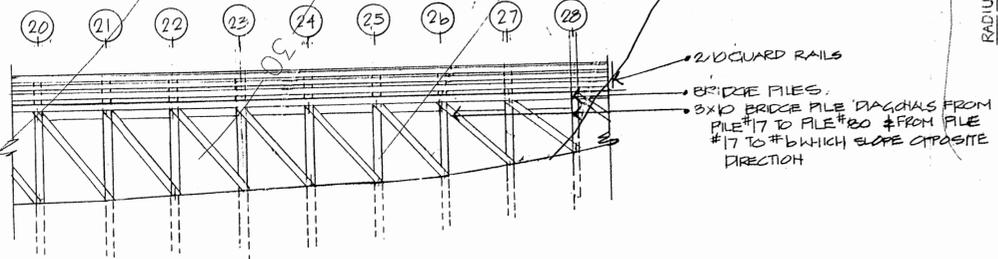
THIS STORM DRAINAGE SYSTEM TO BE CONSTRUCTED BY THE TRANSPORTATION IMPROVEMENT DISTRICT AS PART OF MONTICELLO AVENUE EXTENDED CONSTRUCTION PROJECT.



SHALE DIAGONAL BRACE OF 2 2X10-1EA DATE OF THE 12X12 PLYWOOD 2X6 TRG SHEET PILES. MALES: TOP R1 = 6X8 - INTERMEDIATE R2 1/2 X 12 - BOTTOM R3 = 6X6 12 X FACE PILES 12" X BRIDGE PILES. CONSULT DETAIL SEE DETAIL.

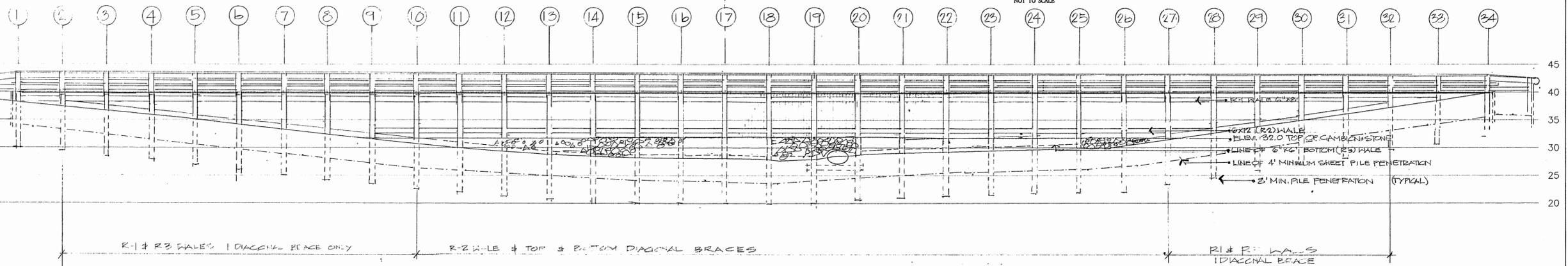
**PLAN OF BRIDGE DAM:**

HIGHWAY R.O.M.



- 2X10 GUARD RAILS
- BRIDGE PILES
- 3X10 BRIDGE PILE DIAGONALS FROM PILE #17 TO PILE #20 & FROM PILE #17 TO #6 WHICH SLOPE OPPOSITE DIRECTION

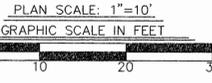
**PARTIAL DIRECT PROJECTION ALONG THE CORD BETWEEN ABUTMENTS:**



R-1 & R-3 MALES 1 DIAGONAL BRACE ONLY

R-2 MALE & TOP & BOTTOM DIAGONAL BRACES

R1 & R3 MALES 1 DIAGONAL BRACE



PROFILE IS THE TRUE PROJECTION ALONG THE 300 FOOT RADIUS AT THE FACE PILES.

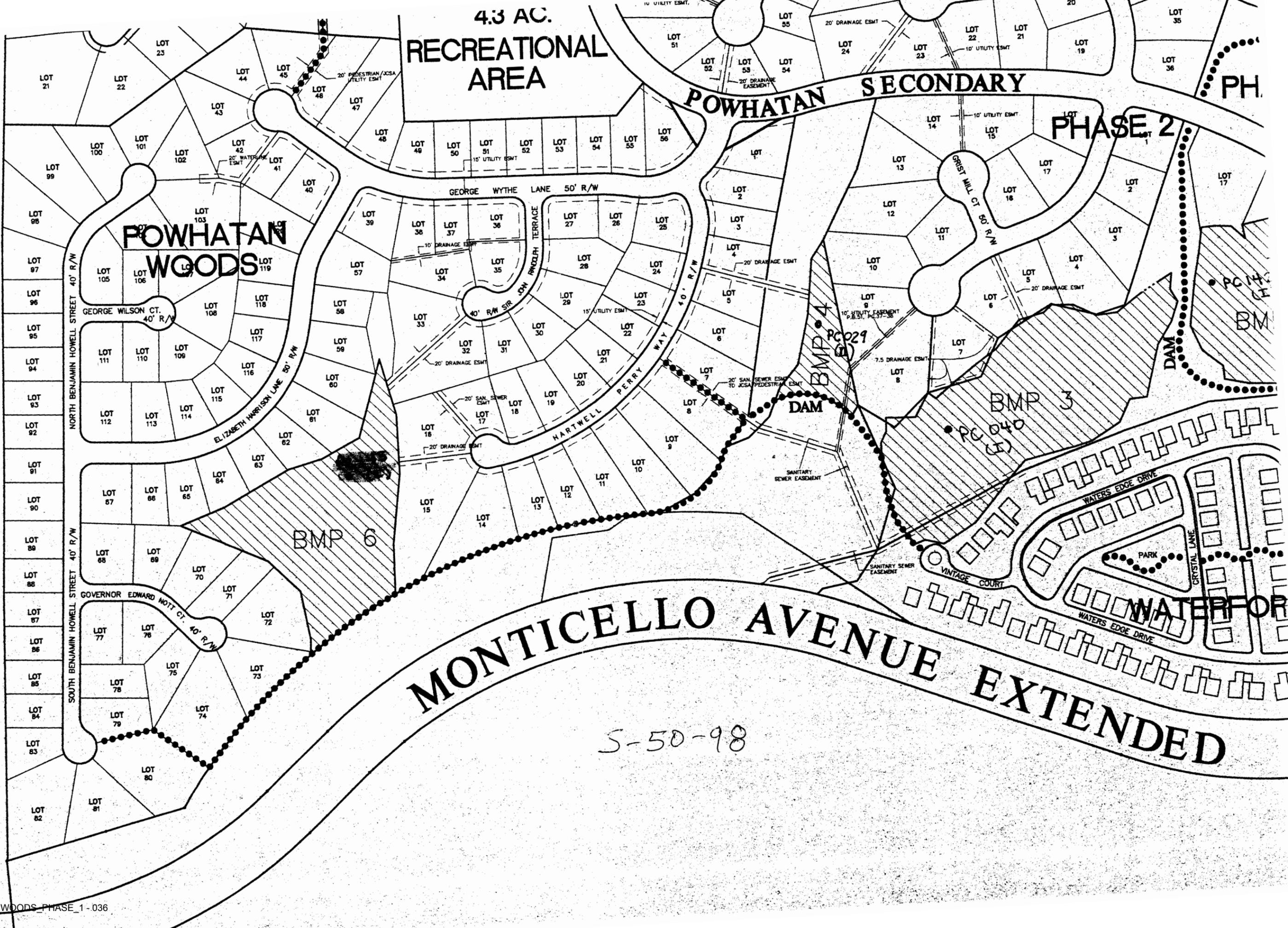
4.3 AC.  
RECREATIONAL  
AREA

POWHATAN SECONDARY  
PHASE 2

POWHATAN  
WOODS

MONTICELLO AVENUE EXTENDED

S-50-98



**POWHATAN WOODS**

**PHASE 1**

**JAMES CITY COUNTY, VIRGINIA**

**JULY 1998**

**REVISED SEPTEMBER 21, 1998**

**STORMWATER MANAGEMENT CALCULATIONS**



---

Langley and McDonald, P.C.

Engineers  
Surveyors  
Planners  
Landscape Architects  
Environmental Consultants

5544 Greenwich Road, Virginia Beach, VA 23462  
(804) 473-2000 FAX: (804) 497-7933

201 Packets Court, Williamsburg, VA 23185  
(804) 253-2975 FAX: (804) 229-0049

**POWHATAN WOODS**

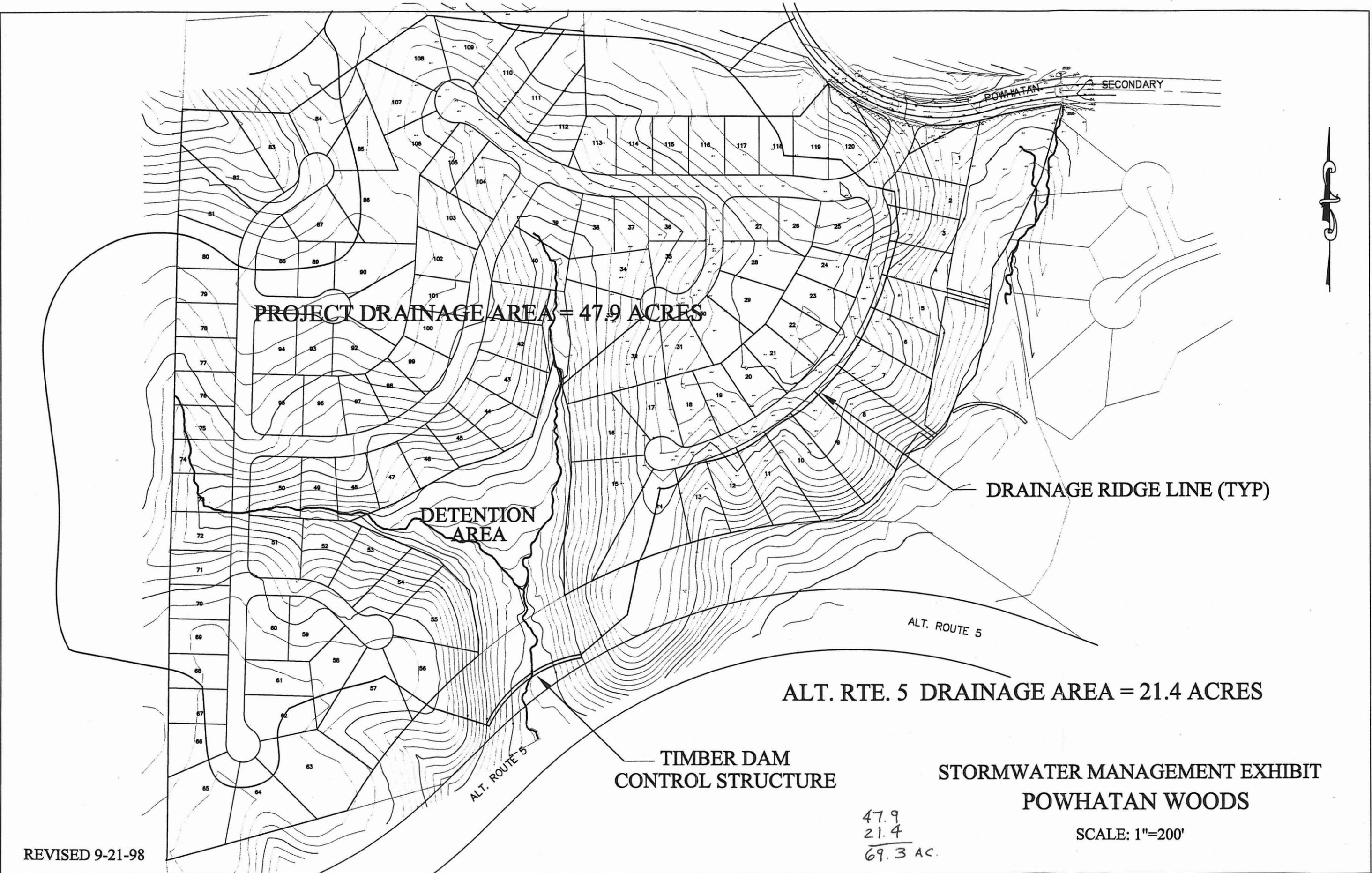
**PHASE 1**

**JAMES CITY COUNTY, VIRGINIA**

**JULY 1998**

**REVISED SEPTEMBER 21,1998**

**STORMWATER MANAGEMENT CALCULATIONS**



REVISED 9-21-98



Langley and McDonald, P.C.  
 ENGINEERS • SURVEYORS • PLANNERS  
 LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS  
 VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject POWHATAN - SOUTH PARCEL  
BMP DESIGN WITH STE 5 INFLOW  
 Computed By PENCI Checked By \_\_\_\_\_

Project No. 95019  
 Client \_\_\_\_\_  
 Date 4/14/95 Sheet No. \_\_\_\_\_  
REV. 5-18-95  
 Rev 9/21/95 "POWTAN"

DESIGN CRITERIA:

USE EXTENDED DRY DETENTION

USE SCS 24 HR TYPE II STORMS: 2YR RAINFALL = 3.5"  
 10YR RAINFALL = 5.75"  
 100YR RAINFALL = 8.0"

POST DEVELOPMENT 2YR & 10YR RELEASE NOT TO EXCEED PRE DEVELOPMENT  
 OFFSITE ROUTE 5 AREA (11.8 AC) TO BE INCLUDED IN TOTAL DRAINAGE TO BMP  
21.4 AC

PRE DEVELOPMENT CONDITIONS

ON-SITE UNDEVELOPED	= 36.1 AC. (HSG=C)	CN=70	}	ALL AREAS WOODED IN GOOD CONDITION
OFFSITE UNDEVELOPED	= 6.6 AC. (HSG=C)	CN=70		
OFFSITE EXIST. REG. SITE	= 1.4 AC. (HSG=C)	CN=74		
CONSERVATION EASEMENT	= 3.8 AC. (HSG=D)	CN=77		
OFFSITE RTE 5 AREA	= 21.4 AC. (HSG=C/D)	CN=72		

TOTAL D.A. = 69.8 AC. AVG. CN = 71  
 H.L. = 1650± S<sub>2</sub> = 2.5% T<sub>c</sub> = 33 min.

CALCULATED 24 HR STORM PEAK FLOW RATES - PRE DEVELOPMENT

2YR PEAK = 29.27 CFS  
 10YR PEAK = 134.37 CFS  
 100YR PEAK = 229.96 CFS

WATER QUALITY RELEASE = 65,900 CF @ ELEV. 30.80



Langley and McDonald, P.C.

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LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS

VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject BMP DESIGN

W/ RTE 5 INFLOW

Computed By Peric Checked by \_\_\_\_\_

Project No. 95019

Client \_\_\_\_\_

Date 4/14/98 Sheet No. \_\_\_\_\_

REV 5-13-98

REV 9-21-98

POST DEVELOPMENT CONDITIONS

IMPERVIOUS RATIO

ONSITE RESIDENTIAL	= 36.1 Ac. (HSG=C)	CN=80	25%
OFFSITE UNDEVELOPED	= 6.6 Ac. (HSG=C)	CN=70	0
OFFSITE EXIST. REG. AREA	= 1.4 Ac. (HSG=C)	CN=74	10%
CONSERVATION EASEMENT	= 3.8 Ac. (HSG=D)	CN=77	0
OFFSITE RTE. 5 ROADWAY	= 7.26 Ac.	CN=98	100%
" " G/W	= 7.64 Ac.	CN=74	0
" " WOODS	= 6.30 Ac.	CN=70	0

TOTAL D.A. = 69.3 Ac. AVG. CN = 79

L.L. = 1600'  $S_0 = 2.5\%$   $T_0 = 30$  min

EXTENDED DETENTION VOLUME FOR 1yr. 24hr. storm (RAINFALL = 2.8")

per TR-55 table 2-1:

rainfall = 2.8"

CN = 79

RUNOFF = 1.05"

VOLUME = 1.05" x 69.3 Ac. =

= 0.023 x 3,018,708 SF

= 65,646 C.F.

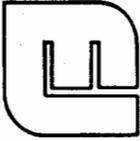
= ELEV. 36.45 ✓

CALCULATED 24HR STORM PEAK INFLOW RATES

2 YR PEAK = 91.65 CFS

10 YR PEAK = 156.89 CFS

100 YR PEAK = 326.72 CFS



Langley and McDonald, P.C.

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LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS

VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject POWHATAN - SOUTH PHASE

BMP DESIGN WITH RTE 5 INFLOW

Computed By Penci Checked by \_\_\_\_\_

Project No. 95019

Client \_\_\_\_\_

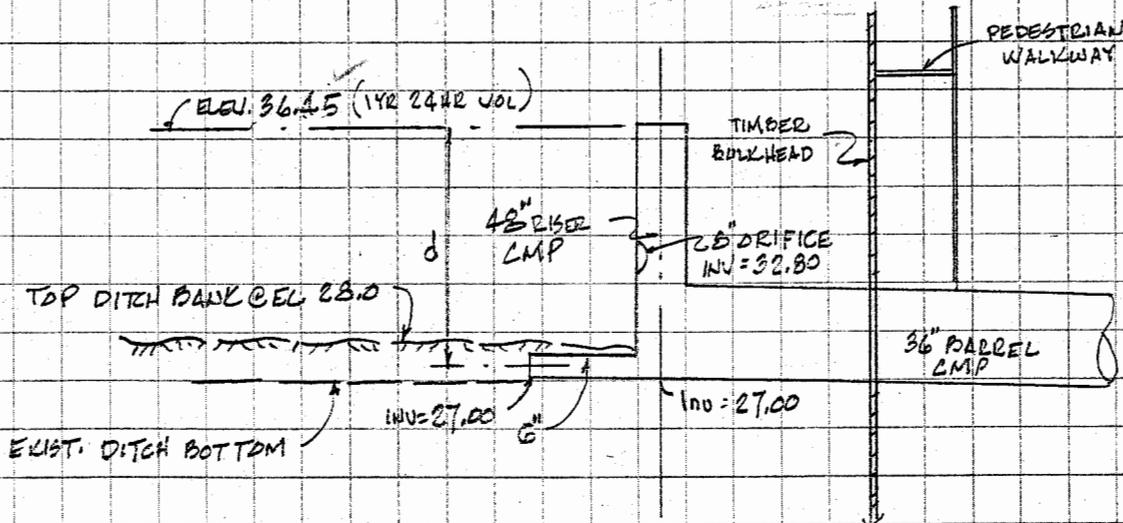
Date 4/14/98 Sheet No. \_\_\_\_\_

REV. 5-18-98

REV 9-21-98

BASIN STORAGE VOLUME

ELEV.	AREA (SF)	AREA/2	VOLUME (CF)	TOTAL VOLUME (CF)
28.0	0	0	0	0
30.0	8904	4452	8904	8904
32.0	24,558	16,731	33,462	42,366
34.0	43,258	33,908	67,819	110,182
36.0	72,666	57,962	115,924	226,106
38.0	109,544	91,105	182,210	408,316
40.0	144,162	126,853	253,706	662,022
42.0	181,644	162,903	325,806	987,828



SUMMARY OF ROUTING RESULTS

2 YR RELEASE	= 5.59 CFS @ ELEV. 36.01	V = 3.3 FPS
10 YR RELEASE	= 65.85 CFS @ ELEV. 37.81	V <sub>F</sub> = 8.83 FPS
100 YR RELEASE	= 110.96 CFS @ ELEV. 39.38	V <sub>F</sub> = 15.13 FPS

**BASIN DRAWDOWN SUMMARY FOR 1YR 24HR STORM VOLUME  
 BMP WITH RTE 5 INFLOW  
 6" WATER QUALITY ORIFICE & 8" CHANNEL PROTECTION ORIFICE  
 INV.(6")=27.00 INV.(8")=32.80**

RISE	VOL(CF)	D(8")	Q(OUT)	D(6")	Q(OUT)	TIME(HR)	SUM(HR)
9.450	265646.00	3.320	3.1129	9.200	2.9102	1.9160	1.9160
9.000	226106.00	2.870	2.8943	8.750	2.8381	1.4947	3.4107
8.500	197125.00	2.370	2.6301	8.250	2.7559	1.6077	5.0184
8.000	168144.00	1.870	2.3362	7.750	2.6710	1.7565	6.7749
7.500	139163.00	1.370	1.9997	7.250	2.5834	1.9701	8.7450
7.000	110182.00	0.870	1.5935	6.750	2.4928	1.3699	10.1149
6.500	93228.00	0.370	1.0392	6.250	2.3987	2.0469	12.1618
6.000	76274.00	0.000	0.0000	5.750	2.3007	2.1422	14.3040
5.500	59320.00	0.000	0.0000	5.250	2.1984	2.2521	16.5562
5.000	42366.00	0.000	0.0000	4.750	2.0911	1.1749	17.7310
4.500	34000.00	0.000	0.0000	4.250	1.9780	1.2506	18.9816
4.000	25635.00	0.000	0.0000	3.750	1.8580	1.3435	20.3252
3.500	17269.00	0.000	0.0000	3.250	1.7297	1.4604	21.7855
3.000	8904.00	0.000	0.0000	2.750	1.5911	0.4296	22.2152
2.500	6678.00	0.000	0.0000	2.250	1.4392	0.4872	22.7023
2.000	4452.00	0.000	0.0000	1.750	1.2693	0.5764	23.2788
1.500	2226.00	0.000	0.0000	1.250	1.0727	0.7107	23.9895
1.000	100.00	0.000	0.0000	0.750	0.8309	0.0579	24.0474
0.500	0.00	0.000	0.0000	0.250	0.4797	0.0000	24.0474
0.000	0.00	0.000	0.0000	0.000	0.0000	0.0000	24.0474

36.45  
 27.00  
 9.45

**SUMMARY OF RUNOFF ANALYSIS AND DETENTION BASIN PERFORMANCE**

- 2 YR - 24 HR PRE-DEVELOPMENT PEAK DISCHARGE = 49.27 CFS
- 2 YR - 24 HR POST DEVELOPMENT PEAK DISCHARGE = 91.68 CFS
- 2 YR - 24 HR POST DEVELOPMENT ROUTING DISCHARGE = 5.59 CFS @ Elevation 36.01 ✓
- 10 YR - 24 HR PRE-DEVELOPMENT PEAK DISCHARGE = 134.37 CFS
- 10 YR - 24 HR POST DEVELOPMENT PEAK DISCHARGE = 206.29 CFS
- 10 YR - 24 HR POST DEVELOPMENT ROUTING DISCHARGE = 65.85 CFS @ Elevation 37.81
- 100 YR - 24 HR POST DEVELOPMENT ROUTING DISCHARGE = 110.96 CFS @ Elevation 39.38 D.H.W.

1yr 24hr storm - 36.45 - 265,646 ±  
 2yr storm - 36.01 - 226,106  
 39,540 = 17.5%

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 1  
TYPE : CURVILINEAR UH  
DESCRIPTION : Pre-development with Rte 5

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge..... = 123.83 (cfs)  
Time Interval..... = 6 (min)  
Time to Peak..... = 25.39 (min)  
Time of Base..... = 126.97 (min)  
Rainfall Excess..... = 1.00 (in)  
Storm Duration..... = 5.07 (min)  
Basin Lag Time..... = 22.85 (min)  
Shape Factor..... = 484.00

[BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
Curve Number..... = 71

[TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
Flow Length (L)..... = 1600.00 (ft)  
Time of Concentration..... = 38.09 (min)

UNIT HYDROGRAPH REPORT

RECORD NUMBER : 2  
TYPE : CURVILINEAR UH  
DESCRIPTION : Post development with Rte 5

[UNIT HYDROGRAPH INFORMATION]

Peak Discharge..... = 155.92 (cfs)  
Time Interval..... = 5 (min)  
Time to Peak..... = 20.17 (min)  
Time of Base..... = 100.83 (min)  
Rainfall Excess..... = 1.00 (in)  
Storm Duration..... = 4.02 (min)  
Basin Lag Time..... = 18.15 (min)  
Shape Factor..... = 484.00

[BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
Curve Number..... = 79

[TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
Flow Length (L)..... = 1600.00 (ft)  
Time of Concentration..... = 30.25 (min)

## HYDROGRAPH REPORT

RECORD NUMBER : 1  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 2yr-predevelopment with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 49.27 (cfs)  
 Volume..... = 6.14 (acft)  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 738.00 (min)  
 Time of Base..... = 1542.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 1  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 123.83 (cfs)  
 Shape Factor..... = 484.00  
  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 25.39 (min)  
 Time of Base..... = 126.97 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 22.85 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 71

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 38.09 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 3.50 (in)  
 Return Period..... = 2 (yr)  
 Storm Duration..... = 24.00 (hr)

## HYDROGRAPH REPORT

RECORD NUMBER : 2  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 10yr-predevelopment with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 134.37 (cfs)  
 Volume..... = 15.60 (acft)  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 738.00 (min)  
 Time of Base..... = 1548.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 1  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 123.83 (cfs)  
 Shape Factor..... = 484.00  
  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 25.39 (min)  
 Time of Base..... = 126.97 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 22.85 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 71

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 38.09 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 5.75 (in)  
 Return Period..... = 10 (yr)  
 Storm Duration..... = 24.00 (hr)

## HYDROGRAPH REPORT

RECORD NUMBER : 3  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 100yr-predevelopment with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 229.96 (cfs)  
 Volume..... = 26.47 (acft)  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 738.00 (min)  
 Time of Base..... = 1548.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 1  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 123.83 (cfs)  
 Shape Factor..... = 484.00  
 Time Interval..... = 6 (min)  
 Time to Peak..... = 25.39 (min)  
 Time of Base..... = 126.97 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 22.85 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 71

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 38.09 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 8.00 (in)  
 Return Period..... = 100 (yr)  
 Storm Duration..... = 24.00 (hr)

## HYDROGRAPH REPORT

RECORD NUMBER : 4  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 2yr Post-development with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 91.68 (cfs)  
 Volume..... = 9.04 (acft)  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 730.00 (min)  
 Time of Base..... = 1525.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 2  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 155.92 (cfs)  
 Shape Factor..... = 484.00  
  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 20.17 (min)  
 Time of Base..... = 100.83 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 18.15 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 79

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 30.25 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 3.50 (in)  
 Return Period..... = 2 (yr)  
 Storm Duration..... = 24.00 (hr)

## HYDROGRAPH REPORT

RECORD NUMBER : 5  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 10yr Post-development with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 206.29 (cfs)  
 Volume..... = 19.96 (acft)  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 730.00 (min)  
 Time of Base..... = 1525.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 2  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 155.92 (cfs)  
 Shape Factor..... = 484.00  
  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 20.17 (min)  
 Time of Base..... = 100.83 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 18.15 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 79

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 30.25 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 5.75 (in)  
 Return Period..... = 10 (yr)  
 Storm Duration..... = 24.00 (hr)

## HYDROGRAPH REPORT

RECORD NUMBER : 6  
 TYPE : COMPUTED FLOOD  
 DESCRIPTION : 100yr Post-development with Rte 5

## [HYDROGRAPH INFORMATION]

Peak Discharge..... = 326.72 (cfs)  
 Volume..... = 31.81 (acft)  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 730.00 (min)  
 Time of Base..... = 1525.00 (min)  
 Multiplication factor..... = 1.00

## [UNIT HYDROGRAPH INFORMATION]

Unit hydrograph #..... = 2  
 Unit hydrograph type..... = CURVILINEAR UH  
 Peak Discharge..... = 155.92 (cfs)  
 Shape Factor..... = 484.00  
  
 Time Interval..... = 5 (min)  
 Time to Peak..... = 20.17 (min)  
 Time of Base..... = 100.83 (min)  
 Rainfall Excess..... = 1.00 (in)  
 Basin Lag Time..... = 18.15 (min)

## [BASIN DESCRIPTION]

Watershed Area..... = 69.30 (ac)  
 Curve Number..... = 79

## [TIME CONCENTRATION -- SCS LAG]

Channel Slope (S)..... = 0.02500  
 Flow Length (L)..... = 1600.00 (ft)  
 Time of Concentration..... = 30.25 (min)

## [RAINFALL DESCRIPTION]

Distribution Type..... = SCS II  
 Total Precipitation..... = 8.00 (in)  
 Return Period..... = 100 (yr)  
 Storm Duration..... = 24.00 (hr)

OUTLET STRUCTURE REPORT

RECORD NUMBER : 1  
TYPE : STAND PIPE WEIR  
DESCRIPTION : BMP Pond Outfall with Rte 5

[RATING CURVE LIMIT]

Minimum Elevation..... = 27.00 (ft)  
Maximum Elevation..... = 42.00 (ft)  
Elevation Increment..... = 0.20 (ft)

[STANDPIPE INFORMATION]

DESCRIPTION : 48" Dia. Riser

[OUTLET STRUCTURE INFORMATION]

Radius..... = 2.00000 (ft)  
Crest Length..... = 12.57 (ft)  
Crest Elevation..... = 36.45 (ft)  
Fraction Open Area..... = 1.00000

[RECTANGULAR STAND PIPE EQUATION]

ORIFICE EQ:  $Q = C_o * A * (2gh)^{0.5}$   
WEIR EQ:  $Q = C_w * L * H^{exp}$   
Coefficient  $C_o$  ..... = 0.60000  
Coefficient  $C_w$  ..... = 3.08000  
Exponential..... = 1.50000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)  
A = Wetted area, (sqft)  
L = Crest length, (ft)

[ORIFICE INFORMATION]

SUBRECORD : 1  
DESCRIPTION : 6" ORIFICE

[OUTLET STRUCTURE INFORMATION]

Radius..... = 0.25000  
Invert Elevation..... = 27.00000 (ft)  
Coefficient  $C_o$ ..... = 0.60000  
# of Openings..... = 1

[CIRCULAR ORIFICE EQUATION]

$Q = C_o * A * [2gh/k]^{0.5}$   
A = Wetted area, (sqft)  
K = 1

[ORIFICE INFORMATION]

SUBRECORD : 2  
DESCRIPTION : 8" ORIFICE

[OUTLET STRUCTURE INFORMATION]

Radius..... = 0.33000  
Invert Elevation..... = 32.80000 (ft)  
Coefficient Co..... = 0.60000  
# of Openings..... = 1

[CIRCULAR ORIFICE EQUATION]

$Q = C_o * A * [2gh / k]^{0.5}$   
A = Wetted area, (sqft)  
K = 1

OUTLET STRUCTURE REPORT

RECORD NUMBER : 1
TYPE : STAND PIPE WEIR
DESCRIPTION : BMP Pond Outfall with Rte 5

[CULVERT INFORMATION]

DESCRIPTION : 36" CMP Outlet Pipe

[OUTLET STRUCTURE INFORMATION]

Circular Radius..... = 1.50000 (ft)
Culvert Invert Elevation..... = 27.00000 (ft)
Slope..... = 0.00830
Manning's N-value..... = 0.02400
Orifice Coefficient..... = 0.50000
Tailwater..... = 26.80000 (ft)
Number barrels..... = 1

[UNSUBMERGED EQUATION]

H/Diam = Hc/Diam + K \*(Q/A\*Diam^0.5))^M - 0.5\*S^2
Coefficient K..... = 0.00180
coefficient M..... = 2.50000

[SUBMERGED EQUATION]

H/Diam = c\*(Q/(A\*Diam^0.5))^Z + Y - 0.5\*S^2
Coefficient c..... = 0.03000
Coefficient Y..... = 0.74000

[DEFINITIONS]

H = Headwater depth above inlet control section invert, (ft)
Diam = Interior height of culvert barrel, (ft)
Hc = Specific head at critical depth (dc + Vc^2/2g), (ft)
Q = Discharge, (cuft/s)
A = Full cross sectional area of culvert barrel, (sqft)
S = Culvert barrel slope, (ft/ft)

RESERVOIR REPORT

RECORD NUMBER : 1  
 STORAGE TYPE : MAN STAGE/STOR  
 DISCHARGE TYPE : COMP STAGE/DISC  
 DESCRIPTION : BMP Pond with Rte 5

[RATING CURVE LIMIT]

Minimum Elevation..... = 27.00 (ft)  
 Maximum Elevation..... = 42.00 (ft)  
 Elevation Increment..... = 0.20 (ft)

[STAGE STORAGE INFORMATION]

Input file = NULL  
 Output file = NULL

[Manual Storage vs. Elevation]

ELEVATION (ft)	STORAGE (cf)
30.00	8904.00
32.00	42366.00
34.00	110182.00
36.00	226106.00
38.00	408316.00
40.00	662022.00
42.00	987828.00

[STAGE DISCHARGE INFORMATION]

OUTLET STRUCTURE:  
 STR # : 1  
 TYPE : STAND PIPE WEIR  
 DESCRIPTION : BMP Pond Outfall with Rte 5

HYDROGRAPH REPORT

RECORD NUMBER : 7  
TYPE : RESER STOR. IND  
DESCRIPTION : 2yr Post Routing with Rte 5

[HYDROGRAPH INFORMATION]

Peak Discharge..... = 5.59 (cfs)  
Volume..... = 9.02 (acft)  
Time Interval..... = 5 (min)  
Time to Peak..... = 910.00 (min)  
Time of Base..... = 2700.00 (min)  
Peak Elevation..... = 36.01 (ft)

[INFLOW HYDROGRAPH INFORMATION]

Hydrograph #..... = 4  
Hydrograph Description..... = 2yr Post-development with Rte 5

HYDROGRAPH REPORT

RECORD NUMBER : 8  
TYPE : RESER STOR. IND  
DESCRIPTION : 10yr Post Routing with Rte 5

[HYDROGRAPH INFORMATION]

Peak Discharge..... = 65.85 (cfs)  
Volume..... = 19.94 (acft)  
Time Interval..... = 5 (min)  
Time to Peak..... = 760.00 (min)  
Time of Base..... = 2980.00 (min)  
Peak Elevation..... = 37.81 (ft)

[INFLOW HYDROGRAPH INFORMATION]

Hydrograph #..... = 5  
Hydrograph Description..... = 10yr Post-development with Rte 5

HYDROGRAPH REPORT

RECORD NUMBER : 9  
TYPE : RESER STOR. IND  
DESCRIPTION : 100yr Post Routing with Rte 5

[HYDROGRAPH INFORMATION]

Peak Discharge..... = 110.96 (cfs)  
Volume..... = 31.79 (acft)  
Time Interval..... = 5 (min)  
Time to Peak..... = 755.00 (min)  
Time of Base..... = 3045.00 (min)  
Peak Elevation..... = 39.38 (ft)

[INFLOW HYDROGRAPH INFORMATION]

Hydrograph #..... = 6  
Hydrograph Description..... = 100yr Post-development with Rte 5

**POWHATAN WOODS**

**PHASE 1**

**JAMES CITY COUNTY, VIRGINIA**

**JUNE 1998**

**SUPPORTING ENGINEERING DOCUMENTS**

**STORM DRAINAGE CALCULATIONS**

**PRELIMINARY PAVEMENT DESIGN**

**EROSION & SEDIMENT CONTROL NARRATIVE**



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**POWHATAN WOODS**

**PHASE 1**

**JAMES CITY COUNTY, VIRGINIA**

**JUNE 1998**

**SUPPORTING ENGINEERING DOCUMENTS**

**STORM DRAINAGE CALCULATIONS**

**PRELIMINARY PAVEMENT DESIGN**

**EROSION & SEDIMENT CONTROL NARRATIVE**

Calculated by: PENCI Date: \_\_\_\_\_  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_  
 N = 0.013 RCP  
 Storm Frequency: 10 YEAR

Project No.: \_\_\_\_\_  
 Project Desc: POWHATAN WOODS

STORM DRAINAGE COMPUTATION SHEET Sheet \_\_\_\_\_ of \_\_\_\_\_ Sheets

LOCATION			RUN-OFF									PIPE - CHANNEL DESIGN								HGL DATA				
LINE I.D.	FROM (UP)	TO (DOWN)	AREA-AC.		RUN-OFF COEFF.	INCREM. CA	ACCUM. CA	FLOW - MIN.			INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN VEL. (FPS)	CONVEYANCE LENGTH (FT)	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE (FT./FT.)	VELOCITY (FPS)	COVER ELEV. UPSTREAM
			INCREMENT	TOTAL				TO INLET/UPPER RCH	WITHIN REACH	TOTAL TC														
	1	2	2.33	2.33	0.35	0.82	0.82	15.0	0.2	15.2	5.25	4.31	15"		0.0050	4.57	3.71	4.2	40					
	2	3	1.44	3.77	0.40	0.58	1.40		0.3	15.5	5.23	7.32	18"		0.0104	10.71	6.05	6.5	118					
	3	4	0.90		0.40	0.36																		
			1.50	6.17	0.35	0.53	2.29		0.2	15.7	5.20	11.91	24"		0.0100	22.62	7.20	7.9	85					
	5	6	0.73	0.73	0.40	0.29	0.29	12.0	0.3	12.3	5.70	1.65	15"		0.0456	19.79	11.22	8.1	170					
	6	7	0.95	1.71	0.35	0.24	0.63		0.3	12.6	5.66	3.57	15"		0.0180	8.67	7.85	7.1	114					
	7	4	1.05	2.76	0.35	0.37	1.00				5.61	5.61	15"		0.0363	12.31	16.00	9.0	90					
	8	3	1.50		0.35	0.53	0.53	12.0	0.2	12.2	5.70	3.02	15"		0.0062	5.09	4.13	4.3	40					
	4	9	0.32		0.35	0.27																		
				9.25		+ 1.00																		
						+ 2.29	3.56	15.7	0.2	15.9	5.17	18.41	24"		0.0066	18.41	5.86	5.9	67					
	10	11	0.60		0.40	0.24	0.24	6.0	0.2	10.2	6.00	1.44	15"		0.0075	5.71	4.64	3.9	45					
	11	9	0.60		0.40	0.24	0.48		0.2	10.4	5.97	2.87	15"		0.0050	4.57	3.71	3.9	40					
	9	12	0.17		0.35	0.14																		
				10.62		+ 3.56	4.18	15.9			5.15	21.53	30"		0.0025	21.70	4.42	4.4	24			0.0025		

Calculated by: Penel Date: \_\_\_\_\_  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_  
 N = 0.018 (RCP)  
 Storm Frequency: 10 YEAR

Project No.: \_\_\_\_\_  
 Project Desc: POWHATAN WOODS

**STORM DRAINAGE COMPUTATION SHEET** Sheet \_\_\_\_\_ of \_\_\_\_\_ Sheets

LOCATION			RUN-OFF							PIPE - CHANNEL DESIGN								HGL DATA						
LINE I.D.	FROM (UP)	TO (DOWN)	AREA-AC.		RUN-OFF COEFF.	INCREM. CA	ACCUM. CA	FLOW - MIN.			INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN VEL. (FPS)	CONVEYANCE LENGTH (FT)	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE (FT./FT.)	VELOCITY (FPS)	COVER ELEV. UPSTREAM
			INCREMENT	TOTAL				TO INLET/ UPPER RCH	WITHIN REACH	TOTAL TC														
	13	14	0.54	0.54	0.40	0.34	0.34	12.0	0.4	12.4	5.70	1.94	15"	0.0176	8.57	6.97	5.7	125						
	14	15	0.69	1.53	0.40	0.28	0.62		0.2	12.6	5.64	3.50	15"	0.0206	9.27	7.54	7.3	92						
	15	16	0.64	2.17	0.40	0.26	0.88				5.61	4.94	15"	0.0144	7.75	6.30	6.6	104						
	16	17									4.94	15"	0.0249	19.34	15.72	13.5	96							
	17	18									4.94	15"	0.0222	4.94	2.79	2.3	36							
	19	20	0.63	0.63	0.40	0.25	0.25	12.0	0.8	12.8	5.70	1.43	15"	0.0650	4.57	3.71	3.5	168						
	20	21	0.71	1.34	0.40	0.28	0.53		0.3	13.1	5.58	2.96	15"	0.0100	6.46	5.25	5.4	108						
	21	22	0.69	2.03	0.40	0.28	0.81				5.54	4.49	15"	0.0200	9.14	7.43	7.4	80						
	22	23									4.49	15"	0.1266	23.18	18.84	15.4	64							
	23	24									4.49	15"	0.0020	4.70	2.65	2.7	24							

Calculated by: PERI Date: \_\_\_\_\_  
 Checked By: \_\_\_\_\_ Date: \_\_\_\_\_  
 N = 0.013 (RCP)  
 Storm Frequency: 10 YEAR

Project No.: \_\_\_\_\_  
 Project Desc: POWHATAN WOODS

STORM DRAINAGE COMPUTATION SHEET Sheet \_\_\_\_\_ of \_\_\_\_\_ Sheets

LOCATION			RUN-OFF									PIPE - CHANNEL DESIGN								HGL DATA				
LINE I.D.	FROM (UP)	TO (DOWN)	AREA-AC.		RUN-OFF COEFF.	INCREM. CA	ACCUM. CA	FLOW - MIN.			INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN VEL. (FPS)	CONVEYANCE LENGTH (FT)	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE (FT./FT.)	VELOCITY (FPS)	COVER ELEV. UPSTREAM
			INCREMENT	TOTAL				TO INLET/ UPPER RCH	WITHIN REACH	TOTAL TC														
	25	26	0.93	0.93	0.40	0.15	0.13	10.0	0.3	10.3	6.00	0.78	15"		0.0050	4.57	3.71	2.8	77					
	26	30	0.91	0.62	0.40	0.12	0.25		0.1	10.4	5.96	1.49	15"		0.0089	17.91	14.56	8.9	52					
	30	29	0.10	0.74	0.40	0.04	0.29		0.3	10.7	5.94	1.72	15"		0.0183	8.74	7.10	5.5	104					
	28	27	0.43		0.40	0.17	0.17	10.0	0.2	10.2	6.00	1.02	15"		0.0271	10.63	8.65	5.4	70					
	27	29	0.70	1.87	0.40	0.28																		
						+0.29	0.74	10.7	0.1	10.6	5.90	4.37	15"		0.0050	4.57	3.71	4.2	82					
	29	30	0.34	2.21	0.60	0.20	0.94				5.91	5.56	15"		0.0089	16.96	13.78	12.0	120					
	30	31									5.56		18"		0.0028	5.56	3.14	3.1	80					
	32	33	1.40	1.40	0.4	0.56	0.56	12.0	0.1	12.1	5.70	3.19	15"		0.0560	15.29	12.43	9.7	74					
	33	34	0.35	1.73	0.4	0.18	0.69		0.2	12.3	5.69	3.92	15"		0.0226	9.71	7.90	7.3	97					
	34	35	0.19	1.92	0.6	0.11	0.80				5.66	4.53	15"		0.0052	4.66	3.79	4.0	84					

STORM SEWER SUMMARY REPORT  
POWHATAN WOODS PHASE 1  
FILE: LINE-A.SIM

RAINFALL FILE: EASTERN.RND

10 YEAR DESIGN STORM

I = 147.680 / ( Tc + 19.000 ) ^ 0.950

LINE ID		FLOW RATE INFO						PIPE INFO				HYDRAULIC INFO			
LINE#	DESCRIPTION	INC AR	RUNOFF C	INLTIME	INLT I	INC CIA	INPUTQ	UNIFORM	SIZE/	INVERT	PIPE	NVAL	HGLSLOPE	HYD GRD	VEL
	DOWNLINE#	TOT AR	WEIGHTED	Tc	TOTL I	TOT CIA	TOTALQ	FLOWCAP	TYPE	UP/DOWN	LEN	INVSLOP	JLC	UP/DOWN	UP/DOWN
		(ac)	C	(min)	(in/h)	(cfs)	(cfs)	(cfs)	(in)	(ft)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft/s)
1	9-12	0.0	0.00	0.00	9.01	21.53	21.53		30D	44.90	24	0.013	0.003	47.39	4.39
	DNLN = 0	0.0	-nan	1.95	8.21	0.00	21.53	22.1	30D	44.83		0.003	0.75	47.33	4.39
2	4-9	0.0	0.00	0.00	9.01	18.41	18.41		24D	45.84	67	0.013	0.007	48.06	5.86
	DNLN = 1	0.0	-nan	1.76	8.28	0.00	18.41	18.3	24D	45.40		0.007	0.75	47.62	5.86
3	3-4	0.0	0.00	0.00	9.01	11.91	11.91		24D	48.63	85	0.013	0.010	49.68	7.09
	DNLN = 2	0.0	-nan	0.49	8.79	0.00	11.91	22.6	24D	47.78		0.010	0.65	48.83	7.09
4	2-3	0.0	0.00	0.00	9.01	7.32	7.32		18D	50.30	113	0.013	0.010	51.33	5.64
	DNLN = 3	0.0	-nan	0.16	8.94	0.00	7.32	10.7	18D	49.13		0.010	0.75	50.19	5.47
5	1-2	0.0	0.00	0.00	9.01	4.31	4.31		15D	50.95	40	0.013	0.005	51.92	4.94
	DNLN = 4	0.0	-nan	0.00	9.01	0.00	4.31	6.5	15D	50.55		0.010	0.35	51.70	3.64
6	8-3	0.0	0.00	0.00	9.01	3.02	3.02		15D	49.38	40	0.013	0.003	50.30	3.36
	DNLN = 3	0.0	-nan	0.00	9.01	0.00	3.02	5.1	15D	49.13		0.006	0.35	50.19	2.72
7	7-4	0.0	0.00	0.00	9.01	5.61	5.61		15D	51.05	90	0.013	0.036	51.65	9.71
	DNLN = 2	0.0	-nan	1.60	8.34	0.00	5.61	12.3	15D	47.78		0.036	0.70	48.38	9.71
8	6-7	0.0	0.00	0.00	9.01	3.57	3.57		15D	53.10	114	0.013	0.010	53.86	4.60
	DNLN = 7	0.0	-nan	1.10	8.54	0.00	3.57	8.7	15D	51.05		0.018	0.50	52.67	2.91
9	5-6	0.0	0.00	0.00	9.01	1.65	1.65		15D	60.85	170	0.013	0.044	61.43	3.47
	DNLN = 8	0.0	-nan	0.00	9.01	0.00	1.65	13.8	15D	53.10		0.046	0.35	54.02	1.70
10	11-9	0.0	0.00	0.00	9.01	2.87	2.87		15D	46.15	40	0.013	0.002	47.70	2.34
	DNLN = 1	0.0	-nan	0.64	8.73	0.00	2.87	4.6	15D	45.95		0.005	0.75	47.62	2.34
11	10-11	0.0	0.00	0.00	9.01	1.44	1.44		15D	46.50	45	0.013	0.001	47.79	1.17
	DNLN = 10	0.0	-nan	0.00	9.01	0.00	1.44	5.7	15D	46.15		0.008	0.35	47.76	1.17

STORM SEWER SUMMARY REPORT  
 POWHATAN WOODS PHASE 1  
 FILE: LINE-B.STM

RAINFALL FILE: EASTERN.RND

10 YEAR DESIGN STORM

I = 147.680 / ( Tc + 19.000 ) ^ 0.950

LINE ID		FLOW RATE INFO							PIPE INFO				HYDRAULIC INFO			
LINE#	DESCRIPTION	INC AR	RUNOFF C	INLTIME	INLT I	INC CIA	INPUTQ	UNIFORM	SIZE/	INVERT	PIPE	NVAL	HGLSLOPE	HYD GRD	VEL	
	DOWNLINE#	TOT AR	WEIGHTED	Tc	TOTL I	TOT CIA	TOTALQ	FLOWCAP	TYPE	UP/DOWN	LEN	INVSLOP	JLC	UP/DOWN	UP/DOWN	
		(ac)	C	(min)	(in/h)	(cfs)	(cfs)	(cfs)	(in)	(ft)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft/s)	
1	17-18	0.0	0.00	0.00	9.01	4.94	4.94		18D	40.10	36	0.013	0.002	41.58	2.80	
	DNLN = 0	0.0	-nan	1.68	8.31	0.00	4.94	5.5	18D	40.00		0.003	0.35	41.50	2.80	
2	16-17	0.0	0.00	0.00	9.01	4.94	4.94		15D	48.50	96	0.013	0.081	49.39	5.29	
	DNLN = 1	0.0	-nan	1.34	8.44	0.00	4.94	18.8	15D	40.35		0.085	0.35	41.62	4.03	
3	15-16	0.0	0.00	0.00	9.01	4.94	4.94		15D	50.00	104	0.013	0.013	50.89	5.29	
	DNLN = 2	0.0	-nan	0.98	8.58	0.00	4.94	7.8	15D	48.50		0.014	0.65	49.54	4.52	
4	14-15	0.0	0.00	0.00	9.01	3.50	3.50		15D	55.30	92	0.013	0.021	55.83	6.99	
	DNLN = 3	0.0	-nan	0.76	8.67	0.00	3.50	9.3	15D	53.40		0.021	0.65	53.93	6.99	
5	13-14	0.0	0.00	0.00	9.01	1.94	1.94		15D	57.50	125	0.013	0.014	58.13	3.67	
	DNLN = 4	0.0	-nan	0.00	9.01	0.00	1.94	8.6	15D	55.30		0.018	0.35	56.33	1.80	

STORM SEWER SUMMARY REPORT  
 POWHATAN WOODS PHASE 1  
 FILE: LINE-C.STM

RAINFALL FILE: EASTERN.RND

10 YEAR DESIGN STORM

I = 147.680 / ( Tc + 19.000 ) ^ 0.950

LINE ID		FLOW RATE INFO						PIPE INFO				HYDRAULIC INFO			
LINE#	DESCRIPTION	INC AR	RUNOFF C	INLTIME	INLT I	INC CIA	INPUTQ	UNIFORM	SIZE/	INVERT	PIPE	NVAL	HGLSLOPE	HYD GRD	VEL
	DOWNLINE#	TOT AR	WEIGHTED	Tc	TOTL I	TOT CIA	TOTALQ	FLOWCAP	TYPE	UP/DOWN	LEN	INVSLOP	JLC	UP/DOWN	UP/DOWN
		(ac)	C	(min)	(in/h)	(cfs)	(cfs)	(cfs)	(in)	(ft)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft/s)
1	23-24	0.0	0.00	0.00	9.01	4.49	4.49		18D	40.05	24	0.013	0.002	41.54	2.54
	DNLN = 0	0.0	-nan	1.99	8.19	0.00	4.49	4.8	18D	40.00		0.002	0.35	41.50	2.54
2	22-23	0.0	0.00	0.00	9.01	4.49	4.49		15D	48.40	64	0.013	0.120	49.25	5.07
	DNLN = 1	0.0	-nan	1.75	8.28	0.00	4.49	23.0	15D	40.30		0.127	0.35	41.58	3.66
3	21-22	0.0	0.00	0.00	9.01	4.49	4.49		15D	50.00	80	0.013	0.018	50.85	5.07
	DNLN = 2	0.0	-nan	1.46	8.39	0.00	4.49	9.1	15D	48.40		0.020	0.50	49.39	4.32
4	20-21	0.0	0.00	0.00	9.01	2.96	2.96		15D	54.70	108	0.013	0.010	55.30	5.12
	DNLN = 3	0.0	-nan	1.11	8.53	0.00	2.96	6.5	15D	53.62		0.010	0.50	54.22	5.12
5	19-20	0.0	0.00	0.00	9.01	1.43	1.43		15D	55.54	168	0.013	0.003	56.08	3.31
	DNLN = 4	0.0	-nan	0.00	9.01	0.00	1.43	4.6	15D	54.70		0.005	0.35	55.50	1.72

STORM SEWER SUMMARY REPORT  
 POWHATAN WOODS PHASE 1  
 FILE: LINE-D.STM

RAINFALL FILE: EASTERN.RND

10 YEAR DESIGN STORM

I = 147.680 / ( Tc + 19.000 ) ^ 0.950

LINE ID		FLOW RATE INFO						PIPE INFO				HYDRAULIC INFO			
LINE#	DESCRIPTION	INC AR	RUNOFF C	INLTIME	INLT I	INC CIA	INPUTQ	UNIFORM	SIZE/	INVERT	PIPE	NVAL	HGLSLOPE	HYD GRD	VEL
	DOWNLINE#	TOT AR	WEIGHTED	Tc	TOTL I	TOT CIA	TOTALQ	FLOWCAP	TYPE	UP/DOWN	LEN	INVSLOP	JLC	UP/DOWN	UP/DOWN
		(ac)	C	(min)	(in/h)	(cfs)	(cfs)	(cfs)	(in)	(ft)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft/s)
1	30-31	0.0	0.00	0.00	9.01	5.56	5.56		18D	44.03	80	0.013	0.003	45.52	3.15
	DNLN = 0	0.0	-nan	2.11	8.15	0.00	5.56	5.6	18D	43.80		0.003	0.35	45.30	3.15
2	29-30	0.0	0.00	0.00	9.01	5.56	5.56		15D	53.10	128	0.013	0.066	54.04	5.60
	DNLN = 1	0.0	-nan	1.69	8.30	0.00	5.56	17.0	15D	44.28		0.069	0.50	45.57	4.53
3	27-29	0.0	0.00	0.00	9.01	4.37	4.37		15D	57.58	32	0.013	0.020	58.19	7.32
	DNLN = 2	0.0	-nan	1.62	8.33	0.00	4.37	9.1	15D	56.94		0.020	0.75	57.55	7.32
4	36-27	0.0	0.00	0.00	9.01	1.72	1.72		15D	59.00	104	0.013	0.007	59.52	3.52
	DNLN = 3	0.0	-nan	0.91	8.61	0.00	1.72	8.7	15D	57.10		0.018	0.70	58.82	1.40
5	26-36	0.0	0.00	0.00	9.01	1.49	1.49		15D	63.00	52	0.013	0.074	63.49	3.35
	DNLN = 4	0.0	-nan	0.61	8.74	0.00	1.49	17.9	15D	59.00		0.077	0.35	59.66	2.27
6	25-26	0.0	0.00	0.00	9.01	0.78	0.78		15D	63.38	77	0.013	0.003	63.77	2.74
	DNLN = 5	0.0	-nan	0.00	9.01	0.00	0.78	4.5	15D	63.00		0.005	0.35	63.55	1.50
7	28-27	0.0	0.00	0.00	9.01	1.02	1.02		15D	59.00	70	0.013	0.009	59.45	2.97
	DNLN = 3	0.0	-nan	0.00	9.01	0.00	1.02	10.6	15D	57.10		0.027	0.35	58.82	0.83

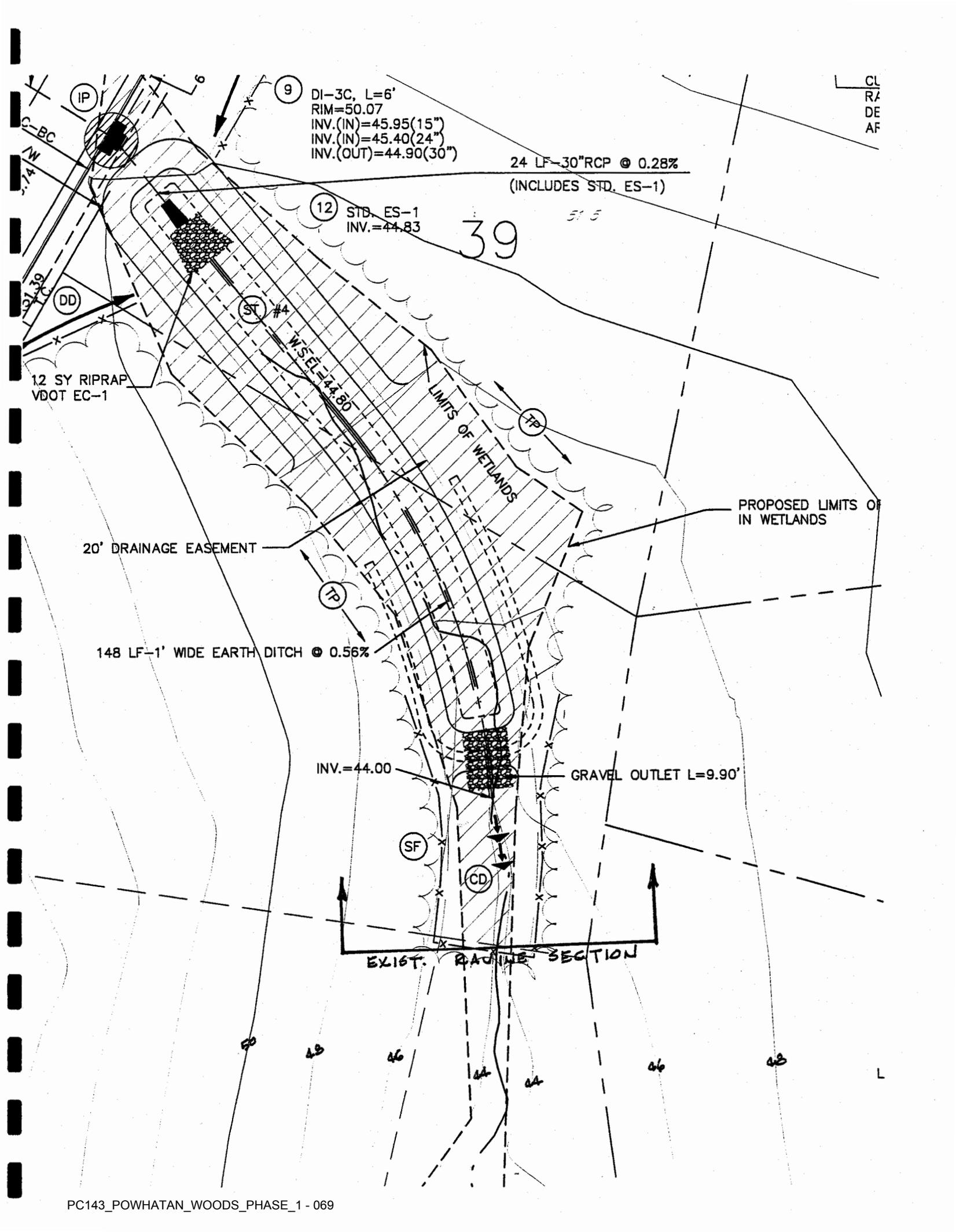
STORM SEWER SUMMARY REPORT  
 POWHATAN WOODS PHASE 1  
 FILE: LINE-E.STM

RAINFALL FILE: EASTERN.RND

10 YEAR DESIGN STORM

I = 147.680/ ( Tc + 19.000) ^ 0.950

LINE ID		FLOW RATE INFO						PIPE INFO				HYDRAULIC INFO				
LINE#	DESCRIPTION	INC AR	RUNOFF C	INLTIME	INLT I	INC CIA	INPUTQ	UNIFORM	SIZE/	INVERT	PIPE	NVAL	HGLSLOPE	HYD GRD	VEL	
	DOWNLINE#	TOT AR	WEIGHTED	Tc	TOTL I	TOT CIA	TOTALQ	FLOWCAP	TYPE	UP/DOWN	LEN	INVSLOP	JLC	UP/DOWN	UP/DOWN	
		(ac)	C	(min)	(in/h)	(cfs)	(cfs)	(cfs)	(in)	(ft)	(ft)	(ft/ft)	(ft/ft)	(ft)	(ft/s)	
1	34-35	0.0	0.00	0.00	9.01	4.53	4.53		15D		54.62	24	0.013	0.005	55.86	3.69
	DNLN = 0	0.0	-nan	0.57	8.76	0.00	4.53	4.6	15D		54.50		0.005	0.75	55.75	3.69
2	33-34	0.0	0.00	0.00	9.01	3.92	3.92		15D		57.79	97	0.013	0.023	58.36	7.27
	DNLN = 1	0.0	-nan	0.35	8.85	0.00	3.92	9.7	15D		55.60		0.023	0.75	56.17	7.27
3	32-33	0.0	0.00	0.00	9.01	3.19	3.19		15D		61.93	74	0.013	0.052	62.79	4.40
	DNLN = 2	0.0	-nan	0.00	9.01	0.00	3.19	15.3	15D		57.79		0.056	0.50	58.97	2.66



CL  
RA  
DE  
AF

DI-3C, L=6'  
RIM=50.07  
INV.(IN)=45.95(15")  
INV.(IN)=45.40(24")  
INV.(OUT)=44.90(30")

24 LF-30"RCP @ 0.28%  
(INCLUDES STD. ES-1)

12 STD. ES-1  
INV.=44.83

39

12 SY RIPRAP  
VDOT EC-1

20' DRAINAGE EASEMENT

PROPOSED LIMITS OF  
IN WETLANDS

148 LF-1' WIDE EARTH DITCH @ 0.56%

INV.=44.00

GRAVEL OUTLET L=9.90'

EXIST. RAILLINE SECTION

Proposed Outfall Ditch @ #12  
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	#12 Outfall Mod
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	0.006300 ft/ft	
Left Side Slope	4.000000 H : V	
Right Side Slope	4.000000 H : V	
Bottom Width	1.00	ft
Discharge	21.53	cfs

Results		
Depth	1.23	ft
Flow Area	7.27	ft <sup>2</sup>
Wetted Perimeter	11.14	ft
Top Width	10.83	ft
Critical Depth	1.01	ft
Critical Slope	0.016497 ft/ft	
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	1.37	ft
Froude Number	0.64	
Flow is subcritical.		

Drainage Outfall @ #12 - Existing Ravine  
Worksheet for Irregular Channel

Project Description	
Project File	untitled.fm2
Worksheet	#12 Outfall
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data					
Channel Slope	0.015400 ft/ft				
Elevation range: 43.50 ft to 46.00 ft.					
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness	
0.00	46.00	0.00	44.00	0.070	
10.00	45.00				
15.00	44.00				
16.50	43.50				
18.00	44.00				
26.00	45.00				
44.00	46.00				
Discharge	21.53	cfs			

Results		
Wtd. Mannings Coefficient	0.070	
Water Surface Elevation	45.06	ft
Flow Area	11.18	ft <sup>2</sup>
Wetted Perimeter	17.88	ft
Top Width	17.55	ft
Height	1.56	ft
Critical Depth	44.65	ft
Critical Slope	0.094200	ft/ft
Velocity	1.93	ft/s
Velocity Head	0.06	ft
Specific Energy	45.11	ft
Froude Number	0.43	
Flow is subcritical.		

Table  
Rating Table for Irregular Channel

Project Description	
Project File	untitled.fm2
Worksheet	#12 Outfall
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Channel Slope	0.015400 ft/ft

Input Data			
	Minimum	Maximum	Increment
Water Surface Elevation	43.50	46.00	0.10 ft

Rating Table				
Water Surface Elevation (ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)	
43.50	0.070	0.00	0.00	
43.60	0.070	0.01	0.35	
43.70	0.070	0.07	0.55	
43.80	0.070	0.19	0.72	
43.90	0.070	0.42	0.87	
44.00	0.070	0.76	1.01	
44.10	0.070	1.16	1.04	
44.20	0.070	1.81	1.12	
44.30	0.070	2.72	1.22	
44.40	0.070	3.95	1.32	
44.50	0.070	5.52	1.42	
44.60	0.070	7.48	1.53	
44.70	0.070	9.85	1.63	
44.80	0.070	12.67	1.73	
44.90	0.070	15.98	1.83	
45.00	0.070	19.80	1.93	
45.10	0.070	23.13	1.93	
45.20	0.070	27.37	1.95	
45.30	0.070	32.54	2.00	
45.40	0.070	38.69	2.05	
45.50	0.070	45.87	2.11	
45.60	0.070	54.14	2.18	
45.70	0.070	63.56	2.25	
45.80	0.070	74.19	2.32	
45.90	0.070	86.09	2.39	
46.00	0.070	99.31	2.47	



Langley and McDonald, P.C.

ENGINEERS • SURVEYORS • PLANNERS  
LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS

VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject POWHATAN WOODS

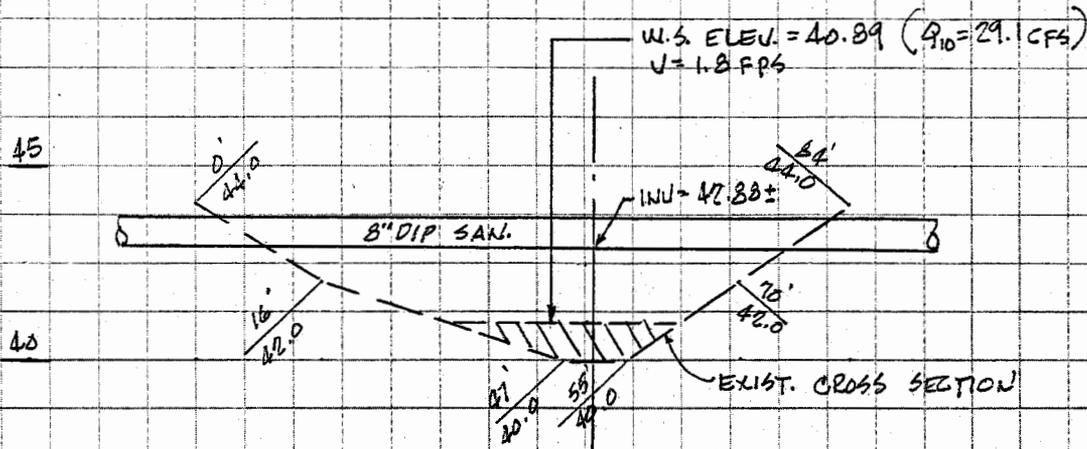
Project No. \_\_\_\_\_

Client \_\_\_\_\_

Computed By FEU Checked by \_\_\_\_\_

Date \_\_\_\_\_ Sheet No. \_\_\_\_\_

CHECK FLOW IN EXISTING DITCH @ PROPOSED SANITARY CROSSING:



FLOW DATA @ OUTFALL #12 (UPSTREAM OF CROSSING)

$$A = 10.62 \text{ Ac.}$$

$$CA = 4.18$$

$$I = 5.15$$

$$\text{ADDITIONAL DA} = 4.2 \text{ Ac. @ } C = 0.35 \quad \therefore CA = 1.47$$

TOTAL FLOW @ CROSSING:

$$CA = 4.18 + 1.47 = 5.65$$

$$I = 5.15$$

$$\underline{Q_{10} = 29.1 \text{ CFS}}$$

# PLAN VIEW - EXIST. DITCH SECTION & SAN CROSSING

SAN. M.H.#18  
 RIM=48.00  
 INV(IN)=43.30  
 INV(OUT)=43.20

44 LF-18" RCP @ 0.22% (INCLUDES  
 80 LF-15" F

DITCH BOTTOM @ ELEV. 40.0 ±  
 BOTTOM OF SAN. @ ELEV. 42.8 ±

PILE BENT SEWER BRIDGE

200 LF-8" DIP SAN @ 0.1  
 (17) STD. RIM  
 INV  
 INV

(18) STD. ES-1  
 INV.=40.00  
 9 SY RIPRAP  
 VDOT EC-1

20' SANITARY SEWER EASEMENT

20' SANITARY

44

42

40

40

42

44

Existing Ditch @ San crossing  
Worksheet for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\pw-ph1.fm2
Worksheet	San-crossing
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data	
Channel Slope	0.015400 ft/ft
Elevation range: 40.00 ft to 44.00 ft.	
Station (ft)	Elevation (ft)
0.00	44.00
16.00	42.00
47.00	40.00
55.00	40.00
70.00	42.00
84.00	44.00
Discharge	29.10 cfs

Start Station	End Station	Roughness
0.00	84.00	0.070

Results	
Wtd. Mannings Coefficient	0.070
Water Surface Elevation	40.89 ft
Flow Area	16.13 ft <sup>2</sup>
Wetted Perimeter	28.48 ft
Top Width	28.39 ft
Height	0.89 ft
Critical Depth	40.57 ft
Critical Slope	0.098023 ft/ft
Velocity	1.80 ft/s
Velocity Head	0.05 ft
Specific Energy	40.94 ft
Froude Number	0.42
Flow is subcritical.	

Table  
Rating Table for Irregular Channel

Project Description	
Project File	c:\haestad\fmw\pw-ph1.fm2
Worksheet	San-crossing
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Constant Data	
Channel Slope	0.015400 ft/ft

Input Data			
	Minimum	Maximum	Increment
Water Surface Elevation	40.00	42.50	0.50 ft

Rating Table				
Water Surface Elevation (ft)	Wtd. Mannings Coefficient	Discharge (cfs)	Velocity (ft/s)	
40.00	0.070	0.00	0.00	
40.50	0.070	9.02	1.31	
41.00	0.070	37.63	1.93	
41.50	0.070	92.18	2.43	
42.00	0.070	178.65	2.88	
42.50	0.070	309.68	3.41	

PROJECT 98019  
POWHATAN WOODS - PHASE 1

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INLET NUMBER 1                      LENGTH 12.0                      STATION

DRAINAGE AREA = 2.330 ACRES                      C VALUE = .350                      CA = 0.815  
SUM CA= 0.815 INT= 3.50 CFS= 2.854 CO= 0.000 GUTTER FLOW= 2.854

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
7.67	2.0	0.26	0.0833	4.0	0.70	3.5	0.146	0.123

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
REQUIRED LENGTH (ft) = 12.6                      EFFICIENCY= 1.00  
CFS INTERCEPTED= 2.84                      CFS CARRYOVER= 0.01

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INLET NUMBER 2                      LENGTH 10.0                      STATION

DRAINAGE AREA = 1.440 ACRES                      C VALUE = .400                      CA = 0.576  
SUM CA= 0.576 INT= 3.50 CFS= 2.016 CO= 0.000 GUTTER FLOW= 2.016

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
6.37	2.0	0.31	0.0833	4.0	0.79	3.5	0.146	0.136

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
REQUIRED LENGTH (ft) = 10.2                      EFFICIENCY= 1.00  
CFS INTERCEPTED= 2.01                      CFS CARRYOVER= 0.00

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INLET NUMBER 3                      LENGTH 8.0                      STATION

DRAINAGE AREA = 0.850 ACRES                      C VALUE = .400                      CA = 0.340  
DRAINAGE AREA = 0.050 ACRES                      C VALUE = .400                      CA = 0.020

FOR THE FIRST SIDE  
SUM CA= 0.340 INT= 3.50 CFS= 1.190 CO= 0.000 GUTTER FLOW= 1.190  
FOR THE OTHER SIDE  
SUM CA= 0.020 INT= 3.50 CFS= 0.070 CO= 0.000 GUTTER FLOW= 0.070  
AT THE INLET

SUM CA= 0.360 INT= 3.50 CFS= 1.260 CO= 0.000 GUTTER FLOW= 1.260

GUTTER SLOPE = 0.0010 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 1.19 (cfs) IS 10.32 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX  
P EFFEC. LENGTH (ft) = 11.60                      H (ft) = 0.290  
DEPTH OF WATER (ft) = 0.13                      SPREAD (ft) = 6.28

---

INLET NUMBER 4                      LENGTH 2.5                      STATION

DRAINAGE AREA = 0.320 ACRES                      C VALUE = .850                      CA = 0.272

SUM CA= 0.272 INT= 3.50 CFS= 0.952 CO= 0.000 GUTTER FLOW= 0.952

GUTTER SLOPE = 0.0386 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.78	2.0	0.72	0.0833	4.0	0.99	3.5	0.146	0.166

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 8.1                      EFFICIENCY= 0.49

CFS INTERCEPTED= 0.46                      CFS CARRYOVER= 0.49

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INLET NUMBER 5                      LENGTH 10.0                      STATION

DRAINAGE AREA = 0.730 ACRES                      C VALUE = .400                      CA = 0.292

SUM CA= 0.292 INT= 3.50 CFS= 1.022 CO= 0.000 GUTTER FLOW= 1.022

GUTTER SLOPE = 0.0570 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.40	2.0	0.83	0.0833	4.0	1.00	3.5	0.146	0.166

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 9.3                      EFFICIENCY= 1.00

CFS INTERCEPTED= 1.02                      CFS CARRYOVER= 0.00

---

INLET NUMBER 6                      LENGTH 8.0                      STATION

DRAINAGE AREA = 0.980 ACRES                      C VALUE = .350                      CA = 0.343

SUM CA= 0.343 INT= 3.50 CFS= 1.201 CO= 0.000 GUTTER FLOW= 1.201

GUTTER SLOPE = 0.0250 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
4.22	2.0	0.47	0.0833	4.0	0.94	3.5	0.146	0.157

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 8.1                      EFFICIENCY= 1.00

CFS INTERCEPTED= 1.20                      CFS CARRYOVER= 0.00

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INLET NUMBER 7                      LENGTH 8.0                      STATION

DRAINAGE AREA = 1.050 ACRES                      C VALUE = .350                      CA = 0.367

SUM CA= 0.367 INT= 3.50 CFS= 1.286 CO= 0.000 GUTTER FLOW= 1.286

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
4.82	2.0	0.41	0.0833	4.0	0.90	3.5	0.146	0.152

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 7.9                      EFFICIENCY= 1.00

CFS INTERCEPTED= 1.29                      CFS CARRYOVER= 0.00

---

INLET NUMBER 8                      LENGTH 8.0                      STATION

DRAINAGE AREA = 0.850 ACRES                      C VALUE = .350                      CA = 0.298

DRAINAGE AREA = 0.650 ACRES                      C VALUE = .350                      CA = 0.227

FOR THE FIRST SIDE

SUM CA= 0.298 INT= 3.50 CFS= 1.041 CO= 0.000 GUTTER FLOW= 1.041

FOR THE OTHER SIDE

SUM CA= 0.227 INT= 3.50 CFS= 0.796 CO= 0.000 GUTTER FLOW= 0.796

AT THE INLET

SUM CA= 0.525 INT= 3.50 CFS= 1.837 CO= 0.000 GUTTER FLOW= 1.837

GUTTER SLOPE = 0.0010 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 1.04 (cfs) IS 9.71 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 11.60                      H (ft) = 0.290

DEPTH OF WATER (ft) = 0.17                      SPREAD (ft) = 8.07



INLET NUMBER 11                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.450 ACRES            C VALUE = .400            CA = 0.180  
DRAINAGE AREA = 0.150 ACRES            C VALUE = .400            CA = 0.060

FOR THE FIRST SIDE <sup>0.630</sup>  
SUM CA= 0.180 INT= 3.50 CFS= 0.630 CO= 0.000 GUTTER FLOW= 0.630  
FOR THE OTHER SIDE  
SUM CA= 0.060 INT= 3.50 CFS= 0.210 CO= 0.000 GUTTER FLOW= 0.210  
AT THE INLET

SUM CA= 0.240 INT= 3.50 CFS= 0.840 CO= 0.000 GUTTER FLOW= 0.840

GUTTER SLOPE = 0.0010 FT/FT            PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.63 (cfs) IS 7.62 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXXXX  
P EFFEC. LENGTH (ft) = 9.60                      H (ft) = 0.290  
DEPTH OF WATER (ft) = 0.11                      SPREAD (ft) = 5.43

PROJECT 98019  
 POWHATAN WOODS - PHASE 1

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INLET NUMBER 13                      LENGTH 8.0                      STATION

DRAINAGE AREA = 0.840 ACRES                      C VALUE = .400                      CA = 0.336  
 SUM CA= 0.336 INT= 3.50 CFS= 1.176 CO= 0.000 GUTTER FLOW= 1.176

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
4.52	2.0	0.44	0.0833	4.0	0.92	3.5	0.146	0.155

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
 REQUIRED LENGTH (ft) = 7.6                      EFFICIENCY= 1.00  
 CFS INTERCEPTED= 1.18                      CFS CARRYOVER= 0.00

---

INLET NUMBER 14                      LENGTH 6.0                      STATION

DRAINAGE AREA = 0.690 ACRES                      C VALUE = .400                      CA = 0.276  
 SUM CA= 0.276 INT= 3.50 CFS= 0.966 CO= 0.000 GUTTER FLOW= 0.966

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.88	2.0	0.52	0.0833	4.0	0.95	3.5	0.146	0.160

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
 REQUIRED LENGTH (ft) = 6.8                      EFFICIENCY= 0.98  
 CFS INTERCEPTED= 0.94                      CFS CARRYOVER= 0.02

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INLET NUMBER 15                      LENGTH 6.0                      STATION

DRAINAGE AREA = 0.240 ACRES                      C VALUE = .400                      CA = 0.096  
 DRAINAGE AREA = 0.600 ACRES                      C VALUE = .400                      CA = 0.240

FOR THE FIRST SIDE  
 SUM CA= 0.096 INT= 3.50 CFS= 0.336 CO= 0.020 GUTTER FLOW= 0.356  
 FOR THE OTHER SIDE  
 SUM CA= 0.240 INT= 3.50 CFS= 0.840 CO= 0.000 GUTTER FLOW= 0.840  
 AT THE INLET

SUM CA= 0.336 INT= 3.50 CFS= 1.176 CO= 0.020 GUTTER FLOW= 1.196

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .020 (ft./ft.) AND 0.84 (cfs) IS 3.43 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX  
 P EFFEC. LENGTH (ft) = 9.60                      H (ft) = 0.290  
 DEPTH OF WATER (ft) = 0.14                      SPREAD (ft) = 6.88

PROJECT 98019  
 POWHATAN WOODS - PHASE 1

INLET NUMBER 19                      LENGTH 6.0                      STATION

DRAINAGE AREA = 0.630 ACRES                      C VALUE = .400                      CA = 0.252  
 SUM CA= 0.252 INT= 3.50 CFS= 0.882 CO= 0.000 GUTTER FLOW= 0.882

GUTTER SLOPE = 0.0230 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.36	2.0	0.60	0.0833	4.0	0.98	3.5	0.146	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXXX  
 REQUIRED LENGTH (ft) = 6.8                      EFFICIENCY= 0.98  
 CFS INTERCEPTED= 0.86                      CFS CARRYOVER= 0.02

INLET NUMBER 20                      LENGTH 6.0                      STATION

DRAINAGE AREA = 0.710 ACRES                      C VALUE = .400                      CA = 0.284  
 SUM CA= 0.284 INT= 3.50 CFS= 0.994 CO= 0.020 GUTTER FLOW= 1.014

GUTTER SLOPE = 0.0050 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
6.39	2.0	0.31	0.0833	4.0	0.79	3.5	0.146	0.136

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXXX  
 REQUIRED LENGTH (ft) = 5.1                      EFFICIENCY= 1.00  
 CFS INTERCEPTED= 1.01                      CFS CARRYOVER= 0.00

INLET NUMBER 21                      LENGTH 6.0                      STATION

DRAINAGE AREA = 0.290 ACRES                      C VALUE = .400                      CA = 0.116  
 DRAINAGE AREA = 0.400 ACRES                      C VALUE = .400                      CA = 0.160

FOR THE FIRST SIDE  
 SUM CA= 0.116 INT= 3.50 CFS= 0.406 CO= 0.000 GUTTER FLOW= 0.406  
 FOR THE OTHER SIDE  
 SUM CA= 0.160 INT= 3.50 CFS= 0.560 CO= 0.000 GUTTER FLOW= 0.560  
 AT THE INLET

SUM CA= 0.276 INT= 3.50 CFS= 0.966 CO= 0.000 GUTTER FLOW= 0.966

GUTTER SLOPE = 0.0080 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .008 (ft./ft.) AND 0.56 (cfs) IS 3.60 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX  
 P EFFEC. LENGTH (ft) = 9.60                      H (ft) = 0.290  
 DEPTH OF WATER (ft) = 0.12                      SPREAD (ft) = 5.96

PROJECT 98019  
POWHATAN WOODS - PHASE 1

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INLET NUMBER 25                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.330 ACRES              C VALUE = .400              CA = 0.132  
SUM CA= 0.132 INT= 3.50 CFS= 0.462 CO= 0.000 GUTTER FLOW= 0.462

GUTTER SLOPE = 0.0470 FT/FT              PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.62	2.0	1.23	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
REQUIRED LENGTH (ft) = 6.3                      EFFICIENCY= 1.00  
CFS INTERCEPTED= 0.46                      CFS CARRYOVER= 0.00

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INLET NUMBER 26                      LENGTH    2.5                      STATION

DRAINAGE AREA = 0.310 ACRES              C VALUE = .400              CA = 0.124  
SUM CA= 0.124 INT= 3.50 CFS= 0.434 CO= 0.000 GUTTER FLOW= 0.434

GUTTER SLOPE = 0.0483 FT/FT              PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.57	2.0	1.27	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
REQUIRED LENGTH (ft) = 6.2                      EFFICIENCY= 0.61  
CFS INTERCEPTED= 0.26                      CFS CARRYOVER= 0.17

---

INLET NUMBER 36                      LENGTH    4.0                      STATION

DRAINAGE AREA = 0.100 ACRES              C VALUE = .400              CA = 0.040  
SUM CA= 0.040 INT= 3.50 CFS= 0.140 CO= 0.170 GUTTER FLOW= 0.310

GUTTER SLOPE = 0.0242 FT/FT              PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.58	2.0	1.27	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX  
REQUIRED LENGTH (ft) = 4.4                      EFFICIENCY= 0.99  
CFS INTERCEPTED= 0.31                      CFS CARRYOVER= 0.00

---

INLET NUMBER 27                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.340 ACRES                      C VALUE = .400                      CA = 0.136

DRAINAGE AREA = 0.360 ACRES                      C VALUE = .400                      CA = 0.144

FOR THE FIRST SIDE

SUM CA= 0.136 INT= 3.50 CFS= 0.476 CO= 0.000 GUTTER FLOW= 0.476

FOR THE OTHER SIDE

SUM CA= 0.144 INT= 3.50 CFS= 0.504 CO= 0.000 GUTTER FLOW= 0.504

AT THE INLET

SUM CA= 0.280 INT= 3.50 CFS= 0.980 CO= 0.000 GUTTER FLOW= 0.980

GUTTER SLOPE = 0.0010 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.50 (cfs) IS 6.78 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60                      H (ft) = 0.290

DEPTH OF WATER (ft) = 0.13                      SPREAD (ft) = 6.02

---

INLET NUMBER 33                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.330 ACRES                      C VALUE = .400                      CA = 0.132

SUM CA= 0.132 INT= 3.50 CFS= 0.462 CO= 0.000 GUTTER FLOW= 0.462

GUTTER SLOPE = 0.0200 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.90	2.0	1.05	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 4.9                      EFFICIENCY= 1.00

CFS INTERCEPTED= 0.46                      CFS CARRYOVER= 0.00

---

INLET NUMBER 34                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.190 ACRES                      C VALUE = .600                      CA = 0.114

SUM CA= 0.114 INT= 3.50 CFS= 0.399 CO= 0.000 GUTTER FLOW= 0.399

GUTTER SLOPE = 0.0430 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.56	2.0	1.28	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 5.8                      EFFICIENCY= 1.00

CFS INTERCEPTED= 0.40                      CFS CARRYOVER= 0.00

---

INLET NUMBER 28                      LENGTH    8.0                      STATION

DRAINAGE AREA = 0.430 ACRES                      C VALUE = .400                      CA = 0.172

SUM CA= 0.172 INT= 3.50 CFS= 0.602 CO= 0.000 GUTTER FLOW= 0.602

GUTTER SLOPE = 0.0500 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.77	2.0	1.13	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 7.2                      EFFICIENCY= 1.00

CFS INTERCEPTED= 0.60                      CFS CARRYOVER= 0.00

---

INLET NUMBER 29                      LENGTH    6.0                      STATION

DRAINAGE AREA = 0.170 ACRES                      C VALUE = .600                      CA = 0.102

DRAINAGE AREA = 0.170 ACRES                      C VALUE = .600                      CA = 0.102

FOR THE FIRST SIDE

SUM CA= 0.102 INT= 3.50 CFS= 0.357 CO= 0.000 GUTTER FLOW= 0.357

FOR THE OTHER SIDE

SUM CA= 0.102 INT= 3.50 CFS= 0.357 CO= 0.000 GUTTER FLOW= 0.357

AT THE INLET

SUM CA= 0.204 INT= 3.50 CFS= 0.714 CO= 0.000 GUTTER FLOW= 0.714

GUTTER SLOPE = 0.0010 FT/FT                      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.36 (cfs) IS 5.55 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60                      H (ft) = 0.290

DEPTH OF WATER (ft) = 0.10                      SPREAD (ft) = 4.87

POWHATAN OF WILLIAMSBURG SECONDARY - PHASE V-B

DRAINAGE AREA RIDGE LINE (TYP)

POWHATAN RECREATION SITE

POWHATAN SECONDARY

POWHATAN OF WILLIAMSBURG SECONDARY - PHASE III

FUTURE DEVELOPMENT

CONSERVATION EASEMENT

CONSERVATION EASEMENT

140' R/W

ROUTE 5

LEGEND

-  DRAINAGE STRUCTURE NUMBER
-  DRAINAGE AREA
-  RUNOFF COEFFICIENT



**Langley and McDonald, P.C.**  
 Engineers • Surveyors • Planners  
 Landscape Architects • Environmental Consultants  
 VIRGINIA BEACH  
 WILLIAMSBURG



DES. \_\_\_\_\_  
 DWG. \_\_\_\_\_  
 CHK. \_\_\_\_\_  
 DATE \_\_\_\_\_

DRAINAGE AREA MAP  
**POWHATAN WOODS**  
 PHASE I

JAMES CITY COUNTY VIRGINIA

SHEET OF \_\_\_\_\_  
 DISK DA-MAP.DWG  
 PROJ. NO. 98019  
 DWG.

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: GEORGE WYTHE LANE  
 FROM STA. 8+52 TO STA. 10+50  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	1,200	1. CBR Values =	7.50	7.50	7.50
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	1200	2. Enter No. of Tests =	3		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	1,200 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 14.5 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	2.25	2.0	4.5
BM-2	2.25	3.0	6.8
Aggregate	0.60	8.0	4.8
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>13.0</b>	<b>16.1</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: GEORGE WYTHE LANE  
 FROM STA. 10+50 TO STA. 18+80  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	950	1. CBR Values =	7.50	7.50	7.50
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	950	2. Enter No. of Tests =	3		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	950 ADT	6. Soil Support Value =	10.00	(Assumed)	

**PAVEMENT DESIGN**

Thickness Index Required = 13.8 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	2.25	2.0	4.5
BM-2	2.25	3.0	6.8
Aggregate	0.60	8.0	4.8
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>13.0</b>	<b>16.1</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: GEORGE WYTHE LANE  
 FROM STA. 18+80 TO STA. 20+71  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	80	1. CBR Values =	7.50	7.50	0.00
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	80	2. Enter No. of Tests =	2		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	80 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 6.4 inches (Min.)

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: HARTWELL PERRY WAY  
 FROM STA. 11+63 TO STA. 20+86  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

1. Vehicles Per Day =	230
2. % Heavy Traffic =	5 %
3. Equiv. Present ADT =	230
4. Design Period	10 Yrs.
5. % Growth =	0 %
6. Growth Factor =	1.00
7. V.P.D. Projection =	230 ADT

**SUBGRADE ANALYSIS**

1. CBR Values =	7.50	7.50	0.00
2. Enter No. of Tests =	2		
3. Average CBR =	7.50		
4. Design CBR =	5.00		
5. Soil Resiliency Factor =	2.00		
6. Soil Support Value =	10.00	(Assumed)	

**PAVEMENT DESIGN**

Thickness Index Required = 8.0 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: SIR JOHN RANDOLPH TERRACE  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	100	1. CBR Values =	7.50	7.50	0.00
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	100	2. Enter No. of Tests =	2		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	100 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 6.4 inches (Min.)

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: ELIZABETH HARRISON LANE  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	640	1. CBR Values =	7.50	7.50	7.50
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	640	2. Enter No. of Tests =	3		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	640 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 12.2 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	2.25	2.0	4.5
BM-2	2.25	3.0	6.8
Aggregate	0.60	8.0	4.8
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>13.0</b>	<b>16.1</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: NORTH BENJAMIN HOWELL STREET  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	200	1. CBR Values =	7.50	7.50	0.00
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	200	2. Enter No. of Tests =	2		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	200 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 7.6 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: SOUTH BENJAMIN HOWELL STREET  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	240	1. CBR Values =	7.50	7.50	0.00
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	240	2. Enter No. of Tests =	2		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	240 ADT	6. Soil Support Value =	10.00	(Assumed)	

**PAVEMENT DESIGN**

Thickness Index Required = 8.0 inches

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: GOVERNOR EDWARD NOTT COURT  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

**SUBGRADE ANALYSIS**

1. Vehicles Per Day =	100	1. CBR Values =	7.50	7.50	0.00
2. % Heavy Traffic =	5 %		0.00	0.00	0.00
3. Equiv. Present ADT =	100	2. Enter No. of Tests =	2		
4. Design Period	10 Yrs.	3. Average CBR =	7.50		
5. % Growth =	0 %	4. Design CBR =	5.00		
6. Growth Factor =	1.00	5. Soil Resiliency Factor =	2.00		
7. V.P.D. Projection =	100 ADT	6. Soil Support Value =	10.00 (Assumed)		

**PAVEMENT DESIGN**

Thickness Index Required = 6.4 inches (Min.)

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>

PRELIMINARY PAVEMENT DESIGN  
 VHRC 73-R21

PROJECT: Powhatan Woods  
 LOCATION: James City County  
 STREET: GEORGE WILSON COURT  
 FROM STA. TO STA.  
 DATE: 03-Jun-98

**TRAFFIC ANALYSIS**

1. Vehicles Per Day =	70
2. % Heavy Traffic =	5 %
3. Equiv. Present ADT =	70
4. Design Period	10 Yrs.
5. % Growth =	0 %
6. Growth Factor =	1.00
7. V.P.D. Projection =	70 ADT

**SUBGRADE ANALYSIS**

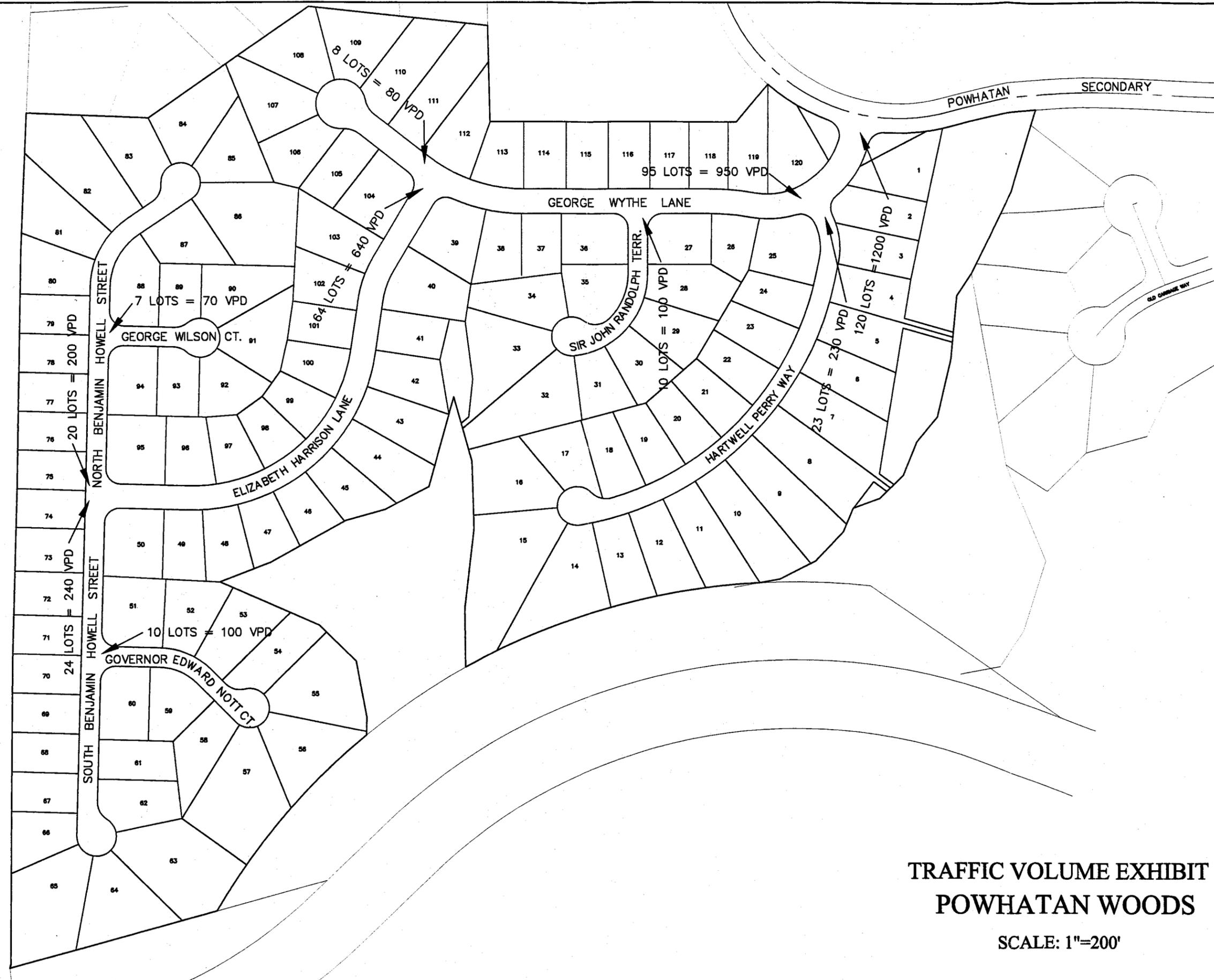
1. CBR Values =	7.50	7.50	0.00
2. Enter No. of Tests =	2		
3. Average CBR =	7.50		
4. Design CBR =	5.00		
5. Soil Resiliency Factor =	2.00		
6. Soil Support Value =	10.00	(Assumed)	

**PAVEMENT DESIGN**

Thickness Index Required = 6.4 inches (Min.)

ALT. 'A'

Material	Factor	Thickness	Index
SM-2A	1.67	2.0	3.3
Aggregate	1.00	6.0	6.0
Sel. Material	0.60	0.0	0.0
<b>TOTAL</b>		<b>8.0</b>	<b>9.3</b>



**TRAFFIC VOLUME EXHIBIT  
POWHATAN WOODS**

SCALE: 1"=200'

**POWHATAN WOODS  
PHASE 1  
JAMES CITY COUNTY, VIRGINIA**

**EROSION AND SEDIMENT CONTROL PLAN NARRATIVE  
JUNE 1998**

PROJECT DESCRIPTION

Powhatan Woods is a proposed 120 lot residential subdivision situated within the overall Powhatan of Williamsburg Secondary project site. Powhatan Woods is located on the south side of Powhatan Secondary approximately 1800 feet south of News Road. The total project encompasses 52.26 acres of land, of which 26.08 acres are depicted as Phase 1 on the site development plans. Phase 1 proposes 56 residential building lots. As shown on the site development plans, approximately 6.5 acres will be cleared for proposed roadways, utility installation, and drainage facilities. The project site is identified as assessor's Parcel No. (1-9) Tax Map (38-3).

EXISTING SITE CONDITIONS

The entire site is undeveloped and moderately wooded with light understory. The landform in the general area is a rolling terrain with slopes varying from relatively flat to slopes of approximately 10 % along the ravine areas. Elevations within the project site generally range from elevation 30 to elevation 80. Drainage from the project is directed to tributary drainageways of Powhatan Creek.

SOILS

The predominant soil types which will be disturbed during the project construction are Caroline fine sandy loam, Emporia fine sandy loam, Emporia complex, and Johnston complex, as depicted on soil mapping contained in the USDA - Soil Conservation Service, Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.

Caroline fine sandy loam is deep, gently sloping, and well drained. It is on narrow upland ridges and side slopes. Typically, the surface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 9 inches thick. The subsoil extends to a depth of 47 inches. It is mostly strong brown clay loam and yellowish red clay, sandy clay, and sandy clay loam. The

substratum is strong brown, stratified clay, clay loam, and fine sandy loam that extends from 47 inches to at least 72 inches. The permeability of this soil is moderately slow, and available water capacity is moderate. Surface runoff is medium. ~~The erosion hazard is moderate.~~ The subsoil has a moderate shrink-swell potential. This soil is in capability subclass IIe. These soils are in hydrologic soil group C.

Emporia fine sandy loam appears on medium and broad upland ridges. This soil is deep, gentle sloping, and well drained. Typically, the surface layer of this soil is dark grayish brown fine sandy loam 4 inches thick. The subsurface layer is pale brown loam 9 inches thick. The subsoil extends to a depth of 58 inches. It is yellowish brown loam with mostly strong brown mottles in the upper part; yellowish brown fine sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated gray, brown, and red, firm sandy clay loam to a depth of at least 75 inches. Permeability of this Emporia soil is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. Surface runoff is medium. ~~The erosion hazard is moderate.~~ A perched high water table is at a depth of 3 to 4 ½ feet in the winter and spring. This soil is in capability subclass IIe. These soils are in hydrologic soil group C.

Emporia complex appears on side slopes along drainageways. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of 45-50 inches and is yellowish brown loam with mostly strong brown mottles in the upper parts; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated gray, brown, and red, firm sandy clay loam to a depth of at least 75 inches. In this Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The available water capacity is moderate. Surface runoff is medium. ~~The erosion hazard is moderate.~~ The subsoil has moderate shrink-swell potential. A perched high water table is at a depth of 3 to 4 ½ feet in winter and spring. This soil is in capability subclass VIIe. The hydrologic soil group for this soil is C.

Johnston complex consists of areas of nearly level and very poorly drained soils. These soils are on flood plains and along major drainageways. Typically, the surface layer is black silt loam about 8 inches thick. The subsoil is black silty clay loam 26 inches thick. The substratum is black sandy clay loam and gray fine sandy loam to a depth of at least 60 inches. The permeability is moderate and the available water capacity is high. The shrink-swell potential is low. These soils are in capability subclass VIIw. The hydrologic soil group for this soil is D.

## CRITICAL EROSION AREAS

The soils identified on the site suggest a moderate erosion hazard. The potential for more severe erosion may exist within the ravine areas. With the exception of storm drainage outfalls and one sanitary sewer crossing installation, no construction is anticipated within these areas. All disturbed slopes will be stabilized by vegetative practices.

## EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated. All vegetative and structural erosion and sediment control practices will be constructed and maintained according to minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, 1992, and in accordance with York County Standards.

### STRUCTURAL PRACTICE:

The following practices are shown on the development plan sheets and detailed on erosion control details sheet.

1. TEMPORARY CONSTRUCTION ENTRANCE (3.02)

A temporary construction entrance will be installed at the beginning of the main entrance road at Powhatan Secondary.

2. CONSTRUCTION ROAD STABILIZATION (3.03)

Proposed roadway areas shall receive the base course of gravel as soon as practical following grading and subbase preparation.

3. SILT FENCE (3.05)

Silt fence will be installed where shown on the plan.

4. STORM DRAIN INLET PROTECTION (3.07)

Storm drain inlet protection will be installed for all drainage inlet structures where shown on the plan.

5. TEMPORARY FILL DIVERSION (3.10)

Temporary fill diversions shall be constructed at the top of all fill areas at the end of each workday as needed.

6. OUTLET PROTECTION (3.18)

Outlet protection shall be placed at all drainage outfalls.

7. TEMPORARY SEDIMENT TRAP (3.13)

Temporary sediment traps shall be installed at locations shown on the plans.

8. TREE PROTECTION (3.38)

Tree protection fencing or other suitable devices shall be placed along the "limits of clearing" to protect desirable trees from mechanical and other injury during land disturbing and construction activity.

VEGETATIVE PRACTICES:

1. TOPSOIL STOCKPILE

Topsoil shall be stripped from areas to be graded and stockpiled for later use. The Owner shall approve stockpile locations.

2. TEMPORARY SEEDING (3.31)

All distributed areas on-site will be seeded with a fast-germinating, temporary vegetation immediately following grading or where exposed soil surfaces will not be brought to final grade for a period of time exceeding 15 days. Selection of the appropriate seed mixture as recommended by the Virginia Erosion and Sediment Control Handbook, 1992 will depend on the time of year it is to be applied.

MANAGEMENT STRATEGIES AND CONSTRUCTION SEQUENCE

1. Establish tree protection/clearing limits flagging and erosion control devices.
2. Clear sufficient areas to allow for the placement of the construction entrances. The construction entrances shall be in place immediately (no longer than 24 hours) following clearing activities.
3. Roadway clearing and grubbing operations shall proceed upon inspection and

approval of the construction entrance by the County. During this activity temporary earth swales may be necessary to maintain proper drainage.

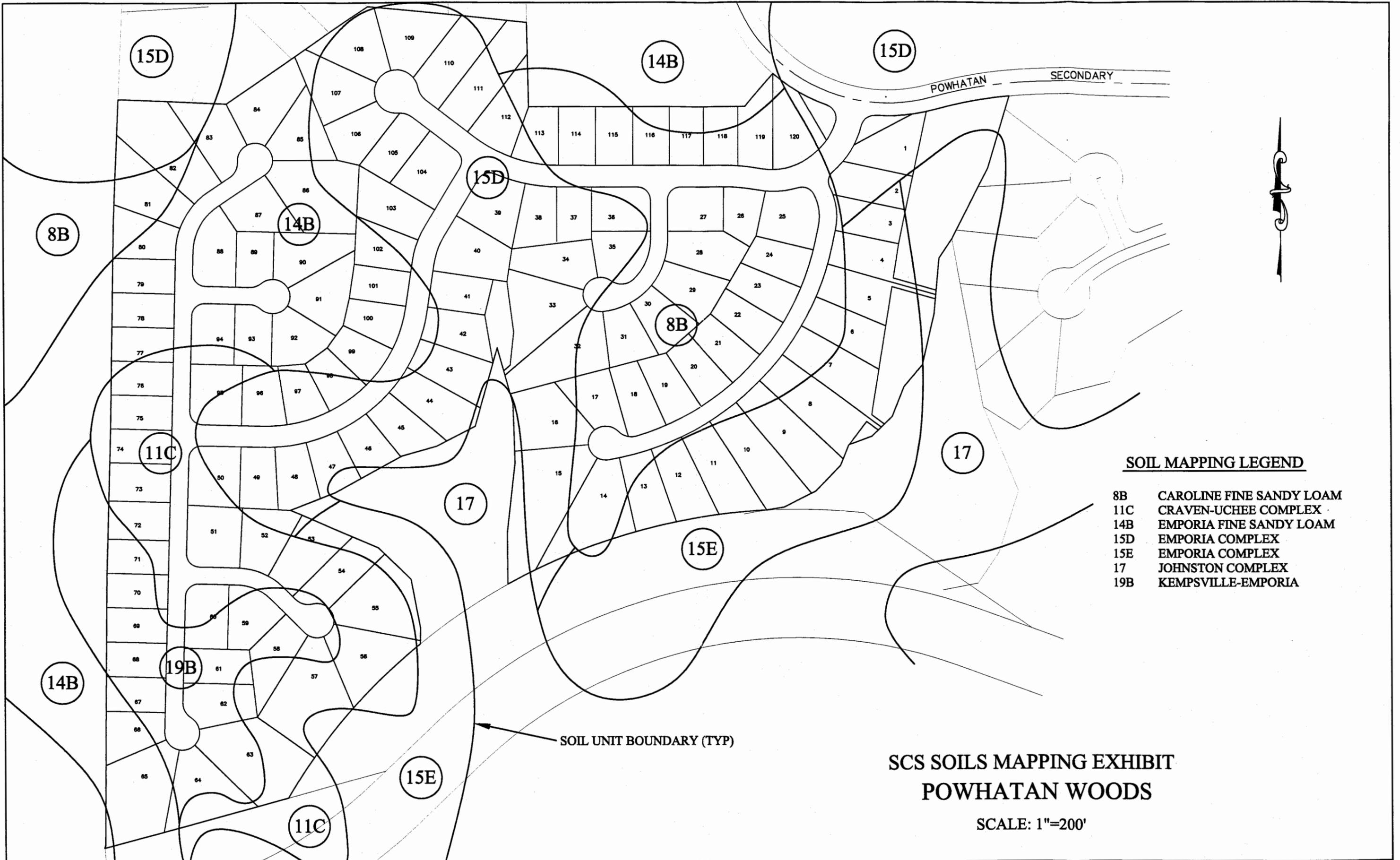
4. It is the contractor's option to schedule the order for which areas will be cleared and graded first, second, etc.
5. If temporary stockpiles are used, the contractor shall install silt fences at the base to prevent sediment runoff. Stockpiles shall not be placed within any easement, or between the right-of-way and the building setback line.
6. **Construction of the storm drainage system and sediment traps shall commence immediately after an area has been cleared and left free of all roots, stumps, and debris. Place all permanent erosion and sediment control devices.**
7. After the storm drainage system and sediment traps are in place, the contractor shall rough grade and prepare the subgrade of the roadways.
8. Install sewer and water utilities, curb and gutter, sub-base materials and pavement surface course in the roadways.
9. Provide permanent seeding as required. Permanent seeding may take place at prior phases as deemed appropriate.
10. Temporary sediment traps shall be removed and the area stabilized.

#### PERMANENT STABILIZATION

All areas disturbed by grading will be stabilized with permanent seeding immediately following finish grading. Seeding will be done according to Std. and Spec. 3.32 of the Virginia erosion and Sediment Control Handbook, 1992. Permanently seeded areas shall be protected during establishment with straw mulch.

#### MAINTENANCE

Maintenance of temporary erosion and sediment control devices is the responsibility of the developer. In general, all erosion and sediment control measures will be checked weekly and after each significant rainfall. The sediment basin traps will be checked regularly for sediment cleanout. Silt fencing shall be inspected immediately after each rainfall and at least daily during prolonged rainfall for undermining or repair. All seeded areas will be checked to insure a good stand of grass is maintained. Seeded areas deficient shall be reseeded as necessary.



**SOIL MAPPING LEGEND**

- 8B CAROLINE FINE SANDY LOAM
- 11C CRAVEN-UCHEE COMPLEX
- 14B EMPORIA FINE SANDY LOAM
- 15D EMPORIA COMPLEX
- 15E EMPORIA COMPLEX
- 17 JOHNSTON COMPLEX
- 19B KEMPSVILLE-EMPORIA

**SCS SOILS MAPPING EXHIBIT  
POWHATAN WOODS**

SCALE: 1"=200'

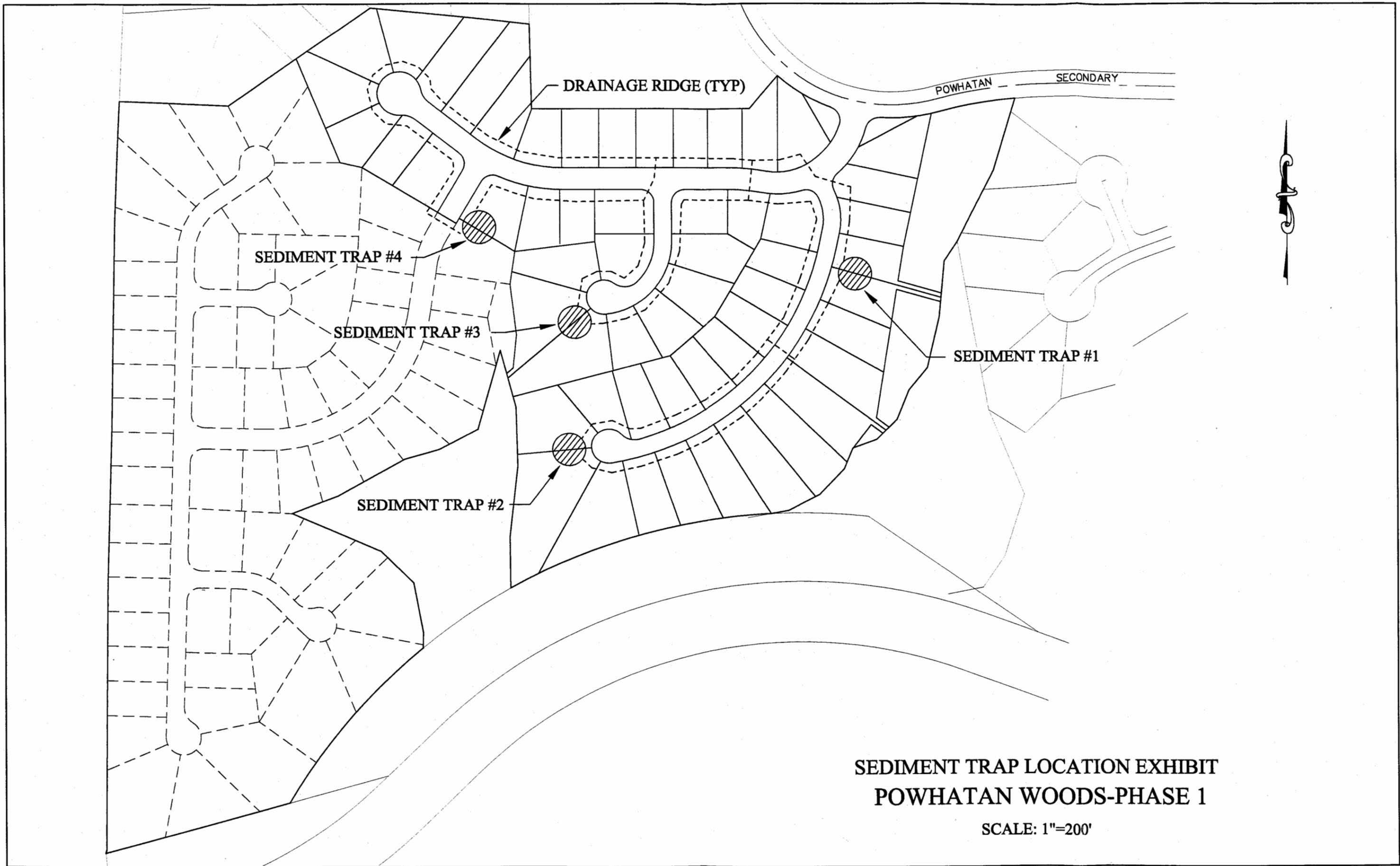
**PROJECT: POWHATAN WOODS PHASE 1**

**SEDIMENT TRAP SIZING**

TRAP NUMBER	PRE- CONSTRUCTION	POST CONSTRUCTION	VOLUME REQUIRED (134CY/AC)	WET DEPTH (FT)	WATER SURFACE DIMENSIONS		AREA OF WATER SURFACE (SF)	DRY DEPTH (FT)	WET VOLUME PROVIDED (CY)	DRY VOLUME PROVIDED (CY)	TOTAL VOLUME PROVIDED (CY)	OK?
	DRAINAGE AREA (AC)	DRAINAGE AREA (AC)			LENGTH (FT)	WIDTH (FT)						
ST#1	1	1	134	2	45	25	1125	1.4	70.83	69.31	140.14	YES
ST#2	0.9	0.9	120.6	2	50	20	1000	1.4	62.96	62.83	125.79	YES
ST#3	1.05	1.05	140.7	2	75	15	1125	1.4	70.83	72.21	143.05	YES
ST#4	1.65	1.65	221.1	1.6	145	15	2175	1.2	109.56	114.25	223.80	YES

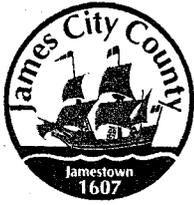
**OUTFALL SIZING**

TRAP NUMBER	DRY DEPTH (FT)	<b>STANDARDS</b>							
		H	Ho	W	L	H	Ho	W	
ST#1	1.4	2.4	1.4	2.0	6	1.0	0.0	2.0	
ST#2	1.4	2.4	1.4	2.0	5.4	1.5	0.5	2.0	
ST#3	1.4	2.4	1.4	2.0	6.3	2.0	1.0	2.0	
ST#4	1.2	2.2	1.2	2.0	9.9	2.5	1.5	2.5	
0	0.0	1.0	0.0	2.0	0	3.0	2.0	2.5	
0	0.0	1.0	0.0	2.0	0	2.5	2.5	3.0	
0	0.0	1.0	0.0	2.0	0	4.0	3.0	3.0	
						4.5	3.5	4.0	
						5.0	4.0	4.5	



**SEDIMENT TRAP LOCATION EXHIBIT  
POWHATAN WOODS-PHASE 1**

SCALE: 1"=200'



# DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. Box 8784, WILLIAMSBURG, VIRGINIA 23187-8784  
 (757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE  
 (757) 253-6626  
 codecomp@james-city.va.us

ENVIRONMENTAL DIVISION  
 (757) 253-6670  
 environ@james-city.va.us

PLANNING  
 (757) 253-6685  
 planning@james-city.va.us

COUNTY ENGINEER  
 (757) 253-6678  
 INTEGRATED PEST MANAGEMENT  
 (757) 253-2620

POWHATAN Woods Phase I BMP  
 Timber Crib Wall  
 PC 143; S-50-98

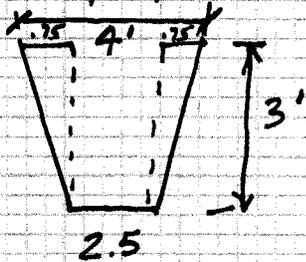
## Design Discharge Outflows from BMP (post dev)

$Q_2 = 5.59 \text{ CFS}$   
 $Q_{10} = 65.85 \text{ CFS}$

} Routed BMP flow

UNROUTED  
 2 = 91.68 CFS  
 10 = 206.29 CFS

Outfall Channel from 36"  $\phi$  BMP Barrel downstream to VDOT 42" RCP Culvert



$$3V = 0.25H:1V$$

$$BW = 2.5' \quad D = 3'$$

$$TW = 4'$$

$$SS = 0.25H:1V$$

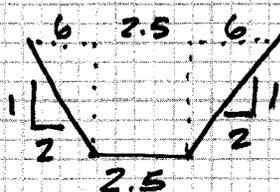
$$S = \frac{25.6 - 25.3}{33'} = 0.91\%$$

$Q_2 =$  VELOCITY 2.9 FPS  $>$  2.5 FPS  
 Depth 0.71 ft.

NO GOOD FOR BARE SOIL  
 NEED LINED

$Q_{10} =$  Depth 3.57'  $>$  3.0' OVERTOPS  
 VELOCITY 5.4 FPS  $>$  2.5

## NEW SECTION (DESIGN)



$$BW = 2.5'$$

$$D = 3'$$

$$TW = 14.5'$$

$$SS = 2H:1V \text{ MAX.}$$

$$S = 0.91\%$$

LINING GRASS  $n = 0.03$

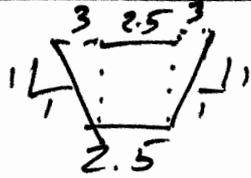
$Q_2 =$  VELOCITY 2.6 FPS  
 DEPTH 0.58'

$Q_{10} =$  Depth 1.98  
 $V = 5.1 \text{ FPS}$

OK 2H:1V w/ GRASS

WITH MATTING EC-2 ( $n = 0.05$ )  $Q_2$  VEL 1.8 FPS /  $Q_{10}$  VEL 3.5 FPS  
 DEPTH 0.76' / DEPTH 2.5 FT.

TRY 1H:1V w/ MATTING



$$TW = 8.5$$

$$BW = 2.5$$

$$S = 0.0091\%$$

LINING EC-MATTING  $n = 0.05$

$$Q_2 = \begin{array}{l} \text{VELOCITY } 2.0 \text{ FPS} \\ \text{Depth } 0.85' \end{array}$$

$$Q_{10} = \begin{array}{l} \text{VELOCITY } 3.8 \text{ FPS} \\ \text{Depth } 3.10 > 3' \text{ NO GOOD.} \end{array}$$

∴ 2H:1V w/ GRASS meets minimum.

2H:1V w/ EC-2 Preferred

# LANDMARK DESIGN GROUP

Powhatan Dam

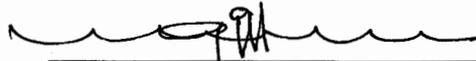
Project Visitation – May 13, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam

1. The trees cut down to provide room for the Stilling Basin need to be removed as they are on the highway Right-of-Way.
2. Owner needs to install a lock on the riser barrel enclosure hatch.
3. Riser tee is installed in the riser.
4. The traffic grate is installed on the standard end wall eight-inch drain. The grate as found was clogged with leaves and debris from recent rains. Recommend owner establish a maintenance procedure to clean the drain after storms.
5. All other elements of the bridge dam are substantially built as designed and or modified.
6. Contractor required to install locking manhole or access into the riser

Submitted by:



Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

Engineers ♦ Planners ♦ Surveyors ♦ Landscape Architects ♦ Environmental Consultants  
4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgwb.com

# LANDMARK DESIGN GROUP

Powhatan Dam

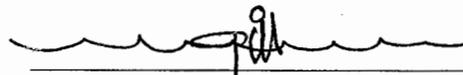
Project Visitation – March 29, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam and Foreman Ben

1. Ben and crew are busy cleaning up the site.
2. Work is well done on bridge and the following items remain.
  - A. Highway grate for 8 inch Ø end.
  - B. Hinge, hasp, and lock on barrel access hatch.
  - C. Access hatch into barrel needs to be installed.
  - D. Tee needs to be installed.
3. Site work required beyond the bridge to be done by owner is as follows:
  - A. Seed disturbed area.
  - B. Remove dead fall and cut trees between the bridge and 199 road embankment.
  - C. Cut back banks of stream drainageway to 1:3 slope.

Submitted by:

  
\_\_\_\_\_  
Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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# LANDMARK DESIGN GROUP

Powhatan Dam

Project Visitation – March 12, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam

1. Met with Ben and reviewed project.
2. Reviewed visitation notes February 14, 2002 and called Ben confirming running deck on observation platform perpendicular to main walk decking.
3. Instructed Ben to fill inside of observation deck/track rack at base drainage barrel to level of top of pipe with 57 stone and cap with Rip Rap.
4. The VDOT-EW 12 grate requires a removable traffic grate see drawing C-20.
5. The top of trash rack, anti-vortex device requires a manhole access cover, which can be accessed thru the locking hatch cover in the deck.
6. Rip Rap at base complete on down streamside and 75% complete on up streamside.
7. Bridge pile cross bracing can now be placed.
8. Workmanship is very good.

Submitted by:



---

Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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# LANDMARK DESIGN GROUP

Powhatan Dam

Project Visitation – February 28, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam

1. Met With Ben the Foreman, job looks better each week.
2. Starting to drive sheet piles for trash rack viewing platform.
3. Handrail cap being installed.
4. Deck 80% ± completed.
5. Filter fabric placed on west side under the bridge. Rip Rap pending delivery. Grading in place to facilitate Rip Rap placement.
6. Mr. Steve Romeo will visit next week.

Submitted by:

*Stephen Powers, LS for*  
Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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# LANDMARK DESIGN GROUP

Powhatan Dam

Project Visitation – February 20, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam, Steve Romeo

1. Met with Foreman Ben from Virginia Marine Structures.
2. Culvert & barrel set and forming of concrete base anchor being set.
3. Down stream flare location will require removal of a large oak and small poplar tree, which will interfere with riprap.
4. Approved use of rip stone number 1 along base after discussion with Steve Romeo.
5. Deck 50 percent complete.
6. Down stream handrail going on and looks great.
7. Ben called on 02/22/02 in reference to viewing platform over trash rack and barrel riser:
  - a. The barrel riser concrete base requires that the sides of the trash rack enclosure be extended to 20 feet  $\pm$  per side (from the 16 foot design dimension)
  - b. This was approved with provision of an extra face pile at the center of each face.

Submitted by:



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Senior Project Manager

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# LANDMARK DESIGN GROUP

Powhatan Dam

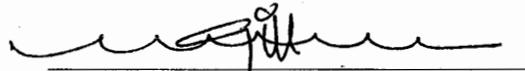
Project Visitation – February 14, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam, Steve Romeo

1. Reviewed project with Ben the Foreman.
2. Culvert and barrel concrete pad has been poured.
3. Abutments poured.
4. Reviewed prototype downstream guardrail anchor bolt offset and approved it with bolt nicked to prevent unscrewing of nuts.
5. Deck being installed and is fitting nicely.
6. Approved running deck in observation cover the trash rack to run tangential to the arch i.e. perpendicular to bridge decking.

Submitted by:



Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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# LANDMARK DESIGN GROUP

Powhatan Dam

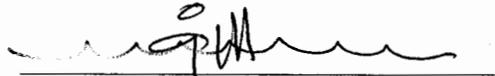
Project Visitation – February 8, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam, Steve Romeo

1. Deck stringers in.
2. Upstream handrail posts installed.
3. Awaiting CMP culvert and barrel.
4. Approved downstream handrail post offset by 1 inch in diameter bolt as an example to test rigidity.

Submitted by:



Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

# LANDMARK DESIGN GROUP

Powhatan Dam

Project Visitation - January 30, 2002

LMDG No. 1980019-000.23

Present: Will Gwilliam, Steve Romeo

1. Work progressing well.
2. Sheet piling all in and retainer wales in place.
3. Corrugated metal pipe, barrel and cap on order.
4. Hand rail posts being installed.
5. They are ready to drive sheet piling around abutments.
6. Concrete deck on abutment to slope  $\frac{1}{4}$ " / foot to upstream side for surface drainage.
7. Downstream 2 by stringers laid out and spaced to a uniform curve. Approved notching face of piles by 3" or posts by 1" to accommodate curve.

Submitted by:



---

Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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Powhatan Detention Dam  
Project Visitation  
January 24, 2002

1. All sheet piling is in place and looks very good, tight, true and plumb.
2. The east end as currently placed comes exactly to grade. Accordingly it was agreed to use the existing end pile section pile no.# 33 to no.# 34 as the concrete end bulkhead section.
3. The viewing platform around the drain, barrel have to be pulled out to facilitate sheet pile and main drain installation. The Concrete Foreman was on job to discuss drainage barrel location and installation procedure which will require temporary pumping. Pile replacement will occur after the culvert and barrel are in place.

Submitted by:



---

Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

File: 1980019-000.23

# LANDMARK DESIGN GROUP

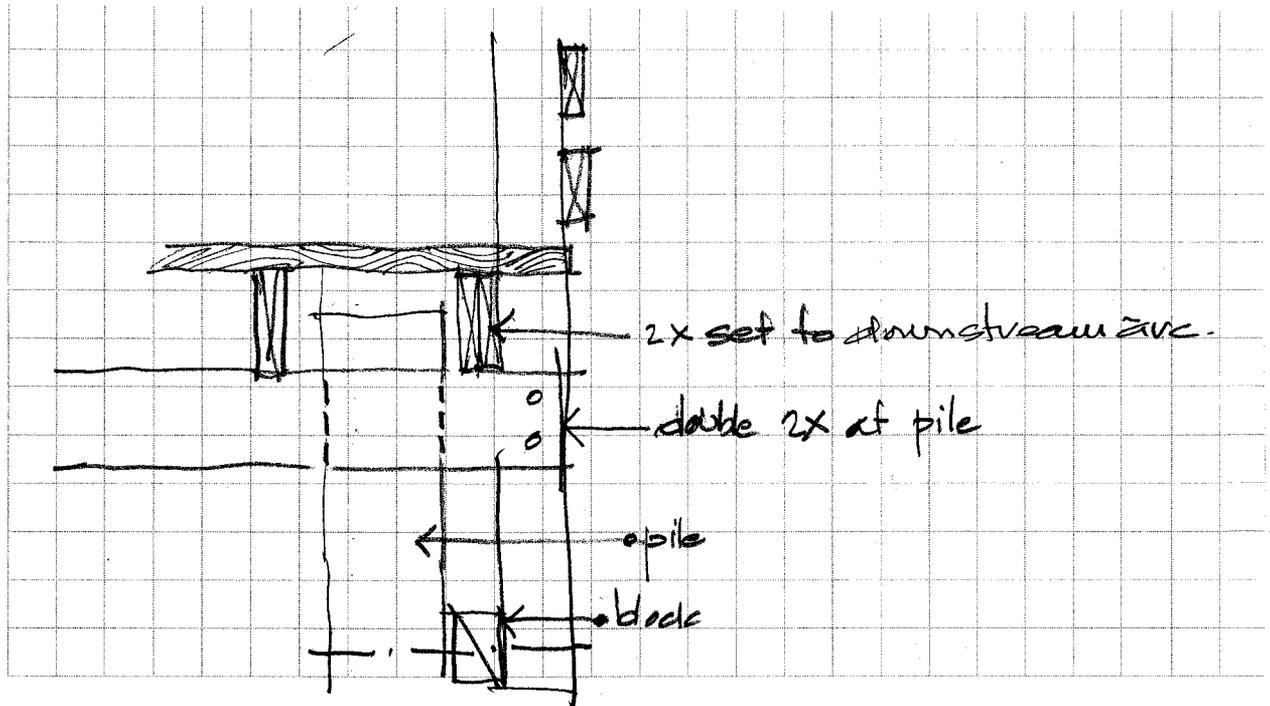
Powhatan Dam

Project Visitation - January 18, 2002

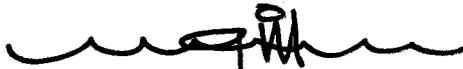
LMDG No. 1980019-000.23

Review project with Ben.

1. New up to date drawings on site.
2. Wales all in place, and arc looks very good.
3. Sheet piles being driven and going in tight and true and plumb. Crew waiting for longer sheet piles.
4. Discussed down stream guard rail post locations as upstream posts are being installed at 8'-0" centers, which varies from down stream existing piles.
  - However, as there are no sheet piles on down stream face to brace the guard rail post to at the bottom, it was agreed to:
    - Place the downstream posts in line of the piles on the radius line so they are braced at bottom to the existing piles.
    - Align the down stream face of the guard posts to be 9'± from the upstream post arc so the downstream arc is parallel to the up stream arc. See detail below.



Submitted by:

  
Willard E. Gwilliam, F.A.I.A.  
Senior Project Manager

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ENV. DIV.

Langley and McDonald, P.C.

GEORGE E. LANGLEY  
Consultant  
T. JOSEPH McDONALD  
1906-1982

Engineers  
Surveyors  
Planners  
Landscape Architects  
Environmental Consultants

August 24, 1998



Ms. Tamara A. M. Rosario  
Department of Development Management  
James City County  
P.O. Box 8784  
Williamsburg, VA 23187-8784

Re: Powhatan Woods Phase I  
Case No. S-50-98

Dear Ms. Rosario:

Accompanying this letter are ten sets of plans for the referenced project, revised pursuant to your letter dated July 29 1998. The following revisions have been made:

PLANNING

1. The total number of existing platted single family use lots are tabulated as follows:

Phase I	-	49 lots
Phase IA	-	2 lots
Phase II	-	36 lots
Phase III	-	2 lots
Phase IV-A	-	31 lots
Phase IV-B	-	31 lots
Phase V-A	-	11 lots
The Clusters	-	16 lots
<b>TOTAL</b>	<b>=</b>	<b>178 LOTS</b>

The total amount of open space/common areas platted are tabulated as follows: (These areas are exclusive of the existing lakes which will be conveyed to the homeowners association).

Phase I-A	-	0.5950 acres
Phase III	-	0.5708 acres
Phase IV-A	-	0.3259 acres
Phase IV-B	-	0.4788 acres
Phase V-A	-	2.3850 acres
The Clusters	-	3.0050 acres
Recreation Site	-	4.2983 acres
Conservation Easements	-	20.2264 acres
<b>TOTAL</b>	<b>=</b>	<b>31.8852 acres</b>

MAIN OFFICE  
5544 Greenwich Road  
Virginia Beach, VA 23462  
(757) 473-2000  
FAX: (757) 497-7933

201 Packets Court  
Williamsburg, VA 23185  
(757) 253-2975  
FAX: (757) 229-0049

2. There are no slopes greater than 25% within Phase I.
3. Pedestrian walking trails added to connect Powhatan Woods with Powhatan secondary Phase V-B, the existing timber walkway to Phase III, and the proposed timber walkway near Monticello Avenue.
4. Note regarding natural open space added to the Master Layout Plan. This note will also appear on the final subdivision plat.
5. Note regarding setbacks added to the Master Layout Plan. All lot dimensions areas, etc. will be shown on the final subdivision plat.

#### ENVIRONMENTAL

- ✓ 1. A Land Disturbing Permit and Siltation Agreement requirement is acknowledged.
- ✓ 2. A Subdivision Agreement requirement is acknowledged.
- ✓ 3. The water and sewer inspection fee requirement is acknowledged.
- ✓ 4. The Inspection/Maintenance Agreement requirement for the BMP is acknowledged.
- ✓ 5. As-built drawings for the BMP structure will be provided upon completion. Certification note added to plan as requested.
6. Streetlights provided at locations requested.
- ✓ 7. There are no slopes in excess of 25% within the Phase I construction limits. The limit of wetlands is shown on the plan sheets and Master Erosion/Sediment Control Plan. The RPA line and buffer per tax map are shown on the plan sheets and Master Erosion/Sediment Control Plan.
- ✓ 8. Locations for stockpile/overburden fill areas are shown on the plan sheets and Master Erosion/Sediment Control Plan.
- ✓ 9. No offsite land disturbing areas are anticipated for this project.
- ✓ 10. Silt fence added along George Wythe Lane as requested.
- ✓ 11. Diversion dikes extended as requested.
- ✓ 12. Silt fence replaced with diversion dike as requested.
- ✓ 13. Diversion dike extended as requested.
- ✓ 14. Diversion dike added to these areas to trap clean water as requested.
- ✓ 15. Sediment basin design data added to E&S details sheet.
- ✓ 16. Sediment trap details added to the E&S details sheet.
- ✓ 17. Additional notes, sequencing and temporary slope drains for the sediment traps added to the plan and profile sheets as requested.
- ✓ 18. Check dams replaced with silt fence as requested.

19. Additional silt fence added as requested.
20. Drainage easement for lots 34-38 added as requested.
21. Temporary right-of-way diversion added as requested.
22. Construction sequence added to Master Erosion/Sediment Control Plan.
23. We inspected the existing BMP outfall structure on August 19, 1998 and found minimal undermining of the concrete anchor block on the upstream side of the outfall pipe. We verified that the wood sheeting is consistent around the pipe and observed that there was water standing up to the bottom of the pipe. We do not feel that concrete fill is necessary, but have instructed that the Owner place additional concrete beneath the anchor block.
24. Drainage area map revised as requested.
25. Adequacy analysis previously submitted and approved by Darryl Cook.
26. BMP calculation worksheet not required at this time per Darryl Cook.
27. Conservation easement plats will be provided under separate cover.
28. Proposed BMP plans and calculations previously submitted.
29. BMP maintenance easement and access easements added to the Master Erosion/Sediment Control Plan.
30. Check dam and permanent diversion berm added to plans per Darryl Cook.
31. Attached is copy of letter to Steve Martin, COE, addressing the special conditions of the wetlands permit. The restrictive covenants are in draft form and are being reviewed by Centex Homes. After their review, the final version will be submitted to the COE.

#### HEALTH DEPARTMENT

1. Private well regulation note added to the Master Layout Plan.

#### COUNTY ENGINEER

1. Plat and deed of easement for the proposed conservation easements will be provided under separate cover.

#### JCSA

1. Additional easements for water and sewer added to plan sheets.
2. Hydraulic analysis of the water system will be forthcoming under separate cover.
3. Manhole numbering is for identification purposes only and not intended to be in any particular order.
4. DIP pipe specified as requested.
5. Length of restrained joints added to the profile sheets as Lr and Lb.
6. Separation distances added to the plan sheets.
7. Additional profiles of waterline added to the profile sheets.
8. Air release valves added as requested.

9. Additional gate valves added as requested.
10. The sanitary sewer bridge will be constructed in accordance with JCSA standard details and specifications.
11. Completed water and sanitary sewer data sheets attached.
12. Water and sanitary sewer easements shown on the 25 scale plans sheets. These easements will be shown on the final recordation plat.
13. Distances to closest fire hydrants along Powhatan Secondary added to the plan sheets.
14. The location of the existing 8" waterline stub across Powhatan Secondary has been revised to agree with the waterline as-builts and field survey data. This stub is intended to serve this development area. It would not be practical or monetarily feasible to construct a new connection that would require boring under Powhatan Secondary.
15. Sewer lateral serving lots 53 & 54 relocated as requested.
16. Lot numbers added as requested.
17. Water service for lot 42 relocated as requested.
18. The 100 year flood routing elevation added to the Master Erosion/Sediment Control Plan.
19. Invert of proposed sewer connection to existing manhole revised as requested.
20. Street names added as requested.
21. Lot number added as requested.
22. Water service added as requested.

#### **VDOT**

1. Stop signs added to the plan sheets as requested.
2. Structures 32-33 are within the right-of way-limits. Drainage easement from structure 35 extended to the limits of wetlands as requested.
3. UD-2 underdrain added to the proposed median. UD-4 added to all sag locations.
4. Profile revised to provide sight distance for 20 MPH and K=20.
5. Labeling of route numbers added as requested.
6. The portion of the road from the returns to the end of construction will be closed to traffic and will not be dedicated as a public street until the road is extended and additional lots platted.
7. Inlet #33 changed to a DI-3C as requested.
8. Pipe calculations for structures 1-24 attached.
9. Street names added to typical road sections as requested.
10. General Note #1 revised as requested.

11. Sediment trap construction sequencing and additional notes added to the profile sheets.
12. The proffered improvements to Route 613 (News Rd.) based on conditions of rezoning, dated February 2, 1987, were superceded by new proffers when Powhatan Secondary Master Plan was revised to include Alternate Route 5. The current proffers, dated March 11, 1996, require the developer to make cash payments towards these improvements. This proffer has been fulfilled. A copy of the current proffers is attached.

**ENVIRONMENTAL DIVISION (August 19, 1998 Comments)**

1. Structural calculations will be forwarded to the County upon our receipt of geotechnical engineering information from the Owner. It is our understanding that the geotechnical engineering work will commence once the site has been rough graded to approximate subgrade elevation.
2. It is our belief that a dam break analysis would be inappropriate given the close proximity of the proposed roadway.
3. The overburden fill area noted for lots 5-11 has been removed in lieu of clearing a portion of the future extension of Elizabeth Harrison Lane.
4.
  - A. Additional details added to the plans.
  - B. Asphalt coated aluminized steel pipe has been specified.
  - C. Size of anti-vortex device added to the plans.
  - D. Additional rip rap added to the plans as requested.
  - E. The structure has been modified as requested to include a 4" pipe at the bottom and a 8" orifice at elevation 32.7.
  - F. An 8" tee has been added to the 8" orifice opening.

Accompanying these plans are one set of attachments marked "FOR VDOT" and one set of attachments marked "FOR JCC ENVIRONMENTAL DIVISION". If you need further clarification or need to discuss any of our responses, please contact us at 253-2975.

Best regards,

LANGLEY AND McDONALD, P.C.



Stephen A. Romeo, L.S.  
Principal

SAR/tmp  
Enclosure

Larry S. Barry, P.E., President  
Norman H. Mason, L.S., VP  
Vaughn B. Rinner, C.L.A.  
Elizabeth J. Anderson, P.E.  
Kenneth A. Dierks  
Robert P. Kerr, R.E.P., P.W.S.  
Clayton E. Massey, P.E.

# LANDMARK DESIGN GROUP

Charles R. Orsborne, L.S.  
Stephen A. Romeo, L.S.  
Kenneth E. Rodman, Jr., P.E.  
Mark W. Strickland, P.E.  
William R. Turner, Jr., A.I.C.P.  
A. Gary Webb, P.E.

September 17, 2002

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



Re.: Powhatan Woods Storm Water Management Facility  
JCC BMP 10 Code PC 143

Dear Mr. Thomas,

This letter is in response to your August 1, 2002 letter to Mr. Eric Markowski of Centex Homes, owner and developer of the referenced project.

### Construction Certification

1. The Construction Certification on sheet R-1 has been signed and dated. With regard to your assertion that this certification is not consistent with note #18 of the Erosion and Sediment Control notes on sheet C-17 of the approved plans:

IRRELEVANT →

A) Aforementioned Erosion and Sediment Control notes were authored by the County and required to be included on all site and subdivision plans as a condition of plan approval by the County. We have objected to this previously as the County is enriching one profession at the expense of others licensed by the same Board to provide this service.

OK →

B) Title 54.1, Chapter 4, Article 1, § 54.1-400 of the Code of Virginia, defines "Architect" as "a person who, by reason of his knowledge of the mathematical and physical sciences, and the principals of architecture and architectural design, acquired by professional education, practical experience, or both, is qualified to engage in the practice of architecture and whose competence has been attested by the Board through licensure as an architect," and "The "practice of architecture" means any service wherein the principals and methods of architecture are applied, such as consultation, investigation, evaluation, planning and design, and includes the responsible administration of construction contracts, in connection with any private or public buildings, structures or projects, or the related equipment or accessories." "Board" means the Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects."

OK →

C) Title 54.1, Chapter 4, Article 1, § 54.1-401 of the Code of Virginia, exempts "Practice of professional engineering and land surveying by a licensed architect when such practice is incidental to what may be properly considered an architectural undertaking."

OK SEAL +  
DATE MATCH

D) This BMP is more of an architectural undertaking than an engineering undertaking. Therefore, we deem that the Construction Certification provided on sheet R-1 and the

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application of all professional seals on sheets R-1 through R-3 is in compliance with the pertinent State and Local Regulations. We are perplexed as to why you question the logic of having the Designer inspect the construction of these facilities and certify its' completeness and compliance with the design wherein you issued a building permit based upon the Designer's stamped drawings. Furthermore, this project was approved and construction had commenced prior to the February 1, 2002 issuance date of the County's Storm Water Management/BMP Facilities, Record Drawings and Construction Certification, Standard Forms and Instructions. We have previously objected to and continue to object to your attempts to impose this document on projects whose approvals and construction predated the date of issue of the document.

IRRELEVANT →

Record Drawing

OK  
RD 13 OK.

- 2. We deem that all certifications and professional seals are in compliance with the pertinent State and Local Regulations and are enclosing one reproducible and one copy of the drawing set for your acceptance.

Construction Related Items

OK →

- 3. Centex is addressing this item.
- 4. Centex is addressing this item.
- 5. Centex is addressing this item.
- 6. Centex is addressing this item.
- 7. Centex is addressing this item.
- 8. Centex is addressing this item.
- 9. Centex is addressing this item.
- 10. Centex is addressing this item.
- 11. Centex is addressing this item.
- 12. Details for re-shaping and lining the man-made channel to protect it from potentially erosive discharge velocity have been added to the plans.

Please contact us if further clarification of any of the forgoing is needed.

Sincerely,

The LandMark Design Group, Inc.



Stephen A. Romeo, LS  
Principal



Willard E. Gwilliam, FAIA, LTC USA Ret.

Copy: Eric Markowski, Centex Homes  
John T.P. Horne, JCC Development Management  
File 1980019-000.23



Larry S. Barry, P.E., President  
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September 17, 2002

Mr. Scott J. Thomas, P.E.  
Civil Engineer  
Environmental Division  
James City County  
P.O. Box 8784  
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Re.: Powhatan Woods Storm Water Management Facility  
JCC BMP 10 Code PC 143

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### Construction Certification

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  - A) Aforementioned Erosion and Sediment Control notes were authored by the County and required to be included on all site and subdivision plans as a condition of plan approval by the County. We have objected to this previously as the County is enriching one profession at the expense of others licensed by the same Board to provide this service.
  - B) Title 54.1, Chapter 4, Article 1, § 54.1-400 of the Code of Virginia, defines "Architect" as "a person who, by reason of his knowledge of the mathematical and physical sciences, and the principals of architecture and architectural design, acquired by professional education, practical experience, or both, is qualified to engage in the practice of architecture and whose competence has been attested by the Board through licensure as an architect," and "The "practice of architecture" means any service wherein the principals and methods of architecture are applied, such as consultation, investigation, evaluation, planning and design, and includes the responsible administration of construction contracts, in connection with any private or public buildings, structures or projects, or the related equipment or accessories." "Board" means the Board for Architects, Professional Engineers, Land Surveyors, Certified Interior Designers and Landscape Architects."
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  - D) This BMP is more of an architectural undertaking than an engineering undertaking. Therefore, we deem that the Construction Certification provided on sheet R-1 and the

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Record Drawing

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Construction Related Items

3. Centex is addressing this item.
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10. Centex is addressing this item.
11. Centex is addressing this item.
12. Details for re-shaping and lining the man-made channel to protect it from potentially erosive discharge velocity have been added to the plans.

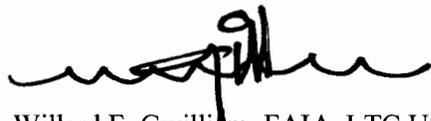
Please contact us if further clarification of any of the forgoing is needed.

Sincerely,

The LandMark Design Group, Inc.



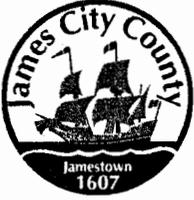
Stephen A. Romeo, LS  
Principal



Willard E. Gwilliam, FAIA, LTC USA Ret.

Copy: Eric Markowski, Centex Homes  
John T.P. Horne, JCC Development Management  
File 1980019-000.23





# DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784  
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planning@james-city.va.us

COUNTY ENGINEER  
(757) 253-6678  
INTEGRATED PEST MANAGEMENT  
(757) 253-2620

August 1, 2002

Eric Markowski  
Centex Homes  
213 Riverwalk Parkway  
Suite 101  
Chesapeake, Va. 23320

Re: Powhatan Woods Phase I  
County Plan No. S-50-98  
Timber Crib Wall - Stormwater Management Facility  
County BMP ID Code: PC 143

Dear Mr. Markowski:

The Environmental Division has reviewed certification documents as submitted to our office on May 24<sup>th</sup> 2002 for the BMP at the above referenced project. The record drawing set provides as-built and construction certification information for a large timber crib wall extended dry detention BMP situated at the southwest corner of the project near new alternate Route 5.

Based on our review of the project and a concurrent field inspection as performed on July 31<sup>st</sup> 2002, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site:

**Construction Certification:**

1. The construction certification as offered on Sheet R-1 of the record drawing dated May 22<sup>nd</sup> 2002 is not consistent with the provisions of the approved plan and County BMP certification procedure. Firstly, the professional seal provided with the construction certification is neither signed or dated. Secondly, the certification is not consistent with Note # 18 of the Erosion and Sediment Control Notes on Sheet C-17 of the approved plan set which stated the following:

*"As-built drawings must be provided for all detention/BMP facilities. Also upon completion, the construction of all detention/BMP facilities shall be certified by a professional engineer who inspected the structure during construction. The certification shall state that to the best of his/her judgement, knowledge and belief, the structure was constructed in accordance with the approval plans and specifications".*

Also, on May 8<sup>th</sup> 2002 our division forwarded a letter to you (copy attached) which outlined as-built and construction certification requirements relative to this specific BMP. An information packet entitled, *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* was attached to this letter. Pages 1, 3 and 4 of this document provide clear guidance relative to County construction certification requirements associated with stormwater management/BMP facilities.

**Record Drawings:**

2. The record drawing set, Sheets R-1, R-2 and R-3 dated May 22<sup>nd</sup> 2002, are **satisfactory**; however, since the construction certification was provided on Sheet R-1 of the record drawing set, the above related comment will need to be resolved before we can accept the record drawings as final. Once resolved, please forward one reproducible and one blue/black line set of the record drawings to our office.

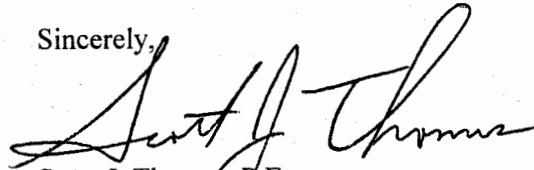
**Construction - Related Items:**

3. Remove silt fence present along the upstream and east end of the BMP.
4. Stabilize the access path approaches on slopes adjacent to the timber dam in accordance with approved plan requirements (6-inch crusher run).
5. Clear and remove all vegetation, debris and trash from the grate of the EW-12 low flow orifice just upstream from the riser. The low flow orifice shall not be obstructed by trash and debris.
6. Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 42-inch storm drain pipe which enters the basin at the upstream, east side of the wall. Cattails and sediment accumulations 6 to 18 inches deep covered most of the outlet protection pad. Flow into the facility shall not be obstructed by sediment and vegetation.
7. Stabilize the large bare soil area present on the slope at the east end of the wall (abutment) with seed and mulch.
8. Stabilize with seed and mulch the bare soil areas present along the upstream toe on both the east and west sides (approximately 15 ft. wide) of the wall. It appears this area was used to access the riser and for wall construction purposes.
9. Stabilize with seed and mulch bare soil areas present along the downstream toe of wall on the west side of the wall. It appears this area was used to access the outfall channel and for wall construction purposes.
10. Geotextile fabric which underlays the toe riprap along the downstream toe of the wall should not be exposed. A light soil covering will aid to prevent degradation of the fabric due to ultraviolet exposure and help to prevent undermining should the downstream toe become inundated.
11. Provide a lock on the 2' x 2' access hatch as provided on the wooden observation deck above the riser. Also, the approved plan required an access port on the anti-vortex/trash rack cap for the riser structure. This port should be located on top of the riser cap just beneath the wood deck access hatch. This will allow access into the riser for future inspection and maintenance purposes. Provide a copy of keys to the Environmental Division.

12. Outfall Channel. The stormwater conveyance channel as constructed from the outfall end of the stilling basin (at the 36-inch barrel outfall) to the downstream 42-inch culvert at Alternate Route 5 was not a part of approved plan S-50-98 nor a part of the final design configuration for the BMP. Based on our field observations, the channel cut from the stilling basin to the culvert generally consists of a trapezoidal-shaped channel approximately 3 ft. in depth with a 2.5 ft. bottom width, 4 ft. top width and very steep sideslopes (0.25H:1V). In accordance with the provisions of the Virginia Erosion and Sediment Control Manual and the Virginia Stormwater Management Handbook, outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel. Man-made channels constructed at the outflows of BMPs must be designed and constructed to have erosion resistance and capacity for the 2- and 10-year discharge from the BMP, respectively. Based on design data in our active file, the 2-year discharge from the BMP is 5.59 cfs and the 10-year discharge is 65.85 cfs. It does not appear that the stormwater conveyance channel as constructed has adequate erosion resistance or capacity to handle discharges from the BMP. Therefore, provide computations to show adequacy of the channel as constructed; or alternatively, provide a design which has adequate lining and dimensions to comply with the provisions of the VESCH and the VSMH and which will be constructed in the field.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Joe Buchite, at 757-253-6643 if you have any further comments or questions.

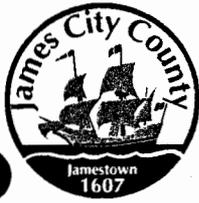
Sincerely,



Scott J. Thomas, F.E.  
Civil Engineer  
Environmental Division

cc: Steve Romeo and Willard Gwilliam, LandMark Design Group - via fax  
Ben Delosier, VMS - via fax  
Joe Buchite - JCC Environmental Division

G:\SWMProg\AsBuilts\S5098.pc143



## DEVELOPMENT MANAGEMENT

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planning@james-city.va.us

COUNTY ENGINEER  
(757) 253-6678  
INTEGRATED PEST MANAGEMENT  
(757) 253-2620

August 1, 2002

Eric Markowski  
Centex Homes  
213 Riverwalk Parkway  
Suite 101  
Chesapeake, Va. 23320

Re: Powhatan Woods Phase I  
County Plan No. S-50-98  
Timber Crib Wall - Stormwater Management Facility  
County BMP ID Code: PC 143

Dear Mr. Markowski:

The Environmental Division has reviewed certification documents as submitted to our office on May 24<sup>th</sup> 2002 for the BMP at the above referenced project. The record drawing set provides as-built and construction certification information for a large timber crib wall extended dry detention BMP situated at the southwest corner of the project near new alternate Route 5.

Based on our review of the project and a concurrent field inspection as performed on July 31<sup>st</sup> 2002, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site:

**Construction Certification:**

1. The construction certification as offered on Sheet R-1 of the record drawing dated May 22<sup>nd</sup> 2002 is not consistent with the provisions of the approved plan and County BMP certification procedure. Firstly, the professional seal provided with the construction certification is neither signed or dated. Secondly, the certification is not consistent with Note # 18 of the Erosion and Sediment Control Notes on Sheet C-17 of the approved plan set which stated the following:

***"As-built drawings must be provided for all detention/BMP facilities. Also upon completion, the construction of all detention/BMP facilities shall be certified by a professional engineer who inspected the structure during construction. The certification shall state that to the best of his/her judgement, knowledge and belief, the structure was constructed in accordance with the approval plans and specifications".***

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2. The record drawing set, Sheets R-1, R-2 and R-3 dated May 22<sup>nd</sup> 2002, are **satisfactory**; however, since the construction certification was provided on Sheet R-1 of the record drawing set, the above related comment will need to be resolved before we can accept the record drawings as final. Once resolved, please forward one reproducible and one blue/black line set of the record drawings to our office.

Construction - Related Items:

*Reinspect 9-27-05  
ok to sign off on BMP.*

3. ✓ Remove silt fence present along the upstream and east end of the BMP.
4. ✓ Stabilize the access path approaches on slopes adjacent to the timber dam in accordance with approved plan requirements (6-inch crusher run).
5. ✓ Clear and remove all vegetation, debris and trash from the grate of the EW-12 low flow orifice just upstream from the riser. The low flow orifice shall not be obstructed by trash and debris.
6. ✓ Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 42-inch storm drain pipe which enters the basin at the upstream, east side of the wall. Cattails and sediment accumulations 6 to 18 inches deep covered most of the outlet protection pad. Flow into the facility shall not be obstructed by sediment and vegetation.  
*Relatively clean*
7. Stabilize the large bare soil area present on the slope at the east end of the wall (abutment) with seed and mulch.
8. ✓ Stabilize with seed and mulch the bare soil areas present along the upstream toe on both the east and west sides (approximately 15 ft. wide) of the wall. It appears this area was used to access the riser and for wall construction purposes.
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*NEED  
KEY*

12. **Outfall Channel.** The stormwater conveyance channel as constructed from the outfall end of the stilling basin (at the 36-inch barrel outfall) to the downstream 42-inch culvert at Alternate Route 5 was not a part of approved plan S-50-98 nor a part of the final design configuration for the BMP. Based on our field observations, the channel cut from the stilling basin to the culvert generally consists of a trapezoidal-shaped channel approximately 3 ft. in depth with a 2.5 ft. bottom width, 4 ft. top width and very steep sideslopes (0.25H:1V). In accordance with the provisions of the Virginia Erosion and Sediment Control Manual and the Virginia Stormwater Management Handbook, outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel. Man-made channels constructed at the outflows of BMPs must be designed and constructed to have erosion resistance and capacity for the 2- and 10-year discharge from the BMP, respectively. Based on design data in our active file, the 2-year discharge from the BMP is 5.59 cfs and the 10-year discharge is 65.85 cfs. It does not appear that the stormwater conveyance channel as constructed has adequate erosion resistance or capacity to handle discharges from the BMP. Therefore, provide computations to show adequacy of the channel as constructed; or alternatively, provide a design which has adequate lining and dimensions to comply with the provisions of the VESCH and the VSMH and which will be constructed in the field.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Joe Buchite, at 757-253-6643 if you have any further comments or questions.

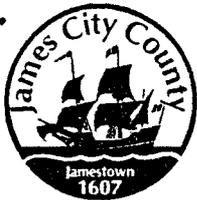
Sincerely,



Scott J. Thomas, P.E.  
Civil Engineer  
Environmental Division

cc: Steve Romeo and Willard Gwilliam, LandMark Design Group - via fax  
Ben Delosier, VMS - via fax  
Joe Buchite - JCC Environmental Division

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# DEVELOPMENT MANAGEMENT

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planning@james-city.va.us

COUNTY ENGINEER  
(757) 253-6678  
INTEGRATED PEST MANAGEMENT  
(757) 253-2620

May 8, 2002

Eric Markowski  
Centex Homes  
Assistant Land Development Manager  
213 Riverwalk Parkway, Suite 101  
Chesapeake, Va. 23320

Re: Powhatan Woods Phase I  
County Plan No. S-50-98  
Timber Crib Wall - Stormwater Management Facility  
County BMP ID Code: PC 143

Dear Mr. Markowski:

Based on our review of the project, the following items must be addressed prior to release of the developer's surety instrument for the above referenced stormwater management/BMP facility at the site:

**Record Drawing and Construction Certification:**

1. Note # 18 of the Erosion and Sediment Control Notes on Sheet C-17 of the approved plan set required as-built drawings and construction certification for the timber dam control structure following completion. To date neither have been received. The note on the approved plan is as follows:

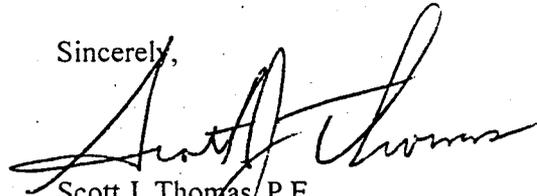
*"As-built drawings must be provided for all detention/BMP facilities. Also upon completion, the construction of all detention/BMP facilities shall be certified by a professional engineer who inspected the structure during construction. The certification shall state that to the best of his/her judgement, knowledge and belief, the structure was constructed in accordance with the approval plans and specifications".*

To aid in the understanding current submittal requirements for record (as-built) drawings and construction certifications, I have attached the following information packet entitled *James City County, Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms and Instructions.*

Once information as such is received, our division can proceed with the final field inspection of structure. A final field inspection will determine if any construction-related items are necessary for completion. It is our normal process to not proceed with final inspection of stormwater management facilities until such time as the record drawings are received, reviewed and compared for consistency to approved design plan requirements.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Beth Davis at 757-253-6702, if you have any further comments or questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott J. Thomas". The signature is fluid and cursive, written over the typed name below.

Scott J. Thomas, P.E.  
Civil Engineer  
Environmental Division

G:\SWMProg\AsBuilts\S5098.pc143

**Scott Thomas**

---

**From:** Scott Thomas  
**Sent:** Wednesday, December 04, 2002 2:01 PM  
**To:** Doug Murrow  
**Subject:** RE: Dam Structure - Rt. 5 ext.

I issued a letter to the owner on August 1st 2002, which outlined outstanding issues relative to the BMP. There was a construction certification and record drawings issues which have since been resolved. There were 9 field related construction issues that as I last heard, the owner was working on.

I have not been contacted by the owner to inform me these field-related items were completed and to reinspect the facility, so basically I am at the same point I was when I last spoke with you. Upon notification to reinspect the structure, I would inform you so one of your inspectors could accompany me to look at the railing issue.

Attached is my letter dated August 1st.

Scott

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

**From:** Doug Murrow  
**Sent:** Wednesday, December 04, 2002 10:18 AM  
**To:** Scott Thomas  
**Subject:** Dam Structure - Rt. 5 ext.

Scott,  
Could you give me an update on this structure.

Thanks  
Doug

1003-2-12 IBL

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Thursday, August 01, 2002 9:59 AM  
**To:** Joe Basilone  
**Subject:** Timber Crib Wall at Powhatan Woods

Joe,

Back in May of this year we had some correspondence about the large timber crib wall BMP for Powhatan Woods Phase 1, County Plan No. S-50-98, BMP Code PC 143. You had raised issue about the need for a building permit due to the walkway and handrail structure based on your inspector's observations. At that time I forwarded you some information on the dam, including a revised design drawing for modifications that Virginia Marine Constructors were performing to reconstruct the structure.

Since that time, the developer is stating that construction of the BMP is complete and is requesting release of Erosion and Sediment Control bond we are holding for the project. I have received as-built drawings for the facility and performed a final inspection for BMP purposes yesterday (7/31/02). I am generating a letter to Eric Markowski of Centex Homes listing deficiencies associated with the as-builts, construction certification and field (construction) related items associated with the BMP.

I was wondering if the building permit issue has been resolved by you or your staff or if it is still outstanding and, if still outstanding, does Codes want me to include a comment on the letter I am preparing.

Please respond as soon as you can.

Thanks

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

*TALKED to Doug Morrow  
10/4/02  
- Architect Const Cert  
- Contact him upon reinspection*

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Friday, May 03, 2002 9:14 AM  
**To:** Joe Basilone  
**Cc:** Darryl Cook  
**Subject:** RE: dam/pedestrian bridge

Joe

I agree. My question is would Codes have seen this site plan when it went through the review process? Lately as a courtesy, I have been contacting Bo when I review a site or subdivision plan and see a retaining wall or dam structure that in my professional opinion, thinks need to be reviewed by codes. As I understand, there may be times that you may not see the plan.

I also direct your or your staff's attention to another similar case. It is the regional block wall dam (dry pond) at Powhatan Secondary. The original plan number was SP-38-99 and it has an assigned County BMP ID code PC 136. It is located in back of the new Powhatan Village Phase 1 & 2 along News Road. It is a Mesa Retaining Wall system (segmental concrete blocks with geogrid tie-backs) and is about 12-15' high. It also has a proposed walking trail and railing across the top.

For this particular BMP, we have dealt with a variety of certification issues and have posed issue with the developer/engineer about the structural integrity of the structure and the general lack of information available to support their certification (geotechnical testing, inspection logs, etc.). We have not released bond on this structure either.

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

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

**From:** Joe Basilone  
**Sent:** Friday, May 03, 2002 7:05 AM  
**To:** Scott Thomas  
**Cc:** Doug Murrow; Leland Kemp  
**Subject:** RE: dam/pedestrian bridge

This structure, and others like it in the future, requires a building permit and inspections. This might not be the case if it was purely a dam, I would defer to Darryl and Doug to figure that out, but since it will have provision for a ped. walkway across it, it needs a permit. Has VMC taken it apart and put it back together properly yet? Please make sure no one in your office gives them final approval until we work our way through this. Thanks. Joe.

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

**From:** Scott Thomas  
**Sent:** Thursday, May 02, 2002 3:49 PM  
**To:** Joe Basilone  
**Cc:** Darryl Cook; Pat Menichino; John Horne  
**Subject:** RE: dam/pedestrian bridge

Sorry I sent it to John

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

**From:** Scott Thomas  
**Sent:** Thursday, May 02, 2002 3:38 PM  
**To:** John Horne  
**Cc:** Darryl Cook; Pat Menichino; John Horne  
**Subject:** RE: dam/pedestrian bridge

Joe

The structure is a timber crib wall BMP that needs constructed as part of the Powhatan Woods Phase I project, approved County Plan No. S-50-98. The assigned County BMP Code No. is PC 143. The facility is a dry type detention pond which uses a timber crib wall to reduce wetland impacts. It serves 69.3 acres.

In September of last year we issued a notice to comply to build the timber BMP, which to that point was not even started. Me and John Horne met with the current manager of the project, Eric Markowski of Centex Homes, who stated that Virginia Marine Constructors would be disassembling the BMP wall which was started and incorrectly built and finishing the structure.

Since that time, I have only spot checked their progression from an engineering standpoint, as I would normally not do a final inspection of the facility until I have received as-builts and construction certification. I don't know if Joe Buchite or Pat have followed up with compliance inspections.

I will walk over a drawing that was submitted to our office in July showing structural information on the dam structure.

Here is contact information for Eric

Eric Markowski  
Centex Homes  
Assistant Land Development Manager  
213 Riverwalk Parkway  
Chesapeake, Va. 23320  
757-312-9660 Ext 233  
Fax: 757-312-0861  
emarkowski@centexhomes.com

Scott

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

**From:** John Horne  
**Sent:** Thursday, May 02, 2002 11:31 AM  
**To:** Joe Basilone; Wayland Bass; Doug Murrow; Pat Menichino  
**Cc:** Leland Kemp; Scott Thomas; Darryl Cook  
**Subject:** RE: dam/pedestrian bridge

Scott, Darryl, and Pat have lots of information on the structure

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

**From:** Joe Basilone  
**Sent:** Thursday, May 02, 2002 9:24 AM  
**To:** Wayland Bass; John Horne; Doug Murrow; Pat Menichino  
**Cc:** Leland Kemp  
**Subject:** dam/pedestrian bridge

On the north side of Monticello Ave. between the Greensprings time shares and the Target shopping center a new structure has been built. It's made of salt treated lumber and it is both a dam and a pedestrian/bike path bridge. To the best of my knowledge, the contractor for this structure has not called for any inspections. I am unsure if he has a permit, and its difficult to cross reference since I am unsure of the exact address for this location. LD noted today that the guardrail on this structure is in violation of BOCA Section 1021.3 because the guard is built in a manner that creates a ladder effect. Does anyone know:

1. Who the contractor is for this job?
  2. If he has a permit?
  3. If the county is involved in this job?
  4. If anyone else (JCC staff) has done any kind of inspections and/or alerted the contractor to any other problems.
- Thanks. Joe.

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Friday, May 03, 2002 9:14 AM  
**To:** Joe Basilone  
**Cc:** Darryl Cook  
**Subject:** RE: dam/pedestrian bridge

Joe

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

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**Cc:** Darryl Cook; Pat Menichino; John Horne  
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**Cc:** Darryl Cook; Pat Menichino; John Horne  
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Centex Homes  
Assistant Land Development Manager  
213 Riverwalk Parkway  
Chesapeake, Va. 23320  
757-312-9660 Ext 233  
Fax: 757-312-0861  
emarkowski@centexhomes.com

Scott

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

**From:** John Horne  
**Sent:** Thursday, May 02, 2002 11:31 AM  
**To:** Joe Basilone; Wayland Bass; Doug Murrow; Pat Menichino  
**Cc:** Leland Kemp; Scott Thomas; Darryl Cook  
**Subject:** RE: dam/pedestrian bridge

Scott, Darryl, and Pat have lots of information on the structure

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

**From:** Joe Basilone  
**Sent:** Thursday, May 02, 2002 9:24 AM  
**To:** Wayland Bass; John Horne; Doug Murrow; Pat Menichino  
**Cc:** Leland Kemp  
**Subject:** dam/pedestrian bridge

On the north side of Monticello Ave. between the Greensprings time shares and the Target shopping center a new structure has been built. It's made of salt treated lumber and it is both a dam and a pedestrian/bike path bridge. To the best of my knowledge, the contractor for this structure has not called for any inspections. I am unsure if he has a permit, and its difficult to cross reference since I am unsure of the exact address for this location. LD noted today that the guardrail on this structure is in violation of BOCA Section 1021.3 because the guard is built in a manner that creates a ladder effect. Does anyone know:

1. Who the contractor is for this job?
2. If he has a permit?
3. If the county is involved in this job?
4. If anyone else (JCC staff) has done any kind of inspections and/or alerted the contractor to any other problems.

Thanks. Joe.

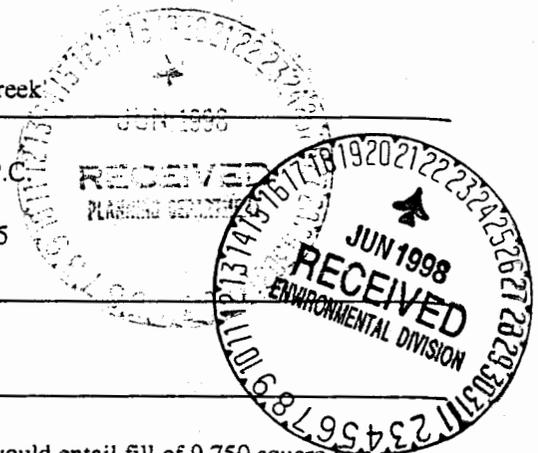


Project Number: 98-5273

Waterway: Powhatan Creek

1. Participant:  
 Centex Homes  
 2006 Old Greenbrier Road, Suite 5  
 Chesapeake, VA 23320  
 Attn: Paylor Spruill

2. Authorized Agent:  
 Langley & McDonald, P.C.  
 201 Packetts Court  
 Williamsburg, VA 23185  
 Attn: John Lowenthal



3. Address of Job Site:  
 South of News Rd, east of Powhatan Creek, north of Rt 5 in James City County

4. Project Description:

You plan to develop Powhatan Woods, a residential subdivision on 35.7 acres. Development would entail fill of 9,750 square feet of headwater wetlands for 3 lots; encroachment on 8,328 square feet (including fill of 77 square feet) of headwater wetlands for a stormwater facility ("dry pond"); and temporary inundation/saturation of 1.48 acres of headwater wetlands by the 1 year 24 hour storm (design storm) within the stormwater pond. The location of the proposed work is shown on the attached drawings.

5. Findings

We have reviewed your application number 98-5273-18 to perform work in wetlands and other waters of the United States as described in part 4 above and in the enclosed drawings and have found that your proposal satisfies the criteria contained in the Corps Nationwide Permit (NWP) 26, attached, except for general condition 12 (historic properties). (The Corps Nationwide Permits were published in the Federal Register (61 FR 65874) on December 13, 1996 and the regulations governing their use can be found in 33 CFR 330 published in Volume 56, Number 226 of the Federal Register dated November 22, 1991.)

We are awaiting concurrence from the Virginia Department of Historic Resources that the project will have no affect on historic resources.\* Therefore, in accordance with General Condition number 12 (historic properties) of the Nationwide Permits, this Nationwide Permit verification is not valid until after the Corps has completed consultation with the Virginia Department of Historic Resources over potential impacts to historic properties. **No work can commence in wetlands or other waters of the U. S. until after consultation is completed.** We will advise you as soon as consultation has been completed.

Provided the enclosed conditions and the special permit conditions listed below are met, an individual Department of the Army Permit will not be required. However, you must obtain an individual Virginia Water Protection Permit (VWPP) and/or waiver from the Virginia Department of Environmental Quality (DEQ) - Water Division and all other required State and local permits before this verification is valid.

We accept your plan to compensate for the proposed wetland impacts. This compensation plan consists of the following:

- a. Preservation of 5.65 acres of wetlands and upland buffer on site. This preservation area includes 2 known populations of least trillium (*Trillium pusillum* var. *virginiana*) a federal species at risk. Preservation would be accomplished by placing a restrictive covenant over this area (excluding authorized fill for the stormwater pond). The location of the preservation area is shown on the drawing entitled "Powhatan Secondary, South of News Road, Environmental Constraints Exhibit, Conservation Easement Areas" prepared by Langley & McDonald, P.C., dated March 19, 1998 and received by this office on May 4, 1998.
- b. Pre and post construction monitoring of the plant community within the design storm pool of the stormwater BMP. This monitoring is an effort to demonstrate that a smaller area of wetlands will be affected by this facility than the extent of the design pool (1.48 acres).

Special conditions of your authorization include the following:

- a. You or your agent must develop and execute a legal instrument to protect/preserve the upland and wetland areas proposed as compensation for wetland impacts. We recommend that these compensation areas be preserved in perpetuity through a restrictive covenant or protective easement.
- b. The restrictive covenant (deed restriction, conservation easement or open space easement) used to preserve the area must be approved by our office of counsel before it is recorded.
- c. The applicant must submit a final map or drawing showing the extent of wetland and upland preservation areas on these parcels.
- d. The restrictive covenant must be submitted to James City County for recording prior to initiating fill operations in the wetlands on these parcels. A receipt of this submittal must be submitted to this office as well.

e. Three permanent monitoring stations will be established within the areas receiving stormwater inundation/saturation to document species shift or plant community succession. Monitoring will be conducted prior to construction and 1,2,3, and 5 years following construction of the BMP. The purpose of the monitoring requirement is an attempt by the applicant to demonstrate that an area less than 1.48 acres is impacted by inundation/saturation due to the design storm. The selected points are to be located by physical survey and are to be positioned as follows: one point shall be located 50- 75 ft. upstream from the impoundment structure; one point shall be located at the upstream limit of the 1 yr, 24 hour storm flood elevation level; and one point shall be located halfway between the impoundment structure and the upstream limit.

f. A sediment trap or forebay must be constructed in association with the stormwater pond. This trap will facilitate maintenance of the stormwater structure and reduce siltation of the affected wetland areas.

g. Outlet protection (riprap or similar measures) must be incorporated into the design and construction of the storm water BMP ponds.

This verification is valid until December 13, 1998, unless the Norfolk District Engineer uses discretionary authority to modify, suspend or revoke this verification. The Chief of Engineers will periodically review the nationwide permits and their conditions and will decide to either modify, reissue or revoke the permits. If NWP 26 is reissued without modification or if your activity complies with any subsequent nationwide permit, the expiration date of this verification will not change. However, if NWP 26 is modified or revoked so that the activity listed above would no longer be authorized and you have commenced or are under contract to commence the work, you will have twelve months from the date of that permit change to complete the activity. Activities completed under the authorization of a nationwide permit which was in effect at the time the activity was completed continue to be authorized by that nationwide permit.

It is your responsibility to remain informed of changes to the nationwide permits. We will issue a special public notice announcing any changes to the nationwide permits when they occur.

Copy Furnished (w/o enclosures):

Planning Department, James City County  
Virginia Department of Environmental Quality, Virginia Beach  
U. S. Fish and Wildlife Service, Gloucester

---

6. Corps Contact: Steven Martin at (757) 441-7787.

---

*Nicholas L. Konchuba*

Nicholas L. Konchuba  
Chief, Eastern Virginia Regulatory Section

# LANDMARK DESIGN GROUP TRANSMITTAL



To: Scott Thomas  
 Company: James City County Environmental  
 From: Caleb Hurst  
 Date: December 17, 2001  
 Subject: Powhatan Woods  
 LMDG Job No.: 1980019

*PC 143; S-50-98*

Attached please find:

- Prints
- Plans
- Specifications
- Drawings
- Report
- Letter
- 

Transmitted as checked below:

- For your use
- As requested
- For review and comment
- For approval
- Approved
- 

Copies	Date	Drawing No.	Description
2	12/07/01	7202 W	Timber Dam Control Structure Sheet

Notes:

Scott,  
 Please find attached two copies of a Timber Dam Control Structure sheet of the Powhatan Woods subdivision plans. This sheet shows laminated wales and was revised 12-7-01 as noted by the designer.  
 Please do not hesitate to contact me if you have any questions or comments, or need additional information.

Copies

1. File: 1980019 \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Enclosures

LandMark Design Group, Inc.

By: *Caleb Hurst*

# LANDMARK DESIGN GROUP TRANSMITTAL



To: Scott Thomas  
 Company: James City County Environmental  
 From: Caleb Hurst  
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1. File: 1980019 \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Enclosures

LandMark Design Group, Inc.

By: *Caleb Hurst*

# LANDMARK DESIGN GROUP TRANSMITTAL

To: Darryl Cook  
 Company: JCC Environmental Division  
 From: Steve Romeo  
 Date: 3/1/2000  
 Subject: Powhatan Woods  
 LMDG Job No.: 198019

*NOT APPROVED to fill -  
 Keep as originally designed -  
 3/9/00*

**Attached please find:**

- Prints
- Plans
- Specifications
- Drawings
- Report
- Letter
- 

**Transmitted as checked below:**

- For your use
- As requested
- For review and comment
- For approval
- Approved
- 

Copies	Date	Drawing No.	Description
1	7/14/98	7204W	C18 Timber Dam

**Notes:**

Developer inquired about possibility to construct upper third of structure with earth. Please call me when you have time to discuss.

**Copies**

1. File: \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

**Enclosures**

- 
- 
- 
- 
- 

LandMark Design Group, Inc.

By: Steve Romeo

Engineers ♦ Planners ♦ Surveyors ♦ Landscape Architects ♦ Environmental Consultants  
 4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgb.com



# Langley and McDonald

# Transmittal

ENGINEERS • PLANNERS • SURVEYORS

5544 Greenwich Road  
Virginia Beach, Virginia 23462  
(804) 473-2000

201 Packets Court  
Williamsburg, Virginia 23185  
(804) 253-2975

Project: POWHATAN WOODS

To: DARBYL COOK From: LOU PENCI  
ENVIRONMENTAL DIVISION Date: 9-22-98  
JAMES CITY COUNTY Reply requested:  Yes  No  
 Reply to: \_\_\_\_\_

We are sending you:

- Attached
- Under separate cover via: \_\_\_\_\_

- Prints
- Copy of letter
- Plans
- Specifications
- Shop drawings
- \_\_\_\_\_

Transmitted as checked below:

- For your use
- As requested
- For review and comment
- For approval
- Return for correction
- Approved as noted
- Approved
- \_\_\_\_\_

PC 143

Copies	Date	No.	Description
1	9-21-98		REVISED STORMWATER MANAGEMENT CALCULATIONS

Remarks: DARBYL - THESE CALCS REFLECT THE LATEST WATERSHED INFLOW AREA (21.4 Ac) FROM ROUTE 5 PER "MMM". THE ROUTING INDICATE A SMALL INCREASE IN WATER SURFACE ELEVATIONS (0.10'± to 0.20'±). ALSO THE DRAWDOWN SUMMARY SHEET REFLECTS A 6" LOWER ORIFICE INSTEAD OF A 4" ORIFICE TO ACHIEVE A TOTAL OF 24 HOUR DRAWDOWN. IF YOU HAVE ANY QUESTIONS, PLEASE CALL ME.

THANKS

Copies

1. File: 98019

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

Enclosures

\_\_\_\_\_

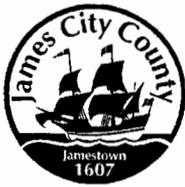
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Langley and McDonald

By: Lou Penci



**James City County Environmental Division  
Stormwater Management / BMP Inspection Report  
Detention and Retention Pond Facilities**

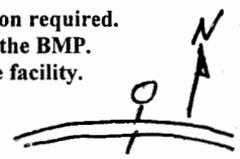
5-50-98

County BMP ID Code (if known): PC 143  
 Name of Facility: POWHATAN Woods Phase I BMP No.: 1 of 1 Date: 7/31/02  
 Location: End of North Benjamin Howell (West 159) near New Route 5  
 Name of Owner: Centex Homes  
 Name of Inspector: SJ Thomas  
 Type of Facility: Large Timber Crib Wall w/ walkway + observation deck  
 Weather Conditions: Sunny, Hot 80's Type:  Final Inspection  County BMP Inspection Program  Owner Inspection

If an inspection item is not applicable, mark NA, otherwise mark the appropriate column.

- O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.
- Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
- Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.

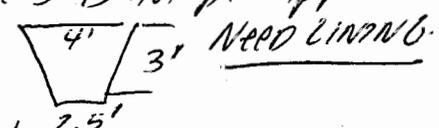
Provide an explanation and details in the comment column, if routine or urgent are marked.



Facility Item	O.K.	Routine	Urgent	Comments
<b>Embankments and Side Slopes:</b> <u>Large timber crib wall</u>				
Grass Height	✓			<u>All treated lumber; wall 10' high at riser; riser encircled &amp; covered by observ deck; 8" spacing in slats around riser; 21x24 hatch thru deck; Class I riprap along U/S and D/S wall faces. walkway 9' wide.</u>
Vegetation Condition	✓			
Tree Growth	✓			
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	✓			
<b>Interior Landscaping/Planted Areas:</b> <input type="checkbox"/> None <input type="checkbox"/> Constructed Wetland/Shallow Marsh <input checked="" type="checkbox"/> Naturally Established Vegetation				
Vegetated Conditions	✓			<u>natural upslope veg &amp; woods EW-12 with grate 15' north of riser U/S</u>
Trash & Debris		✓		
Floating Material		✓		
Erosion	✓			
Sediment	✓			
Dead Plant	✓	✓		
Aesthetics	✓			
Other	✓			
Notes: <u>Serves subdivision &amp; road drainage from New Route 5</u>				

Facility Item	O.K.	Routine	Urgent	Comments
<b>Water Pools:</b> <input type="checkbox"/> Permanent Pool (Retention Basin) <input type="checkbox"/> Shallow Marsh (Detention Basin) <input checked="" type="checkbox"/> None, Dry (Detention Basin)				
Shoreline Erosion	✓			
Algae	✓			
Trash & Debris	✓			
Sediment	✓			None u/s or d/s.
Aesthetics	✓			Wall is gothic structure
Other				
<b>Inflows (Describe Types/Locations):</b> Natural channel primary; 42" RCP from Monticello Ave (EAST)				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris		✓		clean veg & sediment at pipe outfall
Sediment		✓		within BMP
Outlet Protection		✓		Sediment 6"-1' deep
Other				
<b>Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):</b> 48" coated riser; w/ Alum CAP				
Condition of Structure	✓			8" fee on file.
Corrosion	✓			Good.
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other	✓	✓		Riser obstructed by deck. No hatch in riser.
<b>Principal Outlet Structure - Barrel, Conduit, etc.:</b> 36" barrel w/ Alum end section; laid on grade.				
Condition of Structure	✓			
Settlement	✓			Laid on surface. exposed.
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			L=20; W=25' class II; 3' deep
Other		✓		outfall ditch not per plan *
<b>Emergency Spillway (Overflow):</b> Top of wall is emerg. overflow				
Vegetation				
Lining				
Erosion				
Trash & Debris				
Other				
<b>Notes:</b> d/s channel deep cut, bare whole way from BMP to VDOT culvert. Potential to erode.				

Facility Item	O.K.	Routine	Urgent	Comments
<b>Nuisance Type Conditions:</b>				
Mosquito Breeding	✓			None observed.
Animal Burrows	✓			
Graffiti	✓			
Other	✓			
<b>Surrounding Perimeter Conditions:</b> South New Route 5; Wooded everywhere else.				
Land Uses	✓			Mainly woods. Remote setting
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			Natural Look
Access /Maintenance Roads or Paths	✓			easy access, north access path from public road.
Other				
<b>Remarks:</b>				
<ul style="list-style-type: none"> <li>• stabilize <del>north &amp; south</del> <sup>west &amp; east</sup> access path approaches on slopes adjacent to wall.</li> <li>• clean &amp; remove trash &amp; debris from EW-11 grate &amp; 6" LF on file. 90% blocked.</li> <li>• clean veg &amp; sediment 6"-12" deep at 42" pipe inflow to BMP (right) east side of BMP wall. Clean with 10-15' of outfall pipe.</li> <li>• stabilize large bare soil area right (east) abutment slope.</li> <li>• Provide lock on 2'x2' access hatch on wood observ. deck. Also provide access port on riser to inspect below wood hatch. Provide keys to ENV DIV.</li> <li>• Remove SF along U/S right (east) side of wall.</li> <li>• stabilize O/S toe along wall, 15' wide, west side only (left)</li> <li>• stabilize U/S left (west) toe along wall, 15' wide.</li> <li>• Ditch cut from OP stilling basin to O/S VDOT 42" culvert across New Route 5 is not per approved plan.</li> </ul>				
Overall Environmental Division Internal Rating: <u>3</u>				
<ul style="list-style-type: none"> <li>• Const Cert Issue.</li> </ul>				
<div style="display: flex; justify-content: space-between;"> <div> <p>Signature: <u>[Signature]</u> P.E.</p> <p>Title: <u>Civil Engineer ENV DIV</u></p> </div> <div> <p>Date: <u>7/31/02 3:30pm</u></p> </div> </div>				



WATERSHED	PC	MAINTENANCE PLAN	No	CTRL STRUC DESC	CMP Riser
BMP ID NO	143	SITE AREA acre	26.08	CTRL STRUC SIZE inches	48
PLAN NO	S-50-98	LAND USE	Res Planned Com	OTLT BARRL DESC	CMP Barrel
TAX PARCEL	(37-04)(01-02)	old BMP TYP	Timber Crib Wall	OTLT BARRL SIZE inch	36
PIN NO	3740100002	JCC BMP CODE			
CONSTRUCTION DATE		POINT VALUE	4	EMERG SPILLWAY	No
PROJECT NAME	Powhatan Woods Phase 1 & 2			DESIGN HW ELEV	39.38
FACILITY LOCATION	End North Benjamin Howell at new Rt 5			PERM POOL ELE	na
CITY-STATE	Williamsburg, VA	SVC DRAIN AREA acres	69.3	2-YR OUTFLOW cfs	5.59
CURRENT OWNER	Centex Homes			10-YR OUTFLOW cfs	65.85
OWNER ADDRESS	213 Riverwalk Parkway			REC DRAWING	Yes
OWNER ADDRESS 2	Suite 101	SERVICE AREA DESCR	Sec 1/2 & 21.4 ac offsite		
CITY-STATE-ZIP CODE	Chesapeake, Va. 23320	IMPERV AREA acres	17.00	CONSTR CERTI	Yes
OWNER PHONE	757-366-5500	RECV STREAM	UT of Powhatan Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	No	LAST INSP DATE	7/31/2002
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	3
		CHAN PROT CTRL	Yes	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	6.09	BMP # 6. Massive timber wall structure w/ walkway.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

[Get Last BMP No](#)

[Return to Menu](#)

WATERSHED	PC	MAINTENANCE PLAN	No	CTRL STRUC DESC	<i>CMP</i> Alum Riser
BMP ID NO	143	SITE AREA acre	26.08	CTRL STRUC SIZE inches	48 <i>CMP</i>
PLAN NO	S-50-98	LAND USE	Res Planned Com	OTLT BARRL DESC	<del>Alum</del> Barrel
TAX PARCEL	(37-04)(01-02)	old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	36
PIN NO	3740100002	JCC BMP CODE			
CONSTRUCTION DATE	<i>5/1/02</i>	POINT VALUE	4	EMERG SPILLWAY	No
PROJECT NAME	Powhatan Woods Phase 1/2			DESIGN HW ELEV	39.38 <i>39.15</i>
FACILITY LOCATION	West of 159 Hartwell Perry Way			PERM POOL ELE	na
CITY-STATE	Williamsburg, VA	SVC DRAIN AREA acres	69.3	2-YR OUTFLOW cfs	5.59
CURRENT OWNER	Centex Homes			10-YR OUTFLOW cfs	65.85
OWNER ADDRESS	213 Riverwalk Parkway			REC DRAWING	No <i>Yes</i>
OWNER ADDRESS 2	Suite 101	SERVICE AREA DESCRI	Sec 1/2 & 21.4 ac offsite		
CITY-STATE-ZIP CODE	Chesapeake, Va. 23320	IMPERV AREA acres	0.00	CONSTR CERTI	No <i>Yes</i>
OWNER PHONE	757-366-5500	RECV STREAM	UT of Powhatan Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	No	LAST INSP DATE	12/11/2001 <i>7/31/02</i>
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	<i>3</i>
		CHAN PROT CTRL	Yes	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	6.09	Near Alt 5. BMP # 6. <del>Not complete.</del>	
		SW/FLOOD CONTROL	Yes	Massive timber wall structure w/	
		GEOTECH REPORT	No	walkway.	

Get Last BMP No

Return to Menu

3-7-02 /



3-7-02 2

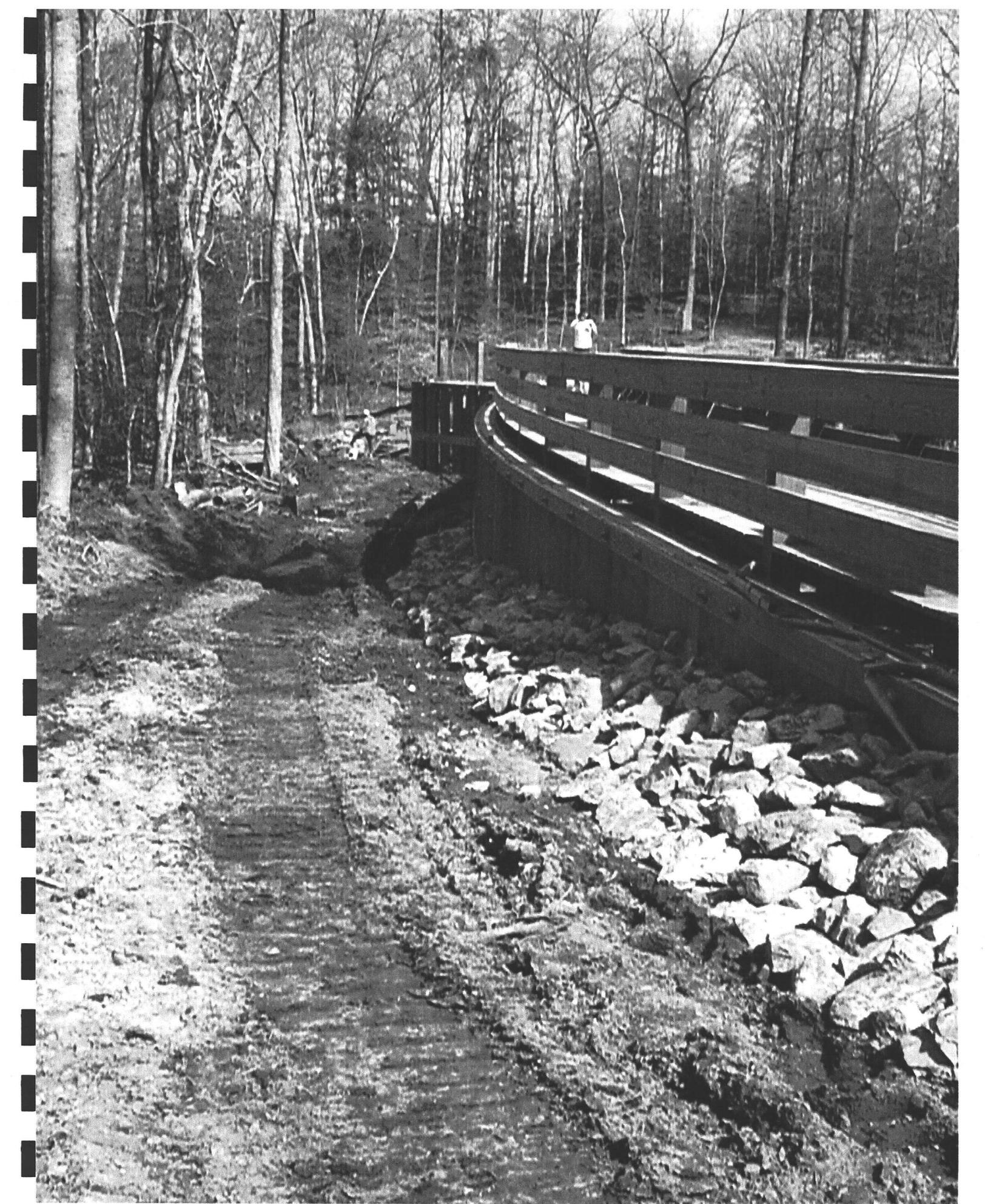






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3-7-02







11-14-01 2



3

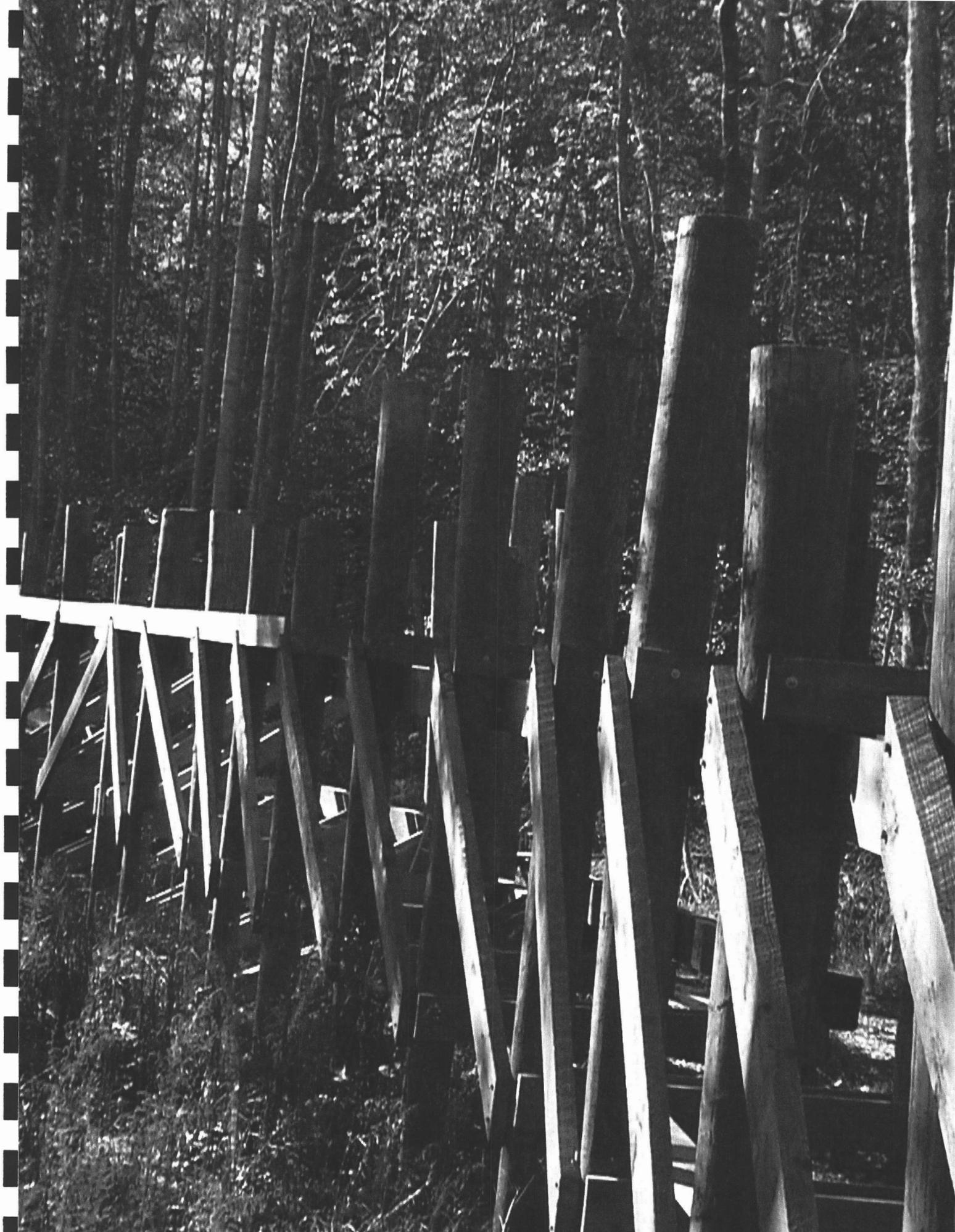
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11-14-01 5



2  
11-14-07



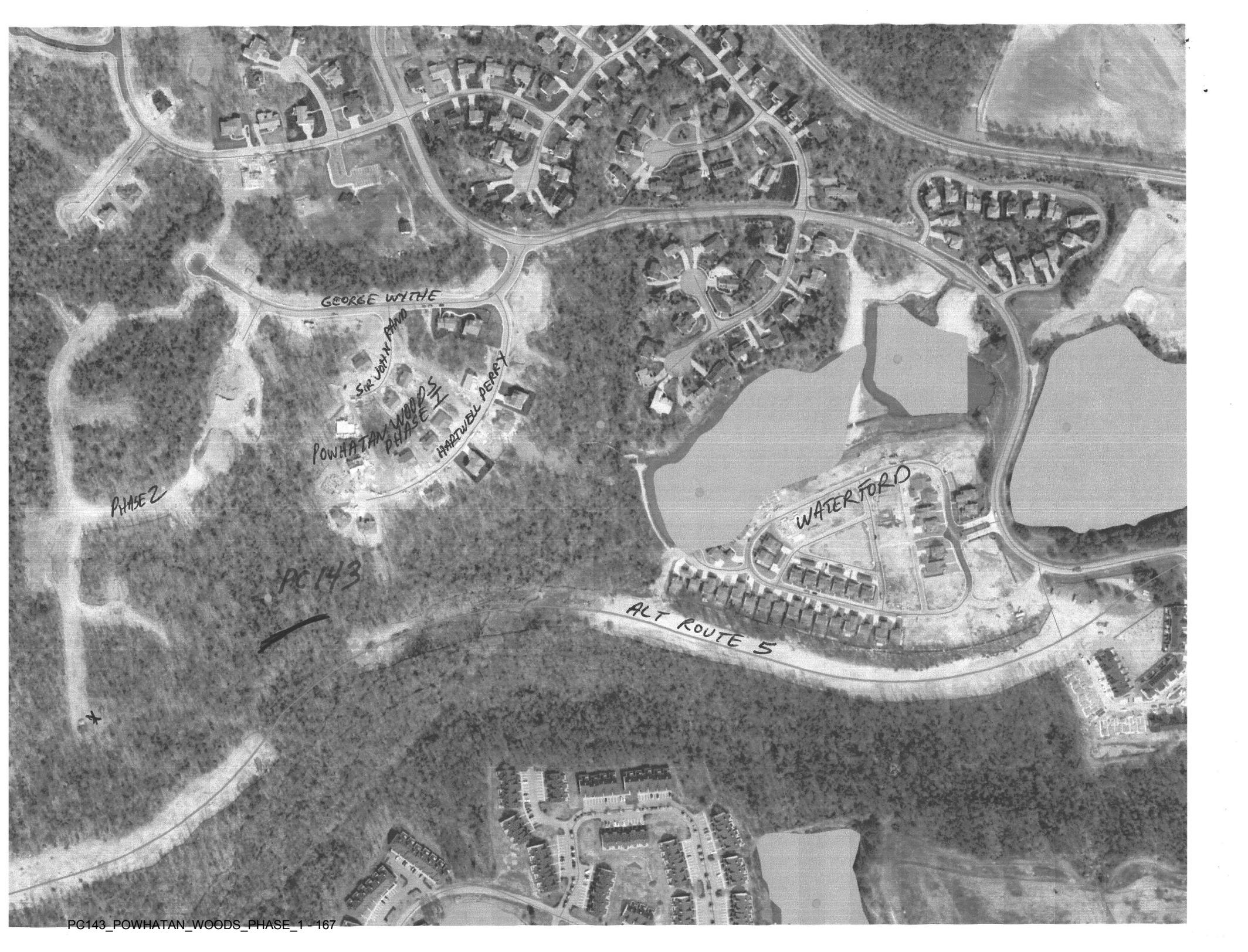


8

11-14-01



11-14-01 9



PC143  
S-50-98

APPROVED 10/14/98  
APPROVED 12/18/98 REV PLAN

PRECON 10/16/98

HOLD \$80,000 REVISED 1/24/00

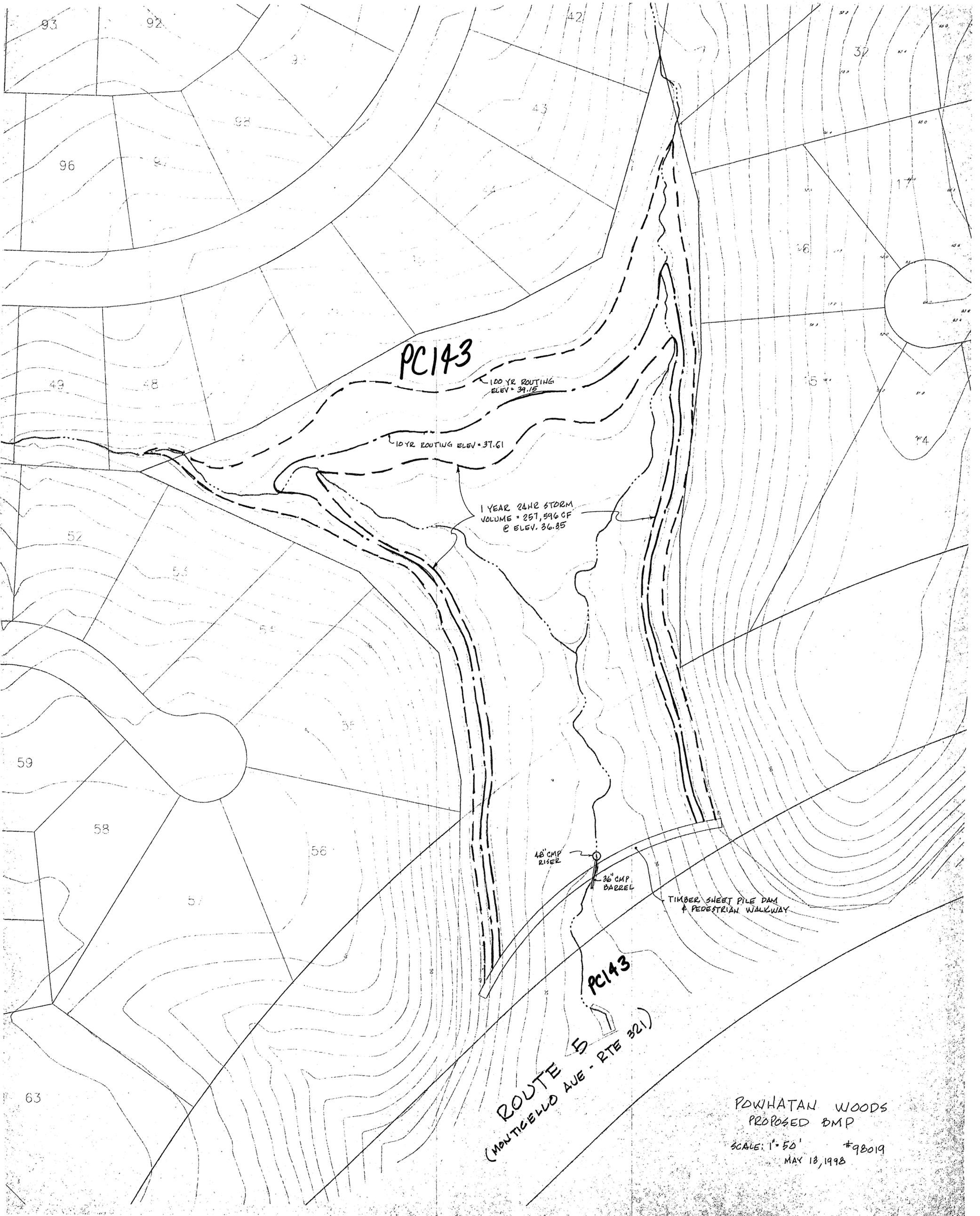
DA = ~~479AC~~ 69.3AC  
~~79~~ CN 79

PC143

NOTE 18 on Sheet 17

PW #1

S. 30-98



PC143

100 YR ROUTING  
ELEV = 39.15

10 YR ROUTING ELEV = 37.61

1 YEAR 24HR STORM  
VOLUME = 257,596 CF  
@ ELEV. 36.85

48\"/>

36\"/>

TIMBER SHEET PILE DAM  
& PEDESTRIAN WALKWAY

PC143

ROUTE 5  
(MONTICELLO AVE - RTE 321)

POWHATAN WOODS  
PROPOSED BMP  
SCALE: 1" = 50'  
#98019  
MAY 18, 1998

ENVIRONMENTAL DIVISION REVIEW COMMENTS  
POWHATAN WOODS  
PLAN NO. S-50-98  
July 7, 1998 MCE/DEC

1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.
2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of lots.
3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.
4. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project.
5. As-built drawings must be provided for the detention basin on completion. Also, a note shall be provided on the plan stating that upon completion, the construction of the dam will be certified by a professional engineer who has inspected the structure during construction.
6. Provide a streetlight plan that meets the requirements of the James City County streetlight policy. Provide lights at the following locations: between lots 6/7, 10/11, 14/15, 32/33, 43/44, in the radius of the curves on lots 25, 36, 39, and ~~in the radius of the curve in the open space adjacent to lot 1.~~
7. Provide an environmental inventory in accordance with Chesapeake Bay Ordinance Section 23-10B.
8. Show any temporary soil stockpile areas, staging and equipment storage areas. The entire road system appears to be a cut section, which will generate the need for temporary stockpiles. The placement of stockpiles is regulated by JCC and are not located at the discretion of the owner.
8. Identify any off-site land disturbing areas required with proper erosion control measures.
10. Provide silt fence along the southern edge of clearing for George Wythe Lane from the intersection of Hartwell Perry Way to the intersection of Sir John Randolph Terrace. See sheet C-3.
11. Extend the diversion dike (DD) shown on sheet C-3 from the sediment trap (located between lots 4 and 5) north to George Wythe Lane. Extend the DD in the other direction to station 15+50 shown on sheet C-5.

12. Replace silt fence along the southern clearing limit of George Wythe with Diversion Dike. The dike should begin at the intersection with John Randolph (sheet C-3) and tie into the dike leading into the trap number 4 shown on sheet C-4.

13. Extend diversion dike shown on sheet C-6 to lot 12, station 19+30. This will capture the runoff from the small draw that drains lots 18 and 19.

14. 17.36 acres of runoff are routed through the storm sewer system (not counting the first two drainage inlets that, as proposed, do not flow into sed. traps). However the sediment traps have been sized for only 4.6 acres of drainage. It appears that silt fence is being used to divert clean water away from the disturbed areas in an attempt to limit the size of the sediment traps. An example of this can be seen at the intersection of Elizabeth Harrison and George Wythe. Silt fence is not an acceptable method of diverting runoff. Clean water can be diverted around the disturbed area by means of a stabilized diversion dike and/or piping. It must then be returned to sheet flow. Provide more information on the sizing of the traps versus the drainage area. Examine the possibility of converting the traps to basins.

*see skt. C-17*

15. Submit a Sediment Basin Design Data Sheet for all sediment basins proposed to ensure design is in accordance with the 1992 VESCH criteria.

16. Provide details of a sediment trap on the erosion control detail sheet. Refer to VESCH for the correct detail. Provide sizing requirements and elevations for each sediment trap on the plan for use by the site contractor.

*ok.*

17. It is unclear from the plan sheets how the sediment traps are to function. The preferable sequence would be to install the storm outfall pipes from the manhole structure located just below each trap to the flared end, and tie the outfall of the trap into the storm pipe. This will carry the water down the slope in a protected manner, and will also eliminate the logistical problem of installing pipe downstream of an existing trap outfall. See sheets 8, 9, and 10.

*use silt fence*

18. Provide details of the proposed check dams in the wetlands below each sediment trap. Are these permanent or temporary? List sizes of structures, and materials used to construct them. It is questionable whether these dams will be of much use in slowing velocities as the existing channel is a very small baseflow channel of less than one foot in depth.

19. Due to the erodibility of the soils in this area, all storm sewer, sanitary sewer, and waterline easements must be protected from erosion prior to the establishment of vegetation. Provide silt fence at 100 foot intervals across the easements (perpendicular to the pipe) to act as check dams, and help hold the soil in place. These easements are shown on sheets C-3 and C-6.

*used  
drawings*

20. Lot to lot drainage must be addressed for lots 34-38, to prevent problems during the buildout of the project. Provide swales, pipes, and drainage easements as

necessary. This can be shown on sheet C-4 of the plan.

✓ 21. Provide a temporary right-of-way diversion at the entrance of the project directing runoff from the upslope disturbed area to the existing stilling basin referred to on sheet C-12. Examine this stilling basin and provide information on its condition, and modifications required for its use as a sediment trap. Show this stilling basin (sediment trap) on sheet C-3. Storm sewer structure 35 should also be directed to this sediment trap.

*see sht C-3*

C-21 22. Provide a detailed sequence of construction on the plan.

23. The existing wooden BMP structure that will serve a portion of this site is in need of repair and routine maintenance. Provide information on the plan to address this issue. This must be performed prior to any additional water is routed to it.

*fill w/ concrete*

24. Amend the drainage area map to correct the drainage area for structure 15. The calculations show a slightly larger drainage area than is shown on the map.

*been revised*

25. Submit an adequacy analysis for all receiving channels to ensure that the channel is stable for the 2-year velocity.

26. Submit a BMP calculation worksheet that demonstrates that this project meets the county's criteria. *- depends on Mat Rd Ext.*

*ok - previous by submitted*

27. Provide conservation easements for all Natural Open Space areas claimed in the BMP worksheet. *will be coming*

28. Provide a plan for the proposed stormwater management facility, and anticipate additional review comments regarding the interface between the proposed storm drain outfalls and the BMP.

29. Provide stormwater management facility easement to include a 20-foot wide access easement and a 15-foot wide maintenance easement measured from the 100-year storm elevation and including the dam and outlet structure.

*future*

30. There is no outfall channel below structure 35. Therefore, either extend the pipe or provide a paved ditch to the rear property line of lot 1 to eliminate a future maintenance problem.

*provide d.d. adj to lot 1*

31. Provide evidence that any required wetlands permits have been obtained. The current submittal of the corps permit is not final. It appears from the information provided that the sediment trap below structure 12 is not accounted for in the wetland impact. Provide the restrictive covenants for the 6.5 acres of wetland preservation. *- will be coming w/ fall submittal*