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: **CC002**

DATE VERIFIED: **November 09, 2017**

QUALITY ASSURANCE TECHNICIAN: **Jonathan Craig**

LOCATION: WILLIAMSBURG, VIRGINIA

James City County VIRGINIA Jamestown 1607

CERTIFICATE OF AUTHENTICITY

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BMP NUMBER: **CC002**

DATE VERIFIED: **September 10, 2018**

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

Charles E. Lovett II

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

M E M O R A N D U M

DATE: November 09, 2017

SCANNER: Jonathan Craig, Assistant Environment Coordinator

RE: Files Approved for Scanning

Maintenance Agreements: YES
(in file as of scan date)

General File ID or BMP ID: CC002

PIN: 5020100090

Owner Name: WILLIAMSBURG CORPORATE CENTER ASSOC T/A BUSCH CORPORATE CENTER ASSOC

Legal Description: BASIN B STORMWATER BASIN BUSCH CORP CENTER

Local Address: 416 MCLAWS CIRCLE

Easement:

Recorded Plat:

Comments: Review of electronic file prior to destruction of 1 record drawing. Hard copy destroyed. Maintenance agreement book 533 page 4 added from courthouse records.

CERTIFICATE OF AUTHENTICITY

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BMP NUMBER: **CC-002**

DATE VERIFIED: **March 15, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 11, 2010

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

FROM: Tina Cantwell, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: CC002

PIN: 5020100090

Subdivision, Tract, Business or Owner Name (if known): Williamsburg Corporate Center Association T/A Busch Corporate Center Association

Property Description: Basin B Stormwater Basin Busch Corporate Center

Site Address: 416 McLaws Circle

(For internal use only) **Box** 11 **Drawer:** 6

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

Comments

1. Maintenance Agreement

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 25th day of September, 1991, between Busch Properties, Inc., and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: McLaw's Circle Detention Basin, Busch Corporate Center, Tax Parcel (50-2)(1-77)

and James City County, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the runoff control facility, hereinafter referred to as the "FACILITY," located on and serving the above-described property to ensure that the FACILITY is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations.

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

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

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

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

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

RETURNED TO JCC ATTORNEY OFFICE, BLDG C, 101C MOUNTS BAY RD, WILLIAMSBURG
10/29/91

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

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

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

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 25th day of September, 19 91.

COVENANTOR(S)

Clive Chu

Clive Chu
Vice President and
General Manager

ATTEST:

William B Ulbert

COVENANTOR(S)

ATTEST:

STATE OF VIRGINIA
~~CITY~~/COUNTY OF James City

I hereby certify that on this 25th day of September 1991, before the subscribed, a Notary Public of the State of Virginia, ~~and for the City/County of~~ at large, aforesaid personally appeared before me Clive Chu
(Name of Acknowledging Party)
and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 25th day of September, 19 91.

Nancy A. Ehly
Notary Public

My Commission expires: 1/26/92

Approved as to form:

0261U
Revised 3/91

VIRGINIA: ~~City of Williamsburg and~~ County of James City, to Wit:
In the Clerk's office of the Circuit Court of the ... Williamsburg and County of James City the 8 day of Oct, 1991 This ... with certificate annexed and admitted ... at 3:26 o'clock
Teste: Helene S. Ward, Clerk
by [signature]
Deputy Clerk

2. Completed Construction Certification

James City County, Virginia
Environmental Division

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

County Plan No.: SP-119-01
Project Name: McCLAWS Center
Stormwater Management Facility: New Forebay at exist Dry Pond (CC 002)
Phase: ☐ I ☐ II ☒ III

☐ Information Received. Date/By: Sept 16 '03 LANDTECH Resource 03-504
☐ Administrative Check.
- ☒ Record Drawing Date/By: LANDTECH 9/4/03
- ☐ Construction Certification Date/By:
- ☒ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☒ Insp/Maint Agreement #/Date: Previous Busch Corp Center
- ☐ BMP Maintenance Plan Location:
- ☐ Other:

☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
☒ Yes ☐ No Location: Note 20 Sheet C8

☒ Assign **County BMP ID Code**: Code: CC002 EXIST BMP
☒ Preliminary Input into Division's "As-Built Tracking Log"
☒ Add Location to GIS Database Map. Obtain site information (GPIN, Owner, Site Area, Address, etc.) CC002
☒ Preliminary Log into Access BMP Database (BMP ID #, Plan No., GPIN, Project Name, etc.) CC002
☒ Active Project File Review (correspondence, H&H, etc.).
☒ Initial As-Built File setup (Label, copy hydraulics, BMP plan and detail information, etc.).
☒ Inspector Check of RD/CC (forward to inspector using transmittal for cursory review).
☒ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to Field Inspection).
☒ Final Inspection (FI) Performed Date: 11/20/03
☒ Record Drawing (RD) Review (***) Date: 9/24/03
☒ Construction Certification (CC) Review Date: N/A SIMPLE DEVICE, NOTHING TO CERT. TO.
☐ Actions:
- ☒ No comments. 11/20/03
- ☐ Comments. Letter Forwarded. Date:
  - ☐ Record Drawing (RD)
  - ☐ Construction Certification (CC)
  - ☐ Construction-Related (CR)
  - ☐ Site Issues (SI)
  - ☐ Other :

CALL TO KEN JENKINS
SEND REPRODUCIBLE.

☐ Second Submission:
☐ Reinspection (if necessary):
☒ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
☒ Notify Inspector and Inspector Supervisor using "Surety Request Form". 11/20/03
☐ 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). NO, CC002
☐ Copy Final Inspection Report into County BMP Inspection Program file. NO
☐ Obtain Digital Photographs of BMP and log into computer.
☒ Complete "As-built Tracking Log"
☐ Last check of BMP Access Database. Add to PRIDE database. NO
☐ NO Add to JCC Hydrology & Hydraulic database (optional).
☐ NO Add to PRIDE BMP ratings database.

Plan Reviewer: [signature] Date: 11/20/03

*** See separate checklist.

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.)

<u>Section 1 - Site Information:</u>

Project Name: McLaws Centre
Structure/BMP Name: Sediment Forebay for Existing Pond
Project Location: 416 McLaws Circle
BMP Location: SW Corner of Existing BMP
County Plan No.: SP - 119 - 01

Project Type:
- ☐ Residential
- ☐ Business
- ☐ Commercial
- ☒ Office
- ☐ Institutional
- ☐ Industrial
- ☐ Public
- ☐ Roadway
- ☐ Other ____

Tax Map/Parcel No.: 5020100090
BMP ID Code (if known): CC 002
Zoning District:: M-1
Land Use:
Site Area (sf or acres): 2.78 ac.

Brief Description of Stormwater Management/BMP Facility: Construct sediment forebay in existing BMP. Forebay to serve McLaws centre and McLaws Park developments

Nearest Visible Landmark to SWM/BMP Facility: BMP located NW of McLaws Centre

Nearest Vertical Ground Control (if known):
- ☒ JCC Geodetic Ground Control
- ☐ USGS
- ☐ Temporary
- ☐ Arbitrary
- ☐ Other

Station Number or Name: 329
Datum or Reference Elevation: 81.75
Control Description: 3 1/4" disk
Control Location from Subject Facility: Approx. 1000' north at intersection of Rt. 60 & Rt. 199

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: 5/02
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: Toano Contractors, Inc.
Name of Professional Firm Who Routinely Monitored Construction: Unkown
Date of Completion for SWM/BMP Facility: 6/02
Date of Record Drawing/Construction Certification Submittal: 9/9/03

(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: CD+A, Inc.
Mailing Address: 368 McLaws Circle
Williamsburg, Va. 23185
Business Phone: (757) 565-0003 Fax: (757) 565-0416
Contact Person: Andy Piplico Title: President

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: Richmond Engineering, Inc.
Mailing Address: 1643 Merrimac Trail
Williamsburg, Va. 23185
Business Phone: (757) 229-1776
Fax: (757) 229-4683
Responsible Plan Preparer: Kenneth Jenkins
Title: P.E.
Plan Name: Busch Corporate Center McLaws Centre
Firm's Project No. 01183
Plan Date: 10/25/01
Sheet No.'s Applicable to SWM/BMP Facility: C3 / C4 / / / /

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

Name: Toano Contractors, Inc
Mailing Address: 8589 Richmond Road
Toano, Va. 23168
Business Phone: 566-0097
Fax: 566-8874
Contact Person: Randy Taylor
Site Foreman/Supervisor: Chris Taylor
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: LandTech Resources, Inc.
Mailing Address: 5810-F Mooretown Rd.
Williamsburg, Va. 23188
Business Phone: (757) 565-1677
Fax: (757) 565-0782

Name: Kenneth M. Jenkins
Title: Senior Engineer

Signature: Kenneth M. Jenkins
Date: 9/9/03

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.

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No.022872
PROFESSIONAL ENGINEER

__________________ (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.

__________________ (Seal)

Virginia Registered
Professional Engineer

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).

NA 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.

NA 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

XX 4. Top widths, berm widths and embankment side slopes.

XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

NA 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.

NA 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

NA 8. Elevation of the principal spillway crest or outlet crest of the structure.

NA 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.

NA 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

INC. 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. Concrete Anti-Vortex Top not installed as called for on approved plans

NA 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.**

NA 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

NA 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

NA 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.

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

NA 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

NA 19. Fencing location and type, if applicable to facility.

INC. 20. BMP vicinity properly cleaned of stockpiles and construction debris. Sediment Buildup in Forebay

NA 21. No visual signs of erosion or channel degradation immediately downstream of facility.

NA 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

XX A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

XX A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

INC. A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes. Not installed

NA 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.

NA 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).

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

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

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

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

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

NA A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

3. As-Built Plan

RECORD DRAWING CERTIFICATION

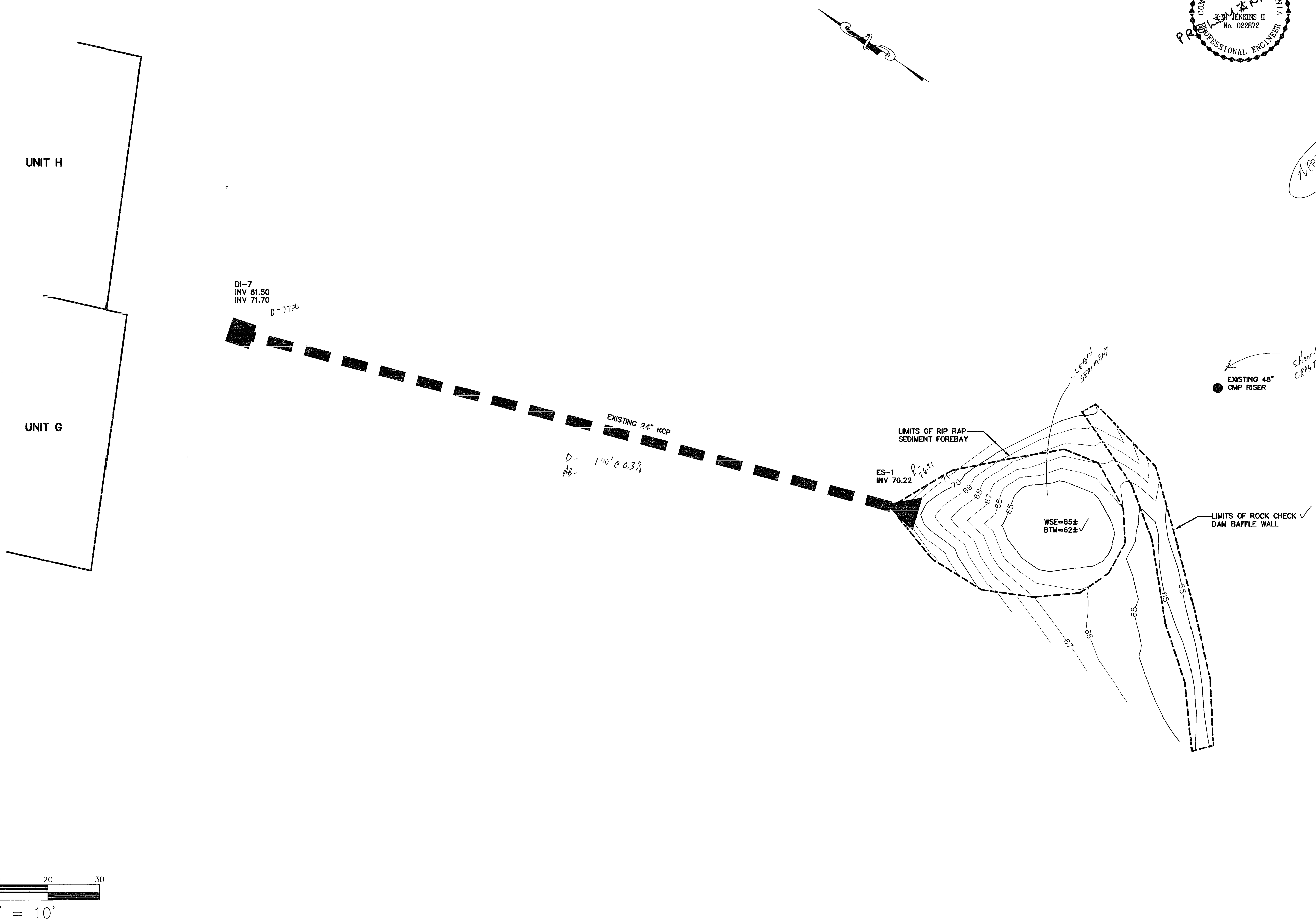
I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE ACTUAL CONDITION OF THE STORMWATER MANAGEMENT/ BMP FACILITY. THE FACILITY APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN, SPECIFICATIONS AND STORMWATER MANAGEMENT PLAN, EXCEPT AS SPECIFICALLY NOTED.

COMMONWEALTH OF VIRGINIA
JENKINS II
No. 022872
PROFESSIONAL ENGINEER

PRELIMINARY

Need SIGNATURE!

RECEIVED
SEP 2003



McLAWS CENTRE
BMP RECORD DRAWING PLAN
SEDIMENT FOREBAY

County Plan Number SP-119-01 - BMP ID Code: CC 002

James City County Virginia

NO.	DATE	REVISION / COMMENT / NOTE

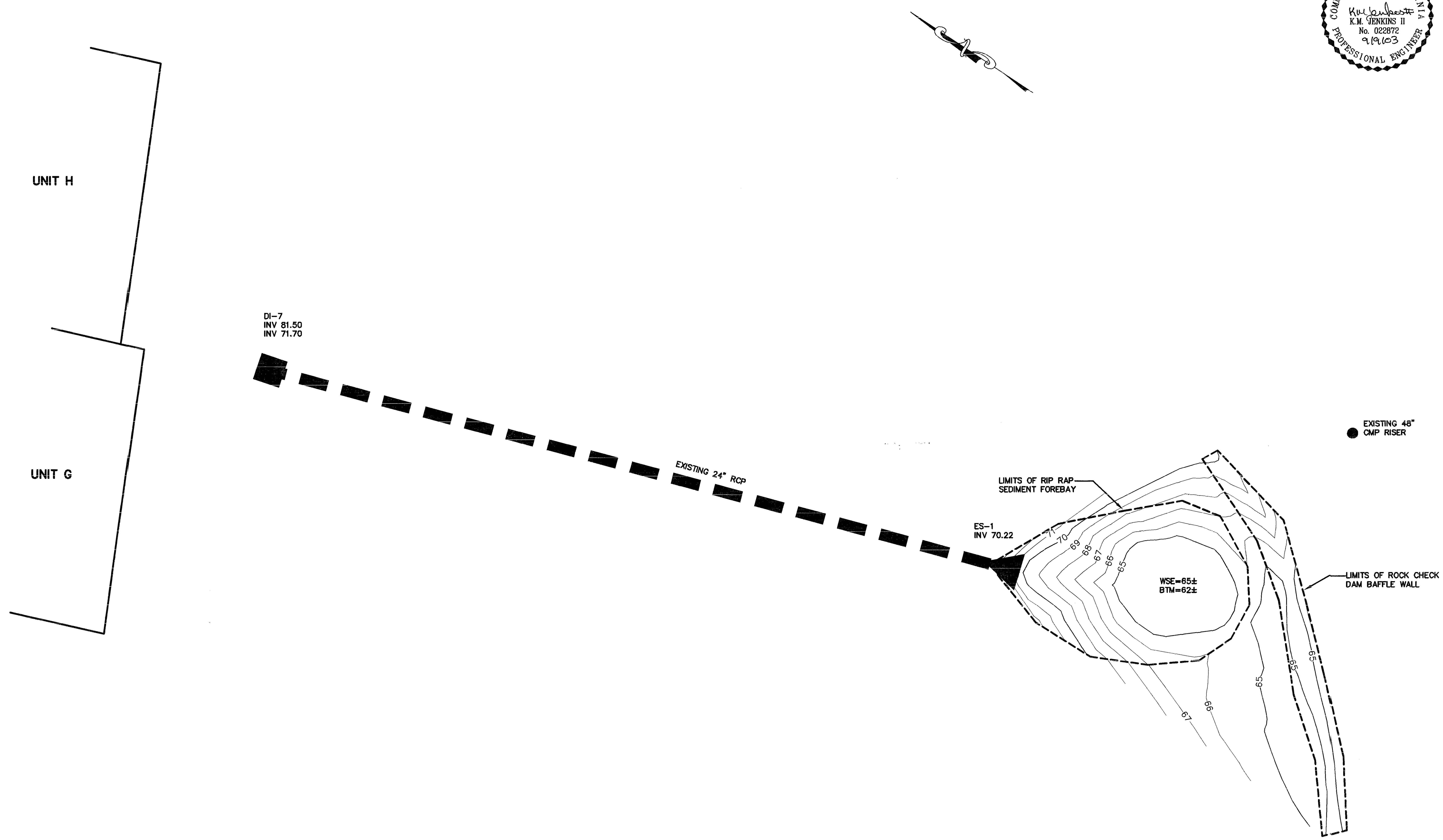
LandTech Resources, Inc.
Surveying · Engineering · GPS
5610-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 10'
DATE: 9/9/03
JOB: 03-504
DRAWN BY: KMJ
SHEET: 1 OF 1

RECORD DRAWING CERTIFICATION

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.

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
9/9/03
PROFESSIONAL ENGINEER



10 0 10 20 30

Scale 1" = 10'

CC002; SP-119-01

APPROVED
James City County
Environmental Division
By:
Date: 11-20-03

McLAWS CENTRE
BMP RECORD DRAWING PLAN
SEDIMENT FOREBAY

County Plan Number SP-119-01 - BMP ID Code: CC 002

James City County Virginia

NO.	DATE	REVISION / COMMENT / NOTE

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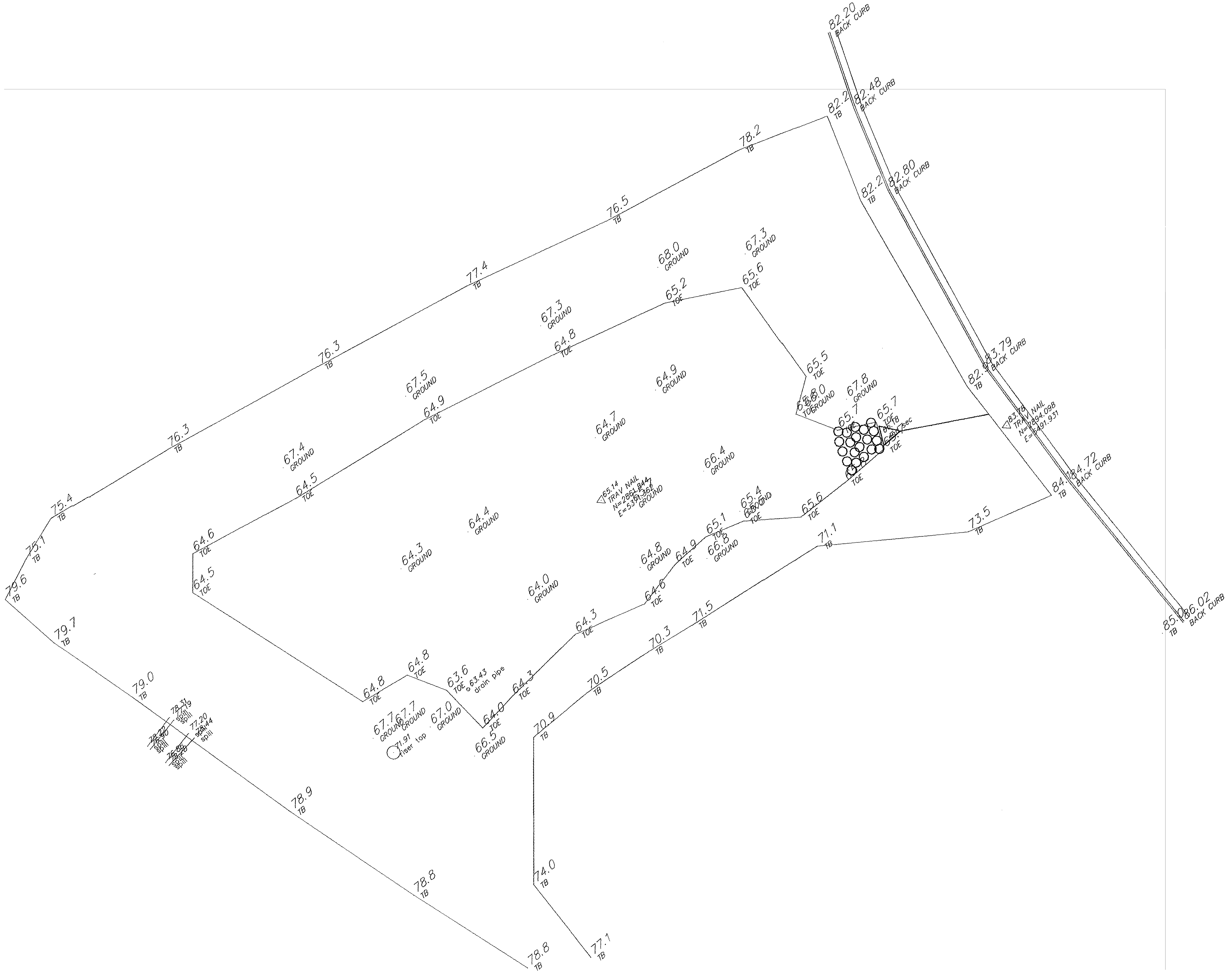
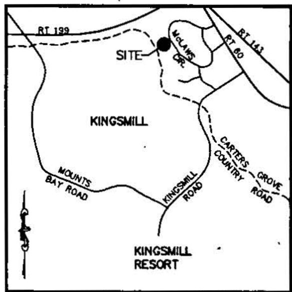


BUSCH CORPORATE CENTER
STORMWATER BASIN B AS-BUILT
1/14/02 SCALE: 1"=20'



VICINITY MAP
SCALE: 1"=2000'

SITE PLAN OF 428 MCLAWS CIRCLE (PARCELS 9 & 10)

BUSCH CORPORATE CENTER
JAMES CITY COUNTY VIRGINIA
JCC SP-100-07

TABLE OF CONTENTS

NOTES:
1) PER FEMA COMMUNITY PANEL NUMBER 510201 0050 B DATED 2/6/91 THE SITE APPEARS TO BE IN FLOOD ZONE "X".
2) TOPOGRAPHIC SURVEY SHOWN HEREON IS BASED ON A FIELD SURVEY PERFORMED BY LANDTECH RESOURCES, INC. – SEPTEMBER 2007.
3) BOUNDARY PER PLAT BY LANDMARK DESIGN GROUP, TITLED "PLAT OF SUBDIVISION OF PARCELS 9, 10, 14, & 60 AND RE-SUBDIVISION OF BASIN B BEING A PORTION OF PARCEL C", DATED 9/22/00 AND RECORDED IN PB 81, PG 37-39.
4) THE EXISTENCE AND LOCATION (HORIZONTAL AND VERTICAL) OF EXISTING UTILITIES ARE NOT GUARANTEED AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
5) THE PROFESSIONAL ENGINEER WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR THE PLAN REVIEW PHASE OF THIS PROJECT. ONCE THE PLANS ARE APPROVED BY THE COUNTY THE OWNER/DEVELOPER SHALL PROVIDE THE COUNTY WITH THE NAME OF THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT.
6) THE OWNER WILL BE REQUIRED TO OBTAIN A VSMP PERMIT FROM THE VIRGINIA DEPARTMENT OF CONSERVATION & RECREATION IF THE DISTURBED AREA IS GREATER THAN 2,500 SF. THIS PERMIT WILL REQUIRE A STORMWATER POLLUTION PREVENTION PLAN.
7) WETLANDS AND RPA SHOWN HEREON PER ROTH ENVIRONMENTAL, LLC ENVIRONMENTAL INVENTORY DATED 9/14/07.
8) A LAND DISTURBING PERMIT AND SILTATION AGREEMENT, WITH SURETY ARE REQUIRED FOR THIS PROJECT.
9) HORIZONTAL AND VERTICAL DATUM BASED ON JCC GEODETIC GROUND CONTROL NETWORK.
10) A STANDARD INSPECTION/MAINTENANCE AGREEMENT IS REQUIRED TO BE EXECUTED WITH THE COUNTY DUE TO THE PROPOSED STORMWATER CONVEYANCE SYSTEMS AND STORMWATER MANAGEMENT/BMP FACILITIES UPGRADES.
11) ALL OBJECTIONABLE AND DELETERIOUS MATERIAL IS TO BE REMOVED FROM THE SITE AND DISPOSED OF IN A STATE APPROVED FACILITY MEETING THE REQUIREMENTS OF ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.
12) THE PROPOSED STORMWATER MANAGEMENT (BMP FACILITY) UPGRADES FOR THIS PROJECT WILL REQUIRE SUBMISSION, REVIEW AND APPROVAL OF A RECORD DRAWING (AS-BUILT) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND/SURETY. THIS ACTIVITY SHALL BE ADEQUATELY COORDINATED AND PERFORMED BEFORE, DURING, AND FOLLOWING CONSTRUCTION IN ACCORDANCE WITH CURRENT COUNTY GUIDELINES.
13) THIS SITE LIES IN THE COUNTY WATERSHED OF COLLEGE CREEK.
14) THERE ARE NO ANTICIPATED OFFSITE LAND DISTURBING AREAS ANTICIPATED FOR THIS PROJECT.
15) ALL DRAINAGE EASEMENTS DESIGNATED ON THIS PLAN SHALL BE PRIVATE.
16) THERE IS NO OUTDOOR STORAGE ANTICIPATED WITH THIS PROJECT.
17) ALL UTILITIES WILL BE PLACED UNDERGROUND.
18) ALL SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II DIVISION 3 OF THE ZONING ORDINANCE.

PARCEL 9 STATISTICAL INFORMATION

ZONE	M1
DISTRICT	ROBERTS
PARCEL ID NO.	5020100095
ADDRESS	428 MCLAWS CIRCLE
PROPOSED USE	OFFICE/WAREHOUSE
WATER	PUBLIC
SEWER	PUBLIC
SITE AREA	6.91 AC.
DISTURBED AREA	2.95 AC.±
BUILDING FLOOR AREA	20,000 SF (OFFICE SPACE = 14,250 SF; WAREHOUSE SPACE= 5,750 SF)
BUILDING FOOTPRINT AREA	20,000 SF
PAVED AREA	1.97 AC.
IMPERVIOUS AREA	2.43 AC. (35%)
GREEN AREA	4.48 AC. (65%)
PARKING SPACES	
REQUIRED:	57 (14,250 SF OFFICE SPACE @ 1 SPACE/250 SF = 57)
PROVIDED:	57
H/C REQUIRED:	3
H/C PROVIDED:	4
LOADING SPACES	
REQUIRED:	2
PROVIDED:	2
BICYCLE SPACES	
REQUIRED:	5
PROVIDED:	5
MAX BUILDING HEIGHT	35'
SETBACKS	
FRONT:	50'
SIDE:	20'
REAR:	20'
ITE CODE	710/150
AM PEAK HOUR TRIP GENERATION	23 + 4 = 27
PM PEAK HOUR TRIP GENERATION	22 + 4 = 26

PARCEL 10 STATISTICAL INFORMATION

ZONE	M1
DISTRICT	ROBERTS
PARCEL ID NO.	5020100095
ADDRESS	428 MCLAWS CIRCLE
PROPOSED USE	OFFICE
WATER	PUBLIC
SEWER	PUBLIC
SITE AREA	6.02 AC.
DISTURBED AREA	5.8 AC.± (PARCEL 10 = 4.65 AC.±; BMP PARCEL = 1.15 AC.±)
BUILDING FLOOR AREA	63,169 SF
BUILDING FOOTPRINT AREA	31,585 SF
PAVED AREA	2.19 AC.
IMPERVIOUS AREA	2.92 AC. (49%)
GREEN AREA	3.10 AC. (51%)
PARKING SPACES	
REQUIRED:	253 (60,552 SF OFFICE SPACE @ 1 SPACE/250 SF = 253)
PROVIDED:	256
H/C REQUIRED:	7
H/C PROVIDED:	9
BICYCLE SPACES	
REQUIRED:	10
PROVIDED:	10
MAX BUILDING HEIGHT	35'
SETBACKS	
FRONT:	50'
SIDE:	20'
REAR:	20'
ITE CODE	710
AM PEAK HOUR TRIP GENERATION	98
PM PEAK HOUR TRIP GENERATION	95

STORMWATER MANAGEMENT NARRATIVE

THE EXISTING SITE IS WOODED AND SLOPES FROM THE NORTHWEST TO THE SOUTHEAST AT APPROXIMATELY 2% TO AN EXISTING JCC BMP CC002. THE PROPOSED ONSITE DRAINAGE SYSTEM IS A SERIES OF DRAINAGE INLETS AND PIPES WHICH WILL CONVEY THE SITE RUNOFF TO THE UPGRADED BMP CC002. THE EXISTING BMP UPGRADES CONSIST OF EXPANDING THE STORAGE VOLUME, CONVERTING THE EXISTING OUTLET CMP RISER TO RCP AND MODIFYING THE EMERGENCY SPILLWAY TO PASS THE 100-YEAR STORM. THE EXISTING JCC BMP CC002 WILL NOT FUNCTION AS A TEMPORARY EROSION AND SEDIMENT CONTROL MEASURE. IT WILL ALWAYS FUNCTION AS A PERMANENT STORMWATER MANAGEMENT FACILITY.

BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1 - 800 - 552 - 7001

OWNER/DEVELOPER

LEEBCOR PROPERTIES, INC.
5388 DISCOVERY BLVD., STE #220
WILLIAMSBURG, VA. 23188
PHONE: (757) 220-5577
FAX: (757) 565-0416
CONTACT: DEREK ROBERTSON

NO.	DATE	REVISION / COMMENT / NOTE
4	6/20/08	REV PER JCC LTR DTD 6/2/08
3	5/28/08	REV PER JCC LTR DTD 4/15/08
2	4/15/08	REV PER OWNER 4/14/08
1	3/10/08	REV PER JCC LTR DTD 10/22/07

LandTech Resources, Inc.
Surveying . GPS . Engineering
201 Bulifants Blvd., Ste A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

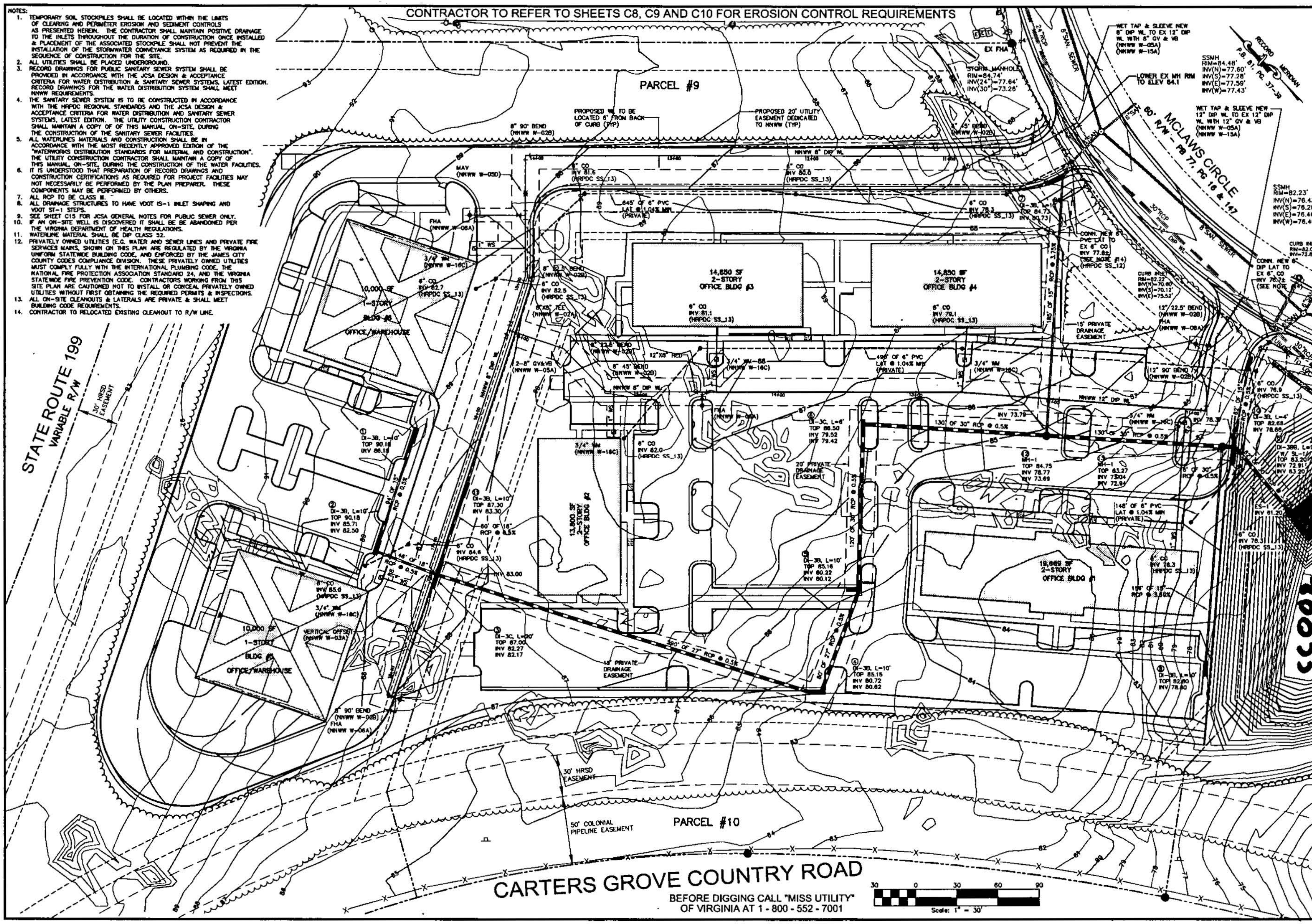
COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
Lic. No. 022872
PROFESSIONAL ENGINEER

JOB: 07-340
DWG NO: 07-340CS
DATE: 9/11/07
DRAWN BY: KMJ
SHEET: C1 OF 20

NOTES:

1. TEMPORARY SOIL STOCKPILES SHALL BE LOCATED WITHIN THE LIMITS OF CLEARING AND PERIMETER EROSION AND SEDIMENT CONTROLS AS PRESENTED HEREIN. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE TO THE INLETS THROUGHOUT THE DURATION OF CONSTRUCTION ONCE INSTALLED & PLACEMENT OF THE ASSOCIATED STOCKPILE SHALL NOT PREVENT THE INSTALLATION OF THE STORMWATER CONVEYANCE SYSTEM AS REQUIRED IN THE SEQUENCE OF CONSTRUCTION FOR THE SITE.
2. ALL UTILITIES SHALL BE PLACED UNDERGROUND.
3. RECORD DRAWINGS FOR PUBLIC SANITARY SEWER SYSTEM SHALL BE PROVIDED IN ACCORDANCE WITH THE JCSA DESIGN & ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION & SANITARY SEWER SYSTEMS, LATEST EDITION. RECORD DRAWINGS FOR THE WATER DISTRIBUTION SYSTEM SHALL MEET NNWW REQUIREMENTS.
4. THE SANITARY SEWER SYSTEM IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE HRPDC REGIONAL STANDARDS AND THE JCSA DESIGN & ACCEPTANCE CRITERIA FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, LATEST EDITION. THE UTILITY CONSTRUCTION CONTRACTOR SHALL MAINTAIN A COPY OF OF THIS MANUAL, ON-SITE, DURING THE CONSTRUCTION OF THE SANITARY SEWER FACILITIES.
5. ALL WATERLINES MATERIALS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE MOST RECENTLY APPROVED EDITION OF THE "WATERWORKS DISTRIBUTION STANDARDS FOR MATERIAL AND CONSTRUCTION". THE UTILITY CONSTRUCTION CONTRACTOR SHALL MAINTAIN A COPY OF THIS MANUAL, ON-SITE, DURING THE CONSTRUCTION OF THE WATER FACILITIES.
6. IT IS UNDERSTOOD THAT PREPARATION OF RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS AS REQUIRED FOR PROJECT FACILITIES MAY NOT NECESSARILY BE PERFORMED BY THE PLAN PREPARER. THESE COMPONENTS MAY BE PERFORMED BY OTHERS.
7. ALL RCP TO BE CLASS III.
8. ALL DRAINAGE STRUCTURES TO HAVE VDOT IS-1 INLET SHAPING AND VDOT ST-1 STEPS.
9. SEE SHEET C15 FOR JCSA GENERAL NOTES FOR PUBLIC SEWER ONLY.
10. IF AN ON-SITE WELL IS DISCOVERED IT SHALL BE BE ABANDONED PER THE VIRGINIA DEPARTMENT OF HEALTH REGULATIONS.
11. WATERLINE MATERIAL SHALL BE DIP CLASS 52.
12. PRIVATELY OWNED UTILITIES (E.G. WATER AND SEWER LINES AND PRIVATE FIRE SERVICES MAINS, SHOWN ON THIS PLAN ARE REGULATED BY THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE, AND ENFORCED BY THE JAMES CITY COUNTY CODES COMPLIANCE DIVISION. THESE PRIVATELY OWNED UTILITIES MUST COMPLY FULLY WITH THE INTERNATIONAL PLUMBING CODE, THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 24, AND THE VIRGINIA STATEWIDE FIRE PREVENTION CODE. CONTRACTORS WORKING FROM THIS SITE PLAN ARE CAUTIONED NOT TO INSTALL OR CONCEAL PRIVATELY OWNED UTILITIES WITHOUT FIRST OBTAINING THE REQUIRED PERMITS & INSPECTIONS.
13. ALL ON-SITE CLEANOUTS & LATERALS ARE PRIVATE & SHALL MEET BUILDING CODE REQUIREMENTS.
14. CONTRACTOR TO RELOCATED EXISTING CLEANOUT TO R/W LINE.

CONTRACTOR TO REFER TO SHEETS C8, C9 AND C10 FOR EROSION CONTROL REQUIREMENTS



BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1 - 800 - 552 - 7001

Scale: 1" = 30'

SITE PLAN OF 428 MCLAWS CIRCLE
BUSCH CORPORATE CENTER
UTILITY PLAN
James City County Virginia

NO.	DATE	REVISION / COMMENT / NOTE
3	5/28/08	REV PER JCC LTR DTD 4/15/08
2	4/15/08	REV PER OWNER 4/14/08
1	3/10/08	REV PER JCC LTR DTD 10/22/07

COMMONWEALTH OF VIRGINIA
K.M. EDWARDS II
Lic. No. 022572
PROFESSIONAL ENGINEER

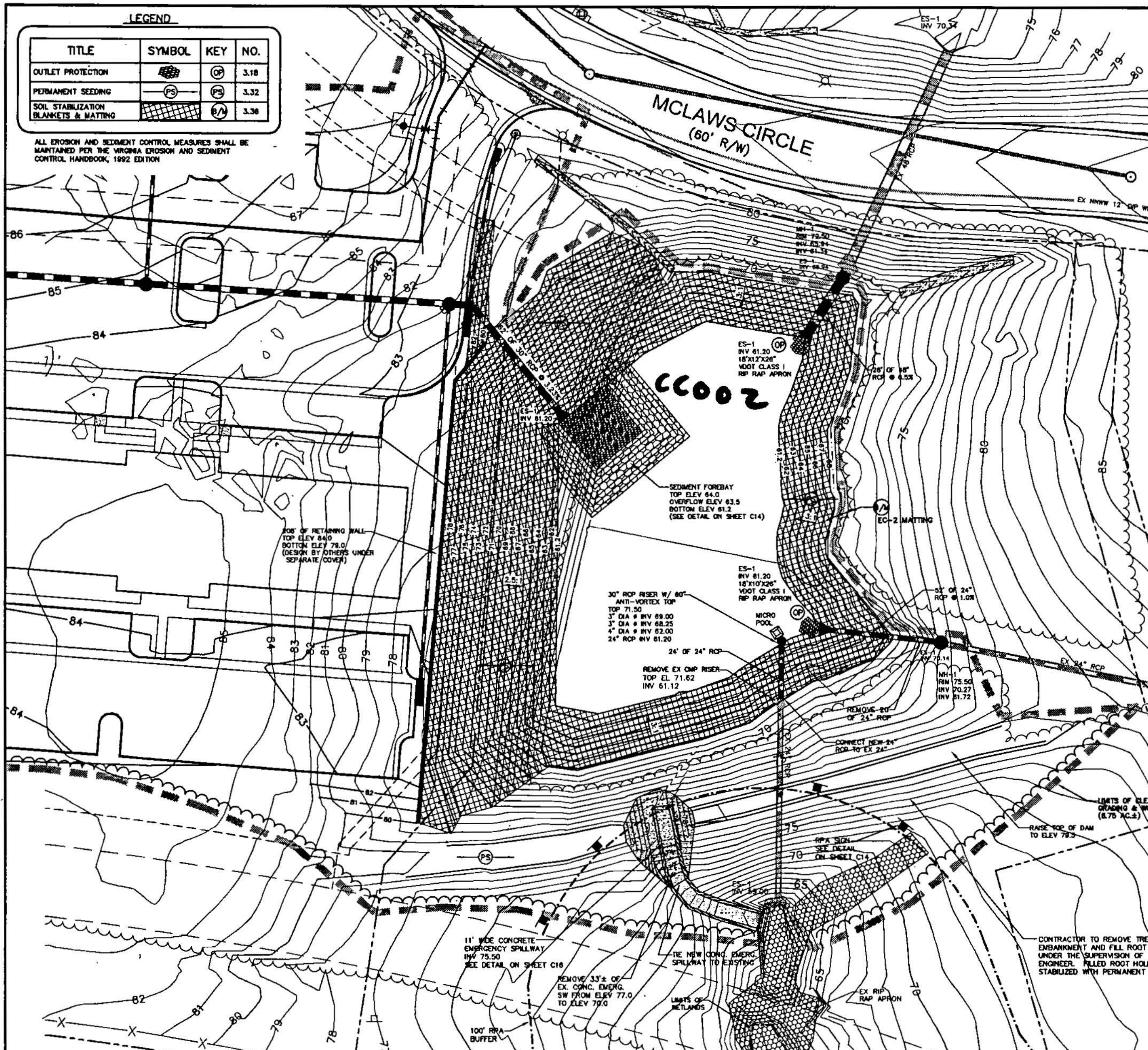
LandTech Resources, Inc.
Surveying . GPS . Engineering
201 Bulifants Blvd., Ste. A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 30'
DATE: 9/11/07
JOB: 07-340
DRAWN BY: KMJ
SHEET: C6 OF 20

LEGEND

TITLE	SYMBOL	KEY	NO.
OUTLET PROTECTION		OP	3.18
PERMANENT SEEDING	—PS—	PS	3.32
SOIL STABILIZATION BLANKETS & MATTING		B/M	3.36

ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED PER THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, 1992 EDITION



DRY EXTENED DETENTION POND MAINTENANCE AND INSPECTION PROGRAM

A MAINTENANCE PROGRAM IS REQUIRED TO ENSURE THE STORMWATER MANAGEMENT (SWM)/BEST MANAGEMENT PRACTICE (BMP) FACILITY FUNCTIONS AS DESIGNED AND TO PROVIDE FOR REASONABLE AESTHETIC CONDITIONS. PROPER MAINTENANCE IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT AT INFLOW LOCATIONS, PRETREATMENT AREAS, THE BMP ITSELF, ITS PRINCIPAL CONTROL STRUCTURES AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION AND ESTABLISHMENT OF VEGETATION IN DISTURBED SITE AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL WILL BE REQUIRED ONCE EVERY 5 TO 10 YEARS. IF OTHER CONSTRUCTION OR RELATED LAND-DISTURBING ACTIVITIES ARE PERFORMED UPSLOPE OF THE BMP, ADEQUATE PROTECTION MEASURES SHOULD BE IMPLEMENTED WITH INSPECTIONS PERFORMED AT LEAST ONCE WEEKLY.

THE OWNER OR ITS DESIGNATED REPRESENTATIVE WILL INSPECT THE SWM/BMP STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR (MORE OR LESS) A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPRPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. KETS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

THE BMP SERVES A DRAINAGE AREA OF 75.0± ACRES ASSOCIATED WITH THE BUSCH CORPORATE CENTER. THE FACILITY IS A 4-POINT, DRY EXTENDED DETENTION POND, JAMES CITY COUNTY TYPE F-2 BMP. A DRY EXTENDED DETENTION POND TEMPORARILY STORES STORMWATER RUNOFF FROM A PORTION OF THE BUSCH CORPORATE CENTER. PRINCIPAL STRUCTURES ASSOCIATED WITH THE BMP CONSIST OF A 48" RCP, 30" RCP & 24" RCP INFLOW PIPES, 30" RCP VERTICAL RISER, 24" RCP OUTLET BARREL AND 11' WIDE CONCRETE LINED EMERGENCY SPILLWAY. THERE ARE 3 OPENINGS IN THE RISER TO PROVIDE FOR WATER QUALITY DRAWDOWN AND CONTROL FOR THE 1- AND 10- YEAR DESIGN STORM EVENTS. DURING THE 100-YEAR STORM, THE MAXIMUM WATER LEVEL SHOULD RISE TO THE TOP OF DAM.

INSPECTION AND MAINTENANCE OF THE BMP WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1) INSPECT FOR SEDIMENT BUILDUP BY VISUAL OBSERVATION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPYH WITHIN THE POND STORAGE AREAS. IF THE DEPTH OF SEDIMENT REACES THE DEPTH OF 1'-5" ABOVE THE BOTTOM OF THE FOREBAY (OR CLEANOUT ELEVATION OF 62.6), REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN THE RISER BOTTOM AND OUTLET PIPES OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA

2) PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT. TREES, SHRUBS AND WOODY VEGETATION ARE NOT TO BE PERMITTED TO GROW ALONG OR ON ANY PART OF THE EMBANKMENT THAT WAS CONSTRUCTED USING ENGINEERED (COMPACTED) FILLS.

3) PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS AT LEAST ONCE EVERY 4 YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY QUALIFIED INDEPENDENT SOIL TESTING LABORATORY SUCH AS VPI&SU. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4) IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF THE SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVER SEED IN ACCORDANCE WITH CURRENT RECOMMENDATIONS OR REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).

5) PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTIONS AND CREST SPILLWAY FOR THE OBSERVANCE OF COLLECTED TRASH AND DEBRIS. IMMEDIATELY REMOVE ANY TRASH OR DEBRIS THAT PREVENTS THE MOVEMENT OR WATER. REMOVE ANY TRASH AND LITTER DOWNSTREAM AND AT STORM DRAIN OR CHANNEL INFLOW LOCATIONS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE.

6) PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICES/WEIRS, OUTLET BARREL AND POND EMBANKMENT. EXPOSED METAL SURFACES SHALL BE RE-PAINTED OR RE-GALVANIZED TO MINIMIZE RUST DAMAGE OR REPLACED IF RUST DAMAGE IS IRREVERSIBLE. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.

7) PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDESLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING.

8) PERFORM YEARLY OBSERVATIONS OF PERIMETER AREAS SURROUNDING THE FACILITY TO ENSURE CHANGES IN LAND USE, TOPOGRAPHY OR ACCESS HAVE NOT OCCURED AND DO NOT AFFECT THE OPERATION, MAINTENANCE, ACCESS OR SAFETY FEATURES AS PROVIDED. APPROPRIATE ACTION IS REQUIRED TO ENSURE ADEQUACY AND TO PROVIDE A CLEAR, SAFE PASSAGE FOR MAINTENANCE VEHICLES TO THE ENGINEERED EMBANKMENT AND PRINCIPAL FLOW CONTROL STRUCTURES.

9) RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

10) THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.

CONTRACTOR TO REFER TO SHEETS C8, C9 AND C10 FOR THE EROSION CONTROL REQUIREMENTS

Scale: 1" = 20'

BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1 - 800 - 552 - 7001

SITE PLAN OF 428 MCLAWS CIRCLE

BUSCH CORPORATE CENTER
BMP EXPANSION

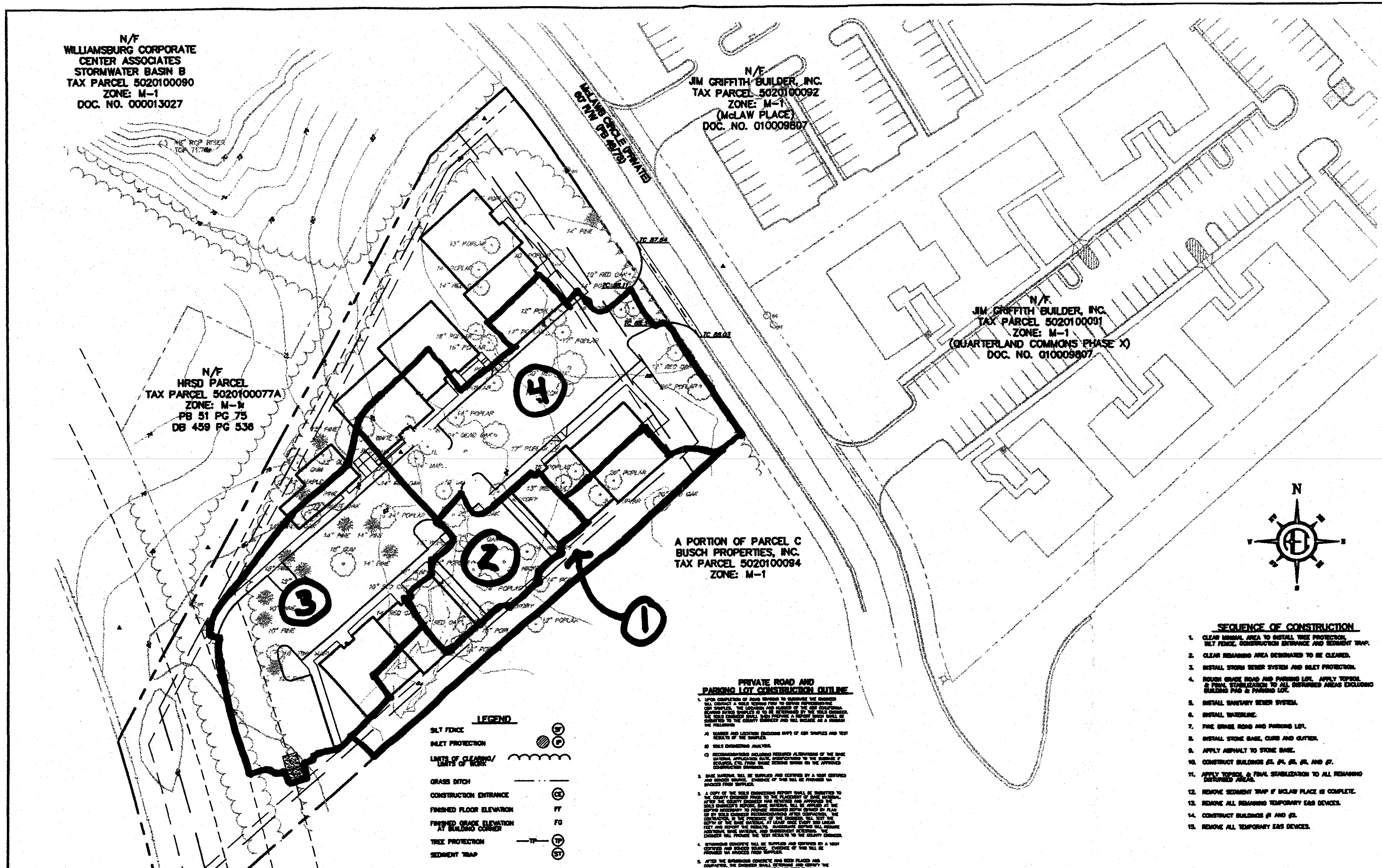
James City County
Virginia

NO.	DATE	REVISION / COMMENT / NOTE
3	5/28/08	REV PER JCC LTR DTD 4/15/08
2	4/15/08	REV PER OWNER 4/14/08
1	3/10/08	REV PER JCC LTR DTD 10/22/07

COMMONWEALTH OF VIRGINIA
PROFESSIONAL ENGINEER

LandTech Resources, Inc.
Surveying - GPS - Engineering
201 Bulifants Blvd., Ste. A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 20'
DATE: 9/11/07
JOB: 07-340
DRAWN BY: KMJ
SHEET: C7 OF 20



TREE PROTECTION FENCE TO BE ORANGE MESH OR SNOW FENCING.

PERMANENT STABILIZATION

ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT SEEDING IMMEDIATELY FOLLOWING FINISH GRADING. SEEDING SHALL BE DONE WITH KENTUCKY 31 TALL FESCUE ACCORDING TO STD. & SPEC. 3.32, "PERMANENT SEEDING", OF THE HANDBOOK. EROSION BLANKETS WILL BE INSTALLED OVER FILL SLOPES WHICH HAVE BEEN BROUGHT TO FINAL GRADE AND HAVE BEEN SEEDED TO PROTECT THE SLOPES FROM RILL AND GULLY EROSION TO ALLOW THE SEED TO GERMINATE PROPERLY. MULCH (STRAW OR FIBER) WILL BE USED ON RELATIVELY FLAT AREAS. IN ALL SEEDING OPERATIONS, SEED, FERTILIZER AND LIME WILL BE APPLIED PRIOR TO MULCHING.

PRIVATE ROAD AND PARKING LOT CONSTRUCTION OUTLINE

1. UPON COMPLETION OF ROAD GRADING TO SUBGRADE THE ENGINEER WILL CONTACT A SOILS TESTING FIRM TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF THE CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL BE SUBMITTED TO THE COUNTY ENGINEER AND WILL INCLUDE AS A MINIMUM THE FOLLOWING:
   A) NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.
   B) SOILS ENGINEERING ANALYSIS.
   C) RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE, MODIFICATIONS TO THE SUBGRADE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
2. BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
3. A COPY OF THE SOILS ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE SOILS ENGINEER'S REPORT, BASE MATERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY SOILS ENGINEER RECOMMENDATIONS) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE BASE MATERIAL AT LEAST ONCE EVERY 200 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BASE MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.
4. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
5. AFTER THE BITUMINOUS CONCRETE HAS BEEN PLACED AND COMPACTED, THE ENGINEER SHALL DETERMINE AND CERTIFY THE THICKNESS OF THE ASPHALT. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE BEING INSTALLED IN THE APPROPRIATE LOCATIONS.
6. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY ENGINEER PRIOR TO THE ACTUAL INSPECTIONS.
7. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER TO PARTIAL RELEASE OF SURETY.
8. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).

MAINTENANCE

IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED DAILY AND AFTER SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. THE SEDIMENT TRAP WILL BE CHECKED REGULARLY FOR SEDIMENT CLEANOUT.
2. THE GRAVEL OUTLETS WILL BE CHECKED REGULARLY FOR A SEDIMENT BUILDUP WHICH WILL PREVENT DRAINAGE. IF THE GRAVEL IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.
3. THE SEEDED AREAS WILL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RESEEDED AS NEEDED.

SEQUENCE OF CONSTRUCTION

1. CLEAR MINIMAL AREA TO INSTALL TREE PROTECTION, SILT FENCE, CONSTRUCTION ENTRANCE AND SEDIMENT TRAP.
2. CLEAR REMAINING AREA DESIGNATED TO BE CLEARED.
3. INSTALL STORM SEWER SYSTEM AND INLET PROTECTION.
4. ROUGH GRADE ROAD AND PARKING LOT. APPLY TOPSOIL & FINAL STABILIZATION TO ALL DISTURBED AREAS EXCLUDING BUILDING PAD & PARKING LOT.
5. INSTALL SANITARY SEWER SYSTEM.
6. INSTALL WATERLINE.
7. FINE GRADE ROAD AND PARKING LOT.
8. INSTALL STONE BASE, CURB AND GUTTER.
9. APPLY ASPHALT TO STONE BASE.
10. CONSTRUCT BUILDINGS #3, #4, #5, #6, AND #7.
11. APPLY TOPSOIL & FINAL STABILIZATION TO ALL REMAINING DISTURBED AREAS.
12. REMOVE SEDIMENT TRAP IF MCLAW PLACE IS COMPLETE.
13. REMOVE ALL REMAINING TEMPORARY E&S DEVICES.
14. CONSTRUCT BUILDINGS #1 AND #2.
15. REMOVE ALL TEMPORARY E&S DEVICES.

30 0 30 60 90

Scale 1" = 30'

BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1-800-552-7001

Rickmond Engineering, Inc.
Engineering Surveying Land Planning
1643 Merrimac Trail, Williamsburg, VA 23185, Voice: (757)229-1776, Fax: (757)229-4683
Vint Hill - P.O. Box 861647, Warrenton, VA 20187, Voice: (540)349-7730, Fax: (540)349-7731
www.rickmond.com

Designed By: KMJ | Drawn By: KMJ | Scale: 1"=30' | Date: 10.25.01

No. | By | Revision | App. | Date

BUSCH CORPORATE CENTER
PARCEL 14B
GRADING PLAN
JAMES CITY COUNTY, VIRGINIA

Job Number: 01183 | Sheet No.: C3

CC002_BUSCH_CORPORATE_CENTER_DET_BASIN - 21 of 68

DRAINAGE AREA MAP

4. Watershed Map

Erosion and Sediment Control Narrative

for

428 McLaws Circle

September 24, 2007
Revised March 18, 2008
Revised April 15, 2008
Revised July 31, 2008

Project Number 07-340

LandTech Resources, Inc.
201 Bulifants Blvd., Ste. A, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

Erosion and Sediment Control Narrative

for

428 McLaws Circle

September 24, 2007
Revised March 18, 2008
Revised April 15, 2008
Revised July 31, 2008

Project Number 07-340

COMMONWEALTH OF VIRGINIA
K.M.Jenkins II
K.M. JENKINS II
Lic. No. 022872
7/31/08
PROFESSIONAL ENGINEER

LandTech Resources, Inc.
201 Bulifants Blvd., Ste. A, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

TABLE OF CONTENTS

SECTION

PROJECT DESCRIPTION

The project consists of the development of 13+/- acres for an office park at 428 McLaws Circle in the Busch Corporate Center of James City County, Virginia. After construction is complete the site will contain a total of 5.35 acres covered by impervious surfaces. The total disturbed area is approximately 8.75 acres.

EXISTING CONDITIONS

Currently the site is mostly wooded and slops from the northwest to southeast at approximately 2% to an existing James City County BMP (CC002).

ADJACENT AREAS

The site is bounded on the north by a developed parcel, on the east by McLaws Circle, on the south by the existing JCC BMP (CC002) and on the west by Route 199 and Carters Grove Country Road.

OFF-SITE AREA

The existing off-site JCC BMP (CC002) is being modified along with the construction of this project. Plans for the BMP modification are included in the design documents for this project.

SOILS

Craven-Uchee complex (11C)

This complex consists of moderately well drained Craven soils and well drained Uchee soils. These deep, strongly sloping soils are so intermingled that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of the Craven soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale olive fine sandy loam 5 inches thick. The subsoil extends to a depth of 42 inches. It is yellowish brown clay in the upper part and yellowish brown sandy clay loam mottled with gray in the middle and lower parts. The substratum extends to a depth of at least 72 inches. It is brownish yellow fine sandy loam mottled gray with gray in the upper part and gray loamy fine sand with yellow mottles in the lower part.

Typically, the surface layer of the Uchee soils is dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is light yellowish brown and very pale brown loamy fine sand 19 inches thick. The subsoil extends to a depth of 56 inches. It is strong brown sandy clay loam above a depth of 36 inches and strong brown sandy clay loam and clay mottled with gray and red from 36 to 56 inches. The substratum from 56 inches to at least 65 inches is variegated red, brown, and gray stratified sandy loam and sandy clay loam.

In the Craven soils, permeability is slow; and in the Uchee soils it is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe. The subsoil of both soils has moderate shrink-swell potential.

Emporia complex (15E)

This complex consists of areas of deep, steep, well drained Emporia soils and areas of similar soils that formed over layers of fossil shells.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale brown loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish brown loam with mostly strong brown mottles in the upper part; 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 brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

In these Emporia soils, permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe. The subsoil has moderate shrink-swell potential.

Kempsville-Emporia fine sandy loams (19B)

This complex consists of deep, gently sloping, well drained soils that are so intermingled that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of this Kempsville soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 10 inches thick. The subsoil extends to a depth of 55 inches thick. It is yellowish brown and strong brown fine sandy loam and sandy clay loam to a depth of 32 inches. Below this, the subsoil is mottled fine sandy loam that is somewhat firm and compacted over yellowish brown sandy clay loam. The substratum is yellowish brown fine sandy clay loam to a depth of at least 68 inches.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 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, 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 brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

The permeability of the Kempsville soil is moderate. In the Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The erosion hazard is moderate. The subsoil of the Kempsville soil has low shrink-swell potential, and that of the Emporia soil has moderate shrink-swell potential.

Slagle fine sandy loam (29B)

This soil is deep, gently sloping, and moderately well drained.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is yellowish brown fine sandy loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is mostly mottled yellowish brown clay loam to a depth of 25 inches. Below this depth, the subsoil is mostly mottled clay loam and sandy clay loam. The substratum is mottled sandy clay loam to a depth of at least 60 inches.

In this Slagle soil permeability is moderate in the upper part of the subsoil and moderately slow or slow in the lower part. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential.

CRITCAL EROSION AREAS

The critical erosion area associated with this site is the existing BMP (CC002) located down grade of the project. To prevent sediment from leaving the site to this area, it is imperative that the contractor install all erosion and sediment control measures shown on these plans before any land disturbing activities commence. Regular inspection and maintenance is also required for all erosion and sediment control measures to keep them functioning as designed.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all structural and vegetative erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the latest edition of Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards shall be adhered to unless otherwise waived or approved by variance.

STRUCTURAL PRACTICES

Temporary Stone Construction Entrance – 3.02

A construction entrance shall be provided at the point of ingress and egress to reduce the amount of mud transported onto paved public roads by motor vehicles and runoff.

Silt Fence – 3.05

Silt fence shall be placed around the limits of clearing to intercept and detain small amounts of sediment from disturbed areas during construction operations.

Storm Drain Inlet Protection – 3.07

Storm drain protection is installed at all drainage inlets to prevent sediment from entering the storm drainage systems prior to permanent stabilization for the disturbed areas.

Culvert Inlet Protection – 3.08

Permanent culvert inlet protection shall be installed at the outlet of the BMP as depicted on the plans.

Diversion Dike – 3.09

Diversion dikes shall be installed to divert storm runoff from upslope drainage areas away from unprotected disturbed areas and to divert sediment-laden runoff from a disturbed area to a sediment-trapping facility (sediment trap).

Sediment Trap – 3.13

Three temporary sediment traps will be provided to detain sediment-laden runoff from small disturbed areas long enough to allow the majority of the sediment to settle out.

Outlet Protection – 3.18

Outlet protection shall be provided to prevent scour at stormwater outlets, to protect the outlet structure, and to minimize the potential for downstream erosion.

Rock Check Dam – 3.20

Rock check dams shall be provided to reduce the velocity of concentrated stormwater flows, thereby reducing erosion at the end of the clean water diversion dikes.

Soil Stabilization Blankets and Matting – 3.36

Jute mesh shall be provided to aid in controlling erosion on the fill slopes by providing a microclimate which protects young vegetation and promotes its establishment.

Tree Preservation and Protection – 3.38

Tree preservation and protection shall be provided to protect desirable trees from mechanical and other injury during land disturbing and construction activity.

Dust Control – 3.39

Dust control shall be provided to prevent surface and air movement of dust from exposed soil surfaces and reduce the presence of airborne substances which may present health hazards, traffic safety problems or harm animal or plant life.

VEGETATIVE PRACTICES

Permanent Seeding – 3.32

All denuded areas, which will be left dormant for extended periods of time, shall be seeded with permanent vegetation immediately following grading. Selection of the seed mixture will depend on the time of year it is applied.

MANAGEMENT STRATEGIES

- Sediment trapping measures will be installed as the first step in grading and will be seeded and mulched immediately following installation.
- Temporary seeding or other stabilization will follow immediate after grading.
- The contractor shall be responsible for the installation and maintenance of all erosion and sediment control practices depicted on the Plans.
- After achieving adequate stabilization, the temporary controls will be cleaned and removed. Any areas disturbed in the removal process shall be graded, top soiled, and seeded accordingly.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be accomplished with Kentucky 31 Tall Fescue according to Standards and Specifications 3.32, Permanent Seeding of the VESCH. Soil stabilization blankets will be installed over slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

STORMWATER MANAGEMENT

This project is for the construction of a 13+/- acre office park and upgrade of existing off-site JCC BMP (CC002) in the Busch Corporate Center. The current BMP configuration is not adequate to prevent degradation to the existing downstream channel. After development the existing BMP (CC002) will be upgraded to maximize the attenuation of the one-year, 24-hour runoff volume. To meet the stormwater quality requirements of the James City County BMP Point System and the stormwater quantity requirements of Minimum Standard 19 of the Virginia Stormwater Management Handbook the existing BMP will be upgraded to an extended dry detention basin (Type F-2 BMP). The outlet structure releases the 1-year, 24-hour volume post-development storm of 135.11 cfs at 24.85 cfs. The 10-year post-development storm of 351.12 cfs is released at 178.83 cfs. The 100-year post-development storm passes through the BMP outlet structure with 0.37 foot of freeboard. The 0.37 foot is less than the desired minimum of 1.0 foot, but is acceptable in this modification case as the proposed BMP footprint is minimized to preserve existing vegetation and minimize disturbance.

CALCULATIONS

Appendix A contains design calculations for the storm sewer conveyance system.
Appendix B contains design calculations for the existing BMP modification.
Appendix C contains design calculations for three onsite Sediment Traps.

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

Temporary Stone Construction Entrance – 3.02

The entrance shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic dressing with additional stone or the washing and reworking of existing stone as conditions demand. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

Silt Fence – 3.05

Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the silt fence is not longer required shall be dressed to conform with the existing grade, prepared and seeded.

Storm Drain Inlet Protection – 3.07

The structure shall be inspected after each rain and repairs made as needed.

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.

Structures shall be removed and the area stabilized when the remaining drainage area has been properly stabilized.

Culvert Inlet Protection – 3.08

The structure shall be inspected after each rain and repairs made as needed.

Aggregate shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding, which interfere with on-site construction.

Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

Temporary structures shall be removed when they have served their useful purpose but not before the upslope area has been permanently stabilized.

Diversion Dike – 3.09

The measures shall be inspected after every storm and repairs made to the dike, flow channel, outlet or sediment trapping facility, as necessary. Once every week, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each work day.

Sediment Trap – 3.13

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Sediment removal from the basin shall be deposited in a suitable area and in such a manner that it will not erode and cause sediment problems.

Filter stone shall be regularly checked to ensure that filtration performance is maintained. Stone choked with sediment shall be removed and cleaned or replaced.

The structure shall be checked regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet shall be checked to ensure that its center is at least 1 foot below the top of the embankment.

Rock Check Dams – 3.20

Check dams shall be checked for sediment accumulation after each runoff-producing storm event. Sediment shall be removed when it reaches one half of the original height of the measure.

Regular inspections shall be made to insure that the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam shall be corrected immediately.

Permanent Seeding – 3.32

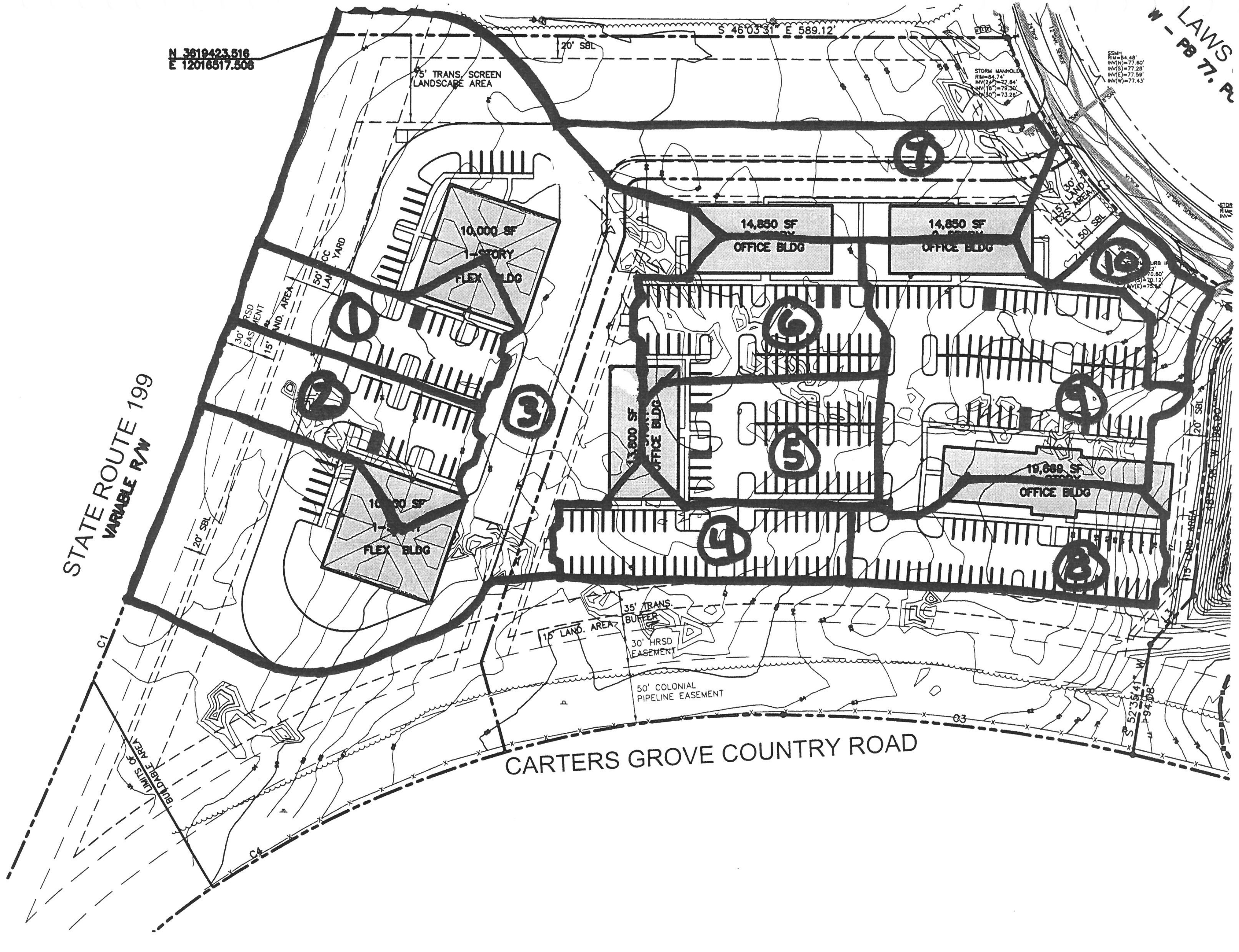
The seeded/mulched areas should be checked regularly to ensure that a good stand is established and maintained. Areas should be fertilized, mulched and re-seeded as needed. When it is clear that plants have not germinated on an area or have died, these areas must be re-seeded immediately to prevent erosion damage. However, it is extremely important to determine for what reason germination did not take place and make any corrective action necessary prior to re-seeding the area.

- Fertilizer shall be applied using approved fertilization methods and equipment.
- Formulations and application rates shall conform to the guidelines given in VESCH.
- Maintain a ground cover or organic mulch around trees that is adequate to prevent erosion, protect roots, and hold water.

Soil Stabilization Blankets and Matting – 3.36

All soil stabilization blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope. Continue to monitor these areas until which time they become permanently stabilized; at that time an annual inspection should be adequate.

APPENDIX A



N 3619423.516
E 12016517.506
S 46°03'31" E 589.12'
20' SBL
75' TRANS. SCREEN
LANDSCAPE AREA
LAWS
W - PB 77, PL
10,000 SF
1-STORY
FLEX BLDG
14,850 SF
OFFICE BLDG
14,850 SF
OFFICE BLDG
13,600 SF
OFFICE BLDG
19,669 SF
OFFICE BLDG
10,000 SF
FLEX BLDG
30' HRSD EASEMENT
15' LAND. AREA
20' SBL
STATE ROUTE 199
VARIABLE R/W
35' TRANS. BUFFER
15' LAND. AREA
30' HRSD EASEMENT
50' COLONIAL PIPELINE EASEMENT
CARTERS GROVE COUNTRY ROAD
LIMITS OF BUILDABLE AREA
1
2
3
4
5
6
7
8
9
10

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- 1

c= .63

A= .65 Ac.

	C	A	CA
Roof/Road	.90	.35	.32
Grass/Woods	.30	.30	.09
		.65	.41

OVERLAND FLOW

L= 100 ft.

S= 3.0 %

Tc= 7 min.

CHANNEL FLOW

H= 1 ft.

L= 140 ft.

Tc= 0.5 min.

Tc= 7.5 min.

i_{10}= 6.5 in/hr

Q=CAi=(.63)(.65 Ac.)(6.5 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.66 cfs

$Q_{PI} = CAI = (.63)(.65)(4.0) = 1.64$ cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 08:54:05
Page: 1

Hec22 Calculation Report: DI #1

esults:

low Intercepted:	1.64	cfs
low Bypassed:	0.00	cfs
nlet Length:	9.09	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	17.24	ft
epth at Curb:	0.24	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.64	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	9.09	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 2

	C	A	CA
Roof/Road	.90	.35	.32
Grass/Woods	.30	.30	.09
		.65	.41

c= .63

A= .65 Ac:

OVERLAND FLOW

L= 100 ft.

S= 3.0 %

Tc= 7 min.

CHANNEL FLOW

H= 1 ft.

L= 140 ft.

Tc= 0.5 min.

Tc= 7.5 min.

i_{10} = 6.5 in/hr

Q=CAi=(.63)(.65 Ac.)(6.5 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.66 cfs

Q_{DI} = CAI = (.63)(.65)(4.0) = 1.64 cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 08:56:06
Page: 1

Hec22 Calculation Report: DI #2

esults:

low Intercepted:	1.64	cfs
low Bypassed:	0.00	cfs
nlet Length:	9.09	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	17.24	ft
epth at Curb:	0.24	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.64	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
anning's n:	0.016	
avement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	9.09	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 3

c= .58
A= 3.07 Ac.

	C	A	CA
Roof/Road	.90	1.43	1.29
Woods/Grass	.30	1.64	0.49
		3.07	1.78

OVERLAND FLOW

L= 100 ft.
S= 3.0 %
Tc= 7 min.

CHANNEL FLOW

H= 4 ft.
L= 530 ft.
Tc= 1 min.

Tc= 8 min.

i_{10}= 6.4 in/hr

Q=CAi=(.58)(3.07 Ac.)(6.4 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 11.40 cfs

Q_{DI} = CAI = (.58)(3.07)(4.0) = 7.12 cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:01:29
Page: 1

Hec22 Calculation Report: DI#3

esults:

low Intercepted:	3.85	cfs
low Bypassed:	0.00	cfs
nlet Length:	19.97	ft
plash-over Velocity:	0.00	ft/s
onding Width:	17.00	ft
epth at Curb:	0.49	ft
fficiency:		
urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

low Data Input:

nput Method:	Known Flow	
nown Flow:	3.85	cfs

nlet Parameters:

omputation Type:	Sag	
nlet Type:	Curb	
ongitudinal Slope:	0.00	ft/ft
anning's n:	0.016	
avement Cross Slope:	0.03	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	19.97	ft
urb Throat Type:	Horizontal	
nclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

Flanking DI required to intercept
(7.12cfs − 3.85cfs)= 3.27cfs.

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:05:37
Page: 1

Hec22 Calculation Report: DI #11

Results:

Flow Intercepted:	3.27	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.33	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	9.60	ft
Depth at Curb:	0.38	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.27	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.03	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	9.33	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- H

	C	A	CA
Roof/Road	.90	.38	.34
Grass	.30	.03	.01
		.41	.35

c= .85
A= .41 Ac:

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.85)(.41 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.51 cfs

$Q_{DI} = CAI = (.85)(.41)(4.0) = 1.39$ cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:08:29
Page: 1

Hec22 Calculation Report: DI #4

esults:

low Intercepted:	1.39	cfs
low Bypassed:	0.00	cfs
nlet Length:	8.51	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	8.04	ft
epth at Curb:	0.23	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.39	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.02	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	8.51	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- 5

c= .86
A= .49 Ac:

	C	A	CA
Roof/Road	.90	.45	.41
Grass	.30	.04	.01
		.49	.42

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.86)(.49 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.03 cfs

$Q_{DI} = CAI = (.86)(.49)(4.0) = 1.69$ cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:09:47
Page: 1

Hec22 Calculation Report: DI #5

esults:

low Intercepted:	1.69	cfs
low Bypassed:	0.00	cfs
nlet Length:	9.59	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	9.26	ft
epth at Curb:	0.24	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.69	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.02	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	9.59	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 6

c= .85
A= .52 Ac:

	C	A	CA
Roof/Road	.90	.47	.42
Grass	.30	.05	.02
		.52	.44

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.85)(.52 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.18 cfs

Q_{DI} = CAI = (.85)(.52)(4.0) = 1.77 cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:11:18
Page: 1

Hec22 Calculation Report: DI #6

==

esults:

----

low Intercepted:	1.77	cfs
low Bypassed:	0.00	cfs
nlet Length:	5.99	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	20.00	ft
epth at Curb:	0.19	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

----

nput Method:	Known Flow	
nown Flow:	1.77	cfs

nlet Parameters:

----

omputation Type:	Sag	
nlet Type:	Curb	
Longitudinal Slope:	0.00	ft/ft
anning's n:	0.016	
avement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	5.99	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- 7

c= .65
A= .79 Ac.

	C	A	CA
Roof/Road	.90	.45	.41
Grass	.30	.34	.10
		.79	.51

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.65)(.79 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.70 cfs

$Q_{0I} = CAI = (.65)(.79)(4.0) = 2.05$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:15:35
Page: 1

Hec22 Calculation Report: DI #7

Results:

Flow Intercepted:	2.05	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.68	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.42	ft
Depth at Curb:	0.27	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	2.05	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	9.68	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 8

c= .81
A= .53 Ac:

	C	A	CA
Roof / Road	.90	.46	.41
Grass	.30	.07	.02
		.53	.43

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10} = 7.2 in/hr

Q=CAi=(.81)(.53 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.09 cfs

$Q_{DI} = CAI = (.81)(.53)(4.0) = 1.72$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:17:11
Page: 1

Hec22 Calculation Report: DI# 8

Results:

Flow Intercepted:	1.72	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	8.45	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	10.69	ft
Depth at Curb:	0.26	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	1.72	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	8.45	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. OF

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY DATE

SCALE

DA-9

c= .83
A= 1.09 Ac:

	C	A	CA
Roof / Road	.90	.94	.85
Grass	.30	.15	.05
		1.09	.90

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.83)(1.09 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 6.51 cfs

Q_{DI} = CAI = (.83)(1.09)(4.0) = 3.62 cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:19:10
Page: 1

Hec22 Calculation Report: DI #9

Results:

Flow Intercepted:	3.62	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	12.10	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	17.76	ft
Depth at Curb:	0.34	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.62	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	12.10	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 10

c= .53
A= .19 Ac:

	C	A	CA
Roof/Road	.90	.07	.06
Grass	.30	.12	.04
		.19	.10

OVERLAND FLOW

L= — ft.
S= — %
Tc= — min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.53)(.19 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= .73 cfs

Q_{2I} = CAI = (.53)(.19)(4.0) = 0.40 cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:20:34
Page: 1

Hec22 Calculation Report: DI#10

Results:

Flow Intercepted:	0.40	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	3.18	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	4.24	ft
Depth at Curb:	0.19	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	0.40	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	3.18	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

LandTech Resources, Inc.

Storm Drainage Design

Phone: (757) 565-1677 Fax: (757) 565-0782

Project Manager: *Kenny Jenkins*
Project Engineer. *Kenny Jenkins*

For Tc Accumulation, Use VELOCITY (1) from Pipe Slope or (2) V=Q/A : **1**

Project Number: **07-340** *Project:* **428 McLaws Circle** Year Storm: **10**

Structure		Rational Formula: Q = CiA									Pipe Data					Mannings Formula				
				CA		Inlet Time Tc (min)		(in/hr)	Runoff, Q (cfs)		Inverts		(ft)	%	(in)	Velocity (ft/sec)				N
From	To	Area "A" (ac)	Coefficient "C"	Incremental	Cumulative	Incremental	Cumulative	Rain	Incremental	Cumulative	UPstream	DOWN-stream	Length	Slope	Diameter	Based on Q/A	Based on pipe slope	Capacity (cfs)	Flow Time (min)	Manning's
From	To	Area	C	CAInc	CaCum	TimeInc	TimeCum	Rain	Qinc	Qcum	InvertUp	InvertDown	Length	Slope	Diameter	VelocityQA	VelocityS	Capacity	FlowTime	ManningsN
1	2	0.65	0.6	0.41	0.41	8	8.00	6.30	2.58	**2.58**	86.18	85.71	94	0.50%	15	2.10	3.72	4.57	0.42	0.013
2	3	0.65	0.6	0.41	0.82	8	8.42	6.22	2.55	**5.09**	82.50	82.27	46	0.50%	18	2.88	4.20	7.43	0.18	0.013
11	3	1.41	0.6	0.82	0.82	8	8.00	6.30	5.15	**5.15**	83.30	83.00	60	0.50%	18	2.92	4.20	7.43	0.24	0.013
3	4	1.66	0.6	0.96	2.60	8	8.60	6.18	5.95	**16.08**	82.17	80.72	290	0.50%	27	4.04	5.51	21.90	0.88	0.013
4	5	0.41	0.9	0.35	2.95	5	9.48	6.02	2.10	**17.75**	80.62	80.22	80	0.50%	27	4.46	5.51	21.90	0.24	0.013
5	6	0.49	0.9	0.42	3.37	5	9.72	5.98	2.52	**20.14**	80.12	79.52	120	0.50%	30	4.10	5.91	29.00	0.34	0.013
6																				

LandTech Resources, Inc.

Hydraulic Grade Line (HGL) Calculations

Project Number: *07-340*
Project: ***428 McLaws Circle***
Date: *7.31.08*

From Structure	HGL Slope (%)	HGL Fall (ft)	Velocity Head $V^2/2g$ (ft)	*Invert Shaped?*	*Surface Flow?*	STRUCTURE LOSSES: Bend Losses *Angle (deg)*	Bend Losses @ To (ft)	Bend Losses @ From (ft)	ENTRANCE @ To (ft)	ENTRANCE @ From (ft)	EXIT (ft)	TOTAL (ft)	HGL @ FROM	Performance Checks & Intermediate Computations: *Rim/Flowline (Max. Allow. Elevation)*	"Freeboard" (ft)	Elev., top of pipe @ From	Structure #'s: FROM-TO	TC plus Pipe Flow Time	Elevation at 80% Full Flow	Too Shallow?	Computed Pipe Dia
	HGLSlope	HGLFall	VelocityHead	*Shaped*	*Surface*	*BendAngle*	BendatTo	BendatFrom	EntratTo	EntratFrom	Exit	TotalStruc	HGLatFrom	*RimElev*	Freeboard	PipeTopEl	FromTo	TCplusPipeTime	FlowRatio	Control	DiaComp
1	0.160%	0.150	0.07	*Y*	*Y*	*0*	0.000	0.000	0.017	0.000	0.024	0.016	**87.18**	***89.69***	2.51	87.62	1-2	8.42	87.18	**80% D**	12.1
2	0.235%	0.108	0.13	*Y*	*Y*	*90*	0.093	0.000	0.032	0.017	0.045	0.041	**84.12**	***89.68***	5.56	84.21	2-3	8.60	83.70	**HGL**	15.6
11	0.241%	0.145	0.13	*Y*	*Y*	*0*	0.000	0.000	0.033	0.000	0.046	0.030	**84.50**	***86.80***	2.30	85.01	11-3	8.24	84.50	**80% D**	15.7
3	0.270%	0.782	0.25	*Y*	*Y*	*90*	0.183	0.093	0.063	0.033	0.089	0.140	**83.97**	***86.50***	2.53	84.69	3-4	9.48	83.97	**80% D**	24.0
4	0.329%	0.263	0.31	*Y*	*Y*	*90*	0.223	0.183	0.077	0.063	0.108	0.230	**82.83**	***84.65***	1.82	83.14	4-5	9.72	82.42	**HGL**	25.0
5	0.241%	0.290	0.26	*Y*	*Y*	*20*	0.042	0.223	0.065	0.077	0.092	0.255	**82.33**	***84.66***	2.33	82.91	5-6	10.06	82.12	**HGL**	26.2

Tailwater Elevation at Outfall point # 6): ***81.79***

LandTech Resources, Inc. — Phone: (757) 565-1677 Fax: (757) 565-0782

Storm Drainage Design

Project Manager: Kenny Jenkins
Project Engineer. Kenny Jenkins

For Tc Accumulation, Use VELOCITY (1) from Pipe Slope or (2) V=Q/A : **1**

Project Number: **07-340** *Project:* 428 McLaws Circle Year Storm: **10**

Structure		Rational Formula: Q = CiA									Pipe Data					Mannings Formula				
				CA		Inlet Time Tc (min)		(in/hr)	Runoff, Q (cfs)		Inverts		(ft)	%	(in)	Velocity (ft/sec)				N
From	To	Area "A" (ac)	Coefficient "C"	Incremental	Cumulative	Incremental	Cumulative	Rain	Incremental	Cumulative	UPstream	DOWN-stream	Length	Slope	Diameter	Based on Q/A	Based on pipe slope	Capacity (cfs)	Flow Time (min)	Manning's
From	To	Area	C	CAInc	CaCum	TimeInc	TimeCum	Rain	Qinc	Qcum	InvertUp	InvertDown	Length	Slope	Diameter	VelocityQA	VelocityS	Capacity	FlowTime	ManningsN
6	12	5.79	0.6	3.71	3.71	5	5.00	6.96	25.77	**25.77**	79.42	78.77	130	0.50%	30	5.25	5.91	29.00	0.37	0.013
7	12	0.79	0.7	0.51	0.51	5	5.00	6.96	3.57	**3.57**	80.73	73.79	185	3.75%	15	2.91	10.20	12.51	0.30	0.013
12	13	0.00	0.0	0.00	4.22	0	5.37	6.87	0.00	**28.98**	73.69	73.04	130	0.50%	30	5.90	5.91	29.00	0.37	0.013
8	13	0.53	0.8	0.43	0.43	5	5.00	6.96	2.99	**2.99**	78.80	73.04	156	3.69%	15	2.43	10.11	12.41	0.26	0.013
13	9	0.00	0.0	0.00	4.65	0	5.73	6.78	0.00	**31.53**	72.94	72.91	6	0.50%	30	6.42	5.91	29.00	0.02	0.013
10	9	0.19	0.5	0.10	0.10	5	5.00	6.96	0.70	**0.70**	78.68	78.37	62	0.50%	15	0.57	3.72	4.57	0.28	0.013
9	ES	1.09	0.8	0.90	5.65	5	5.75	6.78	6.13	**38.33**	69.55	68.00	46	3.37%	30	7.81	15.34	75.29	0.05	0.013
ES																				

LandTech Resources, Inc.

Hydraulic Grade Line (HGL) Calculations

Project Number: *07-340*
Project: ***428 McLaws Circle***
Date: *7.31.08*

From Structure	HGL Slope (%)	HGL Fall (ft)	Velocity Head V²/2g (ft)	Invert Shaped?	Surface Flow?	STRUCTURE LOSSES: Bend Losses Angle (deg)	Bend Losses @ To (ft)	Bend Losses @ From (ft)	ENTRANCE @ To (ft)	ENTRANCE @ From (ft)	EXIT (ft)	TOTAL (ft)	HGL @ FROM	Performance Checks & Intermediate Computations: Rim/Flowline (Max. Allow. Elevation)	"Freeboard" (ft)	Elev., top of pipe @ From	Structure #'s: FROM-TO	TC plus Pipe Flow Time	Elevation at 80% Full Flow	Too Shallow?	Computed Pipe Dia.
	HGLSlope	HGLFall	VelocityHead	Shaped	Surface	BendAngle	BendatTo	BendatFrom	EntratTo	EntratFrom	Exit	TotalStruc	HGLatFrom	RimElev	Freeboard	PipeTopEl	FromTo	TCplusPipeTime	FlowRatio	Control	DiaComp
6	0.395%	0.514	0.43	Y	Y	90	0.308	0.000	0.107	0.000	0.150	0.097	81.79	86.00	4.21	82.21	6-12	5.37	81.42	HGL	28.7
7	0.306%	0.566	0.13	Y	Y	0	0.000	0.000	0.033	0.000	0.046	0.030	81.77	84.23	2.46	82.17	7-12	5.30	81.73	HGL	9.4
12	0.500%	0.649	0.54	Y	Y	90	0.390	0.308	0.135	0.107	0.189	0.393	81.18	84.75	3.57	76.48	12-13	5.73	75.69	HGL	30.0
8	0.214%	0.334	0.09	Y	Y	0	0.000	0.000	0.023	0.000	0.032	0.021	80.49	82.30	1.81	80.24	8-13	5.26	79.80	HGL	8.8
13	0.591%	0.035	0.64	Y	Y	90	0.461	0.390	0.160	0.135	0.224	0.487	80.13	83.27	3.14	75.73	13-9	5.75	74.94	HGL	31.0
10	0.012%	0.007	0.01	Y	Y	0	0.000	0.000	0.001	0.000	0.002	0.001	79.68	82.18	2.50	80.12	10-9	5.28	79.68	80% D	7.4
9	0.874%	0.402	0.95	Y	Y	90	0.682	0.461	0.237	0.160	0.331	0.619	79.61	82.70	3.09	72.34	9-ES	5.80	71.55	HGL	23.3

Tailwater Elevation at Outfall point # ES): **78.59**

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/19/07
SCALE ______

DESIGN OUTLET PROTECTION
FROM MH #9

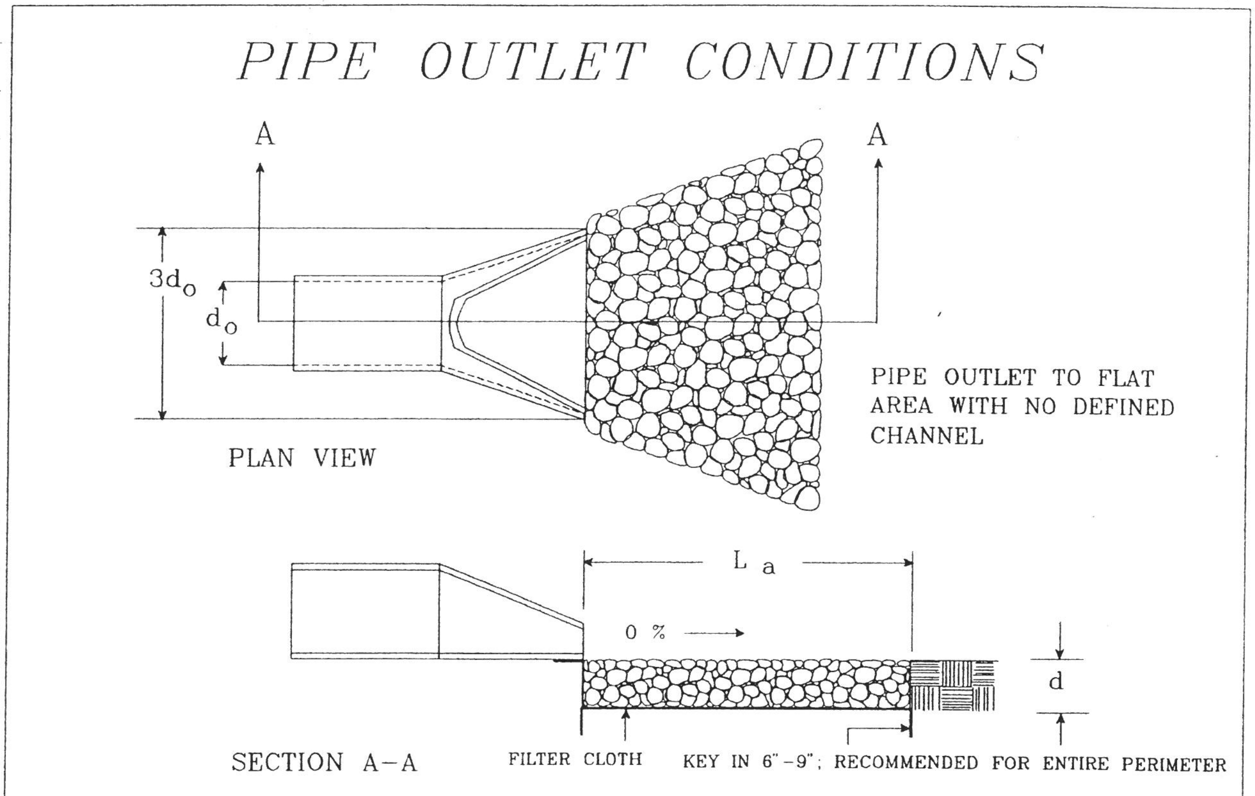


Plate 3.18-4
Q = 38.63 cfs
d = 2.5'
3d = 8'
La = 12'
W = d + .4La = 8'
d_{50} = 0.2'

USE 12' x 8' x 26"
VDOT CLASS I
RIP RAP APRON

Erosion and Sediment Control Narrative

for

428 McLaws Circle

September 24, 2007
Revised March 18, 2008
Revised April 15, 2008
Revised July 31, 2008

Project Number 07-340

LandTech Resources, Inc.
201 Bulifants Blvd., Ste. A, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

Erosion and Sediment Control Narrative

for

428 McLaws Circle

September 24, 2007
Revised March 18, 2008
Revised April 15, 2008
Revised July 31, 2008

Project Number 07-340

COMMONWEALTH OF VIRGINIA
K.M. Jenkins II
K.M. JENKINS II
Lic. No. 022872
7/31/08
PROFESSIONAL ENGINEER

LandTech Resources, Inc.
201 Bulifants Blvd., Ste. A, Williamsburg, VA
Phone 757-565-1677
Fax 757-565-0782

TABLE OF CONTENTS

PROJECT DESCRIPTION

The project consists of the development of 13+/- acres for an office park at 428 McLaws Circle in the Busch Corporate Center of James City County, Virginia. After construction is complete the site will contain a total of 5.35 acres covered by impervious surfaces. The total disturbed area is approximately 8.75 acres.

EXISTING CONDITIONS

Currently the site is mostly wooded and slops from the northwest to southeast at approximately 2% to an existing James City County BMP (CC002).

ADJACENT AREAS

The site is bounded on the north by a developed parcel, on the east by McLaws Circle, on the south by the existing JCC BMP (CC002) and on the west by Route 199 and Carters Grove Country Road.

OFF-SITE AREA

The existing off-site JCC BMP (CC002) is being modified along with the construction of this project. Plans for the BMP modification are included in the design documents for this project.

SOILS

Craven-Uchee complex (11C)

This complex consists of moderately well drained Craven soils and well drained Uchee soils. These deep, strongly sloping soils are so intermingled that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of the Craven soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale olive fine sandy loam 5 inches thick. The subsoil extends to a depth of 42 inches. It is yellowish brown clay in the upper part and yellowish brown sandy clay loam mottled with gray in the middle and lower parts. The substratum extends to a depth of at least 72 inches. It is brownish yellow fine sandy loam mottled gray with gray in the upper part and gray loamy fine sand with yellow mottles in the lower part.

Typically, the surface layer of the Uchee soils is dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is light yellowish brown and very pale brown loamy fine sand 19 inches thick. The subsoil extends to a depth of 56 inches. It is strong brown sandy clay loam above a depth of 36 inches and strong brown sandy clay loam and clay mottled with gray and red from 36 to 56 inches. The substratum from 56 inches to at least 65 inches is variegated red, brown, and gray stratified sandy loam and sandy clay loam.

In the Craven soils, permeability is slow; and in the Uchee soils it is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe. The subsoil of both soils has moderate shrink-swell potential.

Emporia complex (15E)

This complex consists of areas of deep, steep, well drained Emporia soils and areas of similar soils that formed over layers of fossil shells.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale brown loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish brown loam with mostly strong brown mottles in the upper part; 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 brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

In these Emporia soils, permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe. The subsoil has moderate shrink-swell potential.

Kempsville-Emporia fine sandy loams (19B)

This complex consists of deep, gently sloping, well drained soils that are so intermingled that it is not practical to separate them at the scale used in mapping.

Typically, the surface layer of this Kempsville soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 10 inches thick. The subsoil extends to a depth of 55 inches thick. It is yellowish brown and strong brown fine sandy loam and sandy clay loam to a depth of 32 inches. Below this, the subsoil is mottled fine sandy loam that is somewhat firm and compacted over yellowish brown sandy clay loam. The substratum is yellowish brown fine sandy clay loam to a depth of at least 68 inches.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 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, 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 brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

The permeability of the Kempsville soil is moderate. In the Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The erosion hazard is moderate. The subsoil of the Kempsville soil has low shrink-swell potential, and that of the Emporia soil has moderate shrink-swell potential.

Slagle fine sandy loam (29B)

This soil is deep, gently sloping, and moderately well drained.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is yellowish brown fine sandy loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is mostly mottled yellowish brown clay loam to a depth of 25 inches. Below this depth, the subsoil is mostly mottled clay loam and sandy clay loam. The substratum is mottled sandy clay loam to a depth of at least 60 inches.

In this Slagle soil permeability is moderate in the upper part of the subsoil and moderately slow or slow in the lower part. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential.

CRITCAL EROSION AREAS

The critical erosion area associated with this site is the existing BMP (CC002) located down grade of the project. To prevent sediment from leaving the site to this area, it is imperative that the contractor install all erosion and sediment control measures shown on these plans before any land disturbing activities commence. Regular inspection and maintenance is also required for all erosion and sediment control measures to keep them functioning as designed.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all structural and vegetative erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the latest edition of Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards shall be adhered to unless otherwise waived or approved by variance.

STRUCTURAL PRACTICES

Temporary Stone Construction Entrance – 3.02

A construction entrance shall be provided at the point of ingress and egress to reduce the amount of mud transported onto paved public roads by motor vehicles and runoff.

Silt Fence – 3.05

Silt fence shall be placed around the limits of clearing to intercept and detain small amounts of sediment from disturbed areas during construction operations.

Storm Drain Inlet Protection – 3.07

Storm drain protection is installed at all drainage inlets to prevent sediment from entering the storm drainage systems prior to permanent stabilization for the disturbed areas.

Culvert Inlet Protection – 3.08

Permanent culvert inlet protection shall be installed at the outlet of the BMP as depicted on the plans.

Diversion Dike – 3.09

Diversion dikes shall be installed to divert storm runoff from upslope drainage areas away from unprotected disturbed areas and to divert sediment-laden runoff from a disturbed area to a sediment-trapping facility (sediment trap).

Sediment Trap – 3.13

Three temporary sediment traps will be provided to detain sediment-laden runoff from small disturbed areas long enough to allow the majority of the sediment to settle out.

Outlet Protection – 3.18

Outlet protection shall be provided to prevent scour at stormwater outlets, to protect the outlet structure, and to minimize the potential for downstream erosion.

Rock Check Dam – 3.20

Rock check dams shall be provided to reduce the velocity of concentrated stormwater flows, thereby reducing erosion at the end of the clean water diversion dikes.

Soil Stabilization Blankets and Matting – 3.36

Jute mesh shall be provided to aid in controlling erosion on the fill slopes by providing a microclimate which protects young vegetation and promotes its establishment.

Tree Preservation and Protection – 3.38

Tree preservation and protection shall be provided to protect desirable trees from mechanical and other injury during land disturbing and construction activity.

Dust Control – 3.39

Dust control shall be provided to prevent surface and air movement of dust from exposed soil surfaces and reduce the presence of airborne substances which may present health hazards, traffic safety problems or harm animal or plant life.

VEGETATIVE PRACTICES

Permanent Seeding – 3.32

All denuded areas, which will be left dormant for extended periods of time, shall be seeded with permanent vegetation immediately following grading. Selection of the seed mixture will depend on the time of year it is applied.

MANAGEMENT STRATEGIES

- Sediment trapping measures will be installed as the first step in grading and will be seeded and mulched immediately following installation.
- Temporary seeding or other stabilization will follow immediate after grading.
- The contractor shall be responsible for the installation and maintenance of all erosion and sediment control practices depicted on the Plans.
- After achieving adequate stabilization, the temporary controls will be cleaned and removed. Any areas disturbed in the removal process shall be graded, top soiled, and seeded accordingly.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be accomplished with Kentucky 31 Tall Fescue according to Standards and Specifications 3.32, Permanent Seeding of the VESCH. Soil stabilization blankets will be installed over slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

STORMWATER MANAGEMENT

This project is for the construction of a 13+/- acre office park and upgrade of existing off-site JCC BMP (CC002) in the Busch Corporate Center. The current BMP configuration is not adequate to prevent degradation to the existing downstream channel. After development the existing BMP (CC002) will be upgraded to maximize the attenuation of the one-year, 24-hour runoff volume. To meet the stormwater quality requirements of the James City County BMP Point System and the stormwater quantity requirements of Minimum Standard 19 of the Virginia Stormwater Management Handbook the existing BMP will be upgraded to an extended dry detention basin (Type F-2 BMP). The outlet structure releases the 1-year, 24-hour volume post-development storm of 135.11 cfs at 24.85 cfs. The 10-year post-development storm of 351.12 cfs is released at 178.83 cfs. The 100-year post-development storm passes through the BMP outlet structure with 0.37 foot of freeboard. The 0.37 foot is less than the desired minimum of 1.0 foot, but is acceptable in this modification case as the proposed BMP footprint is minimized to preserve existing vegetation and minimize disturbance.

CALCULATIONS

Appendix A contains design calculations for the storm sewer conveyance system.
Appendix B contains design calculations for the existing BMP modification.
Appendix C contains design calculations for three onsite Sediment Traps.

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

Temporary Stone Construction Entrance – 3.02

The entrance shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic dressing with additional stone or the washing and reworking of existing stone as conditions demand. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

Silt Fence – 3.05

Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the silt fence is not longer required shall be dressed to conform with the existing grade, prepared and seeded.

Storm Drain Inlet Protection – 3.07

The structure shall be inspected after each rain and repairs made as needed.

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.

Structures shall be removed and the area stabilized when the remaining drainage area has been properly stabilized.

Culvert Inlet Protection – 3.08

The structure shall be inspected after each rain and repairs made as needed.

Aggregate shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding, which interfere with on-site construction.

Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

Temporary structures shall be removed when they have served their useful purpose but not before the upslope area has been permanently stabilized.

Diversion Dike – 3.09

The measures shall be inspected after every storm and repairs made to the dike, flow channel, outlet or sediment trapping facility, as necessary. Once every week, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each work day.

Sediment Trap – 3.13

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Sediment removal from the basin shall be deposited in a suitable area and in such a manner that it will not erode and cause sediment problems.

Filter stone shall be regularly checked to ensure that filtration performance is maintained. Stone choked with sediment shall be removed and cleaned or replaced.

The structure shall be checked regularly to ensure that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet shall be checked to ensure that its center is at least 1 foot below the top of the embankment.

Rock Check Dams – 3.20

Check dams shall be checked for sediment accumulation after each runoff-producing storm event. Sediment shall be removed when it reaches one half of the original height of the measure.

Regular inspections shall be made to insure that the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam shall be corrected immediately.

Permanent Seeding – 3.32

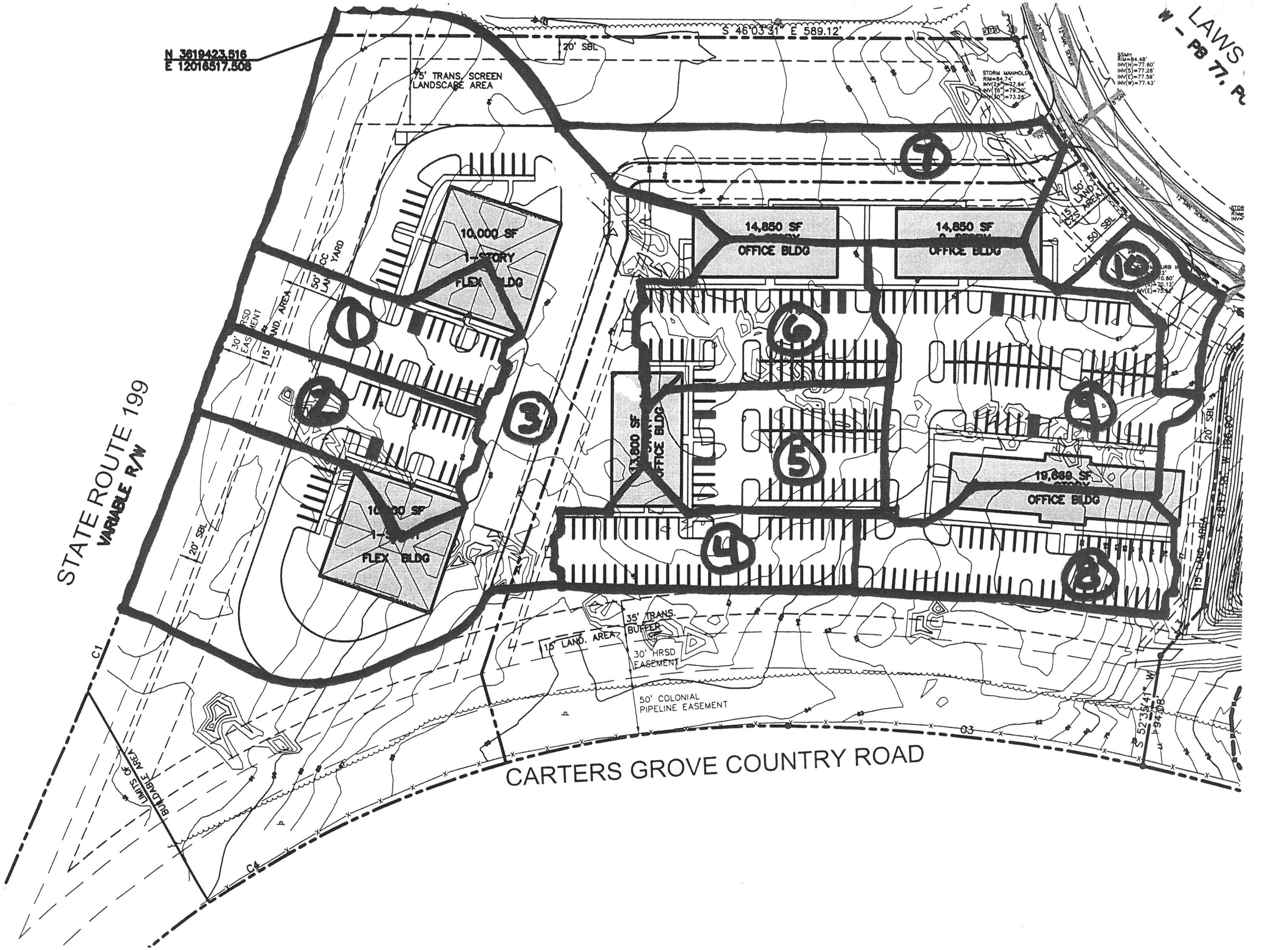
The seeded/mulched areas should be checked regularly to ensure that a good stand is established and maintained. Areas should be fertilized, mulched and re-seeded as needed. When it is clear that plants have not germinated on an area or have died, these areas must be re-seeded immediately to prevent erosion damage. However, it is extremely important to determine for what reason germination did not take place and make any corrective action necessary prior to re-seeding the area.

- Fertilizer shall be applied using approved fertilization methods and equipment.
- Formulations and application rates shall conform to the guidelines given in VESCH.
- Maintain a ground cover or organic mulch around trees that is adequate to prevent erosion, protect roots, and hold water.

Soil Stabilization Blankets and Matting – 3.36

All soil stabilization blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope. Continue to monitor these areas until which time they become permanently stabilized; at that time an annual inspection should be adequate.

APPENDIX A



CARTERS GROVE COUNTRY ROAD
STATE ROUTE 199
VARIABLE R/W
LAWS
W - PB 77, P
S 46°03'31" E 589.12'
N 3619423.516
E 12016517.506
20' SBL
75' TRANS. SCREEN
LANDSCAPE AREA
10,000 SF
1-STORY
FLEX BLDG
14,850 SF
OFFICE BLDG
13,800 SF
OFFICE BLDG
19,669 SF
OFFICE BLDG
35' TRANS. BUFFER
15' LAND. AREA
30' HRSD EASEMENT
50' COLONIAL
PIPELINE EASEMENT
LIMITS OF
BUILDABLE AREA
STORM MANHOLE
SSMH
50' SBL
15' LAND. AREA
C1
C3
C4
1
2
3
4
5
6
7
8
9
10

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 1

c= .63
A= .65 Ac.

	C	A	CA
Roof/Road	.90	.35	.32
Grass/Woods	.30	.30	.09
		.65	.41

OVERLAND FLOW

L= 100 ft.
S= 3.0 %
Tc= 7 min.

CHANNEL FLOW

H= 1 ft.
L= 140 ft.
Tc= 0.5 min.

Tc= 7.5 min.

i_{10} = 6.5 in/hr

Q=CAi=(.63)(.65 Ac.)(6.5 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.66 cfs

$Q_{DI} = CAI = (.63)(.65)(4.0) = 1.64$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 08:54:05
Page: 1

Hec22 Calculation Report: OI #1

===

Results:

Flow Intercepted:	1.64	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.09	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	17.24	ft
Depth at Curb:	0.24	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	1.64	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	9.09	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- 2

	C	A	CA
Roof/Road	.90	.35	.32
Grass/Woods	.30	.30	.09
		.65	.41

c= .63
A= .65 Ac:

OVERLAND FLOW

L= 100 ft.
S= 3.0 %
Tc= 7 min.

CHANNEL FLOW

H= 1 ft.
L= 140 ft.
Tc= 0.5 min.

Tc= 7.5 min.

i_{10}= 6.5 in/hr

Q=CAi=(.63)(.65 Ac.)(6.5 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.66 cfs

$Q_{DI} = CAI = (.63)(.65)(4.0) = 1.64$ cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 08:56:06
Page: 1

Hec22 Calculation Report: DI #2

===

esults:

low Intercepted:	1.64	cfs
low Bypassed:	0.00	cfs
nlet Length:	9.09	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	17.24	ft
epth at Curb:	0.24	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.64	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	9.09	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ________ OF ________

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ________ DATE ________

SCALE ________

DA- 3

c= .58
A= 3.07 Ac.

	C	A	CA
Roof/Road	.90	1.43	1.29
Woods/Grass	.30	1.64	0.49
		3.07	1.78

OVERLAND FLOW

L= 100 ft.
S= 3.0 %
Tc= 7 min.

CHANNEL FLOW

H= 4 ft.
L= 530 ft.
Tc= 1 min.

Tc= 8 min.

i_{10} = 6.4 in/hr

Q=CAi=(.58)(3.07 Ac.)(6.4 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 11.40 cfs

Q_{DI} = CAI = (.58)(3.07)(4.0) = 7.12 cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:01:29
Page: 1

Hec22 Calculation Report: DI#3

===

Results:

Flow Intercepted:	3.85	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	19.97	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	17.00	ft
Depth at Curb:	0.49	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.85	cfs

Inlet Parameters:

Computation Type:	Sag	
Inlet Type:	Curb	
Longitudinal Slope:	0.00	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.03	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft

Curb Opening Length:	19.97	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

Flanking DI required to intercept
(7.12cfs – 3.85cfs)= 3.27cfs.

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:05:37
Page: 1

Hec22 Calculation Report: DI #11

===

Results:

Flow Intercepted:	3.27	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.33	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	9.60	ft
Depth at Curb:	0.38	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.27	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.03	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	9.33	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ____ OF ____

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ____ DATE ____

SCALE ____

DA- H

c= .85
A= .41 Ac:

	C	A	CA
Roof/Road	.90	.38	.34
Grass	.30	.03	.01
		.41	.35

OVERLAND FLOW

L= — ft.
S= — %
Tc= — min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.85)(.41 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.51 cfs

$Q_{DI} = CAI = (.85)(.41)(4.0) = 1.39$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:08:29
Page: 1

Hec22 Calculation Report: DI #4

===

Results:

Flow Intercepted:	1.39	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	8.51	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	8.04	ft
Depth at Curb:	0.23	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	1.39	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.02	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft

Curb Opening Length:	8.51	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 5

c= .86
A= .49 Ac.

	C	A	CA
Roof/Road	.90	.45	.41
Grass	.30	.04	.01
		.49	.42

OVERLAND FLOW

L= — ft.
S= — %
Tc= — min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.86)(.49 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.03 cfs

Q_{DI} = CAI = (.86)(.49)(4.0) = 1.69 cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:09:47
Page: 1

Hec22 Calculation Report: DI #5

esults:

low Intercepted:	1.69	cfs
low Bypassed:	0.00	cfs
nlet Length:	9.59	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	9.26	ft
epth at Curb:	0.24	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	1.69	cfs

nlet Parameters:

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.02	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	9.59	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 6

c= .85
A= .52 Ac:

	C	A	CA
Roof/Road	.90	.47	.42
Grass	.30	.05	.02
		.52	.44

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10} = 7.2 in/hr

Q=CAi=(.85)(.52 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.18 cfs

$Q_{DI} = CAI = (.85)(.52)(4.0) = 1.77$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:11:18
Page: 1

Hec22 Calculation Report: DI #6

Results:

Flow Intercepted:	1.77	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	5.99	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	20.00	ft
Depth at Curb:	0.19	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	1.77	cfs

Inlet Parameters:

Computation Type:	Sag	
Inlet Type:	Curb	
Longitudinal Slope:	0.00	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	5.99	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 7

c= .65
A= .79 Ac:

	C	A	CA
Roof/Road	.90	.45	.41
Grass	.30	.34	.10
		.79	.51

OVERLAND FLOW

L= — ft.
S= — %
Tc= — min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.65)(.79 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.70 cfs

$Q_{DI} = CAI = (.65)(.79)(4.0) = 2.05$ cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:15:35
Page: 1

Hec22 Calculation Report: DI#7

===

Results:

Flow Intercepted:	2.05	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.68	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.42	ft
Depth at Curb:	0.27	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	2.05	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	9.68	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 8

c= .81
A= .53 Ac:

OVERLAND FLOW

	C	A	CA
Roof / Road	.90	.46	.41
Grass	.30	.07	.02
		.53	.43

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.81)(.53 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.09 cfs

Q_{DI} = CAI = (.81)(.53)(4.0) = 1.72cfs

User Name: KJENKINS
Project: 07-340

Date: 03-14-08
Time: 09:17:11
Page: 1

Hec22 Calculation Report: DI#8

Results:

Flow Intercepted:	1.72	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	8.45	ft
Splash-over Velocity:	0.00	ft/s
Ponding Width:	10.69	ft
Depth at Curb:	0.26	ft
Efficiency:		
Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	1.72	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	2.00	in
Gutter Width:	2.00	ft
Curb Opening Length:	8.45	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 9

c= .83
A= 1.09 Ac:

	C	A	CA
Roof / Road	.90	.94	.85
Grass	.30	.15	.05
		1.09	.90

OVERLAND FLOW

L= — ft.

S= — %

Tc= — min.

CHANNEL FLOW

H= — ft.

L= — ft.

Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.83)(1.09 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 6.51 cfs

$Q_{DI} = CAI = (.83)(1.09)(4.0) = 3.62\ cfs$

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:19:10
Page: 1

Hec22 Calculation Report: DI #9

==

esults:

----

low Intercepted:	3.62	cfs
low Bypassed:	0.00	cfs
nlet Length:	12.10	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	17.76	ft
epth at Curb:	0.34	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

----

nput Method:	Known Flow	
nown Flow:	3.62	cfs

nlet Parameters:

----

omputation Type:	Grade	
nlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	12.10	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
urb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

JOB 07-340

SHEET NO. ______ OF ______

CALCULATED BY KMJ DATE 3/14/08

CHECKED BY ______ DATE ______

SCALE ______

DA- 10

c= .53
A= .19 Ac:

	C	A	CA
Roof/Road	.90	.07	.06
Grass	.30	.12	.04
		.19	.10

OVERLAND FLOW

L= — ft.
S= — %
Tc= — min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.53)(.19 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= .73 cfs

Q_{0I} = CAI = (.53)(.19)(4.0) = 0.40 cfs

ser Name: KJENKINS
roject: 07-340

Date: 03-14-08
Time: 09:20:34
Page: 1

Hec22 Calculation Report: DI#10

===

esults:

low Intercepted:	0.40	cfs
low Bypassed:	0.00	cfs
nlet Length:	3.18	ft
plash-over Velocity:	0.00	ft/s
Ponding Width:	4.24	ft
epth at Curb:	0.19	ft

fficiency:

urb	100.00	%
rate	*	%
lotted	*	%
otal:	100.00	%

Flow Data Input:

nput Method:	Known Flow	
nown Flow:	0.40	cfs

nlet Parameters:

omputation Type:	Grade	
let Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
anning's n:	0.016	
Pavement Cross Slope:	0.01	ft/ft
utter Cross Slope:	0.08	ft/ft
ocal Depression:	2.00	in
utter Width:	2.00	ft
urb Opening Length:	3.18	ft
urb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
nlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
urb Orifice Coefficient:	0.670	

LandTech Resources, Inc.

Storm Drainage Design

Phone: (757) 565-1677 Fax: (757) 565-0782

Project Manager: Kenny Jenkins

Project Engineer. Kenny Jenkins

Project Number: 07-340 Project: 428 McLaws Circle

For Tc Accumulation, Use VELOCITY (1) from Pipe Slope or (2) V=Q/A : 1

Year Storm: 10

Structure		Rational Formula: Q = CiA									Pipe Data						Mannings Formula			
				CA		Inlet Time T_c (min)		(in/hr)	Runoff, Q (cfs)		Inverts		(ft)	%	(in)	Velocity (ft/sec)				N
From	To	Area "A" (ac)	Coefficient "C"	Incremental	Cumulative	Incremental	Cumulative	Rain	Incremental	Cumulative	UPstream	DOWN-stream	Length	Slope	Diameter	Based on Q/A	Based on pipe slope	Capacity (cfs)	Flow Time (min)	Manning's
From	To	Area	C	CAInc	CaCum	TimeInc	TimeCum	Rain	Qinc	Qcum	InvertUp	InvertDown	Length	Slope	Diameter	VelocityQA	VelocityS	Capacity	FlowTime	ManningsN
1	2	0.65	0.6	0.41	0.41	8	8.00	6.30	2.58	**2.58**	86.18	85.71	94	0.50%	15	2.10	3.72	4.57	0.42	0.013
2	3	0.65	0.6	0.41	0.82	8	8.42	6.22	2.55	**5.09**	82.50	82.27	46	0.50%	18	2.88	4.20	7.43	0.18	0.013
11	3	1.41	0.6	0.82	0.82	8	8.00	6.30	5.15	**5.15**	83.30	83.00	60	0.50%	18	2.92	4.20	7.43	0.24	0.013
3	4	1.66	0.6	0.96	2.60	8	8.60	6.18	5.95	**16.08**	82.17	80.72	290	0.50%	27	4.04	5.51	21.90	0.88	0.013
4	5	0.41	0.9	0.35	2.95	5	9.48	6.02	2.10	**17.75**	80.62	80.22	80	0.50%	27	4.46	5.51	21.90	0.24	0.013
5	6	0.49	0.9	0.42	3.37	5	9.72	5.98	2.52	**20.14**	80.12	79.52	120	0.50%	30	4.10	5.91	29.00	0.34	0.013
6																				

LandTech Resources, Inc.

Hydraulic Grade Line (HGL) Calculations

Project Number: *07-340*

Project: *428 McLaws Circle*

Date: *7.31.08*

From Structure	HGL: Slope (%) (HGLSlope)	HGL: Fall (ft) (HGLFall)	Velocity Head V²/2g (ft) (VelocityHead)	Invert Shaped? (Shaped)	Surface Flow? (Surface)	Structure Losses – Bend Losses: Angle (deg) (BendAngle)	Bend Losses: @ To (ft) (BendatTo)	Bend Losses: @ From (ft) (BendatFrom)	Entrance: @ To (ft) (EntratTo)	Entrance: @ From (ft) (EntratFrom)	EXIT (ft) (Exit)	TOTAL (ft) (TotalStruc)	HGL @ FROM (HGLatFrom)	Rim/Flowline (Max. Allow. Elevation) (RimElev)	"Freeboard" (ft) (Freeboard)	Elev., top of pipe @ From (PipeTopEl)	Structure #s: FROM-TO (FromTo)	TC plus Pipe Flow Time (TCplusPipeTime)	Elevation at 80% Full Flow (FlowRatio)	Too Shallow? (Control)	Computed Pipe Dia. (DiaComp)
1	0.160%	0.150	0.07	Y	Y	0	0.000	0.000	0.017	0.000	0.024	0.016	87.18	89.69	2.51	87.62	1-2	8.42	87.18	80% D	12.1
2	0.235%	0.108	0.13	Y	Y	90	0.093	0.000	0.032	0.017	0.045	0.041	84.12	89.68	5.56	84.21	2-3	8.60	83.70	HGL	15.6
11	0.241%	0.145	0.13	Y	Y	0	0.000	0.000	0.033	0.000	0.046	0.030	84.50	86.80	2.30	85.01	11-3	8.24	84.50	80% D	15.7
3	0.270%	0.782	0.25	Y	Y	90	0.183	0.093	0.063	0.033	0.089	0.140	83.97	86.50	2.53	84.69	3-4	9.48	83.97	80% D	24.0
4	0.329%	0.263	0.31	Y	Y	90	0.223	0.183	0.077	0.063	0.108	0.230	82.83	84.65	1.82	83.14	4-5	9.72	82.42	HGL	25.0
5	0.241%	0.290	0.26	Y	Y	20	0.042	0.223	0.065	0.077	0.092	0.255	82.33	84.66	2.33	82.91	5-6	10.06	82.12	HGL	26.2

Tailwater Elevation at Outfall point # 6): **81.79**

LandTech Resources, Inc.

Storm Drainage Design

Phone: (757) 565-1677 Fax: (757) 565-0782

Project Manager: Kenny Jenkins
Project Engineer. Kenny Jenkins

For Tc Accumulation, Use VELOCITY (1) from Pipe Slope or (2) V=Q/A : 1

Project Number: 07-340 Project: 428 McLaws Circle Year Storm: 10

Structure		Rational Formula: Q = CiA									Pipe Data						Mannings Formula			
				CA		Inlet Time Tc (min)		(in/hr)	Runoff, Q (cfs)		Inverts		(ft)	%	(in)	Velocity (ft/sec)				N
From	To	Area "A" (ac)	Coefficient "C"	Incremental	Cumulative	Incremental	Cumulative	Rain	Incremental	Cumulative	UPstream	DOWN-stream	Length	Slope	Diameter	Based on Q/A	Based on pipe slope	Capacity (cfs)	Flow Time (min)	Manning's
From	To	Area	C	CAInc	CaCum	TimeInc	TimeCum	Rain	Qinc	Qcum	InvertUp	InvertDown	Length	Slope	Diameter	VelocityQA	VelocityS	Capacity	FlowTime	ManningsN
6	12	5.79	0.6	3.71	3.71	5	5.00	6.96	25.77	**25.77**	79.42	78.77	130	0.50%	30	5.25	5.91	29.00	0.37	0.013
7	12	0.79	0.7	0.51	0.51	5	5.00	6.96	3.57	**3.57**	80.73	73.79	185	3.75%	15	2.91	10.20	12.51	0.30	0.013
12	13	0.00	0.0	0.00	4.22	0	5.37	6.87	0.00	**28.98**	73.69	73.04	130	0.50%	30	5.90	5.91	29.00	0.37	0.013
8	13	0.53	0.8	0.43	0.43	5	5.00	6.96	2.99	**2.99**	78.80	73.04	156	3.69%	15	2.43	10.11	12.41	0.26	0.013
13	9	0.00	0.0	0.00	4.65	0	5.73	6.78	0.00	**31.53**	72.94	72.91	6	0.50%	30	6.42	5.91	29.00	0.02	0.013
10	9	0.19	0.5	0.10	0.10	5	5.00	6.96	0.70	**0.70**	78.68	78.37	62	0.50%	15	0.57	3.72	4.57	0.28	0.013
9	ES	1.09	0.8	0.90	5.65	5	5.75	6.78	6.13	**38.33**	69.55	68.00	46	3.37%	30	7.81	15.34	75.29	0.05	0.013
ES																				

LandTech Resources, Inc. — **Hydraulic Grade Line (HGL) Calculations**

Project Number: *07-340*
Project: *428 McLaws Circle*
Date: *7.31.08*

	HGL					~~~~~~ STRUCTURE LOSSES ~~~~~~							HGL	Performance Checks & Intermediate Computations							
						Bend Losses			ENTRANCE			(ft)									
From Structure	Slope (%)	Fall (ft)	Velocity Head $V^2/2g$ (ft)	Invert Shaped?	Surface Flow?	Angle (deg)	@ To (ft)	@ From (ft)	@ To (ft)	@ From (ft)	EXIT (ft)	TOTAL	@ FROM	Rim Flowline (Max. Allow. Elevation)	"Freeboard" (ft)	Elev., top of pipe @ From	Structure #'s: FROM-TO	TC plus Pipe Flow Time	Elevation at 80% Full Flow	Too Shallow?	Computed Pipe Dia.
	HGLSlope	HGLFall	VelocityHead	Shaped	Surface	BendAngle	BendatTo	BendatFrom	EntratTo	EntratFrom	Exit	TotalStruc	HGLatFrom	RimElev	Freeboard	PipeTopEl	FromTo	TCplusPipeTime	FlowRatio	Control	DiaComp
6	0.395%	0.514	0.43	Y	Y	90	0.308	0.000	0.107	0.000	0.150	0.097	81.79	86.00	4.21	82.21	6-12	5.37	81.42	HGL	28.7
7	0.306%	0.566	0.13	Y	Y	0	0.000	0.000	0.033	0.000	0.046	0.030	81.77	84.23	2.46	82.17	7-12	5.30	81.73	HGL	9.4
12	0.500%	0.649	0.54	Y	Y	90	0.390	0.308	0.135	0.107	0.189	0.393	81.18	84.75	3.57	76.48	12-13	5.73	75.69	HGL	30.0
8	0.214%	0.334	0.09	Y	Y	0	0.000	0.000	0.023	0.000	0.032	0.021	80.49	82.30	1.81	80.24	8-13	5.26	79.80	HGL	8.8
13	0.591%	0.035	0.64	Y	Y	90	0.461	0.390	0.160	0.135	0.224	0.487	80.13	83.27	3.14	75.73	13-9	5.75	74.94	HGL	31.0
10	0.012%	0.007	0.01	Y	Y	0	0.000	0.000	0.001	0.000	0.002	0.001	79.68	82.18	2.50	80.12	10-9	5.28	79.68	80% D	7.4
9	0.874%	0.402	0.95	Y	Y	90	0.682	0.461	0.237	0.160	0.331	0.619	79.61	82.70	3.09	72.34	9-ES	5.80	71.55	HGL	23.3

Tailwater Elevation at Outfall point # ES): **78.59**

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. ____ OF ____
CALCULATED BY KMJ DATE 9/19/07
SCALE ____

DESIGN OUTLET PROTECTION
FROM MH #9

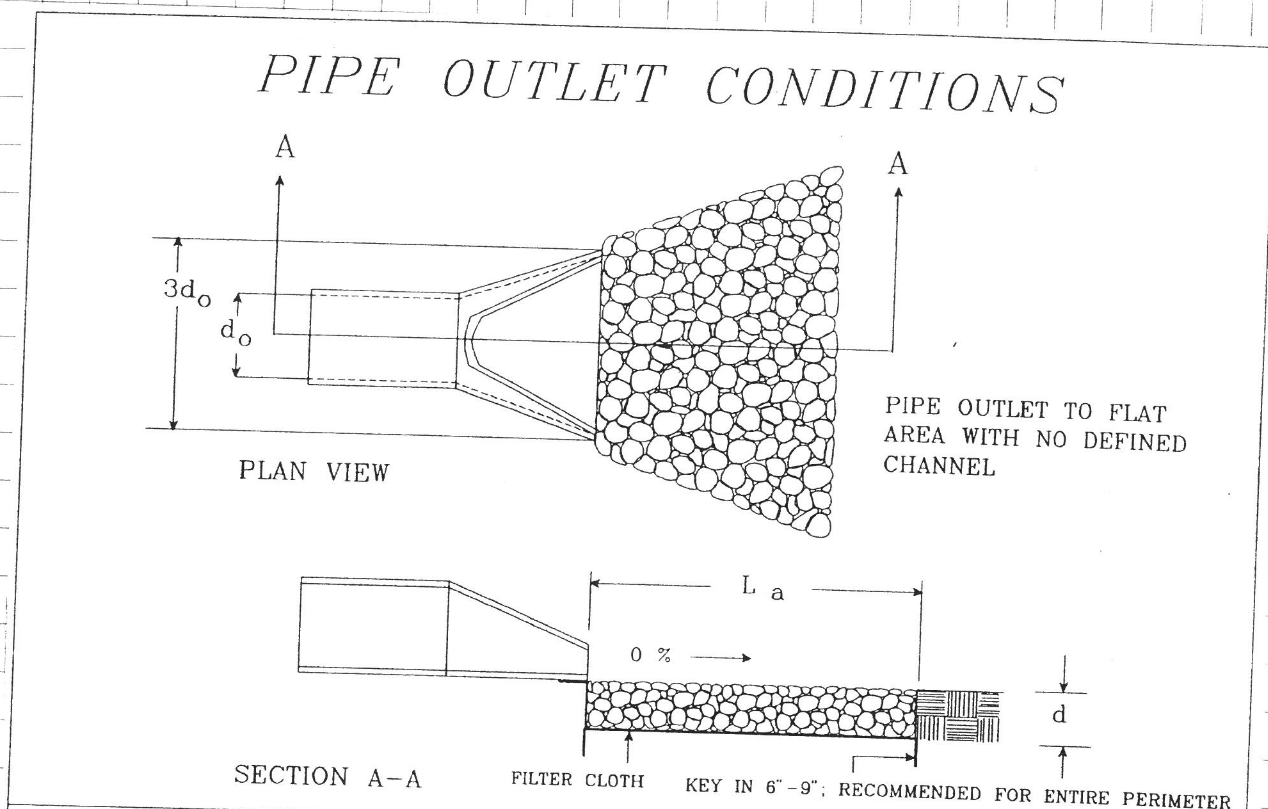


Plate 3.18-4
Q = 38.63 cfs
d = 2.5'
3d = 8'
La = 12'
W = d + .4La = 8'
d_{50} = 0.2'

USE 12' x 8' x 26"
VDOT CLASS I
RIP RAP APRON

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Mclaws Circle

PROJECT NO. 07-340

SHEET NO. ________ OF ________

CALCULATED BY KMJ DATE 9/19/07

SCALE ________

DESIGN OUTLET PROTECTION
EX 24" RCP FROM
McLAWS CENTRE CONDOS

PIPE OUTLET CONDITIONS

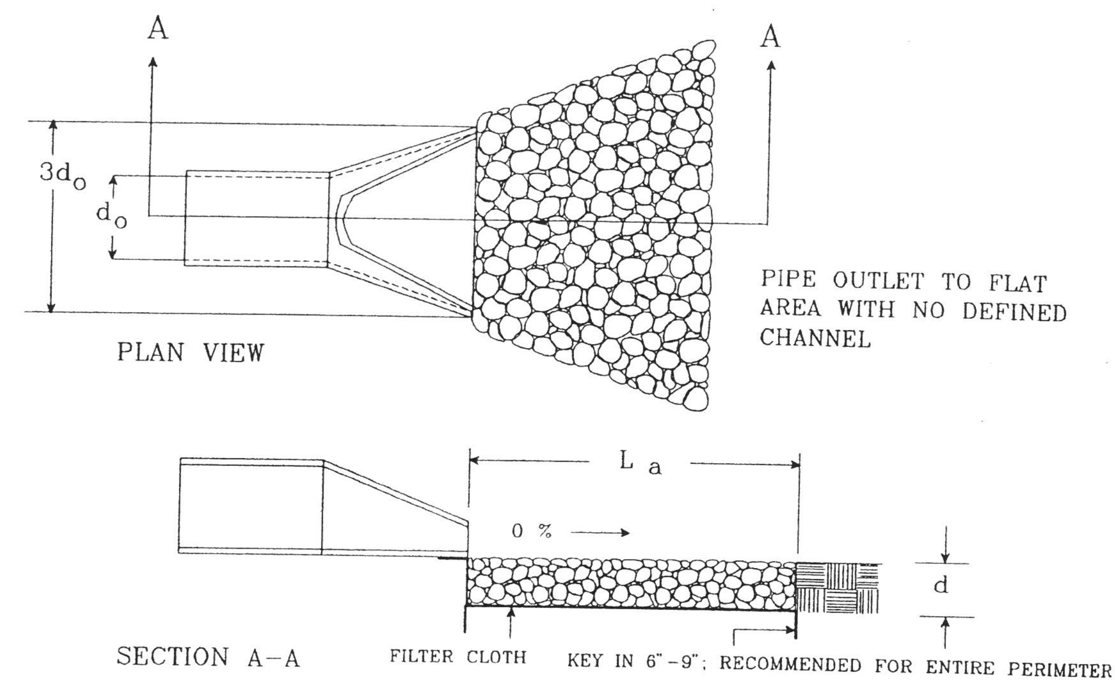


Plate 3.18-4
Q = 24.34 cfs (capacity)
d = 2'
3d = 6'
La = 18'
W = d + .4La = 10'
d_{50} = .2'

USE 18' x 10' x 26"
VDOT CLASS I
RIP RAP APRON

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/19/07
SCALE ______

DESIGN OUTLET PROTECTION
FROM Ex 48" RCP

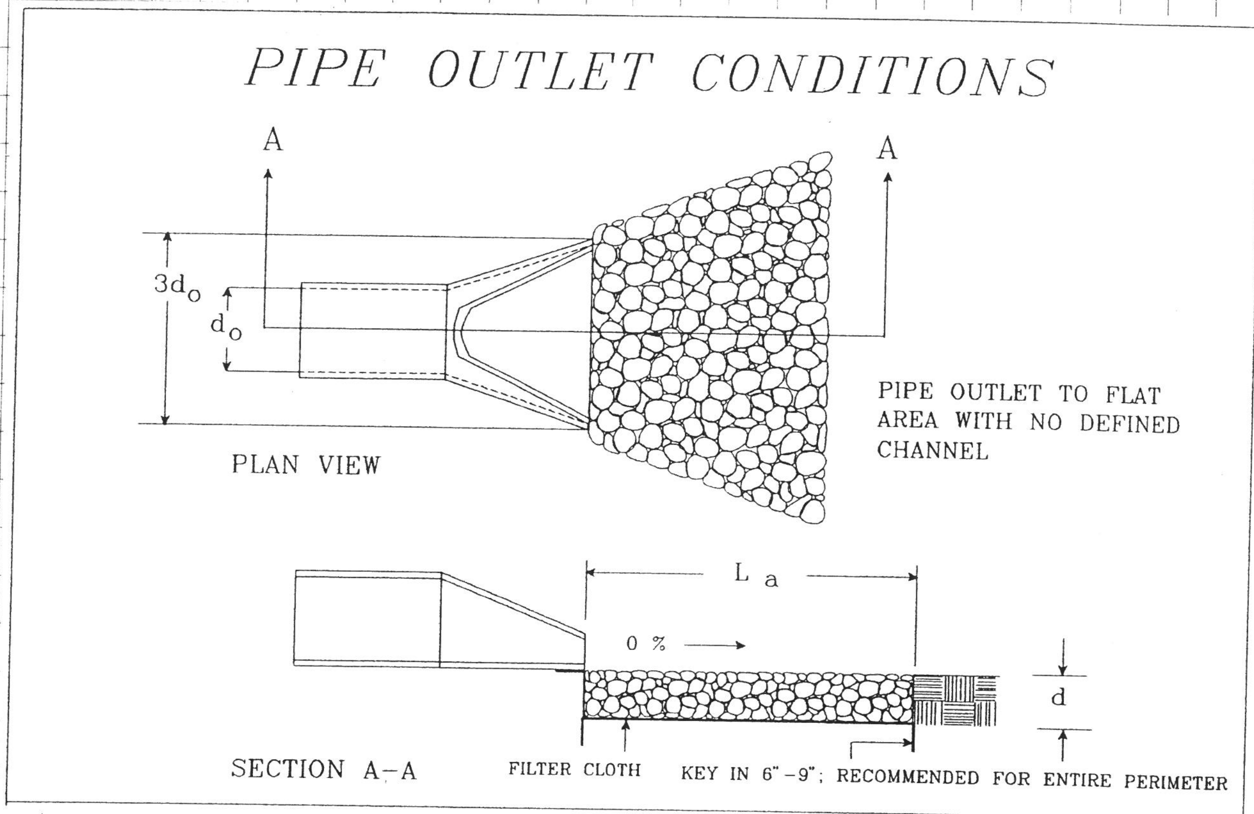


Plate 3.18-4
Q = 101.57 cfs (capacity)
d = 4'
3d = 12'
La = 18'
W = d + .4La = 12'
d_{50} = 0.2'

USE 18' x 12' x 26"
VDOT CLASS I
RIP RAP APRON

APPENDIX B

LandTech
Resources, Inc.
Surveying • Engineering • GPS
201 Bulifants Blvd., Suite A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Melaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 3/17/08
SCALE

DESIGN SEDIMENT FOREBAY

Treatment Volume = 0.1 inches per impervious acre

Impervious Area = 5.35 Ac = 233,046 sf

Forebay Volume = $\frac{233{,}046\text{sf} \mid 0.1\text{in} \mid \text{ft}}{\mid \mid 12\text{in}}$ = 1,942 cf

ELEV (ft)	ΔELEV (ft)	SA (sf)	STORAGE (cf)	ACCUM STORAGE (cf)
66.0		586		0
	1.0		693	
67.0		800		693
	1.0		919	
68.0		1038		1612
	0.5		560	
68.5		1200		2172

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-194
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/5/07
SCALE ______

REVISED DESIGN CRITERIA

1) New Drainage Area = 68 Ac (original) + 5 Ac (McLaws Centre) + 2 Ac (additional on 428 McLaws Circle)

New Drainage Area = 75 Ac.

2) 41.4 Ac. Grandfathered from Water Quality

3) 33.6 Ac required to obtain Water Quality

4) Entire 75 Ac. drainage area assumed to be 60% impervious

5) BMP will designed as JCC F2 BMP to treat the entire 75 Ac. per L&M calculations 4/22/91

6) Release 1-year, 24-hour storm over 24 hours.

7) 2-Year Outflow = 39.65 cfs (Design)
10-Year Outflow = 45.42 cfs (Design)
100-Year Outflow = 74.12 cfs (Design)

8) Post-Development Tc = 15 min.

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Busch Corporate Center BMP	KMJ	9/5/07
Location	**Checked**	**Date**
James City County, Va.		

Check one: ☐ Present ☒ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area ☒ acres ☐ mi^2 ☐ %	Product of CN x area
C	Roof / Road	98			45.0	4,410
C	Grass (Good Condition)	74			30.0	2,220
					Totals ➔ 75	6,630

1/ Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{6,630}{75} = 88.4$; Use CN ➔ 88

2. Runoff

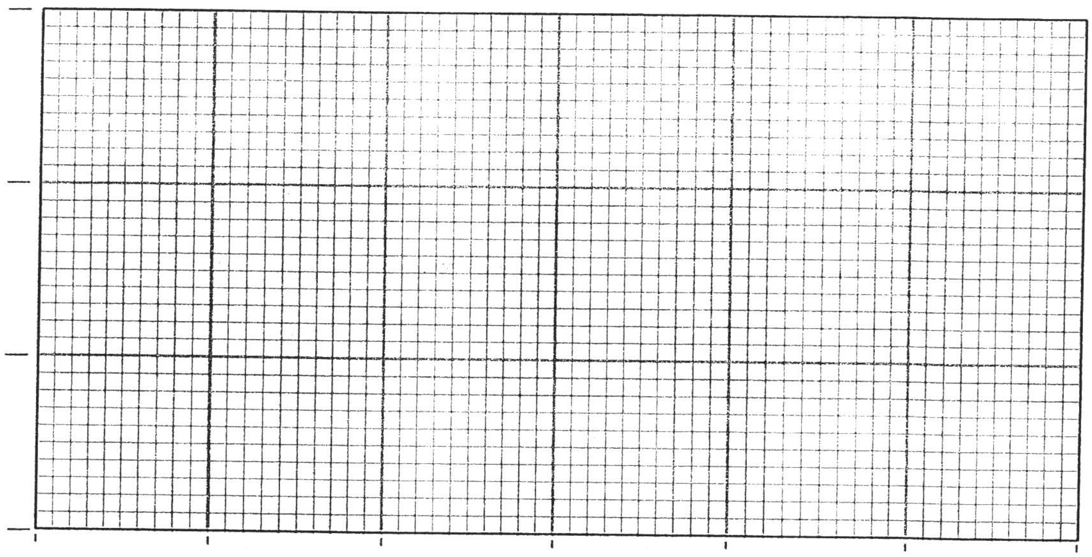
		Storm #1	Storm #2	Storm #3	Storm #4
Frequency	yr	1	2	10	100
Rainfall, P (24-hour)	in	2.8	3.5	5.8	8.0
Runoff, Q (Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)	in	1.7	2.3	4.5	6.6

Worksheet 6a: Detention basin storage, peak outflow discharge (q_o) known

Project	By	Date
Busch Corporate Center BMP	KMJ	9/6/07
Location: James City County, Va.	Checked	Date

Check one: ☐ Present ☒ Developed

☐ Elevation or ☐ stage



Detention basin storage (acre feet)

1. Data:
   Drainage area .... Am = .1172 mi2
   Rainfall distribution type (I, IA, II, III) = II

	1st Stage	2nd Stage
2. Frequency .... yr	2	10
3. Peak inflow discharge q_i .... ft3/s (from worksheet 4 or 5b)	184.60	351.12
4. Peak outflow discharge q_u ft3/s	39.65	45.42 [1/]
5. Compute $\frac{q_o}{q_i}$	.21	.13
6. $\frac{V_s}{V_r}$ .... (Use $\frac{q_o}{q_i}$ with figure 6-1)	.45	.53
7. Runoff, Q .... in (From worksheet 2)	2.3	4.5
8. Runoff volume V_r.................. ac ft ($V_r = QA_m$ 53.33)	14.38	28.13
9. Storage volume, V_s .... ac-ft ($V_s = V_r (\frac{V_s}{V_r})$)	6.47	14.91
	282,000cf	650,000cf
10. Maximum storage E_{max} (from plot)		

1/ 2nd stage q_o includes 1st stage q_o.

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME Busch Corporate Center BMF
PROJECT NO. 07-194
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/6/07
SCALE ______

DESIGN EXTENDED DRY DETENTION BMP F-2

Treatment Volume = 0.5 inch/impervious acre released over 24 hours

Treatment Volume is per Consideration #2 of Langley + McDonald calculations dated 4/22/91 for the Detention Pond Modification. The detention time was increased from 12 hours to 24 hours. The L+M calculations are the following two pages.

Impervious Area = 75 Ac × 0.60 = 45 ac.

$$WQv = \frac{45\ Ac.}{} \cdot \frac{43{,}560\,sf}{1\ Ac} \cdot \frac{0.5\,in}{} \cdot \frac{1\,ft}{12\,in} = 81{,}675\ cf$$

$$Q_{24HR} = \frac{81{,}675\,cf}{24\,hr} \cdot \frac{1\,hr}{60\,m} \cdot \frac{1\,m}{60\,s} = 0.95\ cfs$$

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH • WILLIAMSBURG • VIRGINIA

Subject BCCW McLaws Circle Detention Pond Modification
Computed By SAR Checked By

Project No. 7406953
Client BPI
Date 4/22/91 Sheet No. 1

TOTAL DRAINAGE AREA = 68 ACRES (DIGITIZED FROM DRAWING 3923AW.)
PRESENTLY DEVELOPED AREA = 41.4 ACRES (APPROX. 60% IMPERVIOUS)
FUTURE DEVELOPMENT AREA = 26.6 ACRES
- 1.8 ACRES McLAWS CIRCLE DETENTION POND
- 1.8 ACRES FUTURE DETENTION POND SITE ACROSS McLAWS CIRCLE
23.0 ACRES DEVELOPABLE AREA

UNDER CURRENT COUNTY REGULATIONS, THE REMAINING 23.0 ACRES MAY BE DEVELOPED AT 60% IMPERVIOUS COVER AND LEAVE 40% GREEN AREA. WE ASSUME THAT 25% OF THE GREEN AREA WILL BE LEFT AS NATURAL OPEN SPACE.

40% OF 23.0 ACRES = 9.2 ACRES GREEN AREA
25% OF 9.2 ACRES = 2.3 ACRES NATURAL OPEN SPACE
2.3 ACRES ÷ 23.0 ACRES = 10% NATURAL OPEN SPACE

CONSIDERATION # 1 – PURSUANT TO THE COUNTY'S TEN POINT BMP SYSTEM, NATURAL OPEN SPACE CREDITS ARE CALCULATED AT 0.1 POINT PER 1% NATURAL OPEN SPACE, THEREFORE, 10% NATURAL OPEN SPACE YIELDS 1 POINT. IN ORDER TO DEVELOP THIS LAND IN ACCORDANCE WITH THE COUNTY'S TEN POINT BMP SYSTEM, A NINE POINT BMP SERVING THE 23.0 ACRES WOULD BE NECESSARY.

9 POINT BMP – EXTENDED DRY DETENTION – RUNOFF VOLUME PRODUCED BY 1.0 INCH DETAINED 24 HRS WITH SHALLOW MARSH IN BOTTOM STAGE.

$A = 26.6$ AC
$I = (23 \times 0.6)/26$
$R_V = 0.05 + 0.009 I$
$R = 1.0$ INCH
$R_M = 0.45$ INCH
$V_{OL} = [(R)(R_V)/12] A$
$= 50{,}210$ CF
$V_{OLB} = [(R_M)(R_V)/12] A$
$= 22{,}595$ CF
$V_{OL} - V_{OLB} = 27{,}615$ CF RELEASED OVER 24 HRS = 0.3 CFS
POLLUTANT LOADING = $P \times P_j \times R_V \times C \times A \times 2.72/12$
$= 45 \times 0.9 \times 0.52 \times 1.06 \times 26.6 \times 2.72/12$
$= 135$ LBS/YR

THE 9 POINT BMP YIELDS AN AVERAGE TOTAL POLLUTANT REMOVAL EFFICIENCY OF 50%, THEREFORE, 135 LBS/YR × 50% = 67.5 LBS/YR POLLUTANT REMOVAL

CONSIDERATION #2 - PURSUANT TO THE 67.5 LBS/YR POLLUTANT REMOVAL PROVIDED IN CONSIDERATION #1, WHAT BMP WOULD YIELD THE SAME OR BETT RESULTS OVER THE ENTIRE 68 ACRE DRAINAGE BASIN.

BMP SELECTED - EXTENDED DRY DETENTION - RUNOFF VOLUME PRODUCED BY 0.5 INCH DETAINED 12 HRS.

$A = 68\ AC$

$I = [(41.4 \times 0.6) + (23.0 \times 0.6)] / 68$

$R_V = 0.05 + 0.009\, I$

$R = 0.5$ INCH

$V_{OC} = [(R)(R_V)/12]\, A$

$= 69{,}115$ CF RELEASED OVER 12 HRS = 1.6 CFS

POLLUTANT LOADING $= P \times P_J \times R_V \times C \times A \times 2.72 / 12$

$= 45 \times 0.9 \times 0.56 \times 1.06 \times 68 \times 2.72 / 12$

$= 371$ LBS/YR

THIS BMP YIELDS AN AVERAGE TOTAL POLLUTANT REMOVAL EFFICIENCY OF 20%, THEREFORE, 371 LBS/YR × 20% = 97 LBS/YR POLLUTANT REMOVAL

6 Pond BMP

41 acres developed

27 acres

1-Year Hydrograph

```
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 02/21/2008  Thursday
    Time: 12:07:35
   Input: BCC1.IN
  Output: BCC1.OUT
```

```
===========================   PROGRAM EXECUTION   ===========================

                        NUMBER OF STORMS TO BE MODELED    :    1
                        NUMBER OF CHANNELS                :    0
                        NUMBER OF SUBAREAS                :    1
                        UPSTREAM HYDROGRAPHS ENTER AT     :    0 LOCATIONS
                        NUMBER OF TIME STEPS              :  500
                        COMPUTATIONAL TIME INCREMENT      : .100 Hours

 NOTE:   The DURATION of the final computed hydrograph(s) for this watershed
         system will be 50.000 hours.
```

```
======================   UNIT HYDROGRAPH METHODOLOGY   =======================

 The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
 The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary
 units) or 2.08356 (Metric units).
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 02/21/2008  Thursday
    Time: 12:07:35
   Input: BCC1.IN
  Output: BCC1.OUT
```

```
==============================   SUBAREA DATA   ==============================
```

SUBAREA ID NO	AREA (mi2)	TIME OF CONCENTRATION (hrs)	CURVE NUMBER	BASEFLOW (cfs)	DOWNSTREAM CHANNELS
1	.1172	.250	88.00	.0	

```
     Composite Watershed Curve Number = 88.00
 Minimum Subarea Time of Concentration =  .250 hours.
1*******************************     SCSHYDRO     *******************************
```

```
******************************   Version 3.21   ******************************
*****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

PROJECT: BUSCH CORPORATE CENTER
   User:  LandTech Resources
   Date: 02/21/2008  Thursday
   Time: 12:07:35
  Input: BCC1.IN
 Output: BCC1.OUT
                                                   RETURN PERIOD (yrs):      1

=====================   RAINFALL HYETOGRAPH INFORMATION   ====================


         RAINFALL HYETOGRAPH: SCS TYPE II
         RAINFALL DURATION:    24.00 Hours
         RAINFALL DEPTH:        2.80 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

      .000,   .00      2.000,   .06      4.000,   .13      6.000,   .22
     7.000,   .27      8.000,   .34      8.500,   .37      9.000,   .41
     9.500,   .46      9.750,   .48     10.000,   .51     10.500,   .57
    11.000,   .66     11.500,   .79     11.750,  1.00     12.000,  1.86
    12.500,  2.06     13.000,  2.16     13.500,  2.24     14.000,  2.30
    16.000,  2.46     20.000,  2.67     24.000,  2.80
1******************************   SCSHYDRO   ******************************
******************************   Version 3.21   ******************************
*****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

PROJECT: BUSCH CORPORATE CENTER
  Input: BCC1.IN
 Output: BCC1.OUT
                                                   RETURN PERIOD (yrs):      1


   SUBAREA     1        SUBAREA     1        SUBAREA     1        SUBAREA     1


    AREA (square miles)           :        .1172
    TIME OF CONCENTRATION (hrs):           .25
    RUNOFF CURVE NUMBER           :      88.00
    BASEFLOW (cfs)                :        .00
    DOWNSTREAM CHANNELS           :
```

SUBAREA RUNOFF (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7.00	.00	.01	.03	.06	.09	.13	.17	.21	.25	.29
8.00	.32	.38	.45	.51	.57	.62	.68	.75	.82	.88
9.00	.93	1.01	1.13	1.23	1.30	1.37	1.47	1.61	1.73	1.83
10.00	1.91	2.09	2.40	2.64	2.80	2.94	3.26	3.81	4.25	4.53
11.00	4.75	5.47	6.78	7.79	8.41	8.87	13.14	21.90	39.77	80.94
12.00	131.83	135.11	87.04	51.09	36.34	29.69	24.72	18.92	15.29	13.76
13.00	13.23	12.38	10.99	10.09	9.72	9.57	9.13	8.32	7.79	7.57
14.00	7.48	7.51	7.55	7.43	7.19	6.91	6.62	6.33	6.06	5.80

15.00	5.55	5.32	5.11	4.91	4.73	4.57	4.43	4.30	4.19	4.10
16.00	4.02	3.96	3.92	3.88	3.84	3.81	3.78	3.75	3.72	3.68
17.00	3.65	3.62	3.59	3.56	3.53	3.50	3.46	3.43	3.40	3.37
18.00	3.34	3.31	3.27	3.24	3.21	3.18	3.15	3.12	3.08	3.05
19.00	3.02	2.99	2.96	2.92	2.89	2.86	2.83	2.80	2.77	2.73
20.00	2.70	2.67	2.64	2.61	2.58	2.55	2.52	2.49	2.46	2.43
21.00	2.41	2.38	2.36	2.34	2.31	2.29	2.27	2.25	2.23	2.21
22.00	2.19	2.18	2.16	2.14	2.13	2.11	2.10	2.09	2.08	2.07
23.00	2.06	2.05	2.04	2.03	2.03	2.02	2.02	2.01	2.01	2.00
24.00	2.00	1.64	.88	.38	.17	.07	.03	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 135.11
TIME TO PEAK (hrs): 12.10

1****************************** SCSHYDRO ******************************
****************************** Version 3.21 ******************************
***************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 02/21/2008 Thursday
Time: 12:07:35
Input: BCC1.IN
Output: BCC1.OUT

RETURN PERIOD (yrs): 1

========================= DOWNSTREAM HYDROGRAPH =========================

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7.00	.00	.01	.03	.06	.09	.13	.17	.21	.25	.29
8.00	.32	.38	.45	.51	.57	.62	.68	.75	.82	.88
9.00	.93	1.01	1.13	1.23	1.30	1.37	1.47	1.61	1.73	1.83

10.00	1.91	2.09	2.40	2.64	2.80	2.94	3.26	3.81	4.25	4.53
11.00	4.75	5.47	6.78	7.79	8.41	8.87	13.14	21.90	39.77	80.94
12.00	131.83	135.11	87.04	51.09	36.34	29.69	24.72	18.92	15.29	13.76
13.00	13.23	12.38	10.99	10.09	9.72	9.57	9.13	8.32	7.79	7.57
14.00	7.48	7.51	7.55	7.43	7.19	6.91	6.62	6.33	6.06	5.80
15.00	5.55	5.32	5.11	4.91	4.73	4.57	4.43	4.30	4.19	4.10
16.00	4.02	3.96	3.92	3.88	3.84	3.81	3.78	3.75	3.72	3.68
17.00	3.65	3.62	3.59	3.56	3.53	3.50	3.46	3.43	3.40	3.37
18.00	3.34	3.31	3.27	3.24	3.21	3.18	3.15	3.12	3.08	3.05
19.00	3.02	2.99	2.96	2.92	2.89	2.86	2.83	2.80	2.77	2.73
20.00	2.70	2.67	2.64	2.61	2.58	2.55	2.52	2.49	2.46	2.43
21.00	2.41	2.38	2.36	2.34	2.31	2.29	2.27	2.25	2.23	2.21
22.00	2.19	2.18	2.16	2.14	2.13	2.11	2.10	2.09	2.08	2.07
23.00	2.06	2.05	2.04	2.03	2.03	2.02	2.02	2.01	2.01	2.00
24.00	2.00	1.64	.88	.38	.17	.07	.03	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 135.11
TIME TO PEAK (hrs): 12.10
Hydrograph Saved In: BCC1.DAT

1****************************** SCSHYDRO ******************************
****************************** Version 3.21 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 02/21/2008 Thursday
Time: 12:07:35
Input: BCC1.IN
Output: BCC1.OUT

RETURN PERIOD (yrs): 1

========================= HYDROLOGIC SUMMARY ===========================
==================== Volumes, Losses, and Discharges =====================

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 2.80

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	17.502	10.227	41.56	135.113	1.801
TOTAL WATERSHED	17.502	10.227	41.56	135.113	1.801

TOTAL WATERSHED AREA (square miles):	.1172	
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft):	10.2274	
COMPOSITE WATERSHED CURVE NUMBER:	88.00	
MINIMUM SUBAREA TIME OF CONCENTRATION:	.250	hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

10-Year Hydrograph

```
1******************************     SCSHYDRO     ******************************
 ******************************   Version 3.21   ******************************
 *****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   *****************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 09/05/2007 Wednesday
    Time: 15:53:44
   Input: BCC10.IN
  Output: BCC10.OUT
```

```
===========================   PROGRAM EXECUTION   ============================

                    NUMBER OF STORMS TO BE MODELED     :     1
                    NUMBER OF CHANNELS                 :     0
                    NUMBER OF SUBAREAS                 :     1
                    UPSTREAM HYDROGRAPHS ENTER AT      :     0 LOCATIONS
                    NUMBER OF TIME STEPS               :   500
                    COMPUTATIONAL TIME INCREMENT       :  .100 Hours

NOTE:   The DURATION of the final computed hydrograph(s) for this watershed
        system will be 50.000 hours.
```

```
======================   UNIT HYDROGRAPH METHODOLOGY   =======================

The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary
units) or 2.08356 (Metric units).
```


```
1******************************     SCSHYDRO     ******************************
 ******************************   Version 3.21   ******************************
 *****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   *****************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 09/05/2007 Wednesday
    Time: 15:53:44
   Input: BCC10.IN
  Output: BCC10.OUT
```


```
==============================   SUBAREA DATA   ==============================
```

SUBAREA ID NO	AREA (mi2)	TIME OF CONCENTRATION (hrs)	CURVE NUMBER	BASEFLOW (cfs)	DOWNSTREAM CHANNELS
1	.1172	.250	88.00	.0	

```
     Composite Watershed Curve Number = 88.00
 Minimum Subarea Time of Concentration =  .250 hours.
```


```
1******************************     SCSHYDRO     ******************************
```

```
****************************** Version 3.21 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
   User: LandTech Resources
   Date: 09/05/2007 Wednesday
   Time: 15:53:44
  Input: BCC10.IN
 Output: BCC10.OUT
                                                  RETURN PERIOD (yrs):     10

====================  RAINFALL HYETOGRAPH INFORMATION  ====================


         RAINFALL HYETOGRAPH: SCS TYPE II
         RAINFALL DURATION:    24.00 Hours
         RAINFALL DEPTH:        5.80 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

     .000,    .00      2.000,   .13      4.000,   .28      6.000,   .46
    7.000,    .57      8.000,   .70      8.500,   .77      9.000,   .85
    9.500,    .95      9.750,  1.00     10.000,  1.05     10.500,  1.18
   11.000,   1.36     11.500,  1.64     11.750,  2.07     12.000,  3.85
   12.500,   4.26     13.000,  4.48     13.500,  4.63     14.000,  4.76
   16.000,   5.10     20.000,  5.52     24.000,  5.80
1******************************  SCSHYDRO  ******************************
 ****************************** Version 3.21 ******************************
 ****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
  Input: BCC10.IN
 Output: BCC10.OUT
                                                  RETURN PERIOD (yrs):     10


   SUBAREA     1        SUBAREA     1        SUBAREA     1        SUBAREA     1

    AREA (square miles)          :        .1172
    TIME OF CONCENTRATION (hrs):          .25
    RUNOFF CURVE NUMBER          :      88.00
    BASEFLOW (cfs)               :        .00
    DOWNSTREAM CHANNELS          :
```

SUBAREA RUNOFF (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.03	.08	.15	.24	.32	.41	.50	.58	.66
5.00	.74	.82	.90	.98	1.05	1.13	1.20	1.27	1.34	1.41
6.00	1.48	1.58	1.73	1.85	1.95	2.04	2.12	2.19	2.27	2.34
7.00	2.41	2.59	2.88	3.11	3.26	3.38	3.49	3.58	3.67	3.76
8.00	3.84	4.06	4.43	4.72	4.90	5.03	5.23	5.49	5.70	5.86
9.00	5.98	6.26	6.71	7.06	7.27	7.44	7.75	8.25	8.63	8.87
10.00	9.05	9.68	10.82	11.65	12.11	12.42	13.48	15.41	16.81	17.55
11.00	18.03	20.29	24.57	27.63	29.21	30.18	43.15	69.58	119.59	227.85
12.00	351.12	348.46	221.15	128.18	89.76	72.32	59.64	45.38	36.49	32.71
13.00	31.38	29.32	25.99	23.82	22.91	22.54	21.48	19.55	18.28	17.75
14.00	17.53	17.56	17.65	17.35	16.78	16.11	15.42	14.75	14.10	13.48

15.00	12.90	12.36	11.86	11.40	10.98	10.60	10.26	9.96	9.70	9.48
16.00	9.30	9.16	9.05	8.96	8.88	8.80	8.72	8.65	8.57	8.50
17.00	8.42	8.34	8.27	8.19	8.12	8.04	7.97	7.89	7.82	7.74
18.00	7.67	7.59	7.52	7.44	7.37	7.29	7.22	7.14	7.07	6.99
19.00	6.92	6.84	6.77	6.70	6.62	6.55	6.47	6.40	6.32	6.25
20.00	6.17	6.10	6.03	5.95	5.88	5.81	5.75	5.68	5.62	5.55
21.00	5.49	5.44	5.38	5.32	5.27	5.22	5.17	5.12	5.08	5.03
22.00	4.99	4.95	4.91	4.88	4.84	4.81	4.78	4.75	4.72	4.70
23.00	4.68	4.65	4.64	4.62	4.60	4.59	4.58	4.57	4.56	4.55
24.00	4.55	3.71	2.00	.86	.38	.16	.07	.03	.01	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 351.12
TIME TO PEAK (hrs): 12.00

1****************************** SCSHYDRO ******************************
****************************** Version 3.21 ******************************
***************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS *******************

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 09/05/2007 Wednesday
Time: 15:53:44
Input: BCC10.IN
Output: BCC10.OUT

RETURN PERIOD (yrs): 10

========================== DOWNSTREAM HYDROGRAPH ==========================

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.03	.08	.15	.24	.32	.41	.50	.58	.66
5.00	.74	.82	.90	.98	1.05	1.13	1.20	1.27	1.34	1.41
6.00	1.48	1.58	1.73	1.85	1.95	2.04	2.12	2.19	2.27	2.34
7.00	2.41	2.59	2.88	3.11	3.26	3.38	3.49	3.58	3.67	3.76
8.00	3.84	4.06	4.43	4.72	4.90	5.03	5.23	5.49	5.70	5.86
9.00	5.98	6.26	6.71	7.06	7.27	7.44	7.75	8.25	8.63	8.87

10.00	9.05	9.68	10.82	11.65	12.11	12.42	13.48	15.41	16.81	17.55
11.00	18.03	20.29	24.57	27.63	29.21	30.18	43.15	69.58	119.59	227.85
12.00	351.12	348.46	221.15	128.18	89.76	72.32	59.64	45.38	36.49	32.71
13.00	31.38	29.32	25.99	23.82	22.91	22.54	21.48	19.55	18.28	17.75
14.00	17.53	17.56	17.65	17.35	16.78	16.11	15.42	14.75	14.10	13.48
15.00	12.90	12.36	11.86	11.40	10.98	10.60	10.26	9.96	9.70	9.48
16.00	9.30	9.16	9.05	8.96	8.88	8.80	8.72	8.65	8.57	8.50
17.00	8.42	8.34	8.27	8.19	8.12	8.04	7.97	7.89	7.82	7.74
18.00	7.67	7.59	7.52	7.44	7.37	7.29	7.22	7.14	7.07	6.99
19.00	6.92	6.84	6.77	6.70	6.62	6.55	6.47	6.40	6.32	6.25
20.00	6.17	6.10	6.03	5.95	5.88	5.81	5.75	5.68	5.62	5.55
21.00	5.49	5.44	5.38	5.32	5.27	5.22	5.17	5.12	5.08	5.03
22.00	4.99	4.95	4.91	4.88	4.84	4.81	4.78	4.75	4.72	4.70
23.00	4.68	4.65	4.64	4.62	4.60	4.59	4.58	4.57	4.56	4.55
24.00	4.55	3.71	2.00	.86	.38	.16	.07	.03	.01	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 351.12
TIME TO PEAK (hrs): 12.00
Hydrograph Saved In: BCC10.DAT

1****************************** SCSHYDRO ******************************
****************************** Version 3.21 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 09/05/2007 Wednesday
Time: 15:53:44
Input: BCC10.IN
Output: BCC10.OUT

RETURN PERIOD (yrs): 10

========================== HYDROLOGIC SUMMARY ==========================
==================== Volumes, Losses, and Discharges =====================

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 5.80

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	36.254	27.622	23.81	351.124	4.681
TOTAL WATERSHED	36.254	27.622	23.81	351.124	4.681

TOTAL WATERSHED AREA (square miles):	.1172
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft):	27.6222
COMPOSITE WATERSHED CURVE NUMBER:	88.00
MINIMUM SUBAREA TIME OF CONCENTRATION:	.250 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

100-Year Hydrograph

```
1******************************     SCSHYDRO     ******************************
 ******************************   Version 3.21   ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    *****************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 09/10/2007    Monday
    Time: 16:55:11
   Input: BCC100.IN
  Output: BCC100.OUT
```

```
===========================  PROGRAM EXECUTION  ============================

                      NUMBER OF STORMS TO BE MODELED    :     1
                      NUMBER OF CHANNELS                :     0
                      NUMBER OF SUBAREAS                :     1
                      UPSTREAM HYDROGRAPHS ENTER AT     :     0 LOCATIONS
                      NUMBER OF TIME STEPS              :   500
                      COMPUTATIONAL TIME INCREMENT      :  .100 Hours

 NOTE:   The DURATION of the final computed hydrograph(s) for this watershed
         system will be 50.000 hours.
```

```
======================  UNIT HYDROGRAPH METHODOLOGY  ======================

 The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
 The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary
 units) or 2.08356 (Metric units).
```


```
1******************************     SCSHYDRO     ******************************
 ******************************   Version 3.21   ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    *****************

 PROJECT: BUSCH CORPORATE CENTER
    User: LandTech Resources
    Date: 09/10/2007    Monday
    Time: 16:55:11
   Input: BCC100.IN
  Output: BCC100.OUT
```


```
==============================  SUBAREA DATA  ==============================
```

SUBAREA ID NO	AREA (mi2)	TIME OF CONCENTRATION (hrs)	CURVE NUMBER	BASEFLOW (cfs)	DOWNSTREAM CHANNELS
1	.1172	.250	88.00	.0	

```
     Composite Watershed Curve Number = 88.00
 Minimum Subarea Time of Concentration =  .250 hours.
```


```
1******************************     SCSHYDRO     ******************************
```

```
******************************   Version 3.21   ******************************
*****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

PROJECT: BUSCH CORPORATE CENTER
   User: LandTech Resources
   Date: 09/10/2007    Monday
   Time: 16:55:11
  Input: BCC100.IN
 Output: BCC100.OUT
                                                  RETURN PERIOD (yrs):    100

=====================   RAINFALL HYETOGRAPH INFORMATION   ====================


         RAINFALL HYETOGRAPH: SCS TYPE II
         RAINFALL DURATION:    24.00 Hours
         RAINFALL DEPTH:        8.00 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

      .000,    .00       2.000,    .18       4.000,    .38       6.000,    .64
     7.000,    .78       8.000,    .96       8.500,   1.06       9.000,   1.18
     9.500,   1.30       9.750,   1.38      10.000,   1.45      10.500,   1.63
    11.000,   1.88      11.500,   2.26      11.750,   2.86      12.000,   5.30
    12.500,   5.88      13.000,   6.18      13.500,   6.39      14.000,   6.56
    16.000,   7.04      20.000,   7.62      24.000,   8.00
1******************************   SCSHYDRO      ******************************
******************************   Version 3.21   ******************************
*****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

PROJECT: BUSCH CORPORATE CENTER
  Input: BCC100.IN
 Output: BCC100.OUT
                                                  RETURN PERIOD (yrs):    100


   SUBAREA      1       SUBAREA      1       SUBAREA      1       SUBAREA      1


    AREA (square miles)           :         .1172
    TIME OF CONCENTRATION (hrs)   :         .25
    RUNOFF CURVE NUMBER           :       88.00
    BASEFLOW (cfs)                :         .00
    DOWNSTREAM CHANNELS           :

                              SUBAREA RUNOFF (cfs)
```

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.01	.04	.11	.20	.31	.41	.52	.63	.73	.83
4.00	.93	1.08	1.30	1.49	1.65	1.79	1.93	2.06	2.18	2.31
5.00	2.42	2.54	2.65	2.76	2.87	2.98	3.08	3.18	3.28	3.38
6.00	3.47	3.65	3.92	4.14	4.29	4.41	4.53	4.63	4.73	4.83
7.00	4.92	5.23	5.76	6.16	6.40	6.58	6.72	6.84	6.96	7.08
8.00	7.18	7.54	8.16	8.63	8.90	9.09	9.38	9.79	10.11	10.32
9.00	10.49	10.91	11.63	12.17	12.48	12.69	13.17	13.94	14.52	14.85
10.00	15.08	16.05	17.86	19.15	19.81	20.21	21.84	24.84	26.96	28.03
11.00	28.67	32.08	38.64	43.23	45.46	46.74	66.25	105.94	179.63	336.68
12.00	511.79	503.85	318.60	184.10	128.44	103.13	84.86	64.46	51.77	46.37
13.00	44.46	41.53	36.79	33.71	32.42	31.88	30.37	27.64	25.84	25.09
14.00	24.76	24.81	24.92	24.50	23.69	22.74	21.77	20.81	19.89	19.02

15.00	18.20	17.43	16.73	16.08	15.48	14.94	14.46	14.04	13.67	13.36
16.00	13.10	12.90	12.75	12.62	12.50	12.39	12.28	12.18	12.07	11.96
17.00	11.85	11.75	11.64	11.53	11.43	11.32	11.21	11.11	11.00	10.89
18.00	10.79	10.68	10.58	10.47	10.36	10.26	10.15	10.05	9.94	9.83
19.00	9.73	9.62	9.52	9.41	9.31	9.20	9.10	8.99	8.89	8.78
20.00	8.68	8.57	8.47	8.37	8.27	8.17	8.07	7.98	7.89	7.80
21.00	7.72	7.63	7.56	7.48	7.40	7.33	7.26	7.19	7.13	7.07
22.00	7.01	6.95	6.90	6.85	6.80	6.75	6.71	6.67	6.63	6.60
23.00	6.56	6.53	6.51	6.48	6.46	6.44	6.42	6.41	6.40	6.39
24.00	6.38	5.21	2.81	1.21	.53	.23	.10	.04	.01	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 511.79
TIME TO PEAK (hrs): 12.00

1****************************** SCSHYDRO ******************************
****************************** Version 3.21 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 09/10/2007 Monday
Time: 16:55:11
Input: BCC100.IN
Output: BCC100.OUT

RETURN PERIOD (yrs): 100

========================== DOWNSTREAM HYDROGRAPH ==========================

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.01	.04	.11	.20	.31	.41	.52	.63	.73	.83
4.00	.93	1.08	1.30	1.49	1.65	1.79	1.93	2.06	2.18	2.31
5.00	2.42	2.54	2.65	2.76	2.87	2.98	3.08	3.18	3.28	3.38
6.00	3.47	3.65	3.92	4.14	4.29	4.41	4.53	4.63	4.73	4.83
7.00	4.92	5.23	5.76	6.16	6.40	6.58	6.72	6.84	6.96	7.08
8.00	7.18	7.54	8.16	8.63	8.90	9.09	9.38	9.79	10.11	10.32
9.00	10.49	10.91	11.63	12.17	12.48	12.69	13.17	13.94	14.52	14.85

10.00	15.08	16.05	17.86	19.15	19.81	20.21	21.84	24.84	26.96	28.03
11.00	28.67	32.08	38.64	43.23	45.46	46.74	66.25	105.94	179.63	336.68
12.00	511.79	503.85	318.60	184.10	128.44	103.13	84.86	64.46	51.77	46.37
13.00	44.46	41.53	36.79	33.71	32.42	31.88	30.37	27.64	25.84	25.09
14.00	24.76	24.81	24.92	24.50	23.69	22.74	21.77	20.81	19.89	19.02
15.00	18.20	17.43	16.73	16.08	15.48	14.94	14.46	14.04	13.67	13.36
16.00	13.10	12.90	12.75	12.62	12.50	12.39	12.28	12.18	12.07	11.96
17.00	11.85	11.75	11.64	11.53	11.43	11.32	11.21	11.11	11.00	10.89
18.00	10.79	10.68	10.58	10.47	10.36	10.26	10.15	10.05	9.94	9.83
19.00	9.73	9.62	9.52	9.41	9.31	9.20	9.10	8.99	8.89	8.78
20.00	8.68	8.57	8.47	8.37	8.27	8.17	8.07	7.98	7.89	7.80
21.00	7.72	7.63	7.56	7.48	7.40	7.33	7.26	7.19	7.13	7.07
22.00	7.01	6.95	6.90	6.85	6.80	6.75	6.71	6.67	6.63	6.60
23.00	6.56	6.53	6.51	6.48	6.46	6.44	6.42	6.41	6.40	6.39
24.00	6.38	5.21	2.81	1.21	.53	.23	.10	.04	.01	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
30.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
31.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
32.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
33.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
34.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
35.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
36.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
37.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
38.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
39.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
40.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
41.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
42.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
43.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
44.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
45.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
46.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
47.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
48.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
49.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 511.79
TIME TO PEAK (hrs): 12.00
Hydrograph Saved In: BCC100.DAT

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1******************************    SCSHYDRO     ******************************
 ******************************  Version 3.21   ******************************
 *****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************
```

PROJECT: BUSCH CORPORATE CENTER
User: LandTech Resources
Date: 09/10/2007 Monday
Time: 16:55:11
Input: BCC100.IN
Output: BCC100.OUT

RETURN PERIOD (yrs): 100

```
===========================  HYDROLOGIC SUMMARY  ===========================
====================  Volumes, Losses, and Discharges  =====================
```

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 8.00

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	50.005	40.922	18.16	511.789	6.823
TOTAL WATERSHED	50.005	40.922	18.16	511.789	6.823

TOTAL WATERSHED AREA (square miles):	.1172
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft):	40.9221
COMPOSITE WATERSHED CURVE NUMBER:	88.00
MINIMUM SUBAREA TIME OF CONCENTRATION:	.250 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

LandTech Resources, Inc.
Surveying • Engineering • GPS
201 Bulifants Blvd., Suite A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 7/29/08
SCALE

DRY POND STAGE-STORAGE

ELEV (ft)	Δ ELEV (ft)	SA (sf)	STORAGE (cf)	ACCUM. STORAGE (cf)
62.0		36		0
	1.0		50	
63.0		64		50
	1.0		82	
64.0		100		132
	1.0		3132	
65.0		6164		3264
	1.0		10,862	
66.0		15,560		14,126
	1.0		16,739	
67.0		17,918		30,865
	1.0		18,599	
68.0		19,280		49,464
	1.0		22,490	
69.0		25,700		71,954
	1.0		26,585	
70.0		27,470		98,539
	1.0		28,441	
71.0		29,412		126,980
	1.0		30,630	
72.0		31,848		157,610
	1.0		33,405	
73.0		34,962		191,015
	1.0		37,356	
74.0		39,750		228,371
	1.0		42,237	
75.0		44,724		270,608

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PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 7/29/08
SCALE

DRY POND STAGE-STORAGE

ELEV (ft)	Δ ELEV (ft)	SA (sf)	STORAGE (cf)	ACCUM STORAGE (cf)
75.0		44,724		270,608
	1.0		47,496	
76.0		50,268		318,104
	1.0		53,990	
77.0		57,712		372,094
	1.0		63,216	
78.0		68,720		435,310
	1.0		74,642	
79.0		80,564		509,952
	1.0		87,159	
80.0		93,754		597,111
	0.5		48,676	
80.5		100,950		645,787

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PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KWJ DATE 11/29/07
SCALE

EXISTING OUTLET ORIFICE

4" PERFORATED PVC PIPE

$Q = 0.6 A \sqrt{2gh}$ - orifice equation

orifice invert @ 62.0'

4" ORIFICE AREA = .0873 sf

ELEV	H	Q
62.0	0	0
64.0	2	0.59
66.0	4	0.84
68.0	6	1.03
70.0	8	1.19
72.0	10	1.33
74.0	12	1.46
76.0	14	1.57
78.0	16	1.68
79.0	17	1.73
79.5	17.5	1.76

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PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 11/29/07
SCALE

EXISTING OUTLET ORIFICE

3" ORIFICE

$Q = 0.6A\sqrt{2gh}$ - orifice equation

orifice invert @ 68.25

3" ORIFICA AREA = .0491 sf

ELEV	H	Q
68.25	0	0
70.00	1.75	0.31
72.00	3.75	0.46
74.00	5.75	0.57
76.00	7.75	0.66
78.00	9.75	0.74
79.00	10.75	0.78
79.50	11.25	0.79

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PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 11/29/07
SCALE

EXISTING OUTLET ORIFICE

3" ORIFICE

$Q = 0.6 A\sqrt{2gh}$ – orifice equation

orifice invert @ 69.0

3" ORIFICE AREA = .0491 sf

ELEV	H	Q
69.00	0	0
70.00	1	.24
72.00	3	.41
74.00	5	.53
76.00	7	.63
78.00	9	.71
79.00	10	.75
79.50	10.5	.77

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PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 12/4/07
SCALE

MODIFIED OUTLET WEIR

30" Riser

$Q = 9.739\, D_R H^{3/2}$ – Weir equation

weir elevation @ 73.00

ELEV	H	Q
73.00	0.0	0
74.00	1.0	24.39
75.00	2.0	68.87
76.00	3.0	126.51
77.00	4.0	194.78
78.00	5.0	272.21
79.00	6.0	357.83
80.00	7.0	450.92
80.50	7.5	500.09

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Resources, Inc.
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5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-194
SHEET NO. ____ OF ____
CALCULATED BY KMJ DATE 9/10/07
SCALE ____

DESIGN OUTLET BARREL

USE EXISTING 85' OF 24" RCP @ 3.65%

$INV_{IN} = 61.10$
$INV_{OUT} = 59.00$
$TW_{ELEV} = 60.60$

Q	dn	dc	Vn	R	H	ho	LSo	HW	HW_{ELEV}
0	—	—	—	—	—	—	—	—	62.10
10	.65	1.13	11.19	.37	5.96	1.57	3.10	4.43	66.53
20	.96	1.61	13.49	.49	7.31	1.81	3.10	6.02	68.12
30	1.23	1.86	14.86	.56	8.23	1.93	3.10	7.06	69.16
40	1.52	1.95	15.62	.61	8.73	1.98	3.10	7.61	69.71
50	2.00	2.00	15.92	.50	10.02	2.00	3.10	8.92	71.02
60	2.00	2.00	19.11	.50	14.45	2.00	3.10	13.35	75.45
70	2.00	2.00	22.29	.50	19.65	2.00	3.10	18.55	80.65

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201 Bulifants Blvd., Suite A, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 12/12/07
SCALE

MODIFIED EMERGENCY SPILLWAY

Since the existing concrete spillway elevation of 77.00 is too high to pass the 100 year post-development storm without overtopping the dam the emergency spillway crest will be lowered.

Modified Emergency Spillway:

Elev 76.50

Sideslope = 2:1

Bottom Width = 11.0'

$Q = CLH^{3/2}$ $C = 3.33$

Elev	H	Q
76.50	0	0
77.00	0.5	12.95
78.00	1.5	67.29
79.00	2.5	144.79
80.00	3.5	239.85
80.50	4.0	293.04

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Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Mclaws Place
PROJECT NO. 07-194
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/10/07
SCALE ______

DESIGN EMERGENCY SPILLWAY

Existing Concrete Spillway:

Elev 75.50

Bottom Width = 6'

Slope = 19.1%

Length = 55'

Sideslope = 2:1

n=.013

Depth Flow at 293.04cfs is 0.93'. Since depth of flow is less than 1' the channel is adequate. Wings will provided at transition from flat section to sloped section.

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PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-340
SHEET NO. OF
CALCULATED BY KMJ DATE 12/4/07
SCALE

MODIFIED STAGE - STORAGE - DISCHARGE

STAGE (ft)	STORAGE (ac-ft)	DISCHARGE (cfs)
62.00	.0008	0.00
63.00	.0015	0.42
64.00	.0023	0.59
65.00	.1415	0.73
66.00	.3572	0.84
67.00	.4113	0.94
68.00	.4426	1.03
68.25	.4795	1.05
69.00	.5900	1.31
70.00	.6306	1.74
71.00	.6752	1.98
72.00	.7311	2.20
72.50	.7669	2.29
73.00	.8026	2.36
74.00	.9125	26.91
75.00	1.0267	58.98
76.00	1.1540	61.08
76.50	1.2394	62.02
77.00	1.3249	75.93
78.00	1.5776	132.19
79.00	1.8495	211.62
80.00	2.1523	308.60
80.50	2.3175	362.75

Modified 1-Year Routing

```
1******************************     PONDOPT      ******************************
 ******************************   Version 1.83   ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:51:56
Output: RBCCP1.OUT

SOLUTION FOR 1 STORMS.

TIME INCREMENT: .100 Hours

STORM NUMBER	HYDROGRAPH IN FILE:
1	BCC1.DAT

STORM NUMBER	PEAK INFLOW (cfs)	ALLOWABLE PEAK DISCHARGE (cfs)	DURATION (min)	RUNOFF VOLUME (ft3)	TAILWATER STAGE (ft)
1	135.113	N/A	2994.00	.4455E+06	60.600


```
1******************************     PONDOPT      ******************************
 ******************************   Version 1.83   ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:51:56
Output: RBCCP1.OUT

Stage-Area-Discharge
Filename: RBCCP.DAT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

================= STAGE-STORAGE-DISCHARGE RELATIONSHIP ==================

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< STORM 1 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>

STAGE (ft)	STORAGE VOLUME (ac-ft)	DISCHARGE (cfs)
62.000	.0000	.0000
63.000	.1132E-02	.4200
64.000	.3018E-02	.5900
65.000	.5696E-01	.7300
66.000	.2981	.8400
67.000	.6821	.9400
68.000	1.109	1.030
68.250	1.224	1.050
69.000	1.625	1.310

70.000	2.235	1.740
71.000	2.887	1.980
72.000	3.590	2.200
73.000	4.357	2.360
74.000	5.214	26.91
75.000	6.183	58.98
76.000	7.273	61.08
76.500	7.871	62.02
77.000	8.512	75.93
78.000	9.961	132.2
79.000	11.67	211.6
80.000	13.67	308.6
80.500	14.79	362.8

```
1****************************** PONDOPT ******************************
****************************** Version 1.83 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:51:56
Output: RBCCP1.OUT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

<<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 73.92 feet.
MAXIMUM INFLOW: 135.1 cfs.
MAXIMUM OUTFLOW: 24.85 cfs.
MAXIMUM STORAGE: 5.142 acre-feet.

CONTINUITY ERROR: .502E-02 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	62.000
6	.000	.000	62.000
12	.000	.000	62.000
18	.000	.000	62.000
24	.000	.000	62.000
30	.000	.000	62.000
36	.000	.000	62.000
42	.000	.000	62.000
48	.000	.000	62.000
54	.000	.000	62.000
60	.000	.000	62.000
66	.000	.000	62.000
72	.000	.000	62.000
78	.000	.000	62.000
84	.000	.000	62.000
90	.000	.000	62.000
96	.000	.000	62.000
102	.000	.000	62.000
108	.000	.000	62.000
114	.000	.000	62.000
120	.000	.000	62.000
126	.000	.000	62.000
132	.000	.000	62.000
138	.000	.000	62.000
144	.000	.000	62.000
150	.000	.000	62.000
156	.000	.000	62.000
162	.000	.000	62.000
168	.000	.000	62.000

174	.000	.000	62.000
180	.000	.000	62.000
186	.000	.000	62.000
192	.000	.000	62.000
198	.000	.000	62.000
204	.000	.000	62.000
210	.000	.000	62.000
216	.000	.000	62.000
222	.000	.000	62.000
228	.000	.000	62.000
234	.000	.000	62.000
240	.000	.000	62.000
246	.000	.000	62.000
252	.000	.000	62.000
258	.000	.000	62.000
264	.000	.000	62.000
270	.000	.000	62.000
276	.000	.000	62.000
282	.000	.000	62.000
288	.000	.000	62.000
294	.000	.000	62.000
300	.000	.000	62.000
306	.000	.000	62.000
312	.000	.000	62.000
318	.000	.000	62.000
324	.000	.000	62.000
330	.000	.000	62.000
336	.000	.000	62.000
342	.000	.000	62.000
348	.000	.000	62.000
354	.000	.000	62.000
360	.000	.000	62.000
366	.000	.000	62.000
372	.000	.000	62.000
378	.000	.000	62.000
384	.000	.000	62.000
390	.000	.000	62.000
396	.000	.000	62.000
402	.000	.000	62.000
408	.000	.000	62.000
414	.000	.000	62.000
420	.000	.000	62.000
426	.007	.004	62.010
432	.026	.019	62.045
438	.057	.046	62.110
444	.093	.081	62.193
450	.132	.119	62.283
456	.170	.158	62.376
462	.210	.197	62.469
468	.248	.236	62.561
474	.287	.274	62.653
480	.325	.312	62.743
486	.377	.359	62.854
492	.446	.421	63.007
498	.511	.452	63.191
504	.567	.499	63.467
510	.619	.550	63.765
516	.679	.591	64.004
522	.751	.593	64.023
528	.818	.597	64.052
534	.877	.603	64.090
540	.932	.609	64.135
546	1.013	.617	64.190
552	1.127	.626	64.259
558	1.225	.638	64.342
564	1.304	.651	64.437
570	1.373	.666	64.542
576	1.474	.682	64.656
582	1.614	.700	64.787
588	1.733	.721	64.935
594	1.826	.732	65.021

600	1.907	.737	65.060
606	2.091	.741	65.103
612	2.395	.747	65.155
618	2.639	.754	65.215
624	2.804	.761	65.283
630	2.936	.769	65.355
636	3.261	.778	65.434
642	3.814	.788	65.529
648	4.249	.800	65.640
654	4.530	.814	65.762
660	4.749	.828	65.893
666	5.469	.842	66.025
672	6.777	.854	66.139
678	7.788	.868	66.277
684	8.410	.883	66.432
690	8.871	.900	66.599
696	13.139	.922	66.816
702	21.904	.954	67.156
708	39.772	1.006	67.734
714	80.942	1.219	68.739
720	131.827	1.783	70.179
726	135.113	2.152	71.784
732	87.036	2.356	72.975
738	51.087	15.992	73.555
744	36.339	21.861	73.794
750	29.691	24.222	73.891
756	24.715	24.853	73.916
762	18.921	24.211	73.890
768	15.293	22.707	73.829
774	13.758	20.975	73.758
780	13.228	19.391	73.694
786	12.382	17.997	73.637
792	10.991	16.661	73.583
798	10.089	15.365	73.530
804	9.720	14.209	73.483
810	9.573	13.243	73.443
816	9.134	12.420	73.410
822	8.323	11.638	73.378
828	7.790	10.880	73.347
834	7.573	10.203	73.319
840	7.483	9.637	73.296
846	7.506	9.183	73.278
852	7.548	8.833	73.264
858	7.429	8.548	73.252
864	7.188	8.286	73.241
870	6.909	8.024	73.231
876	6.618	7.757	73.220
882	6.332	7.485	73.209
888	6.057	7.212	73.198
894	5.796	6.940	73.187
900	5.550	6.672	73.176
906	5.321	6.410	73.165
912	5.109	6.157	73.155
918	4.913	5.915	73.145
924	4.735	5.684	73.135
930	4.573	5.466	73.127
936	4.428	5.261	73.118
942	4.300	5.071	73.110
948	4.190	4.897	73.103
954	4.097	4.737	73.097
960	4.020	4.593	73.091
966	3.961	4.466	73.086
972	3.915	4.354	73.081
978	3.878	4.257	73.077
984	3.844	4.173	73.074
990	3.811	4.100	73.071
996	3.779	4.036	73.068
1002	3.748	3.978	73.066
1008	3.716	3.926	73.064
1014	3.685	3.878	73.062
1020	3.654	3.834	73.060

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1032	3.591	3.753	73.057
1038	3.559	3.715	73.055
1044	3.527	3.679	73.054
1050	3.496	3.644	73.052
1056	3.464	3.609	73.051
1062	3.433	3.575	73.049
1068	3.401	3.542	73.048
1074	3.369	3.508	73.047
1080	3.338	3.476	73.045
1086	3.306	3.443	73.044
1092	3.274	3.411	73.043
1098	3.243	3.378	73.041
1104	3.211	3.346	73.040
1110	3.179	3.314	73.039
1116	3.147	3.282	73.038
1122	3.116	3.250	73.036
1128	3.084	3.219	73.035
1134	3.052	3.187	73.034
1140	3.020	3.155	73.032
1146	2.989	3.123	73.031
1152	2.957	3.091	73.030
1158	2.925	3.059	73.028
1164	2.893	3.027	73.027
1170	2.861	2.996	73.026
1176	2.829	2.964	73.025
1182	2.797	2.932	73.023
1188	2.766	2.900	73.022
1194	2.734	2.868	73.021
1200	2.702	2.836	73.019
1206	2.670	2.805	73.018
1212	2.638	2.773	73.017
1218	2.607	2.741	73.016
1224	2.577	2.709	73.014
1230	2.547	2.678	73.013
1236	2.518	2.647	73.012
1242	2.489	2.617	73.010
1248	2.462	2.587	73.009
1254	2.435	2.558	73.008
1260	2.409	2.529	73.007
1266	2.384	2.501	73.006
1272	2.359	2.473	73.005
1278	2.336	2.447	73.004
1284	2.313	2.421	73.002
1290	2.291	2.396	73.001
1296	2.269	2.371	73.000
1302	2.249	2.360	72.999
1308	2.230	2.360	72.998
1314	2.211	2.359	72.997
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1326	2.175	2.359	72.993
1332	2.159	2.359	72.991
1338	2.143	2.358	72.989
1344	2.129	2.358	72.986
1350	2.115	2.357	72.984
1356	2.102	2.357	72.981
1362	2.089	2.357	72.978
1368	2.078	2.356	72.975
1374	2.067	2.356	72.972
1380	2.057	2.355	72.969
1386	2.048	2.355	72.966
1392	2.040	2.354	72.962
1398	2.032	2.353	72.959
1404	2.026	2.353	72.956
1410	2.020	2.352	72.952
1416	2.015	2.352	72.948
1422	2.011	2.351	72.945
1428	2.007	2.351	72.941
1434	2.005	2.350	72.937
1440	2.003	2.349	72.934
1446	1.637	2.348	72.928

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1458	.379	2.344	72.898
1464	.168	2.340	72.875
1470	.072	2.336	72.852
1476	.031	2.332	72.827
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1488	.004	2.324	72.777
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1614	.000	2.242	72.260
1620	.000	2.238	72.236
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1632	.000	2.230	72.188
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1644	.000	2.222	72.140
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1656	.000	2.215	72.092
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1668	.000	2.207	72.044
1674	.000	2.203	72.021
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1692	.000	2.188	71.945
1698	.000	2.182	71.919
1704	.000	2.177	71.894
1710	.000	2.171	71.868
1716	.000	2.165	71.843
1722	.000	2.160	71.817
1728	.000	2.154	71.792
1734	.000	2.149	71.767
1740	.000	2.143	71.741
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1752	.000	2.132	71.691
1758	.000	2.127	71.666
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1770	.000	2.116	71.616
1776	.000	2.110	71.591
1782	.000	2.105	71.567
1788	.000	2.099	71.542
1794	.000	2.094	71.517
1800	.000	2.088	71.493
1806	.000	2.083	71.468
1812	.000	2.078	71.444
1818	.000	2.072	71.419
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1836	.000	2.056	71.346
1842	.000	2.051	71.322
1848	.000	2.046	71.298
1854	.000	2.040	71.274
1860	.000	2.035	71.250
1866	.000	2.030	71.226
1872	.000	2.025	71.203

1878	.000	2.019	71.179
1884	.000	2.014	71.155
1890	.000	2.009	71.131
1896	.000	2.004	71.108
1902	.000	1.999	71.084
1908	.000	1.993	71.061
1914	.000	1.988	71.037
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1950	.000	1.954	70.891
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1974	.000	1.930	70.792
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1986	.000	1.918	70.743
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2004	.000	1.901	70.671
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2016	.000	1.890	70.623
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2028	.000	1.878	70.575
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2154	.000	1.762	70.092
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2166	.000	1.751	70.047
2172	.000	1.746	70.025
2178	.000	1.741	70.003
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2238	.000	1.643	69.774
2244	.000	1.633	69.752
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2256	.000	1.614	69.708
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2268	.000	1.596	69.664
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2286	.000	1.568	69.600
2292	.000	1.559	69.579
2298	.000	1.550	69.558

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2310	.000	1.532	69.516
2316	.000	1.523	69.495
2322	.000	1.514	69.475
2328	.000	1.505	69.454
2334	.000	1.497	69.434
2340	.000	1.488	69.414
2346	.000	1.479	69.394
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2358	.000	1.462	69.354
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2370	.000	1.445	69.314
2376	.000	1.437	69.295
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2538	.000	1.234	68.781
2544	.000	1.227	68.762
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2568	.000	1.201	68.687
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2580	.000	1.189	68.650
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2598	.000	1.170	68.595
2604	.000	1.163	68.577
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2616	.000	1.151	68.541
2622	.000	1.145	68.523
2628	.000	1.139	68.505
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2646	.000	1.120	68.453
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2658	.000	1.108	68.419
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2814	.000	1.026	67.950
2820	.000	1.024	67.930
2826	.000	1.022	67.911
2832	.000	1.020	67.891
2838	.000	1.018	67.871
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2862	.000	1.011	67.792
2868	.000	1.010	67.773
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2892	.000	1.003	67.695
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3216	.000	.906	66.662
3222	.000	.904	66.642
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3240	.000	.898	66.584
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3414	.000	.844	66.040
3420	.000	.842	66.022
3426	.000	.840	66.004
3432	.000	.838	65.978
3438	.000	.834	65.949
3444	.000	.831	65.920
3450	.000	.828	65.892
3456	.000	.825	65.864
3462	.000	.822	65.835
3468	.000	.819	65.807
3474	.000	.816	65.779
3480	.000	.813	65.751
3486	.000	.810	65.724
3492	.000	.807	65.696
3498	.000	.804	65.668
3504	.000	.800	65.641
3510	.000	.797	65.613
3516	.000	.794	65.586
3522	.000	.791	65.559
3528	.000	.789	65.532
3534	.000	.786	65.505
3540	.000	.783	65.478
3546	.000	.780	65.451
3552	.000	.777	65.425
3558	.000	.774	65.398
3564	.000	.771	65.372
3570	.000	.768	65.345
3576	.000	.765	65.319

3582	.000	.762	|	65.293
3588	.000	.759	|	65.267
3594	.000	.756	|	65.241
3600	.000	.754	|	65.215
3606	.000	.751	|	65.189
3612	.000	.748	|	65.163
3618	.000	.745	|	65.138
3624	.000	.742	|	65.112
3630	.000	.740	|	65.087
3636	.000	.737	|	65.062
3642	.000	.734	|	65.036
3648	.000	.731	|	65.011
3654	.000	.722	|	64.940
3660	.000	.706	|	64.830
3666	.000	.691	|	64.723
3672	.000	.677	|	64.618
3678	.000	.662	|	64.516
3684	.000	.648	|	64.416
3690	.000	.634	|	64.317
3696	.000	.621	|	64.221
3702	.000	.608	|	64.127
3708	.000	.595	|	64.035
3714	.000	.358	|	62.852
3720	.000	.000	|	61.546

1****************************** PONDOPT ******************************
****************************** Version 1.83 ******************************
***************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS *****************

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:51:56
Output: RBCCP1.OUT

ROUTING SUMMARY --
SIMULATION MODE --
FOR THE ABOVE CASE --

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	73.916	5.14	135.113	24.853

Modified 10-Year Routing

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1******************************     PONDOPT      ******************************
 ******************************   Version 1.83   ******************************
 *****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
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PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:54:01
Output: RBCCP10.OUT

SOLUTION FOR 1 STORMS.

TIME INCREMENT: .100 Hours

STORM NUMBER	HYDROGRAPH IN FILE:
1	BCC10.DAT

STORM NUMBER	PEAK INFLOW (cfs)	ALLOWABLE PEAK DISCHARGE (cfs)	DURATION (min)	RUNOFF VOLUME (ft3)	TAILWATER STAGE (ft)
1	351.124	N/A	2994.00	.1203E+07	60.600


```
1******************************     PONDOPT      ******************************
 ******************************   Version 1.83   ******************************
 *****************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:54:01
Output: RBCCP10.OUT

Stage-Area-Discharge
Filename: RBCCP.DAT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

================= STAGE-STORAGE-DISCHARGE RELATIONSHIP ==================

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< STORM 1 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

STAGE (ft)	STORAGE VOLUME (ac-ft)	DISCHARGE (cfs)
62.000	.0000	.0000
63.000	.1132E-02	.4200
64.000	.3018E-02	.5900
65.000	.5696E-01	.7300
66.000	.2981	.8400
67.000	.6821	.9400
68.000	1.109	1.030
68.250	1.224	1.050
69.000	1.625	1.310

70.000	2.235	1.740
71.000	2.887	1.980
72.000	3.590	2.200
73.000	4.357	2.360
74.000	5.214	26.91
75.000	6.183	58.98
76.000	7.273	61.08
76.500	7.871	62.02
77.000	8.512	75.93
78.000	9.961	132.2
79.000	11.67	211.6
80.000	13.67	308.6
80.500	14.79	362.8

1****************************** PONDOPT ******************************
****************************** Version 1.83 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:54:01
Output: RBCCP10.OUT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

<<<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 78.59 feet.
MAXIMUM INFLOW: 351.1 cfs.
MAXIMUM OUTFLOW: 178.8 cfs.
MAXIMUM STORAGE: 10.97 acre-feet.

CONTINUITY ERROR: .167E-02 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	62.000
6	.000	.000	62.000
12	.000	.000	62.000
18	.000	.000	62.000
24	.000	.000	62.000
30	.000	.000	62.000
36	.000	.000	62.000
42	.000	.000	62.000
48	.000	.000	62.000
54	.000	.000	62.000
60	.000	.000	62.000
66	.000	.000	62.000
72	.000	.000	62.000
78	.000	.000	62.000
84	.000	.000	62.000
90	.000	.000	62.000
96	.000	.000	62.000
102	.000	.000	62.000
108	.000	.000	62.000
114	.000	.000	62.000
120	.000	.000	62.000
126	.000	.000	62.000
132	.000	.000	62.000
138	.000	.000	62.000
144	.000	.000	62.000
150	.000	.000	62.000
156	.000	.000	62.000
162	.000	.000	62.000
168	.000	.000	62.000

174	.000	.000	62.000
180	.000	.000	62.000
186	.000	.000	62.000
192	.000	.000	62.000
198	.000	.000	62.000
204	.000	.000	62.000
210	.000	.000	62.000
216	.000	.000	62.000
222	.000	.000	62.000
228	.000	.000	62.000
234	.000	.000	62.000
240	.003	.002	62.005
246	.026	.017	62.041
252	.080	.060	62.143
258	.155	.129	62.307
264	.238	.210	62.501
270	.324	.296	62.705
276	.410	.382	62.910
282	.496	.442	63.127
288	.580	.494	63.435
294	.663	.563	63.843
300	.744	.592	64.014
306	.824	.596	64.043
312	.902	.602	64.083
318	.979	.609	64.135
324	1.054	.618	64.197
330	1.128	.628	64.268
336	1.200	.639	64.350
342	1.272	.652	64.440
348	1.341	.666	64.539
354	1.410	.681	64.647
360	1.477	.697	64.763
366	1.582	.714	64.889
372	1.729	.731	65.007
378	1.855	.735	65.043
384	1.953	.739	65.083
390	2.039	.744	65.126
396	2.119	.749	65.172
402	2.195	.754	65.220
408	2.269	.760	65.271
414	2.341	.766	65.324
420	2.411	.772	65.379
426	2.587	.778	65.438
432	2.880	.786	65.505
438	3.111	.794	65.580
444	3.263	.803	65.662
450	3.383	.812	65.748
456	3.486	.822	65.838
462	3.582	.832	65.931
468	3.672	.842	66.017
474	3.760	.848	66.078
480	3.845	.854	66.142
486	4.064	.861	66.209
492	4.431	.868	66.281
498	4.715	.876	66.361
504	4.896	.885	66.445
510	5.034	.893	66.533
516	5.226	.902	66.624
522	5.491	.912	66.720
528	5.705	.922	66.821
534	5.857	.933	66.925
540	5.983	.943	67.029
546	6.261	.952	67.130
552	6.712	.961	67.237
558	7.057	.972	67.351
564	7.274	.982	67.471
570	7.437	.993	67.594
576	7.753	1.005	67.722
582	8.251	1.017	67.857
588	8.631	1.030	68.001
594	8.869	1.041	68.139

600	9.048	1.059	68.277
606	9.679	1.104	68.405
612	10.820	1.153	68.546
618	11.653	1.207	68.702
624	12.111	1.264	68.867
630	12.416	1.324	69.032
636	13.478	1.391	69.189
642	15.410	1.467	69.365
648	16.806	1.552	69.563
654	17.552	1.643	69.774
660	18.033	1.737	69.992
666	20.292	1.791	70.213
672	24.571	1.854	70.474
678	27.634	1.927	70.780
684	29.211	2.004	71.107
690	30.184	2.075	71.432
696	43.153	2.164	71.838
702	69.578	2.270	72.436
708	119.588	10.811	73.344
714	227.845	47.808	74.652
720	351.124	61.884	76.428
726	348.460	129.251	77.948
732	221.151	178.825	78.587
738	128.180	177.487	78.570
744	89.764	155.439	78.293
750	72.321	131.596	77.989
756	59.644	113.457	77.667
762	45.377	96.609	77.368
768	36.487	81.217	77.094
774	32.710	71.405	76.837
780	31.381	64.926	76.604
786	29.320	61.802	76.384
792	25.985	61.361	76.150
798	23.816	60.848	75.890
804	22.913	60.256	75.608
810	22.537	59.663	75.325
816	21.478	59.068	75.042
822	19.552	51.043	74.753
828	18.281	43.313	74.511
834	17.754	37.227	74.322
840	17.526	32.514	74.175
846	17.565	28.912	74.062
852	17.645	26.278	73.974
858	17.354	24.420	73.899
864	16.777	22.863	73.835
870	16.112	21.504	73.780
876	15.423	20.290	73.730
882	14.746	19.188	73.685
888	14.095	18.178	73.644
894	13.480	17.249	73.606
900	12.901	16.390	73.571
906	12.361	15.594	73.539
912	11.861	14.857	73.509
918	11.401	14.174	73.481
924	10.981	13.542	73.455
930	10.600	12.960	73.432
936	10.260	12.424	73.410
942	9.960	11.934	73.390
948	9.699	11.489	73.372
954	9.479	11.087	73.355
960	9.300	10.727	73.341
966	9.159	10.410	73.328
972	9.049	10.134	73.317
978	8.959	9.895	73.307
984	8.877	9.688	73.298
990	8.799	9.508	73.291
996	8.722	9.350	73.285
1002	8.646	9.209	73.279
1008	8.571	9.082	73.274
1014	8.495	8.965	73.269
1020	8.420	8.858	73.265

1026	8.344	8.757	|	73.261
1032	8.269	8.662	|	73.257
1038	8.194	8.571	|	73.253
1044	8.118	8.483	|	73.249
1050	8.043	8.398	|	73.246
1056	7.968	8.315	|	73.243
1062	7.893	8.233	|	73.239
1068	7.818	8.153	|	73.236
1074	7.743	8.074	|	73.233
1080	7.668	7.996	|	73.230
1086	7.593	7.919	|	73.226
1092	7.517	7.842	|	73.223
1098	7.442	7.765	|	73.220
1104	7.367	7.689	|	73.217
1110	7.293	7.613	|	73.214
1116	7.218	7.537	|	73.211
1122	7.143	7.462	|	73.208
1128	7.068	7.386	|	73.205
1134	6.994	7.311	|	73.202
1140	6.919	7.236	|	73.199
1146	6.845	7.161	|	73.196
1152	6.770	7.086	|	73.193
1158	6.695	7.011	|	73.189
1164	6.621	6.936	|	73.186
1170	6.547	6.862	|	73.183
1176	6.472	6.787	|	73.180
1182	6.398	6.713	|	73.177
1188	6.323	6.638	|	73.174
1194	6.249	6.564	|	73.171
1200	6.175	6.489	|	73.168
1206	6.101	6.415	|	73.165
1212	6.027	6.341	|	73.162
1218	5.955	6.267	|	73.159
1224	5.884	6.193	|	73.156
1230	5.814	6.120	|	73.153
1236	5.746	6.048	|	73.150
1242	5.681	5.977	|	73.147
1248	5.616	5.908	|	73.145
1254	5.554	5.839	|	73.142
1260	5.494	5.773	|	73.139
1266	5.435	5.707	|	73.136
1272	5.379	5.644	|	73.134
1278	5.324	5.582	|	73.131
1284	5.271	5.522	|	73.129
1290	5.220	5.463	|	73.126
1296	5.170	5.406	|	73.124
1302	5.123	5.351	|	73.122
1308	5.077	5.298	|	73.120
1314	5.034	5.247	|	73.118
1320	4.992	5.197	|	73.116
1326	4.952	5.150	|	73.114
1332	4.914	5.104	|	73.112
1338	4.878	5.060	|	73.110
1344	4.843	5.018	|	73.108
1350	4.811	4.977	|	73.107
1356	4.780	4.939	|	73.105
1362	4.751	4.902	|	73.104
1368	4.724	4.867	|	73.102
1374	4.699	4.834	|	73.101
1380	4.676	4.803	|	73.100
1386	4.655	4.774	|	73.098
1392	4.635	4.747	|	73.097
1398	4.618	4.721	|	73.096
1404	4.602	4.698	|	73.095
1410	4.588	4.676	|	73.094
1416	4.576	4.656	|	73.094
1422	4.566	4.638	|	73.093
1428	4.558	4.622	|	73.092
1434	4.551	4.608	|	73.092
1440	4.546	4.595	|	73.091
1446	3.714	4.497	|	73.087

1452	2.005	4.150	73.073
1458	.860	3.575	73.049
1464	.381	2.949	73.024
1470	.164	2.383	73.001
1476	.070	2.356	72.977
1482	.027	2.352	72.952
1488	.009	2.348	72.927
1494	.000	2.344	72.901
1500	.000	2.340	72.876
1506	.000	2.336	72.851
1512	.000	2.332	72.826
1518	.000	2.328	72.801
1524	.000	2.324	72.776
1530	.000	2.320	72.751
1536	.000	2.316	72.726
1542	.000	2.312	72.701
1548	.000	2.308	72.676
1554	.000	2.304	72.651
1560	.000	2.300	72.626
1566	.000	2.296	72.601
1572	.000	2.292	72.577
1578	.000	2.288	72.552
1584	.000	2.284	72.527
1590	.000	2.280	72.503
1596	.000	2.276	72.478
1602	.000	2.273	72.454
1608	.000	2.269	72.429
1614	.000	2.265	72.405
1620	.000	2.261	72.380
1626	.000	2.257	72.356
1632	.000	2.253	72.332
1638	.000	2.249	72.307
1644	.000	2.245	72.283
1650	.000	2.241	72.259
1656	.000	2.238	72.235
1662	.000	2.234	72.211
1668	.000	2.230	72.187
1674	.000	2.226	72.163
1680	.000	2.222	72.139
1686	.000	2.218	72.115
1692	.000	2.215	72.091
1698	.000	2.211	72.067
1704	.000	2.207	72.043
1710	.000	2.203	72.019
1716	.000	2.199	71.995
1722	.000	2.193	71.969
1728	.000	2.188	71.944
1734	.000	2.182	71.918
1740	.000	2.176	71.892
1746	.000	2.171	71.867
1752	.000	2.165	71.841
1758	.000	2.159	71.816
1764	.000	2.154	71.791
1770	.000	2.148	71.765
1776	.000	2.143	71.740
1782	.000	2.137	71.715
1788	.000	2.132	71.690
1794	.000	2.126	71.665
1800	.000	2.121	71.640
1806	.000	2.115	71.615
1812	.000	2.110	71.590
1818	.000	2.104	71.565
1824	.000	2.099	71.541
1830	.000	2.093	71.516
1836	.000	2.088	71.491
1842	.000	2.083	71.467
1848	.000	2.077	71.442
1854	.000	2.072	71.418
1860	.000	2.067	71.394
1866	.000	2.061	71.369
1872	.000	2.056	71.345

1878	.000	2.051	|	71.321
1884	.000	2.045	|	71.297
1890	.000	2.040	|	71.273
1896	.000	2.035	|	71.249
1902	.000	2.030	|	71.225
1908	.000	2.024	|	71.201
1914	.000	2.019	|	71.177
1920	.000	2.014	|	71.154
1926	.000	2.009	|	71.130
1932	.000	2.003	|	71.107
1938	.000	1.998	|	71.083
1944	.000	1.993	|	71.060
1950	.000	1.988	|	71.036
1956	.000	1.983	|	71.013
1962	.000	1.977	|	70.989
1968	.000	1.971	|	70.964
1974	.000	1.965	|	70.939
1980	.000	1.959	|	70.914
1986	.000	1.953	|	70.889
1992	.000	1.947	|	70.865
1998	.000	1.942	|	70.840
2004	.000	1.936	|	70.815
2010	.000	1.930	|	70.791
2016	.000	1.924	|	70.766
2022	.000	1.918	|	70.742
2028	.000	1.912	|	70.718
2034	.000	1.906	|	70.694
2040	.000	1.901	|	70.670
2046	.000	1.895	|	70.646
2052	.000	1.889	|	70.622
2058	.000	1.883	|	70.598
2064	.000	1.878	|	70.574
2070	.000	1.872	|	70.550
2076	.000	1.866	|	70.527
2082	.000	1.861	|	70.503
2088	.000	1.855	|	70.479
2094	.000	1.849	|	70.456
2100	.000	1.844	|	70.433
2106	.000	1.838	|	70.409
2112	.000	1.833	|	70.386
2118	.000	1.827	|	70.363
2124	.000	1.822	|	70.340
2130	.000	1.816	|	70.317
2136	.000	1.811	|	70.294
2142	.000	1.805	|	70.271
2148	.000	1.800	|	70.248
2154	.000	1.794	|	70.225
2160	.000	1.789	|	70.203
2166	.000	1.783	|	70.180
2172	.000	1.778	|	70.158
2178	.000	1.772	|	70.135
2184	.000	1.767	|	70.113
2190	.000	1.762	|	70.090
2196	.000	1.756	|	70.068
2202	.000	1.751	|	70.046
2208	.000	1.746	|	70.024
2214	.000	1.740	|	70.002
2220	.000	1.731	|	69.978
2226	.000	1.721	|	69.955
2232	.000	1.711	|	69.932
2238	.000	1.701	|	69.909
2244	.000	1.691	|	69.886
2250	.000	1.681	|	69.863
2256	.000	1.671	|	69.840
2262	.000	1.662	|	69.817
2268	.000	1.652	|	69.795
2274	.000	1.642	|	69.773
2280	.000	1.633	|	69.751
2286	.000	1.623	|	69.728
2292	.000	1.614	|	69.707
2298	.000	1.604	|	69.685

2304	.000	1.595	69.663
2310	.000	1.586	69.642
2316	.000	1.577	69.620
2322	.000	1.568	69.599
2328	.000	1.558	69.578
2334	.000	1.549	69.557
2340	.000	1.540	69.536
2346	.000	1.531	69.515
2352	.000	1.523	69.494
2358	.000	1.514	69.474
2364	.000	1.505	69.453
2370	.000	1.496	69.433
2376	.000	1.487	69.413
2382	.000	1.479	69.393
2388	.000	1.470	69.373
2394	.000	1.462	69.353
2400	.000	1.453	69.333
2406	.000	1.445	69.313
2412	.000	1.436	69.294
2418	.000	1.428	69.275
2424	.000	1.420	69.255
2430	.000	1.412	69.236
2436	.000	1.403	69.217
2442	.000	1.395	69.198
2448	.000	1.387	69.179
2454	.000	1.379	69.160
2460	.000	1.371	69.142
2466	.000	1.363	69.123
2472	.000	1.355	69.105
2478	.000	1.347	69.087
2484	.000	1.339	69.068
2490	.000	1.332	69.050
2496	.000	1.324	69.032
2502	.000	1.316	69.014
2508	.000	1.309	68.996
2514	.000	1.302	68.976
2520	.000	1.295	68.956
2526	.000	1.288	68.936
2532	.000	1.281	68.916
2538	.000	1.274	68.896
2544	.000	1.267	68.877
2550	.000	1.260	68.857
2556	.000	1.254	68.838
2562	.000	1.247	68.818
2568	.000	1.240	68.799
2574	.000	1.234	68.780
2580	.000	1.227	68.761
2586	.000	1.220	68.742
2592	.000	1.214	68.723
2598	.000	1.207	68.704
2604	.000	1.201	68.686
2610	.000	1.195	68.667
2616	.000	1.188	68.649
2622	.000	1.182	68.630
2628	.000	1.175	68.612
2634	.000	1.169	68.594
2640	.000	1.163	68.576
2646	.000	1.157	68.558
2652	.000	1.151	68.540
2658	.000	1.144	68.522
2664	.000	1.138	68.505
2670	.000	1.132	68.487
2676	.000	1.126	68.469
2682	.000	1.120	68.452
2688	.000	1.114	68.435
2694	.000	1.108	68.418
2700	.000	1.102	68.400
2706	.000	1.096	68.383
2712	.000	1.090	68.367
2718	.000	1.085	68.350
2724	.000	1.079	68.333

2730	.000	1.073	68.316
2736	.000	1.067	68.300
2742	.000	1.062	68.283
2748	.000	1.056	68.267
2754	.000	1.050	68.251
2760	.000	1.049	68.232
2766	.000	1.047	68.213
2772	.000	1.046	68.194
2778	.000	1.044	68.176
2784	.000	1.043	68.157
2790	.000	1.041	68.138
2796	.000	1.040	68.119
2802	.000	1.038	68.101
2808	.000	1.037	68.082
2814	.000	1.035	68.064
2820	.000	1.034	68.045
2826	.000	1.032	68.027
2832	.000	1.031	68.008
2838	.000	1.029	67.989
2844	.000	1.027	67.969
2850	.000	1.025	67.949
2856	.000	1.024	67.929
2862	.000	1.022	67.909
2868	.000	1.020	67.890
2874	.000	1.018	67.870
2880	.000	1.017	67.850
2886	.000	1.015	67.831
2892	.000	1.013	67.811
2898	.000	1.011	67.791
2904	.000	1.009	67.772
2910	.000	1.008	67.752
2916	.000	1.006	67.733
2922	.000	1.004	67.713
2928	.000	1.002	67.694
2934	.000	1.001	67.674
2940	.000	.999	67.655
2946	.000	.997	67.636
2952	.000	.995	67.617
2958	.000	.994	67.597
2964	.000	.992	67.578
2970	.000	.990	67.559
2976	.000	.989	67.540
2982	.000	.987	67.521
2988	.000	.985	67.501
2994	.000	.983	67.482
3000	.000	.982	67.463
3006	.000	.980	67.444
3012	.000	.978	67.425
3018	.000	.977	67.407
3024	.000	.975	67.388
3030	.000	.973	67.369
3036	.000	.971	67.350
3042	.000	.970	67.331
3048	.000	.968	67.312
3054	.000	.966	67.294
3060	.000	.965	67.275
3066	.000	.963	67.256
3072	.000	.961	67.238
3078	.000	.960	67.219
3084	.000	.958	67.201
3090	.000	.956	67.182
3096	.000	.955	67.163
3102	.000	.953	67.145
3108	.000	.951	67.127
3114	.000	.950	67.108
3120	.000	.948	67.090
3126	.000	.946	67.071
3132	.000	.945	67.053
3138	.000	.943	67.035
3144	.000	.941	67.017
3150	.000	.940	66.998

3156	.000	.938	66.978
3162	.000	.936	66.958
3168	.000	.934	66.938
3174	.000	.932	66.918
3180	.000	.930	66.898
3186	.000	.928	66.878
3192	.000	.926	66.858
3198	.000	.924	66.838
3204	.000	.922	66.818
3210	.000	.920	66.798
3216	.000	.918	66.778
3222	.000	.916	66.759
3228	.000	.914	66.739
3234	.000	.912	66.719
3240	.000	.910	66.700
3246	.000	.908	66.680
3252	.000	.906	66.661
3258	.000	.904	66.641
3264	.000	.902	66.622
3270	.000	.900	66.602
3276	.000	.898	66.583
3282	.000	.896	66.564
3288	.000	.894	66.544
3294	.000	.893	66.525
3300	.000	.891	66.506
3306	.000	.889	66.487
3312	.000	.887	66.468
3318	.000	.885	66.449
3324	.000	.883	66.429
3330	.000	.881	66.411
3336	.000	.879	66.392
3342	.000	.877	66.373
3348	.000	.875	66.354
3354	.000	.873	66.335
3360	.000	.872	66.316
3366	.000	.870	66.297
3372	.000	.868	66.279
3378	.000	.866	66.260
3384	.000	.864	66.241
3390	.000	.862	66.223
3396	.000	.860	66.204
3402	.000	.859	66.186
3408	.000	.857	66.167
3414	.000	.855	66.149
3420	.000	.853	66.131
3426	.000	.851	66.112
3432	.000	.849	66.094
3438	.000	.848	66.076
3444	.000	.846	66.057
3450	.000	.844	66.039
3456	.000	.842	66.021
3462	.000	.840	66.003
3468	.000	.837	65.976
3474	.000	.834	65.947
3480	.000	.831	65.919
3486	.000	.828	65.890
3492	.000	.825	65.862
3498	.000	.822	65.834
3504	.000	.819	65.806
3510	.000	.816	65.778
3516	.000	.812	65.750
3522	.000	.809	65.722
3528	.000	.806	65.694
3534	.000	.803	65.667
3540	.000	.800	65.639
3546	.000	.797	65.612
3552	.000	.794	65.585
3558	.000	.791	65.558
3564	.000	.788	65.530
3570	.000	.785	65.504
3576	.000	.782	65.477

3582	.000	.779	65.450
3588	.000	.777	65.423
3594	.000	.774	65.397
3600	.000	.771	65.370
3606	.000	.768	65.344
3612	.000	.765	65.318
3618	.000	.762	65.291
3624	.000	.759	65.265
3630	.000	.756	65.239
3636	.000	.753	65.214
3642	.000	.751	65.188
3648	.000	.748	65.162
3654	.000	.745	65.137
3660	.000	.742	65.111
3666	.000	.739	65.086
3672	.000	.737	65.060
3678	.000	.734	65.035
3684	.000	.731	65.010
3690	.000	.721	64.934
3696	.000	.705	64.824
3702	.000	.690	64.718
3708	.000	.676	64.613
3714	.000	.661	64.510
3720	.000	.647	64.410
3726	.000	.634	64.312
3732	.000	.620	64.216
3738	.000	.607	64.122
3744	.000	.594	64.030
3750	.000	.319	62.760
3756	.000	.000	61.594

1****************************** PONDOPT ******************************
****************************** Version 1.83 ******************************
****************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:54:01
Output: RBCCP10.OUT

ROUTING SUMMARY --
SIMULATION MODE --
FOR THE ABOVE CASE --

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	78.587	11.0	351.124	178.825

Modified 100-Year Routing

```
1******************************      PONDOPT        ******************************
 ******************************   Version 1.83     ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:56:33
Output: RBCCP100.OUT

SOLUTION FOR 1 STORMS.

TIME INCREMENT: .100 Hours

STORM NUMBER	HYDROGRAPH IN FILE:
1	BCC100.DAT

STORM NUMBER	PEAK INFLOW (cfs)	ALLOWABLE PEAK DISCHARGE (cfs)	DURATION (min)	RUNOFF VOLUME (ft3)	TAILWATER STAGE (ft)
1	511.789	N/A	2994.00	.1783E+07	60.600


```
1******************************      PONDOPT        ******************************
 ******************************   Version 1.83     ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    ******************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:56:33
Output: RBCCP100.OUT

Stage-Area-Discharge
Filename: RBCCP.DAT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

================== STAGE-STORAGE-DISCHARGE RELATIONSHIP ===================

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<< STORM 1 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

STAGE (ft)	STORAGE VOLUME (ac-ft)	DISCHARGE (cfs)
62.000	.0000	.0000
63.000	.1132E-02	.4200
64.000	.3018E-02	.5900
65.000	.5696E-01	.7300
66.000	.2981	.8400
67.000	.6821	.9400
68.000	1.109	1.030
68.250	1.224	1.050
69.000	1.625	1.310

70.000	2.235	1.740
71.000	2.887	1.980
72.000	3.590	2.200
73.000	4.357	2.360
74.000	5.214	26.91
75.000	6.183	58.98
76.000	7.273	61.08
76.500	7.871	62.02
77.000	8.512	75.93
78.000	9.961	132.2
79.000	11.67	211.6
80.000	13.67	308.6
80.500	14.79	362.8

1****************************** PONDOPT ******************************
****************************** Version 1.83 ******************************
***************** COMPUTER-AIDED HYDROLOGY & HYDRAULICS ******************

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:56:33
Output: RBCCP100.OUT

TAILWATER STAGE: 60.600 feet.
INITIAL STAGE: 62.000 feet.

<<<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 80.13 feet.
MAXIMUM INFLOW: 511.8 cfs.
MAXIMUM OUTFLOW: 323.1 cfs.
MAXIMUM STORAGE: 13.97 acre-feet.

CONTINUITY ERROR: -.433E-05 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	62.000
6	.000	.000	62.000
12	.000	.000	62.000
18	.000	.000	62.000
24	.000	.000	62.000
30	.000	.000	62.000
36	.000	.000	62.000
42	.000	.000	62.000
48	.000	.000	62.000
54	.000	.000	62.000
60	.000	.000	62.000
66	.000	.000	62.000
72	.000	.000	62.000
78	.000	.000	62.000
84	.000	.000	62.000
90	.000	.000	62.000
96	.000	.000	62.000
102	.000	.000	62.000
108	.000	.000	62.000
114	.000	.000	62.000
120	.000	.000	62.000
126	.000	.000	62.000
132	.000	.000	62.000
138	.000	.000	62.000
144	.000	.000	62.000
150	.000	.000	62.000
156	.000	.000	62.000
162	.000	.000	62.000
168	.000	.000	62.000

174	.000	.000	62.000
180	.005	.003	62.008
186	.037	.025	62.059
192	.107	.082	62.195
198	.203	.170	62.405
204	.307	.273	62.649
210	.415	.379	62.903
216	.522	.450	63.177
222	.628	.518	63.576
228	.732	.591	64.004
234	.834	.595	64.034
240	.934	.601	64.078
246	1.084	.610	64.139
252	1.297	.622	64.228
258	1.489	.638	64.344
264	1.648	.658	64.485
270	1.792	.680	64.646
276	1.927	.705	64.825
282	2.057	.730	65.004
288	2.183	.736	65.052
294	2.305	.741	65.104
300	2.424	.748	65.159
306	2.540	.754	65.218
312	2.653	.761	65.281
318	2.764	.768	65.348
324	2.872	.776	65.418
330	2.977	.784	65.492
336	3.080	.793	65.568
342	3.181	.801	65.648
348	3.279	.810	65.731
354	3.375	.820	65.817
360	3.469	.830	65.906
366	3.646	.840	66.000
372	3.917	.846	66.063
378	4.135	.853	66.132
384	4.289	.860	66.204
390	4.415	.868	66.279
396	4.527	.876	66.356
402	4.632	.884	66.436
408	4.732	.892	66.518
414	4.828	.900	66.601
420	4.922	.909	66.687
426	5.225	.918	66.776
432	5.758	.927	66.875
438	6.160	.938	66.983
444	6.400	.948	67.088
450	6.575	.958	67.195
456	6.718	.967	67.305
462	6.845	.978	67.418
468	6.963	.988	67.532
474	7.076	.998	67.649
480	7.184	1.009	67.767
486	7.538	1.020	67.890
492	8.161	1.032	68.021
498	8.626	1.042	68.153
504	8.897	1.062	68.285
510	9.090	1.105	68.408
516	9.377	1.148	68.533
522	9.792	1.193	68.664
528	10.112	1.240	68.799
534	10.323	1.288	68.937
540	10.487	1.339	69.068
546	10.912	1.394	69.195
552	11.634	1.451	69.328
558	12.169	1.512	69.469
564	12.478	1.575	69.615
570	12.694	1.639	69.764
576	13.167	1.704	69.917
582	13.944	1.757	70.072
588	14.516	1.795	70.229
594	14.847	1.834	70.392

600	15.078	1.874	70.558
606	16.052	1.916	70.731
612	17.859	1.961	70.921
618	19.145	2.007	71.121
624	19.806	2.052	71.326
630	20.215	2.098	71.537
636	21.835	2.147	71.759
642	24.842	2.201	72.008
648	26.964	2.242	72.263
654	28.029	2.286	72.535
660	28.666	2.331	72.816
666	32.083	4.674	73.094
672	38.638	11.170	73.359
678	43.232	17.471	73.616
684	45.465	23.161	73.847
690	46.744	28.169	74.039
696	66.252	34.985	74.252
702	105.939	47.283	74.635
708	179.626	59.721	75.353
714	336.679	68.530	76.734
720	511.789	166.698	78.434
726	503.848	278.926	79.694
732	318.602	323.102	80.134
738	184.103	299.149	79.903
744	128.439	251.429	79.410
750	103.126	206.325	78.933
756	84.857	170.177	78.478
762	64.461	139.440	78.091
768	51.768	115.936	77.711
774	46.373	97.451	77.383
780	44.465	83.067	77.127
786	41.529	73.584	76.916
792	36.791	67.918	76.712
798	33.708	62.541	76.519
804	32.421	61.681	76.319
810	31.879	61.300	76.117
816	30.374	60.872	75.901
822	27.643	60.369	75.661
828	25.840	59.837	75.408
834	25.090	59.294	75.150
840	24.763	55.495	74.891
846	24.812	48.107	74.661
852	24.921	42.515	74.487
858	24.505	38.232	74.353
864	23.687	34.830	74.247
870	22.743	32.036	74.160
876	21.767	29.682	74.086
882	20.808	27.662	74.023
888	19.888	26.023	73.964
894	19.016	24.632	73.907
900	18.196	23.357	73.855
906	17.433	22.183	73.807
912	16.726	21.103	73.763
918	16.075	20.107	73.723
924	15.481	19.191	73.686
930	14.943	18.349	73.651
936	14.462	17.577	73.620
942	14.038	16.872	73.591
948	13.669	16.233	73.565
954	13.358	15.658	73.542
960	13.103	15.144	73.521
966	12.904	14.691	73.502
972	12.749	14.296	73.486
978	12.620	13.955	73.472
984	12.503	13.660	73.460
990	12.392	13.403	73.450
996	12.283	13.178	73.441
1002	12.176	12.977	73.432
1008	12.068	12.796	73.425
1014	11.961	12.631	73.418
1020	11.854	12.478	73.412

1026	11.747	12.334	|	73.406
1032	11.640	12.199	|	73.401
1038	11.533	12.069	|	73.395
1044	11.427	11.944	|	73.390
1050	11.320	11.824	|	73.385
1056	11.213	11.706	|	73.381
1062	11.107	11.590	|	73.376
1068	11.000	11.477	|	73.371
1074	10.894	11.364	|	73.367
1080	10.788	11.254	|	73.362
1086	10.681	11.144	|	73.358
1092	10.575	11.035	|	73.353
1098	10.469	10.926	|	73.349
1104	10.363	10.818	|	73.345
1110	10.257	10.711	|	73.340
1116	10.151	10.603	|	73.336
1122	10.045	10.496	|	73.331
1128	9.940	10.390	|	73.327
1134	9.834	10.283	|	73.323
1140	9.729	10.177	|	73.318
1146	9.623	10.071	|	73.314
1152	9.518	9.965	|	73.310
1158	9.413	9.859	|	73.305
1164	9.307	9.754	|	73.301
1170	9.203	9.648	|	73.297
1176	9.097	9.543	|	73.293
1182	8.993	9.437	|	73.288
1188	8.888	9.332	|	73.284
1194	8.783	9.227	|	73.280
1200	8.678	9.122	|	73.275
1206	8.574	9.017	|	73.271
1212	8.470	8.912	|	73.267
1218	8.367	8.808	|	73.263
1224	8.267	8.704	|	73.258
1230	8.169	8.601	|	73.254
1236	8.074	8.499	|	73.250
1242	7.981	8.399	|	73.246
1248	7.890	8.301	|	73.242
1254	7.802	8.205	|	73.238
1260	7.717	8.111	|	73.234
1266	7.635	8.019	|	73.230
1272	7.555	7.929	|	73.227
1278	7.478	7.842	|	73.223
1284	7.403	7.757	|	73.220
1290	7.331	7.674	|	73.216
1296	7.262	7.594	|	73.213
1302	7.195	7.517	|	73.210
1308	7.130	7.442	|	73.207
1314	7.069	7.369	|	73.204
1320	7.010	7.300	|	73.201
1326	6.953	7.232	|	73.198
1332	6.900	7.168	|	73.196
1338	6.849	7.105	|	73.193
1344	6.800	7.046	|	73.191
1350	6.754	6.989	|	73.189
1356	6.711	6.935	|	73.186
1362	6.670	6.883	|	73.184
1368	6.632	6.834	|	73.182
1374	6.597	6.788	|	73.180
1380	6.564	6.744	|	73.179
1386	6.534	6.702	|	73.177
1392	6.506	6.664	|	73.175
1398	6.481	6.628	|	73.174
1404	6.459	6.595	|	73.172
1410	6.440	6.564	|	73.171
1416	6.422	6.536	|	73.170
1422	6.408	6.510	|	73.169
1428	6.396	6.487	|	73.168
1434	6.387	6.467	|	73.167
1440	6.380	6.449	|	73.167
1446	5.212	6.311	|	73.161

1452	2.813	5.825	73.141
1458	1.206	5.017	73.108
1464	.535	4.139	73.072
1470	.230	3.344	73.040
1476	.098	2.671	73.013
1482	.038	2.358	72.988
1488	.012	2.354	72.963
1494	.000	2.350	72.937
1500	.000	2.346	72.912
1506	.000	2.342	72.887
1512	.000	2.338	72.862
1518	.000	2.334	72.836
1524	.000	2.330	72.811
1530	.000	2.326	72.786
1536	.000	2.322	72.761
1542	.000	2.318	72.736
1548	.000	2.314	72.711
1554	.000	2.310	72.686
1560	.000	2.306	72.661
1566	.000	2.302	72.636
1572	.000	2.298	72.612
1578	.000	2.294	72.587
1584	.000	2.290	72.562
1590	.000	2.286	72.538
1596	.000	2.282	72.513
1602	.000	2.278	72.488
1608	.000	2.274	72.464
1614	.000	2.270	72.439
1620	.000	2.266	72.415
1626	.000	2.262	72.390
1632	.000	2.259	72.366
1638	.000	2.255	72.342
1644	.000	2.251	72.317
1650	.000	2.247	72.293
1656	.000	2.243	72.269
1662	.000	2.239	72.245
1668	.000	2.235	72.221
1674	.000	2.231	72.197
1680	.000	2.228	72.173
1686	.000	2.224	72.149
1692	.000	2.220	72.125
1698	.000	2.216	72.101
1704	.000	2.212	72.077
1710	.000	2.208	72.053
1716	.000	2.205	72.029
1722	.000	2.201	72.005
1728	.000	2.196	71.980
1734	.000	2.190	71.954
1740	.000	2.184	71.929
1746	.000	2.179	71.903
1752	.000	2.173	71.877
1758	.000	2.167	71.852
1764	.000	2.162	71.826
1770	.000	2.156	71.801
1776	.000	2.151	71.776
1782	.000	2.145	71.751
1788	.000	2.140	71.725
1794	.000	2.134	71.700
1800	.000	2.129	71.675
1806	.000	2.123	71.650
1812	.000	2.118	71.625
1818	.000	2.112	71.600
1824	.000	2.107	71.576
1830	.000	2.101	71.551
1836	.000	2.096	71.526
1842	.000	2.090	71.502
1848	.000	2.085	71.477
1854	.000	2.080	71.453
1860	.000	2.074	71.428
1866	.000	2.069	71.404
1872	.000	2.063	71.379

1878	.000	2.058	71.355
1884	.000	2.053	71.331
1890	.000	2.048	71.307
1896	.000	2.042	71.283
1902	.000	2.037	71.259
1908	.000	2.032	71.235
1914	.000	2.026	71.211
1920	.000	2.021	71.187
1926	.000	2.016	71.164
1932	.000	2.011	71.140
1938	.000	2.006	71.116
1944	.000	2.000	71.093
1950	.000	1.995	71.069
1956	.000	1.990	71.046
1962	.000	1.985	71.023
1968	.000	1.980	70.999
1974	.000	1.974	70.974
1980	.000	1.968	70.949
1986	.000	1.962	70.924
1992	.000	1.956	70.900
1998	.000	1.950	70.875
2004	.000	1.944	70.850
2010	.000	1.938	70.826
2016	.000	1.932	70.801
2022	.000	1.926	70.777
2028	.000	1.921	70.752
2034	.000	1.915	70.728
2040	.000	1.909	70.704
2046	.000	1.903	70.680
2052	.000	1.897	70.656
2058	.000	1.892	70.632
2064	.000	1.886	70.608
2070	.000	1.880	70.584
2076	.000	1.874	70.560
2082	.000	1.869	70.536
2088	.000	1.863	70.513
2094	.000	1.857	70.489
2100	.000	1.852	70.466
2106	.000	1.846	70.442
2112	.000	1.841	70.419
2118	.000	1.835	70.396
2124	.000	1.829	70.373
2130	.000	1.824	70.349
2136	.000	1.818	70.326
2142	.000	1.813	70.303
2148	.000	1.807	70.280
2154	.000	1.802	70.258
2160	.000	1.796	70.235
2166	.000	1.791	70.212
2172	.000	1.785	70.189
2178	.000	1.780	70.167
2184	.000	1.775	70.144
2190	.000	1.769	70.122
2196	.000	1.764	70.100
2202	.000	1.759	70.077
2208	.000	1.753	70.055
2214	.000	1.748	70.033
2220	.000	1.743	70.011
2226	.000	1.735	69.988
2232	.000	1.725	69.965
2238	.000	1.715	69.941
2244	.000	1.705	69.918
2250	.000	1.695	69.895
2256	.000	1.685	69.872
2262	.000	1.675	69.849
2268	.000	1.666	69.827
2274	.000	1.656	69.804
2280	.000	1.646	69.782
2286	.000	1.637	69.760
2292	.000	1.627	69.738
2298	.000	1.618	69.716

2304	.000	1.608	69.694
2310	.000	1.599	69.672
2316	.000	1.590	69.651
2322	.000	1.581	69.629
2328	.000	1.571	69.608
2334	.000	1.562	69.587
2340	.000	1.553	69.565
2346	.000	1.544	69.544
2352	.000	1.535	69.524
2358	.000	1.526	69.503
2364	.000	1.517	69.482
2370	.000	1.509	69.462
2376	.000	1.500	69.441
2382	.000	1.491	69.421
2388	.000	1.482	69.401
2394	.000	1.474	69.381
2400	.000	1.465	69.361
2406	.000	1.457	69.341
2412	.000	1.448	69.322
2418	.000	1.440	69.302
2424	.000	1.432	69.283
2430	.000	1.423	69.263
2436	.000	1.415	69.244
2442	.000	1.407	69.225
2448	.000	1.399	69.206
2454	.000	1.390	69.187
2460	.000	1.382	69.168
2466	.000	1.374	69.150
2472	.000	1.366	69.131
2478	.000	1.358	69.113
2484	.000	1.351	69.094
2490	.000	1.343	69.076
2496	.000	1.335	69.058
2502	.000	1.327	69.040
2508	.000	1.319	69.022
2514	.000	1.312	69.004
2520	.000	1.305	68.984
2526	.000	1.298	68.964
2532	.000	1.291	68.944
2538	.000	1.284	68.924
2544	.000	1.277	68.905
2550	.000	1.270	68.885
2556	.000	1.263	68.865
2562	.000	1.257	68.846
2568	.000	1.250	68.826
2574	.000	1.243	68.807
2580	.000	1.236	68.788
2586	.000	1.230	68.769
2592	.000	1.223	68.750
2598	.000	1.217	68.731
2604	.000	1.210	68.712
2610	.000	1.204	68.693
2616	.000	1.197	68.675
2622	.000	1.191	68.656
2628	.000	1.184	68.638
2634	.000	1.178	68.620
2640	.000	1.172	68.601
2646	.000	1.166	68.583
2652	.000	1.159	68.565
2658	.000	1.153	68.547
2664	.000	1.147	68.530
2670	.000	1.141	68.512
2676	.000	1.135	68.494
2682	.000	1.129	68.477
2688	.000	1.123	68.459
2694	.000	1.117	68.442
2700	.000	1.111	68.425
2706	.000	1.105	68.408
2712	.000	1.099	68.391
2718	.000	1.093	68.374
2724	.000	1.087	68.357

2730	.000	1.081	68.340
2736	.000	1.075	68.323
2742	.000	1.070	68.307
2748	.000	1.064	68.290
2754	.000	1.058	68.274
2760	.000	1.053	68.257
2766	.000	1.049	68.240
2772	.000	1.048	68.221
2778	.000	1.046	68.202
2784	.000	1.045	68.183
2790	.000	1.043	68.165
2796	.000	1.042	68.146
2802	.000	1.040	68.127
2808	.000	1.039	68.109
2814	.000	1.037	68.090
2820	.000	1.036	68.071
2826	.000	1.034	68.053
2832	.000	1.033	68.034
2838	.000	1.031	68.016
2844	.000	1.030	67.997
2850	.000	1.028	67.977
2856	.000	1.026	67.957
2862	.000	1.024	67.938
2868	.000	1.023	67.918
2874	.000	1.021	67.898
2880	.000	1.019	67.878
2886	.000	1.017	67.858
2892	.000	1.015	67.839
2898	.000	1.014	67.819
2904	.000	1.012	67.800
2910	.000	1.010	67.780
2916	.000	1.008	67.760
2922	.000	1.007	67.741
2928	.000	1.005	67.721
2934	.000	1.003	67.702
2940	.000	1.001	67.683
2946	.000	1.000	67.663
2952	.000	.998	67.644
2958	.000	.996	67.625
2964	.000	.994	67.605
2970	.000	.993	67.586
2976	.000	.991	67.567
2982	.000	.989	67.548
2988	.000	.988	67.529
2994	.000	.986	67.509
3000	.000	.984	67.490
3006	.000	.982	67.471
3012	.000	.981	67.452
3018	.000	.979	67.433
3024	.000	.977	67.414
3030	.000	.976	67.396
3036	.000	.974	67.377
3042	.000	.972	67.358
3048	.000	.971	67.339
3054	.000	.969	67.320
3060	.000	.967	67.301
3066	.000	.965	67.283
3072	.000	.964	67.264
3078	.000	.962	67.245
3084	.000	.960	67.227
3090	.000	.959	67.208
3096	.000	.957	67.190
3102	.000	.955	67.171
3108	.000	.954	67.153
3114	.000	.952	67.134
3120	.000	.950	67.116
3126	.000	.949	67.097
3132	.000	.947	67.079
3138	.000	.945	67.061
3144	.000	.944	67.042
3150	.000	.942	67.024

3156	.000	.941	67.006
3162	.000	.939	66.986
3168	.000	.937	66.966
3174	.000	.935	66.946
3180	.000	.933	66.926
3186	.000	.931	66.906
3192	.000	.929	66.886
3198	.000	.927	66.866
3204	.000	.925	66.846
3210	.000	.923	66.826
3216	.000	.921	66.806
3222	.000	.919	66.787
3228	.000	.917	66.767
3234	.000	.915	66.747
3240	.000	.913	66.727
3246	.000	.911	66.708
3252	.000	.909	66.688
3258	.000	.907	66.669
3264	.000	.905	66.649
3270	.000	.903	66.630
3276	.000	.901	66.610
3282	.000	.899	66.591
3288	.000	.897	66.572
3294	.000	.895	66.552
3300	.000	.893	66.533
3306	.000	.891	66.514
3312	.000	.889	66.495
3318	.000	.888	66.476
3324	.000	.886	66.456
3330	.000	.884	66.437
3336	.000	.882	66.418
3342	.000	.880	66.399
3348	.000	.878	66.381
3354	.000	.876	66.362
3360	.000	.874	66.343
3366	.000	.872	66.324
3372	.000	.871	66.305
3378	.000	.869	66.287
3384	.000	.867	66.268
3390	.000	.865	66.249
3396	.000	.863	66.231
3402	.000	.861	66.212
3408	.000	.859	66.194
3414	.000	.858	66.175
3420	.000	.856	66.157
3426	.000	.854	66.138
3432	.000	.852	66.120
3438	.000	.850	66.102
3444	.000	.848	66.083
3450	.000	.847	66.065
3456	.000	.845	66.047
3462	.000	.843	66.029
3468	.000	.841	66.011
3474	.000	.839	65.988
3480	.000	.836	65.959
3486	.000	.832	65.931
3492	.000	.829	65.902
3498	.000	.826	65.874
3504	.000	.823	65.846
3510	.000	.820	65.817
3516	.000	.817	65.789
3522	.000	.814	65.762
3528	.000	.811	65.734
3534	.000	.808	65.706
3540	.000	.805	65.678
3546	.000	.802	65.651
3552	.000	.799	65.623
3558	.000	.796	65.596
3564	.000	.793	65.569
3570	.000	.790	65.542
3576	.000	.787	65.515

3582	.000	.784	|	65.488
3588	.000	.781	|	65.461
3594	.000	.778	|	65.434
3600	.000	.775	|	65.408
3606	.000	.772	|	65.381
3612	.000	.769	|	65.355
3618	.000	.766	|	65.329
3624	.000	.763	|	65.302
3630	.000	.760	|	65.276
3636	.000	.758	|	65.250
3642	.000	.755	|	65.224
3648	.000	.752	|	65.198
3654	.000	.749	|	65.173
3660	.000	.746	|	65.147
3666	.000	.743	|	65.122
3672	.000	.741	|	65.096
3678	.000	.738	|	65.071
3684	.000	.735	|	65.046
3690	.000	.732	|	65.021
3696	.000	.727	|	64.980
3702	.000	.712	|	64.870
3708	.000	.697	|	64.762
3714	.000	.682	|	64.656
3720	.000	.667	|	64.553
3726	.000	.653	|	64.452
3732	.000	.639	|	64.353
3738	.000	.626	|	64.256
3744	.000	.613	|	64.161
3750	.000	.600	|	64.068
3756	.000	.508	|	63.519
3762	.000	.002	|	62.004
3768	.000	.000	|	61.998

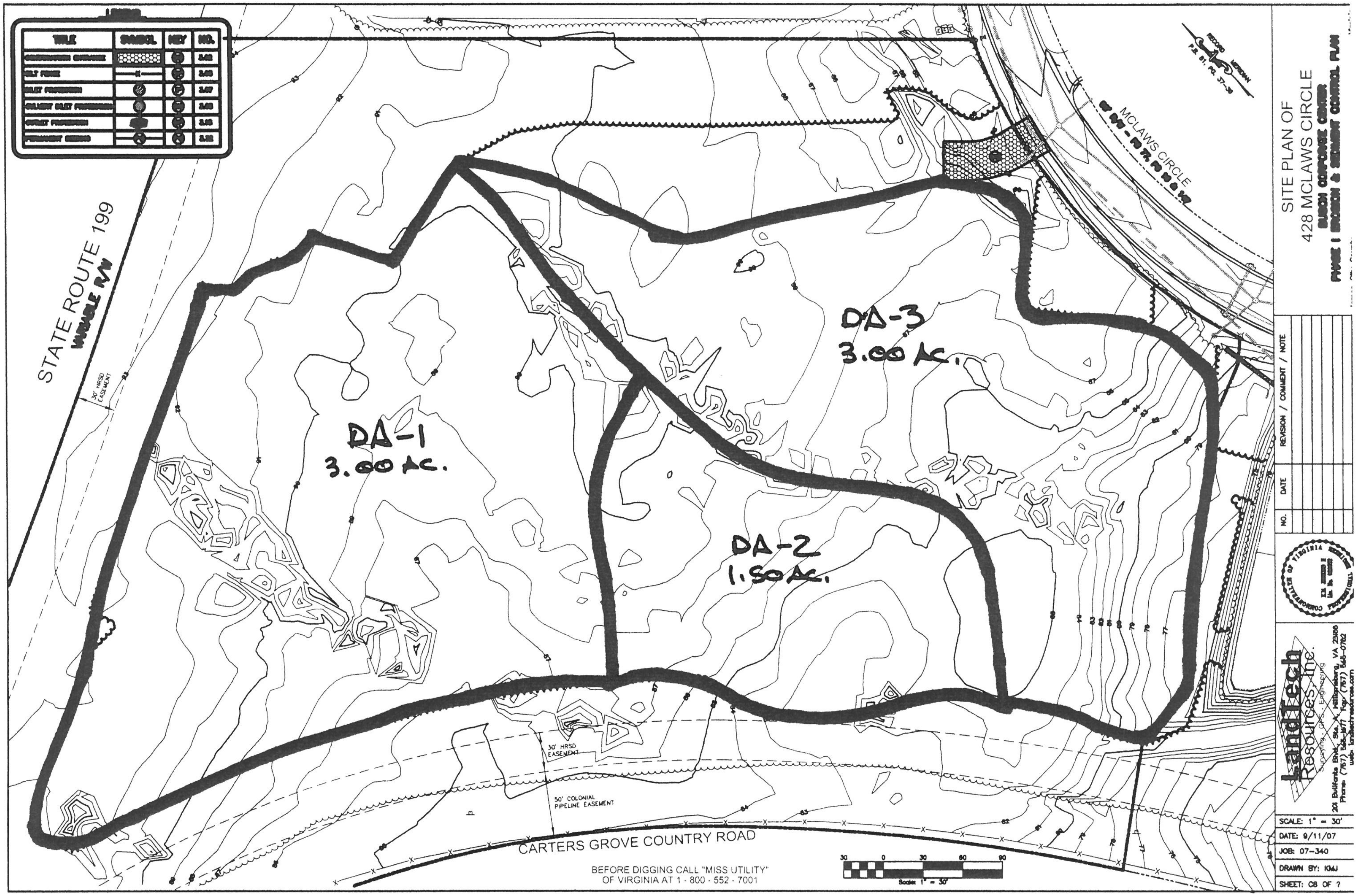
```
1******************************     PONDOPT     ******************************
 ******************************   Version 1.83   ******************************
 *****************    COMPUTER-AIDED HYDROLOGY & HYDRAULICS    *****************
```

PROJECT: REV BUSCH CORPORATE CENTER BMP
User: LandTech Resources
Date: 07/30/2008 Wednesday
Time: 15:56:33
Output: RBCCP100.OUT

ROUTING SUMMARY --
SIMULATION MODE --
FOR THE ABOVE CASE --

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	80.134	14.0	511.789	323.102

APPENDIX C



PHASE I E&S DRAINAGE AREAS

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Melaws Circle
PROJECT NO. 07-340
SHEET NO. ____ OF ____
CALCULATED BY KMJ DATE 9/19/07
SCALE ____

DESIGN SEDIMENT TRAP #1

Drainage Area = 3.00 Ac.

Initial Storage = 3.00 Ac × 134 cyd/ac = 402 cyd

Dry Storage = 201 cyd

Wet Storage = 201 cyd

Calculate Wet Storage:

$V_1 = 201$ cyd $= 5{,}427$ cf
$D_1 = 2$

$V_1 = .85 \times A_1 \times D_1$

$5427 = .85 \times A_1 \times 2'$

$A_1 = 3{,}192 = 57' \times 57'$ ELEV 85.0

Calculate Dry Storage:

$V_2 = 201$ cyd $= 5{,}427$ cf
$D_2 = 1.5$
$A_1 = 3{,}192$

$V_2 = \frac{A_1 + A_2}{2} \times D_2 \Rightarrow 5{,}427 = \frac{3{,}192 + A_2}{2} \times 1.5$

$A_2 = 4{,}044$ sf $= 64' \times 64'$ ELEV 86.5

$L = 6 \times 3.0 = 18'$

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 Mclaws Circle
PROJECT NO. 07-340
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/19/07
SCALE ______

DESIGN SEDIMENT TRAP #2

Drainage Area = 1.50 Ac

Initial storage = 1.50 Ac × 134 cyd/ac = 202 cyd

Dry Storage = 101 cyd

Wet Storage = 101 cyd

Calculat Wet storage:

V_1 = 101 cyd = 2,727 cf
$D_1 = 2$

$V_1 = .85 \times A_1 \times D_1$

$2{,}727 = .85 \times A_1 \times 2$

A_1 = 1605 sf = 40' × 40' ELEV 82.5

Calculate Dry Storage:

V_2 = 101 cyd = 2,727 cf
D_2 = 1.5'
$A_1 = 1605$

$V_2 = \frac{A_1 + A_2}{2} \times D_2 \Rightarrow 2{,}727 = \frac{1605 + A_2}{2} \times 1.5$

A_2 = 2031 sf = 45' × 45' ELEV 84.0

L = 6 × 1.5' = 9'

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME 428 McLaws Circle
PROJECT NO. 07-340
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 9/19/07
SCALE ______

DESIGN SEDIMENT TRAP #3

Drainage Area = 3.00 Ac.

Initial Storage = 3.00 Ac × 134 cyd/ac = 402 cyd

Dry Storage = 201 cyd

Wet Storage = 201 cyd

Calculate Wet Storage:

V_1 = 201 cyd = 5,427 cf
D_1 = 4'

$V_1 = .85 \times A_1 \times D_1$

$5427 = .85 \times A_1 \times 4$

A_1 = 1596 cf = 40' × 40' ELEV 76.0

Calculate Dry Storage:

V_2 = 201 cyd = 5,427 cf
D_2 = 3'
A_1 = 1596

$V_2 = \frac{A_1 + A_2}{2} \times D_2 \Rightarrow 5427 = \frac{1596 + A_2}{2} \times 3$

A_2 = 2,022 = 45' × 45' ELEV 79.0

L = 6 × 3.0' = 18'

APPENDIX D

GET Solutions, Inc.
Geotechnical · Environmental · Testing

G E T Solutions, Inc.
1592 Penniman Road, Suite E
Williamsburg, Virginia 23185
Phone: (757) 564-6452
Fax: (757) 564-6453

FIELD REPORT No. 1

Project No. WM08-143G
Permit No.
Permit Date:

Project Name:
428 McLaws Circle Office Complex

Location:
Busch Corporate Center
James City County, Virginia

Client:
Leebcor, Inc.

Contractor:
Same

Scope of Services:
BMP Dam Embankment Observations

Day/Date: Weather/Temp:
Mon/14 April 08 Overcast/50°

Arrive on Site:
1000

Depart Site:
1030

Time on Site:
0.5

Travel Time:
0.5

Reporting Time:
0.5

TOTAL CHARGEABLE HOURS: **1.5**
CHARGEABLE EXPENSES: **6 mi.**

Engineer visited site to make preliminary observations of BMP dam embankment located adjacent to the south property line of the referenced project site. It is our understanding that this BMP facility will accept storm water from the development and that as part of the project, the embankment will need to be raised about 2 feet in elevation. The purpose of this visit was to ascertain the suitability of the existing dam embankment for support of the additional soil fill. This investigation was accomplished by making visual observations of the condition of the embankment and noting the embankment with respect to erosion and subsidence which might indicate embankment instability.

Observation of the existing embankment, which is several years old, did not disclose the presence of side slope or crest erosion features which would indicate poor soil compaction or slope instability. The top of the embankment was level with no indications of subsidence which would indicate poor soil compaction. Observations of the emergency spillway which consists of a concrete sluice over the embankment itself indicated the panels had not settled, and there were no indications of erosion around or below the panels.

Based on our site observations, it is our opinion that the embankment could support the weight of an additional 2 feet of fill without adverse effects. We understand that additional geotechnical exploration will be performed as part of the geotechnical study for this project, at which time specific recommendations will be made.

Distribution:
(1) Client via email
(jliebler@cda.hrcoxmail.com)
(1) LandTech Resources, Inc. via email
(kjenkins@landtechresources.com)

COMMONWEALTH OF VIRGINIA
ROBERT C. MOSS, III
Lic. No. 019982
PROFESSIONAL ENGINEER

By:
Robert C. Moss
Robert C. Moss, PE
G E T Solutions, Inc.

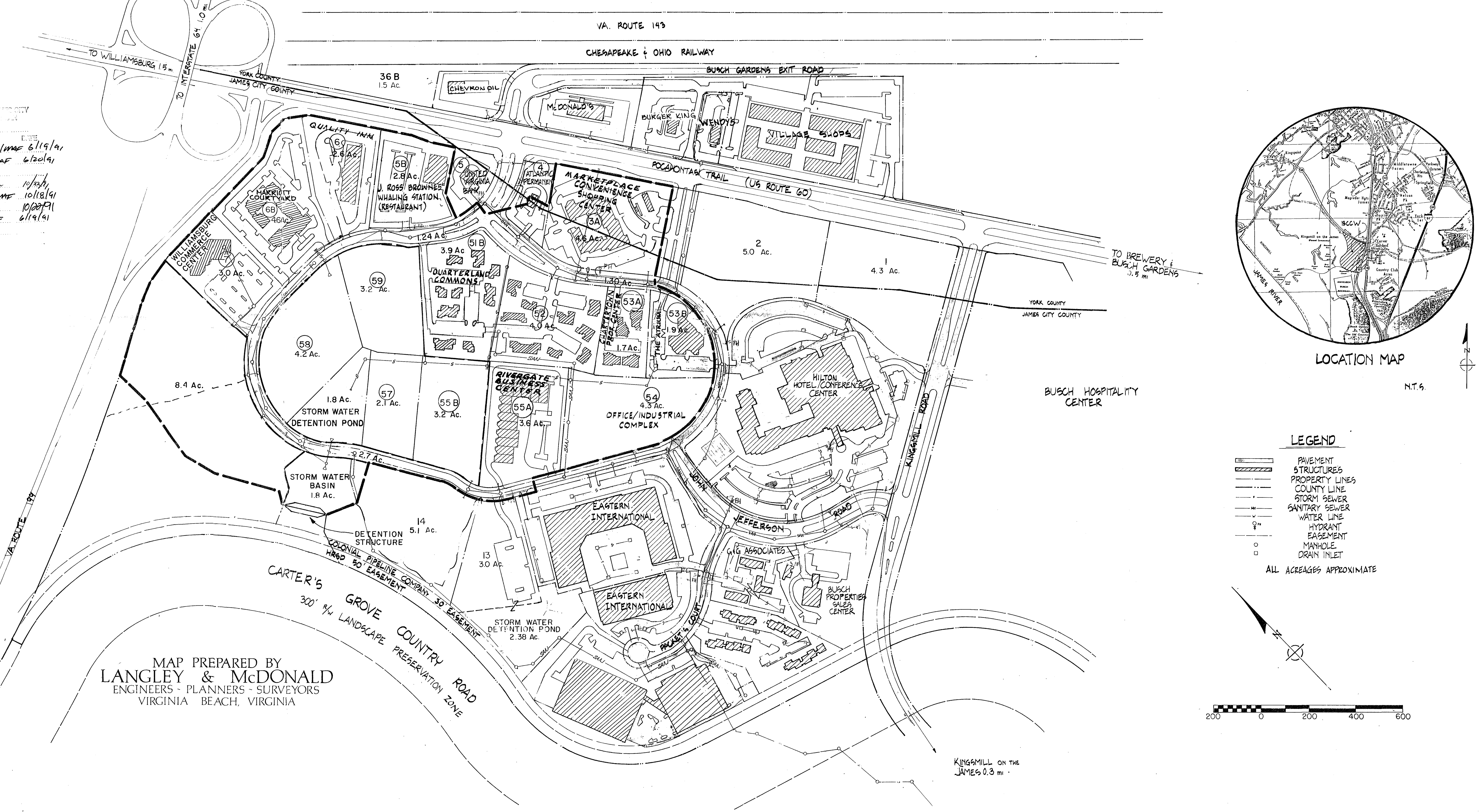
5. Construction Plan

SP62-91

BUSCH CORPORATE CENTER · WILLIAMSBURG

JAMES CITY COUNTY · YORK COUNTY · VIRGINIA

DRAINAGE AREAS
STORMWATER MANAGEMENT FACILITIES



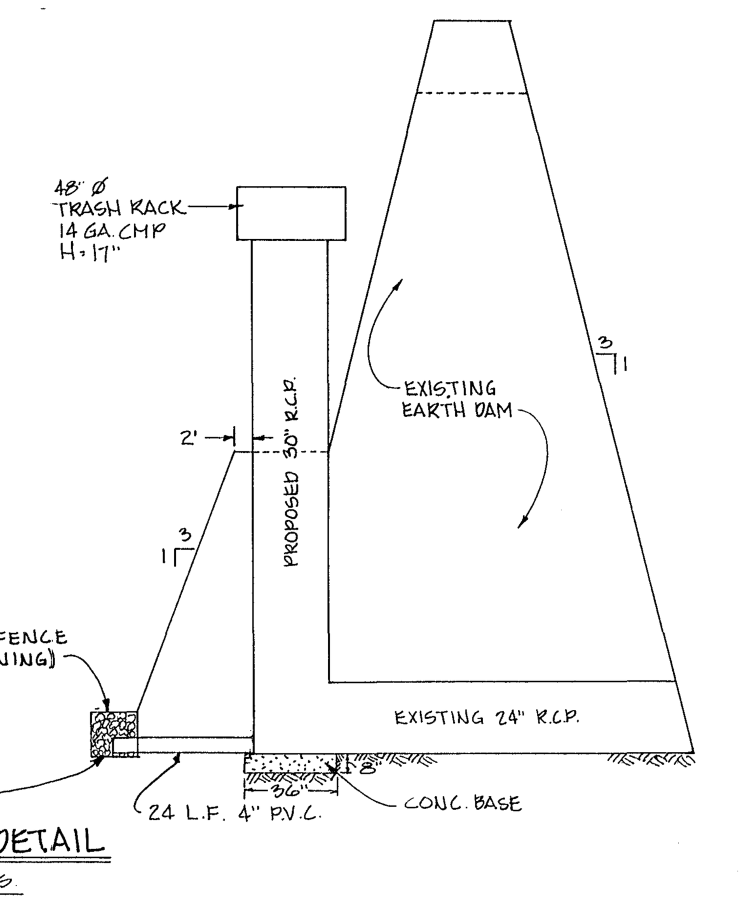
MAP PREPARED BY
LANGLEY & McDONALD
ENGINEERS - PLANNERS - SURVEYORS
VIRGINIA BEACH, VIRGINIA

L M Proj. # 74069B53 DWG. # 3923AW

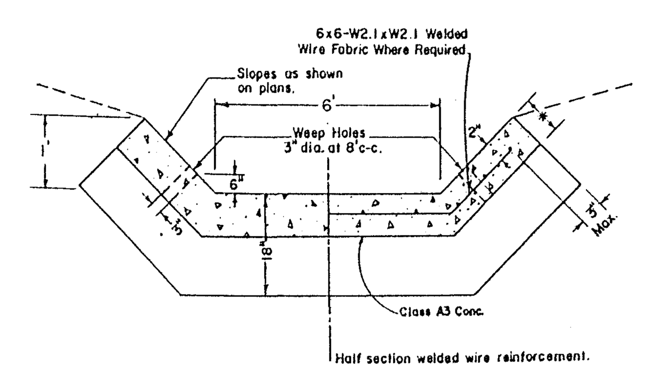
CC 002

OHW
72-39

TOP OF DAM ELEV. = 74.00
100 YR. STORM PEAK ELEV. = 72.20
EMERGENCY SPILLWAY ELEV. = 71.50
10 YR. STORM PEAK ELEV. = 70.08
2 YR. STORM PEAK ELEV. = 68.49
CREST OF STAND PIPE = 66.00
INVERT OF 3" DIA. ORIFICES = 64.00
(3 SPACED @ 120°) TYP.
INVERT OF 3" DIA. ORIFICES = 63.00
INVERT OF 3" DIA. ORIFICES = 62.25
ELEV. = 62.00



DAM DETAIL
N.T.S.

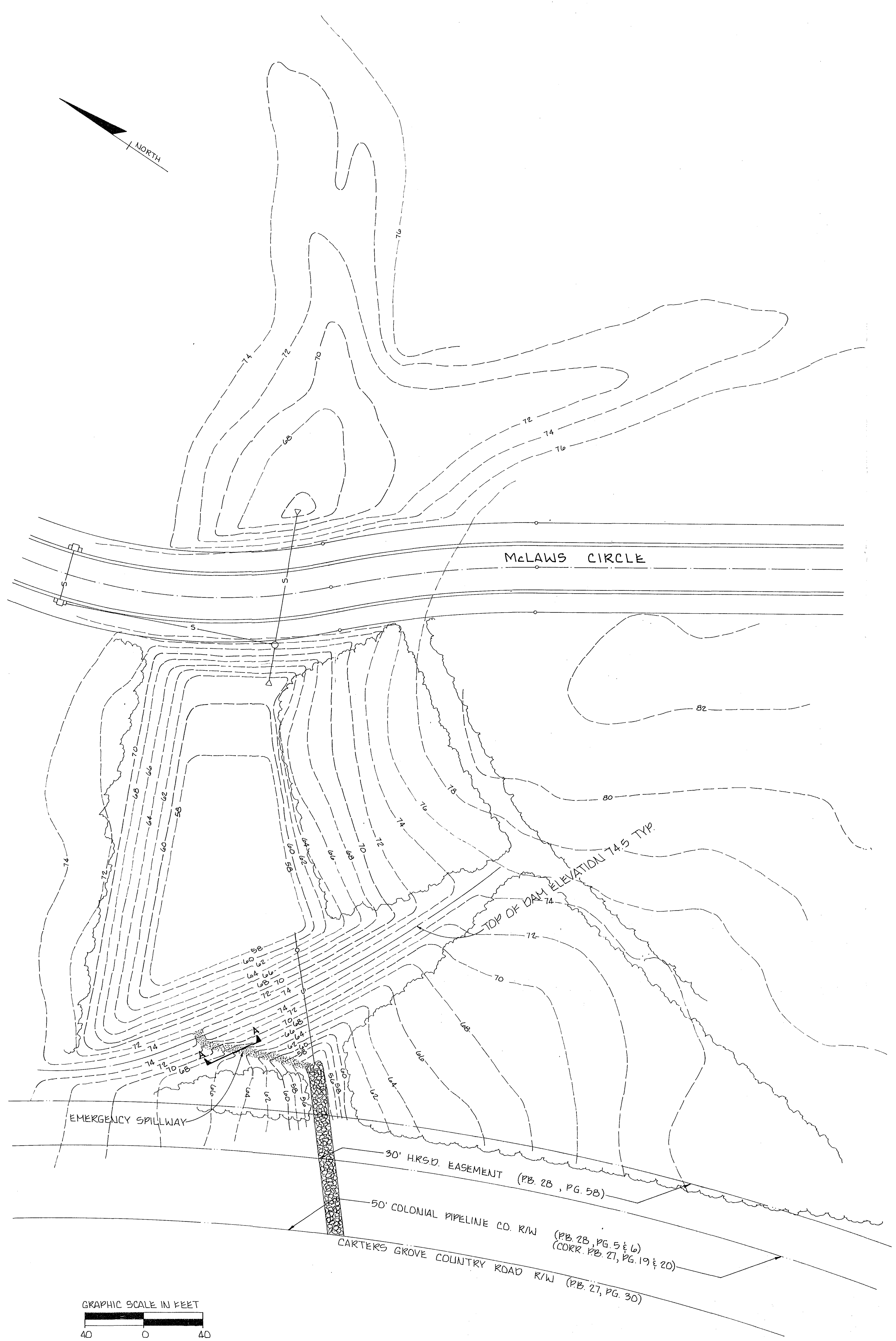


SECTION A-A
N.T.S.

GENERAL NOTES

1. ALL WORK TO BE IN ACCORDANCE WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION, "ROAD AND BRIDGE SPECIFICATIONS, DATED 1987, AND THE VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION, "ROAD DESIGN AND BRIDGE STANDARDS," 1986 UNLESS OTHERWISE NOTED.
2. VERTICAL CONTROL IS 0.00 NATIONAL OCEAN SURVEY M.S.L.
3. HORIZONTAL CONTROL BASED UPON VIRGINIA PLANE COORDINATE GRID SYSTEM SOUTH ZONE.
4. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR IS DIRECTED TO NOTIFY ALL APPLICABLE OWNERS OF UTILITIES OF THE LIMITS OF IMPENDING CONSTRUCTION IN ORDER THAT THE UTILITY COMPANIES MAY SAFEGUARD THEIR FACILITIES.

   ALL VIRGINIA POWER AND C&P FACILITIES REQUIRING RELOCATION ARE TO BE DONE SO BY AFOREMENTIONED UTILITIES AT CONTRACTOR'S EXPENSE.
5. ALL STORM SEWER PIPES AND DROP INLETS TO BE CLEANED OF DEBRIS AND ERODED MATERIAL AT LAST STAGES OF CONSTRUCTION.
6. ALL DRAINAGE STRUCTURES TO CONFORM TO VIRGINIA DEPARTMENT OF TRANSPORTATION, "ROAD DESIGNS AND STANDARDS," 1986 UNLESS OTHERWISE INDICATED.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING WITH MATCHING MATERIALS ANY PAVEMENT, DRIVEWAYS, WALKS, CURBS, ETC. THAT MUST BE CUT OR THAT ARE DAMAGED DURING CONSTRUCTION.
8. ALL CONCRETE TO BE CLASS "A-3" AIR ENTRAINED (3,000 PSI).
9. CONTRACTOR SHALL NOT COMMENCE WORK SHOULD RAIN BE FORECAST WITHIN 72 HOURS.



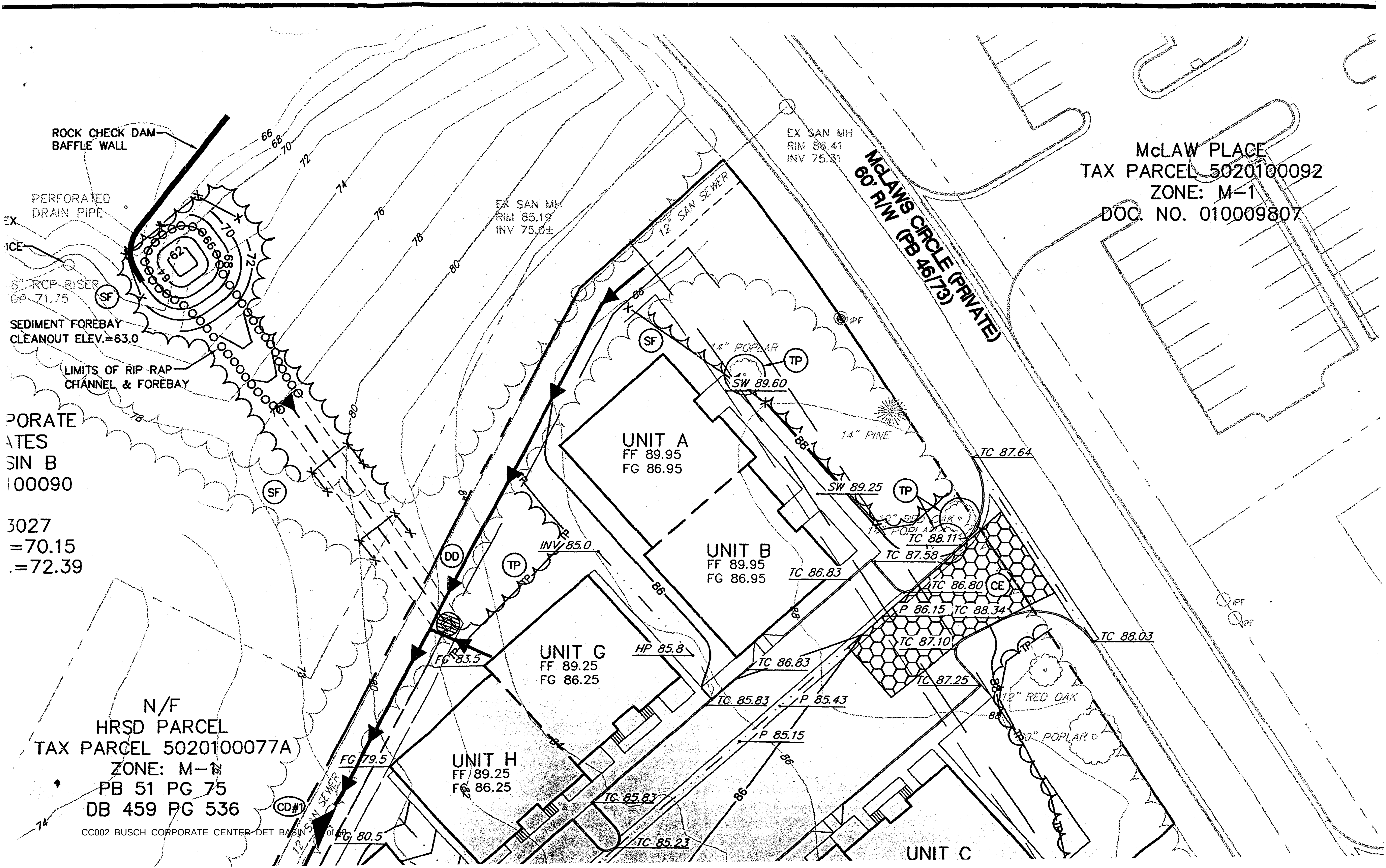
NOTE: VDOT IS NOT RESPONSIBLE FOR THE DETENTION POND OR ANY OF ITS APPURTENANCES.

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS•PLANNERS•SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

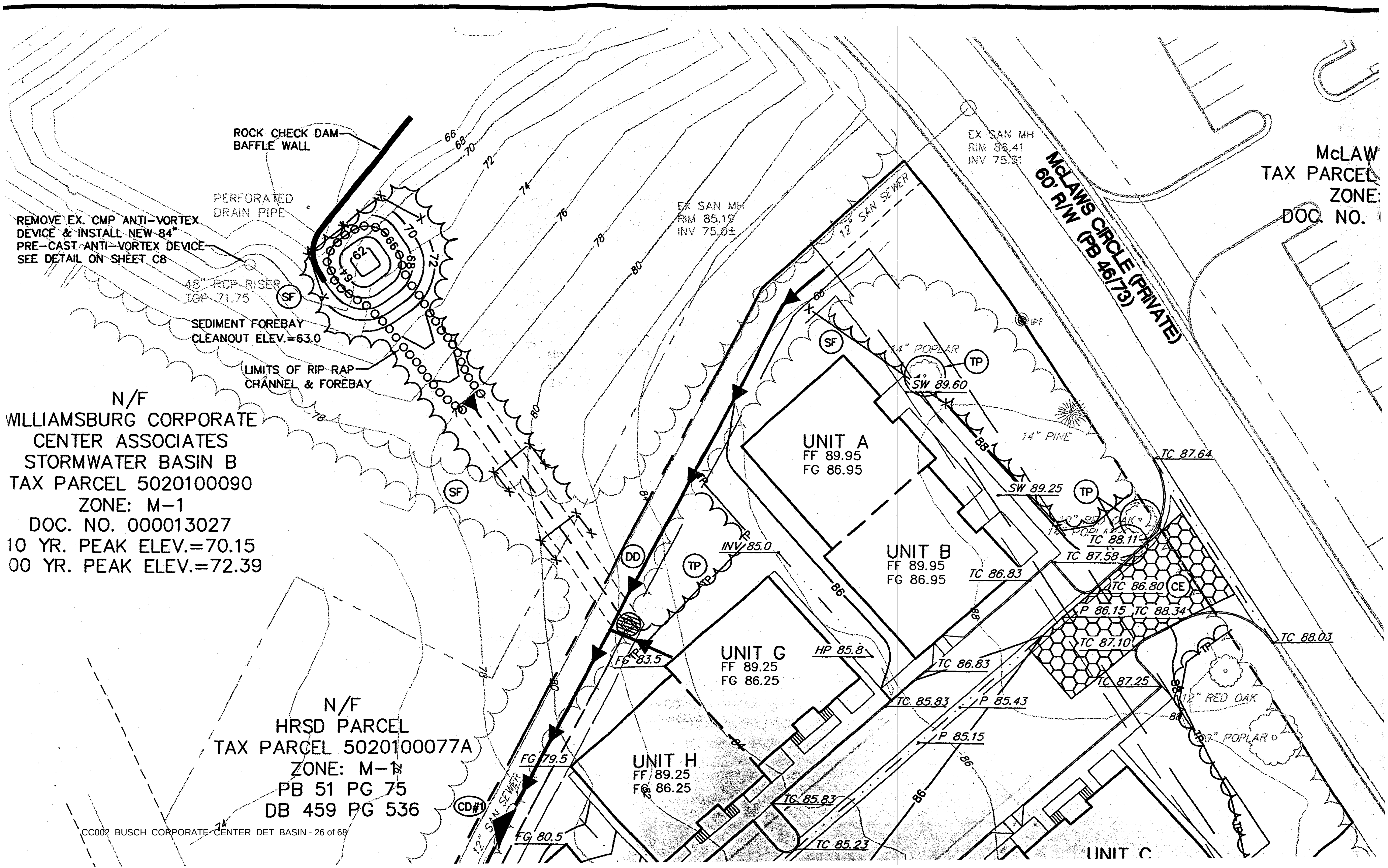
DES.	SAK
DWN.	CLJ
CHK.	NHH
DATE	3-29-91

BUSCH CORPORATE CENTER - WILLIAMSBURG
McLAWS CIRCLE DETENTION BASIN
WATER QUALITY IMPROVEMENT MODIFICATIONS
CONVERT 24" RCP CULVERT TO 30" RCP STAND PIPE
PLAN AMENDING SP 93-87

PROJ. NO.	74069893
SCALE:	1" = 40'
SHEET 1 OF 1	
DWG.	3923W



ROCK CHECK DAM
BAFFLE WALL
PERFORATED
DRAIN PIPE
8" RCP RISER
TOP 71.75
SEDIMENT FOREBAY
CLEANOUT ELEV.=63.0
LIMITS OF RIP RAP
CHANNEL & FOREBAY
EX SAN MH
RIM 85.19
INV 75.0±
EX SAN MH
RIM 86.41
INV 75.31
12" SAN SEWER
McLAWS CIRCLE (PRIVATE)
60' R/W (PB 46/73)
McLAW PLACE
TAX PARCEL 5020100092
ZONE: M-1
DOC. NO. 010009807
14" POPLAR
14" PINE
SW 89.60
SW 89.25
UNIT A
FF 89.95
FG 86.95
UNIT B
FF 89.95
FG 86.95
UNIT G
FF 89.25
FG 86.25
UNIT H
FF 89.25
FG 86.25
UNIT C
TC 87.64
TC 88.11
TC 87.58
TC 86.83
TC 86.80
P 86.15
TC 88.34
TC 87.10
TC 88.03
TC 87.25
TC 86.83
TC 85.83
P 85.43
P 85.15
TC 85.83
TC 85.23
12" RED OAK
INV 85.0
HP 85.8
FG 83.5
FG 79.5
FG 80.5
N/F
HRSD PARCEL
TAX PARCEL 5020100077A
ZONE: M-1
PB 51 PG 75
DB 459 PG 536
=70.15
=72.39



ROCK CHECK DAM
BAFFLE WALL
PERFORATED
DRAIN PIPE
REMOVE EX. CMP ANTI-VORTEX
DEVICE & INSTALL NEW 84"
PRE-CAST ANTI-VORTEX DEVICE
SEE DETAIL ON SHEET C8
48" RCP RISER
TOP 71.75
SEDIMENT FOREBAY
CLEANOUT ELEV.=63.0
LIMITS OF RIP RAP
CHANNEL & FOREBAY
N/F
WILLIAMSBURG CORPORATE
CENTER ASSOCIATES
STORMWATER BASIN B
TAX PARCEL 5020100090
ZONE: M-1
DOC. NO. 000013027
10 YR. PEAK ELEV.=70.15
00 YR. PEAK ELEV.=72.39
N/F
HRSD PARCEL
TAX PARCEL 5020100077A
ZONE: M-1
PB 51 PG 75
DB 459 PG 536
EX SAN MH
RIM 85.19
INV 75.0±
EX SAN MH
RIM 86.41
INV 75.31
McLAWS CIRCLE (PRIVATE)
60' R/W (PB 46/73)
12" SAN SEWER
McLAW
TAX PARCEL
ZONE:
DOC. NO.
UNIT A
FF 89.95
FG 86.95
UNIT B
FF 89.95
FG 86.95
UNIT G
FF 89.25
FG 86.25
UNIT H
FF 89.25
FG 86.25
UNIT C
14" POPLAR
14" PINE
12" RED OAK
SW 89.60
SW 89.25
TC 87.64
TC 88.11
TC 87.58
TC 86.83
TC 86.80
P 86.15
TC 88.34
TC 87.10
TC 88.03
TC 87.25
TC 86.83
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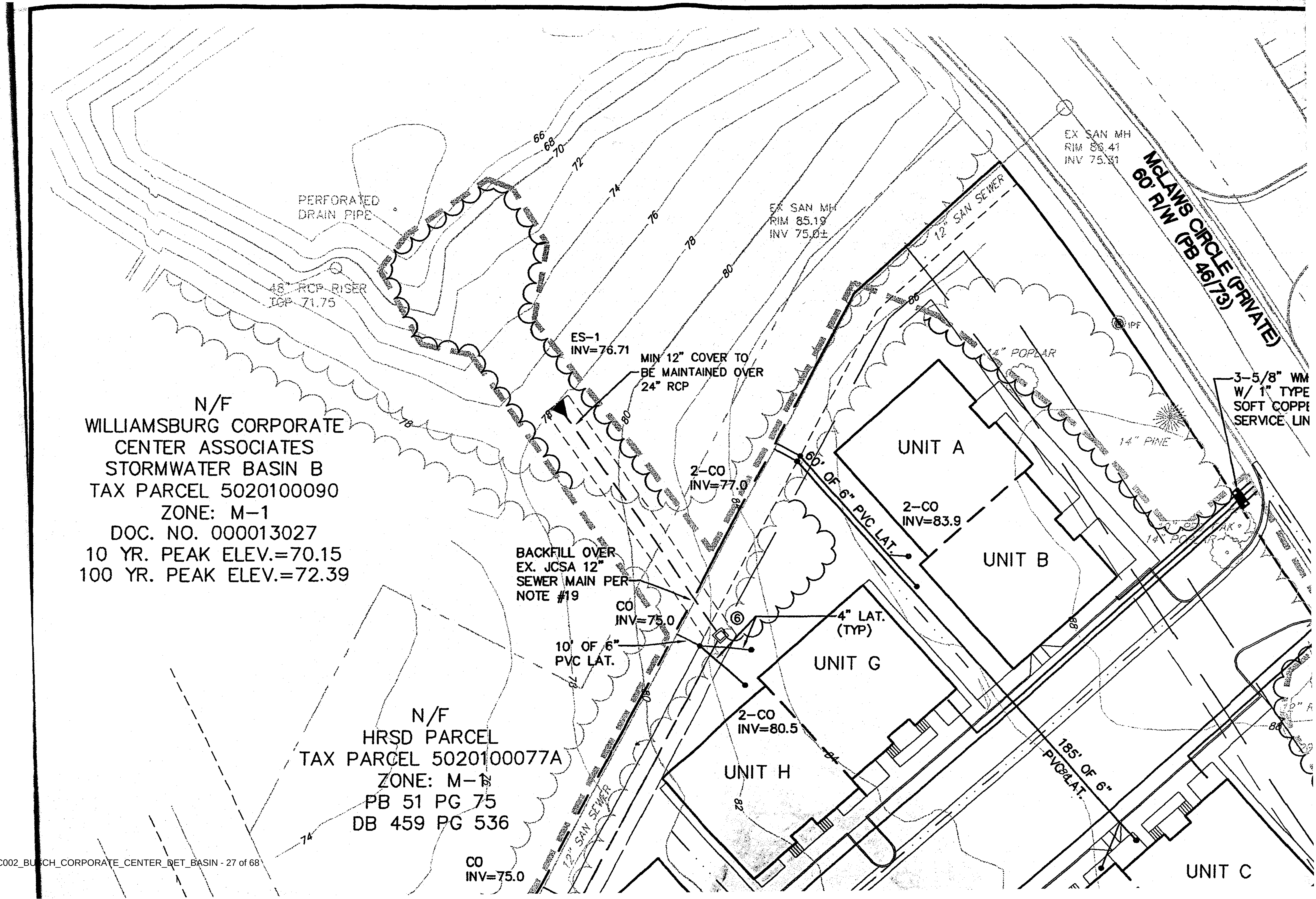
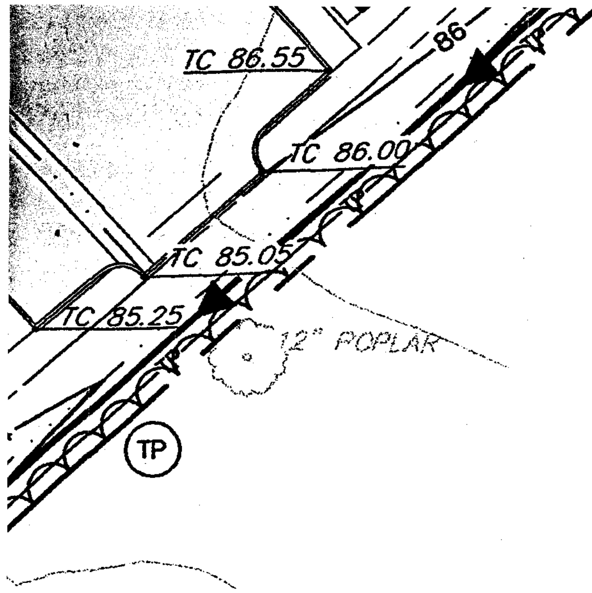
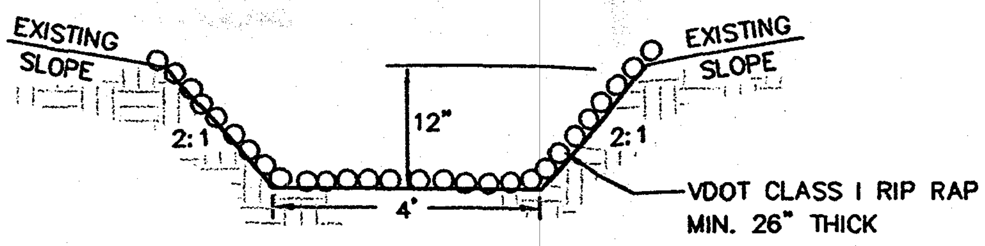
TC 85.83
TC 85.23
HP 85.8
INV 85.0
FG 83.5
FG 79.5
FG 80.5
SF
TP
DD
CE
CD#1
IPF


PERFORATED DRAIN PIPE
48" RCP RISER TOP 71.75
EX SAN MH RIM 85.19 INV 75.0±
EX SAN MH RIM 86.41 INV 75.31
McLAWS CIRCLE (PRIVATE) 60' R/W (PB 46/73)
12" SAN SEWER
ES-1 INV=76.71
MIN 12" COVER TO BE MAINTAINED OVER 24" RCP
N/F
WILLIAMSBURG CORPORATE CENTER ASSOCIATES
STORMWATER BASIN B
TAX PARCEL 5020100090
ZONE: M-1
DOC. NO. 000013027
10 YR. PEAK ELEV.=70.15
100 YR. PEAK ELEV.=72.39
2-CO INV=77.0
60' OF 6" PVC LAT.
2-CO INV=83.9
UNIT A
UNIT B
14" POPLAR
14" PINE
IPF
3-5/8" WM W/ 1" TYPE SOFT COPPE SERVICE LIN
BACKFILL OVER EX. JCSA 12" SEWER MAIN PER NOTE #19
CO INV=75.0
4" LAT. (TYP)
10' OF 6" PVC LAT.
UNIT G
2-CO INV=80.5
UNIT H
185' OF 6" PVC LAT.
N/F
HRSD PARCEL
TAX PARCEL 5020100077A
ZONE: M-1
PB 51 PG 75
DB 459 PG 536
12" SAN SEWER
CO INV=75.0
UNIT C

A PORTION OF
BUSCH PROPERTIES, INC.
TAX PARCEL 5020100094
ZONE: M-1



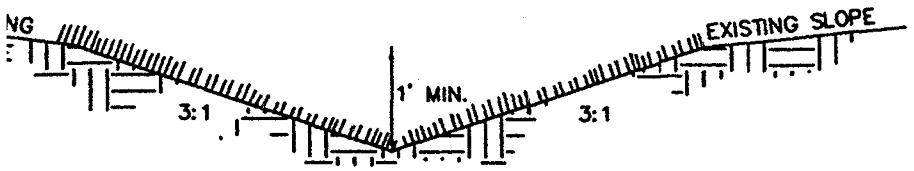


RIP RAP CHANNEL

LEGEND

SILT FENCE	SF
INLET PROTECTION	IP
LIMITS OF CLEARING/ LIMITS OF WORK	
SWALE/DITCH	
CONSTRUCTION ENTRANCE	CE
FINISHED FLOOR ELEVATION	FF
FINISHED GRADE ELEVATION AT BUILDING CORNER	FG
SIDEWALK ELEVATION	SW
PAVEMENT ELEVATION	P
TREE PROTECTION	TP
CHECK DAM	CD
DIVERSION DIKE	DD

TREE PROTECTION FENCE TO BE ORANGE MESH OR SNOW FENCING.



GRASS SWALE DETAIL

ROCK CHECK DAM BAFFLE WALL

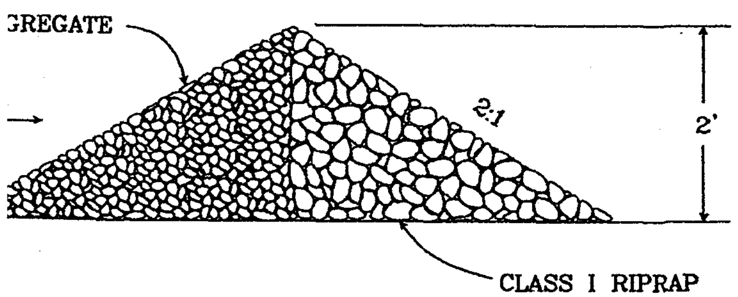
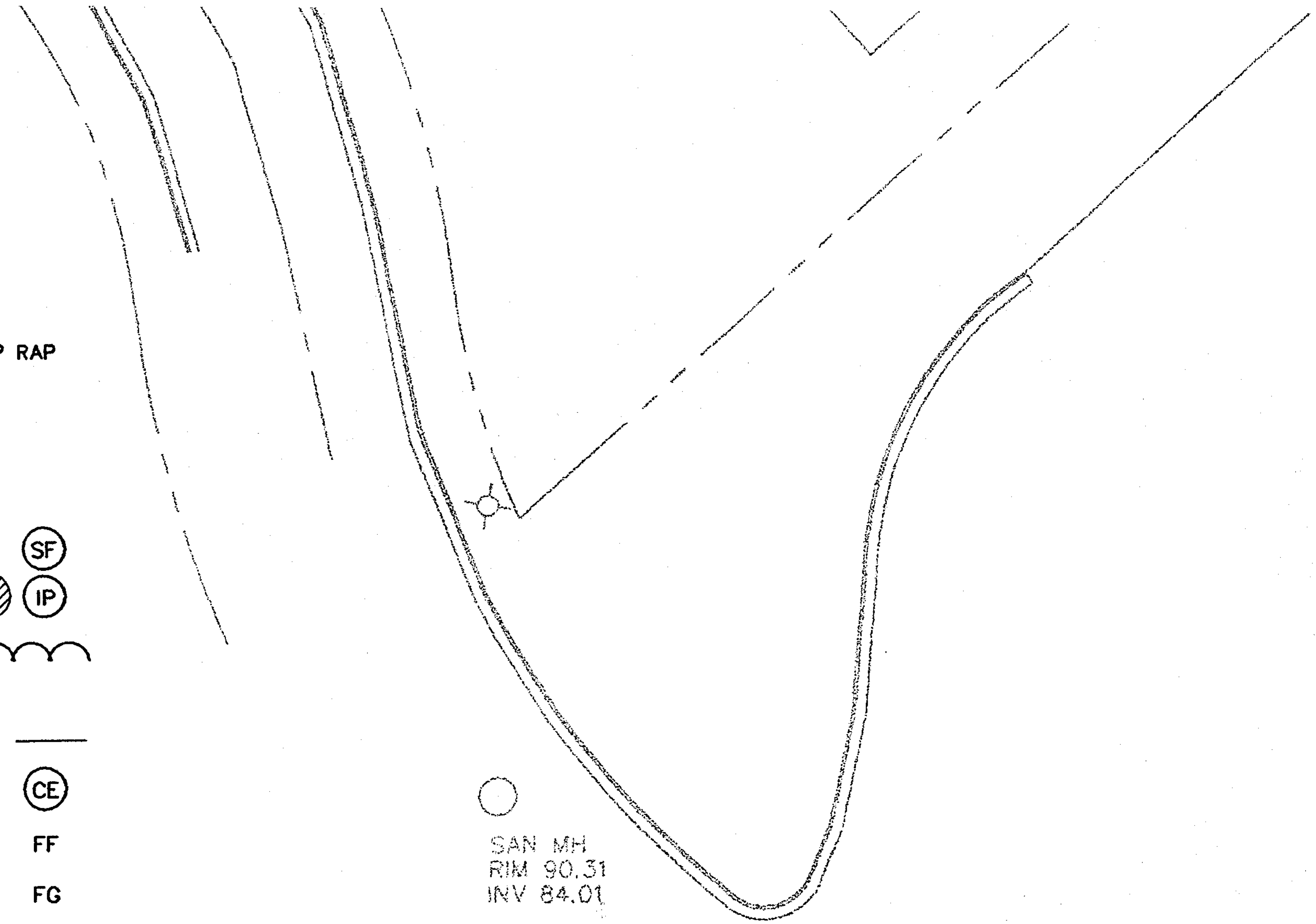


PLATE. 3.20-1



OFF-SITE BMP PROTECTION
THE EXISTING OFF-SITE BMP LOCATED TO THE NORTHWEST OF THE SITE IS NOT DESIGNED FOR SEDIMENT CONTROL. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT SEDIMENT DOES NOT MIGRATE FROM THE SITE TO THE EXISTING BMP. IF SEDIMENT DOES MIGRATE TO THE EXISTING BMP IT WILL BE THE CONTRACTORS REPONSIBILITY TO PROTECT THE BMP FROM FURTHER DEGREDATION BY INSTALLING ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES, REMOVING THE ACCUMULATED SEDIMENT AND RESTORING THE BMP TO ORIGINAL CONDITION. THESE RESTORATION REQUIREMENTS WILL NEED TO BE COORDINATED WITH THE OWNER, ENGINEER, AND THE COUNTY.

PERMANENT STABILIZATION
ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT SEEDING IMMEDIATELY FOLLOWING FINISH GRADING. SEEDING SHALL BE DONE WITH KENTUCKY 31 TALL FESCUE ACCORDING TO STD. & SPEC. 3.32, "PERMANENT SEEDING", OF THE HANDBOOK. EROSION BLANKETS WILL BE INSTALLED OVER FILL SLOPES WHICH HAVE BEEN BROUGHT TO FINAL GRADE AND HAVE BEEN SEEDED TO PROTECT THE SLOPES FROM RILL AND GULLY EROSION TO ALLOW THE SEED TO GERMINATE PROPERLY. MULCH (STRAW OR FIBER) WILL BE USED ON RELATIVELY FLAT AREAS. IN ALL SEEDING OPERATIONS, SEED, FERTILIZER AND LIME WILL BE APPLIED PRIOR TO MULCHING.

MAINTENANCE
IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED DAILY AND AFTER SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. THE CHECK DAMS WILL BE CHECKED REGULARLY FOR SEDIMENT CLEANOUT.

2. THE GRAVEL OUTLETS WILL BE CHECKED REGULARLY FOR A SEDIMENT BUILDUP WHICH WILL PREVENT DRAINAGE. IF THE GRAVEL IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.

3. THE SEEDED AREAS WILL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RESEEDED AS NEEDED.

PI
1.
2.
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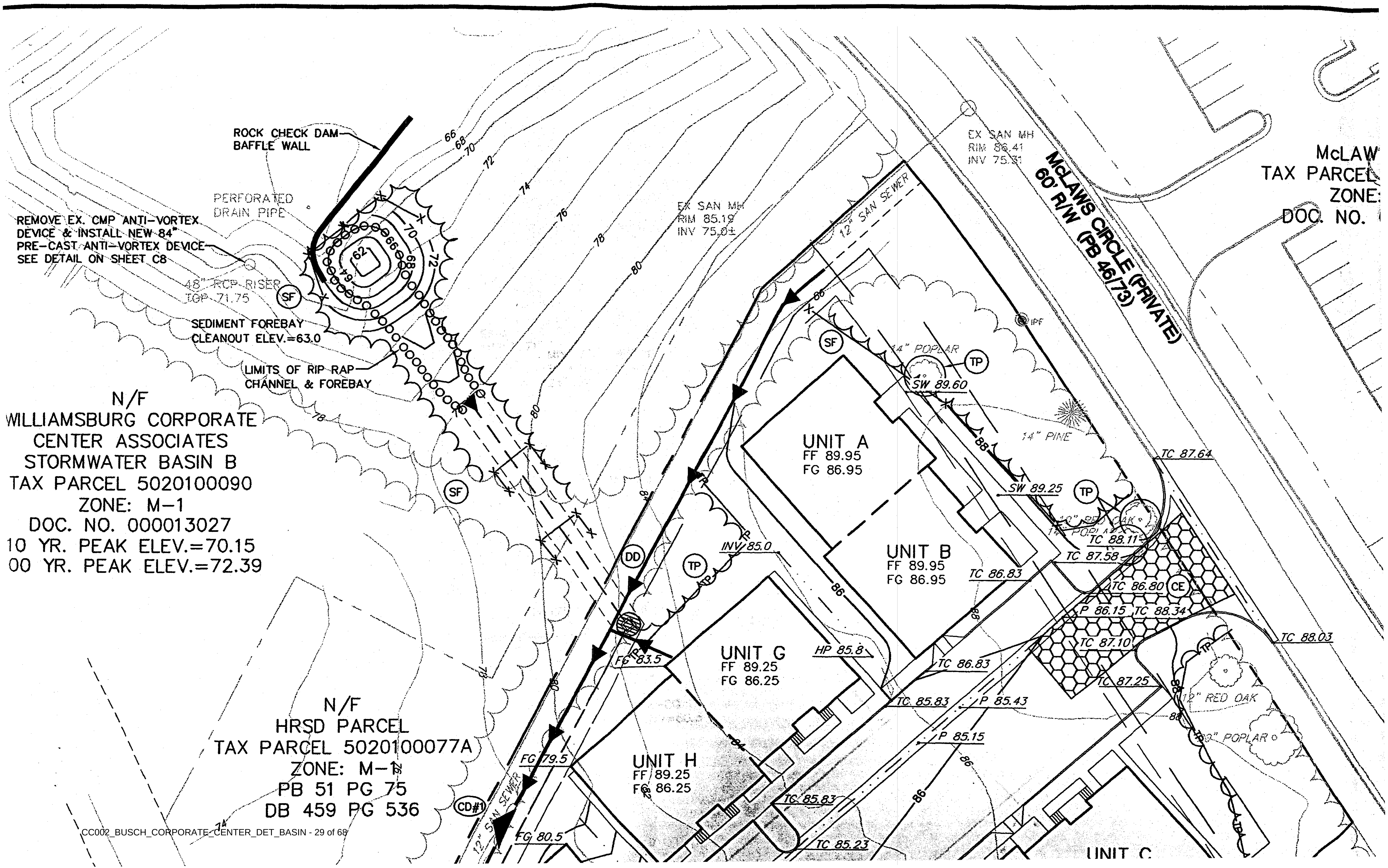
11
12
13
14


ROCK CHECK DAM
BAFFLE WALL
PERFORATED
DRAIN PIPE
REMOVE EX. CMP ANTI-VORTEX
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SEE DETAIL ON SHEET C8
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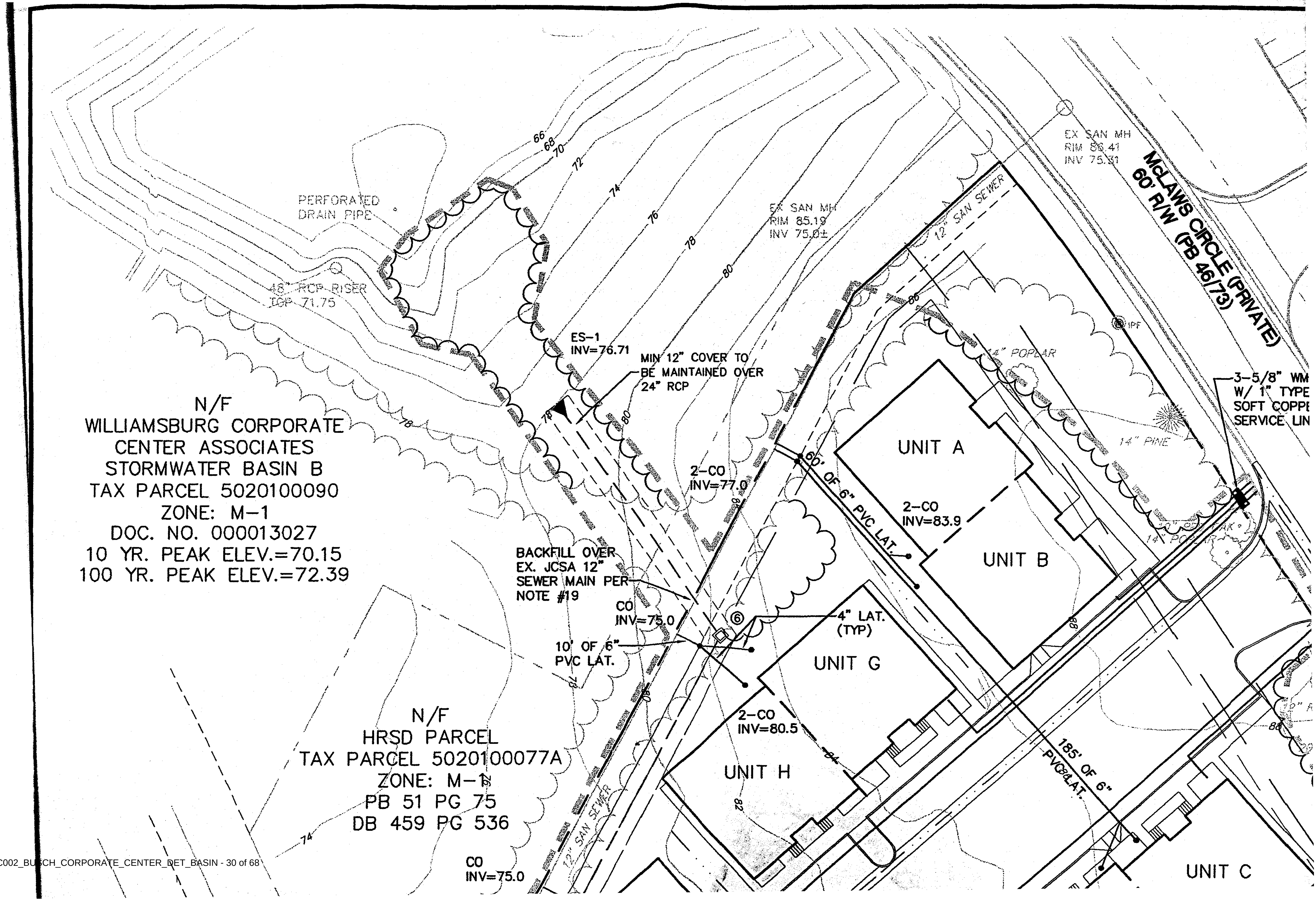
TOP 71.75
SEDIMENT FOREBAY
CLEANOUT ELEV.=63.0
LIMITS OF RIP RAP
CHANNEL & FOREBAY
N/F
WILLIAMSBURG CORPORATE
CENTER ASSOCIATES
STORMWATER BASIN B
TAX PARCEL 5020100090
ZONE: M-1
DOC. NO. 000013027
10 YR. PEAK ELEV.=70.15
00 YR. PEAK ELEV.=72.39
N/F
HRSD PARCEL
TAX PARCEL 5020100077A
ZONE: M-1
PB 51 PG 75
DB 459 PG 536
EX SAN MH
RIM 85.19
INV 75.0±
EX SAN MH
RIM 86.41
INV 75.31
McLAWS CIRCLE (PRIVATE)
60' R/W (PB 46/73)
McLAW
TAX PARCEL
ZONE:
DOC. NO.
12" SAN SEWER
14" POPLAR
SW 89.60
14" PINE
SW 89.25
TC 87.64
UNIT A
FF 89.95
FG 86.95
UNIT B
FF 89.95
FG 86.95
UNIT G
FF 89.25
FG 86.25
UNIT H
FF 89.25
FG 86.25
UNIT C
INV 85.0
HP 85.8
FG 83.5
FG 79.5
FG 80.5
TC 86.83
TC 88.11
TC 87.58
TC 86.80
P 86.15
TC 88.34
TC 87.10
TC 88.03
TC 87.25
TC 85.83
P 85.43
P 85.15
TC 85.83
TC 85.23
12" RED OAK
30" POPLAR
SF
TP
DD
CE
CD#1


N/F
WILLIAMSBURG CORPORATE
CENTER ASSOCIATES
STORMWATER BASIN B
TAX PARCEL 5020100090
ZONE: M-1
DOC. NO. 000013027
10 YR. PEAK ELEV.=70.15
100 YR. PEAK ELEV.=72.39
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48" RCP RISER
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ES-1
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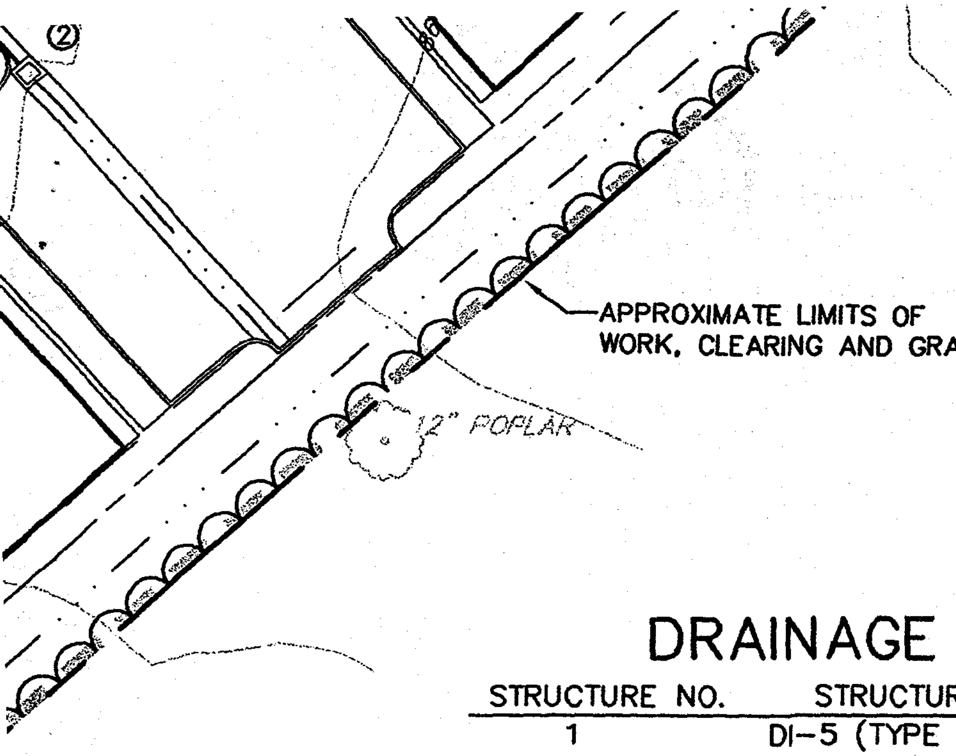
24" RCP
EX SAN MH
RIM 85.19
INV 75.0±
EX SAN MH
RIM 86.41
INV 75.31
McLAWS CIRCLE (PRIVATE)
60' R/W (PB 46/73)
12" SAN SEWER
IPF
14" POPLAR
14" PINE
3-5/8" WM
W/ 1" TYPE
SOFT COPPE
SERVICE LIN
UNIT A
UNIT B
UNIT G
UNIT H
UNIT C
2-CO
INV=77.0
2-CO
INV=83.9
2-CO
INV=80.5
60' OF 6" PVC LAT.
BACKFILL OVER
EX. JCSA 12"
SEWER MAIN PER
NOTE #19
CO
INV=75.0
4" LAT.
(TYP)
10' OF 6"
PVC LAT.
185' OF 6"
PVC LAT.
N/F
HRSD PARCEL
TAX PARCEL 5020100077A
ZONE: M-1
PB 51 PG 75
DB 459 PG 536
12" SAN SEWER
CO
INV=75.0



A PORTION OF PARCEL C
BUSCH PROPERTIES, INC.
TAX PARCEL 5020100094
ZONE: M-1

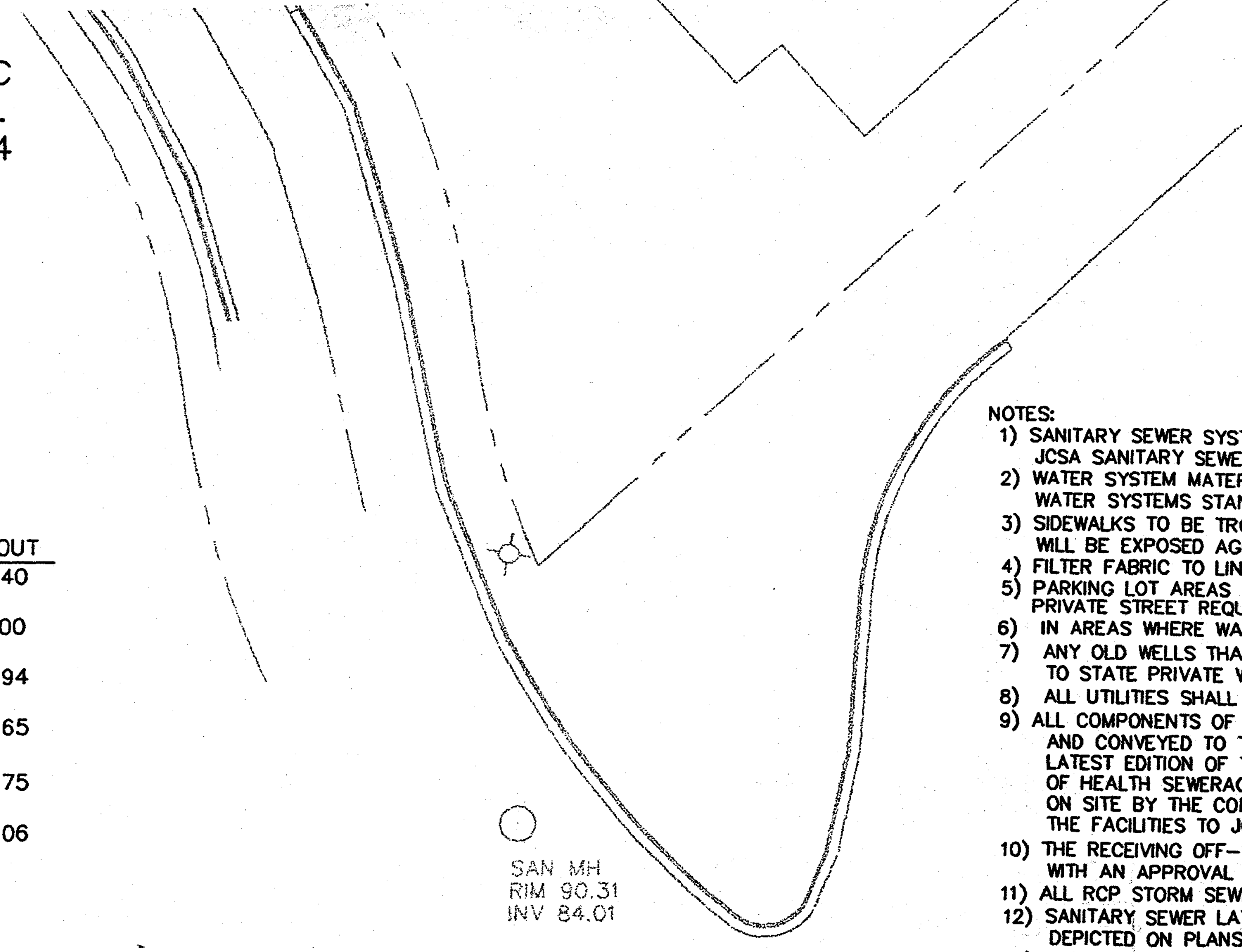
POSED 15' PRIVATE
NAGE EASEMENT

DRAINAGE STRUCTURE TABLE

STRUCTURE NO.	STRUCTURE TYPE	RIM	INV. IN	INV. OUT
1	DI-5 (TYPE III GRATE)	81.90		78.40
2	DI-1	83.95		81.00
3	DI-1	82.32	78.04	77.94
4	DI-1	84.43	78.75	78.65
5	MH-1	83.00	77.85	77.75
6	DI-7	81.50	77.16	77.06

STORM SEWER TABLE

STRUCTURE FROM	STRUCTURE TO	PIPE
1	3	120' OF 21" RCP @ 0.3%
3	5	30' OF 24" RCP @ 0.3%
2	4	55' OF 15" RCP @ 4.09%
4	3	135' OF 15" RCP @ 0.45%
5	6	200' OF 24" RCP @ 0.3%
6	ES-1	100' OF 24" RCP @ 0.3%



NOTES:
1) SANITARY SEWER SYSTEM
JCSA SANITARY SEWER
2) WATER SYSTEM MATERIAL
WATER SYSTEMS STAND
3) SIDEWALKS TO BE TROWL
WILL BE EXPOSED AGGRE
4) FILTER FABRIC TO LINE
5) PARKING LOT AREAS SHA
PRIVATE STREET REQUIRE
6) IN AREAS WHERE WATER
7) ANY OLD WELLS THAT M
TO STATE PRIVATE WELL
8) ALL UTILITIES SHALL BE
9) ALL COMPONENTS OF THE
AND CONVEYED TO THE
LATEST EDITION OF THE
OF HEALTH SEWERAGE R
ON SITE BY THE CONTRA
THE FACILITIES TO JCSA.
10) THE RECEIVING OFF-SITE
WITH AN APPROVAL DAT
11) ALL RCP STORM SEWER P
12) SANITARY SEWER LATERA
DEPICTED ON PLANS.
13) WATER SERVICE LINES TO
ON PLANS.
14) CONTRACTOR IS RESPONS
MAIN WITHIN THE PROJEC
EASEMENT. CONTRACTO
15) ALL STORM DRAIN ACCES
16) THE ONLY OFFSITE LAND
STORMWATER EASEMENT
17) THE ON-SITE SOILS CONS
SURVEY OF JAMES CITY
APRIL 1985.
18) ALL STORM DRAIN ACCES
19) A SAND "CUSHION" FROM
UPPER PIPE, AT LEAST T

6. Design Calculations

MCLAWS CENTRE
BUSCH CORPORATE CENTER

DRAINAGE CALCULATIONS

November 5, 2001
(Revised January 14, 2002)
(Revised January 30, 2002)

Rickmond
ENGINEERING, INC.

Project No. 01183

SP-119-01

1643 Merrimac Trail
Williamsburg, VA 23185
Phone: 757-229-1776
Fax: 757-229-4683

Vint Hill • P.O.Box 861647
Warrenton, VA 20187
Phone: 540-349-7730
Fax: 540-349-7731

www.rickmond.com

MCLAWS CENTRE
BUSCH CORPORATE CENTER

DRAINAGE CALCULATIONS

November 5, 2001
(Revised January 14, 2002)
(Revised January 30, 2002)

Rickmond ENGINEERING, INC.

COMMONWEALTH OF VIRGINIA
K.M. Jenkins II
K.M. JENKINS II
No.022872
1/30/02
PROFESSIONAL ENGINEER

Project No. 01183

1643 Merrimac Trail
Williamsburg, VA 23185
Phone: 757-229-1776
Fax: 757-229-4683

Vint Hill • P.O.Box 861647
Warrenton, VA 20187
Phone: 540-349-7730
Fax: 540-349-7731

www.rickmond.com

TABLE OF CONTENTS

PROJECT DESCRIPTION

This project consists of a 2.78-acre parcel of land located on McLaws Circle in the Busch Corporate Center. The site will contain nine office buildings totaling 21,200 sq. ft. with 86 parking spaces, sidewalks, and landscaping. The site is served by public water and sewer.

EXISTING CONDITIONS

Currently, the entire site is wooded and slopes from McLaws Circle and the rear to the middle.

ADJACENT AREAS

The site is bounded on the north by McLaws Circle (private road). Directly across McLaws Circle from the site, two parcels containing office buildings are currently under construction. The site is bounded on the west and east by undeveloped land in the corporate park and on the south by Carters Grove Country Road.

OFF-SITE AREAS

The only off-site area to be disturbed is the 20' wide path to install storm sewer pipe from the site to the existing Stormwater Basin B.

SOILS

The on-site soils consist of Kempsville-Emporia fine sandy loams (19B).

Kempsville-Emporia fine sandy loams are deep, gently sloping, and well-drained soils.

Typically, the surface layer of this Kempsville soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 10 inches thick.

The subsoil extends to a depth of 55 inches. It is yellowish brown and strong brown fine sandy loam and sandy clay loam to a depth of 32 inches. Below this, the subsoil is mottled fine sandy loam that is somewhat firm and compact over yellowish brown fine sandy loam. The substratum is yellowish brown fine sandy loam to a depth of at least 68 inches.

Typically, the surface layer of this Emporia soils is dark grayish brown fine sandy loam about 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 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.

The permeability of the Kempsville soil is moderate. In the Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The erosion hazard for each soil is moderate.

CRITICAL EROSION AREAS

The critical erosion area of this site is the downstream rip rap channel and detention pond. To prevent sediment from entering these areas it is imperative that the contractor install all erosion and sediment control measures shown on these plans before any land disturbing activities commence. Regular inspection and maintenance is also required for all erosion and sediment control measure to keep them functioning as designed.

Erosion and Sediment Control Measures

The following erosion and sediment (E&S) control measures are used on-site:

- A construction entrance is installed at the entrance to reduce the amount of mud transported onto paved public roads by motor vehicles and runoff.

- Inlet protection is installed at all drainage inlets to prevent sediment from entering the storm drainage systems prior to permanent stabilization for the disturbed area.

- Sediment trap is installed to detain sediment laden runoff from upstream disturbed areas long enough to allow the majority of the sediment to settle out.

- Soil stabilization matting will be used on all slopes steeper than 3:1 to aid in controlling erosion by providing a microclimate which protects young vegetation and promotes its establishment.

- Diversion dike is used to divert sediment-laden runoff from a disturbed area to a sediment trap.

- Tree protection will be used to protect desirable trees during land disturbing activities.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be done with Kentucky 31 Tall Fescue according to Std, and Spec. 3.32, PERMANENT SEEDING, of the handbook. Erosion control blankets will be installed over fill slopes which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

STORMWATER MANAGEMENT

The site drains to a previously approved detention pond, which meets the requirements of James City County for water quality and quantity. The detention pond is shown on JCC Plan SP-62-91 and was approved on 10/22/91.

MAINTENANCE

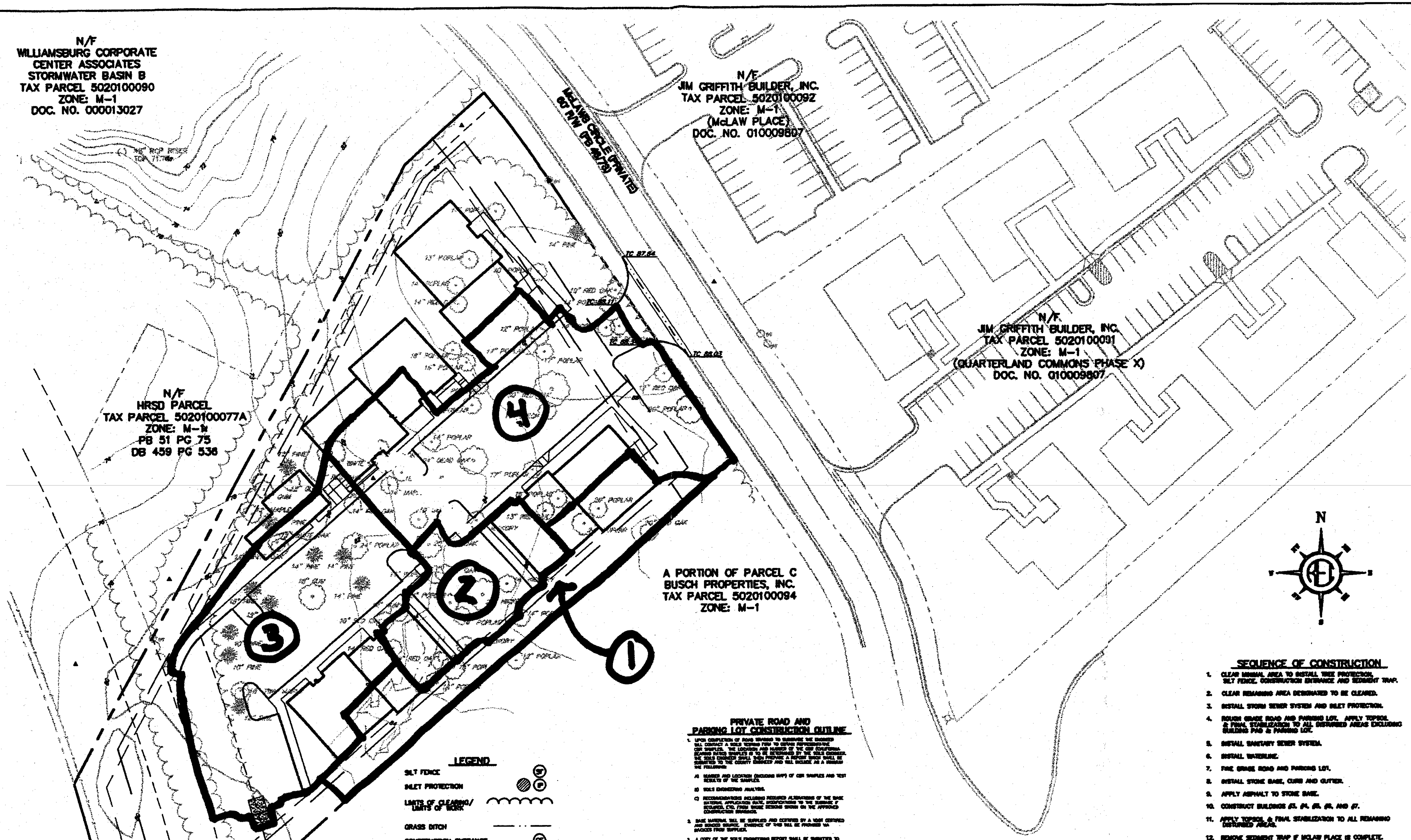
In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

- The sediment trap will be checked regularly for sediment cleanout.

- The gravel outlets will be checked regularly for a sediment buildup which will prevent drainage. If the gravel is clogged by sediment, it shall be removed and cleaned or replaced.

- The seeded areas will be checked regularly to ensure that a good stand is maintained. Areas should be fertilized and reseeded as needed.

- The diversion dikes shall be inspected after every storm and repairs made to the dike, flow channel, outlet or sediment trapping facility, as necessary. Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.



LEGEND

SILT FENCE	SF
INLET PROTECTION	IP
LIMITS OF CLEARING/ LIMITS OF WORK	
GRASS DITCH	
CONSTRUCTION ENTRANCE	CE
FINISHED FLOOR ELEVATION	FF
FINISHED GRADE ELEVATION AT BUILDING CORNER	FG
TREE PROTECTION	—TP— TP
SEDIMENT TRAP	ST

TREE PROTECTION FENCE TO BE ORANGE MESH OR SNOW FENCING.

PERMANENT STABILIZATION

ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT SEEDING IMMEDIATELY FOLLOWING FINISH GRADING. SEEDING SHALL BE DONE WITH KENTUCKY 31 TALL FESCUE ACCORDING TO STD. & SPEC. 3.32, "PERMANENT SEEDING", OF THE HANDBOOK. EROSION BLANKETS WILL BE INSTALLED OVER FILL SLOPES WHICH HAVE BEEN BROUGHT TO FINAL GRADE AND HAVE BEEN SEEDED TO PROTECT THE SLOPES FROM RILL AND GULLY EROSION TO ALLOW THE SEED TO GERMINATE PROPERLY. MULCH (STRAW OR FIBER) WILL BE USED ON RELATIVELY FLAT AREAS. IN ALL SEEDING OPERATIONS, SEED, FERTILIZER AND LIME WILL BE APPLIED PRIOR TO MULCHING.

PRIVATE ROAD AND PARKING LOT CONSTRUCTION OUTLINE

1. UPON COMPLETION OF ROAD GRADING TO SUBGRADE THE ENGINEER WILL CONTACT A SOILS TESTING FIRM TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF THE CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL BE SUBMITTED TO THE COUNTY ENGINEER AND WILL INCLUDE AS A MINIMUM THE FOLLOWING:
   A) NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.
   B) SOILS ENGINEERING ANALYSIS.
   C) RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE, MODIFICATIONS TO THE SUBGRADE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
2. BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
3. A COPY OF THE SOILS ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE SOILS ENGINEER'S REPORT, BASE MATERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY SOILS ENGINEER RECOMMENDATIONS) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE BASE MATERIAL AT LEAST ONCE EVERY 200 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BASE MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.
4. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
5. AFTER THE BITUMINOUS CONCRETE HAS BEEN PLACED AND COMPACTED, THE ENGINEER SHALL DETERMINE AND CERTIFY THE THICKNESS OF THE ASPHALT. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE BEING INSTALLED IN THE APPROPRIATE LOCATIONS.
6. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY ENGINEER PRIOR TO THE ACTUAL INSPECTIONS.
7. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER TO PARTIAL RELEASE OF SURETY.
8. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).

MAINTENANCE

IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED DAILY AND AFTER SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. THE SEDIMENT TRAP WILL BE CHECKED REGULARLY FOR SEDIMENT CLEANOUT.
2. THE GRAVEL OUTLETS WILL BE CHECKED REGULARLY FOR A SEDIMENT BUILDUP WHICH WILL PREVENT DRAINAGE. IF THE GRAVEL IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.
3. THE SEEDED AREAS WILL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RESEEDED AS NEEDED.

SEQUENCE OF CONSTRUCTION

1. CLEAR MINIMAL AREA TO INSTALL TREE PROTECTION, SILT FENCE, CONSTRUCTION ENTRANCE AND SEDIMENT TRAP.
2. CLEAR REMAINING AREA DESIGNATED TO BE CLEARED.
3. INSTALL STORM SEWER SYSTEM AND INLET PROTECTION.
4. ROUGH GRADE ROAD AND PARKING LOT. APPLY TOPSOIL & FINAL STABILIZATION TO ALL DISTURBED AREAS EXCLUDING BUILDING PAD & PARKING LOT.
5. INSTALL SANITARY SEWER SYSTEM.
6. INSTALL WATERLINE.
7. FINE GRADE ROAD AND PARKING LOT.
8. INSTALL STONE BASE, CURB AND GUTTER.
9. APPLY ASPHALT TO STONE BASE.
10. CONSTRUCT BUILDINGS #3, #4, #5, #6, AND #7.
11. APPLY TOPSOIL & FINAL STABILIZATION TO ALL REMAINING DISTURBED AREAS.
12. REMOVE SEDIMENT TRAP IF McLAW PLACE IS COMPLETE.
13. REMOVE ALL REMAINING TEMPORARY E&S DEVICES.
14. CONSTRUCT BUILDINGS #1 AND #2.
15. REMOVE ALL TEMPORARY E&S DEVICES.

30 0 30 60 90
Scale 1" = 30'

BEFORE DIGGING CALL "MISS UTILITY" OF VIRGINIA AT 1-800-552-7001

Rickmond Engineering, Inc.
Engineering Surveying Land Planning
1643 Merrimac Trail
Williamsburg, VA 23185
Voice: (757)229-1776
Fax: (757)229-4683
Vint Hill · P.O. Box 861647
Warrenton, VA 20187
Voice: (540)349-7730
Fax: (540)349-7731
www.rickmond.com

Designed By:	Drawn By:	Scale:	Date:
KMJ	KMJ	1"=30'	10.25.01

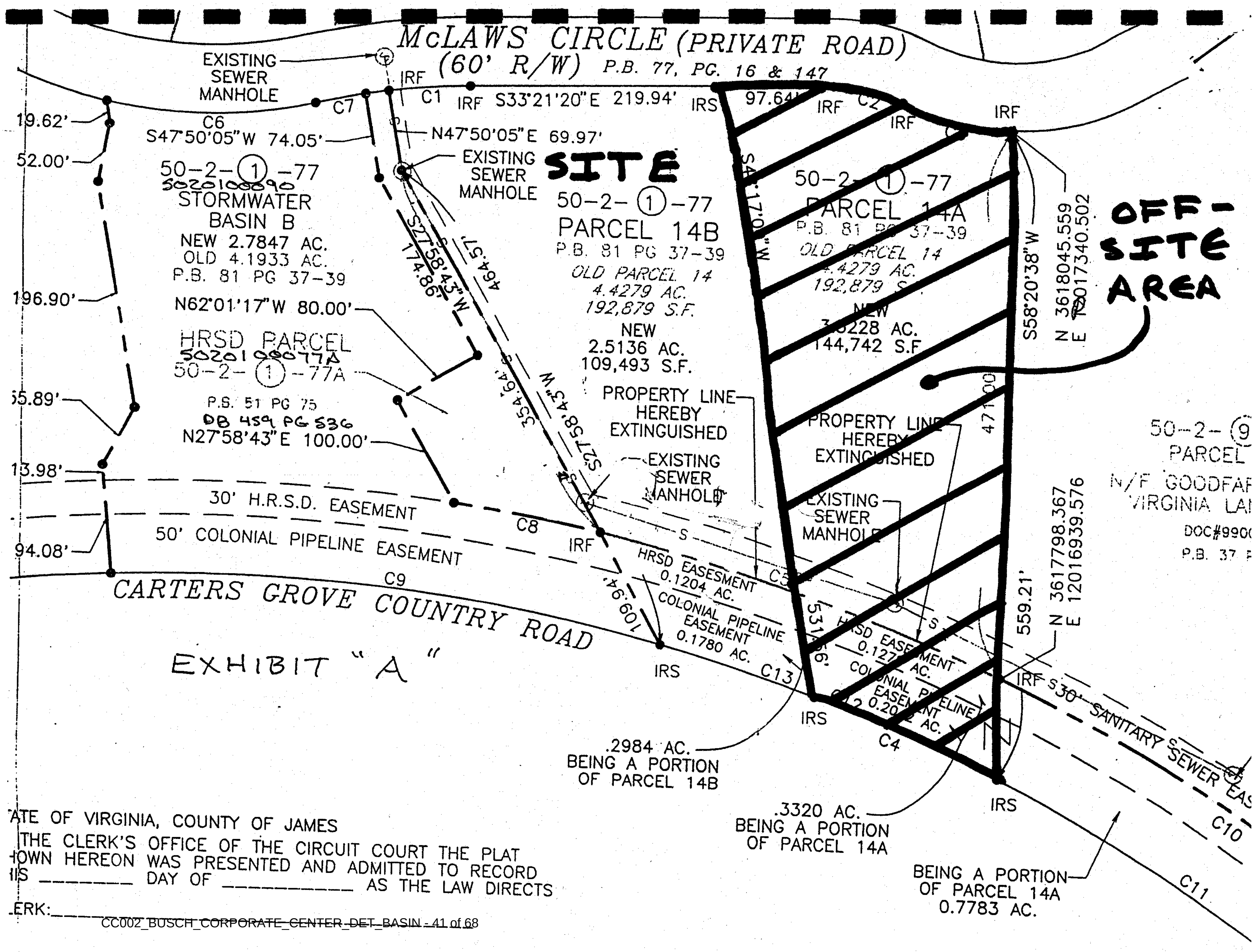
COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022672
PROFESSIONAL ENGINEER

No.	By	Revision	App.	Date

BUSCH CORPORATE CENTER
PARCEL 14B
GRADING PLAN
JAMES CITY COUNTY VIRGINIA

Job Number	Sheet No.
01183	C3

DRAINAGE AREA MAP


McLAWS CIRCLE (PRIVATE ROAD)
(60' R/W) P.B. 77, PG. 16 & 147
EXISTING SEWER MANHOLE
IRF
C1
IRF S33°21'20"E 219.94' IRS
97.64'
IRF C2
IRF
IRF
C7
C6
S47°50'05"W 74.05'
N47°50'05"E 69.97'
19.62'
52.00'
EXISTING SEWER MANHOLE
SITE
50-2-(1)-77
5020100090
STORMWATER BASIN B
NEW 2.7847 AC.
OLD 4.1933 AC.
P.B. 81 PG 37-39
50-2-(1)-77
PARCEL 14B
P.B. 81 PG 37-39
OLD PARCEL 14
4.4279 AC.
192,879 S.F.
NEW
2.5136 AC.
109,493 S.F.
50-2-(1)-77
PARCEL 14A
P.B. 81 PG 37-39
OLD PARCEL 14
4.4279 AC.
192,879 S.F.
NEW
3.3228 AC.
144,742 S.F.
OFF-SITE AREA
N 3618045.559
E 12017340.502
S58°20'38"W
471.00'
S27°58'43"W
174.86'
464.57'
354.64'
S27°58'43"W
196.90'
N62°01'17"W 80.00'
HRSD PARCEL
50201000077A
50-2-(1)-77A
P.B. 51 PG 75
DB 459 PG 536
N27°58'43"E 100.00'
55.89'
13.98'
94.08'
PROPERTY LINE HEREBY EXTINGUISHED
EXISTING SEWER MANHOLE
PROPERTY LINE HEREBY EXTINGUISHED
EXISTING SEWER MANHOLE
30' H.R.S.D. EASEMENT
50' COLONIAL PIPELINE EASEMENT
C8
IRF
HRSD EASESMENT 0.1204 AC.
COLONIAL PIPELINE EASEMENT 0.1780 AC.
C3
531.56'
HRSD EASEMENT 0.1272 AC.
COLONIAL PIPELINE EASEMENT 0.2012 AC.
559.21'
N 3617798.367
E 12016939.576
50-2-(9)
PARCEL
N/F GOODFA
VIRGINIA LA
DOC#990
P.B. 37
C9
CARTERS GROVE COUNTRY ROAD
109.94'
IRS
C13
IRS
C4
IRF
30' SANITARY SEWER EAS
IRS
C10
C11
EXHIBIT "A"
.2984 AC. BEING A PORTION OF PARCEL 14B
.3320 AC. BEING A PORTION OF PARCEL 14A
BEING A PORTION OF PARCEL 14A 0.7783 AC.
ATE OF VIRGINIA, COUNTY OF JAMES
THE CLERK'S OFFICE OF THE CIRCUIT COURT THE PLAT
HOWN HEREON WAS PRESENTED AND ADMITTED TO RECORD
HIS ________ DAY OF ____________ AS THE LAW DIRECTS
LERK:

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
229-1776

JOB 01183
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY ______ DATE ______
SCALE ______

DA- 1 For Storm Sewer Design Calculations

c=0.62
A=2.50 Ac:

	C	A	CA
Roof/Road	.90	1.50	1.35
Grass	.20	1.00	.20
		2.50	1.55

OVERLAND FLOW

L= — ft.
S= — %
Tc= <5 min.

2.50 ac offsite will drain through DI #1 when adjacent site is developed.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= <5 min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.60)(2.50 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 10.80 cfs

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JOB 01183
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 1/9/02
CHECKED BY ______ DATE ______
SCALE ______

DA- 1 For Ditch and DI # 1 Design at Buildout

c= .39
A= .44 Ac.

	C	A	CA
Roof	.90	.11	.10
Grass	.20	.33	.07
		.44	.17

OVERLAND FLOW

L= 20 ft.
S= 5 %
Tc= <5 min.

CHANNEL FLOW

H= 4.6 ft.
L= 300 ft.
Tc= <5 min.

Tc= 5 min.

i_{10}= 7.2 in/hr i_2 = 5.7 in/hr

Q=CAi=(.39)(.44 Ac.)(7.2 in/hr)(C_f 1.0) C_f for storms 25 yr+ (VDOT Manual Pg. 1-11)

Q_{10}= 1.24 cfs

Q_2 = CAI = (.39)(.44)(5.7) = 0.98 cfs

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JOB 01183
SHEET NO. ____ OF ____
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY ____ DATE ____
SCALE ____

DA- 2

c= .83
A= .18 Ac.

	C	A	CA
Roof/Road	.90	.17	.15
Grass	.20	.01	.00
		.18	.15

OVERLAND FLOW

L= 42 ft.
S= 1.0 %
Tc= <5 min.

CHANNEL FLOW

H= .55 ft.
L= 55 ft.
Tc= <5 min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.83)(.18 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 1.08 cfs

Q_{DI} = CA(4.0) = (.83)(.18)(4.0) = 0.60 cfs

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JOB 01183
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY ______ DATE ______
SCALE ______

DA- 3

c= .82
A= .56 Ac.

	C	A	CA
Roof / Road	.90	.50	.45
Grass	.20	.06	.01
		.56	.46

OVERLAND FLOW

L= 42 ft.
S= 1.0 %
Tc= <5 min.

CHANNEL FLOW

H= 0.7 ft.
L= 140 ft.
Tc= <5 min.

Tc= 5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.82)(.56 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 3.31 cfs

Q_{DI} = CA(4.0) = (.82)(.56)(4.0) = 1.84 cfs

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JOB 01183
SHEET NO. ______ OF ______
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY ______ DATE ______
SCALE ______

DA- 4

c= .74
A= .53 Ac.

	C	A	CA
Roof / Road	.90	.41	.37
Grass	.20	.12	.02
		.53	.39

OVERLAND FLOW

L= 120 ft.
S= 2.5 %
Tc= 6 min.

CHANNEL FLOW

H= 1.3 ft.
L= 130 ft.
Tc= — min.

Tc= 6 min.

i_{10}= 7.0 in/hr

Q=CAi=(.74)(.53 Ac.)(7.0 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.75 cfs

Q_{DI} = CA(4.0) = (.74)(.53)(4.0) = 1.57 cfs

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JOB 01183
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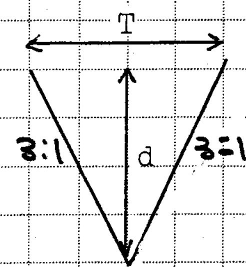
CHECKED BY ______ DATE ______
SCALE ______

V-DITCH DESIGN

DA-1
"Worst Case"

Q= ____ cfs
S= 1.53%
L= ____ ft.

T= 6 ft.
d= 1.0 ft.



$R=\frac{zd}{2(z^2+1)^{\frac{1}{2}}}=\frac{(3)(1\ ft.)}{2(10)^{\frac{1}{2}}}=\underline{0.47}\ ft.$

n=.030

$A=zd^2=(\underline{3})(\underline{1}\ ft.)^2=\underline{3}\ ft.^2$

Check Capacity:

Q_{10} = 1.24 cfs   d = 0.44'   Since d = 0.44' < 1.0'
Capacity is adequate

Check Velocity:

Q_2 = 0.98 cfs   d = 0.40'   V = 2.03 fps

Since V = 2.03 fps < 5.0 fps
Velocity is adequate

Rickmond
RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
Williamsburg, VA 23185-5624
Phone: 757-229-1776
Fax: 757-229-4683
e-mail rei@rickmond.com

PROJECT NO. 01183
PROJECT NAME
SHEET NO. OF
CALCULATED BY KHJ DATE 10/31/01
CHECKED BY DATE
SCALE

DESIGN DI #1

$Q = 2.00$ cfs
$S_x = 0.333$ ft/ft
DI-5
$L = 3.33'$
$W = 3.00'$

$P = 2(W+L) = 12.66'$

From Chart 14: $d = 0.15'$

$T = \frac{d}{S_x} = \frac{.15'}{.333} = .45'$ OK

USE VDOT DI-5

Rickmond

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
Williamsburg, VA 23185-5624
Phone: 757-229-1776
Fax: 757-229-4683
e-mail rei@rickmond.com

PROJECT NO. 01183
PROJECT NAME
SHEET NO. OF
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY DATE
SCALE

DESIGN DI #2

$Q = 0.60$ cfs
$S_x = .01$ ft/ft
DI-1
$L = 2.5'$
$W = 2.5'$

$P = 2W + L = 2(2.5) + 2.5 = 7.5'$

From Chart 14: $d = .14'$

$T = \frac{d}{S_x} = \frac{.14}{.01} = 14'$ OK

USE VDOT DI-1

Rickmond

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Williamsburg, VA 23185-5624
Phone: 757-229-1776
Fax: 757-229-4683
e-mail rei@rickmond.com

PROJECT NO. 01183
PROJECT NAME
SHEET NO. OF
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY DATE
SCALE

DESIGN DI #3

Q = 1.84 cfs
S_x = .01 ft/ft
DI-1
L = 2.5'
W = 2.5'

P = 2W + L = 2(2.5) + 2.5 = 7.5'

From Chart 14: d = .20

$T = \frac{d}{S_x} = \frac{.20}{.01} = .20'$ OK

USE VDOT DI-1

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
Williamsburg, VA 23185-5624
Phone: 757-229-1776
Fax: 757-229-4683
e-mail rei@rickmond.com

PROJECT NO. 01183
PROJECT NAME
SHEET NO. OF
CALCULATED BY KMJ DATE 10/31/01
CHECKED BY DATE
SCALE

DESIGN DI #4

Q = 1.57 cfs
S_x = .01 ft/ft
DI-1
L = 2.5'
W = 2.5'

P = 2W+L = 2(2.5) + 2.5 = 7.5'

From Chart 14.8 d = .17'

$T = \frac{d}{S_x} = \frac{.17'}{.01} = 17'$ OK

USE VDOT DI-1

Rickmond Engineering, Inc. **Storm Drainage Design** Phone: (757) 229-1776 Fax: (757) 229-4683

Project Manager: *Kenny Jenkins*

Project Engineer: *Kenny Jenkins*

For Tc Accumulation, Use VELOCITY (1) from Pipe Slope or (2) V=Q/A : **1**

Project Number: **00183** *Project:* **McLAWS CENTRE** Year Storm: **10**

Structure		Rational Formula: Q = CiA									Pipe Data					Mannings Formula				
				CA		Inlet Time T_c (min)		(in/hr)	Runoff, Q (cfs)		Inverts		(ft)	%	(in)	Velocity (ft/sec)				N
From	To	Area "A" (ac)	Coefficient "C"	Incremental	Cumulative	Incremental	Cumulative	Rain	Incremental	Cumulative	UPstream	DOWN-stream	Length	Slope	Diameter	Based on Q/A	Based on pipe slope	Capacity (cfs)	Flow Time (min)	Manning's
From	To	Area	C	CAInc	CaCum	TimeInc	TimeCum	Rain	Qinc	Qcum	InvertUp	InvertDown	Length	Slope	Diameter	VelocityQA	VelocityS	Capacity	FlowTime	ManningsN
1	3	2.50	0.6	1.55	1.55	5	5.00	6.96	10.78	**10.78**	78.40	78.04	120	0.30%	21	4.48	3.61	8.68	0.55	0.013
2	4	0.18	0.8	0.15	0.15	5	5.00	6.96	1.04	**1.04**	81.00	78.75	55	4.09%	15	0.85	10.65	13.07	0.09	0.013
4	3	0.53	0.7	0.39	0.54	6	6.00	6.72	2.64	**3.64**	78.65	78.04	135	0.45%	15	2.97	3.54	4.34	0.64	0.013
3	5	0.56	0.8	0.46	2.55	5	6.64	6.58	3.02	**16.79**	77.94	77.85	30	0.30%	24	5.34	3.94	12.39	0.13	0.013
5	6	0.00	0.0	0.00	2.55	0	6.76	6.56	0.00	**16.72**	77.75	77.16	200	0.30%	24	5.32	3.91	12.29	0.85	0.013
6	ES	0.11	0.6	0.06	2.61	5	7.61	6.38	0.39	**16.65**	77.06	76.76	100	0.30%	24	5.30	3.94	12.39	0.42	0.013
ES																				

Rickmond Engineering, Inc. — **Hydraulic Grade Line (HGL) Calculations**

Project Number: ***00183***
Project: ***McLAWS CENTRE***

Date: ***1.15.02***

	HGL					~~~~~~ STRUCTURE LOSSES ~~~~~~	Bend Losses		ENTRANCE			(ft)	HGL	Performance Checks & Intermediate Computations					
From Structure	Slope (%)	Fall (ft)	Velocity Head V²/2g (ft)	*Invert Shaped?*	*Surface Flow?*	*Angle (deg)*	@ To (ft)	@ From (ft)	@ To (ft)	@ From (ft)	EXIT (ft)	TOTAL	@ FROM	*Rim/Flowline (Max. Allow. Elevation)*	"Freeboard" (ft)	Elev., top of pipe @ From	Structure #'s: FROM-TO	TC plus Pipe Flow Time	Elevation at 80% Full Flow
	HGLSlope	HGLFall	VelocityHead	*Shaped*	*Surface*	*BendAngle*	BendatTo	BendatFrom	EntratTo	EntratFrom	Exit	TotalStruc	HGLatFrom	*RimElev*	Freeboard	PipeTopEl	FromTo	TCplusPipeTime	FlowRatio
1	0.463%	0.556	0.31	*Y*	*Y*	*0*	0.000	0.000	0.078	0.000	0.109	0.071	81.70	*81.90*	0.20	80.38	1-3	5.55	79.80
2	0.026%	0.014	0.01	*Y*	*Y*	*0*	0.000	0.000	0.003	0.000	0.004	0.003	82.00	*83.95*	1.95	82.44	2-4	5.09	82.00
4	0.318%	0.429	0.14	*Y*	*Y*	*90*	0.098	0.000	0.034	0.003	0.048	0.033	81.54	*84.43*	2.89	80.09	4-3	6.64	79.65
3	0.551%	0.165	0.44	*Y*	*Y*	*90*	0.319	0.098	0.111	0.078	0.155	0.216	81.08	*82.32*	1.24	80.19	3-5	6.76	79.54
5	0.547%	1.094	0.44	*Y*	*Y*	*65*	0.229	0.319	0.110	0.111	0.154	0.380	80.70	*83.00*	2.30	80.00	5-6	7.61	79.35
6	0.543%	0.543	0.44	*Y*	*Y*	*65*	0.227	0.229	0.109	0.110	0.153	0.319	79.22	*81.50*	2.28	79.31	6-ES	8.04	78.66

Tailwater Elevation at Outfall point # ES): ***78.36***

HGL	HGL	HGL	HGL	80% D	HGL	Control	Too Shallow?
26.8	26.9	26.9	14.0	5.8	22.8	DistComp	Computed Pipe Dia.

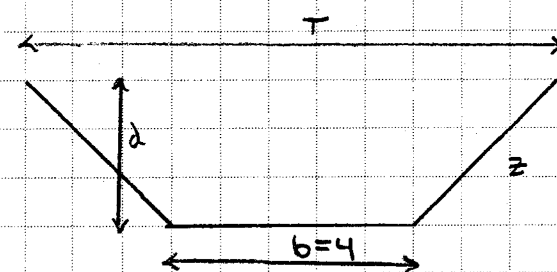
RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776
(804) 875-1785

JOB 01183
SHEET NO. ____ OF ____
CALCULATED BY KMJ DATE 1/16/02
CHECKED BY ____ DATE ____
SCALE ____

TRAPEZOIDAL-DITCH DESIGN
RIP RAP CHANNEL

Q= 16.27 cfs
S= 21.5 %
L= 50 ft.

T= 8 ft.
d= 1 ft.



$$R=\frac{bd + zd^2}{b + 2d(z^2+1)^{\frac{1}{2}}} = \frac{(4\ ft)(1\ ft) + (2)(1\ ft)^2}{(4\ ft) + 2(1\ ft)(5)^{\frac{1}{2}}} = 0.71\ ft$$

n= .033

$$A=bd + zd^2 = (4\ ft)(1\ ft) + (2)(1\ ft)^2 = 6\ ft^2$$

d=0.36 ft V=9.47fps

RIP RAP LINED CHANNEL OK

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
Williamsburg, VA 23185-5624
Phone: 757-229-1776
Fax: 757-229-4683
e-mail: rei@rickmond.com

PROJECT NO. 01183
PROJECT NAME
SHEET NO. OF
CALCULATED BY KMJ DATE 1/15/01
CHECKED BY DATE
SCALE

DESIGN FOREBAY

Impervious Area = 1.16 acre + (2.5 acre offsite)(0.60)
= 1.16 acre + 1.50 acre
= 2.66 acre

Forebay Volume = $\frac{2.66 \text{ acre}}{} \left| \frac{0.1 \text{ inch}}{} \right| \frac{43{,}560 \text{ sf}}{1 \text{ acre}} \left| \frac{1 \text{ ft}}{12 \text{ inch}} \right.$
= 966 cf

Forebay depth = 4'

Forebay area = $\frac{966 \text{ cf}}{4 \text{ ft}}$ = 242 sf = 16' x 16'

RICKMOND ENGINEERING, INC.

1643 Merrimac Trail
Williamsburg, VA 23185
Phone: 757-229-1776
Fax: 757-229-4683

Vint Hill • P.O.Box 861647
Warrenton, VA 20187
Phone: 540-349-7730
Fax: 540-349-7731

www.rickmond.com

8. Correspondence With Owners

Att: Kenny

busch corporate center williamsburg

January 11, 2002

Mr. Andy Piplico
Piplico and Associates
4780 Longhill Road
Williamsburg, Virginia 23185

SP119-01
McLANS Centre

Re: Offsite Drainage, Lot 14, Busch Corporate Center

Dear Mr. Piplico:

The storm water drainage infrastructure and retention ponds now owned by the Williamsburg Center Association DBA Busch Corporate Center-Williamsburg were designed to accommodate the offsite drainage needs of the adjacent lots in the business park.

Accordingly, you have the Association's permission to utilize the retention pond to the north of your lot for retention purposes in accordance with the approved development plans for your lot.

ALLOWS FOR USE OF BMP.

WHAT ABOUT 24" RCP STORM DRAIN OUTFALL. DRAINAGE EASEMENT NECESSARY.

Let me know if you need anything else.

Sincerely,

William B. Voliva

William B. Voliva, Jr.
President
Williamsburg Center Association
DBA Busch Corporate Center-Williamsburg

WBV/ne

cc: William I. Pennock

Att: Scott T.

HRSD

P. O. BOX 5911, VIRGINIA BEACH, VIRGINIA 23471-0911 • (757) 460-2261 FAX (757) 460-2372

4 February, 2002

Mr. Kenneth M. Jenkins, P.E.
Rickmond Engineering
1643 Merrimac Trail
Williamsburg, VA 23185

Re: Busch Corporate Center, - McLaws Centre

Dear Mr. Jenkins:

Thank you for the complete set of the proposed plans for the subject project, submitted to this office for review on 12/07/01. This plan set consists of 9 sheets, C1 to C9 and contains thereon your original PE stamp and signature. In response to the review of these plans, Mr. Steve Richendollar, our Real Estate Manager is in the process of preparing a 20' easement to be granted to the developer for the proposed storm drainage discussed in my previous letter. This easement will be executed at our earliest opportunity upon receipt of the necessary plat, as discussed directly with the developer. Please be advised that Political Jurisdiction, easements must be presented to our commission for final approval and cannot be done so until the plat is received.

There seems to be some concern at the County regarding the proposed temporary erosion and sediment control shown on sheet C3 and the final grade plan on sheet C4. There appears to be no detrimental impact on the existing HRSD easement, or the future use of the adjacent HRSD pump station site. The same applies to the vegetation and landscaping plan as shown on sheet C5. Please be advised that HRSD does routinely access all of our easements for maintenance and inspection of our lines, we will make every effort not to damage the landscaping and in the event of an emergency repair, will make every reasonable effort to return the site to it's original condition. Therefore, as regards HRSD, I recommend plans approval by the County.

Please feel free to provide a copy of this letter to the appropriate County office where your plans are under review. If I can be of further assistance, please contact me.

Respectfully,

William A. Harrison
Interceptor Engineer

cc: Steve Richendollar, HRSD Real Estate
Jon Liebler, VP, CD&A
JCSA - Dev. Management

Spotswood A. Johnson

From: Frances C. Geissler
Sent: Wednesday, July 23, 2008 10:51 AM
To: Spotswood A. Johnson; Wayland Bass
Subject: FW: 428 Mc Laws

fyi

From: Joe Buchite
Sent: Wednesday, July 23, 2008 9:31 AM
To: Frances C. Geissler
Subject: 428 Mc Laws

Fran,
Sorry I haven't gotten back in touch with you sooner but I didn't have the answers to your questions. Met with contractor and engineer onsite yesterday and it appears a plan revision is necessary for the project due to running sand on the northern slopes on the pond. The revision will involve grading the slopes on the southern side to provide for additional capacity and basically leaving the first 6 foot of the bottom of the BMP as it currently exists. I hope that we should be able to have the improvements to the BMP complete and stabilized by the end of August or early September.
Thanks,
Joe Buchite

Transmittal

LandTech Resources, Inc.
Surveying - Mapping - GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Tel: 757-565-1677 Fax: 757-565-0782

12345678910111213141516171819202122232425262728293031
SEP 2003
RECEIVED
ENVIRONMENTAL DIVISION

To: Scott Thomas. P.E.
Company: JCC Environmental Division
From: Kenneth Jenkins
Date: 9/9/03
Job Name/Number: 03-504

The following have been sent:
- ☐ as requested
- ☒ for review and comment
- ☐ please sign and return
- ☐ for temporary use, please return by _____

Quantity	Drawing Date	Description
1	9/9/03	BMP Record Drawings
1	9/9/03	BMP Record Drawing Certification Form

Remarks:

cc:Andy Piplico

Signature: Kenneth M. Jenkins

9. Inspection Reports

JAMES CITY COUNTY
ENVIRONMENTAL DIVISION
P.O. BOX 8784
WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6670

INSPECTION REPORT – EROSION AND SEDIMENT CONTROL

Date: 08/08/08
Project: 428 Mc Laws
Phone: 757-220-5577
Fax: 757-565-0416

Permittee: Leebcorp Inc.
5388 Discovery Park Blvd. Suite 220
Williamsburg, VA 23188

An inspection of the above-referenced project was conducted on 8/7/08, the following represents an evaluation of that project's compliance with James City County's Environmental Regulations. Items identified below as "Needs Repair" are deficiencies that must be corrected.

IN COMPLIANCE	NEEDS REPAIR	
☐	☐	SEDIMENT BASIN-
☐	☐	SEDIMENT TRAP-
☐	☐	CONSTRUCTION ENTRANCE-
☐	☒	SILT FENCE-
☐	☒	INLET PROTECTION- Install inlet protection on DI on McLaws Circle. Direct runoff to drop inlet storm sewer # 9 DI-3BB and install appropriate inlet protection as indicated on the approved plan. Install inlet protection on storm sewer #8 DI-3B.
☐	☐	STABILIZATION-
☐	☒	OTHER ITEMS-Remove sediment from all paved surfaces. Reinstall diversion at northern entrance to project.

Notice is hereby given that those deficiencies listed shall be corrected in accordance with James City County's Environmental Requirements ***on or before*** 8/13/08. The site will be re-inspected at that time and you are invited to accompany the inspector on that date. Failure to comply with this report will result in Enforcement Actions.

Joe Buchite
JCC Environmental Division Inspector

Justin Bradley/ Brent Willin
Project Representative Notified

11. Miscellaneous

Date Record Created: [redacted]

Created By: [redacted]

WS_BMPNO: CC002

Print Record

PRINTED ON
Thursday, March 11, 2010
11:24:09 AM

WATERSHED	CC
BMP ID NO	002
PLAN NO	SP-62-91
TAX PARCEL	(50-2)(1-77)
PIN NO	50201000077
CONSTRUCTION DATE	10/22/1991
PROJECT NAME	Busch Corporate Center (Pond A)
FACILITY LOCATION	McLaws Circle - Southwest Corner
CITY-STATE	Williamsburg, Va. 23185
CURRENT OWNER	Williamsburg Center Assoc DBA Busch Corp Center
OWNER ADDRESS	100 Kingsmill Road
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, Va. 23188
OWNER PHONE	253-3938
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN	No
SITE AREA acre	68
LAND USE	Lim Bus/Indust
old BMP TYP	Dry Pond
JCC BMP CODE	F2 Dry ED with forebay
POINT VALUE	9
SVC DRAIN AREA acres	73.3
SERVICE AREA DESCRI	Office, Light Indust & Paved Roadway
IMPERV AREA acres	14.00
RECV STREAM	UT of Halfway Creek
EXT DET-WQ-CTRL	Yes
WTR QUAL VOL acre-ft	0.634
CHAN PROT CTRL	No
CHAN PROT VOL acre-ft	0
SW/FLOOD CONTROL	Yes
GEOTECH REPORT	No

CTRL STRUC DESC	RCP Riser
CTRL STRUC SIZE inches	30
OTLT BARRL DESC	RCP
OTLT BARRL SIZE inch	24
EMERG SPILLWAY	Yes
DESIGN HW ELEV	72.39
PERM POOL ELEV	None
2-YR OUTFLOW cfs	40.00
10-YR OUTFLOW cfs	45.00
REC DRAWING	No
CONSTR CERTIF	No
LAST INSP DATE	1/10/2002
Inspected by:	[redacted]
INTERNAL RATING	3

MISC/COMMENTS

Orig Design Modified 3/22/91. Forebay McLaws Center SP11901. Upgrade SP-100-07.

Additional Comments: [redacted]

CC002

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

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

James City County, Virginia
Environmental Division
Stormwater Management Program

11:00 - 1:30

Record Drawing / Construction Certification Submittal for a BMP

Date: 9/24/03

Inspector:
- ☒ Pat Menichino
- ☐ Joe Buchite
- ☐ Beth Davis
- ☐ Gerry Lewis
- ☐ Jim Rudnicky
- ☐ Other: ______

?

Project: McClains Center
BMP Facility: New Forebay on Existing Det Basin
Plan No.: SP-119-01
Assigned County BMP ID Code: CC 002

I have received a transmittal for a ☒ Record Drawing and ☐ Construction Certification for the above referenced facility on Sept 16. Prior to performing a field inspection of the BMP and performing a full review of these certification items, 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 observed in the field. Please review the drawing and return to me promptly so I can proceed with the review of certification material.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and may make comment on the following areas: Inspection/Maintenance agreement, Record Drawings (RD), Construction Certification (CC) and Construction-Related (CR) field items as it pertains to the BMP. If you have any other related non-BMP site issues such as site erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, you must proceed with closing out these items on your own accord; or alternatively, if needed, I can easily add these items to any comment letter that I may generate to the owner.

Let me know if I need to add any site-related items to my punch list.

Scott

Forebay + New Riser
CAP ONLY.

AsBuilts\Admin\z-inspector

No comments —

Soils Information: Site: 19B Kempsville-Emp FSL Hydric: ❒ Yes ☒ No

Soil Survey Sheet DA: 19B HSG: B/C

BMP: ______ Hydric: ❒ Yes ❒ No

Description of Soils at BMP: OFFSITE, EXIST BMP.

BMP Control: ❒ None ❒ Onsite ☒ Offsite ☒ Previously Approved ❒ Manufactured BMP SP-62-91 CC002

BMP Types:
1- Name: Dry Pond (JCC BMP Type ____ - ____), Points ______
2- Name: ______ (JCC BMP Type ____ - ____), Points ______
3- Name: ______ (JCC BMP Type ____ - ____), Points ______

Onsite Drainage: ☒ Reinforced Concrete Pipe ❒ Corrugated Metal Pipe ❒ Aluminum Type Pipe
❒ Corrugated Polyethylene Pipe ❒ PVC Type Pipe ☒ Open Channel Type
❒ Storm Drain ❒ Culverts Type: ______
❒ Inlets ❒ Other (Specify): ______

1. VDOT Standards & Specifications Referenced for work **within** R/W: ☒ Yes ❒ No
2. VDOT Standards & Specifications Referenced for work **outside** R/W: ☒ Yes ❒ No

Site Limitations: ❒ RPA ❒ RMA ❒ Steep Slopes ❒ Delineated Wetlands
❒ Hydric Soils ❒ Critical Soils ❒ Vegetated ❒ Buffers: ______
❒ Defined Natural Drainage Features onsite ❒ Downstream Storm/Culv.
❒ Downstream Channel Erosion ❒ Floodplain ❒ Problem Drainage Area
❒ Stormwater Hotspot ❒ Other, ______
❒ Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).

? NO ENV INVENTORY!

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

❒ Yes ❒ No	# offsite Dry Pond		
Predev (Present)	DA = ac.	C/CN =	Tc = min / hrs.
2-year	cfs		
10-year	cfs		
100-year	cfs		
PostDev w/o Detention (Inflow)	DA = 73.3 ac.	C/CN =	Tc = min / hrs.
1-year			
2-year	159.12 cfs		
10-year	208.08 cfs		
100-year	297.84 cfs		
PostDev with Detention (Routed)	DA = ac.	C/CN =	Tc = min / hrs.
2-year	39.65 cfs	at El. 68.18	
10-year	45.42 cfs	at El. 70.15	
100-year (DHW)	74.12 cfs	at El. 72.39	

Downstream Tailwater Assumption for Pond Routing: ?

Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables: ❒ Yes ❒ No

Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ❒ Yes ❒ No

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

❒ Check if None ❒ Provided: BMP # _____ Type: ______________________________

Y N * See Below for Pertinent WQv /Stream CPv Design Information.

❒ ❒ Top of Facility (Dam Crest) El. ____________

❒ ❒ Design High Water (100-year) El. ____________

❒ ❒ Emergency Spillway (ES) Crest El. ____________ BW:_______ SS: _________

❒ ❒ FreeBoard ____________ 1 ft. or > with Emerg. Spillway.

❒ Acceptable ❒ Not Acceptable. ____________ 2 ft. or > w/o Emerg. Spillway.

❒ ❒ Principal Spillway (Riser) Crest El. ____________ Size/Type: ________________

❒ ❒ Principal Spillway Crest 1 ft. below Crest of Emergency Spillway. ❒ Yes ❒ No ❒ N/A

❒ ❒ Stage-Storage Curve or Data

❒ ❒ Outlet Rating Curve or Table (Composite Structure)

❒ ❒ Extended Detention for WQ Provided (Min. 24 hours) ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year, 24 hour detention criteria for Stream Channel Protection. ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year design storm El. ____________ or Volume ________________

❒ ❒ Normal/Permanent Pool El. ____________ ❒ N/A

❒ ❒ Orifice/Weir #1 (Highest El.) El. ____________ Type: ________________

❒ ❒ Orifice/Weir #2 El. ____________ Type: ________________

❒ ❒ Orifice/Weir #3 El. ____________ Type: ________________

❒ ❒ Orifice/Weir #4 El. ____________ Type: ________________

❒ ❒ Orifice/Weir #5 (Lowest El.) El. ____________ Type: ________________

❒ ❒ Low Flow Orifice (ExDet, CPv) El. ____________ Type: ________________

❒ ❒ Pond Drain w/ Valve (24 hr.) El. ____________ Type: ________________

❒ ❒ Pond Bottom (Positive Drain) El. ____________ Riser Height: ____________

❒ ❒ Steps or Access Provided (for over 4 ft. depth) ❒ N/A

❒ ❒ Riser Base Bottom El. __________ Type: ________________

❒ ❒ Core Trench ❒ N/A

❒ ❒ Anti-Seep Collars or other Acceptable Seepage Control Method. ❒ N/A

❒ ❒ Principal Spillway Anti-Vortex/Trash Rack Device Type: ____________________

❒ ❒ Low Flow Orifice Trash Rack. Type: ____________________

❒ ❒ Outlet Barrel: Type/Class: ____________ Size: ________________

Inv. U/S: ____________ Inv D/S: ________________

Slope: ______ ________ Length: ______________ (ft.)

❒ ❒ Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.

❒ ❒ Outlet Protection.

❒ Standard Riprap Outlet Protection (OP) Type: ________________________

❒ Special Dissipator Structure (SDS) Type: ________________________

❒ ❒ BMP Cleanout Elevation El. ____________ or Depth ____________

❒ ❒ Adequate Channel Downstream of BMP: ❒ 1-year, 24-hour; or ❒ MS # 19 criteria.

Sketch or Notes, If Necessary:

<u>* WQv / Stream CPv Design Summary</u>

Imperv. Area	____________
WQTV (Per JCC Man)	____________
WQ Vol. Required	____________
WQ Vol. Provided	____________
1-yr SCPv Required	____________
1-yr SCPv Provided	____________
Ext Det Orifice Size	____________

Sediment Trap & Basins

❒ Temporary Sediment Trap # 1 ______________ DA = ____________ < 3 acres

❒ Temporary Sediment Trap # 2 ______________ DA = ____________ < 3 acres

❒ Temporary Sediment Basin # 1 ______________ DA = ____________ ❒ BMP # ____ convert.

❒ Temporary Sediment Basin # 2 ______________ DA = ____________ ❒ BMP # ____ convert.

E&SC Plan Comments: ____

Plan Review Steps & Components:

Y N

- ☒ ☐ First "Look-Thru". Quick look through plan for familiarity and completeness.
- ☒ ☐ Existing Utilities - Miss Utility (1-800-552-7001) or other methods
- ☐ ☒ Responsible Land-Disturber Certification; Disturbed Area Estimate.
- ☐ ☒ Worksheet for BMP Point System. 10 point (New Dev) or Pollutant Load method (Redevelopment).
- ☒ ☐ FEMA Special Flood Hazard Areas. Check location relative to property site and/or development area.
- ☐ ☒ Check JCC Tax Parcel Maps for RPA / RMA locations and Tax Parcel number.
- ☒ ☐ Stormwater hotspot, general layout and/or BMP separation distances (if any) are satisfactory.
- ☐ ☒ Environmental Inventory - Chesapeake Bay Ordinance requirements satisfactory.
- ☐ ☒ Highlight/check impacts to any Environmental Sensitive Areas (wetlands, RPA, floodplain, steep slopes, etc.).
- ☐ ☒ Offsite borrow, waste areas and onsite stockpiles areas addressed.
- ☒ ☐ Review existing topography to determine adequacy of perimeter E&SC plan (Phase I).
- ☒ ☐ Current version of Standard JCC Erosion & Sediment Control Notes on plan.
- ☒ ☐ Virginia E&SC Regulations. Minimum Standards # 1 thru # 19 appear satisfied.
- ☒ ☐ Check for Offsite Work; Grading Plan conflicts such as excessive cut-fill slopes, deep excavations, etc.
- ☒ ☐ Review adequacy of onsite E&SC plan (Phase II).
- ☒ ☐ Review layout to check for conflicts (utilities, buildings, parking, buffers, etc.). SS
- ☒ ☐ Storm Drainage - culverts, inlets, channels, storm drains. (pipe data, cover, conflicts, specs or reference to VDOT).
- ☒ ☐ Proper Outlet Protection or Energy Dissipator information, details and computations.
- ☐ ☒ Review Sequence of Construction (for E&SC and SWM/BMP installation).
- ☒ ☐ Review E&SC Narrative (preferred to be on plan); SWM Narrative (Report). Report
- ☒ ☐ Review for any Lot-to-Lot or adjacent property uncontrolled drainage problems.
- ☒ ☐ Review plan based on Chapter 19 Subdivision ordinance as it relates to SWM/BMP control.
- ☒ ☐ Review plan based on Chapter 24 Zoning as it relates to SWM/BMP control.
- ☒ ☐ Review plan based on Chapter 23 Chesapeake Bay ordinance requirements.
- ☐ ☒ Review plan based on JCC E&SC/SWM Design Plan Checklist.
- ☒ ☐ Review plan based on Virginia Erosion and Sediment Control Handbook (VESCH).
- ☒ ☐ Review E&SC Plan Design Report and computations (Attached report).
- ☐ ☒ Review plan based on JCC BMP manual for BMP type selected for project.
- ☐ ☒ Review plan based on Virginia Stormwater Management Handbook (VSMH) for BMP type.
- ☒ ☐ Review SWM Design Report and computations (Attached Report).
- ☒ ☐ Review plan based on JCC Stormwater Conveyance System Design/Construction Guidelines.
- ☒ ☐ Review plan based on General Knowledge and Experience for Design/Construction.
- ☐ ☒ Review plan based on other BMP design/construction references. List:
- ☒ ☐ Review BMP for Buffer/Setback Requirements (Min 25 ft. from DHW) and Access.
- ☐ ☒ Review BMP Benching (aquatic, safety) & Pondscape Plan (deep pool, shallow water, shoreline fringes, etc.).
- ☐ ☒ Review Maintenance Plan for SWM / BMP facility. Detailed and specific guidance for long-term maintenance.
- ☒ ☐ Well defined, adequate channels downstream of uncontrolled or SWM/BMP areas. (MS # 19 or 1-year criteria).
- ☐ ☒ Adequate conversion plan for TSB to use as permanent BMP.
- ☐ ☒ Geotechnical. Information per Appendix E (infiltration) or to substantiate use of other BMPs (wet pond, etc.).
- ☒ ☐ Provisions on plan requiring Record Drawing and Construction Certification of SWM facilities.
- ☐ ☐ Drainage, Maintenance and Open Space Easements (if provided) appear satisfactory.
- ☐ ☐ Wetland Permit required prior to issuance of a Land-Disturbance Permit or Final Approval.
- ☐ ☐ Inclusion of H&H and SWM / BMP data into any JCC databases.
- ☐ ☐ Other: ______________________________

Prepared Environmental Division comments for the following categories based on above review areas:

☒ ☐ ***General Comments:***	☒ ☐ ***Erosion & Sediment Control Plan:***
☐ ☐ ***Floodplain:***	☒ ☐ ***Chesapeake Bay Preservation:***
☒ ☐ ***Stormwater Management / Drainage:***	☐ ☐ ***Other:***

Additional Notes & Comments: E+S C problems; Is within the BMP service area.

(Note: THIS FORM FOR COUNTY USE ONLY.)

☒ 1st Rev ☐ 2nd Rev ☐ 3rd Rev

[signature] Signature	12-21-01 5:31pm Date
Signature	Date
Signature	Date