



Stormwater Division

MEMORANDUM

DATE: March 5, 2010
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jo Anna Ripley, Stormwater
PO: 270712
RE: Files Approved for Scanning

General File ID or BMP ID: PC183

PIN: 3230100012

Subdivision, Tract, Business or Owner

Name (if known):

Spotswood Commons Apartments

Property Description:

Apartments

Site Address:

4700 Longhill Road

(For internal use only)

Box 5

Drawer: 3

Agreements: (in file as of scan date)

Y

Book or Doc#:

010007085

Page:

780

146

809

126

780

146

Comments

Spotswood Commons Apartments was created out of PIN 3240100029

Date Record Created:

WS_BMPNO:

PC183

Print Record

Created By:

WATERSHED PC

BMP ID NO 183

PLAN NO SP-82-01

TAX PARCEL (32-3)(1-12)

PIN NO 3230100012

CONSTRUCTION DATE 10/1/2001

PROJECT NAME Spotswood Commons Apartments

FACILITY LOCATION 4700 Longhill Road

CITY-STATE Williamsburg, Va. 23188

CURRENT OWNER CWTW Williamsburg LP c/o Commonwealth Properties

OWNER ADDRESS 9030 Stony Point Parkway

OWNER ADDRESS 2 Suite 490

CITY-STATE-ZIP CODE Richmond, Va. 23235

OWNER PHONE

MAINT AGREEMENT Yes

EMERG ACTION PLAN No

**PRINTED ON
Friday, March 05, 2010
10:09:59 AM**

MAINTENANCE PLAN No

SITE AREA acre 25.25

LAND USE R5 Multi Family

old BMP TYP Wet Pond

JCC BMP CODE A2 Wet Pond

POINT VALUE 9

SVC DRAIN AREA acres 10.6

SERVICE AREA DESCRI Apartments, Parking & Roads

IMPERV AREA acres 3.05

RECV STREAM UT of Powhatan Creek

EXT DET-WQ-CTRL Yes

WTR QUAL VOL acre-ft 0.64

CHAN PROT CTRL No

CHAN PROT VOL acre-ft 0

SW/FLOOD CONTROL Yes

GEOTECH REPORT No

CTRL STRUC DESC Conc Weir W

CTRL STRUC SIZE inches 36

OTLT BARRL DESC RCP Barrel

OTLT BARRL SIZE inch 30

EMERG SPILLWAY Yes

DESIGN HW ELEV 72.9

PERM POOL ELEV 69.00

2-YR OUTFLOW cfs 3.88

10-YR OUTFLOW cfs 18.45

REC DRAWING Yes

CONSTR CERTIF No

LAST INSP DATE 3/31/2003 Inspected by:

INTERNAL RATING 3

MISC/COMMENTS

form Crown Landing. BMP #1 SP-15-01.
Weir wall in RCP pipe apron.

Get Last BMP No

Return to Menu

Additional Comments:



DECLARATION OF COVENANTS

COPY

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 13 day of April, ~~2000~~ ²⁰⁰¹,
between CWTW Williamsburg L.P.,
and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the
following property: 4700 Longhill Rd., James City County, VA 23188,
Deed Book 780, Page No. 146 or Instrument No. Tax Parcel No.,
and James City County, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.
2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.
3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.
4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.
5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.
6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.
7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.
8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.
9. This COVENANT shall be recorded in the County Land Records.

instrument # 010007085
Recorded 4/20/01

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 13 day of April, ~~10~~ 2001

COVENANTOR(S)
CWTW Williamsburg, L.P. ✓
By: CW Williamsburg, LLC
By: CW Williamsburg II, LLC

Print Name/Title SA Middleton
Steven A. Middleton, Manager

ATTEST:

Joseph W. Crenshaw

COVENANTOR(S)

Print Name/Title _____

ATTEST:

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF Richmond

I hereby certify that on this 13 day of April, ~~10~~ 2001, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of Richmond, aforesaid personally appeared Steven A. Middleton and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 13 day of April, ~~10~~ 2001.

W.A. Kralj
Notary Public

My Commission expires: 6-30-04

Approved as to form:

Deputy County Attorney

This Declaration of Covenants prepared by:
MICHAEL (BUTCH) MILLER
(Print Name)

PRJ. Mgt.
(Title)

4021 SEABOARD COURT
(Address)

ROLTSMOUTH, VA. 23701
(City) (State) (Zip)

Kendefrom
COPY

DECLARATION OF COVENANTS
INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 17th day of September, 1996 between TATE TERRACE REALTY INVESTORS, INC., ROBERT S. HORNSBY, & CHARTER, L.L.C. and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property and/or adjacent/contiguous properties: Tax Parcel No. (32.4) (01-0-0029) Longhill Road, as recorded in Deed Book 780 Page 146, 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 right-of-ways 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.

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 DECLARATION shall be recorded in the County Land Records.

10. COVENANTOR(S) hereby agree that all costs of maintenance and repair associated with the Detention Facility shall be divided between COVENANTOR(S) on a pro-rated basis, based upon the percentage of comparative impervious area of present and future developments served by the Detention Facility attributable to each party (including for purposes hereof, those properties owned by COVENANTOR(S) and their affiliates). Each party's pro-rated share shall be determined at the time maintenance or repair is required and calculated by an engineer selected by the mutual agreement of COVENANTOR(S). The COVENANTOR(S) do hereby agree that the engineer's determination shall be the final and conclusive determination of the parties respective obligations hereunder.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 17th day of September, 1996.

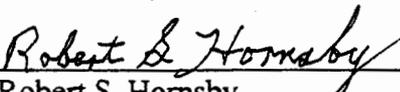
TATE TERRACE REALTY INVESTORS, INC.



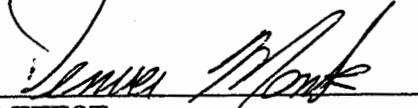
Steven B. Sandler, President



ATTEST Art Sandler, Secretary



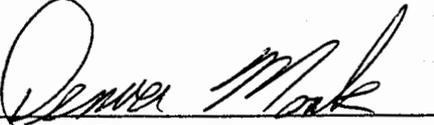
Robert S. Hornsby



ATTEST



Charter L.L.C.



ATTEST

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF Virginia Beach

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify that Steven B. Sandler + Art Sandler, whose names is signed as such to the foregoing

writing bearing date 17th day of September, 1996, this day sworn
the same before me in my jurisdiction aforesaid.

GIVEN under my hand this 19th day of September, 1996.

Debra A. Deety

Notary Public

My Commission expires: August 31, 1998

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF JAMES City

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify
that ROBERT S. HORNBY, whose name is signed as such to the foregoing
writing bearing date 17th day of SEPTEMBER, 1996, this day sworn
the same before me in my jurisdiction aforesaid.

GIVEN under my hand this 17th day of SEPTEMBER, 1996.

Mary R. Selden

Notary Public

My Commission expires: July 31st, 1998

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF JAMES City

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify
that ROBERT S. HORNBY, SECRETARY whose name is signed as such to the foregoing
writing bearing date 17th day of SEPTEMBER, 1996, this day sworn
the same before me in my jurisdiction aforesaid.

GIVEN under my hand this 17th day of SEPTEMBER, 1996.

Mary R. Selden

Notary Public

My Commission expires: July 31st, 1998

Approved as to form:

She P. Rogers
Deputy County Attorney

This Declaration of Covenants prepared by:
Steven B. Sandler, President
Tate Terrace Realty Investors, Inc.
448 Viking Drive, Suite 200
Virginia Beach, VA 23452

Tate Terrace Realty Investors, Inc.

448 VIKING DRIVE, SUITE 200 • VIRGINIA BEACH, VIRGINIA 23452

MAILING ADDRESS: P.O. BOX 8368 • VIRGINIA BEACH, VIRGINIA 23450

TELEPHONE: (804) 498-1112 • TELEFAX: (804) 498-1161



September 3, 1996

Mr. Darryl Cook
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: Kendelton Section One

Dear Darryl:

Enclosed please find the following documents for the above referenced project:

1. Erosion & Sediment Bond
2. Application for Certificate to Construct Water & Sewer Facilities
3. Land Disturbing Permit Application
4. Siltation Agreement

The Declaration of Covenants, Inspection/Maintenance of Runoff Control Facility has been forwarded to Mr. Bobby Hornsby for his signature. I will forward this document to you as soon as I receive it back from Mr. Hornsby.

Should you need any additional information, please do not hesitate to contact me. I look forward to working with you on this project.

Sincerely,

A handwritten signature in cursive script that reads "Debra A. Dietz".

Debra A. Dietz
Real Estate Administrator

/dad
Enclosures



BOARD OF SUPERVISORS

101-C MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6609

Fax: (757) 253-6833

~~RONALD A. NERWITT~~
POWhatan DISTRICT

JAY T. HARRISON, SR.
BERKELEY DISTRICT

JOHN J. MCGLENNON
JAMESTOWN DISTRICT

BRUCE C. GOODSON
ROBERTS DISTRICT

JAMES G. KENNEDY
STONEHOUSE DISTRICT

January 15, 2002

Mr. William W. Doyel
208 Sheffield Road
Williamsburg, VA 23188-1549



Dear Mr. Doyel:

Thank you for your letter of December 28, 2001. The property referenced in your letter is 4700 Longhill Road, more specifically identified as Tax Map ID: (32-3)(1-12). The construction occurring is for "Crown Landing Apartments," a development consisting of 212 apartments located among 12 buildings ranging in height from two stories to three stories.

The land is zoned R-5, Multifamily Residential; therefore, residential uses such as apartment complexes, townhouses, two-, three-, and four-family structures are permitted by-right and only required administrative approval by various County staff departments. Development of the property does not require legislative approval by the Board of Supervisors. As such, it was not possible to address broader, off-site impacts. By law, these issues can only be addressed when a project requires the approval of the Board of Supervisors either during a rezoning of the property or through the issuance of a special use permit. A site plan for development is required however, which addresses on-site impacts.

The site plan for this development was originally submitted in 1997; however, an amendment was submitted and approved on July 3, 2001. Both plans were subjected to the County's normal review process. More specifically, the plan was reviewed by, among others:

- the Development Review Committee (DRC). This is a four-member subcommittee of the Planning Commission tasked with reviewing projects that are either greater than 30,000-square feet in size or propose more than 50 new residential units. The plan was approved by the DRC on December 31, 1997.
- the James City County Planning Division. This Division is tasked with reviewing the plan to ensure that all Zoning Ordinance requirements (e.g., landscaping, parking, height limits, setbacks, signage, lighting, etc.) are met. The plan does meet all Zoning Ordinance requirements.
- the James City County Fire Department to ensure that all safety and accessibility (fire lane, access, fire hydrant spacing, etc.) requirements are met. The plan meets all Fire Department requirements.
- the James City Service Authority (JCSA) to ensure water and sewer infrastructure is adequately provided. A waterline analysis was prepared, analyzed, and approved.

Mr. William W. Doyel

January 15, 2002

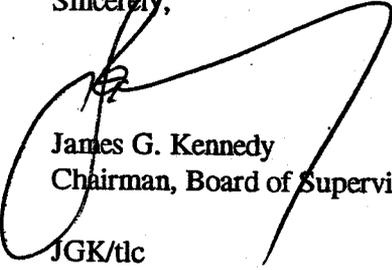
Page 2

- the James City County Engineer. One of the Engineer's tasks is to ensure the adopted County Sidewalk Plan is implemented. In response to your inquiry and concern, a 5-foot wide concrete sidewalk is required and will be constructed across the frontage of this property (approximately 1,000 feet). According to the developer, this sidewalk will be constructed near the end of February 2002. The County does not have any requirement to provide interim sidewalks during construction. Regarding the bike lane, the County has received a Federal grant to construct such a facility along Longhill Road and engineering for the bike lane should begin soon.
- the Virginia Department of Transportation (VDOT). VDOT has reviewed and approved the plans and has required the installation of both right- and left-hand turn lanes to maintain an acceptable level of service and safety on Longhill Road.
- the James City County Environmental Division. The Environmental Division is responsible for enforcing the County Erosion and Sedimentation Control regulations, Stormwater Management Control regulations, and the Chesapeake Bay Preservation Ordinance. The plan has also been reviewed by the Army Corps of Engineers.

Further, clear cutting was necessary internal to the site given the proposed density and re-grading that needed to occur. However, please note that property line buffers are required and will be maintained. Most significant is the buffer along Longhill Road. The Zoning Ordinance requires an average 50-foot wide buffer to be maintained. The project, as approved, provides for an average 225-foot wide buffer, with the minimum width being 145 feet. The Environmental Division reviewed an erosion and sedimentation control plan to ensure that no sediment runoff escapes the site during construction. Construction activities are monitored by the Division's inspectors. Also reviewed was a stormwater management control plan. This plan has been developed to control post-development stormwater runoff so that adjacent properties will not be adversely impacted by the new project. The excavating you refer to is for an engineered stormwater management retention pond (also called a BMP) which is needed to meet this requirement. The pond, along with the other required improvements, ensure that off-site drainage impacts are controlled so that the existing drainage patterns (features) remain adequate.

In summary, these plans have been reviewed by many different agencies and in great detail and fully meet all Ordinance requirements for development related activity. I hope this information addresses your concerns. If I can be of further assistance, please contact me.

Sincerely,



James G. Kennedy
Chairman, Board of Supervisors

JGK/tlc
crownlanding.ltr

cc: O. Marvin Sowers, Jr., Planning Director
Darryl Cook, Environmental Director

ENVIRONMENTAL DIVISION REVIEW COMMENTS
CROWN LANDING APARTMENTS
PLAN NO. SP-133-97
December 17, 1997

1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.
2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of lots.
3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.
4. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project.
5. As-built drawings must be provided for the detention basin upon completion. Also, a note shall be provided on the plan stating that upon completion, the construction of the BMP will be certified by a professional engineer who has inspected the structure during construction.
6. The detention basin / BMP will serve as a sediment basin during the construction of the project. Provide a baffle wall within the basin. The Plan calls for the removal of the 36" RCP barrel upon completion of construction, we recommend that this structure not be removed and be utilized as an emergency spillway and a draw down structure should the BMP ever need to be completely drained.
7. Provide and label the limits of cut and fill slopes on the plan. Some areas do not show the full extent of the filling required. See plan sheets 8 & 10 in the areas around the proposed sediment basins.
8. Submit a BMP calculation worksheet that demonstrates that this project meets the county's criteria. (Darryl some info has been submitted.....)
9. Provide existing and final contours on the plan. The final contours are to be at no greater than 2-foot intervals. (See previous comment #7 above).
10. Provide conservation easements for all Natural Open Space areas claimed in the BMP worksheet. - show location & size -
11. Provide stormwater management facility easement to include a 20-foot wide access easement and a 15-foot wide maintenance easement measured from the 100-year storm elevation and including the dam and outlet structure.

ENVIRONMENTAL DIVISION REVIEW COMMENTS

Crown Landing Apartments

SP-015-01

March 19, 2001

MDW/DEC

- ✓1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.
- ✓2. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.
- ③. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project.
- ✓4. Record Drawing and Construction Certification. The stormwater management/BMP facility as proposed 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. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed during and following construction in accordance with current County guidelines. Modify note #19 of the James City County Standard Erosion Control Notes to reflect the new requirements.
- ⑤. Show any temporary soil stockpile areas, staging and equipment storage areas.
- ✓6. Provide spot elevations on all building corners.
- ✓7. Label the limits of clearing on the plan.
- ⑧. Extend all riprap outfalls into basins or traps to the bottom of the slope. - 1 deficiency on C-5
- ✓9. On sheet C-4, provide culvert inlet protection in lieu of silt fence over the upstream end of first culvert under Crown Landing Way.
- ✓10. The plan needs to be signed by a professional engineer as the project includes the design of measures such as the detention basin that are not able to be sealed by a surveyor. The previous design was sealed by an engineer.
- ⑪. Wetlands. Provide evidence that the necessary wetlands permits have been obtained or have not expired for this project. Refer to Chapter 23 Chesapeake Bay Preservation ordinance, Section 23-9(b)(8). need re-issuance of delineation
- ✓12. VPDES. Land disturbance for the project exceeds five (5) acres. Therefore, it is the owner's responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. Contact the Tidewater Regional Office of the DEQ at (757) 518-2000 or the Central Office at (804) 698-4000 for further information.
- ✓13. Environmental Inventory. The environmental inventory does not clearly identify the limits of wetlands. Please improve the readability of the wetlands information.
- ✓14. E&SC Narrative. Provide a brief erosion and sediment control plan narrative in accordance with VESCH requirements. The narrative should include important site, adjacent parcel, soil and development information as well as specific control and stabilization measures proposed for the site.
- ✓15. Sequence of Construction. Provide a sequence of construction outlining installation of erosion and sediment control measures for the project including temporary pipes and associated site and utility work. Include perimeter areas required for installation of erosion and sediment control and utility connections. Further comments may be made based upon more detailed and clearer information being presented.

**James City County, Virginia
Environmental Division**

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

County Plan No.: SP-15-01; AMEND SP-82-01
 Project Name: Spotswood Common Apartments
 Stormwater Management Facility: Dry Pond w/ SM Micropool

Phase: I II III
 Date/By: Dec 13 '02 LANDMARK

Information Received. Date/By: 12-12-02 LANDMARK
 Administrative Check. Date/By: RCVD 7/29/03 GET

Record Drawing Date/By: 12-12-02 LANDMARK
 Construction Certification Date/By: RCVD 7/29/03 GET

RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only)
 Insp/Maint Agreement #/Date: #010007085 4/20/01

BMP Maintenance Plan Location: Sheet C-5
 Other: _____

Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
 Yes No Location: Note #19 Sheet C-10 & Notes on Sheet C-5

Assign County BMP ID Code Code: PC183

Preliminary Input into Division's "As-Built Tracking Log"
 Add Location to GIS Database Map. Obtain site information (GPIN, Owner, Site Area, Address, etc.)

Preliminary Log into Access BMP Database (BMP ID #, Plan No., GPIN, Project Name)
 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.). GR

Pre-Inspection Drawing Review - Approved Plan (Quick look prior to Field Inspection).
 Final Inspection (FI) Performed Date: 3/31/03 SJT

Record Drawing (RD) Review (*) Date: 4/3/03 SJT
 Construction Certification (CC) Review Date: 7/29/03 SJT

Actions:
 No comments.
 Comments. Letter Forwarded. Date: 4/03/03

Record Drawing (RD)
 Construction Certification (CC)

Construction-Related (CR)
 Site Issues (SI)
 Other: _____

Second Submission: LANDMARK 4/7/03 OK; GET 7/28/03 OK

Third Submission: _____

Acceptable for stormwater management facility purposes (RD/CC/CR/Other). Proceed with bond release.
 If ok for full release, notify Inspector and Inspector Supervisor using "Surety Request Form".

Check/Clean active file of any remaining material and finish "As-Built" file.
 Add to County BMP Inventory/Inspection schedule (Phase I, II or III).

Copy Final Inspection Report into County BMP Inspection Program file.
 Obtain Digital Photographs of BMP and log into computer.

Add to JCC Hydrology & Hydraulic database (optional).
 Complete "As-built Tracking Log".

BMP Certification Information Acceptable

Plan Reviewer: [Signature] Date: 7/29/03

* See separate checklist.

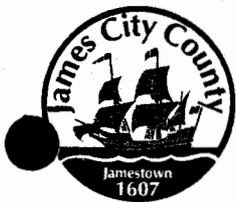
*** SEE BACK**

Am

C W T W WILLIAMSBURG LP
c/o Commonwealth Properties LLC
9030 Stony Point Parkway
Suite 490
Richmond VA. 23235

CONTACT:

- * Upon completion, the construction of all detention / burl facilities shall be certified by a PE who inspected the structure during const.



DEVELOPMENT MANAGEMENT

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

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

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

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

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

April 3, 2003

Mr. Joseph Carney
Waverton Associates
4021 Seaboard Court
Portsmouth, Va. 23701

Re: Spotswood Commons Apartments
County Plan No. SP-15-01; Amended SP-82-01
County BMP ID Code: PC 183

2-15-03 Meet Michael Spivy
Contractor. Went
over punch list items.

✓ 5-1-03 Reinspect
X 5-5-03 Reinspect

Dear Mr. Carney:

In response to your recent request concerning reduction or release of surety for the above referenced project, the Environmental Division has reviewed active file information and performed field inspections for the above referenced project. A record drawing was submitted to our office for BMP # 1 which is a wet pond BMP situated in the northwest corner of the project at the far end of Chesdale Court behind Building Unit # 3.

Based on our review of the project and concurrent field inspections as performed for the BMP and the site, the following items must be addressed prior to reduction or release of the developer's surety instrument and to proceed with closing out the project. For simplicity purposes, BMP related issues are indicated first. Site-related erosion and sediment control issues, as compiled by the assigned Environmental Division inspector, are indicated in the latter portion of the document.

Construction Certification (BMP # 1):

✓
7-29-03
GET SOLUTIONS

1. In accordance with Note # 19 on Sheet C-10 and various notes on Sheet 5 of the approved plan, construction certification is required for the stormwater management/BMP facility. None was provided. This is especially important since the facility has a large engineered and compacted earthen embankment. The certification can be in letter format or by use of the certification statement as provided in Section 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*. A copy of these requirements are attached.

Record Drawing (BMP # 1):

✓ OK
RCVD
4-11-03

2. Along with the record drawing set, submit completed record drawing and construction certification forms, Sections 1 through 5, and applicable record drawing checklists from the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet). The Environmental Division began use of the forms and checklists in this packet effective February 1st 2001.

✓
OK
4-11-03

3. Provide a certification statement for the record drawing set. Refer to Pages 3 and 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*.

Construction - Related Items (BMP # 1):

Reseed + Mulch, Grass not growing

*5-5-03
GRASS
GERMINATING
OK [signature]*

4.

Bare soil areas were present on a majority of the top of dam, the downstream face of the dam and the emergency spillway. Stabilize all disturbed soil areas with seed and mulch or matting.

5.

Clean and remove all dead wood debris and construction debris (wooden stakes) from the downstream face of the dam.

5-21-03

6.

Clean and remove organic matter (leaves) and debris which has accumulated at the end of the paved flume. The paved flume is situated on an interior graded side slope at the south end of the basin.

*OK
5-5-03*

7.

Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 18-inch storm drain pipe which enters the basin at the south end of the pond near the paved flume. Sediment accumulation was 4 inches deep within and at the outfall end of the pipe. Sediment also covered most of the outlet protection pad. Flow into the facility shall not be obstructed by sediment and vegetation. Re-establish the outlet protection pad per the approved plan specifications, if necessary.

5-1-03

8.

Riprap ADDED, 24" RCP STILL FULL OF SED MORE THAN 18" NO!
Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 18-inch and 24-inch storm drain pipes which enter the basin at the north corner of the pond. This location is approximately 20 ft. east of the concrete flow control structure. Sediment accumulations were excessive (18 inches deep) at the outfall ends of the pipes and covered most of the outlet protection pads. Flow into the facility shall not be obstructed by sediment and vegetation. Re-establish outlet protection pads per the approved plan specifications, if necessary.

*X OK
5-5-03*

9.

Clear and remove all vegetation, debris and sediment within 10 feet of the front face of the concrete flow control structure where the inlet end of the 12-inch PVC low flow orifice is situated. Also, clean vegetation from inside the 12-inch PVC pipe and clean accumulated stone from within the bottom of the concrete box between the outlet end of the 12-inch PVC low flow orifice and the inlet end of the 30-inch concrete outlet pipe. Flow into the riser and barrel shall not be obstructed by vegetation, sediment and debris.

5-1-03

10.

Clean and remove all trash and debris collected along the fence at the outlet end of the 30-inch concrete pipe barrel through the dam. It appears the chain link fence which spans across the natural channel just downstream of the outlet end of the pipe barrel is trapping a considerable amount of debris. The fence should be cut to at least the top height of the 30-inch pipe to allow free-flow out of the basin. Flow out of the basin shall not be obstructed by structures, trash and debris.

5-1-03

11.

To prevent unauthorized access, add a padlock to the gate situated at the south corner of the basin near the parking area to the south of Building Unit # 3. Provide an extra set of keys or combination for the lock to the Environmental Division office.

*OK
5-5-03*

ONE KEY PROVIDED.

Site - Related Issues:

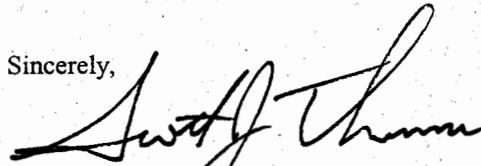
1. A pipe was observed behind the pool outfalling into riprap and toward a denuded easement area. Ensure filter cloth is installed under the riprap and stabilize the denuded easement area with a vegetative cover.
2. Remove sediment and repair riprap at outfall 57.
3. Remove debris/trash from the 90 LF grass swale shown at the end of outfall 57 and stabilize the denuded swale with a vegetative cover.
4. Repair erosion at yard inlet 25 and stabilize with a vegetative cover.
5. A pipe was observed in-between units 13 and 14 outfalling into a denuded area and sediment was observed downslope. Stabilize area where pipe outfalls in-between units 13 and 14.
6. Repair sink hole at yard inlet 2 and stabilize with a vegetative cover.

Bath
↓

- Beth* ↓
7. Remove mulch and sediment from yard inlet 17 and stabilize denuded area draining toward yard inlet 17 with a vegetative cover.
 8. Stabilize area draining toward yard inlet 20 with a vegetative cover.
 9. Stabilize denuded slope in-between units 3 and 5 with a vegetative cover.
 10. Repair sink hole at the toe of the slope behind unit 3 and stabilize with a vegetative cover.
 11. Stabilize denuded area on slope adjacent to drainage easement behind units 12 and 13. Sediment was observed downslope.
 12. Remove silt fence and repair erosion in sanitary sewer easement at toe of slope behind parking lot adjacent to unit 12 and maintenance building.
 13. Stabilize denuded area at top of slope adjacent to curb inlet 12 with a vegetative cover.

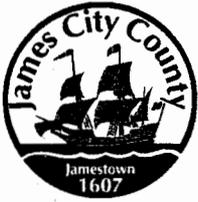
Once this work is satisfactorily completed, contact our office appropriately for reinspection. We can then proceed with final release of the surety and/or closing out the project. Any questions pertaining to BMP related items can be directed to the undersigned. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Any comments or questions pertaining to site-related erosion and sediment control issues can be directed to the assigned Environmental Division inspector, Beth Davis at 757-253-6702.

Sincerely,



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

cc: Peter Farrell, LandMark Design Group - via fax
Beth Davis, JCC Environmental Division Inspector



DEVELOPMENT MANAGEMENT

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

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

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

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

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

April 3, 2003

Mr. Joseph Carney
Waverton Associates
4021 Seaboard Court
Portsmouth, Va. 23701

Re: Spotswood Commons Apartments
County Plan No. SP-15-01; Amended SP-82-01
County BMP ID Code: PC 183

Dear Mr. Carney:

In response to your recent request concerning reduction or release of surety for the above referenced project, the Environmental Division has reviewed active file information and performed field inspections for the above referenced project. A record drawing was submitted to our office for BMP # 1 which is a wet pond BMP situated in the northwest corner of the project at the far end of Chesdale Court behind Building Unit # 3.

Based on our review of the project and concurrent field inspections as performed for the BMP and the site, the following items must be addressed prior to reduction or release of the developer's surety instrument and to proceed with closing out the project. For simplicity purposes, BMP related issues are indicated first. Site-related erosion and sediment control issues, as compiled by the assigned Environmental Division inspector, are indicated in the latter portion of the document.

Construction Certification (BMP # 1):

- 1. In accordance with Note # 19 on Sheet C-10 and various notes on Sheet 5 of the approved plan, construction certification is required for the stormwater management/BMP facility. None was provided. This is especially important since the facility has a large engineered and compacted earthen embankment. The certification can be in letter format or by use of the certification statement as provided in Section 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*. A copy of these requirements are attached.

Record Drawing (BMP # 1):

- ✓ 2. Along with the record drawing set, submit completed record drawing and construction certification forms, Sections 1 through 5, and applicable record drawing checklists from the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet). The Environmental Division began use of the forms and checklists in this packet effective February 1st 2001.
- ✓ 3. Provide a certification statement for the record drawing set. Refer to Pages 3 and 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*.

Construction - Related Items (BMP # 1):

4. Bare soil areas were present on a majority of the top of dam, the downstream face of the dam and the emergency spillway. Stabilize all disturbed soil areas with seed and mulch or matting.
5. Clean and remove all dead wood debris and construction debris (wooden stakes) from the downstream face of the dam.
6. Clean and remove organic matter (leaves) and debris which has accumulated at the end of the paved flume. The paved flume is situated on an interior graded side slope at the south end of the basin.
7. Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 18-inch storm drain pipe which enters the basin at the south end of the pond near the paved flume. Sediment accumulation was 4 inches deep within and at the outfall end of the pipe. Sediment also covered most of the outlet protection pad. Flow into the facility shall not be obstructed by sediment and vegetation. Re-establish the outlet protection pad per the approved plan specifications, if necessary.
8. Clean and remove sediment accumulations and vegetation within 10 feet of the outfall end of the 18-inch and 24-inch storm drain pipes which enter the basin at the north corner of the pond. This location is approximately 20 ft. east of the concrete flow control structure. Sediment accumulations were excessive (18 inches deep) at the outfall ends of the pipes and covered most of the outlet protection pads. Flow into the facility shall not be obstructed by sediment and vegetation. Re-establish outlet protection pads per the approved plan specifications, if necessary.
9. Clear and remove all vegetation, debris and sediment within 10 feet of the front face of the concrete flow control structure where the inlet end of the 12-inch PVC low flow orifice is situated. Also, clean vegetation from inside the 12-inch PVC pipe and clean accumulated stone from within the bottom of the concrete box between the outlet end of the 12-inch PVC low flow orifice and the inlet end of the 30-inch concrete outlet pipe. Flow into the riser and barrel shall not be obstructed by vegetation, sediment and debris.
10. Clean and remove all trash and debris collected along the fence at the outlet end of the 30-inch concrete pipe barrel through the dam. It appears the chain link fence which spans across the natural channel just downstream of the outlet end of the pipe barrel is trapping a considerable amount of debris. The fence should be cut to at least the top height of the 30-inch pipe to allow free-flow out of the basin. Flow out of the basin shall not be obstructed by structures, trash and debris.
11. To prevent unauthorized access, add a padlock to the gate situated at the south corner of the basin near the parking area to the south of Building Unit # 3. Provide an extra set of keys or combination for the lock to the Environmental Division office.

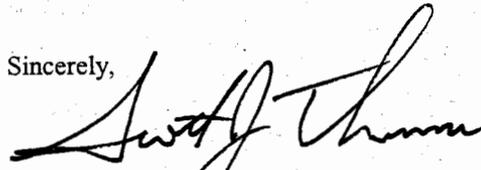
Site - Related Issues:

1. A pipe was observed behind the pool outfalling into riprap and toward a denuded easement area. Ensure filter cloth is installed under the riprap and stabilize the denuded easement area with a vegetative cover.
2. Remove sediment and repair riprap at outfall 57.
3. Remove debris/trash from the 90 LF grass swale shown at the end of outfall 57 and stabilize the denuded swale with a vegetative cover.
4. Repair erosion at yard inlet 25 and stabilize with a vegetative cover.
5. A pipe was observed in-between units 13 and 14 outfalling into a denuded area and sediment was observed downslope. Stabilize area where pipe outfalls in-between units 13 and 14.
6. Repair sink hole at yard inlet 2 and stabilize with a vegetative cover.

7. Remove mulch and sediment from yard inlet 17 and stabilize denuded area draining toward yard inlet 17 with a vegetative cover.
8. Stabilize area draining toward yard inlet 20 with a vegetative cover.
9. Stabilize denuded slope in-between units 3 and 5 with a vegetative cover.
10. Repair sink hole at the toe of the slope behind unit 3 and stabilize with a vegetative cover.
11. Stabilize denuded area on slope adjacent to drainage easement behind units 12 and 13. Sediment was observed downslope.
12. Remove silt fence and repair erosion in sanitary sewer easement at toe of slope behind parking lot adjacent to unit 12 and maintenance building.
13. Stabilize denuded area at top of slope adjacent to curb inlet 12 with a vegetative cover.

Once this work is satisfactorily completed, contact our office appropriately for reinspection. We can then proceed with final release of the surety and/or closing out the project. Any questions pertaining to BMP related items can be directed to the undersigned. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Any comments or questions pertaining to site-related erosion and sediment control issues can be directed to the assigned Environmental Division inspector, Beth Davis at 757-253-6702.

Sincerely,



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

cc: Peter Farrell, LandMark Design Group - via fax
Beth Davis, JCC Environmental Division Inspector

WAVERTON ASSOCIATES, Inc.
4021 Seaboard Court
Portsmouth, Va., 23701
(757)405-1400 Fax (757)405-1550



FAX COVER LETTER

DATE: 7/29/03

FAX NUMBER DIALED: 757-269-4032
COMPANY NAME: James City County
PLEASE DELIVER TO: Beth Davis
FAX SENT FROM: Jeff Fremeau
E-MAIL ADDRESS: jfremeau@wavertonassociates.com

WE ARE TRANSMITTING _____ PAGES (INCLUDING THIS COVER LETTER), IF YOU SHOULD
ENCOUNTER DIFFICULTIES, PLEASE ADVISE IMMEDIATELY BY CONTACTING THE ABOVE
LISTED PERSON AT _____ (757)405-1400

REGARDING- BMP certification
Crown Landing / spotswood commons

If I can be of any service, please call.

APPROVED
James City County
Environmental Division
By: _____
Date: _____

CONST CERT
PC 183; SP-15-01

**Report of Subsurface Exploration and
Laboratory Testing
BMP No.1 Dam Evaluation
Spotswood Commons Apartments
James City County, Virginia
GET Project No. WM03-406G
July 28, 2003
Prepared For: Waverton Associates**





July 28, 2003

**TO: Waverton Associates
 4021 Seaboard Court
 Portsmouth, Virginia 23701**

Attn: Mr. Jeff Fremeau

**RE: Report of Subsurface Exploration and Laboratory Testing
 BMP No.1 Dam Evaluation
 Spotswood Commons Apartments
 James City County, Virginia
 GET Project No. WMO3-406G**

Dear Mr. Fremeau:

G E T Solutions Inc. has completed our geotechnical investigation and review of the project plans and specifications of the existing dam for the BMP facility (BMP No.1) within Spotswood Commons Apartments, formerly called Crown Landing Apartments. Spotswood Commons Apartments is located off Longhill Road within James City County, Virginia. Specifically, the BMP facility is located within the southwest quadrant of the apartment complex, west of Chesdale Court.

The purpose of this study was to obtain information on the general subsurface conditions of the dam in order to evaluate its suitability. Therefore, several hand auger borings were performed at various locations along the dam. The subsurface conditions encountered were then evaluated to determine the conditions of the dam, including degree of compaction and estimated permeability rates.

Project Description

The current BMP facility includes an earthen dam, which is about 9 feet in height. At the time of our field investigation, the dam structure had straw and some grass cover. Based on our review of the project plans and specifications there is not a key way beneath the dam, however the material used for the embankment fill needs to extend 2 feet below the base of the dam. In addition, all fill material used for the dam should consist of a Clay material.

Report of Subsurface Exploration and Laboratory Testing
 BMP No.1 Dam Evaluation
 Spotswood Commons Apartments
 James City County, Virginia
 GET Project No. WMO3-406G

July 28, 2003

Field Exploration

In order to explore the general subsurface soil conditions, a total of four (4) hand auger borings were performed along the dam. Three (3) hand auger borings were performed along the top of the embankment, and one (1) hand auger was performed along the upstream slope of the embankment. The hand auger boring termination depths ranged from 7 to 12 feet. During the hand auger operations, a probe rod was used at various depths to determine the relative density (degree of compaction) of the underlying soils. Upon completion, the ground water level was measured and the boring holes were backfilled with cement grout mix.

The hand auger boring locations were established, located and staked in the field by a representative of G E T Solutions, Inc. The approximate boring locations are shown on the "Boring Location Plan" attached to this report. This plan was developed by LandMark Design Group and reproduced by G E T Solutions, Inc.

Laboratory Testing

Representative portions of soil samples collected during drilling were collected, labeled and transferred to our laboratory for classification and analysis. The soil classification was performed by an experienced Geologist in accordance with ASTM D2488.

Six representative soil samples were selected and subjected to laboratory testing, which included natural moisture, passing #200 sieve, and Atterberg Limits analysis, in order to corroborate the visual classification of the subsurface soils encountered within the hand auger borings. These test results are noted in Table I and are presented on the "Log of Boring" sheets attached to this report.

Table I – Laboratory Test Results

| Boring No. | Depth (Feet) | Natural Moisture (%) | Percent Passing #200 | Atterberg Limits (LL/PL/PI) | Classification |
|------------|--------------|----------------------|----------------------|-----------------------------|----------------|
| HA-1 | 0.75-1.5 | 14.2 | 32 | Non Plastic | SM |
| HA-1 | 4.5-5.5 | 21.5 | 45 | 29/20/9 | SC |
| HA-2 | 6-7 | 24.2 | 45 | 31/23/8 | SC |
| HA-3 | 2-3 | 18.1 | 41 | 27/15/12 | SC |
| HA-4 | 3-4 | 19.0 | 46 | 66/28/38 | SC |
| HA-4 | 5-6 | 23.9 | 27 | Non Plastic | SM |



Report of Subsurface Exploration and Laboratory Testing
BMP No.1 Dam Evaluation
Spotswood Commons Apartments
James City County, Virginia
GET Project No. WM03-406G

July 28, 2003

Subsurface Soil Conditions

The results of our field exploration program indicated the presence of 2 to 3 inches of topsoil material at the boring locations. Underlying the topsoil, the soils recovered primarily consisted of Clayey SAND (SC), with intermittent layers of Silty SAND (SM). These soils were frequently noted to contain trace organic material. During the hand auger boring operations, a probe rod was used to aid in the determination of the density of the dam soils. The resistance of the soils to the hand auger penetration in combination with intermittent probing indicated that the embankment soils were of medium dense relative density (estimated to have a degree of compaction in excess of 95% of the standard proctor maximum dry density, ASTM D698).

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration and the Generalized Soil Profile are attached to this report and should be reviewed for specific information as to the individual borings. The stratifications shown on the records of the subsurface exploration represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual.

Permeability Rates

Based on the field testing and corroborated with laboratory testing results (published values compared to classification results), the estimated coefficient of permeability of the existing soils are as follows:

| Soil Type | USCS Classification | Coefficient of Permeability (cm/sec) |
|-------------|---------------------|--|
| Clayey SAND | SC | 1×10^{-6} to 1×10^{-9} |

The coefficient of permeability is inversely proportional to the degree of compaction. In this case, the soil appears to be rather well compacted, thus yielding a low coefficient of permeability.



Report of Subsurface Exploration and Laboratory Testing
BMP No. 1 Dam Evaluation
Spotswood Commons Apartments
James City County, Virginia
GET Project No. WM03-408G

July 28, 2003

Conclusions

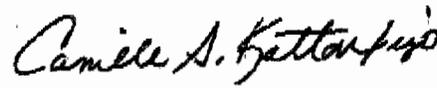
Based on our field testing procedures, the embankment fill, including the 2-foot of fill beneath the dam was determined to have been properly compacted during construction. The low permeability material present within the embankment dam appears to extend below the base of the dam a minimum of 2 feet, which serves as the key way.

Based on the visual classification, laboratory testing, and the degree of compaction of the embankment soils, it is our professional opinion that the entire dam was constructed with material suitable for "core" material, and thus the dam is considered suitable. Additionally, the dam slopes appear to be stable as constructed (4:1 slope).

We appreciate the opportunity to offer our services to you, and trust that you will call this office with any questions that you may have.

Respectfully Submitted,
G E T Solutions, Inc.


James R. Wheeler
Staff Geologist

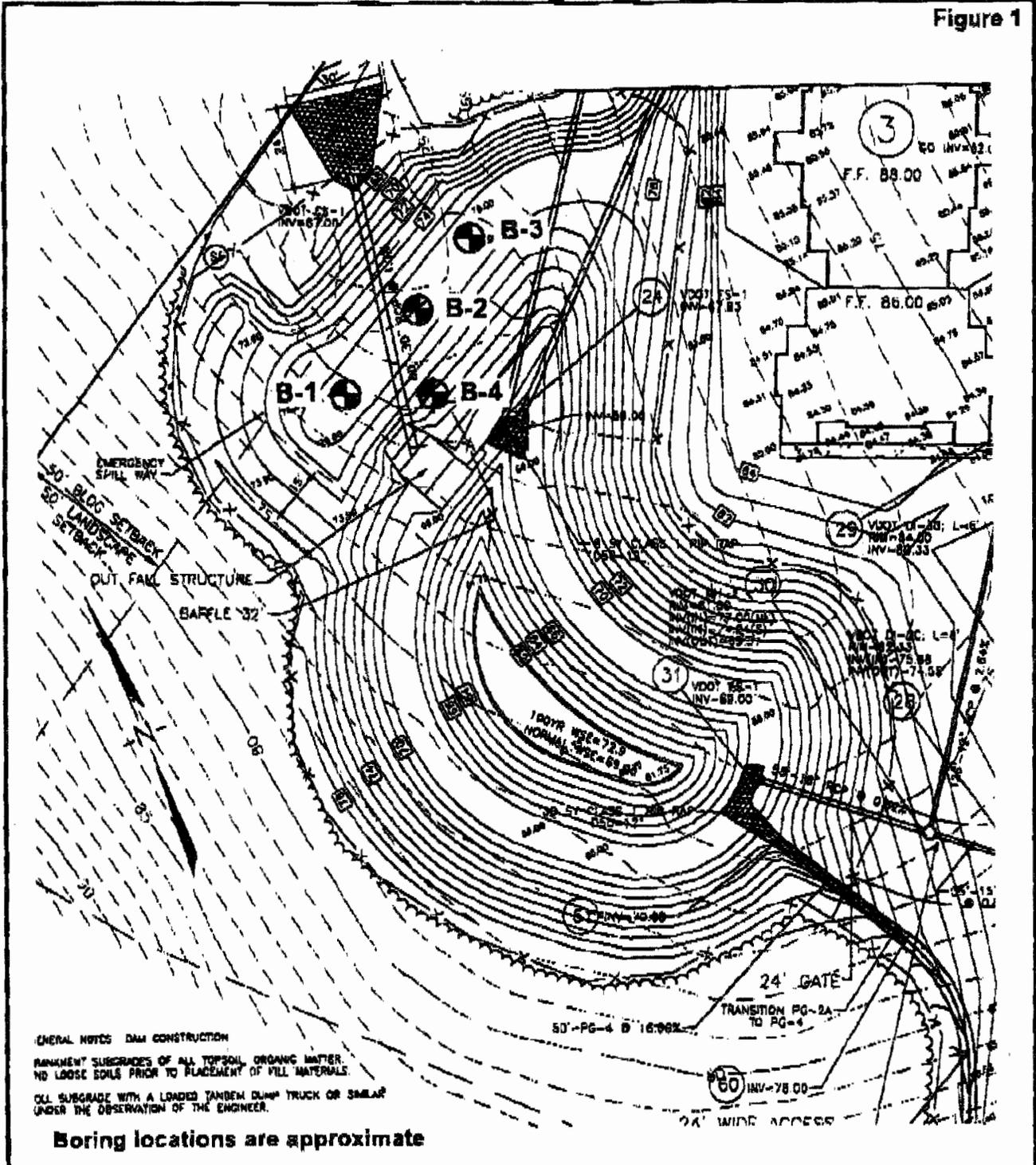

Camille A. Kattan, P. E.
Principal Engineer
VA Lic. # 18045

Copies: (2) Client

Attachments Boring Location Plan
Log of Borings
Generalized Soil Profile



Figure 1



BORING LOCATION PLAN

PROJECT: BMP No.1 Dam – Spotswood Commons Apartments
 James City County, Virginia

PROJECT NO: WM03-406G

CLIENT: Waverton Associates

SCALE: NTS
DATE: 07/22/2003
PLOT BY: JRW

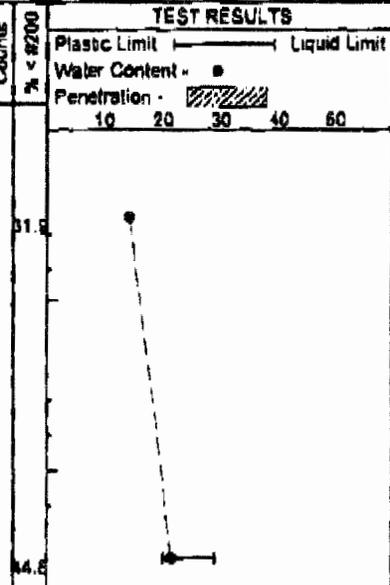


LOG OF BORING
No. HA-1

PROJECT: BMP Dam Evaluation at Spotswood Commons Apartments **PROJECT NO.:** WM03-406G
CLIENT: Waverton Associates
PROJECT LOCATION: James City County, Virginia
LOCATION: See Attached Boring Location Plan **ELEVATION:**
DRILLER: GET Solutions, Inc. **LOGGED BY:** J. Wheeler
DRILLING METHOD: Hand Auger **DATE:** 6-18-03
DEPTH TO - WATER> INITIAL: 9 **AFTER 24 HOURS:** 9 **CAVING>** C

This information pertains only to this boring and should not be interpreted as being indicative of the site.

| Depth (feet) | Description | Graphic | Sample No. | Blow Counts | TEST RESULTS | |
|--------------|---|---------|------------|-------------|---|--------------|
| | | | | | Plastic Limit Water Content - Penetration - | Liquid Limit |
| 0.17 | 2 Inches of Topsoil | | | | | |
| 1.5 | Brown to tan, moist, Silty, fine to medium SAND (SM) with trace Clay and organics | | | | | |
| 2.29 | Dark brown, moist, Silty, fine to medium SAND (SM) with some organics | | | | | |
| 3.5 | Brown, moist, Silty, Clayey, fine to medium SAND (SM-SC) with some organics | | | | | |
| 4.5 | Orangeish-brown, moist, Clayey SAND (SC) with trace organics | | | | | |
| 4.5 | Tan, moist, Silty, fine to medium SAND (SM) with trace Clay | | | | | |
| 4.5 | Orangeish-brown, moist, Clayey SAND (SC) with trace organics | | | | | |
| 6.5 | Gray, moist, Silty, fine to medium SAND (SM) with trace organics | | | | | |
| 9 | Light gray to tan, moist to wet, Silty, fine to medium SAND (SM) | | | | | |
| 12 | Boring terminated at 12 ft. | | | | | |





LOG OF BORING
No. HA-2

PROJECT: BMP Dm Evaluation at Spotswood Commons Apartments PROJECT NO.: WM03-406G
 CLIENT: Waverton Associates
 PROJECT LOCATION: James City County, Virginia
 LOCATION: See Attached Boring Location Plan ELEVATION: _____
 DRILLER: GET Solutions, Inc. LOGGED BY: J. Wheeler
 DRILLING METHOD: Head Auger DATE: 6-18-03
 DEPTH TO WATER: INITIAL: 9.5 AFTER 24 HOURS: 15 CAVING: C

This information pertains only to this boring and should not be interpreted as being indicative of the site.

| Depth (feet) | Description | Graphic | Sample No. | Blow Counts | % < #200 | TEST RESULTS | |
|--------------|---|----------|------------|-------------|----------|---------------|--------------|
| | | | | | | Plastic Limit | Liquid Limit |
| 0.17 | 2 inches of Topsoil | [Symbol] | | | | | |
| 0.17 - 1.5 | Dark brown, moist, Silty, fine to medium SAND (SM) with some organics | [Symbol] | | | | | |
| 1.5 - 8.0 | Orangish brown, moist, Clayey SAND (SC) | [Symbol] | | | | | |
| 8.0 - 10.0 | Gray to light gray, moist to wet, Silty, fine to medium SAND (SM) | [Symbol] | | | | | |
| 10.0 - 14.0 | Boring terminated at 10 ft. | | | | | | |

Figure



LOG OF BORING
No. HA-3

PROJECT: BMP Dam Evaluation at Spotswood Commons Apartments PROJECT NO.: WM01-4060
 CLIENT: Waverion Associates
 PROJECT LOCATION: James City County, Virginia
 LOCATION: See Attached Boring Location Plan ELEVATION: _____
 DRILLER: GET Solutions, Inc. LOGGED BY: J. Wheeler
 DRILLING METHOD: Hand Auger DATE: 6-18-03
 DEPTH TO - WATER> INITIAL: ∅ R AFTER 24 HOURS: ∅ CAVING> ∅

This information pertains only to this boring and should not be interpreted as being indicative of the site.

| Depth (feet) | Description | Graphic | Sample No. | Blow Counts | TEST RESULTS | |
|--------------|---|---------|------------|-------------|---------------|--------------|
| | | | | | Plastic Limit | Liquid Limit |
| 0.0 - 0.25 | 3 inches of Topsoil | | | | | |
| 0.25 - 6.0 | Tan to orangish brown, moist, Clayey SAND (SC) with trace organics at 0.25-1 foot | | | | | |
| 6.0 - 7.0 | Tan, moist, Silty, fine to medium SAND (SM) with trace Clay | | | | | |
| 7.0 - 8.0 | Mottled, orangish brown and grey, moist to wet, Clayey SAND (SC) | | | | | |
| 8.0 - 14.0 | Boring terminated at 8 ft. | | | | | |

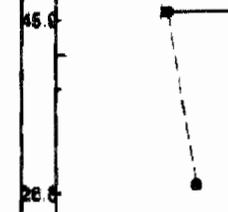


**LOG OF BORING
No. HA-4**

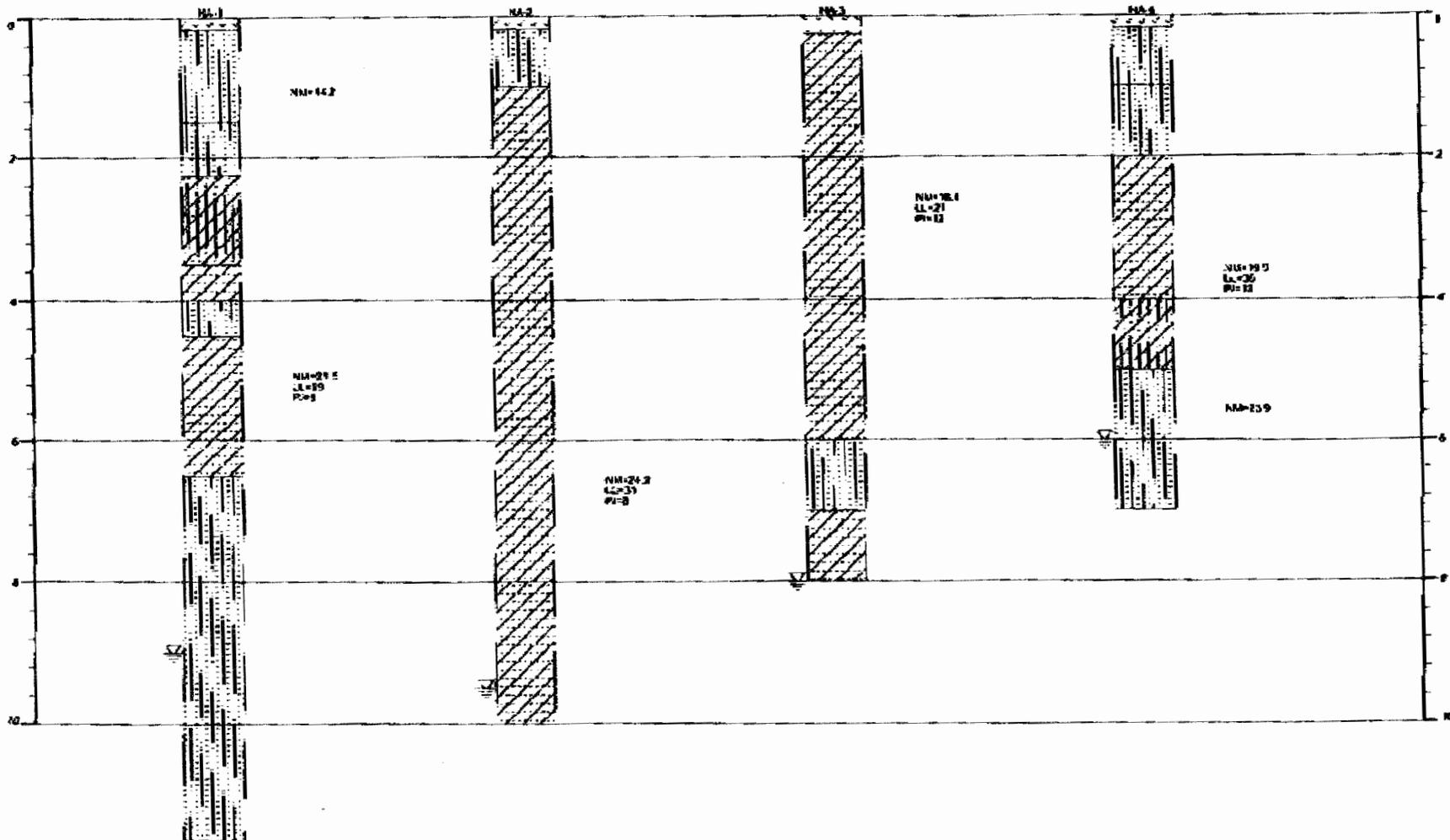
PROJECT: BMP Item Evaluation at Spotswood Commons Apartments PROJECT NO.: WM03-406G
 CLIENT: Waverton Associates
 PROJECT LOCATION: James City County, Virginia
 LOCATION: See Attached Boring Location Plan ELEVATION: _____
 DRILLER: GET Solutions, Inc. LOGGED BY: J. Wheeler
 DRILLING METHOD: Hand Auger DATE: 6-18-03
 DEPTH TO - WATER> INITIAL: 6 AFTER 24 HOURS: 6 CAVING> L

This information pertains only to this boring and should not be interpreted as being indicative of the site.

| Depth (feet) | Description | Graphic | Sample No. | Blow Counts | % < #200 | TEST RESULTS | |
|--------------|--|---------------------|------------|-------------|----------|-------------------|-----------------|
| | | | | | | Plastic Limit | Liquid Limit |
| | | | | | | Water Content - ● | Penetration - ▨ |
| | | | | | | 10 | 20 30 40 50 |
| 0.17 | 2 Inches of Topsoil | [Dotted pattern] | | | | | |
| 1 | Tan, moist, Silty, fine to medium SAND (SM) | [Dotted pattern] | | | | | |
| 2 | Dark brown, moist, Silty, fine to medium SAND (SM) with some organic | [Dotted pattern] | | | | | |
| 2 | Mottled, orangish brown and gray, moist, Clayey SAND (SC) | [Diagonal hatching] | | | | | |
| 4 | Orangish brown, moist, Silty, Clayey, fine to medium SAND (SM-SC) | [Diagonal hatching] | | | | | |
| 5 | Gray, moist, Silty, fine to medium SAND (SM) | [Dotted pattern] | | | | | |
| 6 | Orangish and reddish brown, wet, Silty, fine to medium SAND (SM) with trace Clay | [Dotted pattern] | | | | | |
| 7 | Boring terminated at 7 ft. | | | | | | |



Depth in Feet



Jul 29 2003 - 2:30PM - Get Solutions

No. 0338 - 9.12.12

- Soil symbols**
- Topsoil
 - Silty sand
 - Poorly graded clayey silty sand
 - Clayey sand

| | | |
|---|-----------------------------|-----------------------|
| GET Solutions, Inc. | | |
| GENERALIZED SOIL PROFILE | | |
| HOORSCALE SCALE | DRAWN BY/APPROVED BY IRW | DATE DRAWN 7/23/03 |
| BMP Dam Evaluation at Spotswood Commons Apartments | | |
| PROJECT NO. WM03-406G | | FIGURE NUMBER |

LANDMARK DESIGN GROUP TRANSMITTAL



To: Scott Thomas
 Company: JCC-Environmental
 From: Peter Farrell
 Date: 04/07/03
 Subject: Spottswood Commons

LMDG Job No.: 1950040-000.21

Attached please find:

- | | |
|--|--|
| <input type="checkbox"/> Prints <input type="checkbox"/> Plans <input type="checkbox"/> Specifications <input type="checkbox"/> Drawings <input type="checkbox"/> Report <input type="checkbox"/> Letter <input checked="" type="checkbox"/> Stormwater Management/BMP Facilities Record Drawings & Construction Certification Forms | Transmitted as checked below: <input type="checkbox"/> For your use <input type="checkbox"/> As requested <input type="checkbox"/> For review and comment <input type="checkbox"/> For approval <input type="checkbox"/> Approved <input type="checkbox"/> |
|--|--|

| Copies | Date | Drawing No. | Description |
|--------|---------|-------------|---|
| 1 | 1/14/03 | N/A | Stormwater Management/BMP Facilities Record Drawings & Construction Certification Forms |
| | | | |
| | | | |
| | | | |

Notes:
 Scott,

This was transmitted to our client Steve Middleton-Commonwealth Properties, January 14, 2003.

- Copies
1. File: 1950040-000.21 _____
 2. _____
 3. _____
 4. _____
 5. _____

Enclosures

-
-
-
-
-

LandMark Design Group, Inc.

By: _____ MAL _____

Scott Thomas
JCC Env.

LANDMARK DESIGN GROUP TRANSMITTAL

To: Steve Middleton
Company: Commonwealth Properties
From: Steve Romeo
Date: 01/14/03
Subject: Spotswood Commons Apartments-Alta/ACSM Land Title Survey
LMDG Job No.: 1950040-000.21

Attached please find:

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

Transmitted as checked below:

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

| Copies | Date | Drawing No. | Description |
|--------|--------------|------------------------------------|---|
| 6 | Rev. 1/14/03 | 13571W, 13571AW, 13572W, 13573W | Spotswood Commons Apartments-Alta/ACSM Land Title Survey |
| 1 | | | Stormwater Management/BMP Facilities Record Drawing and Construction Certification Forms |
| | | | |
| | | | |

Notes:

Copies

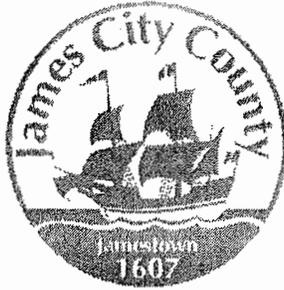
1. File: 1950040-000.21 _____
2. _____
3. _____
4. _____
5. _____

Enclosures

-
-
-
-
-

LandMark Design Group, Inc.

By: Trish Penci



James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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

Section 1 - Site Information:

Project Name: SPOTSWOOD COMMONS
Structure/BMP Name: BMP # 1
Project Location: SR 612 LONGHILL RD. 1100' WEST OF OLDE TOWNE
BMP Location: SOUTH WESTERLY CORNER OF PARCEL
County Plan No.: SP-1501 - AMENDMENT SP-B201

Project Type: Residential Business Commercial Office Institutional Industrial Public Roadway Other APARTMENTS
Tax Map/Parcel No.: 32301 00012
BMP ID Code (if known): PC-183
Zoning District: R-5
Land Use: APARTMENTS
Site Area (sf or acres): 25 ± ACRES

Brief Description of Stormwater Management/BMP Facility: WET POND

Nearest Visible Landmark to SWM/BMP Facility: BUILDINGS #3 AND #7

Nearest Vertical Ground Control (if known):
 JCC Geodetic Ground Control USGS Temporary Arbitrary Other
Station Number or Name: 310
Datum or Reference Elevation: NGV 1929
Control Description: 3/4" DISK IN CONCRETE
Control Location from Subject Facility: APPROXIMATELY 1 MILE WESTERLY ALONG LONGHILL ROAD FROM SITE.

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: MAY 21, 2001
Facility Monitored by County Representative during Construction: Yes No Unknown
Name of Site Work Contractor Who Constructed Facility: TRIAD/WAYERTON
Name of Professional Firm Who Routinely Monitored Construction: _____
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: RECORD DWG 12/12/02

(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: _____
Mailing Address: _____
Business Phone: _____ Fax: _____
Contact Person: _____ Title: _____

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

Firm Name: LANN MARK DERION GROUP
Mailing Address: 4029 IRONBOUND RD, STE 100
WILLIAMSBURG, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049
Responsible Plan Preparer: STEPHEN POWERS, LS
Title: PRINCIPAL
Plan Name: CROWN LIVING APARTMENTS
Firm's Project No. 1950040
Plan Date: 7-12-01
Sheet No.'s Applicable to SWM/BMP Facility: C-3 / C-5 / C-8 / C-10 /

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

Name: _____
Mailing Address: _____
Business Phone: _____
Fax: _____
Contact Person: _____
Site Foreman/Supervisor: _____
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

Construction Certification

Firm Name: LANDMARK DESIGN GROUP, INC
 Mailing Address: 4029 IRON BOUND RD.
WILLIAMS BURG VA 23188
 Business Phone: 253-2975
 Fax: 229-0049

Firm Name: _____
 Mailing Address: _____
 Business Phone: _____
 Fax: _____

Name: PETER FARRELL
 Title: DIRECTOR OF SURVEYS

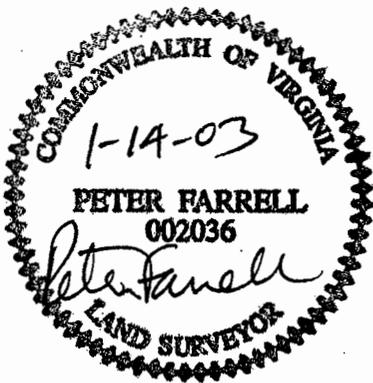
Name: _____
 Title: _____

Signature: Peter Farrell
 Date: 1-14-03

Signature: _____
 Date: _____

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

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.

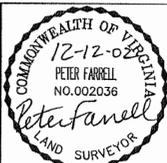


(Seal)

(Seal)

Virginia Registered Professional Engineer
 or Certified Land Surveyor

Virginia Registered
 Professional Engineer



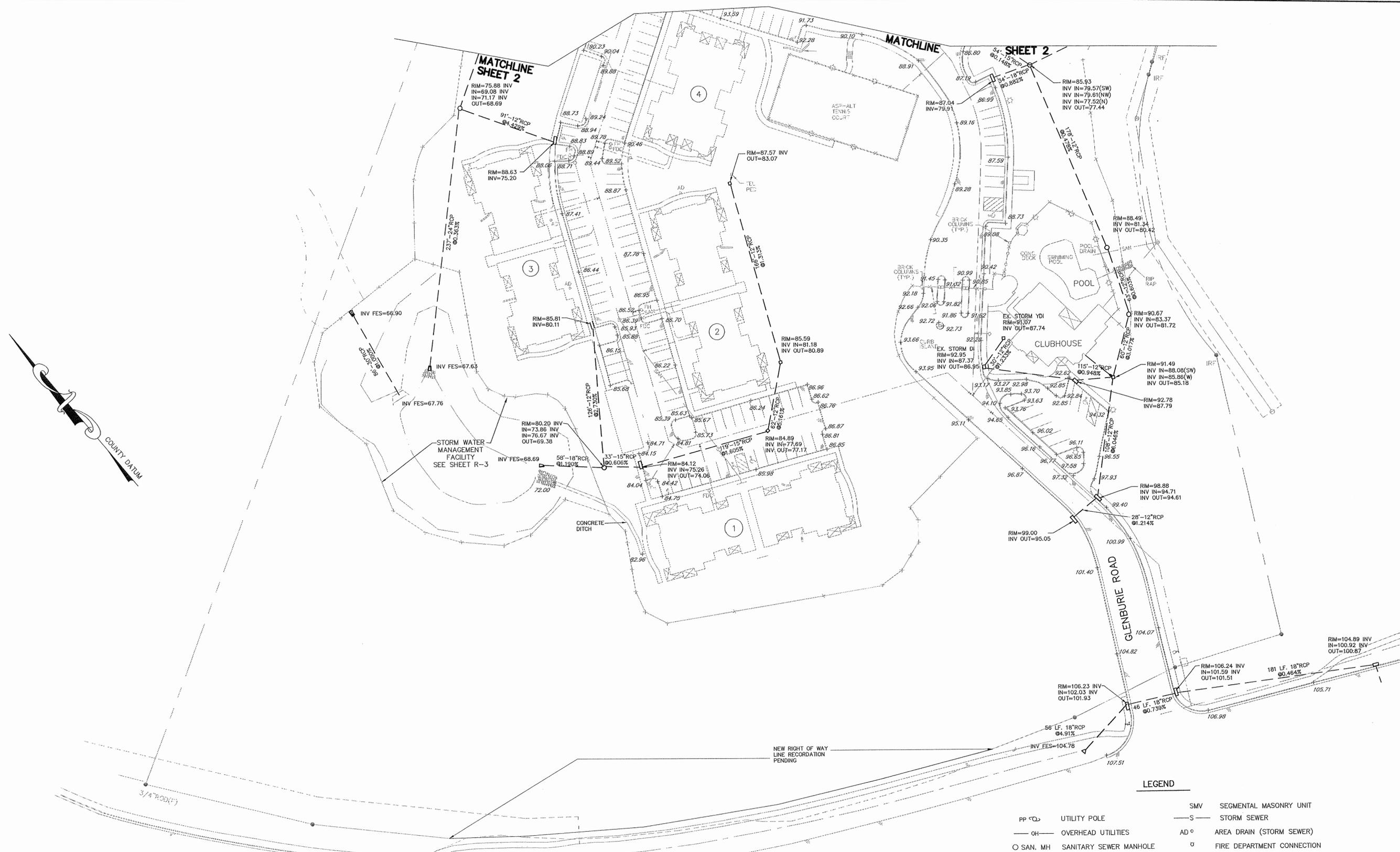
4028 Ironbound Road
Williamsburg, VA 23185
Tel: (757) 253-2975
Fax: (757) 228-0049
Email: info@landmarkdesign.com

5544 Greenwich Road
Williamsburg, VA 23162
Tel: (757) 473-2000
Fax: (757) 497-7833
Email: info@landmarkdesign.com

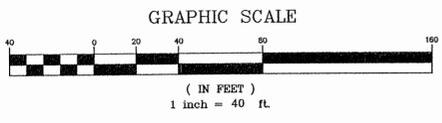
LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

STORM SEWER RECORD DRAWINGS
SPOTSWOOD COMMONS APARTMENTS
LONGHILL ROAD - STATE ROUTE 612
BERKELEY DISTRICT - JAMES CITY COUNTY, VIRGINIA
CWTW WILLIAMSBURG, L. P.

Designed: N/A Date: 09/19/02
Checked: PF/SAR Scale: 1"=40'
File Mgr./Drawn: CRO CADD File name: STORMSEWER.DWG
Project Number: 1950040-000.21 Dwg. File No.: 13203AW
Drawing Number: **R-1**
1 OF 3



NOTE:
THIS PROPERTY FALLS WITHIN FLOOD ZONE "X",
AREA DETERMINED TO BE OUTSIDE THE 500 YEAR
FLOOD PLAIN, AS SHOWN ON FEMA PANEL NO.
510201-0035B FOR JAMES CITY COUNTY, VIRGINIA,
DATED FEBRUARY 6, 1991.



NOTE:
UNDERGROUND UTILITIES SHOWN
ARE BASED ON FIELD LOCATION
OF SURFACE FEATURES AND
APPROVED SITE PLAN.

LEGEND

| | | | |
|-----------|------------------------------------|----------|--|
| PP (C) | UTILITY POLE | SMV | SEGMENTAL MASONRY UNIT |
| OH | OVERHEAD UTILITIES | S | STORM SEWER |
| O SAN. MH | SANITARY SEWER MANHOLE | AD | AREA DRAIN (STORM SEWER) |
| — | EDGE OF PAVEMENT | FD | FIRE DEPARTMENT CONNECTION |
| IRF ● | IRON ROD FOUND | — W — | WATERLINE |
| CO □ | SANITARY CLEAN OUT | ◇ | FIRE HYDRANT |
| ☆ | LIGHT POLE | W | WATER VALVE |
| — SAN — | SANITARY SEWER | BSL | BUILDING SETBACK LINE |
| ○ MH | MANHOLE | — | SIGN |
| □ YD | YARD DRAIN (STORM SEWER) | CONCRETE | |
| ES | END SECTION (STORM SEWER) | — | CENTERLINE OF STREAM |
| ♿ | PARKING SPACE FOR DISABLED PERSONS | DI | DROP INLET (STORM SEWER) |
| | | — | CURB RAMP FOR ACCESS BY DISABLED PERSONS |

APPROVED
James City County
Environmental Division
By: *[Signature]*
Date: 4-11-03

PC/83; SP-15-01



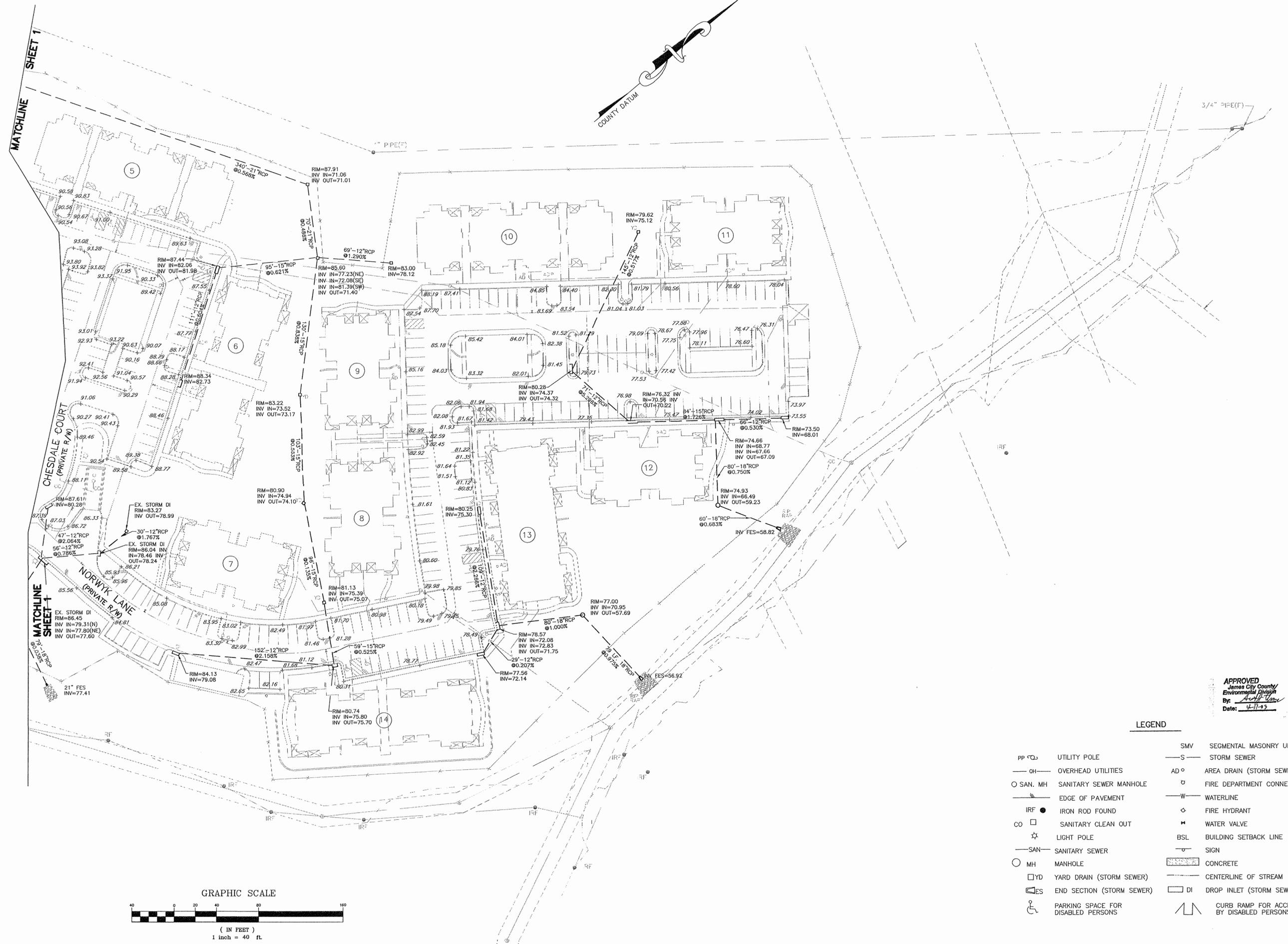
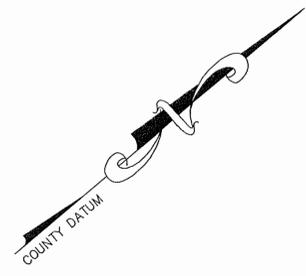
5225 Ingham Road
Williamsburg, VA 23185
Tel. (757) 253-2975
Email: info@landmarkag.com

5544 Greenwich Road
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax. (757) 467-7933
Email: info@landmarkag.com

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

STORM SEWER RECORD DRAWINGS
SPOTSWOOD COMMONS APARTMENTS
LONGHILL ROAD - STATE ROUTE 612
BERKELEY DISTRICT - JAMES CITY COUNTY, VIRGINIA
CWTW WILLIAMSBURG, L.P.

Designed: N/A Date: 09/06/02
Checked: PF/SAR Scale: 1"=40'
File Mgr./Drawn: CRO CADD File name: STORMMAS03.DWG
Project Number: 1950040-000.21 Dwg. File No.: 13203BW
Drawing Number: 2 OF 3 **R-2**

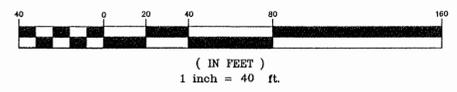


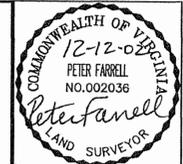
APPROVED
James City County
Environmental Design
By: *[Signature]*
Date: 4-11-03

LEGEND

- | | | | |
|-----------|------------------------------------|----------|--|
| PP ⊙ | UTILITY POLE | SMV | SEGMENTAL MASONRY UNIT |
| — OH — | OVERHEAD UTILITIES | — S — | STORM SEWER |
| ○ SAN. MH | SANITARY SEWER MANHOLE | AD ⊙ | AREA DRAIN (STORM SEWER) |
| — | EDGE OF PAVEMENT | ⊙ | FIRE DEPARTMENT CONNECTION |
| IRF ● | IRON ROD FOUND | — W — | WATERLINE |
| CO □ | SANITARY CLEAN OUT | ◇ | FIRE HYDRANT |
| ★ | LIGHT POLE | ⊕ | WATER VALVE |
| — SAN — | SANITARY SEWER | BSL | BUILDING SETBACK LINE |
| ○ MH | MANHOLE | — | SIGN |
| □ YD | YARD DRAIN (STORM SEWER) | CONCRETE | |
| ES | END SECTION (STORM SEWER) | — | CENTERLINE OF STREAM |
| ♿ | PARKING SPACE FOR DISABLED PERSONS | DI | DROP INLET (STORM SEWER) |
| | | ⏏ | CURB RAMP FOR ACCESS BY DISABLED PERSONS |

GRAPHIC SCALE





4028 Ironbound Road
 Suite 200
 Williamsburg, VA 23188
 Tel: (757) 233-2875
 Fax: (757) 233-2875
 Email: info@landmarkdg.com

5544 Greenwich Road
 Virginia Beach, VA 23462
 Tel: (757) 473-2000
 Fax: (757) 487-7933
 Email: info@landmarkdg.com

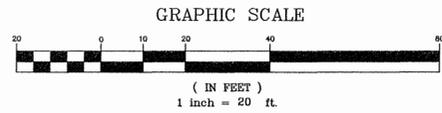
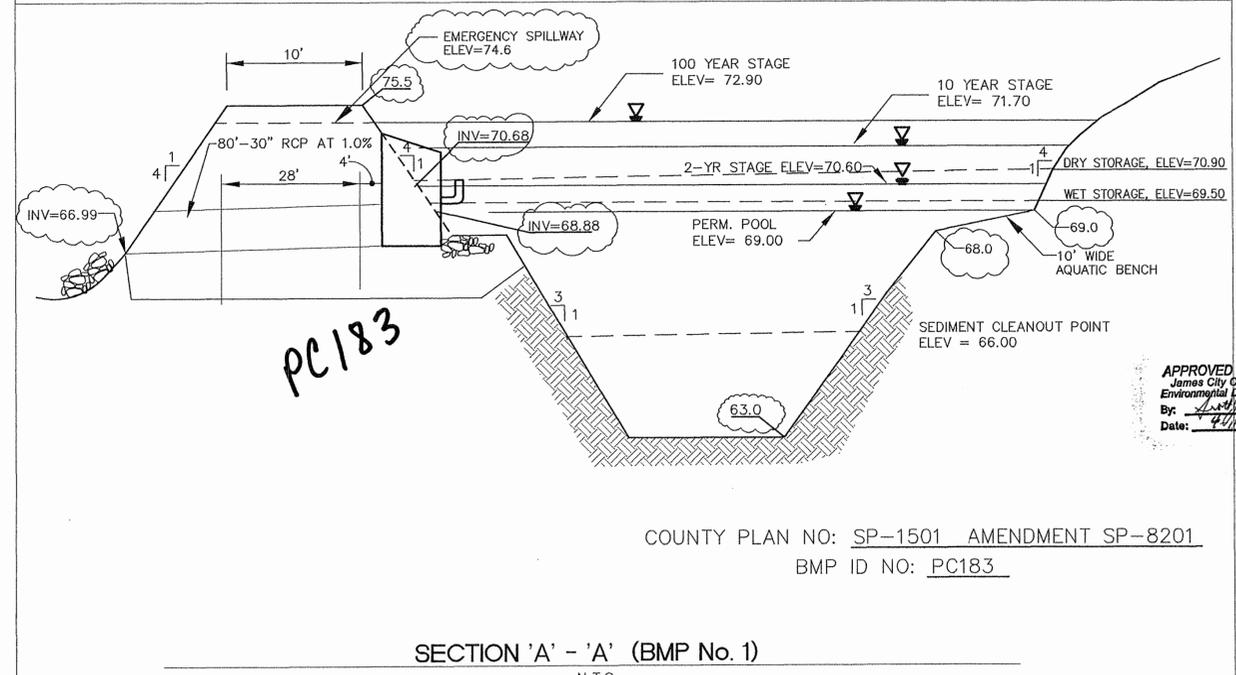
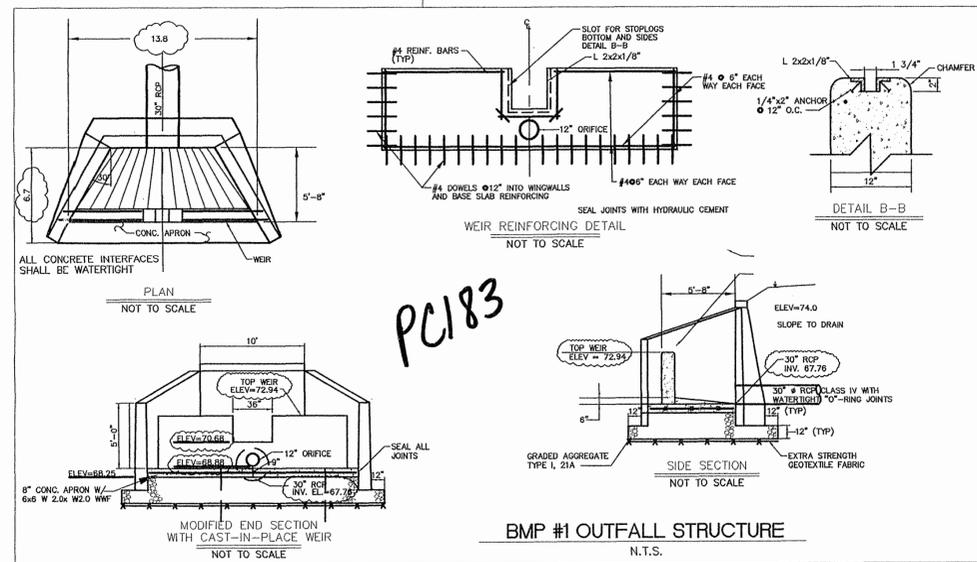
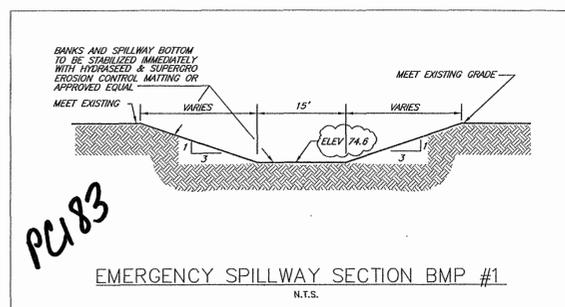
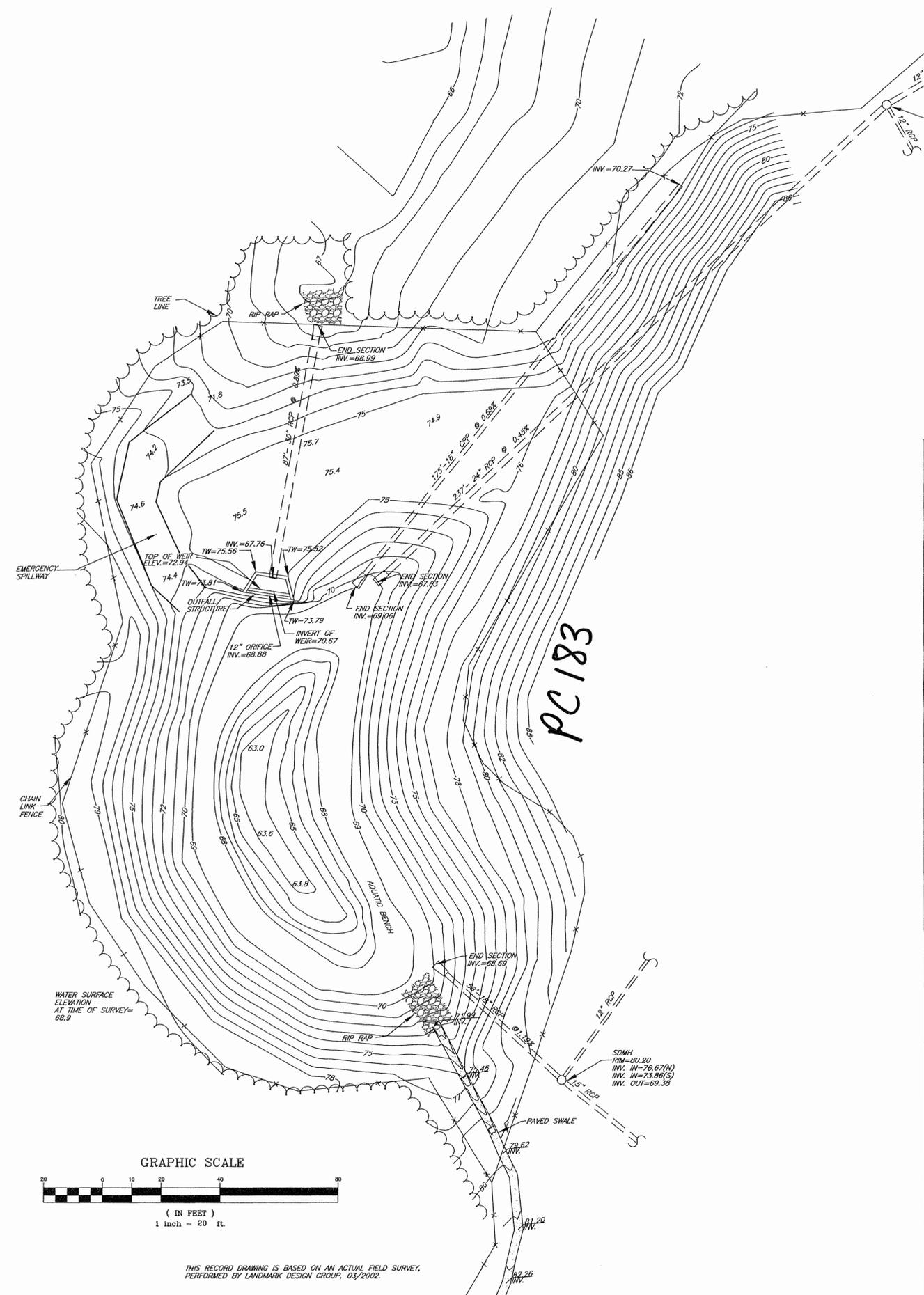
LANDMARK DESIGN GROUP
 Engineers • Planners • Surveyors
 Landscape Architects • Environmental Scientists

STORMWATER MANAGEMENT/BMP FACILITY MAINTENANCE PLAN

UPON FINAL STABILIZATION OF SITE, REMOVE ACCUMULATED SEDIMENTS FROM BMP, SUCH THAT DESIGN VOLUMES ARE ACHIEVED TO THE EXTENT PRACTICABLE.

MAINTENANCE OPERATION OF FACILITIES MANAGEMENT NEED TO REGULARLY INSPECT AND MAINTAIN VEGETATION ON SLOPES. KEEP PRINCIPAL AND EMERGENCY SPILLWAYS FREE OF EXCESS DEBRIS AND FOREST LITTER, SINCE FACILITY IS ADJACENT TO FOREST. DAM NEEDS TO BE KEPT FREE OF WOODY GROWTH. OBSERVE OUTFALL STRUCTURE TO ENSURE RIPRAP APRON IS IN GOOD CONDITION.

COORDINATE WITH JCC ENVIRONMENTAL DIVISION FOR PERIODIC INSPECTIONS OF BMP FACILITY.



THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY, PERFORMED BY LANDMARK DESIGN GROUP, 03/2002.

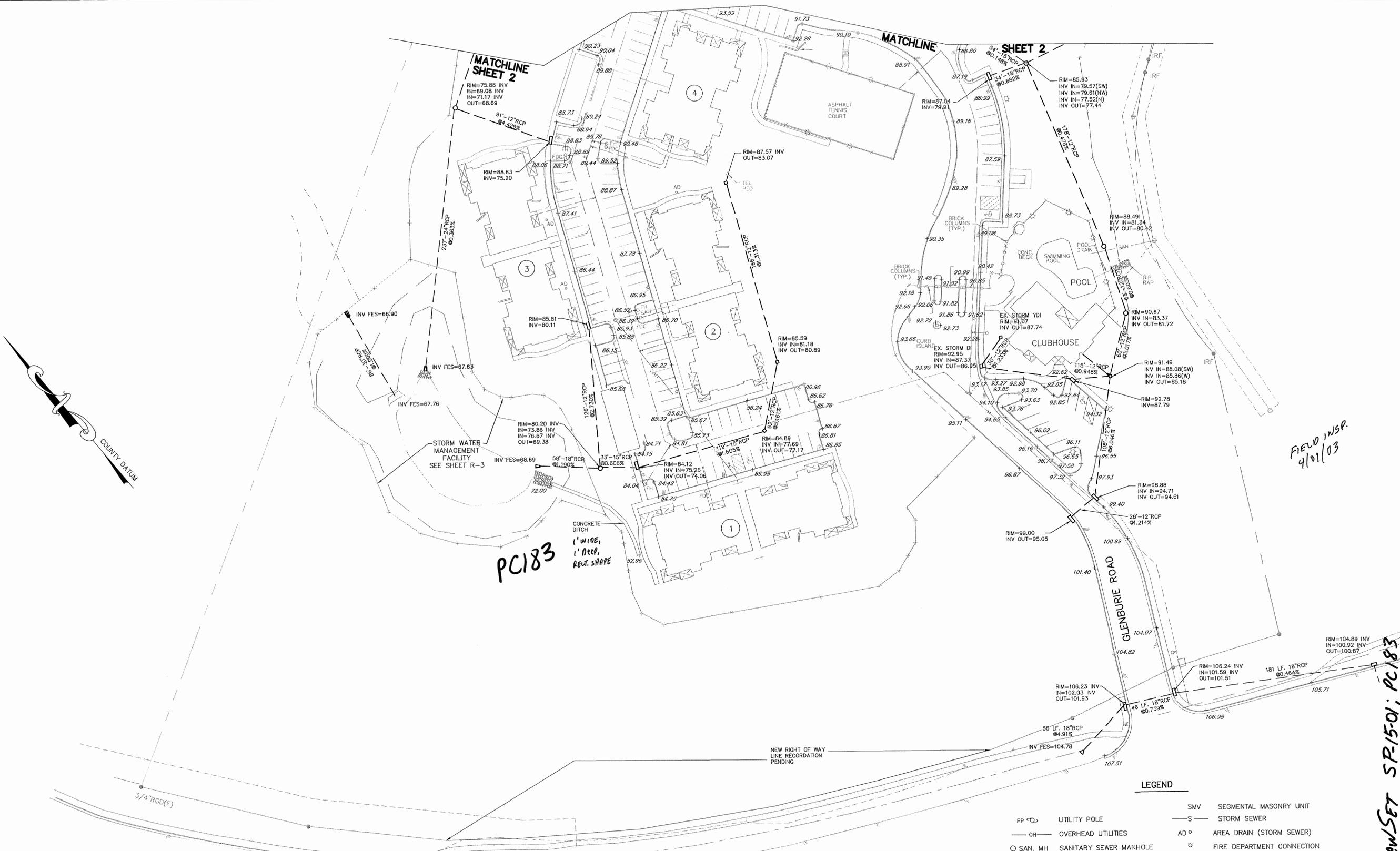
APPROVED
 James City County
 Environmental Division
 By: [Signature]
 Date: 4/11/13

COUNTY PLAN NO: SP-1501 AMENDMENT SP-8201
 BMP ID NO: PC183

SECTION 'A' - 'A' (BMP No. 1)

RECORD DRAWING
 BMP NO. 1
 CROWN LANDING APARTMENTS
 LONGHILL ROAD - STATE ROUTE 82
 BERKELEY DISTRICT - JAMES CITY COUNTY, VIRGINIA

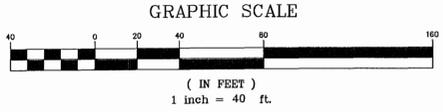
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| Designed: LMDG | Date: 04/17/02 |
| Checked: PF | Scale: 1"=20' |
| File Mgr./Drawn: AST | CADD File name: BMPRECORD.DWG |
| Project Number: 1950040-000.20 | Dep. File No.: 13203W |
| Drawing Number | R-3 |



FIELD INSP.
 4/01/03

PC183
 1" WIDE,
 1' DEEP,
 RECT. SHAPE

NOTE:
 THIS PROPERTY FALLS WITHIN FLOOD ZONE "X",
 AREA DETERMINED TO BE OUTSIDE THE 500 YEAR
 FLOOD PLAIN, AS SHOWN ON FEMA PANEL NO.
 510201-0035B FOR JAMES CITY COUNTY, VIRGINIA,
 DATED FEBRUARY 6, 1991.



NOTE:
 UNDERGROUND UTILITIES SHOWN
 ARE BASED ON FIELD LOCATION
 OF SURFACE FEATURES AND
 APPROVED SITE PLAN.

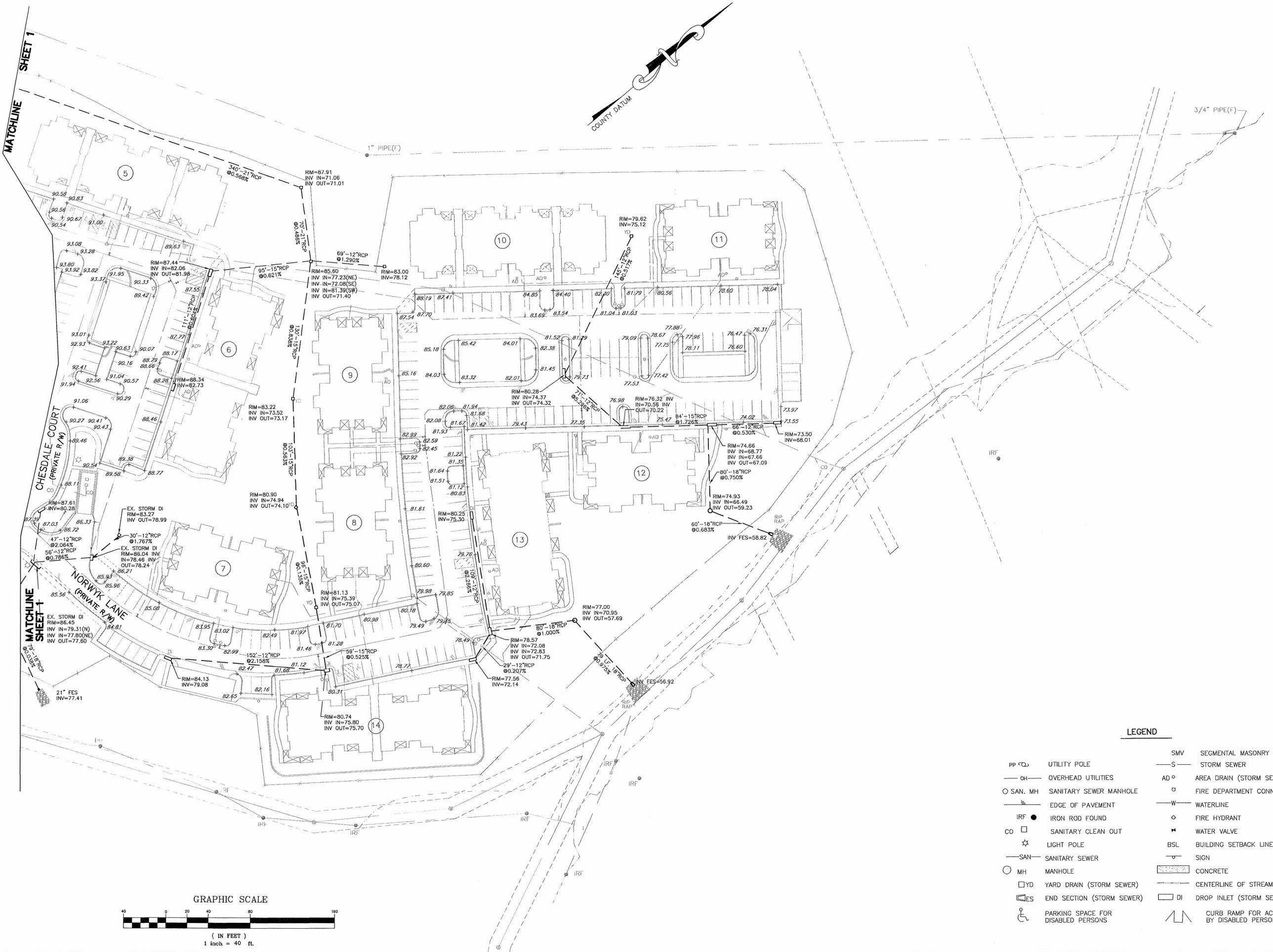
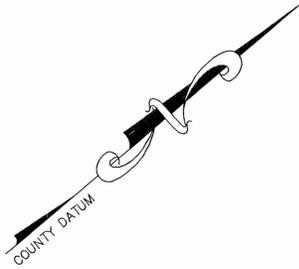
LEGEND

| | | | |
|-----------|------------------------------------|----------|--|
| PP | UTILITY POLE | SMW | SEGMENTAL MASONRY UNIT |
| OH | OVERHEAD UTILITIES | S | STORM SEWER |
| ○ SAN. MH | SANITARY SEWER MANHOLE | AD | AREA DRAIN (STORM SEWER) |
| — | EDGE OF PAVEMENT | ○ | FIRE DEPARTMENT CONNECTION |
| IRF | IRON ROD FOUND | — W — | WATERLINE |
| CO | SANITARY CLEAN OUT | ◇ | FIRE HYDRANT |
| ☆ | LIGHT POLE | ⋈ | WATER VALVE |
| — SAN — | SANITARY SEWER | BSL | BUILDING SETBACK LINE |
| ○ MH | MANHOLE | — | SIGN |
| ○ YD | YARD DRAIN (STORM SEWER) | CONCRETE | |
| ES | END SECTION (STORM SEWER) | — | CENTERLINE OF STREAM |
| ♿ | PARKING SPACE FOR DISABLED PERSONS | DI | DROP INLET (STORM SEWER) |
| | | — | CURB RAMP FOR ACCESS BY DISABLED PERSONS |

SJT Review SET SP-15-01; PC183

STORM SEWER RECORD DRAWINGS
SPOTSWOOD COMMONS APARTMENTS
 LONGHILL ROAD - STATE ROUTE 612
 BERKELEY DISTRICT - JAMES CITY COUNTY, VIRGINIA
 CMTW WILLIAMSBURG, L. P.

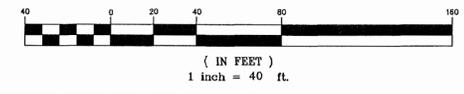
| | | | |
|------------------|---------------|-----------------|----------------------|
| Designed: | N/A | Date: | 09/19/02 |
| Checked: | PF/SAR | Scale: | 1"=40' |
| File Mgr./Drawn: | CRO | CADD File Name: | SP15-01-02-01-01.dwg |
| Project Number: | 1950040-00021 | Dwg. File No.: | 13203AW |
| Drawing Number: | | | R-1 |



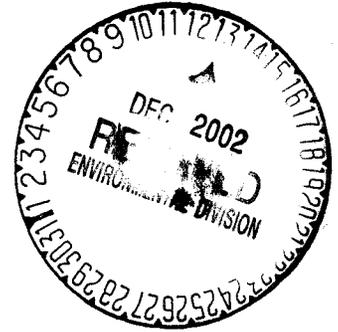
LEGEND

- | | | | |
|-----------|------------------------------------|-------|--|
| PP ⊙ | UTILITY POLE | SMV | SEGMENTAL MASONRY UNIT |
| — OH — | OVERHEAD UTILITIES | — S — | STORM SEWER |
| ○ SAN. MH | SANITARY SEWER MANHOLE | AD ° | AREA DRAIN (STORM SEWER) |
| — | EDGE OF PAVEMENT | ⊕ | FIRE DEPARTMENT CONNECTION |
| IRF ● | IRON ROD FOUND | — W — | WATERLINE |
| CO □ | SANITARY CLEAN OUT | ⊕ | FIRE HYDRANT |
| ☆ | LIGHT POLE | ⊕ | WATER VALVE |
| — SAN — | SANITARY SEWER | BSL | BUILDING SETBACK LINE |
| ○ MH | MANHOLE | ⊕ | SIGN |
| □ YD | YARD DRAIN (STORM SEWER) | ▨ | CONCRETE |
| ⊕ ES | END SECTION (STORM SEWER) | — | CENTERLINE OF STREAM |
| ♿ | PARKING SPACE FOR DISABLED PERSONS | □ DI | DROP INLET (STORM SEWER) |
| | | ⊕ | CURB RAMP FOR ACCESS BY DISABLED PERSONS |

GRAPHIC SCALE



LANDMARK DESIGN GROUP TRANSMITTAL



To: BETH DAVIS
 Company: JAMES CITY COUNTY, ENVIRONMENTAL
 From: PETER FARRELL, LS
 Date: 12/13/02
 Subject: SPOTTSWOOD COMMONS APARTMENTS

LMDG Job No.: 1950040-000.21

Attached please find:

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

Transmitted as checked below:

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

| Copies | Date | Drawing No. | Description |
|--------|---------|-------------|---|
| 3 | 9/19/02 | 13203W | RECORD DRAWINGS FOR STORM SEWER & STORMWATER DETENTION POND |
| | | | |
| | | | PC 183; SP-15-01 |
| | | | AMEND SP-82-01 |

Notes:
 SUBMITTED FOR PRELIMINARY REVIEW

*NO PACKET FORMS
 NO CC
 NO ASBUILT CERT.*

- Copies**
1. File: _____
 2. _____
 3. _____
 4. _____

- Enclosures**
- -
 -
 -

LandMark Design Group, Inc.

FOR TOWN LANDING APARTMENTS

GHILL ROAD - STATE ROUTE 612

BERKELEY DISTRICT - JAMES CITY COUNTY

SP-15-01

*COPY
SP-15-01
AMEND SP-82-01*

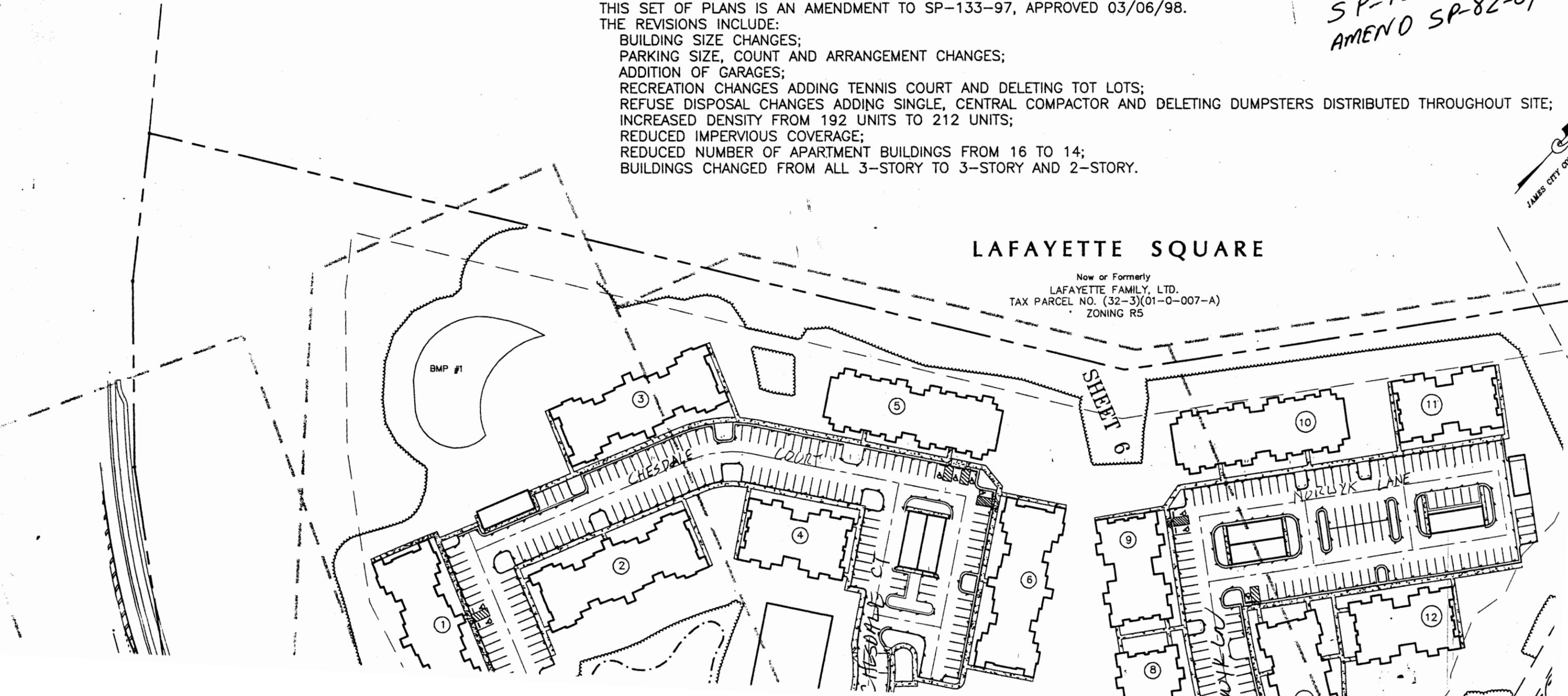
THIS SET OF PLANS IS AN AMENDMENT TO SP-133-97, APPROVED 03/06/98.

THE REVISIONS INCLUDE:

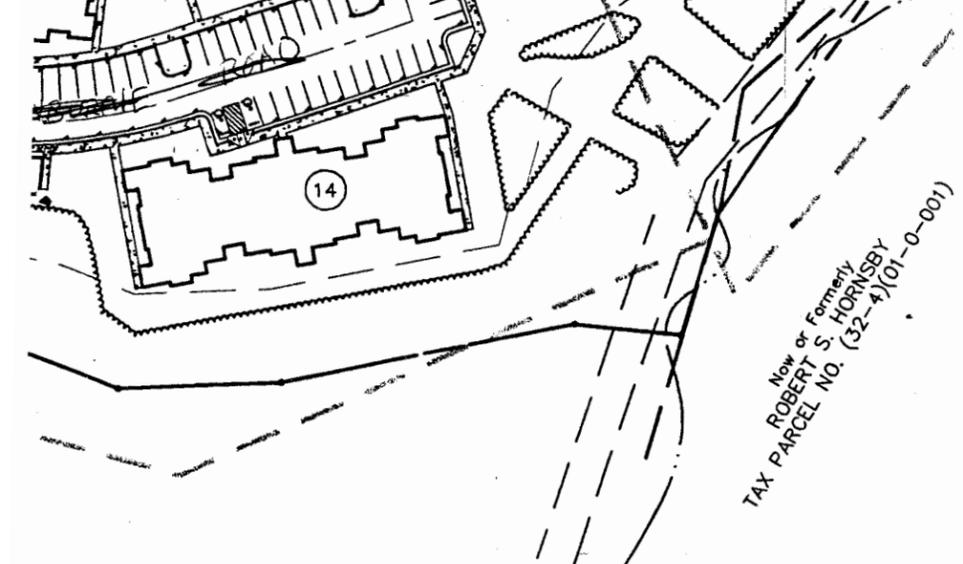
- BUILDING SIZE CHANGES;
- PARKING SIZE, COUNT AND ARRANGEMENT CHANGES;
- ADDITION OF GARAGES;
- RECREATION CHANGES ADDING TENNIS COURT AND DELETING TOT LOTS;
- REFUSE DISPOSAL CHANGES ADDING SINGLE, CENTRAL COMPACTOR AND DELETING DUMPSTERS DISTRIBUTED THROUGHOUT SITE;
- INCREASED DENSITY FROM 192 UNITS TO 212 UNITS;
- REDUCED IMPERVIOUS COVERAGE;
- REDUCED NUMBER OF APARTMENT BUILDINGS FROM 16 TO 14;
- BUILDINGS CHANGED FROM ALL 3-STORY TO 3-STORY AND 2-STORY.

LAFAYETTE SQUARE

Now or Formerly
LAFAYETTE FAMILY, LTD.
TAX PARCEL NO. (32-3)(01-0-007-A)
ZONING R5



JAMES CITY COUNTY

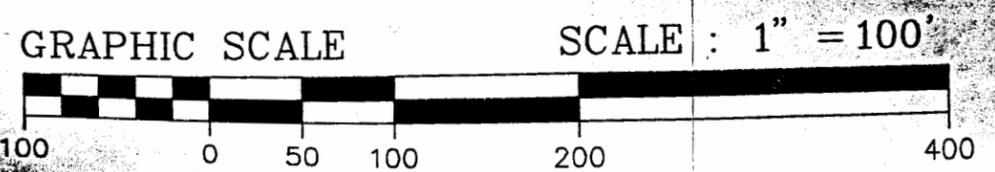


SUMMARY DATA

| | REQUIRED | APPROVED PLAN | AMENDED PLAN |
|-----------------------------------|--|----------------------------|---|
| GROSS SITE AREA: | | 25.25 ACRES | 25.25 ACRES |
| NET SITE AREA: | | 23.73 ACRES | 23.73 ACRES |
| IMPERVIOUS COVER: | | 384,972 SQ. FT. | 319,709 SQ. FT. |
| TOTAL OPEN SPACE (% NET ACREAGE): | 8.30 ACRES (35%) | 16.41 ACRES (69%) | 16.57 ACRES (70%) |
| RECREATIONAL AREA: | 2.12 ACRES | 2.23 ACRES (1.9 AC. REQ'D) | 2.12 ACRES |
| (0.5 ACRE PER 50 UNITS) | | | |
| NATURAL UNDISTURBED OPEN SPACE: | 11.34 ACRES | 11.97 ACRES | 11.34 ACRES |
| PARKING: | | 397 SPACES | 385 SPACES (68 1-BEDROOM APARTMENTS A |
| OPEN PARKING: | | 397 SPACES | 357 SPACES PER UNIT AND 144 TWO/THRE |
| COVERED PARKING: | | 0 SPACES | 28 SPACES APARTMENTS @ 2.2 SPACES P |
| DISABLED PARKING: | 8 SPACES | 8 SPACES | 14 SPACES |
| BASE DENSITY: | | 8.0 UNITS/ACRE | 8.0 UNITS/ACRE |
| DENSITY BONUS 1 | | | |
| (INCREASED FRONT SETBACK 175') | | 0.72 UNITS/ACRE | 0.84 UNITS/ACRE |
| DENSITY BONUS 2 | | | |
| (POOL/REC. FACILITIES) | | 0.72 ACRES | 0.72 ACRES |
| TOTAL DENSITY PERMITTED: | 12 UNITS/ACRE MAX | 9.44 UNITS/ACRE | 9.56 UNITS/ACRE (9.60 MAXIMUM ALLOWABLE @ 120% OF BASE) |
| NUMBER OF UNITS: | | 192 | 212 |
| DENSITY PROPOSED: | N/A | 8.09 UNITS/ACRE | 8.93 UNITS/ACRE |
| DISTURBED AREA: | 14± ACRES | | |
| SITE ZONING: | R-5 MULTI-FAMILY RESIDENTIAL DISTRICT | | |
| TAX PARCEL NO. | (32-3) (01-0-0012) | | |
| OWNER/DEVELOPER: | COMMONWEALTH PROPERTIES, LLC ATTN: STEVEN MIDDLETON 9030 STONY POINT PARKWAY, SUITE 490 RICHMOND, VIRGINIA 23235 PHONE: 804-327-9500 | | |

FLOOD ZONE: THIS LOT FALLS WITHIN FLOOD ZONE "X" AREA DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN AS SHOWN ON FEMA PANEL NO. 510201-0035B FOR JAMES CITY COUNTY, VIRGINIA, DATED FEB 6, 1991.

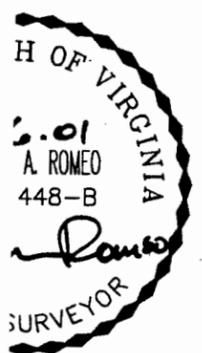
PARKING FOR THIS PLAN IS BASED UPON 11/6/00 WAIVER GRANTED BY PLANNING COMMISSION REGARDING CASE NO. C-67-00
ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE.



REVISED FEBRUARY 23, 2001
REVISED MARCH 1, 2001
REVISED APRIL 16, 2001 PER JCC AND VDOT REVIEW COMMENTS
REVISED JUNE 6, 2001 PER JCC AND VDOT REVIEW COMMENTS

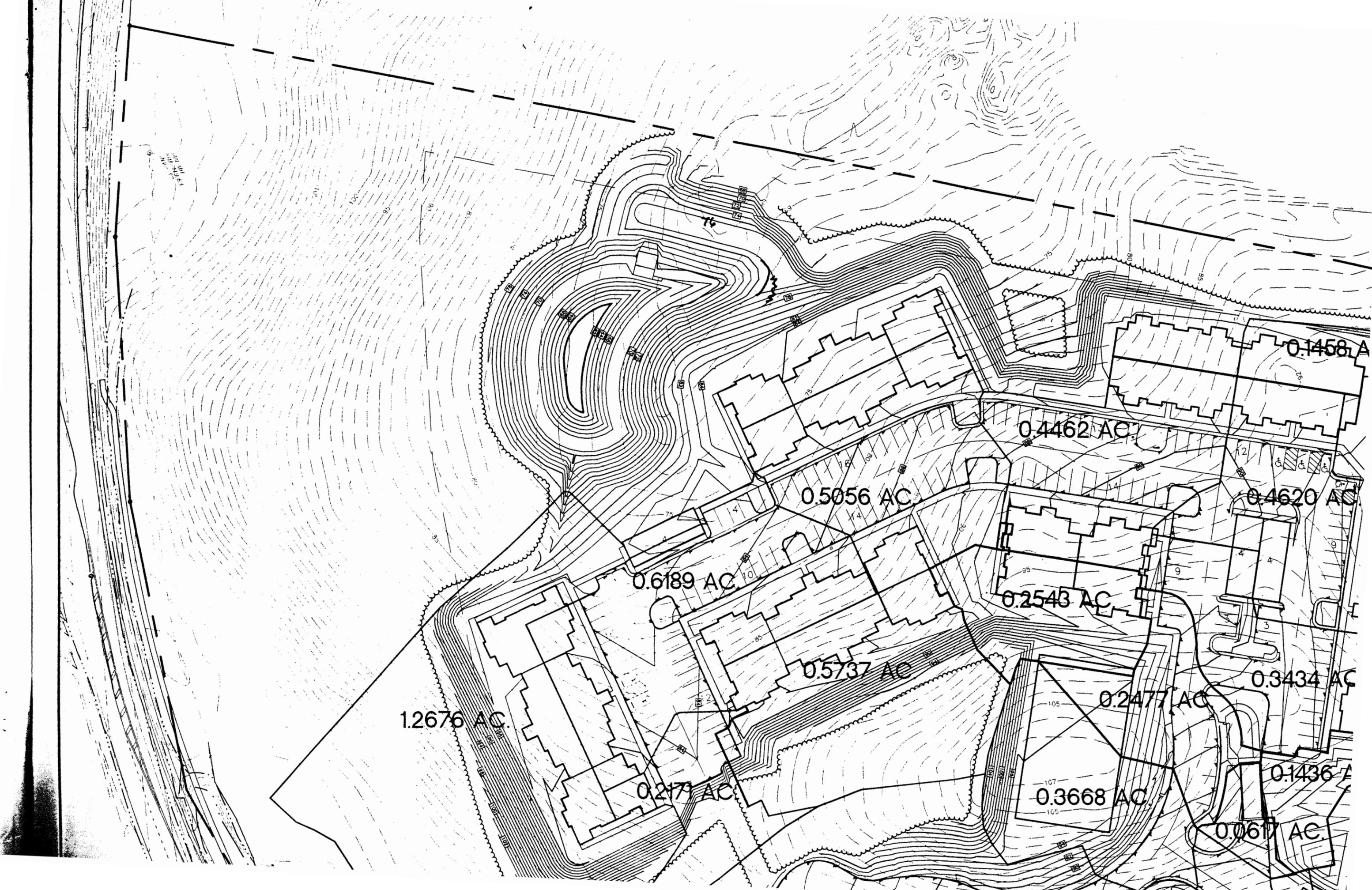
INDEX MAP

3: 1" = 100'



C-1

12277 \



1.2676 AC.

0.6189 AC.

0.5056 AC.

0.5737 AC.

0.2171 AC.

0.4462 AC.

0.2543 AC.

0.2477 AC.

0.3668 AC.

0.1458 AC.

0.4620 AC.

0.3434 AC.

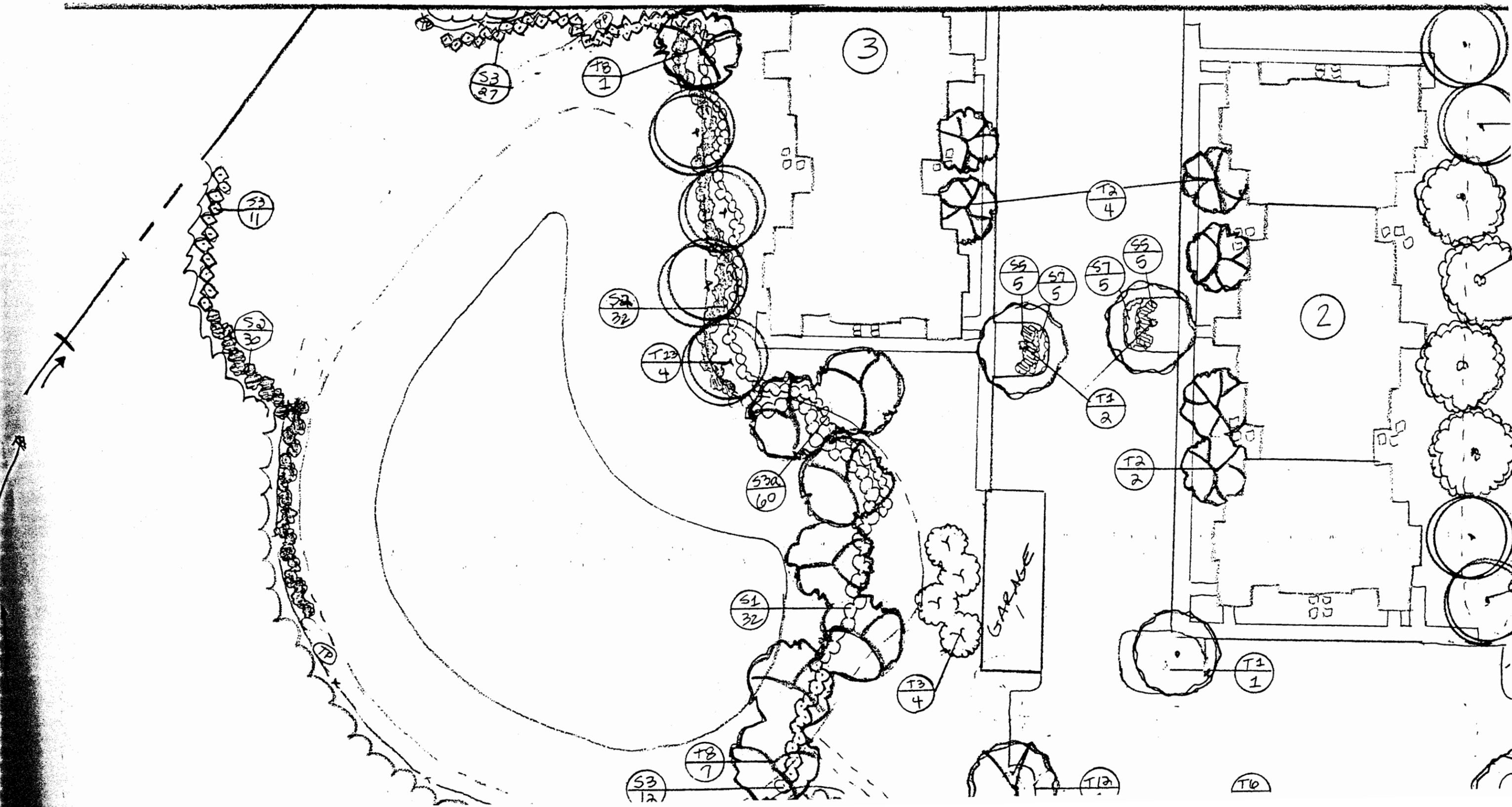
0.1436 AC.

0.0617 AC.

38
-14
-13

39
-14
-13

MATCH





TRANSMITTAL

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

Main Office: 5544 Greenwich Road, Virginia Beach, VA 23462
(757) 473-2000 FAX#: (757) 497-7933
Williamsburg Office: 201 Packets Court, Williamsburg, VA 23185
(757) 253-2975 FAX#: (757) 229-0049
e-mail: langley@langleyeng.com

Project: Crown Landing Apartments (L&M # 1950040-000.03)

To: Daryl Cook
James City County Code Compliance
Environmental Division

From: Stuart W. Rayburn

Date: March 3, 1998

Reply requested: Yes No

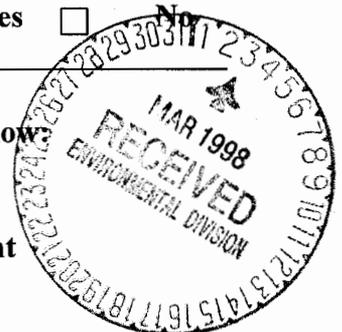
Reply to: _____

We are sending you:

- Attached
- Under separate cover via: _____
- Prints
- Copy of letter
- Plans
- Specifications
- Shop drawings
- Calculations

Transmitted as checked below:

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



| Copies | Date | Drawing No. | Description |
|--------|------|-------------|-------------|
|--------|------|-------------|-------------|

| Copies | Date | Drawing No. | Description |
|--------|---------------|-------------|---|
| 2 | March 3, 1998 | | Revised BMP#1 routing for new outfall structure |
| | | | |
| | | | |
| | | | |
| | | | |

Remarks: Attached are the revised calculations for the routing of BMP#1 utilizing the new outfall structure. The new outfall structure uses only one 30" pipe through the dam and includes a 12" orifice and a 3' weir for the permanent outfall. The weir and 12" orifice will be blocked off during construction to elevation 71.5. This will allow the structure to serve as the principle spillway for the temporary sediment basin. The results of the routing are very similar to the previously submitted scenario. Also included are the revised storm sewer calculations and anti-seep collar calcs.

Copies

1. File: 1950040-000.03
2. CGJ
3. LSB
4. _____
5. _____

Enclosures

-
-
-
-
-

Langley and McDonald

By: Stuart W. Rayburn

If enclosures are not as noted, kindly notify us at once.

Storm Sewer Summary Report

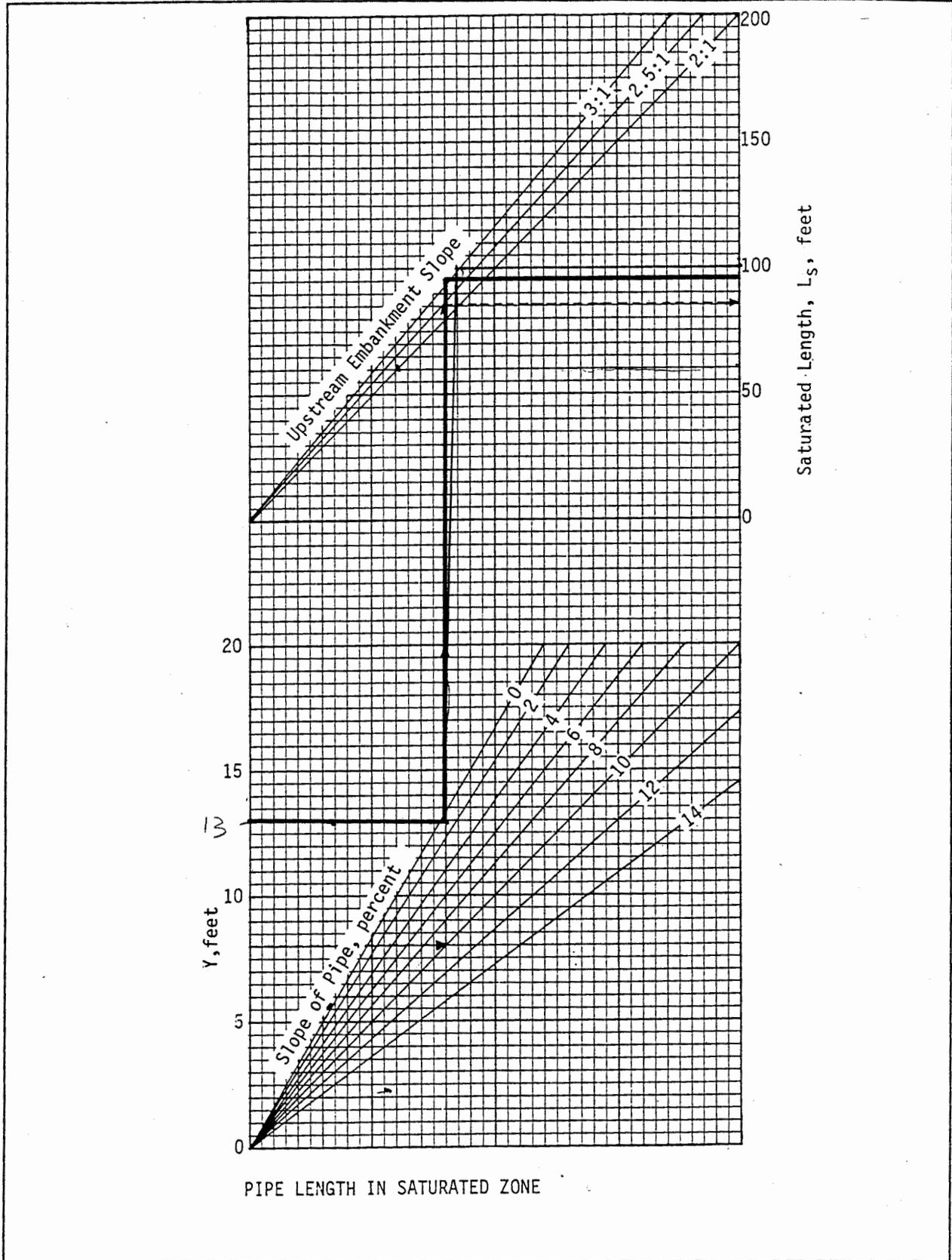
| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | Dns line No. |
|---|---------|-----------------|--------------------------|------------------|-------------------|--------------------|----------------|---------------|----------------------|-----------------|--------------|
| 1 | E2-E1 | 10.79 | 21 c | 46.0 | 54.00 | 55.00 | 2.174 | 54.77 | 55.77 | 2.27 | End |
| 2 | E3-E2 | 8.05 | 18 c | 98.0 | 58.50 | 65.48 | 7.122 | 59.07 | 66.05 | 3.49 | 1 |
| 3 | E4-E3 | 2.33 | 12 c | 153.0 | 65.48 | 70.80 | 3.477 | 69.54 | 71.45 | 0.38 | 2 |
| 4 | E5-E2 | 1.01 | 12 c | 42.0 | 62.30 | 64.00 | 4.048 | 62.56 | 64.26 | 0.77 | 1 |
| 5 | E6-E3 | 2.89 | 12 c | 136.0 | 65.48 | 68.20 | 2.000 | 69.54* | 70.44* | 0.27 | 2 |
| 6 | E7-E6 | 1.60 | 12 c | 70.0 | 68.20 | 69.60 | 2.000 | 70.71* | 70.85* | 0.08 | 5 |
| 7 | E8-E7 | 0.57 | 12 c | 138.0 | 69.60 | 72.90 | 2.391 | 70.93 | 73.22 | 0.14 | 6 |
| PROJECT FILE: CRLDG-E.STM | | | I-D-F FILE: JAMESC~1.IDF | | | TOTAL NO. LINES: 7 | | | RUN DATE: 02-26-1998 | | |
| NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; * Indicates surcharge condition. | | | | | | | | | | | |

Storm Sewer Tabulation

| Line # | Line ID | Incr. Area (ac) | Rnoff coeff (C) | Incr. CA | Sum CA | Tc (min) | Rnfal Inten (in/hr) | Total runoff (cfs) | Add. flow (cfs) | Total flow (cfs) | Capac. @ full (cfs) | Line size (in x in) | Line length (ft) | Line slope (%) | Veloc. up (ft/s) | Veloc. down (ft/s) | NG up (ft) | NG down (ft) | Invert up (ft) | Invert down (ft) | Dns line # |
|--------|---------|-----------------|-----------------|----------|--------|----------|---------------------|--------------------|-----------------|------------------|---------------------|---------------------|------------------|----------------|------------------|--------------------|------------|--------------|----------------|------------------|------------|
| 1 | E2-E1 | 0.37 | 0.84 | 0.31 | 1.69 | 7.5 | 6.38 | 10.8 | 0.0 | 10.8 | 27.6 | 21 c | 46 | 2.17 | 10.6 | 10.6 | 65.50 | 60.00 | 55.00 | 54.00 | 0 |
| 2 | E3-E2 | 0.60 | 0.79 | 0.47 | 1.24 | 6.9 | 6.52 | 8.1 | 0.0 | 8.1 | 28.0 | 18 c | 98 | 7.12 | 13.1 | 13.1 | 71.00 | 65.50 | 65.48 | 58.50 | 1 |
| 3 | E4-E3 | 0.48 | 0.69 | 0.33 | 0.33 | 5.0 | 7.04 | 2.3 | 0.0 | 2.3 | 6.6 | 12 c | 153 | 3.48 | 4.3 | 3.0 | 76.55 | 71.00 | 70.80 | 65.48 | 2 |
| 4 | E5-E2 | 0.16 | 0.90 | 0.14 | 0.14 | 5.0 | 7.04 | 1.0 | 0.0 | 1.0 | 7.2 | 12 c | 42 | 4.05 | 6.2 | 6.2 | 66.60 | 65.50 | 64.00 | 62.30 | 1 |
| 5 | E6-E3 | 0.37 | 0.53 | 0.20 | 0.43 | 6.2 | 6.71 | 2.9 | 0.0 | 2.9 | 5.0 | 12 c | 136 | 2.00 | 3.7 | 3.7 | 73.00 | 71.00 | 68.20 | 65.48 | 2 |
| 6 | E7-E6 | 0.29 | 0.53 | 0.15 | 0.23 | 5.8 | 6.82 | 1.6 | 0.0 | 1.6 | 5.0 | 12 c | 70 | 2.00 | 2.0 | 2.0 | 72.00 | 73.00 | 69.60 | 68.20 | 5 |
| 7 | E8-E7 | 0.15 | 0.54 | 0.08 | 0.08 | 5.0 | 7.04 | 0.6 | 0.0 | 0.6 | 5.5 | 12 c | 138 | 2.39 | 2.6 | 0.7 | 75.30 | 72.00 | 72.90 | 69.60 | 6 |

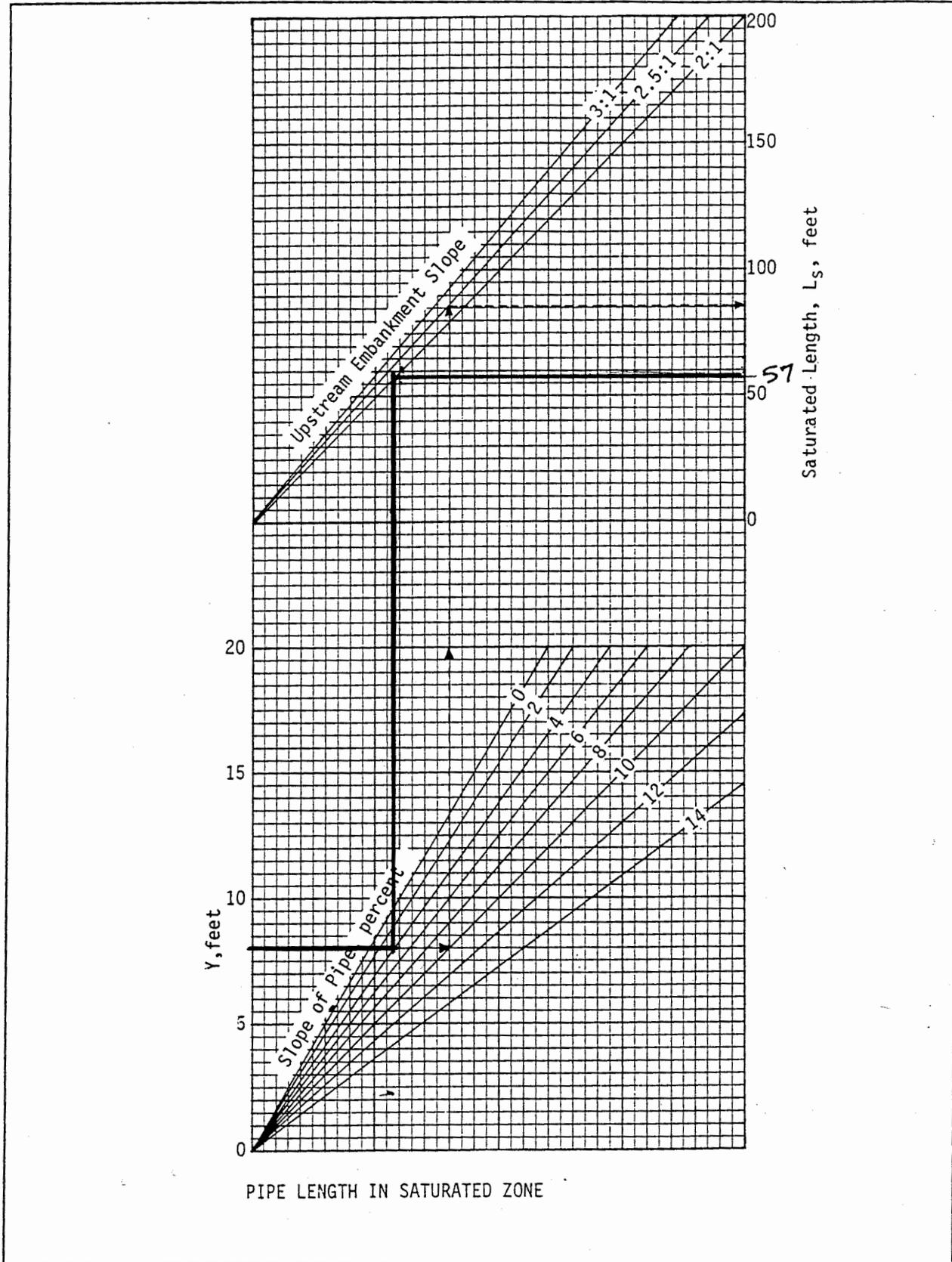
| | | | |
|---------------------------|--------------------------|--------------------------|----------------------|
| PROJECT FILE: CRLDG-E.STM | I-D-F FILE: JAMESC~1.IDF | TOTAL NUMBER OF LINES: 7 | RUN DATE: 02-26-1998 |
|---------------------------|--------------------------|--------------------------|----------------------|

NOTES: c = circular; e = elliptical; b = box; Intensity = $103.3336 / (Tc + 15.80002)^{.8849566}$; Return period = 10 Yrs.



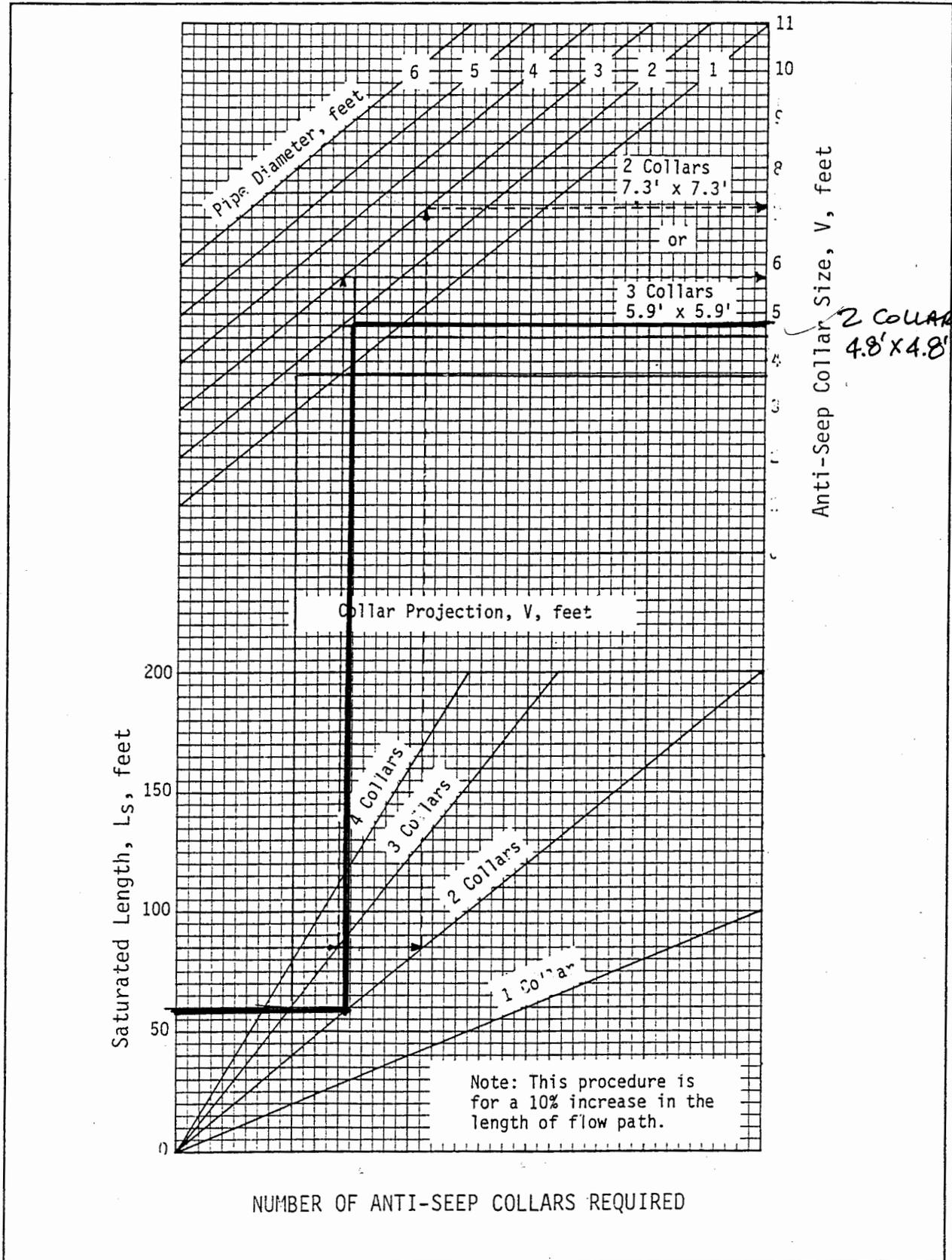
Source: USDA-SCS

Plate 3.14-11



Source: USDA-SCS

Plate 3.14-11



Crown Landing Apartments Drainage and Erosion Control Narrative

The site for this project refers to a 25.26 ac parcel on Longhill Road approximately 700 feet northwest of Olde Town Road. The site consists to two drainage areas. The southeast portion of the site is part of the 106 acre watershed which drains to an existing dry detention basin located to the east of the site. The northwest portion of the includes 10.24 acres which drains to an area of wetlands on the northern side of the site. The existing terrain is rolling to mountainous with slopes ranging from 3-30 %.

In addressing the drainage issues of this site roughly the same drainage areas were maintained. A portion of the area draining to the existing dry pond will be rerouted to the proposed wet detention basin (Basin #1) in the northwest corner of the site. This wet detention basin will treat the northwest area of the site, 11.17 acres. The remainder of the site is treated by the existing dry detention basin (Basin #2) designed by AES as part of the Westmoreland Subdivision development.

25.26
- 11.17
14.09

Basin #1 is an 9-point BMP based on the 4Vr permanent pool design criteria. This basin will also function as a temporary sediment basin during construction. The area draining to Basin #1 has increased to take advantage of its higher removal efficiency. The pond permanent pool is set at 4Vr. The 2-year storm is detained to maintain pre-development runoff rates. The principal spillway will accommodate the 10-year storm and the emergency spillway will accommodate the 100-year storm.

Basin #2 is qualifies as a 6-point BMP as an extended dry detention facility. The area draining to Basin #2 is only a small portion of the overall watershed for that basin and therefore the development of this parcel affects the performance of this structure very little. The existing dry detention basin was found to be adequate for both water quality and quantity and therefore no modifications are necessary. A temporary sediment basin and a temporary sediment trap will be utilized during construction to prevent sediment from entering the existing basin.

The 10 point BMP system required by James City County is achieved by a combination of the existing 6-point BMP, the proposed 9-point BMP and open space credits. 44% of the site is treated by the 9-point BMP accounting for 3.96 points. 45% of the site is treated by the 6-point BMP accounting for 2.70 points. 46% of the site is allowable open space, which accounts for 4.6 points. Any open space which is disturbed during construction, including temporary sediment basin area, is to be revegetated upon completion of construction. The combinations of these treatment measures brings the total for the site to 11.26 points.

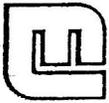
The following erosion control measures were utilized on the site:

- Gravel Construction Entrance at the site access to Longhill Road.
- Silt Fence around the perimeter to prevent sediment from leaving the site.
- Diversion Dikes at the toe of significant slopes and to divert overland flow to the temporary sediment structures.

- Inlet Protection on all proposed drainage structures. There are on existing drainage structures that require inlet protection.
- Tree protection at the limits of clearing on the perimeter as well as at the central park
- Outlet Protection at all stormwater outfalls
- Temporary Sediment Basins and Sediment Trap to treat stormwater from disturbed areas

The limits of clearing have been minimized in the interest of preserving trees and maintaining the character of the existing land. The development is also located more than 200' from Longhill Road providing a significant buffer from the highway.

L&M # 95040-03 (51)
SWR
1-30-98



Langlely and McDonald, P.C.

ENGINEERS • SURVEYORS • PLANNERS

LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS

VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject CROWN LANDING APARTMENTS

OPEN SPACE

Computed By ELK Checked By _____

Project No. 92040-03121

Client National Housing

Date 12/3/97 Sheet No. _____

OPEN SPACE REQUIRED: 35% OF NET DEVELOPABLE AREA

NET DEVELOPABLE AREA = 23.733 AC

REQ'D OPEN SPACE = $23.733 \times 0.35 = 8.307$ AC

OPEN SPACE PROVIDED:

NON-OPEN SPACE AREA (ROADS, BLDGS, PARKING LOTS)

$$\begin{aligned} \text{BLDG AREA} &= 5 \times 5376 = 26880 \text{ SF} \\ &+ 11 \times 4816 = 52976 \text{ SF} \\ \hline &49856 \text{ SF} = 1.83 \text{ AC} \end{aligned}$$

ROADS + PARKING LOT AREA = 241,360 SF = 5.54 AC

TOTAL NON-OPEN SPACE = 1.83 + 5.54 = 7.37 AC

OPEN SPACE AREA = 25.26 AC - 7.37 AC = 17.89 AC

% OPEN SPACE PROVIDED: $\frac{17.89}{23.73} = 0.75\%$



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VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject CROWN LANDING APARTMENTS

NATURAL OPEN SPACE - BMP

Computed By SWR Checked By _____

Project No. 95040-03 (51)

Client National Housing

Date 12/3/97 Sheet No. _____

NATURAL OPEN SPACE PROVIDED FOR BMP PURPOSES:

CRITERIA: WIDTH > 35'

AREA UNDISTURBED OR REVEGETATED

AREA OUTSIDE OF ANY EASEMENTS.

AREA PROVIDED:

| | |
|------------------------------|--------------------|
| 8.80 AC | |
| 1.07 - <u>leisure</u> - Park | 11.72 |
| 1.16 - | -1.07 |
| <u>0.69</u> | <u>10.65</u> = 42% |
| 11.72 AC | 25.26 |

$\frac{11.72 \text{ AC}}{25.26} = 46.4\%$

(SEE EXHIBIT)

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

25.26 ac

| <u>BMP</u> | <u>BMP Points</u> | | <u>Fraction of Site Served by BMP</u> | | <u>Weighted BMP Points</u> |
|---------------------------------------|-------------------|---|---------------------------------------|------|----------------------------|
| WET POND - BMP #1 | 9 | x | 0.44 | 11.7 | 3.96 |
| EXIST. DRY POND - BMP #2 | 6 | x | 0.45 | 11.4 | 2.70 |
| | | x | | | |
| | | x | | | |
| TOTAL WEIGHTED STRUCTURAL BMP POINTS: | | | | | 6.66 |

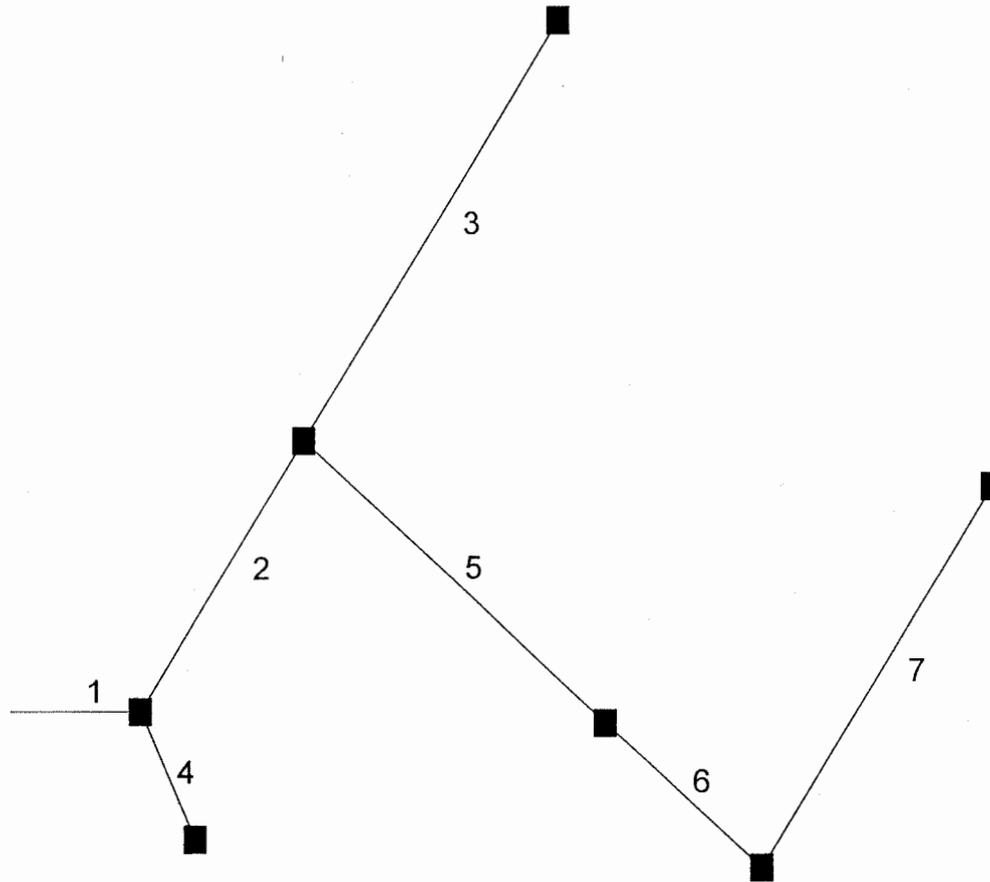
B. NATURAL OPEN SPACE CREDIT

| <u>Fraction of Site</u> | | <u>Natural Open Space Credit</u> | | <u>Points for Natural Open Space</u> |
|-------------------------|---|----------------------------------|---|--------------------------------------|
| 46 | x | 0.1 (0.1 per 1%) | = | 4.6 |

C. TOTAL WEIGHTED POINTS

| | | | | |
|-----------------------|---|---------------------------|---|-------|
| 6.66 | + | 4.60 | = | 11.26 |
| Structural BMP Points | | Natural Open Space Points | | TOTAL |

Plan View



Storm Sewer Tabulation

| Line # | Line ID | Incr. Area (ac) | Rnoff coeff (C) | Incr. CA | Sum CA | Tc (min) | Rnfal Inten (in/hr) | Total runoff (cfs) | Add. flow (cfs) | Total flow (cfs) | Capac. @ full (cfs) | Line size (in x in) | Line length (ft) | Line slope (%) | Veloc. up (ft/s) | Veloc. down (ft/s) | NG up (ft) | NG down (ft) | Invert up (ft) | Invert down (ft) | Dns line # |
|---|---------|-----------------|-----------------|----------|--------|----------|--------------------------|--------------------|-----------------|------------------|---------------------|---------------------|--------------------------|----------------|------------------|--------------------|----------------------|--------------|----------------|------------------|------------|
| 1 | E2-E1 | 0.37 | 0.84 | 0.31 | 1.69 | 7.5 | 6.38 | 10.8 | 0.0 | 10.8 | 27.6 | 21 c | 46 | 2.17 | 4.5 | 4.5 | 65.50 | 60.00 | 55.00 | 54.00 | 0 |
| 2 | E3-E2 | 0.60 | 0.79 | 0.47 | 1.24 | 6.9 | 6.52 | 8.1 | 0.0 | 8.1 | 28.0 | 18 c | 98 | 7.12 | 5.9 | 4.6 | 71.00 | 65.50 | 65.48 | 58.50 | 1 |
| 3 | E4-E3 | 0.48 | 0.69 | 0.33 | 0.33 | 5.0 | 7.04 | 2.3 | 0.0 | 2.3 | 6.6 | 12 c | 153 | 3.48 | 4.3 | 3.0 | 76.55 | 71.00 | 70.80 | 65.48 | 2 |
| 4 | E5-E2 | 0.16 | 0.90 | 0.14 | 0.14 | 5.0 | 7.04 | 1.0 | 0.0 | 1.0 | 7.2 | 12 c | 42 | 4.05 | 6.2 | 6.2 | 66.60 | 65.50 | 64.00 | 62.30 | 1 |
| 5 | E6-E3 | 0.37 | 0.53 | 0.20 | 0.43 | 6.2 | 6.71 | 2.9 | 0.0 | 2.9 | 5.0 | 12 c | 136 | 2.00 | 4.8 | 3.7 | 73.00 | 71.00 | 68.20 | 65.48 | 2 |
| 6 | E7-E6 | 0.29 | 0.53 | 0.15 | 0.23 | 5.8 | 6.82 | 1.6 | 0.0 | 1.6 | 5.0 | 12 c | 70 | 2.00 | 3.7 | 2.0 | 72.00 | 73.00 | 69.60 | 68.20 | 5 |
| 7 | E8-E7 | 0.15 | 0.54 | 0.08 | 0.08 | 5.0 | 7.04 | 0.6 | 0.0 | 0.6 | 5.5 | 12 c | 138 | 2.39 | 2.6 | 0.8 | 75.30 | 72.00 | 72.90 | 69.60 | 6 |
| PROJECT FILE: CRLDG-E.STM | | | | | | | I-D-F FILE: JAMESC~1.IDF | | | | | | TOTAL NUMBER OF LINES: 7 | | | | RUN DATE: 01-25-1998 | | | | |
| NOTES: c = circular; e = elliptical; b = box; Intensity = $103.3336 / (Tc + 15.80002)^{.8849566}$; Return period = 10 Yrs. | | | | | | | | | | | | | | | | | | | | | |

Storm Sewer Summary Report

| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | Dns line No. |
|---|---------|-----------------|--------------------------|------------------|-------------------|--------------------|----------------|---------------|----------------------|-----------------|--------------|
| 1 | E2-E1 | 10.79 | 21 c | 46.0 | 54.00 | 55.00 | 2.174 | 61.75* | 61.90* | 0.41 | End |
| 2 | E3-E2 | 8.05 | 18 c | 98.0 | 58.50 | 65.48 | 7.122 | 62.31 | 66.56 | 0.70 | 1 |
| 3 | E4-E3 | 2.33 | 12 c | 153.0 | 65.48 | 70.80 | 3.477 | 67.26 | 71.45 | 0.38 | 2 |
| 4 | E5-E2 | 1.01 | 12 c | 42.0 | 62.30 | 64.00 | 4.048 | 62.56 | 64.26 | 0.77 | 1 |
| 5 | E6-E3 | 2.89 | 12 c | 136.0 | 65.48 | 68.20 | 2.000 | 67.26 | 68.92 | 0.46 | 2 |
| 6 | E7-E6 | 1.60 | 12 c | 70.0 | 68.20 | 69.60 | 2.000 | 69.38 | 70.14 | 0.28 | 5 |
| 7 | E8-E7 | 0.57 | 12 c | 138.0 | 69.60 | 72.90 | 2.391 | 70.42 | 73.22 | 0.14 | 6 |
| PROJECT FILE: CRLDG-E.STM | | | I-D-F FILE: JAMESC~1.IDF | | | TOTAL NO. LINES: 7 | | | RUN DATE: 01-25-1998 | | |
| NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; * Indicates surcharge condition. | | | | | | | | | | | |



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

Subject CROWN LANDING APT
RUNOFF COEFF. CALLS
Computed By SWR Checked By _____

Project No. 95040-03-(51)
Client _____
Date _____ Sheet No. 5/6

SYSTEM "E"

E2

$$A = 0.37 \text{ AC}$$

$$C = \frac{(0.33)(0.9) + (0.04)(0.3)}{0.37} = 0.84$$

E3

$$A = 0.60 \text{ AC}$$

$$C = \frac{(0.49)(0.9) + (0.11)(0.3)}{0.60} = 0.79$$

E4

$$A = 0.48 \text{ AC}$$

$$\text{GREEN AREA} = 0.17$$

$$C = \frac{(0.31)(0.9) + (0.17)(0.3)}{0.48} = 0.69$$

E5

$$A = 0.16$$

$$C = 0.9$$

OVERLAND FLOW TO BMP #1

$$A = 6.34 \text{ AC}, \text{ POND AREA} = \pm 0.71 \text{ AC}$$

$$C = \frac{(0.31)(0.9) + (0.71)(1.0) + (5.32)(0.3)}{6.34} = 0.41$$

OVERLAND FLOW TO EXISTING BMP

$$A = 5.39 \text{ AC}$$

$$C = \frac{(0.24)(0.9) + (5.15)(0.3)}{5.39} = 0.33$$



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LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject CROWN LANDING APARTMENTS
10 PT BMP SYSTEM
Computed By SWR Checked By _____

Project No. 95040-03 (S1)
Client National Housing
Date 12/3/97 Sheet No. _____

TOTAL SITE AREA = 25.26 AC

AREA TO BMP#1 = 11.17 AC

AREA TO BMP#2 = 9.82 AC

TOTAL TREATED AREA = 21.79 AC

AREA DRAINING OFF SITE = 25.26 - 21.79 = 3.47 AC

BMP#1 (9-PT WET POND) :

$$\frac{11.97 \text{ AC}}{25.26} = 0.44$$

$$9 \times 0.44 = 3.96$$

BMP#2 (EX. 6-PT DRY POND) :

$$\frac{11.43}{25.26} = 0.45$$

$$6 \times 0.45 = 2.70$$

$$\text{NATURAL OPEN SPACE} = \frac{11.72 \text{ AC}}{25.26 \text{ AC}} = 0.46 = 4.6 \text{ PTS}$$

TOTAL PTS = 11.26 PTS



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LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS

VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject CROWN LANDING APARTMENTS

WET POND DESIGN

Computed By SWR Checked By _____

Project No. 95040-03 (51)

Client National HOUSING

Date 11/24/97 Sheet No. _____

BMP # 1 DESIGN

TOTAL DRAINAGE AREA = 11.17 AC

IMPERVIOUS AREA = 3.67 AC

$$\% \text{ IMP} = \frac{3.67 \text{ AC}}{11.17} = 33\% \checkmark$$

9-PT BMP

PERM POOL VOLUME (4.0 V_r)

$$V_r = \frac{0.45}{12} (0.05 + 0.009(33)) \frac{11.17}{10.96} = 0.1426 \text{ AC-FT}$$

$$4.0 V_r = 4.0 (0.1426) = 0.5704 \text{ AC-FT} = 25,317 \text{ CF}$$

2-YR PRE DEVELOPMENT RUNOFF RATE = 7.31 CFS

2-YR POST DEVELOPMENT RUNOFF RATE = 18.47 CFS

10-YR POST DEVELOPMENT RUNOFF RATE = 36.71 CFS

100-YR POST DEVELOPMENT RUNOFF RATE = 66.78 CFS

PERM. POOL ELEV = 69.0 VOL. PROVIDED (43496 CF)

Crown Landing Apartments Drainage Summary

Area Draining to BMP #1

| System C | | | |
|----------------|-------|------|------|
| Structure # | Area | C | CA |
| C2 | 0.89 | 0.6 | 0.53 |
| C3 | 0.15 | 0.62 | 0.09 |
| C4 | 0.51 | 0.81 | 0.41 |
| C5 | 0.15 | 0.66 | 0.10 |
| C6 | 0.60 | 0.63 | 0.38 |
| C7 | 0.19 | 0.52 | 0.10 |
| C8 | 0.52 | 0.50 | 0.26 |
| C9 | 0.40 | 0.81 | 0.32 |
| C10 | 0.27 | 0.46 | 0.12 |
| C11 | 0.76 | 0.79 | 0.60 |
| C12 | 0.02 | 0.9 | 0.02 |
| C13 | 0.31 | 0.42 | 0.13 |
| C14 | 0.02 | 0.9 | 0.02 |
| C15 | 0.35 | 0.44 | 0.15 |
| Total | 5.14 | | 0.63 |
| Overland Flow | 6.03 | 0.41 | 2.47 |
| TOTAL TO BMP#1 | | | |
| | 11.17 | | 0.50 |

Area Draining to BMP #2 (existing BMP)

| System A | | | |
|-------------|------|------|------|
| Structure # | Area | C | CA |
| A2 | 0.46 | 0.70 | 0.32 |
| A3 | 0.18 | 0.80 | 0.14 |
| A4 | 0.54 | 0.49 | 0.26 |
| A5 | 0.80 | 0.34 | 0.27 |
| Total | 1.98 | | 0.51 |

System B

| Structure # | Area | C | CA |
|-------------|------|------|------|
| B2 | 0.15 | 0.82 | 0.12 |
| B3 | 0.56 | 0.4 | 0.22 |
| Total | 0.71 | | 0.49 |

System D

| Structure # | Area | C | CA |
|-------------|------|------|------|
| D2 | 0.27 | 0.72 | 0.19 |
| D3 | 0.15 | 0.78 | 0.12 |
| D4 | 0.36 | 0.72 | 0.26 |
| D5 | 0.46 | 0.68 | 0.31 |
| Total | 1.24 | | 0.71 |

System E

| Structure # | Area | C | CA |
|-------------|------|------|------|
| E2 | 0.37 | 0.84 | 0.31 |
| E3 | 0.6 | 0.79 | 0.47 |
| E4 | 0.48 | 0.69 | 0.33 |
| E5 | 0.16 | 0.90 | 0.14 |
| E6 | 0.37 | 0.53 | 0.20 |
| E7 | 0.29 | 0.53 | 0.15 |
| E8 | 0.15 | 0.54 | 0.08 |
| Total | 2.42 | | 0.70 |

| | | | |
|---------------|------|------|------|
| Overland Flow | 5.08 | 0.33 | 1.68 |
|---------------|------|------|------|

TOTAL TO BMP

| | | | |
|--|-------|--|------|
| | 11.43 | | 0.36 |
|--|-------|--|------|

Revised (1/30/98)



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

Subject CROWN LANDING APARTMENTS
RIP-ROCK DESIGN
Computed By SWR Checked By _____

Project No. 95040-03(51)
Client National Housing
Date 12/5/97 Sheet No. 3/4

E1

DISCHARGE ONTO GRASSY SLOPE = MINIMUM TAILWATER CONDITION

15" RCP, $Q = 7.6$ cfs

$$L_a = 10'$$

$$\text{UPSTREAM APRON WIDTH: } D_o = 3D = 3 \times 1.25' = 3.75'$$

$$\text{DOWNSTREAM APRON WIDTH: } W = D_o + L_a = 13.75'$$

$$d_{50} = 6''$$

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-27-1998 14:07:43
 Watershed file: --> C:\95040-03\ESN .MOP
 Hydrograph file: --> C:\95040-03\EXN2.HYD

Crown Landing Apartments BMP #1 Existing Conditions

>>>> Input Parameters Used to Compute Hydrograph <<<<

| Subarea Description | AREA (acres) | CN | Tc (hrs) | * Tt (hrs) | Precip. (in) | Runoff (in) | Ia/p input/used |
|------------------------|-----------------|------|-------------|---------------|-----------------|----------------|--------------------|
| Basin #1 | 11.17 | 70.0 | 0.50 | 0.00 | 3.36 | 0.92 | I.26 .26 |

* Travel time from subarea outfall to composite watershed outfall point.
 I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 11.17 acres or 0.01745 sq.mi
 Peak discharge = 7 cfs

>>>> Computer Modifications of Input Parameters <<<<

| Subarea Description | Input Values | | Rounded Values | | Ia/p | Ia/p Messages |
|------------------------|--------------|--------------|----------------|--------------|--------------------------|------------------|
| | Tc (hr) | * Tt (hr) | Tc (hr) | * Tt (hr) | Interpolated (Yes/No) | |
| Basin #1 | 0.49 | 0.00 | 0.50 | 0.00 | Yes | -- |

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-27-1998 14:07:43
Watershed file: --> C:\95040-03\ESN .MOP
Hydrograph file: --> C:\95040-03\EXN2.HYD

Crown Landing Apartments BMP #1 Existing Conditions

>>> Summary of Subarea Times to Peak <<<<

| Subarea | Peak Discharge at Composite Outfall (cfs) | Time to Peak at Composite Outfall (hrs) |
|---------------------|---|---|
| Basin #1 | 7 | 12.4 |
| Composite Watershed | 7 | 12.4 |

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-27-1998 14:08:38
Watershed file: --> C:\95040-03\FUTN .MOP
Hydrograph file: --> C:\95040-03\FUTN10.HYD

Crown Landing Apartments BMP #1 Future Conditions

>>> Summary of Subarea Times to Peak <<<<

| Subarea | Peak Discharge at Composite Outfall (cfs) | Time to Peak at Composite Outfall (hrs) |
|---------------------|---|---|
| Basin #1 | 36 | 12.2 |
| Composite Watershed | 36 | 12.2 |

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 01-27-1998 14:08:38
Watershed file: --> C:\95040-03\FUTN .MOP
Hydrograph file: --> C:\95040-03\FUTN100.HYD

Crown Landing Apartments BMP #1 Future Conditions

>>>> Input Parameters Used to Compute Hydrograph <<<<

| Subarea Description | AREA (acres) | CN | Tc (hrs) | * Tt (hrs) | Precip. (in) | Runoff (in) | Ia/p input/used |
|------------------------|-----------------|------|-------------|---------------|-----------------|----------------|--------------------|
| Basin #1 | 11.17 | 81.0 | 0.30 | 0.00 | 7.68 | 5.44 | 1.06 .10 |

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 11.17 acres or 0.01745 sq.mi
Peak discharge = 64 cfs

>>>> Computer Modifications of Input Parameters <<<<

| Subarea Description | Input Values | | Rounded Values | | Ia/p | Ia/p Messages |
|------------------------|--------------|--------------|----------------|--------------|--------------------------|--------------------|
| | Tc (hr) | * Tt (hr) | Tc (hr) | * Tt (hr) | Interpolated (Yes/No) | |
| Basin #1 | 0.25 | 0.00 | 0.30 | 0.00 | No | Computed Ia/p < .1 |

* Travel time from subarea outfall to composite watershed outfall point.

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* Crown Landing Apartments BMP #1
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Inflow Hydrograph: c:\95040-03\FUT2 .HYD
 Rating Table file: c:\95040-03\BMP1 .PND

----INITIAL CONDITIONS----
 Elevation = 69.00 ft
 Outflow = 0.00 cfs
 Storage = 43,401 cu-ft

GIVEN POND DATA

INTERMEDIATE ROUTING
 COMPUTATIONS

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) | 2S/t (cfs) | 2S/t + 0 (cfs) |
|-------------------|------------------|--------------------|---------------|-------------------|
| 69.00 | 0.0 | 43,401 | 241.1 | 241.1 |
| 69.15 | 1.5 | 45,139 | 250.8 | 252.3 |
| 69.30 | 2.1 | 46,915 | 260.6 | 262.7 |
| 69.45 | 2.5 | 48,732 | 270.7 | 273.2 |
| 69.60 | 2.9 | 50,589 | 281.0 | 283.9 |
| 69.75 | 3.3 | 52,486 | 291.6 | 294.9 |
| 69.90 | 3.6 | 54,425 | 302.4 | 306.0 |
| 70.05 | 3.9 | 56,405 | 313.4 | 317.3 |
| 70.20 | 4.1 | 58,426 | 324.6 | 328.7 |
| 70.35 | 4.4 | 60,490 | 336.1 | 340.5 |
| 70.50 | 4.6 | 62,596 | 347.8 | 352.4 |
| 70.65 | 4.9 | 64,744 | 359.7 | 364.6 |
| 70.80 | 5.4 | 66,936 | 371.9 | 377.3 |
| 70.95 | 6.5 | 69,171 | 384.3 | 390.8 |
| 71.10 | 8.0 | 71,450 | 396.9 | 404.9 |
| 71.25 | 9.7 | 73,773 | 409.9 | 419.6 |
| 71.40 | 11.7 | 76,141 | 423.0 | 434.7 |
| 71.55 | 13.8 | 78,553 | 436.4 | 450.2 |
| 71.70 | 16.1 | 81,010 | 450.1 | 466.2 |
| 71.85 | 18.6 | 83,513 | 464.0 | 482.6 |
| 72.00 | 21.2 | 86,061 | 478.1 | 499.3 |
| 72.15 | 24.0 | 88,656 | 492.5 | 516.5 |
| 72.30 | 26.9 | 91,298 | 507.2 | 534.1 |
| 72.45 | 29.9 | 93,985 | 522.1 | 552.0 |
| 72.60 | 33.1 | 96,721 | 537.3 | 570.4 |
| 72.75 | 36.4 | 99,503 | 552.8 | 589.2 |
| 72.90 | 39.8 | 102,333 | 568.5 | 608.3 |
| 73.05 | 43.3 | 105,212 | 584.5 | 627.8 |
| 73.20 | 46.9 | 108,139 | 600.8 | 647.7 |
| 73.35 | 50.6 | 111,115 | 617.3 | 667.9 |
| 73.50 | 52.1 | 114,139 | 634.1 | 686.2 |

GIVEN POND DATA

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) |
|-------------------|------------------|--------------------|
| 73.65 | 52.9 | 117,214 |
| 73.80 | 53.8 | 120,338 |
| 73.95 | 54.6 | 123,513 |
| 74.10 | 55.5 | 126,738 |
| 74.25 | 56.3 | 130,014 |

INTERMEDIATE ROUTING
COMPUTATIONS

| 2S/t (cfs) | 2S/t + 0 (cfs) |
|---------------|-------------------|
| 651.2 | 704.1 |
| 668.5 | 722.3 |
| 686.2 | 740.8 |
| 704.1 | 759.6 |
| 722.3 | 778.6 |

Time increment (t) = 0.100 hrs.

***** SUMMARY OF ROUTING COMPUTATIONS *****

Pond File: c:\95040-03\BMP1 .PND
Inflow Hydrograph: c:\95040-03\FUT2 .HYD
Outflow Hydrograph: c:\95040-03\F2OUT .HYD

Starting Pond W.S. Elevation = 69.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 18.00 cfs
Peak Outflow = 4.91 cfs
Peak Elevation = 70.65 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 43,401 cu-ft
Peak Storage From Storm = 21,396 cu-ft

Total Storage in Pond = 64,797 cu-ft

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* Crown Landing Apartments BMP #1
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Inflow Hydrograph: c:\95040-03\FUT10 .HYD
 Rating Table file: c:\95040-03\BMP1 .PND

----INITIAL CONDITIONS----
 Elevation = 69.00 ft
 Outflow = 0.00 cfs
 Storage = 43,401 cu-ft

GIVEN POND DATA

INTERMEDIATE ROUTING
 COMPUTATIONS

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) | 2S/t (cfs) | 2S/t + 0 (cfs) |
|-------------------|------------------|--------------------|---------------|-------------------|
| 69.00 | 0.0 | 43,401 | 241.1 | 241.1 |
| 69.15 | 1.5 | 45,139 | 250.8 | 252.3 |
| 69.30 | 2.1 | 46,915 | 260.6 | 262.7 |
| 69.45 | 2.5 | 48,732 | 270.7 | 273.2 |
| 69.60 | 2.9 | 50,589 | 281.0 | 283.9 |
| 69.75 | 3.3 | 52,486 | 291.6 | 294.9 |
| 69.90 | 3.6 | 54,425 | 302.4 | 306.0 |
| 70.05 | 3.9 | 56,405 | 313.4 | 317.3 |
| 70.20 | 4.1 | 58,426 | 324.6 | 328.7 |
| 70.35 | 4.4 | 60,490 | 336.1 | 340.5 |
| 70.50 | 4.6 | 62,596 | 347.8 | 352.4 |
| 70.65 | 4.9 | 64,744 | 359.7 | 364.6 |
| 70.80 | 5.4 | 66,936 | 371.9 | 377.3 |
| 70.95 | 6.5 | 69,171 | 384.3 | 390.8 |
| 71.10 | 8.0 | 71,450 | 396.9 | 404.9 |
| 71.25 | 9.7 | 73,773 | 409.9 | 419.6 |
| 71.40 | 11.7 | 76,141 | 423.0 | 434.7 |
| 71.55 | 13.8 | 78,553 | 436.4 | 450.2 |
| 71.70 | 16.1 | 81,010 | 450.1 | 466.2 |
| 71.85 | 18.6 | 83,513 | 464.0 | 482.6 |
| 72.00 | 21.2 | 86,061 | 478.1 | 499.3 |
| 72.15 | 24.0 | 88,656 | 492.5 | 516.5 |
| 72.30 | 26.9 | 91,298 | 507.2 | 534.1 |
| 72.45 | 29.9 | 93,985 | 522.1 | 552.0 |
| 72.60 | 33.1 | 96,721 | 537.3 | 570.4 |
| 72.75 | 36.4 | 99,503 | 552.8 | 589.2 |
| 72.90 | 39.8 | 102,333 | 568.5 | 608.3 |
| 73.05 | 43.3 | 105,212 | 584.5 | 627.8 |
| 73.20 | 46.9 | 108,139 | 600.8 | 647.7 |
| 73.35 | 50.6 | 111,115 | 617.3 | 667.9 |
| 73.50 | 52.1 | 114,139 | 634.1 | 686.2 |

GIVEN POND DATA

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) |
|-------------------|------------------|--------------------|
| 73.65 | 52.9 | 117,214 |
| 73.80 | 53.8 | 120,338 |
| 73.95 | 54.6 | 123,513 |
| 74.10 | 55.5 | 126,738 |
| 74.25 | 56.3 | 130,014 |

INTERMEDIATE ROUTING
COMPUTATIONS

| 2S/t (cfs) | 2S/t + 0 (cfs) |
|---------------|-------------------|
| 651.2 | 704.1 |
| 668.5 | 722.3 |
| 686.2 | 740.8 |
| 704.1 | 759.6 |
| 722.3 | 778.6 |

Time increment (t) = 0.100 hrs.

***** SUMMARY OF ROUTING COMPUTATIONS *****

Pond File: c:\95040-03\BMP1 .PND
Inflow Hydrograph: c:\95040-03\FUT10 .HYD
Outflow Hydrograph: c:\95040-03\F10OUT .HYD

Starting Pond W.S. Elevation = 69.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

| | | |
|----------------|---|-----------|
| Peak Inflow | = | 36.00 cfs |
| Peak Outflow | = | 16.86 cfs |
| Peak Elevation | = | 71.75 ft |

***** Summary of Approximate Peak Storage *****

| | | |
|-------------------------|---|--------------|
| Initial Storage | = | 43,401 cu-ft |
| Peak Storage From Storm | = | 38,367 cu-ft |
| | | ----- |
| Total Storage in Pond | = | 81,769 cu-ft |

Warning: Inflow hydrograph truncated on left side.

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* Crown Landing Apartments BMP #1
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Inflow Hydrograph: c:\95040-03\FUT100 .HYD
 Rating Table file: c:\95040-03\BMP1 .PND

----INITIAL CONDITIONS----

Elevation = 69.00 ft
 Outflow = 0.00 cfs
 Storage = 43,401 cu-ft

GIVEN POND DATA

INTERMEDIATE ROUTING
 COMPUTATIONS

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) | 2S/t (cfs) | 2S/t + 0 (cfs) |
|-------------------|------------------|--------------------|---------------|-------------------|
| 69.00 | 0.0 | 43,401 | 241.1 | 241.1 |
| 69.15 | 1.5 | 45,139 | 250.8 | 252.3 |
| 69.30 | 2.1 | 46,915 | 260.6 | 262.7 |
| 69.45 | 2.5 | 48,732 | 270.7 | 273.2 |
| 69.60 | 2.9 | 50,589 | 281.0 | 283.9 |
| 69.75 | 3.3 | 52,486 | 291.6 | 294.9 |
| 69.90 | 3.6 | 54,425 | 302.4 | 306.0 |
| 70.05 | 3.9 | 56,405 | 313.4 | 317.3 |
| 70.20 | 4.1 | 58,426 | 324.6 | 328.7 |
| 70.35 | 4.4 | 60,490 | 336.1 | 340.5 |
| 70.50 | 4.6 | 62,596 | 347.8 | 352.4 |
| 70.65 | 4.9 | 64,744 | 359.7 | 364.6 |
| 70.80 | 5.4 | 66,936 | 371.9 | 377.3 |
| 70.95 | 6.5 | 69,171 | 384.3 | 390.8 |
| 71.10 | 8.0 | 71,450 | 396.9 | 404.9 |
| 71.25 | 9.7 | 73,773 | 409.9 | 419.6 |
| 71.40 | 11.7 | 76,141 | 423.0 | 434.7 |
| 71.55 | 13.8 | 78,553 | 436.4 | 450.2 |
| 71.70 | 16.1 | 81,010 | 450.1 | 466.2 |
| 71.85 | 18.6 | 83,513 | 464.0 | 482.6 |
| 72.00 | 21.2 | 86,061 | 478.1 | 499.3 |
| 72.15 | 24.0 | 88,656 | 492.5 | 516.5 |
| 72.30 | 26.9 | 91,298 | 507.2 | 534.1 |
| 72.45 | 29.9 | 93,985 | 522.1 | 552.0 |
| 72.60 | 33.1 | 96,721 | 537.3 | 570.4 |
| 72.75 | 36.4 | 99,503 | 552.8 | 589.2 |
| 72.90 | 39.8 | 102,333 | 568.5 | 608.3 |
| 73.05 | 43.3 | 105,212 | 584.5 | 627.8 |
| 73.20 | 46.9 | 108,139 | 600.8 | 647.7 |
| 73.35 | 50.6 | 111,115 | 617.3 | 667.9 |
| 73.50 | 52.1 | 114,139 | 634.1 | 686.2 |

GIVEN POND DATA

| ELEVATION (ft) | OUTFLOW (cfs) | STORAGE (cu-ft) |
|-------------------|------------------|--------------------|
| 73.65 | 52.9 | 117,214 |
| 73.80 | 53.8 | 120,338 |
| 73.95 | 54.6 | 123,513 |
| 74.10 | 55.5 | 126,738 |
| 74.25 | 56.3 | 130,014 |

INTERMEDIATE ROUTING
COMPUTATIONS

| 2S/t (cfs) | 2S/t + 0 (cfs) |
|---------------|-------------------|
| 651.2 | 704.1 |
| 668.5 | 722.3 |
| 686.2 | 740.8 |
| 704.1 | 759.6 |
| 722.3 | 778.6 |

Time increment (t) = 0.100 hrs.

***** SUMMARY OF ROUTING COMPUTATIONS *****

Pond File: c:\95040-03\BMP1 .PND
Inflow Hydrograph: c:\95040-03\FUT100 .HYD
Outflow Hydrograph: c:\95040-03\F100OUT .HYD

Starting Pond W.S. Elevation = 69.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 64.00 cfs
Peak Outflow = 39.98 cfs
Peak Elevation = 72.91 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 43,401 cu-ft
Peak Storage From Storm = 59,081 cu-ft

Total Storage in Pond = 102,483 cu-ft

Warning: Inflow hydrograph truncated on left side.

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

***** COMPOSITE OUTFLOW SUMMARY *****

| Elevation (ft) | Q (cfs) | Contributing Structures |
|----------------|---------|-------------------------|
| 69.00 | 0.0 | 1 |
| 69.15 | 1.5 | 1 |
| 69.30 | 2.1 | 1 |
| 69.45 | 2.5 | 1 |
| 69.60 | 2.9 | 1 |
| 69.75 | 3.3 | 1 |
| 69.90 | 3.6 | 1 |
| 70.05 | 3.9 | 1 |
| 70.20 | 4.1 | 1 |
| 70.35 | 4.4 | 1 |
| 70.50 | 4.6 | 1 |
| 70.65 | 4.9 | 1 |
| 70.80 | 5.4 | 1 +2 |
| 70.95 | 6.5 | 1 +2 |
| 71.10 | 8.0 | 1 +2 |
| 71.25 | 9.7 | 1 +2 |
| 71.40 | 11.7 | 1 +2 |
| 71.55 | 13.8 | 1 +2 |
| 71.70 | 16.1 | 1 +2 |
| 71.85 | 18.6 | 1 +2 |
| 72.00 | 21.2 | 1 +2 |
| 72.15 | 24.0 | 1 +2 |
| 72.30 | 26.9 | 1 +2 |
| 72.45 | 29.9 | 1 +2 |
| 72.60 | 33.1 | 1 +2 |
| 72.75 | 36.4 | 1 +2 |
| 72.90 | 39.8 | 1 +2 |
| 73.05 | 43.3 | 1 +2 |
| 73.20 | 46.9 | 1 +2 |
| 73.35 | 50.6 | 1 +2 |
| 73.50 | 52.1 | 4 |
| 73.65 | 52.9 | 4 |
| 73.80 | 53.8 | 4 |
| 73.95 | 54.6 | 4 |
| 74.10 | 55.5 | 4 |
| 74.25 | 56.3 | 4 |
| 74.40 | 0.0 | |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outlet Structure File: c:\95040-03\BMP1 .STR
Planimeter Input File: c:\95040-03\BMP1 .VOL
Rating Table Output File: c:\95040-03\BMP1 .PND

Min. Elev.(ft) = 69 Max. Elev.(ft) = 74.4 Incr.(ft) = .15

Additional elevations (ft) to be included in table:

* * * * *

SYSTEM CONNECTIVITY

| Structure | No. | Q Table | Q Table |
|------------|-----|---------|---------|
| ----- | --- | ----- | ----- |
| ORIFICE | 1 | | -> 1 |
| WEIR-VR | 2 | + 1 | -> 3 |
| CULVERT-CR | 4 | ? 3 | -> 5 |

Outflow rating table summary was stored in file:
c:\95040-03\BMP1 .PND

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE

Orifice - Based on Area and Datum Elevation

| | |
|-----------------------|------|
| E1 elev.(ft)? | 69 |
| E2 elev.(ft)? | 74.4 |
| Orifice coeff.? | .6 |
| Invert elev.(ft)? | 69 |
| Datum elev.(ft) ? | 69.0 |
| Orifice area (sq ft)? | .785 |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

>>>>> Structure No. 2 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

| | |
|------------------------------|------|
| E1 elev. (ft)? | 70.7 |
| E2 elev. (ft)? | 74.4 |
| Weir coefficient? | 3.30 |
| Weir elev. (ft)? | 70.7 |
| Length (ft)? | 3 |
| Contracted/Suppressed (C/S)? | S |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

>>>>> Structure No. 4 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

| | |
|----------------|-------|
| E1 elev. (ft)? | 69 |
| E2 elev. (ft)? | 74.4 |
| Diam. (ft)? | 2.5 |
| Inv. el. (ft)? | 67.35 |
| Slope (ft/ft)? | .005 |
| T1 ratio? | 1.07 |
| T2 ratio? | 1.2 |
| K Coeff.? | .0098 |
| M Coeff.? | 2 |
| c Coeff.? | .0398 |
| Y Coeff.? | .67 |
| Form 1 or 2? | 1 |
| Slope factor? | -0.5 |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

| Elevation (ft) | Q (cfs) | Computation Messages |
|----------------|---------|----------------------|
| 69.00 | 0.0 | H =0.0 |
| 69.15 | 1.5 | H =.15 |
| 69.30 | 2.1 | H =.3 |
| 69.45 | 2.5 | H =.45 |
| 69.60 | 2.9 | H =.6 |
| 69.75 | 3.3 | H =.750 |
| 69.90 | 3.6 | H =.9 |
| 70.05 | 3.9 | H =1.05 |
| 70.20 | 4.1 | H =1.2 |
| 70.35 | 4.4 | H =1.35 |
| 70.50 | 4.6 | H =1.5 |
| 70.65 | 4.9 | H =1.65 |
| 70.80 | 5.1 | H =1.8 |
| 70.95 | 5.3 | H =1.95 |
| 71.10 | 5.5 | H =2.1 |
| 71.25 | 5.7 | H =2.25 |
| 71.40 | 5.9 | H =2.4 |
| 71.55 | 6.0 | H =2.55 |
| 71.70 | 6.2 | H =2.7 |
| 71.85 | 6.4 | H =2.85 |
| 72.00 | 6.5 | H =3.0 |
| 72.15 | 6.7 | H =3.15 |
| 72.30 | 6.9 | H =3.3 |
| 72.45 | 7.0 | H =3.45 |
| 72.60 | 7.2 | H =3.6 |
| 72.75 | 7.3 | H =3.75 |
| 72.90 | 7.5 | H =3.9 |
| 73.05 | 7.6 | H =4.05 |
| 73.20 | 7.7 | H =4.2 |
| 73.35 | 7.9 | H =4.35 |
| 73.50 | 8.0 | H =4.5 |
| 73.65 | 8.2 | H =4.65 |
| 73.80 | 8.3 | H =4.8 |
| 73.95 | 8.4 | H =4.95 |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

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Outflow Rating Table for Structure #1

ORIFICE Orifice - Based on Area and Datum Elevation

| Elevation (ft) | Q (cfs) | Computation Messages |
|----------------|---------|----------------------|
| 74.10 | 8.5 | H =5.1 |
| 74.25 | 8.7 | H =5.25 |
| 74.40 | 0.0 | E = or > E2=74.4 |

C = .6 A = .785 sq.ft.

H (ft) = Table elev. - Datum elev. (69 ft)

Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outflow Rating Table for Structure #2
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

| Elevation (ft) | Q (cfs) | Computation Messages |
|----------------|---------|----------------------|
| 69.00 | 0.0 | E < Inv.El.= 70.7 |
| 69.15 | 0.0 | E < Inv.El.= 70.7 |
| 69.30 | 0.0 | E < Inv.El.= 70.7 |
| 69.45 | 0.0 | E < Inv.El.= 70.7 |
| 69.60 | 0.0 | E < Inv.El.= 70.7 |
| 69.75 | 0.0 | E < Inv.El.= 70.7 |
| 69.90 | 0.0 | E < Inv.El.= 70.7 |
| 70.05 | 0.0 | E < Inv.El.= 70.7 |
| 70.20 | 0.0 | E < Inv.El.= 70.7 |
| 70.35 | 0.0 | E < Inv.El.= 70.7 |
| 70.50 | 0.0 | E < Inv.El.= 70.7 |
| 70.65 | 0.0 | E < Inv.El.= 70.7 |
| 70.80 | 0.3 | H =.1 |
| 70.95 | 1.2 | H =.25 |
| 71.10 | 2.5 | H =.4 |
| 71.25 | 4.0 | H =.55 |
| 71.40 | 5.8 | H =.7 |
| 71.55 | 7.8 | H =.85 |
| 71.70 | 9.9 | H =1.0 |
| 71.85 | 12.2 | H =1.15 |
| 72.00 | 14.7 | H =1.3 |
| 72.15 | 17.3 | H =1.45 |
| 72.30 | 20.0 | H =1.6 |
| 72.45 | 22.9 | H =1.75 |
| 72.60 | 25.9 | H =1.9 |
| 72.75 | 29.1 | H =2.05 |
| 72.90 | 32.3 | H =2.2 |
| 73.05 | 35.7 | H =2.35 |
| 73.20 | 39.1 | H =2.5 |
| 73.35 | 42.7 | H =2.65 |
| 73.50 | 46.4 | H =2.8 |
| 73.65 | 50.2 | H =2.95 |
| 73.80 | 54.0 | H =3.1 |
| 73.95 | 58.0 | H =3.25 |

Outlet Structure File: BMPI .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

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Outflow Rating Table for Structure #2
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

| Elevation (ft) | Q (cfs) | Computation Messages |
|----------------|---------|----------------------|
| 74.10 | 62.1 | H =3.4 |
| 74.25 | 66.2 | H =3.55 |
| 74.40 | 0.0 | E = or > E2=74.4 |

C = 3.3 L (ft) = 3

H (ft) = Table elev. - Invert elev. (70.7 ft)

Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outflow Rating Table for Structure #4
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

| Elevation (ft) | Q (cfs) | Computation | Messages |
|----------------|---------|----------------------|-------------------|
| 69.00 | 11.8 | Equ.1: HW =1.65 | dc=1.153 Ac=2.213 |
| 69.15 | 13.7 | Equ.1: HW =1.8 | dc=1.247 Ac=2.446 |
| 69.30 | 15.4 | Equ.1: HW =1.95 | dc=1.326 Ac=2.645 |
| 69.45 | 17.4 | Equ.1: HW =2.1 | dc=1.409 Ac=2.852 |
| 69.60 | 19.3 | Equ.1: HW =2.25 | dc=1.488 Ac=3.047 |
| 69.75 | 21.0 | Equ.1: HW =2.4 | dc=1.556 Ac=3.211 |
| 69.90 | 22.9 | Equ.1: HW =2.55 | dc=1.628 Ac=3.385 |
| 70.05 | 24.7 | Transition: HW =2.7 | |
| 70.20 | 26.6 | Transition: HW =2.85 | |
| 70.35 | 28.4 | Submerged: HW =3.0 | |
| 70.50 | 29.9 | Submerged: HW =3.15 | |
| 70.65 | 31.5 | Submerged: HW =3.3 | |
| 70.80 | 32.8 | Submerged: HW =3.45 | |
| 70.95 | 34.1 | Submerged: HW =3.6 | |
| 71.10 | 35.5 | Submerged: HW =3.75 | |
| 71.25 | 36.8 | Submerged: HW =3.9 | |
| 71.40 | 38.0 | Submerged: HW =4.05 | |
| 71.55 | 39.1 | Submerged: HW =4.2 | |
| 71.70 | 40.2 | Submerged: HW =4.35 | |
| 71.85 | 41.4 | Submerged: HW =4.5 | |
| 72.00 | 42.5 | Submerged: HW =4.65 | |
| 72.15 | 43.5 | Submerged: HW =4.8 | |
| 72.30 | 44.6 | Submerged: HW =4.95 | |
| 72.45 | 45.6 | Submerged: HW =5.1 | |
| 72.60 | 46.5 | Submerged: HW =5.25 | |
| 72.75 | 47.5 | Submerged: HW =5.4 | |
| 72.90 | 48.4 | Submerged: HW =5.55 | |
| 73.05 | 49.4 | Submerged: HW =5.7 | |
| 73.20 | 50.4 | Submerged: HW =5.85 | |
| 73.35 | 51.2 | Submerged: HW =6.0 | |
| 73.50 | 52.1 | Submerged: HW =6.15 | |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

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Outflow Rating Table for Structure #4
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

| Elevation (ft) | Q (cfs) | Computation | Messages |
|----------------|---------|------------------|----------|
| 73.65 | 52.9 | Submerged: | HW =6.3 |
| 73.80 | 53.8 | Submerged: | HW =6.45 |
| 73.95 | 54.6 | Submerged: | HW =6.6 |
| 74.10 | 55.5 | Submerged: | HW =6.75 |
| 74.25 | 56.3 | Submerged: | HW =6.9 |
| 74.40 | 0.0 | E = or > E2=74.4 | |

Used Unsubmerged Equ. Form (1) for elev. less than 70.03 ft
Used Submerged Equation for elevations greater than 70.35 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=70.03 ft; Q1=24.41 cfs; E2=70.35 ft; Q2=28.42 cfs

Outlet Structure File: BMP1 -- .STR -

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outflow Rating Table 3
Table 3 = 1 + 2

| Elevation (ft) | Q (cfs) | Contributing Structures |
|----------------|---------|-------------------------|
| 69.00 | 0.0 | 1 |
| 69.15 | 1.5 | 1 |
| 69.30 | 2.1 | 1 |
| 69.45 | 2.5 | 1 |
| 69.60 | 2.9 | 1 |
| 69.75 | 3.3 | 1 |
| 69.90 | 3.6 | 1 |
| 70.05 | 3.9 | 1 |
| 70.20 | 4.1 | 1 |
| 70.35 | 4.4 | 1 |
| 70.50 | 4.6 | 1 |
| 70.65 | 4.9 | 1 |
| 70.80 | 5.4 | 1 +2 |
| 70.95 | 6.5 | 1 +2 |
| 71.10 | 8.0 | 1 +2 |
| 71.25 | 9.7 | 1 +2 |
| 71.40 | 11.7 | 1 +2 |
| 71.55 | 13.8 | 1 +2 |
| 71.70 | 16.1 | 1 +2 |
| 71.85 | 18.6 | 1 +2 |
| 72.00 | 21.2 | 1 +2 |
| 72.15 | 24.0 | 1 +2 |
| 72.30 | 26.9 | 1 +2 |
| 72.45 | 29.9 | 1 +2 |
| 72.60 | 33.1 | 1 +2 |
| 72.75 | 36.4 | 1 +2 |
| 72.90 | 39.8 | 1 +2 |
| 73.05 | 43.3 | 1 +2 |
| 73.20 | 46.9 | 1 +2 |
| 73.35 | 50.6 | 1 +2 |
| 73.50 | 54.4 | 1 +2 |
| 73.65 | 58.3 | 1 +2 |
| 73.80 | 62.3 | 1 +2 |
| 73.95 | 66.4 | 1 +2 |
| 74.10 | 70.6 | 1 +2 |
| 74.25 | 74.9 | 1 +2 |
| 74.40 | 0.0 | - |

Outlet Structure File: BMP1 .STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Crown Landing Apartments BMP #1

Outflow Rating Table 5
Table 5 = 3 ? 4

| Elevation (ft) | Q (cfs) | Contributing Structures |
|----------------|---------|-------------------------|
| 69.00 | 0.0 | 1 |
| 69.15 | 1.5 | 1 |
| 69.30 | 2.1 | 1 |
| 69.45 | 2.5 | 1 |
| 69.60 | 2.9 | 1 |
| 69.75 | 3.3 | 1 |
| 69.90 | 3.6 | 1 |
| 70.05 | 3.9 | 1 |
| 70.20 | 4.1 | 1 |
| 70.35 | 4.4 | 1 |
| 70.50 | 4.6 | 1 |
| 70.65 | 4.9 | 1 |
| 70.80 | 5.4 | 1 +2 |
| 70.95 | 6.5 | 1 +2 |
| 71.10 | 8.0 | 1 +2 |
| 71.25 | 9.7 | 1 +2 |
| 71.40 | 11.7 | 1 +2 |
| 71.55 | 13.8 | 1 +2 |
| 71.70 | 16.1 | 1 +2 |
| 71.85 | 18.6 | 1 +2 |
| 72.00 | 21.2 | 1 +2 |
| 72.15 | 24.0 | 1 +2 |
| 72.30 | 26.9 | 1 +2 |
| 72.45 | 29.9 | 1 +2 |
| 72.60 | 33.1 | 1 +2 |
| 72.75 | 36.4 | 1 +2 |
| 72.90 | 39.8 | 1 +2 |
| 73.05 | 43.3 | 1 +2 |
| 73.20 | 46.9 | 1 +2 |
| 73.35 | 50.6 | 1 +2 |
| 73.50 | 52.1 | 4 |
| 73.65 | 52.9 | 4 |
| 73.80 | 53.8 | 4 |
| 73.95 | 54.6 | 4 |
| 74.10 | 55.5 | 4 |
| 74.25 | 56.3 | 4 |
| 74.40 | 0.0 | - |



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

Subject CROWN LANDING APARTMENTS
ANTI-SEEP COLLAR DESIGN
Computed By SWR Checked By _____

Project No. 1950040-000.03
Client NATIONAL HOUSING
Date 3/3/98 Sheet No. _____

BMP / TEMP. SEDIMENT BASIN #1

DEPTH OF WATER AT RISER CREST = 13'

PIPE SLOPE = 1.0%

UPSTREAM EMBANKMENT = 4:1 (NOT ON NOMOGRAPH \therefore USED 3:1)

PROVIDE 2 COLLARS: 7.7' x 7.7' (30" BARREL)

(FROM PLATES 3.14-11 & 3.14-12)

$P = 2.6 \therefore 2P = 5.2$, $14P = 36.4$ (30' USED BECAUSE BARREL IS ONLY 44')

TEMP. SEDIMENT BASIN #2

DEPTH OF WATER AT RISER CREST = 8'

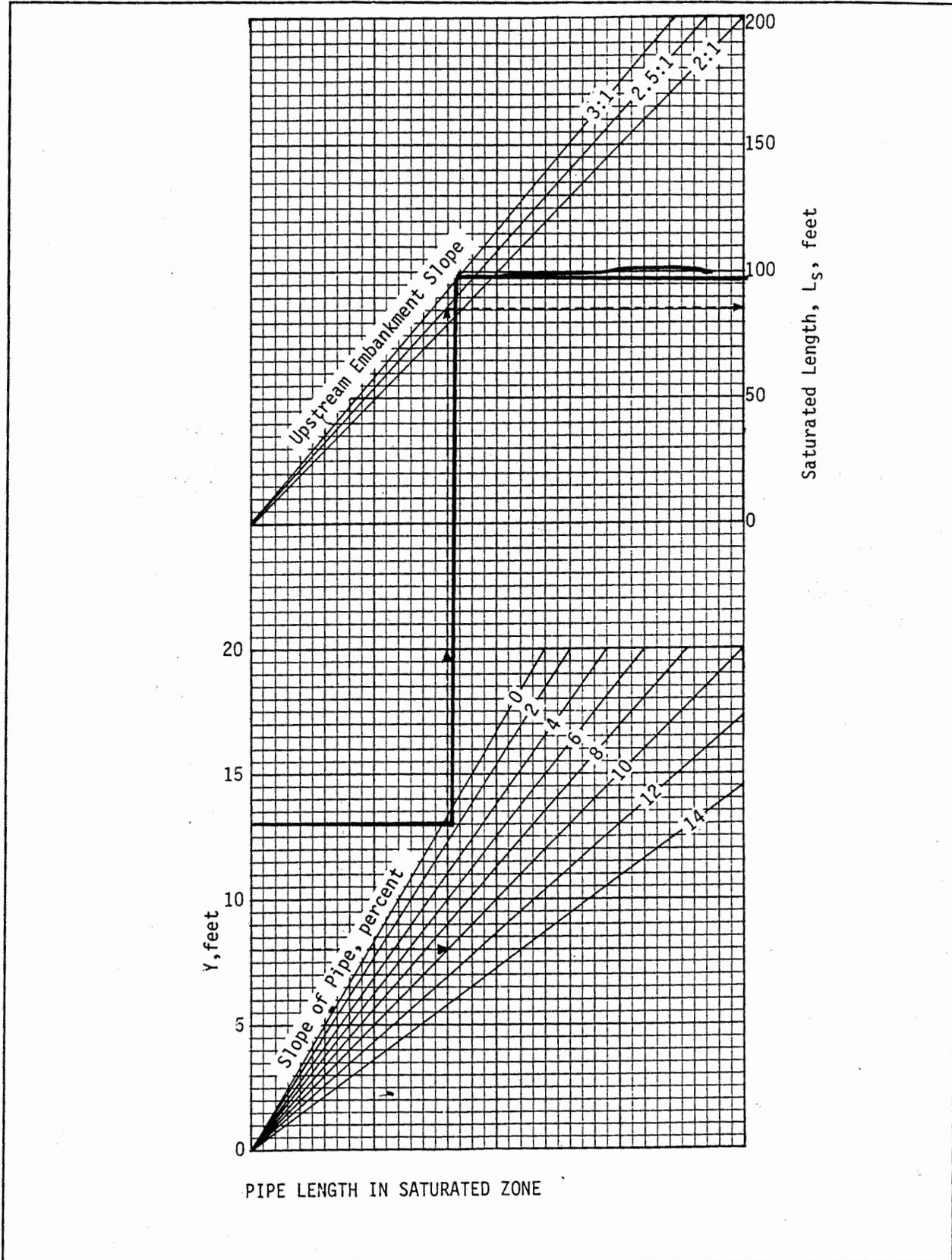
PIPE SLOPE = 4%

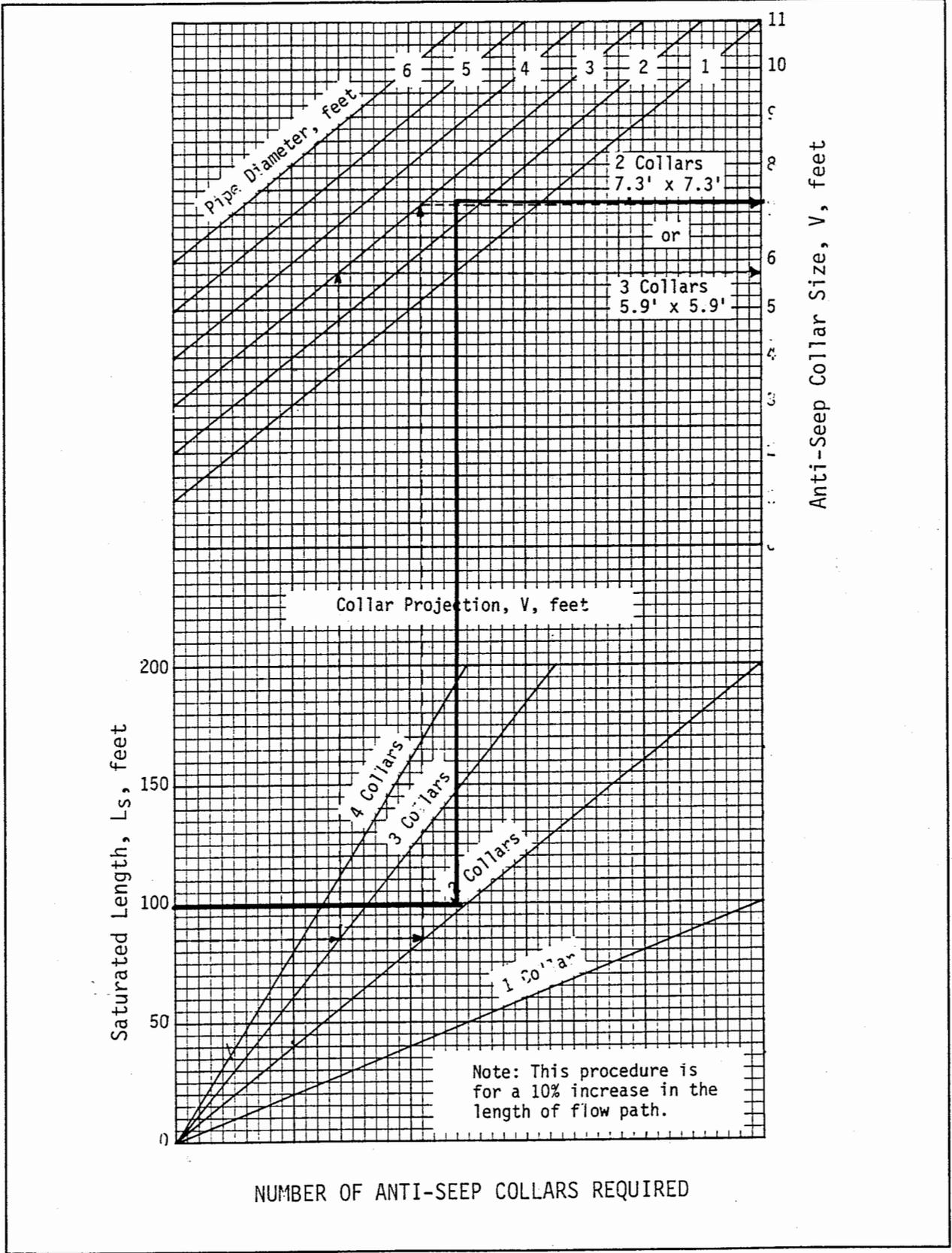
UPSTREAM EMBANKMENT = 2:1

PROVIDE 2 COLLARS: 4.8' x 4.8' (21" BARREL)

(FROM PLATES 3.14-11 & 3.14-12)

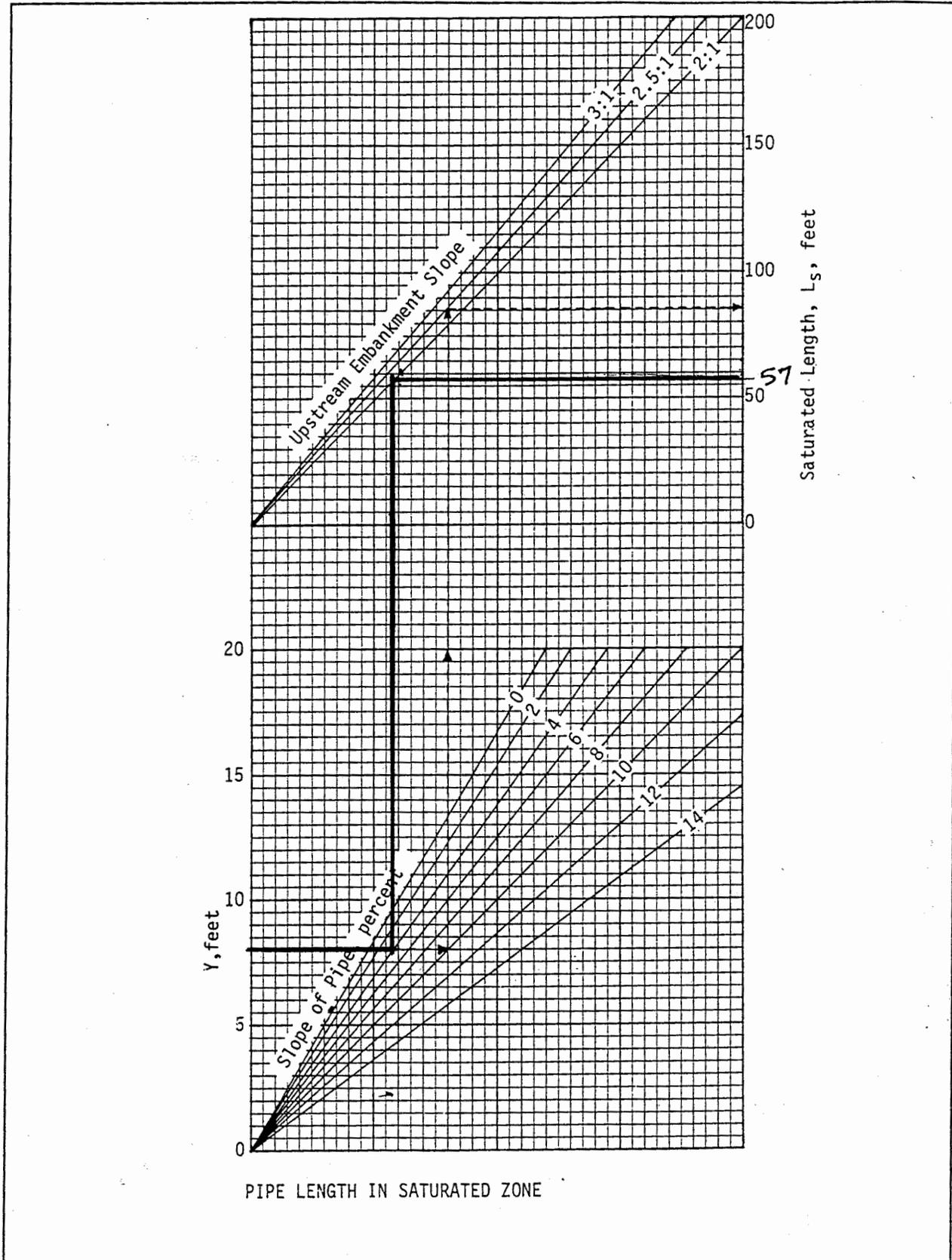
$P = 1.53' \therefore 2P = 3'$, $14P = 21.4'$





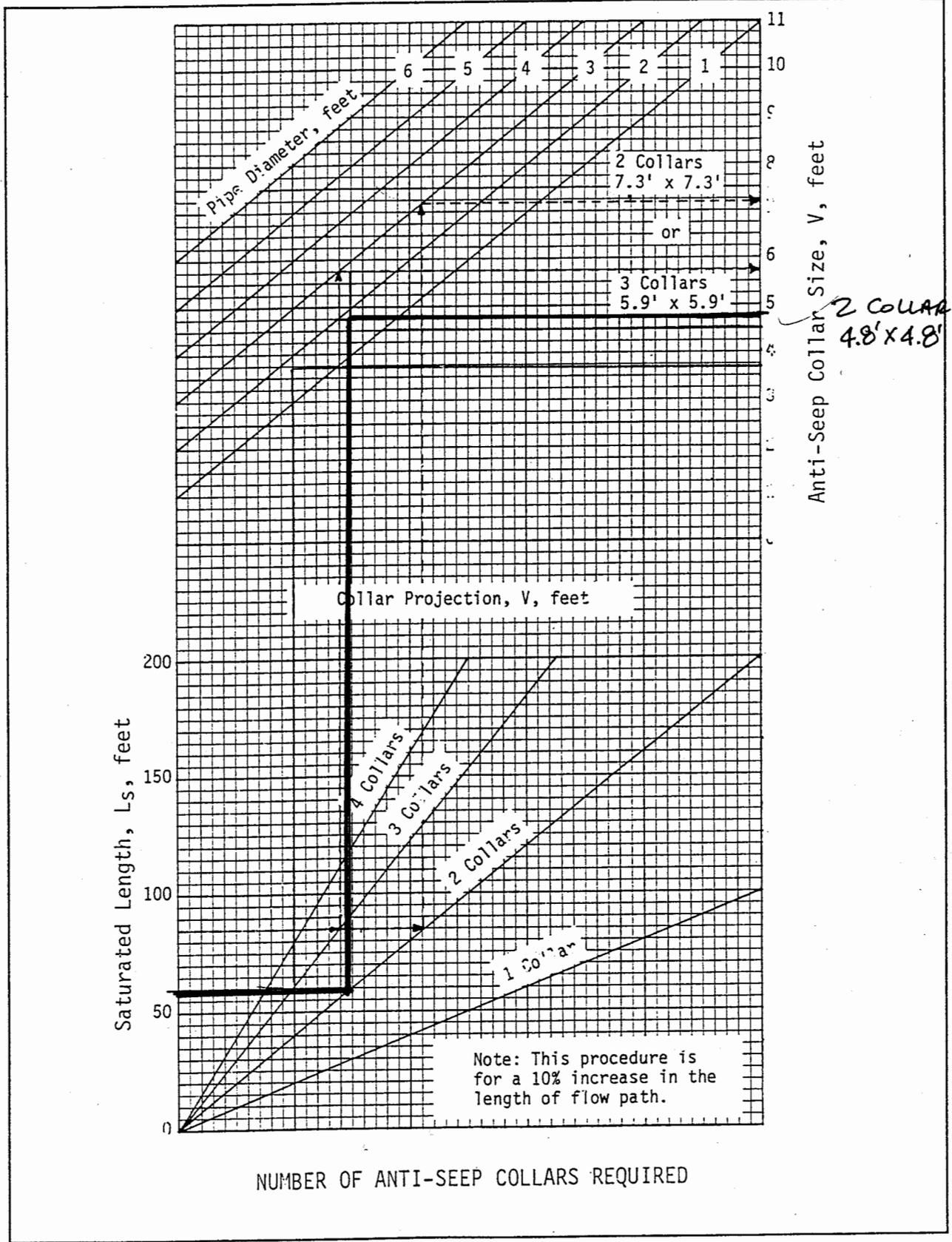
Source: USDA-SCS

Plate 3.14-12



Source: USDA-SCS

Plate 3.14-11



Source: USDA-SCS

Plate 3.14-12

Storm Sewer Summary Report

| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | Dns line No. | |
|---|---------|--------------------------|----------------|------------------|--------------------|-------------------|----------------|----------------------|-------------|-----------------|--------------|--|
| 1 | B1-B2 | 2.42 | 12 c | 95.0 | 80.00 | 81.00 | 1.053 | 83.00* | 83.44* | 0.19 | End | |
| 2 | B3-B2 | 1.58 | 12 c | 44.0 | 81.00 | 87.60 | 15.000 | 83.63 | 88.13 | 0.28 | 1 | |
| PROJECT FILE: CRLDG-B.STM | | I-D-F FILE: JAMESC~1.IDF | | | TOTAL NO. LINES: 2 | | | RUN DATE: 02-26-1998 | | | | |
| NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; * Indicates surcharge condition. | | | | | | | | | | | | |

Storm Sewer Tabulation

| Line # | Line ID | Incr. Area (ac) | Rnoff coeff (C) | Incr. CA | Sum CA | Tc (min) | Rnfal Inten (in/hr) | Total runoff (cfs) | Add. flow (cfs) | Total flow (cfs) | Capac @ full (cfs) | Line size (in x in) | Line length (ft) | Line slope (%) | Veloc. up (ft/s) | Veloc. down (ft/s) | NG up (ft) | NG down (ft) | Invert up (ft) | Invert down (ft) | Dns line # |
|--|---------|-----------------|-----------------|----------|--------|----------|--------------------------|--------------------|-----------------|------------------|--------------------|---------------------|--------------------------|----------------|------------------|--------------------|----------------------|--------------|----------------|------------------|------------|
| 1 | B1-B2 | 0.15 | 0.82 | 0.12 | 0.35 | 5.2 | 6.97 | 2.4 | 0.0 | 2.4 | 3.7 | 12 c | 95 | 1.05 | 3.1 | 3.1 | 94.55 | 80.80 | 81.00 | 80.00 | 0 |
| 2 | B3-B2 | 0.56 | 0.40 | 0.22 | 0.22 | 5.0 | 7.04 | 1.6 | 0.0 | 1.6 | 13.8 | 12 c | 44 | 15.00 | 3.7 | 2.0 | 95.05 | 94.55 | 87.60 | 81.00 | 1 |
| PROJECT FILE: CRLDG-B.STM | | | | | | | I-D-F FILE: JAMESC~1.IDF | | | | | | TOTAL NUMBER OF LINES: 2 | | | | RUN DATE: 02-26-1998 | | | | |
| NOTES: c = circular; e = elliptical; b = box; Intensity = 103.3336 / (Tc + 15.80002) ^ .8849566; Return period = 10 Yrs. | | | | | | | | | | | | | | | | | | | | | |

Storm Sewer Summary Report

| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | Dns line No. |
|---|---------|-----------------|--------------------------|------------------|-------------------|---------------------|----------------|---------------|----------------------|-----------------|--------------|
| 1 | C1-C2 | 18.72 | 30 c | 86.0 | 68.00 | 68.86 | 1.000 | 70.00 | 70.31 | 0.82 | End |
| 2 | C3-C2 | 15.88 | 27 c | 78.0 | 68.86 | 70.66 | 2.308 | 71.12 | 72.03 | 0.79 | 1 |
| 3 | C4-C3 | 13.76 | 24 c | 114.0 | 70.66 | 73.29 | 2.307 | 72.82 | 74.60 | 0.80 | 2 |
| 4 | C5-C4 | 11.67 | 24 c | 168.0 | 73.29 | 73.97 | 0.405 | 75.40 | 75.80 | 0.30 | 3 |
| 5 | C6-C5 | 11.48 | 24 c | 178.0 | 73.97 | 74.69 | 0.404 | 76.10 | 76.52 | 0.29 | 4 |
| 6 | C7-C6 | 5.34 | 21 c | 137.0 | 74.69 | 75.24 | 0.401 | 76.81 | 76.96 | 0.10 | 5 |
| 7 | C8-C7 | 3.96 | 18 c | 103.0 | 75.24 | 75.72 | 0.466 | 77.06 | 77.20 | 0.10 | 6 |
| 8 | C9-C8 | 2.28 | 12 c | 168.0 | 75.72 | 80.60 | 2.905 | 77.30 | 81.24 | 0.37 | 7 |
| 9 | C11-C6 | 4.23 | 12 c | 79.0 | 75.70 | 79.65 | 5.000 | 76.81 | 80.54 | 0.67 | 5 |
| 10 | C12-C3 | 2.16 | 15 c | 90.0 | 82.50 | 87.00 | 5.000 | 82.83 | 87.33 | 1.44 | 2 |
| 11 | C13-C12 | 0.92 | 12 c | 28.0 | 88.60 | 88.90 | 1.071 | 88.94 | 89.24 | 0.30 | 10 |
| 12 | C14-C12 | 1.20 | 12 c | 150.0 | 87.00 | 88.55 | 1.033 | 88.76 | 89.06 | 0.18 | 10 |
| 13 | C15-C14 | 1.08 | 12 c | 30.0 | 88.55 | 88.85 | 1.000 | 89.24 | 89.29 | 0.21 | 12 |
| 14 | C10-C7 | 0.87 | 12 c | 32.0 | 75.24 | 75.92 | 2.125 | 77.06* | 77.08* | 0.03 | 6 |
| PROJECT FILE: CRLDG-C.STM | | | I-D-F FILE: JAMESC~1.IDF | | | TOTAL NO. LINES: 14 | | | RUN DATE: 02-26-1998 | | |
| NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; * Indicates surcharge condition. | | | | | | | | | | | |

Storm Sewer Tabulation

| Line # | Line ID | Incr. Area (ac) | Rnoff coeff (C) | Incr. CA | Sum CA | Tc (min) | Rnfal Inten (in/hr) | Total runoff (cfs) | Add. flow (cfs) | Total flow (cfs) | Capac @ full (cfs) | Line size (in x in) | Line length (ft) | Line slope (%) | Veloc. up (ft/s) | Veloc. down (ft/s) | NG up (ft) | NG down (ft) | Invert up (ft) | Invert down (ft) | Dns line # |
|--------|---------|-----------------|-----------------|----------|--------|----------|---------------------|--------------------|-----------------|------------------|--------------------|---------------------|------------------|----------------|------------------|--------------------|------------|--------------|----------------|------------------|------------|
| 1 | C1-C2 | 0.89 | 0.60 | 0.53 | 3.24 | 10.3 | 5.77 | 18.7 | 0.0 | 18.7 | 41.0 | 30 c | 86 | 1.00 | 6.4 | 4.4 | 84.90 | 80.00 | 68.86 | 68.00 | 0 |
| 2 | C3-C2 | 0.15 | 0.62 | 0.09 | 2.71 | 9.8 | 5.86 | 15.9 | 0.0 | 15.9 | 47.0 | 27 c | 78 | 2.31 | 6.3 | 4.0 | 88.20 | 84.90 | 70.66 | 68.86 | 1 |
| 3 | C4-C3 | 0.51 | 0.81 | 0.41 | 2.30 | 9.2 | 5.99 | 13.8 | 0.0 | 13.8 | 34.4 | 24 c | 114 | 2.31 | 6.3 | 4.4 | 86.20 | 88.20 | 73.29 | 70.66 | 2 |
| 4 | C5-C4 | 0.15 | 0.66 | 0.10 | 1.88 | 8.3 | 6.19 | 11.7 | 0.0 | 11.7 | 14.4 | 24 c | 168 | 0.40 | 3.9 | 3.7 | 93.70 | 86.20 | 73.97 | 73.29 | 3 |
| 5 | C6-C5 | 0.60 | 0.63 | 0.38 | 1.79 | 7.3 | 6.43 | 11.5 | 0.0 | 11.5 | 14.4 | 24 c | 178 | 0.40 | 3.8 | 3.7 | 91.05 | 93.70 | 74.69 | 73.97 | 4 |
| 6 | C7-C6 | 0.19 | 0.52 | 0.10 | 0.81 | 6.5 | 6.62 | 5.3 | 0.0 | 5.3 | 10.0 | 21 c | 137 | 0.40 | 2.2 | 2.2 | 79.00 | 91.05 | 75.24 | 74.69 | 5 |
| 7 | C8-C7 | 0.52 | 0.50 | 0.26 | 0.58 | 5.9 | 6.78 | 4.0 | 0.0 | 4.0 | 7.2 | 18 c | 103 | 0.47 | 2.2 | 2.2 | 78.50 | 79.00 | 75.72 | 75.24 | 6 |
| 8 | C9-C8 | 0.40 | 0.81 | 0.32 | 0.32 | 5.0 | 7.04 | 2.3 | 0.0 | 2.3 | 6.1 | 12 c | 168 | 2.90 | 4.3 | 2.9 | 84.15 | 78.50 | 80.60 | 75.72 | 7 |
| 9 | C11-C6 | 0.76 | 0.79 | 0.60 | 0.60 | 5.0 | 7.04 | 4.2 | 0.0 | 4.2 | 8.0 | 12 c | 79 | 5.00 | 5.8 | 5.4 | 90.15 | 91.05 | 79.65 | 75.70 | 5 |
| 10 | C12-C3 | 0.02 | 0.90 | 0.02 | 0.32 | 6.0 | 6.76 | 2.2 | 0.0 | 2.2 | 14.4 | 15 c | 90 | 5.00 | 8.4 | 8.4 | 92.58 | 88.20 | 87.00 | 82.50 | 2 |
| 11 | C13-C12 | 0.31 | 0.42 | 0.13 | 0.13 | 5.0 | 7.04 | 0.9 | 0.0 | 0.9 | 3.7 | 12 c | 28 | 1.07 | 3.9 | 3.9 | 92.58 | 92.58 | 88.90 | 88.60 | 10 |
| 12 | C14-C12 | 0.02 | 0.90 | 0.02 | 0.17 | 5.2 | 6.99 | 1.2 | 0.0 | 1.2 | 3.6 | 12 c | 150 | 1.03 | 3.0 | 1.5 | 92.53 | 92.58 | 88.55 | 87.00 | 10 |
| 13 | C15-C14 | 0.35 | 0.44 | 0.15 | 0.15 | 5.0 | 7.04 | 1.1 | 0.0 | 1.1 | 3.6 | 12 c | 30 | 1.00 | 3.2 | 1.9 | 92.53 | 92.53 | 88.85 | 88.55 | 12 |
| 14 | C10-C7 | 0.27 | 0.46 | 0.12 | 0.12 | 5.0 | 7.04 | 0.9 | 0.0 | 0.9 | 5.2 | 12 c | 32 | 2.13 | 1.1 | 1.1 | 79.10 | 79.00 | 75.92 | 75.24 | 6 |

PROJECT FILE: CRLDG-C.STM

I-D-F FILE: JAMESC~1.IDF

TOTAL NUMBER OF LINES: 14

RUN DATE: 02-26-1998

NOTES: c = circular; e = elliptical; b = box; Intensity = $103.3336 / (Tc + 15.80002)^{.8849566}$; Return period = 10 Yrs.

Storm Sewer Summary Report

| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | Dns line No. |
|---|---------|-----------------|--------------------------|------------------|-------------------|--------------------|----------------|---------------|----------------------|-----------------|--------------|
| 1 | E2-E1 | 10.79 | 21 c | 46.0 | 54.00 | 55.00 | 2.174 | 54.77 | 55.77 | 2.27 | End |
| 2 | E3-E2 | 8.05 | 18 c | 98.0 | 58.50 | 65.48 | 7.122 | 59.07 | 66.05 | 3.49 | 1 |
| 3 | E4-E3 | 2.33 | 12 c | 153.0 | 65.48 | 70.80 | 3.477 | 69.54 | 71.45 | 0.38 | 2 |
| 4 | E5-E2 | 1.01 | 12 c | 42.0 | 62.30 | 64.00 | 4.048 | 62.56 | 64.26 | 0.77 | 1 |
| 5 | E6-E3 | 2.89 | 12 c | 136.0 | 65.48 | 68.20 | 2.000 | 69.54* | 70.44* | 0.27 | 2 |
| 6 | E7-E6 | 1.60 | 12 c | 70.0 | 68.20 | 69.60 | 2.000 | 70.71* | 70.85* | 0.08 | 5 |
| 7 | E8-E7 | 0.57 | 12 c | 138.0 | 69.60 | 72.90 | 2.391 | 70.93 | 73.22 | 0.14 | 6 |
| PROJECT FILE: CRLDG-E.STM | | | I-D-F FILE: JAMESC~1.IDF | | | TOTAL NO. LINES: 7 | | | RUN DATE: 02-26-1998 | | |
| NOTES: c = circular; e = elliptical; b = box; Return period = 10 Yrs.; * Indicates surcharge condition. | | | | | | | | | | | |

Storm Sewer Tabulation

| Line # | Line ID | Incr. Area (ac) | Rnoff coeff (C) | Incr. CA | Sum CA | Tc (min) | Rnfal Inten (in/hr) | Total runoff (cfs) | Add. flow (cfs) | Total flow (cfs) | Capac @ full (cfs) | Line size (in x in) | Line length (ft) | Line slope (%) | Veloc. up (ft/s) | Veloc. down (ft/s) | NG up (ft) | NG down (ft) | Invert up (ft) | Invert down (ft) | Dns line # |
|--------|---------|-----------------|-----------------|----------|--------|----------|---------------------|--------------------|-----------------|------------------|--------------------|---------------------|------------------|----------------|------------------|--------------------|------------|--------------|----------------|------------------|------------|
| 1 | E2-E1 | 0.37 | 0.84 | 0.31 | 1.69 | 7.5 | 6.38 | 10.8 | 0.0 | 10.8 | 27.6 | 21 c | 46 | 2.17 | 10.6 | 10.6 | 65.50 | 60.00 | 55.00 | 54.00 | 0 |
| 2 | E3-E2 | 0.60 | 0.79 | 0.47 | 1.24 | 6.9 | 6.52 | 8.1 | 0.0 | 8.1 | 28.0 | 18 c | 98 | 7.12 | 13.1 | 13.1 | 71.00 | 65.50 | 65.48 | 58.50 | 1 |
| 3 | E4-E3 | 0.48 | 0.69 | 0.33 | 0.33 | 5.0 | 7.04 | 2.3 | 0.0 | 2.3 | 6.6 | 12 c | 153 | 3.48 | 4.3 | 3.0 | 76.55 | 71.00 | 70.80 | 65.48 | 2 |
| 4 | E5-E2 | 0.16 | 0.90 | 0.14 | 0.14 | 5.0 | 7.04 | 1.0 | 0.0 | 1.0 | 7.2 | 12 c | 42 | 4.05 | 6.2 | 6.2 | 66.60 | 65.50 | 64.00 | 62.30 | 1 |
| 5 | E6-E3 | 0.37 | 0.53 | 0.20 | 0.43 | 6.2 | 6.71 | 2.9 | 0.0 | 2.9 | 5.0 | 12 c | 136 | 2.00 | 3.7 | 3.7 | 73.00 | 71.00 | 68.20 | 65.48 | 2 |
| 6 | E7-E6 | 0.29 | 0.53 | 0.15 | 0.23 | 5.8 | 6.82 | 1.6 | 0.0 | 1.6 | 5.0 | 12 c | 70 | 2.00 | 2.0 | 2.0 | 72.00 | 73.00 | 69.60 | 68.20 | 5 |
| 7 | E8-E7 | 0.15 | 0.54 | 0.08 | 0.08 | 5.0 | 7.04 | 0.6 | 0.0 | 0.6 | 5.5 | 12 c | 138 | 2.39 | 2.6 | 0.7 | 75.30 | 72.00 | 72.90 | 69.60 | 6 |

PROJECT FILE: CRLDG-E.STM

I-D-F FILE: JAMESC~1.IDF

TOTAL NUMBER OF LINES: 7

RUN DATE: 02-26-1998

NOTES: c = circular; e = elliptical; b = box; Intensity = $103.3336 / (Tc + 15.80002)^{.8849566}$; Return period = 10 Yrs.

LANDMARK DESIGN GROUP TRANSMITTAL

To: Darryl Cook
 Company: JCC Environmental Division
 From: Caleb Hurst
 Date: June 28, 2001
 Subject: Crown Landing
 LMDG Job No.: 1950040-000.08

Attached please find:

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

Transmitted as checked below:

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

| Copies | Date | Drawing No. | Description |
|--------|----------|-------------|-------------------------------|
| 1 | 06/28/01 | | Revised Drainage calculations |
| | | | |
| | | | |
| | | | |

Notes:

Please find attached revised drainage calculations to include storm manhole #37A.
 Please do not hesitate to contact me if you have any questions or comments.

Copies

1. File: 1950040-000.08 _____
2. _____
3. _____
4. _____
5. _____

Enclosures

-
-
-
-
-

LandMark Design Group, Inc.

By: Caleb Hurst

FILE: 95040-08Storm2.xls
 Project: Crown Landing Apartments
 Location: James City County, Va.
 Design: MRG
 Date: 2/26/01
 Revision: 6/28/01
 Yr. Storm: 10 Yr.
 N Value: 0.013

LANDMARK DESIGN GROUP, INC.
 4029 Ironbound Road, Suite 100
 Williamsburg, Virginia 23188

STORM SEWER DESIGN COMPUTATIONS

| FROM PT. | TO PT. | DRAIN. AREA | RUN-OFF COEFF. | C x A INCR. | C x A ACCUM. | INLET TIME | RAIN FALL | RUNOFF "Q" | | INVERT ELEV | | LENGTH | SLOPE | PIPE DIAM. | VELOCITY | CAPACITY | FLOW TIME | FLOW RATIO | VELOCITY RATIO | REMARKS |
|----------|--------|-------------|----------------|-------------|--------------|------------|-----------|------------|-------|-------------|-------|--------|---------|------------|----------|----------|-----------|------------|----------------|----------------------|
| | | acres | "C" | | | min. | in/hr | cfs | cfs | UP | LOW | ft. | ft./ft. | inches | ft./sec. | cfs | min. | Qp/Qf | Vp/Vf | |
| | | [E] | [E] | | | [E] | | | | [E] | | [E] | | [E] | | | | | | |
| 5 | 7 | 0.38 | 0.90 | 0.34 | 0.34 | 5.00 | 7.10 | 2.43 | 2.43 | 72.36 | 72.23 | 28 | 0.0047 | 12 | 3.09 | 2.43 | 0.15 | 1.00 | 1.00 | VDOT DI-3B RIM=76.03 |
| 6 | 7 | 0.32 | 0.90 | 0.29 | 0.29 | 7.00 | 6.63 | 1.89 | 1.89 | 75.12 | 72.90 | 108 | 0.0206 | 12 | 5.87 | 5.09 | 0.31 | 0.37 | 0.91 | VDOT DI-3B RIM=78.79 |
| 7 | 7A | 0.40 | 0.90 | 0.36 | 0.99 | 5.15 | 7.06 | 2.55 | 6.98 | 71.65 | 70.85 | 80 | 0.0100 | 18 | 6.33 | 10.46 | 0.21 | 0.67 | 1.07 | VDOT DI-3B RIM=76.57 |
| 7A | 8 | 0.00 | 0.00 | 0.00 | 0.99 | 5.36 | 7.01 | 0.00 | 6.92 | 57.80 | 57.00 | 80 | 0.0100 | 18 | 6.33 | 10.46 | 0.21 | 0.66 | 1.07 | VDOT MH-2 RIM=76.50 |
| 9 | 10 | 0.98 | 0.37 | 0.36 | 0.36 | 15.00 | 5.25 | 1.90 | 1.90 | 75.23 | 74.76 | 142 | 0.0033 | 12 | 3.00 | 2.05 | 0.79 | 0.93 | 1.15 | VDOT DI-1 RIM=78.23 |
| 10 | 11 | 0.30 | 0.90 | 0.27 | 0.64 | 15.79 | 5.14 | 1.40 | 3.27 | 74.66 | 70.96 | 68 | 0.0544 | 12 | 9.71 | 8.27 | 0.12 | 0.40 | 0.92 | VDOT DI-3B RIM=78.74 |
| 11 | 13 | 0.38 | 0.90 | 0.34 | 0.98 | 15.91 | 5.13 | 1.76 | 5.02 | 70.71 | 69.15 | 84 | 0.0185 | 15 | 7.35 | 8.76 | 0.19 | 0.57 | 1.03 | VDOT DI-3B RIM=74.88 |
| 12 | 13 | 0.46 | 0.90 | 0.41 | 0.41 | 7.00 | 6.63 | 2.73 | 2.73 | 68.33 | 67.94 | 65 | 0.0059 | 12 | 3.48 | 2.73 | 0.31 | 1.00 | 1.00 | VDOT DI-3B RIM=72.00 |
| 13 | 14 | 0.42 | 0.90 | 0.37 | 1.76 | 16.10 | 5.10 | 1.91 | 9.00 | 67.44 | 66.85 | 80 | 0.0074 | 18 | 5.09 | 9.00 | 0.26 | 1.00 | 1.00 | VDOT DI-3B RIM=73.07 |
| 14 | 15 | 0.00 | 0.00 | 0.00 | 1.76 | 16.36 | 5.07 | 0.00 | 8.94 | 59.30 | 58.86 | 60 | 0.0073 | 18 | 5.88 | 8.96 | 0.17 | 1.00 | 1.16 | VDOT MH-2 RIM=74.30 |
| 1 | 4 | 0.15 | 0.90 | 0.13 | 0.13 | 5.00 | 7.10 | 0.95 | 0.95 | 78.83 | 75.57 | 152 | 0.0214 | 12 | 4.71 | 5.19 | 0.54 | 0.18 | 0.71 | VDOT DI-3B RIM=82.50 |
| 4 | 3 | 0.34 | 0.90 | 0.31 | 0.44 | 5.54 | 6.97 | 2.13 | 3.07 | 75.47 | 75.05 | 57 | 0.0075 | 12 | 3.91 | 3.07 | 0.24 | 1.00 | 1.00 | VDOT DI-3B RIM=79.24 |
| 3 | 2 | 0.08 | 0.70 | 0.06 | 0.50 | 5.78 | 6.91 | 0.39 | 3.43 | 74.95 | 74.04 | 97 | 0.0094 | 12 | 4.37 | 3.43 | 0.37 | 1.00 | 1.00 | VDOT DI-1 RIM=79.50 |
| 2 | 16 | 0.63 | 0.52 | 0.33 | 0.82 | 10.00 | 6.04 | 1.98 | 4.97 | 73.79 | 73.18 | 102 | 0.0060 | 15 | 4.05 | 4.97 | 0.42 | 1.00 | 1.00 | VDOT DI-1 RIM=79.50 |
| 16 | 20 | 0.21 | 0.65 | 0.14 | 0.96 | 10.42 | 5.96 | 0.83 | 5.74 | 73.08 | 71.97 | 130 | 0.0085 | 15 | 5.60 | 5.95 | 0.39 | 0.96 | 1.16 | VDOT DI-1 RIM=82.00 |
| 17 | 20 | 0.33 | 0.35 | 0.11 | 0.11 | 10.00 | 6.04 | 0.69 | 0.69 | 78.00 | 77.43 | 75 | 0.0075 | 12 | 3.00 | 3.08 | 0.42 | 0.23 | 0.77 | VDOT DI-1 RIM=84.20 |
| 18 | 19 | 0.34 | 0.90 | 0.31 | 0.31 | 7.00 | 6.63 | 2.05 | 2.05 | 82.96 | 82.30 | 108 | 0.0061 | 12 | 3.89 | 2.78 | 0.46 | 0.74 | 1.10 | VDOT DI-3B RIM=86.63 |
| 19 | 20 | 0.46 | 0.90 | 0.42 | 0.72 | 7.46 | 6.53 | 2.72 | 4.74 | 82.05 | 81.53 | 95 | 0.0054 | 15 | 3.86 | 4.74 | 0.41 | 1.00 | 1.00 | VDOT DI-3B RIM=85.97 |
| 20 | 21 | 0.22 | 0.90 | 0.20 | 2.00 | 10.81 | 5.89 | 1.15 | 11.78 | 71.47 | 71.10 | 66 | 0.0056 | 21 | 4.90 | 11.78 | 0.22 | 1.00 | 1.00 | VDOT DI-1 RIM=84.30 |
| 21 | 23 | 0.15 | 0.90 | 0.13 | 2.13 | 11.03 | 5.86 | 0.77 | 12.47 | 70.85 | 68.89 | 350 | 0.0056 | 24 | 5.91 | 16.90 | 0.99 | 0.74 | 1.10 | VDOT DI-1 RIM=86.60 |
| 22 | 23 | 0.45 | 0.90 | 0.40 | 0.40 | 7.00 | 6.63 | 2.66 | 2.66 | 75.33 | 71.00 | 85 | 0.0509 | 12 | 8.92 | 8.00 | 0.16 | 0.33 | 0.88 | VDOT DI-3B RIM=87.19 |
| 23 | 24 | 0.00 | 0.00 | 0.00 | 2.53 | 12.02 | 5.69 | 0.00 | 14.41 | 68.79 | 67.83 | 235 | 0.0041 | 24 | 4.59 | 14.41 | 0.85 | 1.00 | 1.00 | VDOT MH-2 RIM=75.00 |
| 25 | 26 | 0.25 | 0.48 | 0.12 | 0.12 | 8.00 | 6.42 | 0.78 | 0.78 | 83.15 | 81.21 | 167 | 0.0116 | 12 | 3.57 | 3.82 | 0.78 | 0.21 | 0.74 | VDOT DI-1 RIM=86.15 |
| 26 | 27 | 0.57 | 0.42 | 0.24 | 0.36 | 8.78 | 6.27 | 1.51 | 2.27 | 81.11 | 78.10 | 63 | 0.0479 | 12 | 8.36 | 7.76 | 0.13 | 0.29 | 0.85 | VDOT DI-1 RIM=84.21 |
| 27 | 28 | 0.22 | 0.60 | 0.13 | 0.49 | 8.90 | 6.24 | 0.81 | 3.08 | 77.60 | 75.88 | 120 | 0.0143 | 12 | 5.90 | 4.24 | 0.34 | 0.73 | 1.09 | VDOT DI-1 RIM=83.54 |
| 28 | 30 | 0.62 | 0.79 | 0.49 | 0.98 | 9.24 | 6.18 | 3.02 | 6.07 | 74.55 | 74.24 | 35 | 0.0089 | 15 | 4.94 | 6.07 | 0.12 | 1.00 | 1.00 | VDOT DI-3B RIM=82.33 |
| 29 | 30 | 0.51 | 0.74 | 0.37 | 0.37 | 7.00 | 6.63 | 2.48 | 2.48 | 80.33 | 77.00 | 126 | 0.0264 | 12 | 6.99 | 5.77 | 0.30 | 0.43 | 0.95 | VDOT DI-3B RIM=84.00 |

FILE: STORM.XLS
 Date: 2/26/01
 Revision: 6/28/01
 Yr. Storm: 10 Yr.
 N Value: 0.013

| FROM PT. | TO PT. | DRAIN. AREA | RUN-OFF COEFF. | C x A INCR. | C x A ACCUM. | INLET TIME | RAIN FALL | RUNOFF "Q" | | INVERT ELEV | | LENGTH | SLOPE | PIPE DIAM. | VELOCITY | CAPACITY | FLOW TIME | FLOW RATIO | VELOCITY RATIO | REMARKS |
|--|--------|-------------|----------------|-------------|--------------|------------|-----------|------------|-------|-------------|-----------|--------|---------|------------|----------|----------|-----------|------------|----------------|----------------------|
| | | acres | "C" | | | min. | in/hr | cfs | cfs | UP | LOW | ft. | ft./ft. | inches | ft./sec. | cfs | min. | Qp/Qf | Vp/Vf | |
| 30 | 31 | [E] 0.00 | [E] 0.00 | 0.00 | 1.36 | [E] 9.36 | 6.15 | 0.00 | 8.35 | [E] 69.37 | [E] 69.00 | [E] 58 | 0.0064 | [E] 18 | 4.72 | 8.35 | 0.20 | 1.00 | 1.00 | VDOT MH-2 RIM=81.00 |
| 32 | 33 | 0.80 | 0.52 | 0.41 | 0.41 | 10.00 | 6.04 | 2.50 | 2.50 | 80.09 | 80.00 | 18 | 0.0050 | 12 | 3.19 | 2.50 | 0.09 | 1.00 | 1.00 | VDOT DI-3B RIM=85.50 |
| 34 | 35 | 0.25 | 0.51 | 0.13 | 0.13 | 8.00 | 6.42 | 0.82 | 0.82 | 95.20 | 95.03 | 28 | 0.0062 | 12 | 3.00 | 2.79 | 0.16 | 0.30 | 0.85 | VDOT DI-3B RIM=98.88 |
| 35 | 37 | 0.16 | 0.59 | 0.10 | 0.22 | 8.16 | 6.39 | 0.61 | 1.43 | 94.93 | 88.50 | 108 | 0.0595 | 12 | 7.61 | 8.65 | 0.24 | 0.17 | 0.69 | VDOT DI-3B RIM=98.88 |
| 36A | 36 | 0.10 | 0.65 | 0.06 | 0.06 | 5.00 | 7.10 | 0.45 | 0.45 | 88.00 | 87.64 | 30 | 0.0120 | 12 | 3.00 | 3.88 | 0.17 | 0.12 | 0.61 | VDOT DI-1 RIM=91.35 |
| 36 | 37 | 0.29 | 0.58 | 0.17 | 0.23 | 10.00 | 6.04 | 1.02 | 1.40 | 87.14 | 85.98 | 114 | 0.0102 | 12 | 4.20 | 3.58 | 0.45 | 0.39 | 0.92 | VDOT DI-3B RIM=93.05 |
| 37 | 37A | 0.20 | 0.90 | 0.18 | 0.47 | 10.45 | 5.96 | 1.09 | 2.80 | 85.48 | 83.58 | 60 | 0.0317 | 12 | 7.71 | 6.31 | 0.13 | 0.44 | 0.96 | VDOT DI-3B RIM=92.17 |
| 37A | 38 | 0.00 | 0.00 | 0.00 | 0.47 | 10.58 | 5.93 | 0.00 | 2.79 | 83.48 | 81.40 | 65 | 0.0321 | 12 | 7.70 | 6.35 | 0.14 | 0.44 | 0.95 | VDOT MH-2 RIM=88.00 |
| 38 | 39 | 0.00 | 0.00 | 0.00 | 0.47 | 10.72 | 5.91 | 0.00 | 2.78 | 80.40 | 80.00 | 80 | 0.0050 | 12 | 3.69 | 2.50 | 0.36 | 1.11 | 1.16 | VDOT MH-2 RIM=86.50 |
| 40 | 41 | 0.14 | 0.30 | 0.04 | 0.04 | 6.00 | 6.86 | 0.30 | 0.30 | 79.00 | 78.37 | 30 | 0.0208 | 12 | 3.00 | 5.12 | 0.17 | 0.06 | 0.46 | VDOT DI-1 RIM=82.00 |
| 41 | 43 | 0.06 | 0.68 | 0.04 | 0.09 | 6.17 | 6.69 | 0.28 | 0.57 | 78.27 | 77.52 | 59 | 0.0127 | 12 | 3.37 | 4.00 | 0.29 | 0.14 | 0.66 | VDOT DI-3B RIM=82.94 |
| 42 | 43 | 0.25 | 0.72 | 0.18 | 0.18 | 5.00 | 6.96 | 1.24 | 1.24 | 80.31 | 78.89 | 47 | 0.0303 | 12 | 5.77 | 6.17 | 0.14 | 0.20 | 0.74 | VDOT DI-3B RIM=85.98 |
| 43 | 44 | 0.37 | 0.65 | 0.24 | 0.50 | 5.14 | 6.92 | 1.65 | 3.47 | 77.27 | 77.19 | 22 | 0.0039 | 15 | 3.70 | 4.00 | 0.10 | 0.87 | 1.14 | VDOT DI-3B RIM=84.56 |
| <i>EXTENDED PIPE SYSTEM AFTER SEDIMENT TRAP IS REMOVED</i> | | | | | | | | | | | | | | | | | | | | |
| 32 | 45 | 0.80 | 0.52 | 0.41 | 0.41 | 10.00 | 6.04 | 2.50 | 2.50 | 80.09 | 79.86 | 47 | 0.0050 | 12 | 3.19 | 2.50 | 0.25 | 1.00 | 1.00 | VDOT DI-3B RIM=85.50 |
| 43 | 45 | 0.37 | 0.65 | 0.24 | 0.50 | 5.14 | 6.92 | 1.65 | 3.47 | 77.27 | 77.03 | 64 | 0.0039 | 15 | 3.70 | 4.00 | 0.29 | 0.87 | 1.14 | VDOT DI-3B RIM=84.56 |
| 38 | 45 | 0.00 | 0.00 | 0.00 | 0.47 | 10.72 | 5.91 | 0.00 | 2.78 | 80.40 | 79.53 | 175 | 0.0050 | 12 | 3.69 | 2.50 | 0.79 | 1.11 | 1.16 | VDOT MH-2 RIM=86.50 |
| 45 | 46 | 0.00 | 0.00 | 0.00 | 1.39 | 11.51 | 5.68 | 0.00 | 7.87 | 76.78 | 76.65 | 22 | 0.0057 | 18 | 4.45 | 7.87 | 0.08 | 1.00 | 1.00 | VDOT MH-2 RIM=84.00 |
| 46 | 47 | 1.00 | 0.90 | 0.90 | 2.29 | 11.60 | 5.66 | 5.10 | 12.95 | 76.55 | 74.53 | 50 | 0.0405 | 15 | 10.55 | 12.95 | 0.08 | 1.00 | 1.00 | |
| 47 | 48 | 1.00 | 0.90 | 0.90 | 3.19 | 11.67 | 5.65 | 5.09 | 18.00 | 74.43 | 70.51 | 50 | 0.0783 | 15 | 14.67 | 18.00 | 0.06 | 1.00 | 1.00 | |

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM E

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 18 | 2.5 | 2.52 | 12 | 0.50 | 80.09 | 80.00 | 81.09 | 81.00 | 85.50 | 0.00 | 32-33 |

Project file: CrownE.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM F

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 80 | 6.78 | 2.52 | 12 | 0.50 | 80.40 | 80.00 | 83.90 | 81.00 | 86.50 | 0.00 | 38-39 |
| 2 | 1 | 65 | 6.78 | 6.37 | 12 | 3.20 | 83.48 | 81.40 | 86.43 | 84.07 | 88.00 | 86.50 | 37A-38 |
| 3 | 2 | 60 | 3.99 | 6.34 | 12 | 3.17 | 85.48 | 83.58 | 87.71 | 86.95 | 92.17 | 88.00 | 37-37A |
| 4 | 3 | 114 | 1.47 | 3.59 | 12 | 1.02 | 87.14 | 85.98 | 88.30 | 88.11 | 93.05 | 92.17 | 36-37 |
| 5 | 3 | 108 | 1.43 | 8.69 | 12 | 5.95 | 94.93 | 88.50 | 95.44 | 88.78 | 98.88 | 92.17 | 35-37 |
| 6 | 5 | 28 | 0.82 | 2.77 | 12 | 0.61 | 95.20 | 95.03 | 95.60 | 95.59 | 98.88 | 98.88 | 34-35 |
| 7 | 4 | 30 | 0.45 | 3.9 | 12 | 1.20 | 88.00 | 87.64 | 88.35 | 88.36 | 91.35 | 93.05 | 36A-36 |

Project file: CrownF.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM G

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 22 | 5.58 | 3.89 | 15 | 0.36 | 77.27 | 77.19 | 79.16 | 79.00 | 84.56 | 0.00 | 43-44 |
| 2 | 1 | 47 | 1.24 | 6.19 | 12 | 3.02 | 80.31 | 78.89 | 80.78 | 79.44 | 85.98 | 84.56 | 42-43 |
| 3 | 1 | 59 | 0.87 | 4.02 | 12 | 1.27 | 78.27 | 77.52 | 79.47 | 79.44 | 82.94 | 84.56 | 41-43 |
| 4 | 3 | 30 | 0.3 | 5.16 | 12 | 2.10 | 79.00 | 78.37 | 79.49 | 79.49 | 82.00 | 82.94 | 40-41 |

Project file: CrownG.stm
Return period = 10 Yrs.

Scott,

I will conduct an overall site inspection when I return from vacation in January '03 for any non-BMP site issues.

Beth
12-23-02

Record Drawing / Construction Certification Submittal for a BMP

Date: 12/19/01

*Gerry
SAFELY many
Field problems.*

- Inspector:
- Pat Menichino
 - Joe Buchite
 - Beth Davis
 - Gerry Lewis
 - Jim Rudnicki
 - Other: _____

Project: Spotswood Commons (Crown Landing)
BMP Facility: BMP #1 WET POND
Plan No.: SP-15-01
Assigned County BMP ID Code: PC 183

I have received a transmittal for a Record Drawing and Construction Certification for the above referenced facility on 12/13/02. Prior to full engineering review of these items and a field inspection, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw in the field. Please review the drawing and return to me promptly so I can proceed with the review for certification purposes.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and may make comment in 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. If needed, I can easily add these items to any comment letter that I may generate the Owner/Engineer for the BMP. Let me know if I need to add items for site issues to my process.

Scott

SP-15-01

**CROWN LANDING
APARTMENTS**

Longhill Road

James City County, Virginia



**AMENDED
STORMWATER MANAGEMENT
AND DRAINAGE CALCULATIONS**

**March 2001
Revised April 2001**

Project # 1950040-000.05

**LANDMARK
DESIGN GROUP**

Engineers • Planners • Surveyors
Landscape Architects • Environmental Consultants

**4029 Ironbound Road, Suite 100
Williamsburg, VA 23188
(757)253-2975**

Crown Landing Apartments Drainage and Erosion Control Narrative

The site for this project is a 25.26 ac. parcel at 4700 Longhill Road approximately 700 feet northwest of Olde Towne Road. The site consists of two drainage areas. The southeast portion of the site is part of the 106 acre watershed which drains to an existing dry detention basin located to the east of the site. The northwest portion of the site includes 10.24 acres, which drains to an area of wetlands on the northern side of the site. The existing terrain is rolling to mountainous with slopes ranging from 3-30%.

In addressing the drainage issues of this site, roughly the same drainage areas were maintained. A portion of the area draining to the existing dry pond will be rerouted to the proposed wet detention basin (Basin #1) in the northwest corner of the site. **This wet detention basin will treat the northwest area of the site, 10.6 acres. 11.5 acres of the site is treated by the existing dry detention basin (Basin #2) designed by AES as part of the Westmoreland Subdivision development.** The remainder of the property, which is left in an undeveloped condition, drains to the receiving channel downstream of BMP #2.

DEC old criteria is acceptable as this is a site plan modify. w/ an improved layout.
Basin #1 is a 9-point BMP based on the 4Vr permanent pool design criteria. This basin will also function as a temporary sediment basin during construction. The area draining to Basin #1 is increased to take advantage of its higher removal efficiency. The pond permanent pool is set at 4Vr. The 2-year storm is detained to maintain pre-development runoff rates. The principal spillway will accommodate the 10-year storm and the emergency spillway will accommodate the 100-year storm.

- see note above

Basin #2 qualifies as a 6-point BMP extended dry detention facility. The area draining to Basin #2 is 11% of the overall watershed for that basin and therefore the development of this parcel affects the performance of this structure very little. The existing dry detention basin was found to be adequate for both water quality and quantity and therefore no modifications are necessary. A temporary sediment basin and a temporary sediment trap will be utilized during construction to prevent sediment from entering the existing basin.

The 10-point BMP system required by James City County is achieved by a combination of the existing 6-point BMP, the proposed 9-point BMP and open space credits. 42% of the site is treated by the 9-point BMP accounting for 3.78 points. 46% of the site is treated by the 6-point BMP accounting for 2.76 points. 35% of the site is allowable open space, which accounts for 3.5 points. Any open space which is disturbed during construction, including temporary sediment basin area, is to be revegetated upon completion of construction. The combination of these treatment measures brings the total for the site to 10.04 points.

The following erosion control measures were utilized on the site:

- Gravel Construction Entrance at the site access to Longhill Road.
- Silt Fence around the perimeter to prevent sediment from leaving the site.

- Diversion Dikes at the toe of significant slopes and to divert overland flow to the temporary sediment structures.
- Inlet Protection on all proposed drainage structures. There are no existing drainage structures that require inlet protection.
- Tree protection at the limits of clearing on the perimeter as well as areas where existing trees are to be retained within the site.
- Outlet Protection at all stormwater outfalls.
- Temporary Sediment Basins and Sediment Trap to treat stormwater from disturbed areas.

The limits of clearing have been minimized in the interest of preserving trees and maintaining the character of the existing land. The development is also located more than 200' from Longhill Road providing a significant buffer from the highway.

FILE: 95040-08Storm2.xls
 Project: Crown Landing Apartments
 Location: James City County, Va.
 Design: MRG
 Date: 2/26/01
 Revision: 4/17/01
 Yr. Storm: 10 Yr.
 N Value: 0.013

LANDMARK DESIGN GROUP, INC.
 4029 Ironbound Road, Suite 100
 Williamsburg, Virginia 23188

STORM SEWER DESIGN COMPUTATIONS

| FROM PT. | TO PT. | DRAIN. AREA | RUN-OFF COEFF. | C x A INCR. | C x A ACCUM. | INLET TIME | RAIN FALL | RUNOFF "Q" | | INVERT ELEV | | LENGTH | SLOPE | PIPE DIAM. | VELOCITY | CAPACITY | FLOW TIME | FLOW RATIO | VELOCITY RATIO | REMARKS |
|----------|--------|-------------|----------------|-------------|--------------|------------|-----------|------------|-------|-------------|-------|--------|---------|------------|----------|----------|-----------|------------|----------------|----------------------|
| | | acres | "C" | | | min. | in/hr | cfs | cfs | UP | LOW | ft. | ft./ft. | inches | ft./sec. | cfs | min. | Qp/Qf | Vp/Vf | |
| 5 | 7 | 0.38 ✓ | 0.90 | 0.34 | 0.34 | 5.00 | 7.10 | 2.43 | 2.43 | 72.36 | 72.23 | 28 | 0.0047 | 12 | 3.09 | 2.43 | 0.15 | 1.00 | 1.00 | VDOT DI-3B RIM=76.03 |
| 6 | 7 | 0.32 ✓ | 0.90 | 0.29 | 0.29 | 7.00 | 6.63 | 1.89 | 1.89 | 75.12 | 72.90 | 108 | 0.0206 | 12 | 5.87 | 5.09 | 0.31 | 0.37 | 0.91 | VDOT DI-3B RIM=78.79 |
| 7 | 7A | 0.40 ✓ | 0.90 | 0.36 | 0.99 | 5.15 | 7.06 | 2.55 | 6.98 | 71.65 | 70.85 | 80 | 0.0100 | 18 | 6.33 | 10.46 | 0.21 | 0.67 | 1.07 | VDOT DI-3B RIM=76.57 |
| 7A | 8 | 0.00 ✓ | 0.00 | 0.00 | 0.99 | 5.36 | 7.01 | 0.00 | 6.92 | 57.80 | 57.00 | 80 | 0.0100 | 18 | 6.33 | 10.46 | 0.21 | 0.66 | 1.07 | VDOT MH-2 RIM=76.50 |
| 9 | 10 | 0.98 ✓ | 0.37 | 0.36 | 0.36 | 15.00 | 5.25 | 1.90 | 1.90 | 75.23 | 74.76 | 142 | 0.0033 | 12 | 3.00 | 2.05 | 0.79 | 0.93 | 1.15 | VDOT DI-1 RIM=78.23 |
| 10 | 11 | 0.30 ✓ | 0.90 | 0.27 | 0.64 | 15.79 | 5.14 | 1.40 | 3.27 | 74.66 | 70.96 | 68 | 0.0544 | 12 | 9.71 | 8.27 | 0.12 | 0.40 | 0.92 | VDOT DI-3B RIM=78.74 |
| 11 | 13 | 0.38 ✓ | 0.90 | 0.34 | 0.98 | 15.91 | 5.13 | 1.76 | 5.02 | 70.71 | 69.15 | 84 | 0.0185 | 15 | 7.35 | 8.76 | 0.19 | 0.57 | 1.03 | VDOT DI-3B RIM=74.88 |
| 12 | 13 | 0.46 ✓ | 0.90 | 0.41 | 0.41 | 7.00 | 6.63 | 2.73 | 2.73 | 68.33 | 67.94 | 65 | 0.0059 | 12 | 3.48 | 2.73 | 0.31 | 1.00 | 1.00 | VDOT DI-3B RIM=72.00 |
| 13 | 14 | 0.42 ✓ | 0.90 | 0.37 | 1.76 | 16.10 | 5.10 | 1.91 | 9.00 | 67.44 | 66.85 | 80 | 0.0074 | 18 | 5.09 | 9.00 | 0.26 | 1.00 | 1.00 | VDOT DI-3B RIM=73.07 |
| 14 | 15 | 0.00 ✓ | 0.00 | 0.00 | 1.76 | 16.36 | 5.07 | 0.00 | 8.94 | 59.30 | 58.86 | 60 | 0.0073 | 18 | 5.88 | 8.96 | 0.17 | 1.00 | 1.16 | VDOT MH-2 RIM=74.30 |
| 1 | 4 | 0.15 ✓ | 0.90 | 0.13 | 0.13 | 5.00 | 7.10 | 0.95 | 0.95 | 78.83 | 75.57 | 152 | 0.0214 | 12 | 4.71 | 5.19 | 0.54 | 0.18 | 0.71 | VDOT DI-3B RIM=82.50 |
| 4 | 3 | 0.34 ✓ | 0.90 | 0.31 | 0.44 | 5.54 | 6.97 | 2.13 | 3.07 | 75.47 | 75.05 | 57 | 0.0075 | 12 | 3.91 | 3.07 | 0.24 | 1.00 | 1.00 | VDOT DI-3B RIM=79.24 |
| 3 | 2 | 0.08 ✓ | 0.70 | 0.06 | 0.50 | 5.78 | 6.91 | 0.39 | 3.43 | 74.95 | 74.04 | 97 | 0.0094 | 12 | 4.37 | 3.43 | 0.37 | 1.00 | 1.00 | VDOT DI-1 RIM=79.50 |
| 2 | 16 | 0.63 ✓ | 0.52 | 0.33 | 0.82 | 10.00 | 6.04 | 1.98 | 4.97 | 73.79 | 73.18 | 102 | 0.0060 | 15 | 4.05 | 4.97 | 0.42 | 1.00 | 1.00 | VDOT DI-1 RIM=79.50 |
| 16 | 20 | 0.21 ✓ | 0.65 | 0.14 | 0.96 | 10.42 | 5.96 | 0.83 | 5.74 | 73.08 | 71.97 | 130 | 0.0085 | 15 | 5.60 | 5.95 | 0.39 | 0.96 | 1.16 | VDOT DI-1 RIM=82.00 |
| 17 | 20 | 0.33 ✓ | 0.35 | 0.11 | 0.11 | 10.00 | 6.04 | 0.69 | 0.69 | 78.00 | 77.43 | 75 | 0.0075 | 12 | 3.00 | 3.08 | 0.42 | 0.23 | 0.77 | VDOT DI-1 RIM=84.20 |
| 18 | 19 | 0.34 ✓ | 0.90 | 0.31 | 0.31 | 7.00 | 6.63 | 2.05 | 2.05 | 82.96 | 82.30 | 108 | 0.0061 | 12 | 3.89 | 2.78 | 0.46 | 0.74 | 1.10 | VDOT DI-3B RIM=86.63 |
| 19 | 20 | 0.46 ✓ | 0.90 | 0.42 | 0.72 | 7.46 | 6.53 | 2.72 | 4.74 | 82.05 | 81.53 | 95 | 0.0054 | 15 | 3.86 | 4.74 | 0.41 | 1.00 | 1.00 | VDOT DI-3B RIM=85.97 |
| 20 | 21 | 0.22 ✓ | 0.90 | 0.20 | 2.00 | 10.81 | 5.89 | 1.15 | 11.78 | 71.47 | 71.10 | 66 | 0.0056 | 21 | 4.90 | 11.78 | 0.22 | 1.00 | 1.00 | VDOT DI-1 RIM=84.30 |
| 21 | 23 | 0.15 ✓ | 0.90 | 0.13 | 2.13 | 11.03 | 5.86 | 0.77 | 12.47 | 70.85 | 68.89 | 350 | 0.0056 | 24 | 5.91 | 16.90 | 0.99 | 0.74 | 1.10 | VDOT DI-1 RIM=86.60 |
| 22 | 23 | 0.45 ✓ | 0.90 | 0.40 | 0.40 | 7.00 | 6.63 | 2.66 | 2.66 | 75.33 | 71.00 | 85 | 0.0509 | 12 | 8.92 | 8.00 | 0.16 | 0.33 | 0.88 | VDOT DI-3B RIM=87.19 |
| 23 | 24 | 0.00 ✓ | 0.00 | 0.00 | 2.53 | 12.02 | 5.69 | 0.00 | 14.41 | 68.79 | 67.83 | 235 | 0.0041 | 24 | 4.59 | 14.41 | 0.85 | 1.00 | 1.00 | VDOT MH-2 RIM=75.00 |
| 25 | 26 | 0.25 ✓ | 0.48 | 0.12 | 0.12 | 8.00 | 6.42 | 0.78 | 0.78 | 83.15 | 81.21 | 167 | 0.0116 | 12 | 3.57 | 3.82 | 0.78 | 0.21 | 0.74 | VDOT DI-1 RIM=86.15 |
| 26 | 27 | 0.57 ✓ | 0.42 | 0.24 | 0.36 | 8.78 | 6.27 | 1.51 | 2.27 | 81.11 | 78.10 | 63 | 0.0479 | 12 | 8.36 | 7.76 | 0.13 | 0.29 | 0.85 | VDOT DI-1 RIM=84.21 |
| 27 | 28 | 0.22 ✓ | 0.60 | 0.13 | 0.49 | 8.90 | 6.24 | 0.81 | 3.08 | 77.60 | 75.88 | 120 | 0.0143 | 12 | 5.90 | 4.24 | 0.34 | 0.73 | 1.09 | VDOT DI-1 RIM=83.54 |
| 28 | 30 | 0.62 ✓ | 0.79 | 0.49 | 0.98 | 9.24 | 6.18 | 3.02 | 6.07 | 74.55 | 74.24 | 35 | 0.0089 | 15 | 4.94 | 6.07 | 0.12 | 1.00 | 1.00 | VDOT DI-3B RIM=82.33 |
| 29 | 30 | 0.51 ✓ | 0.74 | 0.37 | 0.37 | 7.00 | 6.63 | 2.48 | 2.48 | 80.33 | 77.00 | 126 | 0.0264 | 12 | 6.99 | 5.77 | 0.30 | 0.43 | 0.95 | VDOT DI-3B RIM=84.00 |

FILE: STORM.XLS
 Date: 2/26/01
 Revision: 4/17/01
 Yr. Storm: 10 Yr.
 N Value: 0.013

| FROM PT. | TO PT. | DRAIN. AREA | RUN-OFF COEFF. | C x A INCR. | C x A ACCUM. | INLET TIME | RAIN FALL | RUNOFF "Q" | | INVERT ELEV | | LENGTH | SLOPE | PIPE DIAM. | VELOCITY | CAPACITY | FLOW TIME | FLOW RATIO | VELOCITY RATIO | REMARKS | |
|----------|--------|-------------|----------------|-------------|--------------|------------|-----------|------------|------|-------------|-------|--------|---------|------------|----------|----------|-----------|------------|----------------|------------|-----------|
| | | acres | "C" | | | min. | in/hr | cfs | cfs | UP | LOW | ft. | ft./ft. | inches | ft./sec. | cfs | min. | Qp/Qf | Vp/Vf | | |
| 30 | 31 | 0.00 | ✓ | 0.00 | 0.00 | 9.36 | 6.15 | 0.00 | 8.35 | 69.37 | 69.00 | 58 | 0.0064 | 18 | 4.72 | 8.35 | 0.20 | 1.00 | 1.00 | VDOT MH-2 | RIM=81.00 |
| 32 | 33 | 0.80 | ✓ | 0.52 | 0.41 | 10.00 | 6.04 | 2.50 | 2.50 | 80.09 | 80.00 | 18 | 0.0050 | 12 | 3.19 | 2.50 | 0.09 | 1.00 | 1.00 | VDOT DI-3B | RIM=85.50 |
| 34 | 35 | 0.25 | ✓ | 0.51 | 0.13 | 8.00 | 6.42 | 0.82 | 0.82 | 95.20 | 95.03 | 28 | 0.0062 | 12 | 3.00 | 2.79 | 0.16 | 0.30 | 0.85 | VDOT DI-3B | RIM=98.88 |
| 35 | 37 | 0.16 | ✓ | 0.59 | 0.10 | 8.16 | 6.39 | 0.61 | 1.43 | 94.93 | 88.50 | 108 | 0.0595 | 12 | 7.61 | 8.65 | 0.24 | 0.17 | 0.69 | VDOT DI-3B | RIM=98.88 |
| 36A | 36 | 0.10 | ✓ | 0.65 | 0.06 | 5.00 | 7.10 | 0.45 | 0.45 | 88.00 | 87.64 | 30 | 0.0120 | 12 | 3.00 | 3.88 | 0.17 | 0.12 | 0.61 | VDOT DI-1 | RIM=91.35 |
| 36 | 37 | 0.29 | ✓ | 0.58 | 0.17 | 10.00 | 6.04 | 1.02 | 1.40 | 87.14 | 85.98 | 114 | 0.0102 | 12 | 4.20 | 3.58 | 0.45 | 0.39 | 0.92 | VDOT DI-3B | RIM=93.05 |
| 37 | 38 | 0.20 | ✓ | 0.90 | 0.18 | 10.45 | 5.96 | 1.09 | 2.80 | 85.48 | 81.40 | 120 | 0.0340 | 12 | 7.87 | 6.54 | 0.25 | 0.43 | 0.95 | VDOT DI-3B | RIM=92.17 |
| 38 | 39 | 0.00 | ✓ | 0.00 | 0.00 | 10.71 | 5.91 | 0.00 | 2.78 | 80.40 | 80.00 | 80 | 0.0050 | 12 | 3.69 | 2.50 | 0.36 | 1.11 | 1.16 | VDOT MH-2 | RIM=86.50 |
| 40 | 41 | 0.14 | ✓ | 0.30 | 0.04 | 6.00 | 6.86 | 0.30 | 0.30 | 79.00 | 78.37 | 30 | 0.0208 | 12 | 3.00 | 5.12 | 0.17 | 0.06 | 0.46 | VDOT DI-1 | RIM=82.00 |
| 41 | 43 | 0.06 | ✓ | 0.68 | 0.04 | 6.17 | 6.69 | 0.28 | 0.57 | 78.27 | 77.52 | 59 | 0.0127 | 12 | 3.37 | 4.00 | 0.29 | 0.14 | 0.66 | VDOT DI-3B | RIM=82.94 |
| 42 | 43 | 0.25 | ✓ | 0.72 | 0.18 | 5.00 | 6.96 | 1.24 | 1.24 | 80.31 | 78.89 | 47 | 0.0303 | 12 | 5.77 | 6.17 | 0.14 | 0.20 | 0.74 | VDOT DI-3B | RIM=85.98 |
| 43 | 44 | 0.37 | ✓ | 0.65 | 0.24 | 5.14 | 6.92 | 1.65 | 3.47 | 77.27 | 77.19 | 22 | 0.0039 | 15 | 3.70 | 4.00 | 0.10 | 0.87 | 1.14 | VDOT DI-3B | RIM=84.56 |

CROWN LANDING APARTMENTS

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM A

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|-----------------|----------------|---------------|-------------------|--------------------|------------------|-------------------|--------------------|--------------------|--------------------|--------------------|------------------|------------------|----------------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 60 | 9.7 | 8.99 | 18 | 0.73 | 59.30 | 58.86 | 61.51 | 61.00 | 74.30 | 0.00 | 14-15 |
| 2 | 1 | 80 | 9.7 | 9.02 | 18 | 0.74 | 67.44 | 66.85 | 68.84 | 68.25 | 73.07 | 74.30 | 13-14 |
| 3 | 2 | 65 | 2.73 | 2.76 | 12 | 0.60 | 68.33 | 67.94 | 69.72 | 69.34 | 72.00 | 73.07 | 12-13 |
| 4 | 2 | 84 | 5.06 | 8.8 | 15 | 1.86 | 70.71 | 69.15 | 71.61 | 69.84 | 74.88 | 73.07 | 11-13 |
| 5 | 4 | 68 | 3.3 | 8.31 | 12 | 5.44 | 74.66 | 70.96 | 75.43 | 71.94 | 78.74 | 74.88 | 10-11 |
| 6 | 5 | 142 | 1.9 | 2.05 | 12 | 0.33 | 75.23 | 74.76 | 76.14 | 75.77 | 78.23 | 78.74 | 9-10 |

Project file: CrownLandingA.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM B

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|-----------------|----------------|---------------|-------------------|--------------------|------------------|-------------------|--------------------|--------------------|--------------------|--------------------|------------------|------------------|----------------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 80 | 6.87 | 10.5 | 18 | 1.00 | 57.80 | 57.00 | 61.34 | 61.00 | 76.50 | 0.00 | 7A-8 |
| 2 | 1 | 80 | 6.87 | 10.5 | 18 | 1.00 | 71.65 | 70.85 | 72.65 | 71.75 | 76.57 | 76.50 | 7-7A |
| 3 | 2 | 28 | 2.43 | 7.16 | 18 | 0.46 | 72.36 | 72.23 | 73.13 | 73.12 | 76.03 | 76.57 | 5-7 |
| 4 | 2 | 108 | 1.89 | 5.11 | 12 | 2.06 | 75.12 | 72.90 | 75.70 | 73.33 | 78.79 | 76.57 | 6-7 |

Project file: CrownB.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM C

| Line No. | To Line | Length (ft) | Total Flow (cfs) | Capac. Full (cfs) | Pipe Size (in) | Pipe Slope (%) | Inv Elev Up (ft) | Inv Elev Dn (ft) | HGL Elev Up (ft) | HGL Elev Dn (ft) | Gr/Rim EI (ft) | Gr/Rim EI (ft) | Line ID |
|----------|---------|-------------|------------------|-------------------|----------------|----------------|------------------|------------------|------------------|------------------|----------------|----------------|---------|
| 1 | End | 235 | 16.32 | 14.46 | 24 | 0.41 | 68.79 | 67.83 | 72.92 | 71.70 | 75.00 | 71.50 | 23-24 |
| 2 | 1 | 85 | 2.66 | 8.04 | 12 | 5.09 | 75.33 | 71.00 | 76.02 | 73.34 | 87.19 | 75.00 | 22-23 |
| 3 | 1 | 350 | 13.66 | 16.93 | 24 | 0.56 | 70.85 | 68.89 | 74.62 | 73.34 | 86.60 | 75.00 | 21-23 |
| 4 | 3 | 66 | 12.89 | 11.86 | 21 | 0.56 | 71.47 | 71.10 | 75.31 | 74.87 | 84.30 | 86.60 | 20-21 |
| 5 | 4 | 95 | 4.77 | 4.78 | 15 | 0.55 | 82.05 | 81.53 | 83.07 | 82.56 | 85.97 | 84.30 | 19-20 |
| 6 | 5 | 108 | 2.05 | 2.78 | 12 | 0.61 | 82.96 | 82.30 | 83.68 | 83.33 | 86.63 | 85.97 | 18-19 |
| 7 | 4 | 75 | 0.69 | 3.1 | 12 | 0.76 | 78.00 | 77.43 | 78.35 | 77.76 | 84.20 | 84.30 | 17-20 |
| 8 | 4 | 130 | 6.28 | 5.97 | 15 | 0.85 | 73.08 | 71.97 | 76.98 | 75.75 | 82.00 | 84.30 | 16-20 |
| 9 | 8 | 102 | 5.45 | 4.99 | 15 | 0.60 | 73.79 | 73.18 | 77.89 | 77.17 | 79.50 | 82.00 | 2-16 |
| 10 | 9 | 97 | 3.47 | 3.45 | 12 | 0.94 | 74.95 | 74.04 | 78.86 | 77.94 | 79.50 | 79.50 | 3-2 |
| 11 | 10 | 57 | 3.08 | 3.06 | 12 | 0.74 | 75.47 | 75.05 | 79.33 | 78.91 | 79.24 | 79.50 | 4-3 |
| 12 | 11 | 152 | 0.95 | 5.22 | 12 | 2.14 | 78.83 | 75.57 | 79.67 | 79.57 | 82.50 | 79.24 | 1-4 |

Project file: CrownC.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM D

| Line No. | To Line | Length (ft) | Total Flow (cfs) | Capac. Full (cfs) | Pipe Size (in) | Pipe Slope (%) | Inv Elev Up (ft) | Inv Elev Dn (ft) | HGL Elev Up (ft) | HGL Elev Dn (ft) | Gr/Rim EI (ft) | Gr/Rim EI (ft) | Line ID |
|----------|---------|-------------|------------------|-------------------|----------------|----------------|------------------|------------------|------------------|------------------|----------------|----------------|---------|
| 1 | End | 58 | 8.6 | 8.39 | 18 | 0.64 | 69.37 | 69.00 | 71.89 | 71.50 | 81.00 | 71.50 | 30-31 |
| 2 | 1 | 126 | 2.48 | 5.79 | 12 | 2.64 | 80.33 | 77.00 | 81.00 | 77.46 | 84.00 | 81.00 | 29-30 |
| 3 | 1 | 35 | 6.12 | 6.08 | 15 | 0.89 | 74.55 | 74.24 | 75.58 | 75.28 | 82.33 | 81.00 | 28-30 |
| 4 | 3 | 120 | 3.1 | 4.26 | 12 | 1.43 | 77.60 | 75.88 | 78.35 | 76.52 | 83.54 | 82.33 | 27-28 |
| 5 | 4 | 63 | 2.29 | 7.78 | 12 | 4.78 | 81.11 | 78.10 | 81.75 | 78.67 | 84.21 | 83.54 | 26-27 |
| 6 | 5 | 167 | 0.78 | 3.84 | 12 | 1.16 | 83.15 | 81.21 | 83.52 | 81.88 | 86.15 | 84.21 | 25-26 |

Project file: CrownD.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM E

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 18 | 2.5 | 2.52 | 12 | 0.50 | 80.09 | 80.00 | 81.09 | 81.00 | 85.50 | 0.00 | 32-33 |

Project file: CrownE.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM F

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 80 | 3.99 | 2.52 | 12 | 0.50 | 80.40 | 80.00 | 82.00 | 81.00 | 86.50 | 0.00 | 38-39 |
| 2 | 1 | 120 | 3.99 | 6.57 | 12 | 3.40 | 85.48 | 81.40 | 86.33 | 82.19 | 92.17 | 86.50 | 37-38 |
| 3 | 2 | 114 | 1.47 | 3.59 | 12 | 1.02 | 87.14 | 85.98 | 87.65 | 86.82 | 93.05 | 92.17 | 36-37 |
| 4 | 2 | 108 | 1.43 | 8.69 | 12 | 5.95 | 94.93 | 88.50 | 95.44 | 88.78 | 98.88 | 92.17 | 35-37 |
| 5 | 4 | 28 | 0.82 | 2.77 | 12 | 0.61 | 95.20 | 95.03 | 95.60 | 95.59 | 98.88 | 98.88 | 34-35 |
| 6 | 3 | 30 | 0.45 | 3.9 | 12 | 1.20 | 88.00 | 87.64 | 88.28 | 87.87 | 91.35 | 93.05 | 36A-36 |

Project file: CrownF.stm
Return period = 10 Yrs.

HYDRAULIC GRADE LINE CALCULATIONS SUMMARY - SYSTEM G

| Line No. | To Line | Length | Total Flow | Capac. Full | Pipe Size | Pipe Slope | Inv Elev Up | Inv Elev Dn | HGL Elev Up | HGL Elev Dn | Gr/Rim EI | Gr/Rim EI | Line ID |
|----------|---------|--------|------------|-------------|-----------|------------|-------------|-------------|-------------|-------------|-----------|-----------|---------|
| | | (ft) | (cfs) | (cfs) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 22 | 5.58 | 3.89 | 15 | 0.36 | 77.27 | 77.19 | 79.16 | 79.00 | 84.56 | 0.00 | 43-44 |
| 2 | 1 | 47 | 1.24 | 6.19 | 12 | 3.02 | 80.31 | 78.89 | 80.78 | 79.44 | 85.98 | 84.56 | 42-43 |
| 3 | 1 | 59 | 0.87 | 4.02 | 12 | 1.27 | 78.27 | 77.52 | 79.47 | 79.44 | 82.94 | 84.56 | 41-43 |
| 4 | 3 | 30 | 0.3 | 5.16 | 12 | 2.10 | 79.00 | 78.37 | 79.49 | 79.49 | 82.00 | 82.94 | 40-41 |

Project file: CrownG.stm
Return period = 10 Yrs.

CROWN LANDING APARTMENTS

PROJECT NO. 1950040-000.08

HEC12 Version: V2.91

Run Date: 02-27-2001

Revised: 4/17/01

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| | | | |
|----------------|--------|-----|---------|
| INLET NUMBER 1 | LENGTH | 6.0 | STATION |
|----------------|--------|-----|---------|

DRAINAGE AREA = 0.130 ACRES C VALUE = .900 CA = 0.117
SUM CA=0.117 INT=4.00 CFS=0.468 CO=0.000 GUTTER FLOW=0.468

GUTTER SLOPE = 0.0400 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| | | | | | | | | |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
| 1.68 | 2.0 | 1.19 | 0.0833 | 4.0 | 1.00 | 3.5 | 0.146 | 0.167 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 6.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.47 CFS CARRYOVER= 0.00

=====

| | | | |
|----------------|--------|-----|---------|
| INLET NUMBER 4 | LENGTH | 8.0 | STATION |
|----------------|--------|-----|---------|

DRAINAGE AREA = 0.340 ACRES C VALUE = .900 CA = 0.306
SUM CA=0.306 INT=4.00 CFS=1.224 CO=0.000 GUTTER FLOW=1.224

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

| | | | | | | | | |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
| 4.65 | 2.0 | 0.43 | 0.0833 | 4.0 | 0.88 | 3.5 | 0.146 | 0.149 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 7.9 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.22 CFS CARRYOVER= 0.00

=====

| | | | |
|----------------|--------|-----|---------|
| INLET NUMBER 5 | LENGTH | 6.0 | STATION |
|----------------|--------|-----|---------|

DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270
DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072

FOR THE FIRST SIDE: SUM CA=0.270 INT=4.00 CFS=1.080 CO=0.000 GUTTER FLOW=1.080
FOR THE OTHER SIDE: SUM CA=0.072 INT=4.00 CFS=0.288 CO=0.000 GUTTER FLOW=0.288
AT THE INLET: SUM CA=0.342 INT=4.00 CFS=1.368 CO=0.000 GUTTER FLOW=1.368

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.08 (cfs) IS 5.39 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.16 SPREAD (ft) = 7.51

=====

CHECK STORM

INLET NUMBER 5 LENGTH 6.0 STATION

DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270
DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072

FOR THE FIRST SIDE: SUM CA=0.270 INT=6.50 CFS=1.755 CO=0.000 GUTTER FLOW=1.755
FOR THE OTHER SIDE: SUM CA=0.072 INT=6.50 CFS=0.468 CO=0.000 GUTTER FLOW=0.468
AT THE INLET: SUM CA=0.342 INT=6.50 CFS=2.223 CO=0.000 GUTTER FLOW=2.223

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.76 (cfs) IS 7.13 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.22 SPREAD (ft) = 10.38

=====

INLET NUMBER 6 LENGTH 8.0 STATION

DRAINAGE AREA = 0.320 ACRES C VALUE = .900 CA = 0.288
SUM CA=0.288 INT=4.00 CFS=1.152 CO=0.000 GUTTER FLOW=1.152

GUTTER SLOPE = 0.0170 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 4.72 | 2.0 | 0.42 | 0.0833 | 4.0 | 0.88 | 3.5 | 0.146 | 0.149 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 7.3 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.15 CFS CARRYOVER= 0.00

=====

INLET NUMBER 7 LENGTH 6.0 STATION

DRAINAGE AREA = 0.100 ACRES C VALUE = .900 CA = 0.090
DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270

FOR THE FIRST SIDE: SUM CA=0.090 INT=4.00 CFS=0.360 CO=0.000 GUTTER FLOW=0.360
FOR THE OTHER SIDE: SUM CA=0.270 INT=4.00 CFS=1.080 CO=0.000 GUTTER FLOW=1.080
AT THE INLET: SUM CA=0.360 INT=4.00 CFS=1.440 CO=0.000 GUTTER FLOW=1.440

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.08 (cfs) IS 5.39 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.16 SPREAD (ft) = 7.77

=====

CHECK STORM

INLET NUMBER 7 LENGTH 6.0 STATION

DRAINAGE AREA = 0.100 ACRES C VALUE = .900 CA = 0.090
DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270

FOR THE FIRST SIDE: SUM CA=0.090 INT=6.50 CFS=0.585 CO=0.000 GUTTER FLOW=0.585
FOR THE OTHER SIDE: SUM CA=0.270 INT=6.50 CFS=1.755 CO=0.000 GUTTER FLOW=1.755
AT THE INLET: SUM CA=0.360 INT=6.50 CFS=2.340 CO=0.000 GUTTER FLOW=2.340

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.76 (cfs) IS 7.13 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.22 SPREAD (ft) = 10.74

=====

INLET NUMBER 10 LENGTH 8.0 STATION

DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270
SUM CA=0.270 INT=4.00 CFS=1.080 CO=0.000 GUTTER FLOW=1.080

GUTTER SLOPE = 0.0400 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 3.12 | 2.0 | 0.64 | 0.0833 | 4.0 | 0.98 | 3.5 | 0.146 | 0.164 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 8.7 EFFICIENCY= 0.99
CFS INTERCEPTED= 1.07 CFS CARRYOVER= 0.01

=====

INLET NUMBER 11 LENGTH 10.0 STATION

DRAINAGE AREA = 0.380 ACRES C VALUE = .900 CA = 0.342
SUM CA=0.342 INT=4.00 CFS=1.368 CO=0.020 GUTTER FLOW=1.388

GUTTER SLOPE = 0.0350 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 4.14 | 2.0 | 0.48 | 0.0833 | 4.0 | 0.92 | 3.5 | 0.146 | 0.155 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 9.6 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.39 CFS CARRYOVER= 0.00

=====

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 12 | LENGTH | 6.0 | STATION |
|-----------------|--------|-----|---------|

| | | |
|-----------------------------|----------------|------------|
| DRAINAGE AREA = 0.400 ACRES | C VALUE = .900 | CA = 0.360 |
| DRAINAGE AREA = 0.060 ACRES | C VALUE = .900 | CA = 0.054 |

| | | | | | |
|---------------------|--------------|----------|-----------|----------|-------------------|
| FOR THE FIRST SIDE: | SUM CA=0.360 | INT=4.00 | CFS=1.440 | CO=0.000 | GUTTER FLOW=1.440 |
| FOR THE OTHER SIDE: | SUM CA=0.054 | INT=4.00 | CFS=0.216 | CO=0.000 | GUTTER FLOW=0.216 |
| AT THE INLET: | SUM CA=0.414 | INT=4.00 | CFS=1.656 | CO=0.000 | GUTTER FLOW=1.656 |

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.44 (cfs) IS 6.40 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.18 SPREAD (ft) = 8.53

=====

CHECK STORM

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 12 | LENGTH | 6.0 | STATION |
|-----------------|--------|-----|---------|

| | | |
|-----------------------------|----------------|------------|
| DRAINAGE AREA = 0.400 ACRES | C VALUE = .900 | CA = 0.360 |
| DRAINAGE AREA = 0.060 ACRES | C VALUE = .900 | CA = 0.054 |

| | | | | | |
|---------------------|--------------|----------|-----------|----------|-------------------|
| FOR THE FIRST SIDE: | SUM CA=0.360 | INT=6.50 | CFS=2.340 | CO=0.000 | GUTTER FLOW=2.340 |
| FOR THE OTHER SIDE: | SUM CA=0.054 | INT=6.50 | CFS=0.351 | CO=0.000 | GUTTER FLOW=0.351 |
| AT THE INLET: | SUM CA=0.414 | INT=6.50 | CFS=2.691 | CO=0.000 | GUTTER FLOW=2.691 |

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 2.34 (cfs) IS 8.25 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.25 SPREAD (ft) = 11.79

=====

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 13 | LENGTH | 8.0 | STATION |
|-----------------|--------|-----|---------|

| | | | | |
|-----------------------------|----------------|------------|----------|-------------------|
| DRAINAGE AREA = 0.420 ACRES | C VALUE = .900 | CA = 0.378 | | |
| SUM CA=0.378 | INT=4.00 | CFS=1.512 | CO=0.000 | GUTTER FLOW=1.512 |

GUTTER SLOPE = 0.0170 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| | | | | | | | | |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
| 5.64 | 2.0 | 0.35 | 0.0833 | 4.0 | 0.81 | 3.5 | 0.146 | 0.138 |

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 8.6 EFFICIENCY= 0.99
CFS INTERCEPTED= 1.50 CFS CARRYOVER= 0.01

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=====
INLET NUMBER 18                LENGTH  6.0          STATION
DRAINAGE AREA = 0.340 ACRES    C VALUE = .900      CA = 0.306
SUM CA=0.306  INT=4.00  CFS=1.224  CO=0.000  GUTTER FLOW=1.224

GUTTER SLOPE = 0.0100 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD      W      W/T      SW      SW/SX      Eo      a      S'W      SE
5.82      2.0      0.34      0.0833     4.0      0.79     3.5     0.146     0.136

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 6.7          EFFICIENCY= 0.98
CFS INTERCEPTED= 1.20          CFS CARRYOVER= 0.02
=====

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=====
INLET NUMBER 19                LENGTH  6.0          STATION
DRAINAGE AREA = 0.360 ACRES    C VALUE = .900      CA = 0.324
DRAINAGE AREA = 0.100 ACRES    C VALUE = .900      CA = 0.090

FOR THE FIRST SIDE:  SUM CA=0.324  INT=4.00  CFS=1.296  CO=0.020  GUTTER FLOW=1.316
FOR THE OTHER SIDE:  SUM CA=0.090  INT=4.00  CFS=0.360  CO=0.000  GUTTER FLOW=0.360
AT THE INLET:        SUM CA=0.414  INT=4.00  CFS=1.656  CO=0.020  GUTTER FLOW=1.676

GUTTER SLOPE = 0.0100 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.32 (cfs) IS 6.08 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.18          SPREAD (ft) = 8.60
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=====
CHECK STORM
INLET NUMBER 19                LENGTH  6.0          STATION
DRAINAGE AREA = 0.360 ACRES    C VALUE = .900      CA = 0.324
DRAINAGE AREA = 0.100 ACRES    C VALUE = .900      CA = 0.090

FOR THE FIRST SIDE:  SUM CA=0.324  INT=6.50  CFS=2.106  CO=0.020  GUTTER FLOW=2.126
FOR THE OTHER SIDE:  SUM CA=0.090  INT=6.50  CFS=0.585  CO=0.000  GUTTER FLOW=0.585
AT THE INLET:        SUM CA=0.414  INT=6.50  CFS=2.691  CO=0.020  GUTTER FLOW=2.711

GUTTER SLOPE = 0.0100 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 2.13 (cfs) IS 7.87 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.25          SPREAD (ft) = 11.85
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=====
INLET NUMBER 22                LENGTH  6.0          STATION
DRAINAGE AREA = 0.400 ACRES    C VALUE = .900      CA = 0.360
DRAINAGE AREA = 0.050 ACRES    C VALUE = .900      CA = 0.045

FOR THE FIRST SIDE:  SUM CA=0.360  INT=4.00  CFS=1.440  CO=0.000  GUTTER FLOW=1.440
FOR THE OTHER SIDE:  SUM CA=0.045  INT=4.00  CFS=0.180  CO=0.000  GUTTER FLOW=0.180
AT THE INLET:        SUM CA=0.405  INT=4.00  CFS=1.620  CO=0.000  GUTTER FLOW=1.620

GUTTER SLOPE = 0.0100 FT/FT      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.44 (cfs) IS 6.40 (ft.)

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XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.18          SPREAD (ft) = 8.41

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CHECK STORM

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=====
INLET NUMBER 22                LENGTH  6.0          STATION
DRAINAGE AREA = 0.400 ACRES    C VALUE = .900      CA = 0.360
DRAINAGE AREA = 0.050 ACRES    C VALUE = .900      CA = 0.045

FOR THE FIRST SIDE:  SUM CA=0.360  INT=6.50  CFS=2.340  CO=0.000  GUTTER FLOW=2.340
FOR THE OTHER SIDE:  SUM CA=0.045  INT=6.50  CFS=0.292  CO=0.000  GUTTER FLOW=0.292
AT THE INLET:        SUM CA=0.405  INT=6.50  CFS=2.632  CO=0.000  GUTTER FLOW=2.632

GUTTER SLOPE = 0.0100 FT/FT      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 2.34 (cfs) IS 8.25 (ft.)

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XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.24          SPREAD (ft) = 11.62

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=====
INLET NUMBER 28                LENGTH  6.0          STATION
DRAINAGE AREA = 0.320 ACRES    C VALUE = .900      CA = 0.288
DRAINAGE AREA = 0.300 ACRES    C VALUE = .900      CA = 0.270

FOR THE FIRST SIDE:  SUM CA=0.288  INT=4.00  CFS=1.152  CO=0.000  GUTTER FLOW=1.152
FOR THE OTHER SIDE:  SUM CA=0.270  INT=4.00  CFS=1.080  CO=0.000  GUTTER FLOW=1.080
AT THE INLET:        SUM CA=0.558  INT=4.00  CFS=2.232  CO=0.000  GUTTER FLOW=2.232

GUTTER SLOPE = 0.0100 FT/FT      PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.15 (cfs) IS 5.61 (ft.)

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XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.22          SPREAD (ft) = 10.41

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=====

CHECK STORM

INLET NUMBER 28 LENGTH 6.0 STATION

DRAINAGE AREA = 0.320 ACRES C VALUE = .900 CA = 0.288
DRAINAGE AREA = 0.300 ACRES C VALUE = .900 CA = 0.270

FOR THE FIRST SIDE: SUM CA=0.288 INT=6.50 CFS=1.872 CO=0.000 GUTTER FLOW=1.872
FOR THE OTHER SIDE: SUM CA=0.270 INT=6.50 CFS=1.755 CO=0.000 GUTTER FLOW=1.755
AT THE INLET: SUM CA=0.558 INT=6.50 CFS=3.627 CO=0.000 GUTTER FLOW=3.627

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.87 (cfs) IS 7.37 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.30 SPREAD (ft) = 14.39

=====

INLET NUMBER 29 LENGTH 6.0 STATION

DRAINAGE AREA = 0.500 ACRES C VALUE = .900 CA = 0.450
DRAINAGE AREA = 0.010 ACRES C VALUE = .900 CA = 0.009

FOR THE FIRST SIDE: SUM CA=0.450 INT=4.00 CFS=1.800 CO=0.000 GUTTER FLOW=1.800
FOR THE OTHER SIDE: SUM CA=0.009 INT=4.00 CFS=0.036 CO=0.000 GUTTER FLOW=0.036
AT THE INLET: SUM CA=0.459 INT=4.00 CFS=1.836 CO=0.000 GUTTER FLOW=1.836

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.80 (cfs) IS 7.22 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.19 SPREAD (ft) = 9.14

=====

CHECK STORM

INLET NUMBER 29 LENGTH 6.0 STATION

DRAINAGE AREA = 0.500 ACRES C VALUE = .900 CA = 0.450
DRAINAGE AREA = 0.010 ACRES C VALUE = .900 CA = 0.009

FOR THE FIRST SIDE: SUM CA=0.450 INT=6.50 CFS=2.925 CO=0.000 GUTTER FLOW=2.925
FOR THE OTHER SIDE: SUM CA=0.009 INT=6.50 CFS=0.058 CO=0.000 GUTTER FLOW=0.058
AT THE INLET: SUM CA=0.459 INT=6.50 CFS=2.984 CO=0.000 GUTTER FLOW=2.984

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 2.92 (cfs) IS 9.18 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.26 SPREAD (ft) = 12.63

=====

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 32 | LENGTH | 6.0 | STATION |
|-----------------|--------|-----|---------|

| | | |
|-----------------------------|----------------|------------|
| DRAINAGE AREA = 0.700 ACRES | C VALUE = .510 | CA = 0.357 |
| DRAINAGE AREA = 0.110 ACRES | C VALUE = .510 | CA = 0.056 |

| | | | | | |
|---------------------|--------------|----------|-----------|----------|-------------------|
| FOR THE FIRST SIDE: | SUM CA=0.357 | INT=4.00 | CFS=1.428 | CO=0.000 | GUTTER FLOW=1.428 |
| FOR THE OTHER SIDE: | SUM CA=0.056 | INT=4.00 | CFS=0.224 | CO=0.000 | GUTTER FLOW=0.224 |
| AT THE INLET: | SUM CA=0.413 | INT=4.00 | CFS=1.652 | CO=0.000 | GUTTER FLOW=1.652 |

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 1.43 (cfs) IS 6.37 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.18 SPREAD (ft) = 8.52

=====

CHECK STORM

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 32 | LENGTH | 6.0 | STATION |
|-----------------|--------|-----|---------|

| | | |
|-----------------------------|----------------|------------|
| DRAINAGE AREA = 0.700 ACRES | C VALUE = .510 | CA = 0.357 |
| DRAINAGE AREA = 0.110 ACRES | C VALUE = .510 | CA = 0.056 |

| | | | | | |
|---------------------|--------------|----------|-----------|----------|-------------------|
| FOR THE FIRST SIDE: | SUM CA=0.357 | INT=6.50 | CFS=2.320 | CO=0.000 | GUTTER FLOW=2.320 |
| FOR THE OTHER SIDE: | SUM CA=0.056 | INT=6.50 | CFS=0.365 | CO=0.000 | GUTTER FLOW=0.365 |
| AT THE INLET: | SUM CA=0.413 | INT=6.50 | CFS=2.685 | CO=0.000 | GUTTER FLOW=2.685 |

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 2.32 (cfs) IS 8.22 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.25 SPREAD (ft) = 11.77

=====

| | | | |
|-----------------|--------|-----|---------|
| INLET NUMBER 34 | LENGTH | 6.0 | STATION |
|-----------------|--------|-----|---------|

| | | | | |
|-----------------------------|----------------|------------|----------|-------------------|
| DRAINAGE AREA = 0.250 ACRES | C VALUE = .510 | CA = 0.127 | | |
| SUM CA=0.127 | INT=4.00 | CFS=0.510 | CO=0.000 | GUTTER FLOW=0.510 |

GUTTER SLOPE = 0.0440 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| | | | | | | | | |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
| 1.70 | 2.0 | 1.17 | 0.0833 | 4.0 | 1.00 | 3.5 | 0.146 | 0.167 |

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXXX
REQUIRED LENGTH (ft) = 6.5 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.51 CFS CARRYOVER= 0.00

```

=====
INLET NUMBER 35                LENGTH  6.0          STATION
DRAINAGE AREA = 0.160 ACRES    C VALUE = .590      CA = 0.094
SUM CA=0.094  INT=4.00  CFS=0.378  CO=0.000  GUTTER FLOW=0.378

GUTTER SLOPE = 0.0440 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD      W      W/T      SW      SW/SX      Eo      a      S'W      SE
1.52      2.0     1.31     0.0833    4.0       1.00    3.5     0.146    0.167

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 5.7          EFFICIENCY= 1.00
CFS INTERCEPTED= 0.38           CFS CARRYOVER= 0.00
=====

```

```

=====
INLET NUMBER 36                LENGTH  6.0          STATION
DRAINAGE AREA = 0.330 ACRES    C VALUE = .580      CA = 0.191
SUM CA=0.191  INT=4.00  CFS=0.766  CO=0.000  GUTTER FLOW=0.766

GUTTER SLOPE = 0.0333 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD      W      W/T      SW      SW/SX      Eo      a      S'W      SE
2.33      2.0     0.86     0.0833    4.0       1.00    3.5     0.146    0.167

XXXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX
REQUIRED LENGTH (ft) = 7.0          EFFICIENCY= 0.97
CFS INTERCEPTED= 0.74           CFS CARRYOVER= 0.02
=====

```

```

=====
INLET NUMBER 37                LENGTH  6.0          STATION
DRAINAGE AREA = 0.200 ACRES    C VALUE = .610      CA = 0.122
DRAINAGE AREA = 0.130 ACRES    C VALUE = .610      CA = 0.079

FOR THE FIRST SIDE
SUM CA=0.122  INT=4.00  CFS=0.488  CO=0.050  GUTTER FLOW=0.538  FOR THE OTHER SIDE
SUM CA=0.079  INT=4.00  CFS=0.317  CO=0.000  GUTTER FLOW=0.317  AT THE INLET

SUM CA= 0.201  INT= 4.00  CFS= 0.805  CO= 0.050  GUTTER FLOW= 0.855

GUTTER SLOPE = 0.0100 FT/FT    PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 0.54 (cfs) IS 3.11 (ft.)

XXXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60          H (ft) = 0.460
DEPTH OF WATER (ft) = 0.11          SPREAD (ft) = 5.50
=====

```

=====
CHECK STORM

INLET NUMBER 37 LENGTH 6.0 STATION

DRAINAGE AREA = 0.200 ACRES C VALUE = .610 CA = 0.122
DRAINAGE AREA = 0.130 ACRES C VALUE = .610 CA = 0.079

FOR THE FIRST SIDE

SUM CA=0.122 INT=6.50 CFS=0.793 CO=0.050 GUTTER FLOW=0.843 FOR THE OTHER SIDE
SUM CA= 0.079 INT=6.50 CFS=0.515 CO=0.000 GUTTER FLOW=0.515 AT THE INLET

SUM CA= 0.201 INT= 6.50 CFS= 1.308 CO= 0.050 GUTTER FLOW= 1.358

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .010 (ft./ft.) AND 0.84 (cfs) IS 4.56 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXXX

P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.460
DEPTH OF WATER (ft) = 0.16 SPREAD (ft) = 7.49

=====
INLET NUMBER 41 LENGTH 4.0 STATION

DRAINAGE AREA = 0.060 ACRES C VALUE = .680 CA = 0.041
SUM CA=0.041 INT=4.00 CFS=0.163 CO=0.000 GUTTER FLOW=0.163

GUTTER SLOPE = 0.0360 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 1.15 | 2.0 | 1.73 | 0.0833 | 4.0 | 1.00 | 3.5 | 0.146 | 0.167 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 3.8 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.16 CFS CARRYOVER= 0.00

=====
INLET NUMBER 42 LENGTH 6.0 STATION

DRAINAGE AREA = 0.250 ACRES C VALUE = .720 CA = 0.180
SUM CA=0.180 INT=4.00 CFS=0.720 CO=0.000 GUTTER FLOW=0.720

GUTTER SLOPE = 0.0360 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 2.03 | 2.0 | 0.98 | 0.0833 | 4.0 | 1.00 | 3.5 | 0.146 | 0.167 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 7.0 EFFICIENCY= 0.97
CFS INTERCEPTED= 0.70 CFS CARRYOVER= 0.02

=====
INLET NUMBER 43 LENGTH 10.0 STATION

DRAINAGE AREA = 0.370 ACRES C VALUE = .650 CA = 0.240
SUM CA=0.240 INT=4.00 CFS=0.962 CO=0.020 GUTTER FLOW=0.982

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

| SPREAD | W | W/T | SW | SW/SX | Eo | a | S'W | SE |
|--------|-----|------|--------|-------|------|-----|-------|-------|
| 2.47 | 2.0 | 0.81 | 0.0833 | 4.0 | 1.00 | 3.5 | 0.146 | 0.166 |

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXXX

REQUIRED LENGTH (ft) = 8.8 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.98 CFS CARRYOVER= 0.00

Subject CROWN LANDING

Computed LMP Checked _____

LANDMARK DESIGN GROUP

Project # 1950040-00.05

Client _____

Date 2-28-01 Sheet # _____

Rev. 4-13-01

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants

TOTAL SITE AREA = 25.25 ACRES

AREA TO BMP #1 (ONSITE) = 10.60 ACRES

AREA TO BMP #2 (EXISTING OFFSITE) = 11.50 ACRES

TOTAL TREATED AREA = 22.10 ACRES

AREA DRAINING OFFSITE = 25.25 - 22.10 = 3.15 ACRES

BMP #1 (9 point wet Pond):

$$\frac{10.60}{25.25} = 0.42$$

$$9 \times 0.42 = 3.78$$

BMP #2 (2L. 6 point Dry Pond):

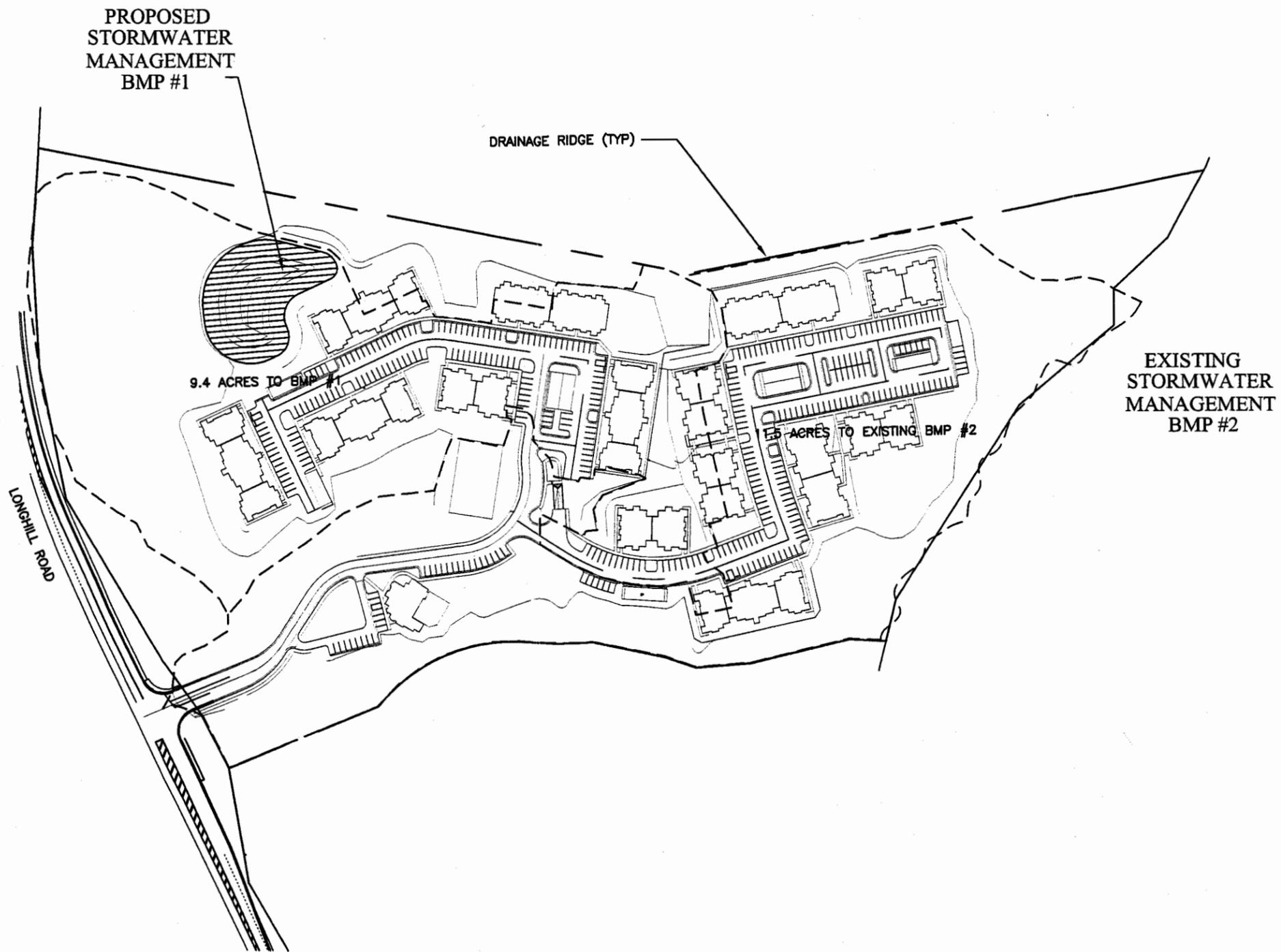
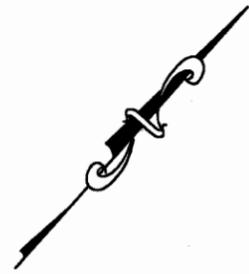
$$\frac{11.50}{25.25} = 0.46$$

$$6 \times 0.46 = 2.76$$

NATURAL OPEN SPACE REQUIRED

$$(10.0) - (3.78 + 2.76) = 3.46$$

$$0.346 \times 25.25 = 8.74 \text{ ACRES}$$

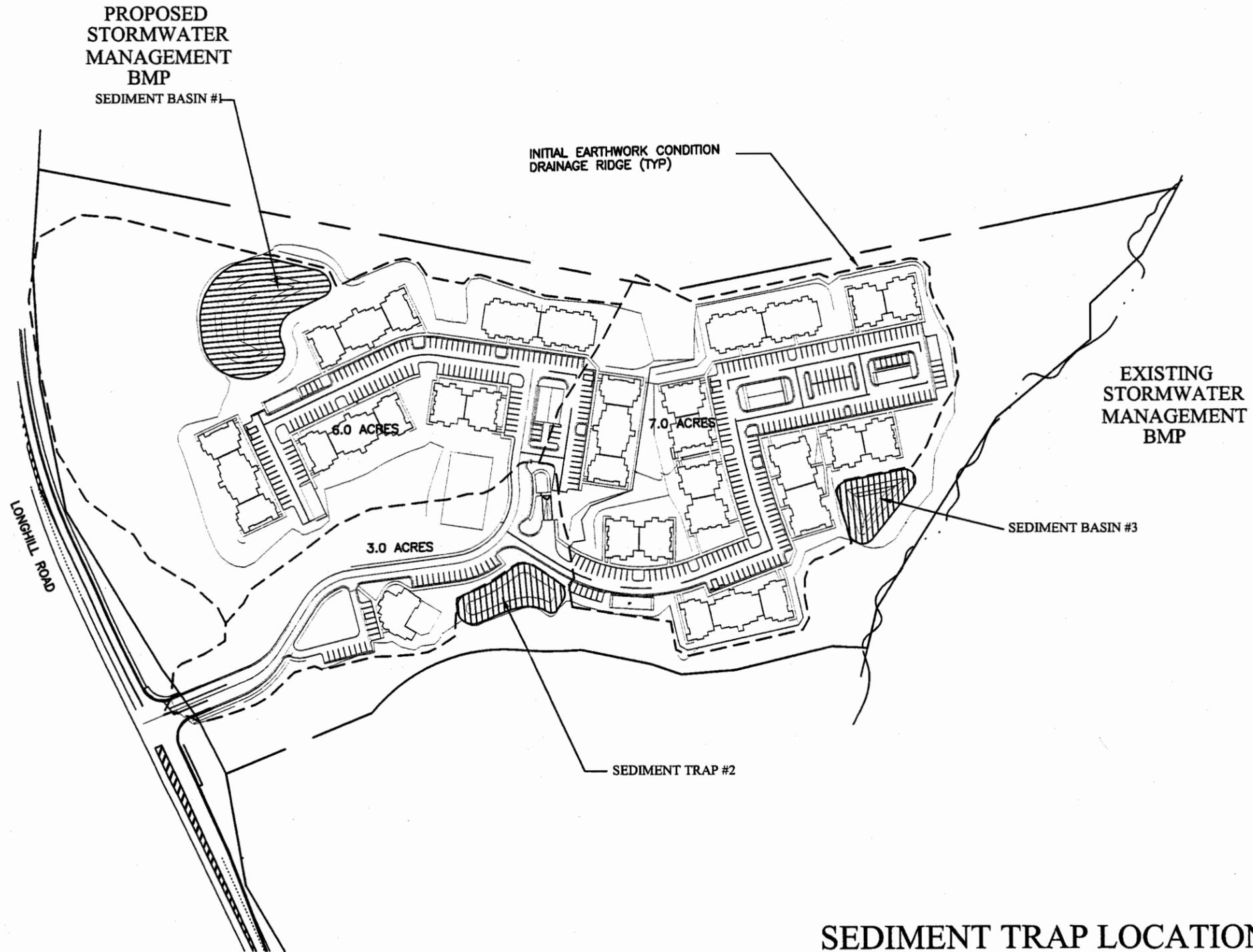
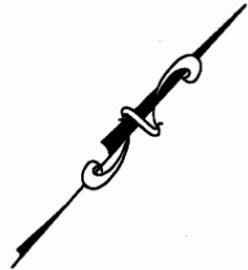


**BMP DRAINAGE AREA EXHIBIT
CROWN LANDING APARTMENTS**

SCALE: 1"=200'

LANDMARK
DESIGN GROUP
Engineers - Surveyors - Planners
Landscape Architects - Environmental Consultants

REVISED 4-13-01

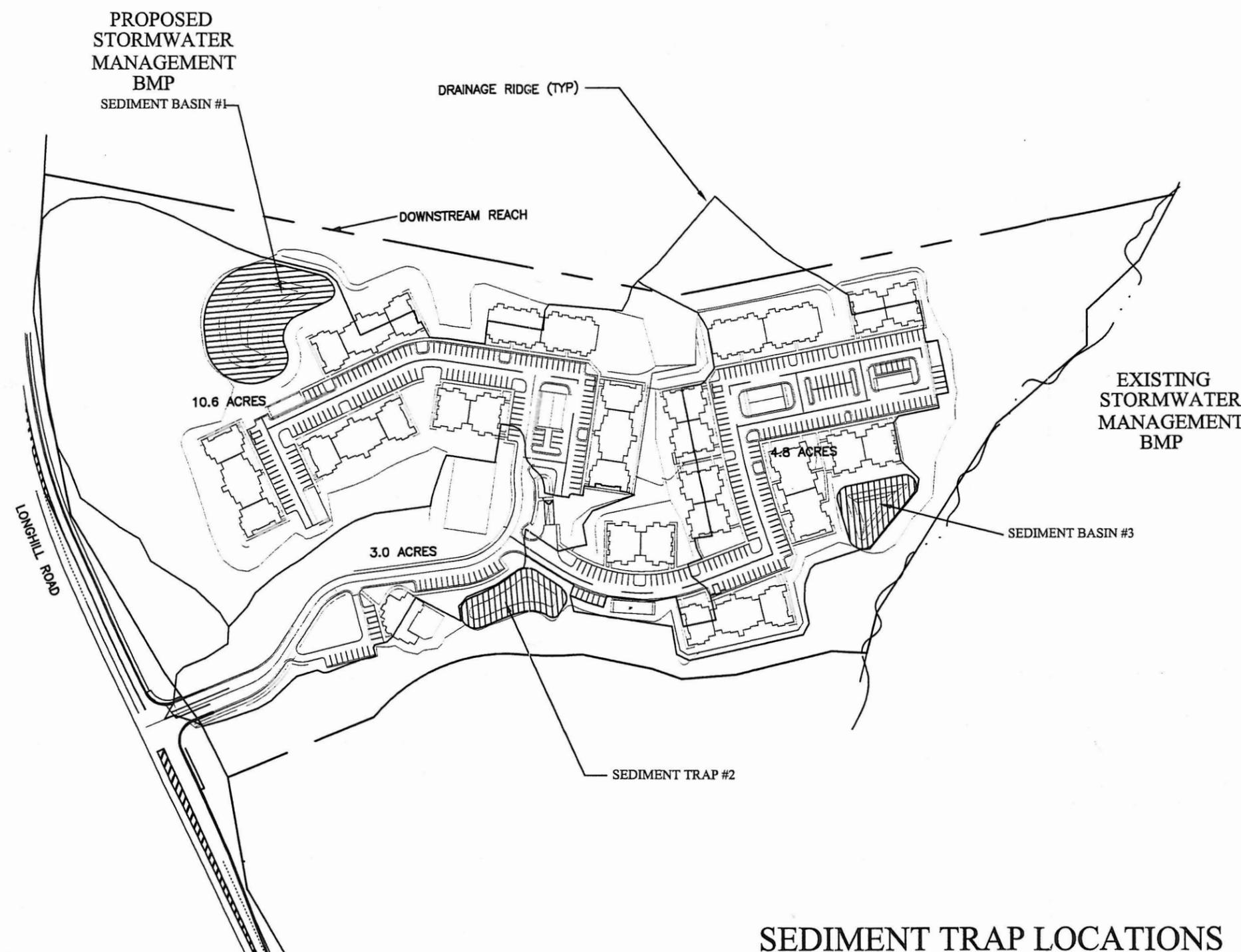


**SEDIMENT TRAP LOCATIONS
& DRAINAGE AREAS DURING INITIAL GRADING
CROWN LANDING APARTMENTS**

SCALE: 1"=200'

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**SEDIMENT TRAP LOCATIONS
& DRAINAGE AREAS WITH STORM DRAINAGE IN PLACE
CROWN LANDING APARTMENTS**

SCALE: 1"=200'

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Landscape Architects - Environmental Consultants

REVISED 4-13-01

Subject CROWN LANDING
APARTMENTS

Computed LMP Checked _____



Project # 1950040-000.05

Client _____

Date 2/23/01 Sheet # _____

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BMP #1

TOTAL DRAINAGE AREA = 10.60 ACRES

IMPERVIOUS AREA = 3.05 ACRES

$$\% \text{ IMP} = \frac{3.05}{10.60} = 29\%$$

9 POINT BMP

PERMANENT POOL VOLUME = 4UR

$$V_2 = \frac{0.45}{12} (3.05 + 0.009(29)) 10.6 = 0.1213 \text{ AC-FT}$$

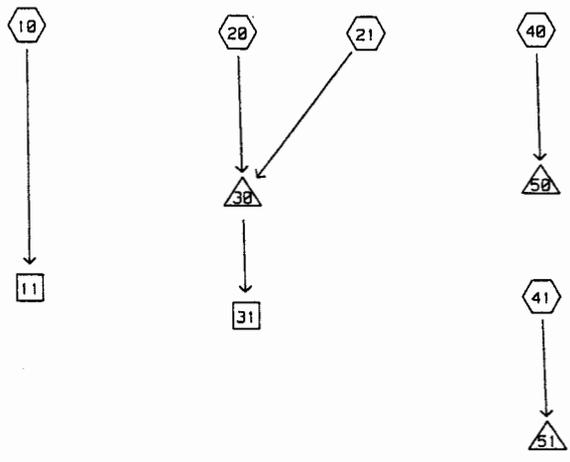
$$4V_2 = 4(0.1213) = 0.4852 \text{ AC-FT} = 21,134 \text{ C.F. REQUIRED}$$

PERMANENT POOL ELEV = 69.00

VOLUME PROVIDED = 28,154 C.F.

↳ why so much larger than req'd?

WATERSHED ROUTING =====



| | | |
|-------------------|---|-------------|
| SUBCATCHMENT 10 | = Predevelopment to Reach | -> REACH 11 |
| SUBCATCHMENT 20 | = Storm drainage contributing area | -> POND 30 |
| SUBCATCHMENT 21 | = Overland wooded to pond | -> POND 30 |
| SUBCATCHMENT 40 | = Storm drainage & overland to Basin #3 | -> POND 50 |
| SUBCATCHMENT 41 | = Graded overland to Basin #3 | -> POND 51 |
| REACH 11 | = Downstream reach | -> |
| REACH 31 | = Downstream reach | -> |
| POND 30 | = BMP #1 | -> REACH 31 |
| POND 30 secondary | = BMP #1 | -> REACH 31 |
| POND 50 | = Basin #3 | -> |
| POND 51 | = Basin #3 | -> |

TYPE II 24-HOUR RAINFALL= 3.36 IN

Prepared by LandMark Design Group

12 Apr 01

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SUBCATCHMENT 10 **Predevelopment to Reach**

was 7 ft/s prev.

PEAK= 9.52 CFS @ 12.05 HRS, VOLUME= .56 AF

| ACRES | CN | |
|-------|----|-----------------|
| 8.20 | 70 | Existing wooded |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 3.36 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|---|------------------------------------|------------------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland sheet flow | 8.1 |
| Forest w/Heavy Litter | Kv=2.5 L=375' s=.095 '/' V=.77 fps | } 0.5 previously |
| SHALLOW CONCENTRATED/UPLAND FLOW | ravine flow | |
| Woodland | Kv=5 L=300' s=.033 '/' V=.91 fps | |
| Total Length= 675 ft | | Total Tc= 13.6 |

SUBCATCHMENT 20 **Storm drainage contributing area**

PEAK= 13.95 CFS @ 12.03 HRS, VOLUME= .79 AF

| ACRES | CN | |
|-------|----|------------------------|
| 2.95 | 98 | Buildings and pavement |
| .70 | 39 | Open area "A" soils |
| 2.15 | 74 | Open area "C" soils |
| 1.00 | 70 | Wooded area |
| 6.80 | 80 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 3.36 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|---------------------|------------------------------------|----------|
| DIRECT ENTRY | Initial time plus pipe flow | 13.5 |

SUBCATCHMENT 21 **Overland wooded to pond**

PEAK= 6.79 CFS @ 11.95 HRS, VOLUME= .29 AF

| ACRES | CN | |
|-------|-----|---------------------|
| .15 | 100 | Normal pond surface |
| .10 | 98 | Buildings |
| 3.55 | 70 | Wooded area |
| 3.80 | 72 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 3.36 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|---|----------------------------------|----------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland | 5.9 |
| Forest w/Heavy Litter | Kv=2.5 L=320' s=.13 '/' V=.9 fps | |

TYPE II 24-HOUR RAINFALL= 3.36 IN

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REACH 11

Downstream reach

Qin = 9.52 CFS @ 12.05 HRS, VOLUME= .56 AF
 Qout= 9.27 CFS @ 12.07 HRS, VOLUME= .56 AF, ATTEN= 3%, LAG= 1.4 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.55 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 2.1 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = .8 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

REACH 31

Downstream reach

Qin = 3.88 CFS @ 12.37 HRS, VOLUME= 1.00 AF
 Qout= 3.88 CFS @ 12.40 HRS, VOLUME= .99 AF, ATTEN= 0%, LAG= 2.1 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.40 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 1.6 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = 1.0 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

TYPE II 24-HOUR RAINFALL= 3.36 IN

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2-79

POND 30

BMP #1

Qin = **18.93 CFS** @ 12.00 HRS, VOLUME= 1.08 AF
 Qout= **3.88 CFS** @ 12.37 HRS, VOLUME= 1.00 AF, ATTEN= 80%, LAG= 22.2 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 69.0 | 11029 | 0 | 0 | PEAK STORAGE = 19724 CF |
| 70.0 | 12965 | 11997 | 11997 | PEAK ELEVATION= 70.6 FT |
| 71.0 | 15016 | 13991 | 25988 | FLOOD ELEVATION= 75.0 FT |
| 72.0 | 17182 | 16099 | 42087 | START ELEVATION= 69.0 FT |
| 73.0 | 19464 | 18323 | 60410 | SPAN= 1-20 HRS, dt=.05 HRS |
| 74.0 | 21861 | 20663 | 81072 | Tdet= 86 MIN (.99 AF) |
| 75.0 | 24374 | 23118 | 104190 | |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|---------|---|
| 1 | P | 67.8' ✓ | 30" CULVERT n=.013 L=80' S=.01'/' Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 69.0' ✓ | 12" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r) (Use H/2 if H<d) |
| 3 | 1 | 70.7' ✓ | 3' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 3.1, 0, 0, 0 |
| 4 | 1 | 74.0' ✓ | 7' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 0, 0, 0, 0 |

Primary Discharge

- └─1=Culvert
- └─2=Orifice/Grate
- └─3=Broad-Crested Rectangular Weir
- └─4=Broad-Crested Rectangular Weir

TYPE II 24-HOUR RAINFALL= 5.04 IN

Prepared by LandMark Design Group

12 Apr 01

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SUBCATCHMENT 10 Predevelopment to Reach

PEAK= 22.56 CFS @ 12.04 HRS, VOLUME= 1.28 AF

| ACRES | CN | |
|-------|------|-----------------|
| 8.20 | 70 ✓ | Existing wooded |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.04 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|---|---------------------|----------------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland sheet flow | 8.1 |
| Forest w/Heavy Litter Kv=2.5 L=375' s=.095 '/' | V=.77 fps | 5.5 } too low |
| SHALLOW CONCENTRATED/UPLAND FLOW | ravine flow | |
| Woodland Kv=5 L=300' s=.033 '/' | V=.91 fps | |
| Total Length= 675 ft | | Total Tc= 13.6 |

SUBCATCHMENT 20 Storm drainage contributing area

PEAK= 26.73 CFS @ 12.03 HRS, VOLUME= 1.53 AF

| ACRES | CN | |
|-------|----|------------------------|
| 2.95 | 98 | Buildings and pavement |
| .70 | 39 | Open area "A" soils |
| 2.15 | 74 | Open area "C" soils |
| 1.00 | 70 | Wooded area |
| 6.80 | 80 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.04 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|--------------|-----------------------------|----------|
| DIRECT ENTRY | Initial time plus pipe flow | 13.5 |

SUBCATCHMENT 21 Overland wooded to pond

PEAK= 14.97 CFS @ 11.95 HRS, VOLUME= .65 AF

| ACRES | CN | |
|-------|-----|---------------------|
| .15 | 100 | Normal pond surface |
| .10 | 98 | Buildings |
| 3.55 | 70 | Wooded area |
| 3.80 | 72 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.04 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|--|----------|----------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland | 5.9 |
| Forest w/Heavy Litter Kv=2.5 L=320' s=.13 '/' | V=.9 fps | |

TYPE II 24-HOUR RAINFALL= 5.04 IN

Prepared by LandMark Design Group

12 Apr 01

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REACH 11

Downstream reach

Qin = 22.56 CFS @ 12.04 HRS, VOLUME= 1.28 AF
 Qout= 22.15 CFS @ 12.06 HRS, VOLUME= 1.28 AF, ATTEN= 2%, LAG= 1.1 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.77 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 2.5 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = .7 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

REACH 31

Downstream reach

Qin = 14.51 CFS @ 12.20 HRS, VOLUME= 2.06 AF
 Qout= 14.46 CFS @ 12.22 HRS, VOLUME= 2.06 AF, ATTEN= 0%, LAG= 1.3 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.65 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 2.3 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = .7 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

TYPE II 24-HOUR RAINFALL= 5.04 IN

Prepared by LandMark Design Group

12 Apr 01

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POND 30

BMP #1

Qin = 38.00 CFS @ 11.99 HRS, VOLUME= 2.18 AF
 Qout= 14.51 CFS @ 12.20 HRS, VOLUME= 2.06 AF, ATTEN= 62%, LAG= 12.7 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 69.0 | 11029 | 0 | 0 | PEAK STORAGE = 36826 CF |
| 70.0 | 12965 | 11997 | 11997 | PEAK ELEVATION= 71.7 FT |
| 71.0 | 15016 | 13991 | 25988 | FLOOD ELEVATION= 75.0 FT |
| 72.0 | 17182 | 16099 | 42087 | START ELEVATION= 69.0 FT |
| 73.0 | 19464 | 18323 | 60410 | SPAN= 1-20 HRS, dt=.05 HRS |
| 74.0 | 21861 | 20663 | 81072 | Tdet= 71.1 MIN (2.06 AF) |
| 75.0 | 24374 | 23118 | 104190 | |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|--------|---|
| 1 | P | 67.8' | 30" CULVERT n=.013 L=80' S=.01'/' Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 69.0' | 12" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r) (Use H/2 if H<d) |
| 3 | 1 | 70.7' | 3' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 3.1, 0, 0, 0 |
| 4 | 1 | 74.0' | 7' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 0, 0, 0 |

Primary Discharge

- └─1=Culvert
- └─2=Orifice/Grate
- └─3=Broad-Crested Rectangular Weir
- └─4=Broad-Crested Rectangular Weir

TYPE II 24-HOUR RAINFALL= 5.50 IN

Prepared by LandMark Design Group

12 Apr 01

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SUBCATCHMENT 10 Predevelopment to Reach

PEAK= 26.48 CFS @ 12.04 HRS, VOLUME= 1.51 AF

| ACRES | CN | |
|-------|----|-----------------|
| 8.20 | 70 | Existing wooded |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.50 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|----------------------------------|---|----------------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland sheet flow | 8.1 |
| Forest w/Heavy Litter | Kv=2.5 L=375' s=.095 '/' V=.77 fps | |
| SHALLOW CONCENTRATED/UPLAND FLOW | ravine flow | 5.5 |
| Woodland | Kv=5 L=300' s=.033 '/' V=.91 fps | |
| Total Length= 675 ft | | Total Tc= 13.6 |

SUBCATCHMENT 20 Storm drainage contributing area

PEAK= 30.35 CFS @ 12.03 HRS, VOLUME= 1.75 AF

| ACRES | CN | |
|-------|----|------------------------|
| 2.95 | 98 | Buildings and pavement |
| .70 | 39 | Open area "A" soils |
| 2.15 | 74 | Open area "C" soils |
| 1.00 | 70 | Wooded area |
| 6.80 | 80 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.50 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|--------------|-----------------------------|----------|
| DIRECT ENTRY | Initial time plus pipe flow | 13.5 |

SUBCATCHMENT 21 Overland wooded to pond

PEAK= 17.37 CFS @ 11.95 HRS, VOLUME= .75 AF

| ACRES | CN | |
|-------|-----|---------------------|
| .15 | 100 | Normal pond surface |
| .10 | 98 | Buildings |
| 3.55 | 70 | Wooded area |
| 3.80 | 72 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 5.50 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|----------------------------------|---|----------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland | 5.9 |
| Forest w/Heavy Litter | Kv=2.5 L=320' s=.13 '/' V=.9 fps | |

TYPE II 24-HOUR RAINFALL= 5.50 IN

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REACH 11

Downstream reach

Qin = 26.48 CFS @ 12.04 HRS, VOLUME= 1.51 AF
 Qout= 26.02 CFS @ 12.05 HRS, VOLUME= 1.50 AF, ATTEN= 2%, LAG= 1.1 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.81 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 2.7 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = .6 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

REACH 31

Downstream reach

Qin = 18.45 CFS @ 12.18 HRS, VOLUME= 2.38 AF
 Qout= 18.38 CFS @ 12.20 HRS, VOLUME= 2.38 AF, ATTEN= 0%, LAG= 1.6 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) | SPECIAL 100' CHANNEL | STOR-IND+TRANS METHOD |
|--------------|---------------------|----------------|----------------------|----------------------------|
| 66.00 | 0.00 | 0.00 | | PEAK ELEV.= 66.71 FT |
| 66.10 | .20 | .10 | | PEAK VELOCITY= 2.4 FPS |
| 66.20 | .60 | .62 | LENGTH= 100 FT | TRAVEL TIME = .7 MIN |
| 66.30 | 1.30 | 1.84 | | SPAN= 1-20 HRS, dt=.05 HRS |
| 66.40 | 2.40 | 3.96 | | |
| 66.50 | 3.70 | 7.17 | | |
| 66.60 | 5.40 | 11.67 | | |
| 66.70 | 7.40 | 17.60 | | |
| 66.80 | 9.60 | 25.12 | | |
| 66.90 | 12.20 | 34.39 | | |
| 67.00 | 15.00 | 45.55 | | |

TYPE II 24-HOUR RAINFALL= 5.50 IN

Prepared by LandMark Design Group

12 Apr 01

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10-2R

POND 30

BMP #1

Qin = 43.50 CFS @ 11.99 HRS, VOLUME= 2.50 AF
 Qout= 18.45 CFS @ 12.18 HRS, VOLUME= 2.38 AF, ATTEN= 58%, LAG= 11.4 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 69.0 | 11029 | 0 | 0 | PEAK STORAGE = 40750 CF |
| 70.0 | 12965 | 11997 | 11997 | PEAK ELEVATION= 71.9 FT |
| 71.0 | 15016 | 13991 | 25988 | FLOOD ELEVATION= 75.0 FT |
| 72.0 | 17182 | 16099 | 42087 | START ELEVATION= 69.0 FT |
| 73.0 | 19464 | 18323 | 60410 | SPAN= 1-20 HRS, dt=.05 HRS |
| 74.0 | 21861 | 20663 | 81072 | Tdet= 67.2 MIN (2.37 AF) |
| 75.0 | 24374 | 23118 | 104190 | |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|--------|---|
| 1 | P | 67.8' | 30" CULVERT n=.013 L=80' S=.01'/' Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 69.0' | 12" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r) (Use H/2 if H<d) |
| 3 | 1 | 70.7' | 3' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 3.1, 0, 0, 0 |
| 4 | 1 | 74.0' | 7' BROAD-CRESTED RECTANGULAR WEIR Q=C L H ^{1.5} C=3.1, 3.1, 3.1, 3.1, 0, 0, 0, 0 |

Primary Discharge

- └─1=Culvert
- └─2=Orifice/Grate
- └─3=Broad-Crested Rectangular Weir
- └─4=Broad-Crested Rectangular Weir

TYPE II 24-HOUR RAINFALL= 7.68 IN

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12 Apr 01

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100 year

SUBCATCHMENT 10 Predevelopment to Reach

PEAK= 46.12 CFS @ 12.03 HRS, VOLUME= 2.64 AF

| ACRES | CN | |
|-------|----|-----------------|
| 8.20 | 70 | Existing wooded |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 7.68 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|----------------------------------|------------------------------------|----------------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland sheet flow | 8.1 |
| Forest w/Heavy Litter | Kv=2.5 L=375' s=.095 '/' V=.77 fps | |
| SHALLOW CONCENTRATED/UPLAND FLOW | ravine flow | 5.5 |
| Woodland | Kv=5 L=300' s=.033 '/' V=.91 fps | |
| Total Length= 675 ft | | Total Tc= 13.6 |

SUBCATCHMENT 20 Storm drainage contributing area

PEAK= 47.76 CFS @ 12.03 HRS, VOLUME= 2.81 AF

| ACRES | CN | |
|-------|----|------------------------|
| 2.95 | 98 | Buildings and pavement |
| .70 | 39 | Open area "A" soils |
| 2.15 | 74 | Open area "C" soils |
| 1.00 | 70 | Wooded area |
| 6.80 | 80 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 7.68 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|--------------|-----------------------------|----------|
| DIRECT ENTRY | Initial time plus pipe flow | 13.5 |

SUBCATCHMENT 21 Overland wooded to pond

PEAK= 29.26 CFS @ 11.94 HRS, VOLUME= 1.30 AF

| ACRES | CN | |
|-------|-----|---------------------|
| .15 | 100 | Normal pond surface |
| .10 | 98 | Buildings |
| 3.55 | 70 | Wooded area |
| 3.80 | 72 | |

SCS TR-20 METHOD
 TYPE II 24-HOUR
 RAINFALL= 7.68 IN
 SPAN= 1-20 HRS, dt=.05 HRS

| Method | Comment | Tc (min) |
|----------------------------------|----------------------------------|----------|
| SHALLOW CONCENTRATED/UPLAND FLOW | Overland | 5.9 |
| Forest w/Heavy Litter | Kv=2.5 L=320' s=.13 '/' V=.9 fps | |

TYPE II 24-HOUR RAINFALL= 7.68 IN

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REACH 11

Downstream reach

Qin = 46.12 CFS @ 12.03 HRS, VOLUME= 2.64 AF
 Qout= 45.45 CFS @ 12.05 HRS, VOLUME= 2.64 AF, ATTEN= 1%, LAG= .9 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) |
|--------------|---------------------|----------------|
| 66.00 | 0.00 | 0.00 |
| 66.10 | .20 | .10 |
| 66.20 | .60 | .62 |
| 66.30 | 1.30 | 1.84 |
| 66.40 | 2.40 | 3.96 |
| 66.50 | 3.70 | 7.17 |
| 66.60 | 5.40 | 11.67 |
| 66.70 | 7.40 | 17.60 |
| 66.80 | 9.60 | 25.12 |
| 66.90 | 12.20 | 34.39 |
| 67.00 | 15.00 | 45.55 |

SPECIAL 100' CHANNEL

 LENGTH= 100 FT

STOR-IND+TRANS METHOD
 PEAK ELEV.= 67.00 FT
 PEAK VELOCITY= 3.0 FPS
 TRAVEL TIME = .5 MIN
 SPAN= 1-20 HRS, dt=.05 HRS

REACH 31

Downstream reach

Qin = 37.70 CFS @ 12.13 HRS, VOLUME= 3.96 AF
 Qout= 37.53 CFS @ 12.15 HRS, VOLUME= 3.95 AF, ATTEN= 0%, LAG= 1.2 MIN

| ELEV (FT) | END AREA (SQ-FT) | DISCH (CFS) |
|--------------|---------------------|----------------|
| 66.00 | 0.00 | 0.00 |
| 66.10 | .20 | .10 |
| 66.20 | .60 | .62 |
| 66.30 | 1.30 | 1.84 |
| 66.40 | 2.40 | 3.96 |
| 66.50 | 3.70 | 7.17 |
| 66.60 | 5.40 | 11.67 |
| 66.70 | 7.40 | 17.60 |
| 66.80 | 9.60 | 25.12 |
| 66.90 | 12.20 | 34.39 |
| 67.00 | 15.00 | 45.55 |

SPECIAL 100' CHANNEL

 LENGTH= 100 FT

STOR-IND+TRANS METHOD
 PEAK ELEV.= 66.93 FT
 PEAK VELOCITY= 2.9 FPS
 TRAVEL TIME = .6 MIN
 SPAN= 1-20 HRS, dt=.05 HRS

TYPE II 24-HOUR RAINFALL= 7.68 IN

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POND 30

BMP #1

100 year

Qin = 70.24 CFS @ 11.98 HRS, VOLUME= 4.11 AF
 Qout= 37.70 CFS @ 12.13 HRS, VOLUME= 3.96 AF, ATTEN= 46%, LAG= 9.3 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 69.0 | 11029 | 0 | 0 | PEAK STORAGE = 58816 CF |
| 70.0 | 12965 | 11997 | 11997 | PEAK ELEVATION= 72.9 FT |
| 71.0 | 15016 | 13991 | 25988 | FLOOD ELEVATION= 75.0 FT |
| 72.0 | 17182 | 16099 | 42087 | START ELEVATION= 69.0 FT |
| 73.0 | 19464 | 18323 | 60410 | SPAN= 1-20 HRS, dt=.05 HRS |
| 74.0 | 21861 | 20663 | 81072 | Tdet= 56 MIN (3.96 AF) |
| 75.0 | 24374 | 23118 | 104190 | |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|--------|---|
| 1 | P | 67.8' | 30" CULVERT n=.013 L=80' S=.01'/1 Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 69.0' | 12" ORIFICE/GRATE Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d) |
| 3 | 1 | 70.7' | 3' BROAD-CRESTED RECTANGULAR WEIR Q=C L H^1.5 C=3.1, 3.1, 3.1, 3.1, 3.1, 0, 0, 0 |
| 4 | 1 | 74.0' | 7' BROAD-CRESTED RECTANGULAR WEIR Q=C L H^1.5 C=3.1, 3.1, 3.1, 3.1, 0, 0, 0 |

Primary Discharge

- └─1=Culvert
- └─2=Orifice/Grate
- └─3=Broad-Crested Rectangular Weir
- └─4=Broad-Crested Rectangular Weir

Reach downstream of BMP - 2yr Pre Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Channel Depth |

| Input Data | |
|------------|----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 9.52 cfs |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|------------------------|---------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 66.56 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 4.6 ft ² |
| Wetted Perimeter | 16.72 ft |
| Top Width | 16.68 ft |
| Actual Depth | 0.56 ft |
| Critical Elevation | 66.48 ft |
| Critical Slope | 0.084765 ft/ft |
| Velocity | 2.05 ft/s |
| Velocity Head | 0.07 ft |
| Specific Energy | 66.62 ft |
| Froude Number | 0.69 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP - 2yr Post Routed Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Channel Depth |

| Input Data | |
|------------|-----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 3.88 cfs |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|------------------------|---------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 66.40 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 2.4 ft ² |
| Wetted Perimeter | 11.94 ft |
| Top Width | 11.91 ft |
| Actual Depth | 0.40 ft |
| Critical Elevation | 66.33 ft |
| Critical Slope | 0.095538 ft/ft |
| Velocity | 1.64 ft/s |
| Velocity Head | 0.04 ft |
| Specific Energy | 66.44 ft |
| Froude Number | 0.65 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP - 10yr Post Routed Worksheet for Irregular Channel

Project Description

| | |
|--------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Channel Depth |

Input Data

| | |
|-----------|----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 14.51 cfs |

Options

| | |
|------------------------------|--------------------------|
| Current Roughness Method | Improved Lotter's Method |
| Open Channel Weighting Metho | Improved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

Results

| | |
|------------------------|---------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 66.65 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 6.4 ft ² |
| Wetted Perimeter | 19.58 ft |
| Top Width | 19.53 ft |
| Actual Depth | 0.65 ft |
| Critical Elevation | 66.57 ft |
| Critical Slope | 0.080133 ft/ft |
| Velocity | 2.28 ft/s |
| Velocity Head | 0.08 ft |
| Specific Energy | 66.73 ft |
| Froude Number | 0.70 |
| Flow Type | Subcritical |

Roughness Segments

| Start Station | End Station | Mannings Coefficient |
|---------------|-------------|----------------------|
| 0+00 | 1+18 | 0.060 |

Natural Channel Points

| Station (ft) | Elevation (ft) |
|--------------|----------------|
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP - 10yr Pre Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Channel Depth |

| Input Data | |
|------------|----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 22.56 cfs |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|------------------------|---------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 66.77 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 8.9 ft ² |
| Wetted Perimeter | 23.10 ft |
| Top Width | 23.05 ft |
| Actual Depth | 0.77 ft |
| Critical Elevation | 66.68 ft |
| Critical Slope | 0.075554 ft/ft |
| Velocity | 2.55 ft/s |
| Velocity Head | 0.10 ft |
| Specific Energy | 66.87 ft |
| Froude Number | 0.72 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP - 100yr Pre Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formu |
| Solve For | Channel Depth |

| Input Data | |
|------------|----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 46.12 cfs |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|------------------------|----------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 67.00 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 15.1 ft ² |
| Wetted Perimeter | 30.21 ft |
| Top Width | 30.14 ft |
| Actual Depth | 1.00 ft |
| Critical Elevation | 66.90 ft |
| Critical Slope | 0.068684 ft/ft |
| Velocity | 3.05 ft/s |
| Velocity Head | 0.14 ft |
| Specific Energy | 67.15 ft |
| Froude Number | 0.76 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP - 100yr Post Routed Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Channel Depth |

| Input Data | |
|------------|----------------|
| Slope | 0.038000 ft/ft |
| Discharge | 37.70 cfs |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|------------------------|----------------------|
| Mannings Coefficient | 0.060 |
| Water Surface Elevatio | 66.93 ft |
| Elevation Range | 66.00 to 70.00 |
| Flow Area | 13.0 ft ² |
| Wetted Perimeter | 28.01 ft |
| Top Width | 27.95 ft |
| Actual Depth | 0.93 ft |
| Critical Elevation | 66.83 ft |
| Critical Slope | 0.070554 ft/ft |
| Velocity | 2.90 ft/s |
| Velocity Head | 0.13 ft |
| Specific Energy | 67.06 ft |
| Froude Number | 0.75 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

Reach downstream of BMP Worksheet for Irregular Channel

| Project Description | |
|---------------------|-------------------|
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Discharge |

| Input Data | |
|------------------------|----------------|
| Slope | 0.038000 ft/ft |
| Water Surface Elevatio | 67.00 ft |

| Options | |
|------------------------------|-------------------------|
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| Results | |
|----------------------|----------------------|
| Mannings Coefficient | 0.060 |
| Elevation Range | 66.00 to 70.00 |
| Discharge | 45.55 cfs |
| Flow Area | 15.0 ft ² |
| Wetted Perimeter | 30.07 ft |
| Top Width | 30.00 ft |
| Actual Depth | 1.00 ft |
| Critical Elevation | 66.89 ft |
| Critical Slope | 0.068798 ft/ft |
| Velocity | 3.04 ft/s |
| Velocity Head | 0.14 ft |
| Specific Energy | 67.14 ft |
| Froude Number | 0.76 |
| Flow Type | Subcritical |

| Roughness Segments | | |
|--------------------|-------------|----------------------|
| Start Station | End Station | Mannings Coefficient |
| 0+00 | 1+18 | 0.060 |

- seems high

| Natural Channel Points | |
|------------------------|----------------|
| Station (ft) | Elevation (ft) |
| 0+00 | 70.00 |
| 0+25 | 68.00 |
| 0+52 | 66.00 |
| 0+85 | 68.00 |
| 1+18 | 70.00 |

what about low flow channel?

Table Rating Table for Irregular Channel

| | |
|---------------------|-------------------|
| Project Description | |
| Worksheet | Reach 1 |
| Flow Element | Irregular Channel |
| Method | Manning's Formul |
| Solve For | Discharge |

| | |
|------------|----------------|
| Input Data | |
| Slope | 0.038000 ft/ft |

| | |
|------------------------------|-------------------------|
| Options | |
| Current Roughness Method | mproved Lotter's Method |
| Open Channel Weighting Metho | mproved Lotter's Method |
| Closed Channel Weighting Met | Horton's Method |

| | | | |
|---------------------------|---------|---------|-----------|
| Attribute | Minimum | Maximum | Increment |
| Water Surface Elevation (| 66.00 | 68.00 | 0.10 |

| Water Surface Elevation (ft) | Discharge (cfs) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) |
|------------------------------|-----------------|-----------------|------------------------------|-----------------------|----------------|
| 66.00 | N/A | N/A | N/A | N/A | N/A |
| 66.10 | 0.10 | 0.65 | 0.2 | 3.01 | 3.00 |
| 66.20 | 0.62 | 1.04 | 0.6 | 6.01 | 6.00 |
| 66.30 | 1.84 | 1.36 | 1.3 | 9.02 | 9.00 |
| 66.40 | 3.96 | 1.65 | 2.4 | 12.03 | 12.00 |
| 66.50 | 7.17 | 1.91 | 3.7 | 15.03 | 15.00 |
| 66.60 | 11.67 | 2.16 | 5.4 | 18.04 | 18.00 |
| 66.70 | 17.60 | 2.39 | 7.4 | 21.05 | 21.00 |
| 66.80 | 25.12 | 2.62 | 9.6 | 24.05 | 24.00 |
| 66.90 | 34.39 | 2.83 | 12.2 | 27.06 | 27.00 |
| 67.00 | 45.55 | 3.04 | 15.0 | 30.07 | 30.00 |
| 67.10 | 58.73 | 3.24 | 18.1 | 33.07 | 33.00 |
| 67.20 | 74.07 | 3.43 | 21.6 | 36.08 | 36.00 |
| 67.30 | 91.69 | 3.62 | 25.3 | 39.09 | 39.00 |
| 67.40 | 111.73 | 3.80 | 29.4 | 42.09 | 42.00 |
| 67.50 | 134.30 | 3.98 | 33.7 | 45.10 | 45.00 |
| 67.60 | 159.52 | 4.15 | 38.4 | 48.11 | 48.00 |
| 67.70 | 187.51 | 4.33 | 43.3 | 51.11 | 51.00 |
| 67.80 | 218.38 | 4.49 | 48.6 | 54.12 | 54.00 |
| 67.90 | 252.25 | 4.66 | 54.2 | 57.13 | 57.00 |
| 68.00 | 289.23 | 4.82 | 60.0 | 60.13 | 60.00 |

Reservoir Report

Reservoir No. 1 - BMP#1 (FOR STORAGE CALC. ONLY)

English

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

| Stage ft | Elevation ft | Contour area sqft | Incr. Storage cuft | Total storage cuft |
|----------|--------------|-------------------|--------------------|--------------------|
| 0.00 | 62.00 | 1,070 | 0 | 0 |
| 1.00 | 63.00 | 1,680 | 1,375 | 1,375 |
| 2.00 | 64.00 | 2,372 | 2,026 | 3,401 |
| 3.00 | 65.00 | 3,147 | 2,760 | 6,161 |
| 4.00 | 66.00 | 4,003 | 3,575 | 9,736 |
| 5.00 | 67.00 | 4,941 | 4,472 | 14,208 |
| 6.00 | 68.00 | 5,961 | 5,451 | 19,659 |
| 7.00 | 69.00 | 11,029 | 8,495 | 28,154 |
| 8.00 | 70.00 | 12,965 | 11,997 | 40,151 |
| 9.00 | 71.00 | 15,016 | 13,991 | 54,141 |
| 10.00 | 72.00 | 17,182 | 16,099 | 70,240 |

Culvert / Orifice Structures

| | [A] | [B] | [C] | [D] |
|---------------|--------|------|------|------|
| Rise in | = 0.0 | 0.0 | 0.0 | 0.0 |
| Span in | = 0.0 | 0.0 | 0.0 | 0.0 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length ft | = 0.0 | 0.0 | 0.0 | 0.0 |
| Slope % | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .013 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = --- | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|---------------------|-----------|------|------|------|
| Crest Len ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Eqn. Exp. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = No | No | No | No |
| Tailwater Elevation | = 0.00 ft | | | |

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

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| 0.00 | 0 | 62.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.10 | 138 | 62.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.20 | 275 | 62.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.30 | 413 | 62.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.40 | 550 | 62.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.50 | 688 | 62.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.60 | 825 | 62.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.70 | 963 | 62.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.80 | 1,100 | 62.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.90 | 1,238 | 62.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.00 | 1,375 | 63.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Continues on next page...

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| 1.10 | 1,578 | 63.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.20 | 1,780 | 63.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.30 | 1,983 | 63.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.40 | 2,185 | 63.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.50 | 2,388 | 63.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.60 | 2,591 | 63.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.70 | 2,793 | 63.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.80 | 2,996 | 63.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.90 | 3,198 | 63.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.00 | 3,401 | 64.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.10 | 3,677 | 64.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.20 | 3,953 | 64.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.30 | 4,229 | 64.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.40 | 4,505 | 64.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.50 | 4,781 | 64.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.60 | 5,057 | 64.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.70 | 5,333 | 64.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.80 | 5,609 | 64.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.90 | 5,885 | 64.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.00 | 6,161 | 65.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.10 | 6,518 | 65.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.20 | 6,876 | 65.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.30 | 7,233 | 65.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.40 | 7,591 | 65.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.50 | 7,948 | 65.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.60 | 8,306 | 65.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.70 | 8,663 | 65.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.80 | 9,021 | 65.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.90 | 9,378 | 65.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.00 | 9,736 | 66.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.10 | 10,183 | 66.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.20 | 10,630 | 66.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.30 | 11,077 | 66.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.40 | 11,524 | 66.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.50 | 11,972 | 66.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.60 | 12,419 | 66.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.70 | 12,866 | 66.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.80 | 13,313 | 66.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.90 | 13,760 | 66.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.00 | 14,208 | 67.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.10 | 14,753 | 67.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.20 | 15,298 | 67.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.30 | 15,843 | 67.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.40 | 16,388 | 67.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.50 | 16,933 | 67.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.60 | 17,478 | 67.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.70 | 18,023 | 67.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.80 | 18,568 | 67.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.90 | 19,113 | 67.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.00 | 19,659 | 68.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.10 | 20,508 | 68.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.20 | 21,358 | 68.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.30 | 22,207 | 68.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Continues on next page...

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| 6.40 | 23,057 | 68.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.50 | 23,906 | 68.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.60 | 24,756 | 68.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.70 | 25,605 | 68.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.80 | 26,455 | 68.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.90 | 27,304 | 68.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.00 | 28,154 | 69.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.10 | 29,353 | 69.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.20 | 30,553 | 69.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.30 | 31,753 | 69.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.40 | 32,952 | 69.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.50 | 34,152 | 69.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.60 | 35,352 | 69.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.70 | 36,551 | 69.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.80 | 37,751 | 69.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.90 | 38,951 | 69.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.00 | 40,151 | 70.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.10 | 41,550 | 70.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.20 | 42,949 | 70.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.30 | 44,348 | 70.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.40 | 45,747 | 70.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.50 | 47,146 | 70.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.60 | 48,545 | 70.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.70 | 49,944 | 70.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.80 | 51,343 | 70.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.90 | 52,742 | 70.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.00 | 54,141 | 71.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.10 | 55,751 | 71.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.20 | 57,361 | 71.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.30 | 58,971 | 71.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.40 | 60,581 | 71.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.50 | 62,190 | 71.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.60 | 63,800 | 71.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.70 | 65,410 | 71.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.80 | 67,020 | 71.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.90 | 68,630 | 71.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 10.00 | 70,240 | 72.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

...End

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project CROWN LANDING APARTMENTS

Basin # 1 Location WESTERLY PORTION OF SITE

Total area draining to basin: 10.60 acres. (WITH STORM DRAINAGE IN PLACE)

Basin Volume Design

Wet Storage:

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

$$67 \text{ cu. yds.} \times \underline{10.6} \text{ acres} = \underline{710} \text{ cu. yds.} \quad 19,175 \text{ CF}$$

2. Available basin volume = 1255 cu. yds. at elevation 69.50. (From storage - elevation curve)

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

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

4. Available volume before cleanout required.

$$33 \text{ cu. yds.} \times \underline{10.6} \text{ acres} = \underline{350} \text{ cu. yds.} = 9450 \text{ CF}$$

5. Elevation corresponding to cleanout level = 66.00.

(From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 3.50 ft. (Min. = 1.0 ft.)

Dry Storage:

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

$$67 \text{ cu. yds.} \times \underline{10.6} \text{ acres} = \underline{710} \text{ cu. yds.} = 19,175 \text{ CF}$$

$$\text{WET STORAGE} + \text{DRY STORAGE REQ'D} = \underline{38,350 \text{ CF}}$$

8. Total available basin volume at crest of riser* = 1953 cu. yds. at elevation 70.90. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 6 in.
10. Diameter of flexible tubing = 8 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of ^{WEIR} Riser = 70.70
- Top of Dam = 76.00
- Design High Water = 72.9 (100 YEAR STORM)
- Upstream Toe of Dam = 62.0

Basin Shape

12. $\frac{\text{Length of Flow}}{\text{Effective Width}} = \frac{L}{We} = \underline{3}$

If > 2 , baffles are not required _____

If < 2 , baffles are required _____

Runoff

13. $Q_2 = \underline{18.93}$ cfs (From Chapter 5)
14. $Q_{25} = \underline{43.50}$ cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2 = \underline{\hspace{2cm}}$ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25} = \underline{43.50}$ cfs. (riser and barrel)

EMERGENCY SPILLWAY PROVIDED IS TOO HIGH TO AID IN PASSING 25YR STORM

16. With emergency spillway:

Assumed available head (h) = _____ ft. (Using Q_2)

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

Without emergency spillway:

Assumed available head (h) = 1.0 ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. ~~Riser diameter (D_r) = _____ in. Actual head (h) = 1.0 ft.~~

~~(From Plate 3.14-8.)~~

~~Note: Avoid orifice flow conditions.~~

18. Barrel length (l) = 30 ft.

Head (H) on barrel through embankment = 3.9 ft.

(From Plate 3.14-7).

19. Barrel diameter = 30 in.

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

- ~~20. Trash rack and anti-vortex device~~

~~Diameter = _____ inches.~~

~~Height = _____ inches.~~

~~(From Table 3.14-D).~~

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p =$ _____ cfs.

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

(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 10.7 ft.
 Slope of upstream face of embankment (Z) = 4 :1.
 Slope of principal spillway barrel (S_b) = 1 %
 Length of barrel in saturated zone (L_s) = 80 ft.
24. Number of collars required = 2 dimensions = 6.5' x 6.5'
 (from Plate 3.14-12). $P = 2.0'$ $2P = 4.0'$ $14P = 28'$

Final Design Elevations

25. Top of Dam = 76.0
 Design High Water = 72.9 (100 YEAR STORM)
 Emergency Spillway Crest = 74.0
 Principal Spillway Crest = 70.7
 Dewatering Orifice Invert = 69.5
 Cleanout Elevation = 66.00
 Elevation of Upstream Toe of Dam
 or Excavated Bottom of "Wet Storage
 Area" (if excavation was performed) = 62.0

Subject _____

Computed LMP Checked _____



Project # 1950040-000.05

Client _____

Date 2/23/01 Sheet # _____

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TEMPORARY SEDIMENT BASIN #1

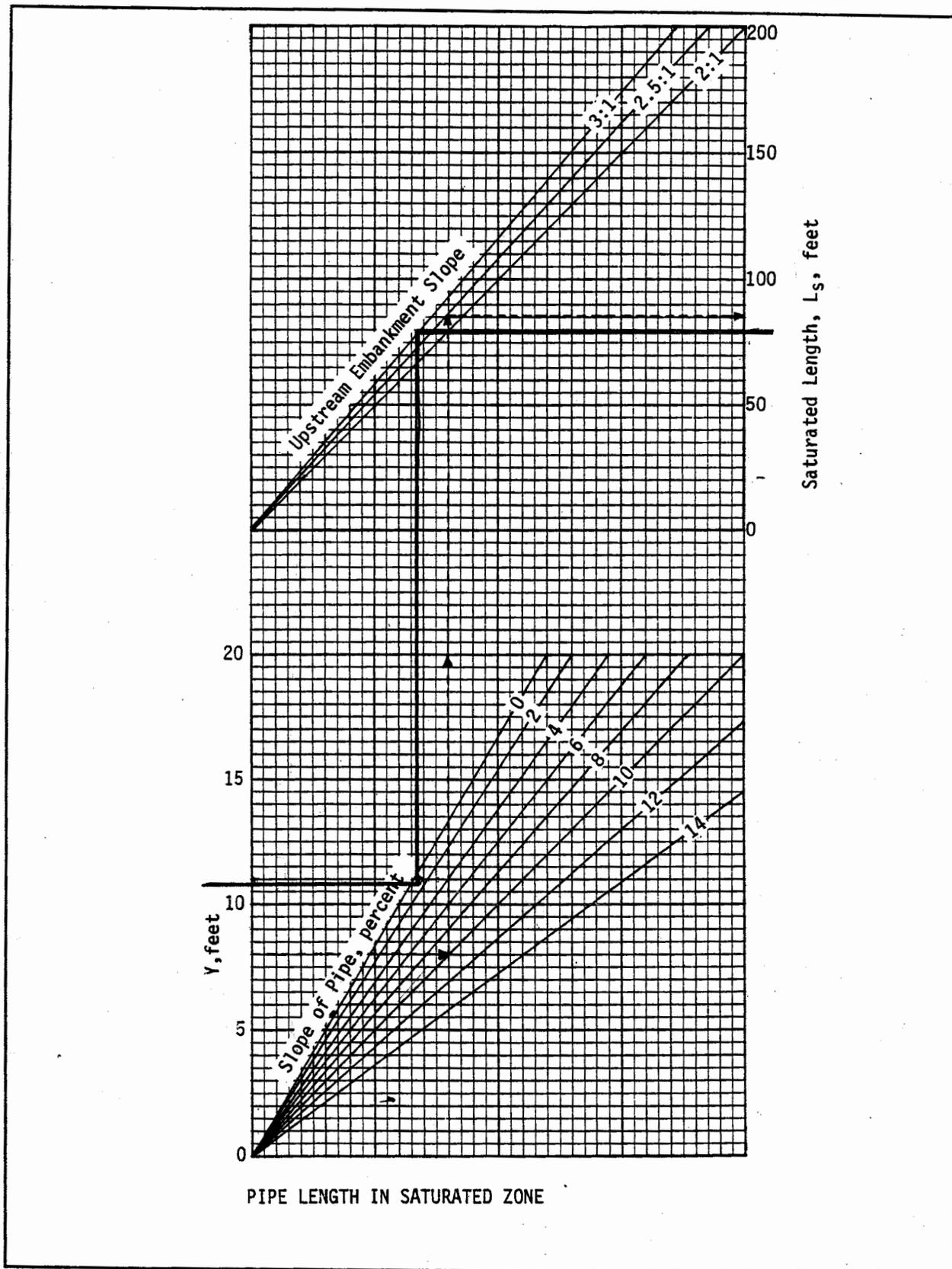
DEWATERING ORIFICE:

$$\left. \begin{array}{l} \text{DRY STORAGE RWU} = 70.90 \\ \text{DEWATERING INU} = 69.50 \end{array} \right\} H = 1.4'$$

$$Q = \frac{3}{21,600}'' \\ = \frac{17,010 \text{ CF}}{21,600} = 0.79 \text{ CFS}$$

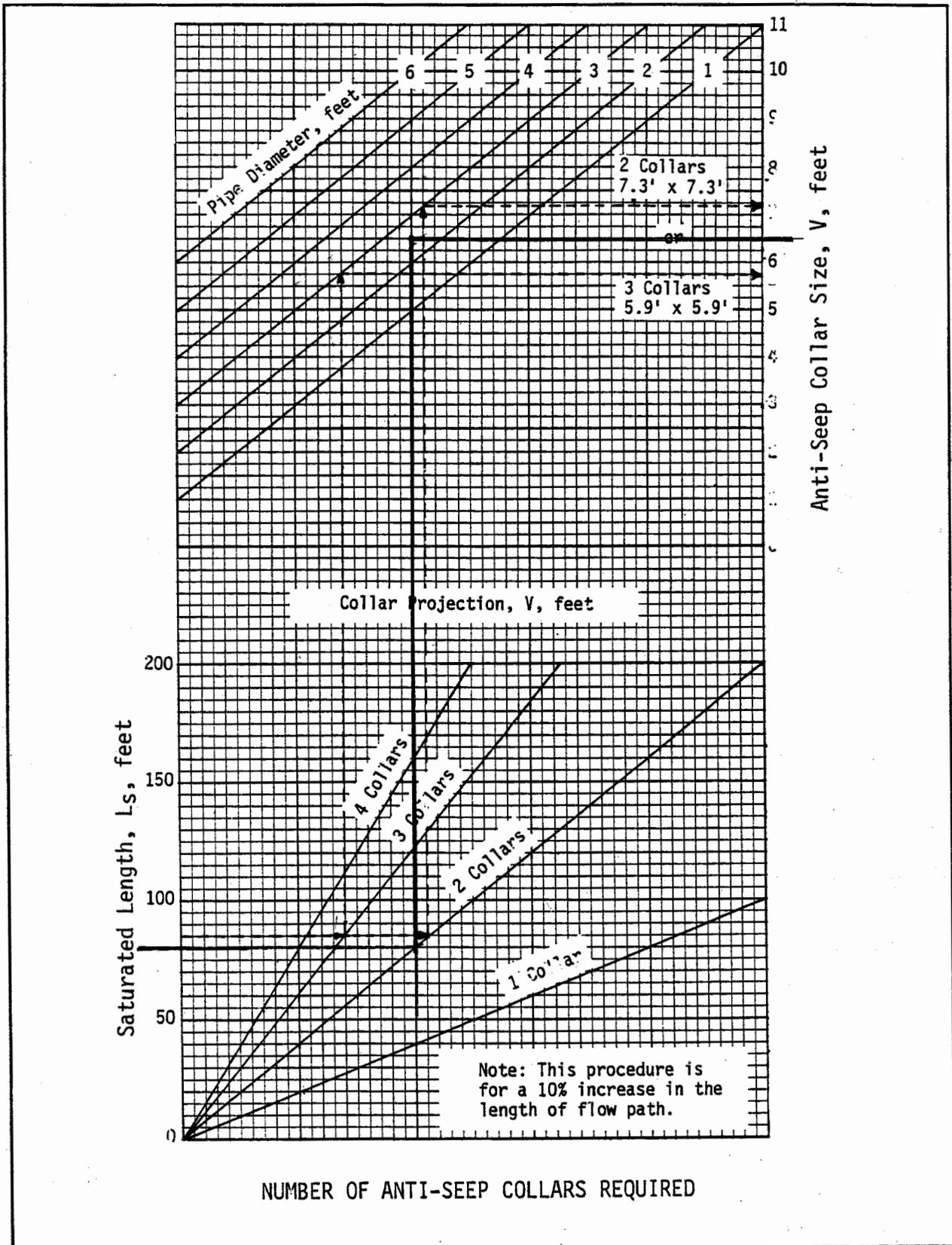
$$A = \frac{Q}{(64.32 \times \frac{H}{2})^{1/2} (0.6)} \\ = \frac{0.79}{(64.32 \times \frac{1.4}{2})^{1/2} (0.6)} \\ = 0.196 \text{ SF}$$

$$d = 2 \left(\frac{A}{3.14} \right)^{1/2} \\ = 2 \left(\frac{0.196}{3.14} \right)^{1/2} = 0.50' = 6 \text{ inches}$$



Source: USDA-SCS

Plate 3.14-11



Source: USDA-SCS

Plate 3.14-12

BMP #1 OUTFALL

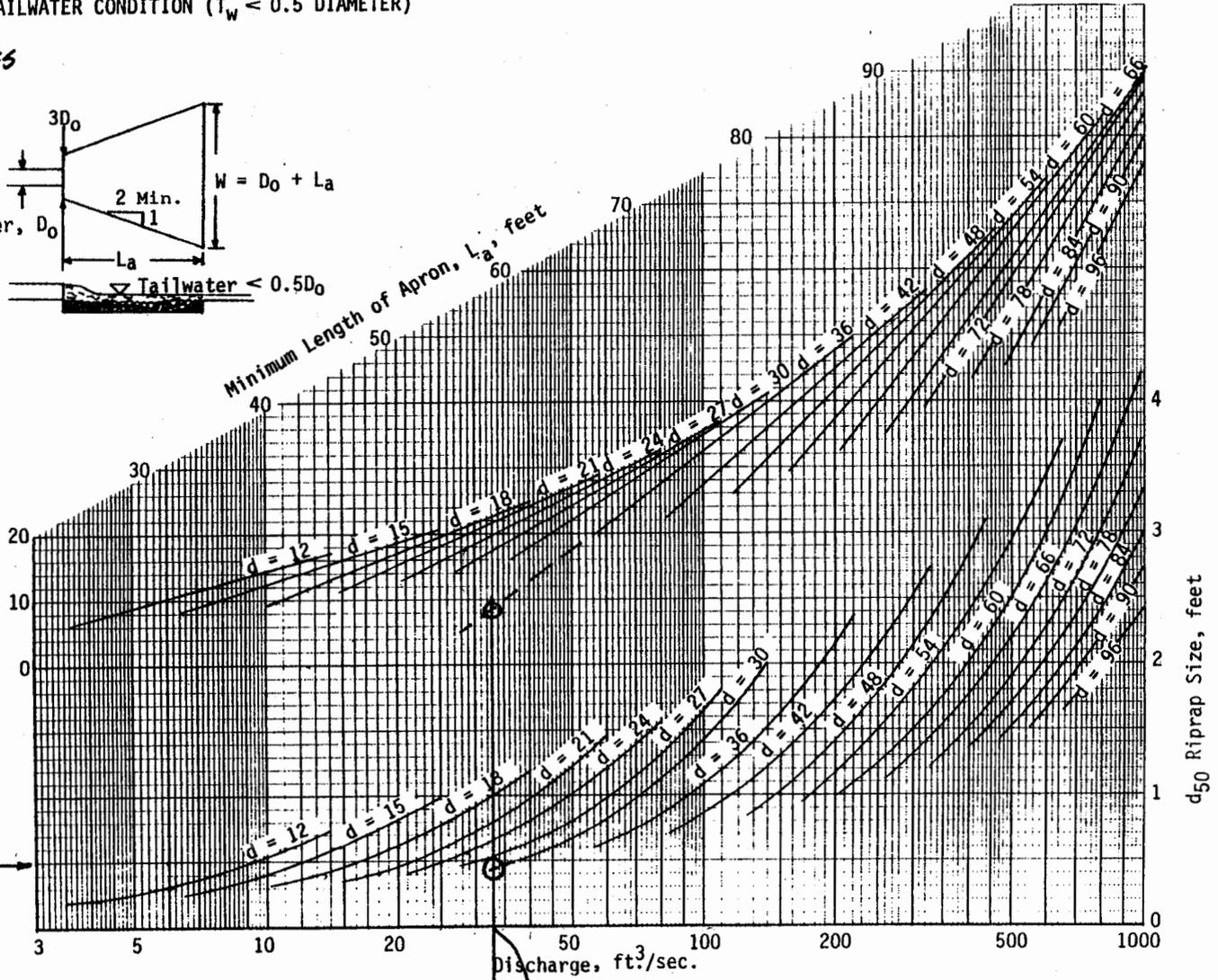
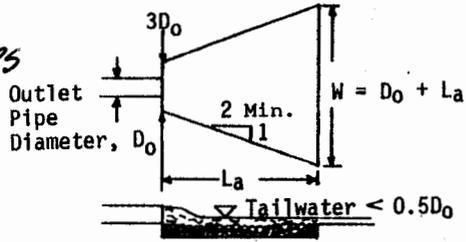
Source: USDA-SCS

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

$Q_{100} = 33.16$ CFS

$D_o = 30"$

$J = 6.8$ FPS



Recommended Min.
 $d_{50} = 6"$

III - 164

Plate 3.18-3

1992

3.18

Subject _____

Computed LMP Checked _____



Project # 1950010-008.05
Client _____
Date 2/27/01 Sheet # _____

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TEMPORARY SEDIMENT BASIN #1

TEMPORARY PIPE:
54 - #55

AREA - 2.0 ACRES

C = 0.60 (DURING ROUGH GRADING)

T_c = 9 MIN. (130' OVERLAND @ 4% = 7 min. + 350' TRAVEL ALONG DIV. DIKE = 2 min.)

I₂ = 4.8 Q₂ = 5.76 CFS

I₁₀ = 6.2 Q₁₀ = 7.44 CFS

USE 130' 18" HDPE @ 0.56% Q_{cap} = 8.52 CFS

Culvert Calculator Report

Temp. pipe #54-#55

Solve For: Headwater Elevation

| Culvert Summary | | | |
|------------------------------|----------|-------------------------|----------------|
| Allowable HW Elevation | 0.00 ft | Headwater Depth/ Height | 1.09 |
| Computed Headwater Elevation | 71.64 ft | Discharge | 7.44 cfs |
| Inlet Control HW Elev | 71.62 ft | Tailwater Elevation | 69.50 ft |
| Outlet Control HW Elev | 71.64 ft | Control Type | Outlet Control |

2 yr elev - 70.6
Dry Storage - 70.9'

| Grades | | | |
|-----------------|-----------|-------------------|----------------|
| Upstream Invert | 70.00 ft | Downstream Invert | 69.00 ft |
| Length | 180.00 ft | Constructed Slope | 0.005556 ft/ft |

| Hydraulic Profile | | | |
|---------------------|---------------|-------------------|----------------|
| Profile | S2 | Depth, Downstream | 0.95 ft |
| Slope Type | Steep | Normal Depth | 0.95 ft |
| Flow Regime | Supercritical | Critical Depth | 1.06 ft |
| Velocity Downstream | 6.29 ft/s | Critical Slope | 0.004166 ft/ft |

| Section | | | |
|------------------|----------|----------------------|---------|
| Section Shape | Circular | Mannings Coefficient | 0.010 |
| Section Material | PVC | Span | 1.50 ft |
| Section Size | 18 inch | Rise | 1.50 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---------------------------|----------|------------------------|---------|
| Outlet Control HW Elev | 71.64 ft | Upstream Velocity Head | 0.49 ft |
| Ke | 0.20 | Entrance Loss | 0.10 ft |

| Inlet Control Properties | | | |
|--------------------------|-----------------------|---------------|---------------------|
| Inlet Control HW Elev | 71.62 ft | Flow Control | Unsubmerged |
| Inlet Type | Groove end projecting | Area Full | 1.8 ft ² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

Subject _____

Computed LMP Checked _____



Project # 1950040-000.05

Client _____

Date 2/23/91 Sheet # _____

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants

GRASS SWALE # 58 - #59 (SOUTH SIDE OF BLDG #1)

D.A. = 1.27 ACRES

BLDG # WALKS = 0.15 AC @ C=0.9

WOODED & OPEN = 1.12 AC @ C=0.3

$C_{avg} = 0.37$

$T_c = 9$ MIN. (130' OVERLAND = 8 MIN. + TRAVEL ALONG SWALE = 1 MIN.)

$I_{10} = 6.20$

$Q_{10} = 2.91$ CFS

GRASS SWALE @ 1.40% (SEE SECTION W/3:1 SIDE SLOPES) $d = 0.61'$ $V = 2.57$ FPS

PG-2A TYPE B1, D=6" #59 - #60

$Q_{10} = 2.91$ CFS

$S_o = 5.66\%$

$d = 0.33'$

$V = 6.33$ FPS

PG-A #60 - #61

$Q_{10} = 2.91$ CFS

$S_o = 16.00\%$

$d = 0.21'$

$V = 11.59$ FPS

Grass Swale #58-#59
Worksheet for Triangular Channel

Project Description

| | |
|--------------|--------------------|
| Worksheet | Grass swale #58-#5 |
| Flow Element | Triangular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|----------------------|----------------|
| Mannings Coefficient | 0.030 |
| Slope | 0.014000 ft/ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Discharge | 2.91 cfs |

Results

| | |
|-----------------|---------------------|
| Depth | 0.61 ft |
| Flow Area | 1.1 ft ² |
| Wetted Perimete | 3.88 ft |
| Top Width | 3.68 ft |
| Critical Depth | 0.57 ft |
| Critical Slope | 0.021419 ft/ft |
| Velocity | 2.57 ft/s |
| Velocity Head | 0.10 ft |
| Specific Energy | 0.72 ft |
| Froude Number | 0.82 |
| Flow Type | Subcritical |

PG-2A #59-#60
Worksheet for Triangular Channel

| Project Description | |
|---------------------|--------------------|
| Worksheet | PG2A #59-#60 |
| Flow Element | Triangular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|----------------|
| Mannings Coefficient | 0.015 |
| Slope | 0.056600 ft/ft |
| Left Side Slope | 4.00 H : V |
| Right Side Slope | 4.00 H : V |
| Discharge | 2.91 cfs |

| Results | |
|-----------------|---------------------|
| Depth | 0.33 ft |
| Flow Area | 0.4 ft ² |
| Wetted Perimete | 2.68 ft |
| Top Width | 2.60 ft |
| Critical Depth | 0.51 ft |
| Critical Slope | 0.005401 ft/ft |
| Velocity | 6.88 ft/s |
| Velocity Head | 0.74 ft |
| Specific Energy | 1.06 ft |
| Froude Number | 3.01 |
| Flow Type | Supercritical |

PG-4 #60-#61
Worksheet for Trapezoidal Channel

Project Description

| | |
|--------------|--------------------|
| Worksheet | PG4 #60-#61 |
| Flow Element | Trapezoidal Channe |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|----------------------|----------------|
| Mannings Coefficient | 0.015 |
| Slope | 0.160000 ft/ft |
| Left Side Slope | 1.00 H : V |
| Right Side Slope | 1.00 H : V |
| Bottom Width | 1.00 ft |
| Discharge | 2.91 cfs |

Results

| | |
|-----------------|---------------------|
| Depth | 0.21 ft |
| Flow Area | 0.3 ft ² |
| Wetted Perimete | 1.59 ft |
| Top Width | 1.42 ft |
| Critical Depth | 0.53 ft |
| Critical Slope | 0.005784 ft/ft |
| Velocity | 11.59 ft/s |
| Velocity Head | 2.09 ft |
| Specific Energy | 2.29 ft |
| Froude Number | 4.85 |
| Flow Type | Supercritical |

Subject CROWN LANDING

Computed LM? Checked _____



Project # 1950040-000.05

Client _____

Date 2/26/01 Sheet # _____

221. 4-13-01

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants

SEDIMENT TRAP #2

TOTAL D.A. = 3.0 ACRES

WET VOLUME REQ'D = $3.0 \times 67 \times 27 = 5427 \text{ C.F.}$

AVAILABLE VOLUME AT ELEV. 79.00 = 5756 C.F.

CLEANEST VOLUME = $3.0 \times 33 \times 27 = 2673 \text{ CF}$

ELEV = 78.50

DRY VOLUME REQ'D = $3.0 \times 67 \times 27 = 5427 \text{ CF}$

TOTAL WET & DRY VOLUME REQ'D = 10,854 CF

ELEV = 79.80

GRAVEL OUTLET L = $6 \times 3.0 = 18.0'$

TEMPORARY PIPE:

#56 - #57

AREA = 2.3 ACRES

C = 0.60 (DURING ROUGH GRADING)

T_C = 8 MIN (220' OVERLAND = 7 min. + 125' TRAVEL ALONG DUG DIKE = 1 min.)

I₂ = 5.00 Q₂ = 6.90 CFS

I₁₀ = 6.40 Q₁₀ = 8.83 CFS

USE 60' - 18" HDPE @ 0.067% Q_{cap} = 9.31 CFS (MANNING EQN)

OUTFALL DITCH:

CA = 1.30 } FROM SOIL DRAINAGE CALC'S

I = 5.94 }

Q = 7.72 CFS

Reservoir Report

Reservoir No. 2 - Trap #2 (FOR STORAGE VOLUMES ONLY)

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

| Stage ft | Elevation ft | Contour area sqft | Incr. Storage cuft | Total storage cuft |
|----------|--------------|-------------------|--------------------|--------------------|
| 0.00 | 78.00 | 5,192 | 0 | 0 |
| 1.00 | 79.00 | 6,320 | 5,756 | 5,756 |
| 2.00 | 80.00 | 7,506 | 6,913 | 12,669 |
| 3.00 | 81.00 | 8,749 | 8,128 | 20,797 |
| 4.00 | 82.00 | 10,050 | 9,400 | 30,196 |

Culvert / Orifice Structures

| | [A] | [B] | [C] | [D] |
|---------------|--------|------|------|------|
| Rise in | = 0.0 | 0.0 | 0.0 | 0.0 |
| Span in | = 0.0 | 0.0 | 0.0 | 0.0 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length ft | = 0.0 | 0.0 | 0.0 | 0.0 |
| Slope % | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .013 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = ---- | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|-------------------------------|--------|------|------|------|
| Crest Len ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Eqn. Exp. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = No | No | No | No |
| Tailwater Elevation = 0.00 ft | | | | |

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

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Civ A cfs | Civ B cfs | Civ C cfs | Civ D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| 0.00 | 0 | 78.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.10 | 576 | 78.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.20 | 1,151 | 78.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.30 | 1,727 | 78.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.40 | 2,302 | 78.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.50 | 2,878 | 78.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.60 | 3,454 | 78.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.70 | 4,029 | 78.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.80 | 4,605 | 78.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.90 | 5,180 | 78.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.00 | 5,756 | 79.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Continues on next page...

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|-------------|-----------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|------------------|
| 1.10 | 6,447 | 79.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.20 | 7,139 | 79.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.30 | 7,830 | 79.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.40 | 8,521 | 79.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.50 | 9,212 | 79.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.60 | 9,904 | 79.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.70 | 10,595 | 79.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.80 | 11,286 | 79.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.90 | 11,978 | 79.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.00 | 12,669 | 80.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.10 | 13,482 | 80.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.20 | 14,295 | 80.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.30 | 15,107 | 80.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.40 | 15,920 | 80.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.50 | 16,733 | 80.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.60 | 17,546 | 80.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.70 | 18,358 | 80.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.80 | 19,171 | 80.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.90 | 19,984 | 80.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.00 | 20,797 | 81.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.10 | 21,736 | 81.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.20 | 22,676 | 81.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.30 | 23,616 | 81.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.40 | 24,556 | 81.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.50 | 25,496 | 81.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.60 | 26,436 | 81.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.70 | 27,376 | 81.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.80 | 28,316 | 81.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.90 | 29,256 | 81.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.00 | 30,196 | 82.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

...End

Culvert Calculator Report

Temp. pipe #56-#57

Solve For: Headwater Elevation

| Culvert Summary | | | |
|------------------------------|----------|-------------------------|----------------|
| Allowable HW Elevation | 0.00 ft | Headwater Depth/ Height | 1.23 |
| Computed Headwater Elevation | 81.84 ft | Discharge | 8.83 cfs |
| Inlet Control HW Elev | 81.82 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev | 81.84 ft | Control Type | Outlet Control |

- 79.8 is top of dry storage

| Grades | | | |
|-----------------|----------|-------------------|----------------|
| Upstream Invert | 80.00 ft | Downstream Invert | 79.60 ft |
| Length | 60.00 ft | Constructed Slope | 0.006667 ft/ft |

| Hydraulic Profile | | | |
|---------------------|---------------|-------------------|----------------|
| Profile | S2 | Depth, Downstream | 1.02 ft |
| Slope Type | Steep | Normal Depth | 1.01 ft |
| Flow Regime | Supercritical | Critical Depth | 1.15 ft |
| Velocity Downstream | 6.91 ft/s | Critical Slope | 0.004782 ft/ft |

| Section | | | |
|------------------|----------|----------------------|---------|
| Section Shape | Circular | Mannings Coefficient | 0.010 |
| Section Material | PVC | Span | 1.50 ft |
| Section Size | 18 inch | Rise | 1.50 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---------------------------|----------|------------------------|---------|
| Outlet Control HW Elev | 81.84 ft | Upstream Velocity Head | 0.57 ft |
| Ke | 0.20 | Entrance Loss | 0.11 ft |

| Inlet Control Properties | | | |
|--------------------------|-----------------------|---------------|---------------------|
| Inlet Control HW Elev | 81.82 ft | Flow Control | Submerged |
| Inlet Type | Groove end projecting | Area Full | 1.8 ft ² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

Structure #39 Outfall Swale Worksheet for Triangular Channel

Project Description

| | |
|--------------|-----------------------------|
| Worksheet | Structure #39 Outfall swale |
| Flow Element | Triangular Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|----------------------|----------------|
| Mannings Coefficient | 0.030 |
| Slope | 0.022200 ft/ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Discharge | 2.35 cfs |

Results

| | |
|-----------------|---------------------|
| Depth | 0.52 ft |
| Flow Area | 0.8 ft ² |
| Wetted Perimete | 3.29 ft |
| Top Width | 3.12 ft |
| Critical Depth | 0.52 ft |
| Critical Slope | 0.022038 ft/ft |
| Velocity | 2.90 ft/s |
| Velocity Head | 0.13 ft |
| Specific Energy | 0.65 ft |
| Froude Number | 1.00 |
| Flow Type | Supercritical |

Trap#2 Outfall Ditch

Worksheet for Trapezoidal Channel

Project Description

| | |
|--------------|----------------------|
| Worksheet | Trap#2 ditch outfall |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

Input Data

| | |
|----------------------|----------------|
| Mannings Coefficient | 0.030 |
| Slope | 0.010000 ft/ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 2.00 ft |
| Discharge | 7.72 cfs |

Results

| | |
|-----------------|---------------------|
| Depth | 0.68 ft |
| Flow Area | 2.7 ft ² |
| Wetted Perimete | 6.27 ft |
| Top Width | 6.05 ft |
| Critical Depth | 0.58 ft |
| Critical Slope | 0.018691 ft/ft |
| Velocity | 2.84 ft/s |
| Velocity Head | 0.13 ft |
| Specific Energy | 0.80 ft |
| Froude Number | 0.75 |
| Flow Type | Subcritical |

Table
Rating Table for Trapezoidal Channel

| Project Description | |
|---------------------|----------------------|
| Worksheet | Trap#2 ditch outfall |
| Flow Element | Trapezoidal Channel |
| Method | Manning's Formula |
| Solve For | Channel Depth |

| Input Data | |
|----------------------|----------------|
| Mannings Coefficient | 0.030 |
| Slope | 0.010000 ft/ft |
| Left Side Slope | 3.00 H : V |
| Right Side Slope | 3.00 H : V |
| Bottom Width | 2.00 ft |

| Attribute | Minimum | Maximum | Increment |
|-----------------|---------|---------|-----------|
| Discharge (cfs) | 5.00 | 10.00 | 0.10 |

| Discharge (cfs) | Depth (ft) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) |
|-----------------|------------|-----------------|------------------------------|-----------------------|----------------|
| 5.00 | 0.55 | 2.52 | 2.0 | 5.45 | 5.27 |
| 5.10 | 0.55 | 2.54 | 2.0 | 5.48 | 5.30 |
| 5.20 | 0.56 | 2.55 | 2.0 | 5.52 | 5.33 |
| 5.30 | 0.56 | 2.56 | 2.1 | 5.55 | 5.37 |
| 5.40 | 0.57 | 2.58 | 2.1 | 5.58 | 5.40 |
| 5.50 | 0.57 | 2.59 | 2.1 | 5.62 | 5.43 |
| 5.60 | 0.58 | 2.60 | 2.2 | 5.65 | 5.46 |
| 5.70 | 0.58 | 2.62 | 2.2 | 5.68 | 5.49 |
| 5.80 | 0.59 | 2.63 | 2.2 | 5.71 | 5.52 |
| 5.90 | 0.59 | 2.64 | 2.2 | 5.74 | 5.55 |
| 6.00 | 0.60 | 2.65 | 2.3 | 5.77 | 5.58 |
| 6.10 | 0.60 | 2.66 | 2.3 | 5.81 | 5.61 |
| 6.20 | 0.61 | 2.68 | 2.3 | 5.84 | 5.64 |
| 6.30 | 0.61 | 2.69 | 2.3 | 5.87 | 5.67 |
| 6.40 | 0.62 | 2.70 | 2.4 | 5.90 | 5.70 |
| 6.50 | 0.62 | 2.71 | 2.4 | 5.93 | 5.73 |
| 6.60 | 0.63 | 2.72 | 2.4 | 5.96 | 5.75 |
| 6.70 | 0.63 | 2.73 | 2.5 | 5.99 | 5.78 |
| 6.80 | 0.63 | 2.74 | 2.5 | 6.02 | 5.81 |
| 6.90 | 0.64 | 2.75 | 2.5 | 6.04 | 5.84 |
| 7.00 | 0.64 | 2.76 | 2.5 | 6.07 | 5.86 |
| 7.10 | 0.65 | 2.77 | 2.6 | 6.10 | 5.89 |
| 7.20 | 0.65 | 2.79 | 2.6 | 6.13 | 5.92 |
| 7.30 | 0.66 | 2.80 | 2.6 | 6.16 | 5.94 |
| 7.40 | 0.66 | 2.81 | 2.6 | 6.19 | 5.97 |
| 7.50 | 0.67 | 2.82 | 2.7 | 6.21 | 6.00 |
| 7.60 | 0.67 | 2.83 | 2.7 | 6.24 | 6.02 |
| 7.70 | 0.67 | 2.84 | 2.7 | 6.27 | 6.05 |
| 7.80 | 0.68 | 2.85 | 2.7 | 6.29 | 6.07 |
| 7.90 | 0.68 | 2.86 | 2.8 | 6.32 | 6.10 |
| 8.00 | 0.69 | 2.86 | 2.8 | 6.35 | 6.12 |
| 8.10 | 0.69 | 2.87 | 2.8 | 6.37 | 6.15 |
| 8.20 | 0.70 | 2.88 | 2.8 | 6.40 | 6.17 |
| 8.30 | 0.70 | 2.89 | 2.9 | 6.43 | 6.20 |
| 8.40 | 0.70 | 2.90 | 2.9 | 6.45 | 6.22 |

Table
Rating Table for Trapezoidal Channel

| Discharge (cfs) | Depth (ft) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) |
|--------------------|---------------|--------------------|------------------------------------|-----------------------------|----------------------|
| 8.50 | 0.71 | 2.91 | 2.9 | 6.48 | 6.25 |
| 8.60 | 0.71 | 2.92 | 2.9 | 6.50 | 6.27 |
| 8.70 | 0.72 | 2.93 | 3.0 | 6.53 | 6.30 |
| 8.80 | 0.72 | 2.94 | 3.0 | 6.55 | 6.32 |
| 8.90 | 0.72 | 2.95 | 3.0 | 6.58 | 6.34 |
| 9.00 | 0.73 | 2.96 | 3.0 | 6.60 | 6.37 |
| 9.10 | 0.73 | 2.96 | 3.1 | 6.63 | 6.39 |
| 9.20 | 0.74 | 2.97 | 3.1 | 6.65 | 6.41 |
| 9.30 | 0.74 | 2.98 | 3.1 | 6.68 | 6.44 |
| 9.40 | 0.74 | 2.99 | 3.1 | 6.70 | 6.46 |
| 9.50 | 0.75 | 3.00 | 3.2 | 6.72 | 6.48 |
| 9.60 | 0.75 | 3.01 | 3.2 | 6.75 | 6.50 |
| 9.70 | 0.75 | 3.02 | 3.2 | 6.77 | 6.53 |
| 9.80 | 0.76 | 3.02 | 3.2 | 6.80 | 6.55 |
| 9.90 | 0.76 | 3.03 | 3.3 | 6.82 | 6.57 |
| 10.00 | 0.77 | 3.04 | 3.3 | 6.84 | 6.59 |

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

REV. 4-13-01

Project CROWN LANDING APARTMENTS

Basin # 3 Location NORTHEAST PORTION OF SITE

Total area draining to basin: 7.0 acres. (DURING INITIAL GRADING)
4.8 acres (WITH STORM DRAINAGE IN PLACE)

Basin Volume Design

Wet Storage:

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

$$67 \text{ cu. yds.} \times \underline{7.0} \text{ acres} = \underline{469} \text{ cu. yds.} = 12,663 \text{ CF}$$

2. Available basin volume = 432 cu. yds. at elevation 59.10. (From storage - elevation curve)

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

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

4. Available volume before cleanout required.

$$33 \text{ cu. yds.} \times \underline{7.0} \text{ acres} = \underline{231} \text{ cu. yds.} = 6237 \text{ CF}$$

5. Elevation corresponding to cleanout level = 58.05.

(From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.05 ft.
(Min. = 1.0 ft.)

Dry Storage:

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

$$67 \text{ cu. yds.} \times \underline{7.0} \text{ acres} = \underline{469} \text{ cu. yds.} = 12,663 \text{ CF}$$

$$\text{WET STORAGE} + \text{DRY STORAGE REQ'D} = 25,326 \text{ CF}$$

8. Total available basin volume at crest of riser* = $\frac{942}{26,768 \text{ CF}}$ cu. yds. at elevation 61.00 ✓. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 6 in.
10. Diameter of flexible tubing = 8 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 61.00 ✓
- Top of Dam = 65.20 ✓
- Design High Water = 63.20 ✓ (25yr. storm)
- Upstream Toe of Dam = 57.00
- No ES

Basin Shape

12. $\frac{\text{Length of Flow}}{\text{Effective Width}} = \frac{L}{We} = \underline{2}$
- If > 2, baffles are not required _____
- If < 2, baffles are required _____

Runoff

13. $Q_2 = \underline{22.52}$ cfs (~~From Chapter 5~~) 24 HOUR STORM
14. $Q_{25} = \underline{41.63}$ cfs (~~From Chapter 5~~) 24 HOUR STORM

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2 = \underline{\hspace{2cm}}$ cfs. (riser and barrel)
- Without emergency spillway, required spillway capacity $Q_p = Q_{25} = \underline{41.63}$ cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = _____ ft. (Using Q_2)

$h = \text{Crest of Emergency Spillway Elevation} - \text{Crest of Riser Elevation}$

Without emergency spillway:

Assumed available head (h) = 2.2 ft. (Using Q_{25})

$h = \text{Design High Water Elevation} - \text{Crest of Riser Elevation}$

17. Riser diameter (D_r) = 36 in. Actual head (h) = 2.2 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 60 ft.

Head (H) on barrel through embankment = 6.2 ft.

(From Plate 3.14-7).

19. Barrel diameter = 18 in.

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

20. Trash rack and anti-vortex device

Diameter = 60 inches.

Height = 24 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p =$ _____ cfs.

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

(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 6.2 ft.
 Slope of upstream face of embankment (Z) = 2 :1.
 Slope of principal spillway barrel (S_b) = 1.0 %
 Length of barrel in saturated zone (L_s) = 40 ft.
24. Number of collars required = 2 dimensions = 3.5' x 3.5'
 (from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 65.2
 Design High Water = 63.2
 Emergency Spillway Crest = _____
 Principal Spillway Crest = 61.00
 Dewatering Orifice Invert = 59.10
 Cleanout Elevation = 58.05
 Elevation of Upstream Toe of Dam
 or Excavated Bottom of "Wet Storage
 Area" (if excavation was performed) = 57.0

Subject _____

Computed LMP Checked _____



Project # 1956040-000.05

Client _____

Date 2/27/01 Sheet # _____

REV 4-13-01

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants

TEMPORARY SEDIMENT BASIN #3

DEWATERING ORIFICE:

$$\left. \begin{array}{l} \text{DRY STORAGE ELEV} = 61.00 \\ \text{DEWATERING INU} = 59.10 \end{array} \right\} H = 1.90'$$

$$Q = \frac{5}{21,600} \\ = 12,663 \text{ CF} / 21,600'' = 0.59 \text{ CFS}$$

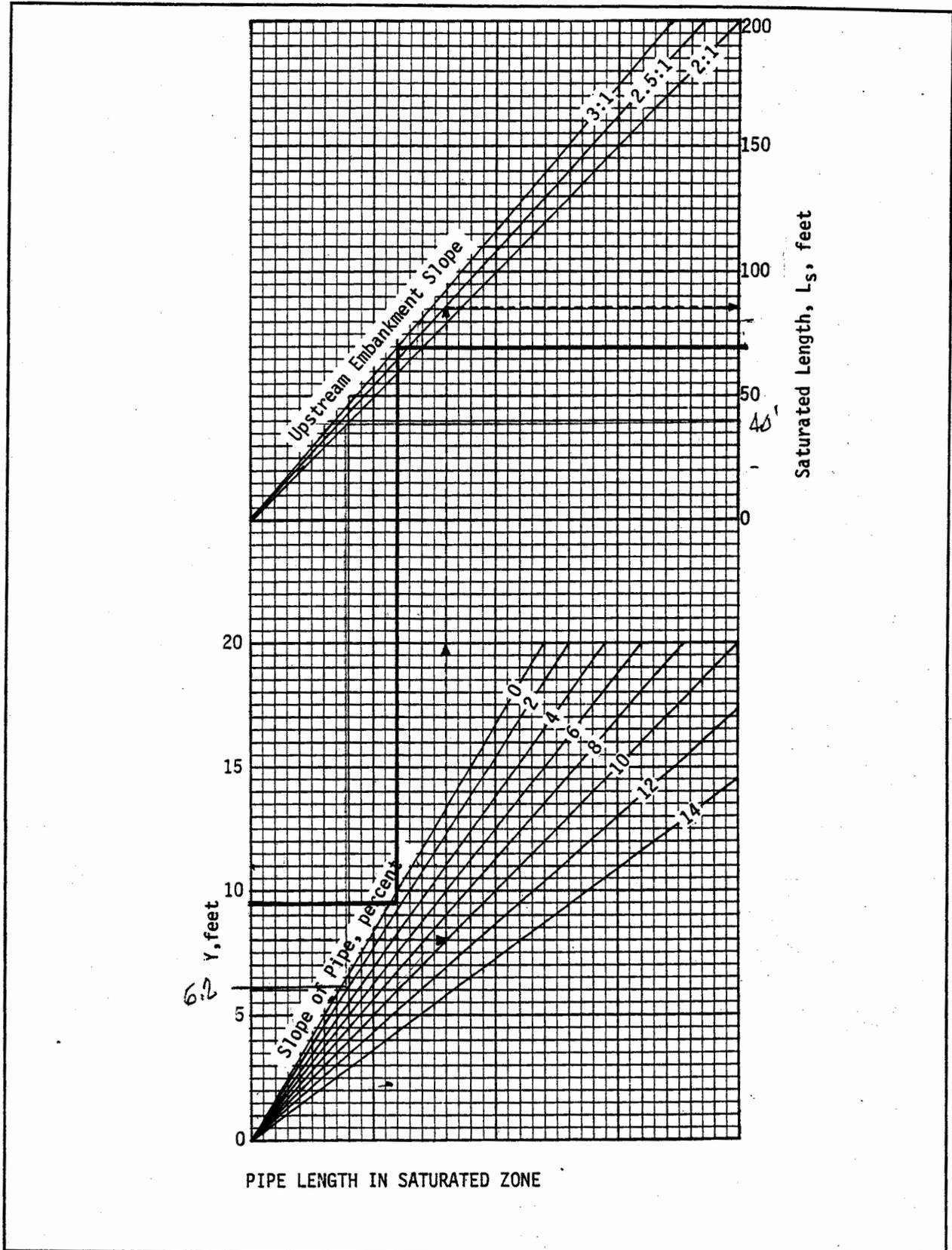
$$A = \frac{Q}{(64.32 \times \frac{H}{2})^{1/2} (0.6)}$$

$$= \frac{0.59}{(64.32 \times \frac{1.90}{2})^{1/2} (0.6)}$$

$$= 0.126 \text{ SF}$$

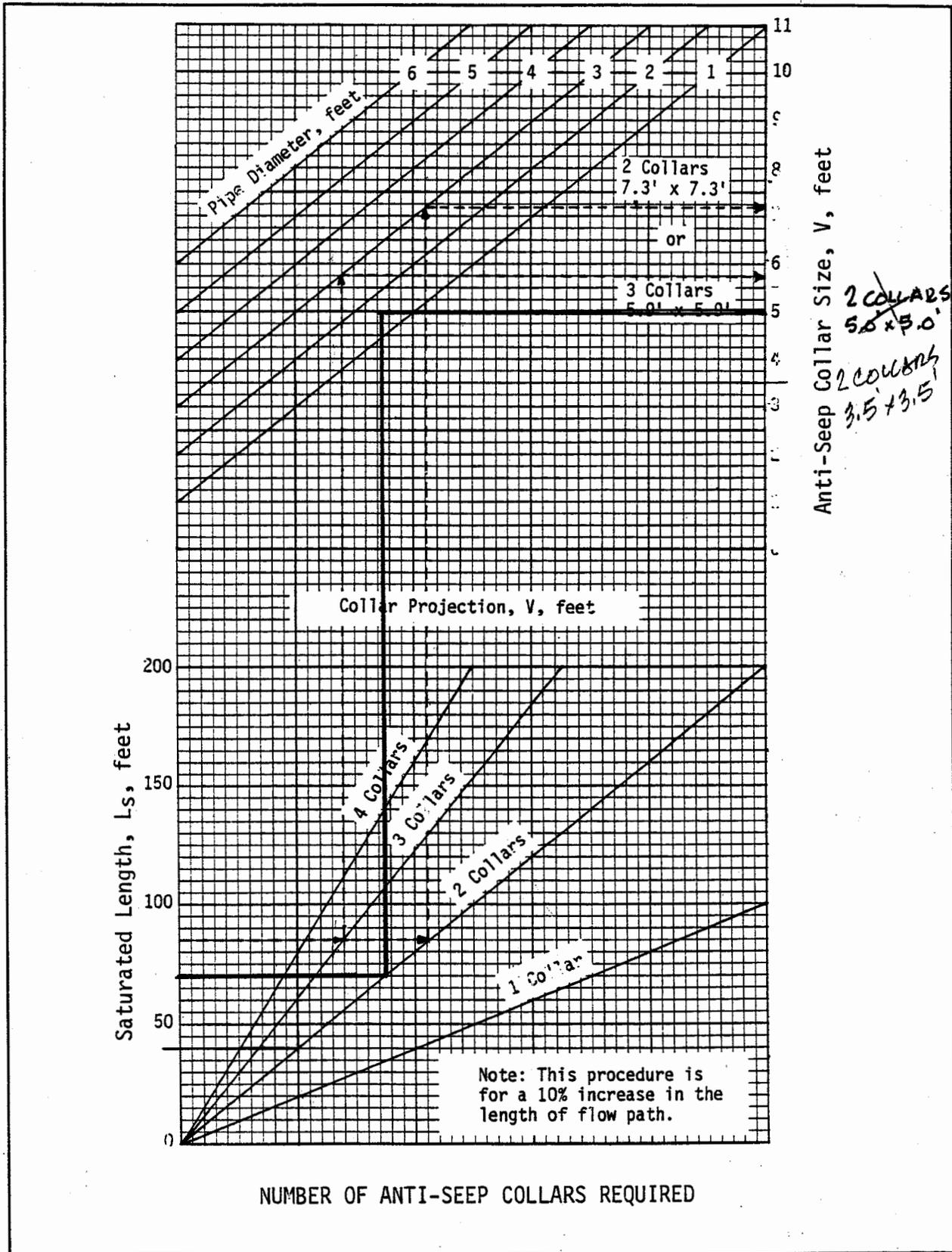
$$d = 2 \left(\frac{A}{3.14} \right)^{1/2}$$

$$= 2 \left(\frac{0.126}{3.14} \right)^{1/2} = 0.20' = 4.8'' \quad \text{USE 6'' ORIFICE}$$



Source: USDA-SCS

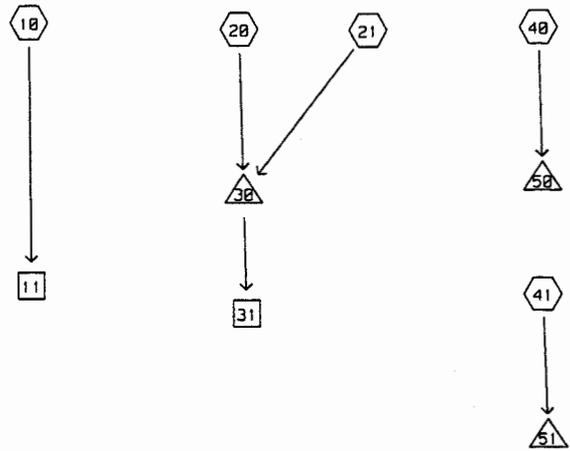
Plate 3.14-11



Source: USDA-SCS

Plate 3.14-12

WATERSHED ROUTING =====



| | | |
|-------------------|---|-------------|
| SUBCATCHMENT 10 | = Predevelopment to Reach | -> REACH 11 |
| SUBCATCHMENT 20 | = Storm drainage contributing area | -> POND 30 |
| SUBCATCHMENT 21 | = Overland wooded to pond | -> POND 30 |
| SUBCATCHMENT 40 | = Storm drainage & overland to Basin #3 | -> POND 50 |
| SUBCATCHMENT 41 | = Graded overland to Basin #3 | -> POND 51 |
| REACH 11 | = Downstream reach | -> |
| REACH 31 | = Downstream reach | -> |
| POND 30 | = BMP #1 | -> REACH 31 |
| POND 30 secondary | = BMP #1 | -> REACH 31 |
| POND 50 | = Basin #3 | -> |
| POND 51 | = Basin #3 | -> |

TYPE II 24-HOUR RAINFALL= 5.50 IN

Prepared by LandMark Design Group

12 Apr 01

HydroCAD 5.11 000388 (c) 1986-1999 Applied Microcomputer Systems

SUBCATCHMENT 40

Storm drainage & overland to Basin #3

PEAK= 23.21 CFS @ 12.06 HRS, VOLUME= 1.51 AF

| ACRES | CN | | SCS TR-20 METHOD |
|-------------|-----------|----------------------|----------------------------|
| 2.65 | 98 | Buildings & pavement | TYPE II 24-HOUR |
| 1.55 | 74 | Open grassed | RAINFALL= 5.50 IN |
| .60 | 70 | Existing wooded | SPAN= 1-20 HRS, dt=.05 HRS |
| <u>4.80</u> | <u>87</u> | | |

| Method | Comment | Tc (min) |
|--------------|----------------------|----------|
| DIRECT ENTRY | Overland & pipe flow | 16.5 |

SUBCATCHMENT 41

Graded overland to Basin #3

PEAK= 41.63 CFS @ 12.00 HRS, VOLUME= 2.33 AF

| ACRES | CN | | SCS TR-20 METHOD |
|-------------|-----------|-----------------|----------------------------|
| 6.40 | 91 | Graded area | TYPE II 24-HOUR |
| .60 | 70 | Existing wooded | RAINFALL= 5.50 IN |
| <u>7.00</u> | <u>89</u> | | SPAN= 1-20 HRS, dt=.05 HRS |

| Method | Comment | Tc (min) |
|--------------|-----------------------|----------|
| DIRECT ENTRY | Overland & swale flow | 11.0 |

TYPE II 24-HOUR RAINFALL= 5.50 IN

Prepared by LandMark Design Group

12 Apr 01

HydroCAD 5.11 000388 (c) 1986-1999 Applied Microcomputer Systems

POND 50

Basin #3

Q_{in} = 23.21 CFS @ 12.06 HRS, VOLUME= 1.51 AF
 Q_{out} = 17.03 CFS @ 12.17 HRS, VOLUME= 1.36 AF, ATTEN= 27%, LAG= 6.8 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 59.1 | 6680 | 0 | 0 | PEAK STORAGE = 21368 CF |
| 64.0 | 9499 | 39639 | 39639 | PEAK ELEVATION= 61.7 FT |
| | | | | FLOOD ELEVATION= 64.0 FT |
| | | | | START ELEVATION= 59.1 FT |
| | | | | SPAN= 1-20 HRS, dt=.05 HRS |
| | | | | Tdet= 101 MIN (1.36 AF) |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|--------|--|
| 1 | P | 57.0' | 18" CULVERT n=.013 L=40' S=.01'/' Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 61.0' | 36" HORIZONTAL ORIFICE/GRATE Q=.6 Area SQR(2gH) (Limited to weir flow @ low head) |
| 3 | 1 | 59.1' | 6" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r) (Use H/2 if H<d) |

Primary Discharge

└─1=Culvert
 └─2=Orifice/Grate
 └─3=Orifice/Grate

POND 51

Basin #3

Q_{in} = 41.63 CFS @ 12.00 HRS, VOLUME= 2.33 AF
 Q_{out} = 19.91 CFS @ 12.14 HRS, VOLUME= 2.11 AF, ATTEN= 52%, LAG= 8.3 MIN

| ELEVATION (FT) | AREA (SF) | INC.STOR (CF) | CUM.STOR (CF) | STOR-IND METHOD |
|-------------------|--------------|------------------|------------------|----------------------------|
| 59.1 | 6680 | 0 | 0 | PEAK STORAGE = 33374 CF |
| 64.0 | 9499 | 39639 | 39639 | PEAK ELEVATION= 63.2 FT |
| | | | | FLOOD ELEVATION= 64.0 FT |
| | | | | START ELEVATION= 59.1 FT |
| | | | | SPAN= 1-20 HRS, dt=.05 HRS |
| | | | | Tdet= 80.6 MIN (2.11 AF) |

| # | ROUTE | INVERT | OUTLET DEVICES |
|---|-------|--------|--|
| 1 | P | 57.0' | 18" CULVERT n=.013 L=40' S=.01'/' Ke=.5 Cc=.9 Cd=.6 |
| 2 | 1 | 61.0' | 36" HORIZONTAL ORIFICE/GRATE Q=.6 Area SQR(2gH) (Limited to weir flow @ low head) |
| 3 | 1 | 59.1' | 6" ORIFICE/GRATE Q=.6 PI r ² SQR(2g) SQR(H-r) (Use H/2 if H<d) |

Primary Discharge

└─1=Culvert
 └─2=Orifice/Grate
 └─3=Orifice/Grate

Reservoir Report

Reservoir No. 3 - Basin #3 (FOR STORAGE VOLUMES ONLY)

English

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

| Stage ft | Elevation ft | Contour area sqft | Incr. Storage cuft | Total storage cuft |
|----------|--------------|-------------------|--------------------|--------------------|
| 0.00 | 57.00 | 5,654 | 0 | 0 |
| 1.00 | 58.00 | 6,158 | 5,906 | 5,906 |
| 2.00 | 59.00 | 6,680 | 6,419 | 12,325 |
| 3.00 | 60.00 | 7,215 | 6,948 | 19,273 |
| 4.00 | 61.00 | 7,765 | 7,490 | 26,763 |
| 5.00 | 62.00 | 8,329 | 8,047 | 34,810 |
| 6.00 | 63.00 | 8,907 | 8,618 | 43,428 |
| 7.00 | 64.00 | 9,499 | 9,203 | 52,631 |
| 8.00 | 65.00 | 10,105 | 9,802 | 62,433 |
| 9.00 | 66.00 | 10,726 | 10,416 | 72,848 |
| 10.00 | 67.00 | 11,371 | 11,049 | 83,897 |

Culvert / Orifice Structures

| | [A] | [B] | [C] | [D] |
|---------------|--------|------|------|------|
| Rise in | = 0.0 | 0.0 | 0.0 | 0.0 |
| Span in | = 0.0 | 0.0 | 0.0 | 0.0 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length ft | = 0.0 | 0.0 | 0.0 | 0.0 |
| Slope % | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .013 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = --- | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|--------------|--------|------|------|------|
| Crest Len ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. ft | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Eqn. Exp. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = No | No | No | No |

Tailwater Elevation = 0.00 ft

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

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|---------------|
| 0.00 | 0 | 57.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.10 | 591 | 57.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.20 | 1,181 | 57.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.30 | 1,772 | 57.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.40 | 2,362 | 57.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.50 | 2,953 | 57.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.60 | 3,544 | 57.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.70 | 4,134 | 57.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.80 | 4,725 | 57.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 0.90 | 5,315 | 57.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.00 | 5,906 | 58.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Continues on next page...

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|-------------|-----------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|------------------|
| 1.10 | 6,548 | 58.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.20 | 7,190 | 58.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.30 | 7,832 | 58.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.40 | 8,474 | 58.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.50 | 9,116 | 58.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.60 | 9,757 | 58.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.70 | 10,399 | 58.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.80 | 11,041 | 58.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.90 | 11,683 | 58.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.00 | 12,325 | 59.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.10 | 13,020 | 59.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.20 | 13,715 | 59.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.30 | 14,409 | 59.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.40 | 15,104 | 59.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.50 | 15,799 | 59.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.60 | 16,494 | 59.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.70 | 17,188 | 59.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.80 | 17,883 | 59.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.90 | 18,578 | 59.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.00 | 19,273 | 60.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.10 | 20,022 | 60.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.20 | 20,771 | 60.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.30 | 21,520 | 60.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.40 | 22,269 | 60.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.50 | 23,018 | 60.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.60 | 23,767 | 60.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.70 | 24,516 | 60.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.80 | 25,265 | 60.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.90 | 26,014 | 60.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.00 | 26,763 | 61.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.10 | 27,567 | 61.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.20 | 28,372 | 61.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.30 | 29,177 | 61.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.40 | 29,981 | 61.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.50 | 30,786 | 61.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.60 | 31,591 | 61.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.70 | 32,395 | 61.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.80 | 33,200 | 61.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 4.90 | 34,005 | 61.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.00 | 34,810 | 62.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.10 | 35,671 | 62.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.20 | 36,533 | 62.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.30 | 37,395 | 62.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.40 | 38,257 | 62.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.50 | 39,119 | 62.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.60 | 39,980 | 62.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.70 | 40,842 | 62.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.80 | 41,704 | 62.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.90 | 42,566 | 62.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.00 | 43,428 | 63.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.10 | 44,348 | 63.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.20 | 45,268 | 63.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.30 | 46,188 | 63.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Continues on next page...

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Discharge cfs |
|-------------|-----------------|-----------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|------------------|
| 6.40 | 47,109 | 63.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.50 | 48,029 | 63.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.60 | 48,949 | 63.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.70 | 49,870 | 63.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.80 | 50,790 | 63.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 6.90 | 51,710 | 63.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.00 | 52,631 | 64.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.10 | 53,611 | 64.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.20 | 54,591 | 64.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.30 | 55,571 | 64.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.40 | 56,551 | 64.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.50 | 57,531 | 64.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.60 | 58,512 | 64.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.70 | 59,492 | 64.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.80 | 60,472 | 64.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.90 | 61,452 | 64.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.00 | 62,433 | 65.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.10 | 63,474 | 65.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.20 | 64,516 | 65.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.30 | 65,557 | 65.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.40 | 66,599 | 65.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.50 | 67,640 | 65.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.60 | 68,682 | 65.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.70 | 69,723 | 65.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.80 | 70,765 | 65.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.90 | 71,806 | 65.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.00 | 72,848 | 66.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.10 | 73,953 | 66.10 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.20 | 75,058 | 66.20 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.30 | 76,163 | 66.30 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.40 | 77,267 | 66.40 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.50 | 78,372 | 66.50 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.60 | 79,477 | 66.60 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.70 | 80,582 | 66.70 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.80 | 81,687 | 66.80 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.90 | 82,792 | 66.90 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 10.00 | 83,897 | 67.00 | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

...End

Subject _____

Computed LMP Checked _____



Project # 1950040-000.05

Client _____

Date 2/27/01 Sheet # _____

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants

TEMPORARY SEDIMENT BASIN #3

TEMPORARY PIPES:

#50 - #51

AREA = 1.40 ACRES

C = 0.60 (DURING ROUGH GRADING)

T_c = 10 MIN (350' OVERLAND - T = 7 MIN + 400' TRAVEL ALONG DIV. DIKE - T = 3 MIN)

I₂ = 4.65 Q₂ = 3.91 CFS

I₁₀ = 6.00 Q₁₀ = 5.04 CFS

USE 175' - 15" HDPE @ 1.20% Q_{cap} = 7.67 CFS (MANNING EQN.)

#52 - #53

AREA = 4.00 ACRES

C = 0.60 (DURING ROUGH GRADING)

T_c = 11 MIN (520' OVERLAND - T = 10 MIN + 100' TRAVEL ALONG DIV. DIKE - T = 1 MIN)

I₂ = 4.50 Q₂ = 12.80 CFS

I₁₀ = 5.85 Q₁₀ = 14.84 CFS

USE 155' - 24" HDPE @ 0.53% Q_{cap} = 18.67 CFS (MANNING EQN.)

LEVEL SPREADER @ NORTH END OF DRAINAGE BYPASS DIVERSION DIKE

AREA = 1.5± ACRES

C = 0.30 (WOODED)

T_c = 12 MIN (100' OVERLAND @ 6% = 10 MIN + 375' TRAVEL ALONG DIV. DIKE = 2 MIN)

I₁₀ = 5.70

Q₁₀ = 2.57 CFS

USE L = 10'

Culvert Calculator Report

Temp. pipe #50-#51

ok

Solve For: Headwater Elevation

| Culvert Summary | | | |
|------------------------------|----------|-------------------------|----------------|
| Allowable HW Elevation | 0.00 ft | Headwater Depth/ Height | 1.14 |
| Computed Headwater Elevation | 64.53 ft | Discharge | 5.04 cfs |
| Inlet Control HW Elev | 63.76 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev | 64.53 ft | Control Type | Outlet Control |

dry stor = 61.0

| Grades | | | |
|-----------------|----------|-------------------|----------------|
| Upstream Invert | 63.10 ft | Downstream Invert | 61.00 ft |
| Length | 1.75 ft | Constructed Slope | 1.200000 ft/ft |

| Hydraulic Profile | | | |
|---------------------|---------------|-------------------|----------------|
| Profile | S2 | Depth, Downstream | 0.42 ft |
| Slope Type | Steep | Normal Depth | 0.20 ft |
| Flow Regime | Supercritical | Critical Depth | 0.91 ft |
| Velocity Downstream | 13.80 ft/s | Critical Slope | 0.004648 ft/ft |

| Section | | | |
|------------------|----------|----------------------|---------|
| Section Shape | Circular | Mannings Coefficient | 0.010 |
| Section Material | PVC | Span | 1.25 ft |
| Section Size | 15 inch | Rise | 1.25 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---------------------------|----------|------------------------|---------|
| Outlet Control HW Elev | 64.53 ft | Upstream Velocity Head | 0.43 ft |
| Ke | 0.20 | Entrance Loss | 0.09 ft |

| Inlet Control Properties | | | |
|--------------------------|-----------------------|---------------|---------------------|
| Inlet Control HW Elev | 63.76 ft | Flow Control | Transition |
| Inlet Type | Groove end projecting | Area Full | 1.2 ft ² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

Culvert Calculator Report

Temp. pipe #52-#53

Solve For: Headwater Elevation

| Culvert Summary | | | |
|------------------------------|----------|-------------------------|----------------|
| Allowable HW Elevation | 0.00 ft | Headwater Depth/ Height | 1.04 |
| Computed Headwater Elevation | 62.37 ft | Discharge | 14.04 cfs |
| Inlet Control HW Elev | 62.34 ft | Tailwater Elevation | 0.00 ft |
| Outlet Control HW Elev | 62.37 ft | Control Type | Outlet Control |

- should be 66.0

| Grades | | | |
|-----------------|-----------|-------------------|----------------|
| Upstream Invert | 60.30 ft | Downstream Invert | 59.30 ft |
| Length | 170.00 ft | Constructed Slope | 0.005882 ft/ft |

| Hydraulic Profile | | | |
|---------------------|---------------|-------------------|----------------|
| Profile | S2 | Depth, Downstream | 1.14 ft |
| Slope Type | Steep | Normal Depth | 1.14 ft |
| Flow Regime | Supercritical | Critical Depth | 1.35 ft |
| Velocity Downstream | 7.57 ft/s | Critical Slope | 0.003586 ft/ft |

| Section | | | |
|------------------|----------|----------------------|---------|
| Section Shape | Circular | Mannings Coefficient | 0.010 |
| Section Material | PVC | Span | 2.00 ft |
| Section Size | 24 inch | Rise | 2.00 ft |
| Number Sections | 1 | | |

| Outlet Control Properties | | | |
|---------------------------|----------|------------------------|---------|
| Outlet Control HW Elev | 62.37 ft | Upstream Velocity Head | 0.60 ft |
| Ke | 0.20 | Entrance Loss | 0.12 ft |

| Inlet Control Properties | | | |
|--------------------------|-----------------------|---------------|---------------------|
| Inlet Control HW Elev | 62.34 ft | Flow Control | Unsubmerged |
| Inlet Type | Groove end projecting | Area Full | 3.1 ft ² |
| K | 0.00450 | HDS 5 Chart | 1 |
| M | 2.00000 | HDS 5 Scale | 3 |
| C | 0.03170 | Equation Form | 1 |
| Y | 0.69000 | | |

SEDIMENT BASIN #3 OUTFALL

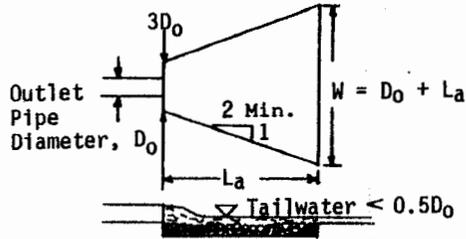
Source: USDA-SCS

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

$Q_{25} = 24.2$ CFS

$D_o = 18"$



Use $L_a = 20'$

Recommended Min. $d_{50} = 6"$

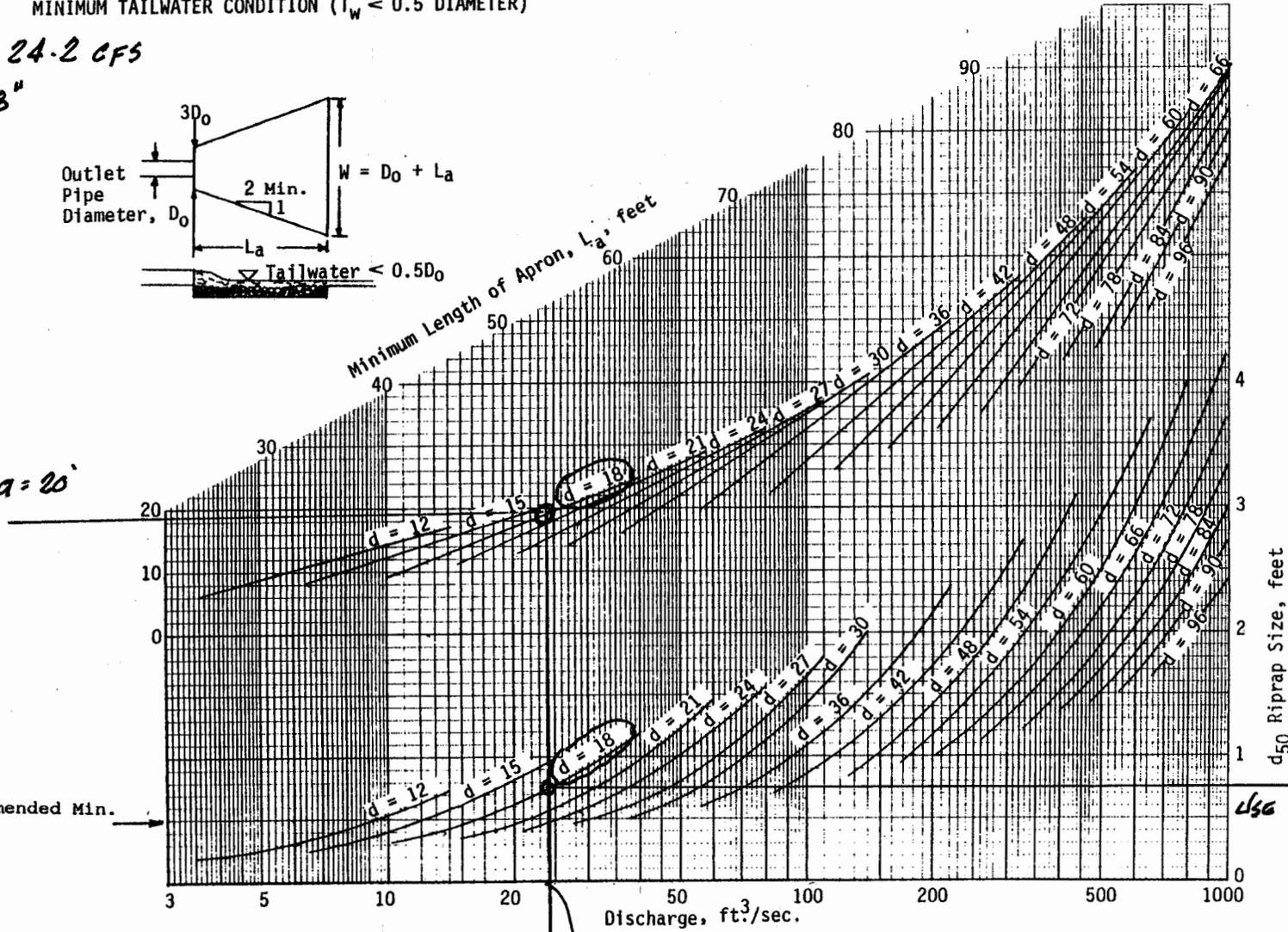


Plate 3.18-3

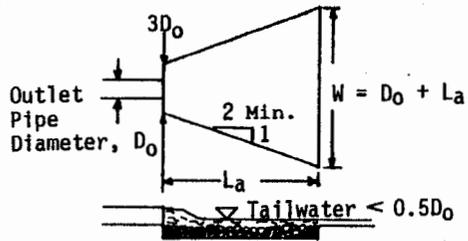
STRUCTURE #15 OUTFALL

Source: USDA-SCS

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

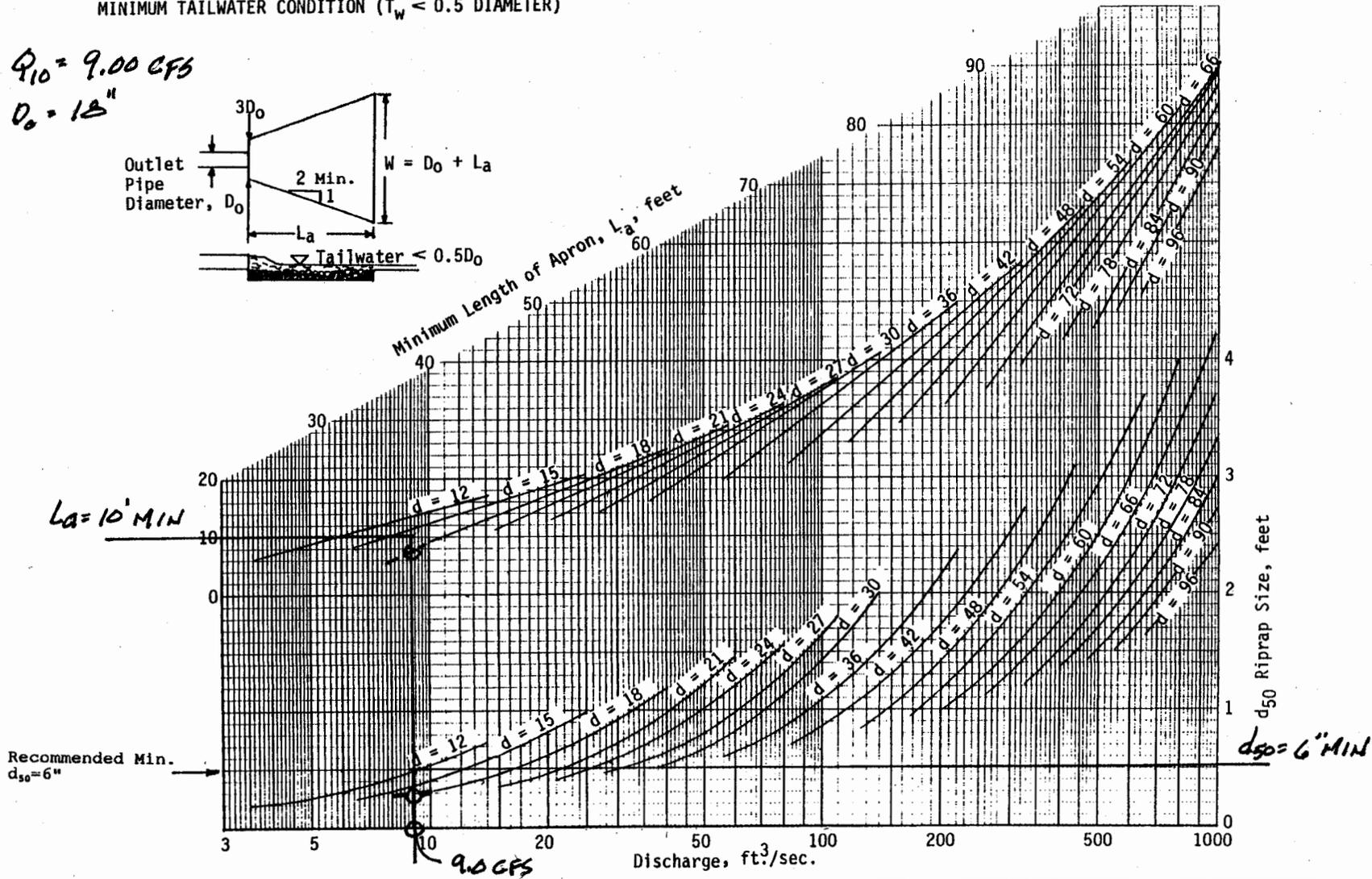
$Q_{10} = 9.00$ CFS

$D_o = 18"$



$L_a = 10'$ MIN

Recommended Min. $d_{50} = 6"$



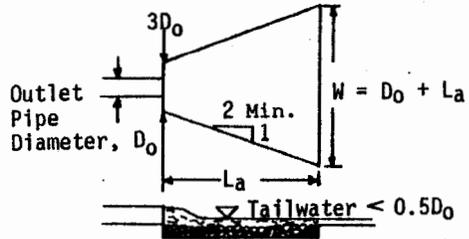
STRUCTURE #8 OUTFALL

Source: USDA-SCS

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

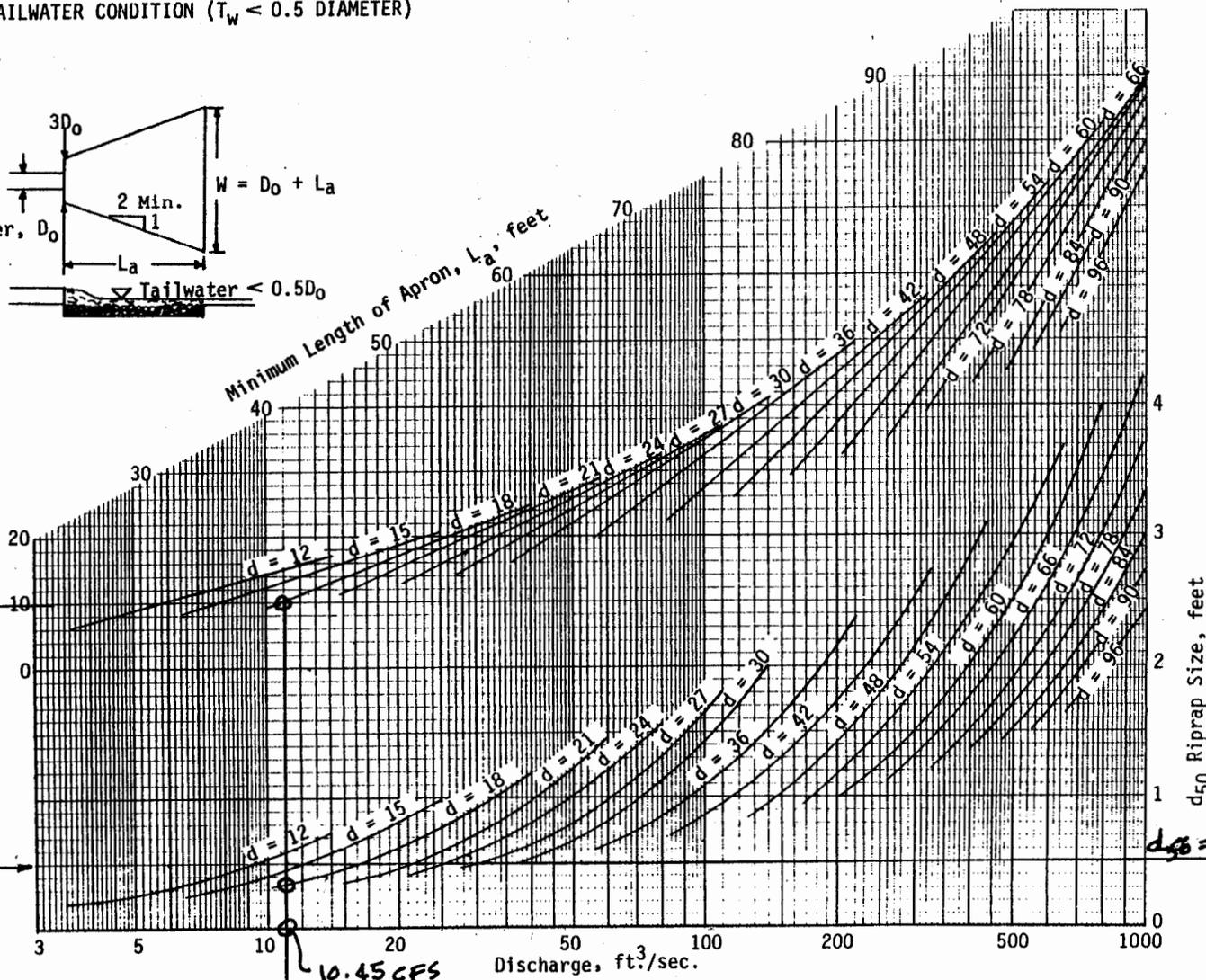
$Q_{10} = 10.45$ CFS

$D_0 = 18"$



$L_a = 10'$

Recommended Min.
 $d_{50} = 6"$



10.45 CFS

$d_{50} = 6"$ MIN