Stormwater Division

MEMORANDUM

DATE: March 9, 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: PC054

PIN: 4640500001B

Subdivision, Tract, Business or Owner Name (if known): Saint Georges Hundred
Saint Thomas Hundred Common Area Section 5

Property Description: Phase 3

Site Address:

(For internal use only) **Box** 6 **Drawer:** 3

Agreements: (in file as of scan date) **Y** **Book or Doc#:** 640 **Page:** 455-456

Comments
Parcel owned by Saint Thomas Hundred Association

10381

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 7th day of Sept, 19 93 between McLin - Dev.Co., and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: St. Geo's Hundred Sec. II Phase III

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.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 7th day of Sept., 1993.

COVENANTOR(S)

Mellen - Dev. Co.
by Mellen - Pres.

ATTEST:

Jean F. Scott

COVENANTOR(S)

ATTEST:

COMMONWEALTH OF VIRGINIA,
CITY/COUNTY OF James City

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify that James R. Chisman, whose name is signed as such to the foregoing writing bearing date 7th day of September, 1993, this day sworn the same before me in my jurisdiction aforesaid.

GIVEN under my hand this 9th day of September, of 1993.

Mary S. Casker
Notary Public

My Commission expires: August 31, 1996

Approved as to form:

Lee P. Rogers

0261U.Wpf
Revised 9/92

VIRGINIA: City of Williamsburg and County of James City, to Wit:
In the Clerk's office of the Circuit Court of the City of Williamsburg and County of James City the 14 day of Sept., 1993 This Covenant was presented with certificate annexed and admitted to record at 3:45 o'clock
Teste: Helen S. Ward, Clerk
by Deputy Clerk

18381

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100 YR D.H.W = 18.21

STANDARD EROSION AND SEDIMENT CONTROL NOTES

The purpose of the erosion control measures shown on these plans shall be to preclude the transport of all waterborne sediments resulting from construction activities from entering onto adjacent properties or State waters. If field inspection reveals the inadequacy of the plan to confine sediment to the project site, appropriate modifications will be made to correct any plan deficiencies.

1. All erosion and sediment control measures shall be installed and maintained in accordance with the "Virginia Erosion and Sediment Control Handbook". The contractor shall be thoroughly familiar with all applicable measures contained therein which may be pertinent to this project.

2. All points of construction ingress and egress shall be protected by a temporary construction entrance to prevent tracking of mud onto public right-of-ways. An entrance permit from VDOT is required prior to any construction activities within state right-of-ways.

3. Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment on-site must be constructed as a first step in grading and be made functional before upslope land disturbance takes place. Earthen structures such as dams, dikes, and diversions must be seeded and mulched immediately after installation. An on-site pre-construction meeting will be held between the Department of Public Works and the Contractor to identify those measures to be initially installed.

4. Maintenance of all erosion and sediment control measures shall be accomplished in accordance with the "Virginia Erosion and Sediment Control Handbook". Maintenance will include the repair of measures damaged by any subcontractor including those of the public utility companies. At the pre-construction meeting, the contractor will supply Public Works with the name of the individual who will be responsible for ensuring maintenance of installed measures on a daily basis.

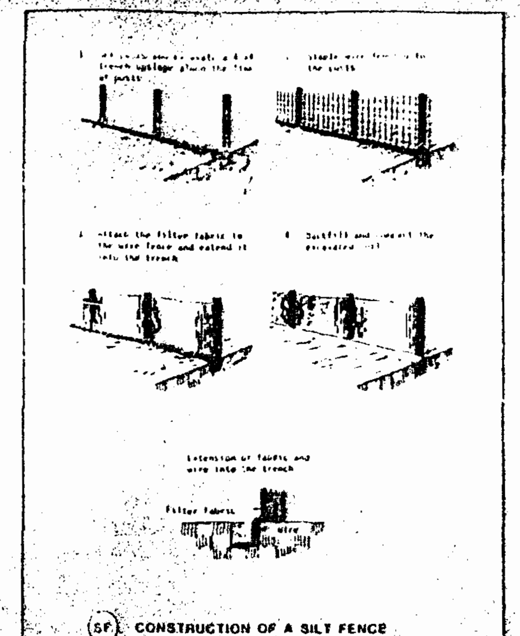
5. Surface flows over cut and fill slopes shall be controlled by either redirecting flows from transversing the slopes or by installing mechanical devices to safely lower water downslope without causing erosion. A temporary fill diversion (Std. & Spec. 3.1[illegible]) shall be installed prior to the end of each working day.

6. Sediment control measures may require minor field adjustments at time of construction to insure their intended purpose is accomplished. Department of Public Works approval will be required for other deviations from the approved plans.

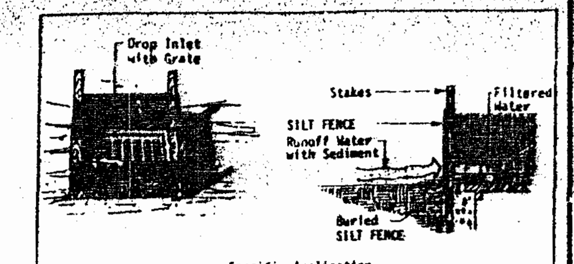
7. [illegible]

8. [illegible]

9. [illegible]



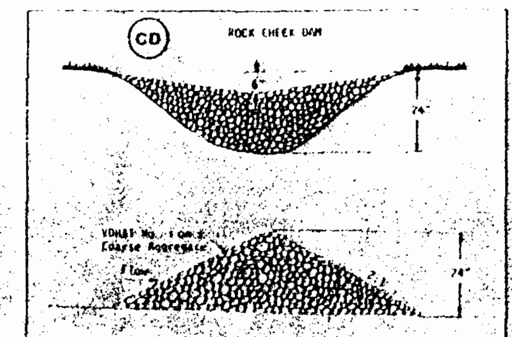
(SF) CONSTRUCTION OF A SILT FENCE

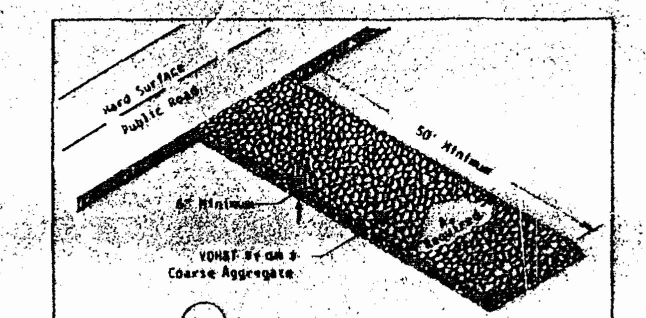


Specific Application

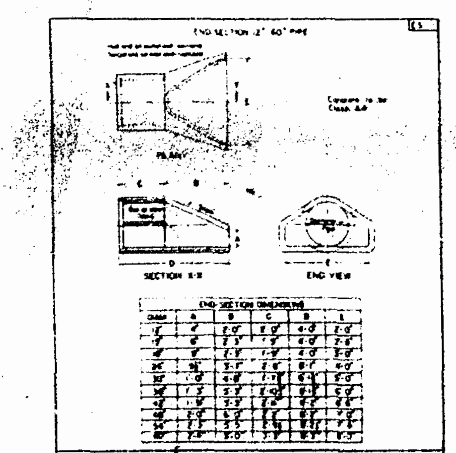
This method of inlet protection is applicable where the inlet drains a relatively flat area (slopes no greater than 5 percent) where sheet or overland flows (not exceeding 0.5 cfs) are typical. The method shall not apply to inlets receiving concentrated flows, such as in street or highway medians.

SILT FENCE DROP INLET SEDIMENT FILTER (IP)





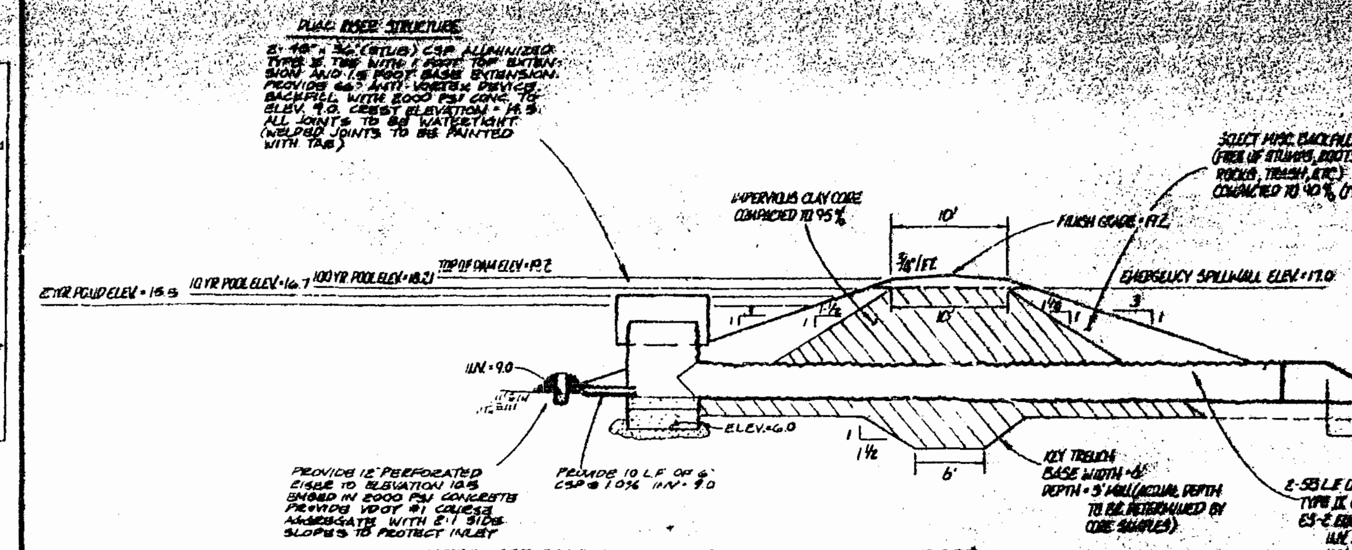
(CE) GRAVEL CONSTRUCTION ENTRANCE



FLARED END-SECTIONS FOR CONCRETE PIPE CULVERTS

ROAD CONSTRUCTION NOTES

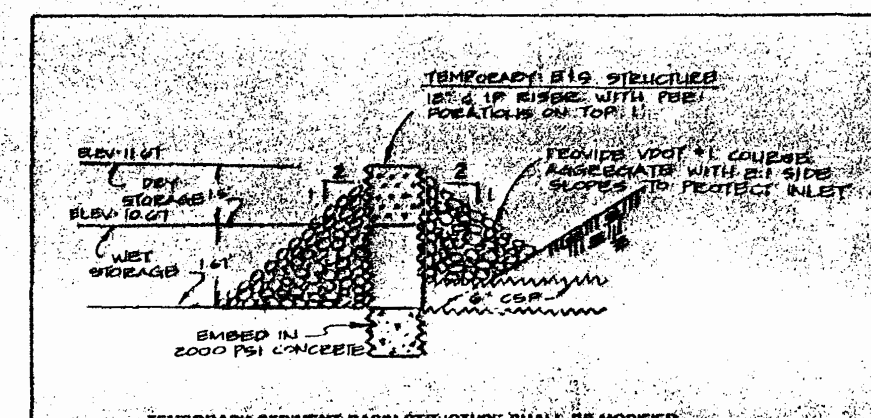
1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]



DAM SECTION A-A

SCALE: 1"=10'

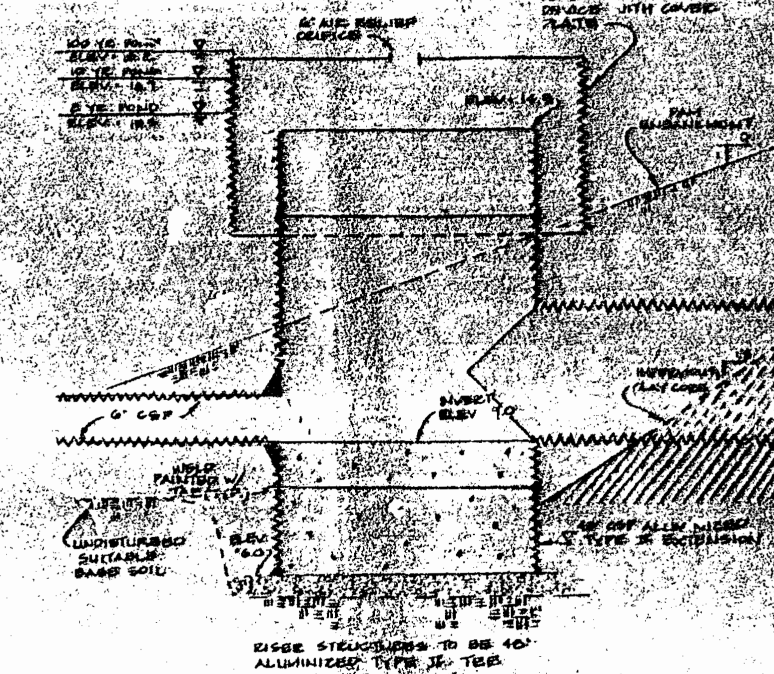
NOTE: SEE DAM CONSTRUCTION NOTES BELOW.



TEMPORARY SEDIMENT BASIN STRUCTURE SHALL BE MODIFIED TO PROVIDE A 12" PERFORATED RISER WITH A CREST OF 10.5' AND NO WET STORAGE UPON STABILIZATION OF DENUDED AREAS WITHIN WATERSHED.

TEMPORARY SEDIMENT BASIN DETAIL

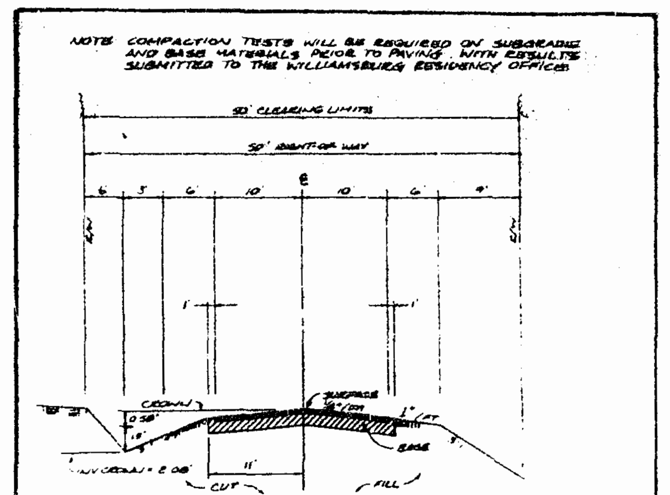
N.T.S.



RISER STRUCTURE DETAIL

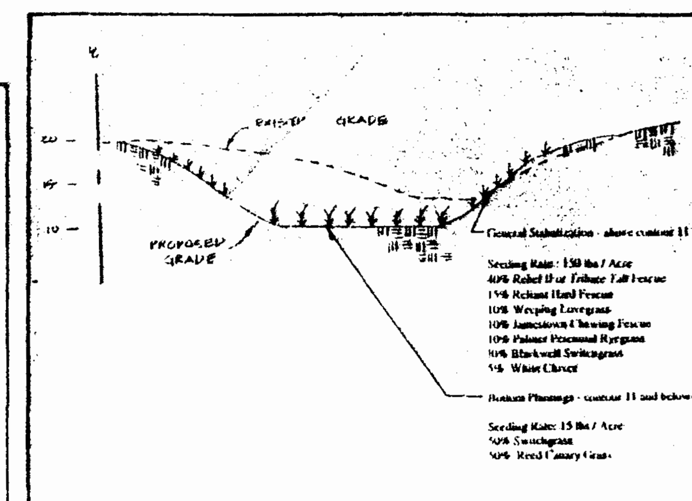
N.T.S.

BEST MANAGEMENT PRACTICE (BMP) POND DETAILS



NOTE: COMPACTION TESTS WILL BE REQUIRED ON SUBGRADE AND BASE MATERIALS PRIOR TO PAVING WITH RESULTS SUBMITTED TO THE WILLIAMSBURG RESIDENCY OFFICE.

TYPICAL ROAD SECTION

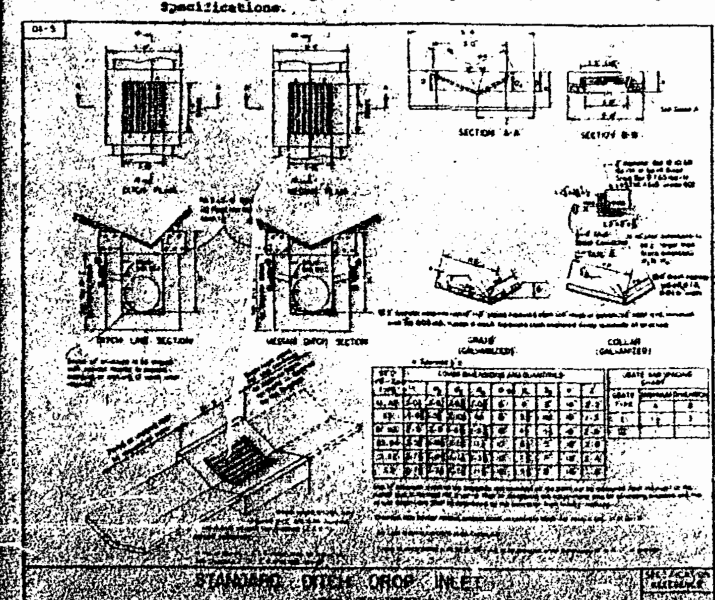


TYPICAL BMP POND SECTION

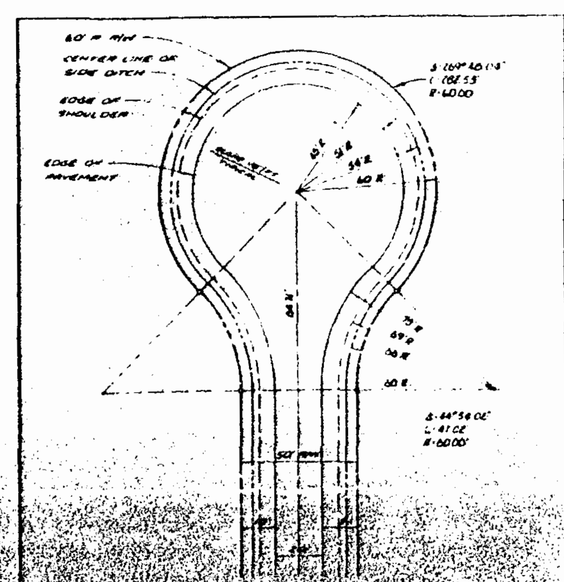
N.T.S.

DAM CONSTRUCTION NOTES

[illegible]

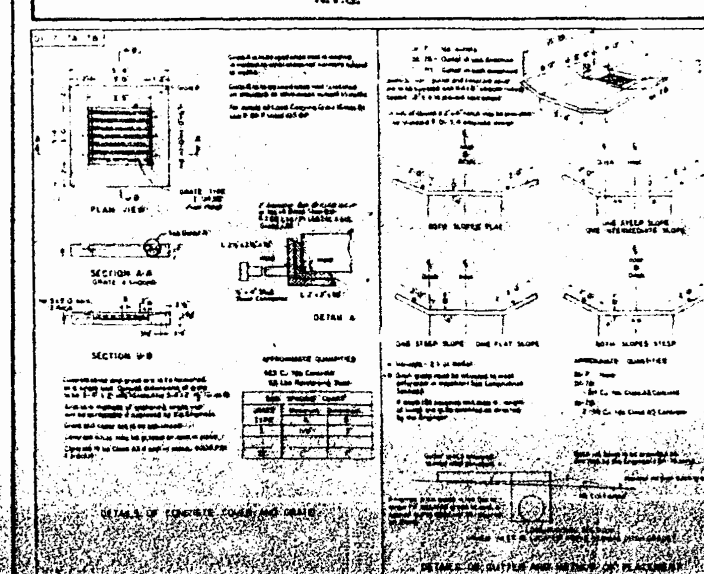


STANDARD DITCH DROP INLET



TYPICAL CUL-DE-SAC DETAIL

NOT TO SCALE



STANDARD MEDIAN DROP INLET

NOTES AND DETAILS
ST. GEORGE'S HUNDRED
SECTION 4, PHASE II

5741 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

9

S-53-93

WILLIAMSBURG
ENVIRONMENTAL
GROUP, INC.

Environmental Consultants

August 24, 1993

Mr. Darryl Cook
Code Compliance
James City County
P.O. Box JC
Williamsburg, Virginia 23187-3627

RE: Saint George's Hundred, Section 5, Phases III and IV
BMP/Sediment Basin Design

Dear Mr. Cook:

As you requested, Williamsburg Environmental Group, Inc. (WEG) has reevaluated the 10-point calculation worksheet to demonstrate that Saint George's Hundred, Section 5, Phases III and IV meet the Chesapeake Bay criteria for James City County. Furthermore, VDOT has requested that the storm sewers associated with the Stormwater Management Plan for the site shall not be submerged below the normal pool of the proposed lake. During an extensive evaluation of these two comments, WEG is recommending that the wet pond BMP be changed to an extended detention design type 2 BMP. By providing this 6 point BMP, the overall Stormwater Management Plan will achieve 15 points due to credit assigned for the treatment of offsite property within the watershed. This design will also allow the storm sewers to be free of permanent backwater inundation. A temporary sediment basin has also been sized for the planned disturbed areas in Phase III and will be implemented by incorporating a temporary modification of the BMP outlet structure.

Several major hydraulic constraints have been considered during BMP design. The most important of these constraints include 10-yr and 100-yr storm elevations. The principal spillway has been designed to prevent the 10-yr storm elevation from exceeding 17.5 feet which will ensure that tailwater conditions do not cause surcharging in upstream inlets. Also, the structure will not allow the 100-yr storm elevation to cause flooding to adjacent homes. Stormwater routings are enclosed along with a revised worksheet for BMP point system, water quality orifice design, and BMP volume calculations (see attachments).

Post-development runoff rates are also typical design constraints for stormwater management structures. Post-development runoff rates to this BMP, however, are not significantly greater than pre-development rates. In order to achieve post-development peak reductions for the 2-yr storm event, approximately 5200 cubic yards of excavation will be required during BMP construction. The design WEG is proposing will result in a post-development increase in peak flow rate of 5 cfs for the 2-yr event. This design, however, will reduce 10-yr and 100-yr post-development storm peaks to below pre-development conditions. This design will require much less excavation and a considerably smaller disturbed area. The increase of 5 cfs during a 2-yr storm event is not expected to significantly impact the receiving waters of Powhatan Creek and WEG feels that this design is more compatible with the proposed development and the environment.

Finally, a temporary sediment basin has been sized for the disturbed areas within the BMP's watershed. Although the *Virginia Erosion and Sediment Control Handbook, Third Edition, 1992* requires a total storage volume of 134 cubic yards per acre of *drainage area*, the handbook also states that the purpose of

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temporary sediment basins *is to detain sediment-laden runoff from disturbed areas*. This sediment basin location is unique because only 5 acres (+-) of disturbance will occur in an 89.8 acre watershed. The current design standards would provide an oversized basin which would require much more excavation and land disturbance than necessary. Therefore, WEG requests an exception to the County's E & S requirements in order to size the sediment basin for the 4.81 acres of disturbed land rather than the 89.8 acres within the watershed.

If you have any questions regarding these issues, please call me or Erik Allen.

Sincerely,

Ronald J. Boyd, P.E.
President

RJB:bw

cc: Steve Wigley, AES

St George's Hundred
BMP Volumes

August 1993

Williamsburg Environmental Group

I Compute Area of Site Treated

Area of Site = 48.16 acres
Area of Watershed Treated = 89.8 acres

Fraction of Site Treated = 89.9/48.16 = 1.87

See Work Sheet For BMP Point System
for BMP points.

II Compute Water Quality Storage Volume For 6 Point BMP.

Impervious Cover of Watershed

	Area (acre)	Imp %	Impervious Area (acre)
1/3 acre lots	32.1	30	9.63
Park	4	60	2.40
Woods onsite	1.3	1	0.01
Woods offsite	6	1	0.06
Cropland offsite	46.4	1	0.46
Entire Watershed	89.8	14	12.57

Rv for 14% impervious cover is .17

A 6 point BMP requires that the first 1" of runoff be detained for 24 hours.

Vol = Rv(Area)(1")(1'/12")(43560ft/acre)
Vol = .17(89.8acres)(1")(1'/12")(43560 ft/acre)
Vol = 55,416 cuft

III Compute Temporary Sediment Basin Volumes

Sizing technique per *Virginia Eriosion and Sediment Control Handbook*

Provide 67 cy per acre Dry Storage
Provide 67 cy per acre Wet Storage

Area Disturbed by R/W and Public Works	3 acre
Area Disturbed by 18 lots (4500 sf/lot)	1.85 acre
Total Disturbed area	4.85 acre
Dry Storage = 67cy(4.85acres)(27cuft/cy)	8774 cuft
Wet Storage = 67cy(4.85acres)(27cuft/cy	8774 cuft
Total Storage	17548 cuft

Worksheet For BMP Point System

St. Georges Hundred
BMP for Phases III and IV

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served By BMP		Weighted BMP Points
Extended Detention	6	x	187%	=	11.22
		x		=	
		x		=	
		x		=	
	TOTAL WEIGHTED BMP POINTS:				**11.22**

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
36%	x	0.10	=	**3.60**

C. TOTAL WEIGHTED POINTS

Structural BMP Points		Natural Open Space Points		
11.22		3.60	=	**15**
				Total

St. Geroges Hundred Stormwater Routings

August 20,1993

Williamsburg Environmental Group

Hydrology

Drainage Area	89.8 acres
Offsite area	52.4 acres
Phases III and IV	23.4 acres
Phases I and II	14 acres
Pre-development	
Time of Concentration	0.98 hrs
SCS Runoff Curve Number	80
2-Yr Peak Discharge	78 cfs
10-yr Peak Discharge	180 cfs
100-yr Development	282 cfs
Pre-development	
Time of Concentration	0.98 hrs
SCS Runoff Curve Number	82
2-Yr Peak Discharge	76 cfs
10-yr Peak Discharge	182 cfs
100-yr Development	285 cfs

Pond Routing Summary

Return Period (yr)	Pre-development Flow (cfs)	Post-development Inflow (cfs)	Post-development Outflow (cfs)	Maximum Stage (ft)
2	78	86	83	15.48
10	180	190	172	16.69
100	282	294	282	18.21

Outlet Structure Description

Two 48" Vertical Standpipes	
Crest Elevation	14.5 ft msl
Two 36" Barrells	
Invert Elevation	9 ft msl
One 6" Water Quality Inlet	
Invert Elevation	9 ft ml
One 20' Wide Trapezoidal Weir	17 ft msl
Crest Elevation	

ORIFICE DESIGN

An orifice will be designed to release the water quality storage volume over a 40 hour perioc

Using the methodology for discharge under a falling head from the
Standard Handbook For Civil Engineers
the following equation was obtained.

t = (2A/Ca(2g)^1/2)((sqrt (h1) - (sqrt(h2))

where

A= area of reservoir	17532	sqft
C= coeficient of discharge	0.6	
a= area of orifice	?	
g= acceleration of gravity	32.2	ft/sec^2
h1= initial head	5.5	ft
h2=head at end	0	ft
t= time to empty the reservoir	24	hrs

Solving the equation for a, the following water quality diameter was obtained
max area 0.197543 sqft
max dia= 0.501518 ft
max dia= 6.018211 in

Therefore we will use a 6" water quality orifice

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:16:54 10-18-1991

Cn for exisitng conditions
includes exisitng residential
exisitng farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	89.80	80

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:16:54 10-18-1991

Cn for exisitng conditions
includes exisitng residential
exisitng farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
Residential, 1/3 ac lots	14.00	86	
Woods, good, future residential	22.10	77	
Woods, good	3.50	77	
Row crops and crop residue	25.10	82	
RC&CR	7.50	85	
RC&CR	17.60	75	
COMPOSITE AREA --->	89.80	80.1	(80)

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:17:50 10-18-1991

Cn for proposed conditions
includes future residential
existing farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	89.80	82

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:17:50 10-18-1991

Cn for proposed conditions
includes future residential
existing farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
Residential, 1/3 ac lots	14.00	86	
Future residential	22.10	86	
Woods, good	3.50	77	
Row crops and crop residue	25.10	82	
RC&CR	7.50	85	
RC&CR	17.60	75	
COMPOSITE AREA --->	89.80	82.3	(82)

ick TR-55 Ver.5.44 S/N:1315400034
ecuted: 10:26:38 10-18-1991 c:\lee\stg's100\SGREV-1.TCT

Tc for 87.4acre watershed with flow path on ag and woods side.
Revised using county's watershed interpretation
For Pre- and Post-development conditions.

Tc COMPUTATIONS FOR:

HEET FLOW (Applicable to Tc only)

Segment ID				
Surface description		crops		
Manning's roughness coeff., n			0.1700	
Flow length, L (total < or = 300)		ft	300.0	
Two-yr 24-hr rainfall, P2		in	3.500	
Land slope, s		ft/ft	0.0060	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$		hrs	0.67	= 0.67

HALLOW CONCENTRATED FLOW

Segment ID				
Surface (paved or unpaved)?			Unpaved	
Flow length, L		ft	1600.0	
Watercourse slope, s		ft/ft	0.0080	
$Avg.V = Csf * (s)^{0.5}$		ft/s	1.4431	
where:	Unpaved Csf = 16.1345			
	Paved Csf = 20.3282			
T = L / (3600*V)		hrs	0.31	= 0.31

HANNEL FLOW

Segment ID				
Cross Sectional Flow Area, a		sq.ft	41.00	
Wetted perimeter, Pw		ft	26.00	
Hydraulic radius, r = a/Pw		ft	1.577	
Channel slope, s		ft/ft	0.0100	
Manning's roughness coeff., n			0.0450	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$		ft/s	4.4859	
Flow length, L		ft	0	
T = L / (3600*V)		hrs	0.00	= 0.00

TOTAL TIME (hrs) 0.98

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Tc for 87.4acre watershed with flow path on ag and woods side.
Revised using county's watershed interpretation
For Pre- and Post-development conditions.

Subarea descr.	Tc or Tt	Time (hrs)
	Tc	0.98

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

Pond File: SGHM .PND
Inflow Hydrograph: SGH2 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 9.00 ft

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

Peak Inflow	=	86.00 cfs
Peak Outflow	=	83.49 cfs
Peak Elevation	=	15.48 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.71 ac-ft
Total Storage in Pond	=	1.71 ac-ft

Warning: Inflow hydrograph truncated on left side.

****
* *
* Saint George's Hundred *
* 10-yr Storm *
* *
* *
* *
****

Inflow Hydrograph: SGH10 .HYD
Rating Table file: SGHM .PND

----INITIAL CONDITIONS----
Elevation = 9.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
9.00	0.0	0.000	0.0	0.0
9.50	0.4	0.007	1.7	2.1
10.00	0.8	0.057	13.9	14.7
10.50	1.1	0.148	35.8	36.9
11.00	1.3	0.248	60.1	61.4
11.50	1.4	0.359	86.9	88.3
12.00	1.6	0.481	116.3	117.9
12.50	1.8	0.614	148.6	150.4
13.00	1.9	0.761	184.1	186.0
13.50	2.0	0.921	222.9	224.9
14.00	2.1	1.096	265.2	267.3
14.50	2.2	1.287	311.4	313.6
15.00	31.9	1.496	362.1	394.0
15.50	86.1	1.725	417.3	503.4
16.00	150.8	1.973	477.4	628.2
16.50	169.0	2.241	542.2	711.2
17.00	176.3	2.527	611.6	787.9
17.50	207.1	2.834	685.8	892.9
18.00	256.5	3.161	764.9	1021.4
18.50	317.7	3.518	851.5	1169.2
19.00	388.1	3.918	948.1	1336.2
19.50	466.6	4.362	1055.5	1522.1
20.00	287.0	4.852	1174.2	1461.2

Time increment (t) = 0.100 hrs.

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

Pond File: SGHM .PND
Inflow Hydrograph: SGH10 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 9.00 ft

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

Peak Inflow	=	190.00 cfs
Peak Outflow	=	171.81 cfs
Peak Elevation	=	16.69 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	2.35 ac-ft
Total Storage in Pond	=	2.35 ac-ft

Warning: Inflow hydrograph truncated on left side.

****
* *
* Saint George's Hundred *
* 100-yr Storm *
* *
* *
* *
****

Inflow Hydrograph: SGH100 .HYD
Rating Table file: SGHM .PND

----INITIAL CONDITIONS----
Elevation = 9.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
9.00	0.0	0.000	0.0	0.0
9.50	0.4	0.007	1.7	2.1
10.00	0.8	0.057	13.9	14.7
10.50	1.1	0.148	35.8	36.9
11.00	1.3	0.248	60.1	61.4
11.50	1.4	0.359	86.9	88.3
12.00	1.6	0.481	116.3	117.9
12.50	1.8	0.614	148.6	150.4
13.00	1.9	0.761	184.1	186.0
13.50	2.0	0.921	222.9	224.9
14.00	2.1	1.096	265.2	267.3
14.50	2.2	1.287	311.4	313.6
15.00	31.9	1.496	362.1	394.0
15.50	86.1	1.725	417.3	503.4
16.00	150.8	1.973	477.4	628.2
16.50	169.0	2.241	542.2	711.2
17.00	176.3	2.527	611.6	787.9
17.50	207.1	2.834	685.8	892.9
18.00	256.5	3.161	764.9	1021.4
18.50	317.7	3.518	851.5	1169.2
19.00	388.1	3.918	948.1	1336.2
19.50	466.6	4.362	1055.5	1522.1
20.00	287.0	4.852	1174.2	1461.2

Time increment (t) = 0.100 hrs.

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

Pond File: SGHM .PND
Inflow Hydrograph: SGH100 .HYD
Outflow Hydrograph: OUT .HYD

Starting Pond W.S. Elevation = 9.00 ft

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

Peak Inflow	=	294.00 cfs
Peak Outflow	=	282.32 cfs
Peak Elevation	=	18.21 ft DHW

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	3.31 ac-ft
Total Storage in Pond	=	3.31 ac-ft

Warning: Inflow hydrograph truncated on left side.

DETENTION POND CALCULATIONS

SUBMITTED 11-12-91

Memorandum

Data: October 21, 1991
To: Steve Wigley
From: Ron Boyd
Re: St. George's Hundred BMP Design,
Response to James City County Comments

In response to James City County comments, you requested that WEG provide additional support documentation concerning the calculations of the runoff curve numbers, time of concentration, and the 2-, 10- and 100-year storm routing information.

Attached are the design summary data and the computer printouts for the requested information. Alterations in the design summary include:

- revision for existing conditions to make drainage areas consistent
- finalization of the pond storage volume with the safety bench

The computer printouts include:

- the runoff curve numbers (CN) for pre- and post-development conditions
- the time of concentration (Tc) data.
  Note: The Tc is the same for pre- and post-development conditions since the undeveloped offsite area has the longest flow path.
- pond routing data for the 2-, 10-, and 100-year storms

One issue which we have discussed is the size of the outlet structure: whether to use one large pipe or two smaller pipes through the dam. Twin 48 inch pipes connected by a box to the 72 inch standpipe appears to be the most practical design since the large pipe may prove to be too large to be practical.

If you have any questions regarding the attached data or you require additional information from WEG concerning the proposed BMP design, please let me know and we will provide it to you for submittal to the County.

Hydrology

Drainage Area	89.8 acres
Offsite area	52.4
Phases III and IV	23.4
Phases I and II	14.0
Pre-Development	
Time of Concentration	0.98
SCS Runoff Curve Number	80
2-Yr Peak Discharge	78 cfs
10-yr Peak Discharge	180 cfs
100-yr Peak Discharge	282 cfs
Post-Development	
Time of Concentration	0.98
SCS Runoff Curve Number	82
2-Yr Peak Discharge	86 ~~78~~ cfs
10-yr Peak Discharge	190 ~~182~~ cfs
100-yr Peak Discharge	294 ~~285~~ cfs

BMP Design- Wet Pond

Impervious Cover	8.03 acres or 8.9%
Rv	0.13
Required BMP Wet Storage Volume (Wet pond Design 7)	84,681 cu ft
Normal Pool	
Elevation	14.5 ft msl
Volume	89,295 cu ft — 162,448 for sed storage
Total Volume with Detention Storage	232,612 cu ft 324,896 for total storage
Top of Embankment	19.2 ft msl
Outlet Structure	One 72-inch vertical standpipe
	Crest elevation 16.3 ft msl
	72-inch horizontal notch
	Crest elevation 14.5 ft msl
	20-ft emergency spillway
	Crest elevation 17.7 ft msl

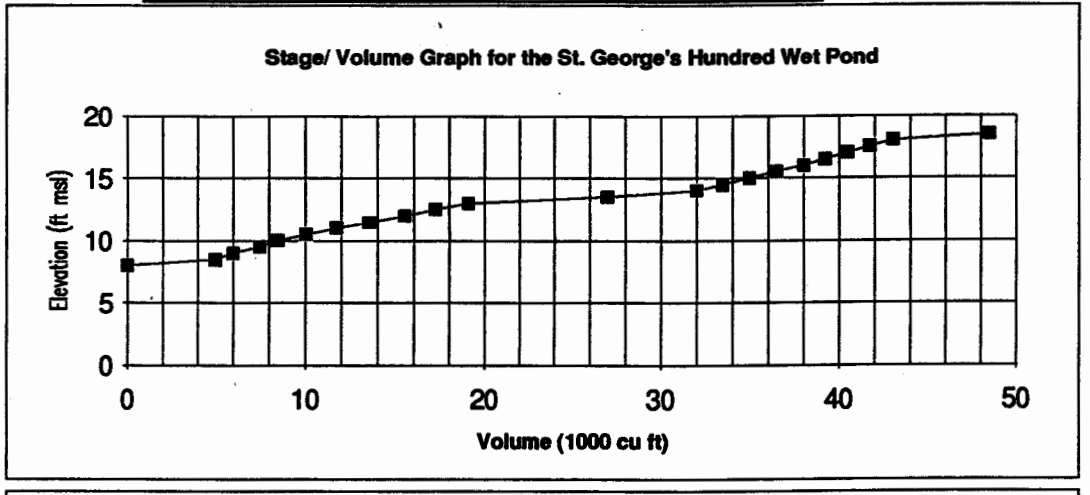
Pond Routing Summary

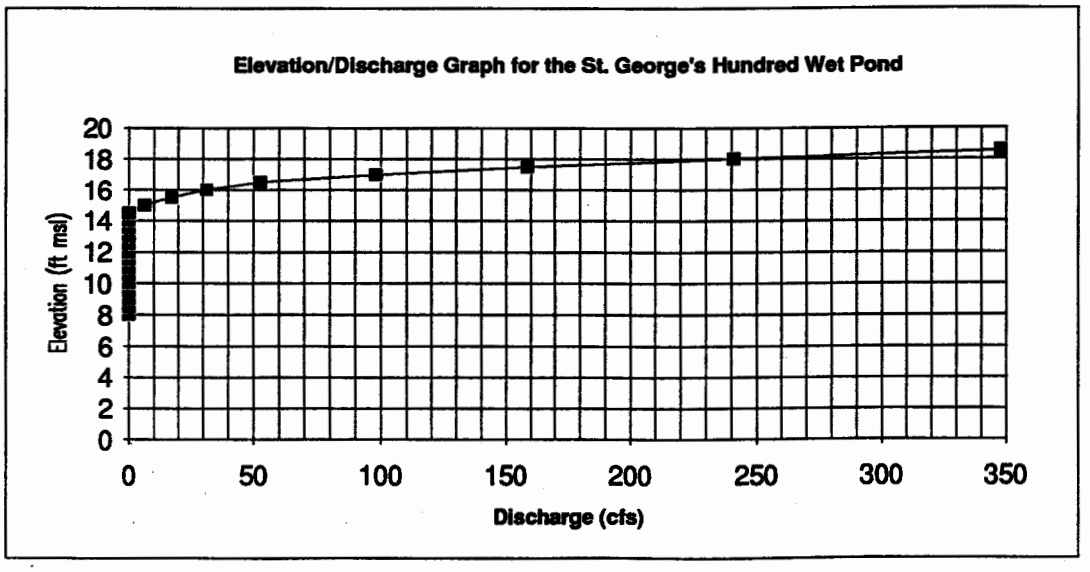
Return Periods (yr)	Peak Inflow (cfs)	Peak Ouflow (cfs)	Maximum Stage (ft msl)
2	86	77	16.8
10	190	182	17.6
100	294	285	18.2

St. George's Hundred - BMP Specifications

18-Oct-91

Elevation (ft msl)	Area (sq ft)	Volume (cu ft)	Discharge (cfs)
8.0	0	0	0
8.5	5000	833	0
9.0	6000	3580	0
9.5	7,500	6,948	0
10.0	8,500	10,945	0
10.5	10,054	15,578	0
11.0	11,739	21,021	0
11.5	13,554	27,339	0
12.0	15,500	34,597	0
12.5	17,246	42,780	0
13.0	19,084	51,858	0
13.5	21,016	61,880	0
14.0	32,000	72,934	0
14.5	33,452	89,295	0
15.0	34,936	106,391	6.3
15.5	36,452	124,236	17.4
16.0	38,000	142,848	31.4
16.5	39,221	162,153	52.6
17.0	40,461	182,072	98.3
17.5	41,721	202,617	158.5
18.0	43,000	223,796	240.9
18.5	48,500	246,658	347.8





Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:16:54 10-18-1991

Cn for exisitng conditions
includes exisitng residential
exisitng farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	89.80	80

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:16:54 10-18-1991

Cn for exisitng conditions
includes exisitng residential
exisitng farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
Residential, 1/3 ac lots	14.00	86	
Woods, good, future residential	22.10	77	
Woods, good	3.50	77	
Row crops and crop residue	25.10	82	
RC&CR	7.50	85	
RC&CR	17.60	75	
COMPOSITE AREA --->	89.80	80.1	(80)

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:17:50 10-18-1991

Cn for proposed conditions
includes future residential
existing farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	89.80	82

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:17:50 10-18-1991

Cn for proposed conditions
includes future residential
existing farming and woods
using county watershed interpretation

RUNOFF CURVE NUMBER DATA

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
Residential, 1/3 ac lots	14.00	86	
Future residential	22.10	86	
Woods, good	3.50	77	
Row crops and crop residue	25.10	82	
RC&CR	7.50	85	
RC&CR	17.60	75	
COMPOSITE AREA --->	89.80	82.3	(82)

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:26:38 10-18-1991 c:\lee\stg's100\SGREV-1.TCT

Tc for 87.4acre watershed with flow path on ag and woods side.
Revised using county's watershed interpretation
For Pre- and Post-development conditions.

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID				
Surface description		crops		
Manning's roughness coeff., n			0.1700	
Flow length, L (total < or = 300)		ft	300.0	
Two-yr 24-hr rainfall, P2		in	3.500	
Land slope, s		ft/ft	0.0060	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$		hrs	0.67	= 0.67

SHALLOW CONCENTRATED FLOW

Segment ID				
Surface (paved or unpaved)?			Unpaved	
Flow length, L		ft	1600.0	
Watercourse slope, s		ft/ft	0.0080	
$Avg.V = Csf * (s)^{0.5}$		ft/s	1.4431	
where:	Unpaved Csf = 16.1345			
	Paved Csf = 20.3282			
T = L / (3600*V)		hrs	0.31	= 0.31

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	41.00	
Wetted perimeter, Pw	ft	26.00	
Hydraulic radius, r = a/Pw	ft	1.577	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0450	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	4.4859	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

TOTAL TIME (hrs) 0.98

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 10:26:38 10-18-1991 c:\lee\stg's100\SGREV-1.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Tc for 87.4acre watershed with flow path on ag and woods side.
Revised using county's watershed interpretation
For Pre- and Post-development conditions.

Subarea descr.	Tc or Tt	Time (hrs)
	Tc	0.98

****
*
* using revised volume file for larger pond *
* using revised watershed area from county input *
*
*
*
****

Inflow Hydrograph: c:\lee\stg's100\SGRP2-O .HYD
Rating Table file: c:\lee\stg's100\SGREV-1 .PND

----INITIAL CONDITIONS----
Elevation = 14.50 ft
Outflow = 0.00 cfs
Storage = 89,295 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
8.00	0.0	0	0.0	0.0
8.50	0.0	833	4.6	4.6
9.00	0.0	3,579	19.9	19.9
9.50	0.0	6,947	38.6	38.6
10.00	0.0	10,945	60.8	60.8
10.50	0.0	15,578	86.5	86.5
11.00	0.0	21,021	116.8	116.8
11.50	0.0	27,339	151.9	151.9
12.00	0.0	34,597	192.2	192.2
12.50	0.0	42,780	237.7	237.7
13.00	0.0	51,858	288.1	288.1
13.50	0.0	61,880	343.8	343.8
14.00	0.0	72,934	405.2	405.2
14.50	0.0	89,295	496.1	496.1
15.00	6.3	106,391	591.1	597.4
15.50	17.4	124,236	690.2	707.6
16.00	31.4	142,848	793.6	825.0
16.50	52.6	162,153	900.8	953.4
17.00	98.3	182,072	1011.5	1109.8
17.50	158.5	202,617	1125.7	1284.2
18.00	240.9	223,796	1243.3	1484.2
18.50	347.8	246,658	1370.3	1718.1
19.00	463.3	271,777	1509.9	1973.2
19.50	577.2	298,524	1658.5	2235.7
20.00	690.0	326,771	1815.4	2505.4

Time increment (t) = 0.100 hrs.

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

Pond File: c:\lee\stg's100\SGREV-1 .PND
Inflow Hydrograph: c:\lee\stg's100\SGRP2-O .HYD
Outflow Hydrograph: c:\lee\stg's100\SG2-O .HYD

Starting Pond W.S. Elevation = 14.50 ft

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

Peak Inflow	=	86.00 cfs
Peak Outflow	=	76.70 cfs
Peak Elevation	=	16.76 ft

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

Initial Storage	=	89,295 cu-ft
Peak Storage From Storm	=	83,360 cu-ft
Total Storage in Pond	=	172,655 cu-ft

Warning: Inflow hydrograph truncated on left side.

POND-2 Version: 5.15 S/N: 1295100016

2YR. STORM INFLOW HYDROGRAPH

>>>>> HYDROGRAPH PRINTOUT <<<<<

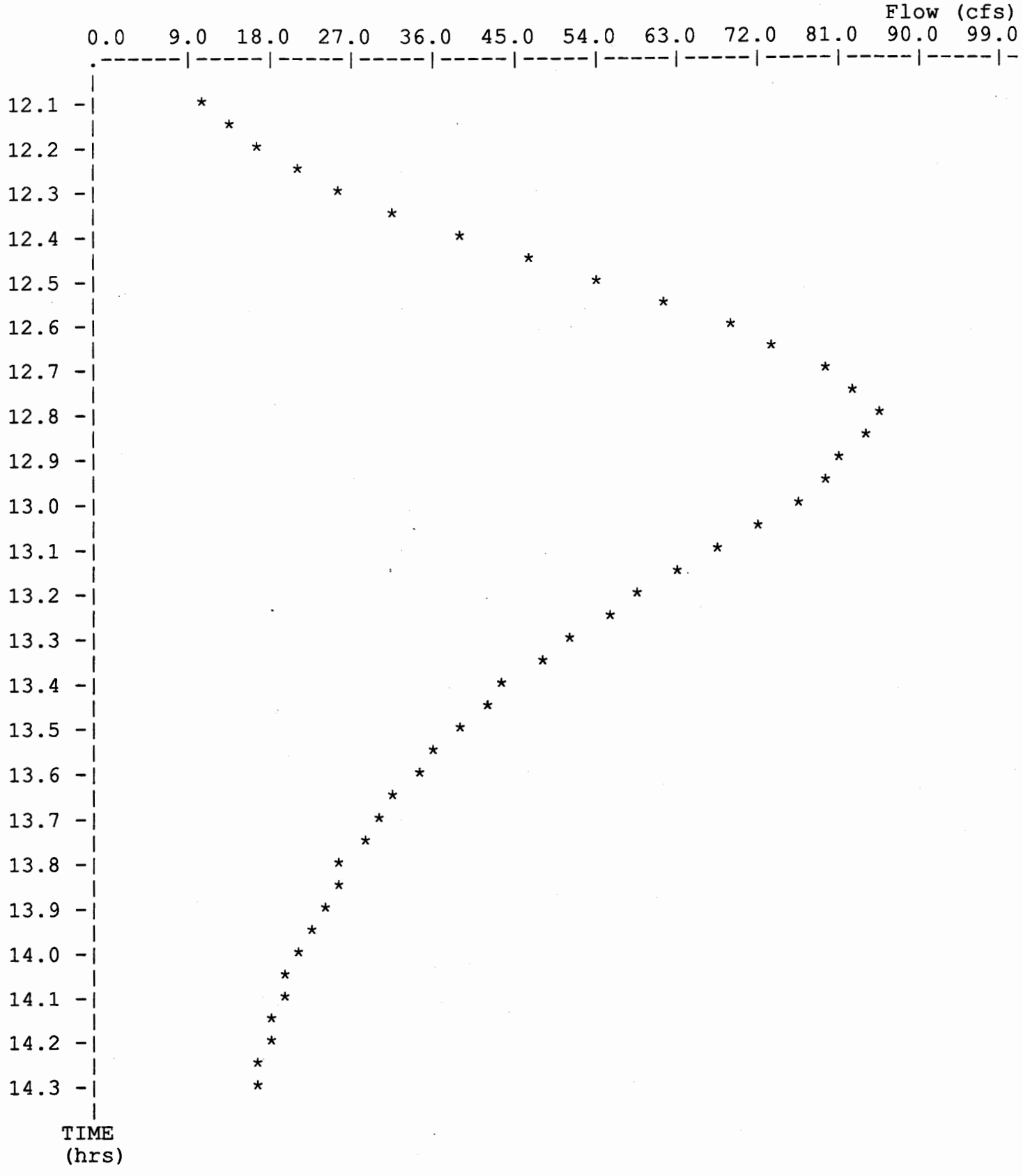
11-22-1991 17:06:33

Hydrograph file: c:\jobfiles\pondpkf1\stg's100\SGRP2-O .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
11.000	2.00	2.00	3.00	3.00	3.00	4.00	4.00
11.700	5.00	5.00	6.00	7.00	10.00	16.00	25.00
12.400	39.00	54.00	69.00	79.00	86.00	81.00	77.00
13.100	68.00	59.00	51.00	44.00	39.00	34.00	30.00
13.800	26.00	24.00	21.00	19.00	18.00	16.00	15.00
14.500	14.00	13.00	12.00	12.00	12.00	11.00	11.00
15.200	10.00	10.00	9.00	9.00	9.00	9.00	8.00
15.900	8.00	8.00	8.00	8.00	7.00	7.00	7.00
16.600	7.00	7.00	6.00	6.00	6.00	6.00	6.00
17.300	6.00	6.00	6.00	6.00	6.00	5.00	5.00
18.000	5.00	5.00	5.00	5.00	5.00	5.00	5.00
18.700	5.00	5.00	5.00	5.00	5.00	5.00	5.00
19.400	5.00	4.00	4.00	4.00	4.00	4.00	4.00
20.100	4.00	4.00	4.00	4.00	4.00	4.00	4.00
20.800	4.00	4.00	4.00	3.00	3.00	3.00	3.00
21.500	3.00	3.00	3.00	3.00	3.00	3.00	3.00
22.200	3.00	3.00	3.00	3.00	3.00	2.00	2.00
22.900	2.00	2.00	2.00	2.00	2.00	2.00	2.00
23.600	2.00	2.00	2.00	2.00	2.00	1.00	1.00
24.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25.000	1.00	1.00	1.00	1.00	0.00	0.00	0.00
25.700	0.00	0.00	0.00				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-22-1991



* File: c:\jobfiles\pondpkfl\stg's100\SGRP2-O .HYD Qmax = 86.0 cfs

POND-2 Version: 5.15 S/N: 1295100016

2 YR. STORM OUTFLOW HYDROGRAPH

>>>>> HYDROGRAPH PRINTOUT <<<<<

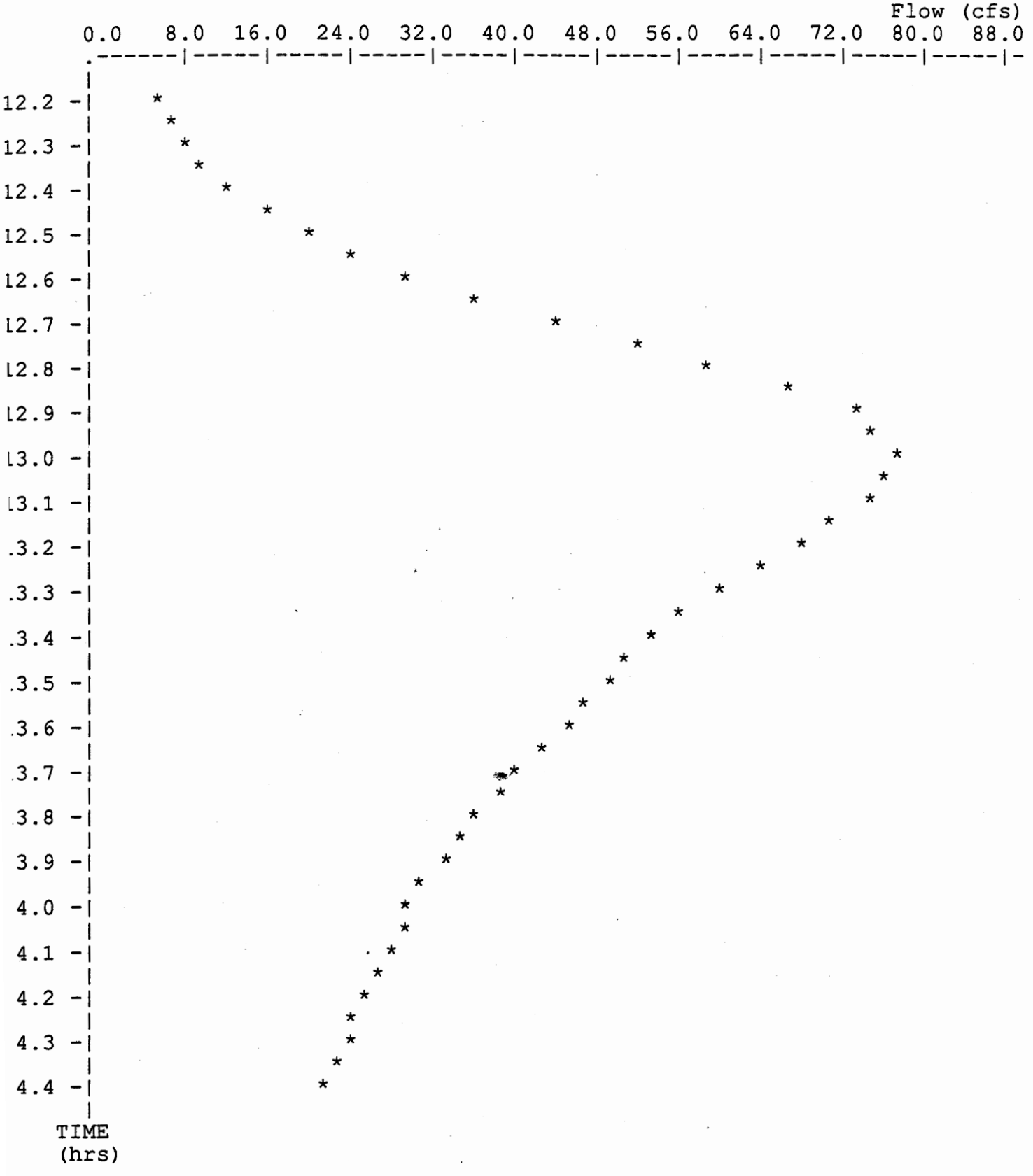
11-20-1991 15:10:39

Hydrograph file: c:\jobfiles\pondpkf1\stg's100\SG2-O .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
11.000	0.00	0.25	0.53	0.84	1.11	1.40	1.73
11.700	2.07	2.44	2.82	3.28	3.93	5.05	7.39
12.400	12.35	19.56	29.57	43.53	59.32	73.45	76.70
13.100	74.24	67.96	60.39	52.85	49.00	44.87	40.62
13.800	36.46	32.67	29.89	27.53	25.38	23.38	21.50
14.500	19.83	18.32	17.01	16.00	15.19	14.45	13.75
15.200	13.10	12.48	11.88	11.30	10.83	10.46	10.07
15.900	9.65	9.32	9.05	8.84	8.57	8.26	8.00
16.600	7.80	7.64	7.41	7.13	6.90	6.72	6.57
17.300	6.46	6.37	6.30	6.26	6.23	6.14	5.99
18.000	5.87	5.76	5.67	5.58	5.51	5.45	5.39
18.700	5.34	5.30	5.26	5.23	5.20	5.18	5.15
19.400	5.14	5.06	4.93	4.81	4.71	4.62	4.54
20.100	4.48	4.42	4.36	4.32	4.28	4.24	4.21
20.800	4.19	4.16	4.14	4.06	3.93	3.82	3.71
21.500	3.63	3.55	3.48	3.42	3.37	3.32	3.28
22.200	3.25	3.22	3.19	3.17	3.15	3.06	2.93
22.900	2.82	2.71	2.63	2.55	2.48	2.42	2.37
23.600	2.32	2.28	2.25	2.22	2.19	2.10	1.97
24.300	1.85	1.74	1.65	1.57	1.50	1.44	1.38
25.000	1.33	1.29	1.26	1.22	1.13	0.99	0.87
25.700	0.76	0.67	0.58				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-20-1991



* File: c:\jobfiles\pondpkfl\stg's100\SG2-O .HYD Qmax = 76.7 cfs

```
**********************************************************
*                                                        *
*     using revised volume file for larger pond          *
*  using revised watershed area from county input        *
*                                                        *
*                                                        *
*                                                        *
**********************************************************
```

Inflow Hydrograph: c:\lee\stg's100\SGRP10-O.HYD
Rating Table file: c:\lee\stg's100\SGREV-1 .PND

----INITIAL CONDITIONS----
Elevation = 14.50 ft
Outflow = 0.00 cfs
Storage = 89,295 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
8.00	0.0	0	0.0	0.0
8.50	0.0	833	4.6	4.6
9.00	0.0	3,579	19.9	19.9
9.50	0.0	6,947	38.6	38.6
10.00	0.0	10,945	60.8	60.8
10.50	0.0	15,578	86.5	86.5
11.00	0.0	21,021	116.8	116.8
11.50	0.0	27,339	151.9	151.9
12.00	0.0	34,597	192.2	192.2
12.50	0.0	42,780	237.7	237.7
13.00	0.0	51,858	288.1	288.1
13.50	0.0	61,880	343.8	343.8
14.00	0.0	72,934	405.2	405.2
14.50	0.0	89,295	496.1	496.1
15.00	6.3	106,391	591.1	597.4
15.50	17.4	124,236	690.2	707.6
16.00	31.4	142,848	793.6	825.0
16.50	52.6	162,153	900.8	953.4
17.00	98.3	182,072	1011.5	1109.8
17.50	158.5	202,617	1125.7	1284.2
18.00	240.9	223,796	1243.3	1484.2
18.50	347.8	246,658	1370.3	1718.1
19.00	463.3	271,777	1509.9	1973.2
19.50	577.2	298,524	1658.5	2235.7
20.00	690.0	326,771	1815.4	2505.4

Time increment (t) = 0.100 hrs.

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

Pond File: c:\lee\stg's100\SGREV-1 .PND
Inflow Hydrograph: c:\lee\stg's100\SGRP10-O.HYD
Outflow Hydrograph: c:\lee\stg's100\SG10-O .HYD

Starting Pond W.S. Elevation = 14.50 ft

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

Peak Inflow	=	190.00 cfs
Peak Outflow	=	182.29 cfs
Peak Elevation	=	17.64 ft

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

Initial Storage	=	89,295 cu-ft
Peak Storage From Storm	=	119,437 cu-ft
Total Storage in Pond	=	208,733 cu-ft

Warning: Inflow hydrograph truncated on left side.

10YR. STORM
INFLOW
HYDROGRAPH

POND-2 Version: 5.15 S/N: 1295100016

>>>>> HYDROGRAPH PRINTOUT <<<<<

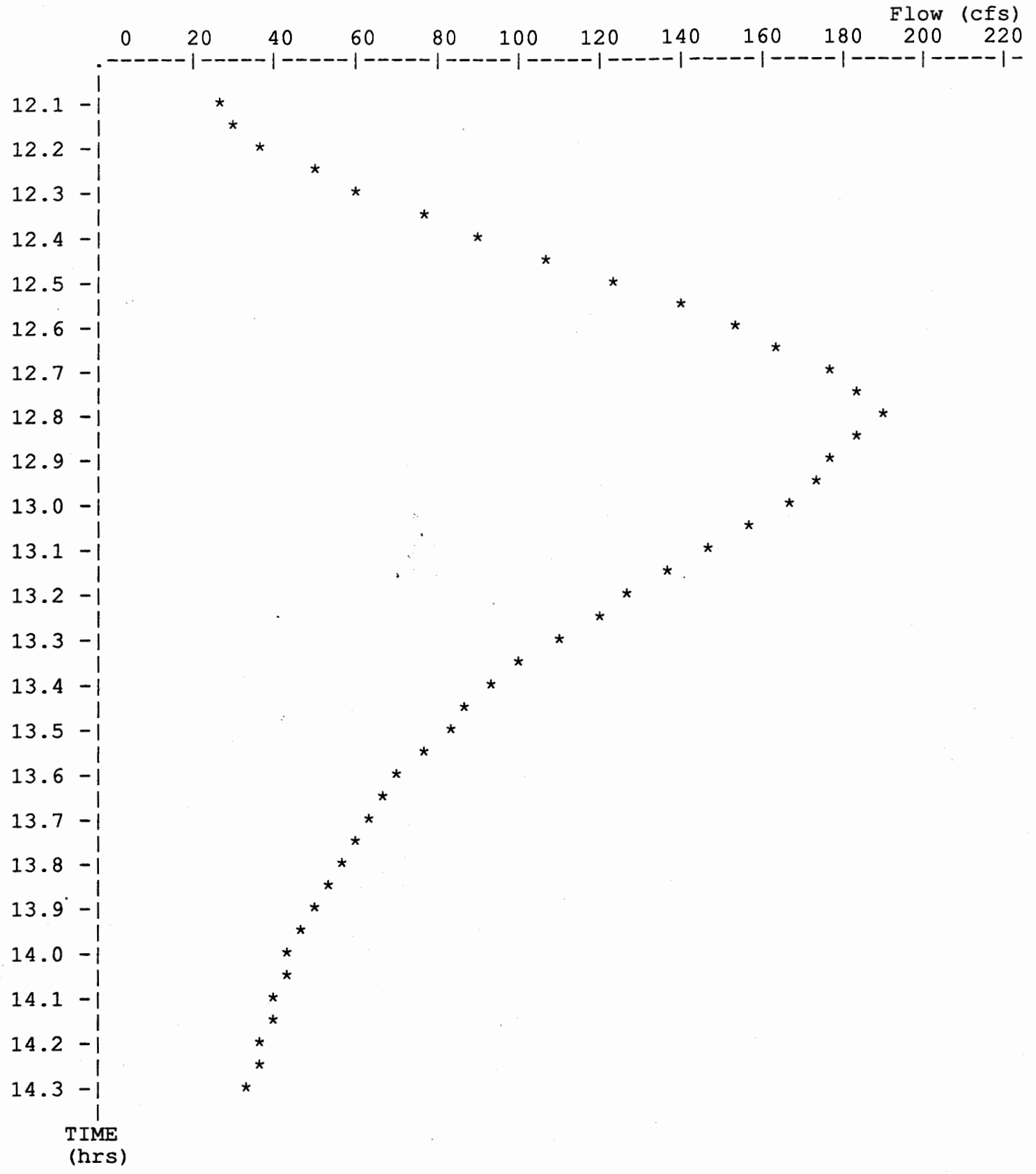
11-22-1991 17:07:02

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SGRP10-O.HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
11.000	6.00	7.00	7.00	8.00	9.00	10.00	11.00
11.700	12.00	14.00	15.00	19.00	25.00	38.00	60.00
12.400	90.00	123.00	154.00	175.00	190.00	178.00	167.00
13.100	147.00	127.00	110.00	93.00	82.00	71.00	63.00
13.800	55.00	50.00	44.00	41.00	37.00	34.00	32.00
14.500	29.00	27.00	26.00	24.00	22.00	21.00	20.00
15.200	20.00	19.00	19.00	18.00	17.00	17.00	16.00
15.900	16.00	15.00	15.00	15.00	14.00	14.00	14.00
16.600	14.00	13.00	13.00	12.00	12.00	12.00	12.00
17.300	11.00	11.00	11.00	11.00	11.00	11.00	11.00
18.000	11.00	11.00	11.00	10.00	10.00	10.00	10.00
18.700	10.00	9.00	9.00	9.00	9.00	9.00	9.00
19.400	9.00	8.00	8.00	8.00	8.00	8.00	8.00
20.100	8.00	8.00	8.00	8.00	8.00	7.00	7.00
20.800	7.00	7.00	7.00	7.00	7.00	7.00	7.00
21.500	6.00	6.00	6.00	6.00	6.00	6.00	6.00
22.200	6.00	6.00	5.00	5.00	5.00	5.00	5.00
22.900	5.00	4.00	4.00	4.00	4.00	4.00	4.00
23.600	4.00	3.00	3.00	3.00	3.00	3.00	3.00
24.300	3.00	2.00	2.00	2.00	2.00	2.00	2.00
25.000	2.00	1.00	1.00	1.00	1.00	1.00	1.00
25.700	0.00	0.00	0.00				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-22-1991



* File: c:\jobfiles\pondpkfl\stg's100\SGRP10-O.HYD Qmax = 190.0 cfs

POND-2 Version: 5.15 S/N: 1295100016

10 YR. STORM OUTFLOW HYDROGRAPH

>>>>> HYDROGRAPH PRINTOUT <<<<<

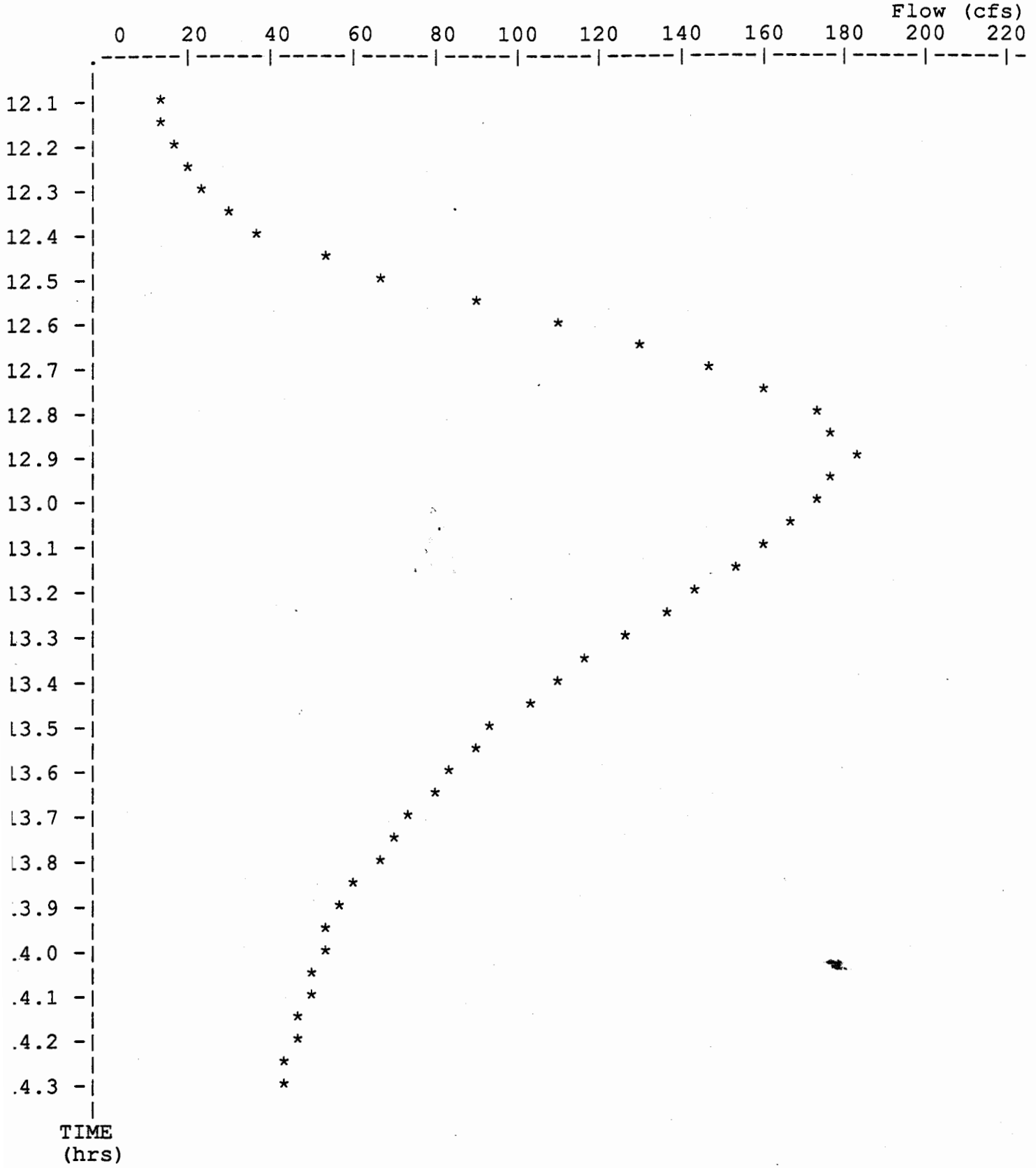
11-20-1991 15:11:07

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SG10-O .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
11.000	0.00	0.81	1.58	2.32	3.09	3.88	4.71
11.700	5.55	6.59	8.18	9.96	12.38	16.23	23.83
12.400	37.82	66.57	110.49	147.79	174.32	182.29	174.23
13.100	160.04	143.88	126.35	109.19	94.84	84.12	74.11
13.800	65.28	57.81	51.97	48.85	45.60	42.26	39.21
14.500	36.33	33.58	31.29	29.79	28.17	26.58	25.13
15.200	23.91	22.85	21.94	21.12	20.25	19.48	18.77
15.900	18.11	17.49	16.97	16.57	16.16	15.72	15.38
16.600	15.10	14.78	14.42	14.03	13.62	13.30	13.04
17.300	12.73	12.38	12.10	11.88	11.70	11.56	11.45
18.000	11.36	11.29	11.23	11.08	10.86	10.69	10.55
18.700	10.44	10.25	10.00	9.80	9.64	9.51	9.41
19.400	9.32	9.16	8.93	8.74	8.59	8.47	8.38
20.100	8.30	8.24	8.19	8.15	8.12	8.00	7.80
20.800	7.64	7.51	7.41	7.32	7.26	7.21	7.16
21.500	7.03	6.82	6.66	6.53	6.42	6.33	6.28
22.200	6.25	6.21	6.13	5.99	5.86	5.76	5.66
22.900	5.58	5.45	5.27	5.11	4.97	4.85	4.74
23.600	4.65	4.51	4.32	4.16	4.01	3.89	3.78
24.300	3.68	3.53	3.34	3.18	3.03	2.90	2.79
25.000	2.69	2.54	2.35	2.18	2.04	1.91	1.79
25.700	1.63	1.43	1.25				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-20-1991



* File: c:\jobfiles\pondpkfl\stg's100\SG10-O .HYD Qmax = 182.3 cfs

```
**********************************************************
*                                                        *
*     using revised volume file for larger pond          *
*  using revised watershed area from county input        *
*                                                        *
*                                                        *
*                                                        *
**********************************************************
```

Inflow Hydrograph: c:\lee\stg's100\SGRP100O.HYD
Rating Table file: c:\lee\stg's100\SGREV-1 .PND

----INITIAL CONDITIONS----
Elevation = 14.50 ft
Outflow = 0.00 cfs
Storage = 89,295 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
8.00	0.0	0	0.0	0.0
8.50	0.0	833	4.6	4.6
9.00	0.0	3,579	19.9	19.9
9.50	0.0	6,947	38.6	38.6
10.00	0.0	10,945	60.8	60.8
10.50	0.0	15,578	86.5	86.5
11.00	0.0	21,021	116.8	116.8
11.50	0.0	27,339	151.9	151.9
12.00	0.0	34,597	192.2	192.2
12.50	0.0	42,780	237.7	237.7
13.00	0.0	51,858	288.1	288.1
13.50	0.0	61,880	343.8	343.8
14.00	0.0	72,934	405.2	405.2
14.50	0.0	89,295	496.1	496.1
15.00	6.3	106,391	591.1	597.4
15.50	17.4	124,236	690.2	707.6
16.00	31.4	142,848	793.6	825.0
16.50	52.6	162,153	900.8	953.4
17.00	98.3	182,072	1011.5	1109.8
17.50	158.5	202,617	1125.7	1284.2
18.00	240.9	223,796	1243.3	1484.2
18.50	347.8	246,658	1370.3	1718.1
19.00	463.3	271,777	1509.9	1973.2
19.50	577.2	298,524	1658.5	2235.7
20.00	690.0	326,771	1815.4	2505.4

Time increment (t) = 0.100 hrs.

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

Pond File: c:\lee\stg's100\SGREV-1 .POND
Inflow Hydrograph: c:\lee\stg's100\SGRP100O.HYD
Outflow Hydrograph: c:\lee\stg's100\SG100-O .HYD

Starting Pond W.S. Elevation = 14.50 ft

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

Peak Inflow	=	294.00 cfs
Peak Outflow	=	284.50 cfs
Peak Elevation	=	18.20 ft

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

Initial Storage	=	89,295 cu-ft
Peak Storage From Storm	=	143,826 cu-ft
Total Storage in Pond	=	233,121 cu-ft

Warning: Inflow hydrograph truncated on left side.

ANTI-SEEP COLLAR DESIGN

16. Depth of water at principal spillway crest (Y) = 6 ft.

    Slope of upstream face of embankment (Z) = 3 :1

    Slope of principal spillway barrel (S_B) = 1.38 %

    Length of barrel in saturated zone (L_s) = 44 ft.
    (From Plate 1.26k, page III-81)

17. Number of collars req'd = 2 dimensions = 8.25' x 8.25'
    (From Plate 1.26l, page III-82)

Elevation (ft msl)	Area (sq ft)	Volume (cu ft)	Discharge (cfs)
8.0	0	0	0
8.5	5000	833	0
9.0	6000	3580	0
9.5	7,500	6,948	0
10.0	8,500	10,945	0
10.5	10,054	15,578	0
11.0	11,739	21,021	0
11.5	13,554	27,339	0
12.0	15,500	34,597	0
12.5	17,253	42,780	0
13.0	19,099	51,858	0
13.5	27,000	61,880	0
14.0	32,000	76,658	0
14.5	33,452	93,019	0
15.0	34,936	110,115	6.3
15.5	36,452	127,960	17.4
16.0	38,000	146,572	31.4
16.5	39,221	165,876	52.6
17.0	40,461	185,796	98.3
17.5	41,721	206,341	158.5
18.0	43,000	227,520	240.9
18.5	48,500	250,382	347.8

72" Barrel 60" Barrel 72" Riser

15.5 - 4'H 274 184 1 - 56

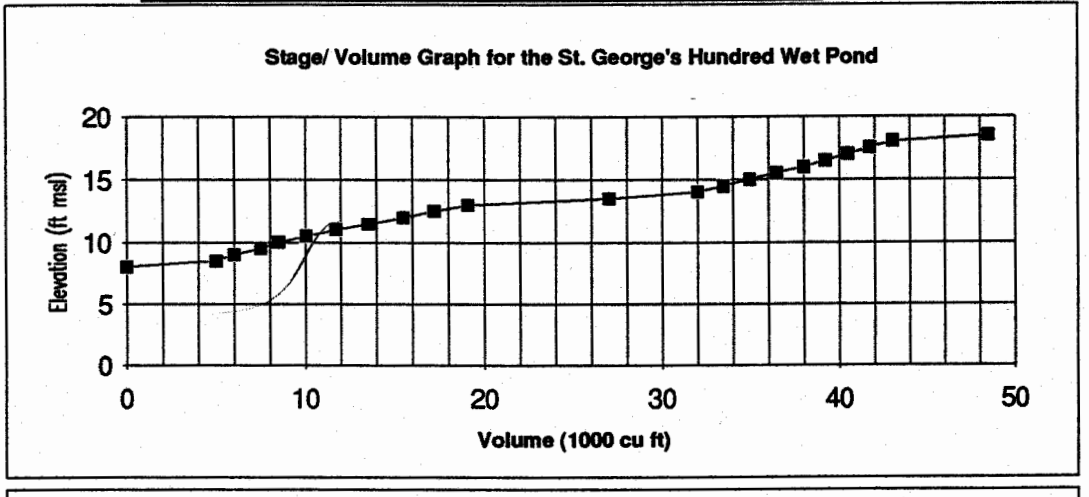
16.5 - 5'H 306 205 2 - 165 only 205

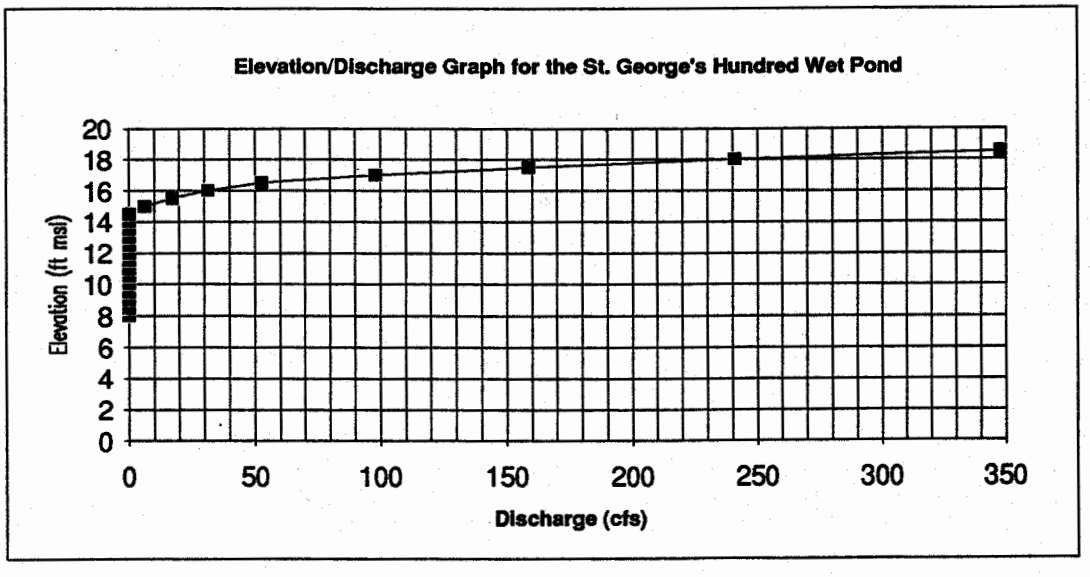
17.5 - 6'H 336 225 3 - 230

18.5 - 7'H 342 243 4 - 270

E.S. - .5' 20' wide = 14 cfs

Qmax @ 100yr = 257





Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: sg100

Comment: St Georges Hundred BMP Outlet Pipe

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0100 ft/ft
Manning's n.....	0.021
Discharge.....	230.00 cfs

Computed Results:

Full Flow Diameter.....	5.71 ft
Full Flow Depth.....	5.71 ft
Velocity.....	8.97 fps
Flow Area.....	25.63 sf
Critical Depth.....	4.21 ft
Critical Slope.....	0.0126 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	230.00 cfs
QMAX @.94D.....	247.41 cfs
Froude Number.....	FULL

INV. IN. - 10.0 ft msl

INV. OUT - 9.0 ft msl

Date: 9/20/91
Initials:LG

WORKSHEET FOR BMP POINT SYSTEM
(Input data under bold headings)

Alternative/Description: St. George's Hundred

Wet Pond for Phases III and IV of SG100
Total Area=61.4 acres
Total Treated Area=36.1 acres
Open Space=19.1(Powhatan Creek)+1.6 (RPA buffer)+1.3 (pond area, etc)= 22 acres

A. STRUCTURAL BMP POINT ALLOCATION

BMP	**BMP Points**		**Percentage of Site Served by BMP**		Weighted BMP Points
WP	9	X	59	=	5.29
		X		=	0.00
		X		=	0.00
		X		=	0.00

TOTAL WIEGHTED STRUCTURAL BMP POINTS: 5.29

B. NATURAL OPEN SPACE CREDIT

Percentage Of Site		Natural Open Space Credit		Points for Natural Open Space
36.00	X	(0.1 per 1%)	=	3.60

C. TOTAL WEIGHTED POINTS

5.29	+	3.60	=	8.89
Structural BMP Points		Natural Open Space Points		TOTAL

Check w/ WNB -

looks OK to me

- need calcs to support design

FILE -
ST. GEO. 5, PH III

Williamsburg Environmental Group, Inc.

Post Office Box 3584
Williamsburg, Virginia 23187
(804) 220-6869
Fax (804) 229-4507

September 19, 1991

Mr. Darryl Cook
Code Compliance
James City County
P.O. Box JC
Williamsburg, VA 23187

RE: Request for Exception - St. Georges Hundred Stormwater Management Plan - Revised

Dear Mr. Cook:

This letter follows up our correspondence of September 3, 1991. On behalf of St. George Corporation, the Williamsburg Environmental Group, Inc. is requesting an exception to the requirements set forth in Chapter 19B of the Code of the County of James City (Ordinance No. 183 Chesapeake Bay Preservation) as they relate to the development of a revised stormwater management plan for Sections III and IV of the St. Georges Hundred project. Specifically, our exception request is associated with the Best Management Practice (BMP) credit given to a facility designed to treat runoff from adjacent properties. The project is located on Route 5 and Sections III and IV contain 28.3 acres of buildable area with 16.3 acres of natural open space planned along Powhatan Creek.

Due to the orientation of the land parcel with wetlands/open space located downstream of the developable uplands, structural BMPs were difficult to plan for the project using the County's 3-step 10-point system. Based on our meeting on September 16, we have included a 9-point wet pond BMP in the intermittent drainageway along the northwest project boundary. With this alternative, 8.9 BMP points were achieved for Phase III and IV of the project (attached map and BMP worksheet). This includes an open space credit of 22 acres comprised of: wetlands and natural area located along Powhatan Creek, the RPA, and the BMP area. Based on the topography of the project site, we were unable to route any drainage from Phases III and IV to the regional pond located near the school site. In order to meet the 10-point requirement, infiltration trenches would also need to be built for the 12 lots draining directly to Powhatan Creek, since any structural pond could only drain 2 to 3 lots in this area.

Based on the location of the BMP shown on the attached map, the pond will treat runoff from a drainage area of almost 90 acres. This includes:

23.4 acres St. Georges Hundred Sections III and IV
14.0 acres St. Georges Hundred Sections I and II
52.4 acres offsite agricultural and woods

There is currently no mechanism for assigning BMP credits for the treatment of offsite runoff with the County's methodology. In the case of the current analysis, two separate offsite areas are being treated, portions of Sections I and II of the project (which do not require BMP treatment) and an agricultural field currently planted in corn.

Methods exist for determining water quality impacts associated with land use changes using published nonpoint source loading rates (Chesapeake Bay Local Assistance Department, 1989) (Northern Virginia Planning District Commission, 1979). Table 1 presents a summary of the pre- and post-development phosphorus loadings for the 28-acre St. Georges Hundred Section III and IV tract, with and without the proposed BMP. Table 2 presents similar nonpoint source loadings for the 90 acre drainage basin above the proposed BMP. The results of Table 1 show an increase in phosphorus loading associated with the development of Sections III and IV; however, by analyzing the entire 90 acre watershed, a decrease in loadings can be seen for the post-development condition with a 50% BMP removal efficiency. This is still true when the 4.9 acres of Section III, which will not be treated by the BMP, are added to the post-development load.

The BMP has been sized to provide treatment and volume control for; the proposed development of Sections III and IV, the existing conditions of Sections I and II, and the existing conditions of the offsite agricultural fields. If the 52 acre agricultural tract is ever developed, the BMP can be easily expanded to include additional storage on the adjacent property. By taking this regional approach to managing stormwater on the St. Georges Hundred site, the temporary sediment pond currently being utilized as a BMP at the entrance to Section III can be abandoned. Drainage can be rerouted to the proposed BMP, therefore, treating portions of Section I and II which would not be otherwise controlled.

Our request for an exception to the County's Chesapeake Bay Preservation Ordinance is not directed at avoiding the stormwater management requirements, but, using alternative approaches to protecting the water quality of Powhatan Creek. By treating offsite areas, nonpoint source phosphorus loadings will be decreased in the future for the 89.8 acre watershed analyzed. In summary, our request for an exception is based on the following points:

Lack of feasible BMP locations on project site
Almost all natural open space located below developable area
Forego using individual lot BMPs (i.e. infiltration trenches)
Maximize site drainage to proposed BMP
Treat 52 acres of offsite agricultural area
Treat 14 acres of St. Georges Hundred Sections I and II
Proposed BMP can be expandable if offsite area develops
Abandon temporary sediment pond currently being maintained as a BMP

If you have any questions regarding our request or the information presented in this letter, please call me at 220-6869. We appreciate your consideration in this matter.

Sincerely,

Ronald J. Boyd, P.E.
President

RJB:bw

Attachments

TABLE 1

St. George's Hundred
Nonpoint Source Loading Rates
for the Proposed Development-
Phases III &IV

	Land Use	Area (ac)	CBLAD Manual P Loading Rates (lb/ac/yr)	CBLAD Total P Load (lb/yr)	Occoquan P Loading Rate (lb/ac/yr)	Occoquan Total P Load (lb/yr)
Existing Conditions						
	Woods	28.3	0.19	5.38	0.1	2.83
Proposed Conditions						
	Woods, untreated	1.6	0.19	0.30	0.1	0.16
	Woods, treated	1.3	0.19	0.25	0.1	0.13
	1/3 ac lots untreated	3.3	2.72	8.98	1	3.3
	1/3 ac lots, treated	22.1	2.72	60.11	1	22.1
	TOTAL without BMP	28.3		69.6		25.7
	TOTAL with BMP	28.3		39.5		14.6

TABLE 2

St. George's Hundred
Nonpoint Source Loading Rates
to Proposed BMP
Drainage Area 110 Acres

	Land Use	Area (ac)	CBLAD Manual P Loading Rate (lb/ac/yr)	CBLAD Total P Load (lb/yr)	Occoquan P Loading Rate (lb/ac/yr)	Occoquan Total P Load lb/yr)
Existing Conditions						
	1/3 ac lot Res.	10	2.72	27.2	1.0	10.0
	Park	4	0.91	3.64	0.5	2.0
	Woods onsite	23.4	0.19	4.45	0.1	2.34
	Woods offsite	6	0.19	1.14	0.1	0.6
	Cropland offsite	46.4	3.71	172.1	4.2	194.9
Total		89.8		208.5		209.8
Proposed Conditions						
	1/3 ac lot Res.	32.1	2.72	87.31	1.0	32.1
	Park	4	0.91	3.64	0.5	2.0
	Woods onsite	1.3	0.19	0.25	0.1	0.13
	Woods offsite	6	0.19	1.14	0.1	0.6
	Cropland offsite	46.4	3.71	172.1	4.2	194.9
Total		89.8		264.4		229.7
With 9 Point Wet Pond BMP				132.2		114.9

Imp Area - 32.1 ac x .3 + 4 x .6 = 12 ac.

% Imp - $\frac{12.0}{89.8}$ = 13.4 %

R_v = 0.17

V_R = 0.64 ac-ft

4 x V_R = 2.55 ac-ft

Sur Area = 0.85 ac

Avg D = 6.1 ft

Would need to be 1.3 ac surface area to have avg D = 4'

8/3/93

2.5 V_R = 1.6 x 43560 = 69,696 ft^3 ≈ 13.8'

4 V_R = 111078 ft^3

Site = 27.1 + 21.6 = 48.7 - 3+4 = Gas Easement

Area Controlled = 89.8

$\frac{89.8}{48.7}$ x 8 = 1.84 x 8 = 14.75

Nat Open 20.6 ⟹ $\frac{20.6}{48.7}$

4.2
18.95

Date: 9/20/91
Initials:LG

WORKSHEET FOR BMP POINT SYSTEM
(Input data under bold headings)

Alternative/Description: St. George's Hundred

Wet Pond for Phases III and IV of SG100
Total Area=61.4 acres
Total Treated Area=36.1 acres
Open Space=19.1(Powhatan Creek)+1.6 (RPA buffer)+1.3 (pond area, etc)= 22 acres

A. STRUCTURAL BMP POINT ALLOCATION

BMP	**BMP Points**		**Percentage of Site Served by BMP**		Weighted BMP Points
WP	9	X	59	=	5.29
		X		=	0.00
		X		=	0.00
		X		=	0.00

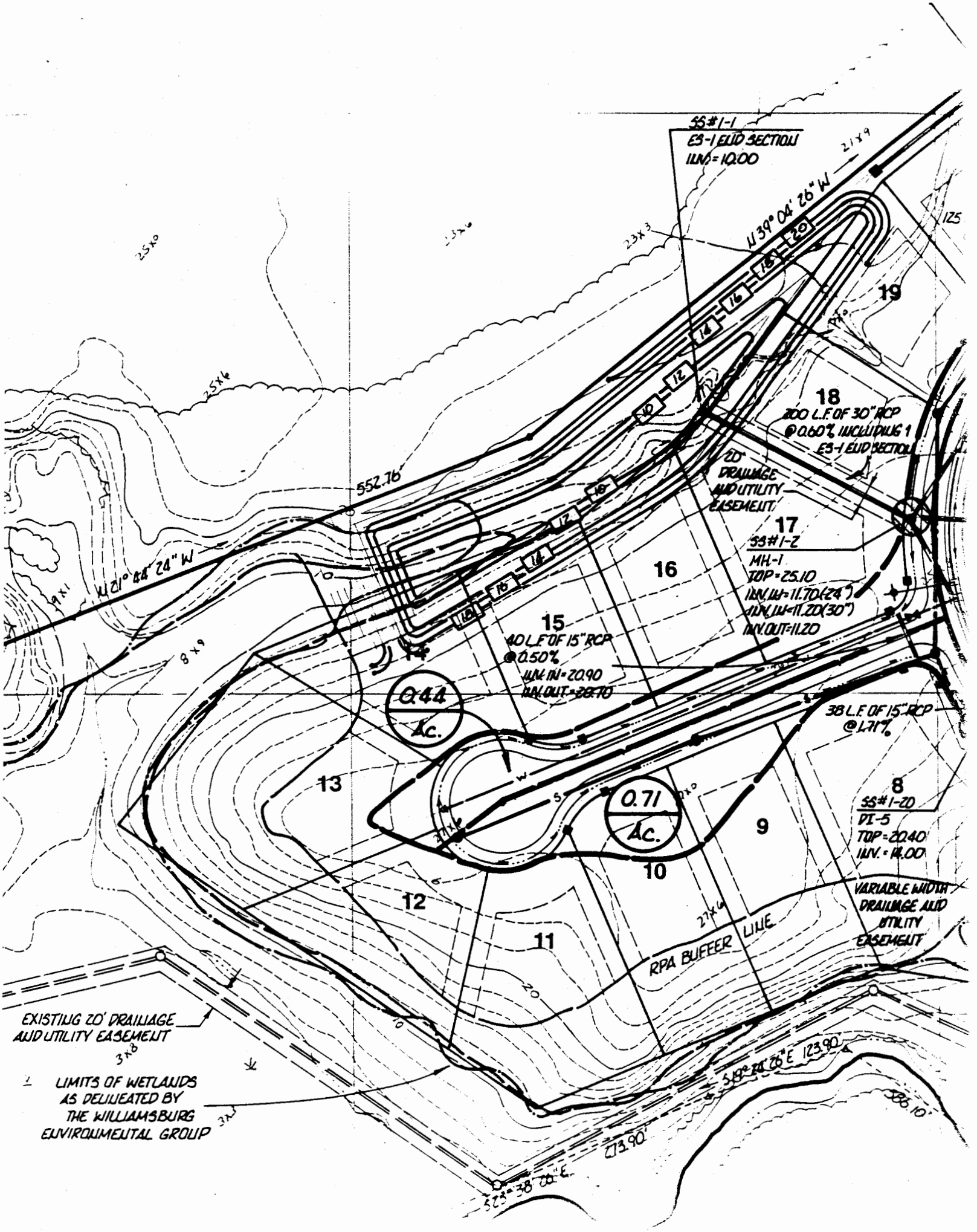
TOTAL WIEGHTED STRUCTURAL BMP POINTS: 5.29

B. NATURAL OPEN SPACE CREDIT

Percentage Of Site		Natural Open Space Credit		Points for Natural Open Space
36.00	X	(0.1 per 1%)	=	3.60

C. TOTAL WEIGHTED POINTS

5.29	+	3.60	=	8.89
Structural BMP Points		Natural Open Space Points		TOTAL

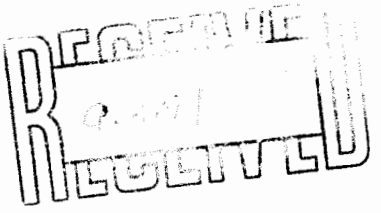

SS#1-1
E3-1 EUD SECTION
ILLN.= 10.00
N 39° 04' 26" W
19
18
200 L.F. OF 30" RCP
@ 0.60% INCLUDING 1
E3-1 EUD SECTION
20' DRAINAGE AND UTILITY EASEMENT
17
SS#1-2
MH-1
TOP = 25.10
INV. IN = 11.70 (24")
INV. IN = 11.20 (30")
INV. OUT = 11.20
16
15
40 L.F. OF 15" RCP
@ 0.50%
INV. IN = 20.90
INV. OUT = 20.70
14
0.44 Ac.
38 L.F. OF 15" RCP
@ 1.71%
13
0.71 Ac.
10
9
8
SS#1-20
DI-5
TOP = 20.40
INV. = 14.00
12
11
VARIABLE WIDTH DRAINAGE AND UTILITY EASEMENT
RPA BUFFER LINE
552.76
N 21° 44' 24" W
EXISTING 20' DRAINAGE AND UTILITY EASEMENT
LIMITS OF WETLANDS AS DELINEATED BY THE WILLIAMSBURG ENVIRONMENTAL GROUP
S 39° 04' 26" E 123.90
S 25° 38' 20" E
273.90'
386.10'

9-24 BMP
Corps Easement

Williamsburg Environmental Group, Inc.

Post Office Box 3584
Williamsburg, Virginia 23187
(804) 220-6869
Fax (804) 229-4507

September 3, 1991



Mr. Darrel Cook
Code Compliance
James City County
P.O. Box JC
Williamsburg, VA 23187

RE: Request for Exception - St. Georges Hundred Stormwater Management Plan

Dear Mr. Cook:

On behalf of St. George Corporation, the Williamsburg Environmental Group, Inc. is requesting an exception to the requirements set forth in Chapter 19B of the Code of the County of James City (Ordinance No. 183 Chesapeake Bay Preservation) as they relate to the development of a stormwater management plan for Sections III and IV of the St. Georges Hundred project. Specifically, our exception request is associated with the Best Management Practice (BMP) credit given to a facility designed to treat runoff from adjacent properties. The project is located on Route 5 and Sections III and IV contain 21 acres of buildable area with 16.3 acres of natural open space planned along Powhatan Creek.

Due to the orientation of the land parcel with wetlands/open space located downstream of the developable uplands, structural BMPs were difficult to plan for the project using the County's 3-step 10-point system. By including a 6-point BMP in the intermittent drainageway along the northwest project boundary and maximizing the drainage routed to this facility, only 6.8 points were achieved (attached map and BMP worksheet). This includes open space credit for the 16.3 acres of wetlands and natural area located along Powhatan Creek. A 9-point pond could be designed if all offsite drainage bypassed the facility. The amount of offsite agricultural runoff precludes designing a marsh within the BMP, though, a 0.5 acre wetland will likely become established in the pond. In order to meet the 10-point requirement, infiltration trenches would also need to be built for the 12 lots draining directly to Powhatan Creek, since any structural pond could only drain 2 to 3 lots in this area.

Based on the location of the BMP shown on the attached map, the pond will treat runoff from a drainage area of 110 acres. This includes:

22 acres St. Georges Hundred ~~Sections~~ Phases III and IV
14 acres St. Georges Hundred ~~Sections~~ Phases I and II
74 acres offsite agricultural and woods

There is currently no mechanism for assigning BMP credits for the treatment of offsite runoff with the County's methodology. In the case of the current analysis, two separate offsite areas are being treated, portions of Sections I and II of the project (which do not require BMP treatment) and an agricultural field currently planted in corn.

Methods exist for determining water quality impacts associated with land use changes using published nonpoint source loading rates (Chesapeake Bay Local Assistance Department, 1989) (Northern Virginia

Planning District Commission, 1979). Table 1 presents a summary of the pre- and post-development phosphorus loadings for the 27-acre St. Georges Hundred Section III and IV tract, with and without the proposed BMP. Table 2 presents similar nonpoint source loadings for the 110 acre drainage basin above the proposed BMP. The results of Table 1 show an increase in phosphorus loading associated with the development of Sections III and IV; however, by analyzing the entire 110 acre watershed, a decrease in loadings can be seen for the post-development condition with a 30% BMP removal efficiency. This is still true when the 6.2 acres of Section III, which will not be treated by the BMP, are added to the post-development load.

The BMP has been sized to provide treatment and volume control for; the proposed development of Sections III and IV, the existing conditions of Sections I and II, and the existing conditions of the offsite agricultural fields. If the 74 acre agricultural tract is ever developed, the BMP can be easily expanded to include additional storage on the adjacent property or become a wet pond facility. By taking this regional approach to managing stormwater on the St. Georges Hundred site, the temporary sediment pond currently being utilized as a BMP at the entrance to Section III can be abandoned. Drainage can be rerouted to the proposed BMP, thus, treating portions of Section I and II which would not be otherwise controlled.

HOW?

WAS THIS DONE?

Our request for an exception to the County's Chesapeake Bay Preservation Ordinance is not directed at avoiding the stormwater management requirements, but, using alternative approaches to protecting the water quality of Powhatan Creek. By treating offsite areas, nonpoint source phosphorus loadings will be decreased in the future for the 110 acre watershed analyzed. In summary, our request for an exception is based on the following points:

Lack of feasible BMP locations on project site
Almost all natural open space located below developable area
Forego using individual lot BMPs (i.e. infiltration trenches)
Maximize site drainage to proposed BMP
Treat 74 acre offsite agricultural area
Treat 14 acres of St. Georges Hundred Sections I and II
Proposed BMP will be expandable if offsite area develops
Abandon temporary sediment pond currently being maintained as a BMP

If you have any questions regarding our request or the information presented in this letter, please call me at 220-6869. We appreciate your consideration in this matter.

Sincerely,

Ronald J. Boyd, P.E.
President

RJB:bw

Attachments

TABLE 1

St. George's Hundred
Nonpoint Source Loading Rates
for the Proposed Development-
Phases III &IV

	Land Use	Area (ac)	CBLAD Manual P Loading Rates (lb/ac/yr)	CBLAD Total P Load (lb/yr)	Occoquan P Loading Rate (lb/ac/yr)	Occoquan Total P Load (lb/yr)
Existing Conditions						
	Woods	28.3	0.19	5.38	0.1	2.83
Proposed Conditions						
	Woods, untreated	1.6	0.19	0.30	0.1	0.16
	Woods, treated	1.3	0.19	0.25	0.1	0.13
	1/3 ac lots untreated	4.6	2.72	12.51	1	4.6
	1/3 ac lots, treated	20.8	2.72	56.58	1	20.8
	TOTAL without BMP	28.3		69.6		25.7
	TOTAL with BMP (30% red-treated area)	28.3		52.6		19.4

TABLE 2

St. George's Hundred
Nonpoint Source Loading Rates
to Proposed BMP
Drainage Area 110 Acres

	Land Use	Area (ac)	CBLAD Manual P Loading Rate (lb/ac/yr)	CBLAD Total P Load (lb/yr)	Occoquan P Loading Rate (lb/ac/yr)	Occoquan Total P Load lb/yr)
Existing Conditions						
	1/3 ac lot Res.	10	2.72	27.2	1.0	10.0
	Park	4	0.91	3.64	0.5	~~14.6~~ 2.0
	Woods onsite	22.3	0.19	4.24	0.1	2.23
	Woods offsite	6	0.19	1.14	0.1	0.6
	Cropland offsite	68	3.71	252.28	4.2	285.6
Total		110.3		288.5		~~318.0~~ 300.4
Proposed Conditions						
	1/3 ac lot Res.	31.0	2.72	84.32	1.0	31.0
	Park	4	0.91	3.64	0.5	2.0
	Woods onsite	1.3	0.19	0.25	0.1	0.13
	Woods offsite	6	0.19	1.14	0.1	0.6
	Cropland offsite	68	3.71	252.28	4.2	285.6
Total		110.3		341.7		318.6
With 6 Point BMP				239.2		223.0

$Imp = 31ac \times .3 = 9.3ac + 4(.6) = \frac{11.7}{110.3}$

$= 10.6\%$

Vol = 1.34

12" depth - 1.34 acres

Area wetland provided = 0.2 acres - not adq

10 Pts - 55.7 ac

- 2.93

7.07 Pts

- need to treat

Wet Ponds -

Design 6 - 1.45 ac ft

Design 7 - 2.31 ac ft

DRY POND

Design 3 - 1.34 ac ft (6 pts)

Date: 9/3/91
Initials:LG

Alt 19

WORKSHEET FOR BMP POINT SYSTEM

Alternative/Description: St Georges Hundred

One dry pond for Phases III and IV plus most of E&S area treated.
Total area treated =36.3 acres
Total area= 55.7 acres
Offsite area= 14.0 acres
Open space =13.4+1.6 (50' RPA buffer) +1.3(area of pond and surrounding open space)
16.30 acres

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Percentage of Site Served by BMP		Weighted BMP Points
DP	6	X	65.17	=	3.91
		X		=	0.00
		X		=	0.00
		X		=	0.00

TOTAL WIEGHTED STRUCTURAL BMP POINTS: 3.91

9 5.81

B. NATURAL OPEN SPACE CREDIT

Percentage Of Site		Natural Open Space Credit		Points for Natural Open Space
29.26	X	(0.1 per 1%)	=	2.93

C. TOTAL WEIGHTED POINTS

3.91	+	2.93	=	6.84
Structural BMP Points		Natural Open Space Points		TOTAL

$\frac{36}{54} \times 4 \approx 3.9$

$\frac{14}{54} \times 1 \approx 2.9$

≈ 6.8

$19/36 \times 3.9 \approx 1.5$

8.3

$42/36 \times 32 \approx 4.5$

12.8

$\frac{114 \times 12 \times 1}{12} =$

$\frac{21}{27} \times 6 \approx 4.7 \quad 6^+$

$\frac{14}{27} \approx 2.3 \quad 3^+$

$\frac{40}{27} \approx 6.9$

≈ 10

VOLUME $\frac{75AC \times .2 \times 1}{12} = 1.25$

VELOCITY ?

St. Geo. Hundred - Section 5

A. Phases III + IV –

Total Sect 5	67.0 acs.
Cons. Area	20.5 ac
Phase 1	11.3
Phase 2	8.3
Phs III + IV	26.9

B. Nat Open Space – $\frac{20.5}{67.0}$ = 30.6% = 3.06 Pts (Phs 1-4)

C. Ph 3+4 - 21 + 16.3 (open) = 37.3 ac

open space – $16.3/37.3$ = 43.7

4.37 pts

need 5.63 pts to total 10 pts

- 6 pt BMP for 94% of site which is 37.3 ac.
  or 35 acres @ 30% reduction

Provided 36 acres inc. Phs 1-4.

also 74 acres offsite -

D. Total Sect 5 – $36/67.0$ = .537 × 6 = 3.22

3.06

6.28

E. Storage Needed = 10.6% Imp inc offsite

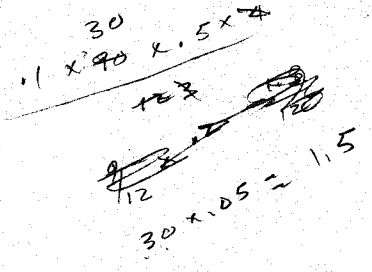
Vol = 1.34 ac ft

→ 1.20 ac of surface for marsh

ELEV	AREA	Δ V	Σ V
10	.25	—	—
12	.32	.57	.57
14	.41	.73	1.30
14	.54	.95	2.25
18	.67	1.21	3.46

Hydrology

Drainage Area	89.8 acres
Offsite area	52.4
Phases III and IV	23.4
Phases I and II	14.0
Pre-Development	
Time of Concentration	0.98
SCS Runoff Curve Number	80
2-Yr Peak Discharge	76 cfs
10-yr Peak Discharge	176 cfs
100-yr Peak Discharge	274 cfs
Post-Development	
Time of Concentration	0.98
SCS Runoff Curve Number	82
2-Yr Peak Discharge	76 cfs
10-yr Peak Discharge	182 cfs
100-yr Peak Discharge	285 cfs



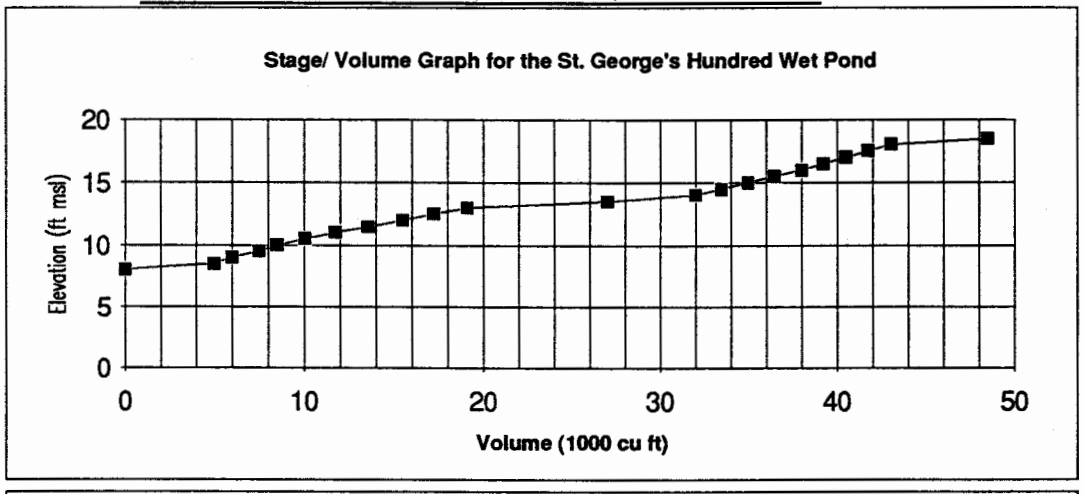
BMP Design- Wet Pond

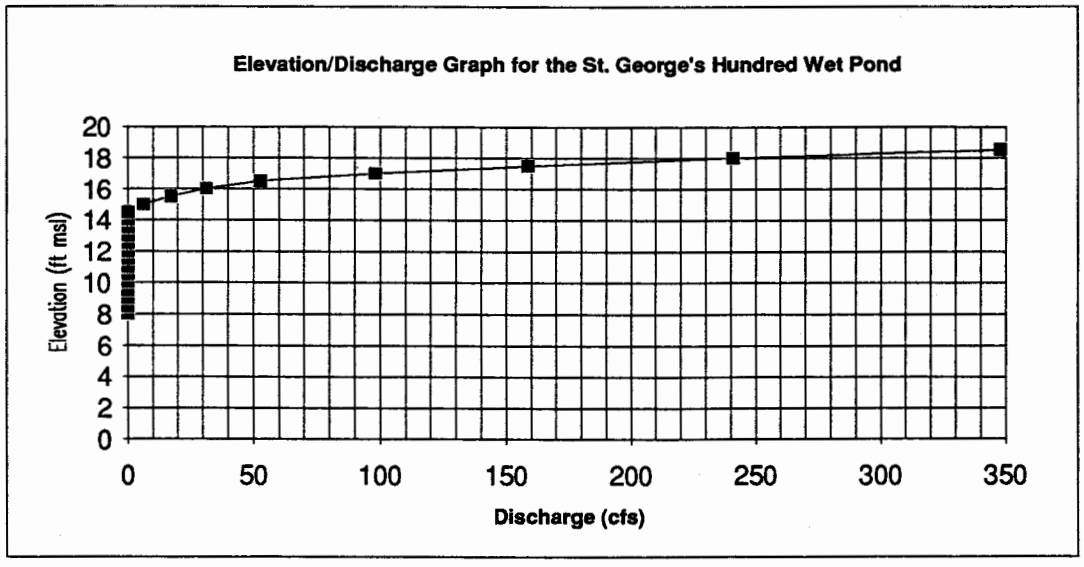
Impervious Cover	8.03 acres or 8.9%
Rv	0.13
Required BMP Wet Storage Volume (Wet pond Design 7)	84,681 cu ft
Normal Pool	
Elevation	14.5 ft msl
Volume	89,295 cu ft
Total Volume with Detention Storage	232,612 cu ft
Top of Embankment	19.2 ft msl
Outlet Structure	One 72-inch vertical standpipe Crest elevation 16.3 ft msl 72-inch horizontal notch Crest elevation 14.5 ft msl 20-ft emergency spillway Crest elevation 17.7 ft msl

Pond Routing Summary

Return Periods (yr)	Peak Inflow (cfs)	Peak Ouflow (cfs)	Maximum Stage (ft msl)
2	86	76	16.8
10	190	182	17.6
100	294	285	18.2

Elevation (ft msl)	Area (sq ft)	Volume (cu ft)	Discharge (cfs)
8.0	0	0	0
8.5	5000	833	0
9.0	6000	3580	0
9.5	7,500	6,948	0
10.0	8,500	10,945	0
10.5	10,054	15,578	0
11.0	11,739	21,021	0
11.5	13,554	27,339	0
12.0	15,500	34,597	0
12.5	17,253	42,780	0
13.0	19,099	51,858	0
13.5	27,000	61,880	0
14.0	32,000	76,658	0
14.5	33,452	93,019	0
15.0	34,936	110,115	6.3
15.5	36,452	127,960	17.4
16.0	38,000	146,572	31.4
16.5	39,221	165,876	52.6
17.0	40,461	185,796	98.3
17.5	41,721	206,341	158.5
18.0	43,000	227,520	240.9
18.5	48,500	250,382	347.8





Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: sg100

Comment: St Georges Hundred BMP Outlet Pipe

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0100 ft/ft
Manning's n.....	0.021
Discharge.....	230.00 cfs

Computed Results:

Full Flow Diameter.....	5.71 ft
Full Flow Depth.....	5.71 ft
Velocity.....	8.97 fps
Flow Area.....	25.63 sf
Critical Depth.....	4.21 ft
Critical Slope.....	0.0126 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	230.00 cfs
QMAX @.94D.....	247.41 cfs
Froude Number.....	FULL

INV. IN. - 10.0 ft msl

INV. OUT - 9.0 ft msl

Date: 9/20/91
Initials:LG

WORKSHEET FOR BMP POINT SYSTEM
(Input data under bold headings)

Alternative/Description: St. George's Hundred

Wet Pond for Phases III and IV of SG100
Total Area=61.4 acres
Total Treated Area=36.1 acres
Open Space=19.1(Powhatan Creek)+1.6 (RPA buffer)+1.3 (pond area, etc)= 22 acres

A. STRUCTURAL BMP POINT ALLOCATION

BMP	**BMP Points**		**Percentage of Site Served by BMP**		Weighted BMP Points
WP	9	X	59	=	5.29
		X		=	0.00
		X		=	0.00
		X		=	0.00

TOTAL WIEGHTED STRUCTURAL BMP POINTS: 5.29

B. NATURAL OPEN SPACE CREDIT

Percentage Of Site		Natural Open Space Credit		Points for Natural Open Space
36.00	X	(0.1 per 1%)	=	3.60

C. TOTAL WEIGHTED POINTS

5.29	+	3.60	=	8.89
Structural BMP Points		Natural Open Space Points		TOTAL

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

February 13, 2002

Mr. Randall E. Punchard
St. George's/St. Thomas' HOA
229 Charleston Place
Williamsburg, Va. 23185

Re: St. Georges Hundred, Section 5, Phase 3
County Plan No. S-53-93
Stormwater Management Facility
County BMP ID Code: PC 054

Dear Mr. Punchard:

It was a pleasure to talk with you on Wednesday February 13th. As discussed, I am forwarding you some "***first contact***" information for your community association to use relative to maintenance of the above stormwater management facility. The subject stormwater management facility (PC 054) is situated in Common Area for Section 5, Phase 3 of St. George's Hundred, further identified as GPIN 4640500001B. It is located just west of Lot 14 along Halstead Lane.

Information as attached includes: a brochure entitled *Best Management Practices Education Program for Homeowners Associations*; landscaping tips for stormwater management BMP's, watershed awareness tips, a sample maintenance plan for a wet/dry pond stormwater management facility; and three brochures related to liability and maintenance. One of these brochures is a good informational handout entitled *A Guide for Maintaining and Operating BMP's*. This publication is distributed through our office in response to a cooperative effort from the Hampton Roads Regional Stormwater Management Committee and HR STORM, a regional stormwater education program offered by the Hampton Roads Planning District Commission.

I have also attached a location map and a copy of information as available in the database under our County BMP Inventory/Inspection program. The pond maintenance plan can be expanded upon further following our inspection as scheduled for Friday February 15th at 3:00 pm.

Our division is always readily available to assist owners and HOA representatives with guidance related to stormwater management facilities and drainage and we sincerely look forward working with you in the future. In the meantime, if you have any additional questions or comments, call me at 757-253-6639.

Sincerely,

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

SWMProg\Education\Subdivisions\StGeorge.fc

AES CONSULTING ENGINEERS
Engineering, Surveying and Planning
5248 Olde Towne Road, Suite 1
WILLIAMSBURG, VIRGINIA 23188

(804) 253-0040

LETTER OF TRANSMITTAL

DATE	JOB NO.
11-22-91	6201

ATTENTION: Darryl Cook

RE: St. Georges Hundred
Section 3, Phase III

TO Darryl Cook
Code Compliance @ J.C.C.

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Additional Pond Calcs / Hydrographs as requested.

RECEIVED

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☒ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

Please call for discussion

COPY TO _____ SIGNED: _____

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

2YR. STORM

POND-2 Version: 5.15 S/N: 1295100016

>>>>> HYDROGRAPH PRINTOUT <<<<<

11-20-1991 15:10:39

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SG2-O .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
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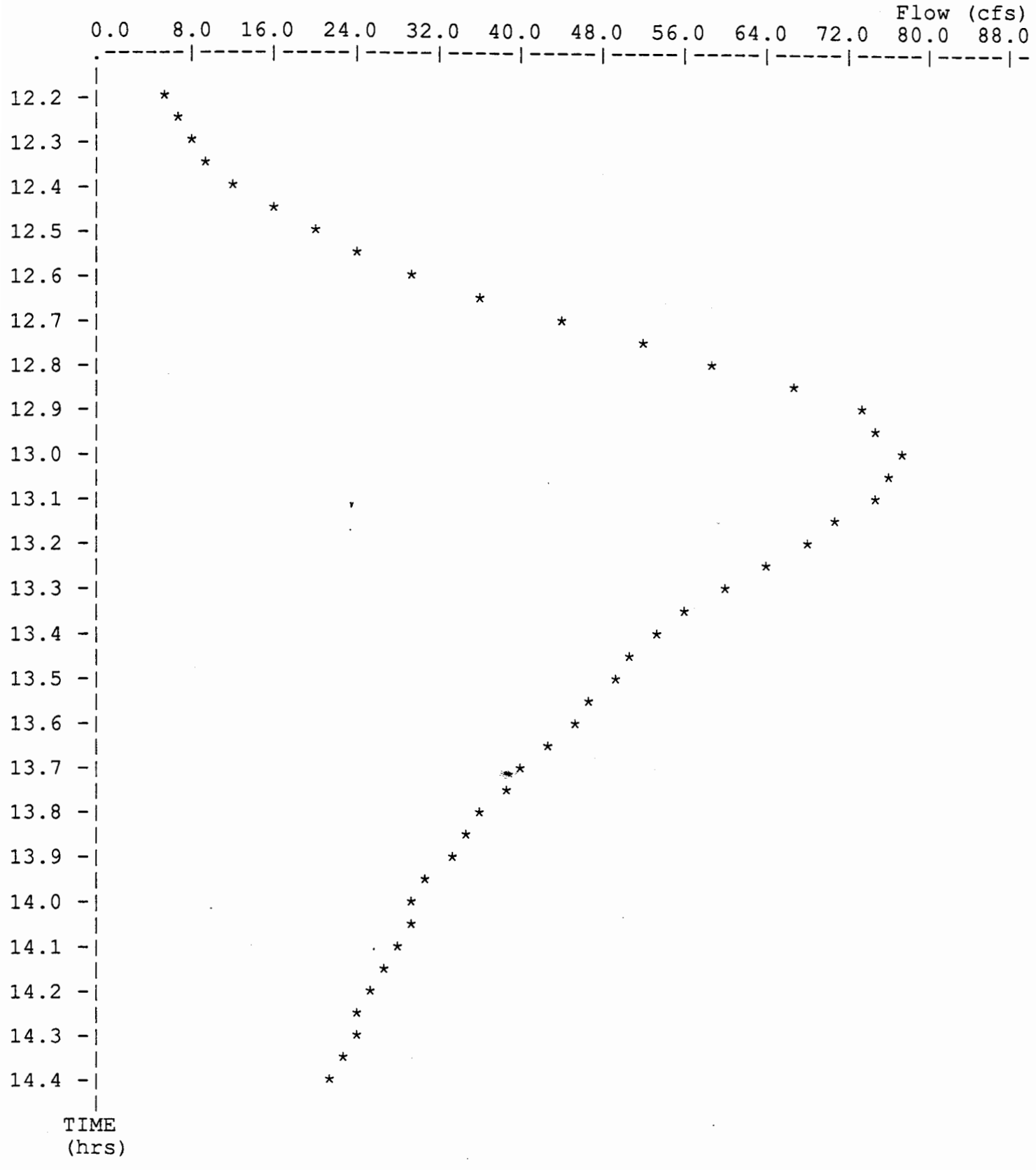
12.400	12.35	19.56	29.57	43.53	59.32	73.45	76.70
13.100	74.24	67.96	60.39	52.85	49.00	44.87	40.62
13.800	36.46	32.67	29.89	27.53	25.38	23.38	21.50
14.500	19.83	18.32	17.01	16.00	15.19	14.45	13.75
15.200	13.10	12.48	11.88	11.30	10.83	10.46	10.07
15.900	9.65	9.32	9.05	8.84	8.57	8.26	8.00
16.600	7.80	7.64	7.41	7.13	6.90	6.72	6.57
17.300	6.46	6.37	6.30	6.26	6.23	6.14	5.99
18.000	5.87	5.76	5.67	5.58	5.51	5.45	5.39
18.700	5.34	5.30	5.26	5.23	5.20	5.18	5.15
19.400	5.14	5.06	4.93	4.81	4.71	4.62	4.54
20.100	4.48	4.42	4.36	4.32	4.28	4.24	4.21
20.800	4.19	4.16	4.14	4.06	3.93	3.82	3.71
21.500	3.63	3.55	3.48	3.42	3.37	3.32	3.28
22.200	3.25	3.22	3.19	3.17	3.15	3.06	2.93
22.900	2.82	2.71	2.63	2.55	2.48	2.42	2.37
23.600	2.32	2.28	2.25	2.22	2.19	2.10	1.97
24.300	1.85	1.74	1.65	1.57	1.50	1.44	1.38
25.000	1.33	1.29	1.26	1.22	1.13	0.99	0.87
25.700	0.76	0.67	0.58				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-20-1991



* File: c:\jobfiles\pondpkf1\stg's100\SG2-O .HYD Qmax = 76.7 cfs

10 YR. STORM

POND-2 Version: 5.15 S/N: 1295100016

>>>>> HYDROGRAPH PRINTOUT <<<<<

11-20-1991 15:11:07

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SG10-O .HYD

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Time on left represents time for first Q in each row.

Time Hours							
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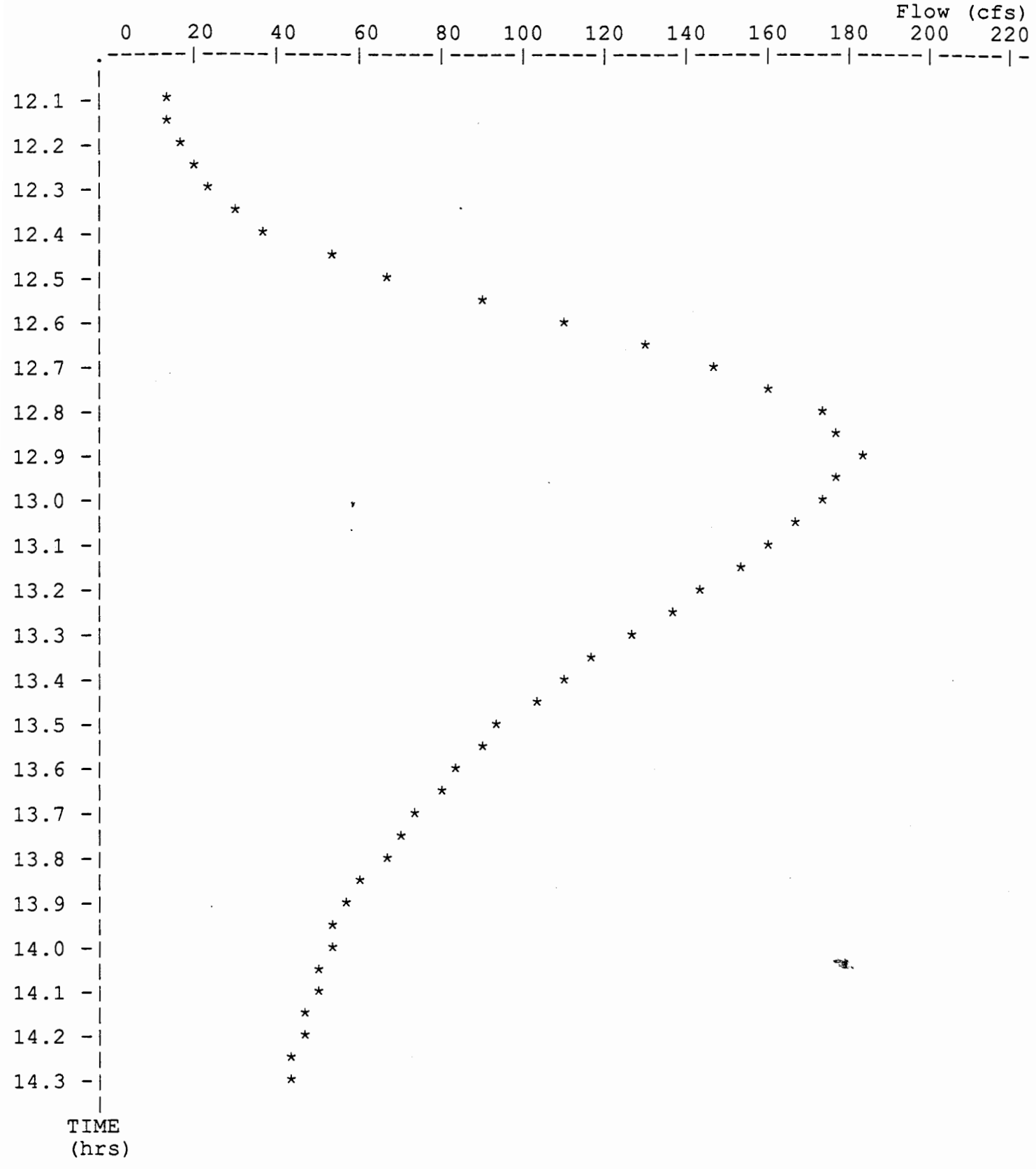
13.100	160.04	143.88	126.35	109.19	94.84	84.12	74.11
13.800	65.28	57.81	51.97	48.85	45.60	42.26	39.21
14.500	36.33	33.58	31.29	29.79	28.17	26.58	25.13
15.200	23.91	22.85	21.94	21.12	20.25	19.48	18.77
15.900	18.11	17.49	16.97	16.57	16.16	15.72	15.38
16.600	15.10	14.78	14.42	14.03	13.62	13.30	13.04
17.300	12.73	12.38	12.10	11.88	11.70	11.56	11.45
18.000	11.36	11.29	11.23	11.08	10.86	10.69	10.55
18.700	10.44	10.25	10.00	9.80	9.64	9.51	9.41
19.400	9.32	9.16	8.93	8.74	8.59	8.47	8.38
20.100	8.30	8.24	8.19	8.15	8.12	8.00	7.80
20.800	7.64	7.51	7.41	7.32	7.26	7.21	7.16
21.500	7.03	6.82	6.66	6.53	6.42	6.33	6.28
22.200	6.25	6.21	6.13	5.99	5.86	5.76	5.66
22.900	5.58	5.45	5.27	5.11	4.97	4.85	4.74
23.600	4.65	4.51	4.32	4.16	4.01	3.89	3.78
24.300	3.68	3.53	3.34	3.18	3.03	2.90	2.79
25.000	2.69	2.54	2.35	2.18	2.04	1.91	1.79
25.700	1.63	1.43	1.25				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-20-1991



* File: c:\jobfiles\pondpkfl\stg's100\SG10-O .HYD Qmax = 182.3 cfs

10YR. STORM
INFLOW
HYDROGRAPH

POND-2 Version: 5.15 S/N: 1295100016

>>>>> HYDROGRAPH PRINTOUT <<<<<

11-22-1991 17:07:02

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SGRP10-O.HYD

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Time on left represents time for first Q in each row.

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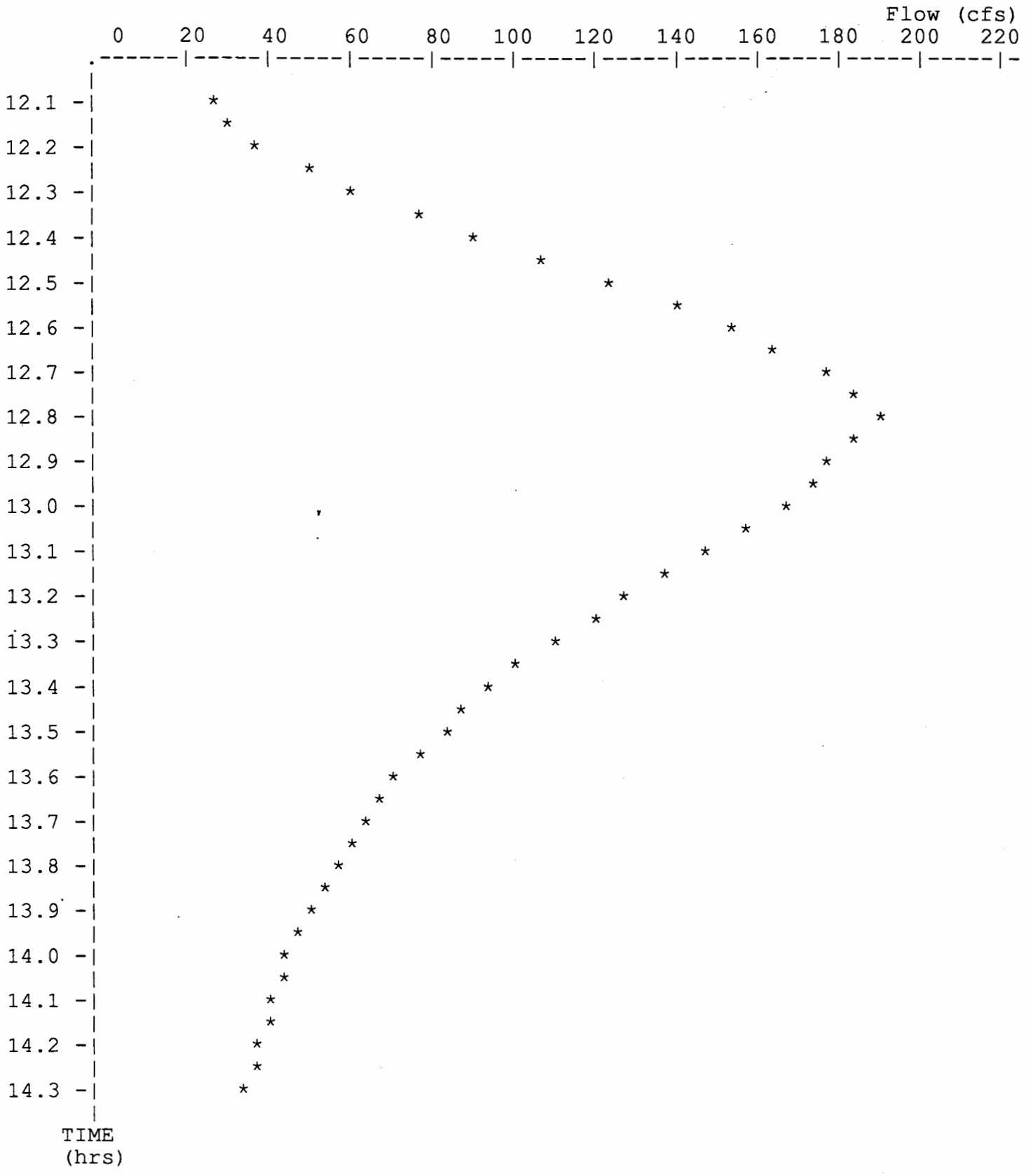
12.400	90.00	123.00	154.00	175.00	190.00	178.00	167.00
13.100	147.00	127.00	110.00	93.00	82.00	71.00	63.00
13.800	55.00	50.00	44.00	41.00	37.00	34.00	32.00
14.500	29.00	27.00	26.00	24.00	22.00	21.00	20.00
15.200	20.00	19.00	19.00	18.00	17.00	17.00	16.00
15.900	16.00	15.00	15.00	15.00	14.00	14.00	14.00
16.600	14.00	13.00	13.00	12.00	12.00	12.00	12.00
17.300	11.00	11.00	11.00	11.00	11.00	11.00	11.00
18.000	11.00	11.00	11.00	10.00	10.00	10.00	10.00
18.700	10.00	9.00	9.00	9.00	9.00	9.00	9.00
19.400	9.00	8.00	8.00	8.00	8.00	8.00	8.00
20.100	8.00	8.00	8.00	8.00	8.00	7.00	7.00
20.800	7.00	7.00	7.00	7.00	7.00	7.00	7.00
21.500	6.00	6.00	6.00	6.00	6.00	6.00	6.00
22.200	6.00	6.00	5.00	5.00	5.00	5.00	5.00
22.900	5.00	4.00	4.00	4.00	4.00	4.00	4.00
23.600	4.00	3.00	3.00	3.00	3.00	3.00	3.00
24.300	3.00	2.00	2.00	2.00	2.00	2.00	2.00
25.000	2.00	1.00	1.00	1.00	1.00	1.00	1.00
25.700	0.00	0.00	0.00				

For System 1 - T_c = 50 min - T_p = 11.25 } use
For System 2 - T_c = 40 min - T_p = 11.25 }

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-22-1991



* File: c:\jobfiles\pondpkf1\stg's100\SGRP10-O.HYD Qmax = 190.0 cfs

POND-2 Version: 5.15 S/N: 1295100016

2YR. STORM INFLOW HYDROGRAPH

>>>>> HYDROGRAPH PRINTOUT <<<<<

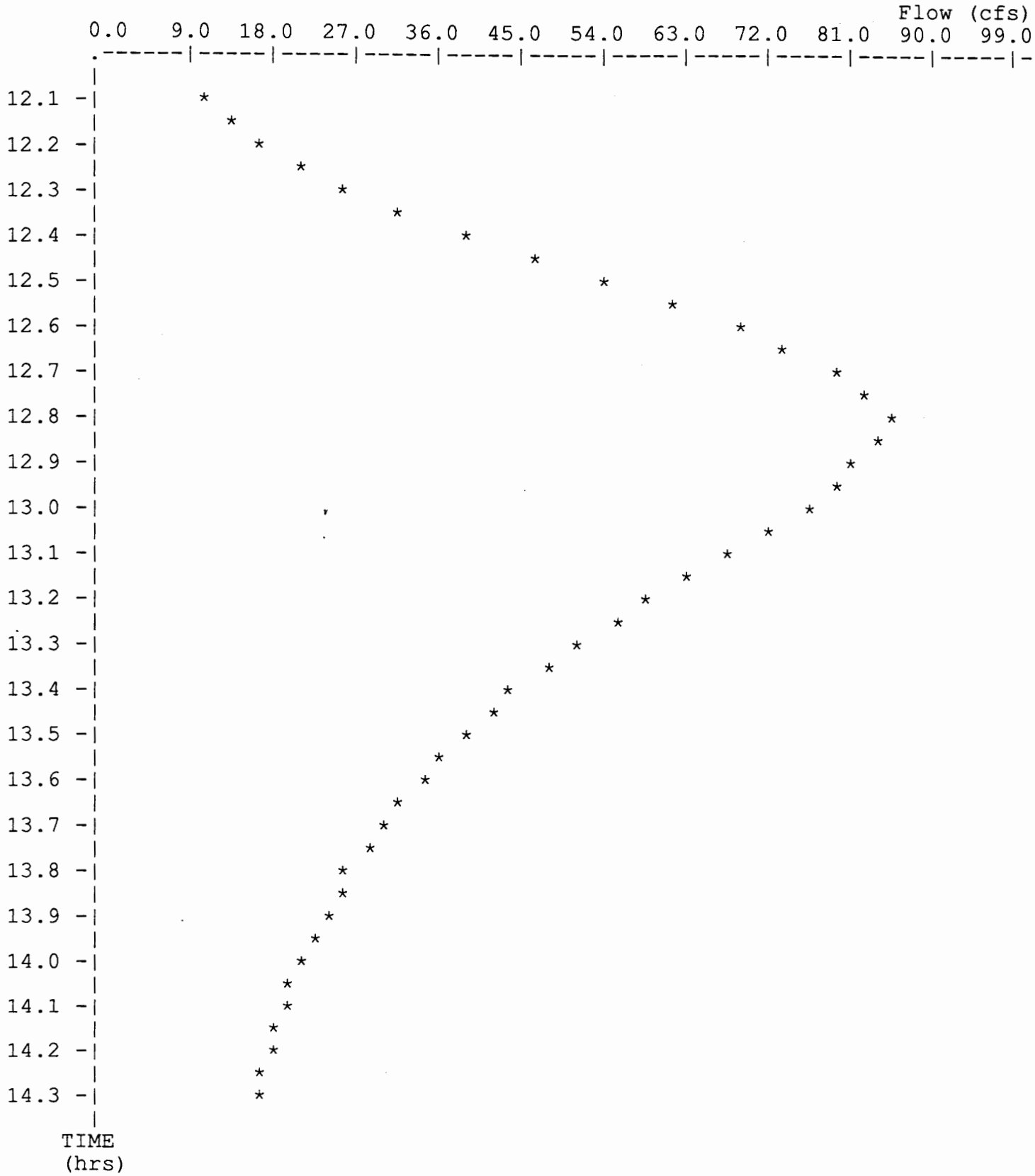
11-22-1991 17:06:33

Hydrograph file: c:\jobfiles\pondpkfl\stg's100\SGRP2-O .HYD

HYDROGRAPH ORDINATES (cfs)
Time increment = 0.100 Hours
Time on left represents time for first Q in each row.

Time Hours							
11.000	2.00	2.00	3.00	3.00	3.00	4.00	4.00
11.700	5.00	5.00	6.00	7.00	10.00	16.00	25.00
12.400	39.00	54.00	69.00	79.00	86.00	81.00	77.00
13.100	68.00	59.00	51.00	44.00	39.00	34.00	30.00
13.800	26.00	24.00	21.00	19.00	18.00	16.00	15.00
14.500	14.00	13.00	12.00	12.00	12.00	11.00	11.00
15.200	10.00	10.00	9.00	9.00	9.00	9.00	8.00
15.900	8.00	8.00	8.00	8.00	7.00	7.00	7.00
16.600	7.00	7.00	6.00	6.00	6.00	6.00	6.00
17.300	6.00	6.00	6.00	6.00	6.00	5.00	5.00
18.000	5.00	5.00	5.00	5.00	5.00	5.00	5.00
18.700	5.00	5.00	5.00	5.00	5.00	5.00	5.00
19.400	5.00	4.00	4.00	4.00	4.00	4.00	4.00
20.100	4.00	4.00	4.00	4.00	4.00	4.00	4.00
20.800	4.00	4.00	4.00	3.00	3.00	3.00	3.00
21.500	3.00	3.00	3.00	3.00	3.00	3.00	3.00
22.200	3.00	3.00	3.00	3.00	3.00	2.00	2.00
22.900	2.00	2.00	2.00	2.00	2.00	2.00	2.00
23.600	2.00	2.00	2.00	2.00	2.00	1.00	1.00
24.300	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25.000	1.00	1.00	1.00	1.00	0.00	0.00	0.00
25.700	0.00	0.00	0.00				

POND-2 Version: 5.15 S/N: 1295100016
Plotted: 11-22-1991



* File: c:\jobfiles\pondpkf1\stg's100\SGRP2-O .HYD Qmax = 86.0 cfs

for Darryl Cook

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 1,BEG. HGL=17.6

SECTION 5, PHASE 3

11-12-91

Darryl,
In AES's opinion this HGL Starting point/elev. of 17.6 is not ~~ect~~ realistic of the 10yr. storm condition. In fact this condition, run at your request, ~~would~~ represents a storm well in excess of the 10yr. storm event.

Why 10yr pond elev 17.6 according to calcs 2yr: 16.8'

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA.23188

REVISED DATE: 11/08/91

DARRYL COOK

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 1,BEG. HGL=16.3

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA.23188

REVISED DATE: 11/26/91

Run date: 11-26-1991
File: A:6201-1.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 19.6 / HT = 30 / WID = 30 / N = .013 / L = 200 / JLC = 1

SS#1-1 TO SS#1-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.30	30.00	10.00	3.99	16.55	0.00	-.5	4.91
UPSTRM	16.76	30.00	11.20	3.99	17.00	0.00	11.4	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.600
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.228
Time of conc (min)	= 50	Critical depth (in)	= 18.41
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.66	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.1
Line capac. (cfs)	= 31.8	Line storage (cuft)	= 982

LINE 2 / Q = 19.8 / HT = 30 / WID = 30 / N = .013 / L = 180 / JLC = 1.2

SS#1-2 TO SS#1-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.00	30.00	11.20	4.04	17.26	0.00	11.4	4.91
UPSTRM	17.42	30.00	12.10	4.04	17.68	0.00	5.79	4.91

Drainage area (ac)	= .99	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.234
Time of conc (min)	= 49	Critical depth (in)	= 19.13
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 1.0
Intensity (in/hr)	= 2.69	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1	Confluence angle (deg)	= 33
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 883

LINE 3 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 150 / JLC = 1

SS#1-3 TO SS#1-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.73	30.00	12.10	3.61	17.93	0.00	5.79	4.91
UPSTRM	18.01	30.00	12.85	3.61	18.21	0.00	8.25	4.91

Drainage area (ac)	= .21	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.187
Time of conc (min)	= 49	Critical depth (in)	= 17.67
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.2
Intensity (in/hr)	= 2.72	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 6.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .2	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.6
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 736

LINE 4 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 130 / JLC = .9

SS#1-4 TO SS#1-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.21	30.00	12.85	3.60	18.41	0.00	8.25	4.91
UPSTRM	18.45	30.00	13.50	3.60	18.65	0.00	12.5	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.500
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.186
Time of conc (min)	= 48	Critical depth (in)	= 17.67
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.75	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	=-29
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.5
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 638

LINE 5 / Q = 18.1 / HT = 30 / WID = 30 / N = .013 / L = 330 / JLC = 1.1

SS#1-5 TO SS#1-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.63	30.00	13.50	3.69	18.84	0.00	12.5	4.91
UPSTRM	19.28	30.00	15.37	3.69	19.49	0.00	1.05	4.91

Rim 18.92

Drainage area (ac)	= 1.84	Slope of invert (%)	= 0.567
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.195
Time of conc (min)	= 46	Critical depth (in)	= 17.67
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.9
Intensity (in/hr)	= 2.82	Req'd grate area (sf)	= 0.5
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2	Confluence angle (deg)	=-2
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.92
Line capac. (cfs)	= 30.9	Line storage (cuft)	= 1620

LINE 6 / Q = 16.1 / HT = 30 / WID = 30 / N = .013 / L = 76 / JLC = 1.1

SS#1-6 TO SS#1-7. / DNLN = 5

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.51	30.00	15.53	3.29	19.68	0.00	.89	4.91
UPSTRM	19.63	30.00	16.23	3.29	19.80	0.00	1.31	4.91

Drainage area (ac)	= .14	Slope of invert (%)	= 0.921
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.155
Time of conc (min)	= 46	Critical depth (in)	= 16.93
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.1
Intensity (in/hr)	= 2.84	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 5.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.05
Line capac. (cfs)	= 39.4	Line storage (cuft)	= 373

LINE 7 / Q = 16.4 / HT = 30 / WID = 30 / N = .013 / L = 311 / JLC = 1.1

SS#1-7 TO SS#1-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.81	30.00	16.26	3.34	19.98	0.00	1.28	4.91
UPSTRM	20.31	30.00	17.36	3.34	20.48	0.00	4.6	4.91

Drainage area (ac)	= 1.1	Slope of invert (%)	= 0.354
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.159
Time of conc (min)	= 44	Critical depth (in)	= 16.93
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 1.2
Intensity (in/hr)	= 2.91	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 5.6	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.2	Confluence angle (deg)	=-90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.47
Line capac. (cfs)	= 24.4	Line storage (cuft)	= 1526

LINE 8 / Q = 15.2 / HT = 30 / WID = 30 / N = .013 / L = 51 / JLC = 1.2

SS#1-8 TO SS#1-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.50	30.00	17.52	3.09	20.65	0.00	4.44	4.91
UPSTRM	20.57	30.00	17.89	3.09	20.72	0.00	4.25	4.91

Drainage area (ac)	= .3	Slope of invert (%)	= 0.725
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.137
Time of conc (min)	= 44	Critical depth (in)	= 16.19
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.3
Intensity (in/hr)	= 2.92	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 5.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .3	Confluence angle (deg)	=-22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.64
Line capac. (cfs)	= 34.9	Line storage (cuft)	= 250

LINE 9 / Q = 13.9 / HT = 30 / WID = 30 / N = .013 / L = 127 / JLC = 1.1

SS#1-9 TO SS#1-10 / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.75	30.00	17.90	2.83	20.87	0.00	4.23	4.91
UPSTRM	20.89	30.00	18.33	2.83	21.02	0.00	4.43	4.91

Drainage area (ac)	= .47	Slope of invert (%)	= 0.339
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.115
Time of conc (min)	= 43	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.5
Intensity (in/hr)	= 2.95	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 4.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .5	Confluence angle (deg)	= 22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.26
Line capac. (cfs)	= 23.9	Line storage (cuft)	= 623

LINE 10 / Q = 13.5 / HT = 30 / WID = 30 / N = .013 / L = 108 / JLC = 1

SS#1-10 - SS#1-11 / DNLN = 9

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.03	30.00	18.35	2.74	21.14	0.00	4.41	4.91
UPSTRM	21.14	29.74	18.66	2.75	21.26	5.57	4.03	4.90

Drainage area (ac)	= .81	Slope of invert (%)	= 0.287
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.103
Time of conc (min)	= 42	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.9
Intensity (in/hr)	= 2.98	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .9	Confluence angle (deg)	= 45
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.19
Line capac. (cfs)	= 22.0	Line storage (cuft)	= 530

LINE 11 / Q = 12.7 / HT = 30 / WID = 30 / N = .013 / L = 182 / JLC = 1

SS#1-11 - SS#1-12 / DNLN = 10

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.26	28.14	18.91	2.65	21.36	14.16	3.78	4.79
UPSTRM	21.39	23.77	19.41	3.04	21.53	24.34	6.43	4.17

Drainage area (ac)	= .99	Slope of invert (%)	= 0.275
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.093
Time of conc (min)	= 41	Critical depth (in)	= 15.44
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 3.02	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.1	Confluence angle (deg)	= 17
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.34
Line capac. (cfs)	= 21.5	Line storage (cuft)	= 815

LINE 12 / Q = 11.7 / HT = 30 / WID = 30 / N = .013 / L = 186 / JLC = 1.2

SS#1-12 - SS#1-13 / DNLN = 11

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.53	25.13	19.44	2.62	21.64	21.34	6.39	4.45
UPSTRM	21.67	19.92	20.01	3.37	21.85	28.34	2.36	3.46

Drainage area (ac)	= 1.19	Slope of invert (%)	= 0.306
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.111
Time of conc (min)	= 40	Critical depth (in)	= 14.69
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.3
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.4
Cumulative C*A	= 3.8	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.4	Confluence angle (deg)	=-12
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.87
Line capac. (cfs)	= 22.7	Line storage (cuft)	= 736

LINE 13 / Q = 6.3 / HT = 18 / WID = 18 / N = .013 / L = 109 / JLC = .9

SS#1-13 - SS#1-14 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.88	11.91	20.89	5.08	22.28	17.03	2.48	1.24
UPSTRM	23.28	11.95	21.93	5.06	23.68	17.00	.61	1.25

Drainage area (ac)	= 2.66	Slope of invert (%)	= 0.954
Runoff coefficient	= .4	Slope energy grade line (%)	= 1.283
Time of conc (min)	= 10	Critical depth (in)	= 11.91
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 5.8
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 1.7
Cumulative C*A	= 1.1	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.3	Confluence angle (deg)	=-55
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.05
Line capac. (cfs)	= 10.3	Line storage (cuft)	= 136

LINE 14 / Q = 7.0 / HT = 24 / WID = 24 / N = .013 / L = 39 / JLC = .9

SS#1-14 - SS#1-15 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.88	17.18	20.45	2.83	22.01	21.30	2.42	2.46
UPSTRM	22.05	14.55	20.67	3.50	22.24	23.45	1.27	1.99

Drainage area (ac)	= 7.54	Slope of invert (%)	= 0.564
Runoff coefficient	= .3	Slope energy grade line (%)	= 0.607
Time of conc (min)	= 40	Critical depth (in)	= 11.75
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 6.4
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 1.8
Cumulative C*A	= 2.3	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.9	Confluence angle (deg)	= 35
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.94
Line capac. (cfs)	= 17.0	Line storage (cuft)	= 87

LINE 15 / Q = 2.3 / HT = 15 / WID = 15 / N = .013 / L = 38 / JLC = .9

SS#1-20 - SS#1-3. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.73	15.00	13.35	1.92	17.78	0.00	5.79	1.23
UPSTRM	17.83	15.00	14.00	1.91	17.89	0.00	5.14	1.23

Drainage area (ac)	= 1.15	Slope of invert (%)	= 1.711
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.267
Time of conc (min)	= 15	Critical depth (in)	= 7.72
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 2.2
Intensity (in/hr)	= 5.11	Req'd grate area (sf)	= 0.6
Cumulative C*A	= 0.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2.3	Confluence angle (deg)	= 80
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 8.4	Line storage (cuft)	= 47

LINE 16 / Q = 2.1 / HT = 24 / WID = 24 / N = .013 / L = 44 / JLC = .9

SS#1-21 -SS#1-9.. / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.75	14.82	19.51	1.01	20.76	23.07	3.12	2.11
UPSTRM	24.38	6.61	23.70	3.03	24.52	21.44	-1.2	0.70

Drainage area (ac)	= .9	Slope of invert (%)	= 9.523
Runoff coefficient	= .4	Slope energy grade line (%)	= 8.256
Time of conc (min)	= 10	Critical depth (in)	= 6.56
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 2.1	Confluence angle (deg)	= 109
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.5
Line capac. (cfs)	= 69.8	Line storage (cuft)	= 62

DARRYL COOK

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 2,BEG. HGL=16.3

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA. 23188

REVISED DATE: 11/26/91

Run date: 11-26-1991
File: A:6201-2.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 48.5 / HT = 36 / WID = 36 / N = .013 / L = 40 / JLC = 1.1

SS#2-1 TO SS#2-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.30	36.00	11.50	6.86	17.03	0.00	5.5	7.07
UPSTRM	16.51	36.00	12.00	6.85	17.24	0.00	6.39	7.07

Drainage area (ac)	= 4.81	Slope of invert (%)	= 1.250
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.528
Time of conc (min)	= 42	Critical depth (in)	= 27.85
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.00	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 16.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 7.2	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 74.6	Line storage (cuft)	= 283

LINE 2 / Q = 41.6 / HT = 36 / WID = 36 / N = .013 / L = 110 / JLC = 1.1

SS#2-2 TO SS#2-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.31	36.00	12.00	5.89	17.85	0.00	6.39	7.07
UPSTRM	17.74	36.00	13.00	5.89	18.28	0.00	5.39	7.07

Drainage area (ac)	= 2.52	Slope of invert (%)	= 0.909
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.389
Time of conc (min)	= 41	Critical depth (in)	= 26.30
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 13.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 3.8	Confluence angle (deg)	= 15
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 63.6	Line storage (cuft)	= 777

LINE 3 / Q = 30.4 / HT = 30 / WID = 30 / N = .013 / L = 110 / JLC = 1.1

SS#2-3 TO SS#2-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.33	30.00	13.50	6.20	18.93	0.00	5.39	4.91
UPSTRM	18.94	30.00	14.25	6.20	19.54	0.00	4.64	4.91

Drainage area (ac)	= 11.21	Slope of invert (%)	= 0.682
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.550
Time of conc (min)	= 30	Critical depth (in)	= 23.21
Inlet time (min)	= 30	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.65	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 8.3	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 20.4	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 33.9	Line storage (cuft)	= 540

LINE 4 / Q = 12.1 / HT = 24 / WID = 24 / N = .013 / L = 185 / JLC = 1.1

SS#2-4 TO SS#2-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.60	24.00	14.75	3.85	19.83	0.00	4.64	3.14
UPSTRM	20.12	24.00	15.50	3.85	20.35	0.00	3.7	3.14

Drainage area (ac)	= 3.67	Slope of invert (%)	= 0.405
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.286
Time of conc (min)	= 21	Critical depth (in)	= 15.31
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.42	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 2.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 8.1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 14.4	Line storage (cuft)	= 581

LINE 5 / Q = 4.0 / HT = 15 / WID = 15 / N = .013 / L = 135 / JLC = .9

SS#2-5 TO SS#2-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.38	15.00	16.25	3.30	20.55	0.00	3.7	1.23
UPSTRM	21.06	15.00	17.25	3.30	21.23	0.00	2.7	1.23

Drainage area (ac)	= 2.25	Slope of invert (%)	= 0.741
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.506
Time of conc (min)	= 20	Critical depth (in)	= 10.28
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.50	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.9	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 4	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 5.6	Line storage (cuft)	= 166

LINE 6 / Q = 12.7 / HT = 24 / WID = 24 / N = .013 / L = 150 / JLC = 1

SS#2-3 TO SS#2-7. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.33	24.00	13.00	4.03	18.59	0.00	6.39	3.14
UPSTRM	18.81	24.00	14.00	4.03	19.06	0.00	2.14	3.14

Drainage area (ac)	= .85	Slope of invert (%)	= 0.667
Runoff coefficient	= .7	Slope energy grade line (%)	= 0.314
Time of conc (min)	= 40	Critical depth (in)	= 15.88
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 4.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 1.8	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 18.5	Line storage (cuft)	= 471

LINE 7 / Q = 10.9 / HT = 24 / WID = 24 / N = .013 / L = 38 / JLC = 1.2

SS#2-7 TO SS#2-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.06	24.00	14.00	3.46	19.24	0.00	2.14	3.14
UPSTRM	19.15	24.00	14.50	3.46	19.33	0.00	1.64	3.14

Drainage area (ac)	= 5.35	Slope of invert (%)	= 1.316
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.231
Time of conc (min)	= 40	Critical depth (in)	= 14.73
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 3.5	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 6.5	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 25.9	Line storage (cuft)	= 119

LINE 8 / Q = 5.6 / HT = 18 / WID = 18 / N = .013 / L = 95 / JLC = .9

SS#2-8 TO SS#2-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.37	18.00	14.50	3.17	19.53	0.00	2.14	1.77
UPSTRM	19.78	18.00	15.30	3.17	19.94	0.00	2.49	1.77

Drainage area (ac)	= 3.48	Slope of invert (%)	= 0.842
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.285
Time of conc (min)	= 25	Critical depth (in)	= 11.48
Inlet time (min)	= 25	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 1.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 5.6	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 19.3
Line capac. (cfs)	= 9.6	Line storage (cuft)	= 168

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 2,BEG. HGL=14.5

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA. 23188

REVISED DATE: 11/08/91

Run date: 11-08-1991
File: A:6201-2.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 48.5 / HT = 36 / WID = 36 / N = .013 / L = 40 / JLC = 1.1

SS#2-1 TO SS#2-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	14.50	36.00	11.50	6.86	15.23	0.00	5.5	7.07
UPSTRM	14.55	30.58	12.00	7.57	15.44	25.74	6.39	6.40

Drainage area (ac)	= 4.81	Slope of invert (%)	= 1.250
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.521
Time of conc (min)	= 42	Critical depth (in)	= 27.85
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.00	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 16.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 7.2	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 74.6	Line storage (cuft)	= 269

LINE 2 / Q = 41.6 / HT = 36 / WID = 36 / N = .013 / L = 110 / JLC = 1.1

SS#2-2 TO SS#2-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	15.53	36.00	12.00	5.89	16.07	0.00	6.39	7.07
UPSTRM	15.93	35.11	13.00	5.93	16.47	11.21	5.39	7.02

Drainage area (ac)	= 2.52	Slope of invert (%)	= 0.909
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.368
Time of conc (min)	= 41	Critical depth (in)	= 26.30
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 13.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 3.8	Confluence angle (deg)	= 15
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 63.6	Line storage (cuft)	= 775

FUTURE

LINE 3 / Q = 30.4 / HT = 30 / WID = 30 / N = .013 / L = 110 / JLC = 1.1

SS#2-3 TO SS#2-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.53	30.00	13.50	6.20	17.12	0.00	5.39	4.91
UPSTRM	17.13	30.00	14.25	6.20	17.73	0.00	4.64	4.91

Drainage area (ac)	= 11.21	Slope of invert (%)	= 0.682
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.550
Time of conc (min)	= 30	Critical depth (in)	= 23.21
Inlet time (min)	= 30	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.65	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 8.3	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 20.4	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 33.9	Line storage (cuft)	= 540

FUTURE

LINE 4 / Q = 12.1 / HT = 24 / WID = 24 / N = .013 / L = 185 / JLC = 1.1

SS#2-4 TO SS#2-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.79	24.00	14.75	3.85	18.02	0.00	4.64	3.14
UPSTRM	18.32	24.00	15.50	3.85	18.55	0.00	3.7	3.14

Drainage area (ac)	= 3.67	Slope of invert (%)	= 0.405
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.286
Time of conc (min)	= 21	Critical depth (in)	= 15.31
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.42	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 2.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 8.1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 14.4	Line storage (cuft)	= 581

FUTURE

LINE 5 / Q = 4.0 / HT = 15 / WID = 15 / N = .013 / L = 135 / JLC = .9

SS#2-5 TO SS#2-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.57	15.00	16.25	3.30	18.74	0.00	3.7	1.23
UPSTRM	19.25	15.00	17.25	3.30	19.42	0.00	2.7	1.23

Drainage area (ac)	= 2.25	Slope of invert (%)	= 0.741
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.506
Time of conc (min)	= 20	Critical depth (in)	= 10.28
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.50	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.9	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 4	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 5.6	Line storage (cuft)	= 166

LINE 6 / Q = 12.7 / HT = 24 / WID = 24 / N = .013 / L = 150 / JLC = 1

SS#2-3 TO SS#2-7. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.53	24.00	13.00	4.03	16.78	0.00	6.39	3.14
UPSTRM	17.00	24.00	14.00	4.03	17.25	0.00	2.14	3.14

Drainage area (ac)	= .85	Slope of invert (%)	= 0.667
Runoff coefficient	= .7	Slope energy grade line (%)	= 0.314
Time of conc (min)	= 40	Critical depth (in)	= 15.88
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 4.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 1.8	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 18.5	Line storage (cuft)	= 471

LINE 7 / Q = 10.9 / HT = 24 / WID = 24 / N = .013 / L = 38 / JLC = 1.2

SS#2-7 TO SS#2-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.25	24.00	14.00	3.46	17.43	0.00	2.14	3.14
UPSTRM	17.34	24.00	14.50	3.46	17.52	0.00	1.64	3.14

Drainage area (ac)	= 5.35	Slope of invert (%)	= 1.316
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.231
Time of conc (min)	= 40	Critical depth (in)	= 14.73
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 3.5	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 6.5	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 25.9	Line storage (cuft)	= 119

LINE 8 / Q = 5.6 / HT = 18 / WID = 18 / N = .013 / L = 95 / JLC = .9

SS#2-8 TO SS#2-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.56	18.00	14.50	3.17	17.72	0.00	2.14	1.77
UPSTRM	17.97	18.00	15.30	3.17	18.13	0.00	2.49	1.77

Drainage area (ac)	= 3.48	Slope of invert (%)	= 0.842
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.285
Time of conc (min)	= 25	Critical depth (in)	= 11.48
Inlet time (min)	= 25	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 1.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 5.6	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 19.3
Line capac. (cfs)	= 9.6	Line storage (cuft)	= 168

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 2,BEG. HGL=17.6

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA. 23188

REVISED DATE: 11/08/91

Run date: 11-08-1991
File: A:6201-2.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 48.5 / HT = 36 / WID = 36 / N = .013 / L = 40 / JLC = 1.1

SS#2-1 TO SS#2-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.60	36.00	11.50	6.86	18.33	0.00	5.5	7.07
UPSTRM	17.81	36.00	12.00	6.85	18.54	0.00	6.39	7.07

Drainage area (ac)	= 4.81	Slope of invert (%)	= 1.250
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.528
Time of conc (min)	= 42	Critical depth (in)	= 27.85
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.00	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 16.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 7.2	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 74.6	Line storage (cuft)	= 283

LINE 2 / Q = 41.6 / HT = 36 / WID = 36 / N = .013 / L = 110 / JLC = 1.1

SS#2-2 TO SS#2-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.61	36.00	12.00	5.89	19.15	0.00	6.39	7.07
UPSTRM	19.04	36.00	13.00	5.89	19.58	0.00	5.39	7.07

Drainage area (ac)	= 2.52	Slope of invert (%)	= 0.909
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.389
Time of conc (min)	= 41	Critical depth (in)	= 26.30
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 13.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 3.8	Confluence angle (deg)	= 15
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 63.6	Line storage (cuft)	= 777

FUTURE

LINE 3 / Q = 30.4 / HT = 30 / WID = 30 / N = .013 / L = 110 / JLC = 1.1

SS#2-3 TO SS#2-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.63	30.00	13.50	6.20	20.23	0.00	5.39	4.91
UPSTRM	20.24	30.00	14.25	6.20	20.84	0.00	4.64	4.91

Drainage area (ac)	= 11.21	Slope of invert (%)	= 0.682
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.550
Time of conc (min)	= 30	Critical depth (in)	= 23.21
Inlet time (min)	= 30	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.65	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 8.3	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 20.4	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.4
Line capac. (cfs)	= 33.9	Line storage (cuft)	= 540

FUTURE

LINE 4 / Q = 12.1 / HT = 24 / WID = 24 / N = .013 / L = 185 / JLC = 1.1

SS#2-4 TO SS#2-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.90	24.00	14.75	3.85	21.13	0.00	4.64	3.14
UPSTRM	21.42	24.00	15.50	3.85	21.65	0.00	3.7	3.14

Drainage area (ac)	= 3.67	Slope of invert (%)	= 0.405
Runoff coefficient	= .5	Slope energy grade line (%)	= 0.286
Time of conc (min)	= 21	Critical depth (in)	= 15.31
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.42	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 2.7	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 8.1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 14.4	Line storage (cuft)	= 581

FUTURE

LINE 5 / Q = 4.0 / HT = 15 / WID = 15 / N = .013 / L = 135 / JLC = .9

SS#2-5 TO SS#2-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.68	15.00	16.25	3.30	21.85	0.00	3.7	1.23
UPSTRM	22.36	15.00	17.25	3.30	22.53	0.00	2.7	1.23

Drainage area (ac)	= 2.25	Slope of invert (%)	= 0.741
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.506
Time of conc (min)	= 20	Critical depth (in)	= 10.28
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.50	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.9	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 4	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 21.2
Line capac. (cfs)	= 5.6	Line storage (cuft)	= 166

LINE 6 / Q = 12.7 / HT = 24 / WID = 24 / N = .013 / L = 150 / JLC = 1

SS#2-3 TO SS#2-7. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.63	24.00	13.00	4.03	19.89	0.00	6.39	3.14
UPSTRM	20.11	24.00	14.00	4.03	20.36	0.00	2.14	3.14

Drainage area (ac)	= .85	Slope of invert (%)	= 0.667
Runoff coefficient	= .7	Slope energy grade line (%)	= 0.314
Time of conc (min)	= 40	Critical depth (in)	= 15.88
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 4.1	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 1.8	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 18.5	Line storage (cuft)	= 471

LINE 7 / Q = 10.9 / HT = 24 / WID = 24 / N = .013 / L = 38 / JLC = 1.2

SS#2-7 TO SS#2-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.36	24.00	14.00	3.46	20.54	0.00	2.14	3.14
UPSTRM	20.45	24.00	14.50	3.46	20.63	0.00	1.64	3.14

Drainage area (ac)	= 5.35	Slope of invert (%)	= 1.316
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.231
Time of conc (min)	= 40	Critical depth (in)	= 14.73
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 3.5	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 6.5	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.15
Line capac. (cfs)	= 25.9	Line storage (cuft)	= 119

LINE 8 / Q = 5.6 / HT = 18 / WID = 18 / N = .013 / L = 95 / JLC = .9

SS#2-8 TO SS#2-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.67	18.00	14.50	3.17	20.83	0.00	2.14	1.77
UPSTRM	21.08	18.00	15.30	3.17	21.24	0.00	2.49	1.77

Drainage area (ac)	= 3.48	Slope of invert (%)	= 0.842
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.285
Time of conc (min)	= 25	Critical depth (in)	= 11.48
Inlet time (min)	= 25	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 4.03	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 1.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 5.6	Confluence angle (deg)	= 90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 19.3
Line capac. (cfs)	= 9.6	Line storage (cuft)	= 168

Rev 5-83

22(5-18)

Project ST. GEORGE'S HUNDRED
SECTION 5, PHASE III

Plan Sheet No. 1 Designer HWP
Rev. Date _____ Date 9/16/91

Sheet 1 of 1

HYDROLOGICAL DATA:

D.A. = 0.41 AC. T_c = 10 MIN. C = 0.40

I_2 = 4.70 IN/HR I_{10} = 6.1 IN/HR

Q_2 = CIA = (0.40)(4.7)(0.41) = 0.77 CFS

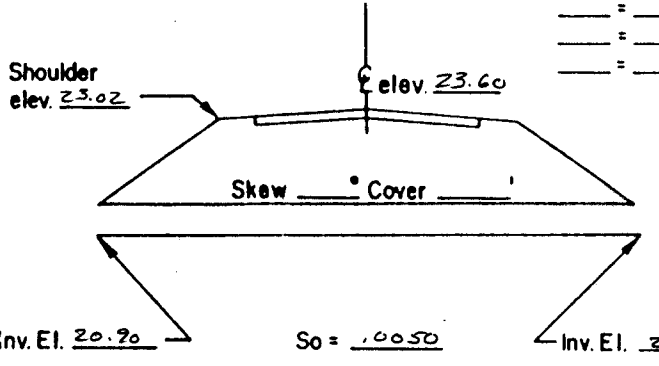
Q_{10} = (0.40)(6.1)(0.41) = 1.00 CFS

AHW Controls

100 yr. Flood plain _____ elev. _____
Design AHW depth _____ elev. _____
Structures _____ elev. _____

STATION: _____

freq. TW elev.
_____ = _____
_____ = _____
_____ = _____
_____ = _____
_____ = _____



DISCHARGES USED

Q 2 = 0.77 CFS
Q 10 = 1.00 CFS
Q ____ = _____ CFS
Q ____ = _____ CFS
Q ____ = _____ CFS

RISK ASSESSMENT ADT _____

Detours Available _____, Length _____
Overtopping Stage _____
Flood Plain Management _____
Criteria and Significant Impact _____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS									CONT. HW. ELEV.	OUTLET VELOCITY		End Treat.	COMMENTS
			INLET CONT.		OUTLET CONTROL											
			HW/D	HW	Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW		C.M.	Smooth		
15" RCP	1.00		0.4	0.50		0.45	0.85	0.85	N/A	0.20	0.65	21.40				INLET HW ELEV. CONTROLS

17.6/1

Design Flood Exceed. Prob. _____ Elev. _____
Overtop Flood Exceed. Prob. _____ Elev. _____
Base Flood 1% Exceed. Prob. _____ Elev. _____

SUMMARY & RECOMMENDATIONS:

(Rev. 1/85)

ROADSIDE DITCH DESIGN

(SECTION 5, PHASE III)

PROJECT ST. GEORGE'S HUNDRED
DATE 9/18/91
PROJ# 6201

TC = 10 MIN I_{10} = 6.10 IN/HR I_2 = 4.70 IN/HR C = 0.40

NAME OF STREET WELLINGTON CIRCLE

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	Q_2= CI_2A CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	Q_{10}= $CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
27+75	26+50	L	0.09	0.17	0.17	.0217	1.10	3.00	GRASS	0.22	0.22	-	3.7	GRASS 'V' DITCH W/2:1 I.S. DOWN
27+75	26+50	R	0.17	0.32	0.32	.0217	1.18	3.00	GRASS	0.41	0.41	-	4.8	"
26+50	25+07.88	L	0.10	0.19	0.36	.0337	1.60	3.00	GRASS	0.24	0.46	-	4.7	"
26+50	25+07.88	R	0.51	0.96	1.28	.0337	2.20	3.00	GRASS	1.25	1.66	-	7.4	"
27+75	31+38.77	L	0.25	0.47	0.47	.0165	1.30	3.00	GRASS	0.61	0.61	-	5.8	"
27+75	31+38.77	R	0.80	1.50	1.50	.0165	1.75	3.00	GRASS	1.95	1.95	-	8.8	"
33+12.50	31+38.77	L	0.90	1.69	1.69	.0150	1.70	3.00	GRASS	2.20	2.20	-	9.5	"
33+12.50	31+38.77	R	0.40	0.75	0.75	.0150	1.40	3.00	GRASS	0.98	0.98	-	7.1	"
33+12.50	37+14.79	L	0.23	0.43	0.43	.0125	1.15	3.00	GRASS	0.56	0.56	-	5.9	"
33+12.50	36+25	R	2.12	3.99	3.99	.0125	2.00	3.00	GRASS	5.18	5.18	-	13.5	"

(SECTION 5, ANNEX III)

ROADSIDE DITCH DESIGN

PROJECT ST. GEORGE'S HUNDRED
DATE 9/18/91
PROJ# 6201

TC = 10 MIN I_{10} = 6.10 IN/HR I_2 = 4.70 IN/HR C = 0.40

NAME OF STREET HALSTEAD LANE AND ROTHBURY DRIVE

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	Q_2= CI_2A CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	Q_{10}= $CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
HALSTEAD LANE														
14+75	10+35.74	L	0.50	0.94	0.94	.0083	1.25	3.00	GRASS	1.22	1.22	—	8.3	GRASS V-DITCH 2:1SS, 1.5'DD
14+75	10+35.74	R	0.41	0.77	0.77	.0083	1.20	3.00	GRASS	1.00	1.00	—	7.8	"
ROTHBURY DRIVE														
15+50	19+00	L	1.10	2.07	2.07	.0100	1.60	3.00	GRASS	2.69	2.69	—	10.9	"
15+50	19+00	R	0.96	1.80	1.80	.0100	1.50	3.00	GRASS	2.34	2.34	—	10.2	"
19+00	20+50	L	0.26	0.49	2.56	.0369	2.70	3.00	GRASS	0.64	3.33	—	9.6	"
19+00	20+50	R	0.34	0.64	2.44	.0369	2.60	3.00	GRASS	0.63	3.17	—	9.5	"

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 1,BEG. HGL=14.5

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA.23188

REVISED DATE: 11/08/91

Run date: 11-08-1991
File: A:6201-1.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 19.6 / HT = 30 / WID = 30 / N = .013 / L = 200 / JLC = 1

SS#1-1 TO SS#1-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	14.50	30.00	10.00	3.99	14.75	0.00	-.5	4.91
UPSTRM	14.96	30.00	11.20	3.99	15.20	0.00	11.4	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.600
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.228
Time of conc (min)	= 50	Critical depth (in)	= 18.41
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.66	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.1
Line capac. (cfs)	= 31.8	Line storage (cuft)	= 982

LINE 2 / Q = 19.8 / HT = 30 / WID = 30 / N = .013 / L = 180 / JLC = 1.2

SS#1-2 TO SS#1-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	15.20	30.00	11.20	4.04	15.46	0.00	11.4	4.91
UPSTRM	15.62	30.00	12.10	4.04	15.88	0.00	5.79	4.91

Drainage area (ac)	= .99	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.234
Time of conc (min)	= 49	Critical depth (in)	= 19.13
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 1.0
Intensity (in/hr)	= 2.69	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1	Confluence angle (deg)	= 33
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 883

LINE 3 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 150 / JLC = 1

SS#1-3 TO SS#1-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	15.93	30.00	12.10	3.61	16.13	0.00	5.79	4.91
UPSTRM	16.21	30.00	12.85	3.61	16.41	0.00	8.25	4.91

Drainage area (ac)	= .21	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.187
Time of conc (min)	= 49	Critical depth (in)	= 17.67
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.2
Intensity (in/hr)	= 2.72	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 6.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .2	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.6
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 736

LINE 4 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 130 / JLC = .9

SS#1-4 TO SS#1-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.41	30.00	12.85	3.60	16.61	0.00	8.25	4.91
UPSTRM	16.65	30.00	13.50	3.60	16.85	0.00	12.5	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.500
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.186
Time of conc (min)	= 48	Critical depth (in)	= 17.67
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.75	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	=-29
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.5
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 638

LINE 5 / Q = 18.1 / HT = 30 / WID = 30 / N = .013 / L = 330 / JLC = 1.1

SS#1-5 TO SS#1-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	16.83	30.00	13.50	3.69	17.04	0.00	12.5	4.91
UPSTRM	17.42	24.60	15.37	4.21	17.69	23.06	1.05	4.31

Drainage area (ac)	= 1.84	Slope of invert (%)	= 0.567
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.197
Time of conc (min)	= 46	Critical depth (in)	= 17.67
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.9
Intensity (in/hr)	= 2.82	Req'd grate area (sf)	= 0.5
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2	Confluence angle (deg)	=-2
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.92
Line capac. (cfs)	= 30.9	Line storage (cuft)	= 1521

EXISTING

LINE 6 / Q = 16.1 / HT = 30 / WID = 30 / N = .013 / L = 76 / JLC = 1.1

SS#1-6 TO SS#1-7. / DNLN = 5

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.72	26.30	15.53	3.51	17.91	19.13	.89	4.60
UPSTRM	17.66	17.16	16.23	5.56	18.14	29.69	1.31	2.90

Drainage area (ac)	= .14	Slope of invert (%)	= 0.921
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.298
Time of conc (min)	= 46	Critical depth (in)	= 16.93
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.1
Intensity (in/hr)	= 2.84	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 5.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.05
Line capac. (cfs)	= 39.4	Line storage (cuft)	= 285

EXISTING

LINE 7 / Q = 16.4 / HT = 30 / WID = 30 / N = .013 / L = 311 / JLC = 1.1

SS#1-7 TO SS#1-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.19	23.13	16.26	4.02	18.44	25.11	1.28	4.08
UPSTRM	18.84	17.75	17.36	5.42	19.29	29.49	4.6	3.02

Drainage area (ac)	= 1.1	Slope of invert (%)	= 0.354
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.275
Time of conc (min)	= 44	Critical depth (in)	= 16.93
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 1.2
Intensity (in/hr)	= 2.91	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 5.6	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.2	Confluence angle (deg)	=-90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.47
Line capac. (cfs)	= 24.4	Line storage (cuft)	= 1104

EXISTING

LINE 8 / Q = 15.2 / HT = 30 / WID = 30 / N = .013 / L = 51 / JLC = 1.2

SS#1-8 TO SS#1-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.34	21.84	17.52	3.94	19.58	26.62	4.44	3.84
UPSTRM	19.26	16.41	17.89	5.52	19.73	29.87	4.25	2.75

Drainage area (ac)	= .3	Slope of invert (%)	= 0.725
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.291
Time of conc (min)	= 44	Critical depth (in)	= 16.19
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.3
Intensity (in/hr)	= 2.92	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 5.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .3	Confluence angle (deg)	=-22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.64
Line capac. (cfs)	= 34.9	Line storage (cuft)	= 168

EXISTING

LINE 9 / Q = 13.9 / HT = 30 / WID = 30 / N = .013 / L = 127 / JLC = 1.1

SS#1-9 TO SS#1-10 / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.82	23.09	17.90	3.41	20.00	25.11	4.23	4.08
UPSTRM	19.95	19.49	18.33	4.12	20.22	28.62	4.43	3.38

Drainage area (ac)	= .47	Slope of invert (%)	= 0.339
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.167
Time of conc (min)	= 43	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.5
Intensity (in/hr)	= 2.95	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 4.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .5	Confluence angle (deg)	= 22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.26
Line capac. (cfs)	= 23.9	Line storage (cuft)	= 473

EXISTING

LINE 10 / Q = 13.5 / HT = 30 / WID = 30 / N = .013 / L = 108 / JLC = 1

SS#1-10 - SS#1-11 / DNLN = 9

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.24	22.73	18.35	3.30	20.41	25.11	4.41	4.08
UPSTRM	20.33	20.06	18.66	3.86	20.56	28.24	4.03	3.49

Drainage area (ac)	= .81	Slope of invert (%)	= 0.287
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.139
Time of conc (min)	= 42	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.9
Intensity (in/hr)	= 2.98	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .9	Confluence angle (deg)	= 45
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.19
Line capac. (cfs)	= 22.0	Line storage (cuft)	= 408

EXISTING

LINE 11 / Q = 12.7 / HT = 30 / WID = 30 / N = .013 / L = 182 / JLC = 1

SS#1-11 - SS#1-12 / DNLN = 10

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.56	19.84	18.91	3.68	20.77	28.39	3.78	3.45
UPSTRM	20.84	17.16	19.41	4.37	21.14	29.69	6.43	2.90

Drainage area (ac)	= .99	Slope of invert (%)	= 0.275
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.199
Time of conc (min)	= 41	Critical depth (in)	= 15.44
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 3.02	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.1	Confluence angle (deg)	= 17
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.34
Line capac. (cfs)	= 21.5	Line storage (cuft)	= 578

EXISTING

LINE 12 / Q = 11.7 / HT = 30 / WID = 30 / N = .013 / L = 186 / JLC = 1.2

SS#1-12 - SS#1-13 / DNLN = 11

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.14	20.36	19.44	3.26	21.30	27.87	6.39	3.58
UPSTRM	21.35	16.11	20.01	4.35	21.65	29.92	2.36	2.69

Drainage area (ac)	= 1.19	Slope of invert (%)	= 0.306
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.185
Time of conc (min)	= 40	Critical depth (in)	= 14.69
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.3
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.4
Cumulative C*A	= 3.8	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.4	Confluence angle (deg)	=-12
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.87
Line capac. (cfs)	= 22.7	Line storage (cuft)	= 583

EXISTING

LINE 13 / Q = 6.3 / HT = 18 / WID = 18 / N = .013 / L = 109 / JLC = .9

SS#1-13 - SS#1-14 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.88	11.91	20.89	5.08	22.28	17.03	2.48	1.24
UPSTRM	23.28	11.95	21.93	5.06	23.68	17.00	.61	1.25

Drainage area (ac)	= 2.66	Slope of invert (%)	= 0.954
Runoff coefficient	= .4	Slope energy grade line (%)	= 1.283
Time of conc (min)	= 10	Critical depth (in)	= 11.91
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 5.8
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 1.7
Cumulative C*A	= 1.1	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.3	Confluence angle (deg)	=-55
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.05
Line capac. (cfs)	= 10.3	Line storage (cuft)	= 136

EXISTING

LINE 14 / Q = 7.0 / HT = 24 / WID = 24 / N = .013 / L = 39 / JLC = .9

SS#1-14 - SS#1-15 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.70	15.05	20.45	3.29	21.87	23.07	2.42	2.11
UPSTRM	21.95	12.17	20.67	4.36	22.24	24.00	1.27	1.60

Drainage area (ac)	= 7.54	Slope of invert (%)	= 0.564
Runoff coefficient	= .3	Slope energy grade line (%)	= 0.952
Time of conc (min)	= 40	Critical depth (in)	= 11.75
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 6.4
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 1.8
Cumulative C*A	= 2.3	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.9	Confluence angle (deg)	= 35
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.94
Line capac. (cfs)	= 17.0	Line storage (cuft)	= 72

PROPOSED

LINE 15 / Q = 2.3 / HT = 15 / WID = 15 / N = .013 / L = 38 / JLC = .9

SS#1-~~20~~ 16 - SS#1-3. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	15.93	15.00	13.35	1.92	15.98	0.00	5.79	1.23
UPSTRM	16.03	15.00	14.00	1.91	16.09	0.00	5.14	1.23

Drainage area (ac)	= 1.15	Slope of invert (%)	= 1.711
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.267
Time of conc (min)	= 15	Critical depth (in)	= 7.72
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 2.2
Intensity (in/hr)	= 5.11	Req'd grate area (sf)	= 0.6
Cumulative C*A	= 0.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2.3	Confluence angle (deg)	= 80
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 8.4	Line storage (cuft)	= 47

EXISTING

LINE 16 / Q = 2.1 / HT = 24 / WID = 24 / N = .013 / L = 44 / JLC = .9

SS#1-~~21~~ 17 -SS#1-9.. / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.06	6.56	19.51	3.07	20.20	21.39	3.12	0.70
UPSTRM	24.38	6.61	23.70	3.03	24.52	21.44	-1.2	0.70

Drainage area (ac)	= .9	Slope of invert (%)	= 9.523
Runoff coefficient	= .4	Slope energy grade line (%)	= 9.525
Time of conc (min)	= 10	Critical depth (in)	= 6.56
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 2.1	Confluence angle (deg)	= 109
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.5
Line capac. (cfs)	= 69.8	Line storage (cuft)	= 31

HYDRAULIC REPORT FOR

ST. GEORGE'S HUNDRED

JOB NO. 6201

SYSTEM 1,BEG. HGL=17.6

SECTION 5, PHASE 3

prepared by:

AES CONSULTING ENGINEERS

5248 Olde Towne Rd,Suite 1

Williamsburg, VA.23188

REVISED DATE: 11/08/91

Run date: 11-08-1991
File: A:6201-1.ST3

Return Period = 10 Yrs
Rainfall file: JAMES CITY CO.....

LINE 1 / Q = 19.6 / HT = 30 / WID = 30 / N = .013 / L = 200 / JLC = 1

SS#1-1 TO SS#1-2. / Outfall

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	17.60	30.00	10.00	3.99	17.85	0.00	-.5	4.91
UPSTRM	18.06	30.00	11.20	3.99	18.30	0.00	11.4	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.600
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.228
Time of conc (min)	= .50	Critical depth (in)	= 18.41
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.66	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.1
Line capac. (cfs)	= 31.8	Line storage (cuft)	= 982

LINE 2 / Q = 19.8 / HT = 30 / WID = 30 / N = .013 / L = 180 / JLC = 1.2

SS#1-2 TO SS#1-3. / DNLN = 1

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	18.30	30.00	11.20	4.04	18.56	0.00	11.4	4.91
UPSTRM	18.72	30.00	12.10	4.04	18.98	0.00	5.79	4.91

Drainage area (ac)	= .99	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.234
Time of conc (min)	= 49	Critical depth (in)	= 19.13
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 1.0
Intensity (in/hr)	= 2.69	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 7.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1	Confluence angle (deg)	= 33
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 883

LINE 3 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 150 / JLC = 1

SS#1-3 TO SS#1-4. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.03	30.00	12.10	3.61	19.23	0.00	5.79	4.91
UPSTRM	19.31	30.00	12.85	3.61	19.51	0.00	8.25	4.91

Drainage area (ac)	= .21	Slope of invert (%)	= 0.500
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.187
Time of conc (min)	= 49	Critical depth (in)	= 17.67
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.2
Intensity (in/hr)	= 2.72	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 6.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .2	Confluence angle (deg)	=-25
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.6
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 736

LINE 4 / Q = 17.7 / HT = 30 / WID = 30 / N = .013 / L = 130 / JLC = .9

SS#1-4 TO SS#1-5. / DNLN = 3

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.51	30.00	12.85	3.60	19.71	0.00	8.25	4.91
UPSTRM	19.75	30.00	13.50	3.60	19.95	0.00	12.5	4.91

Drainage area (ac)	= 0	Slope of invert (%)	= 0.500
Runoff coefficient	= 0	Slope energy grade line (%)	= 0.186
Time of conc (min)	= 48	Critical depth (in)	= 17.67
Inlet time (min)	= 0	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 2.75	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 0	Confluence angle (deg)	=-29
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.5
Line capac. (cfs)	= 29.0	Line storage (cuft)	= 638

LINE 5 / Q = 18.1 / HT = 30 / WID = 30 / N = .013 / L = 330 / JLC = 1.1

SS#1-5 TO SS#1-6. / DNLN = 4

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.93	30.00	13.50	3.69	20.14	0.00	12.5	4.91
UPSTRM	20.58	30.00	15.37	3.69	20.79	0.00	1.05	4.91

Drainage area (ac)	= 1.84	Slope of invert (%)	= 0.567
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.195
Time of conc (min)	= 46	Critical depth (in)	= 17.67
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.9
Intensity (in/hr)	= 2.82	Req'd grate area (sf)	= 0.5
Cumulative C*A	= 6.4	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2	Confluence angle (deg)	=-2
Default Q (cfs)	= 0	Natural ground elev (ft)	= 18.92
Line capac. (cfs)	= 30.9	Line storage (cuft)	= 1620

EXISTING

LINE 6 / Q = 16.1 / HT = 30 / WID = 30 / N = .013 / L = 76 / JLC = 1.1

SS#1-6 TO SS#1-7. / DNLN = 5

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	20.81	30.00	15.53	3.29	20.98	0.00	.89	4.91
UPSTRM	20.93	30.00	16.23	3.29	21.10	0.00	1.31	4.91

Drainage area (ac)	= .14	Slope of invert (%)	= 0.921
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.155
Time of conc (min)	= 46	Critical depth (in)	= 16.93
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.1
Intensity (in/hr)	= 2.84	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 5.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .1	Confluence angle (deg)	= 0
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.05
Line capac. (cfs)	= 39.4	Line storage (cuft)	= 373

EXISTING

LINE 7 / Q = 16.4 / HT = 30 / WID = 30 / N = .013 / L = 311 / JLC = 1.1

SS#1-7 TO SS#1-8. / DNLN = 6

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.11	30.00	16.26	3.34	21.28	0.00	1.28	4.91
UPSTRM	21.61	30.00	17.36	3.34	21.78	0.00	4.6	4.91

Drainage area (ac)	= 1.1	Slope of invert (%)	= 0.354
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.159
Time of conc (min)	= 44	Critical depth (in)	= 16.93
Inlet time (min)	= 20	Req'd length curb inlet (ft)	= 1.2
Intensity (in/hr)	= 2.91	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 5.6	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.2	Confluence angle (deg)	=-90
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.47
Line capac. (cfs)	= 24.4	Line storage (cuft)	= 1526

EXISTING

LINE 8 / Q = 15.2 / HT = 30 / WID = 30 / N = .013 / L = 51 / JLC = 1.2

SS#1-8 TO SS#1-9. / DNLN = 7

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	21.80	30.00	17.52	3.09	21.95	0.00	4.44	4.91
UPSTRM	21.87	30.00	17.89	3.09	22.02	0.00	4.25	4.91

Drainage area (ac)	= .3	Slope of invert (%)	= 0.725
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.137
Time of conc (min)	= 44	Critical depth (in)	= 16.19
Inlet time (min)	= 5	Req'd length curb inlet (ft)	= 0.3
Intensity (in/hr)	= 2.92	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 5.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .3	Confluence angle (deg)	=-22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.64
Line capac. (cfs)	= 34.9	Line storage (cuft)	= 250

EXISTING

LINE 9 / Q = 13.9 / HT = 30 / WID = 30 / N = .013 / L = 127 / JLC = 1.1

SS#1-9 TO SS#1-10 / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	22.05	30.00	17.90	2.83	22.17	0.00	4.23	4.91
UPSTRM	22.19	30.00	18.33	2.83	22.32	0.00	4.43	4.91

Drainage area (ac)	= .47	Slope of invert (%)	= 0.339
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.115
Time of conc (min)	= 43	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.5
Intensity (in/hr)	= 2.95	Req'd grate area (sf)	= 0.1
Cumulative C*A	= 4.7	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .5	Confluence angle (deg)	= 22
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.26
Line capac. (cfs)	= 23.9	Line storage (cuft)	= 623

EXISTING

LINE 10 / Q = 13.5 / HT = 30 / WID = 30 / N = .013 / L = 108 / JLC = 1

SS#1-10 - SS#1-11 / DNLN = 9

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	22.33	30.00	18.35	2.74	22.44	0.00	4.41	4.91
UPSTRM	22.44	30.00	18.66	2.74	22.56	0.00	4.03	4.91

Drainage area (ac)	= .81	Slope of invert (%)	= 0.287
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.108
Time of conc (min)	= 42	Critical depth (in)	= 15.44
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.9
Intensity (in/hr)	= 2.98	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= .9	Confluence angle (deg)	= 45
Default Q (cfs)	= 0	Natural ground elev (ft)	= 25.19
Line capac. (cfs)	= 22.0	Line storage (cuft)	= 530

EXISTING

LINE 11 / Q = 12.7 / HT = 30 / WID = 30 / N = .013 / L = 182 / JLC = 1

SS#1-11 - SS#1-12 / DNLN = 10

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	22.56	30.00	18.91	2.58	22.66	0.00	3.78	4.91
UPSTRM	22.74	30.00	19.41	2.58	22.84	0.00	6.43	4.91

Drainage area (ac)	= .99	Slope of invert (%)	= 0.275
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.096
Time of conc (min)	= 41	Critical depth (in)	= 15.44
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.1
Intensity (in/hr)	= 3.02	Req'd grate area (sf)	= 0.3
Cumulative C*A	= 4.2	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.1	Confluence angle (deg)	= 17
Default Q (cfs)	= 0	Natural ground elev (ft)	= 28.34
Line capac. (cfs)	= 21.5	Line storage (cuft)	= 893

EXISTING

LINE 12 / Q = 11.7 / HT = 30 / WID = 30 / N = .013 / L = 186 / JLC = 1.2

SS#1-12 - SS#1-13 / DNLN = 11

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	22.84	30.00	19.44	2.38	22.93	0.00	6.39	4.91
UPSTRM	22.99	30.00	20.01	2.38	23.08	0.00	2.36	4.91

Drainage area (ac)	= 1.19	Slope of invert (%)	= 0.306
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.081
Time of conc (min)	= 40	Critical depth (in)	= 14.69
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 1.3
Intensity (in/hr)	= 3.07	Req'd grate area (sf)	= 0.4
Cumulative C*A	= 3.8	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 1.4	Confluence angle (deg)	=-12
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.87
Line capac. (cfs)	= 22.7	Line storage (cuft)	= 913

EXISTING

LINE 13 / Q = 6.3 / HT = 18 / WID = 18 / N = .013 / L = 109 / JLC = .9

SS#1-13 - SS#1-14 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	23.09	18.00	20.89	3.57	23.29	0.00	2.48	1.77
UPSTRM	23.67	18.00	21.93	3.57	23.86	0.00	.61	1.77

Drainage area (ac)	= 2.66	Slope of invert (%)	= 0.954
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.524
Time of conc (min)	= 10	Critical depth (in)	= 11.91
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 5.8
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 1.7
Cumulative C*A	= 1.1	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.3	Confluence angle (deg)	=-55
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.05
Line capac. (cfs)	= 10.3	Line storage (cuft)	= 193

EXISTING

LINE 14 / Q = 7.0 / HT = 24 / WID = 24 / N = .013 / L = 39 / JLC = .9

SS#1-14 - SS#1-15 / DNLN = 12

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	23.09	24.00	20.45	2.22	23.17	0.00	2.42	3.14
UPSTRM	23.20	24.00	20.67	2.22	23.28	0.00	1.27	3.14

Drainage area (ac)	= 7.54	Slope of invert (%)	= 0.564
Runoff coefficient	= .3	Slope energy grade line (%)	= 0.271
Time of conc (min)	= 40	Critical depth (in)	= 11.75
Inlet time (min)	= 40	Req'd length curb inlet (ft)	= 6.4
Intensity (in/hr)	= 3.08	Req'd grate area (sf)	= 1.8
Cumulative C*A	= 2.3	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 6.9	Confluence angle (deg)	= 35
Default Q (cfs)	= 0	Natural ground elev (ft)	= 23.94
Line capac. (cfs)	= 17.0	Line storage (cuft)	= 123

PROPOSED

LINE 15 / Q = 2.3 / HT = 15 / WID = 15 / N = .013 / L = 38 / JLC = .9

SS#1-~~20~~ 16 - SS#1-3. / DNLN = 2

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	19.03	15.00	13.35	1.92	19.08	0.00	5.79	1.23
UPSTRM	19.13	15.00	14.00	1.91	19.19	0.00	5.14	1.23

Drainage area (ac)	= 1.15	Slope of invert (%)	= 1.711
Runoff coefficient	= .4	Slope energy grade line (%)	= 0.267
Time of conc (min)	= 15	Critical depth (in)	= 7.72
Inlet time (min)	= 15	Req'd length curb inlet (ft)	= 2.2
Intensity (in/hr)	= 5.11	Req'd grate area (sf)	= 0.6
Cumulative C*A	= 0.5	Depth at inlet opening (in)	= 6
Flow contrib (cfs)	= 2.3	Confluence angle (deg)	= 80
Default Q (cfs)	= 0	Natural ground elev (ft)	= 20.4
Line capac. (cfs)	= 8.4	Line storage (cuft)	= 47

EXISTING

LINE 16 / Q = 2.1 / HT = 24 / WID = 24 / N = .013 / L = 44 / JLC = .9

SS#1-~~21~~ 17 -SS#1-9.. / DNLN = 8

	HGL	DEPTH	INVERT	VEL	EGL	T WID	COVER	AREA
DNSTRM	22.05	24.00	19.51	0.68	22.05	0.00	3.12	3.14
UPSTRM	24.38	6.61	23.70	3.03	24.52	21.44	-1.2	0.70

Drainage area (ac)	= .9	Slope of invert (%)	= 9.523
Runoff coefficient	= .4	Slope energy grade line (%)	= 5.321
Time of conc (min)	= 10	Critical depth (in)	= 6.56
Inlet time (min)	= 10	Req'd length curb inlet (ft)	= 0.0
Intensity (in/hr)	= 5.93	Req'd grate area (sf)	= 0.0
Cumulative C*A	= 0.4	Depth at inlet opening (in)	= 0
Flow contrib (cfs)	= 2.1	Confluence angle (deg)	= 109
Default Q (cfs)	= 0	Natural ground elev (ft)	= 24.5
Line capac. (cfs)	= 69.8	Line storage (cuft)	= 85

Darryl Cook
REVISED 8-30-93

(SECTION 5, ANNEX 2)

ROADSIDE DITCH DESIGN

PROJECT ST. GEORGE'S HUNDRED
DATE 9/18/91
PROJ# 6201

TC = 10 MIN I_{10} = 6.10 IN/HR I_2 = 4.70 IN/HR. C = 0.40

NAME OF STREET HALSTEAD LANE AND ROTHBURY DRIVE

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	Q_2= CI_2A CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	Q_{10}= $CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
HALSTEAD LANE														
14+75	10+35.74	L	0.50	0.94	0.94	.0083	1.25	3.00	GRASS	1.22	1.22	—	8.3	GRASS V-DITCH Z:1 SS, 1.5' DEEP
14+75	10+35.74	R	0.41	0.77	0.77	.0083	1.20	3.00	GRASS	1.00	1.00	—	7.8	"
ROTHBURY DRIVE														
15+50	19+00	L	1.10	2.07	2.07	.0100	1.60	3.00	GRASS	2.69	2.69	—	10.9	"
15+50	19+00	R	0.96	1.80	1.80	.0100	1.50	3.00	GRASS	2.34	2.34	—	10.2	"
19+00	20+50	L	0.26	0.49	2.56	.0369	2.70	3.00	CONC.	0.64	3.33	—	9.6	CONC. "V" D=6" SS Z:1
19+00	20+50	R	0.34	0.64	2.44	.0369	2.60	3.00	CONC.	0.83	3.17	—	9.5	per VDOT Drainage manual Fig. 2.8.2.3

22(5-18)

Project ST. GEORGE'S HUNROAD
SECTION 5, PHASE III

Plan Sheet No. 1 Designer HWP
Rev. Date _____ Date 9/16/91

Sheet 1 of 1

OK

HYDROLOGICAL DATA:

D.A. = 0.41 AC. T_c = 10 MIN. C = 0.40

I_2 = 4.70 IN/HR I_{10} = 6.1 IN/HR

Q_2 = C I A = (0.40)(4.7)(0.41) = 0.77 CFS

Q_{10} = (0.40)(6.1)(0.41) = 1.00 CFS

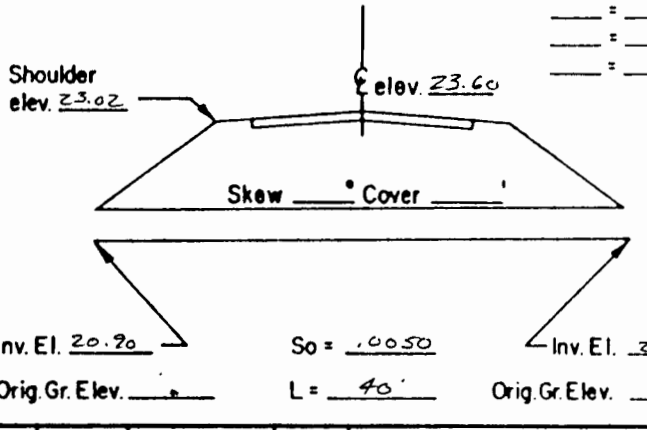
AHW Controls

100 yr. Flood plain _____ elev. _____
Design AHW depth _____ elev. _____
Structures _____ elev. _____

STATION: _____

freq. TW elev.

_____ = _____
_____ = _____
_____ = _____
_____ = _____
_____ = _____



DISCHARGES USED

Q 2 = 0.77 CFS
Q 10 = 1.00 CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS

RISK ASSESSMENT ADT _____

Detours Available _____, Length _____
Overtopping Stage _____
Flood Plain Management _____
Criteria and Significant Impact _____

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS									CONT. HW. ELEV.	OUTLET VELOCITY		End Treat.	COMMENTS
			INLET CONT.		OUTLET CONTROL											
			HW/D	HW	Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW		C.M.	Smooth		
15" RCP	1.00		0.4	0.50		0.45	0.85	0.85	N/A	0.20	0.65	21.90				INLET HW ELEV. CONTROLS

SUMMARY & RECOMMENDATIONS:

Design Flood Exceed. Prob. _____ Elev. _____
Overtop Flood Exceed. Prob. _____ Elev. _____
Base Flood 1% Exceed. Prob. _____ Elev. _____

(Rev. 1/85)

(SECTION 5, PHASE III)

ROADSIDE DITCH DESIGN

PROJECT ST. GEORGE'S HUNDRED
DATE 9/18/91
PROJ# 6201

TC = 10 MIN I_{10} = 6.10 IN/HR I_2 = 3.70 IN/HR C = 0.40

NAME OF STREET WELLINGTON CIRCLE

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	$Q_2 = CI_2A$ CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	$Q_{10} = CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
27+75	26+50	L	0.09	0.17	0.17	.0217	1.10	3.00	GRASS	0.22	0.22	-	3.7	GRASS 'V' DITCH W/2:1 SS 1.5' DEPTH
27+75	26+50	R	0.17	0.32	0.32	.0217	1.18	3.00	GRASS	0.41	0.41	-	4.8	"
26+50	25+07.88	L	0.10	0.19	0.36	.0337	1.60	3.00	GRASS	0.24	0.46	-	4.7	"
26+50	25+07.88	R	0.51	0.96	1.28	.0337	2.20	3.00	GRASS	1.25	1.66	-	7.4	"
27+75	31+38.77	L	0.25	0.47	0.47	.0165	1.30	3.00	GRASS	0.61	0.61	-	5.8	"
27+75	31+38.77	R	0.80	1.50	1.50	.0165	1.75	3.00	GRASS	1.95	1.95	-	8.8	"
33+12.50	31+38.77	L	0.90	1.69	1.69	.0150	1.70	3.00	GRASS	2.20	2.20	-	9.5	"
33+12.50	31+38.77	R	0.90	0.75	0.75	.0150	1.40	3.00	GRASS	0.98	0.98	-	7.1	"
33+12.50	37+19.79	L	0.23	0.43	0.43	.0125	1.15	3.00	GRASS	0.56	0.56	-	5.9	"
33+12.50	36+25	R	2.12	3.99	3.99	.0125	2.00	3.00	GRASS	5.18	5.18	-	13.5	"

SCALE IN FEET
0 100 0

NOTE:
THE LAND DISTURBING PERMIT, WHEN ISSUED, WILL REQUIRE CONSTRUCTION OF THE DETENTION/SEDIMENT BASIN PRIOR TO ANY OTHER CONSTRUCTION ACTIVITIES ON THE REMAINDER OF THE PROJECT.

STATISTICS ON DAM

TOP OF DAM ELEVATION = ~~19.9~~ FEET 19.3
ELEVATION OF NORMAL POOL = 14.5 FEET
SURFACE AREA OF NORMAL POOL = 0.79 ACRES
DRAINAGE BASIN AREA = 89.8 ACRES
DRAINAGE BASIN AREA TO POND SURFACE AREA RATIO = 114 : 1
HEIGHT OF DAM = 10.7 FEET
LENGTH OF DAM = 130 FEET
MAXIMUM WIDTH OF DAM = 64 FEET
MAXIMUM DEPTH OF NORMAL POOL = 6 FEET
AVERAGE DEPTH AT MID-LAKE = 5 FEET

	ELEVATION (FEET)	RELEASE RATE (CFS)
NORMAL POOL	14.5	0
2 YEAR STORM	16.8	76
10 YEAR STORM	17.6	182
100 YEAR STORM	18.2	284

PRINCIPAL SPILLWAY WEIR CREST ELEVATION = ~~14.0~~
EMERGENCY SPILLWAY OPERATES IN EXCESS OF 10 YEAR STORM EVENT
EMERGENCY SPILLWAY ELEVATION = ~~18.9~~ 18.2

GENERAL NOTES:

1. LAKE AREA CLEARING - STUMPS SHALL BE REMOVED BETWEEN ELEVATION 17 AND 8.5 AROUND THE ENTIRE PERIMETER OF THE LAKE. LAKE PERIMETER TO BE CONTOURED WHERE PRACTICAL.
2. ALL DISTURBED AREAS SHALL BE PERMANENTLY SEEDED WITHIN 7 DAYS AFTER ACHIEVING FINAL GRADE. SHOULD AN AREA BE DISTURBED INITIALLY WITH THE INTENT OF NOT BEING BROUGHT TO FINAL GRADE IN A REASONABLE AMOUNT OF TIME, THAT AREA SHALL BE TEMPORARILY SEEDED WITHIN 15 DAYS OF THE INITIAL DISTURBANCE.
3. STRIP AND STOCKPILE TOPSOIL AT LOCATION APPROVED BY THE OWNER OR ENGINEER.
4. ALL JOINTS IN CORRUGATE METAL PIPE AND PRINCIPAL SPILLWAY STRUCTURE TO BE WATER TIGHT.
5. ALL COMPACTION PERCENTS ARE EXPRESSED AS A PERCENTAGE OF MAXIMUM DENSITY AND OPTIMUM MOISTURE AS PER ASSHTO T99.
6. THE VIRGINIA DEPARTMENT OF TRANSPORTATION IS NOT RESPONSIBLE FOR THE OPERATION AND MAINTENANCE OF OR FAILURE OF THE BASIN AND ITS CONTROL STRUCTURES. ALL MAINTENANCE TO BE THE ULTIMATE RESPONSIBILITY OF THE ST. GEORGE'S HUNDRED HOMEOWNERS' ASSOCIATION.

•66" METAL RISER
TOP = 15.41
PRIMARY SPILLWAY = 13.71
•12" CMP INTAKE RISER
TOP = 10.85
INV = 7.84
(10 L.F. FORWARD OF 66" RISER)

•66" METAL RISER
TOP = 15.32
PRIMARY SPILLWAY = 13.62
•12" CMP INTAKE RISER
TOP = 10.97
INV = 8.29
(10 L.F. FORWARD OF 66" RISER)

48" CMP RISERS

NOTE: THE REMOVAL OF THE EXISTING TEMPORARY SEDIMENT BASIN #1 SHALL NOT OCCUR UNTIL THE BMP POND (NEW BASIN) HAS BEEN CONSTRUCTED. THE STORM DRAINAGE MODIFICATIONS MADE, DIVERTING THE MAJORITY OF THE RUNOFF FROM THIS BASIN, AND AFTER APPROVAL BY THE JAMES CITY COUNTY CODE COMPLIANCE EROSION CONTROL INSPECTOR.

NOTE: CONTRACTOR SHALL PROVIDE ALL STORM SEWER MANHOLES IN EXCESS OF A TEN FOOT DEPTH WITH VDOT STANDARD SAFETY SLABS.

S-64-91
S-53-93; PC054

AS-BUILT DRAWING 8/27/99

No.	DATE	REVISION / COMMENT / NOTE	BY
3	8/27/99	AS-BUILT DRAWING	SOW
2	11/5/93	REVISED PER FINAL COMMENTS	SOW
1	9/29/93	REVISED AS PER FINAL COMMENTS	SOW

COMMONWEALTH OF VIRGINIA
STEVEN O WIGLEY
No. 019387
6-30-95
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994
AES CONSULTING ENGINEERS

DRAINAGE, SEDIMENT AND EROSION CONTROL PLAN
ST. GEORGE'S HUNDRED
SECTION 5, PHASE III

OWNER/DEVELOPER: JAMES R. CHISMAN DEVELOPMENT COMPANY
BERKELEY DISTRICT — JAMES CITY COUNTY — VIRGINIA

Designed SOW/HWP	Drawn AES
Scale 1"=100'	Date JULY, 1993
Project No. 6201-5	
Drawing No. 5	

(SECTIONS 5, AREAS C & D)

ROADSIDE DITCH DESIGN

PROJECT ST. GEORGE'S HUNDRED
DATE 9/18/91
PROJ# 6201

TC = 10 MIN I_{10} = 6.10 IN/HR I_2 = 4.70 IN/HR. C = 0.40

NAME OF STREET HALSTEAD LANE AND ROTHBURY DRIVE

FROM STATION (DIRECTION	TO STATION OF FLOW)	LEFT OR RIGHT	A AC	Q_2= CI_2A CFS	CUMULA Q_2 CFS	AVG SLOPE FT/FT	ACTUAL VEL_2 FPS	ALLOW VEL_2 FPS	LINING TYPE	Q_{10}= $CI_{10}A$ CFS	CUM Q_{10} CFS	ACT VEL_{10} FPS	DEPTH OF $FLOW_{10}$ IN.	REMARKS
HALSTEAD LANE														
14+75	10+35.74	L	0.50	0.94	0.94	.0083	1.25	3.00	GRASS	1.22	1.22	—	8.3	GRASS "V" DITCH Z=15, 1.5'DEEP
14+75	10+35.74	R	0.41	0.77	0.77	.0083	1.20	3.00	GRASS	1.00	1.00	—	7.8	"
ROTHBURY DRIVE														
15+50	19+00	L	1.10	2.07	2.07	.0100	1.60	3.00	GRASS	2.69	2.69	—	10.9	"
15+50	19+00	R	0.96	1.80	1.80	.0100	1.50	3.00	GRASS	2.34	2.34	—	10.2	"
19+00	20+50	L	0.26	0.49	2.56	.0369	2.70	3.00	GRASS	0.64	3.33	—	9.6	"
19+00	20+50	R	0.34	0.64	2.44	.0369	2.60	3.00	GRASS	0.83	3.17	—	9.5	"

DEVELOPMENT MANAGEMENT

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COUNTY ENGINEER
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INTEGRATED PEST MANAGEMENT
(757) 253-2620

May 6, 2002

Mr. Randall Punchard
St. Georges/St. Thomas HOA
229 Charleston Place
Williamsburg, Va. 23185

12-18-02
Reinspect

PRIDE
- TRASH RACK
- OF
- FOREBAY BAFFLE WALL
- EDUCATE RESIDENTS
- Cobbs in ES
- Fill Hole House Riser/ Barrel

Re: St. Georges Hundred, Section 5, Phase 3
Stormwater Management Facility
County Plan No. S-53-93; County BMP ID Code: PC 054

Dear Mr. Punchard:

At your request, the Environmental Division is forwarding information relative to a detailed inspection performed for the above referenced facility. In addition to specific comments as outlined below, the following additional information is also attached for your group's review and use:

- ☐ A 1 inch = 800 ft. scale map showing the general location of the BMP;
- ☐ A 1 inch = 100 ft. scale ortho photo map from County GIS;
- ☐ A current Inspection Report for the BMP dated February 15th 2002;
- ☐ A Maintenance Plan prepared specifically for the BMP;
- ☐ General landscaping guidance for BMP's (tips);
- ☐ Watershed awareness guidelines (tips);
- ☐ A pond buffer information packet.

The pond appears to have been designed as a old County design type 2 extended detention dry pond with an 18-inch deep wet marsh bottom pool. The facility has a standard riser/barrel configuration, similar to many other detention pond designs in the County. However, this facility has a dual riser/barrel system and appears to be functioning more as a wet pond due to a deeper bottom wet pool. The tributary area and BMP is situated within the tidal main stem subwatershed of Powhatan Creek. For further information, refer to narrative and graphics for the tidal main stem in the draft Powhatan Creek Watershed Plan on the County website at www.james-city.va.us.

Currently there are design plans and details, computations and an as-built drawing for the facility in our records file. Design plans were prepared by AES Consulting Engineers (Project No. 6201-5) in August of 1993 under assigned County Plan No. S-53-93. The design drawings and correspondence are available for review through the County records management office. The as-built drawing and pond computations are available for review through the Environmental Division.

A specific maintenance plan was prepared for the BMP and provided to you as a courtesy. The plan was prepared based on our general knowledge of maintenance required for these types of facilities and following our site specific inspection. It is provided for information and guidance purposes when no other specifically approved maintenance plan is available for use. The plans are not meant to replace or supersede any specific recommendations offered by a qualified professional.

The maintenance plan only addresses normal structural, stormwater runoff control and aesthetic activities related to safe function of the facility. Other landscaping, cosmetic or ornamental features associated with the facility are usually left to the discretion of the Owner, or its designated representative, unless these features deter from the structural integrity or the performance of water quality/quantity controls as designed and constructed for the facility.

Specific Comments about the Pond (PC 054):

Based on field observations, the facility appears to be in satisfactory condition for its age of nearly 10 years. Some maintenance mowing is being performed on the east (lot side) of the facility; however, the facility is in need of regular (routine) maintenance typical of most wet and dry detention pond facilities in the County.

From our perspective, main concerns were the need to clear and remove trees, shrubs and woody vegetation from the entire dam embankment, toe erosion along the left dam abutment (east, lot side), and the need to clean and remove sediment, vegetation, debris and organic material collected around the principal flow control and inflow structures for the facility.

Thick brush, high weeds and pines and other substantial tree growth was present along the top of dam and on the upstream and downstream pond embankment slopes. Usually trees, shrubs and woody vegetation are not permitted to grow on any part of pond embankments constructed using engineered (compacted) fills. Saturated roots mats combined with high wind can cause trees to overtop and accelerate soil erosion and embankment failure conditions. For older facilities which may have established tree growth, we recommend that trees be cut flush to or below ground level and be maintained in that fashion as to not disturb root systems that may already be extensive. Efforts should then be made to reduce trees from re-establishing and replace the tree growth with a low-maintenance grass covering.

Vegetation and brush were also present around the dual 48-inch pipe riser structures and within the emergency spillway, which is situated through the dam embankment. All trees, brush and woody vegetation should be removed within 10 feet of the riser pipe and along the entire emergency spillway. Flow to or through these appurtenances should not be obstructed by vegetation.

At the left (east-lot side) pond abutment, where dam fill meets original ground, there is considerable surface gully erosion. It appears runoff from adjacent lot areas is concentrating and running along the toe of dam causing surface erosion. Corrective action needs performed to eliminate this situation which may eventually threaten the structural integrity of the dam embankment. Repair the gullies by filling with compacted soil and stabilize with seed and mulch or erosion control matting. Also,

correct the problem at the source by eliminating the source of concentrated runoff or redirect it away from the downstream dam embankment.

There was a considerable amount of sediment, trash, floating debris (leaves, dead tree branches, etc.) and organic material affecting the stormwater function of the facility. Firstly, large-sized floating dead wood pieces and other materials were obstructing flow into both the small 12-inch riser pipes situated within the shallow water pool. The left (west) 12-inch riser was completely clogged and not functioning. The right (east) 12-inch riser was partially clogged but functional. Clear and remove all debris from the top (crest) openings of the riser pipes, clean both the 12-inch vertical risers and 12-inch pipes which lead to the larger 48-inch risers. Remove all dead wood pieces present along the east and west shores of the BMP which have the potential to float to these flow control structures. In addition, also clear any debris from within the emergency spillway. None of the primary flow control structures should be obstructed with debris or trash.

It is also recommended that anti-vortex/trash rack devices be incorporated on the top (crest) of the dual 12-inch corrugated metal vertical riser pipes. These pipes are the main flow control devices for the BMP during low flow periods and are susceptible to clogging by trash or wood debris. Flat racks or flat bars should not be used. The anti-vortex devices can be simple in nature and can consist of sleeve, hooded or bar-rack type devices which are durable, removable and easily accessed. Many simple types are available on the market or can be prefabricated by most contractors. Suggestions include: a modified VDOT DI-7 or inverted VDOT DI-5 bar grate unit or commonly available beehive, convex, basket type or other similar rack devices. High density polyethylene trash racks per Technical Bulletin # 7 of the VaDCR can be considered.

An adequately sized riprap outlet protection pad should be established at the end of the two 36-inch pipe outlet barrels which go through the dam. It was noted that there was little or no outlet protection rock at the outfall end of the pipes to dissipate energy and provide erosion resistance; however, there were currently no signs of substantial degradation or erosion of the downstream natural channel.

Two primary inflow pipes convey drainage into the BMP facility. Pipe 1 is a larger size 36-inch reinforced concrete pipe drain which enters at the back (north) end of the BMP behind Lot 18 (151 Wellington Circle). Pipe 2 is a 30-inch reinforced concrete storm drain which outfalls into the east side of the pond. Pipe 2 traverses between Lot 17 (100 Halstead) and Lot 18 (151 Wellington Circle). There was sediment approximately 18 inches deep in the outfall end of Pipe 1 and a sediment plume about 2 feet deep within the BMP just beyond the outfall end of the pipe. Vegetation was also obstructing the outfall of this pipe. Clean and remove sediment and vegetation within 10-15 feet of the end of the storm drain pipe to establish unobstructed flow. It is recommended that a rock riprap baffle wall be constructed across the BMP area at this end of the pond to serve as a pretreatment sediment forebay and to force sediments to settle out at an easily accessible location for future cleanout purposes. This will also aid in minimizing the progression of sediment to the main BMP area and prolong dredging of the BMP on a mass scale. *(Note: If pursued, review and approval may be necessary through the Environmental Division).*

Lastly, a cursory investigation was performed on the connecting upstream storm drainage systems which convey flow to the BMP. Most of the storm inlets are yard inlets in backyards or curb-type inlets located along the roadways. Most of the inlets had normally expected amounts of trash, debris, sediments, leaves and grass clippings within the structures. All inlets should be inspected on a routine basis and any such materials and obstructions removed to prevent migration of these items to the pond and to prevent obstructions which can cause localized flooding in yard or roadway areas.

Education of residents about aspects of watershed awareness and the prevention of pollution into storm drainage systems should be a prime objective. Of importance for this specific BMP is education about the overuse of nutrients in yard turf areas, proper disposal of grass clippings and yard wastes and use of pond buffering techniques, especially along the east (lot) side of the BMP. Existing trees and ground cover should be preserved within the pond buffer (25 feet minimum suggested) to the greatest extent possible, rather than use of turf to the waters edge. Native trees, shrubs and ground cover within the pond buffer help to filter and infiltrate runoff from impervious and managed turf areas, stabilize banks to minimize erosion, provide shade to reduce thermal increases and deter direct access to the waters edge. *(A variety of miscellaneous information is attached on this subject, including the pond buffer information packet.)*

Hopefully, this material is helpful to your group to understand maintenance associated with the stormwater management pond. Please review the attached information and contact us at 757-253-6639 or 757-253-6673, if you have any further questions or comments.

Sincerely,

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

SJT/sjt
Enclosures

Shared\SWMProg\Education\Subdivisions\StGeorge.let1

DEVELOPMENT MANAGEMENT

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February 13, 2002

Mr. Randall E. Punchard
St. George's/St. Thomas' HOA
229 Charleston Place
Williamsburg, Va. 23185

Re: St. Georges Hundred, Section 5, Phase 3
County Plan No. S-53-93
Stormwater Management Facility
County BMP ID Code: PC 054

Dear Mr. Punchard:

It was a pleasure to talk with you on Wednesday February 13th. As discussed, I am forwarding you some "*first contact*" information for your community association to use relative to maintenance of the above stormwater management facility. The subject stormwater management facility (PC 054) is situated in Common Area for Section 5, Phase 3 of St. George's Hundred, further identified as GPIN 4640500001B. It is located just west of Lot 14 along Halstead Lane.

Information as attached includes: a brochure entitled *Best Management Practices Education Program for Homeowners Associations*; landscaping tips for stormwater management BMP's, watershed awareness tips, a sample maintenance plan for a wet/dry pond stormwater management facility; and three brochures related to liability and maintenance. One of these brochures is a good informational handout entitled *A Guide for Maintaining and Operating BMP's*. This publication is distributed through our office in response to a cooperative effort from the Hampton Roads Regional Stormwater Management Committee and HR STORM, a regional stormwater education program offered by the Hampton Roads Planning District Commission.

I have also attached a location map and a copy of information as available in the database under our County BMP Inventory/Inspection program. The pond maintenance plan can be expanded upon further following our inspection as scheduled for Friday February 15th at 3:00 pm.

Our division is always readily available to assist owners and HOA representatives with guidance related to stormwater management facilities and drainage and we sincerely look forward working with you in the future. In the meantime, if you have any additional questions or comments, call me at 757-253-6639.

Sincerely,

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

SWMProg\Education\Subdivisions\StGeorge.fc

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May 6, 2002

Mr. Randall Punchard
St. Georges/St. Thomas HOA
229 Charleston Place
Williamsburg, Va. 23185

Re: St. Georges Hundred, Section 5, Phase 3
Stormwater Management Facility
County Plan No. S-53-93; County BMP ID Code: PC 054

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The maintenance plan only addresses normal structural, stormwater runoff control and aesthetic activities related to safe function of the facility. Other landscaping, cosmetic or ornamental features associated with the facility are usually left to the discretion of the Owner, or its designated representative, unless these features deter from the structural integrity or the performance of water quality/quantity controls as designed and constructed for the facility.

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correct the problem at the source by eliminating the source of concentrated runoff or redirect it away from the downstream dam embankment.

There was a considerable amount of sediment, trash, floating debris (leaves, dead tree branches, etc.) and organic material affecting the stormwater function of the facility. Firstly, large-sized floating dead wood pieces and other materials were obstructing flow into both the small 12-inch riser pipes situated within the shallow water pool. The left (west) 12-inch riser was completely clogged and not functioning. The right (east) 12-inch riser was partially clogged but functional. Clear and remove all debris from the top (crest) openings of the riser pipes, clean both the 12-inch vertical risers and 12-inch pipes which lead to the larger 48-inch risers. Remove all dead wood pieces present along the east and west shores of the BMP which have the potential to float to these flow control structures. In addition, also clear any debris from within the emergency spillway. None of the primary flow control structures should be obstructed with debris or trash.

It is also recommended that anti-vortex/trash rack devices be incorporated on the top (crest) of the dual 12-inch corrugated metal vertical riser pipes. These pipes are the main flow control devices for the BMP during low flow periods and are susceptible to clogging by trash or wood debris. Flat racks or flat bars should not be used. The anti-vortex devices can be simple in nature and can consist of sleeve, hooded or bar-rack type devices which are durable, removable and easily accessed. Many simple types are available on the market or can be prefabricated by most contractors. Suggestions include: a modified VDOT DI-7 or inverted VDOT DI-5 bar grate unit or commonly available beehive, convex, basket type or other similar rack devices. High density polyethylene trash racks per Technical Bulletin # 7 of the VaDCR can be considered.

An adequately sized riprap outlet protection pad should be established at the end of the two 36-inch pipe outlet barrels which go through the dam. It was noted that there was little or no outlet protection rock at the outfall end of the pipes to dissipate energy and provide erosion resistance; however, there were currently no signs of substantial degradation or erosion of the downstream natural channel.

Two primary inflow pipes convey drainage into the BMP facility. Pipe 1 is a larger size 36-inch reinforced concrete pipe drain which enters at the back (north) end of the BMP behind Lot 18 (151 Wellington Circle). Pipe 2 is a 30-inch reinforced concrete storm drain which outfalls into the east side of the pond. Pipe 2 traverses between Lot 17 (100 Halstead) and Lot 18 (151 Wellington Circle). There was sediment approximately 18 inches deep in the outfall end of Pipe 1 and a sediment plume about 2 feet deep within the BMP just beyond the outfall end of the pipe. Vegetation was also obstructing the outfall of this pipe. Clean and remove sediment and vegetation within 10-15 feet of the end of the storm drain pipe to establish unobstructed flow. It is recommended that a rock riprap baffle wall be constructed across the BMP area at this end of the pond to serve as a pretreatment sediment forebay and to force sediments to settle out at an easily accessible location for future cleanout purposes. This will also aid in minimizing the progression of sediment to the main BMP area and prolong dredging of the BMP on a mass scale. *(Note: If pursued, review and approval may be necessary through the Environmental Division).*

Lastly, a cursory investigation was performed on the connecting upstream storm drainage systems which convey flow to the BMP. Most of the storm inlets are yard inlets in backyards or curb-type inlets located along the roadways. Most of the inlets had normally expected amounts of trash, debris, sediments, leaves and grass clippings within the structures. All inlets should be inspected on a routine basis and any such materials and obstructions removed to prevent migration of these items to the pond and to prevent obstructions which can cause localized flooding in yard or roadway areas.

Education of residents about aspects of watershed awareness and the prevention of pollution into storm drainage systems should be a prime objective. Of importance for this specific BMP is education about the overuse of nutrients in yard turf areas, proper disposal of grass clippings and yard wastes and use of pond buffering techniques, especially along the east (lot) side of the BMP. Existing trees and ground cover should be preserved within the pond buffer (25 feet minimum suggested) to the greatest extent possible, rather than use of turf to the waters edge. Native trees, shrubs and ground cover within the pond buffer help to filter and infiltrate runoff from impervious and managed turf areas, stabilize banks to minimize erosion, provide shade to reduce thermal increases and deter direct access to the waters edge. *(A variety of miscellaneous information is attached on this subject, including the pond buffer information packet.)*

Hopefully, this material is helpful to your group to understand maintenance associated with the stormwater management pond. Please review the attached information and contact us at 757-253-6639 or 757-253-6673, if you have any further questions or comments.

Sincerely,

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

SJT/sjt
Enclosures

Shared\SWMProg\Education\Subdivisions\StGeorge.let1

STORMWATER MANAGEMENT FACILITY MAINTENANCE PLAN (PC 054 - St. Georges Hundred Section 5, Phase 3)

(Note: This is a typical Maintenance Plan for your Detention or Retention Pond facility. For general use by HOA's, or other designated parties which are responsible for operation, maintenance and inspection of the facility when no other specifically approved plans are available. This is provided as a courtesy by the Environmental Division of James City County for informational purposes only. This plan addresses normal structural and stormwater runoff control aspects of the facility. It does not address landscaping, cosmetic, or ornamental features associated with the facility nor does it replace any specific recommendations offered by a registered professional.)

Maintenance Plan (Detention or Retention Pond BMP's)

A maintenance program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) pond facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment into pretreatment areas (if applicable), the SWM/BMP itself, its principal inflow and outflow control structures and downstream waterways. Following facility installation and establishment of vegetation in disturbed areas, inspections for sediment buildups should be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If other construction or related land-disturbing activities are performed upland of the BMP, adequate protection measures should be implemented and inspection frequencies increased to at least once weekly.

The designated party will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action will be taken to ensure appropriate maintenance. Keys to locked access points or structures shall be made available to the County upon request and adequate notice should be given to nearby residences of inspection or maintenance activities that may take place.

A Declaration of Covenants, Inspection/Maintenance of Runoff Control Facility exists for this facility in County Land Records, Deed Book 640, Page 455 dated September 7th 1993.

Facility Description:

The BMP is situated west of Halstead Lane in St. Georges Section 5, Phase 3. It serves a drainage area of 89.8 acres including offsite area. The facility is an old County designation type 2, 4 point extended detention pond BMP with a shallow marsh bottom. A dry-type detention pond temporarily stores runoff and is normally dry during non-rainfall periods; however in this case a shallow depth marsh (wet) bottom also exists in conjunction with the upper dry extended detention levels. Typically draw down times range from 24 to 72 hours following a storm event. The facility contains dual 48-inch corrugated metal pipe risers with 60-inch anti-vortex/trash rack caps, dual 36-inch corrugated metal outlet pipe barrels and a 10 foot wide bottom, grass-lined trapezoidal shaped emergency spillway. Two pipes 12-inch corrugated metal pipes extended out (northward) from the principal riser pipes to the water pool. These pipes also have 12-inch vertical pipe risers about 2-3 ft. high which are intended to provide for water quality draw down purposes and to offer control for smaller storm events. During the 100-year storm, the maximum water level should rise to about 4.5 feet above the top of the riser to El. 18.2, which is within 1 ft. of top of dam at El. 19.3. During this type of larger storm event, the emergency spillway, which is located through the embankment directly west of the riser structure, will discharge flow. If functioning properly, normal storm events should reach an elevation above the 12-inch pipe risers and at or just above the larger 48-inch pipe risers and should draw down in about 24 to 36 hours.

Inspection and Maintenance of the Facility Should Consist of the Following Additional Measures:

1. Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond's storage area. If sediment reaches a depth that impairs the function of the dual 12-inch vertical riser pipes, removal is required. This level would be about 2' - 0" above the bottom of pond at the small riser locations which corresponds to cleanout at around Elevation 9.5. At the same time, or at least once per year, clean fully clean the small 12-inch risers and associated trash racks and outlet pipes, the primary larger 48-inch risers and the 36-inch outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area.

2. Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not be permitted to grow on any part of pond embankment that was constructed using engineered (compacted) fills.

3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed a qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.

4. In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations of the Virginia Erosion and Sediment Control Handbook (VESCH).

5. Perform quarterly inspections of both the small and large size riser pipes and the emergency crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and to provide an attractive appearance.

6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on both the small and large size risers, anti-vortex and trash rack caps, orifices/weirs, outlet barrels and pond embankment. Exposed metal surfaces shall be painted to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a registered professional engineer may be required to assess the integrity of the structure.

7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseeding.

8. Perform yearly observations of perimeter areas which surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features provided for the facility. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.

9. Strive to maintain natural buffer areas adjacent to the pond. Pond buffers should be 25 ft. minimum in width and contain native vegetation resembling meadow or forest conditions.

10. Inspect and exercise pond drain valves, if provided, on a regular basis.

11. Record Keeping. Keep reasonable, accurate written records of inspections and maintenance activities performed for the BMP structure at all times. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.

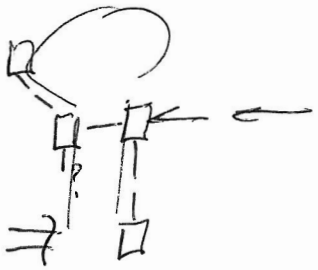
12. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Environmental Division of James City County.

(End)

1) Front Lot 228 — curb Low impounded.
2) Pipe Channel-outfall end - woods @ 221 Charleston.

Gordon Barryman. LOT 16 Halstead (left of 221)

3) SECTION 6 PLAN LOT 15-6 AND drainage network to that pipe. END OF CHARLESTON?



Scott Thomas

From: Darryl Cook
Sent: Wednesday, April 17, 2002 9:56 AM
To: John Horne; Scott Thomas; Wayland Bass
Subject: St Geo 100 Meeting

The St Geo HOA (Randy Punchard) has requested a meeting to discuss drainage issues, BMP responsibility and the surety bonds. It is a followup to the meeting held with them earlier in the year. You are one of the people they suggested attend the meeting. It is tenatively set for May 14 at 8:30. Please indicate if you feel if you need to attend and if so, can you make it at that time.

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

Database Inventory No. (if known): PC 054

Name of Facility: St. George's Hundred Sec 5 Phase 3 BMP No.: _____ Date: 10/12/00

Location: end of Halstead Ln.

Name of Owner: _____

Inspector: Rick Hall

Type of Facility: Detention basin

Weather Conditions: sunny

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

O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory.
Routine - The item checked requires attention, but does not present an immediate threat to the function of the BMP.
Urgent - The item checked requires immediate attention to keep the BMP operational and prevent damage to the facility.

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height		✓		weeds, trees - natural
Vegetated Condition		✓		
Weed Growth		✓		
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			perch water seeps on side slope -
Fencing or Benches				
Constructed Wetlands (Interior Landscaped & Planted) Areas: NA				
Vegetated Conditions				
Trash & Debris				
Floatables				
Erosion				
Sediment				
Dead Plant				
Aesthetics				
Other				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools	☐ Permanent Pool (Retention Basin) ☑ Shallow Marsh (Detention Basin)			
Shoreline Erosion	✓			
Algae	✓			
Trash & Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other				
Inflow Stuctures (Describe Locations):		west end		
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			18" RCP is 75% Full of standing water/sediment
Sediment		✓		
Aesthetics	✓			
Other				
Principal Flow Control Structure - Intake, Riser, etc. (Describe Location):				east end
Condition of Structure	✓			
Corrosion	✓			difficult to inspect due to weeds
Trash and Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure	✓			
Settlement	✓			hard to see - weeds
Trash & Debris	✓			
Sediment	✓			
Erosion	✓			
Other				
Emergency Spillway (Overflow):				
Vegetation	✓			
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other				

Maintenance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other				
Surrounding Perimeter Conditions:				
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓	✓		
Access /Maintenance Roads or Paths		✓		
Other				

Remarks:

Basin has heavy weeds and small trees — Inlet and outlet channels obscured by vegetation.
Could become nuisance area.

Overall Environmental Division Internal Rating: 2

Signature: Richard Hall **Date:** 10/12/00

Title: Environmental Specialist

SWMProg\BMP\CoInspProg\DetRet.wpd

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

S-53-93

County BMP ID Code (if known): PC054

Name of Facility: St. Georges Hundred Sec 5 PH 3 HALSTEAD LANE BMP No.: 1 of 1 Date: 2-15-02

Location: Behind (west of) Lot 14 106 Halstead Lane

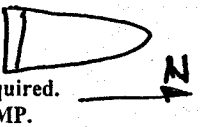
Name of Owner: St. Georges Hundred Association

Name of Inspector: SJ Thomas w/ Donna Hale, Randy Purchard

Type of Facility: Wet Pond or Extended Detention

Weather Conditions: Cloudy, Cool, 50's Type: ☐ Final Inspection ☒ County BMP Inspection Program ☐ Owner Inspection

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



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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	EARTHEN EMBANK 10' HIGH; TW=15'			
Grass Height	✓			
Vegetation Condition		✓	✓	Brush, Weeds 4' High
Tree Growth		✓	✓	Some Pines + Trees
Erosion		✓		Toe erosion left (west)
Trash & Debris	✓			
Seepage	✓			None found.
Fencing or Benches				
Interior Landscaping/Planted Areas:	☐ None	☑ Constructed Wetland/Shallow Marsh	☐ Naturally Established Vegetation	
Vegetated Conditions	✓			Cattail, Algae.
Trash & Debris	✓			Floating debris
Floating Material		✓	✓	
Erosion	✓			
Sediment				1' deep at LF Outf.
Dead Plant	✓	✓		
Aesthetics				
Other				
Notes:	Services SF Lots Roads & Offsite Area			

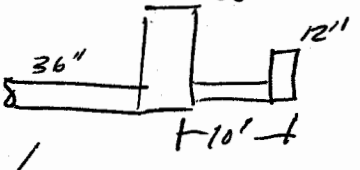
Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☐ Permanent Pool (Retention Basin) ☒ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			Little
Algae	✓			Yes 80% of NP
Trash & Debris		✓	✓	See Prev Note Dead wood
Sediment	✓			
Aesthetics	✓	✓		Pool is unsightly.
Other				Pool 1-2ft deep at southend.
Inflows (Describe Types/Locations): ① North 36"RCP ② EAST 30"RCP				
Condition of Structure	✓			① FES ② FES
Erosion	✓			
Trash and Debris	✓			
Sediment		✓	✓	② SED 18" deep ①
Outlet Protection				① clear veg 10-15' from Pipe Outfall
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): Dual 48"ϕ CMP w/ 60" CMP CAP				
Condition of Structure	✓			Asphalt Coated Aspv
Corrosion	✓			Some, Discolored
Trash and Debris	✓			West (left) LF orif completely clogged
Sediment	✓			Right is open & functional
Vegetation				Clear Veg 10' from Risers
Other				
Principal Outlet Structure - Barrel, Conduit, etc. : Dual 36" CMP Barrel w/ End Spet. & OP				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment				
Outlet Protection	✓			May need OP in future
Other				
Emergency Spillway (Overflow): 10' wide, GRASS, 1.5' deep				
Vegetation	✓	✓	✓	Clear brush & dead logs &
Lining	✓			trees
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			winter
Animal Burrows	✓			none
Graffiti	✓			none.
Other				
Surrounding Perimeter Conditions: MAINLAND FARM West; East Homes + Halstead				
Land Uses	✓			
Vegetation		✓		Usually Brown-Orange Pond Grass
Trash & Debris	✓			
Aesthetics Buffers	✓			Good NAT Buffers east + west
Access /Maintenance Roads or Paths				Halstead LANE
Other				

Remarks:

- o clear trees + brush on embank.
- o Repair toe erosion left Abutment to (west) House Side.
- o clean floating dead wood, East + west slopes + pool area (clogging LFort.) D.
- o clean left west LFort.
- o Clear veg, brush 10' from dual risers
- o May need to add Rock to OP (monitor)
- o Clean veg, brush, debris from emerg spillway.
- o CLEAN Pipe 1 outfall area. Sed 18" deep in pipe. 2-3' deep in BMP (Note: Natural checkdam has formed in BMP 20' d/s of Pipe 1 out. Causing deposition in nat FB area 2-3' deep.) BMP only 20' wide at Pipe 1 outfall.
- o clear veg + sed from Pipe 1 outfall. Note: Beaver dam forming 50' downstream of Pipe 1, water 2-3' deep.
- o Good NATURAL Buffer along Lots ~~East~~ West Side.

Dual Riser - Barrel



Overall Environmental Division Internal Rating: 3

Signature: Scott J Thomas, P.E. **Date:** 2/15/01.

Title: Civil Engineer ENVIRONMENTAL DIVISION

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Date Record Created:

Created By:

WS_BMPNO: PC054

Print Record

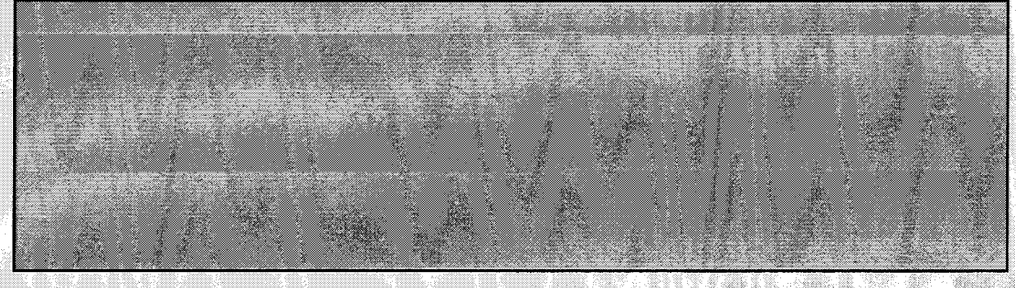
PRINTED ON
Tuesday, March 09, 2010
10:02:01 AM

WATERSHED	PC
BMP ID NO	054
PLAN NO	S-53-93
TAX PARCEL	(46-4)(5-1B)
PIN NO	4640500001B
CONSTRUCTION DATE	12/1/1993
PROJECT NAME	Saint George's Hundred Sec. 5 Ph. 3
FACILITY LOCATION	Behind (west of) 106 Halstead Lane
CITY-STATE	Williamsburg, Va. 23185
CURRENT OWNER	St. Georges Hundred Association
OWNER ADDRESS	P.O. Box 379
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, VA 23187
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No | Return to Menu

MAINTENANCE PLAN	No	CTRL STRUC DESC	Dual Riser
SITE AREA acre	48.16	CTRL STRUC SIZE inches	66" & 12"
LAND USE	Limited Residential	OTLT BARRL DESC	Dual Alum B
old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	36
JCC BMP CODE	F2 Dry ED with forebay		
POINT VALUE	6	EMERG SPILLWAY	Yes
		DESIGN HW ELEV	18.21
		PERM POOL ELEV	7.84
SVC DRAIN AREA acres	89.8	2-YR OUTFLOW cfs	83.49
		10-YR OUTFLOW cfs	171.81
		REC DRAWING	Yes
SERVICE AREA DESCRI	Onsite Lots, Roads & Offsite area		
IMPERV AREA acres	12.57	CONSTR CERTIF	No
RECV STREAM	UT of Powhatan Creek		
EXT DET-WQ-CTRL	Yes	LAST INSP DATE	10/12/2000
WTR QUAL VOL acre-ft	1.27	Inspected by:	
CHAN PROT CTRL	No	INTERNAL RATING	2
CHAN PROT VOL acre-ft	0	MISC/COMMENTS	
SW/FLOOD CONTROL	Yes	West of Lot 14. I/M DB 640 p 455. Treats 41.6 ac offsite/1" runoff for ent DA.	
GEOTECH REPORT	No		

Additional Comments:



308.31'

S 88°17'05"E

0.54 Ac.

541.69'

118.00'

S 89°40'05"E

TIE INTO EX. SWALE @ ELEV.≈26.1

15' DRAINAGE ESMT. TO BE DEDICATED TO J.C.C.

2.61 Ac.

25.0

PROVIDE APPROX. 120 L.F. OF PAVED V-DITCH @ 1.8% SLOPE MIN. 6" DEEP W/3:1 SS.

SS#2-4S
STA. 16+00.21
DI-3C, L=6'
TOP=25.05
INV.=21.00
D=4.05'

SS#2-4A
STA. 15+50
DI-3B, L=4'
TOP=25.42
INV.=21.50
D=3.92'

SS#1-3D
STA. 20+35
DI-3B, L=6'
TOP=27.06
INV.=23.14
D=3.92'

SS#2-5
ES-1 (OR EQUIVALENT)
INV.=23.00
20 L.F. OF 15" RCP (ULTRA-FLO OR PVC A2000) @ 10.00% (INCLUDES END SECTION)

SS#2-4
(STA. 13+00)
DI-3B L=4'
TOP=26.77
INV.=22.85
D=3.92'

25 L.F. OF 15" RCP @ 1.60%

30 L.F. OF 15" RCP @ 1.70%

SS#1-3B
(ULTRA-FLO OR PVC A2000)
STA. 12+56.67
DI-3C, L=6'
TOP=26.71
INV.=22.63
D=4.08'

40 L.F. OF 15" RCP @ 0.53%

0.48 Ac.

0.30 Ac.

0.30 Ac.

0.16 Ac.

0.07 Ac.

0.03 Ac.

0.10 Ac.

0.06 Ac.

0.05

55 L.F. OF 15" RCP (ULTRA-FLO OR PVC A2000) @ 0.42%

SS#2-3A
STA. 16+60
DI-3A
TOP=24.75
INV.=20.83
D=3.92'

55 L.F. OF 18" RCP (ULTRA-FLO OR PVC A2000) @ 0.69%

SS#2-3
STA. 16+00.21
DI-3B, L=4'
TOP=25.05
INV.=20.60
D=4.45'

20 L.F. OF 18" RCP (ULTRA-FLO OR PVC A2000) @ 0.60% (INCLUDES END SECTION.)

SS#2-1
ES-1 (OR EQUIVALENT)
INV.=20.19

SS#2-2
MH 1-1
RIM=25.50
INV.=20.22

15' DRAINAGE ESM'T. (TO BE DEDICATED TO

LIMITS OF CLEARING

LIMITS OF CLEARING (TYP.)

CIP

SF

IP

T.C. 25.83

T.C. 25.54

T.C. 28.98

T.C. 28.98

10 11 12 13 14 15 16 9 8 7 6 5 4 3C

CODE COMPLIANCE PLAN REVIEW COMMENTS
ST. GEORGE'S HUNDRED, SECTION 5, PHASE III
PLAN NO. S-64-91
OCTOBER 8, 1991 DEC

1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.

2. A Subdivision Agreement, with surety, shall be executed with the County prior to recording lots.

3. Water and sewer inspection fees shall be paid prior to the issuance of a Land Disturbing Permit.

4. As-built drawings shall be provided for the detention basin upon completion.

5. A preconstruction conference shall be held on-site between the County, the Developer, the Project Engineer and the Contractor prior to issuance of a Land Disturbing Permit.

6. The Land Disturbing Permit when issued will require construction of the detention/sediment basin prior to any other construction activities on the remainder of the project.

7. Specify that the pipe between SS Nos. 1-6 and the DI located immediately east of that DI on the opposite side of Wellington Circle will be blocked and abandoned in place.

8. The drainage calculations for systems 1 and 2 need to be rerun using as starting elevation the 10-year storm elevation in the pond of 17.6.

9. Provide EC-2 matting on both of sides of Rothburg Drive from Station 19+00 to SS Nos. 1-17 and 1-18.

10. Modify General Note 2 on Sheet 5 regarding the dam construction to state that permanent seeding will occur within 7 days not 30 after achieving final grade.

11. Provide a map showing the entire drainage area to the basin. Also, provide the supporting information regarding the predevelopment and post-development RCN determinations and the times of concentration.

12. Provide additional supporting documentation regarding the routing of the 2-, 10- and 100-year storms through the pond.

13. Provide seepage control for the dam, either anti-seep collars or a filter diaphragm system. The filter system is preferred.

14. Increase the size of the emergency spillway flume to 20 feet to be consistent with control section.

15. Increase the size of the erosion control stone apron at the outlet of the basin to a minimum of 30 feet long and 18 feet wide. Provide a nonwoven filter fabric under the stone.

16. Provide a 20-foot wide maintenance access easement with a gravel road to the basin and a 15-foot wide easement from high water around the pond.

17. An Inspection/Maintenance Agreement must be executed with the County for the pond prior to final approval.

18. Modify the note regarding removal of the existing sediment basin to state that removal will not occur until after the new basin has been constructed, the storm drain modifications have been made diverting most of the runoff from this basin, and after approval by the Code Compliance Erosion Control Inspector.

0367C
5194c

12
-05
98
36

24"

1. 3~~7~~5 WCI
2. 54' bottom right slight separation
3. 61' bottom left slight sep'
4. 70' bottom right
5. 78' bottom right slight sep.
6. 86' Top right side 3-5 o'clock
7. 110' Left - drop
8. 126' Left -

36"

1. 8' - 121 - both right (joints monitored)
2. 16' - left water
3. 24 -
4. 32' - water on right side - leak
5. 48' - significant water - left side
6. 60' - some water, staining

68'

SANIFILL -- JAMES CITY COUNTY TRANSFER
1204 JOLLY POND ROAD
WILLIAMSBURG VA 23188
757.565.1279

TICKET: 89631
DATE: 03/08/2003
TIME: 10:41 - 10:42

CUSTOMER: 3531410 / JAMES CITY COUNTY

P.O.: INVIROMENTAL
GROSS: 4480 LBS Manual
TARE: 4340 LBS Manual
NET: 140 LBS

ORIGIN: JCC / JAMES CITY COUNTY
TRUCK: 104001 LICENSE:
ROUTE: NA / Non App TRAILER #:
COMMENT: ST GEORGES 100 PRIDE PROG

COMMODITY	UNIT	NET/TONSRATE	PRETAX	TAX	TAX	AMOUNT
CD / CONSTRUCTION DEMOLIT	T	0.07 Minimum	3.50	0.00	0.00	3.50

$ 0.00 $ 0.00 $ 3.50

IN OPERATOR: CWR OUT OPERATOR: CWR

DRIVER: Scott A. Thomas 60%
DK

Randall E. Punchard
Agency Manager
Mid-Atlantic Region
Personal Lines Marketing

229 Charleston Place
Williamsburg, VA 23185
757 565-5790
Fax: 757 565-5794
Randall.E.Punchard@travelers.com

St Georges 100 info

PC 054

4. Maint Agmt for St Geo 100 BMP

2. Surety for St Geo's 100 (those still in place)

3. Maint Plan for Their BMP - Scott

4) PAT Drainage Problem - Lot 11 - David Edwards 224 Char. Place
- lots 15+16 Charleston Place 258-0029

5. Randy Punchard - 565-0349 - (h) Neighborhood (HOA) Contact
" - 5790 - busines

1) called 2/7/02 9:45AM
Left Message
2) Met Wed 2/13 9:00AM

& SAFETY

Wet Pond
S-53-93 St Georges
Sec 5 phase 3

Ave. MARCH 11TH week (13TH) wed

S-53-93

PC054

GPIN 4640500001B

St Georges Hundred Association
P.O. Box 379
Wmbg, VA. 23187-0379

Common Area S-5 P-3
St George

0.98 AC.
R1 zoned.

St. Thomas 1995-Beyond
St. Georgess

Randy Punchard
229 Char/St Thomas HOA
St Georges

Ann Culpepper
Charleston Place
Kem-House (229)
Downs Hale
President HOA

Halstead Lane
Behind (west of) 106
Halstead Lane Lot 14
Sec 5 ph 3

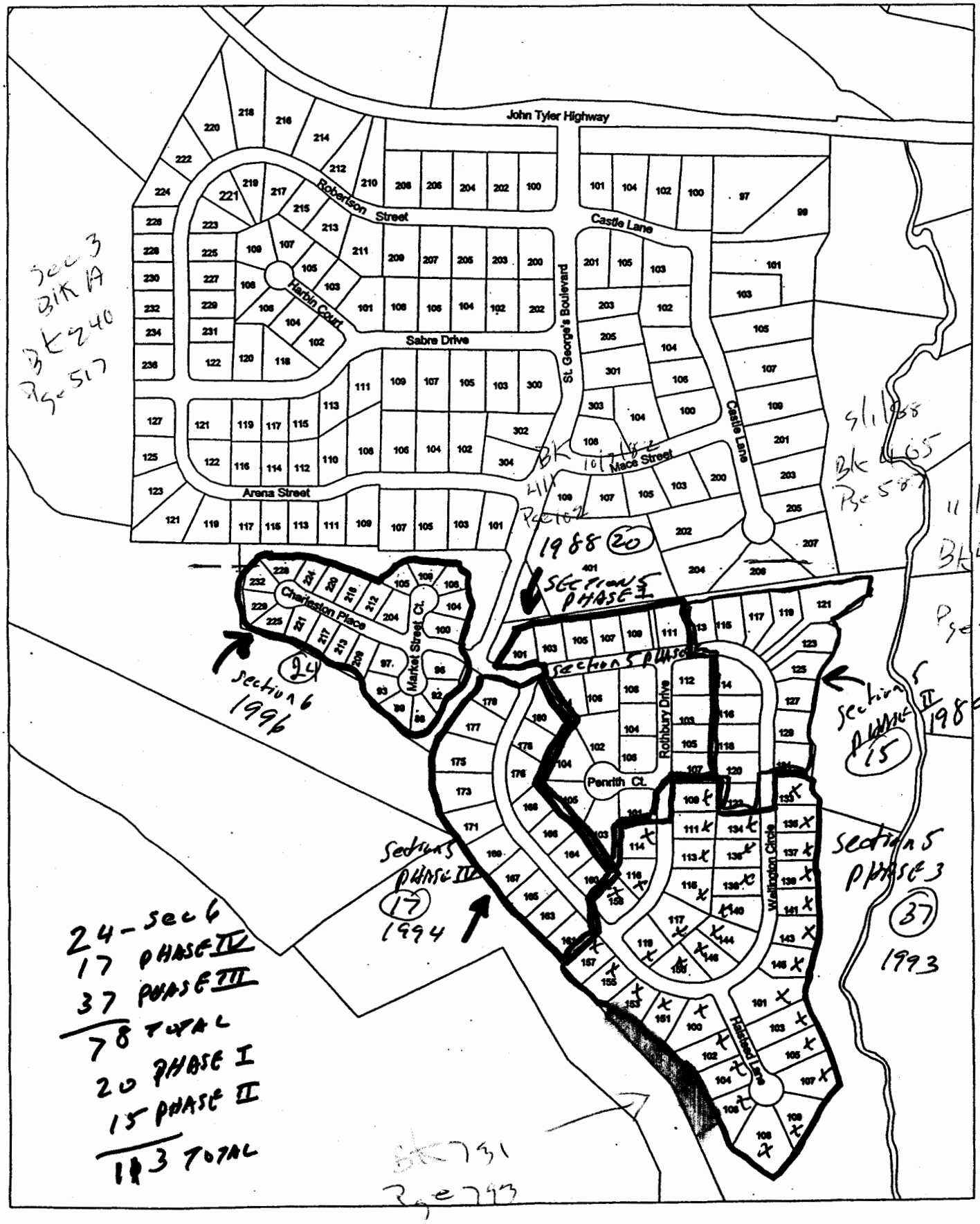
Surety by Site Name

SUBDIVISION SURETY		RELEASED?		EXPIRATION	SILTATION SURETY		RELEASED?		EXPIRATION	NAME
	$0		☐			$0		☐		ST GEORGE'S HUNDRED - GENERAL
BOND	$32,000	R	☑		BOND	$12,000	**R	☑		ST GEORGE'S HUNDRED - SECTION 5 - PHASE 1*
L/C	$24,500	R	☑		BOND	$12,000	**R	☑		ST GEORGE'S HUNDRED - SECTION 5 - PHASE 2*
L/C	$85,000	*	☐	4/22/2002	L/C	$34,000	**R	☑		ST GEORGE'S HUNDRED - SECTION 5 - PHASE 3 POND
L/C	$85,000	**	☐	4/22/2002	L/C	$34,000	*R	☑		ST GEORGE'S HUNDRED - SECTION 5 - PHASE 4
L/C	$75,000		☐	9/25/2002	L/C	$85,000	*	☐	4/22/2002	ST GEORGE'S HUNDRED - SECTION 6

Number Listed: 6

Still in place

St. George's Hundred



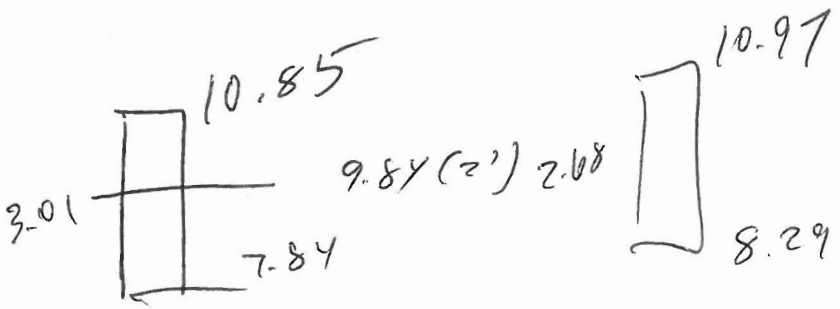
Sec 3 Blk A Bk 240 Pg 517

5/1/88 Bk 405 Pg 587

11/3/88 Bk 455 19 Pg

24 - Sec 6
17 PHASE IV
37 PHASE III
78 TOTAL
20 PHASE I
15 PHASE II
113 TOTAL

Bk 731 Pg 793


10.85
3.01
9.84 (2')
7.84
2.68
10.97
8.29

AES CONSULTING ENGINEERS
Engineering, Surveying and Planning
5248 Olde Towne Road, Suite 1
WILLIAMSBURG, VIRGINIA 23188

(757) 253-0040
FAX (757) 220-8994

LETTER OF TRANSMITTAL

TO James City County Environmental Div.

DATE	JOB NO.
8.27.99	6201-3

ATTENTION David Meador

RE: St. George's Hundred Section 5 Ph. 3

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☒ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Record drawing of pond

PC054

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

The addition of the intake pipes should finalize this as-built. Let me know if you have any questions.

COPY TO _____ SIGNED Leidra P. Wills

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

PRODUCT 239