CERTIFICATE OF AUTHENTICITY

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

BMP NUMBER: **WC040**

DATE VERIFIED: **October 12, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 12, 2010

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

FROM: Tina Cantwell, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: WC040

PIN: 0510900001A

Subdivision, Tract, Business or Owner Name (if known): Association at Stonehouse, Inc. (The)

Property Description: Near (South of) 3136 Hollow Oak Drive

Site Address: Hollow Oak Drive in Stonehouse Subdivision

(For internal use only) **Box** 13 **Drawer:** 8

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

Comments

James City County, Virginia
Environmental Division

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

County Plan No.: S-84-97; AMEND S-55-98
Project Name: Stonehouse SEC 6A Hollow Oak, Phase I
Stormwater Management Facility: Dry Pond ~~Bioretention~~ NCR
Phase: ☐ I ☑ II ☐ III

- ☑ Information Received. Date: NOV 16 00
- ☐ Administrative Check.
  - ☑ Record Drawing Date: 11/16/00 LANDMARK
  - ☑ Construction Certification Date: 11/15/00 LANDMARK
  - ☐ RD/CC Standard Forms (Required after Feb 1st 2001Only)
  - ☐ Insp/Maint Agreement Info: Yes 8-19-99 Required per Comments Dated 10/22/97, Response by Engineer JAN 29 1998 (#4).
  - ☐ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  ☐ Yes ☐ No Note/Sheet: Sheet 13 NOTE #18
- ☑ Assign County BMP ID Code Code: WC 040
- ☑ Log into Division's "As-Built" Tracking Log
- ☑ Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (label, copies of hydraulics, etc.).
- ☑ Inspector Check of RD/CC.
- ☑ Pre-Inspection Drawing Review (Quick look prior to field inspection).
- ☑ Final Inspection (FI) Date: 8/27/01
- ☑ Record Drawing (RD) Review Date: 9/10/01
- ☑ Construction Certification (CC) Review Date: 9/10/01
- ☑ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date:
    - ☑ Record Drawing (RD)
    - ☐ Construction Certification (CC)
    - ☑ Construction-Related (CR)
    - ☐ Site Issues (SI)
    - ☐ Other :
- ☐ Second Submission: 4/14/03 RD OK; Resubmit 4-14-03; Resubmit 7-7-03
- ☐ Third Submission:

- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☑ Notify Darryl & Joan of acceptability using email (preferred) or verbal.
- ☑ Clean active file of all stormwater management related material and finish/establish "As-Built" file.
- ☑ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
- ☐ Copy Final Inspection Report into County BMP Inspection Program file.
- ☑ Add to JCC Hydrology & Hydraulic database (optional).

BMP Certification Information Acceptable

Plan Reviewer: [signature] P.E. Date: 7/8/03

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, 08/00 AND REFLECTS CONDITIONS PRESENT AT THAT TIME.

WC040

RECORD

RISER STRUCTURE (SEE DETAIL)
WITH POND DRAIN AND VALVE
RIM=43.05
TOP RISER=41.35 (AT WEIR)
LOW FLOW PIPE: RIM=36.45, INV=35.36
INV 4"PVC=30.3±
INV 8" DIP=30.0±
INV OUT=29.90

15' ACCESS AND MAINTENANCE EASEMENT

DRAINAGE EASEMENT

15'± WIDE EMER. SPILLWAY

RIP-RAP

SAN. SEWER BRIDGE

94'-18"RCP@2.9%

END SECTION INV=27.13

END SECTION
INV 4"PVC=31.32
INV8"DIP=30.30

VARIABLE WIDTH DRAINAGE EASEMENT AND 100 YR STORM W.S.E.

END SECTION INV=39.42

15' ACCESS AND MAINTENANCE EASEMENT

STORM MH
RIM=53.80
INV IN=46.99
INV OUT=40.03

SAN. MH RIM=37.39

COMMON AREA PARCEL CA9

LOT 19
NO. 3132 HOLLOW OAK DRIVE

LOT 20

LOT 21

RETAINING WALL

LANDSCAPED AREA

138'-24" RCP @6.7%

LOT 18

GRAVEL ACCESS ROAD

CATV PED.
SAN CO

INV. IN=57.04

191'-15" RCP @ 0.5%

DROP INLET
RIM=67.00
INV IN=56.25
INV OUT=56.18

32'-24" RCP @1.8%

DROP INLET
RIM=62.32
INV.=58.03

HOLLOW OAK DRIVE
50' R/W

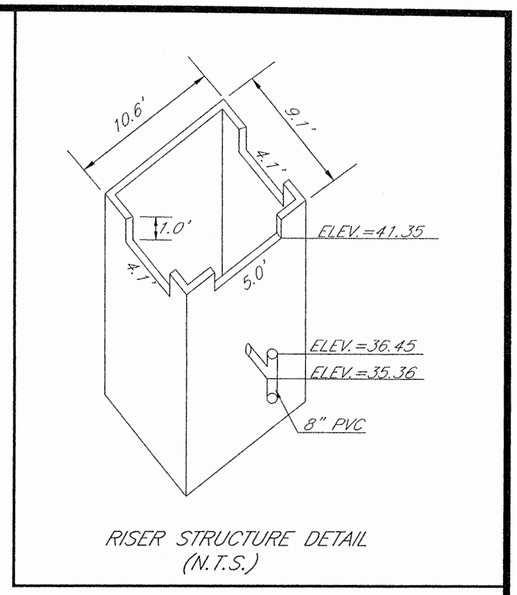
DROP INLET
RIM=67.02
INV=58.76

LOT 17

LOT 16

LOT 15

LOT 14



RISER STRUCTURE DETAIL
(N.T.S.)

APPROVED
James City County
Environmental Division
By:
Date: 4-14-03

FEB 2003
RECEIVED
ENVIRONMENTAL DIVISION

RECORD DRAWING
OF
SWM ATTENUATION BASIN
AT
SECTION VIA STONEHOUSE

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

11/16/00 SCALE 1'=30'
REVISED PER COUNTY COMMENTS:
2/25/03

COMMONWEALTH OF VIRGINIA
2-27-03
PETER FARRELL
No. 002036
Peter Farrell
LAND SURVEYOR

COUNTY PLAN NO. S-84-97
BMP ID NO. WC040

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

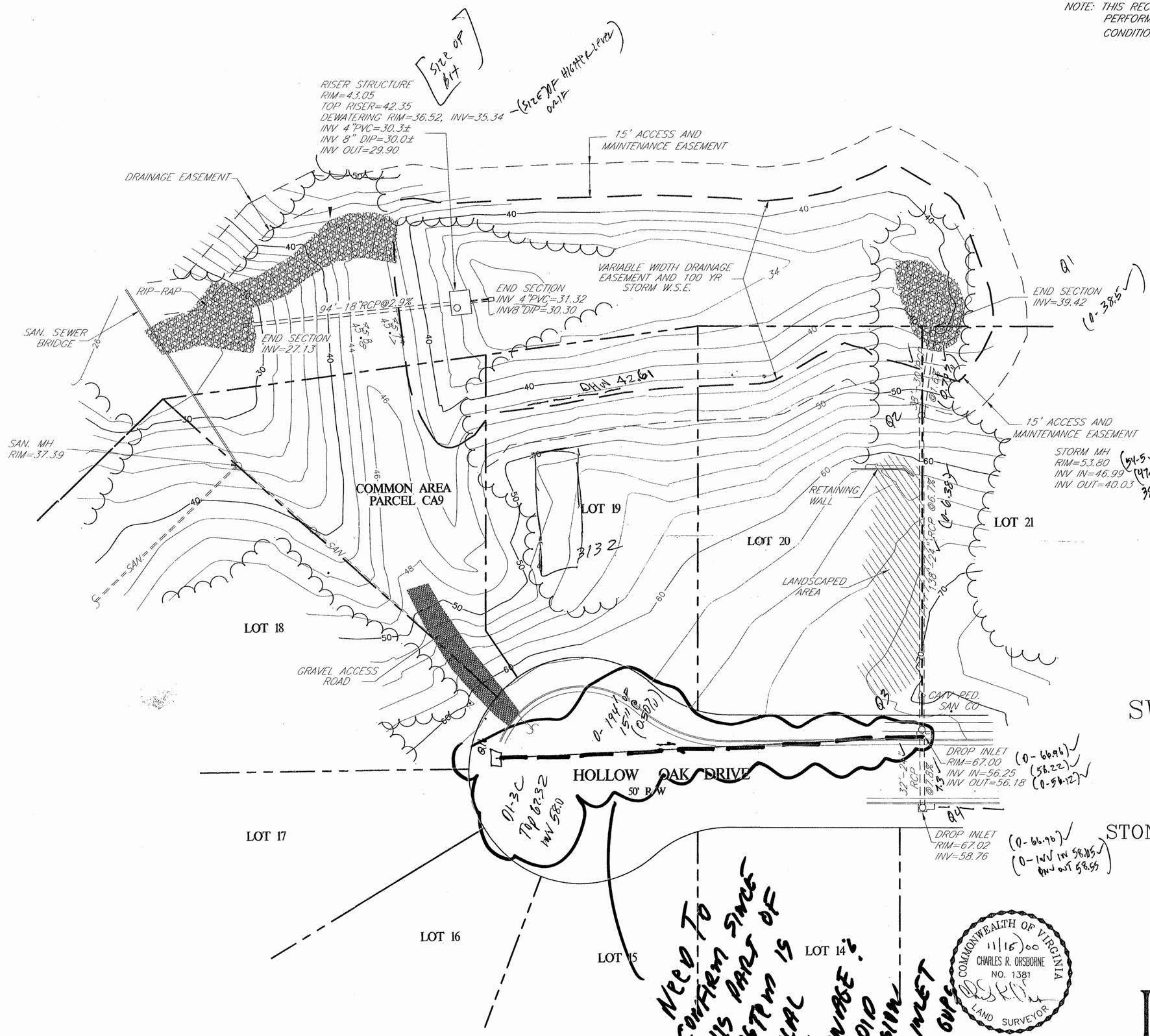
4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 229-0049
Email: lmdg@landmarkdgwb.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

DRAWN BY : PF	PROJ. NO. : 1990131-000.46
CHKD. BY : RSP	DWG. NO. : 11685W

WC040

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, 08/00 AND REFLECTS CONDITIONS PRESENT AT THAT TIME.



NEED TO CONFIRM SINCE THIS PART OF SYSTEM IS CRITICAL FOR DRAINAGE. TO AVOID CONFUSION THAT INLET #Q16 GOES TO BMP.

— NORTH ARROW
— LABELS ADDRESS
— POND DETAIL
— MP.
— SIZE OF BOX

RI PEV A= 5.5AC CN=70 Tc=30min.

POST DEV A= 13.74AC CN=79

POST INFLOW	ROUTED	EL.
32 CFS	2.6 CFS @	37.64
66 CFS	4.2 CFS @	40.77
119 CFS	44.3 CFS @	(42.8)

PRE
2- 40 CFS
10- 100 CFS
100- 200 CFS

CN=79 ≈ 20% (2.75AC)

RECORD DRAWING OF SWM ATTENUATION BASIN AT SECTION VIA STONEHOUSE

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

11/16/00 SCALE 1'=30'

SITE SET 8/27/01

COMMONWEALTH OF VIRGINIA
11/16/00
CHARLES R. ORSBORNE
NO. 1381
LAND SURVEYOR

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

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 229-0049
Email: lmdg@landmarkdgwb.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

DRAWN BY : PF	PROJ. NO. : 1990131-000.46
CHKD. BY : RSP	DWG. NO. : 11685W

PARCEL (11)
GOLF TRUST OF AMERICA, L.P.
DOCUMENT NO. 97-0002802
PART OF HOLE NO.14

LOT 1 22,002.86 S.F. 0.5051 AC.
LOT 6 19,894.03 S.F. 0.4567 AC.
LOT 7 18,714.18 S.F. 0.4296 AC.
LOT 8 21,851.17 S.F. 0.5016 AC.
LOT 9 37,224.67 S.F. 0.8546 AC.
LOT 10 52,266.43 S.F. 1.1999 AC.
LOT 11 27,731.80 S.F. 0.6366 AC.
LOT 12 22,246.95 S.F. 0.5107 AC.
LOT 13 22,246.95 S.F. 0.5107 AC.
LOT 14 22,238.40 S.F. 0.5105 AC.
LOT 15 22,464.25 S.F. 0.5157 AC.
LOT 16 24,631.47 S.F. 0.5701 AC.
LOT 17 30,162.04 S.F. 0.6924 AC.
LOT 18 29,049.40 S.F. 0.6669 AC.
LOT 19 13,977.97 S.F. 0.3209 AC.
LOT 20 17,266.02 S.F. 0.3964 AC.
LOT 21 17,274.56 S.F. 0.3966 AC.
LOT 22 30,001.06 S.F. 0.6887 AC.
LOT 23 24,258.01 S.F. 0.5569 AC.
LOT 24 50,414.33 S.F. 1.1574 AC.
LOT 27 39.56 S.F. .690 AC.
LOT 28 26,857.24 S.F. 0.6166 AC.
LOT 29 24,328.32 S.F. 0.5585 AC.
LOT 30 29,216.90 S.F. 0.6707 AC.
LOT 31 43,753.15 S.F. 1.0044 AC.
LOT 32 21,263.66 S.F. 0.4881 AC.

CROSS BRANCH
HOLLOW OAK DRIVE
HIDDEN NEST
50' R/W
VARIABLE WIDTH R/W

SHEET 4
SHEET 5
SHEET 7
SHEET 9
SHEET 11

DRAINAGE EASEMENT
10' UTILITY EASEMENT FOR EXCLUSIVE USE OF JAMES CITY SERVICE AUTHORITY
10' UTILITY AND DRAINAGE EASEMENT(TYP.)
20' DRAINAGE EASEMENT
VARIABLE WIDTH UTILITY EASEMENT FOR EXCLUSIVE USE OF JAMES CITY SERVICE AUTHORITY
10' DRAINAGE EASEMENT DEDICATED TO HOMEOWNERS ASSOC.
LIMITS OF WETLANDS (TYP.)
VARIABLE WIDTH DRAINAGE EASEMENT
15' DRAINAGE ACCESS AND MAINTENANCE EASEMENT TO BE DEDICATED TO THE HOMEOWNERS ASSOCIATION
COMMON AREA PARCEL (CA8) DRAINAGE EASEMENT 10,873.99 S.F. 0.2496 AC.
20' UTILITY EASEMENT FOR EXCLUSIVE USE OF JAMES CITY SERVICE AUTHORITY TO SERVICE FUTURE SEC. VI-B AND SEC. VI-C
PROP. FIRE HYDRANT ASSEMBLY
PROP. WATER METERS(TYP.)
PROP. SAN CLEANOUT (TYP.)
PROP. WATER METER(TYP.)
PROP. GREASE TRAP
PROP. GREASE VALVE BOX
PROP. PUMP
PART OF PARCEL (A) STONEHOUSE LIMITED LIABILITY COMPANY NATURAL OPEN SPACE

S-87-97
WC040

PROPOSED SANITARY CLEANOUT (TYP)

PROPOSED CLEARING LIMITS (TYP)

PROVIDE TRACER WIRE ALONG THE SANITARY SEWER FORCE MAIN BETWEEN THE GRINDER PUMP VALVE BOXES AND THE SANITARY SEWER MANHOLE. (TYP)

LOT 17

PROPOSED GRINDER PUMP VALVE BOX

PROPOSED ST'D. ROLL CURB

S10°17'22"E 322.51'

21+50

50' R/W (TYP)

29' (TYP) BC-BC

22+00

22+50

23+00

23+50

23+59.49

RADIUS PNT. = 62.81

38' RAD.-BC

TC = 63.11

TC = 62.32

TC = 63.11

PROPOSED CG-12

PROPOSED CLEARING LIMITS (TYP)

STA. 24+00 8" PLUG WITH BLOW-OFF ASSEMBLY

PROPOSED 4' SIDEWALK (TYP)

447 L.F. 8" WATERLINE G.V. TO C.V.

100 L.F. 8" WATERLINE G.V. TO PLUG

LOT 18

TEMPORARILY STABILIZE SLO WITH EC-3 SOIL STABILIZATI (SEE THIS SHEET FOR DETAI

10' UTILITY AND DRAINAGE EASEMENT (TYP. ALL LOTS)

PROPOSED 8" WATERLINE (TYP)

PROPOSED STREET LIGHT (TYP)

PROPOSED 20' SAN. SE FOR THE EXCLUS OF THE JAMES CIT AUTHORITY

PROPOSED 20' DRAINAGE EASEMENT TO BE DEDICATED TO THE HOMEOWNERS ASSOCIATION

SEE SHEET 11 FOR STORM SEWER OUTFALL PROFILE TO RIP RAP STILLING BASIN

PROPOSED WATERLINE HOLLOW OAK DRIVE
STA. 22+97 8"x6" TEE
6" GATE VALVE & BOX
1 - F.H. & BOX
STA. 23+00 8" G.V. & BOX

(TYP. @ 50' INTERVALS

DRAIN WET DRY LENG

LOT 21

LOT 20

(TYP. @ 50' INTERVALS)

PROPOSED CLEARING LIMITS (TYP)

PROPOSED CLEARING LIMITS (TYP)

LOT 19

PROPOSED 10' ACCESS AND MAINTENANCE ROAD (SEE DETAIL SHEET 15)

SEE STORMWATER ATTENUATION BASIN "C" PLAN AND PROFILE SHEET 11

COMMON AREA
PARCEL CA9

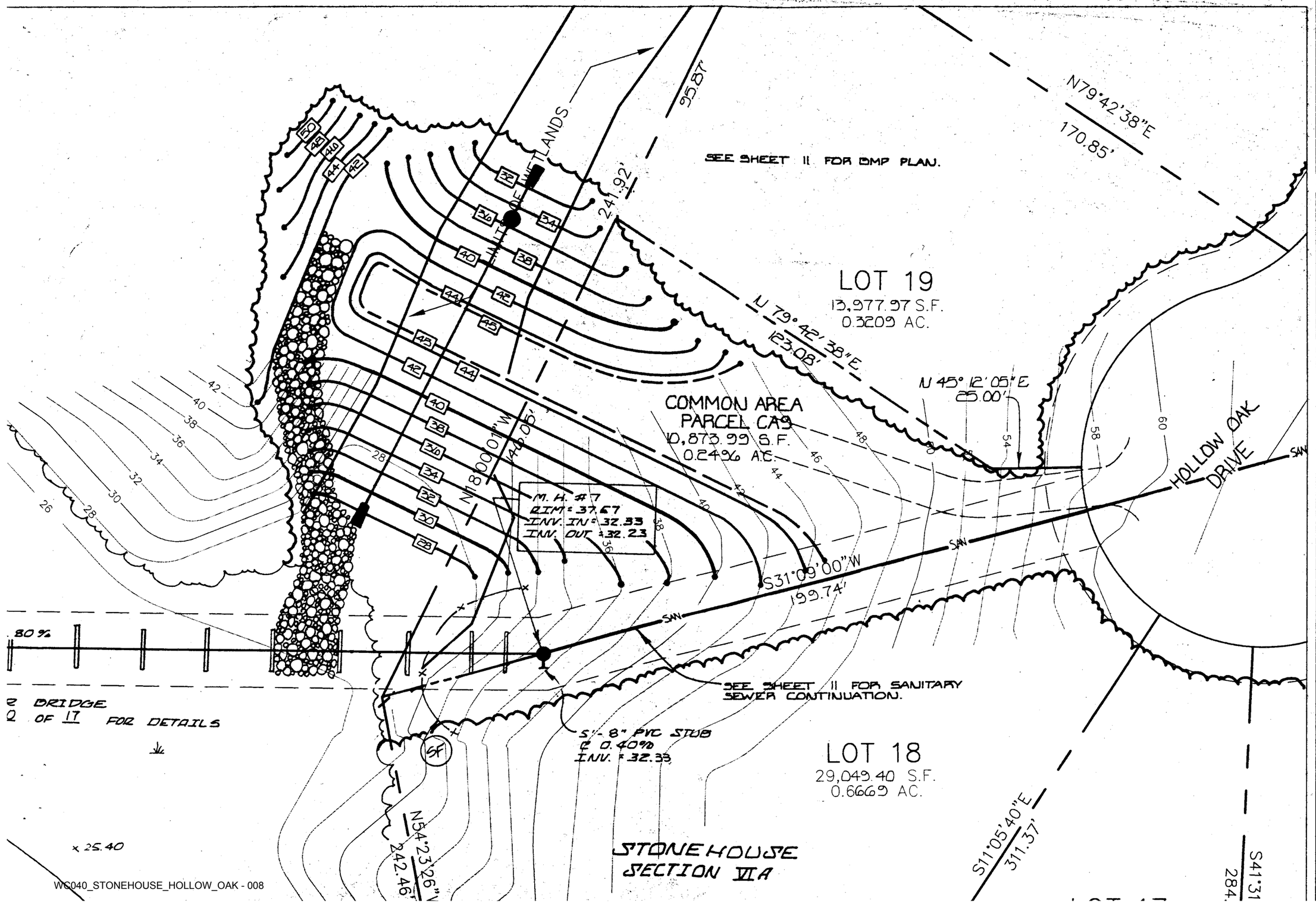
NOTE: ALL DRAINAGE EASEMENTS AND ATTENUATION BASIN ARE TO BE DEDICATED TO THE HOMEOWNERS ASSOCIATION.

VARIABLE WIDTH DRAINAGE EASEMENT AND 100 YR STORM W.S.E.

15' ACCESS AND MAINTENANCE EASEMENT

PVI STA = 22+00
PVI ELEV = 66.00
A.D. = 5.20
K = 38.46
C.L. = 200.00'

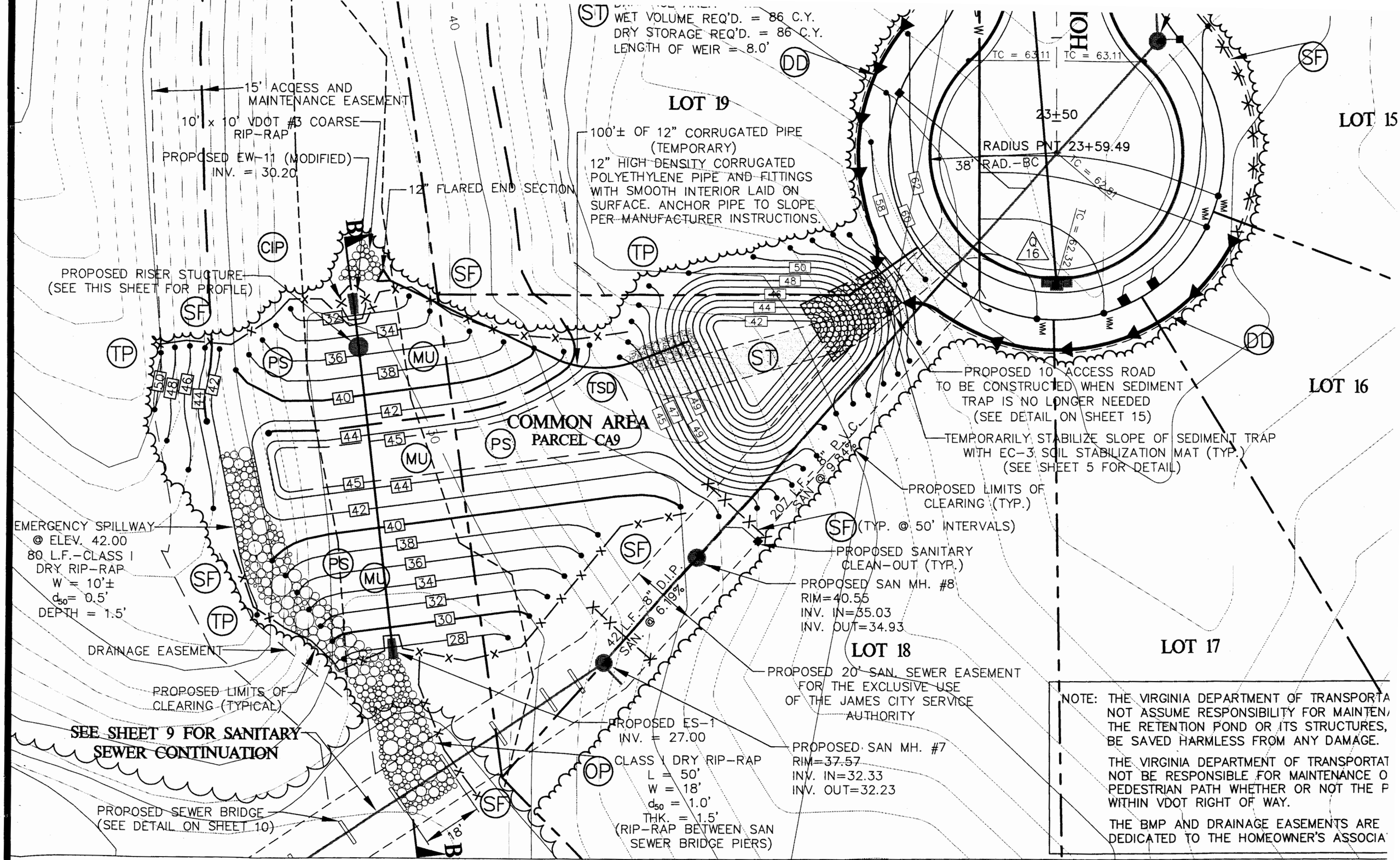
EXISTING GRADE



COMMONWEALTH OF VIRGINIA
JOHN L. HUTCHERSON
No. 7753
PROFESSIONAL ENGINEER

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

WS040_STONEHOUSE_HOLLOW_OAK - 008

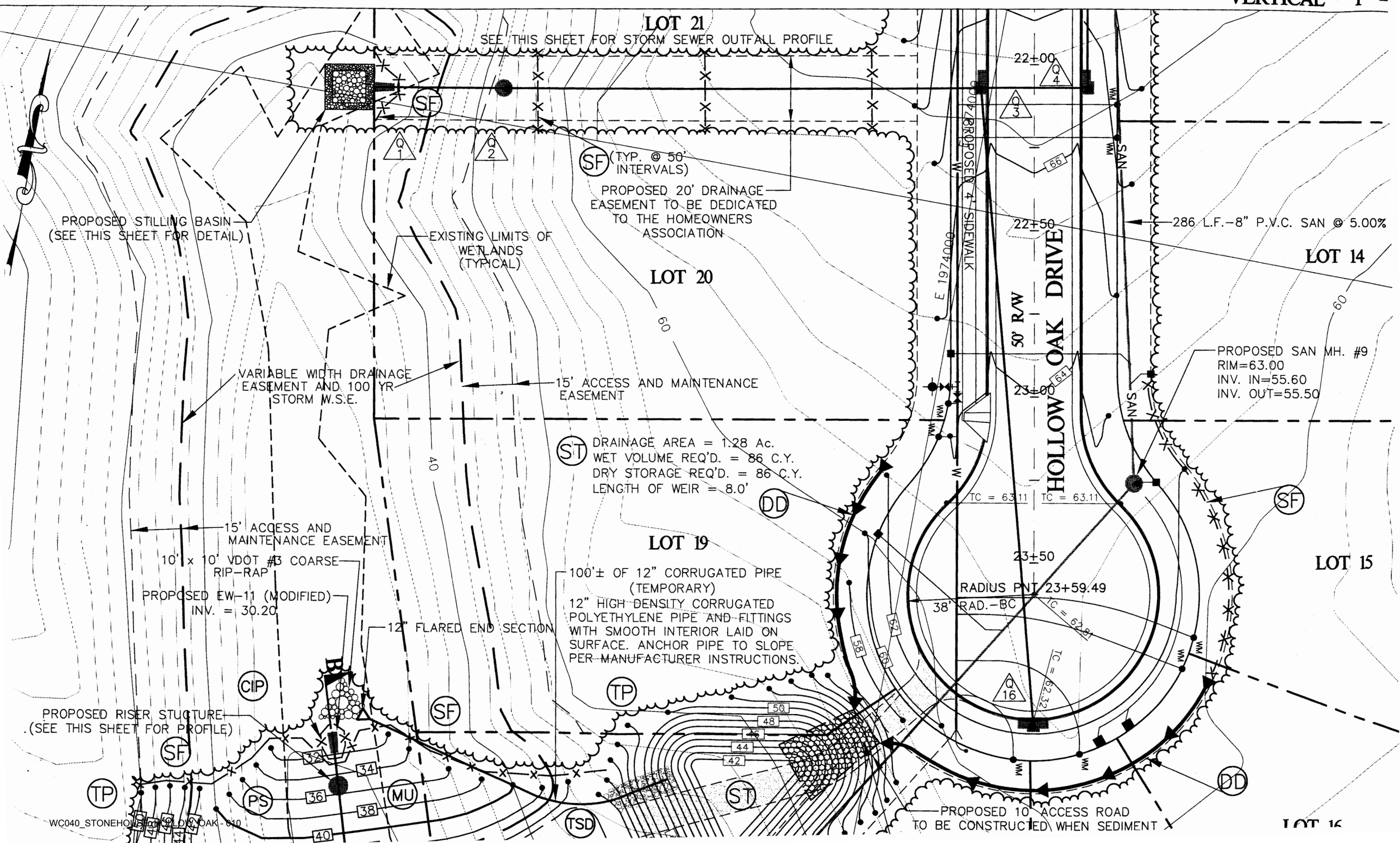


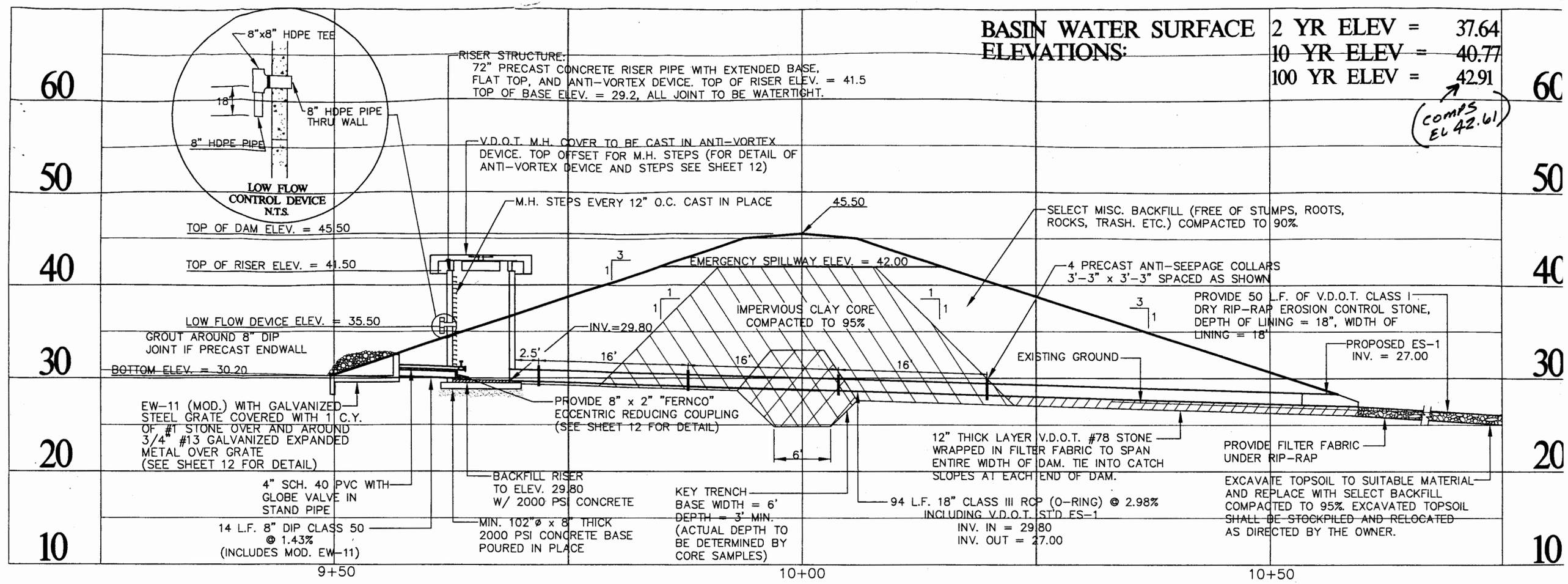
STORMWATER ATTENUATION BASIN "C" PLAN

SCALE: 1"

STOMWATER ATTENUATION BASIN "C" SECTION B-B

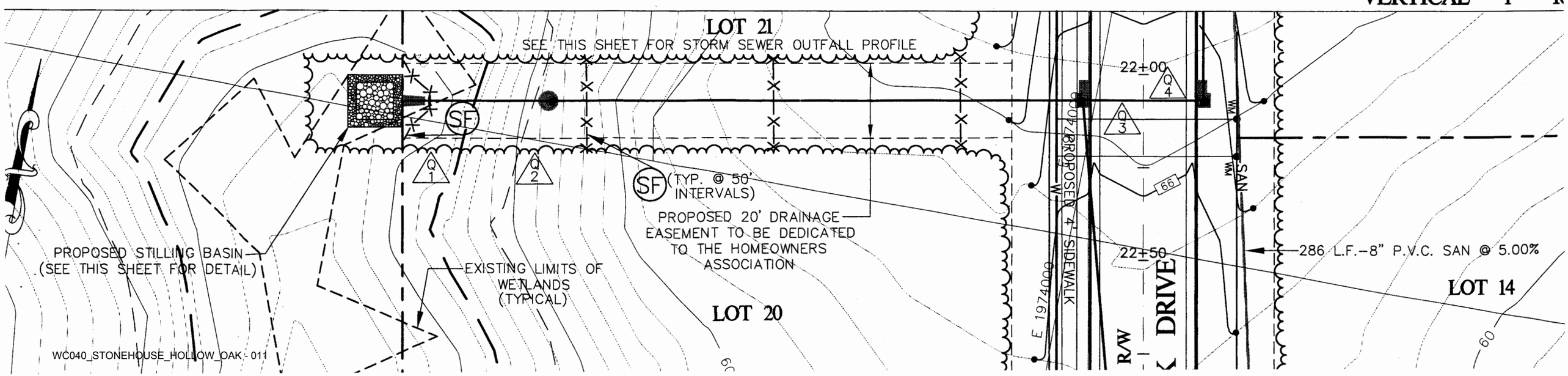
SCALE: HORIZONTAL -
VERTICAL - 1" =





STOMWATER ATTENUATION BASIN "C" SECTION B-B

SCALE: HORIZONTAL - 1"
VERTICAL - 1" = 1(



WC040_STONEHOUSE_HOLLOW_OAK - 011

EARTHWORK FOR STORMWATER BASINS

1. SCOPE: WORK INCLUDED HEREIN CONSISTS OF FURNISHING ALL LABOR, MATERIAL, EQUIPMENT AND SUPPLIES FOR COMPLETION OF ALL EARTHWORK ASSOCIATED WITH THE STORMWATER MANAGEMENT BASIN.

2. TESTING: THE CONTRACTOR SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS IN THE AREAS OF SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX AND COMPACTION. TESTING OF THE MATERIALS FOR USE IN THE CONSTRUCTION OF THE BASIN DAM STRUCTURE SHALL BE IN ACCORDANCE WITH ASTM STANDARDS AND SHALL BE PERFORMED BY A REGISTERED GEOTECHNICAL ENGINEER. CONTRACTOR'S GEOTECHNICAL ENGINEER SHALL BE APPROVED BY THE OWNER. COSTS FOR TESTING AND THE GEOTECHNICAL ENGINEER SHALL BE INCLUDED IN OTHER BID ITEMS ASSOCIATED WITH THE STORMWATER BASIN.

3. INSPECTION: ALL WORK PERFORMED IN RELATION TO THE STORMWATER MANAGEMENT BASIN STRUCTURE SHALL BE OVERSEEN BY A REGISTERED GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL PROVIDE THE GEOTECHNICAL ENGINEER AT HIS EXPENSE.

4. GENERAL EXCAVATION AND BACKFILLING: ALL EXCAVATED MATERIAL WHICH IS UNSATISFACTORY FOR BACKFILL SHALL BE WASTED AND ALL EXCAVATION NOT REQUIRED FOR BACKFILLING SHALL BE DEPOSITED ON SITE AND SPREAD BY THE CONTRACTOR, AS DIRECTED BY THE ENGINEER. ON-SITE EXCAVATED MATERIAL MAY BE USED FOR DAM CONSTRUCTION UNLESS THE GEOTECHNICAL ENGINEER DETERMINES THAT THE MATERIAL DOES NOT MEET THE STANDARDS SET FORTH IN THIS SPECIFICATION. SHOULD ADDITIONAL MATERIAL BE NEEDED, IT SHALL BE PROVIDED BY THE CONTRACTOR FROM APPROVED BORROW LOCATIONS ON THE STONEHOUSE L.L.C. PROPERTY.

5. FOUNDATION AND KEY PREPARATION:

   A. UNDERCUT EXCAVATION FOR THE FOUNDATION SHALL OCCUR TO A POINT WHICH IS 5 FEET BEYOND THE TOE OF THE DAM EMBANKMENT IN EACH DIRECTION. THE UNDERCUT SHALL BE AT LEAST 2 FEET DEEP AND SHALL CONTINUE TO THE DEPTH WHICH IS REQUIRED TO REMOVE ANY ORGANIC SOILS AS DIRECTED BY THE ON-SITE GEOTECHNICAL ENGINEER.

   B. THE FOUNDATION EXCAVATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED BY UNIFIED SOIL CLASSIFICATION SYSTEM AS SM, SC OR CL CONTAINING AT LEAST 15% BY WEIGHT FINES AND HAVING A MAXIMUM PLASTICITY INDEX OF 30%. THE FILL SHALL BE COMPACTED IN TEN INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). IN ADDITION ANY SOILS PLACED IN THE AREA OF THE KEY SHALL BE CLASSIFIED AS SC OR CL AND HAVE A PERMEABILITY OF 0.001 CM/SEC OR LESS.

   C. EXCAVATION FOR THE KEY SHALL BE SIX FEET WIDE AND TO A DEPTH OF SIX FEET FROM THE EXISTING EMBANKMENT CONTOURS. THE KEY SHALL BE CONSTRUCTED PARALLEL TO THE DAM WITH FIVE FEET ON EACH SIDE OF THE DAM'S CENTERLINE. THE KEY SHOULD EXTEND UP THE EXISTING EMBANKMENT TO AN APPROXIMATE ELEVATION OF 33 WHERE IT WILL TAPER TO EXISTING GROUND AT A 1.5 HORIZONTAL TO 1 VERTICAL SLOPE.

   D. THE KEY EXCAVATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SC OR CL AND HAVE A PERMEABILITY OF 0.001 CM/SEC OR LESS.

6. DAM CORE AND COVER:

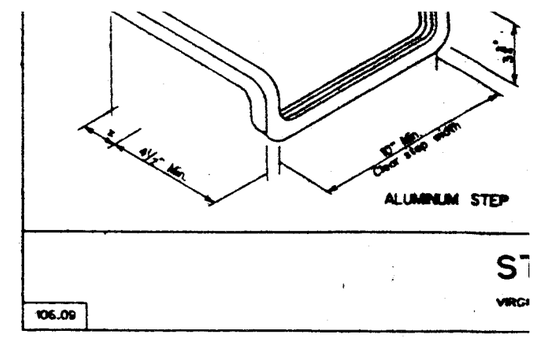
   A. THE CORE SHALL BE CONSTRUCTED OF NON-EXPANSIVE CLAYEY MATERIAL (SC OR CL) WITH A PERMEABILITY OF 0.001 CM/SEC OR LESS. THE FILL SHALL BE COMPACTED IN TEN INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698) PRIOR TO PLACEMENT OF THE NEXT LAYER OF FILL. THE TOP OF THE CORE SHALL BE CONSTRUCTED TO A MINIMUM ELEVATION OF 42 WITH A MINIMUM CREST WIDTH OF 10 FEET AND MAXIMUM SIDE SLOPES OF 1.5 HORIZONTAL TO 1 VERTICAL. BEFORE ANY FILL IS PLACED FOR THE CORE THE FOUNDATION SHALL BE SCARIFIED TO A DEPTH OF SIX TO EIGHT INCHES.

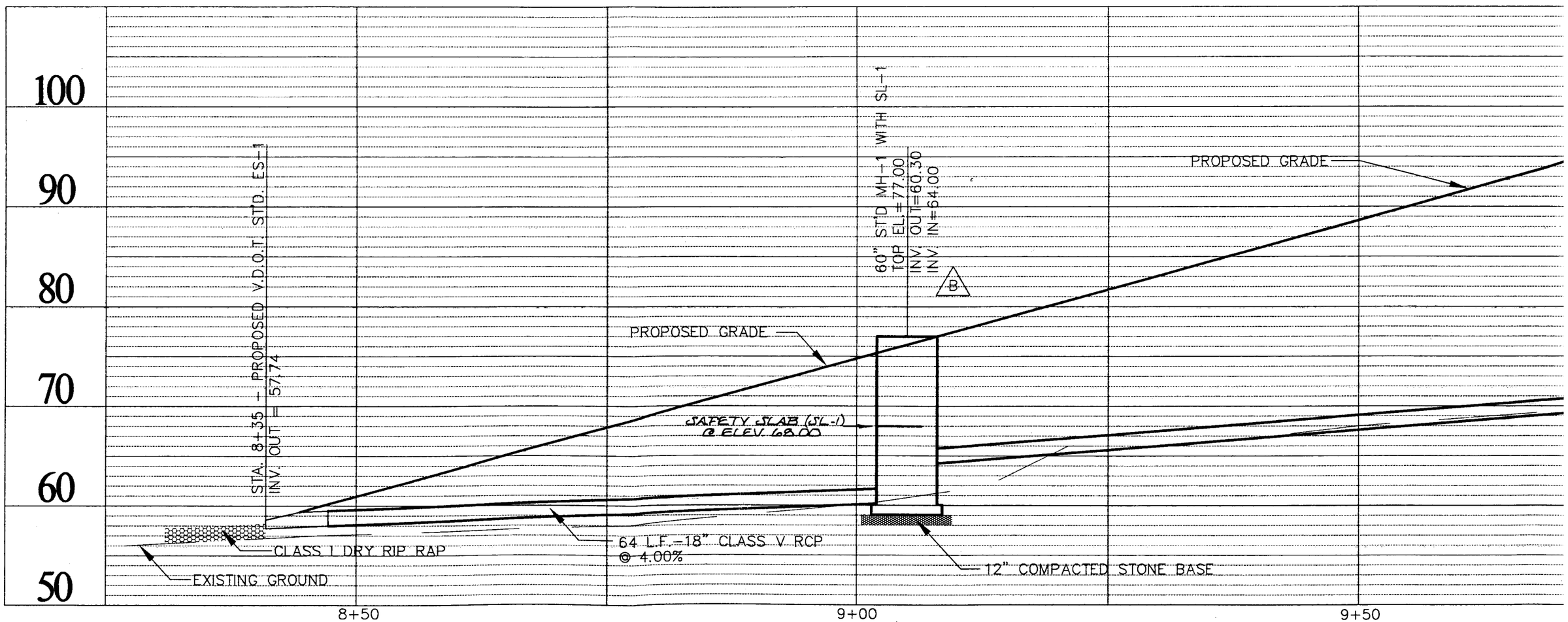
   B. A SILTY FINE SAND OR CLAYEY (SM, SC, OR CL) COVER SHALL BE PLACED OVER THE CORE TO AN ELEVATION OF 45.0 WITH A MINIMUM CREST WIDTH OF TWELVE FEET. SIDE SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL ON THE UPSTREAM SIDE OF THE DAM AND 3 HORIZONTAL TO 1 VERTICAL ON THE DOWNSTREAM SIDE OF THE DAM. VEGETATIVE COVER WITH VDOT STD. EC-2 EROSION CONTROL BLANKET SHALL BE PLACED ON THE SIDE SLOPES AND CREST IN ORDER TO AVOID EROSION.

7. MEASUREMENT AND PAYMENT: PAYMENT FOR ALL WORK PERTAINING TO EXCAVATION, FILLING OR BACKFILLING, TESTING, INSPECTING, OR DEWATERING OF THE STORMWATER MANAGEMENT BASIN AND APPURTANCES SHALL BE INCLUDED IN THE LUMP SUM PRICE BID.

. A SILTY FINE SAND OR CLAYEY (SM, SC, OR CL) COVER SHALL BE PLACED OVER THE CORE TO AN ELEVATION OF 45.0 WITH A MINIMUM CREST WIDTH OF TWELVE FEET. SIDE SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL ON THE UPSTREAM SIDE OF THE DAM AND 3 HORIZONTAL TO 1 VERTICAL ON THE DOWNSTREAM SIDE OF THE DAM. VEGETATIVE COVER WITH VDOT STD. EC-2 EROSION CONTROL BLANKET SHALL BE PLACED ON THE SIDE SLOPES AND CREST IN ORDER TO AVOID EROSION.

:ASUREMENT AND PAYMENT: PAYMENT FOR ALL WORK PERTAINING TO EXCAVATION, FILLING OR BACKFILLING, TESTING, INSPECTING, OR DEWATERING OF THE STORMWATER MANAGEMENT BASIN AND APPURTANCES SHALL BE INCLUDED IN THE LUMP SUM PRICE BID.

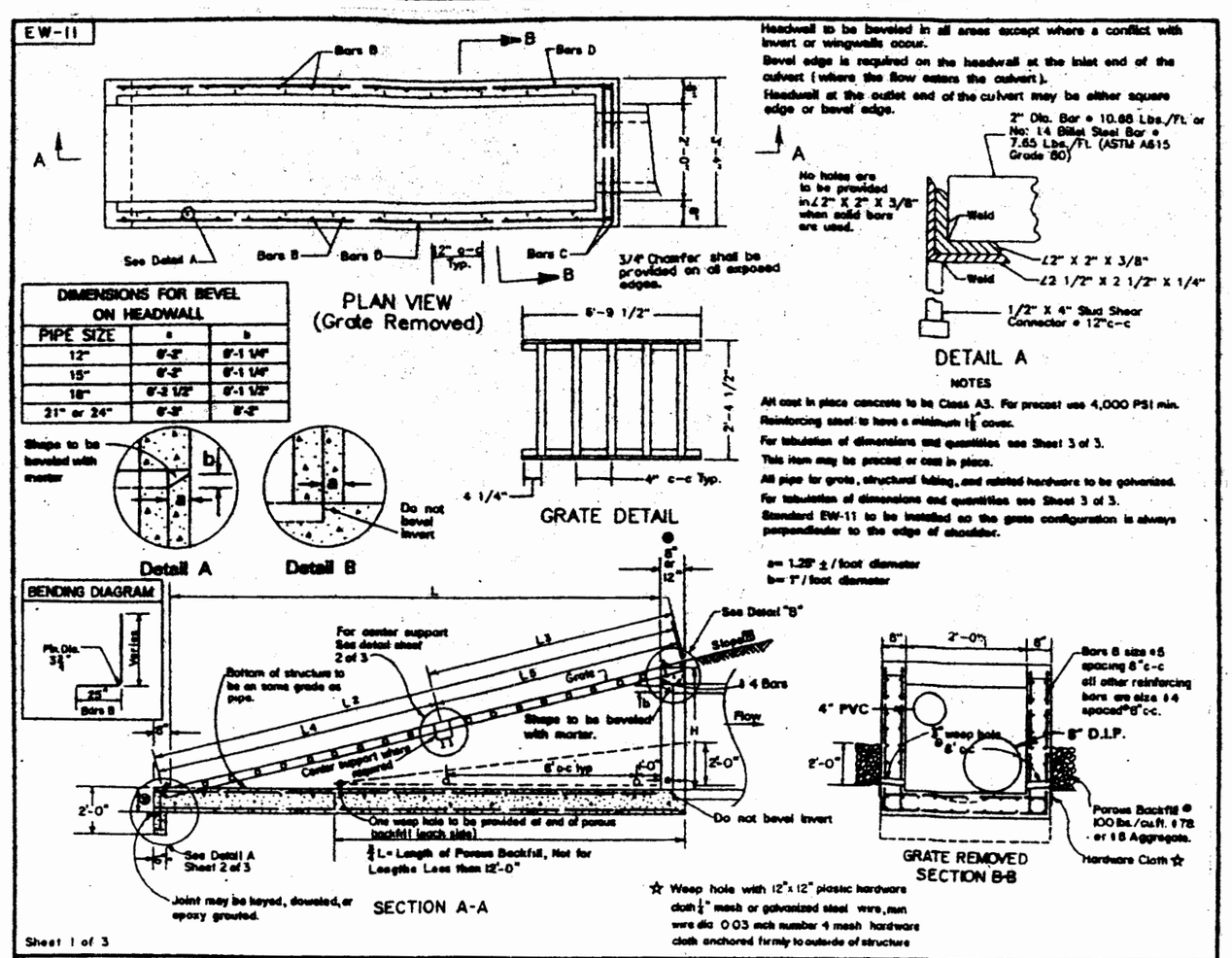




SECTION A-A AT STATION 1

SCALE: HORIZONTA
VERTICAL -

EW-11



PIPE ENDWALL WITH LOAD-CARRYING GRATE

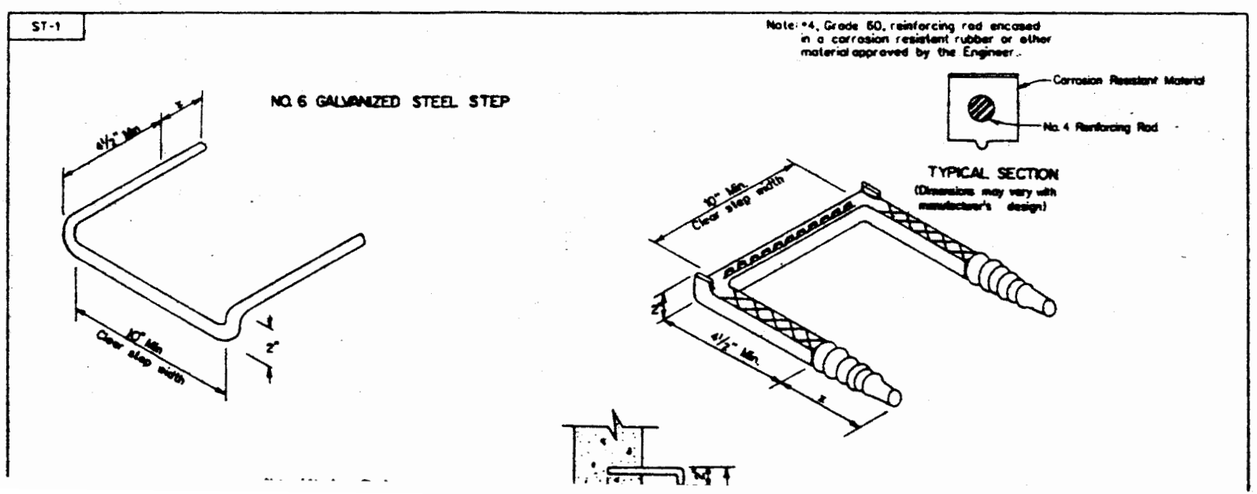
MODIFIED

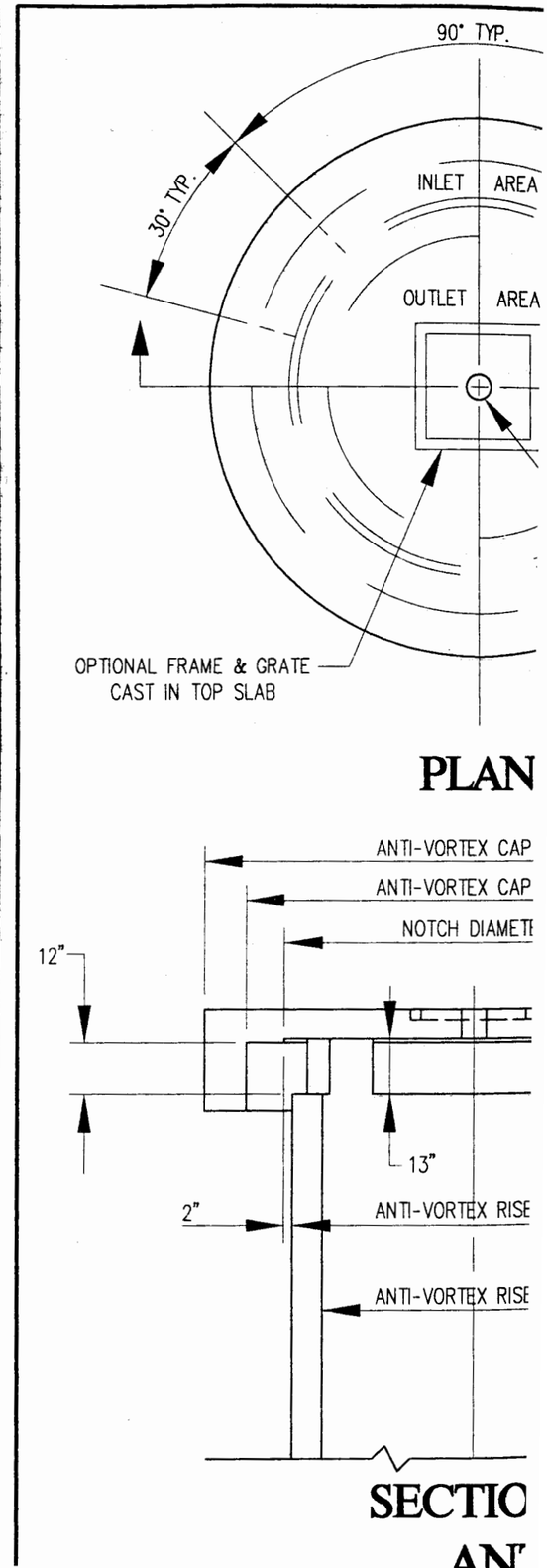
VIRGINIA DEPARTMENT OF TRANSPORTATION

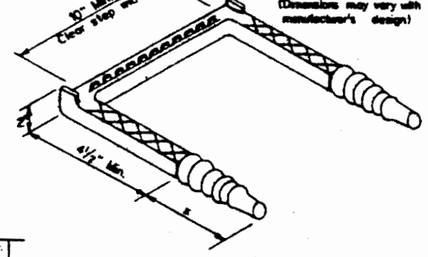
101.26

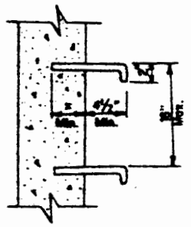
SPECIFICATION REFERENCE

ST-1

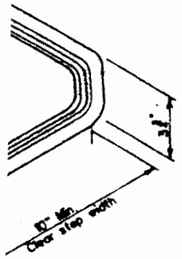








x Min. of 3" embedment



ALUMINUM STEP

NOTES

Steps will be required in all structures with a depth of 4'-0" or greater unless otherwise noted on the plans.

All steps shall protrude 4½" from inside face of structure wall.

Maximum step spacing to be 18" o-c.

Steps shall withstand a minimum load of 300 pounds when extended 4½" from the face of the support.

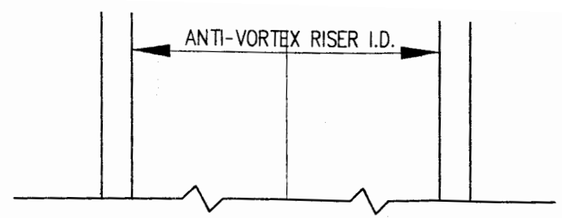
Steps are to be vertically aligned and uniformly spaced for the entire depth of any structure.

In precast units steps may be cast in place, mortared into holes provided by the fabricator, or driven.

Steps differing in dimensions, configuration, or materials from those shown may also be used provided they meet the minimum requirements shown hereon and the Contractor has furnished the Engineer with details and certified test reports of the proposed substitute and has received written approval from the Engineer for the use of such steps.

All steps installed shall be provided with slip-resistant surfaces such as but not limited to, corrugated, knurled, or dimpled surfaces.

STANDARD STEP VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE NONE



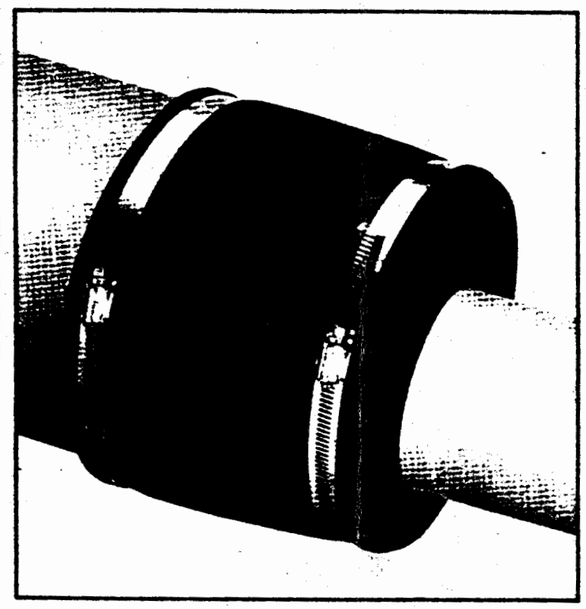
SECTION

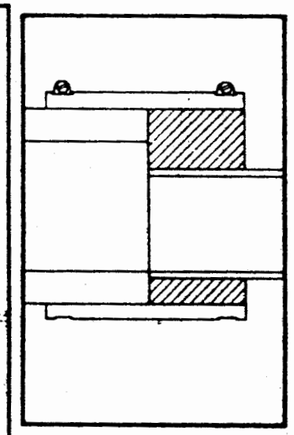
66"	80-1/2"	96"	114"	84-1/2	5.59 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126"	147"	98-1/2"	8.97 T
84'	100"	126"	147'	104"	8.90 T

ANTI-VORTEX DEVICE DETAIL

1" = 3'

ECCENTRIC COUPLINGS

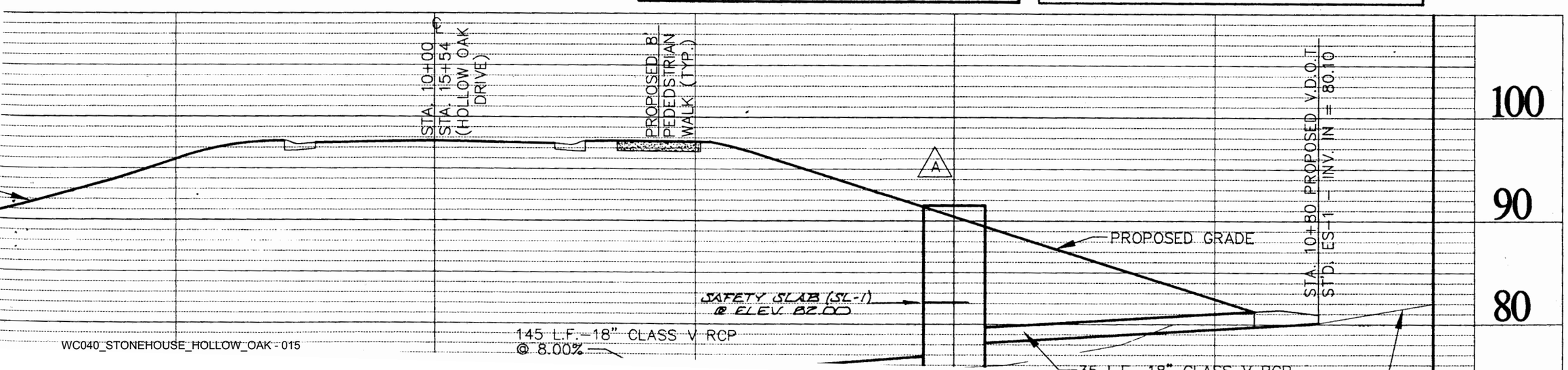




Fernco Eccentric Couplings help maintain an even, continuous flowline in **critical grade conditions.** They're easy to install and available to fit all common sewer pipe size combinations. Made of tough, flexible elastomeric PVC, Eccentric Couplings seal reliably against infiltration and exfiltration. Eccentric bushings fit one end of Fernco Standard Flexible Couplings.

Available for all common sewer pipe materials.

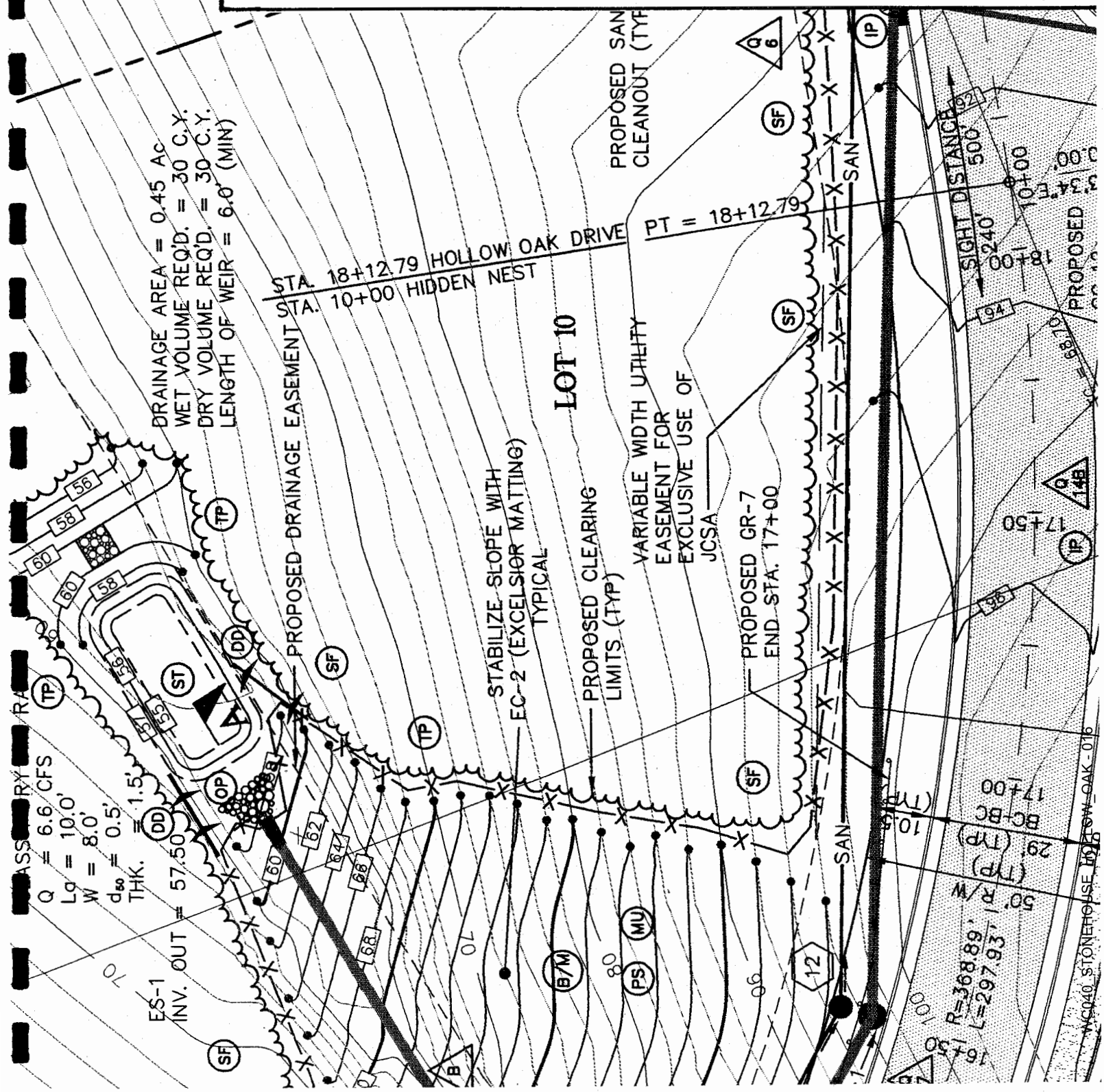
Clay to Clay Clay to CI/Plastic Clay to A-C/Ductile Concrete to Concrete	Concrete to CI/Plastic A-C/Ductile to CI/Plastic A-C/Ductile to A-C/Ductile CI/Plastic to CI/Plastic
When ordering, please provide size and piping materials to be connected.	



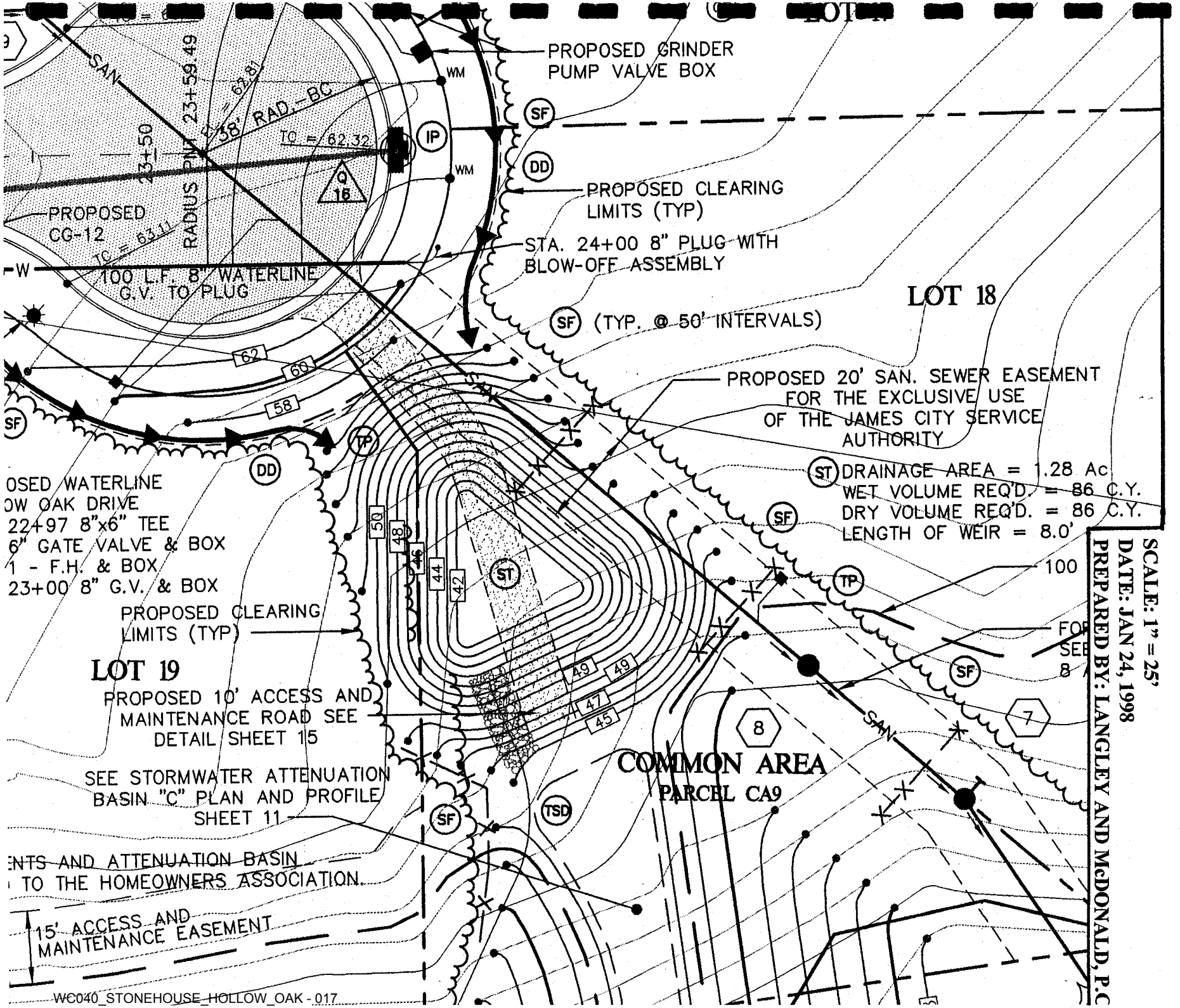
WC040_STONEHOUSE_HOLLOW_OAK - 015

ROAD FILL SEDIMENT TRAP

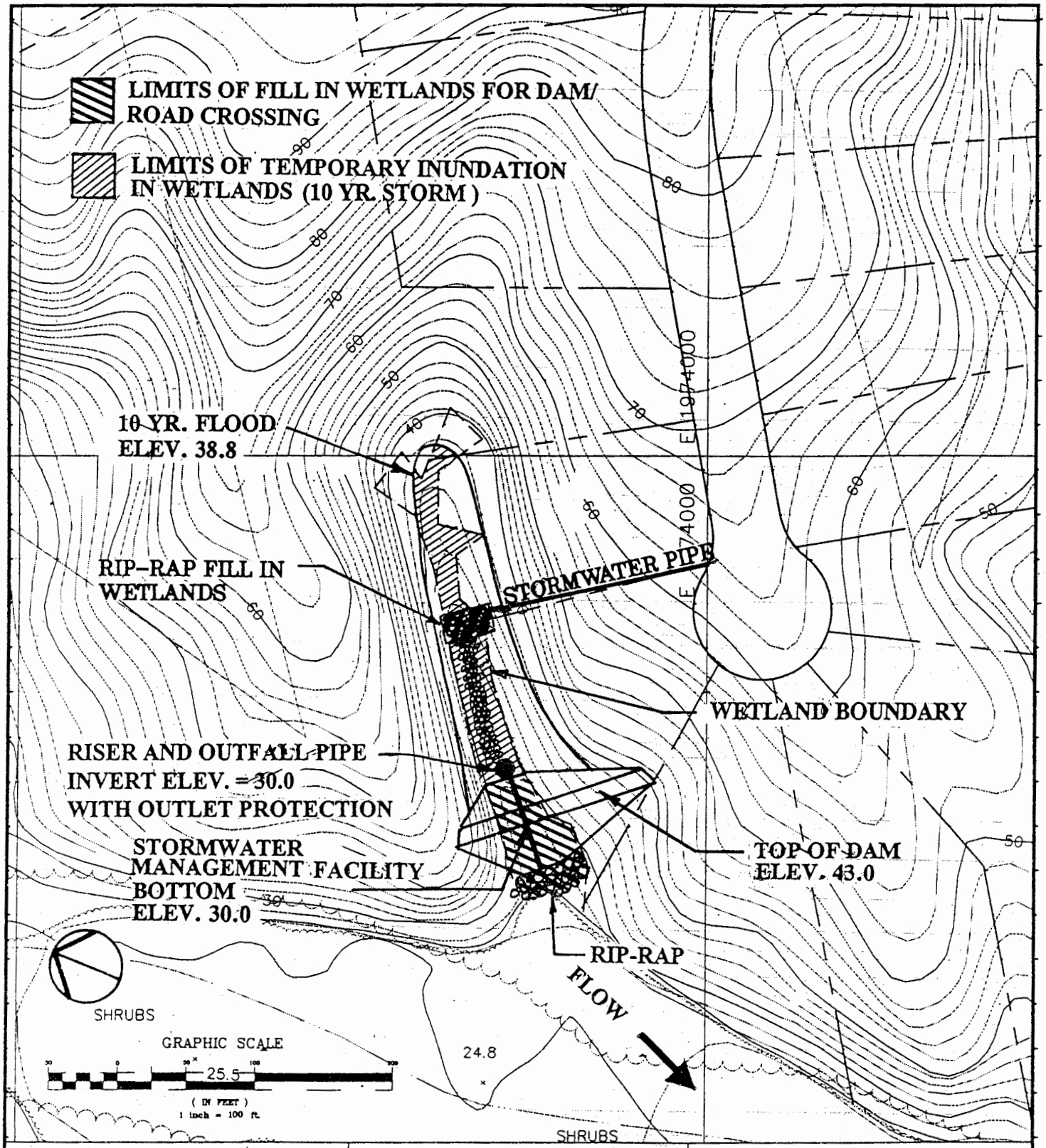
SCALE: 1" = 25'
DATE: JAN 24, 1998
PREPARED BY: LANGLEY AND McDONALD, P.C.



SEDIMENT TRAP NEAR STORMWATER ATTENUATION BASIN



WC040_STONEHOUSE_HOLLOW_OAK - 017



PURPOSE:
DATUM: NAD 1983
ADJACENT PROPERTY OWNERS
1.
2.
3.
4.
5.

PLAN VIEW

STORMWATER MANAGEMENT FACILITY
SECTION VI A

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS · PLANNERS · SURVEYORS
VIRGINIA BEACH — WILLIAMSBURG, VIRGINIA

IN: Un-named Tributary
AT: Mill Swamp
CITY/COUNTY: James City County
APPLICATION BY: Stonehouse L.L.C.
SCALE: 1"=100'
DATE:
SHEET 14 OF 16

DRAINAGE,

STORMWATER MANAGEMENT,

EROSION CONTROL, AND PAVEMENT DESIGN

CALCULATIONS

FOR

STONEHOUSE L.L.C.

DEVELOPMENT AREA ONE, PHASE I

SECTION VIA

WC040

SEPTEMBER 5, 1997
REVISED JANUARY 24, 1998

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

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

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

DRAINAGE,

STORMWATER MANAGEMENT,

EROSION CONTROL, AND PAVEMENT DESIGN

CALCULATIONS

FOR

STONEHOUSE L.L.C.

DEVELOPMENT AREA ONE, PHASE I

SECTION VIA

COMMONWEALTH OF VIRGINIA
JOHN L. HUTCHERSON
No.
7753
CERTIFIED PROFESSIONAL ENGINEER

SEPTEMBER 5, 1997
REVISED JANUARY 24, 1998

Environmental Inventory Section VI

Section VI is bordered by Gold Hole 14 to the north, Mill Swamp to the south and undeveloped areas to the northwest and southeast. The canopy vegetation is comprised of white oak,(*Quercus alba*) sugar maple, (*Acer saccharum*), mockernut hickory (*Carya tomentosa)*, sweet gum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*) and red maple (*Acer rubrum*). The sappling/shrub stratum is comprised of very dense mountain laurel, (*Kalmia latifolia*) holly (*Ilex opaca*), and flowering *dogwood (Cornus florida*); and the herbaceous layer includes wild ginger (*Hexistylis* sp.), strawberry bush *(Euonymus americanus*), white oak seedlings, and red maple seedlings.

The habitat along and including Mill Swamp is considered scrub-shrub and emergent wetlands. The canopy is comprised of alders (*Alnus serrulata*) and black willow (*Salix nigra*) with lizards tail *(Saururus cernuus*), golden ragwort (*Senacio aures),* pickerel weed (*Pontedaria cordata*) and saw grass (*Cladium jamaicense* in the herbaceous layer. The were a few floating aquatic plantrs present in ponded areas comprised of duckweed (*Lemna minor* and *Spirodela sp.*)

The wildlife usage of the area would include species typical of mature woods including mammals such as white tailed deer, raccoons, gray squirrel, beaver, Virginia opossum, red fox and birds including robins, cardinals, sparrows, black birds, blue jays, doves, meadowlarks and turkey vultures. Reptiles and amphibians include usage would include toads, bull frogs, black snake, copperhead, cottonmouth water moccasin, and eastern garter snake

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SECTION VI A SUBDIVISION
COUNTY JAMES CITY DISTRICT STONEHOUSE
DESCRIPTION 10 YEAR, N = 0.013

SHEET 1 OF 5

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCREMENT	CA ACCUMULATED	INLET TIME MINUTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPACITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	SEE MILL POND RUN, SECTION II PREPARED BY LANGLEY AND McDONALD, P.C.																
	FOR SYSTEM "P" STORM SEWER CONTINUATION																
SHOULDER	P2	.007	0.35	.039													
PVMT	P2	.043	0.90	.002	.041												
P2	P1				1.211	7.0	6.7	8.11	95.82	95.66	32	.0050	24	17.21	5.11	6.3	
PVMT	FUTURE INLET	.100	0.90	.090													
FUTURE INLET	P1				.090	5.0	7.1	0.64									
SHOULDER	P1	1.070	0.35	.375													
PVMT	P1	.030	0.90	.027	.402												
P1	Q12				1.703	7.1	6.6	11.24	95.56	91.50	159	.0255	24	38.86	10.15	15.7	
SHOULDER	Q12	.180	0.35	.063													SUMP
PVMT	Q12	.005	0.90	.004													
SHOULDER	Q12	.140	0.35	.049													
PVMT	Q12	.040	0.90	.036	.153												
Q12	Q11				1.856	7.3	6.5	12.06	91.40	90.74	32	.0206	24	34.93	9.57	3.3	
SHOULDER	Q13A	.180	0.35	.063													
PVMT	Q13A	.050	0.90	.045													
Q13A	Q13				.108	5.0	7.1	0.77	99.50	99.34	32	.0050	15	4.91	2.77	11.6	

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SECTION VI A SUBDIVISION
COUNTY JAMES CITY DISTRICT STONEHOUSE
DESCRIPTION 10 YEAR, N = 0.013

SHEET 2 OF 5

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
SHOULDER	Q13	.040	0.35	.014													
PVMT	Q13	.050	0.90	.045	.059												
Q13	Q11				.167	5.0	7.1	1.19	99.24	91.55	102	.0754	15	19.27	8.28	12.1	
SHOULDER	Q11	.050	0.35	.018													SUMP
PVMT	Q11	.040	0.90	.036													
PVMT	Q11	.030	0.90	.027	.080												
Q11	Q10				2.103	7.3	6.5	13.67	90.64	90.33	61	.0050	24	17.21	5.72	10.7	
SHOULDER	Q10A	1.570	0.35	.549													
PVMT	Q10A	.009	0.90	.008													
Q10A	Q10				.558	5.0	7.1	3.96	91.30	91.14	32	.0050	15	4.91	4.19	7.6	
SHOULDER	Q10	.030	0.35	.010													
PVMT	Q10	.040	0.90	.036	.046												
Q10	Q9				2.683	7.5	6.4	17.17	90.23	88.25	128	.0155	24	30.30	9.40	13.6	
SHOULDER	Q9A	.430	0.35	.150													
PVMT	Q9A	.040	0.90	.036													
SHOULDER	Q9A	.085	0.35	.030													
PVMT	Q9A	.030	0.90	.027													
Q9A	Q9				.243	5.0	7.1	1.73	89.22	89.06	32	.0050	15	4.91	3.46	9.2	

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SECTION VI A SUBDIVISION
COUNTY JAMES CITY DISTRICT STONEHOUSE
DESCRIPTION 10 YEAR, N = 0.013

SHEET 3 OF 5

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCREMENT	CA ACCUMULATED	INLET TIME MINUTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPACITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
PVMT	Q9	.040	0.90	.036													
PVMT	Q9	.030	0.90	.027	.063												
Q9	Q8				2.989	7.7	6.4	19.13	88.15	87.19	80	.012	24	26.66	8.71	9.18	
SHOULDER	Q8A	.020	0.35	.007													
PVMT	Q8A	.045	0.90	.041													
Q8A	Q8				.047	5.0	7.1	0.33	88.16	88.00	32	.0050	15	4.91	2.16	14.8	
SHOULDER	Q8	.045	0.90	.041	.041												
Q8	Q7				3.036	8.0	6.3	19.13	87.09	85.07	168	.012	24	26.66	8.71	19.3	
Q7	Q6				3.036	8.3	6.2	18.82	84.97	82.73	186	.0120	24	26.66	8.68	21.4	Q7 = MANHOLE
SHOULDER	Q15A	.960	0.35	.336													
PVMT	Q15A	.080	0.90	.072													
Q15A	Q15				.408	5.0	7.1	2.90	92.50	92.34	32	.0050	15	4.91	3.94	8.1	
SHOULDER	Q15	.050	0.35	.018													
PVMT	Q15	.080	0.90	.072	.089												
Q15	Q14				.497	5.1	7.1	3.53	92.24	86.02	80	.0778	15	19.38	11.40	7.0	

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SECTION VI A SUBDIVISION
COUNTY JAMES CITY DISTRICT STONEHOUSE
DESCRIPTION 10 YEAR, N = 0.013

SHEET 4 OF 5

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
SHOULDER	Q14B	.370	0.35	.130													
PVMT	Q14B	.040	0.90	.036													
Q14B	Q14A				.166	5.0	7.1	1.18	90.50	86.28	63	.0670	15	17.99	7.86	8.0	
SHOULDER	Q14A	.170	0.35	.060													
PVMT	Q14A	.011	0.90	.010													
SHOULDER	Q14A	.300	0.35	.105													
PVMT	Q14A	.030	0.90	.027	.201												
Q14A	Q14				.367	5.2	7.0	2.57	86.18	86.02	32	.0050	15	4.91	3.83	8.4	
PVMT	Q14	.040	0.90	.036													
SHOULDER	Q14	.012	0.35	.004													
SHOULDER	Q14	.030	0.35	.010													
PVMT	Q14	.030	0.90	.027	.078												
Q14	Q6				.942	5.4	7.0	6.59	85.92	83.54	69	.0345	15	12.91	10.01	6.9	
PVMT	Q6	.080	0.90	.072													
SHOULDER	Q6	.030	0.35	.010	.082												
Q6	Q5				4.06	8.9	6.2	25.17	82.63	71.50	179	.0622	24	60.69	17.45	10.3	
PVMT	Q5A	.080	0.90	.072													
SHOULDER	Q5A	.170	0.35	.060													
Q5A	Q5				.132	5.0	7.1	0.94	72.47	72.31	32	.0050	15	4.91	2.93	10.9	

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. STONEHOUSE VI A SUBDIVISION
COUNTY JAMES CITY DISTRICT STONEHOUSE
DESCRIPTION 10 YEAR, N = 0.013

SHEET 5 OF 5

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCREMENT	CA ACCUMULATED	INLET TIME MINUTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPACITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
SHOULDER	Q5	.040	0.35	.014													
PVMT	Q5	.060	0.90	.054	.068												
Q5	Q4				4.26	9.1	6.2	26.41	71.40	58.65	170	.075	24	66.64	18.93	9.0	
SHOULDER	Q4	.110	0.35	.038													
PVMT	Q4	.054	0.90	.049	.087												
Q4	Q3				4.35	9.3	6.2	26.97	58.55	56.22	32	.073	24	65.75	18.85	1.7	
SHOULDER	Q16	.040	0.35	.014													
PVMT	Q16	.100	0.90	.090													
SHOULDER	Q16	.040	0.35	.014													
PVMT	Q16	.100	0.90	.090													
Q16	Q3				.208	5.0	7.1	1.48	58.00	57.03	194	.0050	15	4.91	3.32	58.4	
PVMT	Q3	.054	0.90	.049													
SHOULDER	Q3	.110	0.35	.038	.087												
Q3	Q2				4.65	9.3	6.2	28.80	56.12	47.00	143	.0638	24	61.46	18.22	7.8	Q2 = M.H.
Q2	Q1				4.65	9.4	6.1	28.37	38.80	38.50	38	.0079	30	39.21	8.21	4.6	Q1 = F.E.S.
	Q1 EMPTIES INTO A RIP-RAP STILLING BASIN																

P1 TO Q12
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.025500	ft/ft
Diameter	24.00	in
Discharge	11.24	cfs

Results		
Depth	0.77	ft
Flow Area	1.11	ft^2
Wetted Perimeter	2.67	ft
Top Width	1.94	ft
Critical Depth	1.20	ft
Percent Full	38.30	
Critical Slope	0.005429	ft/ft
Velocity	10.15	ft/s
Velocity Head	1.60	ft
Specific Energy	2.37	ft
Froude Number	2.37	
Maximum Discharge	38.86	cfs
Full Flow Capacity	36.12	cfs
Full Flow Slope	0.002469	ft/ft
Flow is supercritical.		

Q12 TO Q11
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.020600	ft/ft
Diameter	24.00	in
Discharge	12.06	cfs

Results		
Depth	0.84	ft
Flow Area	1.26	ft^2
Wetted Perimeter	2.83	ft
Top Width	1.98	ft
Critical Depth	1.25	ft
Percent Full	42.20	
Critical Slope	0.005597	ft/ft
Velocity	9.57	ft/s
Velocity Head	1.42	ft
Specific Energy	2.27	ft
Froude Number	2.11	
Maximum Discharge	34.93	cfs
Full Flow Capacity	32.47	cfs
Full Flow Slope	0.002842	ft/ft
Flow is supercritical.		

Q13A TO Q13
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	0.77	cfs

Results		
Depth	0.35	ft
Flow Area	0.28	ft^2
Wetted Perimeter	1.39	ft
Top Width	1.12	ft
Critical Depth	0.34	ft
Percent Full	27.78	
Critical Slope	0.005217	ft/ft
Velocity	2.77	ft/s
Velocity Head	0.12	ft
Specific Energy	0.47	ft
Froude Number	0.98	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.000142	ft/ft
Flow is subcritical.		

Q13 TO Q11
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.075400	ft/ft
Diameter	15.00	in
Discharge	1.19	cfs

Results		
Depth	0.22	ft
Flow Area	0.14	ft^2
Wetted Perimeter	1.08	ft
Top Width	0.95	ft
Critical Depth	0.43	ft
Percent Full	17.55	
Critical Slope	0.005239	ft/ft
Velocity	8.22	ft/s
Velocity Head	1.05	ft
Specific Energy	1.27	ft
Froude Number	3.71	
Maximum Discharge	19.08	cfs
Full Flow Capacity	17.74	cfs
Full Flow Slope	0.000339	ft/ft
Flow is supercritical.		

Q11 TO Q10
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	24.00	in
Discharge	13.67	cfs

Results		
Depth	1.42	ft
Flow Area	2.39	ft^2
Wetted Perimeter	4.01	ft
Top Width	1.81	ft
Critical Depth	1.33	ft
Percent Full	71.12	
Critical Slope	0.005967	ft/ft
Velocity	5.72	ft/s
Velocity Head	0.51	ft
Specific Energy	1.93	ft
Froude Number	0.88	
Maximum Discharge	17.21	cfs
Full Flow Capacity	16.00	cfs
Full Flow Slope	0.003652	ft/ft
Flow is subcritical.		

Q10A TO Q10
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	3.96	cfs

Results		
Depth	0.90	ft
Flow Area	0.94	ft^2
Wetted Perimeter	2.53	ft
Top Width	1.12	ft
Critical Depth	0.81	ft
Percent Full	71.93	
Critical Slope	0.006743	ft/ft
Velocity	4.19	ft/s
Velocity Head	0.27	ft
Specific Energy	1.17	ft
Froude Number	0.81	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.003758	ft/ft
Flow is subcritical.		

Q10 TO Q9
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.015500	ft/ft
Diameter	24.00	in
Discharge	17.17	cfs

Results		
Depth	1.13	ft
Flow Area	1.83	ft^2
Wetted Perimeter	3.40	ft
Top Width	1.98	ft
Critical Depth	1.49	ft
Percent Full	56.39	
Critical Slope	0.006997	ft/ft
Velocity	9.40	ft/s
Velocity Head	1.37	ft
Specific Energy	2.50	ft
Froude Number	1.73	
Maximum Discharge	30.30	cfs
Full Flow Capacity	28.16	cfs
Full Flow Slope	0.005761	ft/ft
Flow is supercritical.		

Q9A TO Q9
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	1.73	cfs

Results		
Depth	0.53	ft
Flow Area	0.50	ft^2
Wetted Perimeter	1.78	ft
Top Width	1.24	ft
Critical Depth	0.52	ft
Percent Full	42.66	
Critical Slope	0.005387	ft/ft
Velocity	3.46	ft/s
Velocity Head	0.19	ft
Specific Energy	0.72	ft
Froude Number	0.96	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.000717	ft/ft
Flow is subcritical.		

Q9 TO Q8
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.012000	ft/ft
Diameter	24.00	in
Discharge	19.13	cfs

Results		
Depth	1.32	ft
Flow Area	2.20	ft^2
Wetted Perimeter	3.79	ft
Top Width	1.90	ft
Critical Depth	1.57	ft
Percent Full	65.94	
Critical Slope	0.007742	ft/ft
Velocity	8.71	ft/s
Velocity Head	1.18	ft
Specific Energy	2.50	ft
Froude Number	1.43	
Maximum Discharge	26.66	cfs
Full Flow Capacity	24.78	cfs
Full Flow Slope	0.007152	ft/ft
Flow is supercritical.		

Q8A TO Q8
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	0.33	cfs

Results		
Depth	0.23	ft
Flow Area	0.15	ft^2
Wetted Perimeter	1.10	ft
Top Width	0.96	ft
Critical Depth	0.22	ft
Percent Full	18.19	
Critical Slope	0.005456	ft/ft
Velocity	2.16	ft/s
Velocity Head	0.07	ft
Specific Energy	0.30	ft
Froude Number	0.96	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.000026	ft/ft
Flow is subcritical.		

Q8 TO Q7
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.012000	ft/ft
Diameter	24.00	in
Discharge	19.13	cfs

Results		
Depth	1.32	ft
Flow Area	2.20	ft²
Wetted Perimeter	3.79	ft
Top Width	1.90	ft
Critical Depth	1.57	ft
Percent Full	65.94	
Critical Slope	0.007742	ft/ft
Velocity	8.71	ft/s
Velocity Head	1.18	ft
Specific Energy	2.50	ft
Froude Number	1.43	
Maximum Discharge	26.66	cfs
Full Flow Capacity	24.78	cfs
Full Flow Slope	0.007152	ft/ft
Flow is supercritical.		

Q7 TO Q6
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.012000	ft/ft
Diameter	24.00	in
Discharge	18.82	cfs

Results		
Depth	1.30	ft
Flow Area	2.17	ft^2
Wetted Perimeter	3.76	ft
Top Width	1.91	ft
Critical Depth	1.56	ft
Percent Full	65.18	
Critical Slope	0.007615	ft/ft
Velocity	8.68	ft/s
Velocity Head	1.17	ft
Specific Energy	2.47	ft
Froude Number	1.43	
Maximum Discharge	26.66	cfs
Full Flow Capacity	24.78	cfs
Full Flow Slope	0.006922	ft/ft
Flow is supercritical.		

Q15A TO Q15
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	2.90	cfs

Results		
Depth	0.72	ft
Flow Area	0.74	ft^2
Wetted Perimeter	2.16	ft
Top Width	1.23	ft
Critical Depth	0.68	ft
Percent Full	57.85	
Critical Slope	0.005962	ft/ft
Velocity	3.94	ft/s
Velocity Head	0.24	ft
Specific Energy	0.96	ft
Froude Number	0.90	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.002016	ft/ft
Flow is subcritical.		

Q15 TO Q14
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.077800	ft/ft
Diameter	15.00	in
Discharge	3.53	cfs

Results		
Depth	0.38	ft
Flow Area	0.31	ft^2
Wetted Perimeter	1.45	ft
Top Width	1.15	ft
Critical Depth	0.76	ft
Percent Full	30.01	
Critical Slope	0.006395	ft/ft
Velocity	11.40	ft/s
Velocity Head	2.02	ft
Specific Energy	2.39	ft
Froude Number	3.86	
Maximum Discharge	19.38	cfs
Full Flow Capacity	18.02	cfs
Full Flow Slope	0.002986	ft/ft
Flow is supercritical.		

Q14B TO Q14A
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.067000	ft/ft
Diameter	15.00	in
Discharge	1.18	cfs

Results		
Depth	0.22	ft
Flow Area	0.15	ft^2
Wetted Perimeter	1.09	ft
Top Width	0.96	ft
Critical Depth	0.43	ft
Percent Full	17.99	
Critical Slope	0.005237	ft/ft
Velocity	7.86	ft/s
Velocity Head	0.96	ft
Specific Energy	1.19	ft
Froude Number	3.51	
Maximum Discharge	17.99	cfs
Full Flow Capacity	16.72	cfs
Full Flow Slope	0.000334	ft/ft
Flow is supercritical.		

Q14A TO Q14
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	2.57	cfs

Results		
Depth	0.67	ft
Flow Area	0.67	ft^2
Wetted Perimeter	2.06	ft
Top Width	1.25	ft
Critical Depth	0.64	ft
Percent Full	53.66	
Critical Slope	0.005770	ft/ft
Velocity	3.83	ft/s
Velocity Head	0.23	ft
Specific Energy	0.90	ft
Froude Number	0.92	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.001583	ft/ft
Flow is subcritical.		

Q14 TO Q6
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.034500	ft/ft
Diameter	15.00	in
Discharge	6.59	cfs

Results		
Depth	0.66	ft
Flow Area	0.66	ft^2
Wetted Perimeter	2.04	ft
Top Width	1.25	ft
Critical Depth	1.03	ft
Percent Full	52.88	
Critical Slope	0.010252	ft/ft
Velocity	10.01	ft/s
Velocity Head	1.56	ft
Specific Energy	2.22	ft
Froude Number	2.43	
Maximum Discharge	12.91	cfs
Full Flow Capacity	12.00	cfs
Full Flow Slope	0.010408	ft/ft
Flow is supercritical.		

Q6 TO Q5
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.062200	ft/ft
Diameter	24.00	in
Discharge	25.17	cfs

Results		
Depth	0.94	ft
Flow Area	1.44	ft^2
Wetted Perimeter	3.01	ft
Top Width	2.00	ft
Critical Depth	1.77	ft
Percent Full	46.80	
Critical Slope	0.011098	ft/ft
Velocity	17.45	ft/s
Velocity Head	4.73	ft
Specific Energy	5.67	ft
Froude Number	3.62	
Maximum Discharge	60.69	cfs
Full Flow Capacity	56.42	cfs
Full Flow Slope	0.012380	ft/ft
Flow is supercritical.		

Q5A TO Q5
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	0.94	cfs

Results		
Depth	0.38	ft
Flow Area	0.32	ft^2
Wetted Perimeter	1.47	ft
Top Width	1.15	ft
Critical Depth	0.38	ft
Percent Full	30.78	
Critical Slope	0.005211	ft/ft
Velocity	2.93	ft/s
Velocity Head	0.13	ft
Specific Energy	0.52	ft
Froude Number	0.98	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.000212	ft/ft
Flow is subcritical.		

Q5 TO Q4
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.075000	ft/ft
Diameter	24.00	in
Discharge	26.41	cfs

Results		
Depth	0.91	ft
Flow Area	1.39	ft^2
Wetted Perimeter	2.97	ft
Top Width	1.99	ft
Critical Depth	1.80	ft
Percent Full	45.60	
Critical Slope	0.012024	ft/ft
Velocity	18.93	ft/s
Velocity Head	5.57	ft
Specific Energy	6.48	ft
Froude Number	3.99	
Maximum Discharge	66.64	cfs
Full Flow Capacity	61.95	cfs
Full Flow Slope	0.013630	ft/ft
Flow is supercritical.		

Q4 TO Q3
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.073000	ft/ft
Diameter	24.00	in
Discharge	26.97	cfs

Results		
Depth	0.93	ft
Flow Area	1.43	ft²
Wetted Perimeter	3.00	ft
Top Width	2.00	ft
Critical Depth	1.81	ft
Percent Full	46.50	
Critical Slope	0.012472	ft/ft
Velocity	18.85	ft/s
Velocity Head	5.52	ft
Specific Energy	6.45	ft
Froude Number	3.92	
Maximum Discharge	65.75	cfs
Full Flow Capacity	61.12	cfs
Full Flow Slope	0.014215	ft/ft
Flow is supercritical.		

Q16 TO Q3
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.005000	ft/ft
Diameter	15.00	in
Discharge	1.48	cfs

Results		
Depth	0.49	ft
Flow Area	0.45	ft^2
Wetted Perimeter	1.69	ft
Top Width	1.22	ft
Critical Depth	0.48	ft
Percent Full	39.15	
Critical Slope	0.005306	ft/ft
Velocity	3.32	ft/s
Velocity Head	0.17	ft
Specific Energy	0.66	ft
Froude Number	0.97	
Maximum Discharge	4.91	cfs
Full Flow Capacity	4.57	cfs
Full Flow Slope	0.000525	ft/ft
Flow is subcritical.		

Q3 TO Q2
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.063800	ft/ft
Diameter	24.00	in
Discharge	28.80	cfs

Results		
Depth	1.00	ft
Flow Area	1.58	ft^2
Wetted Perimeter	3.15	ft
Top Width	2.00	ft
Critical Depth	1.84	ft
Percent Full	50.24	
Critical Slope	0.014062	ft/ft
Velocity	18.22	ft/s
Velocity Head	5.16	ft
Specific Energy	6.17	ft
Froude Number	3.61	
Maximum Discharge	61.46	cfs
Full Flow Capacity	57.14	cfs
Full Flow Slope	0.016209	ft/ft
Flow is supercritical.		

Q2 TO Q1
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\section .fm2
Worksheet	SECTION VIA SUBDIVISION
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.007900	ft/ft
Diameter	30.00	in
Discharge	28.37	cfs

Results		
Depth	1.66	ft
Flow Area	3.46	ft^2
Wetted Perimeter	4.76	ft
Top Width	2.36	ft
Critical Depth	1.82	ft
Percent Full	66.32	
Critical Slope	0.006209	ft/ft
Velocity	8.21	ft/s
Velocity Head	1.05	ft
Specific Energy	2.71	ft
Froude Number	1.20	
Maximum Discharge	39.21	cfs
Full Flow Capacity	36.45	cfs
Full Flow Slope	0.004784	ft/ft
Flow is supercritical.		

PROJECT 96038-0652
HEC12 Version: V2.91 Run Date: 08-26-1997

SECTION VIA STORM INLET CALCULATIONS

INLET NUMBER P1 LENGTH 8.0 STATION 10+50 16FT LT **(NOT IN CONTRACT)**

DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027
DRAINAGE AREA = 1.070 ACRES C VALUE = .350 CA = 0.375
SUM CA= 0.402 INT= 3.50 CFS= 1.405 CO= 0.000 GUTTER FLOW= 1.405

GUTTER SLOPE = 0.0228 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
4.89	2.0	0.41	0.0833	4.0	0.89	3.5	0.146	0.151

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.6 EFFICIENCY= 0.99
CFS INTERCEPTED= 1.39 CFS CARRYOVER= 0.01

INLET NUMBER P2 LENGTH 4.0 STATION 10+50 16FT RT **(NOT IN CONTRACT)**

DRAINAGE AREA = 0.007 ACRES C VALUE = .350 CA = 0.002
DRAINAGE AREA = 0.043 ACRES C VALUE = .900 CA = 0.039
SUM CA= 0.041 INT= 3.50 CFS= 0.144 CO= 0.000 GUTTER FLOW= 0.144

GUTTER SLOPE = 0.0228 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.20	2.0	1.67	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 3.1 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.14 CFS CARRYOVER= 0.00

INLET NUMBER Q12 LENGTH 6.0 STATION 10+50 ROAD "C" 16FT LT

DRAINAGE AREA = 0.005 ACRES C VALUE = .900 CA = 0.004
DRAINAGE AREA = 0.180 ACRES C VALUE = .350 CA = 0.063
DRAINAGE AREA = 0.140 ACRES C VALUE = .350 CA = 0.049
DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036

FOR THE FIRST SIDE
SUM CA= 0.068 INT= 3.50 CFS= 0.236 CO= 0.000 GUTTER FLOW= 0.236
FOR THE OTHER SIDE
SUM CA= 0.085 INT= 3.50 CFS= 0.297 CO= 0.000 GUTTER FLOW= 0.297
AT THE INLET

SUM CA= 0.153 INT= 3.50 CFS= 0.534 CO= 0.000 GUTTER FLOW= 0.534

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.30 (cfs) IS 4.93 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.08 SPREAD (ft) = 4.01

INLET NUMBER Q11 LENGTH 4.0 STATION 10+50 ROAD "C" 16FT RT
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027
DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
DRAINAGE AREA = 0.050 ACRES C VALUE = .350 CA = 0.018

FOR THE FIRST SIDE
SUM CA= 0.027 INT= 3.50 CFS= 0.094 CO= 0.000 GUTTER FLOW= 0.094
FOR THE OTHER SIDE
SUM CA= 0.053 INT= 3.50 CFS= 0.187 CO= 0.000 GUTTER FLOW= 0.187
AT THE INLET

SUM CA= 0.080 INT= 3.50 CFS= 0.282 CO= 0.000 GUTTER FLOW= 0.282

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.19 (cfs) IS 3.42 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 7.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.06 SPREAD (ft) = 3.06

INLET NUMBER Q13 LENGTH 6.0 STATION 11+50 ROAD "C" 16FT RT

DRAINAGE AREA = 0.050 ACRES C VALUE = .900 CA = 0.045
DRAINAGE AREA = 0.040 ACRES C VALUE = .350 CA = 0.014
SUM CA= 0.059 INT= 3.50 CFS= 0.206 CO= 0.000 GUTTER FLOW= 0.206

GUTTER SLOPE = 0.0655 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.13	2.0	1.78	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.21 CFS CARRYOVER= 0.00

INLET NUMBER Q13A LENGTH 6.0 STATION 11+50 ROAD "C" 16FT LT

DRAINAGE AREA = 0.180 ACRES C VALUE = .350 CA = 0.063
DRAINAGE AREA = 0.050 ACRES C VALUE = .900 CA = 0.045
SUM CA= 0.108 INT= 3.50 CFS= 0.378 CO= 0.000 GUTTER FLOW= 0.378

GUTTER SLOPE = 0.0655 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.41	2.0	1.42	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.4 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.38 CFS CARRYOVER= 0.00

INLET NUMBER Q10 LENGTH 4.0 STATION 12+75 16FT LT

DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
DRAINAGE AREA = 0.030 ACRES C VALUE = .350 CA = 0.010
SUM CA= 0.046 INT= 3.50 CFS= 0.163 CO= 0.000 GUTTER FLOW= 0.163

GUTTER SLOPE = 0.0228 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.25	2.0	1.59	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 3.3 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.16 CFS CARRYOVER= 0.00

==========

INLET NUMBER Q10A LENGTH 12.0 STATION 12+75 16FT RT

DRAINAGE AREA = 1.570 ACRES C VALUE = .350 CA = 0.549
DRAINAGE AREA = 0.009 ACRES C VALUE = .900 CA = 0.008
SUM CA= 0.558 INT= 3.50 CFS= 1.952 CO= 0.000 GUTTER FLOW= 1.952

GUTTER SLOPE = 0.0228 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
6.02	2.0	0.33	0.0833	4.0	0.81	3.5	0.146	0.140

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 10.4 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.95 CFS CARRYOVER= 0.00

==========

INLET NUMBER Q9 LENGTH 4.0 STATION 14+00 16FT LT

DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027

FOR THE FIRST SIDE
SUM CA= 0.036 INT= 3.50 CFS= 0.126 CO= 0.000 GUTTER FLOW= 0.126
FOR THE OTHER SIDE
SUM CA= 0.027 INT= 3.50 CFS= 0.094 CO= 0.000 GUTTER FLOW= 0.094
AT THE INLET

SUM CA= 0.063 INT= 3.50 CFS= 0.220 CO= 0.000 GUTTER FLOW= 0.220

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.13 (cfs) IS 2.17 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 7.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.05 SPREAD (ft) = 2.60

INLET NUMBER Q9A LENGTH 10.0 STATION 14+00 16FT RT

DRAINAGE AREA = 0.430 ACRES C VALUE = .350 CA = 0.150
DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
DRAINAGE AREA = 0.085 ACRES C VALUE = .350 CA = 0.030
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027

FOR THE FIRST SIDE
SUM CA= 0.186 INT= 3.50 CFS= 0.653 CO= 0.000 GUTTER FLOW= 0.653
FOR THE OTHER SIDE
SUM CA= 0.057 INT= 3.50 CFS= 0.199 CO= 0.000 GUTTER FLOW= 0.199
AT THE INLET

SUM CA= 0.243 INT= 3.50 CFS= 0.851 CO= 0.000 GUTTER FLOW= 0.851

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.65 (cfs) IS 7.76 (ft.)

XXXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXXX
P EFFEC. LENGTH (ft) = 13.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.09 SPREAD (ft) = 4.34

INLET NUMBER Q8 LENGTH 2.5 STATION 14+75 16FT LT

DRAINAGE AREA = 0.045 ACRES C VALUE = .900 CA = 0.041
SUM CA= 0.041 INT= 3.50 CFS= 0.142 CO= 0.000 GUTTER FLOW= 0.142

GUTTER SLOPE = 0.0113 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.36	2.0	1.47	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXXX
REQUIRED LENGTH (ft) = 2.5 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.14 CFS CARRYOVER= 0.00

INLET NUMBER Q8A LENGTH 2.5 STATION 14+75 16FT RT

DRAINAGE AREA = 0.020 ACRES C VALUE = .350 CA = 0.007
DRAINAGE AREA = 0.045 ACRES C VALUE = .900 CA = 0.041
SUM CA= 0.047 INT= 3.50 CFS= 0.166 CO= 0.000 GUTTER FLOW= 0.166

GUTTER SLOPE = 0.0113 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.44	2.0	1.39	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 2.7 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.16 CFS CARRYOVER= 0.00

INLET NUMBER Q6 LENGTH 6.0 STATION 18+50 16FT LT

DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072
DRAINAGE AREA = 0.030 ACRES C VALUE = .350 CA = 0.010
SUM CA= 0.082 INT= 3.50 CFS= 0.289 CO= 0.000 GUTTER FLOW= 0.289

GUTTER SLOPE = 0.0566 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

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

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.5 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.29 CFS CARRYOVER= 0.00

INLET NUMBER Q14 LENGTH 2.5 STATION 10+50 ROAD "B" 16FT LT

DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
DRAINAGE AREA = 0.012 ACRES C VALUE = .350 CA = 0.004
DRAINAGE AREA = 0.030 ACRES C VALUE = .350 CA = 0.010
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027

FOR THE FIRST SIDE
SUM CA= 0.040 INT= 3.50 CFS= 0.141 CO= 0.000 GUTTER FLOW= 0.141
FOR THE OTHER SIDE
SUM CA= 0.037 INT= 3.50 CFS= 0.131 CO= 0.000 GUTTER FLOW= 0.131
AT THE INLET

SUM CA= 0.078 INT= 3.50 CFS= 0.272 CO= 0.000 GUTTER FLOW= 0.272

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.14 (cfs) IS 2.52 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 6.10 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.07 SPREAD (ft) = 3.46

INLET NUMBER Q14A LENGTH 10.0 STATION 10+50 ROAD "B" 16FT RT

DRAINAGE AREA = 0.170 ACRES C VALUE = .350 CA = 0.060
DRAINAGE AREA = 0.011 ACRES C VALUE = .900 CA = 0.010
DRAINAGE AREA = 0.300 ACRES C VALUE = .350 CA = 0.105
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027

FOR THE FIRST SIDE
SUM CA= 0.069 INT= 3.50 CFS= 0.243 CO= 0.000 GUTTER FLOW= 0.243
FOR THE OTHER SIDE
SUM CA= 0.132 INT= 3.50 CFS= 0.462 CO= 0.000 GUTTER FLOW= 0.462
AT THE INLET

SUM CA= 0.201 INT= 3.50 CFS= 0.705 CO= 0.000 GUTTER FLOW= 0.705

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.46 (cfs) IS 6.46 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 13.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.08 SPREAD (ft) = 3.83

INLET NUMBER Q14B LENGTH 4.0 STATION 17+50 16FT RT

DRAINAGE AREA = 0.370 ACRES C VALUE = .350 CA = 0.130
DRAINAGE AREA = 0.040 ACRES C VALUE = .900 CA = 0.036
SUM CA= 0.166 INT= 3.50 CFS= 0.579 CO= 0.000 GUTTER FLOW= 0.579

GUTTER SLOPE = 0.0081 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.69	2.0	0.54	0.0833	4.0	0.96	3.5	0.146	0.161

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 4.2 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.58 CFS CARRYOVER= 0.00

INLET NUMBER Q15 LENGTH 6.0 STATION 12+00 ROAD "B" 16FT LT

DRAINAGE AREA = 0.050 ACRES C VALUE = .350 CA = 0.018
DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072
SUM CA= 0.089 INT= 3.50 CFS= 0.313 CO= 0.000 GUTTER FLOW= 0.313

GUTTER SLOPE = 0.0817 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.26	2.0	1.58	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.3 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.31 CFS CARRYOVER= 0.00

INLET NUMBER Q15A LENGTH 12.0 STATION 12+00 ROAD "B" 16FT RT

DRAINAGE AREA = 0.960 ACRES C VALUE = .350 CA = 0.336
DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072
SUM CA= 0.408 INT= 3.50 CFS= 1.428 CO= 0.000 GUTTER FLOW= 1.428

GUTTER SLOPE = 0.0817 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.88	2.0	0.69	0.0833	4.0	0.99	3.5	0.146	0.165

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 12.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.43 CFS CARRYOVER= 0.00

INLET NUMBER Q5 LENGTH 4.0 STATION 20+37 16FT LT

DRAINAGE AREA = 0.040 ACRES C VALUE = .350 CA = 0.014
DRAINAGE AREA = 0.060 ACRES C VALUE = .900 CA = 0.054
SUM CA= 0.068 INT= 3.50 CFS= 0.238 CO= 0.000 GUTTER FLOW= 0.238

GUTTER SLOPE = 0.0720 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.17	2.0	1.71	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.4 EFFICIENCY= 0.91
CFS INTERCEPTED= 0.22 CFS CARRYOVER= 0.02

INLET NUMBER Q5A LENGTH 6.0 STATION 20+37 16FT RT

DRAINAGE AREA = 0.080 ACRES C VALUE = .900 CA = 0.072
DRAINAGE AREA = 0.170 ACRES C VALUE = .350 CA = 0.060
SUM CA= 0.132 INT= 3.50 CFS= 0.460 CO= 0.000 GUTTER FLOW= 0.460

GUTTER SLOPE = 0.0720 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.49	2.0	1.34	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 7.2 EFFICIENCY= 0.96
CFS INTERCEPTED= 0.44 CFS CARRYOVER= 0.02

INLET NUMBER Q4 LENGTH 6.0 STATION 22+07 16FT LT

DRAINAGE AREA = 0.110 ACRES C VALUE = .350 CA = 0.038
DRAINAGE AREA = 0.054 ACRES C VALUE = .900 CA = 0.049
SUM CA= 0.087 INT= 3.50 CFS= 0.305 CO= 0.020 GUTTER FLOW= 0.325

GUTTER SLOPE = 0.0428 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.45	2.0	1.38	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.3 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.32 CFS CARRYOVER= 0.00

==========

INLET NUMBER Q3 LENGTH 6.0 STATION 22+07 16FT RT

DRAINAGE AREA = 0.054 ACRES C VALUE = .900 CA = 0.049
DRAINAGE AREA = 0.110 ACRES C VALUE = .350 CA = 0.038
SUM CA= 0.087 INT= 3.50 CFS= 0.305 CO= 0.020 GUTTER FLOW= 0.325

GUTTER SLOPE = 0.0428 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.45	2.0	1.38	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.3 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.32 CFS CARRYOVER= 0.00

==========

INLET NUMBER Q16 LENGTH 8.0 STATION 23+98 CUL-DE-SAC

DRAINAGE AREA = 0.040 ACRES C VALUE = .350 CA = 0.014
DRAINAGE AREA = 0.100 ACRES C VALUE = .900 CA = 0.090
DRAINAGE AREA = 0.040 ACRES C VALUE = .350 CA = 0.014
DRAINAGE AREA = 0.100 ACRES C VALUE = .900 CA = 0.090

FOR THE FIRST SIDE
SUM CA= 0.104 INT= 3.50 CFS= 0.364 CO= 0.000 GUTTER FLOW= 0.364
FOR THE OTHER SIDE
SUM CA= 0.104 INT= 3.50 CFS= 0.364 CO= 0.000 GUTTER FLOW= 0.364
AT THE INLET

SUM CA= 0.208 INT= 3.50 CFS= 0.728 CO= 0.000 GUTTER FLOW= 0.728

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.36 (cfs) IS 5.61 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 11.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.09 SPREAD (ft) = 4.35

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

Subject DEVELOPMENT AREA ONE PHASE I
SECTION VI A
Computed By RSP Checked By _____

Project No. _____
Client _____
Date 9/5/92 Sheet No. _____

VI A CULVERT THRU ROAD FILL

L = 236'

INV. IN ELEV. = 81.40
INV. OUT ELEV. = 58.00

S = 9.92%

TRY 24" ϕ < MIN. FOR LONG CULVERT

DRAINAGE AREA

T_c = 18.6 MIN

TR-55 METHOD ATTACHED

$Q_{10} = CiA$

C ≅ 0.35
i = 4.8 { NORFOLK IDF

$Q_{10} = 0.35 \times 4.8 \times 3.9 = 6.6$ CFS

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

January 22, 1998

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	6.6
Channel Bottom Slope (ft/ft)	0.04
Manning's Roughness Coefficient (n-value)	0.013
Channel Diameter (ft)	1.5

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.58
Flow Velocity (fps)	10.52
Froude Number	2.831
Velocity Head (ft)	1.72
Energy Head (ft)	2.3
Cross-Sectional Area of Flow (sq ft)	0.63
Top Width of Flow (ft)	1.46

HYDROCALC Hydraulics for Windows, Version 1.1 Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

January 21, 1998

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	6.6
Channel Bottom Slope (ft/ft)	0.08
Manning's Roughness Coefficient (n-value)	0.013
Channel Diameter (ft)	1.5

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.48
Flow Velocity (fps)	13.52
Froude Number	4.036
Velocity Head (ft)	2.84
Energy Head (ft)	3.32
Cross-Sectional Area of Flow (sq ft)	0.49
Top Width of Flow (ft)	1.4

HYDROCALC Hydraulics for Windows, Version 1.1 Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

January 21, 1998

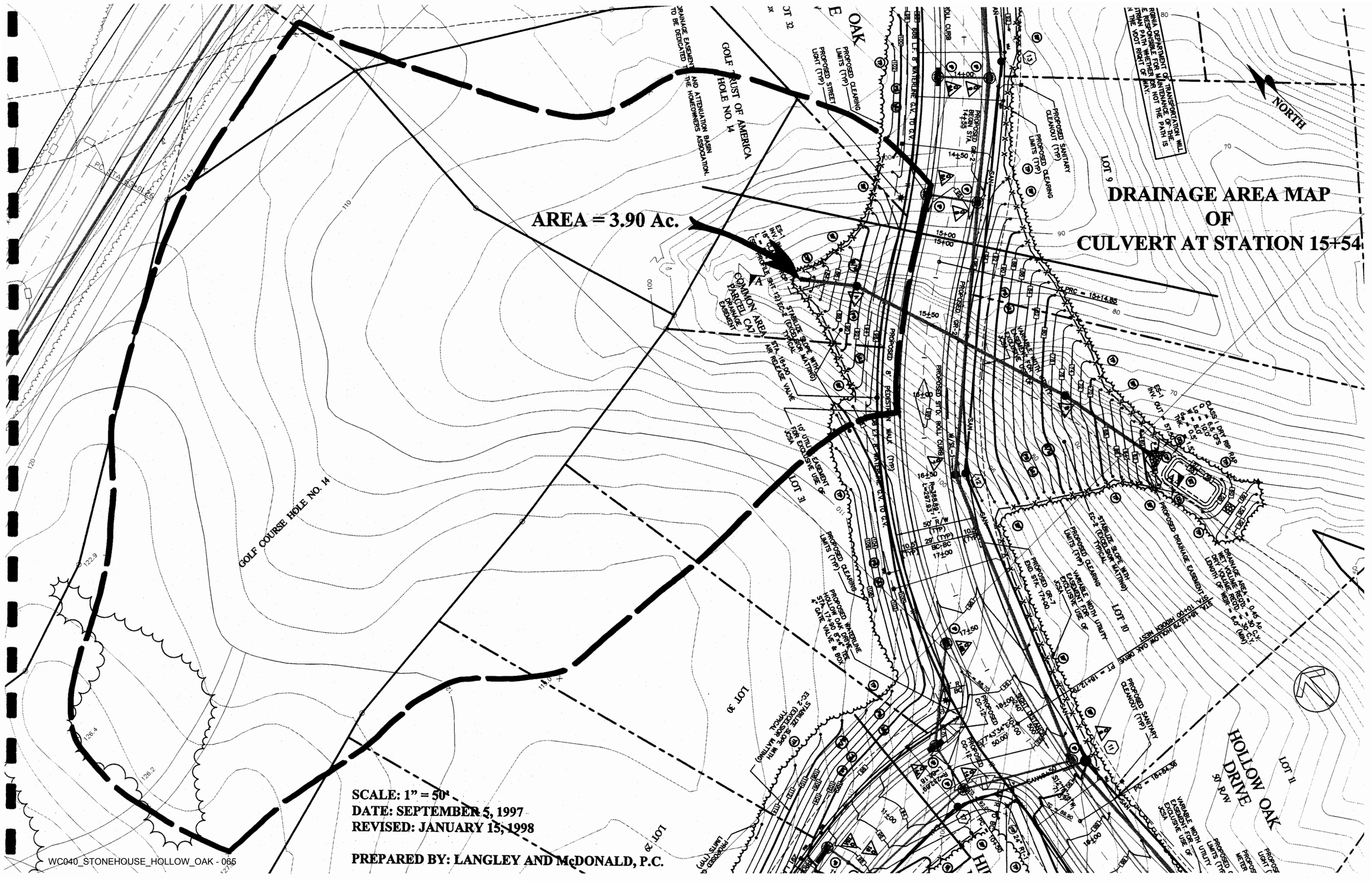
PROGRAM INPUT DATA

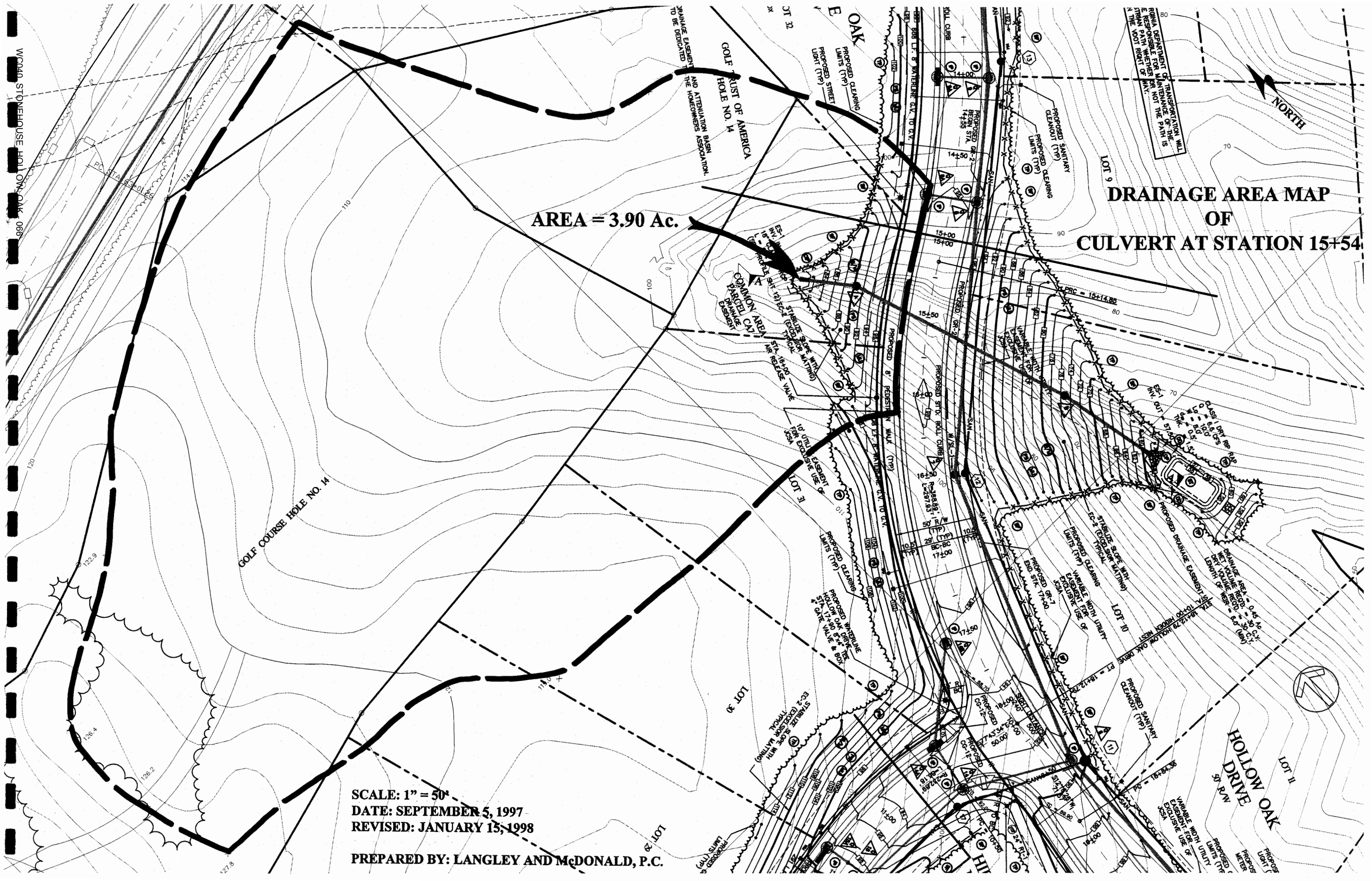
DESCRIPTION	VALUE
Flow Rate (cfs)	6.6
Channel Bottom Slope (ft/ft)	0.06
Manning's Roughness Coefficient (n-value)	0.013
Channel Diameter (ft)	1.5

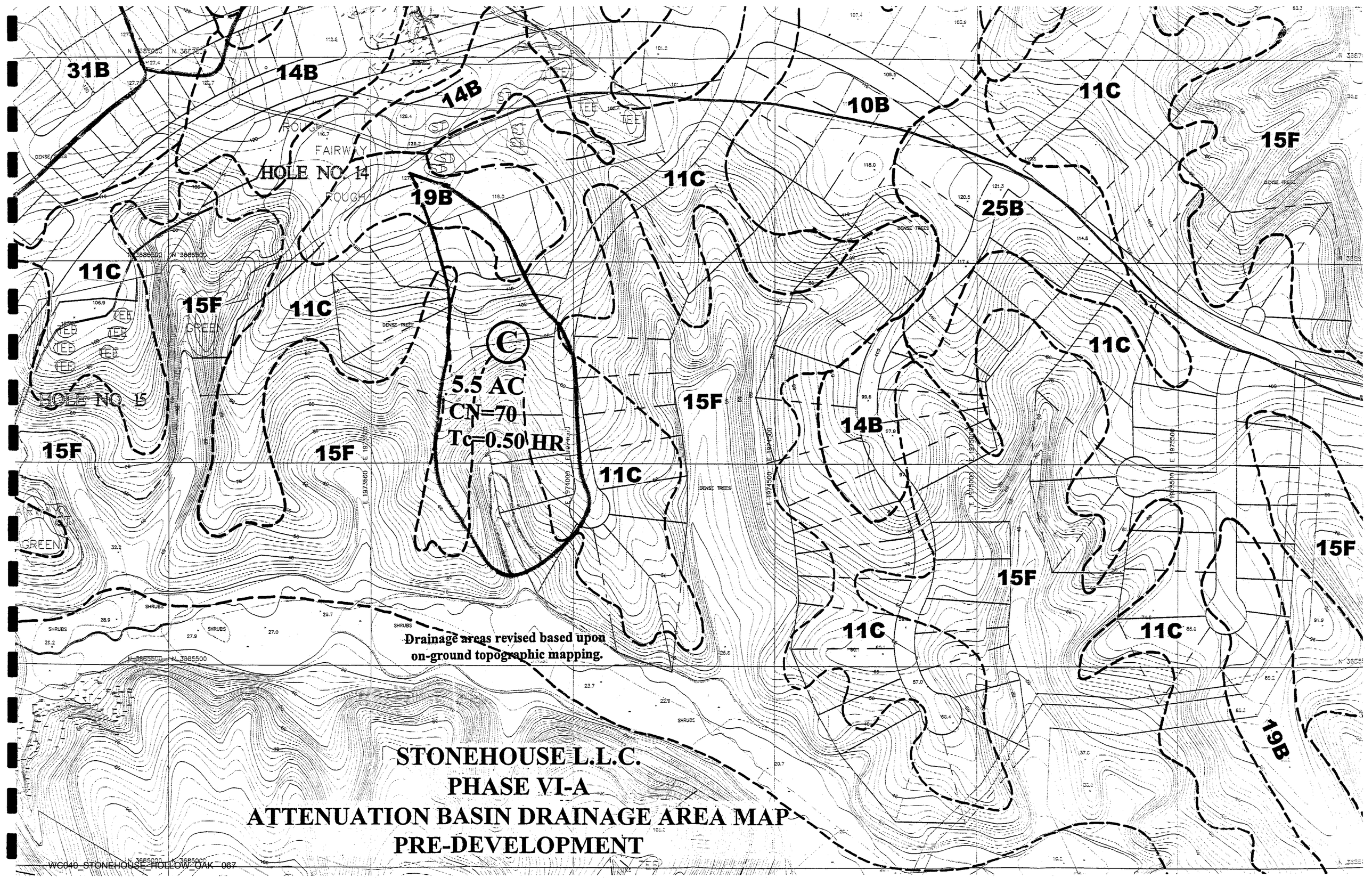
COMPUTATION RESULTS

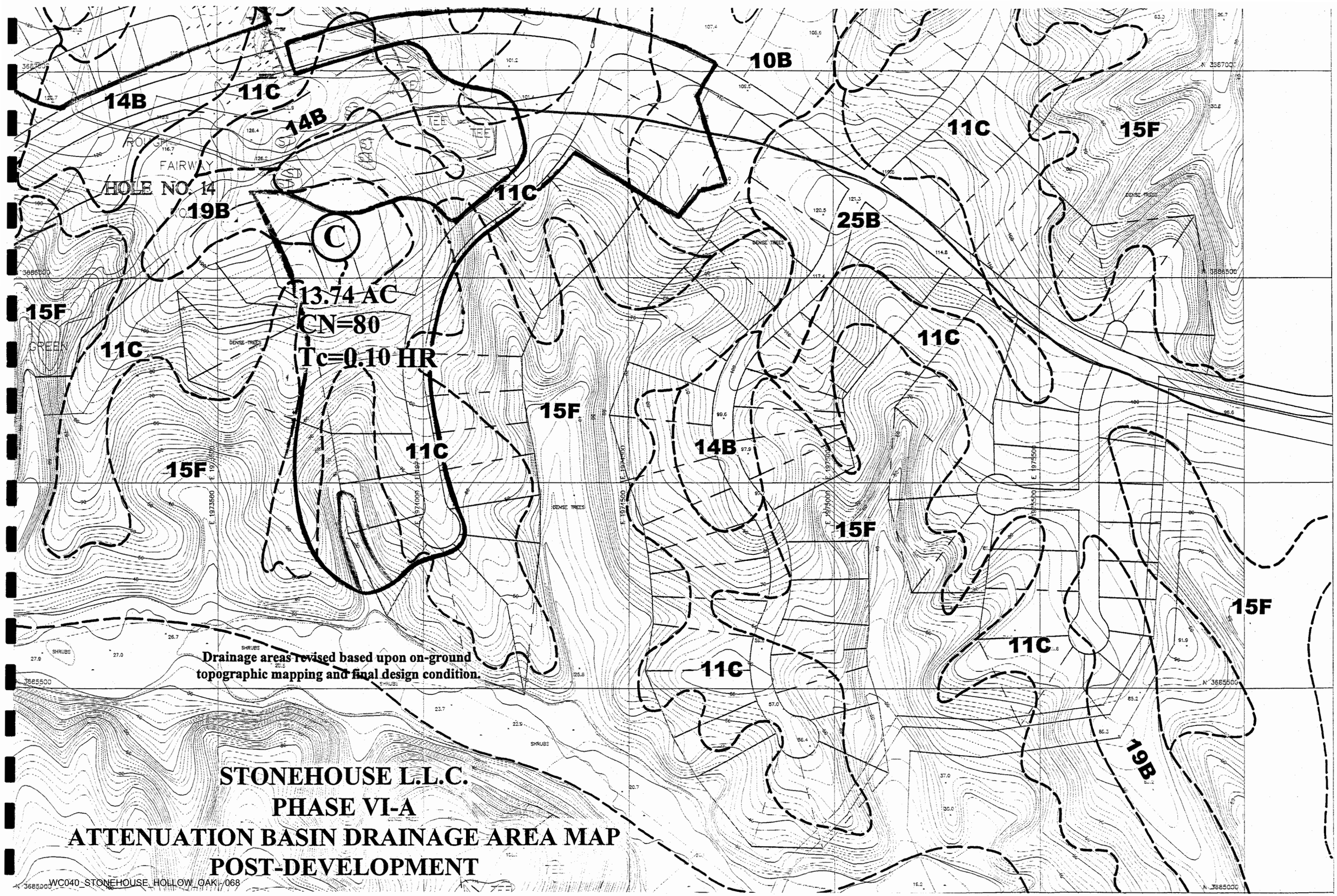
DESCRIPTION	VALUE
Normal Depth (ft)	0.52
Flow Velocity (fps)	12.19
Froude Number	3.488
Velocity Head (ft)	2.31
Energy Head (ft)	2.83
Cross-Sectional Area of Flow (sq ft)	0.54
Top Width of Flow (ft)	1.43

HYDROCALC Hydraulics for Windows, Version 1.1 Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
All Rights Reserved.


DRAINAGE AREA MAP
OF
CULVERT AT STATION 15+54
AREA = 3.90 Ac.
NORTH
GOLF COURSE HOLE NO. 14
GOLF TRUST OF AMERICA
HOLE NO. 14
HOLLOW OAK DRIVE
50' R/W
LOT 9
LOT 10
LOT 11
LOT 30
LOT 31
COMMON AREA
PARCEL CA7
DRAINAGE EASEMENT
DRAINAGE EASEMENT TO BE DEDICATED AND ATTENUATION BASIN THE HOMEOWNERS ASSOCIATION.
PROPOSED CLEARING LIMITS (TYP)
PROPOSED STREET LIGHT (TYP)
PROPOSED SANITARY CLEANOUT (TYP)
PROPOSED 8" PEDESTRIAN WALK (TYP)
PROPOSED 8" WATERLINE C.V. TO C.V.
PROPOSED DRAINAGE EASEMENT (VB)
VARIABLE WIDTH UTILITY EASEMENT FOR EXCLUSIVE USE OF JCSA
STABILIZE SLOPE WITH EC-2 (EXCELSIOR MATTING) TYPICAL
PROPOSED WATERLINE HOLLOW OAK DRIVE STA. 17+90 8"x4" TEE + GATE VALVE & BOX
10' UTIL. EASEMENT FOR EXCLUSIVE USE OF JCSA
PROPOSED GR-2 BEGIN STA. 14+55
PROPOSED GR-2 END STA. 17+00
PROPOSED GR-7 END STA. 17+00
PRC = 15+14.85
PT = 18+12.79
PC = 16+84.56
STA. 18+12.79 HOLLOW OAK DRIVE
STA. 10+70 HOOSIER NEST
STA. 15+00 AIR RELEASE VALVE
ES-1 INV. OUT
CLASS I DRY RIP RAP
DRAINAGE AREA = 0.45 Ac
WET VOLUME REQD. = 50 C.Y.
DRY VOLUME REQD. = 50 C.Y.
LENGTH OF WEIR = 6.0 (MIN)
SCALE: 1" = 50'
DATE: SEPTEMBER 5, 1997
REVISED: JANUARY 15, 1998
PREPARED BY: LANGLEY AND McDONALD, P.C.


DRAINAGE AREA MAP
OF
CULVERT AT STATION 15+54
AREA = 3.90 Ac.
NORTH
GOLF COURSE HOLE NO. 14
GOLF TRUST OF AMERICA
HOLE NO. 14
HOLLOW OAK DRIVE
50' R/W
LOT 9
LOT 10
LOT 11
LOT 30
LOT 31
COMMON AREA
PARCEL CA
DRAINAGE EASEMENT
PROPOSED DRAINAGE EASEMENT
PROPOSED 8' PEDESTRIAN WALK (TYP)
PROPOSED 8" WATERLINE C.V. TO C.V.
PROPOSED CLEARING LIMITS (TYP)
PROPOSED STREET LIGHT (TYP)
PROPOSED SANITARY CLEANOUT (TYP)
PROPOSED WATERLINE
HOLLOW OAK DRIVE TEE
STA. 17+90 P.V.C.
GATE VALVE & BOX
STABILIZE SLOPE WITH
EC-2 (EXCELSOR MATTING)
TYPICAL
VARIABLE WIDTH UTILITY
EASEMENT FOR
EXCLUSIVE USE OF
JCSA
10' UTIL. EASEMENT
FOR EXCLUSIVE USE OF
JCSA
PROPOSED DRAINAGE EASEMENT
DRAINAGE AREA = 0.45 Ac.
WET VOLUME REQD. = 50 C.Y.
DRY VOLUME REQD. = 54 C.Y.
LENGTH OF WEIR = 6.0 (MIN)
CLASS I DRY RIP RAP
W = 6.0 OCS
D = 10.0
TWC = 0.5'
PRC = 15+14.85
PT = 18+12.79 HOLLOW OAK DRIVE
STA. 18+12.79 HOLLOW OAK DRIVE
STA. 10+70 HIDDEN NEST
PC = 16+84.36
SCALE: 1" = 50'
DATE: SEPTEMBER 5, 1997
REVISED: JANUARY 15, 1998
PREPARED BY: LANGLEY AND McDONALD, P.C.


31B
14B
14B
10B
11C
15F
HOLE NO. 14
FAIRWAY
ROUGH
19B
11C
25B
11C
15F
11C
GREEN
HOLE NO. 15
C
5.5 AC
CN=70
Tc=0.50 HR
15F
14B
11C
15F
15F
11C
15F
11C
11C
15F
19B
Drainage areas revised based upon
on-ground topographic mapping.
STONEHOUSE L.L.C.
PHASE VI-A
ATTENUATION BASIN DRAINAGE AREA MAP
PRE-DEVELOPMENT
WC040_STONEHOUSE_HOLLOW_OAK_067



STONEHOUSE L.L.C.
PHASE VI-A
ATTENUATION BASIN DRAINAGE AREA MAP
POST-DEVELOPMENT

WC040_STONEHOUSE_HOLLOW_OAK_-068

STONEHOUSE L.L.C.
DRAINAGE AREA MAP
OF
SECTION VI A

DATE: SEPTEMBER 5, 1997
REVISED: JANUARY 15, 1998

PREPARED BY LANGLEY AND McDONALD, P.C.

Open Channel Analysis / Uniform Flow :
(USING MANNING'S EQUATION :)

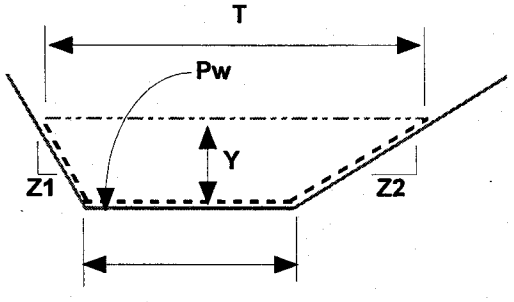
Project : Stonehouse
Location : James City County, VA

$$Q = \frac{1.486 \cdot A \cdot (R_h)^{\frac{2}{3}} \cdot \sqrt{S_o}}{n}$$

$$R_h := \frac{A}{P_w}$$

A = Area of Flow Section
P_w = Wetted Perimeter
R_h = Hydraulic Radius

$$T := B + y \cdot (Z_1 + Z_2)$$



TRAPEZOIDAL, RECTANGULAR or VEE CHANNEL CROSS SECTION

Cross Section Designation :
Ravine I

GIVEN :	**Design flow, Q_{DESIGN} =**	**6.6**	**cubic ft. / sec.**
	Bottom Width, B =	**3**	**feet**
	Channel Slope, S_o =	**0.2**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.025**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	4.29	feet	Y_{Normal} =	**0.21**	**feet**
R_{hn} =	0.18	feet	V_{Normal} =	**8.45**	**f.p.s.**
T_c =	5.72	feet	$Y_{Critical}$ =	**0.45**	**feet**
R_{hc} =	0.34	feet	$V_{Critical}$ =	**3.34**	**f.p.s.**
			$S_{Critical}$ =	**0.0134**	**ft. / ft.**
			F =	**3.49**	

Supercritical Flow / Steep Slope

Cross Section Designation :
Culvert Outfall

GIVEN :	**Design flow, Q_{DESIGN} =**	**6.6**	**cubic ft. / sec.**
	Bottom Width, B =	**15**	**feet**
	Channel Slope, S_o =	**0.03**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.025**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	15.90	feet	Y_{Normal} =	**0.15**	**feet**
R_{hn} =	0.15	feet	V_{Normal} =	**2.85**	**f.p.s.**
T_c =	16.08	feet	$Y_{Critical}$ =	**0.18**	**feet**
R_{hc} =	0.17	feet	$V_{Critical}$ =	**2.36**	**f.p.s.**
			$S_{Critical}$ =	**0.0164**	**ft. / ft.**
			F =	**1.31**	

Supercritical Flow / Steep Slope

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project Stonehouse By ____ Date ____

Location Section VIA - culvert Checked ____ Date ____

Circle one: Present Developed

Circle one: T_c T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only) — Segment ID		Golf Course	
1. Surface description (table 3-1)			
2. Manning's roughness coeff., n (table 3-1) ..		.41	
3. Flow length, L (total L ≤ 300 ft) ..... ft		120	
4. Two-yr 24-hr rainfall, P_2 ..... in		3.5	
5. Land slope, s ..... ft/ft		.05	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ..... hr		+ .28	= .28

Shallow concentrated flow — Segment ID	Upper Swale	Lower Swale	
7. Surface description (paved or unpaved)	Unpaved	Unpaved	
8. Flow length, L ..... ft	150	200	
9. Watercourse slope, s ..... ft/ft	.067	.05	
10. Average velocity, V (figure 3-1) ..... ft/s	4.2	3.6	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr	.01	+ .02	= .03

Channel flow — Segment ID			
12. Cross sectional flow area, a ..... ft^2			
13. Wetted perimeter, p_w ..... ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ..... ft			
15. Channel slope, s ..... ft/ft			
16. Manning's roughness coeff., n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ..... ft/s			
18. Flow length, L ..... ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr		+	=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... hr .31 → 18.6 min

WC040_STONEHOUSE_HOLLOW_OAK - 071

COMPUTATION OF UNIFORM FLOW USING MANNING'S FORMULA:

$$Q = \frac{1.486 \cdot A^{\frac{5}{3}} \cdot \sqrt{S_o}}{n \cdot P_w^{\frac{2}{3}}}$$

Q; Flow, cubic feet per second

A; Cross sectional area of flow at depth "Y"

Pw; Wetted perimeter

WHEN:

$S_o := .0992$	**Slope of invert, ft./ft.**
$n := .013$	**Mannings coefficient of Roughness**
$D := 24$	**Diameter of pipe, inches**
$Q := 6.6$	**Flow, cfs**

COMPUTE NORMAL DEPTH:

Trial value: $Y := 4$ **Depth of flow, inches**

GIVEN

$$Q = \left[\frac{1.486 \cdot \frac{\left[\operatorname{acos}\left(1 - 2 \cdot \frac{Y}{D}\right) \cdot \left(\frac{D}{2}\right)^2 + \left(Y - \frac{D}{2}\right) \cdot \sqrt{Y \cdot (D - Y)} \right]^{\frac{5}{3}}}{144^{\frac{5}{3}}} \cdot \sqrt{S_o}}{n \cdot \left(\operatorname{acos}\left(1 - 2 \cdot \frac{Y}{D}\right) \cdot \frac{D}{12} \right)^{\frac{2}{3}}} \right]$$

Let : $Y_n := \text{find}(Y)$ **Normal Depth :** $Y_n = 4.9$ **inches**

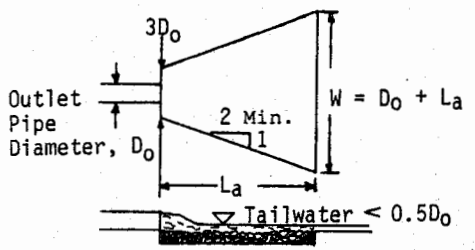
$$A := \frac{\operatorname{acos}\left(1 - 2 \cdot \frac{Y_n}{D}\right) \cdot \left(\frac{D}{2}\right)^2 + \left[\left(Y_n - \frac{D}{2}\right) \cdot \sqrt{Y_n \cdot (D - Y_n)} \right]}{144}$$

$$P_w := \operatorname{acos}\left(1 - 2 \cdot \frac{Y_n}{D}\right) \cdot \frac{D}{12} \qquad V_n := \frac{Q}{A} \qquad V_n = 14.18$$ **Velocity, fps**

DUTLET 15 Q10 = 6.6 CFS

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

FROM GOLF COURSE



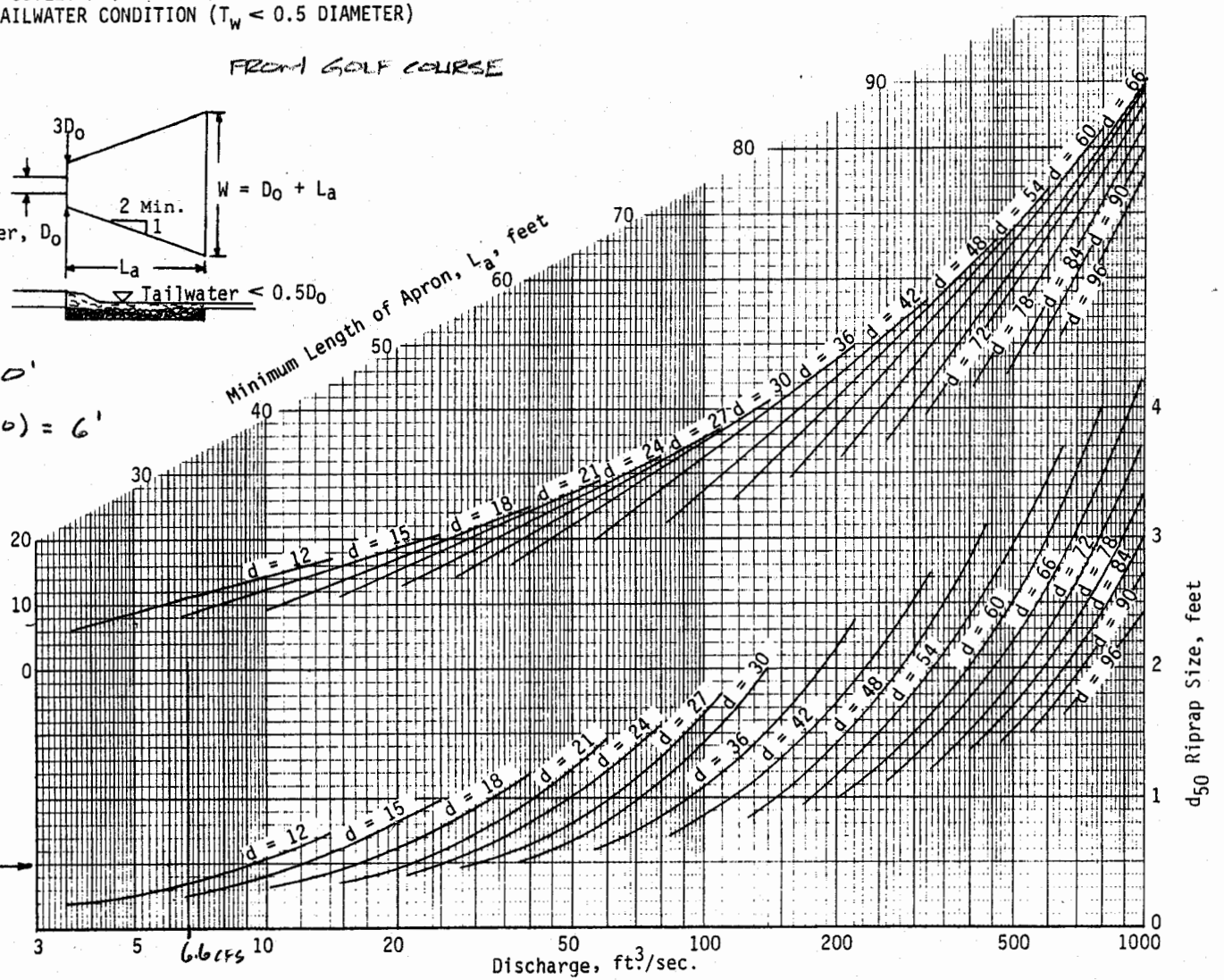
D_o = 24" = 2.0'

W = 2.0 + 0.4(10) = 6'

USE L_a = 10'
W = 8'
d_{50} = 0.5'

d_{50} = 6"
= 0.5'

Recommended Min.
d_{50}=6"



Source: USDA-SCS

Plate 3.18-3

```
Quick TR-55 Ver.5.46   S/N:
Executed: 11:23:57   09-08-1997    c:\96038\bmps\C-EXIST.TCT

                                   STONEHOUSE
                    SUB-REGIONAL STORMWATER MANAGEMENT FACILITIES


                        Tc COMPUTATIONS FOR: C

 SHEET FLOW (Applicable to Tc only)
     Segment ID
     Surface description                        WOODS
     Manning's roughness coeff., n                    0.4000
     Flow length, L (total < or = 300)      ft        100.0
     Two-yr 24-hr rainfall, P2              in        3.400
     Land slope, s                          ft/ft     0.0100
                          0.8
          .007 * (n*L)
     T =  --------------                    hrs       0.46              =  0.46
             0.5     0.4
           P2    *   s

 SHALLOW CONCENTRATED FLOW
     Segment ID
     Surface (paved or unpaved)?                     Unpaved
     Flow length, L                         ft        820.0
     Watercourse slope, s                   ft/ft     0.1100

                            0.5
     Avg.V =  Csf *  (s)                    ft/s      5.3512
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                       hrs       0.04              =  0.04


 CHANNEL FLOW
     Segment ID
     Cross Sectional Flow Area, a           sq.ft     0.00
     Wetted perimeter, Pw                   ft        0.00
     Hydraulic radius, r = a/Pw             ft        0.000
     Channel slope, s                       ft/ft     0.0000
     Manning's roughness coeff., n                    0.0000

                         2/3    1/2
          1.49  *  r    *  s
     V =  -------------------               ft/s      0.0000
                   n

     Flow length, L                         ft           0

     T = L / (3600*V)                       hrs       0.00              =  0.00

    ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                 TOTAL TIME (hrs)      0.50
```

Quick TR-55 Ver.5.46 S/N:
Executed: 11:23:57 09-08-1997 c:\96038\bmps\C-EXIST.TCT

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

STONEHOUSE
SUB-REGIONAL STORMWATER MANAGEMENT FACILITIES

Subarea descr.	Tc or Tt	Time (hrs)
C	Tc	0.50

BMP Pg. 2

Quick TR-55 Ver.5.46 S/N:
Executed: 11:02:09 09-08-1997

STONEHOUSE
SUB-REGIONAL STORMWATER MGMT FACILITIES
SWMF 'C'

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	5.50	70

BMP PG. 3

Quick TR-55 Ver.5.46 S/N:
Executed: 11:02:09 09-08-1997

STONEHOUSE
SUB-REGIONAL STORMWATER MGMT FACILITIES
SWMF 'C'

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS	5.50	70	
COMPOSITE AREA --->	5.50	70.0	(70)

::

BMP PG.4

Quick TR-55 Ver.5.46 S/N:
Executed: 11:25:53 09-08-1997 c:\96038\bmps\C-FUTURE.TCT

STONEHOUSE
SUB-REGIONAL STORMWATER MANAGEMENT FACILITIES
SWMF VI-A

Tc COMPUTATIONS FOR: C

SHEET FLOW (Applicable to Tc only)

Segment ID			
Surface description			
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	30.0	
Two-yr 24-hr rainfall, P2	in	3.400	
Land slope, s	ft/ft	0.0100	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.08	= 0.08

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	3.14	
Wetted perimeter, Pw	ft	6.28	
Hydraulic radius, r = a/Pw	ft	0.500	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0130	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	7.2203	
Flow length, L	ft	1500	
T = L / (3600*V)	hrs	0.06	= 0.06

::

TOTAL TIME (hrs) 0.14

Quick TR-55 Ver.5.46 S/N:
Executed: 11:25:53 09-08-1997 c:\96038\bmps\C-FUTURE.TCT

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

STONEHOUSE
SUB-REGIONAL STORMWATER MANAGEMENT FACILITIES
SWMF VI-A

Subarea descr.	Tc or Tt	Time (hrs)
C	Tc	0.14

BMP PG. 6

Quick TR-55 Ver.5.46 S/N:
Executed: 11:02:55 09-08-1997

STONEHOUSE
SUB-REGIONAL STORMWATER MGMT FACILITIES
SWMF 'C' , VI-A
FUTURE DEVELOPMENT

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	13.74	79

Quick TR-55 Ver.5.46 S/N:
Executed: 11:02:55 09-08-1997

STONEHOUSE
SUB-REGIONAL STORMWATER MGMT FACILITIES
SWMF 'C' , VI-A
FUTURE DEVELOPMENT

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS	1.00	70	
SF RES. 0.5 AC LOTS, 25% IMP	12.74	80	
COMPOSITE AREA --->	13.74	79.3	(79)

::

Return Frequency: 2 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C2EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	5.50	70.0	0.50	0.00	3.40	0.95	I.25	.25

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

Total area = 5.50 acres or 0.00859 sq.mi
Peak discharge = 4 cfs

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

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

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 2 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C2EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	4	12.4
Composite Watershed	4	12.4

BMP PG. 10

Return Frequency: 10 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C10EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	5.50	70.0	0.50	0.00	5.28	2.25	I.16	.16

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

Total area = 5.50 acres or 0.00859 sq.mi
Peak discharge = 10 cfs

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

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

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C10EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	10	12.4
Composite Watershed	10	12.4

Bmp Pg. 12

Return Frequency: 100 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C100EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	5.50	70.0	0.50	0.00	8.00	4.46	I.11 .11

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

Total area = 5.50 acres or 0.00859 sq.mi
Peak discharge = 20 cfs

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

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

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

BMP PG. 13

Return Frequency: 100 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C100EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	20	12.4
Composite Watershed	20	12.4

BMP PG. 14

Return Frequency: 25 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C25EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	5.50	70.0	0.50	0.00	6.25	3.00	I.14	.14

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

Total area = 5.50 acres or 0.00859 sq.mi
Peak discharge = 13 cfs

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

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

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

BMP Pg. 15

Return Frequency: 25 years

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

Executed: 09-08-1997 11:06:02
Watershed file: --> C:\96038\BMPS\C-EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\C25EX.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
EXISTING CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	13	12.4
Composite Watershed	13	12.4

BMP Pg. 16

Return Frequency: 2 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C2FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	13.74	79.0	0.10	0.00	3.40	1.49	I.16	.16

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

Total area = 13.74 acres or 0.02147 sq.mi
Peak discharge = 32 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.14	0.00	0.10	0.00	Yes	--

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

Return Frequency: 2 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C2FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	32	12.1
Composite Watershed	32	12.1

vs 4 ponds

BMP Pg. 18

Return Frequency: 2 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C2FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	1	1	1	9	20	32	19	7	5
Total (cfs)	1	1	1	9	20	32	19	7	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	4	4	3	3	2	2	2	2	1
Total (cfs)	4	4	3	3	2	2	2	2	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	1	1	1	1	1	1	1	1	1
Total (cfs)	1	1	1	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	0	0	0
Total (cfs)	1	1	0	0	0

Return Frequency: 10 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C10FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	13.74	79.0	0.10	0.00	5.28	3.04	I.1 .10

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

Total area = 13.74 acres or 0.02147 sq.mi
Peak discharge = 66 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.14	0.00	0.10	0.00	No	Computed Ia/p < .1

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

BMP Pg. 20

Return Frequency: 10 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C10FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	66	12.1
Composite Watershed	66	12.1

Return Frequency: 10 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C10FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	2	2	3	22	42	66	41	14	10
Total (cfs)	2	2	3	22	42	66	41	14	10

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	8	7	6	5	4	4	3	3	3
Total (cfs)	8	7	6	5	4	4	3	3	3

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	2	2	2	2	2	2	1	1	1
Total (cfs)	2	2	2	2	2	2	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	1	1	0
Total (cfs)	1	1	1	1	0

BMP 26.22

Return Frequency: 25 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C25FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	13.74	79.0	0.10	0.00	6.25	3.90	I.09 .10

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

Total area = 13.74 acres or 0.02147 sq.mi
Peak discharge = 85 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.14	0.00	0.10	0.00	No	Computed Ia/p < .1

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

Return Frequency: 25 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C25FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	85	12.1
Composite Watershed	85	12.1

Return Frequency: 25 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C25FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	2	3	4	28	54	85	53	18	12
Total (cfs)	2	3	4	28	54	85	53	18	12

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	10	9	7	6	6	5	4	4	4
Total (cfs)	10	9	7	6	6	5	4	4	4

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	3	3	3	2	2	2	2	2	2
Total (cfs)	3	3	3	2	2	2	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	1	1	1	0
Total (cfs)	2	1	1	1	0

Return Frequency: 100 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C100FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	13.74	79.0	0.10	0.00	8.00	5.51	I.07 .10

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

Total area = 13.74 acres or 0.02147 sq.mi
Peak discharge = 119 cfs

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

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.14	0.00	0.10	0.00	No	Computed Ia/p < .1

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

Return Frequency: 100 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C100FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	119	12.1
Composite Watershed	119	12.1

Return Frequency: 100 years

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

Executed: 09-08-1997 11:16:02
Watershed file: --> C:\96038\BMPS\C-FUTURE.MOP
Hydrograph file: --> C:\96038\BMPS\C100FU.HYD

STONEHOUSE SECTION VI-A
SWMF VI-A
FUTURE CONDITIONS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	3	4	6	40	77	119	74	26	17
Total (cfs)	3	4	6	40	77	119	74	26	17

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	15	12	10	9	8	7	6	5	5
Total (cfs)	15	12	10	9	8	7	6	5	5

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	4	4	4	3	3	3	2	2	2
Total (cfs)	4	4	4	3	3	3	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	2	2	1	0
Total (cfs)	2	2	2	1	0

POND-2 Version: 5.20
S/N:

STONEHOUSE
SUB-REGIONAL STORMWATER MANAGEMENT FACILITIES
SWMF 'C', VI-A
SURVEY DATA

CALCULATED 01-24-1998 14:22:40
DISK FILE: c:\96038\bmps\C-EXIST .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
30.50	540.00	0.01	0.00	0.00	0.00
32.00	1,918.00	0.04	0.08	0.04	0.04
34.00	5,025.00	0.12	0.23	0.15	0.19
36.00	7,808.00	0.18	0.44	0.29	0.49
38.00	11,451.00	0.26	0.66	0.44	0.93
40.00	16,081.00	0.37	0.94	0.63	1.55
42.00	20,208.00	0.46	1.25	0.83	2.39
44.00	24,452.00	0.56	1.54	1.02	3.41

Elevations With Areas Interpolated From
The Closest Two Planimeter Readings

35.50	-----	0.16	0.41	0.21	0.40

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: C-24-25 .STR

DRAWDOWN CALCS

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
BASIN C 24 HOUR DRAWDOWN
2.5"ORIFICE

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	1
30.75	0.1	2
31.00	0.1	2
31.25	0.1	2
31.50	0.2	2
31.75	0.2	2
32.00	0.2	2
32.25	0.2	2
32.50	0.2	2
32.75	0.2	2
33.00	0.3	2
33.25	0.3	2
33.50	0.3	2
33.75	0.3	2
34.00	0.3	2
34.25	0.3	2
34.50	0.3	2
34.75	0.3	2
35.00	0.3	2
35.25	0.4	2
35.50	0.0	

$\Sigma = 4.6$ 20 INCREMENTS

$20\sqrt{4.6} = 0.23$ AVG CFS out

VOL ÷ Avg CFS = SEC

17,453 ÷ 0.23 = 75,823 SEC

75,823 ÷ 60 ÷ 60 = 21.08 hrs

USE 2½" ORIFICE

Outlet Structure File: C-24-3 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
BASIN C 24 HOUR DRAWDOWN
3" ORIFICE

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	1
30.75	0.1	2
31.00	0.1	2
31.25	0.2	2
31.50	0.2	2
31.75	0.3	2
32.00	0.3	2
32.25	0.3	2
32.50	0.3	2
32.75	0.3	2
33.00	0.4	2
33.25	0.4	2
33.50	0.4	2
33.75	0.4	2
34.00	0.4	2
34.25	0.5	2
34.50	0.5	2
34.75	0.5	2
35.00	0.5	2
35.25	0.5	2
35.50	0.0	

$\sum = 6.6$ 20 increments

$20\sqrt{6.6} = 0.33$ Avg cfs out

VOL ÷ Avg CFS = Sec

17,453 ÷ 0.33 = 52888 sec

52,888 ÷ 60 ÷ 60 = 14.7 hrs No good

Outlet Structure File: C-24-2 .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
BASIN C 24 HOUR DRAWDOWN
2"ORIFICE

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	1
30.70	0.0	2
30.90	0.1	2
31.10	0.1	2
31.30	0.1	2
31.50	0.1	2
31.70	0.1	2
31.90	0.1	2
32.10	0.1	2
32.30	0.1	2
32.50	0.1	2
32.70	0.2	2
32.90	0.2	2
33.10	0.2	2
33.30	0.2	2
33.50	0.2	2
33.70	0.2	2
33.90	0.2	2
34.10	0.2	2
34.30	0.2	2
34.50	0.2	2
34.70	0.2	2
34.90	0.2	2
35.10	0.2	2
35.30	0.2	2
35.50	0.0	

$\Sigma = 3.70$

25 INCREMENTS

$25\sqrt{3.7} = 0.143$ Avg CFS out

Vol ÷ Avg CFS = SEC

17,453 ÷ 0.143 = 117,926 sec

117,926 ÷ 60 ÷ 60 = 32.76 hrs

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outlet Structure File: c:\96038\bmps\C .STR
Planimeter Input File: c:\96038\bmps\C-EXIST .VOL
Rating Table Output File: c:\96038\bmps\C .PND

Min. Elev.(ft) = 30.5 Max. Elev.(ft) = 44 Incr.(ft) = .5

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.		Q Table		Q Table
TABLE	7			->	7
ORIFICE-VC	4			->	4
TABLE	10			->	10
ORIFICE-VC	8	+	4	->	9
STAND PIPE	1	+	9	->	5
ORIFICE-VC	2	?	5	->	3
WEIR-VR	15			->	15

Outflow rating table summary was stored in file:
c:\96038\bmps\C .PND

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	7
31.00	0.1	4
31.50	0.2	4
32.00	0.2	4
32.50	0.2	4
33.00	0.3	4
33.50	0.3	4
34.00	0.3	4
34.50	0.3	4
35.00	0.3	4
35.50	0.4	10 +4
36.00	1.1	10 +4
36.50	1.8	4 +8
37.00	2.2	4 +8
37.50	2.6	4 +8
38.00	2.9	4 +8
38.50	3.2	4 +8
39.00	3.5	4 +8
39.50	3.7	4 +8
40.00	3.9	4 +8
40.50	4.1	4 +8
41.00	4.4	4 +8
41.50	4.5	4 +8
42.00	15.0	4 +8 +1 +15
42.50	40.0	2 +15
43.00	60.0	2 +15
43.50	85.7	2 +15
44.00	116.1	2 +15

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

>>>>>> Structure No. 7 <<<<<<
(Input Data)

TABLE
Input your own rating table.
E1 (ft) =30.5 E2 (ft) =30.708

Constant (ft) added to each elevation was:

Elev. (ft)	Q (cfs)
30.5	0
30.625	.03
30.708	.04

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	30.708
E2 elev.(ft)?	44.001
Orifice coeff.?	.6
Invert elev.(ft)?	30.5
Datum elev.(ft)?	30.604
Diameter (ft)?	.208

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

>>>>>> Structure No. 10 <<<<<<
(Input Data)

TABLE
Input your own rating table.
E1 (ft) =35.5 E2 (ft) =36.167

Constant (ft) added to each elevation was:

Elev. (ft)	Q (cfs)
35.5	0
36.167	.99

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

>>>>>> Structure No. 8 <<<<<<
(Input Data)

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	36.167
E2 elev.(ft)?	44.001
Orifice coeff.?	.6
Invert elev.(ft)?	35.5
Datum elev.(ft)?	35.833
Diameter (ft)?	0.667

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

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

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	41.7
E2 elev.(ft)?	44.001
Crest elev.(ft)?	41.7 - 41.5
Diameter (ft)?	6.0
Weir coefficient?	3.3
Orifice coefficient?	.6
Start transition elev.(ft) @ ?	
Transition height (ft)?	

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	35.5
E2 elev.(ft)?	44.001
Orifice coeff.?	.6
Invert elev.(ft)?	29.8
Datum elev.(ft)?	30.55
Diameter (ft)?	1.50

was 1.25 before

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

>>>>>> Structure No. 15 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	42.0
E2 elev.(ft)?	44.001
Weir coefficient?	3.0
Weir elev.(ft)?	42.0
Length (ft)?	10
Contracted/Suppressed (C/S)?	S

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #7
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	
31.00	0.0	E = or > E2=30.708
31.50	0.0	E = or > E2=30.708
32.00	0.0	E = or > E2=30.708
32.50	0.0	E = or > E2=30.708
33.00	0.0	E = or > E2=30.708
33.50	0.0	E = or > E2=30.708
34.00	0.0	E = or > E2=30.708
34.50	0.0	E = or > E2=30.708
35.00	0.0	E = or > E2=30.708
35.50	0.0	E = or > E2=30.708
36.00	0.0	E = or > E2=30.708
36.50	0.0	E = or > E2=30.708
37.00	0.0	E = or > E2=30.708
37.50	0.0	E = or > E2=30.708
38.00	0.0	E = or > E2=30.708
38.50	0.0	E = or > E2=30.708
39.00	0.0	E = or > E2=30.708
39.50	0.0	E = or > E2=30.708
40.00	0.0	E = or > E2=30.708
40.50	0.0	E = or > E2=30.708
41.00	0.0	E = or > E2=30.708
41.50	0.0	E = or > E2=30.708
42.00	0.0	E = or > E2=30.708
42.50	0.0	E = or > E2=30.708
43.00	0.0	E = or > E2=30.708
43.50	0.0	E = or > E2=30.708
44.00	0.0	E = or > E2=30.708

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #4
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < E1=30.708
31.00	0.1	H =.396
31.50	0.2	H =.896
32.00	0.2	H =1.396
32.50	0.2	H =1.896
33.00	0.3	H =2.396
33.50	0.3	H =2.896
34.00	0.3	H =3.396
34.50	0.3	H =3.896
35.00	0.3	H =4.396
35.50	0.4	H =4.896
36.00	0.4	H =5.396
36.50	0.4	H =5.896
37.00	0.4	H =6.396
37.50	0.4	H =6.896
38.00	0.4	H =7.396
38.50	0.5	H =7.896
39.00	0.5	H =8.396
39.50	0.5	H =8.896
40.00	0.5	H =9.396
40.50	0.5	H =9.896
41.00	0.5	H =10.396
41.50	0.5	H =10.896
42.00	0.6	H =11.396
42.50	0.6	H =11.896
43.00	0.6	H =12.396
43.50	0.6	H =12.896
44.00	0.6	H =13.396

C = .6 A = 3.397947E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (30.604 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #10
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < E1=35.5
31.00	0.0	E < E1=35.5
31.50	0.0	E < E1=35.5
32.00	0.0	E < E1=35.5
32.50	0.0	E < E1=35.5
33.00	0.0	E < E1=35.5
33.50	0.0	E < E1=35.5
34.00	0.0	E < E1=35.5
34.50	0.0	E < E1=35.5
35.00	0.0	E < E1=35.5
35.50	0.0	
36.00	0.7	Interpolated from input table
36.50	0.0	E = or > E2=36.167
37.00	0.0	E = or > E2=36.167
37.50	0.0	E = or > E2=36.167
38.00	0.0	E = or > E2=36.167
38.50	0.0	E = or > E2=36.167
39.00	0.0	E = or > E2=36.167
39.50	0.0	E = or > E2=36.167
40.00	0.0	E = or > E2=36.167
40.50	0.0	E = or > E2=36.167
41.00	0.0	E = or > E2=36.167
41.50	0.0	E = or > E2=36.167
42.00	0.0	E = or > E2=36.167
42.50	0.0	E = or > E2=36.167
43.00	0.0	E = or > E2=36.167
43.50	0.0	E = or > E2=36.167
44.00	0.0	E = or > E2=36.167

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #8
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < E1=36.167
31.00	0.0	E < E1=36.167
31.50	0.0	E < E1=36.167
32.00	0.0	E < E1=36.167
32.50	0.0	E < E1=36.167
33.00	0.0	E < E1=36.167
33.50	0.0	E < E1=36.167
34.00	0.0	E < E1=36.167
34.50	0.0	E < E1=36.167
35.00	0.0	E < E1=36.167
35.50	0.0	E < E1=36.167
36.00	0.0	E < E1=36.167
36.50	1.4	H =.667
37.00	1.8	H =1.167
37.50	2.2	H =1.667
38.00	2.5	H =2.167
38.50	2.7	H =2.667
39.00	3.0	H =3.167
39.50	3.2	H =3.667
40.00	3.4	H =4.167
40.50	3.6	H =4.667
41.00	3.8	H =5.167
41.50	4.0	H =5.667
42.00	4.2	H =6.167
42.50	4.3	H =6.667
43.00	4.5	H =7.167
43.50	4.7	H =7.667
44.00	4.8	H =8.167

C = .6 A = .349415 sq.ft.
H (ft) = Table elev. - Datum elev. (35.833 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #1
STAND PIPE Stand Pipe with weir or orifice flow

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

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < Inv.El.= 41.7
31.00	0.0	E < El=41.7
31.50	0.0	E < El=41.7
32.00	0.0	E < El=41.7
32.50	0.0	E < El=41.7
33.00	0.0	E < El=41.7
33.50	0.0	E < El=41.7
34.00	0.0	E < El=41.7
34.50	0.0	E < El=41.7
35.00	0.0	E < El=41.7
35.50	0.0	E < El=41.7
36.00	0.0	E < El=41.7
36.50	0.0	E < El=41.7
37.00	0.0	E < El=41.7
37.50	0.0	E < El=41.7
38.00	0.0	E < El=41.7
38.50	0.0	E < El=41.7
39.00	0.0	E < El=41.7
39.50	0.0	E < El=41.7
40.00	0.0	E < El=41.7
40.50	0.0	E < El=41.7
41.00	0.0	E < El=41.7
41.50	0.0	E < El=41.7
42.00	10.2	Weir: H =.3
42.50	44.5	Weir: H =.8
43.00	92.2	Weir: H =1.3
43.50	150.2	Weir: H =1.8
44.00	206.5	Orifice: H =2.3

Weir Cw = 3.3 Weir length = 18.84956 ft
Orifice Co = .6 Orifice area = 28.27434 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 43.88863 ft

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #2
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < E1=35.5
31.00	0.0	E < E1=35.5
31.50	0.0	E < E1=35.5
32.00	0.0	E < E1=35.5
32.50	0.0	E < E1=35.5
33.00	0.0	E < E1=35.5
33.50	0.0	E < E1=35.5
34.00	0.0	E < E1=35.5
34.50	0.0	E < E1=35.5
35.00	0.0	E < E1=35.5
35.50	18.9	H =4.95
36.00	19.9	H =5.45
36.50	20.8	H =5.95
37.00	21.6	H =6.45
37.50	22.4	H =6.95
38.00	23.2	H =7.45
38.50	24.0	H =7.95
39.00	24.7	H =8.450
39.50	25.5	H =8.950
40.00	26.2	H =9.450
40.50	26.8	H =9.950
41.00	27.5	H =10.45
41.50	28.2	H =10.95
42.00	28.8	H =11.45
42.50	29.4	H =11.95
43.00	30.0	H =12.45
43.50	30.6	H =12.95
44.00	31.2	H =13.45

C = .6 A = 1.767146 sq.ft.
H (ft) = Table elev. - Datum elev. (30.55 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table for Structure #15
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
30.50	0.0	E < Inv.El.= 42
31.00	0.0	E < Inv.El.= 42
31.50	0.0	E < Inv.El.= 42
32.00	0.0	E < Inv.El.= 42
32.50	0.0	E < Inv.El.= 42
33.00	0.0	E < Inv.El.= 42
33.50	0.0	E < Inv.El.= 42
34.00	0.0	E < Inv.El.= 42
34.50	0.0	E < Inv.El.= 42
35.00	0.0	E < Inv.El.= 42
35.50	0.0	E < Inv.El.= 42
36.00	0.0	E < Inv.El.= 42
36.50	0.0	E < Inv.El.= 42
37.00	0.0	E < Inv.El.= 42
37.50	0.0	E < Inv.El.= 42
38.00	0.0	E < Inv.El.= 42
38.50	0.0	E < Inv.El.= 42
39.00	0.0	E < Inv.El.= 42
39.50	0.0	E < Inv.El.= 42
40.00	0.0	E < Inv.El.= 42
40.50	0.0	E < Inv.El.= 42
41.00	0.0	E < Inv.El.= 42
41.50	0.0	E < Inv.El.= 42
42.00	0.0	H =0.0
42.50	10.6	H =.5
43.00	30.0	H =1.0
43.50	55.1	H =1.5
44.00	84.9	H =2.0

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (42 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table 9
Table 9 = 4 + 8

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	-
31.00	0.1	4
31.50	0.2	4
32.00	0.2	4
32.50	0.2	4
33.00	0.3	4
33.50	0.3	4
34.00	0.3	4
34.50	0.3	4
35.00	0.3	4
35.50	0.4	4
36.00	0.4	4
36.50	1.8	4 +8
37.00	2.2	4 +8
37.50	2.6	4 +8
38.00	2.9	4 +8
38.50	3.2	4 +8
39.00	3.5	4 +8
39.50	3.7	4 +8
40.00	3.9	4 +8
40.50	4.1	4 +8
41.00	4.4	4 +8
41.50	4.5	4 +8
42.00	4.7	4 +8
42.50	4.9	4 +8
43.00	5.1	4 +8
43.50	5.2	4 +8
44.00	5.4	4 +8

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table 5
Table 5 = 9 + 1

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	-
31.00	0.1	4
31.50	0.2	4
32.00	0.2	4
32.50	0.2	4
33.00	0.3	4
33.50	0.3	4
34.00	0.3	4
34.50	0.3	4
35.00	0.3	4
35.50	0.4	4
36.00	0.4	4
36.50	1.8	4 +8
37.00	2.2	4 +8
37.50	2.6	4 +8
38.00	2.9	4 +8
38.50	3.2	4 +8
39.00	3.5	4 +8
39.50	3.7	4 +8
40.00	3.9	4 +8
40.50	4.1	4 +8
41.00	4.4	4 +8
41.50	4.5	4 +8
42.00	15.0	4 +8 +1
42.50	49.4	4 +8 +1
43.00	97.3	4 +8 +1
43.50	155.5	4 +8 +1
44.00	211.9	4 +8 +1

Outlet Structure File: C .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-A
SWMF VI-A

****

Outflow Rating Table 3
Table 3 = 5 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
30.50	0.0	-
31.00	0.1	4
31.50	0.2	4
32.00	0.2	4
32.50	0.2	4
33.00	0.3	4
33.50	0.3	4
34.00	0.3	4
34.50	0.3	4
35.00	0.3	4
35.50	0.4	4
36.00	0.4	4
36.50	1.8	4 +8
37.00	2.2	4 +8
37.50	2.6	4 +8
38.00	2.9	4 +8
38.50	3.2	4 +8
39.00	3.5	4 +8
39.50	3.7	4 +8
40.00	3.9	4 +8
40.50	4.1	4 +8
41.00	4.4	4 +8
41.50	4.5	4 +8
42.00	15.0	4 +8 +1
42.50	29.4	2
43.00	30.0	2
43.50	30.6	2
44.00	31.2	2

Return Freq: 2 years

```
****************
*              *
*  STONEHOUSE  *
*   SWMF VI-A  *
*              *
*              *
*              *
****************
```

Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Rating Table file: c:\96038\bmps\C .PND

----INITIAL CONDITIONS----
Elevation = 30.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
30.50	0.0	0.000
31.00	0.1	0.008
31.50	0.2	0.021
32.00	0.2	0.040
32.50	0.2	0.065
33.00	0.3	0.099
33.50	0.3	0.141
34.00	0.3	0.194
34.50	0.3	0.255
35.00	0.3	0.324
35.50	0.4	0.401
36.00	1.1	0.486
36.50	1.8	0.580
37.00	2.2	0.685
37.50	2.6	0.800
38.00	2.9	0.925
38.50	3.2	1.063
39.00	3.5	1.213
39.50	3.7	1.377
40.00	3.9	1.554
40.50	4.1	1.745
41.00	4.4	1.946
41.50	4.5	2.160
42.00	15.0	2.386
42.50	40.0	2.624
43.00	60.0	2.873
43.50	85.7	3.135
44.00	116.1	3.409

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
2.0	2.1
5.1	5.3
9.7	9.9
15.8	16.0
23.9	24.2
34.2	34.5
46.9	47.2
61.7	62.0
78.4	78.7
97.0	97.4
117.6	118.7
140.4	142.2
165.7	167.9
193.5	196.1
223.9	226.8
257.3	260.5
293.6	297.1
333.2	336.9
376.2	380.1
422.2	426.3
471.0	475.4
522.7	527.2
577.3	592.3
634.9	674.9
695.3	755.3
758.7	844.4
825.1	941.2

Time increment (t) = 6.0 min.

EXECUTED: 01-24-1998 14:24:17 Return Freq: 2 years

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF2OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	1.00	-----	0.0	0.0	0.00	30.50
666.0	1.00	2.0	1.8	2.0	0.10	30.98
672.0	1.00	2.0	3.5	3.8	0.15	31.27
678.0	1.00	2.0	5.1	5.5	0.20	31.52
684.0	1.00	2.0	6.7	7.1	0.20	31.70
690.0	1.00	2.0	8.3	8.7	0.20	31.87
696.0	1.00	2.0	9.9	10.3	0.20	32.04
702.0	4.00	5.0	14.5	14.9	0.20	32.41
708.0	6.00	10.0	23.9	24.5	0.30	33.01
714.0	9.00	15.0	38.3	38.9	0.30	33.67
720.0	20.00	29.0	66.7	67.3	0.30	34.66
726.0	32.00	52.0	116.5	118.7	1.10	36.00
732.0	19.00	51.0	163.1	167.5	2.19	36.99
738.0	7.00	26.0	184.1	189.1	2.50	37.38
744.0	5.00	12.0	190.9	196.1	2.60	37.50
750.0	4.00	9.0	194.6	199.9	2.64	37.56
756.0	4.00	8.0	197.3	202.6	2.66	37.61
762.0	3.00	7.0	199.0	204.3	2.68	37.63
768.0	3.00	6.0	199.6	205.0	2.69	37.64
774.0	2.00	5.0	199.2	204.6	2.68	37.64
780.0	2.00	4.0	197.9	203.2	2.67	37.62
786.0	2.00	4.0	196.6	201.9	2.66	37.59
792.0	2.00	4.0	195.3	200.6	2.64	37.57
798.0	2.00	4.0	194.0	199.3	2.63	37.55
804.0	2.00	4.0	192.8	198.0	2.62	37.53
810.0	2.00	4.0	191.6	196.8	2.61	37.51
816.0	2.00	4.0	190.4	195.6	2.59	37.49
822.0	2.00	4.0	189.2	194.4	2.58	37.47
828.0	1.00	3.0	187.1	192.2	2.54	37.43
834.0	1.00	2.0	184.1	189.1	2.50	37.38
840.0	1.00	2.0	181.2	186.1	2.46	37.32
846.0	1.00	2.0	178.4	183.2	2.42	37.27
852.0	1.00	2.0	175.6	180.4	2.38	37.22
858.0	1.00	2.0	173.0	177.6	2.34	37.17
864.0	1.00	2.0	170.4	175.0	2.30	37.12
870.0	1.00	2.0	167.8	172.4	2.26	37.08
876.0	1.00	2.0	165.4	169.8	2.23	37.03
882.0	1.00	2.0	163.0	167.4	2.19	36.99
888.0	1.00	2.0	160.7	165.0	2.15	36.94
894.0	1.00	2.0	158.4	162.7	2.12	36.90
900.0	1.00	2.0	156.3	160.4	2.08	36.85
906.0	1.00	2.0	154.2	158.3	2.05	36.81
912.0	1.00	2.0	152.1	156.2	2.02	36.77
918.0	1.00	2.0	150.2	154.1	1.99	36.73
924.0	1.00	2.0	148.3	152.2	1.95	36.69

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	1.00	2.0	146.4	150.3	1.92	36.66
936.0	1.00	2.0	144.6	148.4	1.90	36.62
942.0	1.00	2.0	142.9	146.6	1.87	36.59
948.0	1.00	2.0	141.2	144.9	1.84	36.55
954.0	1.00	2.0	139.6	143.2	1.81	36.52
960.0	1.00	2.0	138.0	141.6	1.78	36.49
966.0	1.00	2.0	136.5	140.0	1.73	36.45
972.0	1.00	2.0	135.2	138.5	1.69	36.42
978.0	1.00	2.0	133.9	137.2	1.65	36.39
984.0	1.00	2.0	132.6	135.9	1.61	36.36
990.0	1.00	2.0	131.5	134.6	1.57	36.34
996.0	1.00	2.0	130.4	133.5	1.54	36.31
1002.0	1.00	2.0	129.4	132.4	1.51	36.29
1008.0	1.00	2.0	128.4	131.4	1.48	36.27
1014.0	1.00	2.0	127.5	130.4	1.45	36.25
1020.0	1.00	2.0	126.7	129.5	1.42	36.23
1026.0	1.00	2.0	125.9	128.7	1.40	36.21
1032.0	1.00	2.0	125.2	127.9	1.37	36.20
1038.0	1.00	2.0	124.5	127.2	1.35	36.18
1044.0	1.00	2.0	123.8	126.5	1.33	36.16
1050.0	1.00	2.0	123.2	125.8	1.31	36.15
1056.0	1.00	2.0	122.6	125.2	1.29	36.14
1062.0	1.00	2.0	122.0	124.6	1.28	36.13
1068.0	1.00	2.0	121.5	124.0	1.26	36.11
1074.0	1.00	2.0	121.0	123.5	1.24	36.10
1080.0	1.00	2.0	120.6	123.0	1.23	36.09
1086.0	1.00	2.0	120.1	122.6	1.22	36.08
1092.0	1.00	2.0	119.7	122.1	1.20	36.07
1098.0	1.00	2.0	119.4	121.7	1.19	36.06
1104.0	1.00	2.0	119.0	121.4	1.18	36.06
1110.0	1.00	2.0	118.7	121.0	1.17	36.05
1116.0	1.00	2.0	118.3	120.7	1.16	36.04
1122.0	1.00	2.0	118.1	120.3	1.15	36.04
1128.0	1.00	2.0	117.8	120.1	1.14	36.03
1134.0	1.00	2.0	117.5	119.8	1.13	36.02
1140.0	1.00	2.0	117.3	119.5	1.12	36.02
1146.0	1.00	2.0	117.0	119.3	1.12	36.01
1152.0	1.00	2.0	116.8	119.0	1.11	36.01
1158.0	1.00	2.0	116.6	118.8	1.10	36.00
1164.0	1.00	2.0	116.4	118.6	1.10	36.00
1170.0	0.00	1.0	115.3	117.4	1.06	35.97
1176.0	0.00	0.0	113.3	115.3	0.99	35.92
1182.0	0.00	0.0	111.5	113.3	0.92	35.87
1188.0	0.00	0.0	109.7	111.5	0.86	35.83
1194.0	0.00	0.0	108.1	109.7	0.81	35.79
1200.0	0.00	0.0	106.6	108.1	0.75	35.75

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	0.00	0.0	105.2	106.6	0.70	35.72
1212.0	0.00	0.0	103.9	105.2	0.66	35.68
1218.0	0.00	0.0	102.7	103.9	0.61	35.65
1224.0	0.00	0.0	101.5	102.7	0.57	35.62
1230.0	0.00	0.0	100.4	101.5	0.54	35.60
1236.0	0.00	0.0	99.4	100.4	0.50	35.57
1242.0	0.00	0.0	98.5	99.4	0.47	35.55
1248.0	0.00	0.0	97.6	98.5	0.44	35.53
1254.0	0.00	0.0	96.8	97.6	0.41	35.51
1260.0	0.00	0.0	96.0	96.8	0.40	35.49
1266.0	0.00	0.0	95.2	96.0	0.39	35.46
1272.0	0.00	0.0	94.5	95.2	0.39	35.44
1278.0	0.00	0.0	93.7	94.5	0.38	35.42
1284.0	0.00	0.0	92.9	93.7	0.38	35.40
1290.0	0.00	0.0	92.2	92.9	0.38	35.38
1296.0	0.00	0.0	91.4	92.2	0.37	35.36
1302.0	0.00	0.0	90.7	91.4	0.37	35.34
1308.0	0.00	0.0	90.0	90.7	0.36	35.32
1314.0	0.00	0.0	89.2	90.0	0.36	35.30
1320.0	0.00	0.0	88.5	89.2	0.36	35.28
1326.0	0.00	0.0	87.8	88.5	0.35	35.26
1332.0	0.00	0.0	87.1	87.8	0.35	35.25
1338.0	0.00	0.0	86.4	87.1	0.35	35.23
1344.0	0.00	0.0	85.8	86.4	0.34	35.21
1350.0	0.00	0.0	85.1	85.8	0.34	35.19
1356.0	0.00	0.0	84.4	85.1	0.33	35.17
1362.0	0.00	0.0	83.8	84.4	0.33	35.15
1368.0	0.00	0.0	83.1	83.8	0.33	35.14
1374.0	0.00	0.0	82.4	83.1	0.32	35.12
1380.0	0.00	0.0	81.8	82.4	0.32	35.10
1386.0	0.00	0.0	81.2	81.8	0.32	35.08
1392.0	0.00	0.0	80.5	81.2	0.31	35.07
1398.0	0.00	0.0	79.9	80.5	0.31	35.05
1404.0	0.00	0.0	79.3	79.9	0.31	35.03
1410.0	0.00	0.0	78.7	79.3	0.30	35.02
1416.0	0.00	0.0	78.1	78.7	0.30	35.00
1422.0	0.00	0.0	77.5	78.1	0.30	34.98
1428.0	0.00	0.0	76.9	77.5	0.30	34.97
1434.0	0.00	0.0	76.3	76.9	0.30	34.95
1440.0	0.00	0.0	75.7	76.3	0.30	34.93
1446.0	0.00	0.0	75.1	75.7	0.30	34.91
1452.0	0.00	0.0	74.5	75.1	0.30	34.89
1458.0	0.00	0.0	73.9	74.5	0.30	34.88
1464.0	0.00	0.0	73.3	73.9	0.30	34.86
1470.0	0.00	0.0	72.7	73.3	0.30	34.84
1476.0	0.00	0.0	72.1	72.7	0.30	34.82

EXECUTED: 01-24-1998 14:24:17 Return Freq: 2 years

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	71.5	72.1	0.30	34.80
1488.0	0.00	0.0	70.9	71.5	0.30	34.79
1494.0	0.00	0.0	70.3	70.9	0.30	34.77
1500.0	0.00	0.0	69.7	70.3	0.30	34.75
1506.0	0.00	0.0	69.1	69.7	0.30	34.73
1512.0	0.00	0.0	68.5	69.1	0.30	34.71
1518.0	0.00	0.0	67.9	68.5	0.30	34.70
1524.0	0.00	0.0	67.3	67.9	0.30	34.68
1530.0	0.00	0.0	66.7	67.3	0.30	34.66
1536.0	0.00	0.0	66.1	66.7	0.30	34.64
1542.0	0.00	0.0	65.5	66.1	0.30	34.62
1548.0	0.00	0.0	64.9	65.5	0.30	34.61
1554.0	0.00	0.0	64.3	64.9	0.30	34.59

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

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C2FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF2OUT .HYD

Starting Pond W.S. Elevation = 30.50 ft

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

Peak Inflow = 32.00 cfs
Peak Outflow = 2.69 cfs
Peak Elevation = 37.64 ft

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 0.84 ac-ft

Total Storage in Pond = 0.84 ac-ft

Warning: Inflow hydrograph truncated on left side.

```
****************
*              *
*  STONEHOUSE  *
*   SWMF VI-A  *
*              *
*              *
*              *
****************
```

Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Rating Table file: c:\96038\bmps\C .PND

----INITIAL CONDITIONS----
Elevation = 30.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
30.50	0.0	0.000
31.00	0.1	0.008
31.50	0.2	0.021
32.00	0.2	0.040
32.50	0.2	0.065
33.00	0.3	0.099
33.50	0.3	0.141
34.00	0.3	0.194
34.50	0.3	0.255
35.00	0.3	0.324
35.50	0.4	0.401
36.00	1.1	0.486
36.50	1.8	0.580
37.00	2.2	0.685
37.50	2.6	0.800
38.00	2.9	0.925
38.50	3.2	1.063
39.00	3.5	1.213
39.50	3.7	1.377
40.00	3.9	1.554
40.50	4.1	1.745
41.00	4.4	1.946
41.50	4.5	2.160
42.00	15.0	2.386
42.50	40.0	2.624
43.00	60.0	2.873
43.50	85.7	3.135
44.00	116.1	3.409

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
2.0	2.1
5.1	5.3
9.7	9.9
15.8	16.0
23.9	24.2
34.2	34.5
46.9	47.2
61.7	62.0
78.4	78.7
97.0	97.4
117.6	118.7
140.4	142.2
165.7	167.9
193.5	196.1
223.9	226.8
257.3	260.5
293.6	297.1
333.2	336.9
376.2	380.1
422.2	426.3
471.0	475.4
522.7	527.2
577.3	592.3
634.9	674.9
695.3	755.3
758.7	844.4
825.1	941.2

Time increment (t) = 6.0 min.

EXECUTED: 01-24-1998 14:24:18 Return Freq: 10 years

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	2.00	-----	0.0	0.0	0.00	30.50
666.0	2.00	4.0	3.7	4.0	0.16	31.30
672.0	2.00	4.0	7.3	7.7	0.20	31.76
678.0	2.00	4.0	10.9	11.3	0.20	32.12
684.0	2.00	4.0	14.5	14.9	0.20	32.41
690.0	3.00	5.0	19.0	19.5	0.24	32.71
696.0	3.00	6.0	24.4	25.0	0.30	33.04
702.0	9.00	12.0	35.8	36.4	0.30	33.57
708.0	16.00	25.0	60.2	60.8	0.30	34.46
714.0	22.00	38.0	97.3	98.2	0.43	35.52
720.0	42.00	64.0	157.1	161.3	2.10	36.87
726.0	66.00	108.0	258.7	265.1	3.24	38.56
732.0	41.00	107.0	358.0	365.7	3.83	39.83
738.0	14.00	55.0	404.9	413.0	4.04	40.36
744.0	10.00	24.0	420.7	428.9	4.12	40.53
750.0	8.00	18.0	430.3	438.7	4.18	40.63
756.0	7.00	15.0	436.9	445.3	4.22	40.69
762.0	6.00	13.0	441.4	449.9	4.24	40.74
768.0	5.00	11.0	443.9	452.4	4.26	40.77
774.0	4.00	9.0	444.4	452.9	4.26	40.77
780.0	4.00	8.0	443.9	452.4	4.26	40.77
786.0	4.00	8.0	443.3	451.9	4.26	40.76
792.0	4.00	8.0	442.8	451.3	4.25	40.75
798.0	4.00	8.0	442.3	450.8	4.25	40.75
804.0	3.00	7.0	440.9	449.3	4.24	40.73
810.0	3.00	6.0	438.4	446.9	4.23	40.71
816.0	3.00	6.0	436.0	444.4	4.21	40.68
822.0	3.00	6.0	433.6	442.0	4.20	40.66
828.0	3.00	6.0	431.2	439.6	4.18	40.64
834.0	2.00	5.0	427.9	436.2	4.16	40.60
840.0	2.00	4.0	423.6	431.9	4.13	40.56
846.0	2.00	4.0	419.4	427.6	4.11	40.51
852.0	2.00	4.0	415.2	423.4	4.09	40.47
858.0	2.00	4.0	411.1	419.2	4.07	40.42
864.0	2.00	4.0	407.0	415.1	4.05	40.38
870.0	2.00	4.0	402.9	411.0	4.03	40.33
876.0	2.00	4.0	398.9	406.9	4.02	40.29
882.0	2.00	4.0	394.9	402.9	4.00	40.25
888.0	2.00	4.0	390.9	398.9	3.98	40.20
894.0	2.00	4.0	387.0	394.9	3.96	40.16
900.0	2.00	4.0	383.1	391.0	3.95	40.12
906.0	2.00	4.0	379.3	387.1	3.93	40.08
912.0	2.00	4.0	375.4	383.3	3.91	40.03
918.0	2.00	4.0	371.6	379.4	3.90	39.99
924.0	2.00	4.0	367.9	375.6	3.88	39.95

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	2.00	4.0	364.2	371.9	3.86	39.91
936.0	2.00	4.0	360.5	368.2	3.84	39.86
942.0	2.00	4.0	356.8	364.5	3.83	39.82
948.0	2.00	4.0	353.2	360.8	3.81	39.78
954.0	2.00	4.0	349.6	357.2	3.79	39.73
960.0	2.00	4.0	346.0	353.6	3.78	39.69
966.0	2.00	4.0	342.5	350.0	3.76	39.65
972.0	2.00	4.0	339.0	346.5	3.74	39.61
978.0	1.00	3.0	334.6	342.0	3.72	39.56
984.0	1.00	2.0	329.2	336.6	3.70	39.50
990.0	1.00	2.0	323.9	331.2	3.67	39.43
996.0	1.00	2.0	318.6	325.9	3.64	39.36
1002.0	1.00	2.0	313.3	320.6	3.62	39.29
1008.0	1.00	2.0	308.1	315.3	3.59	39.23
1014.0	1.00	2.0	303.0	310.1	3.57	39.16
1020.0	1.00	2.0	297.9	305.0	3.54	39.10
1026.0	1.00	2.0	292.9	299.9	3.51	39.04
1032.0	1.00	2.0	287.9	294.9	3.48	38.97
1038.0	1.00	2.0	283.1	289.9	3.44	38.90
1044.0	1.00	2.0	278.3	285.1	3.40	38.84
1050.0	1.00	2.0	273.5	280.3	3.36	38.77
1056.0	1.00	2.0	268.9	275.5	3.32	38.71
1062.0	1.00	2.0	264.3	270.9	3.29	38.64
1068.0	1.00	2.0	259.8	266.3	3.25	38.58
1074.0	1.00	2.0	255.4	261.8	3.21	38.52
1080.0	1.00	2.0	251.1	257.4	3.17	38.45
1086.0	1.00	2.0	246.8	253.1	3.13	38.39
1092.0	1.00	2.0	242.6	248.8	3.10	38.33
1098.0	1.00	2.0	238.5	244.6	3.06	38.26
1104.0	1.00	2.0	234.4	240.5	3.02	38.20
1110.0	1.00	2.0	230.5	236.4	2.99	38.14
1116.0	1.00	2.0	226.6	232.5	2.95	38.08
1122.0	1.00	2.0	222.7	228.6	2.92	38.03
1128.0	1.00	2.0	219.0	224.7	2.88	37.97
1134.0	1.00	2.0	215.3	221.0	2.84	37.90
1140.0	1.00	2.0	211.7	217.3	2.81	37.84
1146.0	1.00	2.0	208.1	213.7	2.77	37.79
1152.0	1.00	2.0	204.7	210.1	2.74	37.73
1158.0	1.00	2.0	201.3	206.7	2.70	37.67
1164.0	1.00	2.0	197.9	203.3	2.67	37.62
1170.0	1.00	2.0	194.6	199.9	2.64	37.56
1176.0	1.00	2.0	191.4	196.6	2.61	37.51
1182.0	1.00	2.0	188.3	193.4	2.56	37.45
1188.0	1.00	2.0	185.3	190.3	2.52	37.40
1194.0	1.00	2.0	182.3	187.3	2.47	37.34
1200.0	1.00	2.0	179.5	184.3	2.43	37.29

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	1.00	2.0	176.7	181.5	2.39	37.24
1212.0	1.00	2.0	174.0	178.7	2.35	37.19
1218.0	1.00	2.0	171.3	176.0	2.31	37.14
1224.0	1.00	2.0	168.8	173.3	2.28	37.10
1230.0	1.00	2.0	166.3	170.8	2.24	37.05
1236.0	1.00	2.0	163.9	168.3	2.21	37.01
1242.0	1.00	2.0	161.6	165.9	2.17	36.96
1248.0	1.00	2.0	159.3	163.6	2.13	36.92
1254.0	1.00	2.0	157.1	161.3	2.10	36.87
1260.0	1.00	2.0	155.0	159.1	2.06	36.83
1266.0	1.00	2.0	152.9	157.0	2.03	36.79
1272.0	1.00	2.0	150.9	154.9	2.00	36.75
1278.0	1.00	2.0	149.0	152.9	1.97	36.71
1284.0	1.00	2.0	147.1	151.0	1.94	36.67
1290.0	1.00	2.0	145.3	149.1	1.91	36.63
1296.0	1.00	2.0	143.5	147.3	1.88	36.60
1302.0	1.00	2.0	141.8	145.5	1.85	36.56
1308.0	1.00	2.0	140.2	143.8	1.82	36.53
1314.0	1.00	2.0	138.6	142.2	1.80	36.50
1320.0	1.00	2.0	137.1	140.6	1.75	36.46
1326.0	1.00	2.0	135.7	139.1	1.71	36.43
1332.0	1.00	2.0	134.3	137.7	1.66	36.40
1338.0	1.00	2.0	133.1	136.3	1.62	36.37
1344.0	1.00	2.0	131.9	135.1	1.59	36.35
1350.0	1.00	2.0	130.8	133.9	1.55	36.32
1356.0	1.00	2.0	129.8	132.8	1.52	36.30
1362.0	1.00	2.0	128.8	131.8	1.49	36.28
1368.0	1.00	2.0	127.9	130.8	1.46	36.26
1374.0	1.00	2.0	127.0	129.9	1.43	36.24
1380.0	1.00	2.0	126.2	129.0	1.41	36.22
1386.0	1.00	2.0	125.4	128.2	1.38	36.20
1392.0	1.00	2.0	124.7	127.4	1.36	36.19
1398.0	1.00	2.0	124.0	126.7	1.34	36.17
1404.0	1.00	2.0	123.4	126.0	1.32	36.16
1410.0	1.00	2.0	122.8	125.4	1.30	36.14
1416.0	1.00	2.0	122.2	124.8	1.28	36.13
1422.0	1.00	2.0	121.7	124.2	1.26	36.12
1428.0	1.00	2.0	121.2	123.7	1.25	36.11
1434.0	1.00	2.0	120.7	123.2	1.23	36.10
1440.0	0.00	1.0	119.4	121.7	1.19	36.06
1446.0	0.00	0.0	117.1	119.4	1.12	36.01
1452.0	0.00	0.0	115.0	117.1	1.05	35.96
1458.0	0.00	0.0	113.1	115.0	0.98	35.91
1464.0	0.00	0.0	111.2	113.1	0.92	35.87
1470.0	0.00	0.0	109.5	111.2	0.86	35.83
1476.0	0.00	0.0	107.9	109.5	0.80	35.79

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	106.4	107.9	0.75	35.75
1488.0	0.00	0.0	105.0	106.4	0.70	35.71
1494.0	0.00	0.0	103.7	105.0	0.65	35.68
1500.0	0.00	0.0	102.5	103.7	0.61	35.65
1506.0	0.00	0.0	101.4	102.5	0.57	35.62
1512.0	0.00	0.0	100.3	101.4	0.53	35.59
1518.0	0.00	0.0	99.3	100.3	0.50	35.57
1524.0	0.00	0.0	98.4	99.3	0.46	35.55
1530.0	0.00	0.0	97.5	98.4	0.43	35.52
1536.0	0.00	0.0	96.7	97.5	0.41	35.50
1542.0	0.00	0.0	95.9	96.7	0.40	35.48
1548.0	0.00	0.0	95.1	95.9	0.39	35.46
1554.0	0.00	0.0	94.4	95.1	0.39	35.44

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

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C10FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF10OUT .HYD

Starting Pond W.S. Elevation = 30.50 ft

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

Peak Inflow = 66.00 cfs
Peak Outflow = 4.26 cfs - no change
Peak Elevation = 40.77 ft

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

Initial Storage	=	0.00 ac-ft
Peak Storage From Storm	=	1.85 ac-ft
Total Storage in Pond	=	1.85 ac-ft

Warning: Inflow hydrograph truncated on left side.

```
****************
*              *
*  STONEHOUSE  *
*   SWMF VI-A  *
*              *
*              *
*              *
****************
```

Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Rating Table file: c:\96038\bmps\C .PND

----INITIAL CONDITIONS----
Elevation = 30.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
30.50	0.0	0.000
31.00	0.1	0.008
31.50	0.2	0.021
32.00	0.2	0.040
32.50	0.2	0.065
33.00	0.3	0.099
33.50	0.3	0.141
34.00	0.3	0.194
34.50	0.3	0.255
35.00	0.3	0.324
35.50	0.4	0.401
36.00	1.1	0.486
36.50	1.8	0.580
37.00	2.2	0.685
37.50	2.6	0.800
38.00	2.9	0.925
38.50	3.2	1.063
39.00	3.5	1.213
39.50	3.7	1.377
40.00	3.9	1.554
40.50	4.1	1.745
41.00	4.4	1.946
41.50	4.5	2.160
42.00	15.0	2.386
42.50	40.0	2.624
43.00	60.0	2.873
43.50	85.7	3.135
44.00	116.1	3.409

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
2.0	2.1
5.1	5.3
9.7	9.9
15.8	16.0
23.9	24.2
34.2	34.5
46.9	47.2
61.7	62.0
78.4	78.7
97.0	97.4
117.6	118.7
140.4	142.2
165.7	167.9
193.5	196.1
223.9	226.8
257.3	260.5
293.6	297.1
333.2	336.9
376.2	380.1
422.2	426.3
471.0	475.4
522.7	527.2
577.3	592.3
634.9	674.9
695.3	755.3
758.7	844.4
825.1	941.2

Time increment (t) = 6.0 min.

POND-2 Version: 5.20 S/N:
EXECUTED: 01-24-1998 14:24:20

Return Freq: 25 years

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF25OUT .HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	2.00	-----	0.0	0.0	0.00	30.50
666.0	2.00	4.0	3.7	4.0	0.16	31.30
672.0	3.00	5.0	8.3	8.7	0.20	31.87
678.0	3.00	6.0	13.9	14.3	0.20	32.36
684.0	3.00	6.0	19.4	19.9	0.25	32.73
690.0	4.00	7.0	25.8	26.4	0.30	33.10
696.0	4.00	8.0	33.2	33.8	0.30	33.47
702.0	12.00	16.0	48.6	49.2	0.30	34.07
708.0	20.00	32.0	80.0	80.6	0.31	35.05
714.0	28.00	48.0	125.2	128.0	1.38	36.20
720.0	54.00	82.0	201.8	207.2	2.71	37.68
726.0	85.00	139.0	333.4	340.8	3.72	39.54
732.0	53.00	138.0	462.6	471.4	4.38	40.96
738.0	18.00	71.0	522.6	533.6	5.53	41.55
744.0	12.00	30.0	535.4	552.6	8.58	41.69
750.0	10.00	22.0	538.7	557.4	9.36	41.73
756.0	9.00	19.0	538.8	557.7	9.41	41.73
762.0	7.00	16.0	536.9	554.8	8.95	41.71
768.0	6.00	13.0	533.6	549.9	8.16	41.67
774.0	6.00	12.0	530.7	545.6	7.47	41.64
780.0	6.00	12.0	528.7	542.7	6.99	41.62
786.0	6.00	12.0	527.3	540.7	6.67	41.60
792.0	5.00	11.0	525.8	538.3	6.29	41.59
798.0	4.00	9.0	523.3	534.8	5.72	41.56
804.0	4.00	8.0	521.0	531.3	5.16	41.53
810.0	4.00	8.0	519.4	529.0	4.79	41.51
816.0	4.00	8.0	518.4	527.4	4.53	41.50
822.0	4.00	8.0	517.4	526.4	4.50	41.49
828.0	4.00	8.0	516.4	525.4	4.50	41.48
834.0	4.00	8.0	515.4	524.4	4.49	41.47
840.0	3.00	7.0	513.4	522.4	4.49	41.45
846.0	3.00	6.0	510.4	519.4	4.48	41.42
852.0	3.00	6.0	507.5	516.4	4.48	41.40
858.0	3.00	6.0	504.5	513.5	4.47	41.37
864.0	3.00	6.0	501.6	510.5	4.47	41.34
870.0	3.00	6.0	498.7	507.6	4.46	41.31
876.0	3.00	6.0	495.7	504.7	4.46	41.28
882.0	3.00	6.0	492.8	501.7	4.45	41.25
888.0	2.00	5.0	489.0	497.8	4.44	41.22
894.0	2.00	4.0	484.1	493.0	4.43	41.17
900.0	2.00	4.0	479.2	488.1	4.42	41.12
906.0	2.00	4.0	474.4	483.2	4.42	41.08
912.0	2.00	4.0	469.6	478.4	4.41	41.03
918.0	2.00	4.0	464.8	473.6	4.39	40.98
924.0	2.00	4.0	460.1	468.8	4.36	40.93

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF25OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	2.00	4.0	455.4	464.1	4.33	40.88
936.0	2.00	4.0	450.8	459.4	4.30	40.84
942.0	2.00	4.0	446.3	454.8	4.27	40.79
948.0	2.00	4.0	441.8	450.3	4.25	40.74
954.0	2.00	4.0	437.4	445.8	4.22	40.70
960.0	2.00	4.0	433.0	441.4	4.19	40.65
966.0	2.00	4.0	428.6	437.0	4.17	40.61
972.0	2.00	4.0	424.4	432.6	4.14	40.56
978.0	2.00	4.0	420.1	428.4	4.11	40.52
984.0	2.00	4.0	416.0	424.1	4.09	40.48
990.0	2.00	4.0	411.8	420.0	4.07	40.43
996.0	2.00	4.0	407.7	415.8	4.05	40.39
1002.0	2.00	4.0	403.6	411.7	4.04	40.34
1008.0	2.00	4.0	399.6	407.6	4.02	40.30
1014.0	2.00	4.0	395.6	403.6	4.00	40.25
1020.0	2.00	4.0	391.6	399.6	3.98	40.21
1026.0	2.00	4.0	387.7	395.6	3.97	40.17
1032.0	2.00	4.0	383.8	391.7	3.95	40.13
1038.0	2.00	4.0	379.9	387.8	3.93	40.08
1044.0	2.00	4.0	376.1	383.9	3.92	40.04
1050.0	2.00	4.0	372.3	380.1	3.90	40.00
1056.0	2.00	4.0	368.5	376.3	3.88	39.96
1062.0	2.00	4.0	364.8	372.5	3.86	39.91
1068.0	2.00	4.0	361.1	368.8	3.85	39.87
1074.0	2.00	4.0	357.4	365.1	3.83	39.83
1080.0	2.00	4.0	353.8	361.4	3.81	39.78
1086.0	2.00	4.0	350.2	357.8	3.80	39.74
1092.0	2.00	4.0	346.7	354.2	3.78	39.70
1098.0	2.00	4.0	343.1	350.7	3.76	39.66
1104.0	2.00	4.0	339.6	347.1	3.75	39.62
1110.0	2.00	4.0	336.2	343.6	3.73	39.58
1116.0	1.00	3.0	331.8	339.2	3.71	39.53
1122.0	1.00	2.0	326.4	333.8	3.68	39.46
1128.0	1.00	2.0	321.1	328.4	3.66	39.39
1134.0	1.00	2.0	315.8	323.1	3.63	39.33
1140.0	1.00	2.0	310.6	317.8	3.60	39.26
1146.0	1.00	2.0	305.4	312.6	3.58	39.19
1152.0	1.00	2.0	300.3	307.4	3.55	39.13
1158.0	1.00	2.0	295.3	302.3	3.53	39.07
1164.0	1.00	2.0	290.3	297.3	3.50	39.00
1170.0	1.00	2.0	285.4	292.3	3.46	38.93
1176.0	1.00	2.0	280.5	287.4	3.42	38.87
1182.0	1.00	2.0	275.8	282.5	3.38	38.80
1188.0	1.00	2.0	271.1	277.8	3.34	38.74
1194.0	1.00	2.0	266.5	273.1	3.30	38.67
1200.0	1.00	2.0	261.9	268.5	3.27	38.61

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF25OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	1.00	2.0	257.5	263.9	3.23	38.55
1212.0	1.00	2.0	253.1	259.5	3.19	38.49
1218.0	1.00	2.0	248.8	255.1	3.15	38.42
1224.0	1.00	2.0	244.6	250.8	3.11	38.36
1230.0	1.00	2.0	240.4	246.6	3.08	38.29
1236.0	1.00	2.0	236.3	242.4	3.04	38.23
1242.0	1.00	2.0	232.3	238.3	3.00	38.17
1248.0	1.00	2.0	228.4	234.3	2.97	38.11
1254.0	1.00	2.0	224.5	230.4	2.93	38.05
1260.0	1.00	2.0	220.7	226.5	2.90	37.99
1266.0	1.00	2.0	217.0	222.7	2.86	37.93
1272.0	1.00	2.0	213.4	219.0	2.82	37.87
1278.0	1.00	2.0	209.8	215.4	2.79	37.81
1284.0	1.00	2.0	206.3	211.8	2.75	37.76
1290.0	1.00	2.0	202.9	208.3	2.72	37.70
1296.0	1.00	2.0	199.5	204.9	2.69	37.64
1302.0	1.00	2.0	196.2	201.5	2.65	37.59
1308.0	1.00	2.0	192.9	198.2	2.62	37.53
1314.0	1.00	2.0	189.8	194.9	2.58	37.48
1320.0	1.00	2.0	186.7	191.8	2.54	37.42
1326.0	1.00	2.0	183.7	188.7	2.49	37.37
1332.0	1.00	2.0	180.8	185.7	2.45	37.32
1338.0	1.00	2.0	178.0	182.8	2.41	37.26
1344.0	1.00	2.0	175.2	180.0	2.37	37.21
1350.0	1.00	2.0	172.6	177.2	2.33	37.17
1356.0	1.00	2.0	170.0	174.6	2.29	37.12
1362.0	1.00	2.0	167.5	172.0	2.26	37.07
1368.0	1.00	2.0	165.0	169.5	2.22	37.03
1374.0	1.00	2.0	162.7	167.0	2.19	36.98
1380.0	1.00	2.0	160.4	164.7	2.15	36.94
1386.0	1.00	2.0	158.1	162.4	2.11	36.89
1392.0	1.00	2.0	156.0	160.1	2.08	36.85
1398.0	1.00	2.0	153.9	158.0	2.05	36.81
1404.0	1.00	2.0	151.9	155.9	2.01	36.77
1410.0	1.00	2.0	149.9	153.9	1.98	36.73
1416.0	1.00	2.0	148.0	151.9	1.95	36.69
1422.0	1.00	2.0	146.2	150.0	1.92	36.65
1428.0	1.00	2.0	144.4	148.2	1.89	36.61
1434.0	1.00	2.0	142.6	146.4	1.86	36.58
1440.0	0.00	1.0	140.0	143.6	1.82	36.53
1446.0	0.00	0.0	136.5	140.0	1.73	36.45
1452.0	0.00	0.0	133.3	136.5	1.63	36.38
1458.0	0.00	0.0	130.2	133.3	1.53	36.31
1464.0	0.00	0.0	127.3	130.2	1.44	36.24
1470.0	0.00	0.0	124.6	127.3	1.36	36.18
1476.0	0.00	0.0	122.1	124.6	1.28	36.13

EXECUTED: 01-24-1998 14:24:20 Return Freq: 25 years

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF25OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	119.7	122.1	1.20	36.07
1488.0	0.00	0.0	117.4	119.7	1.13	36.02
1494.0	0.00	0.0	115.3	117.4	1.06	35.97
1500.0	0.00	0.0	113.3	115.3	0.99	35.92
1506.0	0.00	0.0	111.5	113.3	0.92	35.87
1512.0	0.00	0.0	109.7	111.5	0.86	35.83
1518.0	0.00	0.0	108.1	109.7	0.81	35.79
1524.0	0.00	0.0	106.6	108.1	0.75	35.75
1530.0	0.00	0.0	105.2	106.6	0.70	35.72
1536.0	0.00	0.0	103.9	105.2	0.66	35.68
1542.0	0.00	0.0	102.7	103.9	0.61	35.65
1548.0	0.00	0.0	101.5	102.7	0.57	35.62
1554.0	0.00	0.0	100.4	101.5	0.54	35.60

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

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C25FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF25OUT .HYD

Starting Pond W.S. Elevation = 30.50 ft

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

Peak Inflow = 85.00 cfs
Peak Outflow = 9.41 cfs
Peak Elevation = 41.73 ft

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 2.27 ac-ft

Total Storage in Pond = 2.27 ac-ft

Warning: Inflow hydrograph truncated on left side.

```
****************
*              *
*  STONEHOUSE  *
*   SWMF VI-A  *
*              *
*              *
*              *
****************
```

Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Rating Table file: c:\96038\bmps\C .PND

----INITIAL CONDITIONS----
Elevation = 30.50 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
30.50	0.0	0.000
31.00	0.1	0.008
31.50	0.2	0.021
32.00	0.2	0.040
32.50	0.2	0.065
33.00	0.3	0.099
33.50	0.3	0.141
34.00	0.3	0.194
34.50	0.3	0.255
35.00	0.3	0.324
35.50	0.4	0.401
36.00	1.1	0.486
36.50	1.8	0.580
37.00	2.2	0.685
37.50	2.6	0.800
38.00	2.9	0.925
38.50	3.2	1.063
39.00	3.5	1.213
39.50	3.7	1.377
40.00	3.9	1.554
40.50	4.1	1.745
41.00	4.4	1.946
41.50	4.5	2.160
42.00	15.0	2.386
42.50	40.0	2.624
43.00	60.0	2.873
43.50	85.7	3.135
44.00	116.1	3.409

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
2.0	2.1
5.1	5.3
9.7	9.9
15.8	16.0
23.9	24.2
34.2	34.5
46.9	47.2
61.7	62.0
78.4	78.7
97.0	97.4
117.6	118.7
140.4	142.2
165.7	167.9
193.5	196.1
223.9	226.8
257.3	260.5
293.6	297.1
333.2	336.9
376.2	380.1
422.2	426.3
471.0	475.4
522.7	527.2
577.3	592.3
634.9	674.9
695.3	755.3
758.7	844.4
825.1	941.2

Time increment (t) = 6.0 min.

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF100OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	3.00	-----	0.0	0.0	0.00	30.50
666.0	3.00	6.0	5.6	6.0	0.20	31.58
672.0	4.00	7.0	12.2	12.6	0.20	32.22
678.0	4.00	8.0	19.7	20.2	0.25	32.75
684.0	5.00	9.0	28.1	28.7	0.30	33.22
690.0	5.00	10.0	37.5	38.1	0.30	33.64
696.0	6.00	11.0	47.9	48.5	0.30	34.04
702.0	17.00	23.0	70.3	70.9	0.30	34.77
708.0	29.00	46.0	114.3	116.3	1.02	35.94
714.0	40.00	69.0	178.4	183.3	2.42	37.27
720.0	77.00	117.0	288.4	295.4	3.49	38.98
726.0	119.00	196.0	475.6	484.4	4.42	41.09
732.0	74.00	193.0	592.4	668.6	38.10	42.46
738.0	26.00	100.0	603.7	692.4	44.36	42.61
744.0	17.00	43.0	583.8	646.7	31.46	42.33
750.0	15.00	32.0	571.6	615.8	22.10	42.14
756.0	12.00	27.0	564.8	598.6	16.89	42.04
762.0	10.00	22.0	558.6	586.8	14.11	41.96
768.0	9.00	19.0	552.3	577.6	12.62	41.89
774.0	8.00	17.0	546.8	569.3	11.29	41.82
780.0	8.00	16.0	542.3	562.8	10.23	41.77
786.0	8.00	16.0	539.3	558.3	9.51	41.74
792.0	7.00	15.0	536.6	554.3	8.86	41.71
798.0	6.00	13.0	533.4	549.6	8.10	41.67
804.0	6.00	12.0	530.5	545.4	7.42	41.64
810.0	6.00	12.0	528.6	542.5	6.96	41.62
816.0	5.00	11.0	526.6	539.6	6.49	41.59
822.0	5.00	10.0	524.6	536.6	6.01	41.57
828.0	5.00	10.0	523.2	534.6	5.69	41.56
834.0	4.00	9.0	521.6	532.2	5.30	41.54
840.0	4.00	8.0	519.8	529.6	4.88	41.52
846.0	4.00	8.0	518.6	527.8	4.60	41.50
852.0	4.00	8.0	517.6	526.6	4.50	41.49
858.0	4.00	8.0	516.6	525.6	4.50	41.48
864.0	4.00	8.0	515.6	524.6	4.50	41.48
870.0	4.00	8.0	514.7	523.6	4.49	41.47
876.0	4.00	8.0	513.7	522.7	4.49	41.46
882.0	4.00	8.0	512.7	521.7	4.49	41.45
888.0	4.00	8.0	511.7	520.7	4.49	41.44
894.0	3.00	7.0	509.8	518.7	4.48	41.42
900.0	3.00	6.0	506.8	515.8	4.48	41.39
906.0	3.00	6.0	503.9	512.8	4.47	41.36
912.0	3.00	6.0	500.9	509.9	4.47	41.33
918.0	3.00	6.0	498.0	506.9	4.46	41.30
924.0	3.00	6.0	495.1	504.0	4.46	41.28

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF100OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	3.00	6.0	492.2	501.1	4.45	41.25
936.0	3.00	6.0	489.3	498.2	4.44	41.22
942.0	3.00	6.0	486.4	495.3	4.44	41.19
948.0	3.00	6.0	483.6	492.4	4.43	41.16
954.0	3.00	6.0	480.7	489.6	4.43	41.14
960.0	3.00	6.0	477.9	486.7	4.42	41.11
966.0	3.00	6.0	475.0	483.9	4.42	41.08
972.0	3.00	6.0	472.2	481.0	4.41	41.05
978.0	2.00	5.0	468.4	477.2	4.40	41.02
984.0	2.00	4.0	463.6	472.4	4.38	40.97
990.0	2.00	4.0	458.9	467.6	4.35	40.92
996.0	2.00	4.0	454.3	462.9	4.32	40.87
1002.0	2.00	4.0	449.7	458.3	4.30	40.83
1008.0	2.00	4.0	445.2	453.7	4.27	40.78
1014.0	2.00	4.0	440.7	449.2	4.24	40.73
1020.0	2.00	4.0	436.3	444.7	4.21	40.69
1026.0	2.00	4.0	431.9	440.3	4.19	40.64
1032.0	2.00	4.0	427.6	435.9	4.16	40.60
1038.0	2.00	4.0	423.3	431.6	4.13	40.55
1044.0	2.00	4.0	419.1	427.3	4.11	40.51
1050.0	2.00	4.0	414.9	423.1	4.09	40.47
1056.0	2.00	4.0	410.8	418.9	4.07	40.42
1062.0	2.00	4.0	406.7	414.8	4.05	40.38
1068.0	2.00	4.0	402.6	410.7	4.03	40.33
1074.0	2.00	4.0	398.6	406.6	4.01	40.29
1080.0	2.00	4.0	394.6	402.6	4.00	40.24
1086.0	2.00	4.0	390.6	398.6	3.98	40.20
1092.0	2.00	4.0	386.7	394.6	3.96	40.16
1098.0	2.00	4.0	382.8	390.7	3.95	40.12
1104.0	2.00	4.0	379.0	386.8	3.93	40.07
1110.0	2.00	4.0	375.1	383.0	3.91	40.03
1116.0	2.00	4.0	371.3	379.1	3.90	39.99
1122.0	2.00	4.0	367.6	375.3	3.88	39.95
1128.0	2.00	4.0	363.9	371.6	3.86	39.90
1134.0	2.00	4.0	360.2	367.9	3.84	39.86
1140.0	2.00	4.0	356.5	364.2	3.83	39.82
1146.0	2.00	4.0	352.9	360.5	3.81	39.77
1152.0	2.00	4.0	349.3	356.9	3.79	39.73
1158.0	2.00	4.0	345.8	353.3	3.78	39.69
1164.0	2.00	4.0	342.3	349.8	3.76	39.65
1170.0	2.00	4.0	338.8	346.3	3.74	39.61
1176.0	2.00	4.0	335.3	342.8	3.73	39.57
1182.0	2.00	4.0	331.9	339.3	3.71	39.53
1188.0	2.00	4.0	328.5	335.9	3.69	39.49
1194.0	2.00	4.0	325.1	332.5	3.68	39.44
1200.0	2.00	4.0	321.8	329.1	3.66	39.40

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF100OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	2.00	4.0	318.5	325.8	3.64	39.36
1212.0	2.00	4.0	315.3	322.5	3.63	39.32
1218.0	2.00	4.0	312.1	319.3	3.61	39.28
1224.0	2.00	4.0	308.9	316.1	3.60	39.24
1230.0	2.00	4.0	305.7	312.9	3.58	39.20
1236.0	2.00	4.0	302.6	309.7	3.56	39.16
1242.0	2.00	4.0	299.5	306.6	3.55	39.12
1248.0	2.00	4.0	296.4	303.5	3.53	39.08
1254.0	2.00	4.0	293.4	300.4	3.52	39.04
1260.0	2.00	4.0	290.4	297.4	3.50	39.00
1266.0	1.00	3.0	286.4	293.4	3.47	38.95
1272.0	1.00	2.0	281.6	288.4	3.43	38.88
1278.0	1.00	2.0	276.8	283.6	3.39	38.82
1284.0	1.00	2.0	272.1	278.8	3.35	38.75
1290.0	1.00	2.0	267.5	274.1	3.31	38.69
1296.0	1.00	2.0	262.9	269.5	3.27	38.62
1302.0	1.00	2.0	258.5	264.9	3.24	38.56
1308.0	1.00	2.0	254.1	260.5	3.20	38.50
1314.0	1.00	2.0	249.7	256.1	3.16	38.43
1320.0	1.00	2.0	245.5	251.7	3.12	38.37
1326.0	1.00	2.0	241.3	247.5	3.08	38.31
1332.0	1.00	2.0	237.2	243.3	3.05	38.25
1338.0	1.00	2.0	233.2	239.2	3.01	38.18
1344.0	1.00	2.0	229.3	235.2	2.97	38.12
1350.0	1.00	2.0	225.4	231.3	2.94	38.07
1356.0	1.00	2.0	221.6	227.4	2.90	38.01
1362.0	1.00	2.0	217.8	223.6	2.87	37.95
1368.0	1.00	2.0	214.2	219.8	2.83	37.89
1374.0	1.00	2.0	210.6	216.2	2.80	37.83
1380.0	1.00	2.0	207.1	212.6	2.76	37.77
1386.0	1.00	2.0	203.6	209.1	2.73	37.71
1392.0	1.00	2.0	200.2	205.6	2.69	37.65
1398.0	1.00	2.0	196.9	202.2	2.66	37.60
1404.0	1.00	2.0	193.7	198.9	2.63	37.55
1410.0	1.00	2.0	190.5	195.7	2.59	37.49
1416.0	1.00	2.0	187.4	192.5	2.55	37.44
1422.0	1.00	2.0	184.4	189.4	2.50	37.38
1428.0	1.00	2.0	181.4	186.4	2.46	37.33
1434.0	1.00	2.0	178.6	183.4	2.42	37.28
1440.0	0.00	1.0	174.9	179.6	2.37	37.21
1446.0	0.00	0.0	170.3	174.9	2.30	37.12
1452.0	0.00	0.0	165.8	170.3	2.23	37.04
1458.0	0.00	0.0	161.5	165.8	2.17	36.96
1464.0	0.00	0.0	157.3	161.5	2.10	36.87
1470.0	0.00	0.0	153.2	157.3	2.03	36.79
1476.0	0.00	0.0	149.3	153.2	1.97	36.71

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF100OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	145.4	149.3	1.91	36.64
1488.0	0.00	0.0	141.7	145.4	1.85	36.56
1494.0	0.00	0.0	138.2	141.7	1.78	36.49
1500.0	0.00	0.0	134.8	138.2	1.68	36.41
1506.0	0.00	0.0	131.7	134.8	1.58	36.34
1512.0	0.00	0.0	128.7	131.7	1.49	36.28
1518.0	0.00	0.0	125.9	128.7	1.40	36.21
1524.0	0.00	0.0	123.3	125.9	1.31	36.15
1530.0	0.00	0.0	120.8	123.3	1.24	36.10
1536.0	0.00	0.0	118.5	120.8	1.16	36.04
1542.0	0.00	0.0	116.3	118.5	1.09	35.99
1548.0	0.00	0.0	114.2	116.3	1.02	35.94
1554.0	0.00	0.0	112.3	114.2	0.95	35.90

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

Pond File: c:\96038\bmps\C .PND
Inflow Hydrograph: c:\96038\bmps\C100FU .HYD
Outflow Hydrograph: c:\96038\bmps\CF100OUT.HYD

Starting Pond W.S. Elevation = 30.50 ft

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

Peak Inflow = 119.00 cfs
Peak Outflow = 44.36 cfs
Peak Elevation = 42.61 ft

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 2.68 ac-ft

Total Storage in Pond = 2.68 ac-ft

Warning: Inflow hydrograph truncated on left side.

Culvert Calculator Report
Worksheet-7

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	44.00	ft	Headwater Depth/ Height	8.74	
Computed Headwater Elevation	42.91	ft	Discharge	29.50	cfs
Inlet Control HW Elev	41.87	ft	Tailwater Elevation	29.00	ft
Outlet Control HW Elev	42.91	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	29.80	ft	Downstream Invert	27.00	ft
Length	94.00	ft	Constructed Slope	0.029787	ft/ft

Hydraulic Profile					
Profile	Pressure		Depth, Downstream	2.00	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	1.49	ft
Velocity Downstream	16.69	ft/s	Critical Slope	0.074478	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	42.91	ft	Upstream Velocity Head	4.33	ft
Ke	0.50		Entrance Loss	2.17	ft

Inlet Control Properties					
Inlet Control HW Elev	41.87	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Rating Table Report
Worksheet-7

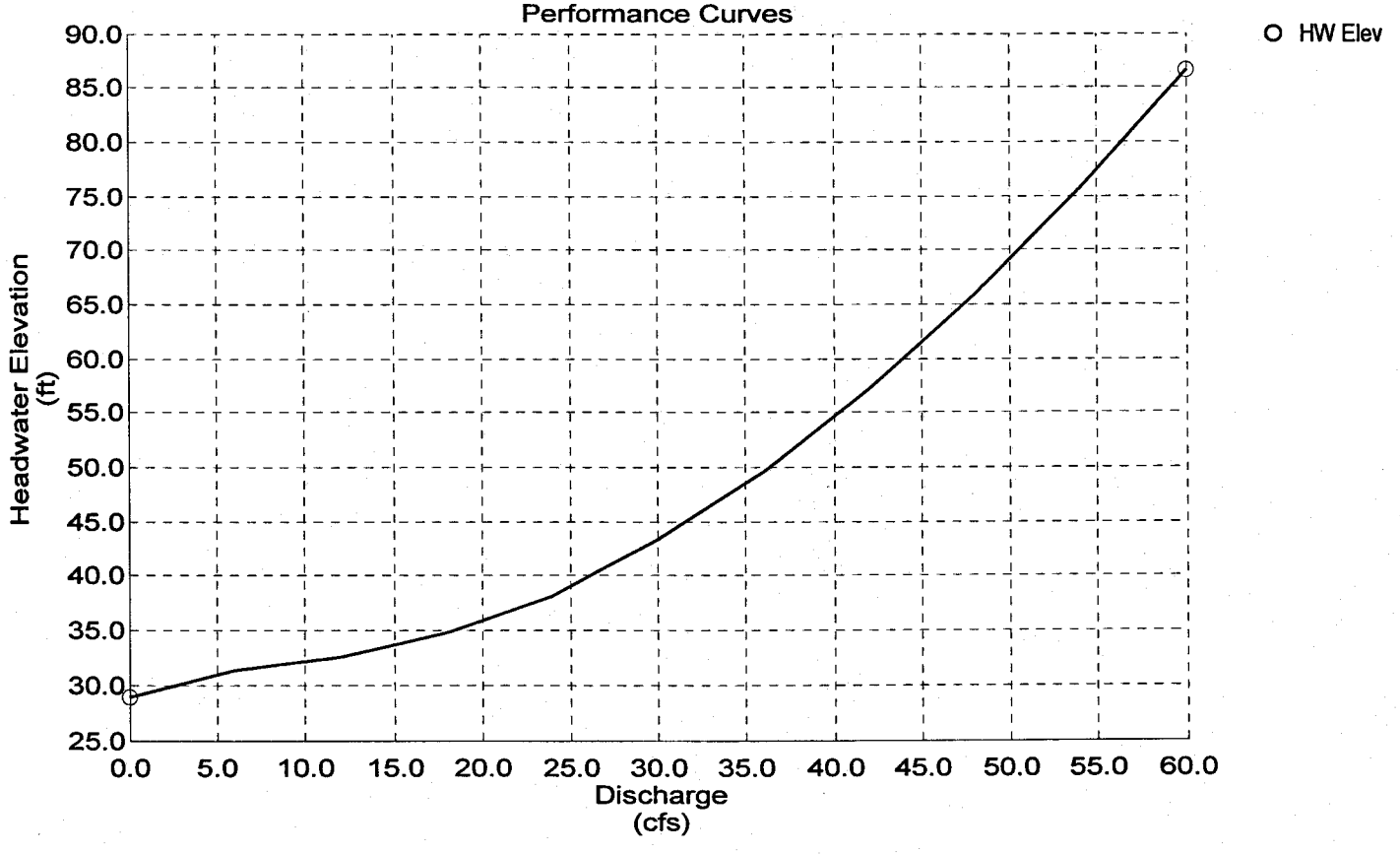
Range Data:

	Minimum	Maximum	Increment
Discharge	0.00	60.00	6.00 cfs

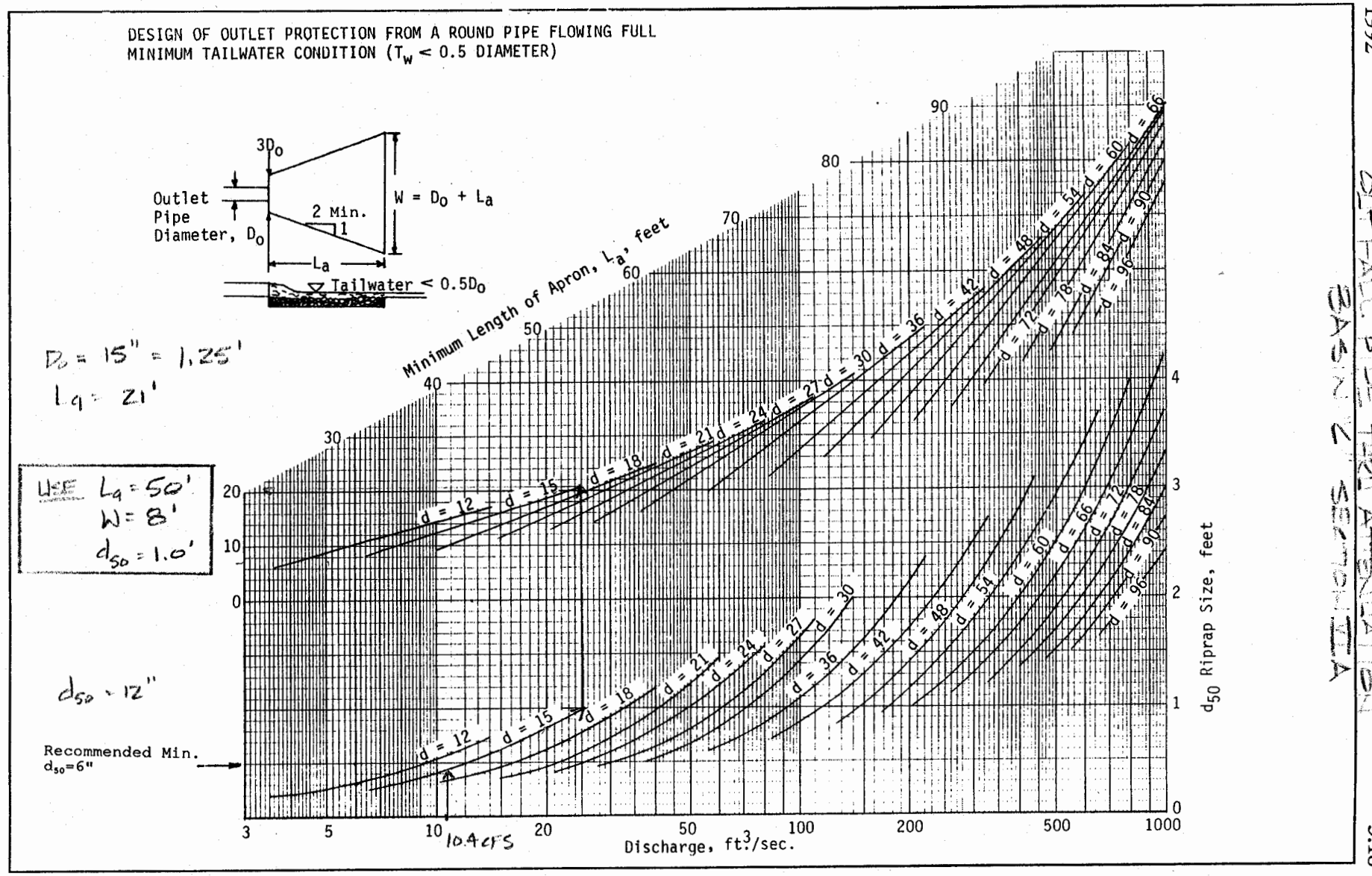
Discharge (cfs)	HW Elev (ft)
0.00	29.00
6.00	31.35
12.00	32.62
18.00	34.91
24.00	38.21
30.00	43.39
36.00	49.72
42.00	57.20
48.00	65.83
54.00	75.61
60.00	86.54

Performance Curves Report
Worksheet-7

Range Data:			
	Minimum	Maximum	Increment
Discharge	0.00	60.00	6.00 cfs



OUTFALL PIPE TRIBUTARY BASIN 2 SECTION A



Source: USDA-SCS

Plate 3.18-3

use 6' min

STONEHOUSE SECTION VIA
ROAD FILL SEDIMENT TRAP

Catchment Area :	0.45	Acres		Side Slope Z:1	2
Length of Weir ;	2.7	feet		Contour Interval :	1
Req'd. Wet Volume :	30	cubic yards	814	cubic feet	
Req'd. Dry Volume :	30	cubic yards	814	cubic feet	
Wet storage Depth :	2	feet	Approx. Bottom Area :	407	sq. ft.

Elevation	Length feet	Width feet	Fillet Radius feet	Area square feet	Inc.Volume cubic feet	Accumlated Volume cubic feet	cubic yards
55	30	12	2	357			
56	34	16	4	530	443	443	16
57	38	20	6	729	630	1073	40
58	42	24	8	953	841	1914	71
59	46	28	10	1202	1078	2992	111

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

Subject SECTION IIIA
SEDIMENT TRAP DESIGN
Computed By _____ Checked By _____

Project No. 96038-0652
Client STONEHOUSE L.L.C.
Date 1/25/98 Sheet No. 1

SEDIMENT TRAP NEAR STORMWATER ATTENUATION BASIN

CATCHMENT AREA : 1.28 Ac
LENGTH OF WEIR = 6(1.28) = 7.68 USE 8.0'
REQ'D WET VOLUME = 86 C.Y. = 2322 C.F.
REQ'D DRY VOLUME = 86 C.Y. = 2322 C.F
WET STORAGE DEPTH = 3 FT
APPROX. BOTTOM AREA = 479 S.F.

SIDE SLOPE : 2:1
CONTOUR INT. : 1

ELEVATION	LENGTH (FEET)	WIDTH (FEET)	FILLET RADIUS (FEET)	AREA (SQ. FT.)	INC. VOLUME (C.F)	ACCUMULATED VOLUME (C.F.)	C.Y.
42	29.7	27.4	2	479			
43	31.7	31.4	4	677	578	578	21.4
44	33.7	35.4	6	901	789	1367	50.6
45	35.7	39.4	8	1150	1025	2392	88.6
46	37.7	43.4	10	1424	1287	3679	136.3
47	39.7	47.4	12	1723	1573	5252	194.5
48	41.7	51.4	14	2047	1885	7137	264.3

FILE: SH VI-A
LANGLEY and McDONALD, P.C.
201 Packets Court
Williamsburg, Virginia 23185

PAVEMENT DESIGN
VHRC 73-R21

PROJECT: STONEHOUSE SETION VI-A
LOCATION: James City Co., Virginia
STREET: MAIN ROAD
FROM STA. 10+00 TO STA.
DATE: 29-Aug-97

TRAFFIC ANALYSIS

1. Vehicles Per Day = 340
2. % Heavy Traffic = 5 %
3. Equiv. Present ADT = 340
4. Design Period 10 Yrs.
5. % Growth = 0 %
6. Growth Factor = 1.00
7. V.P.D. Projection = 340 ADT

SUBGRADE ANALYSIS

1. CBR Values = 10.00 0 0.00 0.00 0.00
2. Enter No. of Tests = 1
3. Average CBR = 10.00
4. Design CBR = 6.67
5. Soil Resiliency Factor = 3.00
6. Soil Support Value = 20.01

PAVEMENT DESIGN

1. Thickness Index Required = 9.0 inches
2. Design

ALT. 'A'

Material	Factor	Thickness	Index	% Asphalt
SM-2A	1.67	2.0	3.3	0.29
Aggregate	1.00	8.0	8.0	
Sel. Material	0.60	0.0	0.0	
TOTAL		10.0	11.3	0.29

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) 259-4116

September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

Re: Stonehouse Section 6A Hollow Oak, Phase I
Dry Pond at Common Area CA9
County BMP ID Code: WC 040

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

Based on our review of information as submitted and a concurrent field observation as performed on August 27th 2001, the following items must be addressed for the basin at **Hollow Oak, Common Area CA9 (WC 040)** prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated November 15th 2000 is **satisfactory**.

Record Drawing:

2. Add the detention basin outlet structure detail as provided on Sheet 11 of the approved plan set to the as-built (record) drawing for the facility. This detai, entitled "Stormwater Attentuation Basin C Section B-B", provides important information about the facility. Annotate the detail as necessary with field-obtained construction information.

3. Show the following additional information on the record drawing: north arrow; type and size of the riser structure; size of the higher level (dewatering) orifice with the turn-down tee; pond drain and valve present; and street address on Lot 19 as 3132 Hollow Oak Drive.

4. Show information for the inlet and storm drain system located at the end of the cul-de-sac at Hollow Oak Drive (near Lots 18/19). This portion of the storm drain system is labeled on the approved plan as Structure Q16 with a single 15-inch storm drain pipe which conveys flow back to Inlet Structure Q3 (at Lot 20/21). This system should be shown on the as-built to clarify drainage from this inlet flows back to the primary storm drain system rather than directly to the BMP. Information on this system should also be shown to confirm proper construction since this inlet/storm drain is at a critical location for drainage and was designed with minimal slope.

5. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-84-97 and BMP ID No. WC 040.

Construction-Related Items:

6. Remove silt fence present along upstream and downstream embankments.

7. Bare soil areas covered approximately 60 percent of the downstream embankment (slope) and rill erosion was starting to form. Seed and mulch all bare soil areas on the embankment to establish acceptable grass stabilization on the downstream pond embankment slope.

8. Clean and remove all dead wood debris from within the BMP pool area, especially along the west and east shorelines and at the back of the facility.

9. Clean and remove accumulated sediment and debris in the vicinity of the upstream end of the low flow orifice. Sediment and debris was measured approximately 2' to 3' deep at this location. The low flow orifice for this structure is an 8-inch ductile iron pipe which extends out northward from the riser to an EW-11 endwall structure which serves as a trash rack protection device. Flow into the low flow orifice must not be obstructed.

10. Appurtenances within the pond riser structure need minor correction for final conversion to permanent BMP mode. The low flow drain within the riser appeared plugged with a boot and should be open to serve as the low level BMP orifice. The drain with the valve at its end should be in a closed position (to serve as a future drain in case of failure of the low flow orifice); however, the valve appeared open or leaking. Final configuration should be per details shown on Sheet 11 of the approved plan (Stormwater Attenuation Basin C Section B-B).

11. Clean and remove sediment (6" to 8" deep) at the outfall end of the 18-inch barrel through the embankment. Flow out of the pond must not be obstructed by sediment or vegetation.

12. Clean and remove debris and sediment from within the stilling basin at the outfall end of the 30-inch pipe located between Lots 20 and 21(ie. at storm drain structure Q1). Sediment was 2' to 4' deep at this location. In addition, debris and wood obstructions were restricting positive drainage along the natural channel from this outfall structure (at Q1) downstream to the BMP area. By hand methods, clear and remove debris and channel obstructions between the primary outfall storm drain and the BMP.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

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

cc: James H. Bennett (fax)

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) 259-4116

September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

Re: Stonehouse Section 6A Hollow Oak, Phase I
Dry Pond at Common Area CA9
County BMP ID Code: WC 040

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

Based on our review of information as submitted and a concurrent field observation as performed on August 27th 2001, the following items must be addressed for the basin at **Hollow Oak, Common Area CA9 (WC 040)** prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated November 15th 2000 is **satisfactory**.

Record Drawing:

2. Add the detention basin outlet structure detail as provided on Sheet 11 of the approved plan set to the as-built (record) drawing for the facility. This detai, entitled "Stormwater Attentuation Basin C Section B-B", provides important information about the facility. Annotate the detail as necessary with field-obtained construction information.

3. Show the following additional information on the record drawing: north arrow; type and size of the riser structure; size of the higher level (dewatering) orifice with the turn-down tee; pond drain and valve present; and street address on Lot 19 as 3132 Hollow Oak Drive.

4. Show information for the inlet and storm drain system located at the end of the cul-de-sac at Hollow Oak Drive (near Lots 18/19). This portion of the storm drain system is labeled on the approved plan as Structure Q16 with a single 15-inch storm drain pipe which conveys flow back to Inlet Structure Q3 (at Lot 20/21). This system should be shown on the as-built to clarify drainage from this inlet flows back to the primary storm drain system rather than directly to the BMP. Information on this system should also be shown to confirm proper construction since this inlet/storm drain is at a critical location for drainage and was designed with minimal slope.

5. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-84-97 and BMP ID No. WC 040.

Construction-Related Items:

6. Remove silt fence present along upstream and downstream embankments.

7. Bare soil areas covered approximately 60 percent of the downstream embankment (slope) and rill erosion was starting to form. Seed and mulch all bare soil areas on the embankment to establish acceptable grass stabilization on the downstream pond embankment slope.

8. Clean and remove all dead wood debris from within the BMP pool area, especially along the west and east shorelines and at the back of the facility.

9. Clean and remove accumulated sediment and debris in the vicinity of the upstream end of the low flow orifice. Sediment and debris was measured approximately 2' to 3' deep at this location. The low flow orifice for this structure is an 8-inch ductile iron pipe which extends out northward from the riser to an EW-11 endwall structure which serves as a trash rack protection device. Flow into the low flow orifice must not be obstructed.

10. Appurtenances within the pond riser structure need minor correction for final conversion to permanent BMP mode. The low flow drain within the riser appeared plugged with a boot and should be open to serve as the low level BMP orifice. The drain with the valve at its end should be in a closed position (to serve as a future drain in case of failure of the low flow orifice); however, the valve appeared open or leaking. Final configuration should be per details shown on Sheet 11 of the approved plan (Stormwater Attenuation Basin C Section B-B).

11. Clean and remove sediment (6" to 8" deep) at the outfall end of the 18-inch barrel through the embankment. Flow out of the pond must not be obstructed by sediment or vegetation.

12. Clean and remove debris and sediment from within the stilling basin at the outfall end of the 30-inch pipe located between Lots 20 and 21(ie. at storm drain structure Q1). Sediment was 2' to 4' deep at this location. In addition, debris and wood obstructions were restricting positive drainage along the natural channel from this outfall structure (at Q1) downstream to the BMP area. By hand methods, clear and remove debris and channel obstructions between the primary outfall storm drain and the BMP.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

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

cc: James H. Bennett (fax)

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) 259-4116

September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

✓ Reinspect 4-14-03
Reinspect 7-7-03

Re: Stonehouse Section 6A Hollow Oak, Phase I
Dry Pond at Common Area CA9
County BMP ID Code: WC 040

5-84-97
5-55-98

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

Based on our review of information as submitted and a concurrent field observation as performed on August 27th 2001, the following items must be addressed for the basin at **Hollow Oak, Common Area CA9 (WC 040)** prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated November 15th 2000 is **satisfactory**.

Record Drawing:

2-24-03 OK ✓

2. Add the detention basin outlet structure detail as provided on Sheet 11 of the approved plan set to the as-built (record) drawing for the facility. This detai, entitled "Stormwater Attentuation Basin C Section B-B", provides important information about the facility. Annotate the detail as necessary with field-obtained construction information.

ALL APPLY

2-24-03 OK ✓

3. Show the following additional information on the record drawing: north arrow; type and size of the riser structure; size of the higher level (dewatering) orifice with the turn-down tee; pond drain and valve present; and street address on Lot 19 as 3132 Hollow Oak Drive.

2-24-03 OK ✓

4. Show information for the inlet and storm drain system located at the end of the cul-de-sac at Hollow Oak Drive (near Lots 18/19). This portion of the storm drain system is labeled on the approved plan as Structure Q16 with a single 15-inch storm drain pipe which conveys flow back to Inlet Structure Q3 (at Lot 20/21). This system should be shown on the as-built to clarify drainage from this inlet flows back to the primary storm drain system rather than directly to the BMP. Information on this system should also be shown to confirm proper construction since this inlet/storm drain is at a critical location for drainage and was designed with minimal slope.

5. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-84-97 and BMP ID No. WC 040.

Construction-Related Items:

6. Remove silt fence present along upstream and downstream embankments. ✓ OK 7-7-03 SE

7. Bare soil areas covered approximately 60 percent of the downstream embankment (slope) and rill erosion was starting to form. Seed and mulch all bare soil areas on the embankment to establish acceptable grass stabilization on the downstream pond embankment slope. MOW O/S FACE DAM, CUT PINES 2-4' High ✓ OK 7-7-03

8. ✓ 4-14-03 Clean and remove all dead wood debris from within the BMP pool area, especially along the west and east shorelines and at the back of the facility. ✓ OK

9. Needs cleaned Clean and remove accumulated sediment and debris in the vicinity of the upstream end of the low flow orifice. Sediment and debris was measured approximately 2' to 3' deep at this location. The low flow orifice for this structure is an 8-inch ductile iron pipe which extends out northward from the riser to an EW-11 endwall structure which serves as a trash rack protection device. Flow into the low flow orifice must not be obstructed. OK 7-7-03 ✓ OK 7-7-03 Some mud, Ask to recleaned

10. ✓ 4-14-03 OK Appurtenances within the pond riser structure need minor correction for final conversion to permanent BMP mode. The low flow drain within the riser appeared plugged with a boot and should be open to serve as the low level BMP orifice. The drain with the valve at its end should be in a closed position (to serve as a future drain in case of failure of the low flow orifice); however, the valve appeared open or leaking. Final configuration should be per details shown on Sheet 11 of the approved plan (Stormwater Attenuation Basin & Section B-B). ✓ OK 4-14-03 ✓ OK - 7-7-03

11. Clean and remove sediment (6" to 8" deep) at the outfall end of the 18-inch barrel through the embankment. Flow out of the pond must not be obstructed by sediment or vegetation. 7-7-03

12. NOT DONE Clean and remove debris and sediment from within the stilling basin at the outfall end of the 30-inch pipe located between Lots 20 and 21(ie. at storm drain structure Q1). Sediment was 2' to 4' deep at this location. In addition, debris and wood obstructions were restricting positive drainage along the natural channel from this outfall structure (at Q1) downstream to the BMP area. By hand methods, clear and remove debris and channel obstructions between the primary outfall storm drain and the BMP. OK 7-7-03 REOPEN CHANNEL, OD

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

Scott J. Thomas

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

cc: James H. Bennett (fax)

Scott - 11/20
For Review
Daryl

LANDMARK DESIGN GROUP
TRANSMITTAL

NOV 2000
RECEIVED
ENVIRONMENTAL DIVISION

To: DARYL COOKE

Company: JAMES CITY CO. ENVIRONMENTAL

From: PETER FARRELL

Date: 11/16/00

Subject: STORMWATER POND RECORD DRAWINGS FOR STONEHOUSE

LMDG Job No.: 1990131-000.46

Attached please find:
- X Prints
- ☐ Plans
- ☐ Specifications
- ☐ Drawings
- ☐ Report
- ☐ Letter
- ☐

Transmitted as checked below:
- ☐ For your use
- ☐ As requested
- X For review and comment
- ☐ For approval
- ☐ Approved
- ☐

Copies	Date	Drawing No.	Description
2 EA. 12 TOTAL	11/16/00	11680-11686	RECORD DRAWINGS FOR VARIOUS STORMWATER PONDS AT STONEHOUSE
			WC 037, WC 038, WC 039, WC 040
			WC 041, WC 042, WC 043

Notes: LETTERS OF CERTIFICATION FROM DICK PHILLIPS, P.E. ARE BEING SENT TO YOU SEPERATELY

Copies	Enclosures
1. File:	☐
2.	☐
3.	☐
4.	☐
5.	☐

LandMark Design Group, Inc.

By: PF

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

Larry S. Barry, P.E., President
Norman H. Mason, L.S., Vice Pres.
Vaughn B. Rinner, C.L.A.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.

LANDMARK DESIGN GROUP

Clayton E. Massey, P.E.
Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Mark W. Strickland, P.E.
A. Gary Webb, P.E.

NOV 2000
RECEIVED
ENVIRONMENTAL DIVISION

November 15, 2000

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

Re: Stonehouse Development Co., L.L.C.
BMP Basin Construction Certificate
Section VIA, Phase 1, Hollow Oak
J.C.C. Case No. S-84-97

Dear Darryl:

This is to confirm that periodic inspection was provided by me and persons under my supervision during the progress of construction of the subject storm water management basin. To the best of my knowledge and judgment, the structure has been constructed in accordance with the approved plans and specifications.

Should you have any questions or wish to discuss this further, please call.

Very truly yours,
The LandMark Design Group Inc.

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

Richard S. Phillips, P.E.
Senior Associate

RSP/cjp

Cc: Brandon Forrest
File 1990131-000.46

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

Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

S-84-97
EPIN 04401 00024

Database Inventory No. (if known): WC 040

Name of Facility: STONEHOUSE SEC 6A Hollow OAK BMP No.: 1 of 1 Date: 08/27/01

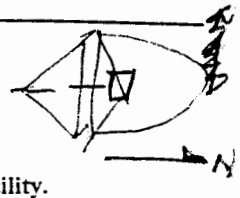
Location: West of 3132 Hollow OAK Drive (LOT 20)

Name of Owner: Stonehouse Development LLC

Inspector: SJ Thomas

Type of Facility: Dry Ext Det.

Weather Conditions: Sunny, Hot, High 80's



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:	U/S SLOPE 2H:1V, D/S 2.5H:1V; TW=10'			
Grass Height		✓		Bare Soil & Little Grass.
Vegetation Condition		✓		40% coverage
Tree Growth	✓			Rill Erosion on Sandy soil.
Erosion		✓		
Trash & Debris	✓			
Seepage	✓			None Observed.
Fencing or Benches	✓			Remove SF.
Interior Landscaping/Planted Areas:	❒ None ❒ Constructed Wetland/Shallow Marsh ☒ Naturally Established Vegetation			
Vegetated Conditions	✓			Little natural veg.
Trash & Debris	✓			Some dead wood NE of riser.
Floating Material	✓			
Erosion	✓			
Sediment		✓		Sediment 2-3' deep ~~EAST~~ NORTH of Riser.
Dead Plant	✓			Extends out about 100'
Aesthetics	✓			
Other				
Services SF Lots + ROADS Hollow OAK Drive.				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools	❒ Permanent Pool (Retention Basin)	❒ Shallow Marsh (Detention Basin)	☒ None (Detention Basin)	
Shoreline Erosion	✓			
Algae	✓			
Trash & Debris		✓		dead wood debris ~~N+S~~ West & EAST shorelines
Sediment		✓		2-3' deep at Low flow orifice.
Aesthetics		✓		Unsightly due to sediment
Other				Holding water 1-2" in pockets However is draining. (LOT 20)
Inflow Stuctures (Describe Locations):	38" RCP AT BACK			
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓	✓		Sed 2-4' deep at PIPE OUTFALL - REBUT
Aesthetics	✓			RIPRAP. HAND CLEAN OF. TO BMP Area.
Other	✓			Also Toe channel from ROAD - STABLE.
Principal Flow Control Structure - Intake, Riser, etc. (Describe Location):	10x9 CONC. STRUCTURE w/ MH LID.			
Condition of Structure	✓			8" PVC Higher level orifice; 8" DCP
Corrosion	✓			Low Flow with 3-4" Plug; 4" drain
Trash and Debris	✓			with VALVE
Sediment	✓			
Aesthetics	✓			LARGE Conc. Structure.
Other		✓	✓	"Not at final config."
Principal Outlet Structure - Barrel, Conduit, etc. :	18" RCP with ES-1 AND OP			
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Sediment		✓	✓	Clean Sed 6-8" deep at barrel end.
Erosion	✓			
Other				OP LOOKS intact
Emergency Spillway (Overflow):	8' WIDE BW Riprap Spillway (~~North~~ WEST Side)			
Vegetation	✓			
Lining	✓			Riprap CLASS I.
Erosion	✓			
Trash & Debris				
Other				

DI SANITARY Sewer ON Piers D/S of pond outfall.

Nuisance Type Conditions:				
Mosquito Breeding	✓			More than none.
Animal Burrows	✓			
Graffiti	✓			
Other	✓			
Surrounding Perimeter Conditions:	~~West~~ NORTH is wetland; ~~East~~ WEST + EAST woods + Lots			
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			NATURAL LOOKING.
Access /Maintenance Roads or Paths	✓			10' wide gravel road to TOD. GOOD access from Hollow OAK RD.
Other		✓		CAREFUL OF BEES IN RISER LID!!

Remarks:

▷ Bare Soil 60% of D/S Emb. Very little grass coverage. Seed + Mulch REQD. May need topsoil as D/S emb. sandy soil. Also Top of dam bare.

▷ Remove SF upstream + d/s toe areas.

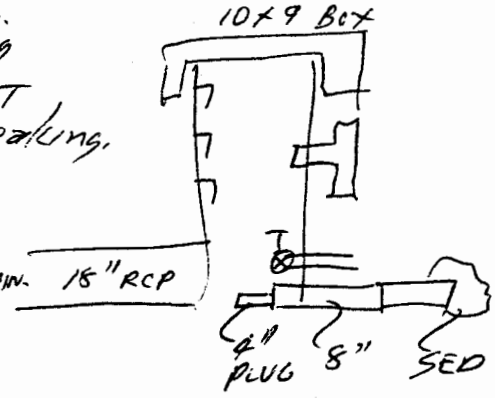
▷ Clean all dead woody veg from BMP pool area. ~~North~~ WEST + EAST shoreline, ~~South shoreline~~

▷ clean Low flow orifice entry of sediment (2-3' deep). Establish unobstructed Low flow into riser Box

▷ Pond Riser Structure was not at final config
4" Low Flow SHOULD BE OPEN - PLUGGED w/ BOOT
4" DRAIN w/ VALVE SHOULD BE CLOSED - WAS open or leaking.
8" turndown - OK

▷ clean Sed 6-8" deep at barrel outfall.

▷ CLEAN FOREBAY AT PRIMARY 24" PIPE INFLOW (LOT 20) 2-4' Deep. CLEAN wood debris in channel from 24" pipe inflow to BMP area. Water is impounding. NEED PB. DRAIN.



Overall Environmental Division Internal Rating: 3 (sed. riser, BARE SOIL)

Signature: Scott A Thomas P.E.

Date: 08/27/01

Title: Civil Engineer ENV DIV

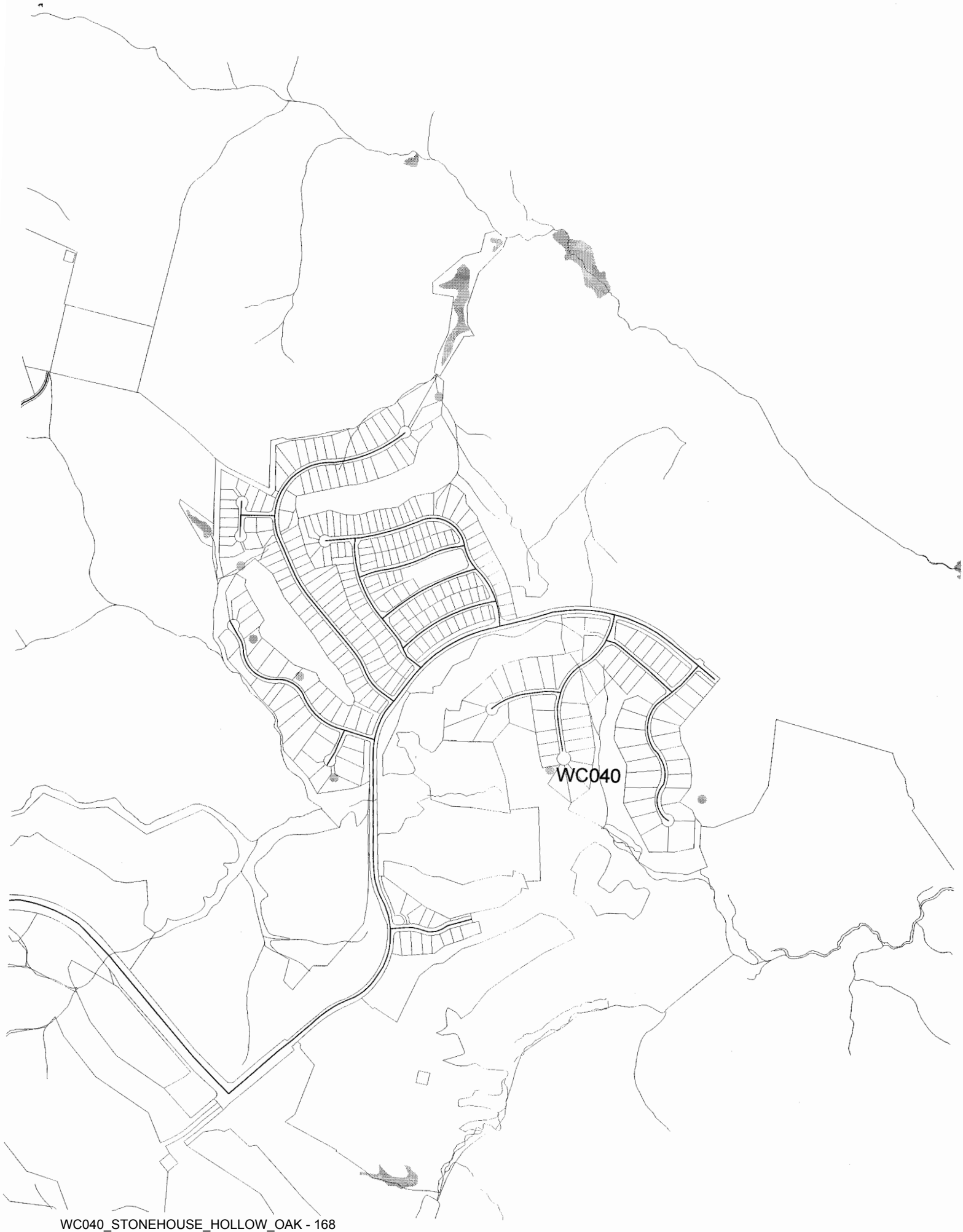
SWMProg\BMP\CoInspProg\DetRet.wpd

WATERSHED	WC	MAINTENANCE PLAN	No	CTRL STRUC DESC	Riser Box
BMP ID NO	040	SITE AREA acre	24.2	CTRL STRUC SIZE inches	10x9
PLAN NO	S-84-97	LAND USE	Res Planned Unit D	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(04-04)(01-24)	old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	18
PIN NO	0440100024	JCC BMP CODE			
CONSTRUCTION DATE	1/1/1999	POINT VALUE	4	EMERG SPILLWAY	Yes
PROJECT NAME	Stonehouse Sec 6A Ph 1 Hollow Oak			DESIGN HW ELEV	42.91
FACILITY LOCATION	Near (south of) 3136 Hollow Oak Drive			PERM POOL ELE	None
CITY-STATE	Williamsburg, Va. 23011	SVC DRAIN AREA acres	13.74	2-YR OUTFLOW cfs	2.69
CURRENT OWNER	Stonehouse Development LLC			10-YR OUTFLOW cfs	4.26
OWNER ADDRESS	120 Tredegar St.			REC DRAWING	Yes
OWNER ADDRESS 2	6th Floor	SERVICE AREA DESCRI	SF Lots & Roads		
CITY-STATE-ZIP CODE	Richmond, Va. 23219	IMPERV AREA acres	2.75	CONSTR CERTI	Yes
OWNER PHONE		RECV STREAM	UT of Bird Swamp WC		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	8/27/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft		INTERNAL RATING	3
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	End of cul-de-sac Hollow Oak Dr. Imperv approx 20%. Large Conc Box Riser.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

SWMF C


WC040

GPIN 0440100024 HOLLOW OAK

STONEHOUSE DEV LLC
120 Tredegar St
6th Floor
Rich Va 23219

WC040

LOC: NEAR (SOUTH) 3136 HOLLOW OAK RD / LIT19

From this point forward the file is not certified. The list below details the documents that have been added to the file, the person that added the documents and the data they were added.

Name	Content	Date
Jo Anna Ripley	Letter from Stonehouse regarding BMPs - WC025,WC040, WC041, WC071, WC073, WC079, WC080	5/30/2013

The Association at Stonehouse, Inc.

May 14, 2012

James City County
Stormwater Management Division
101 Mounts Bay Rd.
PO Box 8784
Williamsburg VA 23187-8784
Attn: Mr. Patrick T. Menichino

Subject: 2010 Stormwater Management Facility (BMP) Inspection Findings

References: (a) JCC/Stormwater Division, six letters addressing BMPs WC040, WC041, WC071, WC073, WC079, WC080, all dated 3 April 2012.
(b) JCC/Stormwater Division, six letters addressing BMPs WC025, WC041, WEC071, WC073, WC080, all dated February 2013.

Mr. Menichino,

Please let me take a few minutes to bring you up to date on the actions we have taken to close the referenced inspection findings. Your letters and previous visit to assist our Grounds and Maintenance Committee were most helpful and resulted in the following actions and long-term commitments:

- A self-inspection and inventory of all components for the 21 BMPs was completed in 2012;

- Our BMP maintenance contract has been completely rewritten and competed to address more thorough maintenance of all BMP components. The new contract was just awarded on 8 May 2013; and

- We are now in the process of updating our Reserve Study to include all BMP components for long-term planning and replacement.

Through volunteer and contracted actions, we have addressed all of the open inspection findings. Our volunteers have cut and stacked well over 1,200 small to medium sized trees that were growing on the dams and in the spillways. Other findings have been addressed through contract actions. I believe that we now have the best and most proactive BMP maintenance program of any community in James City County.

More specific information concerning our corrective actions for each of the open findings are as follows:

1. <u>BMP WC025, 9330 Fieldstone Parkway, 1/7/2010</u>. This inspection finding addressed a "vegetated filter strip" BMP on Fieldstone Parkway.

Conflict in Finding: BMP WC025 is located on Mill Pond Run and is a detention pond. Additionally, BMP WC081 is located at 9330 Fieldstone Parkway and we have been notified by the James City County Environmental Division that it will be extensively rebuilt when Land Bay 3 is developed. COORDINATE W/ ERP + SITE PLANS

2. BMP WC040, Hollow Oak Drive, 1/14/2010. This finding addressed erosion at the inlet discharge point.

Corrective Actions: The Association contracted major work with heavy machinery to correct this problem in 2011. Additionally, trees and wooded vegetation were cleared from the dam top and sides, spillway channel, and outflow basin areas in 2013 to bring this BMP within acceptable standards.

3. BMP WC041, Oak Branch Drive, 1/12/2010. This finding addressed problems at the inlet discharge pipe to include erosion, excessive sediment, and separation at the top of flared end-section of discharge pipe. It also addressed erosion at outlet discharge pipe and debris and trees around the outlet.

Corrective Actions: Routine quarterly maintenance cleared debris and unblocked outlet discharge points. In 2013, all trees and wooded vegetation were cut and removed from the dam top and sides, around the inlet discharge pipe, the overflow spillway, and the outlet settlement basin. On 8 May 2013, a contract work order was approved to remove sediment from the inlet discharge pipe settlement basin and to repair the separation of the flared outlet discharge pipe. These repairs are scheduled to be accomplished before the end of May 2013 to bring this BMP within acceptable standards.

4. BMP WC071, Longwood Drive, 1/11/2010. This finding addressed subsidence around the principal spillway.

Corrective Actions: On 7 May 2013, Mr. William Cain, the Chief Civil Engineer for James City County, inspected the principal spillway riser and advised that it could be repaired from the inside by application of an elastic polymer based grout to seal the minor opening at the top of the outlet discharge pipe where it joins to the vertical riser. He further advised that the eroded area behind the principal spillway riser can then be simply back-filled with a clay based soil. The Association will issue contract work orders to accomplish this work prior to 31 May 2013. Additional actions accomplished in 2013 included cutting and removing all trees and wooded vegetation from the dam tops and sides, overflow spillway channel, and around the outlet discharge settlement basin. The above actions will bring this BMP within acceptable standards by the end of May 2013.

5. BMP WC073, Windy Branch Drive, 1/11/2010. This finding addressed erosion and debris at the inlet discharge point, a blocked outlet structure and channel, removal of trash and debris, and removal of woody vegetation from embankments and spillways.

Corrective Actions: Routine quarterly maintenance has removed trash and debris. In 2013, all trees and wooded vegetation were cut and removed from the dam top and sides, emergency spillways, and inlet settlement basins. On 8 May 2013, a contract work order was approved to remove two large fallen trees that are blocking access to the

outflow discharge pipe and settlement basin at the base of the dam. This work is scheduled to be accomplished prior to the end of May 2013. These collective corrective actions will bring this BMP within acceptable standards by the end of May 2013.

6. BMP WC079, Splitwood Road, 1/8/2010. These findings included erosion at the inlet discharge point, excessive accumulation of sediment in the pond basin, reestablishment of ground cover in the basin bottom and side slopes, lack of routine maintenance, excessive debris, and areas of erosion or slippage on side slopes.

Corrective Actions: In 2011, the developer addressed and repaired the majority of these problems. In 2012, the Association contracted for additional repair of erosion based slippage of riprap on side slopes, rebuilding of inlet settlement basins, and reestablishment of ground cover on the slopes. In 2013, all wooded vegetation and trees were cut and removed from the dam top and sides, spillway channels, and around the outlet discharge settlement basin. These actions have brought this BMP to acceptable standards.

7. BMP WC080, E. Cork Road, 1/8/10. These findings included erosion along inlet pipes and flared end sections, realignment of flared end section of inlet adjacent to emergency spillway, and sink holes adjacent to the outlet pipe.

Corrective Actions: On 8 May 2013, a contract work order was approved to correct for erosion in and around all inlet discharge points, the riprap channel in the pond basin, and to correct for the erosion/sink holes at the outlet discharge point. Additionally, in 2013 all trees and wooded vegetation were cut and removed from the dam top and sides, emergency spillways, and outlet discharge areas. These actions will bring this BMP within acceptable standards by the end of May 2013.

Note: The James City County Environmental Division advises that the inlet discharge pipe adjacent to the emergency spillway is in accordance with their approved construction plans and there is no need for the Association to realign the flared end section.

From the Association's viewpoint, the above actions have addressed all open inspection findings necessary to bring these BMPs back to acceptable standards. Please accept our apologies for the extended time frame in responding to the inspection findings and let me know if you have questions or need additional information.

Sincerely,

Ellen Clark

Ellen Clark, CMCA, AMS, PCAM
Association Manager

9701 Mill Pond Run Toano VA 21368 757-566-0128 fax 757-566-1198

THIS IS NOT AN INVOICE

JAMES RIVER

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO:	THE ASSOCIATION AT STONEHOUSE, INC	QUOTE#:	
		DATE	4/8/2013
PROPERTY	STONEHOUSE (BMP WC 73) 9701 MILL POND ROAD TOANO, VA 28168	TERMS:	

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 73. REMOVAL OF FALLEN OAK TREE FROM THE BACKSIDE OF DAM TO CLEAR OUTFLOW. TREE WILL BE CUT BACK 8-10 FROM UP-ROOTED STUMP		
	LABOR / SITE PREP:	$600.00	$600.00
	ALL DEBRIS WILL BE CHIPPED ON SITE AND DISPURSED		

SUBTOTAL:	$600.00
VA TAX:	$0.00
TOTAL DUE	$600.00

APPROVED BY & DATE:

5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation. We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality. Transplanted material carries no warranty. Annual plantings carry no warranty.

**By executing this quote I hereby agree (1) to pay interest on any past due amount at a rate of 18 percent (18%) per annum (1.5 percent per month of the outstanding balance); and (2) to pay all costs and expenses, including court costs and reasonable attorneys' fees, incurred in the collection of any past due amount.

THIS IS NOT AN INVOICE

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO:	THE ASSOCIATION AT STONEHOUSE, INC	QUOTE#:	
		DATE	4/8/2013
PROPERTY	STONEHOUSE (BMP WC 80) 9701 MILL POND ROAD TOANO, VA 23168	TERMS:	

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 80. ADDTION OF CLASS A RIP RAP STONE AROUND RIGHT SIDE OF UPPER OUTFLOW PIPE AND ERODED AREAS ALONG THE MAIN DRIAN FLOW THROUGHOUT THE BOTTOM CENTER OF BASIN FLOOR.		
	MATERIALS:		
3	TONS OF CLASS A RIP-RAP (GREY)	$55.70 P/T	$167.10
	LABOR / SITE PREP: **(INCLUDES TRACT SKIDSTEER)**	$385.00	$385.00
		SUBTOTAL:	$552.10
		VA TAX:	$8.35
		TOTAL DUE	$560.45

APPROVED BY & DATE:

5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation.
We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality. Transplanted material carries no warranty. Annual plantings carry no warranty.
**By executing this quote I hereby agree (1) to pay interest on any past due amount at a rate of 18 percent (18%) per annum (1.5 percent per month of the outstanding balance); and (2) to pay all costs and expenses, including court costs and reasonable attorneys' fees, incurred in the collection of any past due amount.

THIS IS NOT AN INVOICE

JAMES RIVER
GROUNDS MANAGEMENT

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO: THE ASSOCIATION AT STONEHOUSE, INC

QUOTE#:

DATE 4/8/2013

PROPERTY STONEHOUSE (BMP WC 41)
9701 MILL POND ROAD
TOANO, VA 23168

TERMS:

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 41. REMOVAL OF SEDIMENT FROM OUTFLOW COLLECTION BASIN, THE SEDIMENT WILL DISPURSED ON THE DOWN SIDE OF DAM. EXCAVATING SECTION ABOVE OUTFLOW PIPE TO INSTALL GEO-TEXTILE FABRIC AND 57 STONE TO KEEP FUTURE SEDIMENT FROM ENTERING CRACK IN THE LAST CONNECTION.		
	LABOR / SITE PREP: (INCLUDES MINI EXCAVATOR)	$590.00	$590.00
	MATERIALS:		
1	**GEO TEXTILE FABRIC**	$15.00 P/P	$15.00
0.5	**YARD OF 57 STONE (1-2" GREY)**	$38.50 P/Y	$19.25
		SUBTOTAL:	$624.25
		VA TAX:	$1.71
		TOTAL DUE	$625.96

APPROVED BY & DATE: 5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation.
We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality.
Transplanted material carries no warranty. Annual plantings carry no warranty.
**By executing this quote I hereby agree (1) to pay interest on any past due amount at a rate of 18 percent (18%) per annum (1.5 percent per month of the outstanding balance); and (2) to pay all costs and expenses, including court costs and reasonable attorneys' fees, incurred in the collection of any past due amount.

STONEHOUSE - BMP COMPONENT LISTING - 11 JAN 2013

Stormwater Dry Retention Pond - BMPs		BMP Inlet Components							BMP Outlet Components			
BMP #	Earth Berm Dams	Inlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels	Stone Gabion Barrier	Concrete Drain Box	Metal Drain Grate	Concrete Spillway Riser	Riprap Spillway Overflow	Outlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels
WC019	Mill Pond Run & Leatherleaf Drive	2	2	0	0	1	1	1	0	1	0	0
WC025	Mill Pond Run & Old Grove Lane	1	0	1	0	1	1	1	0	1	0	0
WC037	Leatherleaf Drive, CA-3	2	1	0	0	1	1	1	0	1	1	0
WC038	Turning Leaf Drive, CA-4	1	0	0	0	1	1	1	0	1	1	0
WC039	Leatherleaf Drive, CA-2	1	0	0	0	1	1	1	0	1	1	1
WC040	Hollow Oak Drive, CA-7/CA-8	1	1	0	0	1	1	1	1	1	1	0
WC041	Oak Branch Lane, CA-44	1	1	0	0	1	1	1	1	1	1	0
WC069	Golf Course Maintenance Road	0	0	0	0	1	1	1	1	1	1	0
WC071	Longwood Drive, CA-50	2	2	0	0	1	0	1	1	1	1	1
WC072	Sapling Drive, CA-40	2	2	0	0	1	1	1	1	1	1	0
WC073	Windy Branch Drive, CA-36	1	1	1	0	1	1	1	1	1	1	1
WC074	Trailwood Lane, CA-48C	1	1	1	0	1	1	1	1	1	1	0
WC079	Splitwood Road, CA-50	2	2	3	0	1	1	1	1	1	1	0
WC080	E. Cork Road, CA-50	2	3	2	0	1	1	1	1	1	1	0
WC081	Fieldstone Parkway	1	1	0	1	0	0	1	1	1	1	0
BMP #	Concrete Wall Dams											
WC042	Mountain Berry Court	1	1	0	0	1	1	1	1	1	1	0
WC043	Ridge Drive, CA-51	0	0	0	0	0	0	0	1	2	1	0
BMP #	Timber Dams											
WC075	Morning Mist Lane, CA-48C	1	1	1	0	0	0	0	0	1	0	0
WC076	Sawyer Way, CA-46	1	1	0	0	0	0	0	0	1	0	0
WC077	Mill Pond Run, CA-45D	0	0	0	0	0	0	0	0	1	1	0
WC078	Yarding Way, CA-45C	1	1	1	0	0	0	0	0	1	0	0
	Totals:	24	21	10	1	15	14	16	12	22	16	3

Total Components:	
Earth Berm Dams	15
Concrete Wall Dams	2
Timber Dams	4
Concrete Spillway Risers	16
Concrete Drain Boxes	15
Metal Drain Grates	14
Concrete Discharge Pipes	34
PVC/Steel Discharge Pipes	12
Stone Gabion Barrier	1
Riprap Settlement Basins	37
Riprap Drainage Channels	13

James River

COPY

REQUEST FOR PROPOSALS
Stormwater Detention Pond (BMP) Maintenance

This Request for Proposals (RFP) is issued by The Association at Stonehouse, Inc., and is for professional maintenance service of specified Stormwater Detention Ponds (BMPs) located in the common areas owned and maintained by The Association at Stonehouse for its resident membership.

Response to this RFP is requested no later than 4-9-13. Replies to and questions about this RFP should be forwarded to:

The Association at Stonehouse, Inc.
9701 Mill Pond Run
Toano, VA 23168
Tel: 757- 566-0128
Fax: 757- 566-1198
Email: manager@mpstonehouse.com

Contractor bids are requested for the services specified in the following pages for the remainder of base calendar year January 1 - December 31, 2013, with two contract option years that may be exercised by the Association for calendar years 2014 and 2015.

Contractor bids shall clearly identify costs for each major area of work specified in Exhibit A.

This RFP includes the following information:

BMP Maintenance Contract ..... Page 2
Remuneration Schedule ..... Page 5
Exhibit A ..... Page 6
- Statement of Work ..... Page 6
- Scope of Work ..... Page 7
- BMP Management & Maintenance Requirements ..... Page 8
- Additional Services & Obligations ..... Page 9

Exhibit B, BMP Maintenance Component List ..... Page 10
Exhibit C, Site Plan Identifying all BMP Locations

STORMWATER DETENTION POND (BMP) MAINTENANCE CONTRACT
BY AND BETWEEN _____ *AND*
THE ASSOCIATION AT STONEHOUSE, INC.

This Stormwater Detention Pond (BMP) Maintenance Contract ("Agreement") dated 4-9-13, 2013 between JAMES RIVER GROUNDS MGMT. a Virginia Corporation (also referred to herein as "Contractor"), and The Association at Stonehouse, Inc. a Virginia non-stock corporation (also referred to herein as "Association") provides:

Recitals

Association desires to hire and engage Contractor to provide certain maintenance services in the Association's common areas as more particularly set forth in the attached specifications described as Exhibits A, B, and C which exhibits are expressly incorporated herein by reference and made a part hereof.

Terms and Conditions

Now, therefore, in consideration of the terms and conditions herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Contractor and Association agree as follows:

1. Contractor agrees to perform the services outlined in Exhibit A attached hereto. The relationship between Contractor and Association is that of an independent site support services contractor and not a partner, joint venture, employer, etc. Contractor shall be responsible for the selection and supervision of its employees, the payment of all their payroll taxes, insurance benefits and workman's compensation associated therewith. All employees and subcontractors hired by the Contractor shall be lawfully entitled to work in the United States. Contractor shall be fully liable for and hereby indemnifies and agrees to hold harmless the Association, its Board of Directors, agents and unit owners from any and all violations of federal immigration laws as the result of the immigration status of any of its subcontractors or employees.

2. Contractor shall be compensated for services rendered in accordance with the Remuneration Schedule and in accordance with the other provisions of this Agreement. Association reserves the right to offset against any payment made to Contractor any expenses incurred by the Association in performing any of the Contractor's obligations hereunder should Contractor fail to perform such obligations.

3. Association may direct Contractor to perform additional service for which Association shall bear all expenses. Contractor shall not incur any such additional expense without the prior written approval of the Association. The parties shall sign written agreements specifying the work and listing all costs of any additional services requested or required by the Association.

4. Contractor hereby indemnifies and holds Association, its directors, employees, agents or assigns harmless from all liability, damages, causes of actions, suit or judgment arising from injury to persons or property on the site, which may arise from a breach of this Agreement by Contractor or any negligent or intentional act of Contractor or its agents, subcontractors or employees. The provisions of this Section shall survive the expiration or termination of this Agreement.

5. Contractor's Insurance, Licenses and Permits. At the time the Contract is executed, the Contractor must produce proof of insurance coverage as follows:

a. Certificate of Liability Insurance providing:
   1) Property damage in an amount equal to or more than $500,000.00 minimum;
   2) Bodily injury with a limit of not less than $1 million for each person and for each accident;
   3) If motor vehicles are used, automobile (or truck) bodily injury with a limit of not less than $1 million for each accident and property damage liability with a limit of not less than $500,000.00 for each accident;
b. Workmen's Compensation insurance for all employees on Association property; and
c. The Association at Stonehouse and its managing agent shall be named as additional insured on all the above policies.
d. In addition to the above required insurance, the Contractor shall, at a minimum, maintain and provide proof of the following: State of Virginia Class A Contractors License, Business License, Business Pesticide License with Insurance, and Virginia Registered Commercial Applicators License.
e. Contractor shall maintain the insurance set forth and described above during the term of this agreement. Failure to maintain the required insurance, licenses and/or permits will result in immediate termination of the Contract.

6. Contractor shall be liable for damages to any person or property while performing duties as outlined in Exhibit A, attached hereto.

7. Contract oversight and point of contact for all Contractor inquiries is through the Association Manager for the Board of Directors (BOD). The Association Manager may appoint a Contract Officer Representative (COR) to perform inspection and acceptance of Contractor's work.

8. This Agreement may be terminated at the discretion of the Association upon thirty (30) days written notice to the Contractor without any further obligation or liability hereunder, except as otherwise expressly provided for herein. Upon such termination, Contractor shall only be entitled to receive such remuneration as it would otherwise be entitled to receive hereunder through the date of termination.

9. In addition to any other rights it might have under this Agreement, the Association may withhold any amounts due Contractor under this Agreement which the Association deems necessary to reimburse the Association for any costs or liabilities incurred by the Association as the result of the Contractor's actions or omissions, or failure to fairly perform any or all service obligations in a satisfactory manner. Appropriate adjustments to these withholdings shall be made when the exact amounts owed by the Contractor are determined by the Association Manager.

10. A waiver by the Association of any breach of any term or condition hereof shall not be deemed a waiver of any other, or subsequent breach. In the event of a breach of this Agreement by Contractor, the Association shall have the right to pursue its legal remedies and the right to terminate the Agreement. In the event either party to this Agreement is required to file a legal action due to a breach hereof, the costs of the action, including, but not limited to, reasonable attorney's fees as determined by the Court shall be paid to the prevailing party.

11. This Agreement shall be interpreted and enforced in accordance with the laws of the Commonwealth of Virginia. Both parties hereto expressly agree that if legal action is required to interpret or enforce this Agreement, said action shall be filed in the appropriate court in James City County, Virginia.

12. In the event that any part or provision of this Agreement shall be adjudged unlawful or unenforceable under Virginia law, any lawful intent of the provision and the remainder of this Agreement shall nonetheless survive and remain in full force and effect.

13. Contractor shall ensure all employees and subcontractors while on Association Common Areas are in uniform, i.e., hat and shirt clearly marked with company logo, and present a neat and orderly appearance at all times.

14. Contractor shall use due care, skill and diligence in the performance of its obligations under this Agreement. All services and work to be performed under this Agreement shall be performed in accordance with accepted standards of the profession or trade.

15. This Agreement may not be assigned by Contractor without the prior written approval of the Association, which approval can be withheld in the Association's sole discretion.

16. Each of the undersigned, by evidence of their signature thereto, affirms that it has the authority to bind their respective party to this Agreement.

17. Notices allowed or required pursuant to this Agreement shall be either hand delivered or sent by United States mail, postage paid, to the addresses of the parties set forth below:

a. To the Association:

The Association at Stonehouse, Inc.
9701 Mill Pond Run
Toano, Virginia 23168
Attn: Association Manager

b. To the Contractor:

JAMES RIVER GROUNDS MANAGEMENT
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188

18. This Agreement may not be amended except by a written document signed by both parties.

19. The Parties hereto agree to keep the terms, conditions, and remuneration for this Agreement confidential.

20. This Agreement shall not automatically renew itself without the express written consent of the Association.

Remuneration Schedule

This contract is for the base year 2013, with two option years 2014 & 2015.

For the base contract period beginning MAY, 2013 and ending December 31, 2013, Association shall pay Contractor an annual fee of: $ 11,865.00 in equal monthly payments of $ 988.75.

For the option contract period beginning January 1, 2014 and ending December 31, 2014, Association shall pay Contractor an annual fee of: $ ~~15,816.00~~ 15,180.00 in equal monthly payments of $ ~~1318.00~~ 1265.00

For the option contract period beginning January 1, 2015 and ending December 31, 2015, Association shall pay Contractor an annual fee of: $ ~~15,816.00~~ 14,868 in equal monthly payments of $ ~~1318.00~~ 1239.00

Payment shall be due within thirty (30) days of receipt of written request for payment thereof, which payment shall be subject to the terms and conditions of the Agreement.

The Association shall provide Contractor written notice sixty (60) days prior to the end of the contract period if it wants to exercise the above option contract periods.

Contractor: _____ Date: 4-9-13

By: DALE C. OGNNELL
BRANCH MANAGER

The Association at Stonehouse, Inc. Date: 5-13-13

By: _____

1. STATEMENT OF WORK

This Statement of Work (SOW) is issued by the Association at Stonehouse, Inc. and is specifically for the maintenance of all stormwater detention ponds (BMPs) located in the common areas of the Mill Pond at Stonehouse community.

A. Background. The Association owns and is responsible for the maintenance of twenty-one (21) dry stormwater detention pond BMPs. Fifteen (15) of these BMPs are built around earth berm dams, two (2) BMPs have concrete block dams, and four (4) BMPs have timber dams. The structural components of each BMP are as delineated in Exhibit B. The locations of all BMPs are as delineated in Exhibit C.

B. Objectives.

1. The Association's objectives are to ensure all twenty-one (21) BMPs meet requirements of the Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia; and
2. The objective of this contract is to provide routine quarterly maintenance for all components of each BMP, to include, but not be limited to, the pond basin, dam tops and sides, all inlet and outlet structures, drain boxes and grates, overflow spillways, riprap protected channels and settlement basins.

2. SCOPE OF WORK

A. General Contract Requirements. The Contractor shall:

1. Maintain the twenty-one (21) BMPs year round with maintenance accomplished on a quarterly basis;
2. Provide all materials, labor and equipment required to complete all aspects of BMP maintenance work at each maintenance visit;
3. Ensure a response time of 48 hours for any BMP problem related to this contract;
4. Provide the Association with consultation upon request to assist in resolving problems associated with BMPs at no additional cost;
5. Notify the Association Manager one week prior to all maintenance visits and when the work is done; and
6. Provide written quarterly status reports to the Association Manager of work accomplished during each maintenance visit. The reports shall include problems encountered, changes required, and/or additional work recommended.

B. Personnel. The Contractor shall:

1. Provide the personnel necessary to service and maintain the BMPs;
2. Provide dedicated on-site supervision of its employees during all visits to Stonehouse to clearly assign and review all work accomplished to ensure Association property is maintained in a consistent and professional manner;
3. Provide training for on-site employees to include maintenance and equipment operation procedures which are specific to the common areas, instructions and necessary certifications concerning BMP maintenance and chemical applications, and the professional conduct and courtesy expected of all employees at all times when working on Association property;

4. Ensure all work is performed in a manner that meets applicable OSHA regulations and is safe to its operators, residents, guests, and any pedestrian or vehicle in close proximity to operational machinery;
5. Ensure the On-site Supervisor meets with the Association Manager on a quarterly basis to tour the BMPs and/or discuss maintenance issues or problems encountered. Additional meetings may be called at any time by the Association Manager on an as-needed basis; and
6. In the performance of the work, the Contractor and its employees shall comply with all applicable state and county laws, statues, regulations and instructions issued that pertain to maintenance of stormwater detention ponds, to include all applicable environmental, safety, and security requirements issued by governmental officials, regulatory agencies, law enforcement officials, security guards, etc.

3. *BMP MANAGEMENT & MAINTENANCE REQUIREMENTS*

The Contractor shall provide maintenance services to meet the following specifications:

A. *Control of Vegetation and Wooded Growth.*

1. Grasses. The Contractor shall mow or use sting cutters (weed eaters) at each visit to maintain grasses and vegetation on dam tops and sides at an 8-inch height. Grasses and vegetation shall be removed from all riprap structures.
2. Pine Saplings. Pine saplings shall be cut and removed at each visit from all areas of the BMP, to include the pond basin, dam top and sides, and all riprap structures.
3. Other Wooded Vegetation. Trees and brush shall be cut and removed from the dam top and sides, overflow spillway channels, and all riprap structures.
4. Removal of Cut Wooded Vegetation. Cut pine saplings and other wooded vegetation shall be removed from Association property at each visit. Use of wood chippers to dispose of cut brush and trees shall require the Association Manager's approval on a case-by-case basis.

B. *Cleaning & Sediment Control.*

1. Pond Basins. Loose wooded debris, water-carried tree limbs and trunks, and trash shall be removed from all cleared areas within the pond basin.
2. Concrete Drain Boxes & Grates. Drain boxes and grates shall be cleaned out at each visit to remove all sediment and debris to ensure proper drainage.
3. Inlet and Outlet Settlement Basins. Sediment and debris shall be removed at each visit from all riprap settlement basins.
4. Riprap Channels and Overflow Spillways. Sediment and debris shall be cleared at each visit from all riprap channels and overflow spillways.
5. Sediment Disposal. Sediment removed during cleaning shall be discarded on the outlet side of the dam well away from the outlet and overflow spillway channels.

C. *Clean-Up and Trash Removal.*

1. Trash & Wooded Debris Removal. Trash shall be removed at each visit from all areas and structures within each BMP. Loose wooded debris, to include tree limbs and trunks, that are blocking drain grates, settlement basins, or drainage channels shall be removed at each visit.
2. Trash & Wooded Debris Disposal. Trash and wooded debris shall be removed from Association Property at each visit.

4. *ADDITIONAL SERVICES AND OBLIGATIONS*

A. Additional Work Cost Estimates. If required by the Association Manager, the Contractor shall provide cost estimates for additional work to bring the BMPs into acceptable norms, and for the following additional work:

1. Removal of trees that have fallen into BMPs.
2. Removal of illegal trash dumping (appliances, etc.).
3. Repair of damaged BMP components.
4. Clean-up of debris resulting from hurricanes, tropical storms, etc..
5. Removal of excessive sediment.

B. Property Damage. The Contractor shall assume liability for any property damaged by trimmers, edgers or other equipment operated by the Contractor - including, but not limited to, fences, irrigation systems, plants, shrubs, flowers, windows, signs, structures, lamp posts or automobiles. Damage to these items shall be the responsibility of the contractor to repair or replace. The Association Manager shall be the determining party as to responsibility for repairs/replacement.

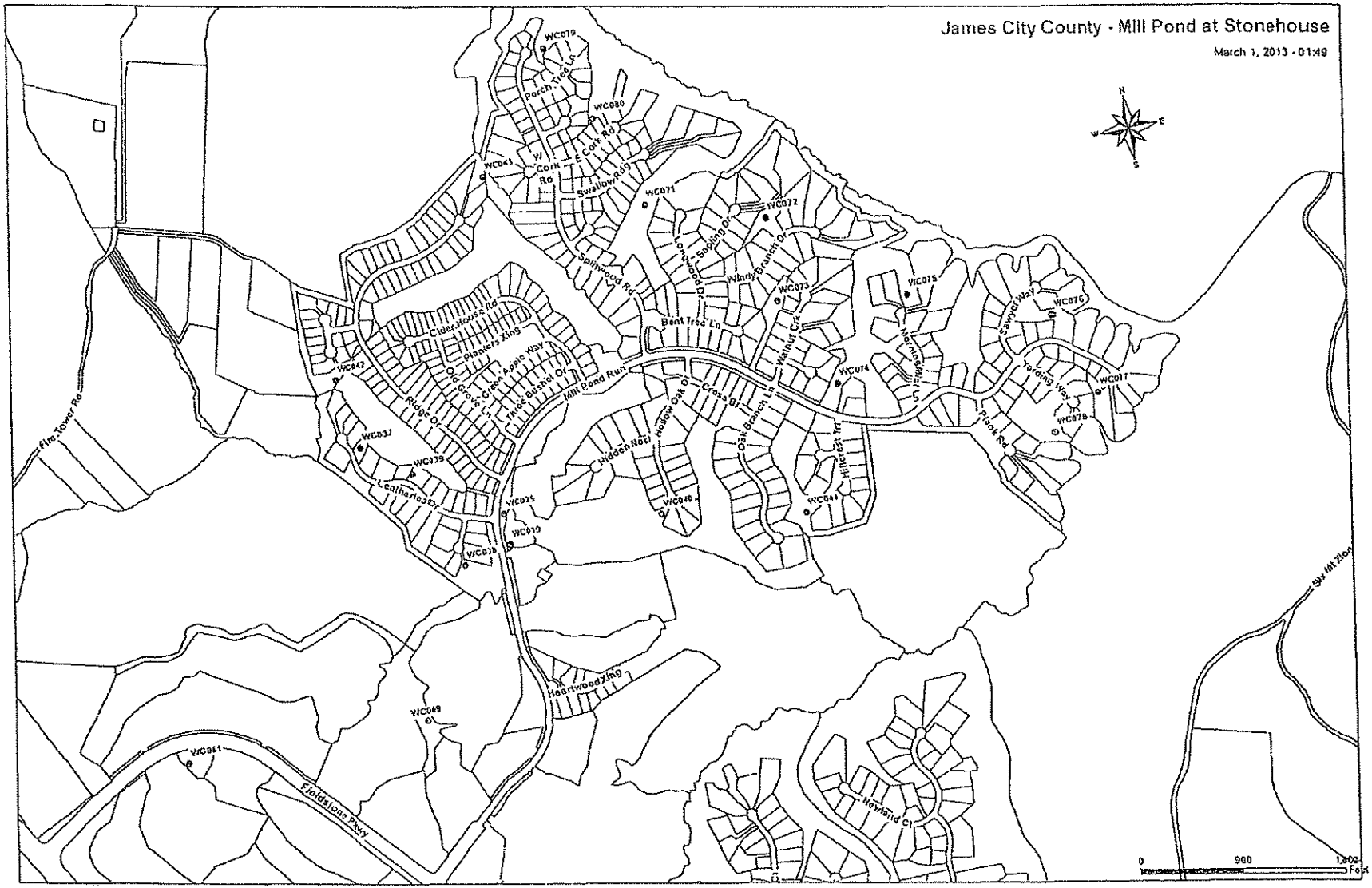
C. Contractor Product Compliance. The Contractor shall warranty that all BMP maintenance products, procedures, and methods of application used in performance of this Agreement comply in all respects with Federal, State, and local laws, ordinances, regulations, and manufacturer's instructions.

D. Complaints and Verbal Abuse. The Contractor shall ensure that all complaints made to the Contractor or its employees by community residents shall be handled professionally and diplomatically with instructions that the complaint should be addressed to the Association Manager. All incidents of verbal abuse by community residents toward Contractor or its employees shall immediately be reported to the Association Manager.

E. Threats to Health and Safety. The Contractor shall immediately report any condition that is or may be threatening to the health and/or safety of any person to the Association Manager.

STONEHOUSE - BMP COMPONENT LISTING - 11 JAN 2013

Stormwater Dry Retention Pond - BMPs		BMP Inlet Components							BMP Outlet Components			
BMP #	Earth Berm Dams	Inlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels	Stone Gabion Barrier	Concrete Drain Box	Metal Drain Grate	Concrete Spillway Riser	Riprap Spillway Overflow	Outlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels
WC019	Mill Pond Run & Leatherleal Drive	2	2	0	0	1	1	1	0	1	0	0
WC025	Mill Pond Run & Old Grove Lane	1	0	1	0	1	1	1	0	1	0	0
WC037	Leatherleal Drive, CA-3	2	1	0	0	1	1	1	0	1	1	0
WC038	Turning Leaf Drive, CA-4	1	0	0	0	1	1	1	0	1	1	0
WC039	Leatherleaf Drive, CA-2	1	0	0	0	1	1	1	0	1	1	1
WC040	Hollow Oak Drive, CA-7/CA-8	1	1	0	0	1	1	1	1	1	1	0
WC041	Oak Branch Lane, CA-44	1	1	0	0	1	1	1	1	1	1	0
WC069	Golf Course Maintenance Road	0	0	0	0	1	1	1	1	1	1	0
WC071	Longwood Drive, CA-50	2	2	0	0	1	0	1	1	1	1	1
WC072	Sapling Drive, CA-40	2	2	0	0	1	1	1	1	1	1	0
WC073	Windy Branch Drive, CA-36	1	1	1	0	1	1	1	1	1	1	1
WC074	Trailwood Lane, CA-48C	1	1	1	0	1	1	1	1	1	1	0
WC079	Splitwood Road, CA-50	2	2	3	0	1	1	1	1	1	1	0
WC080	E. Cork Road, CA-50	2	3	2	0	1	1	1	1	1	1	0
WC081	Fieldstone Parkway	1	1	0	1	0	0	1	1	1	1	0
BMP #	Concrete Wall Dams											
WC042	Mountain Berry Court	1	1	0	0	1	1	1	1	1	1	0
WC043	Ridge Drive, CA-51	0	0	0	0	0	0	0	1	2	1	0
BMP #	Timber Dams											
WC075	Morning Mist Lane, CA-48C	1	1	1	0	0	0	0	0	1	0	0
WC076	Sawyer Way, CA-46	1	1	0	0	0	0	0	0	1	0	0
WC077	Mill Pond Run, CA-45D	0	0	0	0	0	0	0	0	1	1	0
WC078	Yarding Way, CA-45C	1	1	1	0	0	0	0	0	1	0	0
	Totals:	24	21	10	1	15	14	16	12	22	16	3
	Total Components:											
	Earth Berm Dams	15										
	Concrete Wall Dams	2										
	Timber Dams	4										
	Concrete Spillway Risers	16										
	Concrete Drain Boxes	15										
	Metal Drain Grates	14										
	Concrete Discharge Pipes	34										
	PVC/Steel Discharge Pipes	12										
	Stone Gabion Barrier	1										
	Riprap Settlement Basins	37										
	Riprap Drainage Channels	13										


James City County - Mill Pond at Stonehouse
March 1, 2013 - 01:49
N
W
E
S
0
900
1,800
Feet
WC079
Porch Trail
WC080
Cork Rd
W Cork Rd
E Cork Rd
WC041
Swallow Rd
WC071
WC072
Sapling Dr
Longwood Dr
Spillwood Rd
Windy Branch Dr
WC073
WC075
Bent Tree Ln
Walnut Crk
Hornsbury Ln
Sawyer Way
WC076
Cidar Houses Rd
Planters Xing
Old Forge Green Apple Way
Thick Bushel Dr
Mill Pond Run
WC074
Trading Way
WC017
WC078
Flora Tower Rd
WC042
Ridge Dr
Creek Br
Hollow Oak Dr
Hidden Nest
Oak Branch Ln
Hillside Trl
Plank Rd
WC037
WC039
Leatherleaf Dr
WC040
WC041
WC025
WC019
WC038
Sly Mt Zion
Heartwood Xing
WC069
WC081
Fieldstone Pkwy
Newland Ct