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: **WC053**

DATE VERIFIED: **October 12, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 13, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: WC053

PIN: 0510100001

Subdivision, Tract, Business or Owner Name (if known): Stonehouse

Property Description: Private Dam - Coats Pond

Site Address:

(For internal use only) **Box** 23 **Drawer:** 9

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

Comments

Royal New Kent
(804) 966-7023
Fax (804) 966-9012

Agreement

This Agreement, made this 19th day of February 1997 shall settle the dispute between Virginia Legends Golf Management, LLC ("Legends") and Mr. Charles Coates ("Mr. Coates") concerning damage to the Coates Lake Spillway, but shall in no way represent an admission by either party to the validity to any claims made by the other. In order to settle such dispute and difference, the parties have agreed upon a full and final settlement and compromise:

1. In consideration for Mr. Charles Coates releasing Legends of and from all causes of action, damages, liabilities, expenses and costs whatsoever arising by reason of the said occurrences and transactions, whether heretoafter or hereafter accruing and whether now known or not known to the parties hereto, Legends agrees to make repairs to the Coates Lake Spillway in accordance with the plan prepared by the Williamsburg Environmental Group and on file with James City County, such plan being incorporated into this agreement. Such repairs shall be completed in a reasonable period of time, with consideration for adverse weather conditions. updated plan

2. This agreement, including the above-mentioned plan prepared by the Williamsburg Environmental Group, supercedes and merges all prior agreements, promises, understandings, statements, warranties, indemnities and covenants and all inducements to making of this Agreement relied upon by either party herein, whether written or oral, and embodies the parties' complete and entire agreement with respect to the subject matter hereof. No statement or agreement, oral or written, made before the execution of this agreement shall vary or modify the terms hereof in any way whatsoever.

3. This Agreement shall inure to the benefit of and be binding upon the heirs, legal representatives, successors and assigns of the parties

LEGENDS OF VIRGINIA
Post Office Box 3508
Williamsburg, VA
23187-3508

Tom Rasch -

Jerry Flowers -
* 566-1294
869-1544 - mob.

Signed on Aug. 20, 1997, at Hampton, Va

Charles Coates (R.P)

Danny Young - Virginia Legends Golf Management, LLC

Stonehouse Golf Club
(757) 566-1138
Fax (757) 566-4724

Legal Responsibility of Golf Trust ?
Call Gerry Flowers
Tom Rasch - 803-723-4653

Royal New Kent
(804) 966-7023
Fax (804) 966-9012

June 10, 1997

Mr. Charles Coates
P.O. Box 152
Barhamsville, VA 23011

Dear Mr. Coates;

We understand that the Coates Lake spillway has suffered damage from adverse effects and that you feel that all or some of the responsibility is that of The Legends. With the excessive rainfall, possible additional flows from adjoining properties, and an existing blocked overflow pipe in the lake, such damage was inevitable. While The Legends does not accept full responsibility for the damage we have agreed to repair the damage to the spillway portion of the dam. These repairs will be made according to a plan prepared by Williamsburg Environmental Group and on file with Darryl Cook at James City County. We believe these actions will restore the spillway to a better condition than existed before The Legends began construction of the golf course. We would request that, prior to construction, an agreement be signed by you and The Legends stating that once the construction is complete as previously described The Legends will no longer be liable with regard to the dam. Once the agreement, which is being sent to you under separate cover, is signed we can begin construction immediately. We look forward to resolving this issue as quickly as possible.

Sincerely,

Thomas H. Rasch
Projects Manager

Cc: Mr. Darryl Cook, PE
James City County Environmental Director

LEGENDS OF VIRGINIA
Post Office Box 3508
Williamsburg, VA
23187-3508

Stonehouse Golf Club
(757) 566-1138
Fax (757) 566-4724

CONSTRUCTION NOTES

1. A GEOTECHNICAL ENGINEER SHALL BE CONTACTED TO MAKE RECOMMENDATIONS REGARDING STABILITY OF EXISTING DAM, APPROPRIATE CONSTRUCTION TECHNIQUES, AND DEWATERING REQUIREMENTS. ADDITIONALLY, A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL BE PRESENT DURING CONSTRUCTION TO INSPECT SOIL MATERIALS USED ON THE DAM AND COMPLIANCE WITH CONSTRUCTION SPECIFICATIONS.

2. EARTH WORK WILL REQUIRE DISTURBANCE TO THE EXISTING EMBANKMENT. THE CONTRACTOR SHOULD BE PREPARED TO LOWER THE IMPOUNDMENT POOL LEVEL IN THE CASE OF AN EMERGENCY.

3. SOILS USED TO CONSTRUCT THE NEW EMBANKMENT SHOULD CONSIST OF A SOIL MATERIAL FREE OF ORGANICS AND DEBRIS, CLASSIFIED AS SM, SC, CL OR ML WHICH CONTAINS NO LESS THAT 15% PASSING THE NO. 200 SIEVE. SUCH SOILS SHOULD BE AVAILABLE FROM LOCAL ON-SITE SOURCES.

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8. ALL FILL SHOULD BE PLACED IN MAXIMUM 10 INCH LOOSE, HORIZONTAL LIFTS AND MECHANICALLY COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THAT SOIL STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). IN ORDER TO PROPERLY ACHIEVE COMPACTION OF THIS SOIL, THE SOIL SHOULD BE BROUGHT TO WITHIN +/- 4% OF OPTIMUM PRIOR TO COMPACTING.

9. FILL SHALL BE STABILIZED BY SEEDING IMMEDIATELY UPON REACHING FINAL GRADE.

BASIN HYDROLOGY

BASIN CHARACTERISTICS	DA ACRES	CN	Tc HOURS
Post–development	121	71	1.30
Top of Dam Elevation	45.0 ft (msl)		
Normal Pool Elevation	40.0 ft (msl)		
Emergency Spillway Elevation	43.0 ft (msl)		
HYDROLOGIC SUMMARY	2–YR cfs	10–YR cfs	100–YR cfs
Proposed Condition Unrouted	58	151	275
Proposed Condition Routed	47	103	222
ROUTED ELEVATIONS	POST–DEVELOPMENT		
2–yr Elevation	41.08 ft (msl)		
10–yr Elevation	42.89 ft (msl)		
100–yr Elevation	44.95 ft (msl)		

EROSION AND SEDIMENT CONTROL NOTES

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OF STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. IN ADDITION TO THESE NOTES, ALL PROVISIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS SHALL APPLY TO THIS PROJECT.

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK. THE CONTRACTOR SHALL BE THOROUGHLY FAMILIAR WITH ALL APPLICABLE MEASURES CONTAINED THEREIN WHICH MAY BE PERTINENT TO THIS PROJECT.

2. ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS SHALL BE PROTECTED BY A TEMPORARY CONSTRUCTION ENTRANCE TO PREVENT TRACKING OF MUD ONTO PUBLIC RIGHT-OF-WAYS. AN ENTRANCE PERMIT FROM VDOT IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES WITHIN STATE RIGHT-OF-WAYS. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, THE ROAD SHALL BE THOROUGHLY CLEANED AT THE END OF EACH DAY.

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5. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING THE SLOPES OF BY INSTALLING MECHANICAL DEVICES TO SAFELY LOWER WATER DOWNSLOPE WITHOUT CAUSING EROSION. A TEMPORARY FILL DIVERSION (STD. + SPEC. 3.10) SHALL BE INSTALLED PRIOR TO THE END OF EACH WORKING DAY.

6. SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. DIVISION OF CODE COMPLIANCE APPROVAL WILL BE REQUIRED FOR OTHER DEVIATIONS FROM THE APPROVED PLANS.

7. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THIS PLAN OR AS DIRECTED BY THE ENGINEER. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE DIVISION OF CODE COMPLIANCE PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF SAME. THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

9. PERMANENT OR TEMPORARY SOIL STABILIZATION MUST BE APPLIED TO ALL DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION MUST ALSO BE APPLIED TO DENUDED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 30 DAYS. SOIL STABILIZATION MEASURES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING AND THE EARLY APPLICATION OF GRAVEL BASE MATERIAL ON AREAS TO BE PAVED.

10. NO MORE THAN 300 FEET OF SANITARY STORM SEWER, WATERLINES, OR UNDERGROUND UTILITY LINES ARE TO BE OPEN AT ONE TIME. FOLLOWING INSTALLATION OF ANY PORTION OF THESE ITEMS, ALL DISTURBED AREAS ARE TO BE IMMEDIATELY STABILIZED (I.E., THE SAME DAY).

11. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY, OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH SPECIFICATION 3.35. SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME, AND FERTILIZING IN ACCORDANCE WITH SPECIFICATION 3.32, PERMANENT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

13. ALL SLOPES STEEPER THAN 3:1 SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS SUCH AS EXCELSIOR BLANKETS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 3.35, MULCHING AND MANUFACTURER S INSTRUCTIONS. NO SLOPES SHALL BE CREATED STEEPER THAN 2:1.

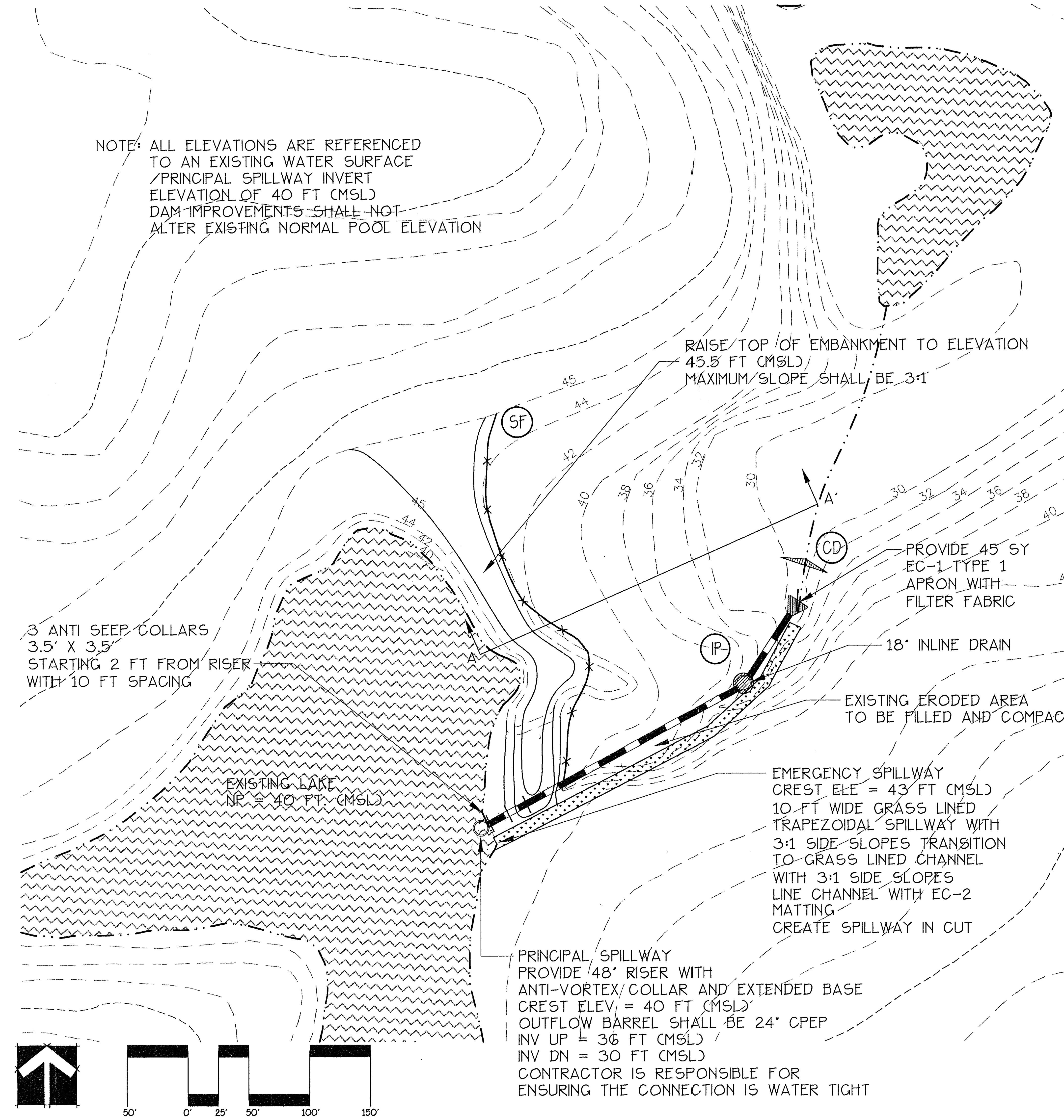
14. INLET PROTECTION IN ACCORDANCE WITH SPECIFICATION 3.07 SHALL BE PROVIDED FOR ALL STORM DRAIN INLETS AS SOON AS PRACTICAL FOLLOWING CONSTRUCTION OF SAME.

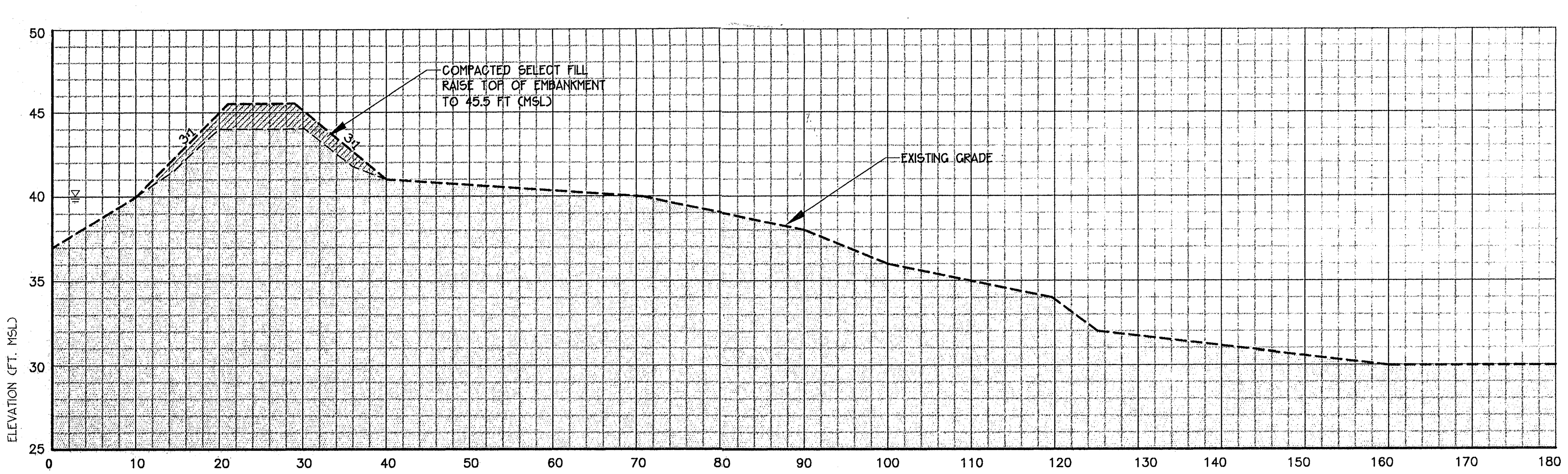
15. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

16. PAVED DITCHES SHALL BE REQUIRED WHEREVER EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

17. TEMPORARY EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. AFTER STABILIZATION IS COMPLETE, ALL MEASURES SHALL BE REMOVED WITHIN 30 DAYS. TRAPPED SEDIMENT SHALL BE SPREAD AND SEEDED.

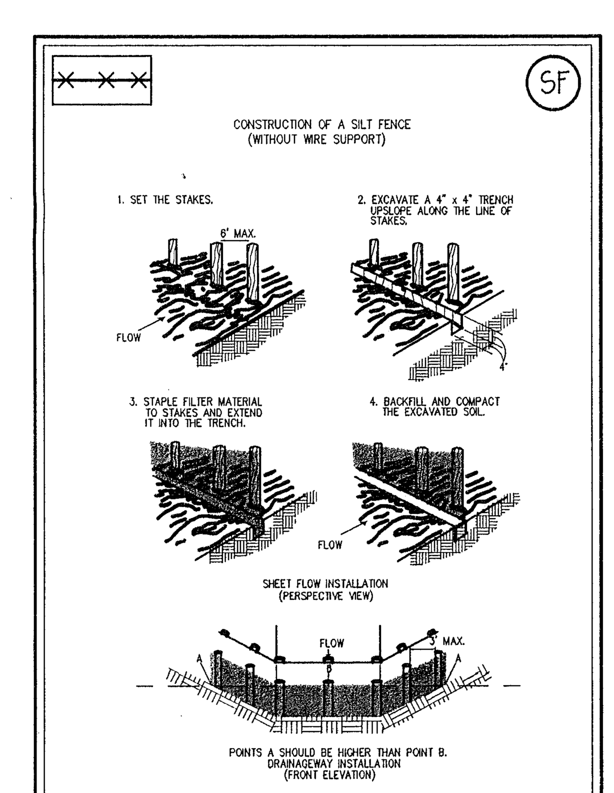
18. AS-BUILT DRAWINGS MUST BE PROVIDED FOR ALL DETENTION/BMP FACILITIES. ALSO UPON COMPLETION, THE CONSTRUCTION OF ALL DETENTION/BMP FACILITIES SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER WHO INSPECTED THE STRUCTURE DURING CONSTRUCTION. THE CERTIFICATION SHALL STATE THAT TO THE BEST OF HIS/HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS.





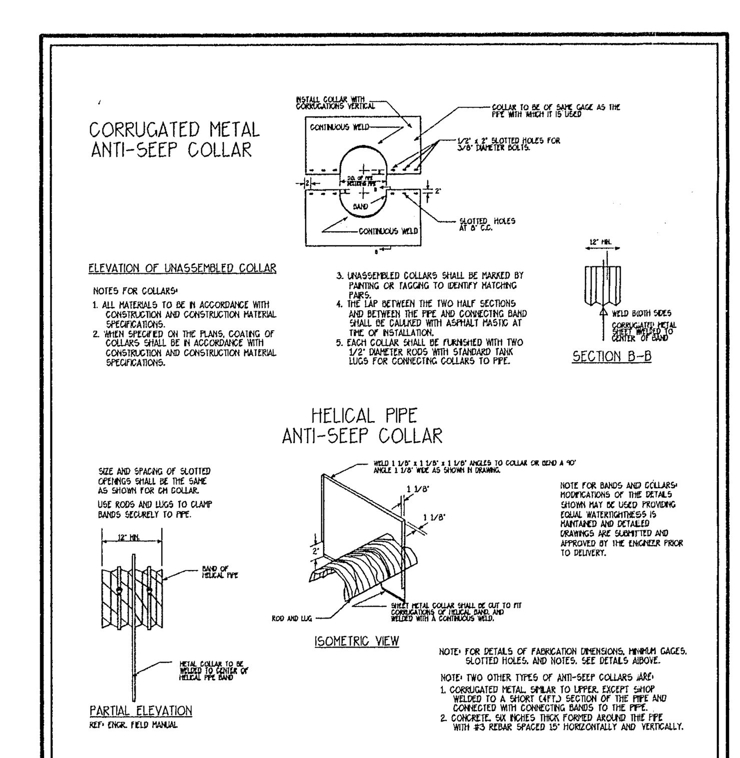
EMBANKMENT SECTION: A-A'

VERTICAL SCALE: 1" = 5' , HORIZONTAL SCALE 1" = 10'



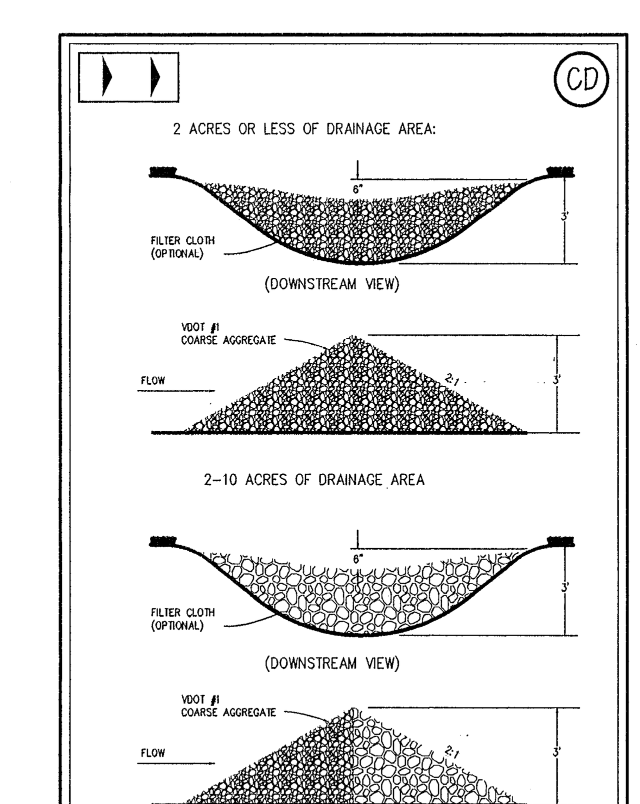
DETAIL: SILT FENCE

NTS



DETAIL: METAL ANTI-SEEP COLLAR'S

NTS

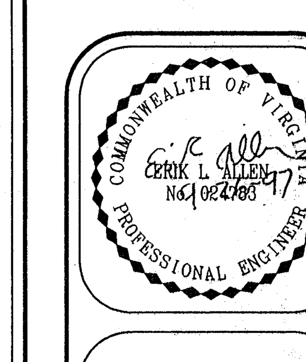


DETAIL: CHECK DAM

NTS

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Environmental Consultants
516-B SOUTH HENRY STREET
WILLIAMSBURG, VIRGINIA 23185
(757) 220 - 6869

OFFSITE DAM IMPROVEMENTS
STONEHOUSE PROPERTY
JAMES CITY COUNTY, VIRGINIA



REVISIONS:
DATE:
9/26/97 REVISED PER COUNTY COMMENTS DATED 9/16/97

DRAWN BY: TJS/JFC/ACAD
DESIGNED BY: TJS/JFC/EA
DATE: 9/9/97
CHECKED BY: BLF/EA/RB

SHEET: 1
JOB #: 318

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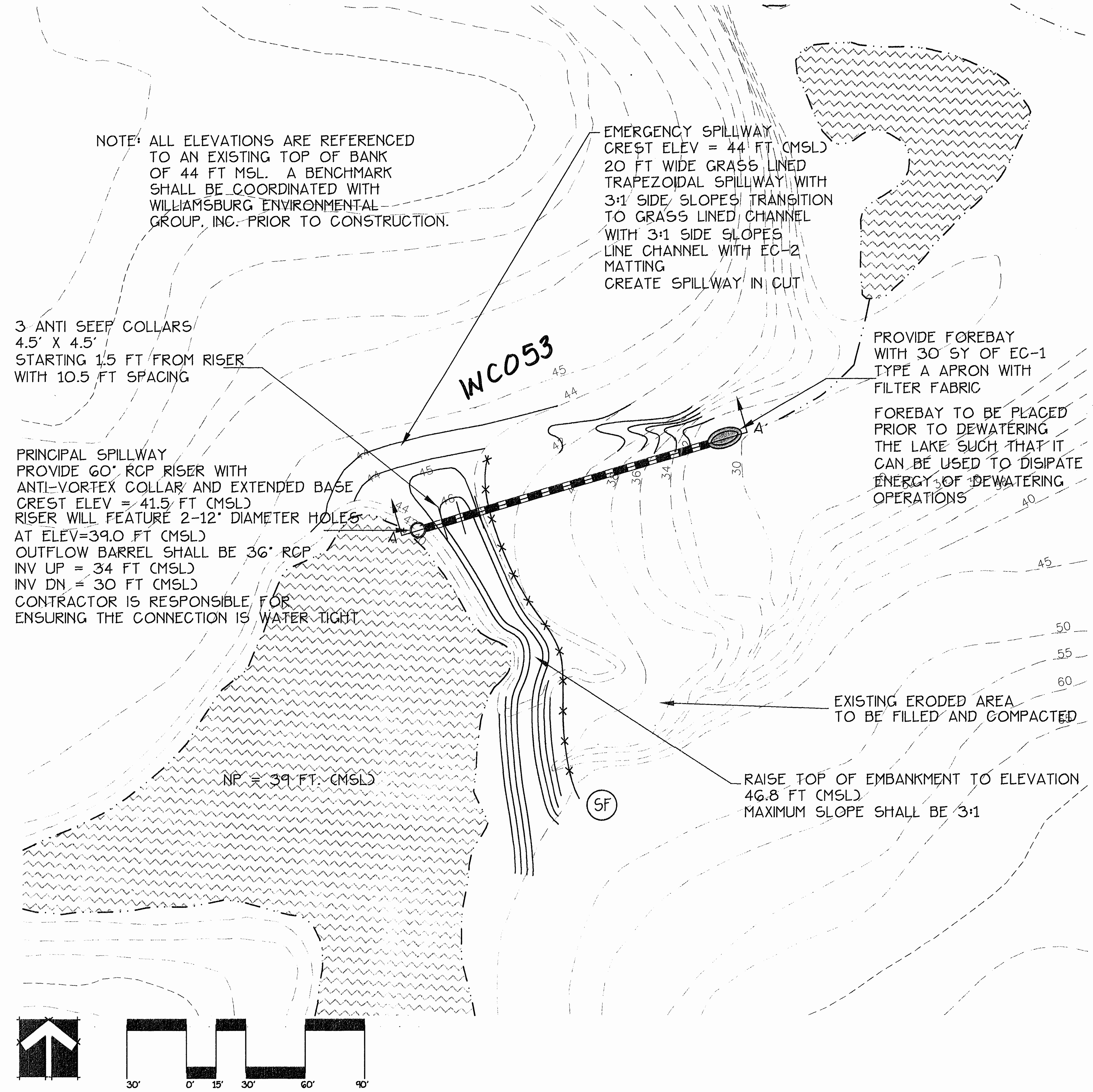
BASIN HYDROLOGY

BASIN CHARACTERISTICS	DA ACRES	CN	Tc HOURS
Post–development	41.2	84	0.29
	76.8	71	0.93
Top of Dam Elevation	46.8 ft (msl)		
Normal Pool Elevation	39.0 ft (msl)		
Emergency Spillway Elevation	44.0 ft (msl)		

HYDROLOGIC SUMMARY	2–YR cfs	10–YR cfs	100–YR cfs
Proposed Condition Unrouted	96	202	332
Proposed Condition Routed	31	98	226

ROUTED ELEVATIONS	POST–DEVELOPMENT
2–yr Elevation	42.01 ft (msl)
10–yr Elevation	43.61 ft (msl)
100–yr Elevation	45.46 ft (msl)



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7. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THIS PLAN OR AS DIRECTED BY THE ENGINEER. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE DIVISION OF CODE COMPLIANCE PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF SAME. THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

9. PERMANENT OR TEMPORARY SOIL STABILIZATION MUST BE APPLIED TO ALL DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION MUST ALSO BE APPLIED TO DENUDED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 30 DAYS. SOIL STABILIZATION MEASURES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING AND THE EARLY APPLICATION OF GRAVEL BASE MATERIAL ON AREAS TO BE PAVED.

10. NO MORE THAN 300 FEET OF SANITARY STORM SEWER, WATERLINES, OR UNDERGROUND UTILITY LINES ARE TO BE OPEN AT ONE TIME. FOLLOWING INSTALLATION OF ANY PORTION OF THESE ITEMS, ALL DISTURBED AREAS ARE TO BE IMMEDIATELY STABILIZED (I.E., THE SAME DAY).

11. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY, OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH SPECIFICATION 3.35. SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME, AND FERTILIZING IN ACCORDANCE WITH SPECIFICATION 3.32, PERMANENT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

13. ALL SLOPES STEEPER THAN 3:1 SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS SUCH AS EXCELSIOR BLANKETS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 3.35, MULCHING AND MANUFACTURER S INSTRUCTIONS. NO SLOPES SHALL BE CREATED STEEPER THAN 2:1.

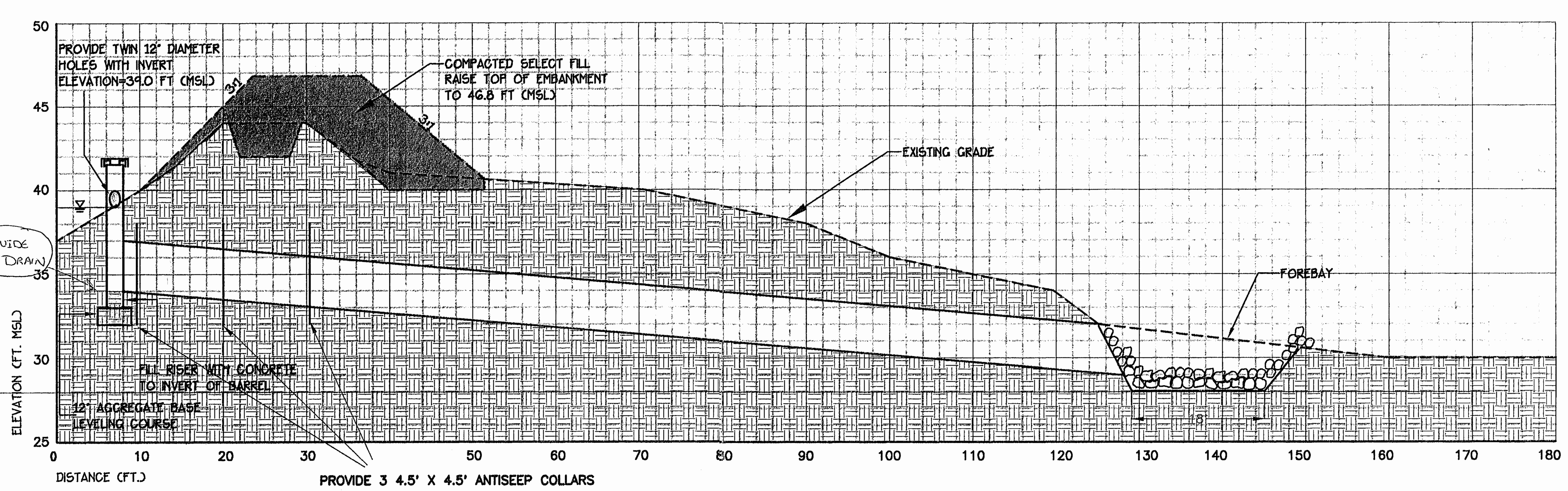
14. INLET PROTECTION IN ACCORDANCE WITH SPECIFICATION 3.07 SHALL BE PROVIDED FOR ALL STORM DRAIN INLETS AS SOON AS PRACTICAL FOLLOWING CONSTRUCTION OF SAME.

15. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

16. PAVED DITCHES SHALL BE REQUIRED WHEREVER EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

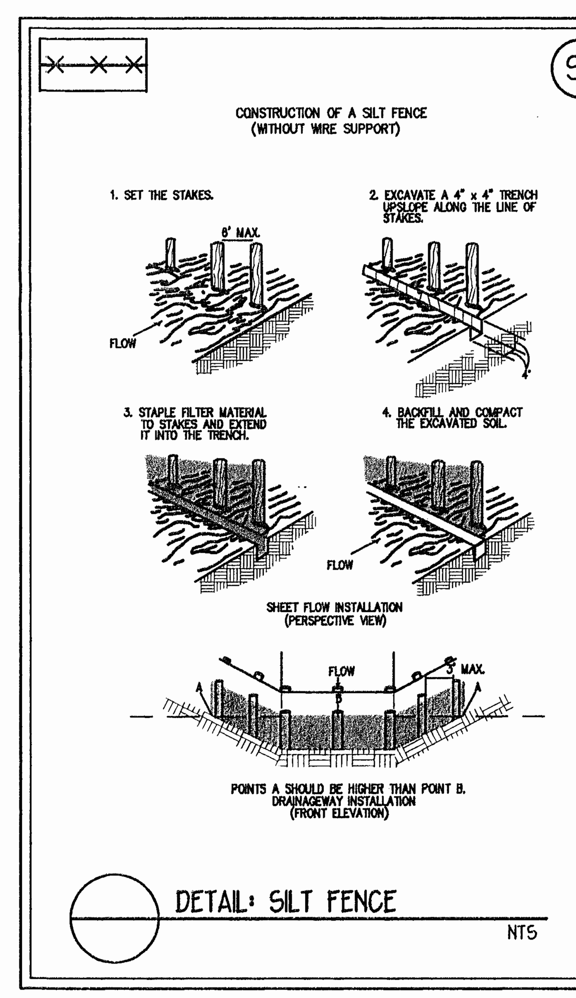
17. TEMPORARY EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. AFTER STABILIZATION IS COMPLETE, ALL MEASURES SHALL BE REMOVED WITHIN 30 DAYS. TRAPPED SEDIMENT SHALL BE SPREAD AND SEEDED.

18. AS-BUILT DRAWINGS MUST BE PROVIDED FOR ALL DETENTION/BMP FACILITIES. ALSO UPON COMPLETION, THE CONSTRUCTION OF ALL DETENTION/BMP FACILITIES SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER WHO INSPECTED THE STRUCTURE DURING CONSTRUCTION. THE CERTIFICATION SHALL STATE THAT TO THE BEST OF HIS/HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS.



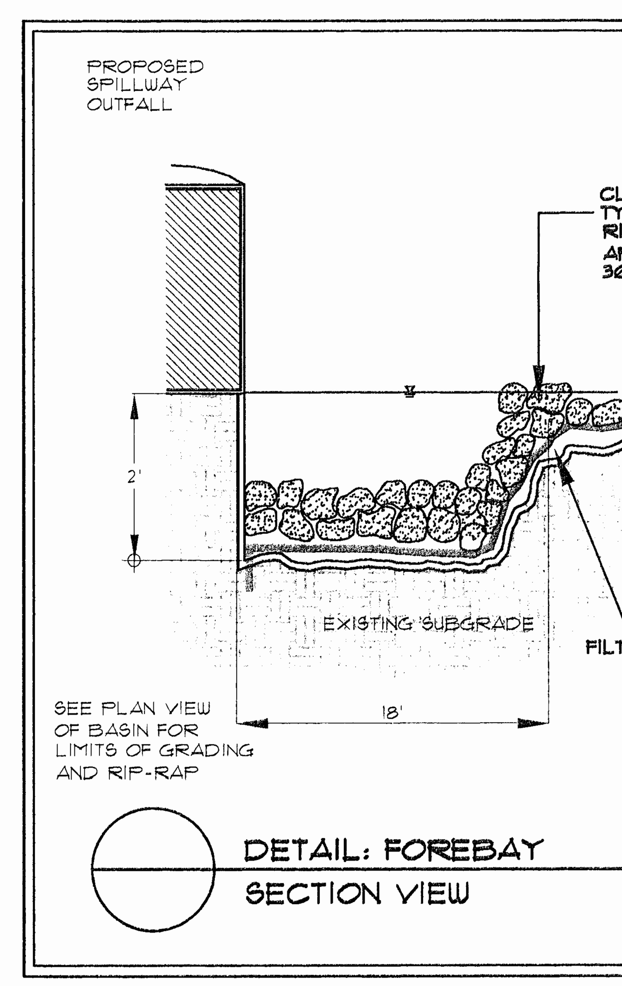
EMBANKMENT SECTION: A–A'

VERTICAL SCALE: 1" = 5', HORIZONTAL SCALE 1" = 10'



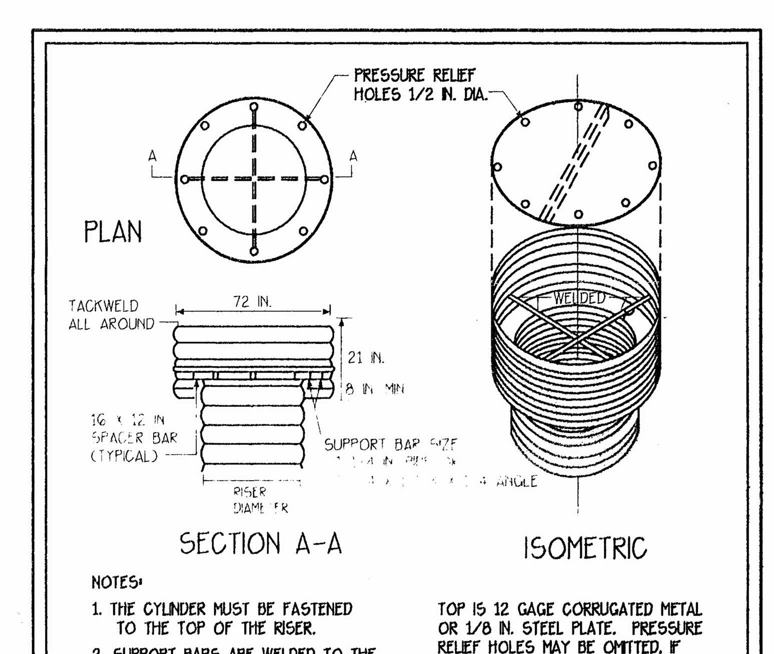
DETAIL: SILT FENCE

NTS



DETAIL: FOREBAY SECTION VIEW

NTS



NOTES:

1. THE CYLINDER MUST BE FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.
3. WELDED TRASH-RACK WITH #8 REBAR MAY BE USED FOR TOP OF BMP RISERS.

TOP IS 12 GAGE CORRUGATED METAL OR 1/8 IN. STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN TOP IS ATTACHED.

CYLINDER IS 12 GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8 IN. STEEL PLATE.

DETAIL: ANTI-VORTEX DEVICE

NTS

WC053

PRIVATE DAM WC053

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Environmental Consultants
516-B SOUTH HENRY STREET
WILLIAMSBURG, VIRGINIA 23185
(757) 220 - 6869

OFFSITE DAM IMPROVEMENTS
STONEHOUSE PROPERTY
JAMES CITY COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
ERIK L. ALLEN
No. 024783
4-6-98
PROFESSIONAL ENGINEER

REVISIONS:

DATE	
9/26/97	REVISED AS PER COUNTY COMMENTS DATED 9/16/97
11/10/97	REVISED AS PER COUNTY COMMENTS
03/27/98	REVISED OUTLET STRUCTURE TO ACCOMODATE STONEHOUSE DEVELOPEMENT

DRAWN BY: JAM/ACAD
DESIGNED BY: TJS/JFC/EA
DATE: 9/9/97
CHECKED BY: BLF/EA/RB
SHEET: 1
JOB #: 318

N/F
CHARLES C. DAVIS
TAX MAP # 47-9
DEED BOOK 47, PAGE 196

I.R.S. ON BEAVER DAM

S 10° - 02' - 56" E
374.59'

I.R.S.

S 52° - 18' - 58" W
208.09'

N 79° - 59' - 58" E 195.10'
170.00'

APPROXIMATE EDGE OF WET GROUND

NEW PROPERTY LINE

NEW LOT 1
AREA = 3.44 ACRES +/-
A PORTION OF TAX MAP #47-6

RESERVE DRAINFIELD SITE

PRIMARY DRAINFIELD SITE

PROPOSED HOUSE LOCATION

PROPOSED WELL LOCATION
(FLAGGED BY HEALTH DEPT.)

I.R.S.

I.R.S. ON EARTH DAM

N/F
STONEHOUSE INC.
"FERNANDEZ TRACT"
TAX MAP (5-1)(1-2)
PLAT BOOK 52, PAGE 37
PLAT BOOK 63, PAGE 94

I.R.F.

I.P.F.

TALL I.P.F. IN POND

POND

Mr. Cooke, ASAP
This is to make clear I notified you over a year ago that this Dam was failing, If County and developers do not act immediately there is going to be three acres of water flood Ware creek.

I.P.F.

N/F
CHARLES D. COATS
TAX MAP (5-1)(1-1)
DEED BOOK 337, PAGE 502
PLAT IN DEED BOOK 62, PAGE 450

N 74° - 14' - 28" E 295.80'
270.80'

LINE

N 44° - 40' - 22" W 536.34'

PROPERTY LINE IS ALONG ℄ OF WARE CREEK

I.P.F.

N/F
J. KILBY DAVIS
TAX MAP # 47-6
ED BOOK 185, PAGE 395

N/F
EDITH B. HAZELWOOD
TAX MAP (4-2)(1-14)
DEED BOOK 392, PAGE 63
PLAT BOOK 48, PAGE 79

I.R.S.

NEW KENT COUNTY
MECHANICSVILLE COUNTY

COMMONWEALTH OF VIRGINIA
JAMES E. MITCHELL
No. 001452B
6-11-96
LAND SURVEYOR

PREPARED BY:
MITCHELL-WILSON ASSOCIATES, P.C.
CIVIL ENGINEERS & LAND SURVEYORS
720 MAIN STREET, SUITE 112, 2ND FLOOR
P.O. BOX 1269
WEST POINT, VIRGINIA 23181

CONSTRUCTION NOTES

1. A GEOTECHNICAL ENGINEER SHALL BE CONTACTED TO MAKE RECOMMENDATIONS REGARDING STABILITY OF EXISTING DAM, APPROPRIATE CONSTRUCTION TECHNIQUES, AND DEWATERING REQUIREMENTS. ADDITIONALLY, A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER SHALL BE PRESENT DURING CONSTRUCTION TO INSPECT SOIL MATERIALS USED ON THE DAM AND COMPLIANCE WITH CONSTRUCTION SPECIFICATIONS.

2. EARTH WORK WILL REQUIRE DISTURBANCE TO THE EXISTING EMBANKMENT. THE CONTRACTOR SHOULD BE PREPARED TO LOWER THE IMPOUNDMENT POOL LEVEL IN THE CASE OF AN EMERGENCY.

3. SOILS USED TO CONSTRUCT THE NEW EMBANKMENT SHOULD CONSIST OF A SOIL MATERIAL FREE OF ORGANICS AND DEBRIS, CLASSIFIED AS SM, SC, CL OR ML WHICH CONTAINS NO LESS THAT 15% PASSING THE NO. 200 SIEVE. SUCH SOILS SHOULD BE AVAILABLE FROM LOCAL ON-SITE SOURCES.

4. PREPARATION OF THE EMBANKMENT FOR FILL PLACEMENT SHOULD INCLUDE CUTTING OF ALL TREES WITHIN THE FILL AREA. TREES SHOULD BE CUT FLUSH TO THE GROUND SURFACE, AS STUMP REMOVAL WOULD LIKELY CAUSE MORE POTENTIAL DAMAGE TO THE DAM THAN THE PRESENCE OF ROTTING STUMPS WITHIN THE ENCAPSULATED EMBANKMENT. THE COMPLETE REMOVAL OF STUMPS IS NOT RECOMMENDED. THE CONTRACTOR SHOULD BE PREPARED TO EXCAVATE STUMPS FROM LARGER TREES (GREATER THAN 8 INCHES IN DIAMETER 4 FEET ABOVE GROUND) SHOULD THESE STUMPS BE LOCATED LESS THAN 4 FEET FROM THE FINAL EMBANKMENT SURFACE MEASURED HORIZONTALLY.

5. STRIPPING SHOULD INCLUDE REMOVAL OF ALL TOPSOIL AND BRUSH VEGETATION FROM AREAS OF FILL PLACEMENT.

6. FILL SHOULD BE PLACED AND COMPACTED IN MAXIMUM 10 INCH HORIZONTAL LIFTS, MEASURED LOOSE. TO PROVIDE FOR HORIZONTAL COMPACTION, THE UPSTREAM AND DOWNSTREAM FACE OF THE DAM WILL REQUIRE NOTCHING BY EXCAVATING SOIL AT TOE OF PROPOSED FILL TO PROVIDE FOR A BENCH ON WHICH TO COMPACT SUBSEQUENT LIFTS. AT AN ELEVATION WHERE THE DESIGN WIDTH OF THE NEW FILL EQUALS THE HORIZONTAL COMPACTION SURFACE WIDTH, THIS EXCESS FILL PLACEMENT EFFORT WOULD NOT BE REQUIRED, AND ANY FILL PLACED AND COMPACTED BEYOND THE DESIGN ZONE OF THE NEW FILL CAN BE REMOVED AND REUSED ELSEWHERE.

7. ALL EXISTING DAM SURFACES, HORIZONTAL OR OTHERWISE, ON WHICH FILL IS TO BE PLACED SHOULD BE SCARIFIED TO A DEPTH OF AT LEAST 4 INCHES PRIOR TO FILL PLACEMENT.

8. ALL FILL SHOULD BE PLACED IN MAXIMUM 10 INCH LOOSE, HORIZONTAL LIFTS AND MECHANICALLY COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THAT SOIL STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). IN ORDER TO PROPERLY ACHIEVE COMPACTION OF THIS SOIL, THE SOIL SHOULD BE BROUGHT TO WITHIN +/- 4% OF OPTIMUM PRIOR TO COMPACTING.

9. FILL SHALL BE STABILIZED BY SEEDING IMMEDIATELY UPON REACHING FINAL GRADE.

BASIN HYDROLOGY

BASIN CHARACTERISTICS	DA ACRES	CN	Tc HOURS
Post–development	121	71	1.30
Top of Dam Elevation	45.0 ft (msl)		
Normal Pool Elevation	40.0 ft (msl)		
Emergency Spillway Elevation	43.0 ft (msl)		
HYDROLOGIC SUMMARY	2–YR cfs	10–YR cfs	100–YR cfs
Proposed Condition Unrouted	58	151	275
Proposed Condition Routed	47	103	222
ROUTED ELEVATIONS	POST–DEVELOPMENT		
2–yr Elevation	41.08 ft (msl)		
10–yr Elevation	42.89 ft (msl)		
100–yr Elevation	44.95 ft (msl)		

EROSION AND SEDIMENT CONTROL NOTES

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OF STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. IN ADDITION TO THESE NOTES, ALL PROVISIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS SHALL APPLY TO THIS PROJECT.

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK. THE CONTRACTOR SHALL BE THOROUGHLY FAMILIAR WITH ALL APPLICABLE MEASURES CONTAINED THEREIN WHICH MAY BE PERTINENT TO THIS PROJECT.

2. ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS SHALL BE PROTECTED BY A TEMPORARY CONSTRUCTION ENTRANCE TO PREVENT TRACKING OF MUD ONTO PUBLIC RIGHT-OF-WAYS. AN ENTRANCE PERMIT FROM VDOT IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES WITHIN STATE RIGHT-OF-WAYS. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, THE ROAD SHALL BE THOROUGHLY CLEANED AT THE END OF EACH DAY.

3. A PRECONSTRUCTION MEETING SHALL BE HELD ON SITE BETWEEN THE COUNTY, THE DEVELOPER, THE PROJECT ENGINEER, AND THE CONTRACTOR PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY FOR APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING. THE CONTRACTOR WILL SUPPLY CODE COMPLIANCE WITH THE NAME OF THE INDIVIDUAL WHO WILL BE RESPONSIBLE FOR ENSURING MAINTENANCE OF INSTALLED MEASURES ON A DAILY BASIS.

4. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT ON-SITE MUST BE CONSTRUCTED AS A FIRST STEP IN GRADING AND BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE. EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS MUST BE SEEDED AND MULCHED IMMEDIATELY AFTER INSTALLATION. PERIODIC INSPECTIONS OF THE EROSION CONTROL MEASURES SHALL BE MADE TO ASSESS THEIR CONDITION. ANY NECESSARY MAINTENANCE OF THE MEASURES SHALL BE ACCOMPLISHED IMMEDIATELY UPON NOTIFICATION BY THE COUNTY AND SHALL INCLUDE THE REPAIR OF MEASURES DAMAGED BY ANY SUBCONTRACTOR INCLUDING THOSE OF THE PUBLIC UTILITY COMPANIES.

5. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING THE SLOPES OF BY INSTALLING MECHANICAL DEVICES TO SAFELY LOWER WATER DOWNSLOPE WITHOUT CAUSING EROSION. A TEMPORARY FILL DIVERSION (STD. + SPEC. 3.10) SHALL BE INSTALLED PRIOR TO THE END OF EACH WORKING DAY.

6. SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. DIVISION OF CODE COMPLIANCE APPROVAL WILL BE REQUIRED FOR OTHER DEVIATIONS FROM THE APPROVED PLANS.

7. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THIS PLAN OR AS DIRECTED BY THE ENGINEER. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE DIVISION OF CODE COMPLIANCE PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF SAME. THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

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12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME, AND FERTILIZING IN ACCORDANCE WITH SPECIFICATION 3.32, PERMANENT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

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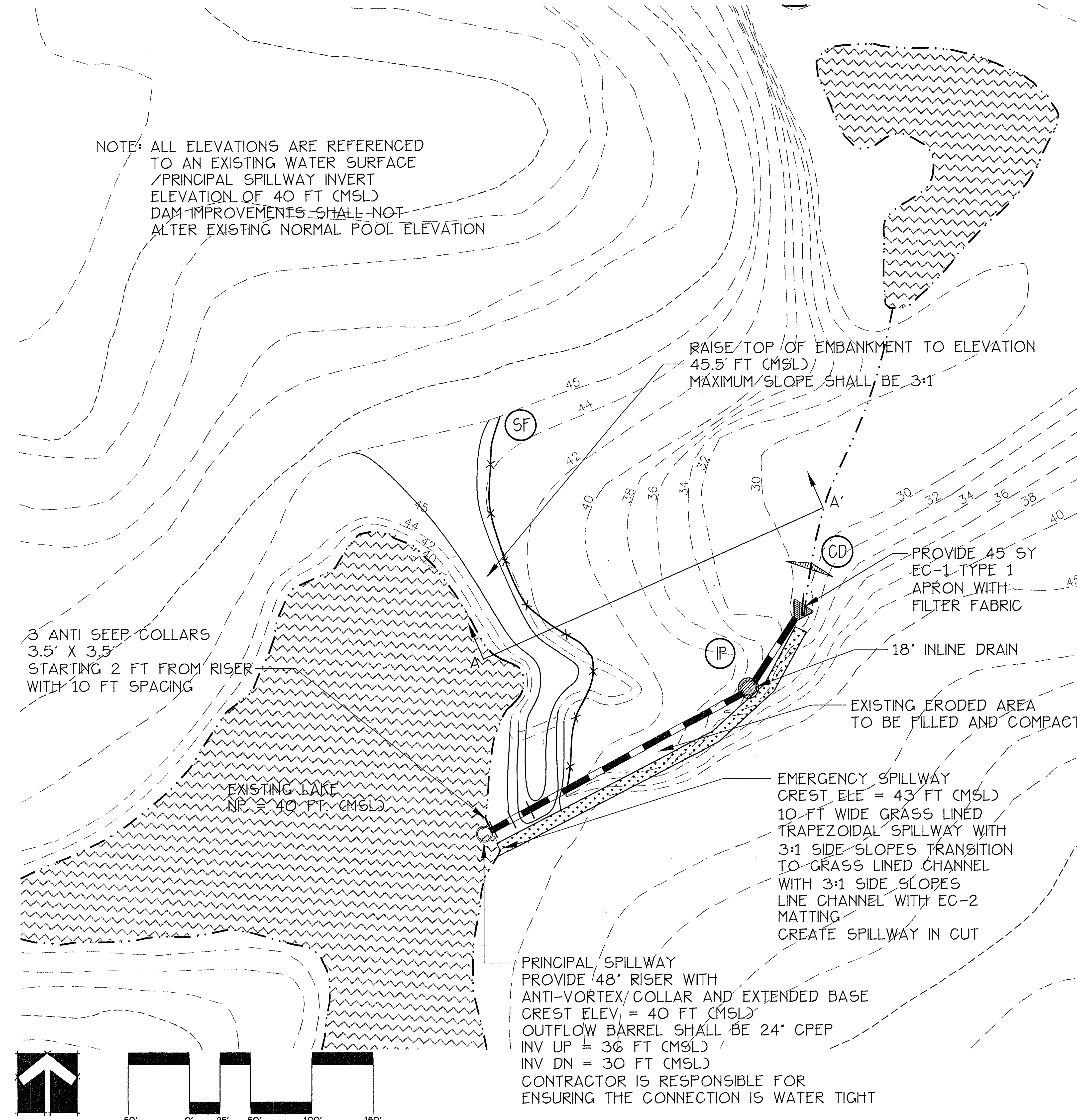
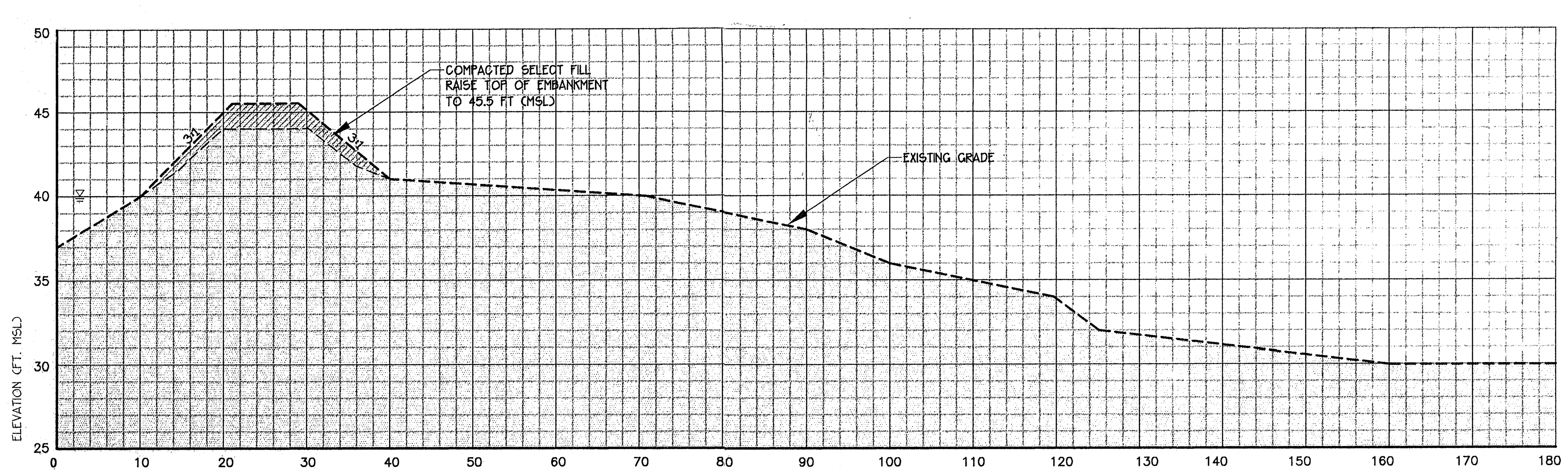
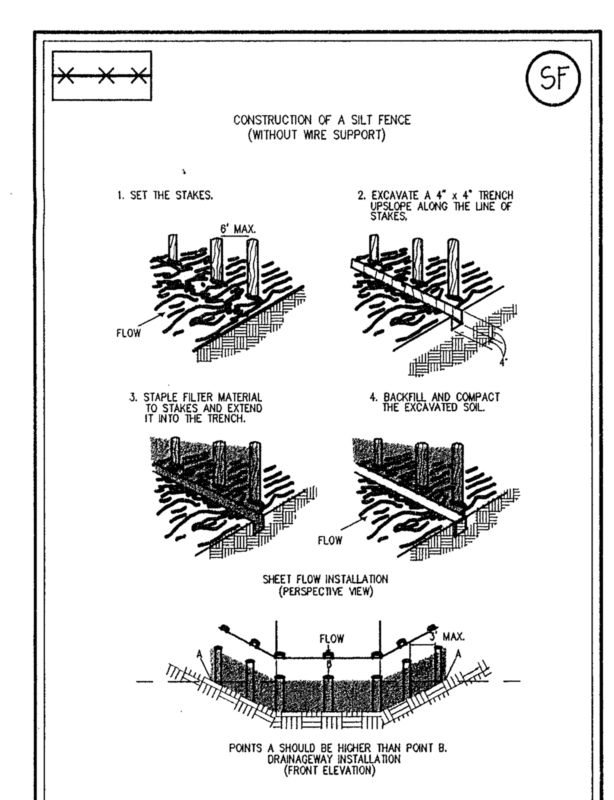




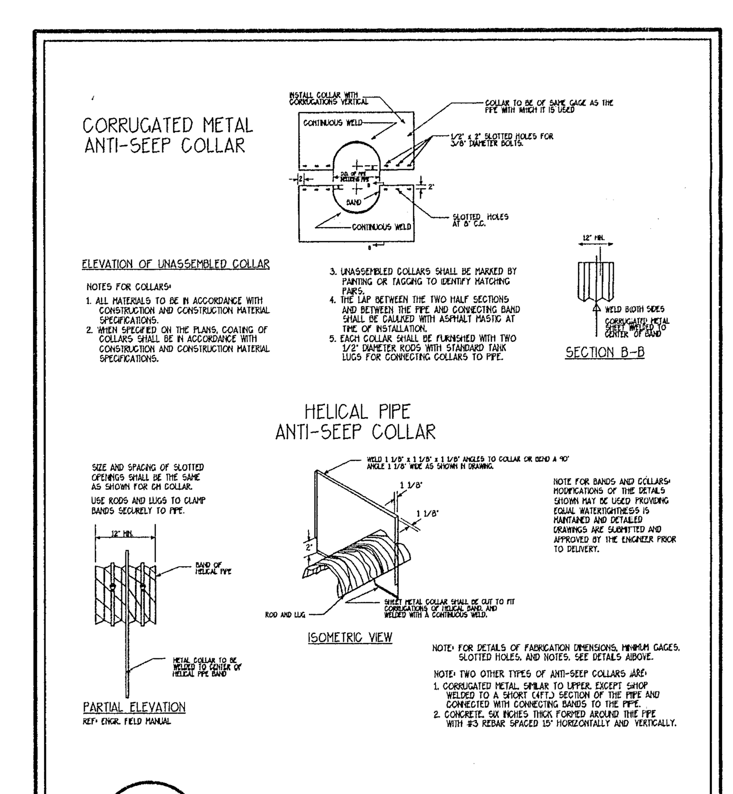
EMBANKMENT SECTION: A-A'

VERTICAL SCALE: 1" = 5' , HORIZONTAL SCALE 1" = 10'



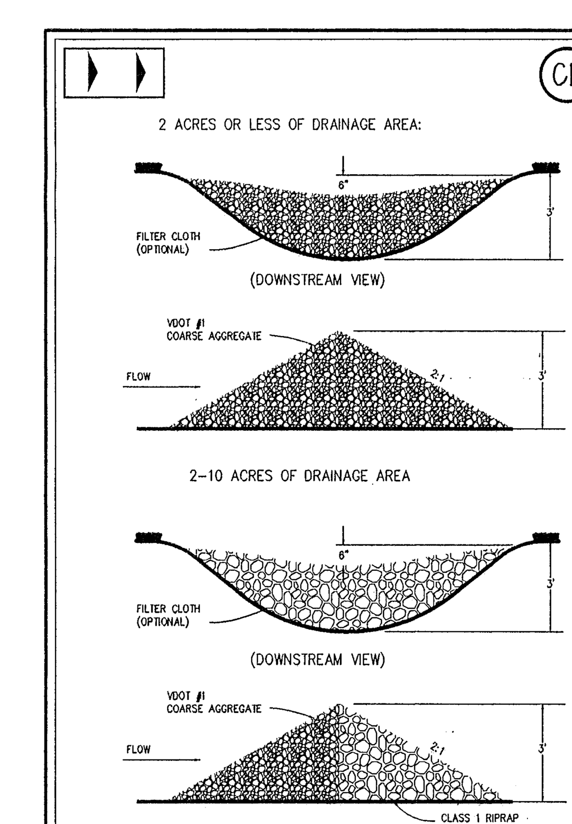
DETAIL: SILT FENCE

NTS



DETAIL: METAL ANTI-SEEP COLLAR'S

NTS



DETAIL: CHECK DAM

NTS

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Environmental Consultants
516-B SOUTH HENRY STREET
WILLIAMSBURG, VIRGINIA 23185
(757) 220 - 6869

OFFSITE DAM IMPROVEMENTS
STONEHOUSE PROPERTY
JAMES CITY COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
ERIK L. ALLEN
No. 024783
PROFESSIONAL ENGINEER

REVISIONS:
DATE:
9/26/97 REVISED PER COUNTY COMMENTS DATED 9/16/97

DRAWN BY: TJS/JFC/ACAD
DESIGNED BY: TJS/JFC/EA
DATE: 9/9/97
CHECKED BY: BLF/EA/RB

SHEET: 1
JOB #: 318

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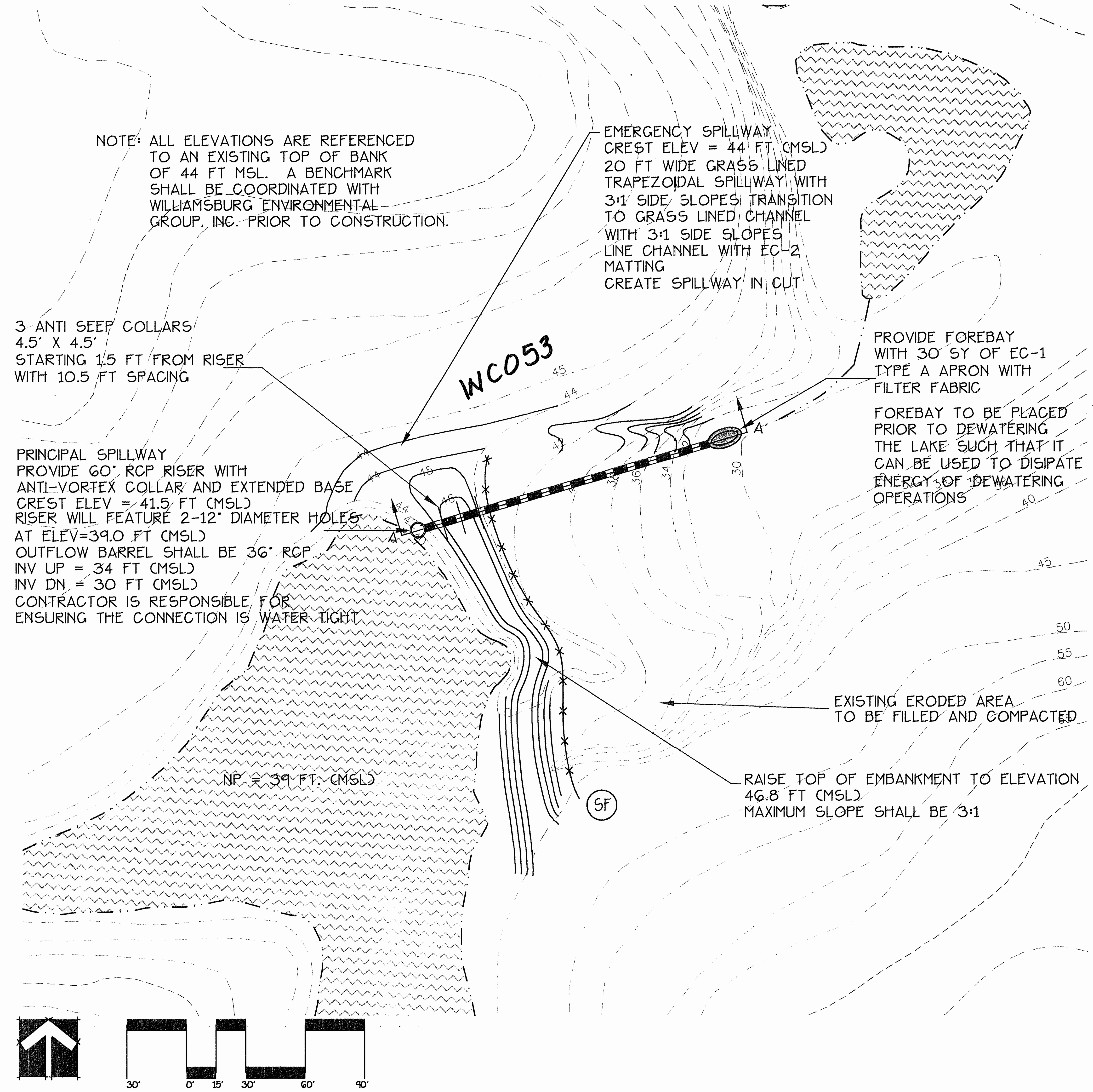
BASIN HYDROLOGY

BASIN CHARACTERISTICS	DA ACRES	CN	Tc HOURS
Post-development	41.2	84	0.29
	76.8	71	0.93
Top of Dam Elevation	46.8 ft (msl)		
Normal Pool Elevation	39.0 ft (msl)		
Emergency Spillway Elevation	44.0 ft (msl)		

HYDROLOGIC SUMMARY	2-YR cfs	10-YR cfs	100-YR cfs
Proposed Condition Unrouted	96	202	332
Proposed Condition Routed	31	98	226

ROUTED ELEVATIONS	POST-DEVELOPMENT
2-yr Elevation	42.01 ft (msl)
10-yr Elevation	43.61 ft (msl)
100-yr Elevation	45.46 ft (msl)



EROSION AND SEDIMENT CONTROL NOTES

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OF STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. IN ADDITION TO THESE NOTES, ALL PROVISIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS SHALL APPLY TO THIS PROJECT.

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK. THE CONTRACTOR SHALL BE THOROUGHLY FAMILIAR WITH ALL APPLICABLE MEASURES CONTAINED THEREIN WHICH MAY BE PERTINENT TO THIS PROJECT.

2. ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS SHALL BE PROTECTED BY A TEMPORARY CONSTRUCTION ENTRANCE TO PREVENT TRACKING OF MUD ONTO PUBLIC RIGHT-OF-WAYS. AN ENTRANCE PERMIT FROM VDOT IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES WITHIN STATE RIGHT-OF-WAYS. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, THE ROAD SHALL BE THOROUGHLY CLEANED AT THE END OF EACH DAY.

3. A PRECONSTRUCTION MEETING SHALL BE HELD ON SITE BETWEEN THE COUNTY, THE DEVELOPER, THE PROJECT ENGINEER, AND THE CONTRACTOR PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY FOR APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING. THE CONTRACTOR WILL SUPPLY CODE COMPLIANCE WITH THE NAME OF THE INDIVIDUAL WHO WILL BE RESPONSIBLE FOR ENSURING MAINTENANCE OF INSTALLED MEASURES ON A DAILY BASIS.

4. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT ON-SITE MUST BE CONSTRUCTED AS A FIRST STEP IN GRADING AND BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE. EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS MUST BE SEEDED AND MULCHED IMMEDIATELY AFTER INSTALLATION. PERIODIC INSPECTIONS OF THE EROSION CONTROL MEASURES SHALL BE MADE TO ASSESS THEIR CONDITION. ANY NECESSARY MAINTENANCE OF THE MEASURES SHALL BE ACCOMPLISHED IMMEDIATELY UPON NOTIFICATION BY THE COUNTY AND SHALL INCLUDE THE REPAIR OF MEASURES DAMAGED BY ANY SUBCONTRACTOR INCLUDING THOSE OF THE PUBLIC UTILITY COMPANIES.

5. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING THE SLOPES OF BY INSTALLING MECHANICAL DEVICES TO SAFELY LOWER WATER DOWNSLOPE WITHOUT CAUSING EROSION. A TEMPORARY FILL DIVERSION (STD. + SPEC. 3.10) SHALL BE INSTALLED PRIOR TO THE END OF EACH WORKING DAY.

6. SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. DIVISION OF CODE COMPLIANCE APPROVAL WILL BE REQUIRED FOR OTHER DEVIATIONS FROM THE APPROVED PLANS.

7. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THIS PLAN OR AS DIRECTED BY THE ENGINEER. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE DIVISION OF CODE COMPLIANCE PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF SAME. THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

9. PERMANENT OR TEMPORARY SOIL STABILIZATION MUST BE APPLIED TO ALL DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION MUST ALSO BE APPLIED TO DENUDED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 30 DAYS. SOIL STABILIZATION MEASURES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING AND THE EARLY APPLICATION OF GRAVEL BASE MATERIAL ON AREAS TO BE PAVED.

10. NO MORE THAN 300 FEET OF SANITARY STORM SEWER, WATERLINES, OR UNDERGROUND UTILITY LINES ARE TO BE OPEN AT ONE TIME. FOLLOWING INSTALLATION OF ANY PORTION OF THESE ITEMS, ALL DISTURBED AREAS ARE TO BE IMMEDIATELY STABILIZED (I.E., THE SAME DAY).

11. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY, OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH SPECIFICATION 3.35. SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME, AND FERTILIZING IN ACCORDANCE WITH SPECIFICATION 3.32, PERMANENT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

13. ALL SLOPES STEEPER THAN 3:1 SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS SUCH AS EXCELSIOR BLANKETS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 3.35, MULCHING AND MANUFACTURER S INSTRUCTIONS. NO SLOPES SHALL BE CREATED STEEPER THAN 2:1.

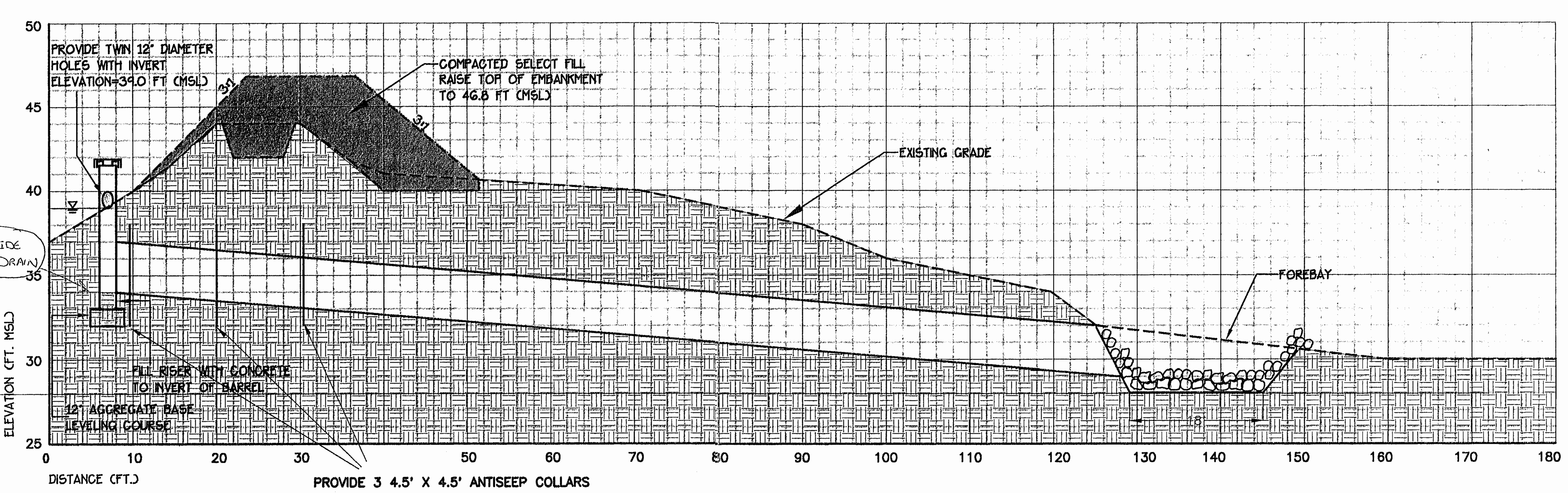
14. INLET PROTECTION IN ACCORDANCE WITH SPECIFICATION 3.07 SHALL BE PROVIDED FOR ALL STORM DRAIN INLETS AS SOON AS PRACTICAL FOLLOWING CONSTRUCTION OF SAME.

15. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

16. PAVED DITCHES SHALL BE REQUIRED WHEREVER EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

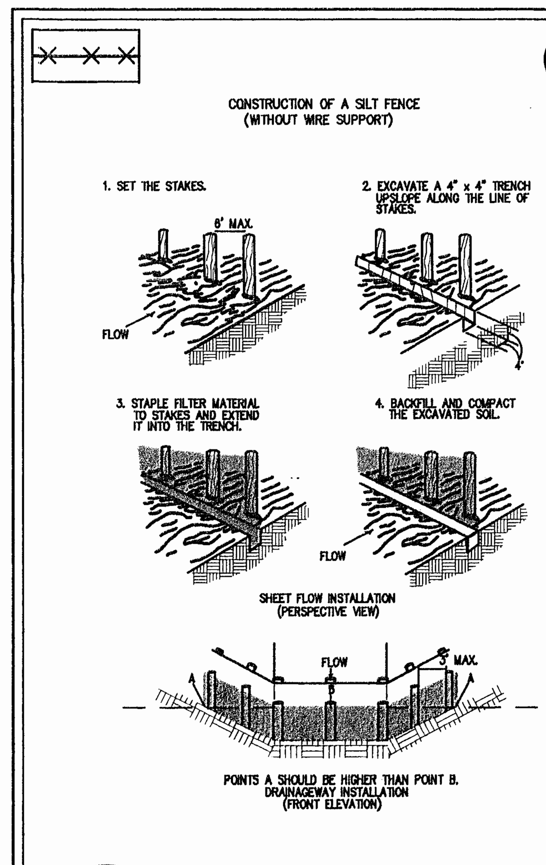
17. TEMPORARY EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. AFTER STABILIZATION IS COMPLETE, ALL MEASURES SHALL BE REMOVED WITHIN 30 DAYS. TRAPPED SEDIMENT SHALL BE SPREAD AND SEEDED.

18. AS-BUILT DRAWINGS MUST BE PROVIDED FOR ALL DETENTION/BMP FACILITIES. ALSO UPON COMPLETION, THE CONSTRUCTION OF ALL DETENTION/BMP FACILITIES SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER WHO INSPECTED THE STRUCTURE DURING CONSTRUCTION. THE CERTIFICATION SHALL STATE THAT TO THE BEST OF HIS/HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS.



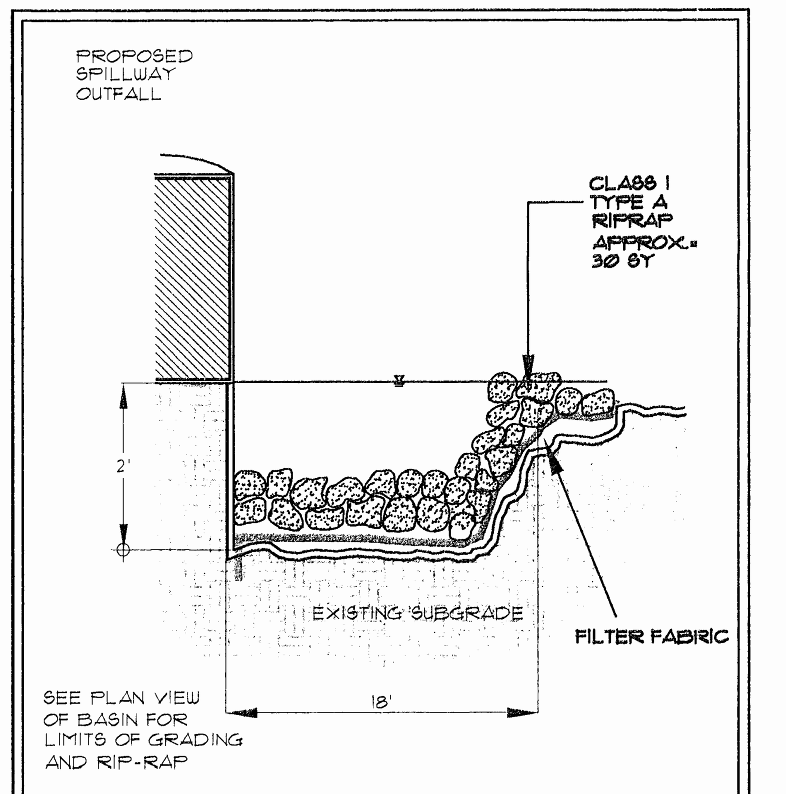
EMBANKMENT SECTION: A-A'

VERTICAL SCALE: 1" = 5', HORIZONTAL SCALE 1" = 10'



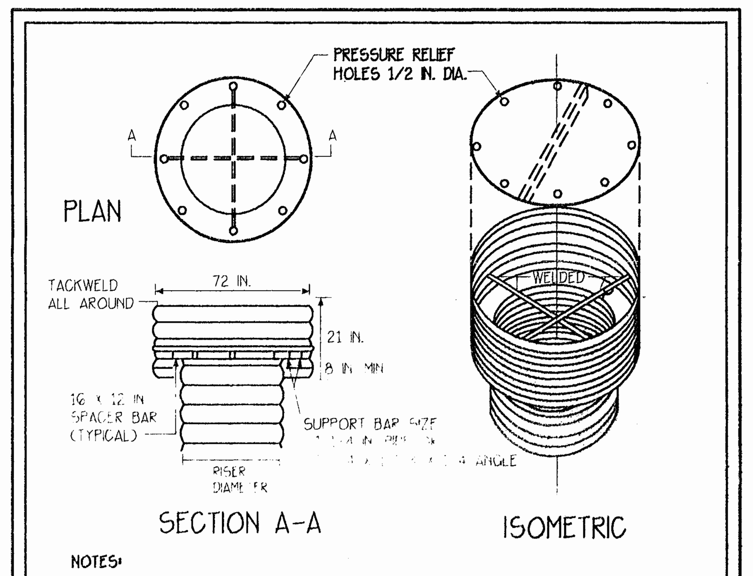
DETAIL: SILT FENCE

NTS



DETAIL: FOREBAY SECTION VIEW

NTS



NOTES:

1. THE CYLINDER MUST BE FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO TOP OF RISER.
3. WELDED TRASH-RACK WITH #8 REBAR MAY BE USED FOR TOP OF BMP RISERS.

TOP IS 12 GAGE CORRUGATED METAL OR 1/8 IN. STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN TOP IS ATTACHED.

CYLINDER IS 12 GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8 IN. STEEL PLATE.

DETAIL: ANTI-VORTEX DEVICE

NTS

WC053

PRIVATE DAM WC053

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Environmental Consultants
516-B SOUTH HENRY STREET
WILLIAMSBURG, VIRGINIA 23185
(757) 220 - 6869

OFFSITE DAM IMPROVEMENTS
STONEHOUSE PROPERTY
JAMES CITY COUNTY, VIRGINIA

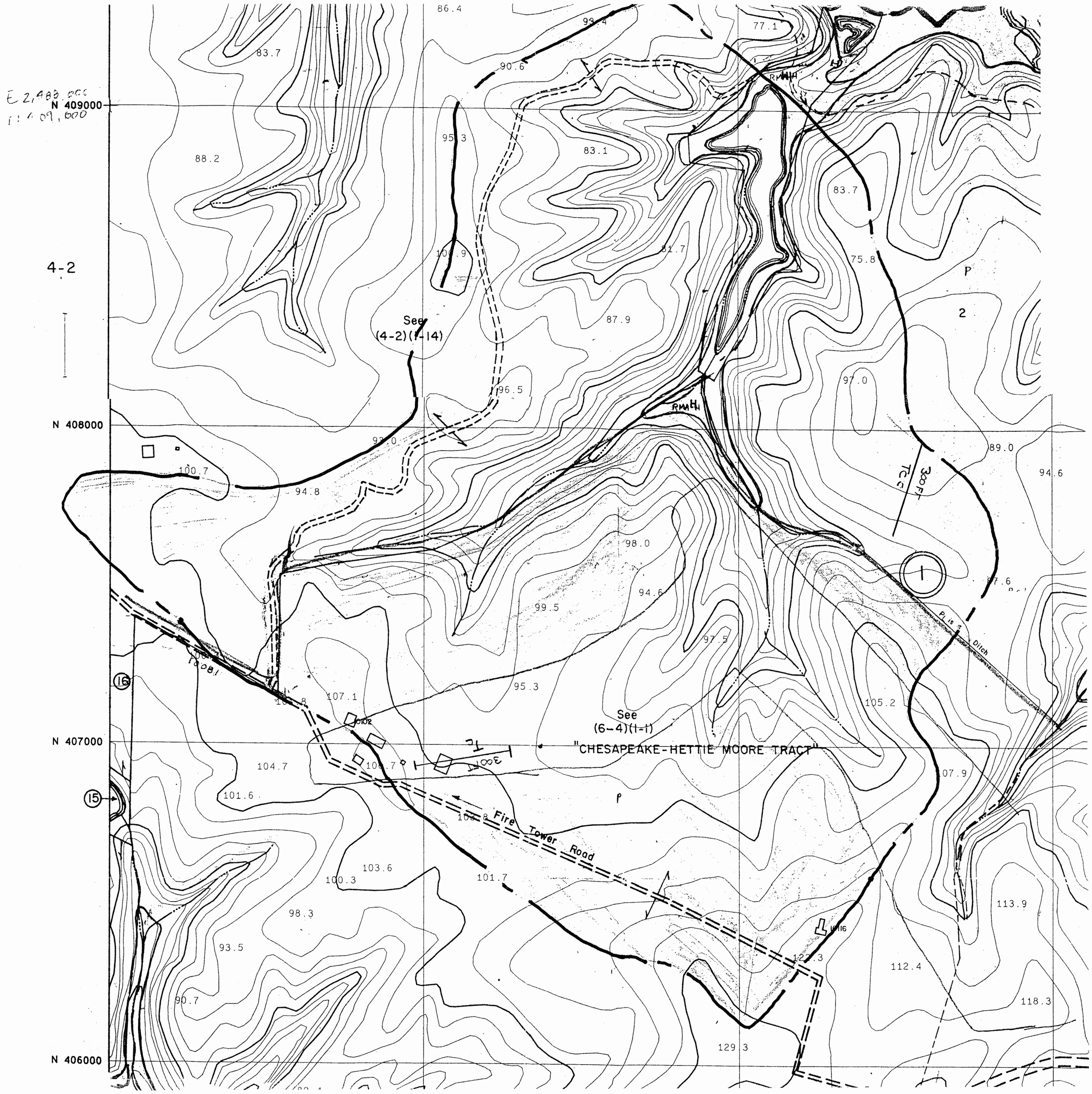
COMMONWEALTH OF VIRGINIA
ERIK L. ALLEN
No. 024783
4-6-98
PROFESSIONAL ENGINEER

REVISIONS:

DATE:	
9/26/97	REVISED AS PER COUNTY COMMENTS DATED 9/16/97
11/10/97	REVISED AS PER COUNTY COMMENTS
03/27/98	REVISED OUTLET STRUCTURE TO ACCOMODATE STONEHOUSE DEVELOPEMENT

DRAWN BY: JAM/ACAD
DESIGNED BY: TJS/JFC/EA
DATE: 9/9/97
CHECKED BY: BLF/EA/RB

SHEET: 1
JOB #: 318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Ditch
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Stormwater Management and Drainage Design Report
Stonehouse, Section V-A, 'Lisburn'

AES Project Number 9088-00
August 2002
Revised October 10, 2002
Second Revision – November 21, 2002

Project Description

This narrative is provided to augment the stormwater management components of the plans for the Section V-A, 'Lisburn' subdivision of the Stonehouse Project. This project site is zoned PUD-R, and is part of parcel (4-4) (1-24) on James City County Tax Maps. The total project area is 83.47 acres with only 12.57 ac. disturbed for the construction of this project.

The proposed Best Management Practices (BMPs) scheduled for this site provide runoff quantity, and stream channel protection only. Through a combination of natural open space, constructed BMP's, existing Coat's Pond, and existing Richardson's Mill Pond, this project and the Stonehouse Phase 1 development is able to meet the performance standards outlined for the protection of the Chesapeake Bay.

Site work for this project is to consist of construction of secondary roadways (with curb and gutter), storm sewers, water system extensions, sanitary sewer system extensions, and drainage improvements to support a single-family residential development. Runoff from the proposed development is discharged two primary ways: Accumulated with storm sewers to runoff control facilities (in this case proposed BMP's, or constructed BMP facilities); and un-concentrated overland runoff (to constructed BMP facilities or existing ponds).

Environmentally Sensitive Areas

Environmentally sensitive areas are designated on the soils map (the soil map is made as a part of the engineering plans). Locations of RMA wetlands are labeled on plan sheets. On the soils map, steep slopes and areas of highly erosive soils are indicated.

Soils

Soils are mapped with reference to the Soil Survey of James City and York Counties and the City of Williamsburg, as issued by the Soil Conservation Service. Soils in the area of the project consist of:

11C – Craven – Uchee Complex, 6 to 10% slopes, Hydrologic Group – C

WC053_STONEHOUSE_LEGENDS_GOLF_COURSE_OFFSITE_DAM_IMPRV_COATS_DAM - 009

These soils are moderately well drained or well drained soils, generally located on side slopes of narrow ridge tops. The surface layer is typically a dark grayish brown, fine sandy loam about 4 inches thick. The subsurface is pale olive fine sandy loam 5 inches thick. The subsoil, extending to a depth of 42 inches, is yellowish brown clay or yellowish brown sandy clay mottled with gray clay. Generally below 42 inches, the substratum consists of a brownish yellow fine sandy loam. Permeability for this soil is low to moderate; shrink-swell potential is moderate; and erosion hazard is severe.

14B – Emporia Fine Sandy Loam, 2 to 6% slopes, Hydrologic Group - C

These soils are well-drained soils, generally located on upland areas. The surface layer is typically a dark grayish brown, fine sandy loam about 4 inches thick. The subsurface is pale brown loam 9 inches thick. The subsoil, extending to a depth of 58 inches, is yellowish brown loam with strong brown mottles in the upper part. Generally below 58 inches, the substratum consists of gray, brown and red, firm sandy clay loam. Permeability for this soil is moderate in the upper layers, and slow to moderately slow in lower layers. Shrink-swell potential is moderate; and erosion hazard is also moderate.

15F – Emporia Complex, 15 to 25% slopes, Hydrologic Group – C

These soils are well drained, and steeply sloped. The surface layer is typically a dark grayish brown, fine sandy loam about 3 inches thick. The subsurface is pale brown loam 3 inches thick. The subsoil, extending to a depth of 45 inches, is yellowish brown loam. Generally below 45 inches, the substratum varies between gray, brown and red firm sandy clay loam. Permeability for this soil is moderate; shrink-swell potential is moderate; and erosion hazard is severe.

19B – Kempsville Emporia fine sandy loams, Hydrologic Group - B

These soils are well drained, and gently sloping. The surface layer is typically dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 10 inches thick. The subsoil extends to a depth of 55 inches and is a yellowish brown and strong brown fine sandy loam and sandy clay loam to a depth of 32 inches below this.

20B – Kenansville Loamy Fine Sand, 2 to 6% slopes, Hydrologic Group - A

These soils are well drained, and gently sloping. Typically, the surface layer of this soil is dark grayish brown loamy fine sand about 2 inches thick. The subsurface layer is light yellowish brown loamy fine sand 23 inches thick. The subsoil is yellowish brown and strong brown fine sandy loam 18 inches thick. The substratum is yellowish brown loamy fine sand with lamellae of brown fine sandy loam to a depth of at least 78 inches.

29A – Slagle, Fine Sandy Loam, 0 to 2% slopes, Hydrologic Group – C

These soils are deep, nearly level and moderately well drained. The surface layer is typically a dark grayish brown, fine sandy loam about 4 inches thick. The subsurface is yellowish brown fine sandy loam 5 inches thick. The subsoil, extending to a depth of 50 inches, is yellowish brown clay loam. Permeability for this soil is moderate and erosion hazard is slight.

31B- Suffolk fine Sandy Loam, 2 to 6% slopes. Hydrologic Group – B

These soils are well-drained soils, generally located on upland areas. The surface layer is typically very dark grayish brown, fine sandy loam about 4 inches thick. The subsurface is yellowish brown fine sandy loam 10 inches thick. The subsoil is strong brown fine sandy loam and sandy clay loam 26 inches in depth. The substratum is brown loamy fine sand to a depth of at least 64 inches.

Description of Site Drainage (Existing and Post-Development)

Current land use in the proposed project area is a natural forest, with very little impervious cover. With a rolling topography and some steeply sloped areas, the existing site conditions promote stormwater runoff to four primary existing natural channels. Ultimately, runoff from the site collects at Coat's Pond or Richardson's Mill Pond.

With proposed residential development planned for the project area, impervious cover will increase up to approximately 25% to 27%. Roadway runoff is collected by curb and gutter, and is directed to adequate channels and/or BMPs through the use of storm sewers or roadside ditches. BMP's collect and detain runoff generated by larger portions of the project. These BMPs are designed to provide stream channel protection for the receiving channel. Runoff from remaining project areas of Lisburn flow in un-concentrated overland flow, ultimately collect at Coat's Pond, the previously constructed Dry Detention Basin (a.k.a. BMP 4-5, "The Great Wall of China"), and Richardson's Mill Pond.

Existing storm water facilities (BMP 4-5, Coats Pond, and BMP 5.1) receiving the flows have been analyzed to insure that the original intent and design of the facilities remain consistent with the development of Lisburn project. In the case of BMP 4-5 and BMP 5.1, both of these facilities had incorporated in their respective design residential development in each watershed. In the case of the BMP 4-5, the ultimate design of the watershed has reduced contributing acreage, yet the facility still provides water quality benefits (the primary goal of the original design). In the case of BMP 5.1, the contributing drainage area has changed slightly (decreased); yet again, the original design incorporated residential development of the watershed. BMP 5.1 provides both water quality and stormwater attenuation.

Also, included is an updated analysis of existing Coats Pond. From our re-evaluation to include the land improvements of the Lisburn subdivision, Coats Pond still provides both stream channel protection and stormwater attenuation, as originally envisioned.

Hydrology and Hydraulics

The current landowner, through an aerial topographic consultant, recently generated topographic information used in the engineering calculations. This topographic information was generated in early 2001. Due to dense vegetation, AES

Consulting Engineers' staff was required to field verify some areas of the project topography for design purposes. (Please note: In original evaluations of the constructed BMP facilities or existing ponds, this aerial topography was not available. The calculations and computer modeling provided with this narrative is based on the latest available aerial topographic information.)

Hydrology and hydraulic modeling was performed using computer spreadsheets generated in-house, and computer modeling for hydrology by Hydraflow. SCS methodology was used in all runoff calculations. 1-year, 2-year, 10-year, and 100-year storm events where evaluated.

Storm sewer system modeling was performed by another module of the Hydraflow software. In these analyses, 10-year storm events were evaluated.

The values of SCS Type II rainfall distributions used are as follows:

Design Storm Frequency (in years)	Rainfall, in inches (for 24-hr. period)
1	2.8
2	3.5
10	5.8
100	8.0

Modeling of Proposed Detention

To meet design constraints of providing stream channel protection and attenuation of runoff to pre-development rates, an earthen dam BMP facility was design for both BMP 5-5 and BMP 5-6. After conversion as a temporary sediment basin, these permanent facilities provided attenuation for the 2-year storm and channel protection using a dewatering / low flow orifice. (It should be noted in the computer analyses that some stormwater attenuation was achieved when these facilities are performing the function as a temporary sediment basin.) Larger storm events are metered with both the low flow orifice and the riser structure and outlet barrel.

Estimations to identify the required size of the dewatering orifice (to meet channel protection requirements) are provided in attached spreadsheets. These estimates identified 3-inch orifice size (3-inch is the minimum suggested orifice size).

Results of the computed modeling are as follows:

BMP #5-5

Storm Freq.	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	0.67	57.14
2	0.75	59.25
10	8.54	62.31
100	33.71	63.92

BMP #5-6

Storm Freq.	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	0.68	44.96
2	0.76	47.11
10	9.86	50.37
100	12.38	52.28

Conclusions for Modeling Results for BMP 5-5 and BMP 5-5

From the modeling results, the proposed earthen structures provide stream channel protection, and additional stormwater management benefits. Noting the sandy nature of the soils on site, some water quality benefits will be realized, although they are not quantified here, through the infiltration of collected stormwater at the BMP facility site. Following is a table identifying the performance of the proposed BMPs.

BMP #5-5

Storm Freq.	Pre-Dev. Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	0.76	7.29	0.67	57.14
2	1.92	12.02	0.75	59.25
10	7.89	30.11	8.54	62.31
100	15.09	48.94	33.71	63.92

BMP #5-6

Storm Freq.	Pre-Dev. Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	0.67	5.69	0.68	44.96
2	1.97	8.94	0.76	47.11
10	9.16	21.22	9.86	50.37
100	18.05	33.94	12.38	52.28

BMP 4-5

A review of previous design documents for this facility identified this structure as a water quality facility only. The re-evaluation confirms this.

Although there is some (minor) stormwater attenuation which can and does occur with this facility, the reductions are somewhat insignificant. With this discovery, further analysis of the downstream facility, Coats Pond, was warranted.

EXISTING BMP #4-5 (CURRENT CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Current-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	8.30	28.27	5.47	50.16
2	18.10	49.36	32.08	50.60
10	63.32	135.16	126.80	51.53
100	116.43	226.92	217.07	52.19

EXISTING BMP #4-5 (POST CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	8.30	33.40	10.98	50.28
2	18.10	56.17	39.95	50.70
10	63.32	145.20	137.65	51.61
100	116.43	238.66	228.27	52.27

Existing Coats Pond

Since some additional stormwater from the development of Lisburn runoff could be identified in the watershed of Coats Pond, further analysis was warranted. Increased runoff contribution to Coats Pond is generated by overland flow from the Lisburn project, and received flows from BMP 4-5.

A further field investigation of the facility of Coats Pond identified a 60-inch riser structure with a 12-inch orifice (invert elevation 38.34), a 36-inch barrel through the embankment, a 16 foot wide emergency spillway (elevation 43.25), and a top of embankment 2.75 feet above the emergency spillway elevation (top of dam elevation 46.00). A model of the pond was generated using recent field measurements and current aerial topography of the existing facility.

An analysis of the current conditions was prepared. This analysis (model) demonstrated the current capability of Coats Pond with current Stonehouse planned improvement scenarios. The impacts of the proposed Lisburn residential project are not quantified in these results, however, the impacts of ultimate development within the watershed of BMP #4-5 are quantified in these results.

EXISTING COATS POND (CURRENT CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Current-Dev. Runoff (in cfs)	Coats Pond Peak Release Rate (in cfs)	Coats Pond Water Surface Elevation
1	16.73	23.93	2.75	39.37
2	34.96	59.79	4.58	40.31
10	117.67	239.92	84.08	42.01
100	213.12	407.04	140.48	44.07

After completing the above analysis, an analysis of all the impacts of planned development within the watershed of Coats Pond, including the Lisburn Project, was prepared. The results are as follows:

EXISTING COATS POND (ULTIMATE POST CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	16.73	26.29	2.88	39.42
2	34.96	74.93	4.72	40.40
10	117.67	255.48	85.62	42.12
100	213.12	424.07	150.63	44.20

Results of calculations and computer modeling has confirmed that:

1. Coats Pond, with the 12-inch orifice provides stream channel protection for the improved watershed of approximately 106 acres.

2. Peak discharges from Coats Pond are reduced to pre-development rates for all storm events for the watershed.
3. In the latest analysis, an extremely minor increase in the water surface elevation is noted at Coats Pond when comparing the current conditions (Stonehouse development without development of the Lisburn subdivision) to the ultimate condition (Stonehouse development with the development of the Lisburn subdivision). The expected riser in water surface elevation for the analyzed storm events are as follows:
    a. For the1-year, 24-hour storm event, the net increase in water surface elevation is less than 1 inch.
    b. For the 2-year, 24-hour storm event, the net increase in water surface elevation is than 1 inch.
    c. For the 10-year, 24-hour storm event, the net increase in water surface elevation is less than 1-1/2 inches.
    d. For the 100-year, 24-hour storm event, the net increase in water surface elevation is less than 1-1/2 inches.
4. In this latest analysis, the volume of flow to the emergency spillway generate by the ultimate development scenario (including the Lisburn development) is <u>less than</u> the predicted volume for the emergency spillway for which dam modification designs where developed in 1997.
5. In this latest analysis, there is 1.8 feet of freeboard available when comparing the water surface elevation of Coat's Pond for the 100-year, 24-hour storm event and the top of dam elevation.

For comparison, a table is attached providing a comparison of the original 1997 hydrology and design analysis with both the expected performance of Coats Pond for current planned development (without development of the Lisburn subdivision) and ultimate development (which includes the full development of the Stonehouse development, including Lisburn subdivision).

EVALUATION OF PERFORMANCE OF COATS POND
LISBURN
AES Project Number 9088-A
November 21, 2002

	1997 Design	Current Performance under Current Designed Development (excludes development of Lisburn)	Ultimate Performance (All Stonehouse Development, including Lisburn)
BASIN CHARACTERISTICS			
Time of Concentration (in minutes)	56	33	33
Weighted CN	75.5	71.3	73.1
Drainage Area (in acres)	118	106.5	106.5
DAM GEOMETRICS			
Top of Dam Elevation	46.8	46 +/-	46 +/-
Normal Pool Elevation	44.0	-	-
Riser/Barrel Design			
Number of Orifices	2	1	1
Diameter of Orifice (in inches)	12	12	12
Top of Riser Elevation	41.5	40.7	40.7
Diameter of Riser (in inches)	60	60	60
Invert of Barrel	34.0	33.7	33.7
Diameter of Barrel (in inches)	36	36	36
Emergency Spillway Design			
Emergency Spillway Elevation	44.0	43.25	43.25
Control Section Width (in feet)	20	16	16
HYDROLOGIC SUMMARY			
Peak Development Runoff			
2-year 24-hour Storm Peak Runoff	96		
10-year 24-hour Storm Peak Runoff	202		
100-year 24-hour Storm Peak Runoff	332		
Post Development Runoff Routed			
2-year 24-hour Storm Peak Discharge	31	4.5	4.9
Water Surface Elevation	42.0	40.3	40.5
Depth of Flow through the Emergency Spillway (in feet)	0.0	0.0	0.0
Net Depth of Flow through Increase (Decrease) Compared to 1997 (Original) Design (in feet)	0.0	0.0	0.0
10-year 24-hour Storm Peak Discharge	98	84.1	86.6
Water Surface Elevation	43.6	42.0	42.2
Depth of Flow through the Emergency Spillway (in feet)	0.0	0.0	0.0
Net Depth of Flow through Increase (Decrease) Compared to 1997 (Original) Design (in feet)	0.0	0.0	0.0
100-year 24-hour Storm Peak Discharge	226	140.5	154.5
Water Surface Elevation	45.5	44.1	44.2
Depth of Flow through the Emergency Spillway (in feet)	1.5	0.9	1.0
Net Depth of Flow through Increase (Decrease) Compared to 1997 (Original) Design (in feet)	-	(0.7)	(0.5)
Riser/Barrel Performance During 100-year 24-hour Storm Event (in cfs)	~103	~100	~102
Flow through Emergency Spillway During 100-year 24-hour Storm Event (in cfs)	~123	~40.5	~52

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - Coats Pond (Existing)

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	38.00	83,423	0	0
2.00	40.00	111,050	194,473	194,473
4.00	42.00	141,685	252,735	447,208
6.00	44.00	172,428	314,113	761,321
8.00	46.00	211,133	383,561	1,144,882

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 36.0	12.0	0.0	0.0
Span in	= 36.0	12.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 33.71	38.34	0.00	0.00
Length ft	= 80.0	0.5	0.0	0.0
Slope %	= 3.70	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 18.84	16.00	225.00	0.00
Crest El. ft	= 40.70	43.25	46.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	0.00
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	38.00	0.00	0.00	---	---	0.00	0.00	0.00	---	---	0.00
0.20	19,447	38.20	56.84	0.00	---	---	0.00	0.00	0.00	---	---	0.00
0.40	38,895	38.40	56.84	0.02	---	---	0.00	0.00	0.00	---	---	0.02
0.60	58,342	38.60	56.84	0.30	---	---	0.00	0.00	0.00	---	---	0.30
0.80	77,789	38.80	56.84	0.82	---	---	0.00	0.00	0.00	---	---	0.82
1.00	97,237	39.00	56.84	1.56	---	---	0.00	0.00	0.00	---	---	1.56
1.20	116,684	39.20	56.84	2.28	---	---	0.00	0.00	0.00	---	---	2.28
1.40	136,131	39.40	56.84	2.83	---	---	0.00	0.00	0.00	---	---	2.83
1.60	155,578	39.60	56.84	3.30	---	---	0.00	0.00	0.00	---	---	3.30
1.80	175,026	39.80	56.84	3.70	---	---	0.00	0.00	0.00	---	---	3.70
2.00	194,473	40.00	56.84	4.07	---	---	0.00	0.00	0.00	---	---	4.07
2.20	219,747	40.20	56.84	4.41	---	---	0.00	0.00	0.00	---	---	4.41
2.40	245,020	40.40	56.84	4.72	---	---	0.00	0.00	0.00	---	---	4.72
2.60	270,294	40.60	56.84	5.02	---	---	0.00	0.00	0.00	---	---	5.02
2.80	295,567	40.80	56.84	5.29	---	---	1.98	0.00	0.00	---	---	7.28
3.00	320,841	41.00	56.84	5.56	---	---	10.31	0.00	0.00	---	---	15.87
3.20	346,114	41.20	56.84	5.81	---	---	22.18	0.00	0.00	---	---	27.99
3.40	371,388	41.40	56.84	6.05	---	---	36.74	0.00	0.00	---	---	42.79

Continues on next page...

Coats Pond (Existing)

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs (36" BARREL)	Clv B cfs (12" ORIFICE IN RISER)	Clv C cfs	Clv D cfs	Wr A cfs (RISER)	Wr B cfs (EMERGENCY SPILLWAY)	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
3.60	396,661	41.60	59.85	6.28	—	—	53.57	0.00	0.00	—	—	59.85
3.80	421,935	41.80	76.97	4.59	—	—	72.38	0.00	0.00	—	—	76.97
4.00	447,208	42.00	83.92	3.18	—	—	80.74	0.00	0.00	—	—	83.92
4.20	478,619	42.20	86.81	2.63	—	—	84.17	0.00	0.00	—	—	86.80
4.40	510,031	42.40	88.99	2.24	—	—	86.74	0.00	0.00	—	—	88.98
4.60	541,442	42.60	90.83	1.95	—	—	88.87	0.00	0.00	—	—	90.82
4.80	572,853	42.80	92.46	1.72	—	—	90.74	0.00	0.00	—	—	92.46
5.00	604,265	43.00	93.96	1.54	—	—	92.41	0.00	0.00	—	—	93.96
5.20	635,676	43.20	95.37	1.39	—	—	93.97	0.00	0.00	—	—	95.36
5.40	667,087	43.40	96.72	1.27	—	—	95.43	3.10	0.00	—	—	99.79
5.60	698,499	43.60	98.01	1.17	—	—	96.83	11.03	0.00	—	—	109.03
5.80	729,910	43.80	99.27	1.08	—	—	98.19	21.73	0.00	—	—	120.99
6.00	761,321	44.00	100.49	1.00	—	—	99.48	34.61	0.00	—	—	135.09
6.20	799,677	44.20	101.69	0.93	—	—	100.74	49.33	0.00	—	—	151.00
6.40	838,033	44.40	102.86	0.87	—	—	101.94	65.71	0.00	—	—	168.52
6.60	876,389	44.60	104.02	0.82	—	—	103.15	83.57	0.00	—	—	187.54
6.80	914,746	44.80	105.15	0.78	—	—	104.32	102.82	0.00	—	—	207.91
7.00	953,102	45.00	106.27	0.73	—	—	105.49	123.35	0.00	—	—	229.57
7.20	991,458	45.20	107.38	0.70	—	—	106.58	145.08	0.00	—	—	252.36
7.40	1,029,814	45.40	108.47	0.66	—	—	107.75	167.97	0.00	—	—	276.38
7.60	1,068,170	45.60	109.55	0.63	—	—	108.87	191.94	0.00	—	—	301.44
7.80	1,106,526	45.80	110.61	0.60	—	—	109.88	216.96	0.00	—	—	327.45
8.00	1,144,882	46.00	111.66	0.58	—	—	111.03	242.98	0.00	—	—	354.59

...End

SEE FINAL STATEMENT

"RE-LOOK" OF ULTIMATE DEVELOPMENT ON COAT'S POND

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.30	5	745	71,570	—	—	—	Pond 4-5 [PRE]
3	SCS Runoff	28.27	5	735	145,544	—	—	—	Pond 4-5 [CURRENT]
4	Reservoir	5.47	5	790	145,544	3	50.16	63,302	Pond 4-5 Routed (Curre
6	SCS Runoff	33.40	5	735	165,224	—	—	—	Pond 4-5 [POST]
7	Reservoir	10.98	5	765	165,224	6	50.28	66,395	Pond 4-5 Routed (Post)
11	SCS Runoff	16.73	5	755	167,511	—	—	—	Coats Pond [PRE]
13	SCS Runoff	23.09	5	735	121,800	—	—	—	Coats Pond [Current]
14	Combine	23.93	5	735	267,343	4, 13	—	—	4-5 routed PLUS Coats Pond
15	Reservoir	2.75	5	1140	248,550	14	39.37	133,382	Coats Pond Routed CURRENT
17	SCS Runoff	25.41	5	735	130,783	—	—	—	Coats Pond [POST]
18	Combine	26.29	5	735	296,006	7, 17	—	—	4-5 routed PLUS Coats Pond
19	Reservoir	2.88	5	1150	257,757	18	39.42	138,350	Coats Pond Routed-POST ULTIMATE

Proj. file: Existing Ponds.gpw	Return Period: 1 yr	Run date: 11-19-2002

Hydraflow Hydrographs by Intelisolve

"RE-LOOK" OF ULTIMATE DEVELOPMENT ON COATS POND

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	18.10	5	745	128,843	---	-----	-----	Pond 4-5 [PRE]
3	SCS Runoff	49.36	5	730	235,820	---	-----	-----	Pond 4-5 [CURRENT]
4	Reservoir	32.08	5	750	235,819	3	50.60	74,727	Pond 4-5 Routed (Curre
6	SCS Runoff	56.17	5	730	261,319	---	-----	-----	Pond 4-5 [POST]
7	Reservoir	39.95	5	745	261,319	6	50.70	77,260	Pond 4-5 Routed (Post)
11	SCS Runoff	34.96	5	755	296,272	---	-----	-----	Coats Pond [PRE]
13	SCS Runoff	41.27	5	735	199,900	---	-----	-----	Coats Pond [Current]
14	Combine	59.79	5	750	435,719	4, 13	-----	-----	4-5 routed PLUS Coats Pond
15	Reservoir	4.58	5	1080	416,790	14	40.31	233,181	Coats Pond Routed CURRENT
17	SCS Runoff	44.35	5	730	211,902	---	-----	-----	Coats Pond [POST]
18	Combine	74.93	5	745	473,220	7, 17	-----	-----	4-5 routed PLUS Coats Pond
19	Reservoir	4.72	5	1090	434,822	18	40.40	245,110	Coats Pond Routed-POST ULTIMATE

Proj. file: Existing Ponds.gpw	Return Period: 2 yr	Run date: 11-19-2002

Hydraflow Hydrographs by Intelisolve

RE-LOOK OF ULTIMATE DEVELOPMENT ON COATS POND

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	63.32	5	740	378,135	---	-----	-----	Pond 4-5 [PRE]
3	SCS Runoff	135.16	5	730	595,480	---	-----	-----	Pond 4-5 [CURRENT]
4	Reservoir	126.80	5	735	595,479	3	51.53	101,827	Pond 4-5 Routed (Curre
6	SCS Runoff	145.20	5	730	635,938	---	-----	-----	Pond 4-5 [POST]
7	Reservoir	137.65	5	735	635,937	6	51.61	104,586	Pond 4-5 Routed (Post)
11	SCS Runoff	117.67	5	755	848,876	---	-----	-----	Coats Pond [PRE]
13	SCS Runoff	116.38	5	730	514,613	---	-----	-----	Coats Pond [Current]
14	Combine	239.92	5	735	1,110,090	4, 13	-----	-----	4-5 routed PLUS Coats Pond
15	Reservoir	84.08	5	765	1,091,009	14	42.01	448,896	Coats Pond Routed CURRENT
17	SCS Runoff	121.45	5	730	535,084	---	-----	-----	Coats Pond [POST]
18	Combine	255.48	5	735	1,171,020	7, 17	-----	-----	4-5 routed PLUS Coats Pond
19	Reservoir	85.62	5	765	1,132,488	18	42.12	465,676	Coats Pond Routed-POST ULTIMATE

Proj. file: Existing Ponds.gpw | Return Period: 10 yr | Run date: 11-19-2002

"RE-LOOK" OF ULTIMATE DEVELOPMENT ON COATS POND

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	116.43	5	740	667,222	---	-----	-----	Pond 4-5 [PRE]
3	SCS Runoff	226.92	5	730	987,623	---	-----	-----	Pond 4-5 [CURRENT]
4	Reservoir	217.07	5	735	987,621	3	52.19	124,134	Pond 4-5 Routed (Curre
6	SCS Runoff	238.66	5	730	1,038,113	---	-----	-----	Pond 4-5 [POST]
7	Reservoir	228.27	5	735	1,038,112	6	52.27	126,994	Pond 4-5 Routed (Post)
11	SCS Runoff	213.12	5	750	1,483,572	---	-----	-----	Coats Pond [PRE]
13	SCS Runoff	197.57	5	730	860,530	---	-----	-----	Coats Pond [Current]
14	Combine	407.04	5	735	1,848,150	4, 13	-----	-----	4-5 routed PLUS Coats Pond
15	Reservoir	140.48	5	760	1,829,046	14	44.07	774,315	Coats Pond Routed CURRENT
17	SCS Runoff	203.91	5	730	887,455	---	-----	-----	Coats Pond [POST]
18	Combine	424.07	5	735	1,925,565	7, 17	-----	-----	4-5 routed PLUS Coats Pond
19	Reservoir	150.63	5	760	1,887,013	18	44.20	798,788	Coats Pond Routed-POST ULTIMATE

Proj. file: Existing Ponds.gpw | Return Period: 100 yr | Run date: 11-19-2002

Hydraflow Hydrographs by Intelisolve

BMP # WC 053 Coats Pond Analyses
for
Stonehouse Section 5-A "Lisburn"
County Plan No. S-27-02

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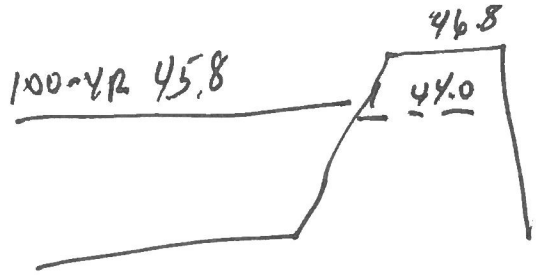
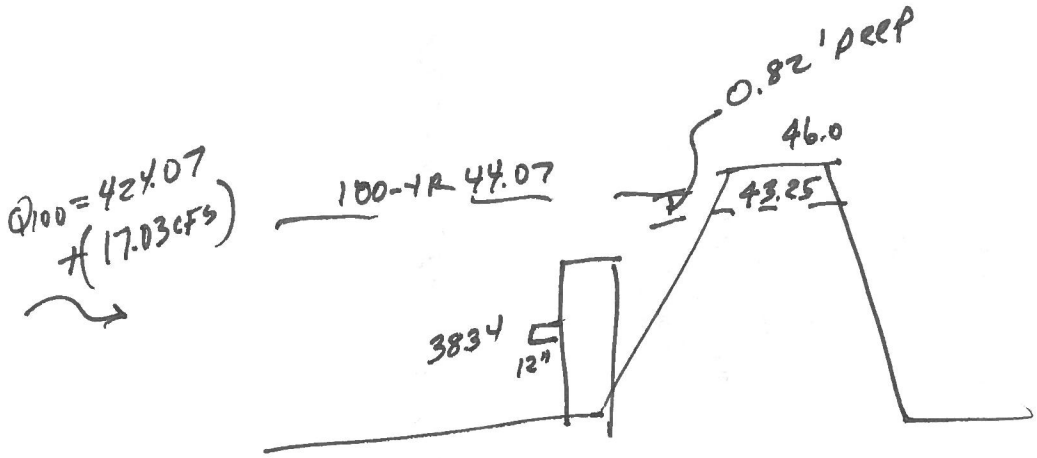
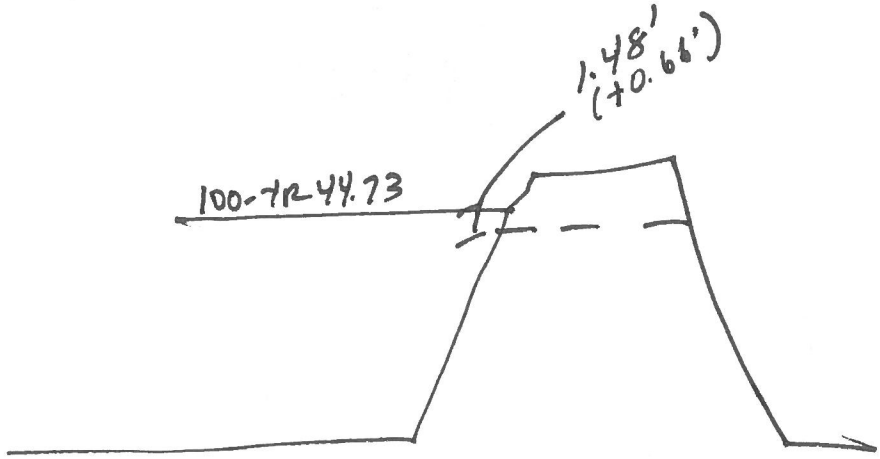


DESIGN



CURRENT - MODEL



FUTURE - MODEL

Existing Coats Pond (WC053)

Since some additional stormwater from the development of Lisburn runoff could be identified in the watershed of Coats Pond, further analysis was warranted. Increased runoff contribution to Coats Pond is generated by overland flow from the Lisburn project, and received flows from BMP 4-5.

A further field investigation of the facility of Coats Pond identified a 72-inch riser structure with a 12-inch orifice (invert elevation 38.34), a 36-inch barrel through the embankment, a 16 foot wide emergency spillway (elevation 43.25), and a top of embankment 2.75 feet above the emergency spillway elevation (top of dam elevation 46.00). A model of the pond was generated using recent field measurements and current aerial topography of the existing facility.

An analysis of the current conditions was prepared. This analysis (model) demonstrated the current capability of Coats Pond with current improvement scenarios. The impacts of the proposed Lisburn residential project are not quantified in these results, however, the impacts of ultimate development within the watershed of BMP #4-5 are quantified in these results.

ORIG. DHW 45.8

EXISTING COATS POND (CURRENT CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Current-Dev. Runoff (in cfs)	Coats Pond Peak Release Rate (in cfs)	Coats Pond Water Surface Elevation
1	16.73 ✓	23.93	2.75 ✓	39.37
2	34.96 ✓	59.79	4.58 ✓	40.31
10	117.67	239.92	84.08	42.01
100	213.12	407.04	140.48	44.07 ✓

After completing the above analysis, an analysis of all the impacts of planned development within the watershed of Coats Pond, including the Lisburn Project, was prepared. The results are as follows:

INCREASE 100-YR, 60.3 CFS.

EXISTING COATS POND (ULTIMATE POST CONDITIONS)

Storm Freq.	Pre-Dev Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	16.73 ✓	26.29	4.20 ✓	40.08
2	34.96 ✓	74.93	11.91 ✓	40.91
10	117.67	255.48	91.96	42.74
100	213.12	424.07	200.79	44.73 ✓

Results of calculations and computer modeling has confirmed that:

1. Coats Pond, with the 12-inch orifice provides stream channel protection for the improved watershed of approximately 106 acres.

BY REDUCING PRE 2- FROM 16.73 CFS to 4.2 CFS.

44.73 + 1.0 = 45.73 < 46 OK.

FLOW IN E.S. / E.S. 43.25 / HF - 0.82' / DHW - 1.48'

2. Peak discharges from Coats Pond are reduced to pre-development rates for all storm events for the watershed. ✓
3. Expected increase in the water surface elevation is less than 9" with ultimate planned development, including the Lisburn Project.
4. Coats Pond's emergency spillway can safely handle the increased runoff of planned development in the watershed, and still provide more than 1 foot of freeboard for the 100-year post-development storm event.

9" RISE IN 100-YR. SAFELY PASSES WITH > 1' FB. TO TOP OF DAM.

• Analyses does not clearly show the ES will have adequate erosion resistance due to increased flow + depth.

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Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - Coats Pond (Existing)

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	38.00	83,423	0	0
2.00	40.00	111,050	194,473	194,473
4.00	42.00	141,685	252,735	447,208
6.00	44.00	172,428	314,113	761,321
8.00	46.00	211,133	383,561	1,144,882

Culvert / Orifice Structures

	BARREL [A]	ORIFICE [B]	[C]	[D]
Rise in	= 36.0	12.0	0.0	0.0
Span in	= 36.0	12.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 33.71	38.34	0.00	0.00
Length ft	= 80.0	0.5	0.0	0.0
Slope %	= 3.70	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	P.S. [A]	E.S. [B]	[C]	[D]
Crest Len ft	= 18.84	16.00	225.00	0.00
Crest El. ft	= 40.70	43.25	46.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	0.00
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	38.00	0.00	0.00	---	---	0.00	0.00	0.00	---	---	0.00
2.00	194,473	40.00	56.84	4.07	---	---	0.00	0.00	0.00	---	---	4.07
4.00	447,208	42.00	83.92	3.18	---	---	80.74	0.00	0.00	---	---	83.92
6.00	761,321	44.00	100.49	1.00	---	---	99.48	34.61	0.00	---	---	135.09
8.00	1,144,882	46.00	111.66	0.58	---	---	111.03	242.98	0.00	---	---	354.59

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - Existing Pond 4-5

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	44.00	920	0	0
1.00	45.00	2,590	1,755	1,755
2.00	46.00	5,690	4,140	5,895
3.00	47.00	8,636	7,163	13,058
4.00	48.00	13,010	10,823	23,881
5.00	49.00	17,093	15,052	38,933
6.00	50.00	23,303	20,198	59,131
7.00	51.00	28,615	25,959	85,090
8.00	52.00	34,956	31,786	116,875
9.00	53.00	41,397	38,177	155,052
10.00	54.00	50,118	45,758	200,809

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 4.0	0.0	0.0	0.0
Span in	= 4.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 44.00	0.00	0.00	0.00
Length ft	= 0.5	0.0	0.0	0.0
Slope %	= 1.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 20.00	180.00	110.00	0.00
Crest El. ft	= 50.00	55.50	64.25	0.00
Weir Coeff.	= 3.33	2.60	3.33	0.00
Weir Type	= Rect	Broad	Rect	—
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	44.00	0.00	—	—	—	0.00	0.00	0.00	—	—	0.00
1.00	1,755	45.00	0.38	—	—	—	0.00	0.00	0.00	—	—	0.38
2.00	5,895	46.00	0.57	—	—	—	0.00	0.00	0.00	—	—	0.57
3.00	13,058	47.00	0.71	—	—	—	0.00	0.00	0.00	—	—	0.71
4.00	23,881	48.00	0.82	—	—	—	0.00	0.00	0.00	—	—	0.82
5.00	38,933	49.00	0.92	—	—	—	0.00	0.00	0.00	—	—	0.92
6.00	59,131	50.00	1.01	—	—	—	0.00	0.00	0.00	—	—	1.01
7.00	85,090	51.00	1.10	—	—	—	66.60	0.00	0.00	—	—	67.70
8.00	116,875	52.00	1.18	—	—	—	188.37	0.00	0.00	—	—	189.55
9.00	155,052	53.00	1.25	—	—	—	346.06	0.00	0.00	—	—	347.31
10.00	200,809	54.00	1.32	—	—	—	532.80	0.00	0.00	—	—	534.12

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.30	5	745	71,570	—	—	—	Pond 4-5 [PRE]
3	SCS Runoff	28.27	5	735	145,544	—	—	—	Pond 4-5 [CURRENT]
4	Reservoir	5.47	5	790	145,544	3	50.16	63,302	Pond 4-5 Routed (Curre
6	SCS Runoff	33.40	5	735	165,224	—	—	—	Pond 4-5 [POST]
7	Reservoir	10.98	5	765	165,224	6	50.28	66,395	Pond 4-5 Routed (Post)
11	SCS Runoff	16.73	5	755	167,511	—	—	—	Coats Pond [PRE]
13	SCS Runoff	23.09	5	735	121,800	—	—	—	Coats Pond [Current]
14	Combine	23.93	5	735	267,343	4, 13	—	—	4-5 routed PLUS Coats Pond
15	Reservoir	2.75	5	1140	248,550	14	39.37	133,382	Coats Pond Routed (CURRENT)
17	SCS Runoff	25.41	5	735	130,783	—	—	—	Coats Pond [POST]
18	Combine	26.29	5	735	296,006	7, 17	—	—	4-5 routed PLUS Coats Pond
19	Reservoir	4.20	5	1065	314,369	18	40.08	204,014	Coats Pond Routed (POST)

NET 0.71' INCREASE

Proj. file: Existing Ponds.gpw | Return Period: 1 yr | Run date: 10-10-2002

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	18.10	5	745	128,843	—	—	—	Pond 4-5 [PRE]
3	SCS Runoff	49.36	5	730	235,820	—	—	—	Pond 4-5 [CURRENT]
4	Reservoir	32.08	5	750	235,819	3	50.60	74,727	Pond 4-5 Routed (Curre
6	SCS Runoff	56.17	5	730	261,319	—	—	—	Pond 4-5 [POST]
7	Reservoir	39.95	5	745	261,319	6	50.70	77,260	Pond 4-5 Routed (Post)
11	SCS Runoff	34.96	5	755	296,272	—	—	—	Coats Pond [PRE]
13	SCS Runoff	41.27	5	735	199,900	—	—	—	Coats Pond [Current]
14	Combine	59.79	5	750	435,719	4, 13	—	—	4-5 routed PLUS Coats Pond
15	Reservoir	4.58	5	1080	416,790	14	40.31	233,181	Coats Pond Routed (CURRENT)
17	SCS Runoff	44.35	5	730	211,902	—	—	—	Coats Pond [POST]
18	Combine	74.93	5	745	473,220	7, 17	—	—	4-5 routed PLUS Coats Pond
19	Reservoir	11.91	5	865	538,906	18	40.91	309,191	Coats Pond Routed (POST)

NET 0.60' INCREASE

Proj. file: Existing Ponds.gpw | Return Period: 2 yr | Run date: 10-10-2002

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	63.32	5	740	378,135	—	—	—	Pond 4-5 [PRE]
3	SCS Runoff	135.16	5	730	595,480	—	—	—	Pond 4-5 [CURRENT]
4	Reservoir	126.80	5	735	595,479	3	51.53	101,827	Pond 4-5 Routed (Curre
6	SCS Runoff	145.20	5	730	635,938	—	—	—	Pond 4-5 [POST]
7	Reservoir	137.65	5	735	635,937	6	51.61	104,586	Pond 4-5 Routed (Post)
11	SCS Runoff	117.67	5	755	848,876	—	—	—	Coats Pond [PRE]
13	SCS Runoff	116.38	5	730	514,613	—	—	—	Coats Pond [Current]
14	Combine	239.92	5	735	1,110,090	4, 13	—	—	4-5 routed PLUS Coats Pond
15	Reservoir	84.08	5	765	1,091,009	14	42.01	448,896	Coats Pond Routed (CURRENT)
17	SCS Runoff	121.45	5	730	535,084	—	—	—	Coats Pond [POST]
18	Combine	255.48	5	735	1,171,020	7, 17	—	—	4-5 routed PLUS Coats Pond
19	Reservoir	91.96	5	790	1,466,025	18	42.74	563,226	Coats Pond Routed (POST)

NET 0.73' INCREASE

Proj. file: Existing Ponds.gpw | Return Period: 10 yr | Run date: 10-10-2002

Hydraflow Hydrographs by Intelisolve

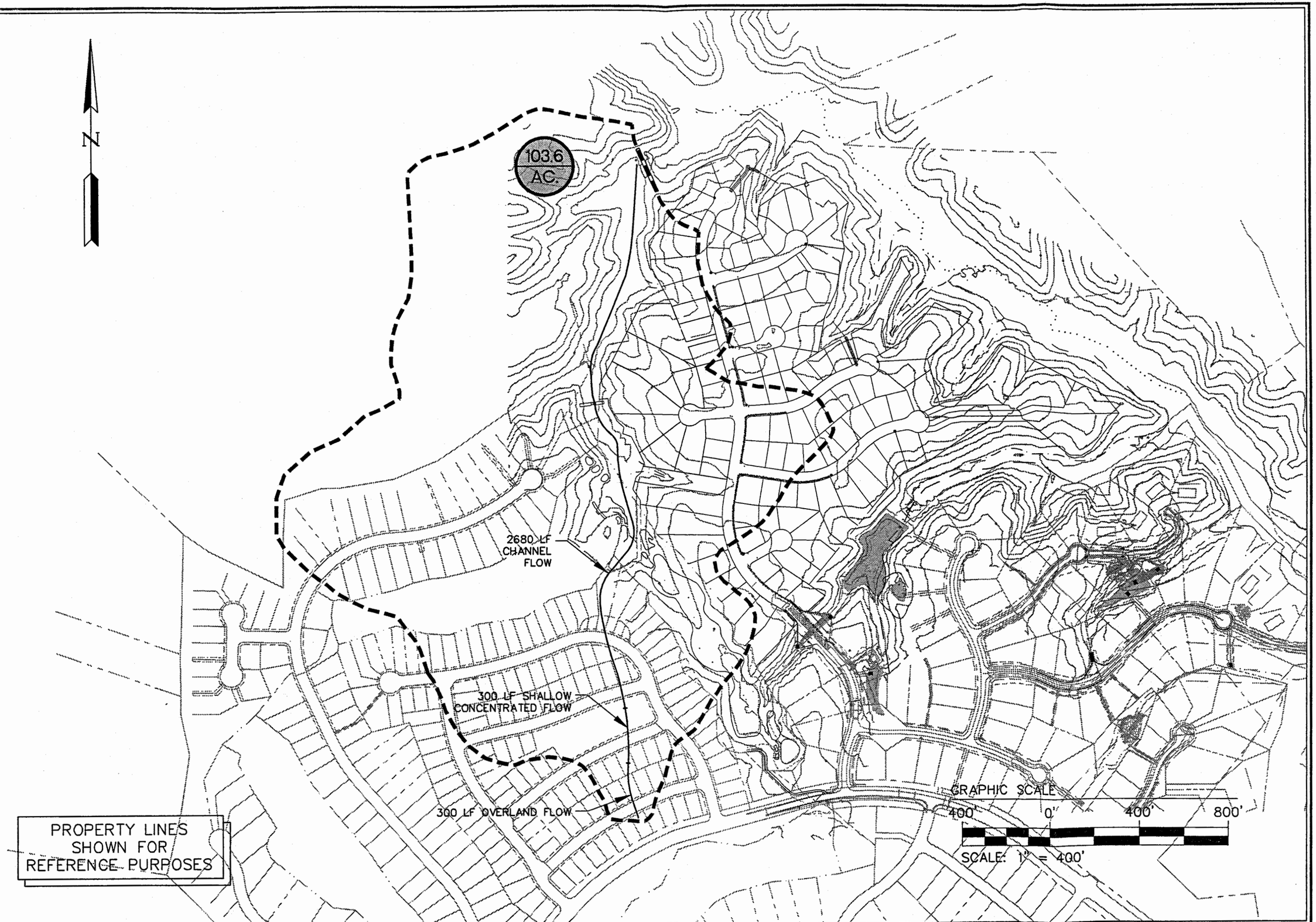
Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	116.43	5	740	667,222	—	—	—	Pond 4-5 [PRE]
3	SCS Runoff	226.92	5	730	987,623	—	—	—	Pond 4-5 [CURRENT]
4	Reservoir	217.07	5	735	987,621	3	52.19	124,134	Pond 4-5 Routed (Curre
6	SCS Runoff	238.66	5	730	1,038,113	—	—	—	Pond 4-5 [POST]
7	Reservoir	228.27	5	735	1,038,112	6	52.27	126,994	Pond 4-5 Routed (Post)
11	SCS Runoff	213.12	5	750	1,483,572	—	—	—	Coats Pond [PRE]
13	SCS Runoff	197.57	5	730	860,530	—	—	—	Coats Pond [Current]
14	Combine	407.04	5	735	1,848,150	4, 13	—	—	4-5 routed PLUS Coats Pond
15	Reservoir	140.48	5	760	1,829,046	14	44.07	774,315	Coats Pond Routed (CURRENT)
17	SCS Runoff	203.91	5	730	887,455	—	—	—	Coats Pond [POST]
18	Combine	424.07	5	735	1,925,565	7, 17	—	—	4-5 routed PLUS Coats Pond
19	Reservoir	200.79	5	775	2,502,877	18	44.73	901,342	Coats Pond Routed (POST)

NET 0.66' INCREASE

Proj. file: Existing Ponds.gpw | Return Period: 100 yr | Run date: 10-10-2002

Hydraflow Hydrographs by Intelisolve



No.	DATE	REVISION / COMMENT / NOTE	BY

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994
CONSULTING ENGINEERS

EXISTING POND
Pre-Dev. Drainage Area
SECTION V-A "LISBURN" AT STONEHOUSE

STONEHOUSE DISTRICT — JAMES CITY COUNTY — VIRGINIA

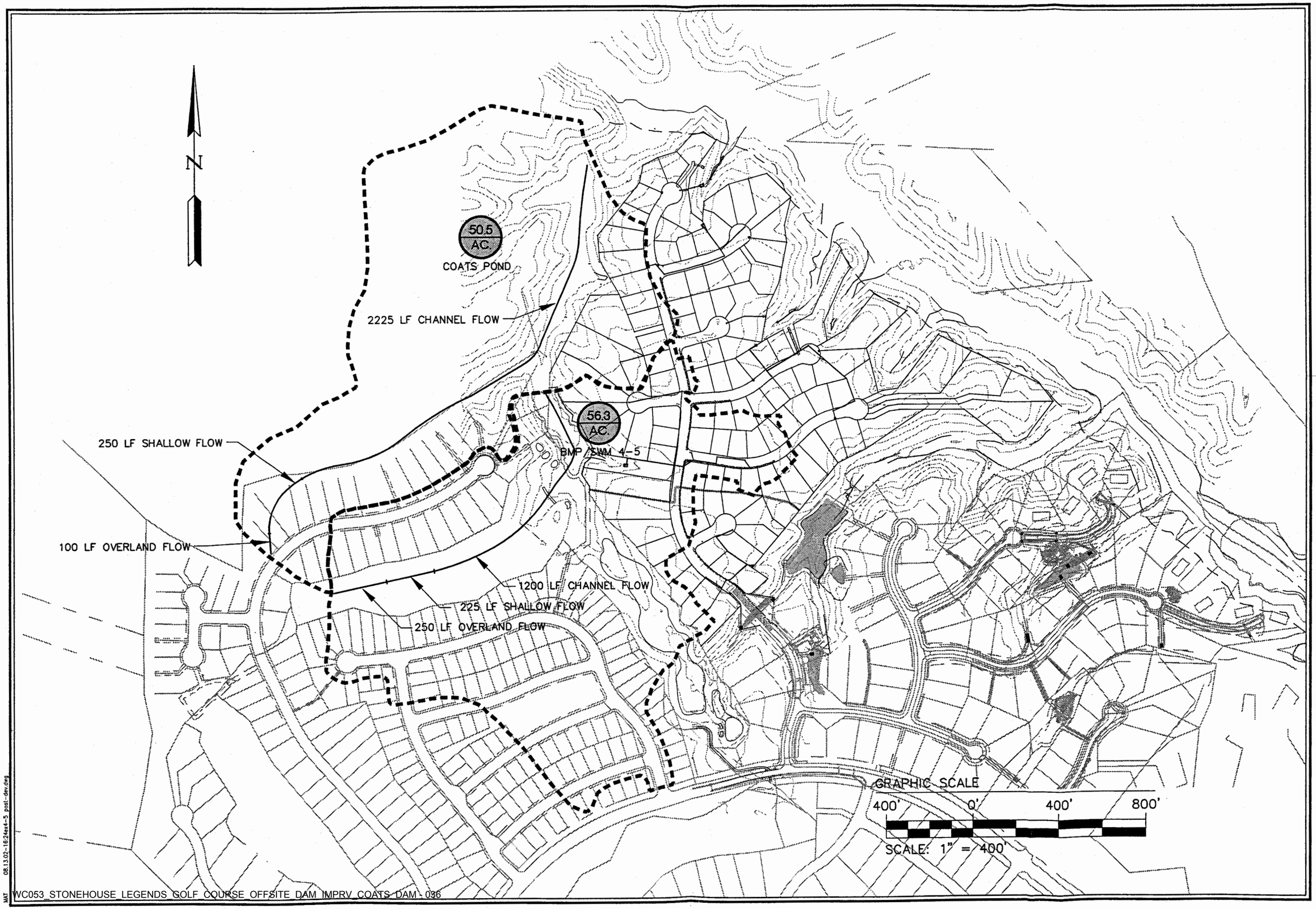
Designed	Drawn
AES	AES
Scale	Date
1"=400'	8/07/02

Project No. 9088

Drawing No. 1 OF 1

MAT 08.08.02-20:14 ex4-5 pre-dev.dwg

WC053_STONEHOUSE_LEGENDS_GOLF_COURSE_OFFSITE_DAM_IMPRV_COATS_DAM 035



No.	DATE	REVISION / COMMENT / NOTE	BY

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

EXISTING POND
Post-Dev. Drainage Area
SECTION V-A "LISBURN" AT STONEHOUSE

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
AES	AES
Scale	Date
1"=400'	8/07/02
Project No.	
9088	
Drawing No.	
1 OF 1	

MAT 08.13.02-16:24ex4-5 post-dev.dwg

WC053_STONEHOUSE_LEGENDS GOLF COURSE_OFFSITE_DAM IMPRV_COATS DAM - 036

ENVIRONMENTAL DIVISION REVIEW COMMENTS
STONEHOUSE SECTION 5A (LISBURN)
COUNTY PLAN NO. S - 027 - 02
August 26 , *2002*

General Comments:

1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project. (Item has been addressed)
2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of lots. (Item has been addressed)
3. Water and sewer inspection fees must be paid prior to the issuance of a Land-Disturbing Permit. (Item has been addressed)
4. An Inspection/Maintenance Agreement shall be executed with the County due to proposed stormwater conveyance systems and BMP facilities associated with this project. (Item has been addressed)
5. Streetlights. Provide streetlight locations on the plan in accordance with streetlight policy. A streetlight rental fee for each light must be paid prior to recordation of the subdivision plat. (Item has been addressed)
6. Wetlands. Prior to initiating grading or other on-site activities on any portion of a lot or parcel, all wetland permits required by federal, state and county laws and regulations shall be obtained and evidence of such submitted to the Environmental Division. Refer to Section 23-9(b)(8) of the Chapter 23 Chesapeake Bay Preservation ordinance. (Note: This includes securing necessary wetland permits through the U.S. Army Corps of Engineers Norfolk District and under the Virginia Department of Environmental Quality nontidal wetlands programs, which became effective October 1st 2001.)(Item has been addressed)

7. Record Drawing and Construction Certification. The stormwater management/BMP facilities as proposed for this project will require submission, review and approval of a record drawing (as-built) <u>and</u> construction certification prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines.(Item has been addressed)

8. Interim Certification. Due to heights of embankment and the dual purpose function of proposed Ponds 5-5 and 5-6, interim construction certification will be required for both facilities. Refer to current County guidelines for requirements. (Item has been addressed)

9. VPDES. It appears land disturbance for the project may exceed five (5) acres. Therefore, it is the owners responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. (Item has been addressed)

10. Professional seal and signature is required on final and complete approved stormwater management plans, drawings, technical reports and specifications.(Item has been addressed)

Floodplain:

11. Provide a note referencing the correct FEMA FIRM panel and any designated special flood hazard areas or zone designations associated with this site, as applicable. Show the limits of Zone A, SFHA (if it applies to the site tract) on all applicable plan of development sheets. (Item has been addressed)

8. BMP 5-6. The reservoir report for BMP 5-6 in tab 18 of the design report shows the pond barrel size at 12-inch diameter (105 ft. at 1.71 percent); however, the detail on Sheet 21 shows the pond barrel size at 10-inch diameter. The computations and construction plans need to show consistent information.

9. Coats Pond. Additional information was provided in the design report to address previous comment # 43. This information included a summary narrative on page 6 of the stormwater management narrative (tab 1) and various drainage maps and hydrologic and hydraulic computations in tabs 22 and 23. Although various individual hydrograph summaries were provided for different scenarios, it must be clearly shown that increases in runoff associated within the Lisburn development as conveyed to and routed through BMP 4-5 and in combination with increased runoff directly to Coats Pond from backlot drainage associated with Lisburn Lots 16-28, do not substantially increase current peak discharges from Coats Pond for the 2-year storm event and do not substantially increase the water surface elevation in the pond for the 100-year storm event beyond current conditions. The hydrograph summaries show peak discharge and WSELs at Coats Pond for routed conditions for the 2-, 10- and 100-year ultimate postdeveloped events; however, there is no model for existing (current) condition of Coats Pond (routed) to properly compare new discharges and water surface elevations to. The following comments must be properly addressed in the Coats Pond analyses as presented. *(Note: Ultimate condition is defined as Lisburn in a fully developed state as proposed with drainage from storm system 2 conveyed to and routed through existing BMP 4-5 and backlot drainage from Lots 16-28 conveyed directly to Coats Pond.).*

   9a) Show a comparison between existing (current) and ultimate routed discharges from Coats Pond for the 2-year design storm events. There natural channel below the pond must have adequate erosion resistance and capacity based on MS-19 criteria if the 2-year outflow from the pond is increased.

   9b) Show a comparison between existing (current) and ultimate water surface elevation of the pond for the 100-year design storm event. There must be no significant increase to the 100-year WSEL nor any impact to adjacent property or structures around or upstream of the pond.

   9c) Based on the "Reservoir Report, Reservoir No. 3 - Coats Pond (Existing)" as provided in tab 23 of the design report, it appears that the emergency spillway for Coats Pond is at El. 43.25. It is unclear what the 100-year water surface elevation is for the existing facility, whether there is currently and discharge through the emergency spillway for the 100-year event and whether there are any discharge or depth increases under ultimate conditions. The hydrograph summary for Coats Pond (routed) shows the 100-year water surface elevation at El. 44.73, thus there is approximately 1.5 feet of flow in the emergency spillway under ultimate conditions. Properly show the emergency spillway at Coats Pond is of adequate depth to safely discharge increased flow for the 100-year storm event and that adequate freeboard exists between the ultimate 100-year event and top of dam. A top of dam elevation for Coats Pond was not indicated in the reservoir report for Coats Pond Existing (Reservoir No. 3).

10. BMP Pretreatment. Previous comment # 45 was not adequately addressed. Stilling basins are typically provided to provide protection against erosion and scour at storm drain pipe outfalls as an alternative to large size (level) outlet protections in accordance with Minimum Standard 3.18 of the VESCH. Stilling basins typically do not provide satisfactory volume for pretreatment in accordance with provisions of the County BMP manual and Minimum Standard 3.04 of the VSMH.

11. Lot-to-Lot Drainage. Address or provide a plan to prevent conveyance of increased or concentrated drainage due to lot development at the following locations: Lot 49 to Lot 48; Lot 51 to Lot 47; Lot 52 to Lot 46; and across Lot 95 (from Lots 96 through 100 and Lots 102 and 103).

STONEHOUSE SEC 5A
"LISBURN" – COATS
POND ANALYSES
S-027-02 WC053

31B- Suffolk fine Sandy Loam, 2 to 6% slopes. Hydrologic Group – B

These soils are well-drained soils, generally located on upland areas. The surface layer is typically vary dark grayish brown, fine sandy loam about 4 inches thick. The subsurface is yellowish brown fine sandy loam 10 inches thick. The subsoil is strong brown fine sandy loam and sandy clay loam 26 inches in depth. The substratum is brown loamy fine sand to a depth of at least 64 inches.

Description of Site Drainage (Existing and Post-Development)

Current land use in the proposed project area is a natural forest, with very little impervious cover. With a rolling topography and some steeply sloped areas, the existing site conditions promote stormwater runoff to four primary existing natural channels. Ultimately, runoff from the site collects at Coat's Pond or Richardson's Mill Pond.

With proposed residential development planned for the project area, impervious cover will increase up to approximately 25% to 27%. Roadway runoff is collected by curb and gutter, and is directed to adequate channels and/or BMPs through the use of storm sewers or roadside ditches. BMP's collect and detain runoff generated by larger portions of the project. These BMPs are designed to provide stream channel protection for the receiving channel. Runoff from remaining project areas of Lisburn flow in un-concentrated overland flow, ultimately collecting at Coat's Pond, the previously constructed Dry Detention Basin (a.k.a. BMP 4-5, "The Great Wall of China"), and Richardson's Mill Pond.

Existing storm water facilities (BMP 4-5, Coats Pond, and BMP 5.1) receiving the flows have been analyzed to insure that the original intent and design of the facilities remain consistent with the development of Lisburn project. In the case of BMP 4-5 and BMP 5.1, both of these facilities had incorporated in their respective design residential development in each watershed. In the case of the BMP 4-5, the ultimate desing of the watershed has reduced contributing acreage, yet the facility still provides water quality benefits (the primary goal of the original design). In the case of BMP 5.1, the contributing drainage area has changed slightly (decreased), yet again the original desing incorporated residential development of the watershed. BMP provides both water quality and stormwater attenuation.

Also included is an updated analysis of existing Coats Pond. From our re-evaluation to include the land improvements of the Lisburn subdivision, Coats Pond still provides both stream channel protection and stormwater attenuation, as originally envisioned.

Hydrology and Hydraulics

The current landowner, through an aerial topographic consultant, recently generated topographic information used in the engineering calculations. This topographic information was generated in early 2001. Due to dense vegetation, AES

WC053_STONEHOUSE_LEGENDS_GOLF_COURSE_OFFSITE_DAM_IMPRV_COATS_DAM - 039

BMP #5-6

Storm Freq.	Pre-Dev. Runoff (in cfs)	Post-Dev. Runoff (in cfs)	Peak Release Rate (in cfs)	BMP Water Surface Elevation
1	0.67	5.69	0.68	44.96
2	1.97	8.94	0.76	47.11
10	9.16	21.22	9.86	50.37
100	18.05	33.94	12.38	52.28

BMP 4-5

A review of previous design documents for this facility identified this structure as a water quality facility only. The re-evaluation confirms this.

Although there is some (minor stormwater attenuation) which can and does occur with this facility, the reductions are somewhat insignificant. With this discovery, further analysis of the downstream facility, Coats Pond, was warranted.

Existing Coats Pond

Since some additional stormwater from the development of Lisburn runoff could be identified in the watershed of Coats Pond, further analysis was warranted. Increased runoff contribution to Coats Pond is generated by overland flow from the Lisburn project, and received flows from BMP 4-5.

A further field investigation of the facility of Coats Pond identified a 72-inch riser structure with a 12-inch orifice, and a 36-inch barrel through the embankment. With current aerial topography, and recent field measurements of the existing facility, a computer model was generated .

Results of calculations and computer modeling has confirmed that:

1. Coats Pond, with the 12-inch orifice provides stream channel protection for the improved watershed of approximately 106 acres.
2. Peak discharges are reduced to pre-development rates for the 2-year 24-hour storm.

REVISED CALCULATION FOR SCS HYDROGRAPH GENERATION
FOR EXISTING BMP / SWM 4-5
STONEHOUSE, SECTION V-A, 'LISBURN'
AES Project No.: 9088-00
August 6, 2002

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 47.2 Acres

B. Pre-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Pre-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-C Craven-Uchee	C	Wooded	7.9	73	575
2)	15-F Emporia Complex	C	Wooded	12.3	73	899
3)	19-B Kempsville-Emporia Fine Sandy Loam	B	Wooded	5.5	60	330
4)	29-A Slagle Fine Sandy Loam	C	Wooded	4.4	73	323
5)	31-B Suffolk	B	Wooded	13.4	60	803
6)	34-E Uchee Loamy Fine Sand	A	Wooded	3.7	36	132
	Totals =			47.2		3,062
	Composite CN =					65

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	mainly wooded	
Manning's roughness coefficient., n (table 5-7)	0.25	
Length of overland flow, L	300	Feet
2-year 24-hour rainfall, P2	3.5	inches
Average slope of overland flow , s	0.04	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.43	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved, wooded	
Length of shallow concentrated flow, L	300	Feet
Average slope of shallow concentrated flow, s	0.065	feet per foot
Average velocity, v	1.0	feet per second
Travel time, Tt = L/(3600*v)	0.08	hours

3) Channel or Pipe Flow

Length of channel flow, L	1375	Feet
Average velocity of channel flow, v	1.5	feet per second
Travel time, Tt = L/(3600*v)	0.25	hours
Total Time of Concentration =	0.77	hours
or	46	minutes

II. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (for total site)

A. Post-Development Drainage Area to Point of Concern = 56.3 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-C Craven-Uchee	C	Residential - 1/2 acre lots	8.9	80	709
2)	14-B Emporia Fine Sandy Loam	C	Residential - 1/2 acre lots	1.2	80	93
3)	15-F Emporia Complex	C	Residential - 1/2 acre lots	12.8	80	1,021
4)	19-B Kempsville-Emporia Fine Sandy Loam	B	Residential - 1/2 acre lots	3.8	70	267
5)	29-A Slagle Fine Sandy Loam	C	Residential - 1/2 acre lots	4.4	80	354
6)	29-B Slagle Fine Sandy Loam	C	Residential - 1/2 acre lots	0.4	80	29
7)	31-B Suffolk	B	Residential - 1/2 acre lots	20.9	70	1,462
8)	34-E Uchee Loamy Fine Sand	A	Residential - 1/2 acre lots	4.1	54	219
	Total Adjusted CN =			56.3		4,155
	Composite CN =					74

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	residential	
Manning's roughness coefficient., n (table 5-7)	0.25	
Length of overland flow, L	100	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.04	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.13	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	250	Feet
Average slope of shallow concentrated flow, s	0.02	feet per foot
Average velocity, v	1.0	feet per second
Travel time, Tt = L/(3600*v)	0.07	hours

3) Channel or Pipe Flow

Length of channel flow, L	2225	Feet
Average velocity of channel flow, v	2.25	feet per second
Travel time, Tt = L/(3600*v)	0.27	hours
Total Time of Concentration =	0.47	hours
or	28	minutes

III. PROPOSED ESTIMATED POND(S) VOLUME ABOVE NORMAL POOL BY ELEVATION

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
44.0		920	0			
45.0	1.0	2590	1755	65	1755	65
46.0	1	5690	4140	153	5895	218
47.0	1	8636	7163	265	13058	484
48.0	1	13010	10823	401	23881	884
49.0	1	17093	15052	557	38933	1442
50.0	1	23303	20198	748	59131	2190
51.0	1	28615	25959	961	85090	3151
52.0	1	34956	31786	1177	116875	4329
53.0	1	41397	38177	1414	155052	5743
54.0	1	50118	45758	1695	200809	7437
55.0	1	57805	53962	1999	254771	9436

IV. DETERMINING RELEASE RATE OF 1-YEAR, 24-HOUR DETAINED FOR 24 HOURS FOR STREAM CHANNEL PROTECTION

Volume of 1-Year, 24-Hour Storm (based upon Hydrograph) = 165,224 cubic feet

Elevation of water surface associated with 1-Year, 24-Hour Storm Volume = 50.5 (Actual WSEL of routed 1-year strom is EL 48.57)

Elevation of Release Inlet for Channel Protection = 46.0

Average Head, in feet, on Release Inlet + 2.3

Average Release Rate Calculation

$$\frac{165{,}224 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 1.9 \text{ cfs}$$

Calculation of Size of Release Inlet

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)
where, Q equals Average Release Rate, in cfs
h equals Average Head, in feet

Diameter of Release Inlet = 0.70 feet, or 9 inches (4" use in Computer Routing)

REVISED CALCULATION FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION
FOR COATS POND (EXISTING)
STONEHOUSE, SECTION V-A, 'LISBURN'
AES Project No.: 9088-00
August 6, 2002

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 103.6 Acres

B. Pre-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Pre-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-C Craven-Uchee	C	Wooded	19.1	73	1,391
2)	15-F Emporia Complex	C	Wooded	37.1	73	2,710
3)	19-B Kempsville-Emporia Fine Sandy Loam	B	Wooded	10.0	60	602
4)	29-A Slagle Fine Sandy Loam	C	Wooded	5.5	60	330
5)	29-B Slagle Fine Sandy Loam	C	Wooded	1.3	73	95
6)	31-B Suffolk	B	Wooded	25.4	60	1,525
7)	34-E Uchee Loamy Fine Sand	A	Wooded	5.2	36	187
	Totals =			103.6		6,841
	Composite CN =					66

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	mainly wooded	
Manning's roughness coefficient., n (table 5-7)	0.25	
Length of overland flow, L	300	Feet
2-year 24-hour rainfall, P2	3.5	inches
Average slope of overland flow , s	0.04	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.43	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved, wooded	
Length of shallow concentrated flow, L	300	Feet
Average slope of shallow concentrated flow, s	0.065	feet per foot
Average velocity, v	1.0	feet per second
Travel time, Tt = L/(3600*v)	0.08	hours

3) Channel or Pipe Flow

Length of channel flow, L	2680	Feet
Average velocity of channel flow, v	1.5	feet per second
Travel time, Tt = L/(3600*v)	0.50	hours
Total Time of Concentration =	1.01	hours
or	61	minutes

II. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (for total site)

A. Post-Development Drainage Area to Point of Concern = 50.5 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-C Craven-Uchee	C	Wooded / Portions of lots	10.8	76	822
2)	14-B Emporia Fine Sandy Loam	C	Mostly Wooded	0.0	76	0
3)	15-F Emporia Complex	C	Wooded / Portions of lots	24.9	76	1,892
4)	19-B Kempsville-Emporia Fine Sandy Loam	B	Mostly Wooded	4.5	63	286
5)	29-A Slagle Fine Sandy Loam	C	Mostly Wooded	1.0	76	78
6)	29-B Slagle Fine Sandy Loam	C	Mostly Wooded	0.9	76	70
7)	31-B Suffolk	B	Wooded / Portions of lots	6.8	63	428
8)	34-E Uchee Loamy Fine Sand	A	Mostly Wooded	1.5	39	60
	Total Adjusted CN =			50.5		3,635
	Composite CN =					72

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	residential	
Manning's roughness coefficient., n (table 5-7)	0.25	
Length of overland flow, L	250	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.04	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.27	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	225	Feet
Average slope of shallow concentrated flow, s	0.02	feet per foot
Average velocity, v	1.0	feet per second
Travel time, Tt = L/(3600*v)	0.06	hours

3) Channel or Pipe Flow

Length of channel flow, L	1200	Feet
Average velocity of channel flow, v	1.5	feet per second
Travel time, Tt = L/(3600*v)	0.22	hours
Total Time of Concentration =	0.56	hours
or	33	minutes

III. PROPOSED ESTIMATED POND(S) VOLUME ABOVE NORMAL POOL BY ELEVATION

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
38.0		83423	0			
40.0	2.0	111050	194473	7203	194473	7203
42.0	2	141685	252735	9361	447208	16563
44.0	2	172428	314113	11634	761321	28197
46.0	2	211133	383561	14206	1144882	42403

IV. DETERMINING RELEASE RATE OF 1-YEAR, 24-HOUR DETAINED FOR 24 HOURS FOR STREAM CHANNEL PROTECTION

Volume of 1-Year, 24-Hour Storm (based upon Hydrograph) = 332,735 cubic feet

Elevation of water surface associated with 1-Year, 24-Hour Storm Volume = 41.1 (Actual WSEL of routed 1-year strom is EL 40.08)

Elevation of Release Inlet for Channel Protection = 38.3

Average Head, in feet, on Release Inlet + 1.4

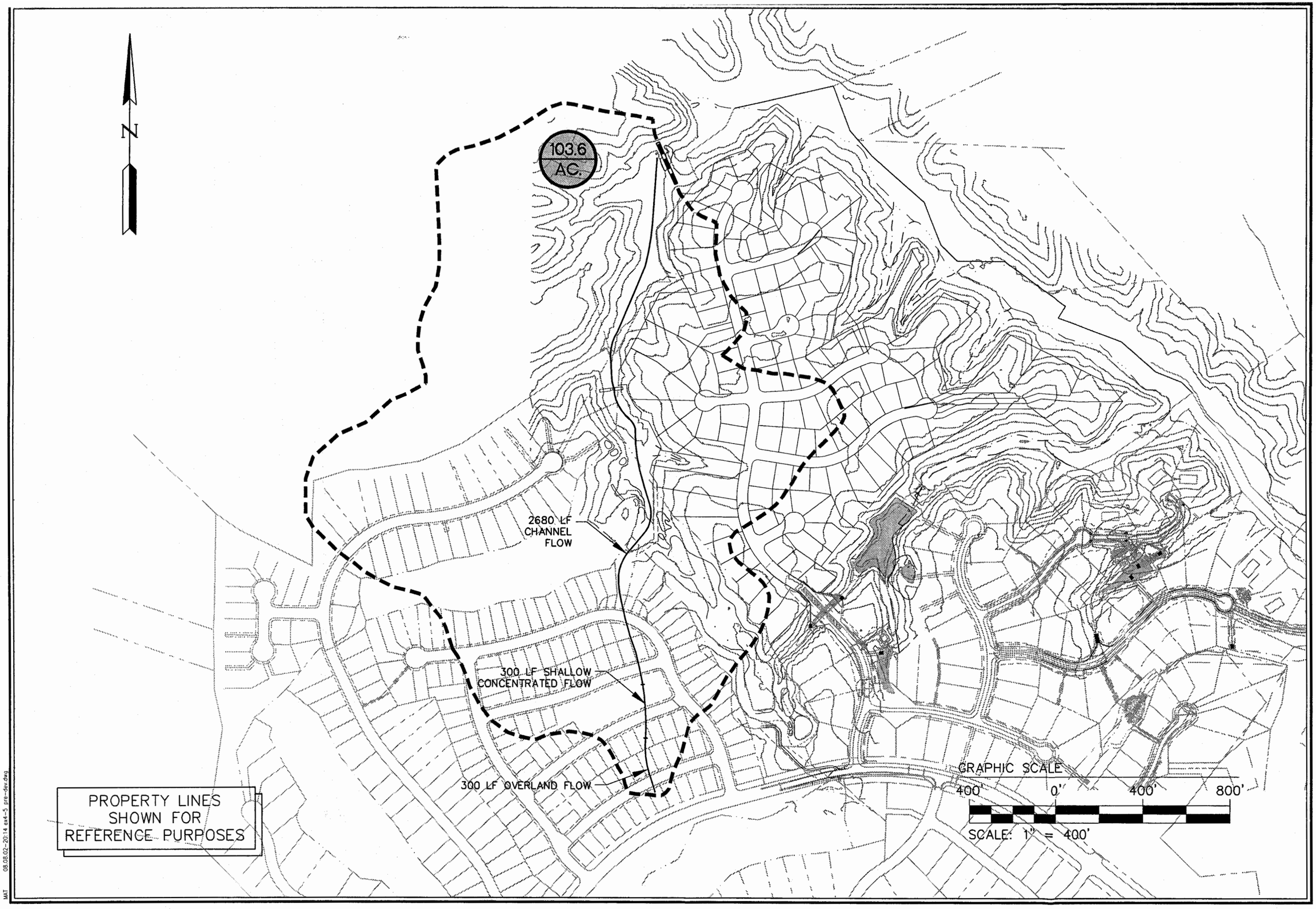
Average Release Rate Calculation

$$\frac{332{,}735 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 3.9 \text{ cfs}$$

Calculation of Size of Release Inlet

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)
where, Q equals Average Release Rate, in cfs
h equals Average Head, in feet

Diameter of Release Inlet = 1.10 feet, or 14 inches (12"Existing)



No.	DATE	REVISION / COMMENT / NOTE	BY

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

AES CONSULTING ENGINEERS

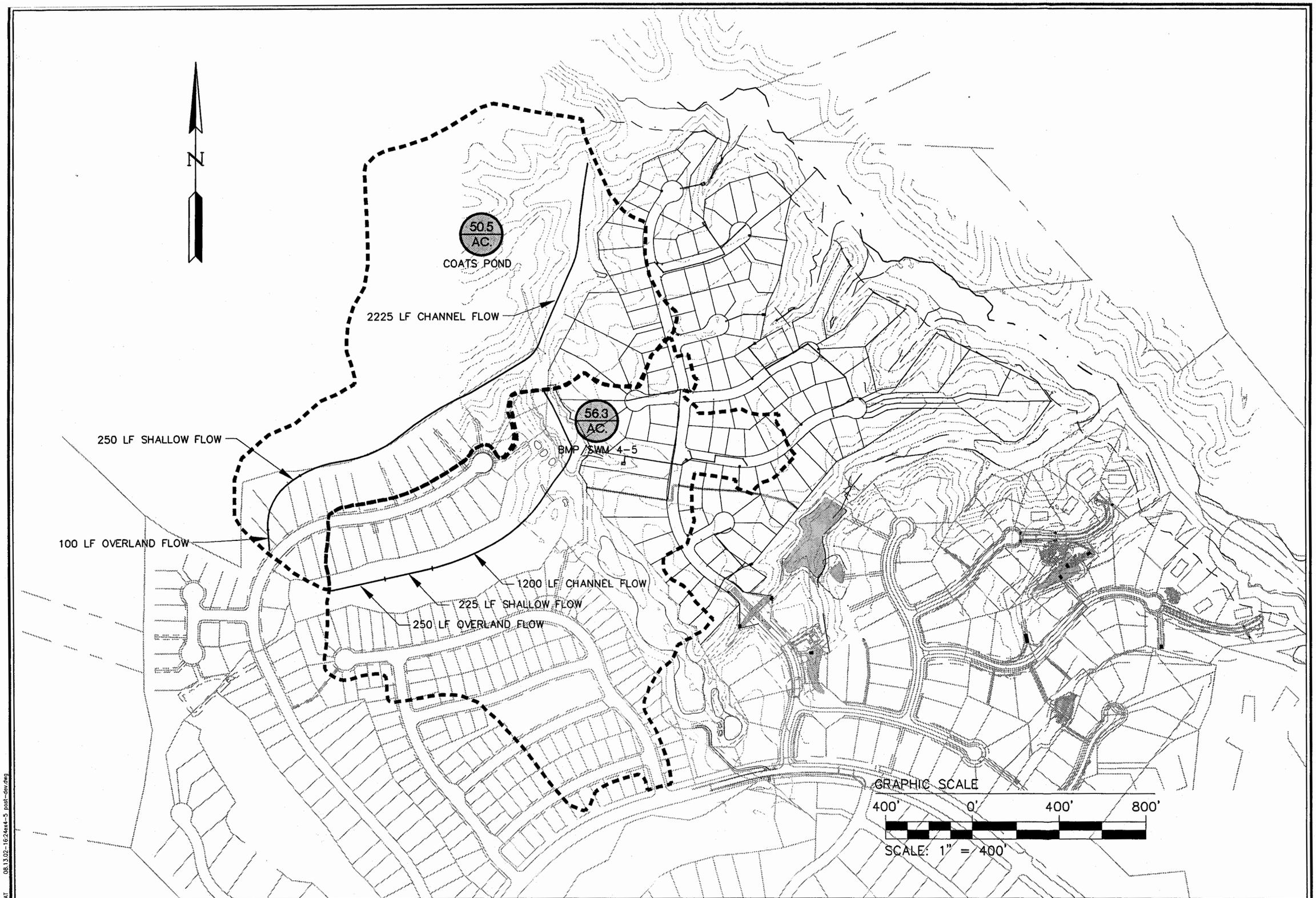
EXISTING POND
Pre-Dev. Drainage Area

SECTION V-A "LISBURN"
AT STONEHOUSE

STONEHOUSE DISTRICT — JAMES CITY COUNTY — VIRGINIA

Designed	Drawn
AES	AES
Scale	Date
1"=400'	8/07/02
Project No.	
9088	
Drawing No.	
1 OF 1	

MAT 08.08.02-20:14 ex4-5 pre-dev.dwg



No.	DATE	REVISION / COMMENT / NOTE	BY

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994
CONSULTING ENGINEERS

EXISTING POND
Post-Dev. Drainage Area
SECTION V-A "LISBURN" AT STONEHOUSE

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
AES	AES
Scale	Date
1"=400'	8/07/02

Project No. 9088

Drawing No. 1 OF 1

MAT 08.13.02-16:24ex4-5 post-dev.dwg

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - Existing Pond 4-5

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	44.00	920	0	0
1.00	45.00	2,590	1,755	1,755
2.00	46.00	5,690	4,140	5,895
3.00	47.00	8,636	7,163	13,058
4.00	48.00	13,010	10,823	23,881
5.00	49.00	17,093	15,052	38,933
6.00	50.00	23,303	20,198	59,131
7.00	51.00	28,615	25,959	85,090
8.00	52.00	34,956	31,786	116,875
9.00	53.00	41,397	38,177	155,052
10.00	54.00	50,118	45,758	200,809

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 4.0	0.0	0.0	0.0
Span in	= 4.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 44.00	0.00	0.00	0.00
Length ft	= 0.5	0.0	0.0	0.0
Slope %	= 1.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 20.00	180.00	110.00	0.00
Crest El. ft	= 50.00	55.50	64.25	0.00
Weir Coeff.	= 3.33	2.60	3.33	0.00
Weir Type	= Rect	Broad	Rect	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	44.00	0.00	---	---	---	0.00	0.00	0.00	---	---	0.00
1.00	1,755	45.00	0.38	---	---	---	0.00	0.00	0.00	---	---	0.38
2.00	5,895	46.00	0.57	---	---	---	0.00	0.00	0.00	---	---	0.57
3.00	13,058	47.00	0.71	---	---	---	0.00	0.00	0.00	---	---	0.71
4.00	23,881	48.00	0.82	---	---	---	0.00	0.00	0.00	---	---	0.82
5.00	38,933	49.00	0.92	---	---	---	0.00	0.00	0.00	---	---	0.92
6.00	59,131	50.00	1.01	---	---	---	0.00	0.00	0.00	---	---	1.01
7.00	85,090	51.00	1.10	---	---	---	66.60	0.00	0.00	---	---	67.70
8.00	116,875	52.00	1.18	---	---	---	188.37	0.00	0.00	---	---	189.55
9.00	155,052	53.00	1.25	---	---	---	346.06	0.00	0.00	---	---	347.31
10.00	200,809	54.00	1.32	---	---	---	532.80	0.00	0.00	---	---	534.12

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - Coats Pond (Existing)

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	38.00	83,423	0	0
2.00	40.00	111,050	194,473	194,473
4.00	42.00	141,685	252,735	447,208
6.00	44.00	172,428	314,113	761,321
8.00	46.00	211,133	383,561	1,144,882

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 36.0	12.0	0.0	0.0
Span in	= 36.0	12.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 33.71	38.34	0.00	0.00
Length ft	= 80.0	0.5	0.0	0.0
Slope %	= 3.70	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 18.84	16.00	225.00	0.00
Crest El. ft	= 40.70	43.25	46.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	0.00
Weir Type	= Riser	Rect	Rect	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

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

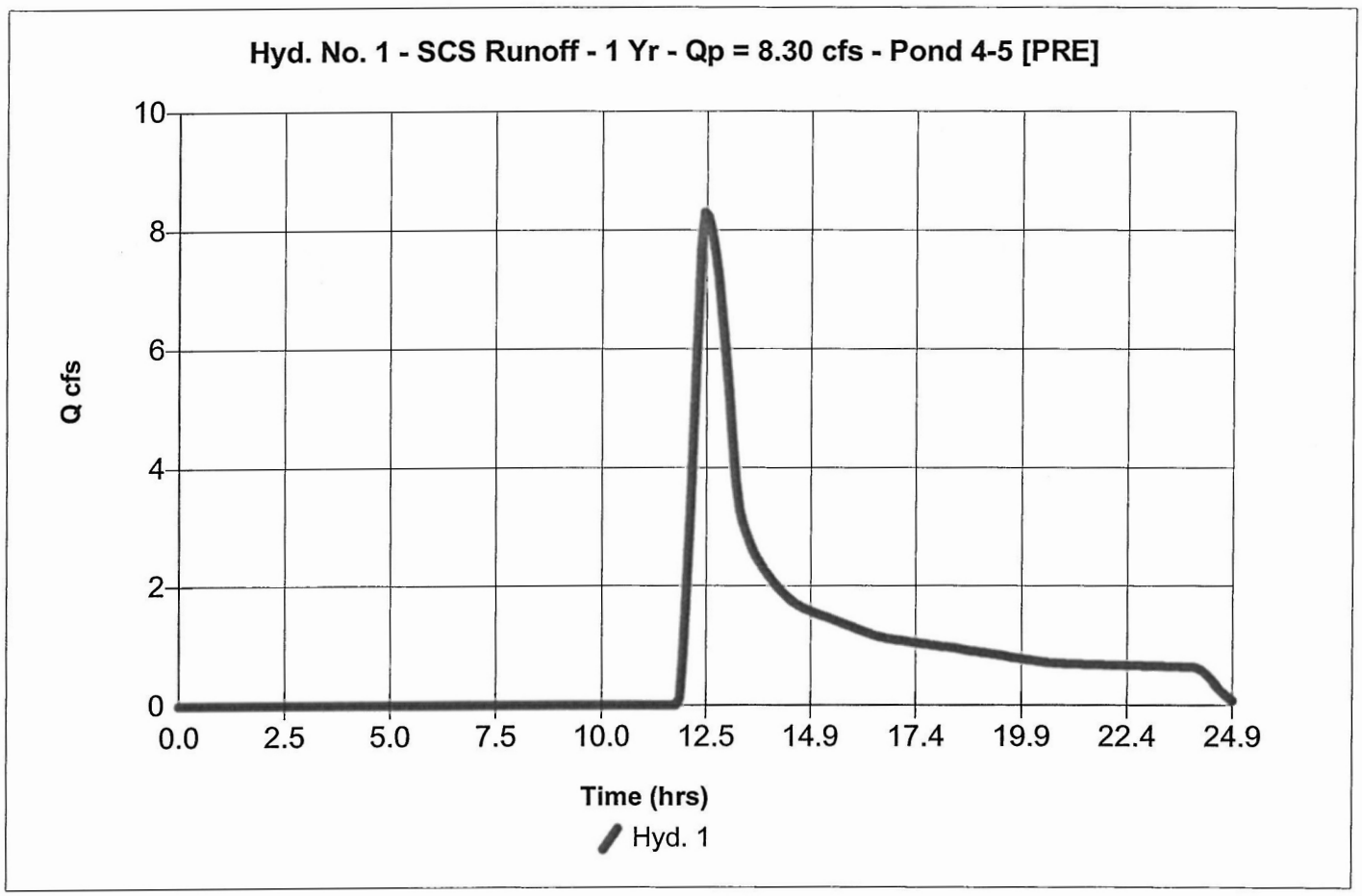
Stage / Storage / Discharge Table

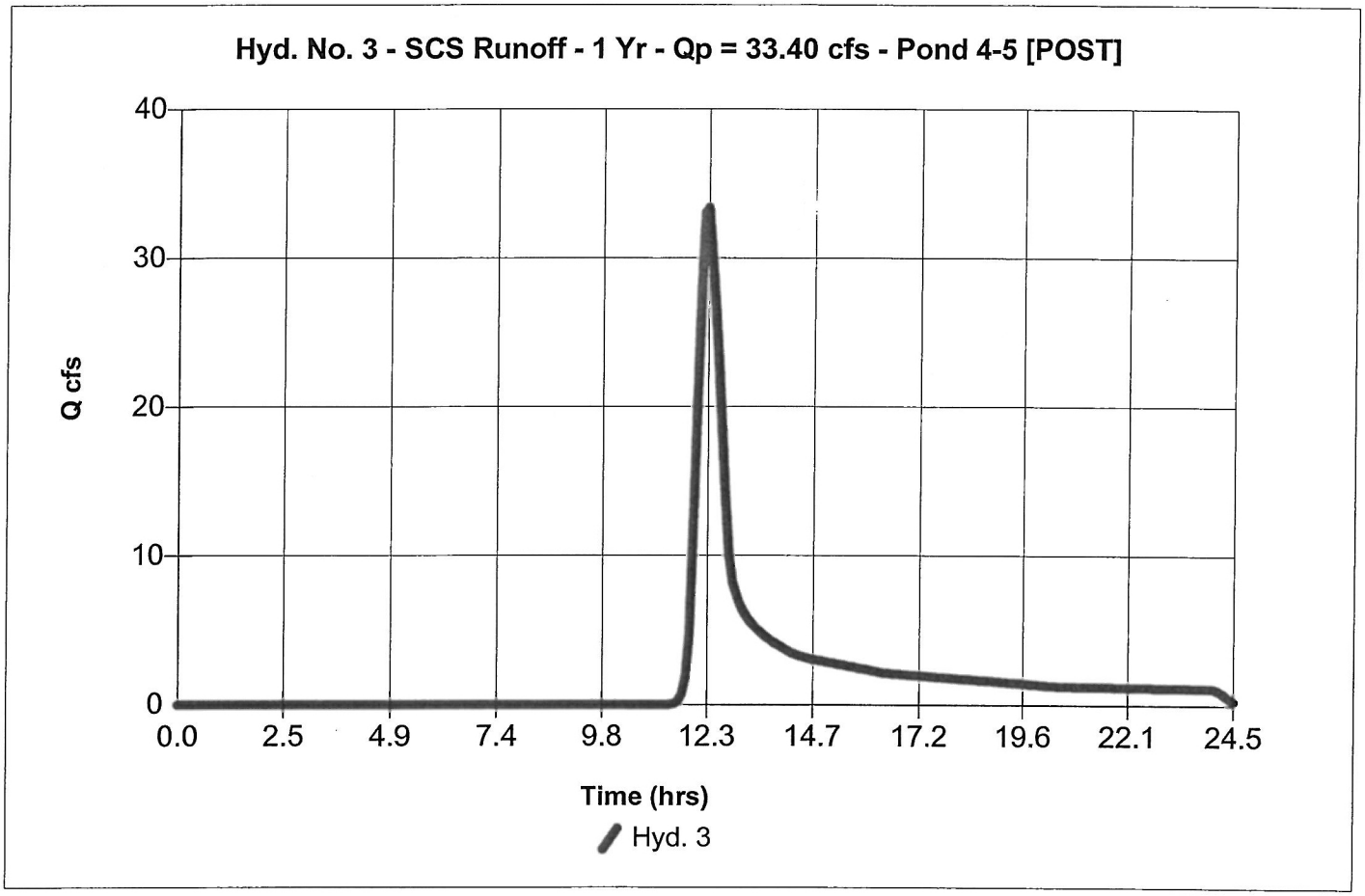
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	38.00	0.00	0.00	---	---	0.00	0.00	0.00	---	---	0.00
2.00	194,473	40.00	56.84	4.07	---	---	0.00	0.00	0.00	---	---	4.07
4.00	447,208	42.00	83.92	3.18	---	---	80.74	0.00	0.00	---	---	83.92
6.00	761,321	44.00	100.49	1.00	---	---	99.48	34.61	0.00	---	---	135.09
8.00	1,144,882	46.00	111.66	0.58	---	---	111.03	242.98	0.00	---	---	354.59

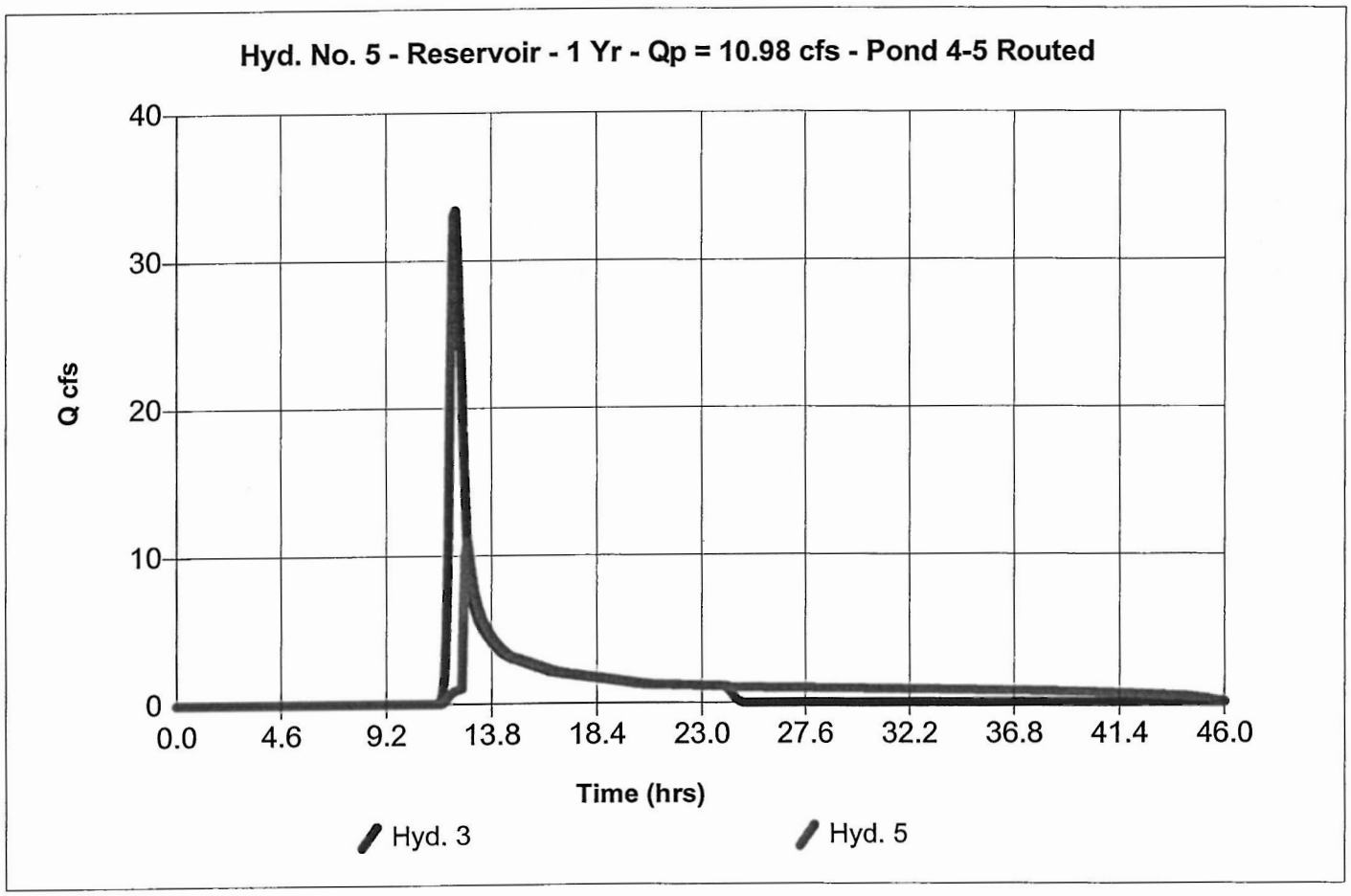
Hydrograph Summary Report

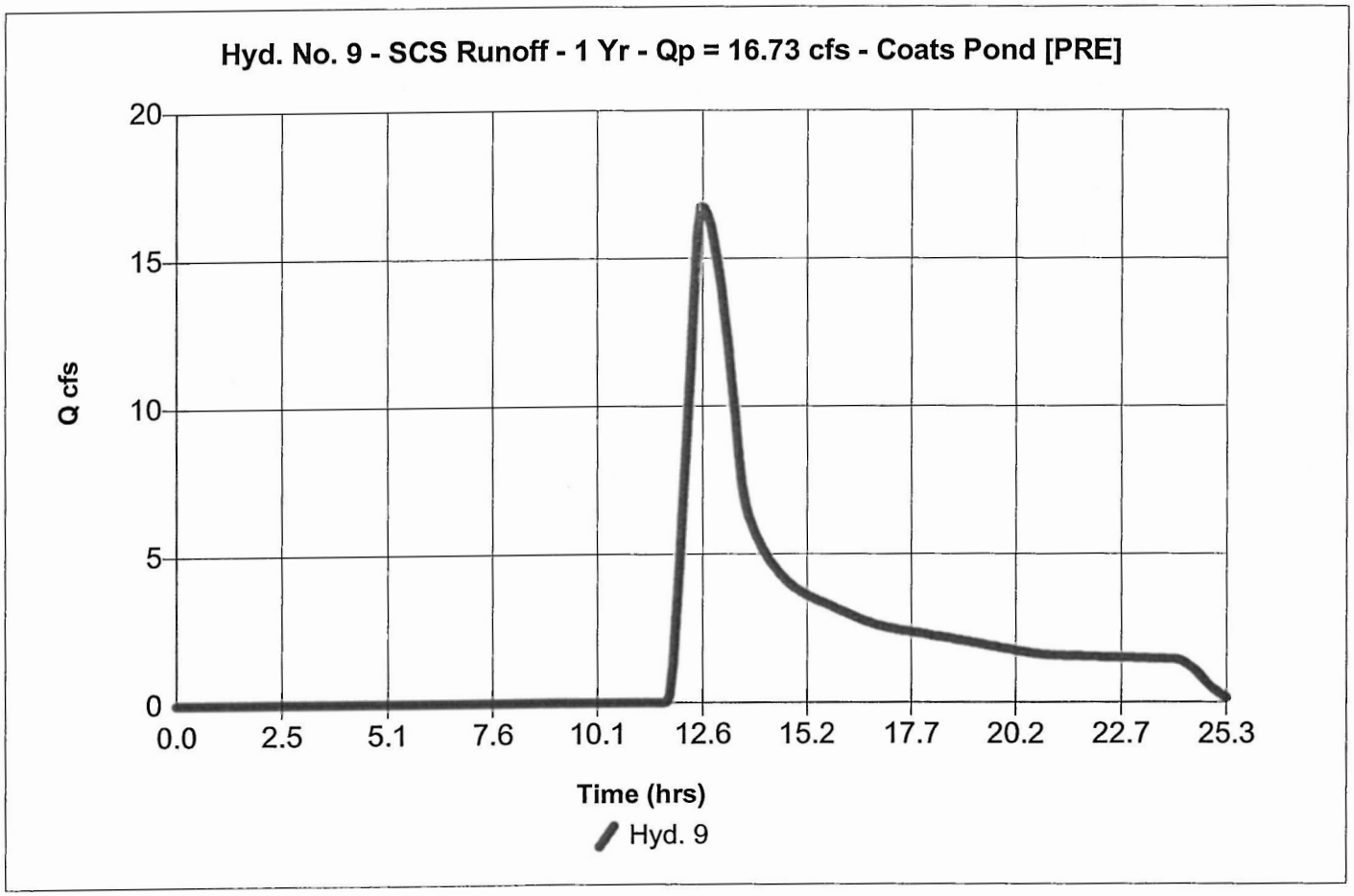
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.30	5	745	71,570	----	------	------	Pond 4-5 [PRE]
3	SCS Runoff	33.40	5	735	165,224	----	------	------	Pond 4-5 [POST]
5	Reservoir	10.98	5	765	165,224	3	50.28	66,395	Pond 4-5 Routed
9	SCS Runoff	16.73	5	755	167,511	----	------	------	Coats Pond [PRE]
11	SCS Runoff	25.41	5	735	130,783	----	------	------	Coats Pond [POST]
13	Combine	42.36	5	735	332,735	3, 9,	------	------	4-5 routed PLUS Coats Pond
16	Reservoir	4.20	5	1065	314,369	13	40.08	204,014	Coats Pond Routed

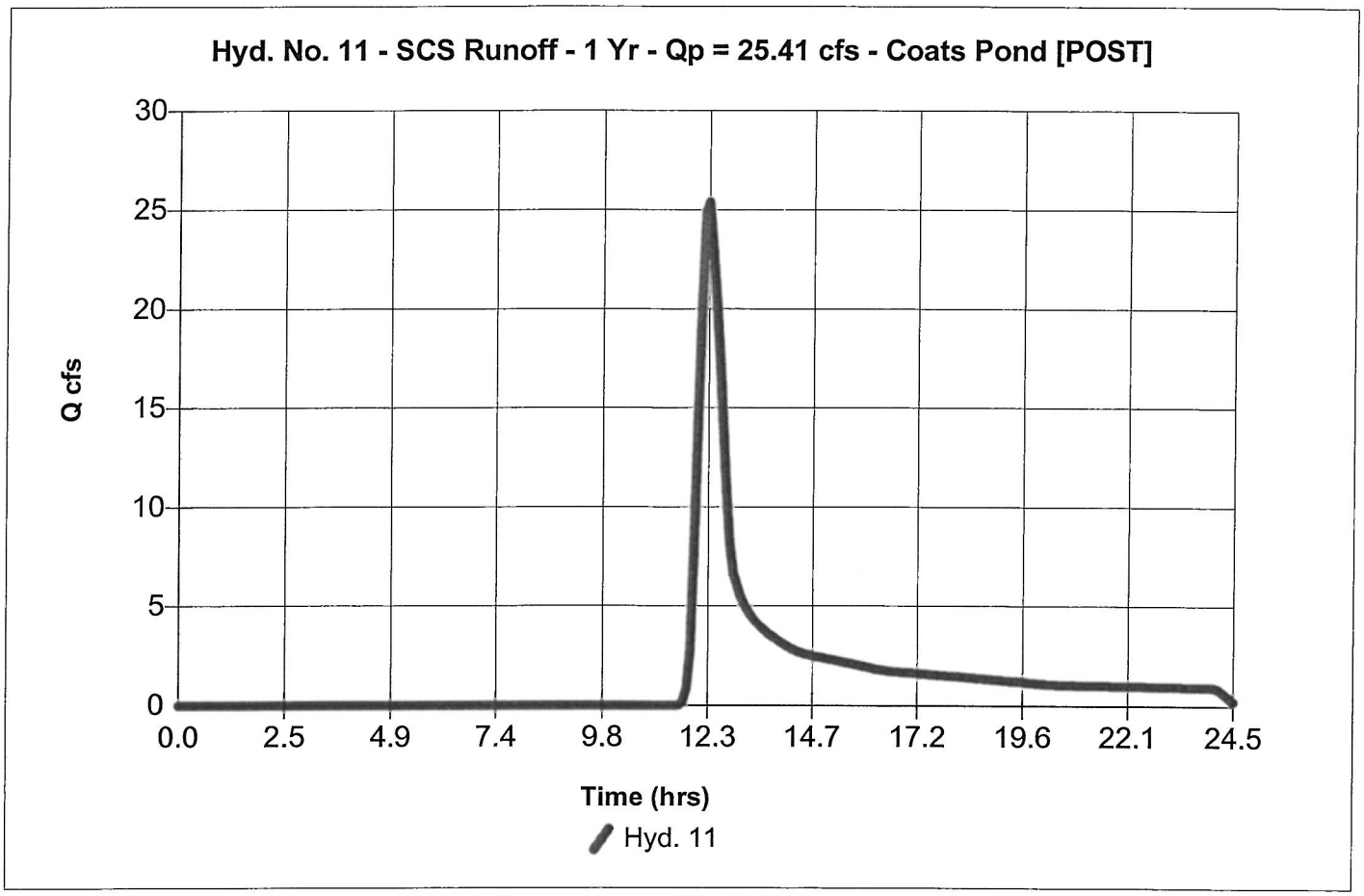
Proj. file: Existing Ponds.gpw | Return Period: 1 yr | Run date: 08-13-2002

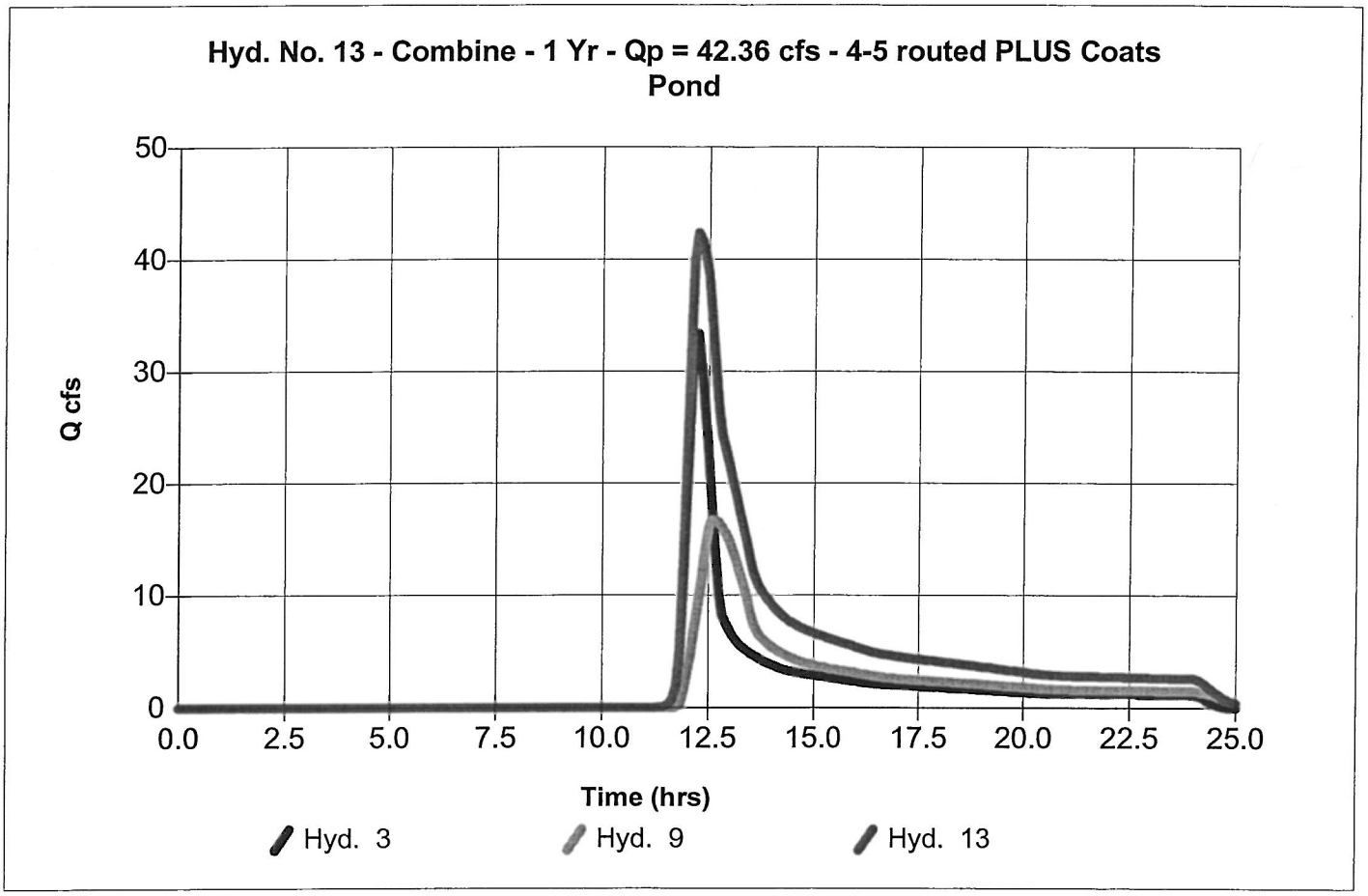

Hyd. No. 1 - SCS Runoff - 1 Yr - Qp = 8.30 cfs - Pond 4-5 [PRE]
Q cfs
10
8
6
4
2
0
0.0
2.5
5.0
7.5
10.0
12.5
14.9
17.4
19.9
22.4
24.9
Time (hrs)
Hyd. 1

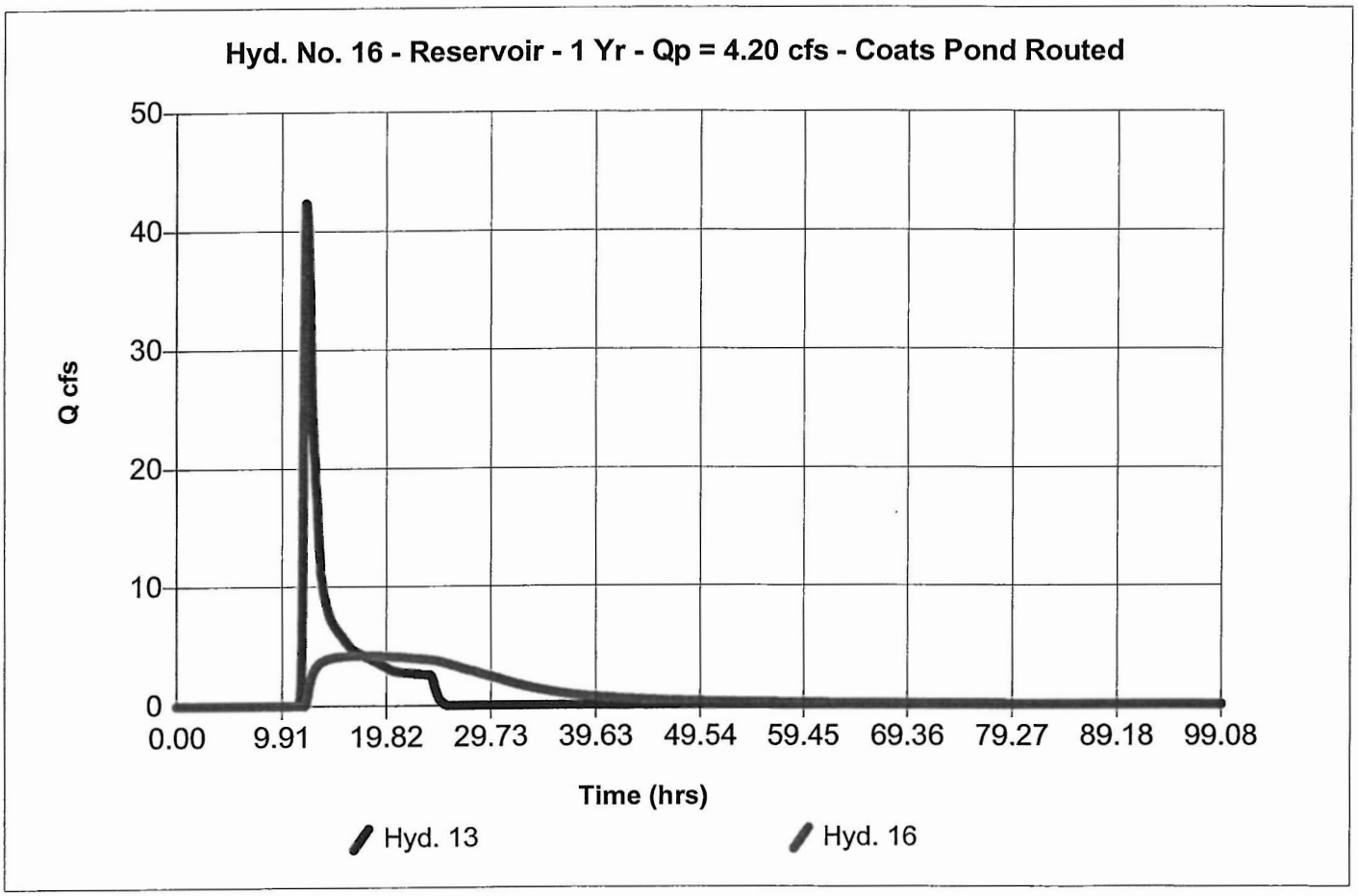

Hyd. No. 3 - SCS Runoff - 1 Yr - Qp = 33.40 cfs - Pond 4-5 [POST]
Q cfs
40
30
20
10
0
0.0
2.5
4.9
7.4
9.8
12.3
14.7
17.2
19.6
22.1
24.5
Time (hrs)
Hyd. 3


Hyd. No. 5 - Reservoir - 1 Yr - Qp = 10.98 cfs - Pond 4-5 Routed
Q cfs
40
30
20
10
0
0.0
4.6
9.2
13.8
18.4
23.0
27.6
32.2
36.8
41.4
46.0
Time (hrs)
Hyd. 3
Hyd. 5


Hyd. No. 9 - SCS Runoff - 1 Yr - Qp = 16.73 cfs - Coats Pond [PRE]
Q cfs
20
15
10
5
0
0.0
2.5
5.1
7.6
10.1
12.6
15.2
17.7
20.2
22.7
25.3
Time (hrs)
Hyd. 9


Hyd. No. 11 - SCS Runoff - 1 Yr - Qp = 25.41 cfs - Coats Pond [POST]
Q cfs
30
25
20
15
10
5
0
0.0
2.5
4.9
7.4
9.8
12.3
14.7
17.2
19.6
22.1
24.5
Time (hrs)
Hyd. 11

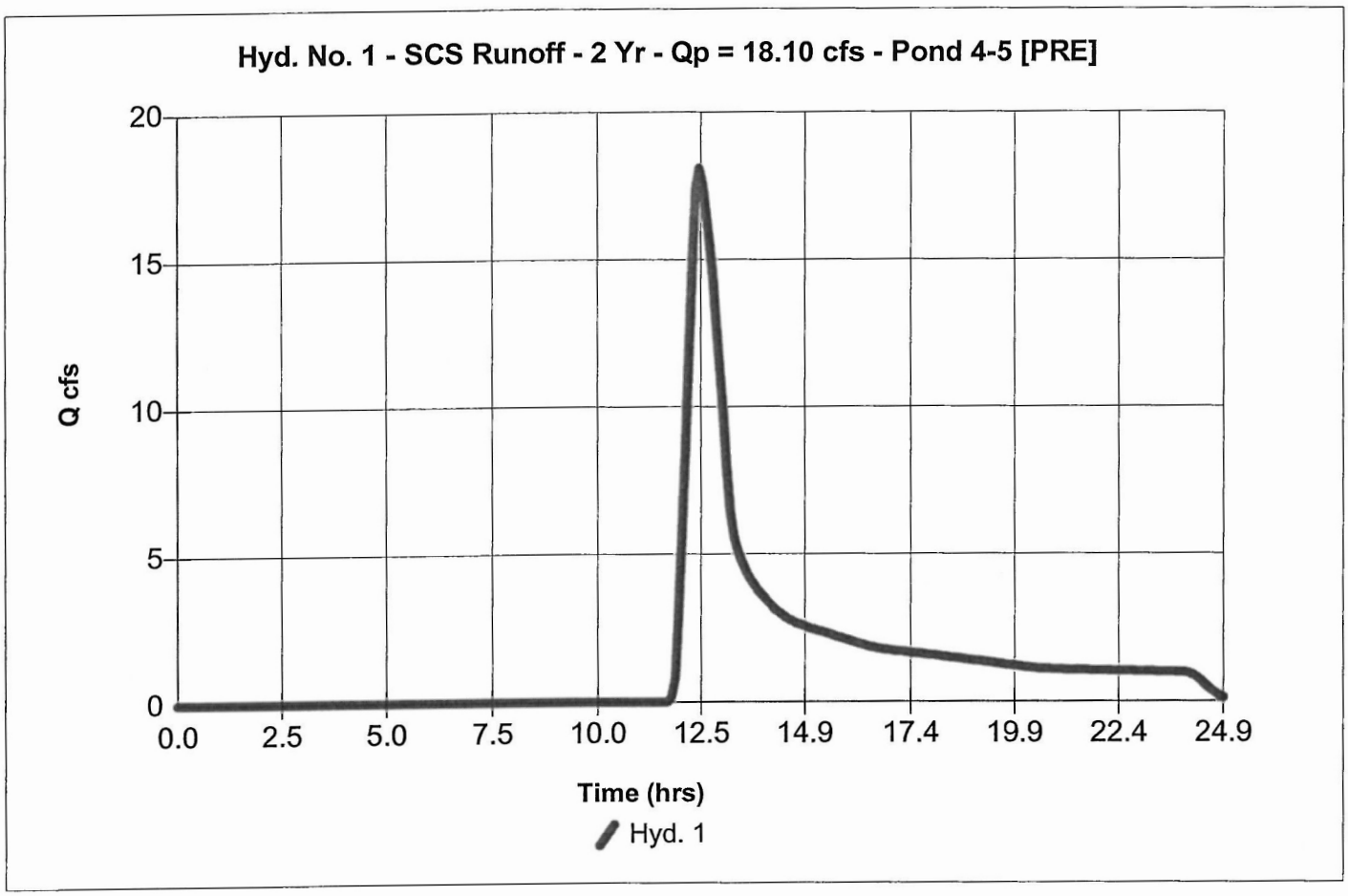

Hyd. No. 13 - Combine - 1 Yr - Qp = 42.36 cfs - 4-5 routed PLUS Coats Pond
Q cfs
50
40
30
20
10
0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
Time (hrs)
Hyd. 3
Hyd. 9
Hyd. 13

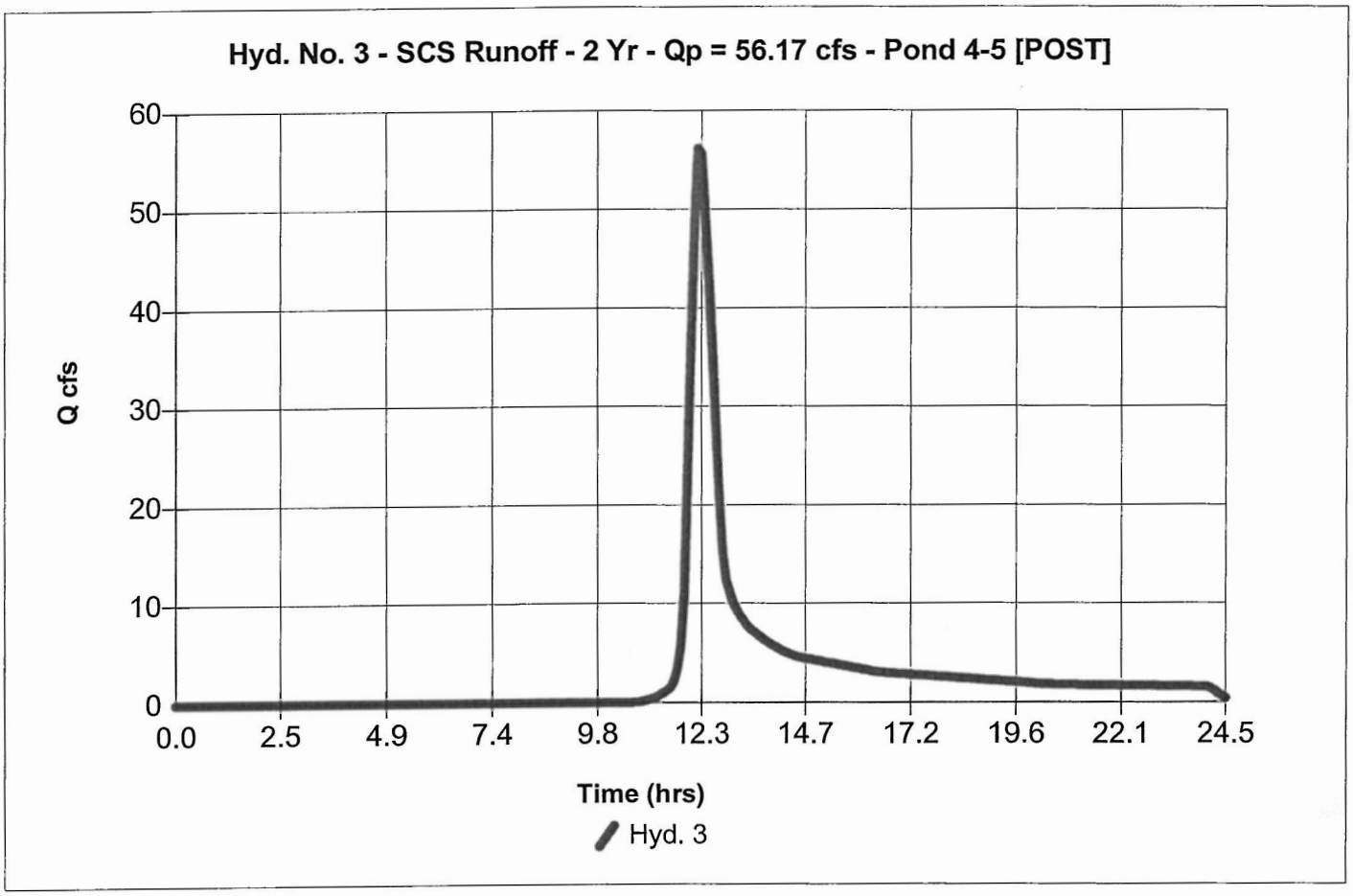

Hyd. No. 16 - Reservoir - 1 Yr - Qp = 4.20 cfs - Coats Pond Routed
Q cfs
50
40
30
20
10
0
0.00
9.91
19.82
29.73
39.63
49.54
59.45
69.36
79.27
89.18
99.08
Time (hrs)
Hyd. 13
Hyd. 16

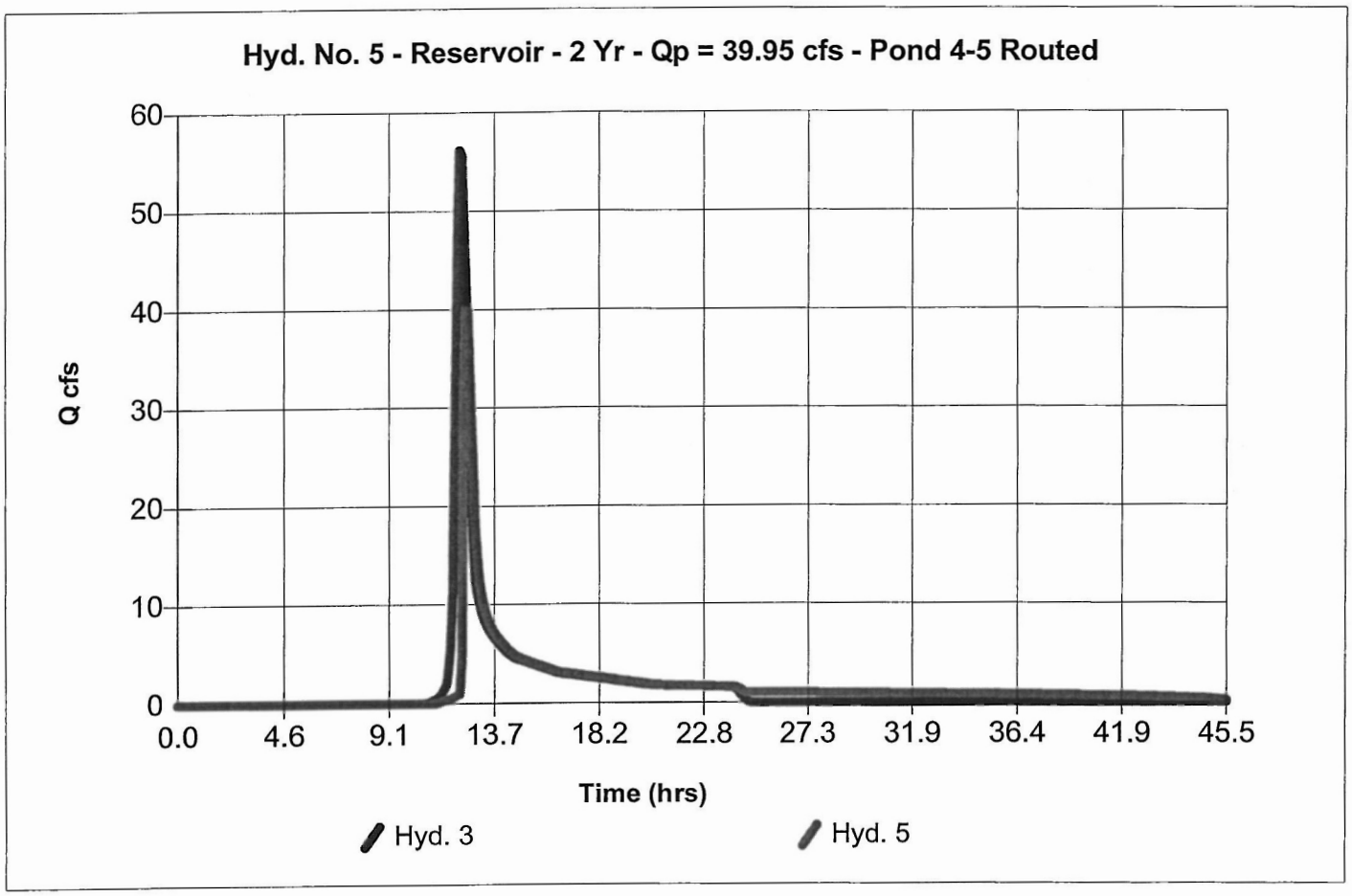
Hydrograph Summary Report

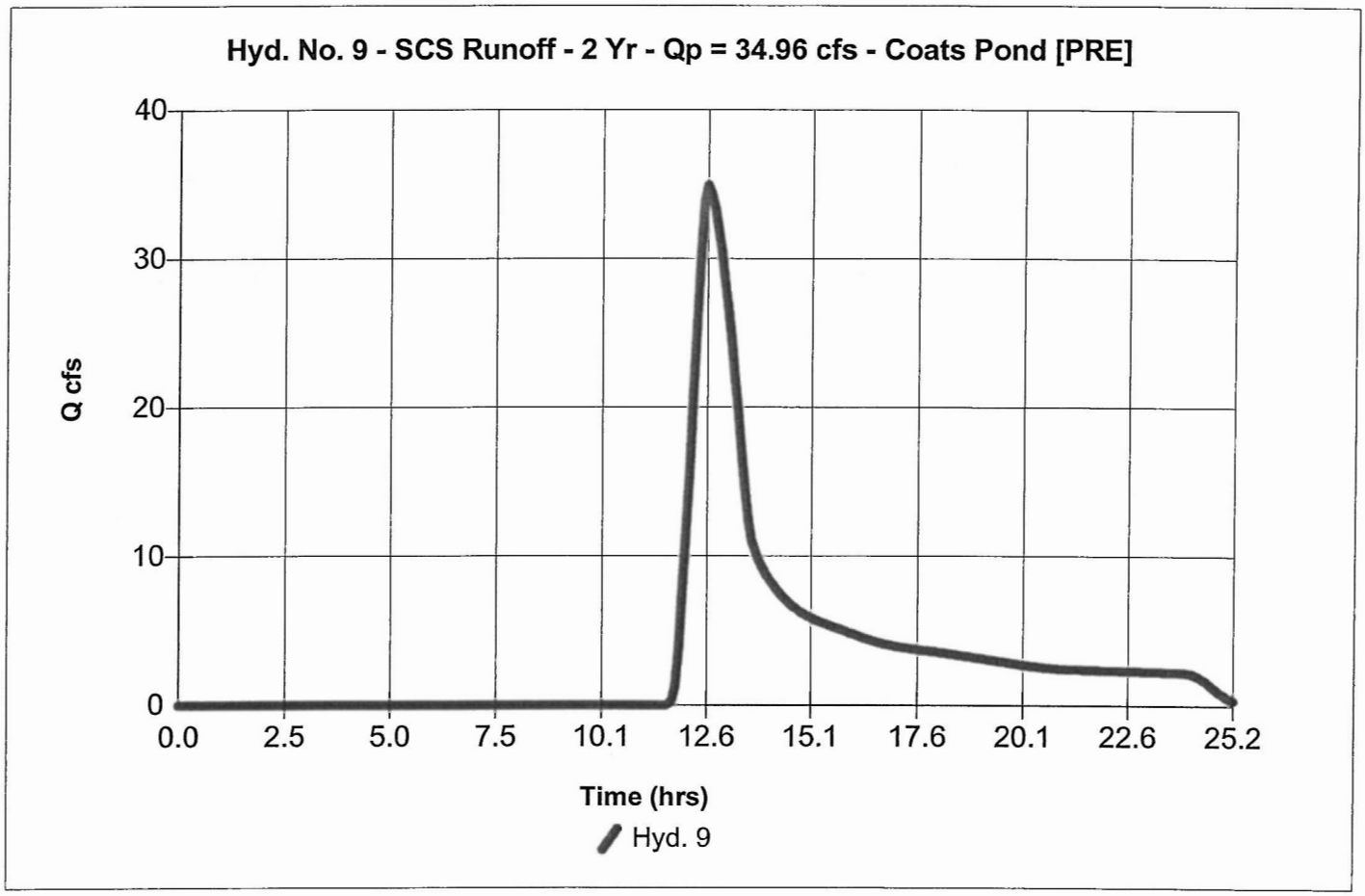
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	18.10	5	745	128,843	----	------	------	Pond 4-5 [PRE]
3	SCS Runoff	56.17	5	730	261,319	----	------	------	Pond 4-5 [POST]
5	Reservoir	39.95	5	745	261,319	3	50.70	77,260	Pond 4-5 Routed
9	SCS Runoff	34.96	5	755	296,272	----	------	------	Coats Pond [PRE]
11	SCS Runoff	44.35	5	730	211,902	----	------	------	Coats Pond [POST]
13	Combine	76.47	5	735	557,591	3, 9,	------	------	4-5 routed PLUS Coats Pond
16	Reservoir	11.91	5	865	538,906	13	40.91	309,191	Coats Pond Routed

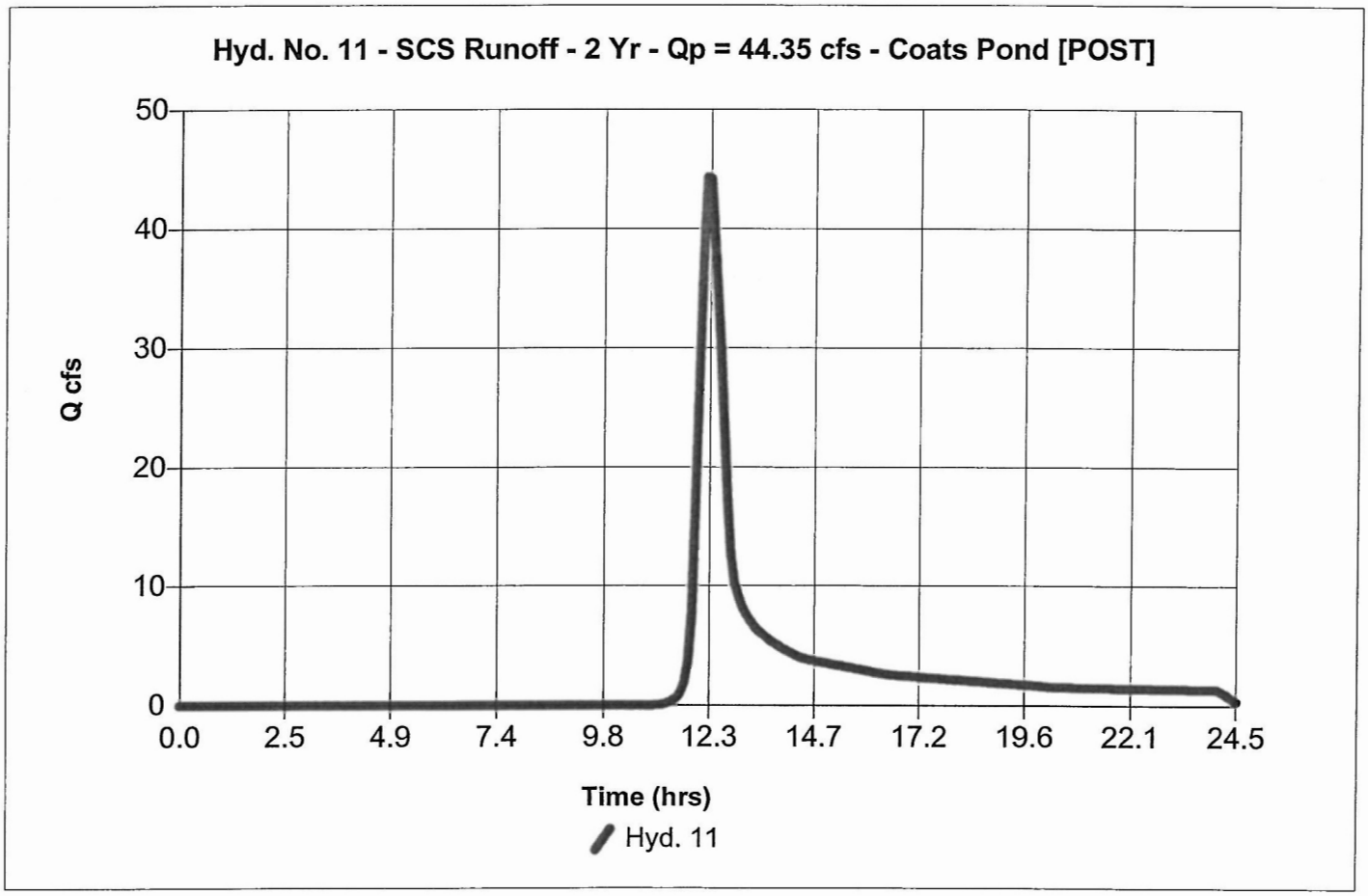
Proj. file: Existing Ponds.gpw | Return Period: 2 yr | Run date: 08-13-2002

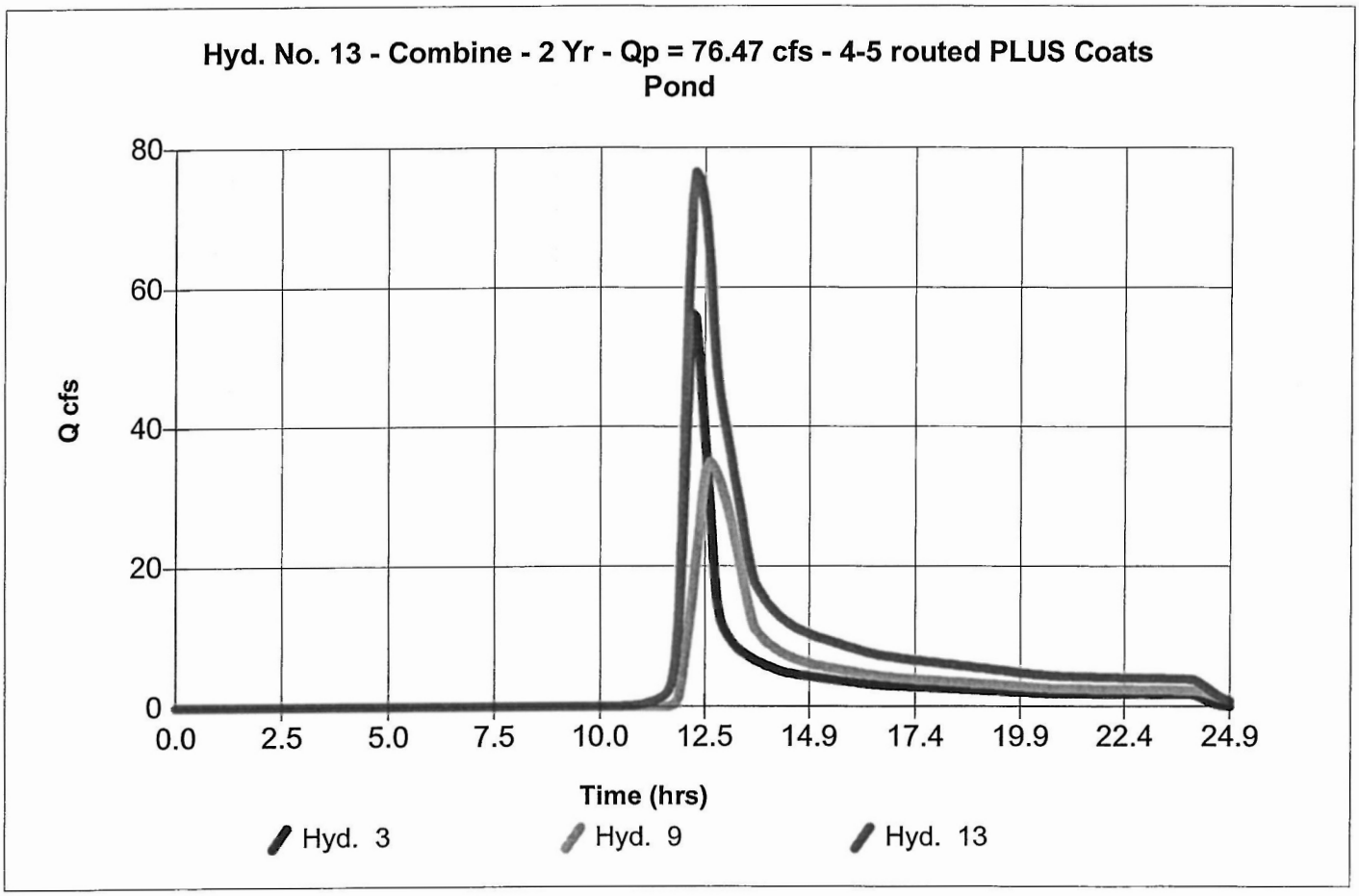

Hyd. No. 1 - SCS Runoff - 2 Yr - Qp = 18.10 cfs - Pond 4-5 [PRE]
Q cfs
20
15
10
5
0
0.0
2.5
5.0
7.5
10.0
12.5
14.9
17.4
19.9
22.4
24.9
Time (hrs)
Hyd. 1

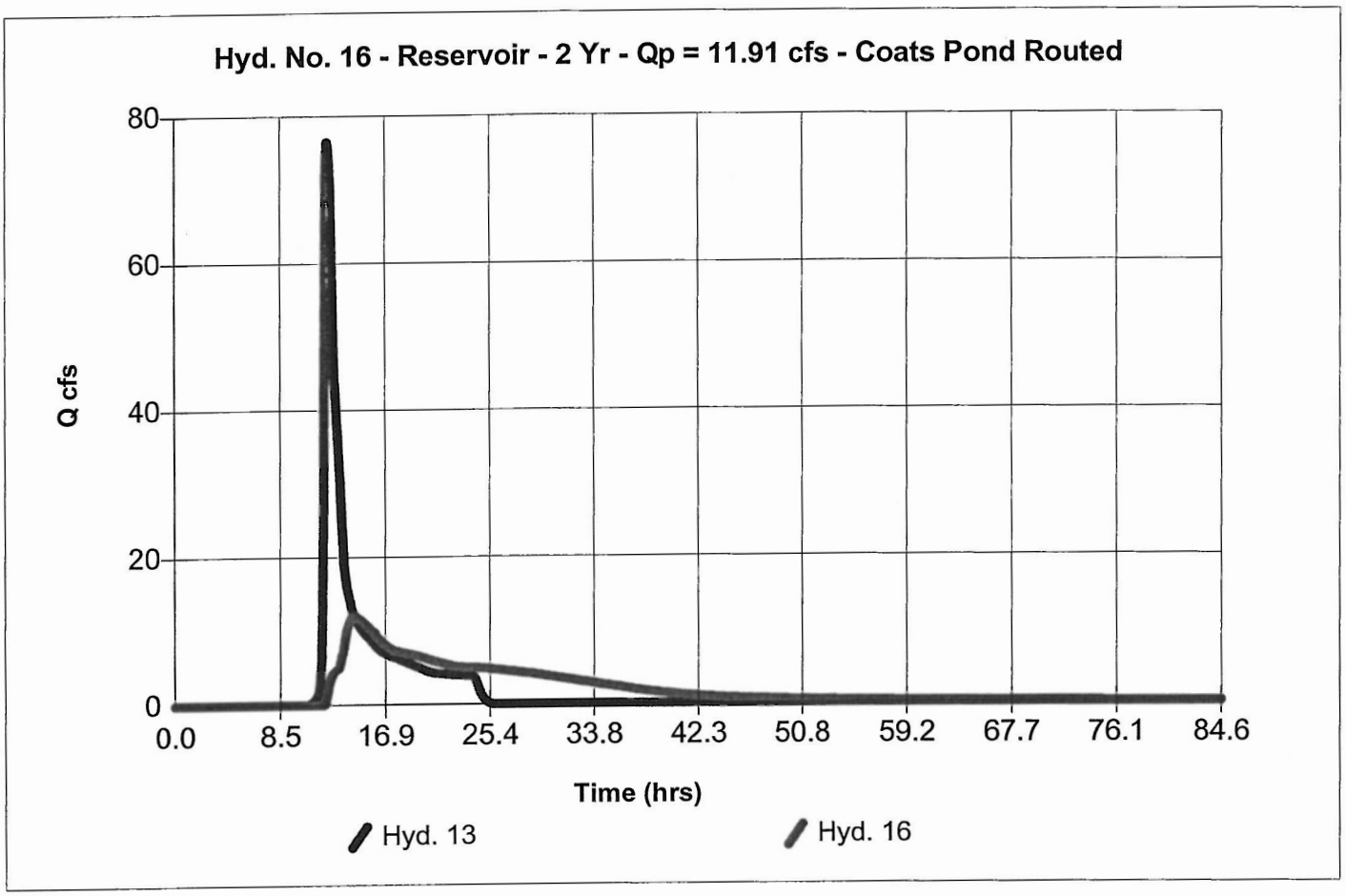

Hyd. No. 3 - SCS Runoff - 2 Yr - Qp = 56.17 cfs - Pond 4-5 [POST]
Q cfs
60
50
40
30
20
10
0
0.0
2.5
4.9
7.4
9.8
12.3
14.7
17.2
19.6
22.1
24.5
Time (hrs)
Hyd. 3


Hyd. No. 5 - Reservoir - 2 Yr - Qp = 39.95 cfs - Pond 4-5 Routed
Q cfs
60
50
40
30
20
10
0
0.0
4.6
9.1
13.7
18.2
22.8
27.3
31.9
36.4
41.9
45.5
Time (hrs)
Hyd. 3
Hyd. 5


Hyd. No. 9 - SCS Runoff - 2 Yr - Qp = 34.96 cfs - Coats Pond [PRE]
Q cfs
40
30
20
10
0
0.0
2.5
5.0
7.5
10.1
12.6
15.1
17.6
20.1
22.6
25.2
Time (hrs)
Hyd. 9


Hyd. No. 11 - SCS Runoff - 2 Yr - Qp = 44.35 cfs - Coats Pond [POST]
Q cfs
50
40
30
20
10
0
0.0
2.5
4.9
7.4
9.8
12.3
14.7
17.2
19.6
22.1
24.5
Time (hrs)
Hyd. 11

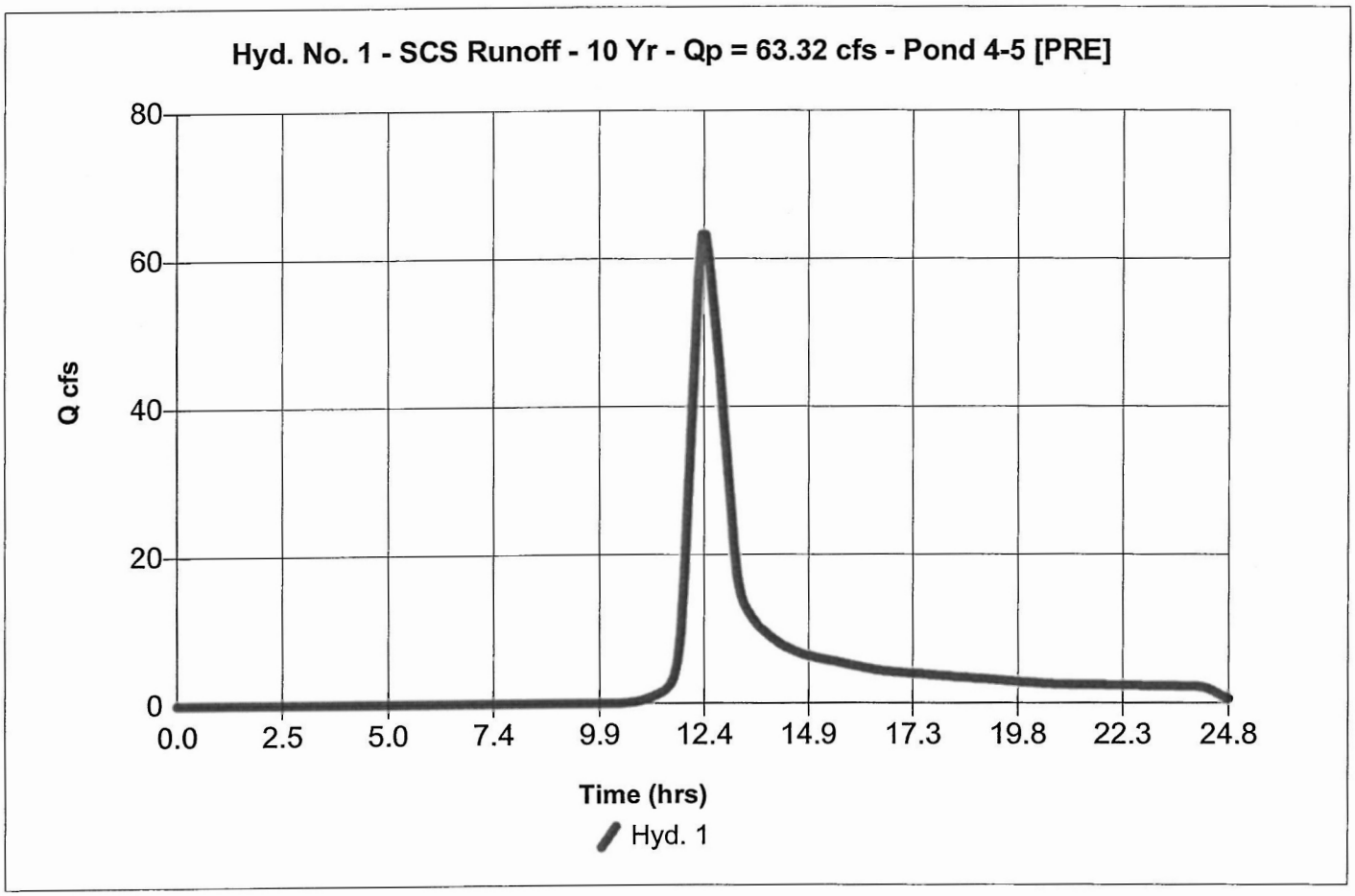

Hyd. No. 13 - Combine - 2 Yr - Qp = 76.47 cfs - 4-5 routed PLUS Coats Pond
Q cfs
80
60
40
20
0
0.0
2.5
5.0
7.5
10.0
12.5
14.9
17.4
19.9
22.4
24.9
Time (hrs)
Hyd. 3
Hyd. 9
Hyd. 13

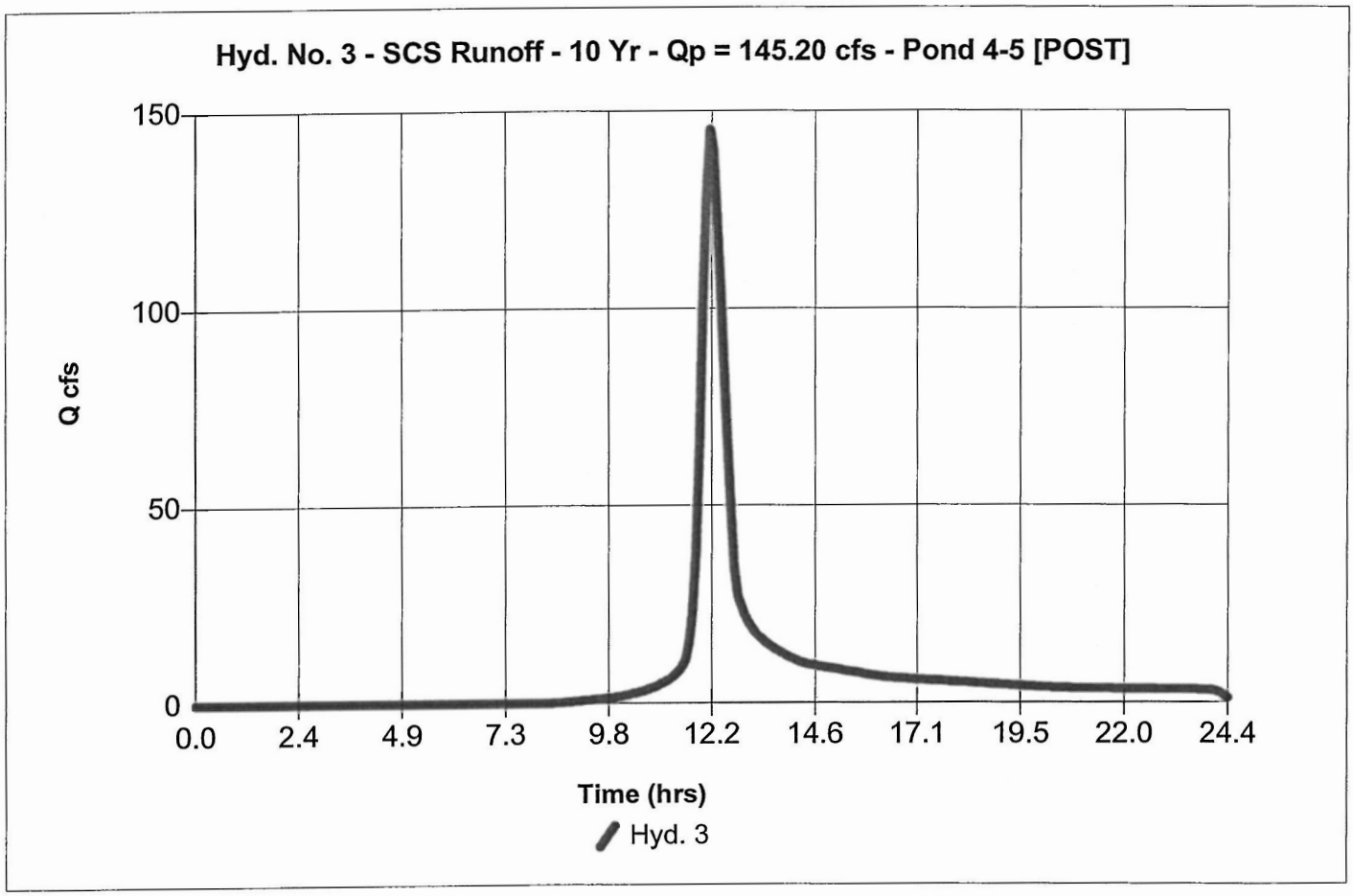

Hyd. No. 16 - Reservoir - 2 Yr - Qp = 11.91 cfs - Coats Pond Routed
Q cfs
80
60
40
20
0
0.0
8.5
16.9
25.4
33.8
42.3
50.8
59.2
67.7
76.1
84.6
Time (hrs)
Hyd. 13
Hyd. 16

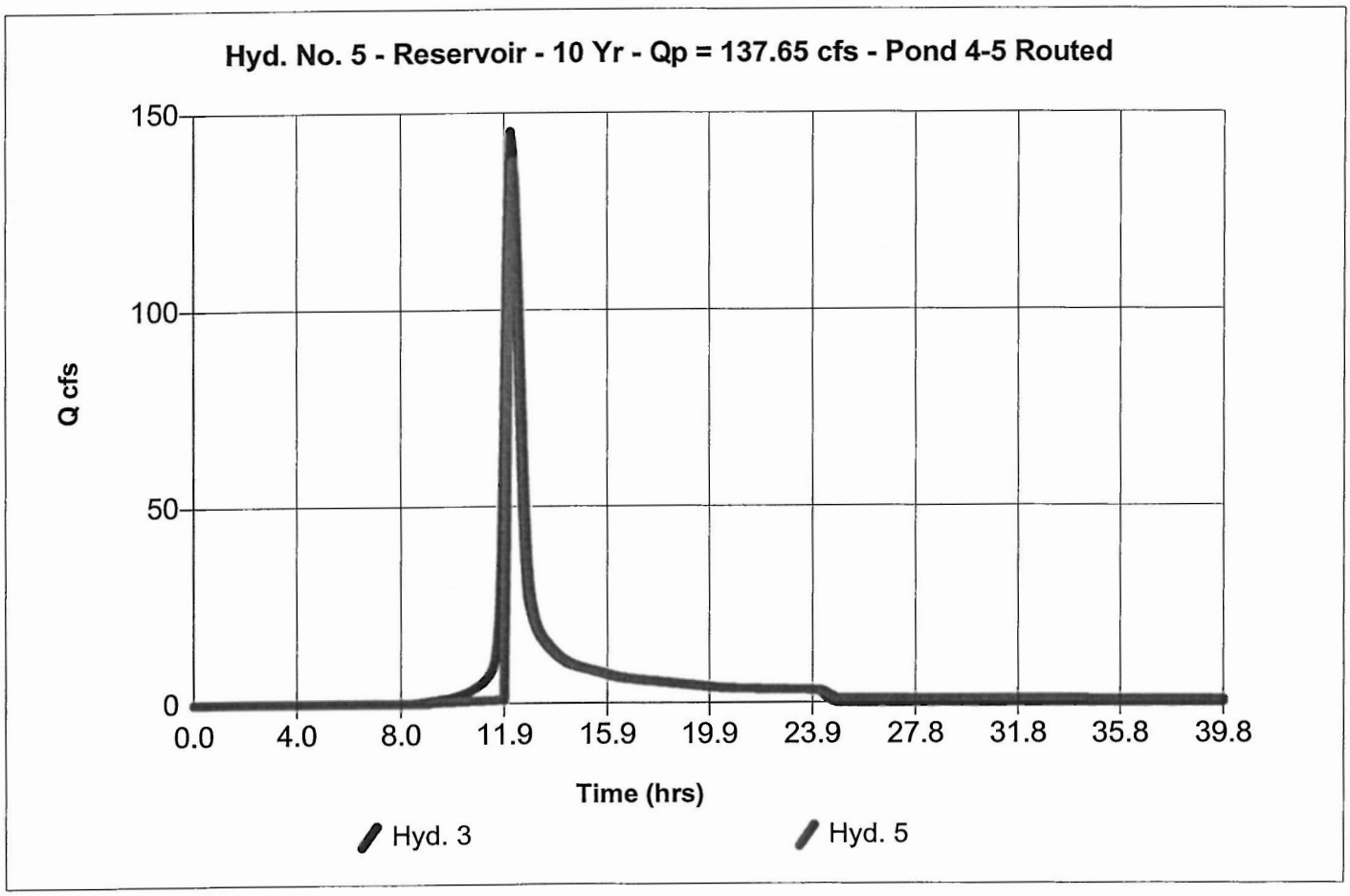
Hydrograph Summary Report

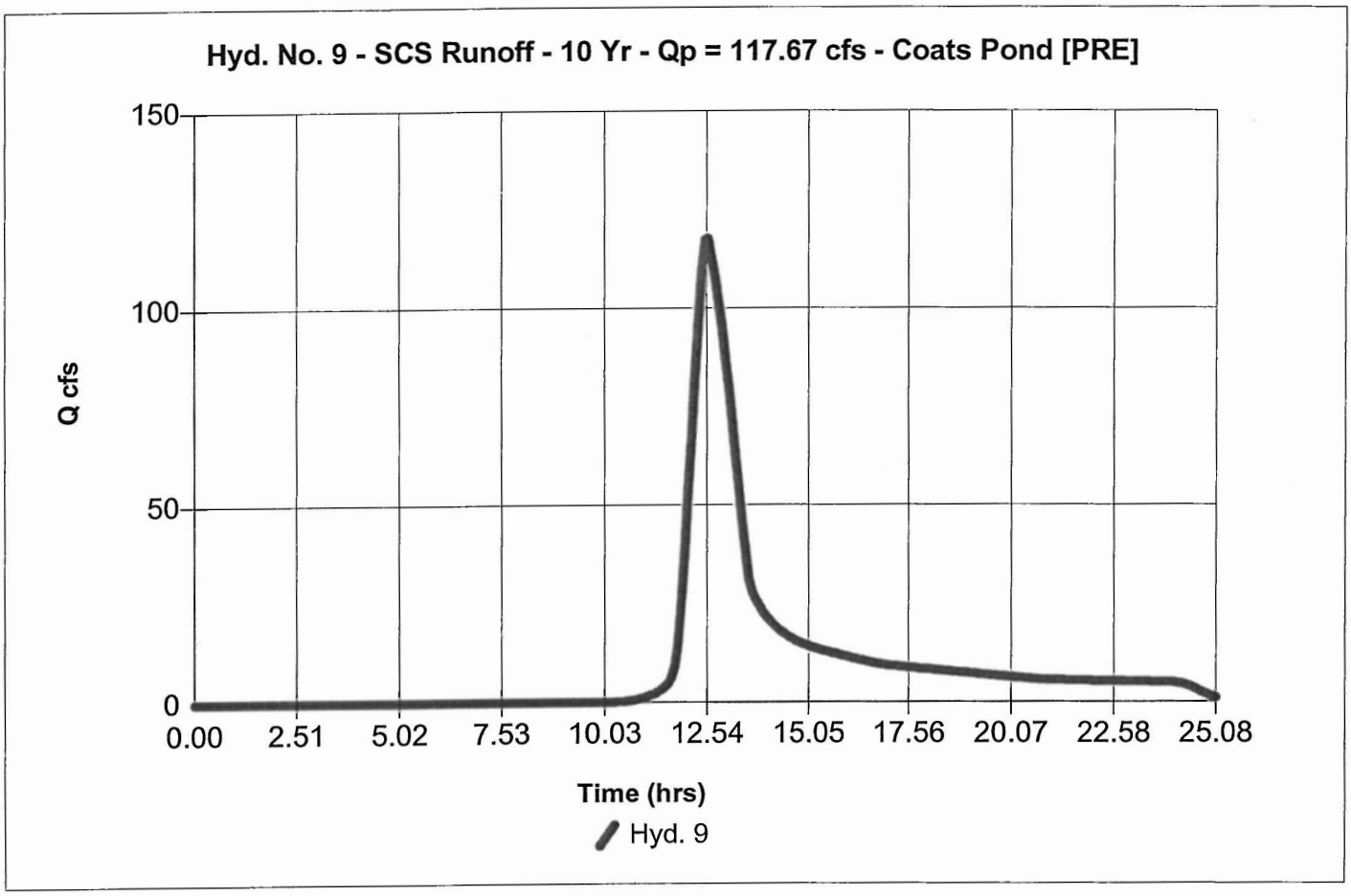
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	63.32	5	740	378,135	----	------	------	Pond 4-5 [PRE]
3	SCS Runoff	145.20	5	730	635,938	----	------	------	Pond 4-5 [POST]
5	Reservoir	137.65	5	735	635,937	3	51.61	104,586	Pond 4-5 Routed
9	SCS Runoff	117.67	5	755	848,876	----	------	------	Coats Pond [PRE]
11	SCS Runoff	121.45	5	730	535,084	----	------	------	Coats Pond [POST]
13	Combine	222.64	5	735	1,484,814	3, 9,	------	------	4-5 routed PLUS Coats Pond
16	Reservoir	91.96	5	790	1,466,025	13	42.74	563,226	Coats Pond Routed

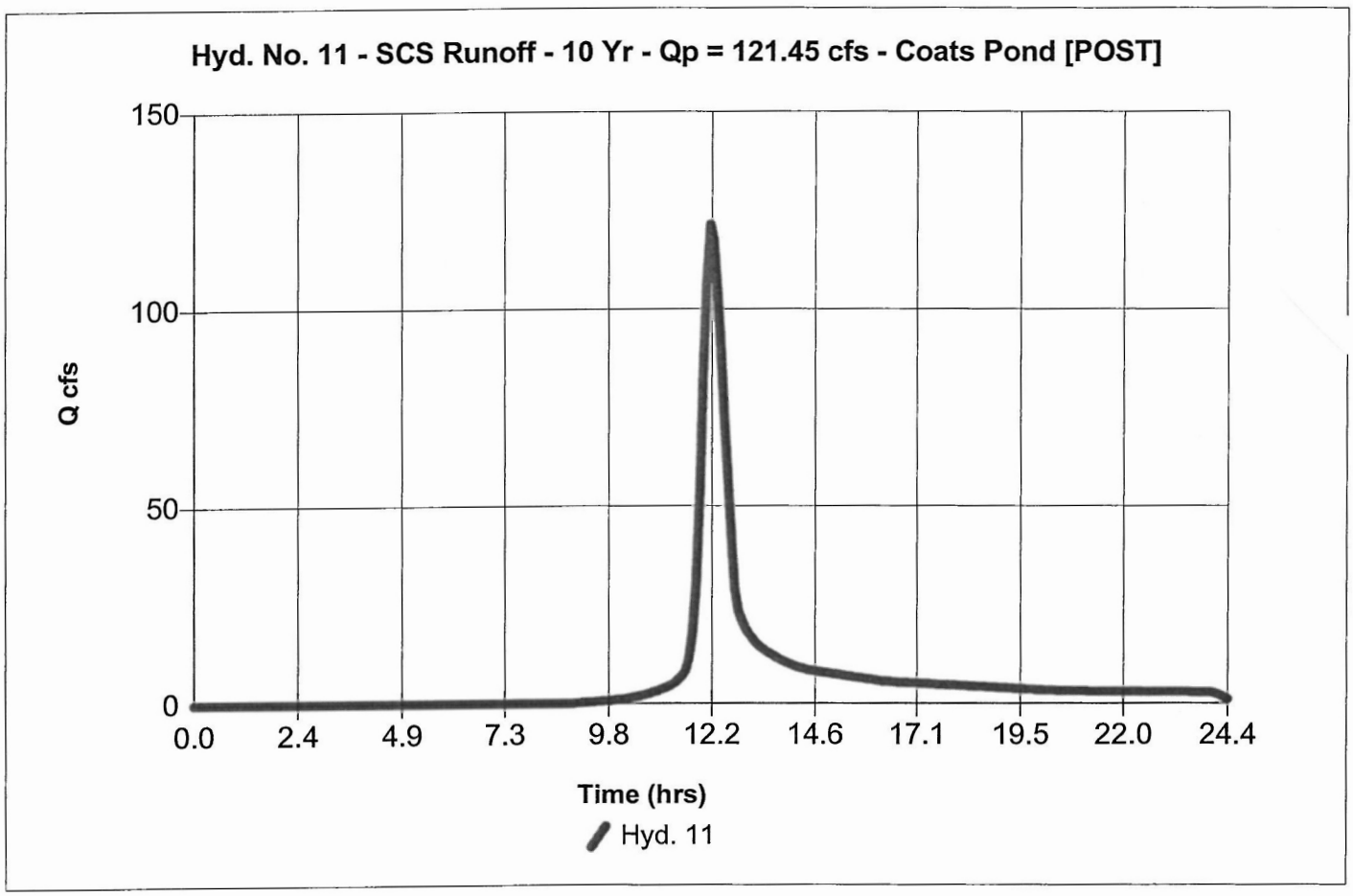
Proj. file: Existing Ponds.gpw | Return Period: 10 yr | Run date: 08-13-2002

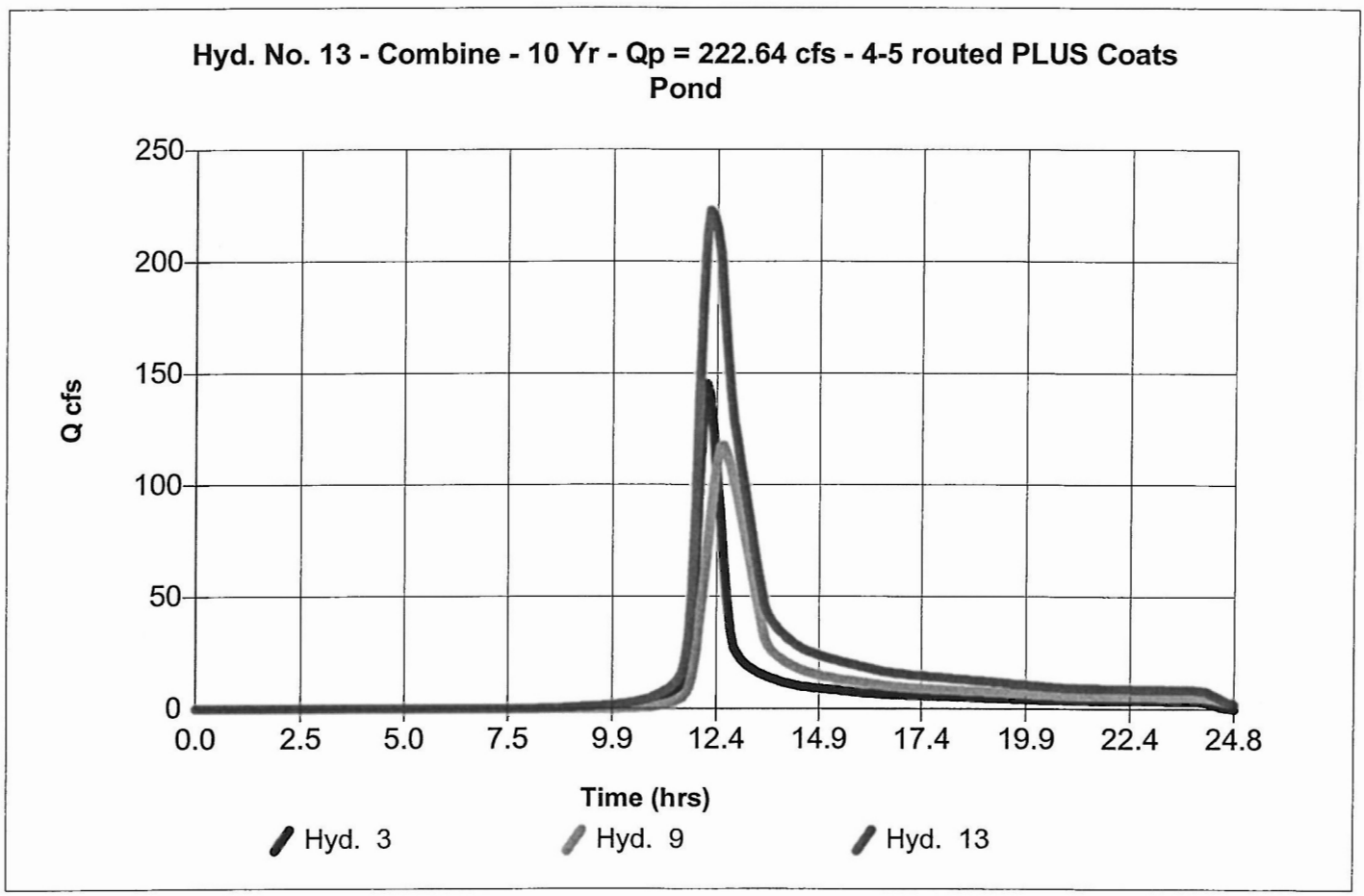

Hyd. No. 1 - SCS Runoff - 10 Yr - Qp = 63.32 cfs - Pond 4-5 [PRE]
Q cfs
80
60
40
20
0
0.0
2.5
5.0
7.4
9.9
12.4
14.9
17.3
19.8
22.3
24.8
Time (hrs)
Hyd. 1

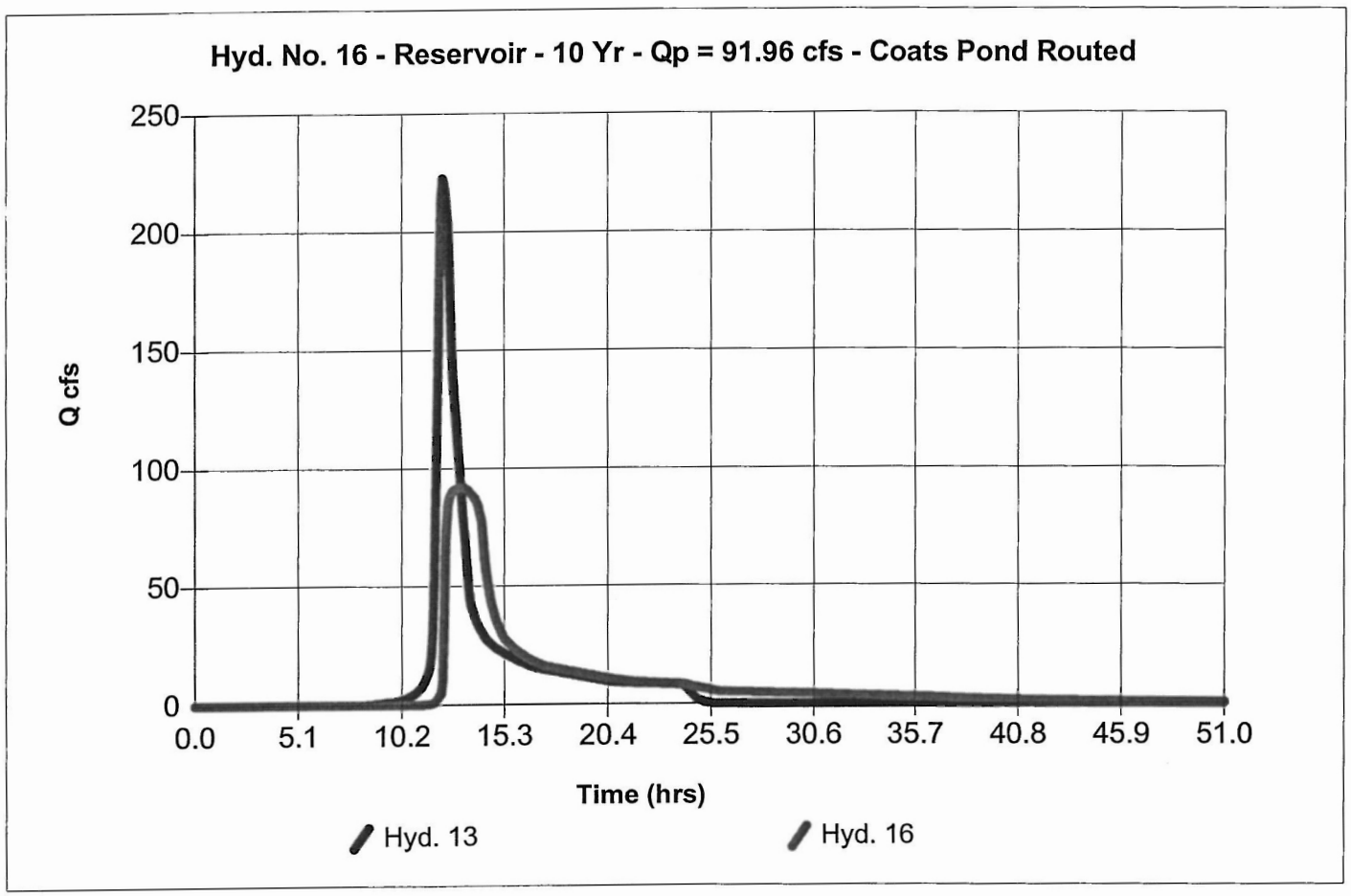

Hyd. No. 3 - SCS Runoff - 10 Yr - Qp = 145.20 cfs - Pond 4-5 [POST]
150
100
50
0
Q cfs
0.0
2.4
4.9
7.3
9.8
12.2
14.6
17.1
19.5
22.0
24.4
Time (hrs)
Hyd. 3


Hyd. No. 5 - Reservoir - 10 Yr - Qp = 137.65 cfs - Pond 4-5 Routed
150
100
50
0
Q cfs
0.0
4.0
8.0
11.9
15.9
19.9
23.9
27.8
31.8
35.8
39.8
Time (hrs)
Hyd. 3
Hyd. 5


Hyd. No. 9 - SCS Runoff - 10 Yr - Qp = 117.67 cfs - Coats Pond [PRE]
150
100
50
0
Q cfs
0.00
2.51
5.02
7.53
10.03
12.54
15.05
17.56
20.07
22.58
25.08
Time (hrs)
Hyd. 9

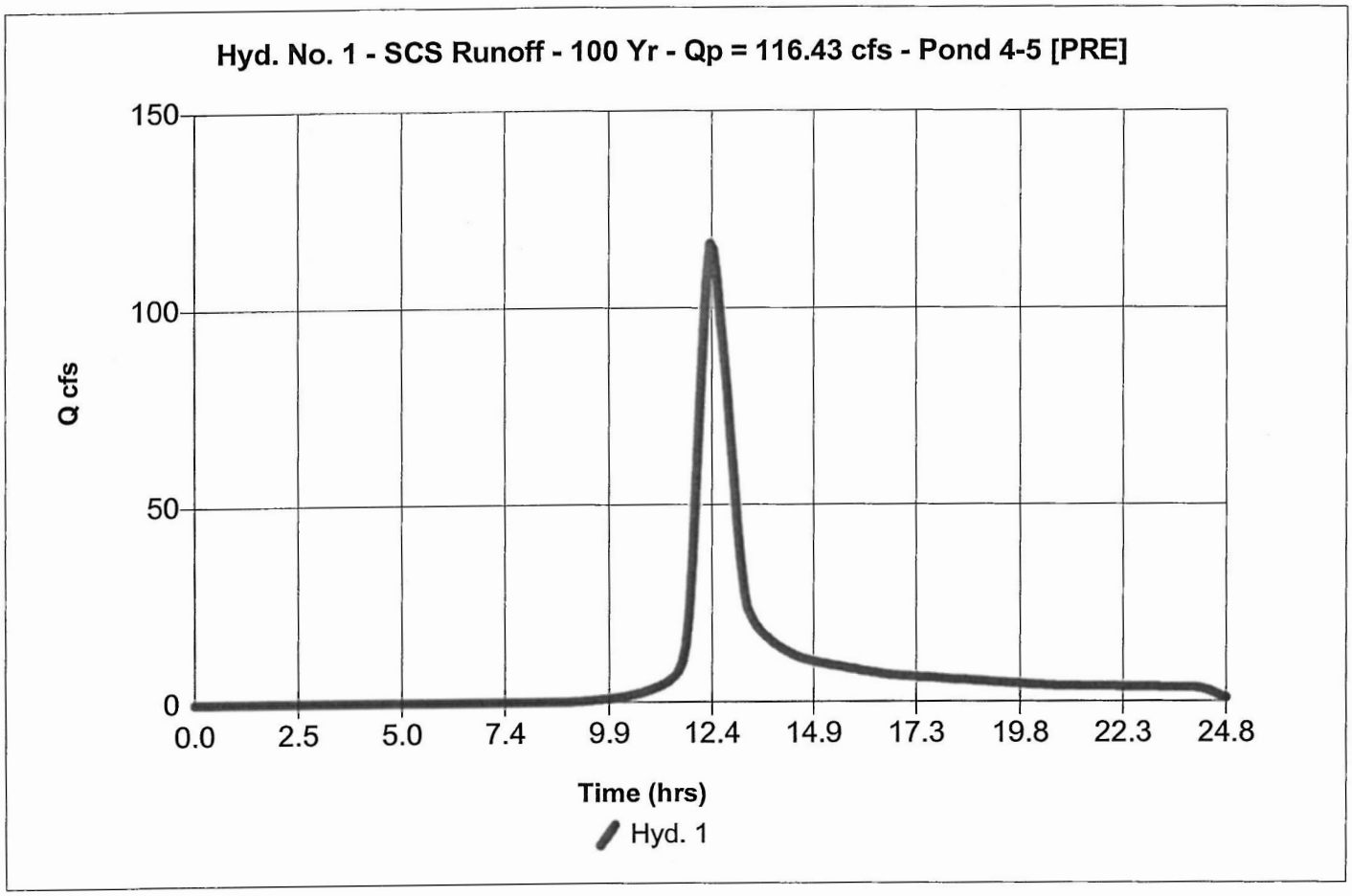

Hyd. No. 11 - SCS Runoff - 10 Yr - Qp = 121.45 cfs - Coats Pond [POST]
150
100
50
0
Q cfs
0.0
2.4
4.9
7.3
9.8
12.2
14.6
17.1
19.5
22.0
24.4
Time (hrs)
Hyd. 11

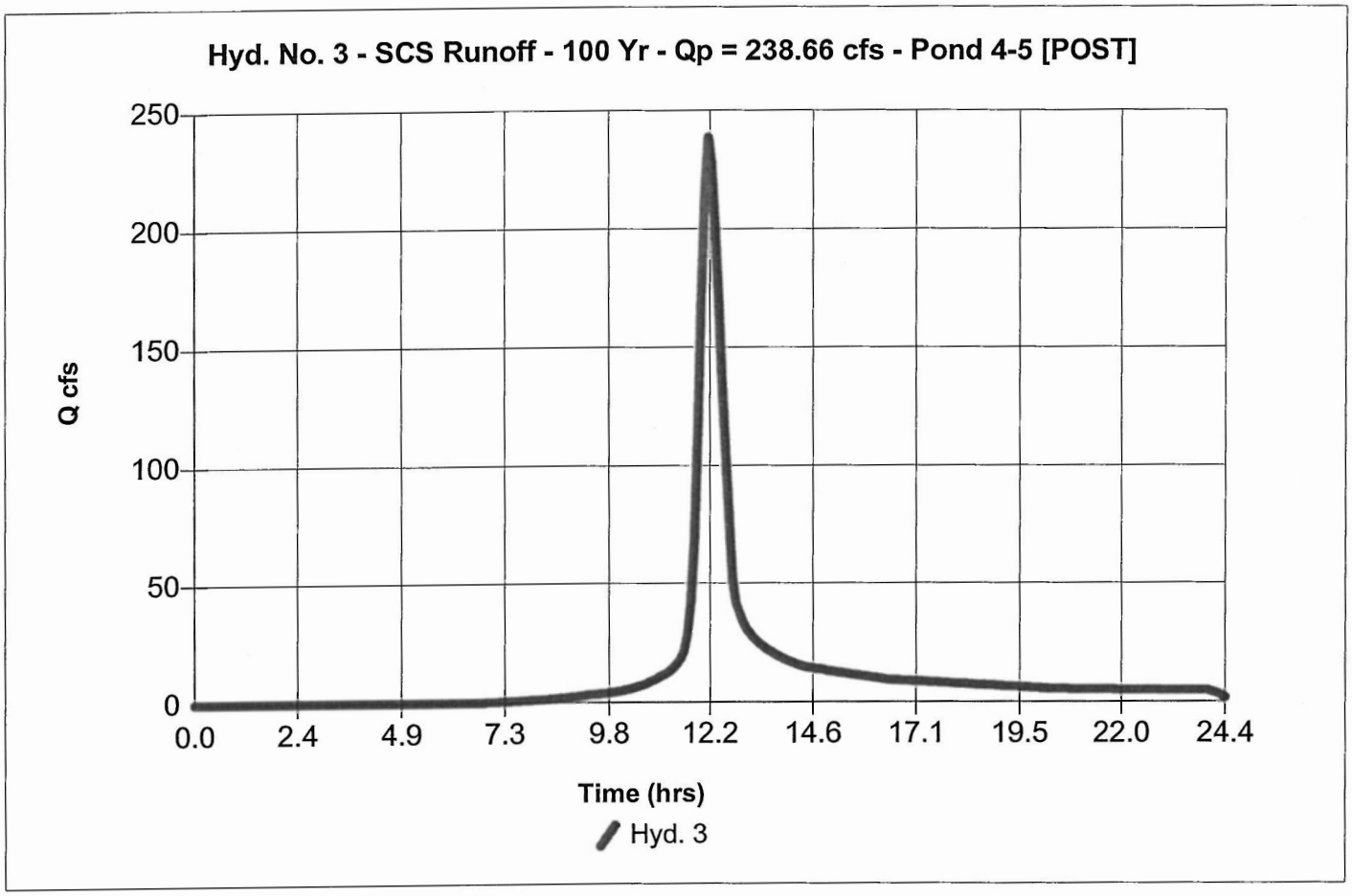

Hyd. No. 13 - Combine - 10 Yr - Qp = 222.64 cfs - 4-5 routed PLUS Coats Pond
Q cfs
250
200
150
100
50
0
0.0
2.5
5.0
7.5
9.9
12.4
14.9
17.4
19.9
22.4
24.8
Time (hrs)
Hyd. 3
Hyd. 9
Hyd. 13

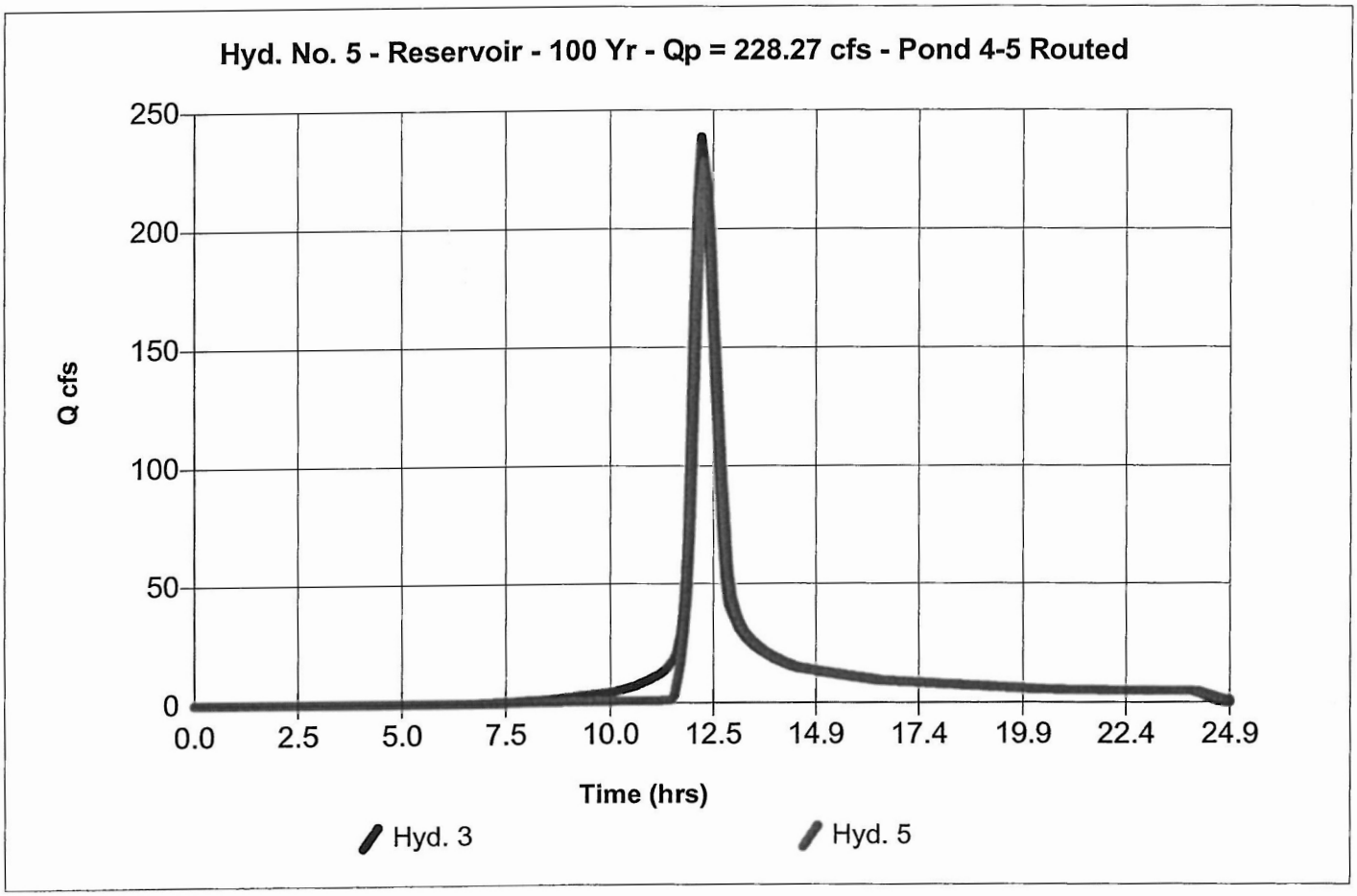

Hyd. No. 16 - Reservoir - 10 Yr - Qp = 91.96 cfs - Coats Pond Routed
Q cfs
250
200
150
100
50
0
0.0
5.1
10.2
15.3
20.4
25.5
30.6
35.7
40.8
45.9
51.0
Time (hrs)
Hyd. 13
Hyd. 16

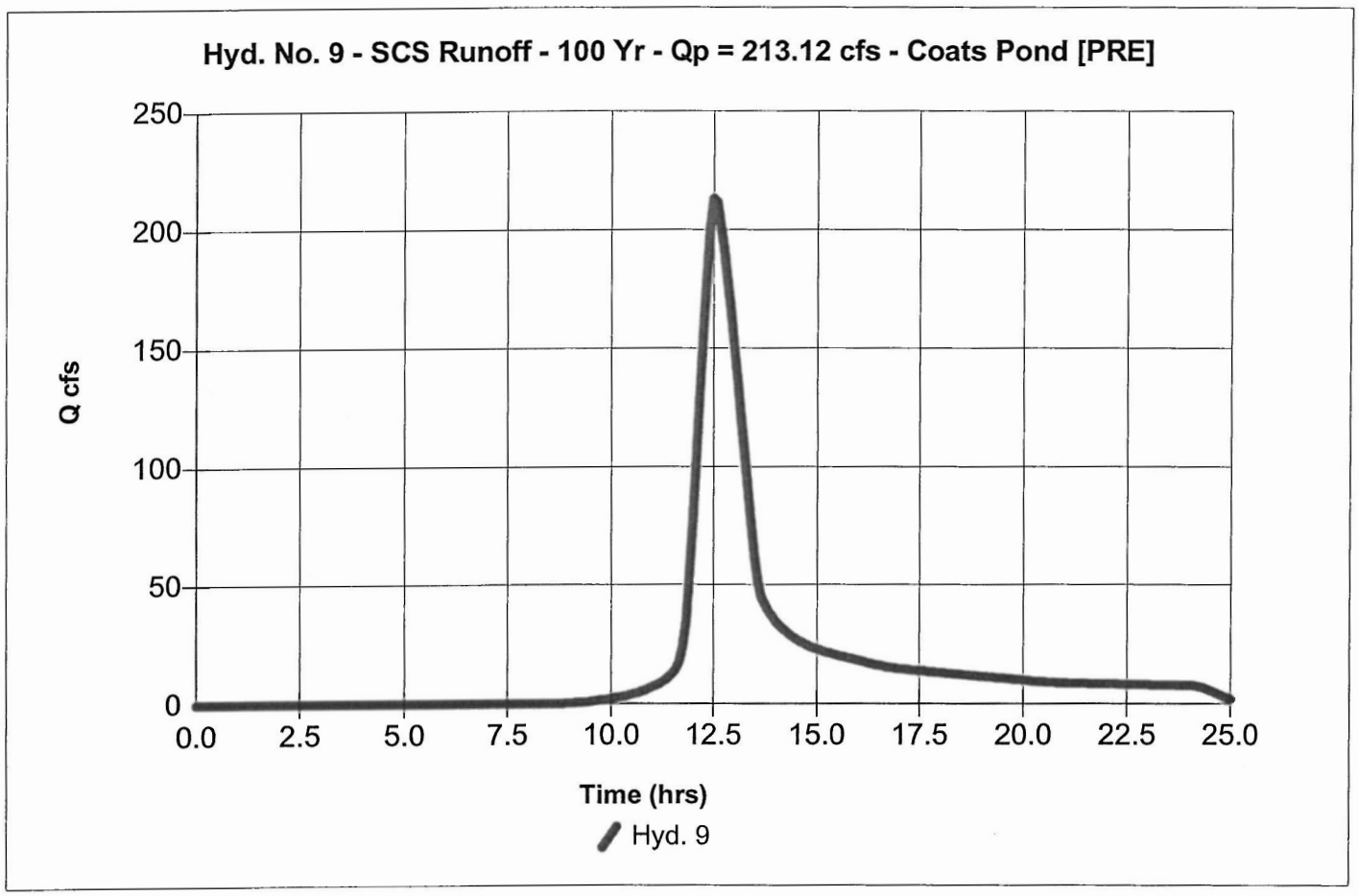
Hydrograph Summary Report

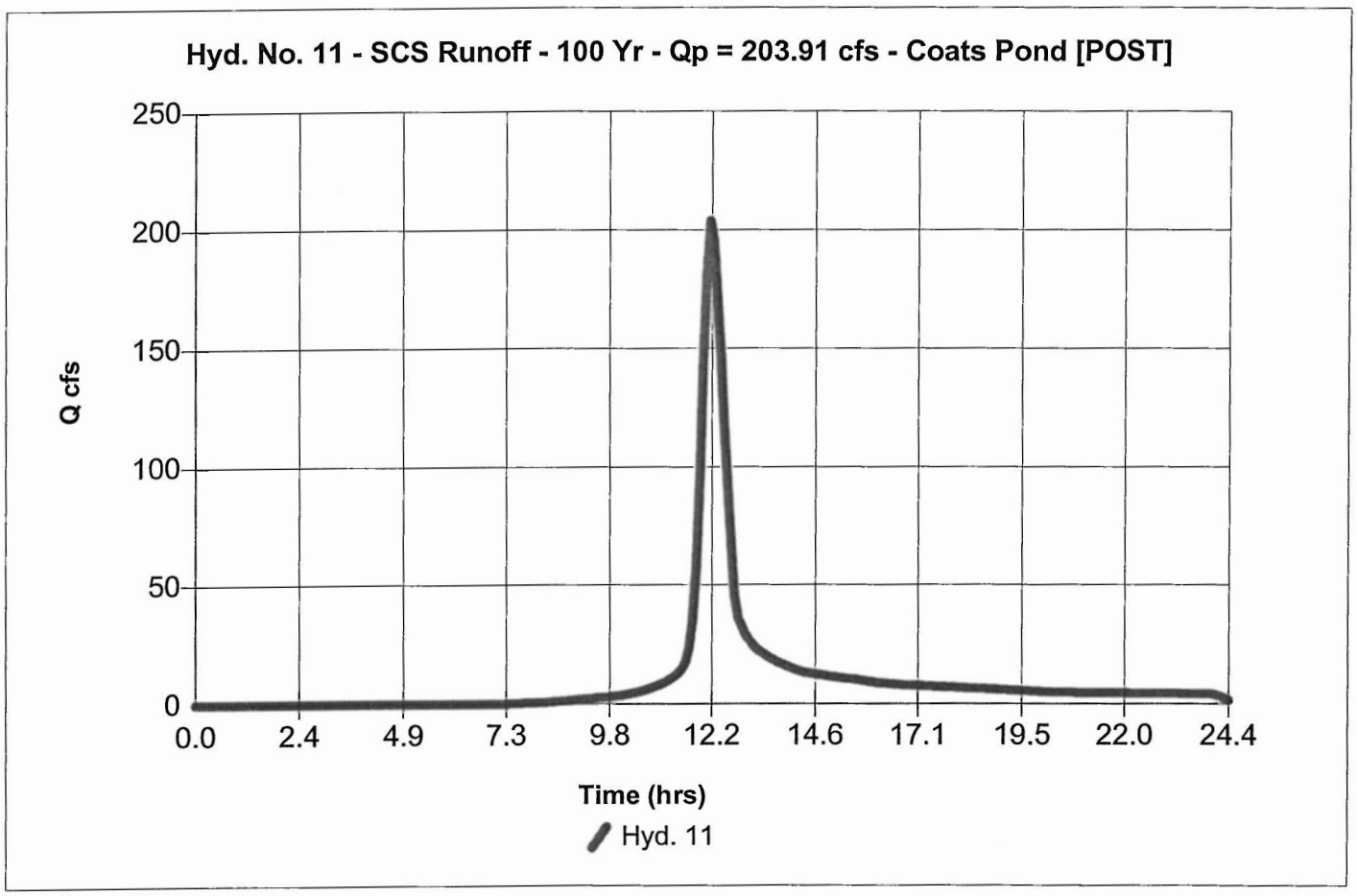
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	116.43	5	740	667,222	----	------	------	Pond 4-5 [PRE]
3	SCS Runoff	238.66	5	730	1,038,113	----	------	------	Pond 4-5 [POST]
5	Reservoir	228.27	5	735	1,038,112	3	52.27	126,994	Pond 4-5 Routed
9	SCS Runoff	213.12	5	750	1,483,572	----	------	------	Coats Pond [PRE]
11	SCS Runoff	203.91	5	730	887,455	----	------	------	Coats Pond [POST]
13	Combine	384.07	5	735	2,521,685	3, 9,	------	------	4-5 routed PLUS Coats Pond
16	Reservoir	200.79	5	775	2,502,877	13	44.73	901,342	Coats Pond Routed

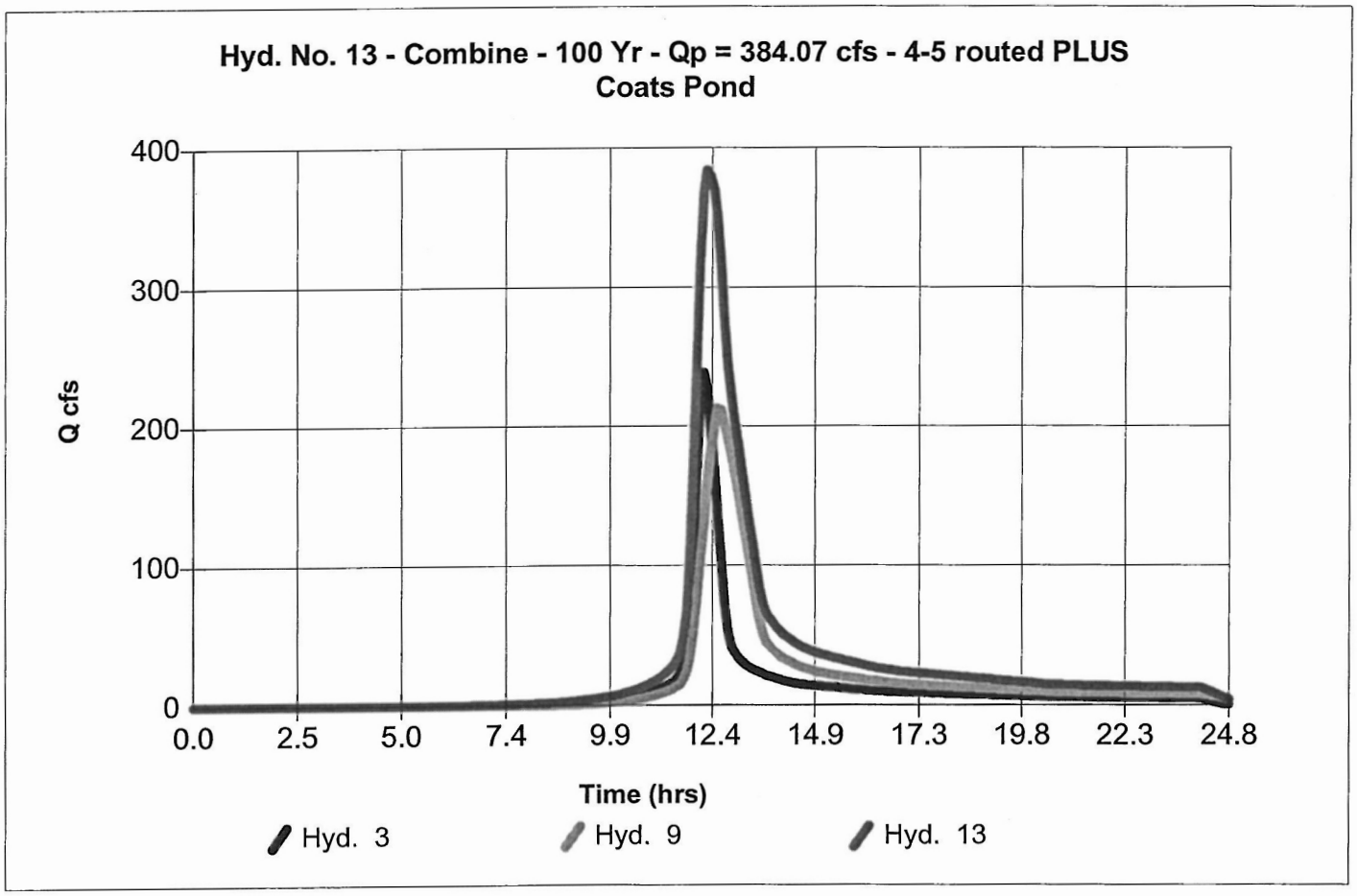

Hyd. No. 1 - SCS Runoff - 100 Yr - Qp = 116.43 cfs - Pond 4-5 [PRE]
150
100
50
0
Q cfs
0.0
2.5
5.0
7.4
9.9
12.4
14.9
17.3
19.8
22.3
24.8
Time (hrs)
Hyd. 1

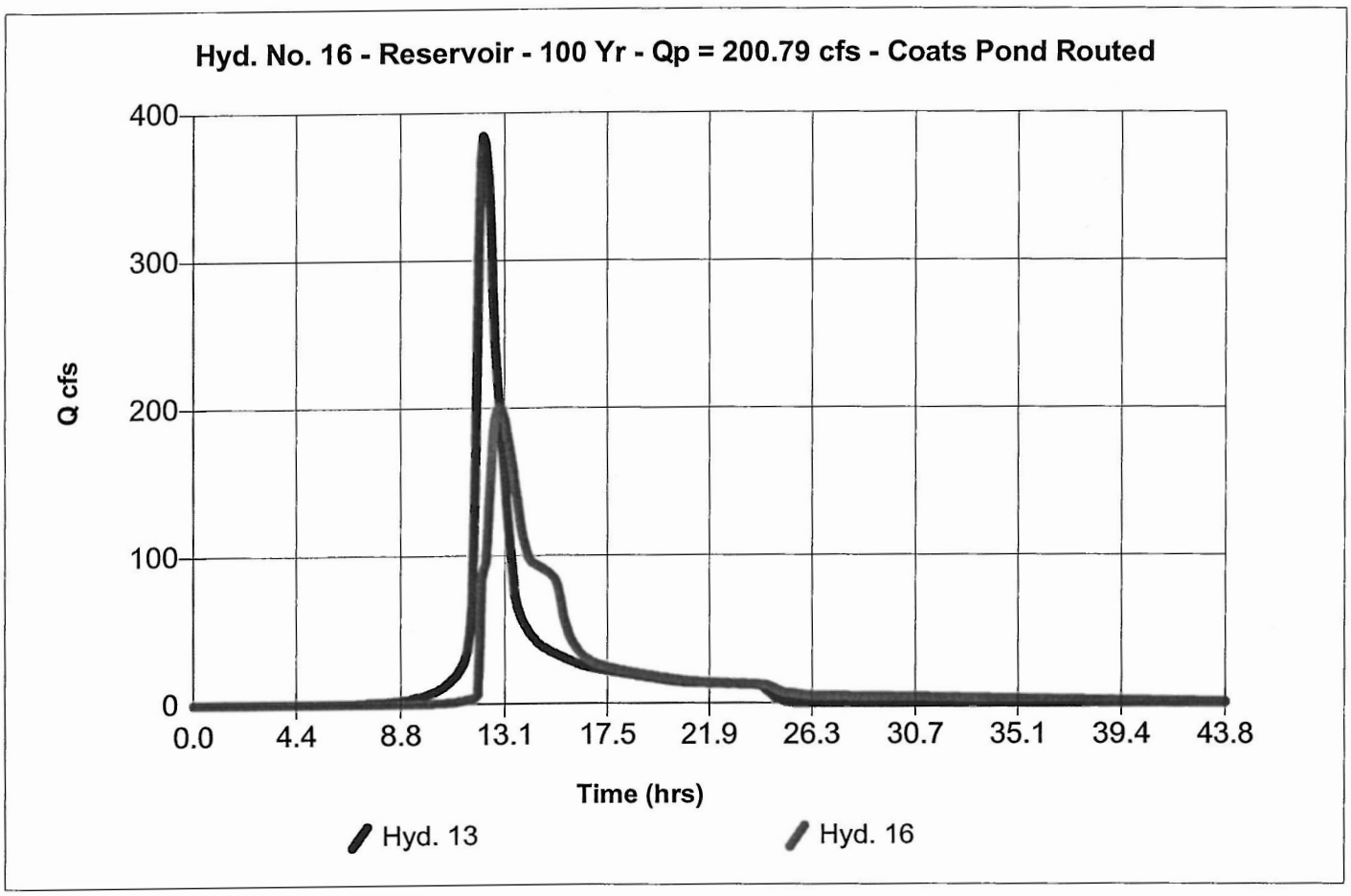

Hyd. No. 3 - SCS Runoff - 100 Yr - Qp = 238.66 cfs - Pond 4-5 [POST]
Q cfs
250
200
150
100
50
0
0.0
2.4
4.9
7.3
9.8
12.2
14.6
17.1
19.5
22.0
24.4
Time (hrs)
Hyd. 3


Hyd. No. 5 - Reservoir - 100 Yr - Qp = 228.27 cfs - Pond 4-5 Routed
Q cfs
250
200
150
100
50
0
0.0
2.5
5.0
7.5
10.0
12.5
14.9
17.4
19.9
22.4
24.9
Time (hrs)
Hyd. 3
Hyd. 5

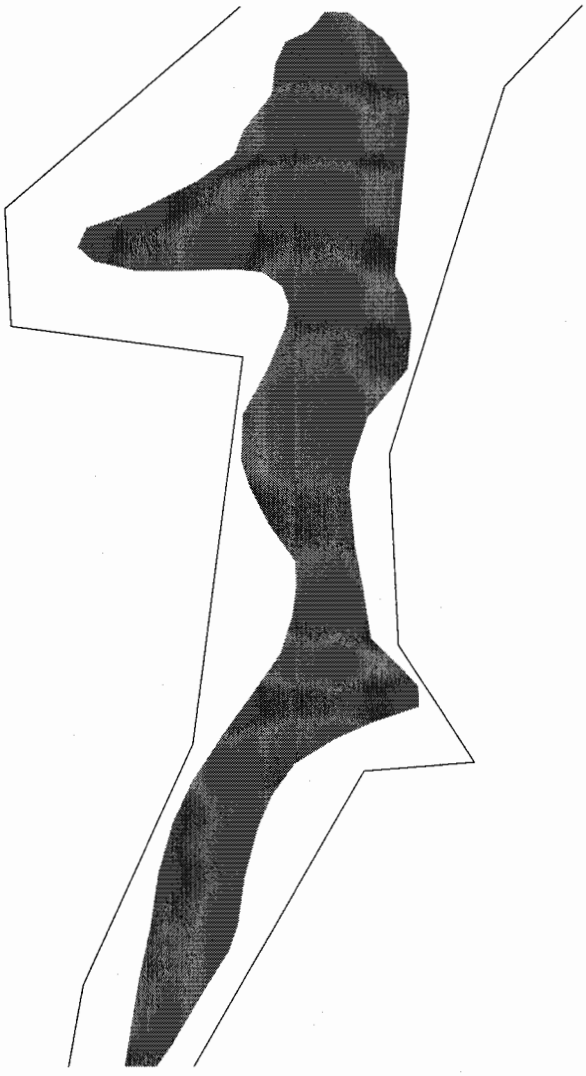

Hyd. No. 9 - SCS Runoff - 100 Yr - Qp = 213.12 cfs - Coats Pond [PRE]
Q cfs
250
200
150
100
50
0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
Time (hrs)
Hyd. 9


Hyd. No. 11 - SCS Runoff - 100 Yr - Qp = 203.91 cfs - Coats Pond [POST]
Q cfs
250
200
150
100
50
0
0.0
2.4
4.9
7.3
9.8
12.2
14.6
17.1
19.5
22.0
24.4
Time (hrs)
Hyd. 11

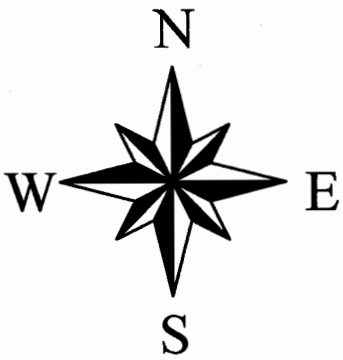

Hyd. No. 13 - Combine - 100 Yr - Qp = 384.07 cfs - 4-5 routed PLUS Coats Pond
Q cfs
400
300
200
100
0
0.0
2.5
5.0
7.4
9.9
12.4
14.9
17.3
19.8
22.3
24.8
Time (hrs)
Hyd. 3
Hyd. 9
Hyd. 13


Hyd. No. 16 - Reservoir - 100 Yr - Qp = 200.79 cfs - Coats Pond Routed
Q cfs
400
300
200
100
0
0.0
4.4
8.8
13.1
17.5
21.9
26.3
30.7
35.1
39.4
43.8
Time (hrs)
Hyd. 13
Hyd. 16

Coats Pond



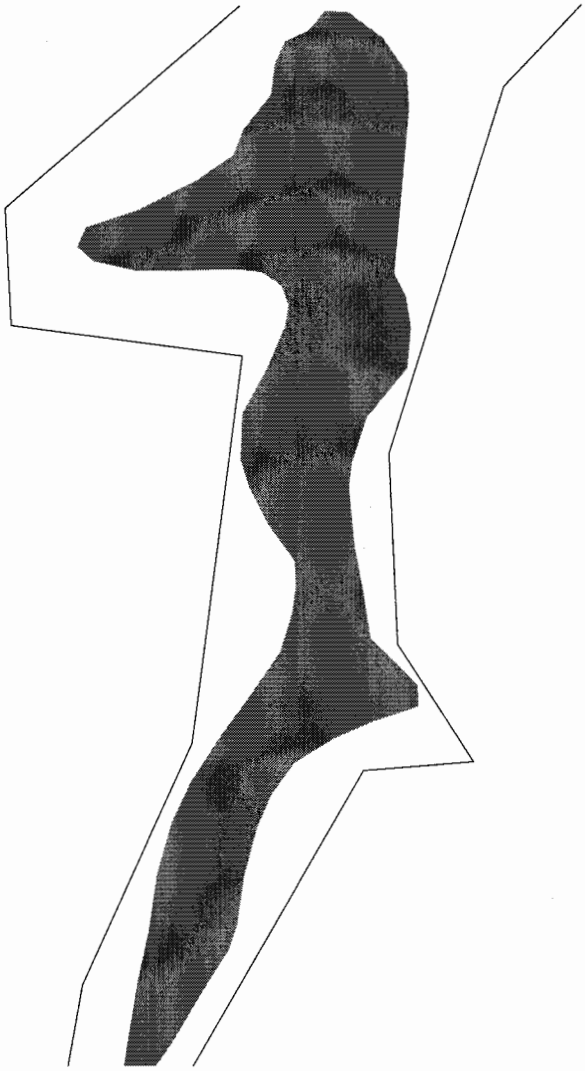
5.5x150' = 825'
.5x150 = .75'
62,000
$\frac{150 \times 150}{2}$ = 11,250
73,250 = 1.68ac - ok

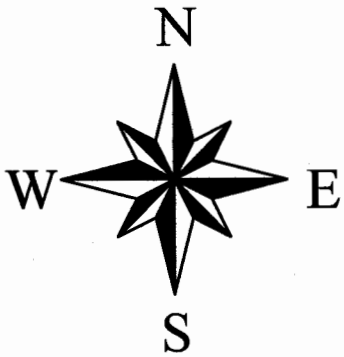


Scale 1"=150'

400 0 400 Feet

Coats Pond





Scale 1"=150'

~~804 966 96~~
564- 3840?

February 15, 1997

Mr. Darryl Cooke.

Mr. Cooke., Here is a copy of the plot where J. Kirby Davis plans to build a home, behind my pond . It bordering on Ware Creek, you already know the condition of that Dam . Due to the County and Stonehouse developers removing the water shed allowing run off, when it rains causing it to over run dam washing it out. Over a year ago it was Nov, 95. I came to see you and I delivered you some pictures of the pond, showing you that the developers at that time turn it into a mud hole. Mr. Cooke this project has destroyed the dam that could damage the E.C.O.. system in Ware Creek. The project has also destroyed the water quality . The removal destroyed the sound beadier. The run off from those agricultural field will wash the nutrients, herbicides and insecticide into the pond, you add that to what is now ,going to come from the golf course you and I both know that spells disaster. That could affect the environment in Ware Creek. Mr. Cooke this has been nearly two years and it has to stop. The County and developers has caused this and I think the State has failed to respond in a correct manner. All of this has happen because of greed powerful developers coming into the county, offering millions in proffers which are little more than a political contribution. Mr. Cooke when our elected government fails Democracy also fails. I am going to alert the head of E.P.A. about what could be damaging to Ware Creek. It is my responsibility to inform then. If the dam should fail before they repair it.

Mr. C.D. Coats

MEMORANDUM

Date: November 10, 1997

To: John Horne, Development Manager

From: Darryl E. Cook, Environmental Director DEC

Subject: Coats Pond

There is a pond a few hundred feet downstream from the Legends/Stonehouse golf course owned by the Coats family. The pond is an old farm pond that receives drainage from Stonehouse property and some adjacent farm fields. The pond's primary pipe spillway became clogged at some point in the past causing the pond's water level to rise to the point where it currently flows out through the pond's earthen emergency spillway. This type of spillway is not intended to ever serve as a primary release structure but only to be used very infrequently during large storm events to safely bypass high flows around the structure. Consequently, there was an existing erosion problem occurring in the earthen spillway even before the golf course construction. This erosion was periodically addressed by Mr. Coats through the use of broken concrete and riprap which served as liners for the spillway.

The current situation regarding the Coats family pond began shortly after construction was started by the Legends Group on the Stonehouse golf course in the spring of 1995. There are three issues that have been raised by the Coats family regarding the impact of the golf course construction on their pond; sedimentation, and the quantity and quality of storm runoff into the pond. I'll discuss each one briefly.

I was requested by Mr. Coats to attend a meeting with several regulatory agencies to review in the field his complaint concerning increased runoff and sedimentation caused by the golf course construction. He alleged that improper erosion control on the golf course was resulting in sedimentation into his pond. As the letter dated May 18, 1995, from the Division of Soil and Water Conservation indicates, there was little or no evidence that the golf course construction was causing sedimentation in his pond. We continued to monitor the golf course throughout the construction process and a review of the stream channel this week indicated that little or no sedimentation occurred in the pond as a result of the construction.

They also claim that increased runoff from the golf course damaged their pond's spillway. There has been a significant deterioration in the spillway since the beginning of the golf course construction. At the present time the level of the pond has been lowered by two to three feet as a result of erosion (cutting down) of the spillway during storm events. During the site plan review process, a commitment was made by the Legends Group to repair the damage to the dam. A design was developed by Williamsburg Environmental Group (WEG) that would have repaired the earthen spillway with a riprap channel. This design was later modified to a pipe spillway at the request of

Mr. Coats. No repairs have yet been made to the dam due primarily to slow response from the Legends Group and the lack of any agreement between the two parties as to continuing responsibility by Legends for the dam. Legends has presented an agreement to Mr. Coats that requires them to repair the dam but then releases them from any future liability for the pond. The situation has been complicated by the recent death of Mr. Coats in early October. The plan is currently under revision by WEG to address my review comments as well as some made by the state.

Concerning the water quality issues, there are two small BMP facilities that intercept runoff from the golf course before it is released into the stream channel to the Coats pond. The golf course also utilizes an integrated pest management program, which establishes the policy regarding the timing and rate of application of fertilizers and other chemicals. The intent is to maximize the chemicals uptake by the plants and minimize their runoff into watercourses. It is difficult to access the impact of the golf course on the pond's water quality as a large part of the golf course property was previously in agriculture and there is still a large amount of agricultural land that drains into the pond. Agricultural activities are a large contributor to water quality problems generally assumed to be at least on a par with golf courses. Also, there have been no serious water quality problems in the pond such as a fish kill. Algae was growing on the pond this summer but that is not an unusual occurrence for this area. The chemical content of the water is unknown and even if it was known, no baseline information is available to compare the current water quality with the pre-construction levels.

The current situation is that the dam design needs to be finalized and presented to the Coats family. Then an agreement needs to be worked out between the two parties to allow access onto the property by Legends and some deal struck regarding future liability. Stonehouse will soon be building at least one BMP immediately above the pond to further control both the stormwater quantity and quality resulting from their development around the golf course. I have encouraged Stonehouse to strongly consider purchase of the pond as they will be required to protect it to a higher degree than would normally be required and the costs involved with the construction of several BMPs could approach acquisition costs of the pond. They are considering the purchase but only if it makes economic sense to them. Jim Franklin of Stonehouse is going to contact Mr. Rob Parker, Mr. Coats son-in-law, to try to open some dialog since the passing of Mr. Coats.

WILLIAMSBURG
ENVIRONMENTAL
GROUP, INC.

Environmental Consultants

MEMORANDUM

TO: Darryl Cook

FROM: Erik Allen

DATE: November 9, 1997

RE: The Legends at Stonehouse
Offsite Dam Improvements

NOV 1997
RECEIVED
PLANNING DEPARTMENT

Enclosed is a revised plan and Hydrologic/Hydraulic Calculations for the offsite dam improvements for the Legends at Stonehouse. Also inclosed is a copy of the Integrated Pest Management Plan. The plans have been revised to accommodate your previous comments. The rating curve for the 24 inch barrel has been revised to correctly indicate its capacity. Furthermore, the time of concentration and curve number has been revised based on our agreement in October. Also, the emergency spillway have been moved to the north side of the dam due to the recent erosion on the southern end of the dam. Additionally, the crest elevation of the riser has been modified to elevation 39 feet msl based on recent observations of the dam and in the effort to make the project feasible.

The plans have also been modified to incorporate comments generated by the Department of Conservation and Recreation. The following are responses to comments dated October 20, 1997.

1. If construction requires dewatering of the lake, a mechanical pump should be used. WEG recommends using the 45 square yard rip rap apron to dissipate energy at the discharge point. No coffer dam use is anticipated.

2. The plan has been revised to indicate keying the fill into the dam.

3. The hydrologic/hydraulic calculations have now been stamped.

If you have any questions, please feel free to call.

516-B South Henry Street Williamsburg, Virginia 23185 (757) 220-6869 FAX (757) 229-4507

WILLIAMSBURG
ENVIRONMENTAL
GROUP, INC.

Environmental Consultants

September 26, 1997

SEP 1997
RECEIVED
PLANNING DEPARTMENT

Darryl Cook
Environmental Division
James City County Department of Development Management
Williamsburg, Virginia 23187-8784

RE: The Legends at Stonehouse
Offsite Lake Improvements

Dear Mr. Cook:

Enclosed are two sets of revised plans for the proposed offsite dam improvements for The Legends at Stonehouse. The plans have been modified to address County review comments. The following are itemized responses to your correspondence dated September 16, 1997.

1. Enclosed are detailed calculations for the Runoff Curve Number and time of concentration. An error was made during our previous discussion when it was indicated that the spillway was designed based on existing conditions. In fact, WEG has designed the structure based on post-development curve numbers which are enclosed. The curve numbers are relatively low because a significant portion of the watershed consists of hydrologic soil group B soils. Because the purpose this exercise is to repair a dam that is currently inappropriately designed. we feel that this hydrologic design exceeds the standards that should be required. Time of concentration calculations are also provided. The most remote portion of the watershed occurs on the golf course where sheet flow occurs through a wooded area and then a turf grass area.

2. An 18 inch linline drain has been incorporated into the plans to allow access to the bend.

3. The hydrologic routings have been modified to indicate a 10 foot wide emergency spillway instead of a 20 foot wide spillway. The result is a slight increase in 100-year storm elevation.

4. A note has been added to the plans to indicate that the eroded area adjacent to the pipe and emergency spillway shall be filled and compacted.

5. Anti-seep collars have been incorporated into the design.

If you have any questions pertaining to the revised plans, please feel free to call.

Sincerely

Erik Allen

Erik Allen, P.E.
Staff Engineer

Requested Erik Allen to forward copy of dam to Rob Parker - check w/ Tom Raesch

516-B South Henry Street Williamsburg, Virginia 23185 (757) 220-6869 FAX (757) 229-4507

Virginia Legends Golf Management, LLC

Memo

To: Darryl Cook

From: Tom Rasch

CC:

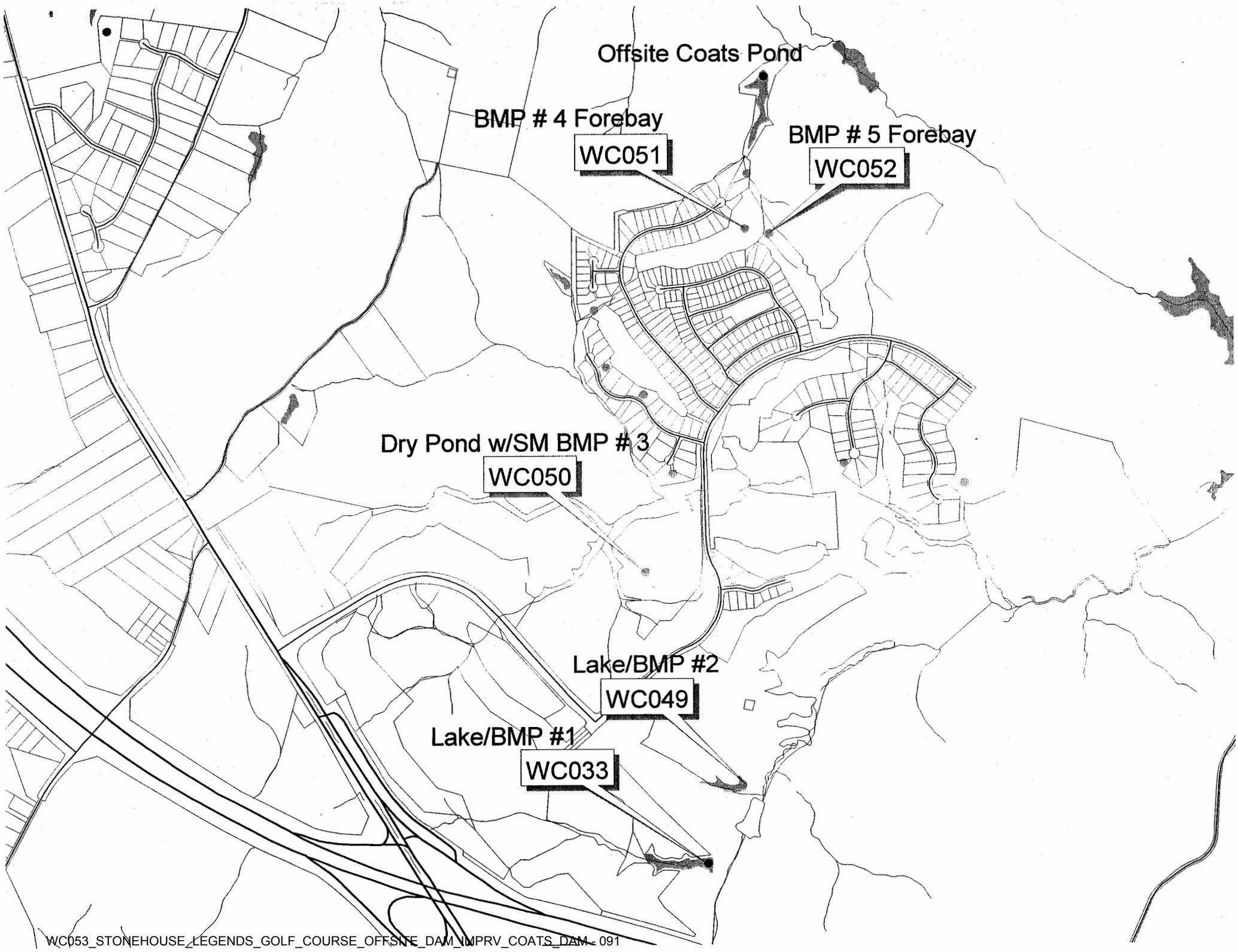
Date: February 17, 1997

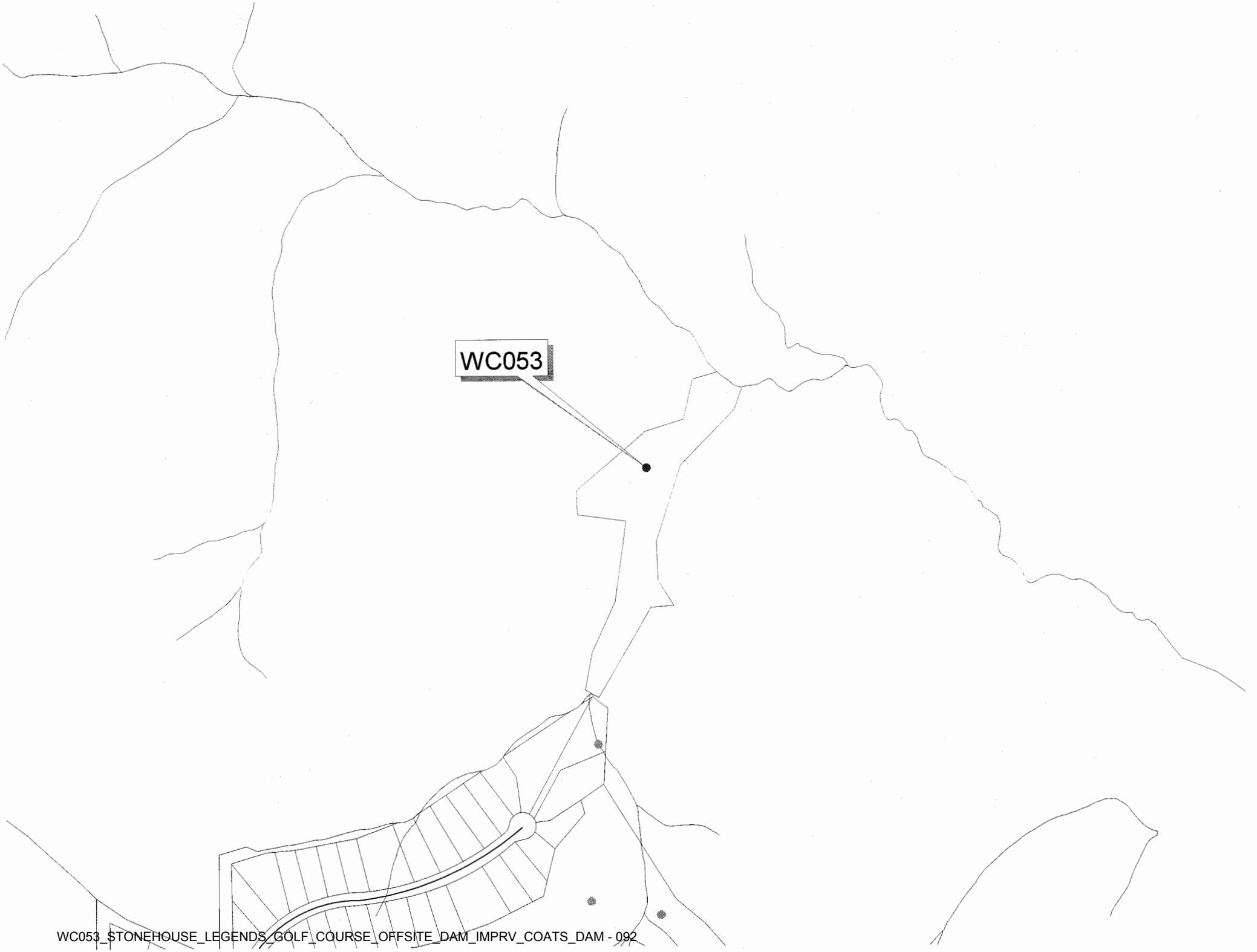
Re: Coates Pond

We are currently working with Williamsburg Environmental Group and Langley McDonald concerning correcting the problems at Mr. Coates pond. Since Stonehouse Management's BMP's will affect the flows into this pond we are very concerned with the long term effects of our work. Therefore we currently drafting an agreement that, upon completion of the work, Virginia Legends Golf Management, LLC will not be responsible for any damage to the pond or structure once the work is complete. Once a suitable plan is developed and the agreement is signed by all parties involved, we will begin the work. If you have any questions please call me at 757-566-1294. Thank you.

Thomas H. Rasch

Virginia Legends Golf Management, LLC


Offsite Coats Pond
BMP # 4 Forebay
WC051
BMP # 5 Forebay
WC052
Dry Pond w/SM BMP # 3
WC050
Lake/BMP #2
WC049
Lake/BMP #1
WC033



WC053_STONEHOUSE_LEGENDS_GOLF_COURSE_OFFSITE_DAM_IMPRV_COATS_DAM - 092

Langley - McDonald

John Hutcherson -

LEGENDS AT STONEHOUSE

COAT'S DAM

HYDRAULICS/HYDROLOGY

COMPUTATIONS

APRIL 6, 1998

WC053

OK - DEC 4/9/98

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

Environmental Consultants

Culvert Calculator Report
36" BARREL

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	3.82	
Computed Headwater Elevation	45.45	ft	Discharge	109.00	cfs
Inlet Control HW Elev	45.45	ft	Tailwater Elevation	33.40	ft
Outlet Control HW Elev	44.86	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	34.00	ft	Downstream Invert	31.00	ft
Length	200.00	ft	Constructed Slope	0.015000	ft/ft

Hydraulic Profile					
Profile	CompositeM2Pressure		Depth, Downstream	2.92	ft
Slope Type	Mild		Normal Depth	N/A	ft
Flow Regime	Subcritical		Critical Depth	2.92	ft
Velocity Downstream	15.52	ft/s	Critical Slope	0.023692	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	44.86	ft	Upstream Velocity Head	3.70	ft
Ke	0.50		Entrance Loss	1.85	ft

Inlet Control Properties					
Inlet Control HW Elev	45.45	ft	Flow Control	Submerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	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				

Culvert Calculator Report
36" BARREL

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	3.82
Computed Headwater Elevation	45.46	ft	Discharge	109.00 cfs
Inlet Control HW Elev	45.46	ft	Tailwater Elevation	35.40 ft
Outlet Control HW Elev	44.19	ft	Control Type	Inlet Control

Grades				
Upstream Invert	34.00	ft	Downstream Invert	33.00 ft
Length	100.00	ft	Constructed Slope	0.010000 ft/ft

Hydraulic Profile				
Profile	CompositeM2Pressure		Depth, Downstream	2.92 ft
Slope Type	Mild		Normal Depth	N/A ft
Flow Regime	Subcritical		Critical Depth	2.92 ft
Velocity Downstream	15.52	ft/s	Critical Slope	0.023692 ft/ft

Section				
Section Shape	Circular		Mannings Coefficient	0.013
Section Material	Concrete		Span	3.00 ft
Section Size	36 inch		Rise	3.00 ft
Number Sections	1			

Outlet Control Properties				
Outlet Control HW Elev	44.19	ft	Upstream Velocity Head	3.70 ft
Ke	0.50		Entrance Loss	1.85 ft

Inlet Control Properties				
Inlet Control HW Elev	45.46	ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall		Area Full	7.1 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			

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

RECEIVED APR 1998 ENVIRONMENTAL DIVISION

TRANSMITTAL LETTER

Environmental Consultants

TO
DARYL COOK

DATE
APRIL 6, 1998

RE
STONEHOUSE OFFSITE DAM

WE ARE SENDING ☒ ATTACHED ☐ UNDER SEPARATE COVER VIA _____

☒ Plans ☐ Contracts ☐ Letters
☐ Prints ☒ Literature ☐ Other:
☐ Copies ☐ Samples

COPIES	DATED	DESCRIPTION
2		COAT'S DAM

THESE ARE BEING SENT:

☐ As per your request ☐ For your comments ☐ For your signature
☒ For your review ☐ For your use/files ☐ For your _____

NOTES

COPY TO

SIGNATURE
Timothy J. Stan

TITLE
STAFF ENGINEER

DATE
4-6-98

516-B South Henry Street Williamsburg, Virginia 23185 (757) 220-6869 FAX (757) 229-4507

COAT'S DAM
4/6/98

Hydrology

Post-Development

Stonehouse

DA	=	41.2 acres
CN	=	84
T_c	=	0.29 hrs

Remaining Watershed

DA	=	76.8 acres
CN	=	71
T_c	=	0.93 hrs

Structure

Orifices:

2 – 12" diameter holes
Elev. = 39.0 ft (msl.) ✓

Riser Structure:

60" RCP Riser
Crest Elev. = 41.5 ft (msl.) ✓

Outlet Barrel:

150 LF of 36" RCP ✓
Inv. Up = 34 ft (msl.)
Inv. Down = 30 ft (msl.)

Emergency Spillway:

20 ft wide Vertical Rectangular Weir
Crest Elev. = 44.0 ft (msl.) ✓

Routings

	2-yr	10-yr	100-yr
Q_{target} (cfs)	36 ✓	47 ✓	210 ✓
Q_{in} (cfs)	96 ✓	202 ✓	332 ✓
Q_{out} (cfs)	31 ✓	98 ✓	226 ✓
Elev (ft msl)	42.01	43.61	45.46

* Hydrology & spillway design provided by Langley & McDonald.

Coat's Dam
Hydrology

Quick TR-55 Ver.5.46 S/N:
Executed: 12:16:41 02-11-1998 C:\96038\COATSP~1\IVE-F.TCT

STONEHOUSE
COATS POND ANALYSIS
SECTION IVE - FUTURE DEVELOPMENT
Tc TO COATS POND

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID			
Surface description			
Manning's roughness coeff., n		0.1500	
Flow length, L (total < or = 300)	ft	200.0	
Two-yr 24-hr rainfall, P2	in	3.400	
Land slope, s	ft/ft	0.0300	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.23	= 0.23

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	3.14	
Wetted perimeter, Pw	ft	6.28	6.28	
Hydraulic radius, r = a/Pw	ft	0.500	0.500	
Channel slope, s	ft/ft	0.0400	0.0100	
Manning's roughness coeff., n		0.0130	0.0130	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	%14.4406	7.2203	
Flow length, L	ft	2000	500	
T = L / (3600*V)	hrs	0.04 +	0.02	= 0.06

::

TOTAL TIME (hrs) 0.29

Quick TR-55 Ver.5.46 S/N:
Executed: 12:16:41 02-11-1998 C:\96038\COATSP~1\IVE-F.TCT

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

STONEHOUSE
COATS POND ANALYSIS
SECTION IVE - FUTURE DEVELOPMENT
Tc TO COATS POND

Subarea descr.	Tc or Tt	Time (hrs)
	Tc	0.29

Return Frequency: 2 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS2.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
STONEHOUSE	41.20	84.0	0.30	0.00	3.60	2.02	I.11	.11
REMAINING	76.80	71.0	1.00	0.00	3.60	1.13	I.23	.23

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

Total area = 118.00 acres or 0.1844 sq.mi
Peak discharge = 96 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
STONEHOUSE	0.29	0.00	0.30	0.00	Yes	--
REMAINING	0.93	0.00	1.00	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: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS2.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
STONEHOUSE	87	12.2
REMAINING	41	12.8
Composite Watershed	96	12.3

Return Frequency: 2 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS2.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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
STONEHOUSE	2	3	5	15	29	57	87	87	60
REMAINING	1	1	1	1	2	3	5	9	15
Total (cfs)	3	4	6	16	31	60	92	96	75

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
STONEHOUSE	37	26	19	15	11	9	8	7	6
REMAINING	23	31	37	41	41	31	24	19	15
Total (cfs)	60	57	56	56	52	40	32	26	21

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
STONEHOUSE	6	5	4	4	4	3	3	3	3
REMAINING	13	10	8	7	6	5	5	4	4
Total (cfs)	19	15	12	11	10	8	8	7	7

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
STONEHOUSE	2	2	2	2	0
REMAINING	4	3	3	2	0

Total (cfs)	6	5	5	4	0

Return Frequency: 10 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS10.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
STONEHOUSE	41.20	84.0	0.30	0.00	5.70	3.92	I.07	.10
REMAINING	76.80	71.0	1.00	0.00	5.70	2.66	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 = 118.00 acres or 0.1844 sq.mi
Peak discharge = 202 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
STONEHOUSE	0.29	0.00	0.30	0.00	No	Computed Ia/p < .1
REMAINING	0.93	0.00	1.00	0.00	Yes	--

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

Return Frequency: 10 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS10.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
STONEHOUSE	171	12.2
REMAINING	108	12.8
Composite Watershed	202	12.3

Return Frequency: 10 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS10.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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
STONEHOUSE	5	7	10	30	59	113	171	171	116
REMAINING	3	4	5	7	9	12	19	31	48
Total (cfs)	8	11	15	37	68	125	190	202	164

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
STONEHOUSE	71	49	37	29	20	17	14	13	12
REMAINING	68	86	100	108	99	76	56	43	34
Total (cfs)	139	135	137	137	119	93	70	56	46

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
STONEHOUSE	11	9	8	8	7	6	6	5	5
REMAINING	27	21	17	14	11	10	9	8	7
Total (cfs)	38	30	25	22	18	16	15	13	12

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
STONEHOUSE	5	4	3	3	0
REMAINING	7	6	5	4	0

Total (cfs)	12	10	8	7	0

Return Frequency: 100 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS100.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
STONEHOUSE	41.20	84.0	0.30	0.00	8.10	6.19	I.05	.10
REMAINING	76.80	71.0	1.00	0.00	8.10	4.67	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 = 118.00 acres or 0.1844 sq.mi
Peak discharge = 332 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
STONEHOUSE	0.29	0.00	0.30	0.00	No	Computed Ia/p < .1
REMAINING	0.93	0.00	1.00	0.00	No	Computed Ia/p < .1

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

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS100.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
STONEHOUSE	269	12.2
REMAINING	200	12.8
Composite Watershed	332	12.3

Return Frequency: 100 years

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

Executed: 02-11-1998 12:19:48
Watershed file: --> C:\96038\COATSP~1\COATS .MOP
Hydrograph file: --> C:\96038\COATSP~1\COATS100.HYD

COATS POND ANALYSIS
ACCOUNT FOR STONEHOUSE DEVELOPMENT
USE WEG PRECIP. DATA

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
STONEHOUSE	8	11	16	47	94	178	269	269	183
REMAINING	6	8	11	16	20	26	40	63	94
Total (cfs)	14	19	27	63	114	204	309	332	277

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
STONEHOUSE	113	78	58	45	32	26	23	20	18
REMAINING	129	162	184	200	175	134	98	75	58
Total (cfs)	242	240	242	245	207	160	121	95	76

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
STONEHOUSE	17	15	13	12	11	10	9	8	8
REMAINING	47	35	28	22	18	16	15	13	12
Total (cfs)	64	50	41	34	29	26	24	21	20

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
STONEHOUSE	7	6	5	5	0
REMAINING	11	10	8	7	0

Total (cfs)	18	16	13	12	0

Coat's Dam
Structure Data

POND-2 Version: 5.20
S/N:

COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
ADD VALUE FOR ELEV 50

CALCULATED 02-11-1998 11:58:29
DISK FILE: C:\96038\COATSP~1\COATS .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)
35.00	82,764.00	1.90	0.00	0.00	0.00
40.00	82,764.00	1.90	5.70	9.50	9.50
46.00	82,764.00	1.90	5.70	11.40	20.90
50.00	82,764.00	1.90	5.70	7.60	28.50

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

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: COATSLM .STR

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

```
*******************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*******************************
```

Outlet Structure File: C:\96038\COATSP~1\COATSLM .STR
Planimeter Input File: C:\96038\COATSP~1\COATS .VOL
Rating Table Output File: C:\96038\COATSP~1\COATSLM .PND

Min. Elev.(ft) = 39 Max. Elev.(ft) = 50 Incr.(ft) = .3

Additional elevations (ft) to be included in table:
* *
40 41

```
*********************************************
                SYSTEM CONNECTIVITY
*********************************************
```

Structure	No.		Q Table		Q Table
TABLE	7			->	7
ORIFICE-VC	8	+	7	->	9
TABLE	6			->	6
ORIFICE-VC	5	+	6	->	10
NULL STRUC	9	+	10	->	11
STAND PIPE	1	+	11	->	12
CULVERT-CR	2	?	12	->	3
WEIR-VR	4			->	4

Outflow rating table summary was stored in file:
C:\96038\COATSP~1\COATSLM .PND

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	6 +9
39.30	1.6	6 +9
39.60	3.3	6 +9
39.90	4.9	6 +9
40.00	5.3	5 +9
40.20	6.3	5 +9
40.50	7.6	5 +9
40.80	8.6	5 +9
41.00	9.3	5 +9
41.10	9.6	5 +9
41.40	10.4	5 +9
41.70	15.9	5 +9 +1
42.00	30.3	5 +9 +1
42.30	49.7	5 +9 +1
42.60	73.1	5 +9 +1
42.90	93.3	2
43.20	95.2	2
43.50	97.2	2
43.80	99.1	2
44.10	103.1	2 +4
44.40	119.6	2 +4
44.70	143.4	2 +4
45.00	172.4	2 +4
45.30	205.6	2 +4
45.60	242.5	2 +4
45.90	282.7	2 +4
46.20	325.8	2 +4
46.50	371.6	2 +4
46.80	419.8	2 +4
47.10	470.4	2 +4
47.40	523.1	2 +4
47.70	577.8	2 +4
48.00	634.3	2 +4
48.30	692.7	2 +4
48.60	752.7	2 +4
48.90	814.3	2 +4
49.20	877.5	2 +4
49.50	942.1	2 +4
49.80	1008.0	2 +4
50.00	1052.7	2 +4

Outlet Structure File: COATSLM .STR

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

```
*****************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*****************************


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

 TABLE
 Input your own rating table.
 E1 (ft) =39        E2 (ft) =39.99

 Constant (ft) added to each elevation was:

     Elev. (ft)    Q (cfs)
     ----------    -------
        39           0
        39.99        2.7
```

Outlet Structure File: COATSLM .STR

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

```
*****************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*****************************


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

 ORIFICE-VC
 Orifice - Vertical Circular


 E1 elev.(ft)?           40.0
 E2 elev.(ft)?            50.001
 Orifice coeff.?         0.6
 Invert elev.(ft)?       39.0
 Datum  elev.(ft)?       39.5
 Diameter (ft)?          1.0
```

Outlet Structure File: COATSLM .STR

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

```
*****************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*****************************


>>>>>> Structure No. 6 <<<<<<
         (Input Data)

 TABLE
 Input your own rating table.
 E1 (ft) =39        E2 (ft) =39.99

 Constant (ft) added to each elevation was:

     Elev. (ft)    Q (cfs)
     ----------    -------
        39           0
        39.99        2.7
```

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	40.0
E2 elev.(ft)?	50.001
Orifice coeff.?	0.6
Invert elev.(ft)?	39.0
Datum elev.(ft)?	39.5
Diameter (ft)?	1.0

Outlet Structure File: COATSLM .STR

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

```
******************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

******************************


>>>>>> NULL Structure <<<<<<
        (Input Data)

 NULL STRUC
 Null Structure -- Add/check between tables

         9 + 10 -> 11
```

Outlet Structure File: COATSLM .STR

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

```
*****************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*****************************


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

 STAND PIPE
 Stand Pipe with weir or orifice flow


 E1 elev.(ft)?            41.5
 E2 elev.(ft)?             50.001
 Crest elev.(ft)?         41.5
 Diameter (ft)?           5.0
 Weir coefficient?        3.3
 Orifice coefficient?     0.6
 Start transition elev.(ft) @ ?
 Transition height (ft)?
```

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

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

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	41.5
E2 elev.(ft)?	50.001
Diam. (ft)?	3.0
Inv. el.(ft)?	34.0
Slope (ft/ft)?	.02
T1 ratio?	
T2 ratio?	
K Coeff.?	.0098
M Coeff.?	2.0
c Coeff.?	.0398
Y Coeff.?	0.67
Form 1 or 2?	1
Slope factor?	-0.5

Outlet Structure File: COATSLM .STR

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

```
*****************************
     COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
       MODIFY STR FILE

*****************************


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

 WEIR-VR
 Weir - Vertical Rectangular


 E1 elev.(ft)?            44
 E2 elev.(ft)?             50.001
 Weir coefficient?        3.33
 Weir elev.(ft)?          44
 Length (ft)?             20
 Contracted/Suppressed (C/S)?  C
```

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	
39.30	0.8	Interpolated from input table
39.60	1.6	Interpolated from input table
39.90	2.5	Interpolated from input table
40.00	0.0	E = or > E2=39.99
40.20	0.0	E = or > E2=39.99
40.50	0.0	E = or > E2=39.99
40.80	0.0	E = or > E2=39.99
41.00	0.0	E = or > E2=39.99
41.10	0.0	E = or > E2=39.99
41.40	0.0	E = or > E2=39.99
41.70	0.0	E = or > E2=39.99
42.00	0.0	E = or > E2=39.99
42.30	0.0	E = or > E2=39.99
42.60	0.0	E = or > E2=39.99
42.90	0.0	E = or > E2=39.99
43.20	0.0	E = or > E2=39.99
43.50	0.0	E = or > E2=39.99
43.80	0.0	E = or > E2=39.99
44.10	0.0	E = or > E2=39.99
44.40	0.0	E = or > E2=39.99
44.70	0.0	E = or > E2=39.99
45.00	0.0	E = or > E2=39.99
45.30	0.0	E = or > E2=39.99
45.60	0.0	E = or > E2=39.99
45.90	0.0	E = or > E2=39.99
46.20	0.0	E = or > E2=39.99
46.50	0.0	E = or > E2=39.99
46.80	0.0	E = or > E2=39.99
47.10	0.0	E = or > E2=39.99
47.40	0.0	E = or > E2=39.99
47.70	0.0	E = or > E2=39.99
48.00	0.0	E = or > E2=39.99
48.30	0.0	E = or > E2=39.99
48.60	0.0	E = or > E2=39.99
48.90	0.0	E = or > E2=39.99
49.20	0.0	E = or > E2=39.99

Outlet Structure File: COATSLM .STR

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

>>>>> CONTINUED from previous page <<<<<

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

Elevation (ft)	Q (cfs)	Computation Messages
49.50	0.0	E = or > E2=39.99
49.80	0.0	E = or > E2=39.99
50.00	0.0	E = or > E2=39.99

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < E1=40.0
39.30	0.0	E < E1=40.0
39.60	0.0	E < E1=40.0
39.90	0.0	E < E1=40.0
40.00	2.7	H =.5
40.20	3.2	H =.7
40.50	3.8	H =1.0
40.80	4.3	H =1.3
41.00	4.6	H =1.5
41.10	4.8	H =1.6
41.40	5.2	H =1.9
41.70	5.6	H =2.2
42.00	6.0	H =2.5
42.30	6.3	H =2.8
42.60	6.7	H =3.1
42.90	7.0	H =3.4
43.20	7.3	H =3.7
43.50	7.6	H =4.0
43.80	7.8	H =4.3
44.10	8.1	H =4.6
44.40	8.4	H =4.9
44.70	8.6	H =5.2
45.00	8.9	H =5.5
45.30	9.1	H =5.8
45.60	9.3	H =6.1
45.90	9.6	H =6.4
46.20	9.8	H =6.7
46.50	10.0	H =7.0
46.80	10.2	H =7.3
47.10	10.4	H =7.6
47.40	10.6	H =7.900
47.70	10.8	H =8.200
48.00	11.0	H =8.5
48.30	11.2	H =8.8

Outlet Structure File: COATSLM .STR

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

>>>>> CONTINUED from previous page <<<<<

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

Elevation (ft)	Q (cfs)	Computation Messages
48.60	11.4	H =9.1
48.90	11.6	H =9.400
49.20	11.8	H =9.700
49.50	12.0	H =10.0
49.80	12.1	H =10.3
50.00	12.3	H =10.5

C = .6 A = .7853982 sq.ft.
H (ft) = Table elev. - Datum elev. (39.5 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table for Structure #6
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	
39.30	0.8	Interpolated from input table
39.60	1.6	Interpolated from input table
39.90	2.5	Interpolated from input table
40.00	0.0	E = or > E2=39.99
40.20	0.0	E = or > E2=39.99
40.50	0.0	E = or > E2=39.99
40.80	0.0	E = or > E2=39.99
41.00	0.0	E = or > E2=39.99
41.10	0.0	E = or > E2=39.99
41.40	0.0	E = or > E2=39.99
41.70	0.0	E = or > E2=39.99
42.00	0.0	E = or > E2=39.99
42.30	0.0	E = or > E2=39.99
42.60	0.0	E = or > E2=39.99
42.90	0.0	E = or > E2=39.99
43.20	0.0	E = or > E2=39.99
43.50	0.0	E = or > E2=39.99
43.80	0.0	E = or > E2=39.99
44.10	0.0	E = or > E2=39.99
44.40	0.0	E = or > E2=39.99
44.70	0.0	E = or > E2=39.99
45.00	0.0	E = or > E2=39.99
45.30	0.0	E = or > E2=39.99
45.60	0.0	E = or > E2=39.99
45.90	0.0	E = or > E2=39.99
46.20	0.0	E = or > E2=39.99
46.50	0.0	E = or > E2=39.99
46.80	0.0	E = or > E2=39.99
47.10	0.0	E = or > E2=39.99
47.40	0.0	E = or > E2=39.99
47.70	0.0	E = or > E2=39.99
48.00	0.0	E = or > E2=39.99
48.30	0.0	E = or > E2=39.99
48.60	0.0	E = or > E2=39.99
48.90	0.0	E = or > E2=39.99
49.20	0.0	E = or > E2=39.99

Outlet Structure File: COATSLM .STR

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

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #6
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
49.50	0.0	E = or > E2=39.99
49.80	0.0	E = or > E2=39.99
50.00	0.0	E = or > E2=39.99

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table for Structure #5
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < E1=40.0
39.30	0.0	E < E1=40.0
39.60	0.0	E < E1=40.0
39.90	0.0	E < E1=40.0
40.00	2.7	H =.5
40.20	3.2	H =.7
40.50	3.8	H =1.0
40.80	4.3	H =1.3
41.00	4.6	H =1.5
41.10	4.8	H =1.6
41.40	5.2	H =1.9
41.70	5.6	H =2.2
42.00	6.0	H =2.5
42.30	6.3	H =2.8
42.60	6.7	H =3.1
42.90	7.0	H =3.4
43.20	7.3	H =3.7
43.50	7.6	H =4.0
43.80	7.8	H =4.3
44.10	8.1	H =4.6
44.40	8.4	H =4.9
44.70	8.6	H =5.2
45.00	8.9	H =5.5
45.30	9.1	H =5.8
45.60	9.3	H =6.1
45.90	9.6	H =6.4
46.20	9.8	H =6.7
46.50	10.0	H =7.0
46.80	10.2	H =7.3
47.10	10.4	H =7.6
47.40	10.6	H =7.900
47.70	10.8	H =8.200
48.00	11.0	H =8.5
48.30	11.2	H =8.8

Outlet Structure File: COATSLM .STR

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

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #5
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
48.60	11.4	H =9.1
48.90	11.6	H =9.400
49.20	11.8	H =9.700
49.50	12.0	H =10.0
49.80	12.1	H =10.3
50.00	12.3	H =10.5

C = .6 A = .7853982 sq.ft.
H (ft) = Table elev. - Datum elev. (39.5 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < Inv.El.= 41.5
39.30	0.0	E < El=41.5
39.60	0.0	E < El=41.5
39.90	0.0	E < El=41.5
40.00	0.0	E < El=41.5
40.20	0.0	E < El=41.5
40.50	0.0	E < El=41.5
40.80	0.0	E < El=41.5
41.00	0.0	E < El=41.5
41.10	0.0	E < El=41.5
41.40	0.0	E < El=41.5
41.70	4.6	Weir: H =.2
42.00	18.3	Weir: H =.5
42.30	37.1	Weir: H =.8
42.60	59.8	Weir: H =1.1
42.90	85.9	Weir: H =1.4
43.20	114.9	Weir: H =1.7
43.50	133.7	Orifice: H =2.0
43.80	143.4	Orifice: H =2.3
44.10	152.4	Orifice: H =2.6
44.40	161.0	Orifice: H =2.9
44.70	169.1	Orifice: H =3.2
45.00	176.9	Orifice: H =3.5
45.30	184.3	Orifice: H =3.8
45.60	191.4	Orifice: H =4.1
45.90	198.3	Orifice: H =4.4
46.20	205.0	Orifice: H =4.7
46.50	211.4	Orifice: H =5.0
46.80	217.7	Orifice: H =5.3
47.10	223.7	Orifice: H =5.6
47.40	229.6	Orifice: H =5.9
47.70	235.4	Orifice: H =6.2

Outlet Structure File: COATSLM .STR

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

>>>>> CONTINUED from previous page <<<<<

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

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

Elevation (ft)	Q (cfs)	Computation	Messages
48.00	241.0	Orifice:	H =6.5
48.30	246.5	Orifice:	H =6.8
48.60	251.9	Orifice:	H =7.1
48.90	257.2	Orifice:	H =7.400
49.20	262.3	Orifice:	H =7.7
49.50	267.4	Orifice:	H =8.0
49.80	272.4	Orifice:	H =8.3
50.00	275.6	Orifice:	H =8.5

Weir Cw = 3.3 Weir length = 15.70796 ft
Orifice Co = .6 Orifice area = 19.63496 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.= 43.32386 ft

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < E1=41.5
39.30	0.0	E < E1=41.5
39.60	0.0	E < E1=41.5
39.90	0.0	E < E1=41.5
40.00	0.0	E < E1=41.5
40.20	0.0	E < E1=41.5
40.50	0.0	E < E1=41.5
40.80	0.0	E < E1=41.5
41.00	0.0	E < E1=41.5
41.10	0.0	E < E1=41.5
41.40	0.0	E < E1=41.5
41.70	84.7	Submerged: HW =7.7
42.00	87.0	Submerged: HW =8.0
42.30	89.1	Submerged: HW =8.3
42.60	91.2	Submerged: HW =8.6
42.90	93.3	Submerged: HW =8.900
43.20	95.2	Submerged: HW =9.200
43.50	97.2	Submerged: HW =9.5
43.80	99.1	Submerged: HW =9.8
44.10	101.0	Submerged: HW =10.1
44.40	102.8	Submerged: HW =10.4
44.70	104.6	Submerged: HW =10.7
45.00	106.4	Submerged: HW =11.0
45.30	108.1	Submerged: HW =11.3
45.60	109.9	Submerged: HW =11.6
45.90	111.6	Submerged: HW =11.9
46.20	113.3	Submerged: HW =12.2
46.50	114.9	Submerged: HW =12.5
46.80	116.5	Submerged: HW =12.8
47.10	118.2	Submerged: HW =13.1
47.40	119.8	Submerged: HW =13.4

Outlet Structure File: COATSLM .STR

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

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Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

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

Elevation (ft)	Q (cfs)	Computation Messages
47.70	121.3	Submerged: HW =13.7
48.00	122.8	Submerged: HW =14.0
48.30	124.4	Submerged: HW =14.3
48.60	125.9	Submerged: HW =14.6
48.90	127.3	Submerged: HW =14.9
49.20	128.8	Submerged: HW =15.2
49.50	130.3	Submerged: HW =15.5
49.80	131.7	Submerged: HW =15.8
50.00	132.7	Submerged: HW =16.0

Used Unsubmerged Equ. Form (1) for elev. less than 37.45 ft
Used Submerged Equation for elevations greater than 37.89 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=37.45 ft; Q1=42.85 cfs; Dc=2.13 ft; E2=37.89 ft; Q2=48.97 cfs

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
39.00	0.0	E < Inv.El.= 44
39.30	0.0	E < Inv.El.= 44
39.60	0.0	E < Inv.El.= 44
39.90	0.0	E < Inv.El.= 44
40.00	0.0	E < Inv.El.= 44
40.20	0.0	E < Inv.El.= 44
40.50	0.0	E < Inv.El.= 44
40.80	0.0	E < Inv.El.= 44
41.00	0.0	E < Inv.El.= 44
41.10	0.0	E < Inv.El.= 44
41.40	0.0	E < Inv.El.= 44
41.70	0.0	E < Inv.El.= 44
42.00	0.0	E < Inv.El.= 44
42.30	0.0	E < Inv.El.= 44
42.60	0.0	E < Inv.El.= 44
42.90	0.0	E < Inv.El.= 44
43.20	0.0	E < Inv.El.= 44
43.50	0.0	E < Inv.El.= 44
43.80	0.0	E < Inv.El.= 44
44.10	2.1	H =.1
44.40	16.8	H =.4
44.70	38.7	H =.7
45.00	65.9	H =1.0
45.30	97.4	H =1.3
45.60	132.6	H =1.6
45.90	171.1	H =1.9
46.20	212.5	H =2.2
46.50	256.7	H =2.5
46.80	303.3	H =2.8
47.10	352.2	H =3.1
47.40	403.3	H =3.4
47.70	456.5	H =3.7
48.00	511.5	H =4.0
48.30	568.3	H =4.3

Outlet Structure File: COATSLM .STR

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

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Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
48.60	626.8	H =4.6
48.90	687.0	H =4.9
49.20	748.7	H =5.2
49.50	811.8	H =5.5
49.80	876.3	H =5.8
50.00	920.1	H =6.0

C = 3.33 L (ft) = 20
H (ft) = Table elev. - Invert elev. (44 ft)
Q (cfs) = C * (L-.2H) * (H**1.5) -- Contracted Weir

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table 9
Table 9 = 7 + 8

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	7
39.30	0.8	7
39.60	1.6	7
39.90	2.5	7
40.00	2.7	8
40.20	3.2	8
40.50	3.8	8
40.80	4.3	8
41.00	4.6	8
41.10	4.8	8
41.40	5.2	8
41.70	5.6	8
42.00	6.0	8
42.30	6.3	8
42.60	6.7	8
42.90	7.0	8
43.20	7.3	8
43.50	7.6	8
43.80	7.8	8
44.10	8.1	8
44.40	8.4	8
44.70	8.6	8
45.00	8.9	8
45.30	9.1	8
45.60	9.3	8
45.90	9.6	8
46.20	9.8	8
46.50	10.0	8
46.80	10.2	8
47.10	10.4	8
47.40	10.6	8
47.70	10.8	8
48.00	11.0	8
48.30	11.2	8
48.60	11.4	8
48.90	11.6	8
49.20	11.8	8
49.50	12.0	8

49.80	12.1	8
50.00	12.3	8

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table 10
Table 10 = 6 + 5

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	6
39.30	0.8	6
39.60	1.6	6
39.90	2.5	6
40.00	2.7	5
40.20	3.2	5
40.50	3.8	5
40.80	4.3	5
41.00	4.6	5
41.10	4.8	5
41.40	5.2	5
41.70	5.6	5
42.00	6.0	5
42.30	6.3	5
42.60	6.7	5
42.90	7.0	5
43.20	7.3	5
43.50	7.6	5
43.80	7.8	5
44.10	8.1	5
44.40	8.4	5
44.70	8.6	5
45.00	8.9	5
45.30	9.1	5
45.60	9.3	5
45.90	9.6	5
46.20	9.8	5
46.50	10.0	5
46.80	10.2	5
47.10	10.4	5
47.40	10.6	5
47.70	10.8	5
48.00	11.0	5
48.30	11.2	5
48.60	11.4	5
48.90	11.6	5
49.20	11.8	5
49.50	12.0	5

49.80	12.1	5
50.00	12.3	5

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table 11
Table 11 = 10 + 9

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	6 +9
39.30	1.6	6 +9
39.60	3.3	6 +9
39.90	4.9	6 +9
40.00	5.3	5 +9
40.20	6.3	5 +9
40.50	7.6	5 +9
40.80	8.6	5 +9
41.00	9.3	5 +9
41.10	9.6	5 +9
41.40	10.4	5 +9
41.70	11.2	5 +9
42.00	12.0	5 +9
42.30	12.7	5 +9
42.60	13.3	5 +9
42.90	13.9	5 +9
43.20	14.5	5 +9
43.50	15.1	5 +9
43.80	15.7	5 +9
44.10	16.2	5 +9
44.40	16.7	5 +9
44.70	17.2	5 +9
45.00	17.7	5 +9
45.30	18.2	5 +9
45.60	18.7	5 +9
45.90	19.1	5 +9
46.20	19.6	5 +9
46.50	20.0	5 +9
46.80	20.4	5 +9
47.10	20.9	5 +9
47.40	21.3	5 +9
47.70	21.7	5 +9
48.00	22.1	5 +9
48.30	22.4	5 +9
48.60	22.8	5 +9
48.90	23.2	5 +9
49.20	23.6	5 +9
49.50	23.9	5 +9

49.80	24.3	5 +9
50.00	24.5	5 +9

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table 12
Table 12 = 11 + 1

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	6 +9
39.30	1.6	6 +9
39.60	3.3	6 +9
39.90	4.9	6 +9
40.00	5.3	5 +9
40.20	6.3	5 +9
40.50	7.6	5 +9
40.80	8.6	5 +9
41.00	9.3	5 +9
41.10	9.6	5 +9
41.40	10.4	5 +9
41.70	15.9	5 +9 +1
42.00	30.3	5 +9 +1
42.30	49.7	5 +9 +1
42.60	73.1	5 +9 +1
42.90	99.8	5 +9 +1
43.20	129.4	5 +9 +1
43.50	148.8	5 +9 +1
43.80	159.1	5 +9 +1
44.10	168.7	5 +9 +1
44.40	177.7	5 +9 +1
44.70	186.4	5 +9 +1
45.00	194.6	5 +9 +1
45.30	202.5	5 +9 +1
45.60	210.1	5 +9 +1
45.90	217.4	5 +9 +1
46.20	224.5	5 +9 +1
46.50	231.4	5 +9 +1
46.80	238.1	5 +9 +1
47.10	244.6	5 +9 +1
47.40	250.9	5 +9 +1
47.70	257.1	5 +9 +1
48.00	263.1	5 +9 +1
48.30	269.0	5 +9 +1
48.60	274.7	5 +9 +1
48.90	280.4	5 +9 +1
49.20	285.9	5 +9 +1
49.50	291.3	5 +9 +1

49.80	296.6	5 +9 +1
50.00	300.1	5 +9 +1

Outlet Structure File: COATSLM .STR

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

****
COATS POND ANALYSIS
DATA FROM WEG STUDY OF 11-9-97
MODIFY STR FILE

****

Outflow Rating Table 3
Table 3 = 12 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
39.00	0.0	6 +9
39.30	1.6	6 +9
39.60	3.3	6 +9
39.90	4.9	6 +9
40.00	5.3	5 +9
40.20	6.3	5 +9
40.50	7.6	5 +9
40.80	8.6	5 +9
41.00	9.3	5 +9
41.10	9.6	5 +9
41.40	10.4	5 +9
41.70	15.9	5 +9 +1
42.00	30.3	5 +9 +1
42.30	49.7	5 +9 +1
42.60	73.1	5 +9 +1
42.90	93.3	2
43.20	95.2	2
43.50	97.2	2
43.80	99.1	2
44.10	101.0	2
44.40	102.8	2
44.70	104.6	2
45.00	106.4	2
45.30	108.1	2
45.60	109.9	2
45.90	111.6	2
46.20	113.3	2
46.50	114.9	2
46.80	116.5	2
47.10	118.2	2
47.40	119.8	2
47.70	121.3	2
48.00	122.8	2
48.30	124.4	2
48.60	125.9	2
48.90	127.3	2
49.20	128.8	2
49.50	130.3	2

49.80	131.7	2
50.00	132.7	2

Coat's Dam
Routing Hydrographs

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*****************************************
*                                       *
*          COATS POND ANALYSIS          *
* POND DATA FROM WEG STUDY OF 11-9-97   *
*  ACCOUNT FOR STONEHOUSE DEVELOPMENT   *
*            MODIFY STR FILE            *
*                                       *
*****************************************
```

Inflow Hydrograph: C:\96038\COATSP~1\COATS2 .HYD
Rating Table file: C:\96038\COATSP~1\COATSLM .PND

----INITIAL CONDITIONS----
Elevation = 39.00 ft
Outflow = 0.00 cfs
Storage = 7.60 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
39.00	0.0	7.600
39.30	1.6	8.170
39.60	3.3	8.740
39.90	4.9	9.310
40.00	5.3	9.500
40.20	6.3	9.880
40.50	7.6	10.450
40.80	8.6	11.020
41.00	9.3	11.400
41.10	9.6	11.590
41.40	10.4	12.160
41.70	15.9	12.730
42.00	30.3	13.300
42.30	49.7	13.870
42.60	73.1	14.440
42.90	93.3	15.010
43.20	95.2	15.580
43.50	97.2	16.150
43.80	99.1	16.720
44.10	103.1	17.290
44.40	119.6	17.860
44.70	143.4	18.430
45.00	172.4	19.000
45.30	205.6	19.570
45.60	242.5	20.140
45.90	282.7	20.710
46.20	325.8	21.280
46.50	371.6	21.850
46.80	419.8	22.420
47.10	470.4	22.990
47.40	523.1	23.560

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + 0 (cfs)
1839.2	1839.2
1977.1	1978.7
2115.1	2118.4
2253.0	2257.9
2299.0	2304.3
2391.0	2397.3
2528.9	2536.5
2666.8	2675.4
2758.8	2768.1
2804.8	2814.4
2942.7	2953.1
3080.7	3096.6
3218.6	3248.9
3356.5	3406.2
3494.5	3567.6
3632.4	3725.7
3770.4	3865.6
3908.3	4005.5
4046.2	4145.3
4184.2	4287.3
4322.1	4441.7
4460.1	4603.5
4598.0	4770.4
4735.9	4941.5
4873.9	5116.4
5011.8	5294.5
5149.8	5475.6
5287.7	5659.3
5425.6	5845.4
5563.6	6034.0
5701.5	6224.6

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
47.70	577.8	24.130	5839.5	6417.3
48.00	634.3	24.700	5977.4	6611.7
48.30	692.7	25.270	6115.3	6808.0
48.60	752.7	25.840	6253.3	7006.0
48.90	814.3	26.410	6391.2	7205.5
49.20	877.5	26.980	6529.2	7406.7
49.50	942.1	27.550	6667.1	7609.2
49.80	1008.0	28.120	6805.0	7813.0
50.00	1052.7	28.500	6897.0	7949.7

Time increment (t) = 6.0 min.

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

Pond File: C:\96038\COATSP~1\COATSLM .PND
Inflow Hydrograph: C:\96038\COATSP~1\COATS2 .HYD
Outflow Hydrograph: C:\96038\COATSP~1\LMOUT2 .HYD

Starting Pond W.S. Elevation = 39.00 ft

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

Peak Inflow = 96.00 cfs
Peak Outflow = 31.20 cfs
Peak Elevation = 42.01 ft

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

Initial Storage = 7.60 ac-ft
Peak Storage From Storm = 5.73 ac-ft

Total Storage in Pond = 13.33 ac-ft

Warning: Inflow hydrograph truncated on left side.

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*****************************************
*                                       *
*          COATS POND ANALYSIS          *
* POND DATA FROM WEG STUDY OF 11-9-97   *
*  ACCOUNT FOR STONEHOUSE DEVELOPMENT   *
*            MODIFY STR FILE            *
*                                       *
*****************************************
```

Inflow Hydrograph: C:\96038\COATSP~1\COATS10 .HYD
Rating Table file: C:\96038\COATSP~1\COATSLM .PND

----INITIAL CONDITIONS----
Elevation = 39.00 ft
Outflow = 0.00 cfs
Storage = 7.60 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
39.00	0.0	7.600
39.30	1.6	8.170
39.60	3.3	8.740
39.90	4.9	9.310
40.00	5.3	9.500
40.20	6.3	9.880
40.50	7.6	10.450
40.80	8.6	11.020
41.00	9.3	11.400
41.10	9.6	11.590
41.40	10.4	12.160
41.70	15.9	12.730
42.00	30.3	13.300
42.30	49.7	13.870
42.60	73.1	14.440
42.90	93.3	15.010
43.20	95.2	15.580
43.50	97.2	16.150
43.80	99.1	16.720
44.10	103.1	17.290
44.40	119.6	17.860
44.70	143.4	18.430
45.00	172.4	19.000
45.30	205.6	19.570
45.60	242.5	20.140
45.90	282.7	20.710
46.20	325.8	21.280
46.50	371.6	21.850
46.80	419.8	22.420
47.10	470.4	22.990
47.40	523.1	23.560

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + 0 (cfs)
1839.2	1839.2
1977.1	1978.7
2115.1	2118.4
2253.0	2257.9
2299.0	2304.3
2391.0	2397.3
2528.9	2536.5
2666.8	2675.4
2758.8	2768.1
2804.8	2814.4
2942.7	2953.1
3080.7	3096.6
3218.6	3248.9
3356.5	3406.2
3494.5	3567.6
3632.4	3725.7
3770.4	3865.6
3908.3	4005.5
4046.2	4145.3
4184.2	4287.3
4322.1	4441.7
4460.1	4603.5
4598.0	4770.4
4735.9	4941.5
4873.9	5116.4
5011.8	5294.5
5149.8	5475.6
5287.7	5659.3
5425.6	5845.4
5563.6	6034.0
5701.5	6224.6

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
47.70	577.8	24.130	5839.5	6417.3
48.00	634.3	24.700	5977.4	6611.7
48.30	692.7	25.270	6115.3	6808.0
48.60	752.7	25.840	6253.3	7006.0
48.90	814.3	26.410	6391.2	7205.5
49.20	877.5	26.980	6529.2	7406.7
49.50	942.1	27.550	6667.1	7609.2
49.80	1008.0	28.120	6805.0	7813.0
50.00	1052.7	28.500	6897.0	7949.7

Time increment (t) = 6.0 min.

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

Pond File: C:\96038\COATSP~1\COATSLM .PND
Inflow Hydrograph: C:\96038\COATSP~1\COATS10 .HYD
Outflow Hydrograph: C:\96038\COATSP~1\LMOUT10 .HYD

Starting Pond W.S. Elevation = 39.00 ft

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

Peak Inflow = 202.00 cfs
Peak Outflow = 97.92 cfs
Peak Elevation = 43.61 ft

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

Initial Storage = 7.60 ac-ft
Peak Storage From Storm = 8.77 ac-ft

Total Storage in Pond = 16.37 ac-ft

Warning: Inflow hydrograph truncated on left side.

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*****************************************
*                                       *
*          COATS POND ANALYSIS          *
* POND DATA FROM WEG STUDY OF 11-9-97   *
*  ACCOUNT FOR STONEHOUSE DEVELOPMENT   *
*            MODIFY STR FILE            *
*                                       *
*****************************************
```

Inflow Hydrograph: C:\96038\COATSP~1\COATS100.HYD
Rating Table file: C:\96038\COATSP~1\COATSLM .PND

----INITIAL CONDITIONS----
Elevation = 39.00 ft
Outflow = 0.00 cfs
Storage = 7.60 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
39.00	0.0	7.600
39.30	1.6	8.170
39.60	3.3	8.740
39.90	4.9	9.310
40.00	5.3	9.500
40.20	6.3	9.880
40.50	7.6	10.450
40.80	8.6	11.020
41.00	9.3	11.400
41.10	9.6	11.590
41.40	10.4	12.160
41.70	15.9	12.730
42.00	30.3	13.300
42.30	49.7	13.870
42.60	73.1	14.440
42.90	93.3	15.010
43.20	95.2	15.580
43.50	97.2	16.150
43.80	99.1	16.720
44.10	103.1	17.290
44.40	119.6	17.860
44.70	143.4	18.430
45.00	172.4	19.000
45.30	205.6	19.570
45.60	242.5	20.140
45.90	282.7	20.710
46.20	325.8	21.280
46.50	371.6	21.850
46.80	419.8	22.420
47.10	470.4	22.990
47.40	523.1	23.560

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + 0 (cfs)
1839.2	1839.2
1977.1	1978.7
2115.1	2118.4
2253.0	2257.9
2299.0	2304.3
2391.0	2397.3
2528.9	2536.5
2666.8	2675.4
2758.8	2768.1
2804.8	2814.4
2942.7	2953.1
3080.7	3096.6
3218.6	3248.9
3356.5	3406.2
3494.5	3567.6
3632.4	3725.7
3770.4	3865.6
3908.3	4005.5
4046.2	4145.3
4184.2	4287.3
4322.1	4441.7
4460.1	4603.5
4598.0	4770.4
4735.9	4941.5
4873.9	5116.4
5011.8	5294.5
5149.8	5475.6
5287.7	5659.3
5425.6	5845.4
5563.6	6034.0
5701.5	6224.6

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
47.70	577.8	24.130	5839.5	6417.3
48.00	634.3	24.700	5977.4	6611.7
48.30	692.7	25.270	6115.3	6808.0
48.60	752.7	25.840	6253.3	7006.0
48.90	814.3	26.410	6391.2	7205.5
49.20	877.5	26.980	6529.2	7406.7
49.50	942.1	27.550	6667.1	7609.2
49.80	1008.0	28.120	6805.0	7813.0
50.00	1052.7	28.500	6897.0	7949.7

Time increment (t) = 6.0 min.

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

Pond File: C:\96038\COATSP~1\COATSLM .PND
Inflow Hydrograph: C:\96038\COATSP~1\COATS100.HYD
Outflow Hydrograph: C:\96038\COATSP~1\LMOUT100.HYD

Starting Pond W.S. Elevation = 39.00 ft

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

Peak Inflow = 332.00 cfs
Peak Outflow = 225.60 cfs
Peak Elevation = 45.46 ft

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

Initial Storage = 7.60 ac-ft
Peak Storage From Storm = 12.28 ac-ft

Total Storage in Pond = 19.88 ac-ft

Warning: Inflow hydrograph truncated on left side.

REPORT OF

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS

OFFSITE DAM IMPROVEMENTS FOR STONEHOUSE TOANO (JAMES CITY COUNTY), VIRGINIA

ECS PROJECT NO. R4435

FOR

MR. JIM FRANKLIN
STONEHOUSE, L.L.C.
1000 MILL POND RUN
TOANO, VIRGINIA 23168

COATS POND

June 5, 1998

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

June 5, 1998

Mr. Jim Franklin
Stonehouse, L.L.C.
1000 Mill Pond Run
Toano, Virginia 23168

ECS Project No. R4435

REF: Offsite Dam Improvements for Stonehouse
Toano (James City County), Virginia

Dear Jim:

As requested, ECS, Ltd. has conducted a subsurface soils exploration within the center line of the existing dam which is situated on the Coates property, adjacent to the Stonehouse property. The general project area is indicated on the vicinity map included in Appendix I. The subsurface exploration was conducted by performing three (3) soil test borings to depths of 15 and 30 feet below the top of the existing dam surface.

The purpose of this subsurface exploration was to evaluate the composition of the existing dam and ascertain the nature of the underlying subsurface soils. The data collected from the soil test borings was utilized to evaluate the general stability and condition of the existing dam.

Site and Project Characteristics

It is our understanding, based on a site visit performed on March 11, 1998 and review of the site plan drawing provided by Williamsburg Environmental Group (WEG), that the existing dam is approximately 140 feet long, 20 feet wide at the crest, and 40 feet wide at the base. The elevation of the top of the dam is about 44 feet, the elevation along the toe of the dam is about 41 feet, and the water level in the pond is about elevation 39 feet. Reportedly, an existing spillway riser and discharge pipe are located near the center of the dam.

At the time of our initial site visit, the face (wet) side of the dam was vegetated with grass and weeds, and the downstream side of the dam was heavily vegetated with thick underbrush and

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small to large diameter trees. Wet and soft conditions were observed along the toe and backside of the dam. It should be noted that the existing riser pipe was not confirmed and the discharge pipe was not located during our site visit. Furthermore, a breach in the dam was observed along the right shoulder (southernmost end) of the dam. This breach generally consisted of an approximately 4 to 6 foot deep by 4 to 6 foot wide meandering cut (washout) which extended the full width of the dam.

To control an increase of water within the impoundment and rise in the pool elevation due to stormwater runoff, WEG has proposed raising the top of the dam and building up (extending) the back side of the dam. In addition, a new principal spillway riser and discharge pipe will be installed, and a new emergency spillway constructed. General maintenance and repairs to the dam will also be performed as required to strengthen the dam embankment. This will include tree removal and grubbing, clearing heavy vegetation from the front and back sides of the embankment, undercutting and backfilling weak zones along the front and back sides of the embankment, and backfilling the breach (washout area) located on the southernmost end of the dam.

Subsurface Exploration Procedures

In order to explore the subsurface soil conditions, three (3) soil test borings were performed along the approximate longitudinal centerline of the existing dam. The borings were extended to depths of 15 feet at each approximate shoulder and to a depth of 30 feet near the center of the dam. The borings were performed with a truck mounted drill rig which utilized continuous-flight, hollow-stem augers to advance the bore holes. Drilling fluid was not used in this process. In general, soil sampling was continuous from depths of 0 to 10 feet, and at 5 foot intervals thereafter. At completion of the drilling operations, the boreholes were backfilled with a lean grout.

Representative soil samples were obtained by means of the split-barrel sampling procedure in accordance with ASTM Specification D-1586. In this procedure, a 2-inch outside diameter (O.D.), split-barrel sampler is driven into the soil a distance of 24 inches by a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12 inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils and relatively consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the penetration resistance value and prevent a direct correlation between drill rigs, drilling procedures, and hammer rod sampler assemblies.

After recovery, representative portions of each sample were removed from the split-barrel sampler and sealed in glass jars. The samples were taken to our laboratory in Richmond,

Virginia for visual classification and laboratory testing. Visual classifications were performed on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS).

The approximate location of the soil test borings are indicated on the boring location diagram included in Appendix I, and the soil test boring logs are included in Appendix II. A brief description of the USCS and Reference Notes for Boring Logs are included in Appendix IV.

Laboratory Testing Program

Representative soil samples collected from the soil test borings were subjected to laboratory testing for purposes of substantiating the visual classifications and to determine the soil's pertinent engineering properties. Laboratory testing included natural moisture content and grain size analysis (percent passing the #200 sieve) testing. The results of the laboratory testing are included in Appendix III of this report.

Subsurface Conditions

The results of our soil test borings and laboratory analysis indicates that the existing dam at the areas and depths sampled, is generally comprised of Silty SAND (SM) fill material of very loose to loose density to depths of about 12 to 16 feet below top of dam surface. The transition from the fill material into the natural original soils was relatively clean along the shoulders of the dam (Borings B-1 and B-3). In this regard, it appears that proper steps were taken to remove heavy topsoil and/or thick vegetation prior to fill placement. The transition between the fill and the original ground surface in Boring B-2, which was performed near the center of the dam, was marked by the presence of a layer of brown and dark gray, Silty and Organic CLAY (CL-OH). This layer was observed between the approximate depths of about 16 feet and 20 feet.

The natural soils underlying the fill along the shoulders of the dam generally consists of erratic deposits of Silty and Clayey SAND (SM-SC and SM) of very loose to loose density. The natural soils underlying the Silty and Organic CLAY layer within the center section of the dam generally consists of a deposit of medium dense, relatively clean SAND (SP-SM), overlying Silty SAND (SM) of loose density.

Groundwater was encountered in the borings at a depth of about 7 to 9 feet below top of dam surface. This depth is just below the approximate water level in the pond, and most likely represents the phreatic water line.

Engineering Evaluation

Based on the results of our soil test borings and laboratory testing, it is our opinion that the existing dam does not appear to meet current state dam design criteria with regard to density and ability to resist water flow. In addition, the dam appears to be lacking a suitable principal spillway or emergency spillway. In general, the dam is classified as a "simple" embankment type structure comprised predominantly of loose, granular fill material (Silty Sands). These Sand fills contain between 18.1 and 36.7 percent passing the No. 200 Sieve. Evidence of high moisture within the dam itself was observed in the soil test borings and was substantiated through laboratory moisture content testing, indicating that the dam was not constructed with an impervious core or impervious upstream face.

It is noted, however, that hydraulic (water) seepage through the backside of the dam was not critical during our field exploration and cursory evaluation of the exterior surfaces of the dam. In this regard, it is our opinion that while the dam is transmitting water, it does not appear to be of significant concern at this time. Furthermore, considering the significant depth of the fill that was encountered in boring B-2 (fill to elevation 28 feet) and the current surface grades along the toe of the dam (elevation 41 feet), it appears that the project area may have been a former deep ravine that was filled in following construction of the dam, or the project area was at near current grade and the dam was constructed with an excavated key trench. Regardless of the site and/or construction history, the dam appears to be adequately anchored below existing surface grade.

Provided the proposed improvements and repairs as discussed in the **Site and Project Characteristics** section of this report are performed, it is our opinion that the dam will support a rise in water elevation within the pond resulting from an increase in stormwater runoff. However, the long term performance of the dam should be closely monitored to verify and/or to check for additional seepage or isolated failures not previously noted. In the event that additional seepage and/or an increase in flow of water through the dam is observed, or the dam is not holding the desired water elevation, then additional steps may be required to improve the condition of the dam. These recommendations would be presented in a supplemental report.

It should be noted that the additional fill may induce settlements due to the presence of potentially compressible layers within and below the existing dam. While these settlements are anticipated to be minimal and should not affect the overall dam performance, the potential affects of these settlements should be considered during construction of the spillway riser and discharge pipe. Settlements of structures bearing within the embankment fills will vary. We expect that the majority of the settlements will occur within the center of the dam, with settlements diminishing up and downstream and toward the shoulders of the dam. To minimize the affect from settlements, these rigid structures could be located on the shoulders

of the dam where relatively dry and firmer natural soils exist below the shallower embankment fill and where settlements will, therefore, be smaller.

Construction Recommendations

The following recommendations pertain to raising the height and increasing the width of the existing dam, constructing a spillway riser and discharge pipe (trenching operations), and backfilling the washout (breached area) near the southernmost end of the dam. Prior to tree removal and grubbing operations along the back side of the dam, and prior to trenching operations within the embankment, the water level in the impoundment should be lowered and maintained as required for safety considerations.

All fill should be placed and compacted to a dry density of at least 95% of that soil's Standard Proctor maximum dry density (ASTM D-698). The compaction should be accomplished by placing the fill in 8 to 10 inch loose lifts and mechanically compacting each lift to the required density prior to placement of subsequent lifts. At least a 5 ton sheepsfoot roller should be employed to attain compaction of cohesive materials. Hand operated equipment should be employed around and immediately above pipes and foundations. Soils should be compacted at moisture contents within +/- 3% of optimum moisture content for the material used. Where backfilling with soil is not possible in deeper excavations, Flowable Fill having a minimum 28 day compressive strength of 150 psi should be employed.

The surface of each compacted lift should be scarified by backdragging to a depth of 2 inches prior to placement of the next lift, this to prevent development of horizontal seepage planes. Fill should be placed in horizontal lifts against slopes no steeper than 1 vertical to 4 horizontal. Where greater slopes exist, and they do in the area of the washout, they should be benched to receive fill. Bench heights should be limited to 3 feet. All areas to receive fill should be cleared of vegetation, root matter, or other organic, unstable material prior to embankment fill placement.

The following fill types are recommended for use on this project:

Backfill (washout area and trenches):– Soil Material classified as CL which contains at least 60% by weight Clay, has a compacted permeability of 10^{-4} cm/sec or less, and is free of organics and rock larger than 4 inches in diameter. Fill should have a maximum Liquid Limit of 50 and maximum plasticity index of 30.

Embankment FilL (general cover/shell):– Soil material classified as SP, SM, SC, CL, or ML free of organics and rock greater than 4 inches in diameter.

Drainage Fill:– VDOT Open Graded Aggregate, Size No. 57 Stone.

The contractor should be required to submit fill materials to the Geotechnical Engineer for approval prior to their employment on this project. Fill operations should be observed by a qualified soil technician to determine if minimum compaction requirements are being met. In-place density tests should be performed with a minimum of 1 tests per 2,500 square feet for each lift of fill placed.

During construction, it may be necessary to employ a drainage blanket along the toe of the dam. If required, this drainage blanket should be designed to control the long term seepage along toe of the dam. In general, it is recommended that a drainage blanket be employed at embankment subgrade elevations; that is, an elevation consistent with the ground surface elevation just beyond the embankment toe. This blanket should extend into the dam from the toe a distance equal to about 20% of the embankment width at its base. The drainage blanket should extend up the shoulders of the ravine a vertical distance of at least 2 feet. Seepage into this drainage blanket should be collected in a toe drain aligned parallel to the downstream toe of the embankment with discharge through a perpendicular drain into the spillway stilling basin. The drainage blanket should consist of a 10 inch thick layer of coarse graded aggregate such as VDOT size No. 57 stone wrapped in a medium duty, nonwoven geosynthetic filter fabric. The toe drain pipe should consist of a 6 inch slotted polyethylene tubing which satisfies the requirements of ASTM F-405. It is noted that, depending on the degree of seepage and water present during construction, some adjustments to the design of the drainage blanket could possibly be made to minimize the extent of this feature.

Closing

As previously discussed in the **Engineering Evaluation** section of this report, a primary unknown exists regarding seepage paths through and below the dam. In this regard, the long term performance of the dam should be closely monitored to verify and/or to check for additional seepage or isolated failures not previously noted. In the event that additional seepage and/or an increase in flow of water through the dam is observed, or the dam is not holding the desired water elevation, then additional steps may be required to improve the condition of the dam. These recommendations would be presented in a supplemental report.

It will be necessary for the Geotechnical Engineer to inspect the backside of the dam following tree and vegetation removal, and direct undercut and replacement of loose and unsuitable embankment material. Similarly, the Engineer should be called on to coordinate the required testing associated with fill placement and compaction.

ECS, Ltd. has appreciated the opportunity to be of service to you on this project. Please contact this office should you have any questions or need further assistance.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Cameron B. Briody, EIT
Project Engineer

David E. Stinnette, P.E.
Engineering Services Manager

COMMONWEALTH OF VIRGINIA
DAVID E. STINNETTE
NO. 028419
PROFESSIONAL ENGINEER

Copies: (2) Stonehouse, L.L.C.
(1) Williamsburg Environmental Group

GEOTECT/REPORTS/R4435

Appendix

I. Vicinity Map and Boring Location Diagram

II. Soil Boring Logs

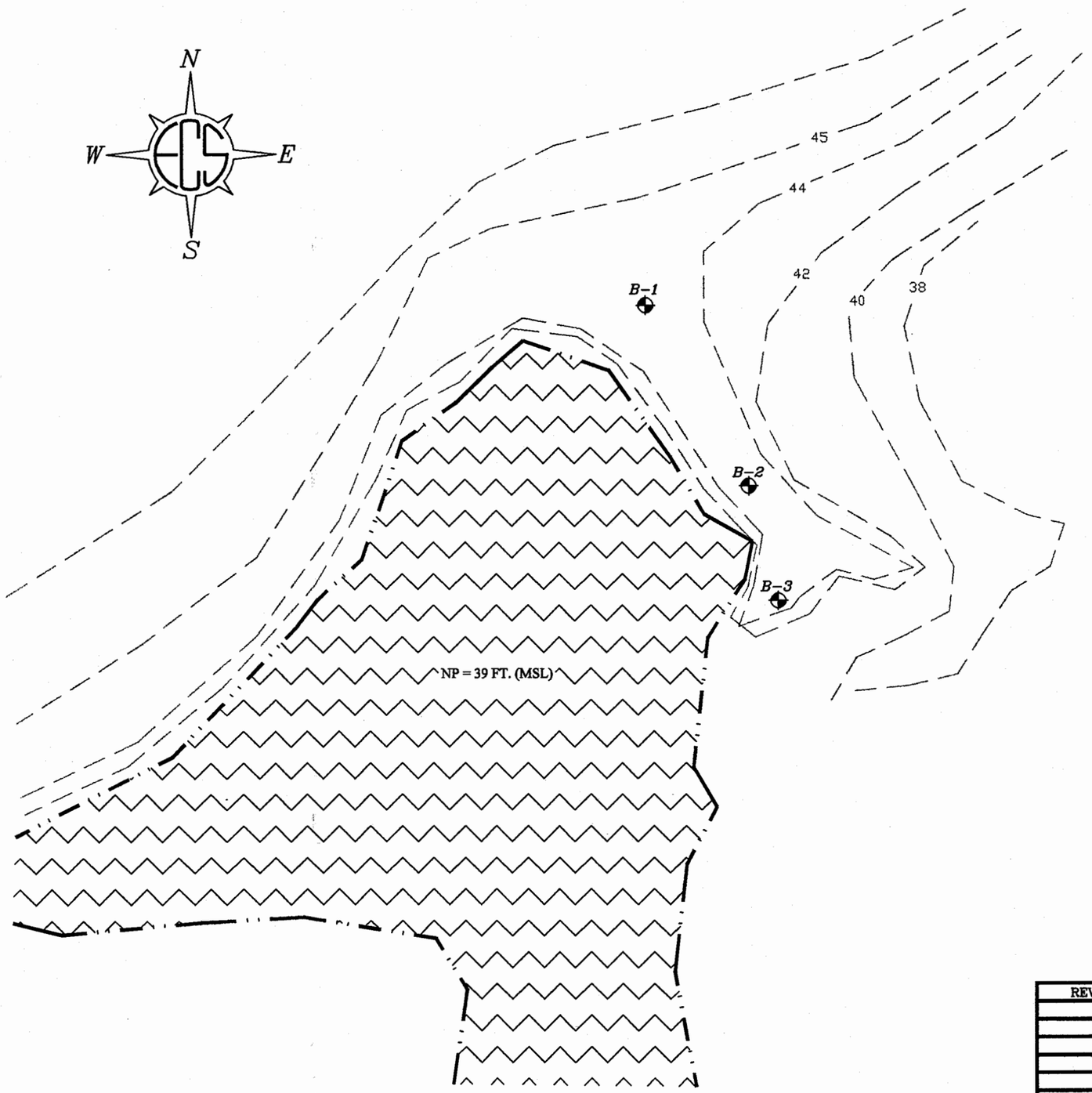
III. Summary of Laboratory Test Data

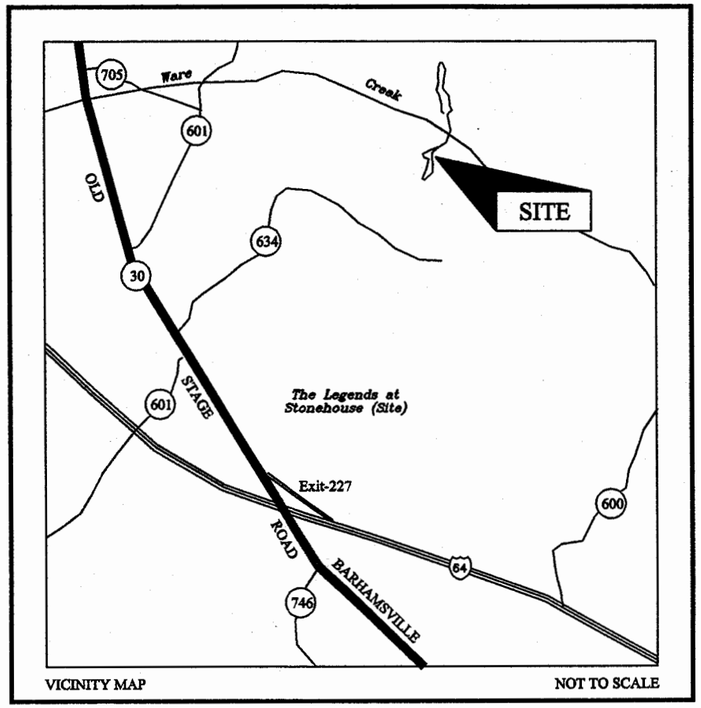
IV. Unified Soil Classification System and Reference Notes for Boring Logs

Appendix I

Vicinity Map and Boring Location Diagram

ECS LTD





SCALE (IN FEET)

20 40

40 0

REVISIONS	ECS LTD ENGINEERING CONSULTING SERVICES, LTD	BORING LOCATION DIAGRAM OFFSITE DAM IMPROVEMENTS				
		STONEHOUSE, L.L.C.				
		KLG	DES	6-5-98	1"=40'	R4435	1 OF 1

Appendix II

Soil Borings Logs

OWNER	JOB #	BORING #	SHEET
STONEHOUSE, L.L.C.	R4435	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
OFFSITE DAM IMPROVEMENTS	WILLIAMSBURG ENVIRONMENTAL GROUP

ECS LTD

SITE LOCATION
FIRE TOWER ROAD, TOANO, VIRGINIA

SURFACE ELEVATION 44.00

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine to Medium SAND, Trace Shell Fragments, Orange and Gray, Moist, Medium Dense, (SM-FILL)		11
	2	SS	24	24	Silty Fine to Medium SAND, Yellowish Orange, Moist to Wet, Very Loose to Loose, (SM) [Possible Fill]	40	4
5	3	SS	24	24			10
	4	SS	24	24			7
	5	SS	24	24		35	3
10					Silty Fine to Medium SAND, Medium Gray, Saturated, Loose, (SM)		
	6	SS	24	24		30	7
15					END OF BORING @ 15.0'		
						25	
20							
						20	
25							
						15	
30							

CALIBRATED PENETROMETER TONS/FT.^{2}: 1, 2, 3, 4, 5+

PLASTIC LIMIT % X — WATER CONTENT % — LIQUID LIMIT % Δ: 10, 20, 30, 40, 50+

STANDARD PENETRATION BLOWS/FT.: 10, 20, 30, 40, 50+

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 8.0' WS OR WD	BORING STARTED 3-23-98	TOPSOIL DEPTH: NONE
WL BCR ACR	BORING COMPLETED 3-23-98	CAVE IN DEPTH @ N/A
WL	RIG FISHBURNE FOREMAN KEITH	DRILLING METHOD HOLLOW STEM AUGER

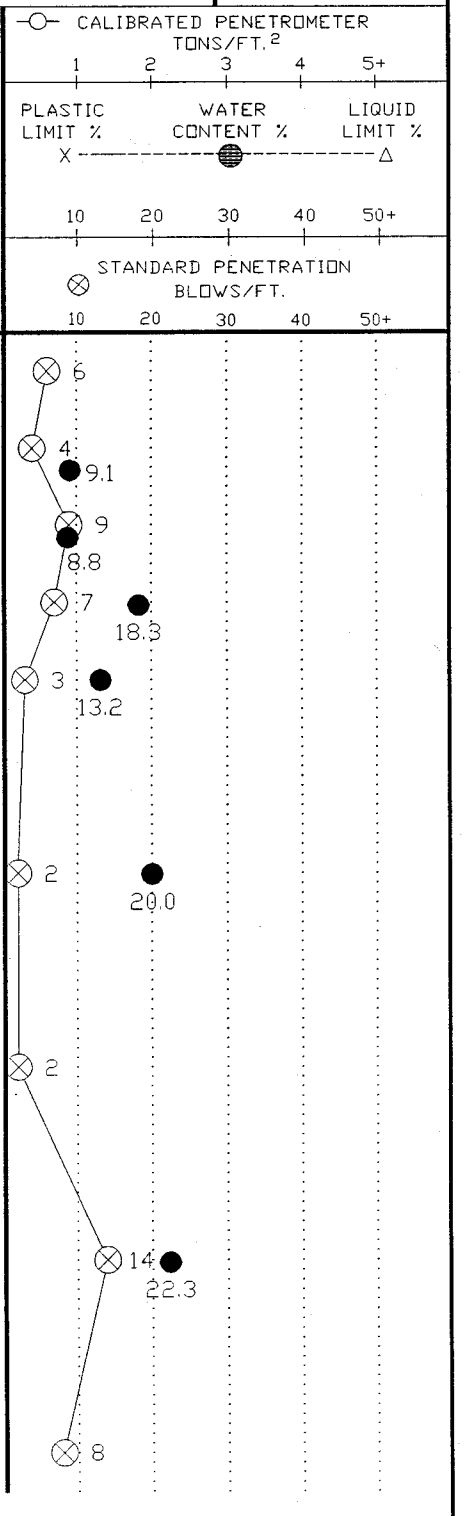
OWNER	JOB #	BORING #	SHEET
STONEHOUSE, L.L.C.	R4435	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
OFFSITE DAM IMPROVEMENTS	WILLIAMSBURG ENVIRONMENTAL GROUP

SITE LOCATION
FIRE TOWER ROAD, TOANO, VIRGINIA

SURFACE ELEVATION 44.00

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
0	1	SS	24	24	Silty Fine SAND, Light Grayish Orange and Tan, Moist, Very Loose to Loose, (SM-FILL)	
	2	SS	24	24		
5	3	SS	24	24	Silty Fine to Medium SAND, Trace Clay, Yellowish Orange and Light Gray, Moist to Wet, Loose, (SM-FILL) [Clay Lenses at 6.0' to 8.0']	40
	4	SS	24	24		
	5	SS	24	24		35
10						
	6	SS	24	24		30
15					Silty and Organic CLAY, Trace Organic Fragments, Brown and Dark Gray, Moist, Very Soft, (CL-OH) [Apparent Original Ground Surface]	
	7	SS	24	24		25
20					Fine to Medium SAND, Trace Silt, Light Grayish Tan, Wet to Saturated, Medium Dense, (SP-SM)	
	8	SS	24	24		20
25					Silty Fine to Medium SAND, Medium Gray, Wet, Loose, (SM)	
	9	SS	24	24		15
30						



END OF BORING @ 30.0'

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 9.0' WS OR WD	BORING STARTED 3-23-98	TOPSOIL DEPTH: NONE
WL BCR ACR	BORING COMPLETED 3-23-98	CAVE IN DEPTH @ N/A
WL	RIG FISHBURNE FOREMAN KEITH	DRILLING METHOD HOLLOW STEM AUGER

OWNER	JOB #	BORING #	SHEET
STONEHOUSE, L.L.C.	R4435	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
OFFSITE DAM IMPROVEMENTS	WILLIAMSBURG ENVIRONMENTAL GROUP

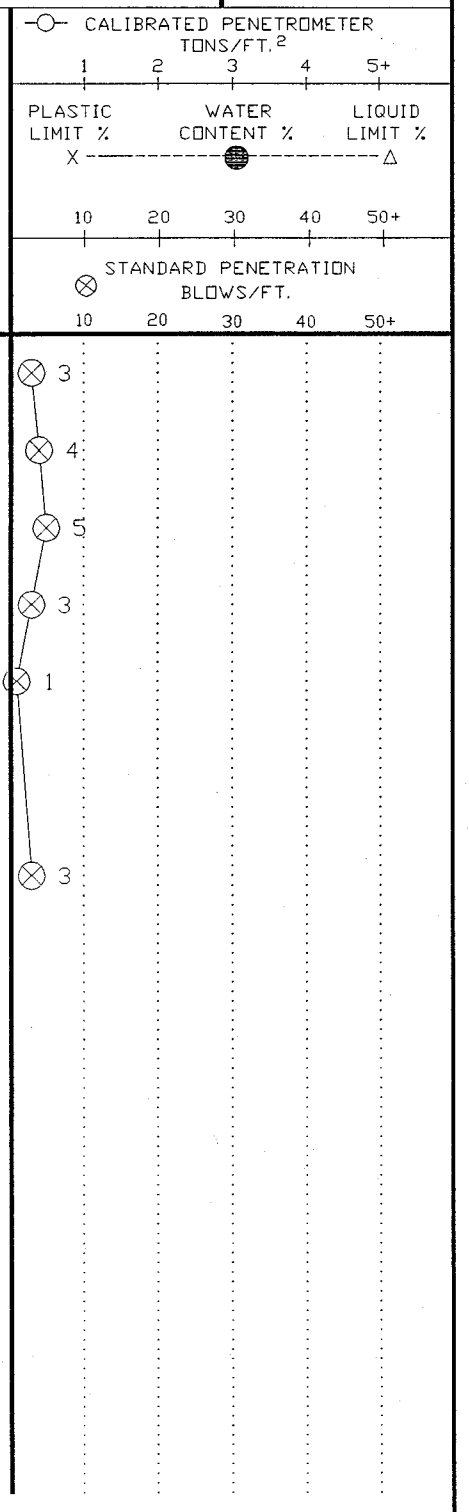
ECS LTD

SITE LOCATION
FIRE TOWER ROAD, TOANO, VIRGINIA

SURFACE ELEVATION 44.00

SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL
1	SS	24	24	Silty Fine to Medium SAND, Yellowish Orange, Moist, Very Loose, (SM-FILL)
2	SS	24	24	
3	SS	24	24	Silty Fine to Medium SAND, Orangish Light Brown, Moist, Loose, (SM-FILL)
4	SS	24	24	Silty Fine to Medium SAND, Trace Clay, Orangish Brown and Light Gray, Moist to Wet, Very Loose, (SM-FILL)
5	SS	24	24	
6	SS	24	24	Clayey Fine to Medium SAND, Orangish Brown, Moist, Very Loose, (SC)

END OF BORING @ 15.0'



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 7.0' WC OR WD	BORING STARTED 3-23-98	TOPSOIL DEPTH: 2"
WL BCR ACR	BORING COMPLETED 3-23-98	CAVE IN DEPTH @ N/A
WL	RIG FISHBURNE FOREMAN KEITH	DRILLING METHOD HOLLOW STEM AUGER

Appendix III

Summary of Laboratory Test Data

Engineering Consulting Services, Ltd.

Richmond, Virginia

Laboratory Testing Summary

Date: 6/5/98

Project Number: R4435 **Project Name:** OFFSITE DAM IMPROVEMENTS (STONEHOUSE)

Project Engineer: D.E.S. **Principal Engineer:** R.C.M. **Summary By:** Q.D.F.

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USC	AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
										Maximum Density (pcf)	Optimum Moisture (%)		
B-2	2	2.0-4.0	9.1	SM	*	*	*	*	18.1	*	*	*	FILL
B-2	3	4.0-6.0	8.8	SM	*	*	*	*	16.6	*	*	*	FILL
B-2	4	6.0-8.0	18.3	SM	*	*	*	*	31.6	*	*	*	FILL
B-2	5	8.0-10.0	13.2	SM	*	*	*	*	21.7	*	*	*	FILL
B-2	6	13.0-15.0	20.0	SM	*	*	*	*	36.7	*	*	*	FILL
B-2	8	23.0-25.0	22.3	SP-SM	*	*	*	*	9.4	*	*	*	

Summary Key:

V = Virginia Test Method
S = Standard Proctor
M = Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization

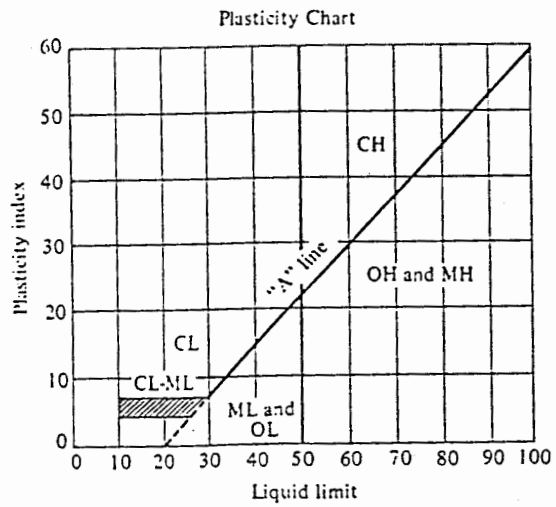
OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted

Appendix IV

Unified Soil Classification System and
Reference Notes for Boring Logs

Unified Soil Classification System (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent: GW, GP, SW, SP; More than 12 per cent: GM, GC, SM, SC; 5 to 12 per cent: *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d, u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d, u	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity			
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt	Peat and other highly organic soils			



[a]Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.
[b]Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

From Winterkorn and Fang, 1975

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS - Split Spoon Sampler
ST - Shelby Tube Sampler
RC - Rock Core; NX,BX,AX
PM - Pressuremeter
DC - Dutch Cone Penetrometer

RB - Rock Bit Drilling
BS - Bulk Sample of Cuttings
PA - Power Auger (no sample)
HSA - Hollow Stem Auger
WS - Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb hammer falling 30 inches on a 2 in. O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands, Silts

SPT-N	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 49	Dense
50 - 80	Very Dense
over 80	Extremely Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25 - 0.49	Soft
0.50 - 0.99	Firm
1.00 - 1.99	Stiff
2.00 - 3.99	Very Stiff
4.00 - 8.00	Hard
over 8.00	Very Hard

III. Unified Soil Classification Symbols:

GP - Poorly Graded Gravel
GW - Well Graded Gravel
GM - Silty Gravel
GC - Clayey Gravels
SP - Poorly Graded Sands
SW - Well Graded Sands
SM - Silty Sands
SC - Clayey Sands

ML - Low Plasticity Silts
MH - High Plasticity Silts
CL - Low Plasticity Clays
CH - High Plasticity Clays
OL - Low Plasticity Organics
OH - High Plasticity Organics
CL-ML - Dual Classification (Typical)

IV. Water Level Measurement Symbols:

WL - Water Level
WS - While Sampling
WD - While Drilling

BCR - Before Casing Removal
ACR - After Casing Removal
WCI - Wet Cave In
DCI - Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases additional methods of measurement are generally applied.

COMMONWEALTH OF VIRGINIA
HOUSE OF DELEGATES
RICHMOND

GEORGE W. GRAYSON
POST OFFICE BOX 1969
WILLIAMSBURG, VIRGINIA 23187

NINETY-SEVENTH DISTRICT

COMMITTEE ASSIGNMENTS:
PRIVILEGES AND ELECTIONS
GENERAL LAWS
TRANSPORTATION
FINANCE
CONSERVATION AND NATURAL RESOURCES

28 October 1997

Mr. Sandy Wanner
County Administrator
James City County
P.O. Box 8784
Williamsburg, VA 23187

Dear Sandy,

As promised in a recent e-mail, I am enclosing videos that show the nutrient runoff from the Stonehouse golf course, which has had a horrendous impact on Coates' Pond. This pond, of course, lies within a Cal Ripkin's baseball throw of Ware Creek.

I have walked the area with the Coates family and, while no expert in these matters, it appears that we are on the verge of seeing major pollution of Ware Creek and, shortly thereafter, Chesapeake Bay.

Thank you for considering my letters and the tapes made available to me by the late C.D. Coates.

Warm regards,

George W. Grayson

GWG:pls
encls.

--neither typed nor mailed at taxpayers' expense--

Hand delivered

OCT 1997

1 Krause Court
Hampton, VA 23664
(804) 850-1425
(804) 727-9700

April 26, 1995

Mr. H. Kirby Burch
Director, Dept. of Conservation and Recreation
203 Governor's Street
Suite 302
Richmond, VA 23219

Dear Mr. Burch:

This letter is to inform you of my family's concerns regarding our property in the Stonehouse District of James City County. We own a deeded right-of-way to this property. The property consist of (2) two ponds adjacent to Ware Creek which flows into the York River.

The Stonehouse District is being developed. The current development is a 300-acre golf course, again adjacent to our property.

A company called Legends is the construction company doing the build-out for Stonehouse, a subsidiary of Chesapeake Corp.

We have been monitoring the development with site observation, pictures, and video and found that sediment and erosion control have been close to non-existent. This, of course, has impacted our fish stocked ponds including additional water run-off which has eroded our dam.

I have met with Mr. Cook, P.E. of Department of Inspections, James City County and his on-site inspector, Mr. Lewis, and the site superintendent for construction. I have also met with Mr. Franklin of Stonehouse, Inc. Mr. Lewis acknowledged there were problems.

The persons mentioned have put my family in a no resolve situation.

I met with Mr. Dowling of Virginia State and Game and did a walk-thru with him. He indicated that there were great concerns here. It is evident that sediment and erosion control measures are certainly lacking or not in place properly. Mr. Dowling also noticed that certain trees were cut that were watershed.

Mr. Dowling contacted the Corps of Engineers, your office and a Mr. Kenny Harper of your Tapahanoc office. I contacted Mr. Harper on 4/25/95 by telephone and he expressed great concern. He suggested that I write to you.

I think that time is of the essence in this case as nothing yet has been resolved. My family would like to avoid this matter going to litigation. We need your help as soon as possible. It seems someone should be held accountable for the run-off of water. The tapes show this.

Our goal is to have this matter resolved immediately. What about long term affects on a golf course such as herbicides and insecticides. Keep in mind that these sections of the course drain into our ponds, Ware Creek, and the York River.

My family and I would appreciate your assistance as soon as possible.

Sincerely,

Robert Parker
Charles Coats
Robert Parker

cc: Mr. D. Cook
Codes Compliance
P.O. Box 8784
Williamsburg, VA 23187

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

DIVISION OF SOIL AND WATER CONSERVATION

Regional Office
P.O. Box 1425
Tappahannock, Virginia 22560
(804) 443-6752
FAX (804) 443-4534

May 18, 1995

Mr. Darryl Cook
Development Engineer
P.O. Box JC
Williamsburg, VA 23187

Dear Mr. Cook:

Thank you accompanying me on an inspection of the Legends at Stonehouse Golf Course project in James City County. Our visit was in response to a complaint from Mr. Robert Parker on behalf of the owner concerning increased runoff and sedimentation of downstream property owned by Mr. Charles Coates. The complaint was received by the Director of the Department of Conservation and Recreation. There were also members of other agencies present during our meeting who will receive a copy of this letter as well as the owner.

During our inspection, we observed that site lines for holes 12, 13 and 14 had been cleared in preparation for the construction of this part of the golf course. These areas were within the drainage area affecting the downstream property of Mr. Coates. The existing drainage swale had been hand cleared, leaving the root mat and leaf litter mulch in place. A sediment trap had been installed in conjunction with diversion dikes to trap sediment laden runoff before entering the drainage swale. We walked the entire swale down to the head of the pond to investigate erosion due to increased runoff and sediment deposits. It was determined by the agencies present that there was little or no evidence that either of these problems existed at this time. The existing stream did not contain sediment deposits consistent with the type of material prevalent on the golf course site, and there was little or no evidence of sediment stains on the vegetation downstream of the cleared area. At the head of the pond, the leaf litter which typically accumulates in the fall was still visible to a depth of one foot. This indicates that there were no significant deposits of sediment from the cleared area that escaped the site.

During our visit, I explained to Mr. Coates that there would be some discolored water from this and any site which was under construction due to the fine particles of soil which are suspended in a solution state and that even the most effective E&S measures will not remove all of these particles. Once the site is fully vegetated and the permanent water quality measures are in place, the stained water should be reduced significantly.

We also inspected the spillway of the existing pond and observed that the outfall of the dam consisted of a rock-lined channel instead of a typical pipe outfall. There was evidence that some erosion had occurred recently which had been repaired by Mr. Coates. It appeared that water had over topped the channel and created two small gullies. The area around the rock-lined channel and the top of the dam did not have a very good cover of vegetation; this is probably due to poor soil and constant shade from the trees.

I also observed that there is a considerable amount of agricultural land which also drains into the pond owned by Mr. Coates. On the way to the dam there is an existing corn field which was plowed this season and does not have a good cover of residue to protect the soil. There was also evidence of erosion next to the road in one area that this field drains to. This leads me to suspect that there may be some adverse effects regarding sedimentation from this area. Mr. David Meador of the Colonial Soil and Water Conservation District also observed this area. As you know, the Virginia Erosion and Sediment Control Law and Regulations does not regulate agricultural operations.

As a result of my site inspection and review of the approved E&S plan, I have the following comments and recommendations;

1. The sediment trap we inspected at hole number 12 will need to be enlarged when the additional areas are cleared. It also appeared that the trap will need to be cleaned out in the near future and re-stabilized. The diversion dikes in this area should be seeded and mulched with temporary vegetation to reduce the chance of failure and for compliance with Minimum Standard 5.

2. The existing drainage swale at hole number 12 should have two rock check dams installed to reduce the velocity of the runoff in the swale. These check dams will allow more of the sediments to settle out of the runoff on-site and will provide an additional protection measure in the event the sediment trap should fail or become overloaded. The soils in the swale appear to be susceptible to erosion and may show signs of erosion as more storm events occur. In any event, the velocity of runoff should be reduced with the check dams until the permanent planting scheme is completed for this area according to the approved plan.

3. The designs for the permanent basins are not yet completed. Careful review of the designs must be carried out to ensure that the required minimum standards are met regarding water quality and quantity. Once the plans are submitted, I would appreciate a copy for review at this office.

4. Mr. Coates should consider establishment of vegetation on the bare areas of his dam to hold the soil in place and prevent further erosion. Even with proper E&S and stormwater management controls in place, there is still a risk of damage to the dam where bare soil can be easily washed away. Creeping Red Fescue may be a suitable vegetation for such a shaded area. However, I recommend that a soil test be conducted to establish proper amounts of soil amendments before seeding the area. Soil sample boxes can be obtained from the James City County Extension Office or from the Colonial Soil and Water Conservation District.

Mr. Coates and Mr. Parker also conveyed concerns of long-term adverse effects on the pond due to chemicals such as herbicides and pesticides applied to the golf course. These are also not regulated under the E&S law. I recommend that they work closely with Mr. Dave Dowling of the Virginia Department of Game and Inland Fisheries to monitor the quality of the pond and fish. If there are excess amounts of these substances washed into the pond, the Department of Environmental Quality should be notified for assistance.

I will continue to monitor the site during construction and will respond to any complaints or requests for assistance from Mr. Coates. As always, I will contact you if the need arises and coordinate joint inspections accordingly.

If there are any questions or if I can be of further assistance, please contact me at (804) 443-6752.

Sincerely,

Ken Harper

Ken Harper
Erosion & Sediment Control Specialist

cc: Mr. Jimmy Edmonds-DCR
Mr. Charles Coates-Owner
Mr. Robert Parker-Owner
Ms. Melissa Schaup-US Army Corps of Engineers
Mr. Dave Dowling-DGIF
Mr. David Meador-Colonial SWCD
Mr. James Franklin-Stonehouse Inc.

MAY-19-97
DARRYL COOKE CALL 253-6670
JOAN ANS - out in FIELD until 11:00A
Left message

DEVELOPMENT MANAGEMENT

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

CODE COMPLIANCE (757) 253-6626
COUNTY ENGINEER (757) 253-6678
INTEGRATED PEST MANAGEMENT (757) 253-2620
PLANNING (757) 253-6685
E-MAIL: codecomp@james-city.va.us
E-MAIL: planning@james-city.va.us

April 11, 1997

Mr. Danny Young
Legends of Virginia, LC
P.O. Box 3508
Williamsburg, VA 23187

RE: Stonehouse - Legends Golf Course

Dear Mr. Young:

This is to confirm our discussion of April 9, 1997, regarding the repair of the dam located on Mr. Coates property. As you know, this item has been the subject of discussion for almost the entire time that the golf course has been under construction. Based on our earlier conversations and correspondence, you committed that Legends would take care of the erosion at the dam either with your own resources or in conjunction with Stonehouse Management.

Based on our discussion of Wednesday, it is my expectation that repairs will be accomplished as soon as possible. Given the fact that a design has been prepared and a letter dated February 17, 1997, stated that an agreement was being drafted between the affected parties, I expect that this work will be accomplished by May 15, 1997. As a letter of credit was posted in conjunction with the project's Siltation Agreement, this surety can be utilized by the County to effect the repairs to the dam.

Please contact me at 253-7763 if you wish to discuss this matter further.

Sincerely,

Darryl E Cook

Darryl E. Cook, P.E.
Environmental Director

cc: Mr. Charles Coates
Mr. James Edmonds, Division of Soil and Water Conservation
Mr. Ken Harper, Division of Soil and Water Conservation

DEVELOPMENT MANAGEMENT

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

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

COUNTY ENGINEER (757) 253-6678

INTEGRATED PEST MANAGEMENT (757) 253-2620

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

June 9, 1997

Mr. Danny Young
Legends of Virginia, LC
P.O. Box 3508
Williamsburg, VA 23187

RE: Stonehouse - Legends Golf Course

Dear Mr. Young:

I wrote to you on April 11, 1997, regarding repair of the dam located on Mr. Coates property. In the almost two months since that time, no action has been taken nor has Mr. Coates even been contacted in an effort to resolve the situation. Therefore, this letter is to notify you that we are beginning the process to draw the surety posted in conjunction with the project's Siltation Agreement to effect repairs to the dam.

Please contact me at 253-7763 if you wish to discuss this matter further.

Sincerely,

Darryl E Cook

Darryl E. Cook, P.E.
Environmental Director

cc: Mr. Charles Coates
Mr. James Edmonds, Division of Soil and Water Conservation
Mr. Ken Harper, Division of Soil and Water Conservation
NationsBank

George Allen
Governor

Becky Norton Dunlop
Secretary of Natural Resources

Kathleen W. Lawrence
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

REPLY TO:
Tappahannock Regional Office
P. O. Box 1425
Tappahannock, VA 22560
Telephone: (804) 443-6752
FAX: (804) 443-4534

203 Governor Street, Suite 206
Richmond, Virginia 23219-2094
Phone: (804) 786-2064 *FAX: (804) 786-1798* *TDD: (804) 786-2121*

September 9, 1996

Mr. Darryl Cook
Development Engineer
P. O. Box JC
Williamsburg, VA 23187

Dear Mr. Cook:

Thank you for meeting with me recently to discuss the Legends Golf Course Project in James City County. As you know, our meeting was in response to a complaint from the downstream property owner concerning damage to the spillway of his existing pond. I met with the owner of the pond at his request on August 8, 1996 to investigate this complaint.

This visit was a follow-up to the inspection we conducted in May of 1995, concerning sedimentation and runoff from the project. My observations and recommendations were conveyed in my letter to you, dated May 18, 1995. During my visit with Mr. Coates on August 8, I noticed that the pond was discolored and that the spillway had experienced erosion beyond the conditions we observed last May. According to Mr. Coates, the pond has been discolored frequently since the Legends project commenced. However, I realize that E&S controls cannot remove all of the sediment and discoloration in runoff during storm events, and have explained this to Mr. Coates.

The fact that the spillway is eroding concerns me greatly. This is a condition which needs to be given priority for corrective action. If the embankment fails, the potential for damage downstream is considerable. During our meeting, you mentioned that the Legends representatives are willing to take action to resolve the problem, and have studied options to do so. I urge you to convey the urgency of making the corrective action as soon as possible to the Legends organization. We have experienced above average rainfall this year, and delaying action could result in considerable damage.

Please keep me informed of the progress to the end of this situation. If I can be of assistance, please do not hesitate to contact me.

Sincerely,

Kenneth W. Harper
Erosion and Sediment Control Specialist

cc: Jimmy Edmonds
C. D. Coates

An Agency of the Natural Resources Secretariat

George Allen
Governor

Becky Norton Dunlop
Secretary of Natural Resources

Kathleen W. Lawrence
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

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203 Governor Street, Suite 206
Richmond, Virginia 23219-2094
Phone: (804) 786-2064 *FAX: (804) 786-1798* *TDD: (804) 786-2121*

October 20, 1997

WEG - Fax 229-4507

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

RE: Dam Improvements, Coates Property

Dear Mr. Cook;

Thank you for submitting the E&S Plan for the proposed dam improvements for the Coates Property in James City County. I have reviewed the plan and have the following comments and concerns for your consideration:

1. There is no mention of how the pond will be drained or if it will be drained to install the new principle riser structure. If it is to be pumped down, there needs to be some type of dewatering structure provided with energy dissipation to prevent erosion at the discharge point. If a coffer dam structure is to be used, it should be noted on the plan.

2. The fill area on the existing dam does not appear to be keyed into the existing grade. I have concerns that this may not be sufficiently stable by placing it with standard compaction methods. Please have the engineer address this issue.

3. The calculations should also be certified with the engineer's stamp.

By copy of this letter, I will be informing Mr. Coates of these concerns. This is done at his request since he is the affected property owner of this project. I also would liked to be notified prior to commencement of corrective work in order to conduct inspections with the owner and county officials.

Please contact me at (804) 443-6752 if there are any questions or if I can be of further assistance.

Sincerely,

Ken Harper
Erosion and Sediment Control Specialist

cc: Jimmy Edmonds-DCR
Joe Battiata-DCR
Mr. Charles Coates

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

Environmental Consultants

TRANSMITTAL LETTER

TO	DATE
DARRYL COOK	9-9-97
	RE THE LEGENDS AT STONEHOUSE OFFSITE DAM IMPROVEMENTS

WE ARE SENDING ☐ ATTACHED ☐ UNDER SEPARATE COVER VIA _____

☐ Plans ☐ Contracts ☐ Letters
☐ Prints ☐ Literature ☐ Other:
☐ Copies ☐ Samples

COPIES	DATED	DESCRIPTION
1		HYDROLOGIC / HYDRAULIC CALCULATIONS
2		DAM IMPROVEMENTS PLAN

THESE ARE BEING SENT:

☐ As per your request ☐ For your comments ☐ For your signature
☐ For your review ☐ For your use/files ☐ For your _____

NOTES

COPY TO

SIGNATURE

TITLE	DATE
STAFF ENGINEER	9-9-97

516-B South Henry Street Williamsburg, Virginia 23185 (757) 220-6869 FAX (757) 229-4507

CONSULTING ENGINEERS

5248 Olde Towne Road • Suite 1 • Williamsburg, Virginia 23188
(757) 253-0040 • Fax (757) 220-8994 • E-mail aes@aesva.com

November 22, 2002

Mr. Scott Thomas, P.E.
Civil Engineer
Environmental Division
James City County
101-E Mounts Bay Road
P.O. Box 8784
Williamsburg, Virginia 23187-8784

APPROVED
James City County
Environmental Division
By: Scott Thomas
Date: 11-25-02
ADDRESSES JCC ENV DIV COMMENT #8 dated Nov 15 2002.

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

RE: JCC Case No. S-27-02
Stonehouse, Bent Tree, Section V – A, "Lisburn" Subdivision
James City County
AES Project No. 9088-A

Dear Mr. Thomas:

First, thank you! Arch Marston, Jason Grimes, and I appreciate your time yesterday to discuss Coats Pond and the Lisburn subdivision.

To follow up on our discussion, I am providing additional information, which consists of:

1. A revised Stormwater Management narrative for the Lisburn subdivision.
2. An evaluation of the performance of Coats Pond, included with the narrative. This comparison identifies the original design performance, the existing performance of Coats Pond (today), and the expected performance of Coats Pond with the development of the Lisburn subdivision.
3. A Reservoir Report of the current Coats Pond, showing a Stage / Storage / Discharge Table.
4. "New" Hydrographic Summary Reports for the 1-year, 2-year, 10-year, and 100-year 24-hour storm events and pond routings. Our previously supplied reports were incorrect and indicated higher discharge rates through Coats Pond than actually would be experienced. The latest reports identify the very minor increases in runoff and discharge that should be expected from the development of the Lisburn subdivision.

To reiterate and summarize our findings (as found in the stormwater narrative), our conclusions are:

- Coats Pond, with the 12-inch orifice, provides stream channel protection for the improved watershed of approximately 106 acres.
- Peak discharges from Coats Pond are reduced to pre-development rates for all storm events for the watershed.

- An extremely minor increase in the water surface elevation is noted at Coats Pond when comparing the current conditions (Stonehouse development without development of the Lisburn subdivision) to the ultimate condition (Stonehouse development with the development of the Lisburn subdivision). Please note that both of these scenarios show much lower flows than the original design anticipated. The expected riser in water surface elevation for the analyzed storm events are as follows:
  i. For the 1-year, 24-hour storm event, the net increase in water surface elevation is less than 1 inch.
  ii. For the 2-year, 24-hour storm event, the net increase in water surface elevation is less than 1 inch.
  iii. For the 10-year, 24-hour storm event, the net increase in water surface elevation is less than 1-1/2 inches.
  iv. For the 100-year, 24-hour storm event, the net increase in water surface elevation is less than 1-1/2 inches.
- The volume of flow to the emergency spillway generated by the ultimate development scenario (including the Lisburn development) is <u>less than</u> the predicted volume for the emergency spillway for which dam modification designs where developed in 1997.
- There is 1.8 feet of freeboard available when comparing the water surface elevation of Coat's Pond for the 100-year, 24-hour storm event, and the top of dam elevation for the ultimate development. (In the 1997 analysis, the expected freeboard was 1.3 feet.)

Once again, thank you for time. If you have any questions regarding this information, please do not hesitate to call.

Sincerely,

AES Consulting Engineers

V. Marc Bennett, P.E.
Senior Project Manager

S:\JOBS\9088\00-SHF\Wordproc\Document\90880L31.vmb.doc

WATERSHED	WC	MAINTENANCE PLAN	No	CTRL STRUC DESC	Riser
BMP ID NO	053	SITE AREA acre	5.507	CTRL STRUC SIZE inches	48
PLAN NO		LAND USE	Gen Agricultural	OTLT BARRL DESC	Barrel
TAX PARCEL	(05-01)(01-01)	old BMP TYP	Farm Pond	OTLT BARRL SIZE inch	36
PIN NO	0510100001	JCC BMP CODE			
CONSTRUCTION DATE	1/1/1999	POINT VALUE		EMERG SPILLWAY	Yes
PROJECT NAME	Coats Pond			DESIGN HW ELEV	45.8
FACILITY LOCATION	South of Ware Creek			PERM POOL ELE	39
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	118	2-YR OUTFLOW cfs	36.00
CURRENT OWNER	Charles D. & JoAnn Coats			10-YR OUTFLOW cfs	47.00
OWNER ADDRESS	6 West Lamington Road			REC DRAWING	No
OWNER ADDRESS 2		SERVICE AREA DESCRI	Portions of Stonehouse & Undev Lands		
CITY-STATE-ZIP CODE	Hampton, Va. 23699-2138	IMPERV AREA acres	0.00	CONSTR CERTI	No
OWNER PHONE		RECV STREAM	UT of Ware Creek		
MAINT AGREEMENT	No	EXT DET-WQ-CTRL	No	LAST INSP DATE	
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	Old Farm Pond. See Legends Stonehouse offsite dam improvement plan (4/1998).	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	Yes		

Get Last BMP No

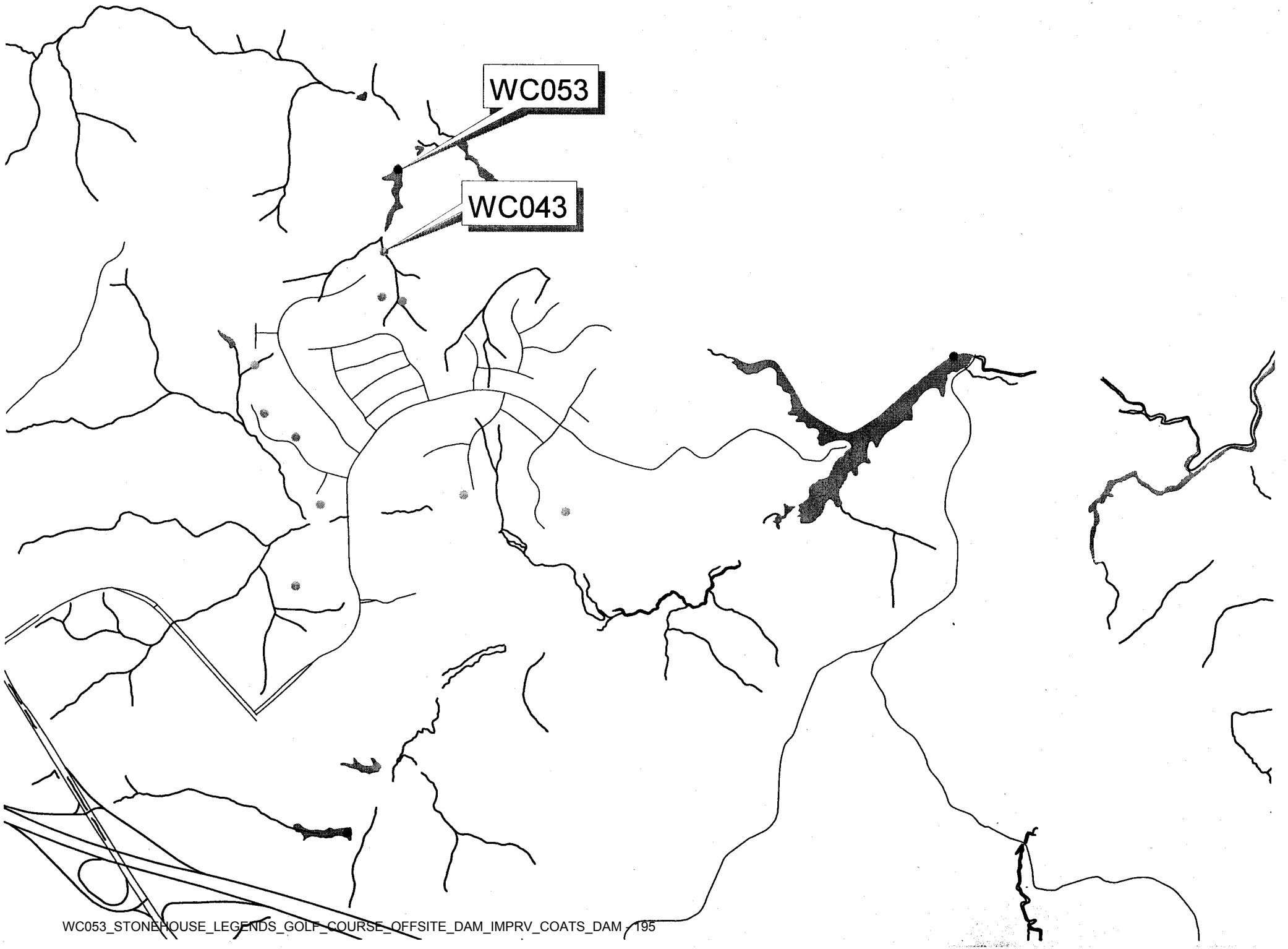
Return to Menu

WATERSHED	WC	MAINTENANCE PLAN	No	CTRL STRUC DESC	Riser
BMP ID NO	053	SITE AREA acre	5.507	CTRL STRUC SIZE inches	48
PLAN NO		LAND USE	Gen Agricultural	OTLT BARRL DESC	Barrel
TAX PARCEL	(05-01)(01-01)	old BMP TYP	Farm Pond	OTLT BARRL SIZE inch	36
PIN NO	0510100001	JCC BMP CODE			
CONSTRUCTION DATE	1/1/1999	POINT VALUE		EMERG SPILLWAY	Yes
PROJECT NAME	Coats Pond-Private Dam			DESIGN HW ELEV	45.8
FACILITY LOCATION	South of Ware Creek			PERM POOL ELE	39
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	118	2-YR OUTFLOW cfs	36.00
CURRENT OWNER	Charles D. & JoAnn Coats			10-YR OUTFLOW cfs	47.00
OWNER ADDRESS	6 West Lamington Road			REC DRAWING	No
OWNER ADDRESS 2		SERVICE AREA DESCRI	Portions of Stonehouse & Undev Lands		
CITY-STATE-ZIP CODE	Hampton, Va. 23699-2138	IMPERV AREA acres	0.00	CONSTR CERTI	No
OWNER PHONE		RECV STREAM	UT of Ware Creek		
MAINT AGREEMENT	No	EXT DET-WQ-CTRL	No	LAST INSP DATE	
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	Old Farm Pond. See Legends Stonehouse offsite dam improvement plan (4/1998).	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	Yes		

Get Last BMP No

Return to Menu

PRIOR TO DEV OF LISBURN


WC053
WC043

ENVIRONMENTAL DIVISION REVIEW COMMENTS
LEGENDS - STONEHOUSE OFFSITE DAM IMPROVEMENTS
COATS PROPERTY
September 16, 1997 DEC

1. Provide documentation on the computation of the Runoff Curve Number (RCN) and the time of concentration.

2. The plan shows a bend in the pipe near the outfall. Either provide a structure at this point to allow access to the bend or revise the plan to eliminate the bend.

3. The emergency spillway is shown as 10-feet wide on the plan but is designed as 20-feet wide in the calculations. Please review and make consistent.

4. Add a note that requires the filling and compaction of the eroded area adjacent to the pipe and emergency spillway.

5. Provide anti-seep collars as necessary to increase the flow length by 15 percent.

Raise dam to maintain 1' freeboard
Prin. Spillway pipe ignored
~~RCN should be 73.5 not 71~~
What is 18" inline drain?
Specify riser type

use $T_c = 0.95$

$CN = 71$

The Legends at Stonehouse
Offsite Dam Improvements Summary

Normal Pool Remains at	Elevation = 40 ft msl
Raise Top of Dam by 1 ft	Elevation = 45 ft msl
Emergency Spillway (10-ft wide grass lined)	Elevation = 43 ft msl
48 inch riser	Crest = 40 ft msl
24 inch Barrel	Inv = 36 ft msl

Do we need another plan?

Provide Plan View

One X-section to show location of emergency spillway

Riprap @ Outfall

Don't need profile.

1. RCN Calcs
2. T_c Calcs
3. Bend in Pipe - need structure
4. E.S. is 20' wide in calcs - 10' wide on plan
5. Reference compacting of eroded area
6. Calcs on Pond Storage - overestimate?