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: **DC011**

DATE VERIFIED: **May 18, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 15, 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: DC011

PIN: 1040200001

Subdivision, Tract, Business or Owner Name (if known): Grove Hill Estates

Property Description: Lot 1 Section 1

Site Address: 7928 Diascund Road

(For internal use only) **Box** 25 **Drawer:** N/A

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

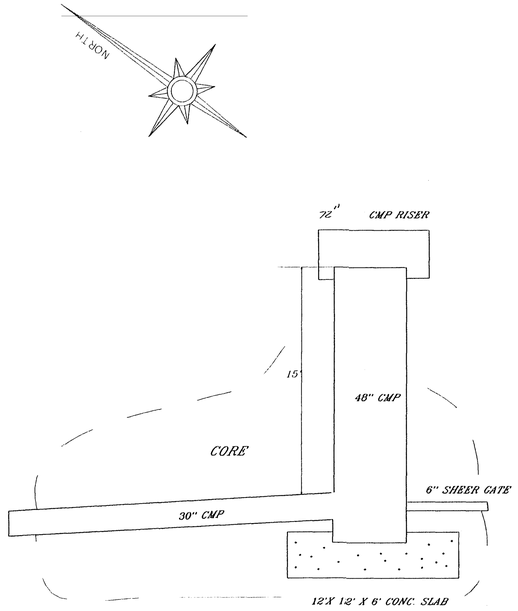
Comments
Covenants, Conditions and Restrictions in file are not recorded.

DC-011

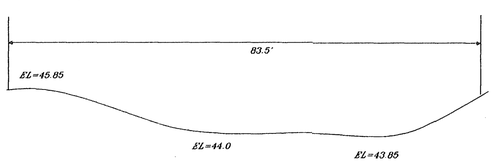
Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

1. As-built plan
2. Completed construction certification
3. Construction Plan
4. Design Calculations
5. Watershed Map
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions



RISER DETAIL
NOT TO SCALE



EMERGENCY SPILLWAY CROSS-SECTION
NOT TO SCALE

AS-BUILT
OF THE POND AND DAM AT
GROVE HILL ESTATES, SECTIONS ONE & TWO
PROPERTY STANDING IN THE NAME OF
JOE FERGUSON AND SONS INC.
STONEHOUSE DISTRICT, JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=60' DATE: 3/8/95
J.N. 33.9

2-YR PRE = 68 CFS
CN = 75
A = 98.5 AC

POST
2-YR. 68 CFS
100-YR. 303 CFS

ROUTED
2-YR. 17.42 CFS @ EL. 42.09
10-YR. 49.77 CFS @ EL. 42.89
100-YR 75 CFS @ EL. 43.8 D.H.W.

NP DESIGN EL. 41.5'
BOTTOM EL. 41.5' (NORM POOL)

HIS LAND SURVEYING, INC.
15500 RIVER BEND TRAIL
LANEXA, VIRGINIA 23089
(804)966-7017

DC 011; 5-24-94

GROVE HILL ESTATES SUBDIVISION
SECTION TWO

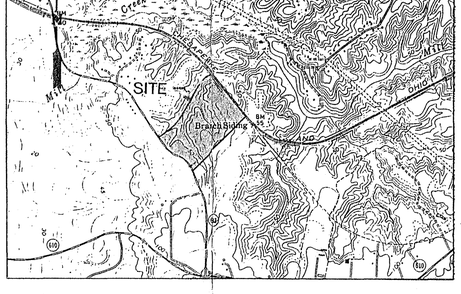
JAMES CITY COUNTY, VIRGINIA

ABBREVIATIONS

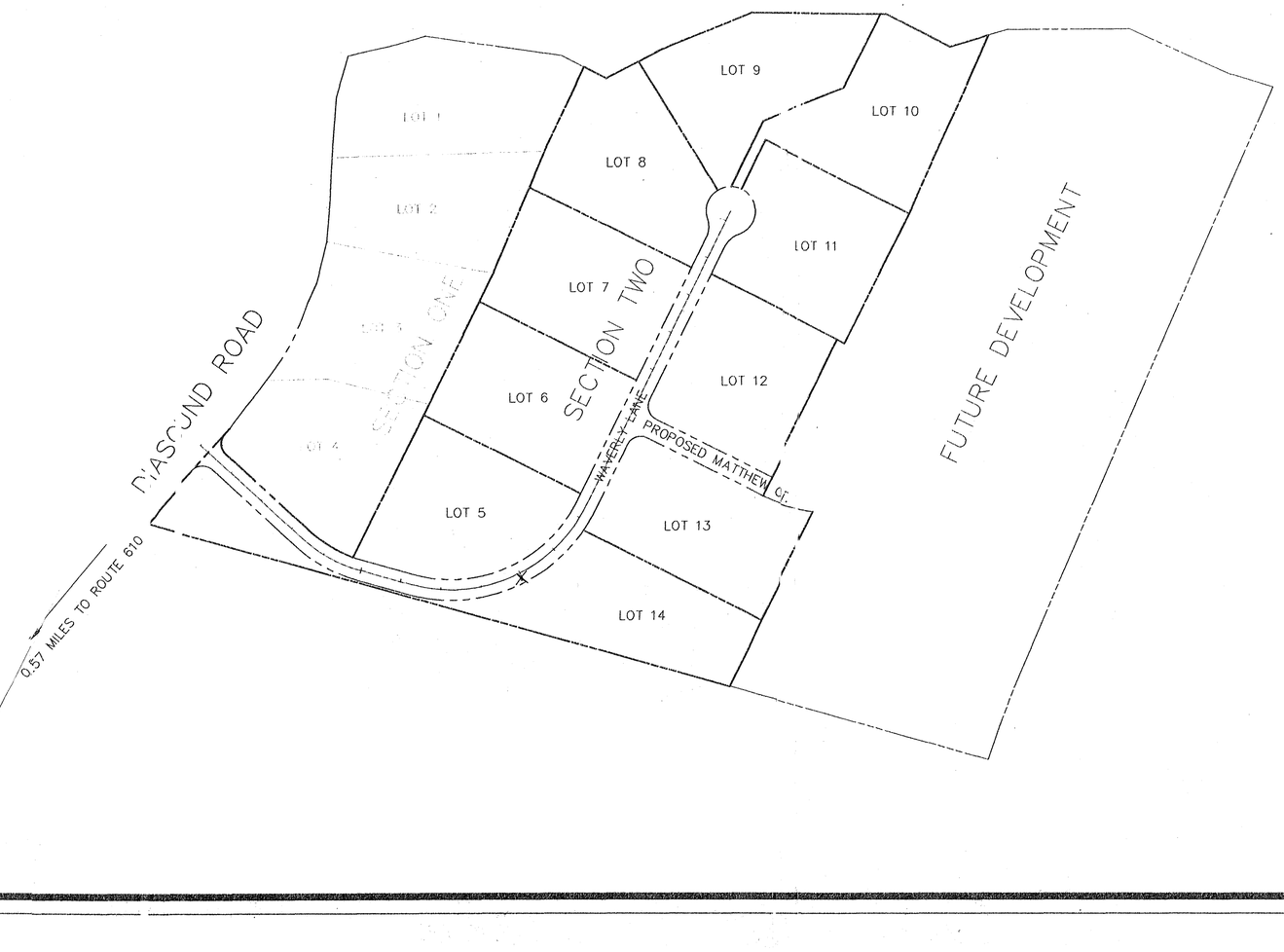
℄	CENTERLINE	PC	POINT ON CURVE
CMP	CORRUGATED METAL PIPE	PL	PROPERTYLINE
CONC.	CONCRETE	P.R.C.	POINT ON REVERSE CURVE
DET.	DETAIL	PT	POINT OF TANGENCY
D.I.	DROP INLET	PSI	POUNDS PER SQUARE INCH
DIA.	DIAMETER	PVC	POLYVINYL CHLORIDE/POINT OF VERTICAL CURVE
DIM	DIMENSION	PVI	POINT OF VERTICAL INTERSECTION
DWG.	DRAWING	PVT	POINT OF VERTICAL TANGENT
ELEV.	ELEVATION	R	RADIUS
EP	EDGE OF PAVEMENT	RCP	REINFORCED CONCRETE PIPE
E&S	EROSION & SEDIMENT	REF	REFERENCE
E.W.	ENDWALL	REINF.	REINFORCED
EXIST.,EX.	EXISTING	REQ'D	REQUIRED
FH	FIRE HYDRANT	RP	RADIUS POINT
FT.	FOOT, FEET	R/W	RIGHT OF WAY
HORIZ	HORIZONTAL	S.F.	SQUARE FOOT/FEET
HP	HIGH POINT	STA.	STATION
INV	INVERT	TC	TOP OF CURB
MAX	MAXIMUM	TYP.	TYPICAL
MIM	MINIMUM	VC	VERTICAL CURVE
MH	MANHOLE	VDOT	VIRGINIA DEPARTMENT OF TRANSPORTATION
NIC	NOT IN CONTRACT	VERT.	VERTICAL
NO.	NUMBER	W/	WITH
NTS	NOT TO SCALE	WWF	WELDED WIRE FABRIC
OC	ON CENTER		

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
TS-1	TITLE SHEET
C-1	ROAD PLAN & PROFILES
C-2	ROAD PLAN & PROFILES
C-3	E & S DETAILS & NOTES
C-4	VDOT STANDARD DETAILS & NOTES



VICINITY MAP
SCALE: 1" = 2000"



REVISIONS

NO.	DATE	DESCRIPTION

S-20-95

ENGINEERS · ARCHITECTS · SURVEYORS
INTERIOR DESIGNERS · PLANNERS
P.O. BOX 3505 WILLIAMSBURG VIRGINIA 23187 (804)253-0673 (804)253-8015

TITLE SHEET

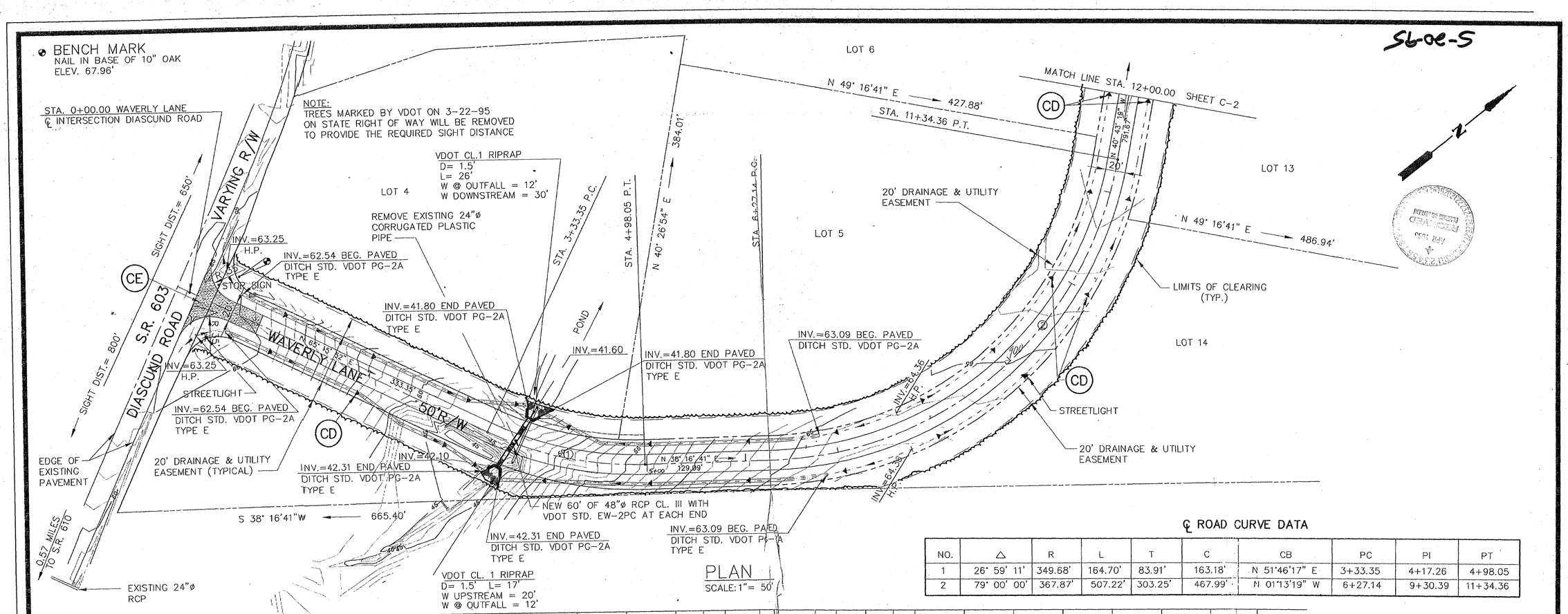
GROVE HILL ESTATES – SECTION TWO
OWNER/DEVELOPER: FERGUSON
JAMES CITY COUNTY VIRGINIA

SCALE AS SHOWN
DESIGNED TCS
DRAWN LBA
CHECKED WJD
DATE 2-21-95
5723
COMMISSION NO.
SHEET
TS-1
1 OF 5

FILENAME: 5723TS.DWG
DATE: 2-21-95
PLOT SCALE: 1" = 50'

DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 005

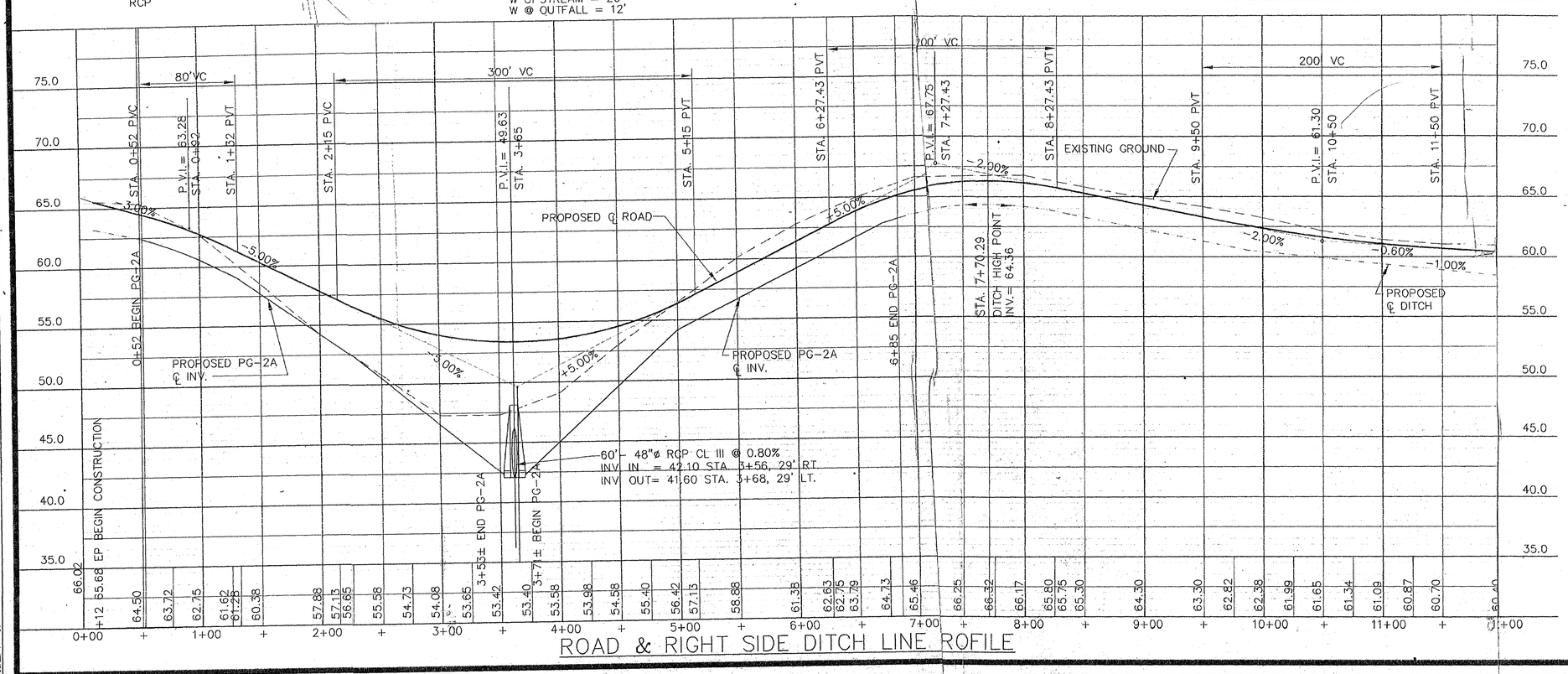
56-06-5



PLAN
SCALE: 1" = 50'

℄ ROAD CURVE DATA

NO.	△	R	L	T	C	CB	PC	PI	PT
1	26° 59' 11'	349.68'	164.70'	83.91'	163.18'	N 51°46'17" E	3+33.35	4+17.26	4+98.05
2	79° 00' 00'	367.87'	507.22'	303.25'	467.99'	N 01°13'19" W	6+27.14	9+30.39	11+34.36



ROAD & RIGHT SIDE DITCH LINE ROFILE

REVISIONS		
NO.	DATE	DESCRIPTION
1	3-28-95	REVISED PER VDOT COMMENTS (3-24-95)
2	3-28-95	REVISED PER JCC COMMENTS (3-03-95) (3-07-95)
3	4-03-95	REVISED PER VDOT COMMENTS (3-31-95)

ENGINEERS · ARCHITECTS · SURVEYORS
INTERIOR DESIGNERS · PLANNERS
P.O. BOX 3306 WILLIAMSBURG, VIRGINIA 23187 (804)253-0673 (804)874-5015

COMMONWEALTH OF VIRGINIA
William J. Johnson Jr.
CERTIFICATE NO. 7842
4/5/95
REGISTERED PROFESSIONAL ENGINEER

ROAD PLAN & PROFILE

GROVE HILL ESTATES – SECTION TWO

OWNER/DEVELOPER: FERGUSON
JAMES CITY COUNTY VIRGINIA

SCALE 1" = 50' HORIZ
1" = 5' VERT

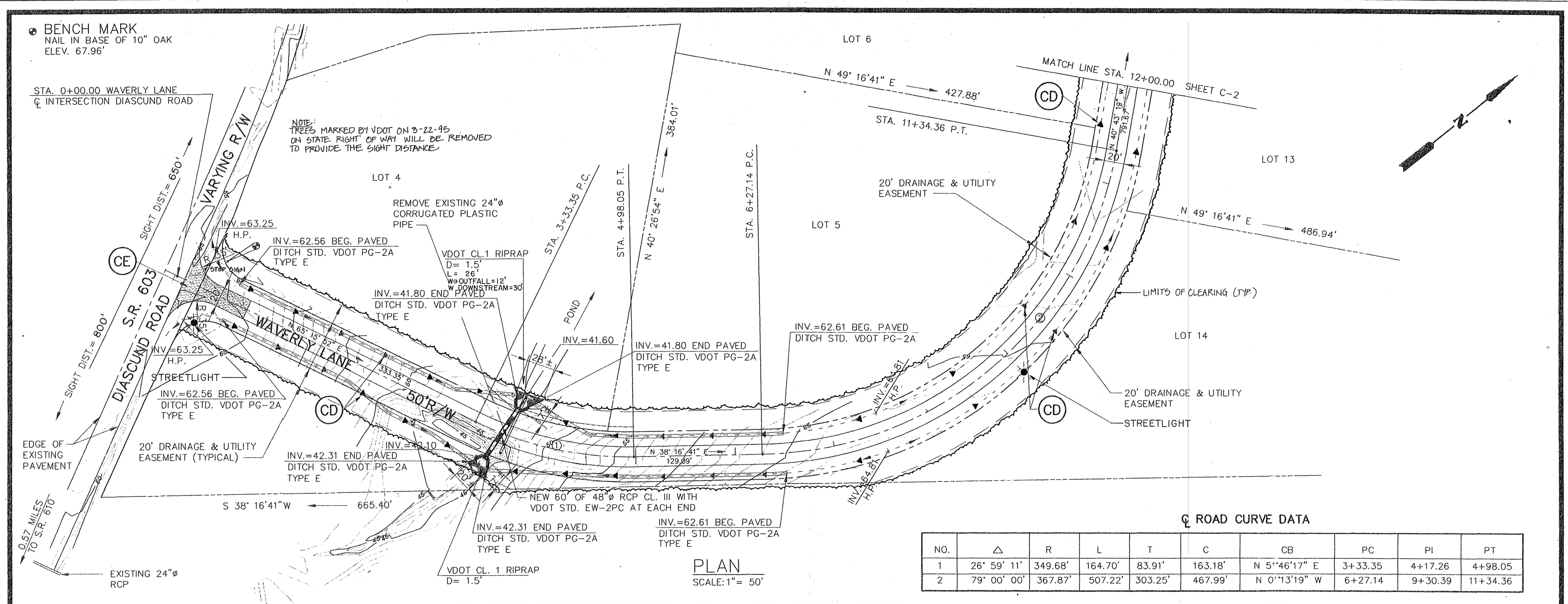
DESIGNED TCS
DRAWN LBA
CHECKED WDJ
DATE 2-21-95

5723
COMMISSION NO.

SHEET
C-1
2 OF 5

FILENAME: DJG 5723CTLDWG
DATE: 3-28-95
PLOT SCALE: 1" = 50'

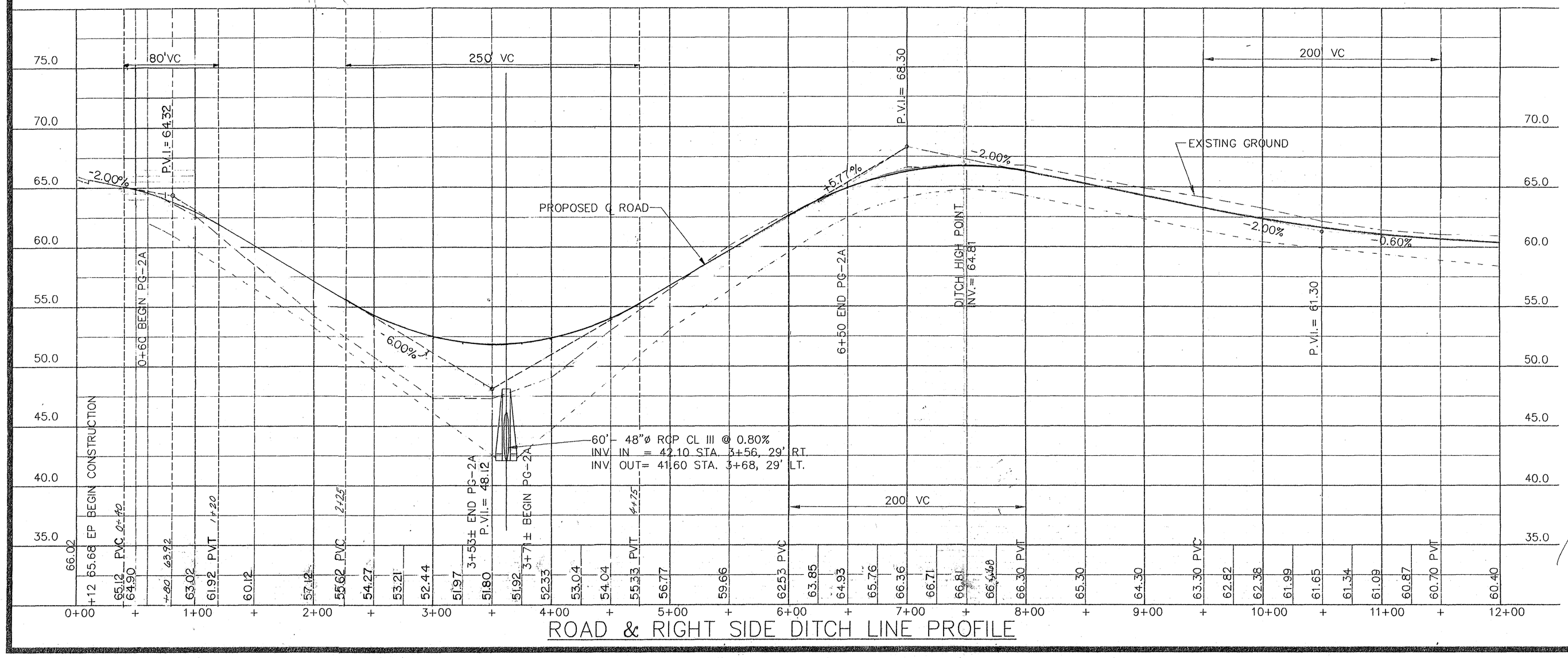
DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 006



PLAN
SCALE: 1" = 50'

℄ ROAD CURVE DATA

NO.	△	R	L	T	C	CB	PC	PI	PT
1	26° 59' 11'	349.68'	164.70'	83.91'	163.18'	N 5°46'17" E	3+33.35	4+17.26	4+98.05
2	79° 00' 00'	367.87'	507.22'	303.25'	467.99'	N 0°13'19" W	6+27.14	9+30.39	11+34.36



ROAD & RIGHT SIDE DITCH LINE PROFILE

VOID

REVISIONS		
NO.	DATE	DESCRIPTION
1	3-28-95	REVISED PER VDOT COMMENTS (3-24-95) WDJ
2	3-28-95	REVISED PER JCC COMMENTS (3-3-95) (3-7-95) WDJ

ENGINEERS · ARCHITECTS · SURVEYORS
INTERIOR DESIGNERS · PLANNERS
P.O. BOX 3505 WILLIAMSBURG, VIRGINIA 23187 (804)253-0673 (804)874-5015

COMMONWEALTH OF VIRGINIA
William D. Johnson, Jr.
CERTIFICATE No. 7427
3/31/95
PROFESSIONAL ENGINEER

ROAD PLAN & PROFILE

GROVE HILL ESTATES – SECTION TWO

OWNER/DEVELOPER: FERGUSON
JAMES CITY COUNTY VIRGINIA

SCALE 1" = 50' HORIZ
1" = 5' VERT

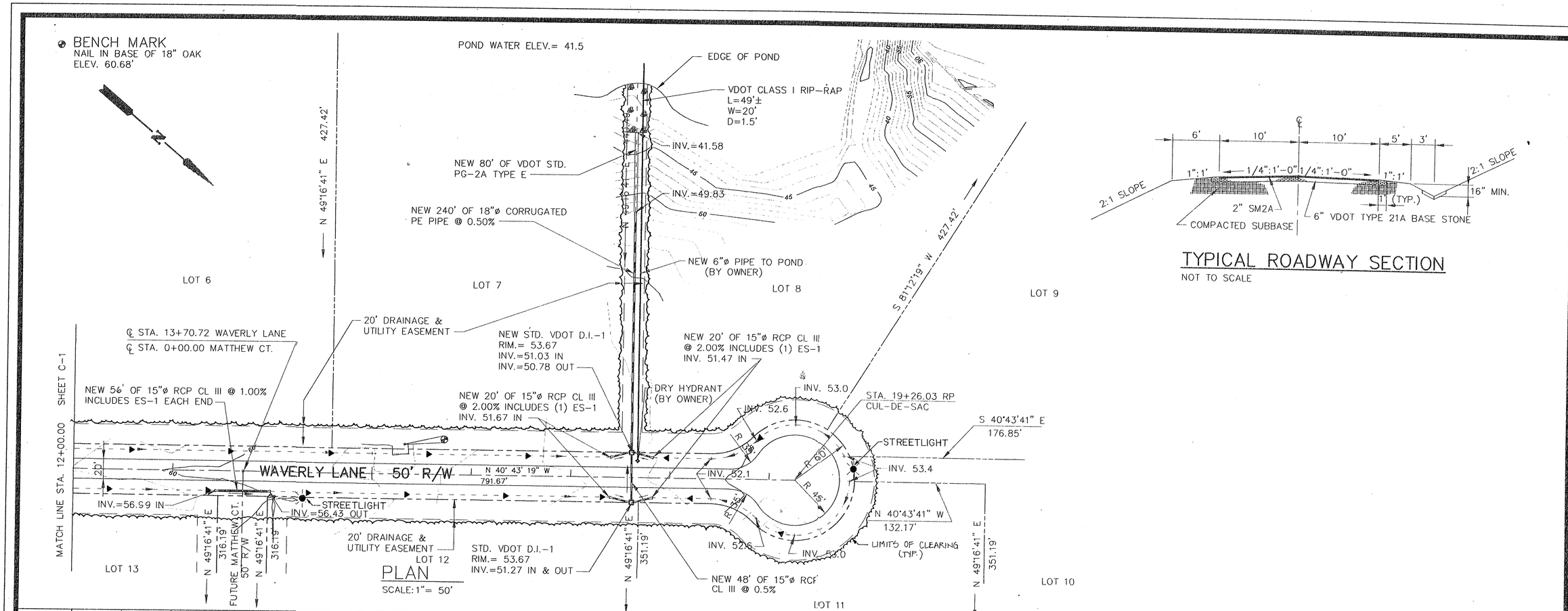
DESIGNED TCS
DRAWN LBA
CHECKED WDJ
DATE 2-21-95

5723
COMMISSION NO.

SHEET
C-1
2 OF 5

FILENAME: DJG 5723C1.DWG
PLOT DATE: 3-28-95
PLOT SCALE: 1" = 50'

DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 007

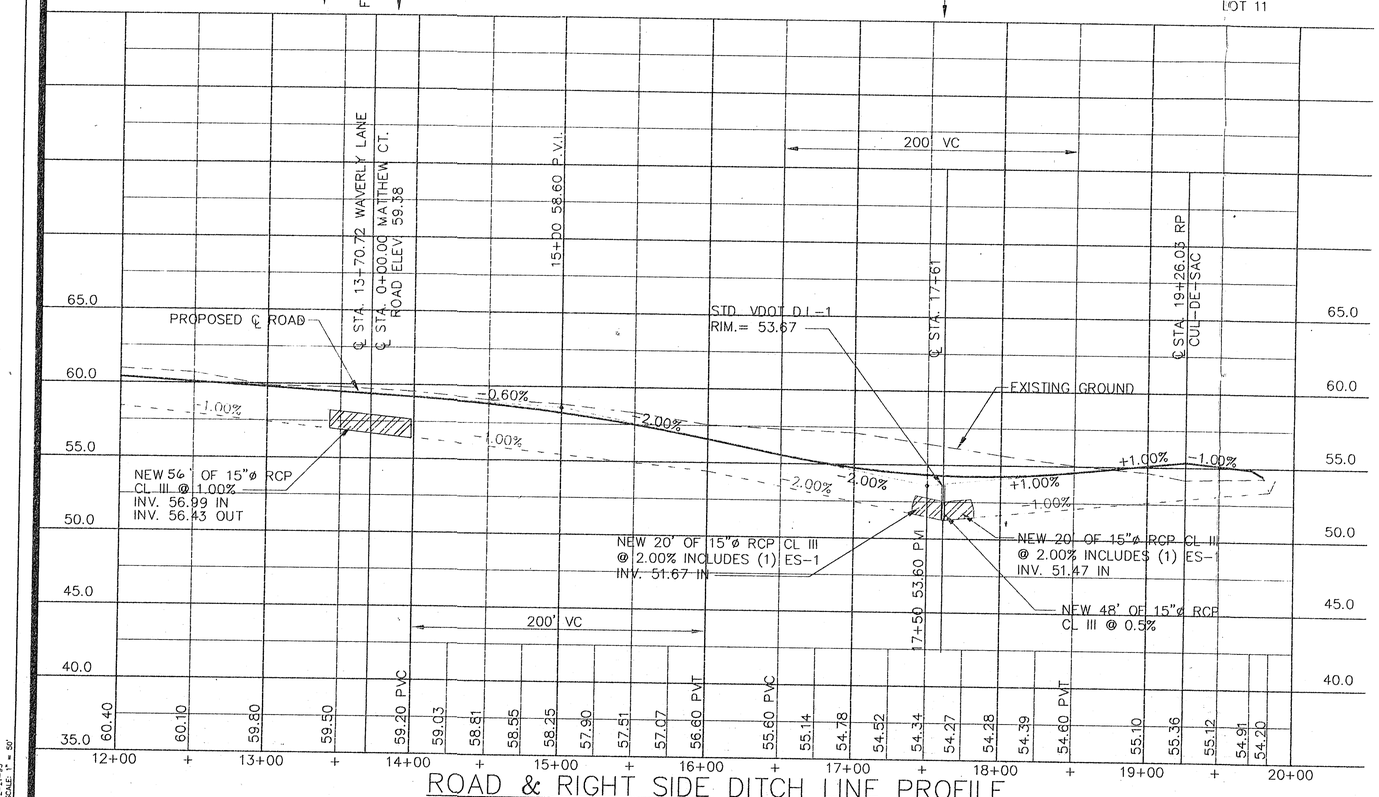


PLAN

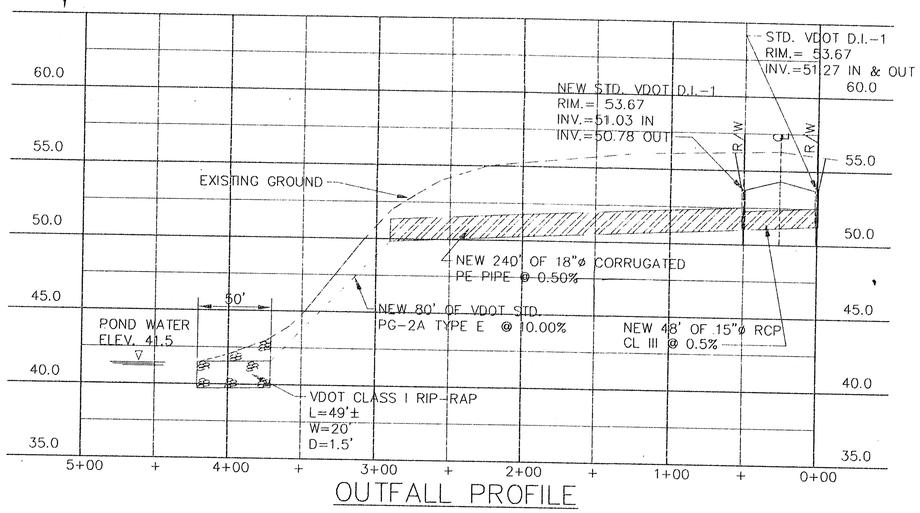
SCALE: 1"= 50'

TYPICAL ROADWAY SECTION

NOT TO SCALE



ROAD & RIGHT SIDE DITCH LINE PROFILE



OUTFALL PROFILE

REVISIONS

NO.	DATE	DESCRIPTION
1	3/28/95	REVISED PER VDOT COMMENTS (3-24-95) WDJ
2	3/20/95	REVISED PER JCC COMMENTS (3-3-95) (3-21-95) WDJ

ENGINEERS · ARCHITECTS · SURVEYORS
INTERIOR DESIGNERS PLANNERS
P.O. BOX 3505 WILLIAMSBURG, VIRGINIA 23187 (804)253-0673 (804)874-5015

COMMONWEALTH OF VIRGINIA
William D. Johnson, Jr.
CERTIFICATE NO. 7427
3/31/95

ROAD PLAN & PROFILE

GROVE HILL ESTATES - SECTION TWO

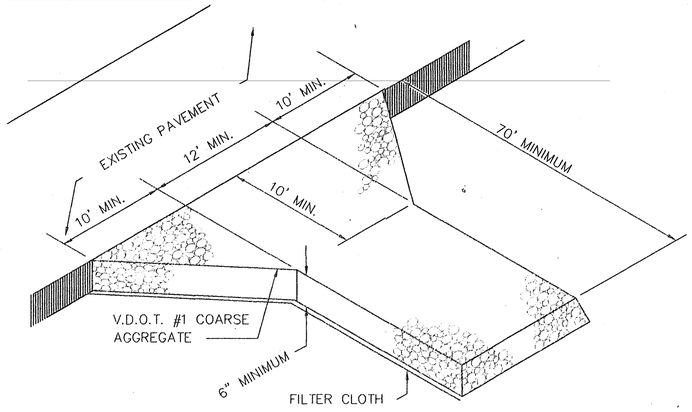
OWNER/DEVELOPER: FERGUSON

JAMES CITY COUNTY VIRGINIA

SCALE	1" = 50' HORIZ 1" = 5' VERT
DESIGNED	TCS
DRAWN	LBA
CHECKED	WDJ
DATE	2-21-95
COMMISSION NO.	5723
SHEET	C-2 3 OF 5

FILENAME: 5723C2.DWG
PLOT DATE: 3-28-95
PLOT SCALE: 1" = 50'

DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 008



(CE) TEMPORARY STONE CONSTRUCTION ENTRANCE VESC 3.02

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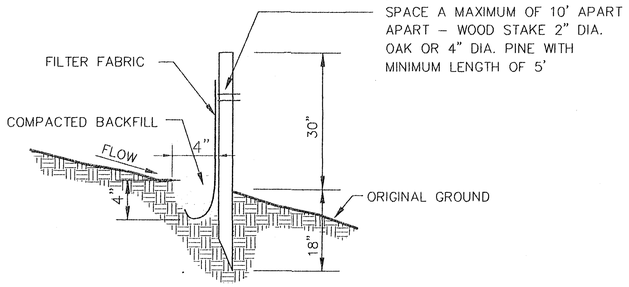

(SF) SILT FENCE VESC 3.05

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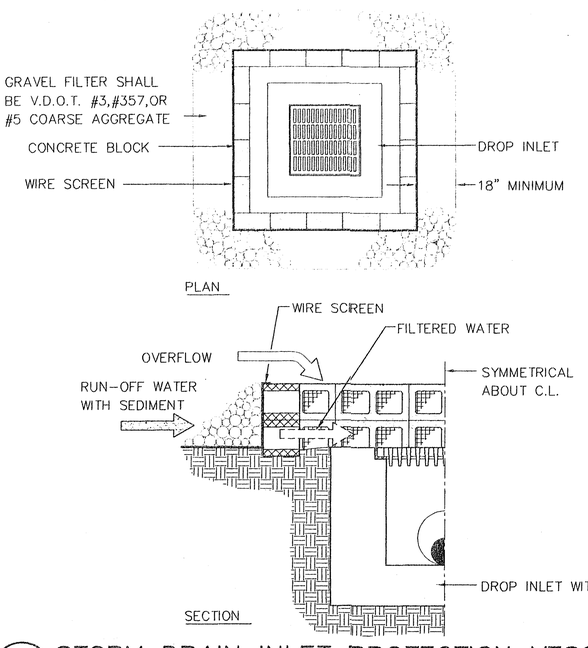

(IP) STORM DRAIN INLET PROTECTION VESC 3.07

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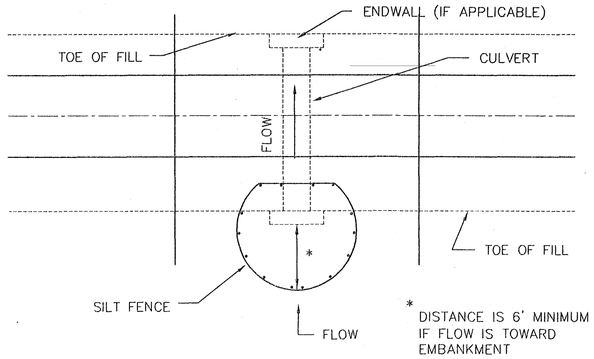

(CIP) CULVERT INLET PROTECTION VESC 3.08

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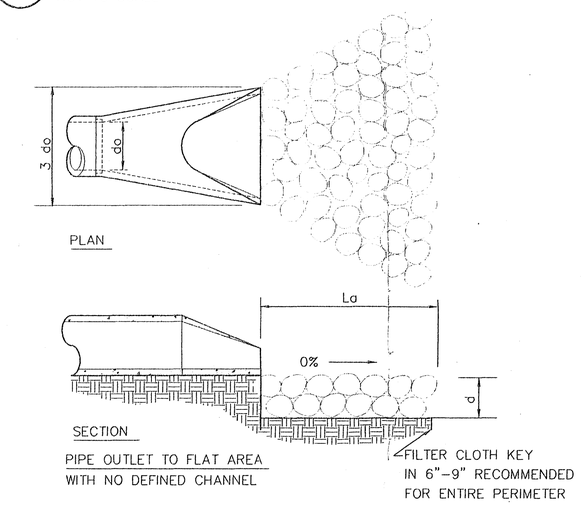

(OP) OUTLET PROTECTION VESC 3.18

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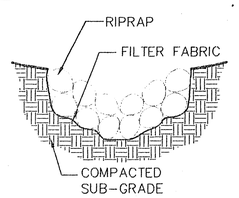

(RR) RIPRAP VESC 3.19

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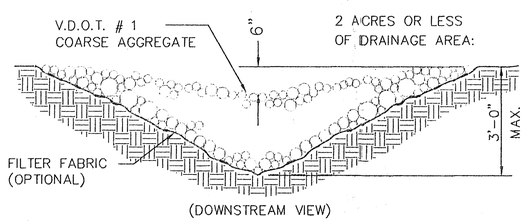


(CD) ROCK CHECK DAMS VESC 3.20

NOT TO SCALE

REVISED BY JCC: 2/3/95

EROSION AND SEDIMENT CONTROL NOTES

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OR STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. 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 THE 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 OR 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 ADJUSTMENT AT THE 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 SEWER, 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 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 FERTILIZER 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 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.

REFERENCE : VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, THIRD EDITION, 1992

REVISIONS

NO.	DATE	DESCRIPTION
1	3-28-95	REVISED PER JCC COMMENTS (3-3-95)

ENGINEERS • ARCHITECTS • SURVEYORS
INTERIOR DESIGNERS • PLANNERS
P.O. BOX 3505 WILLIAMSBURG, VIRGINIA 23187 (804)253-0673 (804)874-5015

COMMONWEALTH OF VIRGINIA — William D. Johnson, III — CERTIFICATE No. 7427 — 4/21/95 — CERTIFIED PROFESSIONAL ENGINEER

E & S CONTROL DETAILS AND NOTES

GROVE HILL ESTATES – SECTION TWO
OWNER/DEVELOPER: FERGUSON
JAMES CITY COUNTY VIRGINIA

SCALE	AS SHOWN
DESIGNED	VE&SC
DRAWN	LBA/MEH
CHECKED	WDJ
DATE	2-21-95
COMMISSION NO.	5723
SHEET	C-3
	4 OF 5

FILENAME: 5723SD.DWG
DATE: 2-21-95
PLOT SCALE: 1/4" = 1'-0"

PC-1

CONCRETE PIPE CULVERT CRUSHING STRENGTH (LBS. PER LIN. FT. ULTIMATE STRENGTH, OR CLASS)								
DIAM. (IN.)	AREA (SQ.FT.)	METHOD A BEDDING — MAXIMUM HEIGHT OF COVER IN FEET — STRENGTH OR CLASS				METHOD B BEDDING B1	B2	DIAM. (IN)
		NON REINF.	III	IV	V	V	V	
12	0.8	1800 14'	14'	19'	29'			12
15	1.2	2125 14'	14'	19'	29'			15
18	1.8	2400 14'	14'	20'	29'			18
21	2.4	2700 13'	14'	20'	29'			21
24	3.1	3000 13'	14'	20'	29'			24
27	4.0		14'	20'	29'			27
30	4.9		14'	20'	29'	USE BETWEEN 30' and 60' B1	USE BETWEEN 60' and 90' B2	30
33	5.9		14'	20'	29'			33
36	7.1		14'	20'	30'			36
42	9.6		14'	21'	30'			42
48	12.6		14'	21'	30'			48
54	15.9		14'	21'	30'			54
60	19.6		14'	21'	30'			60
66	23.8		14'	21'	30'			66
72	28.3		14'	21'	30'			72
78	33.2		14'	21'	30'			78
84	38.5		14'	21'	30'			84
90	44.4		14'	21'	30'			90
96	50.3		14'	21'	30'			96
102	56.7		14'	21'	30'			102
108	63.6		14'	21'	30'			108

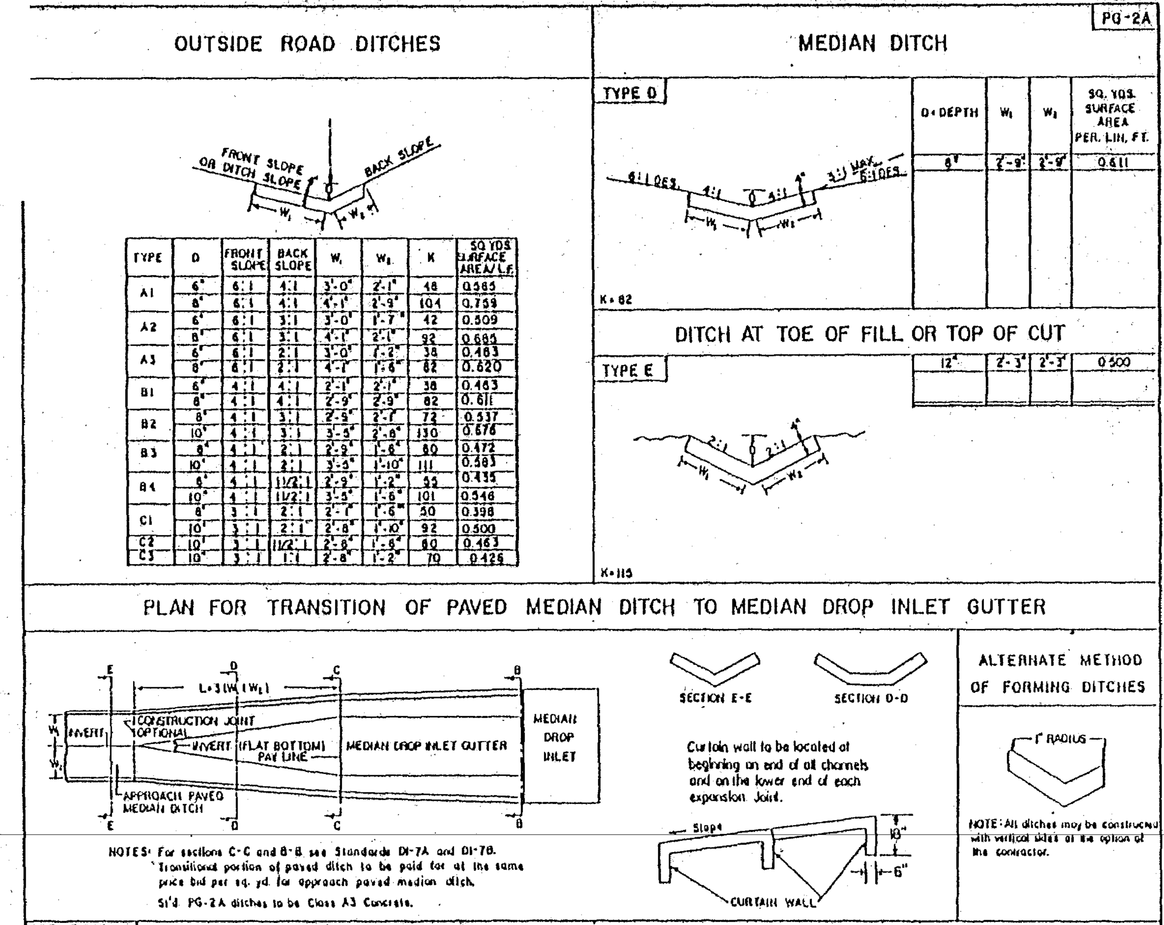
Heights of cover shown in table are for finished construction.

To protect pipe during construction, minimum heights of cover prior to allowing construction traffic to cross installation are to be $\frac{Dia.}{2}$ or 3.0' whichever is the greater. This cover shall extend the full length of the pipe culvert. The approach fill ramp is to extend a minimum of 10(Dia.+3') on each side of the culvert, or to the intersection with a cut.

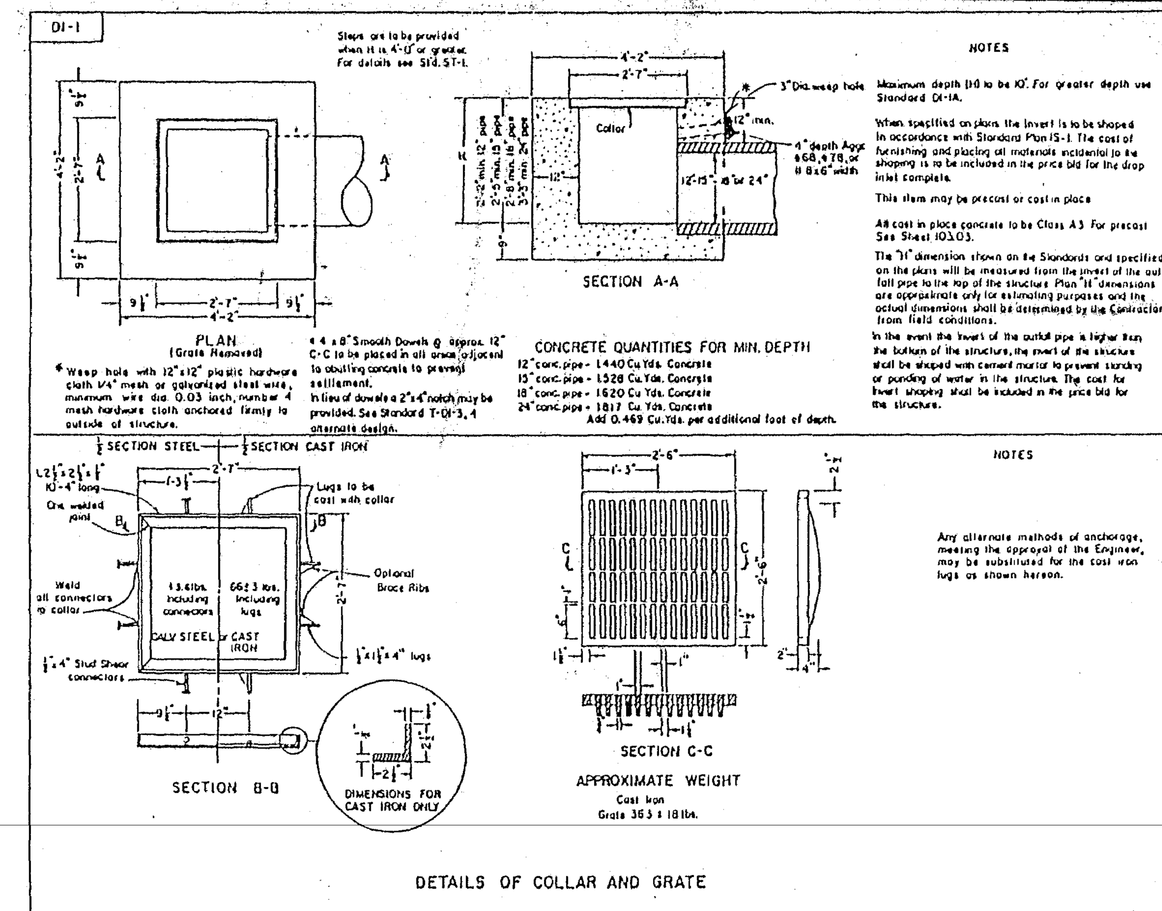
Minimum finished height of cover to be $\frac{Dia.}{2}$ or 2.0' whichever is the greater, except pipe under entrances, median crossovers, street and secondary connections where a 9" min. will be permitted.

Sheet 1 of 17

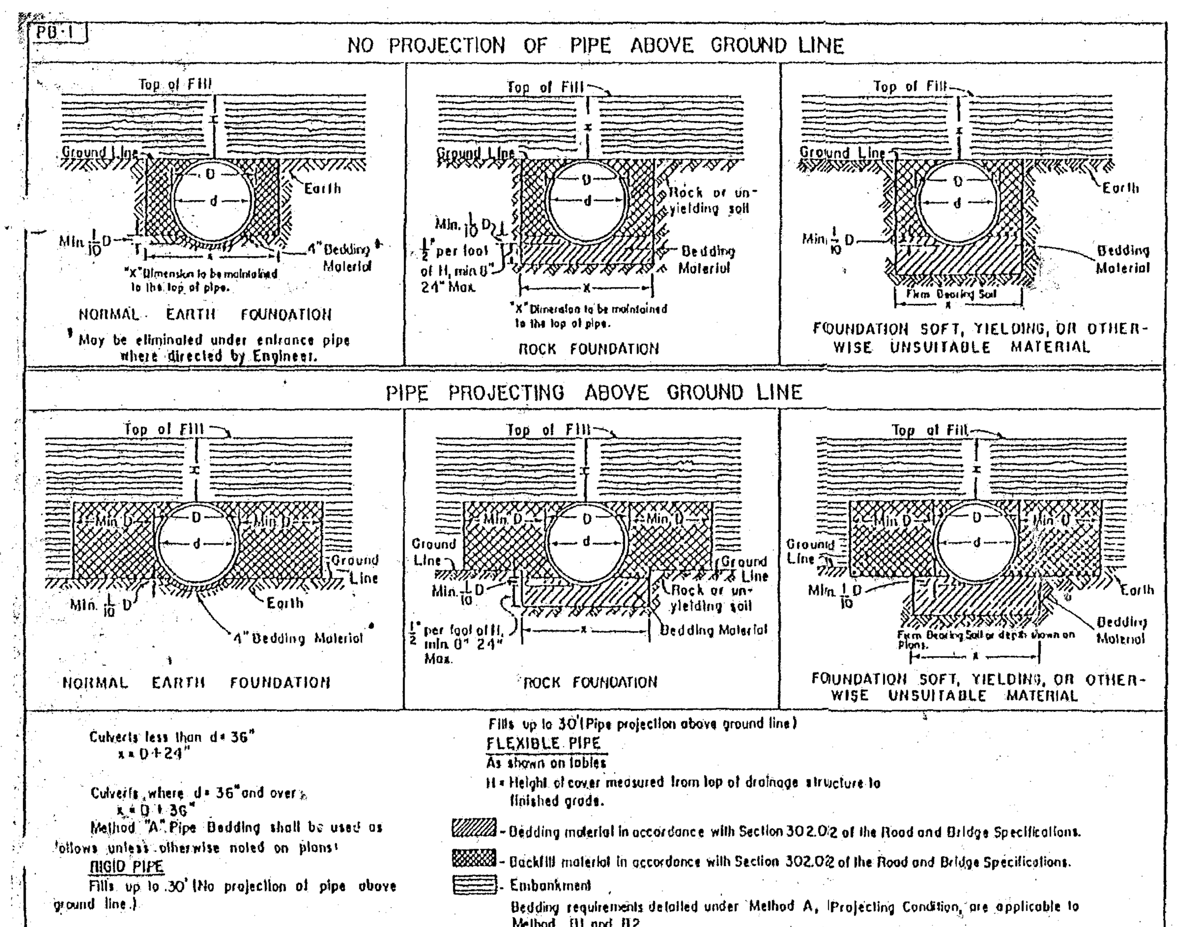
CONCRETE PIPE
CLASS TABLE FOR H-20 LIVE LOAD
VIRGINIA DEPARTMENT OF TRANSPORTATION
107.05 — SPECIFICATION REFERENCE 302, 232



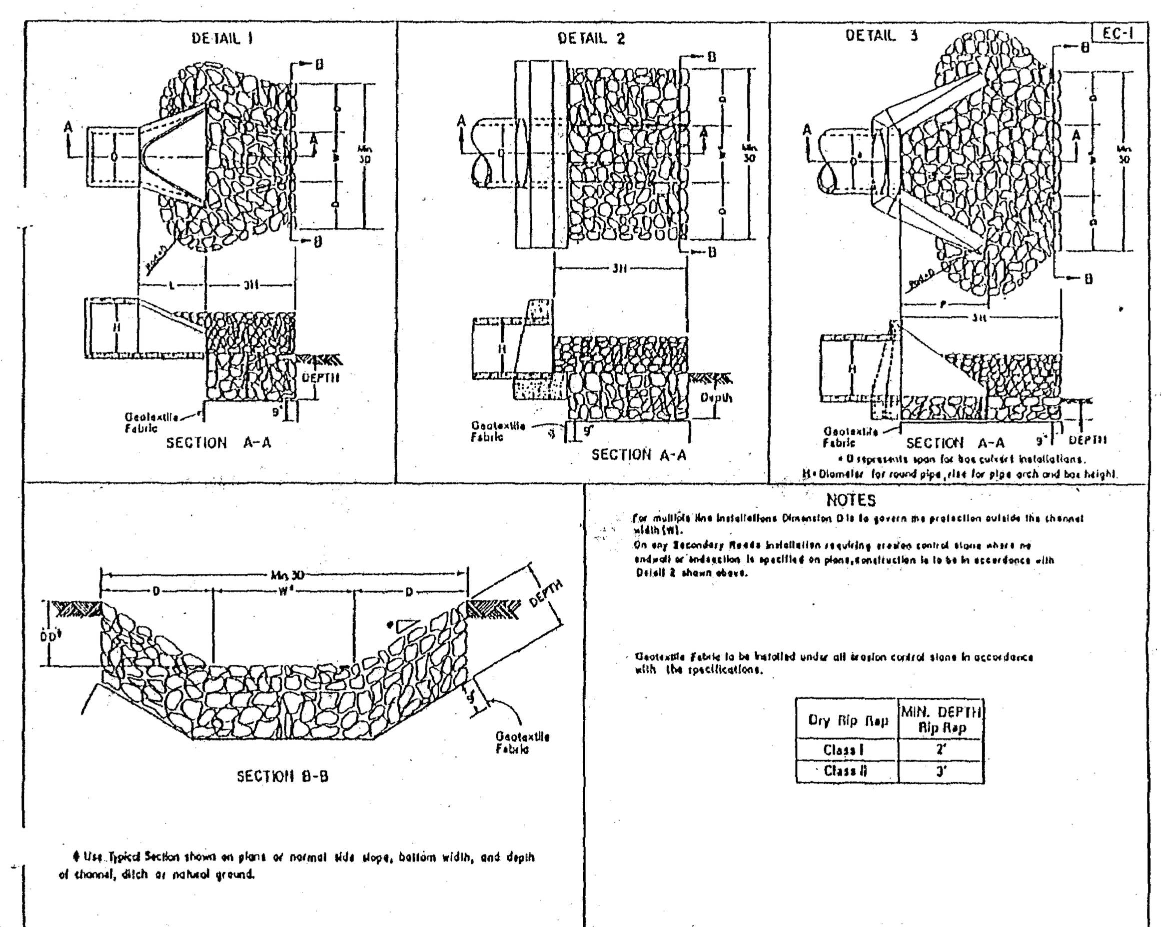
STANDARD PAVED DITCHES
VIRGINIA DEPARTMENT of TRANSPORTATION
SPECIFICATION REFERENCE 502 — 109.01



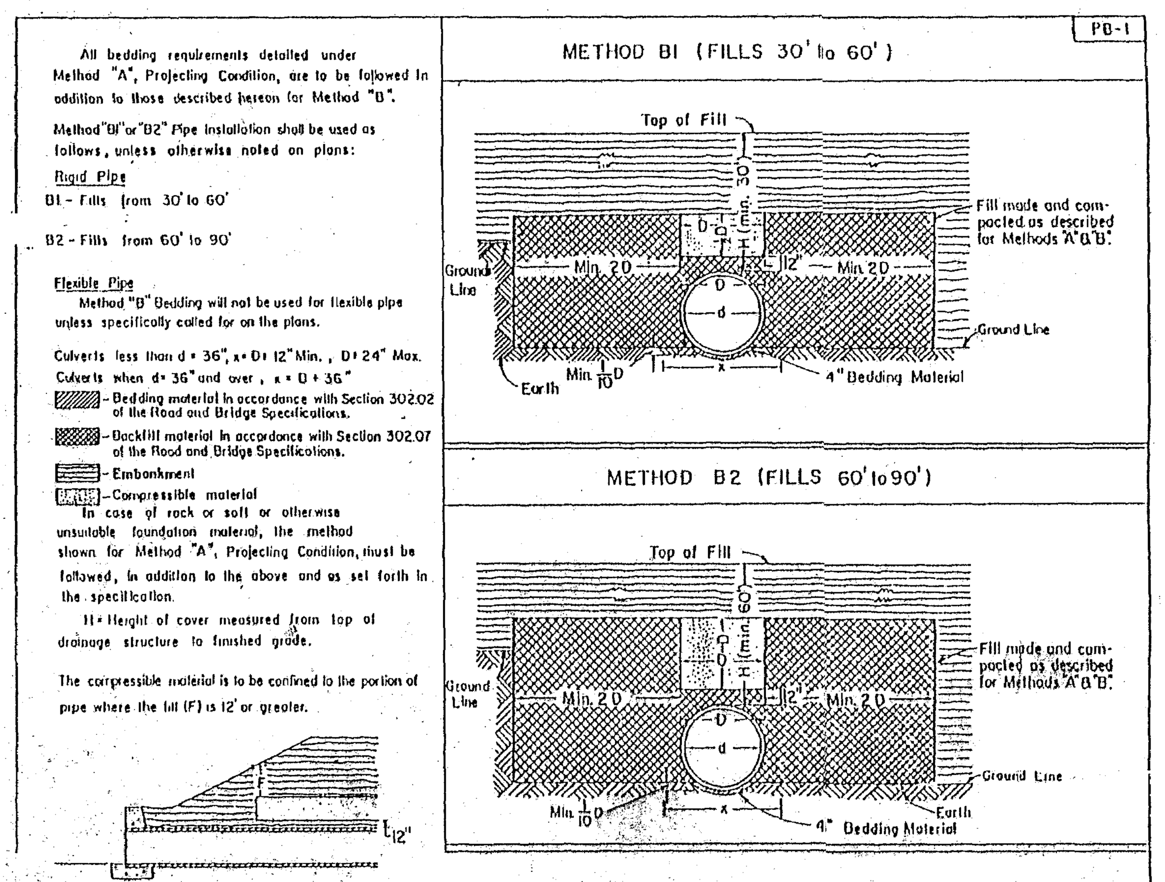
STANDARD DROP INLET
12"-24" PIPE MAXIMUM DEPTH (H)=10'
VIRGINIA DEPARTMENT TRANSPORTATION
104.01 — SPECIFICATION REFERENCE 233, 302



INSTALLATION OF PIPE CULVERTS AND STORM SEWERS
PIPE BEDDING – METHOD "A" (FILLS UP TO 30')
VIRGINIA DEPARTMENT OF TRANSPORTATION — Sheet 1 of 4
107.01 — SPECIFICATION REFERENCE 302, 303

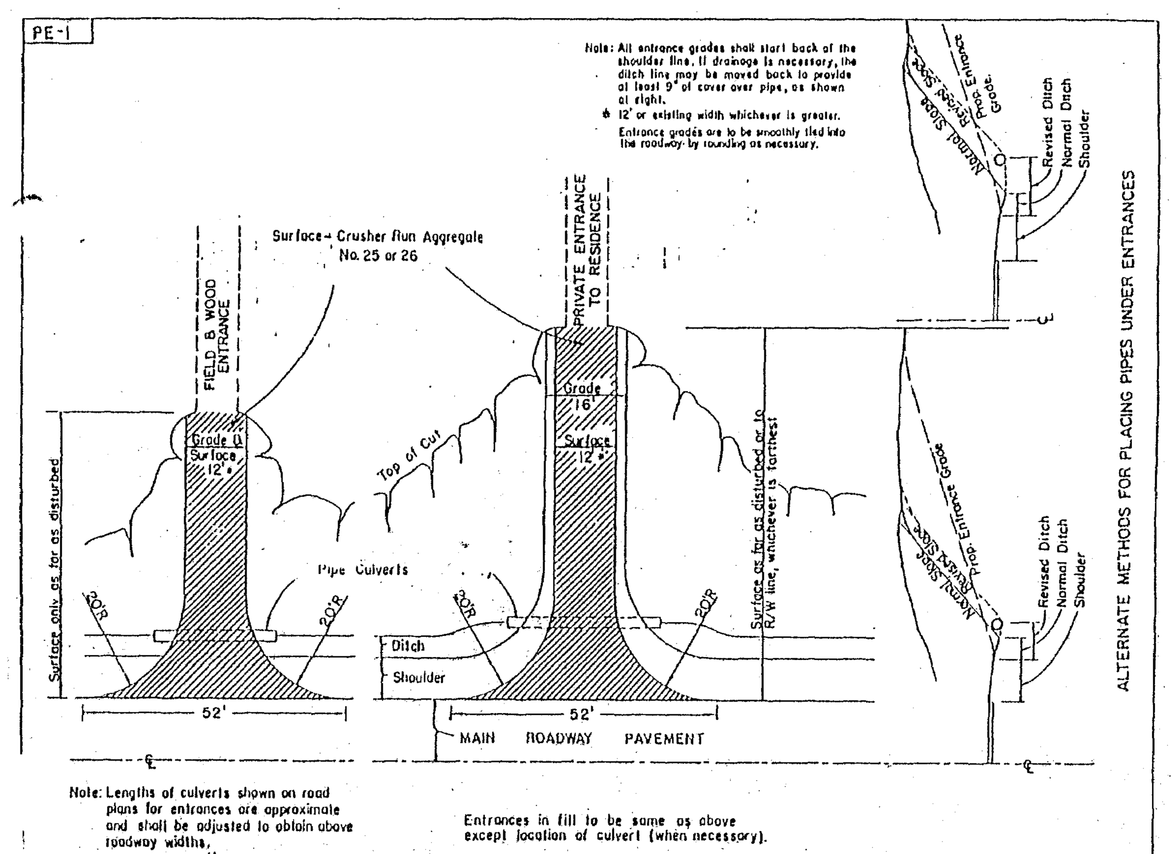


STONE FOR EROSION CONTROL
VIRGINIA DEPARTMENT of TRANSPORTATION
SPECIFICATION REFERENCE 204, 303, 245, 414 — 114.01



FOR SINGLE LINE INSTALLATION ONLY, NOT TO BE USED FOR MULTIPLE LINE CULVERTS

INSTALLATION OF PIPE CULVERTS AND STORM SEWERS
PIPE BEDDING – METHOD "B" (INDUCED TRENCH)
VIRGINIA DEPARTMENT OF TRANSPORTATION — Sheet 2 of 4
SPECIFICATION REFERENCE 302, 303 — 107.02



MINIMUM 15" RCP, LARGER SIZE PIPE AS WARRANTED.
24 FOOT MINIMUM LENGTH

STANDARD PRIVATE ENTRANCES
VIRGINIA DEPARTMENT of TRANSPORTATION
602.02 — SPECIFICATION REFERENCE 512

VDOT GENERAL NOTES

____ 1 All materials and construction within the public right of way shall be in accordance with current Virginia Department of Transportation's specifications and standards.

____ 2 Permits must be obtained from the Virginia Department of Transportation BEFORE construction is started within the existing right of way.

____ 3 Prior to any construction, the contractor shall consult the engineer and verify the approval of the plans by the various agencies.

____ 4 The contractor shall verify the elevations of all points of connection or proposed work to existing curbs, sanitary lines, water lines, etc., prior to construction.

____ 5 When soils occur that are unsuitable for foundations, subgrades, or other roadway purposes, the contractor shall be required to excavate such material below the grade shown on the plans. The areas so excavated shall be backfilled with suitable material and compacted in accordance with VDOT specifications. The contractor shall immediately inform the engineer upon discovery of the unsuitable material. Concurrence of the developer shall be obtained before additional on-site work is undertaken.

____ 6 All storm sewer pipe shall be reinforced tongue and grove concrete pipe in accordance with ASTM-C-76 or alternative pipe that has been approved on the plans. Pipe within the right of way shall be a minimum CL-111 or greater in accordance with VDOT standards 107.05 and specifications 232 and 302.

____ 7 Temporary drainage during construction is to be provided by the contractor to relieve areas that may cause damage to roadways or adjacent property.

____ 8 All concrete shall be class A3-AE (air entrained 3,000 PSI).

____ 9 Curb and gutter shall have 4" of aggregate base 21B under the curb and gutter and aggregate shall extend 1' beyond the back of the curb.

____ 10 All curb and gutter shall have a standard gutter entrance in accordance with VDOT standards.

____ 11 All entrances are to be built in accordance with VDOT standards.

____ 12 The developer is responsible for furnishing and installing stop signs at street intersections.

____ 13 Design or specified materials changes from the approved plans need to be re-submitted to VDOT. A letter needs to accompany the revised plans and/or drainage calculations which shall be submitted to VDOT for review and approval by the resident engineer.

____ 14 The contractor/sub-contractor shall have a current copy of VDOT's "Road and Bridge Specifications" and "Road and Bridge Standards" on the project.

____ 15 VDOT is to receive written notification 48 hours prior to the start of any work.

____ 16 The contractor shall be responsible for locating and protecting all utilities, whether or not shown on the plans, and shall repair at his own expense all utilities damaged by construction. Miss Utility must be contacted at 1-800-552-7001 72 hours prior to the beginning of construction.

____ 17 All utility pedestals, cabinets, fire hydrants, and street lights shall be located a minimum of 9.5' from the edge of pavement adjacent to the right of way line on curb and gutter streets and/or located behind the ditch line on open ditch streets. Pedestals and cabinets should be located at the property lines between lots. Where required, fire hydrant crossings shall have a minimum of 15" of RCP or larger, as warranted in open roadside ditches and have 8' length.

____ 18 All storm sewer pipes, drop inlets, and curb inlets shall be cleaned of debris and eroded material during last stages of construction.

____ 19 The contractor shall be responsible for replacing, with matching materials, any pavement, driveways, walks, curbs, etc., that must be cut or that are damaged during construction.

____ 20 Any errors, conflicts, or discrepancies in this plan shall be reported to the engineer for resolution before proceeding with the work.

____ 21 Compaction reports, with proctor, are required for subgrade, subbase, base, surface course, culverts, drainage structures, and utilities within the right of way by a certified materials test lab in accordance with VDOT specifications and standards.

____ 22 Installation of pipe culverts, storm sewers, and drainage structures shall have bedding material in accordance with VDOT specifications and standards. Backfill shall be suitable material free of debris, tree roots, and excess moisture, and compacted.

____ 23 All roadside ditches shown as paved on plans are to be paved in accordance with the standard typical section as shown on the plans, unless otherwise directed by the resident engineer, in writing. Any additional paving of the ditches, other than those shown on the road plans will be determined prior to acceptance of the roads into the VDOT secondary road system.

____ 24 VDOT and county approval of subdivision road plans does not preclude the right to add additional facilities.

____ 25 VDOT approval of these plans will expire three years from the date of approval.

____ 26 Clearing and grubbing shall be completed within the right of ways, and indicated on the layout plan.

____ 27 The subgrade must be approved by VDOT prior to placement of base.

____ 28 Base must be approved by VDOT for depth, template, and compaction before surface is applied.

____ 29 All utilities are to be in place prior to laying base material.

____ 30 An actual copy of the CBR report is to be submitted to VDOT prior to approval of the the pavement typical design. If the CBR values are less 10, the developer will be required to submit for our approval, his proposed method of construction.

____ 31 Paved ditches may be required where field conditions warrant. Generally, all ditches with slopes exceeding 3% or 1% or less shall be paved unless otherwise approved by the engineer, owner, VDOT, and the local governing body.

____ 32 All erosion and sediment control measures shall be the responsibility of the road contractor.

____ 33 All vegetation and overburden to be removed from shoulder to shoulder prior to the condition of subgrade.

____ 34 Certification and source of materials are to be submitted to VDOT of all materials and be in accordance with the "Road and Bridge Specifications" and "Road and Bridge Standards."

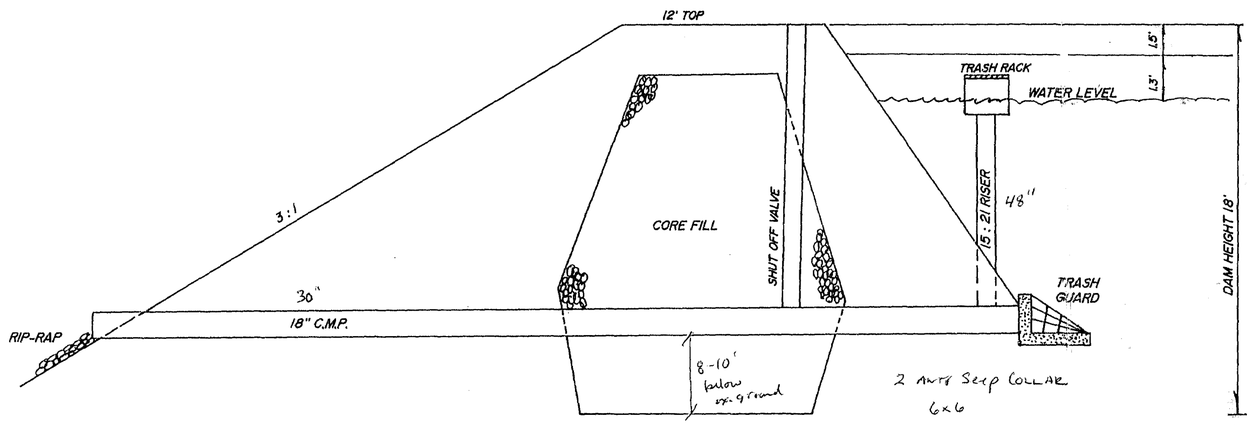
REVISIONS

No.	Date	Description

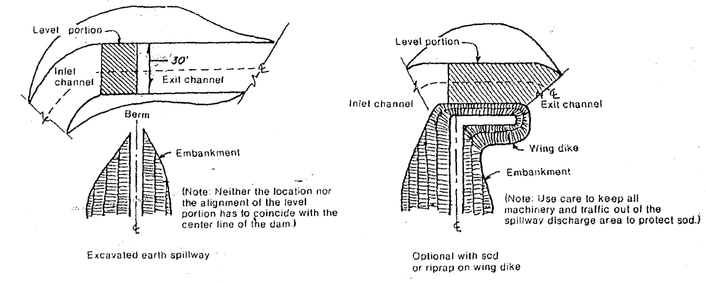
DJG
ENGINEERS · ARCHITECTS · SURVEYORS
INTERIOR DESIGNERS · PLANNERS
P.O. BOX 3505 WILLIAMSBURG, VIRGINIA 23187 (804) 253-0673 (804) 874-5015

VDOT STANDARD DETAILS AND NOTES
GROVE HILL ESTATES – SECTION TWO
OWNER/DEVELOPER: FERGUSON
JAMES CITY COUNTY VIRGINIA

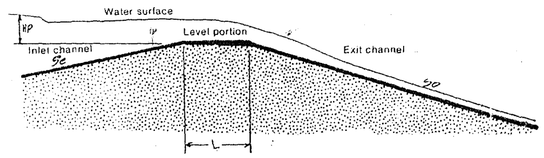
SCALE AS SHOWN
DESIGNED VDOT
DRAWN MEH
CHECKED WDJ
DATE 2-21-95
5723 COMMISSION NO.
SHEET C-4
5 OF 5



DAM & SPILLWAY SECTION



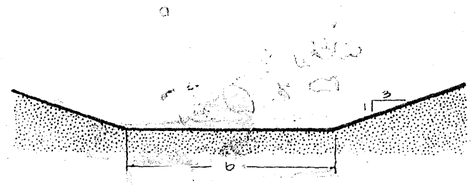
Plan view of earth spillways



Profile along centerline

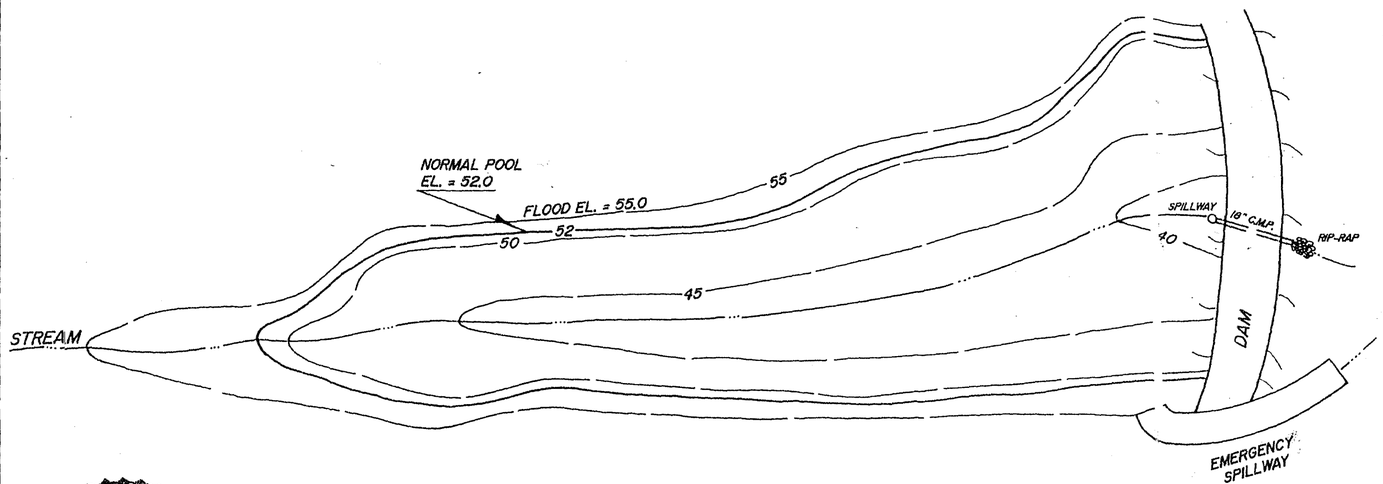
Definition of terms

Hp = depth of water in reservoir above crest
L = length of level portion min. 25 ft.
b = bottom width of spillway
So = slope for exit channel
Se = slope of inlet channel



Cross section of level portion

PROFILE & CROSS SECTION
EXCAVATED EARTH SPILLWAY
NO SCALE



POND PLAN
SCALE: 1" = 100'

NON-TIDAL WETLANDS TO BE FLOODED
4200 S.F. ± OR 0.1 ACRE ±

DRAINAGE CALCULATIONS

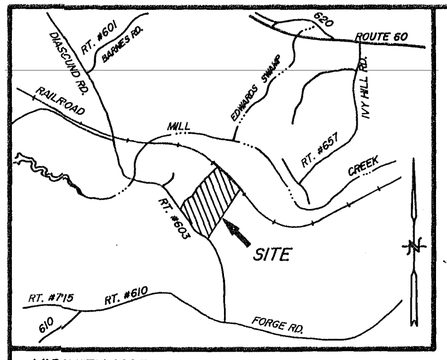
CURVE NUMBER IS 65
RAINFALL INTENSITY 25 YR = 6 MODERATE SLOPE
120 ACRE × 6 INCHES = 720 ACRE-INCHES
720 ACRE-INCHES ÷ 12 = 60 ACRE-FEET
720 ACRE-INCHES × 27154 GAL/ACRE-INCH = 19.5 MIL GALLONS
PEAK DISCHARGE = 55 CFS
Hp = 1.3
V = 5.2

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG # NO.
1633
LAND SURVEYOR

PREPARED BY
H. I. S. LAND SURVEYING
ROUTE #60
LANEXA, VIRGINIA 23089
(804) 966-7017

PLAN GROVE HILL ESTATES
ON PROPOSED POND
ON PROPERTY LOCATED OFF ROUTE #603
POWHATAN DISTRICT
JAMES CITY COUNTY , VIRGINIA

SCALE : NOTED DATE : FEBRUARY 16, 1994



VICINITY MAP

SOURCE OF TITLE:

THE PROPERTY SHOWN ON THIS PLAT WAS CONVEYED BY L. WALLACE SINK, ADMINISTRATOR C.T.A. OF THE ESTATE OF DAVID W. WARE TO J. FERGUSON AND SONS, INC. AND MARY WARE FERGUSON BY DEED DATED DECEMBER 8, 1993 AND RECORDED IN THE OFFICE OF THE CLERK OF THE CIRCUIT COURT OF THE COUNTY OF JAMES CITY IN DEED BOOK 659, PAGE 352.

NOTES:

1.) PROPERTY IS A PORTION OF TAX MAP #(10-4) (1-4).
2.) PROPERTY IS ZONED A1.
3.) TOTAL AREA IN SUBDIVISION = 73.97 ACRES ±
AREA IN LOTS = 524,061.74 S.F. OR 12.03 ACRES.
AREA IN RESIDUE = 61.94 ACRES ±.
4.) MINIMUM LOT SIZE = 3.00 ACRES.
5.) TOTAL NUMBER OF LOTS = 4.
6.) AVERAGE LOT SIZE = 3.01 ACRES.
7.) MINIMUM LOT WIDTH AT FRONT B.S.L. = 200'.
8.) MINIMUM BUILDING SETBACKS:
35' - FRONT
35' - REAR
15' - SIDE
9.) LOTS TO BE SERVED BY PRIVATE WELLS AND DRAINFIELDS.

OWNER'S CERTIFICATE:

THE SUBDIVISION OF LAND SHOWN ON THIS PLAT AND KNOWN AS GROVE HILL ESTATES, SECTION I IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRES OF THE UNDERSIGNED OWNERS, PROPRIETORS AND OR TRUSTEES.

DATE _____ J. FERGUSON AND SONS, INC. _____

DATE _____ MARY WARE FERGUSON _____

STATE OF VIRGINIA
CITY/COUNTY OF _____

I, _____ A NOTARY PUBLIC IN AND FOR THE CITY-COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN THE CITY-COUNTY AFORESAID.

GIVEN UNDER MY NAME THIS _____ DAY OF _____ 19 _____.

MY COMMISSION EXPIRES _____

NOTARY

CERTIFICATE OF APPROVAL:

THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD.

DATE _____ VIRGINIA DEPT. OF TRANSPORTATION _____

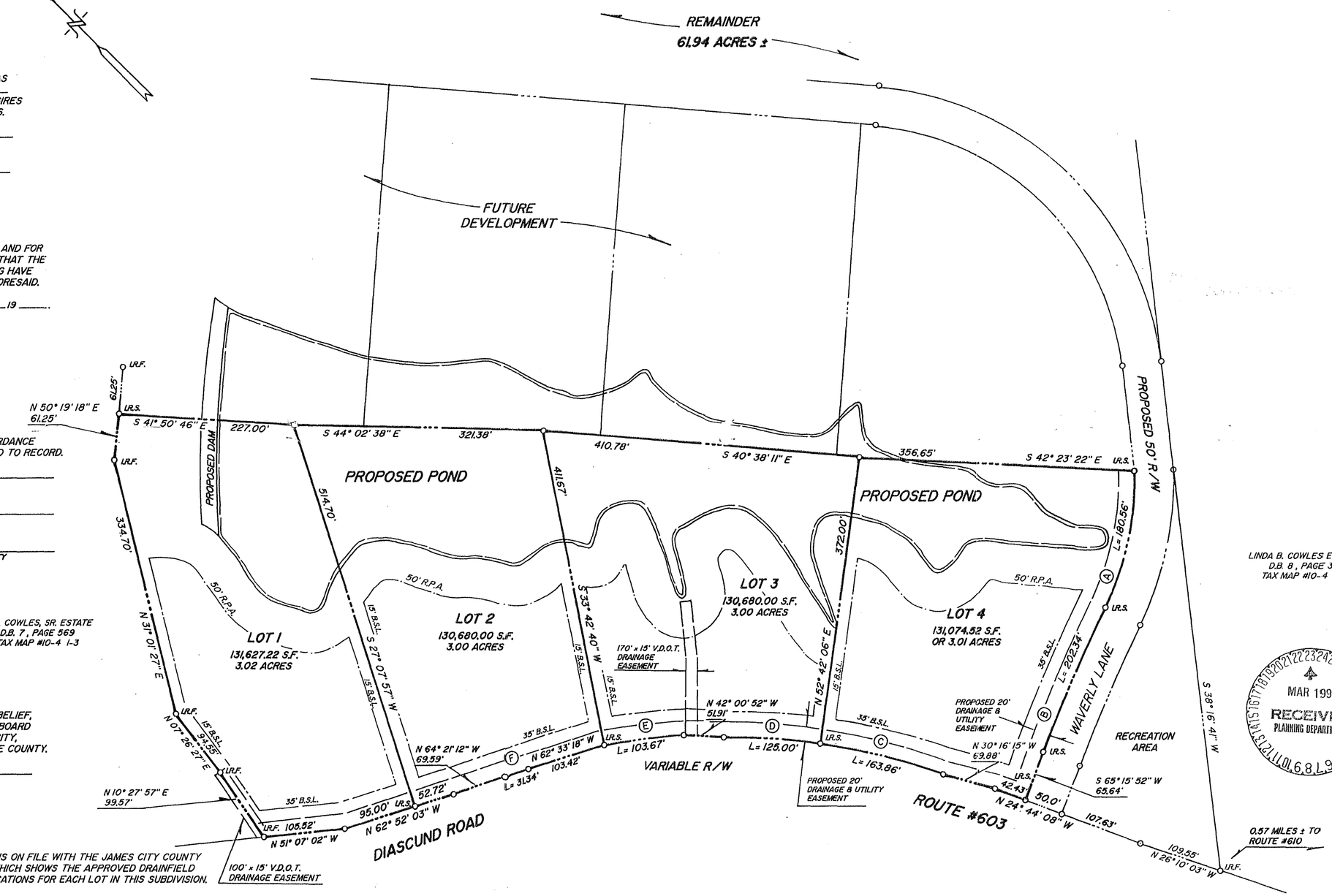
DATE _____ VIRGINIA DEPT. OF HEALTH _____

DATE _____ SUBDIVISION AGENT OF JAMES CITY COUNTY _____

SURVEYOR'S CERTIFICATE:

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE OR BELIEF, THIS PLAT COMPLIES WITH ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY.

DATE _____ DEAN E. RAYNES _____



NOTE:
A COPY OF THIS PLAT IS ON FILE WITH THE JAMES CITY COUNTY HEALTH DEPARTMENT WHICH SHOWS THE APPROVED DRAINFIELD AND RESERVE AREA LOCATIONS FOR EACH LOT IN THIS SUBDIVISION.

DRAINFIELD LOCATIONS SHOWN HEREON ARE PER SOIL TESTS PERFORMED BY ANN L. RUFF SOIL SCIENTIST.

MAR 1994
RECEIVED
PLANNING DEPARTMENT

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
REG # NO.
1633
LAND SURVEYOR

PREPARED BY
H. I. S. LAND SURVEYING
15500 RIVER BEND TRAIL
LANEXA, VIRGINIA 23089
(804) 966-7017

CURVE DATA

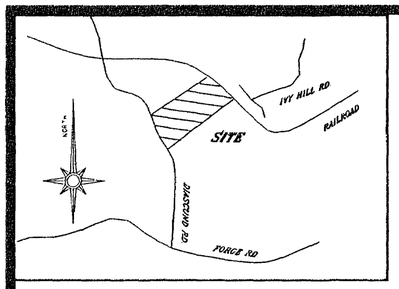
Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ
Δ = 27° 54' 53"	Δ = 05° 44' 24"	Δ = 11° 07' 50"	Δ = 08° 29' 26"	Δ = 07° 00' 00"	Δ = 02° 07' 43"
R = 370.60'	R = 2019.69'	R = 843.51'	R = 843.51'	R = 848.51'	R = 843.51'
L = 180.56'	L = 202.34'	L = 163.86'	L = 125.00'	L = 103.67'	L = 31.34'
C = 178.78'	C = 202.25'	C = 163.61'	C = 124.89'	C = 103.60'	C = 31.34'
CB = S 57° 02' 50" W	CB = S 68° 08' 04" W	CB = N 31° 43' 58" W	CB = N 41° 32' 37" W	CB = N 52° 47' 20" W	CB = N 64° 21' 12" W

SUBDIVISION PLAT
ON PROPERTY TO BE KNOWN AS
SECTION I
GROVE HILL ESTATES
LOCATED POWHATAN DISTRICT
JAMES CITY COUNTY , VIRGINIA

SCALE : 1" = 100' DATE : MARCH 21, 1994

J.O. # 33.9 F.B. "F" 5-24-94

DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 012



VICINITY MAP

CURVE TABLE

CURVE	RADIUS	TANGENT	LENGTH	DELTA	DEGREE	CHORD	CH.BEARING
C-1	324.68'	12.93'	25.85'	4°33'42"	17°38'49"	25.84'	N 40°33'32"E
C-2	342.87'	282.64'	472.75'	79°00'00"	16°42'39"	436.18'	N 01°13'19"W
C-3	60.00'	24.79'	47.02'	44°54'02"	95°29'35"	45.83'	N 63°10'20"W
C-4	60.00'	47.58'	80.45'	76°49'40"	95°29'35"	74.56'	N 47°12'31"W
C-5	60.00'	18.03'	35.03'	33°26'54"	95°29'35"	34.53'	N 07°55'46"E
C-6	60.00'	13.10'	25.79'	24°37'28"	95°29'35"	25.59'	N 36°57'57"E
C-7	60.00'	144.50'	141.27'	134°54'02"	95°29'35"	110.83'	S 63°16'18"E
C-8	60.00'	24.79'	47.02'	44°54'02"	95°29'35"	45.83'	S 18°16'18"E
C-9	35.00'	35.00'	54.98'	90°00'00"	163°42'08"	49.50'	S 85°43'19"E
C-10	376.42'	67.89'	134.33'	20°26'47"	15°13'16"	133.62'	N 39°03'17"E
C-11	35.00'	35.00'	54.98'	90°00'00"	163°42'08"	49.50'	N 04°16'41"E
C-12	392.87'	28.97'	57.84'	8°26'06"	14°35'02"	57.79'	N 36°30'16"W
C-13	392.87'	277.99'	483.85'	70°33'54"	14°35'02"	453.85'	N 02°59'44"E
C-14	374.68'	89.91'	176.47'	26°59'11"	15°17'31"	174.85'	N 51°46'16"E
C-15	35.00'	35.00'	54.98'	90°00'00"	163°42'08"	49.50'	N 20°15'52"E
C-16	35.00'	35.00'	54.98'	90°00'00"	163°42'08"	49.50'	N 69°44'08"W

SOURCE OF TITLE

THE PROPERTY SHOWN ON THIS PLAT WAS CONVEYED BY L. WALLACE SINK ADMINISTRATOR C.T.A. OF THE ESTATE OF DAVID W. WARE TO J. FERGUSON AND SONS, INC. AND MARY WARE FERGUSON BY DEED DATED DECEMBER 8, 1993 AND RECORDED IN THE OFFICE OF THE CLERK OF THE CIRCUIT COURT OF THE COUNTY OF JAMES CITY IN DEED BOOK 659, PAGE 352.

NOTES:

1)PROPERTY IS A PORTION OF TAX MAP #(10-4) (1-4)
2)PROPERTY IS ZONED A1
3)TOTAL AREA IN SUBDIVISION = 61.95 ACRES
AREA IN LOTS =1309687 SF OR 30.07 ACRES
AREA IN REC. AREA = 43931 SF OR 1.01 ACRES
AREA IN ROADS = 104197 SF OR 2.39 ACRES
AREA IN RESIDUE = 24.48 ACRES
4)TOTAL NUMBER OF LOTS = 10
5)AVERAGE LOT SIZE = 3.01 ACRES
6) MINIMUM LOT SIZE = 3.0 ACRES
7)MINIMUM LOT WIDTH AT FRONT B.S.L = 200'
8)MINIMUM BUILDING SETBACKS:
75' FRONT
35' REAR
15' SIDE
9)LOTS TO BE SERVED BY PRIVATE WELL AND DRAINFIELDS

OWNER'S CERTIFICATE:

THE SUBDIVISION OF LAND SHOWN ON THIS KNOWN AS GROVE HILL ESTATES, SECTION TWO IS WITH FREE CONSENT AND IN ACCORDANCE WITH THE DESIRES OF THE UNDERSIGNED OWNERS, PROPRIETORS AND OR TRUSTEES.

DATE J. FERGUSON AND SONS INC

DATE MARY WARE FERGUSON

STATE OF VIRGINIA
COUNTY OF JAMES CITY
I_____ A NOTARY PUBLIC IN AND FOR THE COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED BEFORE ME IN THE COUNTY AFORESAID.

GIVEN UNDER MY HAND THIS____ DAY OF_____ 1995.

MY COMMISSION EXPIRES_____

NOTARY

CERTIFICATE OF APPROVAL:

THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD.

DATE VDOT

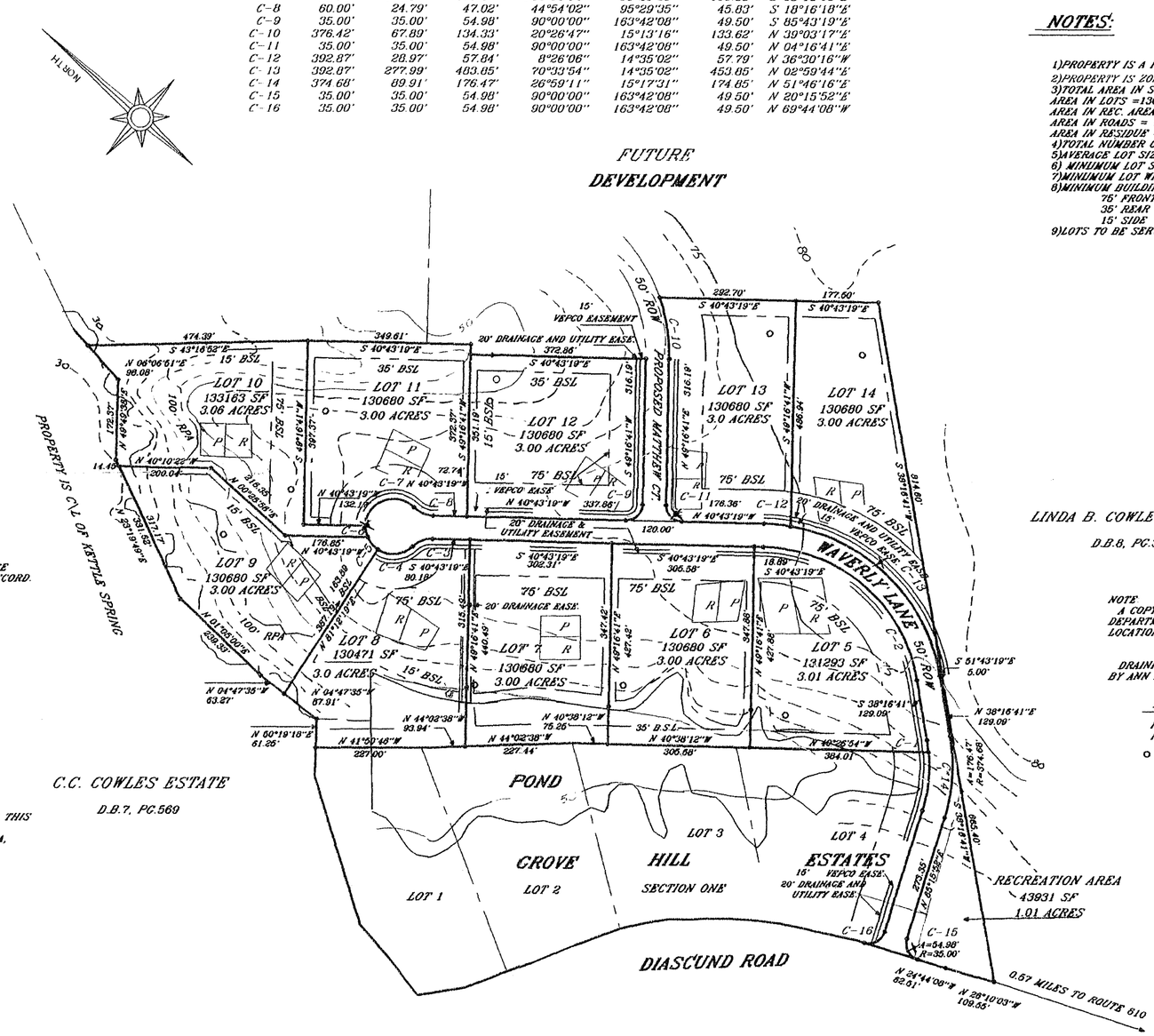
DATE VIRGINIA DEPT OF HEALTH

DATE SUBDIVISION AGENT OF JAMES CITY CO.

SURVEYOR'S CERTIFICATE:

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, THIS PLAT COMPLIES WITH ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY.

3/3/95 DEAN E. RAYNES C.L.S. 1633
DATE



NOTE
A COPY OF THIS PLAT IS ON FILE WITH THE JAMES CITY COUNTY HEALTH DEPARTMENT WHICH SHOWS THE APPROVED DRAINFIELD AND RESERVE AREA LOCATIONS FOR EACH LOT IN THIS SUBDIVISION.

DRAINFIELD LOCATIONS SHOWN HEREON AREPER SOIL TESTS PERFORMED BY ANN L. RUFF SOIL SCIENTIST.

LEGEND:
P PRIMARY DRAINFIELD LOCATION
R RESERVE AREA LOCATION
O WELL

MAR 1995
RECEIVED
PLANNING DEPARTMENT

SUBDIVISION PLAT
ON PROPERTY KNOWN AS
SECTION TWO
GROVE HILL ESTATES
STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE:1"=200' DATE:1/19/95
J.N. 33.9

HIS LAND SURVEYING, INC.
15500 RIVER BEND TRAIL
LANEXA, VIRGINIA 23089
(804)966-7017

S-20-95

STORMWATER DRAINAGE AND BMP CALCULATIONS

FOR

GROVE HILL SUBDIVISION

BY

Keep BMP file - ?
Scott Joan

DJG, INC.
1006 RICHMOND ROAD
WILLIAMSBURG, VA 23185

FEBRUARY 21, 1995

DC 011
S-24-94 PH I
S-20-95 PH II

DJG COMMISSION NO. 5723

THE DEYOUNG-JOHNSON GROUP, INC.

SOLUTION FOR A TRIANGULAR CHANNEL

INE IV, RUN 1, A-B, DESIGN

ISCHARGE	0.59 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.04 FPS	SIDE SLOPE	3.00 TO 1
ORMAL DEPTH	0.44 FEET	AREA	0.57 SQ.FT.
OTTOM SLOPE	0.01000	TOP WIDTH	2.61 FEET
MANNING'S N	0.0500		
RITICAL DEPTH	0.30 FEET	VELOCITY HEAD	0.02 FEET
ROUDE NUMBER	0.39	P + M	6 POUNDS
CRITICAL SLOPE	0.07359		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, A-B, CAPACITY

DISCHARGE	11.60 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.19 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01000	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.99 FEET	VELOCITY HEAD	0.07 FEET
FROUDE NUMBER	0.47	P + M	196 POUNDS
CRITICAL SLOPE	0.04947		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, C-D, DESIGN

DISCHARGE	1.24 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.34 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.56 FEET	AREA	0.93 SQ.FT.
BOTTOM SLOPE	0.01200	TOP WIDTH	3.33 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.40 FEET	VELOCITY HEAD	0.03 FEET
FROUDE NUMBER	0.45	P + M	14 POUNDS
CRITICAL SLOPE	0.06665		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, C-D, CAPACITY

DISCHARGE	12.71 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.39 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01200	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.02 FEET	VELOCITY HEAD	0.09 FEET
FROUDE NUMBER	0.52	P + M	206 POUNDS
CRITICAL SLOPE	0.04887		

LINE IV, RUN 1, D-E 15" CULVERT DESIGN

[illegible]

[illegible]

[illegible]	= [illegible]	[illegible]	[illegible]
Depth (ft)	= [illegible]	Velocity (ft/s)	[illegible]
Discharge (cfs)	= [illegible]	Froude Number	[illegible]
Manning's n	= [illegible]	Critical Depth (ft)	= [illegible]
Slope(decimal)	= [illegible]	Normal Depth (ft)	= [illegible]
Diameter (in)	= [illegible]	Hydraulic Radius (ft)	= [illegible]
		Depth to Centroid(ft)	= [illegible]
		Top Width (ft)	= [illegible]

LINE IV, RUN 1, D-E (15" CULVERT) CAPACITY

Created : Revised
20-Feb-95 20-Feb-95 11:38

MANNING'S EQUATION (Circular cross-section)

Shape (ft)	= (MODE)	Area (sq ft)	= 1.27
Depth (ft)	= (1.25)	Velocity (ft/s)	= 5.20
Discharge (cfs)	= (6.46) <---	Froude Number	=
Manning's n	= (.013)	Critical Depth (ft)	= 1.22
Slope (decimal)	= (.01)	Normal Depth (ft)	= 1.22
Diameter (in)	= (15)	Hydraulic Radius (ft)	= 0.31
		Depth to Centroid (ft)	= 0.62
		Top Width (ft)	= 0.00

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, E-F, DESIGN

DISCHARGE	2.49 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.49 FPS 2.06	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.75 FEET	AREA	1.67 SQ.FT.
BOTTOM SLOPE	0.01000 2%	TOP WIDTH	4.48 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.53 FEET	VELOCITY HEAD	0.03 FEET
FROUDE NUMBER	0.43	P + M	33 POUNDS
CRITICAL SLOPE	0.06073		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, E-F, CAPACITY

DISCHARGE	11.60 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.19 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01000	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.99 FEET	VELOCITY HEAD	0.07 FEET
FROUDE NUMBER	0.47	P + M	196 POUNDS
CRITICAL SLOPE	0.04947		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 1, F-B, DESIGN

DISCHARGE	2.77 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.90 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.70 FEET	AREA	1.46 SQ.FT.
BOTTOM SLOPE	0.01800	TOP WIDTH	4.18 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.56 FEET	VELOCITY HEAD	0.06 FEET
FROUDE NUMBER	0.57	P + M	31 POUNDS
CRITICAL SLOPE	0.05988		

SOLUTION FOR A TRIANGULAR CHANNEL

LINR IV, RUN 1, F-B, CAPACITY

DISCHARGE	15.56 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.93 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01800	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.11 FEET	VELOCITY HEAD	0.13 FEET
FROUDE NUMBER	0.63	P + M	235 POUNDS
CRITICAL SLOPE	0.04757		

LINE IV, RUN 1, B-G (15" CULVERT) DESIGN

Created: Mathcad
02-Feb-98 02-Feb-98 11:30

MANNING'S EQUATION — Circular cross-section

Units (ft)	= FEET	Area (sq ft)	= 0.32
Depth (ft)	= <0.5>	Velocity (ft/s)	= 1.67
Discharge (cfs)	= <0.53>	Froude Number	= 0.87
Manning's n	= <.017>	Critical Depth (ft)	= 0.74
Slope(decimal)	= <.005>	Normal Depth (ft)	= 0.80
Diameter (in)	**= <15>**	**Hydraulic Radius (ft)**	**= 0.36**
		Depth to Centroid(ft)	**= 0.35**
		Top Width (ft)	**= 1.20**

LINE IV, RUN 1, B-G (15" CULVERT) CAPACITY

Created/Revised
20-Feb-95 20-Feb-95 [illegible]

MANNING'S EQUATION — Circular Cross-section

Units (ft)	=	FTE!	Area (sq ft)	=	[illegible]
Depth (ft)	=	<1.25>	Velocity (ft/s)	=	3.74
Discharge (cfs)	**= <4.57>**	**<---**	Froude Number	=	---
Manning's n	**= <.013>**		**Critical Depth (ft)**	**=**	**0.87**
Slope(decimal)	**= <.005>**		**Normal Depth (ft)**	**=**	**1.02**
Diameter (in)	**= <15>**		**Hydraulic Radius (ft)**	**=**	**0.31**
			Depth to Centroid(ft)	=	0.63
			Top Width (ft)	=	0.00

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, A-G, DESIGN

DISCHARGE	0.59 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.04 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.44 FEET	AREA	0.57 SQ.FT.
BOTTOM SLOPE	0.01000	TOP WIDTH	2.61 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.30 FEET	VELOCITY HEAD	0.02 FEET
FROUDE NUMBER	0.39	P + M	6 POUNDS
CRITICAL SLOPE	0.07359		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, A-G, CAPACITY

DISCHARGE	11.60 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.19 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01000	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.99 FEET	VELOCITY HEAD	0.07 FEET
FROUDE NUMBER	0.47	P + M	196 POUNDS
CRITICAL SLOPE	0.04947		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, C-D, DESIGN

DISCHARGE	1.06 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.29 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.52 FEET	AREA	0.82 SQ.FT.
BOTTOM SLOPE	0.01200	TOP WIDTH	3.14 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.38 FEET	VELOCITY HEAD	0.03 FEET
FROUDE NUMBER	0.44	P + M	12 POUNDS
CRITICAL SLOPE	0.06806		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, C-D, CAPACITY

DISCHARGE	12.71 CFS	BASE WIDTH	0.00 FEET
VELOCITY	2.39 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.01200	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.02 FEET	VELOCITY HEAD	0.09 FEET
FROUDE NUMBER	0.52	P + M	206 POUNDS
CRITICAL SLOPE	0.04887		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, D-G, DESIGN

DISCHARGE	1.54 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.74 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.54 FEET	AREA	0.88 SQ.FT.
BOTTOM SLOPE	0.02100	TOP WIDTH	3.26 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.44 FEET	VELOCITY HEAD	0.05 FEET
FROUDE NUMBER	0.59	P + M	15 POUNDS
CRITICAL SLOPE	0.06475		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 2, D-G, CAPACITY

DISCHARGE	16.81 CFS	BASE WIDTH	0.00 FEET
VELOCITY	3.17 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.02100	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.14 FEET	VELOCITY HEAD	0.16 FEET
FROUDE NUMBER	0.68	P + M	250 POUNDS
CRITICAL SLOPE	0.04708		

LINE IV, RUN 3, G-H (18" PIPE) DESIGN

5.1

18"

0.5%

.013

Q=7.4 cfs

LINE IV RUN 3, 3-- (8" PIPE) CAPACITY

[illegible]

[illegible]

Depth (ft) = [illegible]

Discharge (cfs) = 7.17[illegible]

Manning's n = [illegible]

Slope (ft/ft) = [illegible]

Diameter (in) = [illegible]

[illegible]

Froude Number = [illegible]

Critical Depth (ft) = [illegible]

Normal Depth (ft) = [illegible]

Hydraulic Radius (ft) = [illegible]

Depth to Diameter = [illegible]

Top Width (ft) = [illegible]

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 3, H-I, DESIGN

DISCHARGE	5.57 CFS	BASE WIDTH	0.00 FEET
VELOCITY	11.84 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.40 FEET	AREA	0.47 SQ.FT.
BOTTOM SLOPE	0.10000	TOP WIDTH	2.37 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	0.73 FEET	VELOCITY HEAD	2.18 FEET
FROUDE NUMBER	4.69	P + M	132 POUNDS
CRITICAL SLOPE	0.00369		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE IV, RUN 3, H-I, CAPACITY

DISCHARGE	141.10 CFS	BASE WIDTH	0.00 FEET
VELOCITY	26.59 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.10000	TOP WIDTH	7.98 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	2.68 FEET	VELOCITY HEAD	10.99 FEET
FROUDE NUMBER	5.75	P + M	7424 POUNDS
CRITICAL SLOPE	0.00240		

Calculated By: GOERING Date: 1-15-95
Checked By: Date:
N= 0.013 (CEMENT) 0.05 (GRASS)
Storm Frequency 10-YR

P.O. Box 3505
Williamsburg, Virginia 23187

Project No.:
Project Desc. GROVE HILL
Sheet ____ of ____ Sheets

STORM DRAINAGE COMPUTATION SHEET

LOCATION				RUN-OFF										PIPE - CHANNEL DESIGN						HYDRAULIC GRADE LINE								
				AREA-ACRES					TIME OF FLOW - MIN.																			
LINE	RUN	FROM	TO	INCREMENT	TOTAL	RUN-OFF COEFF.	INCREMENTAL CA	ACCUMULATED CA	TO INLET/ UPPER REACH	WITHIN REACH CONVEYANCE	TIME OF CONCENTRATION	INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL C.F.S.	VELOCITY FULL F.P.S.	DESIGN VELOCITY F.P.S.	CONVEYANCE LENGTH FT.	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE FT./FT.	VELOCITY F.P.S.	$V^2/2G$ FT.	H.G.L. ELEV. UPSTREAM	H.G.L. ELEV. DOWNSTREAM	COVER ELEV. TOP OF BANK
IV	1	A	B	0.13	0.13	0.43	0.09	0.09	7	0.5	7.5	6.5	0.59	—	GRASS V-DITCH	0.01	11.6	2.2	1.0	260	53.42	51.27						
		C	D	0.72	0.72	0.37	0.27	0.27	14	4.8	18.8	4.6	1.24	—	"	0.012	12.7	2.4	1.3	650	64.81	56.35						
		D	E	0.02	0.74	0.41	0.30	0.30	2	0	2	7.5	2.25	15"	—	0.010	6.5	5.3	4.8	48	56.95	56.[illegible]						
		E	F	0.13	0.87	0.40	0.05	0.35	4	0.7	4.7	7.1	2.49	—	GRASS V-DITCH	0.010	11.6	2.2	1.5	202	56.47	55.~~72~~ 1.67						
		F	B	0.10	0.97	0.40	0.04	0.39	4	0.5	4.5	7.1	2.77	—	"	0.018	15.6	2.9	1.9	158	54.42	51.27						
		B	G	0.0	1.10								3.36	15"	—	0.005	4.6	3.7	4.1	48	51.27	51.03						
IV	2	A	G	0.13	0.13	0.43	0.09	0.09	7	0.5	7.5	6.5	0.59	—	GRASS V-DITCH	0.01	11.6	2.2	1.0	235	53.42	51.03						
		C	D	0.44	0.44	0.40	0.18	0.18	4	6.2	10.2	5.9	1.06	—	"	0.012	12.7	2.4	1.3	850	64.81	54.42						
		D	G	0.10	0.54	0.40	0.04	0.22	4	1	5	7	1.54	—	"	0.021	16.8	3.2	1.7	158	54.42	51.03						
IV	3	G	H	0.0	1.77								5.49	18"	—	0.005	7.4	4.2	4.6	240	50.78	49.58						
		H	I	0.06	0.06	0.15	0.01	0.01	1	0.2	1.2	8.2	5.57	—	PAVED V-DITCH	0.10	141.1	26.6	11.8	80	49.58	41.57						

SOLUTION FOR A TRIANGULAR CHANNEL

LINE I, RUN 1, A-B, DESIGN

ISCHARGE	0.09 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.17 FPS	SIDE SLOPE	3.00 TO 1
ORMAL DEPTH	0.16 FEET	AREA	0.08 SQ.FT.
OTTOM SLOPE	0.04800	TOP WIDTH	0.96 FEET
MANNING'S N	0.0500		
RITICAL DEPTH	0.14 FEET	VELOCITY HEAD	0.02 FEET
ROUDE NUMBER	0.73	P + M	0 POUNDS
CRITICAL SLOPE	0.09455		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE 1, RUN 1, A-6, CAPACITY

DISCHARGE	25.42 CFS	BASE WIDTH	0.00 FEET
VELOCITY	4.79 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.04800	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.35 FEET	VELOCITY HEAD	0.36 FEET
FROUDE NUMBER	1.04	P + M	383 POUNDS
CRITICAL SLOPE	0.04455		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE 1, RUN 1, B-C, DESIGN

DISCHARGE	0.75 CFS	BASE WIDTH	0.00 FEET
VELOCITY	6.31 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.20 FEET	AREA	0.12 SQ.FT.
BOTTOM SLOPE	0.07100	TOP WIDTH	1.19 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	0.33 FEET	VELOCITY HEAD	0.62 FEET
FROUDE NUMBER	3.53	P + M	10 POUNDS
CRITICAL SLOPE	0.00482		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE 1, RUN 1, 8-C, CAPACITY

DISCHARGE	118.89 CFS	BASE WIDTH	0.00 FEET
VELOCITY	22.40 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ. FT.
BOTTOM SLOPE	0.07100	TOP WIDTH	7.98 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	2.50 FEET	VELOCITY HEAD	7.80 FEET
FROUDE NUMBER	4.84	P + M	5314 POUNDS
CRITICAL SLOPE	0.00245		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE I, RUN 2, A-B, DESIGN

DISCHARGE	0.15 CFS	BASE WIDTH	0.00 FEET
VELOCITY	0.99 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.22 FEET	AREA	0.15 SQ.FT.
BOTTOM SLOPE	0.02200	TOP WIDTH	1.35 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.17 FEET	VELOCITY HEAD	0.02 FEET
FROUDE NUMBER	0.52	P + M	1 POUNDS
CRITICAL SLOPE	0.08833		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE I, RUN 2, A-B, CAPACITY

DISCHARGE	17.21 CFS	BASE WIDTH	0.00 FEET
VELOCITY	3.24 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.02200	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.15 FEET	VELOCITY HEAD	0.16 FEET
FROUDE NUMBER	0.70	P + M	255 POUNDS
CRITICAL SLOPE	0.04693		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE I, RUN 2, B-C, DESIGN

DISCHARGE	1.24 CFS	BASE WIDTH	0.00 FEET
VELOCITY	7.04 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.24 FEET	AREA	0.18 SQ.FT.
BOTTOM SLOPE	0.06600	TOP WIDTH	1.43 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	0.40 FEET	VELOCITY HEAD	0.77 FEET
FROUDE NUMBER	3.57	P + M	18 POUNDS
CRITICAL SLOPE	0.00451		

S[illegible] FOR A TRIANGULAR CHANNEL

LINE I, RUN 2, B-C, CAPACITY

DISCHARGE	116.35 CFS	BASE WIDTH	0.00 FEET
VELOCITY	21.93 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.06800	TOP WIDTH	7.98 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	2.48 FEET	VELOCITY HEAD	7.47 FEET
FROUDE NUMBER	4.74	P + M	5095 POUNDS
CRITICAL SLOPE	0.00246		

LINE I, RUN2, C-D, 48" RCP CULVERT, DESIGN

[illegible]

MANNING'S EQUATION Circular Cross Section

Units (ft)	=	FEET	Area (sq ft)	=	9.50
Depth (ft)	=	<2.38> <----	Velocity (ft/s)	=	11.44
Discharge (cfs)	=	<75>	Froude Number	=	1.[illegible]
Manning's n	=	<.015>	Critical Depth (ft)	=	3.00
Slope(decimal)	=	<.00833>	Normal Depth (ft)	=	2.38
Diameter (in)	=	<48>	Hydraulic Radius (ft)	=	1.17
			Depth to Centroid (ft)	=	1.12
			Top Width (ft)	=	3.00

LINE I, RUN 2, C-D, 48" RCP CULVERT, CAPACITY

MANNING'S EQUATION

Units (ft) = [illegible]

Depth (ft) = [illegible]

Discharge (cfs) = [illegible]

Manning's n = [illegible]

Slope(decimal) = <.00833>

Diameter (in) = <48>

Hydraulic Radius (ft)= 1.00

Depth to Centroid(ft)= 2.20

Top Width (ft) = 0.00

SOLUTION FOR A TRIANGULAR CHANNEL

LINE II, A-B, DESIGN

DISCHARGE	0.09 CFS	BASE WIDTH	0.00 FEET
VELOCITY	0.98 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.18 FEET	AREA	0.10 SQ.FT.
BOTTOM SLOPE	0.02300	TOP WIDTH	1.10 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.14 FEET	VELOCITY HEAD	0.01 FEET
FROUDE NUMBER	0.51	P + M	1 POUNDS
CRITICAL SLOPE	0.09455		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE II, A-R, CAPACITY

DISCHARGE	17.09 CFS	BASE WIDTH	0.00 FEET
VELOCITY	3.32 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.02300	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.16 FEET	VELOCITY HEAD	0.17 FEET
FROUDE NUMBER	0.72	P + M	260 POUNDS
CRITICAL SLOPE	0.04679		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE I.I. B-D, DESIGN

DISCHARGE	0.75 CFS	BASE WIDTH	0.00 FEET
VELOCITY	6.35 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.20 FEET	AREA	0.12 SQ.FT.
BOTTOM SLOPE	0.07200	TOP WIDTH	1.19 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	0.33 FEET	VELOCITY HEAD	0.63 FEET
FROUDE NUMBER	3.55	P + M	10 POUNDS
CRITICAL SLOPE	0.00482		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE (I, B-). CAPACITY

DISCHARGE	119.73 CFS	BASE WIDTH	0.00 FEET
VELOCITY	22.56 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.07200	TOP WIDTH	7.98 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	2.51 FEET	VELOCITY HEAD	7.91 FEET
FROUDE NUMBER	4.88	P + M	5386 POUNDS
CRITICAL SLOPE	0.00245		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE III, A-B, DESIGN

DISCHARGE	0.16 CFS	BASE WIDTH	0.00 FEET
VELOCITY	1.00 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.23 FEET	AREA	0.16 SQ.FT.
BOTTOM SLOPE	0.02200	TOP WIDTH	1.38 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	0.13 FEET	VELOCITY HEAD	0.02 FEET
FROUDE NUMBER	0.52	P + M	1 POUNDS
CRITICAL SLOPE	0.08757		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE III, A-B, CAPACITY

DISCHARGE	17.21 CFS	BASE WIDTH	0.00 FEET
VELOCITY	3.24 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.02200	TOP WIDTH	7.98 FEET
MANNING'S N	0.0500		
CRITICAL DEPTH	1.15 FEET	VELOCITY HEAD	0.16 FEET
FROUDE NUMBER	0.70	P + M	255 POUNDS
CRITICAL SLOPE	0.04693		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE (I), E-D, DESIGN

DISCHARGE	0.72 CFS	BASE WIDTH	0.00 FEET
VELOCITY	6.69 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	0.19 FEET	AREA	0.11 SQ.FT.
BOTTOM SLOPE	0.08500	TOP WIDTH	1.14 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	0.32 FEET	VELOCITY HEAD	0.69 FEET
FROUDE NUMBER	3.83	P + M	10 POUNDS
CRITICAL SLOPE	0.00484		

SOLUTION FOR A TRIANGULAR CHANNEL

LINE III, B-D, CAPACITY

DISCHARGE	130.09 CFS	BASE WIDTH	0.00 FEET
VELOCITY	24.51 FPS	SIDE SLOPE	3.00 TO 1
NORMAL DEPTH	1.33 FEET	AREA	5.31 SQ.FT.
BOTTOM SLOPE	0.06500	TOP WIDTH	7.98 FEET
MANNING'S N	0.0130		
CRITICAL DEPTH	2.59 FEET	VELOCITY HEAD	9.34 FEET
FROUDE NUMBER	5.30	P + M	6332 POUNDS
CRITICAL SLOPE	0.00242		

Calculated By: G. [illegible] Date: 2-15-[illegible]
Checked By: _____ Date: _____
N= [illegible] 0.051 [illegible]
Storm Frequency [illegible]

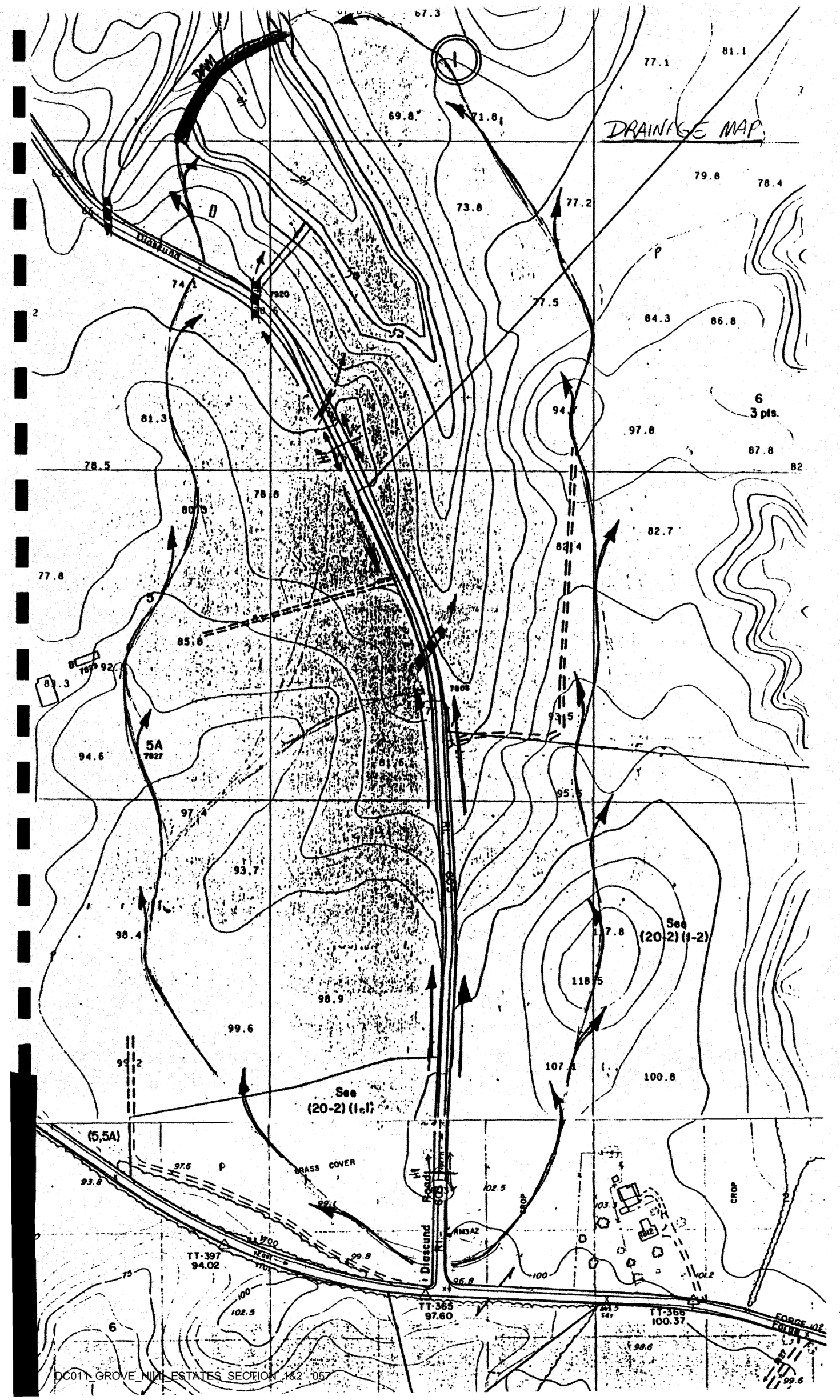
DJG
P.O. Box 3505
Williamsburg, Virginia 23187

Project No.: _____
Project Desc. [illegible]

Sheet _____ of _____ Sheets

STORM DRAINAGE COMPUTATION SHEET

LOCATION				RUN-OFF										PIPE - CHANNEL DESIGN						HYDRAULIC GRADE LINE								
				AREA-ACRES					TIME OF FLOW - MIN.																			
LINE	RUN	FROM	TO	INCREMENT	TOTAL	RUN-OFF COEFF.	INCREMENTAL CA	ACCUMULATED CA	TO INLET/ UPPER REACH	WITHIN REACH CONVEYANCE	TIME OF CONCENTRATION	INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL C.F.S.	VELOCITY FULL F.P.S.	DESIGN VELOCITY F.P.S.	CONVEYANCE LENGTH FT.	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE FT./FT.	VELOCITY F.P.S.	$V^2/2G$ FT.	H.G.L. ELEV. UPSTREAM	H.G.L. ELEV. DOWNSTREAM	COVER ELEV. TOP OF BANK
I	1	A	B	0.05	0.05	0.27	0.014	0.014	6	2	8	6.4	0.09	—	GRASS V-DITCH	0.048	25.4	4.8	1.2	30	64.00	62.56						
		E	C	0.35	0.4	0.27	0.095	0.11	6	0.4	6.4	6.8	0.75	—	PAVED V-DITCH	0.071	118.[illegible]	22.4	6.3	290	62.56	423						
	2	A	B	0.1	0.1	0.35	0.035	0.035	7	2	9	6	0.15	—	GRASS V-DITCH	0.022	17.2	3.2	1.0	100	64.81	62.61						
		B	C	0.6	0.7	0.27	0.16	0.19	7	0.4	7.4	6.5	1.24	—	PAVED V-DITCH	0.068	116.[illegible]	21.2	7.0	700	62.61	43.3						
		C	D	58.9	60.0	0.44	25.9	26.4	14	15	29	3.7	98	48"	—	0.008	131.1	10.4	11.4	60	42.1	41.6						
II		A	B	0.05	0.05	0.27	0.014	0.014	6	2	8	6.4	0.09	—	GRASS V-DITCH	0.023	17.6	3.3	0.9	30	63.25	62.56						
		B	D	0.35	0.4	0.27	0.095	0.11	6	0.4	6.4	6.8	0.75	—	PAVED V-DITCH	0.072	119.7	22.6	6.4	290	62.56	41.8						
III		A	B	0.1	0.1	0.27	0.027	0.027	7	2	9	6	0.16	—	GRASS V-DITCH	0.022	17.2	3.2	1.0	100	64.81	62.61						
		B	D	0.3	0.4	0.27	0.08	0.11	7	0.4	7.4	6.5	0.72	—	PAVED V-DITCH	0.085	130.1	24.5	6.7	242	62.61	41.8						


DRAINAGE MAP
DAM
Diversion
D
P
5
5A
7927
7920
7906
6
3 pts.
See
(20-2) (1-2)
See
(20-2) (1,2)
(5,5A)
GRASS COVER
CROP
Diascund
Road
TT-397
94.02
TT-365
97.60
TT-366
100.37
FORGE ROAD

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB: GROVE HILL
SHEET NO. 1 OF 6
CALCULATED BY: GOERING DATE: 2-9-95
CHECKED BY: DATE:
SCALE:

CN CALCULATIONS:

- SOILS – HYDROLOGIC GROUP

31B	B
11C	C
15E	C

- PRE-DEVELOPMENT CN

	ACRES	LAND COND.	CN
98.5 ac.	58	AGRI.	75
	37.5	WOODS	60
	3	ASPHALT	98

⇒ CN = 70

- POST-DEVELOPMENT CN

	ACRES	LAND COND.	CN
98.5 ac.	58	AGRI	75
	6	WOODS	60
	4	ASPHALT	98
	30.5	LOTS	74

→ [redacted]

BASIN STORAGE UP TO [redacted]

ELEV	AREA (ft²)	$\Sigma(A_i + A_j)/2$	VOL. (ft³)	Σ VOL. (ft³)
30	7995	3997	0	0
32	28760	18377	36755	36755
35	73805	51282	153848	190603
37	105467	89636	179272	369875
40	169611	137539	412617	782492
C.R. 41.5	205757	187684	281526	1064018

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB: GROVE HILL
SHEET NO. 2 OF 6
CALCULATED BY: GOERING DATE: 2-9-95
CHECKED BY: DATE:
SCALE:

BASIN STORAGE ABOVE NORMAL POND ELEV. @ 41.5:

	ELEV	AREA (ft^2)	$\Sigma(A_i + A_j)/2$	VOL (ft^3)	Σ VOL (ft^3)
C.R.	41.5	205757	102879	0	0
	42	217805	211781	105891	105891
	43.5	252827	235316	352974	458865
E.S.	55	291432	272130	408195	867060

STORAGE ALGORITHM: $z_1 = 0.5$ $z_2 = 3.5$

$S_1 = 105891$ $S_2 = 867060$

$$b = \frac{\ln\left(\frac{S_2}{S_1}\right)}{\ln\left(\frac{z_2}{z_1}\right)} = 1.0806 \qquad K_s = \frac{S_2}{z_2^{\,b}} = 223{,}946$$

$$z = \left(\frac{S}{223{,}946}\right)^{1/1.0806} \Longrightarrow S_2 = 223{,}946\left(z^{1.0806}\right)$$

STAGE - STORAGE - DISCHARGE:

RISER = 48" CMP
BARREL = 30" CMP (LENGTH = 80ft) INV. = 26.62
$\therefore Q = Q(0.96)$ (E&S pg. III-98)

ELEV	STAGE	H_p	Q_p	STORAGE
41.5	0	—	—	—
42	0.5	14.13	13.75	105891
43.5	2	15.63	74.31	458865
45	3.5	17.13	77.80	867060

GROVE HILL 2-YR PRE-DEVELOPMENT

GROVE HILL 2-YR PRE-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 2 YEAR
DRAINAGE AREA (ACRES) = 98.5
AVERAGE SLOPE OF DRAINAGE AREA (%) = 3
HYDRAULIC LENGTH (FT) = 3400
IMPERVIOUS SURFACE (%) = 4
HYDRAULIC LENGTH MODIFIED (%) = 30
COMPOSITE CURVE NUMBER = 70
SLOPE ADJUSTMENT FACTOR = .9
PONDING ADJUSTMENT FACTOR = .8

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

WATERSHED LAG ADJUSTED (IMPER. AREAS & CHAN. IMPROV.) IS .501 HOURS
TIME OF CONCENTRATION ADJUSTED IS .834 HOURS
THE PEAK DISCHARGE FROM THIS WATERSHED IS 35 C.F.S.

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

(HOURS)	(C.F.S.)
0,0	
.2	0
.4	.048
.601	.324
.801	2.52
1.001	12.496
1.201	24.632
1.402	35.045
1.602	32.886
1.802	26.688
2.002	18.361
2.202	10.171
2.403	3.133
2.603	.809
2.803	0

GROVE HILL 2-YR POST-DEVELOPMENT

GROVE HILL 2-YR POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 2 YEAR
DRAINAGE AREA (ACRES) = 98.5
[illegible] AREA (%) = 3

GROVE HILL [redacted] POST-DEVELOPMENT

GROVE HILL [redacted] POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 2 YEAR
DRAINAGE AREA (ACRES) = 98.5
AVERAGE SLOPE OF DRAINAGE AREA (%) = 3
HYDRAULIC LENGTH (FT) = 2700
IMPERVIOUS SURFACE (%) = 7
HYDRAULIC LENGTH MODIFIED (%) = 40
COMPOSITE CURVE NUMBER = 75
SLOPE ADJUSTMENT FACTOR = .9
PONDING ADJUSTMENT FACTOR = .86

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

WATERSHED LAG ADJUSTED (IMPER. AREAS & CHAN. IMPROV.) IS .335 HOURS
TIME OF CONCENTRATION ADJUSTED IS .558 HOURS
THE PEAK DISCHARGE FROM THIS WATERSHED IS [redacted]

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

HOURS)	(C.F.S.)
0.0	
.134	.329
.268	1.234
.402	4.041
.536	12.089
.669	30.702
.803	53.084
.937	68.311
1.071	65.157
1.205	51.305
1.339	34.481
1.473	18.797
1.607	6.574
1.741	1.244
1.874	0

STAGE (FT)	DISCHARGE (CFS)	STORAGE (CF)
0	0	0
.5	13.75	105891
2	74.31	458865
3.5	77.8	867060

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
OUTFLOW HYDOGRAPH

(HOURS)	(C.F.S.)
0.000	0.010
0.134	0.057
0.268	0.213
0.402	0.690
[illegible]	[illegible]

[illegible]	[illegible]
1.877	11.984
1.071	14.352
1.206	16.619
1.339	17.415
1.473	17.039
1.607	15.996
1.741	14.776
1.874	13.637
2.008	12.809
2.142	12.032
2.276	11.302
2.410	10.616
2.544	9.972
2.678	9.367
2.812	8.798
2.945	8.264
3.079	7.763
3.213	7.292
3.347	6.849
3.481	6.433
3.615	6.043
3.749	5.676
3.883	5.332
4.017	5.008
4.150	4.704
4.284	4.419
4.418	4.151
4.552	3.899
4.686	3.662
4.820	3.440
4.954	3.231
5.088	3.035

MAXIMUM OUTFLOW IS 17.415 C.F.S. — OK
MAXIMUM STAGE IS .5907778 FT.
MAXIMUM STORAGE IS 127252 CUBIC FEET

GROVE HILL 10-YR POST-DEVELOPMENT

GROVE HILL 10-YR POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 10 YEAR
DRAINAGE AREA (ACRES) = 98.5
AVERAGE SLOPE OF DRAINAGE AREA (%) = 3
HYDRAULIC LENGTH (FT) = 2700
IMPERVIOUS SURFACE (%) = 7
HYDRAULIC LENGTH MODIFIED (%) = 40
COMPOSITE CURVE NUMBER = 75
SLOPE ADJUSTMENT FACTOR = .9
PONDING ADJUSTMENT FACTOR = .88

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

UNADJUSTED TIME OF CONCENTRATION (OVERL. AREAS & CHAN. IMPROV.) IS .335 HOURS

THE PEAK DISCHARGE FROM THIS WATERSHED IS [illegible]

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

HOURS	C.F.S.
0.0	
.134	1.44
.268	5.16
.402	15.338
.536	39.84
.669	88.115
.803	141.749
.937	173.832
1.071	161.09
1.205	124.579
1.339	82.112
1.473	43.522
1.607	14.729
1.741	2.746
1.874	0

STAGE (FT)	DISCHARGE (CFS)	STORAGE (CF)
0	0	0
.5	13.75	105891
2	74.31	456865
3.5	77.9	867060

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
OUTFLOW HYDOGRAPH

(HOURS)	(C.F.S.)
0.000	0.044
0.134	0.241
0.268	0.849
0.402	2.462
0.536	6.187
0.669	12.786
0.803	24.004
0.937	35.396
1.071	43.928
1.205	48.646
1.339	49.772
1.473	48.132
1.607	45.004
1.741	41.539
1.874	38.240
2.008	35.203
2.142	32.408
2.276	29.834
2.410	27.465
2.544	25.284
2.678	23.276
2.812	21.428
2.945	19.726
3.079	18.160
3.213	16.718
3.347	15.390
3.481	14.168
3.615	13.215

3.956	11.636
4.092	10.948
4.130	10.282
4.264	9.659
4.418	9.073
4.552	8.522
4.686	8.005
4.820	7.519
4.954	7.063
5.088	6.634

MAXIMUM OUTFLOW IS 49.778 C.F.S.
MAXIMUM STAGE IS 1.392223 FT.
MAXIMUM STORAGE IS 315845 CUBIC FEET

1.39
41.5
42.89
GL 10-YR
WSEL

GROVE HILL 100-YR POST-DEVELOPMENT

GROVE HILL 100-YR POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 100 YEAR
DRAINAGE AREA (ACRES) = 98.5
AVERAGE SLOPE OF DRAINAGE AREA (%) = 3
HYDRAULIC LENGTH (FT) = 2700
IMPERVIOUS SURFACE (%) = 7
HYDRAULIC LENGTH MODIFIED (%) = 40
COMPOSITE CURVE NUMBER = 75
SLOPE ADJUSTMENT FACTOR = .9
PONDING ADJUSTMENT FACTOR = .93

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

WATERSHED LAG ADJUSTED (IMPER. AREAS & CHAN. IMPROV.) IS .335 HOURS
TIME OF CONCENTRATION ADJUSTED IS .558 HOURS
THE PEAK DISCHARGE FROM THIS WATERSHED IS 303 C.F.S.

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

(HOURS)	(C.F.S.)
0,0	
.134	2.968
.268	10.511
.402	30.515
.536	75.419
.669	160.991
.803	252.157
.937	303.395
1.071	277.855
1.205	213.243
1.339	139.359
1.473	72.951
1.607	31.[illegible]
1.741	4.507

[illegible]	[illegible]	[illegible]
[illegible]	(CFS)	(CF)
[illegible]	[illegible]	[illegible]
9	13.78	108192
12	74.31	453945
13.5	77.6	307060

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE OUTFLOW HYDROGRAPH

(HOURS)	(C.F.S.)
0.000	0.050
0.134	0.49[illegible]
0.268	1.708
0.402	4.819
0.536	11.700
0.669	26.543
0.803	46.494
0.937	65.861
1.071	74.612
1.205	75.031
1.339	75.159
1.473	75.050
1.607	74.300
1.741	74.502
1.874	72.098
2.008	66.372
2.142	61.102
2.276	56.249
2.410	51.782
2.544	47.670
2.678	43.885
2.812	40.400
2.945	37.192
3.079	34.238
3.213	31.519
3.347	29.016
3.481	26.712
3.615	24.591
3.749	22.638
3.883	20.840
4.017	19.185
4.150	17.662
4.284	16.259
4.418	14.968
4.552	13.779
4.686	12.936
4.820	12.151
4.954	11.414
5.088	10.721

MAXIMUM OUTFLOW IS 75 C.F.S.
MAXIMUM STAGE IS 2.296562 FT.
MAXIMUM STORAGE IS 539568 CUBIC FEET

41.5
2.3
43.8

D.H.W.

what is top of dam

STAGE (FT)	DISCHARGE (CFS)	STORAGE (CF)
0	0	0
.5	13.75	105691
2	74.31	458865
3.3	77.8	867060

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE OUTFLOW HYDOGRAPH

(HOURS)	(C.F.S.)
0.000	0.094
0.088	0.540
0.175	1.777
0.263	4.468
0.351	9.392
0.438	18.155
0.526	31.011
0.614	43.904
0.701	54.028
0.789	60.064
0.876	62.321
0.964	61.664
1.052	59.237
1.139	56.213
1.227	53.250
1.315	50.443
1.402	47.784
1.490	45.266
1.578	42.880
1.665	40.619
1.753	38.478
1.841	36.450
1.928	34.529
2.016	32.709
2.104	30.985
2.191	29.352
2.279	27.804
2.367	26.339
2.454	24.951
2.542	23.635
2.629	22.390
2.717	21.209
2.805	20.091
2.892	19.032
2.980	18.029
3.068	17.079
3.155	16.179
3.243	15.326
3.331	14.518

MAXIMUM OUTFLOW IS 62.321 C.F.S.
MAXIMUM STAGE IS 1.703047 FT.
MAXIMUM STORAGE IS 388987 CUBIC FEET

GROVE HILL 25-YR POST-DEVELOPMENT

GROVE HILL 25-YR POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 25 YEAR
DRAINAGE AREA (ACRES) = 98.5
AVERAGE SLOPE OF DRAINAGE AREA (%) = 7
HYDRAULIC LENGTH (FT) = 2700
IMPERVIOUS SURFACE (%) = 7
HYDRAULIC LENGTH MODIFIED (%) = 40
COMPOSITE CURVE NUMBER = 75
SLOPE ADJUSTMENT FACTOR = .9
PONDING ADJUSTMENT FACTOR = .9

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

WATERSHED LAG ADJUSTED (IMPER. AREAS & CHAN. IMPROV.) IS .219 HOURS
TIME OF CONCENTRATION ADJUSTED IS .365 HOURS
THE PEAK DISCHARGE FROM THIS WATERSHED IS 283 C.F.S.

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

(HOURS)	(C.F.S.)
0,0	
.088	4.66
.175	17.754
.263	44.954
.351	92.653
.439	161.57
.526	241.412
.614	282.723
.701	268.496
.789	203.472
.876	133.592
.964	72.177
1.052	27.334

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB: GROVE HILL
SHEET NO. 3 OF 6
CALCULATED BY: GOERING DATE: 2-10-95
CHECKED BY: DATE:
SCALE:

ANTI-SEEP COLLAR CALCULATIONS:

$$L_s = y(z+4)\left(1+\frac{S}{0.25-S}\right)$$

L_s = LENGTH OF BARREL IN SATURATED ZONE (ft)
y = WATER DEPTH AT CREST OF RISER (ft)
z = SLOPE OF UPSTREAM FACE OF EMBANKMENT (z:1 ft)
S = SLOPE OF BARREL IN FT/FT

$$L_s = 11.5'(1+4)\left(1+\frac{0.042}{0.25-0.042}\right)$$

$L_s = 69.1$ ft

PLATE 3.14-12 (E&S) $\Longrightarrow$ 2 ANTI-SEEP COLLARS, 5.5' × 5.5'

DRAWDOWN CALCULATIONS:

AS-BUILT: 10-YR STORM ELEV. = 42.89 VOL. = 1,379,863 ft³

Q_{AVG} = 20.29 cfs (DETERMINED FROM TR-55 METHOD, RESULT ENCLOSED)

$$20.29 = \frac{1379863\ (ft^3)}{T\ (3600)} \Longrightarrow T$$

$T = 18.9$ hrs.

POND OUTLET PROTECTION:

PIPE DIA. = 30" Q_p (100-YR) = 75.16 cfs

- ASSUME MIN. TAILWATER CONDITION.
- APRON LENGTH = 30' (E&S pg III-164)
- APRON WIDTH = UPSTREAM = 3 × DIA. = 3 × 2.5' = 7.5'
  DOWNSTREAM = DIA. + APRON LENGTH = 2.5 + 30 = 32.5'
- RIPRAP: d_{50} = 1'
  depth = 18"

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB GROVE HILL
SHEET NO. — OF 6
CALCULATED BY GOERING DATE 2-9-95
CHECKED BY DATE
SCALE

CULVERT DESIGN: (LINE I, RUN 2, C-D)

AREA = 60 ac
AVG. SLOPE = (99 - 55)/2400' = 1.83%
LENGTH OF TRAVEL = 2700'
% IMPERVIOUS ac. = 5%
% CHANNELIZED = 35%
CN = 38 ac (AGRI) × 80 ⇒ CN = 7585
19 ac (WOOD) × 65
3 ac (ASPHALT) × 92

Q_{10} = 109 cfs (SEE HYDROLOGY PROGRAM RESULTS)

• RESULT VERIFICATION w/ Q = CiA:

A = 60 ac.
C = 38 ac. (AGRI) × 0.50
19 ac. (WOOD) × 0.25 ⇒ C = 0.44
3 ac. (ASPHALT) × 0.95

T_c OVERLAND (SEELYE) 200', 0.44, 1.8% ⇒ 14 MIN.
CHANNEL (KIRPICH) 44', 2500' ⇒ 15 MIN.
TOTAL = 29 MIN.

i_{10} = 3.7 in/hr

Q_{10} = (0.44)(3.7 in/hr)(60 ac.) = **98 cfs**

PROJECT: GROVE HILL 5723

STATION: 3+61

SHEET 5 OF 6

CULVERT DESIGN FORM

DESIGNER / DATE: GOERING / 2-15-95

REVIEWER / DATE: ____ / ____

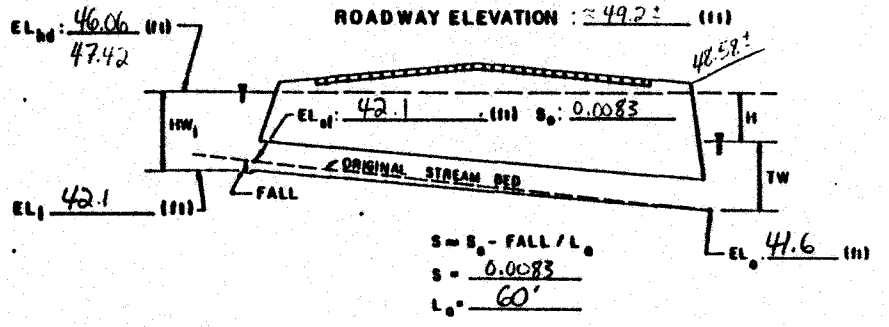
HYDROLOGICAL DATA

SEE ADD'L SHTS.

- ☐ METHOD:
- ☐ DRAINAGE AREA: 60ac. ☐ STREAM SLOPE: 1.83%
- ☐ CHANNEL SHAPE:
- ☐ ROUTING: ☐ OTHER:

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
10 YR	98	1.29



$S = S_o - FALL / L_o$

$S =$ 0.0083

$L_o =$ 60'

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_{hi} (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	h_o	H (7)	EL_{ho} (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
RCP, ROUND 36" (2)	98	49	1.32	3.96	0	46.06	1.29	2.3	2.65	2.65	0.2	1.5	45.75	46.06	35.7	$V = \sqrt{\frac{HW/2g}{k_e}}$
RCP, ROUND 48" (1)	98	98	1.33	5.32	0	47.42	1.29	3.0	3.5	3.5	0.2	1.6	46.70	47.42	41.4	"

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{ef})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_o + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
ef STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

CULVERT BARREL SELECTED:

SIZE: 48"

SHAPE: ROUND

MATERIAL: RCP n 1

ENTRANCE:

DC011_GROVE_HILL_ESTATES_SECTION_1&2 - 070

GROVE HILL CULVERT SIZE 10-YR POST-DEVELOPMENT

GROVE HILL CULVERT SIZE 10-YR POST-DEVELOPMENT

INPUT DESIGN DATA

DESIGN STORM FOR ANALYSIS = 10 YEAR
DRAINAGE AREA (ACRES) = 60
AVERAGE SLOPE OF DRAINAGE AREA (%) = 1.93
HYDRAULIC LENGTH (FT) = 2700
IMPERVIOUS SURFACE (%) = 5
HYDRAULIC LENGTH MODIFIED (%) = 35
COMPOSITE CURVE NUMBER = 75.65
SLOPE ADJUSTMENT FACTOR = 1.15
PONDING ADJUSTMENT FACTOR = .83

RESULTS OF HYDRAULIC CALCULATIONS
(SCS TR-55 & TP-149 PROCEDURES)

WATERSHED LAG ADJUSTED (IMPER. AREAS & CHAN. IMPROV.) IS .444 HOURS
TIME OF CONCENTRATION ADJUSTED IS .74 HOURS
THE PEAK DISCHARGE FROM THIS WATERSHED IS 109 C.F.S.

THE FOLLOWING ARE TIME INCREMENTS AND ORDINATES OF THE
INFLOW HYDROGRAPH

(HOURS)	(C.F.S.)
0,0	
.178	.861
.355	2.848
.533	7.522
.711	20.204
.889	51.965
1.066	86.607
1.244	109.295
1.422	98.57599
1.599	76.884
1.777	50.966
1.955	26.66
2.132	7.985
2.31	1.838
2.488	0

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB: GROVE HILL
SHEET NO. 6 OF 6
CALCULATED BY: GOERING DATE: 2-20-95
CHECKED BY: DATE:
SCALE:

OUTLET PROTECTION FOR 48" RCP CULVERT:

- ASSUME MIN. TAILWATER CONDITION
- Q_{10} = 98 cfs ⟹ APRON LENGTH = 26' (E&S, pg II-164)
- APRON WIDTH: 3 × 4' = 12' UPSTREAM
  26' + 4' = 30' DOWNSTREAM
- RIPRAP d_{50} = 0.9' (MIN.)
  depth = 18"

OUTLET PROTECTION FOR PAVED V-DITCH (LINE IV RUN 3, H-I):

- ASSUME MIN. (42.89) TAILWATER CONDITION
- Q_{10} = 5.57 cfs ⟹ APRON LENGTH 10' (E&S, III-164)
- APRON WIDTH (SINCE 0.4' DEEP ⇒ 0.4' × 3 × 2 = 2.4' WIDE @ SURFACE
  2.4' × 0.4' ≈ 1 sq ft. ∝ 15" PIPE)
  3 × 1.25' = 3.75' UPSTREAM
  1.25' + 10' = 11.25' DOWNSTREAM
- RIPRAP d_{50} = 0.6' (MIN.)
  depth = 18"

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project GROVE HILL

Basin # _____ Location DIASCUND RD.

Total area draining to basin: 98.5 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 98.5 acres = 6600 cu. yds.

2. Available basin volume = 39,408 cu. yds. at elevation 41.5. (From storage - elevation curve)

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

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

4. Available volume before cleanout required.

   33 cu. yds. x 98.5 acres = 3251 cu. yds.

5. Elevation corresponding to cleanout level = 42.0.

   (From Storage - Elevation Curve)

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

Dry Storage:

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

   67 cu. yds. x 98.5 acres = 6600 cu. yds.

8. Total available basin volume at crest of riser* = 39,408 cu. yds. at elevation 41.5. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 48 in.

10. Diameter of flexible tubing = N/A in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 41.5

Top of Dam = 45

Design High Water = 43.8

Upstream Toe of Dam = 30.0

Basin Shape

12. Length of Flow / Effective Width — L / We = 1150' / _____

If > 2, baffles are not required ✓

If < 2, baffles are required _____

Runoff

13. Q_2 = 17.4 cfs (From Chapter 5)

14. Q_{25} = 62.3 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = _____ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = 62.3 cfs. (riser and barrel)

16. With emergency spillway:

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

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

Without emergency spillway:

Assumed available head (h) = 1.7 ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 48 in. Actual head (h) = 1.3 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 80 ft.

Head (H) on barrel through embankment = 15.9 ft. (USING Q_{100} ELEV.)

(From Plate 3.14-7).

19. Barrel diameter = 30 in.

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

20. Trash rack and anti-vortex device

Diameter = 60 inches.

Height = 15.6 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = _____cfs.

22. Bottom width (b) = _____ ft.; the slope of the exit channel (s) = _____ ft./foot; and the minimum length of the exit channel (x) = _____ ft.
(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 11.5 ft.

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

Slope of principal spillway barrel (S_b) = 4.2 %

Length of barrel in saturated zone (L_s) = 69.1 ft.

24. Number of collars required = 2 dimensions = 5.5' x 5.5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 45

Design High Water = 43.8

Emergency Spillway Crest = N/A

Principal Spillway Crest = 41.5

Dewatering Orifice Invert = N/A

Cleanout Elevation = 42.0

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 30

OTEY AND OTEY

ATTORNEYS AT LAW

POST OFFICE BOX 192

WILLIAMSBURG, VIRGINIA 23187

DAVID W. OTEY, SR.
DAVID W. OTEY, JR.

485 MCLAWS CIRCLE, SUITE 1
WILLIAMSBURG, VIRGINIA 23185
TELEPHONE (804) 229-6141
TELEFAX (804) 229-2156

March 9, 1995

Mr. Darryl Cook
Code Compliance Office
James City County
Mounts Bay Road
Williamsburg, Virginia 23185

RE: Grove Hill Estates

Dear Darryl:

Joe Ferguson asked me to write you with respect to the lots adjacent to the lake in Grove Hill Estates. He has asked me to acknowledge that we intend to convey those lots subject to deed restrictions that require each of the eight owners to share in the care and maintenance of the lake and dam. We may also include a provision in the restrictive covenants that permits assessment of these eight lot owners for necessary repairs. Please let me know if additional information is required.

Yours very truly,

David W. Otey, Jr.

David W. Otey, Jr.

DWOJR:aoe

CC

WATERSHED	DC	MAINTENANCE PLAN	No	CTRL STRUC DESC	CMP Riser
BMP ID NO	011	SITE AREA acre	61.95	CTRL STRUC SIZE inches	48
PLAN NO	S-24-94	LAND USE	Gen Agricultural	OTLT BARRL DESC	CMP Barrel
TAX PARCEL	Assorted	old BMP TYP	Wet Pond	OTLT BARRL SIZE inch	30
PIN NO	Assorted	JCC BMP CODE			
CONSTRUCTION DATE	4/1/1995	POINT VALUE		EMERG SPILLWAY	Yes
PROJECT NAME	Grove Hill Est Sec 1&2-Private Dam			DESIGN HW ELEV	43.8
FACILITY LOCATION	Near (behind) 7928 Diascund Rd.			PERM POOL ELE	41.52
CITY-STATE	Williamsburg, Va. 23168	SVC DRAIN AREA acres	98.5	2-YR OUTFLOW cfs	17.42
CURRENT OWNER	Multiple Lot Ownership			10-YR OUTFLOW cfs	49.77
OWNER ADDRESS				REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	SF Lots, Roads & Wooded area		
CITY-STATE-ZIP CODE		IMPERV AREA acres	0.00	CONSTR CERTI	No
OWNER PHONE		RECV STREAM	UT of Diascund 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	Private dam on Lots 1-4 and 5-8. No I/M agreement. S-24-94 Sec 1. S-20-95 Sec 2.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

GROVE HILL ESTATES

COVENANTS, CONDITIONS & RESTRICTIONS

THIS DECLARATION of covenants, conditions & restrictions is made this _____ day of _____, 1994, by J. Ferguson & Sons, Inc., a Virginia corporation.

WITNESSETH:

WHEREAS, J. Ferguson & Sons, Inc. is the owner of the real property in James City County described in the attached Exhibit A and desires to create thereon a community to be known as Grove Hill Estates in accordance with the plan and covenants, conditions and restrictions herein provided.

NOW, THEREFORE, J. Ferguson & Sons, Inc. hereby declares that the real property described in Exhibit A attached hereto and such additions thereto as may hereafter be made pursuant hereto, is and shall be held, transferred, sold, conveyed and occupied subject to the covenants, conditions and restrictions hereafter set forth.

SECTION I

1. Definitions.

a. "Association" shall mean and refer to the Grove Hill Estates Home Owners Association, its successors and assigns.

b. "Common Area" shall mean and refer to those areas of land now or hereafter conveyed to the Association or shown on any recorded subdivision plat of Grove Hill Estates, including recreation areas, which are intended to be devoted to the common use and enjoyment of the owners.

c. "Owners" shall mean and refer to the record owner, whether one or more persons or entities, of the fee simple title to any lot including contract sellers but excluding those having such interests merely as security for the performance of an obligation.

2. Only one (1) single-family dwelling, not to exceed two and one-half (2 1/2) stories in height above existing ground level, shall be erected, placed or permitted to remain within the boundary of each individual lot. No lot or structure thereon shall be used as a convalescent home, nursery, day care center, child care center or group home. No lot shall be subdivided without the written consent of J. Ferguson & Sons, Inc., or its successors or assigns.

3. No dwelling shall be located nearer to the front lot line, or nearer to the side street line, than the building setback line shown on the recorded plat, nor nearer than fifteen (15) feet to

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any side lot line.

4. All garages and any other permanent structures, such as storage rooms, tool house, retaining walls, etc. shall be built of the same material and similar architectural design as permitted for any dwelling. Any structure other than the dwelling shall not be nearer than fifteen (15) feet to any property line. There are to be no metal storage or accessory buildings or any metal dwellings of any sort, except those finished with aluminum trim in accordance with other sections of these covenants. All out buildings, including garages, that are not attached, shall be constructed of the same material and maintain the same looks as that of the house. (Note: Limit sheds to back yards?)

5. No fowl, swine, goats, cattle, or mules shall be allowed or kept on the property, and no dog or cat kennels, rabbit hutches, or pigeon lofts, temporary or permanent, shall be erected. Exotic animals such as lions, snakes, monkeys, chimps, llamas, orangutans, etc., wild or tame, shall not be allowed for any purpose.

6. All fences must be approved by J. Ferguson & Sons, Inc., or its successors or assigns or agents, before construction begins. Fences on corner lots shall not be nearer than twenty-five (25) feet to the street side property line. Fence or wall material shall be of wood, brick, stone or specifically approved fence material. Small gauge wire material used in conjunction with wood, brick or stone fence will be permitted. Fence height shall not exceed six (6) feet.

7. No noxious, offensive or loud activities shall be allowed or carried on upon any lot, nor shall anything be done thereon which may be or become an annoyance or nuisance to the neighborhood or injure the value of the neighboring property.

8. No basement, tent, shack, garage, barn, or other outbuilding shall be used or erected for use as a temporary residence on this property, and no trailer can be placed on this property as a temporary or permanent residence. Recreation vehicles, campers and boats are to be stored behind the front set back line of the dwelling. (Note: This allows vehicles, campers and boats in the front yard.)

9. No vinyl, or aluminum siding is allowed with the exception of special wood like vinyl or aluminum. Approval is required by J. Ferguson & Sons, Inc., its successors or assigns or agents, before installation.

10. Foundations are to be finished in brick, stone, or other materials when specifically approved by J. Ferguson & Sons, Inc., or its successors or assigns or agents, before construction begins.

11. No dwelling house shall be erected with a total floor or

living space, exclusive of all basements, porches, decks, breezeways, garages, etc. of less than eighteen hundred (1,800) square feet for a ranch style or one-story. Any style home other than a one-story home, including tri-levels and bi-level homes, must contain a minimum of two thousand (2,000) square feet, exclusive of all basements, porches, decks, breezeways, garages, etc. All pitches of roofs shall be six-twelfths (6/12) or greater and no one roof line shall be longer than fifty (50) feet.

12. Construction or improvements on the lots must be done in workmanlike manner and once begun, shall be continued to the point where all exterior work shall be completed within twelve (12) months.

13. Before any structure is erected thereon, placed, or altered, the building plans fully completed, specifications, and plot plan for same must be submitted in duplicate to, and approved in writing by J. Ferguson & Sons, Inc., its successors or assigns or agents appointed for the purpose, in order to assure the design of such structure to be in harmony with the existing structures in the subdivision and properly located to conform with the topography and finished ground elevations of the subdivision. One (1) set of plans, specifications, and plot plan will be returned to the owner and one (1) set retained by J. Ferguson & Sons, Inc., its successors or assigns or agents appointed for that purpose. Approval of the plans, specifications, and plot plan will be denied for any structures which are not considered by J. Ferguson & Sons, Inc., its successors or assigns or agents to be in harmony with the existing structures in the subdivision, or which do not meet the requirements of these covenants.

14. A site plan showing the location of the house, well and septic area is to be provided to J. Ferguson & Sons, Inc., its successors or assigns or agents appointed for that purpose.

15. Easements are reserved as shown on the recorded plat and the right is reserved to establish and grant any and all additional easements along any street or property for the purpose of drainage or furnishing light, telephone, sewers, water, or gas to any owner.

16. All sewage must be disposed of in septic tanks meeting local government standards, unless or until municipal sewage is provided for such purposes. No use shall be made of any lot that will constitute a nuisance or will injure the value of the neighboring lots. No bottles, cans, trash, garbage, stumps, waste, refuse, dirt or any other material of any kind or description shall be thrown or dumped on any lot or roadway.

17. All oil or gas tanks must be placed in utility rooms or basements, buried in the ground or surrounded by approved fence.

18. No motor vehicle which does not have a valid inspection

sticker and license to permit its operation upon the highways of the State shall be allowed to remain on any parcel for longer than ten (10) days unless it is parked in a garage or carport, or unless J. Ferguson & Sons, Inc., its successors or assigns or agents consent in writing to its remaining thereon for a longer period.

19. All recreational equipment including swing sets, sliding boards, basketball goals, monkey bars, and any other structure or item of recreation to be located in the rear or side yards only. All trash cans to be stored must be out of view of the street and lake.

20. Every lot and the area between the front property line and the road surface shall be kept clear of all brush, tall grass, and weeds by the owner thereof. Containment and disposal of garbage, waste material, debris, or foreign objects accumulated during and after construction of improvements shall be the responsibility of the owner of the lot, regardless of contractor(s) employed for such work. No sign of any kind shall be displayed to the public view on any lot, except for one (1) sign of not more than five (5) square feet advertising a dwelling or a dwelling under construction or to be constructed upon the property for sale or rent, or designating the property as "sold" or by any community corporation formed for civic purposed by owners of property in the subdivision.

21. Each owner shall be responsible for any damage to the streets or drainage ditches in the subdivision caused by the contractor or any subcontractor engaged in the construction of the improvements on the lot.

22. The Association shall be responsible for the exclusive management and control of the common area and all improvements thereon and shall keep the same in good, clean, attractive and sanitary condition, order and repair. Each owner shall have a right of enjoyment in and to the common area and shall be obligated to be a member of the Association. The Association shall have the authority to levy and the owners are deemed to covenant and agree to pay to the Association general assessments and such special assessments as may be necessary for maintenance of the common area. All such assessments, together with interest thereon and costs of collection, including reasonable attorney's fees, shall be a charge on the land and shall be a continuing lien upon the owner's property.

23. Any owner of a lot in the subdivision shall have the right to prosecute any proceedings at law or in equity against any person, firm, or corporation violating or attempting to violate any restriction herein contained for the purpose by such proceeding of preventing such violation or recovering damages for such violation. The failure of any owner of a lot in the subdivision to bring any such proceeding shall not be considered as a wavier of any rights

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at law or in equity that any such party may have for past or future violations of any covenant herein contained.

24. Any grantee or grantees, by accepting a deed conveying any lot in the subdivision, shall be held to have accepted the covenants, restrictions, conditions and limitations herein contained and to have agreed and bound themselves, their heirs, personal representatives and assigns to keep and observe all of the said covenants, restrictions, conditions, and limitations set forth herein. The invalidation of any of the foregoing covenants and restrictions by a court of competent jurisdiction shall in no way affect any of the other covenants and restrictions.

25. These covenants, conditions and restrictions shall remain in full force and effect for a priod of thirty (30) years from the date hereof at which time they shall expire.

26. All docks, piers, or decks reaching or extending onto the lake must be approved by J. Ferguson & Sons, Inc., its successors or assigns, or agents.

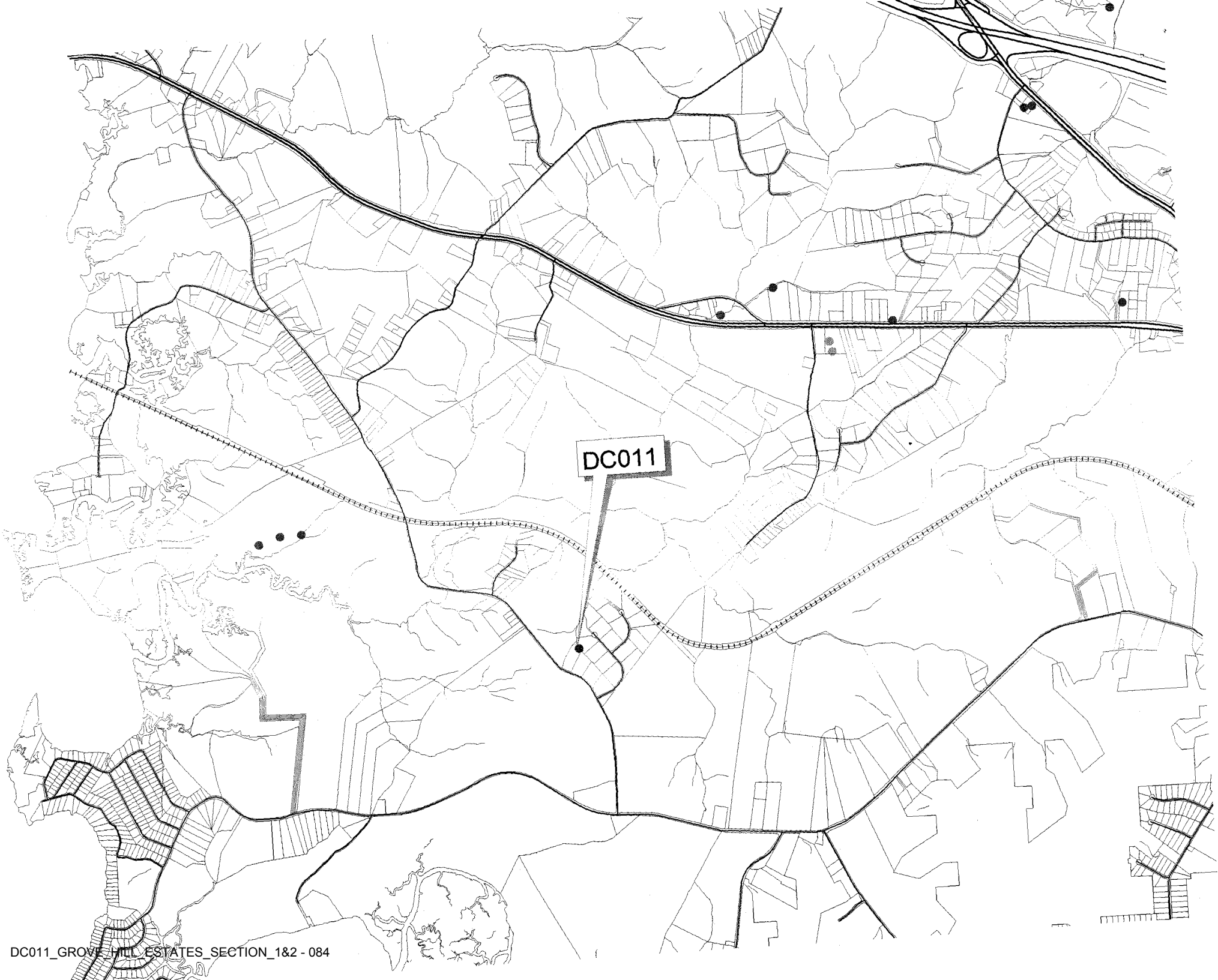
IN WITNESS WHEREOF, on the _____ day of _____, 1994, J. Ferguson & Sons, Inc. has caused its name to be hereunto signed and attested by its duly authorized officers.

J. FERGUSON & SONS, INC.

By: _____

_____

_____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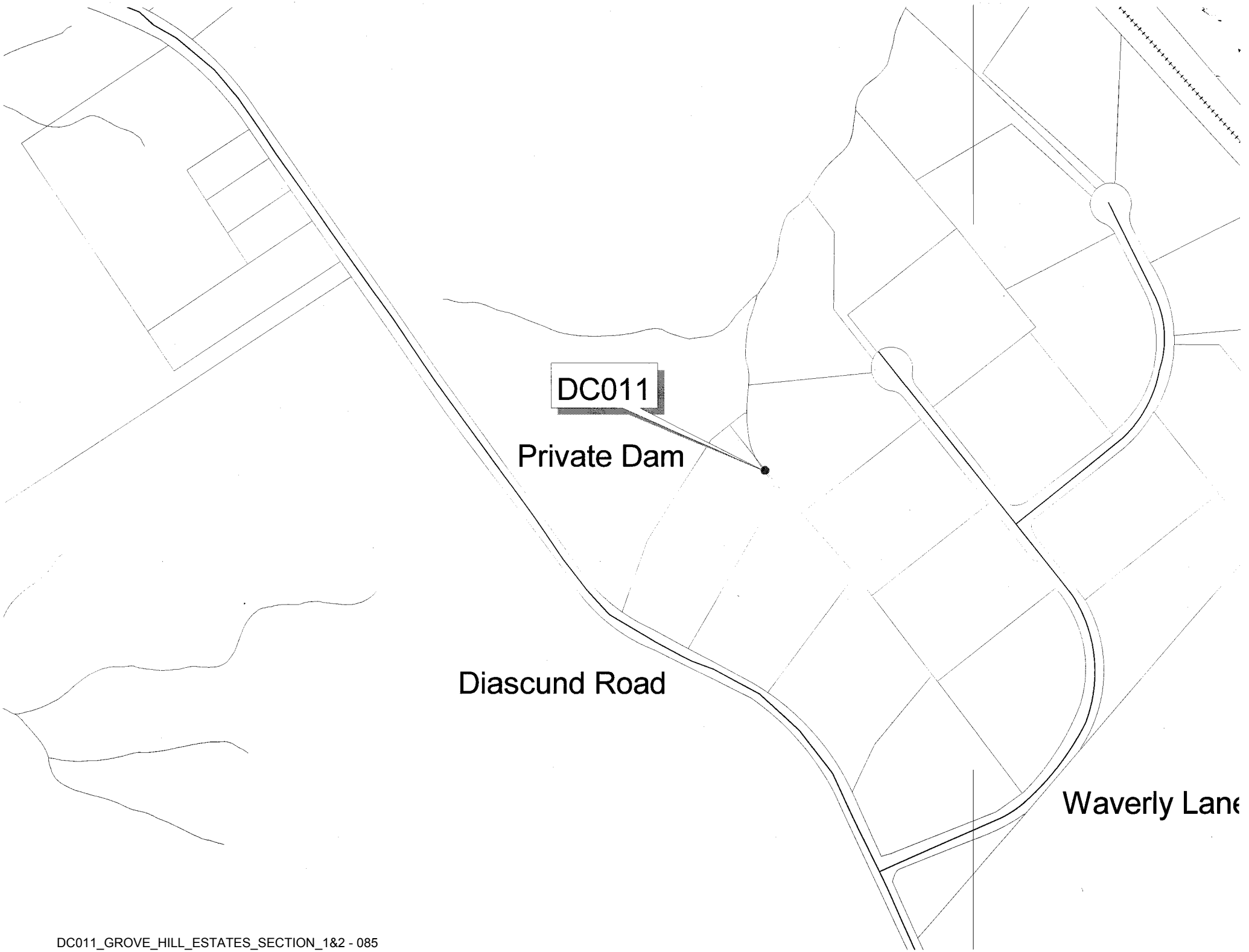

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Grove Hill Estates 2

STORMWATER MANAGEMENT

I. STORMWATER TREATMENT SYSTEM

✓ Drainage Area Map at a maximum scale of 1"=200' showing drainage area boundaries for pre- and post-development conditions and pre- and post-development time of concentration flow paths. For multiphased projects, the map must include all future phases for the project.

✓ Soil Map with site and drainage area outlined.

✓ Receiving Channel and Pipe System Adequacy Determinations. All stormwater must be discharged to an adequate, well-defined receiving system.

NA Worksheet for BMP Point System to determine need for and type of structural BMPs required as well as Natural Open Space BMP points.

NA Stormwater Detention Basin Design Checklist completed for each structure.

NA Conservation Easements required for all Natural Open Space Points claimed in BMP Worksheet.

NA Infiltration Device Design, Detail and Specification. Must include results of a soil test to verify, a minimum infiltration rate of 0.27 inches per hour at the trench location to a depth of 5 feet below the bottom of the trench.

NA Stormwater Management Facility Easements including a 20-foot wide access easement and a 15-foot wide maintenance easement from the 100-year storm elevation and include the dam and outlet structure.

II. STORMWATER CONVEYANCE SYSTEMS

✓ Drainage Calculations to support the design of all conveyance systems; culverts, roadside ditches, storm drain systems, etc.

✓ Culvert Calculations, inlet and outlet control, existing and proposed based on 10-year storm.

✓ Storm Sewer Calculations to include hydraulic grade line, inlet, and spread calculations for 10-year storm.

✓ Open Ditch Calculations, lining determined based on 2-year peak velocity and capacity based on 10-year peak discharge, existing, and proposed.

/ Slope Requirements, minimum longitundinal street slope requirement is 0.75% for grass-lined ditch, 0.5% for paved ditch, and 0.3% for closed (curb and gutter) section.

/ Outlet Protection required for all outfalls in accordance with Chapter 3, VESCH.

strmwtr.lis

CODE COMPLIANCE REVIEW COMMENTS
GROVE HILL ESTATES, SECTION 2
PLAN NO. S-20-95 DEC
March 3, 1995

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

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

3. As-built drawings must be provided for the detention basin.

4. A streetlight rental fee for 4 lights must be paid prior to the recordation of the subdivision plat.

5. Provide streetlights at the following locations:
   a. at the intersection of Waverly Lane, and Diascund Road
   b. on lot 14 at approximately station 9+00
   c. on lot 12 at the intersection of the future road
   d. in the cul-de-sac of Waverly Lane at lots 9/10.

6. Specify the amount and configuration of riprap to be used at the outfall of the 48-inch pipe at station 3+60 in accordance with Spec 3.19 of the third edition of the Virginia Erosion Control Handbook (VESCH).

7. Replace the Erosion Control Notes on sheet C-3 with the revised James City County Erosion Control Notes dated 2/3/95.

8. Provide topography for the entire site including all lots.

9. Provide an environmental inventory for the project in accordance with the Chesapeake Bay Ordinance.

10. As part of the environmental inventory, identify slopes in excess of 25%. If any of these slopes are to be disturbed, submit a request to the Director of Code Compliance for an exception to disturb these slopes. State what special measures, sodding etc., will be undertaken to restabilize these slopes.

11. Provide evidence that any required wetlands permits have been obtained.

12. The minimum slope for a grass lined ditch is 0.75%. Either revise the slope of the ditch at 0.6% or else pave this ditch section.

13. Recalculate the capacity for the 48-inch pipe under Waverly Lane assuming the 10-year elevation in the pond as the tailwater condition rather than the minimum tailwater condition assumed.

14. An emergency spillway must be provided for the existing pond.

15. Provide rock check dams in all ditches at 100 foot intervals.

16. Show existing vegetation and identify limits of clearing on the plan.

17. Provide a 15-foot wide maintenance access easement to the pond from public right-of-way and a 15-foot wide maintenance easement around the 100-year pool elevation.