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: **PC137**

DATE VERIFIED: **October 30, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 13, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: PC137

PIN: 3131300001B

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

Property Description: Open Space

Site Address:

(For internal use only) **Box** 3 **Drawer:** 2

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

Comments

James City County, Virginia
Environmental Division

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

County Plan No.: Mulberry Place S-35-00
Project Name:
Stormwater Management Facility: Wet Pond
Phase: ☐ I ☐ II ☑ III

☑ Information Received. Date: Oct 3 2001
☑ Administrative Check.
- ☑ Record Drawing Date: 9/19/01 AES (9/27/01 CERT)
- ☑ Construction Certification Date: 9/24/01 ECS Ltd.
- ☑ RD/CC Standard Forms (Required after Feb 1st 2001 Only)
- ☑ Insp/Maint Agreement Info: 1/M IN FILE. INST# 000015759 Aug 21 '00
- ☐ Other:

☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
☑ Yes ☐ No Note/Sheet: NOTE #19 Sheet 17; DAM CONST NOTES SHEET 18.
☑ Assign County BMP ID Code Code: PC137
☑ Log into Division's "As-Built" Tracking Log
☑ Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
☑ Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
☑ Active Project File Review (correspondence, H&H, etc.).
☒ Initial As-Built File setup (label, copies of hydraulics, etc.).
☒ Inspector Check of RD/CC. CED.
☒ Pre-Inspection Drawing Review (Quick look prior to field inspection).
☒ Final Inspection (FI) Date: 12-6-01; 10-25-02; 11-1-02; 6-27-03
☒ Record Drawing (RD) Review Date: 11/14/01
☐ Construction Certification (CC) Review Date: 11/
☒ Actions:
- ☐ No comments.
- ☑ Comments. Letter Forwarded. Date: 11/19/01
  - ☒ Record Drawing (RD)
  - ☒ Construction Certification (CC)
  - ☒ Construction-Related (CR)
  - ☑ Site Issues (SI)
  - ☐ Other :

☐ Second Submission: RO 12/10/02 OK
☐ Third Submission:
☐ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
☐ Notify Darryl & Joan of acceptability using email (preferred) or verbal.
☐ Clean active file of all stormwater management related material and finish/establish "As-Built" file.
☒ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
☒ Copy Final Inspection Report into County BMP Inspection Program file.
☐ Digital Photographs obtained.
☒ Add to JCC Hydrology & Hydraulic database (optional).

BMP Certification Information Acceptable

Plan Reviewer: [signature] Date: 7/14/03

James City County, Virginia
Environmental Division

OCT 2001
RECEIVED
ENVIRONMENTAL DIVISION

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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

Section 1 - Site Information:

Project Name: MULBERRY PLACE
Structure/BMP Name: WET EXTENDED DETENTION POND
Project Location: 1500 '± SOUTH OF INTERSECTION CENTERVILLE & LONGHILL RDS.
BMP Location: SOUTHWEST PORTION OF PARCEL
County Plan No.: S - 035 - 00

Project Type: ☒ Residential ☐ Business ☐ Commercial ☐ Office ☐ Institutional ☐ Industrial ☐ Public ☐ Roadway ☐ Other _____

Tax Map/Parcel No.: (31-3) (1-33, 34, 36, 42, 43)
BMP ID Code (if known): PC137
Zoning District:: POLLHATAN
Land Use: R-2, GENERAL RESIDENTIAL
Site Area (sf or acres): 27.81 AC.

Brief Description of Stormwater Management/BMP Facility: WET EXT. DET POND A-3

Nearest Visible Landmark to SWM/BMP Facility: 300'± EAST OF INTERSECTION MULBERRY PLACE & WM. LUDWELL LEE

Nearest Vertical Ground Control (if known):
☒ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: 309 RM3 A2.
Datum or Reference Elevation: 114.00
Control Description: 2" DISK IN CONCRETE, SET APPROX. 3" BELOW GRADE
Control Location from Subject Facility: 175'± SOUTH OF INTERSECTION OF CENTERVILLE RD AND MULBERRY PLACE

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☑ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: 10/1/00
Facility Monitored by County Representative during Construction: ☑ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: C. LEWIS WALTRIP II, INC.
Name of Professional Firm Who Routinely Monitored Construction: E.C.S., LTD.
Date of Completion for SWM/BMP Facility: 9/12/01
Date of Record Drawing/Construction Certification Submittal: 9/19/01

(Note: Record Drawing and Construction Certifications are required within thirty (30) days of the completion of Stormwater Management and/or BMP facility construction. Record Drawings and Construction Certifications must be reviewed and approved by the James City County Environmental Division prior to final inspection, acceptance and bond or surety release.)

Section 3 - Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*

Name: ASSOCIATED DEVELOPERS, INC
Mailing Address: 5300 MERCURY BLVD.
NEWPORT NEWS, VA. 23605
Business Phone: (757) 838-2739 Fax: (757) 838-6337
Contact Person: HENRY STEPHENS Title: OWNER

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

Firm Name: A.E.S. CONSULTING ENGINEERS
Mailing Address: 5248 OLDE TOWNE ROAD, SUITE 1
WILLIAMSBURG, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: CHARLES RECORDS / ARCH MARSTON
Title: DESIGN ENGINEER / P.E
Plan Name: MULBERRY PLACE
Firm's Project No. 8604-1
Plan Date: 4/26/00, REV. 8/15/00
Sheet No.'s Applicable to SWM/BMP Facility: C1 | C10 | C18 | ___ | ___

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

Name: C. LEWIS WALTRIP II, INC.
Mailing Address: P. O. BOX 3522
WILLIAMSBURG, VA. 23187
Business Phone: (757) 253-1883
Fax: (757) 253-0706
Contact Person: DANNY JOHNSON
Site Foreman/Supervisor: WAYNE
Specialty Subcontractors & Purpose (for BMP Construction Only): ___

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES CONSULTING ENGINEERS
Mailing Address: 5248 OLDE TOWNE RD
WILLIAMSBURG, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994

Name: G. ARCHER MARSTON III
Title: PROFESSIONAL ENGINEER

Signature:
Date: 9/27/07

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

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON III
No. 016722

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS, LTD
Mailing Address: 108 INGRAM RD.
WILLIAMSBURG, VA. 23188
Business Phone: (757) 229-6677
Fax: (757) 229-9978

Name: SEE NEXT SHEET
Title:

Signature: SEE NEXT SHEET
Date:

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

SEE NEXT SHEET

(Seal)

Virginia Registered Professional Engineer

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

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

Name: _____
Title: _____

Signature: _____
Date: _____

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

_____ (Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

AES

Construction Certification

Firm Name: E C S, Ltd.
Mailing Address: 108 Ingram Road, Ste. 1
Williamsburg, VA 23188
Business Phone: 757-229-0677
Fax: 757-229-9978

Name: Michael J. Galli
Title: Project Engineer

Signature: Michael J. Galli
Date: 9/24/01

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030684
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer

ECS OR OTHER

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

✓ 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

✓ 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

✓ 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

✓ 4. All plan sheet revision blocks modified to indicate date and record drawing status.

✓ 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

✓ 1. All requirements of Section I (Methods and Presentation) apply to this section.

✓ 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

✓ 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

✓ 4. Top widths, berm widths and embankment side slopes.

✓ 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained. AS-BUILT TOPOGRAPHY SHOWN ON SHEET 10.

NOT BELOW NP

✓ 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

✓ 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design. SEE SPOT GROUND ELEVATIONS

✓ 8. Elevation of the principal spillway crest or outlet crest of the structure.

✓ 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

✓ 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

✓ 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not. NONE

INC 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

INC 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

✓ 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

✓ 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

✓ 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

INC 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

✓ 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

✓ 20. BMP vicinity properly cleaned of stockpiles and construction debris.

✓ 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

✓ A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

✓ A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

✓ A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

✓ A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

N/A A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

✓ A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V). NO SAFETY BENCH, 5' AQUATIC BENCH PRESENT PER APPROVED DESIGN

✓ A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure. CLEARING TAKEN PLACE PER APPROVED DESIGN PLAN

✓ A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

✓ A10. Low flow orifice has a non-clogging mechanism. 90° TURNDOWN

✓ A11. A pond drain pipe with valve was provided.

✓ A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

Record Drawing/Construction Certification Submittal for a BMP Facility

Date: 10-04-01

Inspector:
- [x] Pat Menichino
- [ ] Gerry Lewis
- [x] Beth Davis
- [ ] Mike Woolson
- [ ] Other: _____

TO

Project: Mulberry Place
BMP Facility: Wet Pond
Plan No. S-35-00
BMP ID Code: PC137

I have received a transmittal for a [x] Record Drawing and [x] Construction Certification for the above referenced facility on Oct 03 2001. Prior to full review of these items and field inspection, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw in the field. Please review the drawing and return to me promptly so I can proceed with performing a final engineering inspection for certification purposes.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and will make comment in the following areas: record drawing (RD), construction certification (CC) and construction-related (CR) punch list items. If you have any other related non-BMP site issues such as erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, I can easily add these items to any ~~comment letter that I may forward to the~~ owner/engineer. You can let me know of any outstanding site issues or we can schedule to perform a joint inspection.

If I don't hear from you I will ask you if any other outstanding issues remain before I forward any letters to the owner/engineer.

Scott

Please discuss with me
PTM

SWMProg\BMP\ConInsp\Insp.trans
PC137_MULBERRY_PLACE - 011

MULBERRY PLACE

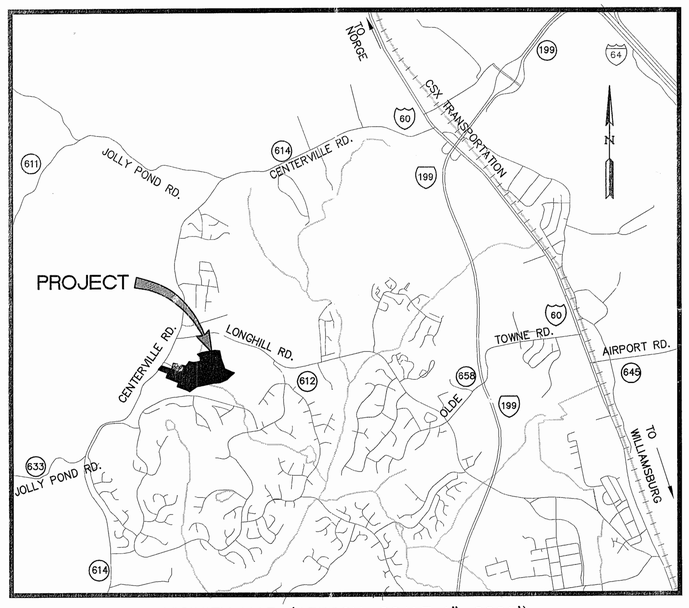
DEVELOPER: ASSOCIATED DEVELOPERS, INC.

JAMES CITY COUNTY, VIRGINIA

POWHATAN DISTRICT

LEGEND

EXISTING		PROPOSED
EX. W	WATER	W
EX. S	SANITARY SEWER	S
	STORM SEWER	
EX. FM	FORCE MAIN	F.M.
	MANHOLE	
	CURB DROP INLET	
	YARD DROP INLET	
	FLARED END SECTION	
	VALVE	
	FIRE HYDRANT ASSEMBLY	
	BLOW-OFF VALVE	
	AIR RELEASE ASSEMBLY	
	CLEAN OUT	
	WATER METER	
	STREETLIGHT	
	CENTERLINE/BASELINE	
	RIGHT OF WAY	
	PROPERTY LINE	
	℄ DITCH/SWALE	
	CONCRETE LINED DITCH	
	EC-3 LINED DITCH	
	EXISTING TREELINE	
	LIMITS OF CLEARING	
	SILT FENCE	
	INLET PROTECTION	
	CHECK DAM	
	STRAW BALE BARRIER	
	RIP RAP	
	REVERSE ROLL TOP GUTTER	
251	GROUND ELEVATION	251
	PROPOSED TOP OF CURB ELEV.	TOC ELEV
	GRADING LINE TIE-IN	
80	EXISTING CONTOUR ELEV.	
	PROPOSED CONTOUR ELEV.	80
	GRADING BY OTHERS	80



VICINITY MAP (APPROX. SCALE 1"=2000')

INDEX OF SHEETS

SHEET NUMBER	DESCRIPTION
1	**COVER SHEET**
2	OVERALL DEVELOPMENT PLAN
3	PRELIMINARY PLAT
4	PRELIMINARY PLAT
5	OVERALL UTILITY PLAN
6	ROAD AND UTILITY PLAN
7	ROAD AND UTILITY PLAN
8	OVERALL DRAINAGE PLAN
9	DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN
10	**DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN**
11	STREETSCAPE, PERIMETER BUFFER AND PARK PLAN
12	CENTERVILLE ROAD BUFFER AND ENTRANCE PLAN
13	ROAD AND UTILITY PROFILE
14	SANITARY SEWER PROFILE
15	ENVIRONMENTAL INVENTORY
16	NOTES AND DETAILS
17	NOTES AND DETAILS
18	**DAM NOTES AND DETAILS**
19	STANDARD WATER DETAILS (JCSA)
20	STANDARD SANITARY SEWER DETAILS (JCSA)

DATE: 4/26/2000
REVISED: 8/15/2000
PROJECT NO.: 8604-1
JCC APPROVED PLAN S-035-01

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
8/15/00
PROFESSIONAL ENGINEER

1. Riser crest to emerg. spillway is less than 1.0
2. High water line to top of dam is greater than 1.0
✓ OK

NOTE:
DUE TO LANDSCAPE REQUIREMENTS LOCATED ALONG THE FRONT SETBACK OF EACH LOT, PROPOSED UTILITY EASEMENTS LOCATED OUTSIDE OF THE RIGHT-OF-WAY SHALL BE APPROVED BY THE DEVELOPER AND ENGINEER.

SUT REVIEW SET

I HEREBY CERTIFY TO THE BEST OF MY JUDGMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CONDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.

VIRGINIA REGISTERED PROFESSIONAL ENGINEER

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
9/19/01
PROFESSIONAL ENGINEER

RECORD DRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

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

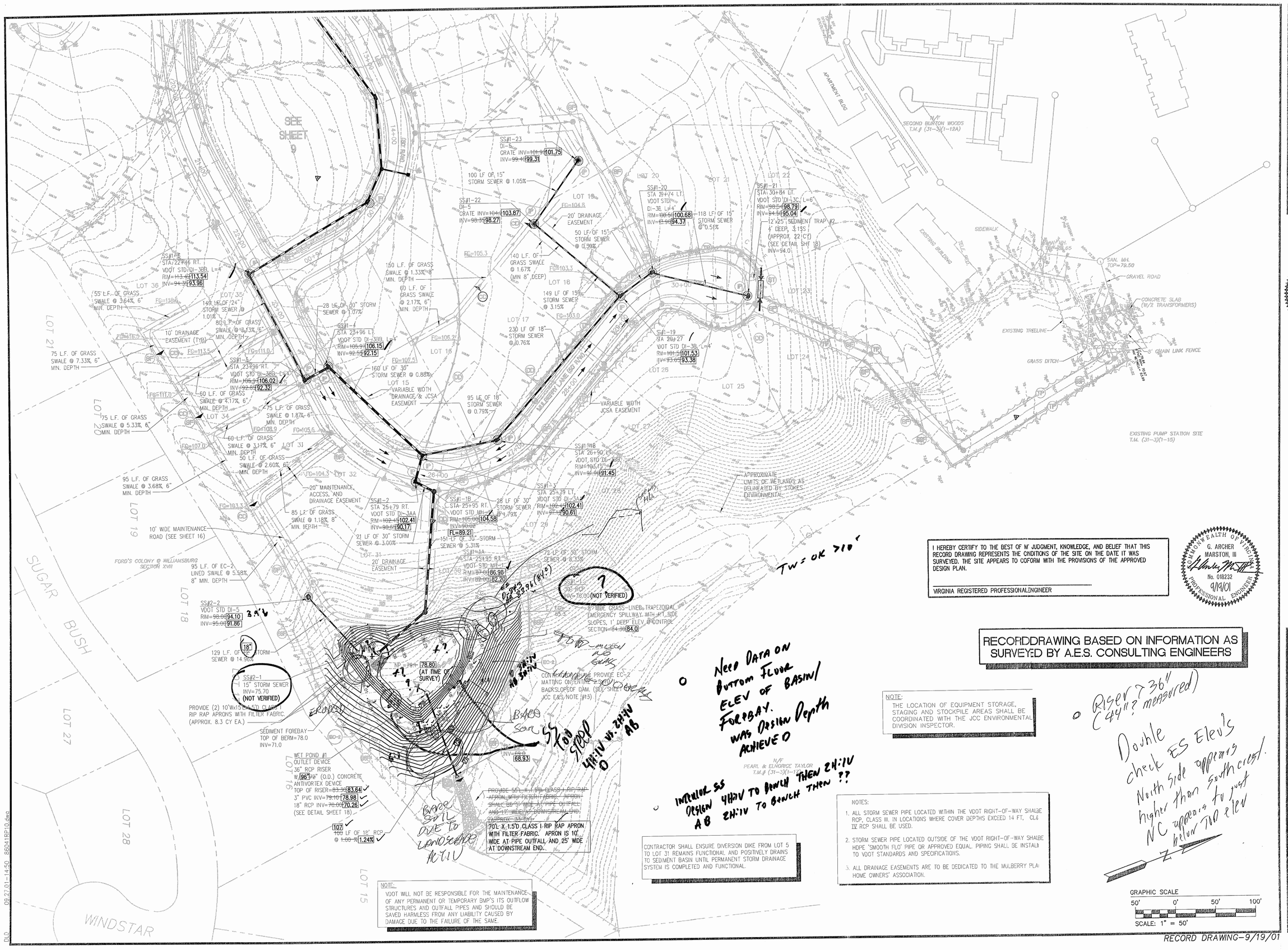
PC 137; S-35-00

No.	DATE	REVISION / COMMENT / NOTE	BY
3	9/19/01	RECORD DRAWING STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

RECORD DRAWING-9/19/01

09.27.01-14:57 86041RP01.dwg
DLD
PC137_MULBERRY_PLACE - 012

No.	DATE	REVISION / COMMENT / NOTE	BY
3	9/19/01	RECORD DRAWING STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR



I HEREBY CERTIFY TO THE BEST OF M' JUDGMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CNDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO COFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.

VIRGINIA REGISTERED PROFESSIONALENGINEER

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
9/19/01
PROFESSIONAL ENGINEER

RECORDDRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
8/15/00
PROFESSIONAL ENGINEER

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

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

MULBERRY PLACE

OWNER / DEVELOPER : ASSOCIATED DEVELOPERS, INC.

FOWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
CBR	LBA/ARH
Scale	Date
1"=50'	4/26/00

Project No. 8604-1

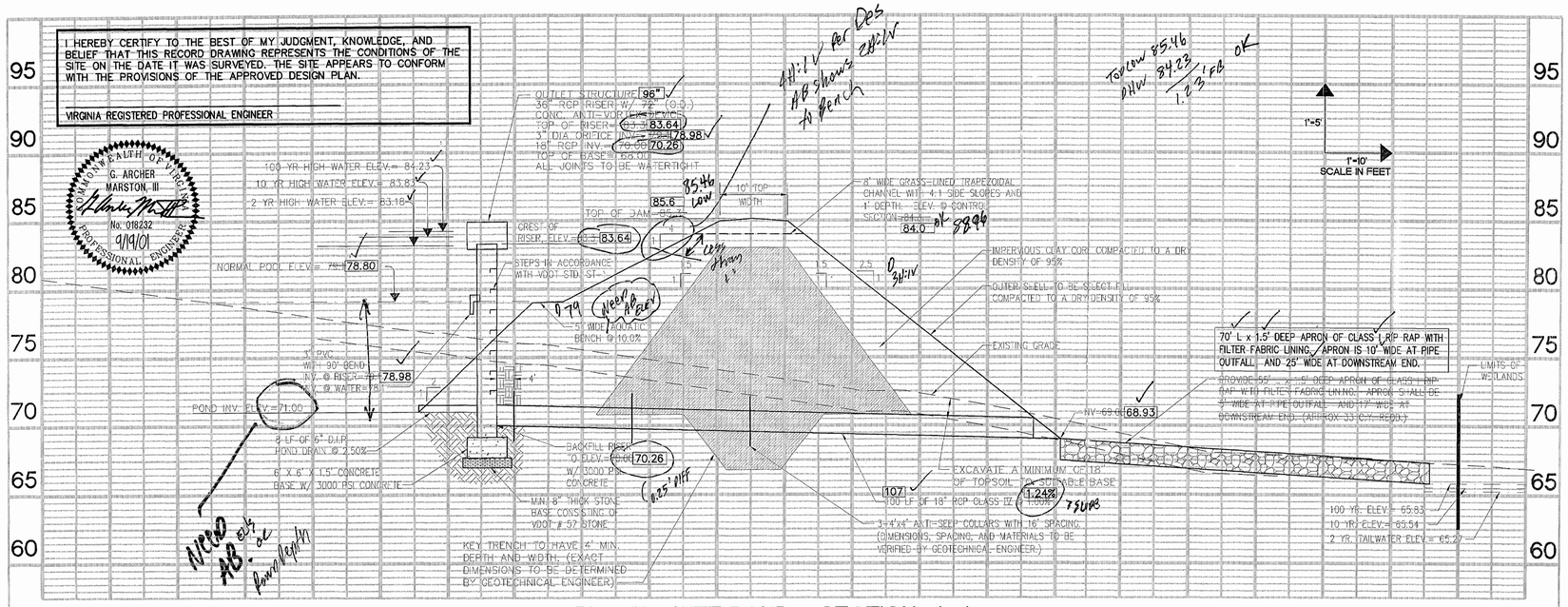
Drawing No. 10

RECORD DRAWING-9/19/01

09.27.01-14:50 B8041RP10.dwg

DLD

PC137_MULBERRY_PLACE - 013



BMP #1 - WET POND - SECTION A-A

DAM CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED TO ENSURE SUITABILITY OF THE SUBGRADE. THE GEOTECHNICAL INVESTIGATION WILL DETERMINE SUITABILITY OF THE FILL MATERIAL, RECOMMENDED ANTI-SEEP MEASURES, KEY TRENCH DEPTH AND WIDTH, AND THE ANTICIPATED LOCATION OF THE PHREATIC LINE. THESE RECOMMENDATIONS ARE HEREBY MADE A PART OF THE DAM'S CONSTRUCTION SPECIFICATIONS. A REPRESENTATIVE OF THE GEOTECHNICAL CONSULTANT SHALL BE ON SITE DURING CONSTRUCTION TO ENSURE PROPER MATERIALS AND DAM CONSTRUCTION METHODS ARE UTILIZED. FOLLOWING DAM CONSTRUCTION, THE GEOTECHNICAL CONSULTANT SHALL PROVIDE WRITTEN DOCUMENTATION, SIGNED BY A PROFESSIONAL ENGINEER, THAT THE DAM WAS BUILT IN ACCORDANCE WITH THEIR RECOMMENDATIONS, PLANS, AND SPECIFICATIONS. THE GEOTECHNICAL CONSULTANT SHALL COORDINATE WITH THE DESIGN ENGINEER IN ORDER TO COMPLETE THE JCC ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT/BMP FACILITIES CONSTRUCTION AND AS-BUILT CERTIFICATION FORM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE DAM CONSTRUCTION SCHEDULE WITH THE GEOTECHNICAL CONSULTANT IN ORDER TO ENSURE ON-SITE MONITORING.

2. SITE PREPARATION:
THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT COVER IN CONSTRUCTION AREA TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.

3. EMBANKMENT:
THE EXPOSED SUB GRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER ANY SUITABLE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING, AT THE DISCRETION OF THE OWNER/GEOTECHNICAL ENGINEER, SHALL BE PERFORMED AT THIS TIME. THE EMBANKMENT SHALL BE KEYED INTO THE UNDISTURBED (EXISTING) SOIL STRATUM. EMBANKMENT SHOULD BE KEYED AT LEAST 3 FEET INTO THE STRATUM OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER (WIDTH=6 FT. MIN.) THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUB-GRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE , AND GENERALLY UNSUITABLE MATERIAL. ALL MATERIALS TO BE USED FOR BACKFILL OR COMPACTED FILL SHALL BE INSPECTED AND, IF NECESSARY, TESTED BY THE GEOTECHNIAL ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT, TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE. THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIALS. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACKFILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. AREAS ON WHICH FILL IS TO BE PLACED SHALL BE SCARIFIED A MINIMUM OF 4 INCHES PRIOR TO PLACEMENT OF FILL.
THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE (+3 TO -2) PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL, THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL WILL BE PLACED IN 6 TO 8 INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUBGRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.

4. CUTOFF TRENCH/KEY TRENCH:
THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH SHALL BE AS SHOWN ON THE PLANS AND SHALL EXTEND UP BOTH ABUTMENTS. THE BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTING EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTING OPERATIONS.

5. PRINCIPAL SPILLWAY:
THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE FOUNDATION'S BASE. ALL JOINTS IN THE PRINCIPAL SPILLWAY STRUCTURE SHALL BE WATERTIGHT CONSTRUCTION. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL, OR CRUSHED STONE SHALL NOT BE USED AS BACKFILL AROUND THE BARREL OR ANTI-SEEP COLLAR. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4 INCH LAYERS AND COMPACTED BY HAND TO THE SAME DENSITY AS THE EMBANKMENT. AMINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

6. VEGETATIVE STABILIZATION:
FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL:	AT LEAST 4" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME:	4,000#/ACRE (90#/1,000 S.F.)
SEED:	KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER:	10/1C/10 MIX, 1,000#/ACRE FALL (23#/1,000 S.F.)
MULCH:	STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)

RECORD DRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

PROPER MAINTENANCE OF THIS FACILITY IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE FACILITY, SPILLWAY(S) AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL FROM THE FACILITY WILL BE REQUIRED ONCE EVERY 10 YEARS. IF OTHER CONSTRUCTION OR RELATED ACTIVITIES ARE PERFORMED ON UPSLOPE PARCELS, ADEQUATE PROTECTION SHOULD BE PROVIDED AND INSPECTIONS PERFORMED AT LEAST ONCE WEEKLY.

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE SWM STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR, A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER, WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. WHERE STRUCTURES ARE TO BE MAINTAINED JOINTLY, ALLOCATION OF MAINTENANCE COSTS WILL BE IN ACCORDANCE WITH THE TERMS ESTABLISHED IN MAINTENANCE AGREEMENTS. KEYS TO LOCKED ACCESS POINTS SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. IF THE DEPTH OF SEDIMENT REACHES THE DEPTH OF 1.1' ABOVE THE BOTTOM OF POND (i.e. CLEANOUT ELEVATION 72.1), REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN THE RISER BOTTOM AND OUTLET PIPE OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

2. PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT. TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

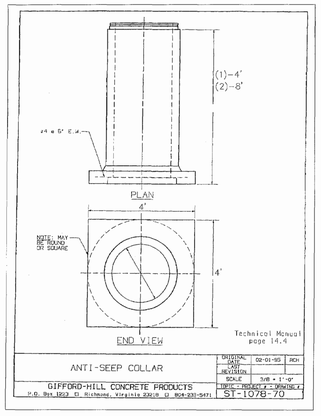
5. PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE.

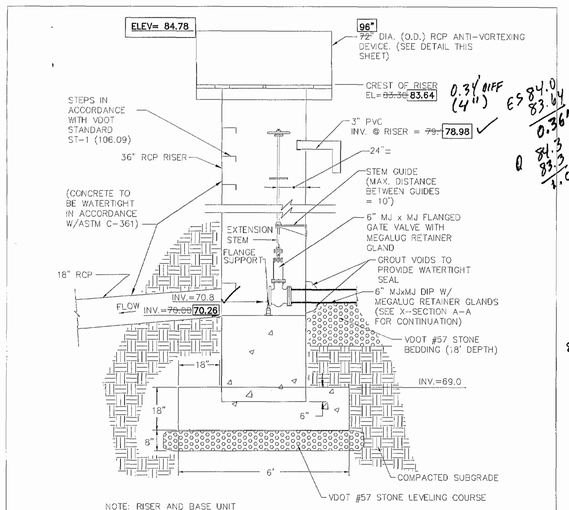
6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.

7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE DETENTION FACILITY FOR SIGNS OF ANIMAL/ RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING AS APPROPRIATE.

8. RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OR INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.



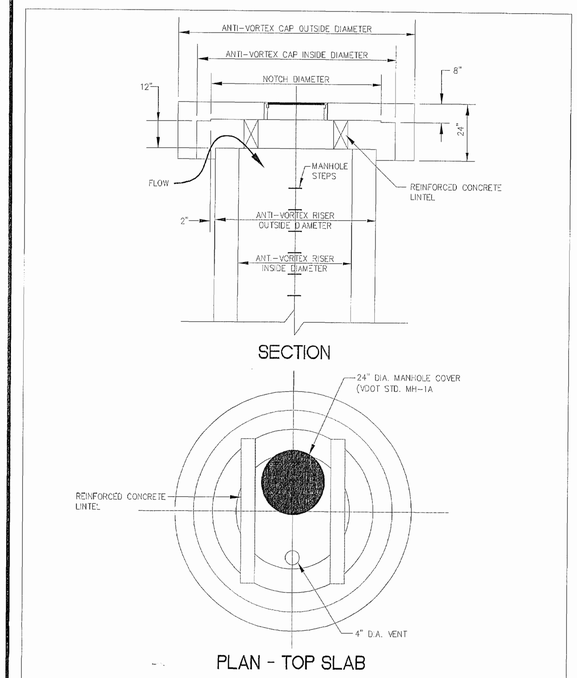


NOTE: RISER AND BASE UNIT TO BE PRECAST.

CROSS SECTION PROP. 48" RISER STRUCTURE WITH ANTI-VORTEXING TOP

NOT TO SCALE

RISER		ANTI-VORTEX CAP		NOTCH DIAMETER	APPROXIMATE CAP WEIGHT
I.D.	O.D.	I.D.	O.D.		
24"	30"	48"	58"	34"	1.49 T
27"	33-1/2"	60"	70" OR 72"	37-1/2"	2.28 T
30"	37"	60"	70" OR 72"	41"	2.26 T
36"	44"	60"	70" OR 72"	48"	2.22 T
42"	51"	72"	86"	55"	3.16 T
48"	58"	84"	100"	62"	4.27 T
54"	66-1/2"	84"	100"	70-1/2"	4.20 T
60"	72"	96"	114"	76"	5.48 T
66"	80-1/2"	96"	114"	84-1/2"	5.39 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126"	147"	98-1/2"	8.97 T
84"	100"	126"	147"	104"	8.90 T

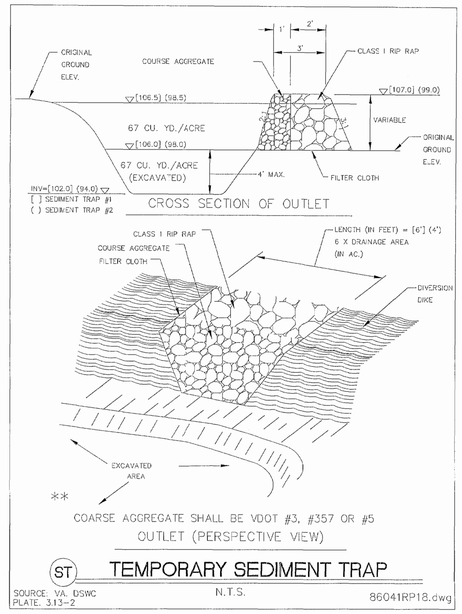


1. ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
2. DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478
3. INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER O.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.)
4. SLAB REINFORCEMENT TO BE ASTM A615 #4 BARS @ 8" E.W. CIRCUMFERENCIAL REINFORCEMENT TO BE A_{sc}=1 @ 0.150 2x6W2.5xW2.5 WWF TO BE MINIMUM.

MATERIAL PROPERTIES:
Fy=60ksi
Fc=4ksi
CONCRETE COVER OVER REINFORCEMET (CCOR)=1"

ANTI- VORTEX DETAIL

NOT TO SCALE



ST TEMPORARY SEDIMENT TRAP

SOURCE: VA. DSWC PLATE. 3.13-2 N.T.S. 86041RP18.dwg

No.	DATE	REVISION / COMMENT / NOTE	BY
3	9/19/01	RECORD DRAWING STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
8/15/00
PROFESSIONAL ENGINEER

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

DAM NOTES AND DETAILS
MULBERRY PLACE
OWNER / DEVELOPER : ASSOCIATED DEVELOPERS, INC.
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
CBR	LBA/ARH
Scale	Date
AS NOTED	4/26/00
Project No.	
8604-1	
Drawing No.	
18	

RECORD DRAWING-9/19/01

MULBERRY PLACE

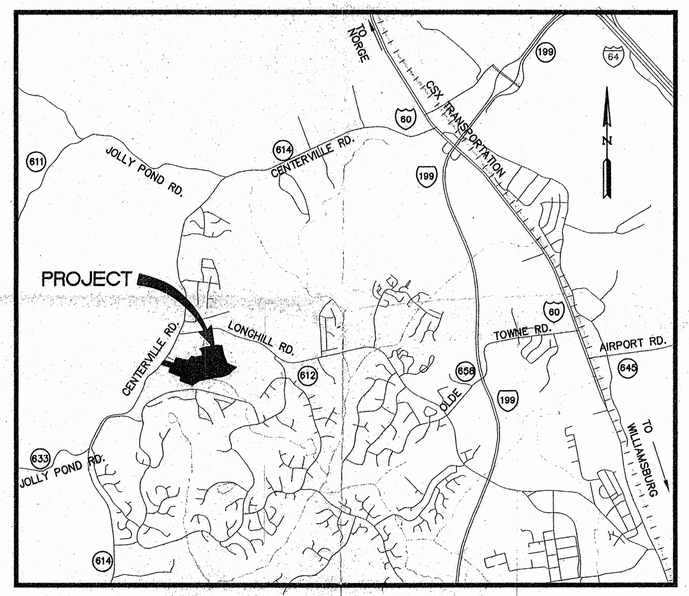
DEVELOPER: ASSOCIATED DEVELOPERS, INC.

JAMES CITY COUNTY, VIRGINIA

POWHATAN DISTRICT

LEGEND

EXISTING		PROPOSED
	WATER	W
	SANITARY SEWER	S
	STORM SEWER	
	FORCE MAIN	F.M.
	MANHOLE	
	CURB DROP INLET	
	YARD DROP INLET	
	FLARED END SECTION	
	VALVE	
	FIRE HYDRANT ASSEMBLY	
	BLOW-OFF VALVE	
	AIR RELEASE ASSEMBLY	
	CLEAN OUT	
	WATER METER	
	STREETLIGHT	
	CENTERLINE/BASELINE	
	RIGHT OF WAY	
	PROPERTY LINE	
	℄ DITCH/SWALE	
	CONCRETE LINED DITCH	
	EC-3 LINED DITCH	
	EXISTING TREELINE	
	LIMITS OF CLEARING	
	SILT FENCE	
	INLET PROTECTION	
	CHECK DAM	
	STRAW BALE BARRIER	
	RIP RAP	
	REVERSE ROLL TOP GUTTER	
	GROUND ELEVATION	24.1
	PROPOSED TOP OF CURB ELEV.	TOC ELEV
	GRADING LINE TIE-IN	
80	EXISTING CONTOUR ELEV.	
	PROPOSED CONTOUR ELEV.	80
	GRADING BY OTHERS	80



VICINITY MAP (APPROX. SCALE 1"=2000')

DATE: 4/26/2000
REVISED: 8/15/2000
PROJECT NO.: 8604-1
JCC APPROVED PLAN S-035-01

INDEX OF SHEETS

SHEET NUMBER	DESCRIPTION
1	**COVER SHEET**
2	OVERALL DEVELOPMENT PLAN
3	PRELIMINARY PLAT
4	PRELIMINARY PLAT
5	OVERALL UTILITY PLAN
6	ROAD AND UTILITY PLAN
7	ROAD AND UTILITY PLAN
8	OVERALL DRAINAGE PLAN
9	DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN
10	**DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN**
11	STREETSCAPE, PERIMETER BUFFER AND PARK PLAN
12	CENTERVILLE ROAD BUFFER AND ENTRANCE PLAN
13	ROAD AND UTILITY PROFILE
14	SANITARY SEWER PROFILE
15	ENVIRONMENTAL INVENTORY
16	NOTES AND DETAILS
17	NOTES AND DETAILS
18	**DAM NOTES AND DETAILS**
19	STANDARD WATER DETAILS (JCSA)
20	STANDARD SANITARY SEWER DETAILS (JCSA)

NOTE:
DUE TO LANDSCAPE REQUIREMENTS LOCATED ALONG THE FRONT SETBACK OF EACH LOT, PROPOSED UTILITY EASEMENTS LOCATED OUTSIDE OF THE RIGHT-OF-WAY SHALL BE APPROVED BY THE DEVELOPER AND ENGINEER.

I HEREBY CERTIFY TO THE BEST OF MY JUDGMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CONDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.

VIRGINIA REGISTERED PROFESSIONAL ENGINEER

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
12/2/02
PROFESSIONAL ENGINEER

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
8/15/00
PROFESSIONAL ENGINEER

RECORD DRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

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

S-35-00; PC137

APPROVED
James City County
Environmental Division
By:
Date: 12-20-02

No.	DATE	REVISION / COMMENT / NOTE	BY
3	12/2/02	RECORD DRAWING STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

RECORD DRAWING-12/2/02

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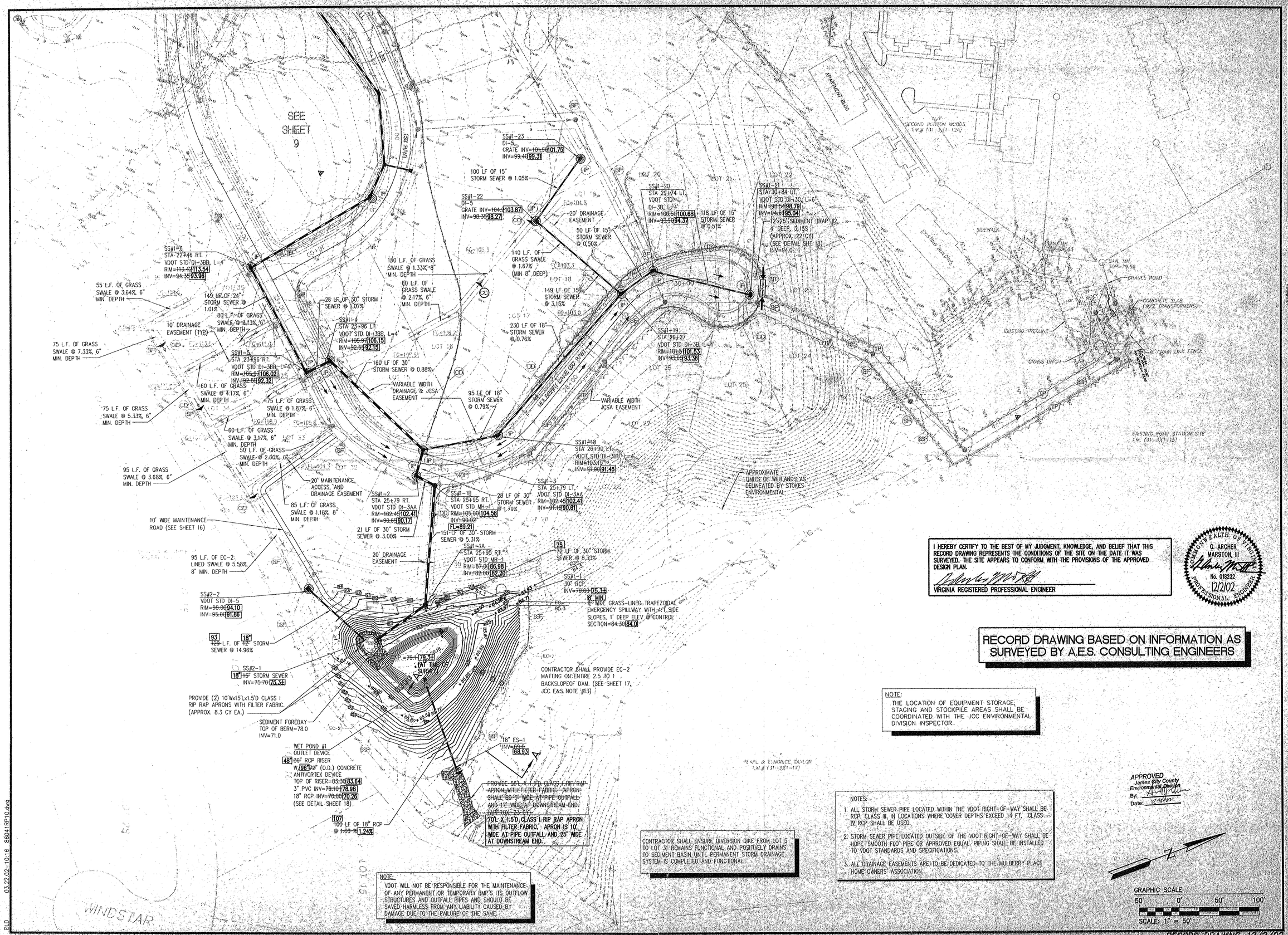
OLD
PC137_MULBERRY_PLACE - 015



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VIRGINIA REGISTERED PROFESSIONAL ENGINEER

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
12/2/02
PROFESSIONAL ENGINEER

RECORD DRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

NOTE:
THE LOCATION OF EQUIPMENT STORAGE, STAGING AND STOCKPILE AREAS SHALL BE COORDINATED WITH THE JCC ENVIRONMENTAL DIVISION INSPECTOR.

NOTE:
VDOT WILL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY PERMANENT OR TEMPORARY BMP'S ITS OUTFLOW STRUCTURES AND OUTFALL PIPES AND SHOULD BE SAVED HARMLESS FROM ANY LIABILITY CAUSED BY DAMAGE DUE TO THE FAILURE OF THE SAME.

CONTRACTOR SHALL ENSURE DIVERSION DIKE FROM LOT 5 TO LOT 31 REMAINS FUNCTIONAL AND POSITIVELY DRAINS TO SEDIMENT BASIN UNTIL PERMANENT STORM DRAINAGE SYSTEM IS COMPLETED AND FUNCTIONAL.

NOTES:
1. ALL STORM SEWER PIPE LOCATED WITHIN THE VDOT RIGHT-OF-WAY SHALL BE RCP, CLASS III, IN LOCATIONS WHERE COVER DEPTHS EXCEED 14 FT. CLASS IV RCP SHALL BE USED.
2. STORM SEWER PIPE LOCATED OUTSIDE OF THE VDOT RIGHT-OF-WAY SHALL BE HDPE "SMOOTH FLO" PIPE OR APPROVED EQUAL. PIPING SHALL BE INSTALLED TO VDOT STANDARDS AND SPECIFICATIONS.
3. ALL DRAINAGE EASEMENTS ARE TO BE DEDICATED TO THE MULBERRY PLACE HOME OWNERS' ASSOCIATION.

APPROVED
James City County
Environmental Division
By: [signature]
Date: 12-19-02

GRAPHIC SCALE
50' 0' 50' 100'
SCALE: 1" = 50'

RECORD DRAWING-12/2/02

No.	DATE	REVISION / COMMENT / NOTE	BY
3	12/2/02	RECORD DRAWING-STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

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

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

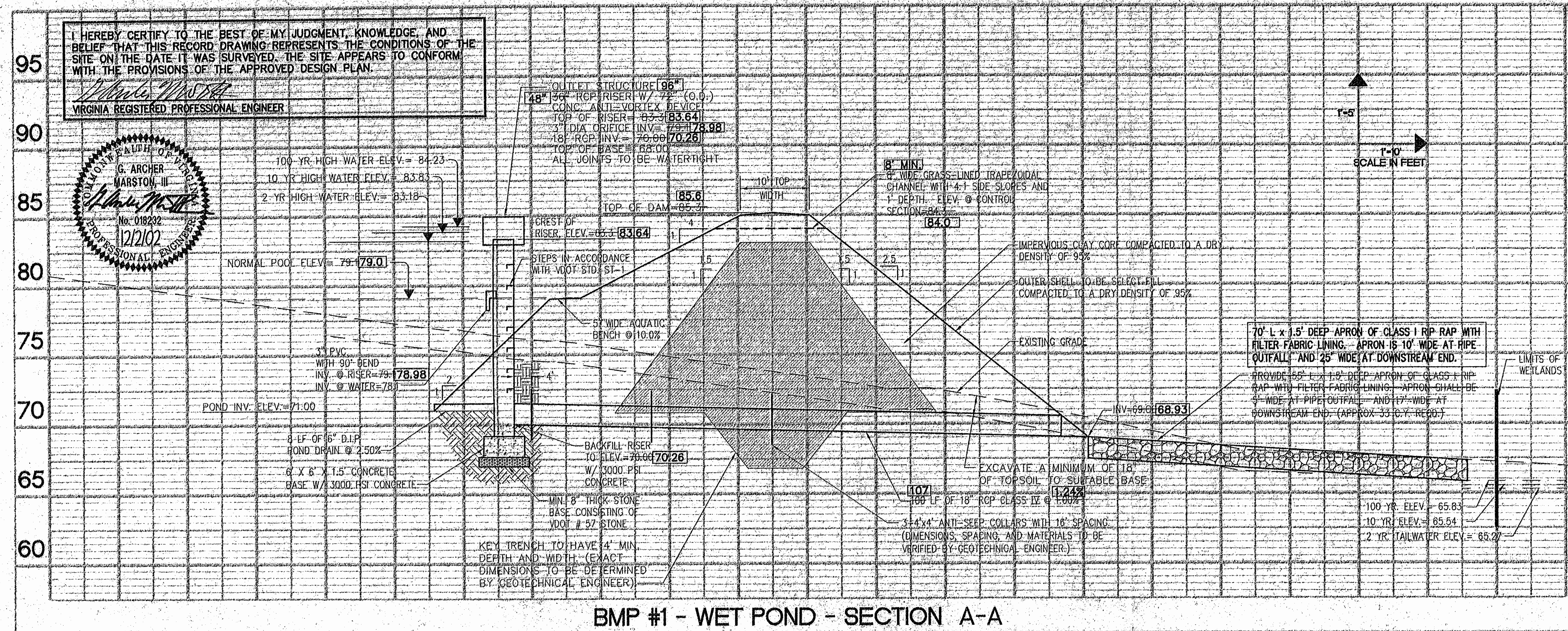
MULBERRY PLACE

OWNER / DEVELOPER: ASSOCIATED DEVELOPERS, INC.
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

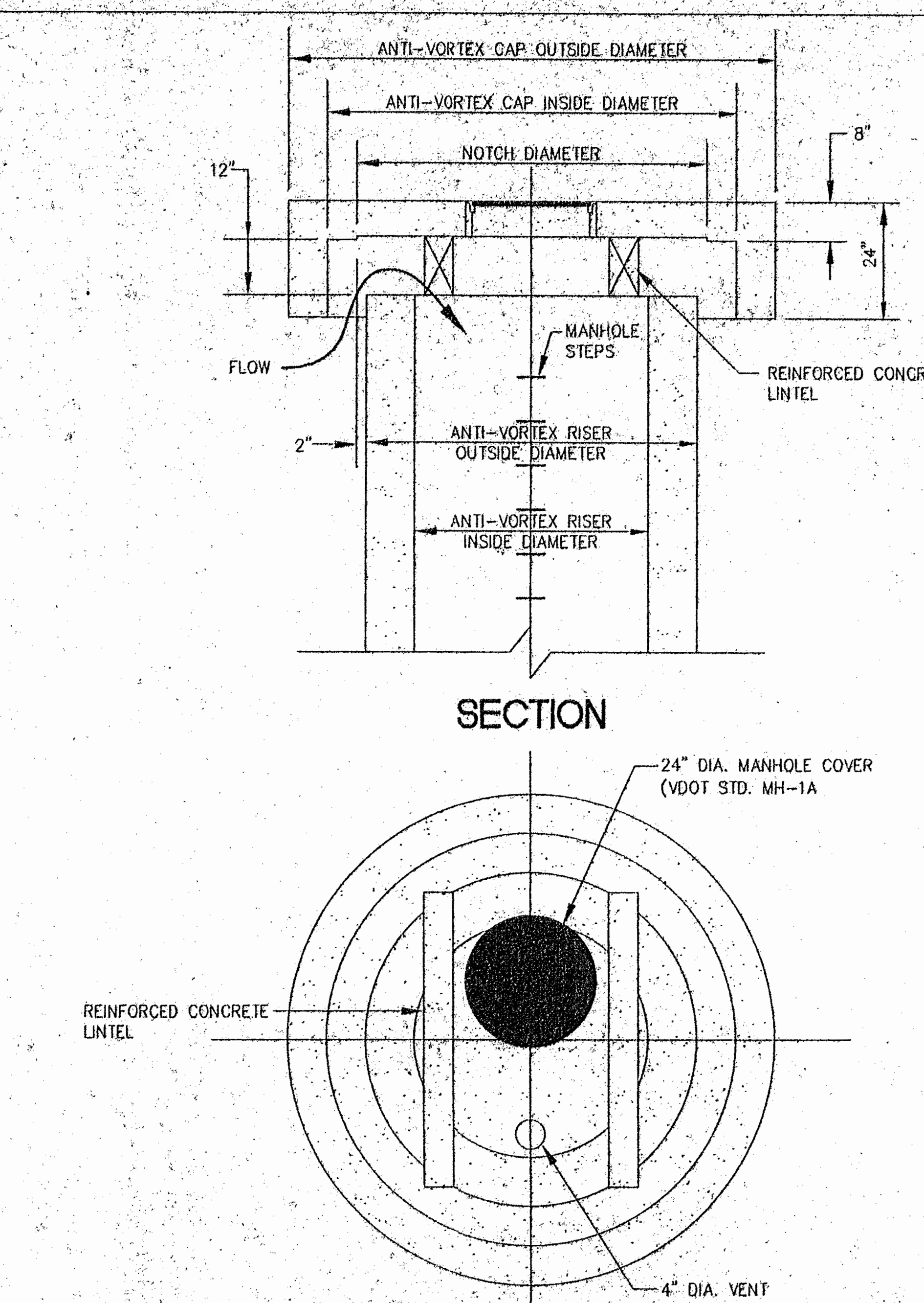
Designed CBR	Drawn LBA/ARH
Scale 1"=50'	Date 4/26/00
Project No. 8604-1	
Drawing No. 10	

03.22.02-10:16 8604IRP10.dwg

PC137_MULBERRY_PLACE - 016



BMP #1 - WET POND - SECTION A-A



PLAN - TOP SLAB

1. ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
2. DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478
3. INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER O.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.)
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Fc=4ksi
CONCRETE COVER OVER REINFORCEMET (CCOR)=1"

ANTI- VORTEX DETAIL
NOT TO SCALE

DAM CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED TO ENSURE SUITABILITY OF THE SUBGRADE. THE GEOTECHNICAL INVESTIGATION WILL DETERMINE SUITABILITY OF THE FILL MATERIAL, RECOMMENDED ANTI-SEEP MEASURES, KEY TRENCH DEPTH AND WIDTH, AND THE ANTICIPATED LOCATION OF THE PHREATIC LINE. THESE RECOMMENDATIONS ARE HEREBY MADE A PART OF THE DAM'S CONSTRUCTION SPECIFICATIONS. A REPRESENTATIVE OF THE GEOTECHNICAL CONSULTANT SHALL BE ON SITE DURING CONSTRUCTION TO ENSURE PROPER MATERIALS AND DAM CONSTRUCTION METHODS ARE UTILIZED. FOLLOWING DAM CONSTRUCTION, THE GEOTECHNICAL CONSULTANT SHALL PROVIDE WRITTEN DOCUMENTATION, SIGNED BY A PROFESSIONAL ENGINEER, THAT THE DAM WAS BUILT IN ACCORDANCE WITH THEIR RECOMMENDATIONS, PLANS, AND SPECIFICATIONS. THE GEOTECHNICAL CONSULTANT SHALL COORDINATE WITH THE DESIGN ENGINEER IN ORDER TO COMPLETE THE JCC ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT/BMP FACILITIES CONSTRUCTION AND AS-BUILT CERTIFICATION FORM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE DAM CONSTRUCTION SCHEDULE WITH THE GEOTECHNICAL CONSULTANT IN ORDER TO ENSURE ON-SITE MONITORING.

2. SITE PREPARATION:
THE CONTRACTOR SHALL STRIP ALL AREAS OF THE PERMANENT COVER IN CONSTRUCTION AREA TO REMOVE ALL UNSUITABLE MATERIALS. THE UNSUITABLE MATERIALS TO BE REMOVED BY STRIPPING SHALL INCLUDE ALL TOPSOIL, DEBRIS AND VEGETABLE MATTER, INCLUDING STUMPS AND ROOTS, AND ALL OTHER MATERIALS WHICH MAY BE UNSUITABLE FOR USE IN THE PERMANENT CONSTRUCTION.

3. EMBANKMENT:
THE EXPOSED SUB GRADE SOILS SHALL BE CAREFULLY INSPECTED BY THE GEOTECHNICAL ENGINEER ANY UNSUITABLE MATERIALS THUS EXPOSED SHALL BE REMOVED AND REPLACED WITH A WELL COMPACTED, SUITABLE MATERIAL. DENSITY TESTING, AT THE DISCRETION OF THE OWNER/GEOTECHNICAL ENGINEER, SHALL BE PERFORMED AT THIS TIME. THE EMBANKMENT SHALL BE KEYED INTO THE UNDISTURBED (EXISTING) SOIL STRATUM. EMBANKMENT SHOULD BE KEYED AT LEAST 3 FEET INTO THE STRATUM OR AS SPECIFIED BY THE GEOTECHNICAL ENGINEER (WIDTH=6 FT. MIN.) THE EMBANKMENT FOUNDATION AND ABUTMENTS SHALL BEAR ON FIRM AND STABLE EXISTING SUB-GRADE WHICH HAS BEEN PREPARED SO AS TO REMOVE ALL ORGANIC, LOOSE , AND GENERALLY UNSUITABLE MATERIAL. ALL MATERIALS TO BE USED FOR BACKFILL OR COMPACTED FILL SHALL BE INSPECTED AND, IF NECESSARY, TESTED BY THE GEOTECHNIAL ENGINEER IN ACCORDANCE WITH ASTM D2487 PRIOR TO PLACEMENT, TO DETERMINE IF THEY ARE SUITABLE FOR THE INTENDED USE. THE FILL MATERIAL SHALL BE TAKEN FROM APPROVED BORROW AREAS. IT SHALL BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOOD VEGETATION, OVERSIZED STONES, ROCKS, OR OTHER OBJECTIONABLE MATERIALS. MATERIALS TO BE USED FOR THE CONSTRUCTION OF THE SHELL SHALL BE SELECT BACKFILL FREE OF STUMPS, ROOTS, ROCKS, TRASH, ETC. AND SHALL BE MORE PERVIOUS THAN THE IMPERVIOUS CLAY CORE. AREAS ON WHICH FILL IS TO BE PLACED SHALL BE SCARIFIED A MINIMUM OF 4 INCHES PRIOR TO PLACEMENT OF FILL.
THE FILL MATERIAL'S MOISTURE CONTENT SHALL BE (+3 TO -2) PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D2216 (I.E. IN GENERAL THE FILL MATERIAL SHOULD CONTAIN SUFFICIENT MOISTURE SO THAT IT CAN BE FORMED INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION). FILL MATERIAL WILL BE PLACED IN 6 TO 8 INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL. FIRST LIFT ON SUBGRADE MAY BE PLACED AT A DEPTH UP TO 30 INCHES TO BRIDGE SUBGRADE WITH OVER OPTIMUM MOISTURE CONTENT. COMPACTION, AS NOTED ON PLAN, SHALL BE OBTAINED GENERALLY BY USING A SHEEPSFOOT COMPACTOR. FINISHED GRADES SHALL BE MERGED NATURALLY INTO THE EXISTING GRADES.

4. CUTOFF TRENCH/KEY TRENCH:
THE TRENCH SHALL BE EXCAVATED ALONG THE CENTERLINE OF THE DAM. THE MINIMUM DEPTH SHALL BE AS SHOWN ON THE PLANS AND SHALL EXTEND UP BOTH ABUTMENTS. THE BOTTOM WIDTH SHALL BE WIDE ENOUGH TO PERMIT OPERATION OF COMPACTING EQUIPMENT. THE SIDE SLOPES SHALL BE NO STEEPER THAN 1:1. COMPACTING OPERATIONS.

5. PRINCIPAL SPILLWAY:
THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE FOUNDATION'S BASE. ALL JOINTS IN THE PRINCIPAL SPILLWAY STRUCTURE SHALL BE WATERTIGHT CONSTRUCTION. PERVIOUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACKFILL AROUND THE BARREL OR ANTI-SEEP COLLAR. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4 INCH LAYERS AND COMPACTED BY HAND TO THE SAME DENSITY AS THE EMBANKMENT. AMINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

6. VEGETATIVE STABILIZATION:
FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL: AT LEAST 4" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME: 4,000#/ACRE (90#/1,000 S.F.)
SEED: KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER: 10/10/10 MIX, 1,000#/ACRE FALL (23#/1,000 S.F.)
MULCH: STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)

RECORD DRAWING BASED ON INFORMATION AS SURVEYED BY A.E.S. CONSULTING ENGINEERS

DLD 03.22.02-09:44 86041RP18.dwg

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

PROPER MAINTENANCE OF THIS FACILITY IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE FACILITY, SPILLWAY(S) AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL FROM THE FACILITY WILL BE REQUIRED ONCE EVERY 10 YEARS. IF OTHER CONSTRUCTION OR RELATED ACTIVITIES ARE PERFORMED ON UPSLOPE PARCELS, ADEQUATE PROTECTION SHOULD BE PROVIDED AND INSPECTIONS PERFORMED AT LEAST ONCE WEEKLY.

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE SWM STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR, A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER, WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. WHERE STRUCTURES ARE TO BE MAINTAINED JOINTLY, ALLOCATION OF MAINTENANCE COSTS WILL BE IN ACCORDANCE WITH THE TERMS ESTABLISHED IN MAINTENANCE AGREEMENTS. KEYS TO LOCKED ACCESS POINTS SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. IF THE DEPTH OF SEDIMENT REACHES THE DEPTH OF 1.1' ABOVE THE BOTTOM OF POND (i.e, CLEANOUT ELEVATION 72.1), REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN THE RISER BOTTOM AND OUTLET PIPE OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

2. PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

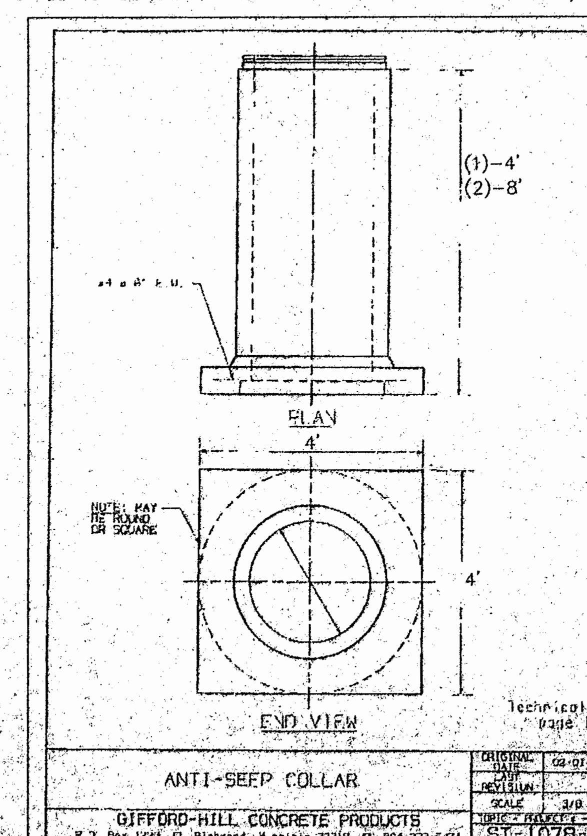
5. PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE.

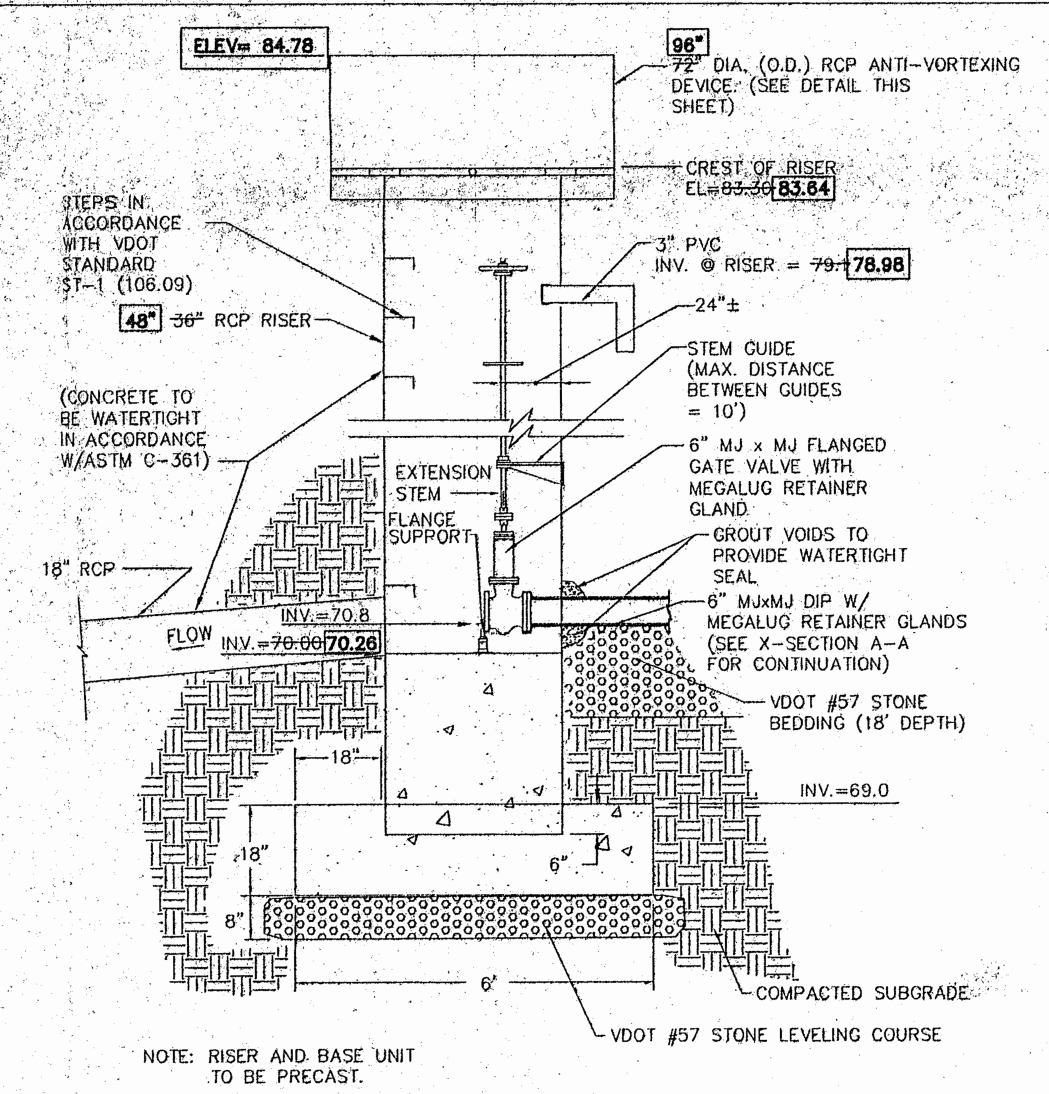
6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.

7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE DETENTION FACILITY FOR SIGNS OF ANIMAL/ RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING AS APPROPRIATE.

8. RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OR INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

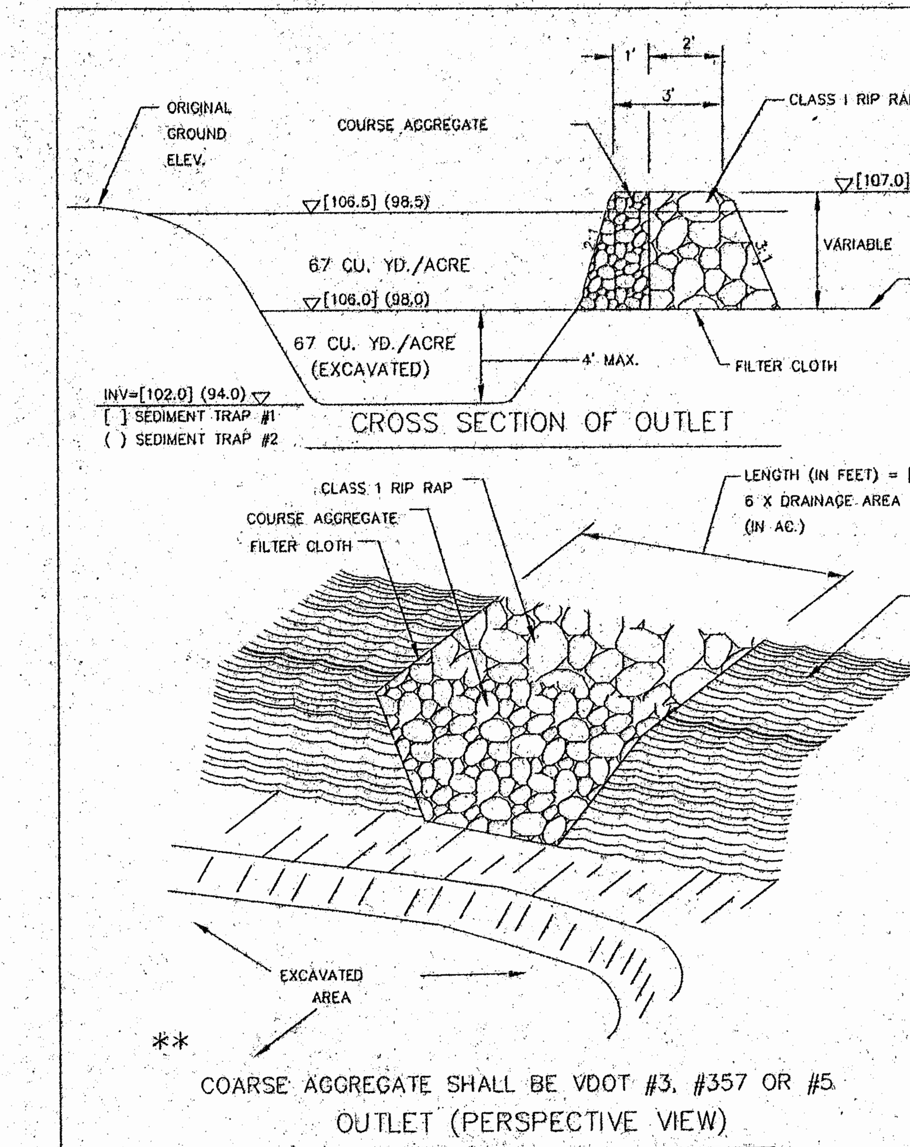




NOTE: RISER AND BASE UNIT TO BE PRECAST.

CROSS SECTION PROP. 48" RISER STRUCTURE WITH ANTI-VORTEXING TOP
NOT TO SCALE

RISER		ANTI-VORTEX CAP		NOTCH DIAMETER	APPROXIMATE CAP WEIGHT
I.D.	O.D.	I.D.	O.D.		
24"	30"	48"	58"	34"	1.49 T
27"	33-1/2"	60"	70" OR 72"	37-1/2"	2.28 T
30"	37"	60"	70" OR 72"	41"	2.26 T
36"	44"	60"	70" OR 72"	48"	2.22 T
42"	51"	72"	86"	55"	3.16 T
48"	58"	84"	100"	62"	4.27 T
54"	66-1/2"	84"	100"	70-1/2"	4.20 T
60"	72"	96"	114"	76"	5.48 T
66"	80-1/2"	96"	114'	84-1/2"	5.39 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126'	147"	98-1/2"	8.97 T
84"	100"	126'	147"	104"	8.90 T



(ST) TEMPORARY SEDIMENT TRAP
N.T.S.

SOURCE: VA. DSWC PLATE. 3.13-2

86041RP18.dwg

APPROVED James City County Environmental Division
By: [signature]
Date: 12-10-02

No.	DATE	REVISION / COMMENT / NOTE	BY
3	12/2/02	RECORD DRAWING STORMWATER MANAGEMENT/BMP FACILITIES	CBR
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

COMMONWEALTH OF VIRGINIA G. ARCHER MARSTON, III No. 018232 8/15/00 PROFESSIONAL ENGINEER

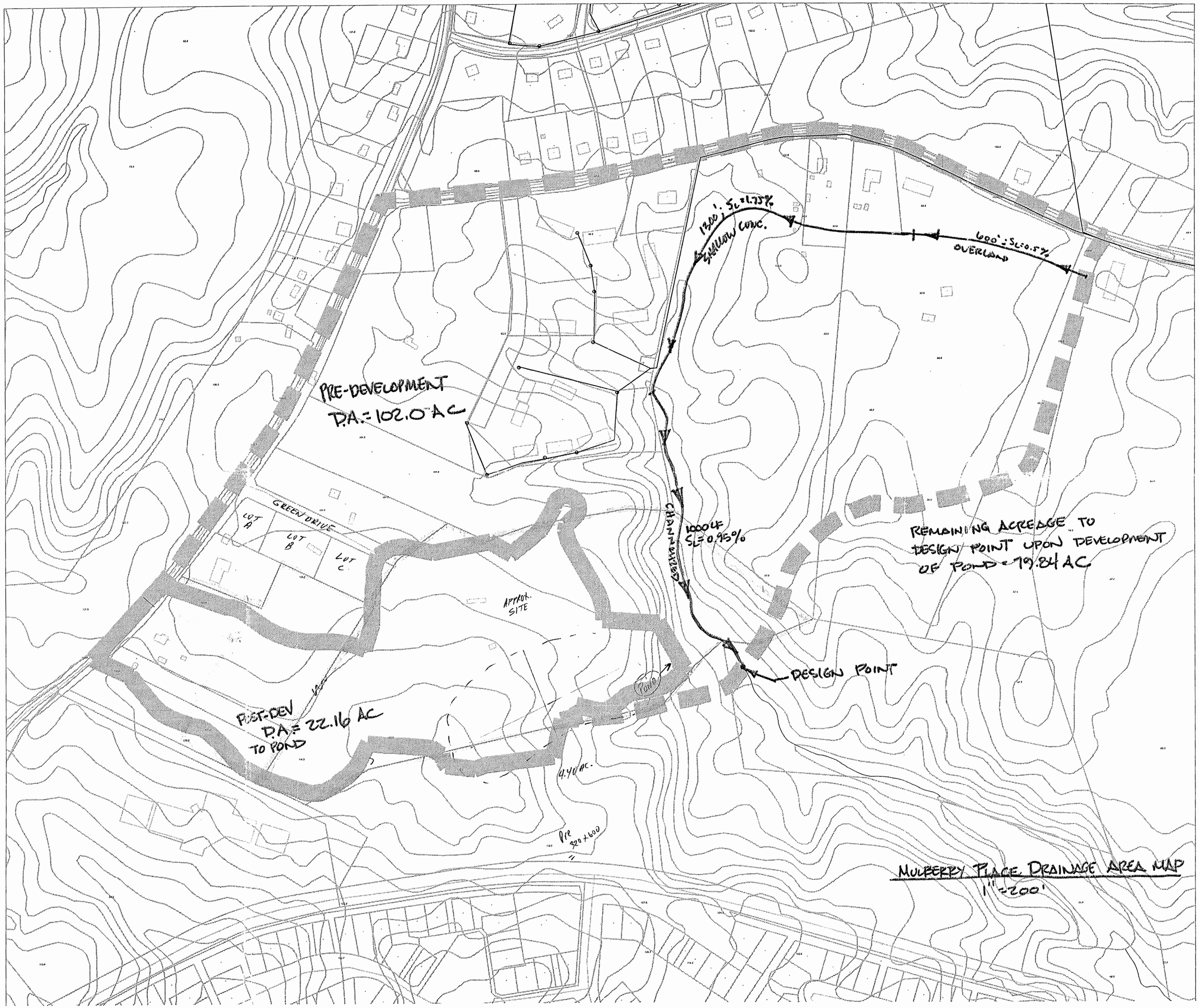
AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

DAM NOTES AND DETAILS
MULBERRY PLACE
OWNER / DEVELOPER : ASSOCIATED DEVELOPERS, INC.
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
CBR	LBA/ARH
Scale	Date
AS NOTED	4/26/00

Project No. 8604-1
Drawing No. 18

RECORD DRAWING-12/2/02



102 AC.
C = 0.30
T_c = 50 MIN.

WARHILL CORPORATION
T.M.# (31-3)(1-34)

N12°14'43"W
118.53'

N69°41'32"E
45.81'

N/F
CORA LEE GREEN
T.M.# (31-3)(1-35)

S77°27'17"E
110.51'

N79°33'32"E 182.82'

OPEN SPACE

EXISTING
POWER POLES
TO BE REMOVED

N35°26'32"E 150.00'

LOT C

E 358.71'

WM. LUDWELL LEE
(50' R/W)

EXISTING
WELL TO BE
ABANDONED

EXISTING BUILDING
TO BE DEMOLISHED
AND REMOVED

REC-LOT

MULBERRY LANE (50' R/W)

BLISS ARMSTEAD COURT
(50' R/W)

STOKES ENVIRONMENTAL

S78°21'53"E
37.26'

S66°45'23"E 242.00'

S52°25'23"W
122.42'

S43°19'44"W
144.73'

APPROXIMATE LIMITS
OF ARCHAEOLOGICAL SITE

PROPOSED
6' WIDE
SOFT PATH

S69°31'20"W 208.92'

S84°16'01"W 180.39'

S78°34'04"W 471.70'

OPEN SPACE

S57°14'07"W 246.56'

N69°55'36"W 282.54'

N64°01'41"W
74.72'

PROPOSED

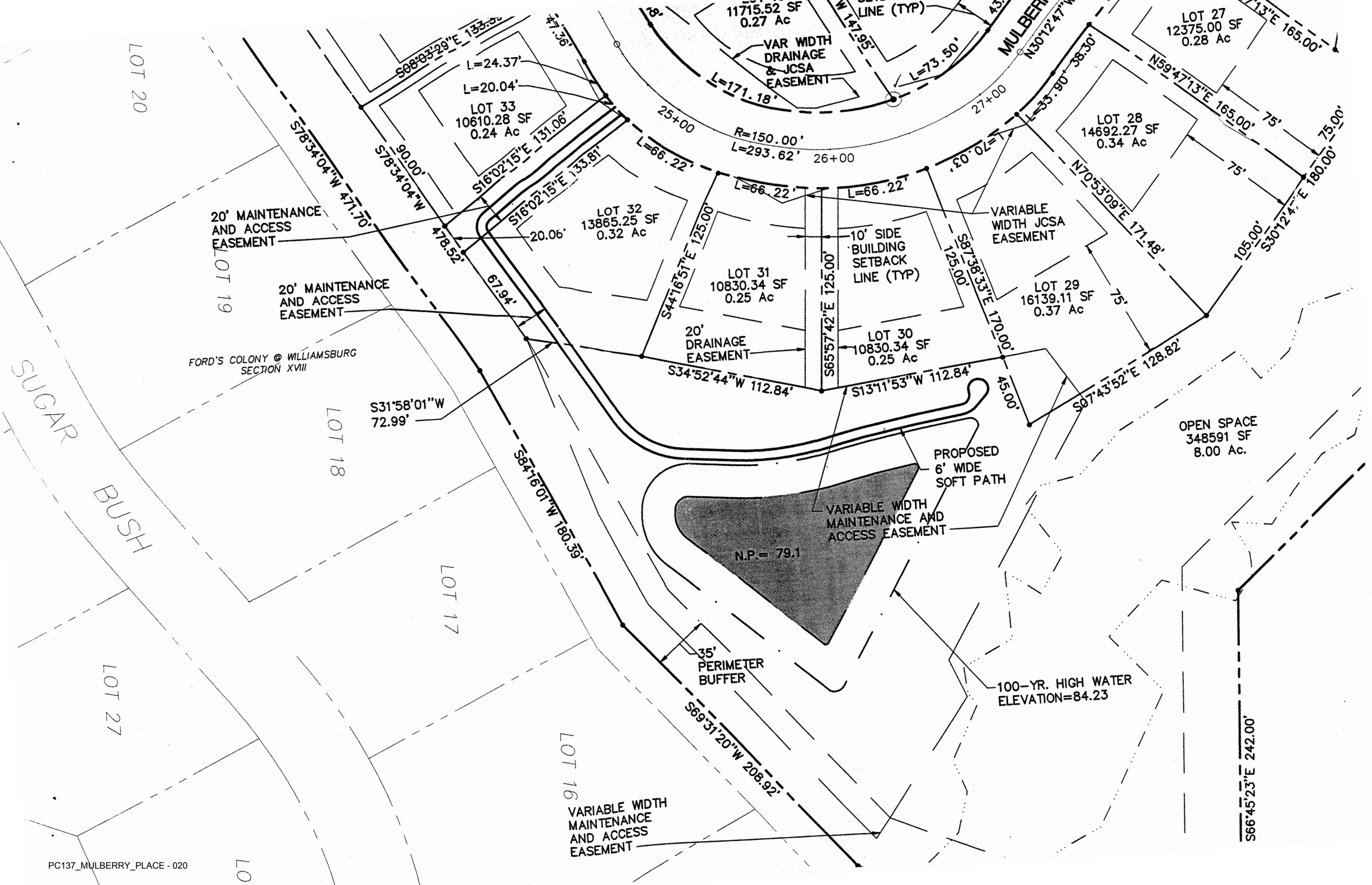
FORD'S COLONY @ WILLIAMSBURG
SECTION XVIII

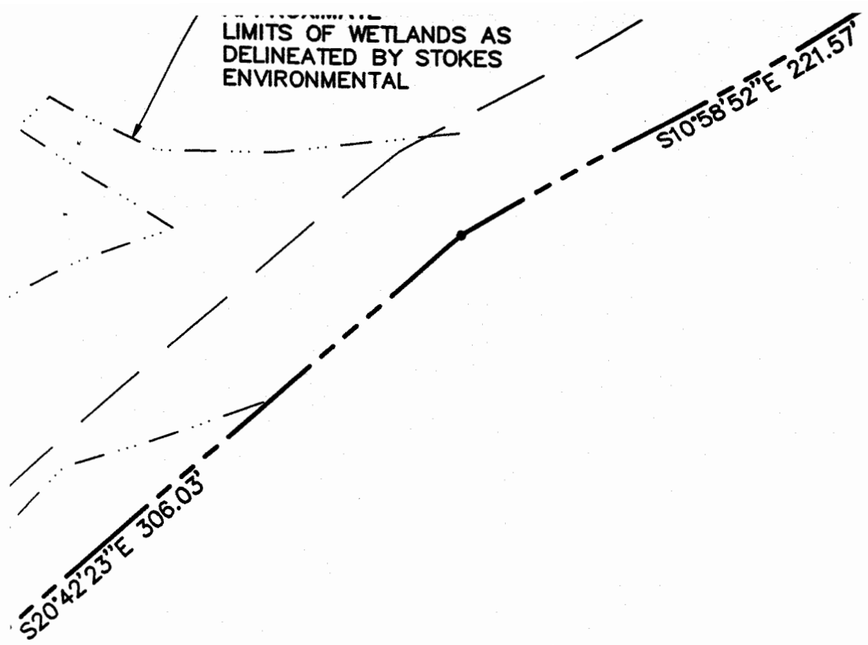
SUGAR BUSH

WINDSTAR

LOT 14
LOT 15
LOT 16
LOT 17
LOT 18
LOT 19
LOT 20
LOT 21
LOT 22
LOT 23
LOT 24
LOT 25
LOT 26
LOT 27
LOT 28
LOT 29
LOT 30
LOT 31

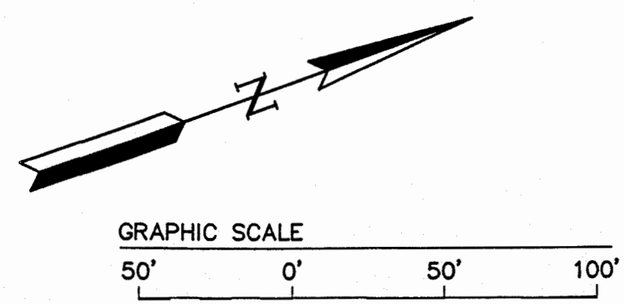
PC137_MULBERRY_PLACE - 019


MULBERRY PLACE
LOT 33
10610.28 SF
0.24 Ac
LOT 32
13865.25 SF
0.32 Ac
LOT 31
10830.34 SF
0.25 Ac
LOT 30
10830.34 SF
0.25 Ac
LOT 29
16139.11 SF
0.37 Ac
LOT 28
14692.27 SF
0.34 Ac
LOT 27
12375.00 SF
0.28 Ac
11715.52 SF
0.27 Ac
VAR WIDTH DRAINAGE & JCSA EASEMENT
R=150.00'
L=293.62'
L=171.18'
L=73.50'
L=24.37'
L=20.04'
L=66.22'
L=70.03'
L=33.90'
25+00
26+00
27+00
20' MAINTENANCE AND ACCESS EASEMENT
20' MAINTENANCE AND ACCESS EASEMENT
20' DRAINAGE EASEMENT
10' SIDE BUILDING SETBACK LINE (TYP)
VARIABLE WIDTH JCSA EASEMENT
VARIABLE WIDTH MAINTENANCE AND ACCESS EASEMENT
PROPOSED 6' WIDE SOFT PATH
N.P.= 79.1
35' PERIMETER BUFFER
100-YR. HIGH WATER ELEVATION=84.23
OPEN SPACE
348591 SF
8.00 Ac.
FORD'S COLONY @ WILLIAMSBURG SECTION XVIII
LOT 20
LOT 19
LOT 18
LOT 17
LOT 16
LOT 27
SUGAR
BUSH
S78°34'04"W 471.70'
S78°34'04"W 90.00'
S16°02'15"E 131.06'
S16°02'15"E 133.81'
478.52'
20.06'
67.94'
S31°58'01"W 72.99'
S84°16'01"W 180.39'
S69°31'20"W 208.92'
S66°45'23"E 242.00'
S07°43'52"E 128.82'
S13°11'53"W 112.84'
S34°52'44"W 112.84'
S44°16'51"E 125.00'
S65°57'42"E 125.00'
S87°38'33"E 170.00'
N70°53'09"E 171.48'
S30°12'47"E 180.00'
N59°47'13"E 165.00'
N30°12'47"W 38.30'
105.00'
75.00'
45.00'
75'



N/F
PEARL & ELNORICE TAYLOR
T.M.# (31-3)(1-17)

NOTE:
ALL DRAINAGE AND PUBLIC ACCESS EASEMENTS TO BE DEDICATED TO MULBERRY PLACE HOMEOWNERS ASSOCIATION.



5248 C
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CONSULTING ENGINEERS

PRELIMINARY PLAT

MULBERRY PLACE

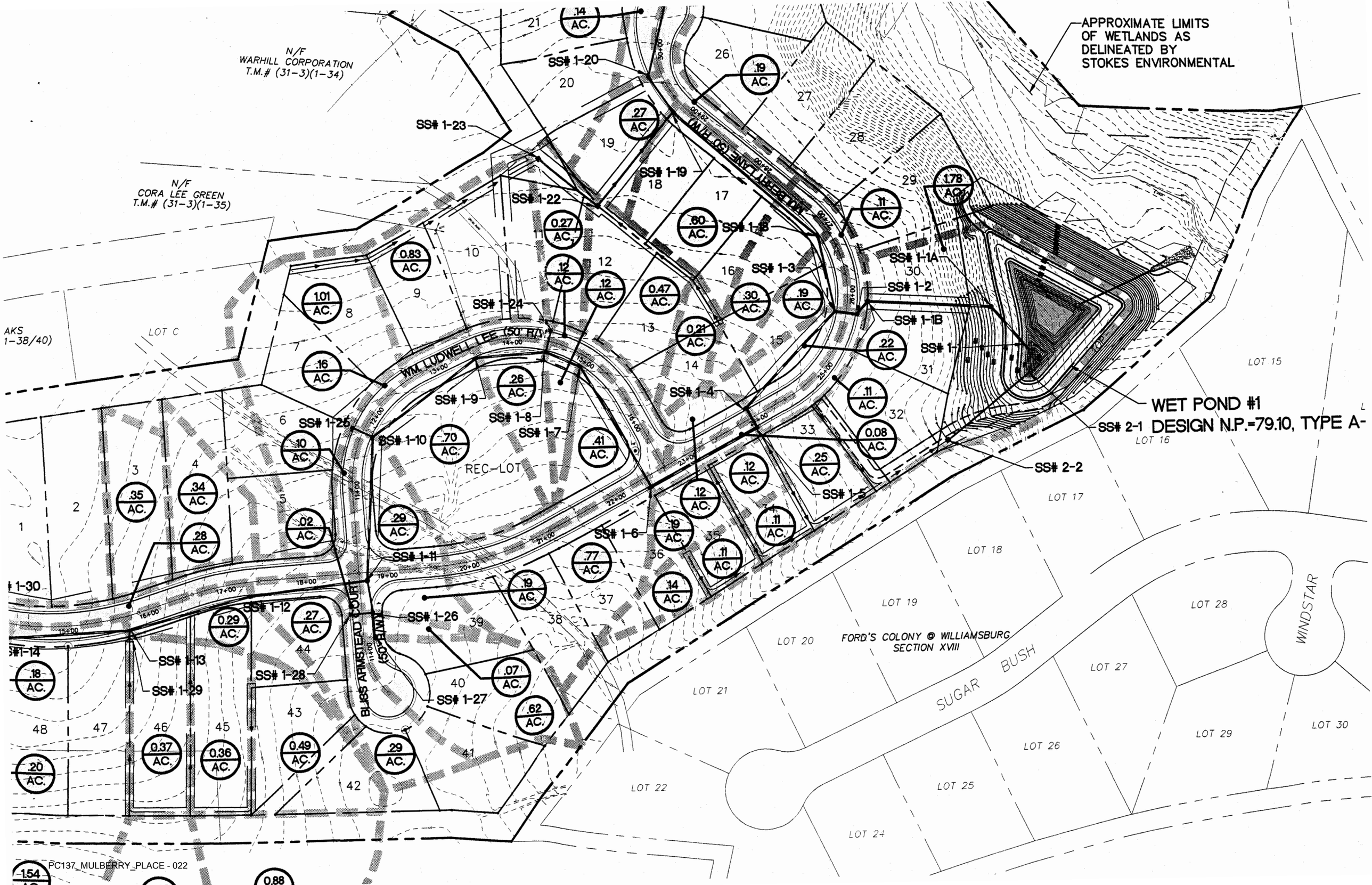
OWNER / DEVELOPER : ASSOCIATED DEVELOPERS, INC.

POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
CBR	LBA/ARH
Scale	Date
1"=50'	4/26/00

Project No.
8604-1

PC137_MULBERRY_PLACE - 021



PC137_MULBERRY_PLACE - 022

SWALE @ 3.68%, 6" MIN. DEPTH

20' MAINTENANCE, ACCESS, AND DRAINAGE EASEMENT

SS#1-2
STA 25+79 RT.
VDOT STD DI-3AA
RIM=102.45
INV=90.65

SS#1-1B
STA 25+95 RT.
VDOT STD MH-1
RIM=105.00
INV=90.02

28 LF OF 30" STORM SEWER @ 1.79%

SS#1-3
STA 25+79 LT.
VDOT STD DI-3AA
RIM=102.45
INV=91.15

LOT 28

LOT 29

LOT 19

FG=103.3

85 L.F. OF GRASS SWALE @ 1.18%, 8" MIN. DEPTH

10' WIDE MAINTENANCE ROAD (SEE SHEET 16)

21 LF OF 30" STORM SEWER @ 3.00%

151 LF OF 30" STORM SEWER @ 5.31%

LOT 31

LOT 30

20' DRAINAGE EASEMENT

SS#1-1A
STA 25+95 RT.
VDOT STD MH-1
RIM=87.00
INV=82.00

72 LF OF 30" STORM SEWER @ 8.33%

FORD'S COLONY @ WILLIAMSBURG SECTION XVIII

95 L.F. OF EC-2 LINED SWALE @ 5.58%, 8" MIN. DEPTH

FG=84.3

SS#1-1
30" RCP
INV=76.00

LOT 18

SS#2-2
VDOT STD DI-5
RIM=98.00
INV=95.00

FG=85.3

8' WIDE GRASS-LINED TRAPEZOIDAL EMERGENCY SPILLWAY WITH 4:1 SIDE SLOPES, 1' DEEP ELEV @ CONTROL SECTION=84.30

BUSH

129 L.F. OF 12" STORM SEWER @ 14.96%

NP.=79.1

CONTRACTOR SHALL PROVIDE EC-2 MATTING ON ENTIRE 2.5 TO 1 BACKSLOPEOF DAM. (SEE SHEET 17, JCC E&S NOTE #13)

LOT 17

SS#2-1
15" STORM SEWER
INV=75.70

FG=85.3

PROVIDE (2) 10'Wx15'Lx1.5'D CLASS I RIP RAP APRONS WITH FILTER FABRIC. (APPROX. 8.3 CY EA.)

LOT 27

SEDIMENT FOREBAY
TOP OF BERM=78.0
INV=71.0

18" ES-1
INV=69.0

WET POND #1
OUTLET DEVICE
36" RCP RISER
W/ 72" (O.D.) CONCRETE ANTIVORTEX DEVICE
TOP OF RISER=83.30
3" PVC INV=79.10
18" RCP INV=70.00
(SEE DETAIL SHEET 18)

LOT 16

FG=85.3

PROVIDE 55'L X 1.5'D CLASS I RIP RAP APRON WITH FILTER FABRIC. APRON SHALL BE 5' WIDE AT PIPE OUTFALL AND 17' WIDE AT DOWNSTREAM END. (APPROX. 33 CY)

LOT 28

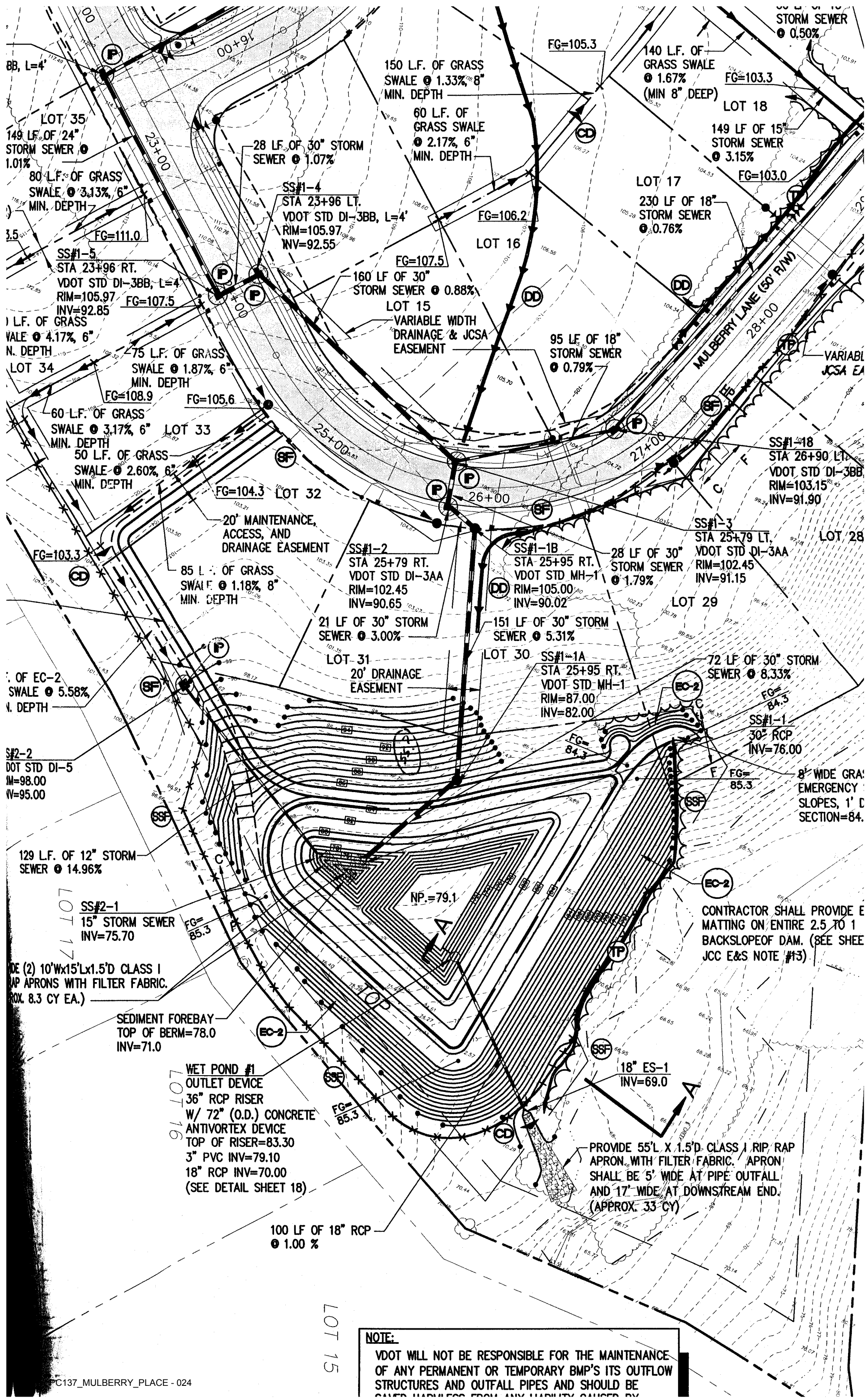
100 LF OF 18" RCP @ 1.00 %

LOT 15

NOTE:

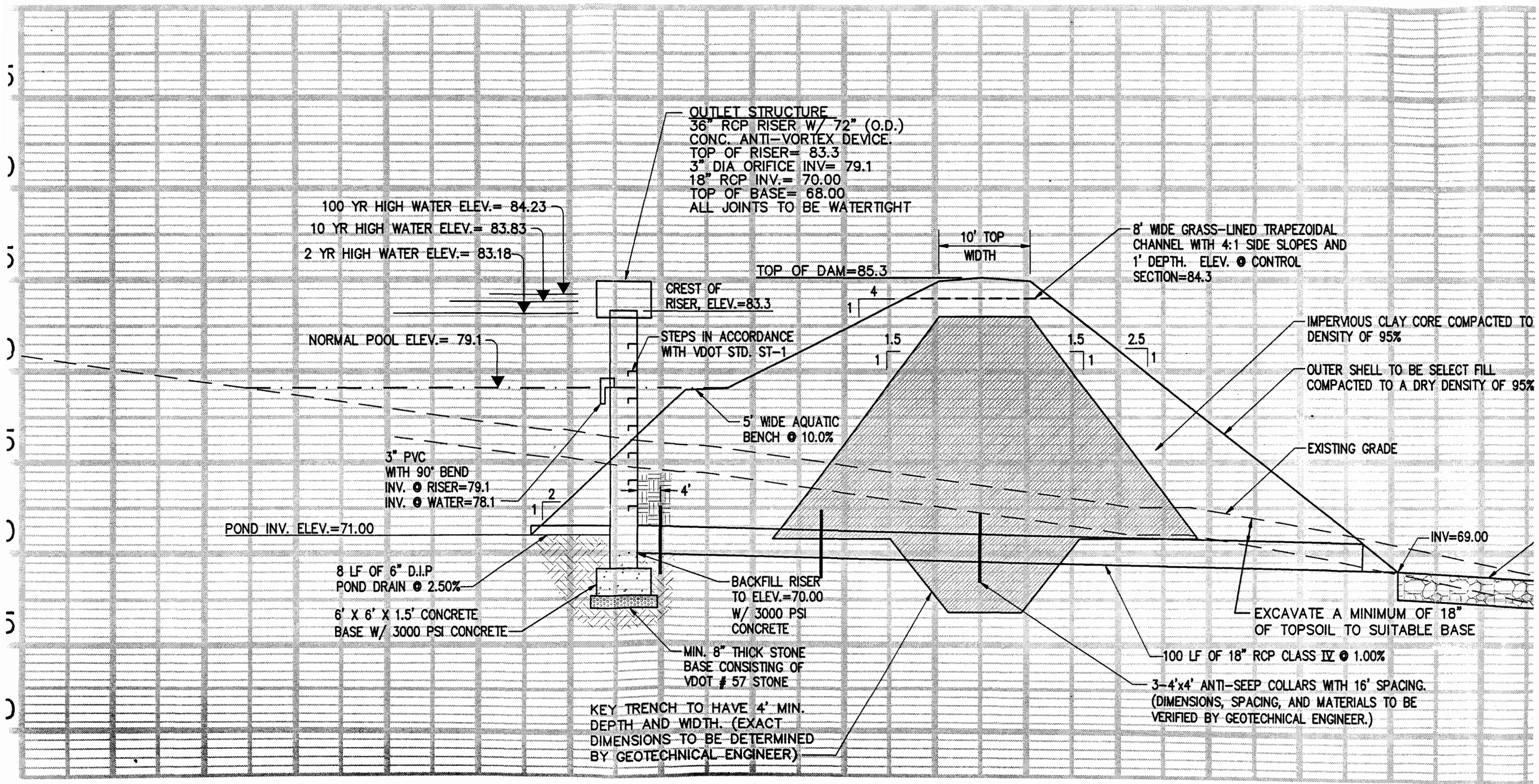
VDOT WILL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY PERMANENT OR TEMPORARY BMP'S ITS OUTFLOW STRUCTURES AND OUTFALL PIPES AND SHOULD BE SAVED HARMLESS FROM ANY LIABILITY CAUSED BY DAMAGE DUE TO THE FAILURE OF THE SAME

CONTRACTOR SHALL ENSURE DIVERS
TO LOT 31 REMAINS FUNCTIONAL A
TO SEDIMENT BASIN UNTIL PERMANE
SYSTEM IS COMPLETED AND FUNCTI



NOTE:

VDOT WILL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY PERMANENT OR TEMPORARY BMP'S ITS OUTFLOW STRUCTURES AND OUTFALL PIPES AND SHOULD BE SAVED HARMLESS FROM ANY LIABILITY CAUSED BY



BMP #1 - WET POND - SECTION A-A

DAM CONSTRUCTION NOTES

GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE SHALL BE PERFORMED SURE SUITABILITY OF THE SUBGRADE. THE GEOTECHNICAL INVESTIGATION WILL DETERMINE BILITY OF THE FILL MATERIAL, RECOMMENDED ANTI-SEEP MEASURES, KEY TRENCH DEPTH AND AND THE ANTICIPATED LOCATION OF THE PHREATIC LINE. THESE RECOMMENDATIONS ARE

EC-37 MULBERRY LOCATION 025

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

PROPER MAINTENANCE OF THIS FACILITY IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE FACILITY, SPILLWAY(S) AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL FROM THE FACILITY WILL BE REQUIRED ONCE EVERY 10 YEARS. IF OTHER CONSTRUCTION OR RELATED ACTIVITIES ARE PERFORMED ON UPSLOPE PARCELS, ADEQUATE PROTECTION SHOULD BE

URE
W/ 72" (O.D.)
RTEX DEVICE.
83.3
INV= 79.1
70.00
68.00
BE WATERTIGHT

F DAM=85.3

QUATIC
10.0%

SER
.00

D

10' TOP WIDTH

8' WIDE GRASS-LINED TRAPEZOIDAL CHANNEL WITH 4:1 SIDE SLOPES AND 1' DEPTH. ELEV. @ CONTROL SECTION=84.3

4
1
1.5
1
1.5
1
2.5
1

IMPERVIOUS CLAY CORE COMPACTED TO A DRY DENSITY OF 95%

OUTER SHELL TO BE SELECT FILL COMPACTED TO A DRY DENSITY OF 95%

EXISTING GRADE

INV=69.00

PROVIDE 55' L x 1.5' DEEP APRON OF CLASS I RIP RAP WITH FILTER FABRIC LINING. APRON SHALL BE 5' WIDE AT PIPE OUTFALL AND 17' WIDE AT DOWNSTREAM END. (APPROX 33 C.Y. REQD.)

LIMITS OF WETLANDS

EXCAVATE A MINIMUM OF 18" OF TOPSOIL TO SUITABLE BASE

100 LF OF 18" RCP CLASS IV @ 1.00%

3-4'x4' ANTI-SEEP COLLARS WITH 16' SPACING. (DIMENSIONS, SPACING, AND MATERIALS TO BE VERIFIED BY GEOTECHNICAL ENGINEER.)

100 YR. ELEV.= 65.83
10 YR. ELEV.= 65.54
2 YR. TAILWATER ELEV.= 65.27

1"=5'
1"=10'
SCALE IN FEET

95
90
85
80
75
70
65
60

#1 - WET POND - SECTION A-A

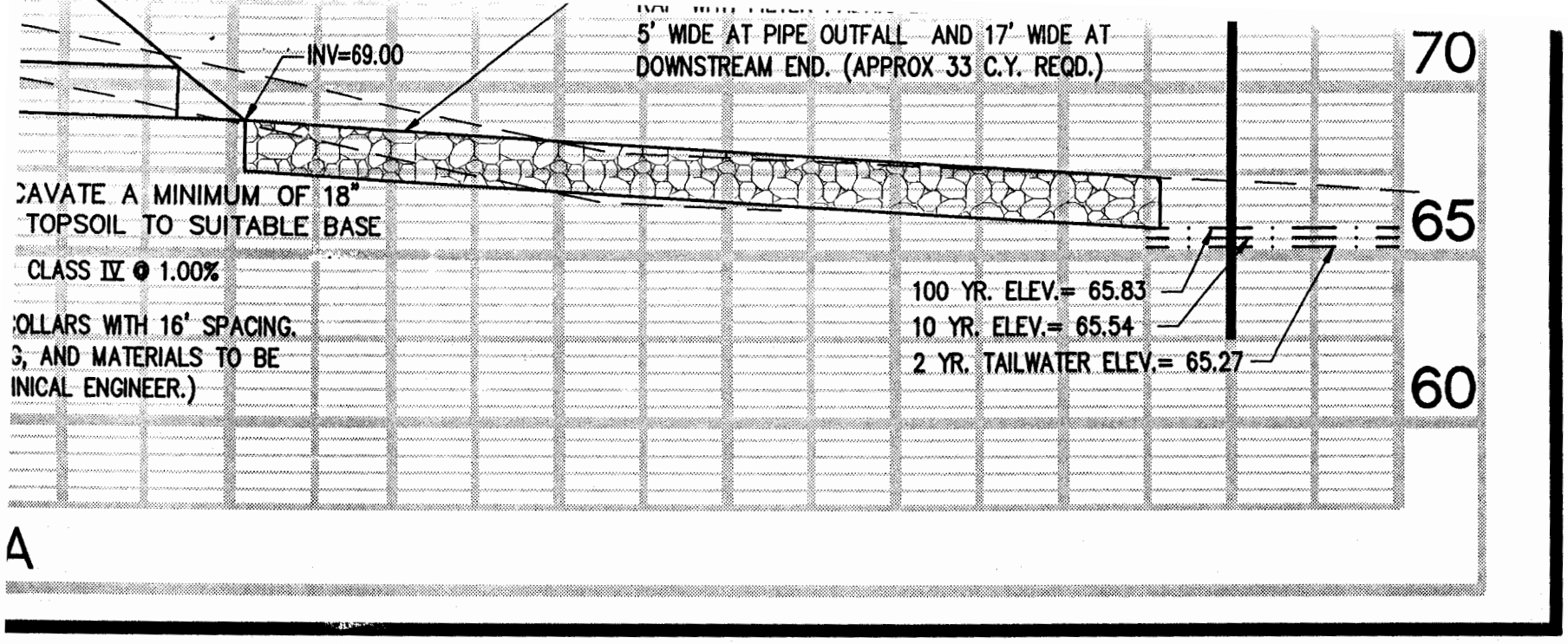
12"

FLOW -

REINFORCED CONCRETE LINTEL

EMENT/ BMP FACILITY MAINTENANCE PLAN

Y IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE
M WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF
ECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS



THE

YEARS.
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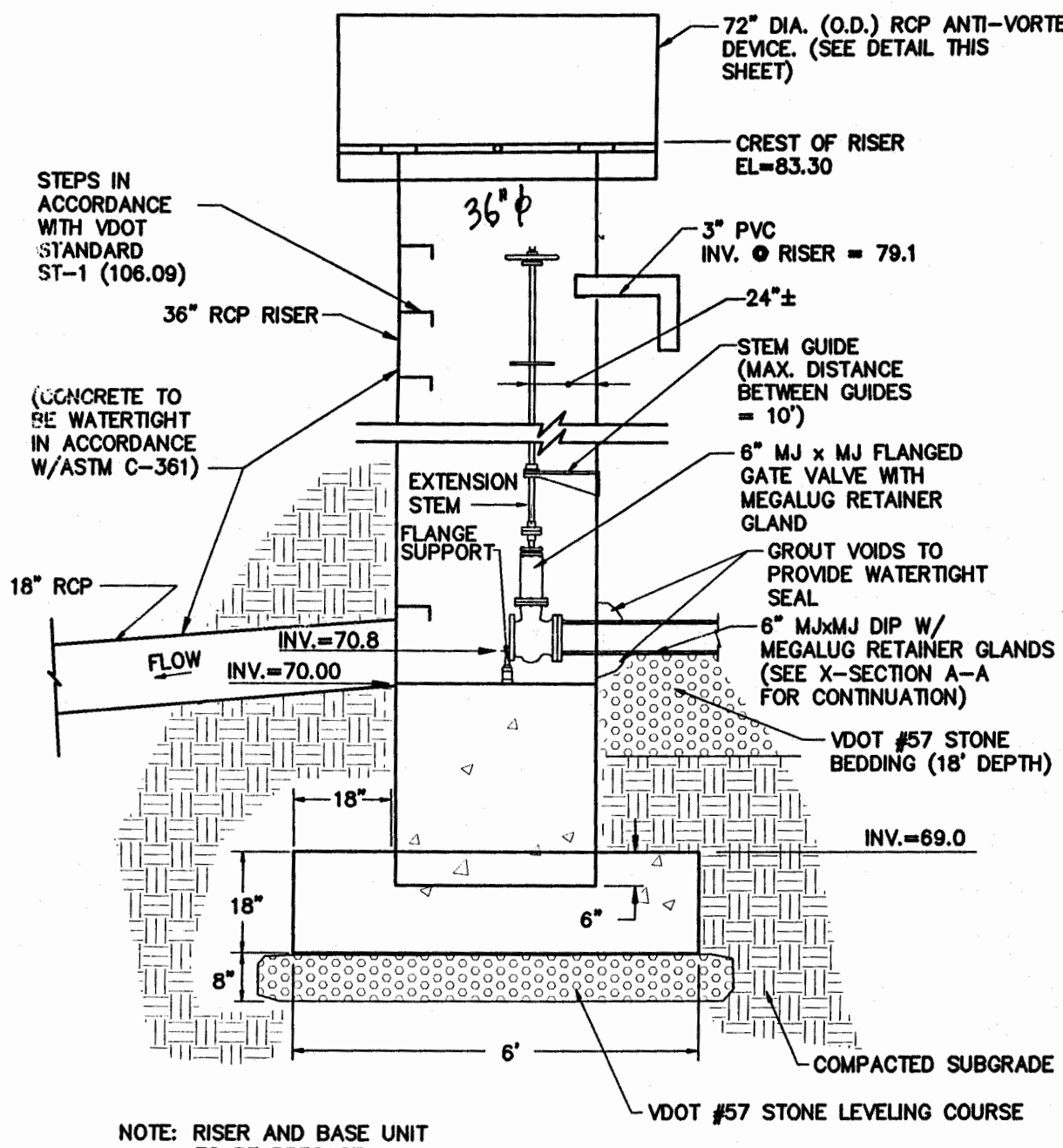


NOTE: RISER AND BASE UNIT TO BE PRECAST.

CROSS SECTION
PROP. 48" RISER STRUCTURE WITH ANTI-VORTEXING TOP

NOT TO SCALE

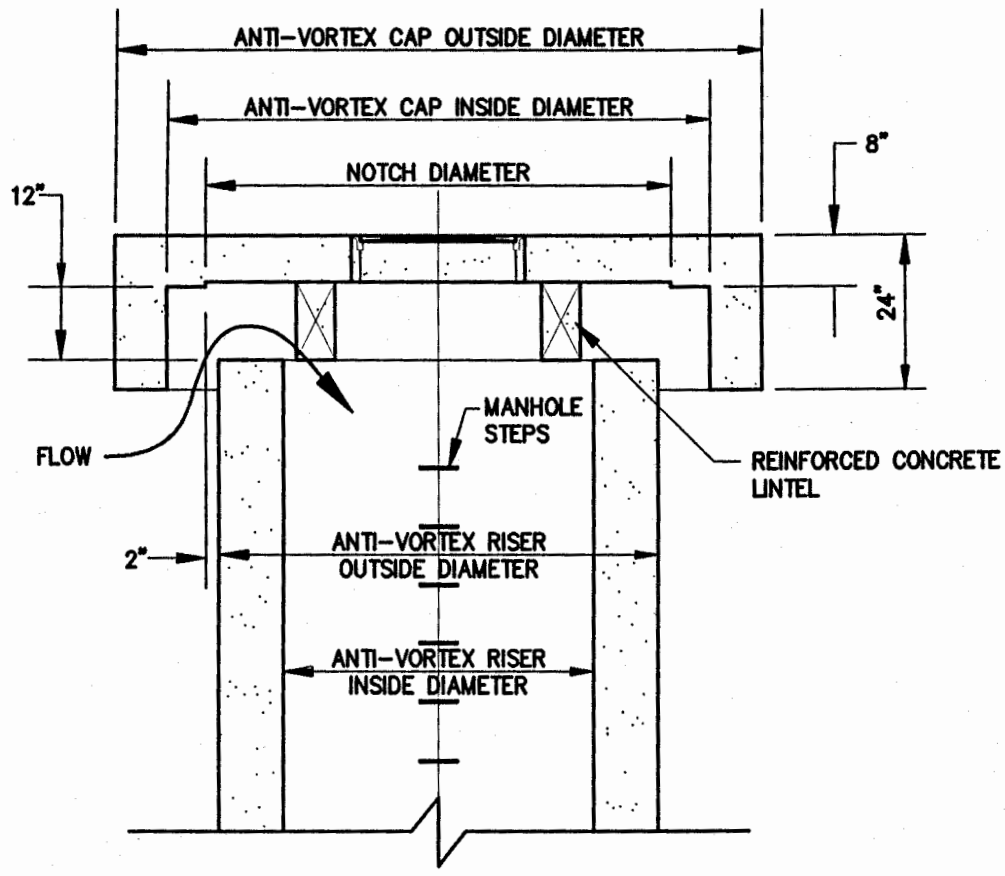
RISER		ANTI-VORTEX CAP		NOTCH DIAMETER	APPROXIMATE CAP WEIGHT
I.D.	O.D.	I.D.	O.D.		
24"	30"	48"	58"	34"	1.49 T
27"	33-1/2"	60"	70" OR 72"	37-1/2"	2.28 T
30"	37"	60"	70" OR 72"	41"	2.26 T
36"	44"	60"	70" OR 72"	48"	2.22 T
42"	51"	72"	86"	55"	3.16 T
48"	58"	84"	100"	62"	4.27 T
54"	66-1/2"	84"	100"	70-1/2"	4.20 T
60"	72"	96"	114"	76"	5.48 T
66"	80-1/2"	96"	114'	84-1/2"	5.39 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126'	147"	98-1/2"	8.97 T
84"	100"	126'	147"	104"	8.90 T

REINFORC
LINTEL

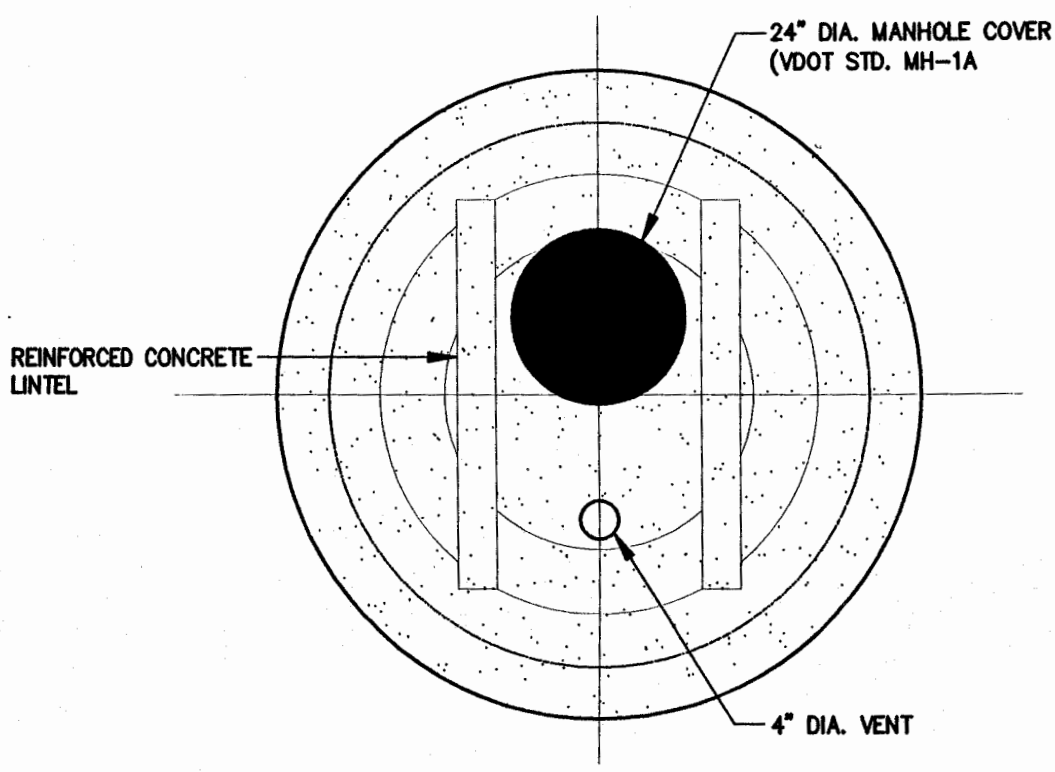
ORIG
GRO
ELEV

INV=[102.0'
[ ] SEDIME
( ) SEDIME

SOURCE: VA
PLATE. 3.13



SECTION



PLAN - TOP SLAB

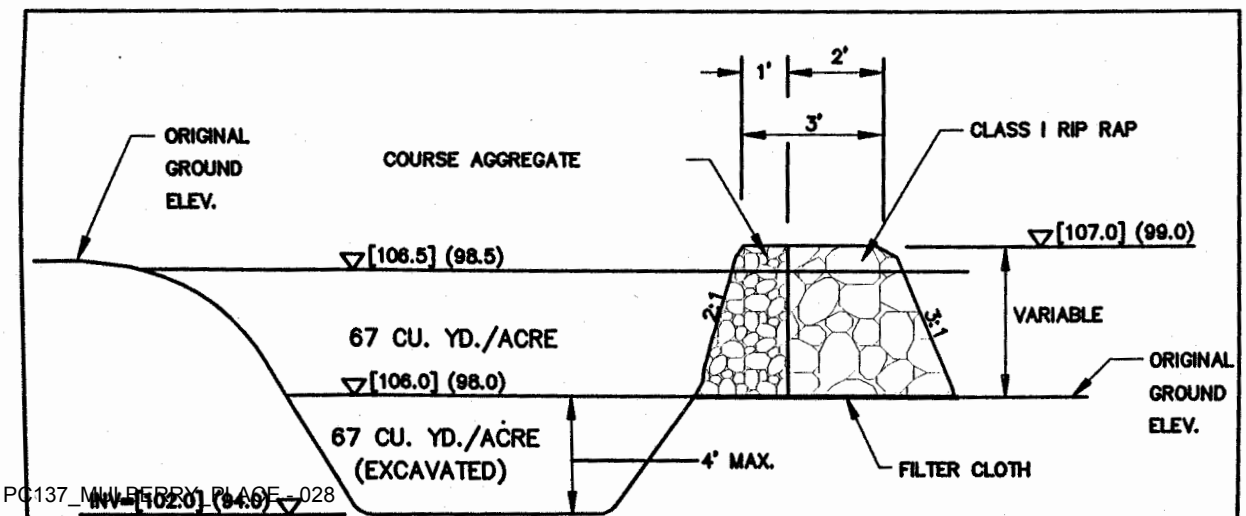
1. ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
2. DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478
3. INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER O.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.)
4. SLAB REINFORCEMENT TO BE ASTM A615 #4 BARS @ 8" E.W. CIRCUMFERENCIAL REINFORCEMENT TO BE A_{sc}=1 @ 0.150 2x6W2.5xW2.5 WWF TO BE MINIMUM.

MATERIAL PROPERTIES:

Fy=60ksi
Fc=4ksi
CONCRETE COVER OVER REINFORCEMET (CCOR)=1"

ANTI- VORTEX DETAIL

NOT TO SCALE



CROSS SECTION OF OUTLET

No.	DATE	BY
2	8/15/00	CBR
1	7/11/00	CBR

REVISION / COMMENT / NOTE

REVISED PER JCC COMMENTS

REVISED PER JCC COMMENTS

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
8/15/00
PROFESSIONAL ENGINEER

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

PERS, INC.
VIRGINIA

PC137_MULBERRY PLACE - 028

AQUATIC BENCH –
PLANTED WITH 40 EACH AT 18" O.C.
BULRUSH
PICKERELWEED
ARROW ARUM
THREE SQUARE
RICE CUT GRASS
SOFT RUSH

25' BUFFER–
LANTED WITH
TREES AND
WAXMYRTLES
SCHEMATIC
T LIST–BMP)

NORMAL POOL (79.1)

LOT 15

100–YR FLOOD
ELEVATION (84.23)

15' MAINTENANCE
ACCESS

PERIMETER BUFFER C

LOT 17

LOT 18

NOTE:
EXISTING TREES MAY BE USED TO OFFSET
TOTAL NUMBER OF REQUIRED TREES UPON
APPROVAL OF THE ZONING ADMINISTRATOR.

LOT 28

WIND ST

SUGAR BUSH

LOT 27

N

LOT 29

LOT 26

LOT 25

No.	D
2	8/1
1	7/1

COMMONWEALTH OF VIRGINIA
JAMES S. PETERS
No. 000393
8/15/00
CERTIFIED LANDSCAPE ARCHITECT

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

CONSULTING ENGINEERS

STREETSCAPE, PERIMETER BUFFER
AND PARK PLAN

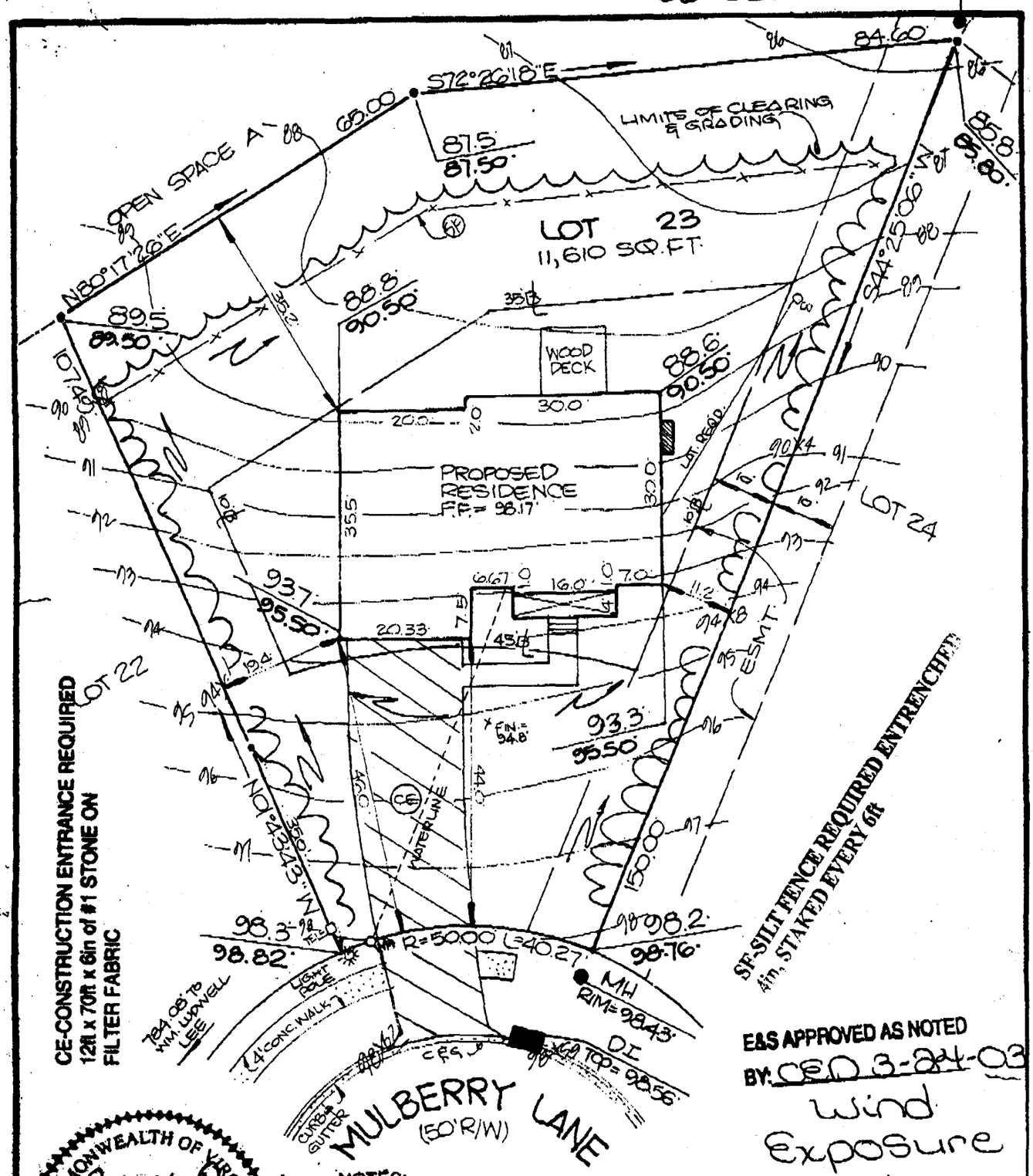
MULBERRY PLACE

OWNER / DEVELOPER : ASSOCIATED DEVELOPERS, INC.

POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed | Drawn

03-0200



COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1402 (a)
1418 (b)
3/1/03
LAND SURVEYOR

NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

- THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES
- BUILDING DIMENSIONS ARE TO THE FRAME LINE.
- PROPOSED FINISHED GRADES ARE IN GENERAL AGREEMENT WITH THE APPROVED SUBDIVISION PLAN
- PROPERTY SHOWN HEREON IS LOCATED IN ZONE X AS SHOWN ON FLOOD INSURANCE RATE MAP COMMUNITY-PANEL NUMBER, 510182 0035B EFFECTIVE DATE: DEC. 16, 1988.

NOTE: BUILDING LOCATIONS SHOWN HERON ARE SUBJECT TO APPROVAL BY APPLICABLE ZONING ADMINISTRATORS PRIOR TO CONSTRUCTION. THE BUILDER MUST VERIFY THE BUILDING DIMENSIONS FROM THE ARCHITECTURAL PLANS BEFORE ANY CONSTRUCTION TAKES PLACE.

DAVIS & ASSOCIATES
SURVEYORS & PLANNERS
YORK COUNTY, VIRGINIA

3796 Mulberry Lane

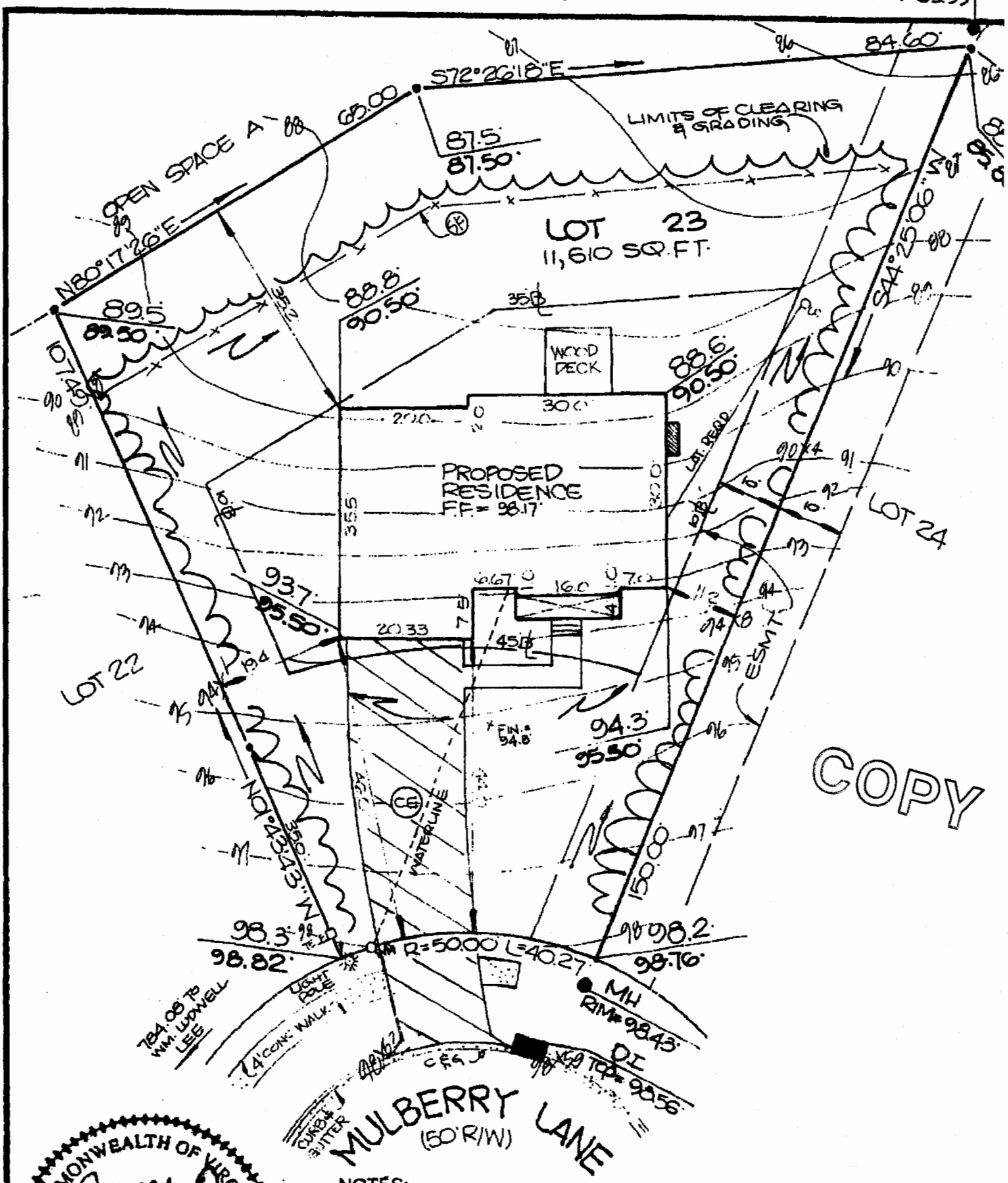
DEVELOPMENT PLAN

LOT 23
SUBDIVISION PLAT OF
MULBERRY PLACE
POWHATAN DISTRICT
JAMES CITY COUNTY, VIRGINIA
(PB. 12-15)

CODE: 02-1402	DWN BY: AR	SCALE: 1" = 20	TO: HARBIN	DATE: 1 MAR. 03

REVISED: 20 MAR. 03
(RIGHT, FRONT ELEV. OF HOUSE)

line #03-0200 changed 1875



COPY

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1402 (a)
1418 (b)

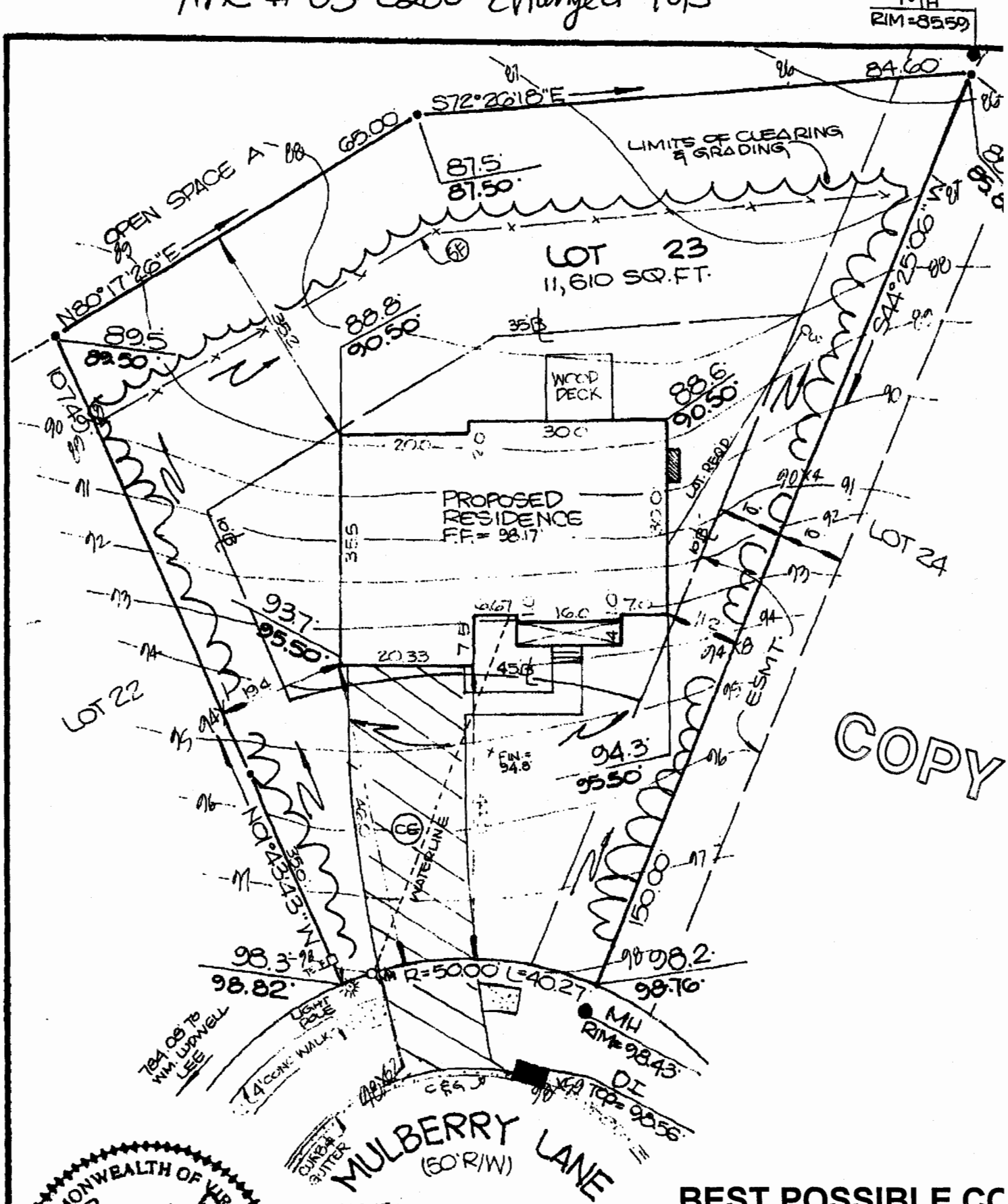
NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

• THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES

line # 03-0200 changed lots



BEST POSSIBLE CO

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1402 (a)
1418 (b)

NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

• THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES

03-0200

MH
RIM=85.59

S72°26'18"E

84.60

68.00

LIMITS OF CLEARING & GRADING

OPEN SPACE A

87.5
87.50

LOT 23
11,610 SQ.FT.

N80°17'26"E

S44°25'06"E

89.5
89.50

88.8
90.50

35.0

WOOD DECK

88.6
90.50

30.0

20.0

LOT READ.

PROPOSED RESIDENCE
F.F.= 98.17

35.5

LOT 24

93.7
95.50

6.67 16.0 7.0

20.33

7.8

45.0

LOT 22

ESMT.

F.N.= 94.8

93.3
95.50

AGC

CE

WATERLINE

N04°43'43"W

150.8

98.3
98.82

R=50.00' L=40.27'

98.76

MH
RIM=98.43

DI

TOP=98.56

LIGHT POLE

4' CONC. WALK

CURB & GUTTER

MULBERRY LANE
(50' R/W)

CE-CONSTRUCTION ENTRANCE REQUIRED
12ft x 70ft x 6in of #1 STONE ON
FILTER FABRIC

SF-SILT FENCE REQUIRED ENTRENCHED
& STAKED EVERY 6ft

COPY

E&S APPROVED AS NOTED
BY: CED 3-24-0

Wind Exposure A/B

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1408 (a)
1418 (b)

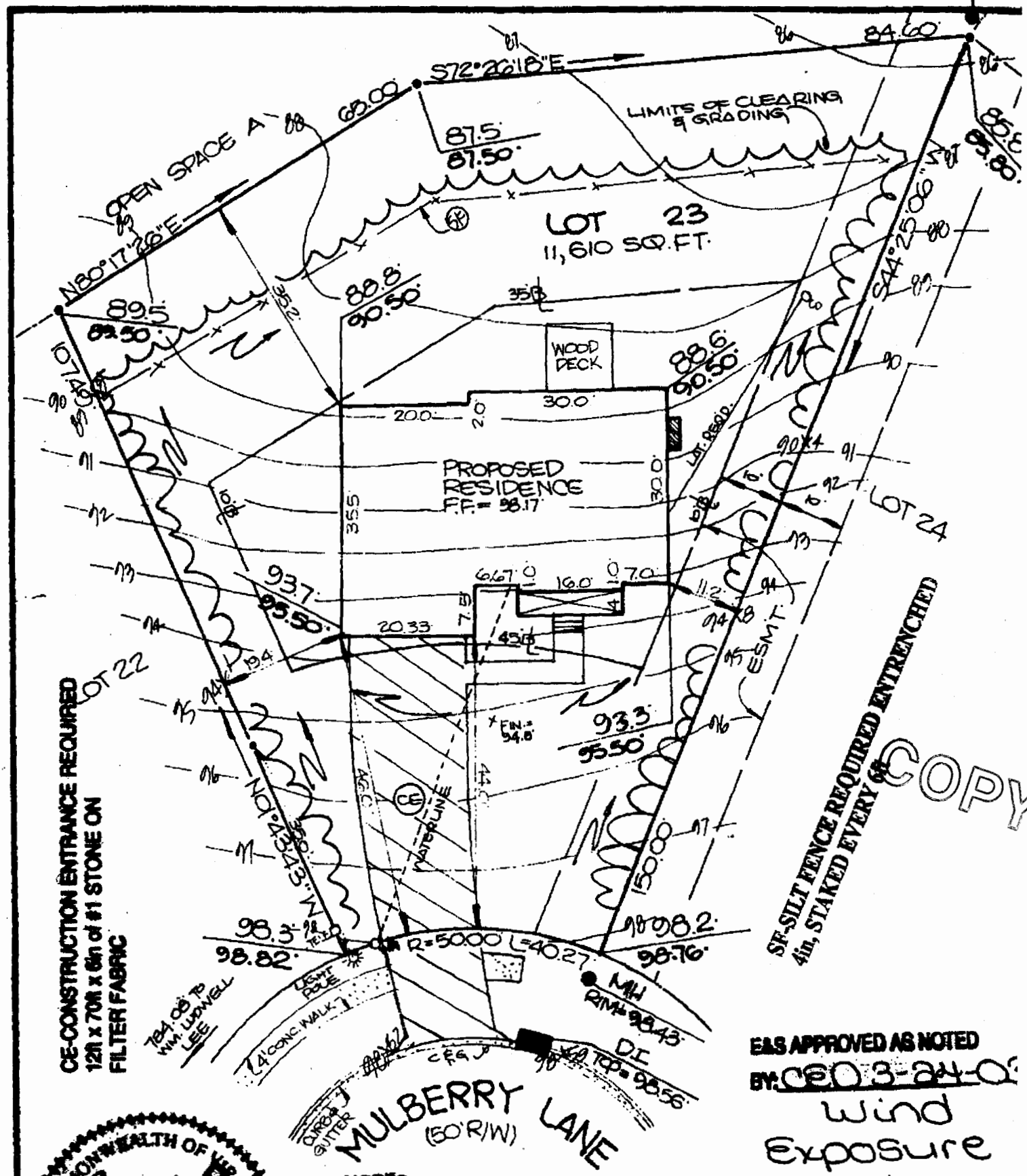
NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

- THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES
- BUILDING DIMENSIONS ARE TO THE FRAME LINE.

03-0200



EAS APPROVED AS NOTED
BY: CEO 3-24-03

Wind
Exposure
A/B

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1402 (a)
1418 (b)

NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

- THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES
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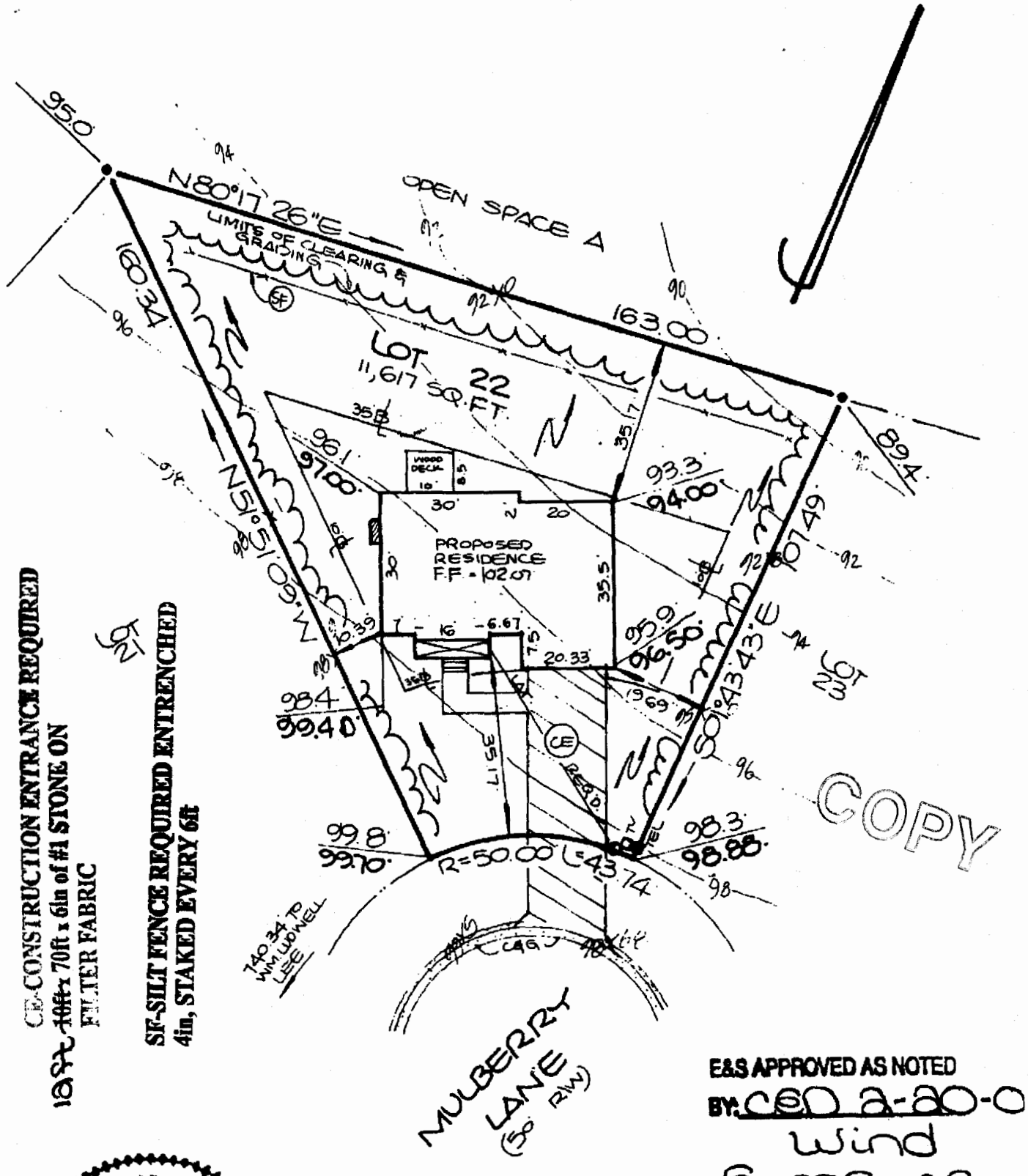


CE-CONSTRUCTION ENTRANCE REQUIRED
18ft x 70ft x 6in of #1 STONE ON FILTER FABRIC

SF-SILT FENCE REQUIRED ENTRENCHED 4in, STAKED EVERY 6ft

E&S APPROVED AS NOTED
BY: CED 2-20-0
Wind Exposure A/B

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
No. 1402 (a)
1418 (b)
2/8/03
LAND SURVEYOR

NOTES:

(CE) - DENOTES CONSTRUCTION ENTRANCE

(SF) - DENOTES SILT FENCE

- THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS ONLY FOR BUILDING PERMIT PURPOSES
- BUILDING DIMENSIONS ARE TO THE FRAME LINE.
- PROPOSED FINISHED GRADES ARE IN GENERAL

WAYNE HARBIN
BUILDER, INC.

FAX TRANSMITTAL

WAYNE HARBIN BUILDER, INC.
3630 George Washington Memorial Hwy., Suite D
Yorktown, VA 23693

DELIVER TO: Scott Thomas

COMPANY: JCC

DATE: Aug 26 '04 TIME:

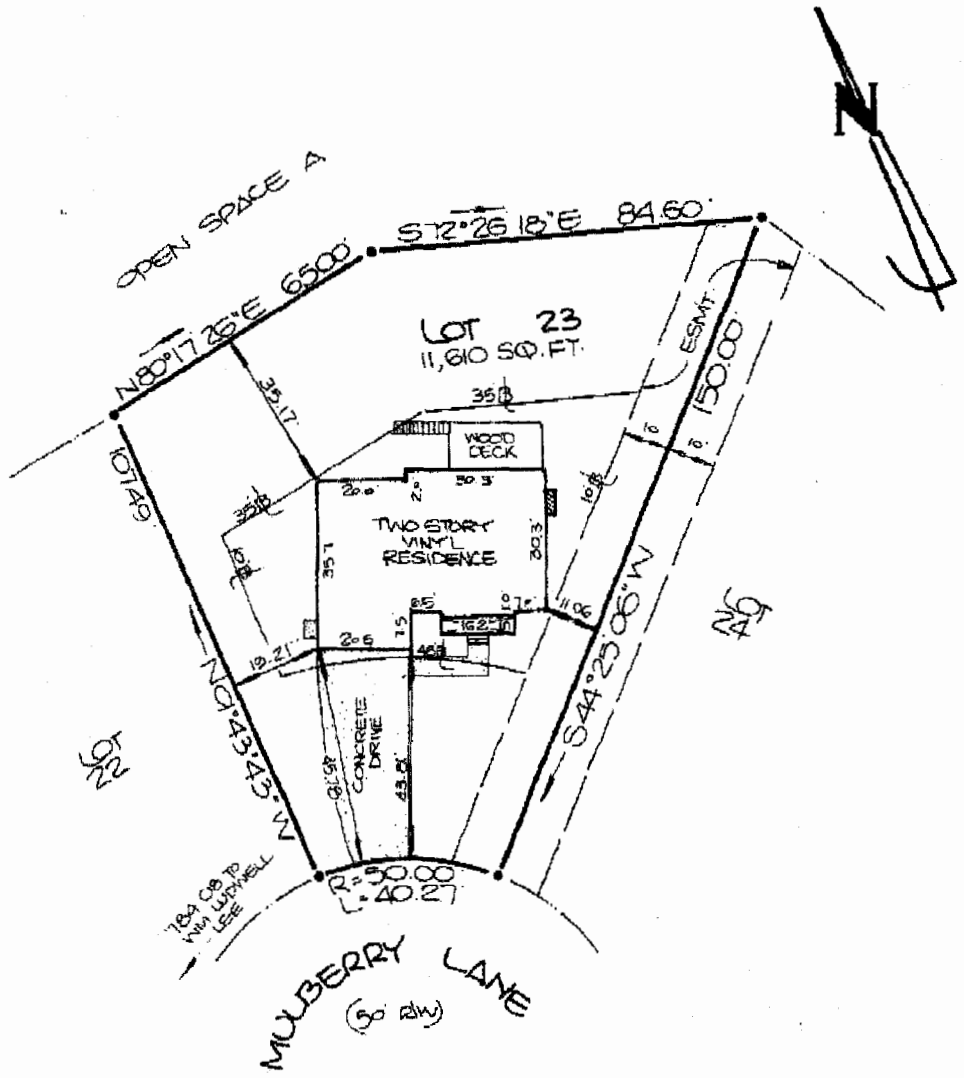
FAX: 259-4032 PHONE:

FROM: Susan (susan@harbinbuilder.com)

FAX: (757) 867-8635 PHONE: (757) 867-8307

COMMENTS:
Plot Plan for Lot 23 Mulberry
Edward and Karin Spencer

Total number of pages (including this page): 2



NOTE : PROPERTY SHOWN HEREON IS LOCATED IN ZONE X AS SHOWN ON FLOOD INSURANCE RATE MAP COMMUNITY-PANEL NUMBER 510162 00356 EFFECTIVE DATE : DEC. 16, 1988

NOTE: ALL UTILITIES UNDERGROUND

SYMBOLS:

- PIPE FOUND
- PIPE SET
- ROD FOUND
- CONC. MONUMENT

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
(LICENSE) No
1402
9/9/03
LAND SURVEYOR

I, Donald W. Davis HEREBY CERTIFY THAT THE SURVEY REPRESENTED BY THIS PLAT WAS MADE BY ME ON THIS DATE AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF THERE ARE NO ENCROACHMENTS OF BUILDINGS UNLESS SHOWN HEREON.

DAVIS & ASSOCIATES
SURVEYORS & PLANNERS
YORK COUNTY, VIRGINIA

JOB LOCATION #3706 MULBERRY LANE

PLAT OF THE PROPERTY OF:
EDWARD T. SPENCER

LOT 23
SUBDIVISION PLAT OF
MULBERRY PLACE

POWHATAN DISTRICT
JAMES CITY COUNTY VIRGINIA
(PB 82 PG 12-15)

CODE: 03-0903	DWN.BY-AR	SCALE: 1" = 30'	T.O. LATCHUM	DATE: 9 SEPT 03

- NEED B.P. FILE INFO
  - GRADING
  - DRAINAGE
  - WTO ENV DIV
- SUBDIV PLAN
  - DRAINAGE PLAN
  - COMMS

PLAT NOT PLOT PLAN FOR Building Permit.

- NO FF
- NO GRADING
- NO DRAINAGE

BP-03-0962
3131300023

AUTOMATIC COVER SHEET

DATE: AUG-26-2004 THU 02:29 PM

TO:

FAX #: 2594032

FROM: WAYNE HARBIN

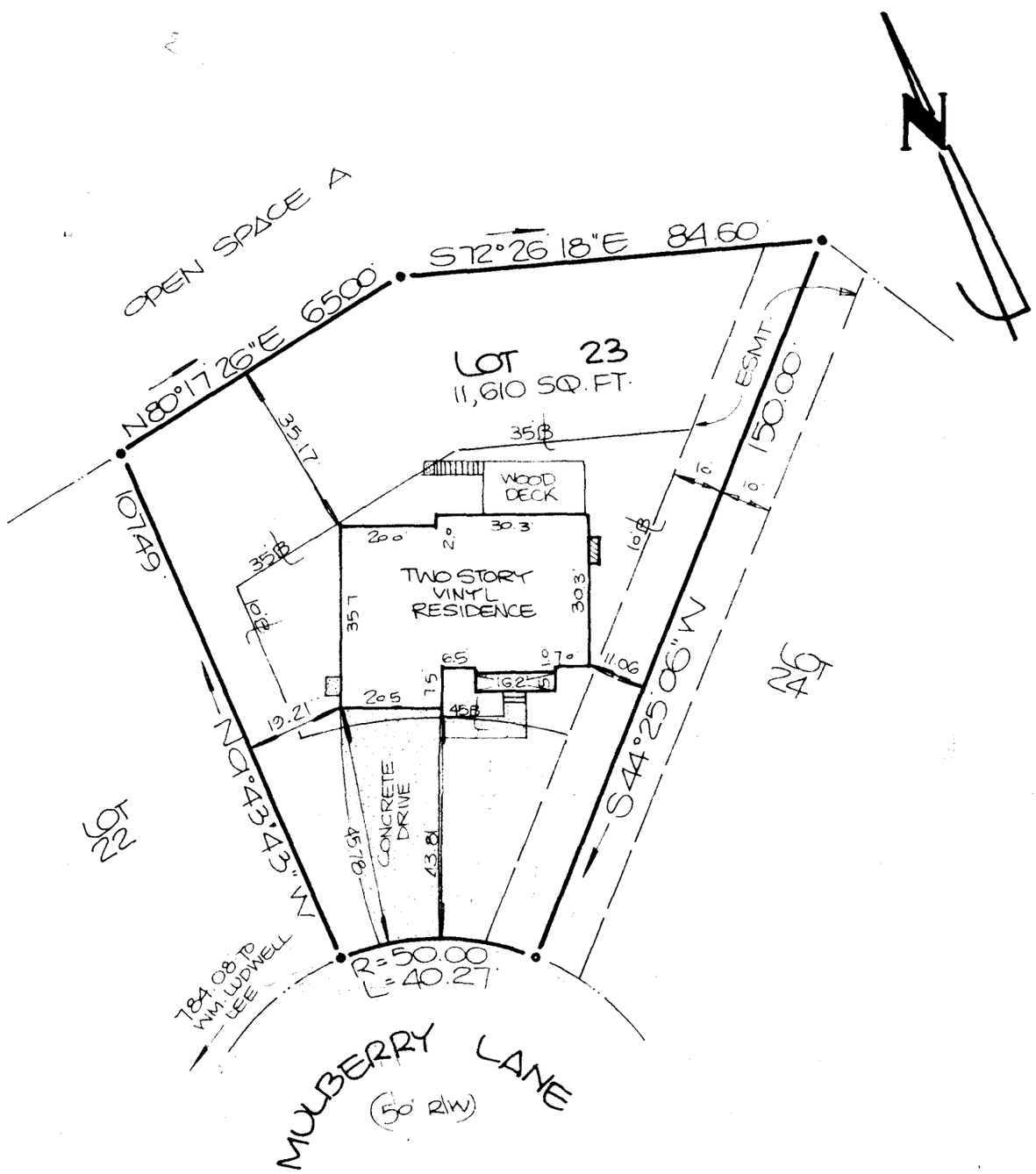
FAX #: 7578678635

03 PAGES WERE SENT

(INCLUDING THIS COVER PAGE)

EDWARD + KAREN SPENCER 757-253-5799

CELL 812-0394



NOTE : PROPERTY SHOWN HEREON IS LOCATED IN ZONE X AS SHOWN ON FLOOD INSURANCE RATE MAP COMMUNITY-PANEL NUMBER 510182 0035B EFFECTIVE DATE : DEC. 16, 1988

NOTE: ALL UTILITIES UNDERGROUND

SYMBOLS:

- PIPE FOUND
- PIPE SET
- ROD FOUND
- CONC. MONUMENT

COMMONWEALTH OF VIRGINIA
DONALD W. DAVIS
(LICENSE) No
1402 a
1418 b
9/9/03
LAND SURVEYOR

I, Donald W. Davis HEREBY CERTIFY THAT THE SURVEY REPRESENTED BY THIS PLAT WAS MADE BY ME ON THIS DATE AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF THERE ARE NO ENCROACHMENTS OF BUILDINGS UNLESS SHOWN HEREON.

DAVIS & ASSOCIATES
SURVEYORS & PLANNERS
YORK COUNTY, VIRGINIA

JOB LOCATION #3796 MULBERRY LANE

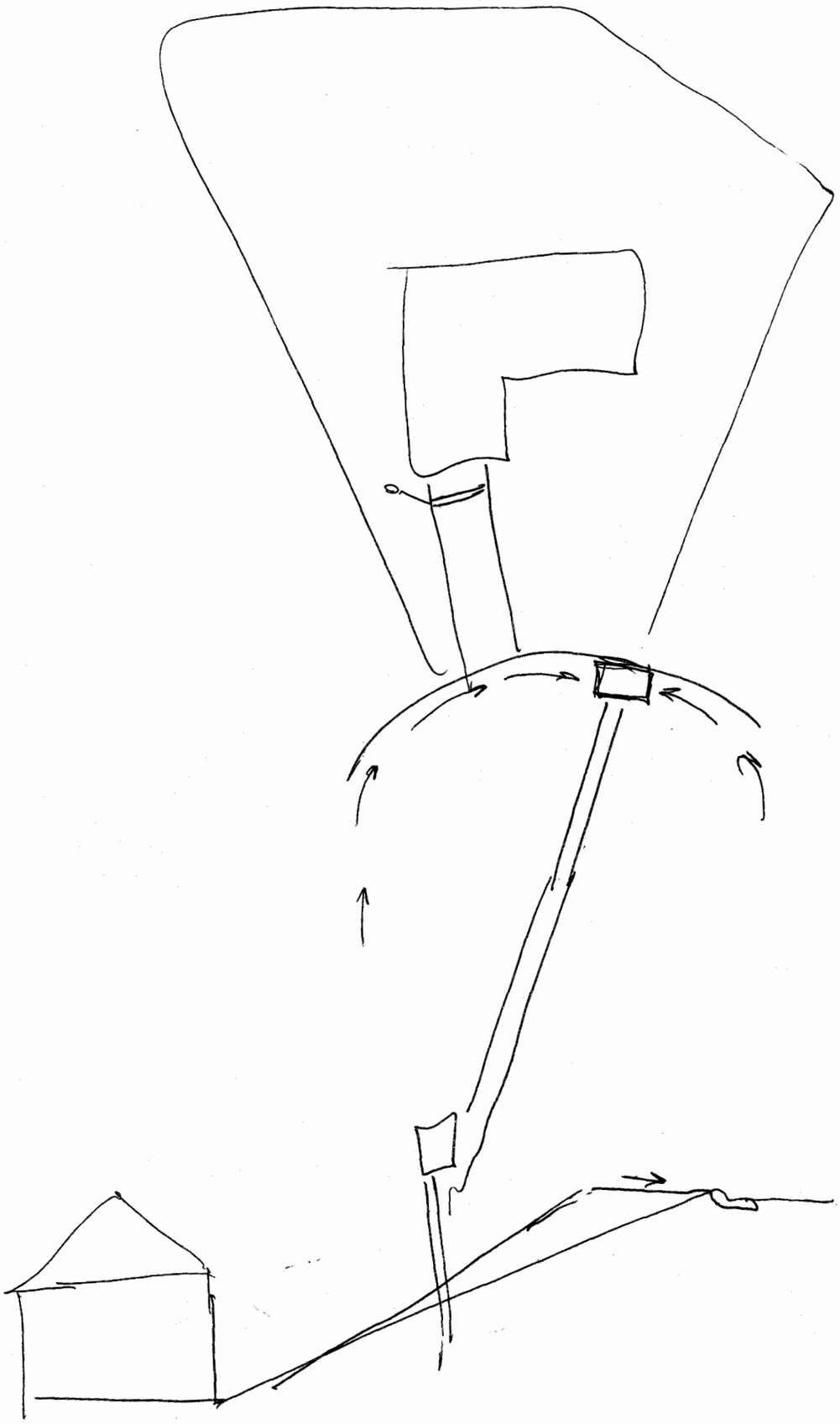
PLAT OF THE PROPERTY OF:
EDWARD T. SPENCER

LOT 23
SUBDIVISION PLAT OF
MULBERRY PLACE

POWHATAN DISTRICT
JAMES CITY COUNTY VIRGINIA
(PB 82 \ PG 12-15)

CODE: 03.0903	DWN.BY-AR	SCALE: 1" = 30	TO: LATCHUM	DATE: 9 SEPT. 03

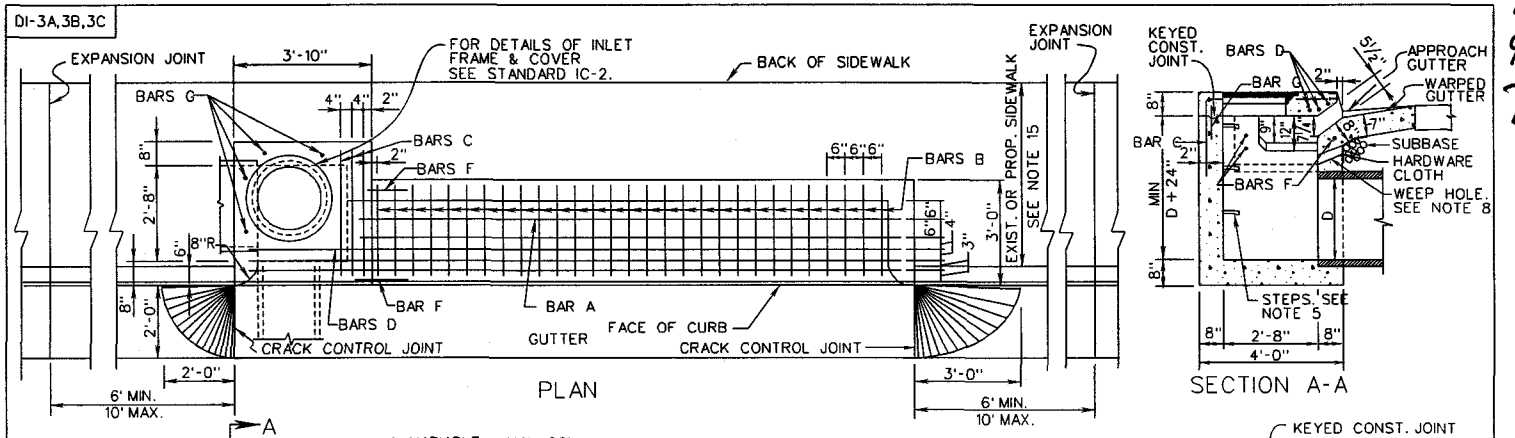
5-35-00

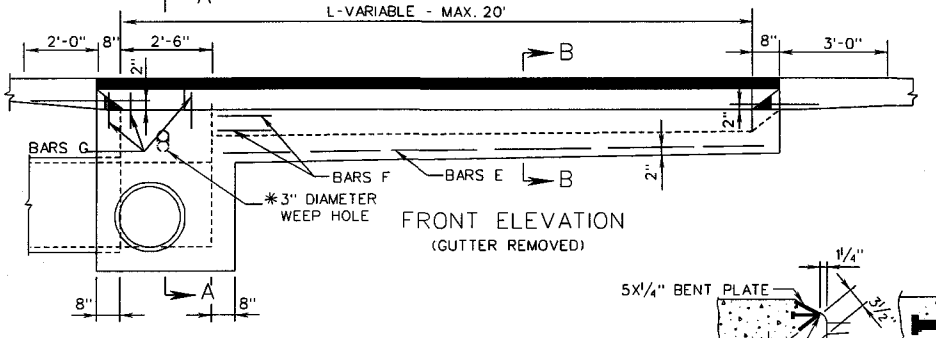


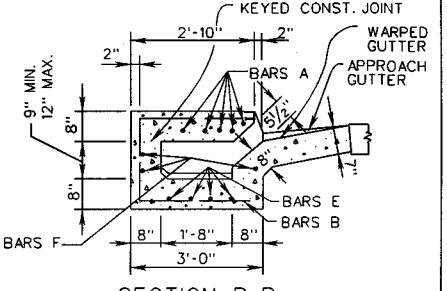
98.54
94.50
4.04

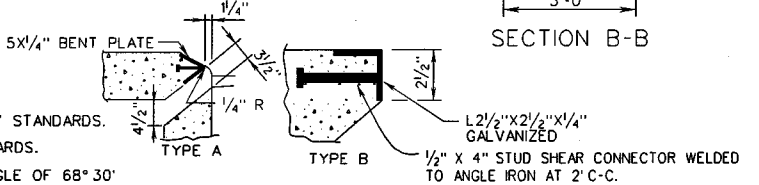
98.79
95.04
3.75

DI-3A,3B,3C







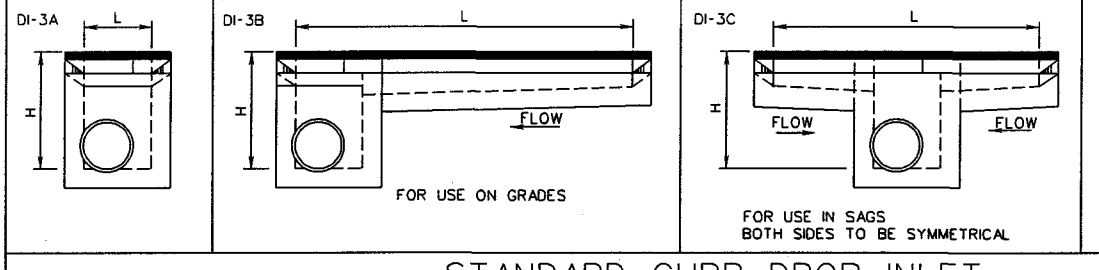


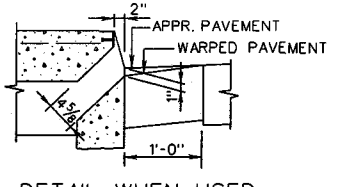
TYPE A NOSE DETAIL SHALL BE USED WITH CG-3 & CG-7 STANDARDS.

TYPE B NOSE DETAIL SHALL BE USED WITH CG-2 STANDARDS.

GALVANIZED PLATE FOR TYPE A TO BE BENT ON AN ANGLE OF 68° 30' CONNECTORS AND IS TO BE ANCHORED WITH 1/2" X 4" STUD SHEAR WELDED TO BENT PLATE AT 2' C-C.

NOSE DETAILS





DETAIL WHEN USED ADJACENT TO CURB WITHOUT GUTTER

SHEET 1 OF 2

STANDARD CURB DROP INLET
12" - 30" PIPE: MAXIMUM DEPTH (H) = 8'

VIRGINIA DEPARTMENT OF TRANSPORTATION

104.09

SPECIFICATION REFERENCE
233
302

TABLE OF QUANTITIES

TYPE	L	AREA OF SLOT	REINFORCING STEEL															
			Concrete	BARS A		BARS B		BARS C		BARS D		BARS E		BARS F		BARS G		WEIGHT
	Ft.	Sq. Ft.	Cu. Yds.	No.	Lin. Ft. *	No.	Lin. Ft. *	No.	Lin. Ft. *	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	Lbs.
DI-3A	2'-6"	1.15	2.26	-	-	-	-	1	5'-7"	3	3'-2"	-	-	-	-	6	1'-0"	22
DI-3B	4'	1.83	2.59	5	1'-6"	2	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	1'-6"	3	1'-6"	4	1'-0"	64
	6'	2.75	3.02	5	3'-6"	6	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	3'-6"	3	1'-6"	4	1'-0"	111
	8'	3.67	3.46	5	5'-6"	10	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	5'-6"	3	1'-6"	4	1'-0"	158
	10'	4.58	3.90	5	7'-6"	14	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	7'-6"	3	1'-6"	4	1'-0"	204
	12'	5.50	4.34	5	9'-6"	18	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	9'-6"	3	1'-6"	4	1'-0"	251
	14'	6.42	4.78	5	11'-6"	22	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	11'-6"	3	1'-6"	4	1'-0"	298
	16'	7.33	5.22	5	13'-6"	26	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	13'-6"	3	1'-6"	4	1'-0"	345
	18'	8.25	5.66	5	15'-6"	30	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	15'-6"	3	1'-6"	4	1'-0"	391
	20'	9.17	6.09	5	17'-6"	34	6'-7" to 6'-10"	3	5'-7"	3	3'-2"	4	17'-6"	3	1'-6"	4	1'-0"	438
DI-3C	6'	2.75	3.01	10	1'-9"	4	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	1'-9"	6	1'-6"	2	1'-0"	111
	8'	3.67	3.45	10	2'-9"	8	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	2'-9"	6	1'-6"	2	1'-0"	158
	10'	4.58	3.89	10	3'-9"	12	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	3'-9"	6	1'-6"	2	1'-0"	205
	12'	5.50	4.33	10	4'-9"	16	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	4'-9"	6	1'-6"	2	1'-0"	252
	14'	6.42	4.77	10	5'-9"	20	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	5'-9"	6	1'-6"	2	1'-0"	298
	16'	7.33	5.21	10	6'-9"	24	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	6'-9"	6	1'-6"	2	1'-0"	345
	18'	8.25	5.65	10	7'-9"	28	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	7'-9"	6	1'-6"	2	1'-0"	392
	20'	9.17	6.09	10	8'-9"	32	6'-7" to 6'-10"	5	5'-7"	3	3'-2"	8	8'-9"	6	1'-6"	2	1'-0"	439

NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS.
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.
8. 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
13. IF INLET IS CONSTRUCTED IN MEDIAN CURB OR WITH INTEGRAL CURB, GUTTER IS TO BE OMITTED (SEE DETAIL).
14. STANDARD INLETS MAY BE CONSTRUCTED WITH CONCRETE BLOCKS IN ACCORDANCE WITH THE DETAILS SHOWN ON STANDARD DRAWING DI-MB.
15. THIS AREA MAY BE EARTHEN, IN WHICH CASE THE EXPANSION JOINTS WILL APPLY ONLY TO CURB AND GUTTER.
16. CONCRETE QUANTITIES SHOWN ARE FOR DEPTH (H) OF 5'-2" WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES. FOR INLETS OF DIFFERENT DEPTHS ADD OR SUBTRACT 0.32 CUBIC YARDS OF CONCRETE FOR EACH FOOT OF DEPTH.
17. LENGTH OF ANGLE IRON AS SHOWN ON SHEET 1 OF 2 IS TO BE L+16" AT 4.10 LBS./FT..
18. * DENOTES LENGTH OF ONE (1) BAR.
19. ALL REINFORCING BARS TO BE #5.
20. WHEN INLET IS USED IN 4'-0" MEDIAN, BACK OF INLET IS TO BE SHAPED TO CONFORM TO PROPOSED CURB.

SPECIFICATION REFERENCE

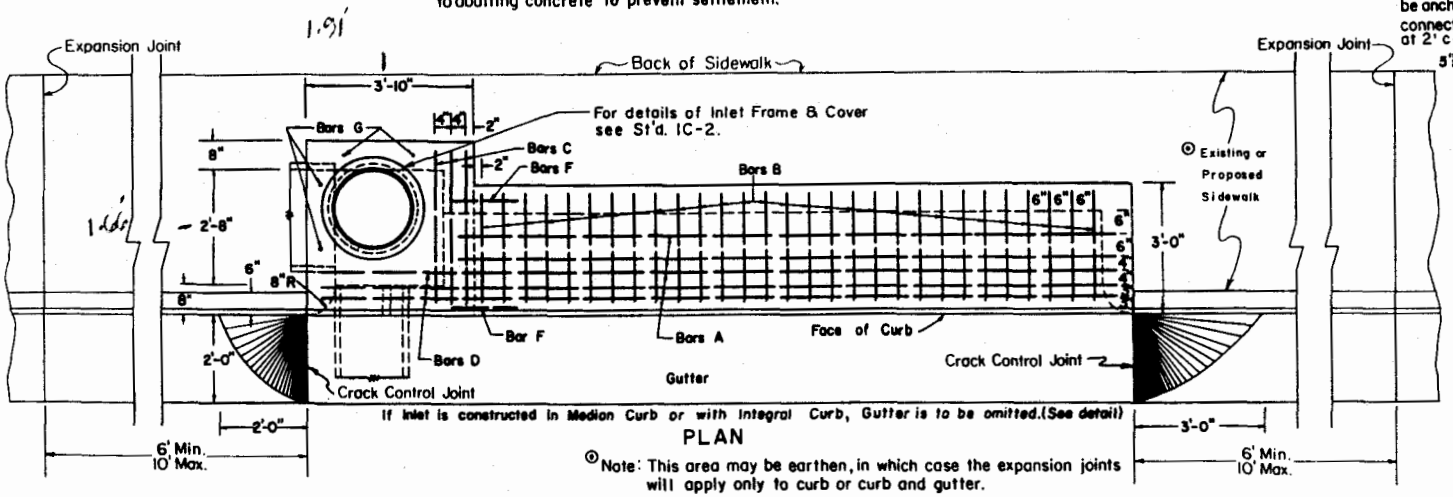
233
302

STANDARD CURB DROP INLET
12" - 30" PIPE: MAXIMUM DEPTH (H) = 8'

VIRGINIA DEPARTMENT OF TRANSPORTATION

DI-3A-3B-3C

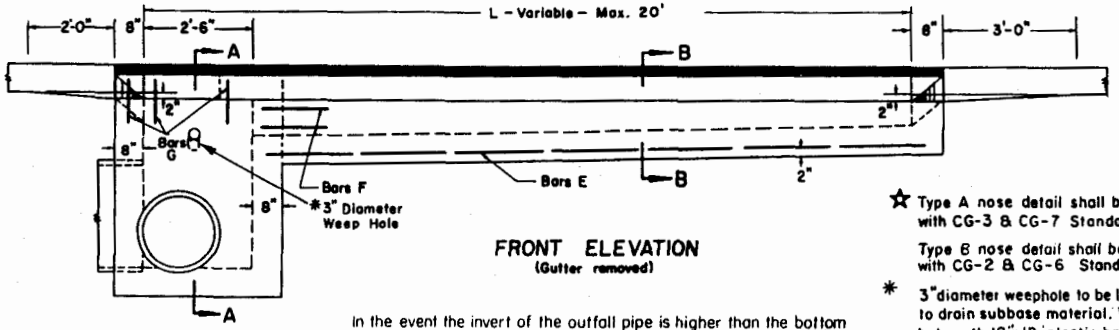
4 x 8" Smooth Dowels@approx.12"C-C to be placed in all areas adjacent to abutting concrete to prevent settlement.



If inlet is constructed in Median Curb or with Integral Curb, Gutter is to be omitted.(See detail)

PLAN

Note: This area may be earthen, in which case the expansion joints will apply only to curb or curb and gutter.



FRONT ELEVATION
(Gutter removed)

Notes: Standard inlets may be constructed with concrete block in accordance with the details shown on Standard Drawing DI-MB.

In the event the invert of the outfall pipe is higher than the bottom of the structure, the invert of the structure shall be shaped with cement mortar to prevent standing or ponding of water in the structure. The cost for invert shaping shall be included in the price bid for the structure.

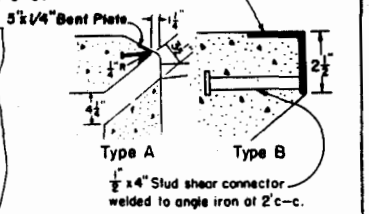
For dimensions and quantities not shown see sheet 2 of 2

☆ Type A nose detail shall be used with CG-3 & CG-7 Standards.

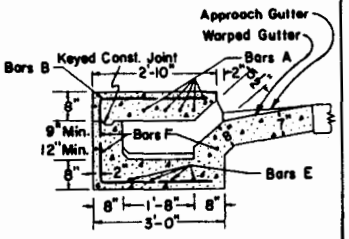
Type B nose detail shall be used with CG-2 & CG-6 Standards.

* 3" diameter weephole to be located to drain subbase material. Weep hole with 12"x12" plastic hardware cloth 1/4" mesh or galvanized steel wire dia. 0.03 inch, number 4 mesh hardware cloth anchored firmly to outside of structure.

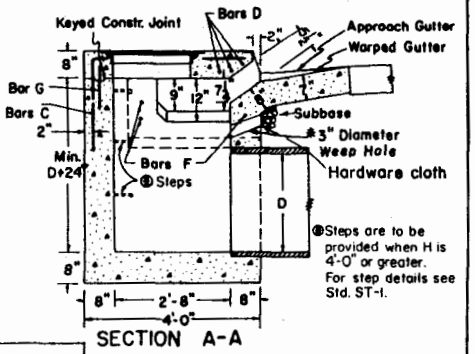
Galvanized plate to be bent on an angle of 68° 30' and is to be anchored with 1/2"x4" stud shear connectors welded to bent plate at 2' c-c.



☆ NOSE DETAILS



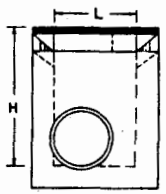
SECTION B-B



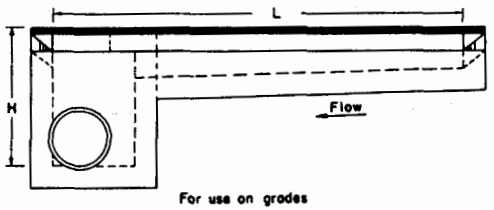
Steps are to be provided when H is 4'-0" or greater. For step details see Std. ST-1.

SECTION A-A

DI-3A

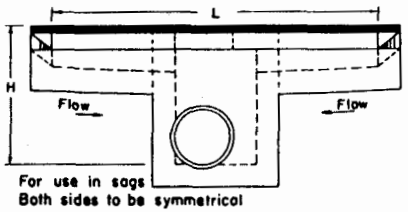


DI-3B

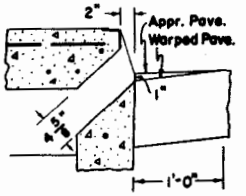


For use on grades

DI-3C



For use in sags
Both sides to be symmetrical



DETAIL WHEN USED ADJACENT TO CURB WITHOUT GUTTER

The "H" dimension shown on the standards and specified on the plans will be measured from the invert of the outfall pipe to the top of the structure. Plan "H" dimensions are approximate only for estimating purposes and the actual dimensions shall be determined by the contractor from field conditions.

When specified on plans the invert is to be shaped in accordance with Standard Plan IS-1. The cost of furnishing and placing all materials incidental to the shaping is to be included in the price bid for the drop inlet complete.

Length of slot (L) will, in every case, be shown on plans.

When inlet is used in 4'-0" Median, back of inlet is to be shaped to conform with proposed curb.

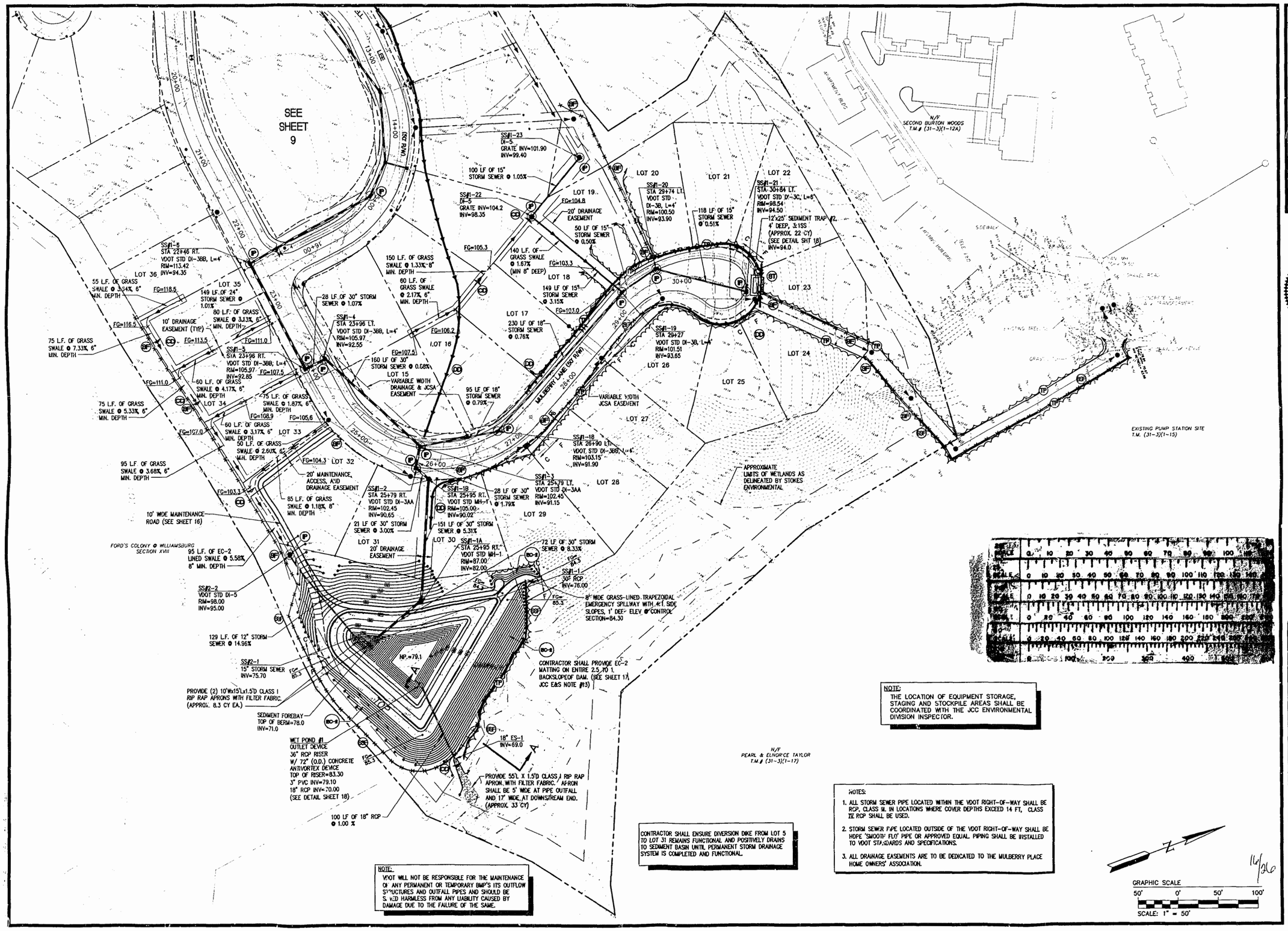
This item may be precast or cast in place.

Sheet 1 of 2

STANDARD CURB DROP INLET
12"-30" PIPE MAXIMUM DEPTH (H) = 8'
VIRGINIA DEPARTMENT of TRANSPORTATION

SPECIFICATION REFERENCE
233
302

COPY



NOTE:
THE LOCATION OF EQUIPMENT STORAGE, STAGING AND STOCKPILE AREAS SHALL BE COORDINATED WITH THE JCC ENVIRONMENTAL DIVISION INSPECTOR.

NOTES:
1. ALL STORM SEWER PIPE LOCATED WITHIN THE VDOT RIGHT-OF-WAY SHALL BE RCP, CLASS III. IN LOCATIONS WHERE COVER DEPTHS EXCEED 14 FT, CLASS IV RCP SHALL BE USED.
2. STORM SEWER PIPE LOCATED OUTSIDE OF THE VDOT RIGHT-OF-WAY SHALL BE HDPE 'SMOOTH FLO' PIPE OR APPROVED EQUAL. PIPING SHALL BE INSTALLED TO VDOT STANDARDS AND SPECIFICATIONS.
3. ALL DRAINAGE EASEMENTS ARE TO BE DEDICATED TO THE MULBERRY PLACE HOME OWNERS' ASSOCIATION.

CONTRACTOR SHALL ENSURE DIVERSION DIKE FROM LOT 5 TO LOT 31 REMAINS FUNCTIONAL AND POSITIVELY DRAINS TO SEDIMENT BASIN UNTIL PERMANENT STORM DRAINAGE SYSTEM IS COMPLETED AND FUNCTIONAL.

NOTE:
VDOT WILL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY PERMANENT OR TEMPORARY BMP'S ITS OUTFLOW STRUCTURES AND OUTFALL PIPES AND SHOULD BE SAVED HARMLESS FROM ANY LIABILITY CAUSED BY DAMAGE DUE TO THE FAILURE OF THE SAME.

No.	DATE	REVISION / COMMENT / NOTE	BY
2	8/15/00	REVISED PER JCC COMMENTS	CBR
1	7/11/00	REVISED PER JCC COMMENTS	CBR

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 019232
8/15/00
PROFESSIONAL ENGINEER

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8934
CONSULTING ENGINEERS

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

MULBERRY PLACE

OWNER / DEVELOPER: ASSOCIATED DEVELOPERS, INC. VIRGINIA
POWHATAN DISTRICT JAMES CITY COUNTY

Designed	Drawn
CBR	LBA/ARH
Scale	Date
1"=50'	4/26/00

Project No. 8604-1

Drawing No. 10

16/26

James City County, Virginia
Environmental Division
Stormwater Management Program

Stormwater Management Design Plan
Staff "Quick" Review

- 3RD REV. 08/22/00

Plan No. 5 - 35 - 00 Date/Time: 05/22/00 11:00AM
Project Name: Mulberry Place
Rough Location: EAST SIDE Centerville RD SR 614, 1000' south int'x SR614 & Longhill Road
ADC Map: Sheet 5 Grid: A - 1 ☒ First Review
Flood Map / Zone: 510201- 00 35B Zone: X ☒ 2ND Review 08-11-00
Description: Outside 500-YEAR FLOODPLAIN
Drainage Area: ☐ Onsite Only ☐ Offsite Only ☒ Combination of Both

AES Proj. 8604-1

Submitted:

Y	N		
☐	☒	Demolition Plan (if applicable)	Sheets:
☒	☐	Site or Geometric Plan	Sheets: 2(OVERALL), 3, 4
☐	☒	Grading Plan	Sheets: 8, 9, 10
☒	☐	Drainage Plan (onsite facilities)	Sheets: 8, 9, 10
☒	☐	E&SC Plan	Sheets: 8, 9, 10
☒	☐	Environmental Inventory	Sheets: 15
☐	☐	Note & Detail Sheets	Sheets: 16, 17, 18
☐	☐	Drainage Map(s)	Report (Apr 26 2000)
☒	☐	Soils Map	15
☐	☒	E&SC and SWM plan checklists.	
☒	☐	E&SC Design Report (Attachment). April 26 2000	
☒	☐	E&SC and Stormwater Management / Drainage Narrative. April 26 2000	
☒	☐	Stormwater Management Design Report (Attachment). April 26 2000	
☐	☒	Waivers, Variances, Exceptions included (Attachments in Writing).	
		☐ VESCH ☒ CBP Ord (RPA, Steep Slope) ☐ Other: OK	
☒	☐	Other (List): SUP-15-99(11/23/99)	

JCC GIS Database: Zoning: R - 2 Tax Parcel ID: (31-3) (1-33..34..36..42..43)
Receiving Water: Powhatan Creek via Ponds in Fords Colony Site Acreage: _____ acres / s.f.

Site Plan Information: Owner: Associated Developers Inc.
Zoning: R - 2 Description: General Residential
Site Area: 27.81 (acres) / s.f
Disturbed Area: 6.5 (acres) / s.f. (23.37 %)
☒ Disturbance > 5 acres, NPDES Notice of Intent required.
Impervious Cover: N/A ? acres / s.f. (. %)
☐ Less than or equal to 60 percent. Meets CBP Ordinance requirements.
☐ More than 60 percent. Does Not Meet CBP Ordinance requirements.
Open / Green Space: ~~7.80~~ 8.00 acres / s.f. (~~28.05~~ 28.77 %)

Site Development Plan:

☒ Residential, Lots, etc.	☐ Commercial (B / O / R)	☐ Govern./Institutional	☐ Industrial
☒ Roadways or Entrances	☐ Parking or Loading	☒ Water	☒ Sewer
☒ Landscaping	☒ SWM/BMP control	☐ Manmade Drainage	☐ Parks, Amenities
☐ Pump/Lift Station (EXISTING)	☐ Dams	☐ Other, R-2 Zoned, 50 LOTS 1.80 du/AC ∴ BMP Required. C+G ROAD SECTION	

c/A, c, c, c, B

Soils Information: Site: 11C, 14B, 14C, 15D, 31B — Hydric: ☐ Yes ☒ No
Soil Survey Sheet 16 — DA: SAME — HSG: C AVG.
BMP: 14C/15D — Hydric: ☐ Yes ☒ No
Description of Soils at BMP: 14C Emporia Fine Sandy Loam; Pond Severe (wet); Percs Slow / 15D Emporia 10 to 15; Severe (slope); Percs Slow

BMP Control: ☐ None ☒ Onsite ☐ Offsite ☐ Previous Approved ☐ Manufactured BMP

BMP Types:
1- Name: WET POND #1 (JCC BMP Type A - 3), Points 80
2- Name: _____ (JCC BMP Type ____ - ____), Points _____
3- Name: _____ (JCC BMP Type ____ - ____), Points _____

OnSite Drainage Type: ☒ Reinforced Concrete Pipe ☐ Corrugated Metal Pipe ☐ Aluminum Type Pipe
☐ Corrugated Polyethylene Pipe ☐ PVC Type Pipe ☐ Open Channel Type
☐ Culverts Type: _____
☐ Other (Specify): _____

1. VDOT Standards & Specifications Referenced for work **within** R/W: ☒ Yes ☐ No
? 2. VDOT Standards & Specifications Referenced for work **outside** R/W: ☐ Yes ☐ No NOT SPECIFIED

Site Limitations: ☐ RPA ☐ RMA ☒ Steep Slopes ☒ Delineated Wetlands
☐ Hydric Soils ☒ Critical Soils ☐ Vegetated ☐ Buffers
☐ Defined Natural Drainage Features onsite ☐ Downstream Storm/Culv.
☐ Evidence of Downstream Channel Erosion (by Field Observation) _____
☐ Floodplain ☐ Problem Drainage Area ☐ Stormwater Hotspot
☐ Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).
☐ Other (Specify): Archaeological site / Exist. structure onsite

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

☒ Yes ☐ No	# WET POND #1 (ACTUALLY WET EXT. DET)					INTENSITY
Predev (Present)	DA = 4.5 APPROX. ac.	C/CN =	Tc =	min / hrs.		1 2.72
2-year ALLOWABLE	~~10.7~~ 11.6	cfs				2 3.26
10-year OUTFLOWS Determined	15.5 16.8	cfs				10 4.52
100-year BY BACKCALC METHODS.	22.2 24.10	cfs				100 6.25
PostDev w/o Detention (Inflow)	DA = ~~22.16~~ 21.08 ac.	C/CN = 0.41	Tc = 20	ALT 29.3 min / hrs.		
2-year	~~29.6~~ 28.2 (28.17)	cfs				
10-year	~~41.7~~ 39.1 (39.08)	cfs				
100-year	~~56.7~~ 54.0 (53.98)	cfs				
PostDev with Detention (Routed)	DA = ~~22.16~~ 21.08 ac.	C/CN = 0.41	Tc = 20	min / hrs.		
2-year	~~3.64~~ 0.5	cfs (0.44)	at El.	~~82.82 82.23~~		83.18
10-year	11.41 ~~[illegible]~~	cfs	at El.	~~[illegible]~~		83.83
100-year INCREASE	25.88 ~~[illegible]~~ (28.57)	cfs	at El.	~~[illegible]~~		84.23

Downstream Tailwater Assumption for Pond Routing: ~~65.00~~ 65.83
Routed Peak Discharges (Outflows) from BMP meets Predevelopment Allowables: ☒ Yes ☐ No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ☒ Yes ☐ No

1-YEAR INFLOW
~~0.44 cfs @ 82.82 WSEL~~
~~RQD 41,496 C.F.~~
CN = 71
Q_{RUNOFF} = 0.66" Q_{1YR} = 23.5 CFS
RQD = 50,503 CF Q_{OUT} = 0.44 CFS
PROV = 50,503 CF @ EL. 83.3

REV. 2

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

☐ Check if None ☒ Provided: BMP # 1 Type: WET POND (WET EXT DET A-3)

Y N * See Below for Pertinent Water Quality Treatment Design Information.

Y	N				
☒	☐	Top of Facility	El.	~~85.10~~ 85.3	
☒	☐	Design High Water	El.	~~84.08~~ 84.23	
☒	☐	Emergency Spillway (E.S.) Crest	El.	~~84.00~~ 84.3	BW: ~~4'~~ 8' SS: 4H:1V (TOKEN)
☒	☐	FreeBoard		~~1.04~~ 1.07	1 ft. or > with E.S.
		☒ Acceptable ☐ Not Acceptable.			2 ft. or > w/o E.S.
☒	☐	Principal Spillway (Riser) Crest	El.	~~83.0~~ 83.3	Size/Type: 36"ϕ RCP
☒	☐	Principal Spillway Crest 1 ft. below crest of emergency spillway.			☐ Yes ☐ No ☐ N/A
☒	☐	Stage-Storage Curve or Data			
☒	☐	Outlet Rating Curve or Table (Discharge Structure Rating)		83.3	
☒	☐	1-year design storm	El.	~~82.65~~	or Volume ~~44496~~ RATIONAL METHOD 50,503 CF. 42,328
☒	☐	1-year, 24 hour detention criteria for Stream Channel Protection.			☒ Yes ☐ No ☐ N/A
☒	☐	Extended Detention Provided (Min. 24 hours)			☒ Yes ☐ No ☐ N/A
☒	☐	Normal/Permanent Pool	El.	~~79.25~~ 79.1	☐ N/A
☒	☐	Orifice/Weir #1 (highest El.)	El.	~~84.00~~ 84.3	Type: EM. SPILLWAY 8' BW: 4H:1V
☒	☐	Orifice/Weir #2	El.	~~83.00~~ 83.3	Type: 36"ϕ RCP W/ 72" HOOD
☒	☐	Orifice/Weir #3	El.	~~79.25~~ 79.1	Type: 3 INCH PVC
☐	☒	Orifice/Weir #4	El.		Type:
☐	☒	Orifice/Weir #5 (lowest El.)	El.	79.10	Type:
☒	☐	Low Flow Orifice (~~ExDet~~ CPv)	El.	~~79.25~~	Type: 3"ϕ
☒	☐	Pond Drain w/ Valve	El.	71.00	Type: 6" D.I.P
☒	☐	Pond Bottom	El.	71.00	Riser Height: ~~14.00~~ 14.3' (2 joints)
☒	☐	Steps or Access Provided (for over 4 ft. depth)		YES	☐ N/A
☒	☐	Riser Base	Bottom El.	67.5	Type: 6'x6'x1.5' CONC.
☒	☐	Core Trench (CLAY)		☐ N/A	
☒	☐	Anti-Seep Collars or other acceptable Seepage Control Method.			☐ N/A
☒	☐	Principal Spillway Anti-Vortex Device and Trash Rack.			Type: Concrete 72" O.D.
☐	☒	Low Flow Orifice Cage-Type Trash Rack.			Type: N/A
☐	☐	Outlet Barrel:	Type/Class: (RCP) CL IV		Size: 18"ϕ
			Inv. U/S: ~~71.0~~ 70.0		Inv D/S: ~~70.00~~ 69.0
			Slope: ~~1.23%~~ 1.00%V		Length: 81' (ft.)
☒	☐	Flared End Section. Matches Outlet Barrel material type.			
☒	☐	Outlet Protection.			
		☒ Standard riprap outlet protection (OP)			Type: ~~14'~~ 55' LX 1.5' Deep, CLASS I RIPRAP CH
		☐ Special Dissipator Structure (SDS)			Type:
☐	☒	Sediment / Cleanout Elevation		El. 72.10	or Depth 1.1'
☒	☐	Adequate Channel Downstream of BMP:		☒ 1-year, 24-hour, or ☐ MS # 19 criteria.	

Sketch or Notes, If Necessary: ½ WQTV PP; ½ EXT. DET POOL

NPOOL = 79.10 | 100-YEAR DHW IS BELOW E.S. ELEV.
DHW = 84.23

* WQV Design Information.

Imperv. Area ~~200AC~~ 8.64AC. @ 41% IMPERV

WQTV 2"IMP/AC ~~32,960 CF~~ ~~65920~~

Vol. Required ~~32,960 X 2 = 65920~~ 62726

Vol. Provided ~~33217 + 33152 = 66177~~ 31,363 × 2 31,473 + 31363 = 62836 CF

Sediment Trap & Basins

☐ Temporary Sediment Trap # 1 _____ DA = 0.90 < 3 acres

☐ Temporary Sediment Trap # 2 _____ DA = ~~0.45~~ 0.26 < 3 acres

☐ ~~Temporary Sediment Basin # 1~~ _____ DA = _____ ☐ BMP # ____ convert.

☐ ~~Temporary Sediment Basin # 2~~ _____ DA = _____ ☐ BMP # ____ convert.

Plan Review Steps & Components:

Y	N	
☒	☐	First "Look-Thru". Quick look through plan for familiarity.
☒	☐	Worksheet for BMP Point System. New plan meets 10 point system or redevelopment method.
☒	☐	FEMA Special Flood Hazard Areas. Check against property, site and development.
☒	☐	Check JCC Tax Parcel Maps for RPA / RMA locations and parcel identification.
☒	☐	Stormwater hotspot, general screening, layout or separation distances (if any) are satisfied.
☒	☐	Environmental Inventory components based on Chesapeake Bay Ordinance requirements.
☒	☐	Highlight and check impact to environmental sensitive areas (wetlands, RPA, steep slope,etc.).
☐	☒	Demolition plan (if any) and Identification of offsite borrow, waste areas and onsite stockpiles.
☒	☐	Review existing topography to determine adequacy of E&SC plan (Phase I) at first clearing.
☐	☒	Review grading plan to check for conflicts (offsite grading, cut-fills, slopes,) & Phase II E&SC.
☒	☐	Review layout plan to check for conflicts (buildings, parking, buffers, etc.).
☒	☐	Highlight culverts and stormdrains. Check pipe data and for utility and cover conflicts.
☒	☐	Review proposed culvert and stormdrain systems including specifications, notes, and details.
☒	☒	Review sequence of construction (for E&SC and SWM/BMP applicability to site work).
☒	☐	Review plan based on Chapter 19 Subdivision ordinance as it relates to SWM/BMP control.
☒	☐	Review plan based on Chapter 24 Zoning as it relates to SWM/BMP control.
☒	☐	Review plan based on Chapter 23 Chesapeake Bay ordinance requirements.
☒	☐	Review plan based on General Knowledge and Experience for Design/Construction.
☒	☐	Review plan based on JCC BMP manual for the BMP type as selected for project.
☐	☒	Review plan based on JCC Stormwater Conveyance System D/C Guidelines (***Future***).
☒	☐	Review plan based on Virginia Erosion and Sediment Control Handbook (VESCH).
☒	☐	Review plan based on Virginia Stormwater Management Handbook (VSMH) for BMP type.
☐	☒	Review plan based on Hampton Roads BMP Design Guidance manual (***Optional***).
☐	☒	Review plan based on MWCOG, Controlling Urban Runoff BMP manual (***Optional***).
☒	☐	Review plan based on standard JCC E&SC and SWM Design Plan Checklists.
☐	☒	Review plan based on JCC BMP Construction Specifications (***Future***).
☒	☐	Review Maintenance Plan for SWM / BMP facility.
☒	☐	Review E&SC Plan Design Report and computations (Attached report).
☒	☐	Review SWM Design Report and computations (Attached Report).
☒	☐	Adequate Channels proven downstream of both uncontrolled or SWM/BMP areas.
☒	☐	Adequate function, conversion of BMPs used as Temp Sed Basins (volume, discharge, WSELs).
☒	☒	Geotechnical. Information per App. E JCC BMP manual or to substantiate use of other BMPs.
☒	☐	Provisions on plan requiring proper Record Drawing and Const. Cert of facility.
☒	☐	Inclusion of H&H and SWM / BMP data into any JCC databases.
☐	☐	Other: SUP-15-99

Prepared Environmental Division comments for the following categories based on above review areas:

☐ ☐	***General Comments:***	☐ ☐	***Erosion & Sediment Control Plan:***
☐ ☐	***Floodplain:***	☐ ☐	***Chesapeake Bay Preservation:***
☐ ☐	***Stormwater Management / Drainage:***	☐ ☐	***Other:*** OK

Additional Notes & Comments: Ok, based on Rational Method not SCS (pg 496). Pond embankment within perimeter buffer. Possible impact to 25% slopes shown SOC & E&SC Phase I plan needs reconfigured. Pond reconfig. (buffer & OHW) -3 POND RECONFIGURED. SAFETY TO WP APPEARS OK. 4H:1VSS, BENCH & LANDSCAPING PROVIDED.

(Note: THIS FORM FOR COUNTY USE ONLY.)

☒ 1st Rev ☒ 2nd Rev ☐ 3rd Rev

Signature: [illegible] Date: 05-24-00

[illegible] 08-11-00

[illegible] 08-22-00

As-Built SWM/BMP Facility Calculations for Mulberry Place

50-Lot Residential Subdivision

Centerville Road

James City County

S-35-00
PC137

Prepared by:
AES Consulting Engineers
5248 Olde Towne Rd.
Williamsburg, Va. 23188
(757) 253-0040

Date: December 2, 2002

CONSULTING ENGINEERS

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	23.5	1	20	42,328	1	----	------	------	1-yr. post
2	Rational	28.2	1	20	50,712	2	----	------	------	2yr. post
3	Rational	39.1	1	20	70,349	10	----	------	------	10-yr. post
4	Rational	54.0	1	20	97,155	100	----	------	------	100-yr. post
6	Reservoir	0.5	1	59	32,601	1	1	83.36	41,126	1-yr Route
7	Reservoir	4.6	1	54	38,742	2	2	83.86	47,268	2-yr Route
8	Reservoir	18.7	1	41	58,304	10	3	84.20	51,710	10-yr Route
9	Reservoir	35.3	1	34	85,085	100	4	84.47	55,269	100-yr Route

Design
1- 0.4 cfs @ EL. 82.65
2- 0.5 cfs @ EL. 83.18
10- 11.4 cfs @ EL. 83.83
100- 25.9 cfs @ EL. 84.23

Low Point T.O.D
85.58
84.23
1.35' FB. > 1' OK.

Proj. file: MPasbuiltpond2.GPW	IDF file: JCChydrographs.IDF	Run date: 12-02-2002

Reservoir Report

English

Reservoir No. 2 - Wet Volume

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	70.16	00	0	0
0.84	71.00	2,242	942	942
1.84	72.00	2,565	2,404	3,346
2.84	73.00	2,904	2,734	6,081
3.84	74.00	3,260	3,082	9,163
4.84	75.00	3,632	3,446	12,609
5.84	76.00	4,021	3,827	16,436
6.84	77.00	4,685	4,353	20,789
7.84	78.00	5,232	4,959	25,748
8.84	79.00	5,803	5,518	31,266

Culvert / Orifice Structures

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

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len ft	=	0.0	0.0	0.0	0.0
Crest El. ft	=	0.00	0.00	0.00	0.00
Weir Coeff.	=	0.00	0.00	0.00	0.00
Eqn. Exp.	=	0.00	0.00	0.00	0.00
Multi-Stage	=	No	No	No	No

Tailwater Elevation = 0.00 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	70.16	---	---	---	---	---	---	---	---	0.00
0.84	942	71.00	---	---	---	---	---	---	---	---	0.00
1.84	3,346	72.00	---	---	---	---	---	---	---	---	0.00
2.84	6,081	73.00	---	---	---	---	---	---	---	---	0.00
3.84	9,163	74.00	---	---	---	---	---	---	---	---	0.00
4.84	12,609	75.00	---	---	---	---	---	---	---	---	0.00
5.84	16,436	76.00	---	---	---	---	---	---	---	---	0.00
6.84	20,789	77.00	---	---	---	---	---	---	---	---	0.00
7.84	25,748	78.00	---	---	---	---	---	---	---	---	0.00
8.84	31,266	79.00	---	---	---	---	---	---	---	---	0.00

Reservoir Report

English

Reservoir No. 1 - Routing Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	79.00	5,803	0	0
1.00	80.00	8,147	6,975	6,975
2.00	81.00	9,344	8,746	15,721
3.00	82.00	10,475	9,910	25,631
4.00	83.00	11,642	11,059	36,690
5.00	84.00	12,864	12,253	48,943
6.00	85.00	14,306	13,585	62,528

Culvert / Orifice Structures

		[A]	[B]	[C]	[D]
Rise in	=	18.0	3.0	0.0	0.0
Span in	=	18.0	3.0	0.0	0.0
No. Barrels	=	1	1	0	0
Invert El. ft	=	70.26	79.00	0.00	0.00
Length ft	=	107.0	2.0	0.0	0.0
Slope %	=	1.24	0.00	0.00	0.00
N-Value	=	.013	.013	.000	.000
Orif. Coeff.	=	0.60	0.60	0.00	0.00
Multi-Stage	=	-----	Yes	No	No

Weir Structures 48" RISER E.S.

		[A]	[B]	[C]	[D]
Crest Len ft	=	12.6 ✓	8.0 ✓	0.0	0.0
Crest El. ft	=	83.64	84.00	0.00	0.00
Weir Coeff.	=	3.00	3.00	0.00	0.00
Eqn. Exp.	=	1.50	1.50	0.00	0.00
Multi-Stage	=	Yes	No	No	No

Tailwater Elevation = 65.83 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	79.00	22.40	0.00	---	---	0.00	0.00	---	---	0.00
1.00	6,975	80.00	23.67	0.22	---	---	0.00	0.00	---	---	0.22
2.00	15,721	81.00	24.88	0.32	---	---	0.00	0.00	---	---	0.32
3.00	25,631	82.00	26.03	0.40	---	---	0.00	0.00	---	---	0.40
4.00	36,690	83.00	27.13	0.47	---	---	0.00	0.00	---	---	0.47
5.00	48,943	84.00	28.19	0.52	---	---	8.14	0.00	---	---	8.66
6.00	62,528	85.00	29.21	0.00	---	---	59.76	24.00	---	---	53.21

Hydrograph Report

English

Hyd. No. 6

1-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 0.49 cfs
Storm frequency	= 1 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Reservoir name	= Routing Pond
Max. Elevation	= 83.36 ft	Max. Storage	= 41,126 cuft

Storage Indication method used.

Total Volume = 32,601 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.10	7.05	79.18	22.64	0.06	-----	-----	-----	-----	-----	-----	0.06
0.12	8.23	79.25	22.72	0.08	-----	-----	-----	-----	-----	-----	0.08
0.13	9.41	79.32	22.82	0.10	-----	-----	-----	-----	-----	-----	0.10
0.15	10.58	79.41	22.93	0.11	-----	-----	-----	-----	-----	-----	0.11
0.17	11.76	79.50	23.05	0.14	-----	-----	-----	-----	-----	-----	0.14
0.18	12.93	79.61	23.18	0.16	-----	-----	-----	-----	-----	-----	0.16
0.20	14.11	79.72	23.33	0.18	-----	-----	-----	-----	-----	-----	0.18
0.22	15.29	79.85	23.48	0.20	-----	-----	-----	-----	-----	-----	0.20
0.23	16.46	79.98	23.65	0.22	-----	-----	-----	-----	-----	-----	0.22
0.25	17.64	80.10	23.80	0.23	-----	-----	-----	-----	-----	-----	0.23
0.27	18.81	80.22	23.95	0.25	-----	-----	-----	-----	-----	-----	0.25
0.28	19.99	80.35	24.11	0.26	-----	-----	-----	-----	-----	-----	0.26
0.30	21.16	80.49	24.28	0.28	-----	-----	-----	-----	-----	-----	0.28
0.32	22.34	80.64	24.45	0.29	-----	-----	-----	-----	-----	-----	0.29
0.33	23.52 <<	80.80	24.64	0.31	-----	-----	-----	-----	-----	-----	0.31
0.35	22.93	80.95	24.83	0.32	-----	-----	-----	-----	-----	-----	0.32
0.37	22.34	81.09	24.99	0.33	-----	-----	-----	-----	-----	-----	0.33
0.38	21.75	81.23	25.15	0.34	-----	-----	-----	-----	-----	-----	0.34
0.40	21.16	81.35	25.29	0.35	-----	-----	-----	-----	-----	-----	0.35
0.42	20.58	81.48	25.44	0.36	-----	-----	-----	-----	-----	-----	0.36
0.43	19.99	81.60	25.58	0.37	-----	-----	-----	-----	-----	-----	0.37
0.45	19.40	81.72	25.71	0.38	-----	-----	-----	-----	-----	-----	0.38
0.47	18.81	81.83	25.84	0.39	-----	-----	-----	-----	-----	-----	0.39
0.48	18.22	81.94	25.96	0.40	-----	-----	-----	-----	-----	-----	0.40
0.50	17.64	82.04	26.08	0.40	-----	-----	-----	-----	-----	-----	0.40
0.52	17.05	82.13	26.18	0.41	-----	-----	-----	-----	-----	-----	0.41
0.53	16.46	82.22	26.28	0.42	-----	-----	-----	-----	-----	-----	0.42
0.55	15.87	82.31	26.37	0.42	-----	-----	-----	-----	-----	-----	0.42
0.57	15.29	82.39	26.46	0.43	-----	-----	-----	-----	-----	-----	0.43
0.58	14.70	82.47	26.55	0.43	-----	-----	-----	-----	-----	-----	0.43
0.60	14.11	82.54	26.64	0.44	-----	-----	-----	-----	-----	-----	0.44
0.62	13.52	82.62	26.72	0.44	-----	-----	-----	-----	-----	-----	0.44
0.63	12.93	82.68	26.79	0.45	-----	-----	-----	-----	-----	-----	0.45
0.65	12.35	82.75	26.86	0.45	-----	-----	-----	-----	-----	-----	0.45
0.67	11.76	82.81	26.93	0.45	-----	-----	-----	-----	-----	-----	0.45
0.68	11.17	82.87	27.00	0.46	-----	-----	-----	-----	-----	-----	0.46

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.70	10.58	82.93	27.06	0.46	-----	-----	-----	-----	-----	-----	0.46
0.72	9.99	82.98	27.12	0.46	-----	-----	-----	-----	-----	-----	0.46
0.73	9.41	83.03	27.17	0.47	-----	-----	-----	-----	-----	-----	0.47
0.75	8.82	83.07	27.21	0.47	-----	-----	-----	-----	-----	-----	0.47
0.77	8.23	83.11	27.25	0.47	-----	-----	-----	-----	-----	-----	0.47
0.78	7.64	83.15	27.29	0.47	-----	-----	-----	-----	-----	-----	0.47
0.80	7.05	83.18	27.33	0.48	-----	-----	-----	-----	-----	-----	0.48
0.82	6.47	83.21	27.36	0.48	-----	-----	-----	-----	-----	-----	0.48
0.83	5.88	83.24	27.39	0.48	-----	-----	-----	-----	-----	-----	0.48
0.85	5.29	83.27	27.42	0.48	-----	-----	-----	-----	-----	-----	0.48
0.87	4.70	83.29	27.44	0.48	-----	-----	-----	-----	-----	-----	0.48
0.88	4.12	83.31	27.46	0.48	-----	-----	-----	-----	-----	-----	0.48
0.90	3.53	83.32	27.48	0.48	-----	-----	-----	-----	-----	-----	0.48
0.92	2.94	83.34	27.49	0.49	-----	-----	-----	-----	-----	-----	0.49
0.93	2.35	83.35	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
0.95	1.76	83.36	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
0.97	1.18	83.36	27.52	0.49	-----	-----	-----	-----	-----	-----	0.49
0.98	0.59	83.36 <<	27.52	0.49	-----	-----	-----	-----	-----	-----	0.49 <<
1.00	0.00	83.36	27.52	0.49	-----	-----	-----	-----	-----	-----	0.49
1.02	0.00	83.36	27.52	0.49	-----	-----	-----	-----	-----	-----	0.49
1.03	0.00	83.36	27.52	0.49	-----	-----	-----	-----	-----	-----	0.49
1.05	0.00	83.35	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
1.07	0.00	83.35	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
1.08	0.00	83.35	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
1.10	0.00	83.35	27.51	0.49	-----	-----	-----	-----	-----	-----	0.49
1.12	0.00	83.34	27.50	0.49	-----	-----	-----	-----	-----	-----	0.49
1.13	0.00	83.34	27.50	0.49	-----	-----	-----	-----	-----	-----	0.49
1.15	0.00	83.34	27.50	0.49	-----	-----	-----	-----	-----	-----	0.49
1.17	0.00	83.34	27.50	0.49	-----	-----	-----	-----	-----	-----	0.49
1.18	0.00	83.33	27.49	0.48	-----	-----	-----	-----	-----	-----	0.48
1.20	0.00	83.33	27.49	0.48	-----	-----	-----	-----	-----	-----	0.48
1.22	0.00	83.33	27.49	0.48	-----	-----	-----	-----	-----	-----	0.48
1.23	0.00	83.33	27.49	0.48	-----	-----	-----	-----	-----	-----	0.48
1.25	0.00	83.33	27.48	0.48	-----	-----	-----	-----	-----	-----	0.48
1.27	0.00	83.32	27.48	0.48	-----	-----	-----	-----	-----	-----	0.48
1.28	0.00	83.32	27.48	0.48	-----	-----	-----	-----	-----	-----	0.48
1.30	0.00	83.32	27.47	0.48	-----	-----	-----	-----	-----	-----	0.48
1.32	0.00	83.32	27.47	0.48	-----	-----	-----	-----	-----	-----	0.48
1.33	0.00	83.31	27.47	0.48	-----	-----	-----	-----	-----	-----	0.48
1.35	0.00	83.31	27.47	0.48	-----	-----	-----	-----	-----	-----	0.48
1.37	0.00	83.31	27.46	0.48	-----	-----	-----	-----	-----	-----	0.48
1.38	0.00	83.31	27.46	0.48	-----	-----	-----	-----	-----	-----	0.48
1.40	0.00	83.30	27.46	0.48	-----	-----	-----	-----	-----	-----	0.48
1.42	0.00	83.30	27.46	0.48	-----	-----	-----	-----	-----	-----	0.48
1.43	0.00	83.30	27.45	0.48	-----	-----	-----	-----	-----	-----	0.48
1.45	0.00	83.30	27.45	0.48	-----	-----	-----	-----	-----	-----	0.48
1.47	0.00	83.29	27.45	0.48	-----	-----	-----	-----	-----	-----	0.48
1.48	0.00	83.29	27.45	0.48	-----	-----	-----	-----	-----	-----	0.48
1.50	0.00	83.29	27.44	0.48	-----	-----	-----	-----	-----	-----	0.48

Continues on next page...

Hydrograph Report

English

Hyd. No. 7

2-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 4.56 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Inflow hyd. No.	= 2	Reservoir name	= Routing Pond
Max. Elevation	= 83.86 ft	Max. Storage	= 47,268 cuft

Storage Indication method used.

Total Volume = 38,742 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.57	18.31	82.93	27.06	0.46	-----	-----	-----	-----	-----	-----	0.46
0.58	17.61	83.02	27.16	0.47	-----	-----	-----	-----	-----	-----	0.47
0.60	16.90	83.10	27.24	0.47	-----	-----	-----	-----	-----	-----	0.47
0.62	16.20	83.18	27.33	0.48	-----	-----	-----	-----	-----	-----	0.48
0.63	15.50	83.26	27.41	0.48	-----	-----	-----	-----	-----	-----	0.48
0.65	14.79	83.33	27.49	0.48	-----	-----	-----	-----	-----	-----	0.48
0.67	14.09	83.40	27.56	0.49	-----	-----	-----	-----	-----	-----	0.49
0.68	13.38	83.46	27.63	0.49	-----	-----	-----	-----	-----	-----	0.49
0.70	12.68	83.52	27.69	0.50	-----	-----	-----	-----	-----	-----	0.50
0.72	11.97	83.58	27.75	0.50	-----	-----	-----	-----	-----	-----	0.50
0.73	11.27	83.64	27.81	0.50	-----	-----	0.20	-----	-----	-----	0.70
0.75	10.57	83.69	27.86	0.50	-----	-----	0.47	-----	-----	-----	0.98
0.77	9.86	83.73	27.91	0.51	-----	-----	1.09	-----	-----	-----	1.60
0.78	9.16	83.77	27.95	0.51	-----	-----	1.78	-----	-----	-----	2.29
0.80	8.45	83.80	27.98	0.51	-----	-----	2.34	-----	-----	-----	2.85
0.82	7.75	83.82	28.01	0.51	-----	-----	2.94	-----	-----	-----	3.46
0.83	7.04	83.84	28.02	0.51	-----	-----	3.41	-----	-----	-----	3.93
0.85	6.34	83.85	28.04	0.51	-----	-----	3.74	-----	-----	-----	4.26
0.87	5.63	83.86	28.05	0.51	-----	-----	3.95	-----	-----	-----	4.46
0.88	4.93	83.86	28.05	0.51	-----	-----	4.05	-----	-----	-----	4.56
0.90	4.23	83.86 <<	28.05	0.51	-----	-----	4.05	-----	-----	-----	4.56 <<
0.92	3.52	83.86	28.05	0.51	-----	-----	3.97	-----	-----	-----	4.48
0.93	2.82	83.85	28.04	0.51	-----	-----	3.81	-----	-----	-----	4.32
0.95	2.11	83.85	28.03	0.51	-----	-----	3.59	-----	-----	-----	4.10
0.97	1.41	83.83	28.02	0.51	-----	-----	3.31	-----	-----	-----	3.82
0.98	0.70	83.82	28.01	0.51	-----	-----	2.98	-----	-----	-----	3.49
1.00	0.00	83.81	27.99	0.51	-----	-----	2.61	-----	-----	-----	3.12
1.02	0.00	83.79	27.98	0.51	-----	-----	2.28	-----	-----	-----	2.79
1.03	0.00	83.78	27.96	0.51	-----	-----	2.04	-----	-----	-----	2.55
1.05	0.00	83.77	27.95	0.51	-----	-----	1.82	-----	-----	-----	2.33
1.07	0.00	83.76	27.94	0.51	-----	-----	1.62	-----	-----	-----	2.12
1.08	0.00	83.75	27.93	0.51	-----	-----	1.43	-----	-----	-----	1.94
1.10	0.00	83.74	27.92	0.51	-----	-----	1.26	-----	-----	-----	1.77
1.12	0.00	83.73	27.91	0.51	-----	-----	1.11	-----	-----	-----	1.62
1.13	0.00	83.72	27.90	0.51	-----	-----	0.97	-----	-----	-----	1.47
1.15	0.00	83.72	27.90	0.51	-----	-----	0.84	-----	-----	-----	1.35

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Hydrograph Report

English

Hyd. No. 8

10-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 18.70 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 3	Reservoir name	= Routing Pond
Max. Elevation	= 84.20 ft	Max. Storage	= 51,710 cuft

Storage Indication method used.

Total Volume = 58,304 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.53	27.36	83.82	28.00	0.51	-----	-----	2.85	-----	-----	-----	3.36
0.55	26.38	83.92	28.11	0.52	-----	-----	5.78	-----	-----	-----	6.30
0.57	25.40	84.01	28.21	0.52	-----	-----	8.59	0.09	-----	-----	9.20
0.58	24.43	84.08	28.27	0.53	-----	-----	10.88	0.57	-----	-----	11.98
0.60	23.45	84.12	28.32	0.53	-----	-----	12.70	1.08	-----	-----	14.31
0.62	22.47	84.16	28.36	0.53	-----	-----	14.07	1.56	-----	-----	16.16
0.63	21.50	84.18	28.38	0.53	-----	-----	15.00	1.88	-----	-----	17.41
0.65	20.52	84.19	28.39	0.53	-----	-----	15.57	2.07	-----	-----	18.18
0.67	19.54	84.20	28.40	0.53	-----	-----	15.87	2.18	-----	-----	18.59
0.68	18.56	84.20 <<	28.40	0.53	-----	-----	15.95	2.21	-----	-----	18.70 <<
0.70	17.59	84.20	28.40	0.53	-----	-----	15.85	2.17	-----	-----	18.55
0.72	16.61	84.20	28.39	0.53	-----	-----	15.61	2.09	-----	-----	18.23
0.73	15.63	84.19	28.39	0.53	-----	-----	15.28	1.97	-----	-----	17.78
0.75	14.66	84.18	28.38	0.53	-----	-----	14.86	1.83	-----	-----	17.21
0.77	13.68	84.16	28.36	0.53	-----	-----	14.37	1.66	-----	-----	16.56
0.78	12.70	84.15	28.35	0.53	-----	-----	13.84	1.47	-----	-----	15.84
0.80	11.72	84.14	28.33	0.53	-----	-----	13.26	1.28	-----	-----	15.06
0.82	10.75	84.12	28.32	0.53	-----	-----	12.65	1.07	-----	-----	14.24
0.83	9.77	84.11	28.30	0.53	-----	-----	12.02	0.85	-----	-----	13.39
0.85	8.79	84.09	28.29	0.53	-----	-----	11.40	0.68	-----	-----	12.61
0.87	7.82	84.07	28.27	0.53	-----	-----	10.77	0.55	-----	-----	11.85
0.88	6.84	84.05	28.25	0.52	-----	-----	10.11	0.41	-----	-----	11.05
0.90	5.86	84.04	28.23	0.52	-----	-----	9.43	0.27	-----	-----	10.22
0.92	4.89	84.02	28.21	0.52	-----	-----	8.72	0.12	-----	-----	9.37
0.93	3.91	84.00	28.19	0.52	-----	-----	8.00	-----	-----	-----	8.52
0.95	2.93	83.97	28.16	0.52	-----	-----	7.27	-----	-----	-----	7.79
0.97	1.95	83.95	28.14	0.52	-----	-----	6.51	-----	-----	-----	7.03
0.98	0.98	83.92	28.11	0.52	-----	-----	5.71	-----	-----	-----	6.23
1.00	0.00	83.90	28.08	0.52	-----	-----	4.91	-----	-----	-----	5.42
1.02	0.00	83.87	28.06	0.51	-----	-----	4.26	-----	-----	-----	4.78
1.03	0.00	83.85	28.04	0.51	-----	-----	3.69	-----	-----	-----	4.21
1.05	0.00	83.83	28.02	0.51	-----	-----	3.19	-----	-----	-----	3.71
1.07	0.00	83.81	28.00	0.51	-----	-----	2.75	-----	-----	-----	3.26
1.08	0.00	83.80	27.98	0.51	-----	-----	2.38	-----	-----	-----	2.89
1.10	0.00	83.78	27.97	0.51	-----	-----	2.13	-----	-----	-----	2.64
1.12	0.00	83.77	27.95	0.51	-----	-----	1.90	-----	-----	-----	2.41

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
1.13	0.00	83.76	27.94	0.51	-----	-----	1.69	-----	-----	-----	2.20
1.15	0.00	83.75	27.93	0.51	-----	-----	1.50	-----	-----	-----	2.00

...End

Hydrograph Report

English

Hyd. No. 9

100-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 35.26 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 4	Reservoir name	= Routing Pond
Max. Elevation	= 84.47 ft	Max. Storage	= 55,269 cuft

Storage Indication method used.

Total Volume = 85,085 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.42	47.23	83.84	28.03	0.51	-----	-----	3.57	-----	-----	-----	4.09
0.43	45.88	84.03	28.23	0.52	-----	-----	9.38	0.26	-----	-----	10.17
0.45	44.53	84.17	28.37	0.53	-----	-----	14.74	1.78	-----	-----	17.05
0.47	43.18	84.28	28.48	0.54	-----	-----	19.25	3.55	-----	-----	23.34
0.48	41.83	84.35	28.56	0.54	-----	-----	22.68	5.05	-----	-----	28.28
0.50	40.48	84.40	28.61	0.54	-----	-----	25.04	6.11	-----	-----	31.66
0.52	39.13	84.43	28.64	0.50	-----	-----	26.67	6.88	-----	-----	33.46
0.53	37.78	84.45	28.66	0.47	-----	-----	27.67	7.35	-----	-----	34.56
0.55	36.43	84.46	28.67	0.46	-----	-----	28.18	7.60	-----	-----	35.12
0.57	35.08	84.47 <<	28.67	0.45	-----	-----	28.30	7.66	-----	-----	35.26 <<
0.58	33.73	84.46	28.67	0.46	-----	-----	28.13	7.57	-----	-----	35.08
0.60	32.39	84.45	28.66	0.47	-----	-----	27.73	7.38	-----	-----	34.63
0.62	31.04	84.44	28.65	0.48	-----	-----	27.15	7.11	-----	-----	33.99
0.63	29.69	84.43	28.63	0.50	-----	-----	26.42	6.76	-----	-----	33.19
0.65	28.34	84.41	28.62	0.53	-----	-----	25.59	6.37	-----	-----	32.27
0.67	26.99	84.39	28.60	0.54	-----	-----	24.69	5.95	-----	-----	31.19
0.68	25.64	84.38	28.58	0.54	-----	-----	23.80	5.55	-----	-----	29.90
0.70	24.29	84.36	28.56	0.54	-----	-----	22.90	5.15	-----	-----	28.59
0.72	22.94	84.34	28.54	0.54	-----	-----	21.99	4.74	-----	-----	27.28
0.73	21.59	84.32	28.52	0.54	-----	-----	21.08	4.34	-----	-----	25.95
0.75	20.24	84.30	28.50	0.54	-----	-----	20.16	3.93	-----	-----	24.63
0.77	18.89	84.28	28.48	0.54	-----	-----	19.30	3.57	-----	-----	23.41
0.78	17.54	84.26	28.46	0.54	-----	-----	18.41	3.21	-----	-----	22.15
0.80	16.19	84.24	28.44	0.53	-----	-----	17.50	2.84	-----	-----	20.88
0.82	14.84	84.22	28.42	0.53	-----	-----	16.58	2.47	-----	-----	19.58
0.83	13.49	84.20	28.40	0.53	-----	-----	15.66	2.10	-----	-----	18.30
0.85	12.14	84.18	28.37	0.53	-----	-----	14.79	1.80	-----	-----	17.13
0.87	10.80	84.15	28.35	0.53	-----	-----	13.89	1.49	-----	-----	15.91
0.88	9.45	84.13	28.33	0.53	-----	-----	12.97	1.18	-----	-----	14.67
0.90	8.10	84.11	28.30	0.53	-----	-----	12.03	0.85	-----	-----	13.41
0.92	6.75	84.08	28.28	0.53	-----	-----	11.13	0.63	-----	-----	12.29
0.93	5.40	84.06	28.25	0.52	-----	-----	10.23	0.44	-----	-----	11.19
0.95	4.05	84.03	28.23	0.52	-----	-----	9.29	0.24	-----	-----	10.05
0.97	2.70	84.00	28.20	0.52	-----	-----	8.31	0.04	-----	-----	8.87
0.98	1.35	83.97	28.17	0.52	-----	-----	7.33	-----	-----	-----	7.85
1.00	0.00	83.94	28.13	0.52	-----	-----	6.31	-----	-----	-----	6.82

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
1.02	0.00	83.91	28.10	0.52	-----	-----	5.33	-----	-----	-----	5.85
1.03	0.00	83.88	28.07	0.52	-----	-----	4.58	-----	-----	-----	5.09
1.05	0.00	83.86	28.05	0.51	-----	-----	3.97	-----	-----	-----	4.49
1.07	0.00	83.84	28.03	0.51	-----	-----	3.44	-----	-----	-----	3.95

...End

English

Reservoir No. 1 - Routing Pond

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

SS DATA

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	71.00	1,513	0	0
1.00	72.00	1,910	1,712	1,712
3.00	74.00	2,963	4,873	6,585
5.00	76.00	4,337	7,300	13,885
7.00	78.00	6,002	10,339	24,224
8.00	79.00	6,837	6,420	30,644
9.00	80.00	9,737	8,287	38,931
11.00	82.00	13,657	23,394	62,325
13.00	84.00	18,101	31,758	94,083
14.00	85.00	20,480	19,291	113,374

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 18.0	3.0	0.0	0.0
Span in	= 18.0	3.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 70.00	79.10	0.00	0.00
Length ft	= 100.0	2.0	0.0	0.0
Slope %	= 1.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= ——	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 9.4	8.0	0.0	0.0
Crest El. ft	= 83.30	84.30	0.00	0.00
Weir Coeff.	= 3.00	3.00	0.00	0.00
Eqn. Exp.	= 1.50	1.50	0.00	0.00
Multi-Stage	= Yes	No	No	No

Tailwater Elevation = 66.83 ft

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	71.00	4.31	0.00	—	—	0.00	0.00	—	—	0.00
1.00	1,712	72.00	9.51	0.00	—	—	0.00	0.00	—	—	0.00
3.00	6,585	74.00	14.59	0.00	—	—	0.00	0.00	—	—	0.00
5.00	13,885	76.00	18.29	0.00	—	—	0.00	0.00	—	—	0.00
7.00	24,224	78.00	21.36	0.00	—	—	0.00	0.00	—	—	0.00
8.00	30,644	79.00	22.74	0.00	—	—	0.00	0.00	—	—	0.00
9.00	38,931	80.00	24.04	0.21	—	—	0.00	0.00	—	—	0.21
11.00	62,325	82.00	26.45	0.39	—	—	0.00	0.00	—	—	0.39
13.00	94,083	84.00	28.66	0.52	—	—	16.55	0.00	—	—	17.07
14.00	113,374	85.00	29.70	0.00	—	—	62.64	14.06	—	—	43.75

English

Hyd. No. 1

1-yr. post

Hydrograph type	= Rational	Peak discharge	= 23.52 cfs
Storm frequency	= 1 yrs	Time interval	= 1 min
Drainage area	= 21.1 ac	Runoff coeff.	= 0.41
Intensity	= 2.72 in	Time of conc. (Tc)	= 20 min
I-D-F Curve	= JCChydrographs.IDF	Reced. limb factor	= 2

Total Volume = 42,328 cuft

Hydrograph Discharge Table

Time (hrs	Outflow cfs)	Time (hrs	Outflow cfs)
0.02	1.18	0.55	15.87
0.03	2.35	0.57	15.29
0.05	3.53	0.58	14.70
0.07	4.70	0.60	14.11
0.08	5.88	0.62	13.52
0.10	7.05	0.63	12.93
0.12	8.23	0.65	12.35
0.13	9.41	0.67	11.76
0.15	10.58	0.68	11.17
0.17	11.76	0.70	10.58
0.18	12.93	0.72	9.99
0.20	14.11	0.73	9.41
0.22	15.29	0.75	8.82
0.23	16.46	0.77	8.23
0.25	17.64	0.78	7.64
0.27	18.81	0.80	7.05
0.28	19.99	0.82	6.47
0.30	21.16	0.83	5.88
0.32	22.34	0.85	5.29
0.33	23.52 <<	0.87	4.70
0.35	22.93	0.88	4.12
0.37	22.34	0.90	3.53
0.38	21.75	0.92	2.94
0.40	21.16	0.93	2.35
0.42	20.58	0.95	1.76
0.43	19.99	0.97	1.18
0.45	19.40	0.98	0.59
0.47	18.81		
0.48	18.22		
0.50	17.64	*...End*	
0.52	17.05		
0.53	16.46		

English

Hyd. No. 2

2yr. post

Hydrograph type	= Rational	Peak discharge	= 28.17 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Drainage area	= 21.1 ac	Runoff coeff.	= 0.41
Intensity	= 3.26 in	Time of conc. (Tc)	= 20 min
I-D-F Curve	= JCChydrographs.IDF	Reced. limb factor	= 2

Total Volume = 50,712 cuft

Hydrograph Discharge Table

Time (hrs	Outflow cfs)	Time (hrs	Outflow cfs)
0.02	1.41	0.55	19.02
0.03	2.82	0.57	18.31
0.05	4.23	0.58	17.61
0.07	5.63	0.60	16.90
0.08	7.04	0.62	16.20
0.10	8.45	0.63	15.50
0.12	9.86	0.65	14.79
0.13	11.27	0.67	14.09
0.15	12.68	0.68	13.38
0.17	14.09	0.70	12.68
0.18	15.50	0.72	11.97
0.20	16.90	0.73	11.27
0.22	18.31	0.75	10.57
0.23	19.72	0.77	9.86
0.25	21.13	0.78	9.16
0.27	22.54	0.80	8.45
0.28	23.95	0.82	7.75
0.30	25.36	0.83	7.04
0.32	26.76	0.85	6.34
0.33	28.17 <<	0.87	5.63
0.35	27.47	0.88	4.93
0.37	26.76	0.90	4.23
0.38	26.06	0.92	3.52
0.40	25.36	0.93	2.82
0.42	24.65	0.95	2.11
0.43	23.95	0.97	1.41
0.45	23.24	0.98	0.70
0.47	22.54		
0.48	21.83		
0.50	21.13	*...End*	
0.52	20.43		
0.53	19.72		

English

Hyd. No. 3

10-yr. post

Hydrograph type	= Rational	Peak discharge	= 39.08 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 21.1 ac	Runoff coeff.	= 0.41
Intensity	= 4.52 in	Time of conc. (Tc)	= 20 min
I-D-F Curve	= JCChydrographs.IDF	Reced. limb factor	= 2

Total Volume = 70,349 cuft

Hydrograph Discharge Table

Time (hrs	Outflow cfs)	Time (hrs	Outflow cfs)
0.02	1.95	0.55	26.38
0.03	3.91	0.57	25.40
0.05	5.86	0.58	24.43
0.07	7.82	0.60	23.45
0.08	9.77	0.62	22.47
0.10	11.72	0.63	21.50
0.12	13.68	0.65	20.52
0.13	15.63	0.67	19.54
0.15	17.59	0.68	18.56
0.17	19.54	0.70	17.59
0.18	21.50	0.72	16.61
0.20	23.45	0.73	15.63
0.22	25.40	0.75	14.66
0.23	27.36	0.77	13.68
0.25	29.31	0.78	12.70
0.27	31.27	0.80	11.72
0.28	33.22	0.82	10.75
0.30	35.17	0.83	9.77
0.32	37.13	0.85	8.79
0.33	39.08 <<	0.87	7.82
0.35	38.11	0.88	6.84
0.37	37.13	0.90	5.86
0.38	36.15	0.92	4.89
0.40	35.17	0.93	3.91
0.42	34.20	0.95	2.93
0.43	33.22	0.97	1.95
0.45	32.24	0.98	0.98
0.47	31.27		
0.48	30.29		
0.50	29.31	*...End*	
0.52	28.33		
0.53	27.36		

English

Hyd. No. 4

100-yr. post

Hydrograph type	= Rational	Peak discharge	= 53.98 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 21.1 ac	Runoff coeff.	= 0.41
Intensity	= 6.25 in	Time of conc. (Tc)	= 20 min
I-D-F Curve	= JCChydrographs.IDF	Reced. limb factor	= 2

Total Volume = 97,155 cuft

Hydrograph Discharge Table

Time (hrs	Outflow cfs)	Time (hrs	Outflow cfs)
0.02	2.70	0.55	36.43
0.03	5.40	0.57	35.08
0.05	8.10	0.58	33.73
0.07	10.80	0.60	32.39
0.08	13.49	0.62	31.04
0.10	16.19	0.63	29.69
0.12	18.89	0.65	28.34
0.13	21.59	0.67	26.99
0.15	24.29	0.68	25.64
0.17	26.99	0.70	24.29
0.18	29.69	0.72	22.94
0.20	32.39	0.73	21.59
0.22	35.08	0.75	20.24
0.23	37.78	0.77	18.89
0.25	40.48	0.78	17.54
0.27	43.18	0.80	16.19
0.28	45.88	0.82	14.84
0.30	48.58	0.83	13.49
0.32	51.28	0.85	12.14
0.33	53.98 <<	0.87	10.80
0.35	52.63	0.88	9.45
0.37	51.28	0.90	8.10
0.38	49.93	0.92	6.75
0.40	48.58	0.93	5.40
0.42	47.23	0.95	4.05
0.43	45.88	0.97	2.70
0.45	44.53	0.98	1.35
0.47	43.18		
0.48	41.83		
0.50	40.48	*...End*	
0.52	39.13		
0.53	37.78		

Hyd. No. 6

1-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 0.44 cfs
Storm frequency	= 1 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Reservoir name	= Routing Pond
Max. Elevation	= 82.65 ft	Max. Storage	= 72,718 cuft

Storage Indication method used.

Total Volume = 30,250 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.05	3.53	79.14	22.92	0.01	—	—	—	—	—	—	0.01
0.07	4.70	79.17	22.96	0.01	—	—	—	—	—	—	0.01
0.08	5.88	79.21	23.01	0.02	—	—	—	—	—	—	0.02
0.10	7.05	79.25	23.07	0.04	—	—	—	—	—	—	0.04
0.12	8.23	79.31	23.15	0.07	—	—	—	—	—	—	0.07
0.13	9.41	79.37	23.23	0.09	—	—	—	—	—	—	0.09
0.15	10.58	79.44	23.32	0.10	—	—	—	—	—	—	0.10
0.17	11.76	79.52	23.43	0.12	—	—	—	—	—	—	0.12
0.18	12.93	79.61	23.54	0.15	—	—	—	—	—	—	0.15
0.20	14.11	79.71	23.67	0.16	—	—	—	—	—	—	0.16
0.22	15.29	79.81	23.80	0.18	—	—	—	—	—	—	0.18
0.23	16.46	79.93	23.95	0.20	—	—	—	—	—	—	0.20
0.25	17.64	80.03	24.08	0.21	—	—	—	—	—	—	0.21
0.27	18.81	80.13	24.20	0.22	—	—	—	—	—	—	0.22
0.28	19.99	80.23	24.32	0.24	—	—	—	—	—	—	0.24
0.30	21.16	80.33	24.45	0.25	—	—	—	—	—	—	0.25
0.32	22.34	80.44	24.59	0.26	—	—	—	—	—	—	0.26
0.33	23.52 <<	80.56	24.73	0.27	—	—	—	—	—	—	0.27
0.35	22.93	80.67	24.88	0.28	—	—	—	—	—	—	0.28
0.37	22.34	80.79	25.02	0.30	—	—	—	—	—	—	0.30
0.38	21.75	80.90	25.15	0.31	—	—	—	—	—	—	0.31
0.40	21.16	81.01	25.28	0.32	—	—	—	—	—	—	0.32
0.42	20.58	81.11	25.41	0.32	—	—	—	—	—	—	0.32
0.43	19.99	81.22	25.53	0.33	—	—	—	—	—	—	0.33
0.45	19.40	81.32	25.65	0.34	—	—	—	—	—	—	0.34
0.47	18.81	81.41	25.76	0.35	—	—	—	—	—	—	0.35
0.48	18.22	81.50	25.87	0.36	—	—	—	—	—	—	0.36
0.50	17.64	81.59	25.98	0.36	—	—	—	—	—	—	0.36
0.52	17.05	81.68	26.08	0.37	—	—	—	—	—	—	0.37
0.53	16.46	81.77	26.18	0.38	—	—	—	—	—	—	0.38
0.55	15.87	81.85	26.27	0.38	—	—	—	—	—	—	0.38
0.57	15.29	81.92	26.36	0.39	—	—	—	—	—	—	0.39
0.58	14.70	82.00	26.45	0.39	—	—	—	—	—	—	0.39
0.60	14.11	82.05	26.51	0.40	—	—	—	—	—	—	0.40
0.62	13.52	82.10	26.57	0.40	—	—	—	—	—	—	0.40
0.63	12.93	82.15	26.62	0.40	—	—	—	—	—	—	0.40

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.65	12.35	82.20	26.67	0.41	—	—	—	—	—	—	0.41
0.67	11.76	82.24	26.72	0.41	—	—	—	—	—	—	0.41
0.68	11.17	82.28	26.77	0.41	—	—	—	—	—	—	0.41
0.70	10.58	82.32	26.82	0.42	—	—	—	—	—	—	0.42
0.72	9.99	82.36	26.86	0.42	—	—	—	—	—	—	0.42
0.73	9.41	82.40	26.90	0.42	—	—	—	—	—	—	0.42
0.75	8.82	82.43	26.94	0.42	—	—	—	—	—	—	0.42
0.77	8.23	82.46	26.97	0.42	—	—	—	—	—	—	0.42
0.78	7.64	82.49	27.00	0.43	—	—	—	—	—	—	0.43
0.80	7.05	82.51	27.03	0.43	—	—	—	—	—	—	0.43
0.82	6.47	82.54	27.06	0.43	—	—	—	—	—	—	0.43
0.83	5.88	82.56	27.08	0.43	—	—	—	—	—	—	0.43
0.85	5.29	82.58	27.11	0.43	—	—	—	—	—	—	0.43
0.87	4.70	82.60	27.12	0.43	—	—	—	—	—	—	0.43
0.88	4.12	82.61	27.14	0.43	—	—	—	—	—	—	0.43
0.90	3.53	82.62	27.16	0.44	—	—	—	—	—	—	0.44
0.92	2.94	82.63	27.17	0.44	—	—	—	—	—	—	0.44
0.93	2.35	82.64	27.18	0.44	—	—	—	—	—	—	0.44
0.95	1.76	82.65	27.18	0.44	—	—	—	—	—	—	0.44
0.97	1.18	82.65	27.19	0.44	—	—	—	—	—	—	0.44
0.98	0.59	82.65 <<	27.19	0.44	—	—	—	—	—	—	0.44 <<
1.00	0.00	82.65	27.19	0.44	—	—	—	—	—	—	0.44
1.02	0.00	82.65	27.19	0.44	—	—	—	—	—	—	0.44
1.03	0.00	82.65	27.19	0.44	—	—	—	—	—	—	0.44
1.05	0.00	82.65	27.18	0.44	—	—	—	—	—	—	0.44
1.07	0.00	82.65	27.18	0.44	—	—	—	—	—	—	0.44
1.08	0.00	82.65	27.18	0.44	—	—	—	—	—	—	0.44
1.10	0.00	82.64	27.18	0.44	—	—	—	—	—	—	0.44
1.12	0.00	82.64	27.18	0.44	—	—	—	—	—	—	0.44
1.13	0.00	82.64	27.17	0.44	—	—	—	—	—	—	0.44
1.15	0.00	82.64	27.17	0.44	—	—	—	—	—	—	0.44
1.17	0.00	82.64	27.17	0.44	—	—	—	—	—	—	0.44
1.18	0.00	82.64	27.17	0.44	—	—	—	—	—	—	0.44
1.20	0.00	82.63	27.17	0.44	—	—	—	—	—	—	0.44
1.22	0.00	82.63	27.17	0.44	—	—	—	—	—	—	0.44
1.23	0.00	82.63	27.16	0.44	—	—	—	—	—	—	0.44
1.25	0.00	82.63	27.16	0.44	—	—	—	—	—	—	0.44
1.27	0.00	82.63	27.16	0.44	—	—	—	—	—	—	0.44
1.28	0.00	82.63	27.16	0.44	—	—	—	—	—	—	0.44
1.30	0.00	82.62	27.16	0.44	—	—	—	—	—	—	0.44
1.32	0.00	82.62	27.15	0.44	—	—	—	—	—	—	0.44
1.33	0.00	82.62	27.15	0.44	—	—	—	—	—	—	0.44
1.35	0.00	82.62	27.15	0.44	—	—	—	—	—	—	0.44
1.37	0.00	82.62	27.15	0.44	—	—	—	—	—	—	0.44
1.38	0.00	82.62	27.15	0.44	—	—	—	—	—	—	0.44
1.40	0.00	82.61	27.15	0.44	—	—	—	—	—	—	0.44
1.42	0.00	82.61	27.14	0.43	—	—	—	—	—	—	0.43
1.43	0.00	82.61	27.14	0.43	—	—	—	—	—	—	0.43
1.45	0.00	82.61	27.14	0.43	—	—	—	—	—	—	0.43

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
1.47	0.00	82.61	27.14	0.43	—	—	—	—	—	—	0.43
1.48	0.00	82.61	27.14	0.43	—	—	—	—	—	—	0.43
1.50	0.00	82.60	27.13	0.43	—	—	—	—	—	—	0.43
1.52	0.00	82.60	27.13	0.43	—	—	—	—	—	—	0.43
1.53	0.00	82.60	27.13	0.43	—	—	—	—	—	—	0.43
1.55	0.00	82.60	27.13	0.43	—	—	—	—	—	—	0.43
1.57	0.00	82.60	27.13	0.43	—	—	—	—	—	—	0.43
1.58	0.00	82.60	27.12	0.43	—	—	—	—	—	—	0.43
1.60	0.00	82.59	27.12	0.43	—	—	—	—	—	—	0.43
1.62	0.00	82.59	27.12	0.43	—	—	—	—	—	—	0.43
1.63	0.00	82.59	27.12	0.43	—	—	—	—	—	—	0.43
1.65	0.00	82.59	27.12	0.43	—	—	—	—	—	—	0.43
1.67	0.00	82.59	27.12	0.43	—	—	—	—	—	—	0.43
1.68	0.00	82.59	27.11	0.43	—	—	—	—	—	—	0.43
1.70	0.00	82.58	27.11	0.43	—	—	—	—	—	—	0.43
1.72	0.00	82.58	27.11	0.43	—	—	—	—	—	—	0.43
1.73	0.00	82.58	27.11	0.43	—	—	—	—	—	—	0.43
1.75	0.00	82.58	27.11	0.43	—	—	—	—	—	—	0.43
1.77	0.00	82.58	27.10	0.43	—	—	—	—	—	—	0.43
1.78	0.00	82.58	27.10	0.43	—	—	—	—	—	—	0.43
1.80	0.00	82.58	27.10	0.43	—	—	—	—	—	—	0.43
1.82	0.00	82.57	27.10	0.43	—	—	—	—	—	—	0.43
1.83	0.00	82.57	27.10	0.43	—	—	—	—	—	—	0.43
1.85	0.00	82.57	27.10	0.43	—	—	—	—	—	—	0.43
1.87	0.00	82.57	27.09	0.43	—	—	—	—	—	—	0.43
1.88	0.00	82.57	27.09	0.43	—	—	—	—	—	—	0.43
1.90	0.00	82.57	27.09	0.43	—	—	—	—	—	—	0.43
1.92	0.00	82.56	27.09	0.43	—	—	—	—	—	—	0.43
1.93	0.00	82.56	27.09	0.43	—	—	—	—	—	—	0.43
1.95	0.00	82.56	27.08	0.43	—	—	—	—	—	—	0.43
1.97	0.00	82.56	27.08	0.43	—	—	—	—	—	—	0.43
1.98	0.00	82.56	27.08	0.43	—	—	—	—	—	—	0.43
2.00	0.00	82.56	27.08	0.43	—	—	—	—	—	—	0.43
2.02	0.00	82.55	27.08	0.43	—	—	—	—	—	—	0.43
2.03	0.00	82.55	27.08	0.43	—	—	—	—	—	—	0.43
2.05	0.00	82.55	27.07	0.43	—	—	—	—	—	—	0.43
2.07	0.00	82.55	27.07	0.43	—	—	—	—	—	—	0.43
2.08	0.00	82.55	27.07	0.43	—	—	—	—	—	—	0.43
2.10	0.00	82.55	27.07	0.43	—	—	—	—	—	—	0.43
2.12	0.00	82.54	27.07	0.43	—	—	—	—	—	—	0.43
2.13	0.00	82.54	27.06	0.43	—	—	—	—	—	—	0.43
2.15	0.00	82.54	27.06	0.43	—	—	—	—	—	—	0.43
2.17	0.00	82.54	27.06	0.43	—	—	—	—	—	—	0.43
2.18	0.00	82.54	27.06	0.43	—	—	—	—	—	—	0.43
2.20	0.00	82.54	27.06	0.43	—	—	—	—	—	—	0.43
2.22	0.00	82.53	27.06	0.43	—	—	—	—	—	—	0.43
2.23	0.00	82.53	27.05	0.43	—	—	—	—	—	—	0.43
2.25	0.00	82.53	27.05	0.43	—	—	—	—	—	—	0.43
2.27	0.00	82.53	27.05	0.43	—	—	—	—	—	—	0.43

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Hydrograph Report

English

Hyd. No. 7

2-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 0.47 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Inflow hyd. No.	= 2	Reservoir name	= Routing Pond
Max. Elevation	= 83.18 ft	Max. Storage	= 81,013 cuft

Storage Indication method used.

Total Volume = 33,563 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.05	4.23	79.15	22.93	0.01	—	—	—	—	—	—	0.01
0.07	5.63	79.18	22.98	0.02	—	—	—	—	—	—	0.02
0.08	7.04	79.23	23.04	0.03	—	—	—	—	—	—	0.03
0.10	8.45	79.28	23.11	0.06	—	—	—	—	—	—	0.06
0.12	9.86	79.35	23.20	0.08	—	—	—	—	—	—	0.08
0.13	11.27	79.42	23.30	0.10	—	—	—	—	—	—	0.10
0.15	12.68	79.51	23.41	0.11	—	—	—	—	—	—	0.11
0.17	14.09	79.61	23.54	0.14	—	—	—	—	—	—	0.14
0.18	15.50	79.71	23.67	0.16	—	—	—	—	—	—	0.16
0.20	16.90	79.83	23.82	0.18	—	—	—	—	—	—	0.18
0.22	18.31	79.95	23.98	0.20	—	—	—	—	—	—	0.20
0.23	19.72	80.06	24.12	0.22	—	—	—	—	—	—	0.22
0.25	21.13	80.17	24.25	0.23	—	—	—	—	—	—	0.23
0.27	22.54	80.28	24.39	0.24	—	—	—	—	—	—	0.24
0.28	23.95	80.40	24.53	0.26	—	—	—	—	—	—	0.26
0.30	25.36	80.52	24.69	0.27	—	—	—	—	—	—	0.27
0.32	26.76	80.65	24.85	0.28	—	—	—	—	—	—	0.28
0.33	28.17 <<	80.79	25.02	0.30	—	—	—	—	—	—	0.30
0.35	27.47	80.93	25.19	0.31	—	—	—	—	—	—	0.31
0.37	26.76	81.07	25.36	0.32	—	—	—	—	—	—	0.32
0.38	26.06	81.21	25.52	0.33	—	—	—	—	—	—	0.33
0.40	25.36	81.34	25.67	0.34	—	—	—	—	—	—	0.34
0.42	24.65	81.46	25.82	0.35	—	—	—	—	—	—	0.35
0.43	23.95	81.59	25.97	0.36	—	—	—	—	—	—	0.36
0.45	23.24	81.70	26.11	0.37	—	—	—	—	—	—	0.37
0.47	22.54	81.82	26.24	0.38	—	—	—	—	—	—	0.38
0.48	21.83	81.93	26.37	0.39	—	—	—	—	—	—	0.39
0.50	21.13	82.03	26.48	0.40	—	—	—	—	—	—	0.40
0.52	20.43	82.11	26.57	0.40	—	—	—	—	—	—	0.40
0.53	19.72	82.18	26.65	0.41	—	—	—	—	—	—	0.41
0.55	19.02	82.25	26.74	0.41	—	—	—	—	—	—	0.41
0.57	18.31	82.32	26.81	0.42	—	—	—	—	—	—	0.42
0.58	17.61	82.39	26.89	0.42	—	—	—	—	—	—	0.42
0.60	16.90	82.45	26.96	0.42	—	—	—	—	—	—	0.42
0.62	16.20	82.51	27.03	0.43	—	—	—	—	—	—	0.43
0.63	15.50	82.57	27.10	0.43	—	—	—	—	—	—	0.43

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.65	14.79	82.63	27.16	0.44	—	—	—	—	—	—	0.44
0.67	14.09	82.68	27.22	0.44	—	—	—	—	—	—	0.44
0.68	13.38	82.73	27.27	0.44	—	—	—	—	—	—	0.44
0.70	12.68	82.78	27.33	0.45	—	—	—	—	—	—	0.45
0.72	11.97	82.82	27.38	0.45	—	—	—	—	—	—	0.45
0.73	11.27	82.86	27.42	0.45	—	—	—	—	—	—	0.45
0.75	10.57	82.90	27.47	0.45	—	—	—	—	—	—	0.45
0.77	9.86	82.94	27.51	0.46	—	—	—	—	—	—	0.46
0.78	9.16	82.97	27.55	0.46	—	—	—	—	—	—	0.46
0.80	8.45	83.01	27.58	0.46	—	—	—	—	—	—	0.46
0.82	7.75	83.03	27.61	0.46	—	—	—	—	—	—	0.46
0.83	7.04	83.06	27.64	0.46	—	—	—	—	—	—	0.46
0.85	6.34	83.08	27.67	0.46	—	—	—	—	—	—	0.46
0.87	5.63	83.11	27.69	0.47	—	—	—	—	—	—	0.47
0.88	4.93	83.12	27.71	0.47	—	—	—	—	—	—	0.47
0.90	4.23	83.14	27.73	0.47	—	—	—	—	—	—	0.47
0.92	3.52	83.15	27.74	0.47	—	—	—	—	—	—	0.47
0.93	2.82	83.16	27.75	0.47	—	—	—	—	—	—	0.47
0.95	2.11	83.17	27.76	0.47	—	—	—	—	—	—	0.47
0.97	1.41	83.17	27.77	0.47	—	—	—	—	—	—	0.47
0.98	0.70	83.18 <<	27.77	0.47	—	—	—	—	—	—	0.47 <<
1.00	0.00	83.18	27.77	0.47	—	—	—	—	—	—	0.47
1.02	0.00	83.17	27.77	0.47	—	—	—	—	—	—	0.47
1.03	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
1.05	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
1.07	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
1.08	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
1.10	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
1.12	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
1.13	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
1.15	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
1.17	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
1.18	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
1.20	0.00	83.16	27.74	0.47	—	—	—	—	—	—	0.47
1.22	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
1.23	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
1.25	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
1.27	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
1.28	0.00	83.15	27.73	0.47	—	—	—	—	—	—	0.47
1.30	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
1.32	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
1.33	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
1.35	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
1.37	0.00	83.14	27.72	0.47	—	—	—	—	—	—	0.47
1.38	0.00	83.14	27.72	0.47	—	—	—	—	—	—	0.47
1.40	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
1.42	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
1.43	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
1.45	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47

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Hydrograph Report

English

Hyd. No. 8

10-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 11.41 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 3	Reservoir name	= Routing Pond
Max. Elevation	= 83.83 ft	Max. Storage	= 91,347 cuft

Storage Indication method used.

Total Volume = 51,418 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.13	15.63	79.55	23.46	0.13	—	—	—	—	—	—	0.13
0.15	17.59	79.67	23.62	0.16	—	—	—	—	—	—	0.16
0.17	19.54	79.80	23.79	0.18	—	—	—	—	—	—	0.18
0.18	21.50	79.95	23.97	0.20	—	—	—	—	—	—	0.20
0.20	23.45	80.08	24.14	0.22	—	—	—	—	—	—	0.22
0.22	25.40	80.20	24.29	0.23	—	—	—	—	—	—	0.23
0.23	27.36	80.34	24.46	0.25	—	—	—	—	—	—	0.25
0.25	29.31	80.48	24.64	0.26	—	—	—	—	—	—	0.26
0.27	31.27	80.63	24.83	0.28	—	—	—	—	—	—	0.28
0.28	33.22	80.80	25.03	0.30	—	—	—	—	—	—	0.30
0.30	35.17	80.97	25.24	0.31	—	—	—	—	—	—	0.31
0.32	37.13	81.16	25.46	0.33	—	—	—	—	—	—	0.33
0.33	39.08 <<	81.35	25.69	0.34	—	—	—	—	—	—	0.34
0.35	38.11	81.55	25.92	0.36	—	—	—	—	—	—	0.36
0.37	37.13	81.74	26.14	0.37	—	—	—	—	—	—	0.37
0.38	36.15	81.92	26.36	0.39	—	—	—	—	—	—	0.39
0.40	35.17	82.08	26.54	0.40	—	—	—	—	—	—	0.40
0.42	34.20	82.21	26.68	0.41	—	—	—	—	—	—	0.41
0.43	33.22	82.33	26.83	0.42	—	—	—	—	—	—	0.42
0.45	32.24	82.45	26.96	0.42	—	—	—	—	—	—	0.42
0.47	31.27	82.57	27.10	0.43	—	—	—	—	—	—	0.43
0.48	30.29	82.69	27.23	0.44	—	—	—	—	—	—	0.44
0.50	29.31	82.80	27.35	0.45	—	—	—	—	—	—	0.45
0.52	28.33	82.91	27.47	0.45	—	—	—	—	—	—	0.45
0.53	27.36	83.01	27.58	0.46	—	—	—	—	—	—	0.46
0.55	26.38	83.11	27.69	0.47	—	—	—	—	—	—	0.47
0.57	25.40	83.20	27.80	0.47	—	—	0.02	—	—	—	0.49
0.58	24.43	83.30	27.90	0.48	—	—	0.43	—	—	—	0.91
0.60	23.45	83.38	27.99	0.48	—	—	0.82	—	—	—	1.30
0.62	22.47	83.46	28.08	0.49	—	—	2.06	—	—	—	2.54
0.63	21.50	83.53	28.16	0.49	—	—	3.39	—	—	—	3.88
0.65	20.52	83.60	28.22	0.49	—	—	4.56	—	—	—	5.05
0.67	19.54	83.65	28.28	0.50	—	—	5.96	—	—	—	6.46
0.68	18.56	83.69	28.33	0.50	—	—	7.17	—	—	—	7.67
0.70	17.59	83.73	28.37	0.50	—	—	8.18	—	—	—	8.68
0.72	16.61	83.76	28.40	0.50	—	—	8.98	—	—	—	9.49

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.73	15.63	83.79	28.43	0.50	—	—	9.62	—	—	—	10.13
0.75	14.66	83.80	28.45	0.51	—	—	10.13	—	—	—	10.64
0.77	13.68	83.82	28.46	0.51	—	—	10.54	—	—	—	11.05
0.78	12.70	83.82	28.47	0.51	—	—	10.79	—	—	—	11.30
0.80	11.72	83.83 <<	28.47	0.51	—	—	10.90	—	—	—	11.41 <<
0.82	10.75	83.83	28.47	0.51	—	—	10.88	—	—	—	11.39
0.83	9.77	83.82	28.47	0.51	—	—	10.75	—	—	—	11.25
0.85	8.79	83.82	28.46	0.51	—	—	10.52	—	—	—	11.02
0.87	7.82	83.81	28.45	0.51	—	—	10.20	—	—	—	10.71
0.88	6.84	83.79	28.44	0.51	—	—	9.84	—	—	—	10.34
0.90	5.86	83.78	28.42	0.50	—	—	9.45	—	—	—	9.96
0.92	4.89	83.76	28.40	0.50	—	—	9.01	—	—	—	9.52
0.93	3.91	83.75	28.38	0.50	—	—	8.52	—	—	—	9.02
0.95	2.93	83.72	28.36	0.50	—	—	7.98	—	—	—	8.48
0.97	1.95	83.70	28.34	0.50	—	—	7.40	—	—	—	7.90
0.98	0.98	83.68	28.31	0.50	—	—	6.78	—	—	—	7.28
1.00	0.00	83.66	28.29	0.50	—	—	6.13	—	—	—	6.63
1.02	0.00	83.63	28.26	0.50	—	—	5.49	—	—	—	5.99
1.03	0.00	83.61	28.24	0.49	—	—	4.92	—	—	—	5.41
1.05	0.00	83.59	28.22	0.49	—	—	4.47	—	—	—	4.96
1.07	0.00	83.57	28.20	0.49	—	—	4.13	—	—	—	4.62
1.08	0.00	83.56	28.18	0.49	—	—	3.81	—	—	—	4.30
1.10	0.00	83.54	28.16	0.49	—	—	3.52	—	—	—	4.01
1.12	0.00	83.53	28.15	0.49	—	—	3.24	—	—	—	3.73
1.13	0.00	83.51	28.13	0.49	—	—	2.99	—	—	—	3.48
1.15	0.00	83.50	28.12	0.49	—	—	2.75	—	—	—	3.24
1.17	0.00	83.49	28.11	0.49	—	—	2.53	—	—	—	3.02
1.18	0.00	83.48	28.09	0.49	—	—	2.32	—	—	—	2.81
1.20	0.00	83.47	28.08	0.49	—	—	2.13	—	—	—	2.62
1.22	0.00	83.46	28.07	0.49	—	—	1.95	—	—	—	2.44
1.23	0.00	83.45	28.06	0.49	—	—	1.78	—	—	—	2.27
1.25	0.00	83.44	28.05	0.49	—	—	1.63	—	—	—	2.11
1.27	0.00	83.43	28.05	0.48	—	—	1.48	—	—	—	1.97
1.28	0.00	83.42	28.04	0.48	—	—	1.35	—	—	—	1.83
1.30	0.00	83.42	28.03	0.48	—	—	1.22	—	—	—	1.71
1.32	0.00	83.41	28.02	0.48	—	—	1.11	—	—	—	1.59
1.33	0.00	83.41	28.02	0.48	—	—	1.00	—	—	—	1.48
1.35	0.00	83.40	28.01	0.48	—	—	0.90	—	—	—	1.38
1.37	0.00	83.40	28.01	0.48	—	—	0.87	—	—	—	1.35
1.38	0.00	83.39	28.00	0.48	—	—	0.85	—	—	—	1.33
1.40	0.00	83.38	28.00	0.48	—	—	0.83	—	—	—	1.31
1.42	0.00	83.38	27.99	0.48	—	—	0.80	—	—	—	1.29
1.43	0.00	83.38	27.98	0.48	—	—	0.78	—	—	—	1.26
1.45	0.00	83.37	27.98	0.48	—	—	0.76	—	—	—	1.24
1.47	0.00	83.37	27.97	0.48	—	—	0.74	—	—	—	1.22
1.48	0.00	83.36	27.97	0.48	—	—	0.72	—	—	—	1.20
1.50	0.00	83.36	27.96	0.48	—	—	0.70	—	—	—	1.18
1.52	0.00	83.35	27.96	0.48	—	—	0.68	—	—	—	1.16
1.53	0.00	83.35	27.95	0.48	—	—	0.66	—	—	—	1.14

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
1.55	0.00	83.34	27.95	0.48	—	—	0.64	—	—	—	1.12
1.57	0.00	83.34	27.95	0.48	—	—	0.62	—	—	—	1.10
1.58	0.00	83.34	27.94	0.48	—	—	0.60	—	—	—	1.08
1.60	0.00	83.33	27.94	0.48	—	—	0.59	—	—	—	1.07
1.62	0.00	83.33	27.93	0.48	—	—	0.57	—	—	—	1.05
1.63	0.00	83.32	27.93	0.48	—	—	0.55	—	—	—	1.03
1.65	0.00	83.32	27.92	0.48	—	—	0.53	—	—	—	1.01
1.67	0.00	83.32	27.92	0.48	—	—	0.52	—	—	—	1.00
1.68	0.00	83.31	27.92	0.48	—	—	0.50	—	—	—	0.98
1.70	0.00	83.31	27.91	0.48	—	—	0.48	—	—	—	0.96
1.72	0.00	83.30	27.91	0.48	—	—	0.47	—	—	—	0.95
1.73	0.00	83.30	27.90	0.48	—	—	0.45	—	—	—	0.93
1.75	0.00	83.30	27.90	0.48	—	—	0.44	—	—	—	0.91
1.77	0.00	83.29	27.90	0.48	—	—	0.42	—	—	—	0.90
1.78	0.00	83.29	27.89	0.48	—	—	0.41	—	—	—	0.88
1.80	0.00	83.29	27.89	0.48	—	—	0.39	—	—	—	0.87
1.82	0.00	83.28	27.89	0.48	—	—	0.38	—	—	—	0.85
1.83	0.00	83.28	27.88	0.48	—	—	0.36	—	—	—	0.84
1.85	0.00	83.28	27.88	0.48	—	—	0.35	—	—	—	0.82
1.87	0.00	83.27	27.88	0.48	—	—	0.33	—	—	—	0.81
1.88	0.00	83.27	27.87	0.48	—	—	0.32	—	—	—	0.80
1.90	0.00	83.27	27.87	0.48	—	—	0.31	—	—	—	0.78
1.92	0.00	83.27	27.87	0.48	—	—	0.29	—	—	—	0.77
1.93	0.00	83.26	27.86	0.47	—	—	0.28	—	—	—	0.76
1.95	0.00	83.26	27.86	0.47	—	—	0.27	—	—	—	0.74
1.97	0.00	83.26	27.86	0.47	—	—	0.26	—	—	—	0.73
1.98	0.00	83.25	27.85	0.47	—	—	0.24	—	—	—	0.72
2.00	0.00	83.25	27.85	0.47	—	—	0.23	—	—	—	0.71
2.02	0.00	83.25	27.85	0.47	—	—	0.22	—	—	—	0.69
2.03	0.00	83.25	27.84	0.47	—	—	0.21	—	—	—	0.68
2.05	0.00	83.24	27.84	0.47	—	—	0.20	—	—	—	0.67
2.07	0.00	83.24	27.84	0.47	—	—	0.19	—	—	—	0.66
2.08	0.00	83.24	27.84	0.47	—	—	0.18	—	—	—	0.65
2.10	0.00	83.24	27.83	0.47	—	—	0.16	—	—	—	0.64
2.12	0.00	83.23	27.83	0.47	—	—	0.15	—	—	—	0.63
2.13	0.00	83.23	27.83	0.47	—	—	0.14	—	—	—	0.62
2.15	0.00	83.23	27.83	0.47	—	—	0.13	—	—	—	0.61
2.17	0.00	83.23	27.82	0.47	—	—	0.12	—	—	—	0.60
2.18	0.00	83.23	27.82	0.47	—	—	0.11	—	—	—	0.59
2.20	0.00	83.22	27.82	0.47	—	—	0.10	—	—	—	0.58
2.22	0.00	83.22	27.82	0.47	—	—	0.09	—	—	—	0.57
2.23	0.00	83.22	27.81	0.47	—	—	0.08	—	—	—	0.56
2.25	0.00	83.22	27.81	0.47	—	—	0.07	—	—	—	0.55
2.27	0.00	83.21	27.81	0.47	—	—	0.07	—	—	—	0.54
2.28	0.00	83.21	27.81	0.47	—	—	0.06	—	—	—	0.53
2.30	0.00	83.21	27.81	0.47	—	—	0.05	—	—	—	0.52
2.32	0.00	83.21	27.80	0.47	—	—	0.04	—	—	—	0.51
2.33	0.00	83.21	27.80	0.47	—	—	0.03	—	—	—	0.50
2.35	0.00	83.20	27.80	0.47	—	—	0.02	—	—	—	0.49

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Hydrograph Report

English

Hyd. No. 9

100-yr Route

Hydrograph type	= Reservoir	Peak discharge	= 25.88 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Inflow hyd. No.	= 4	Reservoir name	= Routing Pond
Max. Elevation	= 84.23 ft	Max. Storage	= 98,522 cuft

Storage Indication method used.

Total Volume = 78,146 cuft

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.22	35.08	80.52	24.69	0.27	—	—	—	—	—	—	0.27
0.23	37.78	80.71	24.92	0.29	—	—	—	—	—	—	0.29
0.25	40.48	80.91	25.16	0.31	—	—	—	—	—	—	0.31
0.27	43.18	81.12	25.42	0.33	—	—	—	—	—	—	0.33
0.28	45.88	81.35	25.69	0.34	—	—	—	—	—	—	0.34
0.30	48.58	81.59	25.97	0.36	—	—	—	—	—	—	0.36
0.32	51.28	81.84	26.27	0.38	—	—	—	—	—	—	0.38
0.33	53.98 <<	82.08	26.54	0.40	—	—	—	—	—	—	0.40
0.35	52.63	82.28	26.77	0.41	—	—	—	—	—	—	0.41
0.37	51.28	82.48	26.99	0.43	—	—	—	—	—	—	0.43
0.38	49.93	82.67	27.20	0.44	—	—	—	—	—	—	0.44
0.40	48.58	82.85	27.41	0.45	—	—	—	—	—	—	0.45
0.42	47.23	83.03	27.61	0.46	—	—	—	—	—	—	0.46
0.43	45.88	83.20	27.80	0.47	—	—	0.02	—	—	—	0.49
0.45	44.53	83.37	27.98	0.48	—	—	0.76	—	—	—	1.25
0.47	43.18	83.53	28.15	0.49	—	—	3.28	—	—	—	3.77
0.48	41.83	83.67	28.30	0.50	—	—	6.45	—	—	—	6.95
0.50	40.48	83.79	28.43	0.50	—	—	9.74	—	—	—	10.25
0.52	39.13	83.90	28.54	0.51	—	—	13.14	—	—	—	13.65
0.53	37.78	83.98	28.64	0.52	—	—	16.04	—	—	—	16.55
0.55	36.43	84.05	28.71	0.52	—	—	18.29	—	—	—	18.81
0.57	35.08	84.10	28.76	0.52	—	—	20.12	—	—	—	20.65
0.58	33.73	84.14	28.80	0.52	—	—	21.69	—	—	—	22.22
0.60	32.39	84.17	28.83	0.53	—	—	22.94	—	—	—	23.46
0.62	31.04	84.19	28.86	0.53	—	—	23.88	—	—	—	24.41
0.63	29.69	84.21	28.88	0.52	—	—	24.59	—	—	—	25.11
0.65	28.34	84.22	28.89	0.51	—	—	25.06	—	—	—	25.57
0.67	26.99	84.23	28.90	0.51	—	—	25.31	—	—	—	25.82
0.68	25.64	84.23 <<	28.90	0.51	—	—	25.37	—	—	—	25.88 <<
0.70	24.29	84.23	28.90	0.51	—	—	25.26	—	—	—	25.77
0.72	22.94	84.22	28.89	0.51	—	—	25.00	—	—	—	25.51
0.73	21.59	84.21	28.88	0.52	—	—	24.61	—	—	—	25.13
0.75	20.24	84.20	28.87	0.53	—	—	24.10	—	—	—	24.63
0.77	18.89	84.18	28.85	0.53	—	—	23.52	—	—	—	24.05
0.78	17.54	84.17	28.83	0.53	—	—	22.85	—	—	—	23.38
0.80	16.19	84.15	28.81	0.52	—	—	22.11	—	—	—	22.63

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
0.82	14.84	84.13	28.79	0.52	—	—	21.29	—	—	—	21.81
0.83	13.49	84.10	28.77	0.52	—	—	20.42	—	—	—	20.94
0.85	12.14	84.08	28.74	0.52	—	—	19.53	—	—	—	20.05
0.87	10.80	84.06	28.71	0.52	—	—	18.60	—	—	—	19.12
0.88	9.45	84.03	28.69	0.52	—	—	17.63	—	—	—	18.15
0.90	8.10	84.00	28.66	0.52	—	—	16.62	—	—	—	17.13
0.92	6.75	83.97	28.62	0.51	—	—	15.49	—	—	—	16.00
0.93	5.40	83.93	28.58	0.51	—	—	14.33	—	—	—	14.84
0.95	4.05	83.90	28.55	0.51	—	—	13.15	—	—	—	13.66
0.97	2.70	83.86	28.51	0.51	—	—	11.95	—	—	—	12.46
0.98	1.35	83.82	28.47	0.51	—	—	10.73	—	—	—	11.24
1.00	0.00	83.78	28.43	0.50	—	—	9.58	—	—	—	10.09
1.02	0.00	83.75	28.39	0.50	—	—	8.61	—	—	—	9.12
1.03	0.00	83.72	28.35	0.50	—	—	7.74	—	—	—	8.24
1.05	0.00	83.69	28.32	0.50	—	—	6.95	—	—	—	7.44
1.07	0.00	83.66	28.29	0.50	—	—	6.23	—	—	—	6.73
1.08	0.00	83.64	28.27	0.50	—	—	5.58	—	—	—	6.08
1.10	0.00	83.61	28.24	0.50	—	—	5.00	—	—	—	5.49
1.12	0.00	83.59	28.22	0.49	—	—	4.52	—	—	—	5.01
1.13	0.00	83.58	28.20	0.49	—	—	4.18	—	—	—	4.67
1.15	0.00	83.56	28.18	0.49	—	—	3.86	—	—	—	4.35
1.17	0.00	83.54	28.17	0.49	—	—	3.56	—	—	—	4.05
1.18	0.00	83.53	28.15	0.49	—	—	3.28	—	—	—	3.77
1.20	0.00	83.51	28.13	0.49	—	—	3.02	—	—	—	3.51
1.22	0.00	83.50	28.12	0.49	—	—	2.78	—	—	—	3.27
1.23	0.00	83.49	28.11	0.49	—	—	2.56	—	—	—	3.05
1.25	0.00	83.48	28.10	0.49	—	—	2.35	—	—	—	2.84
1.27	0.00	83.47	28.08	0.49	—	—	2.16	—	—	—	2.64
1.28	0.00	83.46	28.07	0.49	—	—	1.98	—	—	—	2.46
1.30	0.00	83.45	28.06	0.49	—	—	1.81	—	—	—	2.29
1.32	0.00	83.44	28.06	0.49	—	—	1.65	—	—	—	2.14
1.33	0.00	83.43	28.05	0.48	—	—	1.51	—	—	—	1.99
1.35	0.00	83.43	28.04	0.48	—	—	1.37	—	—	—	1.85
1.37	0.00	83.42	28.03	0.48	—	—	1.24	—	—	—	1.73
1.38	0.00	83.41	28.02	0.48	—	—	1.12	—	—	—	1.61
1.40	0.00	83.41	28.02	0.48	—	—	1.01	—	—	—	1.50
1.42	0.00	83.40	28.01	0.48	—	—	0.91	—	—	—	1.39
1.43	0.00	83.40	28.01	0.48	—	—	0.87	—	—	—	1.36
1.45	0.00	83.39	28.00	0.48	—	—	0.85	—	—	—	1.33
1.47	0.00	83.39	28.00	0.48	—	—	0.83	—	—	—	1.31
1.48	0.00	83.38	27.99	0.48	—	—	0.81	—	—	—	1.29
1.50	0.00	83.38	27.99	0.48	—	—	0.79	—	—	—	1.27
1.52	0.00	83.37	27.98	0.48	—	—	0.76	—	—	—	1.25
1.53	0.00	83.37	27.97	0.48	—	—	0.74	—	—	—	1.22
1.55	0.00	83.36	27.97	0.48	—	—	0.72	—	—	—	1.20
1.57	0.00	83.36	27.97	0.48	—	—	0.70	—	—	—	1.18
1.58	0.00	83.35	27.96	0.48	—	—	0.68	—	—	—	1.16
1.60	0.00	83.35	27.96	0.48	—	—	0.66	—	—	—	1.14
1.62	0.00	83.34	27.95	0.48	—	—	0.64	—	—	—	1.12

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
1.63	0.00	83.34	27.95	0.48	—	—	0.63	—	—	—	1.11
1.65	0.00	83.34	27.94	0.48	—	—	0.61	—	—	—	1.09
1.67	0.00	83.33	27.94	0.48	—	—	0.59	—	—	—	1.07
1.68	0.00	83.33	27.93	0.48	—	—	0.57	—	—	—	1.05
1.70	0.00	83.32	27.93	0.48	—	—	0.55	—	—	—	1.03
1.72	0.00	83.32	27.92	0.48	—	—	0.54	—	—	—	1.01
1.73	0.00	83.32	27.92	0.48	—	—	0.52	—	—	—	1.00
1.75	0.00	83.31	27.92	0.48	—	—	0.50	—	—	—	0.98
1.77	0.00	83.31	27.91	0.48	—	—	0.49	—	—	—	0.96
1.78	0.00	83.31	27.91	0.48	—	—	0.47	—	—	—	0.95
1.80	0.00	83.30	27.90	0.48	—	—	0.45	—	—	—	0.93
1.82	0.00	83.30	27.90	0.48	—	—	0.44	—	—	—	0.92
1.83	0.00	83.29	27.90	0.48	—	—	0.42	—	—	—	0.90
1.85	0.00	83.29	27.89	0.48	—	—	0.41	—	—	—	0.89
1.87	0.00	83.29	27.89	0.48	—	—	0.39	—	—	—	0.87
1.88	0.00	83.28	27.89	0.48	—	—	0.38	—	—	—	0.86
1.90	0.00	83.28	27.88	0.48	—	—	0.36	—	—	—	0.84
1.92	0.00	83.28	27.88	0.48	—	—	0.35	—	—	—	0.83
1.93	0.00	83.28	27.88	0.48	—	—	0.34	—	—	—	0.81
1.95	0.00	83.27	27.87	0.48	—	—	0.32	—	—	—	0.80
1.97	0.00	83.27	27.87	0.48	—	—	0.31	—	—	—	0.79
1.98	0.00	83.27	27.87	0.48	—	—	0.30	—	—	—	0.77
2.00	0.00	83.26	27.86	0.47	—	—	0.28	—	—	—	0.76
2.02	0.00	83.26	27.86	0.47	—	—	0.27	—	—	—	0.75
2.03	0.00	83.26	27.86	0.47	—	—	0.26	—	—	—	0.73
2.05	0.00	83.26	27.85	0.47	—	—	0.25	—	—	—	0.72
2.07	0.00	83.25	27.85	0.47	—	—	0.23	—	—	—	0.71
2.08	0.00	83.25	27.85	0.47	—	—	0.22	—	—	—	0.70
2.10	0.00	83.25	27.84	0.47	—	—	0.21	—	—	—	0.68
2.12	0.00	83.24	27.84	0.47	—	—	0.20	—	—	—	0.67
2.13	0.00	83.24	27.84	0.47	—	—	0.19	—	—	—	0.66
2.15	0.00	83.24	27.84	0.47	—	—	0.18	—	—	—	0.65
2.17	0.00	83.24	27.83	0.47	—	—	0.17	—	—	—	0.64
2.18	0.00	83.23	27.83	0.47	—	—	0.16	—	—	—	0.63
2.20	0.00	83.23	27.83	0.47	—	—	0.14	—	—	—	0.62
2.22	0.00	83.23	27.83	0.47	—	—	0.13	—	—	—	0.61
2.23	0.00	83.23	27.82	0.47	—	—	0.12	—	—	—	0.60
2.25	0.00	83.23	27.82	0.47	—	—	0.11	—	—	—	0.59
2.27	0.00	83.22	27.82	0.47	—	—	0.10	—	—	—	0.58
2.28	0.00	83.22	27.82	0.47	—	—	0.09	—	—	—	0.57
2.30	0.00	83.22	27.81	0.47	—	—	0.09	—	—	—	0.56
2.32	0.00	83.22	27.81	0.47	—	—	0.08	—	—	—	0.55
2.33	0.00	83.21	27.81	0.47	—	—	0.07	—	—	—	0.54
2.35	0.00	83.21	27.81	0.47	—	—	0.06	—	—	—	0.53
2.37	0.00	83.21	27.81	0.47	—	—	0.05	—	—	—	0.52
2.38	0.00	83.21	27.80	0.47	—	—	0.04	—	—	—	0.51
2.40	0.00	83.21	27.80	0.47	—	—	0.03	—	—	—	0.50
2.42	0.00	83.21	27.80	0.47	—	—	0.02	—	—	—	0.49
2.43	0.00	83.20	27.80	0.47	—	—	0.02	—	—	—	0.49

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Outflow cfs
2.45	0.00	83.20	27.80	0.47	—	—	0.01	—	—	—	0.48
2.47	0.00	83.20	27.79	0.47	—	—	—	—	—	—	0.47
2.48	0.00	83.20	27.79	0.47	—	—	—	—	—	—	0.47
2.50	0.00	83.20	27.79	0.47	—	—	—	—	—	—	0.47
2.52	0.00	83.19	27.79	0.47	—	—	—	—	—	—	0.47
2.53	0.00	83.19	27.79	0.47	—	—	—	—	—	—	0.47
2.55	0.00	83.19	27.78	0.47	—	—	—	—	—	—	0.47
2.57	0.00	83.19	27.78	0.47	—	—	—	—	—	—	0.47
2.58	0.00	83.19	27.78	0.47	—	—	—	—	—	—	0.47
2.60	0.00	83.19	27.78	0.47	—	—	—	—	—	—	0.47
2.62	0.00	83.18	27.78	0.47	—	—	—	—	—	—	0.47
2.63	0.00	83.18	27.77	0.47	—	—	—	—	—	—	0.47
2.65	0.00	83.18	27.77	0.47	—	—	—	—	—	—	0.47
2.67	0.00	83.18	27.77	0.47	—	—	—	—	—	—	0.47
2.68	0.00	83.18	27.77	0.47	—	—	—	—	—	—	0.47
2.70	0.00	83.17	27.77	0.47	—	—	—	—	—	—	0.47
2.72	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
2.73	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
2.75	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
2.77	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
2.78	0.00	83.17	27.76	0.47	—	—	—	—	—	—	0.47
2.80	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
2.82	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
2.83	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
2.85	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
2.87	0.00	83.16	27.75	0.47	—	—	—	—	—	—	0.47
2.88	0.00	83.16	27.74	0.47	—	—	—	—	—	—	0.47
2.90	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
2.92	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
2.93	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
2.95	0.00	83.15	27.74	0.47	—	—	—	—	—	—	0.47
2.97	0.00	83.15	27.73	0.47	—	—	—	—	—	—	0.47
2.98	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
3.00	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
3.02	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
3.03	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
3.05	0.00	83.14	27.73	0.47	—	—	—	—	—	—	0.47
3.07	0.00	83.14	27.72	0.47	—	—	—	—	—	—	0.47
3.08	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
3.10	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
3.12	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
3.13	0.00	83.13	27.72	0.47	—	—	—	—	—	—	0.47
3.15	0.00	83.13	27.71	0.47	—	—	—	—	—	—	0.47
3.17	0.00	83.13	27.71	0.47	—	—	—	—	—	—	0.47
3.18	0.00	83.12	27.71	0.47	—	—	—	—	—	—	0.47
3.20	0.00	83.12	27.71	0.47	—	—	—	—	—	—	0.47
3.22	0.00	83.12	27.71	0.47	—	—	—	—	—	—	0.47
3.23	0.00	83.12	27.70	0.47	—	—	—	—	—	—	0.47
3.25	0.00	83.12	27.70	0.47	—	—	—	—	—	—	0.47

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Rational	23.5	1	20	42,328	1	—	—	—	1-yr. post
2	Rational	28.2	1	20	50,712	2	—	—	—	2yr. post
3	Rational	39.1	1	20	70,349	10	—	—	—	10-yr. post
4	Rational	54.0	1	20	97,155	100	—	—	—	100-yr. post
6	Reservoir	0.4	1	59	30,250	1	1	82.65	72,718	1-yr Route
7	Reservoir	0.5	1	59	33,563	2	2	83.18	81,013	2-yr Route
8	Reservoir	11.4	1	48	51,418	10	3	83.83	91,347	10-yr Route
9	Reservoir	25.9	1	41	78,146	100	4	84.23	98,522	100-yr Route

Proj. file: 8604rev1pond.GPW | IDF file: JCChydrographs.IDF | Run date: 07-03-2000

Drainage Calculations for Mulberry Place

(S-35-00)

50-Lot Residential Subdivision

Centerville Road

James City County

Prepared by:
AES Consulting Engineers
5248 Olde Towne Rd.
Williamsburg, Va. 23188
(757) 253-0040

NEEDS STAMP & SEAL.

Revised: June 30, 2000
Submitted: April 26, 2000

AES CONSULTING ENGINEERS

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
#1	10	x	(17.32+3.76)/27.81	=	7.58
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 7.58

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
1.41/27.81 (100)	x	0.1 (0.1 per 1%)	=	0.51
(1.07+3.15)/27.81 (100)	x	0.15 (0.15 per 1%)	=	2.27

TOTAL NATURAL OPEN SPACE CREDIT: 2.78

C. TOTAL WEIGHTED POINTS

7.58	+	2.78	=	10.36
Structural BMP Points		Natural Open Space Points		Total

COUNTY NOTES:
SITE AREA = 27.81 AC.
WET. EXT DET
JCC BMP TYPE A-3
2" PIA

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

PROJECT MULBERRY PLACE
PROJECT NO. 8604-1
SUBJECT
SHEET NO. 1 OF 6
CALCULATED BY CBR DATE 4/25/02

PRE-DEVELOPMENT

D.A. = 102.0 AC (@ DESIGN POINT IN ℄ OF CREEK @ PL)

WEIGHTED "C" FACTOR	C=	AC=
PASTURE	.35	14.53
HOME SITES	.35	2.88
SEC 18, FORD'S COLONY	.30	0.88
SCHOOL	.30	2.17
APARTMENT COMPLEX	.60	10.10
UNDEVELOPED (WOODS)	.25	71.44
WEIGHTED "C"	0.30	102.0

TIME OF CONCENTRATION – 2900 LF

600 LF OF OVERLAND @ 0.50% – T_c = 35 MIN
1300 LF OF SHALLOW CONCENTRATED @ 1.75% – T_c = 10 MIN
1000 LF OF CHANNELIZED – T_c = 5 MIN
T_c = 50 MIN ;

i_2 = 1.83 IN/HR
i_{10} = 2.66 IN/HR
i_{100} = 3.80 IN/HR

$Q_2 = c i_2 A$
$= 0.3(1.83)102.0$
$= 56.0$ CFS ✓

$Q_{10} = c i_{10} A$
$= 0.3(2.66)102.0$
$= 81.4$ CFS ✓

$Q_{100} = c i_{100} A$
$= 0.3(3.80)102.0$
$= 116.3$ CFS ✓

POST-DEVELOPMENT (@ DESIGN POINT)

→ DETERMINE FLOWRATE GENERATED BY DRAINAGE AREA EXCLUDING DRAINAGE AREA CAPTURED BY PROPOSED POND.

D.A. = 102.0 (PRE-DEV) – ~~22.1~~ 21.1 (D.A. TO POND) SEE SHEET 3 = ~~79.9~~ 80.9 AC

WEIGHTED "C" FACTOR	C=	AC=
PASTURE	0.35	8.93
HOMESITES	0.35	1.79
APARTMENT COMPLEX	0.60	10.10
UNDEVELOPED WOODS	0.25	~~59.08~~ 60.09
	C=0.30	~~79.9~~ 80.9

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

PROJECT
PROJECT NO. 8604-1
SUBJECT
SHEET NO. 2 OF 6
CALCULATED BY CBR DATE 4/25/00

T_c = 50 MIN (SAME AS PRE-DEVELOPMENT CONDITION)

$Q_2 = \cancel{0.31}\,0.30(1.83)\,\cancel{79.9}\,80.7$ = ~~45.3~~ 44.4 CFS

$Q_{10} = 0.31(2.66)\,\cancel{79.9}\,80.7$ = ~~65.9~~ 64.6 CFS

$Q_{100} = \cancel{0.31}\,0.30(3.80)\,\cancel{79.9}\,80.7$ = ~~94.1~~ 92.2 CFS

DETERMINE ALLOWABLE FLOWRATE FROM POND TO EQUAL PRE-DEVELOPMENT CONDITION AT DESIGN POINT.

ALLOWABLE RELEASE RATE FROM POND = PRE-DEV RATE - OFFSITE

ALLOW. RATE$_2$ = 56.0 CFS - ~~45.3~~ 44.4 CFS
= ~~10.7~~ 11.6 CFS

ALLOW RATE$_{10}$ = 81.4 - ~~65.9~~ 64.6
= ~~15.5~~ 16.8 CFS

ALLOW RATE$_{100}$ = 116.3 - ~~94.1~~ 92.2
= ~~22.2~~ 24.10 CFS

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PROJECT
PROJECT NO.
SUBJECT
SHEET NO. 3 OF 6
CALCULATED BY DATE

POST-DEVELOPMENT

DA. = ~~22.16~~ 21.08 AC

WEIGHTED "C" FACTOR	C=	AC=
DRAINAGE TO MAJOR STORM SYSTEM (FROM CALCULATIONS)	0.42	18.43
DRAINAGE AROUND POND	0.43	1.78
DRAINAGE FROM LOTS 33-38	0.32	1.95
WEIGHTED "C"	0.41	22.16

TIME OF CONCENTRATION – 20 MIN

WET POND DESIGN TYPE A-3

2"/IMP ACRE ; 60% REMOVAL ; 10 POINTS

IMP. AC. = ~~22.16~~ 21.08 (0.41) = ~~9.08~~ 8.64 AC

REQ. WET VOLUME = 1.0" (~~9.08~~ 8.64 AC) $\frac{1'}{12''}$ $\left(\frac{43560\ SF}{1\ AC}\right)$ = ~~32960~~ 31,363 CF

FROM STAGE-STORAGE ELEV = ~~79.25'~~ 79.1' → PROVIDES ~~33,317~~ 31,473 CF >

PRE-TREATMENT VOLUME = ~~3,296~~ 3,136 CF V_R = ~~32,960~~ 31,363 CF

REQ DRY VOLUME = 1.0" (~~9.08~~ 8.64 AC) $\frac{1}{12}\left(\frac{43560}{1}\right)$ = ~~32,960~~ 31,363 CF

→ SIZE ORIFICE FOR 24 HR DETENTION

AT 82.2' ; PROV. STORAGE = ~~66,869~~ 65,501 CF < ~~33,317~~ 31,473 CF + ~~32,960~~ 31,363 CF = ~~66,277~~ 62,836 CF

$\frac{\cancel{32,960}\ 31,363\ CF}{24\ HRS} \cdot \frac{1\ HR}{3600\ S}$ = ~~0.3815~~ 0.3630 CFS

$h = \frac{82.2' - \cancel{79.25'}\ 79.1'}{2}$ = ~~1.48'~~ 1.55

$A = \frac{Q}{[64.32 \times h]^{0.5}[0.6]} = \frac{\cancel{.3815}\ .3630}{[64.32 \times \cancel{1.48}\ 1.55]^{.5}(.6)}$

= ~~0.0653~~ 0.0606 SF

$A = \pi r^2 = \cancel{0.0653}\ 0.0606\ SF \cdot \frac{144\ IN}{1\ SF}$

r = ~~1.73'~~ 1.67"

d = ~~3.46"~~ 3.34" → USE 3"

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PROJECT Mulberry Place
PROJECT NO. 8604-1
SUBJECT Impervious Calculations (Supporting
SHEET NO. 1 OF 1
CALCULATED BY CPR DATE 6/1/00

WATER QUALITY COMPUTATIONS

DETERMINE IMPERVIOUSNESS OF RESIDENTIAL LOTS:

AVG. LOT SIZE ≅ 13,300 SF

	"C" FACTOR	AREA (SF)	CA
DRIVEWAY/SIDEWALK	0.9	800	720
HOUSE	0.9	2000	1800
WOODS/PASTURE (WITHIN SETBACKS)	0.30	4500	1350
GRASS	0.25	6000	1500
		Σ = 13,300 SF	Σ = 5370

WEIGHTED "C" FACTOR = 0.40

DETERMINE OVERALL IMPERVIOUSNESS OF SUBDIVISION:

→ AREAS WERE DETERMINED FROM PRELIMARY PLAT:

	"C" FACTOR	AREA (AC)	CA
RESIDENTIAL LOTS (FROM ABOVE CALCS)	0.40	10.47	4.19
RIGHT-OF-WAY (SEE CALC BELOW)	0.75	3.46	2.59
OPEN SPACE (WOODS/PASTURE)	0.25	5.74	1.44
RECREATION AREA	0.30	1.21	0.36
N.P.	0.90	0.20	0.18
		Σ = 21.08	Σ = 8.76

WEIGHTED "C" FACTOR = 0.41

C = .41 ✓

DETERMINE IMPERVIOUSNESS OF R/W:

ROAD SECTION 1

38' (BC/BC) + 4' (SIDEWALK) = $\frac{42'}{50'}$ = .84

"C" = $\frac{.84(0.9) + 0.16(.35)}{1}$ = 0.81

ROAD SECTION 2

30' (BC/BC) + 4' (SIDEWALK) = $\frac{34'}{50}$ = 0.68

"C" = $\frac{.68(0.9) + 0.32(.35)}{1}$ = 0.72

	"C"	AREA (AC)
SECTION 1	.80	1.0
SECTION 2	.69	2.46
		Σ = 3.46

WEIGHED "C" = 0.72

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PROJECT
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SHEET NO. OF
CALCULATED BY DATE

DETERMINE 1-YR 24HR STORM VOLUME

	"CN" SOIL TYPE "B"	"C"	"D"	AREA SOIL TYPE "B"	"C"	"D" = TOTAL	COMPOSITE "CN"
RESIDENTIAL LOTS	72	81		8.38	2.09	= 10.47	74
RIGHT-OF-WAY				2.88	0.39	0.19 = 3.46	74
OPEN SPACE	60	73		3.48	2.26	= 5.74	65
REC. AREA	61			1.21		= 1.21	61
N.P.		98			0.20	= 0.20	98
						Σ = 21.08	

$CN = 71$

→ DIA. = 21.08 AC
CN = 71
P = 2.8" RAINFALL
DIRECT RUNOFF DEPTH = 0.66"

$V_{WQ} = 21.08\,AC \cdot \frac{0.66''}{1} \cdot \frac{1\,FT}{12''} \cdot \frac{43{,}560\,SF}{1\,AC} = 50{,}503\ CF$ 62,836

@ ELEV 83.3; PROVIDED VOL = 82,968 > 50,503 + 31,473 = 81,976 CF ∴ O

→ SIZE ORIFICE FOR 24 HR DETENTION

$\frac{50{,}503\ CF}{24\ HR} \cdot \frac{1\ HR}{3600\ S} = 0.5845\ CFS$

$h = \frac{83.3 - 79.1}{2} = 2.1'$

$A = \frac{0.5845}{[64.32 \times 2.1]^{0.5}(0.6)}$

$= 0.0838\ SF \cdot \frac{144\ IN^2}{1\ SF}$

$r = 1.96''$

$d = 3.92'' \rightarrow$ USE 3"

USE 3" PVC ORIFICE TO ATTENUATE 1-YR 24 HR STORM WHILE MEETING DRY VOLUME REQUIREMENT.
CREST OF PRINCIPAL SPILLWAY = 83.3' ✓
INV OF 3" PVC = 79.1' ✓
CREST OF EMERGENCY SPILLWAY = 84.3' ✓ ← 1' ABOVE PRINCIPAL SPILLWAY ✓
TOP OF DAM = 85.3' ✓ ← 100 YR HIGHWATER = 84.23' → 1.07' FREEBOARD

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PROJECT
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SHEET NO. OF
CALCULATED BY DATE

ANTI-SEEP COLLAR DESIGN

$L_S = Y * (Z+4) * [1 + S/(0.25-S)]$ (VESCH 3.14)

$Y = 83.3 - 71 = 12.3$

$Z = 2$

$S = 0.01$ FT/FT

$L_S = 77$ FT

* FOR PERMANENT DAM, L_S must be increase to 15%; VESCH INCREASES 10%

So $L_S + 5\% = 77(1.05) = 81$ FT

USE VESCH PLATE 3.14-12 w/ 81 FT

USE 3-4'X4' ANTI-SEEP COLLARS w/ 17.5' SPACE

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PROJECT
PROJECT NO. 2604-1
SUBJECT
SHEET NO. 5 OF 6
CALCULATED BY CBR DATE 4/25/08

OUTLET PROTECTION DESIGN

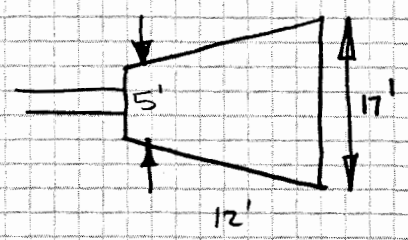
18" RCP PIPE @ ~~1.03~~ 1.0%; Q_{10} = ~~15.3~~ 11.4 CFS

* ASSUME MINIMUM TAILWATER CONDITION

FROM VESCH; PLATE 3.18-3

$L_a = 12'$

$d_{50} = 6''$



BUOYANCY CALCULATION FOR RISER

36" RCP; 14.5' HIGH [83-68.5], 72" ANTI-VORTEX DEVICE

W_W = weight of water displaced by riser

$= 62.4 \text{ PCF} (\pi) 1.5^2 \times 14.5'$

$= 6{,}392 \text{ LBS}$

W_S = weight of structure

= riser + anti-vortex

$= (14.5')(532 \text{ LB/FT}) + 4440 \text{ LB}$

$= 12{,}154 \text{ LB}$

W_b = weight of base

$= 150 \text{ PCF}[(\pi) 1.5^2 (1.5') + 6'(6')(1.5')]$

$= 9690 \text{ LB}$

W_t = Total Structure Weight = $W_W + W_b$

$= 12{,}154 + 9{,}690$

$= 21{,}844 \text{ LB} > W_W = 6{,}392$

FACTOR OF SAFETY = $W_t / W_W = 3.42$ ∴ OK

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PROJECT
PROJECT NO.
SUBJECT
SHEET NO. OF
CALCULATED BY CBR DATE 6/7/00

DETERMINE TAILWATER ELEVATION FOR POND CALCULATIONS

USE PRE-DEV FLOWRATES FROM CALCULATIONS (CONSERVATIVE SINCE POND WILL ATTENUATE PORTION OF PRE-DEV FLOW)

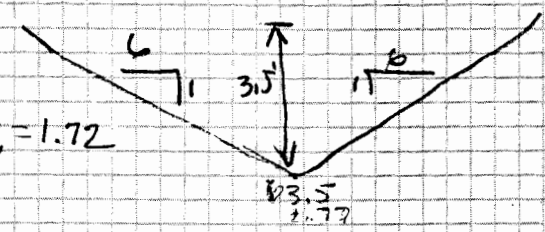
$Q_2 = 56.0$ CFS d = 1.77' TAILWATER = 65.27
$Q_{10} = 81.4$ CFS d = 2.04' TAILWATER = 65.54
$Q_{100} = 116.3$ CFS d = 2.33' TAILWATER = 65.83

CALCULATED BY FLOWMASTER HYDRAULIC MODELING SOFTWARE

@ DESIGN POINT

$P = 42.6'$; $A = 73.5$ SF

$R_h = \frac{A}{P} = \frac{73.5}{42.6} = 1.72$



6:1 SS IN CONSERVATIVE ASSUMPTION

$V = \frac{1.49}{n} R_h^{2/3} S^{1/2}$; $V = \frac{Q}{A}$ $S_L = 0.012$ FT/FT

ASSUME DITCH IS FLOWING FULL; DETERMINE CAPACITY OF CHANNEL.

$Q = A\left(\frac{1.49}{n}\right) R_h^{2/3} S_L^{1/2}$;

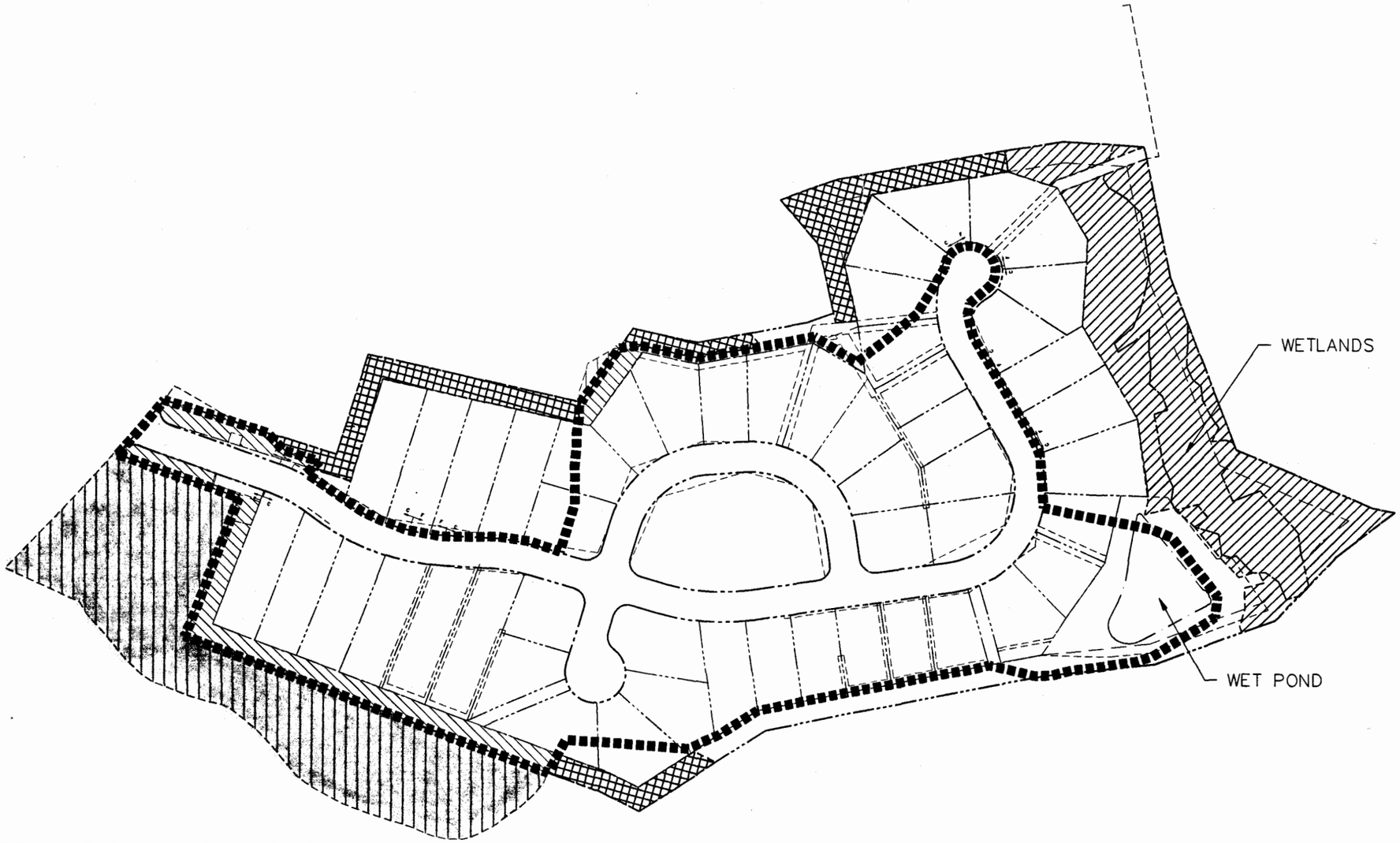
$= 73.5\left(\frac{1.49}{0.050}\right)(1.72)^{2/3}(.012)^{1/2}$

$= 344.5$ CFS @ WSEL = 67'

ALL STORMS ARE SIGNIFICANTLY BELOW A FLOWRATE OF 344.5 CFS WHICH WOULD RESULT IN A WSEL OF 67'.

FOR DESIGN PURPOSES, A TAILWATER ELEVATION OF 65.83' WILL BE USED FOR POND MODELING.

BARREL INV OUT 69.0



LEGEND

Service Area 21.08ac.

- ONSITE = 17.32 AC
- OFF-SITE = 3.76 AC
- OPEN SPACE = 1.41 AC
- OPEN SPACE TO POND = 1.07 AC
- OPEN SPACE ADJACENT TO AND ENCOMPASSING WETLANDS = 3.15 AC
- TOTAL DRAINAGE AREA TO POND = 21.08 AC

GRAPHIC SCALE

200' 0' 200' 400'

SCALE: 1" = 200'

N

No.	DATE	REVISION / COMMENT / NOTE	BY

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CONSULTING ENGINEERS

MULBERRY PLACE

STORMWATER MANAGEMENT BMP POINT MAP

Designed	Drawn
CBR	CBR/HBK
Scale	Date
1"=200'	4/26/00

Project No. 8604-01

Drawing No. 10F1

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	72.0	0.00	18.13	0.00	0.00	7.62	0.0	30.2	3.6	27.71	118.4	6.15	30	8.33	82.00	76.00	83.98	83.83	87.00	78.50	#1A-#1
2	1	151.0	0.00	18.13	0.00	0.00	7.62	0.0	29.4	3.7	28.16	94.52	6.65	30	5.31	90.02	82.00	91.79	84.49	105.00	87.00	#1B-#1A
3	2	21.0	0.22	18.13	0.75	0.16	7.62	5.0	29.3	3.7	28.22	71.03	6.66	30	3.00	90.65	90.02	92.43	92.55	102.45	105.00	#2-#1B
4	3	28.0	0.41	17.91	0.50	0.20	7.46	8.0	29.1	3.7	27.70	54.80	7.20	30	1.79	91.15	90.65	92.91	92.56	102.45	102.45	#3-#2
5	4	160.0	0.12	13.21	0.60	0.07	5.40	5.0	28.2	3.8	20.41	38.36	5.37	30	0.88	92.55	91.15	94.06	93.65	105.97	102.45	#4-#3
6	5	28.0	0.39	13.09	0.45	0.18	5.33	10.0	28.1	3.8	20.20	42.45	4.83	30	1.07	92.85	92.55	94.69	94.73	105.97	105.97	#5-#4
7	6	149.0	0.77	12.70	0.45	0.35	5.15	14.0	27.2	3.9	19.86	22.69	6.55	24	1.01	94.35	92.85	96.11	95.11	113.42	105.97	#6-#5
8	7	170.0	0.41	11.93	0.55	0.23	4.80	13.0	26.3	3.9	18.89	22.62	6.13	24	1.00	96.05	94.35	97.89	96.83	109.12	113.42	#7-#6
9	8	45.0	0.38	11.52	0.40	0.15	4.58	13.0	26.0	4.0	18.10	19.95	5.76	24	0.78	96.40	96.05	98.63	98.34	108.93	109.12	#8-#7
10	9	85.0	0.70	10.86	0.35	0.24	4.22	15.0	25.6	4.0	16.83	19.78	5.36	24	0.76	97.05	96.40	99.62	99.15	109.48	108.93	#9-#8
11	10	160.0	0.29	10.16	0.45	0.13	3.97	11.0	24.7	4.1	16.16	17.43	5.14	24	0.59	98.00	97.05	100.64	99.82	112.13	109.48	#10-#9
12	11	175.0	0.00	9.77	0.00	0.00	3.77	0.0	23.7	4.2	15.65	16.22	4.98	24	0.51	98.90	98.00	101.82	100.99	117.21	112.13	#11-#10
13	12	140.0	0.27	8.58	0.50	0.14	3.18	12.0	22.9	4.2	13.42	15.99	4.27	24	0.50	99.60	98.90	102.70	102.21	114.00	117.21	#12-#11
14	13	150.0	0.65	8.31	0.47	0.31	3.04	12.0	22.1	4.3	13.10	15.99	4.17	24	0.50	100.35	99.60	103.25	102.75	109.20	114.00	#13-#12
15	14	150.0	1.54	5.32	0.35	0.54	2.01	16.0	21.3	4.4	8.83	7.43	5.00	18	0.50	101.10	100.35	104.54	103.48	105.70	109.20	#14-#13
16	15	30.0	0.38	3.78	0.47	0.18	1.47	16.0	21.1	4.4	6.49	6.97	5.29	15	1.17	101.45	101.10	104.90	104.60	105.57	105.70	#15-#14
17	16	45.0	0.72	2.94	0.45	0.32	0.88	16.0	20.8	4.4	3.90	6.46	3.18	15	1.00	101.90	101.45	105.50	105.33	105.86	105.57	#16-#15
18	17	150.0	2.22	2.22	0.25	0.56	0.56	20.0	20.0	4.5	2.51	4.57	2.05	15	0.50	102.65	101.90	105.80	105.57	106.30	105.86	#17-#16
19	4	95.0	0.30	4.29	0.45	0.14	1.85	10.0	19.7	4.6	8.45	9.33	4.78	18	0.79	91.90	91.15	94.27	93.65	103.15	102.45	#18-#3
20	19	230.0	0.60	3.99	0.45	0.27	1.72	11.0	18.4	4.7	8.08	9.16	4.57	18	0.76	93.65	91.90	95.90	94.53	101.51	103.15	#19-#18
21	20	50.0	0.27	0.60	0.45	0.12	0.35	11.0	11.0	5.8	2.04	4.57	1.66	15	0.50	93.90	93.65	96.27	96.22	100.50	101.51	#20-#19

SYSTEM 1

Project File: 860401storm1.stm | I-D-F File: JCCstormsewer.IDF | Total number of lines: 31 | Run Date: 07-03-2000

NOTES: Intensity = 143.72 / (Tc + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 83.83 (ft) POND 10-YR.

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
22	21	118.0	0.33	0.33	0.70	0.23	0.23	7.0	7.0	6.6	1.53	4.60	1.24	15	0.51	94.50	93.90	96.37	96.30	98.54	100.50	#21-#20
23	20	149.0	0.68	2.79	0.40	0.27	1.09	10.0	17.6	4.8	5.26	11.47	4.87	15	3.15	98.35	93.65	99.27	96.22	104.20	101.51	#22-#19
24	23	100.0	2.11	2.11	0.39	0.82	0.82	17.0	17.0	4.9	4.01	6.62	4.05	15	1.05	99.40	98.35	100.20	99.73	101.90	104.20	#23-#22
25	9	28.0	0.28	0.28	0.75	0.21	0.21	5.0	5.0	7.1	1.50	6.68	3.79	15	1.07	105.00	104.70	105.49	105.11	108.93	108.93	#24-#8
26	11	28.0	0.10	0.10	0.75	0.08	0.08	5.0	5.0	7.1	0.53	6.68	2.76	15	1.07	108.00	107.70	108.29	107.95	112.13	112.13	#25-#10
27	12	40.0	0.26	1.19	0.53	0.14	0.59	7.0	11.2	5.8	3.40	11.64	6.25	15	3.25	112.30	111.00	113.04	111.47	116.64	117.21	#26-#11
28	27	30.0	0.62	0.62	0.45	0.28	0.28	11.0	11.0	5.8	1.61	9.86	2.45	15	2.33	113.00	112.30	113.51	113.35	117.04	116.64	#27-#26
29	27	28.0	0.31	0.31	0.56	0.17	0.17	8.0	8.0	6.4	1.11	6.68	1.22	15	1.07	112.60	112.30	113.35	113.35	116.64	116.64	#28-#26
30	14	8.0	2.34	2.34	0.31	0.73	0.73	15.0	15.0	5.1	3.73	22.37	8.01	15	12.00	106.16	105.20	108.47	105.56	109.05	109.20	#29-#13
31	16	36.0	0.46	0.46	0.90	0.41	0.41	7.0	7.0	6.6	2.74	4.17	2.23	15	0.42	101.60	101.45	105.40	105.33	105.57	105.57	#30-#15

Project File: 860401storm1.stm | I-D-F File: JCCstormsewer.IDF | Total number of lines: 31 | Run Date: 07-03-2000

NOTES: Intensity = 143.72 / (Tc + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 83.83 (ft) POND 10-YR.

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	129.0	0.61	0.61	0.40	0.24	0.24	8.0	8.0	6.4	1.56	13.77	2.84	12	14.96	95.00	75.70	95.53	83.83	98.00	77.05	#2-#1

SYSTEM 2

Project File: 860401storm2.stm | I-D-F File: JCCstormsewer.IDF | Total number of lines: 1 | Run Date: 07-03-2000

NOTES: Intensity = 143.72 / (Tc + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 83.83 (ft) POND 10-YR.

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PROJECT	Mulberry Place
PROJECT NO.	8604-1
SUBJECT	Ditch Calculations
SHEET NO.	1
DATE	6/9/2000
BY	CBR

ROADSIDE DITCH DESIGN COMPUTATIONS

INLET Number	INLET Station	From Station	To Station	Side	Area (ac)	C	Tc (min)	I-2 in/hr	I-10 in/hr	S Ditch Slope (ft/ft)	Q-2 (CFS)	Q-2 Carryover (CFS)	Q-2 Cumula. (CFS)	Act Vel-2 (FPS)	Allow Vel-2 (FPS)	Lining Type	Q-10 (CFS)	Q-10 Carryover (CFS)	Q-10 Cumula. (CFS)	Act Vel-10 (FPS)	Depth of Flow10 (ft.)	Remark
		Swale between Lots 2 & 3		N/A	0.35	0.4	8	4.9	6.3	0.0071	0.69		0.69	0.95	2.5	GRASS	0.88		0.88	1.01	0.54	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swale between Lots 3 & 4		N/A	0.34	0.4	8	4.9	6.3	0.0158	0.67		0.67	1.27	2.5	GRASS	0.86		0.86	1.35	0.46	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swale behind Lots 8-11																				
					1.01	0.35	12	4.2	5.6	0.01	1.48		1.48	1.31	2.5	GRASS	1.98		1.98	1.41	0.69	Use Grassed Swale, 3:1 SS, D = 12" Min.,
					0.83	0.4	10	4.6	5.9	0.01	1.53	1.48	3.01	1.56	2.5	GRASS	1.96	1.98	3.94	1.67	0.89	Use Grassed Swale, 3:1 SS, D = 12" Min.,
		Swale behind Lots 11-14																				
					0.21	0.4	10	4.6	5.9	0.0217	0.39		0.39	1.25	2.5	GRASS	0.50		0.50	1.33	0.35	Use Grassed Swale, 3:1 SS, D = 6" Min.,
					0.47	0.4	10	4.6	5.9	0.0133	0.86	0.39	1.25	1.38	2.5	GRASS	1.11	0.50	1.60	1.47	0.60	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swale between Lots 43 & 45			0.49	0.4	10	4.6	5.9	0.01	0.90		0.90	1.15	2.5	GRASS	1.16		1.16	1.23	0.56	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swale behind Lots 45			0.88	0.25	15	3.3	4.5	0.0107	0.73	0.90	1.63	1.37	2.5	GRASS	0.99	1.16	2.15	1.47	0.70	Use Grassed Swale, 3:1 SS, D = 12" Min.,
		Swale behind Lots 46			0.6	0.25	15	3.3	4.5	0.0107	0.50	1.63	2.12	1.47	2.5	GRASS	0.68	2.15	2.82	1.57	0.77	Use Grassed Swale, 3:1 SS, D = 12" Min.,
		Swale between Lots 46 & 47			0.37	0.4	7	5.2	6.5	0.0267	0.77	2.12	2.89	2.23	2.5	GRASS	0.96	2.82	3.78	2.39	0.73	Use EC-2 Lined Swale, 3:1 SS, D = 12" Min.,
		Swale between Lots 45 & 46			0.36	0.4	10	4.6	5.9	0.0146	0.66		0.66	1.23	2.5	GRASS	0.85		0.85	1.31	0.46	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swales draining towards Road																				
		Swale between Lots 34 & 35			0.19	0.4	7	5.2	6.5	0.0313	0.40		0.40	1.45	2.5	GRASS	0.49		0.49	1.52	0.33	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale between Lots 33 & 34			0.12	0.4	7	5.2	6.5	0.0187	0.25		0.25	1.06	2.5	GRASS	0.31		0.31	1.12	0.30	Use Grassed Swale, 3:1 SS, D = 6" Min.,

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PROJECT	Mulberry Place
PROJECT NO.	8604-1
SUBJECT	Ditch Calculations
SHEET NO.	2
DATE	6/9/2000
BY	CBR

ROADSIDE DITCH DESIGN COMPUTATIONS

INLET Number	INLET Station	From Station	To Station	Side	Area (ac)	C	Tc (min)	I-2 in/hr	I-10 in/hr	S Ditch Slope (ft/ft)	Q-2 (CFS)	Q-2 Carryover (CFS)	Q-2 Cumula. (CFS)	Act Vel-2 (FPS)	Allow Vel-2 (FPS)	Lining Type	Q-10 (CFS)	Q-10 Carryover (CFS)	Q-10 Cumula. (CFS)	Act Vel-10 (FPS)	Depth of Flow10 (ft.)	Remark
		Swales draining to back of Lots to Pond																				
		Swale between Lots 35 & 36			0.14	0.4	10	4.6	5.9	0.0364	0.26		0.26	1.37	2.5	GRASS	0.33		0.33	1.46	0.27	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale behind Lot 35			0	0	0			0.0733	0.00	0.26	0.26	1.79	2.5	GRASS	0.00	0.33	0.33	1.89	0.24	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale between Lots 34 & 35			0.11	0.4	7	5.2	6.5	0.0417	0.23	0.26	0.49	1.69	2.5	GRASS	0.29	0.33	0.62	1.80	0.34	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale behind Lot 34			0	0	0			0.0533	0.00	0.49	0.49	1.86	2.5	GRASS	0.00	0.62	0.62	1.97	0.32	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale between Lots 33 & 34			0.11	0.4	7	5.2	6.5	0.0317	0.23	0.49	0.72	1.68	2.5	GRASS	0.29	0.62	0.90	1.78	0.41	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale behind Lot 33			0	0	0			0.0368	0.00	0.72	0.72	1.78	2.5	GRASS	0.00	0.90	0.90	1.88	0.40	Use Grassed Swale, 3:1 SS, D = 6" Min.,
		Swale between Lots 32 & 33			0.25	0.4	10	4.6	5.9	0.0118	0.46	0.72	1.18	1.31	2.5	GRASS	0.59	0.90	1.49	1.39	0.60	Use Grassed Swale, 3:1 SS, D = 8" Min.,
		Swale behind Lot 32			0	0	0			0.0558	0.00	1.18	1.18	2.39	2.5	GRASS	0.00	1.49	1.49	2.53	0.44	Use EC-2 Lined Swale, 3:1 SS, D = 8" Min.,

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PROJECT: MULBERRY PLACE
PROJECT NO.: 8604-1
SUBJECT: Spread Calculations
SHEET NO.: 1
DATE: APR 19,1999
BY: CBR

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	i in/hr	Q-Inter (CFS)	Q Carry- Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	Sw =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 P Effec L (curb opening length)	L/Lt (ft) (depth @ curb)	E(#16) (ft) (efficiency ?)	Q Int CFS d/h	Q Carryover Spread	Remark
MULBERRY PLACE - LEFT																														
T allow = [(38-6)/4]+2 = 10'																														
			14+00 L	0.18	0.9	0.162	0.162	4	0.648		0.648	0.001	0.02	7.9	Flow Approaching From Down Station															
	3C	6									1.656	0.001	0.02		2		0.08								9.6	0.164	0.27	0.607	8.2	
				0.28	0.9	0.252	0.252	4	1.008		1.008	0.001	0.02	9.4	Flow Approaching From Up Station															
T allow = [(30-6)/4]+2 = 8'																														
GRADE	3B	4	24+00 L	0.12	0.6	0.072	0.072	4	0.288		0.288	0.055	0.02	1.1	2	1.818	0.08	4	1	0.015	2	3.44	0.143	0.163	7.6	0.526	0.739	0.213	0.075	
GRADE	3B	4	26+90 L	0.3	0.45	0.135	0.135	4	0.54		0.54	0.008	0.02	4.3	2	0.465	0.08	4	0.915	0.015	2	3.44	0.143	0.151	7.6	0.526	0.739	0.399	0.141	
			25+80 L	0.22	0.5	0.11	0.11	4	0.44	0.075	0.515	0.001	0.02	7.2	Flow Approaching From Down Station															
	3A	2.5									1.036	0.001	0.02		2		0.08								6.1	0.154	0.27	0.57	7.7	
				0.19	0.5	0.095	0.095	4	0.38	0.141	0.521	0.001	0.02	7.3	Flow Approaching From Up Station															
T allow = [(30-6)/4]+2 = 8'																														
GRADE	3B	4	29+35 L	0.6	0.45	0.27	0.27	4	1.08		1.08	0.021	0.02	4.8	2	0.417	0.08	4	0.875	0.015	2	3.44	0.143	0.145	7.6	0.526	0.739	0.799	0.281	
GRADE	3B	4	29+75 L	0.27	0.45	0.122	0.122	4	0.486	0.281	0.767	0.021	0.02	3.8	2	0.526	0.08	4	0.948	0.015	2	3.44	0.143	0.156	7.6	0.526	0.739	0.567	0.2	
			30+80	0.14	0.65	0.091	0.091	4	0.364	0.2	0.564	0.001	0.02	7.5	Flow Approaching From Up Station - LEFT															
	3C	6									1.134	0.001	0.02		2		0.08								9.6	0.128	0.27	0.474	6.4	
				0.19	0.75	0.143	0.143	4	0.57		0.57	0.001	0.02	7.5	Flow Approaching From Up Station - RIGHT															
MULBERRY LANE - RIGHT																														
T allow = [(30-6)/4]+2 = 8'																														
GRADE	3B	4	22+50 R	0.77	0.45	0.347	0.347	4	1.386		1.386	0.055	0.02	3.9	2	0.513	0.08	4	0.941	0.015	2	3.44	0.143	0.155	7.6	0.526	0.739	1.025	0.361	
GRADE	3B	4	24+00 R	0.4	0.45	0.18	0.18	4	0.72	0.361	1.081	0.055	0.02	3.1	2	0.645	0.08	4	0.982	0.015	2	3.44	0.143	0.161	7.6	0.526	0.739	0.799	0.282	
			25+80 R	0.11	0.75	0.083	0.083	4	0.33	0.282	0.612	0.001	0.02	7.7	Flow Approaching From Down Station															
	3A	2.5									0.942	0.001	0.02		2		0.08								6.1	0.142	0.27	0.526	7.1	
				0.11	0.75	0.083	0.083	4	0.33		0.33	0.001	0.02	5.8	Flow Approaching From Up Station															

9.6' COMPUTED, 6' USED.

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PROJECT: MULBERRY PLACE
PROJECT NO.: 8604-1
SUBJECT: Spread Calculations
SHEET NO.: 2
DATE: APR 19,1999
BY: CBR

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry- Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	S'w =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 Effec L	L/Lt (ft) d	E(#16) (ft) h	Q Int CFS d/h	Q Carryover Spread	Remark
MULBERRY PLACE - RIGHT																														
T allow = [(38-6)/4)+2 = 10'																														
GRADE		4	17+35 R	0.27	0.5	0.135	0.135	4	0.54		0.54	0.03	0.02	2.1	2	0.952	0.08	4	1	0.015	2	3.44	0.143	0.163	7.6	0.526	0.739	0.399	0.141	
GRADE		4	15+70 R	0.29	0.55	0.16	0.16	4	0.638	0.141	0.779	0.03	0.02	2.9	2	0.69	0.08	4	0.987	0.015	2	3.44	0.143	0.161	7.6	0.526	0.739	0.576	0.203	
GRADE		4	14+30 R	1.54	0.35	0.539	0.539	4	2.156	0.203	2.359	0.03	0.02	6.6	2	0.303	0.08	4	0.74	0.015	2	3.44	0.143	0.126	7.6	0.526	0.739	1.744	0.615	
GRADE		4	13+55 R	0.72	0.45	0.324	0.324	4	1.296		1.296	0.015	0.02	5.8	2	0.345	0.08	4	0.767	0.015	2	3.44	0.143	0.13	7.6	0.526	0.739	0.958	0.338	
	4		14+00 R	0.2	0.45	0.09	0.09	4	0.36	0.615	0.975	0.001	0.02	9.3	Flow Approaching From Down Station															
		6									1.672	0.001	0.02		2		0.08								9.6	0.164	0.27	0.607	8.2	
				0.18	0.5	0.09	0.09	4	0.36	0.338	0.698	0.001	0.02	8.1	Flow Approaching From Up Station															

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PROJECT: MULBERRY PLACE
PROJECT NO.: 8604-1
SUBJECT: Spread Calculations
SHEET NO.: 3
DATE: APR 19,1999
BY: CBR

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry- Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	S'w =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 Effec L	P	L/Lt (ft)	d	E(#16) (ft)	h	Q Int CFS d/h	Q Carryover Spread	Remark
WALLACE COURT																																	
T allow = [(30-6)/4}+2 = 8'																																	
GRADE	3B	4	11+00 L	0.62	0.45	0.279	0.279	4	1.116		1.116	0.039	0.02	3.6	2	0.556	0.08	4	0.955	0.015	2	3.44	0.143	0.157	7.6		0.526		0.739		0.825	0.291	
20			10+50 L	0.19	0.55	0.105	0.105	4	0.418		0.418	0.001	0.02	6.6	Flow Approaching From Down Station																		
	3A	2.5									0.849	0.001	0.02		2		0.08								6.1		0.136		0.27		0.504	6.8	
				0.07	0.5	0.035	0.035	4	0.14	0.291	0.431	0.001	0.02	6.7	Flow Approaching From Up Station																		
21			10+50 R	0.02	0.75	0.015	0.015	4	0.06		0.06	0.001	0.02	2.8	Flow Approaching From Down Station																		
	3A	2.5									0.698	0.001	0.02		2		0.08								6.1		0.12		0.27		0.444	6	
				0.29	0.55	0.16	0.16	4	0.638		0.638	0.001	0.02	7.8	Flow Approaching From Up Station																		
ARMSTEAD CIRCLE - LEFT																																	
T allow = [(30-6)/4}+2 = 8'																																	
GRADE	3B	4	11+75 L	0.1	0.75	0.075	0.075	4	0.3		0.3	0.033	0.02	1.4	2	1.429	0.08	4	1	0.015	2	3.44	0.143	0.163	7.6		0.526		0.739		0.222	0.078	
4	3A		14+50 L	0.16	0.75	0.12	0.12	4	0.48	0.078	0.558	0.001	0.02	7.4	Flow Approaching From Down Station																		
		2.5									0.918	0.001	0.02		2		0.08								6.1		0.142		0.27		0.526	7.1	
				0.12	0.75	0.09	0.09	4	0.36		0.36	0.001	0.02	6	Flow Approaching From Up Station																		
ARMSTEAD CIRCLE - RIGHT																																	
T allow = [(30-6)/4}+2 = 8'																																	
GRADE	3B	4	11+75 R	0.29	0.45	0.131	0.131	4	0.522		0.522	0.033	0.02	1.9	2	1.053	0.08	4	1	0.015	2	3.44	0.143	0.163	7.6		0.526		0.739		0.386	0.136	
GRADE	3B	6	13+50 R	0.7	0.35	0.245	0.245	4	0.98	0.136	1.116	0.008	0.02	6.4	2	0.313	0.08	4	0.74	0.015	2	3.44	0.143	0.126	9.6		0.625		0.829		0.925	0.191	
GRADE	3B	4	15+00 R	0.41	0.55	0.226	0.226	4	0.902		0.902	0.023	0.02	4	2	0.5	0.08	4	0.941	0.015	2	3.44	0.143	0.155	7.6		0.526		0.739		0.667	0.235	
4	3C		14+50 R	0.26	0.4	0.104	0.104	4	0.416	0.191	0.607	0.001	0.02	7.7	Flow Approaching From Down Station																		
		2.5									1.034	0.001	0.02		2		0.08								6.1		0.154		0.27		0.57	7.7	
				0.12	0.4	0.048	0.048	4	0.192	0.235	0.427	0.001	0.02	6.7	Flow Approaching From Up Station																		

LD-269
Rev 3-83

Project MULBERRY PLACE

Plan Sheet No. ____ Designer ____ Sheet ____ of ____

Rev. Date ____ Date ____

HYDROLOGICAL DATA:

D.A. = 0.18 AC.

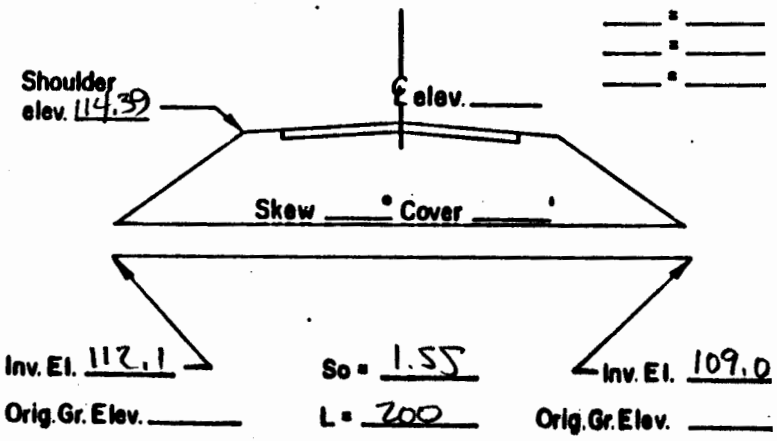
T_c = 5 MIN.
C = 0.4
i_{10} = 7 IN/HR

AHW Controls

STATION ____

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

freq. TWele



DISCHARGES USED

Q 10 = 0.50 CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS

RISK ASSESSMENT ADT ____

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

240 A

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL Ke	dc	(dc+D)/2	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	OUTLET VELOCITY Smooth	End Treat.	COMMENTS
15" RCP	0.50	.	<.5	0.63	0.5	0.4	0.82	0.82	<.4	3.10	0					OK: INLET CONTROL

Design Flood Exceed Prob. ____ Elev ____

84
83.3
82

94083
+
62325

1.3

$$\frac{0.70}{2} = \frac{94083 - x}{31758}$$

188166 - 2x = 23230
82968

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project MULBERRY PLACE

Basin # 1 Location JCC, VA

Total area draining to basin: 21.08 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 21.08 acres = 1,412 cu. yds. ✓ (38,124 cf)

2. Available basin volume = 1441 cu. yds. at elevation 80.0. (From storage - elevation curve) (38907 cf)

   79.1 1166 CY 82.5% Wet 108% DRY

3. Excavate 1441 cu. yds. to obtain required volume*. Perm. Config

   EL 79.10
   30,644 CF
   INV 3" ORIF
   79.10

   * Elevation corresponding to required volume = invert of the dewatering orifice. 80.0

4. Available volume before cleanout required.

   33 cu. yds. x 21.08 acres = 696 cu. yds. (18,792 cf)

   79.10
   77.00
   2.10'

5. Elevation corresponding to cleanout level = 77.0 ✓. 706 CY

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 6.0 ft. (Min. = 1.0 ft.)

   REQD PROV.
   W 38124
   D 38124
   76,248 82968

Dry Storage:

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

   67 cu. yds. x 21.08 acres = 1,412 cu. yds. OK

USING PERMANENT ORIFICE CONFIGURATION IN WET POND, WE PROVIDE @79.1; 1166 CY OF WET STORAGE OR 82.5% OF THE REQUIRED WET VOLUME. @83.3; 3073 CY OF STORAGE, 1166(WET)+1907(DRY) OR 135% OF THE REQUIRED DRY VOLUME WHICH IS DETAINED FOR 24HR RATHER THAN 6HR.

8. Total available basin volume at crest of riser* = 3073 cu. yds. at elevation 83.3. (From Storage - Elevation Curve) (82,971 CF)

* Minimum = 134 cu. yds./acre of total drainage area. = 2,825

9. Diameter of dewatering orifice = 6" in. 2825 - 1441 CY = 37,368 CF / 6 HR = 1.73 CFS

10. Diameter of flexible tubing = 8" in. (diameter of dewatering orifice plus 2 inches). h = (83.9 - 80)/2 = 1.45'

A = 1.73 / [64.32 × 1.45]^0.5 (0.6) = .298 SF = 43 IN²

d = 9.4" ✓

Preliminary Design Elevations

11. Crest of Riser = 83.3 ✓

Top of Dam = 85.3 ✓

Design High Water (100YR) = 84.23 ✓ (1.07' FB)

Upstream Toe of Dam = 69.0

▸ 25-YEAR WSEL. ? 2' FB RQD.

Basin Shape

12. Length of Flow / Effective Width — L / We = 100 / 306

If > 2, baffles are not required _____ ✓

If < 2, baffles are required ✓ NOT PROVIDED DUE TO THE ADDITION OF SEDIMENT FOREBAY

Runoff

SEE ROUTINGS.

13. Q_2 = _____ cfs (From Chapter 5)

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

C I A
0.6 (26)(21.08)
= 32.88 CFS DIST

Principal Spillway Design

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

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

AES CONSULTING ENGINEERS
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PROJECT
PROJECT NO. 8604-1
SUBJECT
SHEET NO. 1 OF 1
CALCULATED BY CBR DATE 4/25/00

SEDIMENT TRAP #1 - LOCATED @ LOT 2

DISTURBED DRAINAGE AREA = 0.90 AC

WET VOLUME = 67 CY/AC (0.90 AC) = DRY VOLUME
= 60.3 CY
= 1,628 CF

PROVIDED VOLUME = 69 CY (WET)
= 16 CY (DRY)

PER CONVERSATION WITH MR. SCOTT THOMAS, THE DRY OK VOLUME HAS NOT BEEN PROVIDED DUE TO SITE CONSTRAINTS FOR BOTH SEDIMENT TRAP #1 AND #2.

∴ ie. TO LIMIT CLEARING, Temporary in nature.

SEDIMENT TRAP #2 - LOCATED @ LOT 23

DISTURBED DRAINAGE AREA = 0.26 AC

WET VOL. = 67 CY/AC (0.26 AC)
= 17.4 CY
= 470 CF

PROVIDED VOLUME = 22 CY (WET)
= 6 CY (DRY)

Worksheet 2: Runoff curve number and runoff

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/			Area ☐ acres ☐ mi^2 ☐ %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
				Totals =		

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = _____ = _____; Use CN = ☐

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr			
Rainfall, P (24-hour) ..... in			
Runoff, Q ..... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

Worksheet 2: Runoff curve number and runoff

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/			Area ☐ acres ☐ mi^2 ☐ %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
				Totals =		

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = _____ = _____; Use CN = ☐

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr			
Rainfall, P (24-hour) ..... in			
Runoff, Q ..... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

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

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

Circle one: T_c T_t through subarea _____

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

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

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

Shallow concentrated flow		Segment ID			
7. Surface description (paved or unpaved)					
8. Flow length, L	ft				
9. Watercourse slope, s	ft/ft				
10. Average velocity, V (figure 3-1)	ft/s				
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=

Channel flow		Segment ID			
12. Cross sectional flow area, a	ft^2				
13. Wetted perimeter, p_w	ft				
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft				
15. Channel slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s				
18. Flow length, L	ft				
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr				

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

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

Circle one: T_c T_t through subarea _____

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

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

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

Shallow concentrated flow		Segment ID					
7. Surface description (paved or unpaved)							
8. Flow length, L	ft						
9. Watercourse slope, s	ft/ft						
10. Average velocity, V (figure 3-1)	ft/s						
11. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=		

Channel flow		Segment ID					
12. Cross sectional flow area, a	ft^2						
13. Wetted perimeter, p_w	ft						
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft						
15. Channel slope, s	ft/ft						
16. Manning's roughness coeff., n							
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V	ft/s						
18. Flow length, L	ft						
19. $T_t = \frac{L}{3600\ V}$ Compute T_t	hr		+		=		
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr						

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Worksheet 6a: Detention basin storage, peak outflow discharge (q_o) known

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

Elevation or stage

Detention basin storage

1. Data:
   Drainage area ..... A_m = _____ mi^2
   Rainfall distribution type (I, IA, II, III) = _____

	1st stage	2nd stage
2. Frequency ..... yr		
3. Peak inflow discharge, q_i .... cfs (From worksheet 4 or 5b)		
4. Peak outflow discharge, q_o .... cfs 1/		
5. Compute $\frac{q_o}{q_i}$		
6. $\frac{V_s}{V_r}$ ..... (Use $\frac{q_o}{q_i}$ with figure 6-1)		
7. Runoff, Q ..... in (From worksheet 2)		
8. Runoff volume, V_r ..... ac-ft ($V_r = QA_m 53.33$)		
9. Storage volume, V_s ..... ac-ft ($V_s = V_r(\frac{V_s}{V_r})$)		
10. Maximum stage, E_{max} (From plot)		

1/ 2nd stage q_o includes 1st stage q_o.

Appendix 9B-1 LD-204 Stormwater Inlet Computations

LD-204
Rev. 6-85

RTE _____ PROJ _____ DATE _____ SHEET _____ OF _____

INLET NUMBER (1)	INLET TYPE (2)	INLET LENGTH (FT) (3)	STATION (4)	DRAINAGE AREA (AC) (5)	C (6)	CA (7)	sum CA (8)	I (IN/HR) ? (9)	Q INCR (CFS) (10)	Q_b, CARRYOVER (CFS) (11)	Q_T, GUTTER FLOW (CFS) (12)	S, GUTTER SLOPE (FT/FT) (13)	S_x, CROSS SLOPE (FT/FT) (14)	T, SPREAD (FT) (15)	W (FT) (16)	W/T (17)	S_w (FT/FT) (18)	S_w/S_x (19)	E_o (App. 9C-8) (20)	a = 12W(S_w - S_x) + Local Depression (21)	S'_w = a/(12W) (22)	$S_e = S_x + S'_w (E_o)$, (FT/FT) (23)	COMPUTED LENGTH, L_T, (FT) (App. 9C-17) (24)	L, SPECIFIED LENGTH (FT) (25)	L/L_T (26)	E (App. 9C-18) (27)	Q_i, INTERCEPTED (CFS) (28)	Q_b, CARRYOVER (CFS) (29)	Sag Inlets Only: d (FT) (30)	Sag Inlets Only: h (FT) (31)	Sag Inlets Only: d/h (32)	Sag Inlets Only: T, SPREAD @ SAG (FT) (33)	REMARKS
									1.134	0.0																							

Appendix 9A-2 Symbols

Symbol	Definition	Units
a	Depth of depression	ft
A	Drainage area	acres
A	Cross-sectional flow area	ft^2
A	Clear opening area of curb inlet or grate	ft^2
b	Manhole diameter or width	ft
C	Runoff coefficient	-
C_W	Weir coefficient	-
d	Depth of gutter flow at the curb line	ft
d_i	Depth at lip of curb opening	ft
D	Diameter of pipe	ft
E	Curb opening efficiency	-
E_o	Ratio of depression flow to total gutter flow	-
g	Acceleration due to gravity	ft/s^2
h	Height of curb opening inlet	ft
$h_?$	Bend head loss	ft
h_e	Entrance head loss	ft
h_f	Friction head loss	ft
h_m	Minor head loss	ft
h_o	Exit head loss	ft
H	Head Loss	ft
HGL_{us}	Elevation of the hydraulic grade line at upstream node	ft
HGL_{ds}	Elevation of the hydraulic grade line at downstream node	ft
i	Rainfall intensity	in/hr
K	Bend loss coefficient	-
K	Entrance loss coefficient	-
K	Exit loss coefficient	-
K	Conveyance of cross section	cfs
K_o	Initial head loss coefficient	-
K_o	Conveyance of the gutter section beyond depression	cfs
K_w	Conveyance of the depressed gutter section	cfs
L	Length of grate inlet	ft
L	Length of curb opening	ft
L	Pipe length	ft
L_T	Curb opening length for 100% interception	ft
L_R	Require length of inlet	ft
n	Manning's roughness coefficient	-
P	Perimeter of grate opening	ft
P_w	Wetted perimeter	ft
Q	Total flow to inlet or flow in gutter	cfs
Q_b	Bypass flow	cfs
Q_i	Intercepted flow	cfs
Q_o	Outlet flow	cfs
Q_s	Gutter capacity above the depressed section	cfs
Q_T	Total flow	cfs
Q_t	Maximum allowable flow	cfs

Appendix 9A-2 Symbols

Q_w	Flow in width W	cfs
R	Hydraulic radius	ft
R_f	Ratio of frontal flow intercepted to total flow	-
R_s	Ratio of side flow intercepted to total flow	-
S	Slope of the energy grade line	ft/ft
S	Longitudinal slope of pavement or gutter slope	ft/ft
S_x	Cross Slope	ft/ft
S_e	Equivalent cross slope	ft/ft
S_f	Friction slope	ft/ft
S_w	Depression section slope or gutter cross slope	ft/ft
S_w	Gutter cross slope including local depression	ft/ft
T	Spread	ft
t_c	Time of concentration	min
T_s	Spread above depressed section	ft
V	Mean velocity, velocity of flow in gutter	fps
V_{ds}	Downstream velocity	fps
V_o	Gutter velocity where splash-over first occurs	fps
V_{us}	Upstream velocity	fps
W	Drainage area width	ft
W	Width of depression	ft
W	Width of gutter pan	ft
W	Width of grate	ft
y	Depth of flow in approach gutter	ft
Z	T/d, reciprocal of the cross slope	-
θ	Angle with respect to centerline of outlet pipe	degrees

9.3 Design Criteria

9.3.1 Design Frequency and Spread

Table 9-1 provides recommended inlet design frequencies and allowable spreads for various roadway classifications.

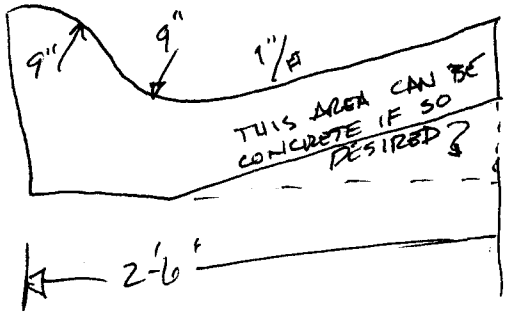
Table 9-2 provides design frequencies for storm drain conduit.

Table 9-1. Criteria for Inlet Design

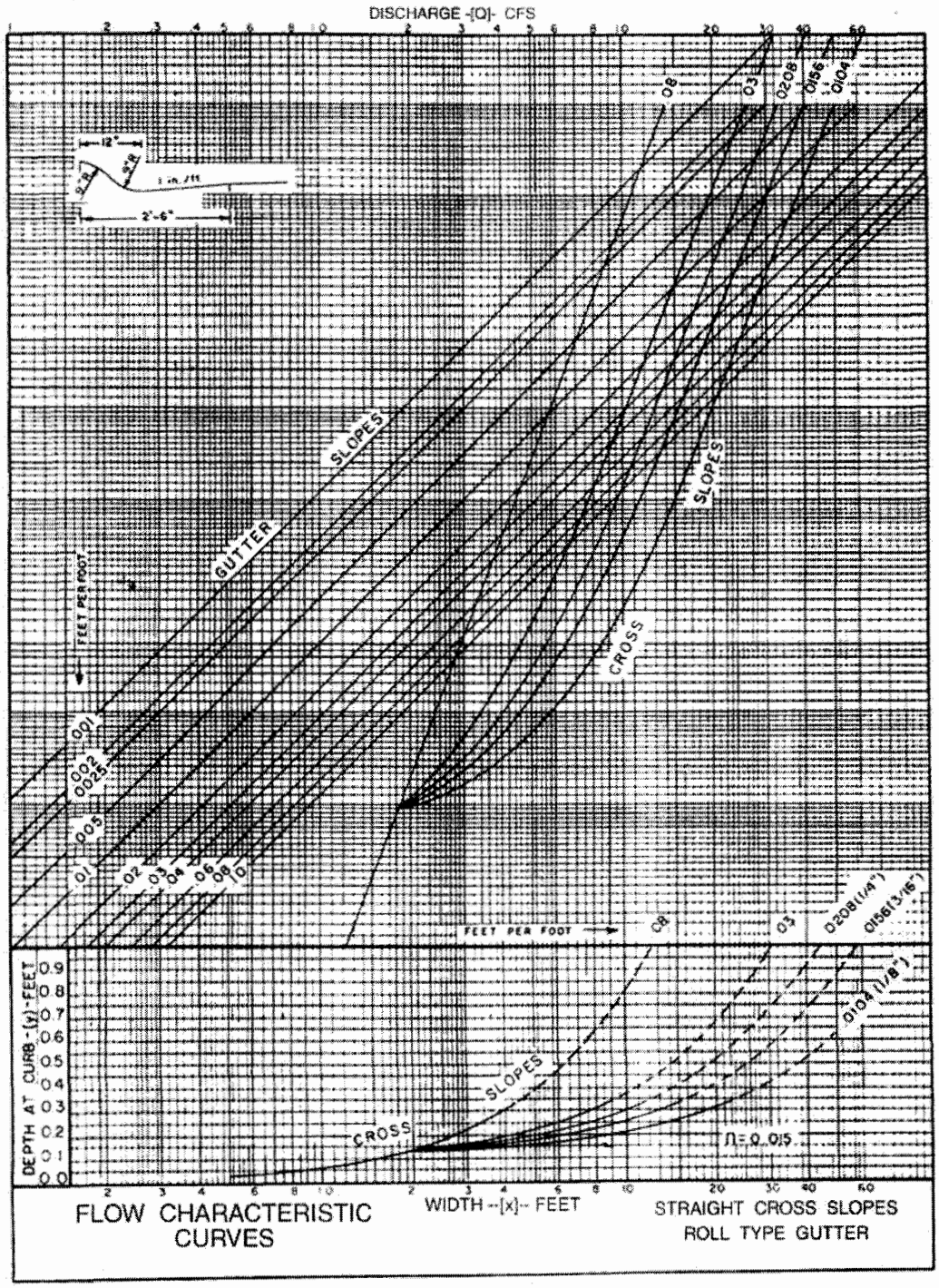
Roadway Classification		Design Speed (mph)	Design Storm Frequency (year[1, 2])	Design Storm Intensity (in./hr.)	Maximum Design Spread Width[3] (ft)
Principal Arterial					
With Shoulder	On Grade	≤ 50	10	Actual	Sh. Width + 3
		> 50	10	Actual	Sh. Width
	Sag Location[5]	All	10	Actual	Sh. Width + 3
Without Shoulder	On Grade	≤ 50	N/A[4]	4	½ Driving Lane + Gutter Width (If Any)
	On Grade[5]	> 50	10	Actual	½ Driving Lane + Gutter Width (If Any)
	Sag Location[5]	≤ 50	N/A[4]	4	½ Driving Lane + Gutter Width (If Any)
		> 50	50	Actual	½ Driving Lane + Gutter Width (If Any)
Minor Arterial, Collector, Local					
With Shoulder	On Grade	≤ 50	N/A[4]	4	Sh. Width + 3
		> 50	N/A[4]	4	Sh. Width
	Sag Location	All	N/A[4]	4	Sh. Width + 3
Without Shoulder	On Grade	All	N/A[4]	4	½ Driving Lane + Gutter Width (If Any)
	Sag Location	All	N/A[4]	4	½ Driving Lane + Gutter Width (If Any)

Table 9-2. Design Frequencies for Storm Drain Conduit

Roadway Classification	Design Speed (mph)	Design Storm Frequency (year[1, 2])
Principal Arterial		
With Shoulder	All	25
Without Shoulder	≤ 50	10
	> 50	25
Minor Arterial, Collector, Local		
With or Without Shoulder	All	10


9"
9"
1"/ft
THIS AREA CAN BE CONCRETE IF SO DESIRED?
2'-6"

Appendix 9C-6 Flow Characteristic Curve (Roll Type Gutter)



Source: VDOT
Comment: REV 6/85

9.5 Design Procedures and Sample Problems

The typical design process would perform all of the calculations in Section 9.5 by the use of computer programs with the possible exception of the hydraulic grade line procedure.

9.5.1 Design Documentation

The following items should be included in the drainage documentation.

- Computation forms for inlets (LD-204), conduits (LD-229), hydraulic grade lines (LD-347)
- Drainage area map
- Information concerning outfalls and tailwaters, existing storm drains, and other design considerations
- A storm drain schematic
- Output from FHWA HEC-12 and/or HY25 computer programs.

9.5.2 Spread Calculations

9.5.2.1 Uniform Cross Slope Procedure

Condition 1: Find spread, given gutter flow, Q.

Step 1: *Determine the following parameters:*

Longitudinal slope (S)
Cross slope (S_x)
Manning's roughness coefficient (n)

Step 2: Compute spread (T), using Equation 9.2.

$$T = 1.243(Qn)^{\frac{3}{8}} S_x^{-\frac{5}{8}} S^{-\frac{3}{16}}$$

Alternatively, use the chart contained in Appendix 9C-2. The procedure for using this chart is provided below.

Step 3: Draw a perpendicular line from gutter flow (Q) to longitudinal or gutter slope (S).

Step 4: Draw a perpendicular line from longitudinal or gutter slope (S) to cross slope (S_x).

Step 5: Draw a perpendicular line from cross slope (S_x) to intersect with Width (x). Spread (T) will be the value at the intersection with Width (x).

Condition 2: Find gutter flow (Q), given spread (T).

This procedure is similar to Condition 1. Solve Equation 9.1 for discharge, Q, or work the procedure for Condition 1 in reverse.

$$Q = \frac{0.56}{n} S_x^{\frac{5}{3}} S^{\frac{1}{2}} T^{\frac{8}{3}}$$

9.5.2.1.1 Uniform Cross Slope Sample Problem

Condition 1: Find spread given the following:

Step 1: Determine the following parameters.

Gutter flow, Q = 5 cfs
Longitudinal slope, S = 0.0035 ft/ft
Cross slope, S_x = 0.0208 ft/ft
Manning's roughness coefficient, n = 0.015

Step 2: Compute Spread (T), using Equation 9.2.

$$T = 1.243(Qn)^{\frac{3}{8}} S_x^{-\frac{5}{8}} S^{-\frac{3}{16}}$$

$$= 1.243 \times (5 \times 0.015)^{\frac{3}{8}} \times 0.0208^{-\frac{5}{8}} \times 0.0035^{-\frac{3}{16}}$$

$$= 15.3 \text{ ft}$$

Refer to the chart in Appendix 9C-2 to view the graphical solution.

Condition 2: Find the gutter capacity given the following:

Step 1: Determine the following parameters.

Allowable spread, T = 14 ft
Longitudinal slope, S = 0.0035 ft/ft
Cross slope, S_x = 0.0208 ft/ft
Manning's roughness coefficient, n = 0.015

Step 2: Compute gutter flow (Q), using Equation 9.1.

$$Q = \frac{0.56}{n} S_x^{\frac{5}{3}} S^{\frac{1}{2}} T^{\frac{8}{3}}$$

$$= \frac{0.56}{0.015} \times 0.0208^{\frac{5}{3}} \times 0.0035^{\frac{1}{2}} \times 14^{\frac{8}{3}}$$

$$= 3.96 \text{ cfs (Say 4.0 cfs)}$$

9.5.3.2 Curb Inlet in Sag Sizing Procedure

Step 1: *Determine the allowable depth of ponding (d) and enter in Col. 30.*

This is the depth above the undepressed gutter line to the water surface associated with the allowable spread and should be at least 1 inch below the top of curb.

Step 2: *Determine the height of the curb inlet opening (h) and enter in Col. 31. Calculate the ratio of d/h and enter in Col. 32.*

If $\frac{d}{h} < 1.2$, *the inlet is in weir control.*

If $\frac{d}{h} > 1.2$, *the inlet is transitioning to orifice control and design would proceed to Step 4.*

Step 3: *Compute the required length (L_R) when the inlet is in weir flow by rearranging Equation 9.10 as follows and enter in Col. 25, then proceed to Step 5.*

$$L_R = \frac{Q}{C_w d^{1.5}} - 1.8W \qquad (9.29)$$

Where:

Q = Total flow reaching inlet, cfs
C_w = Weir coefficient, use 2.3.
d = Allowable ponding depth, ft
W = Inlet depression width, ft

Step 4: *Compute the required length (L_R) when the inlet is in orifice flow by rearranging Equation 9.12 as follows and enter in Col. 25, then proceed to Step 5.*

$$L_R = \frac{Q}{C_o d\sqrt{2gh}} \qquad (9.30)$$

Where:

Q = Total flow reaching inlet, cfs
C_o = Orifice coefficient = 0.67
D = Depth of opening, ft. The depth will vary slightly with the inlet detail used.
g = Acceleration due to gravity = 32.2, ft/s^2
h = Effective head at the centroid of the inlet opening, ft

Step 5: *Select a standard inlet length (L) that is greater than the required length (L_R).*

Step 6: *If the area behind the inlet is prone to flooding or there is the potential for property damage, a check storm intensity of i = 6.5 in/hr will be used to evaluate all inlets down to the sag inlet in question. If the inlet can handle the check storm without flooding then the previous design need not be changed. However, if there is flooding, it may be necessary to double the inlet size. Refer to Table 9-1.*

9.5.3.2.1 Curb Inlet in Sag Sizing Sample Problem

Find: The required inlet length assuming a factor of safety of 2.

Given: Q = 3 cfs, allowable spread = 8 ft, S_x = 0.0208 ft/ft, Inlet depression = 2 in, Standard length increment =2 ft, W = 2 ft, Curb height = 6 in, slot height = 5 in.

Step 1: *Determine the allowable depth of ponding (d) and enter in Col. 30. This is the depth above the undepressed gutter line to the water surface associated with the allowable spread and should be at least 1 inch below the top of curb.*

The depth to 1 inch below the top of curb = 6 - 1 = 5 in (0.42 ft).

The depth of allowable ponding = $T(S_x)$

$T(S_x) = 8(0.0208) = 0.17$ ft

Depth of ponding is less than 1 inch below the top of curb (0.34<0.42)

Step 2: *Determine the height of the curb inlet opening (h) and enter in Col. 31. Calculate the ratio of d/h and enter in Col. 32.*

If $\frac{d}{h}<1.2$, the inlet is in weir control

If $\frac{d}{h}>1.2$, the inlet is transitioning to orifice control and design would proceed to Step 4

$\frac{d}{h}<1.2, \quad \frac{4}{5}=0.80$

0.80<1.2, therefore proceed to Step 3

Step 3: *Compute the required length (L_R) when the inlet is in weir flow by rearranging Equation 9.10 as follows and enter in Col. 25, then proceed to Step 5.*

$$L_R = \frac{Q}{C_w d^{1.5}} - 1.8W$$

$$= \frac{3}{2.3(0.34)^{1.5}} - 1.8(2)$$

$$= 2.97 \text{ ft}$$

Step 4: *Compute the required length* (L_R) *when the inlet is in orifice flow by rearranging Equation 9.12 as follows and enter in Col. 25, then proceed to Step 5.*

$$L_R = \frac{Q}{C_o d\sqrt{2gh}}$$

Step 5: *Select a standard inlet length (L) that is greater than the required length (L_R).*

Using a factor of safety of 2, the required length (L_R) is 5.95 ft. Use an actual inlet length (L) of 6 ft.

Step 6: *If the area behind the inlet is prone to flooding or there is the potential for property damage, a check storm intensity of i = 6.5 in/hr will be used to evaluate all inlets down to the sag inlet in question. If the inlet can handle the check storm without flooding then the previous design need not be changed. However, if there is flooding, it may be necessary to double the inlet size. Refer to Table 9-1.*

9.5.4 Grate in Sag Procedure

Step 1: *Choose a grate and determine standard dimensions to use as a basis for calculations. These dimensions usually include open area and perimeter.*

Step 2: *Determine an allowable ponding depth (d) for the inlet location. If used in a median ditch, the depth should be the medium depth minus a freeboard or the height of the backup berm. The designer should consider the available depth when evaluating median ditches for roads in superelevation.*

Step 3: *Determine the capacity of a grate inlet operating in weir control using Appendices 9C-12 through 9C-16 or Equation 9.13. Under weir conditions, the grate perimeter controls the capacity. To account for clogging, assume one-half of the perimeter of the inlet is available.*

Step 4: *Determine the capacity of a grate inlet operating under orifice control using Appendices 9C-12 through 9C-16 or Equation 9.14. Under orifice conditions,*

REPORT OF

SUBSURFACE EXPLORATION
AND GEOTECHNICAL ENGINEERING ANALYSIS

MULBERRY PLACE
JAMES CITY COUNTY, VIRGINIA

FOR

ASSOCIATED DEVELOPERS, INC.

SEPTEMBER 11, 2000

ECS PROJECT NO. N4248

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

September 11, 2000

Mr. Henry H. Stephens
Associated Developers, Inc.
5300 Mercury Boulevard
PO Drawer 18, Parkview Station
Newport News, Virginia 23605

ECS Project No. N4248

Reference: Subsurface Exploration and Geotechnical Engineering Analysis
Mulberry Place
James City County, Virginia

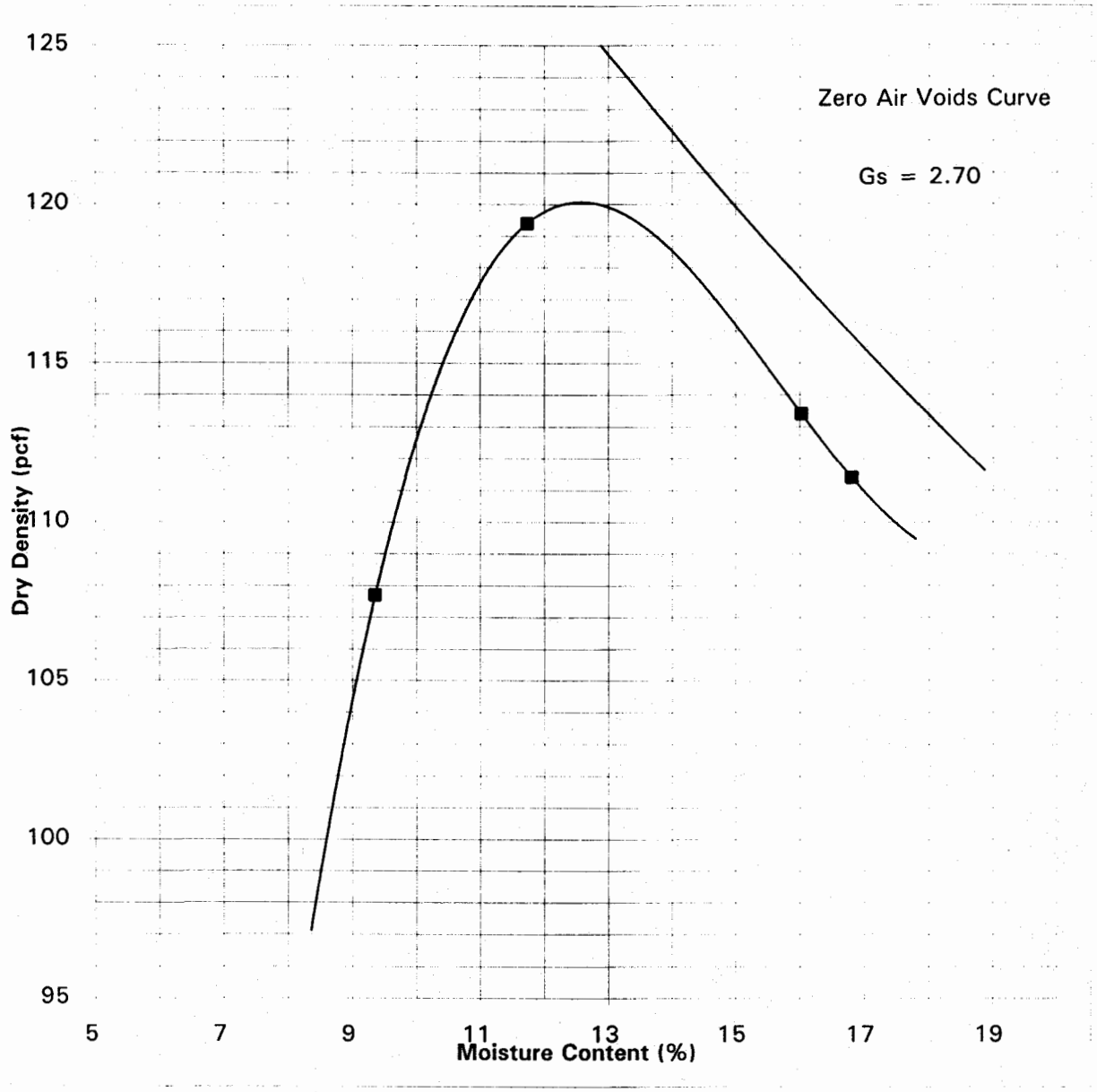
Dear Mr. Stephens:

Engineering Consulting Services, Ltd. has completed a subsurface exploration and engineering analysis for the roadways within Mulberry Place in James City County, Virginia. The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop soils related engineering recommendations to guide design and construction of the subdivision roadways in accordance with VDOT design guidelines. Information to be used in the design of the stormwater management pond is also included. The field exploration was conducted between July 21 and 28, 2000, by performing twelve (12) soil test borings to depths of 10 to 20 feet below existing site grades and collecting eleven (11) bulk soil samples from the proposed pavement subgrade elevation. The bulk samples were collected from below design pavement subgrade elevations at various depths between 0 to 7.5 feet below existing site grades, depending on the existing surface grade. The bulk samples were subjected to California Bearing Ratio (CBR) testing for use in the pavement design. Boring locations are illustrated on the attached boring location diagram.

Field Exploration Procedures

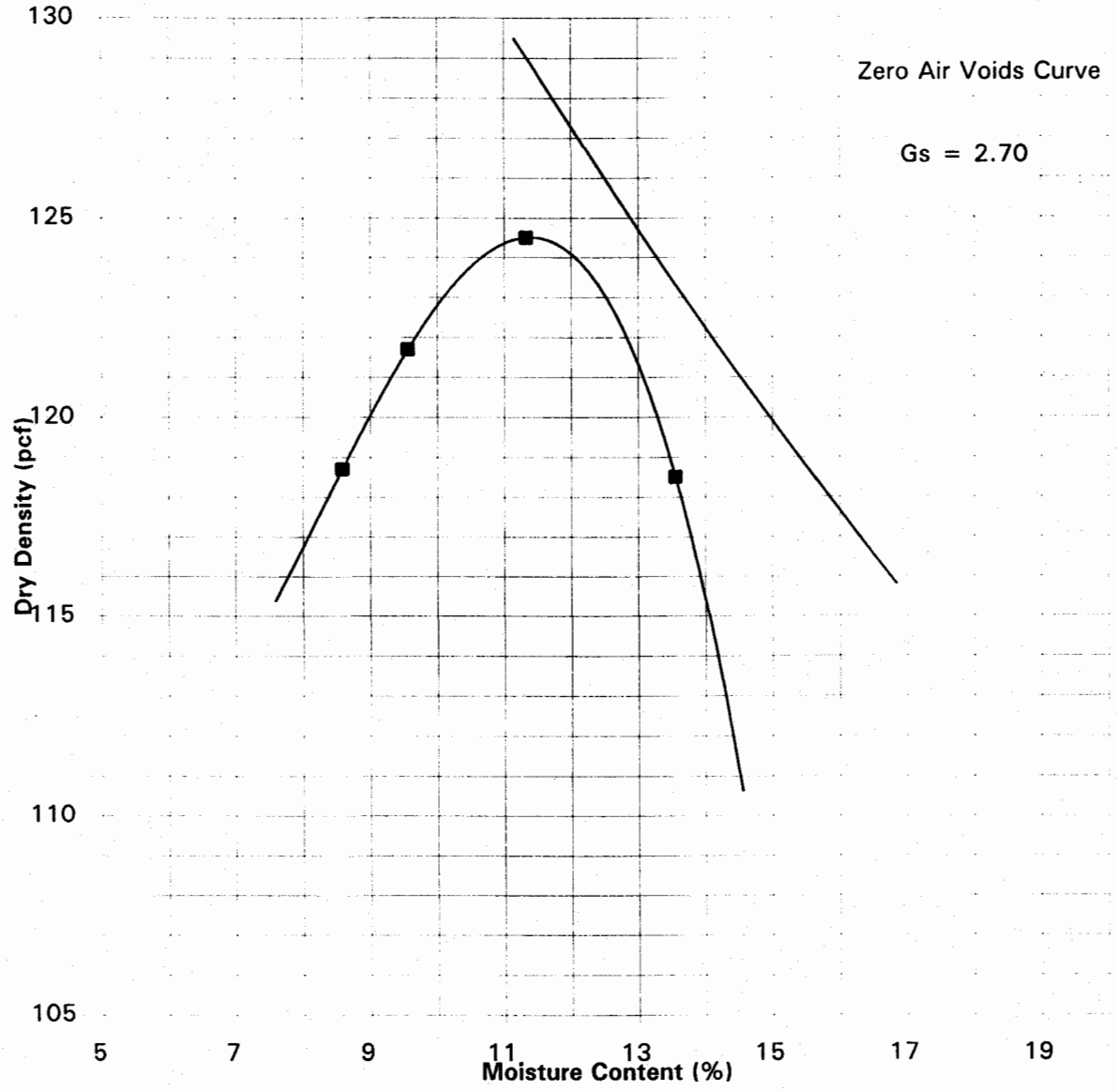
The subsurface soils were observed by performing twelve (12) soil test borings to depths of 10 to 20 feet. The borings were performed with a truck-mounted drill rig. During drilling operations, the drill crew recorded the standard penetration test results (blows per foot) and maintained a log

108 Ingram Road, Unit 1, Williamsburg, Virginia 23185 • (757) 229-6677 • Fax (757) 229-9978
Offices: Richmond, VA • Chesapeake, VA • Washington, D.C. • Williamsburg, VA • Roanoke, VA • Fredericksburg, VA • Danville, VA • Winchester, VA
Aberdeen, MD • Baltimore, MD • Frederick, MD • Research Triangle Park, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC • Greenville, SC • Atlanta, GA



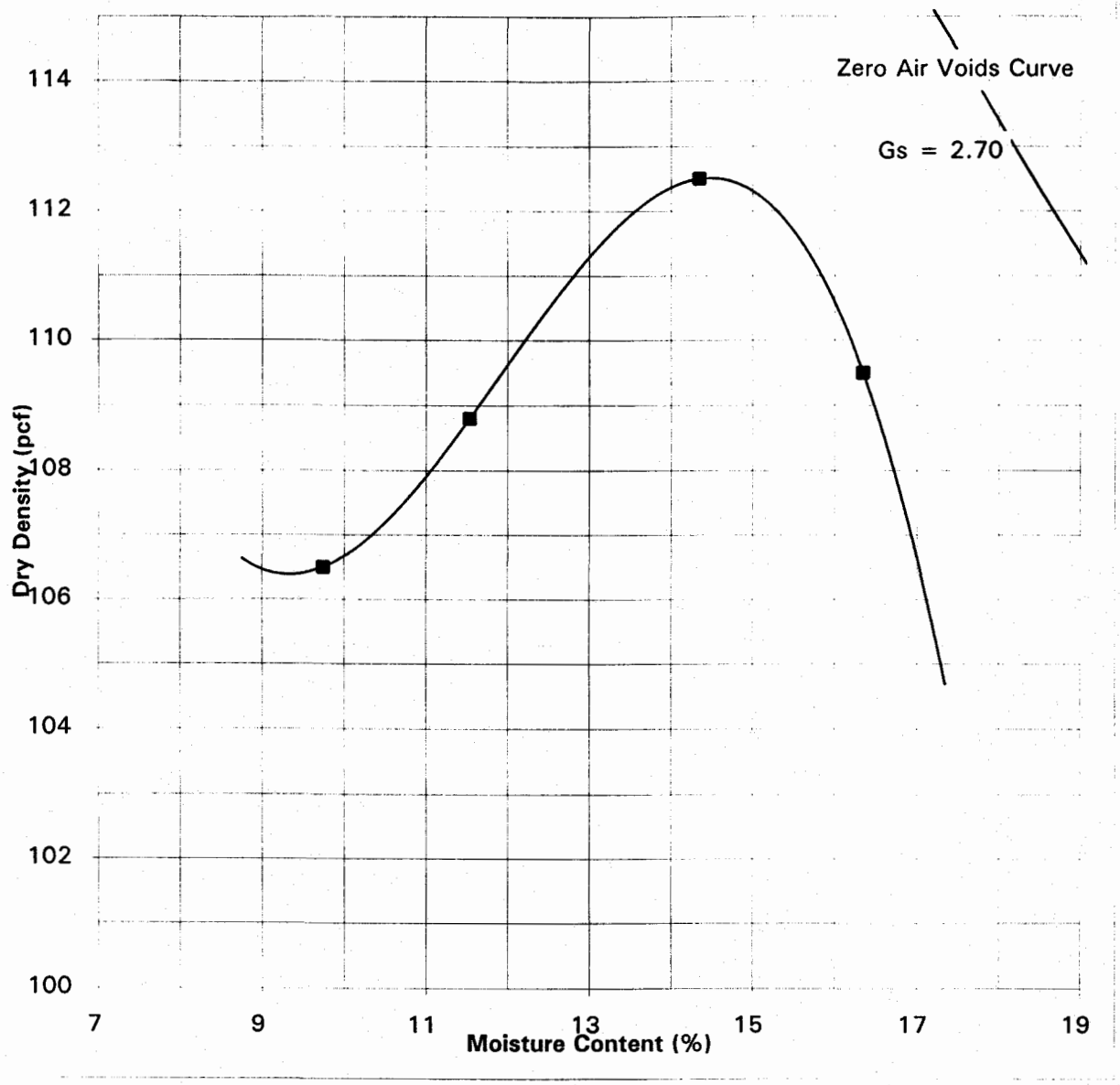
Sample No.	S-9	Natural Moisture Content	14.3
Street		Percent Passing No. 200 Sieve	44.6
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	120.0
Plasticity Index (P	N/A	Optimum Moisture Content (%)	12.6
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	120.0
Description	Orangish Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	12.6
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



Sample No.	S-10	Natural Moisture Content	10.0
Street		Percent Passing No. 200 Sieve	35.3
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	124.5
Plasticity Index (P	N/A	Optimum Moisture Content (%)	11.4
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	124.5
Description	Brown, Moist, Silty Fine SAND	Corr. Optimum Moisture Content (	11.4
Classification	SM	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



Sample No.	S-11	Natural Moisture Content	7.6
Street		Percent Passing No. 200 Sieve	41.2
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	112.5
Plasticity Index (P	N/A	Optimum Moisture Content (%)	14.5
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	112.5
Description	Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	14.5
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place

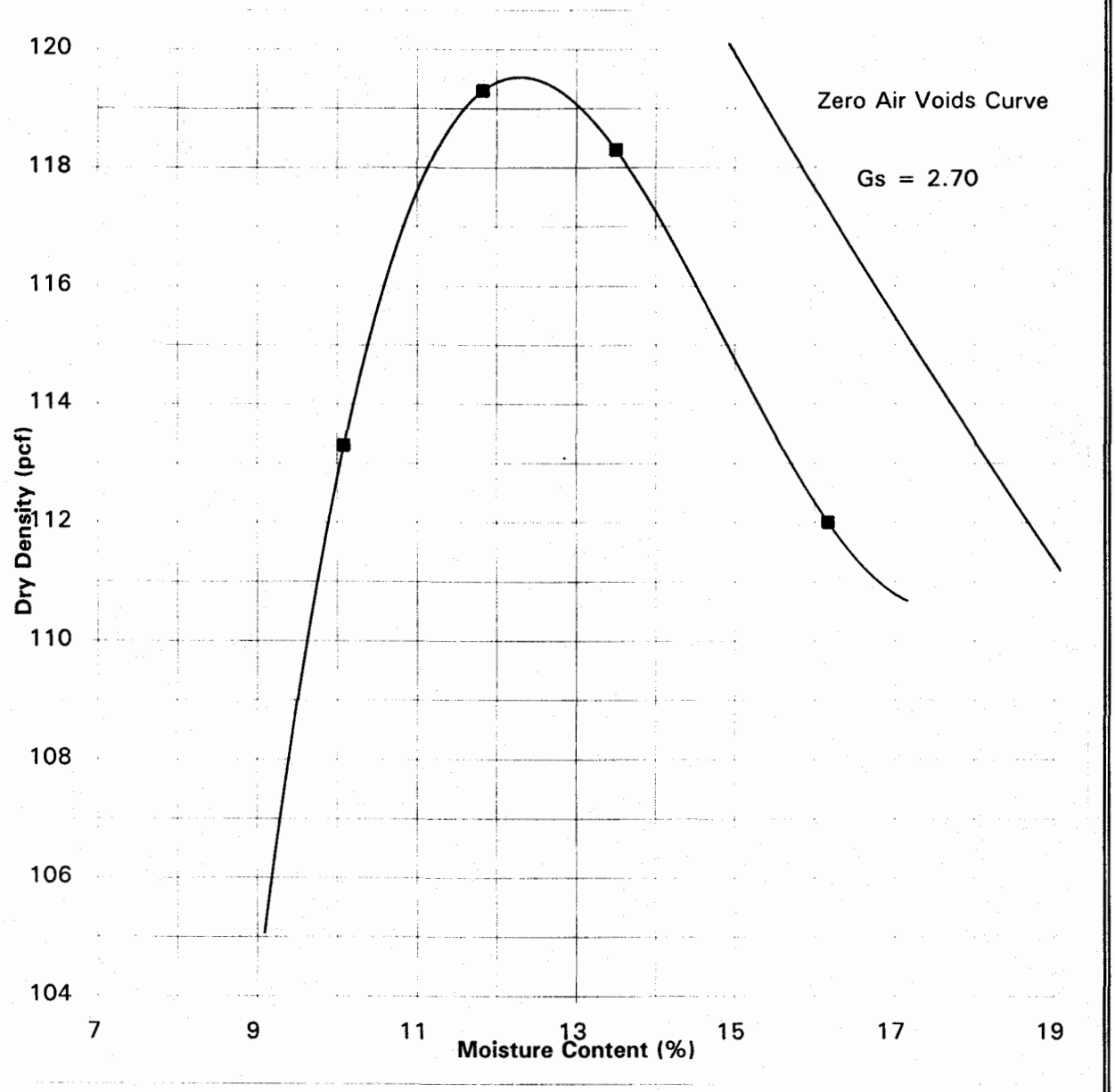
Project No.: N4248

Date: 07/28/00

Engineering Consulting Services, Ltd

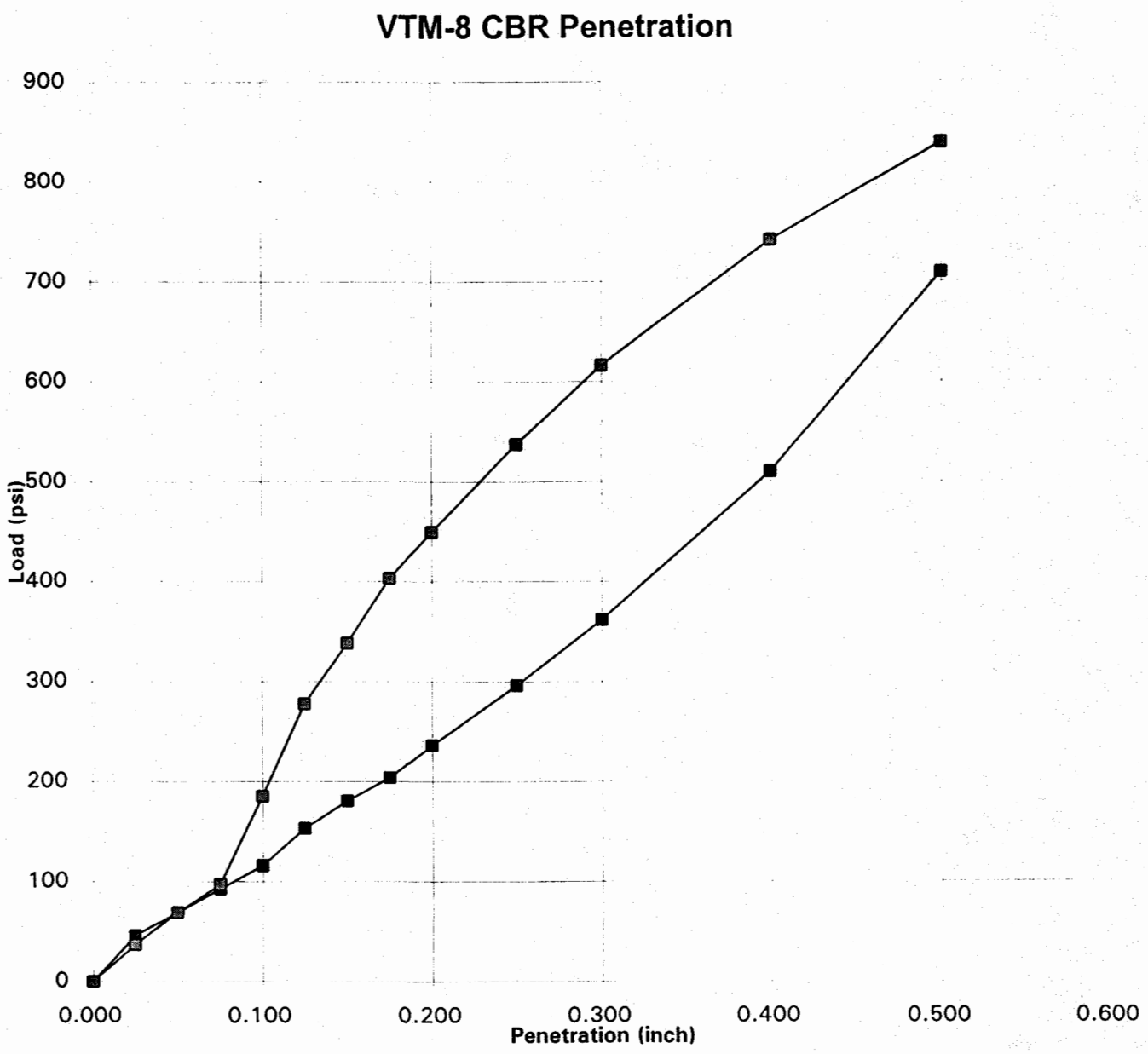
Richmond, Virginia

Moisture Density Relationship Curve



Sample No.	S-Pond	Natural Moisture Content	10.0
Street		Percent Passing No. 200 Sieve	28.0
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	119.5
Plasticity Index (P	N/A	Optimum Moisture Content (%)	12.4
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	119.5
Description	Brown, Moist, Silty Fine SAND / Trace Organics	Corr. Optimum Moisture Content (	12.4
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



Sample No.:	CBR-1	Street:	0
Description:	Brown, Moist, Silty Fine Sandy CLAY	Station No.:	0
Classification:	CL	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	117.3			
Opt. Moisture Content (%)	11.7	Corrected CBR @ 0.1"	18.5	11.6
Natural Moisture Content	17.1	Corrected CBR @ 0.15"	26.9	11.1
Liquid Limit (LL)		Corrected CBR @ 0.2"	26.4	12.1
Plastic Limit (PL)		Dry Density as Molded	115.2	115.2
Plasticity Index (PI)		Molded Moisture Content	17.2	17.2
Liquidity Index (LI)		Percent of Maximum Density	98.2	98.2
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		5.5
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	58.6			

Project: Mulberry Place
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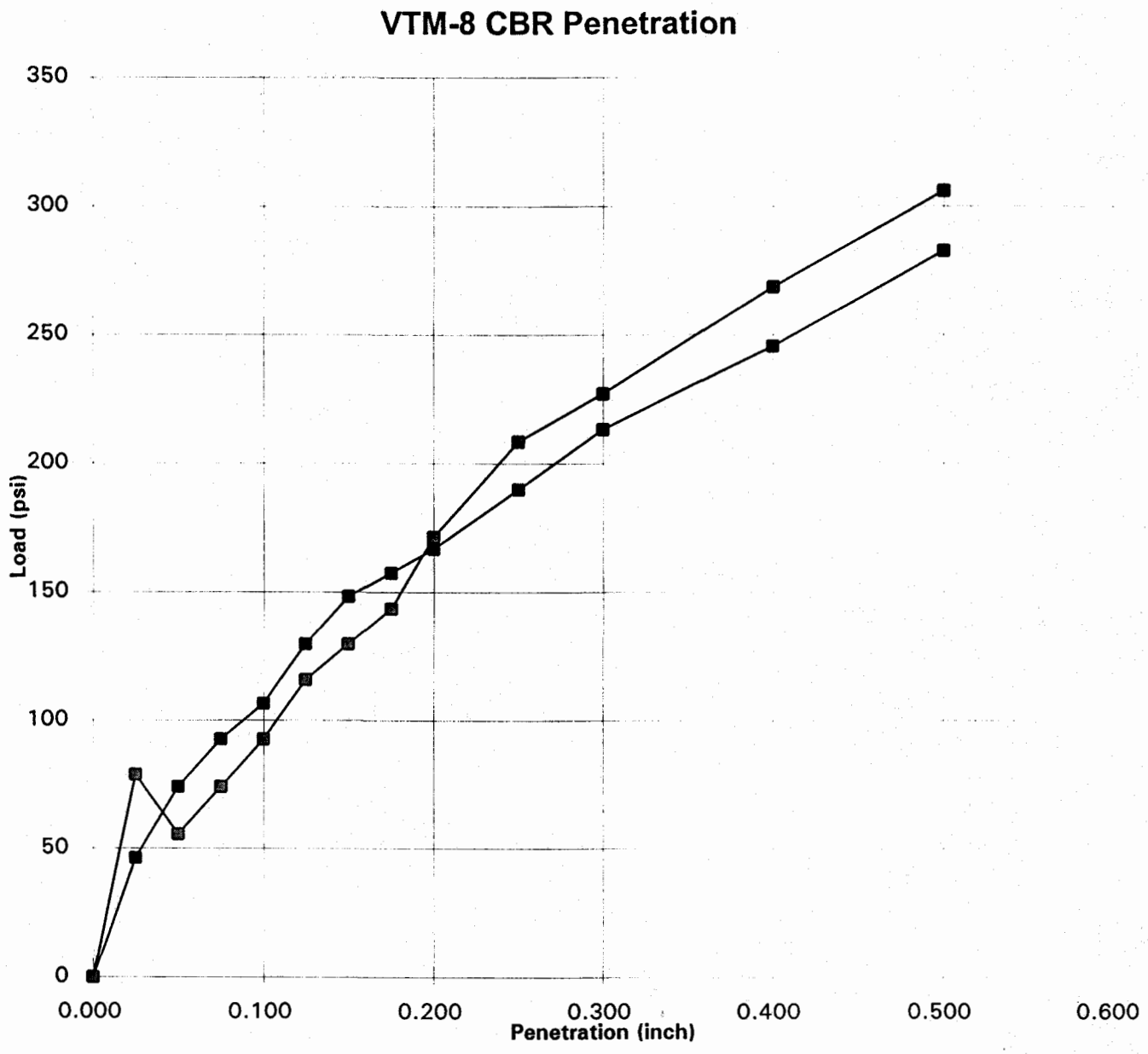

Sample No.:	CBR-2	Street:	0
Description:	Orangish Brown, Moist, Silty Fine Sa	Station No.:	0
Classification:	CL	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	108.2			
Opt. Moisture Content (%)	17.8	Corrected CBR @ 0.1"	9.3	10.7
Natural Moisture Content	23.3	Corrected CBR @ 0.15"	7.4	7.4
Liquid Limit (LL)		Corrected CBR @ 0.2"	7.9	6.0
Plastic Limit (PL)		Dry Density as Molded	106.0	106.0
Plasticity Index (PI)		Molded Moisture Content	23.3	23.3
Liquidity Index (LI)		Percent of Maximum Density	98.0	98.0
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		5.5
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	60.7			

Project: Mulberry Place
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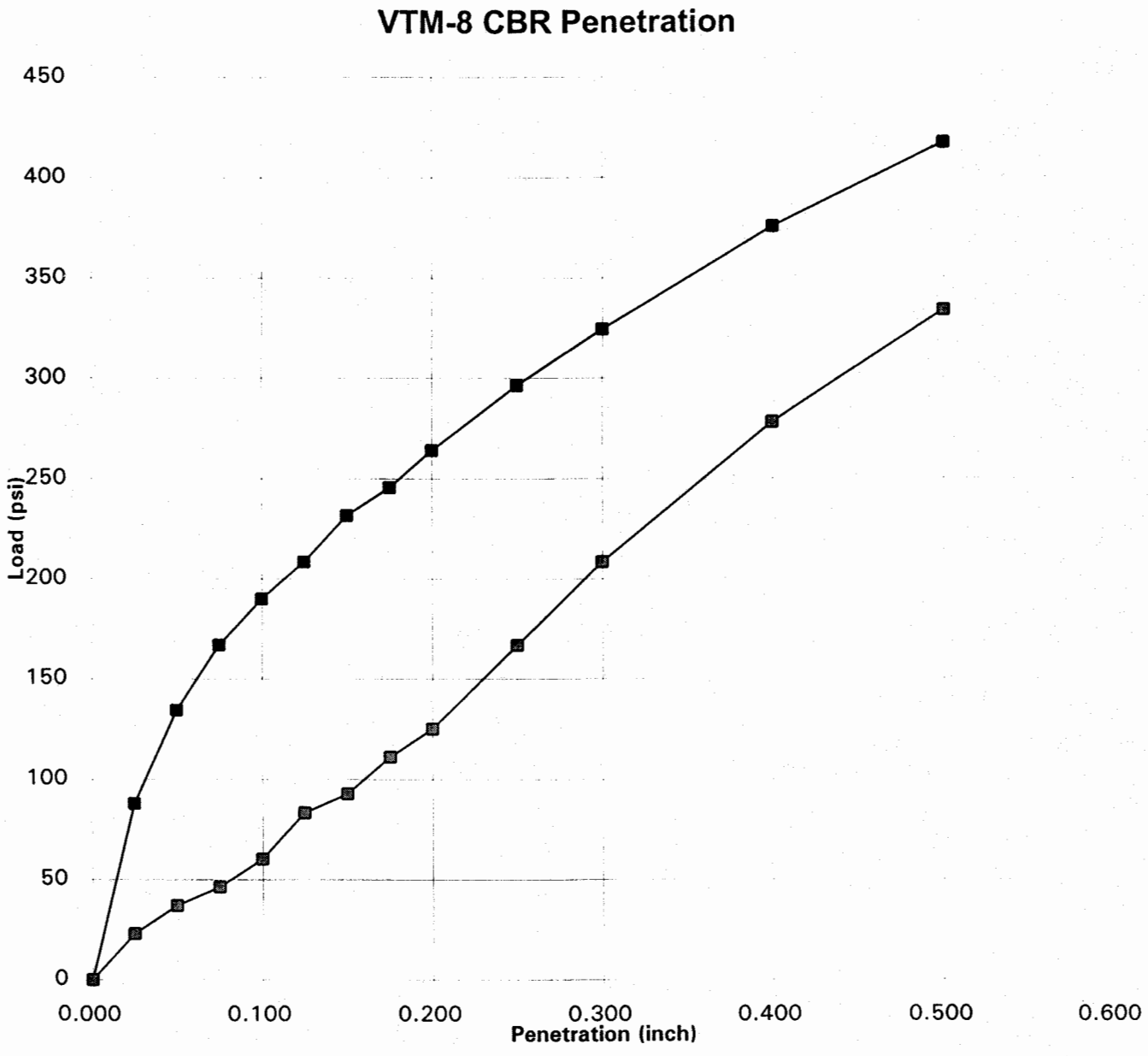

Sample No.:	CBR-3	Street:	0
Description:	Orangish Brown, Moist, Clayey and	Station No.:	0
Classification:	SC	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	121.4			
Opt. Moisture Content (%)	12.8	Corrected CBR @ 0.1"	6.0	19.0
Natural Moisture Content	12.1	Corrected CBR @ 0.15"	5.6	9.7
Liquid Limit (LL)		Corrected CBR @ 0.2"	6.5	7.4
Plastic Limit (PL)		Dry Density as Molded	121.0	121.0
Plasticity Index (PI)		Molded Moisture Content	12.2	12.2
Liquidity Index (LI)		Percent of Maximum Density	99.7	99.7
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-0.6
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	42.0			

Project: Mulberry Place
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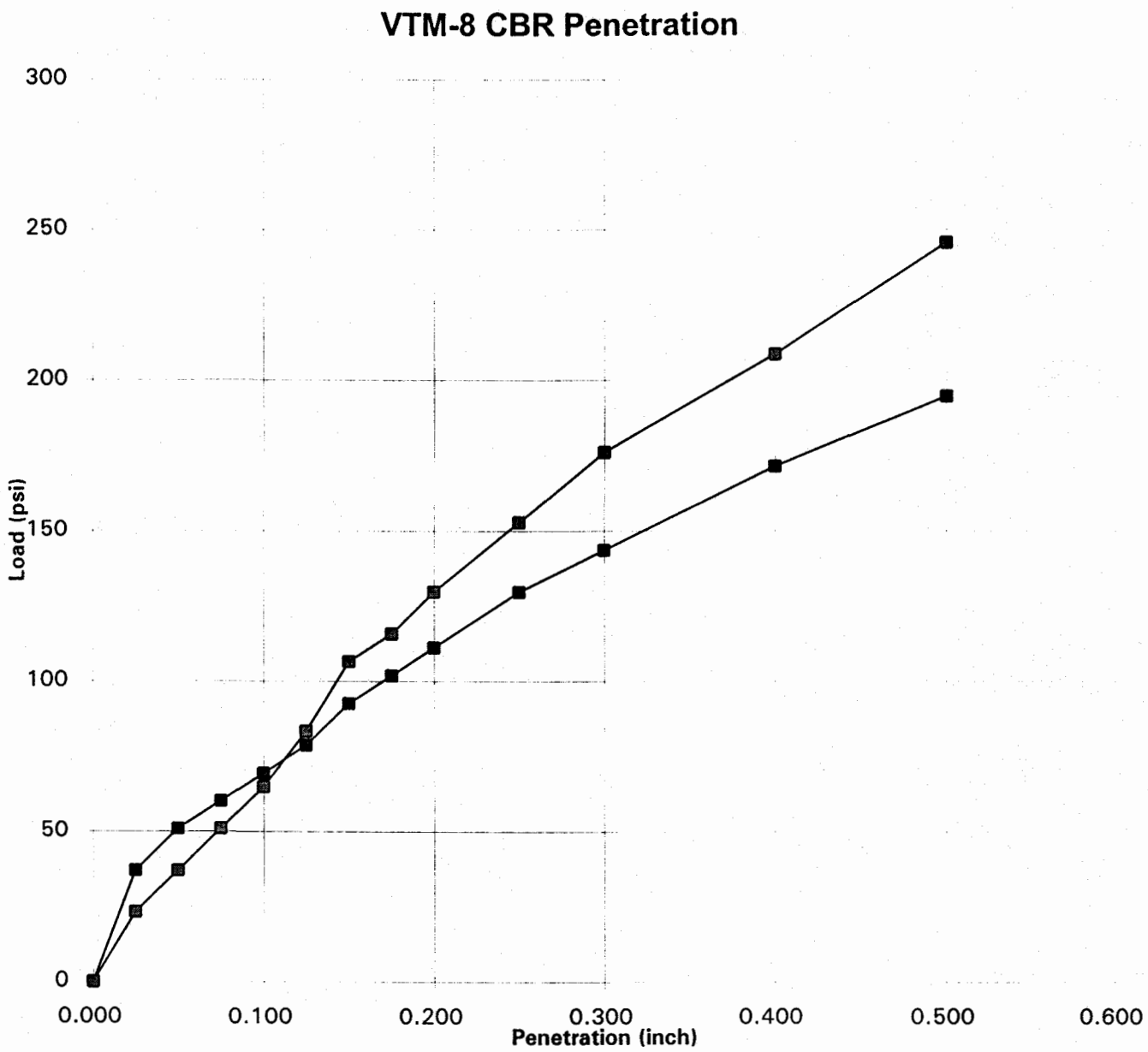
Chesapeake, Virginia
California Bearing Ratio Curves



Sample No.:	CBR-4	Street:	0
Description:	Tannish Brown, Moist, Silty Fine San	Station No.:	0
Classification:	CL	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	112.7			
Opt. Moisture Content (%)	15.4	Corrected CBR @ 0.1"	6.5	7.0
Natural Moisture Content	18.3	Corrected CBR @ 0.15"	7.0	4.2
Liquid Limit (LL)		Corrected CBR @ 0.2"	6.5	4.2
Plastic Limit (PL)		Dry Density as Molded	110.5	110.5
Plasticity Index (PI)		Molded Moisture Content	18.4	18.4
Liquidity Index (LI)		Percent of Maximum Density	98.0	98.0
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		3.0
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	51.1			

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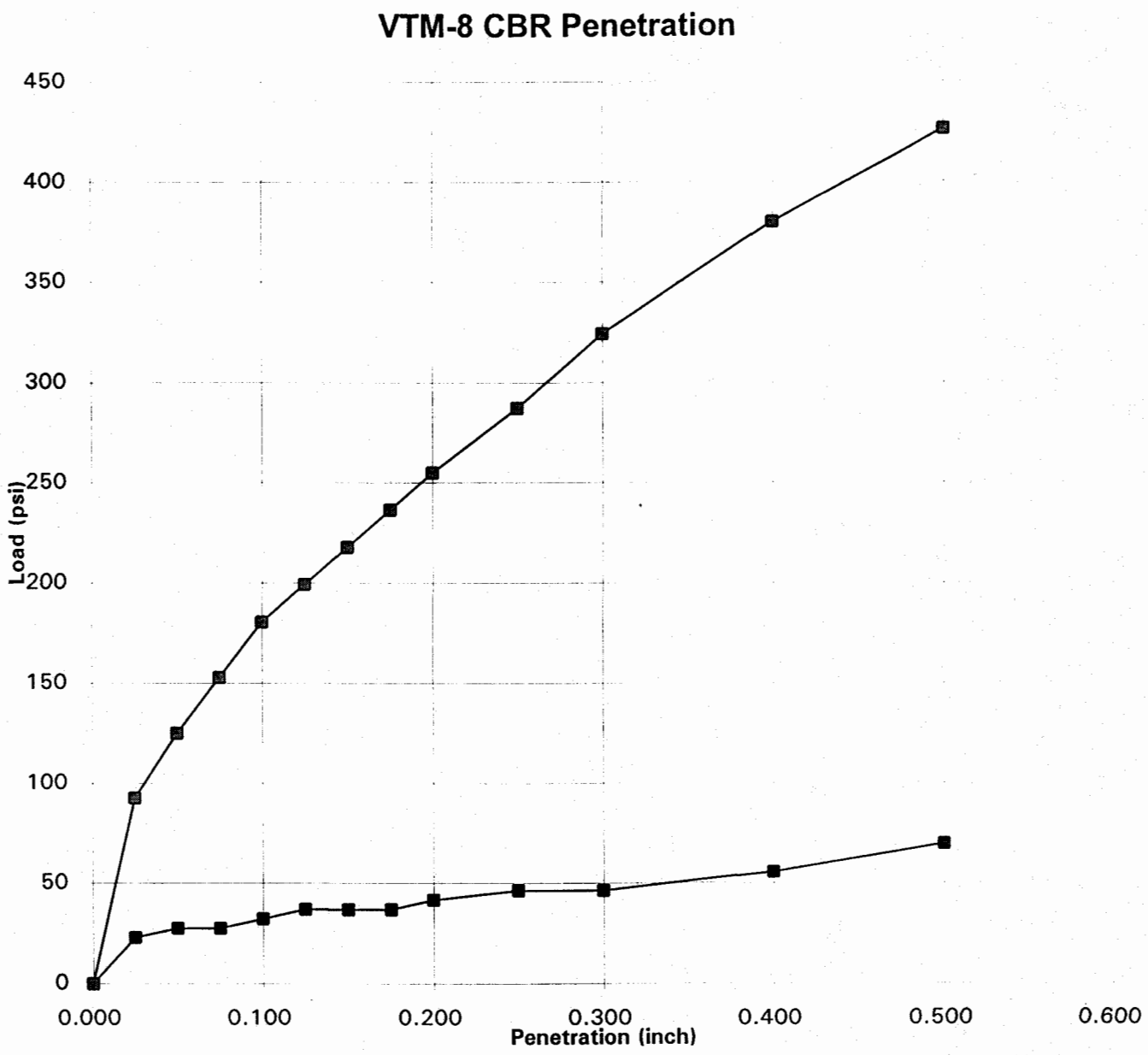

Sample No.:	CBR-5	Street:	0
Description:	Brown, Moist, Clayey and Silty Fine	Station No.:	0
Classification:	SC	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	118.2			
Opt. Moisture Content (%)	12.3	Corrected CBR @ 0.1"	18.1	3.2
Natural Moisture Content	9.3	Corrected CBR @ 0.15"	9.3	0.9
Liquid Limit (LL)		Corrected CBR @ 0.2"	7.4	0.9
Plastic Limit (PL)		Dry Density as Molded	114.8	114.8
Plasticity Index (PI)		Molded Moisture Content	9.4	9.4
Liquidity Index (LI)		Percent of Maximum Density	97.1	97.1
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-2.9
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	39.9			

Project: Mulberry Place
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Chesapeake, Virginia
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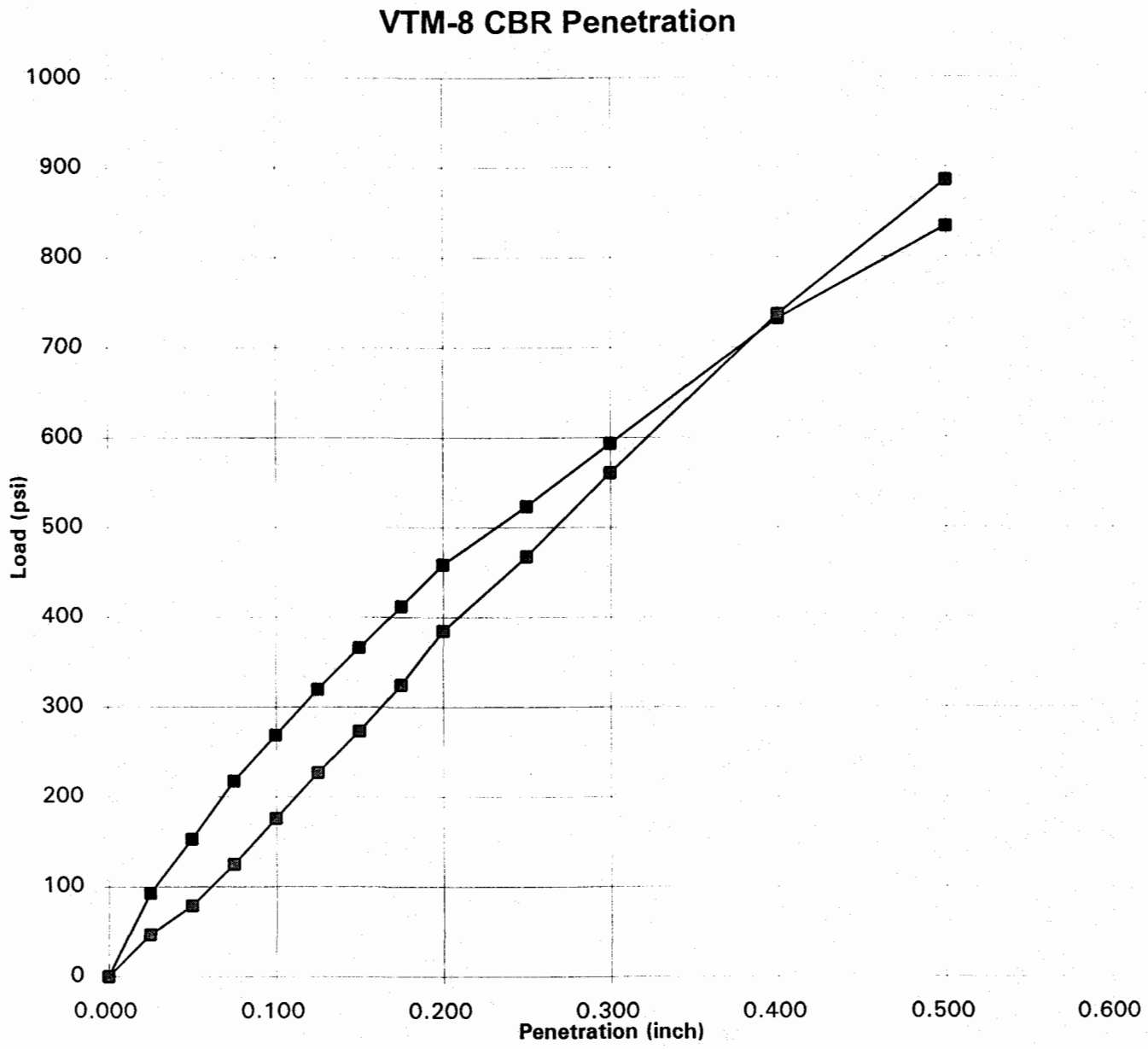

Sample No.:	CBR-6	Street:	0
Description:	Tannish Brown, Moist, Clayey and Sil	Station No.:	0
Classification:	SC	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	121.0			
Opt. Moisture Content (%)	12.1	Corrected CBR @ 0.1"	17.6	26.9
Natural Moisture Content	8.7	Corrected CBR @ 0.15"	19.5	21.3
Liquid Limit (LL)		Corrected CBR @ 0.2"	20.9	19.0
Plastic Limit (PL)		Dry Density as Molded	124.0	124.0
Plasticity Index (PI)		Molded Moisture Content	8.7	8.7
Liquidity Index (LI)		Percent of Maximum Density	102.5	102.5
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-3.4
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	39.2			

Project: Mulberry Place
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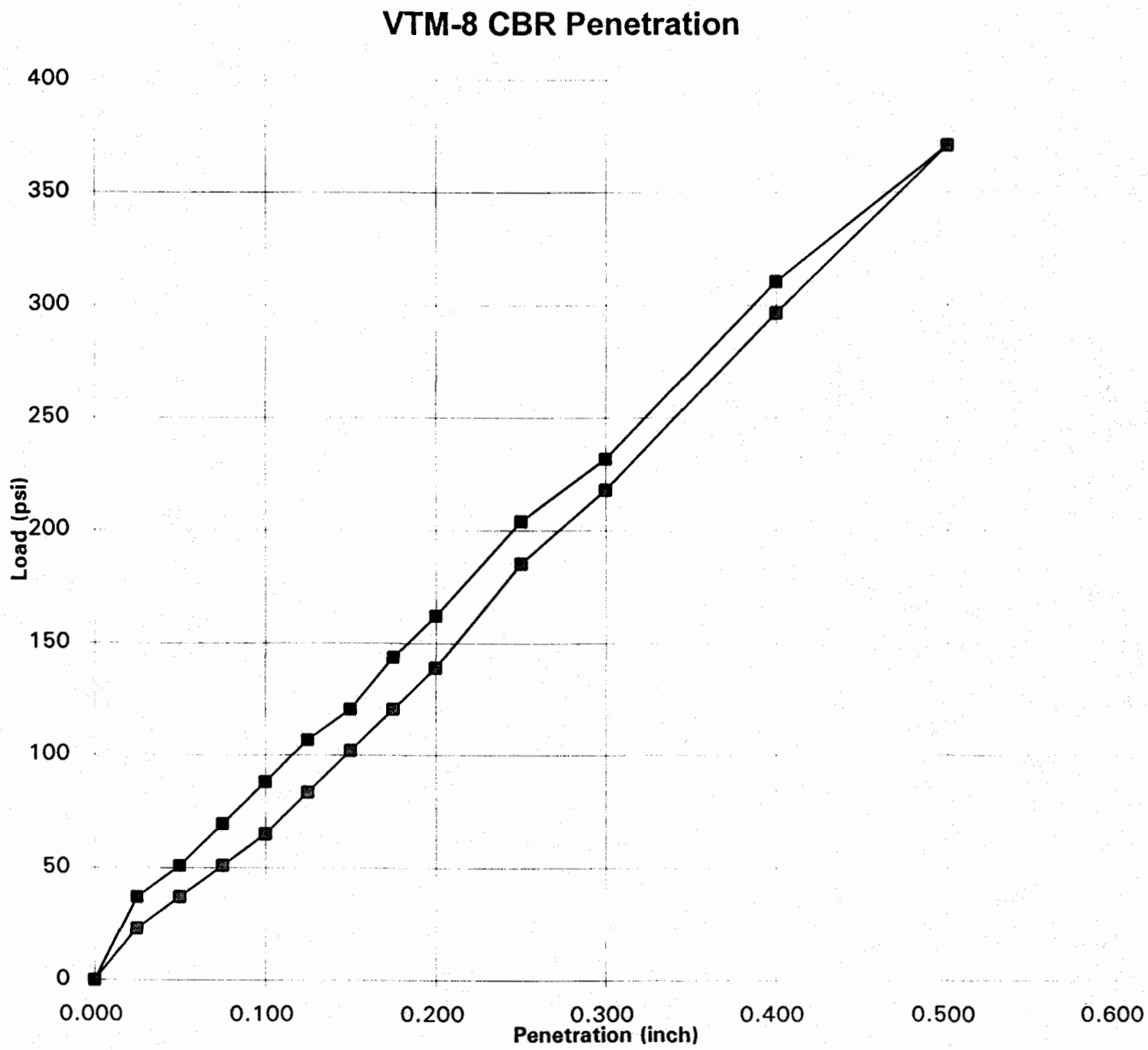

Sample No.:	CBR-7	Street:	0
Description:	Brown, Moist, Clayey and Silty Fine	Station No.:	0
Classification:	SC	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	119.9			
Opt. Moisture Content (%)	13.7	Corrected CBR @ 0.1"	6.5	8.8
Natural Moisture Content	8.3	Corrected CBR @ 0.15"	6.5	7.0
Liquid Limit (LL)		Corrected CBR @ 0.2"	7.4	7.4
Plastic Limit (PL)		Dry Density as Molded	123.4	123.4
Plasticity Index (PI)		Molded Moisture Content	8.3	8.3
Liquidity Index (LI)		Percent of Maximum Density	102.9	102.9
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-5.4
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	38.2			

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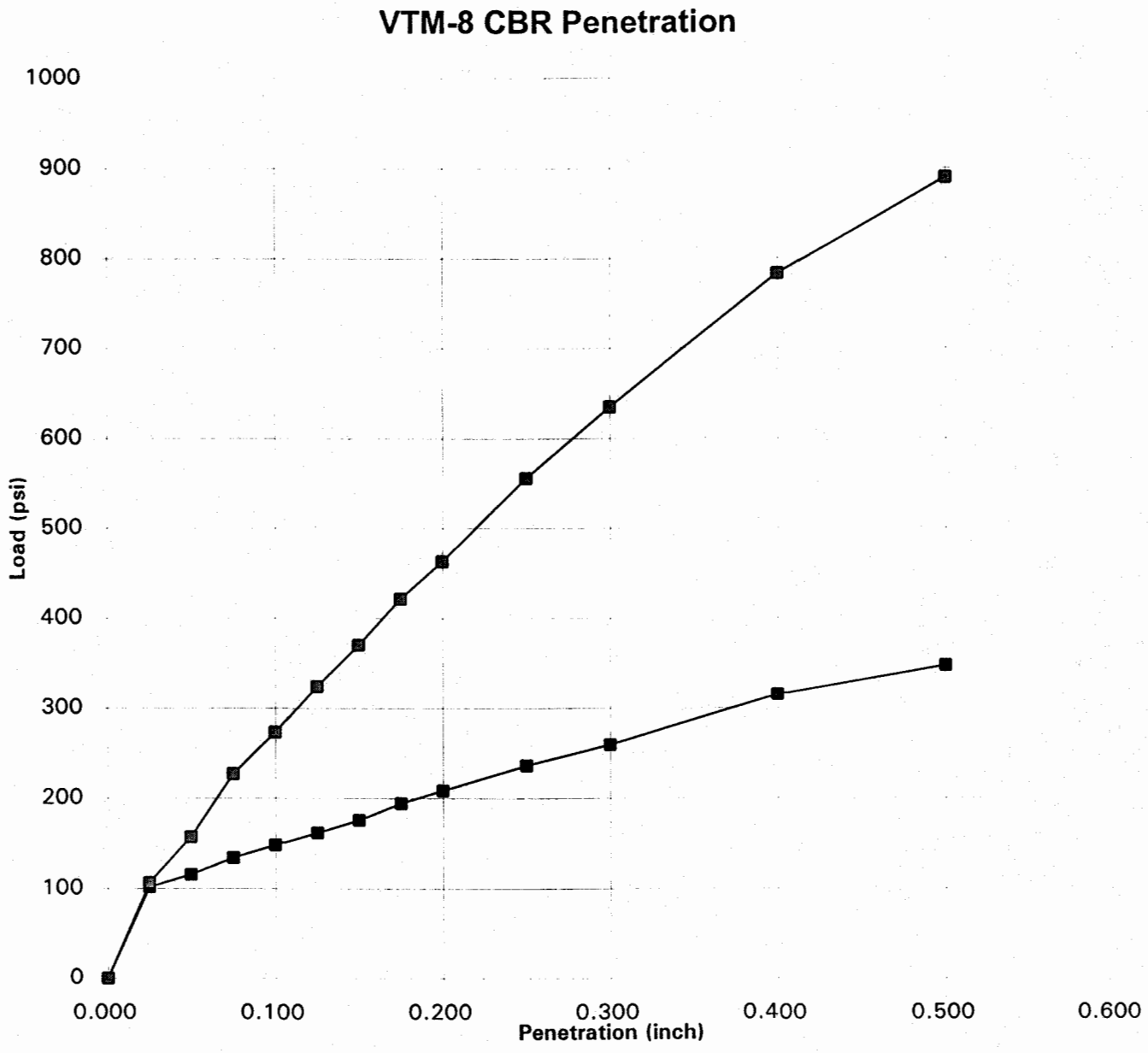
Chesapeake, Virginia
California Bearing Ratio Curves



Sample No.:	CBR-8	Street:	0
Description:	Brown, Moist, Silty Fine SAND/ Trac	Station No.:	0
Classification:	SM	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	116.2			
Opt. Moisture Content (%)	10.8	Corrected CBR @ 0.1"	27.3	14.8
Natural Moisture Content	13.0	Corrected CBR @ 0.15"	21.3	6.0
Liquid Limit (LL)		Corrected CBR @ 0.2"	19.0	6.0
Plastic Limit (PL)		Dry Density as Molded	114.2	114.2
Plasticity Index (PI)		Molded Moisture Content	12.9	12.9
Liquidity Index (LI)		Percent of Maximum Density	98.3	98.3
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		2.1
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	36.4			

Project: Mulberry Place
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Chesapeake, Virginia
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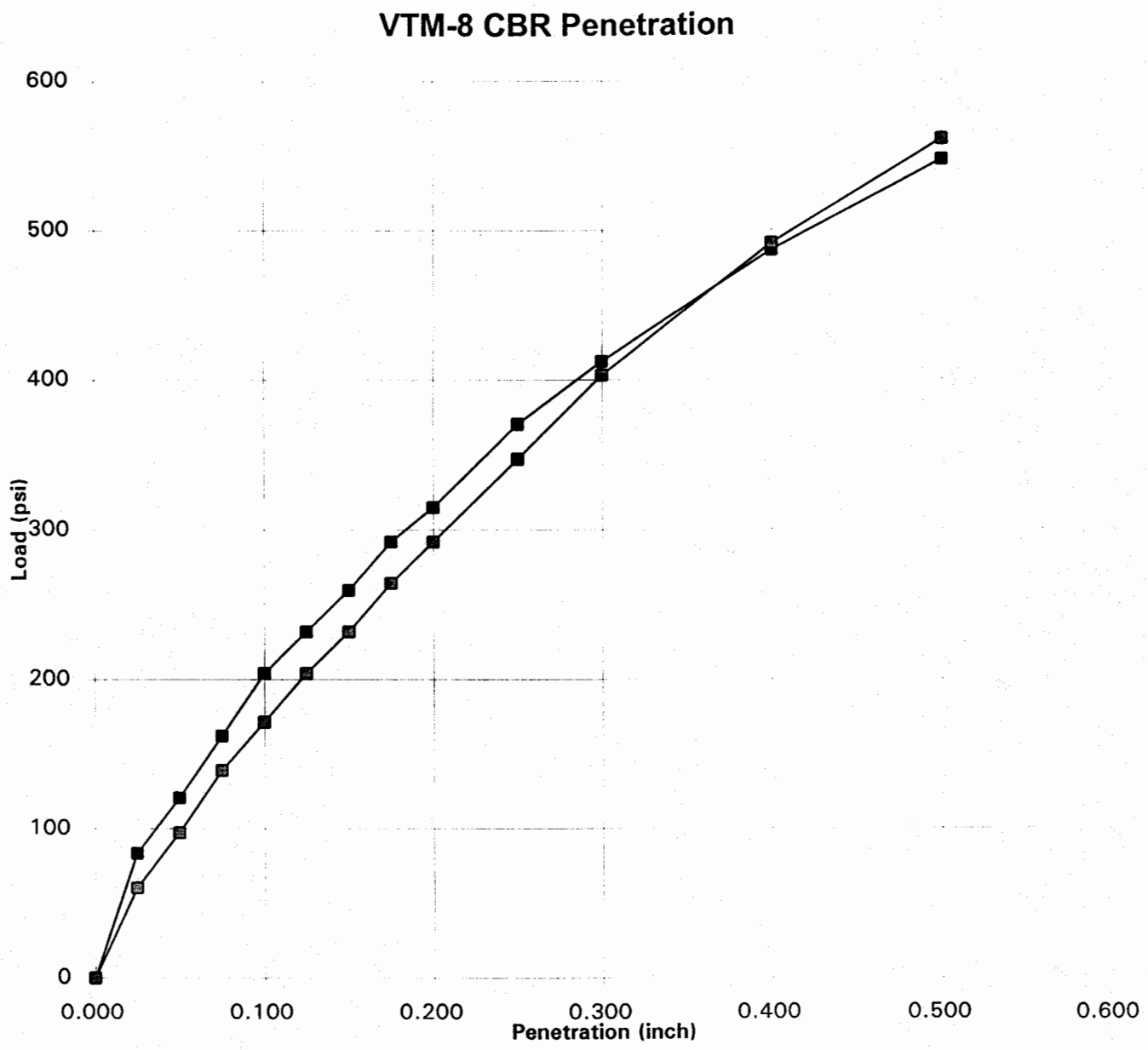

Sample No.:	CBR-9	Street:	0
Description:	Orangish Brown, Moist, Clayey and	Station No.:	0
Classification:	SC	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	120.0			
Opt. Moisture Content (%)	12.6	Corrected CBR @ 0.1"	17.1	20.4
Natural Moisture Content	14.3	Corrected CBR @ 0.15"	13.4	13.9
Liquid Limit (LL)		Corrected CBR @ 0.2"	12.1	11.1
Plastic Limit (PL)		Dry Density as Molded	118.5	118.5
Plasticity Index (PI)		Molded Moisture Content	14.3	14.3
Liquidity Index (LI)		Percent of Maximum Density	98.8	98.8
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		1.7
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	44.6			

Project: Mulberry Place
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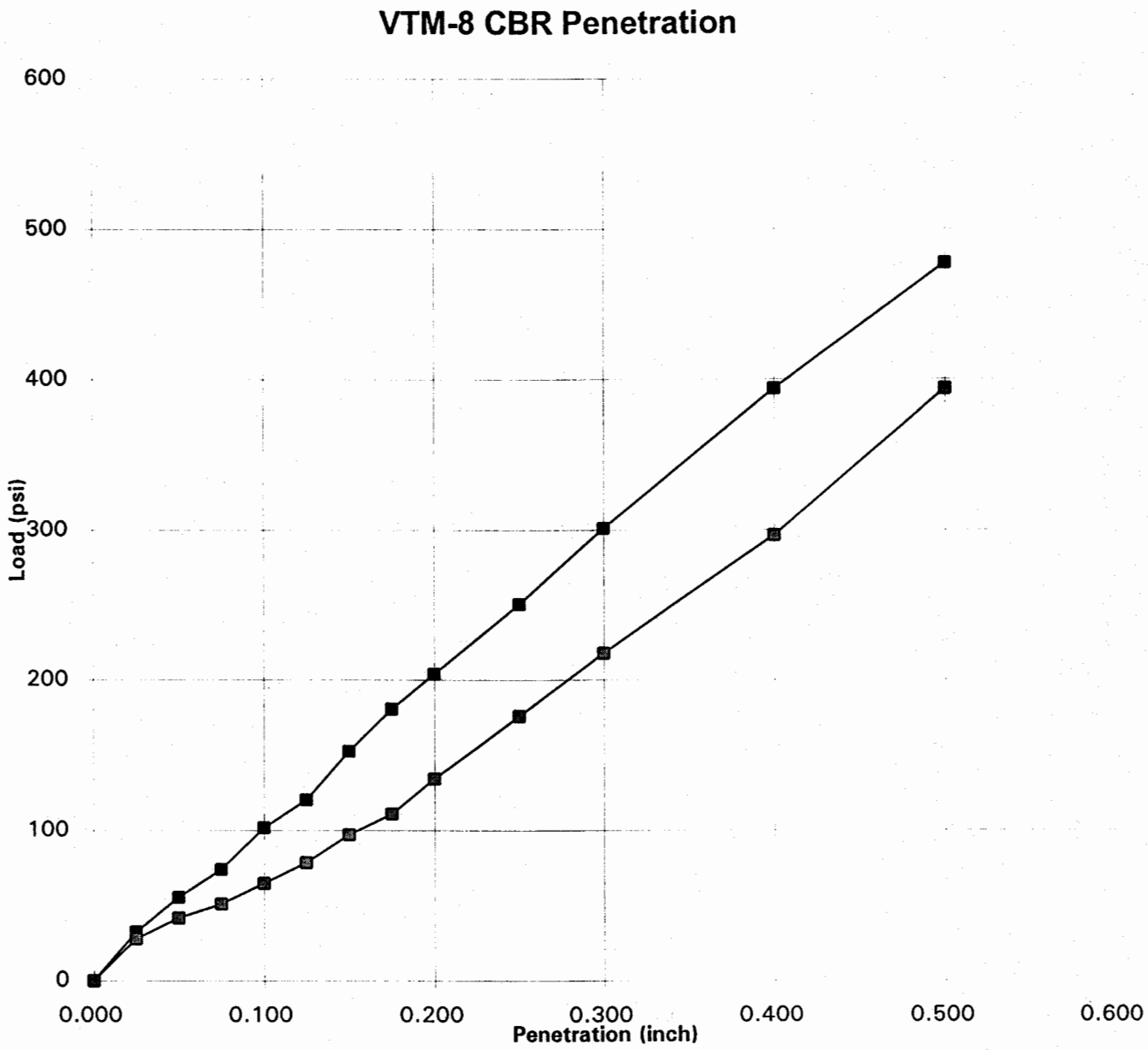

Sample No.:	CBR-10	Street:	0
Description:	Brown, Moist, Silty Fine SAND	Station No.:	0
Classification:	SM	Remark:	

			Unsoaked	Soaked
Maximum Dry Density (pcf)	124.5			
Opt. Moisture Content (%)	11.4	Corrected CBR @ 0.1"	6.5	10.2
Natural Moisture Content	10.0	Corrected CBR @ 0.15"	5.6	9.7
Liquid Limit (LL)		Corrected CBR @ 0.2"	7.0	10.2
Plastic Limit (PL)		Dry Density as Molded	124.5	124.5
Plasticity Index (PI)		Molded Moisture Content	9.9	9.9
Liquidity Index (LI)		Percent of Maximum Density	100.0	100.0
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-1.5
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	35.3			

Project: Mulberry Place
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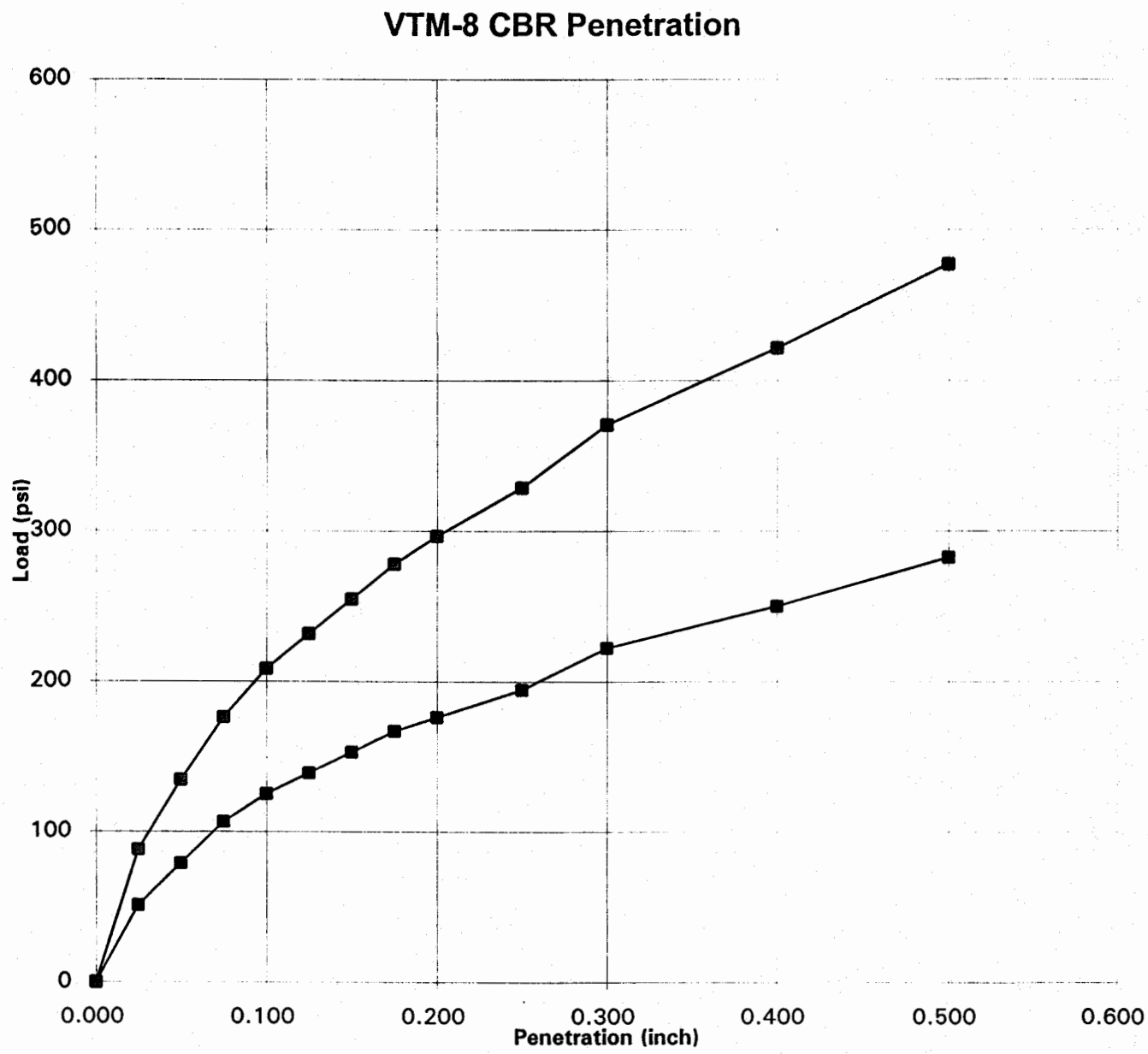
Chesapeake, Virginia
California Bearing Ratio Curves



Sample No.: CBR-11	Street: 0
Description: Brown, Moist, Clayey and Silty Fine	Station No.: 0
Classification: SC	Remark:

			Unsoaked	Soaked
Maximum Dry Density (pcf)	112.5			
Opt. Moisture Content (%)	14.5	Corrected CBR @ 0.1"	20.9	12.5
Natural Moisture Content	7.6	Corrected CBR @ 0.15"	12.0	7.4
Liquid Limit (LL)		Corrected CBR @ 0.2"	8.8	5.1
Plastic Limit (PL)		Dry Density as Molded	110.2	110.2
Plasticity Index (PI)		Molded Moisture Content	7.6	7.6
Liquidity Index (LI)		Percent of Maximum Density	98.0	98.0
Percent Retained 3/4" Sieve	0.0	Moisture Content +/- Opt		-6.9
Percent Retained No. 4 Sieve	0.0	Percent (%)Swell		
Percent Passing No.200 Sieve	41.2			

Project: Mulberry Place
Project No.: N4248
Date: 08/03/00

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Chesapeake, Virginia
California Bearing Ratio Curves

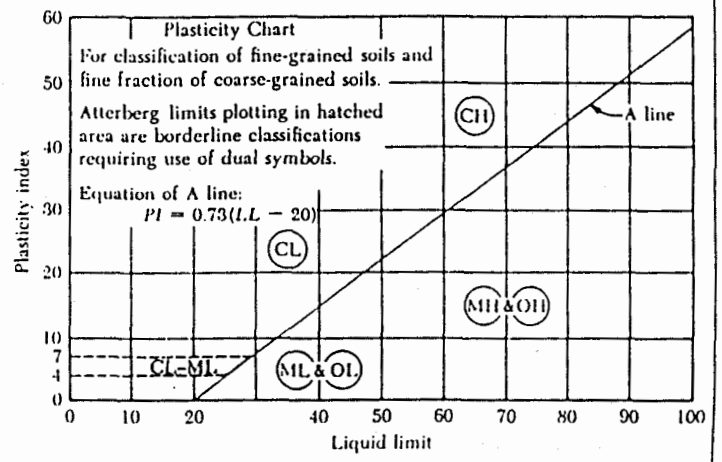
UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

Table Unified System of Classification

Major divisions			Group symbols	Typical names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils

Table (Continued)

	Classification criteria	
Classification on basis of percentage of fines Less than 5% pass No. 200 sieve: GW, GP, SW, SP More than 12% pass No. 200 sieve: GM, GC, SM, SC 5% to 12% pass No. 200 sieve: Borderline classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for GW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Atterberg limits plot above "A" line and plasticity index greater than 7	
	$C_u = D_{60}/D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for SW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Atterberg limits plot above "A" line and plasticity index greater than 7	



Visual-manual identification, see ASTM Designation D2488.

Reprinted from the Annual Book of ASTM Standards

Engineering Consulting Services, Ltd.

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS - Split Spoon Sampler
ST - Shelby Tube Sampler
RC - Rock Core; NX, BX, AX
DC - Dutch Cone Penetrometer
PA - Power Auger (no sample)
HSA - Hollow Stem Auger
PM - Pressuremeter
WS - Wash Sample
BS - Bulk Sample of Cuttings
RB - Rock Bit Drilling

Standard Penetration Test (SPT) refers to the blows per foot of a 140 lb hammer free falling 30 inches on a 2 in. O.D. split-spoon sampler, as specified in ASTM D-1586. The SPT blow count is commonly referred to as the N-value. Typically the split-spoon sampler is driven to depths of 18 to 24 inches. The SPT result, N-value, is commonly determined by summing the second and third 6-inch increments.

II. Correlation of Penetration Resistances to Soil Properties:

COHESIVE SOILS
(CLAY, SILT and COMBINATIONS)

CONSISTENCY	SPT, N (Blows/Foot)	UNDRAINED SHEAR STRENGTH C, (PSF)
VERY SOFT	< 2	<250
SOFT	3 - 5	250 - 500
MEDIUM STIFF	6 - 10	500 - 1000
STIFF	11 - 15	1000 - 2000
VERY STIFF	16- 30	2000 - 4000
HARD	> 31	> 4000

NON-COHESIVE SOILS
(SAND, GRAVEL, SILT and COMBINATIONS)

DENSITY	SPT, N (Blows/Foot)	RELATIVE DENSITY (%)
VERY LOOSE	< 5	0 – 15
LOOSE	6 – 10	16 – 35
MEDIUM DENSE	11 – 30	36 – 65
DENSE	31 – 50	66 – 85
VERY DENSE	51 – 80	86 – 98
EXTREMELY DENSE	> 81	99 - 100

[Particle Size Identification]:

- Boulders: 8 inch diameter or more
- Cobbles: 3 to 8 inch diameter
- Gravel:
  - Coarse: 1 to 3 inch
  - Medium: 1/2 to 1 inch
  - Fine: 1/4 to 1/2 inch
- Sand:
  - Coarse: 2.00 mm to 1/4 inch (diameter of pencil lead)
  - Medium: .42 mm to 2.00 mm (diameter of broom straw)
  - Fine: .074 mm to .42 mm (diameter of human hair)

III. Water Level Measurement Symbols:

WL - Water Level
WCI - Wet Cave In
WS - While Sampling
DCI - Dry Cave In
WD - While Drilling
BCR - Before Casing Removal
ACR - After Casing Removal

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

of the soils encountered in the sampler. Representative portions of each sample were sealed in glass jars and delivered to our Williamsburg laboratory for further visual classification and laboratory testing. Observations for groundwater were also made during drilling operations and recorded on the logs.

Subsurface Conditions

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parentheses following the soil descriptions on the hand auger boring logs. A brief explanation of the USCS and reference notes for boring logs are included herein. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in-situ, the transitions may be gradual.

In general, the subgrade soils consisted of erratic interbedded strata of Silty SAND (SM), Clayey SAND (SC, SC-CL) and Fine Sandy CLAY (CL) that extended to hand auger boring termination at 10 to 20 feet below existing site grades. More detailed subsurface conditions are provided on the enclosed soil test boring logs.

Groundwater was not encountered in any of the borings performed within the proposed roadways. Groundwater was encountered at the proposed location of the stormwater management pond at a depth of about 12 feet below existing surface grade. It should be noted that groundwater fluctuations due to seasonal and environmental conditions should be anticipated. The long-term groundwater levels are not expected to impact construction or design of the roadways. Perched groundwater trapped over a confining stratum (clay) could occur at lower elevations across the site.

Construction Recommendations

For the construction of new exterior pavements, we recommend any soft, unstable and/or unsuitable materials be removed from the pavement areas. The stripped surface should be proofrolled and carefully observed at the time of construction in order to aid in identifying any localized soft or unsuitable materials. Such materials should be removed prior to any fill placement or grading for the new residential roads. If site work is performed during the wetter winter months, we anticipate that cohesive and moisture-sensitive subgrade soils subjected to wet conditions and/or ponding water will become unstable and require undercuts and replacement with dryer, suitable material, or will require scarifying and recompaction. Ideally, site work should be performed during the dryer summer and early fall months to minimize potential undercuts due to moisture intrusion and facilitate compaction. Exposed subgrade soils should be

graded to drain surface moisture, should be protected from repeated construction heavy traffic and covered as soon as possible with the full design depth of the aggregate base course that is compacted in accordance with VDOT specifications. We recommend that the surface asphalt wearing course be placed after heavy construction traffic has ceased (after lots are developed). At that time isolated failed areas (if any) of asphalt base course may be repaired prior to final paving operations.

An important consideration with the design and construction of new pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the possibility of the subgrade materials becoming saturated over a long period of time. Based upon the results of the soil test borings, the groundwater table should not affect the performance of pavements; however, surface runoff water that is trapped during construction on the exposed cohesive subgrade soils could create localized deterioration of the soil's bearing capacity. Standing water that may develop on the surface of the pavement may be minimized by adequate design (surface graded to control runoff to desired locations - catch basins, drain inlets, gutters, etc.), adequate compaction of each lift of pavement material (to minimize localized settlements that result in ponding) and accurate fine grading of each lift of pavement material (to achieve the desired design grades). Standing water that tends to develop within the base course layer may be minimized by installing temporary weep holes in drainage structures, construction of drainage swales and diversion ditches, and proper backfill and grading behind curbs to minimize water intrusion from behind the curbs. Weep holes should be covered with an open graded aggregate wrapped in a suitable non-woven geotextile drainage fabric to remain effective.

The soils encountered in soil test borings and bulk sampling program generally appear to suitable for use as compacted structural fill for roadway support for the new roads at Mulberry Place. It also appears that materials to be cut from the proposed stormwater management pond will be suitable for reuse as engineered fill beneath new roads. A large majority of the roadway cuts appear to be too granular to be used for the earth dam core. However, the lower 2 feet of material to be cut from the pond (Sandy Clay) appear to be suitable for use within the core. The lower 4 feet of cut from the pond may be used for core material if it is mixed to create a more homogeneous clayey material. It also appears that materials to be cut from the utility trenches will generally be suitable for backfill of the trenches. As with any earthwork placement project, it is important that proposed fill materials be properly moisture-conditioned to within 3 percent of the soil's optimum moisture content prior to compaction to the specified Standard Proctor dry density. When the soils encountered in our subsurface exploration program are prepared as recommended, it is our opinion that lime stabilization of the subgrade soils should not required for these subgrade soils. The Geotechnical Engineer should monitor utility trench backfilling operations and roadway subgrade preparations in accordance with applicable VDOT standards. Undercutting of unsuitable materials or utilization of a woven, separation and reinforcement geotextile such as AMOCO Propex 2002 to improve areas of weak subgrade may be used based

on the recommendation of the Geotechnical Engineer. The use of geotextile fabrics to help stabilize subgrade soils and provide a separation between the soil and stone layers may be required on a larger scale during the wetter winter months, especially if the construction schedule limits the time required to rework materials (scarify, dry, and recompact).

Pavement Design

The soil test borings and CBR testing performed on bulk sample subgrade soils collected from the boring locations indicate that the subgrade soils are comprised of Clayey SAND (SC), Sandy CLAY (CL) and Silty SAND (SM) materials. The CBR test results indicate that the subgrade soils possess soaked CBR values of 12.1, 10.7, 19.0, 7.0, 3.2, 26.9, 8.8, 14.8, 20.4, 10.2, and 12.5. We recommend a design CBR value of 8.6, computed as two-thirds of the average soaked CBR value, be considered for pavement design. The lowest and highest soaked CBR values from CBR-5 and CBR-6 (3.2 and 26.9) were not used in the calculation.

The laboratory test results indicated the eleven CBR samples contained between 28 and 61 percent fines (silts and clays) passing the No. 200 sieve. These soils are classified as AASHTO Groups A-7-5, A-6, A-4 and A-2-4. Based on these AASHTO designations, these soils fall between resiliency factor values of 3.0 and 2.5. For design purposes, we will conservatively consider a resiliency factor value of 2.5 in the calculations.

Based on the laboratory test results for the samples obtained from the roadway subgrades and the criteria outlined in Table 1 of the 1996 edition of VDOT's Pavement Design Guide for Subdivision and Secondary Roads in Virginia, we have determined that a Resiliency Factor (RF) of 2.5 should be used for design purposes. Using an RF value of 2.5 and the design CBR value, we computed a Soil Support Value (SSV) of 21.5. The average daily traffic value (ADT), thickness index required (D_R), the proposed designs and the thickness index for the proposed designs (D_P) are summarized in Table 1. A traffic volume of 10 vehicles per day was considered for each single family dwelling in computing the pavement sections for each roadway section.

Road Name	ADT	D_r	Aggregate Base (in.)	Asphalt Base (in.)	Asphalt Surface (in.)	D_p
PROPOSED DESIGNS						
Mulberry Lane STA 10+50 (Entrance) to 23+00	500	10.6	6.0	3.0	1.5	13.725
Mulberry Lane STA 23+00 to 30+00 (End)	220	7.4	6.0	0.0	2.0	9.34
Armstead Circle	100	6.4	6.0	0.0	2.0	9.34
Wallace Court	60	6.4	6.0	0.0	2.0	9.34

Although the above pavement sections meet minimum VDOT criteria for residential and secondary roads, it will likely prove more prudent and ultimately more cost effective to implement a two layer asphalt system for the entire project. This pavement section would be comprised of 1.5 inches of surface asphalt (SM-2A or the new superpave mix SM-9.5), 3.0 inches of base asphalt (BM-2 or the new superpave mix BM-25) and 6 inches of crushed stone aggregate (21A).

Stormwater Management Pond

It is our understanding that the stormwater management pond is planned to be a wet pond with a permanent pool of water. It is also our understanding that the cut for the pond will be approximately 10 feet from existing surface grades. Based on the soil test boring performed in the area of the proposed pond, the soils at a depth of 10 feet are clayey and should retain water successfully. These clayey soils were encountered at a depth of approximately 8 feet below existing surface grade (at the boring location), so if the elevation of the permanent pool is to be higher than this, a more clayey material may need to be benched into the existing slopes to at least the desired pool elevation. The benching should be performed in two foot steps (two feet horizontally and two feet vertically), compacted to at least 95% of the materials standard Proctor maximum dry density, and then shaped as desired. The upper 8 feet of material to be removed from the pond area appears to be suitable for reuse as fill beneath new pavements. The materials between depths of 8 and 10 feet appear to be suitable for use as dam core material.

Closing

We have appreciated being of service to Associated Developers, Inc. during the exploration and design phases of this project and look forward to its successful completion. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Mark L. Jenkins

COMMONWEALTH OF VIRGINIA
MARK L. JENKINS
No. 26153
PROFESSIONAL ENGINEER

Mark L. Jenkins, P.E.
Project Engineer
Williamsburg Branch Manager

Appendix:

1. Boring Location Diagram
2. Soil Boring Logs
3. Laboratory Test Summary
4. Unified Soil Classification System and Reference Notes For Boring Logs

mlj/N4248rds.doc

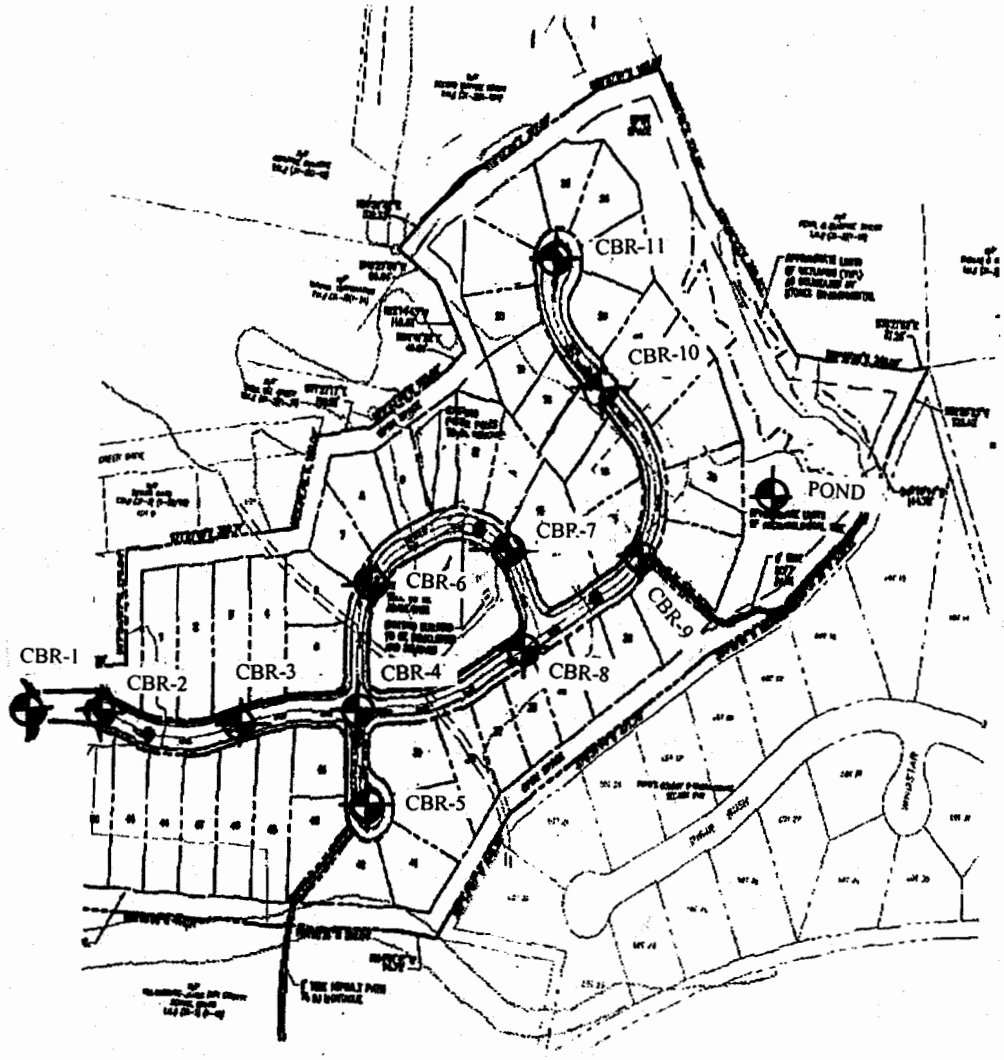
HAND AUGER BORING LOCATION DIAGRAM

ECS Ltd

ECS PROJECT #: N4248

SUBDIVISION: MULBERRY PLACE
LOT & SECTION NUMBER: LOTS 1-50
COUNTY, STATE: JAMES CITY COUNTY, VA
ADC MAP PAGE/GRID: VP/5/A-1

NOT TO SCALE



⊕ = Approximate CBR Location

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	POND	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, With Organic Fragments, Dark Brown, Moist, Loose, (PT)	5
	2	SS	24	24	Silty Fine SAND, Trace Clay, Orangish Brown, Moist, Medium Dense, (SM-SC)	21
5	3	SS	24	24	Silty and Clayey Fine SAND, Orangish Orange, Moist, Medium Dense, (SC)	20
	4	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Brown, Moist, Medium Dense, (SC)	26
	5	SS	24	24	Fine Sandy and Silty CLAY, Orangish and Grayish and Tannish Brown, Moist, Stiff, (CL)	12
10						
	6	SS	24	24	Fine Sandy and Silty CLAY, Dark Gray, Moist, Medium Stiff, (CL)	10
15						
	7	SS	24	24	Silty and Clayey Fine to Medium SAND, With Shell Fragments, Light Gray, Moist to Wet, Stiff, (CL)	11
20					END OF BORING @ 20.0'	
25						
30						

WATER LEVELS (▽) ELEVATION (FT)

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

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

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

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

WL 12'2" WS OR TD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 20"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 17'
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-1	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS / SURFACE ELEVATION)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Brown, Moist, Very Loose, (SM)	3
	2	SS	24	24	Sandy and Silty CLAY, Orangish Brown, Moist, Very Stiff, (CL)	16
5	3	SS	24	24		14
	4	SS	24	24	Silty and Clayey Fine SAND, Orangish Brown, Moist, Medium Dense, (SC-CL)	26
	5	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Brown, Moist, Dense, (SC)	33
10					END OF BORING @ 10.0'	
15						
20						
25						
30						

WATER LEVELS (▽) ELEVATION (FT)

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

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

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

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

WL NONE WS OR WD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 0
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 7'9"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-2	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; SURFACE ELEVATION)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty and Clayey Fine SAND, Brown, Moist, Very Loose, (SC)			2
	2	SS	24	24	Fine Sandy and Silty CLAY, Orangish Brown, Moist, Very Stiff, (CL)			22
5	3	SS	24	24	Fine Sandy and Silty CLAY, Orangish and Reddish and Tannish Brown, Moist, Very Stiff, (CL)			20
	4	SS	24	24				27
	5	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Brown, Moist, Dense, (SC)			32
10	6	SS	24	24				26
					END OF BORING @ 12.0'			
15								
20								
25								
30								

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

WL NONE WS OR TD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 2"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 7'10"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-3	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD
JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty and Clayey Fine SAND, Tannish Brown, Moist, Medium Dense, (SC)			12
	2	SS	24	24				25
5	3	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Brown, Moist, Medium Dense, (SC)			35
	4	SS	24	24				57
	5	SS	24	24	Fine Sandy and Silty CLAY, Yellowish and Tannish Brown, Moist, Very Stiff, (CL)			25
10	6	SS	24	24	Sandy and Silty Fine SAND, Orangish Brown, Moist, Dense, (SM)			47
15					END OF BORING @ 12.0'			
20								
25								
30								

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

WL NONE WS OR TD	BORING STARTED 7-28-00	TOPSOIL DEPTH: 1.5'
WL BCR ACR	BORING COMPLETED 7-28-00	CAVE IN DEPTH ● 9'9"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-4	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; SURFACE ELEVATION)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Fine Sandy and Silty CLAY, Brownish and Reddish White, Very Stiff, (CL)			16
	2	SS	24	24	Fine Sandy and Silty CLAY, Grayish Brown, Moist, Hard, (CL)			32
5	3	SS	24	24	Fine Sandy and Silty CLAY, With Sand Lenses, Light Gray, Moist, Very Stiff, (CL)			30
	4	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Brown, Moist, Dense, (SC)			34
	5	SS	24	24				32
10	6	SS	24	24	Silty Fine SAND, Yellowish Tan, Moist, Dense, (SM)			26
15					END OF BORING @ 12.0'			
20								
25								
30								

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

WL NONE WS OR WD	BORING STARTED 7-28-00	TOPSOIL DEPTH: 4"
WL BCR ACR	BORING COMPLETED 7-28-00	CAVE IN DEPTH ● 9'10"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-5	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Trace Organics, Brown, Moist, Dense, (SM)			40
	2	SS	24	24	Silty Fine SAND, Light Brown, Moist, Medium Dense, (SM)			26
5	3	SS	24	24	Silty and Clayey Fine SAND, With Cobbles, Trace Fine Gravel, Brownish Orange, Moist, Dense, (SC)			36
	4	SS	24	24	No Recovery			43
	5	SS	24	24	Silty and Clayey Fine SAND, With Gravel, Orangish Brown, Moist, Medium Dense, (SC)			23
10								
15					END OF BORING @ 12.0'			
20								
25								
30								

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

WL N/A WS OR WD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 12"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 8'
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-6	1 OF 1

PROJECT NAME: MULBERRY PLACE

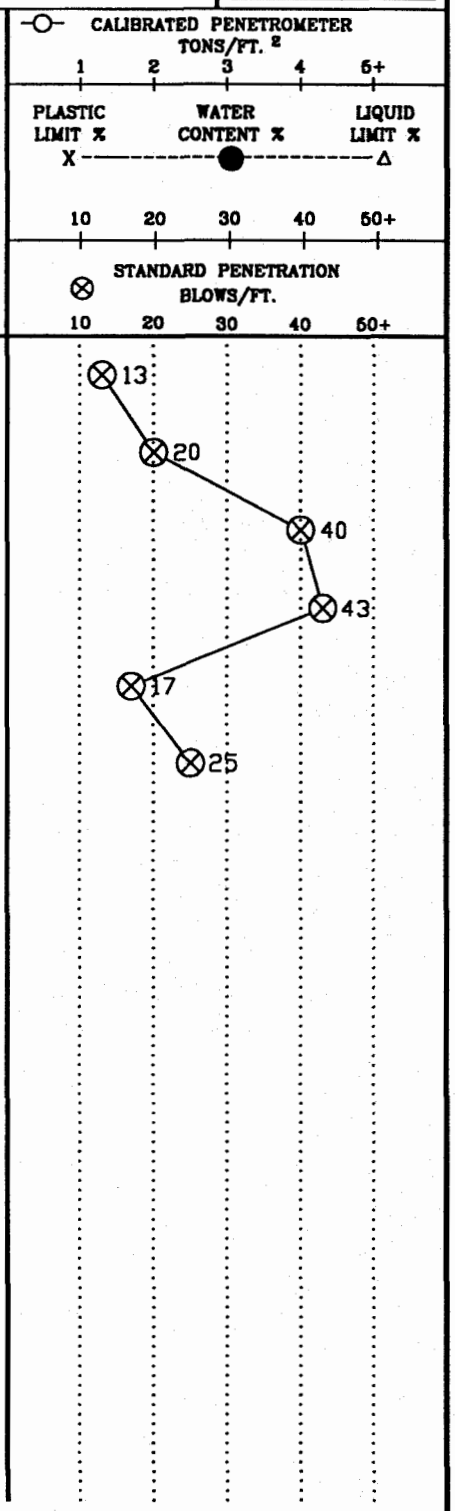
ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ENGLISH UNITS

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS (▽)	ELEVATION (FT)
0	1	SS	24	24	Silty Fine SAND, Tannish Brown, Moist, Medium Dense, (SM)		
	2	SS	24	24	Silty Fine SAND, Trace Clay, Orangish Brown, Moist, Medium Dense, (SM)		
5	3	SS	24	24	Silty and Clayey Fine SAND, Orangish Brown, Moist, Dense, (SC)		
	4	SS	24	24	Silty Fine SAND, Tannish Orange, Moist, Dense, (SM)		
	5	SS	24	24			
10	6	SS	24	24	Silty Fine SAND, Tannish Pinkish and Orange, Moist, Medium Dense, (SM)		
					END OF BORING @ 12.0'		
15							
20							
25							
30							



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

WL NONE WS OR WD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 6"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH @ 11'3"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-7	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

ENGLISH UNITS

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Tannish Brown, Moist, Medium Dense, (SM)			14
	2	SS	24	24	Silty Fine SAND, Orangish Brown, Moist, Medium Dense, (SM)			21
5	3	SS	24	24	Silty and Clayey Fine SAND, Orangish and Reddish and Tannish Brown, Moist, Dense, (SC)			44
	4	SS	24	24	Silty Fine SAND, Orangish and Tannish Brown, Moist, Dense, (SM)			47
	5	SS	24	24	Silty and Clayey Fine SAND, Orangish and Tannish Orange, Moist, Medium Dense, (SC)			18
10	6	SS	24	24	Silty Fine SAND, Trace Clay, Brownish and Pinkish Dark Orange, Moist, Medium Dense, (SM)			26
15					END OF BORING @ 12.0'			
20								
25								
30								

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

WL NONE WS OR WD	BORING STARTED 7-21-00	TOPSOIL DEPTH: NONE
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 11'5"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-8	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; SURFACE ELEVATION)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Brown, Moist, Loose, (SM)			10
	2	SS	24	24	Silty Fine SAND, Orangish and Tannish Brown, Moist, Medium Dense, (SM)			16
5	3	SS	24	24	Silty and Clayey Fine to Medium SAND, Orangish and Reddish Brown, Medium Dense, (SC)			18
	4	SS	24	24	Silty and Clayey Fine to Medium SAND, Trace Gravel, Orangish Brown, Moist, Medium Dense, (SC)			37
	5	SS	24	24	Silty and Clayey Fine SAND, Orangish Brown, Moist, Medium Dense, (SC)			23
10	6	SS	24	24	Silty Fine to Medium SAND, Orangish Brown, Medium Dense, (SM)			18
15					END OF BORING @ 12.0'			
20								
25								
30								

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

WL NONE WS OR TD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 1.5'
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 11'
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-9	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; SURFACE ELEVATION)	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Tannish Brown, Moist, Loose, (SM)			9
	2	SS	24	24	Sandy and Silty CLAY, Orangish Brown, Moist, Very Stiff, (CL)			20
5	3	SS	24	24	Silty and Clayey Fine to Medium SAND, Orangish Brown, Moist, Medium Dense, (SC)			22
	4	SS	24	24				40
	5	SS	24	24	Silty and Clayey Fine SAND, With Organic Lens @9', Orangish Brown, Moist, Medium Dense, (SC)			22
10	6	SS	24	24				18
	7	SS	24	24	Silty Fine SAND, Trace Clay, Orangish Brown, Moist, Medium Dense, (SM)			21
15					END OF BORING @ 14.0'			
20								
25								
30								

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

WL NONE WS OR ⓦD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 4"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 14'
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-10	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

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

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

ENGLISH UNITS

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS (▽)	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, With Organics, Dark Orange, Moist, Very Loose, (SM)			3
	2	SS	24	24	Silty and Clayey Fine SAND, Orangish Brown, Moist, Medium Dense, (SC)			11
5	3	SS	24	24				13
	4	SS	24	24				10
	5	SS	24	24				18
10					END OF BORING @ 10.0'			
15								
20								
25								
30								

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

WL NONE WS OR ⓦD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 4"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 7'6"
WL	RIG FOREMAN RR	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
ASSOCIATED DEVELOPERS, INC.	N4248	B-11	1 OF 1

PROJECT NAME: MULBERRY PLACE

ARCHITECT-ENGINEER:

SITE LOCATION: CENTERVILLE ROAD, JAMES CITY COUNTY, VIRGINIA

ECS LTD

CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+)

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

STANDARD PENETRATION BLOWS/FT. ⊗ (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	STANDARD PENETRATION BLOWS/FT.
0	1	SS	24	24	Silty Fine SAND, Light Brown, Moist, Loose, (SM)	4
	2	SS	24	24	Silty and Clayey Fine SAND, Orangish Brown, Moist, Medium Dense, (SC)	10
5	3	SS	24	24		14
	4	SS	24	24		10
	5	SS	24	24		17
10	6	SS	24	24		22
					END OF BORING @ 12.0'	
15						
20						
25						
30						

WATER LEVELS (▽) — ELEVATION (FT)

SURFACE ELEVATION:

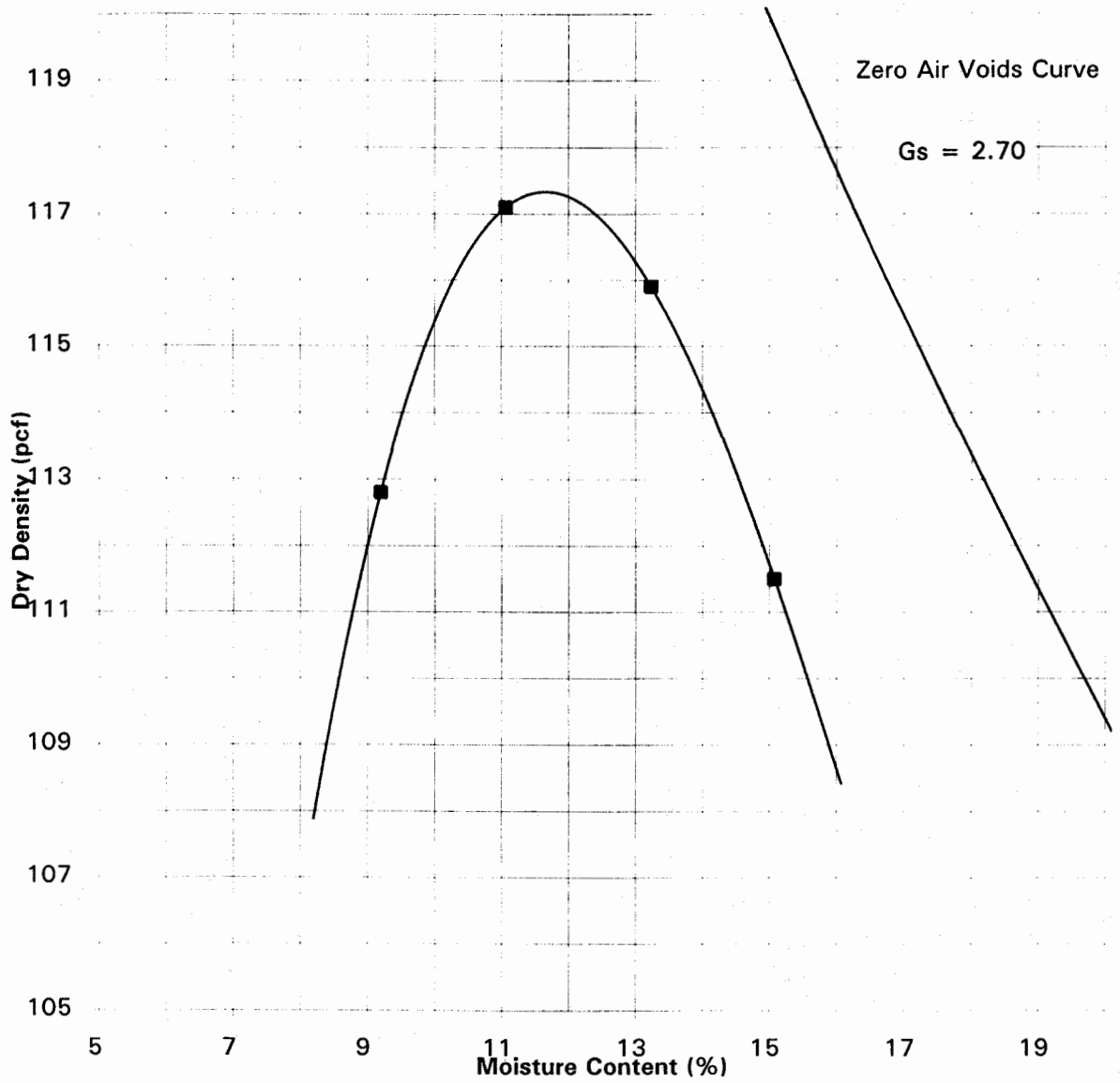
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL NONE WS OR WD	BORING STARTED 7-21-00	TOPSOIL DEPTH: 18"
WL BCR ACR	BORING COMPLETED 7-21-00	CAVE IN DEPTH ● 9'5"
WL	RIG FOREMAN RR	DRILLING METHOD

ECS

CBR Summary

Sample Number	Depth (feet)	% Passing #200 Sieve	Natural Moisture Content %	Atterberg Limits LL/PL/PI	Optimum Moisture %	Max Dry Density %	CBR Value Soaked	CBR Value Unsoaked	USCS Symbol
CBR-1	0-4	58.6	17.1	27/11/16	11.7	117.3	12.1	26.9	CL
CBR-2	1-5	60.7	23.3	41/20/21	17.8	108.2	10.7	9.3	CL
CBR-3	1-5	42.0	12.1	28/12/16	12.8	121.4	19.0	6.5	SC
CBR-4	1-5	51.1	18.3	45/13/32	15.4	112.7	7.0	7.0	CL
CBR-5	1.5-5.5	39.9	9.3	26/11/15	12.3	118.2	3.2	18.1	SC
CBR-6	1-5	39.2	8.7	22/13/09	12.1	121.0	26.9	20.9	SC
CBR-7	2-6	38.2	8.3	28/19/09	13.7	119.9	8.8	7.4	SC
CBR-8	2.5-6.5	36.4	13.0	Non-Plastic	10.8	116.2	14.8	27.3	SM
CBR-9	3.5-7.5	44.6	14.3	27/15/12	12.6	120.0	20.4	17.1	SC
CBR-10	0.5-4.5	35.3	10.0	Non-Plastic	11.4	124.5	10.2	7.0	SM
CBR-11	1.5-5.5	41.2	7.6	22/14/08	14.5	112.5	12.5	20.9	SC
POND	2-6	28.0	10.0	23/13/10	12.4	119.5	-	-	SC



Sample No.	P-1	Natural Moisture Content	17.1
Street		Percent Passing No. 200 Sieve	58.6
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	117.3
Plasticity Index (P	N/A	Optimum Moisture Content (%)	11.7
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	117.3
Description	Brown, Moist, Silty Fine Sandy CLAY	Corr. Optimum Moisture Content (	11.7
Classification	CL	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place

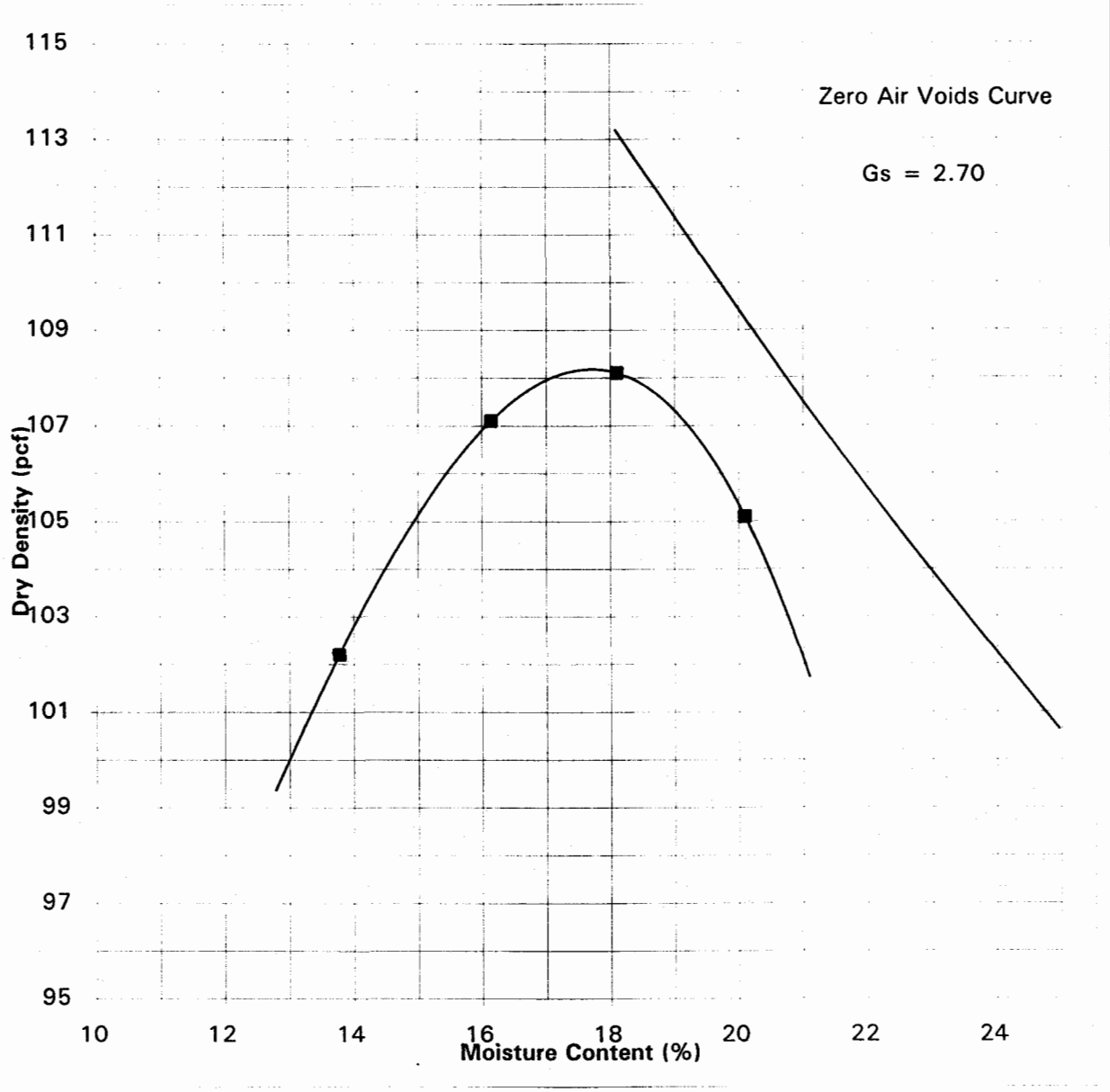
Project No.: N4248

Date: 08/02/00

Engineering Consulting Services, Ltd

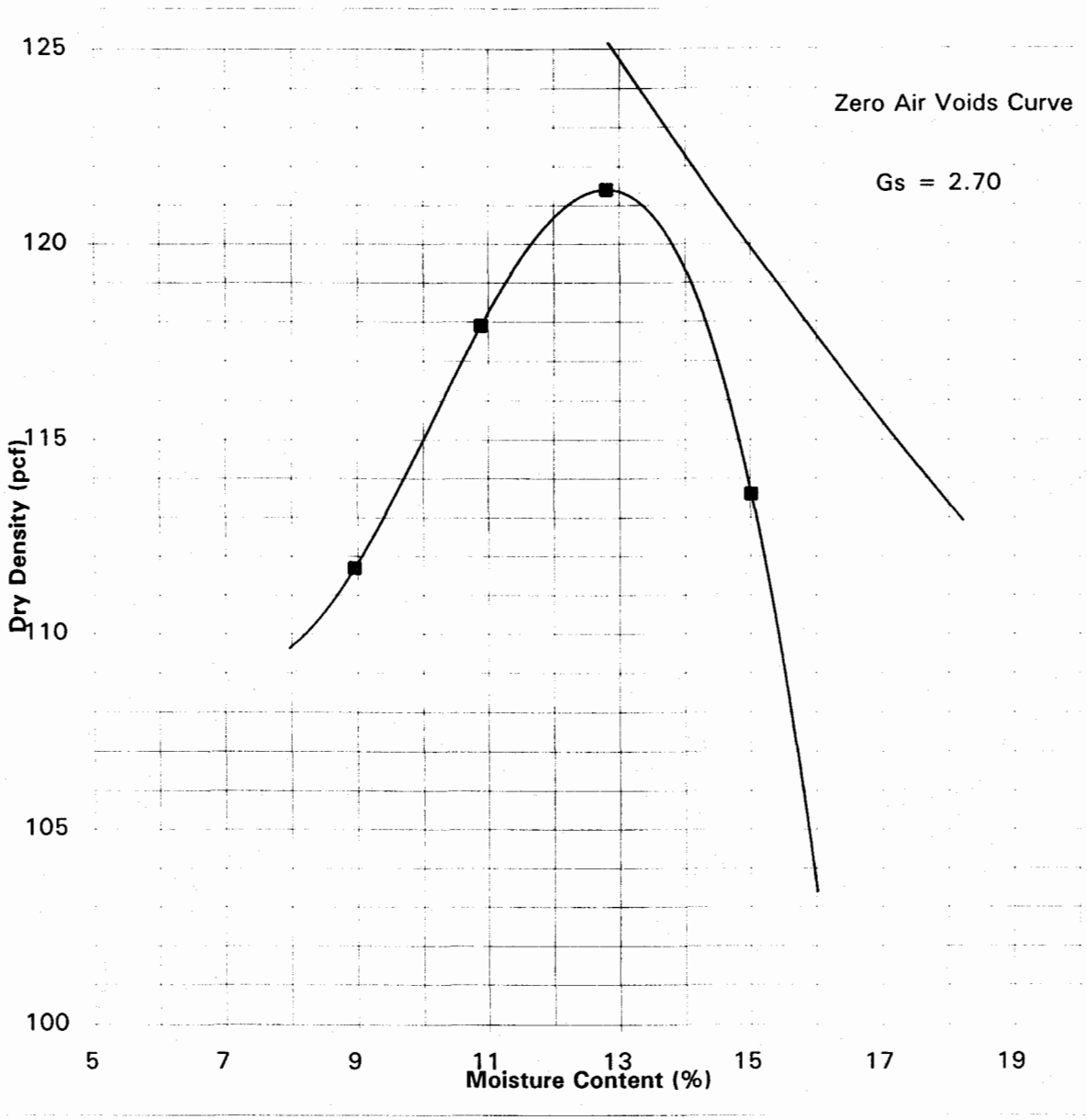
Richmond, Virginia

Moisture Density Relationship Curve



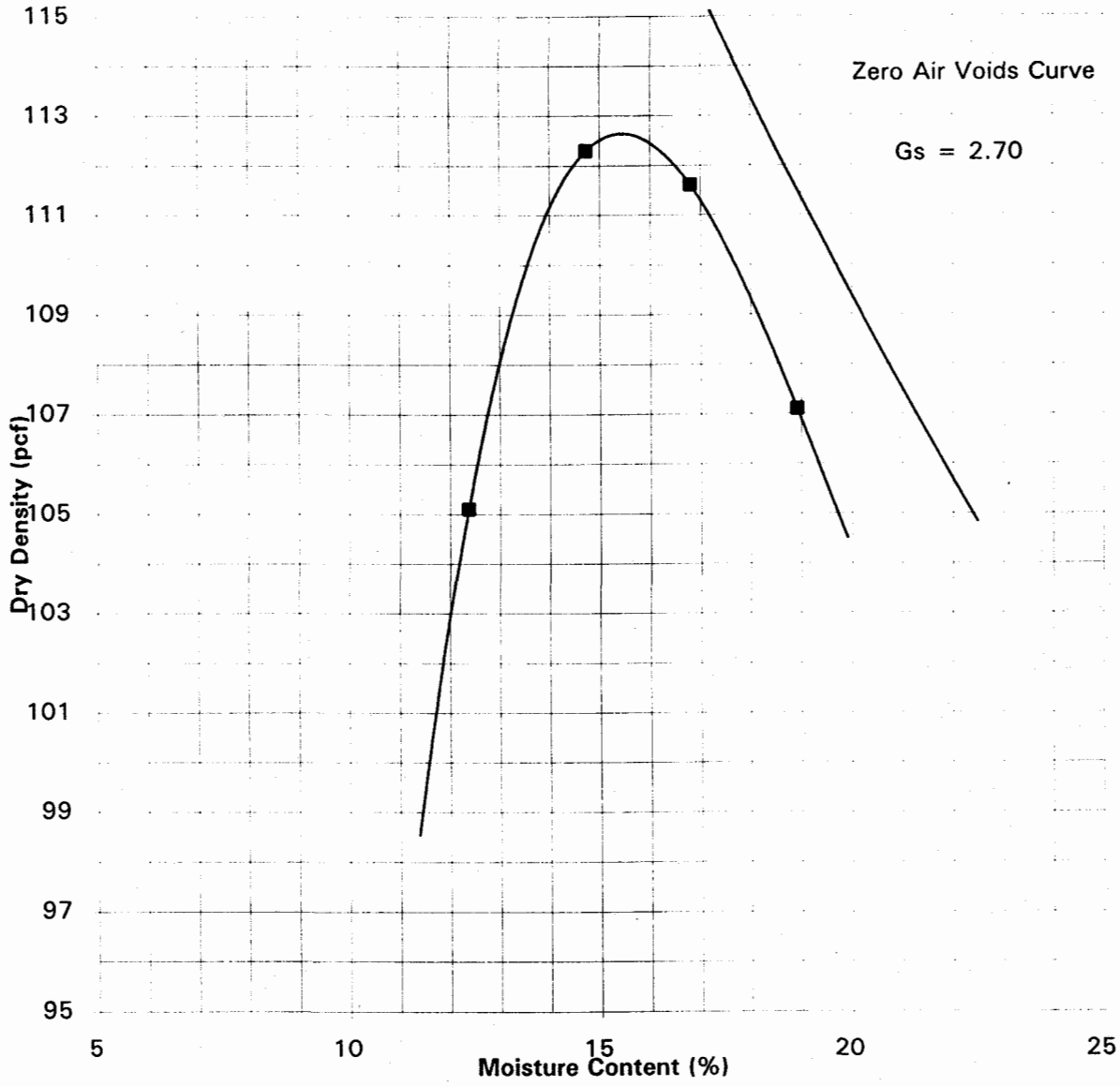
Sample No.	P-2	Natural Moisture Content	23.3
Street		Percent Passing No. 200 Sieve	60.7
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	108.2
Plasticity Index (P	N/A	Optimum Moisture Content (%)	17.8
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	108.2
Description	Orangish Brown, Moist, Silty Fine Sandy CLAY	Corr. Optimum Moisture Content (	17.8
Classification	CL	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 08/02/00	**Moisture Density Relationship Curve**



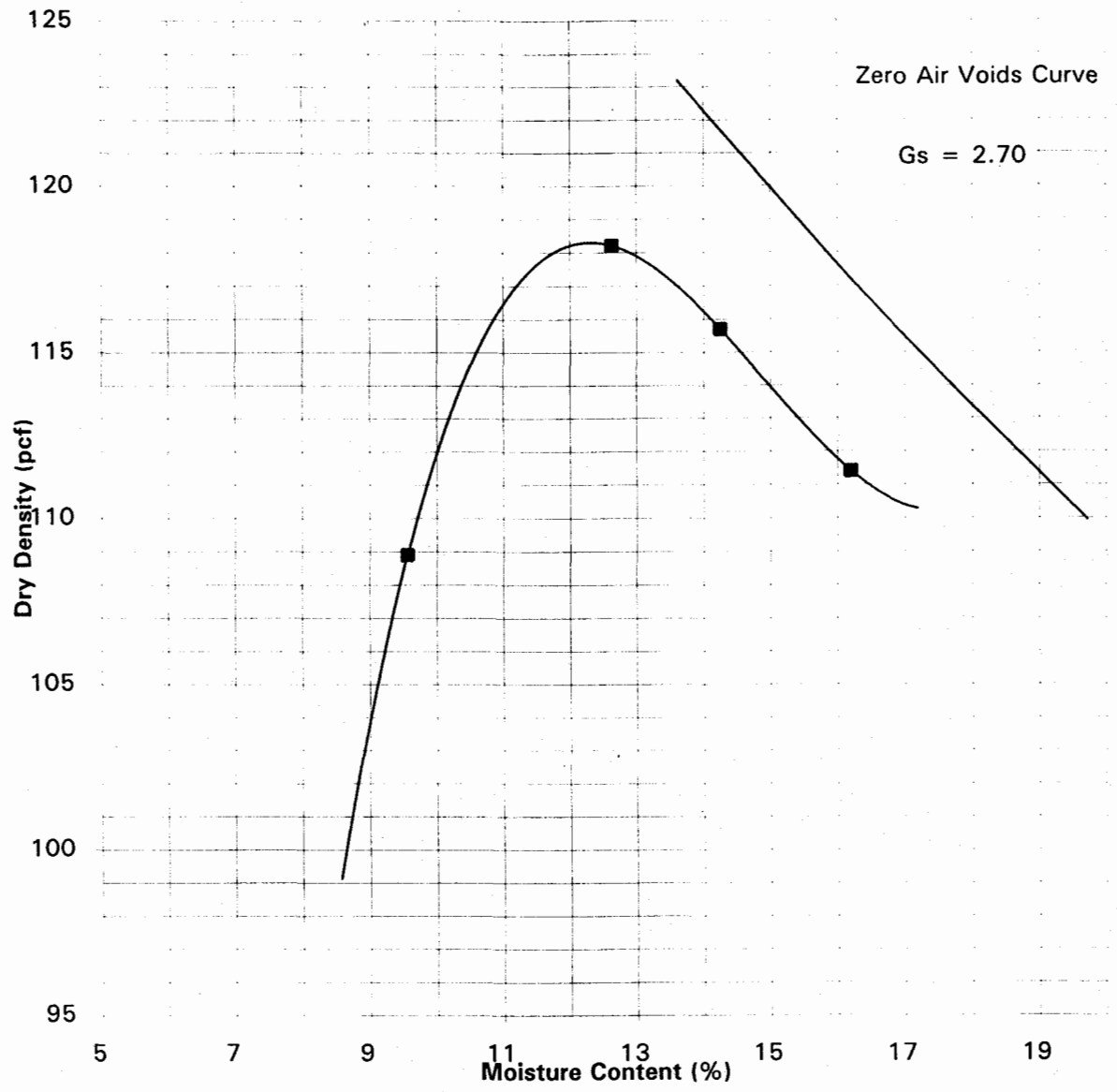
Sample No.	P-3	Natural Moisture Content	12.1
Street		Percent Passing No. 200 Sieve	42.0
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	121.4
Plasticity Index (P	N/A	Optimum Moisture Content (%)	12.8
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	121.4
Description	Orangish Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	12.8
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 08/02/00	**Moisture Density Relationship Curve**



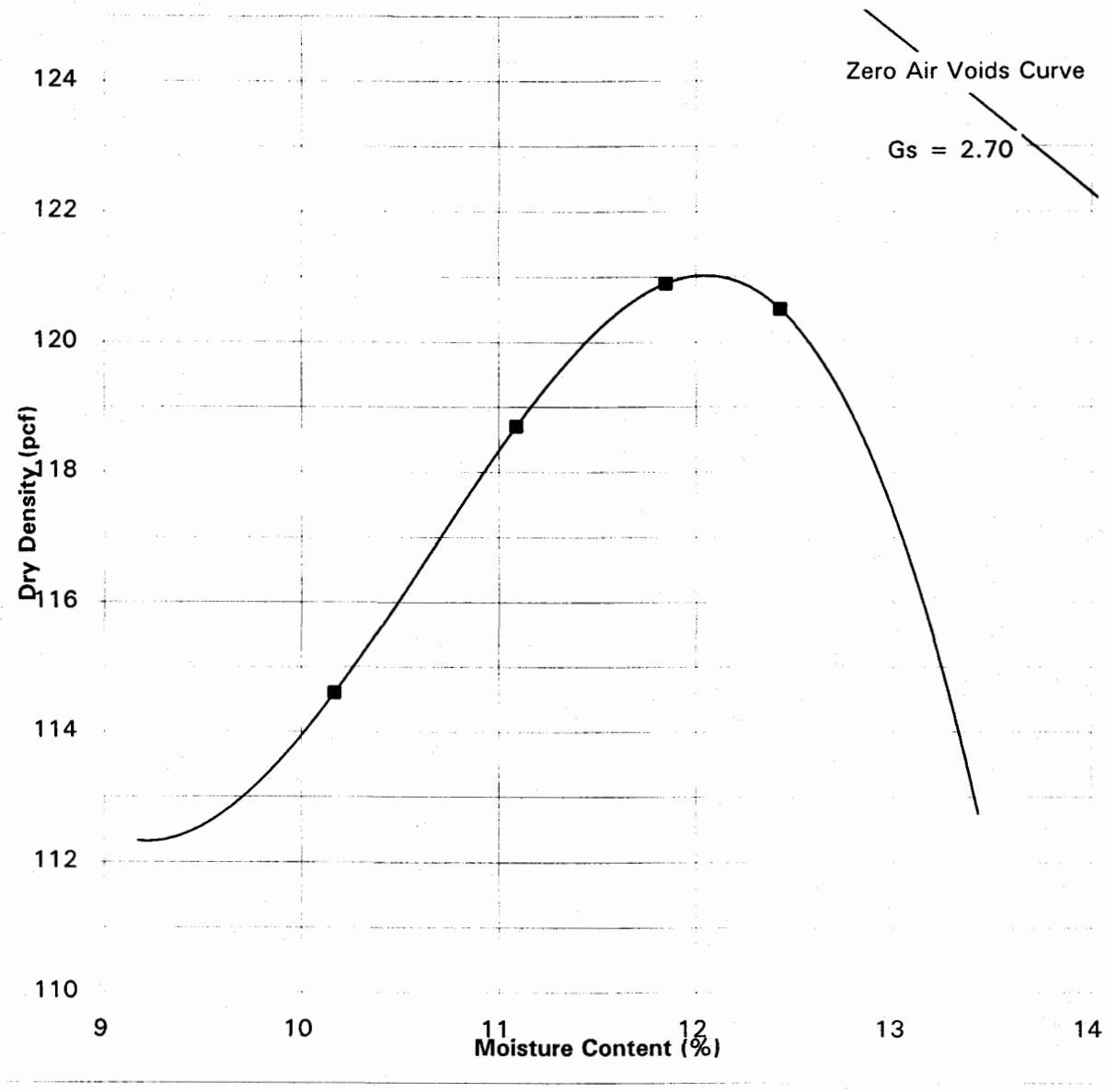
Sample No.	P-4	Natural Moisture Content	18.3
Street		Percent Passing No. 200 Sieve	51.1
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	112.7
Plasticity Index (P	N/A	Optimum Moisture Content (%)	15.4
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	112.7
Description	Tannish Brown, Moist, Silty Fine Sandy CLAY	Corr. Optimum Moisture Content (	15.4
Classification	CL	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 08/02/00	**Moisture Density Relationship Curve**



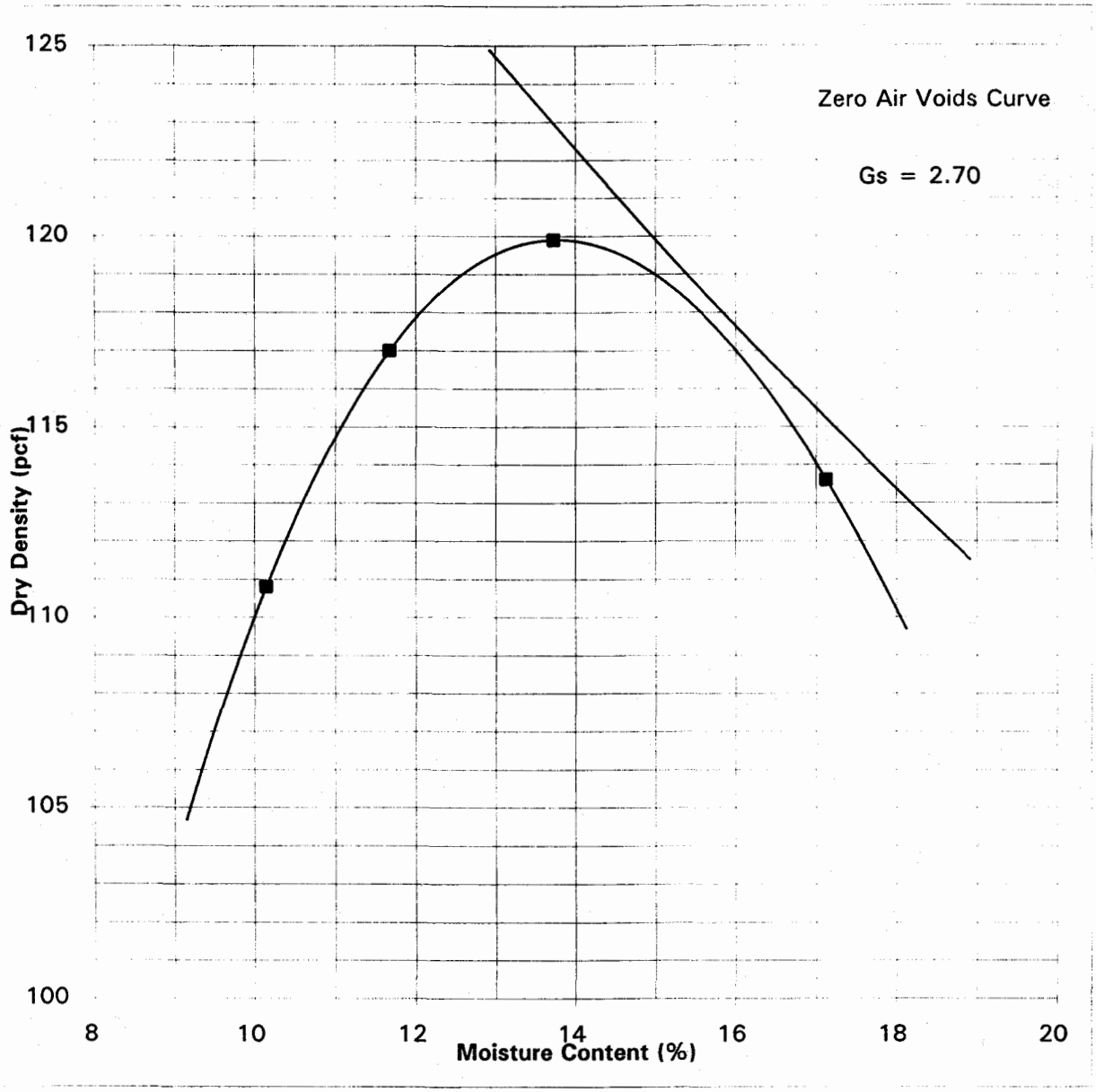
Sample No.	S-5	Natural Moisture Content	9.3
Street		Percent Passing No. 200 Sieve	39.9
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	118.2
Plasticity Index (P	N/A	Optimum Moisture Content (%)	12.3
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	118.2
Description	Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	12.3
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



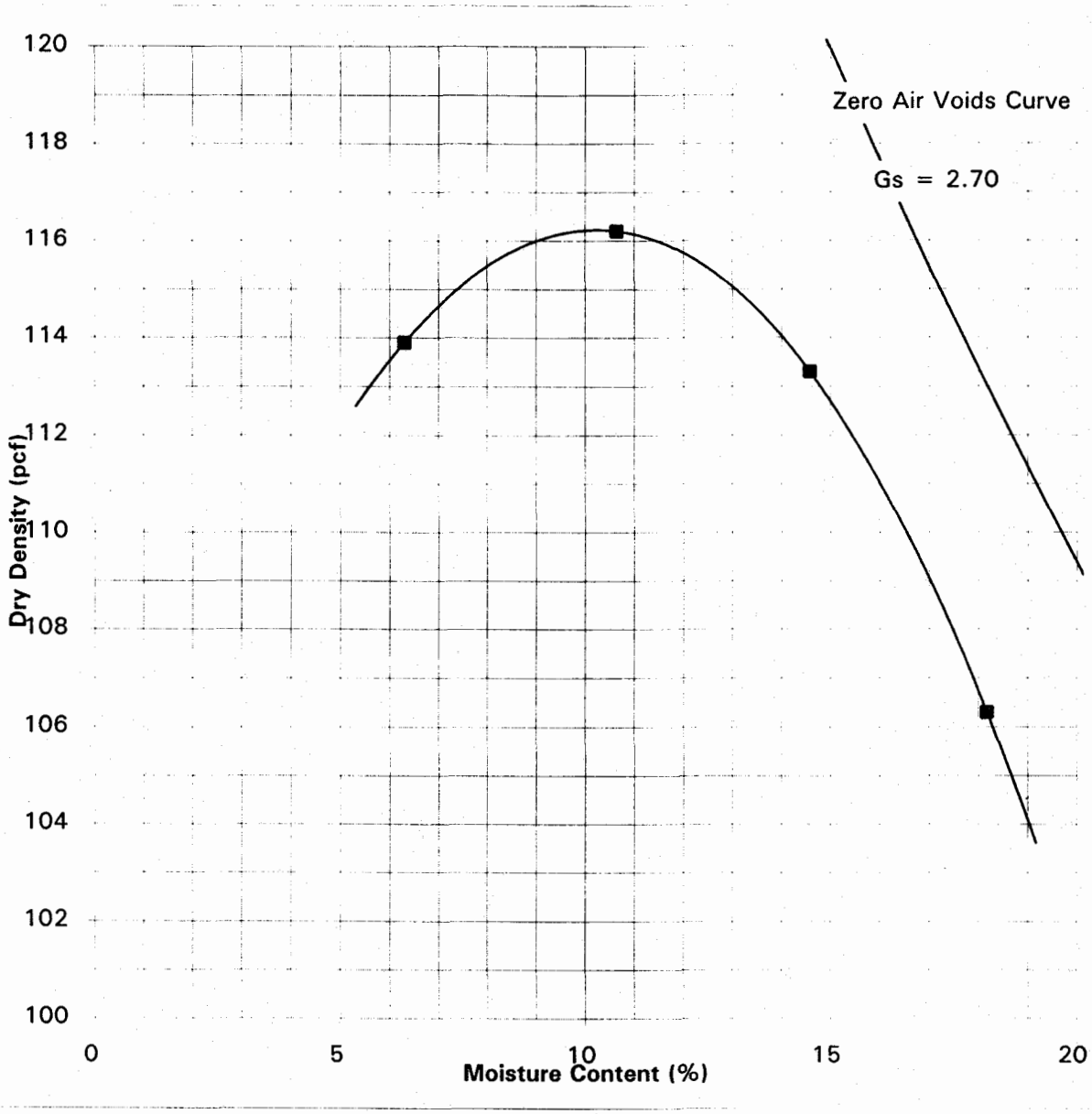
Sample No.	S-6	Natural Moisture Content	8.7
Street		Percent Passing No. 200 Sieve	39.2
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	121.0
Plasticity Index (P	N/A	Optimum Moisture Content (%)	12.1
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	121.0
Description	Tannish Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	12.1
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



Sample No.	S-7	Natural Moisture Content	8.3
Street		Percent Passing No. 200 Sieve	38.2
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	119.9
Plasticity Index (P	N/A	Optimum Moisture Content (%)	13.7
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	119.9
Description	Brown, Moist, Clayey and Silty Fine SAND	Corr. Optimum Moisture Content (	13.7
Classification	SC	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**



Sample No.	S-8	Natural Moisture Content	13.0
Street		Percent Passing No. 200 Sieve	36.4
Station	N/A	Percent Retained on No. 4 Sieve	N/A
Liquid Limit (LL)	N/A	Percent Retained on 3/4" Sieve	N/A
Plastic Limit (PL)	N/A	Maximum Dry Density (pcf)	116.2
Plasticity Index (P	N/A	Optimum Moisture Content (%)	10.2
Liquidity Index (LI	N/A	Corr. Maximum Dry Density (pcf)	116.2
Description	Brown, Moist, Silty Fine SAND/ Trace CLAY	Corr. Optimum Moisture Content (	10.2
Classification	SM	Percent (%) Gravel as Tested	0
Specific Gravity	2.70	Percent (%) Gravel Total	0
Test Standard	ASTM D-698	Test Method	A

Project: Mulberry Place	**Engineering Consulting Services, Ltd**
Project No.: N4248	**Richmond, Virginia**
Date: 07/28/00	**Moisture Density Relationship Curve**

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
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COUNTY ENGINEER
(757) 253-6678
INTEGRATED PEST MANAGEMENT
(757) 259-4116

November 19, 2001

Associated Developers Inc.
5300 Mercury Boulevard
Newport News, Va. 23605

Attn: Henry Stephens

Re: Mulberry Place
County Plan No.: S-35-00
County BMP ID Code: PC 137

Dear Mr. Stephens:

The Environmental Division has reviewed a record drawing and construction certification as submitted to our office on October 3rd 2001 for the above referenced project. The record drawing provides as-built information for a wet extended detention stormwater management facility located in the southeast corner of the subdivision.

Based on our review of information as submitted and a concurrent field observation as performed on November 16th 2001, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated September 24th 2001 is **satisfactory** for the facility.

Record Drawing:

2. Although record drawing Sheet 10 reflects various as-built spot elevations, the spot elevation information is limited to locations above permanent pool elevation (El. 78.8). The record drawing does not reflect if excavated pond depths were achieved in accordance with the approved plan. Provide additional pond bottom elevations to reflect adequate depths were achieved in the main basin and associated forebay. *(Note: The approved plan reflects a proposed bottom elevation of the main basin and forebay at El. 71.0).*

3. Record drawing Sheet 10 needs to reflect as-built invert elevations of the two storm drain pipes which outfall into the sediment forebay. (ie. Structure Numbers SS # 2-1 and SS # 1-1). Obtaining this data may need to be delayed and coordinated until such time as the forebay is cleaned in accordance with construction-related items as outlined below.

4. Confirm the diameter of the concrete riser pipe and adequately reflect size on the record drawing. Based on our field inspection, the inside diameter of the riser appeared to well exceed 36-inch size.

5. Any modifications to the facility due to construction-related issues as outlined below may require revision to the record drawings.

Construction-Related Items:

6. The pond's interior (upstream) side slopes along the east side of the facility do not appear to resemble the approved design plan. The interior side slope from top of dam to the aquatic bench was approved at 4H:1V. Based on record drawing Sheet 10 (1"=50' scale) and our field observations, this interior side slope is 2H:1V or steeper on the entire east side of the facility. *(Note: This attribute was provided as one of the primary safety features for the facility. During the plan approval process, a safety bench was not provided with the understanding that a flatter interior basin side slope of 4H:1V was to be utilized. Refer to Environmental Division comments dated August 11, 2000, comment # 14 and subsequent response by the engineer dated August 15th 2000).*

7. Less than 30 percent of the pond fill embankment has surface grass stabilization and there are portions of the downstream east embankment which are bare with neither mulch or erosion control matting. A 30 ft. long by 12 ft. wide bare soil area is present at the middle portion of the downstream embankment at the east side toe. Better stabilization with grass covering is necessary on the entire fill embankment. *(Note: It appears that lack of adequate topsoil may be primary cause of inadequate vegetation establishment on the dam embankment.)*

8. Once properly stabilized with permanent vegetation, remove silt fence present along the entire downstream embankment toe.

9. Repair erosion on the interior basin fill embankment slope near the sediment forebay. The forebay is located at the southwest corner of the basin.

10. Clean and remove sediment (2 to 4 ft. deep) from within the entire sediment forebay. Establish the bottom elevation of the forebay back to design grade and ensure rock outlet protection is provided at the two pipe outfalls in accordance with the approved plan. Also, clean and remove sediment from the 18-inch and 30-inch storm drain pipes which outfall into the sediment forebay. The outfall pipes had 12 to 18-inches of sediment buildup on end sections and within the pipes. *(Note: The storm drain pipe outfalls were visible at the time of our field inspection.)*

11. Repair surface rill and gully erosion around the entire sediment forebay (10 ft. width) and stabilize with seed and mulch.

12. Repair erosion at the downstream end of the rock check dam which forms the sediment forebay. The erosion is on the main basin side of the rock check.

13. Plantings, in accordance with the approved plan, were not present along the aquatic bench.

14. Final grading is necessary in the south corner of the basin near the riser structure. Piles of soil were present rather than a uniformly graded slope.

15. Based on the provisions of the approved plan, one foot of separation was supposed to be present between the elevation of the riser crest (El. 83.3) and the emergency spillway (El. 84.3). Based on the record drawing , the crest elevation of the riser structure is 4-inches higher than plan and the crest elevation of the emergency spillway is approximately 4-inches lower than plan; thus resulting in a separation between riser crest and emergency spillway crest of 0.36 feet, rather than 1 foot. The crest of the riser structure should be constructed closer to approved design plan elevation.

16. Explain why concrete pipe, greater than plan specified 36-inch diameter, was utilized for the riser structure. Based on rough field measurements, the inside diameter of the riser pipe approximated 42-inch size pipe.

17. Ensure the 3-inch diameter turn-down PVC pipe on the riser is not clogged and the end of the pipe is open. Based on our inspection, there appeared to be an end cap on the 3-inch pipe on the pond (water) side. Flow through the 3-inch pipe into the riser should not be obstructed.

18. Clean vegetation from on and around the grate on storm drain structure # 2-2. This is the grate on the upstream side of the 18-inch pipe into the pond.

19. The cut slope located in common area just west of the gravel access road along the west side of the basin has rill and gully erosion and portions of the slope are not stabilized. Also, drainage from this same cut slope is concentrating at the toe of slope and traversing along the west side of the access road. This concentrated drainage is causing erosion along the gravel access road and across the road at the low point near the basin. This drainage and soil erosion problem needs resolved.

In general, based on our review of the information as submitted, field inspection of the BMP area and construction-related items as noted above, the BMP has not yet been fully converted from temporary sediment basin mode to final permanent BMP mode. In addition, the tributary area to the BMP is largely in an active state with a considerable amount of single family construction yet to be performed. Therefore, conversion to final BMP mode may be premature; however, prior to release of bond all above related items are required to be addressed.

Once this work is satisfactorily completed, contact our office appropriately for reinspection of the BMP. Only then can we proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Beth Davis, at 757-253-6702 if you have any further comments or questions.

Sincerely,

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

cc: Charles Records, AES (via fax)
Danny Johnson, C. Lewis Waltrip (via fax)

G:\SWMProg\AsBuilts\S3500.pc137

Scott Thomas

From: Scott Thomas
Sent: Wednesday, September 08, 2004 12:33 PM
To: 'tapsyvienna@yahoo.com'
Subject: FW: Lot 23 -Mulberry Place Drainage Situation

Karen,

This is for your information. You don't need to understand all the language, but just wanted to keep you informed that progress Is being made on the situation.

Scott J. Thomas, P.E.
James City County
Environmental Division

-----Original Message-----
From: Scott Thomas
Sent: Wednesday, September 08, 2004 9:03 AM
To: 'Charles Records'
Cc: Gerry Lewis; William A. Cain; Darryl Cook
Subject: Lot 23 -Mulberry Place Drainage Situation

Mulberry Place
County Plan No. S-35-00

Charles

I've looked a little more into the drainage complaint situation at Lot 23, 3796 Mulberry Lane (n/f Karen Spencer). This is the citizen who we met during our meeting for Warhill Green. I was able to dig up some record information including her single family plan and design/asbuilt information for the drainage system along Mulberry Lane.

Regardless of whether the inlet and gutter system was designed and installed properly, I believe that one situation present out there is that there is no safe overflow path from the inlet except down her driveway directly to the garage. I would think I would not be as concerned if there was a safe overflow around the home, which doesn't impact the structure; however the situation is too much for the trench drain. Also, as I understand it, VDOT crews did recently clean the pipe segments and their was no blockage. Based on my observations of the downstream system, it appears in good condition and functional.

In reviewing the case file and records, I have some questions that maybe you can help me answer. As you know, Inlet SS # 1-21 is the curb drop inlet in the cul-de-sac at the low point (sag). The storm system begins here and "bucks" grade to take drainage back to the site BMP. The wrap around gutter at the cul-de-sac is roll-top type and the inlet is a very shallow depth VDOT type DI-3C, standard curb drop inlet. It appears total drainage to the inlet is 0.33 acres. Once flow overtops the roll-top curb, it runs directly down the driveway to the house structure.

Based on review of computations in the design report, it appears the pipe sizing, hydraulic grade line and storm sewer computations are in order. However, my questions are about the inlet and gutter computations.

- Computations show an intensity of 4 inches per hour used. As this inlet is at the sag and topography drops away to lots, why wasn't an intensity of 6.5 inches per hour used?
- In looking at the Storm Water Inlet Computation sheet Spread Comps 8604-1 dated April 19, 1999 it is difficult to follow along the spreadsheet as it does not exactly match VDOT Form LD-204. What is the computed depth of flow along the roll-top curb at Lot 23? What is the computed depth at inlet SS # 1-21?
- Is there a possibility that depth of flow along the curb and spread/depth of flow at the inlet combine at the

driveway at Lot 23 to result in bypass?

- Lt (curb opening length) for 100 percent interception was computed as 9.6 feet for inlet SS # 1-21. Why was a 6 foot long inlet length then specified at structure SS # 1-21?
- Why is there 6.4 cfs of carryover shown in the inlet computations. There is no place for carryover to go except toward Lots 22, 23 and 24.
- The design called for an inlet at 4.04 feet deep (Rim 98.54/Invert 94.5); however, the inlet was actually constructed at 3.75 feet deep (Rim 98.79/Invert 95.04). How does the loss of 0.25 feet of inlet depth affect capacity of the gutter, inlet and pipe system?

I am quite concerned about this particular situation as, like I said before, there is direct threat to the house structure. The gutter appears to overtop for storm events less than the 10-year design. If you cannot directly answer these questions, I would like to discuss in full when you get a chance. Can you please also forward this message on to Henry Stephens. I realize the road has been accepted into the VDOT system.

Scott J. Thomas, P.E.
James City County
Environmental Division

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

(757) 253-0040
FAX (757) 220-8994

LETTER OF TRANSMITTAL

TO JCC ENVIRONMENTAL DIVISION

DATE	JOB NO.
11/13/00	8604-1

ATTENTION SCOTT THOMAS

RE: Mulberry Place

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

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☒ REPORT

COPIES	DATE	NO.	DESCRIPTION
1		1	GEOTECHNICAL REPORT PC 137

NOV 2000 RECEIVED ENVIRONMENTAL DIVISION

THESE ARE TRANSMITTED as checked below:

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

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

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

☐ For review and comment ☐ _____

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

REMARKS

COPY TO _____ SIGNED: Charles Records

PC137_MULBERRY_PLACE - 169

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

CONSULTING ENGINEERS

5248 Olde Towne Road • Suite 1 • Williamsburg, Virginia 23188
(757) 253-0040 • Fax (757) 220-8994 • E-mail aes@aesva.com

December 2, 2002

DEC 2002
RECEIVED
ENVIRONMENTAL DIVISION

Mr. Scott J. Thomas, P.E.
Civil Engineer
James City County
101-E Mounts Bay Road
Williamsburg, VA 23187

RE: Mulberry Place – SWM/BMP Facility As-builts – JCC Plan S-35-00
AES Project No. 8604-1

Dear Mr. Thomas:

AES Consulting Engineers, on behalf of Associated Developers, Incorporated, hereby submits the attached revised as-builts for the above referenced project. The BMP/Facility has been reworked in accordance with your requests. It is my understanding that you inspected this facility shortly after the last construction effort, and resolved the construction related issues with representatives of C.L. Waltrip.

Routing calculations have been included which model the as-built conditions. As you will notice, the pond attenuates the 2-year storm and provides 24-hour detention of the 1-year storm as required. As we previously discussed, attenuation of the 10-year storm is not achieved although the discharge is within 10% of design target flowrate. Although the as-built elevations of the weirs and orifices have deviated from the approved design plans, the facility functions within the State and County requirements. One reproducible copy and a black-line copy have been provided for your review. Should you have any questions or need any additional information, please give me a call.

Sincerely,

AES Consulting Engineers

Charles B. Records
Project Engineer

S:\JOBS\8604\01\Wordproc\Document\86041112.cbr.doc

"RECORD DRAWING COMMENTS #2 THROUGH #5 AND CONSTRUCTION-RELATED COMMENT #15 & #16 PROPERLY ADDRESSED." RECORD DRAWING SET DATED 12/02/02 APPROVED.

APPROVED
James City County
Environmental Division
By: Scott J. Thomas
Date: 12-10-02

Scott Thomas

SPENCER DRAINAGE ISSUE.

From: Scott Thomas
Sent: Wednesday, September 08, 2004 9:03 AM
To: 'Charles Records'
Cc: Gerry Lewis; William A. Cain; Darryl Cook
Subject: Lot 23 -Mulberry Place Drainage Situation

Mulberry Place
County Plan No. S-35-00

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Scott J. Thomas, P.E.
James City County
Environmental Division

DEVELOPMENT MANAGEMENT

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

CODE COMPLIANCE (757) 253-6626 codecomp@james-city.va.us
ENVIRONMENTAL DIVISION (757) 253-6670 environ@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
INTEGRATED PEST MANAGEMENT (757) 259-4116

November 19, 2001

Reinspect 12-6-01 SAT

Associated Developers Inc.
5300 Mercury Boulevard
Newport News, Va. 23605

EXT. BOOM HYD EXCAV $150 / 8HR $150/HR After

Attn: Henry Stephens

• Need BMP Road Runoff Control Plan.

Re: Mulberry Place
County Plan No.: S-35-00
County BMP ID Code: PC 137

Reinspect 10-25-02 POND SED REMOVAL OPER PHOTOS

Reinspect 11-1-02 A.R. Runoff Control Plan. 216 ADD 18" CUV APPR. CHECK 1 MORE TIME AFTER RAIN. ADD WATERBAR AT INLET.

Dear Mr. Stephens:

The Environmental Division has reviewed a record drawing and construction certification as submitted to our office on October 3rd 2001 for the above referenced project. The record drawing provides as-built information for a wet extended detention stormwater management facility located in the southeast corner of the subdivision.

Asbuilt Resubmitted Dec 2 2002

Based on our review of information as submitted and a concurrent field observation as performed on November 16th 2001, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

REINSPECT 6-27-02 OWNER PUT FENCE ACROSS ACCESS RD (GATED)

Construction Certification:

1. The construction certification dated September 24th 2001 is **satisfactory** for the facility.

Record Drawing:

✓ 12-10-02 AB AND POND EXCAV

2. Although record drawing Sheet 10 reflects various as-built spot elevations, the spot elevation information is limited to locations above permanent pool elevation (El. 78.8). The record drawing does not reflect if excavated pond depths were achieved in accordance with the approved plan. Provide additional pond bottom elevations to reflect adequate depths were achieved in the main basin and associated forebay. *(Note: The approved plan reflects a proposed bottom elevation of the main basin and forebay at El. 71.0).*

✓ OK 12-10-02

3. Record drawing Sheet 10 needs to reflect as-built invert elevations of the two storm drain pipes which outfall into the sediment forebay. (ie. Structure Numbers SS # 2-1 and SS # 1-1). Obtaining this data may need to be delayed and coordinated until such time as the forebay is cleaned in accordance with construction-related items as outlined below.

✓ OK 12-10-02

4. Confirm the diameter of the concrete riser pipe and adequately reflect size on the record drawing. Based on our field inspection, the inside diameter of the riser appeared to well exceed 36-inch size. (AB ROUTING)

✓ 12-10-02

5. Any modifications to the facility due to construction-related issues as outlined below may require revision to the record drawings.

Construction-Related Items:

6. The pond's interior (upstream) side slopes along the east side of the facility do not appear to resemble the approved design plan. The interior side slope from top of dam to the aquatic bench was approved at 4H:1V. Based on record drawing Sheet 10 (1"=50' scale) and our field observations, this interior side slope is 2H:1V or steeper on the entire east side of the facility. *(Note: This attribute was provided as one of the primary safety features for the facility. During the plan approval process, a safety bench was not provided with the understanding that a flatter interior basin side slope of 4H:1V was to be utilized. Refer to Environmental Division comments dated August 11, 2000, comment # 14 and subsequent response by the engineer dated August 15th 2000).*

7. Less than 30 percent of the pond fill embankment has surface grass stabilization and there are portions of the downstream east embankment which are bare with neither mulch or erosion control matting. A 30 ft. long by 12 ft. wide bare soil area is present at the middle portion of the downstream embankment at the east side toe. Better stabilization with grass covering is necessary on the entire fill embankment. *(Note: It appears that lack of adequate topsoil may be primary cause of inadequate vegetation establishment on the dam embankment.)*

8. Once properly stabilized with permanent vegetation, remove silt fence present along the entire downstream embankment toe.

9. Repair erosion on the interior basin fill embankment slope near the sediment forebay. The forebay is located at the southwest corner of the basin.

10. Clean and remove sediment (2 to 4 ft. deep) from within the entire sediment forebay. Establish the bottom elevation of the forebay back to design grade and ensure rock outlet protection is provided at the two pipe outfalls in accordance with the approved plan. Also, clean and remove sediment from the 18-inch and 30-inch storm drain pipes which outfall into the sediment forebay. The outfall pipes had 12 to 18-inches of sediment buildup on end sections and within the pipes. *(Note: The storm drain pipe outfalls were visible at the time of our field inspection.)*

11. Repair surface rill and gully erosion around the entire sediment forebay (10 ft. width) and stabilize with seed and mulch.

12. Repair erosion at the downstream end of the rock check dam which forms the sediment forebay. The erosion is on the main basin side of the rock check.

13. Plantings, in accordance with the approved plan, were not present along the aquatic bench.

14. Final grading is necessary in the south corner of the basin near the riser structure. Piles of soil were present rather than a uniformly graded slope.

15. Based on the provisions of the approved plan, one foot of separation was supposed to be present between the elevation of the riser crest (El. 83.3) and the emergency spillway (El. 84.3). Based on the record drawing , the crest elevation of the riser structure is 4-inches higher than plan and the crest elevation of the emergency spillway is approximately 4-inches lower than plan; thus resulting in a separation between riser crest and emergency spillway crest of 0.36 feet, rather than 1 foot. The crest of the riser structure should be constructed closer to approved design plan elevation.

16. Explain why concrete pipe, greater than plan specified 36-inch diameter, was utilized for the riser structure. Based on rough field measurements, the inside diameter of the riser pipe approximated 42-inch size pipe.

✓ 17. Ensure the 3-inch diameter turn-down PVC pipe on the riser is not clogged and the end of the pipe is open. Based on our inspection, there appeared to be an end cap on the 3-inch pipe on the pond (water) side. Flow through the 3-inch pipe into the riser should not be obstructed.

12-6

✓ 18. Clean vegetation from on and around the grate on storm drain structure # 2-2. This is the grate on the upstream side of the 18-inch pipe into the pond.

12-4

✓ OK 6-27-03

19. The cut slope located in common area just west of the gravel access road along the west side of the basin has rill and gully erosion and portions of the slope are not stabilized. Also, drainage from this same cut slope is concentrating at the toe of slope and traversing along the west side of the access road. This concentrated drainage is causing erosion along the gravel access road and across the road at the low point near the basin. This drainage and soil erosion problem needs resolved.

CORRECTED BUT MONITOR BEFORE OK

6/27/03 Road & toe stable, no sign of erosion OK.

In general, based on our review of the information as submitted, field inspection of the BMP area and construction-related items as noted above, the BMP has not yet been fully converted from temporary sediment basin mode to final permanent BMP mode. In addition, the tributary area to the BMP is largely in an active state with a considerable amount of single family construction yet to be performed. Therefore, conversion to final BMP mode may be premature; however, prior to release of bond all above related items are required to be addressed.

Once this work is satisfactorily completed, contact our office appropriately for reinspection of the BMP. Only then can we proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Beth Davis, at 757-253-6702 if you have any further comments or questions.

Sincerely,

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

cc: Charles Records, AES (via fax)
Danny Johnson, C. Lewis Waltrip (via fax)

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

County BMP ID Code (if known): _____

Name of Facility: _____ BMP No.: _____ of _____ Date: _____

Location: _____

Name _____ of Owner: Dam in RPA - need to remove trees

Name _____ of Inspector: Plng - remove trees - are they reqd to keep the trees

Type _____ of Facility:

Weather Conditions: _____ Type: ❒ Final Inspection ❒ County BMP Inspection Program ❒ Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height			X	Dam needs to be mowed + grass
Vegetation Condition			X	established - dam covered by
Tree Growth			X	trees, shrubs
Erosion				
Trash & Debris				
Seepage				
Fencing or Benches				
Interior Landscaping/Planted Areas: ❒ None ❒ Constructed Wetland/Shallow Marsh ❒ Naturally Established Vegetation				
Vegetated Conditions				
Trash & Debris				
Floating Material				
Erosion				
Sediment				
Dead Plant				
Aesthetics				
Other				

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

S-35-00

County BMP ID Code (if known): PC 137

Name of Facility: Mulberry Place BMP No.: 1 of 1 Date: 11/16/01 3:20pm

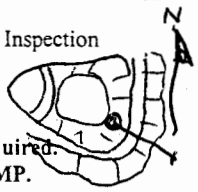
Location: ~~Associated Developers~~

Name of Owner: Associated Developers

Name of Inspector: SJ Thomas

Type of Facility: Wet Ext Det

Weather Conditions: Sunny Mild 70's Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection



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

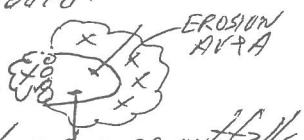
Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	EAST D/S EMB 3H:1V; D S SOUTH 6H:1V; US EAST 2H:1V; 3H:1 elsewhere.			
Grass Height		X	X	Very Little; < 30% coverage
Vegetation Condition		X	X	Matting OK BUT NO GRASS, Very Little topsoil. Bare spot on dam.
Tree Growth	X			No Trees. OK
Erosion	X			Some Rill erosion where no grass.
Trash & Debris		X		None on emb. SF D/S Toe.
Seepage	X			None Observed
Fencing or Benches	X			None D/S side.
Interior Landscaping/Planted Areas:	☒ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation			
Vegetated Conditions		X		Aquatic Bench, 5' No plants
Trash & Debris	X			(Not per plan)
Floating Material	X			
Erosion	X			
Sediment	X			
Dead Plant	X			
Aesthetics	X			
Other	X			
Note: LANDSCAPING on D/S toe allowed per variance (SMALL trees + shrubs)				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion		X		South Corner of basin near riser
Algae	X			None. Water Dark Brown
Trash & Debris	X			
Sediment				1' deep @ riser
Aesthetics	X			OK except no grass; bench plants.
Other				Pool 4' deep @ riser; Sed 1' deep.
Inflows (Describe Types/Locations): 18" CPP & 24" CPP outfalls into forebay. CPP end sections				
Condition of Structure	X			
Erosion		X	X	Surface Rill & Gully erosion around
Trash and Debris	X			entire forebay.
Sediment		X	X	2-4' deep in forebay
Aesthetics		X	X	Surface & Emb erosion @ forebay.
Other				Pipe outfalls visible but clogged w/ sed.
Principal Flow Control Structure - Riser, Intake, etc. (Describe Location): 36" RCP Riser w/ ASTM C478 CAP 84"				
Condition of Structure	X			by 2' (CAP 96' measured) w/ MH LID
Corrosion	X			Riser clean. Measured 44" in
Trash and Debris	X			(Note: Appear to be cap on end of
Sediment	X			PVC. Make sure it's open.)
Aesthetics	X			3" PVC ORIF (3/4 up); GV w/ EXT HANDLE
Other				Riser 16-18' deep w/ steps
Principal Outlet Structure - Barrel, Conduit, etc.: 18" RCP w/ ES-1; Outfall Channel Class I RR 6' BW; 3' D				
Condition of Structure	X			
Settlement	X			
Trash & Debris	X			1 cup.
Erosion/Sediment	X			None. Stable Condition.
Outlet Protection	X			10' wide x 70' long RIPRAP CHANNEL.
Other				No signs of deterioration in D/S Natural Channel.
Emergency Spillway (Overflow): EC-2 22 WIND; 10' BW; 18" Depth.				
Vegetation		X		NO GRASS.
Lining	X			EC-2 OK & intact.
Erosion	X			None.
Trash & Debris	X			None.
Other				
Services SF Lots & ROADS.				

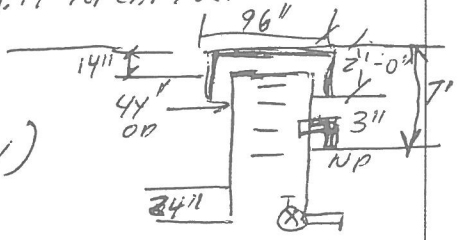
2/8/11

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	X			None.
Animal Burrows	X			
Graffiti	X			Pond remote location
Other				
Surrounding Perimeter Conditions:	North, East, South – Woods; West Subdiv.			
Land Uses	X			Pow CR Pocket wetland to North
Vegetation	X			Upstream.
Trash & Debris	X			
Aesthetics	X			Natural Wooded setting; Remote.
Access /Maintenance Roads or Paths	X			10' WIDE GRAVEL ROAD OFF MULBERRY LANE TO BMP.
Other				

Remarks:
- Portions of east u/s interior slope 2H:1V or steeper. Plan 4H:1V to Bench too steep. (other areas 3H:1V)
- Grass < 30% of fill embankment. Matting & mulch ok, just no grass. Appears to be very little topsoil on areas to be seeded.
- Remove SF along entire d/s toe once emb is stabilized with grass.
- Middle section of north d/s face of dam at toe is bare (30x12). TOP BARE w/MULCH
- Fix u/s emb erosion in back corner of embankment at forebay.
- Aquatic bench plants not present per plan.
- Grade South Corner of basin near riser. Soil is piled, not graded.
- Clean 18" & 24" pipe outfalls of sediment (12-18" thick)
- Repair rill & gully erosion around entire forebay (20' wide)



- Clean + Remove sed in forebay (entire) 2-4' deep. Establish back to design bottom elev. Ensure RR OP are present at SD pipe outfalls.
- Riser appears greater than 36" ID (44" measured). 14" TOP CAP TO CREST. 7' NP TO TOP CONC CAP.
- The 3" PVC turn down orifice appeared to have an end cap on the pond side end. Ensure 3" PVC is open.



- ES: EC-2 Liner OK, NO GRASS, 3 (STABILIZATION)

Overall Environmental Division Internal Rating: 3

- FIX EROSION AT D/S END OF ROCK FOREBAY
- CLEAN VEG FROM #12-2 GRATE.

Signature: [signature] **Date:** 11/16/01 4:12 pm

Title: Civil Engineer ENV DIV

SLOPE ALONG ROAD + PALMETTO

SWMProg\BMP\CoInspProg\DetRet.wpd

Facility Item	O.K.	Routine	Urgent	Comments
Notes:				
Water Pools: ❒ Permanent Pool (Retention Basin) ❒ Shallow Marsh (Detention Basin) ❒ None, Dry (Detention Basin)				
Shoreline Erosion				
Algae				High levels
Trash & Debris				
Sediment				
Aesthetics				
Other				
Inflows (Describe Types/Locations):				
Condition of Structure				
Erosion				
Trash and Debris				
Sediment				
Outlet Protection				
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure				
Corrosion				
Trash and Debris				
Sediment				
Vegetation				
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure				
Settlement				
Trash & Debris				
Erosion/Sediment				
Outlet Protection				
Other				
Emergency Spillway (Overflow):				
Vegetation		X		Bottom well vegetated but need to
Lining	X			remove trees for a distance to prevent
Erosion				flow being impeded
Trash & Debris				
Other				

Facility Item	O.K.	Routine	Urgent	Comments
Notes:				
Nuisance Type Conditions:				
Mosquito Breeding				
Animal Burrows				
Graffiti				
Other				
Surrounding Perimeter Conditions:				
Land Uses				
Vegetation				
Trash & Debris				
Aesthetics				
Access /Maintenance Roads or Paths				
Other				

Remarks:

Overall Environmental Division Internal Rating: ___ _____

Signature: _____ **Date:** _____

Title: _____

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WATERSHED	PC	MAINTENANCE PLAN	No	CTRL STRUC DESC	RCP Riser
BMP ID NO	137	SITE AREA acre	27.81	CTRL STRUC SIZE inches	36
PLAN NO	S-35-00	LAND USE	Gen Resid	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(31-03)(01-33)	old BMP TYP		OTLT BARRL SIZE inch	18
PIN NO	3130100033	JCC BMP CODE	A3 Wet ED Pond		
CONSTRUCTION DATE	9/12/2001	POINT VALUE	10	EMERG SPILLWAY	Yes
PROJECT NAME	Mulberry Place			DESIGN HW ELEV	84.23
FACILITY LOCATION				PERM POOL ELE	79.1
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	21.08	2-YR OUTFLOW cfs	0.47
CURRENT OWNER	Mulberry Place LLC			10-YR OUTFLOW cfs	11.41
OWNER ADDRESS	5300 Mercury Blvd.			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	SF Lots, Roads & Offsite area		
CITY-STATE-ZIP CODE	Newport News, Va. 23605	IMPERV AREA acres	8.64	CONSTR CERTI	Yes
OWNER PHONE		RECV STREAM	UT of Powhatan Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	1.44	INTERNAL RATING	
		CHAN PROT CTRL	Yes	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	1.16		
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	Yes		

Get Last BMP No

Return to Menu

Mulberry Place Homeowners Association

3735 Mulberry Lane
Williamsburg VA 23188

William F. Nicholson
Vice President Bill

Phone: 757-564-8435
Email: vp@mulberryplace.org

Ted

PC137_MULBERRY_PLACE - 184

ENVIRONMENTAL DIVISION REVIEW COMMENTS
WARHILL GREEN
COUNTY PLAN NO. SP – 98 - 04
September 3,2004

MDW/SJT

(Note: At this time, the Environmental Division does not recommend preliminary approval for the project due to issues associated with the lack of a defined, adequate natural receiving channel from the proposed BMP for the project.)

General Comments:

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

2. Water and sewer inspection fees, as applicable, must be paid in full prior to issuance of a Land-Disturbing Permit.

3. A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facilities associated with this project.

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

5. VPDES. It appears land disturbance for the project may exceed one (1) acre. Therefore, it is the owner's responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. Contact the Tidewater Regional Office of the DEQ at (757) 518-2000 or the Central Office at (804) 698-4000 for further information.

6. Offsite Work. Plan Sheet 5 shows offsite grading on the south side of the project (for proposed contours 103 and 104) on the n/f Cora Lee Green parcel, for sanitary sewer on the east side of the project on the n/f Mulberry Place Subdivision parcel and for installation of 120 l.f. of underdrain from the dry swale BMP. Provide evidence of permission to occupy or disturb the offsite adjacent tract from the parcel owners.

7. Watershed. Provide a note on the cover sheet of the plans indicating that this project is situated in Subwatershed 204, Catchment 204-101-1 of the Powhatan Creek watershed of James City County.

8. Powhatan Creek. This project is situated in the Powhatan Creek watershed. Please note the James City County Board of Supervisors, by resolution dated February 26th 2002, adopted eight (8) goals and 21 priorities associated with the Powhatan Creek Watershed Management Plan. This project is subject to the contents of that plan. The owner, applicant, developer and plan preparer should be advised of and completely review the goals, priorities (tools) and entire contents of this study as it applies to the site, including sub-watershed maps, as layout and design of the proposed project

could be affected by and should remain consistent with these items. Refer to the watershed management plan and the associated sub-watershed maps for environmental sensitive areas, features and/or recommendations that may apply to the sub-watershed in which the project area is situated. Specific items that may apply include: stream buffers; onsite stormwater management; on-lot stormwater practices; and a watershed education target area.

9. Label. Label the Longhill Grove apartment projects as County Plan No. SP-44-03 on all sheets as applicable.

Chesapeake Bay Preservation:

10. Percent Impervious. Show percent impervious of the site in the site data tabulation on Sheet 3.

11. Limit of Work. Show the limit of work, including offsite areas and utility connections, on environmental inventory Sheet 2.

12. Provide an environmental inventory certification pursuant to Section 23-10(2)(c) of the Chesapeake Bay Preservation ordinance. This is important for this review case as the result of the inventory on Sheet 2 shows no components on the site.

Erosion & Sediment Control Plan:

13. Temporary Stockpile Areas. Show any temporary soil stockpile, staging and equipment storage areas (with required erosion and sediment controls) or indicate on the plans that none are anticipated for the project site.

14. Offsite Land Disturbing Areas. Based on grading plan Sheet 5, it appears the site may require the importation of fill to achieve proposed site grades. Identify any offsite land disturbing areas including borrow, waste, or disposal sites (with required erosion and sediment controls) or indicate on the plans that none are anticipated for this project.

15. Limits of Work. Show and label a distinct limit of work (clearing and grading) around the site periphery on Sheets 4 and 5. Be sure to include offsite work associated with installation of erosion and sediment controls, utility connections and BMP appurtenances. Ensure disturbed area estimates match land-disturbance inclusive within the limits of work.

16. Sequence of Construction. The following comments pertain to the sequence of construction as presented on Sheet 5:

    16a. Move the sequence to the Phase 1 E&SC plan Sheet 4.

    16b. In Step # 9, state that all topsoil shall be removed to *an approved offsite area* or show onsite locations.

    16c. A "boxed" note on Sheet 4 indicates that the placement of some initial fill is required by the contractor in order to properly achieve positive drainage of disturbed areas to proposed sediment traps # 1 and # 2. If this is the case, show an approximate location of this feature area and show this step in the sequence of construction.

17. Narrative. Based on our site plan review meeting on August 23rd and a subsequent site visit as performed with the applicant and plan preparer on August 25th 2004, the Environmental Division does not agree with the last line in the "existing site conditions" narrative on Sheet 5. It appears that there is no defined, natural receiving channel for temporary sediment trap # 3 and the primary BMP through the Mulberry Place natural open space, especially in the upper (west) portion of the open space directly adjacent to the tract line for Warhill Green. An adequate channel or site design must be provided in compliance with the provisions of Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations. (*Note: See further discussion in the stormwater management/drainage comments below.)*

18. Sediment Traps. As discussed and resolved at the site plan review meeting held on August 23rd 2004, due to the potential for the concentration of drainage onto adjacent, offsite properties proposed sediment traps # 1 and # 2 are to be removed from the plan and replaced with super-silt fence, if silt fence measures can be implemented in accordance with Minimum Standard & Spec. 3.05 of the VESCH for drainage area, slope length, etc. Perimeter silt fence may be able to be utilized effectively if design parameters per the VESCH are not exceeded and runoff from disturbed site areas can be maintained in a sheet (overland) flow conditions, consistent with current (predevelopment) conditions. Also, the location of sediment trap # 1 appears to conflict with the placement of proposed sanitary sewer for Buildings A and B.

19. Demolition Work. The "offsite areas" portion of the E&SC narrative on Sheet 5 indicates that two existing site entrance need removed. Although in the narrative, graphically show the approximate locations of the two existing entrances scheduled for removal.

20. Dust Control. Add dust control measures in accordance with Minimum Standard 3.39 of the VESCH to the erosion and sediment control plan for the site. Dust control may be warranted due to the proximity of the project to Centerville Road, Mulberry Place and Longhill Apartments.

21. Playground. It would appear a cross-culvert/trail is needed across the south dry swale to access the proposed playground in the east part of the site.

Stormwater Management / Drainage:

22. BMP Outfall. As a result of a site plan review meeting held between the plan preparer and County staff on August 23rd and a field meeting held between the applicant, plan preparer and County staff on August 25th 2004, the current arrangement of the outfall from the primary BMP for the site onto natural open space (n/f Mulberry Place Homeowner Association) is ***not*** acceptable. Firstly, it is not preferred to clear dedicated natural open space on offsite adjacent property to install 120 ft. of discharge drain pipe for the dry swale BMP. Secondly, if this were the only option, to properly perform this per the current plan, evidence of an offsite drainage easement of adequate width would be necessary from the offsite owner. Thirdly, staff does not feel that an adequate, defined natural receiving channel exists along the natural open space and Lots 21 through 24 in Mulberry Place to properly outflow discharges from the proposed BMP facility. Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations is clear and specific about the need for defined, adequate receiving channels from development sites and BMP outfalls. Per Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations, concentrated runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. Minimum Standard # 19 also states that outfall from a detention facility shall be discharged to a receiving channel. Technical Bulletin No. 1 by

the Virginia DCR further defines that concentrated runoff leaving a development site, to include discharge from stormwater facilities, must be discharged into an adequate channel and a natural channel is defined as a conveyance with a defined cross-sectional flow area. This is a critical issue that must be resolved prior to any approvals from the Environmental Division. Therefore, provide offsite drainage improvements (and drainage easements) to adequately convey design and overflow discharges from the BMP to an acceptable, defined downstream natural receiving channel location; or alternatively, provide a site design and/or infiltration type BMP so that increased runoff from the development site can be fully infiltrated and not become surface runoff. This would require providing proper supporting geotechnical and hydraulic design information which clearly show no detrimental effects downstream.

23. Site Hydrology. Due to changes in site grading and impervious cover, it would be expected that the time of concentration would change more significantly between pre- and postdevelopment conditions. Currently site hydrology shows postdevelopment only 36 seconds shorter than predevelopment. *(Note: Currently the predevelopment 2-year storm discharge from the site is shown at 1.73 cfs. It would appear that the length of overland flow for predevelopment time of concentration computations is well more than 100 feet. A longer overland flow length would increase the time in the overland flow component thus increasing the overall time of concentration and lower the peak discharge value. It is our opinion that predevelopment discharge for the 2-year storm is being slightly inflated in an attempt to show that discharge from the BMP is lower than traditional 2-year predevelopment levels.).*

24. Dry Swale BMP. The following comments pertain to the dry swale BMP (County type E-2) designs for the project:

    24a. Label the dry swales BMPs as County type E-2 BMPs.

    24b. Provide a typical section for the dry swale BMP, in it's typical arrangement along the north and south property lines, consistent with channel geometry dimensions in the design report (ie. bottom width, channel depth, side slopes of the channel and the permeable soil/underdrain arrangement. Reference schematic E-2 (Figure 16) of the County BMP manual.

    24c. North and south dry swale applications should have engineered soil media and underdrain throughout their entire length, not just select portions.

    24d. The check dams shown in the dry swale BMPs on Sheets 5 and 11 should be temporary for erosion and sediment control purposes, not permanent. Firstly, a check dam is not a feature of a dry swale BMP, but a wet swale per the County BMP manual and the VSMH. Also, page 51 of the County BMP manual does not recommend wet swale applications for residential development as they can create potential nuisance or mosquito-breeding conditions.

    24e. All dry swale details should provide a note referencing Minimum Standard & Spec. 3.13 of the VSMH and Group E (Open Channel System) requirements of the County BMP manual.

24f. As it appears the access roadway/parking area which drains to the north dry swale does not have curb and gutter and will drain to the swale via overland flow; therefore, a pea-gravel diaphragm or other acceptable form of pretreatment is necessary. Refer to page 51 of the County BMP manual.

24g. Provide computations to show maximum ponding time in the dry swale is no more than 48 hours.

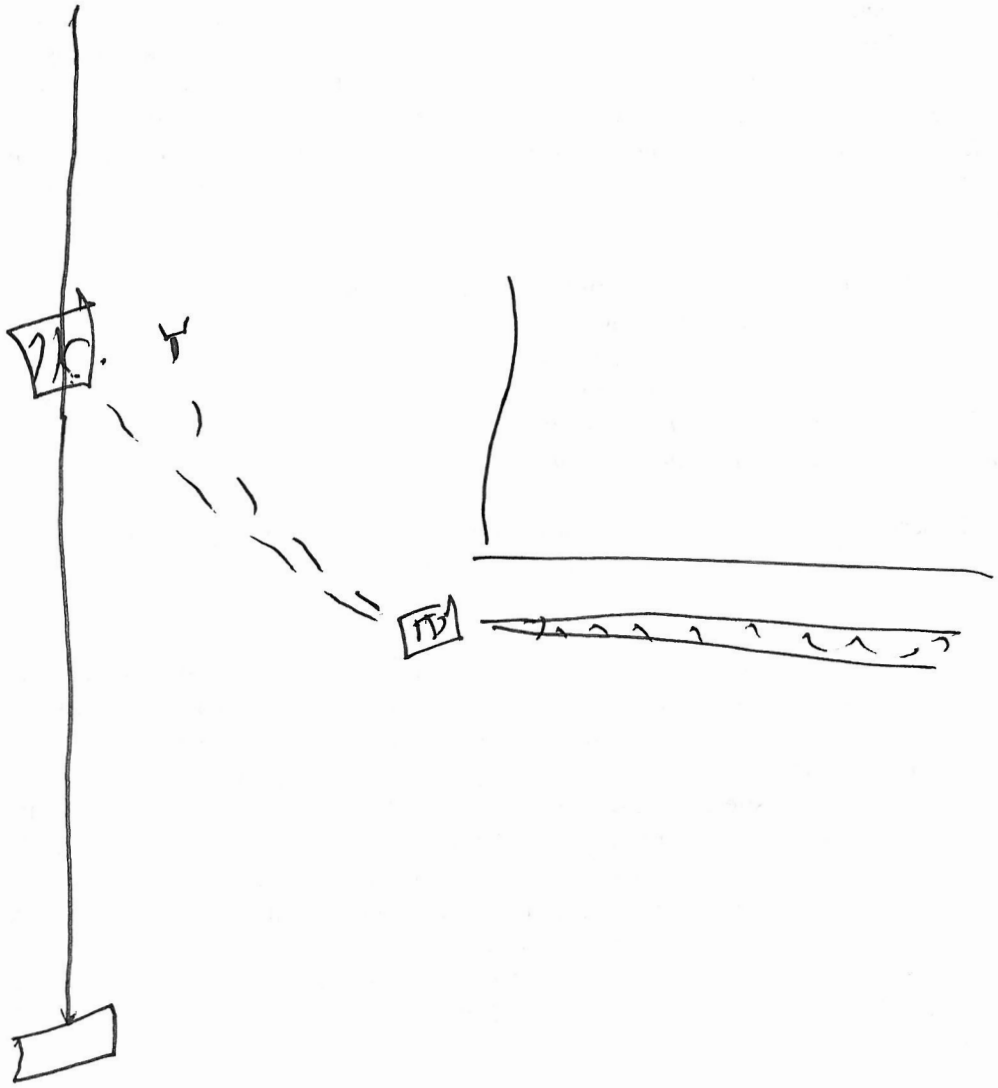
24h. Landscaping. Trees should not be placed directly in the bottom of the dry swale as they could result in flow obstructions and root systems could affect filtering capability and directly damage the underdrain system.

25. BMP Worksheet. The BMP worksheet provided for the project shows 9.79 BMP points using structural methods. Receipt of a waiver request dated August 23rd 2004 is acknowledged. The waiver request cannot be processed accordingly until many of the issues as outlined above are resolved, especially those associated with the type of BMP and outfall arrangement. *(Note: It is possible that the south dry swale may treat some offsite area from the n/f Cora Lee property or Mulberry Place to make up the point differential; however, no drainage map was provided and existing contour information on the adjacent tract is lacking.)*

26. Stormwater Channel. Ensure the stormwater conveyance channel, as situated on the Longhill Grove apartment site between Building Units 7, 8 and 9 (per plan SP-44-03) and the north border of the Warhill Green site is in place and functional to serve as an overflow mechanism should the north dry swale fail or overflow for storms greater than the 10-year frequency. Refer to Item # 2.12 of the *James City County Environmental Division, Stormwater Drainage Conveyance Systems, General Design and Construction Guidelines.*

27. Other. Describe briefly how the rooftop-downspout drainage will be handled around the three building units, including if it be disconnected into yard areas or discharge directly into the dry swales.

28. Low-Impact Design. Use of low-impact development principles and techniques are fully encouraged for use in site design to reduce and control impacts associated with increased stormwater runoff. This includes minimizing disturbance, minimizing impervious area, disconnection of impervious areas, saving existing trees, preserving existing topography and HSG A&B soils, use of flatter site grades, reduced slope heights, increasing time of concentration flow paths, maintaining sheet flow, increasing surface roughness coefficients, use of wide and flat stormwater conveyance channels, clustering landscaping in flow paths, minimizing use of onsite storm drain pipe, on-lot stormwater management, encouraging infiltration and use of bioretention cells with appropriate landscaping. (*Note: As environmental inventory soils map Sheet 2 shows the east portion of the site is situated on 11C, Craven-Uchee and 18B, Kempsville fine sandy loam,, the feasibility exists to explore use of infiltration and/or filtering system type BMPs at this location.)*



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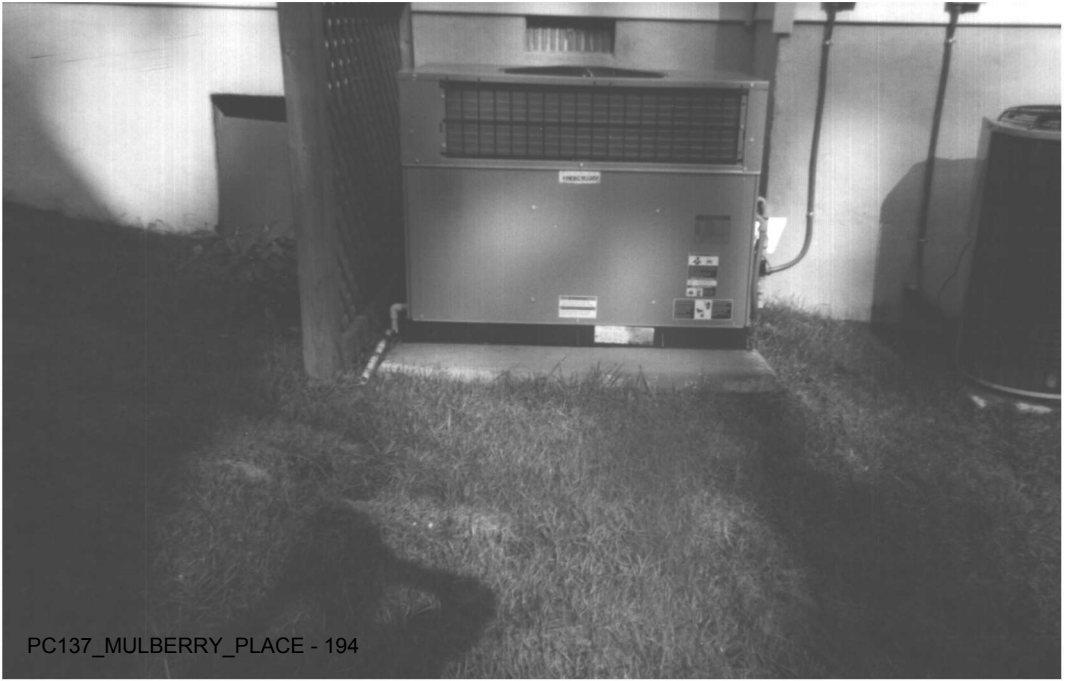
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PC137_MULBERRY_PLACE - 195

PC137_MULBERRY_PLACE - 197

DON'T LOOK
CONSTRUCTION AHEAD

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PC137_MULBERRY_PLACE - 200

PC137_MULBERRY_PLACE - 201

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PC137_MULBERRY_PLACE - 203

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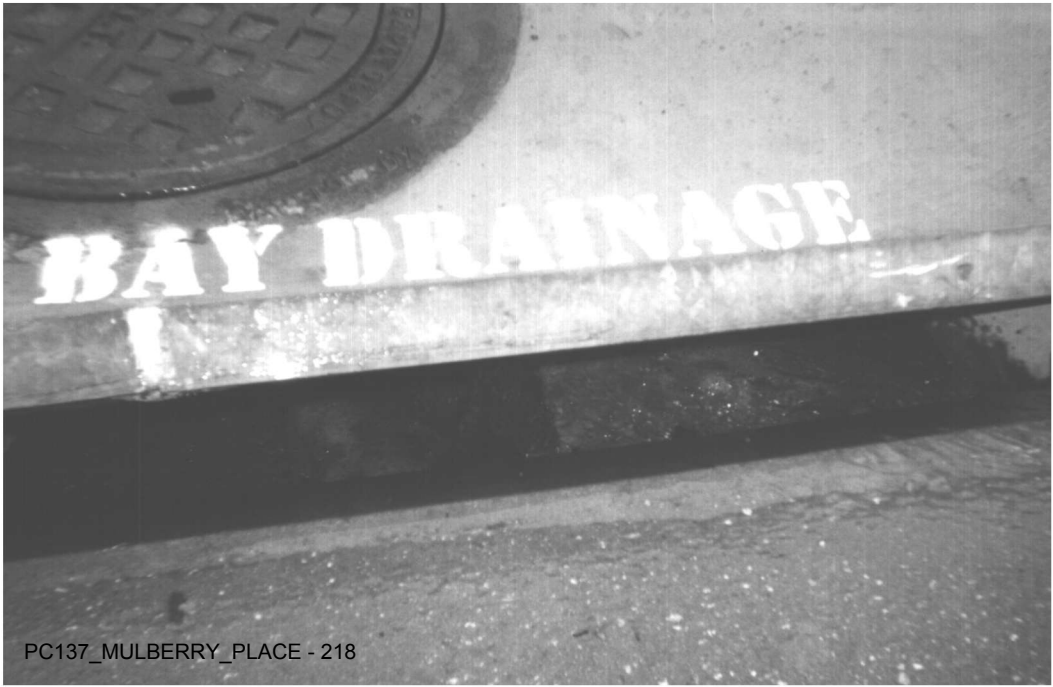

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PC137_MULBERRY_PLACE - 221

COPY

APPLICATION FOR BUILDING PERMI

101-E Mounts Bay Road, P.O. Box 8784, Williamsburg, VA 23187-8784
(757) 253-
FAX: (757) 259-

Office Hours: Mon-Fri 8:00 a.m. - 5:00

CONTRACTOR INFORMATION
License No. 2701 026661
Company Name Wayne Harbin Bldr Inc
Street Address 4514 John Tyler Hwy, Ste H
City Wmsbg State VA Zip 23606
Phone No. ( ) 220-8860 Fax. No. ( ) 220-8853
E-Mail Address
Signature: H. Robertson
Print Name: H. Robertson

OWNER INFORMATION
Name
Address
City State Zip
Phone No. ( ) Fax. No. ( )
E-Mail Address
Signature: Same
Print Name:
Agent:
Print Name:

DESCRIPTION OF WORK
Single family

SAME AS PLAN NUMBER 97-8 (Lists Options)

(For Commercial Projects Only)
Site Plan No. Date Approved

LOCATION OF WORK
Tax Map No. (-) (31. 3. 13 . 23)
Street Address 3796 Mulberry Lane
City Wmsbg State VA Zip 23185
Zone Subdivision Mulberry Place

MECHANICS' LIEN AGENT
Name: Joe Catchum
Address: 1 Old Oyster Pt Rd, Ste 210
City NN State VA Zip 23
Phone No. ( ) 249-7100 Fax. No. ( ) 249-

BUILDING INFORMATION
Stories 2 No. Rooms 8 No. Baths 3 No. Bath Fix. 10
No. Fireplaces 1 Type direct vent
Exterior Finish: (Vinyl, Brick, Wood, Other)
Interior Finish: (Gypsum wallboard, Wood, Other)
Flooring: (Carpet, Wood, Vinyl, Other)
Roofing: (Asphalt-Fiberglass, Wood, Other)
Heat Type: (Gas, Heatpump, Electric, Other)
Air Conditioning-Type: (Central, Window, None)

Floor Area (sq.ft.) 2662
(Do not include Basement, Garage, and Deck/Porch)
Deck (sq.ft.) 120
Porch (sq.ft.) 64
Basement Area (sq.ft.) —
Garage Area (sq.ft.) 452
Total Area (sq.ft.) 3298

Septic ____ Public Sewer ✓ Grinder Pump ____
Well ____ Public H_2O ✓

Estimated Construction Value 122,000 (Do not include Lot $)

OFFICE USE ONLY

Same As 97-8

Lot Width 81
Lot Depth 107.49
Front Property Line 36.17
Right Property Line 19.69
Left Property Line 10.39
Rear Property Line 35

PERMIT NO. 03-0962
LINE NO. 03-0200
Date/Time In 2/18/03
Date Plan Reviewed

Improvement Code 01
Structure Used As SFD
Use Group R4
Occupancy Load
Type Construction 5B
Zoning Approved ✓ mcb
Zoning Disapproved
Plan Approved ✓ mcb
Plan Disapproved

PLAN REVIEW FEE 0
PERMIT FEE 362.78

Notes: SS by ECS Law-M
Zoning ok per mcb
0 Deed Fed Survey + Ab
Tx 5 ok per ccd 1/13

Permit Agreement in Lieu of an Erosion and Sediment Control Plan for a Single-Family Residence in a Subdivision

COPY

Building Permit No.: 3196 Subdivision: Mulberry Plac

Address: ~~3789~~ Mulberry Lane

In lieu of submission of an erosion and sediment control plan for the construction of this single-family dwelling, I agr comply with the limitations and conditions of this agreement to prevent off-site sedimentation. In addition, I agree to co with any requirements determined necessary by employees of JCC Development Management if upon field inspection measures employed on-site are found to not be effective in controlling off-site sedimentation. Such requirements sha based on the conservation standards contained in the Virginia Erosion and Sediment Control Handbook and shall repr the minimum practices necessary to provide adequate control of erosion and sedimentation resulting from this projec

REQUIREMENTS:

1. The site, work, materials, and plans shall be available at all times for inspections by duly authorized officials of J City County.
2. Clearing or grading is permitted only in areas so designated and approved on the project plans. No storage of mat or land disturbance is permitted outside of the limits of clearing. Areas not to be disturbed shall be protected by fer methods approved by the Environmental Division and shall be maintained throughout construction. Acceptable fer methods are presented in the Virginia Erosion and Sediment Control Handbook (VESCH), Specification 3.38, include snow fence, board fence, cord fence, plastic fence, earth berms and silt fence.
3. The owner/developer shall in all cases install a sediment control structure at the time of initial land disturban prevent off-site sedimentation. Such sediment control structures shall be silt fences, gravel filter berms, sediment t perimeter berms or other structures which trap sediment on the property. These structures shall be placed at the of clearing in the locations shown on the approved site plan. The location of the structures may be adjusted to er that all runoff from disturbed areas is directed to the structure.
4. All sediment control structures shall be maintained in an effective operating condition.
5. All soil stockpiles shall be protected by a sediment control measure or be seeded and covered with a mulch materi presented in VESCH Specification 3.35.
6. A construction entrance made of VDOT No. 1 or No. 3 size stone placed on a filter fabric underliner shall be inst as a first step, prior to lot clearing. All vehicle ingress and egress shall be directed over the installed constru entrance to prevent the tracking of mud onto public roads.
7. All cut and/or fill slopes greater than three (3) feet in vertical height shall be graded to a 3:1 or flatter slope.
8. This agreement does not authorize the use of any decomposable materials as fill.
9. Development shall not impair existing surface drainage or constitute a potential sediment hazard. Stormwater ru shall not be conveyed or discharged onto adjacent properties in a manner which may cause damage.
10. All disturbed areas on the lot shall be stabilized within seven days of final grading with permanent vegetation protective ground cover suitable for the time of year.

I further understand that failure to comply with the above requirements within three working days following notice by representatives of the Environmental Division could result in citation for violation of the James City County Erosion Sedimentation Control Ordinance. I also understand that noncompliance could result in revocation of this land disturb permit agreement and the building permit for which it was issued.

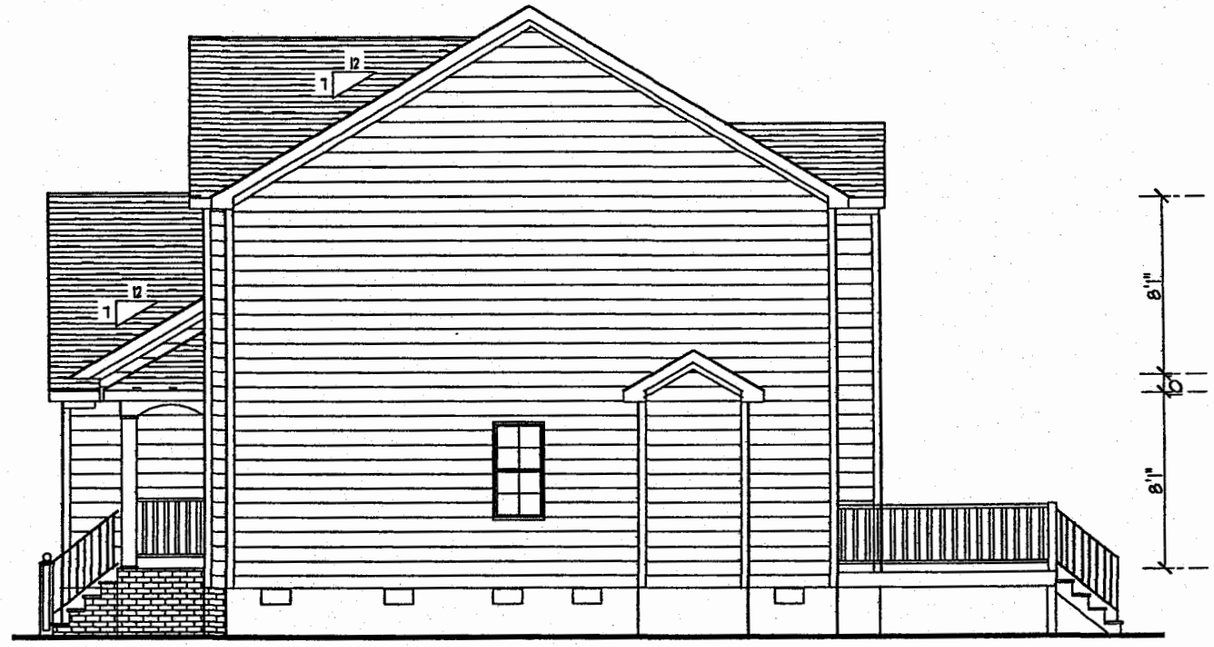
Signature of Landowner: H. Roberton

CEO Responsible Land Disturber: Peter Kozma Certificate No: 10689

(Certified by Dept. of Conservation and Recreation)

Approved By:

FRONT ELEVATION
THE ELIZABETH MODEL
MULBERRY PLACE
SCALE: 1/8" = 1'-0"

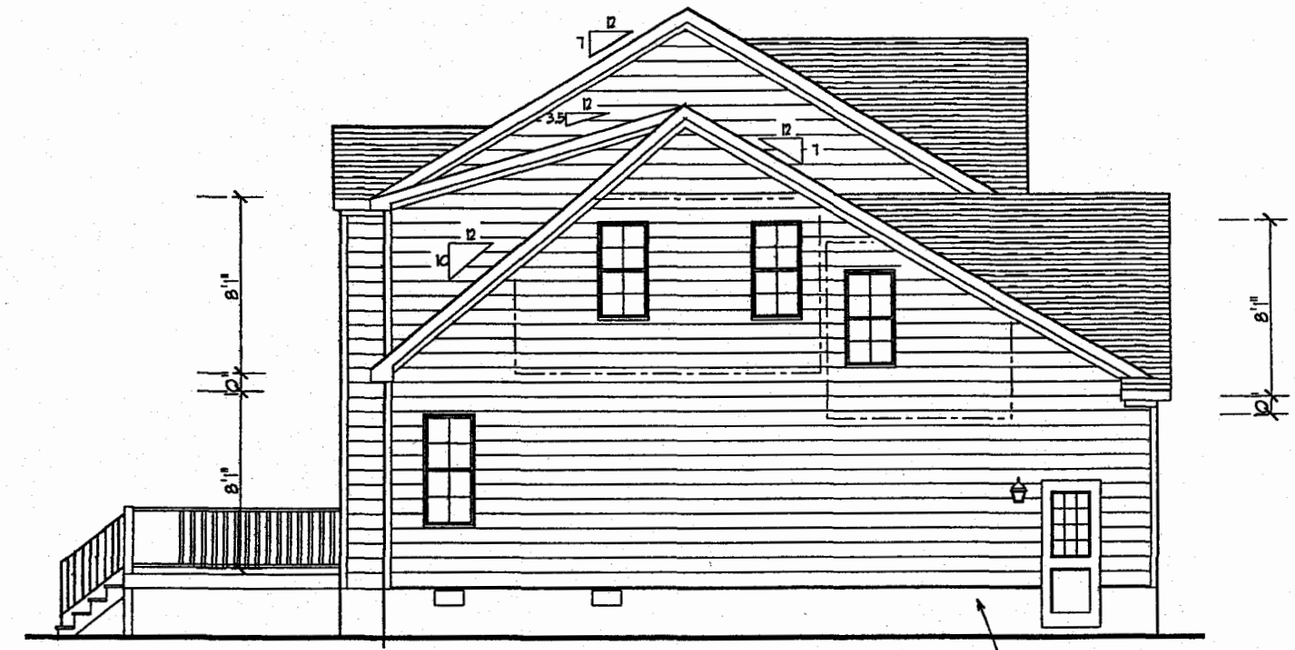


RIGHT SIDE ELEVATION

THE ELIZABETH MODEL

MULBERRY PLACE

SCALE: 1/8" =1'-0"



LEFT SIDE ELEVATION
THE ELIZABETH MODEL
MULBERRY PLACE
SCALE: 1/8" = 1'-0"

PARGED FOUNDATION
(TYP. @ SIDES AND REAR)